TRANSMISSION AND TRANSFER CASE

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MANUAL TRANSMISSION - NV4500 - SERVICE INFORMATION

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MANUAL TRANSMISSION - NV4500 - SERVICE INFORMATION

DIAGNOSIS AND TESTING

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill or an incorrect lubricant level check. A correct lubricant level check can only be made when the vehicle is level. Also allow the lubricant to settle for a minute or so before checking. These recommendations will ensure an accurate check and avoid an underfill or overfill condition. Always check the lubricant level after any addition of fluid to avoid an incorrect lubricant level condition.

Leaks can occur at the mating surfaces of the gear case, adaptor or extension housing, or from the front/rear seals. A suspected leak could also be the result of an overfill condition. Leaks at the rear of the extension or adapter housing will be from the housing oil seals. Leaks at component mating surfaces will probably be the result of inadequate sealer, gaps in the sealer, incorrect bolt tightening or use of a non-recommended sealer. A leak at the front of the transmission will be from either the front bearing retainer or retainer seal. Lubricant may be seen dripping from the clutch housing after extended operation. If the leak is severe, it may also contaminate the clutch disc causing the disc to slip, grab and or chatter.

HARD SHIFTING

Hard shifting is usually caused by a low lubricant level, improper or contaminated lubricants. The consequence of using non-recommended lubricants is noise, excessive wear, internal bind and hard shifting. Substantial lubricant leaks can result in gear, shift rail, synchro, and bearing damage. If a leak goes undetected for an extended period, the first indications of component damage are usually hard shifting and noise.

Component damage, incorrect clutch adjustment or damaged clutch pressure plate or disc are additional probable causes of increased shift effort. Incorrect adjustment or a worn/damaged pressure plate or disc can cause incorrect release. If clutch problem is advanced, gear clash during shifts can result. Worn or damaged synchro rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing hard or noisy shifts. In most cases this condition will decline as the rings wear-in.

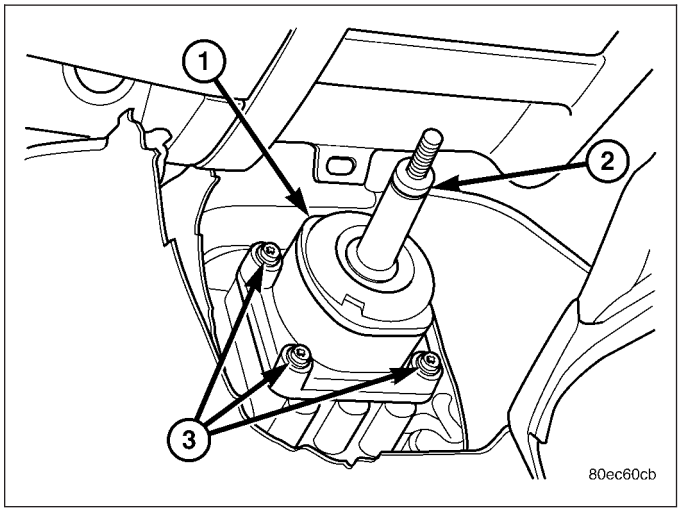
TRANSMISSION NOISE

Most manual transmissions make some noise during normal operation. Rotating gears generate a mild whine that is audible, but generally only at extreme speeds. Severe highly audible transmission noise is generally the initial indicator of a lubricant problem.

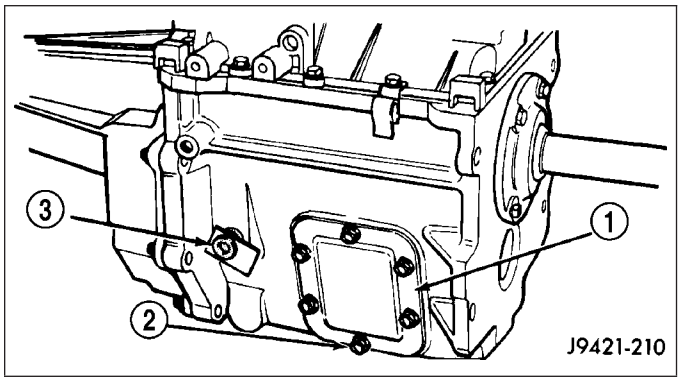
Insufficient, improper or contaminated lubricant will promote rapid wear of gears, synchros, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear breakage.

REMOVAL

1. Shift transmission into Neutral.
2. Remove shift boot screws from floorpan and slide boot upward on the shift lever.
3. Remove shift lever extension from shift tower and lever assembly.
4. Remove shift tower (1) bolts (3).



5. Remove shift tower and isolator plate from transmission shift cover.
6. Raise and support vehicle.
7. Remove skid plate, if equipped.
8. Mark propeller shaft and axle yokes for installation reference and remove shaft/shafts.
9. Remove exhaust system Y-pipe.
10. Disconnect speed sensor and backup light switch connectors.
11. Support engine with safety stand and a wood block.



12. If transmission is to be disassembled, remove drain bolt (2) at bottom of PTO cover (1) and drain lubricant.

TWO WHEEL DRIVE

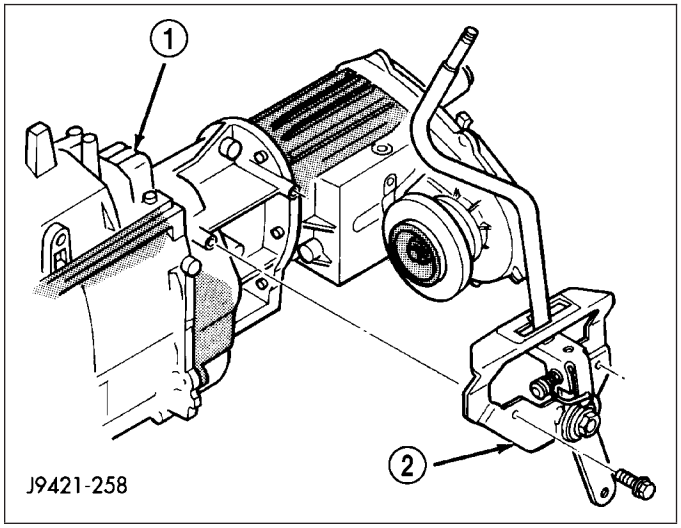
1. Remove bolts attaching transmission to rear crossmember mount.
2. Support and secure transmission with safety chains to a transmission jack.
3. Remove rear crossmember bolts and pry out crossmenber.
4. Remove clutch slave cylinder bolts and move cylinder aside for clearance.

NOTE: The hydraulic linkage has a quick connect at the slave cylinder. This fitting should not be disconnected.

5. Remove transmission harness wires from clips on transmission shift cover.
6. Remove transmission to clutch housing bolts.
7. Slide transmission and jack rearward until input shaft clears clutch housing.
8. Lower transmission jack and remove transmission from under vehicle.

FOUR WHEEL DRIVE

1. Disconnect transfer case shift linkage (2) at transfer case range lever. Then remove transfer case shift mechanism from transmission (1).
2. Support and secure transfer case to transmission jack with safety chains.
3. Remove transfer case mounting nuts.
4. Move transfer case rearward until input gear clears transmission mainshaft.
5. Lower transfer case assembly and move it from under vehicle.
6. Support and secure transmission with safety chains to a transmission jack.
7. Remove transmission harness from retaining clips on transmission shift cover.
8. Remove bolts/nuts attaching transmission mount to rear crossmember.



9. Remove rear crossmember bolts and pry out crossmenber.
10. Remove clutch slave cylinder splash shield, if equipped.
11. Remove clutch slave cylinder bolts and move cylinder aside for clearance.

NOTE: The hydraulic linkage has a quick connect at the slave cylinder. This fitting should not be disconnected.

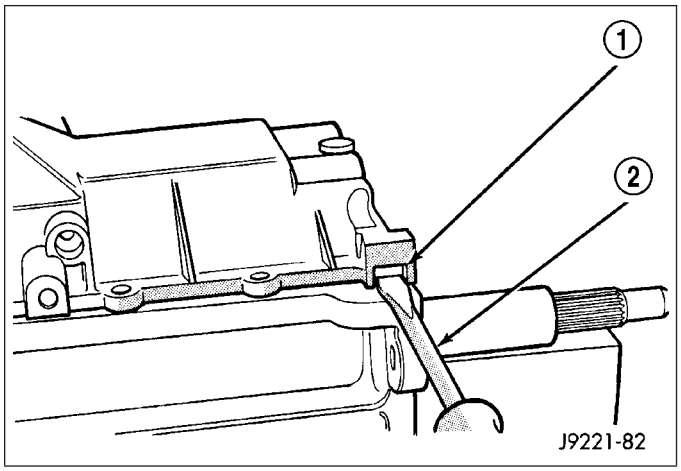
12. Remove transmission to clutch housing bolts.

13. Slide transmission and jack rearward until input shaft clears clutch housing.
14. Remove transmission from under vehicle.

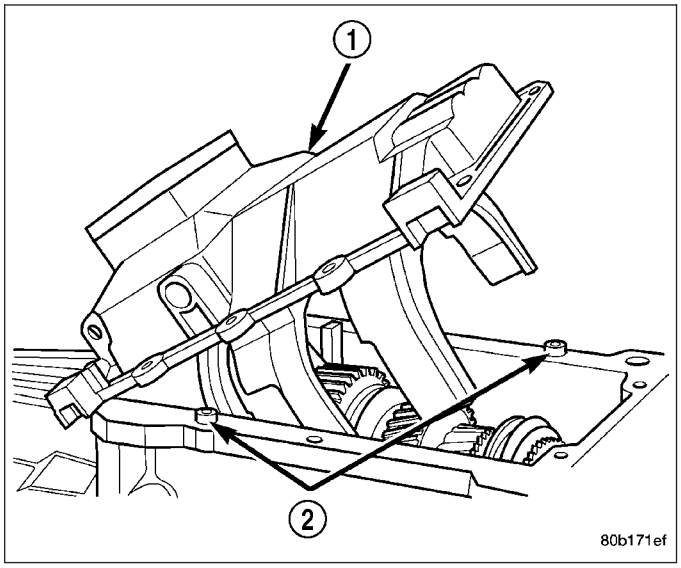
DISASSEMBLY

SHIFT MECHANISM

1. Remove bolts holding shift tower to shift mechanism cover and remove tower.
2. Remove bolts holding shift mechanism cover to transmission.
3. Pry up shift mechanism cover at slot (1) with screw driver (2).

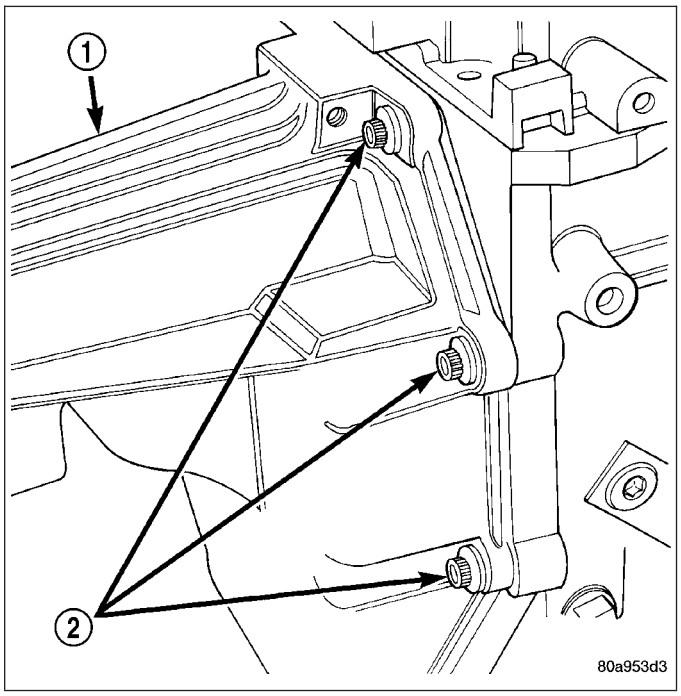


4. Raise shift cover (1) up enough to disengage it from the dowel pins (2).
5. Raise front of the mechanism and lift up and off the transmission.

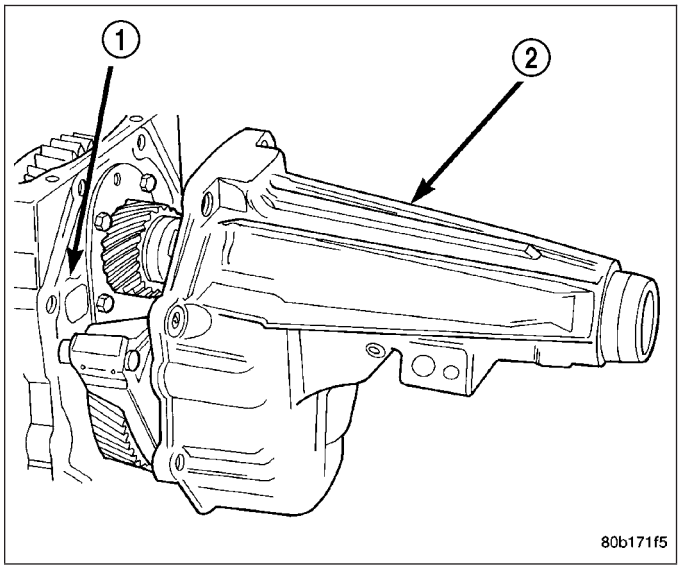


EXTENSION/ADAPTER HOUSING

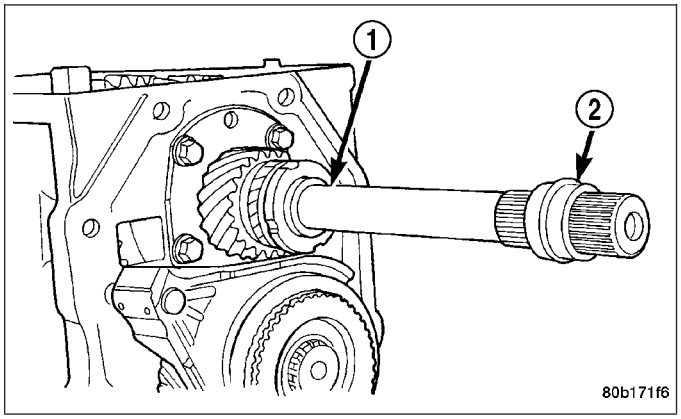
1. Remove extension/adapter housing (1) bolts (2).



2. Remove extension/adapter housing (2) from gear case (1) and alignment dowels.



3. Remove rubber spline seal (2) from end of mainshaft (1) and discard shipping seal.



FIFTH GEAR

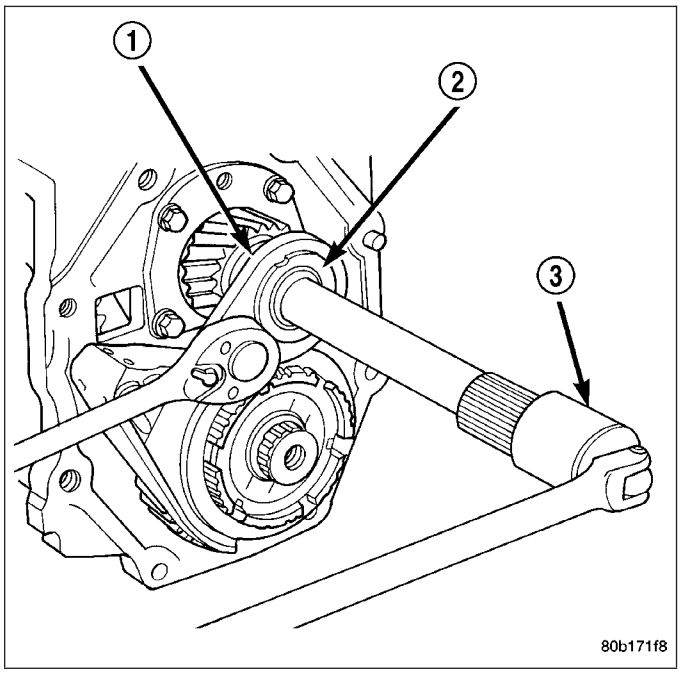
1. Remove extension/adapter housing.
2. Loosen fifth gear clamp nut clamping screw approximately 1 1/2 turns.
3. Install Wrench 6743 (1) on fifth gear nut (2).

NOTE: Wrench only fits one way on nut. Make sure wrench is fully engaged in nut slots and is not cocked.

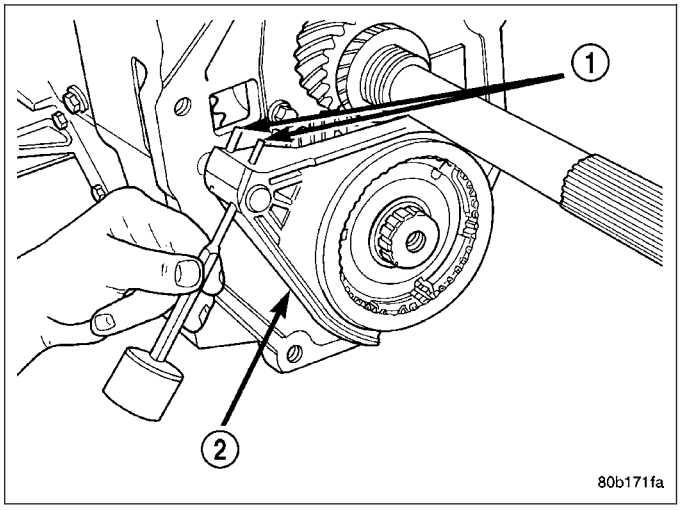
4. Install Socket 6993 4X2 or Socket 6984 4X4 (3) with breaker bar to hold mainshaft and remove fifth gear nut.

NOTE: Wedge breaker bar handle against workbench. Purpose of socket wrench and breaker bar is to prevent mainshaft from turning while nut is loosened.

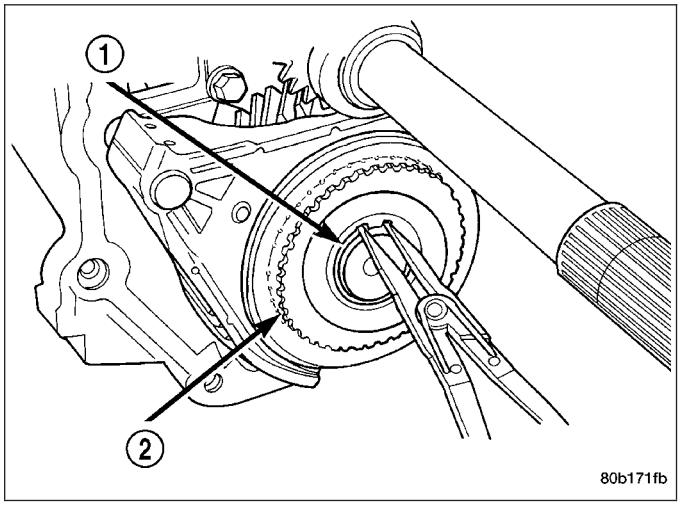
5. Remove fifth gear nut, then remove belleville washer from mainshaft.



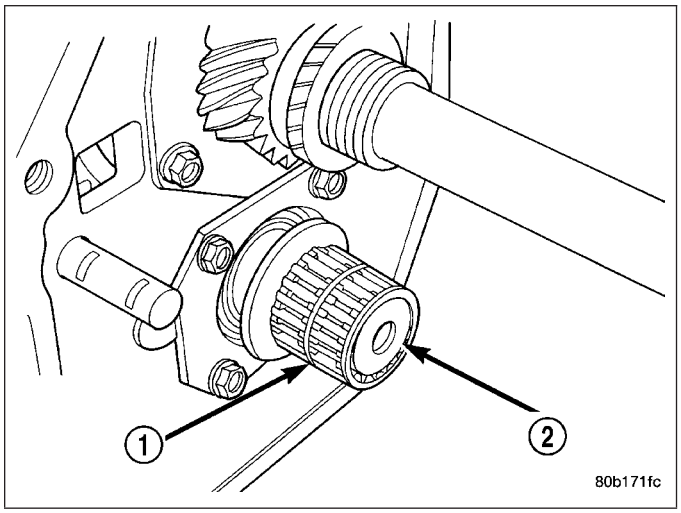
6. Remove fifth gear shift fork (2) roll pins (1). Drive roll pins out from the bottom of fork.



7. Remove fifth gear clutch hub (2) and gear snap ring (1) from countershaft.
8. Remove countershaft fifth gear clutch gear and stop ring.
9. Tap off fifth gear shift fork and gear assembly off rail with plastic mallet.
10. Remove fifth gear shift fork from sleeve.
11. Remove sleeve, struts and strut springs from countershaft fifth gear hub, if necessary.



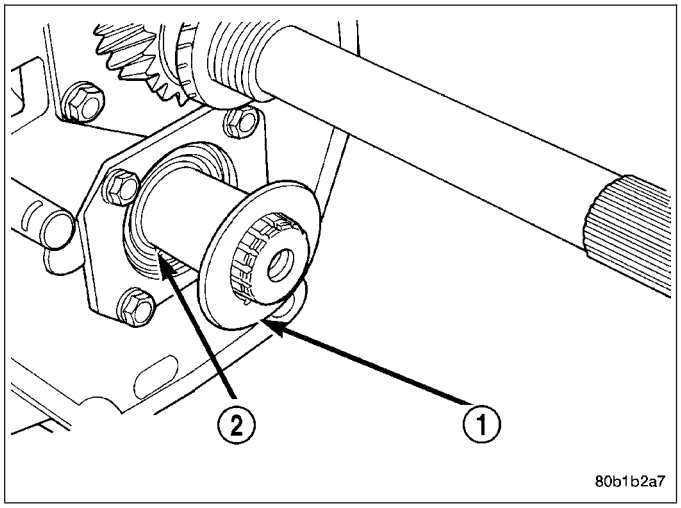
12. Remove countershaft (2) fifth gear needle bearing (1) assembly.



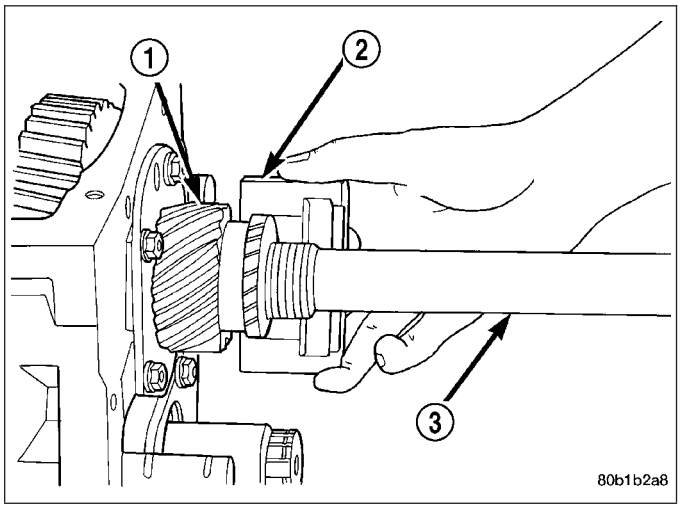
13. Remove coned shape rear bearing thrust washer (1) from countershaft.

NOTE: Note washer bore locating notch for assembly reference.

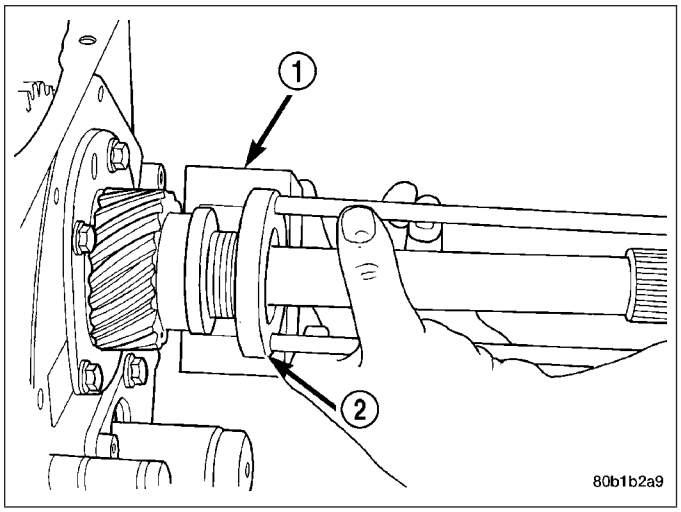
14. Remove thrust washer locating pin (2) from countershaft.



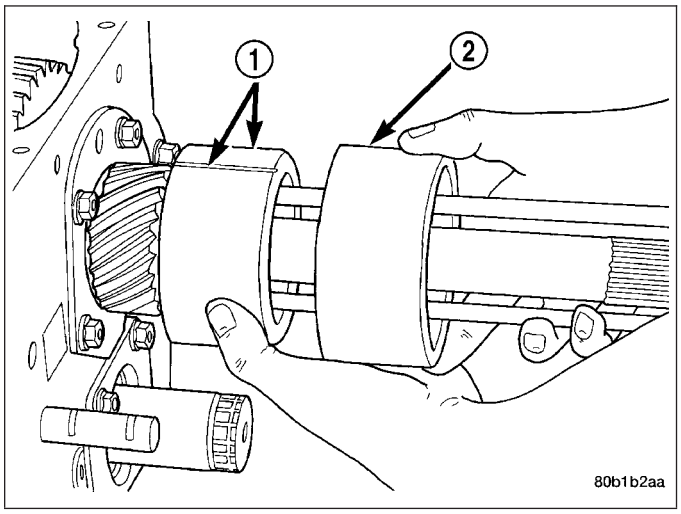
15. Remove mainshaft (3) fifth gear (1) with Puller Set 6444 and Jaw 6459 or 6820 (2). Position first Jaw on gear.



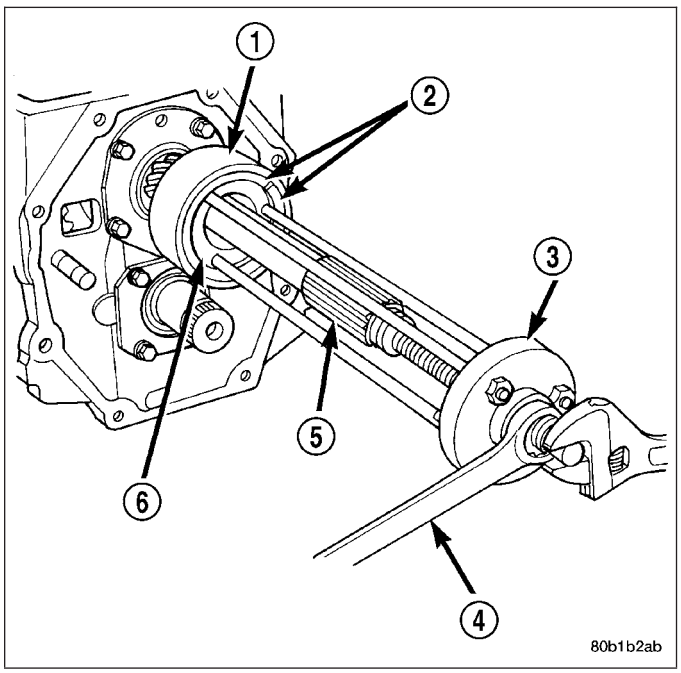
16. Assemble Puller Flange 6444-1(2) and Puller Rods 6444-3 4X2 or 6444-4 4X4. Slide assembly onto output shaft and seat flange in notch of jaw (1).



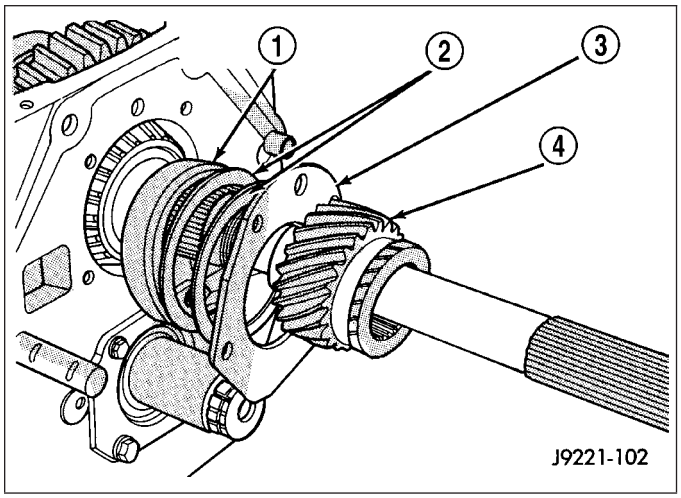
17. Position second puller jaw (1) on gear and in notch of puller flange. Slide Collar 6444-8 (2) over puller jaws to hold them in place.



18. Install Puller and Bolt 6444 on puller rods and secure puller to rods with retaining nuts. Tighten puller bolt (3) to remove gear from shaft splines.

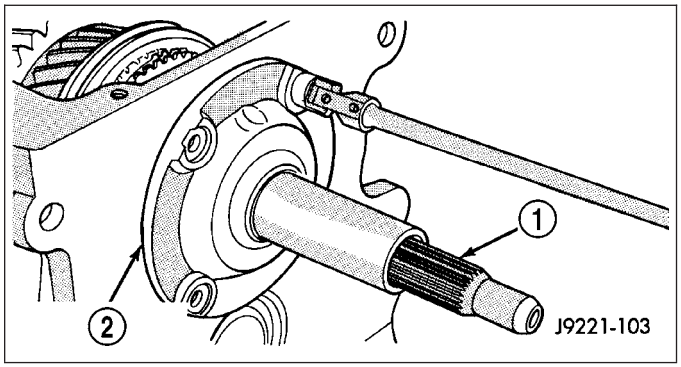


19. Remove mainshaft rear bearing (1) plate (3) bolts and remove fifth gear (4) plate end play shims (2) and bearing cup.

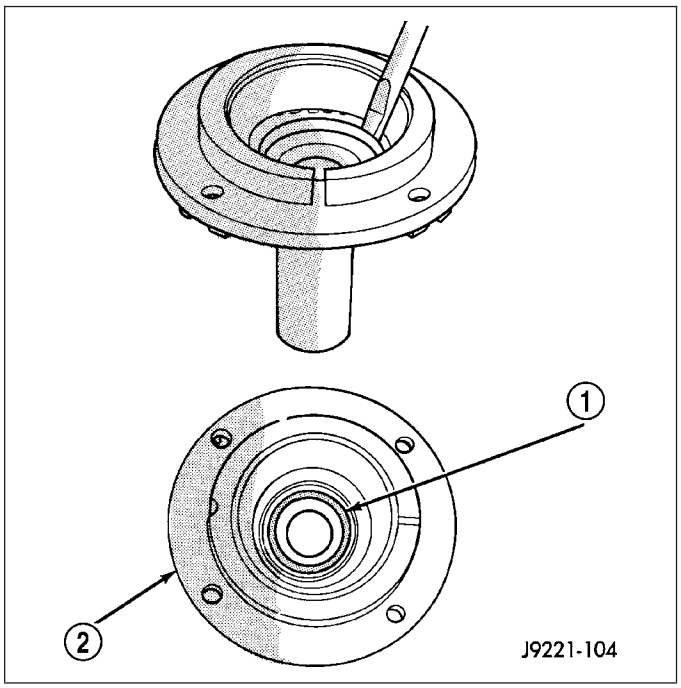


FRONT RETAINER

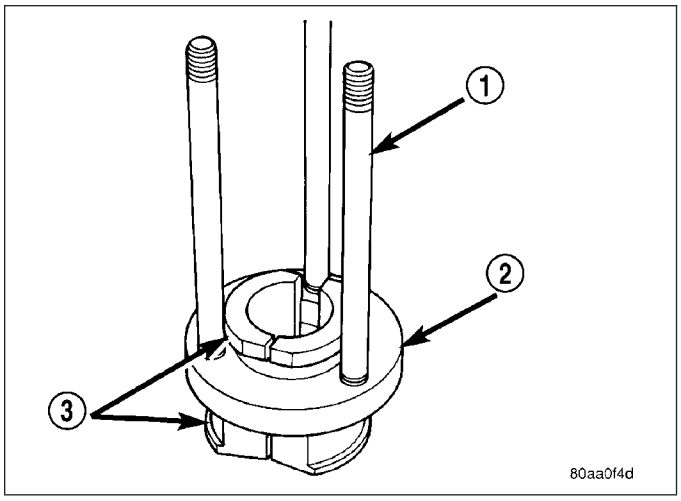
1. Remove and discard front bearing retainer (2) bolts and **discard** bolts.
2. Retainer flange extends into transmission case and is a **snug** fit. Lightly tap retainer (2) back and forth with plastic mallet to work it out of gear case.



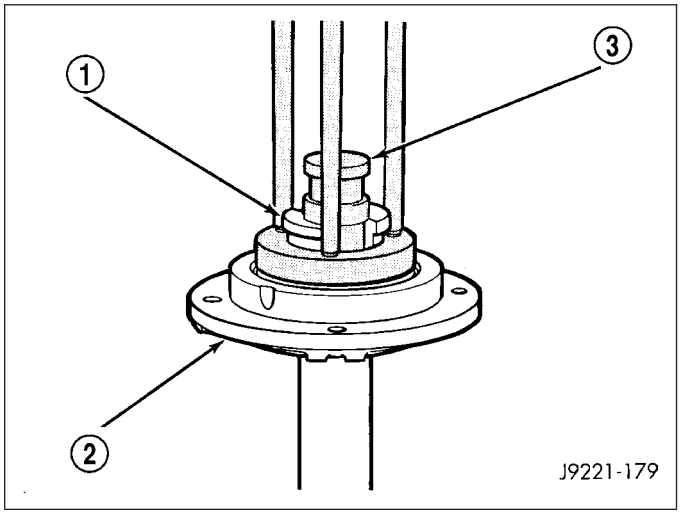
3. Remove front retainer (2) seal (1) by collapsing one side of seal then prying out with seal pick.



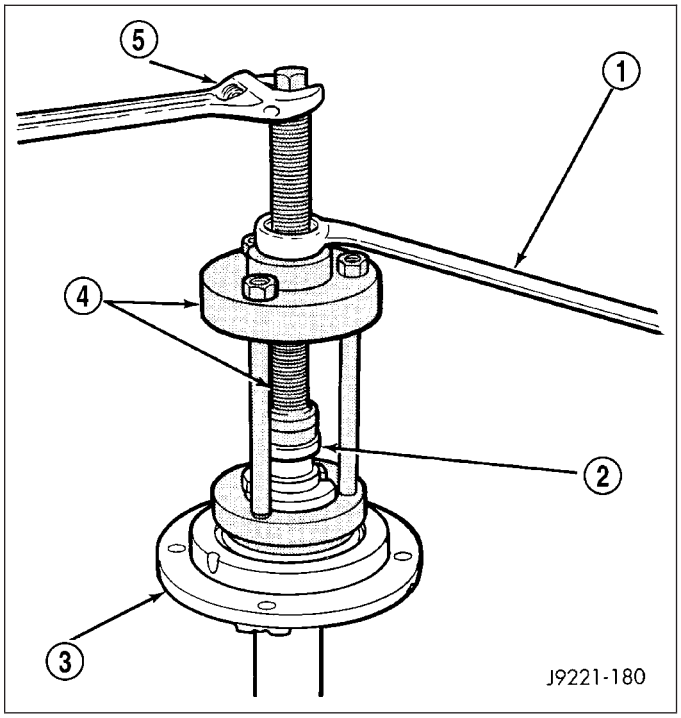
4. Remove front retainer bearing cup with Puller 6444. Assemble Puller Flange 6444-1 (2) and Puller Rods 6444-4 (1). Insert Jaws 6453-1 (3) in puller flange (2). Narrow lip of puller jaws will go under bearing cup.
5. Install Disc C-4487-1 into bearing retainer for Insert 6453-2 to rest upon.



6. Install assembled tools in front retainer (2) with puller jaws seated under bearing cup. Place Insert 6453-2 (1) in center of puller jaws (3), to hold puller jaws in place.

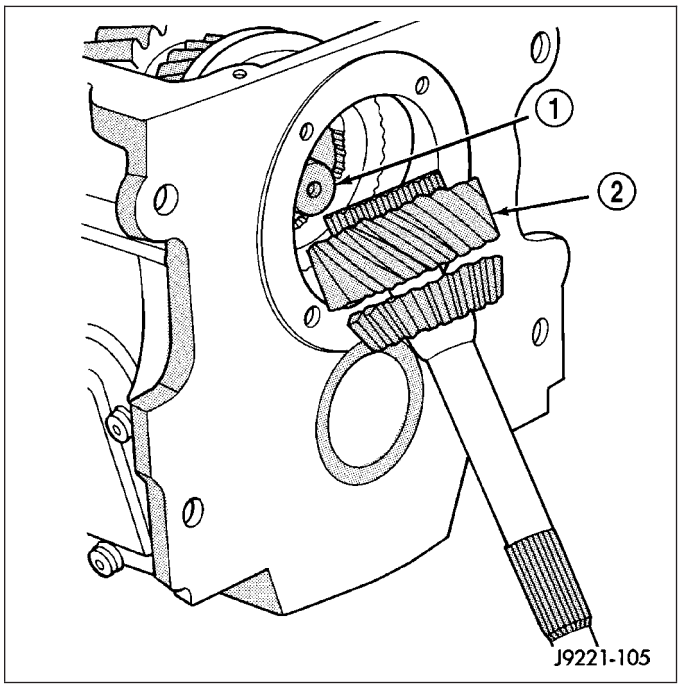


7. Install Puller 6444 (4) on puller rods and install retaining nuts on puller rods. Tighten puller bolt to draw bearing cup out of retainer (3).

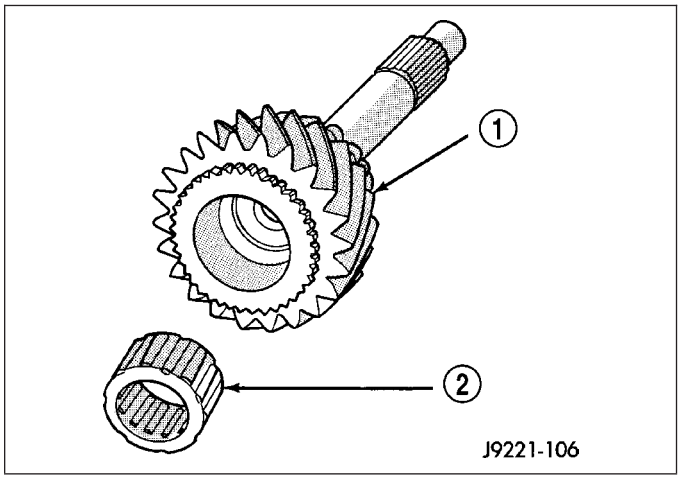


DRIVE GEAR

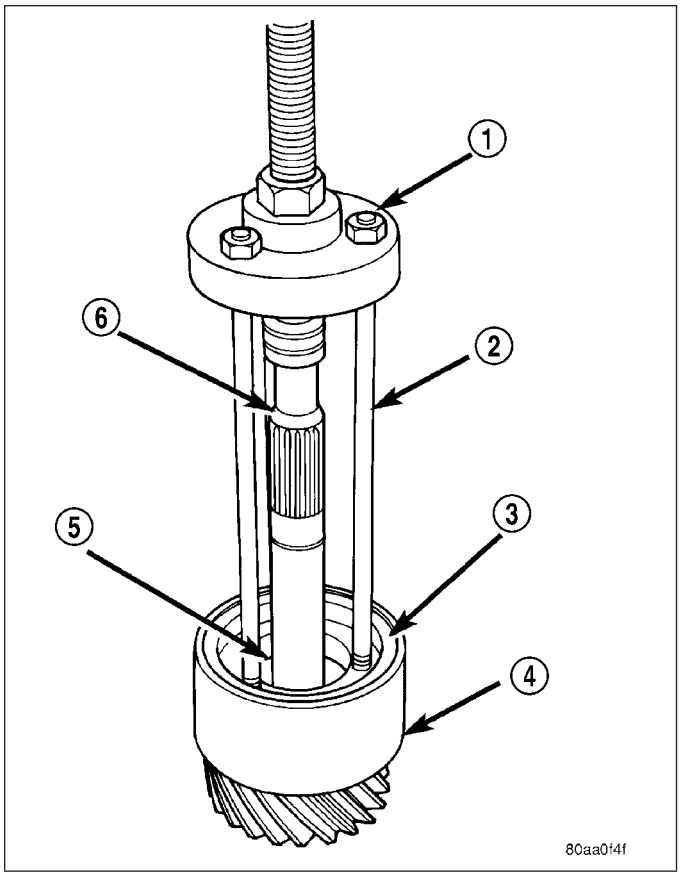
1. Remove drive gear (2) from mainshaft (1).



2. Remove pilot bearing (2) from drive gear (1).

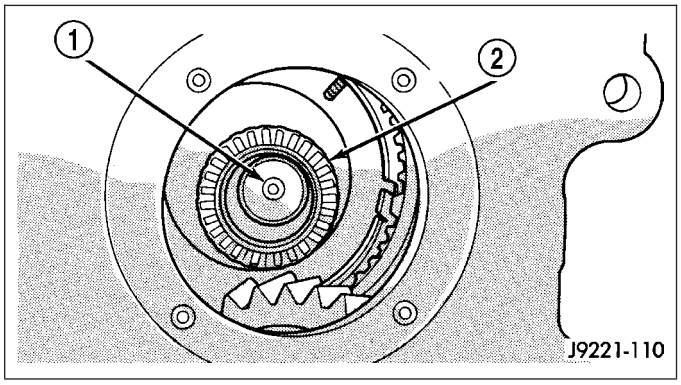


3. Remove tapered bearing from drive gear (6) with Puller Flange 6444-1 (5) and Puller Rods 6444-6 (2).
4. Position first Jaw 6447 (3) on bearing. Slide assembled puller flange and rod tools onto input shaft. Then seat flange in notch of puller jaw.
5. Position second Jaw 6447 on gear and in notch of puller flange. Slide Collar 6444-8 (4) over puller jaws to hold them in place.
6. Install Puller 6444 (1) on puller rods then install retaining nuts. Tighten puller bolt to remove bearing cone from drive gear.

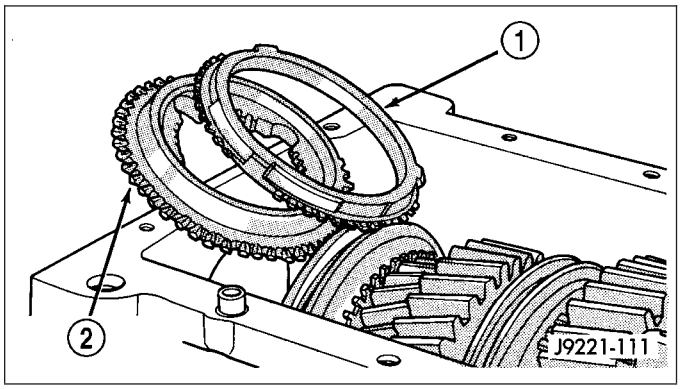


MAINSHAFT AND GEARTRAIN

1. Move 1-2 and 3-4 synchro sleeves into neutral.
2. Remove drive gear thrust bearing (1) from forward end of mainshaft (1).

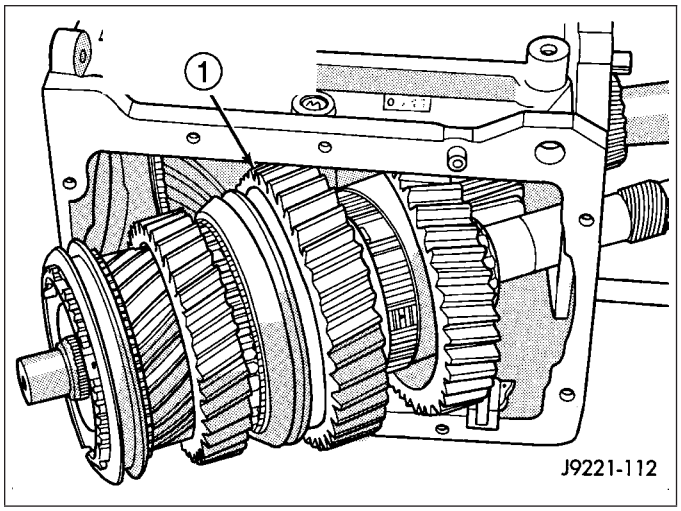


3. Remove fourth gear clutch gear (2) and synchro stop ring (1) from mainshaft.
4. Roll gear case onto left side.



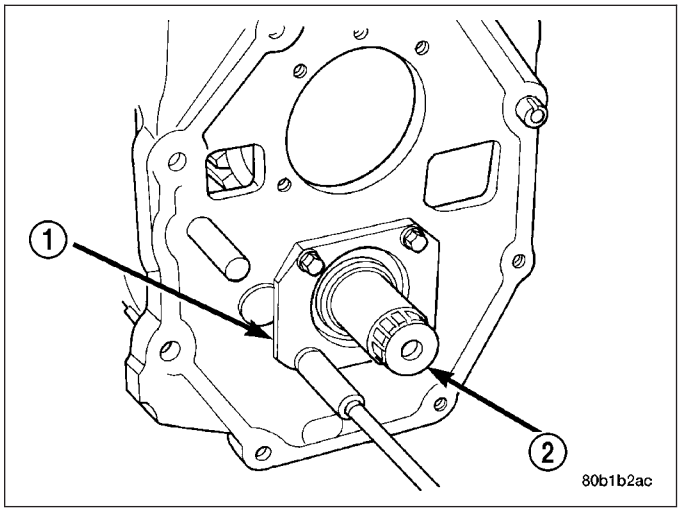
NOTE: Handling mainshaft carefully because gears are lose on the mainshaft.

5. Remove mainshaft assembly (1) by lifting front end of mainshaft slightly. Then grasp mainshaft rear splines and turn spline end of mainshaft counter-clockwise to rotate shaft and geartrain out of case. Tilt mainshaft outward and removed from case.

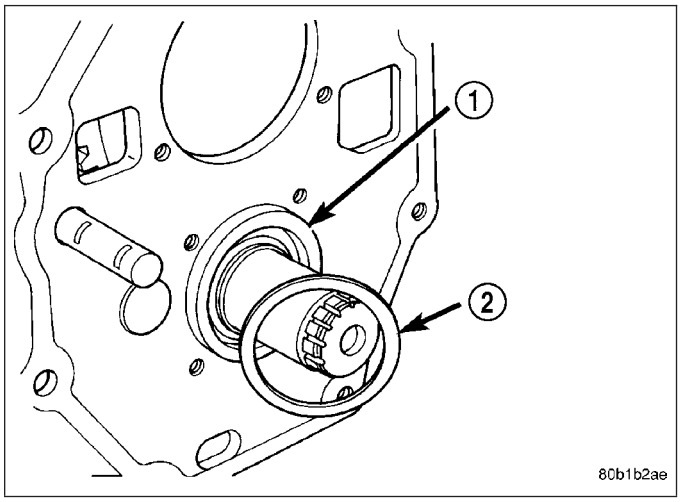


REVERSE IDLER AND COUNTERSHAFT

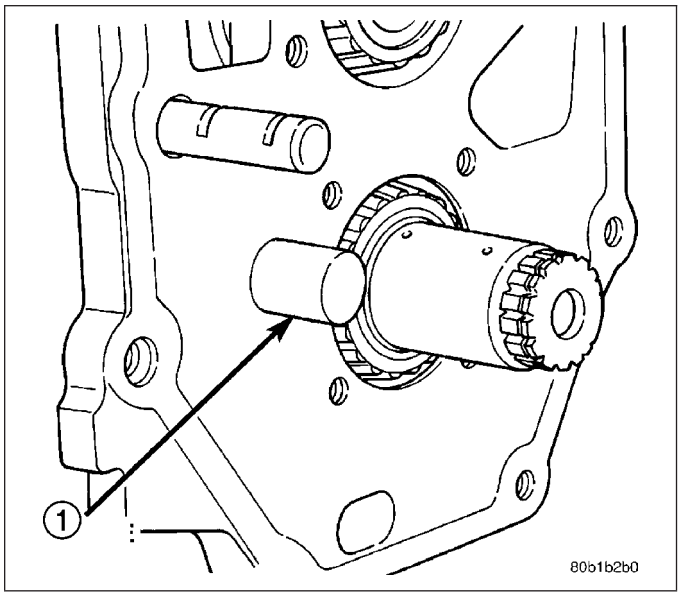
1. Remove countershaft (2) rear bearing plate (1).



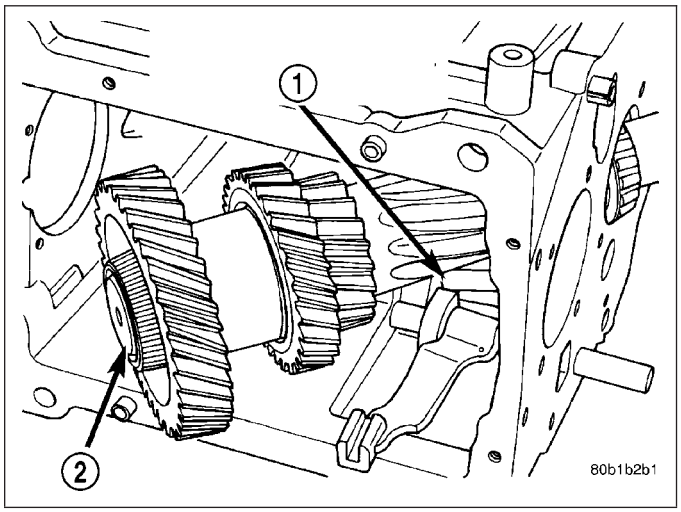
2. Remove countershaft end play shim (2) and rear bearing cup (1).



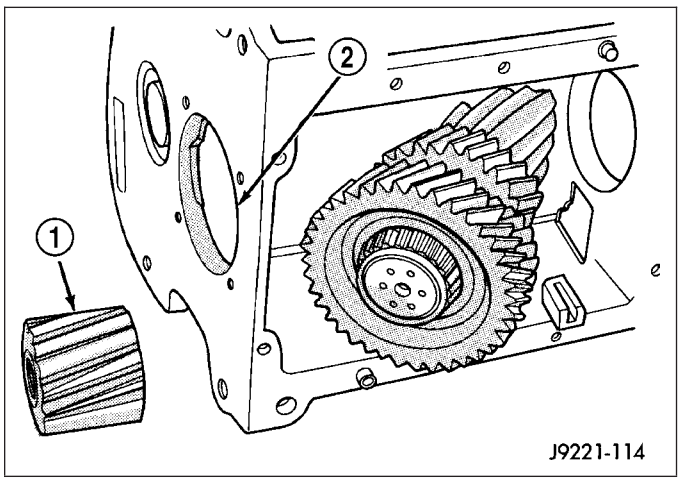
3. Remove reverse idler shaft (1).



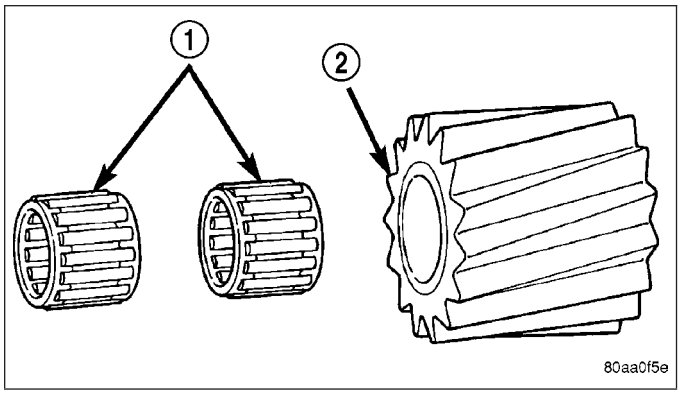
4. Rotate countershaft (2) outward and push reverse idler gear (1) away from countershaft and toward front of case.



5. Remove idler gear (1).

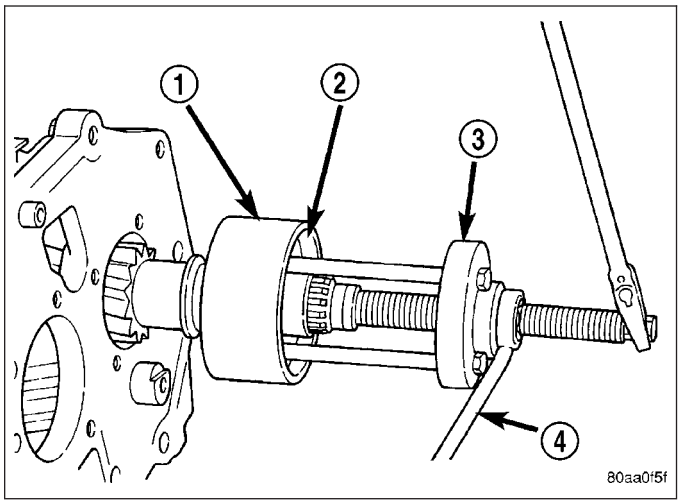


6. Keep reverse idler gear (2) bearings (1) and spacer together. Insert idler shaft through gear and bearings to keep them in place.
7. Remove idler gear thrust washers from gear case. Install washers on idler shaft to keep them together for cleaning and inspection.

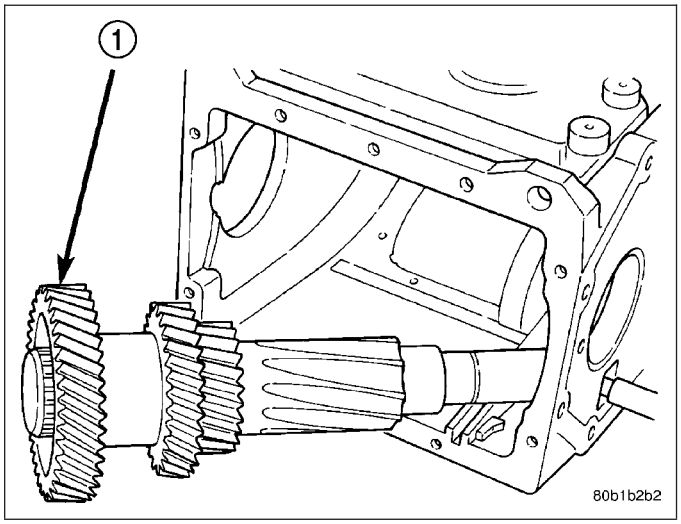


NOTE: Shaft cannot be removed from case until rear bearing has been removed.

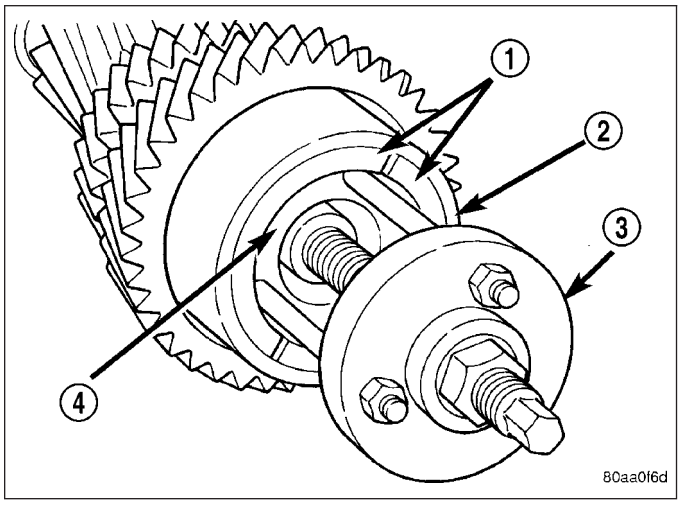
8. Remove countershaft rear bearing with Puller Flange 6444-1 and Puller Rods 6444-4.
9. Position first Jaw 6449 (2) on bearing cone and seat puller flange in notch of puller.
10. Install second Jaw 6449 on bearing and in notch of puller flange. Slide Collar 6444-8 (1) over puller jaws.
11. Install Puller 6444 (3) on puller rods, then secure puller to rods with retaining nuts. Tighten puller bolt to remove bearing from shaft. Tap end of puller bolt with copper mallet to help loosen bearing if necessary.



12. Remove bearing puller tools then rotate countershaft (1) out of case.

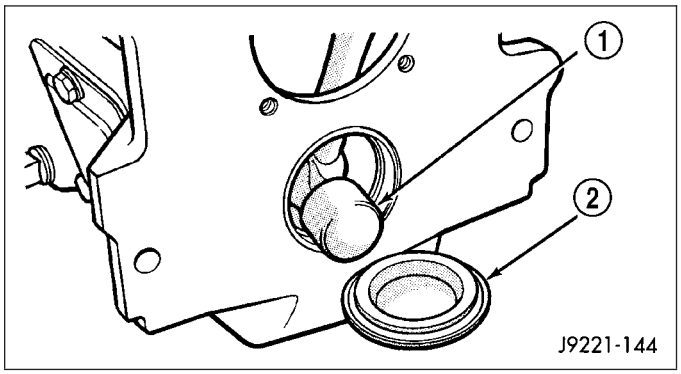


13. Position first Jaw 6451 (1) on countershaft front bearing and seat puller flange in notch of puller jaw.
14. Install second Jaw 6451 on bearing and in notch of puller flange. Slide Collar 6444-8 (2) over puller jaws.
15. Install puller bridge and bolt assembly 6444 on puller bolts and install retaining nuts. Tighten puller bolt to remove bearing from shaft. Tap end of puller bolt with mallet to help loosen bearing.

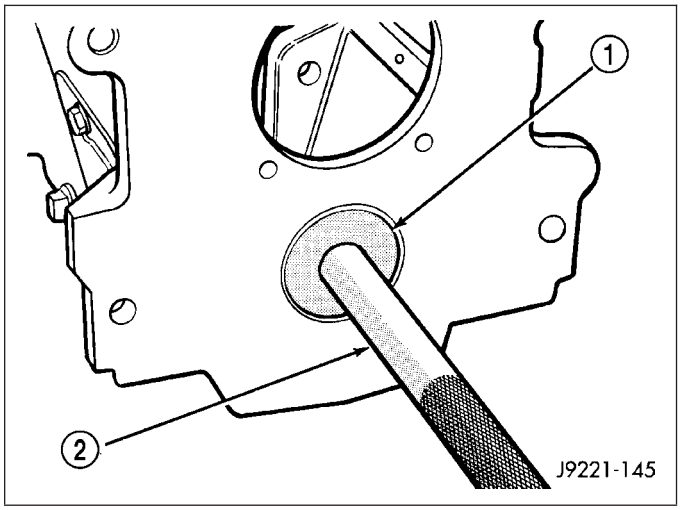


GEAR CASE

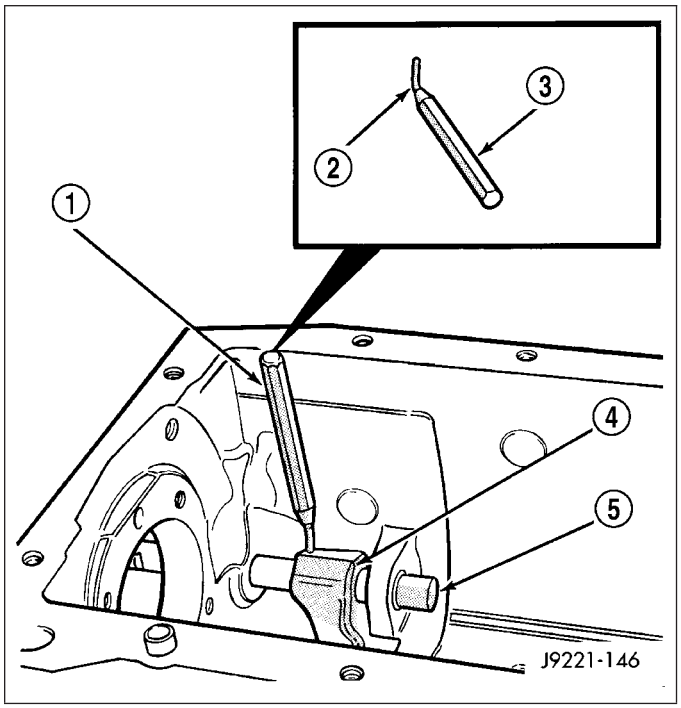
1. Remove countershaft front bearing cap (2) with hammer (1).



2. Remove countershaft front bearing cup with Remover 6454 (1) and Handle C-4171(2).



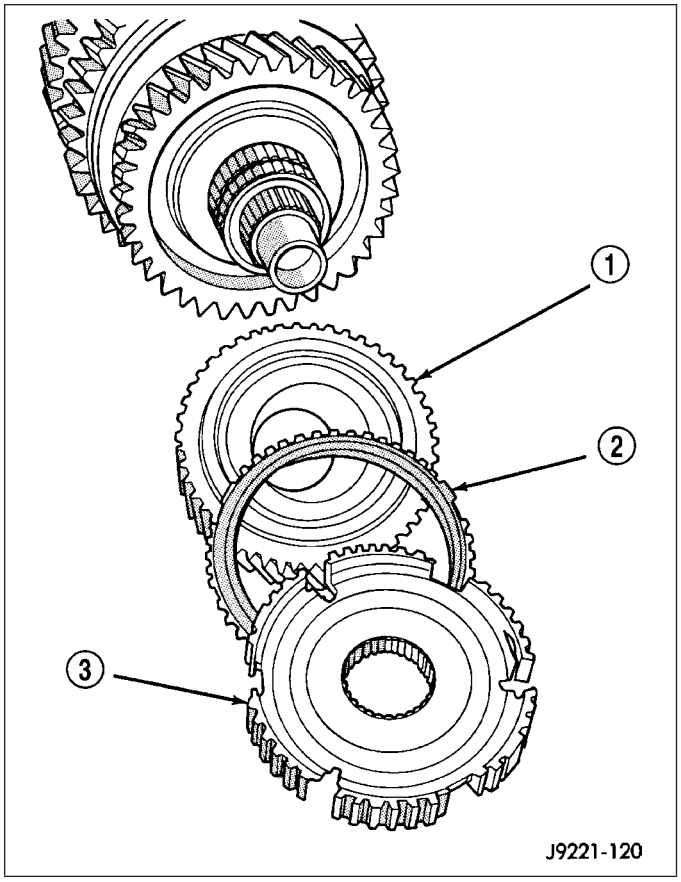
3. Remove roll pin that secures shift lug (4) on shift rail (5) in case. A small pin punch (1) can be modified (2) by putting a slight bend in it to drive pin completely out of shift rail.
4. Remove shift lug rail.



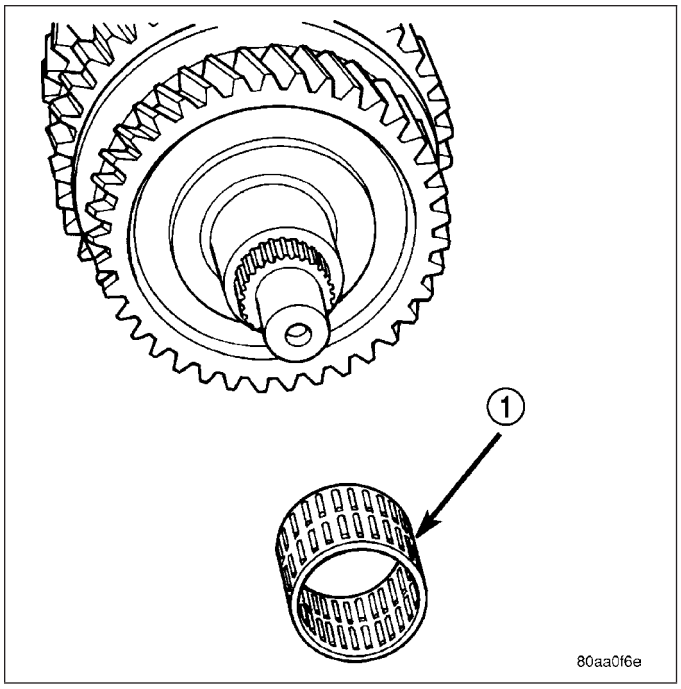
MAINSHAFT

NOTE: Gear and synchro components can be installed backwards. Paint or scribe gear and synchro components for installation reference. Then stack geartrain parts in order of removal.

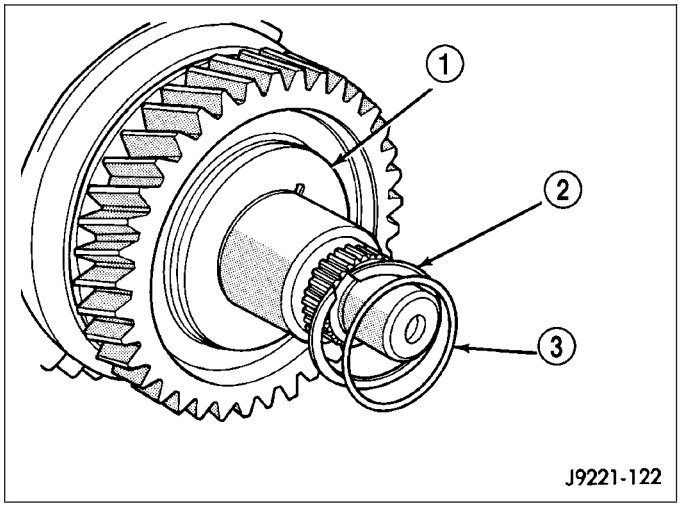
1. Remove drive gear thrust bearing from end of mainshaft, if not previously removed.
2. Place 3-4 gear in a press with support under 3rd gear and Remove 3-4 synchro hub (3), third gear stop ring (2) and third gear (1) as an assembly.



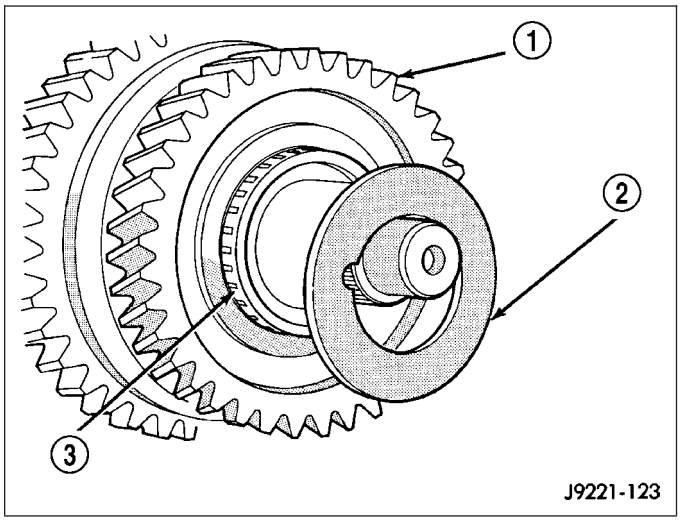
3. Remove third gear bearing (1) from mainshaft.



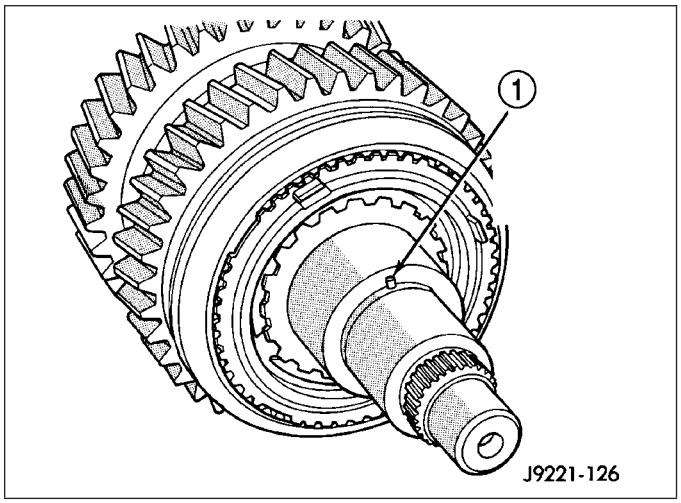
4. Remove third gear bearing spacer (3).
5. Remove second gear thrust washer snap ring (2) from mainshaft



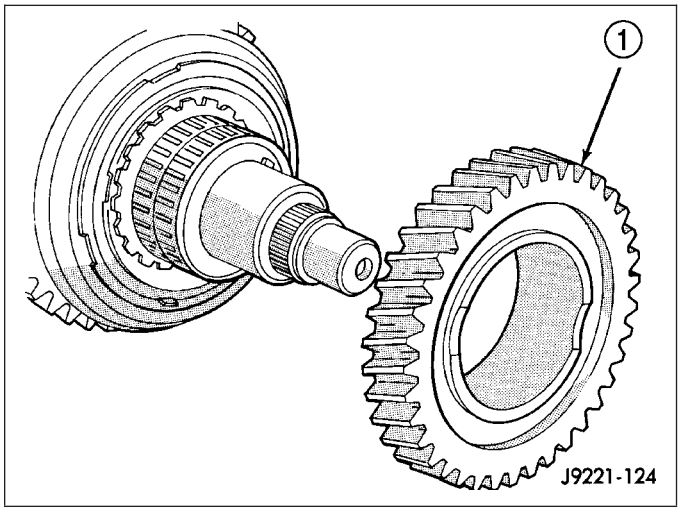
6. Remove second gear (1) thrust washer (2). Note washer notch for locating pin.



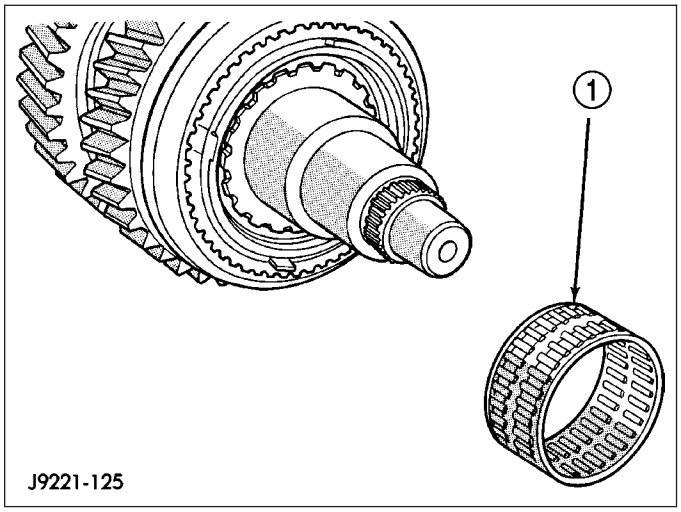
7. Remove thrust washer locating pin (1) with needle nose pliers.



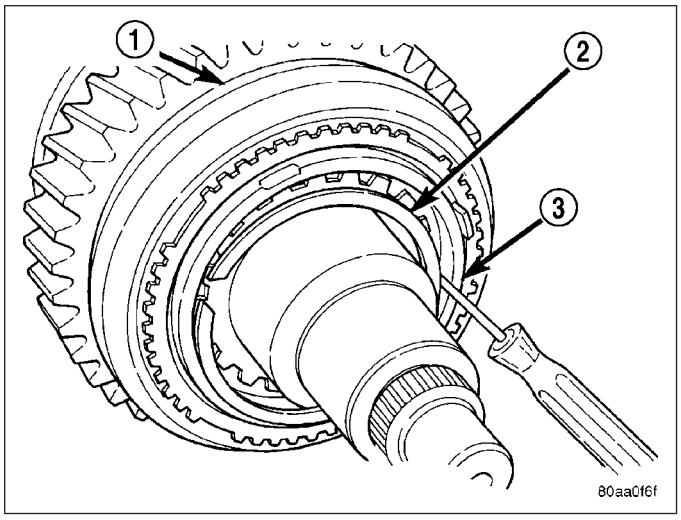
8. Remove second gear (1).



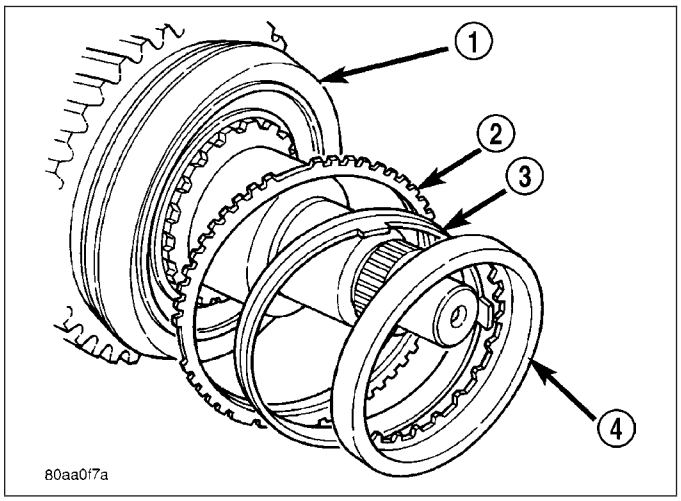
9. Remove second gear bearing (1).



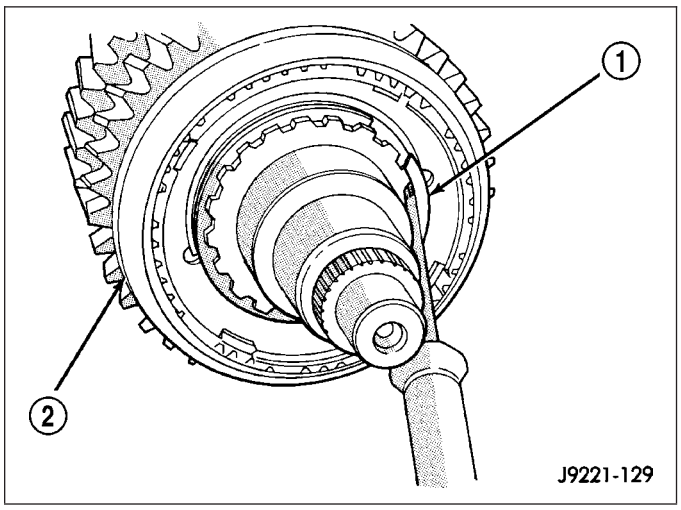
10. Remove second gear clutch cone (3) snap ring (2) from mainshaft synchro hub groove.



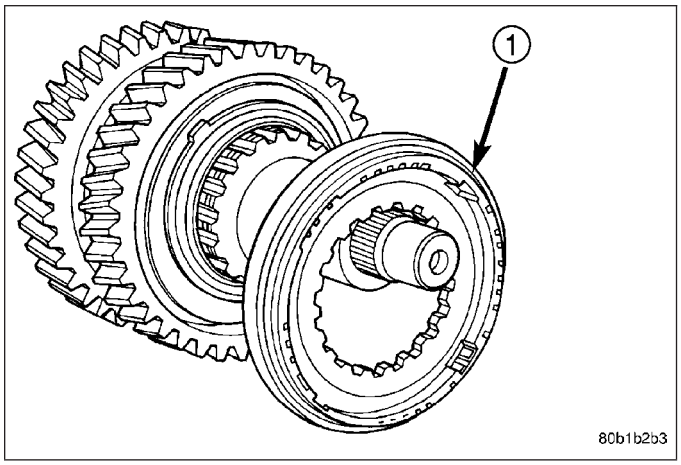
11. Remove second gear clutch cone (4), synchro clutch ring (3) and synchro stop ring (2).



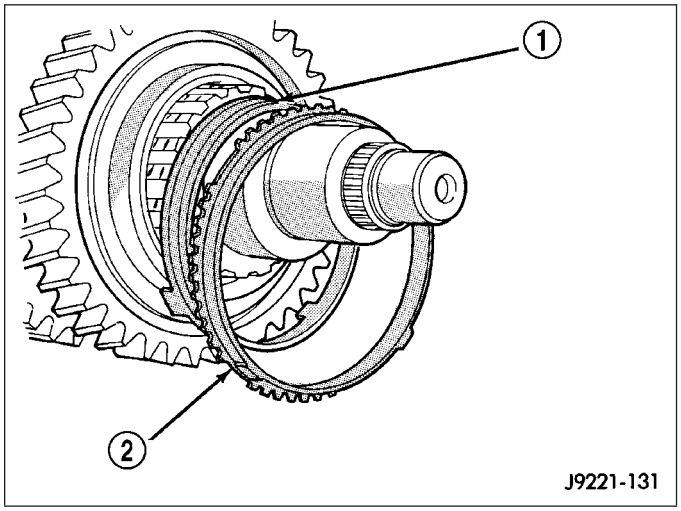
12. Remove 1-2 synchro hub snap ring (1).



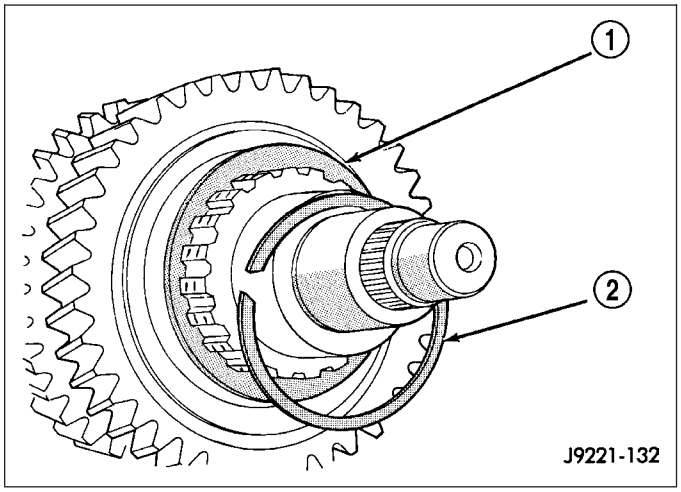
13. Remove 1-2 synchro sleeve, hub (1), struts and springs as an assembly. Tapered side of sleeve also goes toward front. Do not disassemble synchro components unless worn or damaged.



14. Remove first gear synchro stop ring (2) and clutch ring (1).



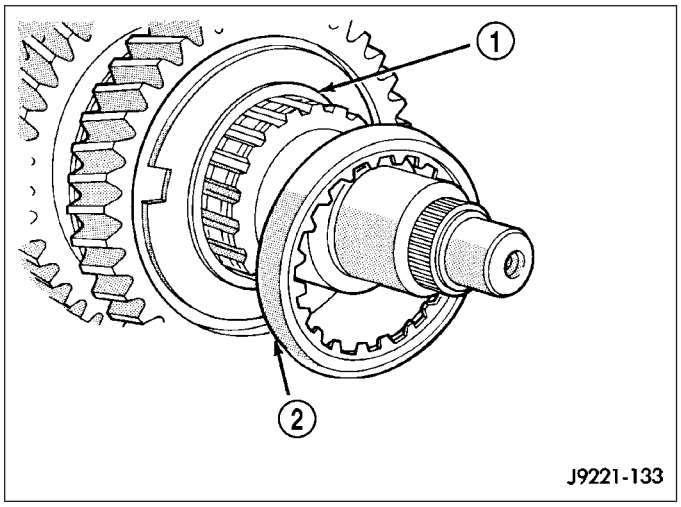
15. Remove first gear (1) clutch cone front snap ring (2) from mainshaft hub.

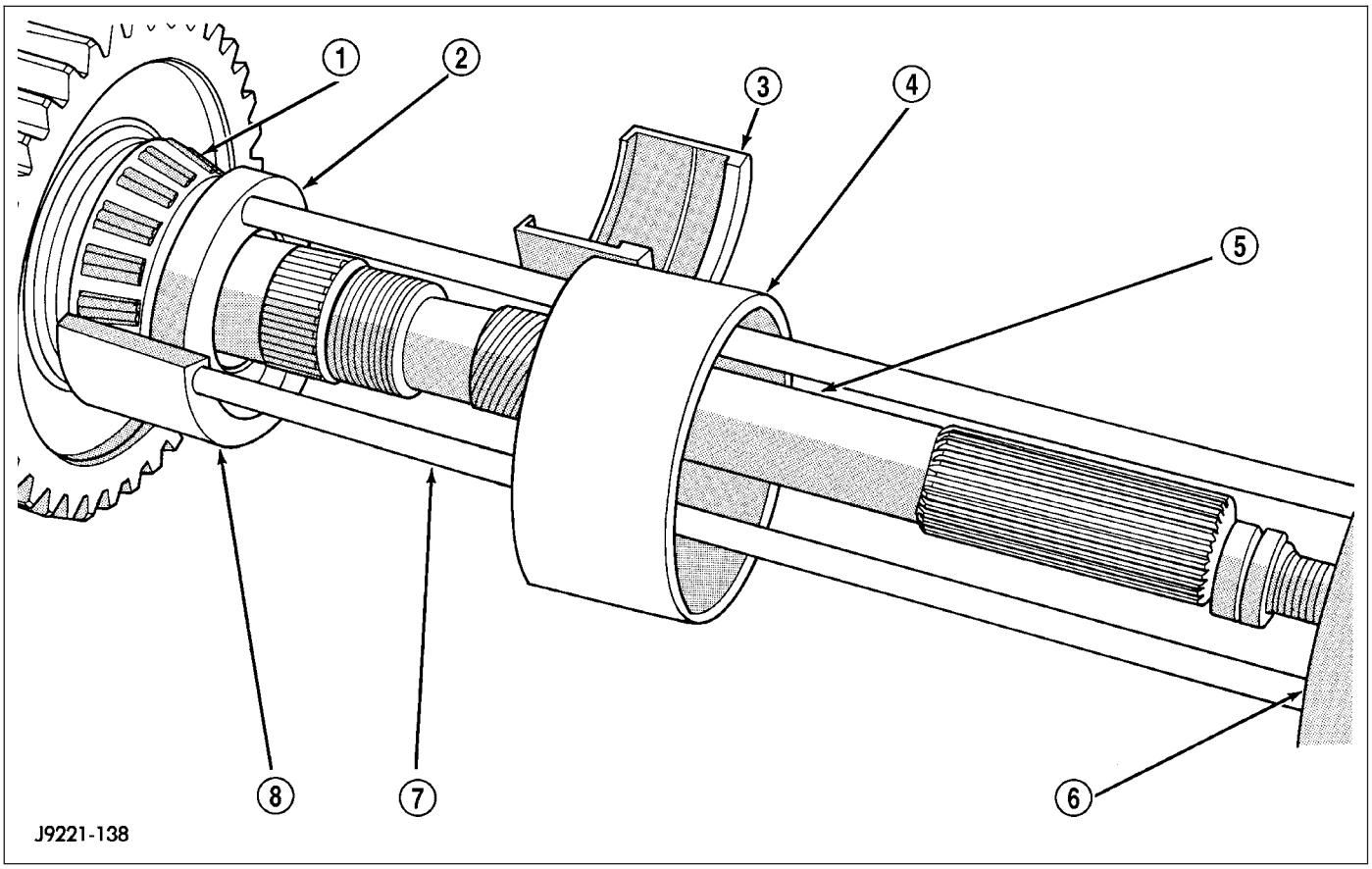


16. Remove first gear clutch cone.

NOTE: Do not remove this snap ring unless mainshaft is being replaced.

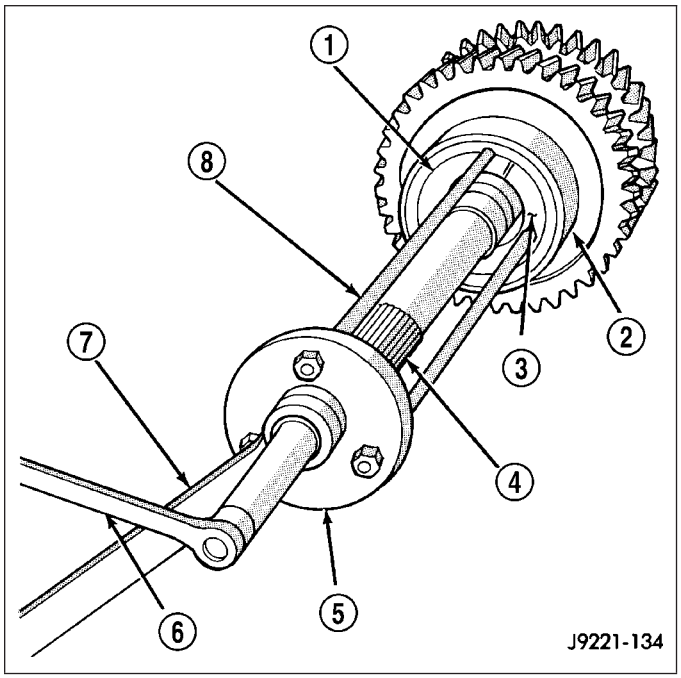
17. Remove first gear clutch gear (2) rear snap ring (1) from mainshaft hub.



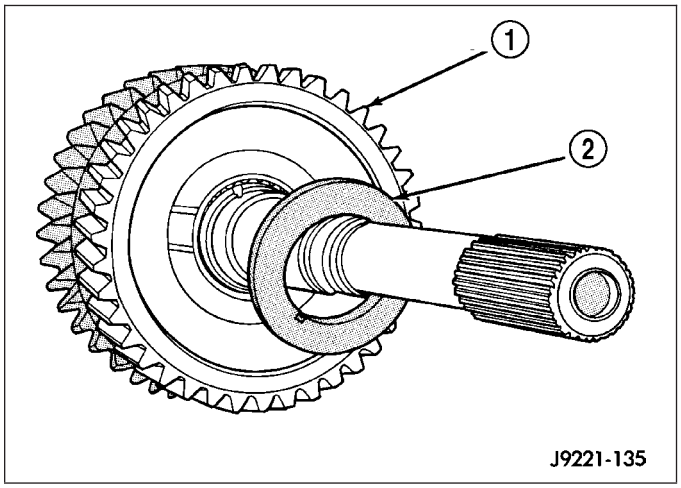


18. Remove mainshaft (5) rear bearing (1), with Puller Flange 6444-1 (6) and Puller Rods 6444-3 (7) for 4X2 or 6444-4 for 4X4.
19. Position the first Jaw 6445 (3) on the bearing cone and seat Puller Flange 6444-1(2) in notch of jaw.
20. Install second Jaw 6445 on the bearing cone and puller flange. Slide Collar 6444-8 (4) over jaws.

21. Install Puller 6444 (5) on the puller rods (8) and secure with nuts. Tighten puller bolt to the remove bearing.
22. Remove bearing puller tools and rear mainshaft bearing from output shaft.



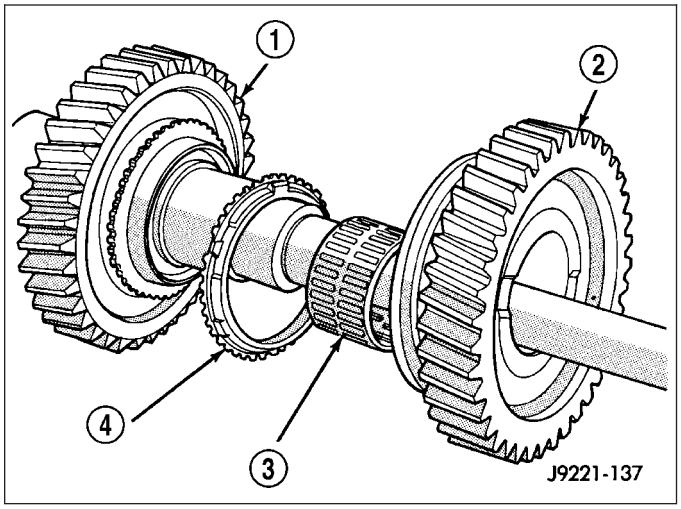
23. Remove reverse gear (1) thrust washer (2).



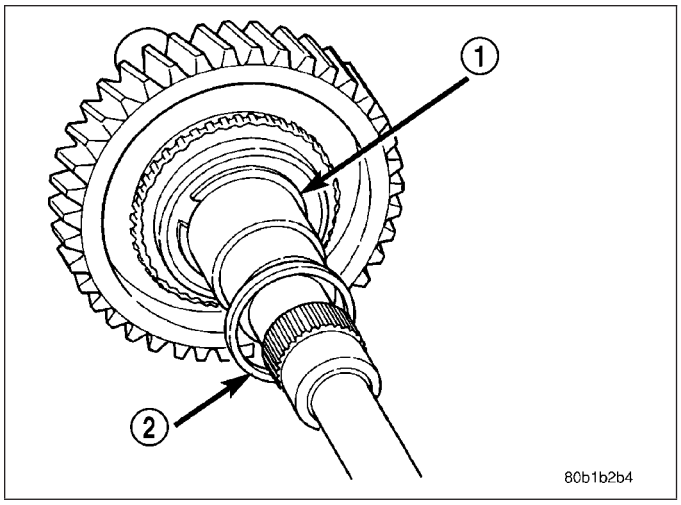
24. Remove reverse gear and synchro components as assembly (2).

CAUTION: Do not disassemble synchro components unless damaged. If synchro sleeve or struts require service, mark position of sleeve on hub before removal. Correct sleeve position is important as sleeve can be installed backwards causing shift problems.

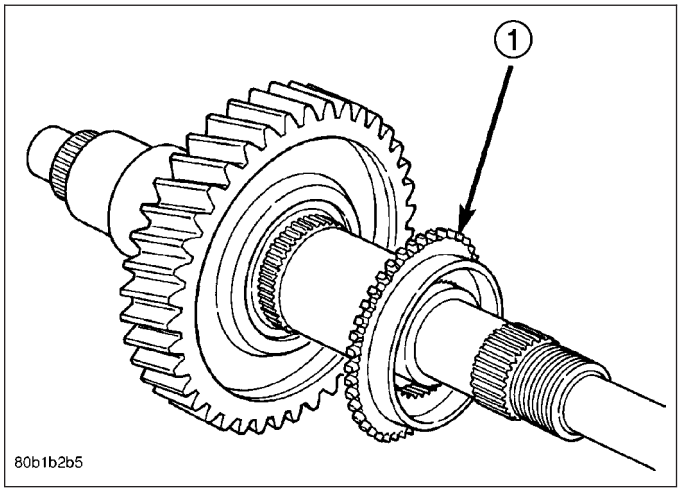
25. Remove reverse gear bearing assembly (3) from mainshaft.



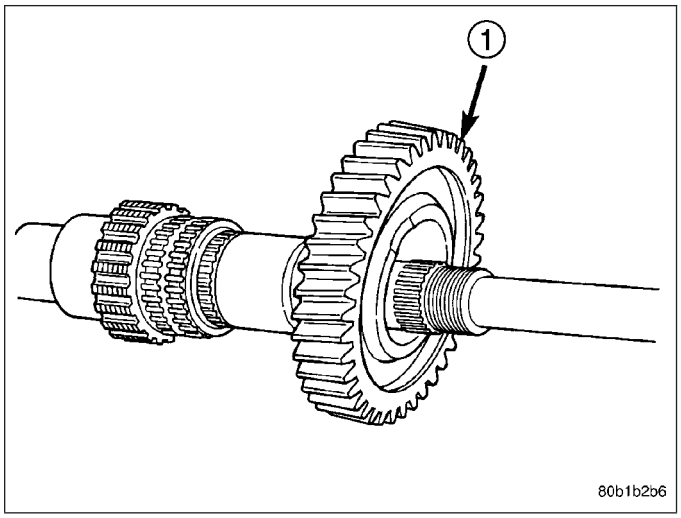
26. Remove reverse gear bearing spacer (2) from mainshaft.
27. Remove reverse clutch gear snap ring (1) with heavy duty snap ring pliers.



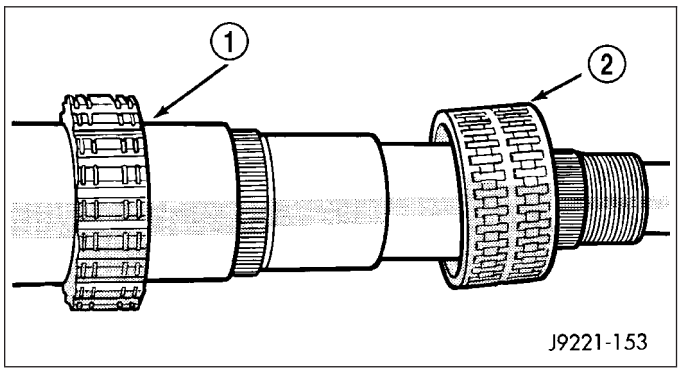
28. Remove reverse clutch gear (1).



29. Remove first gear (1) from bearing and mainshaft.



30. Remove first gear bearing (2) from mainshaft (1).



CLEANING

Clean the gears, shafts, shift components and transmission housings with a standard parts cleaning solvent. Do not use acid or corrosive base solvents. Dry all parts except bearings with compressed air.

Clean the shaft bearings with a mild solvent such as Mopar degreasing solvent, Gunk or similar solvents. Do not dry the bearings with compressed air. Allow the bearings to either air dry or wipe them dry with clean shop towels.

INSPECTION

NOTE: Minor corrosion, nicks, or pitting can be smoothed with 400 grit emery and polished out with crocus cloth.

Inspect the reverse idler gear, bearings, shaft and thrust washers. Replace the bearings if the rollers are worn, chipped, cracked, flat-spotted or brinnelled. Replace the gear if the teeth are chipped, cracked or worn thin.

Inspect the front bearing retainer and bearing cup. Replace the bearing cup if scored, cracked, brinnelled or rough. Check the release bearing slide surface of the retainer carefully. Replace the retainer if worn or damaged in any way.

Inspect mainshaft bearing surfaces, splines, snap ring grooves and threads. Replace the shaft if any surfaces exhibit considerable wear or damage.

Inspect the countershaft and bearings. Replace the shaft if any surfaces exhibit considerable wear or damage.

Inspect shift forks for wear and distortion. Check fit of the sleeve in the fork to be sure the two parts fit and work smoothly. Replace the fork if the roll pin holes are worn oversize or damaged. Do not attempt to salvage a worn fork. Replace shift fork roll pins if necessary or if doubt exists about their condition.

The all bearings for wear, roughness, flat spots, pitting or other damage. Replace the bearings if necessary.

Inspect the blocker rings and fiction cones. replace either part if worn or damaged in any way. Replace if the friction material is burned, flaking off or worn.

Inspect synchro components wear or damage. Replace parts if worn, cracked or distorted.

Inspect all of the thrust washers and locating pins. Replace the pins if bent or worn. Replace the washers if worn or the locating pin notches are distorted.

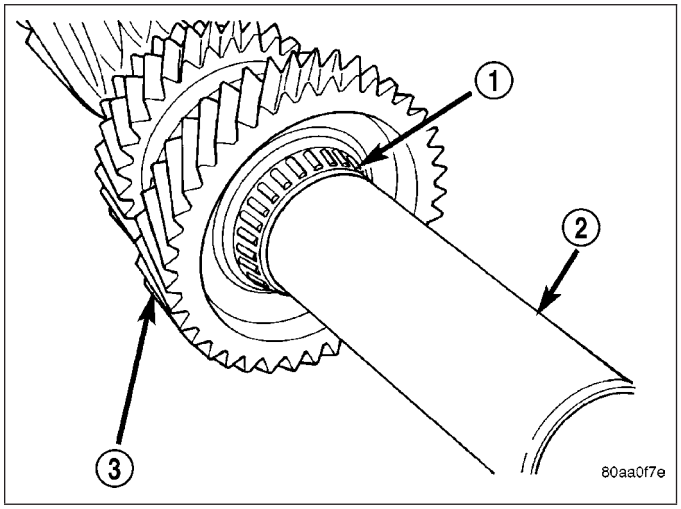
Inspect the case and housing/adapter sealing and mating surfaces are free of burrs and nicks. Inspcet the alignment dowels in the case top surface and in the housing/adapter are tight and in good condition. Replace the gear case or housing/adapter if cracked or broken.

ASSEMBLY

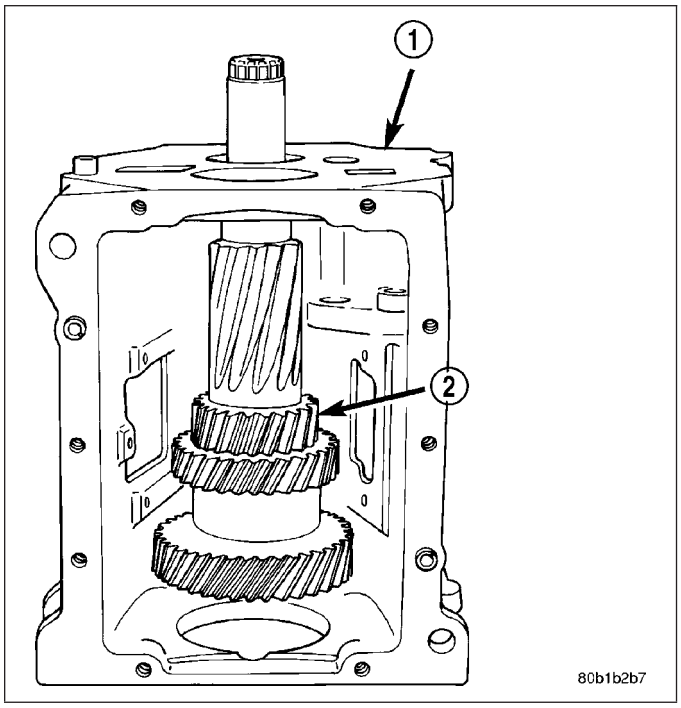
COUNTERSHAFT AND REVERSE IDLER GEAR

NOTE: Gaskets are not used in the transmission. Use Mopar Silicone Sealer or equivalent on all gear case and extension housing sealing surfaces.

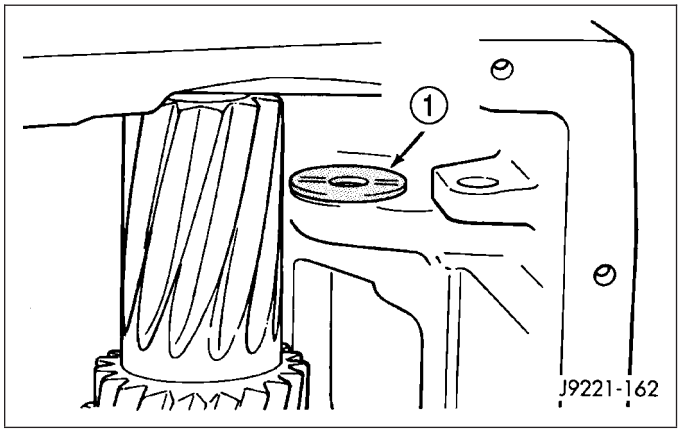
1. Install countershaft front bearing cup in case with Handle C-4171 and Installer 6061-1.
2. Install front bearing (1) on countershaft with Installer C-4340 (2).



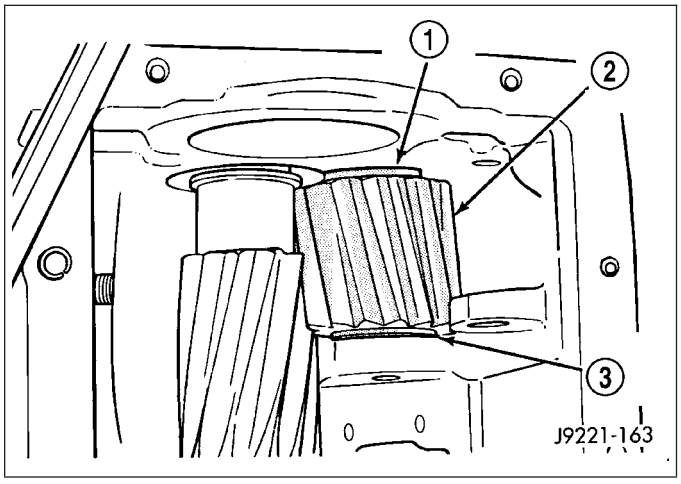
3. Lubricate countershaft front bearing cup and cone with petroleum jelly.
4. Position gear case (1) on end with rear of case facing up.
5. Install countershaft (2) in gear case. Do not install rear countershaft bearing on countershaft at this time.



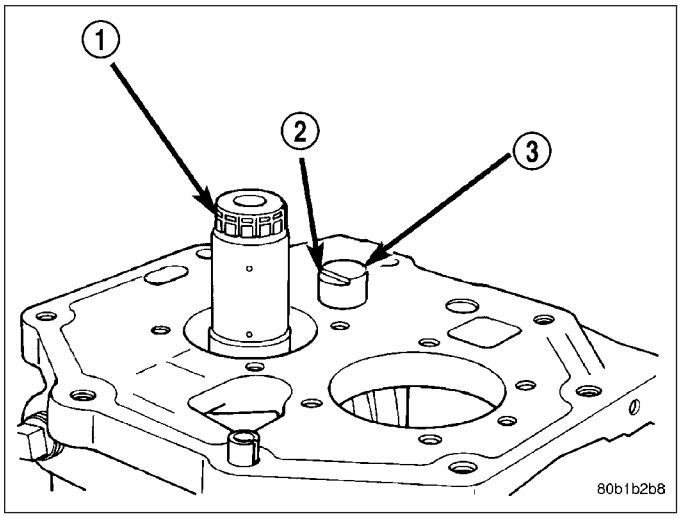
6. Lubricate reverse idler gear bearings with petroleum jelly and install first bearing and second bearing.
7. Install idler gear front thrust washer (1) on boss in gear case. Coat thrust washer with liberal quantity of petroleum jelly to hold it in place.



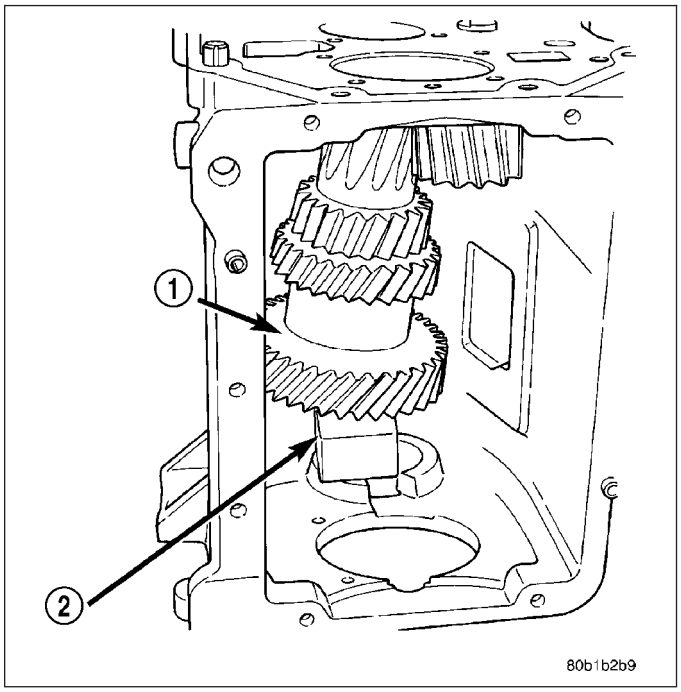
8. Install reverse idler gear (2) in case.
9. Install idler gear rear thrust washer (1) between idler gear and case boss.
10. Align idler gear bearings and thrust washers with a drift.



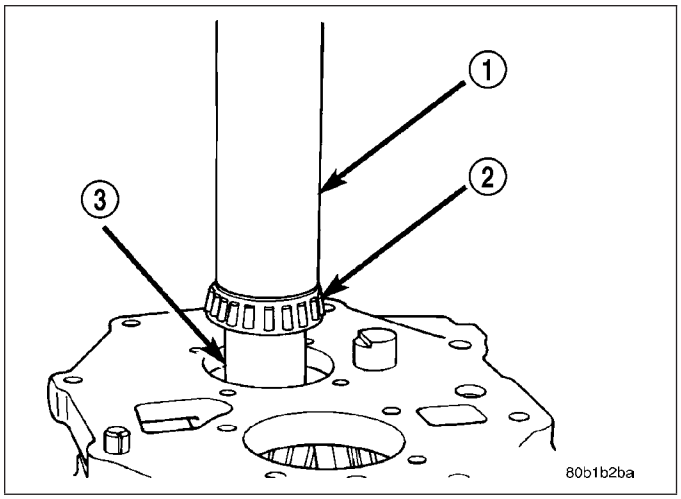
11. Install reverse idler shaft (3) with notched (2) end of shaft facing countershaft (1).



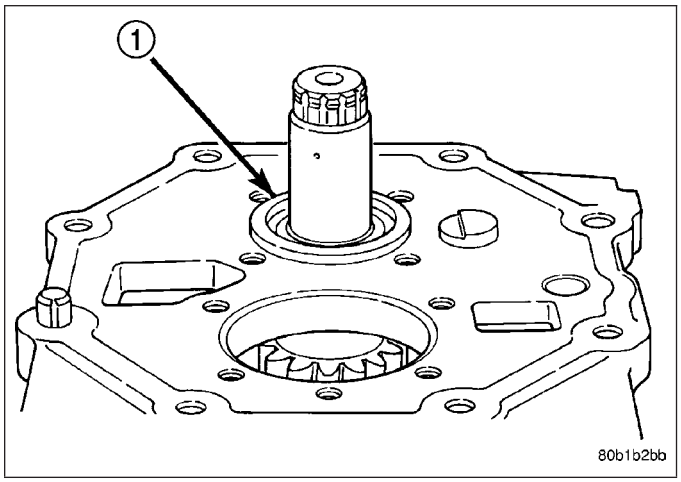
12. Lift countershaft (1) upward and position wood block (2) between front of shaft and case.



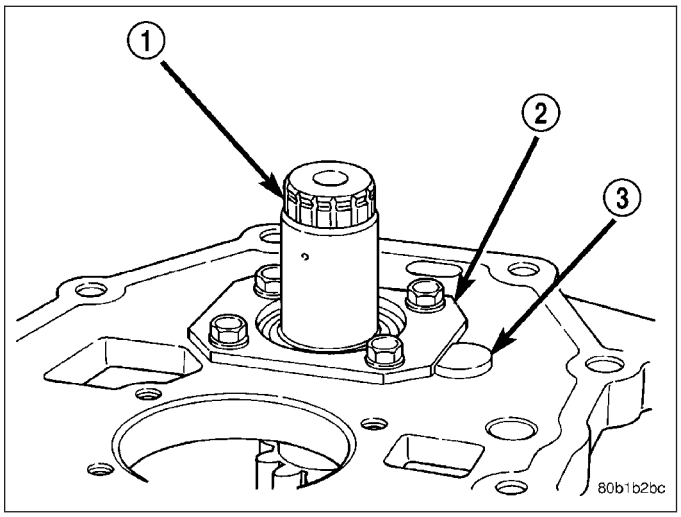
13. Install rear bearing (2) on countershaft (3) with Installer C-4040 (1).
14. Remove wood block from under countershaft and lower countershaft front bearing into front bearing cup.
15. Lubricate countershaft rear bearing cup and cone with petroleum jelly.



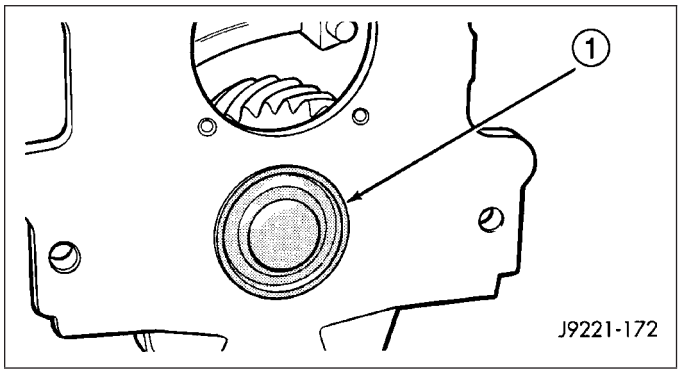
16. Install countershaft rear bearing cup (1) in gear case and over rear bearing. Tap cup into place with plastic mallet if necessary.



17. Install countershaft (1) rear bearing plate (2). Verify plate is seated in notch in reverse idler shaft before tightening bearing plate bolts.

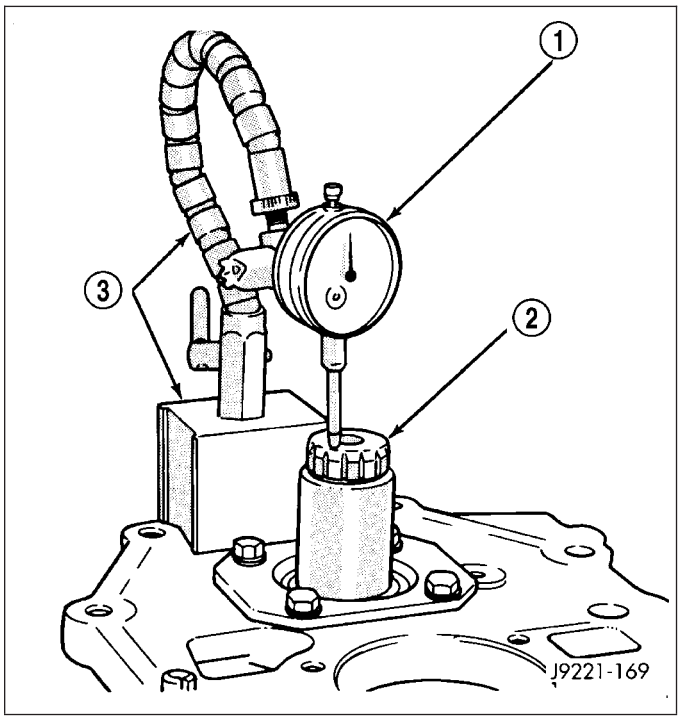


18. Apply Mopar silicone adhesive/sealer or equivalent to flange and lip of **new** front bearing cap (1). Install cap in gear case with Handle C-4171 and Installer C-3972-A.

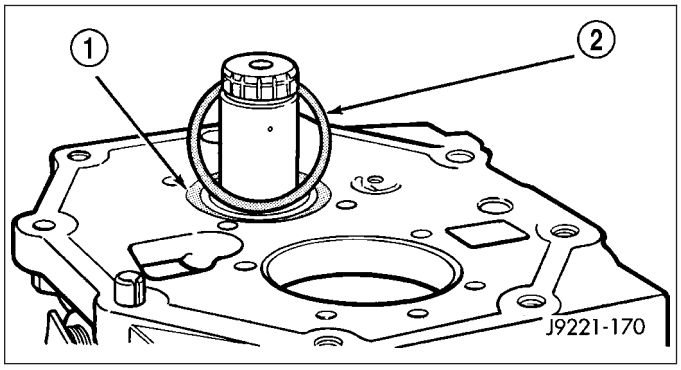


COUNTERSHAFT END PLAY

1. Rotate countershaft 4-5 times to seat bearings.
2. Mount dial indicator (1) on case. Then position indicator plunger on end of countershaft (2) and zero dial indicator.
3. Raise countershaft with screwdriver and note end play reading on dial indicator. End play should be 0.051 - 0.15 mm (0.002 - 0.006 in.).
4. Remove countershaft rear bearing plate.

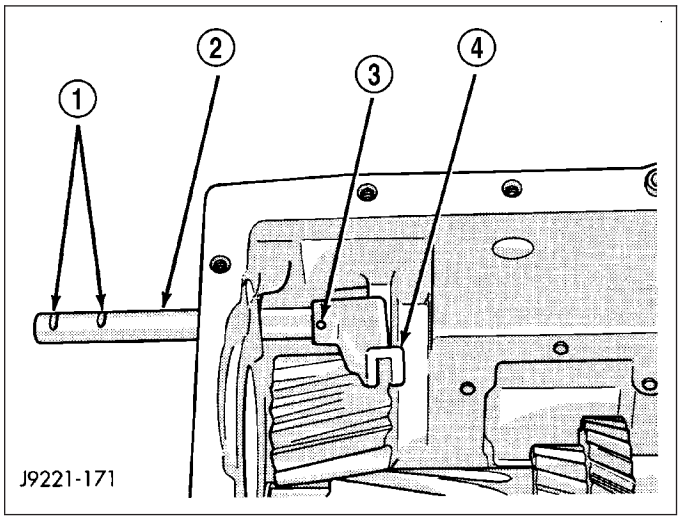


5. Install a end play shim (2) that will provide minimum countershaft end play. Position shim on rear bearing cup (1).
6. Install countershaft rear bearing plate. Verify plate is seated in reverse idler shaft notch and end play shims are still in position before installing bolts.
7. Apply 1-2 drops Mopar Loc N' Seal or equivalent to threads of rear bearing plate bolts. Then install and tighten bearing plate bolts to 23 N·m (200 in. lbs.).



SHIFT LUG AND RAIL

1. Lubricate shift lug and rail with Castrol® Syntorq or equivalent.
2. Insert shift lug rail (2) part way into case.
3. Install shift lug (4) on rail.
4. Position shift rail so roll pin notches (1) are toward outside of case.
5. Install roll pin (3) that secures lug to rail.

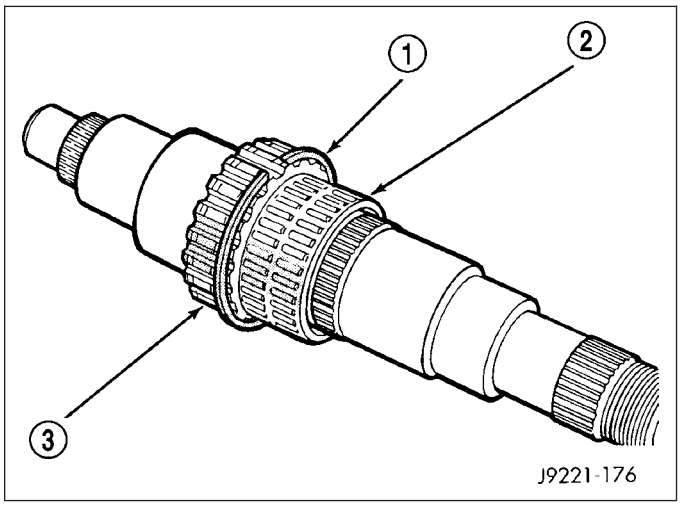


MAINSHAFT AND GEARTRAIN

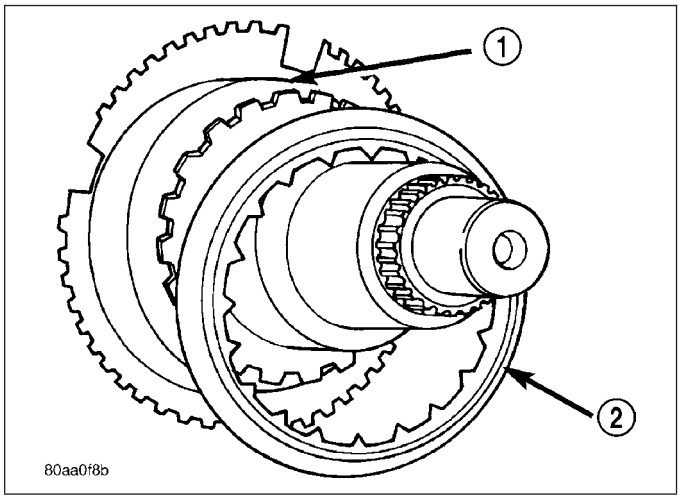
CAUTION: The reverse, 1-2 and 3-4 synchro components can be assembled and installed incorrectly. Follow assembly procedures for component identification and location.

Lubricate mainshaft bearing surfaces and all bearing assemblies with Castrol® Syntorq or with petroleum jelly.

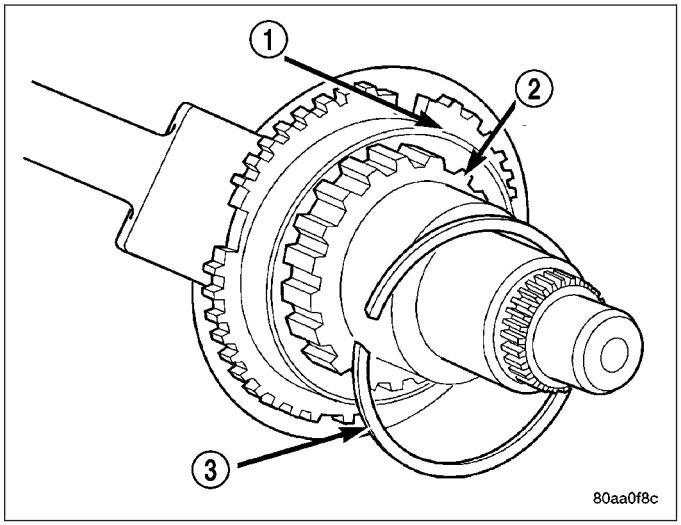
1. Install first gear clutch gear snap ring (1) in rear most groove of mainshaft hub (3).



2. Install first gear clutch cone (2) on mainshaft 1-2 synchro hub (1) with recessed side of cone facing front. Verify cone is seated against snap ring on hub.

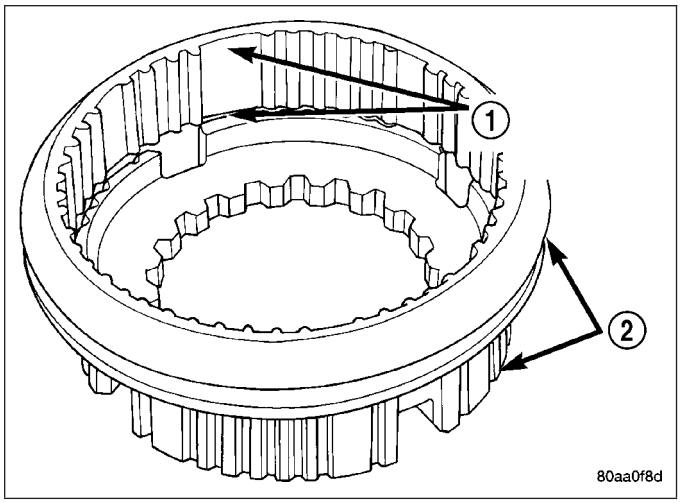


3. Install snap ring (3) on mainshaft 1-2 synchro hub (2) to secure clutch cone (1). Verify snap ring is seated in hub groove and against clutch cone.
4. Support mainshaft in upright position to install remaining gears, snap rings and synchro components. Shaft can be supported in gear case or hole can be cut in workbench to support shaft.

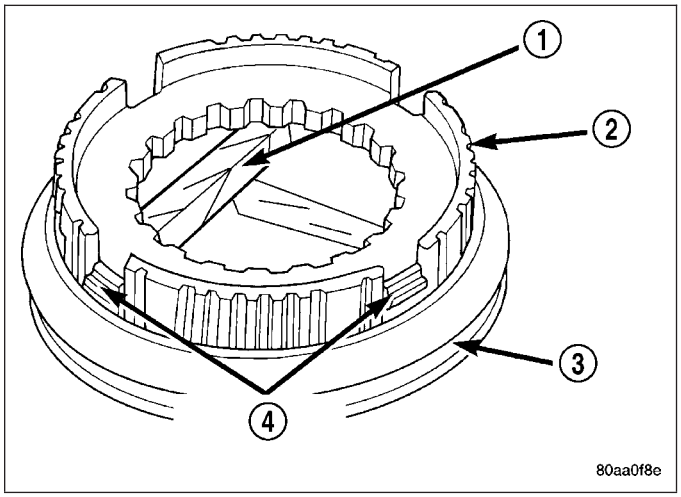


If 1-2 synchro hub (2) and sleeve (1) were disassembled for service, reassemble hub, sleeve, struts and springs as follows:

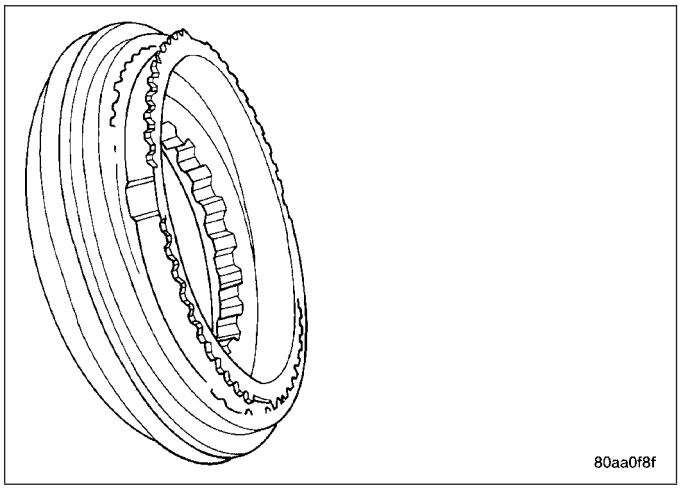
5. Align and install sleeve on hub. Rotate sleeve until it slides onto hub. Sleeve only fits one way and will easily slide onto hub when long slot in sleeve, aligns with long shoulder on hub.



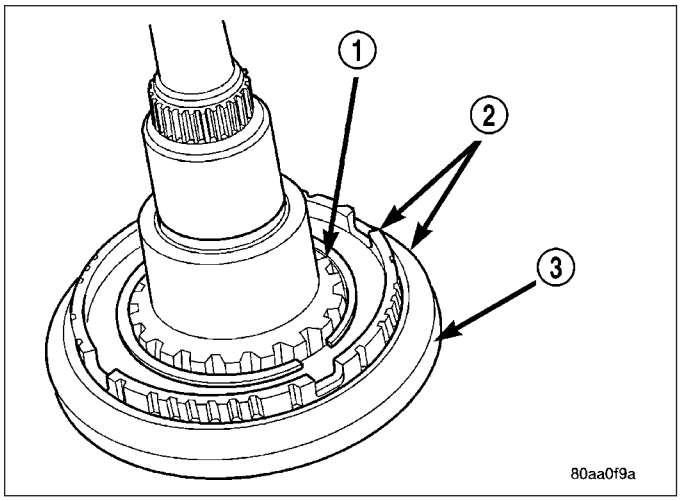
6. Place wood blocks (1) under hub (2) that will raise hub about 3.5 cm (1.375 in.) above surface of workbench. Then allow sleeve to drop down on hub.
7. Install springs and struts in hub (4). Use lots of petroleum jelly to hold them in place. Then compress struts with your fingers and move sleeve (3) upward until struts are started in sleeve. Verify that struts are engaged in sleeve before proceeding.
8. Turn synchro assembly upright. Then move sleeve into neutral position on hub and work struts into sleeve at same time. Be sure struts are seated and springs are not displaced during assembly.



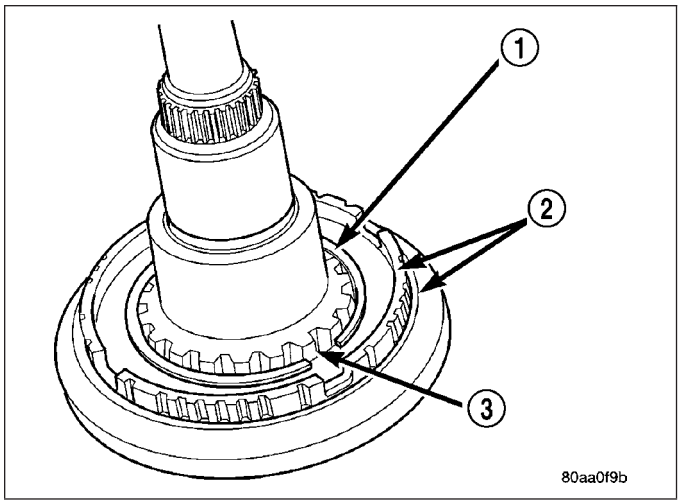
9. Install first gear stop ring in 1-2 synchro hub and sleeve. Verify stop ring is seated and engaged in hub and sleeve.



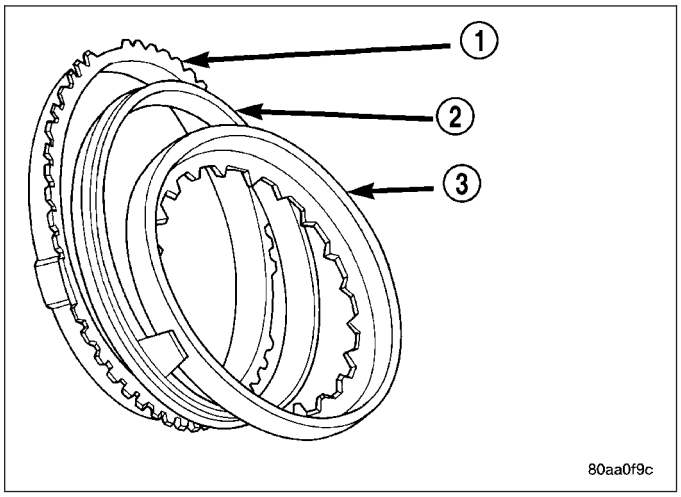
10. Install 1-2 synchro assembly (2) and stop ring on mainshaft with the taper on the sleeve (3) facing forward.



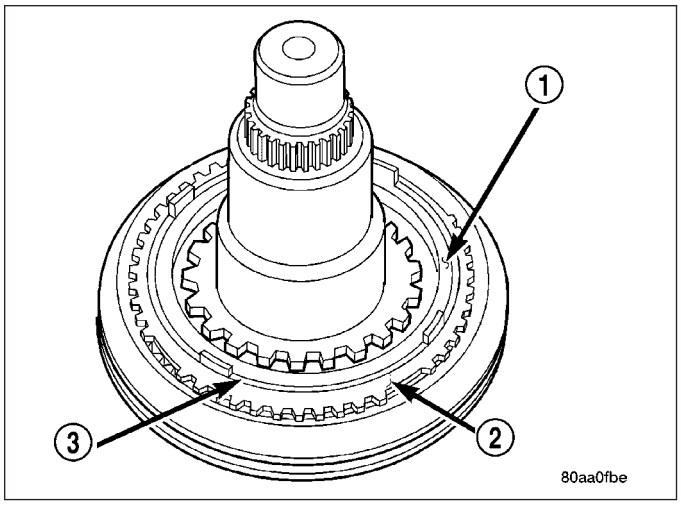
11. Install snap ring (1) that secures 1-2 synchro (2) on mainshaft hub (3). Verify snap ring is seated in groove in mainshaft hub.



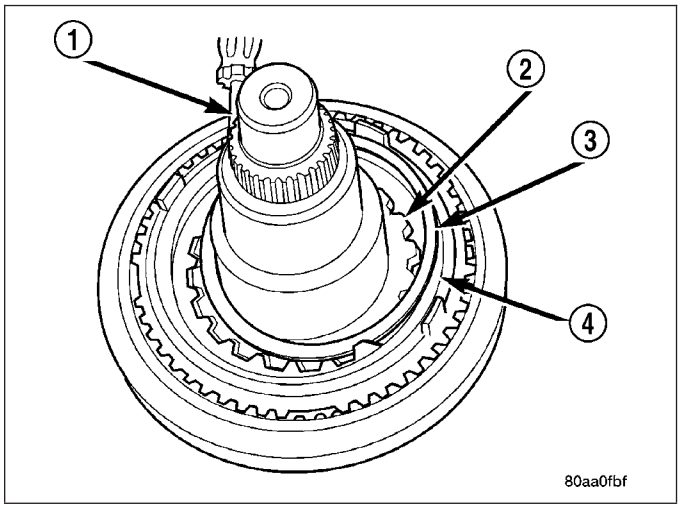
12. Assemble second gear clutch cone (3), clutch ring (2) and stop ring (1).



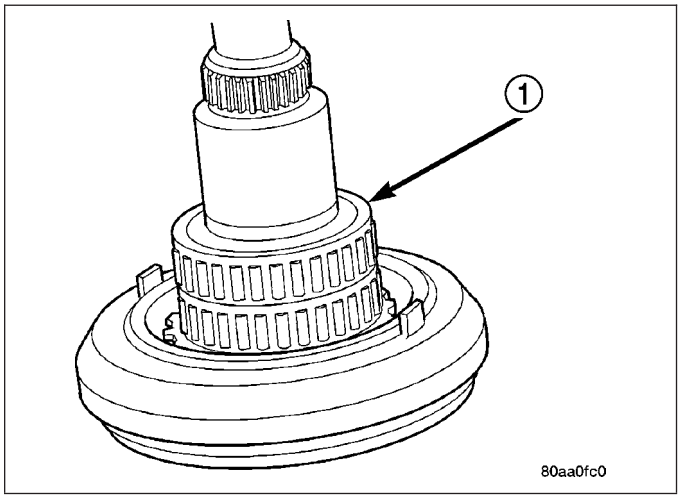
13. Install assembled second gear clutch cone (1) and rings (2) (3) on mainshaft and in 1-2 synchro hub.



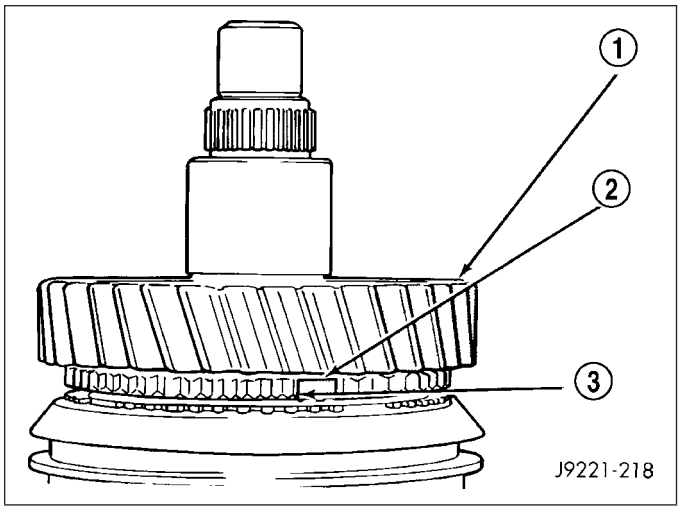
14. Install snap ring (3) that secures second gear clutch cone (4) on mainshaft (2) Use narrow blade screwdriver (1) to work snap ring into hub groove as shown. If snap ring will not fit in groove, clutch cone is slightly misaligned.



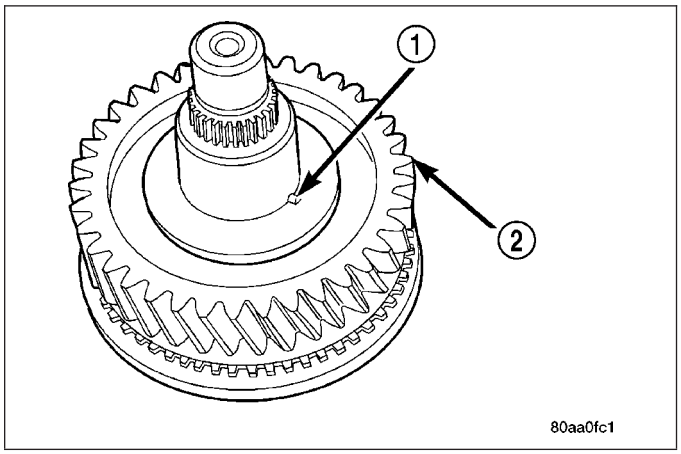
15. Install second gear bearing (1) on mainshaft.



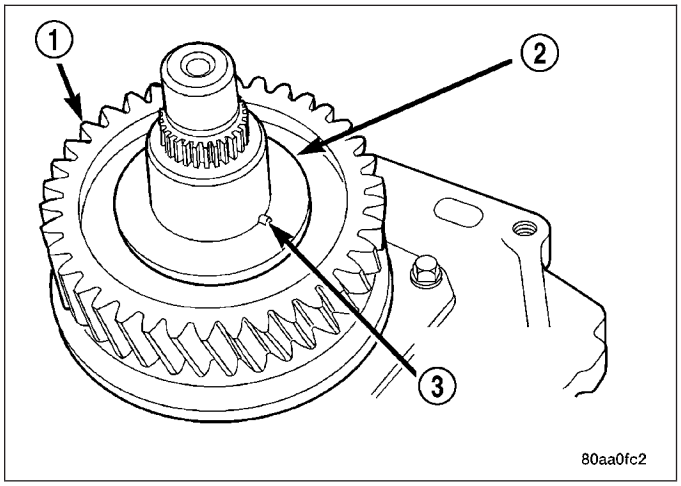
16. Install second gear (1) on mainshaft and bearing. Rotate gear until tabs (2) of second gear clutch ring are seated in tab slots (3) in gear.



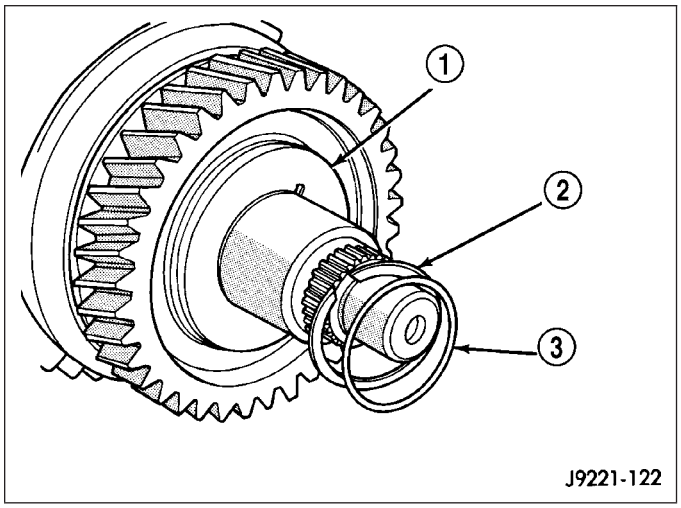
17. Install thrust washer pin (1) in shaft.



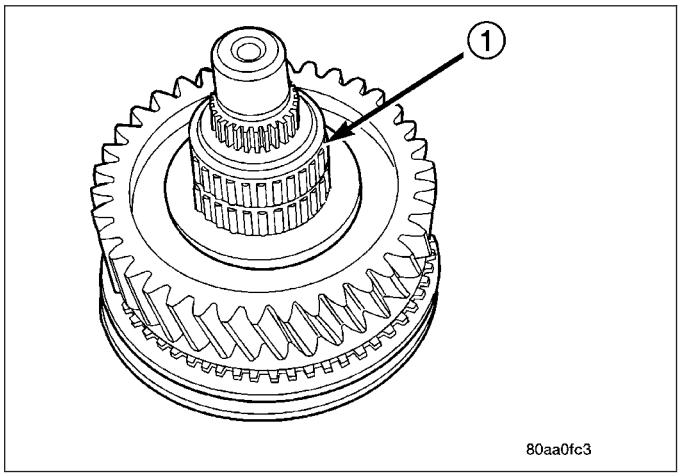
18. Install second gear (1) thrust washer (2). Verify washer is seated on gear and pin (3).



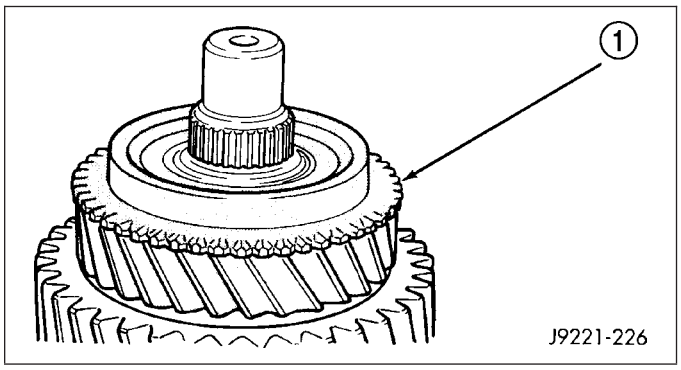
19. Install second gear thrust washer (1) snap ring (2). Verify snap ring is seated in mainshaft groove.
20. Install third gear bearing spacer (3) on shaft and seat it against thrust washer snap ring.



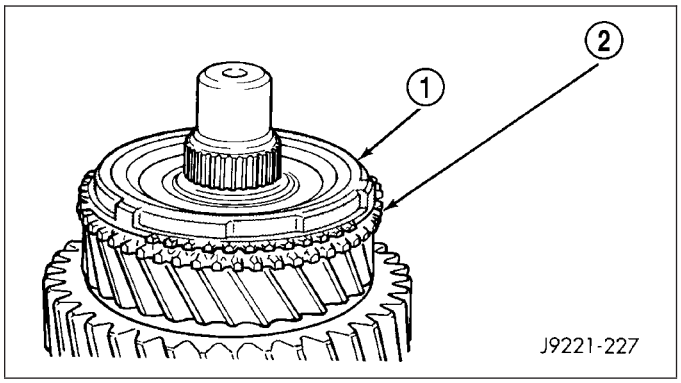
21. Install third gear bearing (1) on mainshaft. Bearing should be flush with mainshaft hub, if not bearing spacer or snap ring was not installed.



22. Install third gear (1) over bearing and onto mainshaft.

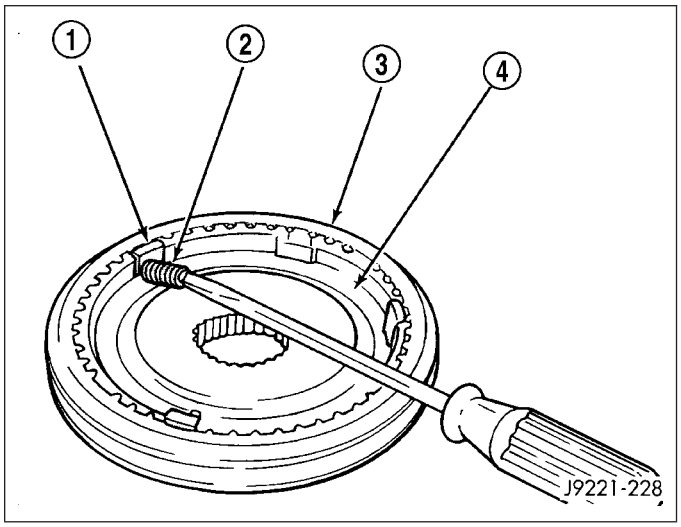


23. Install synchro stop ring (1) on third gear (2). Verify stop ring is seated on cone taper.

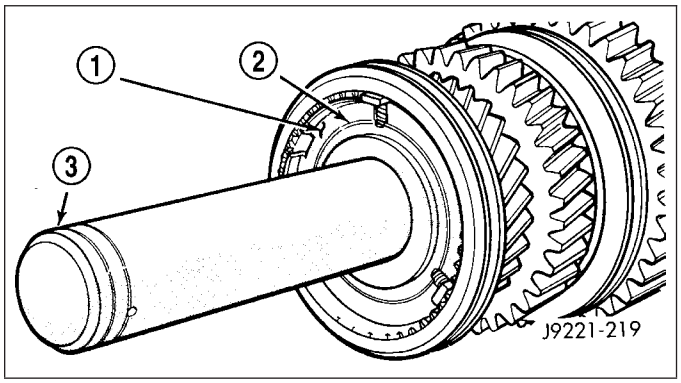


If 3-4 synchro was disassembled for service, reassemble synchro components as follows:

24. Align and install synchro sleeve (3) on hub (4). **Front side of hub has a narrow groove machined in it.** Insert all three synchro struts (1) in slots machined in sleeve and hub. Install and seat synchro springs (2). Use screwdriver to compress springs and seat them in struts and hub as shown.



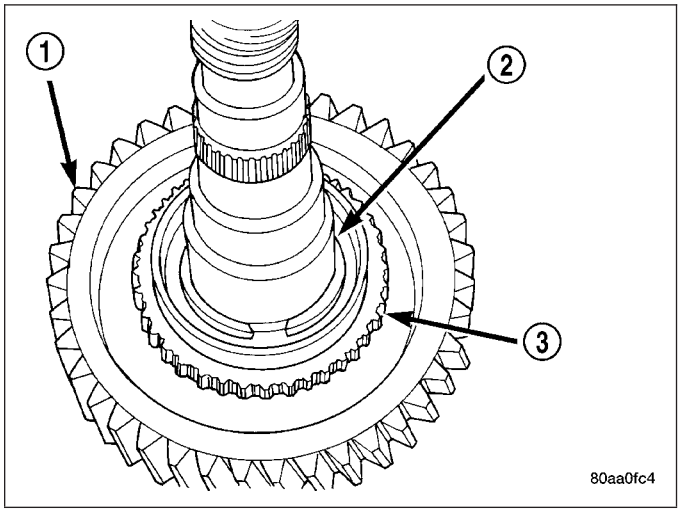
25. Start 3-4 synchro (1) assembly on mainshaft with the hub groove (2) and sleeve groove both facing forward. Tap assembly onto shaft splines until hub is about 3 mm (0.125 in.) away from third gear stop ring. Then align stop ring with synchro sleeve and hub and seat synchro assembly with Installer C-4040 (3).
26. Verify 3-4 synchro hub is seated on shaft with approximately 3 mm (0.125 in.) of shaft spline visible.



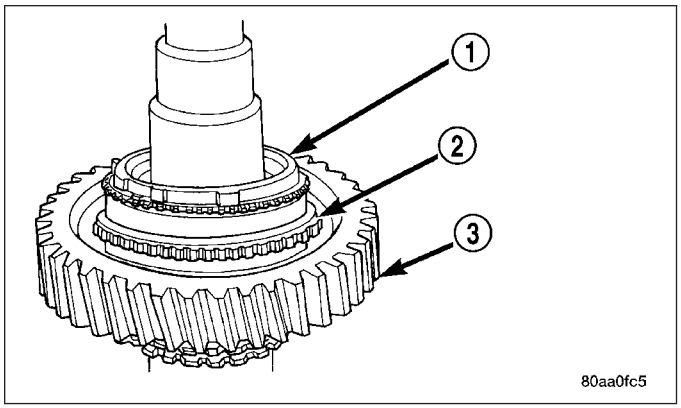
NOTE: If hub is not seated, stop ring lugs are misaligned. Rotate ring until lugs are engaged in 3-4 hub slots.

27. Verify that second and third gear rotate freely at this point. If not, determine the cause and correct.
28. Invert mainshaft in case or bench.
29. Install first gear bearing on mainshaft.

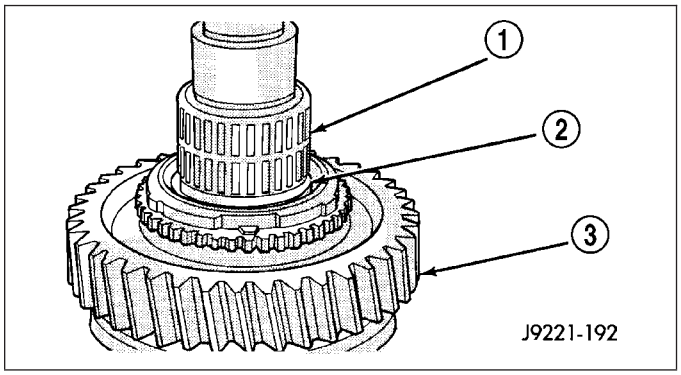
30. Install first gear (1) on shaft with clutch hub side of gear facing the front of shaft. 1-2 synchro hub will not seat properly if clutch ring tabs are misaligned.
31. Install reverse clutch gear (3) on first gear. Verify clutch gear is seated on shaft splines.
32. Install reverse clutch gear snap ring (2) with heavy duty snap ring pliers. Reverse gear will not fit properly if snap ring is not seated.



33. Install stop ring (1) on clutch cone (2). Verify stop ring is seated on cone taper.



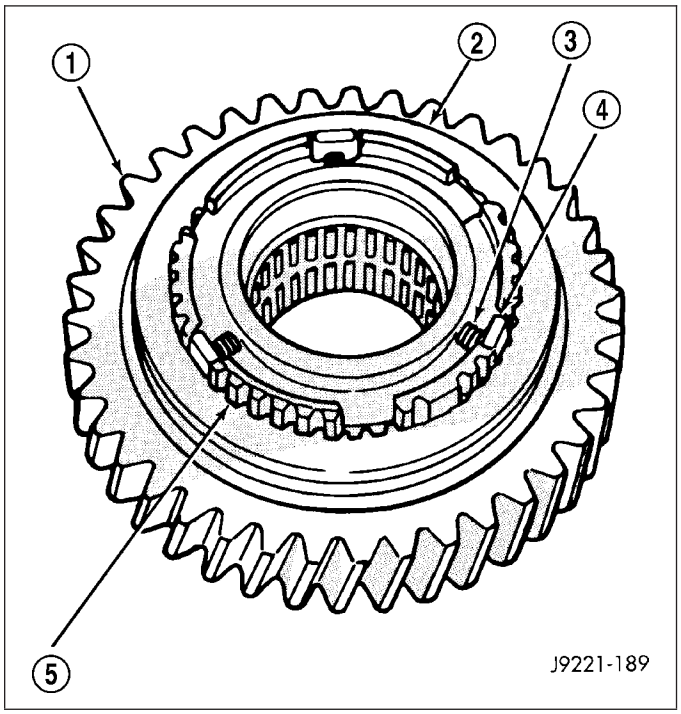
34. Install reverse gear bearing spacer (2) on mainshaft and seat against reverse clutch gear snap ring.
35. Install reverse gear bearing (1) on mainshaft.



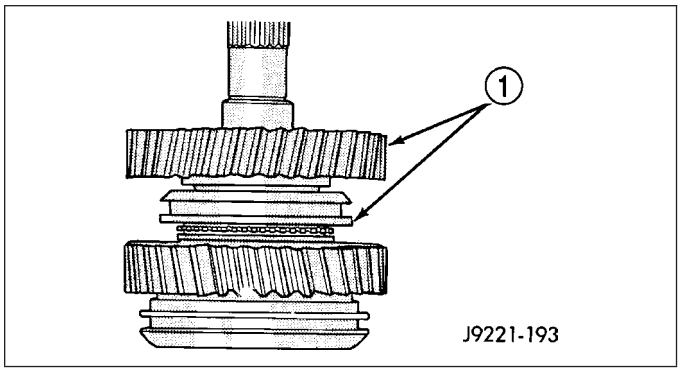
If reverse gear sleeve and struts were disassembled for service, reassemble sleeve, struts and springs as follows:

CAUTION: The reverse sleeve will fit either way on the hub. Verify tapered side of the sleeve faces rearward.

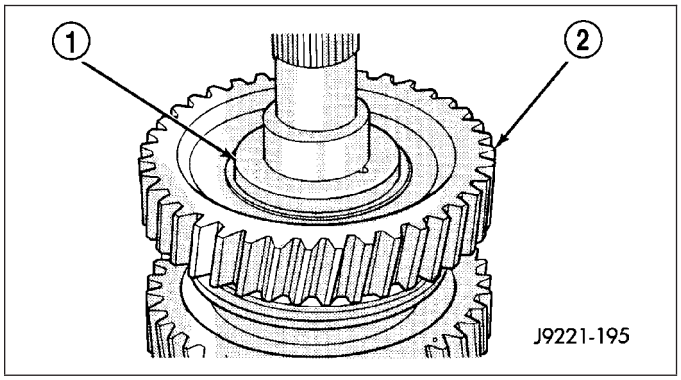
36. Position sleeve (2) on hub (5) so tapered side of sleeve faces rearward. Rotate sleeve to align teeth on sleeve and hub. Sleeve will slide easily into place on hub when properly aligned. Install springs in gear hub. Use petroleum jelly to hold springs (3) in place if desired. Compress first spring with flat blade screwdriver and slide strut (4) into position in hub slot. Then work spring into seat in strut with small hooked tool or screwdriver. Install second and third struts in same manner as described in step (d). Work sleeve upward on hub until struts are centered and seated in sleeve. Sleeve should be in neutral position after seating struts.



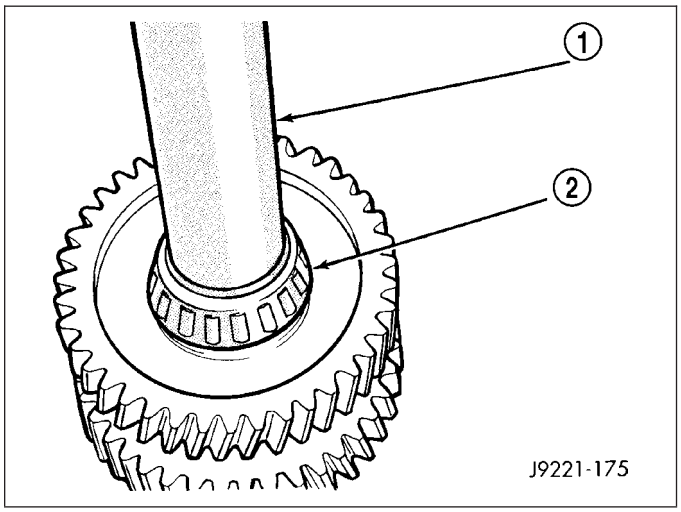
37. Install reverse gear and synchro assembly (1) on mainshaft. Rotate assembly until stop ring lugs engage in hub slots and gear drops into seated position.



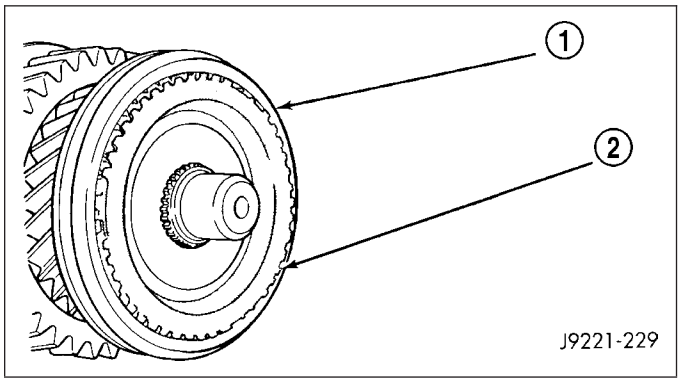
38. Install reverse gear (2) thrust washer (1).



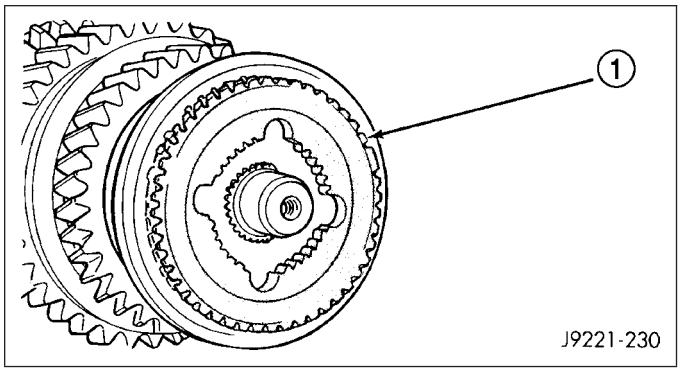
39. Install rear bearing (2) on mainshaft with Installer 6446 (1). Seat bearing on output shaft and against thrust washer.



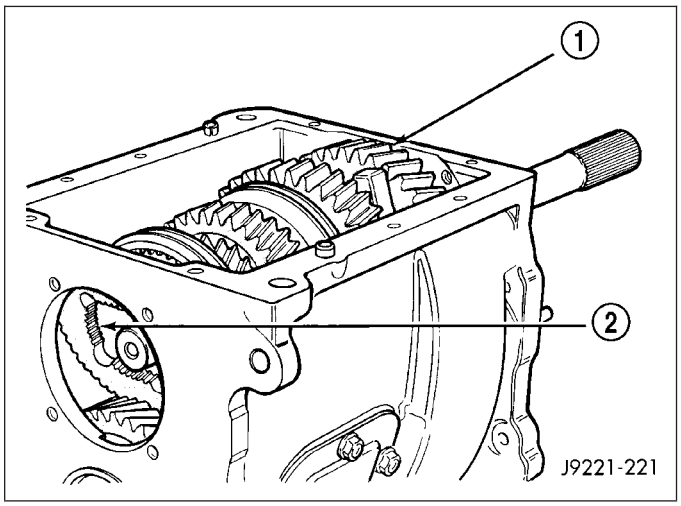
40. Install fourth gear stop ring (2) in 3-4 synchro sleeve (1).



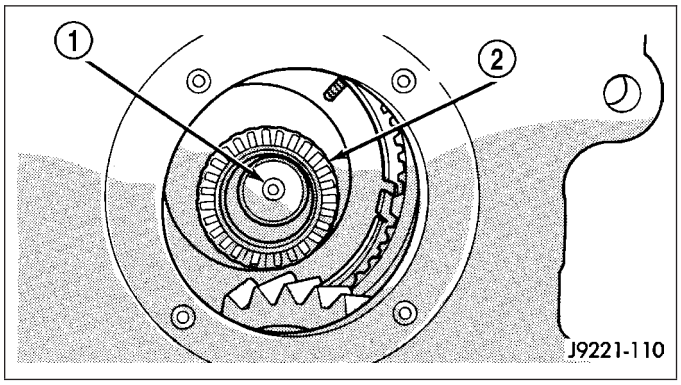
41. Install fourth gear clutch gear (1) in stop ring.
42. Roll gear case onto its left side.
43. Grip mainshaft at pilot bearing hub and just behind reverse gear. Then lift assembly and guide rear of shaft through bearing bore at rear of case.
44. Continue holding front of shaft but switch grip at rear to shaft output splines. Lift mainshaft assembly slightly, align gears and seat assembly in case.



45. Set transmission case upright.

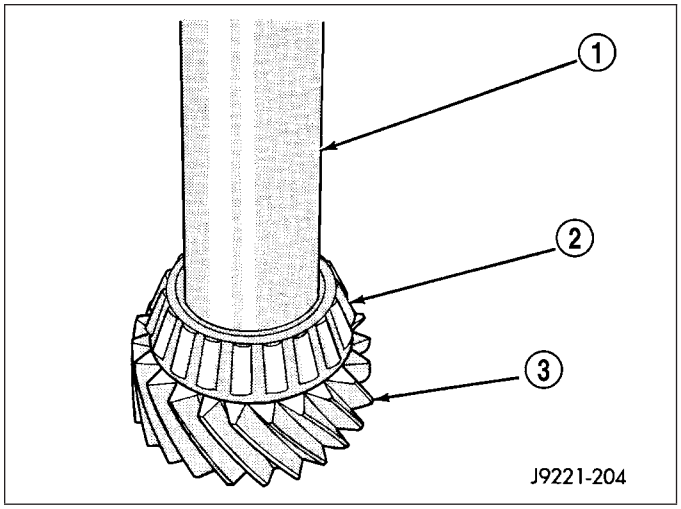


46. Install drive gear thrust bearing (2) on mainshaft (1). Use plenty of petroleum jelly to hold bearing in place.
47. Check alignment and mesh of mainshaft gears. If gears are not aligned, roll case on side and realign shaft and gears in case.

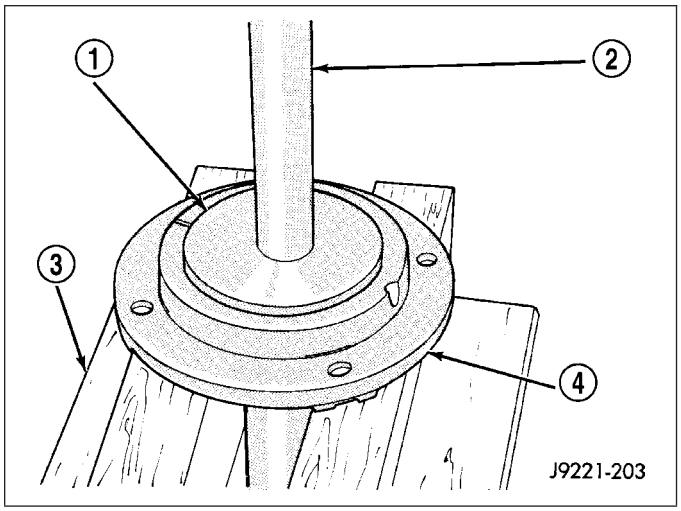


DRIVE GEAR AND RETAINER

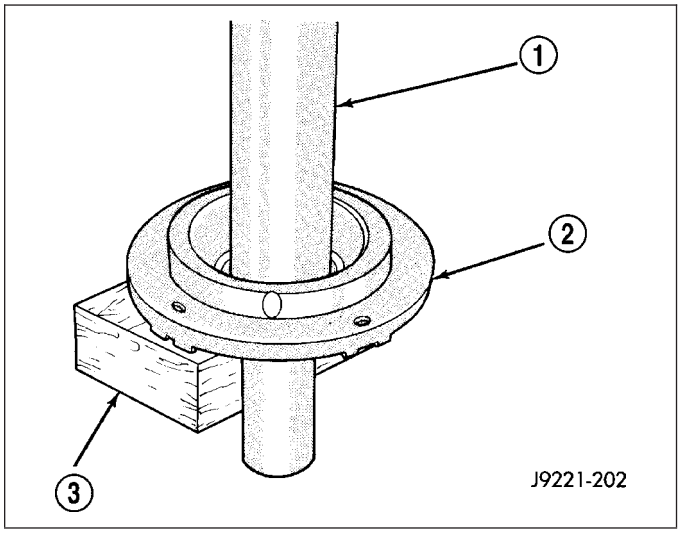
1. Install bearing (2) on drive gear (3) with Installer 6448 (1).
2. Lubricate pilot bearing with petroleum jelly and install it in drive gear bore.
3. Install drive gear on mainshaft. Work gear rearward until mainshaft hub is seated in pilot bearing.



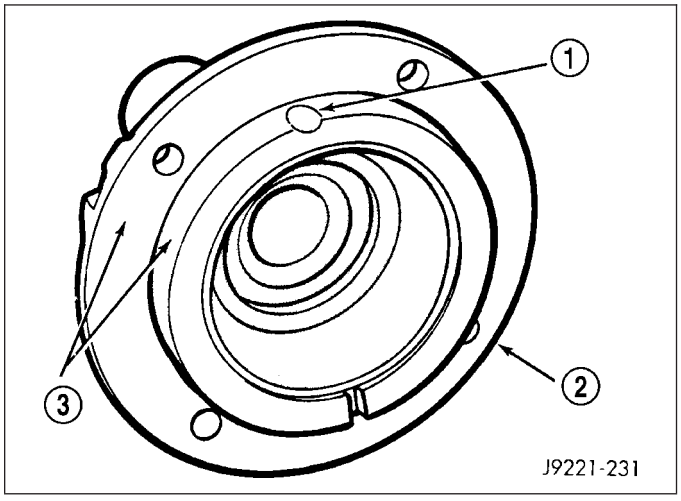
4. Install bearing cup in front retainer (4) with Handle C-4171 (2) and Installer C-4308 (1).



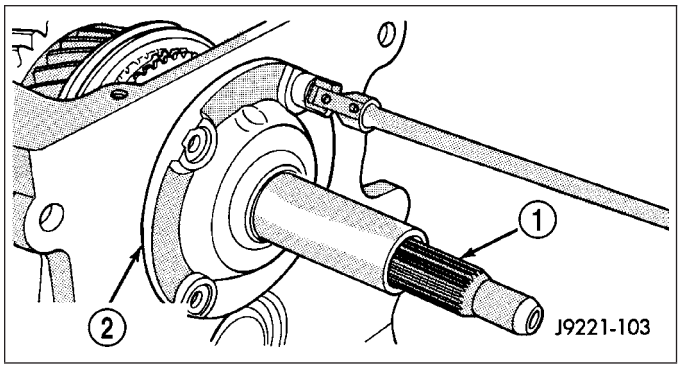
5. Install new oil seal in front bearing retainer (2) with Installer 6052 (1). Use one or two wood blocks (3) to support retainer as shown. Lubricate seal lip with petroleum jelly after installation.
6. Clean contact surfaces of gear case and front bearing retainer with a wax and grease remover.



7. Apply Mopar Silicone Sealer (3) or equivalent to flange surface of front bearing retainer (2).
8. Install front bearing retainer over drive gear and start it into case.
9. Start front bearing retainer in gear case. Verify retainer lube channel (1) is at the top-center **(12 O'clock)** position.



10. Align front bearing retainer (2) bolt holes and tap retainer into place with plastic mallet. Install **new** retainer bolts and tighten to 30 N·m (22 ft. lbs.).



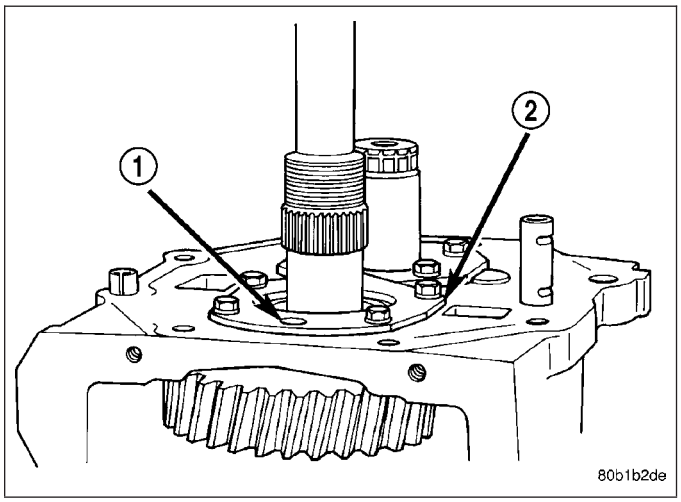
MAINSHAFT END PLAY

1. Install mainshaft rear bearing cup in case and over bearing. Tap bearing cup into place with plastic mallet.
2. Install rear bearing plate (2) to hold mainshaft and rear bearing in position with oil hole at the top (1).

NOTE: Do not install any end play shims at this time.

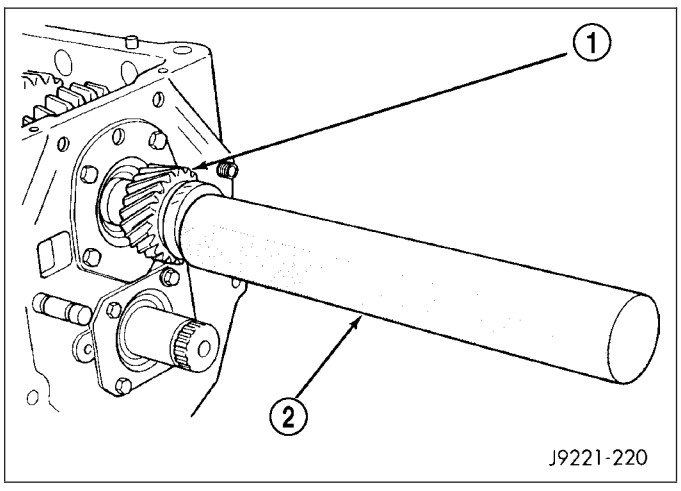
3. Tighten rear bearing plate bolts securely.
4. Place gear case in upright position on bench. Either cut hole in bench to accept drive gear and front retainer or use C-clamps to secure transmission on bench.

NOTE: Do not leave transmission unsupported.



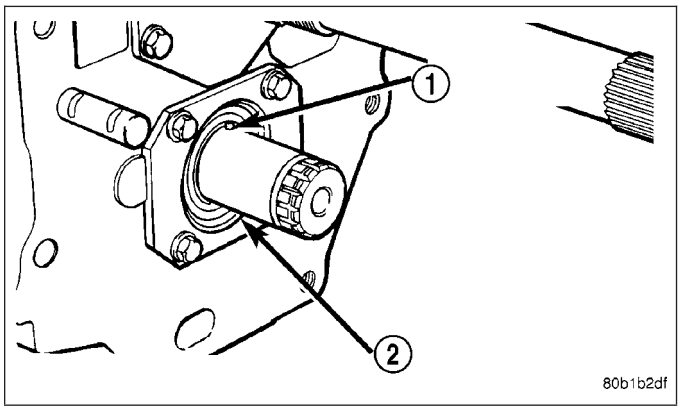
5. Install Extension Rod 8161 into a suitable threaded hole in rear of case.
6. Mount dial indicator on extension rod and position indicator plunger against end of mainshaft.
7. Move mainshaft forward to remove all play then zero dial indicator.
8. Move mainshaft upward and record dial indicator reading. Move mainshaft with pry tool positioned between drive gear and case.
9. End play should be 0.051-0.15 mm (0.002-0.006 in.). Select fit shims are available to adjust end play. If end play adjustment is required, remove bearing plate and install necessary shim.
10. Reinstall rear bearing plate with oil hole in bearing plate at the top.
11. Apply Mopar Lock N' Seal or equivalent to bearing plate bolt threads. Install and tighten bolts to 23 N·m (200 in. lbs.).

12. Install mainshaft fifth gear (1) with Installer 6446 (2). Gear is seated when it contacts rear bearing.

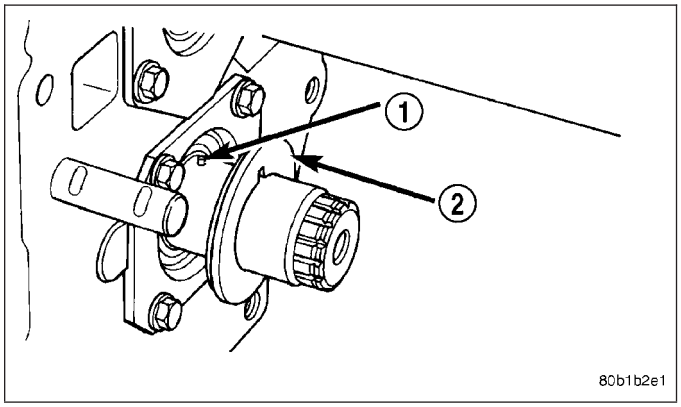


COUNTERSHAFT FIFTH GEAR SYNCHRO

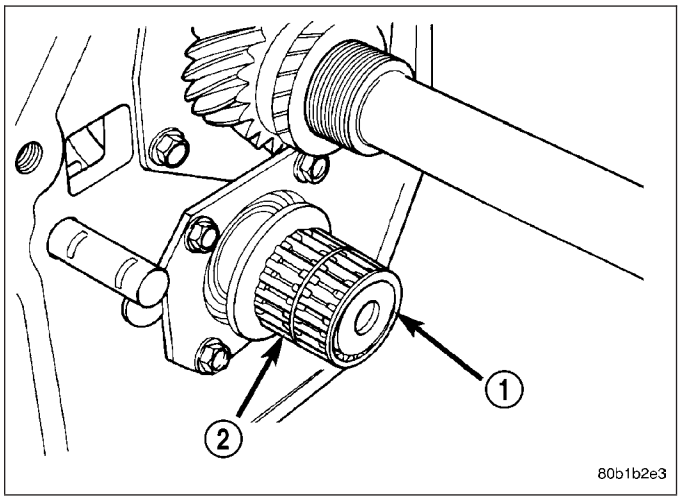
1. Install thrust washer pin (1) in countershaft (2).



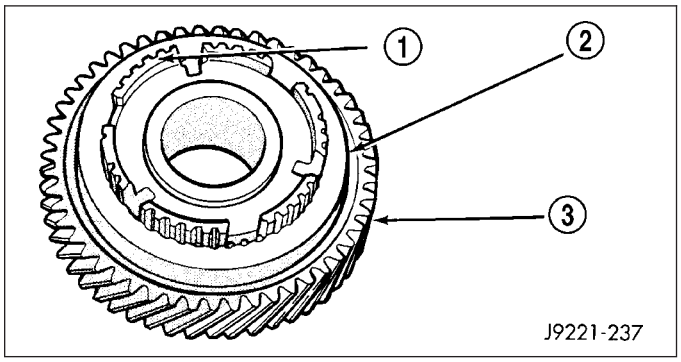
2. Install thrust washer (2) on countershaft. Turn washer until pin (1) engages in washer notch. The flat side of washer faces the rear and cone side faces the front.



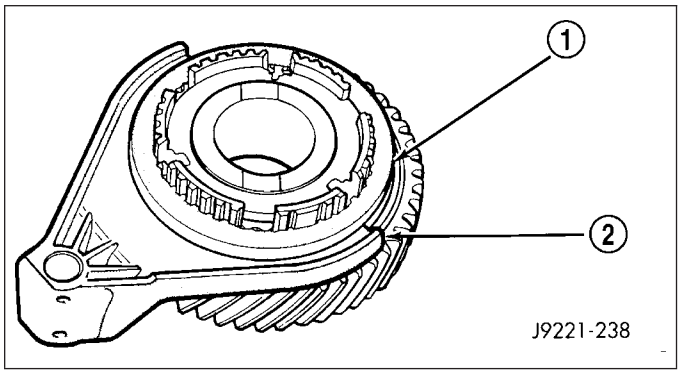
3. Lubricate and install fifth gear bearing (2) on countershaft (1).



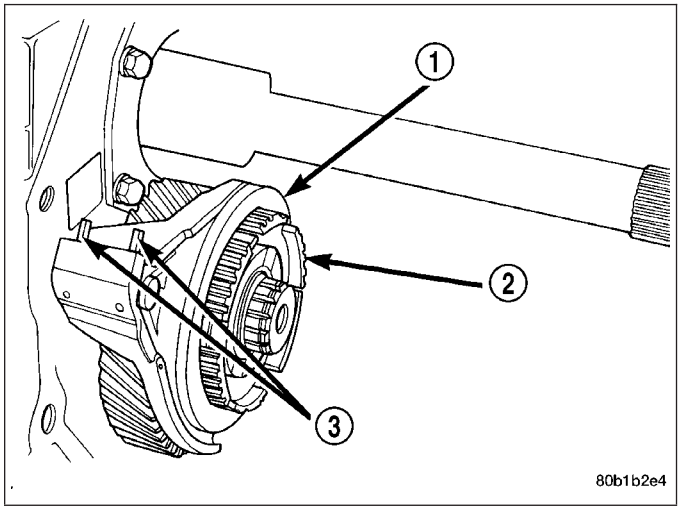
4. Install synchro sleeve (2) on hub (1) of countershaft fifth gear (3) with tapered side of sleeve facing front and the flat side facing rear.
   .



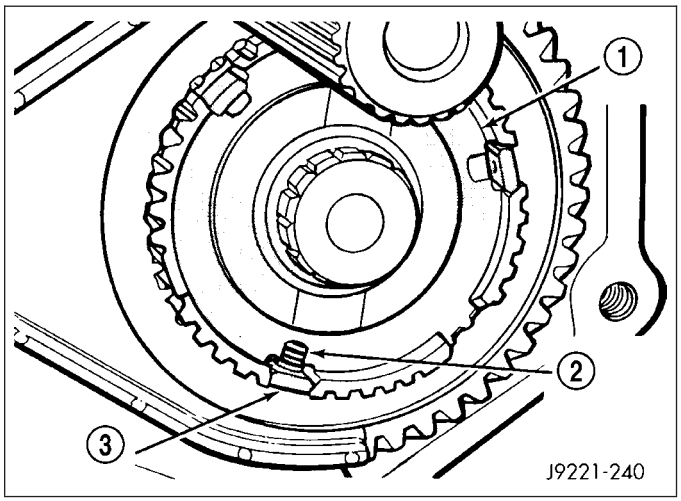
5. Install shift fork (2) in synchro sleeve (1).



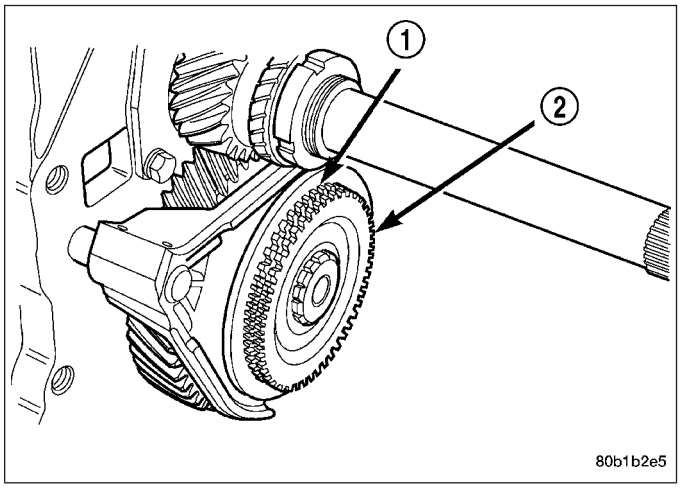
6. Install assembled fifth gear (2), synchro sleeve (1) and shift fork. Align fork with shift lug rail and align gear with bearings and countershaft. Start components onto shaft and rail, then tap gear and fork into place with plastic or rawhide mallet.



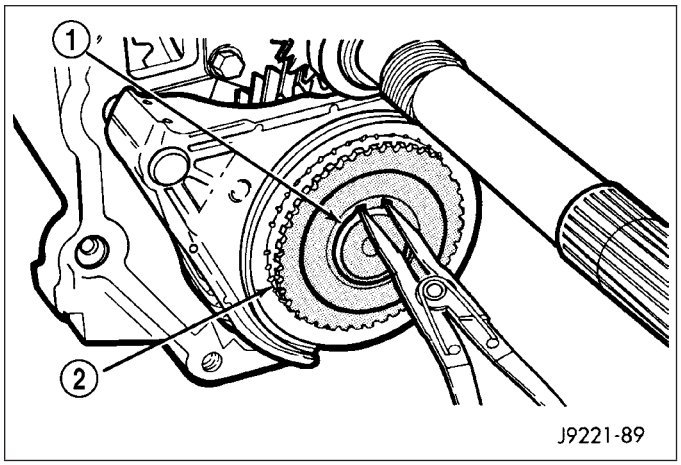
7. Install fifth gear synchro struts (3) and springs (2).



8. Assemble and install fifth synchro clutch gear (2) and stop ring (1) in fifth gear hub. Verify parts are seated in fifth gear hub.

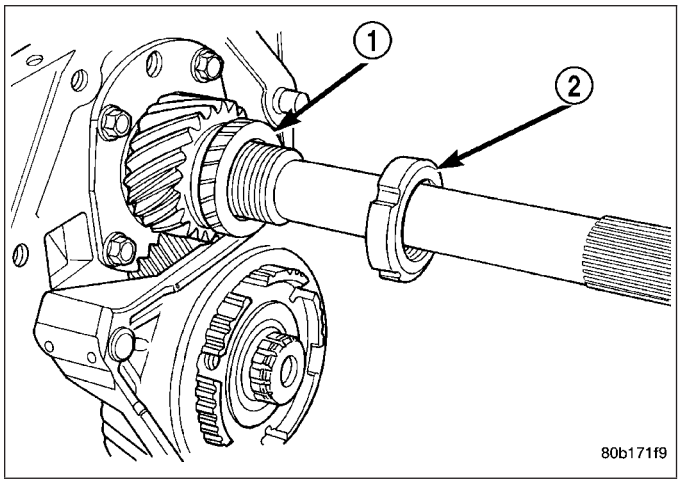


9. Install clutch gear snap ring (1).
10. Align roll pin holes in shift fork with notches in shift lug rail. Then install roll pins from top side of fork.

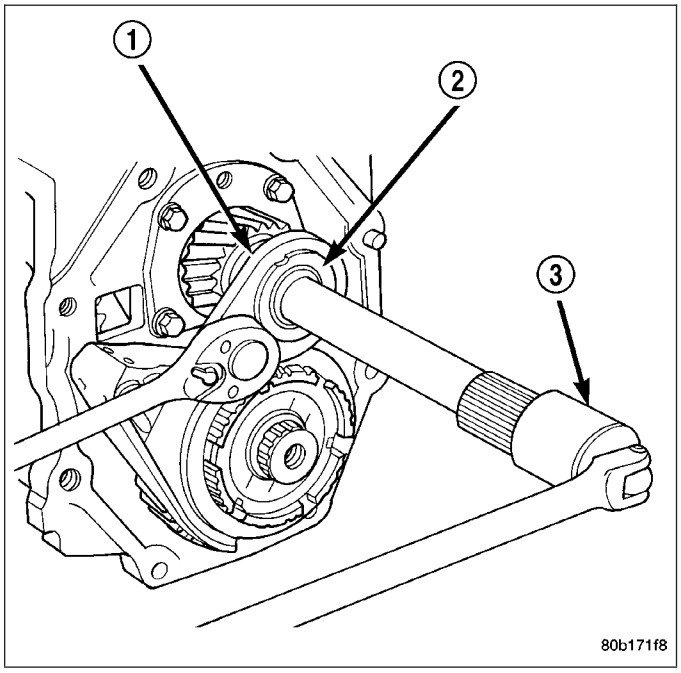


FIFTH GEAR NUT

1. Install belleville washer onto the mainshaft.
2. Install fifth gear nut over the mainshaft.
3. Tighten the clamp bolt until the gap in the clamp nut assembly is closed.
4. Back the clamp bolt off one full turn.
5. Place 10-15 drops of Loctite 272 onto the mainshaft threads where the fifth gear (1) nut (2) will be engaged.
6. Install fifth gear nut on mainshaft.

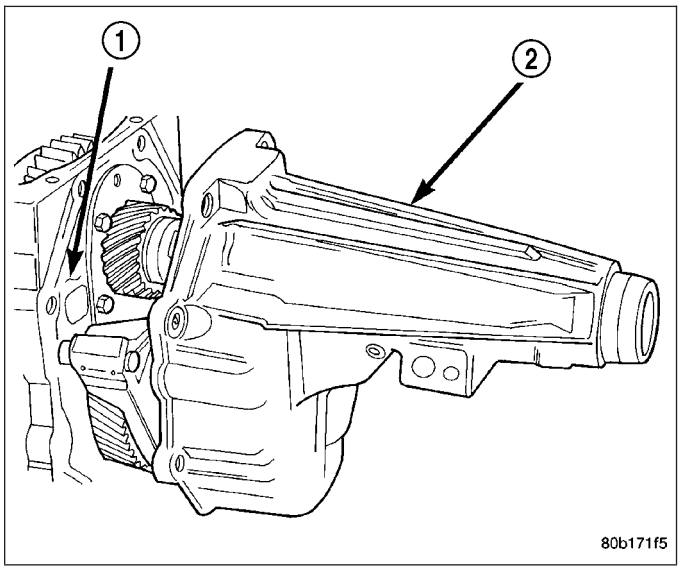


7. Hold mainshaft Socket 6993 4X2 (3) or Socket 6984 4X4 (3) while installing the fifth gear nut (2)
8. Tighten fifth gear nut as much as possible with Wrench 6743 (1), long handle ratchet, breaker bar and applicable socket wrench.
9. Lock mainshaft gears by shifting all synchro sleeves into engaged position.
10. Tighten fifth gear nut with Nut Wrench 6743 and high capacity torque wrench. Tighten nut to 366-380 N·m (270-280 ft. lbs.). Have helper hold transmission steady if necessary.
11. Torque the fifth gear clamp nut clamping bolt to 13.5 N·m (10 ft. lbs.).
12. Unlock the mainshaft gears by shifting all synchro sleeves out of the engaged position.



EXTENSION/ADAPTER HOUSING

1. Clean mating surfaces of extension/adapter housing (2) and gear case (1) with a wax and grease remover.
2. Check alignment dowels in gear case and housing or adapter. Be sure dowels are in position and seated.
3. Apply Mopar Silicone Sealer or equivalent to gear case and housing mating surfaces.
4. Align and install extension/adapter housing on gear case.
5. Apply Mopar Lock N' Seal or equivalent to threads of extension/adapter housing bolts.
6. Install and tighten housing bolts to 54 N·m (40 ft. lbs.).

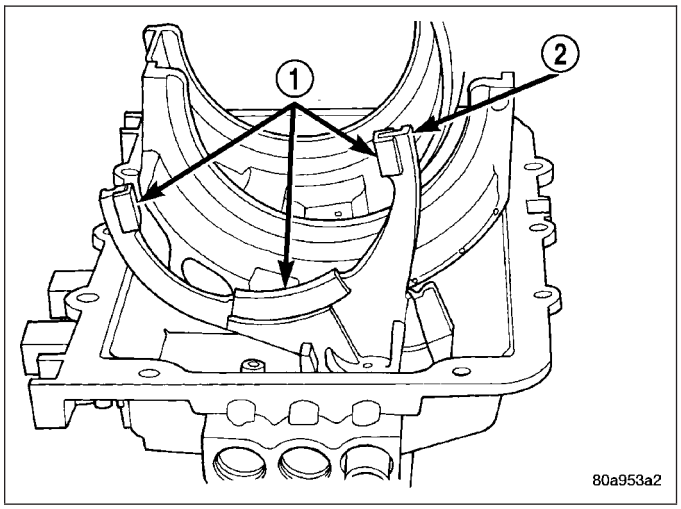


SHIFT MECHANISM

1. Clean mating surfaces of shift cover and gear case with wax and grease remover.
2. Apply a small amount of Mopar silicone sealer or equivalent to sealing surface of shift cover.

CAUTION: Do not over-apply an excessive amount sealer. Excess can squeezed into gear case and could block lubricant feed holes in time.

3. Lubricate synchro sleeves with Castrol® Syntorq gear lubricant or equivalent. Then apply light coat of petroleum jelly to shift fork contact surfaces.
4. Verify shift fork pads (1) are secure.
5. Verify 1-2 and 3-4 synchro sleeves and forks in shift cover are in neutral position.
6. Align and seat shift cover on transmission.



NOTE: If cover will not seat, it may not be aligned on gear case dowels or shift forks are not aligned with sleeves and shift lug.

7. Apply Mopar Lock N' Seal or equivalent to threads of shift cover bolts.
8. Install shift cover bolts and tighten to 27-31 N·m (216-276 in. lbs.).
9. Apply sealer to backup lamp switch. Install switch into cover and tighten to 22-34 N·m (193-265 in. lbs.).
10. Install vent assembly if removed. Apply an adhesive/sealer to vent tube to help secure it in cover.

INSTALLATION

NOTE: If a new transmission is being installed, use all components supplied with the new transmission. For example, if a new shift tower is supplied with the new transmission, do not re-use the original shift tower.

1. Apply light coat of Mopar high temperature bearing grease or equivalent to contact surfaces of the following components:
   - input shaft splines.

- release bearing slide surface of front retainer.
- release bearing bore.
- release fork.
- release fork ball stud.
- propeller shaft slip yoke.

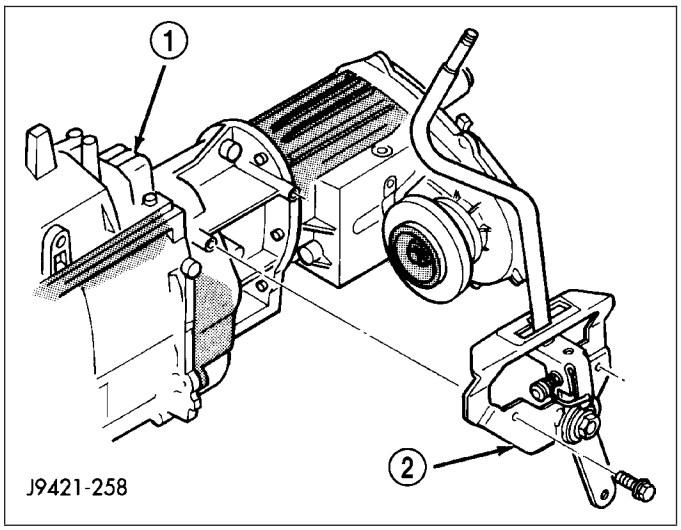
2. Apply sealer to threads of bottom PTO cover bolt and install bolt in case.
3. Mount transmission on jack and position transmission under vehicle.
4. Raise transmission until input shaft is centered in release bearing and clutch disc hub.
5. Move transmission forward and start input shaft in release bearing, clutch disc and pilot bushing.
6. Work transmission forward until seated against clutch housing. Do not allow transmission to remain unsupported after input shaft has entered clutch disc.
7. Install transmission bolts and tighten to 108 N·m (80 ft. lbs.).
8. Install transmission mount on transmission or rear crossmember.
9. Install rear crossmember.
10. Remove transmission jack and engine support fixture.
11. Position transmission harness wires in clips on shift cover.
12. Install clutch slave cylinder and install slave cylinder shield, if equipped.
13. Connect speed sensor and backup light switch wires.

TWO WHEEL DRIVE

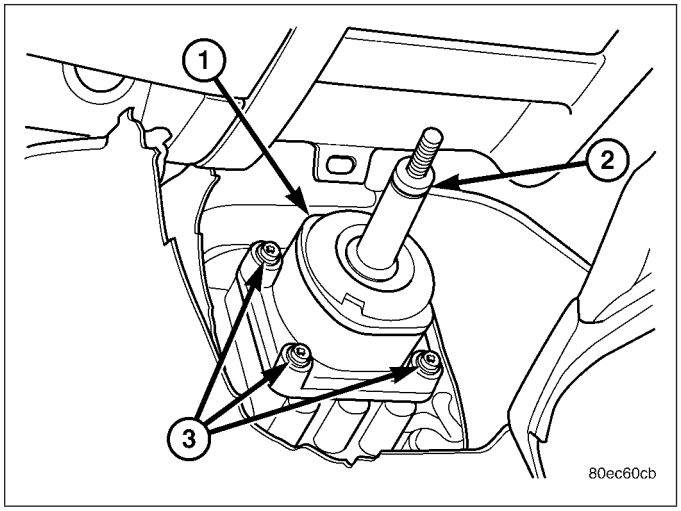
1. Fill transmission with recommended lubricant. Correct fill level is bottom edge of fill plug hole.
2. Align and install propeller shaft.
3. Lower vehicle.
4. Clean the mating surfaces of shift tower, isolator plate and shift cover with suitable wax and grease remover.
5. Apply Mopar Gasket Maker or equivalent to the sealing surface of the shift cover. Do not over apply sealant.
6. Install the isolator plate onto the shift cover, metal side down.
7. Install the shift tower onto the isolator plate. No sealant is necessary between the shift tower and the isolator plate.
8. Verify that the shift tower, isolator plate and the shift tower bushings are properly aligned.
9. Install the bolts to hold the shift tower to the isolator plate and the shift cover. Tighten the shift tower bolts to 10.2-11.25 N·m (7.5-8.3 ft. lbs.).
10. Install the shift lever extension onto the shift tower and lever assembly.
11. Install shift boot and bezel.
12. Connect battery negative cable.

FOUR WHEEL DRIVE

1. Install transfer case shift mechanism (2) on transmission (1).
2. Install transfer case on transmission jack. Secure transfer case to jack with safety chains.
3. Raise jack and align transfer case input gear with transmission mainshaft.
4. Move transfer case forward and seat it on adapter.
5. Install transfer case nuts and tighten to:
   - If 3/8 studs 41-47 N·m (30-35 ft. lbs.).
   - If 5/16 studs 30-41 N·m (22-30 ft. lbs.).
6. Install transfer case shift mechanism to side of transfer case.
7. Connect transfer case shift lever to range lever on transfer case.



8. Align and connect propeller shafts.
9. Fill transmission with required lubricant. Check lubricant level in transfer case and add lubricant if necessary.
10. Install transfer case skid plate, if equipped and crossmember. Tighten attaching bolts/nuts to 41 N·m (30 ft. lbs.).
11. Install exhaust system components.
12. Lower vehicle.
13. Clean the mating surfaces of shift tower, isolator plate and shift cover with suitable wax and grease remover.
14. Apply Mopar Gasket Maker or equivalent to the sealing surface of the shift cover. Do not over apply sealant.
15. Install the isolator plate onto the shift cover, metal side down.
16. Install the shift tower onto the isolator plate. No sealant is necessary between the shift tower and the isolator plate.
17. Verify that the shift tower, isolator plate and the shift tower bushings are properly aligned.
18. Install shift tower (1) bolts (3) and tighten to 10.2-11.25 N·m (7.5-8.3 ft. lbs.).
19. Install shift lever extension onto the shift tower and lever assembly and tighten to 47 N·m (35 ft. lbs.).
20. Install shift lever boot and bezel.
21. Connect battery negative cable.

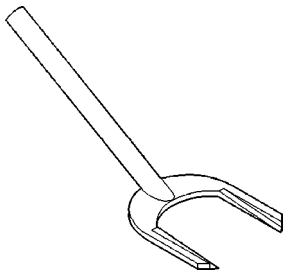


SPECIFICATIONS

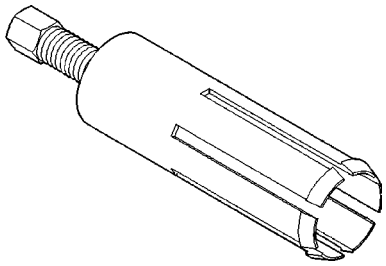
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Switch, Back-up Lamp	22-34	16-25	-
Countershaft Bearing Plate Bolts	19-26	14-19	170-230
Fifth Gear Nut	366-380	270-280	-
Fifth Gear Nut Clamp Bolt	13.5	10	-
Drain and Fill Plug	34-47	25-35	-
Front Bearing Retainer Bolts	27-34	20-25	235-305
Mainshaft Bearing Plate Bolts	19-26	14-19	170-230
PTO Cover Bolts	27-54	20-40	-
Extension/Adapter Housing Bolts	41-68	30-50	-
Shift Mechanism Cover Bolts	27-31	20-23	-
Shift Lever Extension	47	35	-
Transmission Bolts	108	80	-

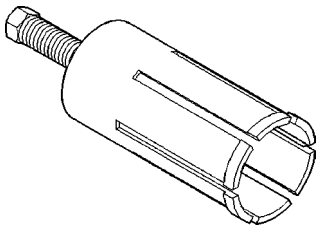
SPECIAL TOOLS



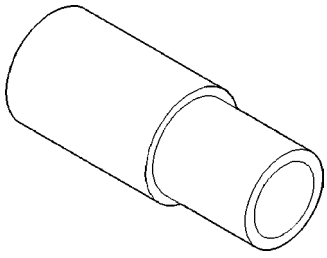
REMOVER C-3985-B



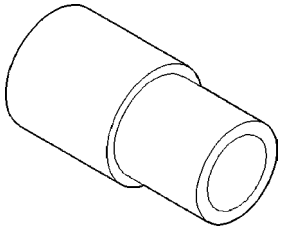
BUSHING REMOVER 6957



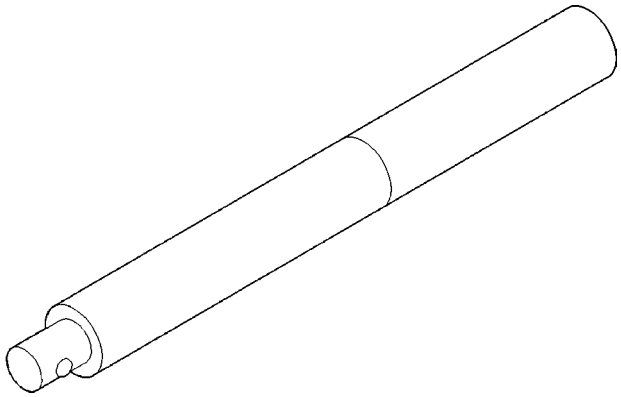
REMOVER BUSHING 8155



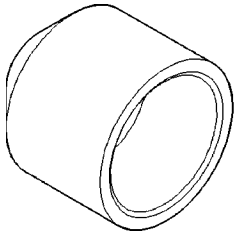
INSTALLER BUSHING 6951



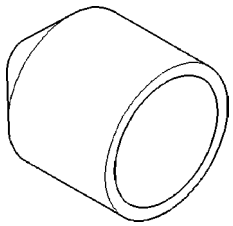
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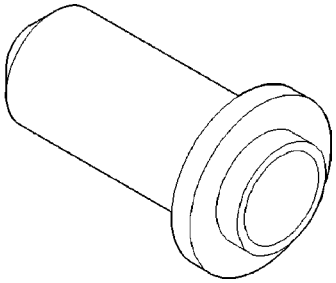
HANDLE C-4171



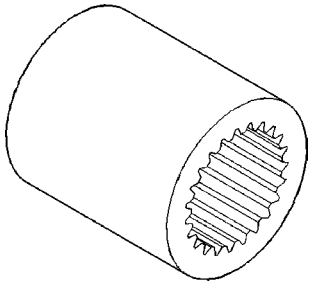
INSTALLER SEAL C-3972-A



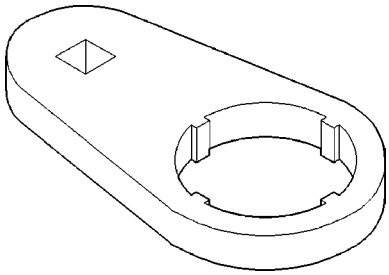
INSTALLER SEAL 8154



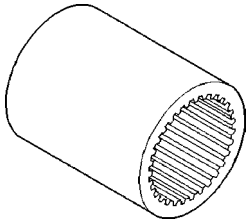
INSTALLER SEAL C-3860-A



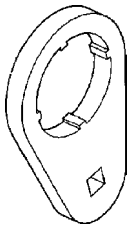
SOCKET 6442



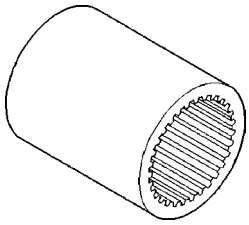
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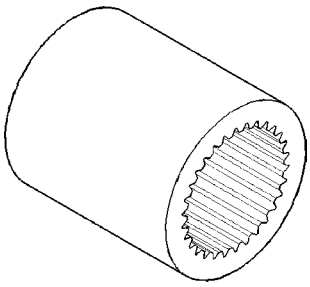
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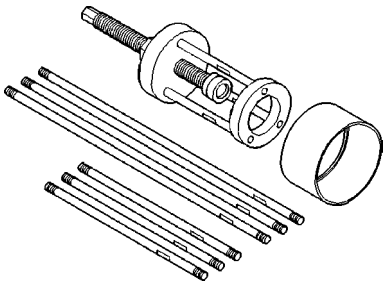
WRENCH 6743



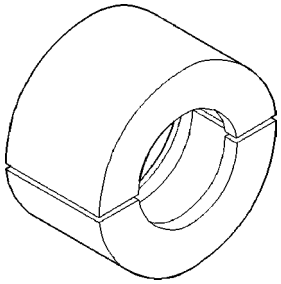
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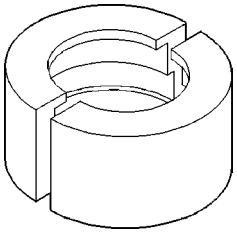
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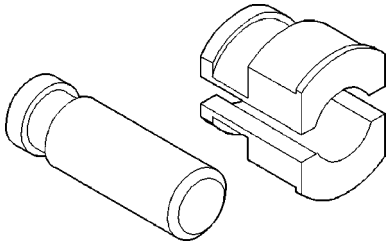
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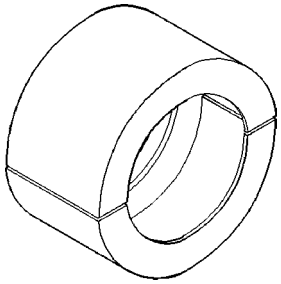
JAWS 6459



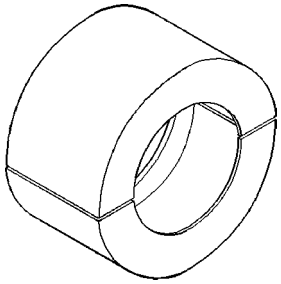
JAWS 6820



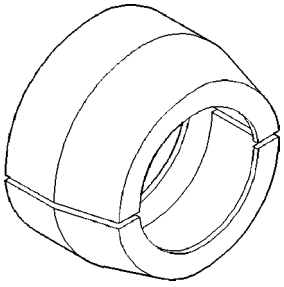
JAWS & INSERT 6453



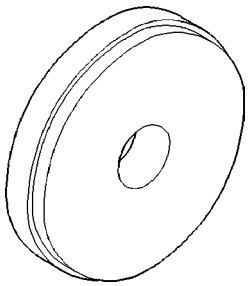
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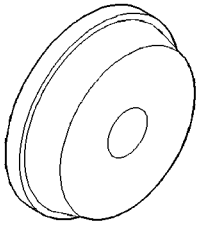
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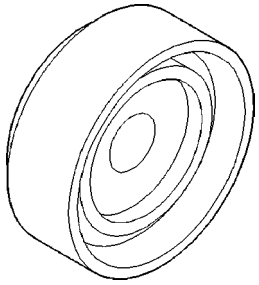
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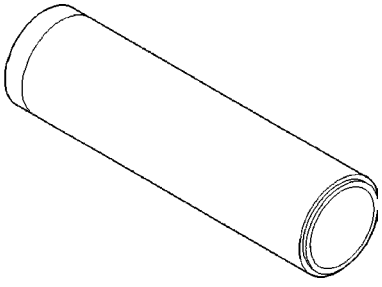
REMOVER 6454



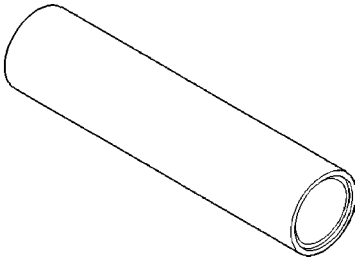
INSTALLER 6061



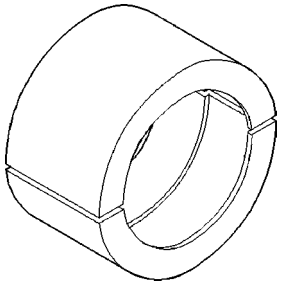
INSTALLER C-4340



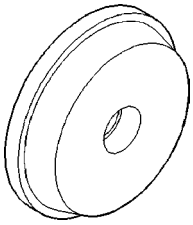
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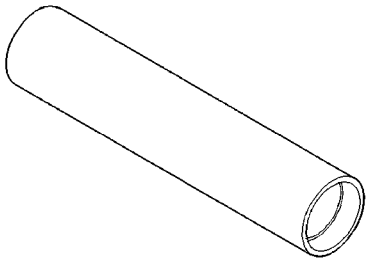
INSTALLER 6448



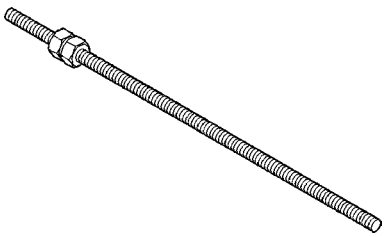
JAWS 6445



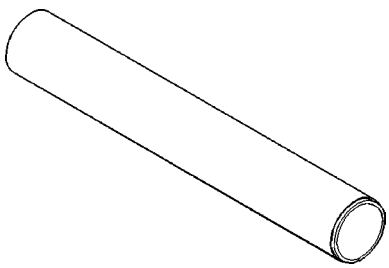
INSTALLER C-4308



INSTALLER 6052



ROD EXTENSION 8161

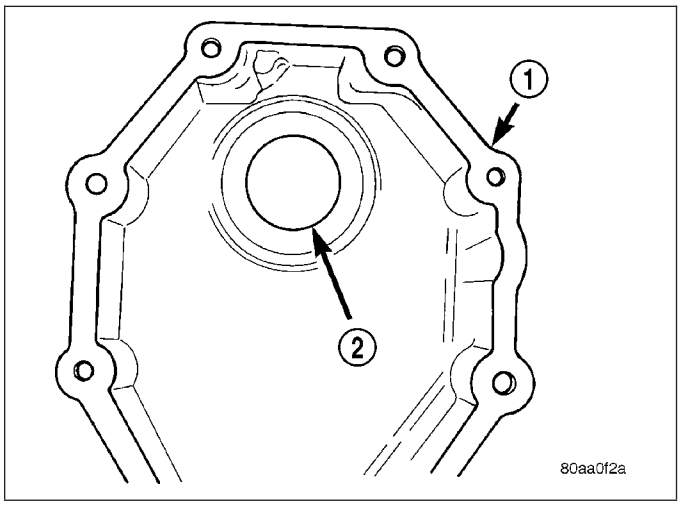


INSTALLER 6446

SEAL-ADAPTER HOUSING

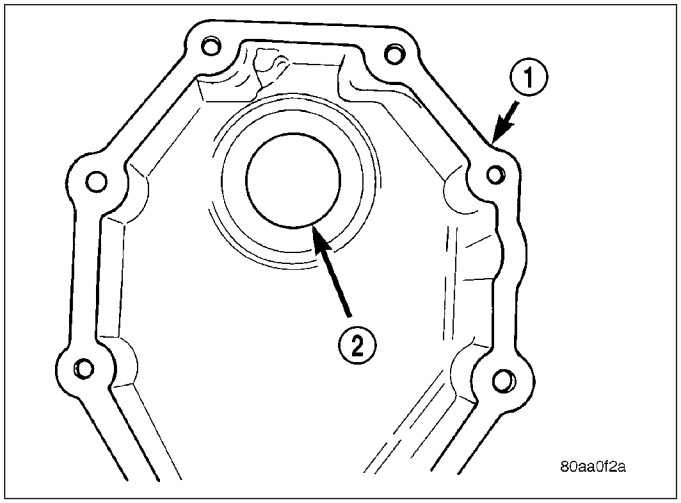
REMOVAL

1. With vehicle in neutral, position vehicle on hoist.
2. Mark propeller shafts and yokes for installation reference and remove the shafts.
3. Support transmission with a transmission jack.
4. Remove engine rear support.
5. Remove transfer case.
6. Remove adapter housing (1) seal (2) with a seal pick.



INSTALLATION

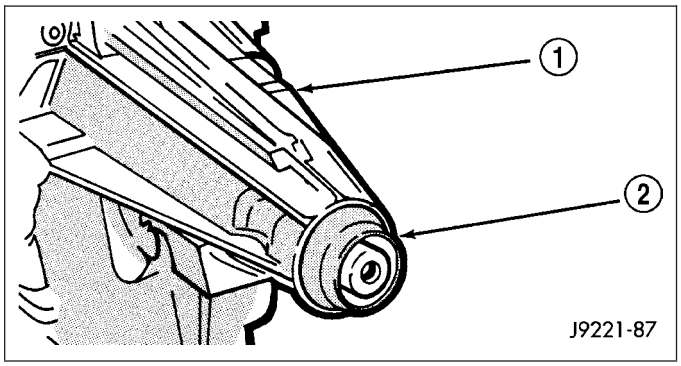
1. Install adapter housing (1) seal (2) with Installer C-3860-A and Handle C-4171.
2. Install transfer case.
3. Install propeller shafts with reference marks aligned.
4. Fill transfer case and transmission to proper level.



SEAL-EXTENSION HOUSING

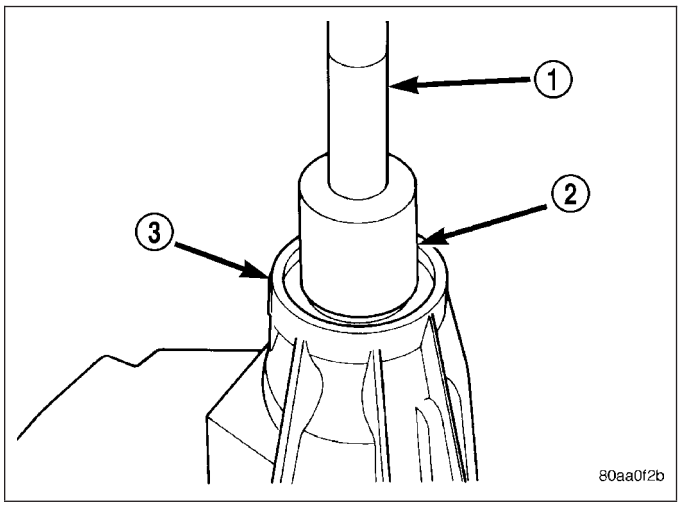
REMOVAL

1. Remove the propeller shaft.
2. Remove extension housing (1) seal (2) with Remover C-3985-B.
3. On heavy duty 4X2 vehicles, remove extension housing seal with a seal pick.
4. On light duty transmissions, remove the extension housing bushing with Remover 6957.
5. On heavy duty transmissions, remove the extension housing bushing with Remover 8155.

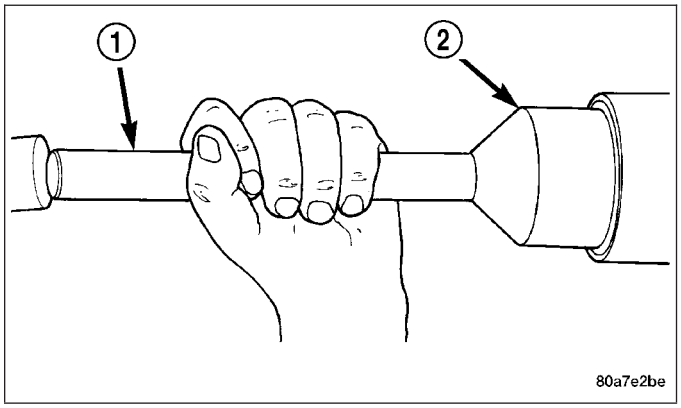


INSTALLATION

1. Install extension housing (3) bushing with Handle C-4171(1) and LD transmission - Installer 6951(2) or HD transmission - Installer 8161(2).



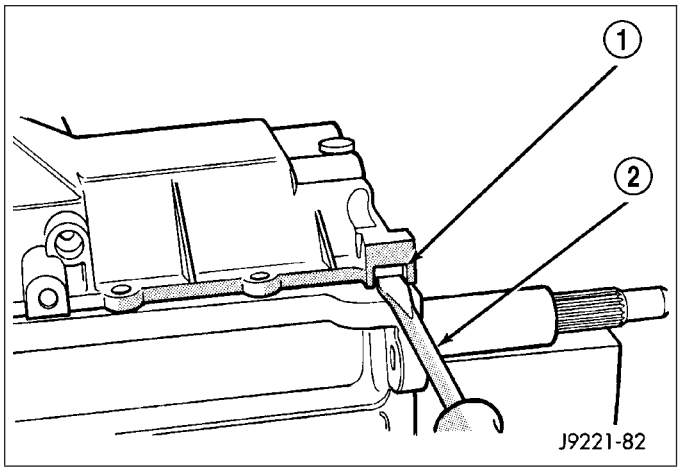
2. Install housing seal with Handle C-4171(1) and LD transmission - Installer C-3972-A or HD transmission - Installer 8154.
3. Install propeller shaft.
4. Check and fill transmission.



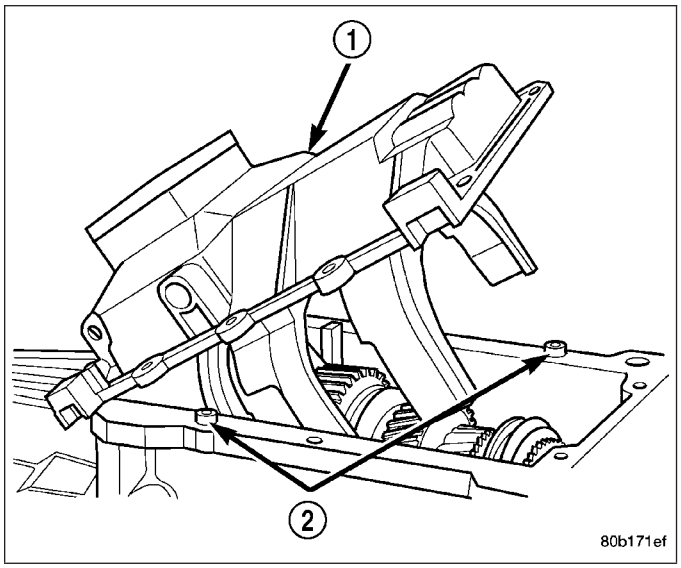
MECHANISM-SHIFT

REMOVAL

1. Remove transmission from vehicle.
2. Remove shift mechanism cover bolts.
3. Pry up shift mechanism cover at slots (1) provided in cover with screw driver (2).



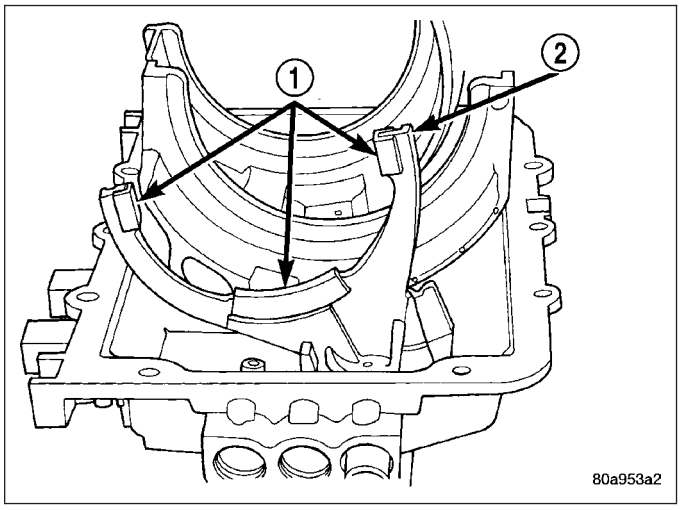
4. Raise cover enough to disengage it from alignment dowels (2) in gear case.
5. Raise front of shift mechanism cover (1) and lift cover up and off gear case.



FIFTH-REVERSE SHIFT FORK PADS

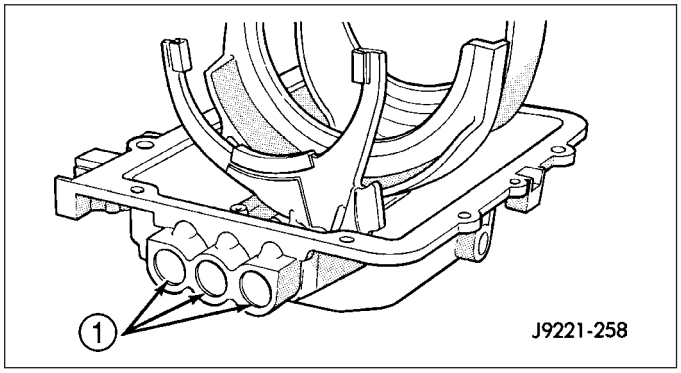
The shift pads (1) on the forks (2) are held in place by tension and a small locating tang.

To remove the pads, grasp a pad with hand and tilt it out and off the fork. If pad is difficult to remove by hand, insert a screwdriver blade between the pad and fork and pry the pad off.



EXPANSION PLUG

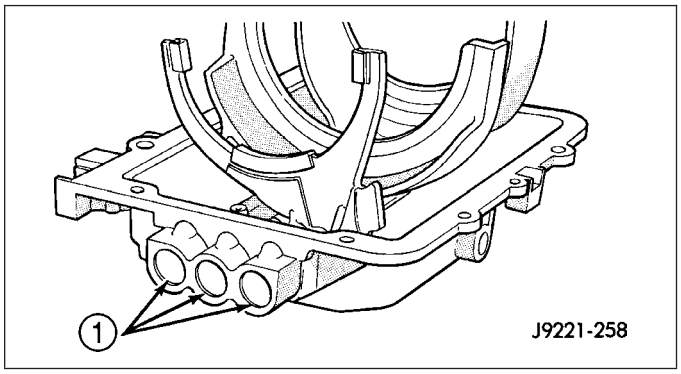
1. Drill 6 mm (1/4 in.) diameter hole in center of the plug (1) to be removed.
2. Pry plug out of cover with tapered punch.
3. Clean all chips from shift cover and plug bores. Then clean plug bores with solvent and dry with clean shop towel.



INSTALLATION

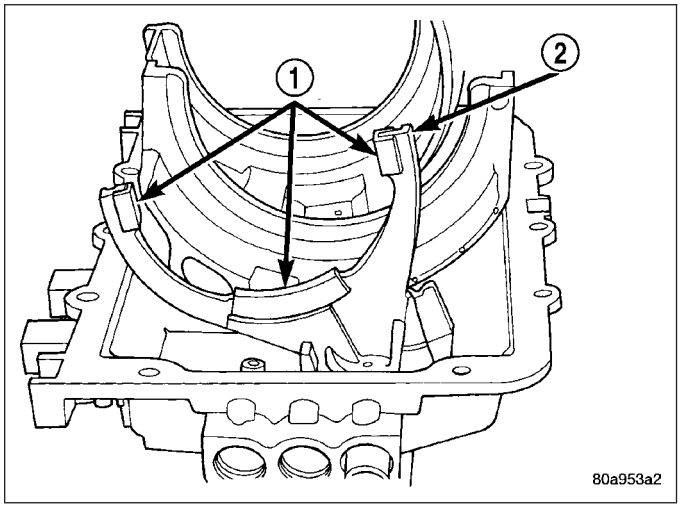
EXPANSION PLUG

1. Apply small bead of Mopar silicone sealer or equivalent to outer edge of each new plug.
2. Position each plug (1) in bore and tap into place with hammer and punch or socket.



SHIFT FORK PADS

1. Align pad locating tab.
2. Snap pads (1) into place and verify locating tabs are locked-in to fork (2).

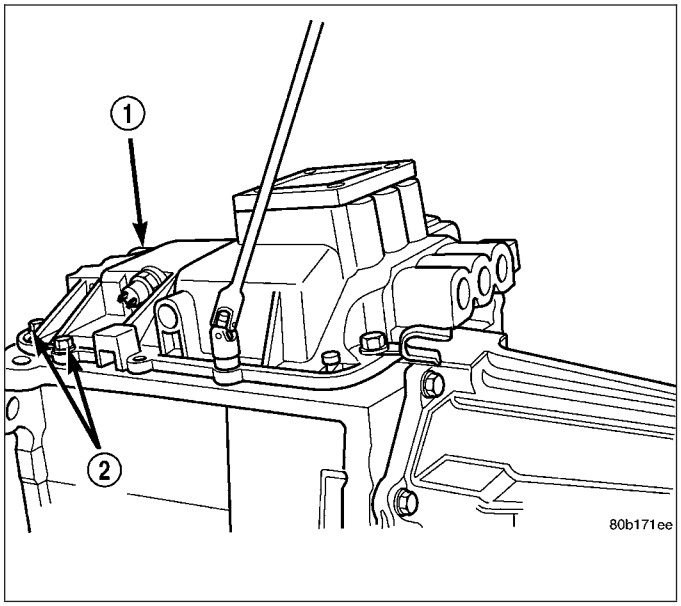


SHIFT COVER

1. Clean mating surfaces of shift mechanism cover and gear case with wax and grease remover.
2. Apply a small amount of Mopar silicone sealer or equivalent to sealing surface of shift mechanism cover.

CAUTION: Do not use an excessive amount sealer. Excess can squeezed into gear case and could block lubricant feed holes in time. Failure to follow these instructions will result in damage.

3. Lubricate synchro sleeves with Castrol® Syntorq gear lubricant or equivalent. Then apply light coat of petroleum jelly to shift fork contact surfaces.
4. Verify 1-2 and 3-4 synchro sleeves and forks in shift cover are in neutral position.
5. Align and seat shift mechanism cover on transmission.



NOTE: If cover will not seat, it may not be aligned on gear case dowels or shift forks are not aligned with sleeves and shift lug.

6. Apply Mopar Lock N' Seal or equivalent to threads of shift cover bolts.
7. Install shift mechanism cover (1) bolts (2) and tighten to 27-31 N·m (216-276 in. lbs.).
8. Apply sealer to backup lamp switch. Install switch into cover and tighten to 22-34 N·m (193-265 in. lbs.).
9. Install vent assembly if removed. Apply an adhesive/sealer to vent tube to help secure it in cover.
10. Install transmission.

MANUAL TRANSMISSION - NV5600 - SERVICE INFORMATION

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MANUAL TRANSMISSION - NV5600 - SERVICE INFORMATION

DIAGNOSIS AND TESTING

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill or an incorrect lubricant level check. A correct lubricant level check can only be made when the vehicle is level. Also allow the lubricant to settle for a minute or so before checking. Always check the lubricant level after any addition of fluid to avoid an incorrect lubricant level condition.

Leaks can occur at mating surfaces of the gear case, adaptor or extension housing, or from the front/rear seals. A leak could also be the result of an overfill condition. Leaks at the rear of the extension or adapter housing will be from the housing oil seals. Leaks at component mating surfaces will probably be the result of inadequate sealer, gaps in the sealer, incorrect bolt tightening or use of a non-recommended sealer. A leak at the front of the transmission will be from either the front bearing retainer or retainer seal. Lubricant may be seen dripping from the clutch housing after extended operation. If the leak is severe, it may also contaminate the clutch disc causing the disc to slip, grab and or chatter.

HARD SHIFTING

Hard shifting is usually caused by a low lubricant level, improper or contaminated lubricants. The consequence of using non-recommended lubricants is noise, excessive wear, internal bind and hard shifting. Substantial lubricant leaks can result in gear, shift rail, synchro, and bearing damage. If a leak goes undetected for an extended period, the first indications of component damage are usually hard shifting and noise.

Component damage, incorrect clutch adjustment or damaged clutch pressure plate or disc are additional probable causes of increased shift effort. Incorrect adjustment or a worn/damaged pressure plate or disc can cause incorrect release. If clutch problem is advanced, gear clash during shifts can result. Worn or damaged synchronizer rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing hard or noisy shifts. In most cases this condition will decline as the rings wear-in.

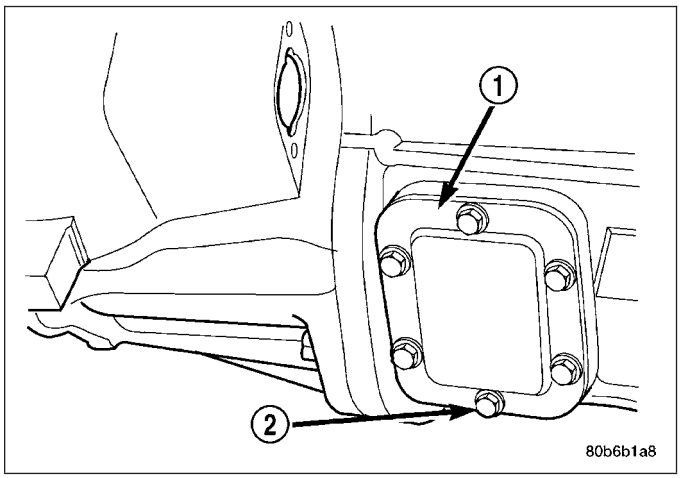
TRANSMISSION NOISE

Most manual transmissions make some noise during normal operation. Rotating gears generate a mild whine that is audible, but generally only at extreme speeds. Severe highly audible transmission noise is generally the initial indicator of a lubricant problem.

Insufficient, improper or contaminated lubricant will promote rapid wear of gears, synchronizers, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear breakage.

REMOVAL

1. With vehicle in neutral, position it on a hoist.
2. Remove shift boot floorpan screws and slide boot upward on the shift lever.
3. Remove shift tower/isolator plate bolts and remove shift tower/isolator plate from transmission case.
4. Remove skid plate, if equipped.
5. Mark propeller shaft/shafts and axle yokes for installation reference and remove shaft/shafts.
6. Remove exhaust system as necessary.
7. Disconnect wires at backup light switch.
8. Support engine with safety stand and wood block.
9. If transmission is to be disassembled, remove drain bolt (2) at bottom of PTO cover (1) and drain lubricant from transmission.



10. Remove clutch slave cylinder splash shield, if equipped.
11. Remove clutch slave cylinder bolts and move cylinder aside for clearance.
12. Remove wire harness from clips on transmission.

TWO WHEEL DRIVE

1. Remove bolts/nuts mounting transmission to the rear mount.
2. Support and secure transmission with safety chains to a transmission jack.
3. Remove rear crossmember bolts and pry out crossmember.
4. Remove transmission clutch housing bolts at the engine block.
5. Slide transmission and jack rearward until input shaft clears clutch disc and pressure plate.
6. Lower transmission jack and remove transmission from under vehicle.

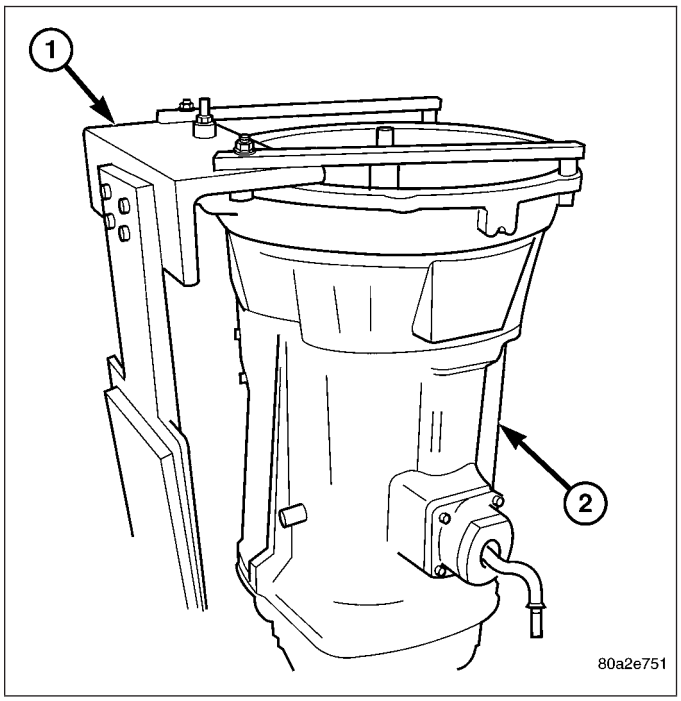
FOUR WHEEL DRIVE

1. Disconnect transfer case shift linkage at transfer case range lever.
2. Support and secure transfer case with safety chains to a transmission jack.
3. Remove transfer case mounting nuts.
4. Move transfer case rearward until input gear clears transmission mainshaft.
5. Lower transfer case assembly and move it from under vehicle.
6. Support and secure transmission with safety chains to a transmission jack.
7. Remove bolts/nuts attaching transmission mount to rear crossmember.
8. Remove rear crossmember bolts and pry out crossmember.
9. Remove transmission clutch housing bolts at the engine block.
10. Move transmission rearward until input shaft clears clutch disc.
11. Lower transmission and remove it from under vehicle.

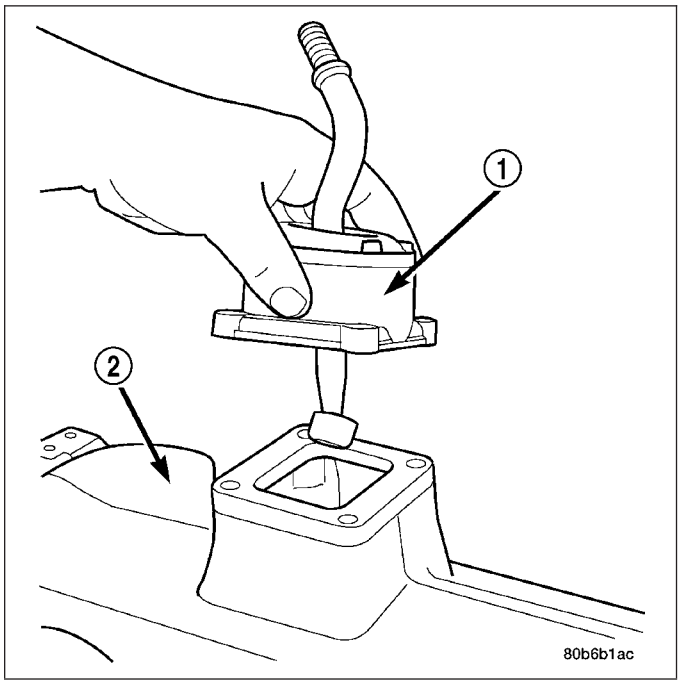
DISASSEMBLY

NOTE: Use Fixture 8241 for moving and handling the transmission. The fixture supports the transmission at the center of gravity in order to ease mounting the transmission into the build fixture.

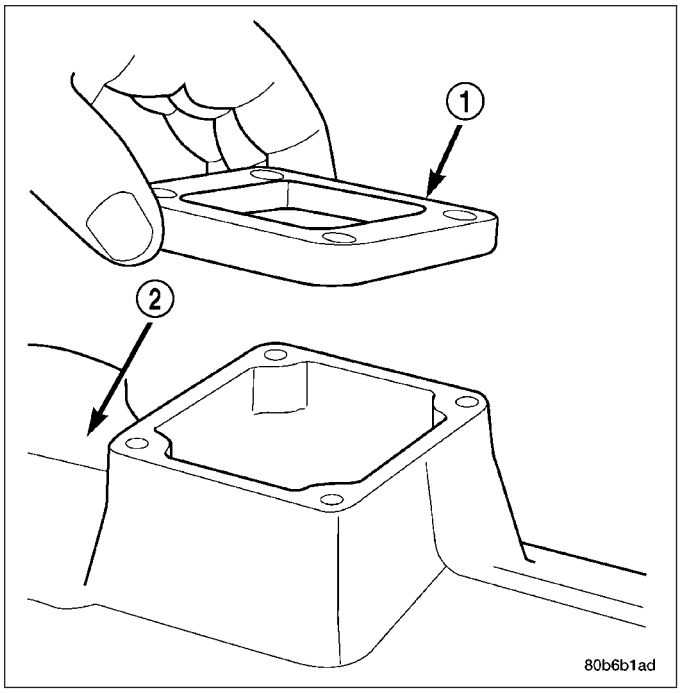
1. Mount transmission (2) into Fixture 8230 (1).
2. Rotate transmission to a horizontal position.



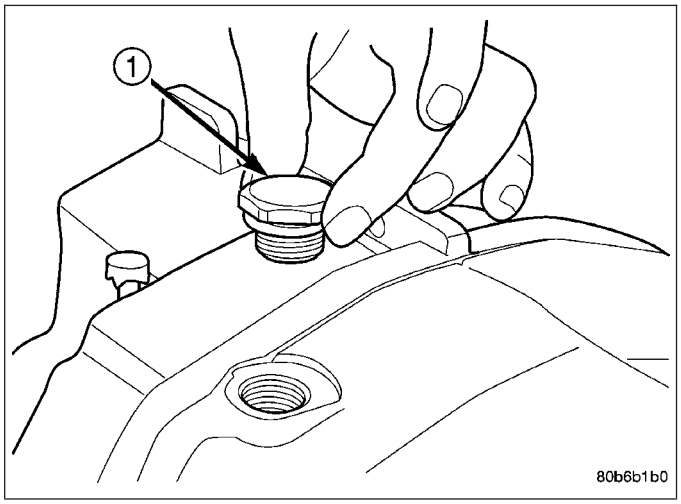
3. Remove shift tower (1) from transmission (2).



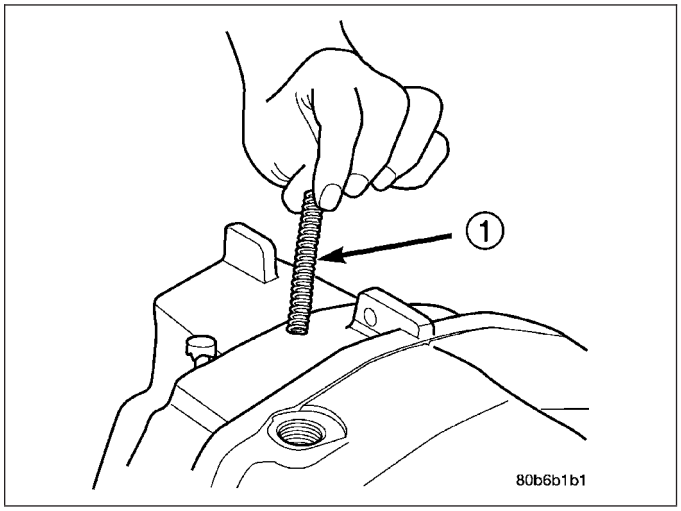
4. Remove isolator plate (1) from transmission (2) .



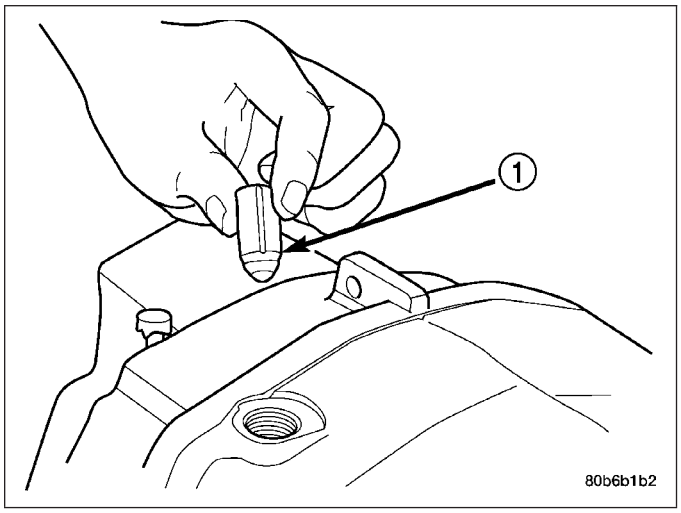
5. Remove primary shift rail detent plug (1).



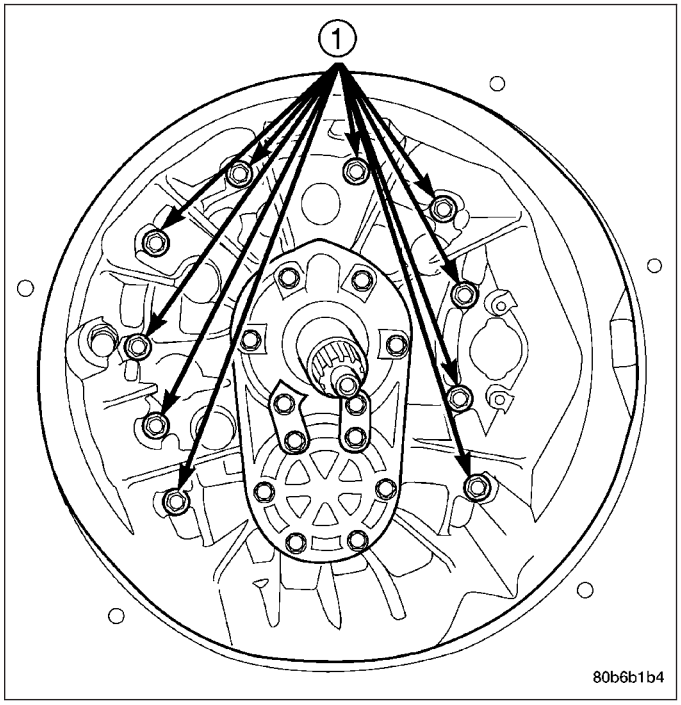
6. Remove primary shift rail detent spring (1).



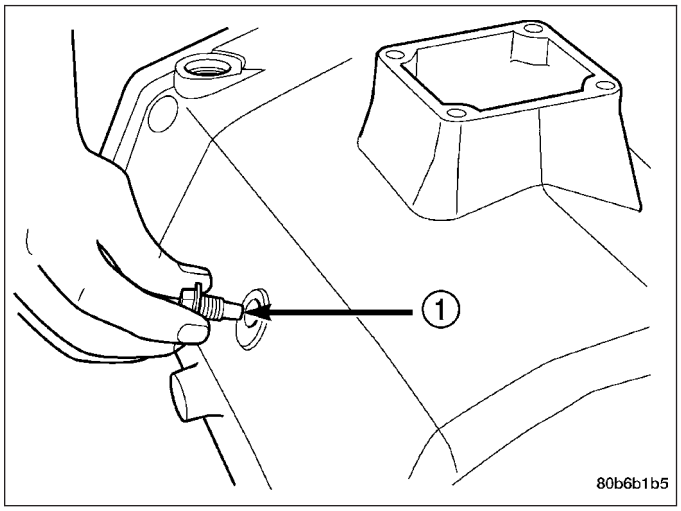
7. Remove primary shift rail detent plunger (1).



8. Remove clutch housing bolts (1) from inside the housing.



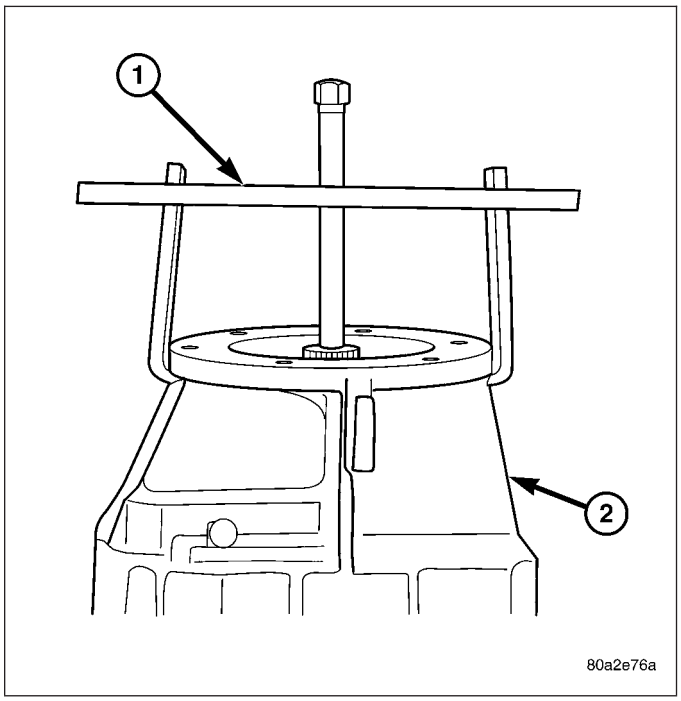
9. Remove shift rail blocker bolt (1) from transmission case.



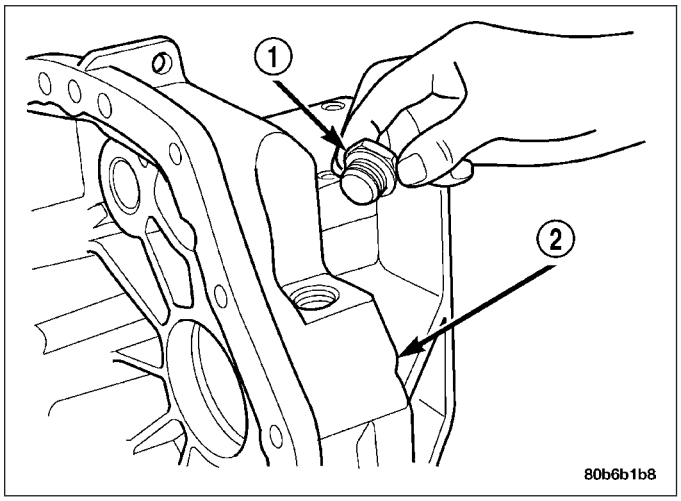
EXTENSION/ADAPTER HOUSING

1. Remove extension/adapter housing bolts from transmission case.
2. Remove extension/adapter housing (2) from the transmission gear case with Puller 8244 (1).

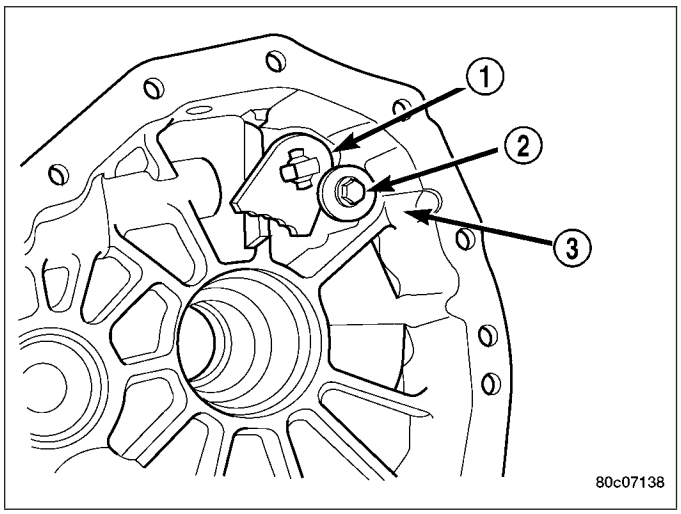
NOTE: Keep housing straight during removal due to reverse idler shaft may bind on one side of the housing.



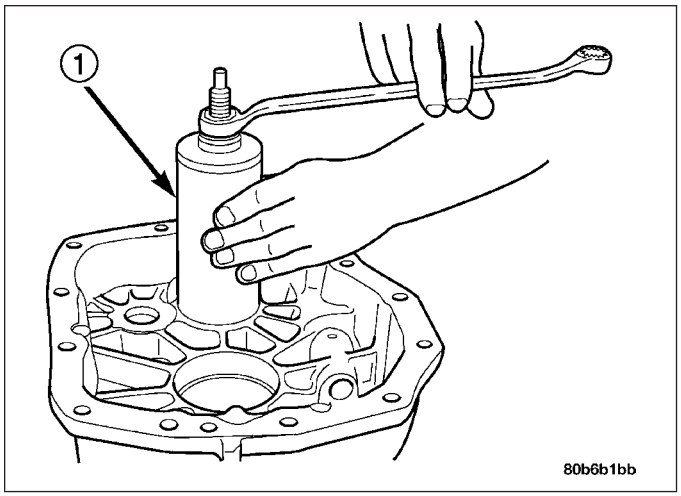
3. Remove crossover detent plug (1), spring and plunger from the extension/adapter housing (2).



4. Remove bolt (2) and washer holding the crossover cam (1) to the extension/adapter housing (3).
5. Remove crossover cam from extension/adapter housing.
6. Remove back-up lamp switch from extension/adapter housing.

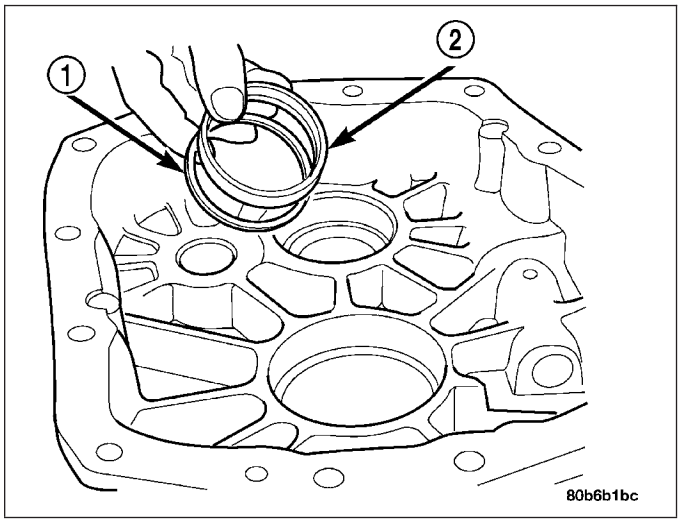


7. Remove countershaft rear bearing race from extension/adapter housing with Remover L-4518 (1).



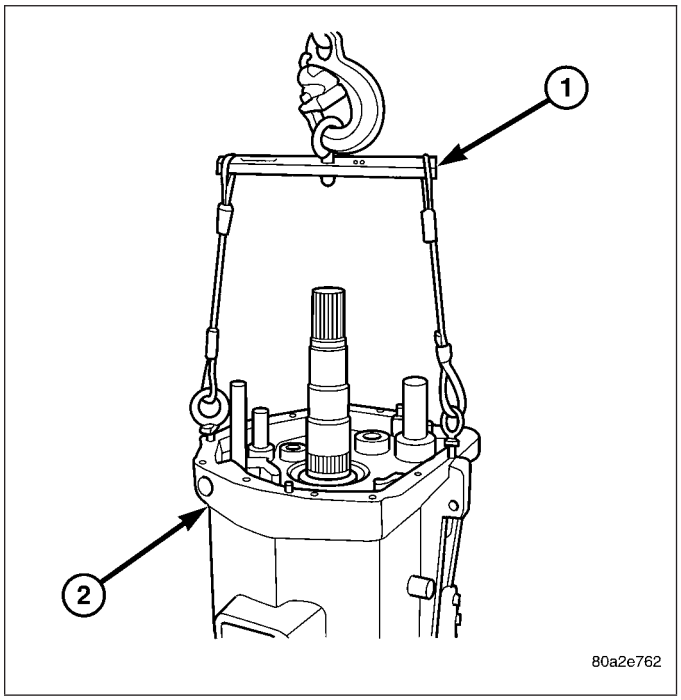
NOTE: Tag all countershaft pre-load shims (1) from between the bearing race (2) and the housing.

8. Remove crossover cam bushing from the extension/adapter housing with Remover 8240.
9. On 4X2 vehicles, remove extension housing seal with a pry tool or a slide hammer and screw.
10. On 4X4 vehicles, remove adapter housing seal with a pry tool or a slide hammer and screw.



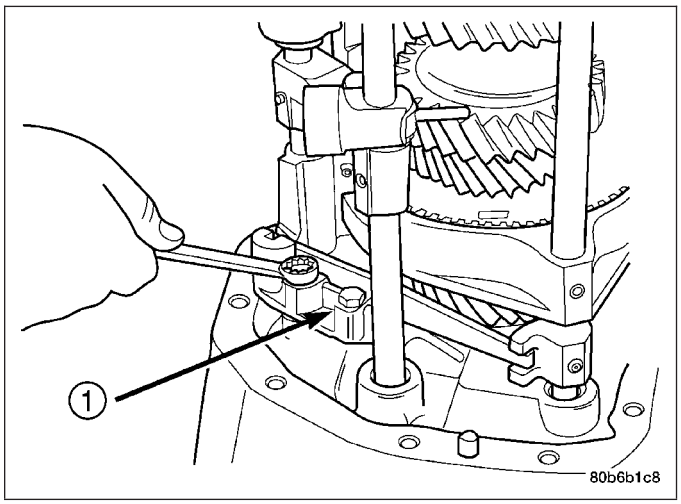
TRANSMISSION GEAR CASE

1. Remove remaining bolts from transmission case to the clutch housing.
2. Remove shift socket roll pin with a 6 mm (7/32 in.) punch and hammer.
3. Turn shift socket so it won't catch the case when lifting it up.
4. Install Fixture 8232 (1) to the transmission case (2).
5. Attach an engine crane or equivalent to Fixture 8232 and remove the transmission gear case from the clutch housing.
6. Remove rear output shaft and countershaft bearing races from the transmission gear case with a brass drift and hammer.

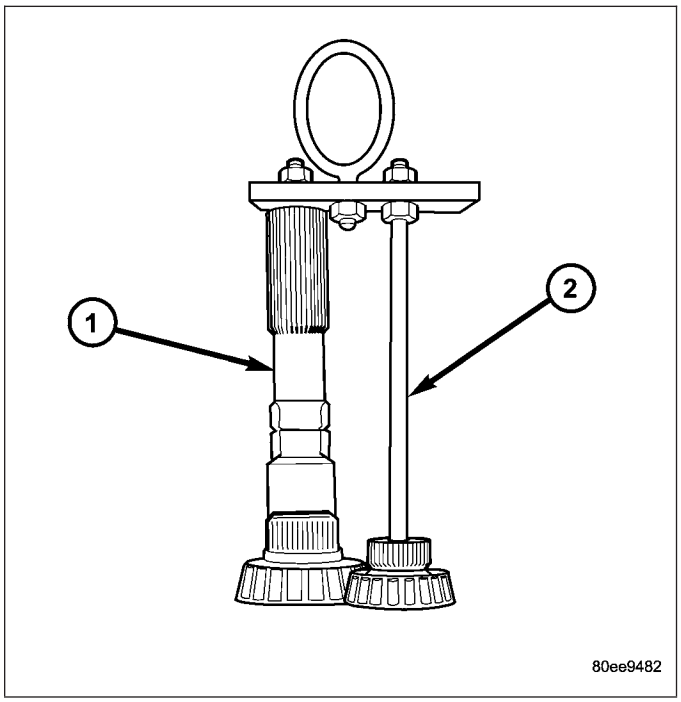


GEARTRAIN

1. Remove 5-6 crossover bracket (1) bolts.

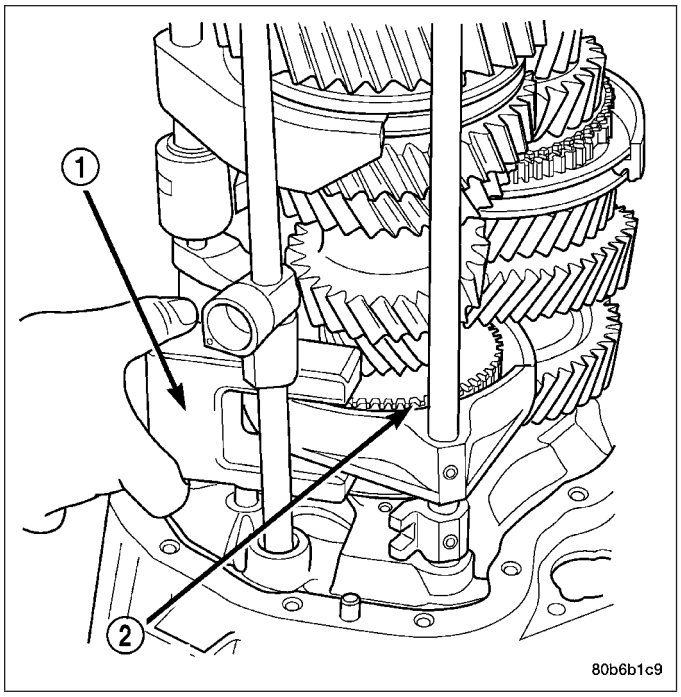


2. Mount Fixture 8232 (2) to output shaft (1) and countershaft.
3. Attach engine crane to Fixture 8232 and raise geartrain approximately 1/4 in. from the clutch housing.
4. Remove 5-6 crossover bracket from the clutch housing.
5. Lower geartrain back into the clutch housing.

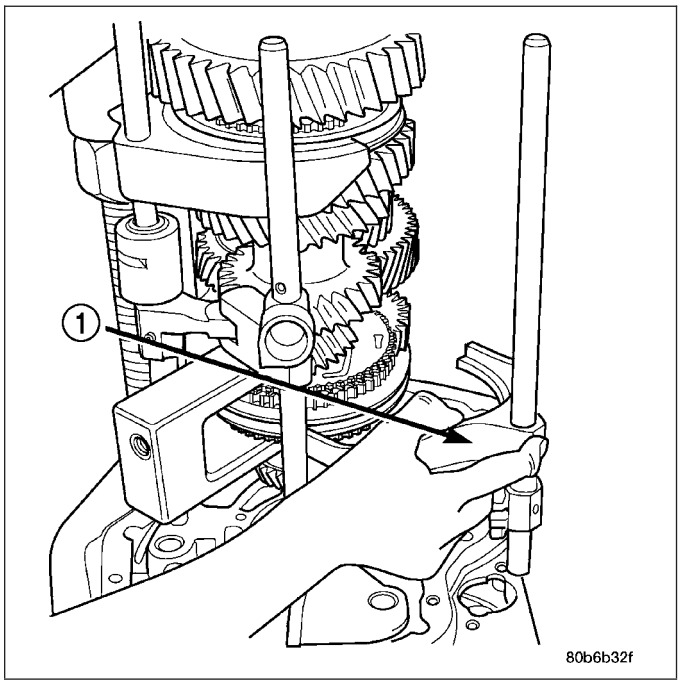


6. Install Holding Tool 8242 (1) onto 5-6 synchro (2) and tighten screw to hold 5-6 synchro together during removal.

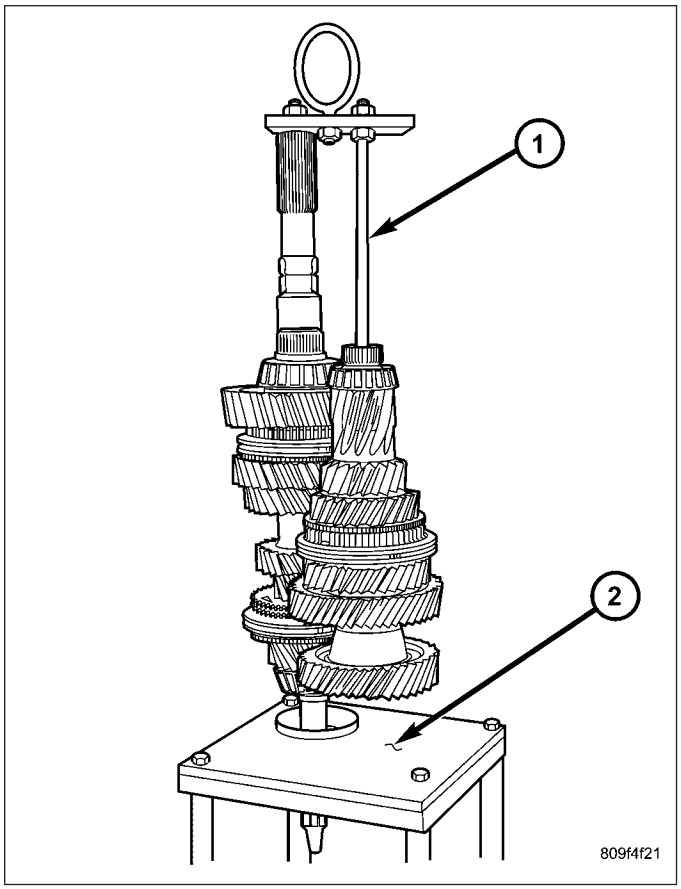
NOTE: Note the order of the shift fork arms at the primary shift rail, while in the Neutral position.



7. Raise geartrain and shift rails until all the shift rails clear the clutch housing.
8. Remove shift rails (1) from the rest of the geartrain.
9. Raise geartrain until the input shaft is clear of the clutch housing.

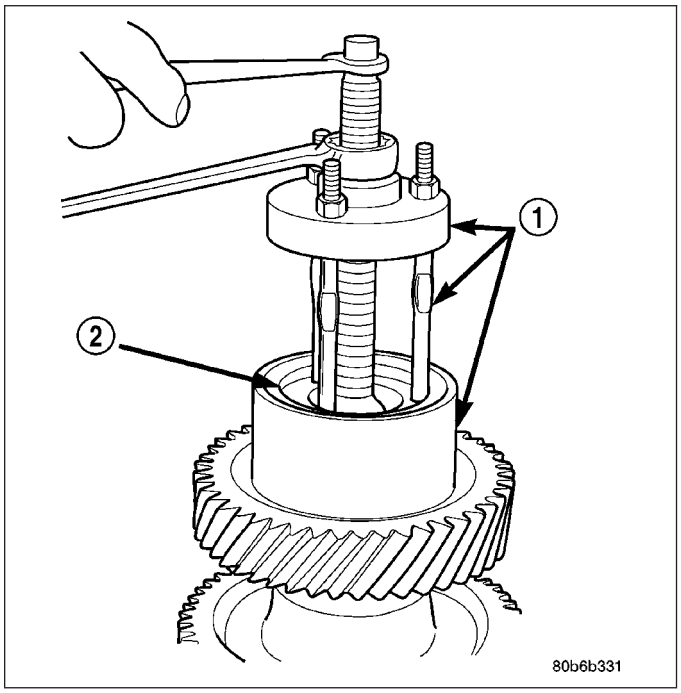


10. Remove geartrain from clutch housing and install geartrain into Support Stand 8246 (2).
11. Remove Fixture 8232 (1) from output shaft and countershaft.
12. Separate countershaft from output shaft.
13. Separate output shaft from the input shaft. Hold 5-6 synchro together while removing output shaft to prevent synchro sleeve from being dislodged from the synchro hub.

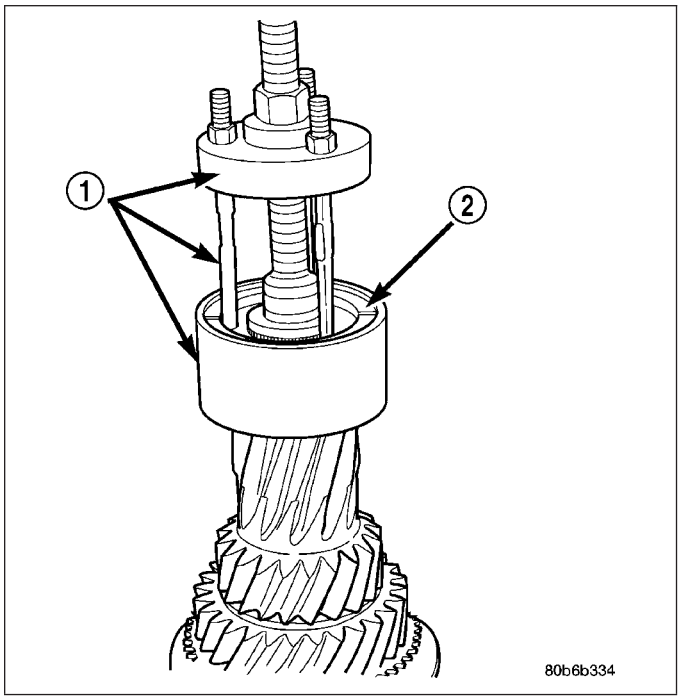


COUNTERSHAFT BEARINGS

1. Remove snap-ring holding the front countershaft bearing onto the countershaft.
2. Remove front countershaft bearing with Collar 6444-8, Jaws 6451 (2), Puller Rods 6444-4 and Puller 6444 (1).

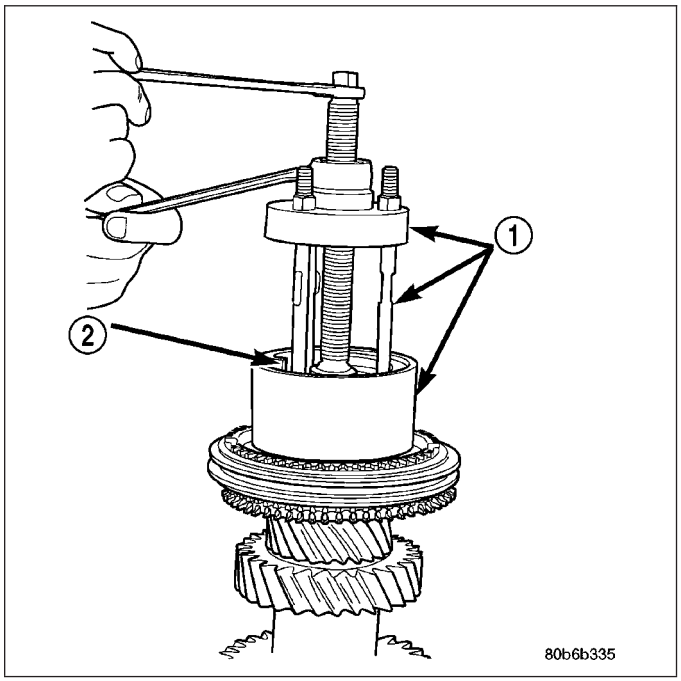


3. Remove rear countershaft bearing with Collar 6444-8, Jaws 6447 (2), Puller Rods 6444-4, Puller 6444 (1) and suitable press button.



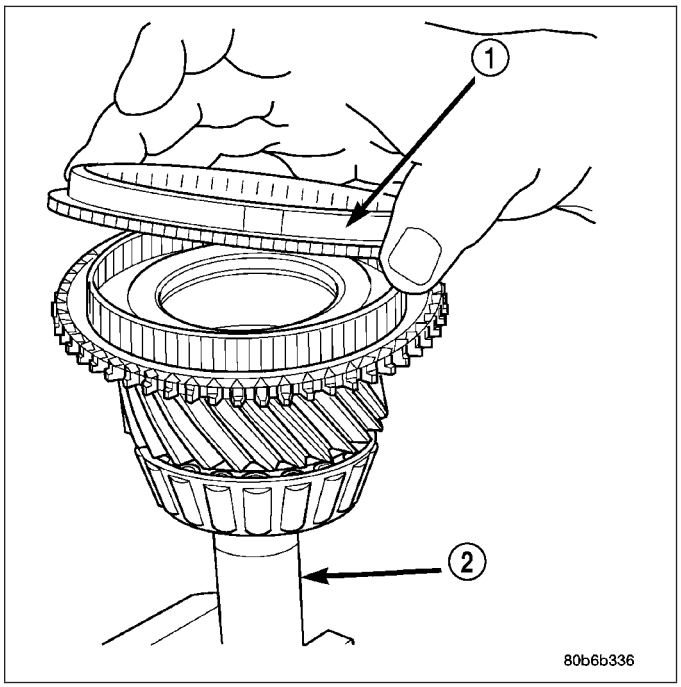
OUTPUT SHAFT BEARINGS

1. Remove snap-ring holding the pocket bearing onto the output shaft.
2. Remove pocket bearing from the output shaft with Sleeve 6444-8, Jaws 8234 (2), Puller Rods 6444-4 and the remainder of Puller 6444 (1).
3. Remove snap-ring holding the rear output shaft bearing onto the output shaft.
4. Use Collar 6444-8, Jaws 8271 and Puller Rods 6444-3 for 4X2 vehicles or Puller Rods 6444-4 for 4X4 vehicles with the remainder of Puller 6444 to remove the rear output shaft bearing from the output shaft.
5. Remove rear output shaft thrust washer from the output shaft.

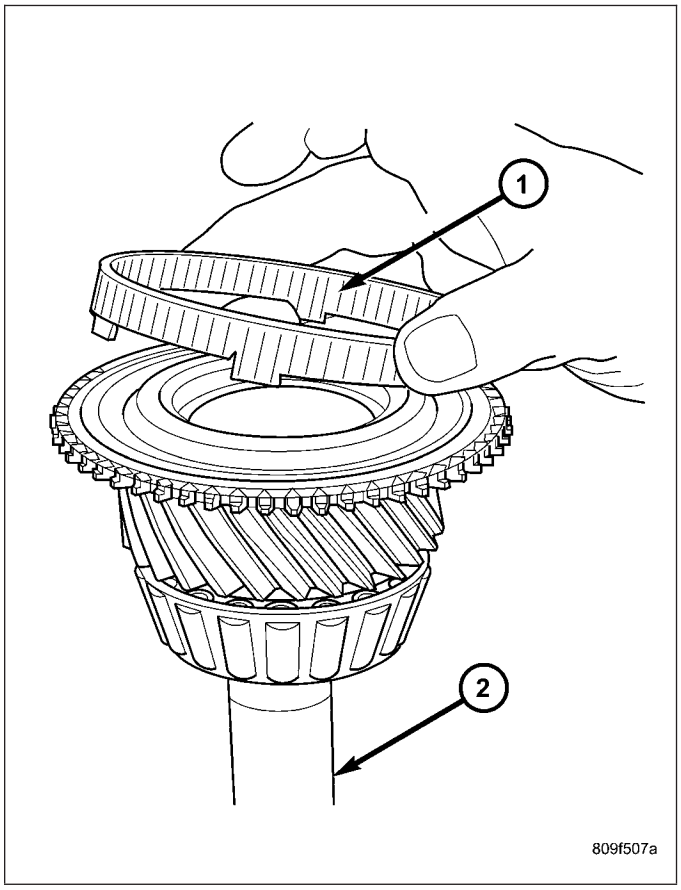


INPUT SHAFT

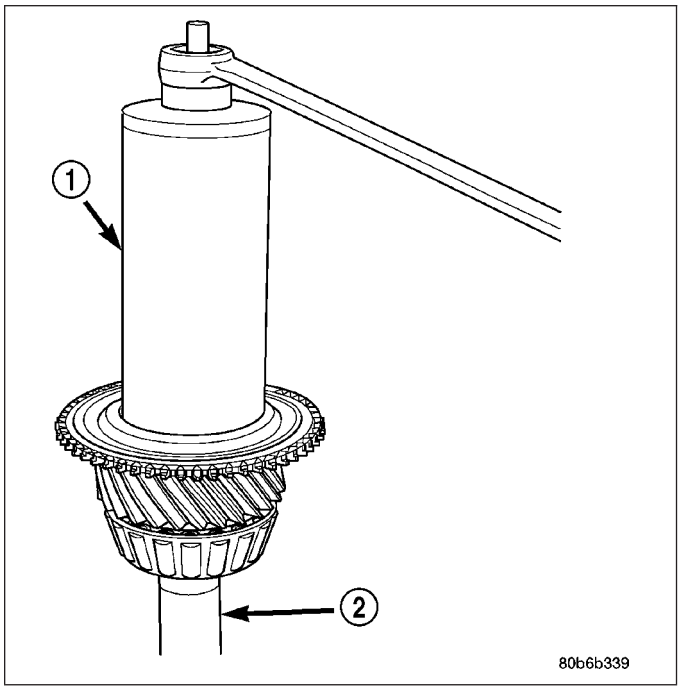
1. Remove fifth gear blocker ring (1) from the input shaft (2).



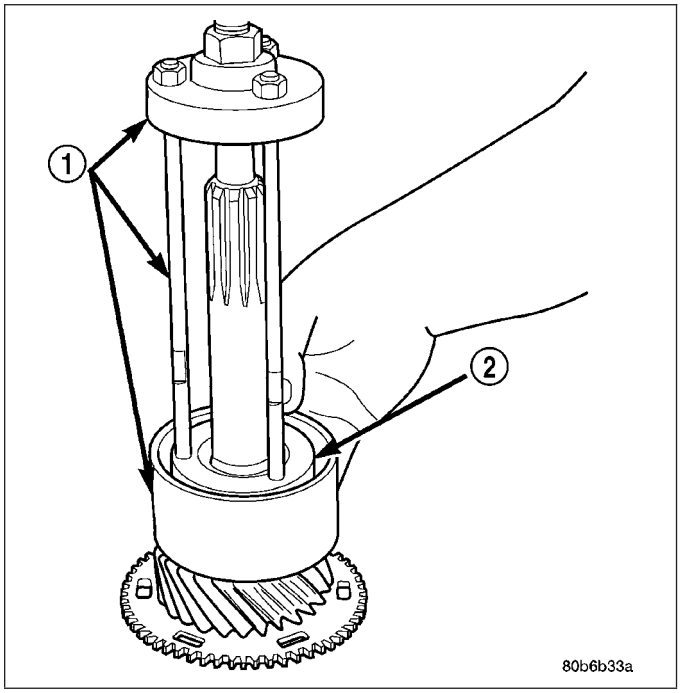
2. Remove fifth gear friction cone (1) from the input shaft (2).



3. Remove output shaft bearing race from the input shaft (2) with Puller L-4518 (1).



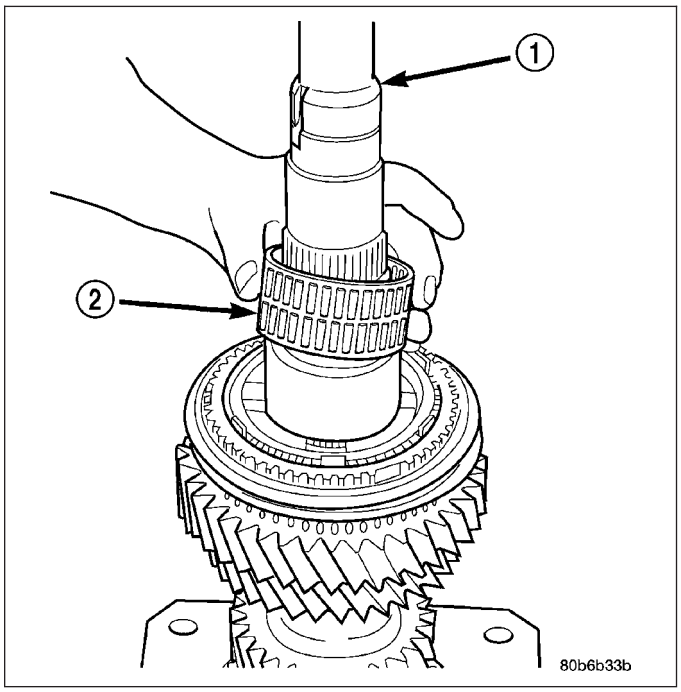
4. Remove input shaft bearing and oil guide from the input shaft with Collar 6444-8, Jaws 8243 (2), Puller Rods 6444-6 and the remainder of Puller 6444 (1).



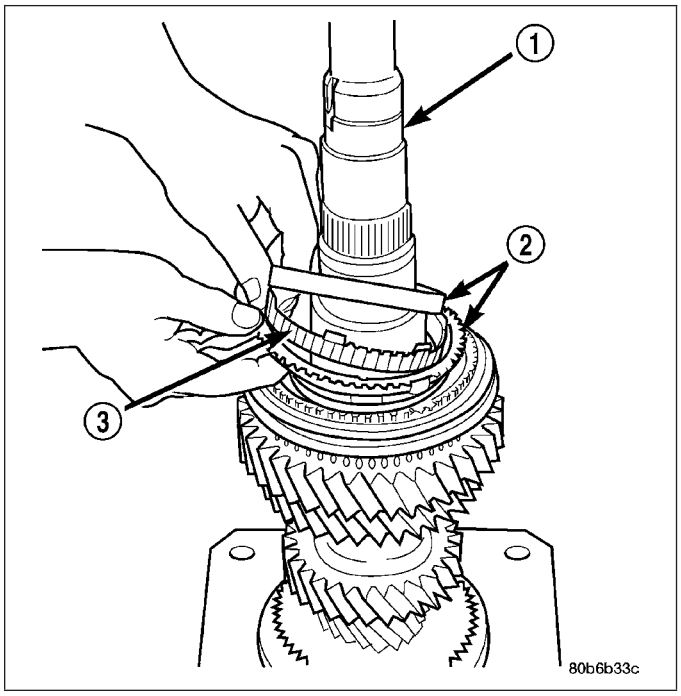
OUTPUT SHAFT

NOTE: Some gear and synchro components can be installed backwards. Mark the gears, clutch gears, synchro hubs, and sleeves for installation reference during disassembly. Use paint or a scribe for marking purposes. Then stack the geartrain parts in order of removal.

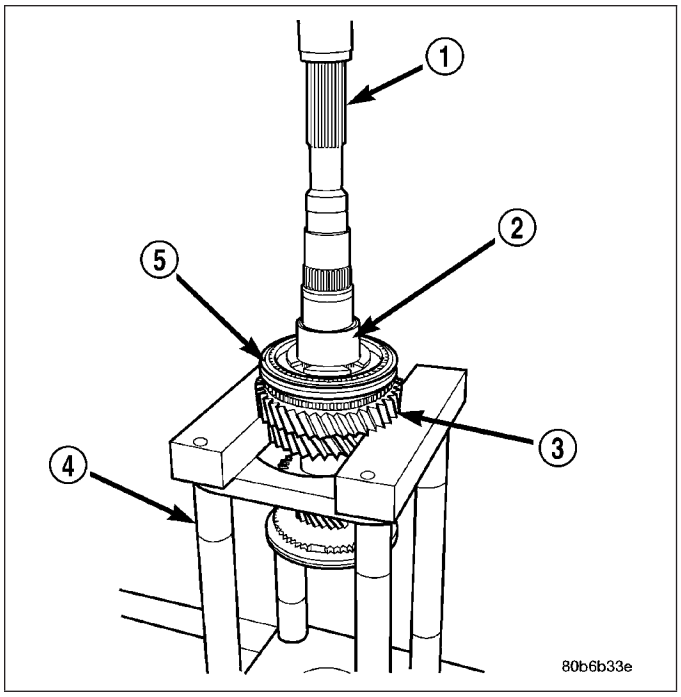
1. Remove first gear from the output shaft.
2. Remove first gear bearing (2) from the output shaft (1).



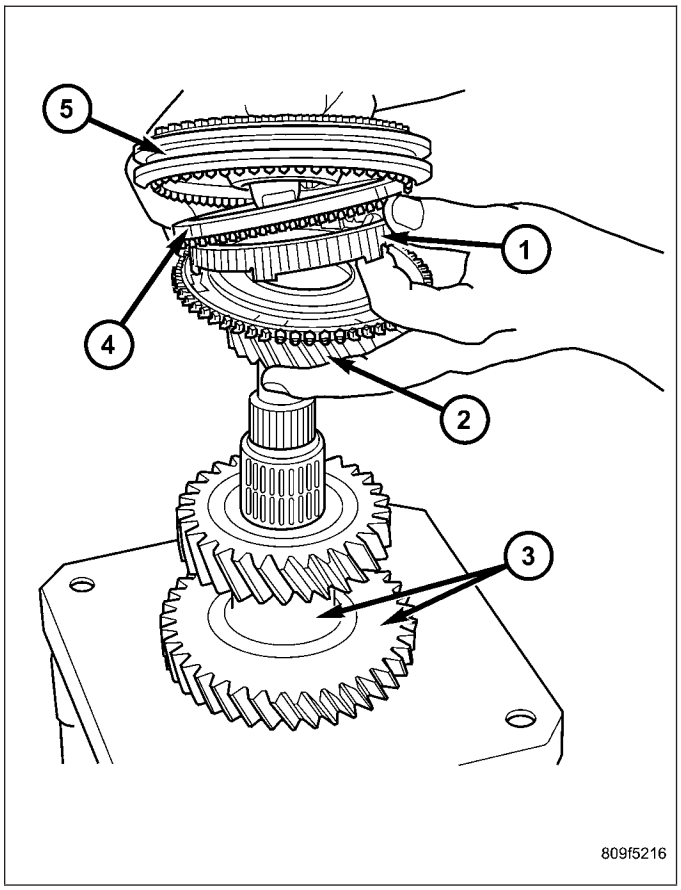
3. Remove first gear blocker rings (2) and cone (3) from the 1-2 synchro assembly.
4. Install the remainder of the output shaft into Fixture 8227 with press blocks under second gear.



5. Install shaft and Fixture assembly into a shop press.
6. Press second gear (3), 1-2 synchro assembly (5) and first gear bearing sleeve (2) from the output shaft (1)
7. Remove second gear bearing from the output shaft.
8. Reverse output shaft in the Fixture 8227 with press blocks positioned under the 5-6 synchro assembly.
9. Press the 5-6 synchro assembly from the output shaft.

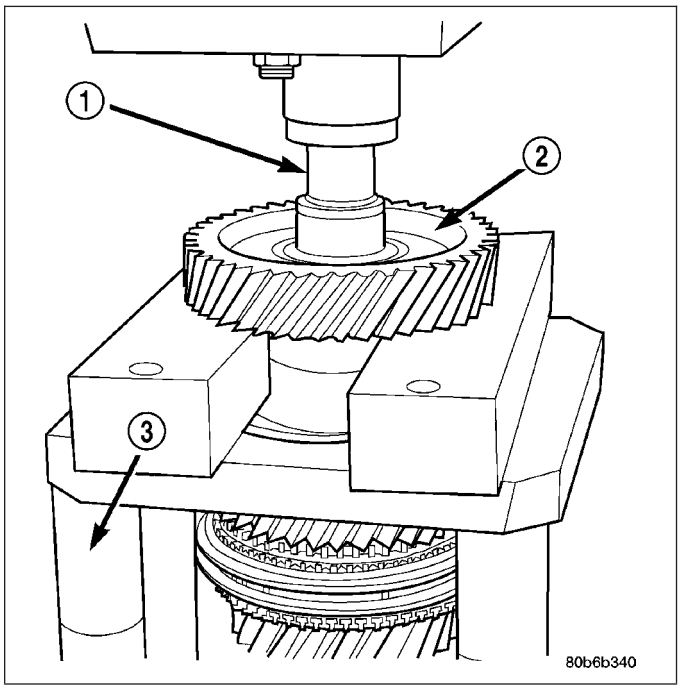


10. Remove sixth gear (2) and the sixth gear bearing from the output shaft (3).

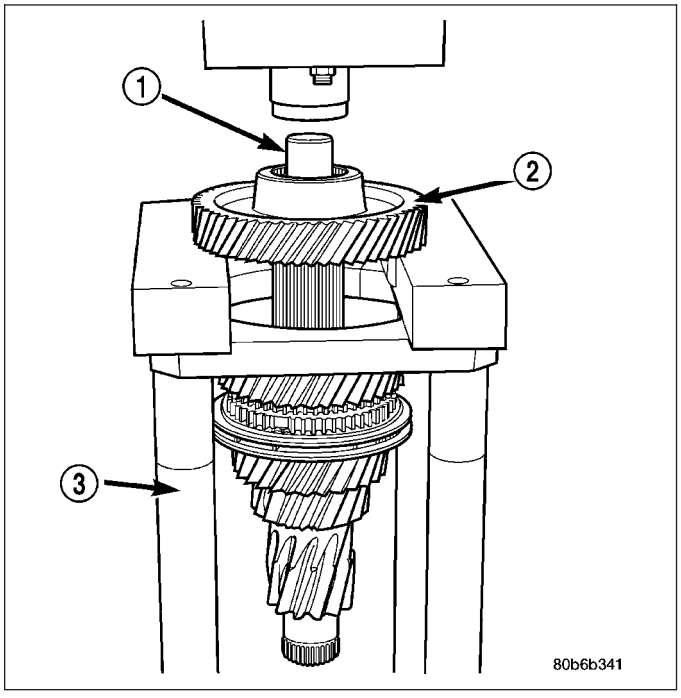


COUNTERSHAFT

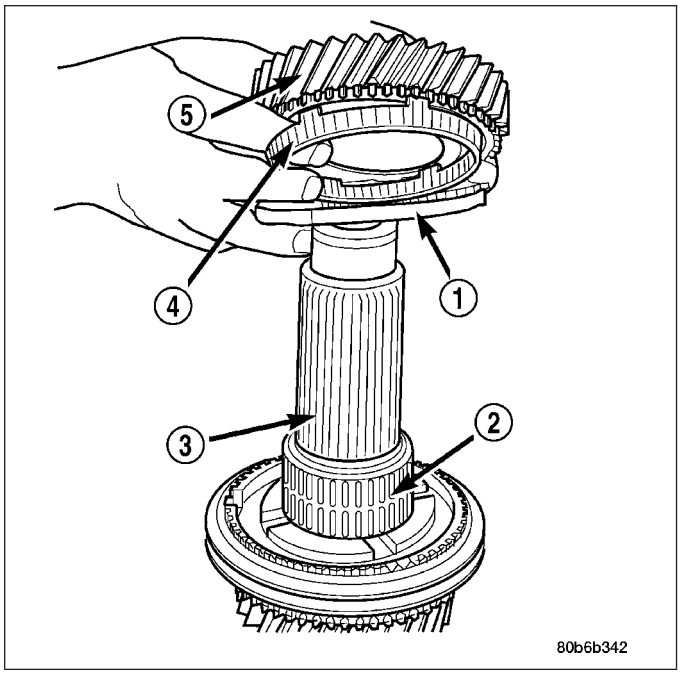
1. Install the countershaft into Fixture 8227 (3) with press blocks located under the fifth countershaft gear (2).
2. Place the assembly into a shop press.
3. Use Guide 8235 (1) on end of countershaft and press the countershaft fifth gear from the countershaft.



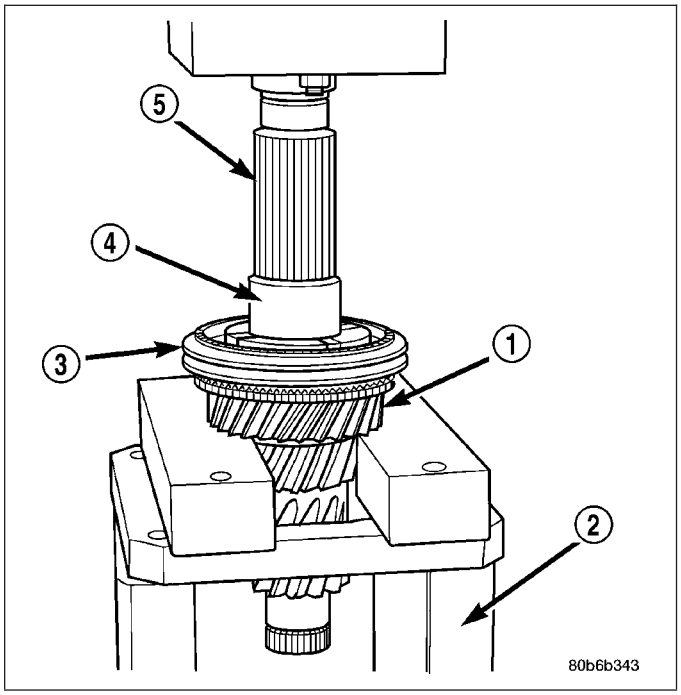
4. Place countershaft in Fixture 8227 (3) with press blocks placed under the sixth countershaft gear (2).
5. Use Guide 8235 (1) on end of countershaft and press the countershaft sixth gear from the countershaft.
6. Remove countershaft from the press and Fixture 8227.



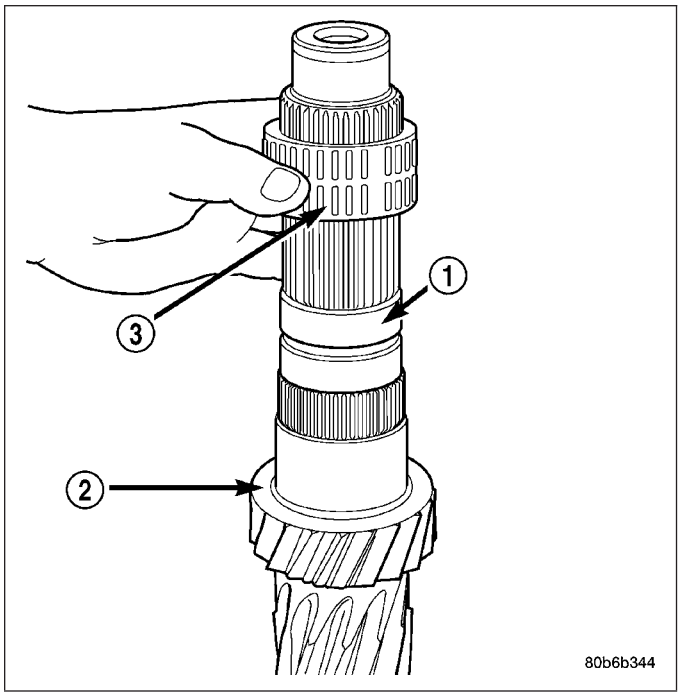
7. Remove fourth countershaft gear (5), friction cone (4), blocker ring (1) and bearing (2) from the countershaft (3).



8. Install countershaft (5) into Fixture 8227 (2) with press blocks located under the third countershaft gear (1).
9. Place assembly into a shop press and press third countershaft gear, 3-4 synchro (3) and fourth countershaft gear bearing sleeve (4) from the countershaft.
10. Remove countershaft from the press and Fixture 8227.

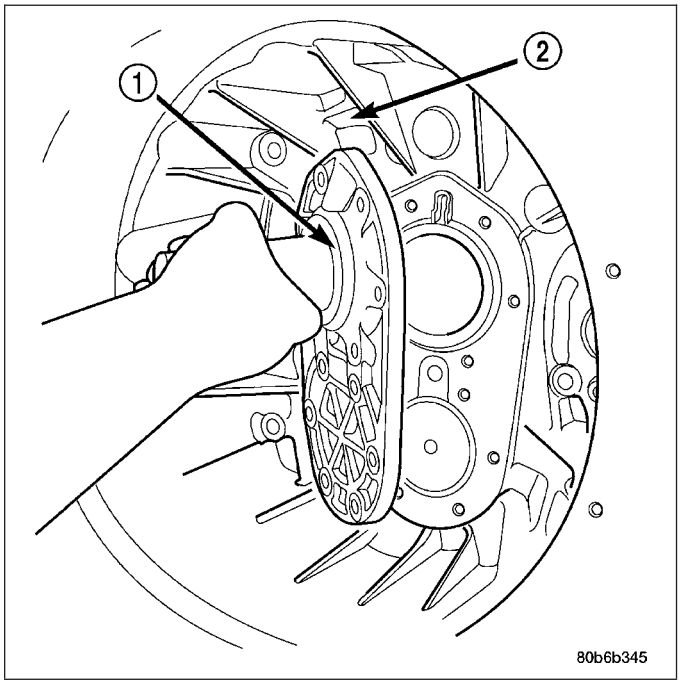


11. Remove third countershaft gear bearing (3) from the countershaft (1).
12. The 2-3 thrust washer (2) should not normally need to be removed from the countershaft. If necessary slide 2-3 thrust washer off countershaft.

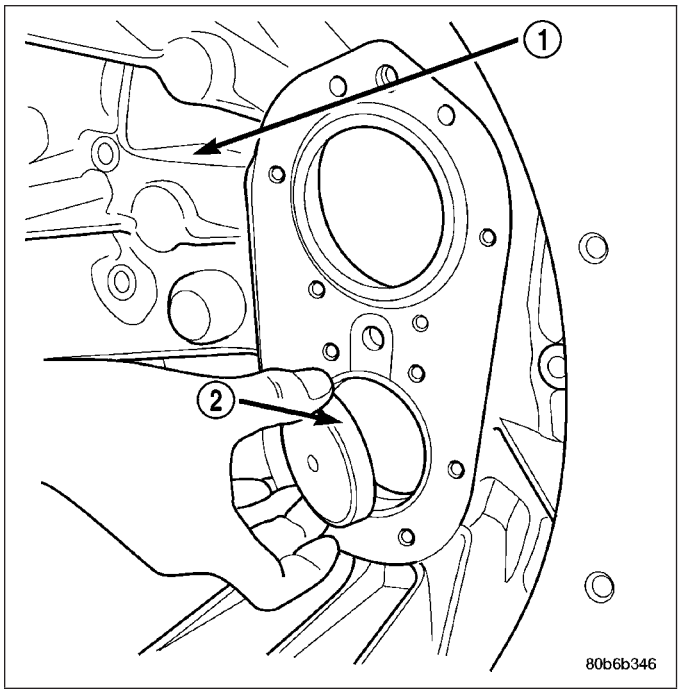


CLUTCH HOUSING

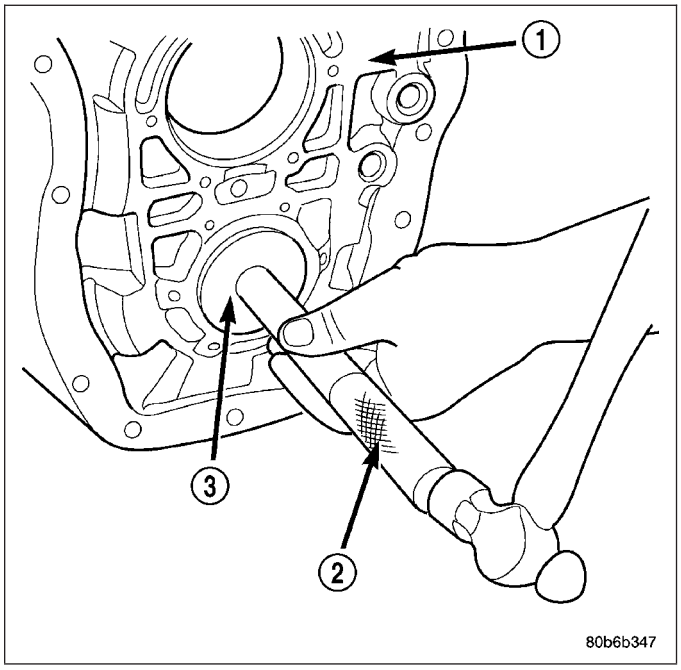
1. Remove input shaft retainer (1) bolts from the clutch housing (2) and remove retainer.



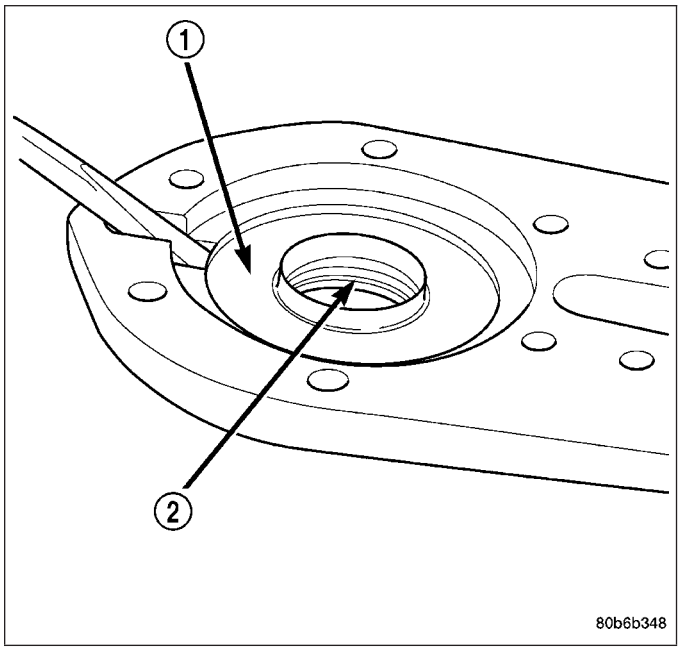
2. Remove countershaft oil guide (2) from the countershaft front bearing bore in the clutch housing (1).



3. Remove countershaft front bearing race, endplay shims and spacer from clutch housing (1) with Remover 6061-1 (3) and Handle C-4171 (2).
4. Remove input shaft bearing race with Remover/Installer 8237 and Handle C-4171.



5. Remove input shaft oil guide (1) and retainer seal (2).



CLEANING - TRANSMISSION

Clean the gears, bearings shafts, extension/adapter housing and gear case with solvent. Dry all parts except the bearings with compressed air. Allow the bearings to either air dry or wipe them dry with clean shop towels.

INSPECTION

NOTE: Minor corrosion, nicks, or pitting can be smoothed with 400 grit emery and polished out with crocus cloth.

Inspect the reverse idler gear, bearings, shaft and thrust washers. Replace the bearings if the rollers are worn, chipped, cracked, flat-spotted or brinnelled. Replace the gear if the teeth are chipped, cracked or worn thin.

Inspect the front bearing retainer and bearing cup. Replace the bearing cup if scored, cracked, brinnelled or rough. Check the release bearing slide surface of the retainer carefully. Replace the retainer if worn or damaged in any way.

Inspect mainshaft bearing surfaces, splines, snap ring grooves and threads. Replace the shaft if any surfaces exhibit considerable wear or damage.

Inspect the countershaft and bearings. Replace the shaft if any surfaces exhibit considerable wear or damage.

Inspect shift forks for wear and distortion. Check fit of the sleeve in the fork to be sure the two parts fit and work smoothly. Replace the fork if the roll pin holes are worn oversize or damaged. Do not attempt to salvage a worn fork. Replace shift fork roll pins if necessary or if doubt exists about their condition.

The all bearings for wear, roughness, flat spots, pitting or other damage. Replace the bearings if necessary.

Inspect the blocker rings and fiction cones. replace either part if worn or damaged in any way. Replace if the friction material is burned, flaking off or worn.

Inspect synchro components wear or damage. Replace parts if worn, cracked or distorted.

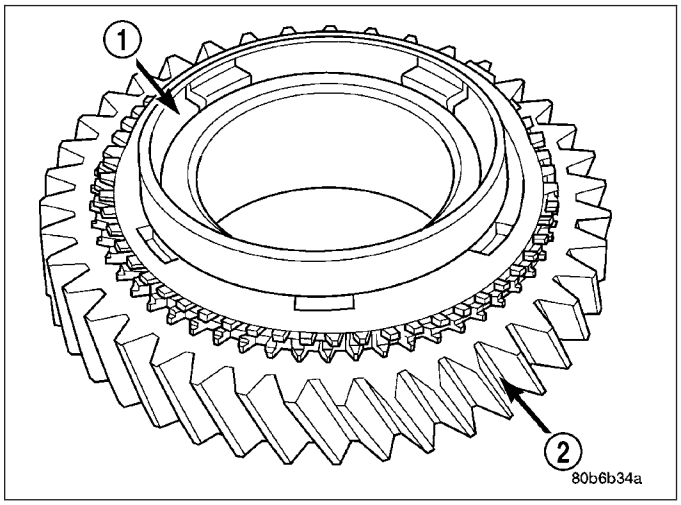
Inspect all of the thrust washers and locating pins. Replace the pins if bent or worn. Replace the washers if worn or the locating pin notches are distorted.

Inspect the case and housing/adapter sealing and mating surfaces are free of burrs and nicks. Inspcet the alignment dowels in the case top surface and in the housing/adapter are tight and in good condition. Replace the gear case or housing/adapter if cracked or broken.

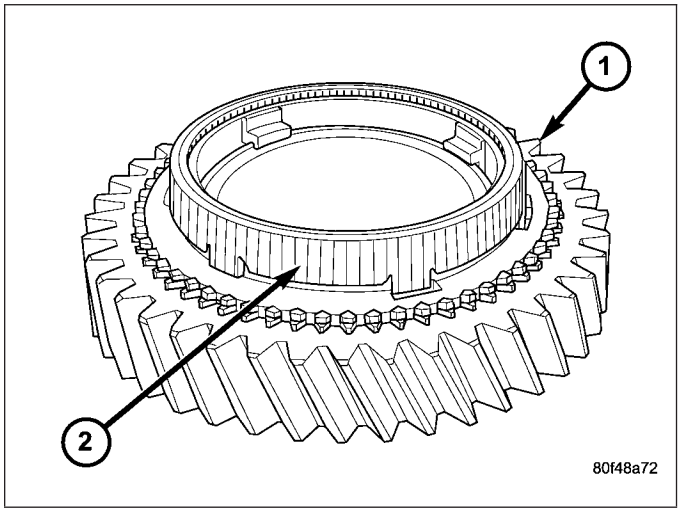
ASSEMBLY

OUTPUT SHAFT

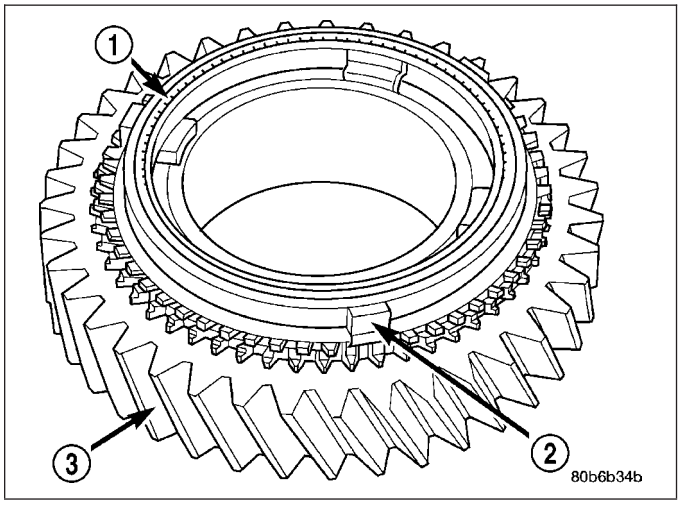
1. Install second gear synchro inner blocker ring (1) onto second gear (1).



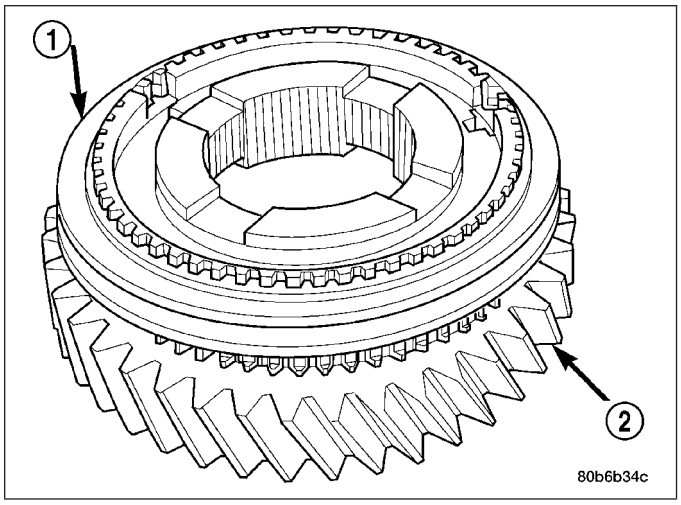
2. Install second gear friction cone (2) over blocker ring and onto second gear (1).



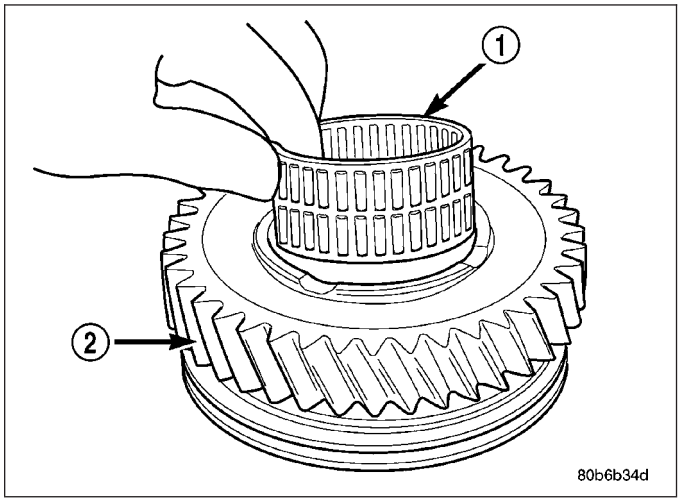
3. Install second gear outer blocker ring (1) on second gear (3) friction cone. Align the lugs on the outer ring with lugs on the inner ring.



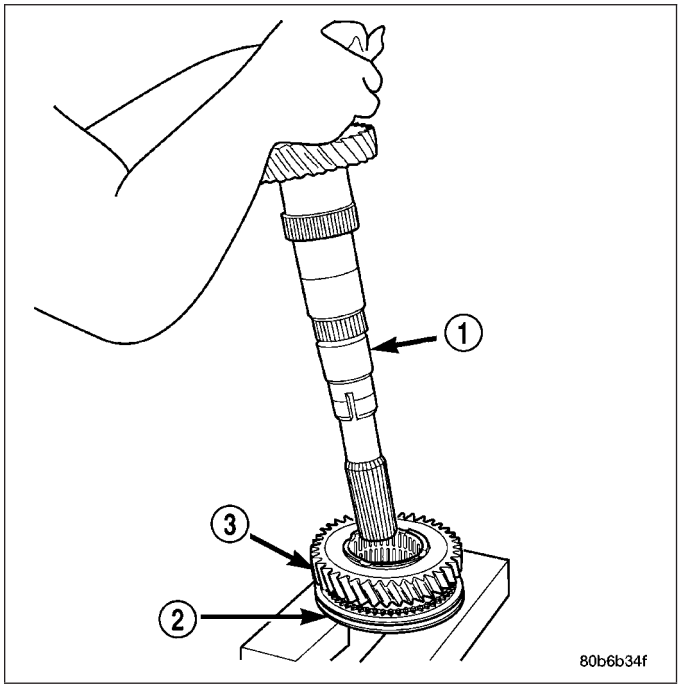
4. Install 1-2 synchro (1) assembly on second gear assembly (2).



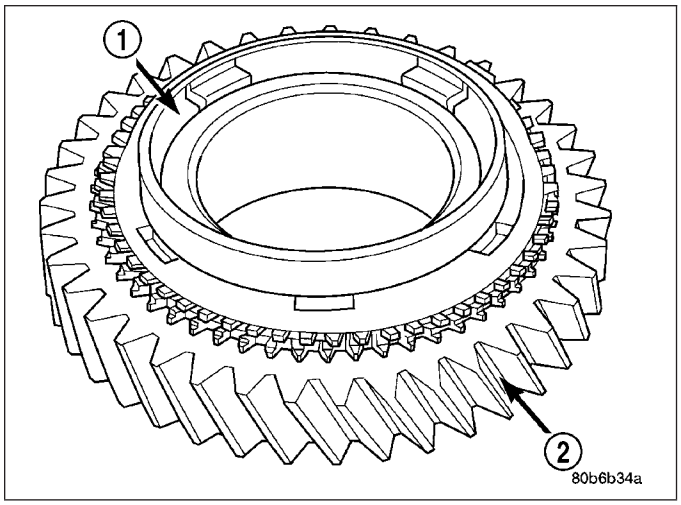
5. Reverse assembly on the bench.
6. Lubricate and install second gear (2) bearing (1).



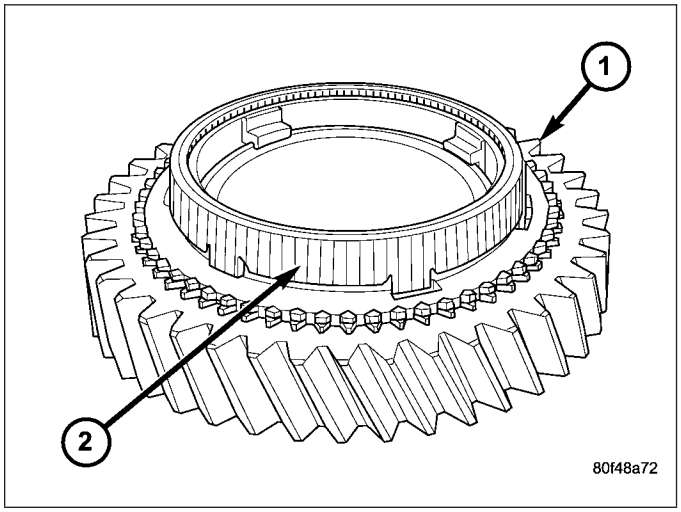
7. Place 1-2 synchro (1), second gear (3) with bearing assembly on shop press with second gear facing upward.
8. Install output shaft (1) into the second gear 1-2 synchro assembly with the front of the output shaft facing upward.
9. Press the output shaft into position.



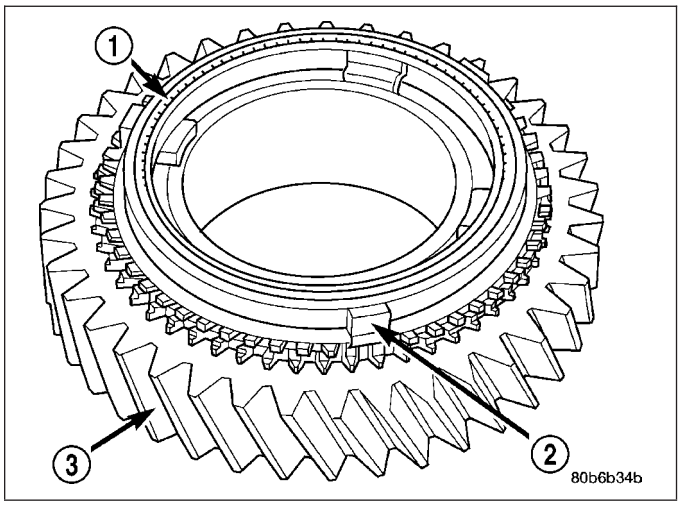
10. Place first gear on bench with the synchro clutch ring up.
11. Install first gear synchro inner blocker ring (1) onto first gear (2).



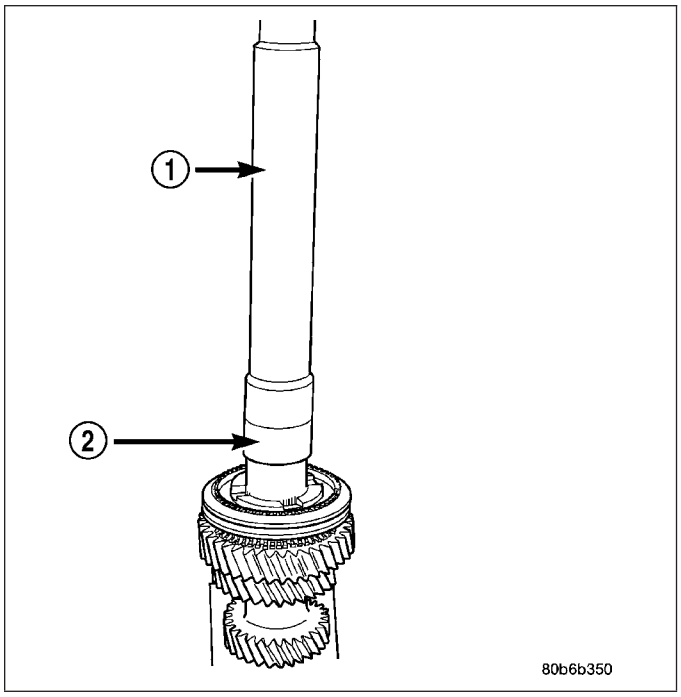
12. Install first gear synchro friction cone (2) over blocker ring and onto first gear (1).



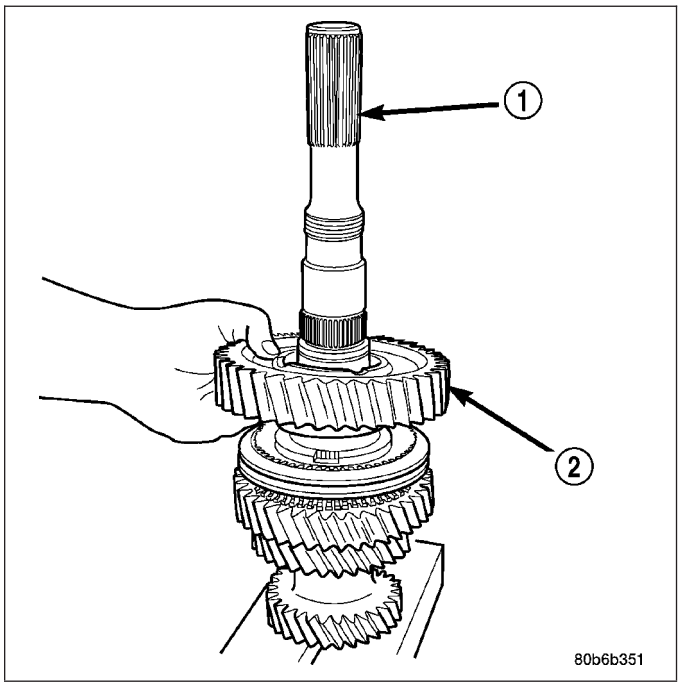
13. Install first gear synchro outer blocker ring (1) over first gear (3) synchro friction cone. Align one of the lugs (1) on the outer ring with a lug on the inner ring.



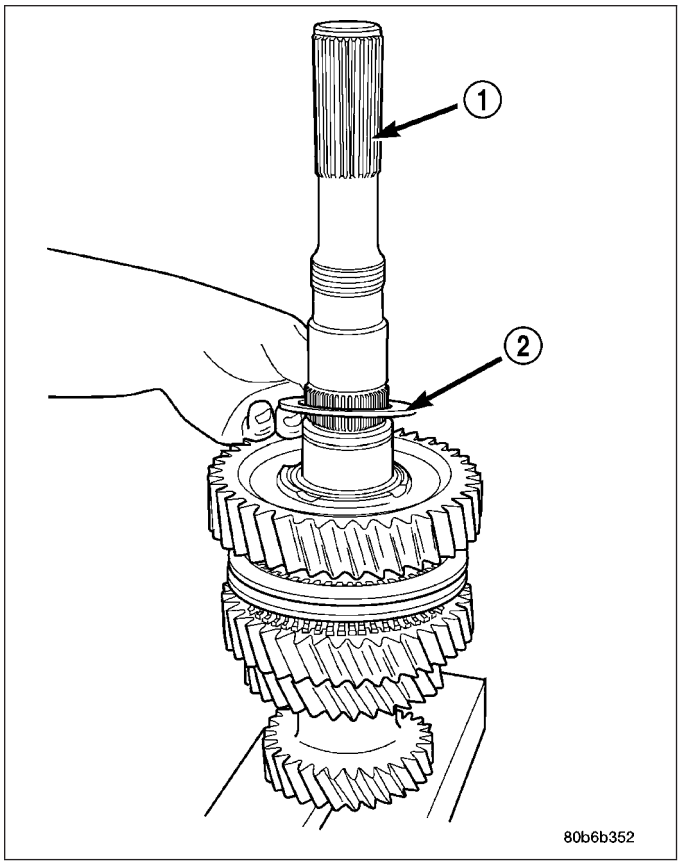
14. Reverse the output shaft in the press.
15. Install first gear bearing sleeve (2) on output shaft with Installer 8228 (1) and a shop press.



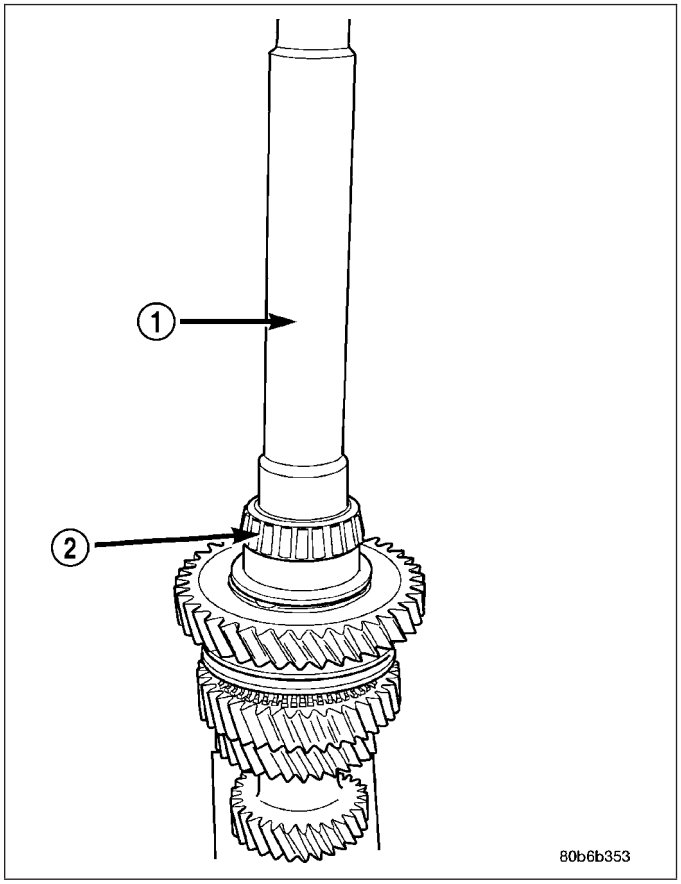
16. Install first gear and blocker assembly (2) onto output shaft (1).
17. Install first gear bearing over the output shaft and into first gear.



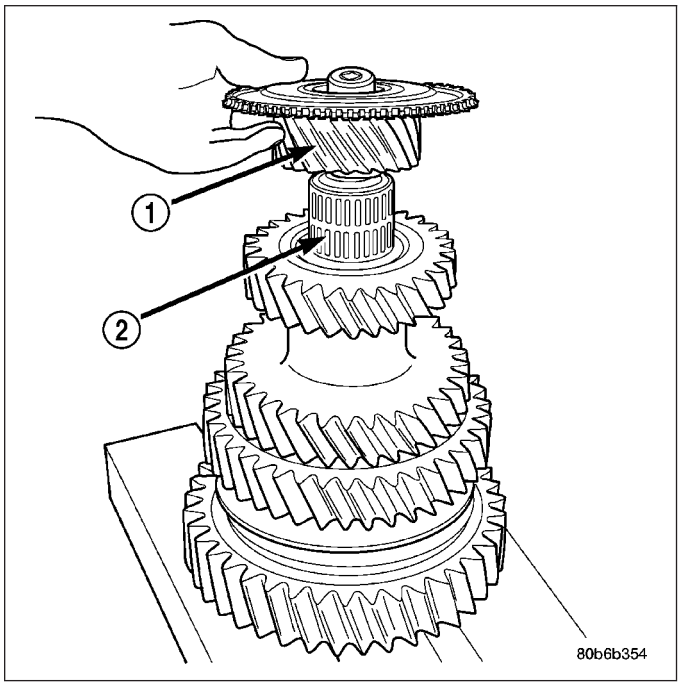
18. Install output shaft thrust washer (2) onto output shaft (1).



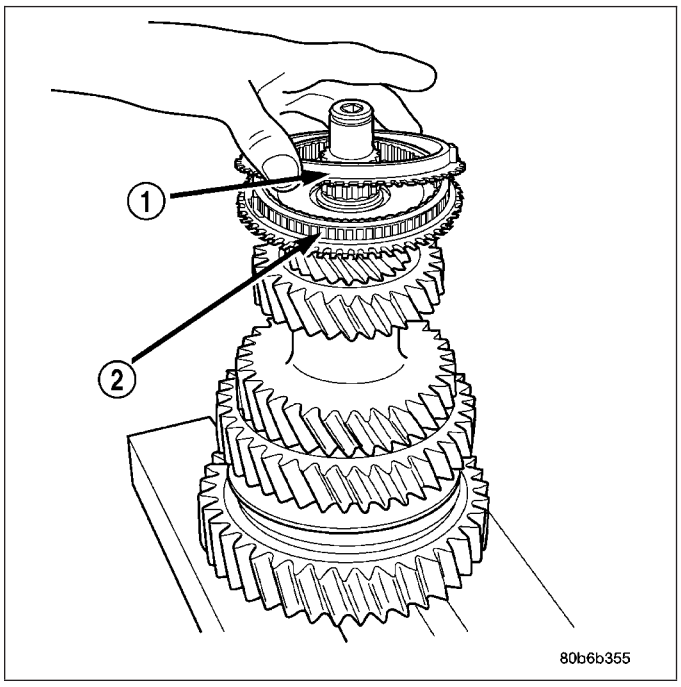
19. Install rear output shaft bearing (2) onto output shaft with Installer 8228 (1) and a shop press.
20. Install a **new** snap-ring to hold the rear output bearing onto the output shaft. Install the thickest snap-ring which will fit into the groove.



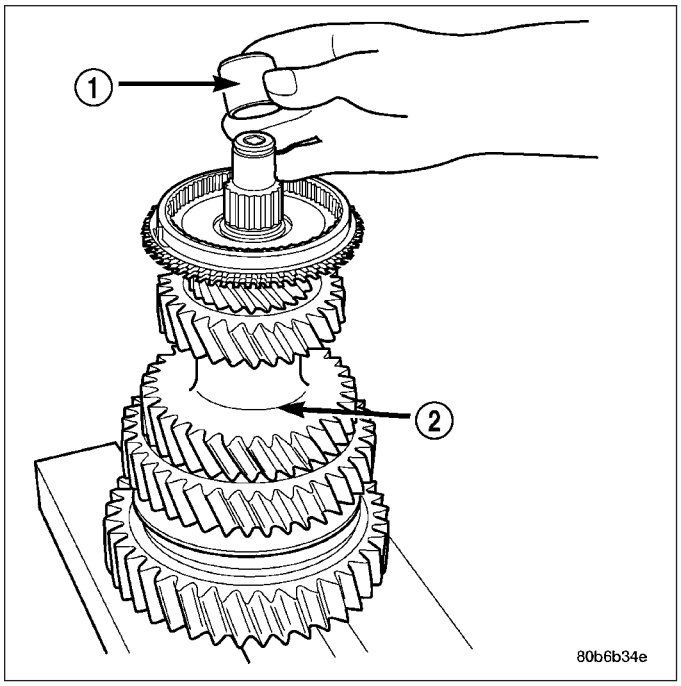
21. Reverse output shaft in the Fixture 8227 and support the shaft with press blocks under first gear.
22. Install sixth gear bearing (2) and sixth gear (1) onto output shaft.



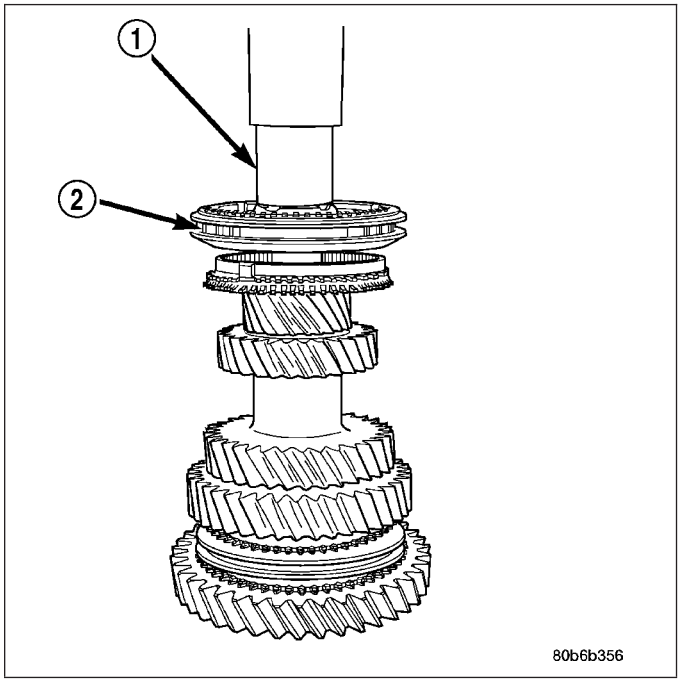
23. Install the sixth gear friction cone onto sixth gear.
24. Install sixth gear blocker ring (1) over the sixth gear friction cone (2).



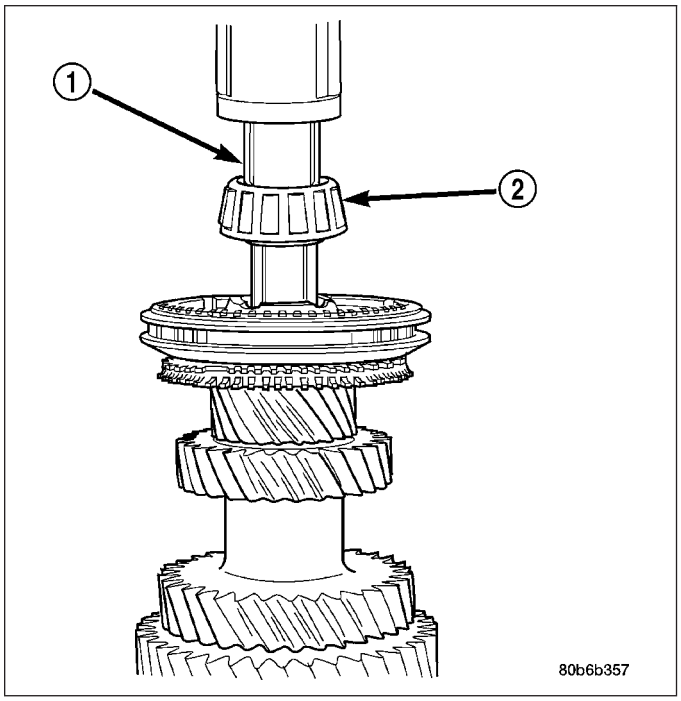
25. Install Guide 8235 (1) onto output shaft (2) end.



26. Install 5-6 synchro (2) over Guide 8235 and onto the output shaft.
27. Press 5-6 synchro onto the output shaft with Installer 8156 (1) and a shop press.

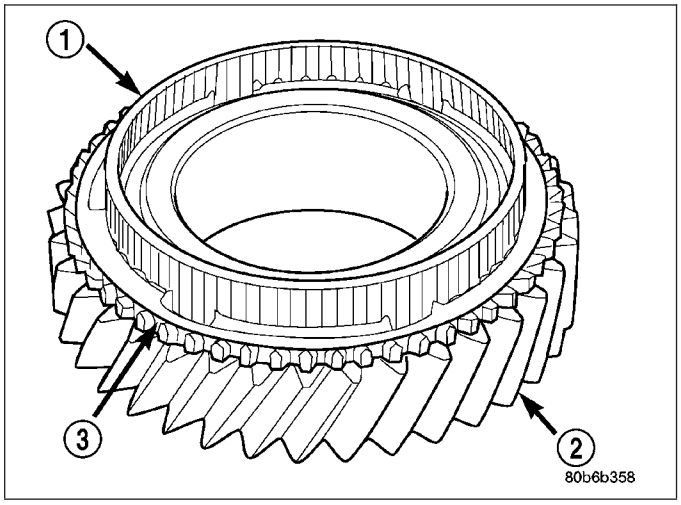


28. Install output shaft pocket bearing (2) onto the output shaft with Guide 8235 (1) and a shop press.
29. Install a **new** snap-ring to hold the output shaft pocket bearing onto the output shaft.

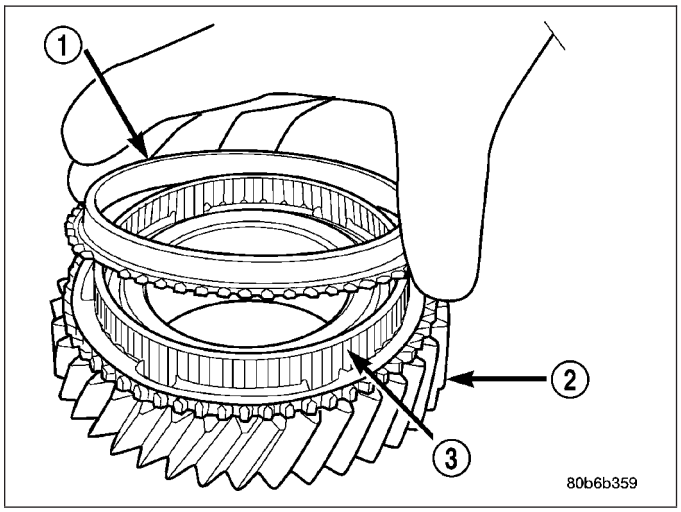


COUNTERSHAFT

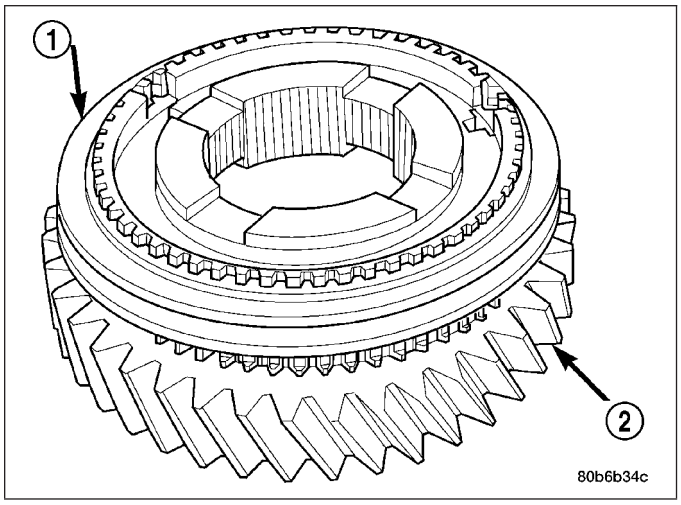
1. Place third countershaft gear (2) on the bench with the synchro clutch ring up (3).
2. Install third countershaft gear friction cone (1) onto third gear.



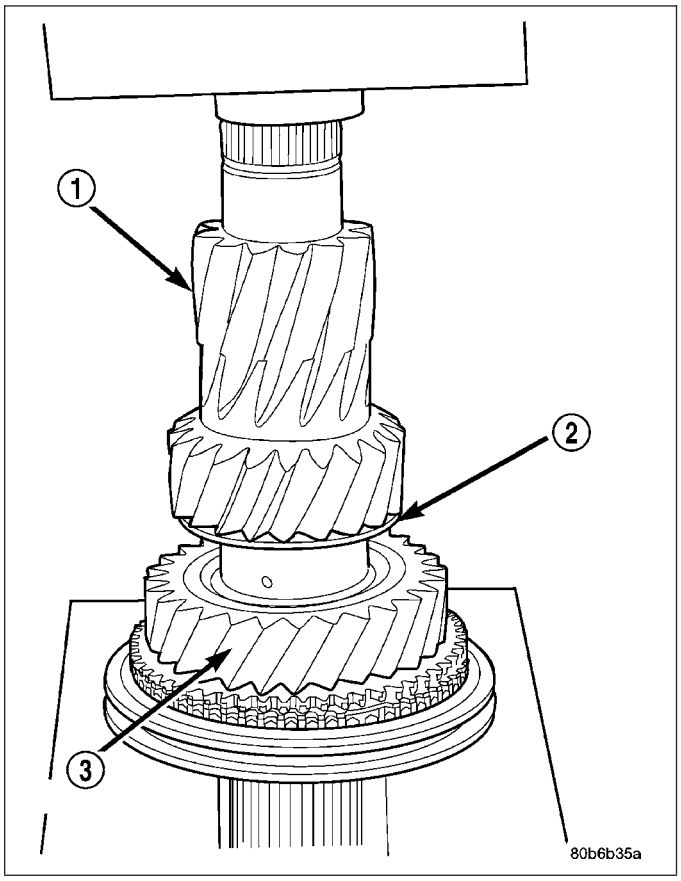
3. Install third countershaft gear (2) blocker ring (1) onto friction cone (3).



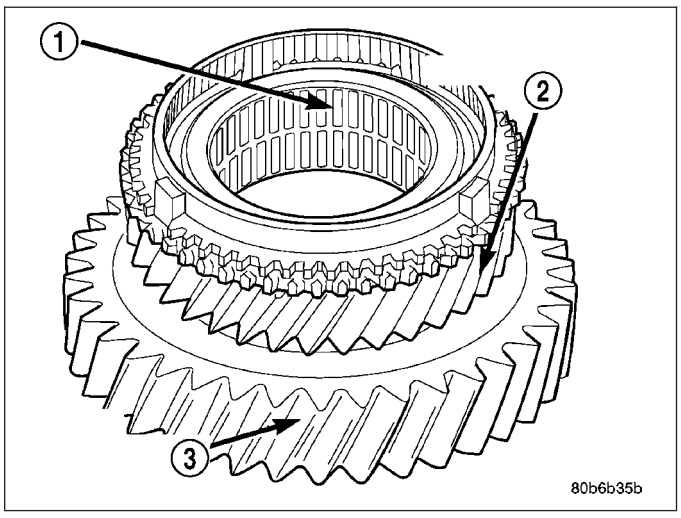
4. Install 3-4 synchro (1) assembly onto the blocker ring/gear (2) assembly.
5. Reverse the assembly on the bench.



6. Install third countershaft gear (3) bearing into the third countershaft gear.
7. Install 2-3 thrust washer (2) onto the countershaft (1)
8. Place third gear/3-4 synchro assembly in a shop press.
9. Install countershaft through the third gear/3-4 synchro assembly.
10. Press countershaft into the 3-4 synchro assembly.

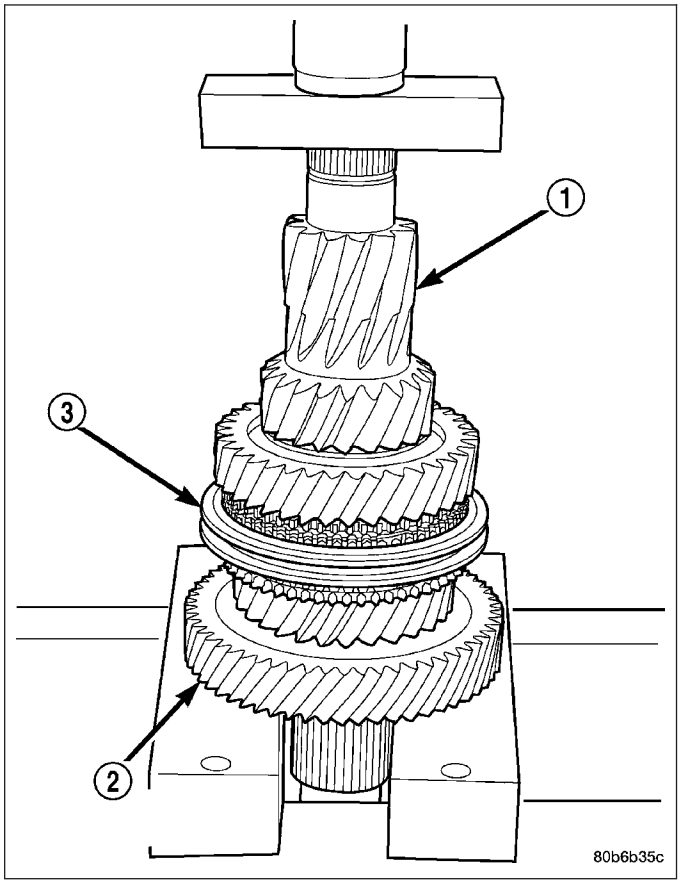


11. Install fourth countershaft gear bearing sleeve onto the output shaft.
12. Press fourth countershaft bearing sleeve onto the countershaft with Installer 8228 and a shop press.
13. Place fourth countershaft gear on the bench with the synchro clutch ring up.
14. Install fourth countershaft gear friction cone onto fourth countershaft gear.
15. Install fourth countershaft gear blocker ring onto the friction cone.
16. Install fourth countershaft gear bearing (1) into the fourth countershaft gear (2).



17. Place sixth countershaft gear (3) in the shop press.
18. Position fourth countershaft gear assembly onto the sixth countershaft gear.
19. Install countershaft (1) into the fourth/sixth countershaft gear (2) assembly in the shop press.
20. Press countershaft into sixth gear.

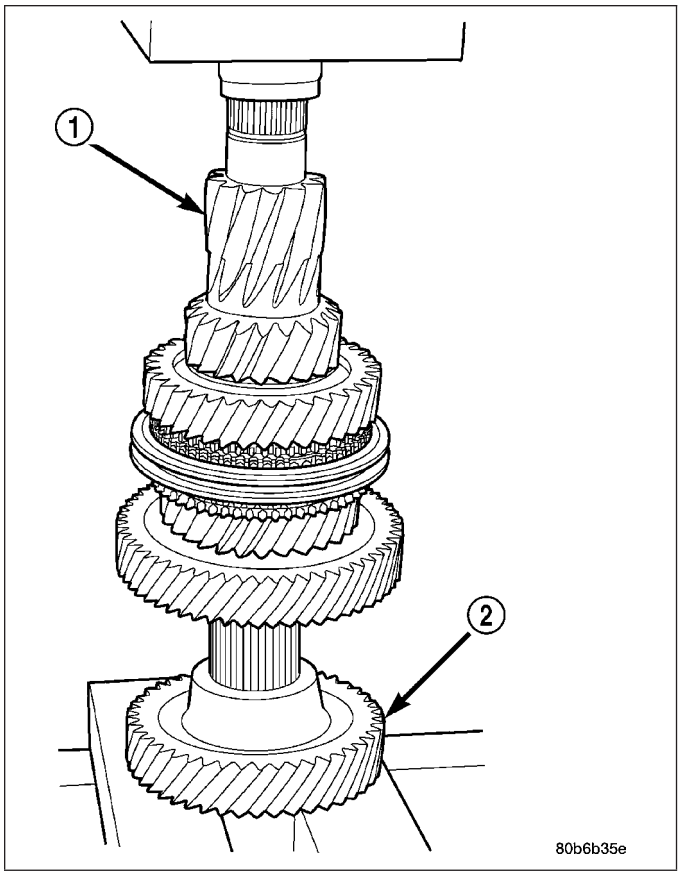
CAUTION: Gear and shaft must be aligned while pressing or the gear will bind on the shaft.



21. Place fifth countershaft gear (2) into the shop press.
22. Install countershaft (1) into the fifth countershaft gear (2) and press countershaft into fifth gear.

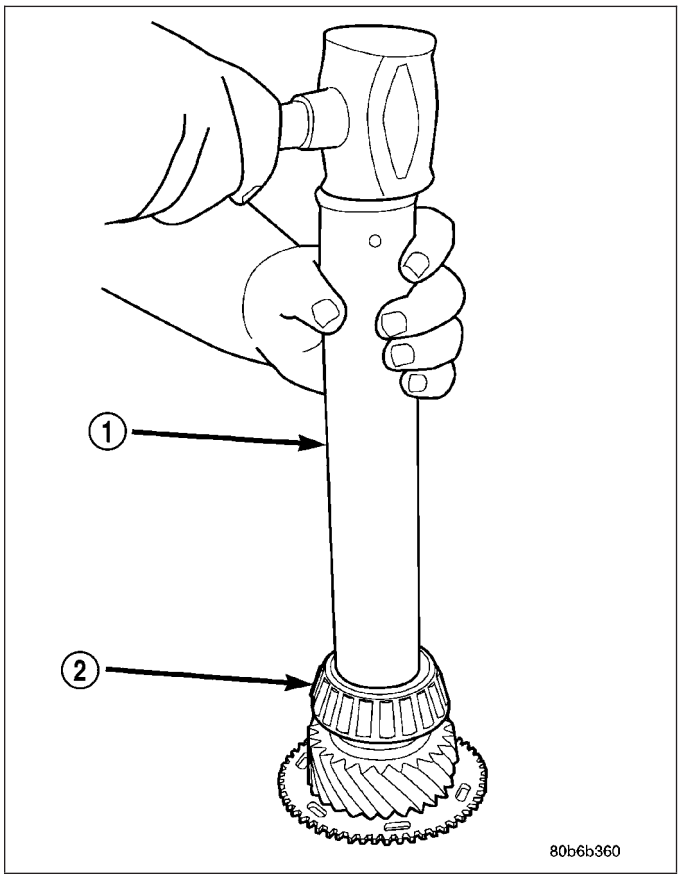
CAUTION: Gear and shaft must be aligned while pressing or the gear will bind on the shaft.

23. Place front countershaft bearing onto the countershaft.
24. Install front countershaft bearing onto the countershaft with Installer 8236 and Handle C-4171.
25. Install a **new** snap-ring to hold the front countershaft bearing onto the countershaft.
26. Place rear countershaft bearing onto the countershaft.

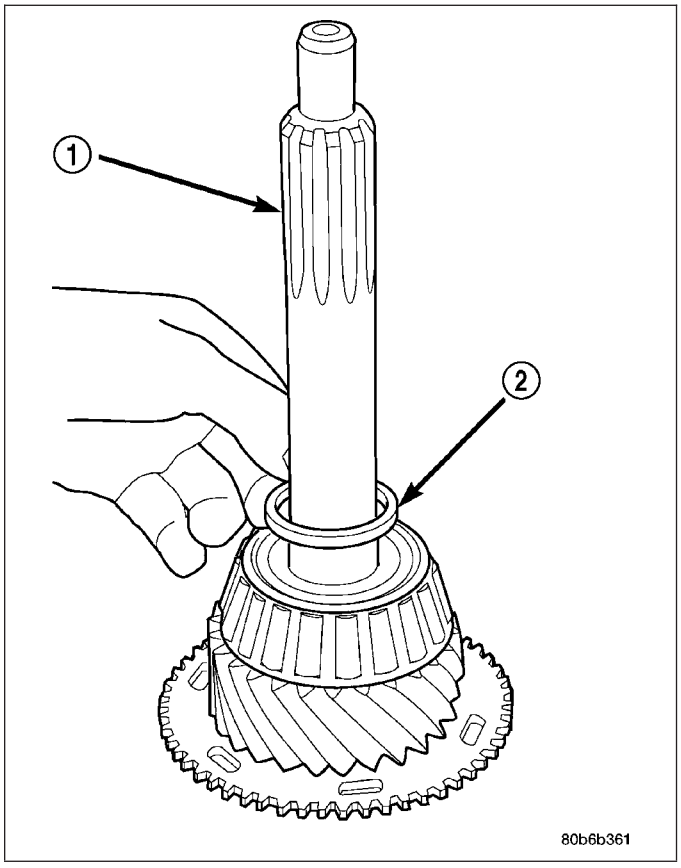


INPUT SHAFT

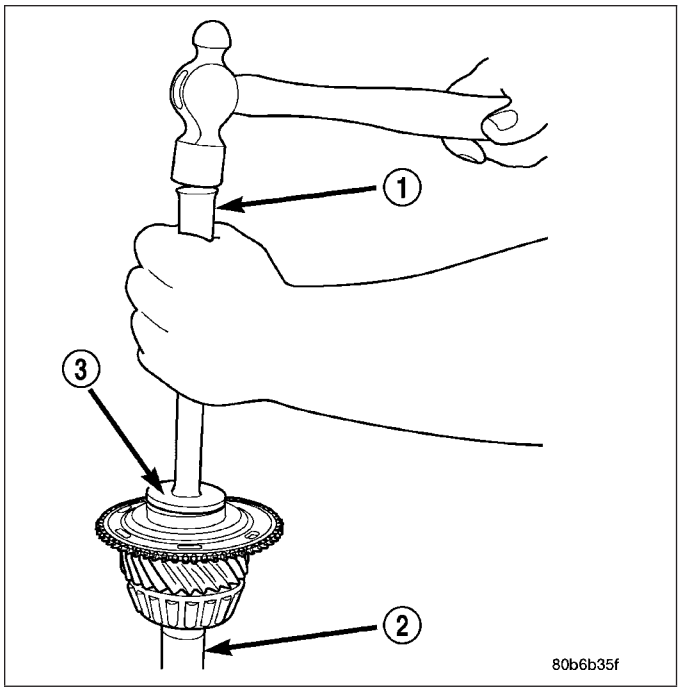
1. Install input shaft bearing (2) onto input shaft with Installer MD998805 (1).



2. Position input shaft (1) bearing oil guide (2) on input shaft.



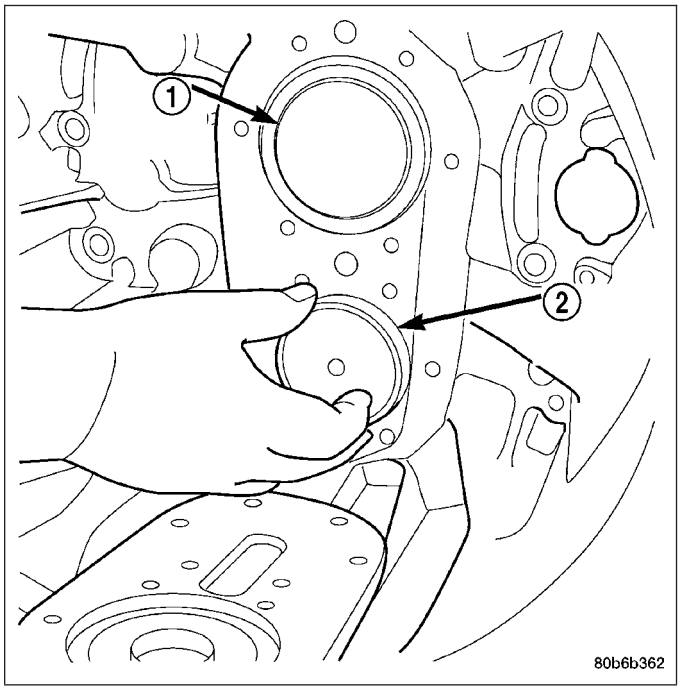
3. Install input shaft bearing oil guide with Installer MD998805.
4. Place the output shaft pocket bearing race in the input shaft.
5. Install output shaft bearing race into input shaft (2) with Installer C-4628 (3) and Handle C-4171(1).



CLUTCH HOUSING

1. Install input shaft bearing race so that the bearing race protrudes 0.3 in. (1) above the front surface of the clutch housing. Install bearing race with Remover/Installer 8237 and Handle C-4171.
2. Install countershaft front bearing race into the clutch housing so that the bearing race protrudes 0.4 in. (2) above the front surface of the clutch housing. Install bearing race with Remover 6061-1 and Handle C-4171.
3. Install countershaft oil guide and spacer into the countershaft front bearing bore in the clutch housing.
4. Clean old sealer from input shaft retainer and clutch housing. **DO NOT** apply new sealer at this time. New sealer will be applied after all the preload measurements are made and end-play shims are installed.

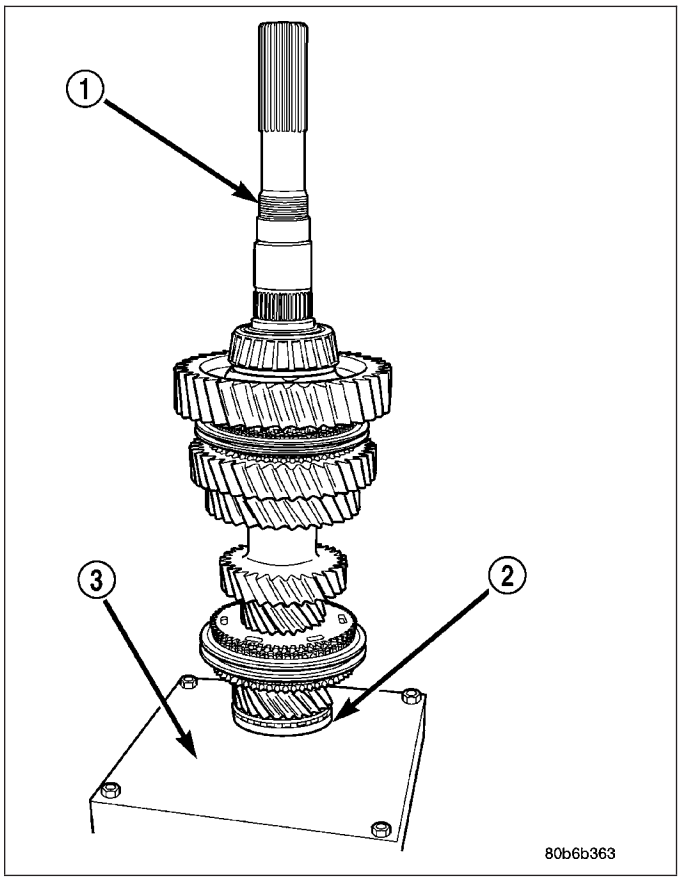
NOTE: Do not replace the input shaft seal at this time. A new seal will be installed after all the preload measurements are made and endplay shims are installed.



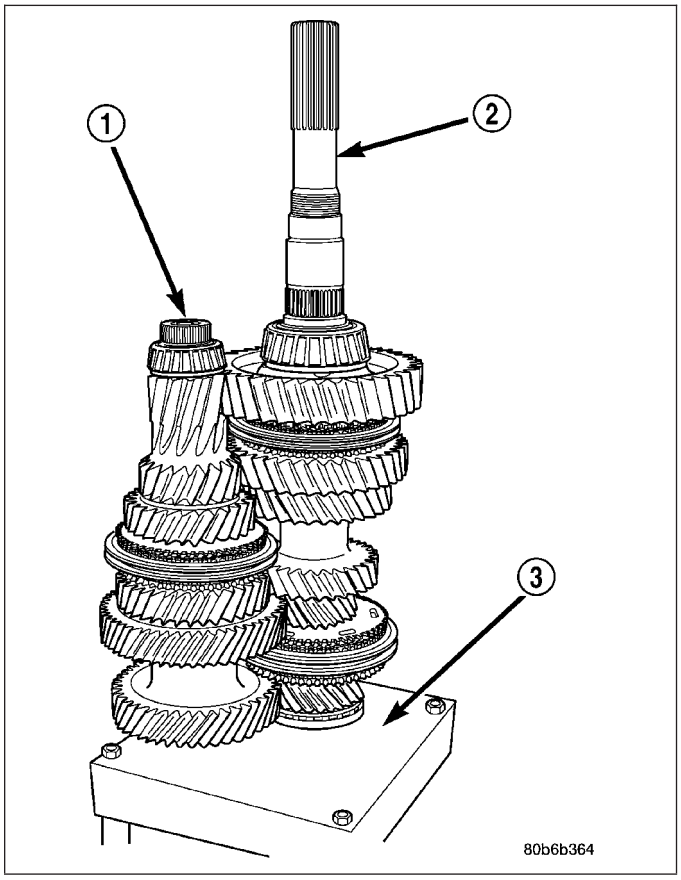
5. Install input shaft retainer onto the clutch housing and install bolts to hold the input shaft retainer.

GEARTRAIN

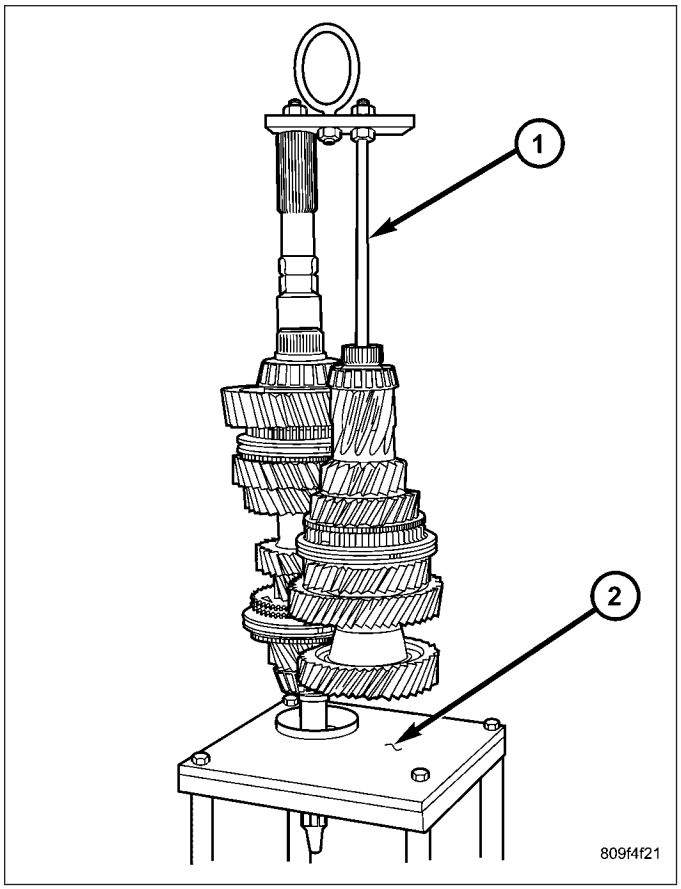
1. Install input shaft (2) into Support Stand 8246 (3).
2. Install fifth gear friction cone onto the input shaft.
3. Install fifth gear blocker ring onto the fifth gear friction cone.
4. Install output shaft into the input shaft (1).



5. Install countershaft (1) into the Support Stand 8246 (3) and verify that all gears are meshed with their mates on the output shaft (2).



6. Install Fixture 8232 (1) to the output shaft and countershaft.
7. Install Holding Tool 8242 onto the 5-6 synchro and tighten the screw to hold the 5-6 synchro together during the remainder of the installation procedure.
8. Attach a engine crane or equivalent to Fixture 8232 (1) and move the geartrain from the Support Stand 8246 (2) to the clutch housing.

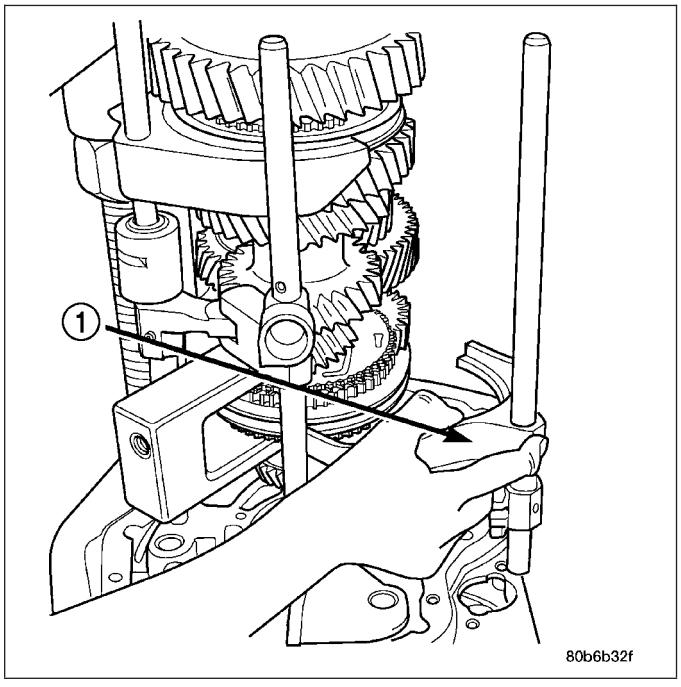


9. Install shift forks and rails (1) onto the geartrain.

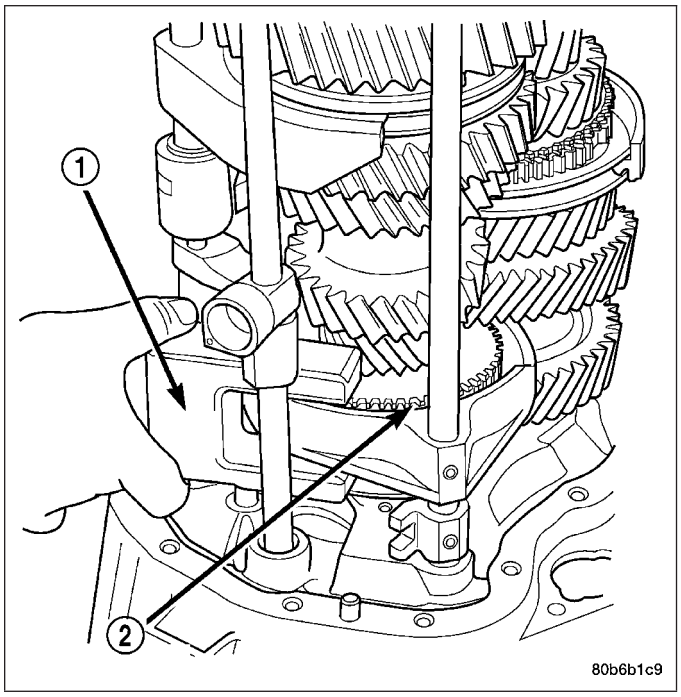
NOTE: The closest shift arm to the geartrain is for Reverse. The next is 5-6, then 3-4 and then 1-2 when moving out from the geartrain.

10. Install geartrain and shift rails into the clutch housing. Lower the geartrain and rails into the housing slowly while guiding input shaft through input shaft seal. Avoid any binds on the shift rails, forks and synchros as the rails enter their bushings.

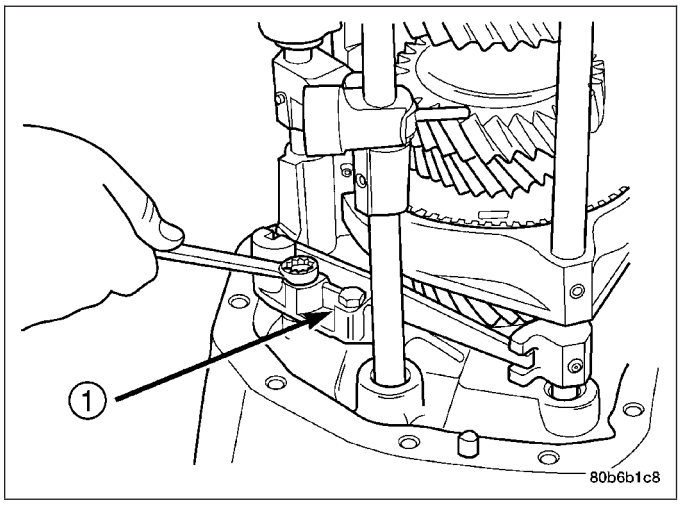
CAUTION: Do not damage input shaft seal with the input shaft splines.



11. With the geartrain approximately 1/4 in. from the clutch housing, remove Holding Tool 8242 (1) from the 5-6 synchro (2).
12. Install 5-6 crossover bracket and arm to the shift rails and the clutch housing.
13. Lower geartrain the remainder of the way into the clutch housing.



14. Install the 5-6 crossover bracket (1) bolts and tighten to 28 N·m (20 ft. lbs.).
15. Remove engine crane and Fixture 8232 from the output shaft and the countershaft.

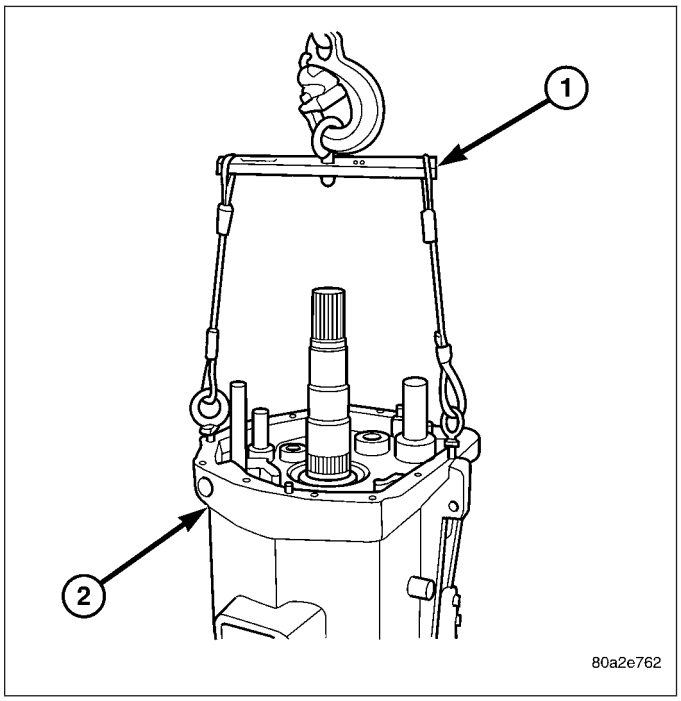


TRANSMISSION GEAR CASE

1. Install rear output shaft bearing race into the transmission gear case with Installer C-4308 and Handle C-4171.
2. Install rear countershaft bearing race into the transmission gear case with Installer 8153 and Handle C-4171.
3. Install Fixture 8232 (1) to the transmission case (2).

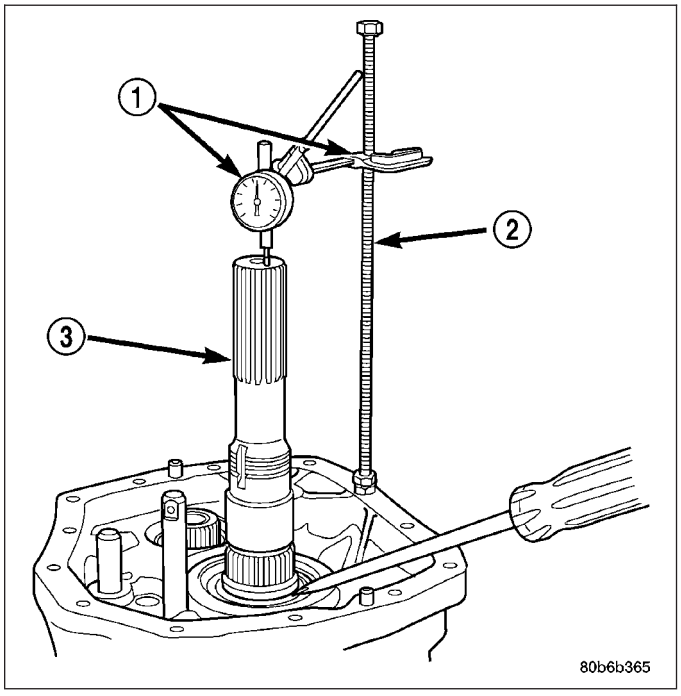
NOTE: Shift socket must be loose on the shift shaft and is rotated a minimum of 90° from its normal position. This will ensure enough clearance to install the transmission gear case.

4. Apply sealant to the clutch housing.
5. Attach an engine crane or equivalent to Fixture 8232 and install the transmission gear case onto the clutch housing.
6. Install clutch housing bolts and tighten to 48 N·m (35 ft.lbs.).
7. Install shift socket roll pin with a suitable 6 mm (7/32 in.) punch and hammer.



MAINSHAFT AND COUNTERSHAFT ENDPLAY

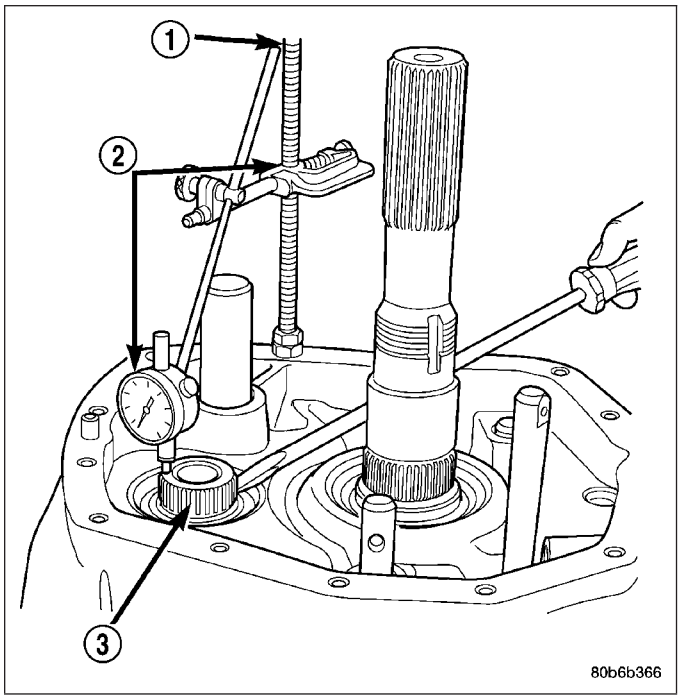
1. With transmission in vertical position, use Socket 6993 to rotate the shafts and seat the bearings.
2. Measure mainshaft (3) endplay with Dial Indicator Set C-3339 (1) and Extension Rod 8161 (2) installed onto the rear of the transmission gear case.



3. Measure countershaft (3) end-play with Dial Indicator Set C-3339 (2) and Extension Rod 8161 (1) installed onto the rear of the transmission gear case.
4. Rotate transmission into a horizontal position and remove the input shaft retainer.
5. Install shims necessary to achieve an end-play of 0-0.10 mm (0-0.004 in.) for the mainshaft and countershaft.

NOTE: Countershaft shims go between the bearing race and spacer. Mainshaft shims go into the input shaft retainer.

6. Install a **new** input shaft seal into the input shaft retainer with Installer C-4965.
7. Install input shaft oil guide with C-3972-A and Handle C-4171.
8. Apply sealer to the input shaft retainer and install retainer onto the clutch housing. Install bolts and tighten to 28 N·m (20 ft.lbs.).

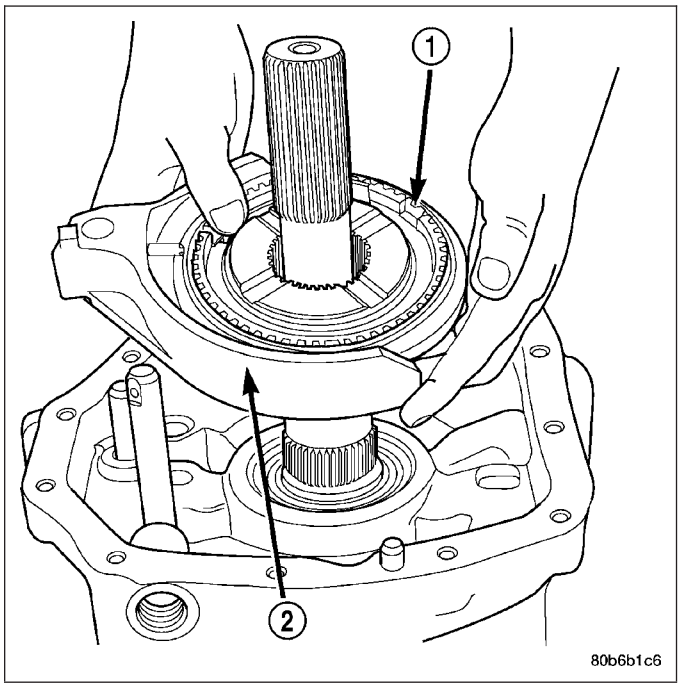


REVERSE GEAR

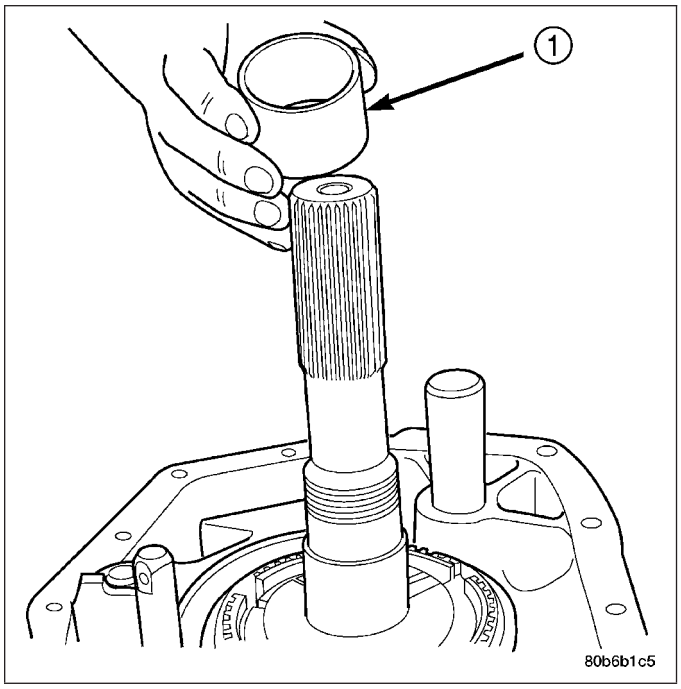
1. Install reverse shift fork (2) and synchronizer (1) as an assembly onto the reverse shift rail and output shaft.

NOTE: Raised square shoulder and snap-ring on the synchro face the case.

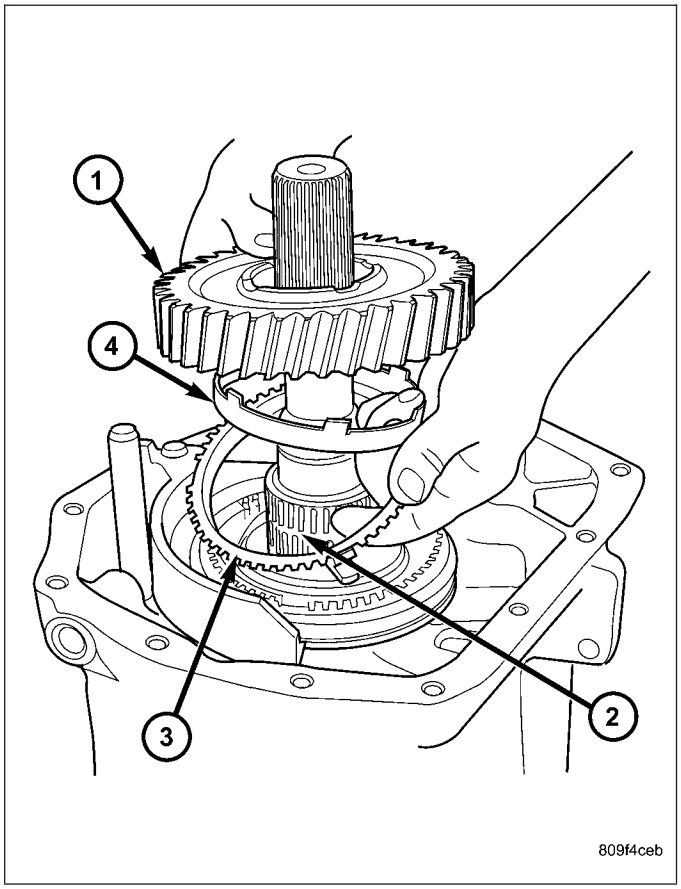
2. Install roll-pin securing the reverse shift fork to the reverse shift rail with 6 mm (7/32 in.) punch and a hammer.



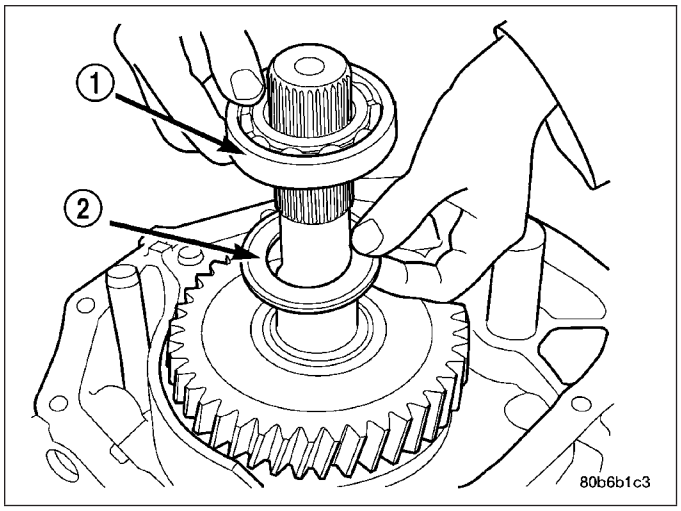
3. Install reverse gear bearing sleeve (1) onto the output shaft with Installer 6446 if necessary.



4. Install reverse gear (1) , reverse gear synchronizer cone (4), reverse gear outer blocker ring (3) and reverse gear bearing (2).

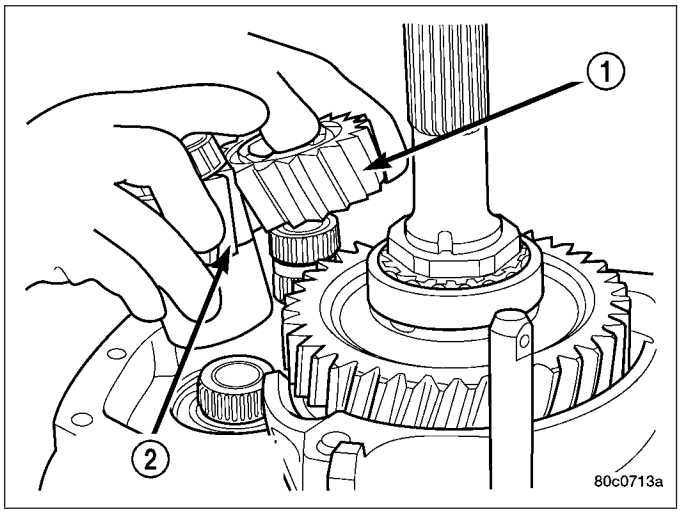


5. Install output shaft ball bearing (1) assembly and reverse thrust washer (2) onto the output shaft.

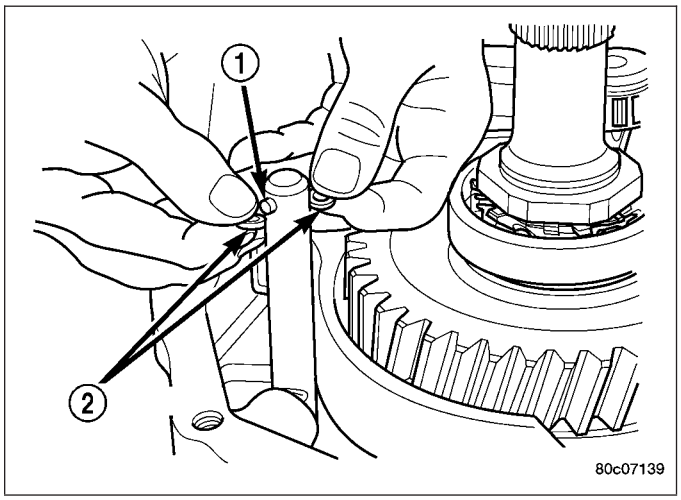


NOTE: Raised shoulder on thrust washer faces away from the reverse gear.

6. Install a **new** output shaft nut onto the output shaft.
7. With Wrench 8226 on the output shaft nut and Socket 6993 or 6984 holding the output shaft, tighten the nut to 339 N·m (250 ft.lbs.).
8. Stake nut into the slot in the output shaft with a 9 mm (5/16 in.) punch.
9. Press countershaft reverse gear into the sleeve with a shop press.
10. Install reverse countershaft rear bearing onto the countershaft reverse gear assembly with Installer C-4652 and Handle C-4171.
11. Install reverse idler gear rear bearing, bearing spacer, front bearing, and front thrust washer onto the idler gear shaft.
12. Install idler (1) and reverse countershaft gears (2) together.
13. Install reverse idler thrust washer from the reverse idler.



14. Install crossover cam rollers (2) and pin (1).

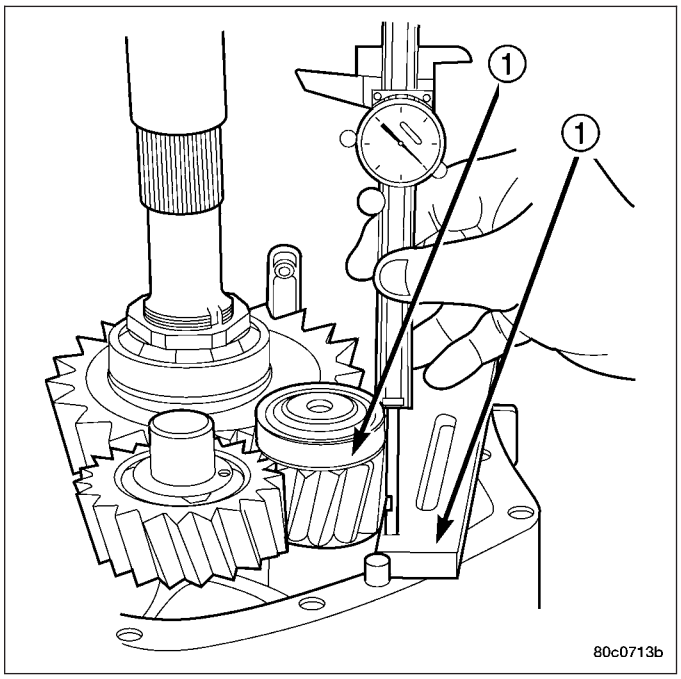


EXTENSION/ADAPTER HOUSING

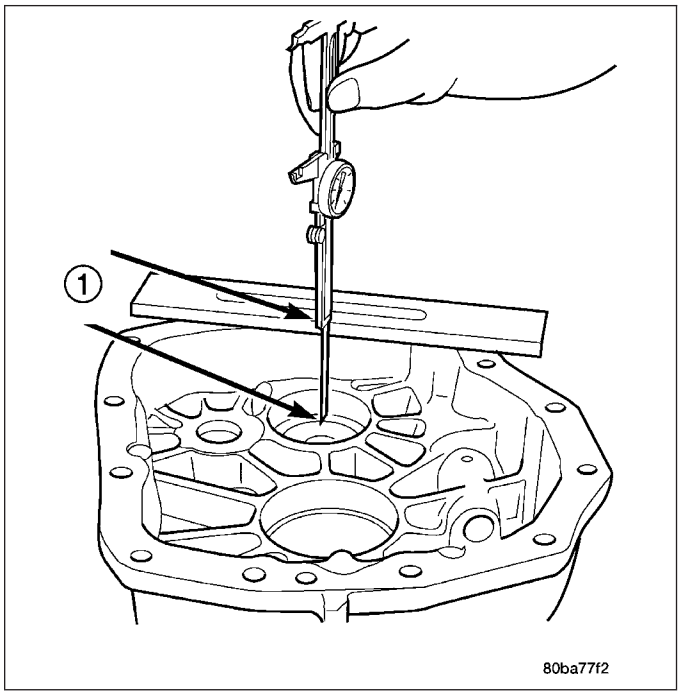
1. Install extension housing bushing with Installer 8156 and Handle C-4171, if necessary. The oil feed hole must be at the 12 o'clock position when installed.
2. On 4X2 vehicles, install extension housing seal with Installer 8154 and Handle C-4171, with the weep hole at the bottom.

NOTE: Drain hole located in the dust boot portion of the seal must face downward (toward the ground) when installed.

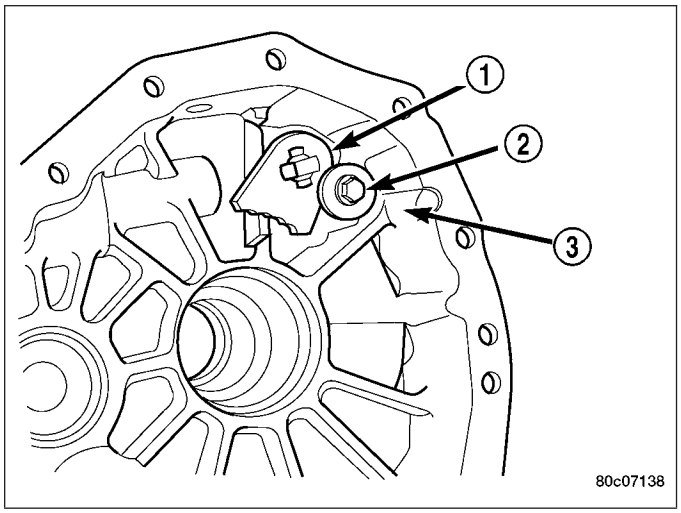
3. On 4X4 vehicles, install adapter housing seal with Installer C-3860-A and Handle C-4171.
4. Install the crossover cam bushing into the extension/adapter housing with Installer 8239 and Handle C-4171.
5. Clean the rear of the transmission case of all sealer.
6. Install reverse countershaft gear bearing race onto the reverse countershaft gear bearing.



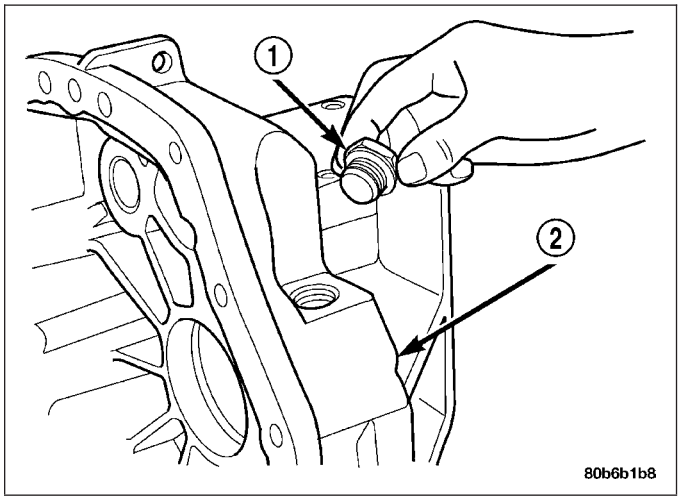
7. Measure the distance (1) from the back of the bearing race to Gauge Bar 6311.
8. Measure thickness of the gauge bar and record the total of the two measurements.
9. Clean all the sealer from the extension/adapter housing.
10. Place Gauge Bar 6311(1) across the housing face. Measure the distance from the top of the bar to the bottom of the reverse countershaft bearing race bore.
11. Subtract thickness of the gauge bar from the measurement and record the result.
12. The difference between the two measurements is the end-play for the reverse countershaft gear assembly.
13. Install shims to achieve 0.15-0.25 mm (0.006-0.010 in.) end-play for the reverse countershaft gear assembly into the reverse countershaft bearing race bore.
14. Use Installer to install the reverse countershaft bearing race into the extension/adapter housing.
15. Install back-up lamp switch into the extension/adapter housing and tighten to 28 N·m (20 ft.lbs.).



16. Install crossover cam (1) into the extension/adapter housing.
17. Install bolt (2) to hold the crossover cam to the extension/adapter housing (3).



18. Install crossover detent plunger, spring and plug (1) into the extension/adapter housing (2). Tighten the plug to 47.5 N·m (35 ft.lbs.).
19. Apply sealer to the surface of the transmission case.
20. Install extension/adapter housing onto the transmission case.
21. Install bolts to hold the extension/adapter housing onto the transmission gear case. Tighten bolts to 48 N·m (35 ft.lbs.).
22. Install shift rail blocker bolt and tighten bolt to 55 N·m (41 ft.lbs.).
23. Install primary shift rail detent plunger, spring and plug into the transmission case. Tighten detent plug to 47.5 N·m (35 ft.lbs.).

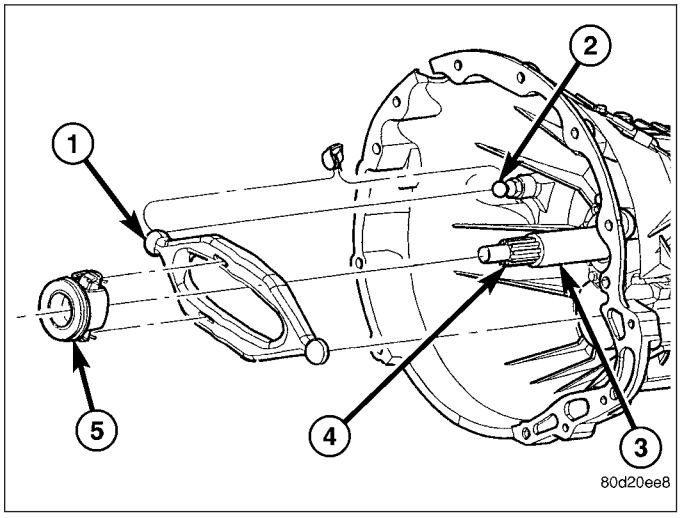


24. Install shift tower onto the transmission case and tighten bolts to 9 N·m (7 ft.lbs.).

INSTALLATION

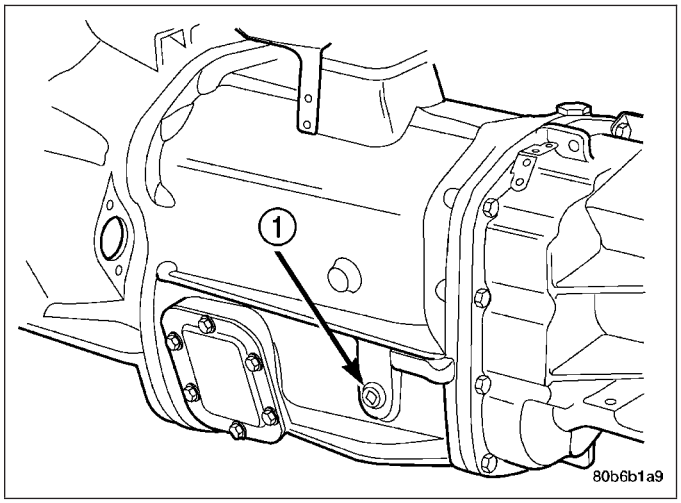
NOTE: If installing a new transmission, use all components supplied with the transmission. If a new shift tower is supplied with the new transmission, do not re-use the original shift tower.

1. Apply a light coat of Mopar high temperature bearing grease or equivalent to contact surfaces of following components:
   - release fork (1)
   - release fork ball stud (2)
   - release bearing slide (3)
   - input shaft splines (4)
   - release bearing bore (5)
2. Apply sealer to threads of bottom PTO cover bolt and install bolt in case.



3. Mount transmission on jack and position transmission under vehicle.
4. Raise transmission until input shaft is centered in clutch disc hub.
5. Move transmission forward and start input shaft in clutch disc and pilot bushing/bearing.

6. Work transmission forward until seated against engine block. Do not allow transmission to remain unsupported after input shaft has entered clutch disc.
7. Install and tighten transmission-to-engine block bolts.
8. Install clutch slave cylinder.
9. Connect backup light switch wires.
10. Position transmission harness wires in clips on transmission.
11. Install transmission mount on transmission or rear crossmember.
12. Install rear crossmember.
13. Remove transmission jack and engine support fixture.
14. Remove transmission fill plug (1) and fill with required lubricant. Check lubricant level in transfer case if equipped.



TWO WHEEL DRIVE

1. Install propeller shaft with reference marks aligned.
2. Install exhaust system components.
3. Remove support and lower vehicle.
4. Shift transmission into third gear.
5. Clean the mating surfaces of shift tower and isolator plate with suitable wax and grease remover.
6. Apply Mopar Gasket Maker or equivalent to sealing surface of the transmission case. Do not over apply sealant.
7. Install isolator plate onto the transmission case metal side down.
8. Install shift tower onto the isolator plate. No sealant is necessary between the shift tower and top of isolator plate.
9. Verify shift tower, isolator plate and the shift socket are properly aligned.
10. Install bolts to hold the shift tower to the isolator plate and the transmission case. Tighten bolts to 10.2–11.25 N·m (7.5–8.3 ft. lbs.).
11. Install shift boot and bezel.

FOUR WHEEL DRIVE

1. Install and secure transfer case on the transmission jack.
2. Raise and align transfer case input gear with transmission mainshaft.
3. Move transfer case forward and seat it on adapter.
4. Install and tighten transfer case mounting nuts to 41-47 N·m (30-35 ft. lbs.) if case has 3/8 studs. If case has 5/16 studs tighten to 30-41 N·m (22-30 ft. lbs.).
5. Connect transfer case shift lever to range lever on transfer case.
6. Install propeller shafts with reference marks aligned.
7. Install transfer case skid plate, if equipped, and crossmember. Tighten attaching bolts/nuts to 41 N·m (30 ft. lbs.).
8. Install exhaust system components.

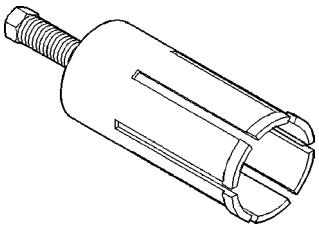
9. Remove support and lower vehicle.
10. Shift transmission into third gear.
11. Clean the mating surfaces of shift tower, isolator plate and transmission case with suitable wax and grease remover.
12. Apply Mopar Gasket Maker or equivalent to the sealing surface of the transmission case. Do not over apply sealant.
13. Install isolator plate onto the transmission case, metal side down.
14. Install shift tower onto the isolator plate. No sealant is necessary between the shift tower and top of isolator plate.
15. Verify that the shift tower, isolator plate and the shift tower bushings are properly aligned.
16. Install the bolts to hold the shift tower to the isolator plate and the transmission case. Tighten the shift tower bolts to 10.2-11.25 N·m (7.5-8.3 ft. lbs.).
17. Install shift lever extension and tighten to 47 N·m (35 ft. lbs.).
18. Install shift lever boot and bezel.

SPECIFICATIONS - NV5600

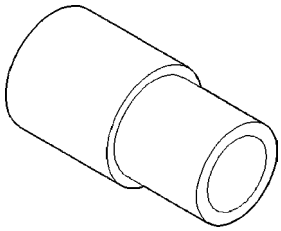
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Plug, Crossover Cam and Detent	48	35	-
Bolt, Input Retainer	28	20	-
Bolt, 5-6 Crossover Bracket	28	20	-
Bolt, Clutch Housing	48	35	-
Bolt, Extension/Adapter Housing	48	35	-
Bolt, Shift Tower	9	7	80
Shift Lever Extension	47	35	-
Switch, Back-up Lamp	28	20	-
Bolt, Shift Blocker	55	41	-
Bolt, PTO Cover	40	30	-
Pivot, Clutch Release Lever	22	16	-
Plug, Fill	30	22	-
Nut, Output Shaft	339	250	-

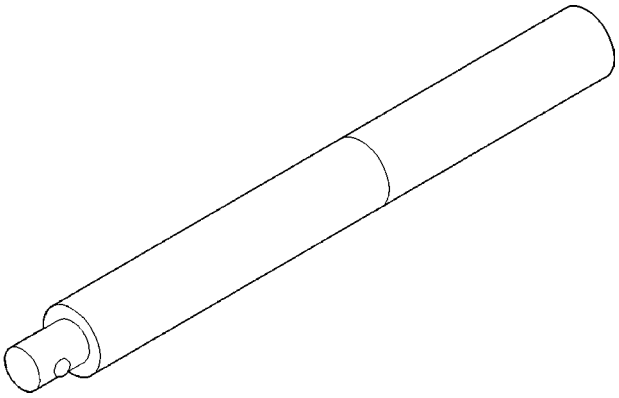
SPECIAL TOOLS



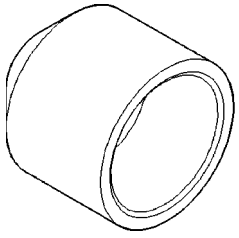
REMOVER 8155



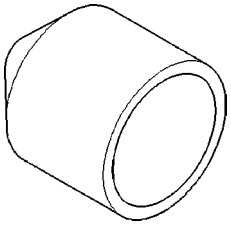
INSTALLER 8156



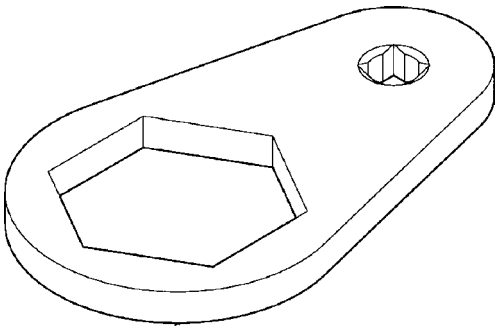
HANDLE C-4171



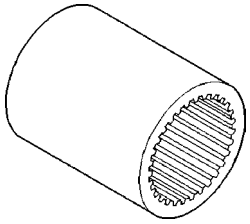
INSTALLER C-3972-A



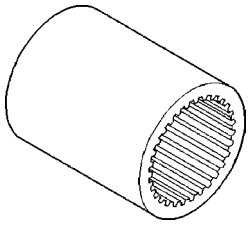
INSTALLER 8154



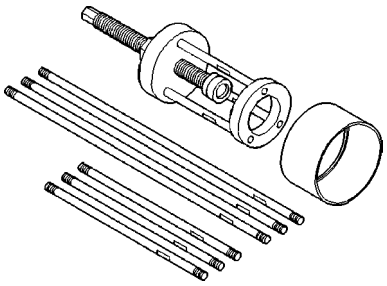
WRENCH 8226



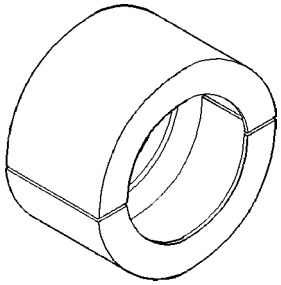
SOCKET 6984



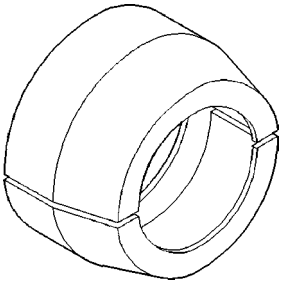
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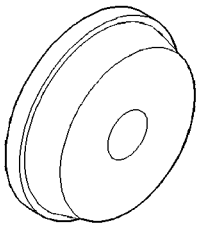
PULLER 6444



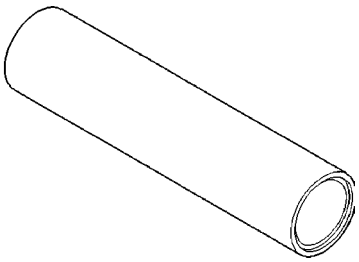
JAWS 6447



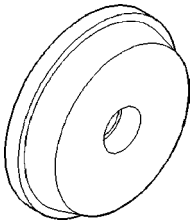
JAWS 6451



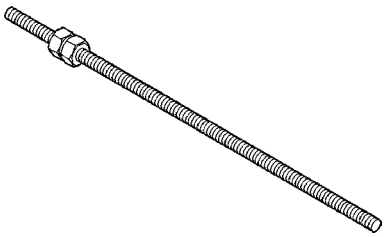
INSTALLER 6061



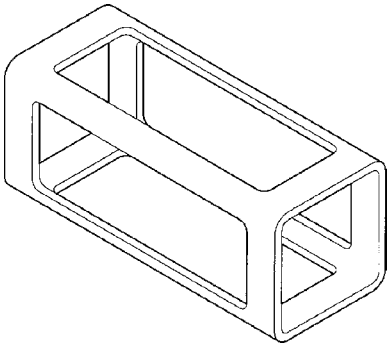
INSTALLER 6448



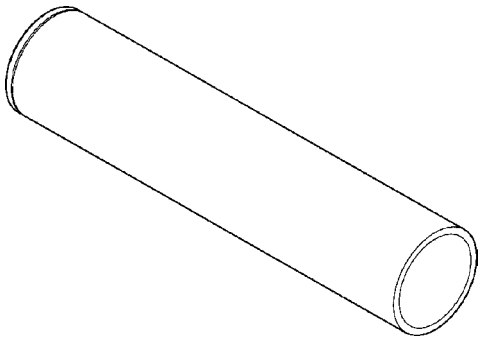
INSTALLER C-4308



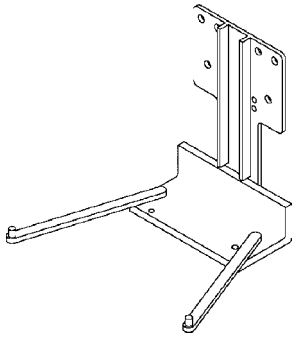
ROD EXTENSION 8161



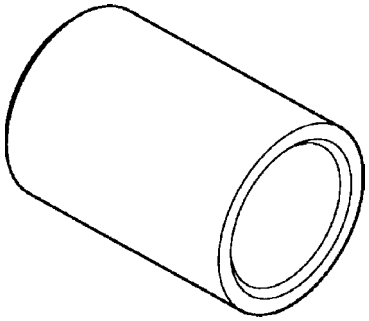
FIXTURE 8227



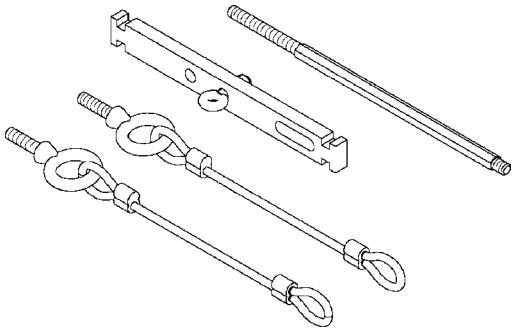
INSTALLER 8228



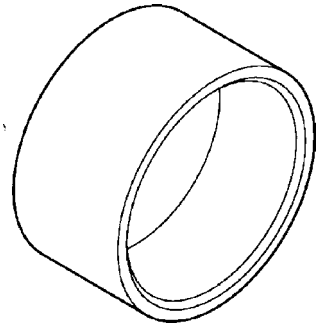
FIXTURE 8230



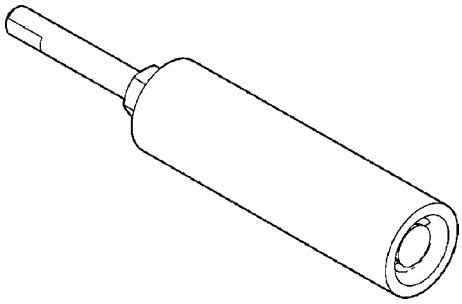
GUIDE 8235



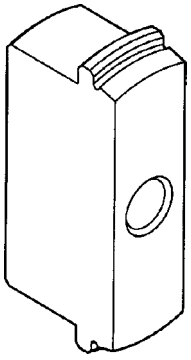
FIXTURE 8232



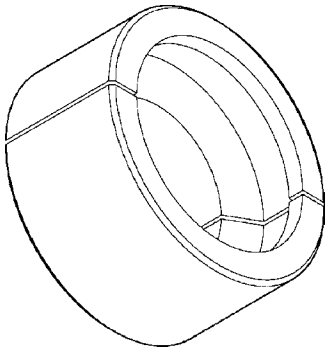
INSTALLER 8236



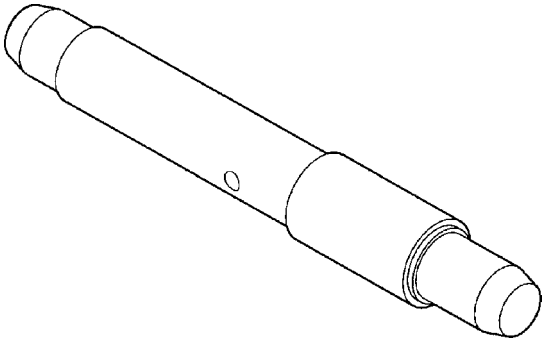
REMOVER 8233



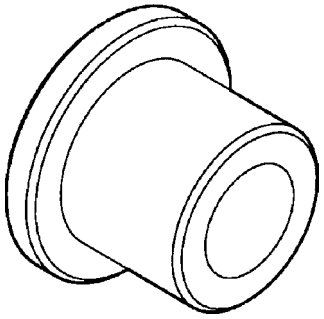
INSTALLER/REMOVER 8237



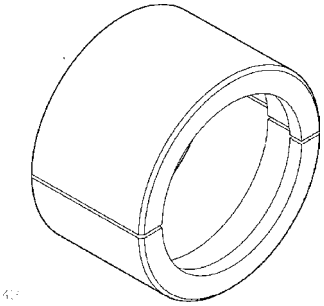
REMOVER 8234



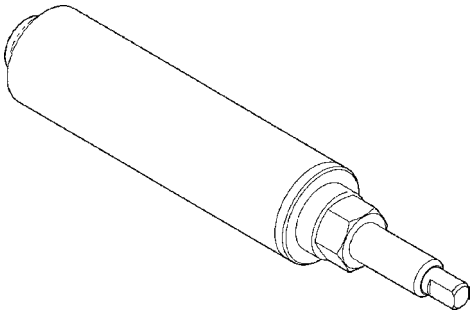
INSTALLER/REMOVE 8238



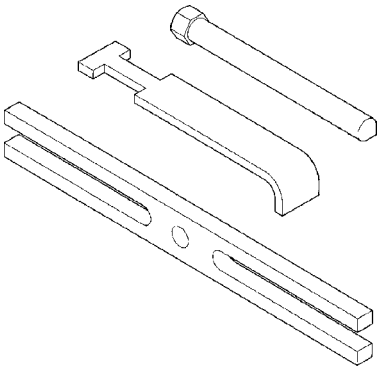
INSTALLER 8239



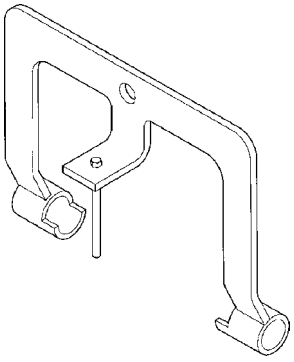
REMOVER 8243



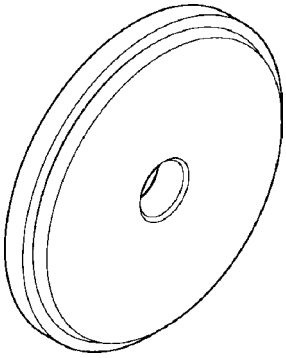
REMOVER 8240



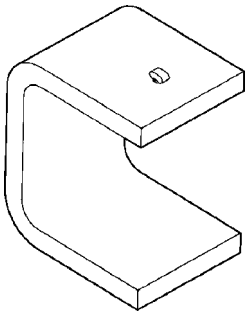
PULLER 8244



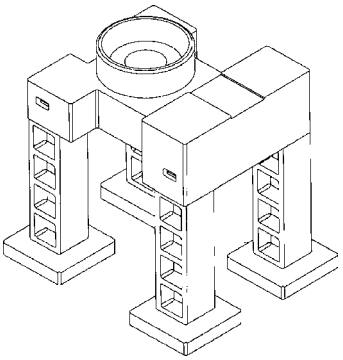
FIXTURE 8241



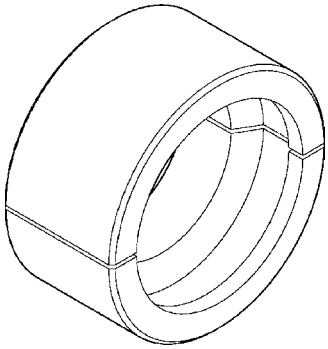
REMOVER 8245



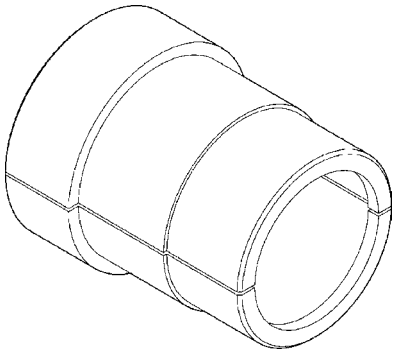
HOLDING 8242



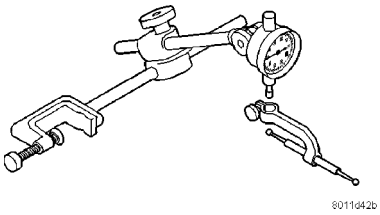
SUPPORT STAND 8246



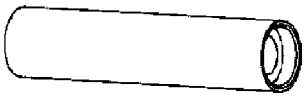
REMOVER 8262



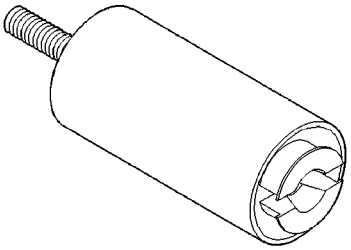
REMOVER 8271



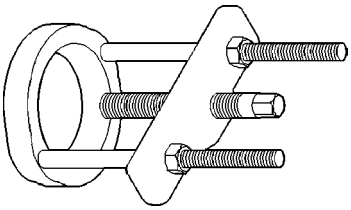
DIAL INDICATOR C-3339



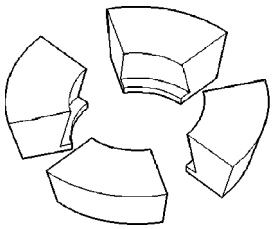
INSTALLER C-4965



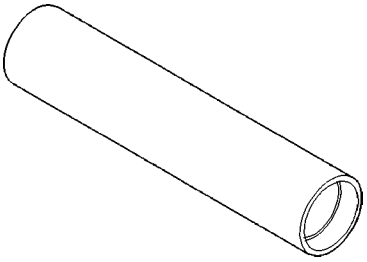
REMOVER L-4418



PULLER C-293-PA



ADAPTERS C-293-52



INSTALLER MD998805

SEAL-ADAPTER HOUSING - NV5600

REMOVAL

1. Raise and support vehicle.
2. Mark propeller shaft and yokes for installation reference and remove shaft.
3. Remove the transfer case.
4. Remove the adapter housing seal with a pry tool or slide hammer with a screw.

INSTALLATION

1. Install adapter housing seal with Installer 8154 and Handle C-4171.
2. Install transfer case.
3. Install propeller shaft with reference marks aligned.
4. Check fluid level.
5. Remove support and lower vehicle.

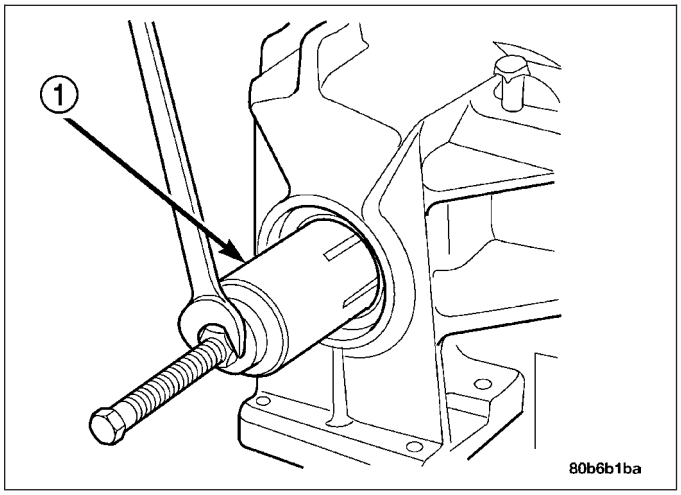
SEAL-EXTENSION HOUSING - NV5600

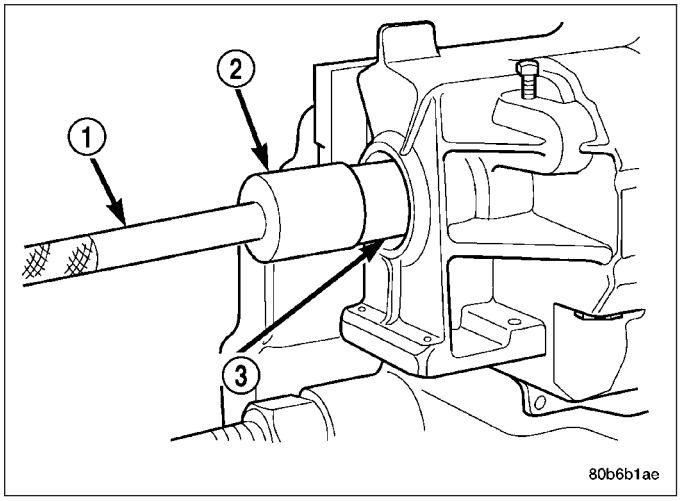
REMOVAL

1. Mark propeller shaft and pinion yoke for installation reference and remove the propeller shaft.
2. Remove extension housing seal with a pry tool or a slide hammer and screw.
3. Remove extension housing bushing with Remover 8155.

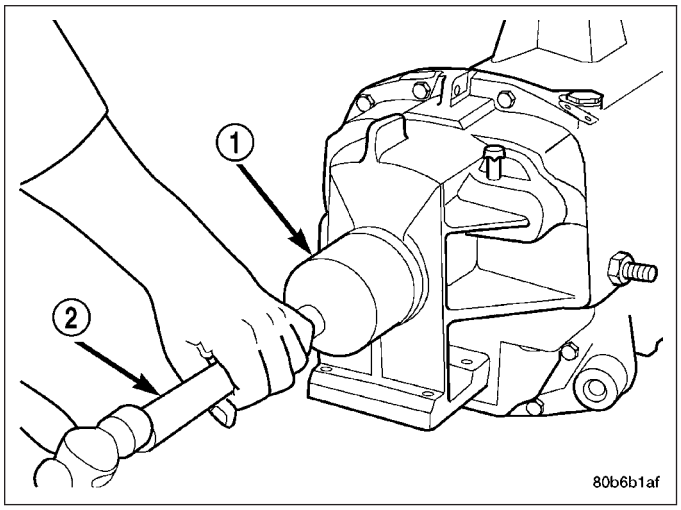
INSTALLATION

1. Install extension housing bushing with Installer 8156 and Handle C-4171.
2. Install extension housing seal with Installer 8154 and Handle C-4171.





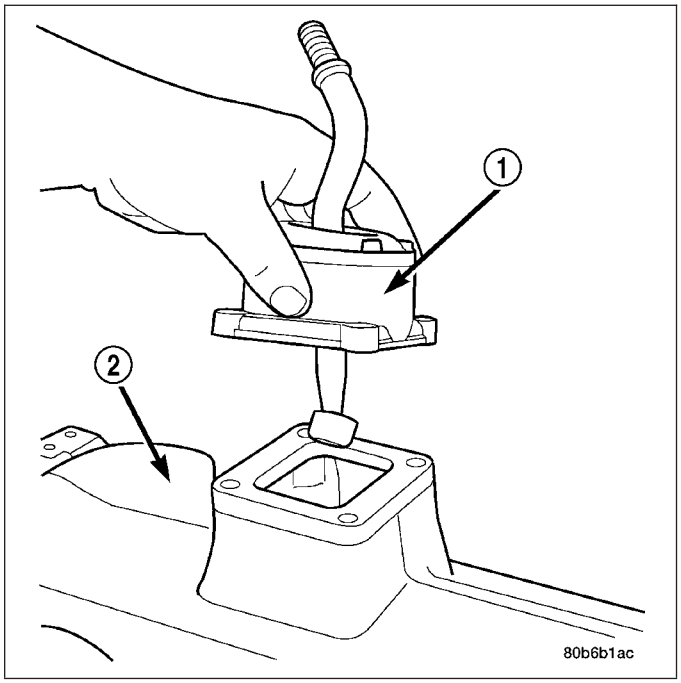
3. Install propeller shaft with reference marks aligned.
4. Check and fill transmission.



COVER-SHIFT - NV5600

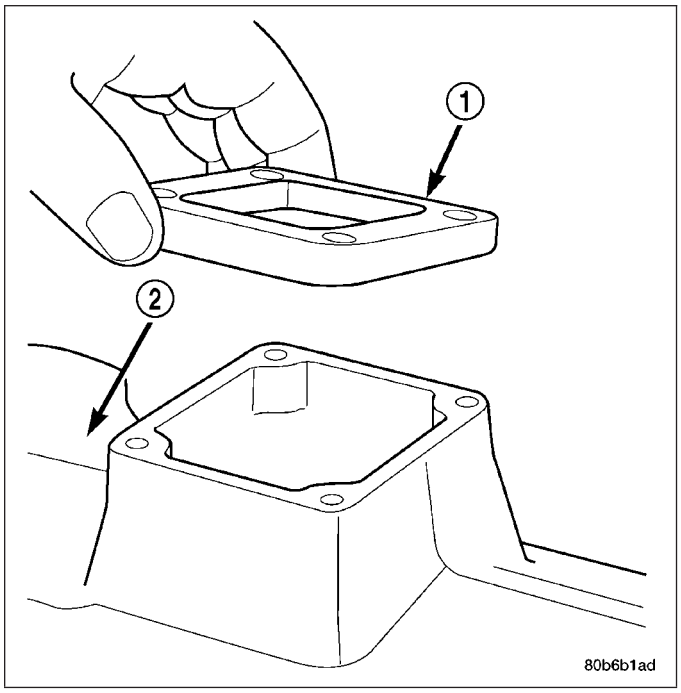
REMOVAL

1. Shift transmission into Neutral.
2. Unscrew and remove the shift lever extension from the shift
3. Remove screws attaching shift boot to floorpan. Then slide boot upward on the shift lever.
4. Remove the bolts holding the shift tower to the isolator plate and transmission gear case.
5. Remove the shift tower and isolator plate from the transmission.



INSTALLATION

1. Shift transmission into third gear.
2. Clean the mating surfaces of shift tower, isolator plate and transmission gear case with suitable wax and grease remover.
3. Apply Mopar Gasket Maker or equivalent to the sealing surface of the transmission. Do not over apply sealant.
4. Install isolator plate onto the transmission, metal side down.
5. Install shift tower onto the isolator plate. No sealant is necessary between the shift tower and isolator plate.
6. Verify shift tower, isolator plate and shift tower bushings are properly aligned.
7. Install shift tower bolts and tighten the shift tower bolts to 8-10 N·m (7-9 ft. lbs.).
8. Install shift lever extension, shift boot and bezel.



MANUAL TRANSMISSION - GETRAG 238 - SERVICE INFORMATION

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MANUAL TRANSMISSION - GETRAG 238 - SERVICE INFORMATION

DIAGNOSIS AND TESTING

MANUAL TRANSMISSION - GETRAG 238

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill or incorrect lubricant level check.

Rear transmission leaks will be from the oil seals or component mating surfaces.

Front transmission leaks will be from the front input shaft retainer seal. Lubricant may drip from the clutch housing after extended operation. If leak is severe, it may contaminate the clutch disc.

Lubricant level check can only be made when the vehicle is level and allowing the lubricant to settle for a minute before checking. This will ensure an accurate check and avoid an under or overfill condition.

HARD SHIFTING

Hard shifting is usually caused by low lubricant level, improper or contaminated lubricants. This will cause noise, excessive wear, internal bind, and hard shifting. Substantial lubricant leaks can result in gear, shift rail, synchro, and bearing damage. The first indications of component damage is usually hard shifting and noise.

Shift component damage, clutch adjustment, worn pressure plate or disc are also causes of increased shift effort. If clutch problem is advanced, gear clash during shifts can result. Worn or damaged synchronizer rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing hard or noisy shifts. In most cases, this condition will decline as the rings wear-in.

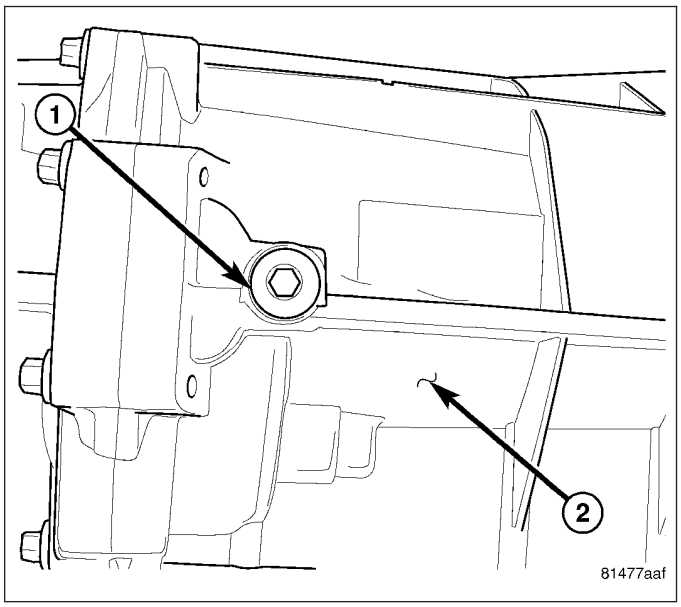
TRANSMISSION NOISE

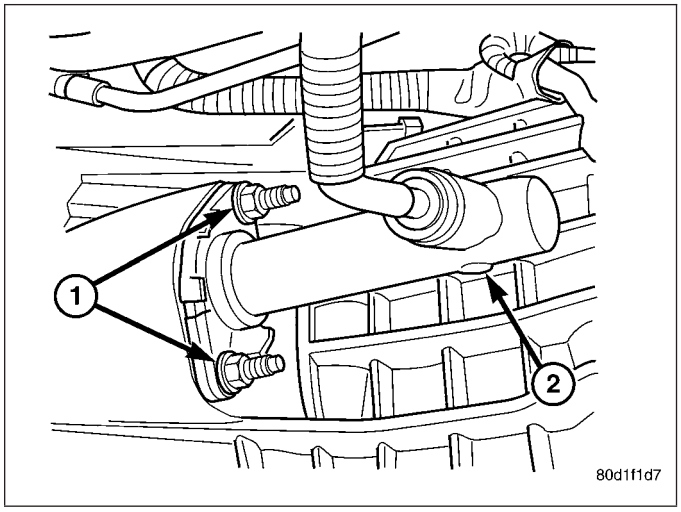
Most manual transmissions make some noise during normal operation. Rotating gears generate a mild whine that is audible, but generally only at extreme speeds.

Severe, highly audible transmission noise is generally the initial indicator of a lubricant problem. Insufficient, improper or contaminated lubricant will promote rapid wear of gears, synchronizer rings, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear and bearing damage.

REMOVAL

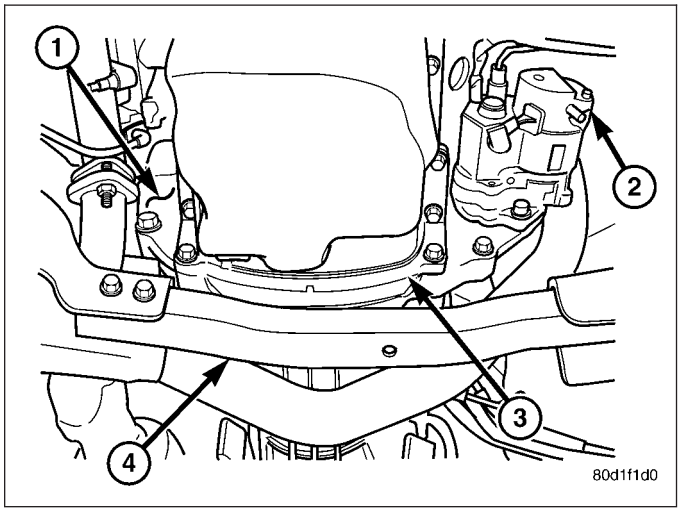
1. Remove drain plug (1) from rear housing (2) and drain fluid.
2. With vehicle in neutral, position vehicle on hoist.
3. Disconnect battery negative cable.
4. Remove shift boot bezel screws and slide boot upward on shift lever extension.
5. Remove shift lever extension from the shift tower and lever assembly.
6. Remove skid plate, if equipped.
7. Drain lubricant if transmission will be disassembled for service.
8. Mark propeller shaft/shafts and companion flange yoke/yokes for installation reference and remove propeller shaft/shafts.
9. Disconnect harness from clips on transmission housing.
10. Remove transfer case linkage if equipped.
11. Remove transfer case mounting nuts and remove transfer case if equipped.
12. Remove slave cylinder (2) mounting nut (1) and remove cylinder.



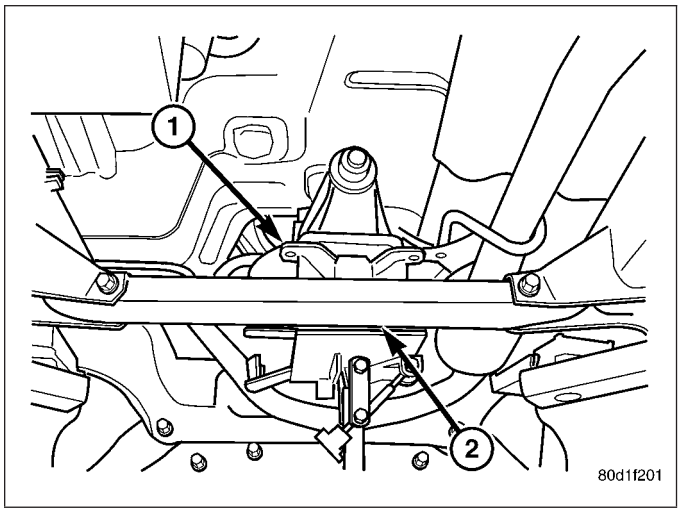


13. Remove starter motor (2), structural dust cover (3) bolts to clutch housing, dust shield (1) bolt and suspension crossmember (4).

CAUTION: Do not remove structural dust cover from enigne block. If cover is removed clutch housing and cover must be aligned with the engine.

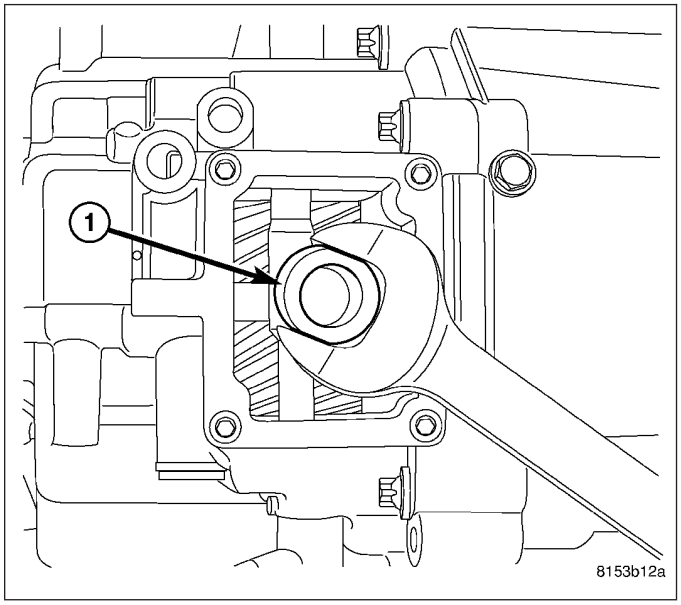


14. Remove exhaust pipe from the exhaust manifolds.
15. Support engine with adjustable jack stand and wood block.
16. Support and secure transmission to a transmission jack with safety chains.
17. Remove bolts from the rear transmission mount.
18. Remove the rear crossmember (2) and transmission mount (1).
19. Remove bolts attaching transmission to the engine.
20. Move transmission rearward until input shaft is clear of clutch disc and pressure plate. Then lower jack and remove transmission from under vehicle.

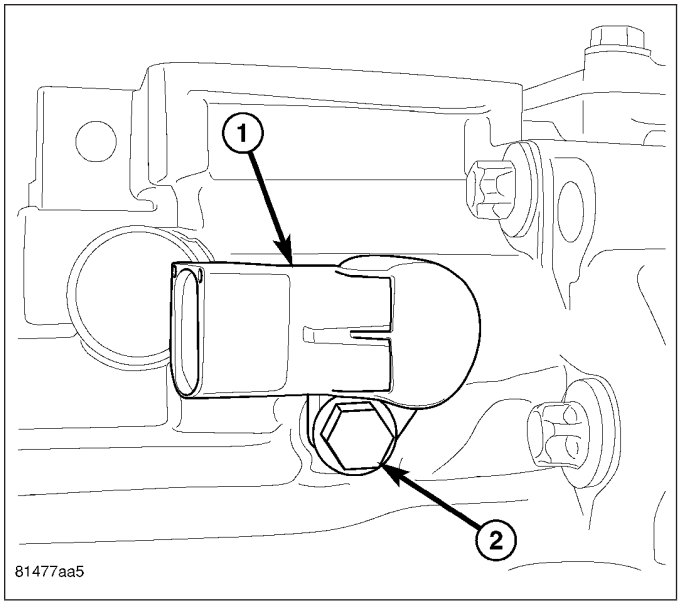


DISASSEMBLY

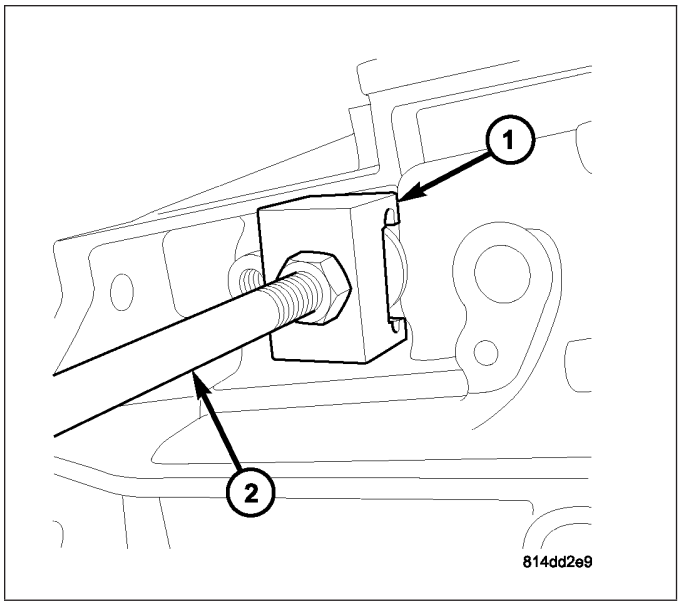
1. Remove shifter socket (1) from main shift rail.



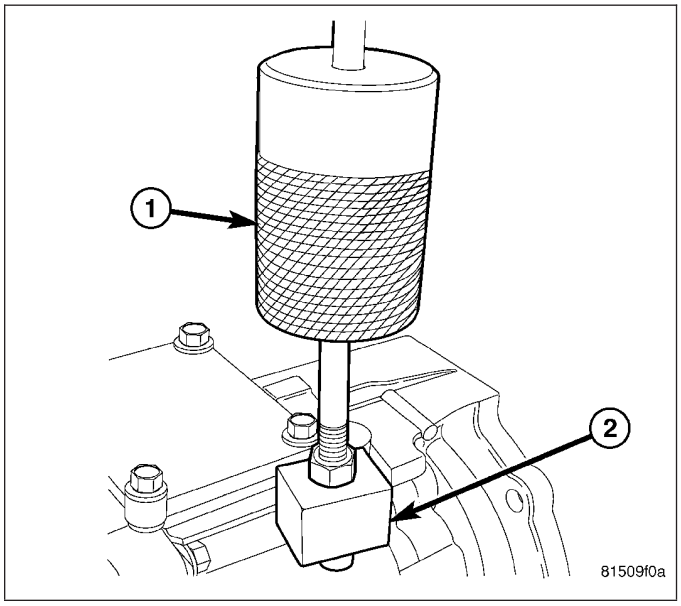
2. Remove back up lamp switch (1) bolt (2) and remove switch.



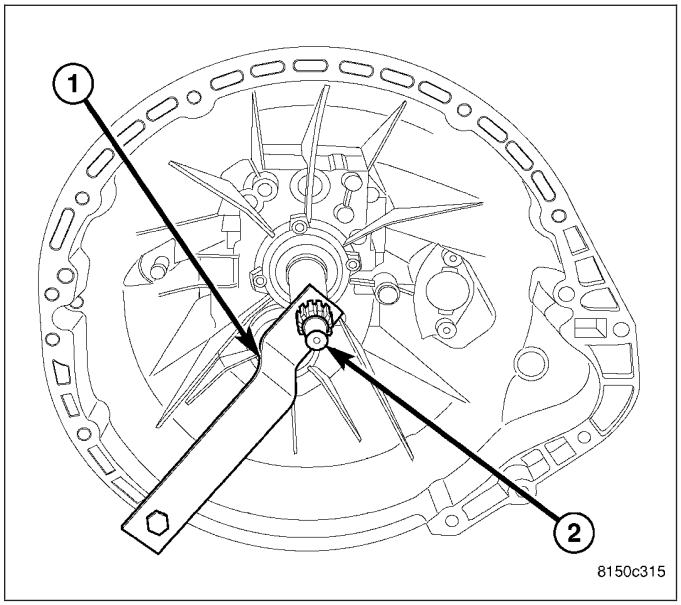
3. Remove large detent plug, next to back up lamp switch opening with Remover 9583 (1) and Slide Hammer C-3752 (2).



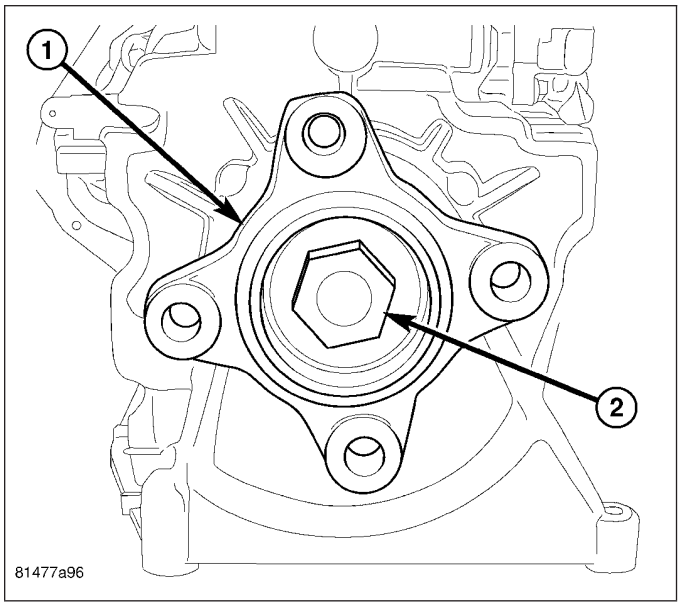
4. Remove two small detent plugs on top of rear housing with Remover 8870 (2) and Slide Hammer C-3752 (1).



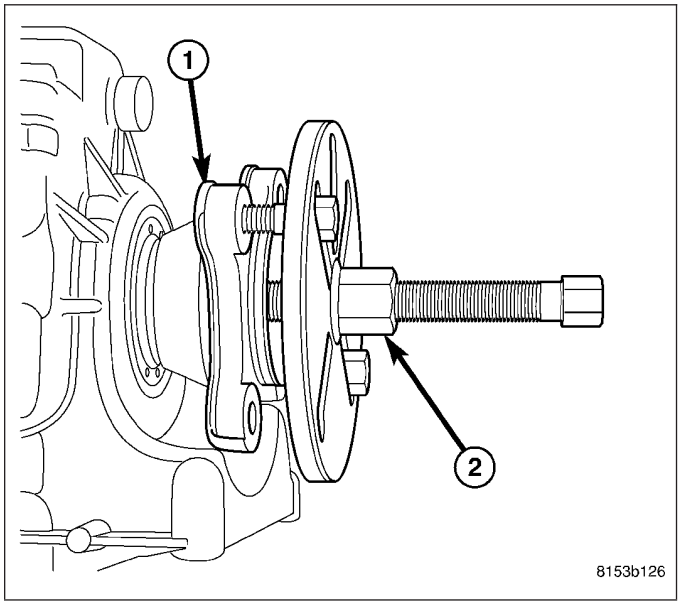
5. Install Wrench 9586 (1) on input shaft (2).



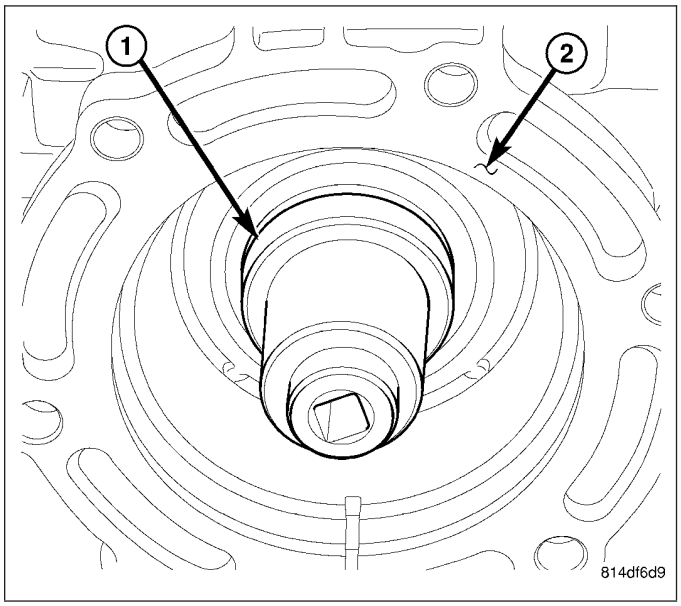
6. Remove output flange (1) nut (2) on 4x2 transmission.



7. Remove output flange (1) on 4x2 transmission with Puller 8992 (2) and Button 9618-2.

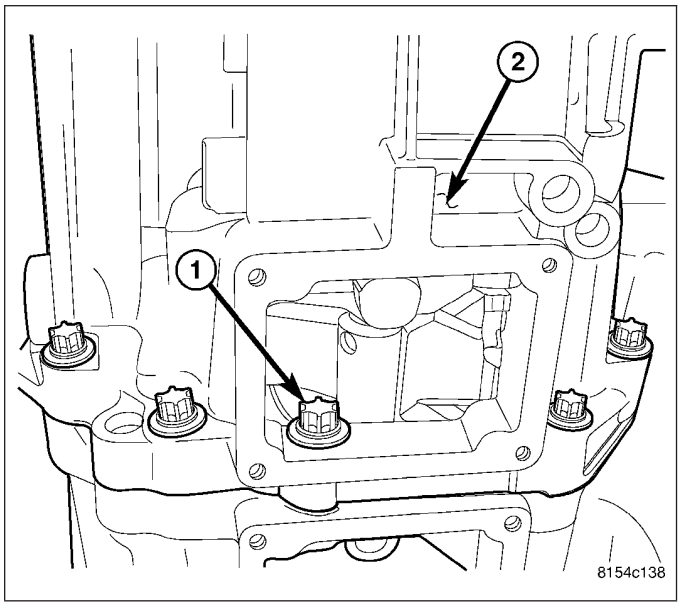


8. Remove output shaft nut with Socket 9584 (1) on 4x4 transmission (2).
9. Remove Wrench 9586 from input shaft.

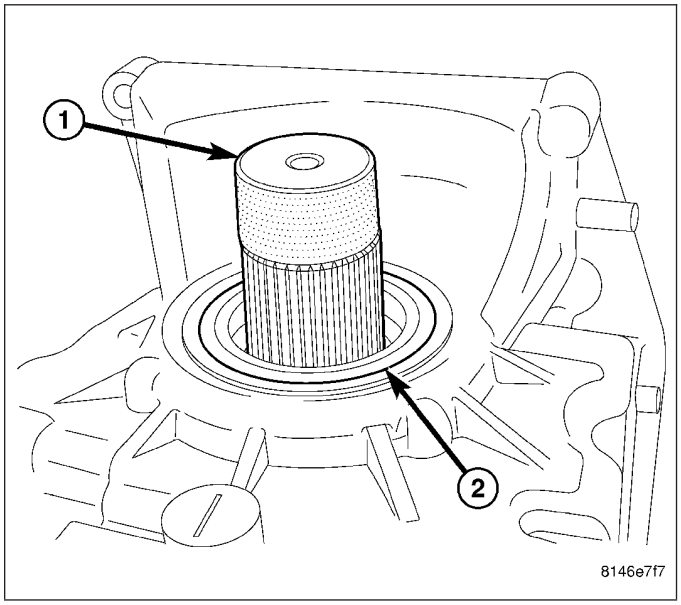


If necessary, remove the cover plate to access the one rear housing (2) bolt (1) located in the opening.

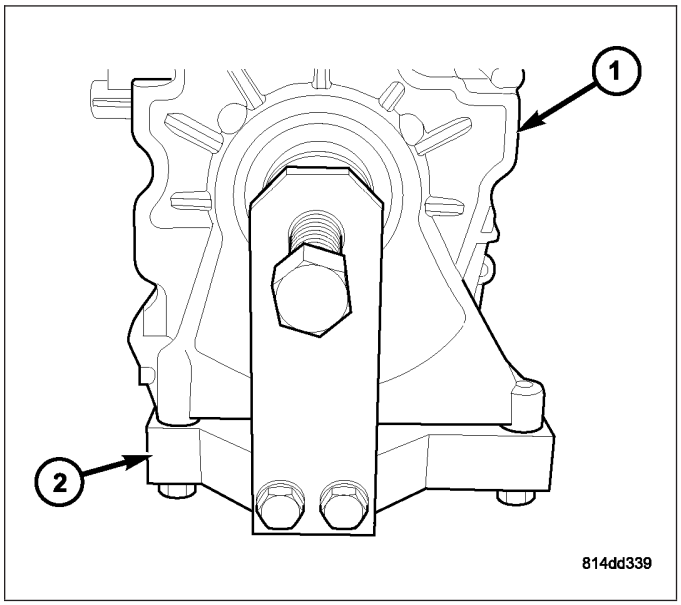
10. Place transmission on front housing and remove rear housing (2) bolts (1).



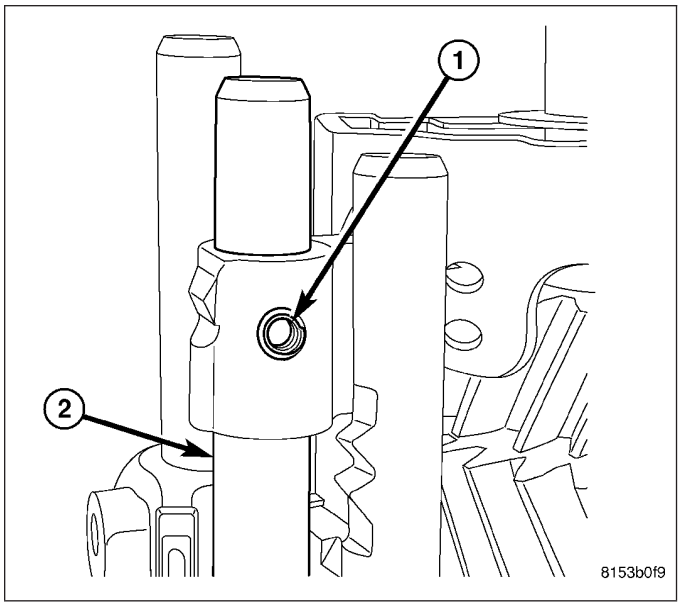
11. Install Button 9618-2 (1) into output shaft (2).



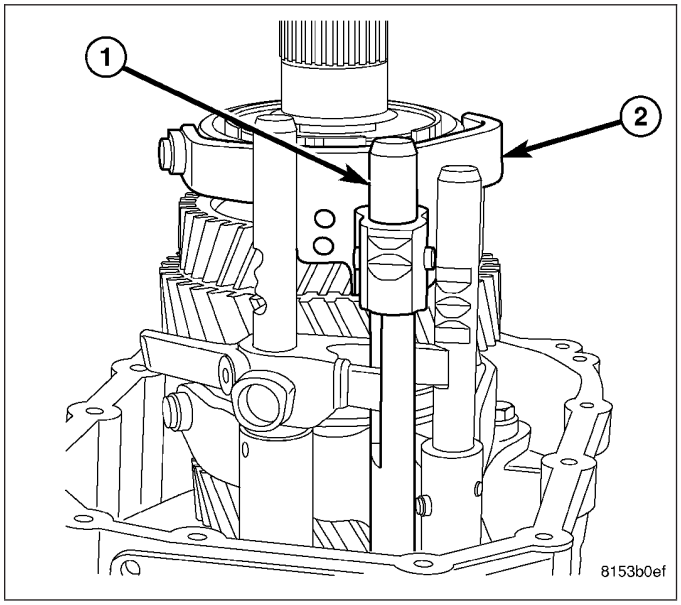
12. Separate rear housing (1) from mainshaft with Puller 9621(2). Bolt puller to the bottom of the rear housing, then turn puller bolt to push mainshaft out of the housing.



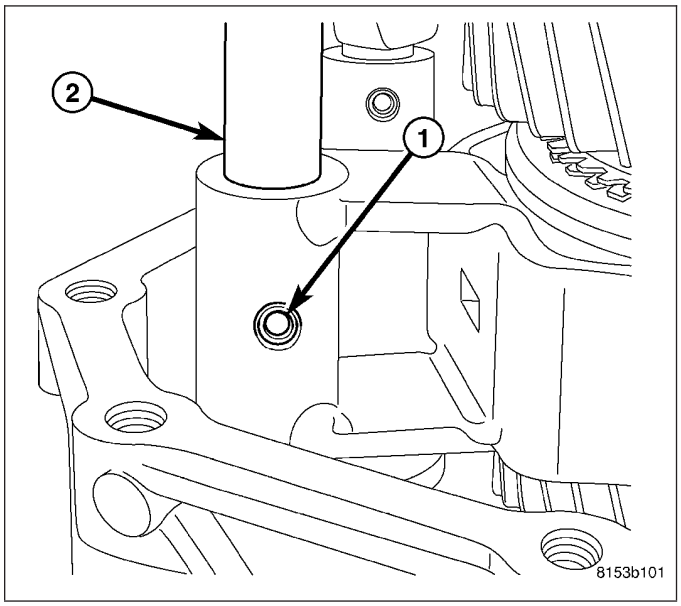
13. Remove reverse shift fork roll pin (1) from reverse shift rail (2).



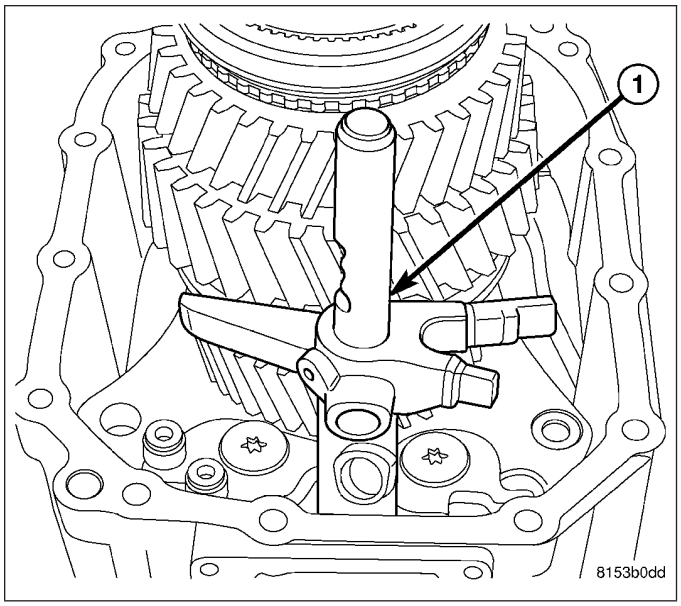
14. Slid reverse shift rail (1) down out of the shift fork (2) and remove reverse shift fork. Then slid shift rail up and out of the front housing.



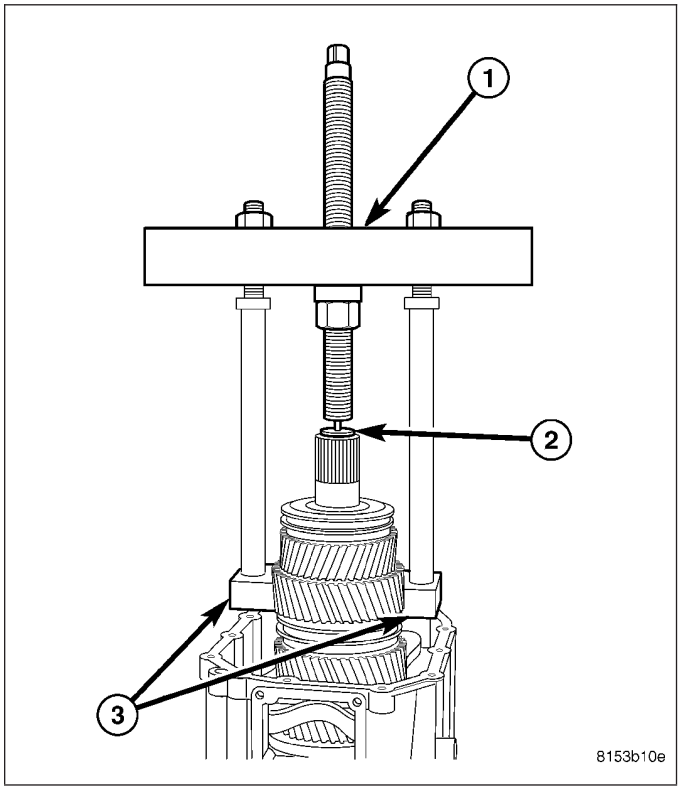
15. Remove 1-2 shift fork roll pin (1) from shift rail (2). Slid shift rail up out of shift fork and rear housing. Remove 1-2 shift fork.



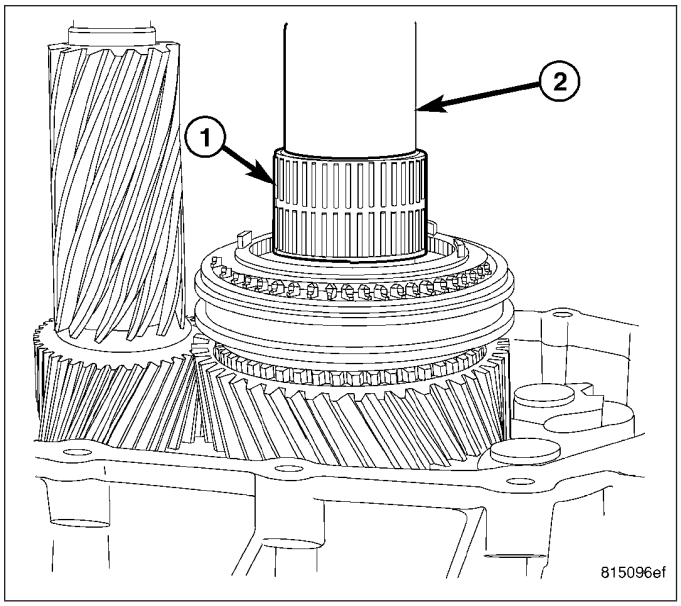
16. Rotate main shift rail (1) clockwise and pull up and out of the front housing.



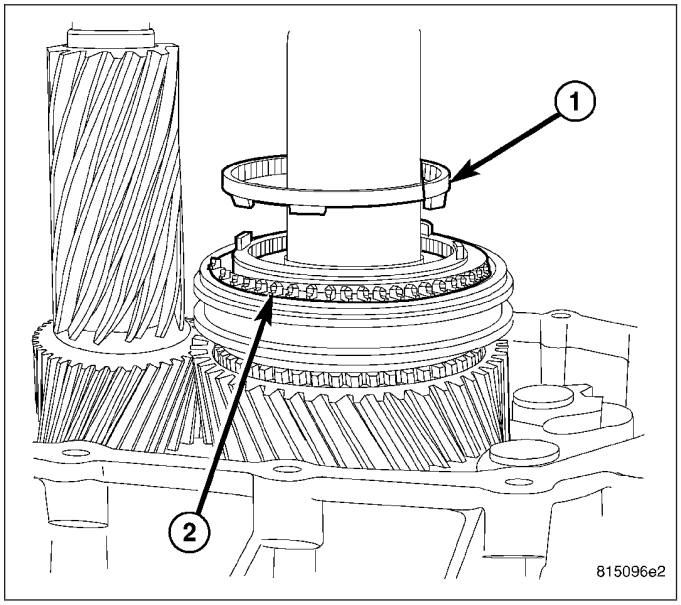
17. Remove first gear, reverse gear, reverse bearing, reverse gear bearing race and reverse synchronizer with Bridge 938 (1), Button 9618-2 (2) and puller Adapters 9628 (3). Position puller Adapters 9628 (3) under first gear.



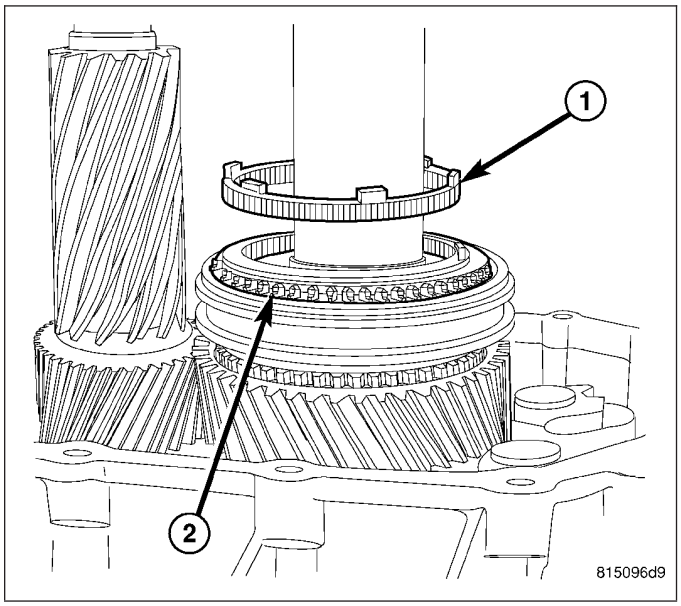
18. Remove first gear bearing (1) from mainshaft (2).



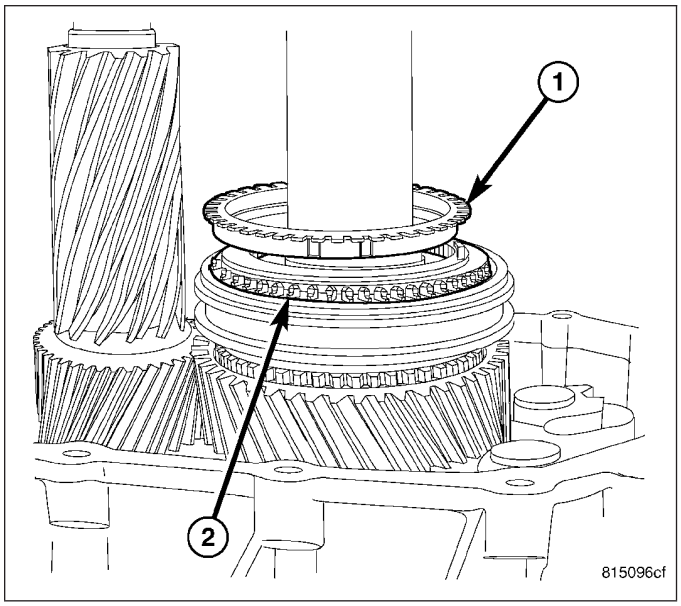
19. Remove first gear synchronizer inner friction ring (1) from 1-2 synchronizer hub (2).



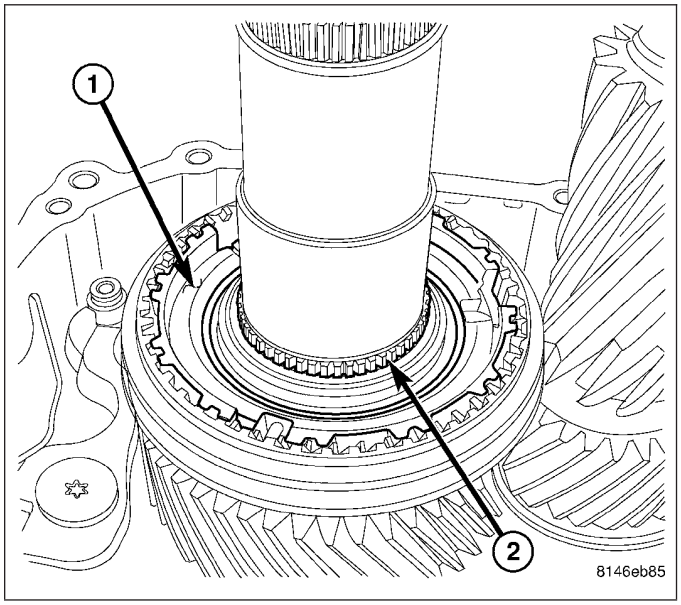
20. Remove first gear synchronizer outer friction ring (1) from 1-2 synchronizer hub (2).



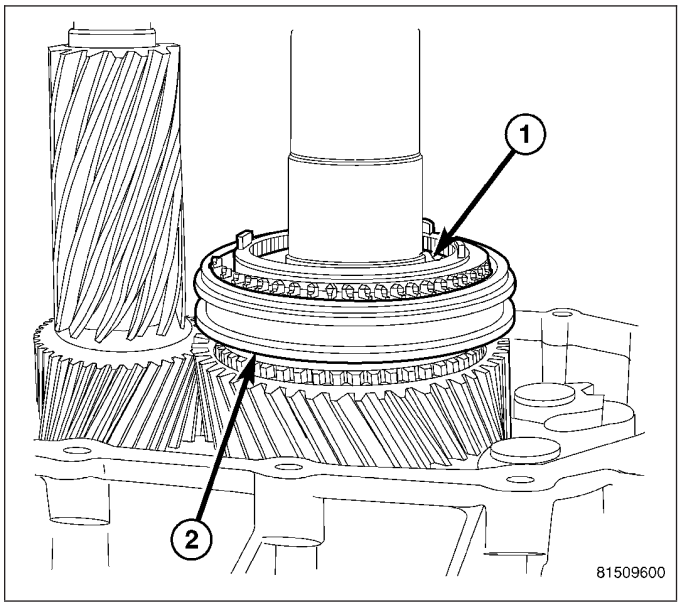
21. Remove first gear synchronizer blocker ring (1) from 1-2 synchronizer hub (2).



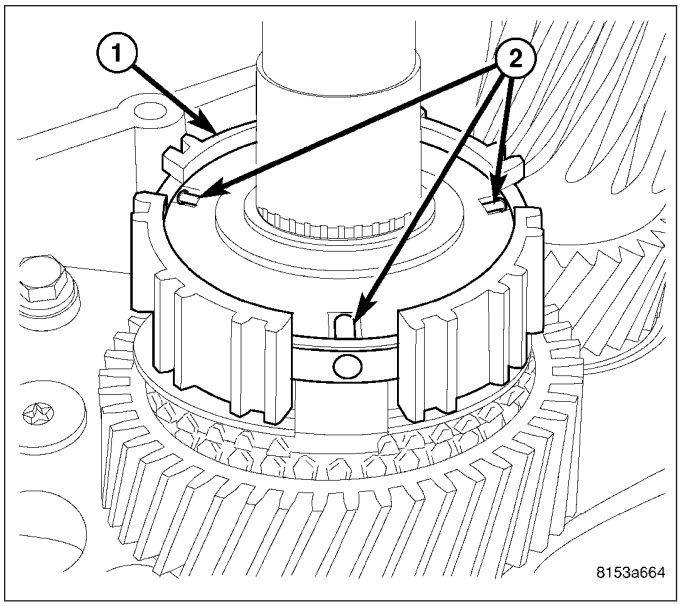
22. Remove 1-2 synchronizer hub (1) snap ring (2).



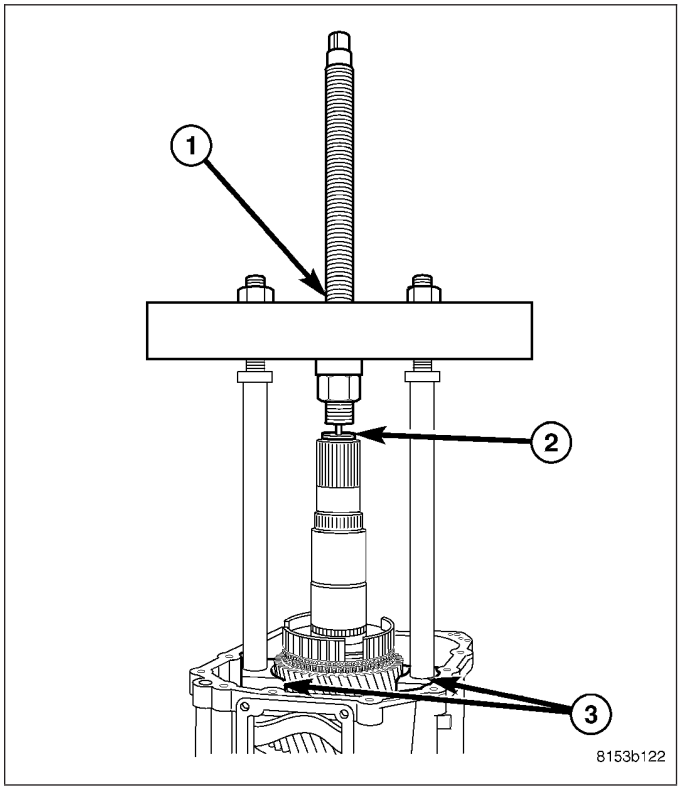
23. Remove 1-2 synchronizer sleeve (1) from 1-2 synchronizer hub (2).



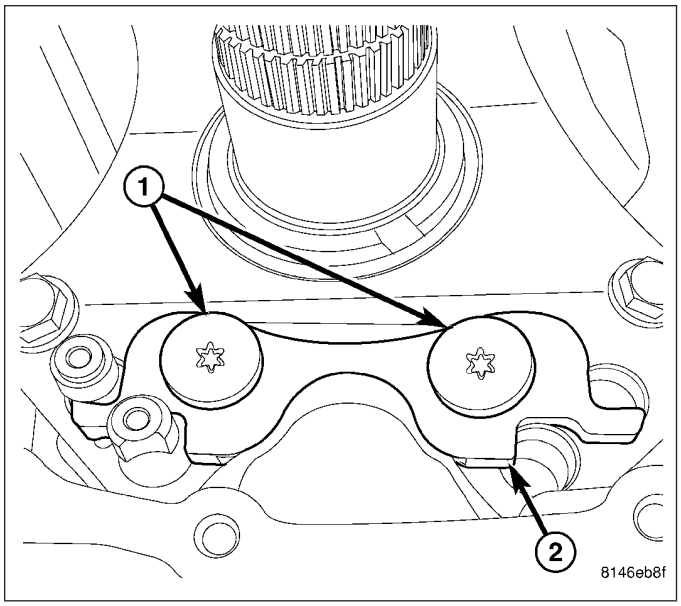
24. Remove 1-2 synchronizer hub (1) detents (2).



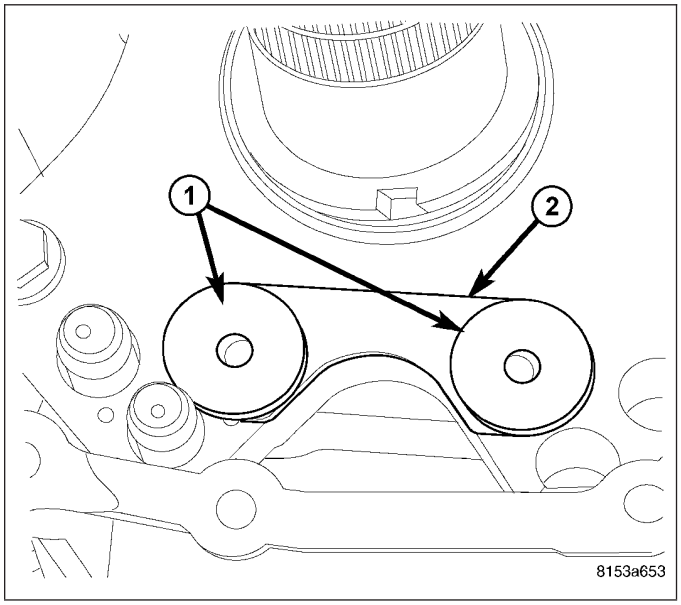
25. Remove second gear and 1-2 synchronizer hub with Bridge 938 (1), Button 9618-2 (2) and Puller Adapters 9627 (3).



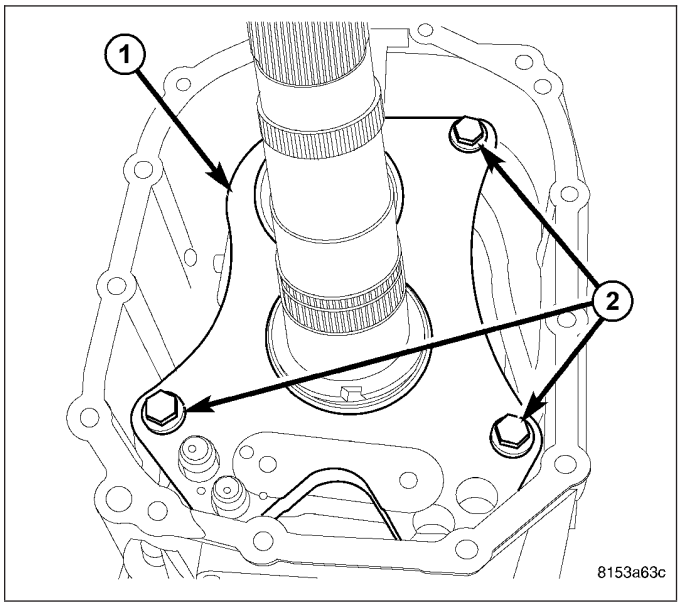
26. Remove interlock plate bolts (1) and remove interlock plate (2).



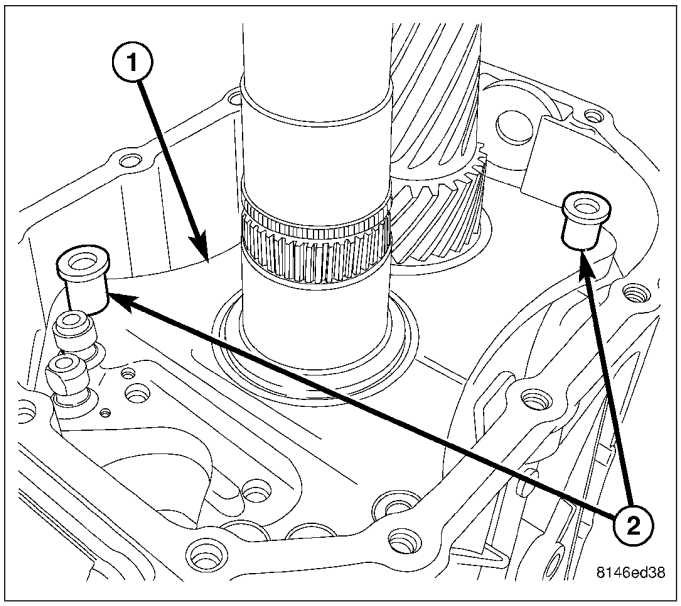
27. Remove washers (1) from intermediate plate (2).



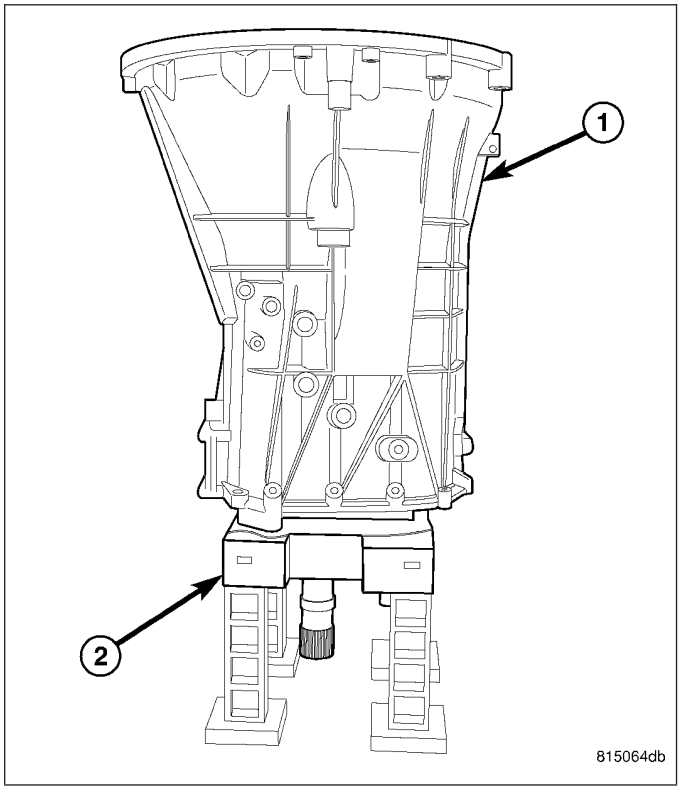
28. Remove intermediate plate (1) bolts (2).



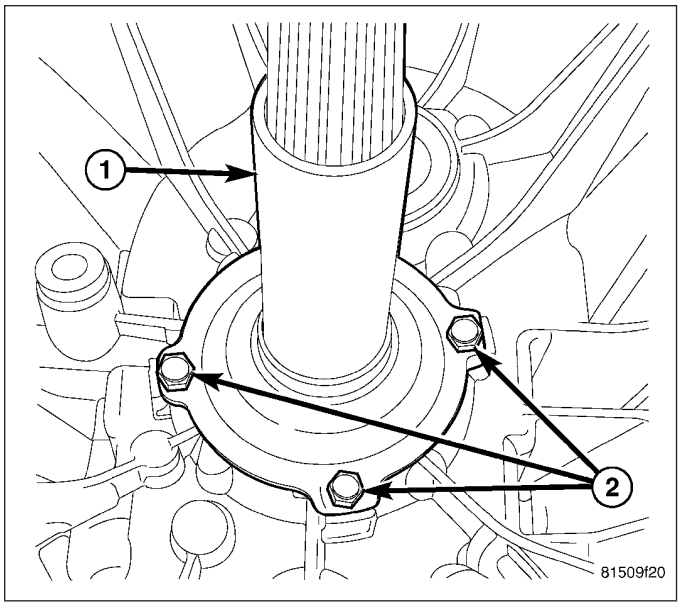
29. Remove intermediate plate (1) dowels (2) with a suitable tool and remove intermediate plate.



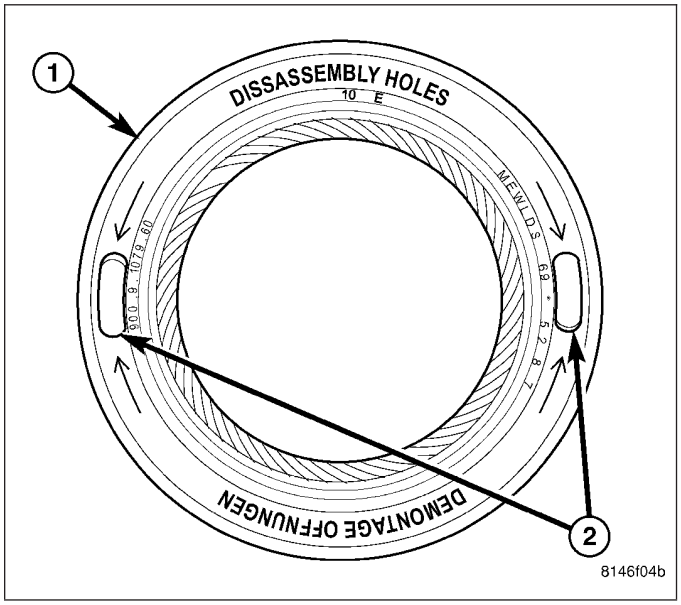
30. Install Fixture 9626 (2) on main/countershaft and shift rails. Turn fixture (2) with transmission (1) over onto the fixture.



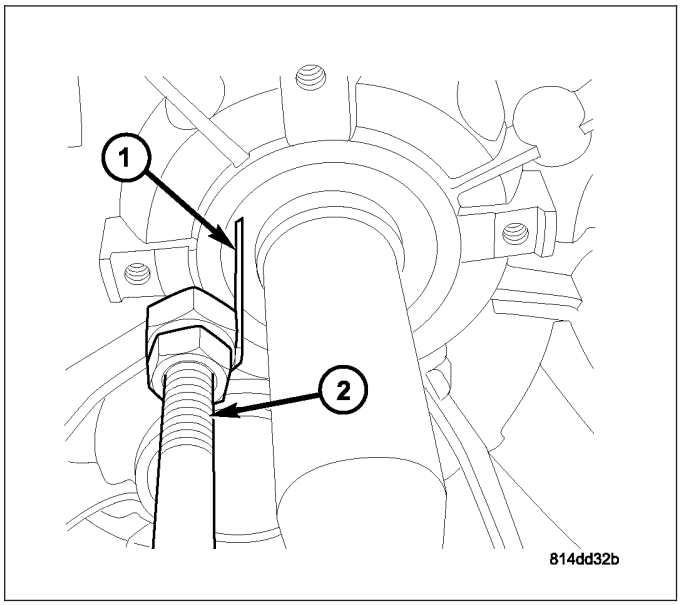
31. Remove clutch release bearing support bolts (2) and retainer (1).



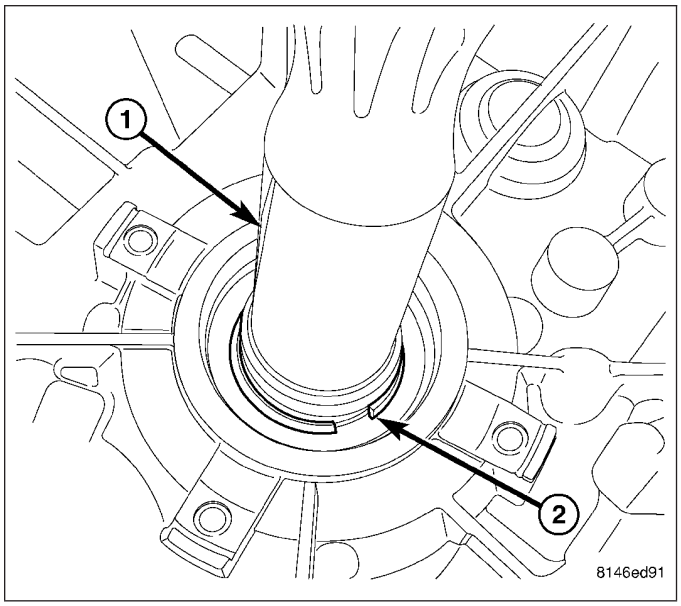
32. Insert seal Remover 9667 through one input shaft seal (1) disassembly hole (2).



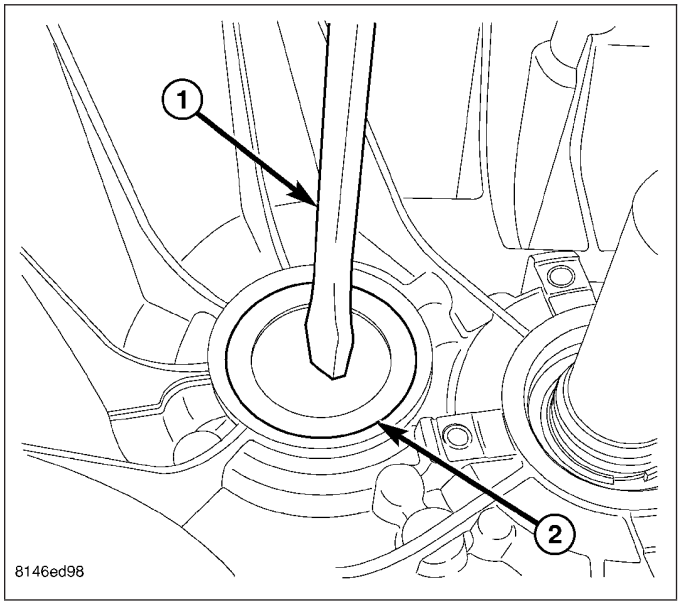
33. Remove input shaft seal with Remover 9667 (1) and Slide Hammer C-3752 (2).



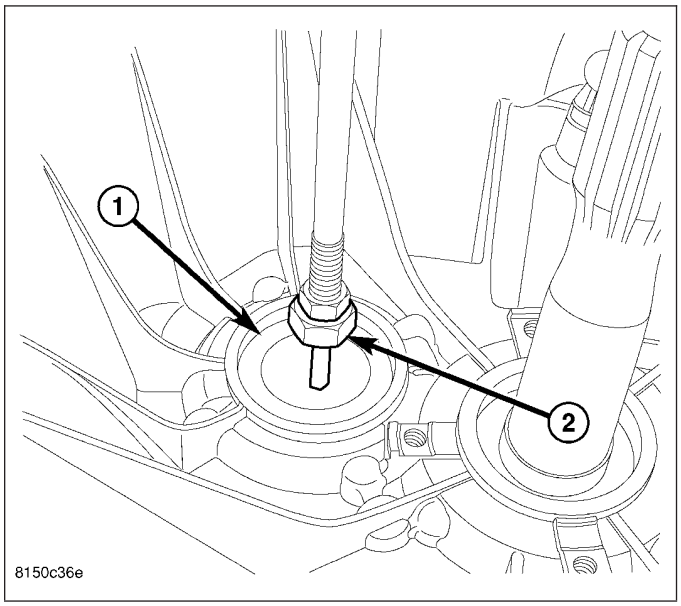
34. Remove input shaft snap ring.



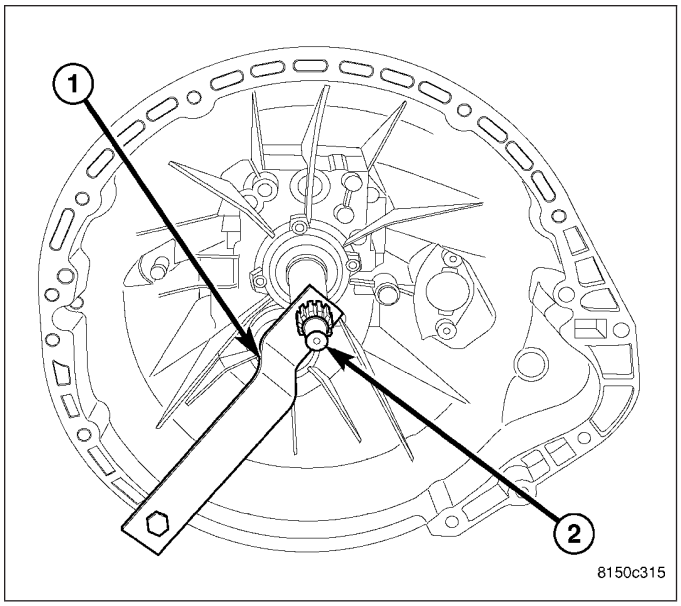
35. Put a hole in the center of the countershaft plug (2) with a punch (1).



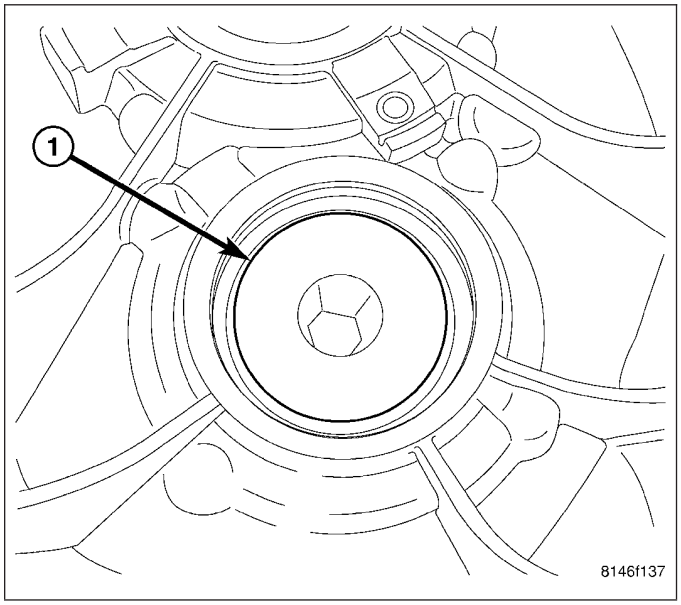
36. Remove countershaft plug (1) from front housing with Puller 9667 (2) and Slid Hammer C-3752.



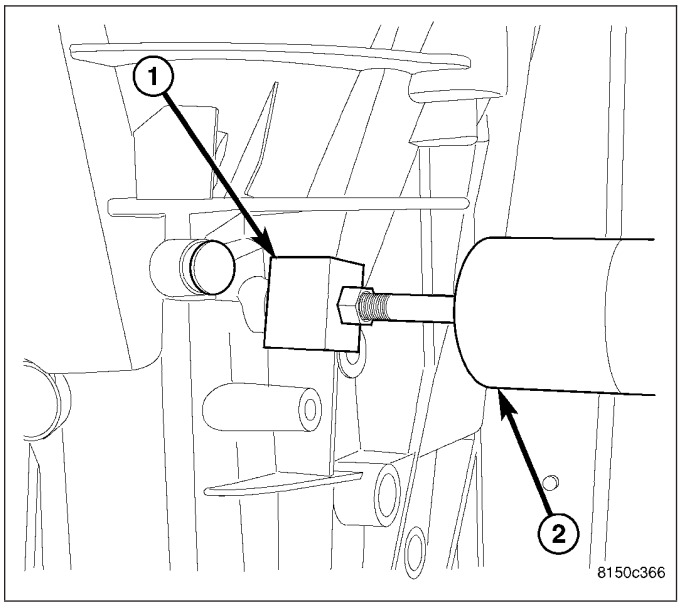
37. Install Wrench 9586 (1) on input shaft (2).



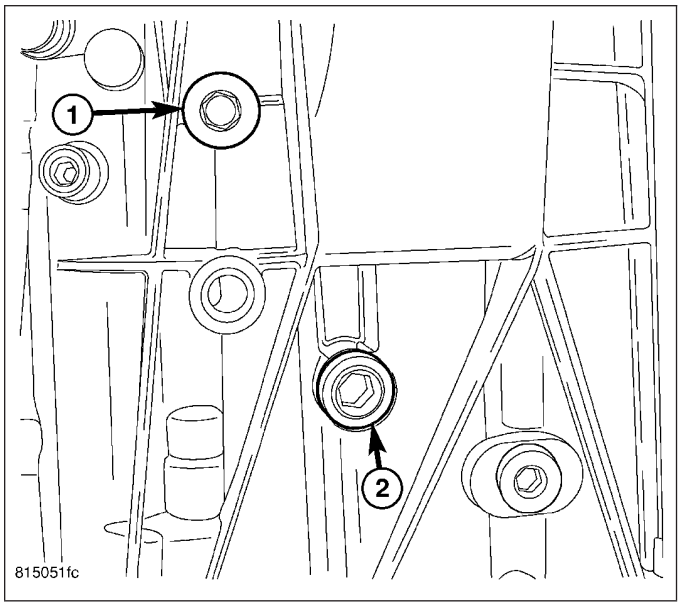
38. Remove countershaft allen bolt (1).
39. Remove input shaft wrench.



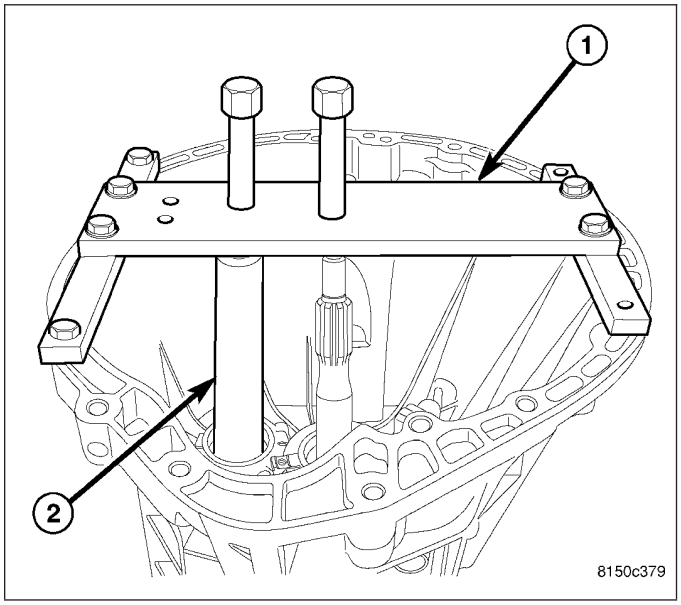
40. Remove two detent plugs from the side of the housing with Remover 8870 (1) and Slide Hammer C-3752 (2).



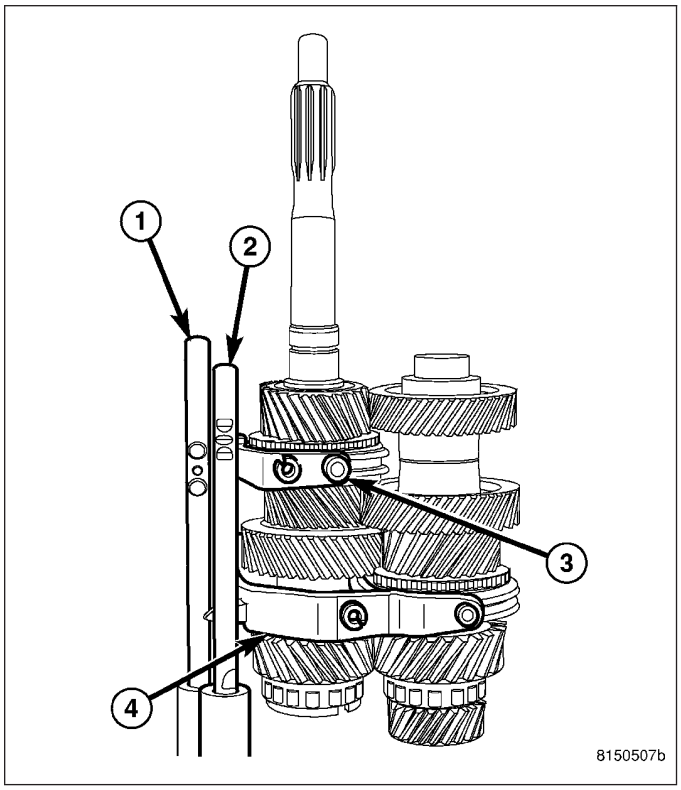
41. Remove 3-4 (2) and 5-6 (1) shift fork pivot bolts from both sides of the front housing.



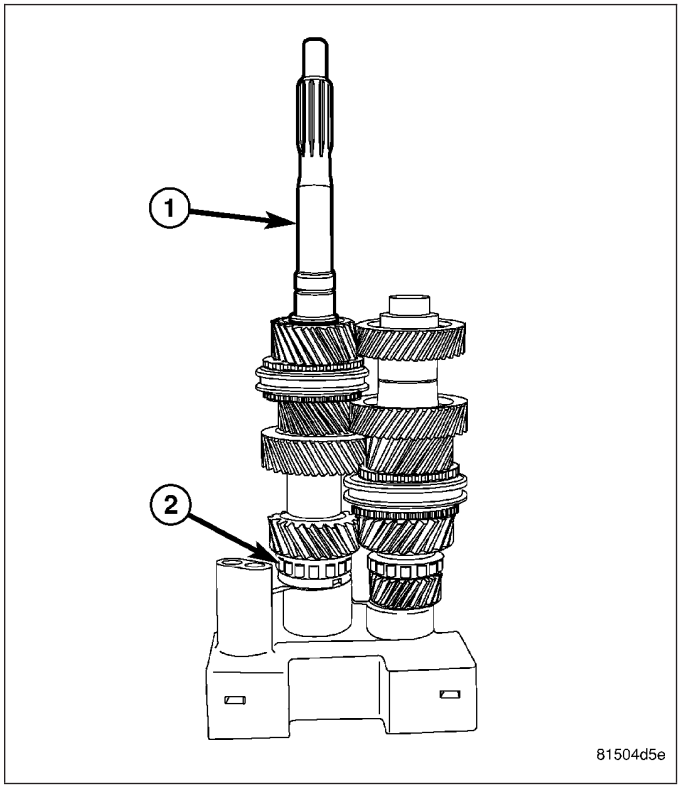
42. Install Puller 9621(1) with puller Plug 9621-2 (2) on front housing. Tighten puller bolts evenly and remove front housing from the mainshaft and countershaft.



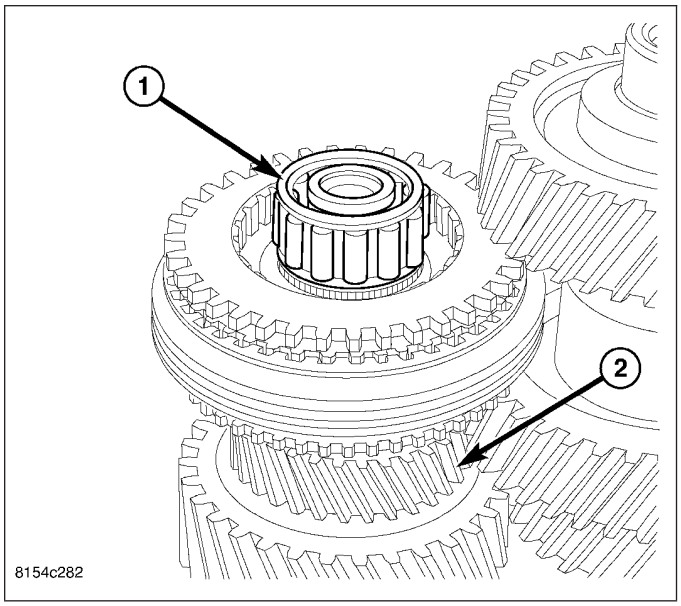
43. Remove 5-6 shift fork (3) and 3-4 shift fork (4). Then remove 5-6 shift rail (1) and 3-4 shift rail (2) from Fixture 9626.



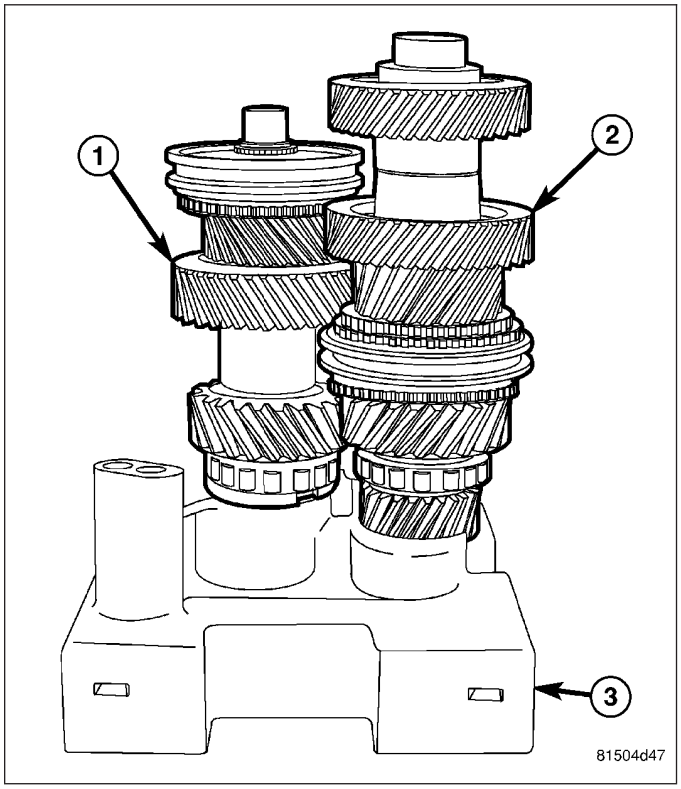
44. Remove input shaft (1) from mainshaft (2).



45. Remove input shaft bearing (1) from mainshaft (2).

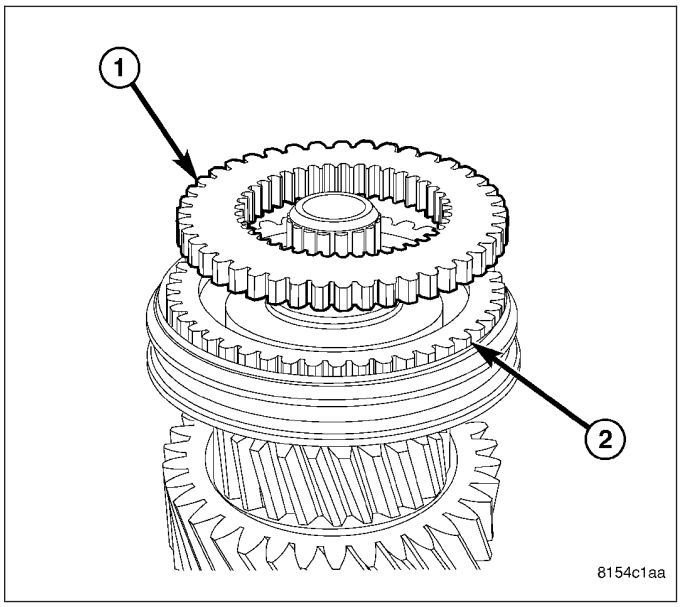


46. Remove countershaft (2) from fixture (3).

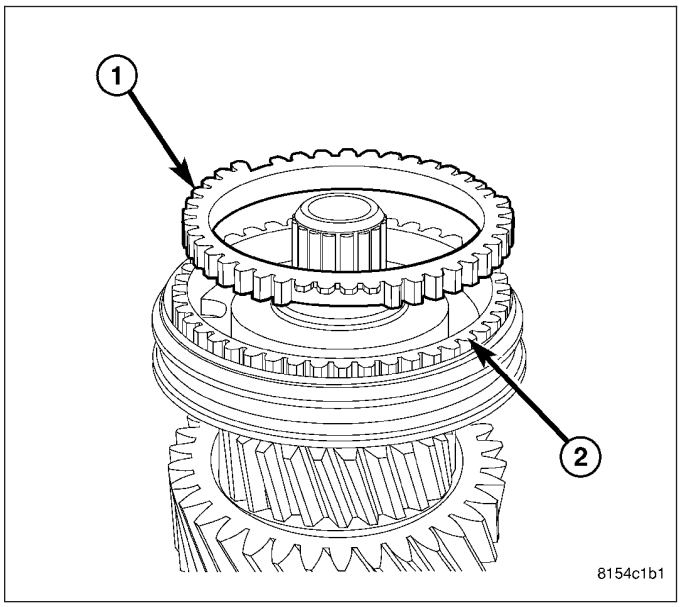


MAINSHAFT

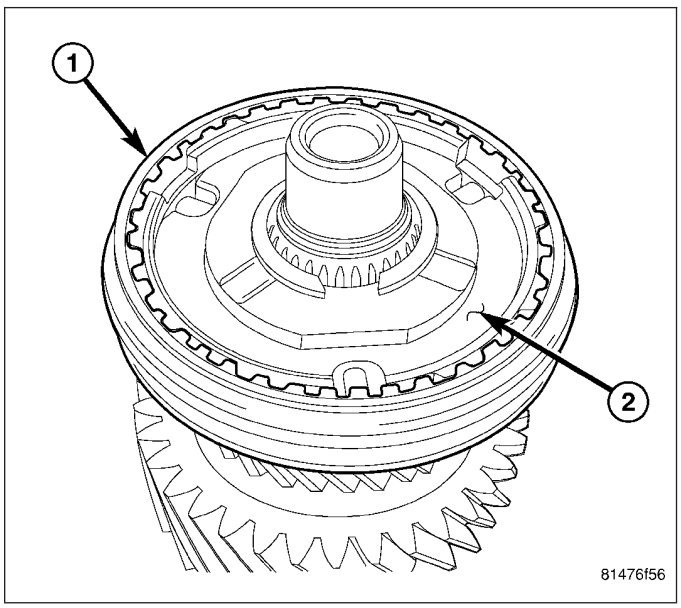
1. Remove fifth gear synchronizer clutch body (1) from 5-6 synchronizer hub (2).



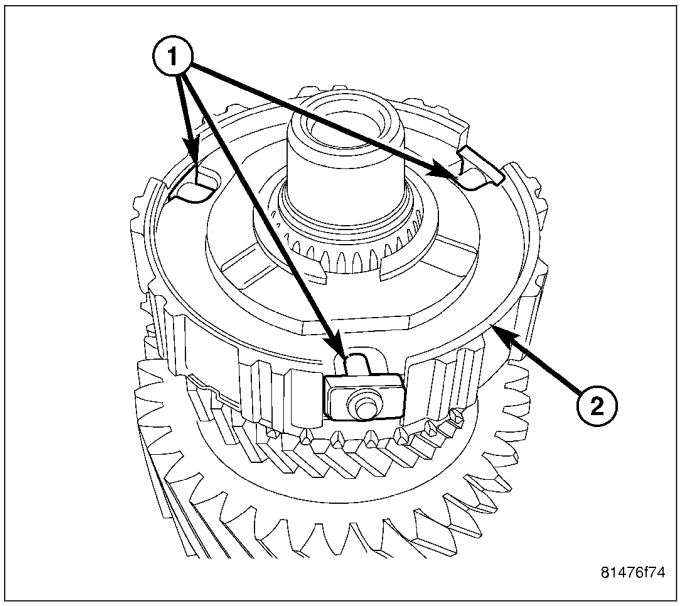
2. Remove fifth gear synchronizer friction ring (1) from 5-6 synchronizer hub (2).



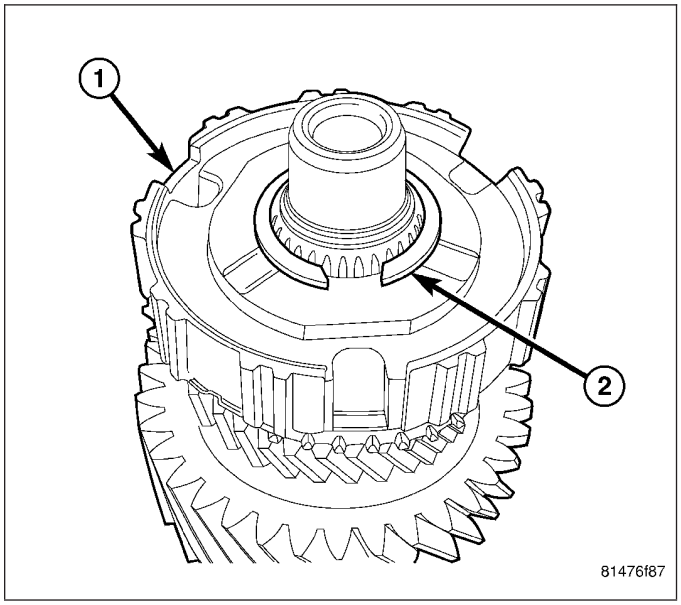
3. Remove 5-6 synchronizer sleeve (1) from hub (2).



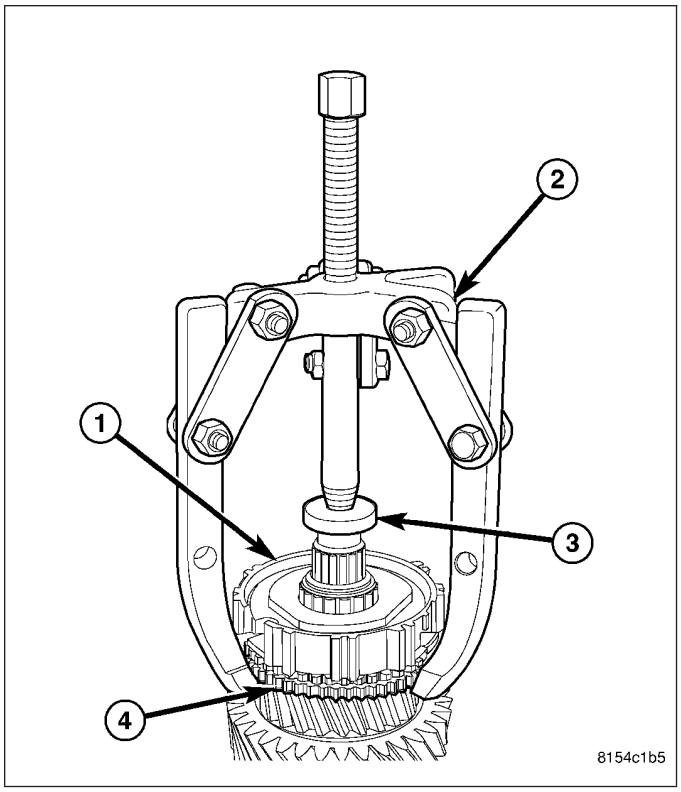
4. Remove 5-6 synchronizer detents (1) from hub (2).



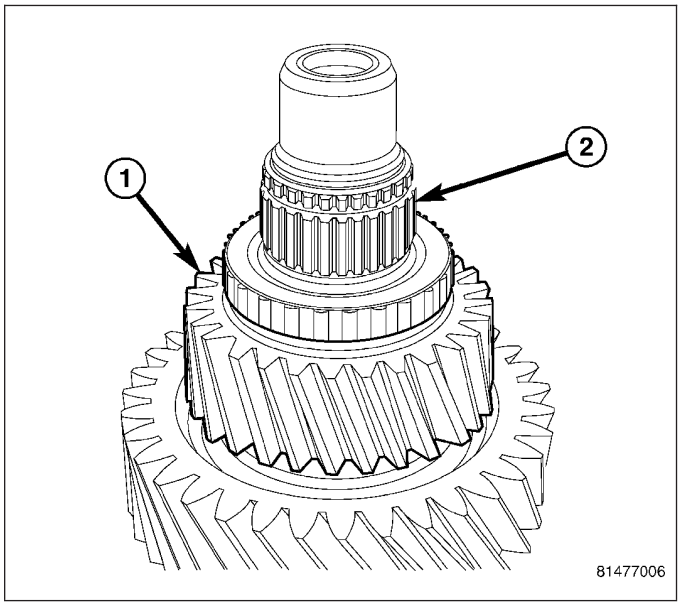
5. Remove 5-6 synchronizer hub (1) snap ring (2).



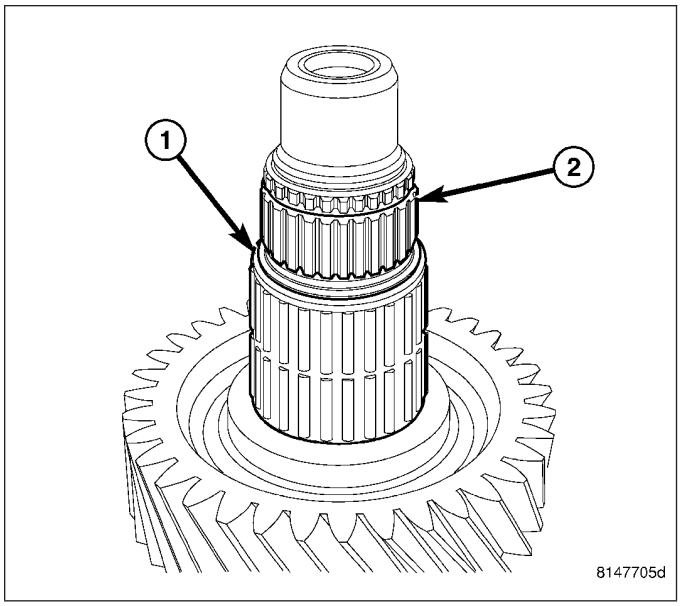
6. Remove 5-6 synchronizer hub (1) with three jaw puller (2) and Button 9618-2 (3). Position jaws under sixth gear clutch body (4).



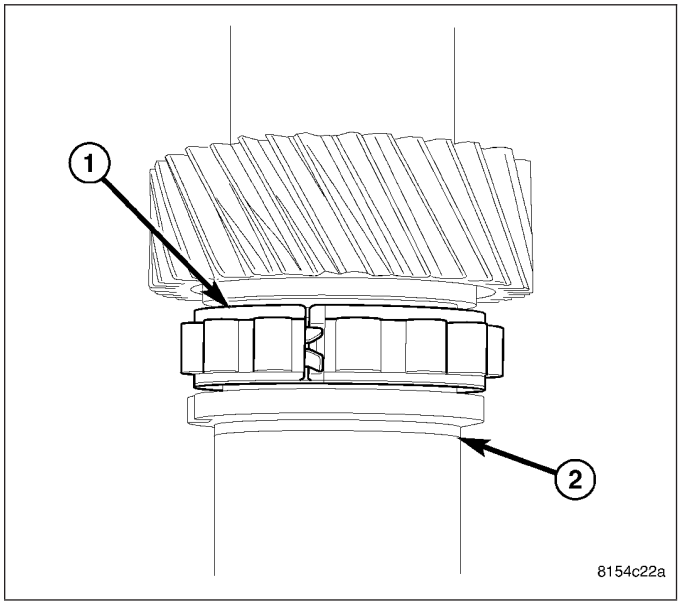
7. Remove sixth gear (1) from mainshaft (2).



8. Remove sixth gear bearing (1) from mainshaft (2).



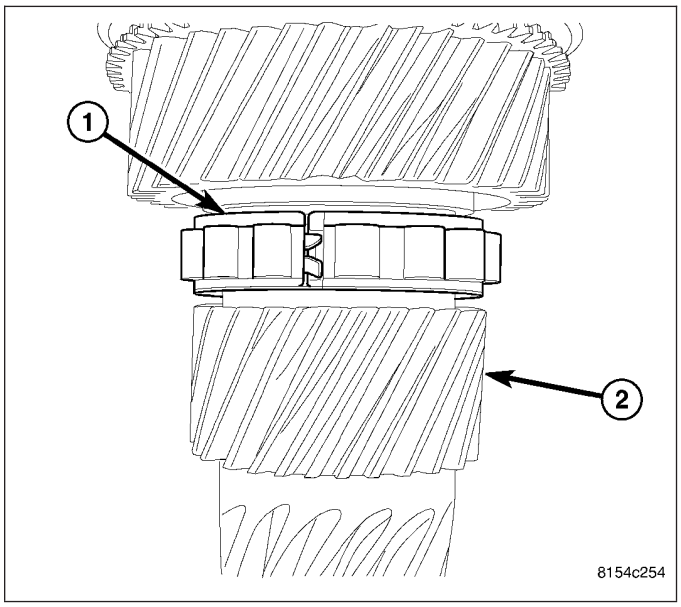
9. Remove mainshaft center support bearing (1) from mainshaft (2).



COUNTERSHAFT

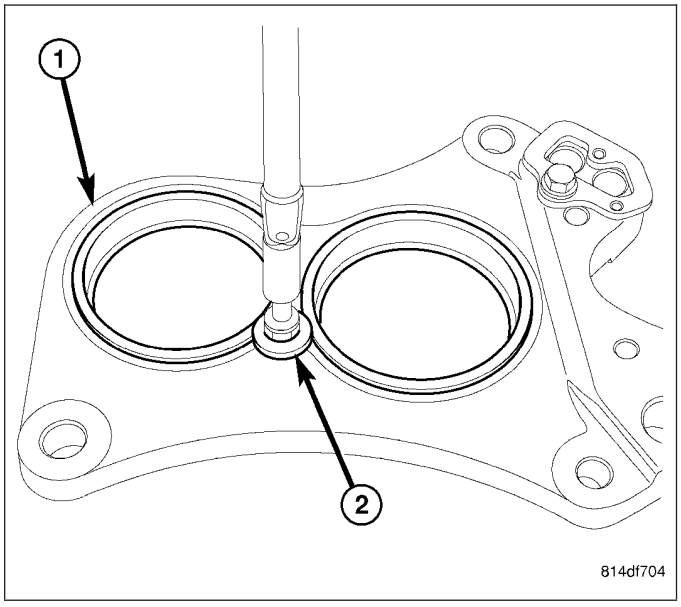
1. Remove countershaft center support bearing (1) from counter shaft (2).

NOTE: Countershaft with 3-4 synchronizer, is serviced as an assembly except bearings.

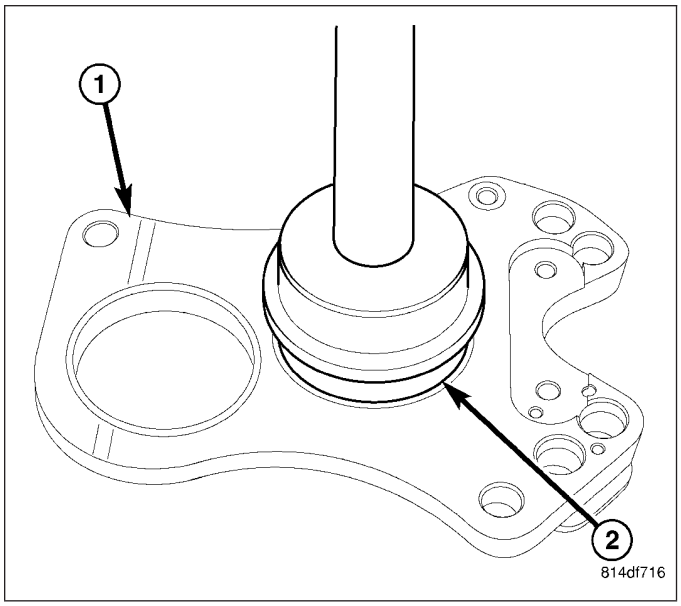


CENTER SUPPORT PLATE

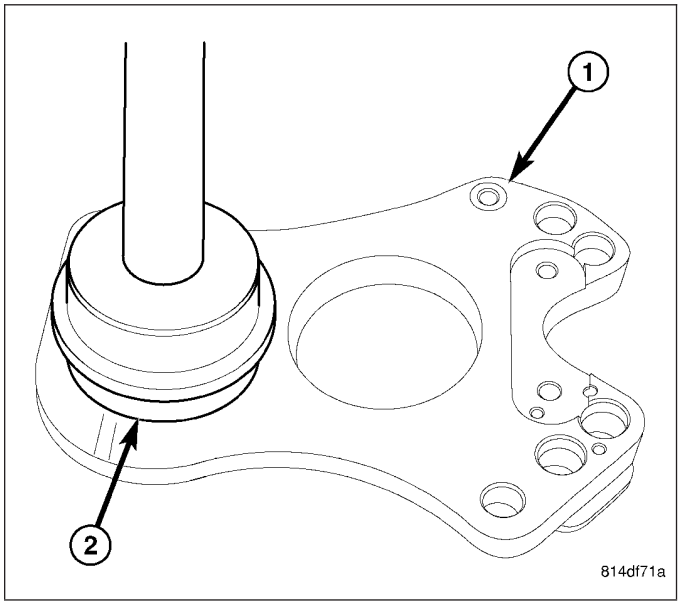
1. Remove center support (1) roller bearing race retainer (2).



2. Remove mainshaft center support (1) bearing race with Remove/Installer 9668 (2) and Handle C4171.

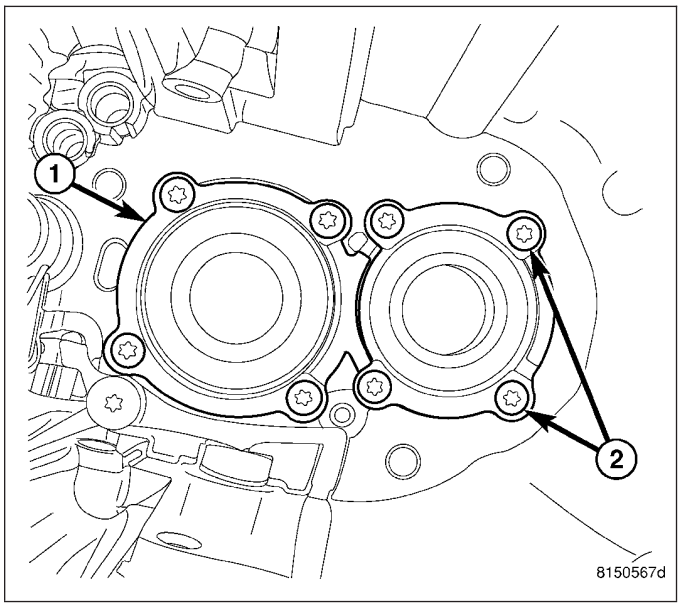


3. Remove countershaft center support (1) bearing race with Remove/Installer 9617 (2) and Handle C4171.



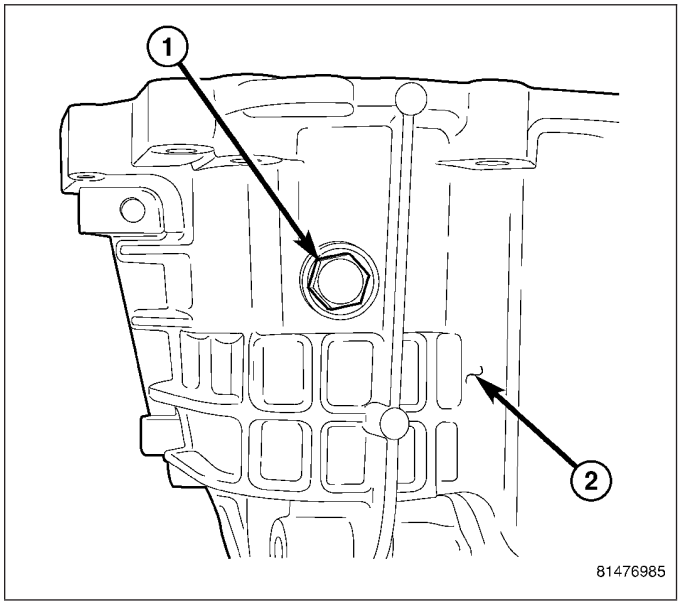
FRONT HOUSING

1. Remove mainshaft bearing retainer (1) and countershaft bearing retainers (2).
2. Remove mainshaft bearing and countershaft bearing with hammer and driver.

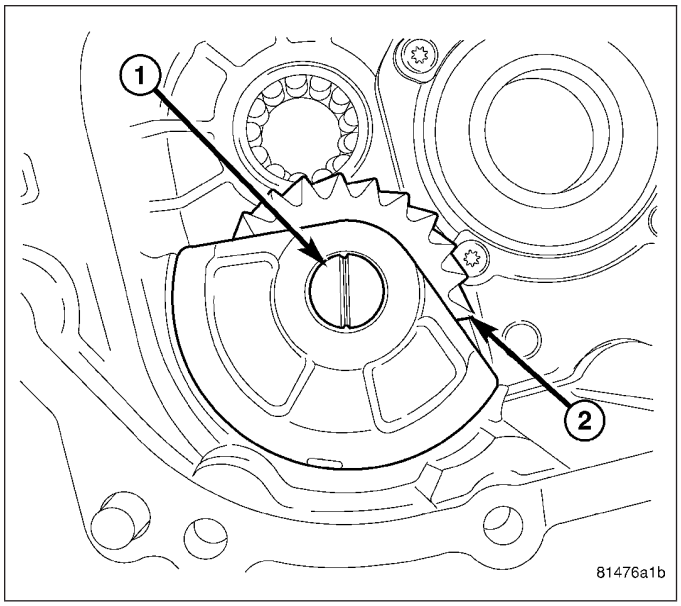


REAR HOUSING

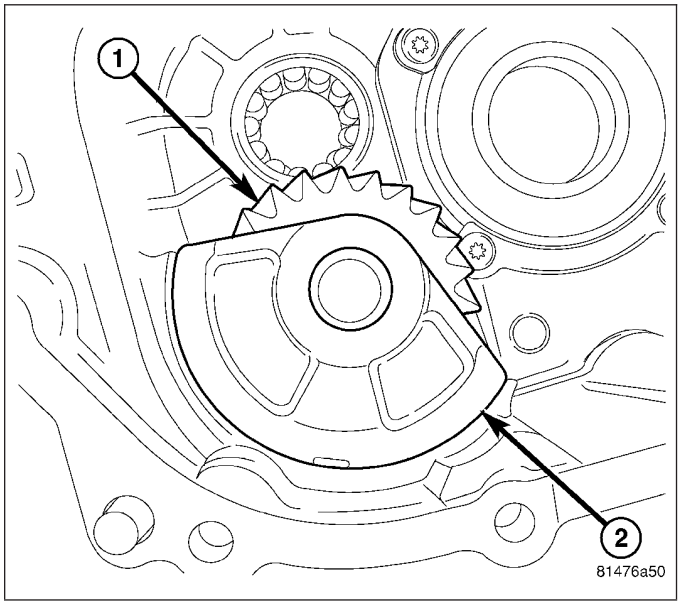
1. Remove reverse idler gear shaft bolt (1) from housing (2).



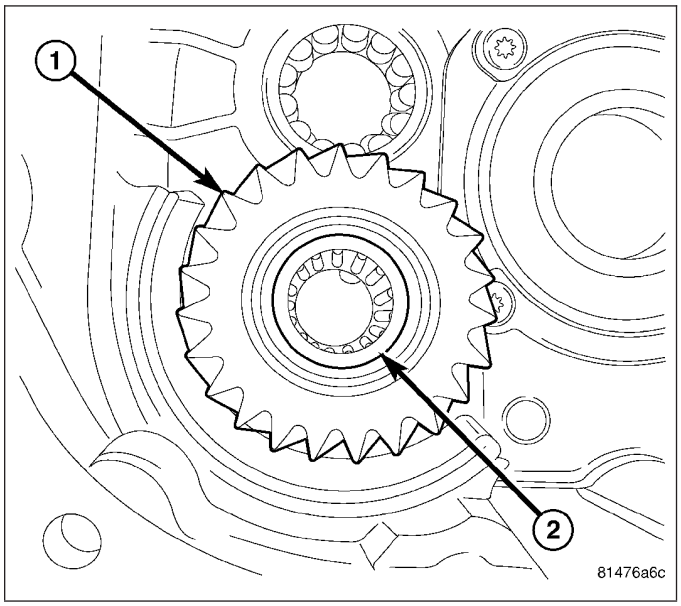
2. Remove reverse idler gear shaft (1) from idler gear (2).



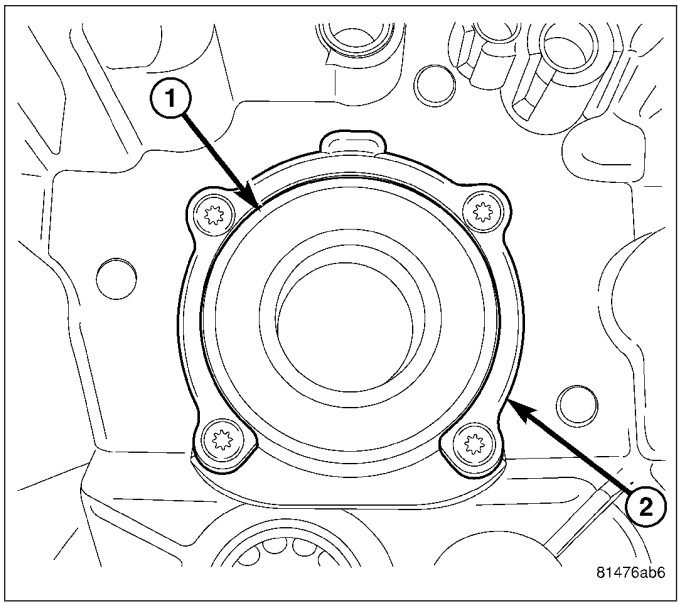
3. Remove reverse idler gear (1) shaft support (2).



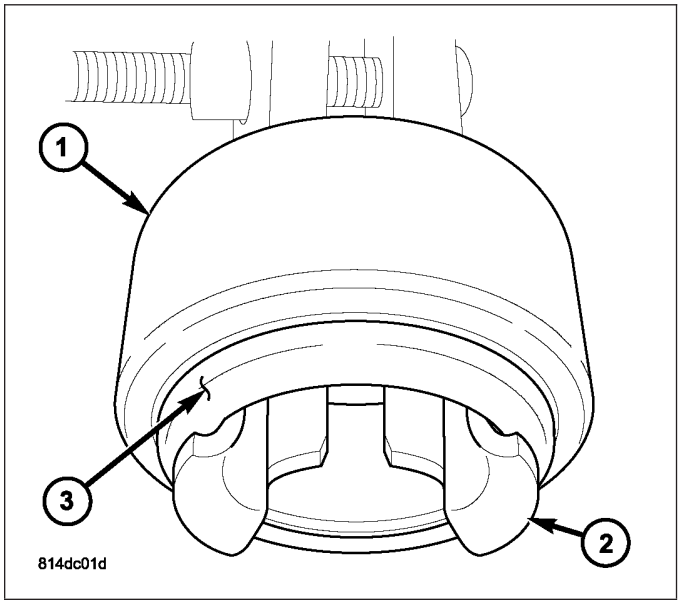
4. Remove reverse idler gear (1) and bearing (2).



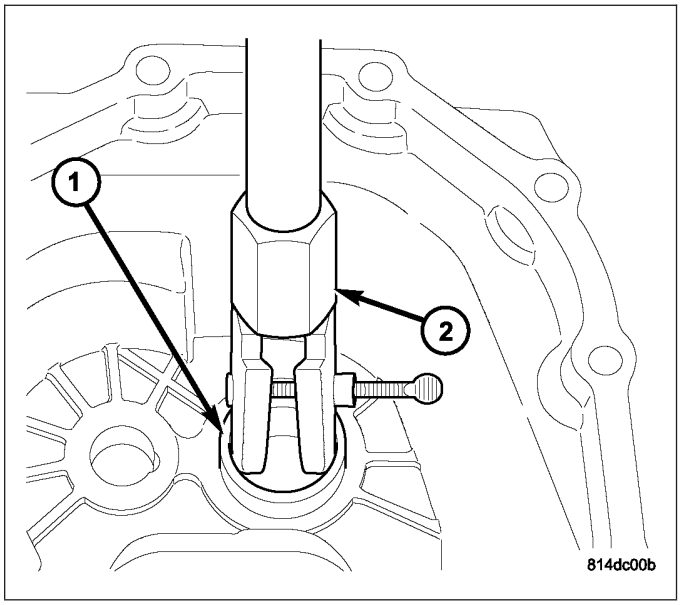
5. Remove mainshaft bearing (1) retainer (2) bolts and remove retainer.
6. Remove bearing from housing with a hammer and driver.



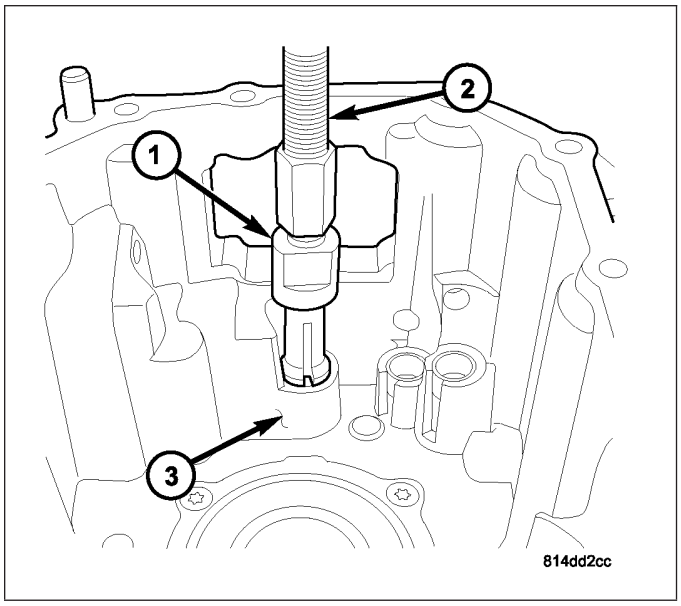
7. Break plastic countershaft roller bearing cage with a screw driver. Then remove cage and roller bearing.
8. Insert Remover 9585 through the countershaft roller bearing shell (1) and expand the tool (2) to grab the bottom (3) of the bearing shell (1).



9. Remove countershaft roller bearing shell (1) from the rear housing with Remover 9585 (2) and Slide Hammer C-637.



10. Remove shift rail roller bearing from rear housing (3) with Remover 9609 (1) and Slide Hammer C-637 (2).



CLEANING

Clean gears, shafts, shift components and transmission housings with a standard parts cleaning solvent. Do not use acid or corrosive base solvents. Dry all parts except bearings with compressed air.

Clean shaft bearings with a mild solvent such as MOPAR® degreasing solvent, Gunk® or similar solvents. Do not dry the bearings with compressed air. Allow the bearings to either air dry or wipe them dry with clean shop towels.

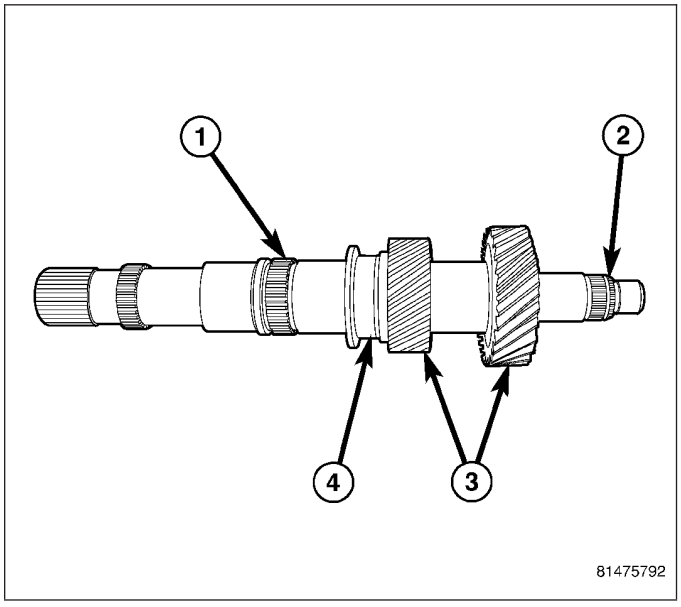
INSPECTION

NOTE: Minor corrosion, nicks, or pitting can be smoothed with 400 grit emery and polished out with crocus cloth.

Bearings: Inspect roller bearings for wear, chips, cracks, flat-spots or brinnelling. Inspect sealed bearings, and verify bearings roll smoothly.

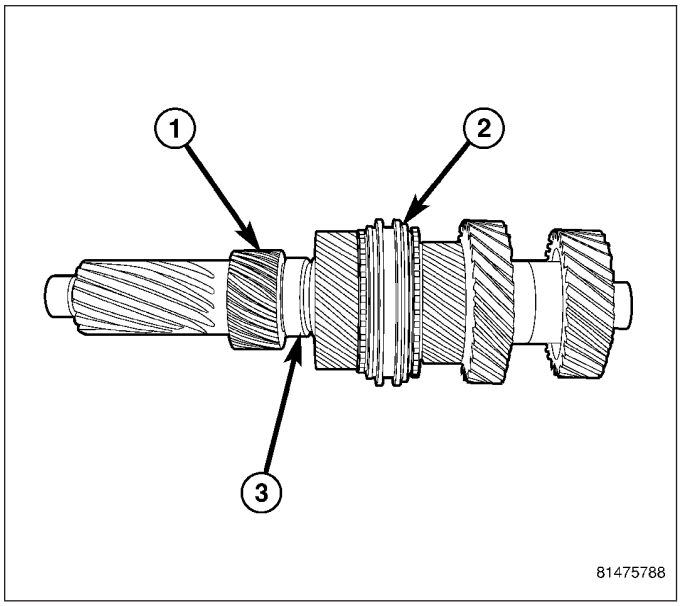
Gears: Inspect for worn, chipped, or cracked teeth. Inspect bearing surfaces for wear or flat-spots.

Mainshaft: Inspect for worn splines (1), snap ring grooves (2) and worn, chipped or cracked teeth (3). Inspect all bearing surfaces (4) for wear or flat-spots. **Third and fourth gear (3) are serviced with mainshaft.**

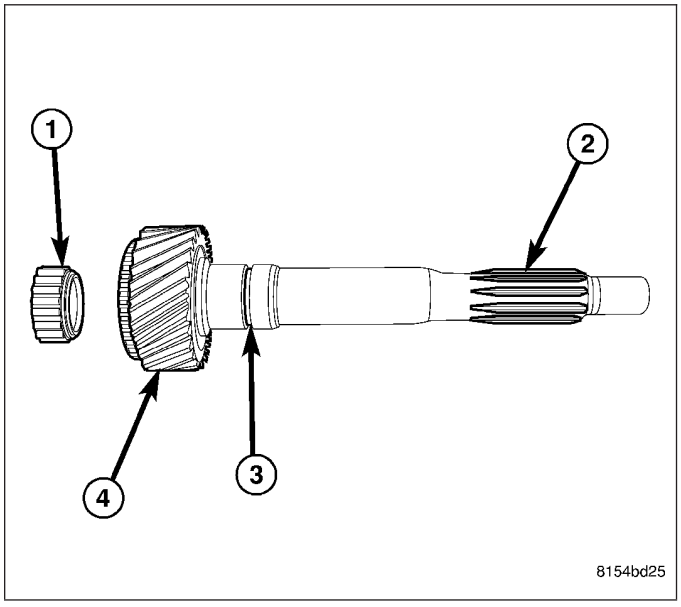


Countershaft: Inspect all gears for worn, chipped or cracked teeth (1). Inspect 3-4 synchronizer assembly for wear (2). Inspect center support bearing surfaces (3) for wear or flat-spots. **The countershaft with 3-4 synchronizer is serviced as an assembly, except for bearings.**

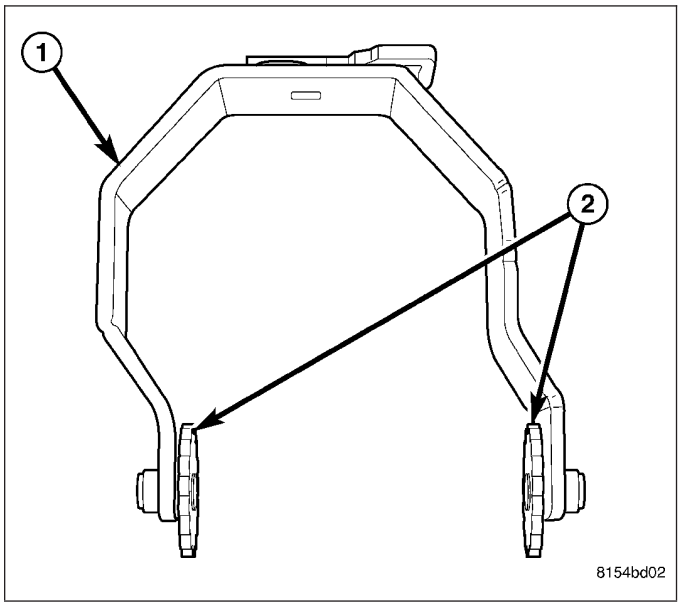
Synchronizer components: Inspect for worn, chipped, or cracked teeth and burned or flaking off friction material. **Synchronizers are serviced as an assembly.**



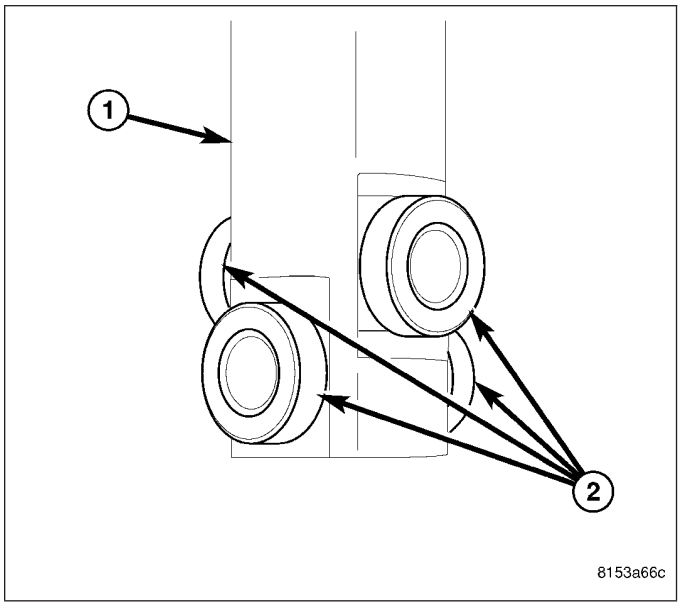
Input Shaft: Inspect input shaft bearing (1) and bearing surfaces for wear or flat-spots. Inspect input shaft splines (2) for wear. Inspect snap ring groove (3) for wear. Inspect fifth gear (4) for worn, chipped, or cracked teeth.



Shift forks: Inspect shift forks (1) for distortion. Inspect fork shoes (2) for wear and fit shoes in synchronizer sleeve to ensure parts fit and work smoothly.

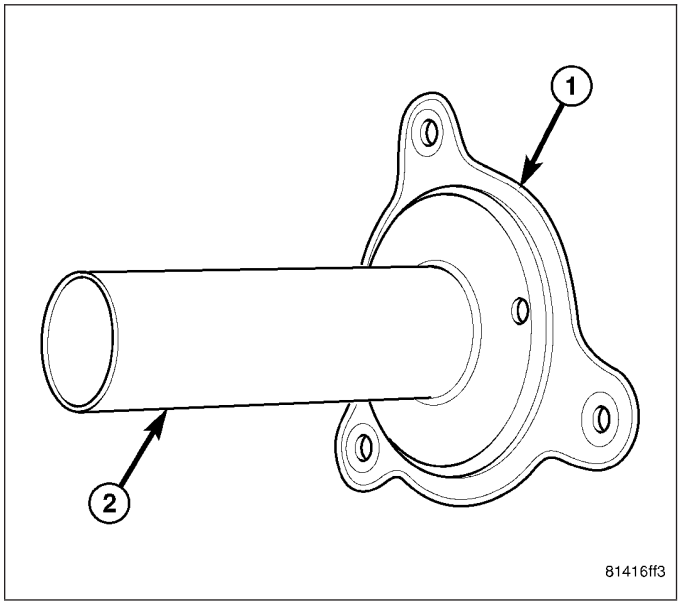


Shift Rails: Inspect shift rails, bushings, and bearing for wear. Verify main shift rail (1) bearings (2) roll smoothly.



Clutch Release Bearing Support: Inspect clutch release bearing support (1) release bearing slide surface (2) for damage.

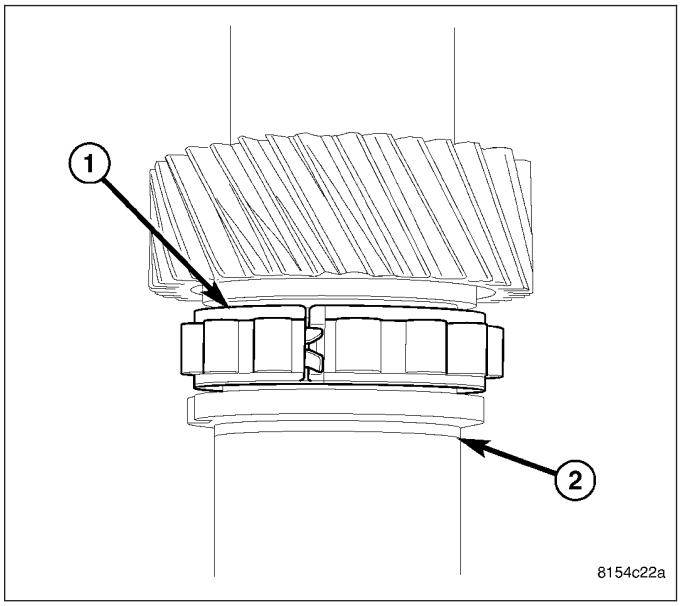
Housing/Tail housing: Inspect sealing and mating surfaces are free of burrs and nicks. Inspect alignment dowels are tight and in good condition. Inspect shift rail bushings for wear.



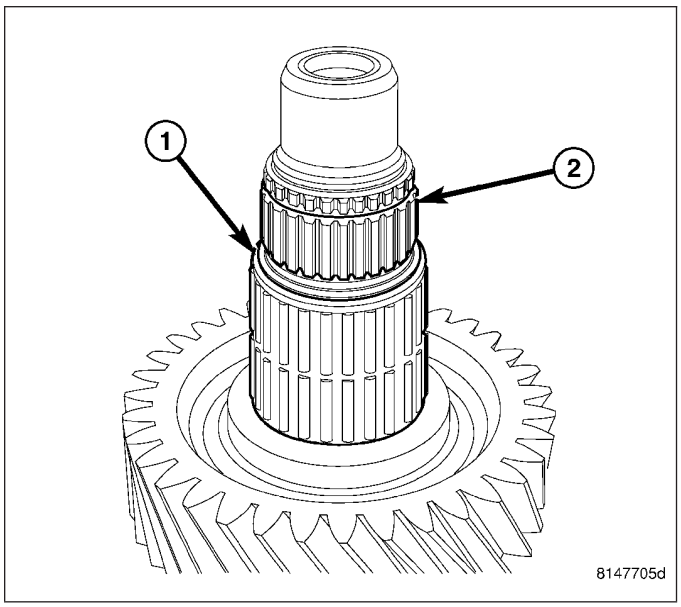
ASSEMBLY

MAINSHAFT

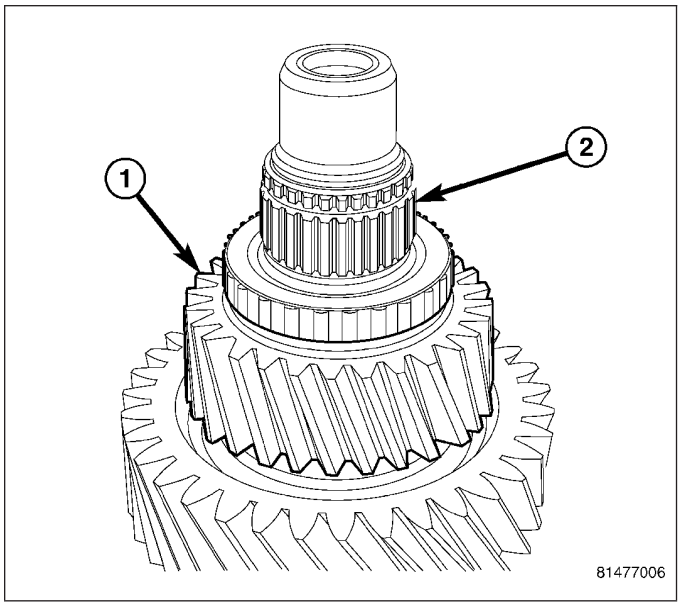
1. Install mainshaft center support bearing (1) on mainshaft (2).



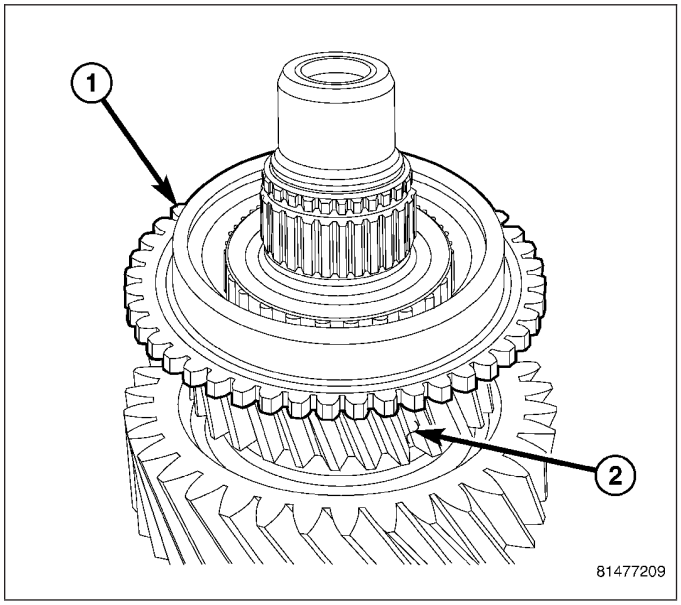
2. Install sixth gear bearing (1) on mainshaft (2).



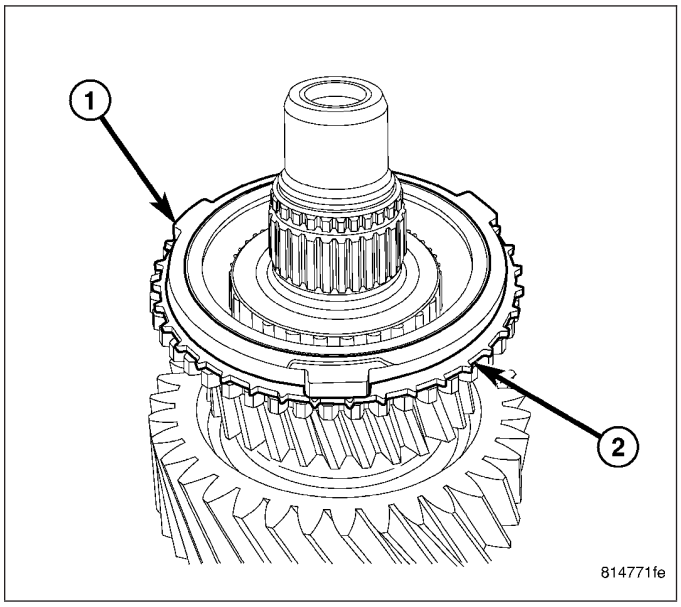
3. Install sixth gear (1) on mainshaft (2).



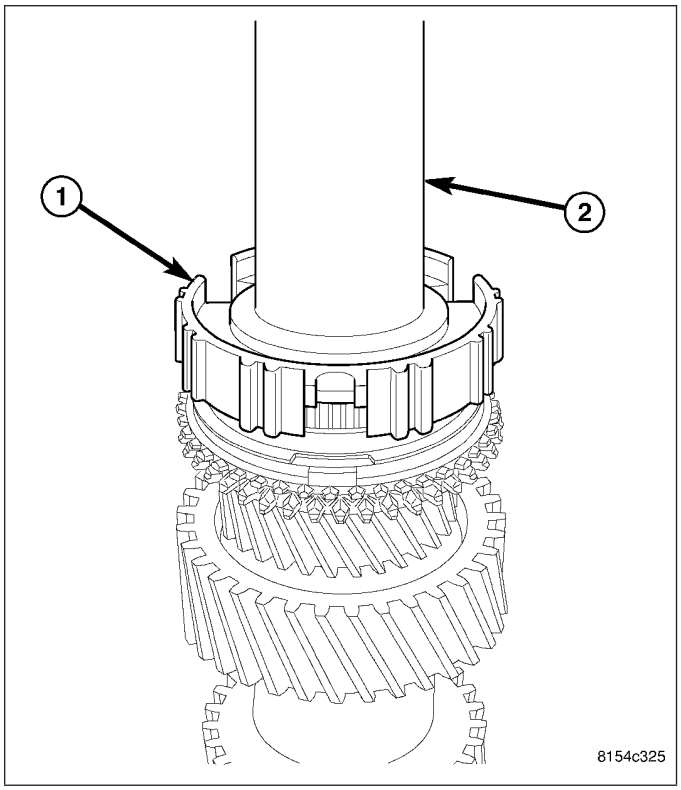
4. Install sixth gear clutch body (1) on sixth gear (2).



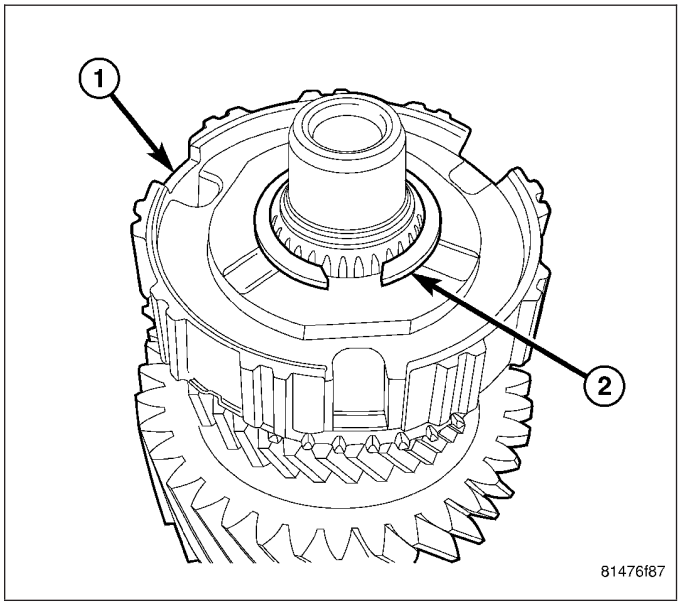
5. Install sixth gear friction ring (1) on clutch body (2).



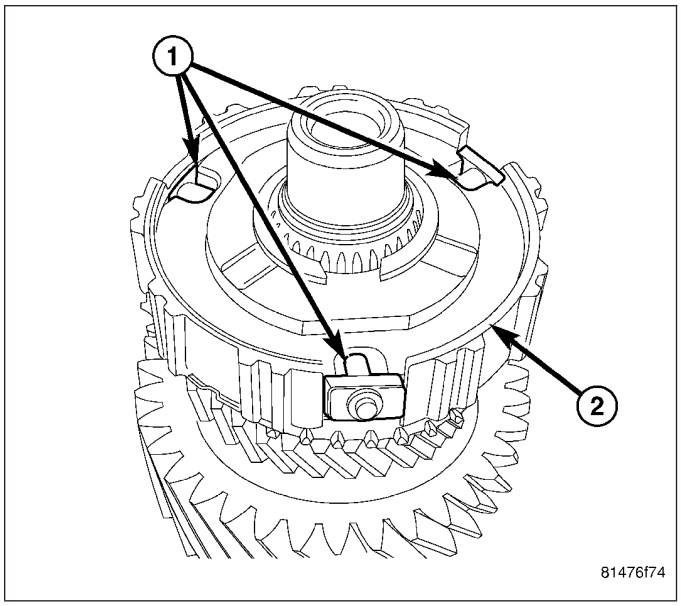
6. Install 5-6 synchronizer hub (1) on mainshaft with Installer W-262 (2).



7. Install 5-6 synchronizer hub (1) snap ring (2).

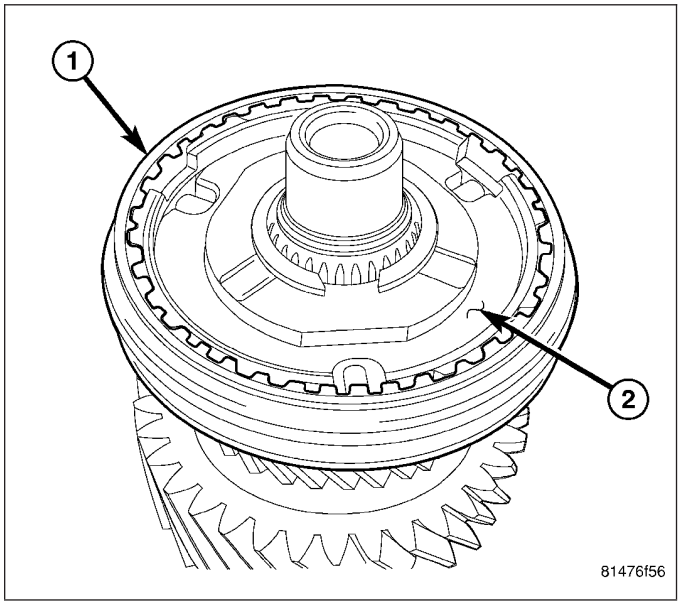


8. Install 5-6 synchronizer detents (1) in hub (2).

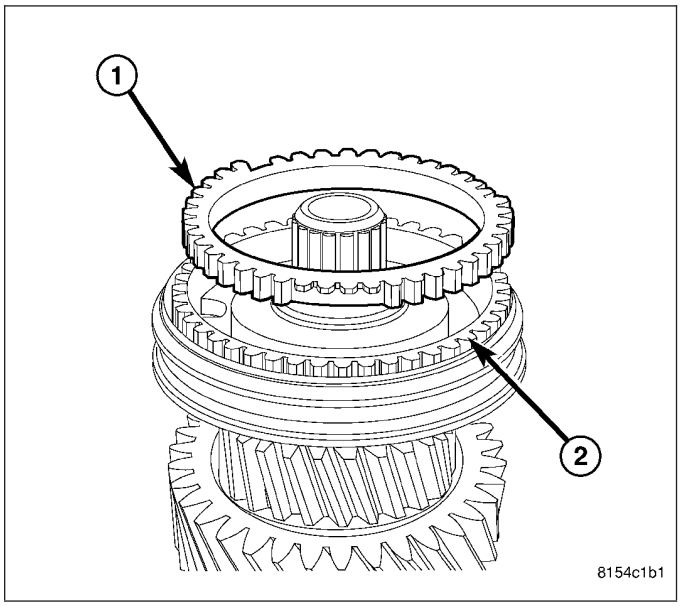


NOTE: Whenever installing a synchronizer sleeve onto the hub, make sure that the grooves in the sleeve are aligned with the detents in the hub.

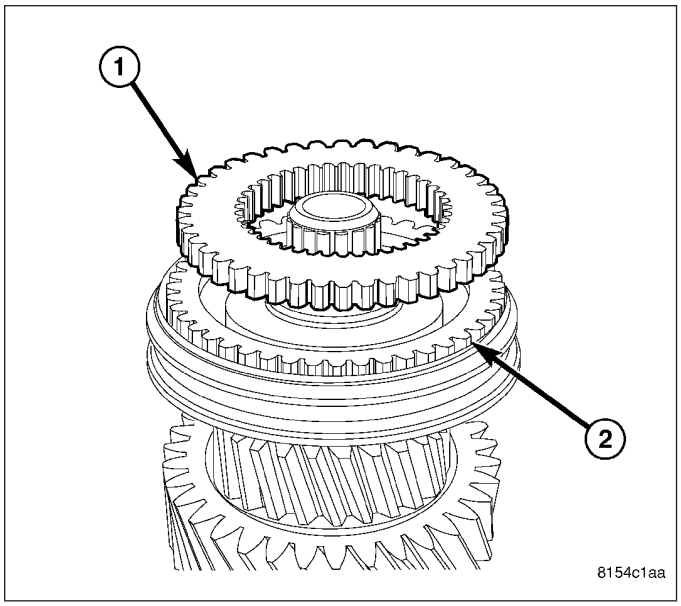
9. Install 5-6 synchronizer sleeve (1) on hub (2).



10. Install fifth gear synchronizer friction ring (1) on 5-6 synchronizer hub (2).

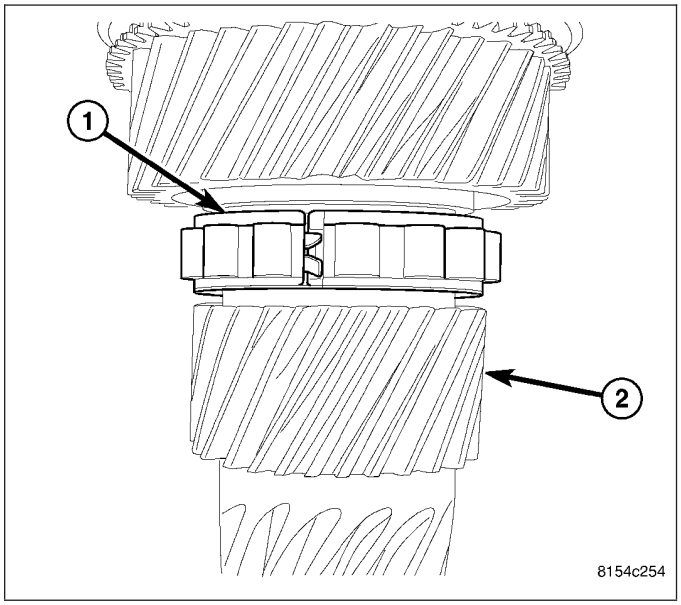


11. Install fifth gear synchronizer clutch body (1) on 5-6 synchronizer hub (2).



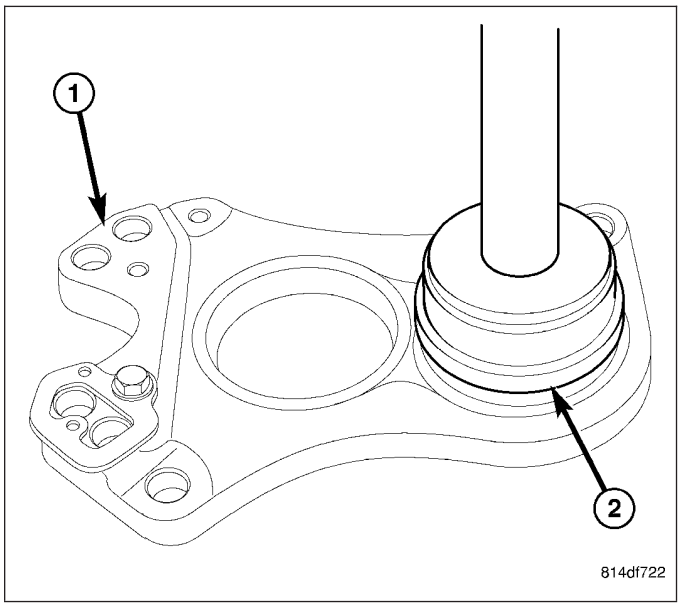
COUNTERSHAFT

1. Install countershaft center support bearing (1) on countershaft (2).

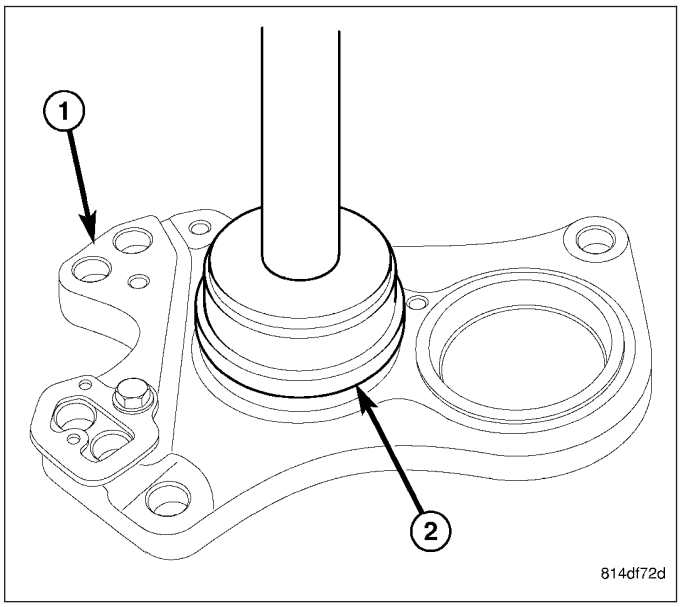


CENTER SUPPORT

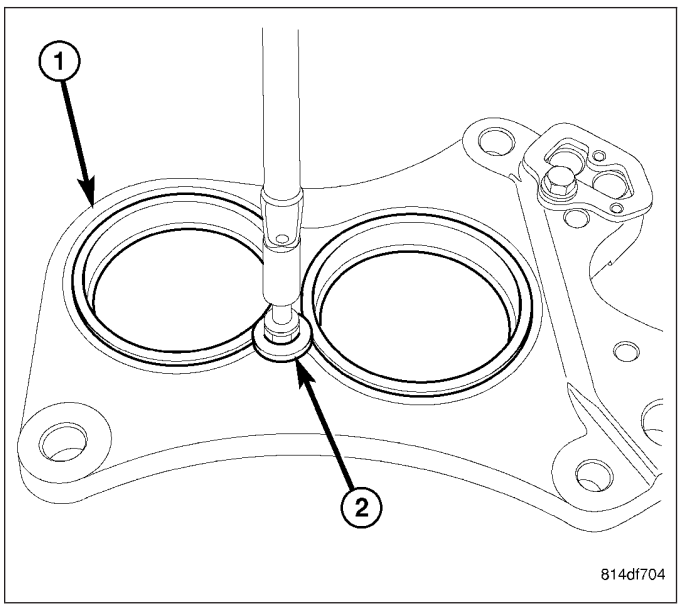
1. Install center support (1) countershaft roller bearing race with Installer/Remover 9617 (2) and Handle C-4171.



2. Install center support (1) mainshaft roller bearing race with Installer/Remover 9668 (2) and Handle C-4171.

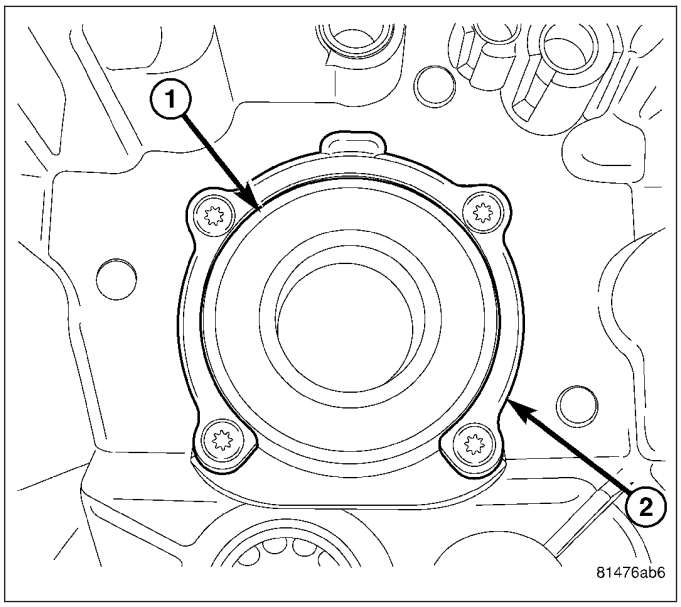


3. Install center support (1) race retainer screw (2) and tighten to 22 N·m (16 ft. lbs.).

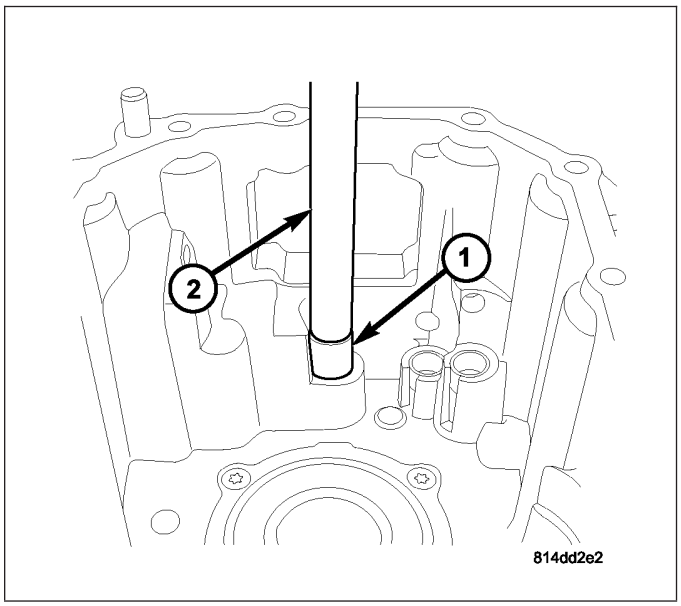


REAR HOUSING

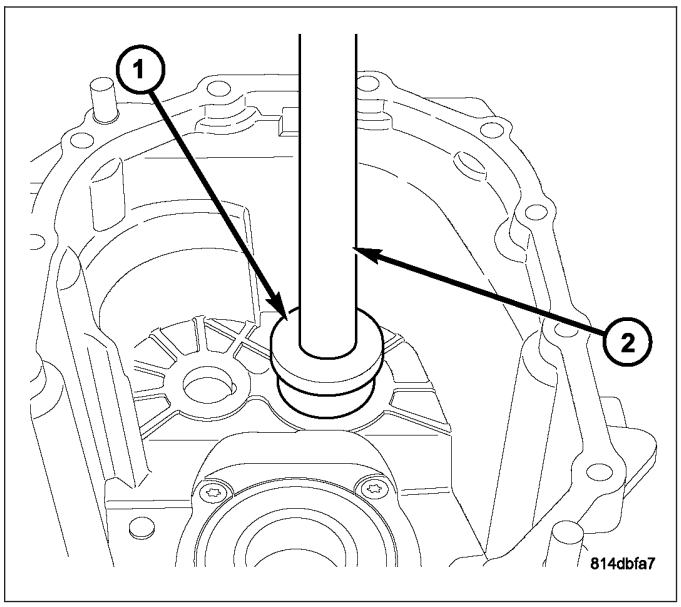
1. Install mainshaft bearing (1) in rear housing with hammer and driver.
2. Install mainshaft bearing (1) retainer (2). Apply Mopar® Lock & Seal Adhesive or equivalent to retainer bolts and tighten to 10 N·m (88 in. lbs.).



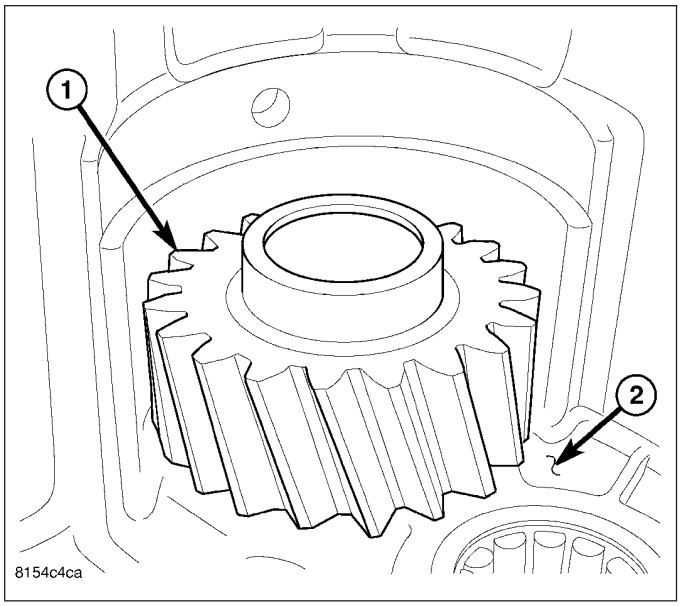
3. Install shift rail roller bearing (1) with Installer 8475 (2).



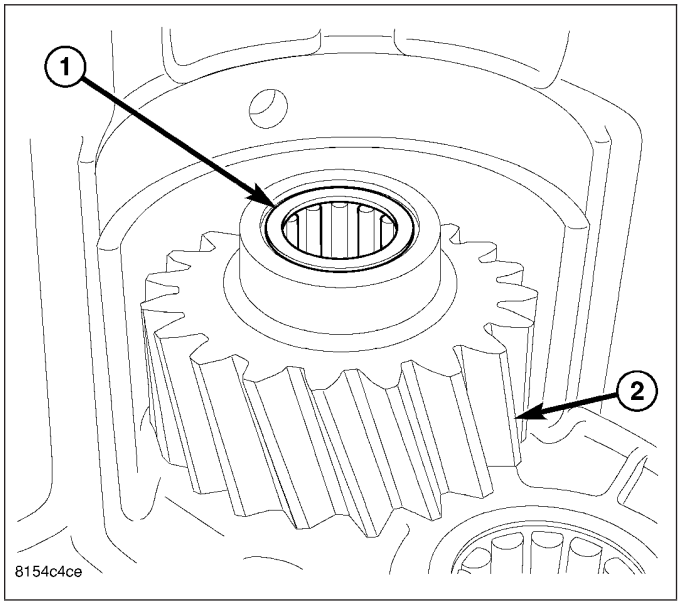
4. Install countershaft bearing with Installer 9624 (1) and Handle C-4171 (2).



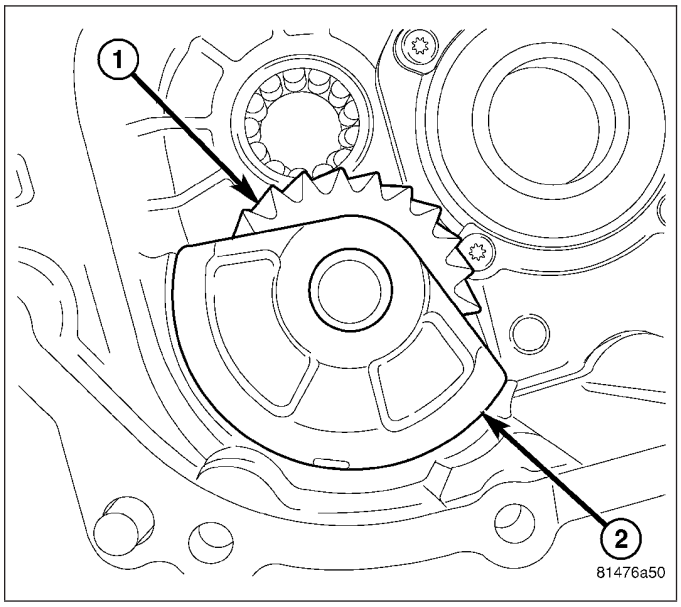
5. Install idler gear (1) in rear housing (2).



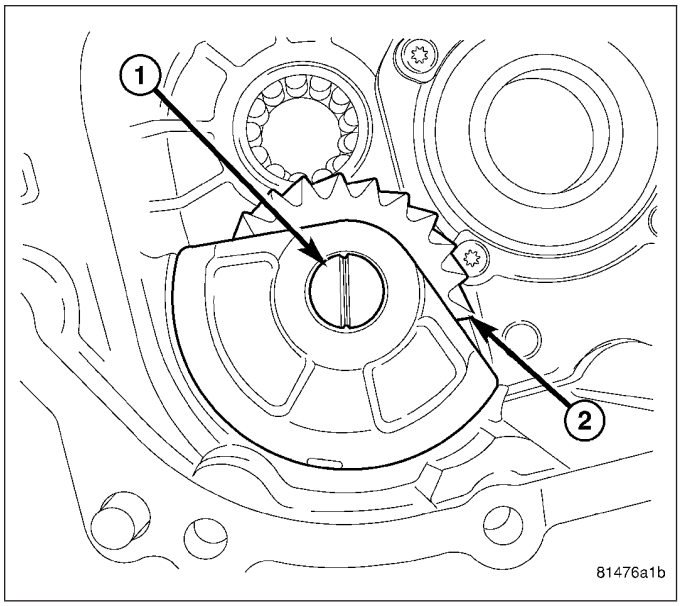
6. Install idler gear bearing (1) in idler gear (2).



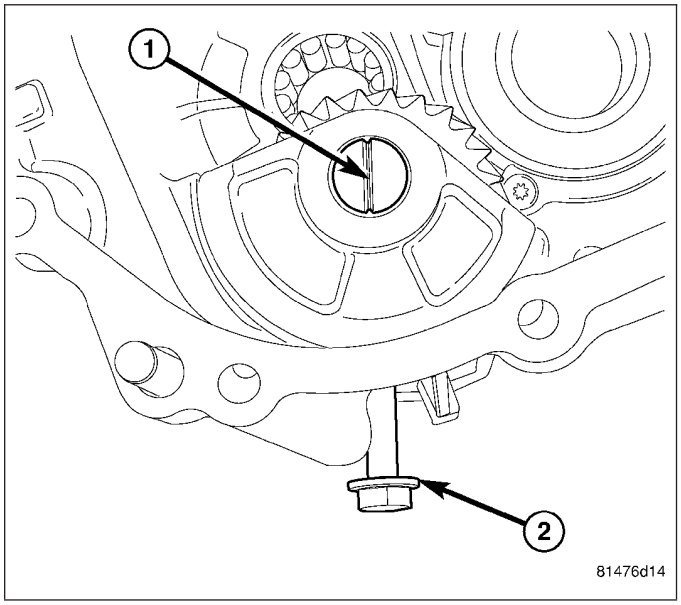
7. Install idler gear (1) shaft support (2).



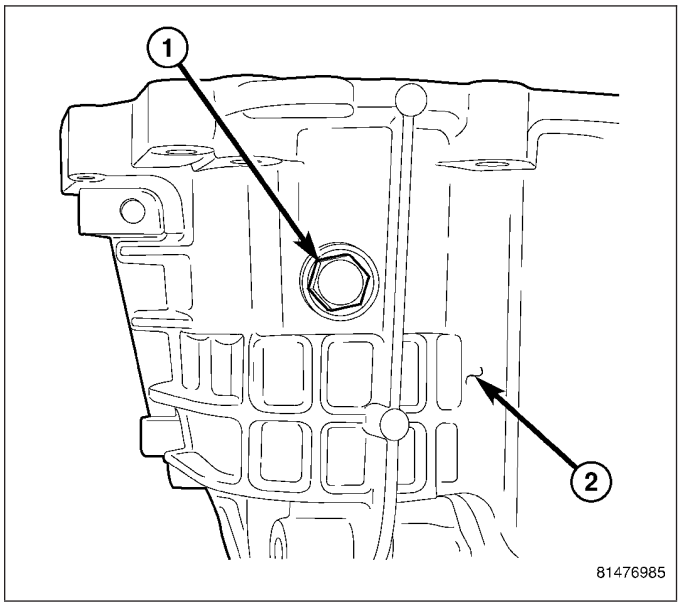
8. Install idler gear (1) shaft (2).



9. Install shaft bolt and align idler gear shaft (1) with shaft bolt (2).

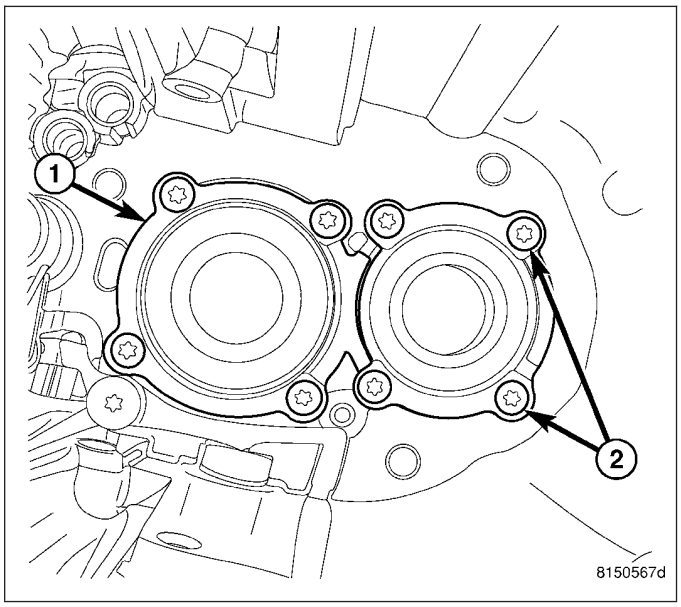


10. Apply Mopar® Lock & Seal Adhesive or equivalent to idler shaft bolt. Tighten bolt (1) in rear housing (2) to 25 N·m (18 ft. lbs.).

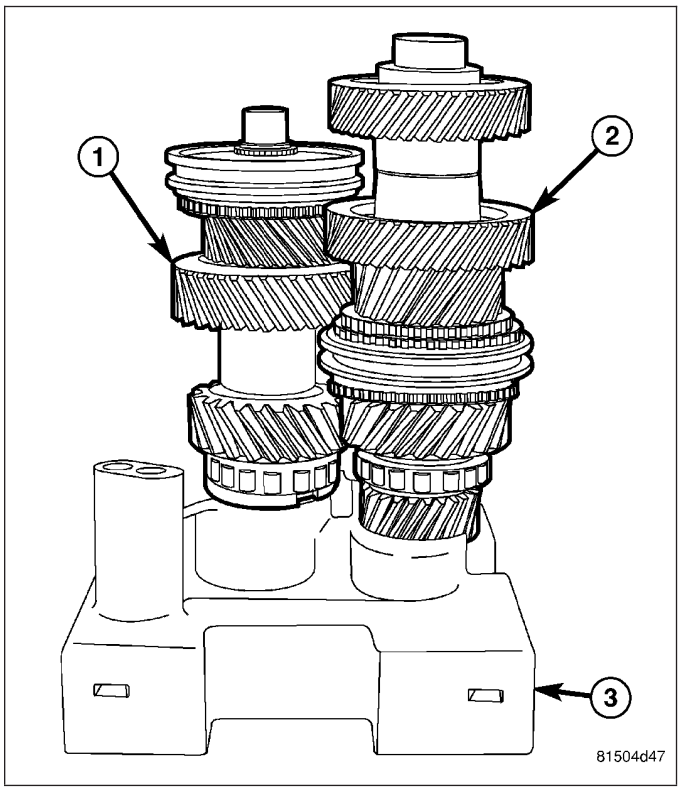


FRONT HOUSING

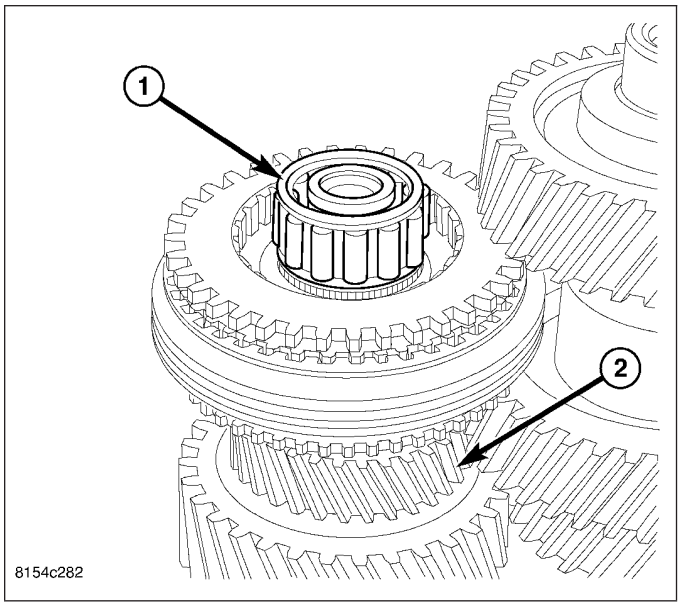
1. Install mainshaft and countershaft bearings in front housing with hammer and driver.
2. Install mainshaft bearing retainer (1) and countershaft bearing retainers (2). Apply Mopar® Lock & Seal Adhesive or equivalent to retainer bolts and tighten to 10 N·m (88 in. lbs.).



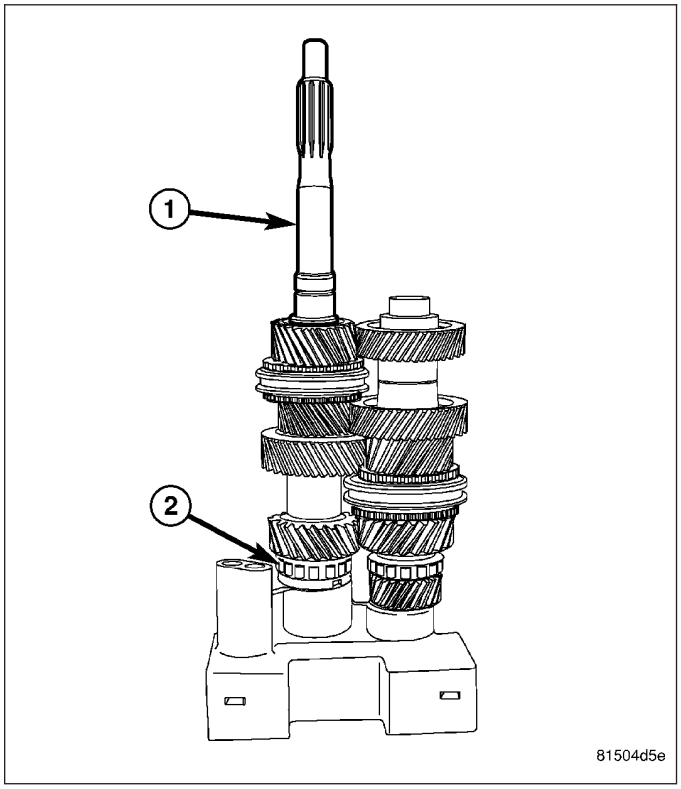
3. Install mainshaft (1) and countershaft (2) in build Fixture 9626 (3).



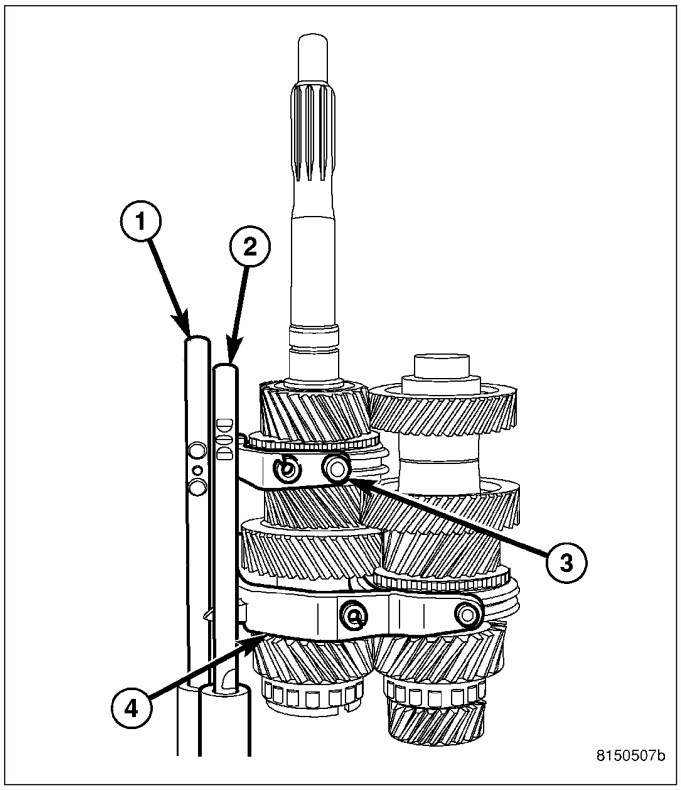
4. Install input shaft bearing (1) on mainshaft (2).



5. Install input shaft (1) on mainshaft (2).



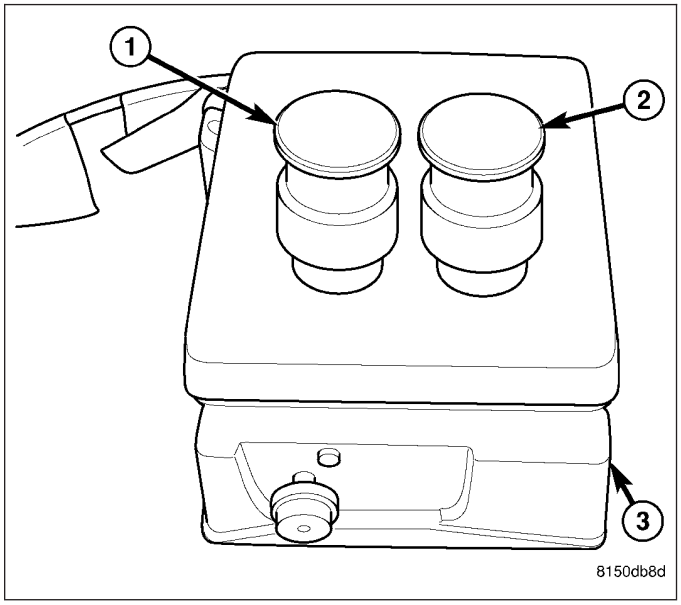
6. Install 5-6 shift rail (1) and 3-4 shift rail (2) in build Fixture 9626. Then install 5-6 shift fork (3) and 3-4 shift fork (4)



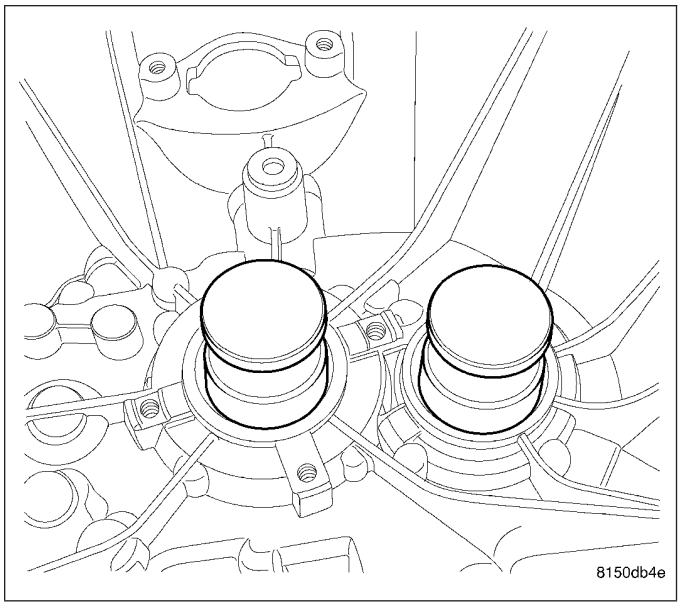
WARNING: Use tongs when handling heated components. Failure to follow these instructions will result in personal injury.

CAUTION: A bearing heater (3) is used to heat Plug 9625 (1) and Plug 9619-1 (2). Use only a bearing heater/hot plate and follow manufactures instructions. Heat components to 100 - 177 Celsius (212° Min - 350° Max Fahrenheit). Never use an open flame to heat components. Never leave components on heater for an extended amount of time. If component is discolored after heating the component has been overheated and must not be used. Failure to follow these instructions will result in component damage.

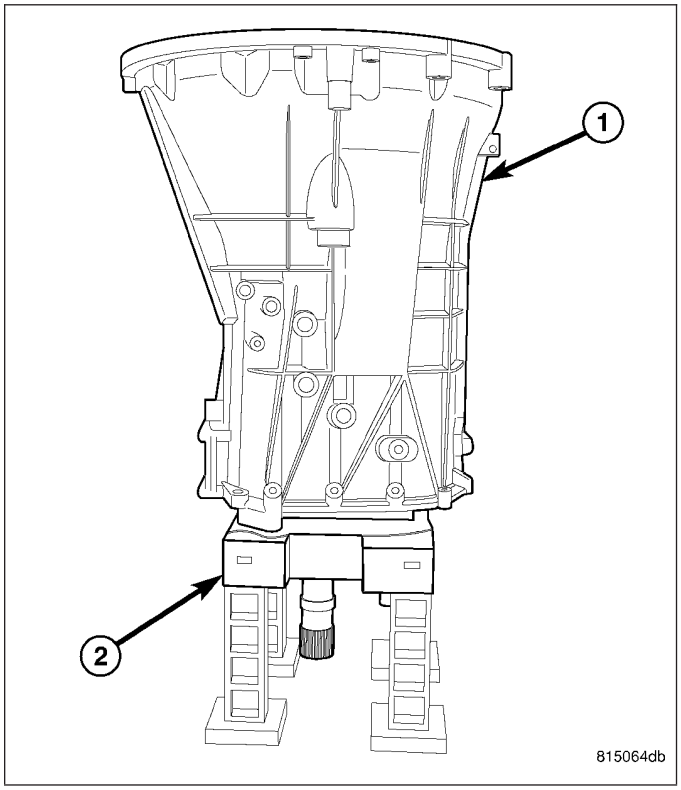
7. Heat Plug 9625 (1) and Plug 9619-1 (2) to 177 Celsius (350° Fahrenheit) with bearing heater (3).



8. With tongs place heated Plug 9625 in countershaft bearing and heated Plug 9619-1 into mainshaft bearing. Allow plugs to heat bearings for two minutes.

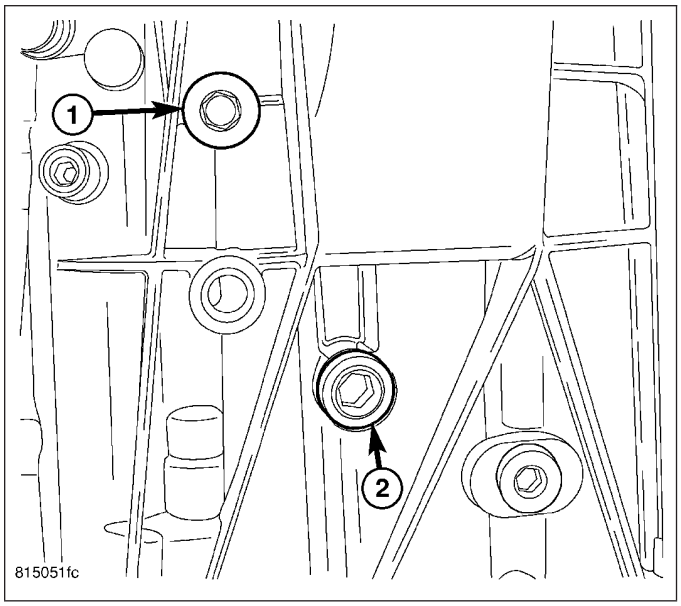


9. Remove Plug 9625 and Plug 9619 with welding gloves or tongs, then install front housing (1) on mainshaft and countershaft in fixture (2).

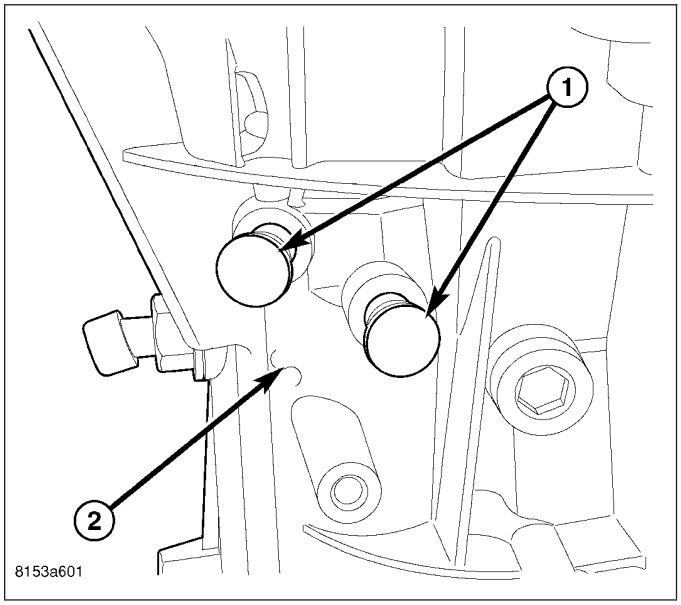


10. Apply Mopar® Lock & Seal Adhesive or equivalent to shift fork pivot bolts. Install 5-6 (1) and 3-4 (2) shift fork pivot bolts, in both sides of the front housing and tighten to 35 N·m (26 ft. lbs.).

NOTE: Verify shift fork pivot holes are aligned with pivot bolt holes before installing bolts.

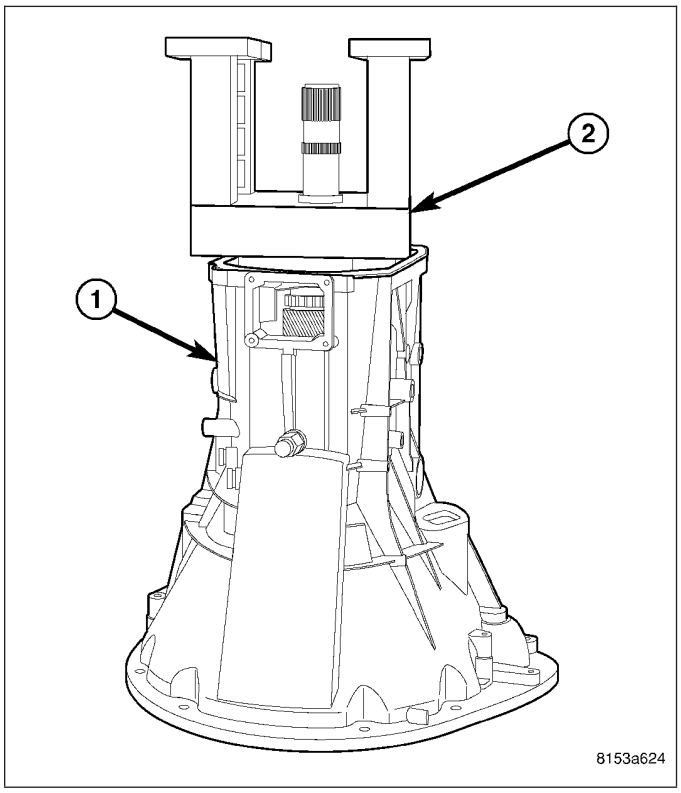


11. Install two detents (1) in the side of the front housing (2).

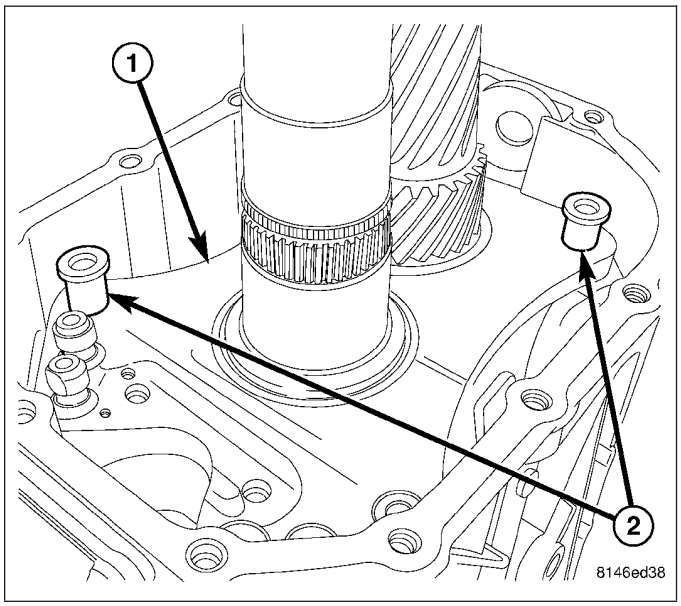


FINAL ASSEMBLY

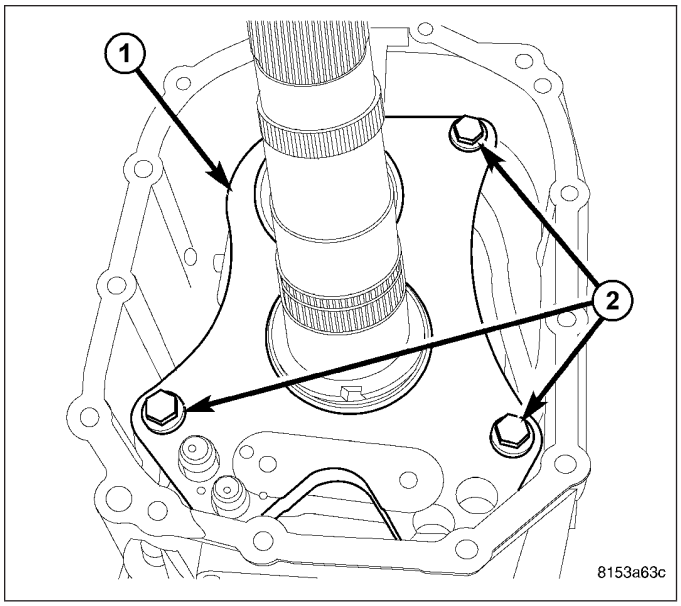
1. Turn front housing (1) with fixture (2) over onto the front housing and remove fixture.



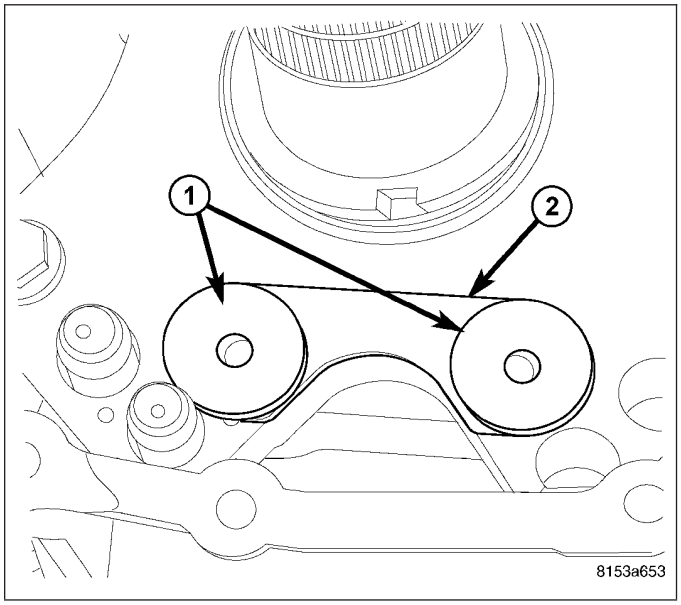
2. Install intermediate plate (1) and two dowels (2).



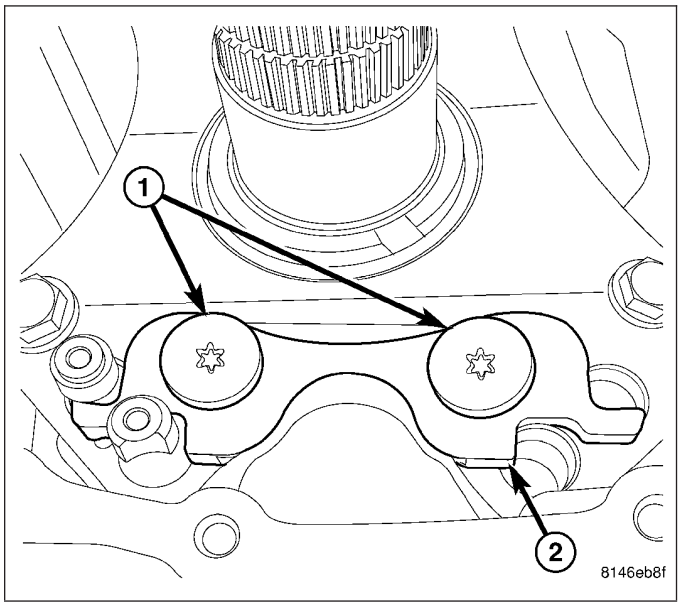
3. Install intermediate plate (1) bolts (2) and tighten to 22 N·m (16 ft. lbs.).



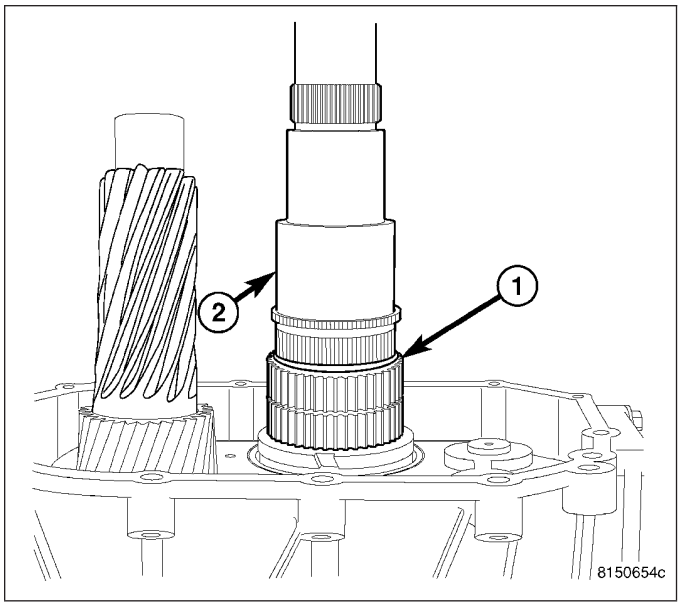
4. Install interlock plate washers (1) on support (2).



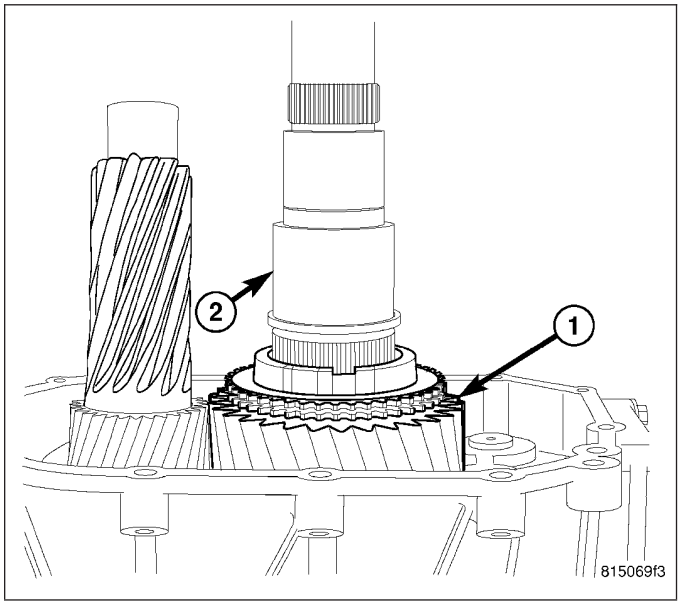
5. Install interlock plate (2) and tighten bolts (1) to 10 N·m (88 in. lbs.).



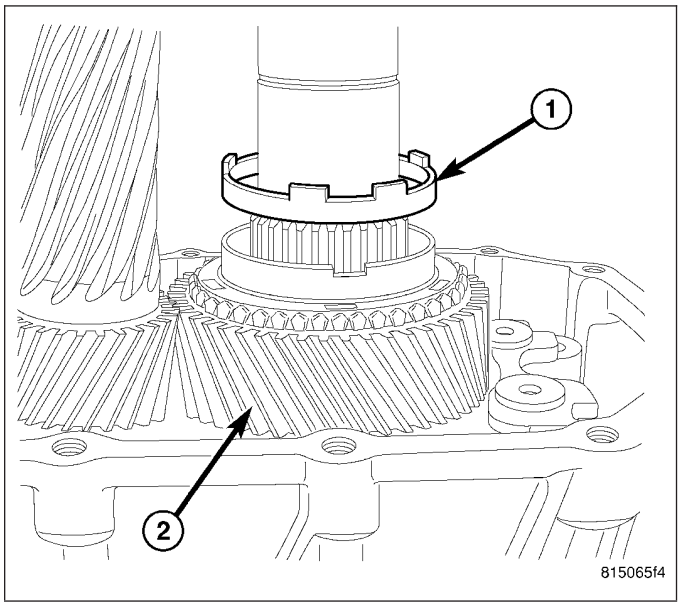
6. Install second gear bearing (1) on mainshaft (2).



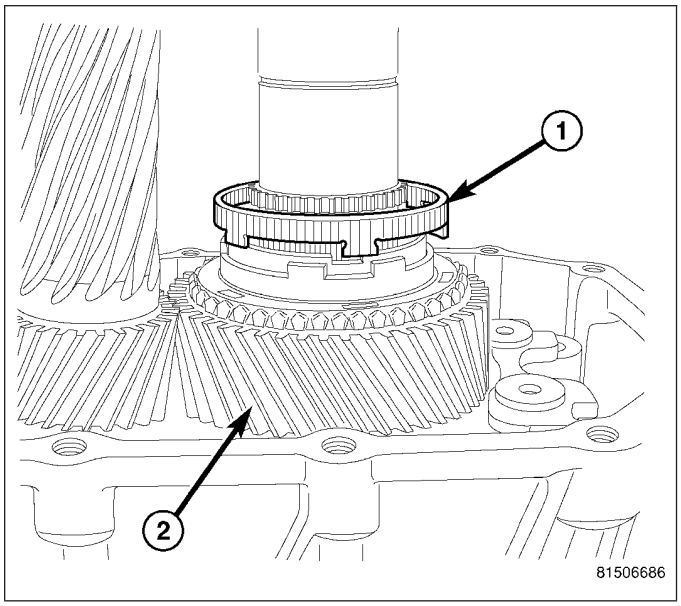
7. Install second gear (1) on mainshaft (2).



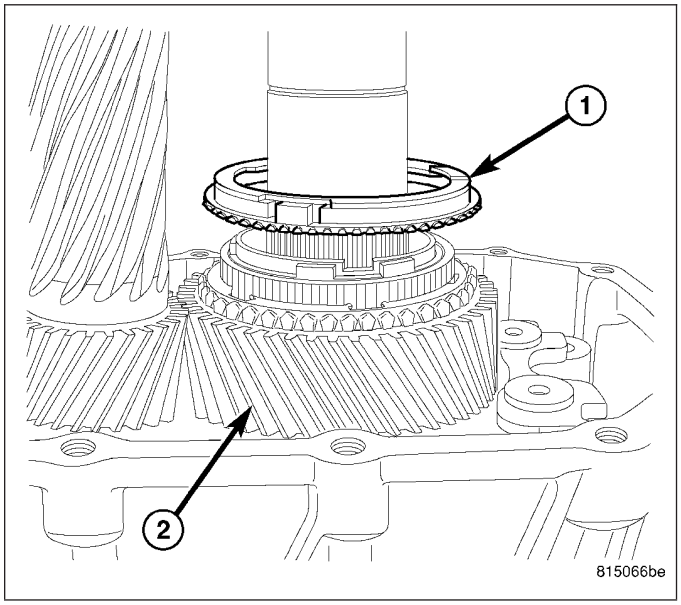
8. Install second gear inner friction ring (1) on second gear (2).



9. Install second gear outer friction ring (1) on second gear (2).

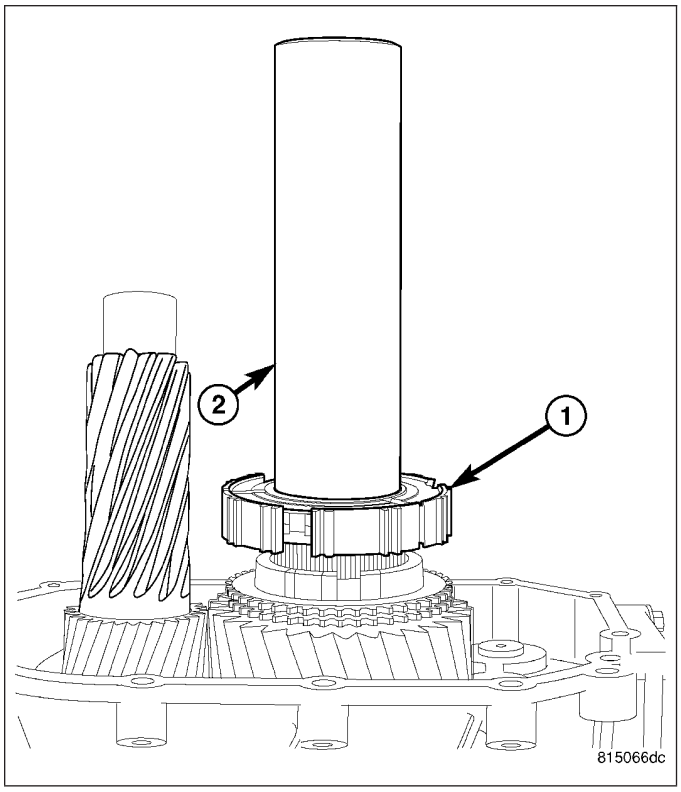


10. Install second gear blocker ring (1) on second gear (2).

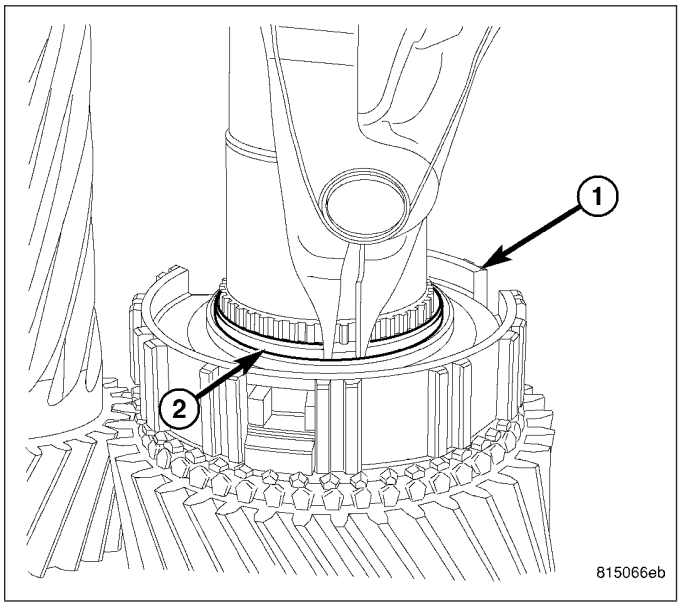


11. Align 1-2 synchronizer hub (1) with blocker ring on mainshaft and install hub with Installer D-389 (2).

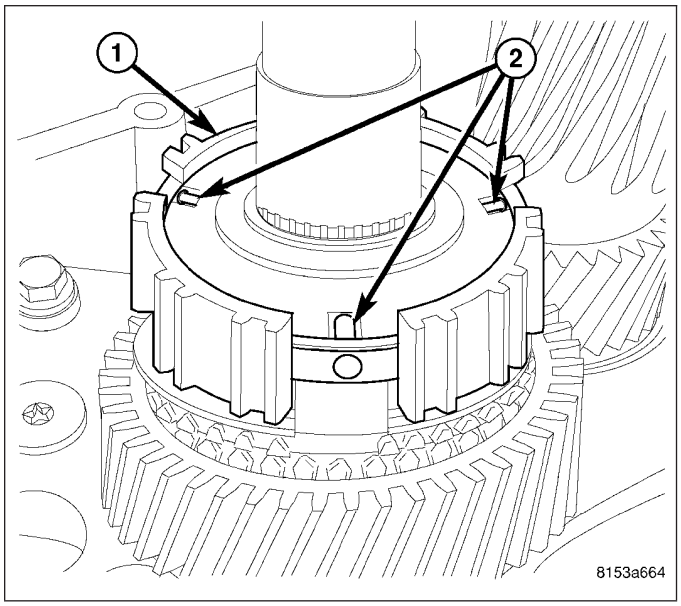
NOTE: If 1-2 synchronizer hub is installed incorrectly the snap ring groove will not be visible.



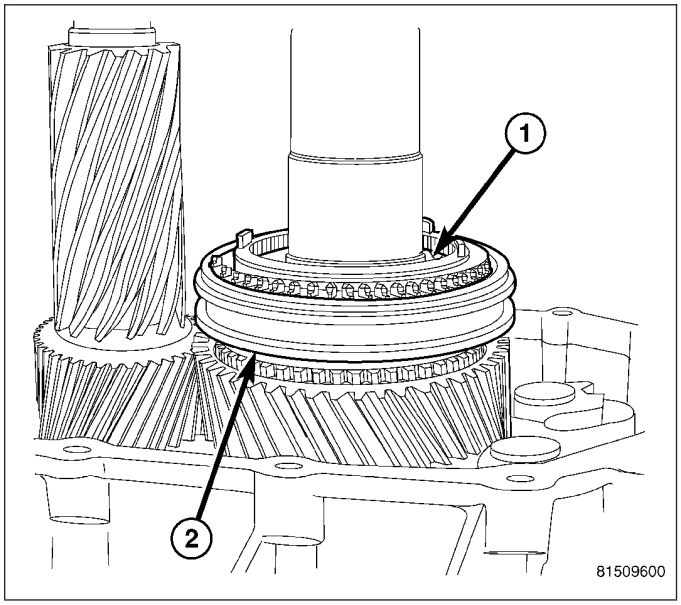
12. Install 1-2 synchronizer hub (1) snap ring (2).



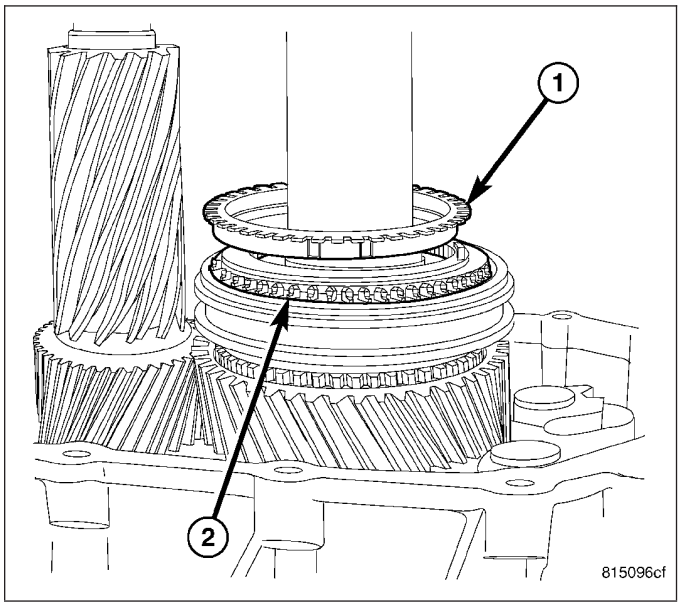
13. Install 1-2 synchronizer hub (1) detents (2).



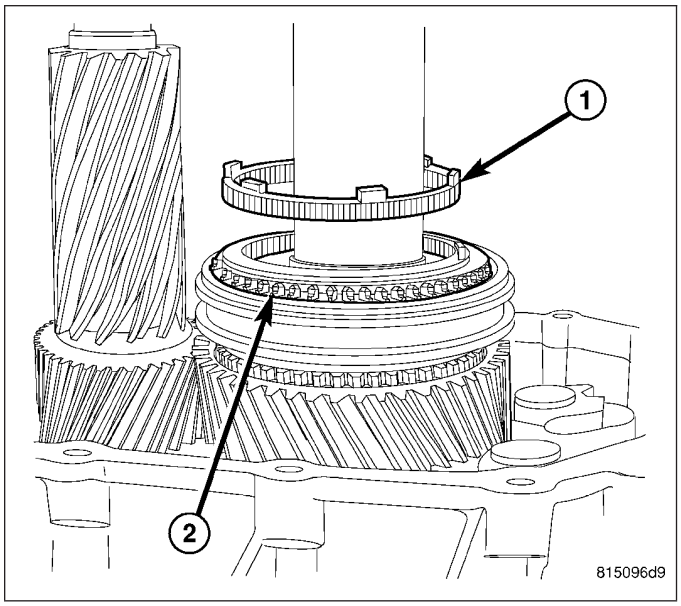
14. Install 1-2 synchronizer sleeve (2) on 1-2 hub (1).



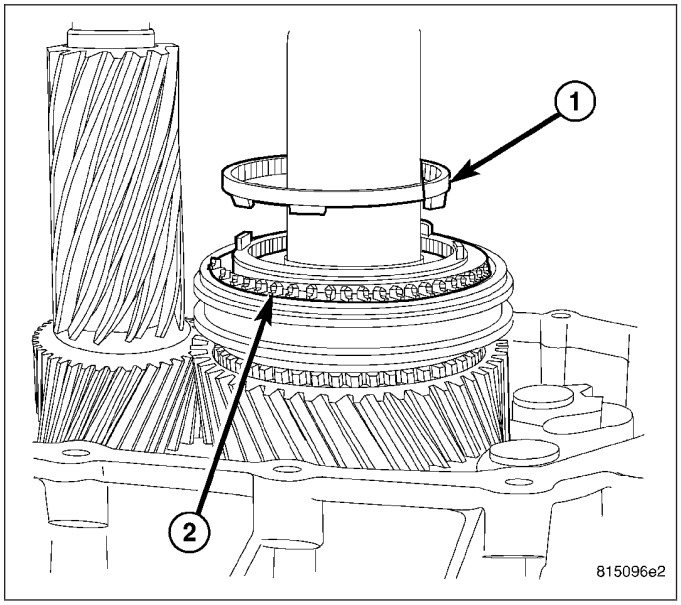
15. Install first gear blocker ring (1) on 1-2 hub (2).



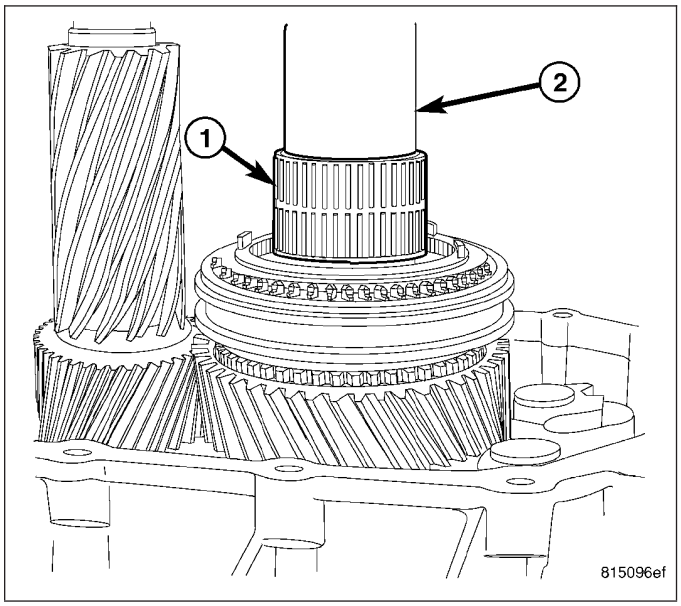
16. Install first gear outer friction ring (1) on 1-2 hub (2).



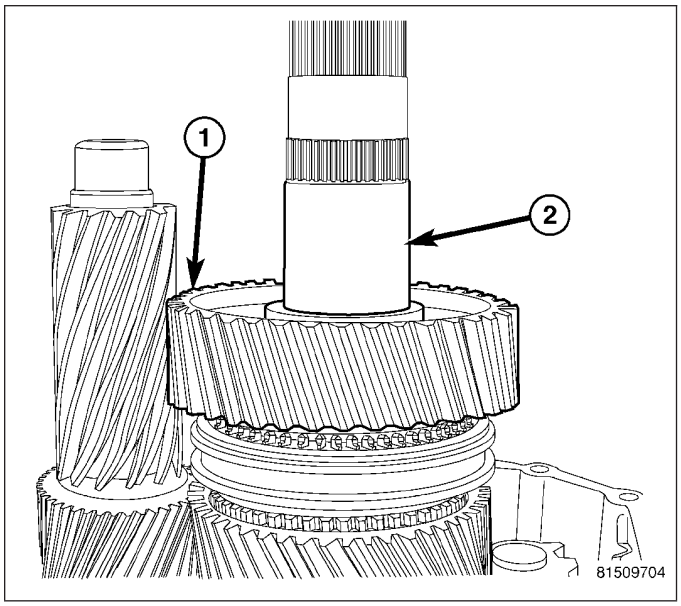
17. Install first gear inner friction ring (1) on 1-2 hub (2).



18. Install first gear bearing (1) on mainshaft (2).



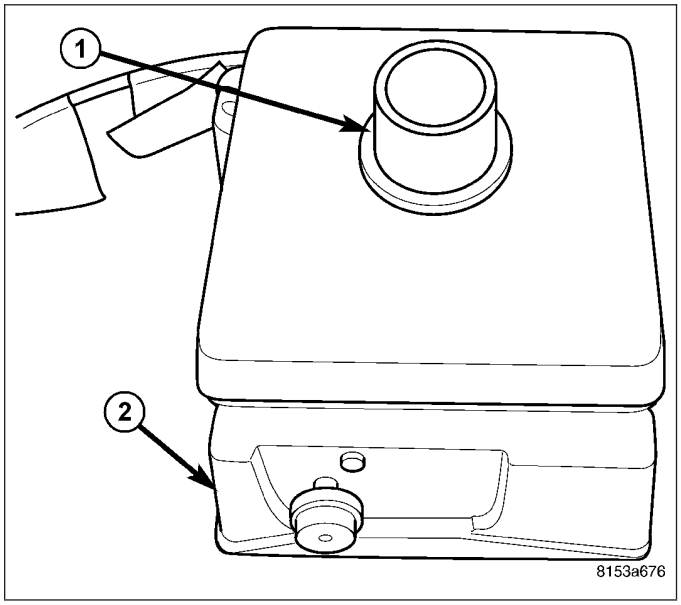
19. Install first gear (1) on mainshaft (2).



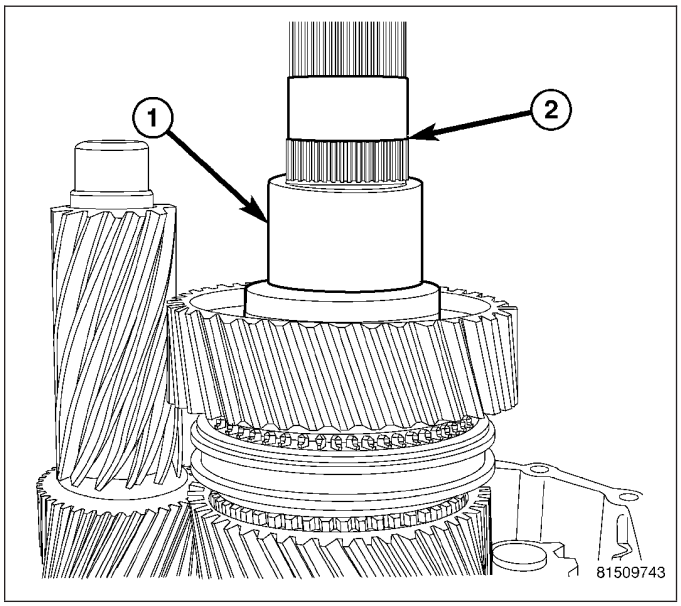
WARNING: Use welding gloves or tongs when handling heated components. Failure to follow these instructions will result in personal injury.

CAUTION: A bearing heater is used to heat reverse bearing race (1). Use only a bearing heater/hot plate and follow manufacturer's instructions. Heat components to 100 - 177 Celsius (212° Min - 350° Max Fahrenheit). Never use an open flame to heat components. Never leave components on heater for an extended amount of time. If component is discolored after heating the component has been overheated and must not be used. Failure to follow these instructions will result in component damage.

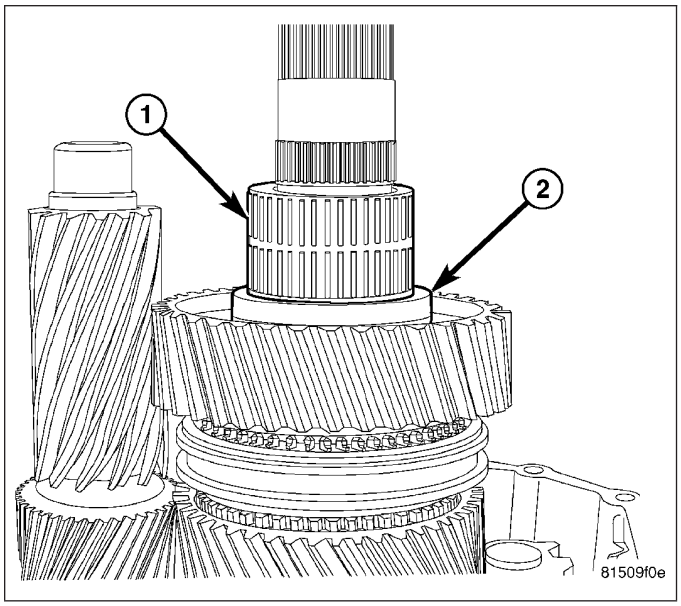
20. Heat reverse bearing race (1) with bearing (2) to 121 Celsius (250° Fahrenheit).



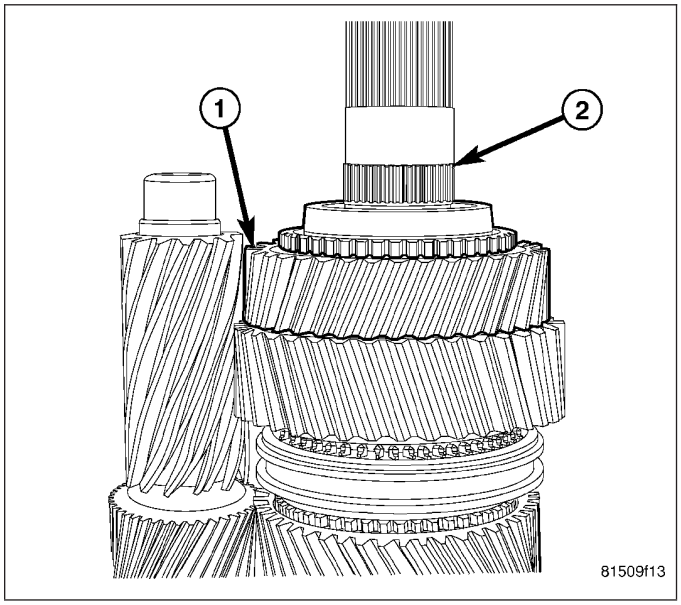
21. With welding gloves or tongs install reverse bearing race (1) on mainshaft (2).



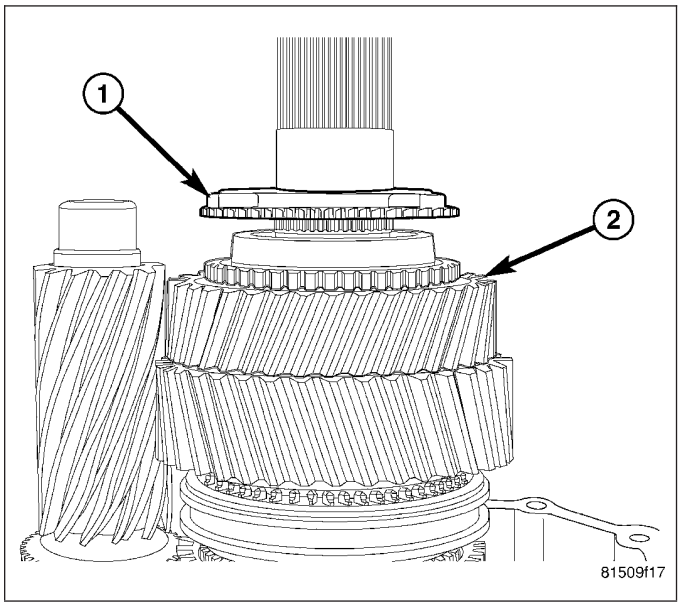
22. Install reverse gear bearing (1) on bearing race (2).



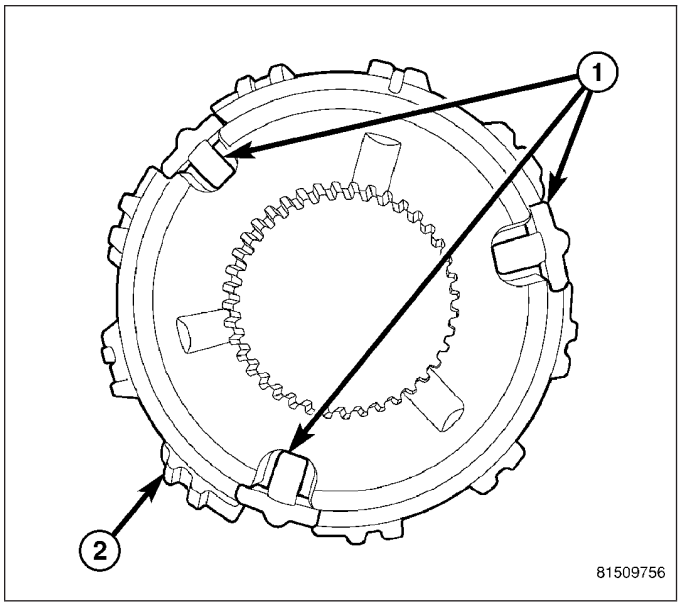
23. Install reverse gear (1) on mainshaft (2).



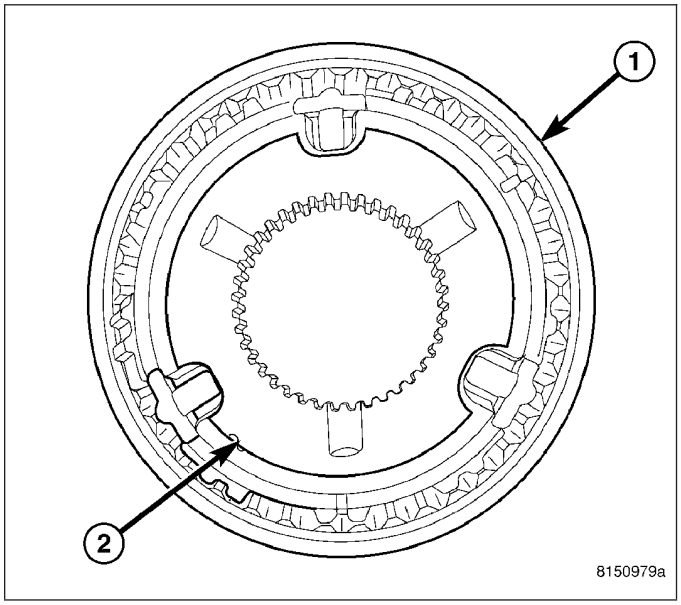
24. Install reverse gear friction/blocker ring (1) on reverse gear (2).



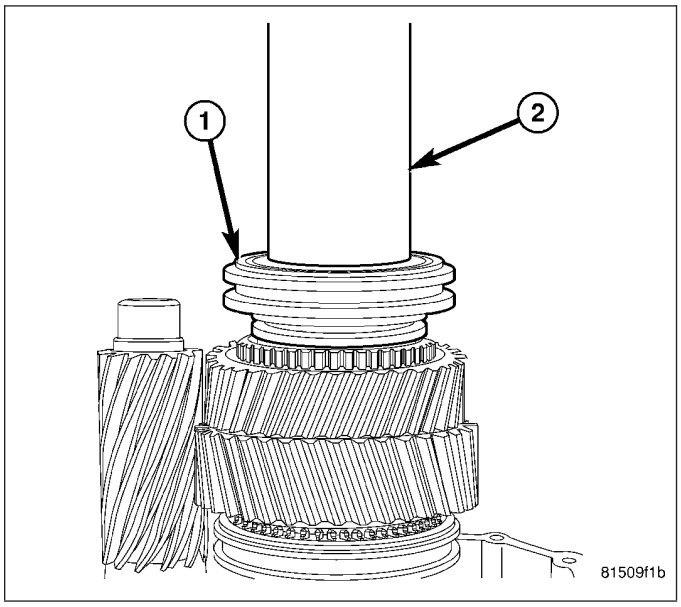
25. Install reverse synchronizer detents (1) in reverse hub (2).



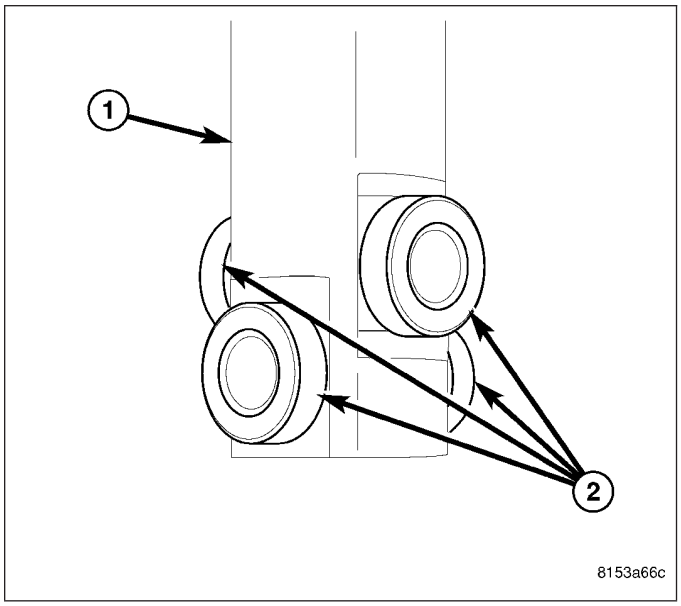
26. Install reverse synchronizer sleeve (1) on reverse hub (2).



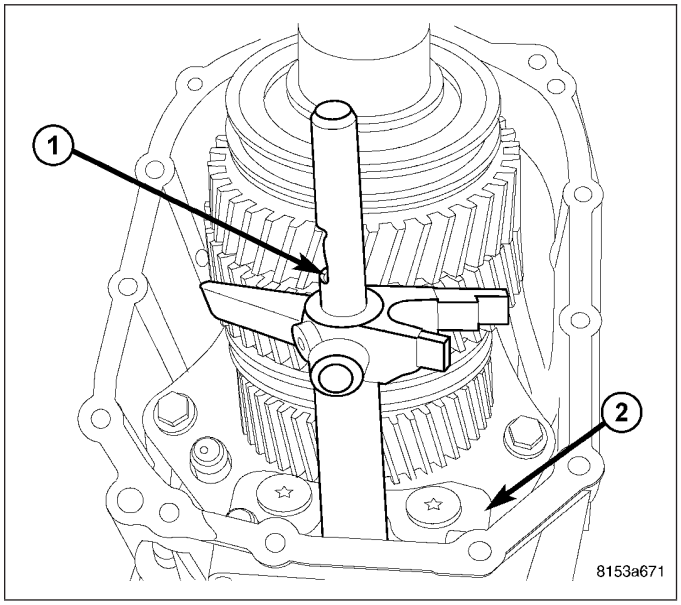
27. Install reverse gear synchronizer hub (1) with Installer D-389 (2).



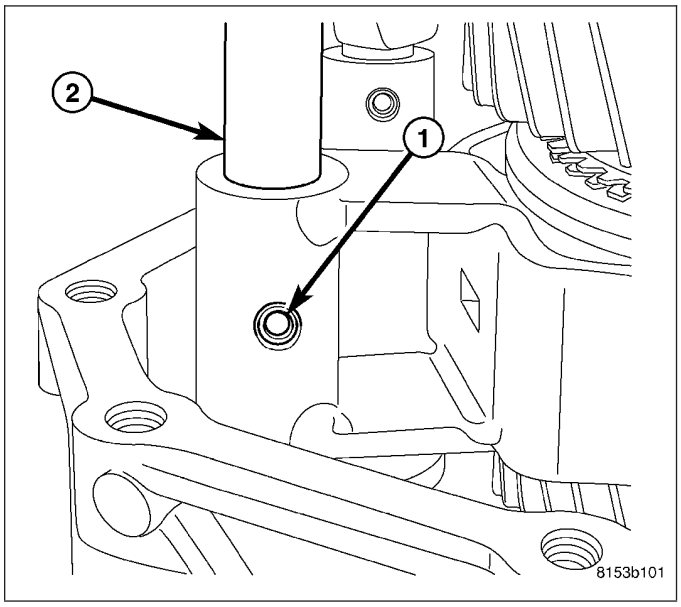
28. Install main shift rail (1) bearings (2) on main shift rail.



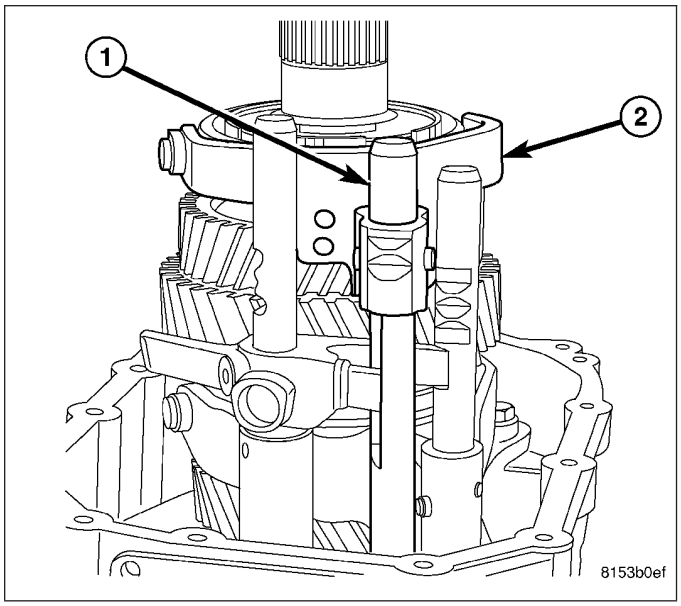
29. Install main shift rail (1) through rail support (2) and housing, then rotate counterclockwise into place.



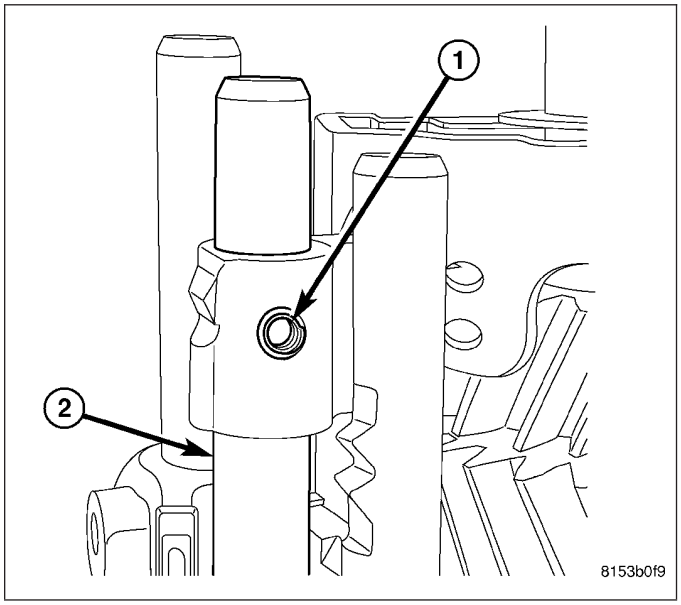
30. Install 1-2 shift fork then, install 1-2 shift rail (2) into shift fork and housing. Install shift fork roll pin (1).



31. Install reverse shift rail (1) into the housing. Then install reverse shift fork (2) and pull shift rail (1) up into the shift fork.



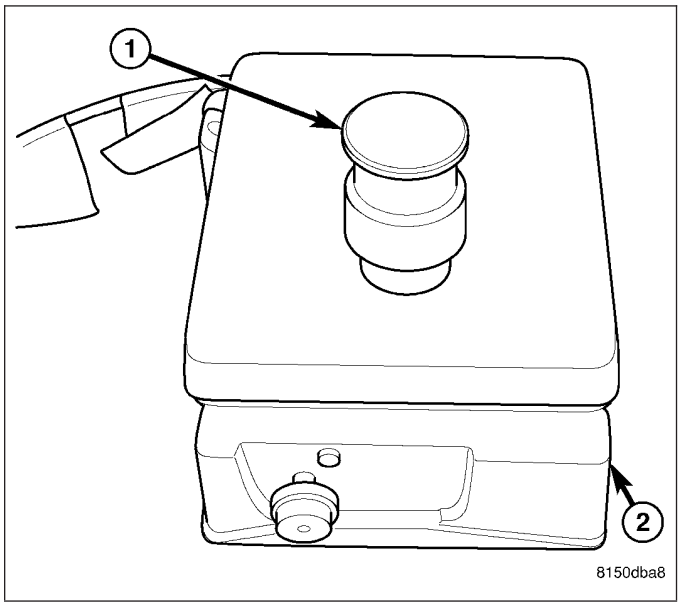
32. Install reverse shift fork roll pin (1).



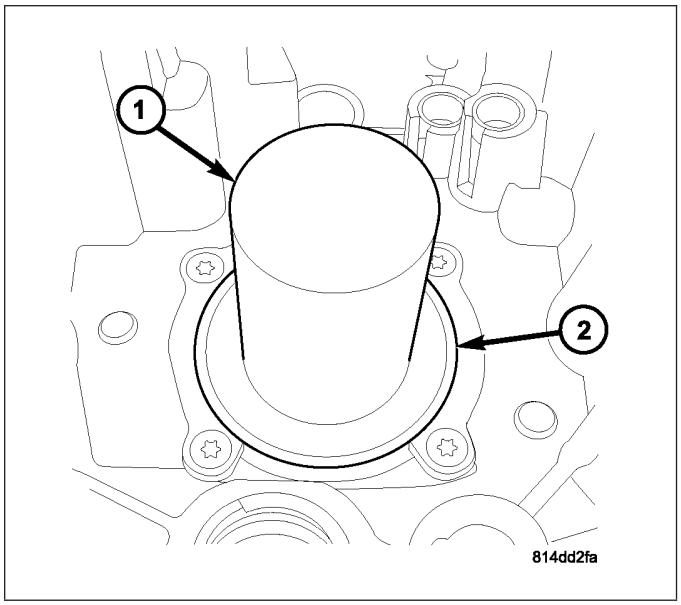
WARNING: Use tongs when handling heated components. Failure to follow these instructions will result in personal injury.

CAUTION: A bearing heater (2) is used to heat Plug 9619-2 (1). Use only a bearing heater/hot plate and follow manufacturer's instructions. Heat components to 100 - 177 Celsius (212° Min - 350° Max Fahrenheit). Never use an open flame to heat components. Never leave components on heater for an extended amount of time. If component is discolored after heating the component has been overheated and must not be used. Failure to follow these instructions will result in component damage.

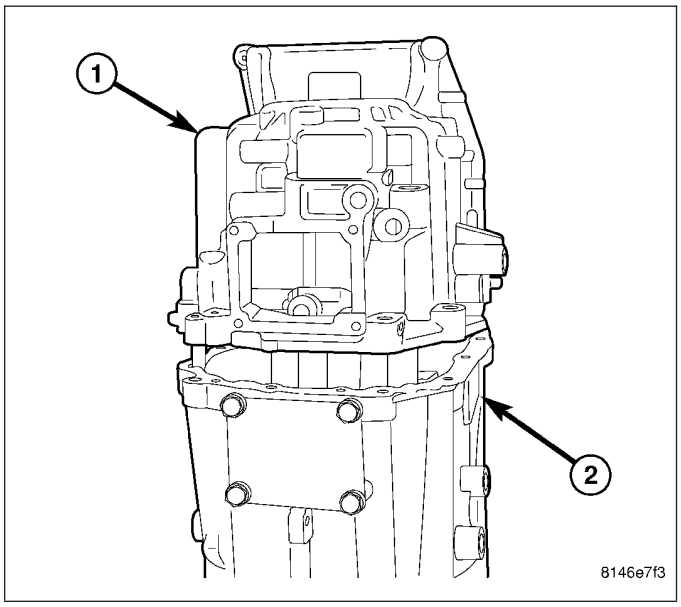
33. Heat Plug 9619-2 (1) to 177 Celsius (350° Fahrenheit) with bearing heater (2).



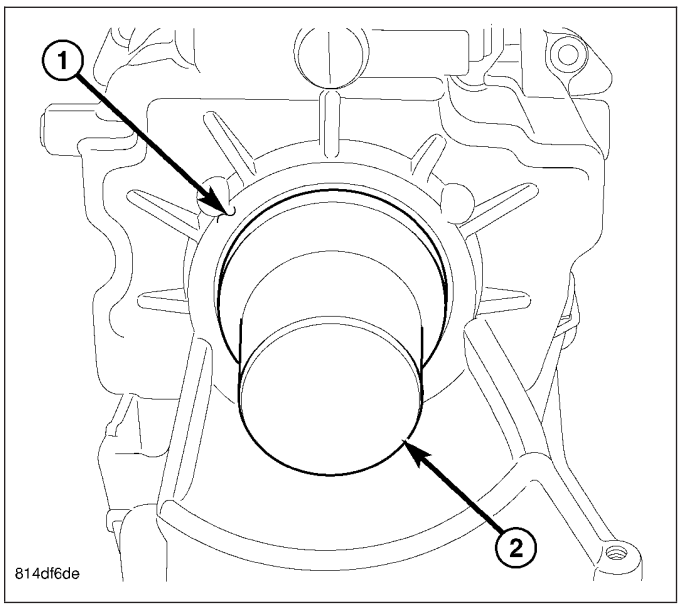
34. With tongs place Plug 9619-2 in rear housing mainshaft bearing (2). Allow plug to heat bearing for two minutes.



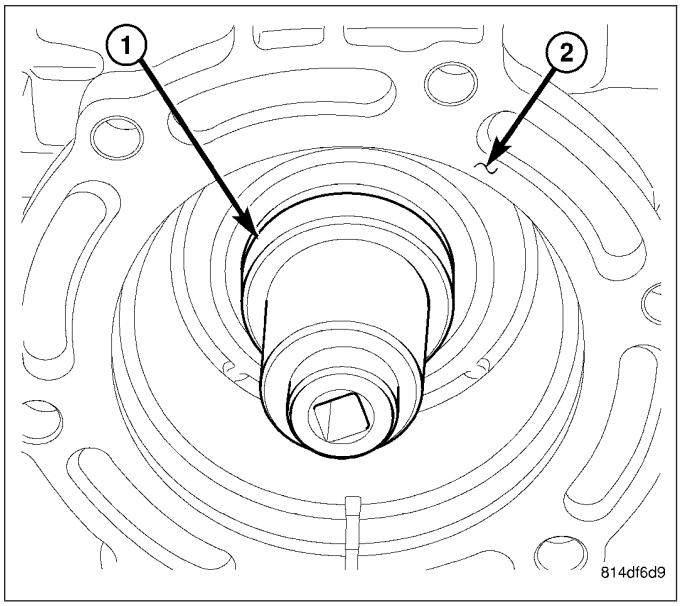
35. Apply a bead of Mopar® Gasket Maker or equivalent to the front housing sealing surface.
36. Remove plug and install rear housing (1) on front housing (2).
37. Install housing bolts and tighten to 22 N·m (16 ft. lbs.).



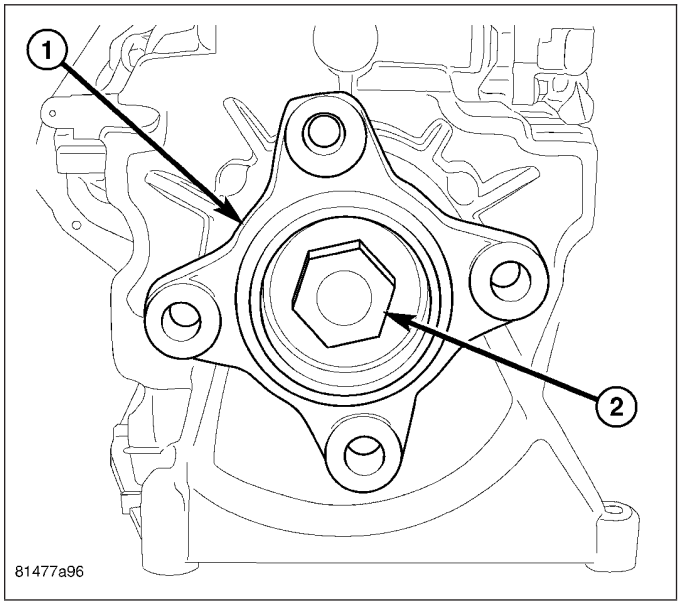
38. Install output shaft seal in rear housing (1) with Installer 9629 (2).



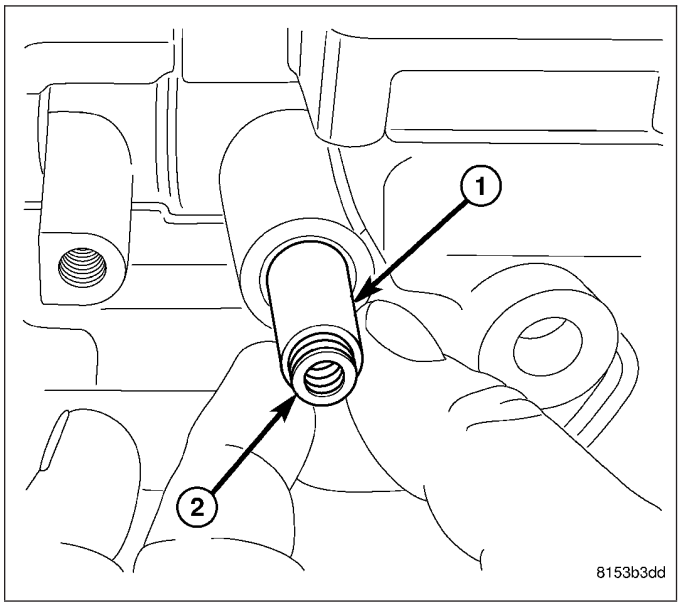
39. Install 4x4 transmission output shaft nut with Socket 9584 and tighten to 200 N·m (147 ft. lbs.). Then loosen nut and tighten to 170 N·m (125 ft. lbs.).



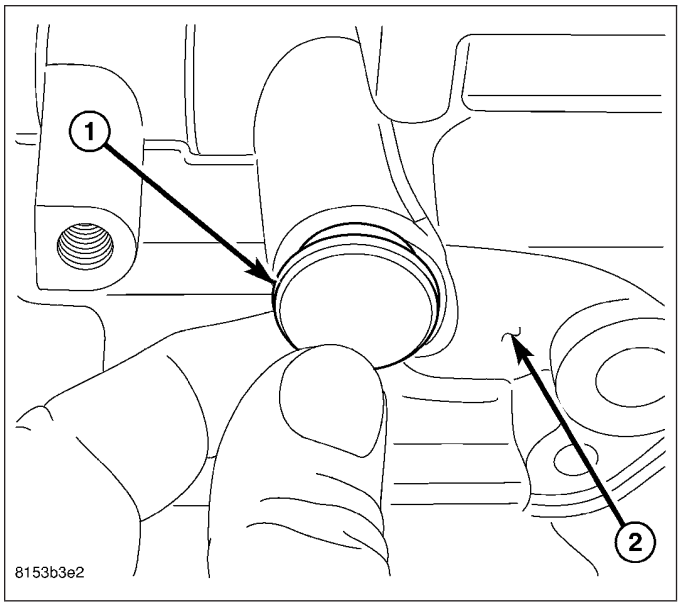
40. Drive output shaft flange onto the output shaft with Installer D-389.
41. Install 4x2 transmission output shaft flange (1) and tighten bolt (2) to 200 N·m (147 ft. lbs.). Then loosen bolt and tighten to 170 N·m (125 ft. lbs.). Remove Wrench 9586 from input shaft.



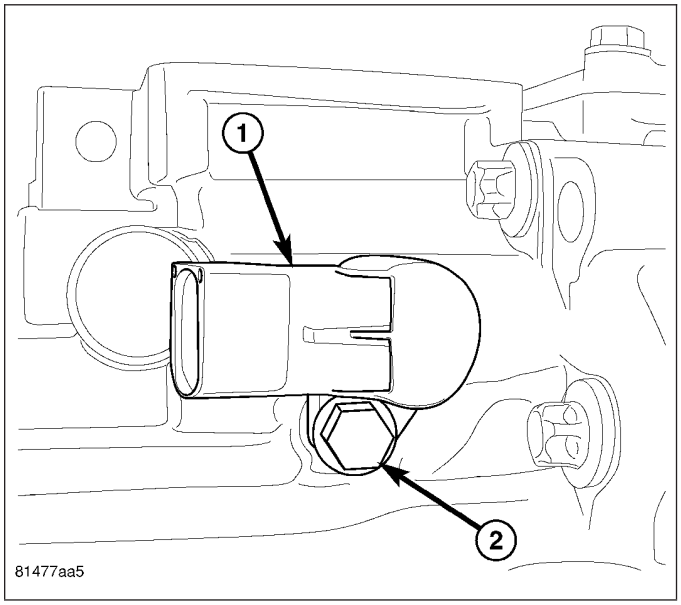
42. Install two detent plugs in the top of the rear housing.
43. Install large detent plunger (1) and spring (2) in the side of the rear housing.



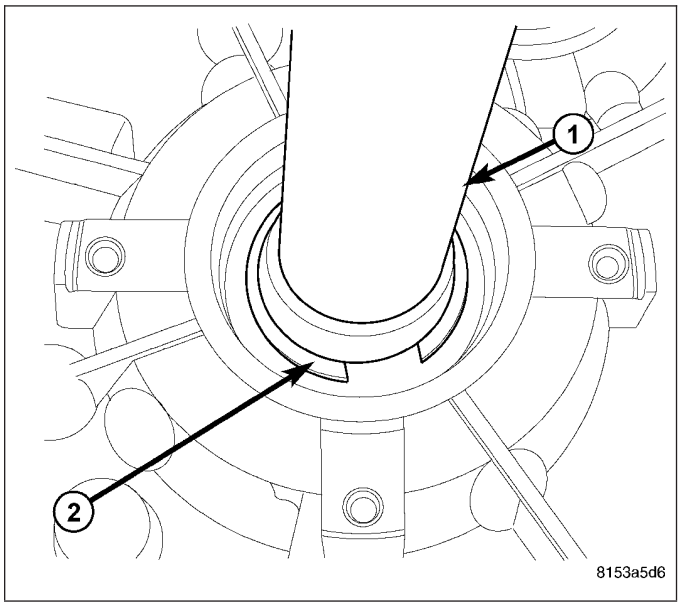
44. Install large detent plug (1) in the side of the rear housing (2).



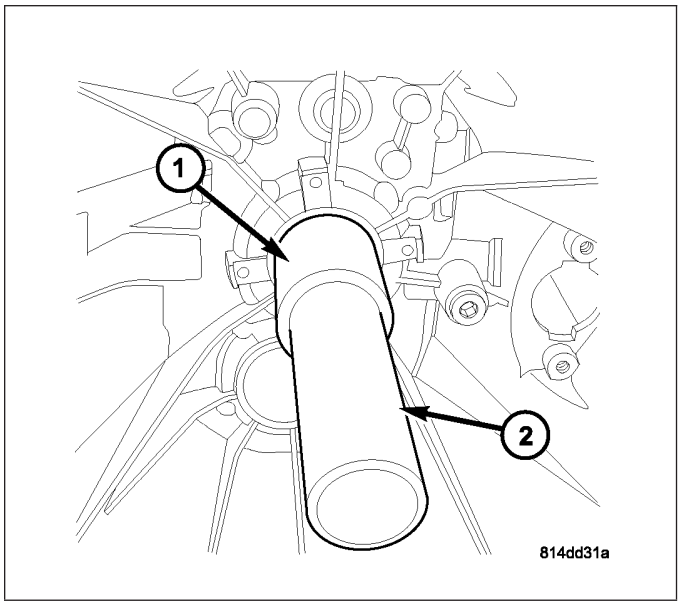
45. Install back up lamp switch (1) and tighten bolt (2) to 10 N·m (88 in. lbs.). Then lay transmission down on bench.



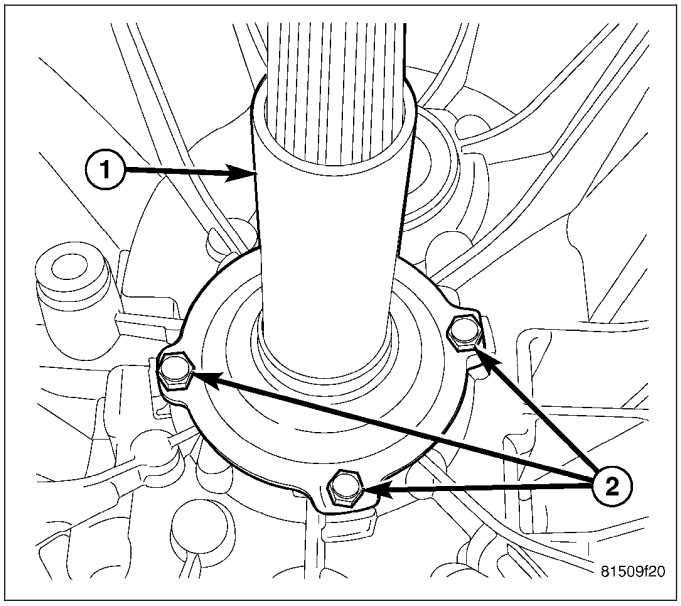
46. Install input shaft (1) snap ring (2).



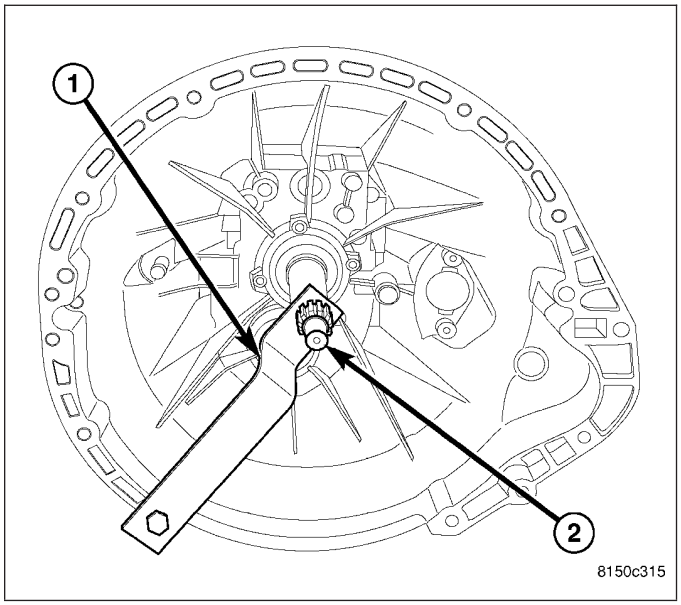
47. Install input shaft seal in front housing with Installer 9620 (1) and Tube C-3717 (2).



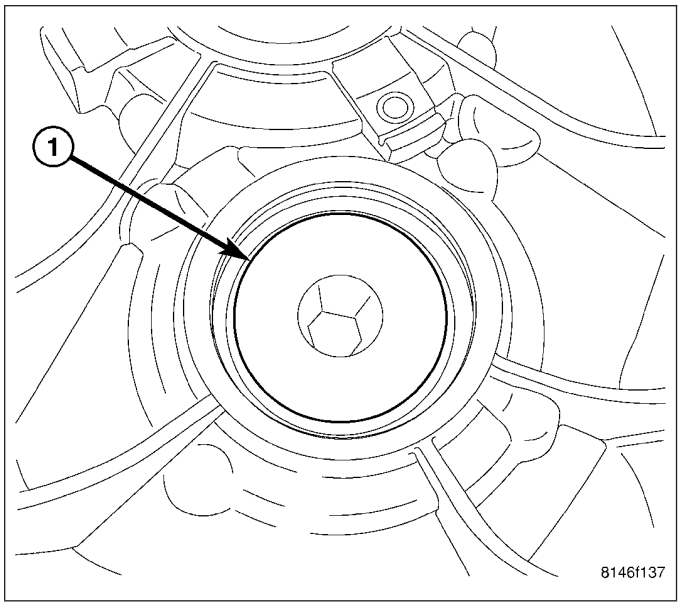
48. Install clutch bearing release support (1) and tighten bolts (2) to 10 N·m (88 in. lbs.).



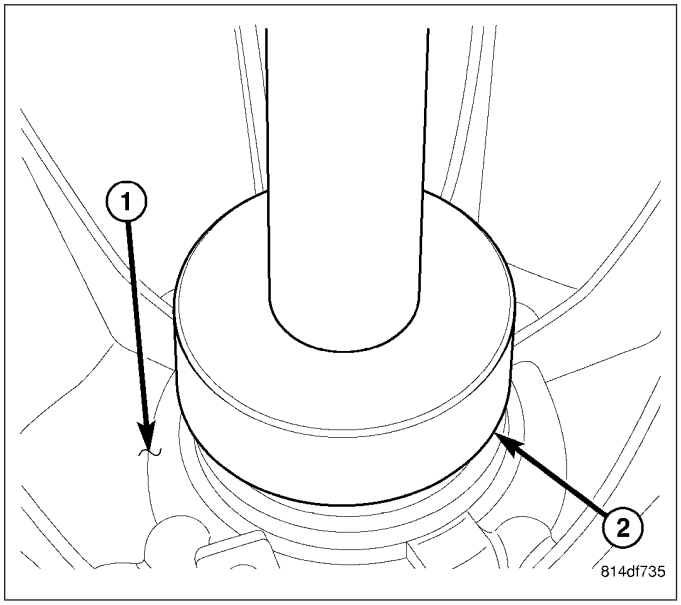
49. Install Wrench 9586 (1) on input shaft (2).



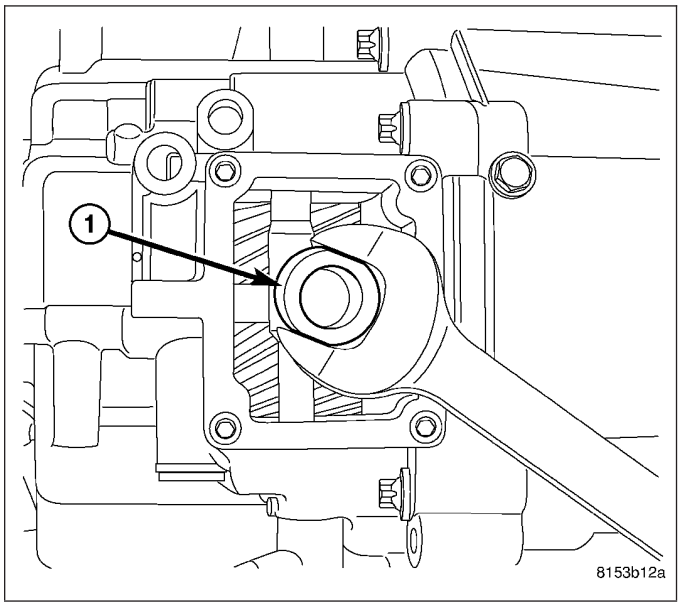
50. Install countershaft allen bolt (1) in front housing. Tighten allen bolt (1) to 90 N·m (66 ft. lbs.).



51. Install countershaft plug in front housing (1) with Installer 9622 (2) and Handle C-4171.

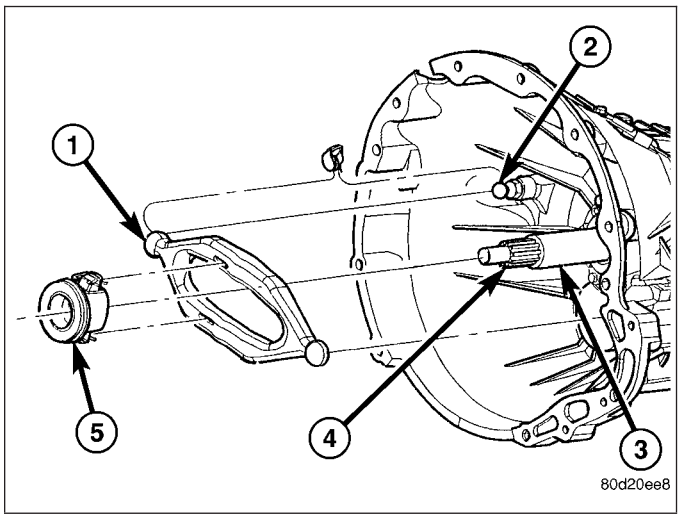


52. Install the cover plate for the second shift tower location, if necessary.
53. Apply Mopar® Lock & Seal or equivalent to shifter socket threads and install shifter socket (1).

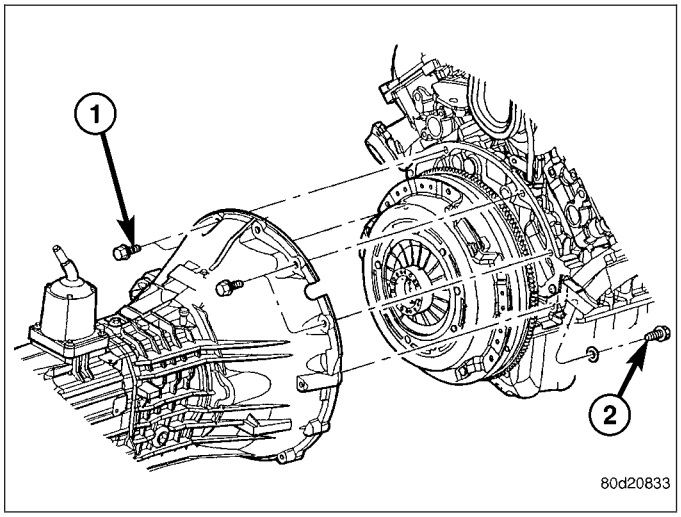


INSTALLATION

1. Clean transmission front housing mounting surface.
2. Apply light coat of Mopar high temperature bearing grease or equivalent to contact surfaces of following components:
   - release fork (1) ball stud (2)
   - release bearing slide surface (3)
   - input shaft splines (4)
   - release bearing bore (5)
   - propeller shaft slip yoke.



3. Support and secure transmission to jack.
4. Raise and align transmission input shaft with clutch disc, then slide transmission into place.
5. Verify front housing is fully seated. Install transmission bolts without washers (1) and tighten bolts into the engine to 41 N·m (30 ft. lbs.). Tighten the bolts with washers (2) into the transmission to 68 N·m (50 ft. lbs.).
6. Install rear crossmember and tighten nuts to 102 N·m (75 ft. lbs.).
7. Install transmission rear mounting bolts and tighten to 68 N·m (50 ft. lbs.).
8. Install front dust shield tighten bolt to 4.5 N·m (40 in. lbs.). If cover was removed, install onto the transmission and engine (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).



9. Install structural dust cover and tighten the bolts to 54 N·m (40 ft. lbs.).
10. Install starter motor.
11. Install suspension crossmember and tighten nuts to 102 N·m (75 ft. lbs.).
12. Connect transmission harnesses to clips on case and connect switches.
13. Install slave cylinder and tighten cylinder nuts to 23 N·m (200 in. lbs.).
14. Install transfer case and transfer case linkage if equipped.
15. Remove transmission jack.
16. Install propeller shaft/shafts with reference marks aligned.
17. Install exhaust on the exhaust manifolds.
18. Fill transmission with lubricant. Correct fill level is to bottom edge of fill plug hole.

SPECIFICATIONS

GETRAG 238 – MANUAL TRANSMISSION

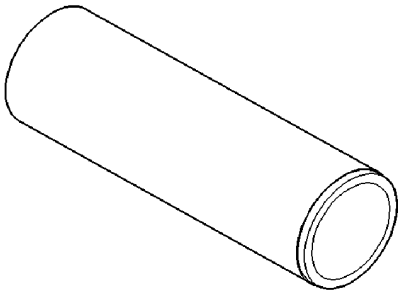
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Drain Plug	50	37	-
Fill Plug	50	37	-
Shift Tower Bolts	10	-	88
Back Up Lamp Switch Bolt	10	-	88
4x2 Output Flange Bolt	200 then loosen and tighten to 170	147 then loosen and tighten to 125	-
4x4 Output Shaft Nut	200 then loosen and tighten to 170	147 then loosen and tighten to 125	-
Housing Bolts	22	16	-
Shift Rail Support Bolts	10	-	88
Intermediate Support Bolts	22	16	-
Intermediate Support Race Retainer Bolt	22	16	-
Countershaft Bolt	90	66	-
Reverse Idler Gear Shaft Bolt	25	18	-
Mainshaft, Countershaft Bearing Retainer Bolts	10	-	88
Input Shaft Retainer Bolts	10	-	88
Shift Fork Pivot Bolts	35	26	-
Support Braket to Trans Bolts	54	40	-

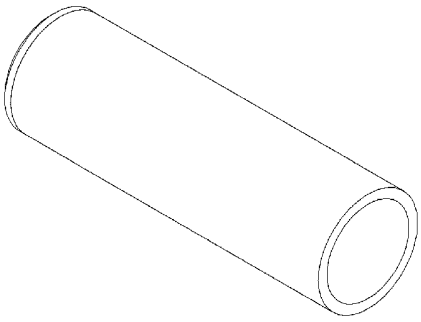
GEAR SPECIFICATIONS

GEAR	RATIO
FIRST	4.23
SECOND	2.53
THIRD	1.67
FOURTH	1.23
FIFTH	1.00
SIXTH	0.79
REVERSE	3.84

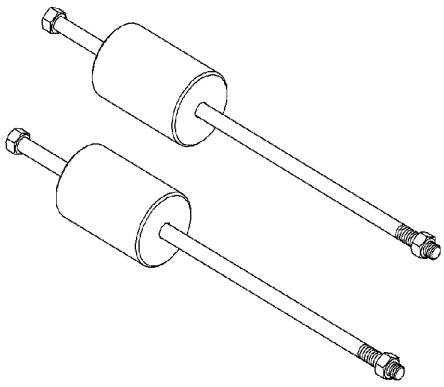
SPECIAL TOOLS



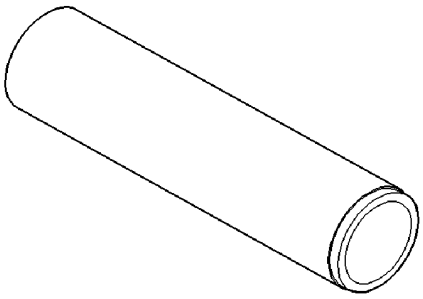
TUBE C-3717



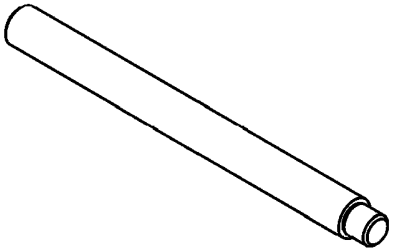
TUBE D-389



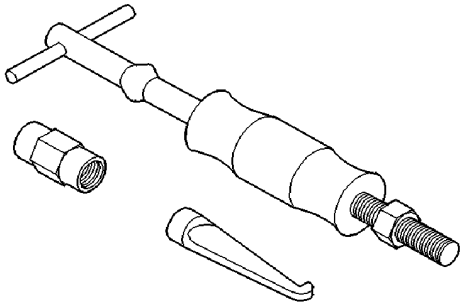
SLIDE HAMMER C-3752



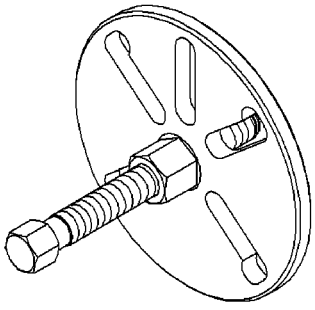
TUBE W-262



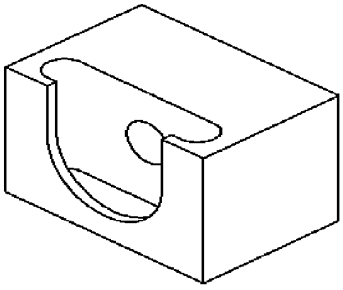
BEARING INSTALLER 8475



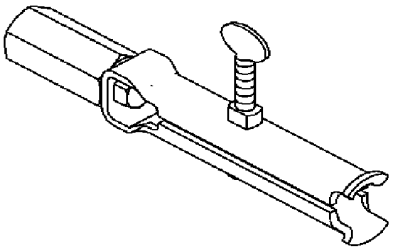
SLIDE HAMMER C-637



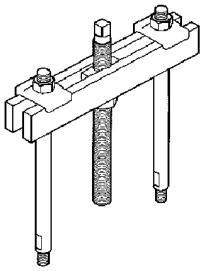
FLANGE PULLER 8992



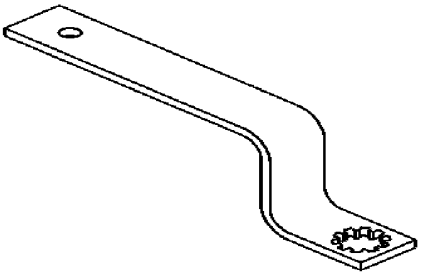
DETENT PULLER 9583



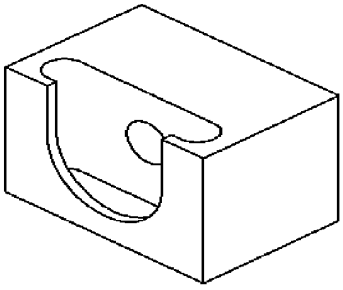
BEARING PULLER 9585



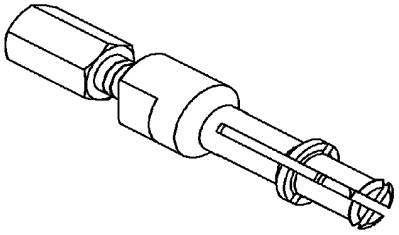
BRIDGE 938



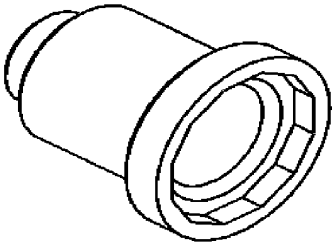
INPUT SHAFT WRENCH 9586



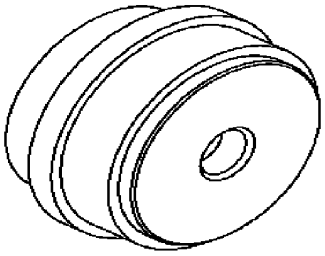
DETENT PULLER 9583



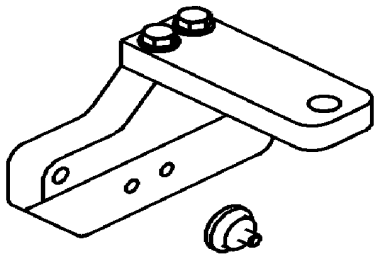
BEARING PULLER 9609



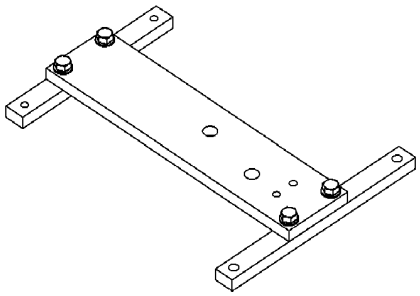
SOCKET 9584



RACE REMOVER/INSTALLER 9617



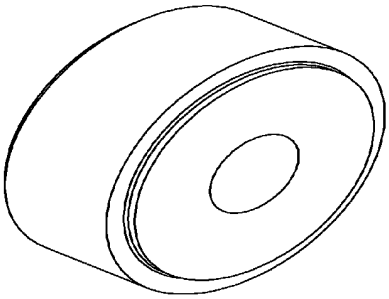
HOUSING PULLER 9618



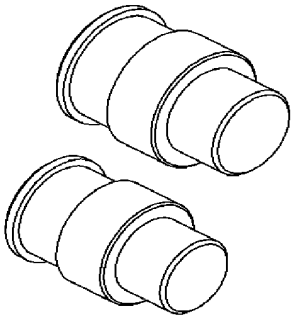
HOUSING PULLER 9621



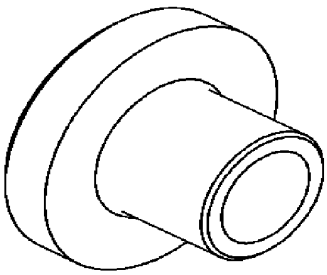
BUTTON 9618-2



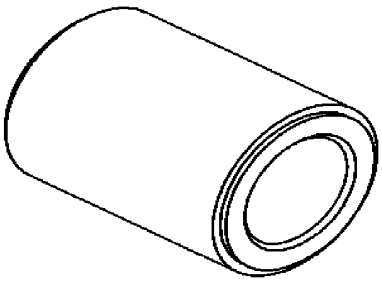
PLUG INSTALLER 9622



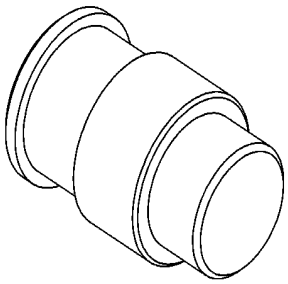
HEAT PLUG 9619-1 & 9619-2



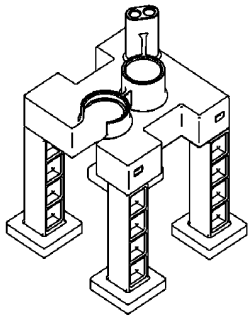
BEARING INSTALLER 9624



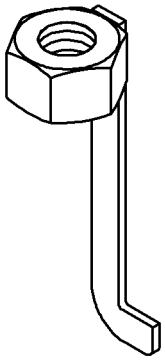
INPUT SEAL INSTALLER 9620



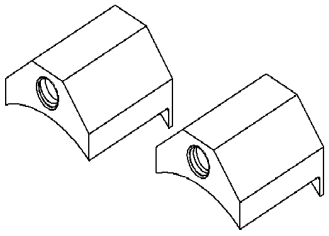
HEAT PLUG 9625



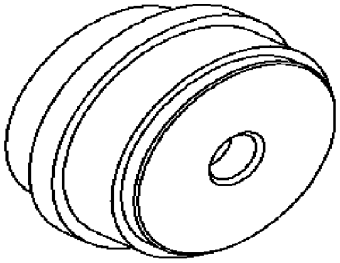
BUILD FIXTURE 9626



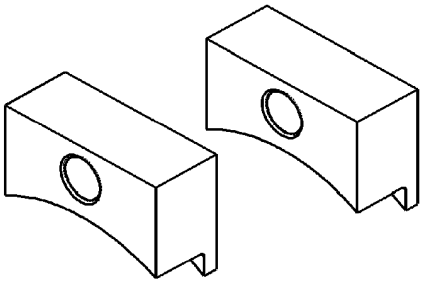
SEAL REMOVER 9667



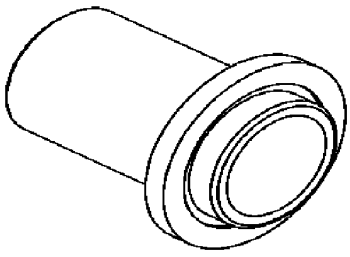
GEAR PULLER ADAPTER 9627



RACE REMOVER/INSTALLER 9668



GEAR PULLER ADAPTER 9628



SEAL INSTALLER 9629

MANUAL TRANSMISSION - G56 - SERVICE INFORMATION

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MANUAL TRANSMISSION - G56 - SERVICE INFORMATION

DIAGNOSIS AND TESTING

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill or incorrect lubricant level check.

Rear transmission leaks will be from the oil seals or component mating surfaces.

Front transmission leaks will be from the front input shaft retainer seal. Lubricant may drip from the clutch housing after extended operation. If leak is severe, it may contaminate the clutch disc.

Lubricant level check can only be made when the vehicle is level and allowing the lubricant to settle for a minute before checking. This will ensure an accurate check and avoid an under or overfill condition.

HARD SHIFTING

Hard shifting is usually caused by low lubricant level, improper or contaminated lubricants. This will cause noise, excessive wear, internal bind, and hard shifting. Substantial lubricant leaks can result in gear, shift rail, synchro, and bearing damage. The first indications of component damage is usually hard shifting and noise.

Shift component damage, clutch adjustment, worn pressure plate or disc are also causes of increased shift effort. If clutch problem is advanced, gear clash during shifts can result. Worn or damaged synchronizer rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing hard or noisy shifts. In most cases, this condition will decline as the rings wear-in.

TRANSMISSION NOISE

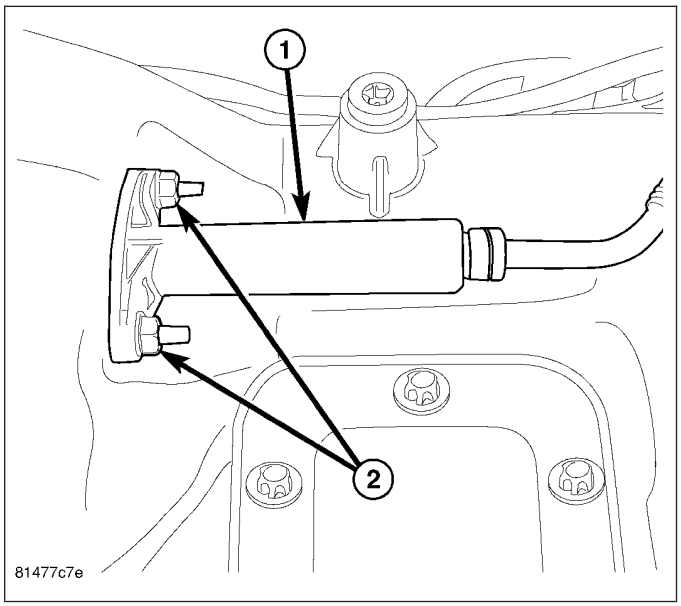
Most manual transmissions make some noise during normal operation. Rotating gears generate a mild whine that is audible, but generally only at extreme speeds.

Severe, highly audible transmission noise is generally the initial indicator of a lubricant problem. Insufficient, improper or contaminated lubricant will promote rapid wear of gears, synchronizer rings, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear and bearing damage.

REMOVAL

1. With vehicle in neutral, position vehicle on hoist.
2. Disconnect battery negative cable.
3. Remove shift boot bezel screws and slide boot upward on shift lever extension.
4. Remove shift lever extension from the shift tower and lever assembly.
5. Remove skid plate, if equipped.
6. Remove drain plug and drain fluid.

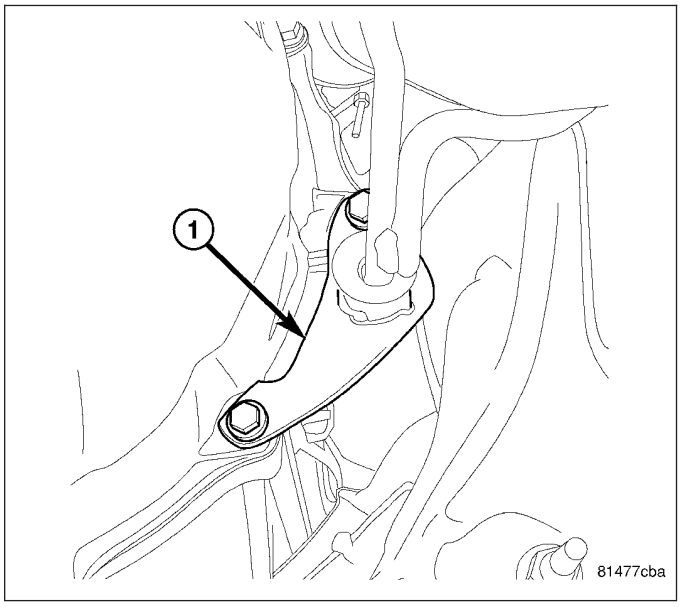
7. Mark propeller shaft/shafts and companion flange yoke/yokes for installation reference and remove propeller shaft/shafts.
8. Disconnect harness from clips on transmission housing.
9. Remove transfer case linkage 4x4 equipped.
10. Remove transfer case mounting nuts and remove transfer case 4x4 equipped.
11. Remove slave cylinder (1) mounting nut (2) and remove cylinder.



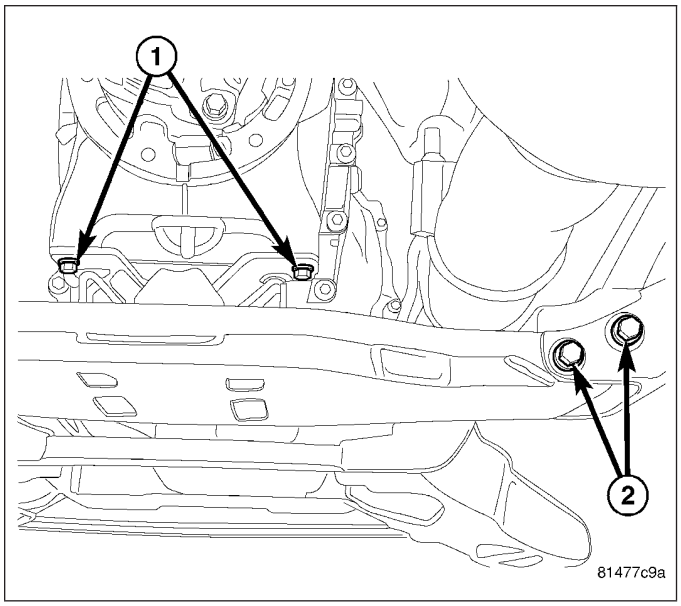
12. Remove starter motor (2), 5.7L structural dust cover (3) bolts to clutch housing, dust shield (1) bolt and suspension crossmember (4).

CAUTION: 5.7L engine only do not remove structural dust cover from enigne block. If cover is removed clutch housing and cover must be aligned with the engine.

13. Remove exhaust bracket (1) bolts and remove bracket.

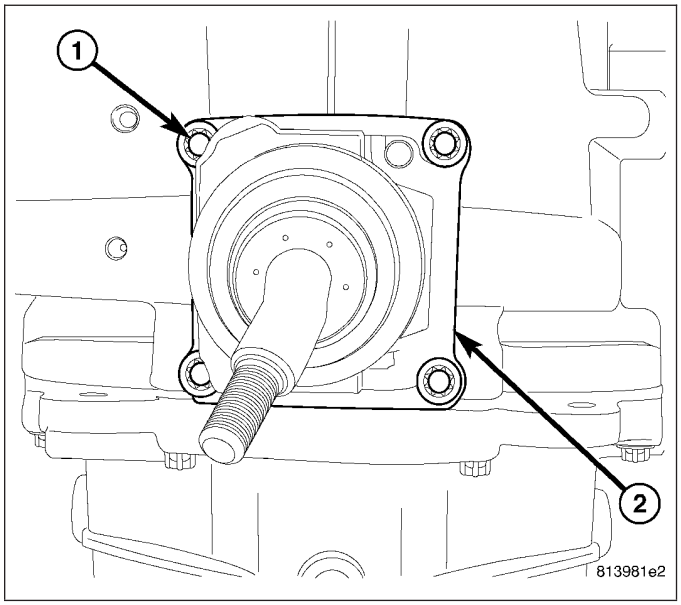


14. Support engine with adjustable jack stand and wood block.
15. Support and secure transmission to a transmission jack with safety chains.
16. Remove transmission mount bolts (1).
17. Remove rear crossmember bolts (2) and remove crossmember with transmission mount.
18. Remove bolts attaching transmission to the engine.
19. Move transmission rearward until input shaft is clear of clutch disc and pressure plate. Then lower jack and remove transmission from under vehicle.

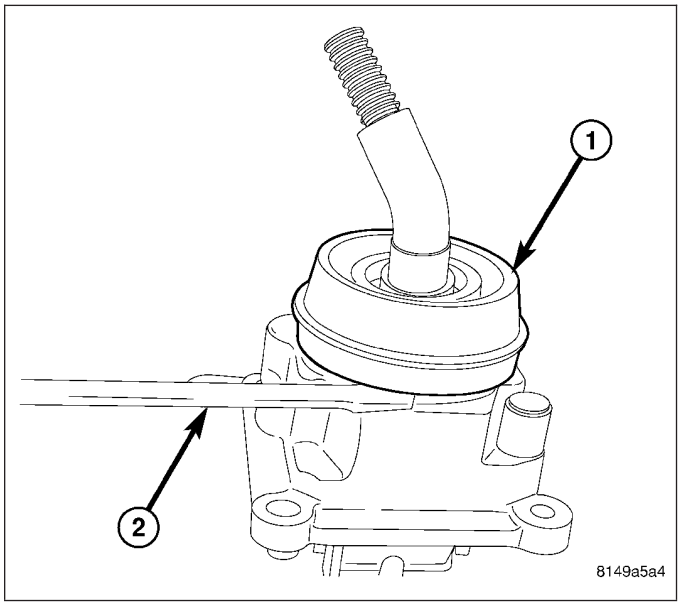


DISASSEMBLY

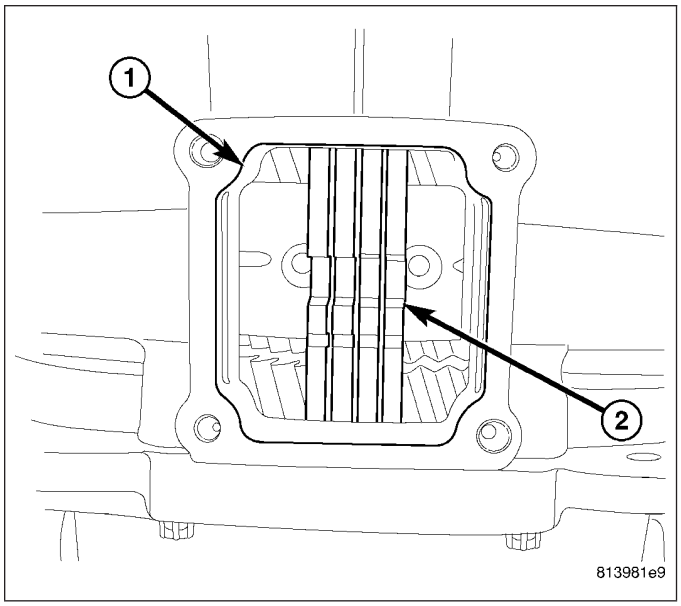
1. Set transmission on rear housing.
2. Remove shift tower bolts (1) and shift tower (2).



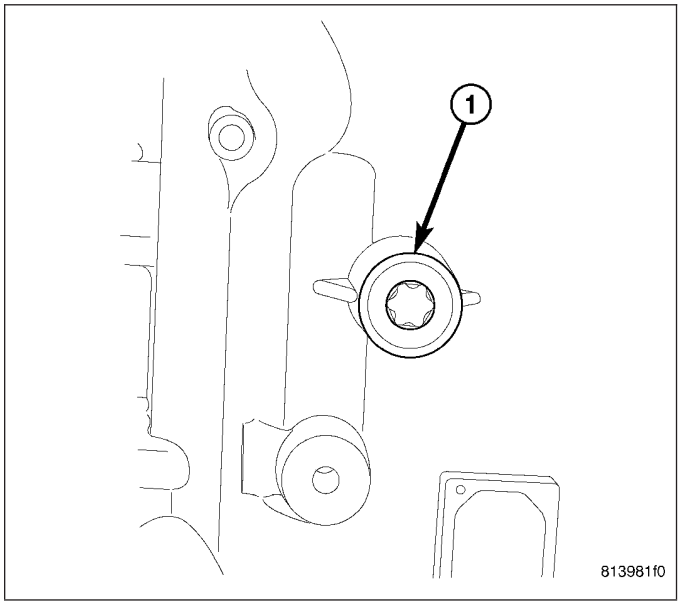
3. Pry off shift tower boot (1) with a screw driver (2).



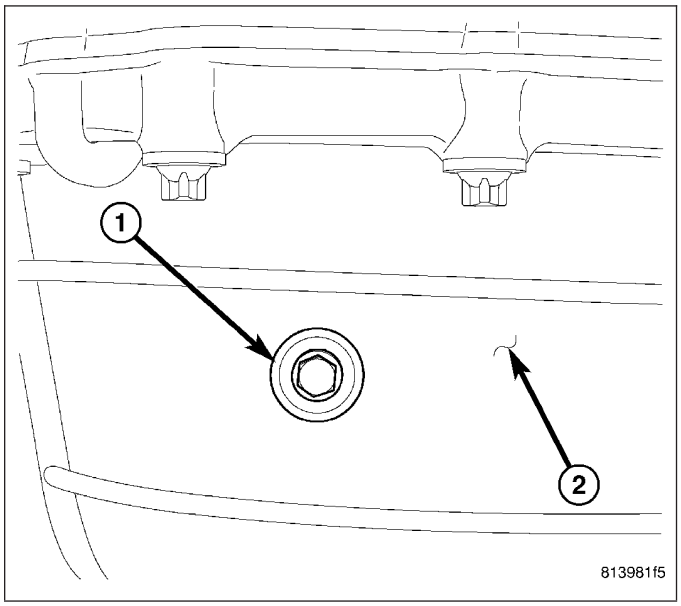
4. Through the shift tower opening (1) align shift rails (2) and install tie strap to shift rails.



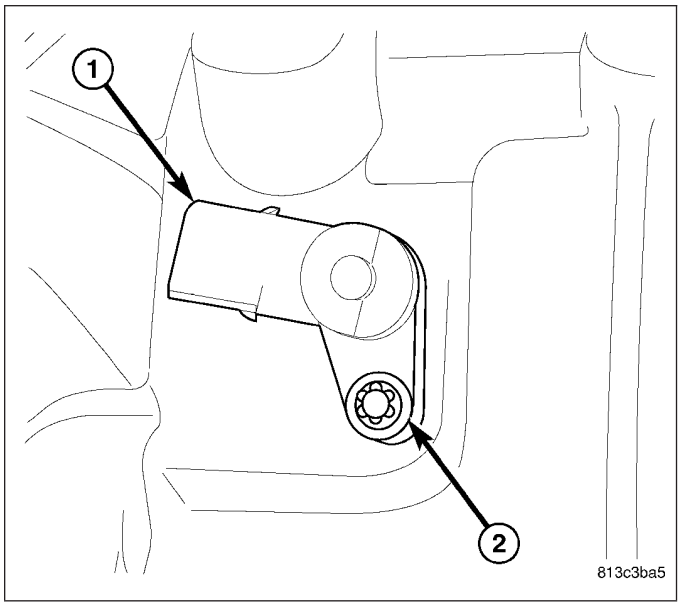
5. Remove 5-6 shift fork pivot pin (1) from both sides of the case.



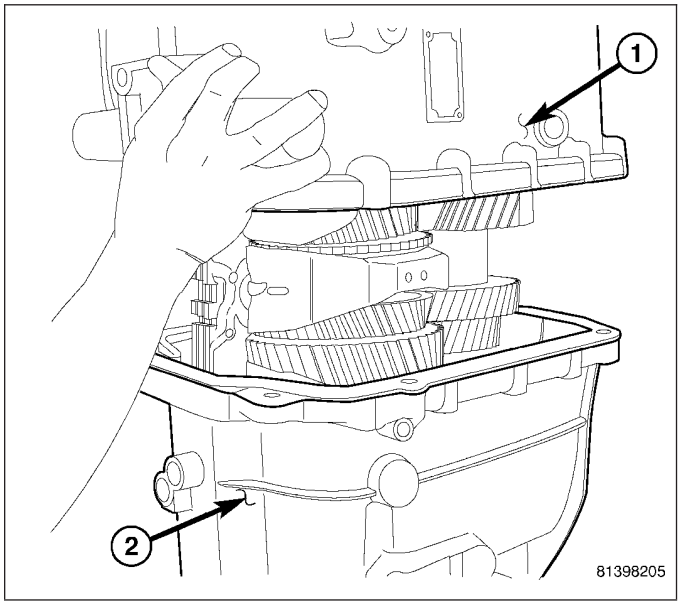
6. Remove reverse idler gear shaft pin (1) from the rear housing (2).



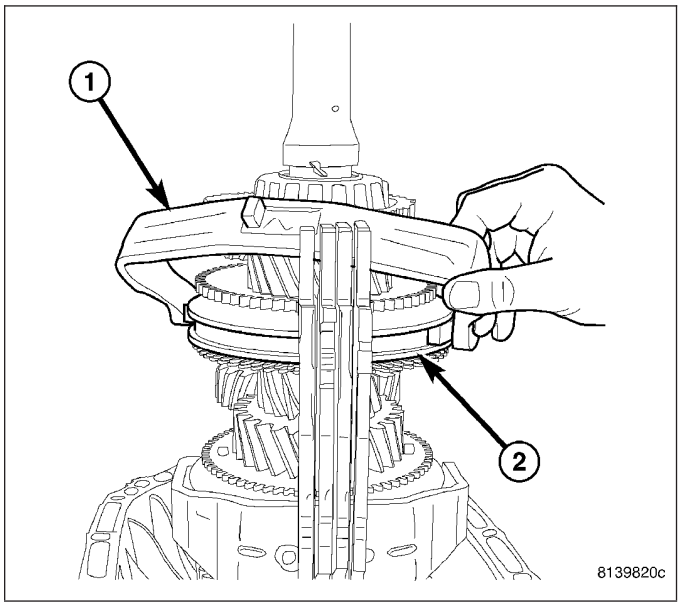
7. Remove back-up lamp switch (1) bolt (2) and remove switch.



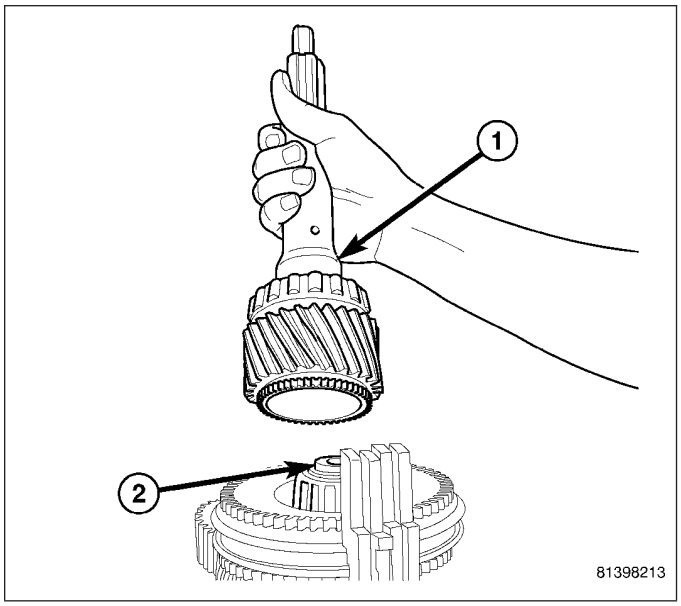
8. Remove transmission housing bolts.
9. Tap housing with dead-blow hammer and lift front housing (1) off rear housing (2).



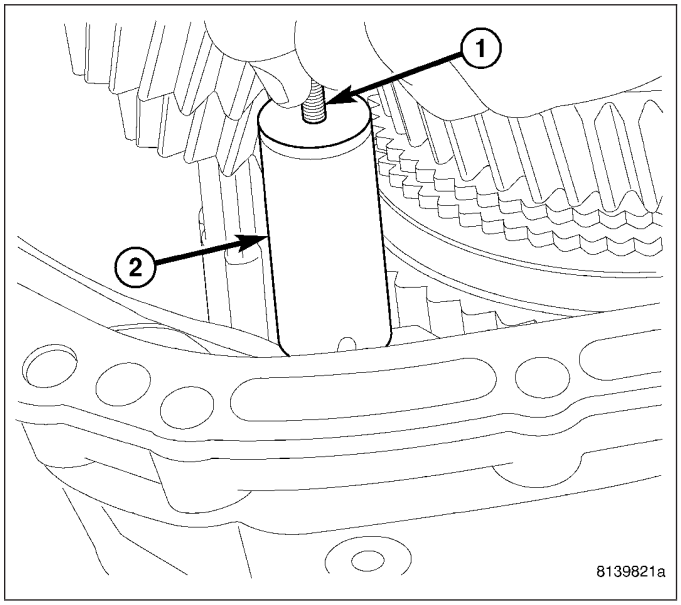
10. Remove 5-6 shift fork (1) from shift rail and synchronizer sleeve (2).



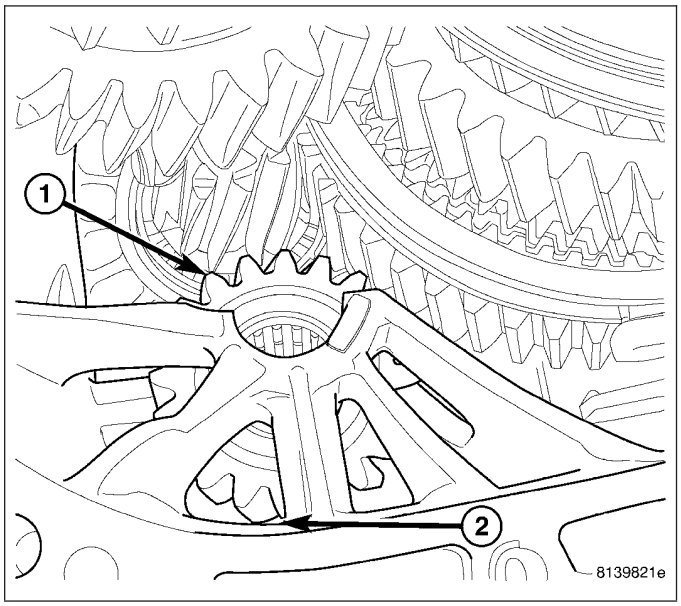
11. Remove input shaft (1) from mainshaft (2).



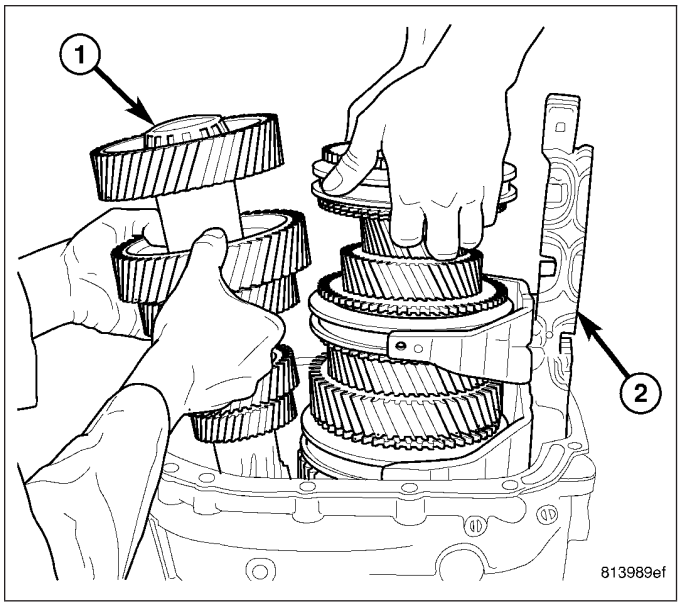
12. Thread a M6x1bolt (1) into the reverse idler gear shaft (2) and pull shaft out of rear housing.



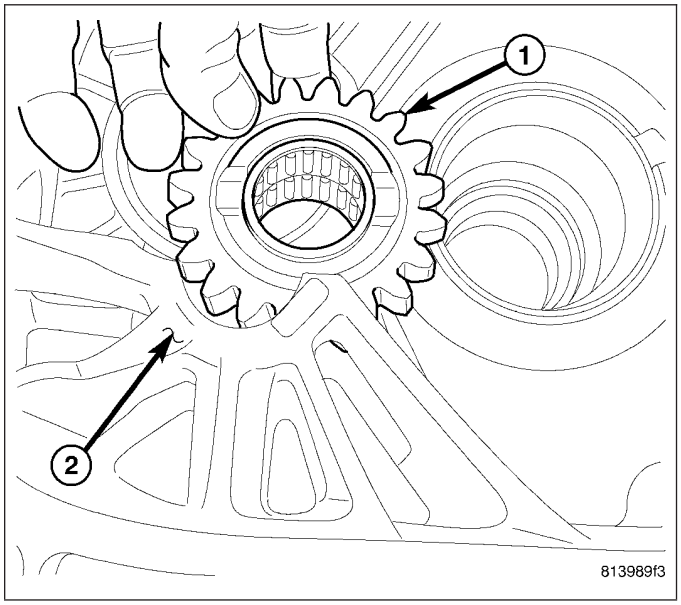
13. Slide reverse idler gear (1) off to the side of the case (2) for disassembly clearance.



14. Lift and tilt countershaft (1) then remove mainshaft with shift rails (2).
15. Remove countershaft.

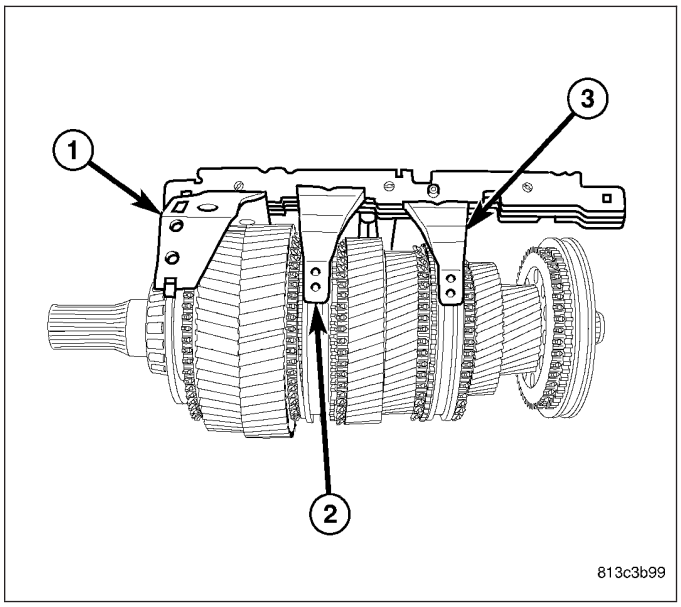


16. Remove reverse idler gear (1) from rear housing (2).

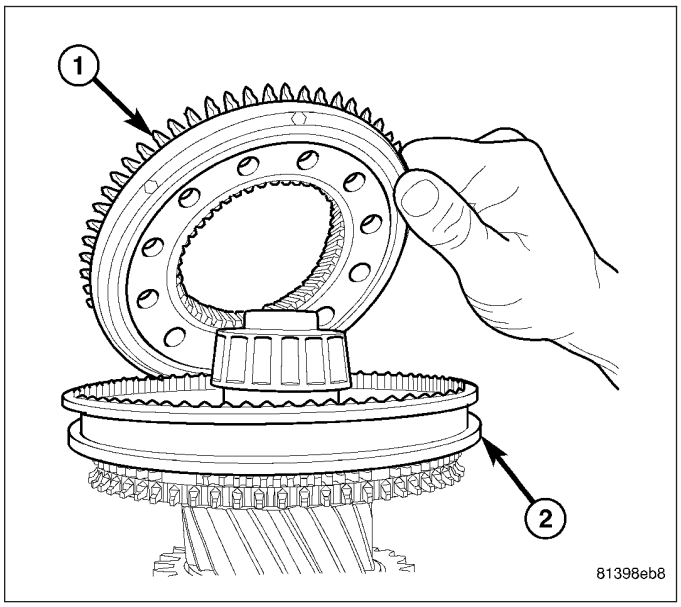


MAINSHAFT

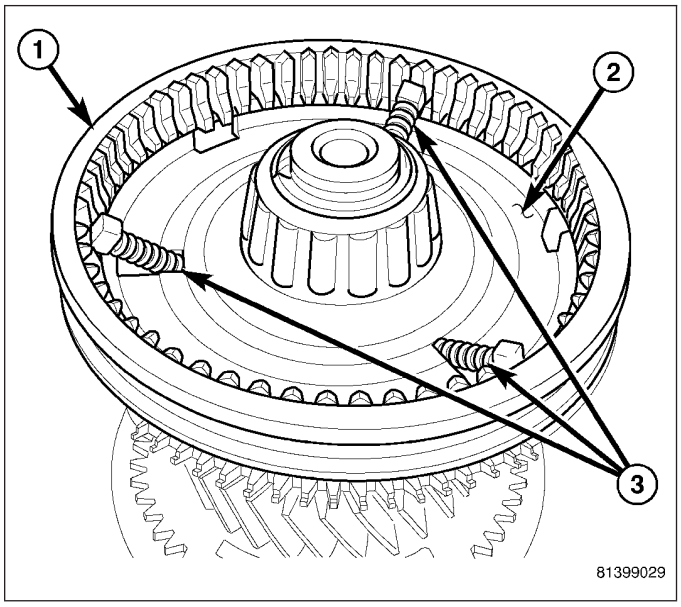
1. Remove reverse (1) 1-2 (2) and 3-4 (3) shift forks and shift rails as an assembly from mainshaft.



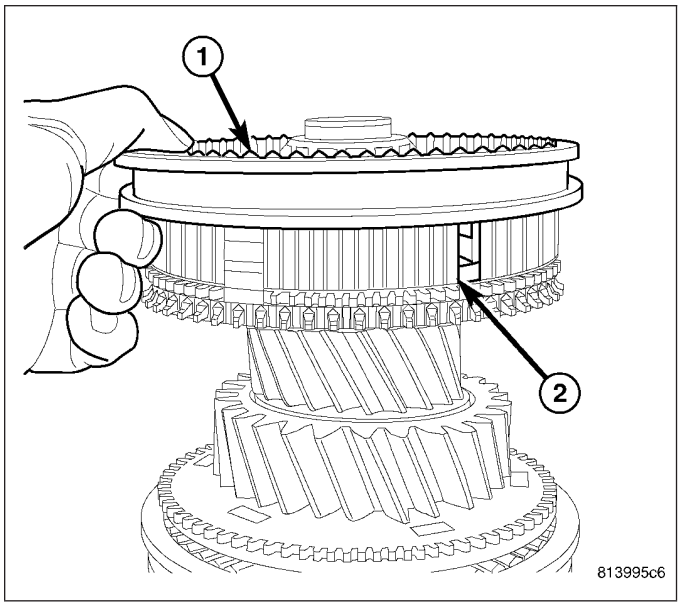
2. Position mainshaft in Fixture 9605 mounted in a vise with sixth gear up.
3. Remove fifth gear synchronizer rings (1) from 5-6 synchronizer hub (2).



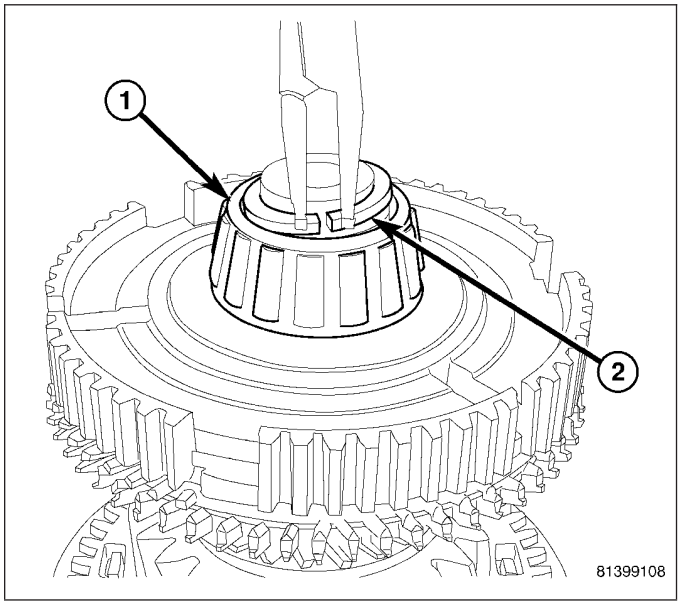
4. Slowly pull 5-6 synchronizer sleeve (1) up on hub (2) enough to remove detents and springs (3).



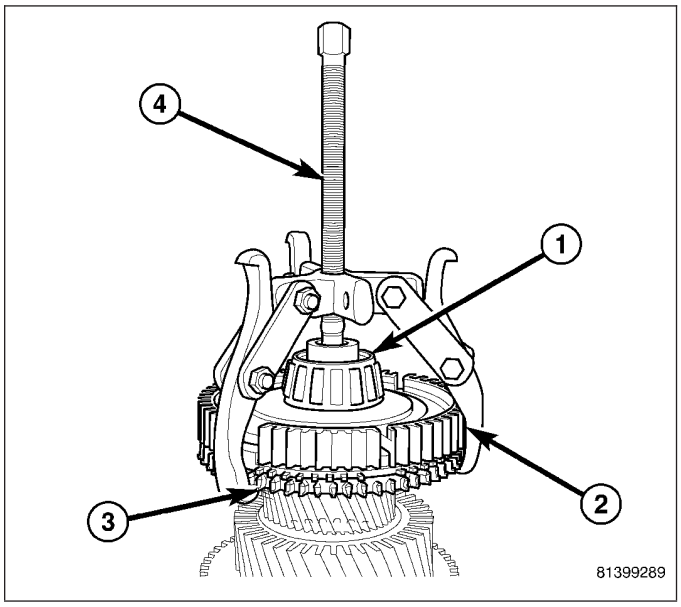
5. Remove 5-6 synchronizer sleeve (1) from hub (2).



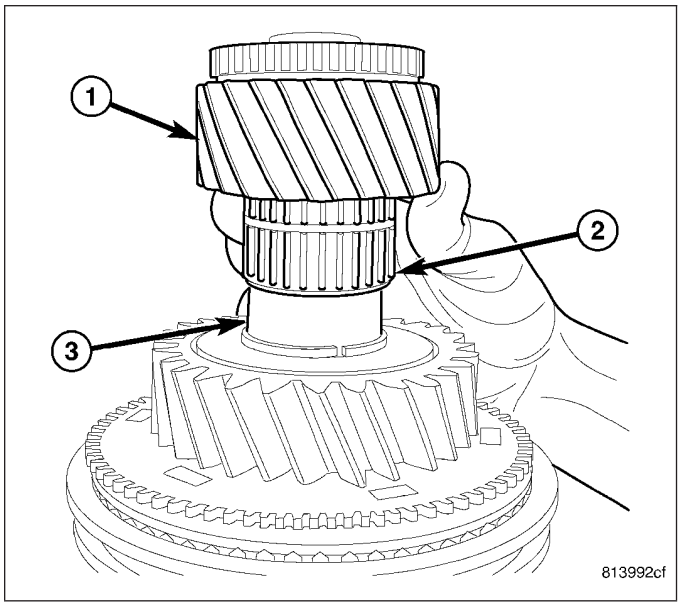
6. Remove mainshaft bearing (1) snap ring (2).



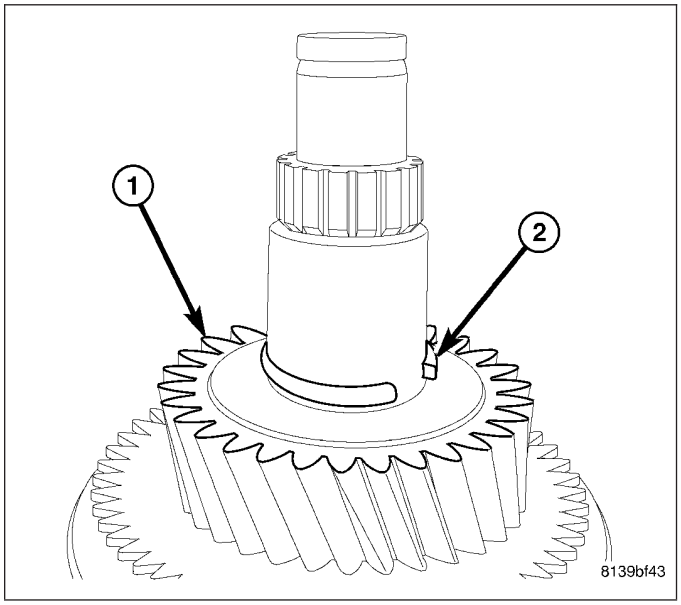
7. Remove mainshaft bearing (1), 5-6 synchronizer hub (2), and sixth gear synchronizer rings (3) with three jaw puller (4). Position puller jaws under sixth gear synchronizer rings (3).



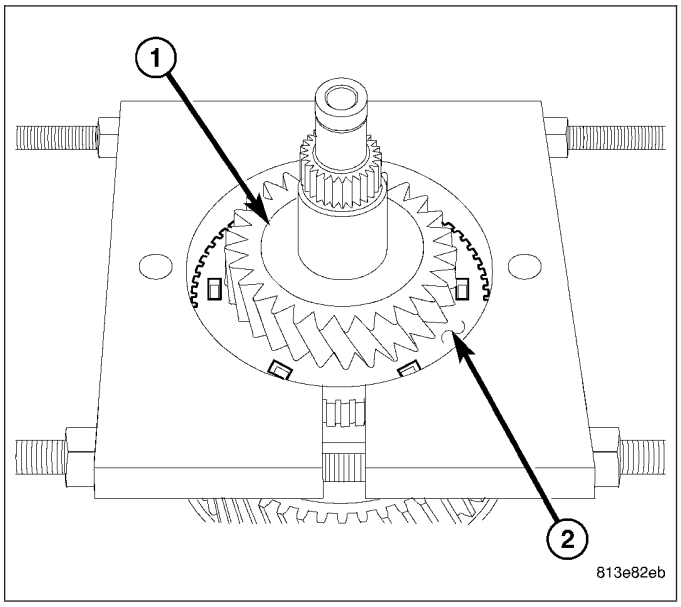
8. Remove sixth gear (1) and bearing (2) from mainshaft (3).



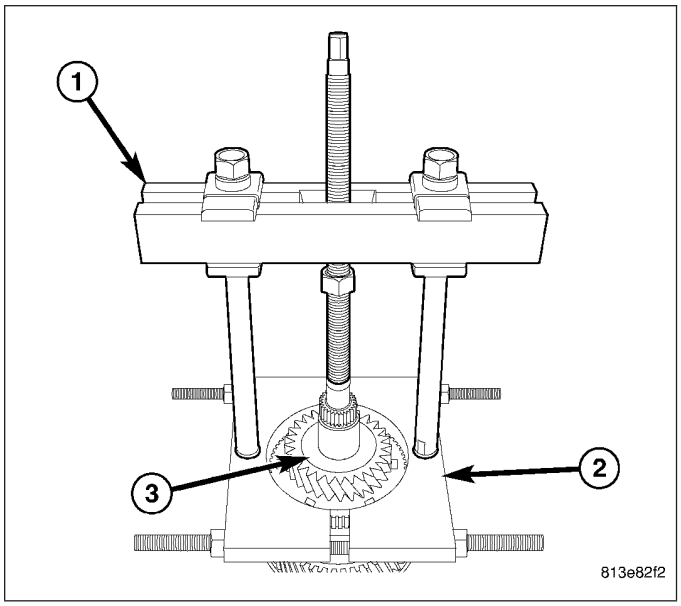
9. Remove fourth gear (1) snap ring (2).



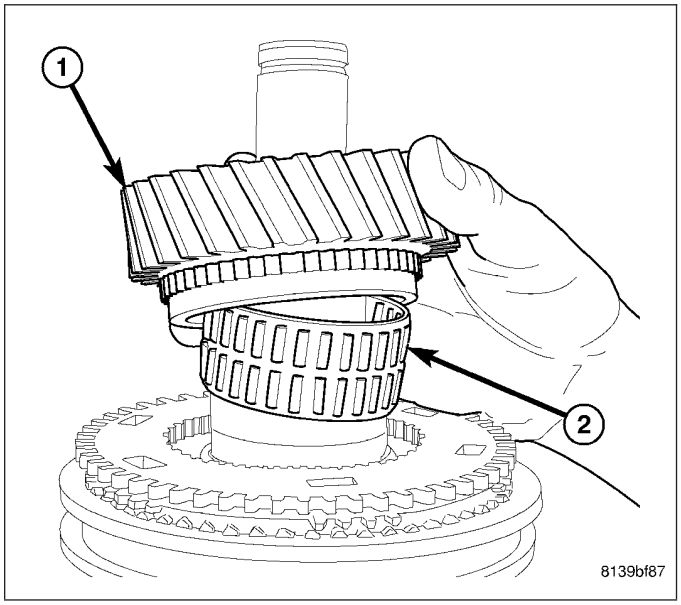
10. Remove fourth gear thrust washer (1) with Puller 9594. Position puller under fourth gear synchronizer stop ring (2).



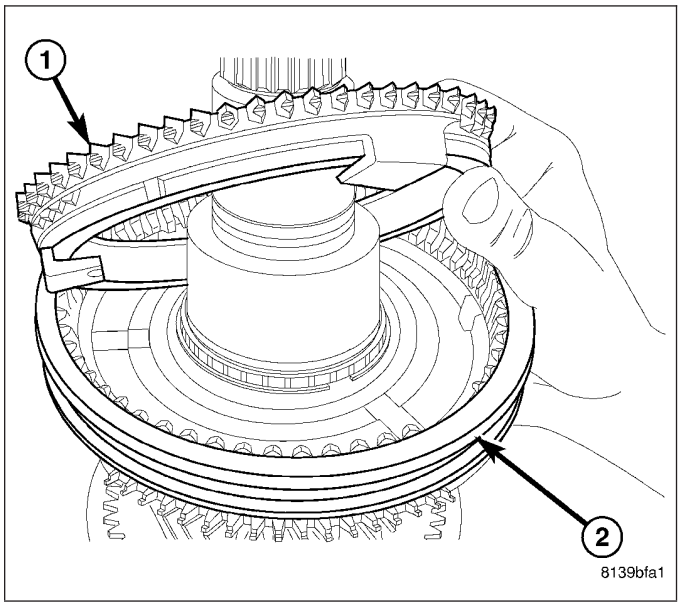
11. Install Bridge 938 (1) into Puller 9594 (2) and remove fourth gear thrust washer (3).



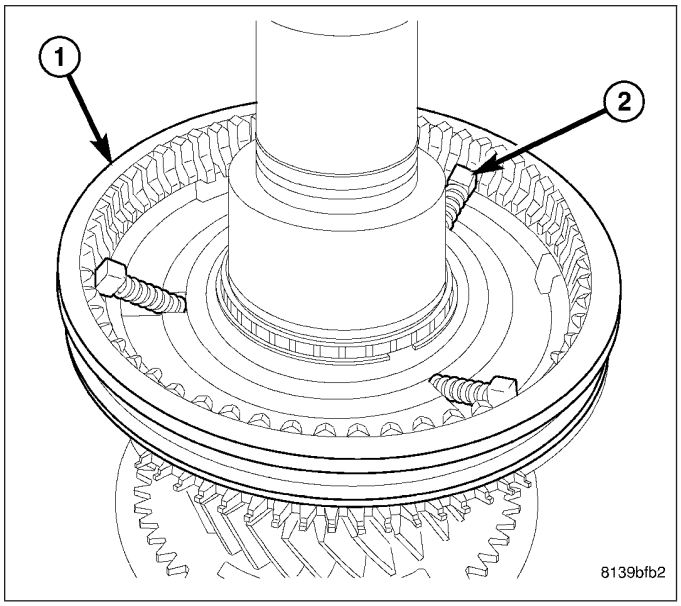
12. Remove fourth gear (1) and bearing (2).



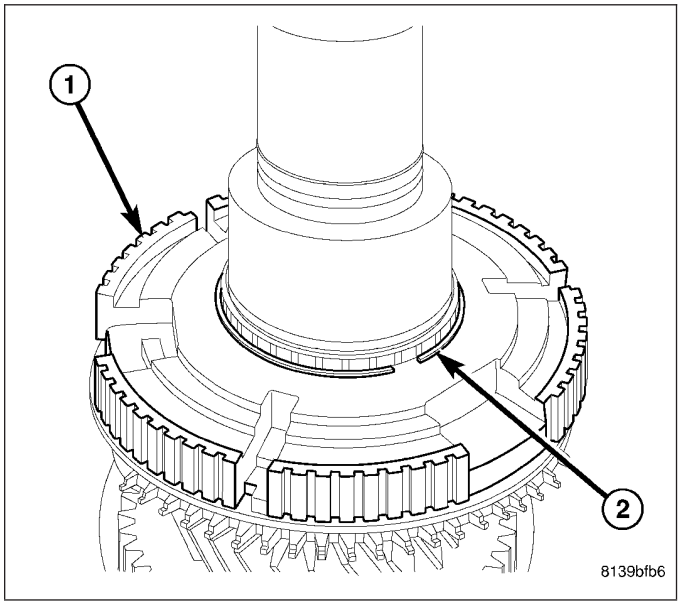
13. Remove fourth gear synchronizer rings (1) from 3-4 synchronizer hub (2) and mark installation reference.



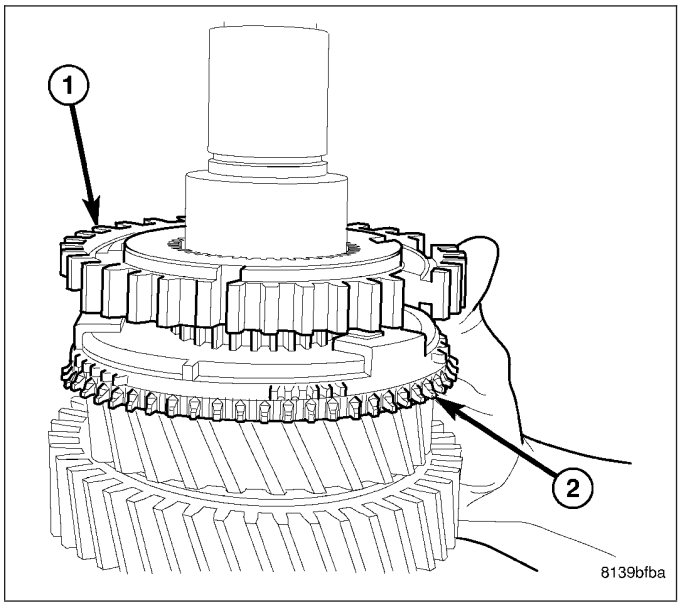
14. Slowly pull 3-4 synchronizer sleeve (1) up on hub enough to remove detents and springs (2).
15. Remove 3-4 synchronizer sleeve (1) from hub (2).



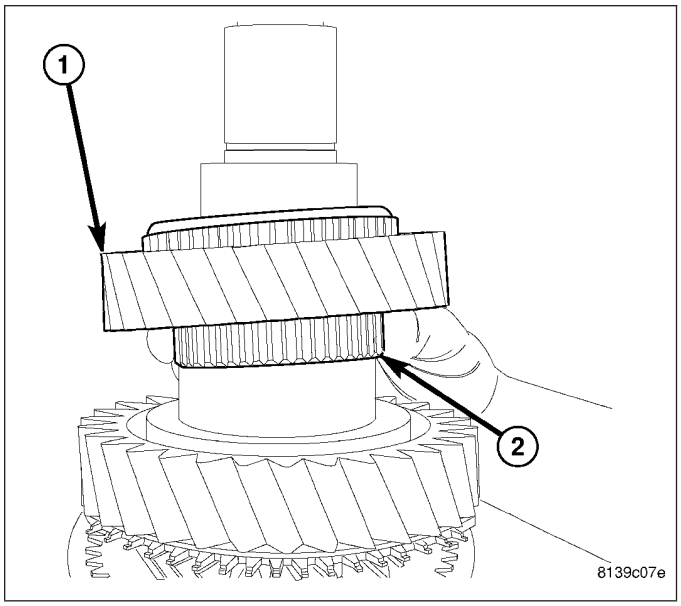
16. Remove 3-4 synchronizer hub (1) snap ring (2).



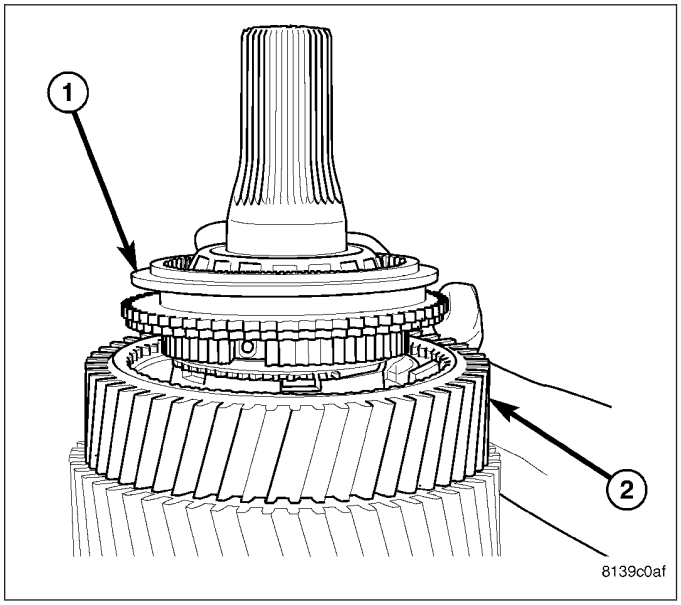
17. Remove 3-4 synchronizer hub (1) and third gear synchronizer rings (2). Mark components for installation reference.



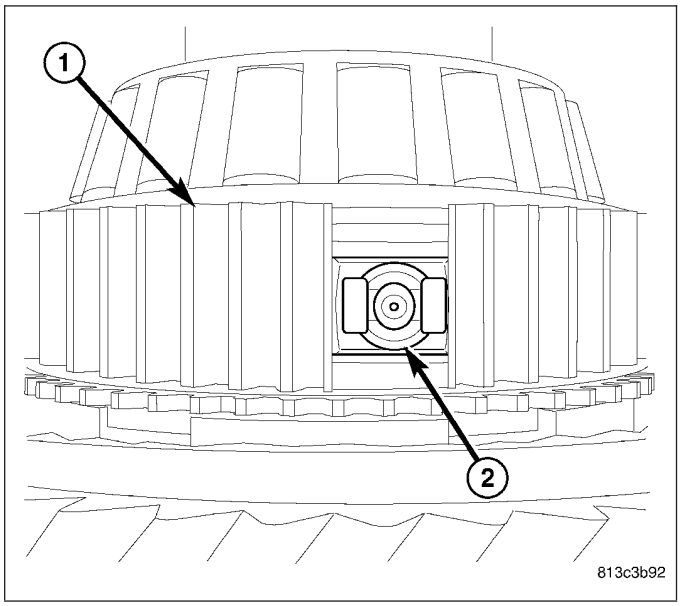
18. Remove third gear (1) and bearing (2).



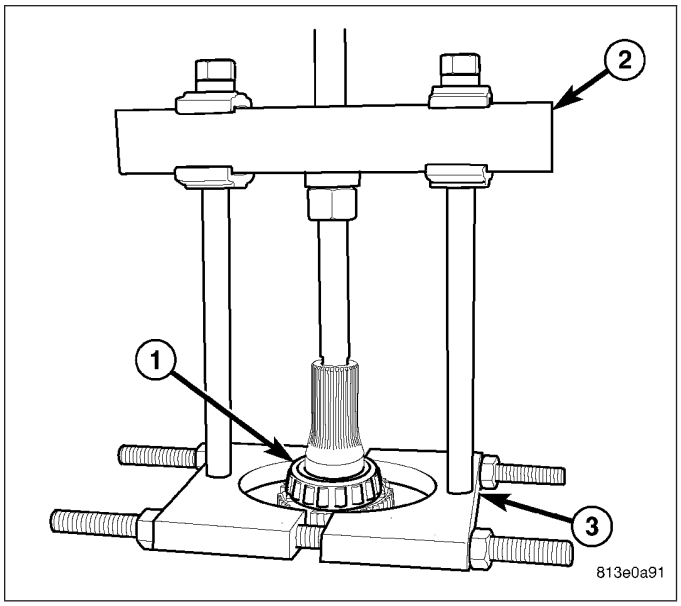
19. Turn mainshaft and Fixture 9605 and secured in vise.
20. Remove 4x4 mainshaft snap ring.
21. Remove reverse gear synchronizer sleeve (1) from reverse gear (2) synchronizer hub.



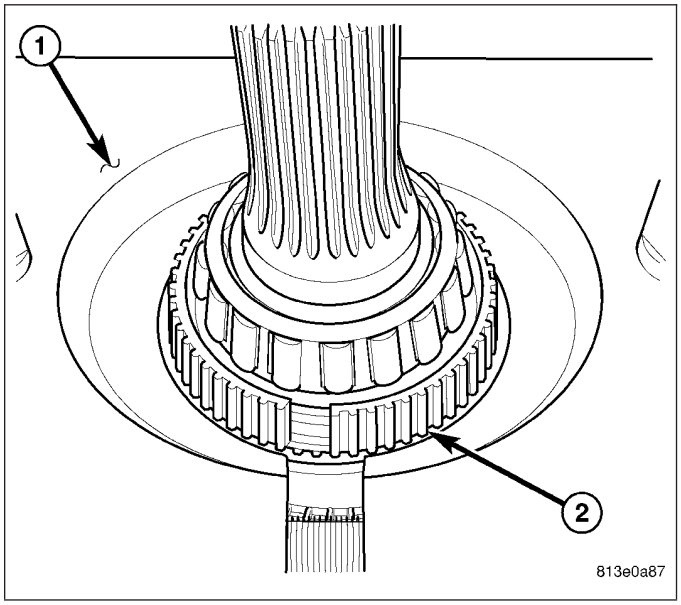
22. Remove reverse gear synchronizer hub (1) detents (2).



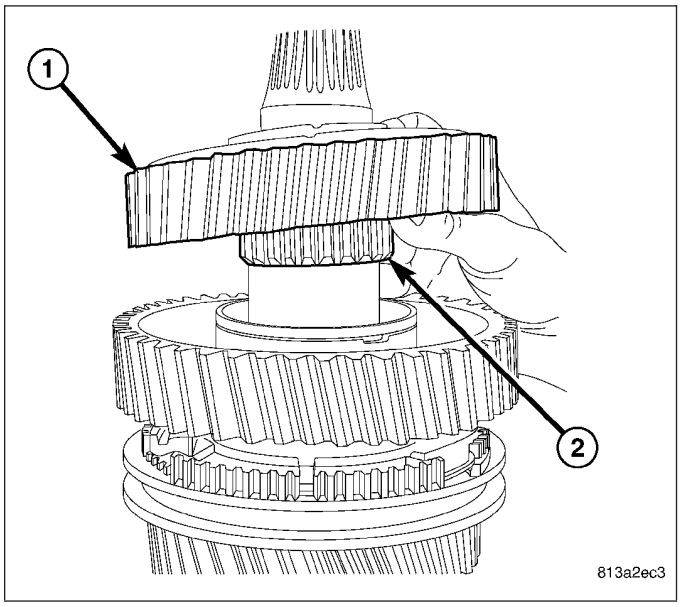
23. Remove mainshaft bearing (1) with Bridge 938 (2) and bearing Puller 9647 (3).



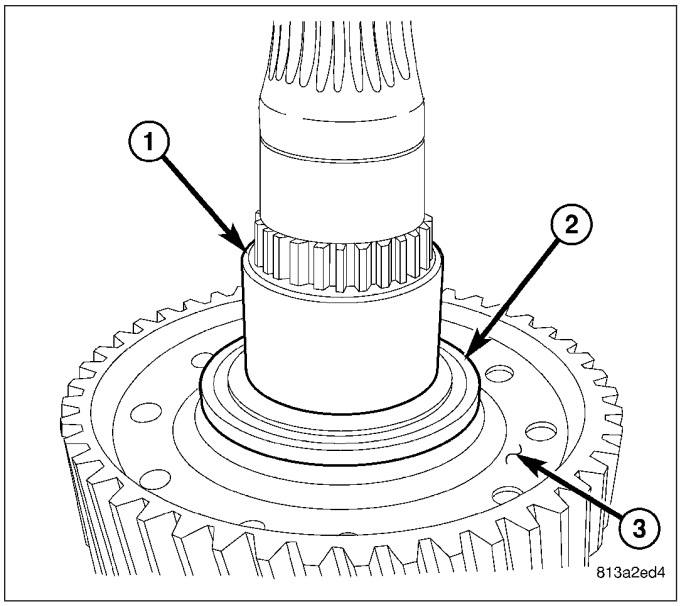
24. Position puller (1) behind reverse synchronizer hub and outer blocker ring (2).



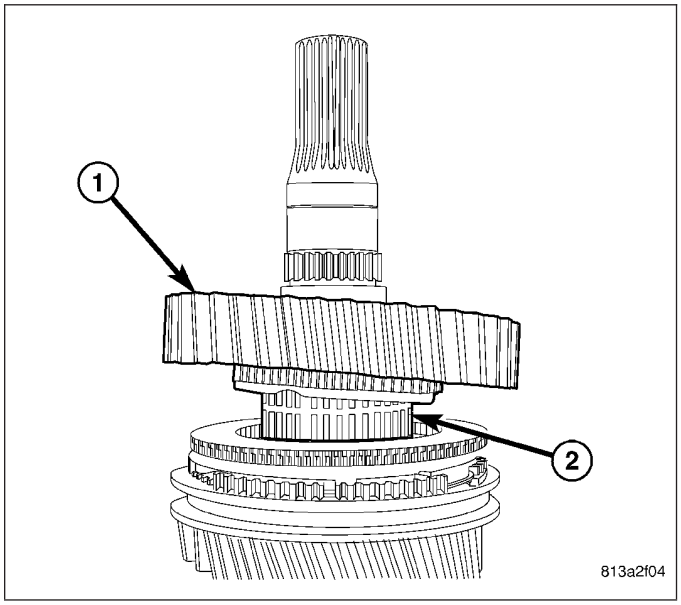
25. Remove reverse gear (1) and bearing (2).



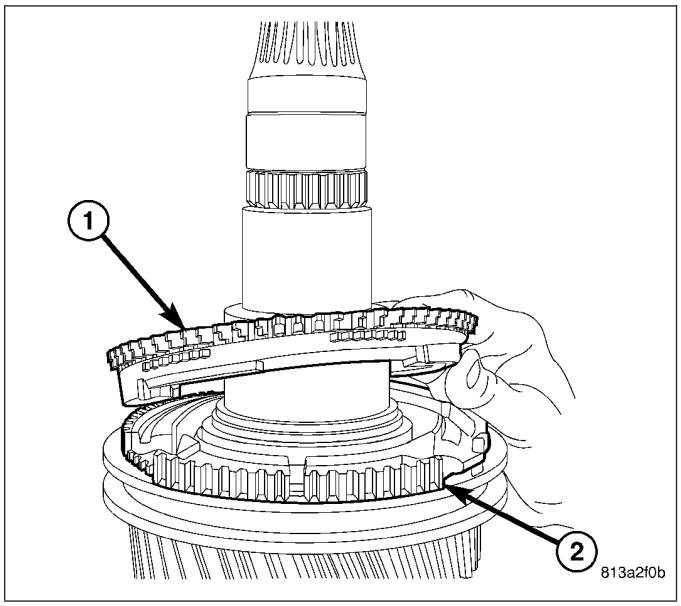
26. Remove reverse gear bearing race (1) and thrust washer (2). Use Puller 9646 and Bridge 938 on first gear (3) to pull off reverse gear bearing race (1) and thrust washer (2).



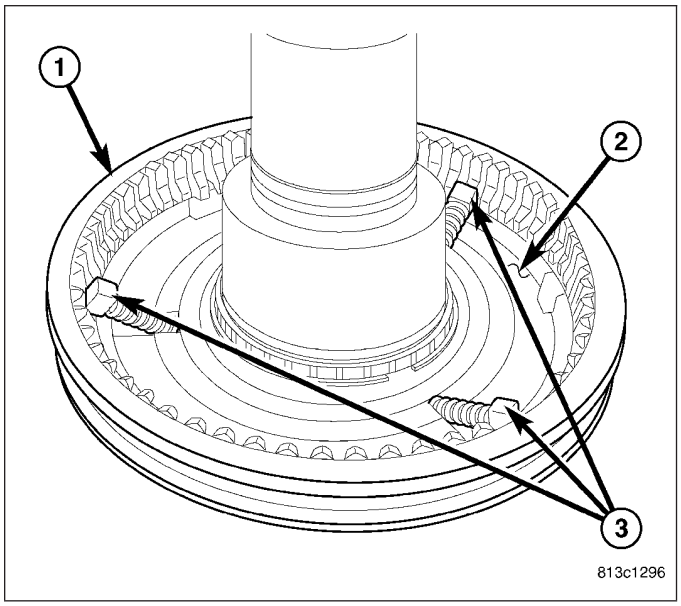
27. Remove first gear and bearing.



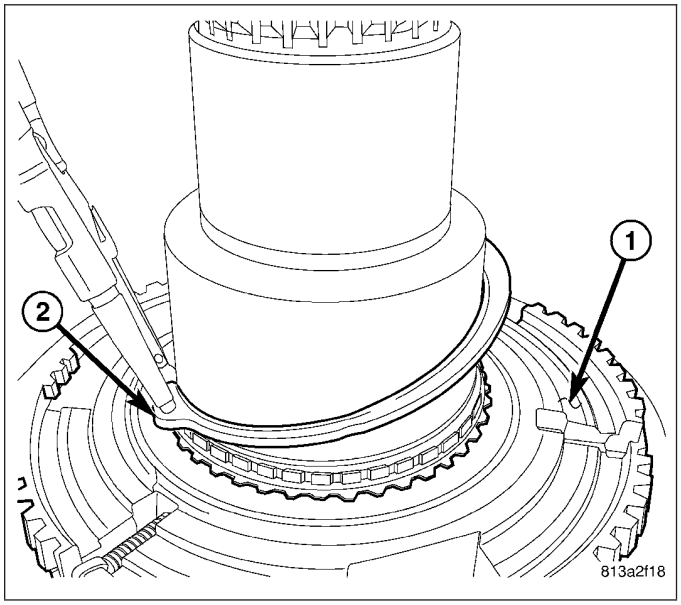
28. Remove first gear synchronizer rings (1) from 1-2 synchronizer hub (2) and mark for installation reference.



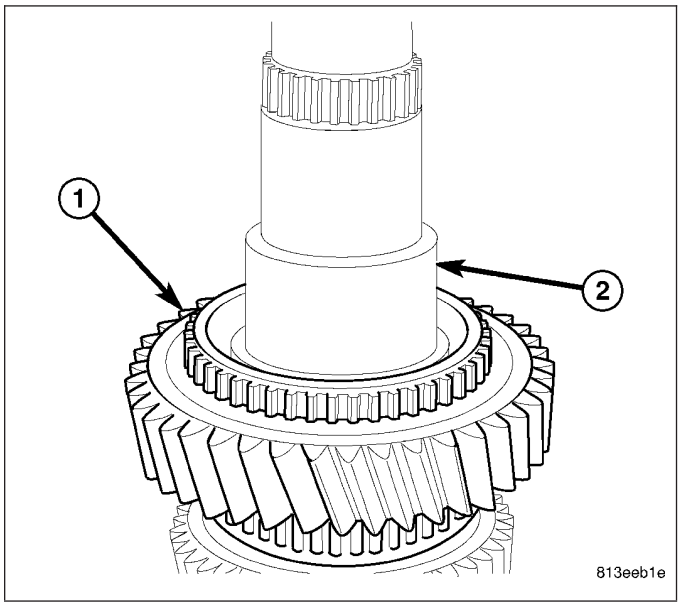
29. Slowly pull 1-2 synchronizer sleeve (1) up on hub (2) enough to remove detents and springs (3).



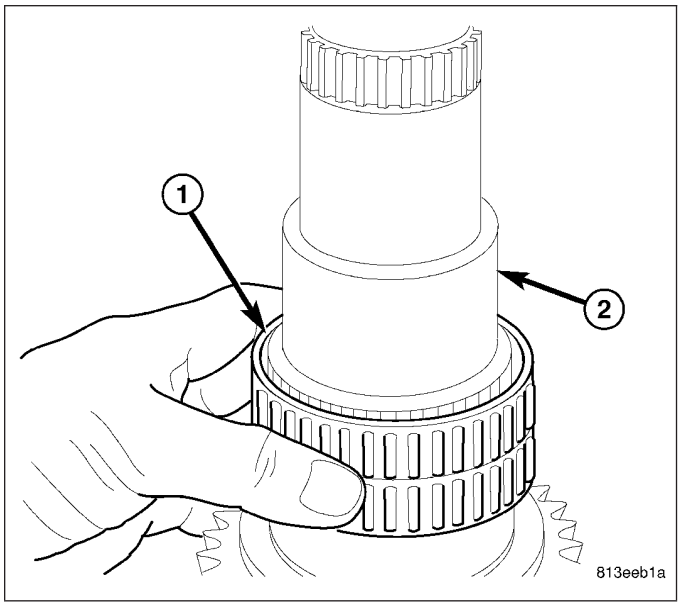
30. Remove 1-2 synchronizer hub (1) snap ring (2) and remove hub with second gear synchronizer rings. Mark components for installation reference.



31. Remove second gear (1) from mainshaft (2).



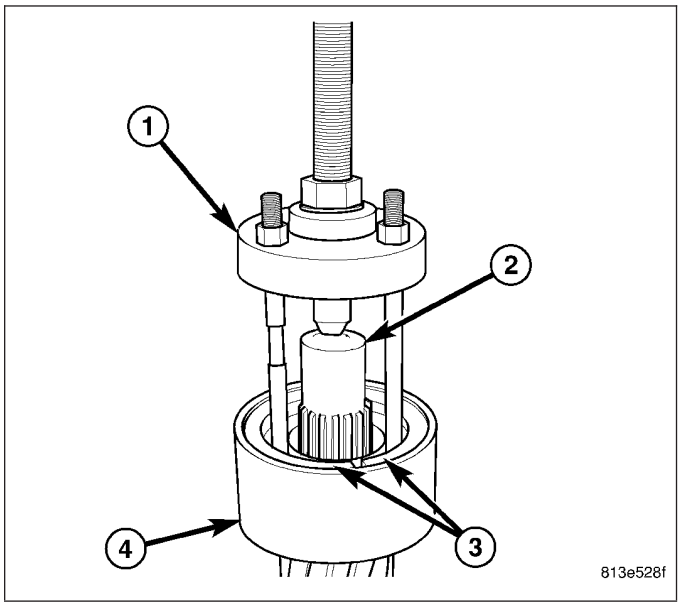
32. Remove second gear bearing (1) from mainshaft (2).



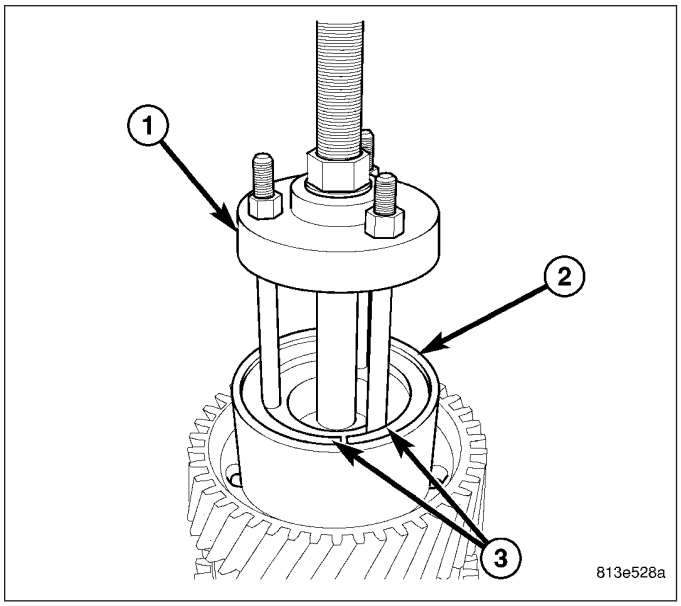
COUNTERSHAFT

NOTE: Bearings are the only component serviced on the countershaft.

1. Remove countershaft rear housing bearing with Puller 6444 (1), Button 8513A (2), Puller Jaws 9597 (3) , Puller Collar 6444-8 (4), Puller Rods 6444-3 and Puller Flange 6444-1. Position Puller Jaws 9597 around bearing and puller flange. Position puller collar around the puller jaws. Tighten the puller bolt and remove countershaft bearing.
2. Remove countershaft first/reverse gear bearing oil slinger from countershaft.

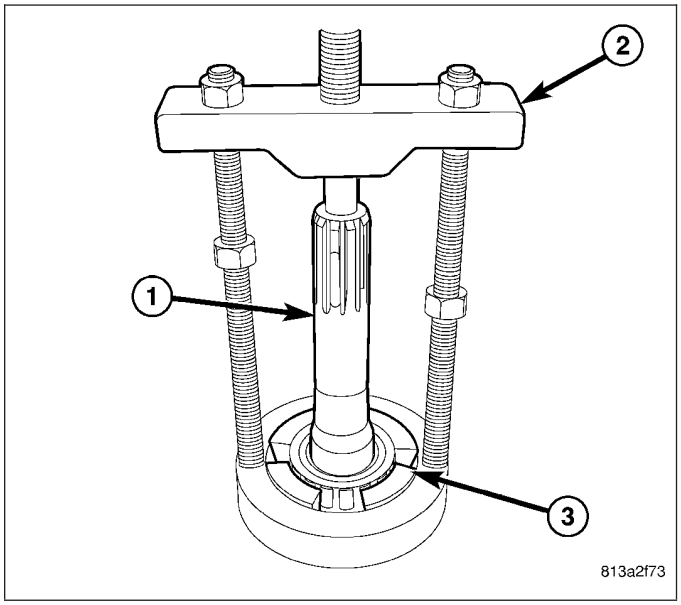


3. Remove countershaft front housing bearing with Puller 6444 (1), Puller Collar 6444-8 (2), Puller Jaws 9597 (3), Puller Rods 6444-3 and Puller Flange 6444-1. Position puller jaws around bearing and puller flange. Position puller collar around the puller jaws. Tighten the puller bolt and remove countershaft bearing.

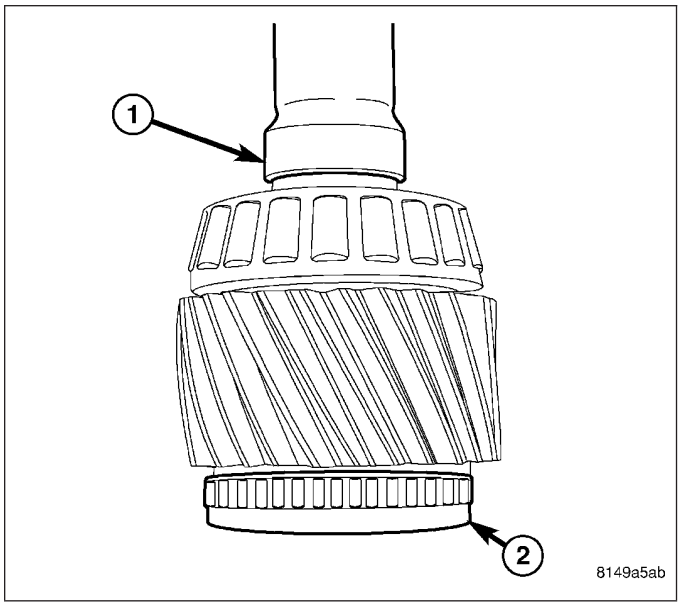


INPUT SHAFT

1. Remove input shaft (1) bearing with Puller C-293 (2) and Adapters C-293-47 (3).
2. Remove input shaft mainshaft bearing gasket.

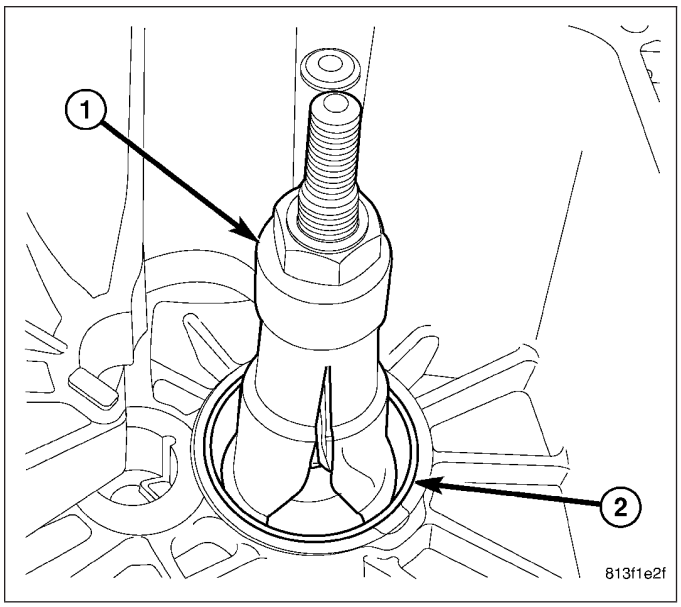


3. Position input shaft (1) mainshaft bearing seal (2) in a vice then twist input shaft (1) out of the seal (2).

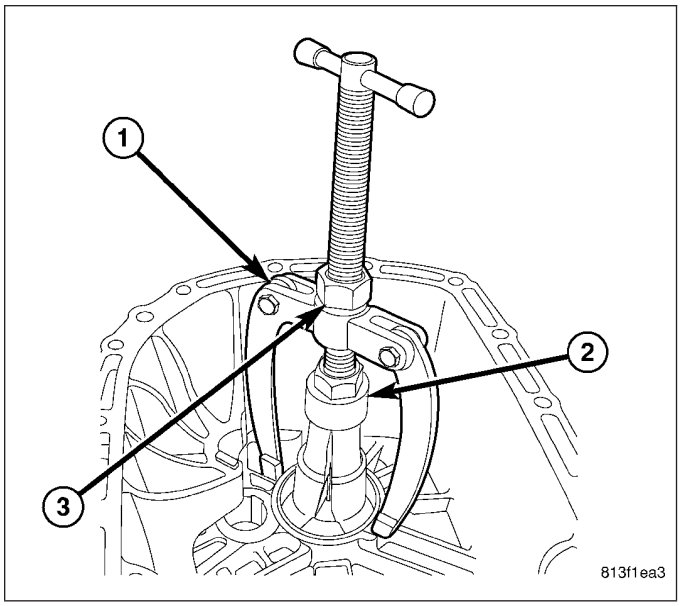


REAR HOUSING

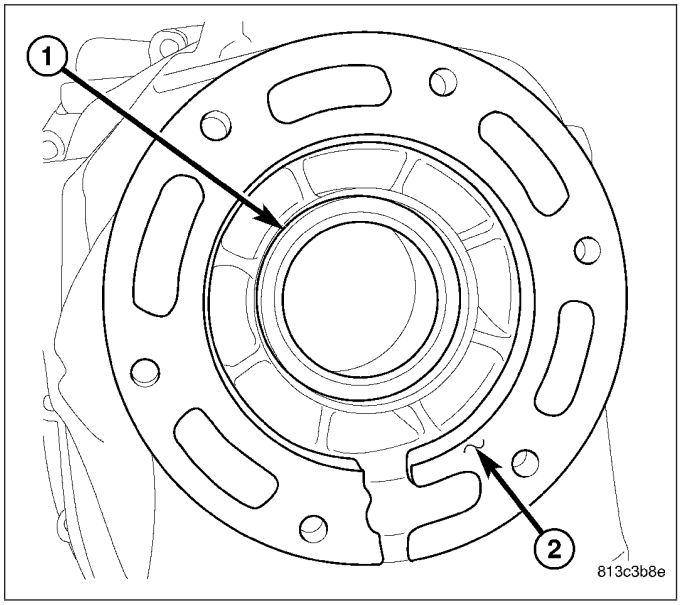
1. Remove countershaft bearing cup and mainshaft bearing cup with Puller 9593 (1) installed in cup (2).



2. Install Remover 8915 (1) on puller (2) and tighten remover nut (3) to pull cups out of the housing.

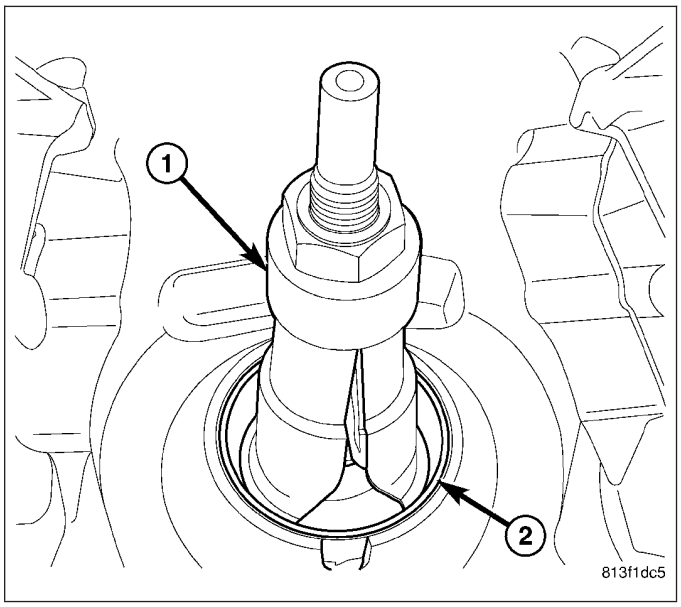


3. Remove output shaft seal (1) from housing (2) with seal pick.

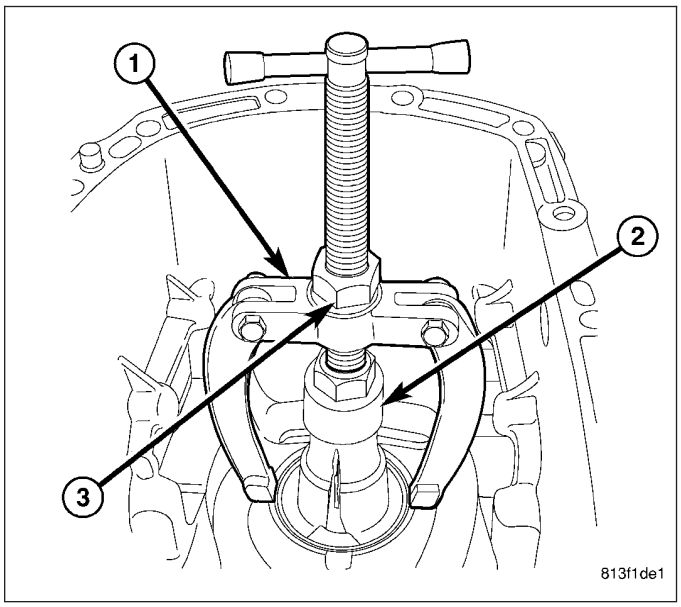


FRONT HOUSING

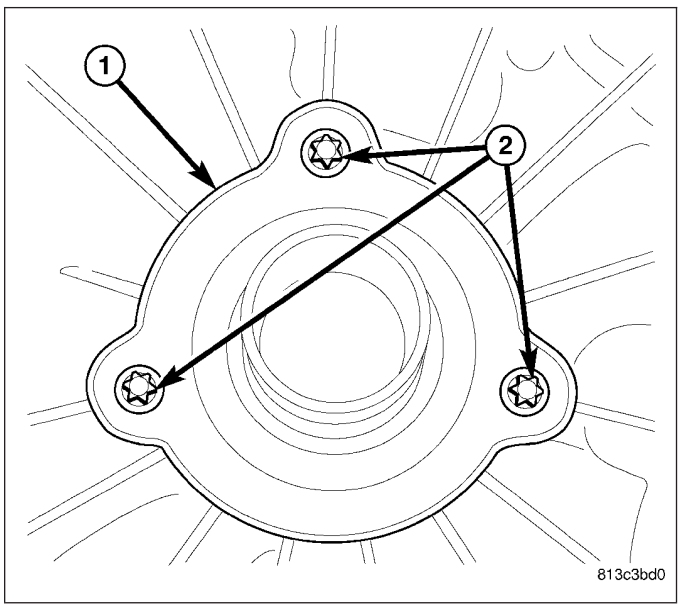
1. Remove countershaft bearing cup and mainshaft bearing cup with Puller 9593 (1) installed in cup (2).



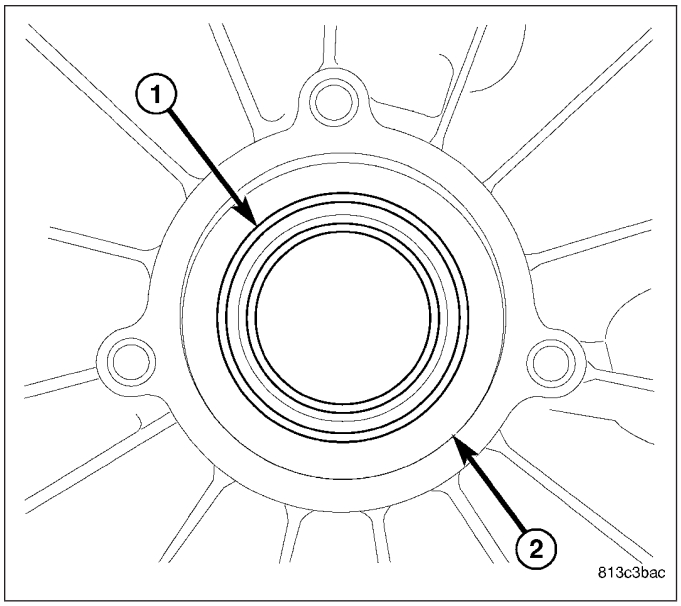
2. Install Remover 8915 (1) on puller (2) and tighten remover nut (3) to pull cups out of the housing. Then remove end-play shims from bearing bores and oil supply washer from mainshaft bearing bore.



3. Remove input shaft retainer (1) bolts (2) and remove retainer.



4. Remove input shaft seal (1) from retainer bore (2) with a seal pick.



CLEANING

Clean gears, shafts, shift components and transmission housings with a standard parts cleaning solvent. Do not use acid or corrosive base solvents. Dry all parts except bearings with compressed air.

Clean shaft bearings with a mild solvent such as MOPAR® degreasing solvent, Gunk® or similar solvents. Do not dry the bearings with compressed air. Allow the bearings to either air dry or wipe them dry with clean shop towels.

INSPECTION

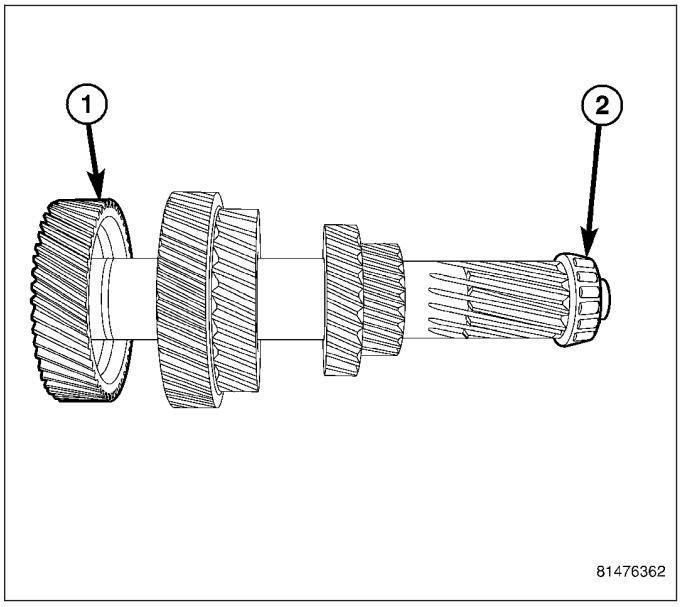
NOTE: Minor corrosion, nicks, or pitting can be smoothed with 400 grit emery and polished out with crocus cloth.

Bearings: Inspect for worn, chipped, cracked, flat-spotted or brinnelled.

Gears: Inspect for worn, chipped or cracked teeth. Inspect bearing surfaces for wear or flat-spotted.

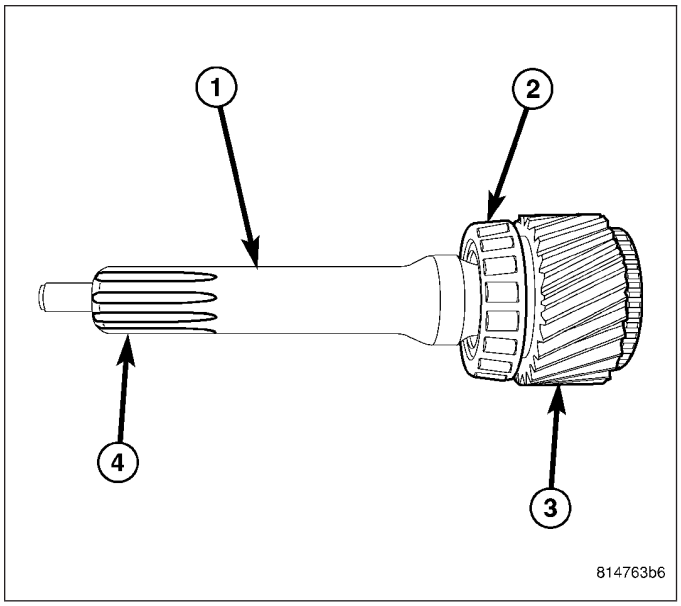
Mainshaft: Inspect for worn splines, snap ring grooves and threads.

Countershaft: Inspect all gears for worn, chipped or cracked teeth (1). Inspect all bearings (2) and bearing surfaces for ware or flat-spotted. **The countershaft is serviced as an assembly, except for bearings.**



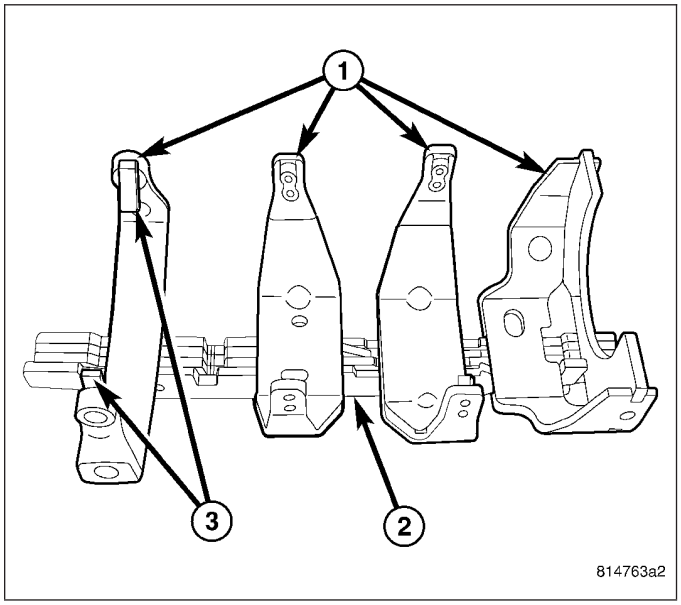
Synchronizer components: Inspect for worn, chipped or cracked teeth and burned or flaking off friction material. **Synchronizer are serviced as an assembly.**

Input Shaft: Inspect shaft (1), bearing (2) surfaces for wear or flat-spotted. Inspect fifth gear (3) for worn, chipped or cracked teeth. Inspect splines (4) for wear and chips.

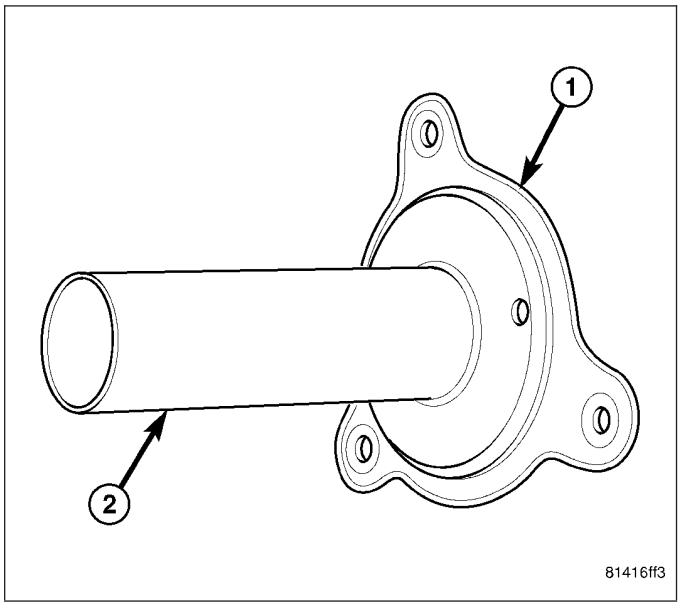


Shift forks and Rails: Inspect shift forks (1) and shoes for wear and distortion. Check fit of fork shoes in synchronizer sleeve to ensure parts fit and work smoothly. Inspect shift rails (2), for wear and distortion. **5-6 shift fork shoes (3) are serviced separately.**

Housing/Tail housing: Inspect sealing and mating surfaces are free of burrs and nicks. Inspect alignment dowels are tight and in good condition. Inspect shift rail bushings for wear.



Input Retainer: Inspect release bearing slide surface (2) and sealing surface.



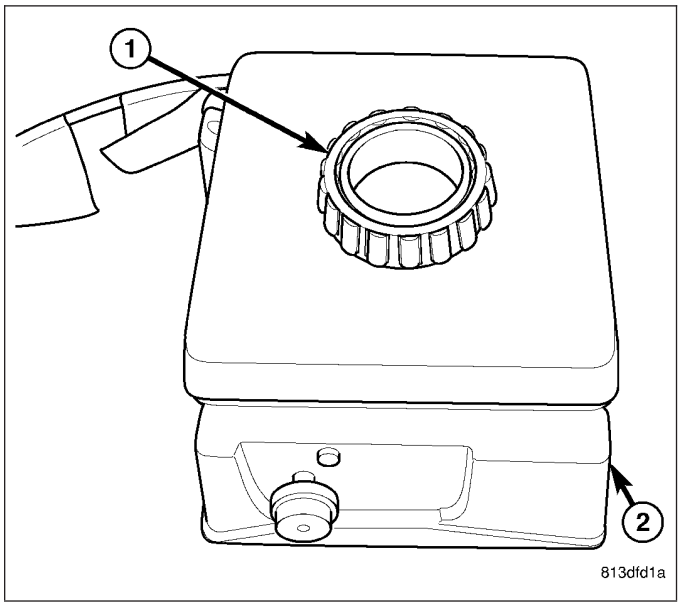
ASSEMBLY

WARNING: Use welding gloves when handling heated components. Failure to follow these instructions will result in personal injury.

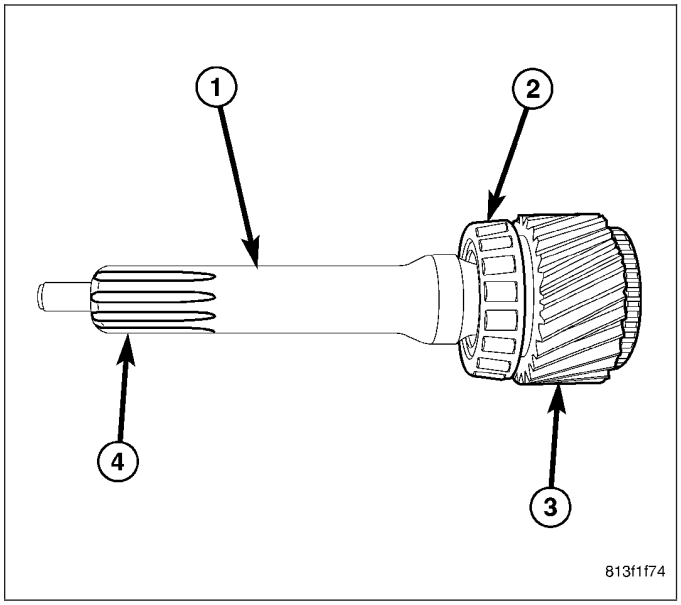
CAUTION: A bearing heater is used to assembly some components. Use only a bearing heater/hot plate and follow manufactures instructions. Heat components to 100 - 177 Celsius (212° Min - 350° Max Fahrenheit). Never use an open flame to heat components. Never leave components on heater for and extended amount of time. If component is discolored after heating the component has been overheated and must not be used. Failure to follow these instructions will result in component damage.

INPUT SHAFT

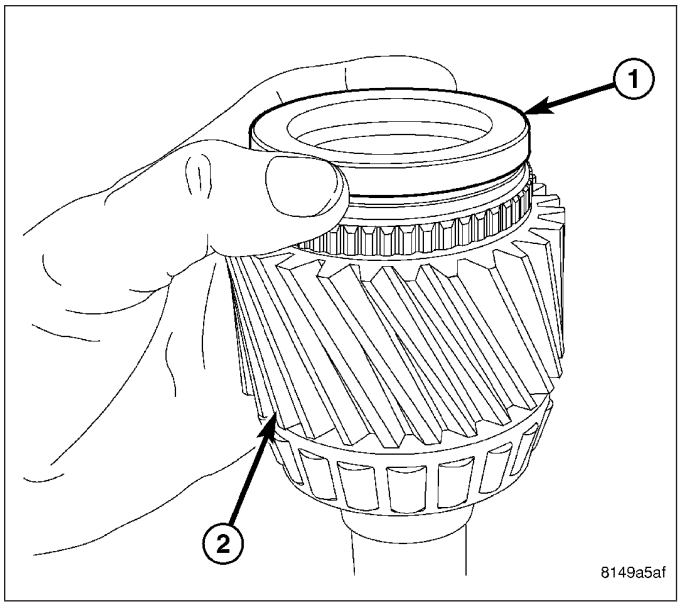
1. Heat input shaft bearing (1) on bearing heater (2).



2. Using welding gloves, install bearing (2) on input shaft (1).

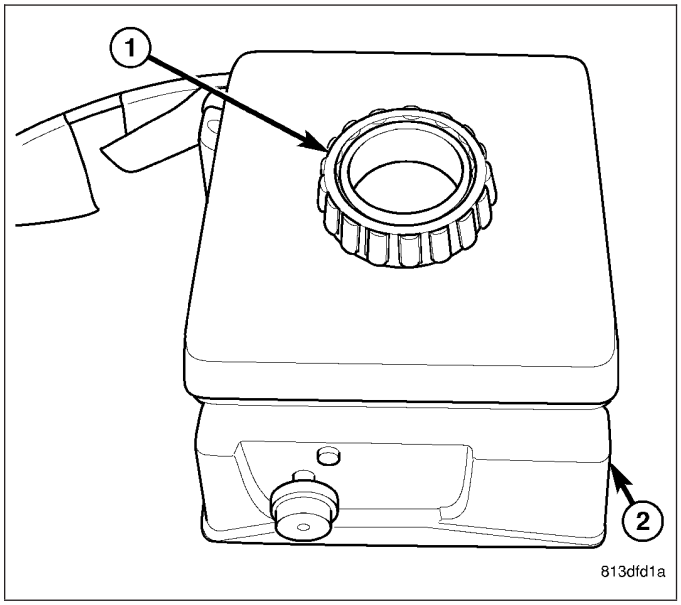


3. Push input shaft mainshaft bearing seal (1) on the end of fifth gear (2).

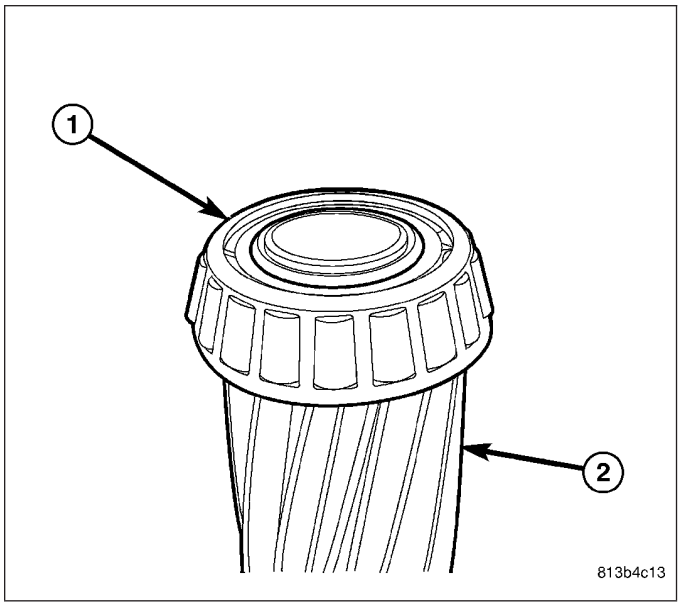


COUNTERSHAFT

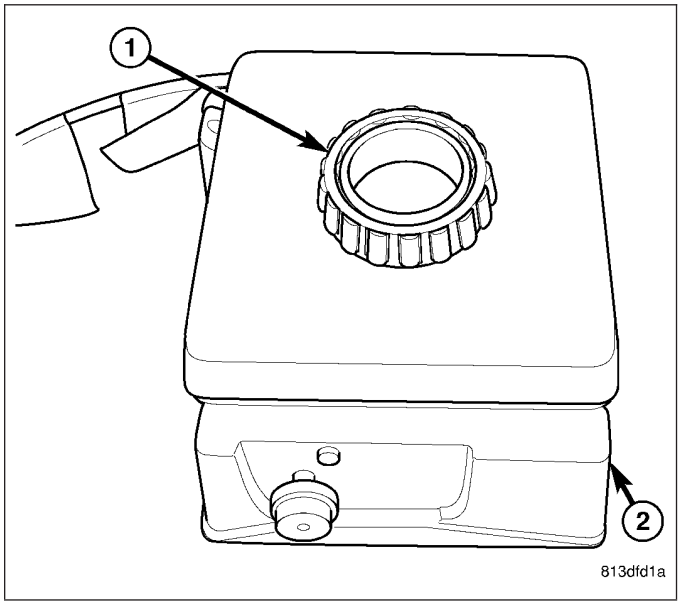
1. Install first/reverse gear bearing oil slinger on the rear housing end of the countershaft.
2. Heat rear housing countershaft bearing (1) on bearing heater (2).



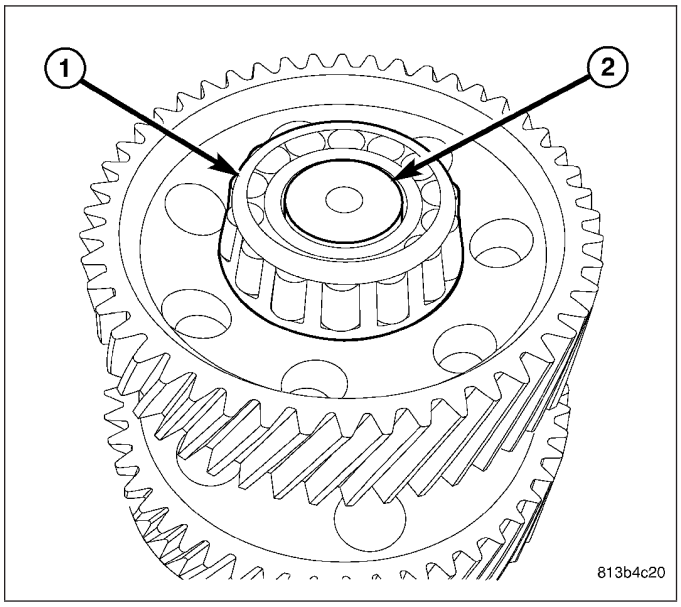
3. Using welding gloves, install countershaft bearing (1) on countershaft (2).



4. Heat front housing countershaft bearing (1) on bearing heater (2).

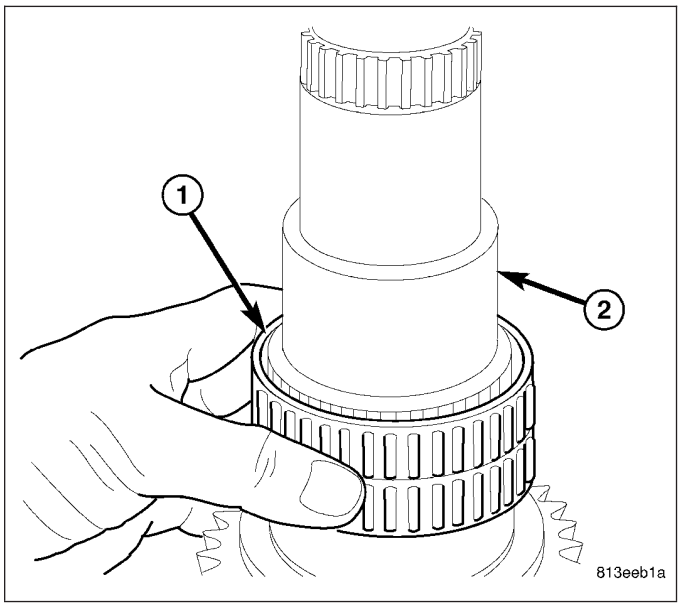


5. Using welding gloves, install front housing countershaft bearing (1) on countershaft (2).

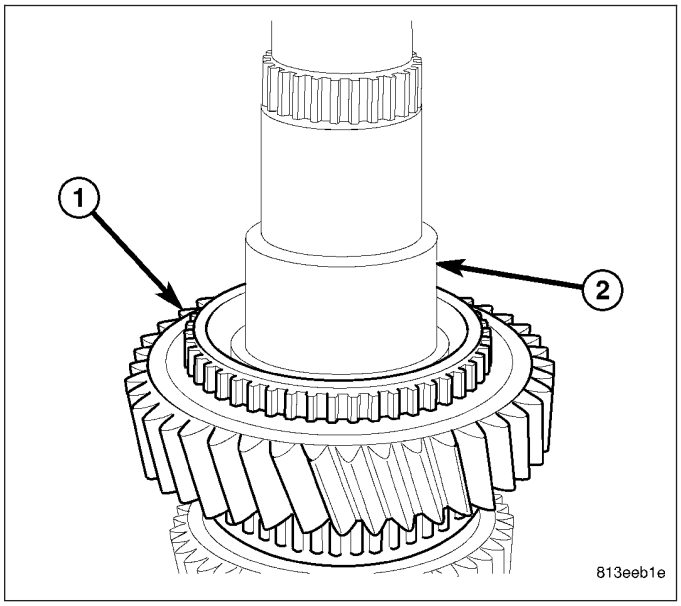


MAINSHAFT

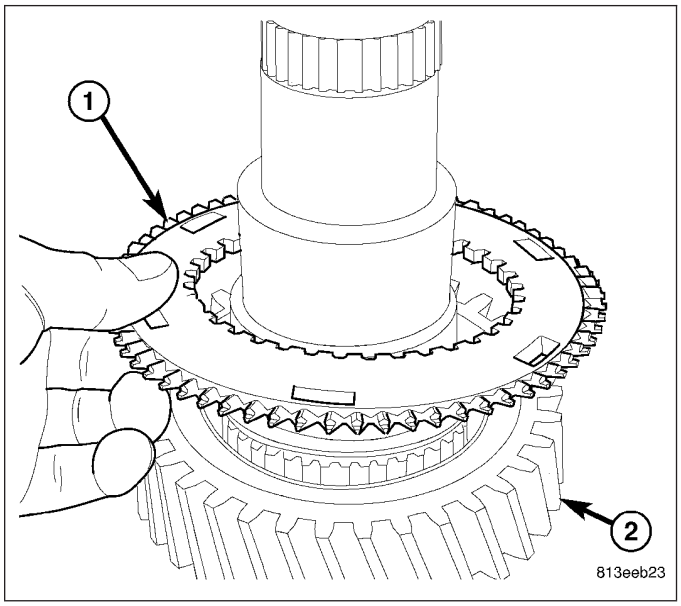
1. Position mainshaft in Fixture 9605 mounted in vise.
2. Install second gear bearing (1) on mainshaft (2).



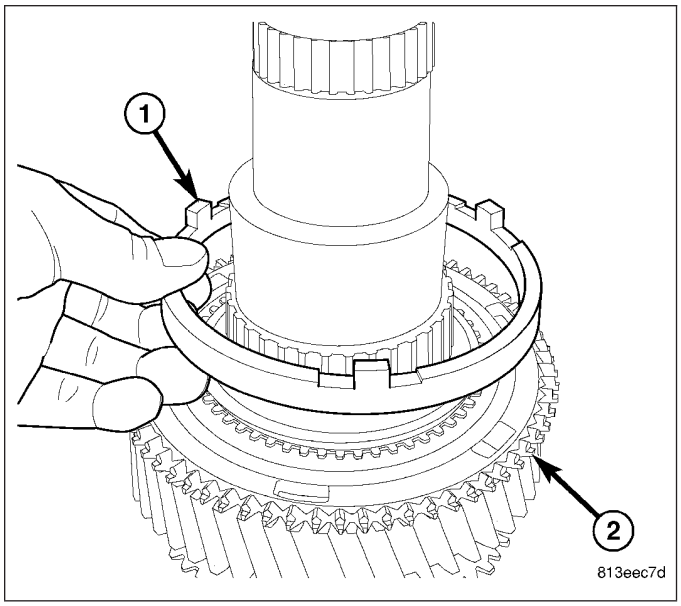
3. Install second gear (1) on mainshaft (2).



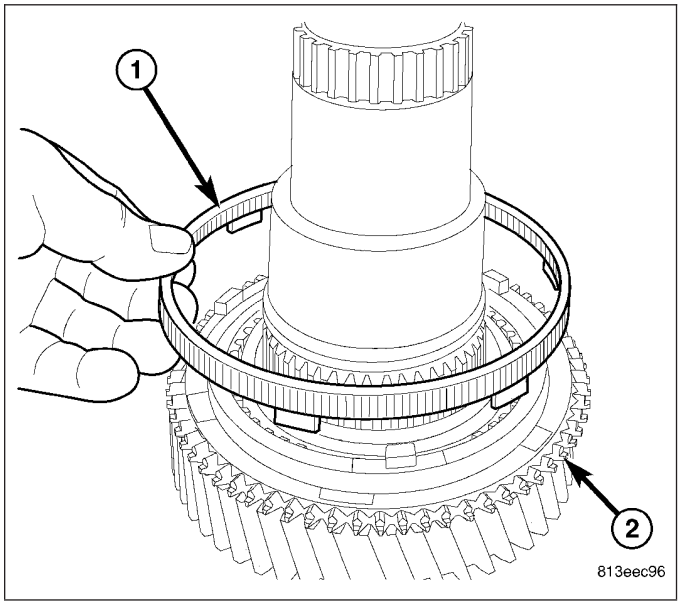
4. Install second gear stop ring (1) with teeth pointing up on second gear (2).



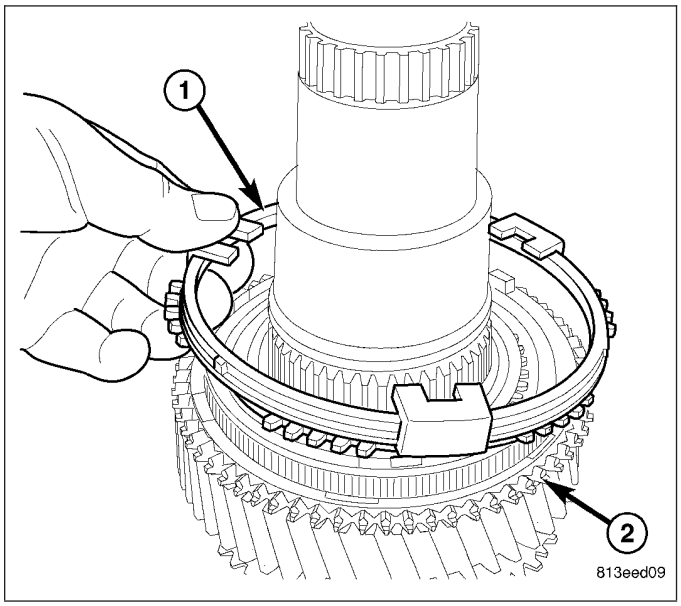
5. Install second gear inner friction ring (1) on stop ring (2).



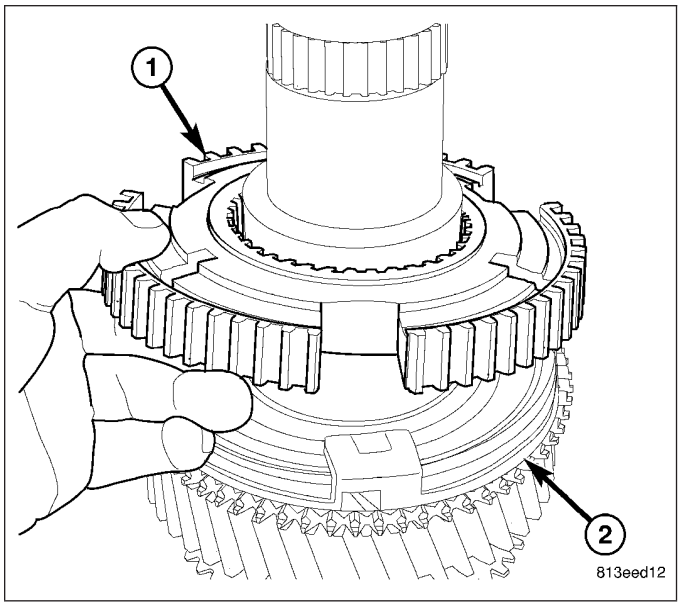
6. Install second gear outer friction ring (1) on stop ring (2).



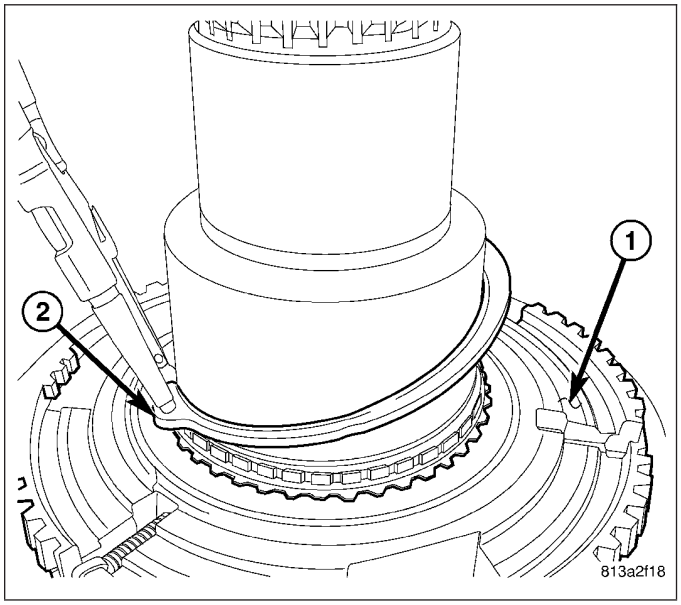
7. Install second gear blocker ring (1) on stop ring (2).



8. Install 1-2 synchronizer hub (1) on mainshaft and synchronizer rings (2).



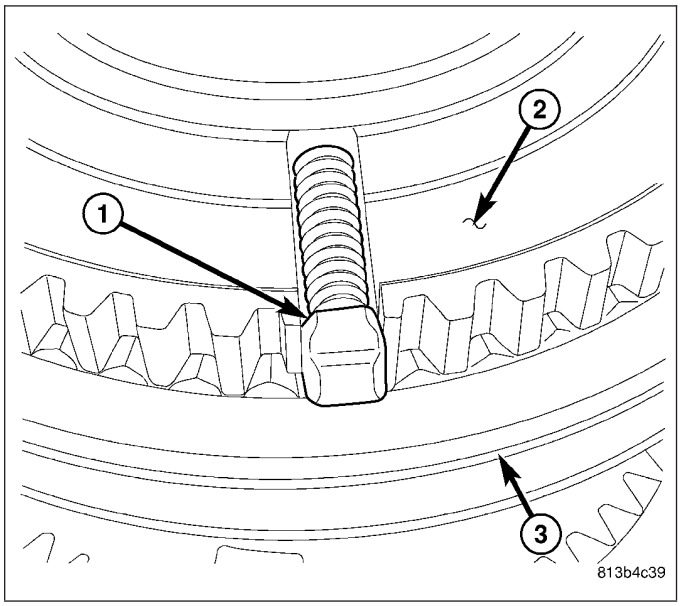
9. Install 1-2 synchronizer hub (1) and hub snap ring (2).



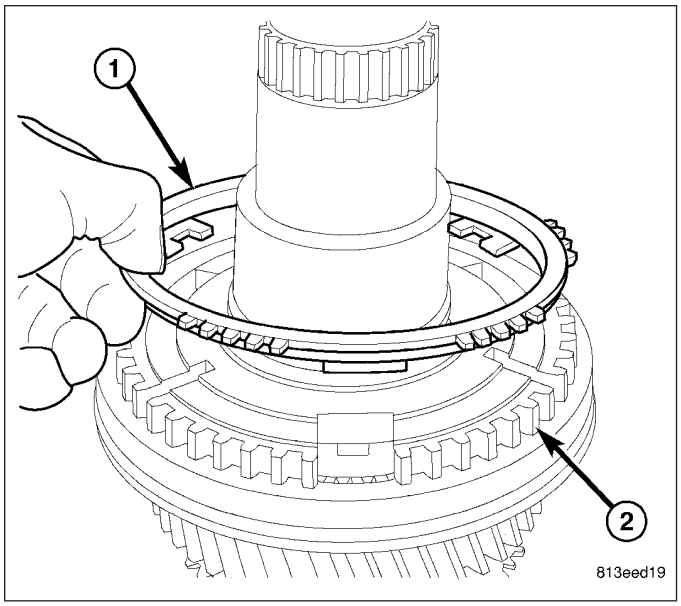
10. Install 1-2 synchronizer sleeve (3) on the hub (2) and push sleeve to the bottom of the hub.

NOTE: 1-2 synchronizer sleeve (3) and hub (2) have one small tooth. They must be aligned to install synchronizer sleeve (3) on hub (2).

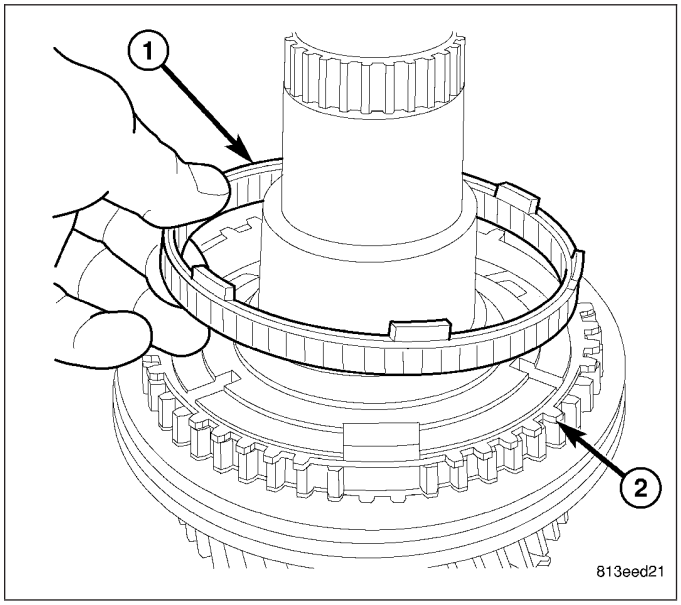
11. Install 1-2 synchronizer detents and springs (1) into synchronizer hub (2) slots. Then push detents behind synchronizer sleeve (3).



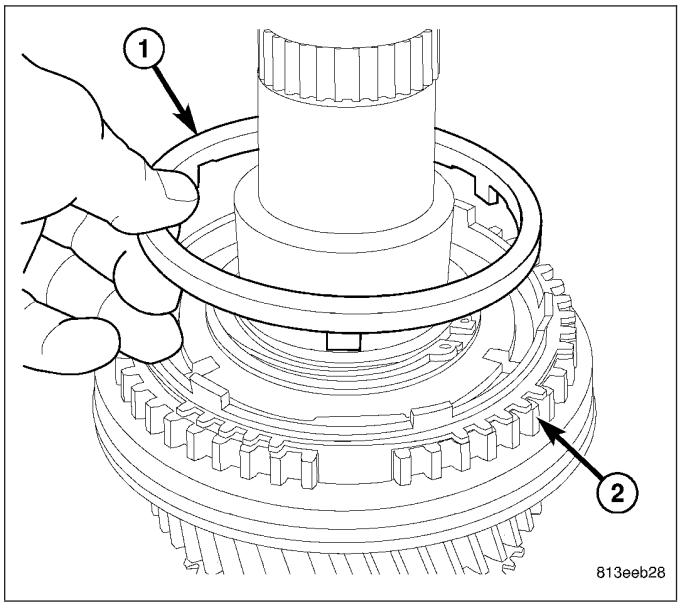
12. Install first gear blocker ring (1) on synchronizer hub (2).



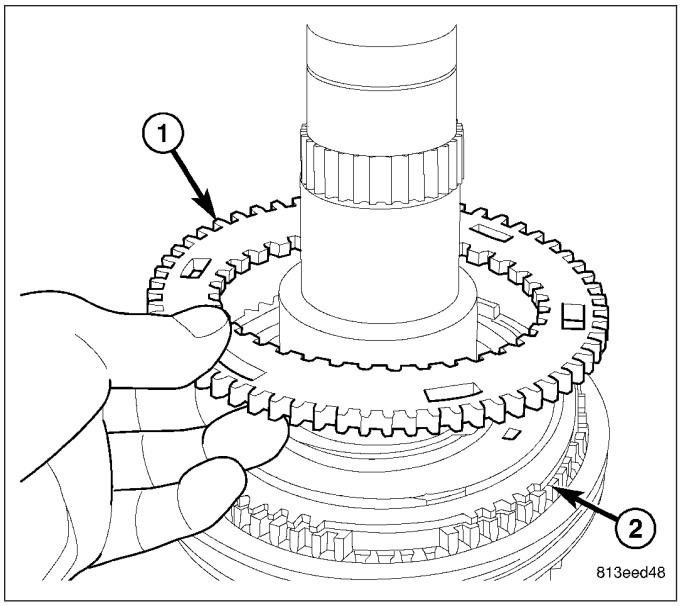
13. Install first gear outer friction ring (1) on synchronizer hub (2).



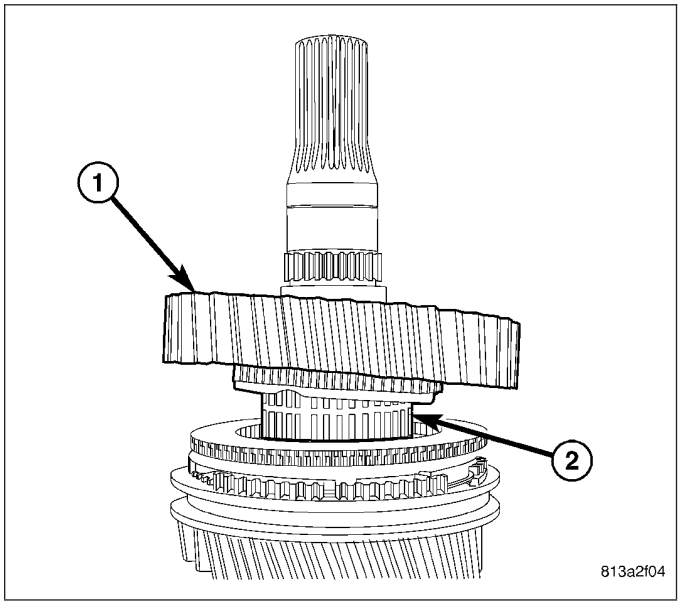
14. Install first gear inner friction ring (1) on synchronizer hub (2).



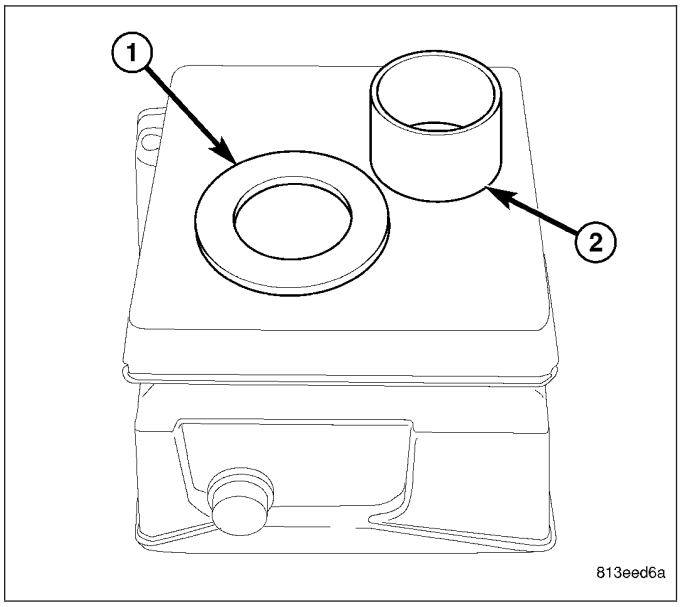
15. Install first gear stop ring (1) with teeth pointing down on synchronizer rings and hub (2).
16. Hold first gear stop ring (1) on synchronizer rings (2) and center 1-2 synchronizer sleeve on the hub.



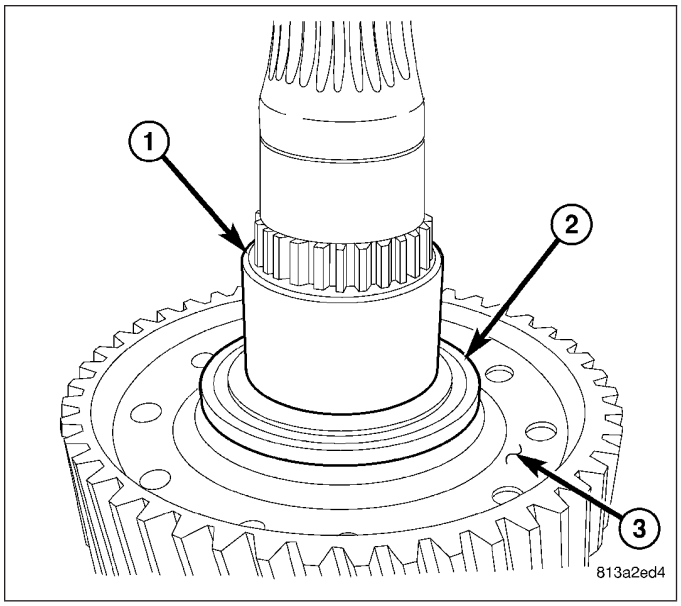
17. Install first gear (1) and bearing (2).



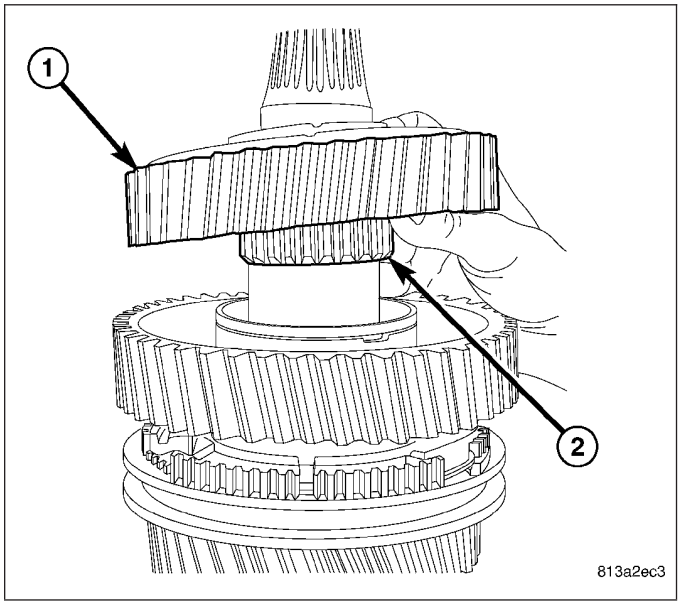
18. Heat thrust washer (1) and reverse gear bearing race (2) on bearing heater.



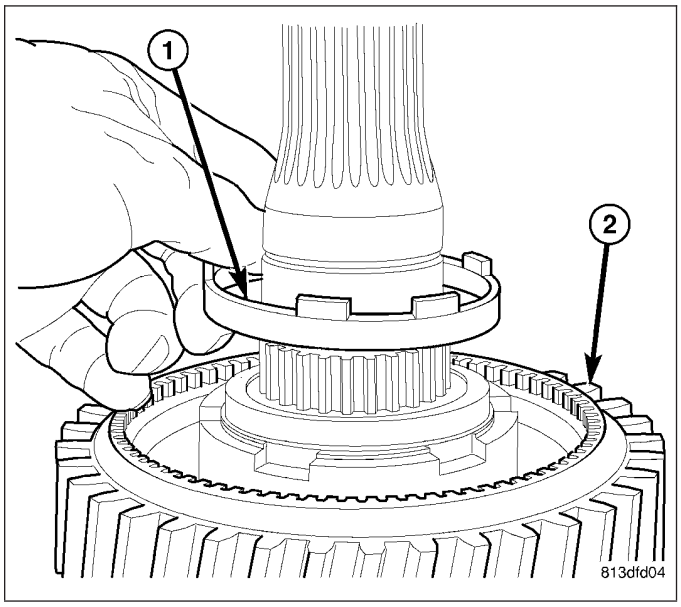
19. Using welding gloves, install thrust washer (2) and reverse gear bearing race (1) on mainshaft.



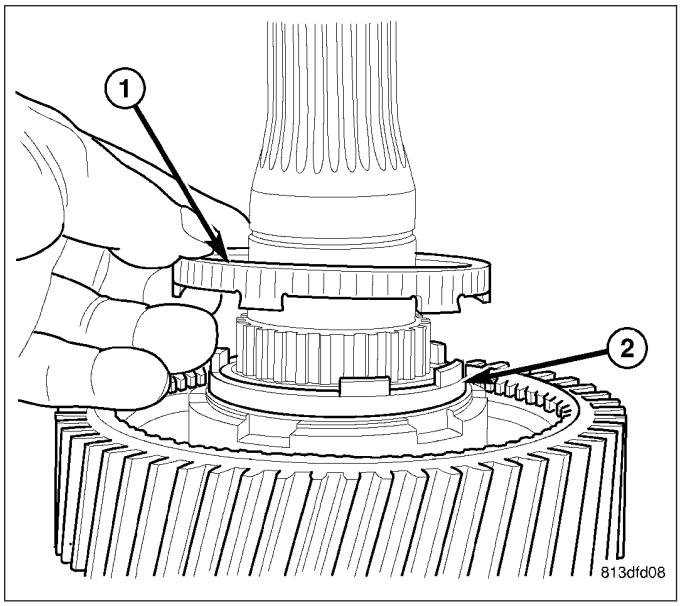
20. Install reverse gear (1) and bearing (2).



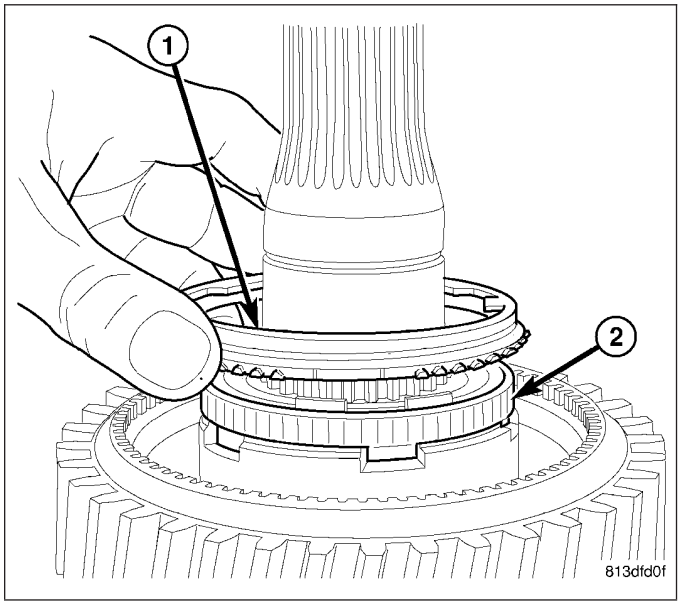
21. Install reverse gear inner friction ring (1) on reverse gear (2).



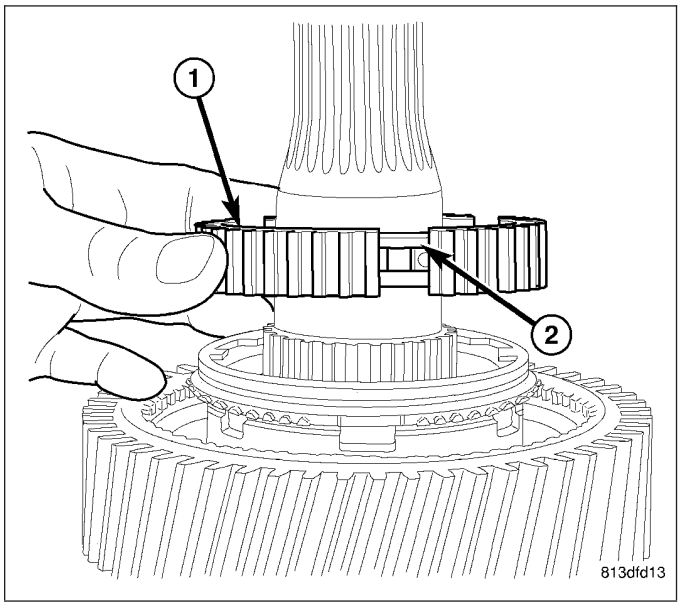
22. Install reverse gear outer friction ring (1) on inner blocker ring (2).



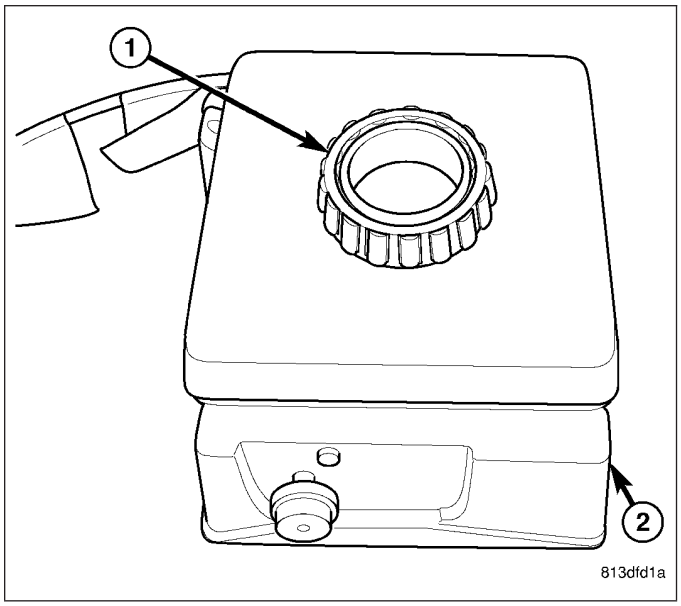
23. Install reverse gear blocker ring (1) on friction ring (2).



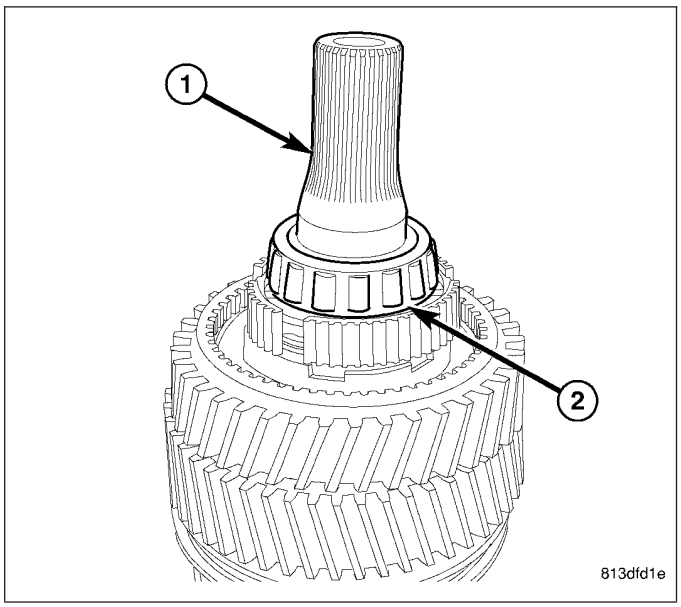
24. Install reverse gear synchronizer hub (1) with snap ring (2) on the top on mainshaft.



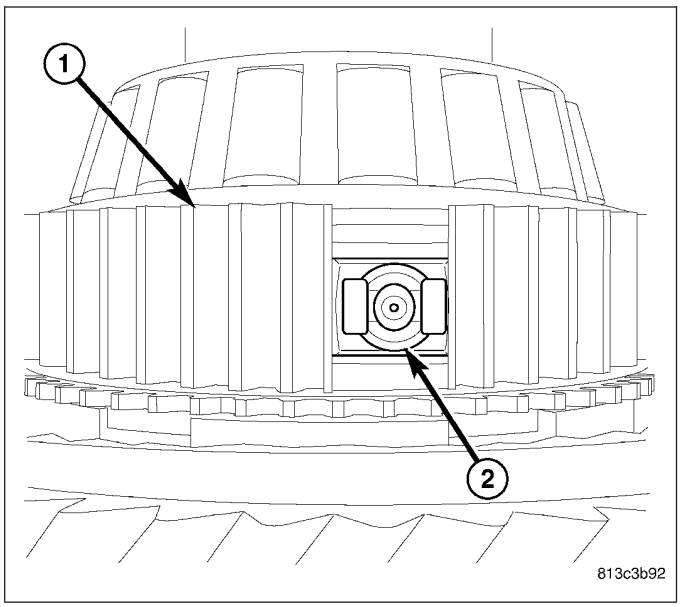
25. Heat mainshaft bearing (1) on bearing heater (2).



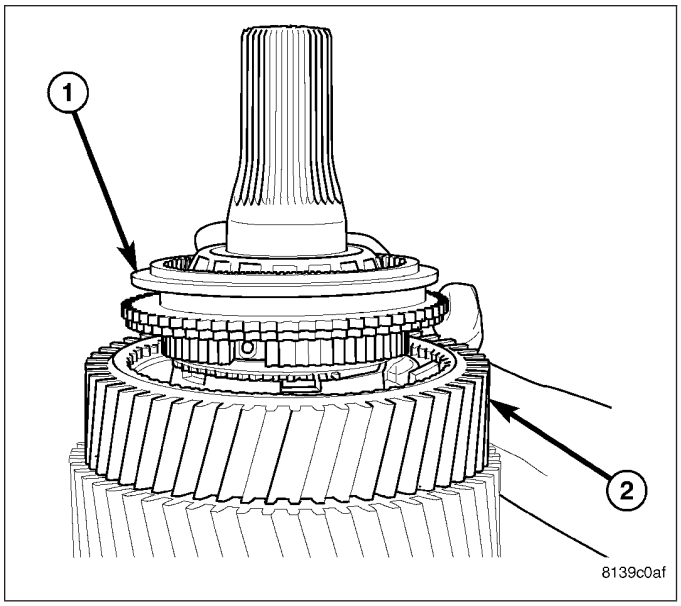
26. Using welding gloves, install mainshaft (1) bearing (2) on mainshaft.
27. On 4x4 transmission install mainshaft (1) bearing (2) snap ring.



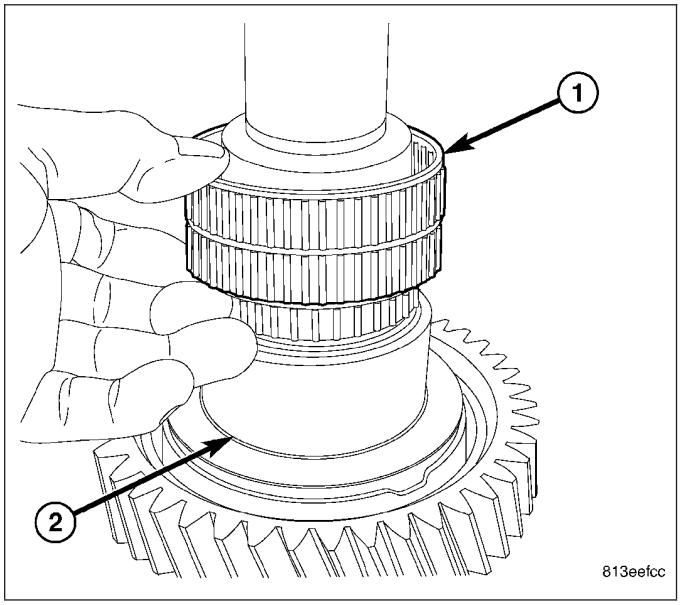
28. Install reverse synchronizer hub (1) detents (2).



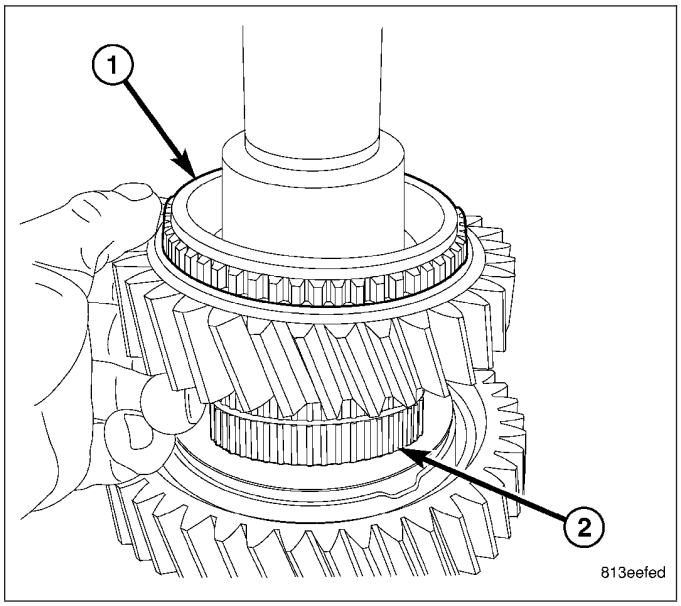
29. Install reverse gear (2) synchronizer sleeve (1) on hub and center sleeve on hub.



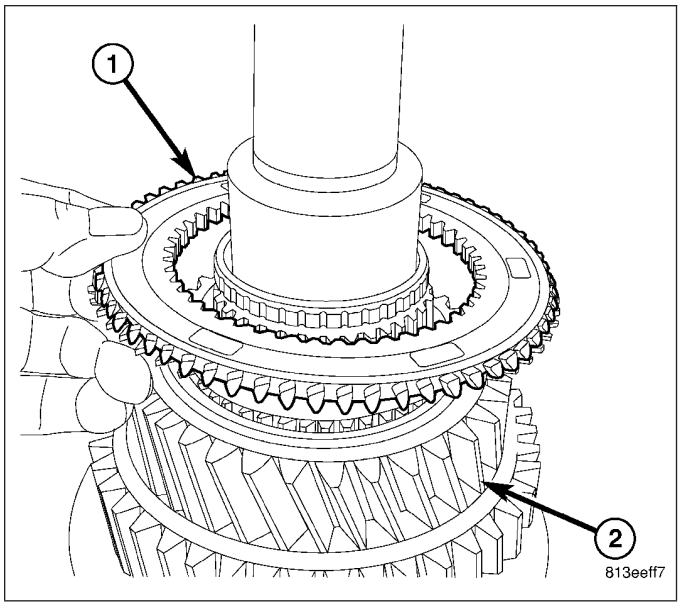
30. Turn mainshaft and Fixture 9605 over and secure in vise.
31. Install third gear bearing (1) on mainshaft (2).



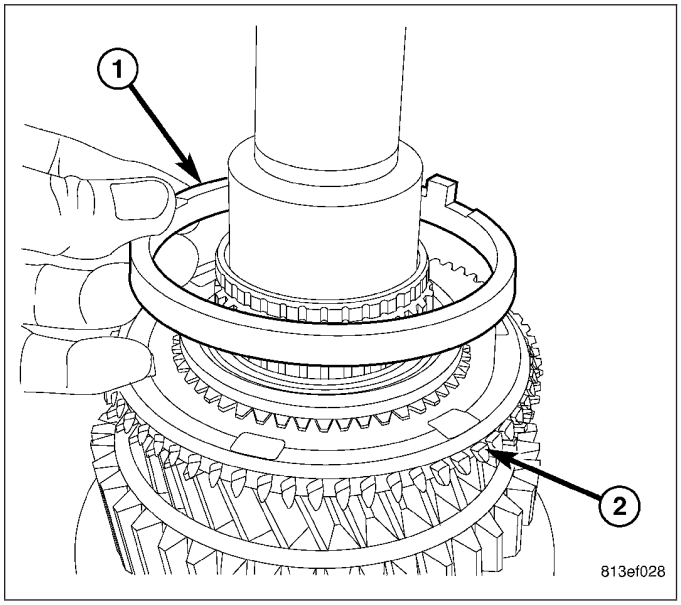
32. Install third gear (1) on mainshaft (2).



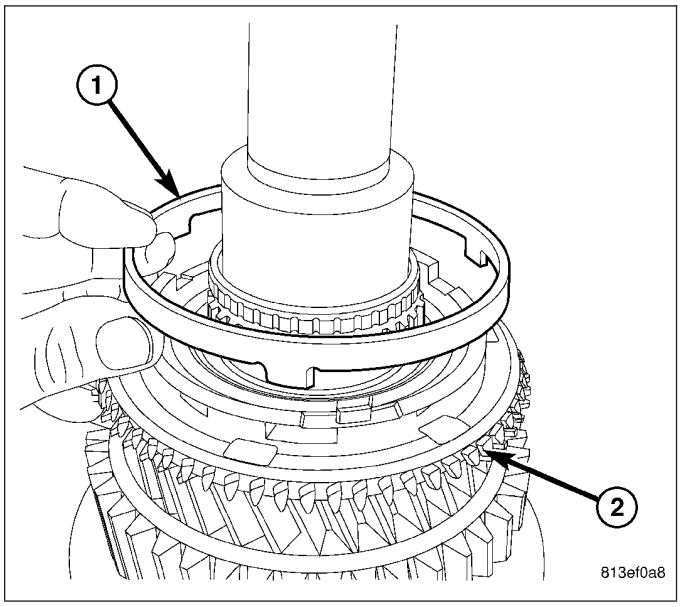
33. Install third gear stop ring (1) with teeth pointing up on third gear (2).



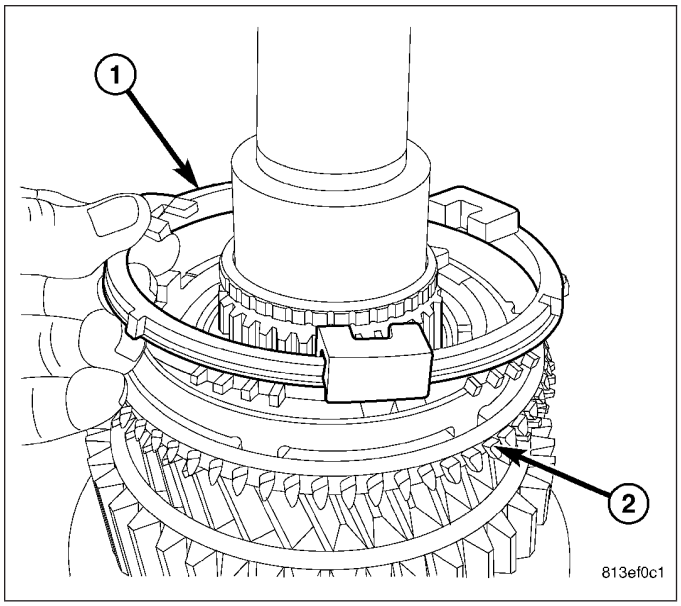
34. Install third gear inner friction ring (1) on stop ring (2).



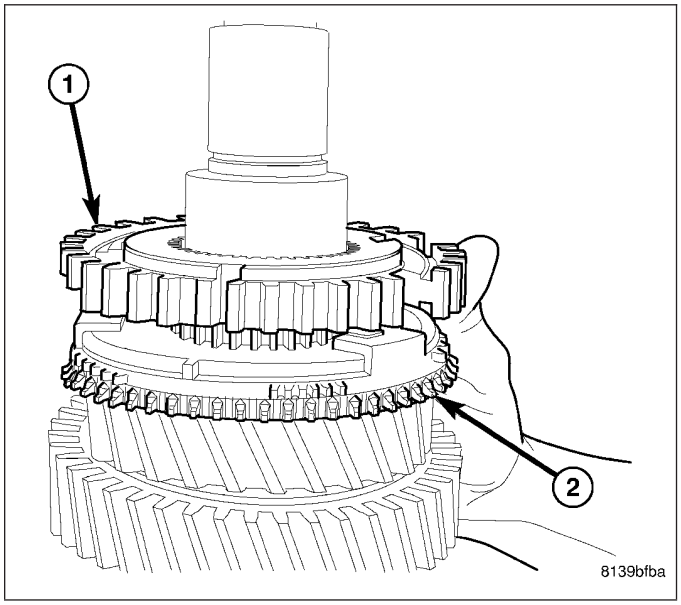
35. Install third gear outer friction ring (1) on stop ring (2).



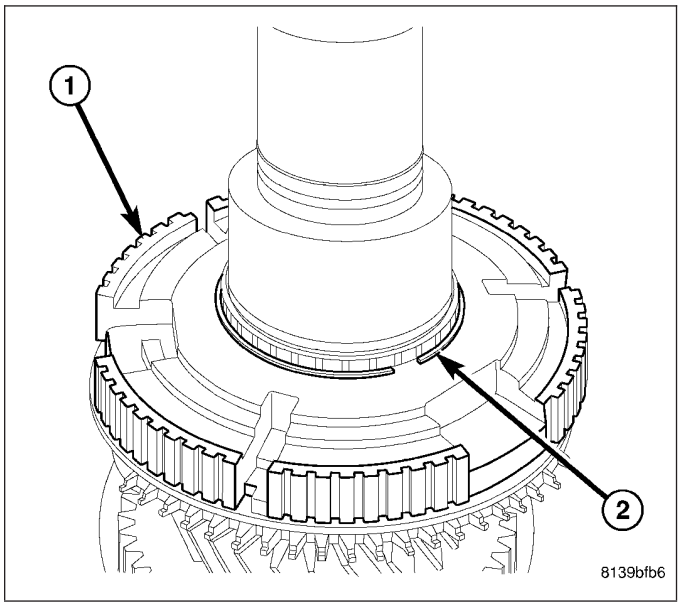
36. Install third gear blocker ring (1) on stop ring (2).



37. Install 3-4 synchronizer hub (1) on third gear synchronizer rings (2).



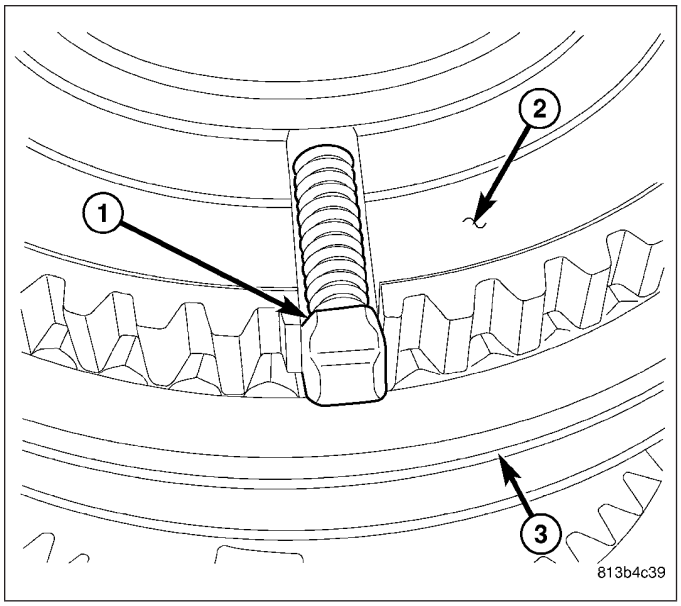
38. Install third gear synchronizer hub (1) snap ring (2).



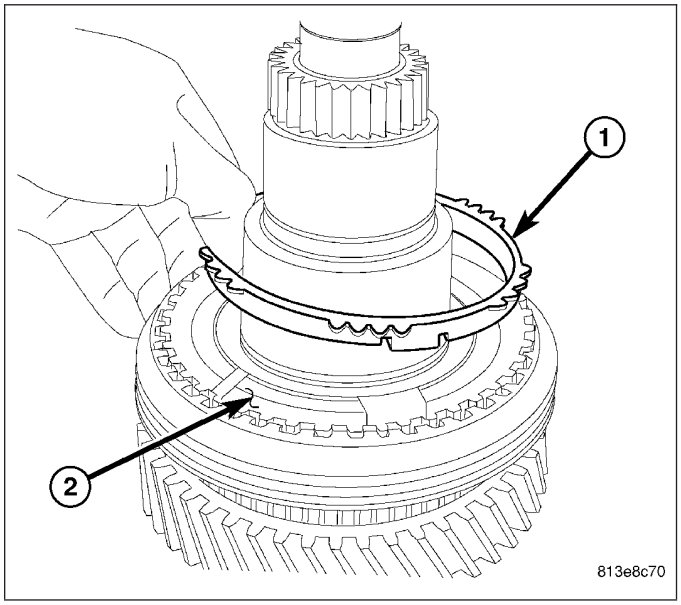
39. Install 3-4 synchronizer sleeve (3) on hub (2) and push sleeve to the bottom of the hub.

NOTE: 3-4 synchronizer sleeve (3) and hub (2) have one small tooth. They must be aligned to install synchronizer sleeve (3).

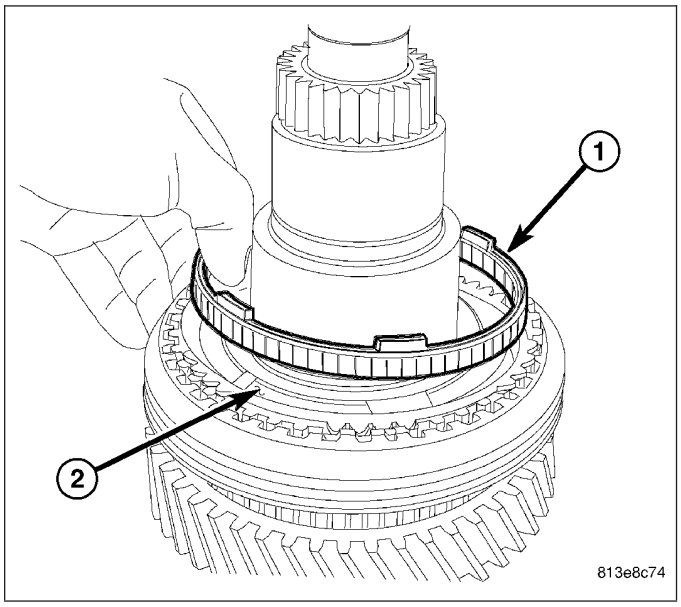
40. Install 3-4 synchronizer detents and springs (1) into synchronizer hub (2) slots. Then push detents (1) behind synchronizer sleeve (3).



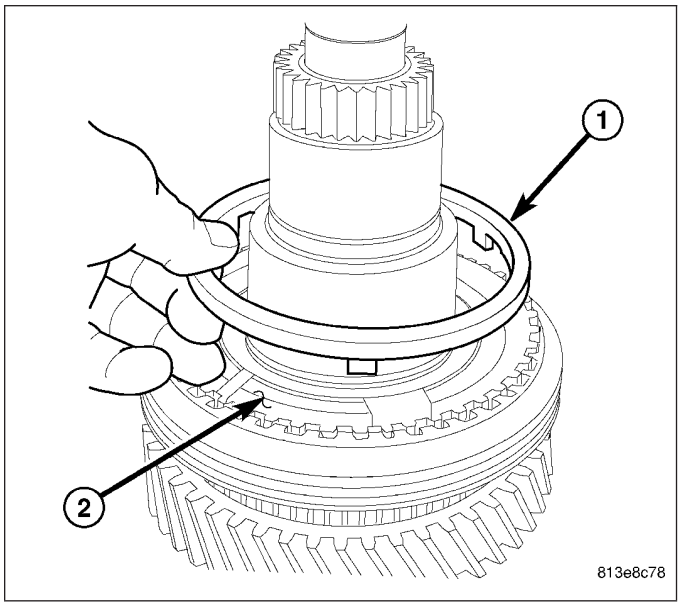
41. Install fourth gear blocker ring (1) on synchronizer hub (2).



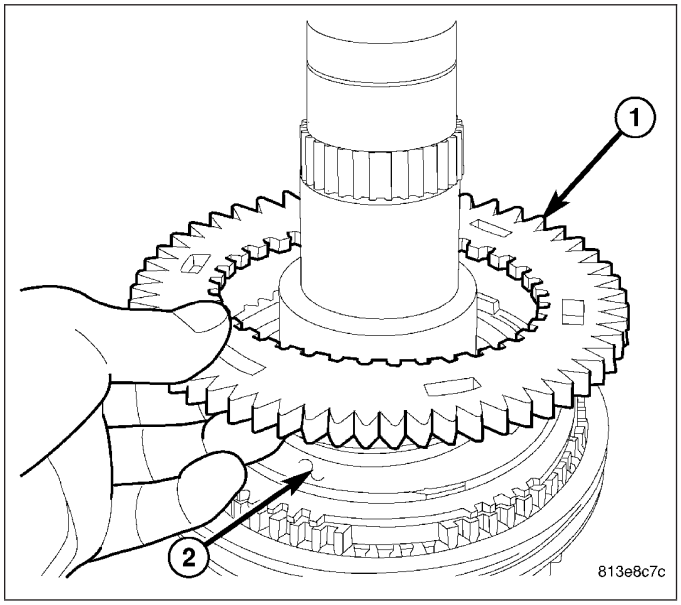
42. Install fourth gear outer friction ring (1) on synchronizer hub (2).



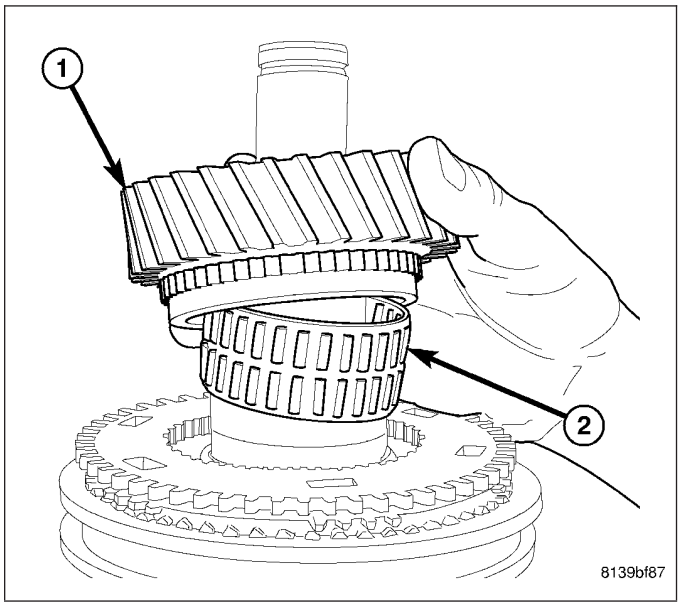
43. Install fourth gear inner friction ring (1) on synchronizer hub (2).



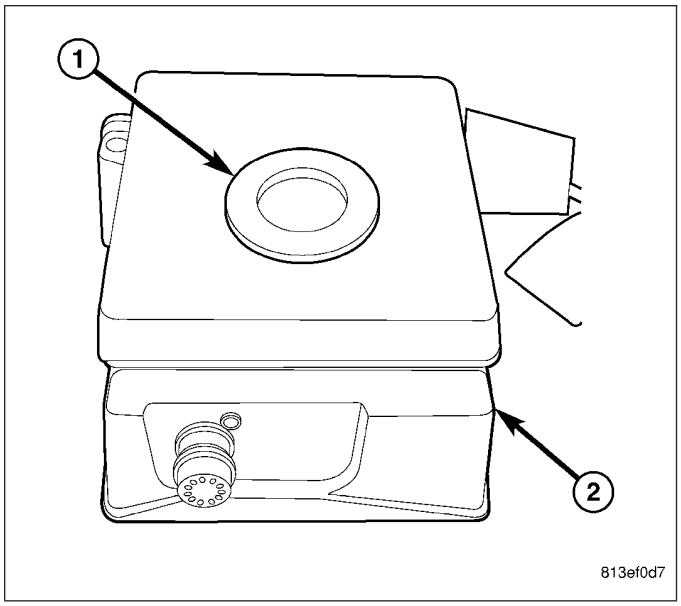
44. Install fourth gear stop ring (1) with teeth pointing down on synchronizer hub (2).
45. Hold fourth gear stop ring (1) on synchronizer hub (2) and center 3-4 synchronizer sleeve on hub.



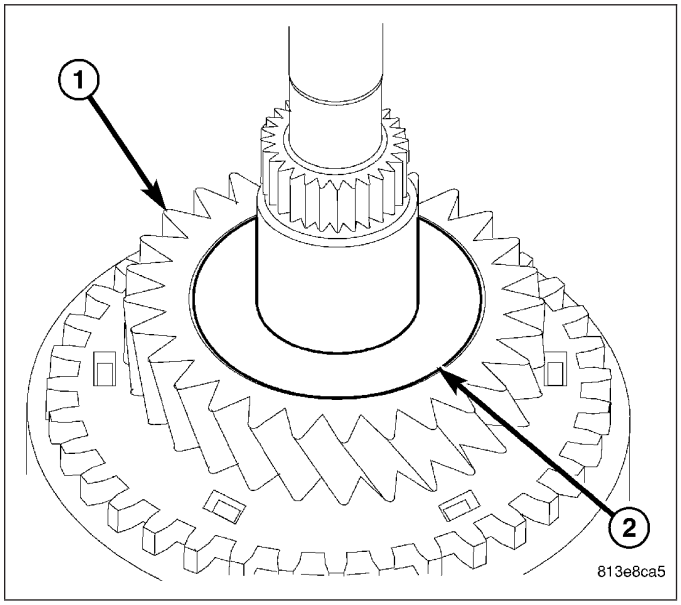
46. Install fourth gear (1) and bearing (2).



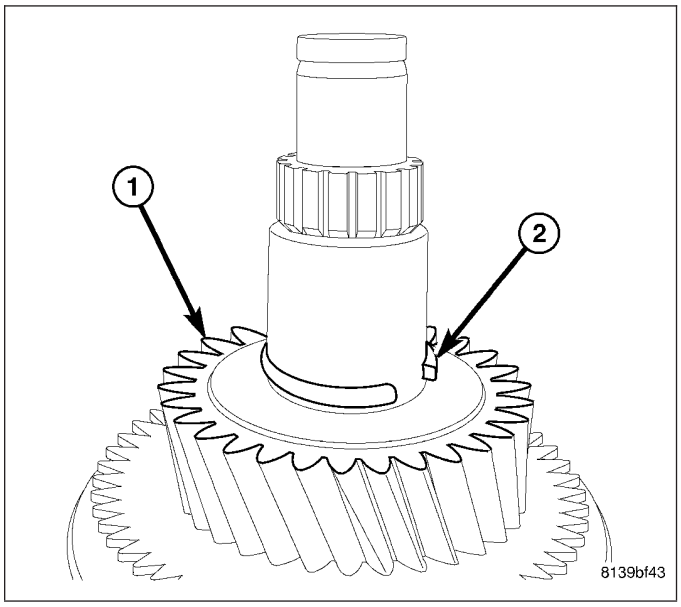
47. Heat fourth gear thrust washer (1) on bearing heater (2).



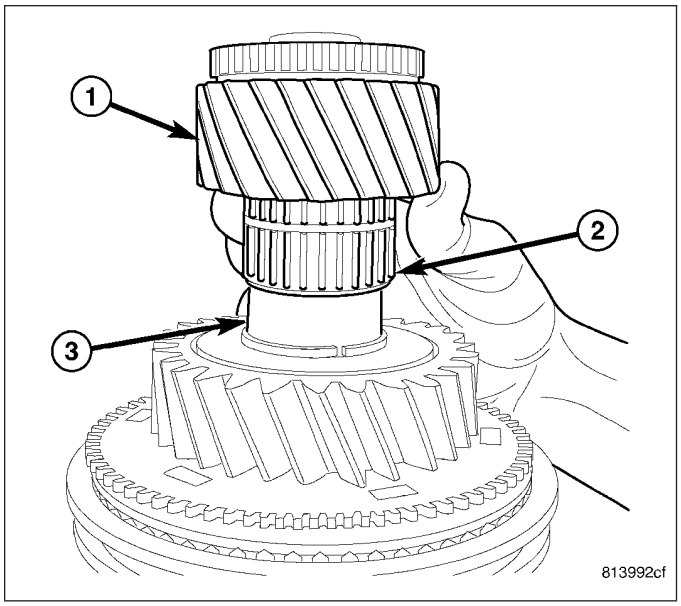
48. Using welding gloves, install fourth gear (1) thrust washer (2).



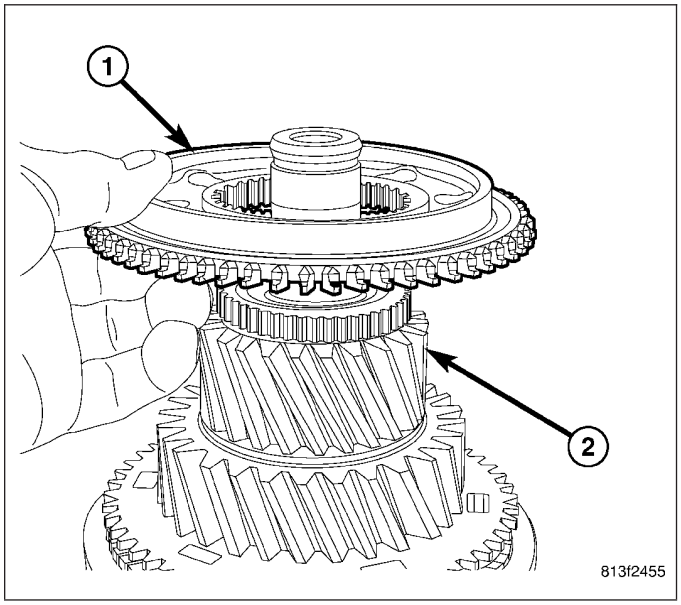
49. Install fourth gear (1) snap ring (2).



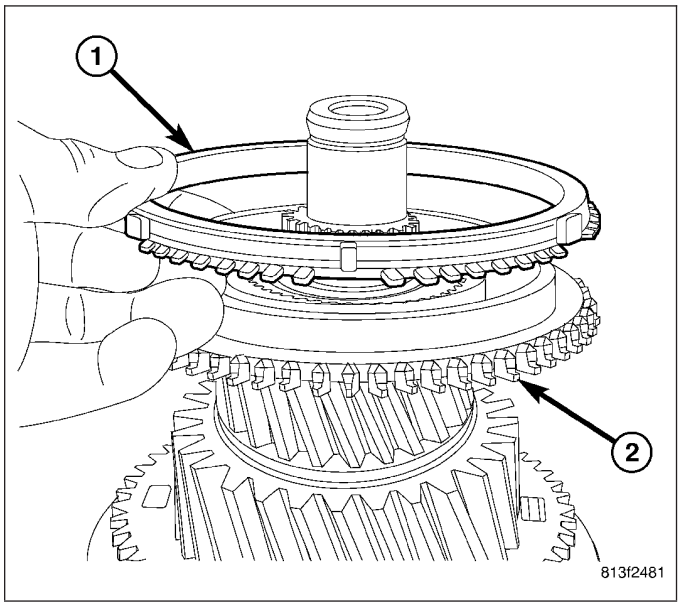
50. Install sixth gear (1) and bearing (2) on mainshaft (3).



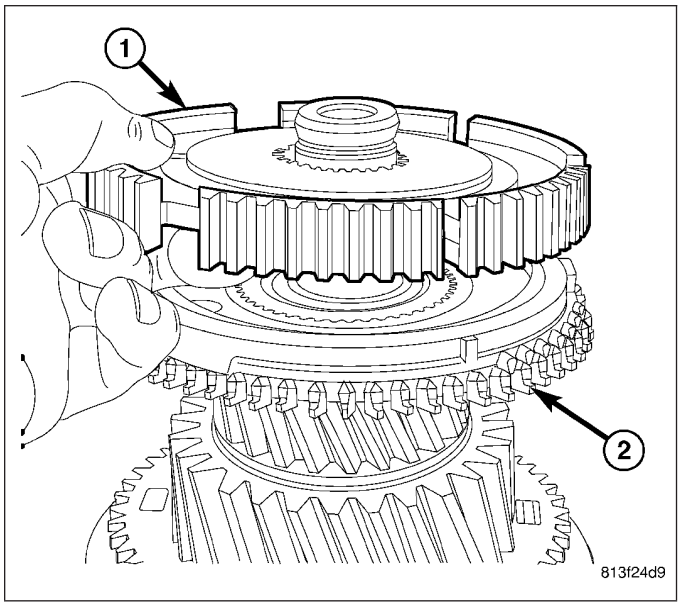
51. Install sixth gear stop ring (1) on sixth gear (2).



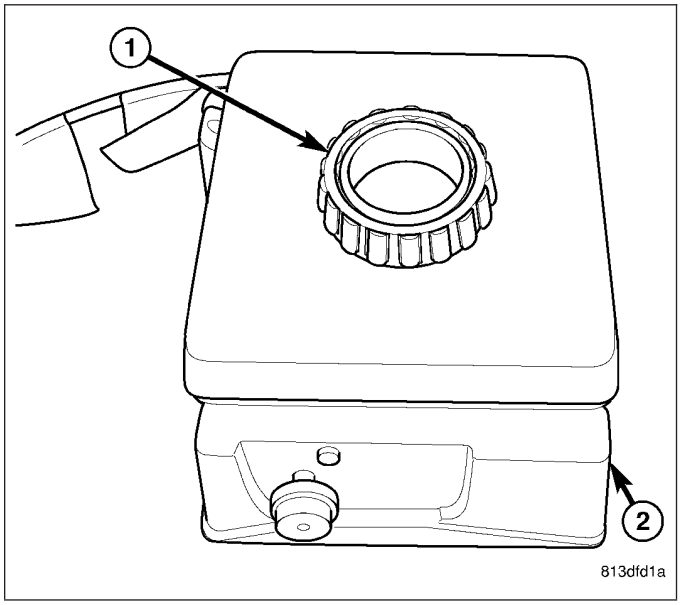
52. Install sixth gear friction ring (1) on stop ring (2).



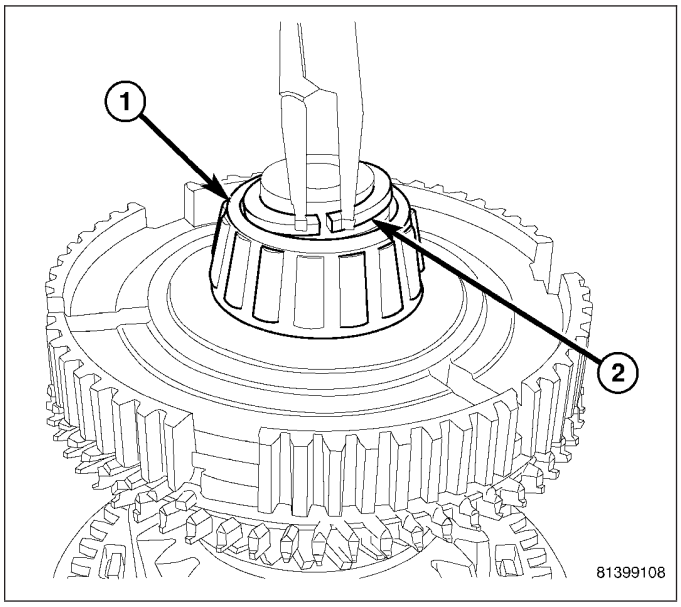
53. Install 5-6 synchronizer hub (1) on sixth gear synchronizer rings (2).



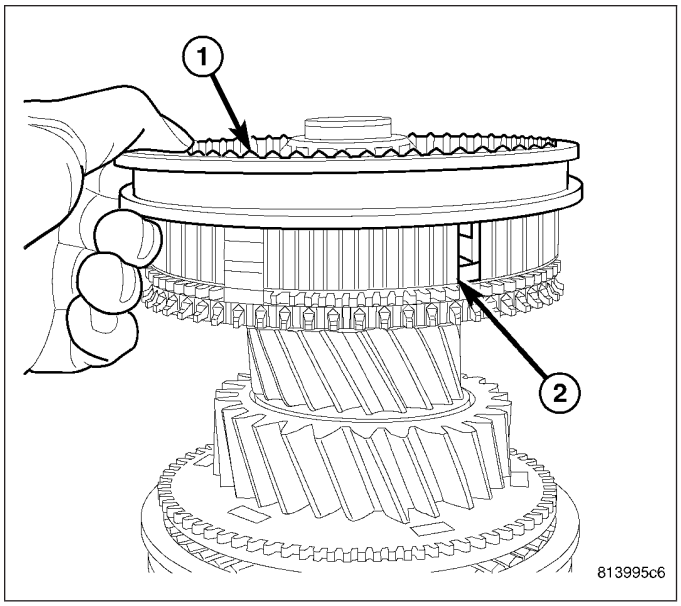
54. Heat mainshaft bearing (1) on bearing heater.



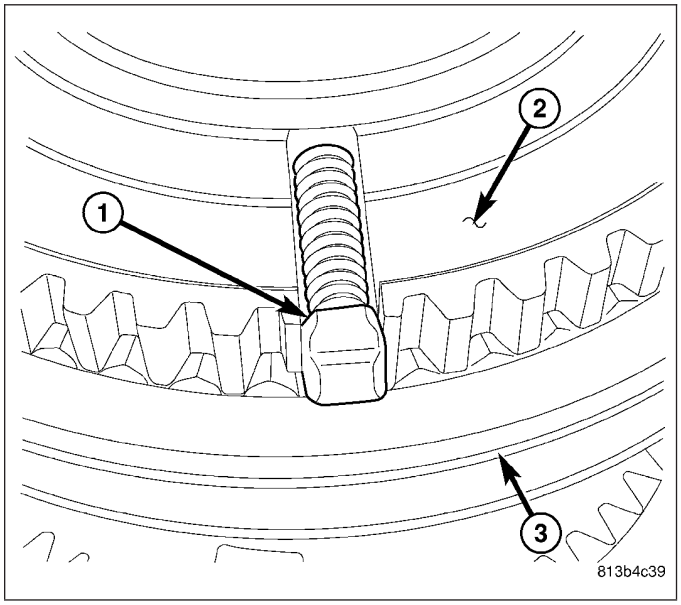
55. Using welding gloves, install mainshaft bearing (1) on mainshaft.
56. Install mainshaft bearing (1) snap ring (2).



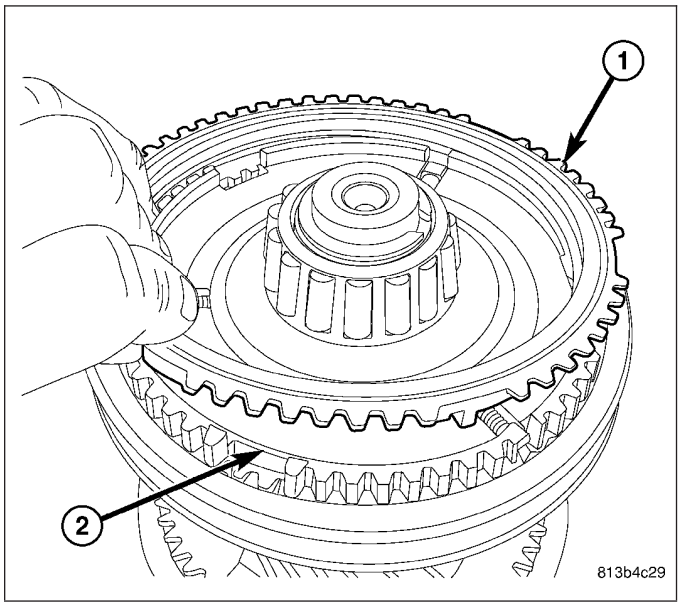
57. Install 5-6 synchronizer sleeve (1) on hub (2) and push sleeve to the bottom of the hub.



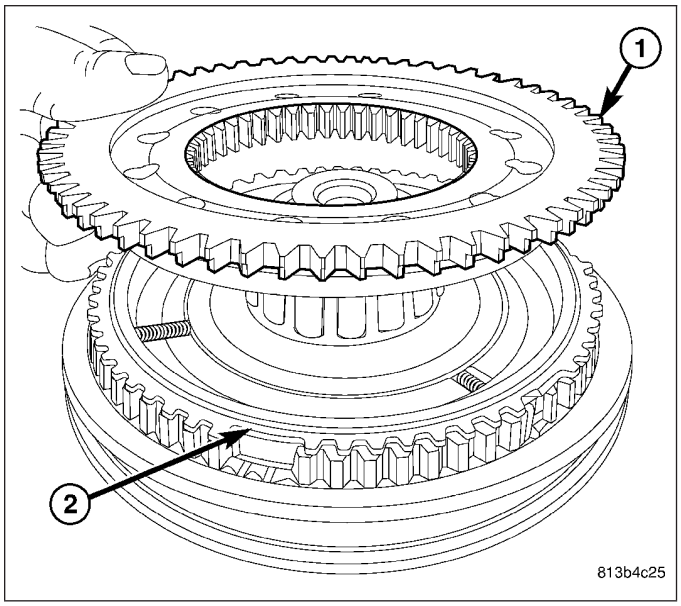
58. Install 5-6 synchronizer detents and springs (1) into synchronizer hub (2) slots. Then push detents behind synchronizer sleeve (3).



59. Install fifth gear friction ring (1) onto hub (2).

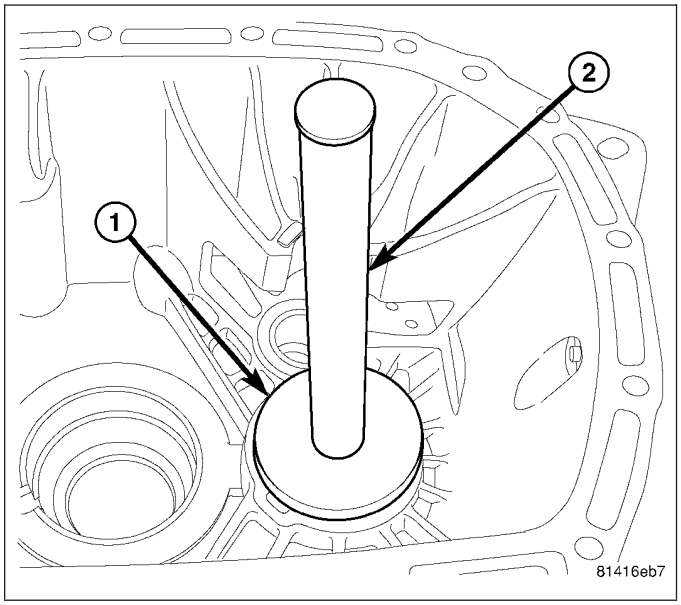


60. Install fifth gear blocker ring with teeth pointing down (1) onto hub (2).
61. Hold fifth gear blocker ring (1) onto hub (2) and center 5-6 synchronizer sleeve on hub (2).

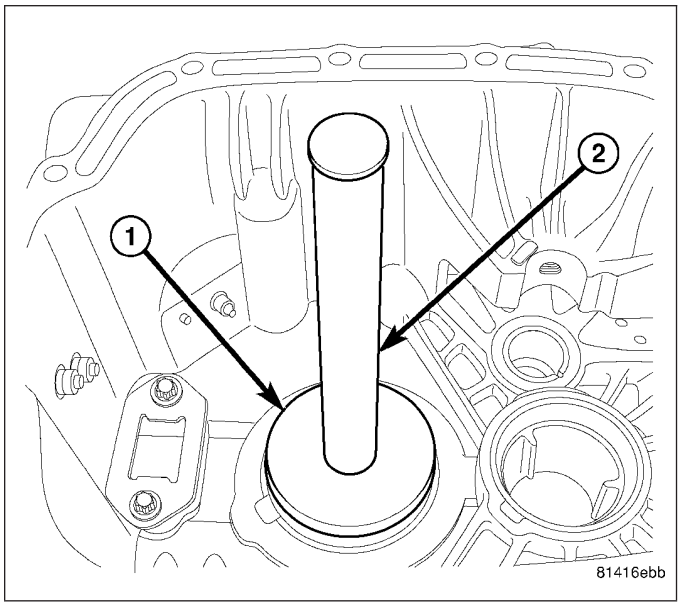


REAR HOUSING

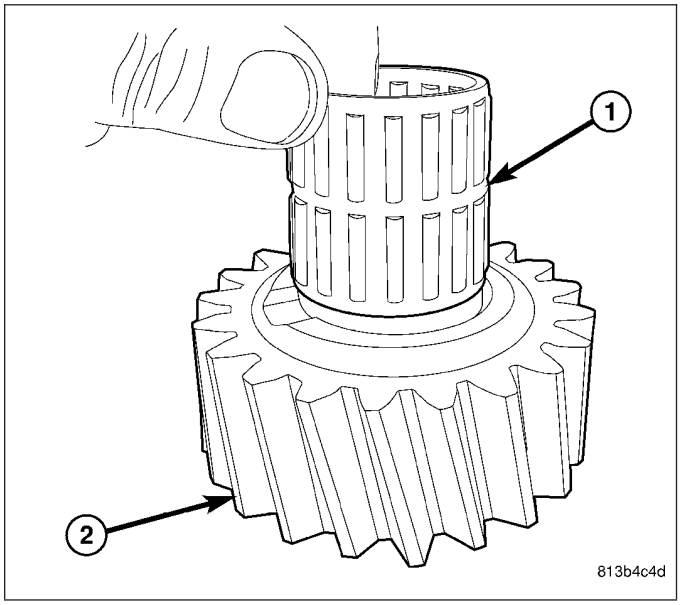
1. Install countershaft bearing cup with Installer 9589 (1) and Handle C-4171 (2).



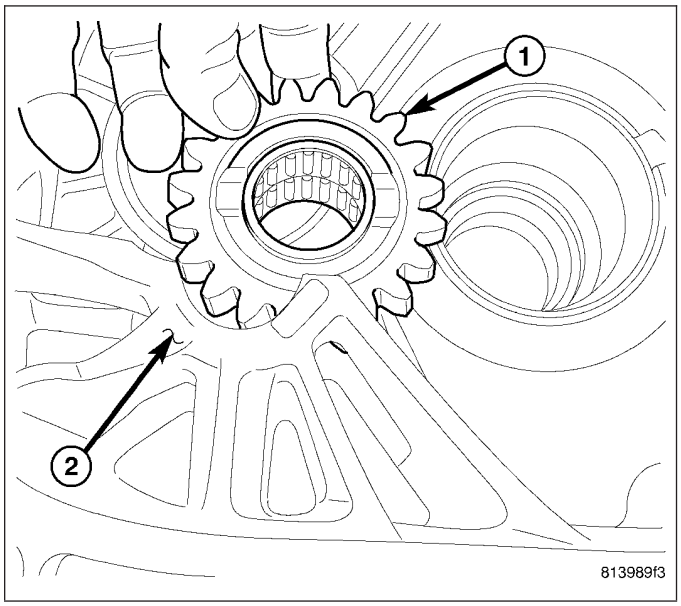
2. Install mainshaft bearing cup with Installer 9588 (1) and Handle C-4171(2).
3. Install output shaft seal with Installer 9598.



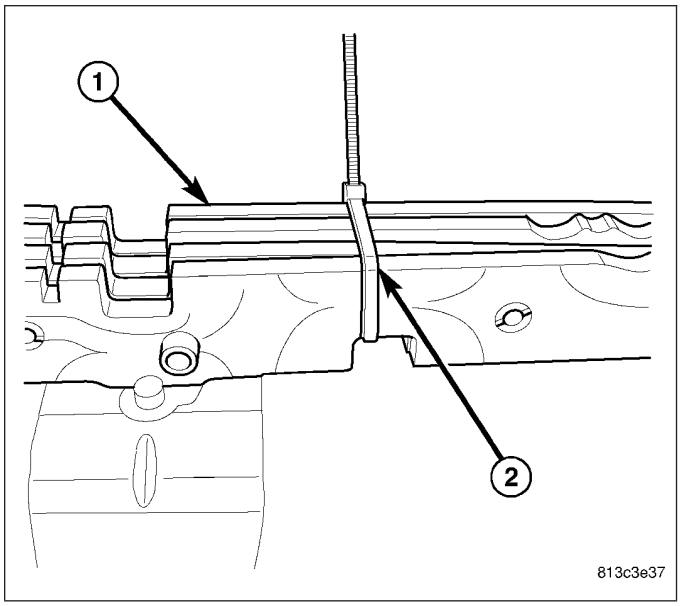
4. Install reverse idler bearing (1) into idler gear (2).



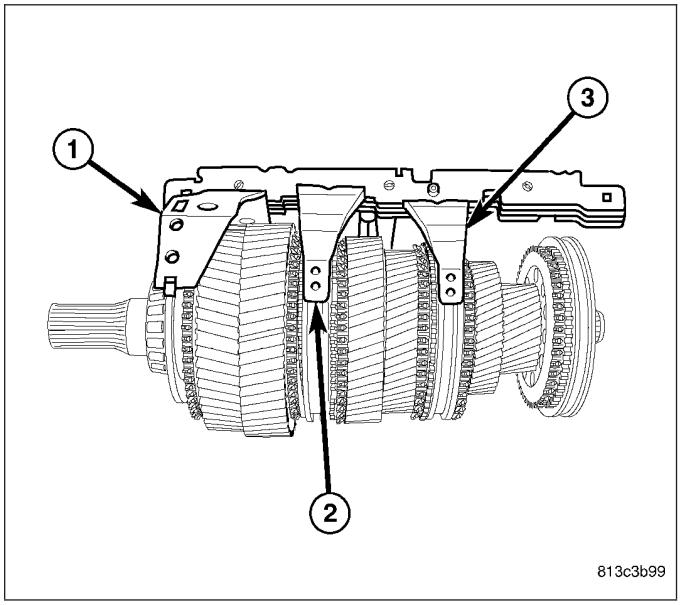
5. Install idler gear (1) into rear housing (2) off to the side. For mainshaft/countershaft installation clearance.



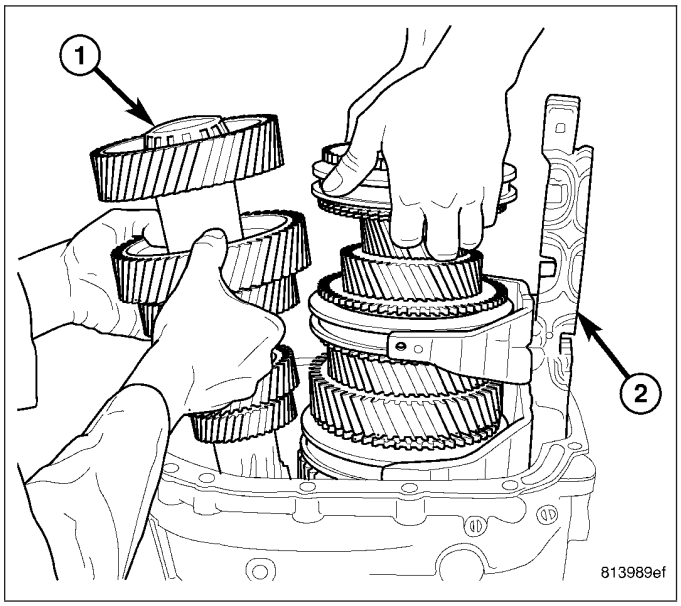
6. Tie strap (2) shift rails (1) together.



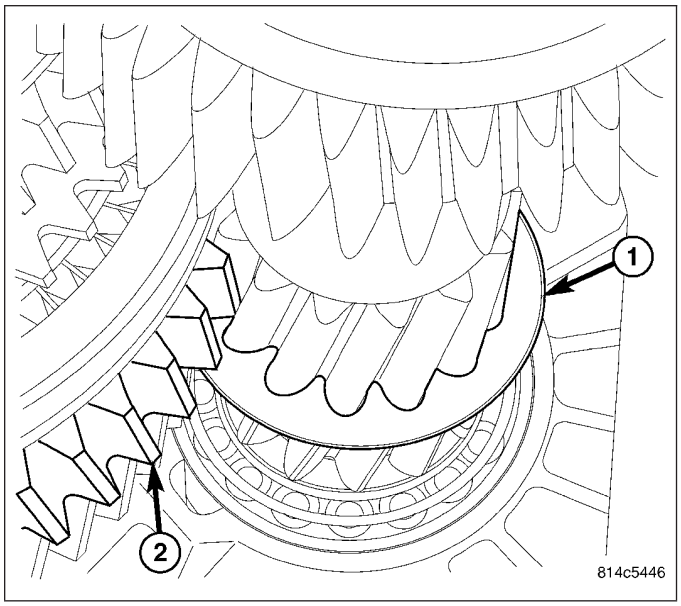
7. Install reverse (1), 1-2 (2) and 3-4 (3) shift rails and forks as and assembly on synchronizer sleeves.



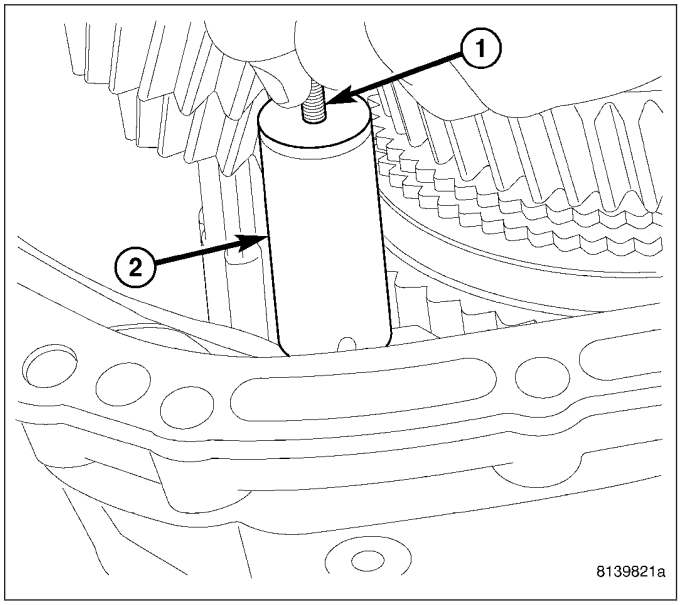
8. Install mainshaft with shift rails (2) into the rear housing. Tilt the mainshaft then tilt the countershaft (1) into the housing.



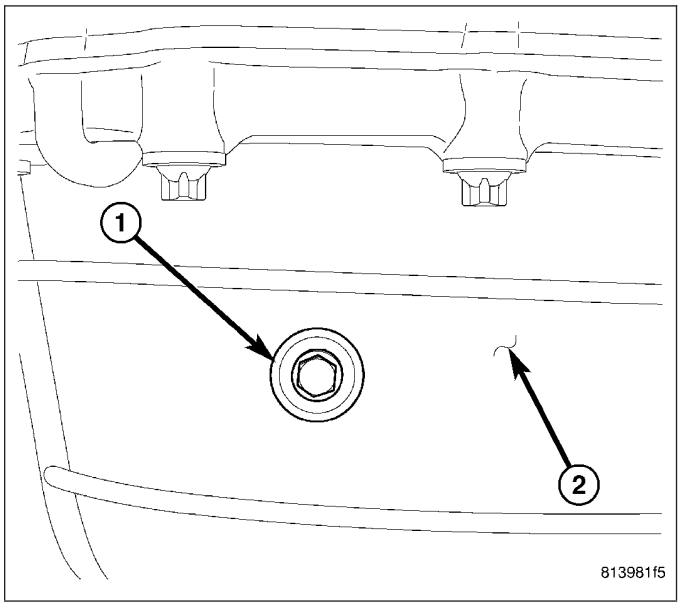
9. Position first/reverse oil slinger (1) between the mainshaft first (2) and reverse gears.



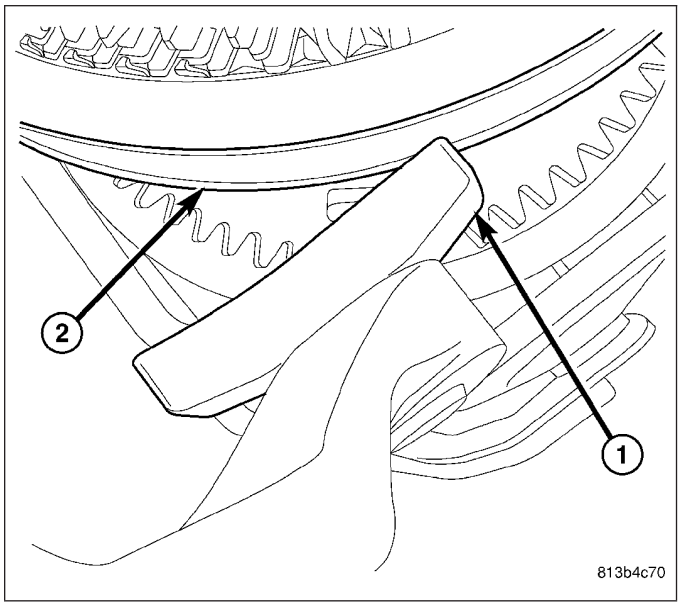
10. Position reverse idler gear and install idler shaft (2) with bolt (1).



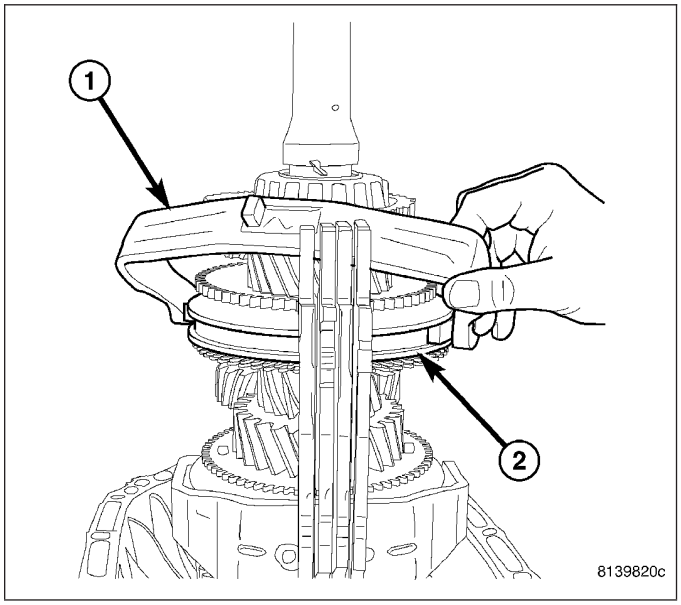
11. Install reverse idler gear shaft pin (1) into rear housing (2) and tighten to 58 N·m (43 ft. lbs.).



12. Install 5-6 shift shoe narrow ends (1) into the 5-6 synchronizer sleeves (2).



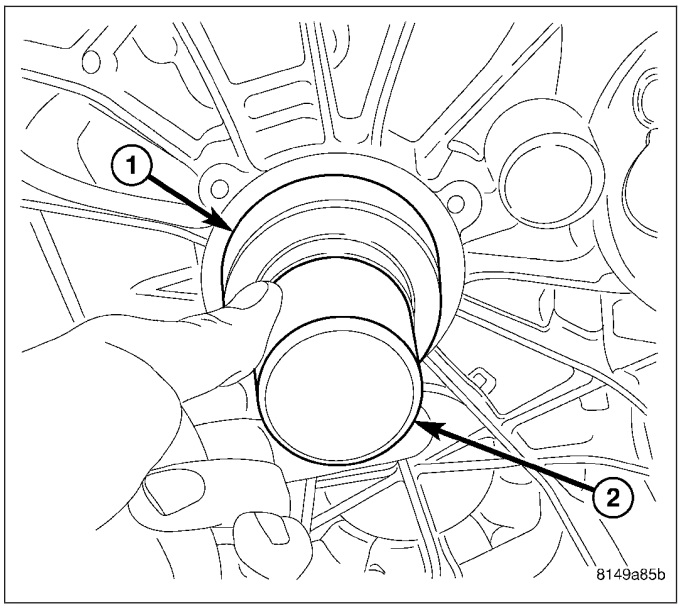
13. Install 5-6 shift fork (1) into the shift rail.



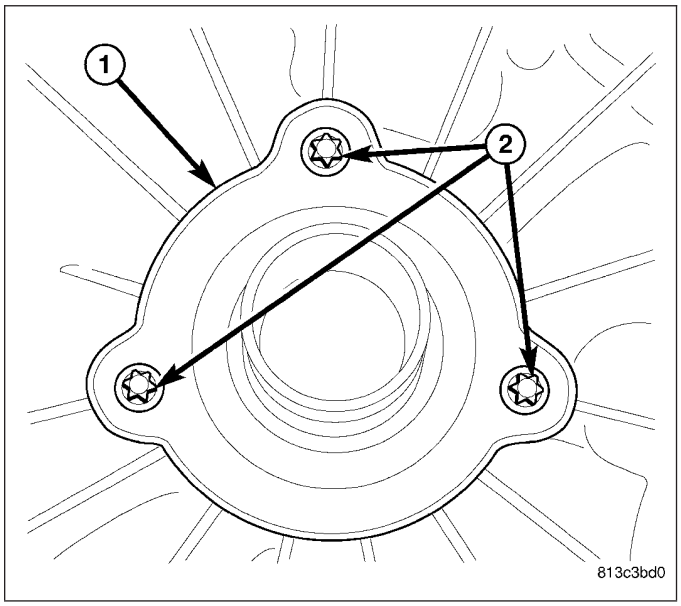
FRONT HOUSING

CAUTION: If mainshaft/bearings or countershaft/ bearings are replaced endplay measurements, must taken to ensure proper bearing preload. Failure to follow these instruction will result in bearing damage.

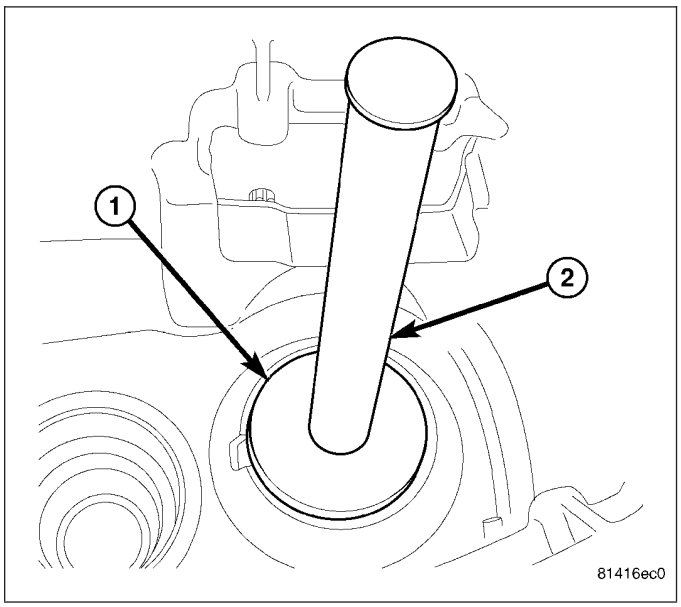
1. Install input shaft seal front housing bore (1) with Installer 9595 (2).



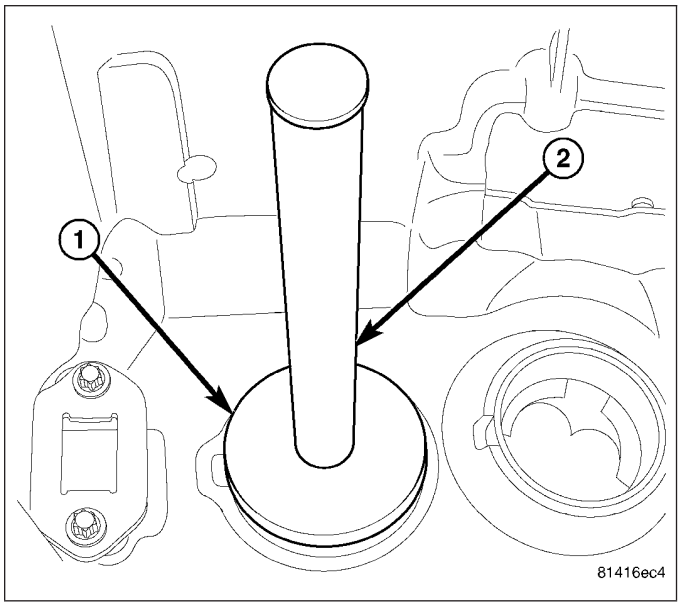
2. Install input shaft retainer (1) and tighten bolts (2) to 23 N·m (17 ft. lbs.).



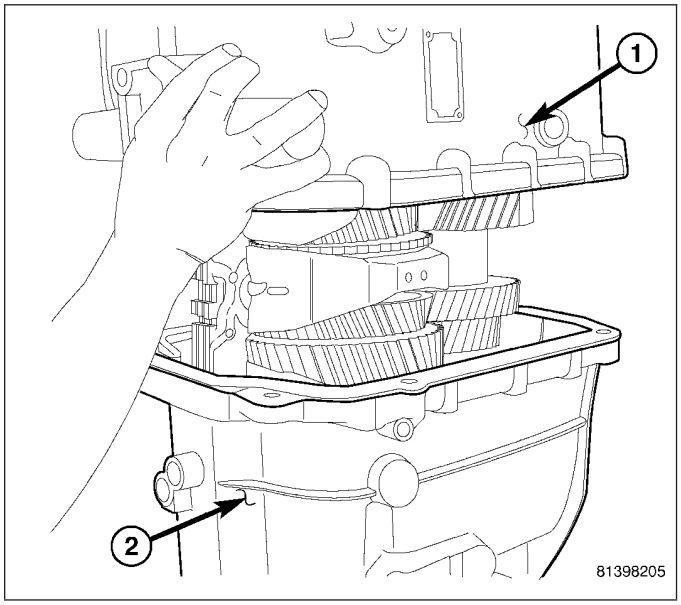
3. Install select end play shims into the countershaft bearing cup bore.
4. Install countershaft bearing cup with Installer 9589 (1) and Handle C-4171(2).



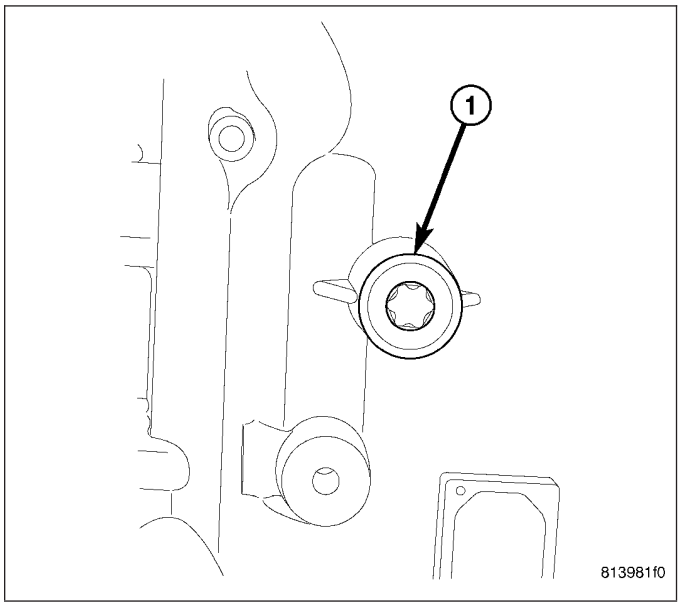
5. Install input shaft bearing oil supply washer and select end play shims into mainshaft bearing cup bore.
6. Install mainshaft bearing cup with Installer 9588 (1) and Handle C-4171 (2).



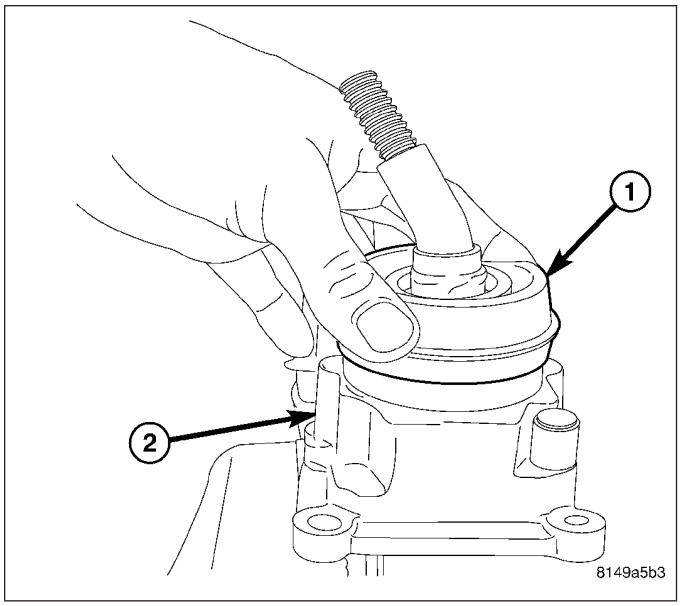
7. Apply Mopar Gasket Maker to the rear housing sealing surface.
8. Install front housing (1) onto the rear housing (2).
9. Install housing bolts and tighten to 58 N·m (43 ft. lbs.).



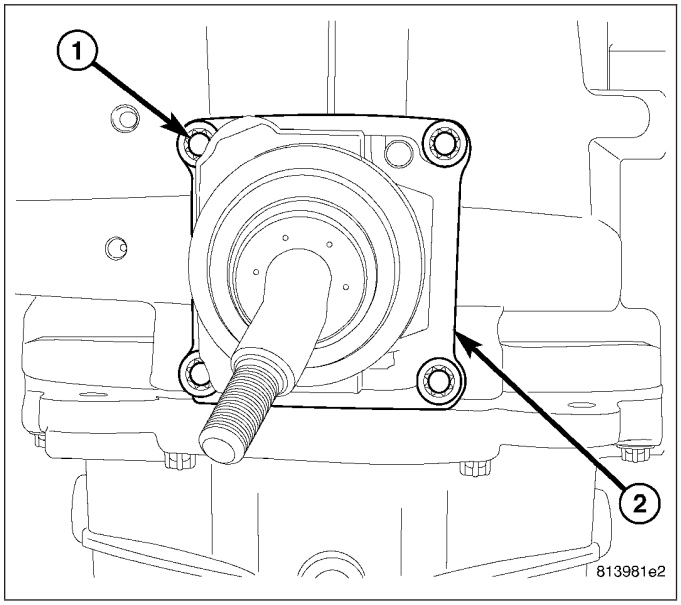
10. Install 5-6 shift fork pins (1) into housing and tighten to 58 N·m (43 ft. lbs.).



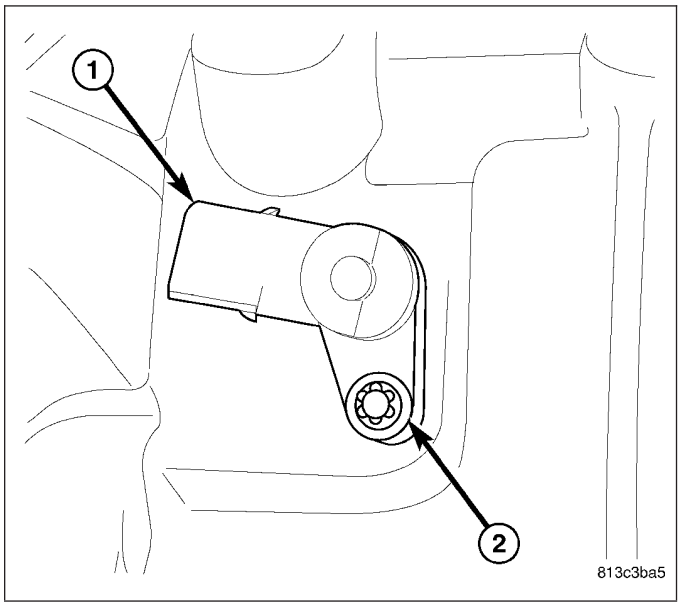
11. Push shift tower boot (1) onto shift tower (2).



12. Remove shift fork tie strap.
13. Apply Mopar Gasket Maker to the shift tower opening.
14. Install shift tower (2) and tighten bolts (1) to 23 N·m (17 ft. lbs.).

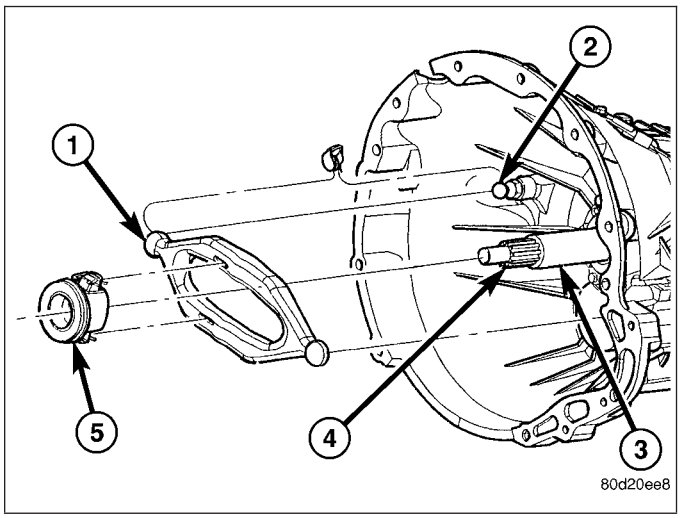


15. Install back up lamp switch (1) and bolt (2).

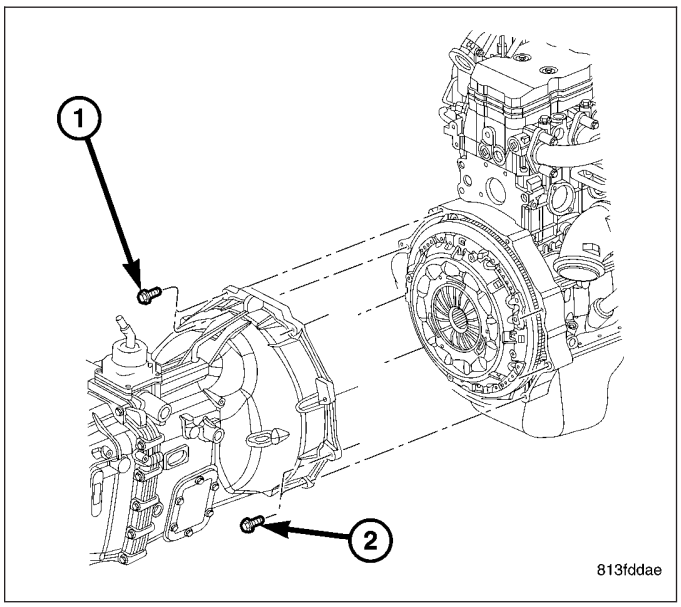


INSTALLATION

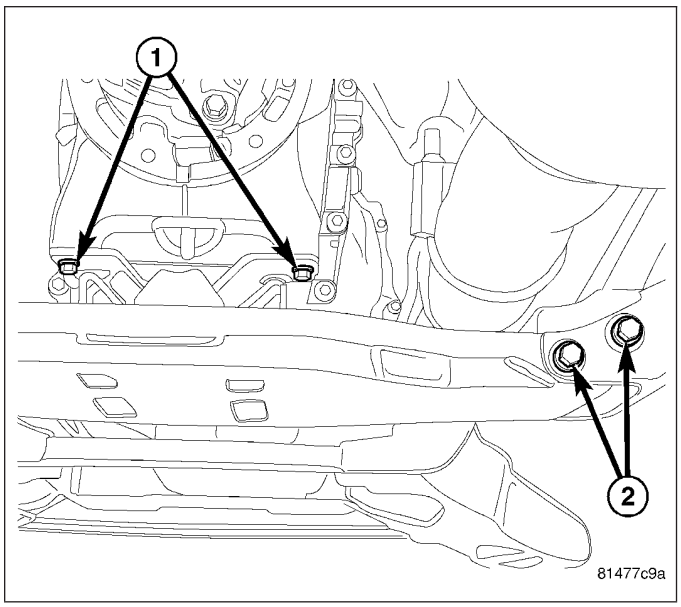
1. Clean transmission front housing mounting surface.
2. Apply light coat of Mopar high temperature bearing grease or equivalent to contact surfaces of following components:
   - release fork (1) ball stud (2)
   - release bearing slide surface (3)
   - input shaft splines (4)
   - release bearing bore (5)
   - propeller shaft slip yoke.



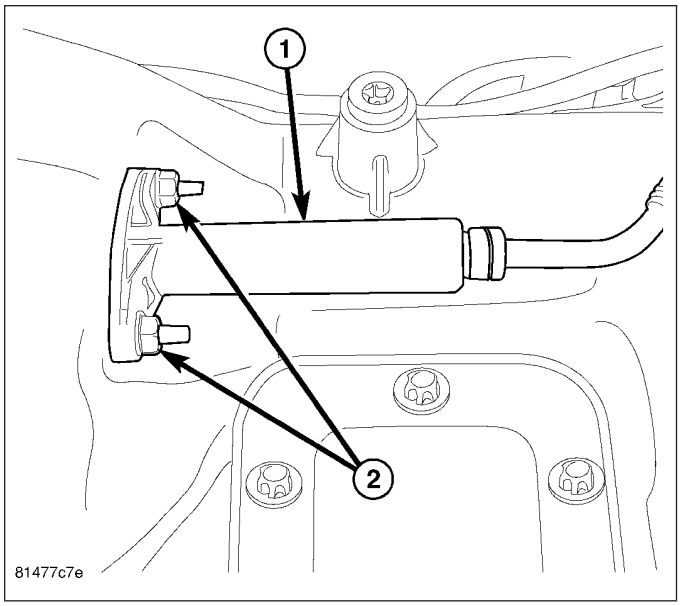
3. Support and secure transmission to jack.
4. Raise and align transmission input shaft with clutch disc, then slide transmission into place.
5. Install exhaust bracket.
6. Verify front housing is fully seated. Install transmission bolts without washers (1) and tighten bolts into the engine to 41 N·m (30 ft. lbs.). Tighten the bolts with washers (2) into the transmission to 68 N·m (50 ft. lbs.).



7. Install crossmember and tighten nuts (2) to 102 N·m (75 ft. lbs.).
8. Install transmission mount bolts (1) and tighten to 68 N·m (50 ft. lbs.).
9. Install front dust shield tighten bolt to 4.5 N·m (40 in. lbs.). On 5.7L if structural dust cover was removed, install onto the transmission and engine (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION).
10. Install structural dust cover and tighten the bolts to 54 N·m (40 ft. lbs.).
11. Install starter motor 5.7L.



12. Connect transmission harnesses to clips on case and connect switches.
13. Install slave cylinder and tighten cylinder nuts to 23 N·m (200 in. lbs.).
14. Install transfer case and transfer case linkage 4x4 equipped.
15. Remove transmission jack.
16. Install propeller shaft/shafts with reference marks aligned.
17. Install exhaust on the exhaust manifolds.
18. Fill transmission with lubricant. Correct fill level is to bottom edge of fill plug hole.



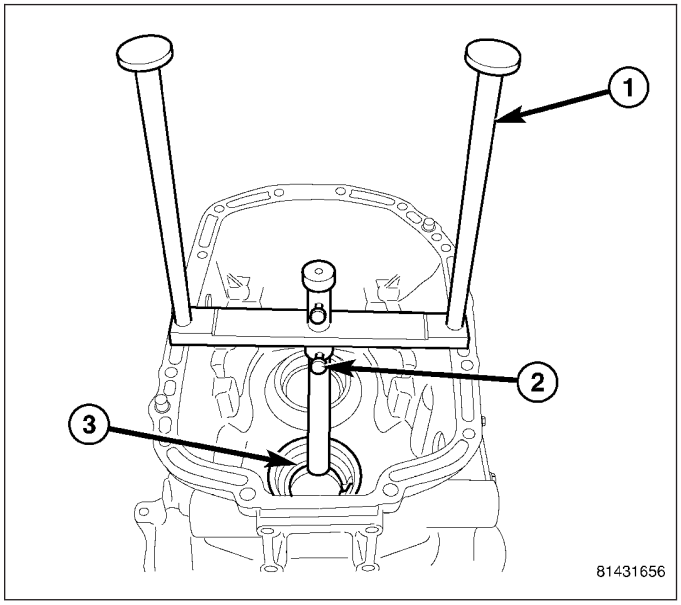
ADJUSTMENTS

MAINSHAFT/COUNTERSHAFT BEARING PRELOAD

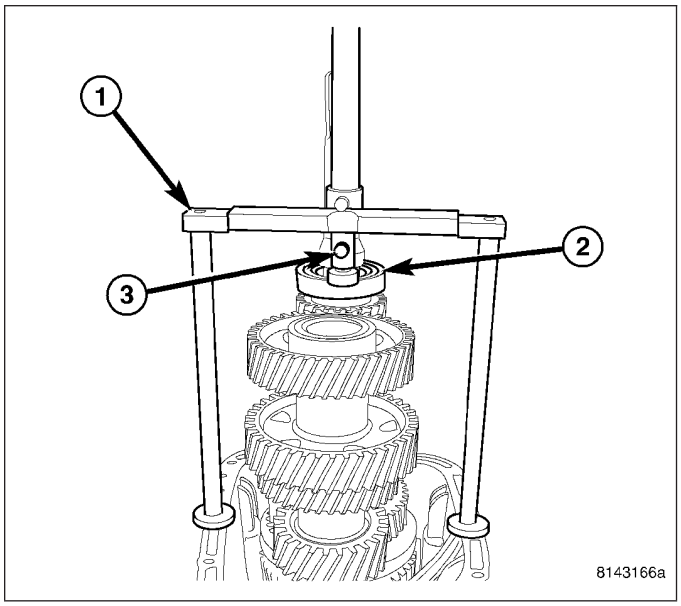
CAUTION: This procedure must be performed any time a mainshaft, countershaft or input shaft bearing or shaft is replaced. Failure to follow these instructions will result in damaging the transmission.

MAINSHAFT

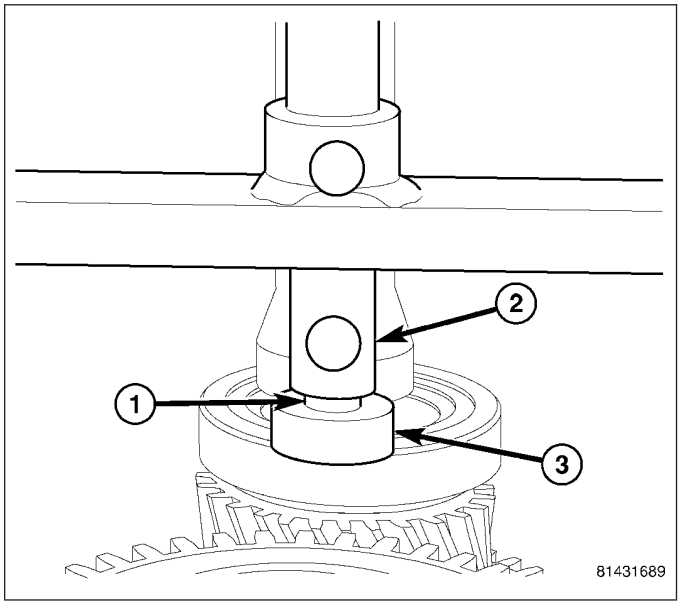
1. Set mainshaft, input shaft and countershaft into the rear housing. Rotate the shafts to seat bearing in rear housing.
2. Remove mainshaft bearing cup, shims and oiler washer from the rear housing.
3. Position Fixture 9592 (1) on front housing over the mainshaft bearing cup bore.
4. Loosen the knob (2) on the fixture and lower the shaft onto the mainshaft bearing cup (3) bore shoulder. Then tighten the knob to hold the shaft.
5. Remove the fixture from the front housing.



6. Place mainshaft shaft bearing cup on mainshaft bearing.
7. Position Fixture 9592 (1) on rear housing over the mainshaft bearing (2).
8. Loosen the knob (3) on the fixture (1). This will allow the rod plunger to drop down on the bearing cup.

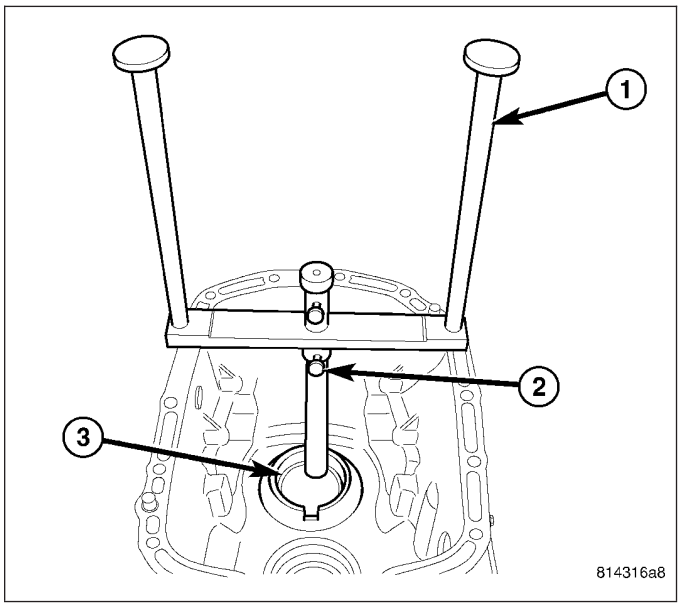


9. Measure the gap (1) between the fixture shaft (2) and the fixture plunger (3). Repeat measurement on the opposite side of the mainshaft cup and bearing. The average of the two measurement, will be the size of the mainshaft select shim.
10. Install new oil supply washer and select shim in front housing mainshaft bearing cup bore and install bearing cup.

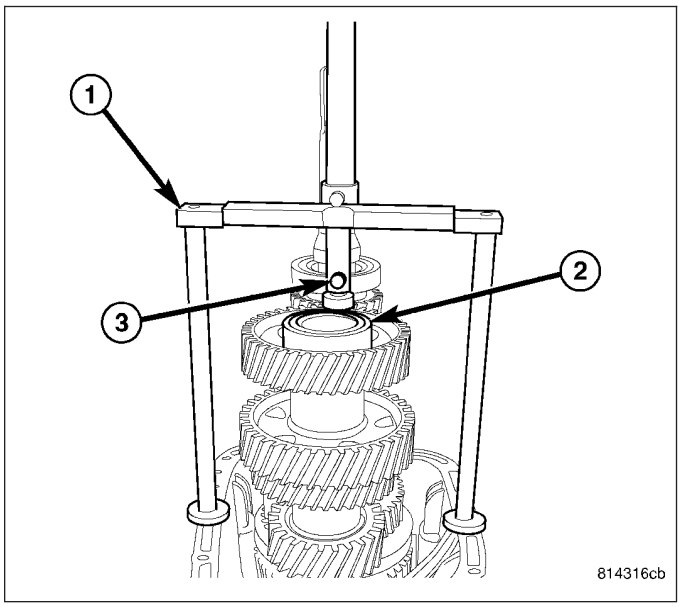


COUNTERSHAFT

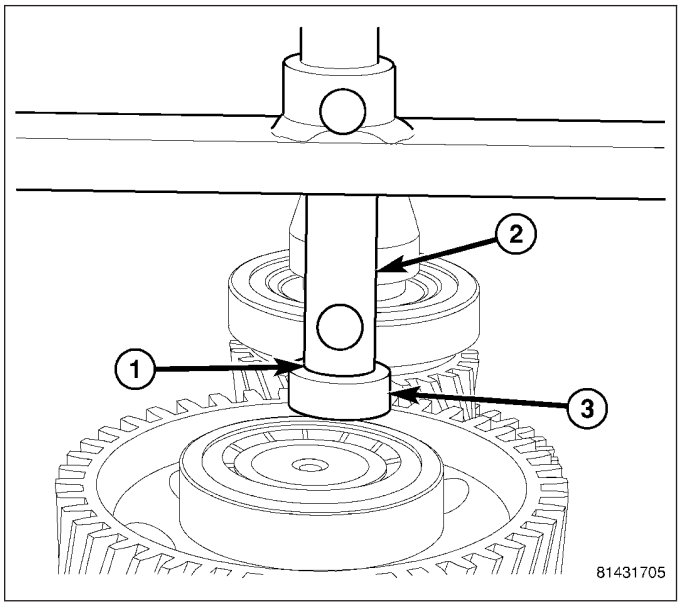
1. Remove countershaft bearing cup and shims from the rear housing.
2. Position Fixture 9592 (1) on rear housing over the countershaft bearing cup bore.
3. Loosen the knob (2) on the fixture and lower the shaft onto the countershaft bearing cup (3) bore shoulder. Then tighten the knob to hold the shaft.
4. Remove the fixture from the front housing.



5. Place countershaft bearing cup on countershaft bearing.
6. Position Fixture 9592 (1) on rear housing over the countershaft bearing (2).
7. Loosen the knob (3) on the fixture (1). This will allow the rod plunger to drop down on the bearing cup.



8. Measure the gap (1) between the fixture shaft (2) and the fixture plunger (3). Repeat measurement on the opposite side of the countershaft cup and bearing. The average of the two measurements, will be the size of the countershaft select shim.
9. Install select shim in front housing countershaft bearing cup bore and install bearing cup.



SPECIFICATIONS

G56 - MANUAL TRANSMISSION

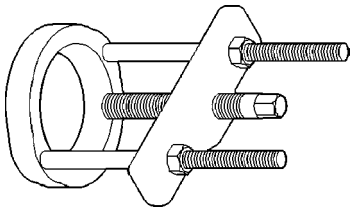
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fill Plug	57	42	-
Drain Plug	57	42	-
Housing Bolts	58	43	-
Input Shaft Retainer Bolts	23	17	-
Shift Tower bolts	23	17	-
5-6 Shift Fork Bolts	58	43	-
Shift Rail Support bolts	58	43	-
Reverse Idler Gear Shaft Bolt	58	43	-
P.T.O. Cover Bolts	58	43	-
Clutch Release Pivot Ball	22	16	-

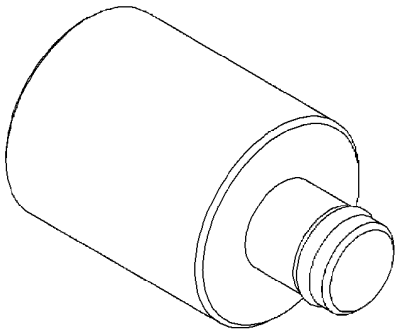
GEAR SPECIFICATIONS

GEAR	RATIO
FIRST	6.29
SECOND	3.48
THIRD	2.10
FOURTH	1.38
FIFTH	1.00
SIXTH	0.79
REVERSE	5.74

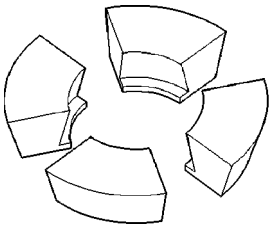
SPECIAL TOOLS



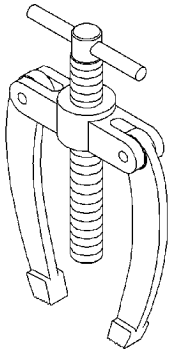
PULLER C-293-PA



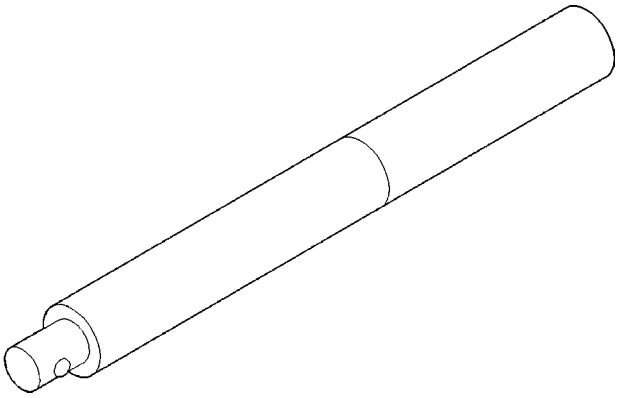
PLUG 8513A



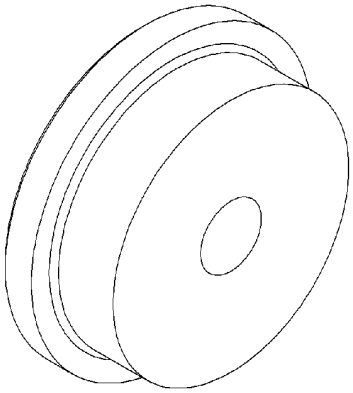
ADAPTERS C-293-47



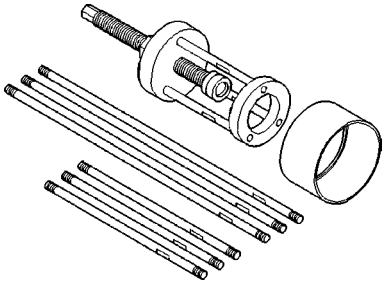
REMOVER 8915



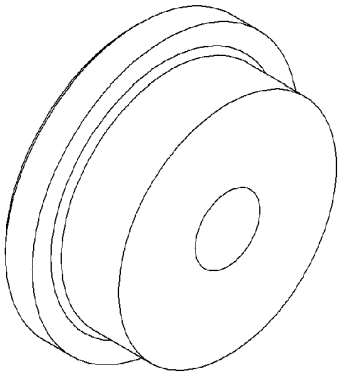
HANDLE C-4171



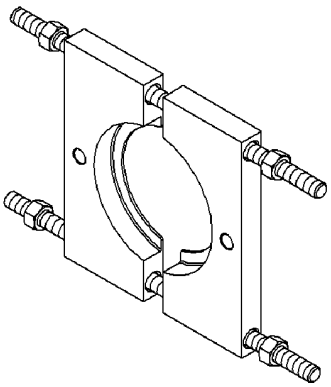
CUP INSTALLER 9588



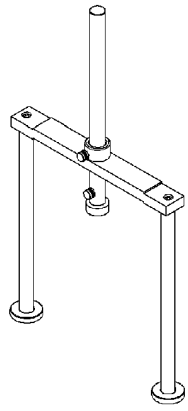
PULLER 6444



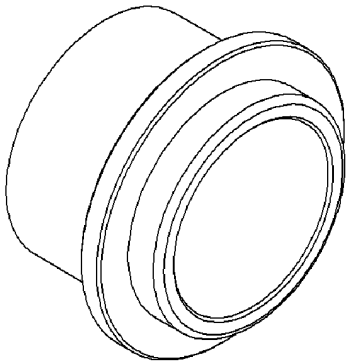
CUP INSTALLER 9589



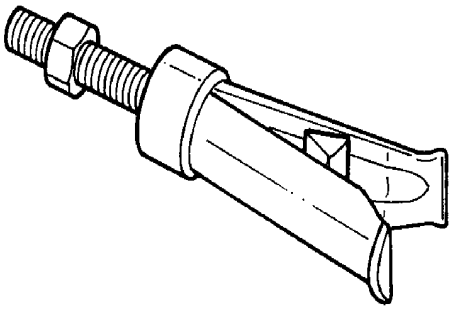
PULLER 9594



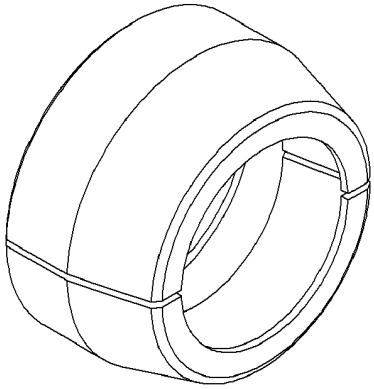
MEASUREMENT FIXTURE 9592



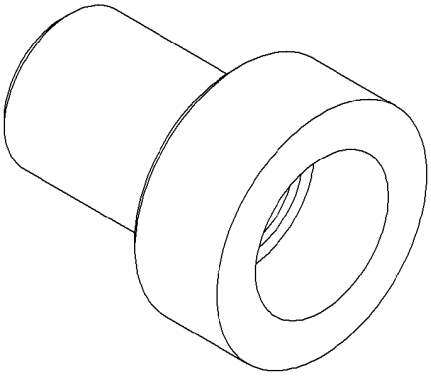
SEAL INSTALLER 9595



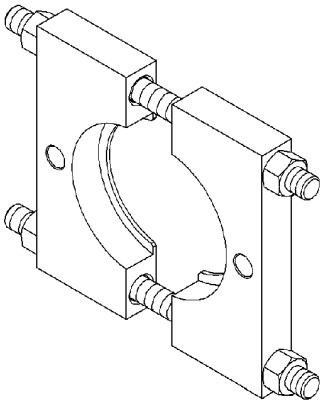
CUP REMOVER 9593



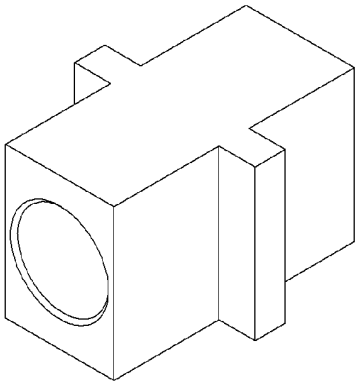
JAWS 9597



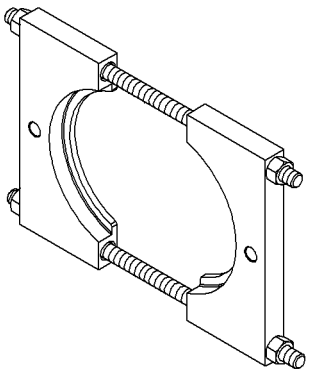
SEAL INSTALLER 9598



PULLER PLATE 9647



MAINSHAFT FIXTURE 9605



PULLER PLATE 9646

MANUAL TRANSMISSION - T56 - SERVICE INFORMATION

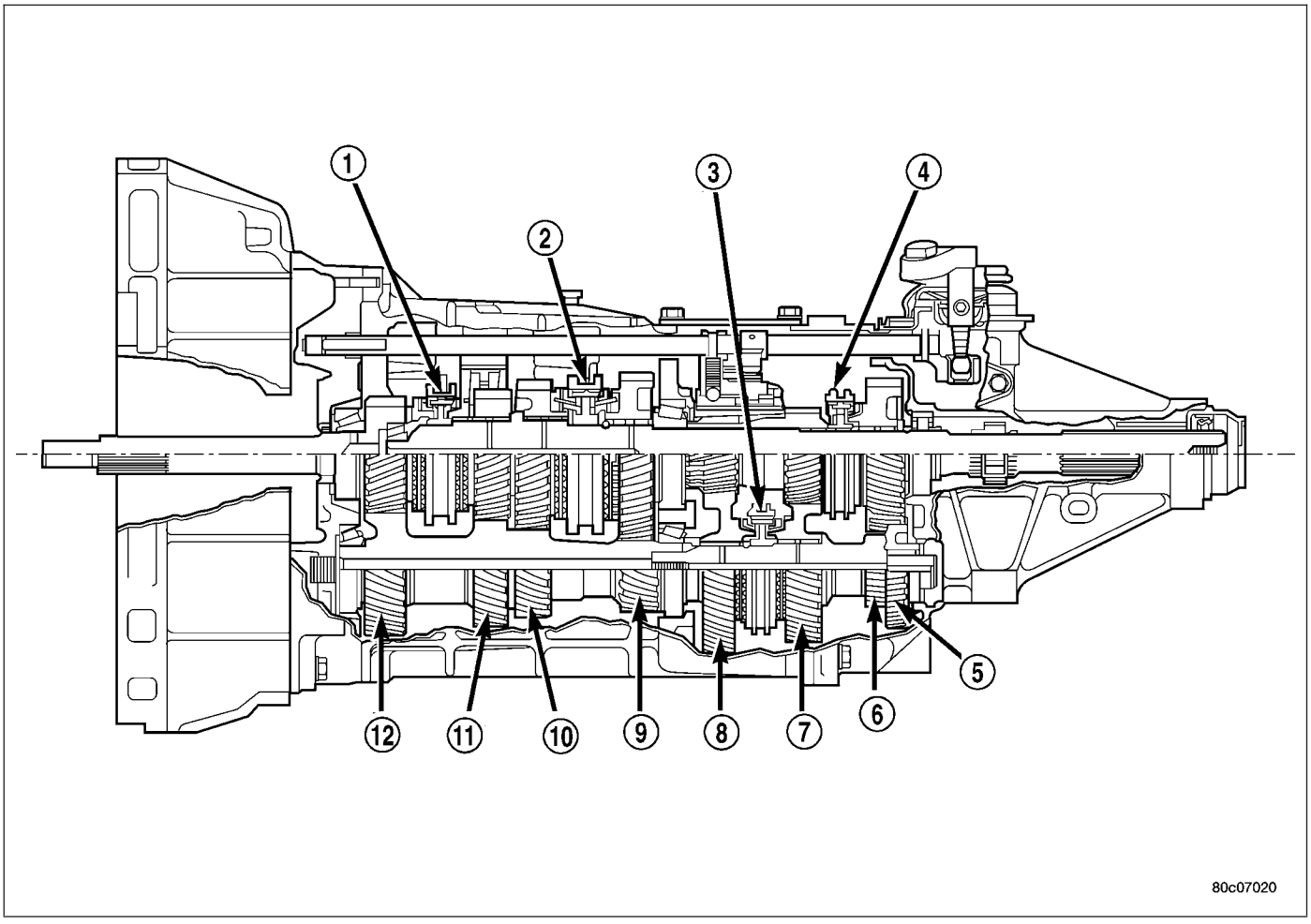
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SOLENOID-REVERSE LOCK-OUT
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MANUAL TRANSMISSION - T56 - SERVICE INFORMATION

OPERATION



NEUTRAL

The input gear supplies input torque from the engine crankshaft via the clutch assembly. All gears turn, but the synchronizers are not engaged with the gear teeth. Because the synchronizers are not engaged, power is not transferred to the main shaft.

1ST GEAR

The 1-2 synchronizer (2) sleeve shifts rearward to engage with the clutch teeth on the first speed gear (1). In this condition, the power from the input gear is transmitted through the cluster gear to the first speed gear. Power is transferred from the speed gear, across the synchronizer sleeve to the main shaft. The gear ratio for first gear is 2.66:1.

2ND GEAR

The 1-2 synchronizer (2) sleeve shifts forward to engage with the clutch teeth on the second speed gear (10). In this condition, the power from the input gear will go through the cluster gear, across the second speed gear, and into the synchronizer sleeve. The sleeve turns the synchronizer hub and main shaft. The gear ratio for second gear is 1.78:1.

3RD GEAR

The 3-4 synchronizer (1) sleeve moves rearward to engage with the clutch teeth of the third speed gear (11). The power is transferred through the input gear to the cluster gear, across the third speed gear, to the synchronizer sleeve. The sleeve turns the synchronizer hub and the main shaft. The gear ratio for third gear is 1.30:1.

4TH GEAR

The 3-4 synchronizer (1) sleeve moves forward to engage with the clutch teeth of the fourth speed gear (12). Input power is transferred straight through the input gear into the synchronizer sleeve. The sleeve turns the synchronizer hub and the main shaft. The gear ratio for fourth gear is 1.00:1.

5TH GEAR

The 5-6 synchronizer (3) sleeve moves rearward to engage with the clutch teeth of the fifth speed gear (7). In this condition, the power from the input gear is transferred through the cluster gear to the cluster gear extension. Power then flows from the extension into the synchronizer hub. The hub turns the synchronizer sleeve, fifth speed gear and the main shaft. The gear ratio for fifth gear is 0.74:1.

6TH GEAR

The 5-6 synchronizer (3) sleeve moves forward to engage with the clutch teeth of the sixth speed gear (8). In this condition, the power from the input gear is transferred through the cluster gear to the cluster gear extension. Power then flows from the extension into the synchronizer hub. The hub turns the synchronizer sleeve, sixth speed gear and the main shaft. The gear ratio for sixth gear is 0.50:1.

REVERSE

The reverse gear synchronizer (4) moves rearward to engage with the reverse speed gear (6). Input power from the input gear travels through the cluster gear to the cluster gear extension. Power flows from the reverse cluster gear to the reverse idler gear, and across the reverse speed gear and synchronizer sleeve to the main shaft. The input gear moves in a clockwise direction, turning the cluster gear and its extension in a counter-clockwise direction. The cluster gear and extension turn the reverse idler gear (5) in a clockwise direction, and the idler gear turns the reverse speed gear in a counter-clockwise direction, resulting in reverse. The gear ratio for reverse gear is 2.90:1.

DIAGNOSIS AND TESTING

MANUAL TRANSMISSION - T56

LOW LUBRICANT LEVEL

A low transmission lubricant level is generally the result of a leak, inadequate lubricant fill or incorrect lubricant level check.

Rear transmission leaks will be from the oil seals or component mating surfaces.

Front transmission leaks will be from the front bearing retainer or retainer seal. Lubricant may drip from the clutch housing after extended operation. If leak is severe, it may contaminate the clutch disc.

Lubricant level check can only be made when the vehicle is level and allowing the lubricant to settle for a minute before checking. This will ensure an accurate check and avoid an underfill or overfill condition.

HARD SHIFTING

Hard shifting is usually caused by low lubricant level, improper or contaminated lubricants. This will cause noise, excessive wear, internal bind, and hard shifting. Substantial lubricant leaks can result in gear, shift rail, synchro, and bearing damage. The first indications of component damage is usually hard shifting and noise.

Shift component damage, clutch adjustment, worn pressure plate or disc are also causes of increased shift effort. If clutch problem is advanced, gear clash during shifts can result. Worn or damaged synchro rings can cause gear clash when shifting into any forward gear. In some new or rebuilt transmissions, new synchro rings may tend to stick slightly causing hard or noisy shifts. In most cases, this condition will decline as the rings wear-in.

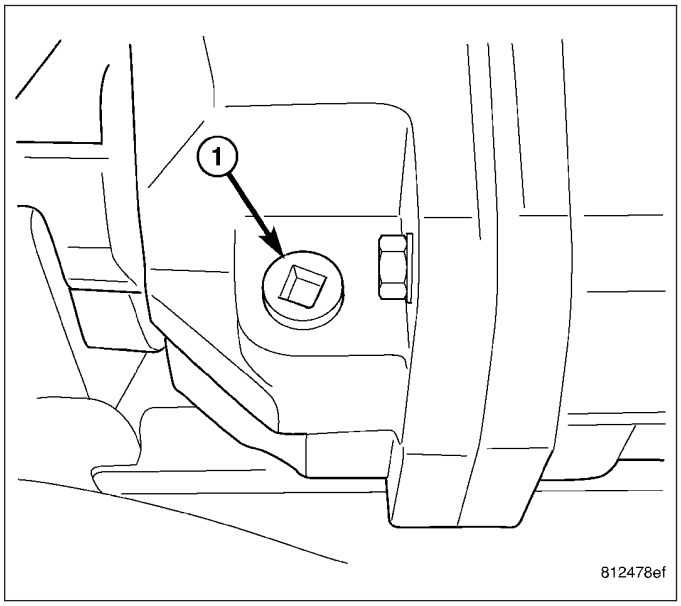
TRANSMISSION NOISE

Most manual transmissions make some noise during normal operation. Rotating gears generate a mild whine that is audible, but generally only at extreme speeds.

Severe, highly audible transmission noise is generally the initial indicator of a lubricant problem. Insufficient, improper or contaminated lubricant will promote rapid wear of gears, synchros, shift rails, forks and bearings. The overheating caused by a lubricant problem, can also lead to gear and bearing damage.

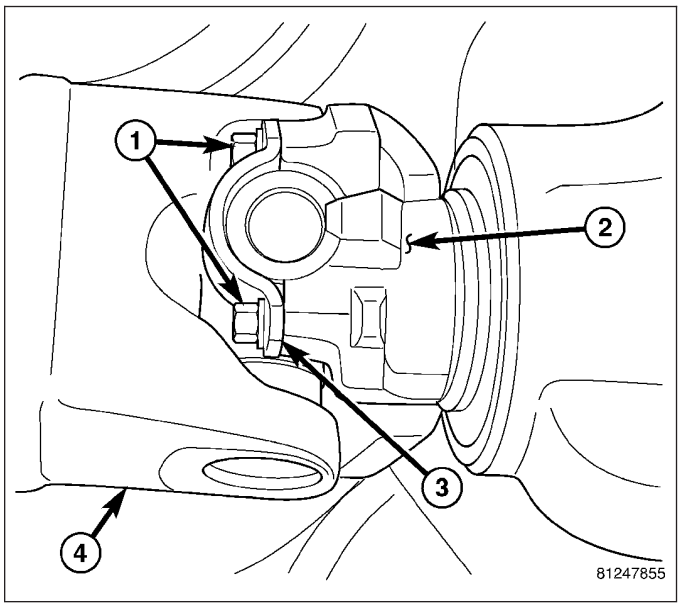
STANDARD PROCEDURE - DRAIN AND FILL

1. Raise and support vehicle.
2. Remove drain plug (1) on transmission tail housing and drain fluid.
3. Install drain plug.
4. Remove transmission fill plug on left side of the transmission case.
5. Fill transmission with Mopar® Synthetic Manual Trans Lubricant 75W-85. The transmission is full when the fluid level is even with the bottom of the fill hole.
6. Install transmission fill plug.

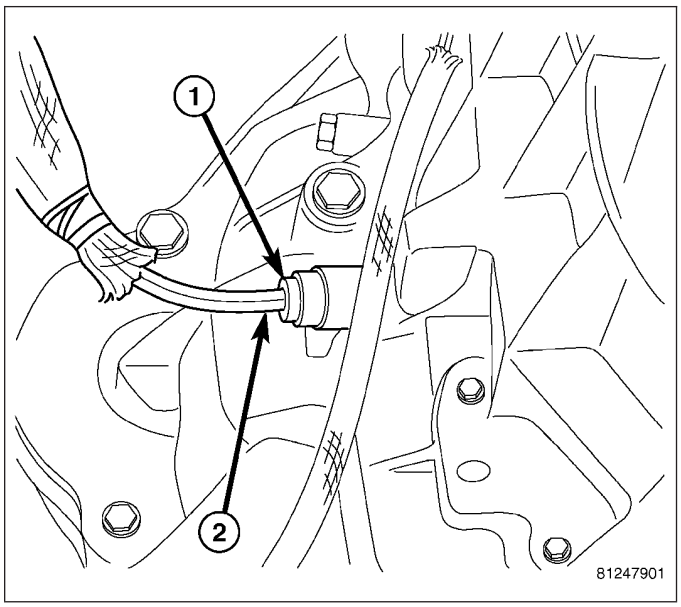


REMOVAL

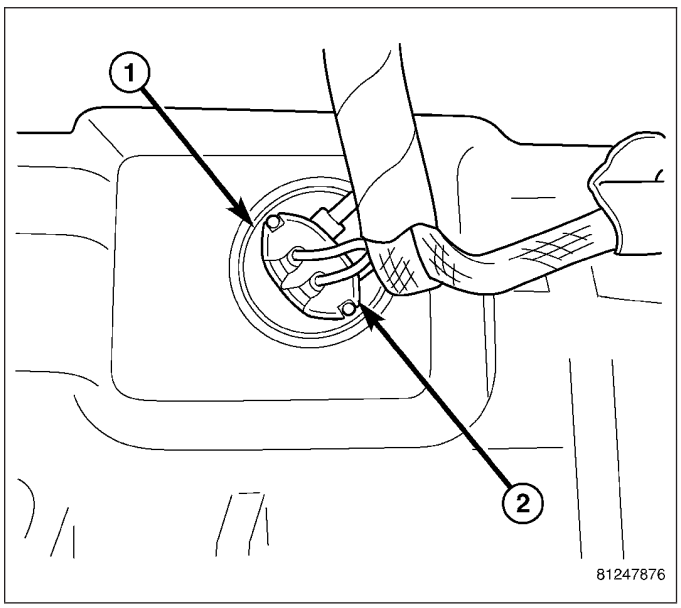
1. With vehicle in neutral, position it on a hoist.
2. Mark installtion reference marks on the propeller shaft, pinion yoke and transmission output shaft.
3. Remove propeller shaft (4) clamp (3) bolts (1) and remove shaft.



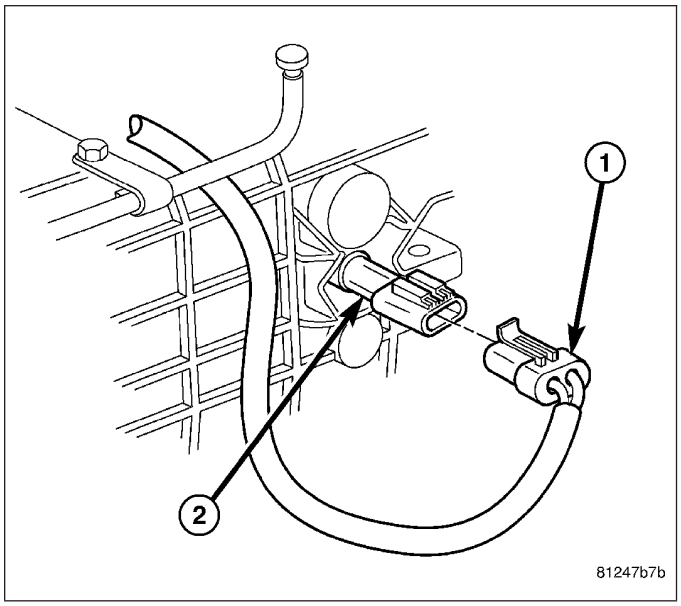
4. Remove shift cover bolts.
5. Remove hydraulic clutch line (2) quick connector (1) at the transmission with Clutch Line Disconnect Tool 6638 or 6638A to disconnect.



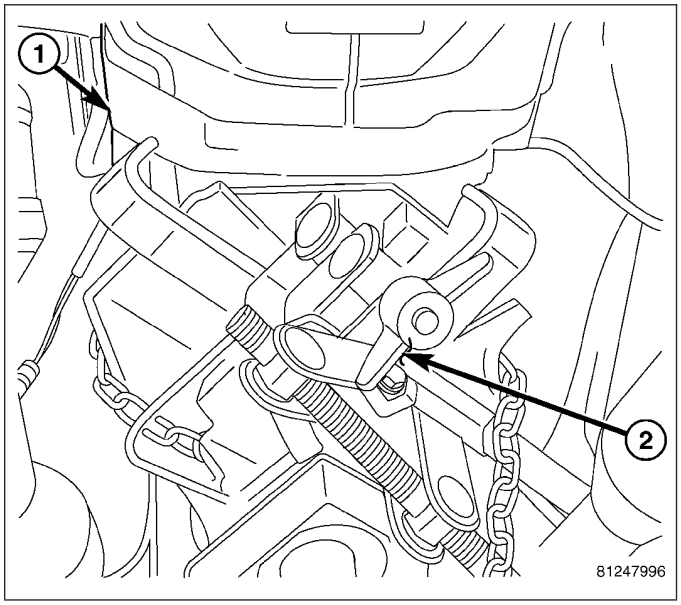
6. Remove reverse lockout solenoid (1) connector (2).
7. Remove fuel line clip fron top plate stud.



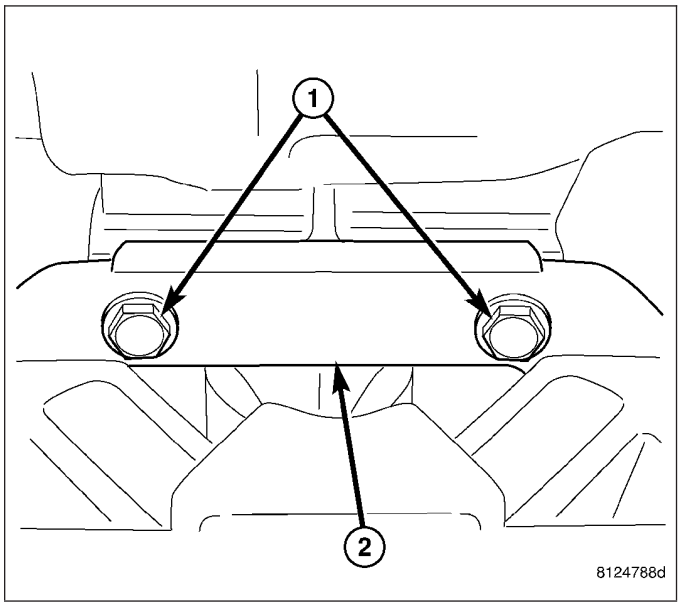
8. Remove back up lamp switch (2) connector (1).



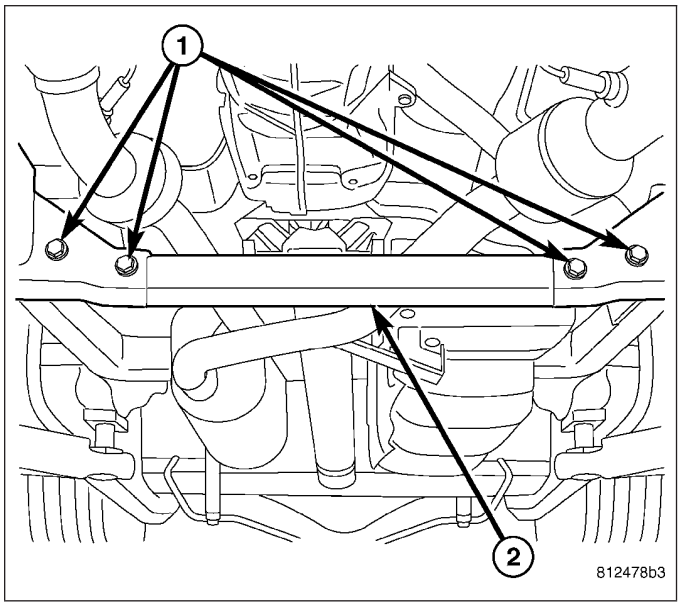
9. Position transmission jack (2) and secure to transmission (1).
10. Remove transmission to clutch housing bolts.



11. Remove transmission mount (2) bolts (1).

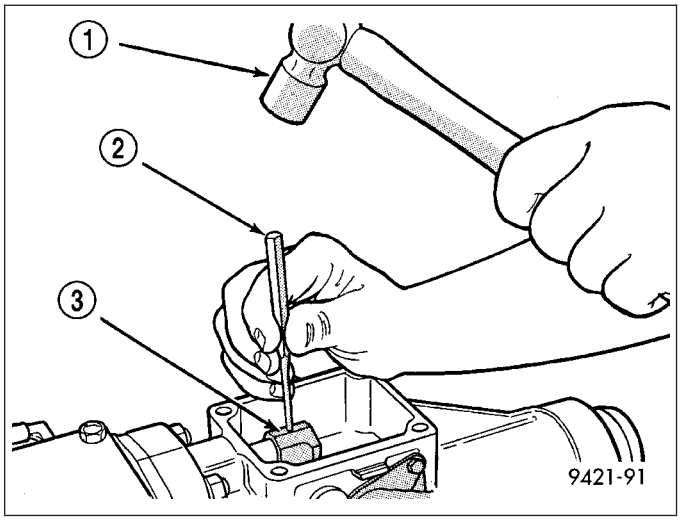


12. Remove transmission crossmember (2) bolts (1).
13. Slide transmission back to clear the bell housing. Then lower transmission.

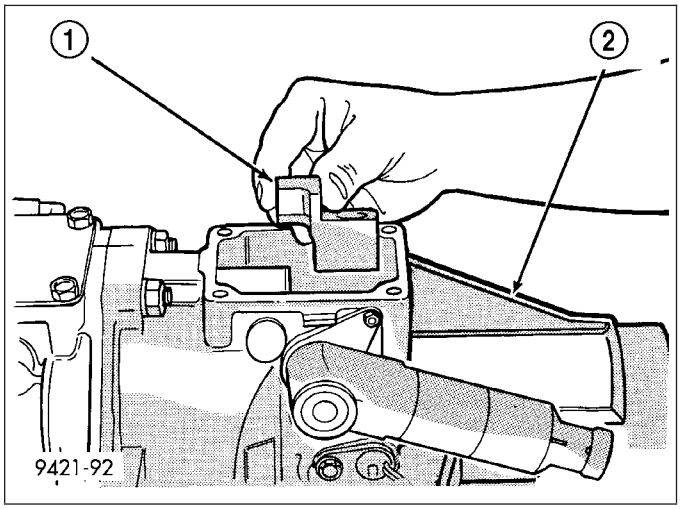


DISASSEMBLY

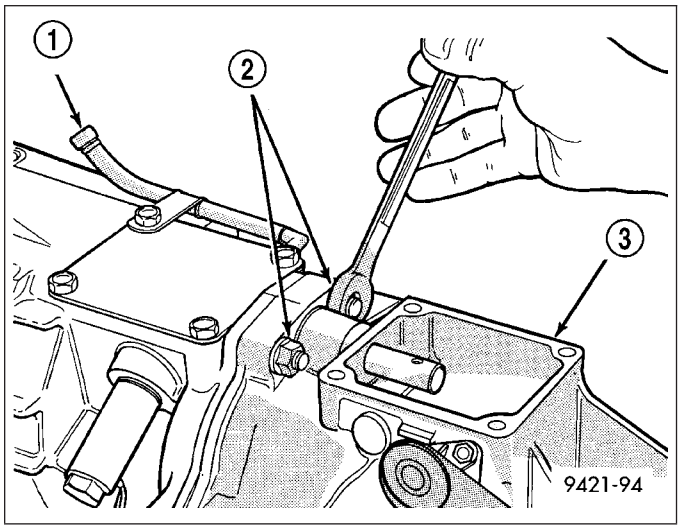
1. Remove shift cover bolts and remove shift cover.
2. Remove roll pin from rear offset lever (3) with a hammer (1) and punch (2).



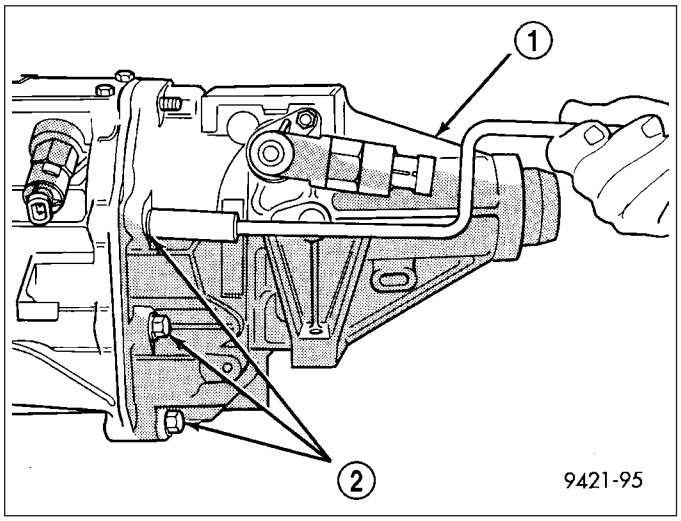
3. Remove offset lever (1) from tail housing (2).
.



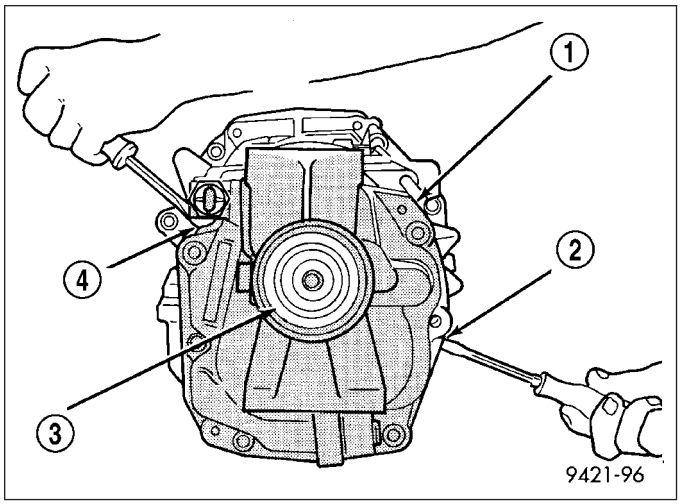
4. Remove two tail housing nuts (2) from top of the transmission tail housing (3).



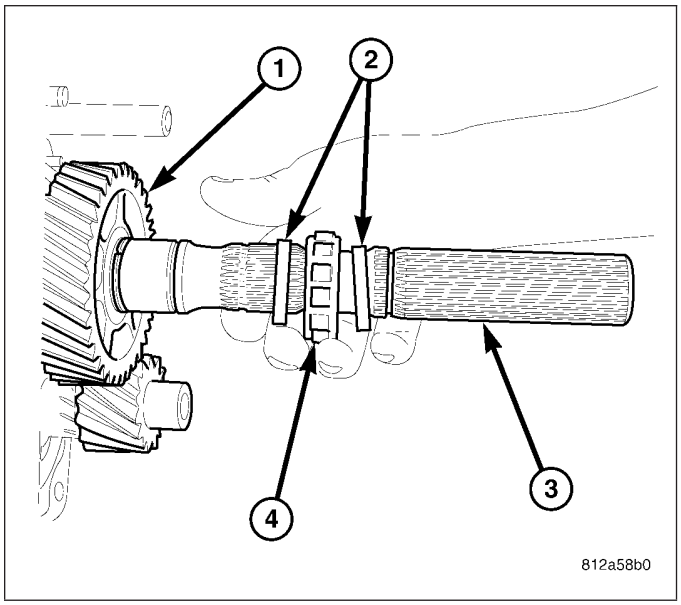
5. Remove six tail housing (1) bolts (2).



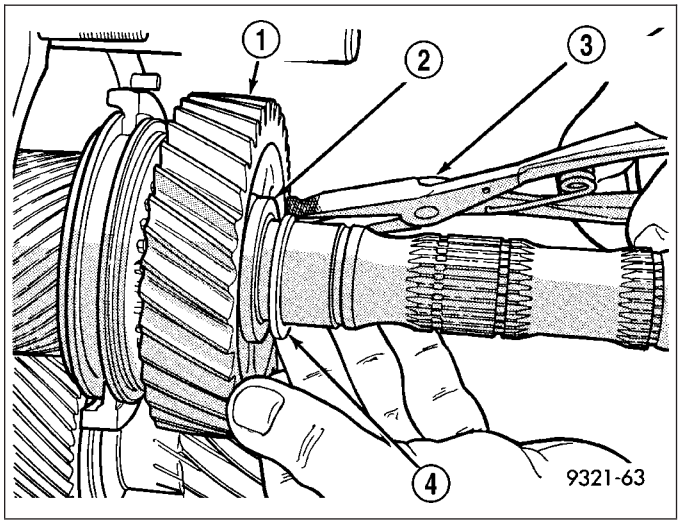
6. Pry tail housing (1) off case at pry points (2) (4) only.



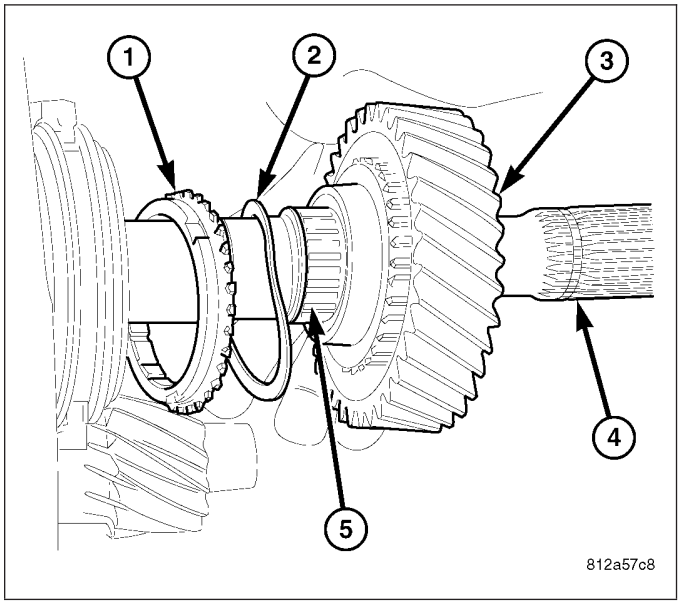
7. Remove mainshaft (3) roller bearing snap ring, roller bearing (4) and spacers (2).



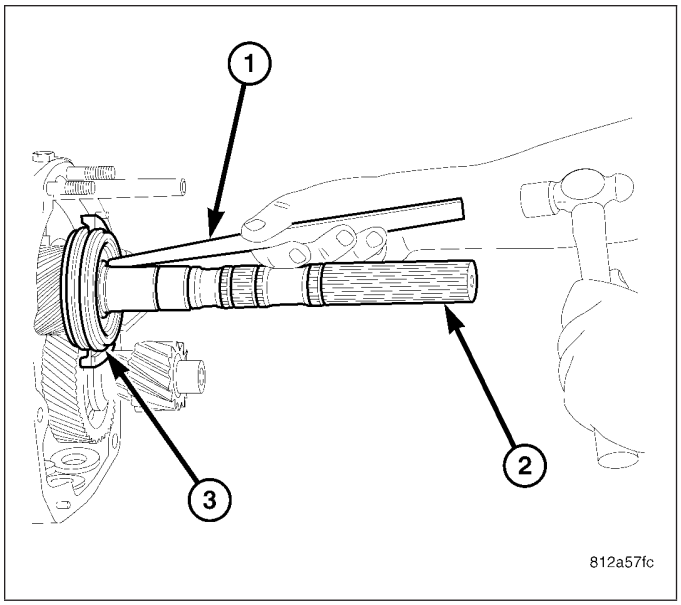
8. Remove reverse gear (1) snap ring (4) and thrust washer (2) from mainshaft.



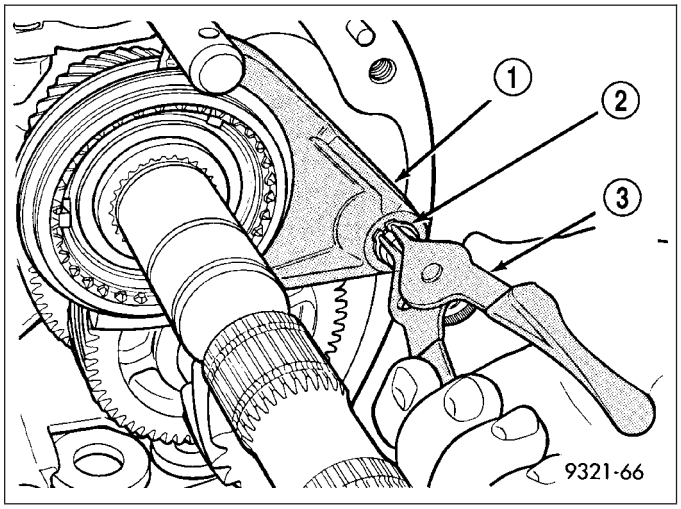
9. Remove reverse gear (3), bearing (5), wave washer (2) and brass reverse blocker ring (1) from mainshaft (4).



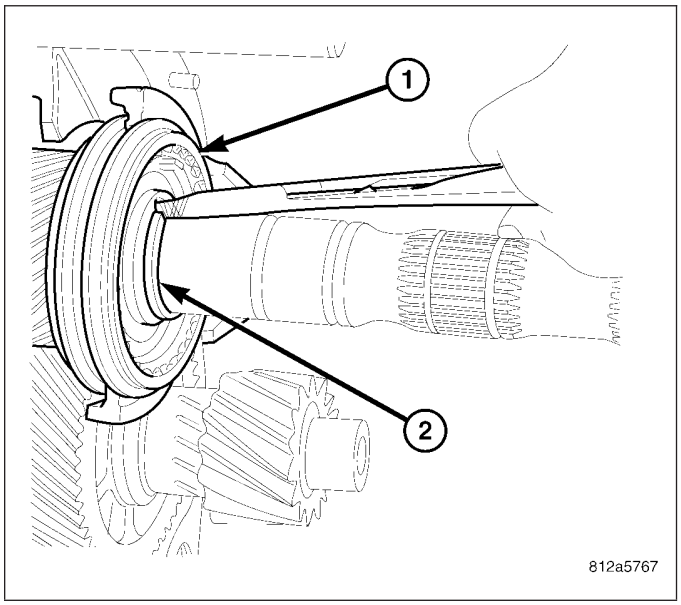
10. Tap reverse synchronizer (3) to relieve pressure on snap ring and remove snap ring.



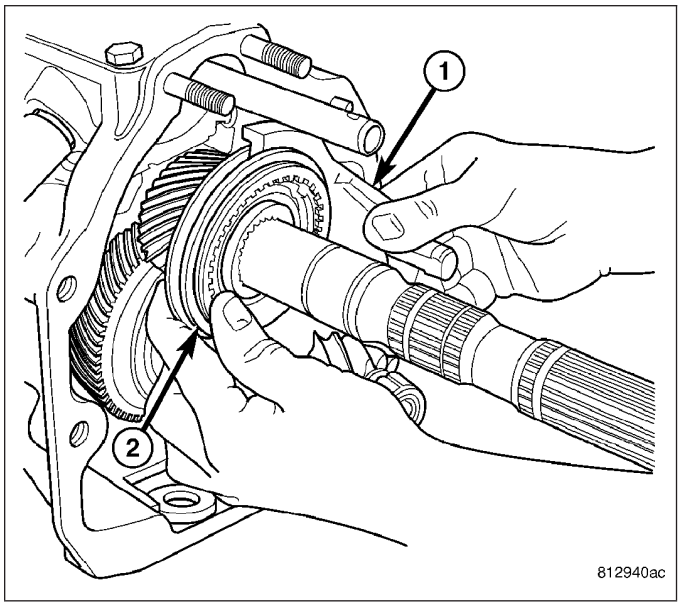
11. Remove reverse shift fork (1) snap ring (2) and discard snap ring.



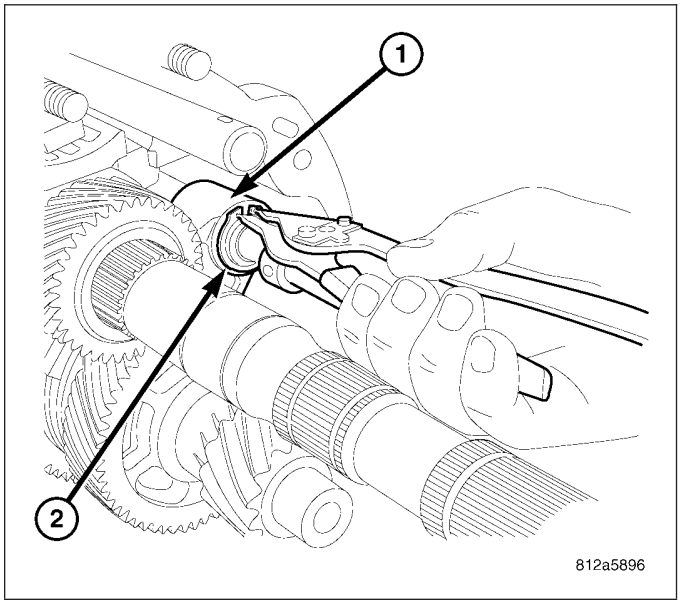
12. Remove reverse synchronizer (1) sleeve snap ring (2).



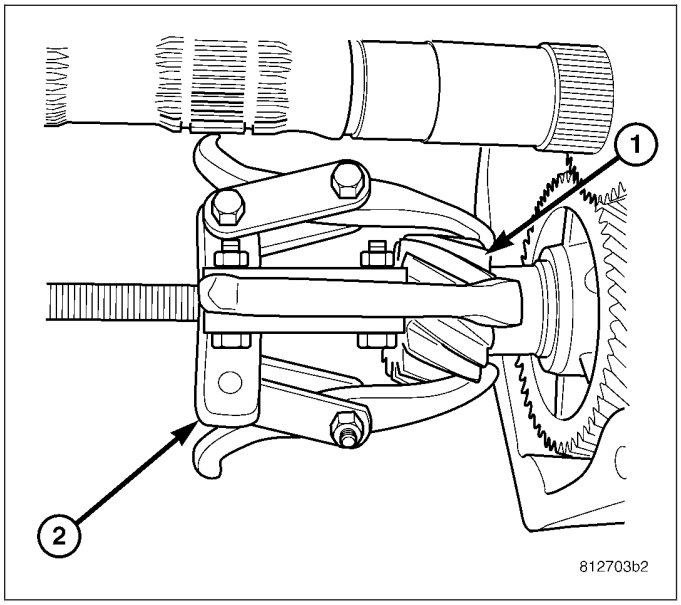
13. Remove shift fork (1) and synchronizer (2) sleeve as an assembly.



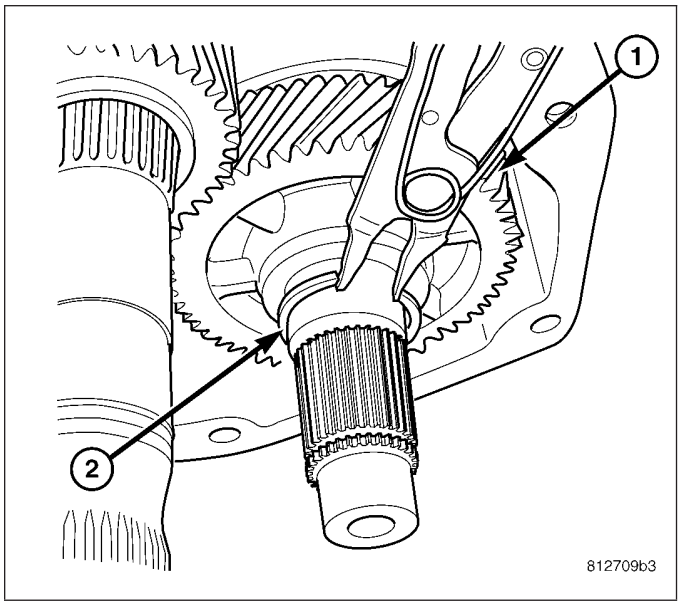
14. Remove 5-6 gear shift fork (1) snap ring (2).



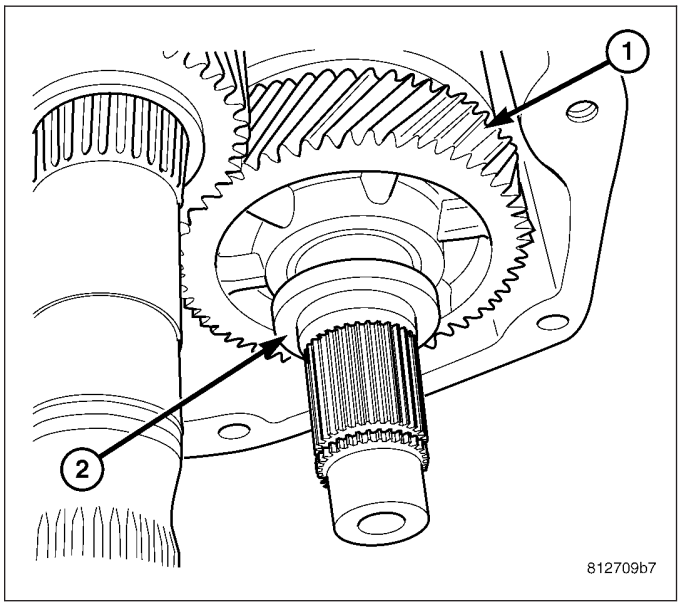
15. Remove reverse gear (1) from countershaft with three jaw puller (2).



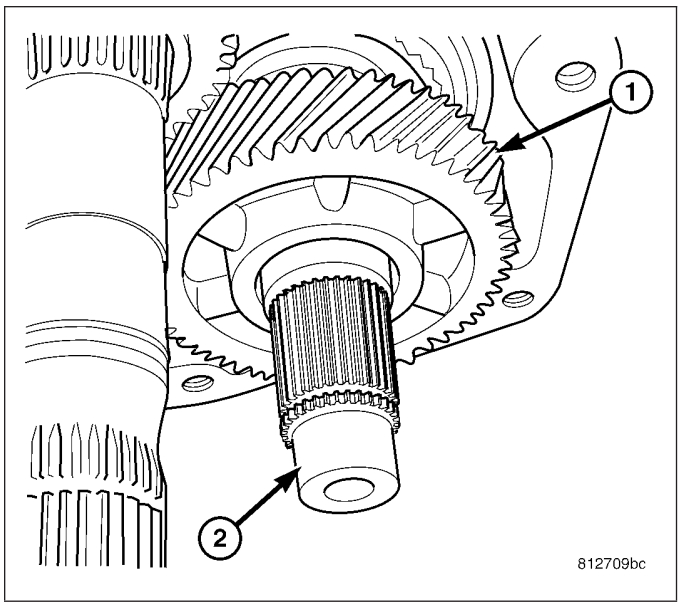
16. Remove fifth gear (1) snap ring (2) from countershaft.



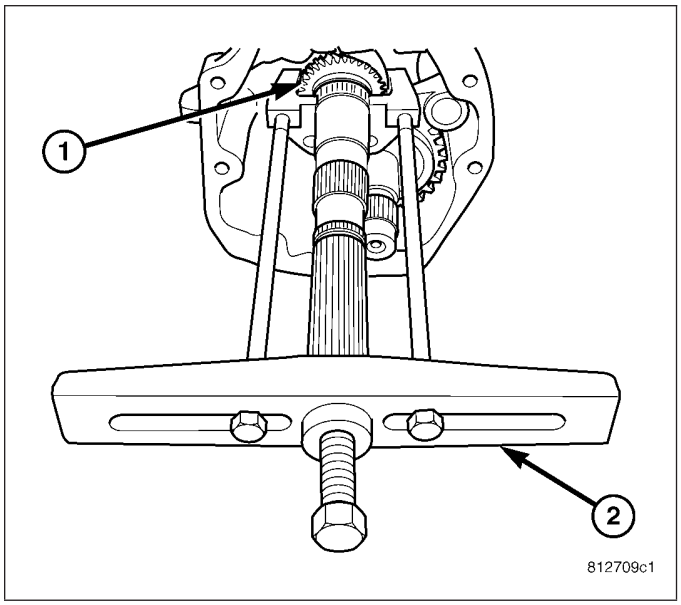
17. Remove fifth gear (1) thrust washer (2) from countershaft.



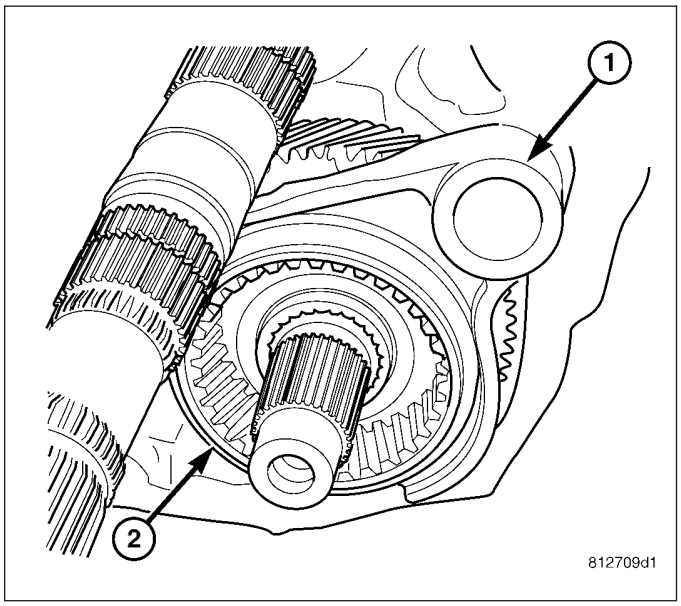
18. Remove fifth gear (1) and bearing from countershaft (2).



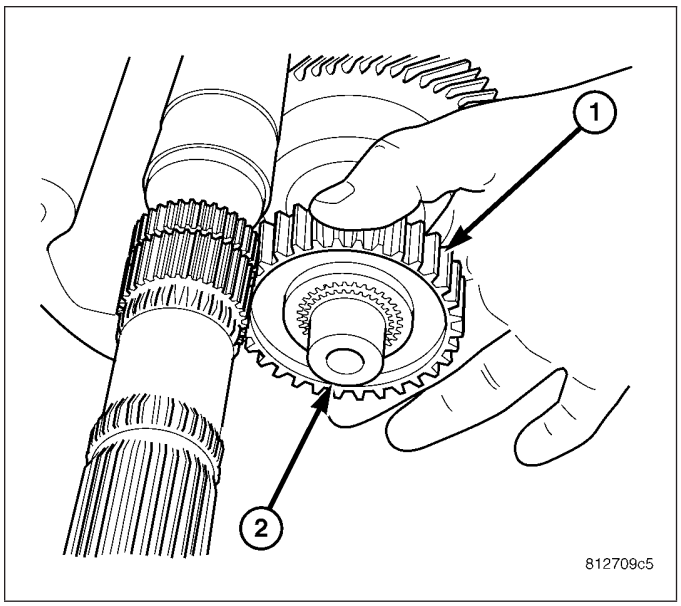
19. Remove 5-6 gear (1) from mainshaft with Puller 9379 (2), Bolts 9378 and Bridge 9382.



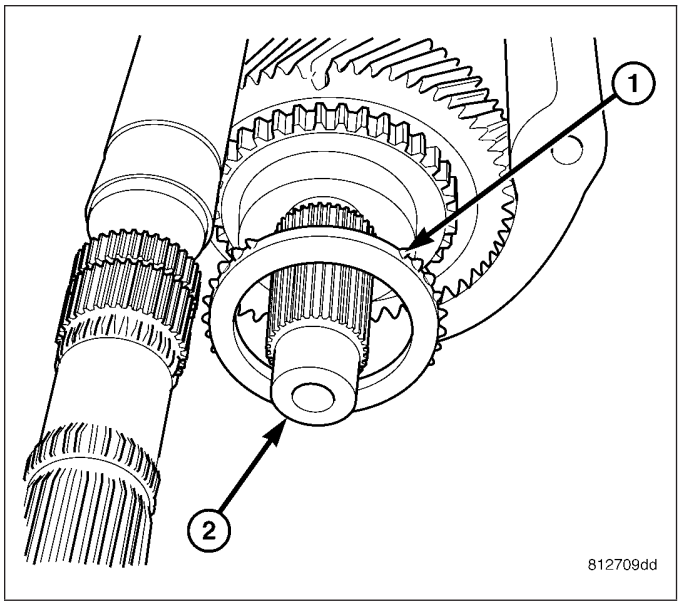
20. Remove shift fork (1) and 5-6 synchronizer sleeve (2).



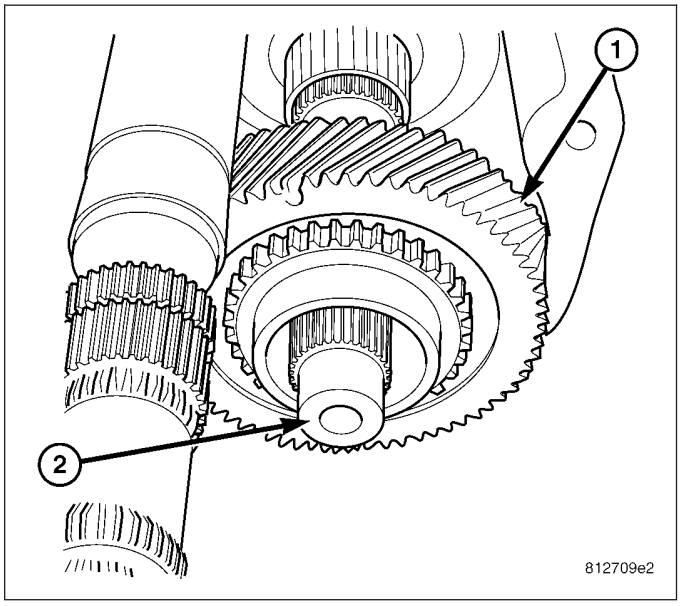
21. Remove 5-6 synchronizer snap ring and synchronizer hub (1) from countershaft (2).



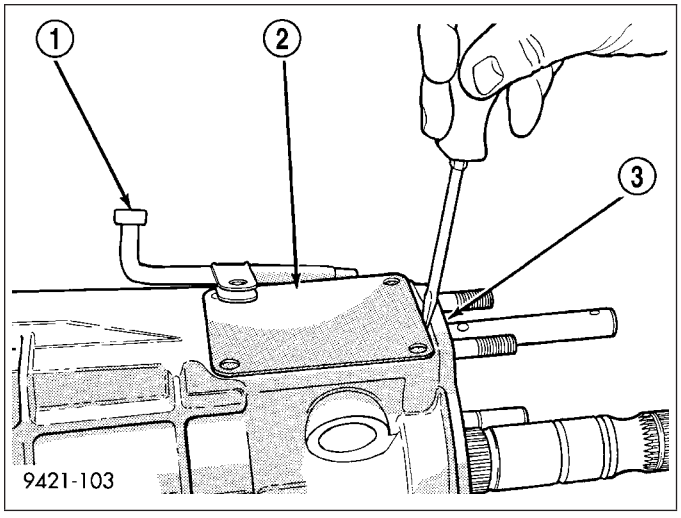
22. Remove sixth gear synchronizer stop ring (1) from countershaft (2).



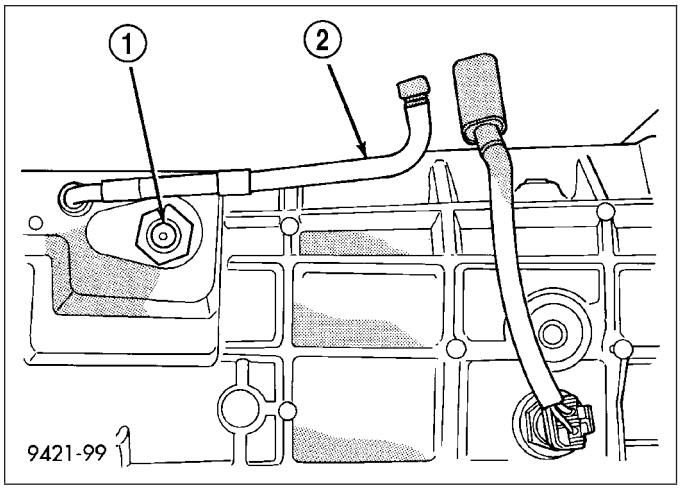
23. Remove sixth gear (1), bearing and thrust washer from countershaft (2).



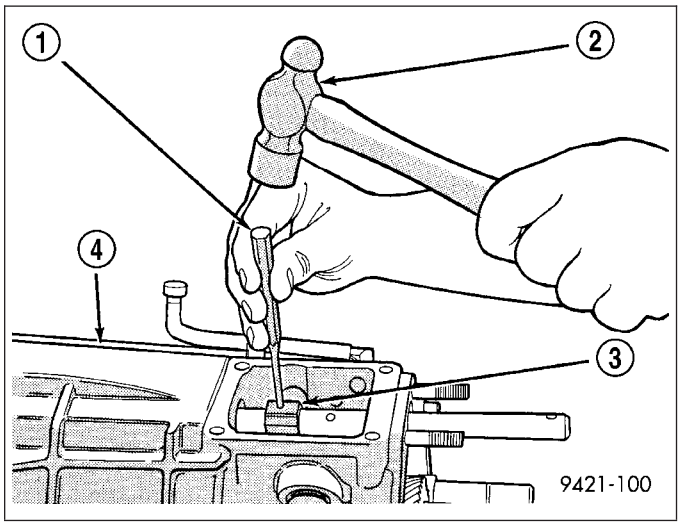
24. Remove top cover plate (2) bolts and pry off cover.



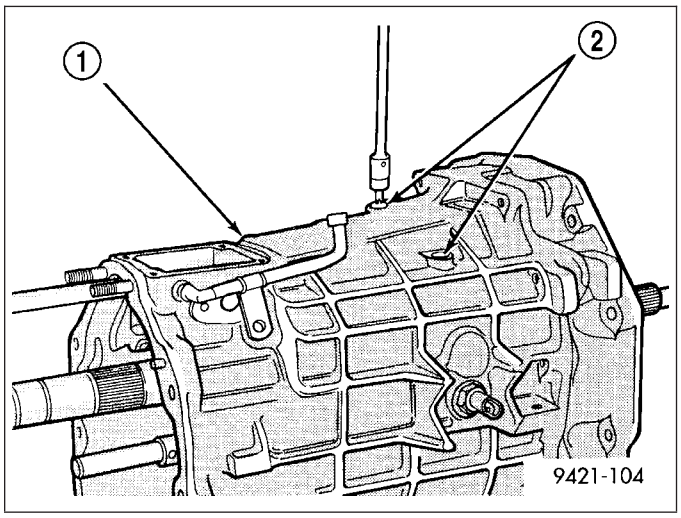
25. Remove shift detent (1) assembly.



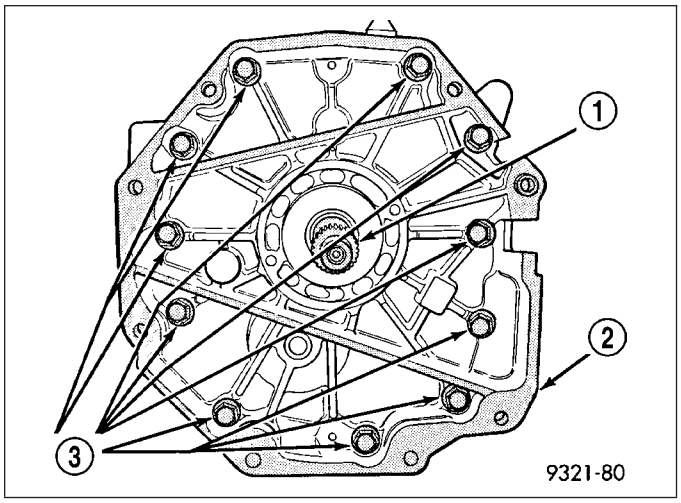
26. Drive roll pin down into front offset lever (3) until loose.



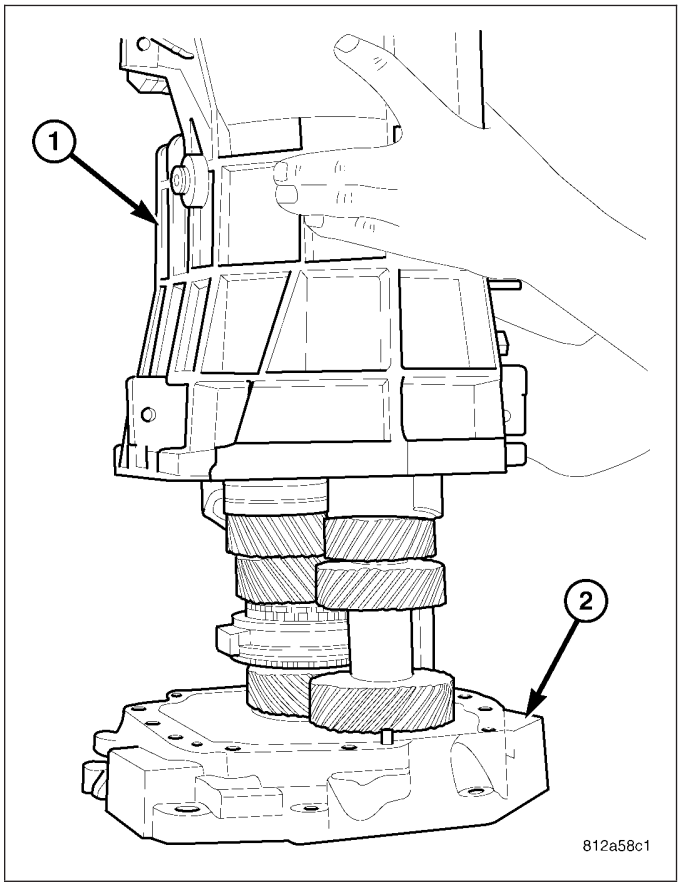
27. Remove reverse lockout solenoid
28. Separate offset lever and guide plate to remove the roll pin that was driven down in Step 26of this procedure.
29. Remove two torx screws (2) located on the top of the transmission case (1).
30. Remove clutch slave cylinder from transmission.



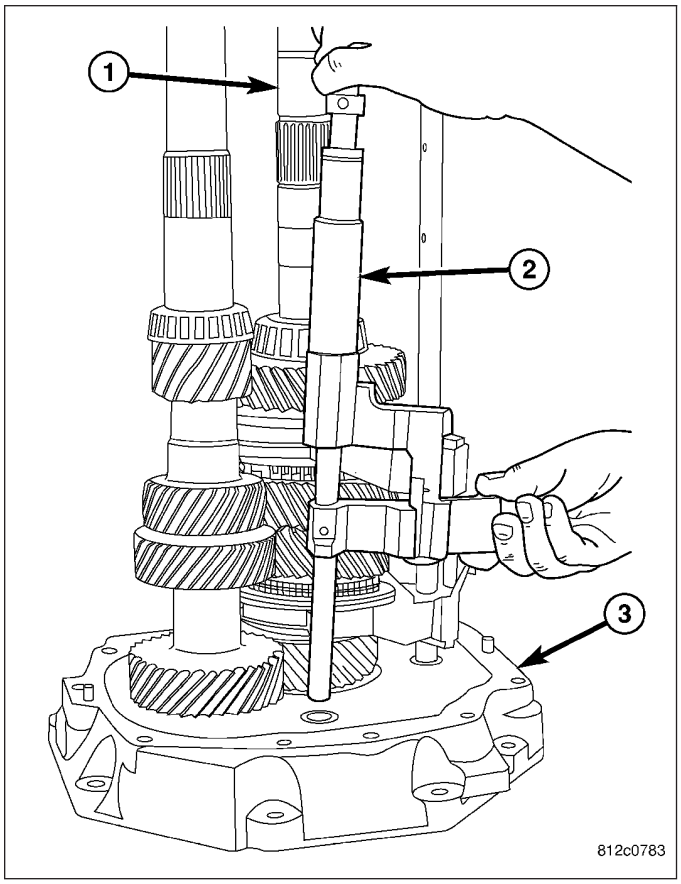
31. Remove all front adapter plate (2) bolts (3) except one to hold the front adapter in place.
32. Stand transmission on Fixture 9387 and bolt adapter to fixture.
33. Install on bench Fixture 9385.



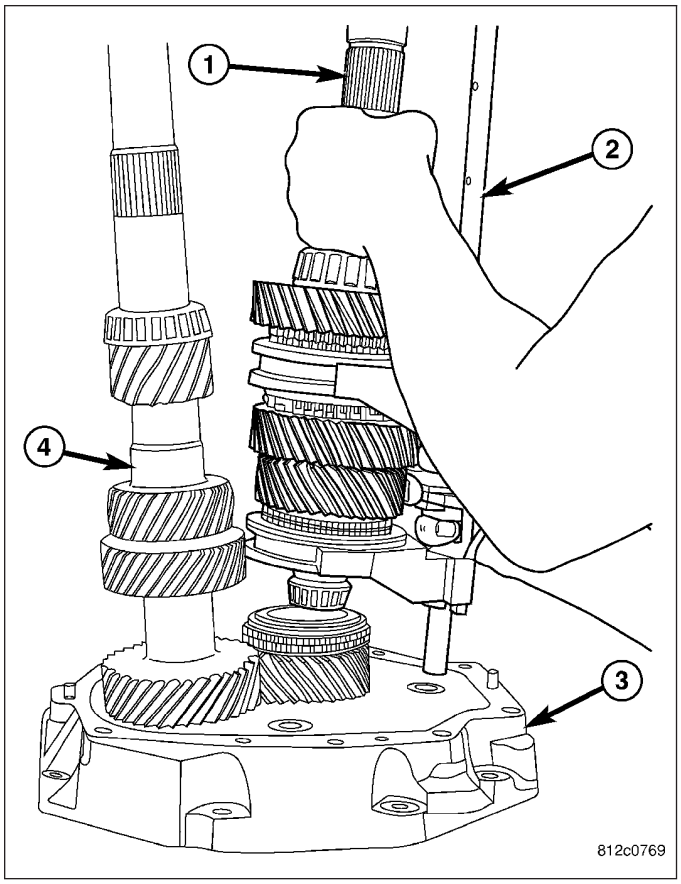
34. Remove remaining adapter bolt and pry transmission case (1) upward. Remove offset lever from shift rail and case from adapter plate (2).



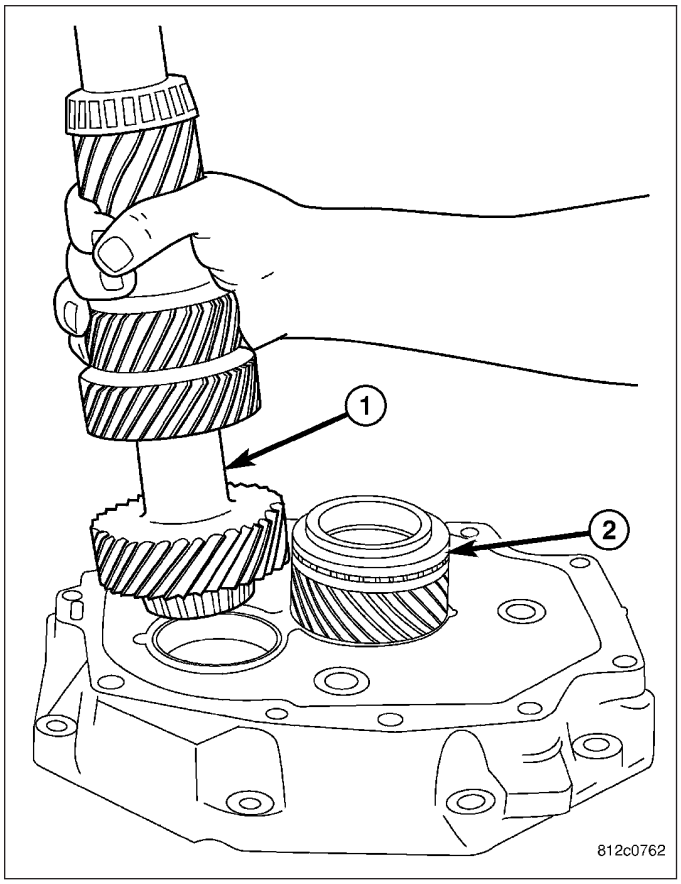
35. Remove reverse rail (2) assembly.



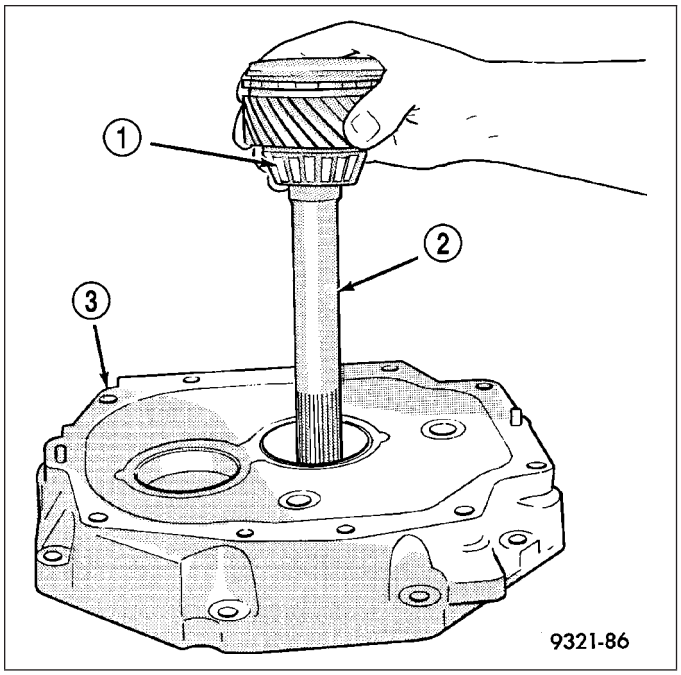
36. Tilt countershaft (4) sideways and lift mainshaft (1) and shift rail a (2) assemblies out of adapter plate (3).



37. Remove countershaft (1) assembly.



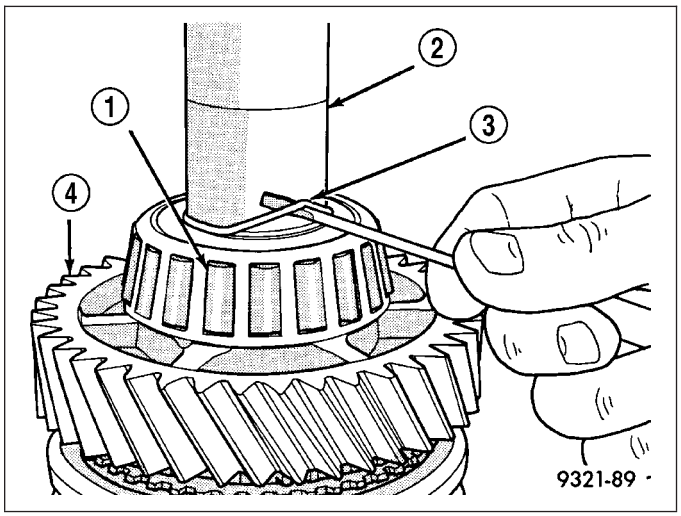
38. Remove input shaft (2) from adapter (3).



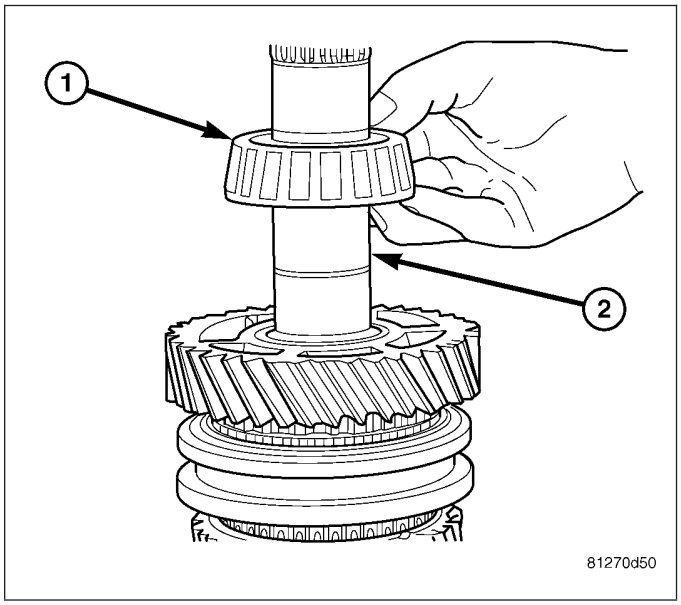
MAINSHAFT

NOTE: Mainshaft snap rings are not interchangeable.

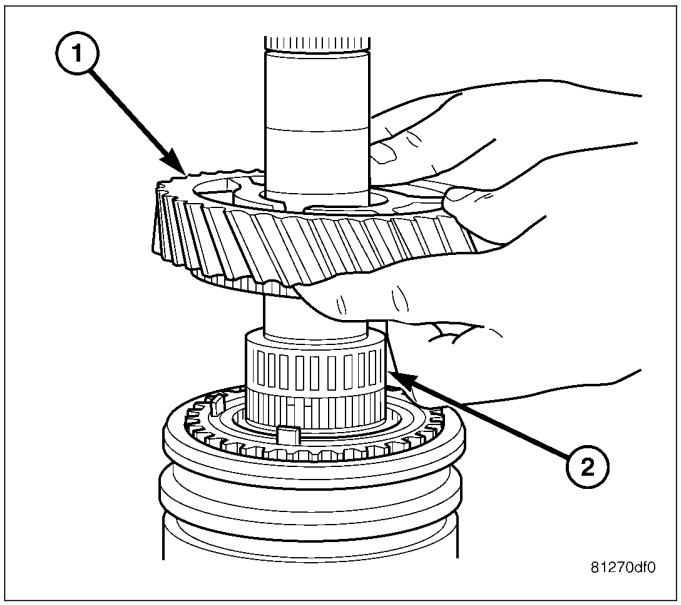
1. Remove and discard mainshaft (2) O-ring (3).



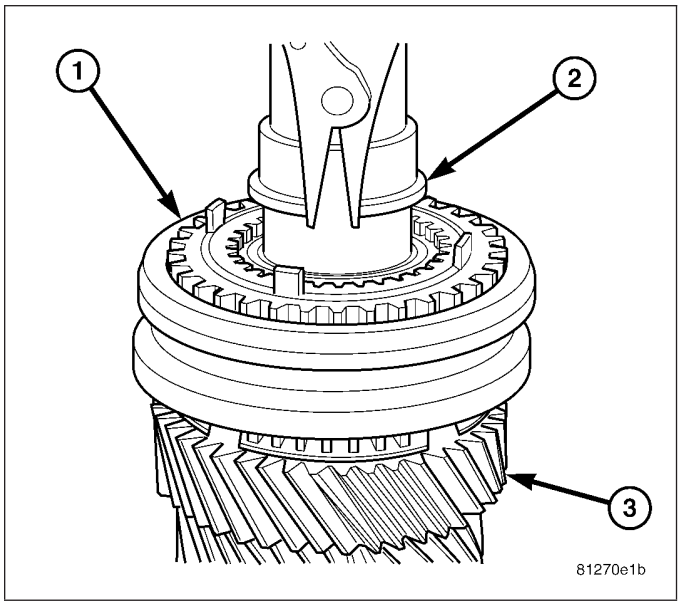
2. Remove rear mainshaft (2) bearing (1).



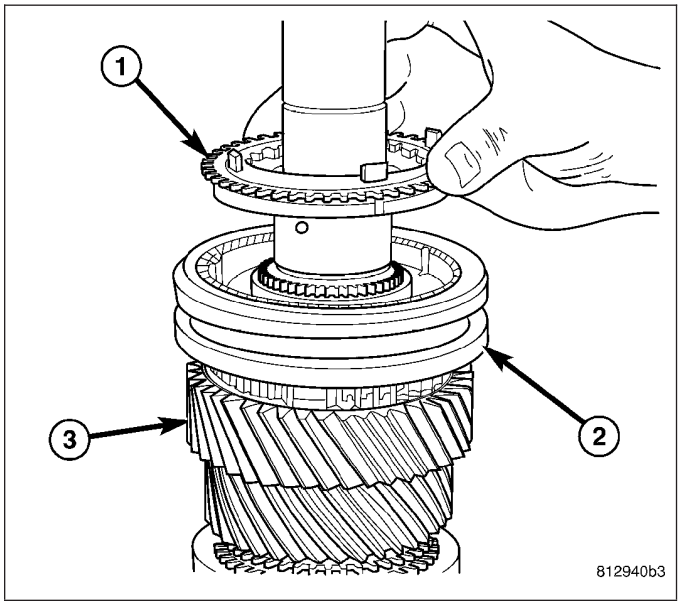
3. Remove first gear (1) and bearing (2) from mainshaft.



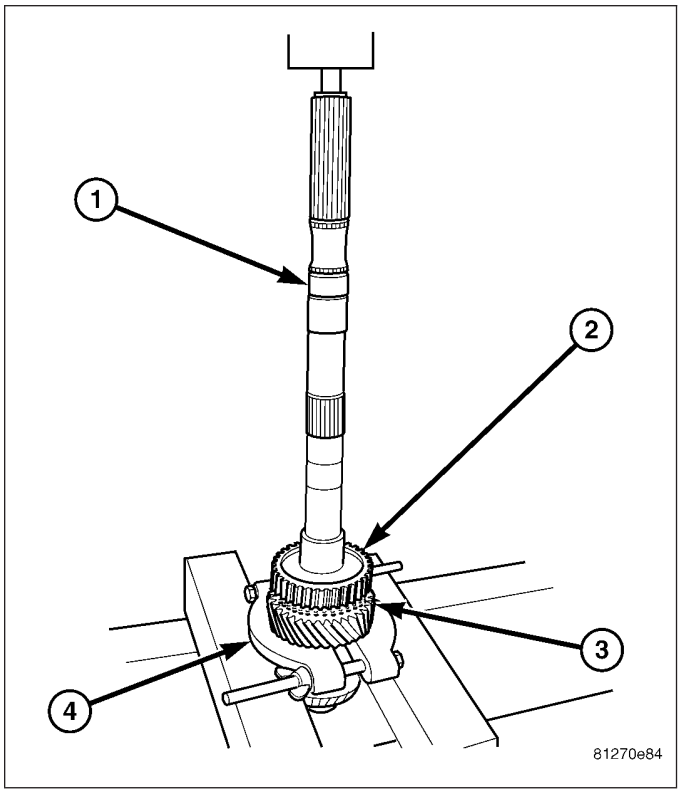
4. Remove 1-2 synchronizer (1) snap ring (2) from mainshaft.



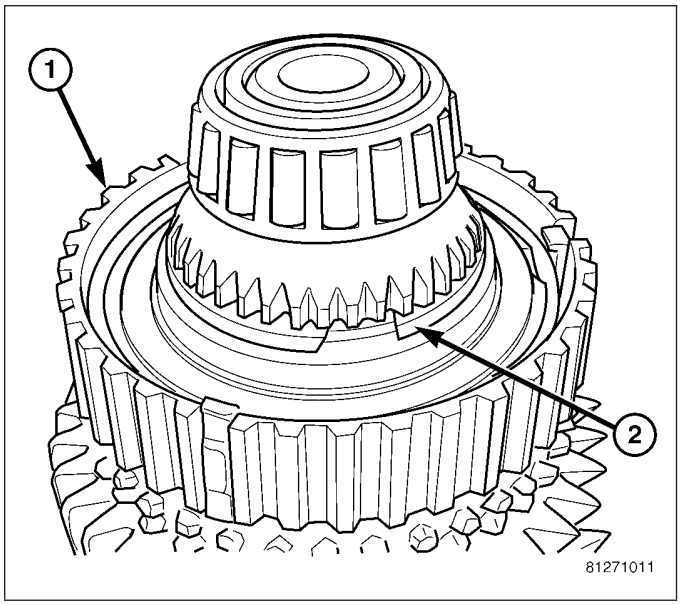
5. Remove 1-2 thrust washer (1) and blocker ring assembly from mainshaft.



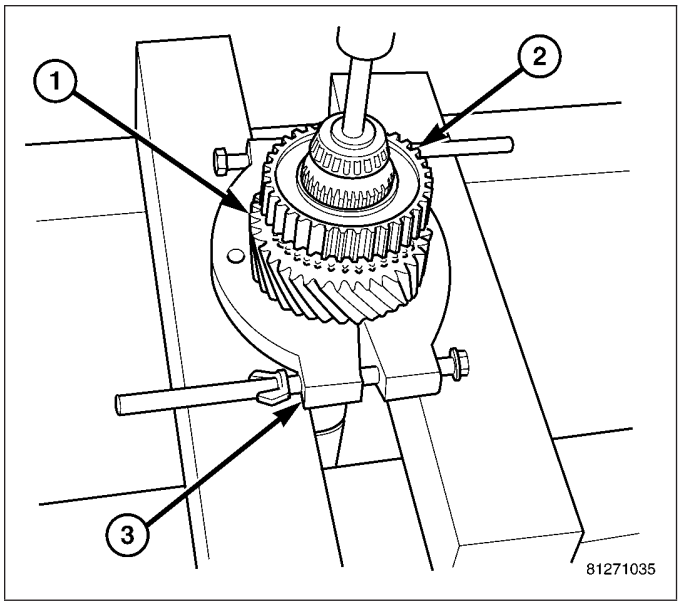
6. Press second gear (3) and synchronizer (2) hub off mainshaft (1) with Splitter 9375 (4).



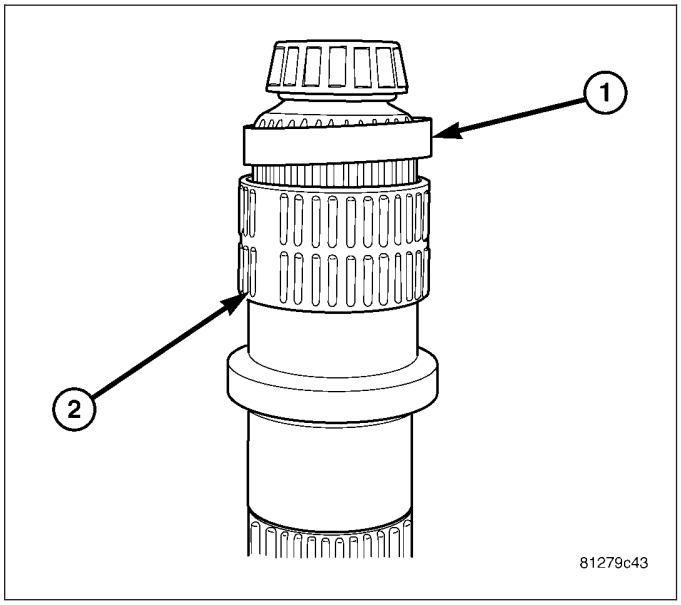
7. Remove 3-4 synchronizer (1) snap ring (2).



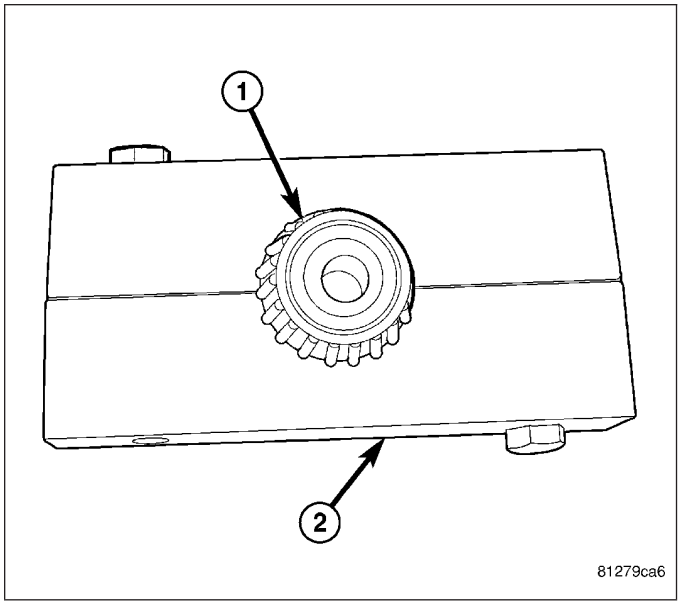
8. Press third gear (1), 3-4 synchronizer (2) hub and sleeve off mainshaft with Splitter 9375 (3).



9. Remove third gear bearing (2) and spacer (1) from mainshaft.

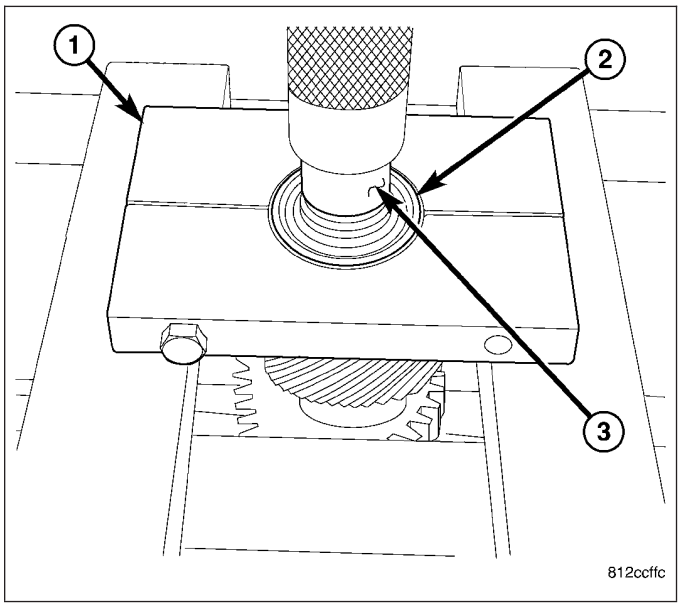


10. Remove mainshaft tapered bearing (1) with bearing Splitter 9386 (2) and press.

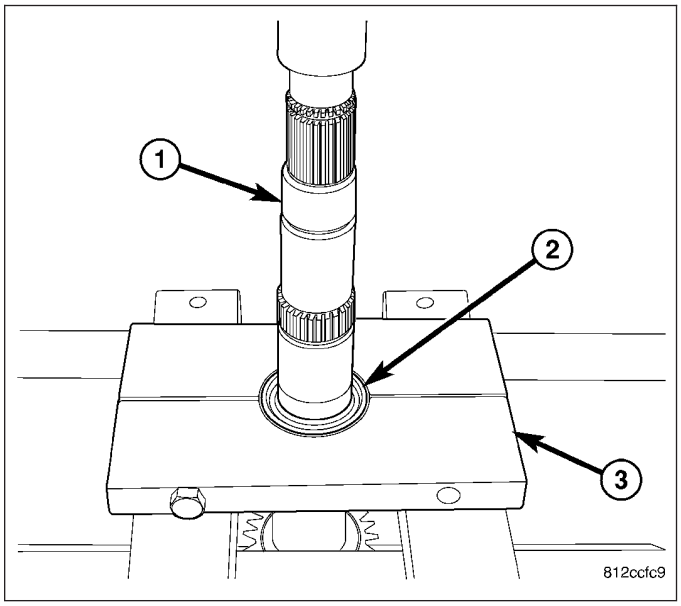


COUNTERSHAFT

1. Remove countershaft adapter plate bearing (2) with Splitter 9388 (1) and Press Adapter 9377 (3).

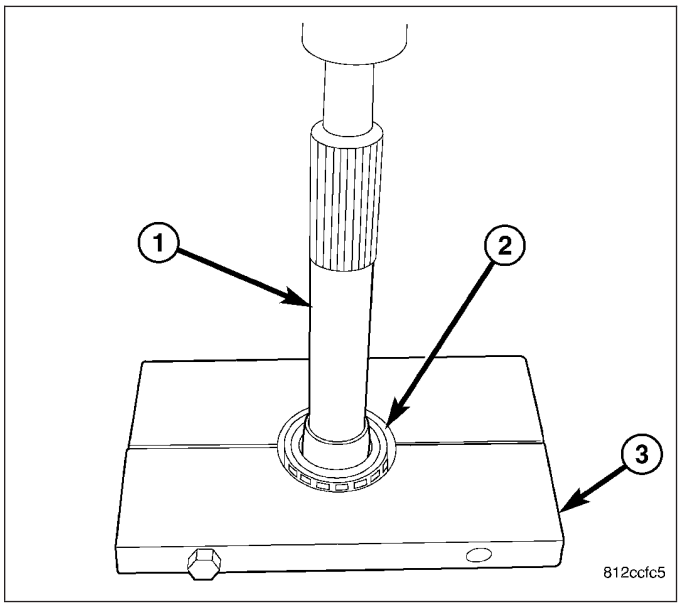


2. Remove countershaft (1) housing bearing (2) with Splitter 9384 (3) and a press.

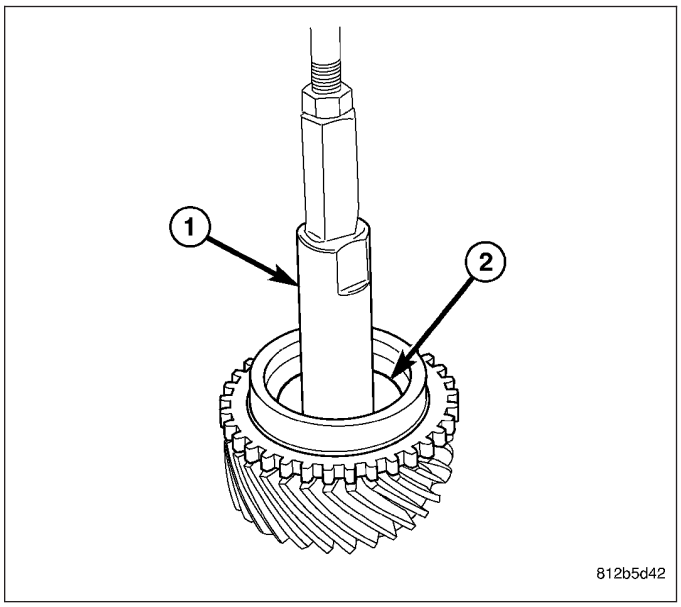


INPUT SHAFT

1. Remove input shaft (1) bearing (2) with Splitter 9384 (3) and a press.

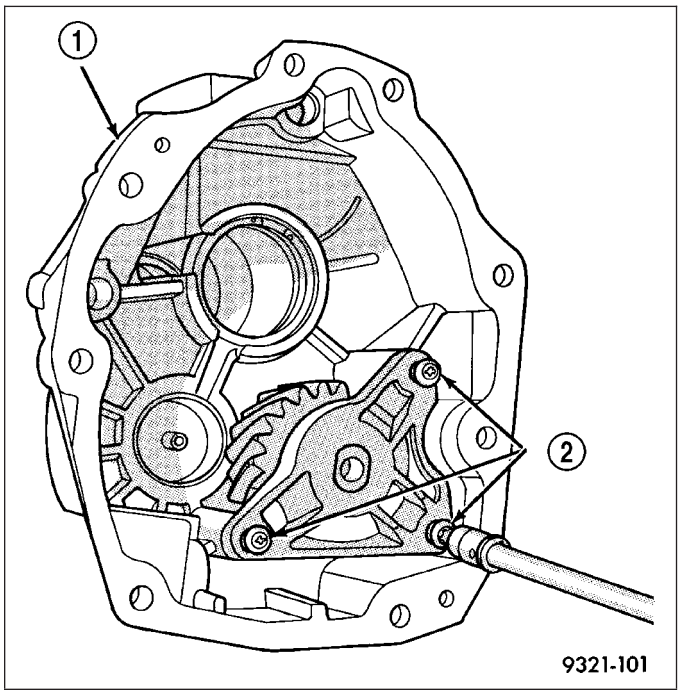


2. Remove input shaft bearing cup (2) with Remover 9381 (1) and Slide Hammer C-3752.

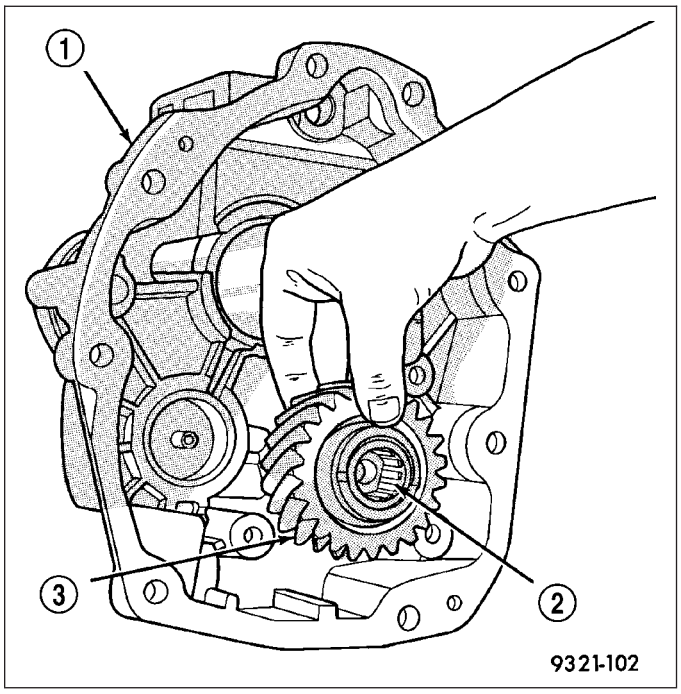


EXTENSION HOUSING

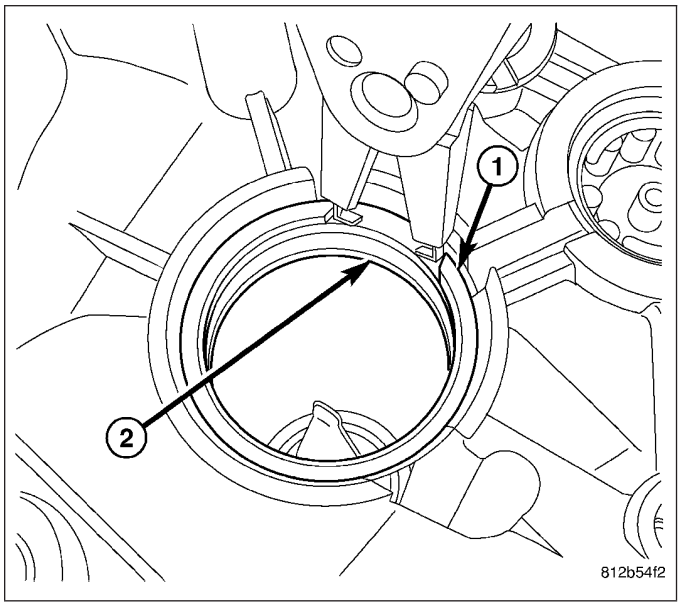
1. Remove idler gear bracket bolts (2) and bracket.



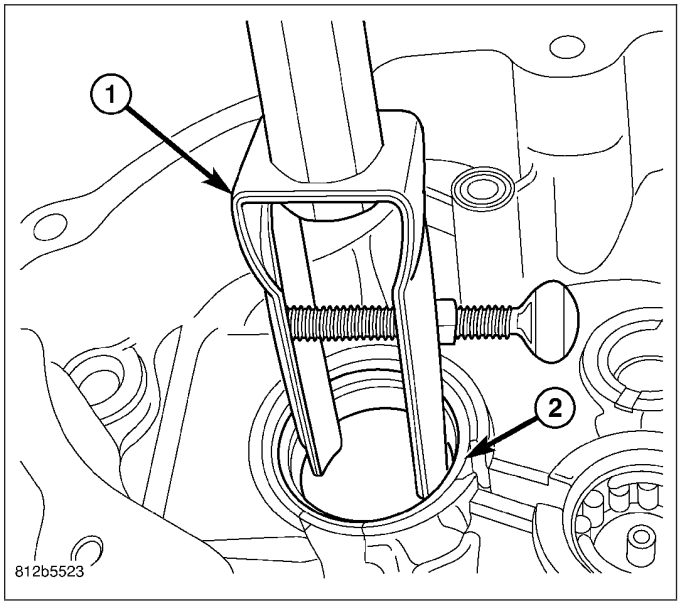
2. Remove thrust washer, gear (3) and bearing (2) from tail housing (1).
3. Remove gear shaft.



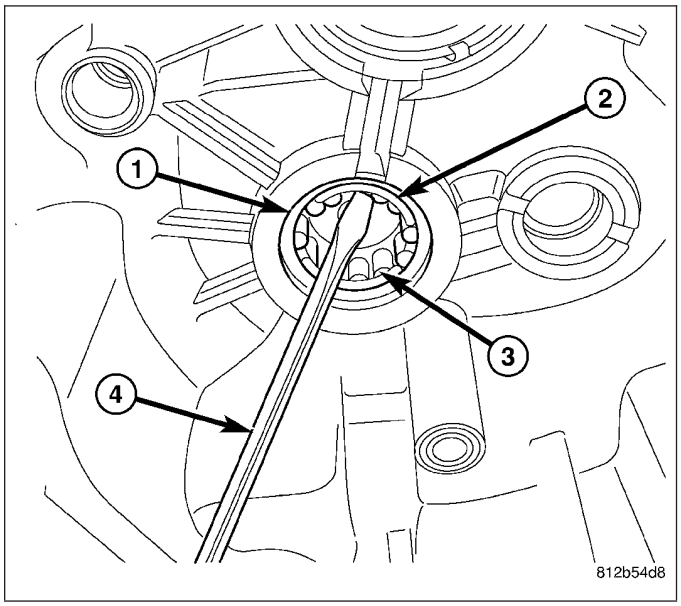
4. Remove mainshaft bearing race (1) snap ring (2).



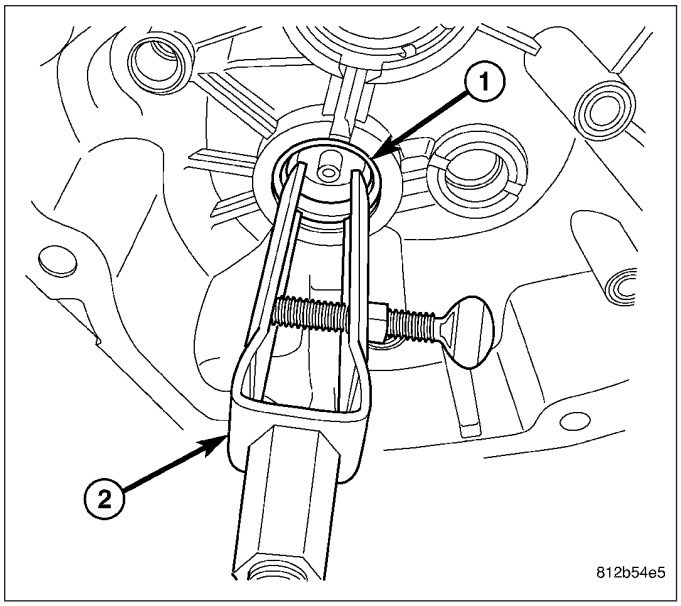
5. Remove mainshaft race (2) with Remove 7794-A (1) and Slide Hammer C-637.



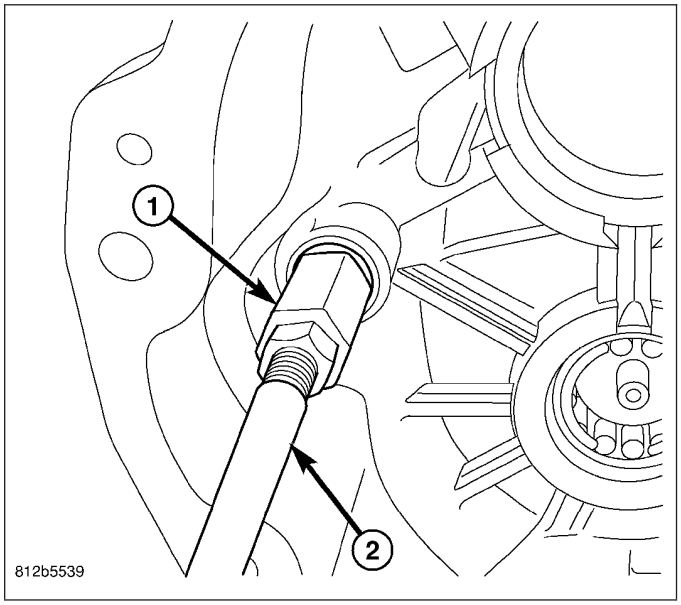
6. Remove countershaft bearing plastic bearing cage (2) and remove roller bearings (3).



7. Remove countershaft bearing race (1) with Remover 9395 (2) and Slide Hammer C-637.

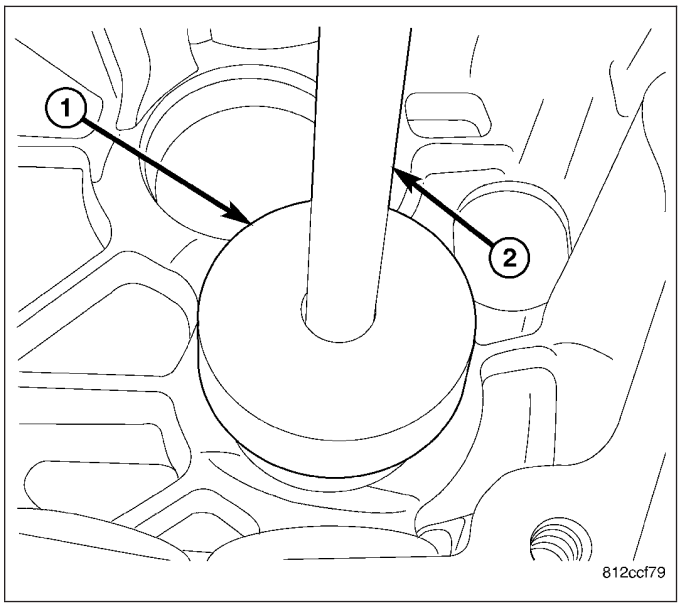


8. Remove shift rail bushings with Remover 9367 (1) and Slide Hammer C-3752 (2).

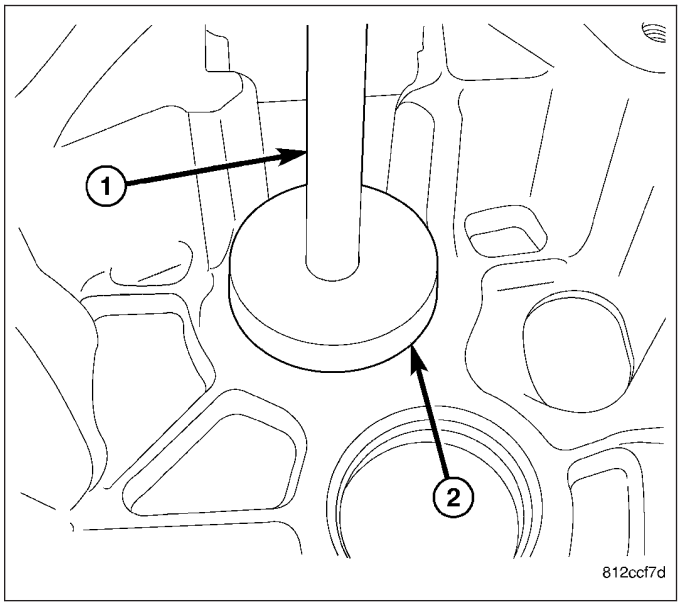


TRANSMISSION CASE

1. Remove shift rail bushings with Remover 9367 and Slide Hammer C-3752.
39. Remove countershaft bearing cups with Remover 9369 (1) and Handle C-4171(2).

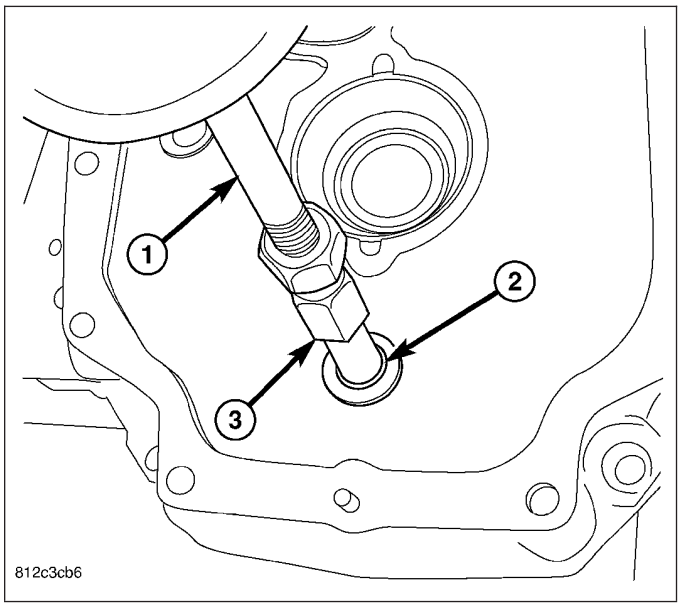


40. Remove mainshaft bearing cups with Remover 9369 (2) and Handle C-4171(1).
41. Remove offset lever guide plate.



TRANSMISSION ADAPTER

1. Remove shift rail bushings (2) with Remover 9367 (3) and Slide Hammer C-3752 (1).
2. Remove countershaft and mainshaft bearing cups and select shims.
3. Remove input shaft seal.



CLEANING

Clean the gears, bearings shafts, extension/adapter housing and gear case with solvent. Dry all parts except the bearings with compressed air. Allow the bearings to either air dry or wipe them dry with clean shop towels.

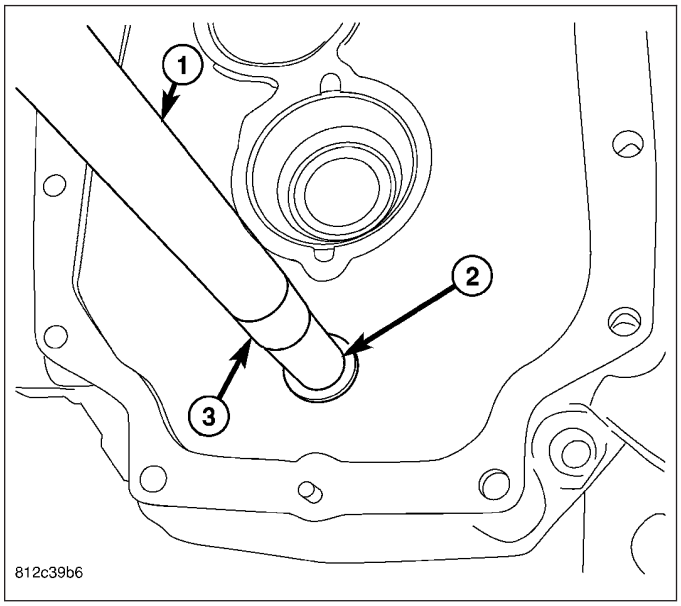
INSPECTION

1. Inspect bearings, shaft and thrust washers. Replace bearings and mating components if worn, chipped, cracked, flat-spotted or brinnelled.
2. Inspect gear tooth surface and replace gear if worn, chipped, cracked.
3. Inspect synchronizers components, if any component is worn or damage, the synchro must be replaced as and assembly.
4. Inspect blocker rings and fiction cones. replace if worn, damaged or if friction material is burned.
5. Inspect shift forks for wear and distortion. Check fit of the sleeve in the fork. Replace fork if the roll pin holes are worn oversize or damaged. Replace shift fork roll pins if necessary or if doubt exists about their condition.
6. Inspect case and housing/adapter sealing and mating surfaces are free of burrs and nicks. Inspect alignment dowels in case, housing and adapter. Replace gear case housing, adapter or extension housing if cracked or broken.

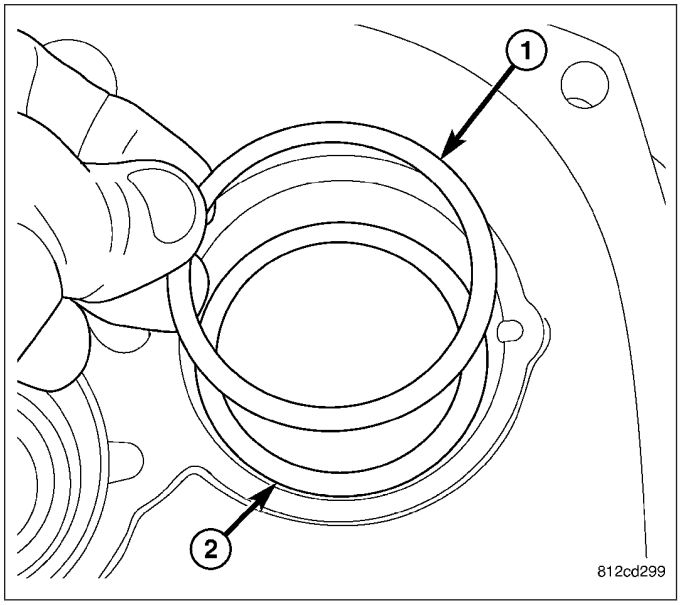
ASSEMBLY

TRANSMISSION ADAPTER

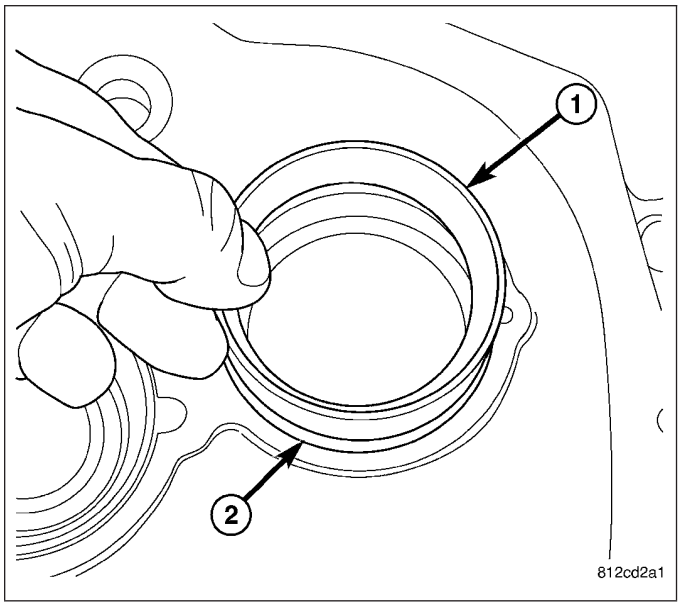
1. Install shift rail bushings (2) with Installer 9368 (3) and Handle C-4171 (1).
2. Install input shaft seal with Installer 9366.



3. Install countershaft and mainshaft select shims (1) in bearing cup bores (2).

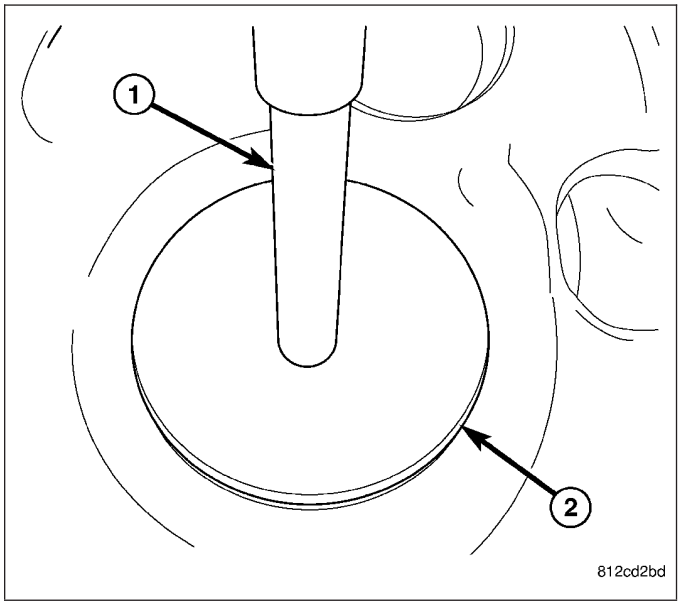


4. Install countershaft and mainshaft bearing cups (2) into adapter plate (2).

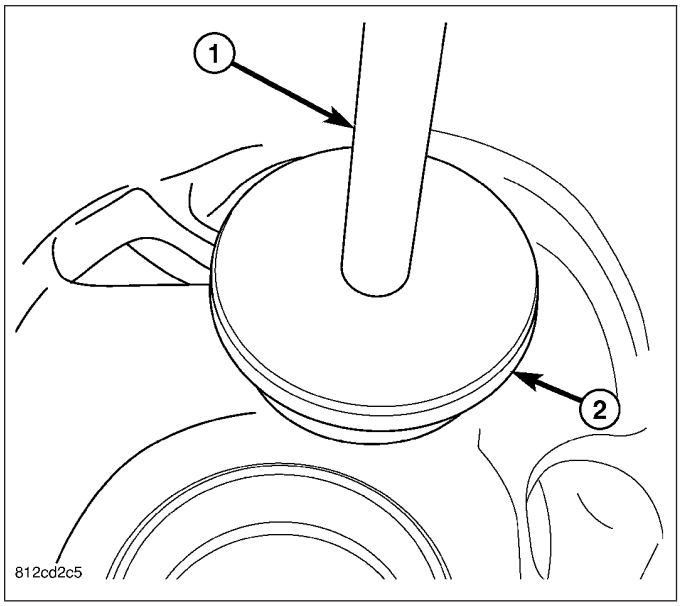


TRANSMISSION CASE

1. Install shift rail bushings with Installer 9368 and Handle C-4171.
2. Install mainshaft bearing cup with Installer 9373 (2) and Handle C-4171 (1).

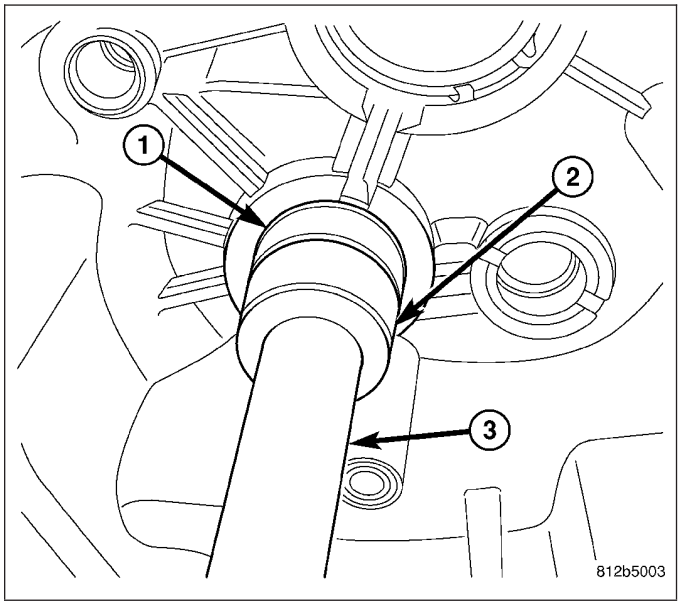


3. Install countershaft bearing cup with Installer 9373 (2) and Handle C-4171 (1).

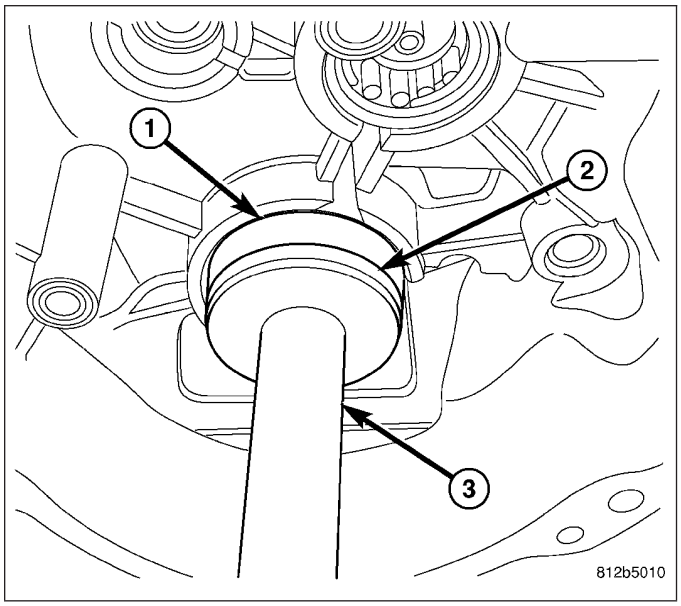


EXTENSION HOUSING

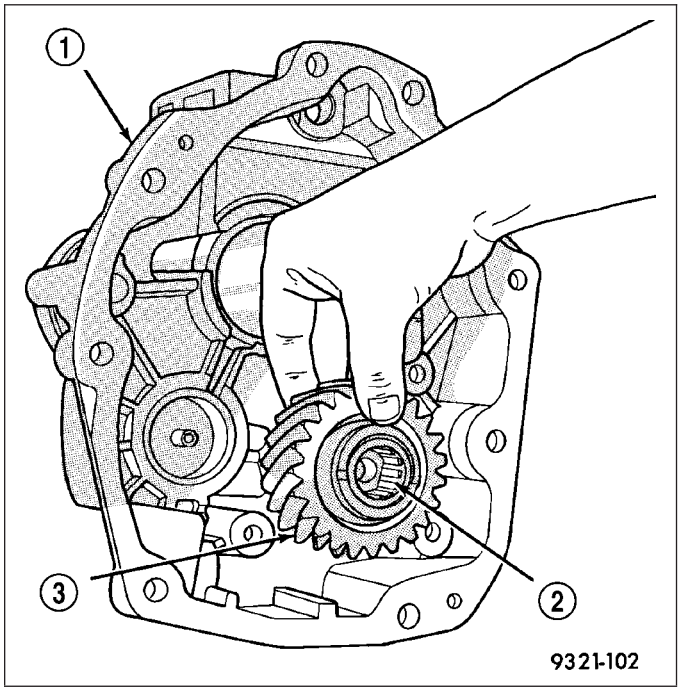
1. Install countershaft bearing (1) with Installer 9394 (2) and Handle C-4171 (3).



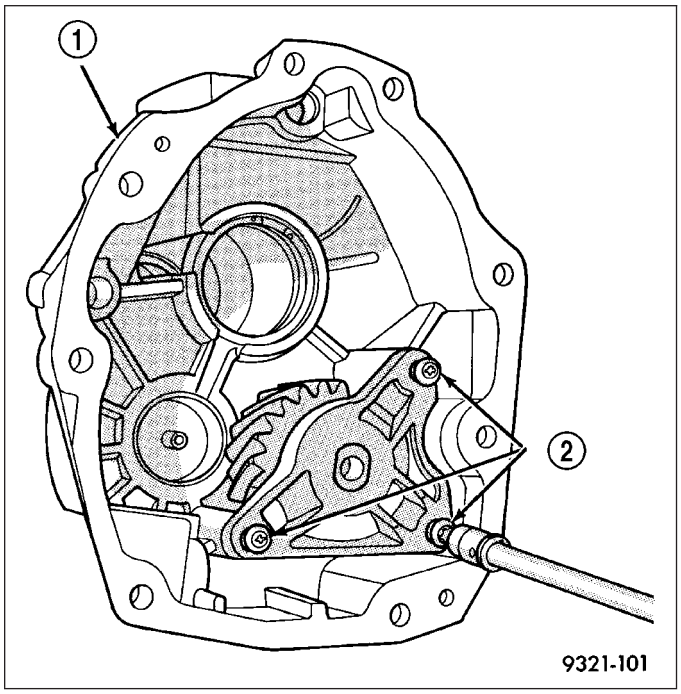
2. Install mainshaft roller bearing race (1) with Installer 9392 (2) and Handle C-4171 (3).
3. Install mainshaft roller bearing race snap ring.
4. Install shift rail bushings with Installer 9368 and Handle C-4171.



5. Install reverse idler gear shaft.
6. Install thrust washer, reverse idler gear (3) and bearing (2).

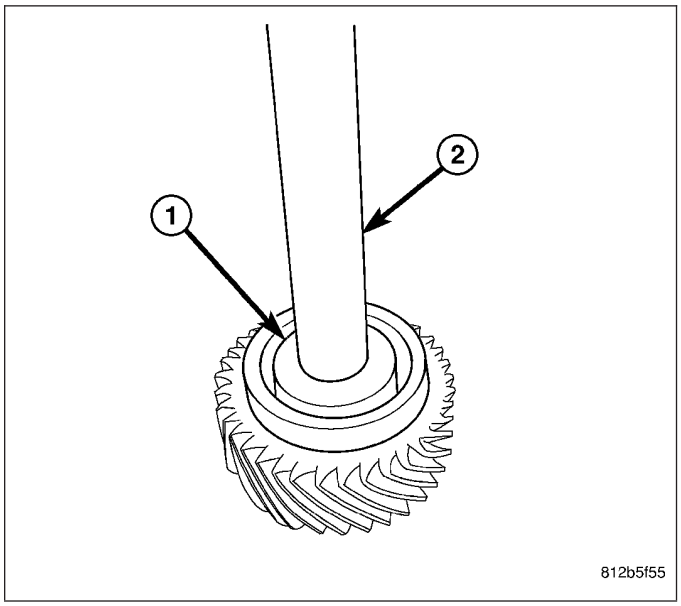


7. Install idler gear bracket into the tail housing (1). Install bolts (2) with Loctite® 242 and tighten to 24 N·m (18 ft. lbs.).

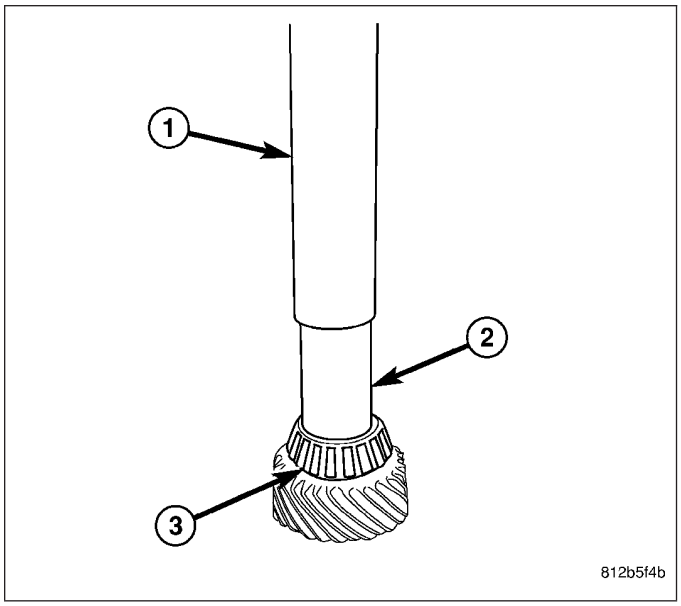


INPUT SHAFT

1. Install input shaft bearing cup with Installer 9380 (1) and Handle C-4171 (2).

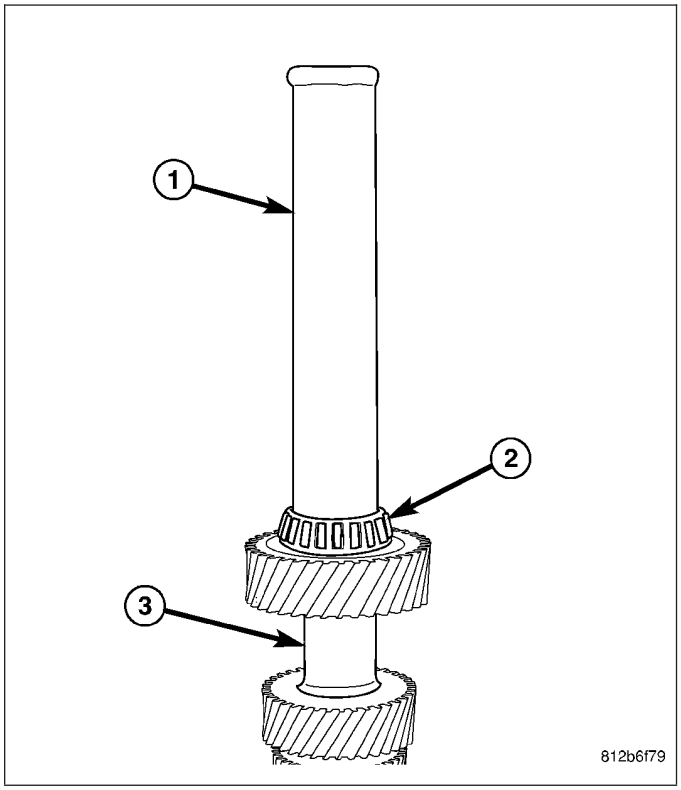


2. Install input shaft bearing (3) with Installer 6052 (2) and Tube MB991317 (1).



COUNTERSHAFT

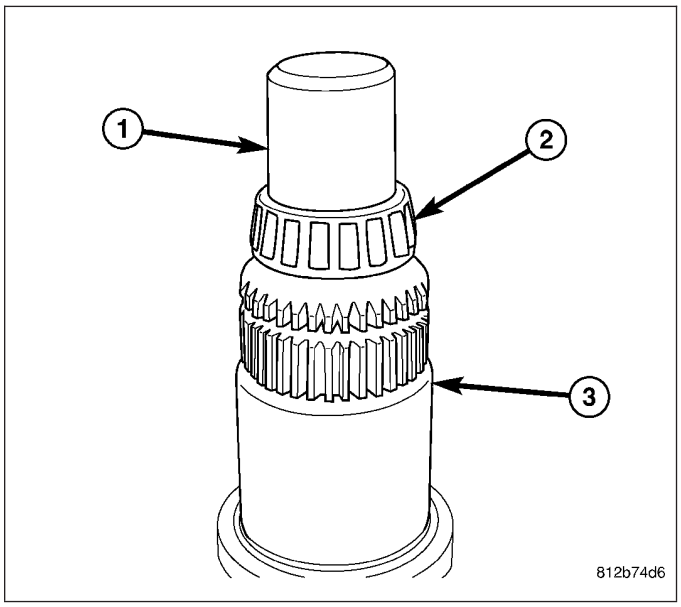
1. Install countershaft (3) bearings (2) with Installer MB998909 (1) and a press.



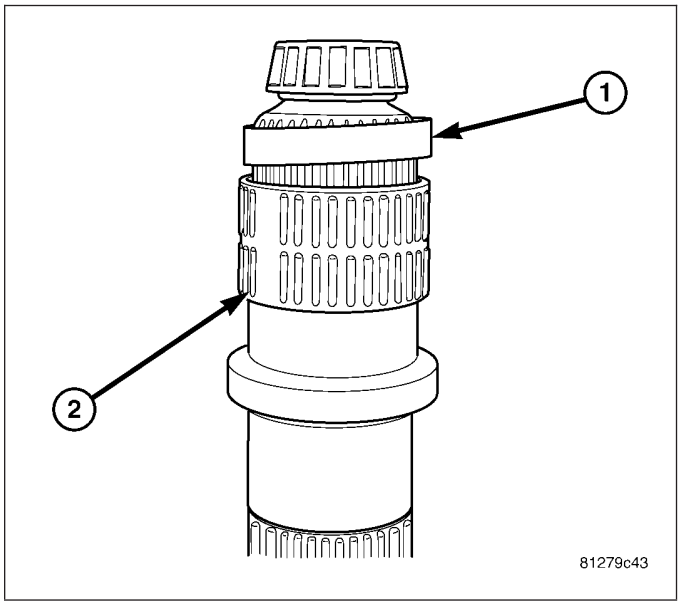
MAINSHAFT

CAUTION: Mainshaft snap rings are not interchangeable.

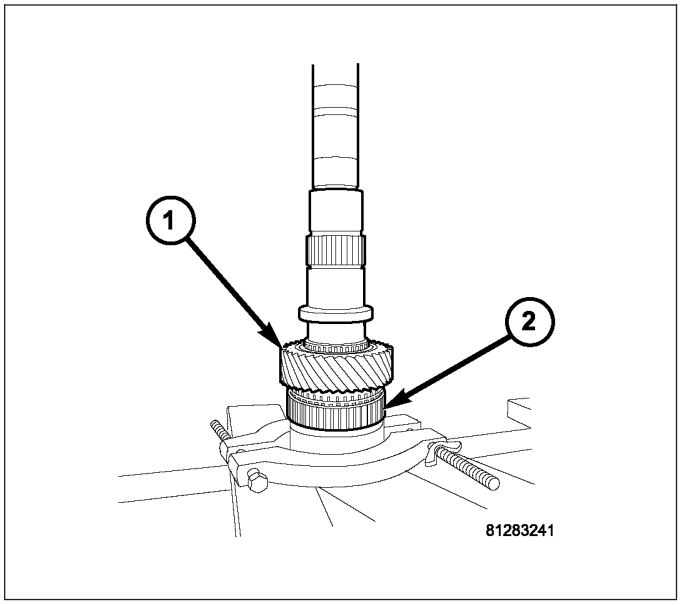
1. Install mainshaft (3) tapered bearing (2) with Installer 9377 (1) and a press.



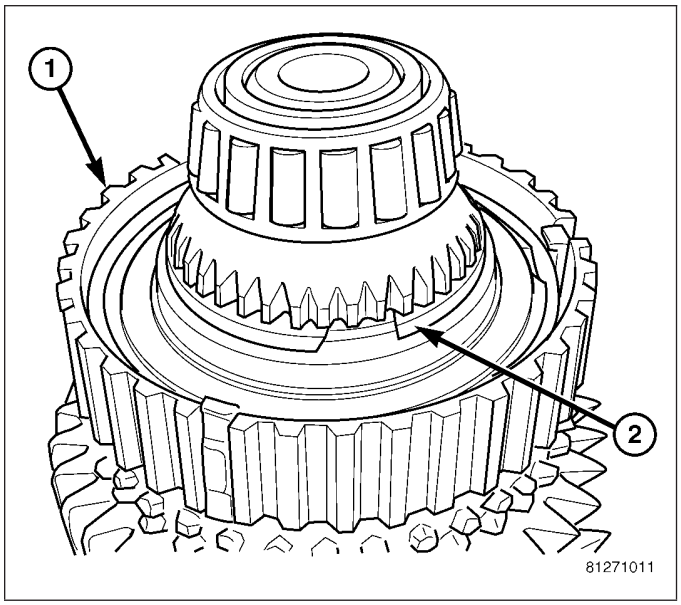
2. Install third gear bearing (2) and spacer (1) on mainshaft.



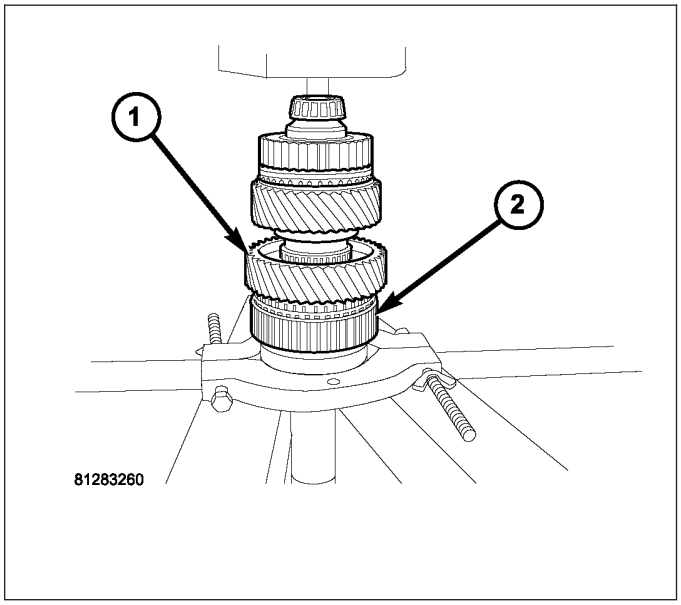
3. Press third gear (1) and 3-4 synchronizer hub (2) onto the mainshaft with Splitter 9375.



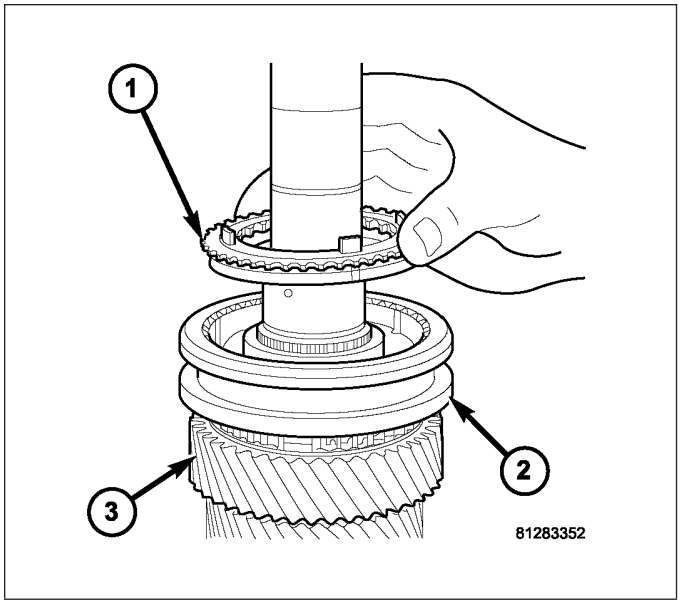
4. Install 3-4 synchronizer sleeve.
5. Install 3-4 synchronizer (1) **original** or **new** snap ring (2).



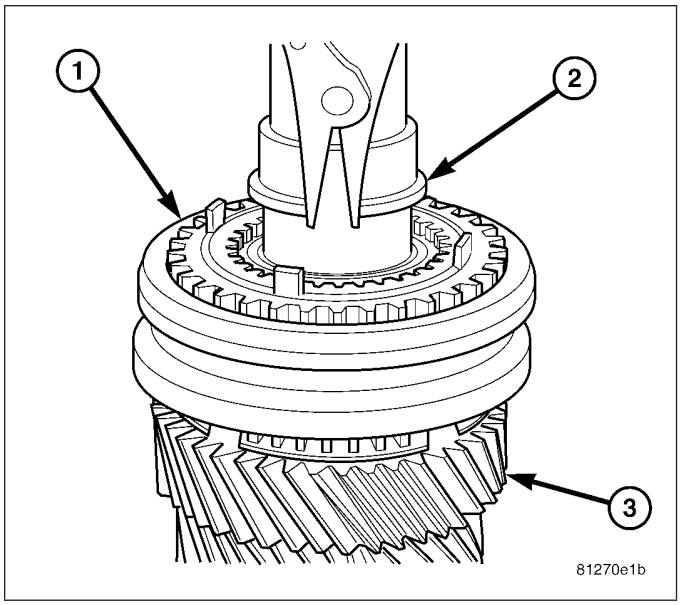
6. Press second gear (1) and 1-2 synchronizer hub (2) onto mainshaft with Splitter 9375.



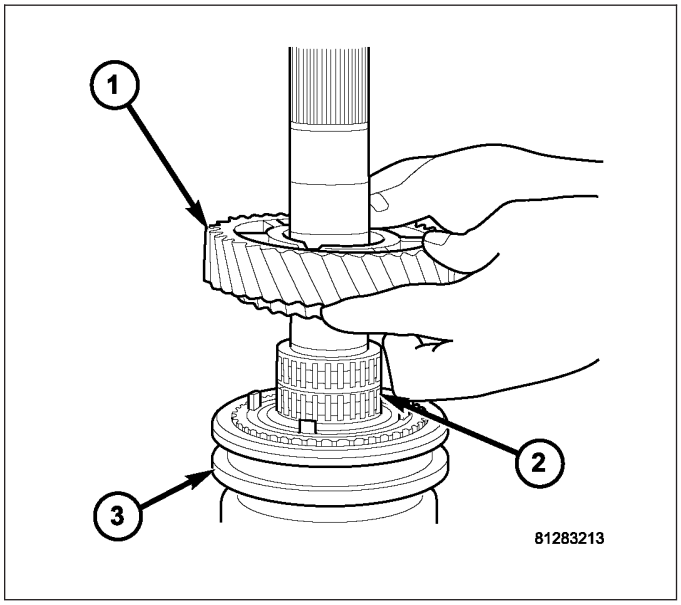
7. Install 1-2 thrust washer and blocker ring (1) assembly onto 1-2 synchronizer (2).



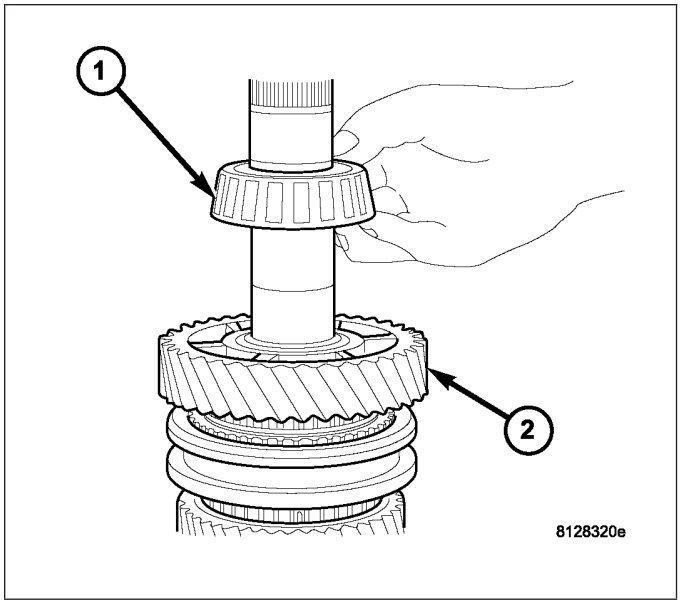
8. Install **original** or **new** 1-2 synchronizer (1) snap ring (2) on mainshaft.



9. Install first gear (1) and bearing (2) on mainshaft.



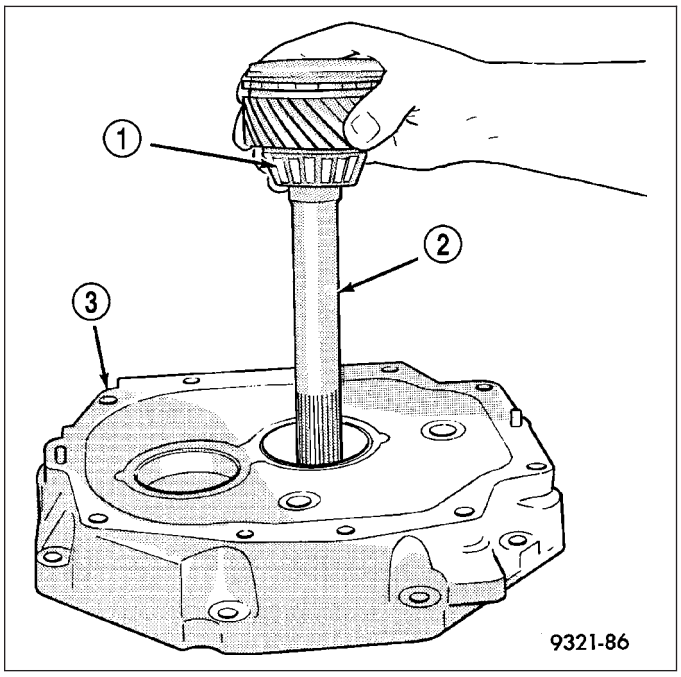
10. Install rear mainshaft tapered bearing (1) on top of first gear (2).



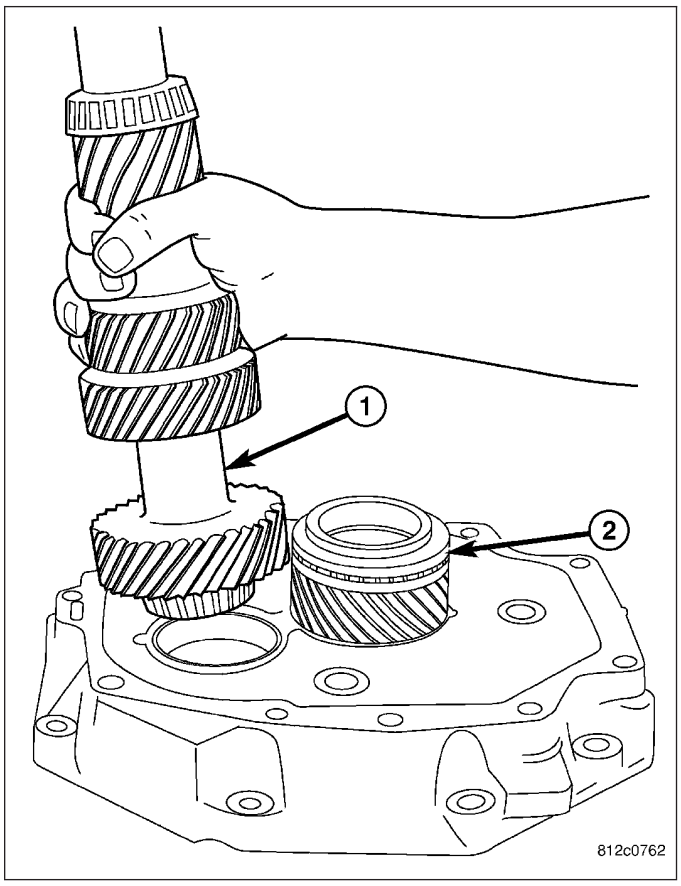
TRANSMISSION HOUSING

NOTE: During assembly refer to Adjustments for Main shaft and Countershaft End Play

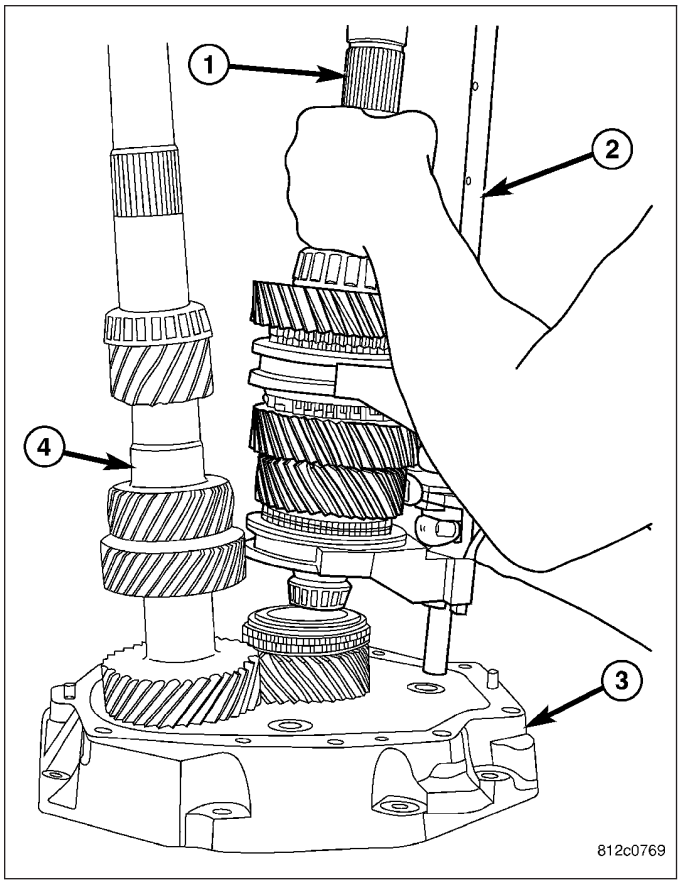
1. Install input shaft seal into adapter plate with Installer 9366.
2. Install input shaft (2) into adapter plate (3).



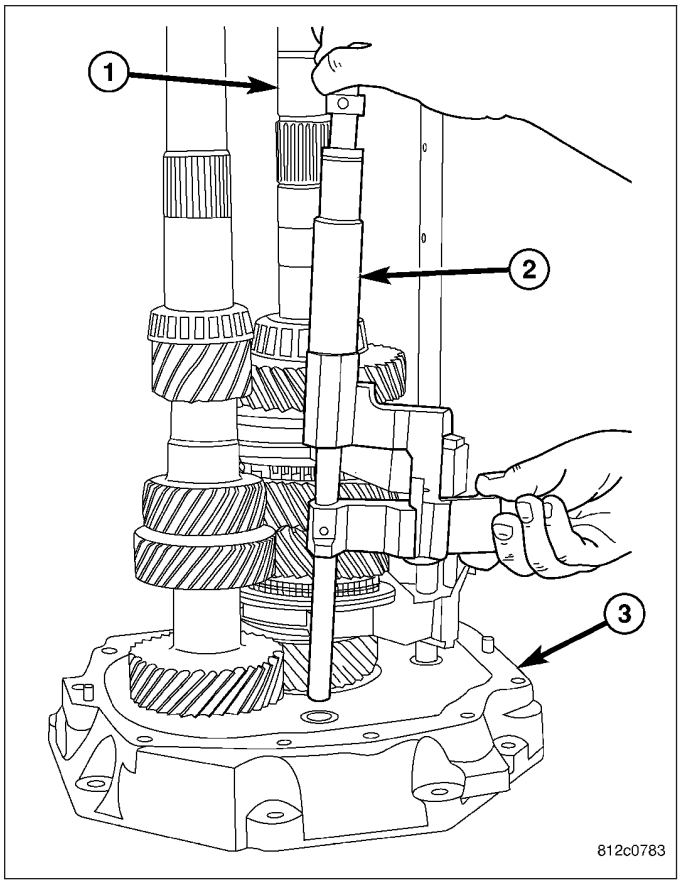
3. Install countershaft (1) assembly into adapter.



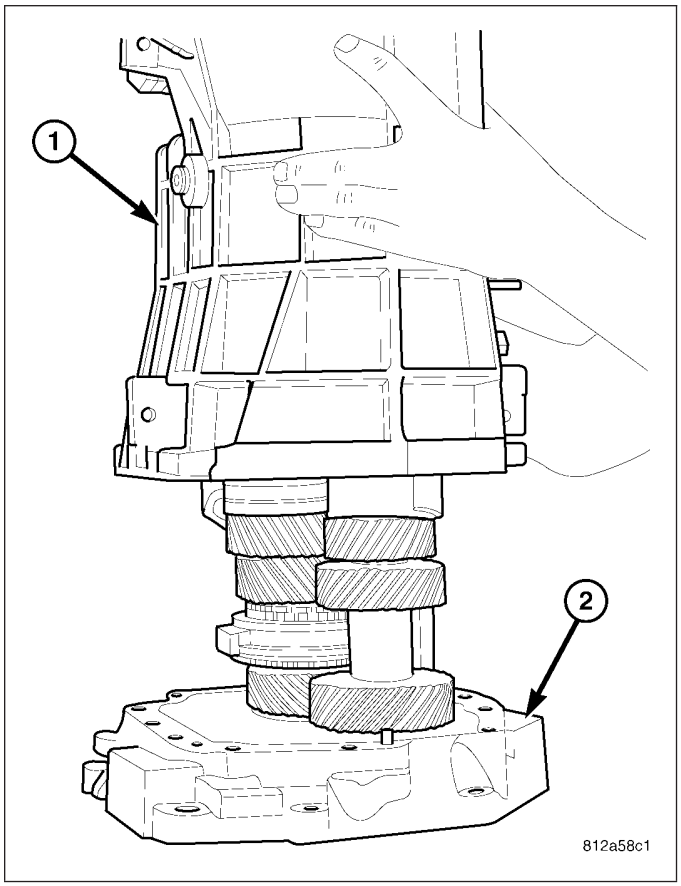
4. Tilt countershaft (4) sideways then install mainshaft (1) and shift rail (2) assemblies into adapter (3).



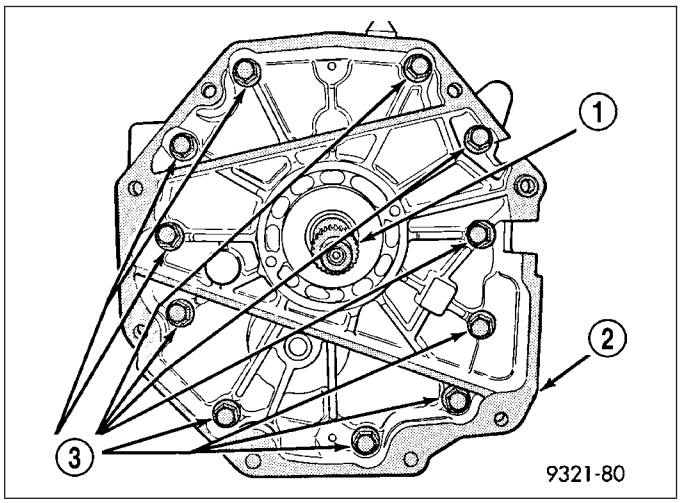
5. Install reverse rail assembly (2) into adapter (3) and on mainshaft (1).
6. Install guide plate and tighten torx bolts to 22 N·m (16 ft. lbs.).
7. Apply Mopar® Gasket Maker to adapter sealing surface.



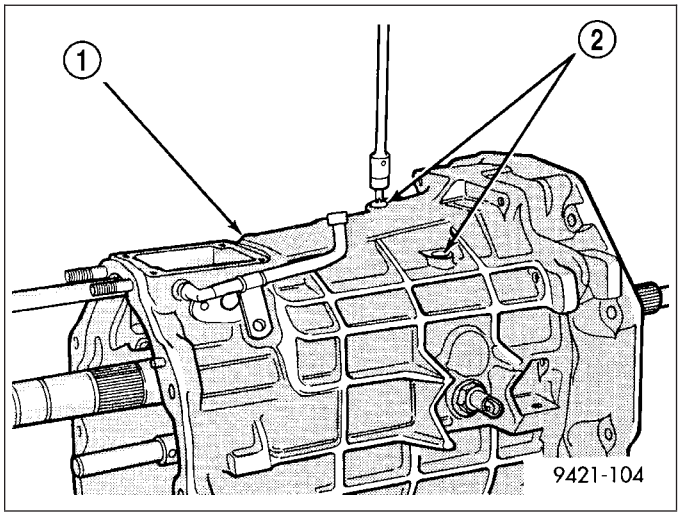
8. Install transmission case (1) on gear set until shift rail through the guide plate. Then install offset lever spring, ball and lever on shift rail and seat transmission case on adapter (2).



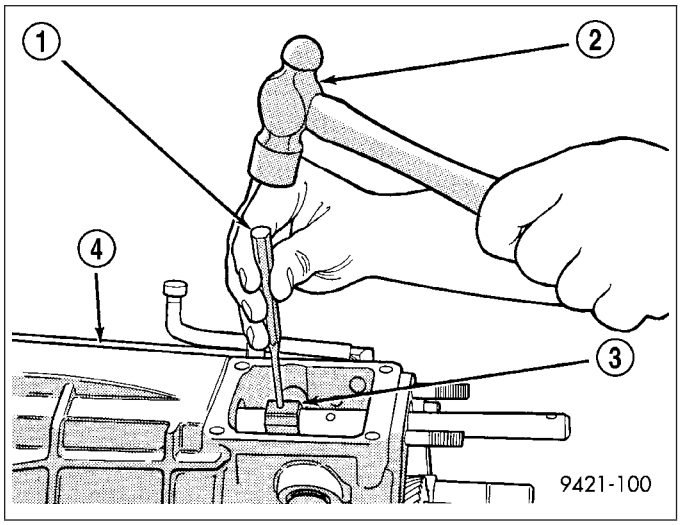
9. Install front adapter (2) bolts (3) and tighten to 34 N·m (25 ft. lbs.).



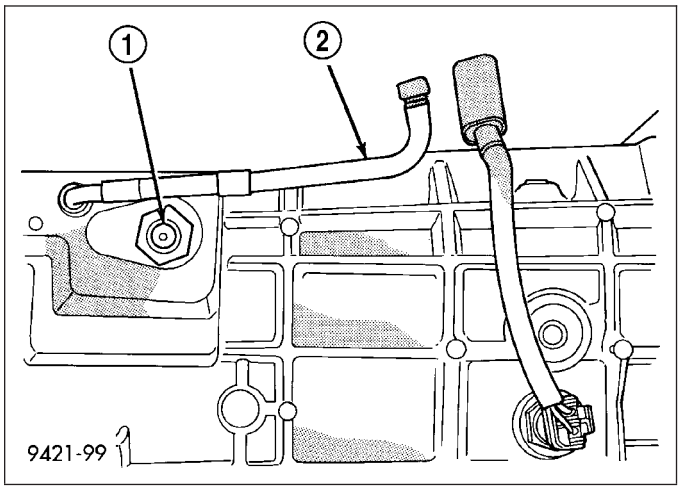
10. Install two torx screws (2) on top of transmission case (1).



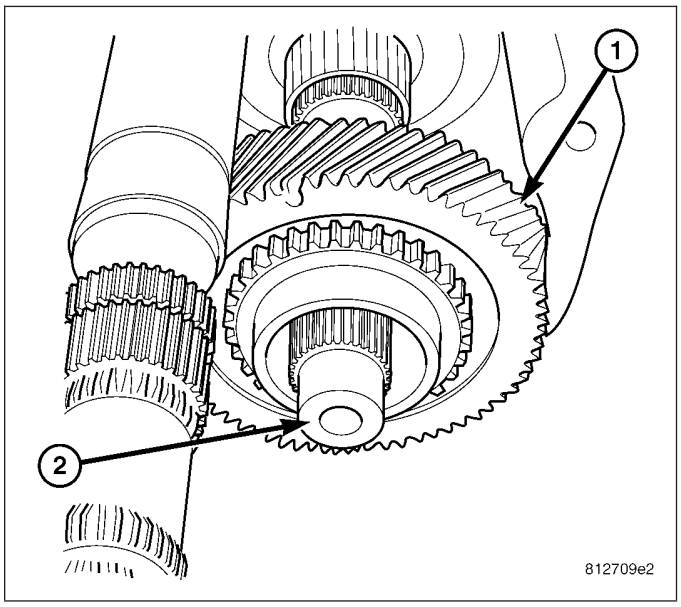
11. Drive roll pin down into offset lever (3) with hammer (2) and punch (1).



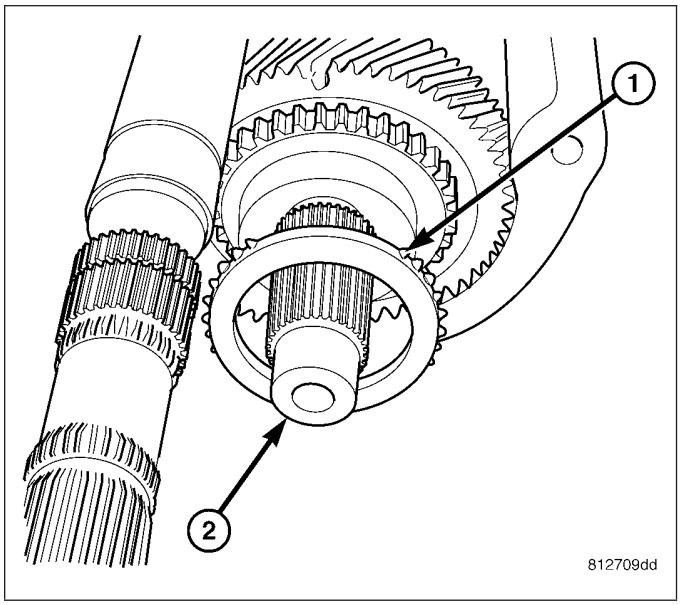
12. Apply Loctite® 242 to shift detente (1) threads. Install shift detente assembly with **new** O-ring and tighten to 34 N·m (25 ft. lbs.).
13. Install reverse lock-out solenoid.
14. Apply Mopar® Gasket Maker to top plate sealing surface.
15. Install top plate bolts and tighten to 20 N·m (15 ft. lbs.).



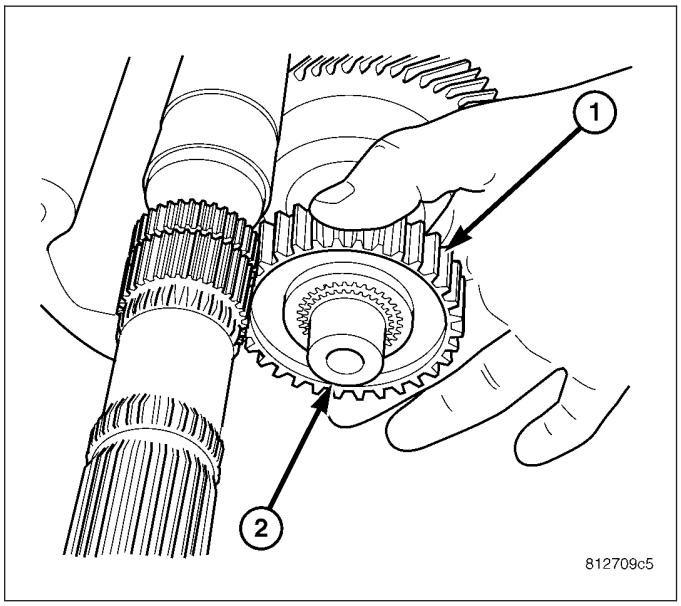
16. Install sixth gear bearing and gear (1) on countershaft (2).
.



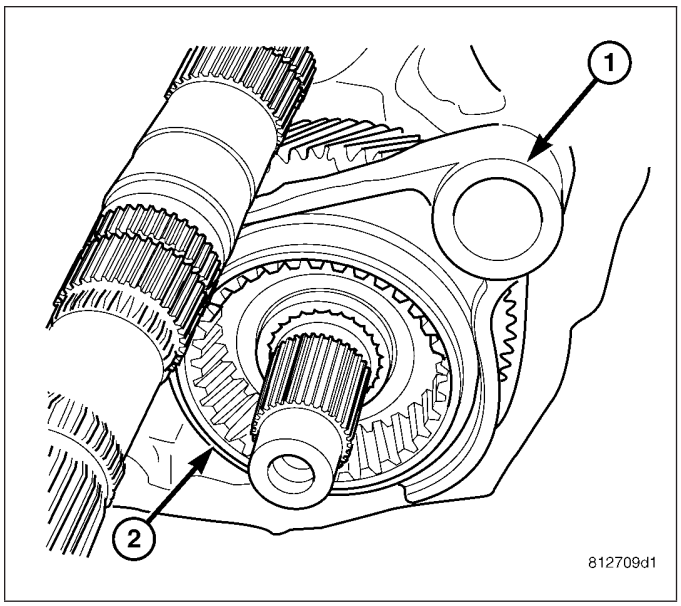
17. Install sixth gear stop ring (1).



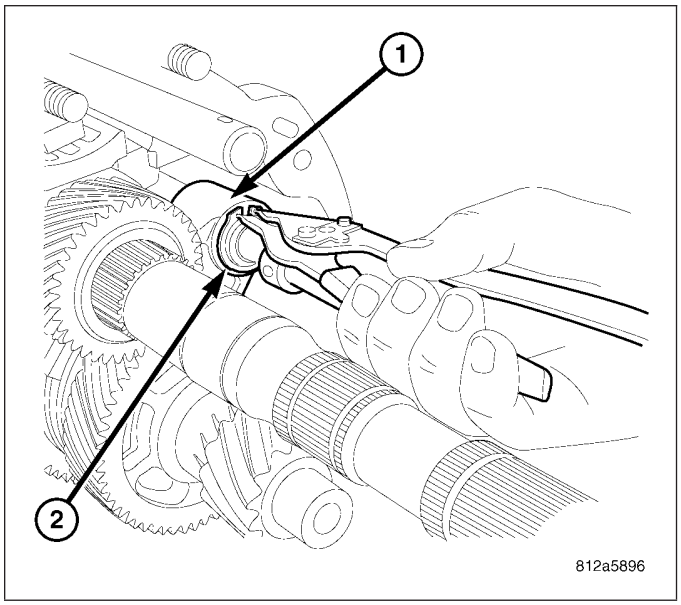
18. Install 5-6 synchronizer (1) on countershaft (2).
19. Install 5-6 synchronizer snap ring.



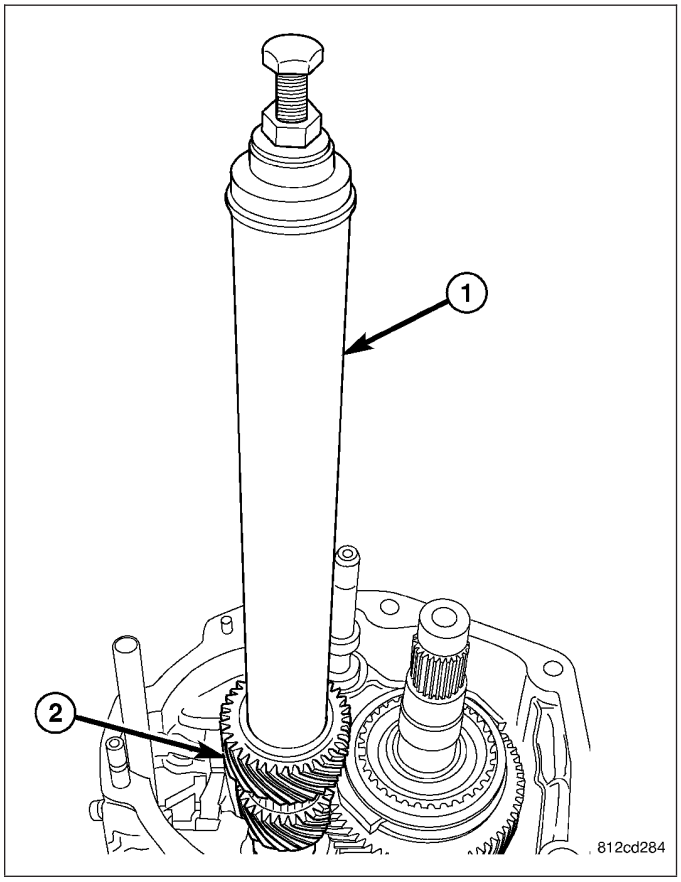
20. Install 5-6 shift fork (1) and synchronizer sleeve (2).



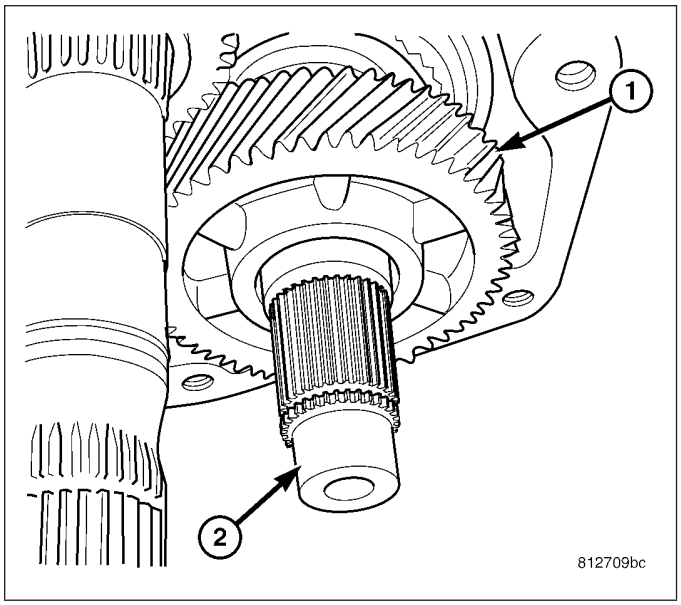
21. Install **new** 5-6 gear shift fork (1) snap ring (2).



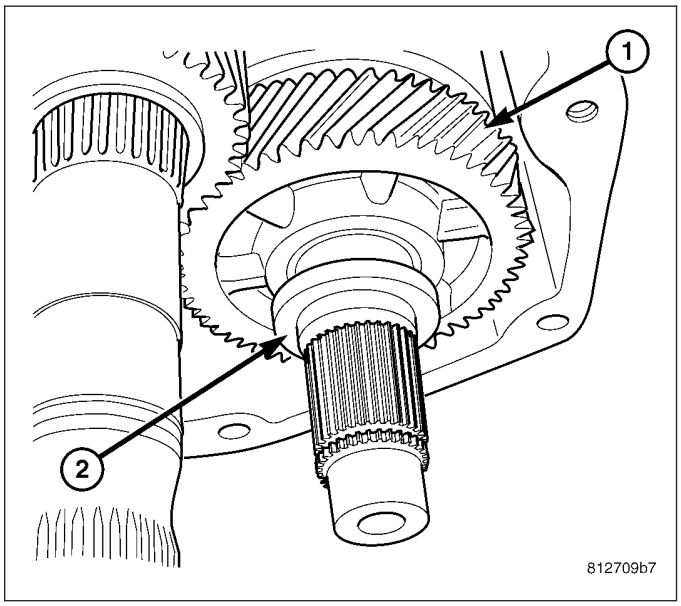
22. Install 5-6 gear (2) on mainshaft with Installer 9391(1).
23. Install fifth gear stop ring.



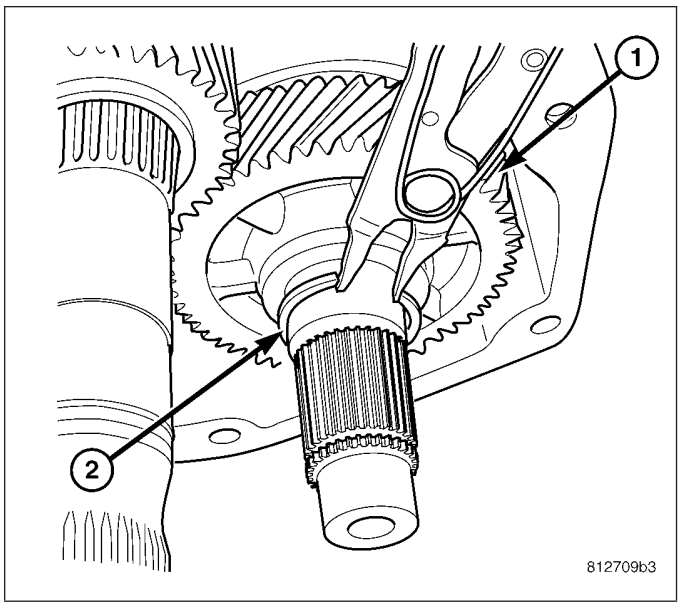
24. Install fifth gear bearing and gear (1) on countershaft (2).



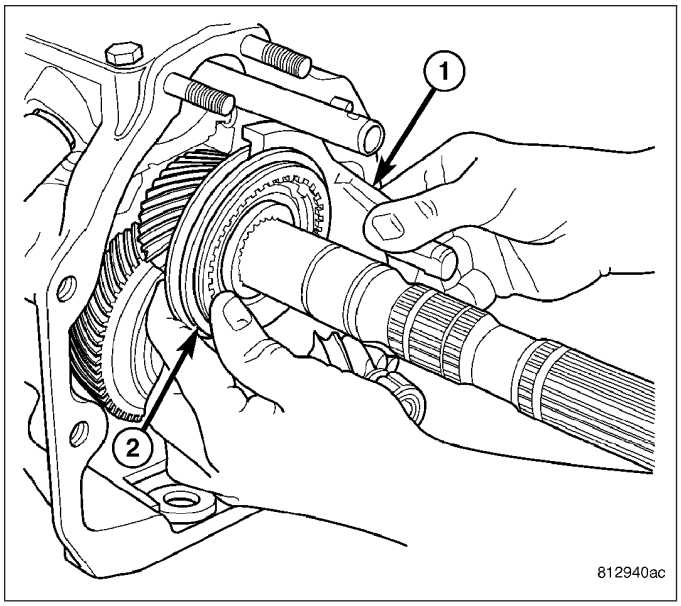
25. Install fifth gear (1) thrust washer (2).



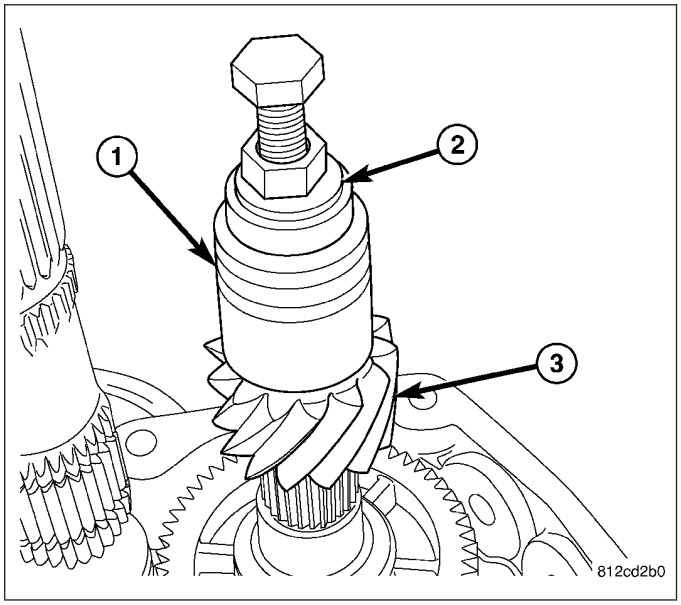
26. Install **new** fifth gear (1) snap ring (2).



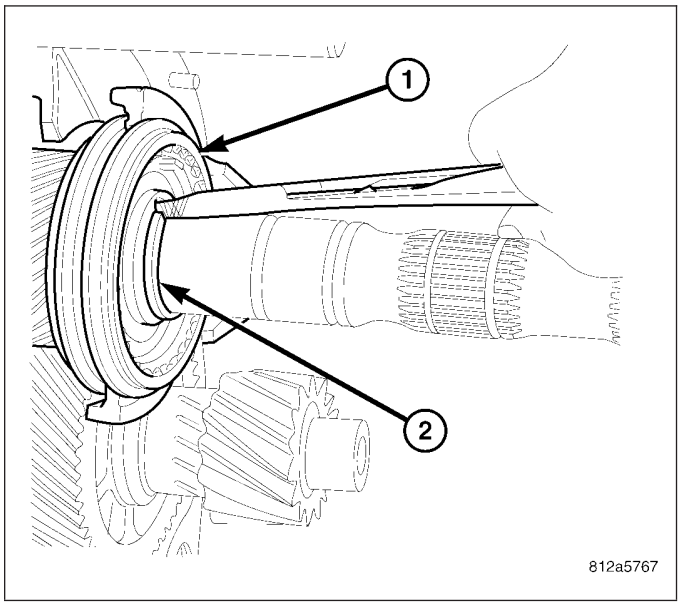
27. Install reverse shift fork (1) and synchronizer (2) sleeve onto main shaft.



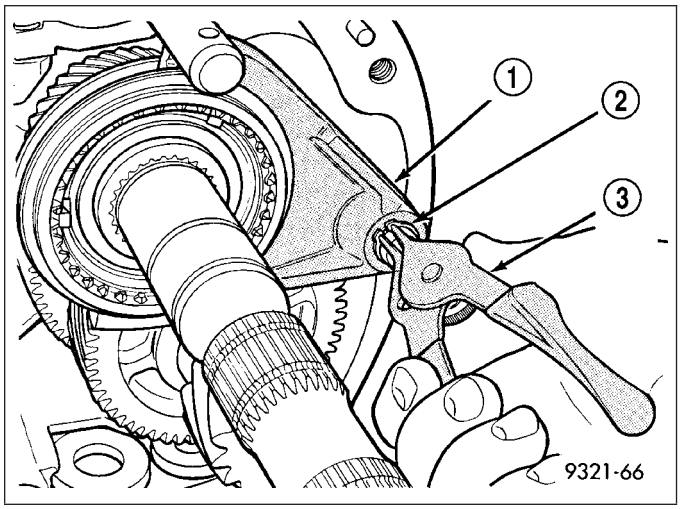
28. Install reverse gear (3) on countershaft with Installer 9391 (2) bolt, bearing and washer and 1 3/16 half inch drive socket (1).
29. Install reverse gear snap ring on countershaft.



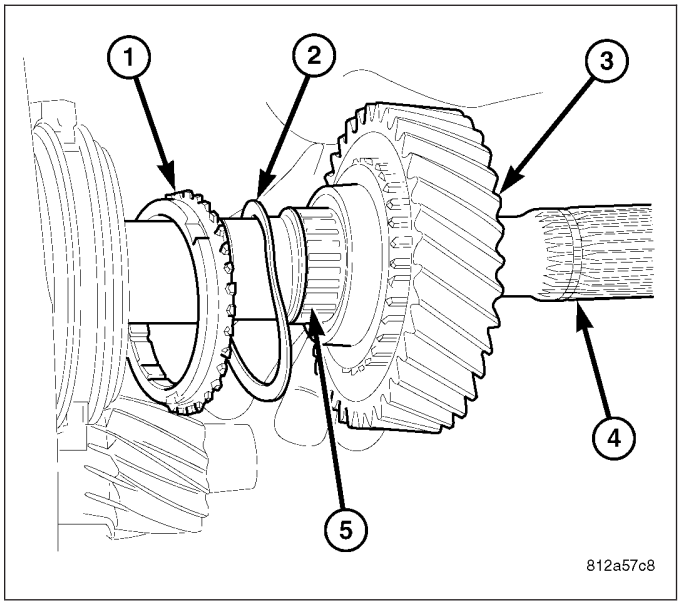
30. Install reverse synchronizer (1) snap ring (2).



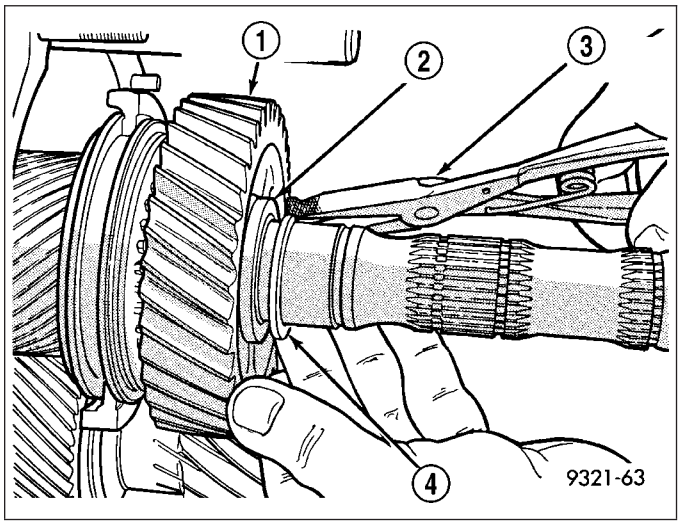
31. Install **new** reverse shift fork (1) snap ring (2) with the flat side facing rearward.



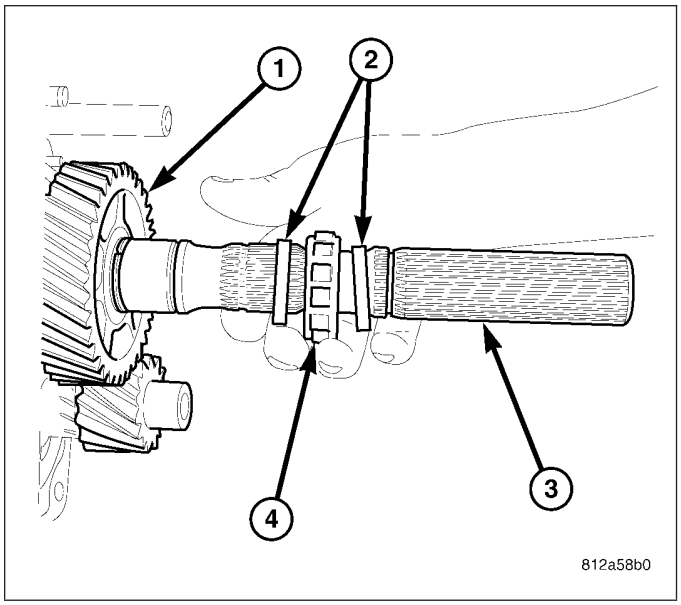
32. Install reverse gear (3), bearing (5), wave washer (2) and brass blocker ring (1) on mainshaft (4).



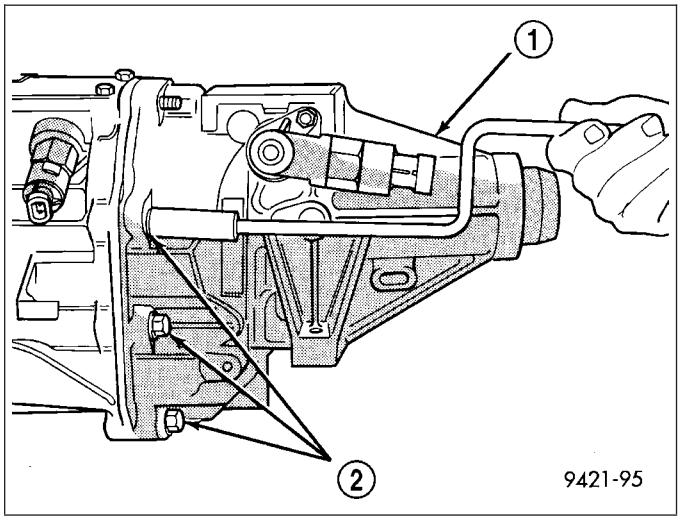
33. Install reverse gear (1) thrust washer (2) and snap ring (4).



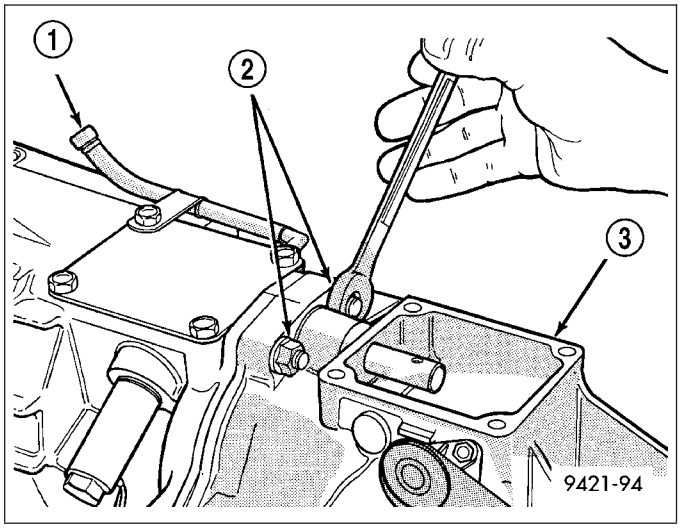
34. Install mainshaft (3) roller bearing (4), spacers (2) and snap ring.
35. Apply Mopar® Gasket Maker to tail housing sealing surface.



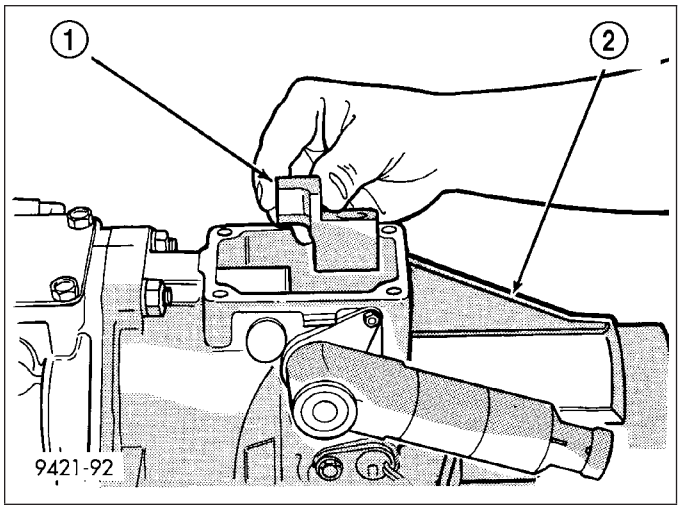
36. Install the six tail housing (1) to case bolts (2) and tighten bolts to 41 N·m (30 ft. lbs.).



37. Install two tail housing nuts (2) on top of transmission tail housing (3).

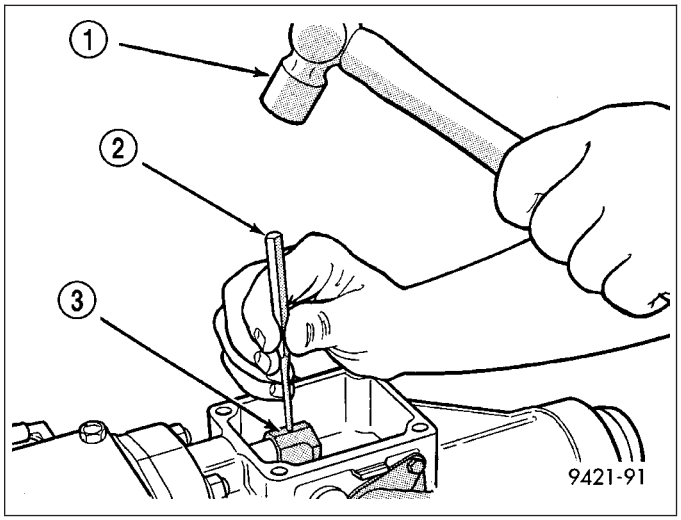


38. Slide offset lever (1) onto shaft in tail housing (2).



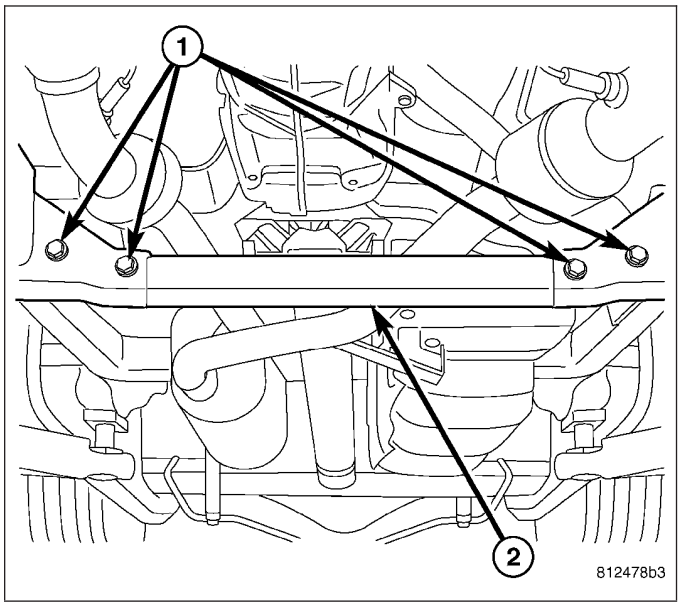
.

39. Install offset lever (3) roll pin with hammer (1) and punch (2)..
40. Install Mopar® Gasket Maker to the shift cover sealing surface and position cover on the transmission.
41. Install shift cover four mounting bolts and tighten to 18 N·m (13 ft. lbs.).

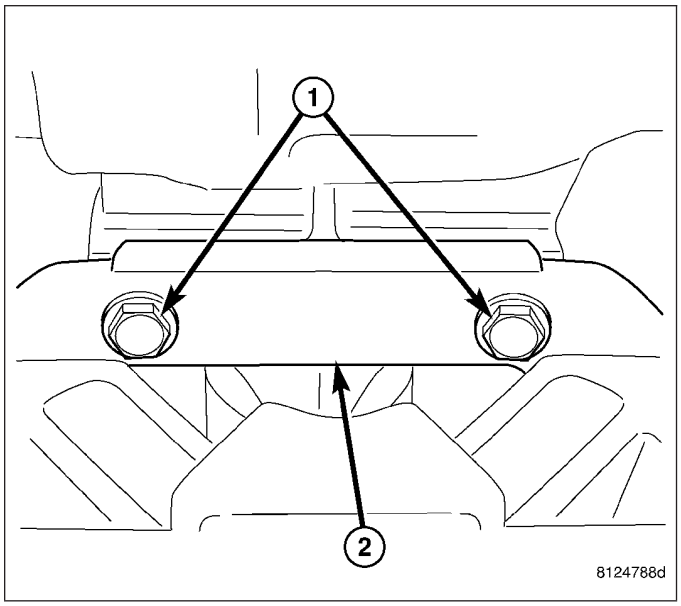


INSTALLATION

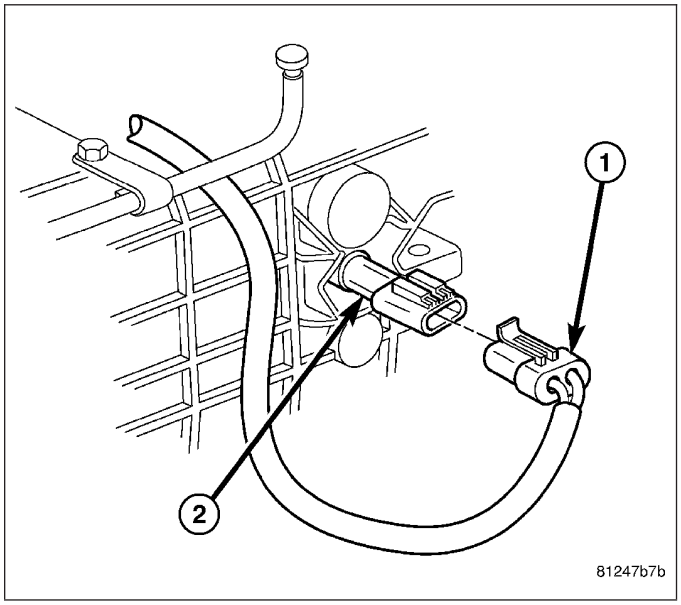
1. Slide transmission back into the clutch and seat against clutch housing.
2. Install transmission bolts to clutch housing bolts and tighten to and tighten bolts to 35 N·m (26 ft. lbs.)
3. Install transmission crossmember (2) and bolts/nuts (1). Tighten nuts to 61 N·m (45 ft. lbs.).



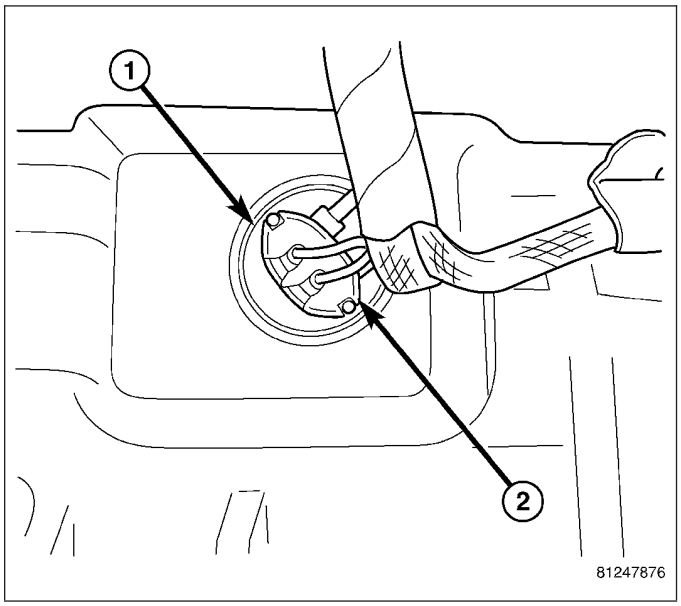
4. Install transmission mount (2) bolts (1) and tighten to 41 N·m (30 ft. lbs.).
5. Remove transmission jack.



6. Install back up lamp switch (2) connector (1).



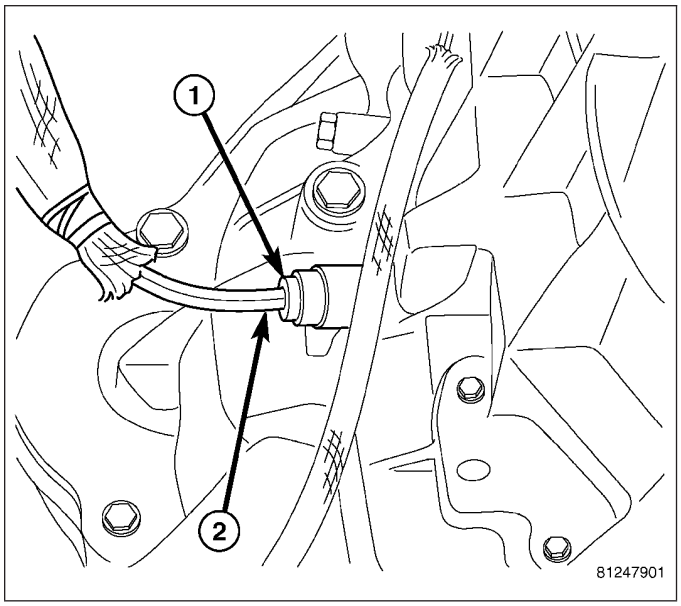
7. Install fuel line to top plate stud.
8. Install reverse lockout solenoid (1) harness connector (2).



9. Install hydraulic clutch quick connector (1) to the slave cylinder.
10. Clean transmission shifter tower sealing surfaces and apply a bead of Mopar® Gasket Maker.
11. Install shifter tower and tighten bolts to 18 N·m (156 in. lbs.).
12. Install propeller shaft with reference marks aligned.

CAUTION: The drive shaft strap bolts must be replaced or cleaned and Loctite® 242 applied.

CAUTION: Replace drive shaft joint straps whenever they are removed. The straps slightly deform when torqued in place. Reuse of the straps may result in reduced clamp load on the universal joint cap.

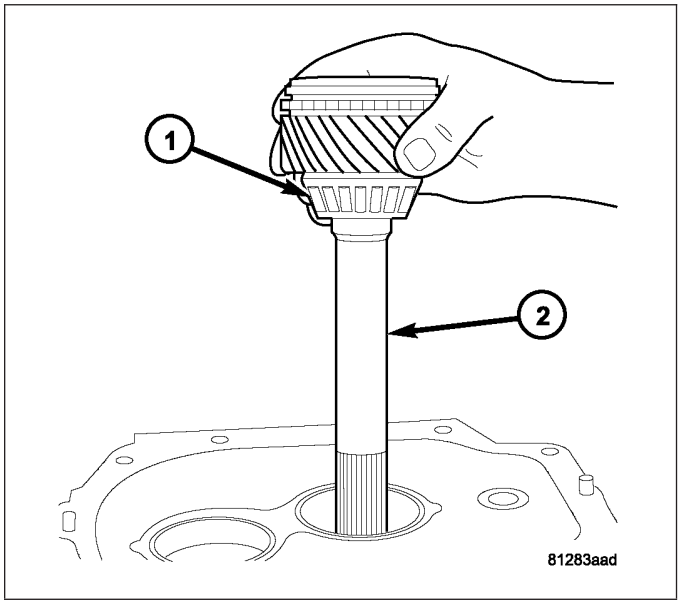


ADJUSTMENTS

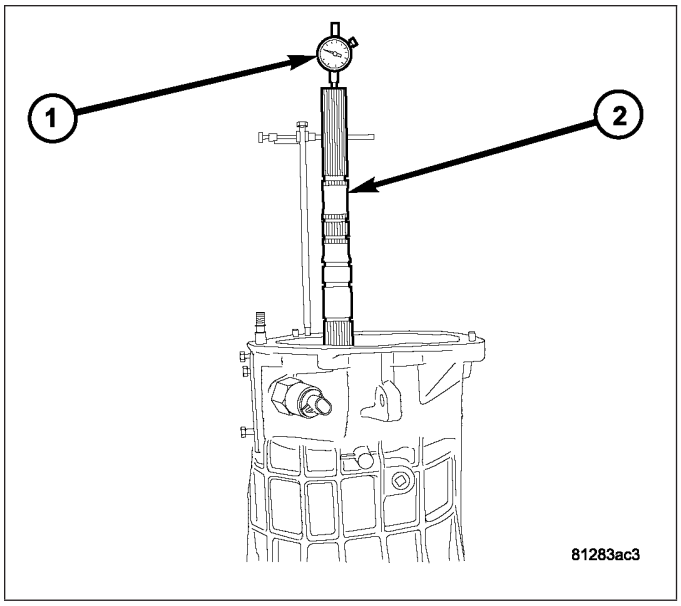
ADUSTMENTS

MAINSHAFT BEARINGS PRELOAD

1. Install input shaft (2) in to front adapter.
2. Install mainshaft and bearing.
3. Install case and bolt together using all bolts.
4. Rotate input shaft and mainshaft to seat bearings.

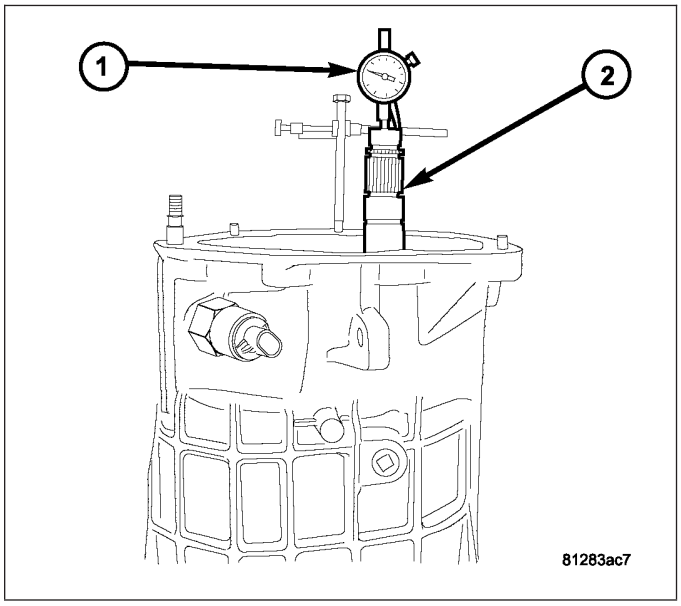


5. Screw Stud 8161 into the case and set up dial indicator (1) on the end of the mainshaft (2).
6. Zero the dial indicator, then push up on the input shaft and record the end play reading. If there is no end play, a thinner shim must be installed behind the input shaft bearing cup in the front adapter. Install .010 in. thinner shims until an end play is obtained.
7. Once an end play reading is obtained, add .002 in. to the reading.
8. Install shim(s) behind the input shaft bearing cup in the front adapter.



COUNTERSHAFT BEARINGS PRELOAD

1. Install countershaft with original shim into adapter.
2. Install case and bolt together using all bolts.
3. Rotate countershaft to seat bearings.
4. Screw Stud 8161 into the case and set up dial indicator (1)on the countershaft (2).
5. Zero dial indicator and record end play. If there is no end play, install .010 in. thinner shim until an end play is obtained.
6. Once an end play reading is obtained, add end play number to the shims in the transmission.
7. Install shim(s) behind the countershaft bearing cup in the front adapter.



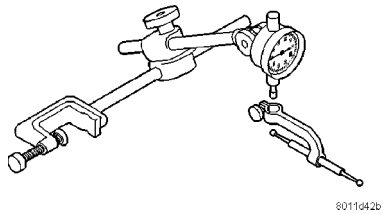
SPECIFICATIONS

MANUAL TRANSMISSION - T56

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Adapter Bolts	34	25	-
Back-up Lamp Switch	34	25	-
Dust Shield Bolts	11	-	95
Clutch Release Bearing	20	15	-
Drain Plug	38	28	-
Fill Plug	27	20	-
Flywheel Bolts	74	55	-
Guide Plate Bolts	22	16	-
Inspection Plug	27	20	-
Interlock Bolt	27	20	-
*Reverse Idler Brkt. Bolts	24	18	-
Reverse Lock-Out Bolt	18	13	-
Shifter Assembly	20	15	-
*Shift Detent Assembly	34	25	-
Trans. Top Cover Bolts	20	15	-
Trans. Crossmember Bolts	61	45	-
Trans. Mount Bolts	41	30	-
Trans. To Clutch Cover Bolts (3/8)	35	26	-
Trans. To Eng. Bolts (7/16)	68	50	-
Trans. To Oil Pan (5/16)	23	-	200
* Needs application of Loctite® 242			

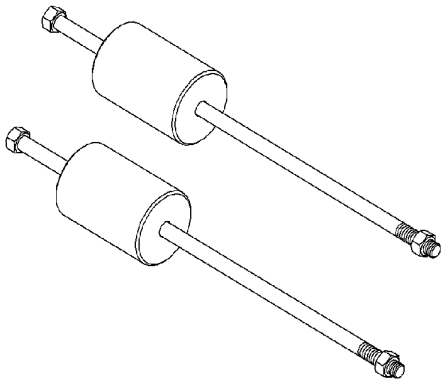
SPECIAL TOOLS



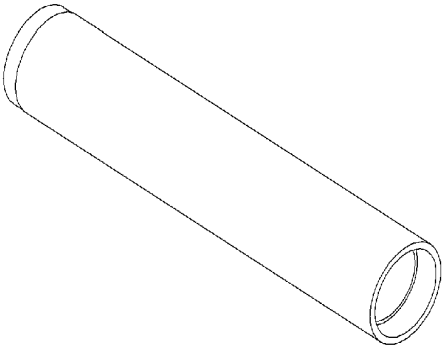
DIAL INDICATOR C-3339



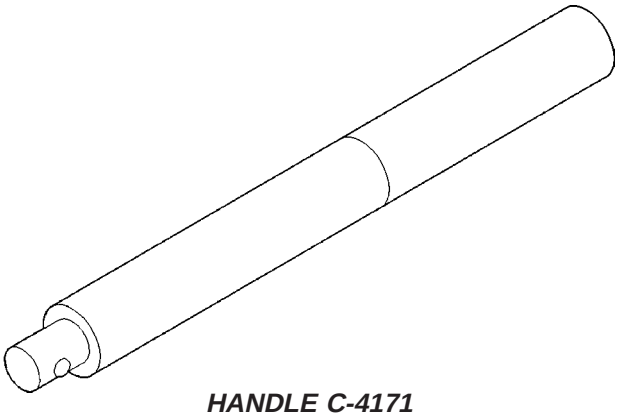
BEARING INSTALLER MB998909



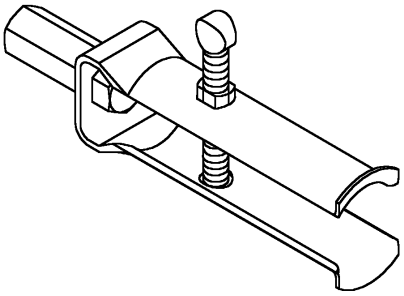
SLIDE HAMMER C-3752



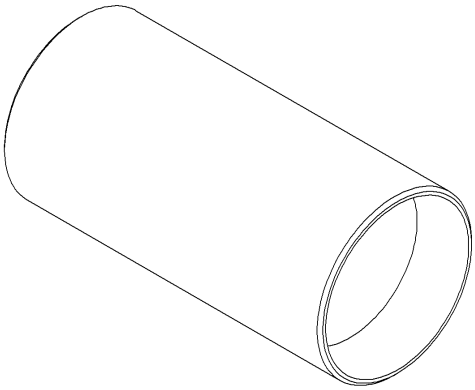
BEARING INSTALLER 6052



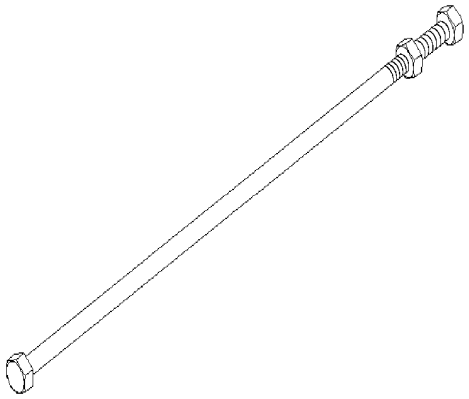
HANDLE C-4171



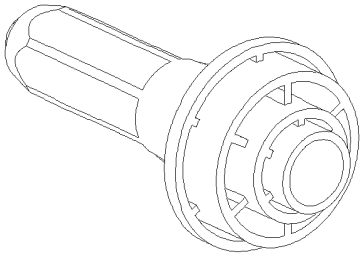
RACE REMOVER 7794-A



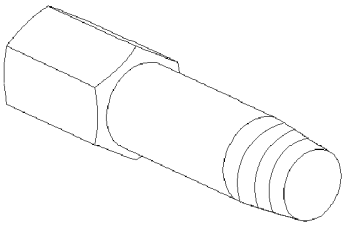
INSTALLER MB-991317



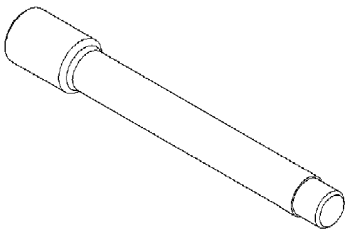
STUD 8161



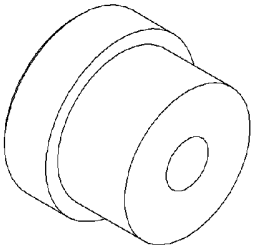
INPUT SHAFT SEAL INSTALLER 9366



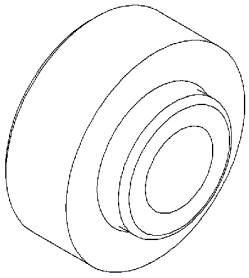
BUSHING REMOVER 9367



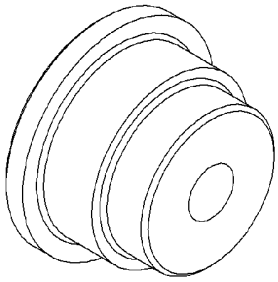
BUSHING INSTALLER 9368



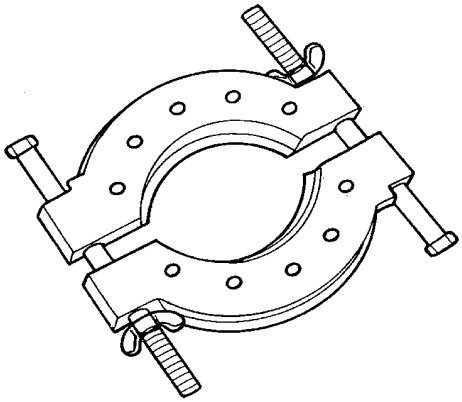
CASE CUP REMOVER 9369



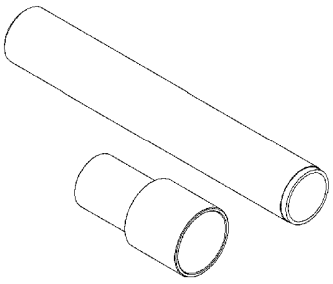
OUTPUT SHAFT SEAL INSTALLER 9372



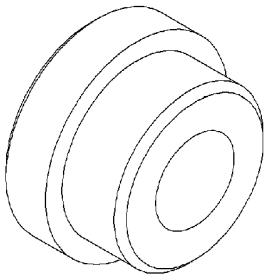
CASE CUP INSTALLER 9373



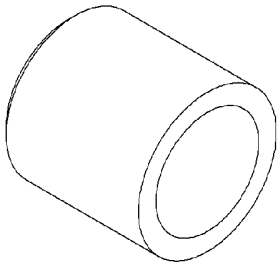
GEAR SPLITTER 9375



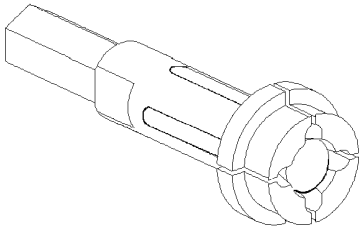
3-4 GEAR PRESS TUBE 9376



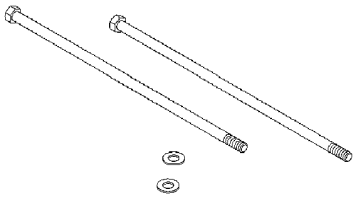
INPUT SHAFT CUP INSTALLER 9380



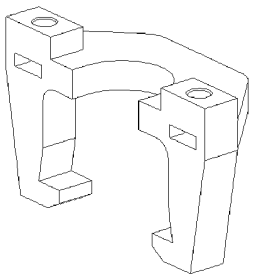
THIRD GEAR PRESS ADAPTER 9377



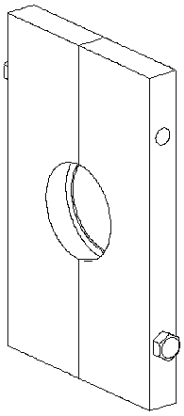
BRIDGE 9382



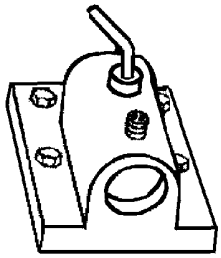
5-6 GEAR REMOVER BOLTS 9378



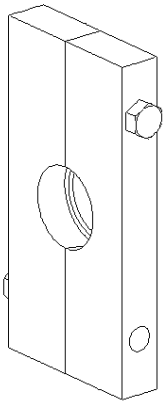
5-6 GEAR REMOVER 9379



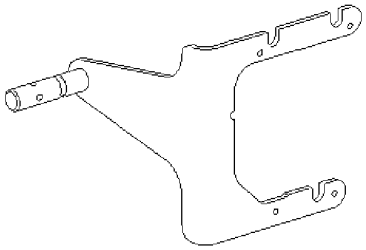
BEARING SPLITTER 9384



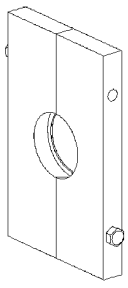
BENCH FIXTURE 9385



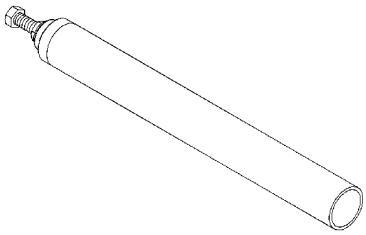
BEARING SPLITTER 9386



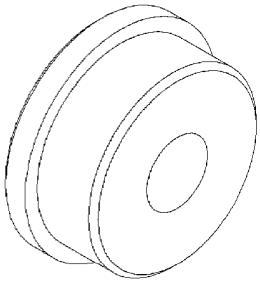
TRANSMISSION FIXTURE 9387



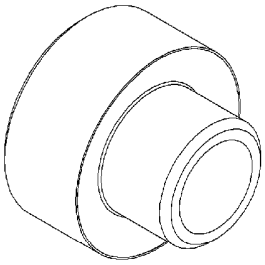
BEARING SPLITTER 9388



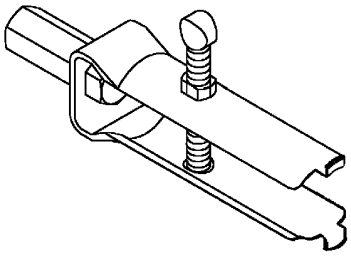
5-6 GEAR INSTALLER 9391



BEARING CUP INSTALLER 9392



BEARING INSTALLER 9394



BEARING REMOVER 9395

SEAL-EXTENSION HOUSING

REMOVAL

NOTE: If extension housing slip yoke bushing is worn the housing must be replaced,

1. Remove propeller shaft.
2. Remove seal with a seal pick.
3. Clean and inspect extension housing where the seal was located.

INSTALLATION

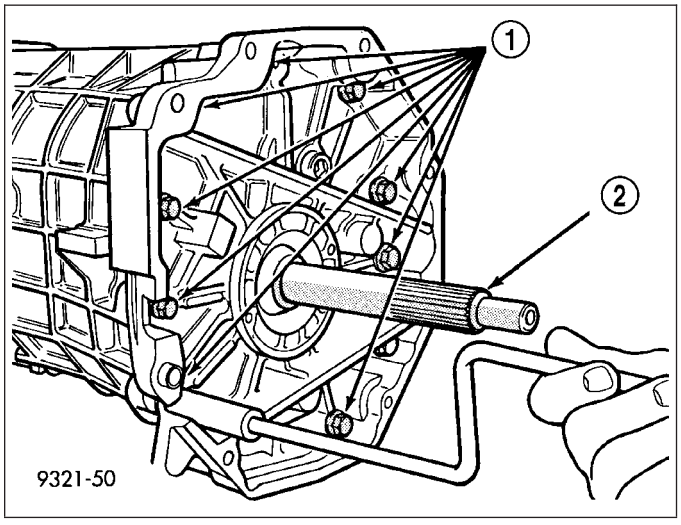
1. Install seal into extension housing with Installer 9372 and Handle C-4171.
2. Install propeller shaft.
3. Check transmission fluid level.

SHAFT-INPUT

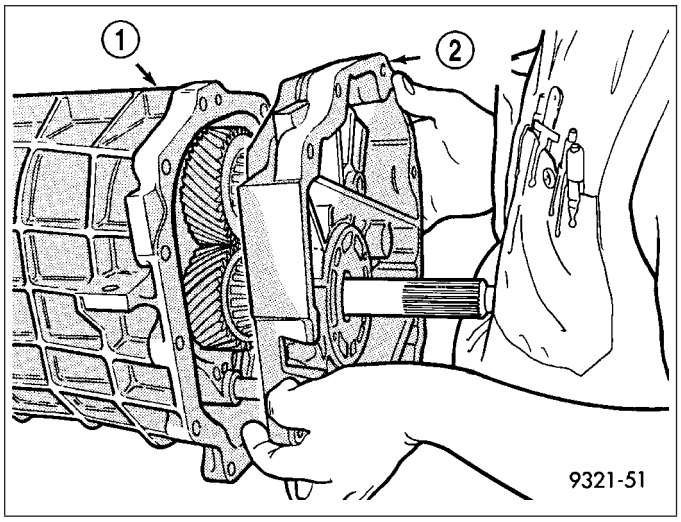
REMOVAL

NOTE: If input shaft is damaged behind the seal, the transmission must be disassembled and inspected.

1. Remove transmission from the vehicle.
2. Measure output shaft end play and record number.
3. Remove clutch slave cylinder from transmission adapter plate.
4. Remove front adapter plate bolts.
5. Pry front cover adapter loose.
6. Hold input shaft while removing adapter.

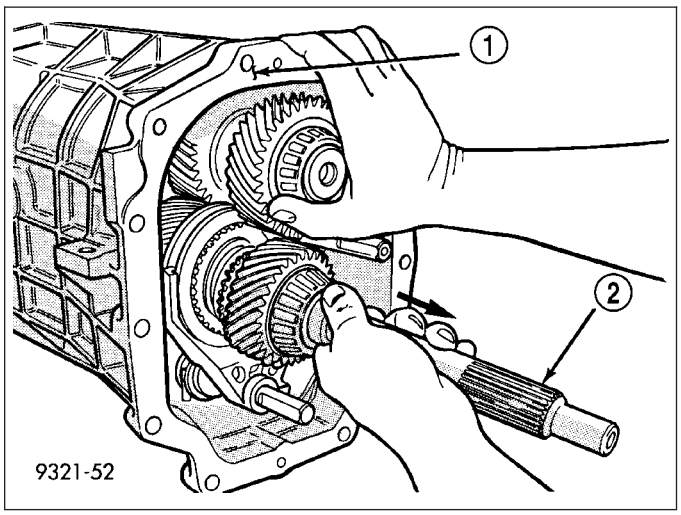


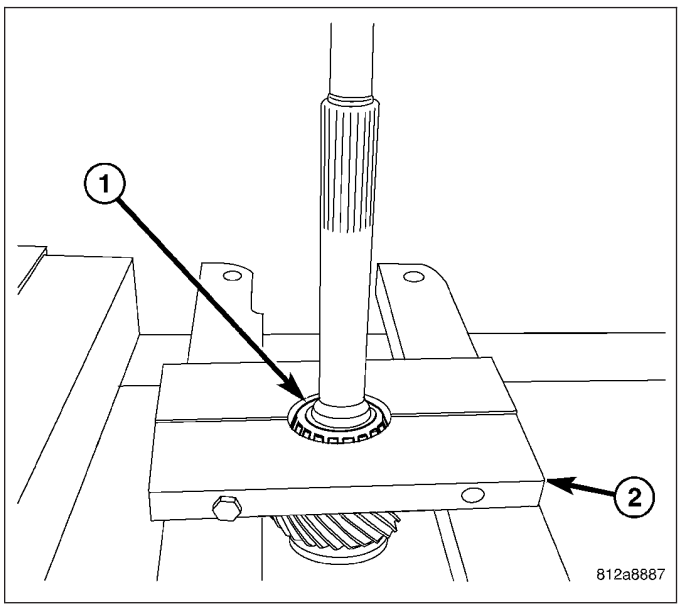
7. Remove seal from transmission adapter.
8. Clean and inspect all sealing surfaces for wear or damage.
9. Lift cluster shaft slightly and remove input shaft from transmission.
10. Remove input shaft bearing with Splitter P-334 and a press.



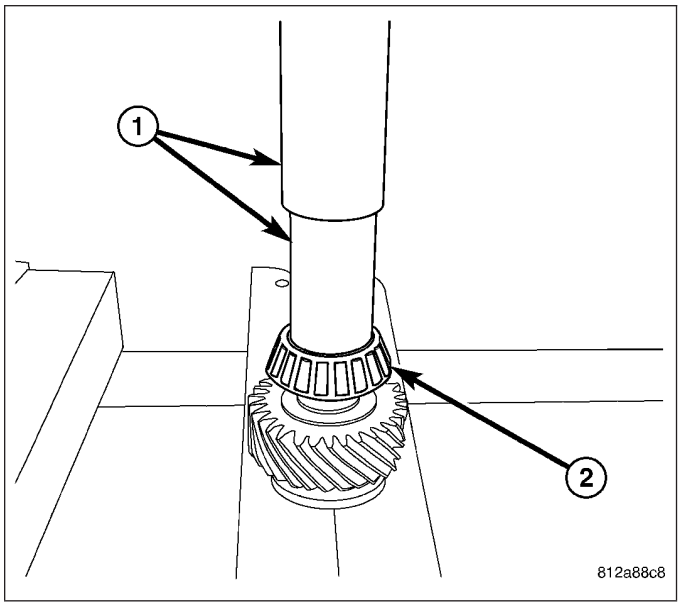
INSTALLATION

1. Install new seal from the fluid side with Installer 9366.
2. Install input shaft bearing on shaft with Installer 6052 and Installer MB-991317.





3. Install new bearing cup in front adapter withl original shim behind cup.
4. Clean sealing surfaces of the transmission case and adapter plate.
5. Install new input shaft and adapter plate (without any Mopar Gasket Maker).
6. Check output shaft end play. It should be the same as measured during the disassemble procedure. If end play is greater than original reading, install a thicker shim. If end play is less than original reading, install a thinner shim.
7. After the correct shim has been installed, remove the adapter plate and apply Mopar Gasket Maker to the sealing surfaces.
8. Install adapter and tighten adapter bolts to 34 N·m (25 ft. lbs.).
9. Install transmission.



SOLENOID-REVERSE LOCKOUT

DESCRIPTION

The reverse lockout solenoid prevents shifting into reverse when the vehicle speed is greater than 3 mph. Solenoid is threaded into the left side of the transmission.

OPERATION

When vehicle speed is less than 5 mph, the PCM provides a ground for the solenoid (energized) and allows shifting. When vehicle speed is greater than 5 mph, the solenoid is deactivated and prevents the transmission from being shifted into reverse.

SOLENOID-REVERSE LOCK-OUT

DESCRIPTION

The reverse lockout solenoid prevents the operator from shifting into reverse when the vehicle speed is greater than 5 mph. The solenoid is threaded into the left side of the transmission.

OPERATION

When vehicle speed is less than 5 mph, the PCM provides a ground for the solenoid (energized) and allows shifting. When vehicle speed is greater than 5 mph, the solenoid is deactivated and prevents the transmission from being shifted into reverse.

AUTOMATIC TRANSMISSION - 545RFE - ELECTRICAL DIAGNOSTICS

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AUTOMATIC TRANSMISSION - 545RFE - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

PRE-DIAGNOSTIC CHECK OUT

For a complete wiring diagram **Refer to Section 8W**.

Diagnostic Test

1. PRE-DIAGNOSTIC CHECK OUT

Check the transmission fluid level. If the fluid level is low, locate and repair any leaks and fill the transmission to the proper level. Refer to the appropriate Service Information for procedures. Many transmission symptoms can be caused by a low fluid level.

Check the battery. To avoid false diagnosis, testing should only be performed with the battery fully charged.

With the scan tool, read Engine (PCM) DTCs. If DTCs are present, refer to the Driveability Category and perform to the appropriate diagnostic procedure(s) before proceeding.

With the scan tool, read Transmission (TCM) DTCs. Record all Stored, Active, and Pending DTC information. Diagnose any Pending DTC as a matured DTC.

With the scan tool, read EATX DTC EVENT DATA. Use this data to identify the conditions in which the DTC was set.

Performing a Battery Disconnect will clear all EATX DTC EVENT DATA and reset all learned Transmission values to the default values, which may temporarily result in erratic shift schedules.

With the scan tool, perform the Shift Lever Position Test. If the test does not pass, refer to the diagnostic procedure for P0706 Check Shifter Signal.

For Gear Ratio Error DTCs, use the scan tool to view CVI Monitor data. Read and record the Clutch Volume Index information.

Use the wiring diagram as a guide. Inspect the wiring and connectors related to this circuit. Repair as necessary.

Refer to the When Monitored and Set Conditions for this DTC. DTCs can set at ignition on, at start up, after driving under specific conditions and after diagnostic monitors have been run.

Refer to applicable Technical Service Bulletins (TSBs) for controller software update information. Some conditions can be corrected by upgrading the Engine (PCM) or Transmission (TCM) controller software.

Refer to any Service Information Tune Ups or Technical Service Bulletins that apply to this symptom.

Were there any repairs made that fixed the vehicle?

Yes >> Testing complete.

No >> Refer to the Transmission category and perform the appropriate diagnostic procedure(s).

P0122-TPS/APP CIRCUIT LOW

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - DIAGNOSIS AND TESTING).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set if the monitored TPS voltage drops below .078 volts for the period of 0.48 seconds.

Possible Causes
RELATED ENGINE TPS/APPS DTC'S PRESENT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Due to the integration of the Powertrain and Transmission Control Modules the New Generation Control Module III will be referred to as the Powertrain Control Module (PCM). The 3–wire TPS (4.7L V-8 Engine) provides the PCM with an input signal voltage that represents the throttle blade position of the throttle body. The Throttle Position Sensor (TPS) is connected to the throttle blade shaft. As the position of the throttle blade changes, the output voltage of the TPS changes.

The PCM supplies approximately 5.0 volts to the TPS. The TPS output voltage (input signal to the PCM) represents the throttle blade position. The PCM receives an input signal voltage from the TPS. This will vary in an approximate range from 0.26 volts at minimum throttle opening (idle), to 4.49 volts at maximum opening (wide open throttle).

The Accelerator Pedal Position Sensor (APPS) is currently used only with the 5.7L V-8 engine. The APPS is a linear potentiometer. It provides the PCM with a voltage signal proportional to the angle, or position of the accelerator pedal. The APPS signal along with inputs from other sensors is used by the PCM to calculate the throttle plate position.

A mechanical cable is used between the accelerator pedal and the APPS assembly. Although a cable is used between the accelerator pedal and the APPS assembly, a mechanical cable is not used between the accelerator pedal and the throttle body. The throttle plate position is electronically controlled by the PCM.

Diagnostic Test

1. DETERMINING IF RELATED ENGINE TPS/APPS DTC'S ARE PRESENT

With the scan tool, check Engine DTC's.

Are there any Engine TPS/APPS DTCs present?

Yes >> Refer to the Drivability Category and perform the appropriate Symptom.

No >> Go To 2

P0122-TPS/APP CIRCUIT LOW (CONTINUED)

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, record the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

With the scan tool, erase Transmission DTCs.

NOTE: To erase EATX DTC DTC EVENT DATA information, a BATTERY DISCONNECT must be performed. Performing a BATTERY DISCONNECT may reset learned Transmission values to controller defaults which may lead to erratic shift schedules.

Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the EATX DTC EVENT DATA.

With the scan tool, read Transmission DTCs.

Did the DTC P0122 TPS/APPS LOW, reset?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0123- TPS/APP CIRCUIT HIGH

For the Transmission circuit diagram (Refer to) (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set if the monitored TPS voltage rises above 4.94 volts for the period of 0.48 seconds.

Possible Causes
RELATED ENGINE TPS/APPS DTC'S PRESENT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Due to the integration of the Powertrain and Transmission Control Modules the New Generation Control Module III will be referred as the Powertrain Control Module (PCM). The 4.7L V-8 Throttle Positioning Sensor (TPS) provides the PCM with an input signal voltage that represents the throttle blade position of the throttle body. The TPS is connected to the throttle blade shaft. As the position of the throttle blade changes, the output voltage of the TPS changes.

The 5.7L V-8 Accelerator Pedal Position Sensor (APPS) is a linear potentiometer that provides the PCM with a voltage signal proportional to the angle, or position of the accelerator pedal. The APPS signal along with inputs from other sensors is used by the PCM to calculate the throttle plate position which is electronically controlled.

Diagnostic Test

1. DETERMINING IF RELATED ENGINE TPS/APPS DTC'S ARE PRESENT

With the scan tool, check Engine DTC's, this includes all one trip failures.

Are there any Engine TPS/APPS DTCs present?

Yes >> Refer to the Drivability category and perform the appropriate symptom.

No >> Go To 2

P0123- TPS/APP CIRCUIT HIGH (CONTINUED)

2. CHECK IF THE DTC IS CURRENT

With the scan tool, record the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

With the scan tool, erase Transmission DTCs.

NOTE: To erase EATX DTC EVENT DATA information, a BATTERY DISCONNECT must be performed. Performing a BATTERY DISCONNECT may reset all learned Transmission values to controller defaults that could lead to an inconsistent shift schedule.

Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the EATX DTC EVENT DATA.

With the scan tool, read Transmission DTCs.

Did the DTC P0123 TPS/APPS HIGH, reset?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0124-TPS/APP INTERMITTENT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete Transmission wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set if the monitored TPS throttle angle between the angles of 6° and 120° and the degree change is greater than 5° within a period of less than 7.0 ms

Possible Causes
RELATED TPS ENGINE DTC'S PRESENT
THROTTLE POSITION SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Due to the integration of the Powertrain and Transmission Control Modules the New Generation Control Module III will be referred as the Powertrain Control Module (PCM). The 4.7L V-8 Throttle Positioning Sensor (TPS) provides the PCM with an input signal voltage that represents the throttle blade position of the throttle body. The TPS is connected to the throttle blade shaft. As the position of the throttle blade changes, the output voltage of the TPS changes.

The 5.7L V-8 Accelerator Pedal Position Sensor (APPS) is a linear potentiometer that provides the PCM with a voltage signal proportional to the angle, or position of the accelerator pedal. The APPS signal along with inputs from other sensors is used by the PCM to calculate the throttle plate position which is electronically controlled.

Diagnostic Test

1. DETERMINING IF RELATED ENGINE TPS DTC'S ARE PRESENT

With the scan tool, check Engine DTC's including all one trip failures.

Are there any Engine TPS/APPS DTCs present?

Yes >> Refer to the Powertrain category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, record the DTC EVENT DATA to help identify the conditions in which the DTC was set.

With the scan tool, erase Transmission DTCs.

NOTE: To erase EATX EVENT DATA information, a BATTERY DISCONNECT must be performed. Performing a BATTERY DISCONNECT may reset all learned transmission values to controller default. This may lead to erratic shift schedules.

Drive the vehicle and try to duplicate the conditions in which the DTC was reported by the DTC EVENT DATA.

With the scan tool, read Transmission DTCs.

Did the DTC P0124 TPS/APPS INTERMITTENT, reset?

Yes >> Go To 3

No >> Go To 4

P0124-TPS/APP INTERMITTENT (CONTINUED)

3. CHECK THROTTLE POSITION SENSOR OPERATION

Ignition On, Engine Not Running.

With the scan tool, under Transmission Sensors, monitor the TPS voltage in the following step.

Slowly open and close the throttle while checking for erratic voltage changes.

Was the TPS voltage change smooth and consistent?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Throttle Position Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

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4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0218-HIGH TEMPERATURE OPERATION ACTIVATED

For the Transmission circuit diagram. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running.
- **Set Condition:**
  Immediately after a Overheat shift schedule is activated when the Transmission temperature exceeds 127° C or 260° F.

Possible Causes
HIGH TEMPERATURE OPERATION ACTIVATED
TORQUE CONVERTER CLUTCH SLIPPING / NOT ACTIVATING
EXCESSIVE TIME IDLING IN GEAR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

Theory of Operation

The DTC is intended as an informational DTC to aid the technician in determining the root cause of a customer dirveability issue. The DTC is also intended to alert the technicain to determine if a cooling system malfunction has occurred or if an additional transmission air to oil cooler is needed to support the customers driving behavior.

Diagnostic Test

1. HIGH TEMPERATURE OPERATION

This DTC is an informational DTC designed to aid the Technician in diagnosing shift quality complaints.

This DTC indicates that the transmission has been operating in the ″Overheat″ shift schedule which may generate a customer complaint.

The customer driving patterns may indicate the need for an additional transmission oil cooler.

Verify proper Engine cooling system operation which would affect proper transmission operation.

Verify proper torque converter clutch operation.

With the scan tool, check the DTC EVENT DATA to help identify the conditions in which the DTC was set.

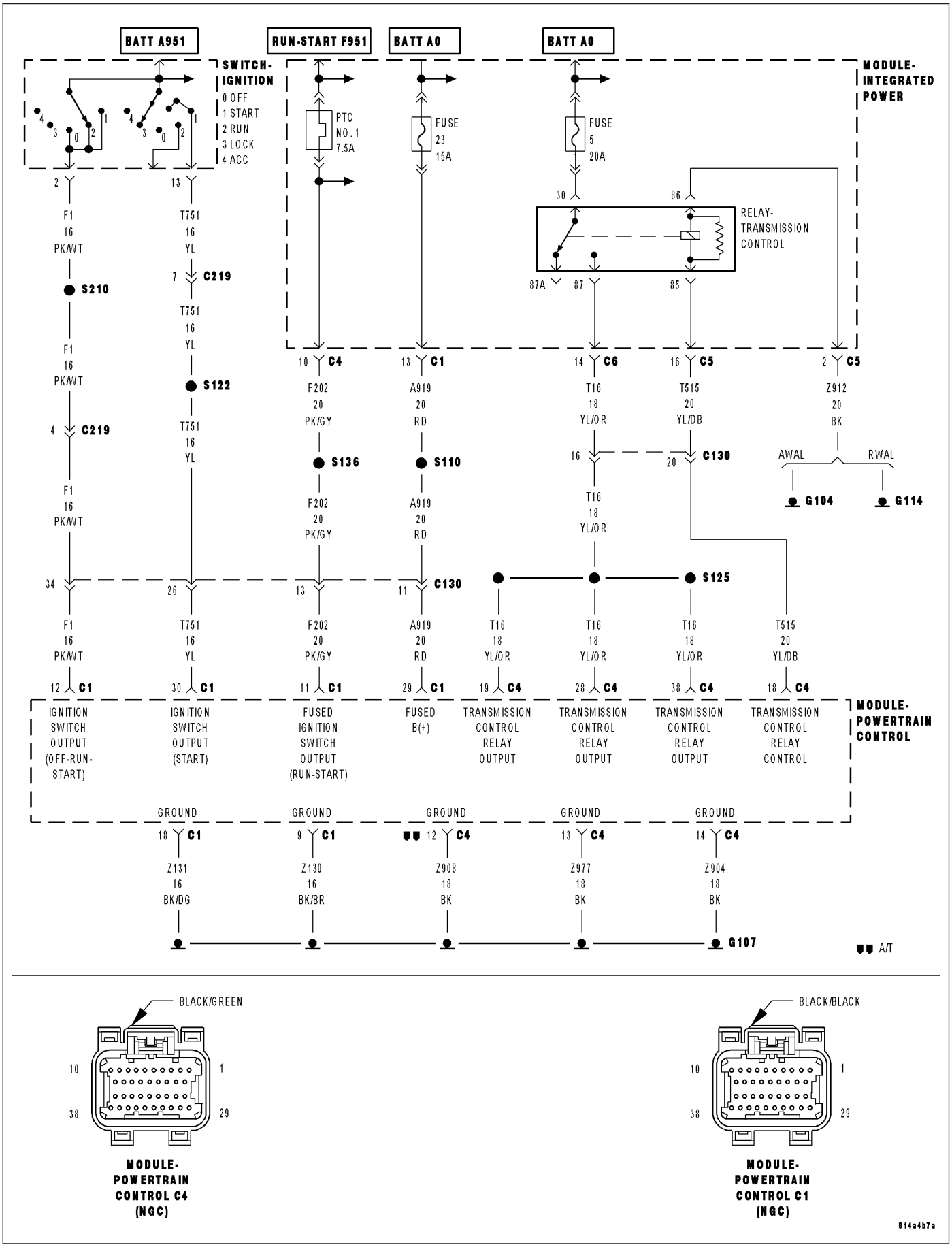
If there are no possible causes remaining, view repair.

Repair

Repair the cause of transmission overheating. Refer to the Service Information for the proper repair procedure. Make sure to check for any Service Bulletins pertaining to this problem.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0562-BATTERY VOLTAGE LOW



MODULE-POWERTRAIN CONTROL C4 (NGC)

MODULE-POWERTRAIN CONTROL C1 (NGC)

814a4b7a

P0562-BATTERY VOLTAGE LOW (CONTINUED)

For the Transmission circuit diagram. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the engine running and the PCM has closed the Transmission Control Relay.
- **Set Condition:**
  If the battery voltage of the Transmission Control Relay Output Sense circuit(s) to the PCM is less than 10.0 volts for the period of 15 seconds. Note: P0562 generally indicates a gradually falling battery voltage or a resistive connection(s) to the PCM. The DTC will also set if the battery voltage sensed at the PCM is less than 6.5-volts for 200ms or where Transmission Control Relay Output circuits are less than 7.2-volts for 200ms.

Possible Causes
RELATED CHARGING SYSTEM DTC'S
(Z908, Z977) GROUND CIRCUIT OPEN OR HIGH RESISTANCE
(A104) FUSED B+ CIRCUIT TO PCM OPEN OR HIGH RESISTANCE
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE
TRANSMISSION CONTROL RELAY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Friction element distress could result from an insufficient supply voltage to properly control the solenoids. To prevent this possibility, the battery voltage is monitored and the system is placed in logical limp-in if the battery voltage drops below the limit.

Diagnostic Test

1. RELATED CHARGING SYSTEM DTC'S

With the scan tool, read the Engine DTC's.

Are there any related Charging System DTC's also present?

Yes >> Refer to the Charging System category and repair any Engine Charging System DTC's, before testing DTC P0562. NOTE: After repairing the Engine Charging System DTC's, perform the Transmission Verification test to verify the transmission was not damaged.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0562-BATTERY VOLTAGE LOW (CONTINUED)

2. CONDITION P0562 PRESENT

NOTE: Generator, battery, and charging system must be fully functional before performing this test.
With the scan tool, read Transmission DTC's.

With the scan tool, Check the STARTS SINCE SET counter for P0562.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter set at 0?

Yes >> Go To 3

No >> Go To 7

---

3. CHECKING (Z908, Z977) GROUND CIRCUITS

Turn the ignition off to the lock position.

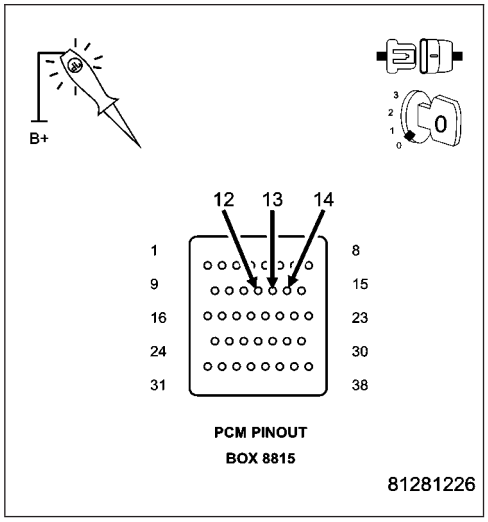
Disconnect the PCM C4 harness connector and connect Miller tool #8815.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Using a 12-volt test light connected to 12-volts, check the PCM (Z908, Z977) Ground circuits at the appropriate terminals of Miller tool #8815.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light illuminate brightly for the PCM (Z908, Z977) Ground circuits?

Yes >> Go To 4

No >> Repair the (Z908, Z977) Ground circuit(s) for an open or high resistance.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

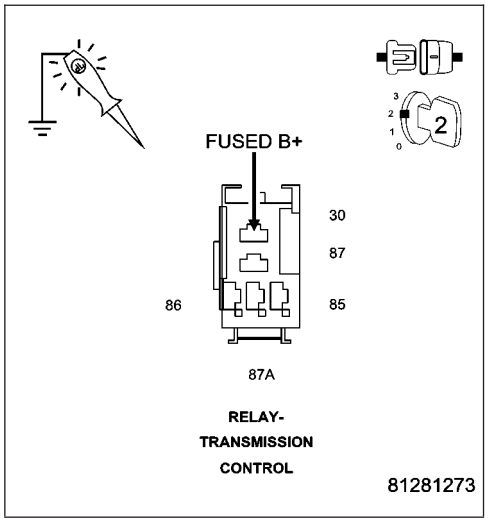
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4. CHECKING (A104) FUSED B+ CIRCUIT

Remove the Transmission Control Relay.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the (A104) Fused B+ circuit at the Transmission Control Relay connector.



Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (A104) Fused B+ circuit for an open or high resistance.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0562-BATTERY VOLTAGE LOW (CONTINUED)

5. CHECKING THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT

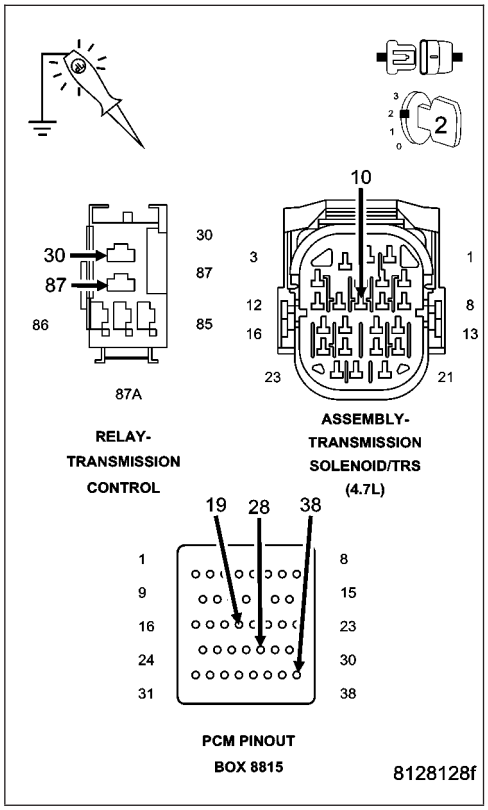
Turn the ignition off to the lock position.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check all (T16) Transmission Control Relay Output circuits at the appropriate terminals of Miller tool #8815.



Does the test light illuminate brightly?

Yes >> Go To 6

No >> Repair the (T16) Transmission Control Relay Output circuit for an open or high resistance.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. TRANSMISSION CONTROL RELAY

Turn the ignition off to the lock position.

Reconnect all previously disconnected connectors.

Install a substitute Relay in place of the Transmission Control Relay.

Start the engine.

Using a voltmeter, measure the vehicles battery voltage.

With the scan tool, monitor the Transmission Switched Battery Voltage.

Compare the scan tool Transmission Switched Battery voltage to the actual battery voltage reading on the voltmeter.

Is the scan tool voltage within 1.0 volt of the battery voltage?

Yes >> Replace the Transmission Control Relay.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0562-BATTERY VOLTAGE LOW (CONTINUED)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0602-CONTROL MODULE PROGRAMMING ERROR/NOT PROGRAMMED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Check for generic software is made at power-up
- **Set Condition:**
  If genic software is found , the MIL will light immediately. This DTC is designed to signal the technician that the controller still has generic software installed.

Possible Causes
PCM - PROGRAMMING ERROR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING)

Theory of Operation

The controller is programmed during manufacturing with generic software to facilitate testing. This software does not have the proper calibrations to control a transmission in a vehicle. The check for generic software is made at power-up. If generic software is found , the MIL will light immediately and the MIL will stay on even if the fault is cleared, until the proper software is installed. Note: Transmission will be placed in limp-in mode.

Diagnostic Test

1. CONTROL MODULE PROGRAMMING ERROR

NOTE: Controller is programmed with generic software and will not allow the correct vehicle Powertrain management.

With the scan tool.

Record the vehicles controller part number.

Select Use Controller Part Number under the Flash Tab.

Flash the controller with the correct software.

Verify the controller flashed successfully.

Test Complete

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1. Perform the Quick Learn Procedure.

P0604-INTERNAL CONTROL MODULE RAM

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  One time after the controller is reset (ignition turned to the RUN position).
- **Set Condition:**
  Whenever the Powertrain Control Module (PCM) detects an internal controller problem.

Possible Causes
POWER OR GROUND CIRCUIT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

After the controller is reset (ignition turned to the RUN position), the microprocessor checks the integrity of each RAM location by writing to it and reading back from it. The read value should be same as value written.

Diagnostic Test

1. CHECK WIRING AND CONNECTORS FOR INTERMITTENT OPERATION

Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits.

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has it's own specific power and ground circuits.
Wiggle the wires while checking for shorted and open circuits.

Check for any Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair the power and/or ground circuits to the PCM and Transmission Control Relay as necessary. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0605-INTERNAL CONTROL MODULE ROM

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  One time after the controller is reset (ignition turned to the RUN position).
- **Set Condition:**
  Whenever the Powertrain Control Module (PCM) detects an internal controller problem.

Possible Causes
POWER OR GROUND CIRCUIT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

After the controller is reset (ignition turned to the RUN position) the microprocessor checks the integrity of the program memory (ROM). A checksum is calculated by adding all used bytes in the program memory. The sum should be the same as a known constant stored in the program memory.

Diagnostic Test

1. CHECK WIRING AND CONNECTORS FOR INTERMITTENT OPERATION

Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits.

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has it's own specific power and ground circuits.
Wiggle the wires while checking for shorted and open circuits.
Check for any Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair the power and/or ground circuits as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0613-INTERNAL TCM

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  1) One time after the controller is reset (ignition turned to the RUN position) and every 60 seconds thereafter. The Delay Test is executed after a reset only.
  2) 2 seconds after an invalid test.
- **Set Condition:**
  If either of the following conditions occur 3 times:
  1) The watchdog fault line remains high after the period has elapsed for the too early - too late watchdog test.
  2) The Transmission Control Relay remains on after the watchdog delay expired.

Possible Causes
POWER OR GROUND CIRCUIT
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The internal Watchdog (WD) is a separate hardware circuit that continuously monitors the microprocessor. To insure the proper operation of the EATX controller the watchdog must receive a signal from the microprocessor within a specific time window (14ms ± 1ms) to prevent a system shutdown after a short delay (570ms). The microprocessor periodically tests the WD's ability to provide this shutdown function using a three phase test;

1) Send the signal too late > 15ms

2) Send the signal too early < 13ms

3) Delay test < 590ms

If the watchdog input signal arrives too early or too late, the Watchdog Fault line will go low and the watchdog delay will start to time out. The delay will be reset by the correct timing of watchdog signal sent during subsequent operations.

The Delay Test checks the delay time out. The Delay Monitor line is pulled low, which forces the delay to start timing out. At the end of the delay time the Transmission Relay will be turned off. The delay test, upon detection of the relay turning off, will immediately turn the relay back on before shutdown can occur.

Diagnostic Test

1. CHECK THE WIRING AND CONNECTORS

Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits.

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has it's own specific power and ground circuits.
Wiggle the wires while checking for shorted and open circuits.

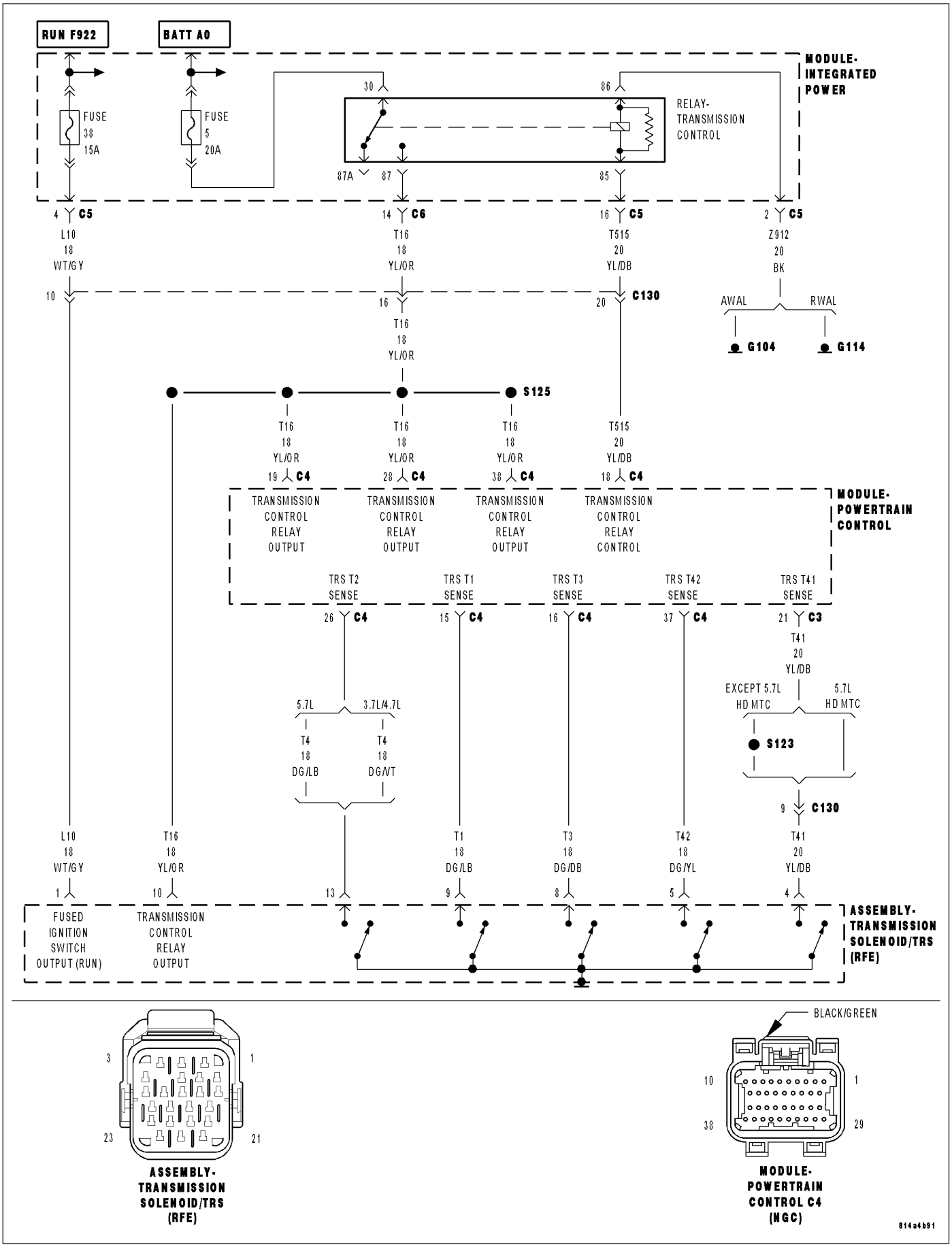
Check for any Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair the power and/or ground circuits as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0706-TRANSMISSION RANGE SENSOR RATIONALITY



P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The DTC will set if the controller detects an invalid PRNDL code which lasts for more than 0.042 seconds.

Possible Causes
SHIFTER OUT OF ADJUSTMENT
TRS SENSE CIRCUIT OPEN
TRS SENSE CIRCUIT SHORT TO GROUND
TRS SENSE CIRCUIT SHORT TO VOLTAGE
METAL DEBRIS IN OIL PAN
TRANSMISSION RANGE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The T1, T2, T3, T41, or T42 (C1 - C5) Sense circuits communicate the shift lever position to the Transmission Control System. Each circuit is terminated at the transmission by a switch (TRS). Each switch can be either open or closed, depending on the shift lever position. The PCM can decode this information and determine the shift lever position.

Each shift lever position has it own unique combination of closed and open switches. This is called a PRNDL code. There are 5 switches, therefore: there are many possible combinations of open and closed switches (codes). There are 12 valid codes: two for neutral, one for each other gear position (5), and five temporary (transition zone) codes. The remainder of the codes should never occur, these are called invalid codes.

Diagnostic Test

1. CHECK TO SEE IF P0706 DTC IS CURRENT

With the scan tool, perform the Shift Lever Position Test.

Select the test outcome from the following:

Test passes:
Go To 6

Test fails with Error Code:
Go To 2

Test fails without Error Code:
Perform the Gearshift Adjustment Procedure per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

2. ASSEMBLY-TRANSMISSION SOLENOID/TRS

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

NOTE: Check connectors - Clean/repair as necessary.

Install Transmission Simulator, Miller tool #8333.

Ignition on, engine not running.

With the scan tool, perform the Shift Lever Position Test.

When the scan tool instructs you to put the Gear Selector in a particular position, you must do so using the selector switch on the Transmission Simulator.

The LED for the gear position in question must be illuminated on the Transmission Simulator prior to pressing ″ENTER″ on the scan tool.

NOTE: When the scan tool requests the O/D off button be depressed, you must use the O/D OFF button in the vehicle or you will fail the Shift Lever Position Test with an error code 11 or OD-TOW/HALL STUCK OPEN.

NOTE: If the Shift Lever Position test fails, make sure to note the identification of the TRS Sense circuit for future reference.

Did the Shift Lever Position test pass?

Yes >> Remove the Oil Pan and Main Valve Body Assembly per the Service Information. Check for metal debris on top of the Solenoid/TRS Assembly and the manual valve code plate. If debris is present, determine the cause of the debris and repair the transmission as necessary. If no problems are found, replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. TRS SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors and install Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the identified (T1, T2, T3, T41, or T42) TRS Sense circuit, from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the identified (T1, T2, T3, T41, or T42) TRS Sense circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

P0706-TRANSMISSION RANGE SENSOR RATIONALITY (CONTINUED)

4. TRS SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the identified (T1, T2, T3, T41, or T42) TRS Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the identified (T1, T2, T3, T41, or T42) TRS Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. TRS SENSE CIRCUIT SHORT TO OTHER CIRCUITS

Measure the resistance between the identified (T1, T2, T3, T41, or T42) TRS Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.

Is the resistance below 100k ohms between the identified (T1, T2, T3, T41, or T42) TRS Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the identified (T1, T2, T3, T41, or T42) TRS Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set the DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wiring and connectors while checking for shorted and open circuits.

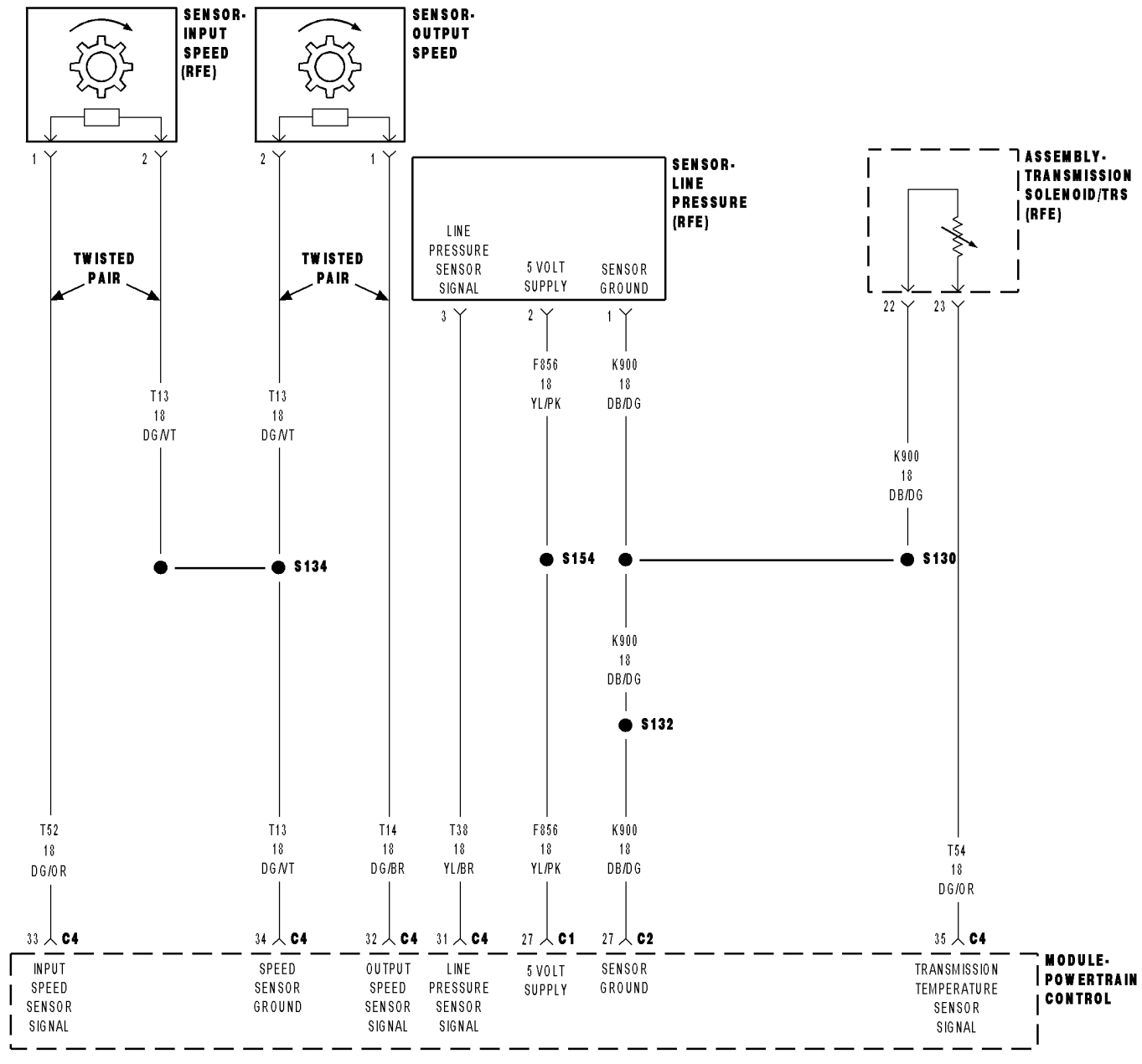
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

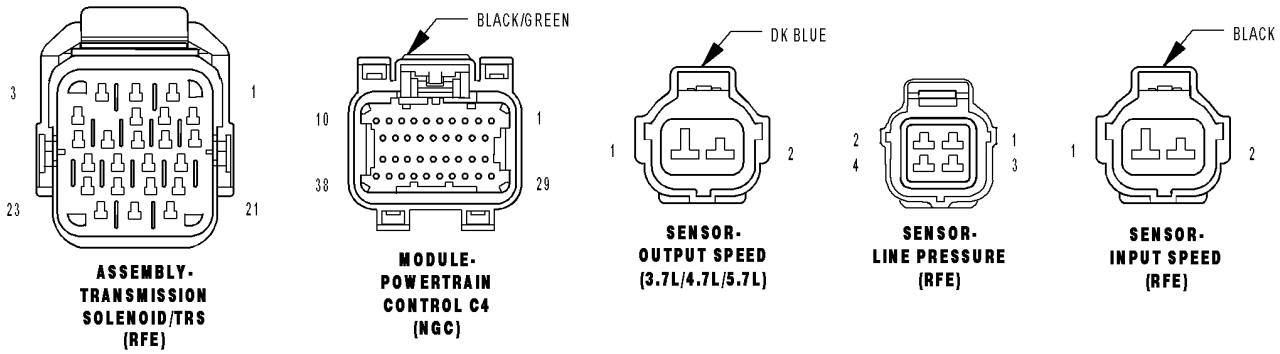
Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE





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P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS) .

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set when the desired transmission temperature does not reach a normal operating temperature within a given time frame. Time is variable due to ambient temperature. Approximate times are starting temperature to warm up time: (-40° F / -40° C - 35 min) (-20° F / -28° C - 25 min) (20° F / -6.6° C - 20 min) (60° F / 15.5 ° C - 10 min)

Possible Causes
RELATED DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Temperature Sensor is a variable resistor that changes with temperature, or otherwise known as a thermister. The temperature of the transmission fluid can affect a variety of electronically controlled transmission operations such as shift quality, torque converter lock-up, and when and/or if certain OBDII or system self-diagnostic test are performed. The Powertrain Control Module (PCM) substitutes a calculated transmission temperature value if a fault is detected in the Transmission Temperature Sensor circuit.

Diagnostic Test

1. DETERMINE IF RELATED DTC'S ARE PRESENT

With the scan tool, check Transmission DTC's.

Are there any other related Transmission Temperature Sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0711.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 4

P0711-TRANSMISSION TEMPERATURE SENSOR PERFORMANCE (CONTINUED)

3. TRANSMISSION TEMPERATURE SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings to the voltage readings listed on the Transmission Simulator.

Do the readings on the scan tool match the Transmission Simulator readings ± 0.2 volts?

Yes >> Replace Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

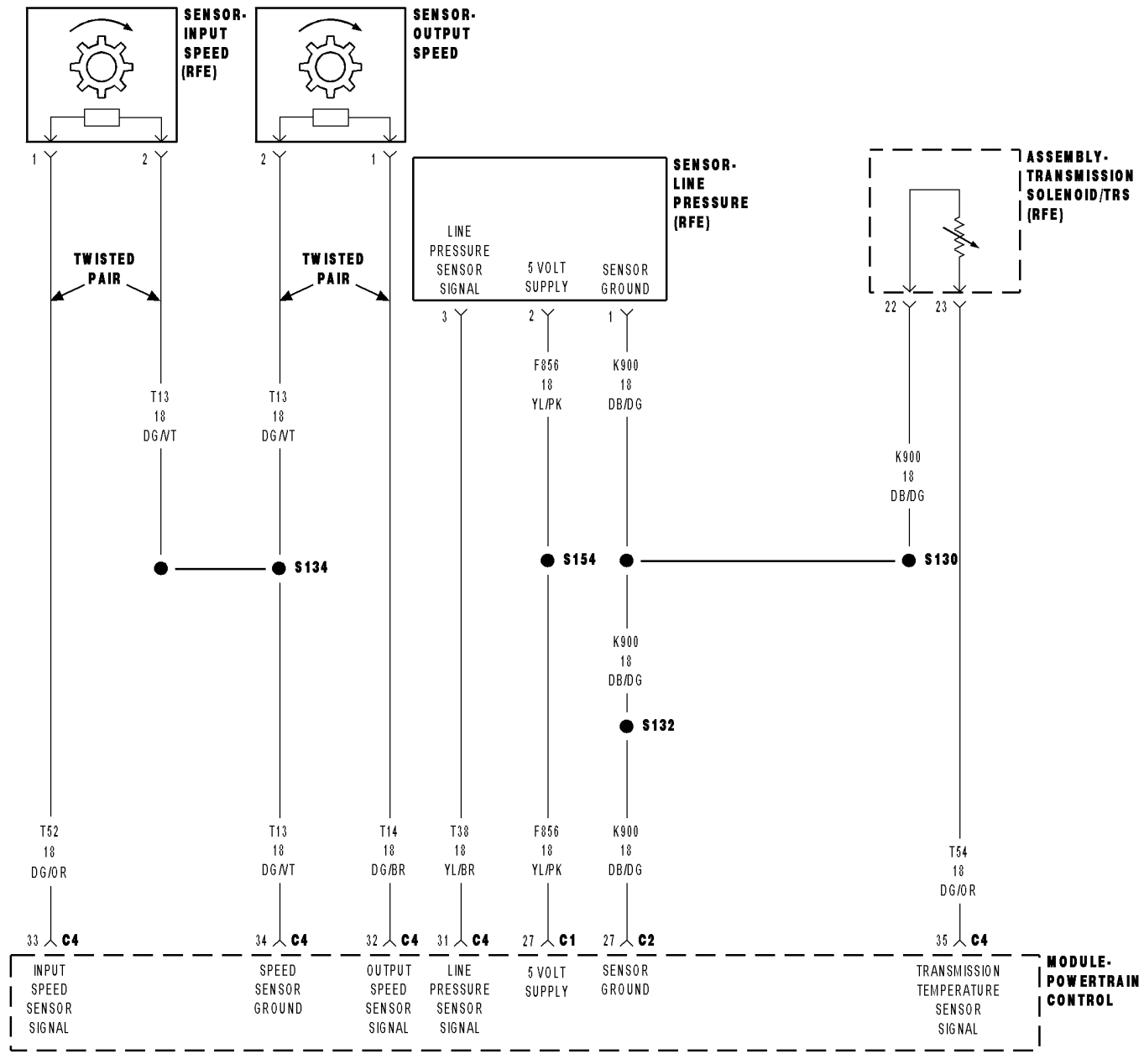
With the scan tool, check the DTC EVENT DATA to help identify the conditions in which the DTC was set.

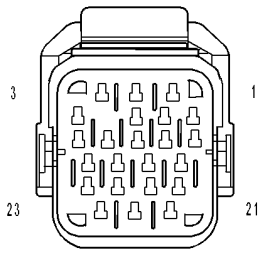
Were there any problems found?

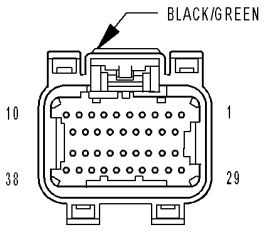
Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

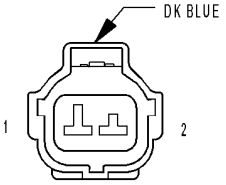
P0712-TRANSMISSION TEMPERATURE SENSOR LOW




ASSEMBLY- TRANSMISSION SOLENOID/TRS (RFE)

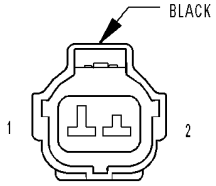


MODULE- POWERTRAIN CONTROL C4 (NGC)



SENSOR- OUTPUT SPEED (3.7L/4.7L/5.7L)


SENSOR- LINE PRESSURE (RFE)



SENSOR- INPUT SPEED (RFE)

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P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The DTC will set when the monitored Temperature Sensor voltage drops below 0.078 volts for the period of 0.45 seconds.

Possible Causes
RELATED DTC'S PRESENT
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Temperature Sensor is a variable resistor that changes with temperature, or otherwise known as a thermister. The temperature of the transmission fluid can affect a variety of electronically controlled transmission operations such as shift quality, torque converter lock-up, and when and/or if certain OBDII or system self-diagnostic test are performed. The Powertrain Control Module (PCM) substitutes a calculated transmission temperature value if a fault is detected in the Transmission Temperature Sensor circuit.

Diagnostic Test

1. DETERMINE IF RELATED DTC'S ARE PRESENT

With the scan tool, check Transmission DTC's.

Are there any line pressure sensor or throttle position sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0712.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 5

P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)

3. TRANSMISSION TEMPERATURE SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

Do the readings on the Transmission Simulator match the scan tool readings ± 0.2 volts?

Yes >> Replace Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.

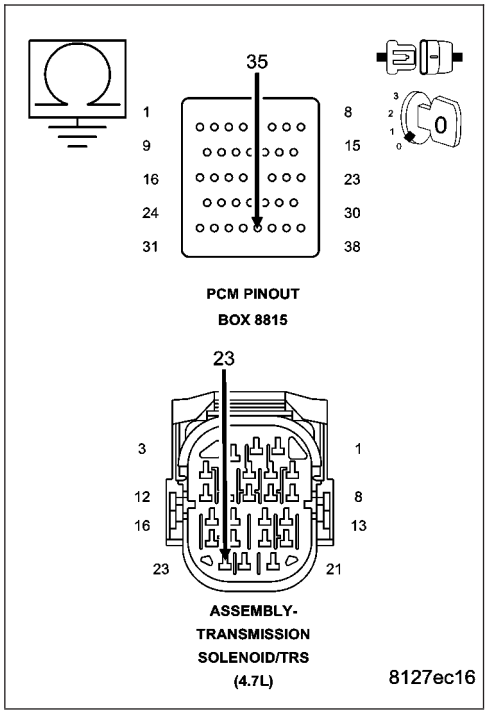
Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance between ground and the (T54) Transmission Temperature Sensor Signal circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0712-TRANSMISSION TEMPERATURE SENSOR LOW (CONTINUED)

5. INTERMITTENT WIRING AND CONNECTORS

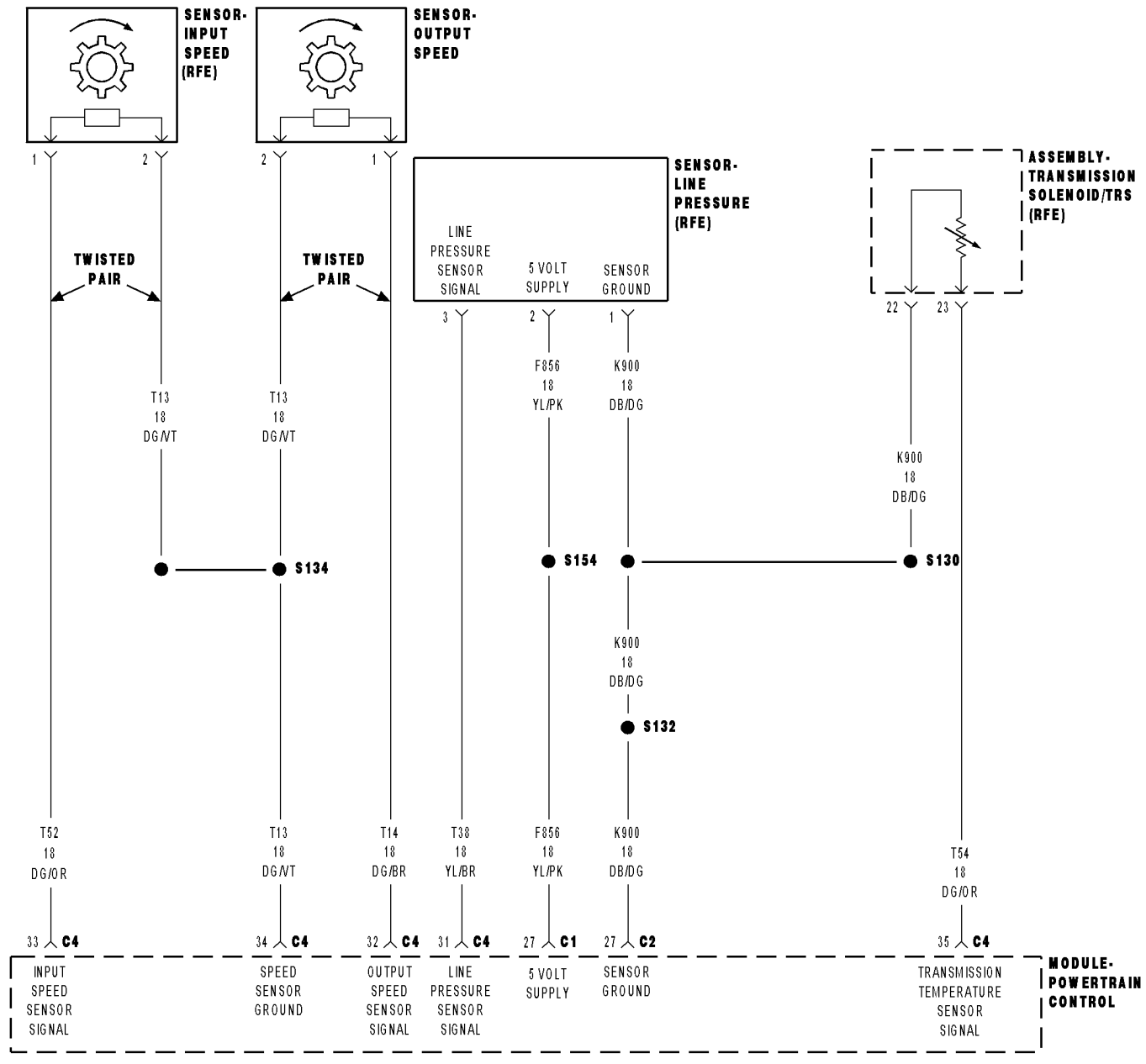
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

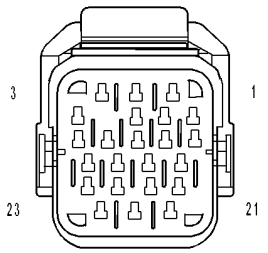
Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

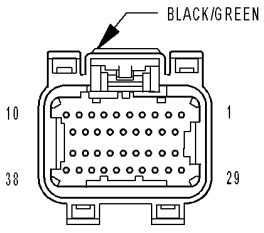
No >> Test Complete.

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH

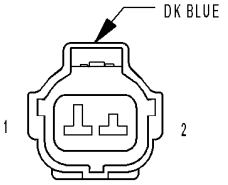




ASSEMBLY- TRANSMISSION SOLENOID/TRS (RFE)



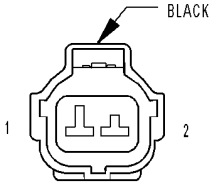
MODULE- POWERTRAIN CONTROL C4 (NGC)



SENSOR- OUTPUT SPEED (3.7L/4.7L/5.7L)



SENSOR- LINE PRESSURE (RFE)



SENSOR- INPUT SPEED (RFE)

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P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The DTC will set when the monitored Temperature Sensor voltage rises above 4.94 volts for the period of 0.45 seconds.

Possible Causes
RELATED DTC'S PRESENT
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Temperature Sensor is a variable resistor that changes with temperature, or otherwise known as a thermister. The temperature of the transmission fluid can affect a variety of electronically controlled transmission operations such as shift quality, torque converter lock-up, and when and/or if certain OBDII or system self-diagnostic test are performed. The Powertrain Control Module (PCM) substitutes a calculated transmission temperature value if a fault is detected in the Transmission Temperature Sensor circuit.

Diagnostic Test

1. DETERMINE IF RELATED DTC'S ARE PRESENT

With the scan tool, check Transmission DTC's.

Are there any line pressure sensor or throttle position sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, check the STARTS SINCE SET counter for P0713.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 5

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)

3. TRANSMISSION TEMPERATURE SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Note: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

Do the readings on the Transmission Simulator match the scan tool readings ± 0.2 volts?

Yes >> Replace Transmission Solenoid/TRS assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

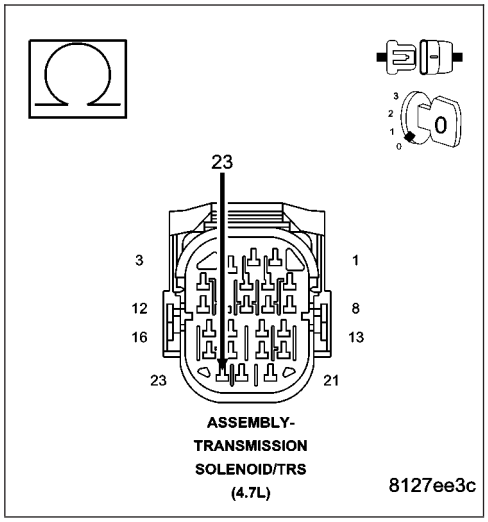
4. (T54) TRANSMISSION SENSOR SIGNAL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T54) Transmission Temperature Sensor Signal circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the Transmission Temperature Sensor Signal circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0713-TRANSMISSION TEMPERATURE SENSOR HIGH (CONTINUED)

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

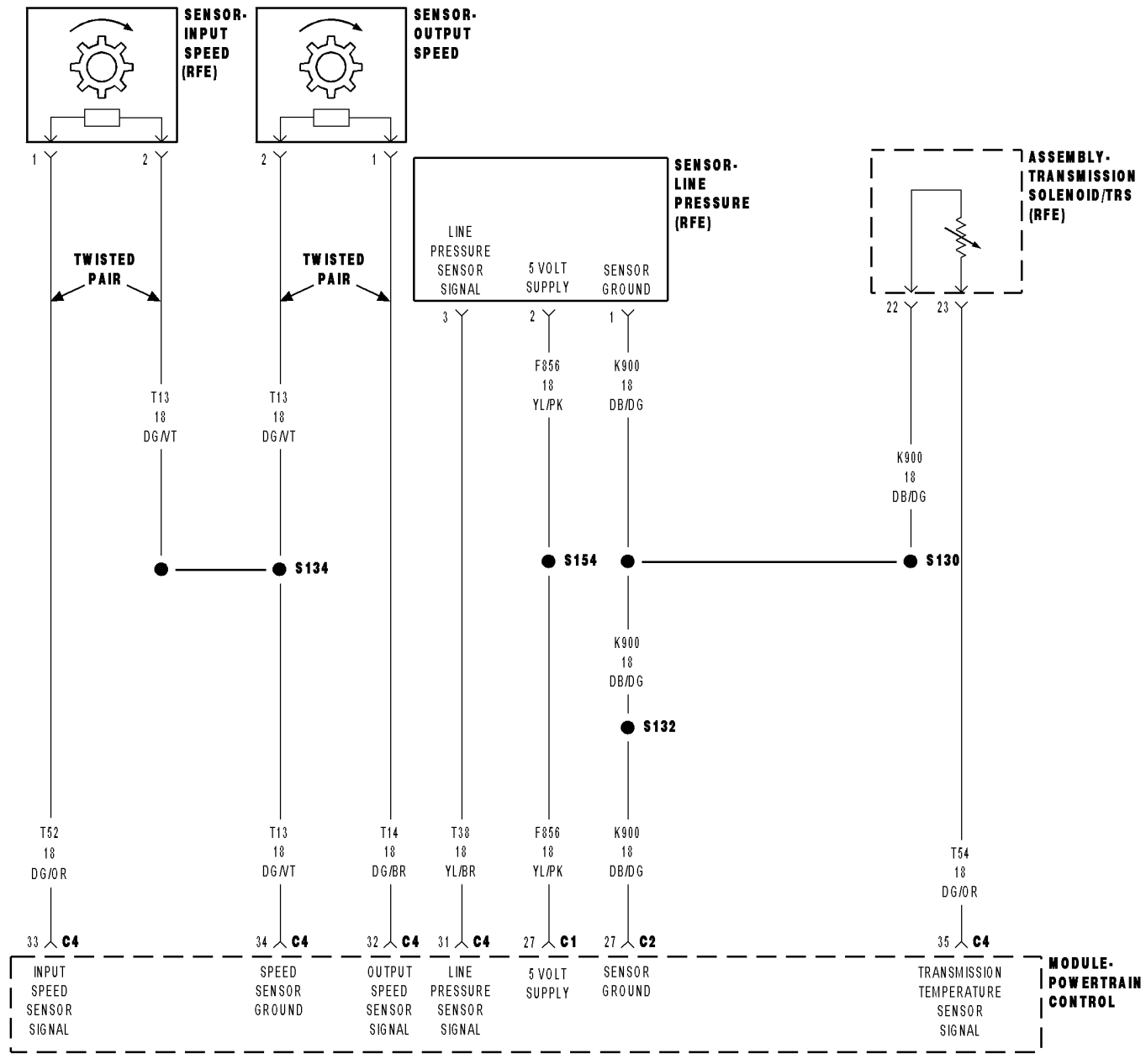
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

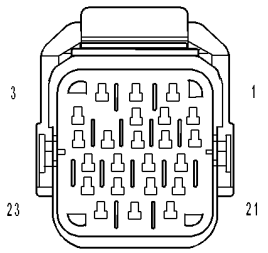
Were there any problems found?

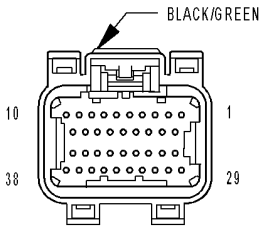
Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

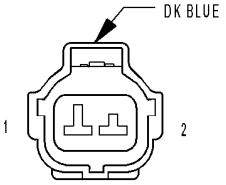
P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT




ASSEMBLY- TRANSMISSION SOLENOID/TRS (RFE)

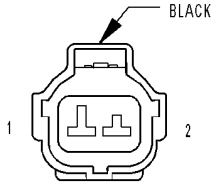


MODULE- POWERTRAIN CONTROL C4 (NGC)



SENSOR- OUTPUT SPEED (3.7L/4.7L/5.7L)


SENSOR- LINE PRESSURE (RFE)



SENSOR- INPUT SPEED (RFE)

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P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS) .

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The DTC will set when the monitored Temperature Sensor voltage fluctuates or changes abruptly within a predetermined period of time.

Possible Causes
RELATED DTC'S PRESENT
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Temperature Sensor is a variable resistor that changes with temperature, or otherwise known as a thermister. The temperature of the transmission fluid can affect a variety of electronically controlled transmission operations such as shift quality, torque converter lock-up, and when and/or if certain OBDII or system self-diagnostic test are performed. The Powertrain Control Module (PCM) substitutes a calculated transmission temperature value if a fault is detected in the Transmission Temperature Sensor circuit.

Diagnostic Test

1. DETERMINE IF RELATED DTC'S ARE PRESENT

With the scan tool, check Transmission DTC's.

Are there any line pressure sensor or throttle position sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.

No >> Go To 2

---

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0714.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 4

P0714-TRANSMISSION TEMPERATURE SENSOR INTERMITTENT (CONTINUED)

3. TRANSMISSION TEMPERATURE SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Input/Output switch to OFF.

With the scan tool, monitor the TRANS TEMP VOLTS while turning the Thermistor Voltage switch to all three positions on the Transmission Simulator.

Compare the scan tool readings with the numbers listed on the Transmission Simulator.

Do the readings on the Transmission Simulator match a non-fluctuating scan tool reading ± 0.2 volts?

Yes >> Replace Transmission Solenoid/TRS assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

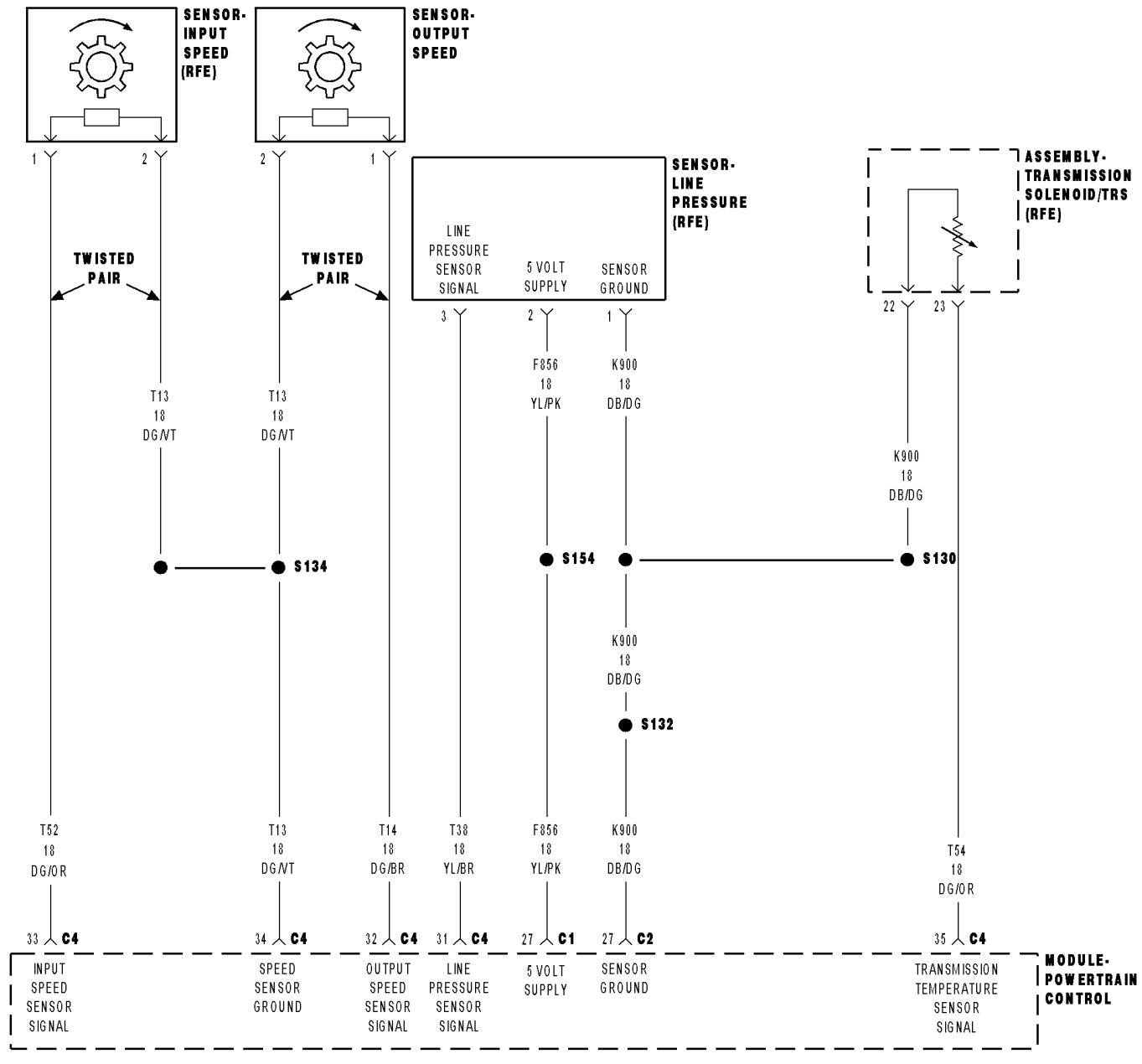
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

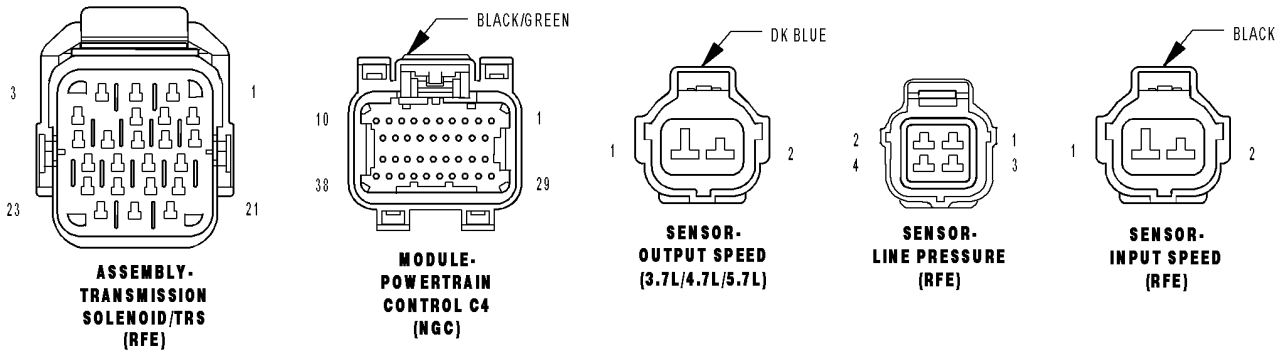
Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0715-INPUT SPEED SENSOR 1 CIRCUIT





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P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS) .

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**
  If there is an excessive change in input RPM in any gear. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
(T13) SPEED SENSOR GROUND CIRCUIT OPEN
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T13) SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND
(T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
INPUT SPEED SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent which may result in the DTCs P0715 and/or P0720 to set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the signal from the input speed sensor at idle in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set when at a stop.

Diagnostic Test

1. CHECK TO SEE IF DTC P0715 IS CURRENT

Start the engine in park.

With the scan tool, monitor the Input Speed Sensor RPM.

Is the Input Speed Sensor RPM below 400 RPM?

Yes >> Go To 2

No >> Go To 9

P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

2. INPUT SPEED SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, set the selector switch to 3000/1000 and the Input/Output switch to ON.

With the scan tool, monitor the Input and Output Speed Sensor RPM.

Does the Input speed read 3000 RPM and the Output speed read 1000 RPM ± 50 RPM?

Yes >> Replace the Input Speed Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

NOTE: Make sure to leave the Speed Sensor, Transmission Solenoid/TRS Assembly, and Line Pressure Sensor harness connectors disconnected.

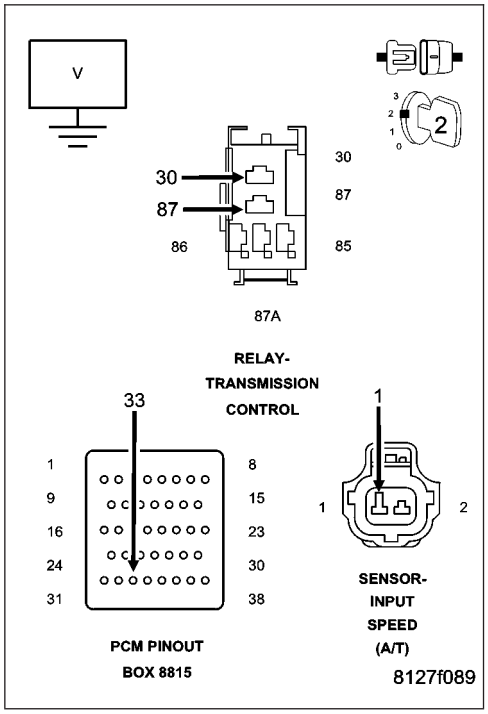
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Remove the Transmission Control Relay.

Place a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Measure the voltage of the (T52) Input Speed Sensor Signal circuit.



Is the voltage above 0.5 volts?

Yes >> Repair the (T52) Input Speed Sensor Signal circuit for a short to voltage.
Perform (NGC) 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

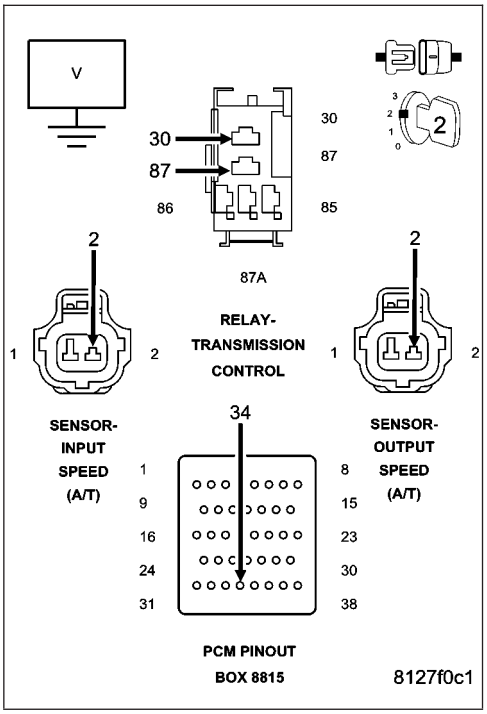
4. (T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE

Measure the voltage of the (T13) Speed Sensor Ground circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T13) Speed Sensor Ground circuit for a short to voltage.
Perform (NGC) 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



5. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT OPEN

Turn the ignition off to the lock position.

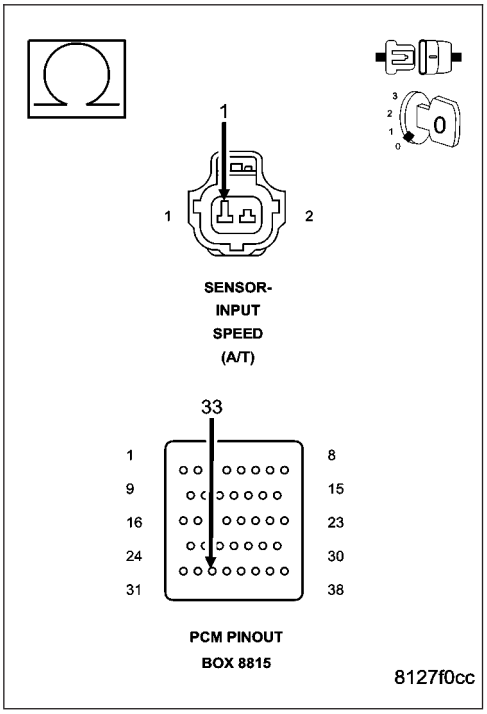
Disconnect the jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Measure the resistance of the (T52) Input Speed Sensor Signal circuit between the Input Speed Sensor harness connector and the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T52) Input Speed Sensor Signal circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

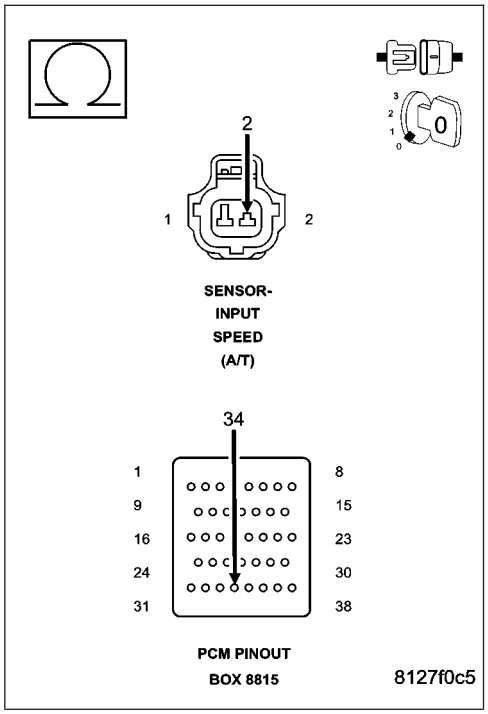
6. (T13) SPEED SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the (T13) Speed Sensor Ground circuit between the Input Speed Sensor harness connector and the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T13) Speed Sensor Ground circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7



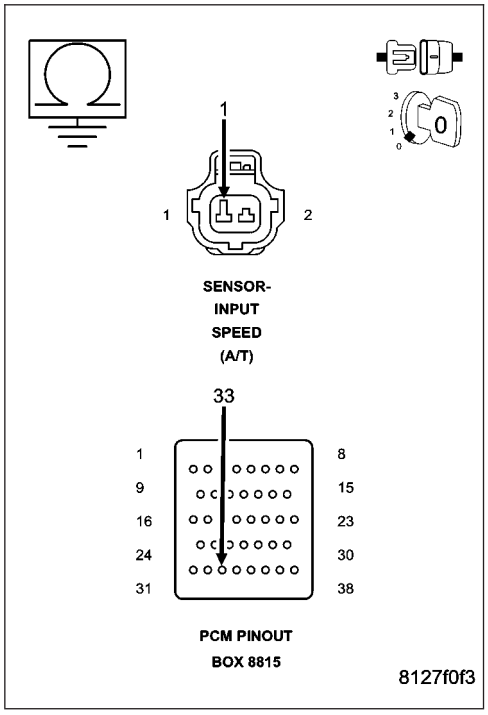
7. (T52) INPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the Input Speed Sensor Signal circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T52) Input Speed Sensor Signal circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

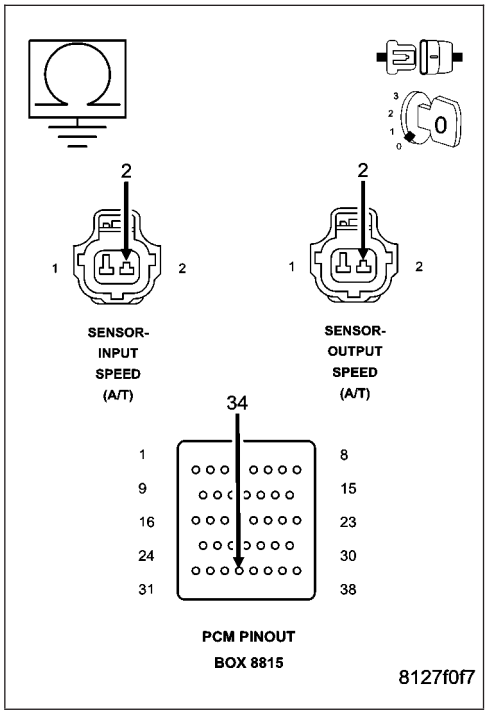
No >> Go To 8



P0715-INPUT SPEED SENSOR 1 CIRCUIT (CONTINUED)

8. (T13) SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T13) Speed Sensor Ground circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T13) Speed Sensor Ground circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

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9. INTERMITTENT WIRING AND CONNECTORS

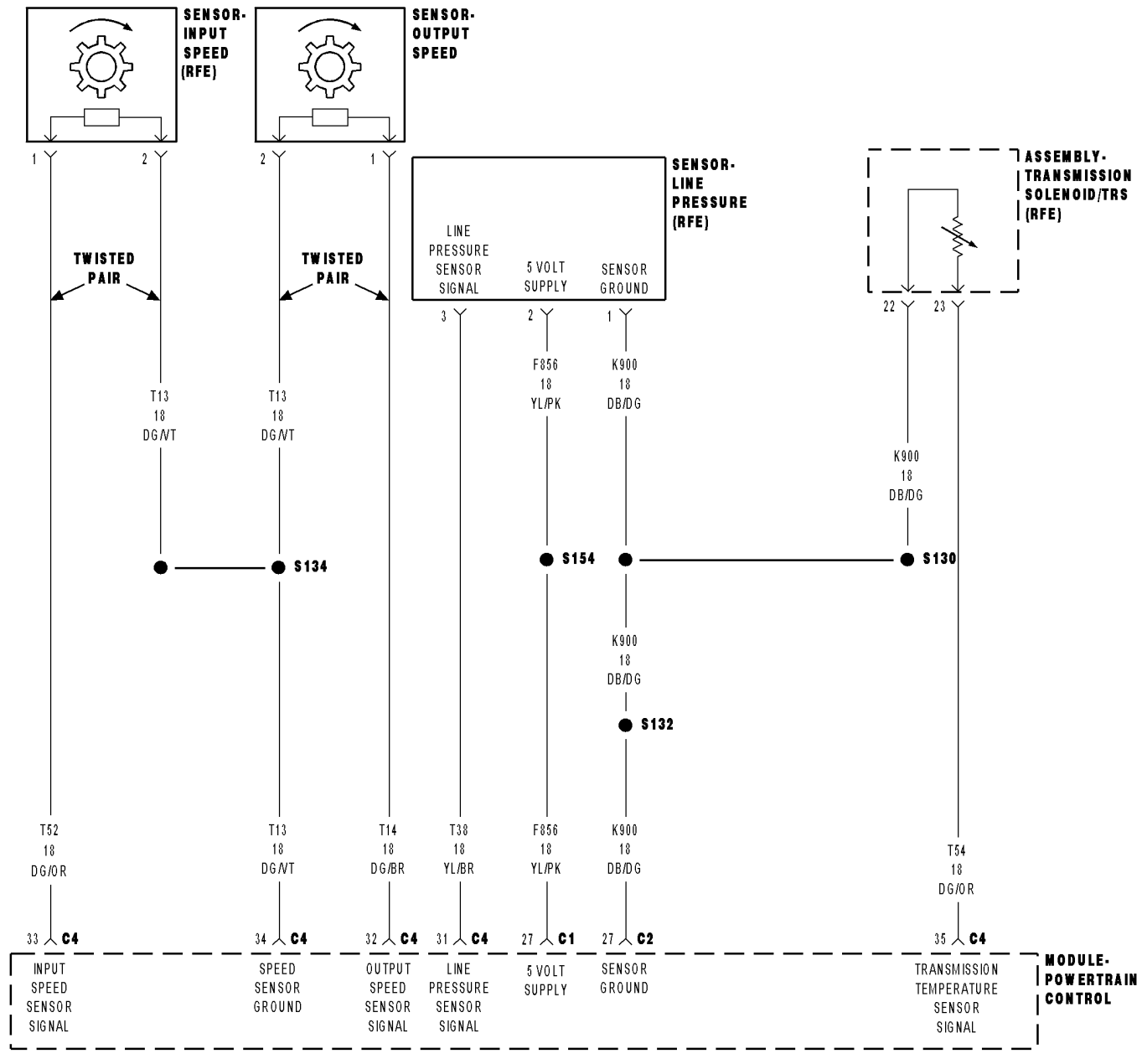
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

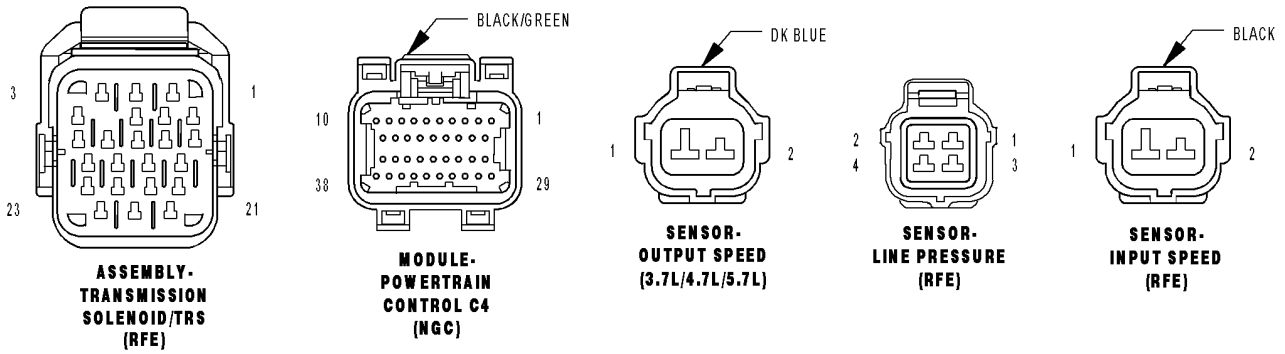
Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0720-OUTPUT SPEED SENSOR CIRCUIT





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P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  The transmission gear ratio is monitored continuously while the transmission is in gear.
- **Set Condition:**
  If there is an excessive change in output RPM in any gear. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
SPEED SENSOR GROUND CIRCUIT OPEN
OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND
OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
OUTPUT SPEED SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding in-gear trouble code is set (codes P0731 through P0736).

2) An excessive change in input or output speeds indicating signal intermittent will result in codes P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the signal from the input speed sensor at idle in neutral. Since the input speed sensor has 60 teeth and the output speed sensor has 30 teeth, this results in a an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

Diagnostic Test

1. CHECK TO SEE IF DTC P0720 IS CURRENT

Turn the ignition off to the lock position.

CAUTION: Properly support the vehicle and raise all drive wheels off the ground.

Release the parking brake.

Start the engine in park.

Place the transmission gear selector in drive, release foot from brake.

WARNING: BE SURE TO KEEP HANDS AND FEET CLEAR OF ROTATING WHEELS.

With the scan tool, monitor the Output Speed Sensor RPM.

Is the Output Speed Sensor RPM below 100 RPM?

Yes >> Go To 2

No >> Go To 9

---

2. OUTPUT SPEED SENSOR

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, set the selector switch to 3000/1000 and the Input/Output switch to ON.

With the scan tool, monitor the Input and Output Speed Sensor RPM

Does the Input Speed read 3000 RPM and the Output Speed read 1000 RPM, ± 50 RPM?

Yes >> Replace the Output Speed Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

3. OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN

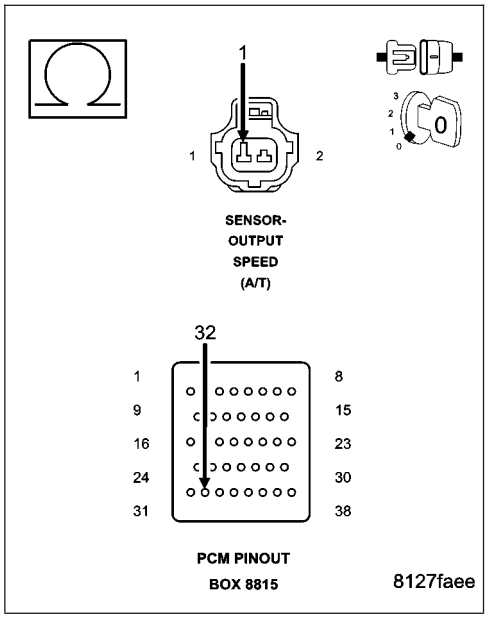
Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors and connect Miller special tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller special tool #8815 to perform diagnosis.

Measure the resistance of the Output Speed Sensor Signal circuit from the Output Speed Sensor harness connector to the appropriate terminal of special tool #8815.



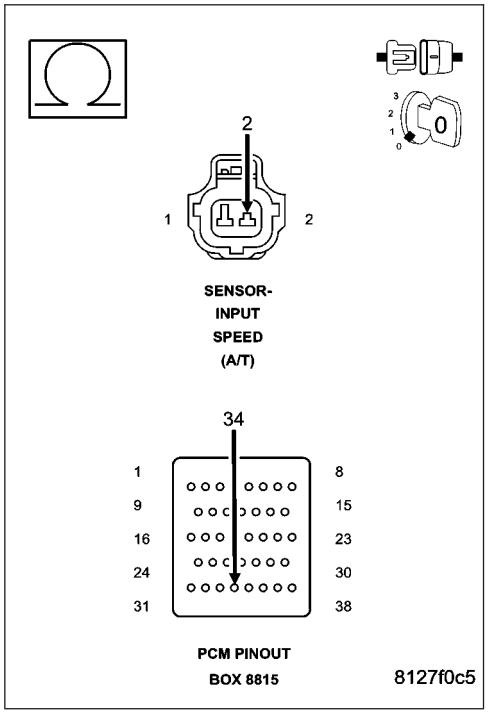
Is the resistance above 5.0 ohms?

Yes >> Repair the Output Speed Sensor Signal circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

4. SPEED SENSOR GROUND CIRCUIT OPEN

Measure the resistance of the Speed Sensor Ground circuit from the Output Speed Sensor harness connector to the appropriate terminal in the special tool #8815.



Is the resistance above 5.0 ohms?

Yes >> Repair the Speed Sensor Ground circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

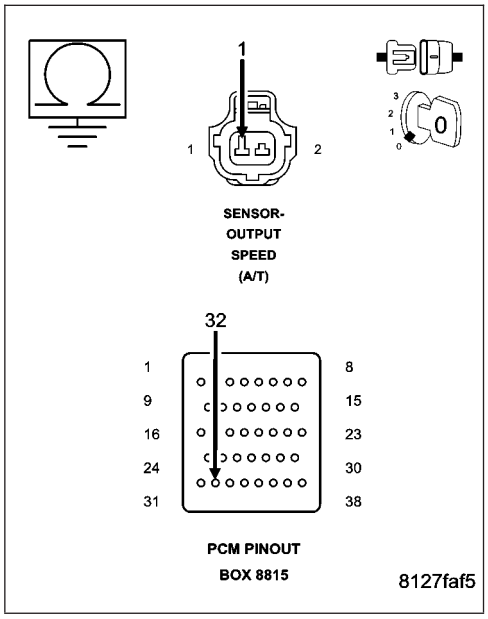
5. OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the Output Speed Sensor Signal circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the Output Speed Sensor Signal circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



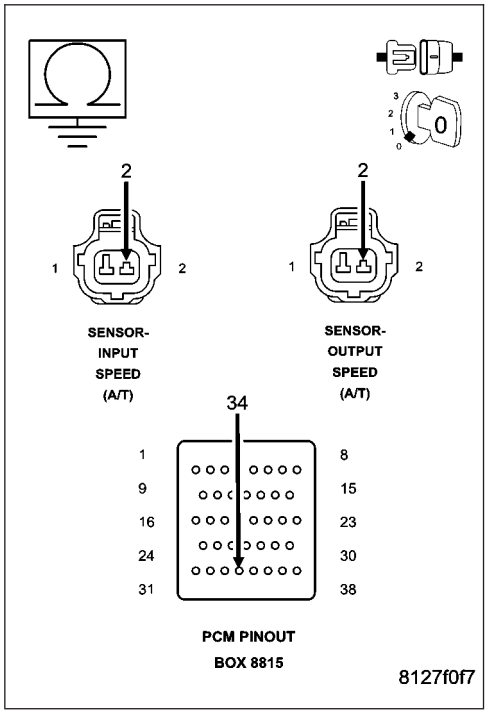
6. SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the Speed Sensor Ground circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the Speed Sensor Ground circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7



P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

7. OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

Place a jumper wire between the Fused B+ circuit and the Transmission Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

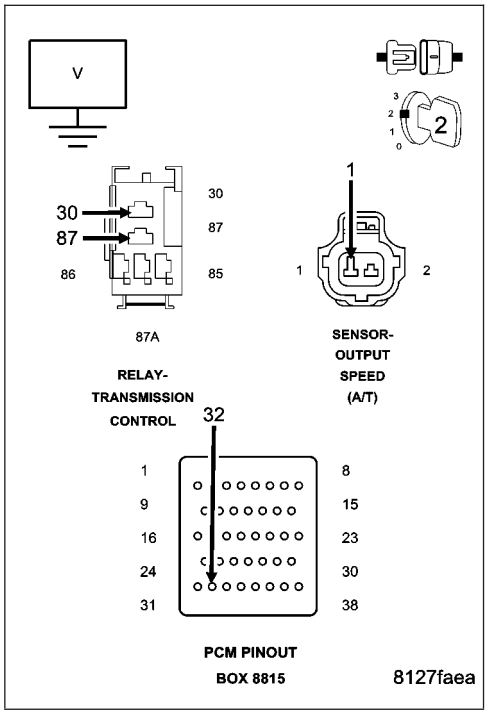
Measure the voltage of the Output Speed Sensor Signal circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the Output Speed Sensor Signal circuit for a short to voltage.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



8. SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE

Measure the voltage of the Speed Sensor Ground circuit.

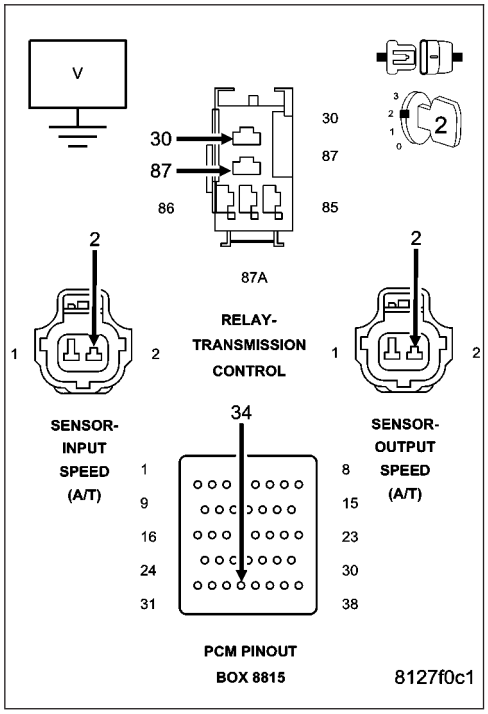
Is the voltage above 0.5 volts?

Yes >> Repair the Speed Sensor Ground circuit for a short to voltage.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0720-OUTPUT SPEED SENSOR CIRCUIT (CONTINUED)

9. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0725-ENGINE SPEED SENSOR CIRCUIT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously every 7 msec with the ignition on and engine running.
- **Set Condition:**
  This DTC will set when the calculated engine speed is less than 390 RPM with the engine running, or greater than 8000 RPM, for the period of 2.0 seconds. The PCM will place the Transmission in Limp-in when this DTC is set. **Note: This is not a Transmission Input Speed Sensor DTC.**

Possible Causes
RELATED ENGINE DTC'S PRESENT
CRANK POSITION SENSOR OR WIRING
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System calculates the engine RPM by directly reading the engine crank position sensor. It compares the calculated value to the engine speed sensor signal transmitted from the Engine Control System over the controllers internal bus. The calculated engine RPM is also compared to a minimum and a maximum value. **Note: Due to the integration of the Powertrain Control Module (PCM) and Transmission Control Module (TCM), bus communication between the modules is internal and unserviceable.**

Diagnostic Test

1. RELATED ENGINE DTCS PRESENT

NOTE: This is not a Transmission Input Speed Sensor DTC.
Ignition on, engine not running.
With the scan tool, read all Engine DTC's. This includes any active or stored or one trip DTCs.

Are there any engine RPM related DTCs present?

Yes >> Refer to the Powertrain category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0725-ENGINE SPEED SENSOR CIRCUIT (CONTINUED)

2. VERIFY IF THE DTC IS CURRENT

Ignition on, engine not running.

With a scan tool, read and record all EATX DTC EVENT DATA.

With the scan tool, erase all active and stored transmission DTCs. (Note: it may be necessary to perform a battery disconnect with the scan tool to clear EATX DTC EVENT DATA.)

Using the EATX DTC EVENT DATA, duplicate the conditions in which the original DTC set.

With the scan tool, read transmission and engine DTCs.

NOTE: Refer to all engine DTCs first in the following question.

Pick the answer below that best describes your findings, (this includes one trip failures).

Transmission DTC P0725 set

Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Also check the Crank Position sensor and wiring. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

Engine DTC set

Refer to the Driveability category and perform the appropriate symptom.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No DTC set at all

Go To 3

---

3. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0731-GEAR RATIO ERROR IN 1ST

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL

Possible Causes
CUT UD PISTON SEAL
LOW FLUID LEVEL
CRACKED OR MISINSTALLED PRIMARY OIL FILTER OR SEAL
STUCK OR STICKING MAIN REGULATOR VALVE
FAILED OVERRUNNING CLUTCH
CUT UD ACCUMULATOR SEAL RING
BROKEN UD ACCUMULATOR PISTON
BROKEN REACTION SHAFT SUPPORT SEAL RING
LOW LINE PRESSURE
BROKEN / MISSING MAIN VALVE BODY BLEED ORIFICE
BROKEN / MISSING DRIBBLER ORIFICE ASSEMBLY IN REACTION SHAFT SUPPORT
POOR MACHINING ON PUMP VALVE BODY FACE
INPUT SPEED SENSOR AND RELATED WIRING
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

P0731-GEAR RATIO ERROR IN 1ST (CONTINUED)
Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

If any of these DTC's are present, perform their respective tests first.

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If any of these DTCs are present, they may cause a Speed Ratio Error. Perform the test for P0944 first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC P0731 IS CURRENT

With the scan tool, perform the 1st Gear Clutch Test. Follow the instructions on the scan tool.

Increase the throttle angle or TPS Degree to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

Did the Clutch Test pass, Input Speed remain at zero?

Yes >> Go To 3

No >> Go To 4

---

3. CHECK FOR INTERMITTENT OPERATION

The conditions to set this DTC are not currently present.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

- If the DTC Event Data shows fault P0731 was set in Park, Reverse, or Neutral, replace the Powertrain Control Module.

- If the DTC Event Data shows fault P0731 set with input RPM = zero, check the input speed sensor and related wiring.

- If the DTC Event Data shows fault P0731 set with line pressure significantly below desired line pressure, check for the cause of low line pressure (i.e., oil level, misinstalled or damaged primary filter or filter seal, sticking main regulator valve in pump, etc.).

- If the DTC Event Data shows fault P0731 set with the UD pressure switch open (but line pressure matches Desired Line Pressure), air check the UD hydraulic clutch circuit for leakage per the Service Information. If the UD hydraulic clutch circuit is OK, replace the solenoid/TRS assembly.

Check the gearshift linkage adjustment.

Intermittent Gear Ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Install Transmission Simulator, Miller tool #8333.

Wiggle wiring and connectors while checking for intermittent operation with the Transmission Simulator.

Gear ratio DTC's can also be set under extreme temperature conditions.

Verify if the problem is only experienced under extreme hot or cold conditions.

Were there any problems found.

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0731-GEAR RATIO ERROR IN 1ST (CONTINUED)

4. INTERNAL TRANSMISSION

Repair internal transmission as necessary. Refer to the Service Information.

If there were any line pressure DTC's present along with this DTC, make sure to inspect the: Primary oil filter and seal, Transmission Oil Pump, and the Main regulator valve per the Service Information.

If DTC's P0876 and/or P0875 were present in addition to the P0731, replace the Transmission Solenoid/TRS Assembly in addition to necessary internal repairs.

Pay particular attention to the following list of possible causes when repairing the transmission condition.

- Cut UD piston seal
- Failed overrunning clutch
- Cut UD accumulator seal ring
- Broken UD accumulator piston
- Broken reaction shaft support seal ring
- Low line pressure
- Broken/missing main valve body bleed orifice
- Broken/missing dribbler orifice assembly in reaction shaft support
- Poor machining on pump valve body face
- Transmission Solenoid/TRS Assembly

View repair.

Repair

Repair internal transmission per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0732-GEAR RATIO ERROR IN 2ND

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL

Possible Causes
RELATED DTC'S PRESENT
INPUT SPEED SENSOR OR WIRING
LOW FLUID LEVEL
CRACKED OR MISINSTALLED PRIMARY OIL FILTER OR SEAL
WORN SOLENOID SWITCH VALVE OR PLUGS
STUCK OR STICKING MAIN REGULATOR VALVE
BURNED UD OR 2C CLUTCH
CUT 2C OR UD PISTON SEAL
BROKEN 2C PISTON CASTING
BROKEN OR MISSING 2C BLEED ORIFICE
BROKEN OR MISSING UD BLEED ORIFICE
CUT 2C OR UD ACCUMULATOR PISTON SEAL
CRACKED 2C OR UD ACCUMULATOR PISTON
CUT OR MISSING #5 OR #7 CHECK BALL
TRANSMISSION SOLENOID/TRS ASSEMBLY
BROKEN WELD - REACTION CARRIER TO REVERSE SUN GEAR
MISSING TEETH ON INPUT CLUTCH HUB TONE WHEEL

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)
Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT
With the scan tool, check for other transmission DTC's

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to appropriate symptom in the Transmission category. Perform the test for P0944–LOSS OF PRIME first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK IF DTC IS CURRENT
With the scan tool, read and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA display information for the DTC P0732?

Yes >> Go To 4

No >> Go To 3

---

3. CHECK EATX DTC EVENT DATA
In the EATX DTC EVENT DATA, identify the DTC that was recorded earlier.

Does the EATX DTC EVENT DATA display information for the DTC P1790, with target gear = 2nd, or with both 2C and UD clutches applying?

Yes >> Go To 4

No >> Go To 7

---

4. CHECK RPM IN EATX DTC EVENT DATA
Refer to the EATX DTC EVENT DATA recorded earlier.

Does the Input RPM read zero?

Yes >> Check the input speed sensor and wiring. Refer to test P0715 and diagnose as if the DTC is current.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CHECK LINE PRESSURE READING
Refer to the EATX DTC EVENT DATA recorded earlier.

Is the line pressure reading more than 10 psi below the desired line pressure?

Yes >> Go To 6

No >> Go To 7

P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)

6. CHECK TRANSMISSION OIL FILTER

Turn the ignition off to the lock position.

Remove and inspect the Transmission Oil Pan for excessive debris per the Service Information.

Remove and inspect the Primary Oil Filter per the Service Information.

NOTE: Make sure the Primary Transmission Oil Filter and seal are properly installed and are not cracked or split.

Does the Oil Pan contain excessive debris and/or is the Primary Oil Filter cracked, plugged or misinstalled?

Yes >> Repair the plugged, cracked, or split Primary Transmission Oil Filter and/or seal. If excessive clutch debris is present, check the clutches for damage. Refer to the Service Information for the proper hydraulic clutch repair procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Remove the Transmission Oil Pump per the Service Information. Check the main Regulator Valve for sticking in its bore, scoring, and/or damage and clean and repair as necessary. If no problem is found, replace the Transmission Solenoid/TRS Assembly.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

7. CHECK TO SEE IF DTC P0732 IS CURRENT

With the scan tool, perform the 2nd Gear Clutch Test. Follow the instructions on the scan tool.

Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

NOTE: If the 2C clutch is faulty, the overrunning clutch will hold and the slip test will pass. The 2nd gear clutch test will not detect a faulty 2C clutch. However, it will detect a faulty UD clutch.

Did the clutch test pass, did the Input Speed remain at zero?

Yes >> Go To 8

No >> Go To 10

---

8. CHECK FOR INTERMITTENT OPERATION

Check the Shifter adjustment per the Service Information.

Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)

9. CHECK FOR SLIPPAGE

With the scan tool, erase Transmission DTCs.

Road test the vehicle.

Is there an obvious slippage noticed in 2nd gear, or runaway on the 1–2 shift?

Yes >> Go To 12

No >> Go To 15

---

10. UD HYDRAULIC CLUTCH CIRCUIT

Remove Transmission Oil Pan and check for excessive debris.

Remove the Valve Body and air check the UD hydraulic clutch circuit (in the case) per the Service Information.

NOTE: The UD clutch passage contains a small bleed orifice, a small amount of air leakage is normal.

Were there any problems found, excessive debris and/or excessive air leakage in the UD clutch hydraulic circuit?

Yes >> Repair as necessary. Check the UD clutch piston seals, reaction shaft support seal rings and the dribbler assembly, and the flatness of the pump valve body and pump housing faces. Check main regulator valve for sticking in the bore.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 11

---

11. UD ACCUMULATOR PISTON

Check the UD bleed orifice, accumulator piston, and accumulator piston seal in the main valve body.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

12. EXCESSIVE DEBRIS

Remove the Transmission Oil Pan and check for excessive debris.

If grey sludge is present, check for a improperly assembled 2C clutch with the thick reaction plate not against the case.

Remove the valve body and air check the 2C hydraulic clutch circuit (in the 2C/4C clutch retainer) per the Service Information.

NOTE: The 2C clutch passage contains a small bleed orifice, a small amount of air leakage is normal.

Were there any problems found, excessive debris, improperly assembled 2C clutch and/or excessive air leakage in the 2C hydraulic clutch circuit?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures. Note: Check the 2C piston seals and bleed orifice.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)

13. 2C ACCUMULATOR

Check the 2C Accumulator piston for cracks or a cut seal.

Check for a cut or missing #7 or #5 check balls.

Check the Solenoid Switch Valve and its plugs for sticking in its bore or excessive wear.

Were there any problems found

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 14

---

14. CHECK FOR BROKEN REVERSE SUN GEAR WELD

Working through the windows in the bottom of the case, check for a broken Reverse Sun gear weld to the reaction carrier as follows:

(1) Hold the Transmission Output Shaft by holding the Transmission Manual Lever in the park position.

(2) Rotate the Input Annulus gear and drive shell, (the drum that encloses the two rearmost carriers).

(3) Check to see if the reaction carrier (the frontmost carrier, whose outer shell is splined to the 2C clutch) is rotating faster than the drive shell is being turned.

Is the reaction carrier turning faster than the drive shell?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the reaction carrier per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

15. CHECK IF DTC RESET

Did the DTC P0732 reset during the road test?

Yes >> Go To 16

No >> Go To 17

P0732-GEAR RATIO ERROR IN 2ND (CONTINUED)

16. LIST OF POSSIBLE CAUSES

If any other DTC's set during the road test, refer to the appropriate symptom in the Transmission category.

If no other DTC's set during the road test, below is a list of possible causes, but not strictly limited to those:

— Check for excessive debris in the Transmission Oil pan, plugged, cracked, or misinstalled Primary Transmission Oil Filter and/or seal.

— Check for cut and/or missing #7 and #5 check balls in the main valve body.

— Check the 2C and UD accumulator pistons and seals, UD bleed orifice, and the Solenoid Switch Valve and Plugs in the main valve body.

— Check the UD clutch piston seals, reaction shaft support seal rings and dribbler assembly.

— Check the 2C clutch piston seals, and bleed orifice.

— Check the main regulator valve for sticking in its bore and the flatness of the pump valve body and pump housing faces.

— Check for a improperly assembled 2C clutch with the thick reaction plate not against the case.

View repair

Repair

Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

17. INTERMITTENT DTC

The conditions to set this DTC are not currently present.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

- If the DTC Event Data shows fault P0732 was set in Park, Reverse, or Neutral, replace the Powertrain Control Module.

- If the DTC Event Data shows fault P0732 set with input RPM = zero, check the input speed sensor and related wiring.

- If the DTC Event Data shows fault P0732 set with line pressure significantly below desired line pressure, check for the cause of low line pressure (i.e., oil level, misinstalled or damaged primary filter or filter seal, sticking main regulator valve in pump, etc.).

- If the DTC Event Data shows fault P0732 set with the UD or 2C pressure switch open (but line pressure matches Desired Line Pressure), air check the UD and 2C hydraulic clutch circuits for leakage per the Service Information. If the UD and 2C hydraulic clutch circuits are OK, replace the Transmission Solenoid/TRS assembly.

Check the gearshift linkage adjustment.

Intermittent Gear Ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Install Transmission Simulator, Miller tool #8333.

Wiggle wiring and connectors while checking for intermittent operation with the Transmission Simulator.

Gear ratio DTC's can also be set under extreme temperature conditions.

Verify if the problem is only experienced under extreme hot or cold conditions.

Were there any problems found.

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0733-GEAR RATIO ERROR IN 3RD

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL

Possible Causes
RELATED DTC'S PRESENT
INPUT SPEED SENSOR OR WIRING
LOW FLUID LEVEL
CRACKED OR MISINSTALLED PRIMARY OIL FILTER OR SEAL
BENT OR BROKEN ACCUMULATOR COVER ON MAIN VALVE BODY
WORN SOLENOID SWITCH VALVE OR PLUGS
STUCK OR STICKING MAIN REGULATOR VALVE
BURNED UD OR OD CLUTCH
CUT OD OR UD PISTON SEAL
BROKEN OR MISSING UD OR OD BLEED ORIFICE IN MAIN VALVE BODY
BROKEN OR MISSING BLEED ORIFICE IN UD OR OD CLUTCH PISTON
CUT OD OR UD ACCUMULATOR PISTON SEAL
CRACKED OD OR UD ACCUMULATOR PISTON
CUT OR MISSING #6 CHECK BALL
TRANSMISSION SOLENOID/TRS ASSEMBLY
BROKEN WELD - REVERSE CARRIER HUB TO CARRIER
BROKEN REACTION SHAFT SUPPORT SEAL RING
POOR MACHINING ON PUMP VALVE BODY FACE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)
Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT
With the scan tool, check for other transmission DTC's

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to appropriate symptom in the Transmission category. Perform the test for P0944–LOSS OF PRIME first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK EATX DTC EVENT DATA
With the scan tool, read and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA display information for the DTC P0733?

Yes >> Go To 4

No >> Go To 3

---

3. TARGET GEAR IN EATX DTC EVENT DATA
In the EATX DTC EVENT DATA, identify the DTC that was recorded earlier.

Does the EATX DTC EVENT DATA display information for the DTC P1790, with target gear = 3rd, or with both OD and UD clutches applying?

Yes >> Go To 4

No >> Go To 7

---

4. CHECK RPM IN EATX DTC EVENT DATA
Refer to the EATX DTC EVENT DATA recorded earlier.

Does the Input RPM read zero?

Yes >> Check the input speed sensor and wiring. Refer to test P0715 and diagnose as if the DTC is current.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CHECK LINE PRESSURE READING
Refer to the EATX DTC EVENT DATA recorded earlier.

Is the line pressure reading more than 10 psi below the desired line pressure?

Yes >> Go To 6

No >> Go To 7

P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)

6. CHECK TRANSMISSION OIL FILTER

Turn the ignition off to the lock position.

Remove and inspect the Transmission Oil Pan for excessive debris per the Service Information.

Remove and inspect the Primary Oil Filter per the Service Information.

NOTE: Make sure the Primary Transmission Oil Filter and seal are properly installed and are not cracked or split.

Does the Oil Pan contain excessive debris and/or is the Primary Oil Filter cracked, plugged or misinstalled?

Yes >> Repair the plugged, cracked, or split Primary Transmission Oil Filter and/or seal. If excessive clutch debris is present, check the clutches for damage. Refer to the Service Information for the proper hydraulic clutch repair procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Remove the Transmission Oil Pump per the Service Information. Check the main Regulator Valve for sticking in its bore, scoring, and/or damage and clean and repair as necessary. If no problem is found, replace the Transmission Solenoid/TRS Assembly.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

7. CHECK TO SEE IF DTC P0733 IS CURRENT

With the scan tool, perform the 3rd Gear Clutch Test. Follow the instructions on the scan tool.

Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

NOTE: If the OD clutch is faulty, the overrunning clutch will hold and the slip test will pass. The 3rd gear clutch test will not detect a faulty OD clutch. However, it will detect a faulty UD clutch.

Did the clutch test pass, did the Input Speed remain at zero?

Yes >> Go To 8

No >> Go To 10

---

8. CHECK FOR INTERMITTENT OPERATION

Check the Shifter adjustment per the Service Information.

Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)

9. CHECK FOR SLIPPAGE

With the scan tool, erase Transmission DTCs.

Road test the vehicle. Check operation in 3rd gear, 4th gear, and Reverse.

Is there an obvious slippage noticed in 3rd gear, or runaway on the 2–3 shift?

Yes >> Go To 12

No >> Go To 16

---

10. UD HYDRAULIC CLUTCH CIRCUIT

Remove Transmission Oil Pan and check for excessive debris.

Remove the Valve Body and air check the UD hydraulic clutch circuit (in the case) per the Service Information.

NOTE: The UD clutch passage contains a small bleed orifice, a small amount of air leakage is normal.

Were there any problems found, excessive debris and/or excessive air leakage in the UD hydraulic clutch circuit?

Yes >> Repair as necessary. Check the UD clutch piston seals, reaction shaft support seal rings and dribbler assemblies, and the flatness of the pump valve body and pump housing faces. Check main regulator valve for sticking in the bore.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 11

---

11. UD ACCUMULATOR PISTON

Check the UD bleed orifice, accumulator piston, and accumulator piston seal in the main valve body.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

12. EXCESSIVE DEBRIS

Remove the Transmission Oil Pan and check for excessive debris.

Remove the valve body and check if the accumulator cover is intact.

Air check the OD hydraulic clutch circuit (in the case) per the Service Information.

NOTE: The OD clutch passage contains a small bleed orifice which connects to the Reverse clutch hydraulic circuit, a small amount of air leakage into the Reverse clutch passage is normal.

Were there any problems found, excessive debris, and/or excessive air leakage in the OD hydraulic clutch circuit?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures. Note: Check the bleed orifice in the OD/Reverse clutch piston.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)

13. OD ACCUMULATOR

Check the OD Accumulator piston for cracks or a cut seal.

Check for a cut or missing #6 check ball.

Check the Solenoid Switch Valve and its plugs for sticking in its bore or excessive wear.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 14

---

14. CHECK FOR NO REVERSE

During the road test on a previous test, did the vehicle have no reverse and no 3rd gear, but 1st and 2nd gears were OK?

Yes >> Go To 15

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

15. CHECK FOR BROKEN REVERSE CARRIER WELD

Remove the Transmission per the Service Information and inspect the weld on the reverse carrier hub.

Were there any problems found?

Yes >> Repair as necessary.

No >> Disassemble and inspect the input clutch assembly. Check the OD and Reverse clutch seals, discs, and bleed orifice (in the OD/Reverse clutch piston). Check the OD hub and shaft. Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

16. CHECK IF DTC RESET

Did the DTC P0733 reset during the road test?

Yes >> Go To 17

No >> Go To 18

P0733-GEAR RATIO ERROR IN 3RD (CONTINUED)

17. LIST OF POSSIBLE CAUSES

If any other DTC's set during the road test, refer to the appropriate symptom in the Transmission category.

If no other DTC's set during the road test, below is a list of possible causes, but not strictly limited to those.

Check for:

— Excessive debris in the Transmission Oil pan, plugged, cracked, or misinstalled Primary Transmission Oil Filter and/or seal.

— Cut or missing #6 check ball in the main valve body.

— OD and UD accumulator pistons and seals and bleed orifices, and the Solenoid Switch Valve and Plugs in the main valve body.

— OD and UD clutch piston seals, reaction shaft support seal rings and dribbler assemblies, and the flatness of the pump valve body and pump housing faces.

— Main regulator valve for sticking in its bore.

View repair

Repair

Repair as necessary. Refer to the Service Information for proper repair procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

18. CHECK FOR INTERMITTENT OPERATION

The conditions to set this DTC are not currently present.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

— If the DTC Event Data shows fault P0733 was set in the Park, Reverse, or Neutral, replace the Powertrain Control Module.

— If the DTC Event Data shows fault P0733 set with input RPM = zero, check the input speed sensor and related wiring.

— If the DTC Event Data shows fault P0733 set with line pressure significantly below desired line pressure, check for the cause of low line pressure (i.e., oil level, misinstalled or damaged primary filter or filter seal, sticking main regulator valve in pump, etc.).

— If the DTC Event Data shows fault P0733 set with the OD or UD pressure switch open (but line pressure matches Desired Line Pressure), air check the OD and UD hydraulic clutch circuits for leakage per the Service Information. If the OD and UD hydraulic clutch circuits are OK, replace the Transmission Solenoid/TRS assembly.

Check the gearshift linkage adjustment.

Intermittent Gear Ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Install the Transmission Simulator, Miller tool #8333.

Wiggle wiring and connectors while checking for intermittent operation with the Transmission Simulator.

Gear ratio DTC's can also be set under extreme temperature conditions.

Verify if the problem is only experienced under extreme hot or cold conditions.

Were there any problems found.

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0734-GEAR RATIO ERROR IN 4TH

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
LOW FLUID LEVEL
INPUT SPEED SENSOR OR WIRING
VALVE BODY ACCUMULATOR COVER FAILED
CUT OD OR 4C ACCUMULATOR SEAL
CRACKED OD OR 4C ACCUMULATOR PISTON
BROKEN OR MISSING OD BLEED ORIFICE IN MAIN VALVE BODY
CUT 4C TOWER SEAL
TRANSMISSION SOLENOID/TRS ASSEMBLY
CUT OR MISSING #5 OR #6 CHECK BALL
WORN SOLENOID SWITCH VALVE OR PLUGS
CUT OD OR 4C PISTON SEAL
STUCK MAIN REGULATOR VALVE
BURNED OD OR 4C CLUTCH
BROKEN OR MISSING 4C BLEED ORIFICE IN 2C/4C RETAINER
BROKEN REACTION SHAFT SUPPORT SEAL RING
POOR MACHINING ON PUMP VALVE BODY FACE
LOOSE / MISSING DRIBBLER ORIFICE ASSEMBLY IN REACTION SHAFT SUPPORT
CRACKED / LOOSE / MISSING OD/REVERSE PISTON BLEED ORIFICE
BROKEN REVERSE CARRIER HUB WELD
BROKEN REVERSE SUN GEAR WELD TO REACTION CARRIER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

P0734-GEAR RATIO ERROR IN 4TH (CONTINUED)

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

If any of these DTC's are present, perform their respective tests first.

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If any of these DTCs are present, they may cause a Speed Ratio Error. Perform the test for P0944 first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK DTC EVENT DATA

With the scan tool, read and record the DTC EVENT DATA.

NOTE: Make sure to record all DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the DTC EVENT DATA display information for the DTC P0734?

Yes >> Go To 4

No >> Go To 3

---

3. CHECK FOR OTHER DTC

In the DTC EVENT DATA recorded earlier, does the DTC EVENT DATA show the DTC P1790, with Target Gear = 4th, or with both the 4C and OD clutches applying?

Yes >> Go To 4

No >> Go To 6

---

4. CHECK INPUT RPM

In the DTC EVENT DATA recorded earlier, does the Input RPM read zero?

Yes >> Refer to the Transmission category and perform the diagnostic procedure for P0715 (Input Speed Sensor Error). Diagnose the DTC as if it is set and current.

No >> Go To 5

P0734-GEAR RATIO ERROR IN 4TH (CONTINUED)

5. CHECK LINE PRESSURE READING

In the DTC EVENT DATA recorded earlier, is the line pressure reading more than 10 PSI below the desired line pressure reading?

Yes >> Remove the Transmission Oil pan and check the Transmission Oil filter for improper installation or plugged, if Primary oil filter is OK, check the main regulator valve in pump. If excessive debris is in the oil pan, check clutches and repair as necessary. Refer to the Service Information for proper repair procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

---

6. CHECK TRANSMISSION FOR SLIPPAGE

Erase DTCs and road test the vehicle.

Check the transmission operation in reverse and all forward gears.

During the road test, was there any obvious slippage noted in 4th gear or a runaway during the 3–4 shift?

Yes >> Go To 8

No >> Go To 7

---

7. CHECK IF DTC RESET

With the scan tool, check for Transmission DTCs after the road test.

Did the DTC P0734 reset?

Yes >> Go To 8

No >> Test Complete.

---

8. CHECK INTERNAL TRANSMISSION

— Remove the Transmission Oil Pan and Valve Body per the Service Information and check for the following:
— Excessive debris in the oil pan.
— Remove the Valve Body and check if the accumulator cover is intact and the 4C tower seal is not cut or split.
— OD and 4C accumulator pistons for cracks and/or cut seals.
— Solenoid Switch Valve and its plugs for stickiness or wear.
— Cut or missing #5 and/or #6 check ball.
— OD bleed orifice on top of the Valve Body
— Air check the OD and 4C hydraulic clutch circuits for excessive leakage. Refer to the Service information.

NOTE: Both the OD and 4C hydraulic clutch circuits contain a small bleed orifice. A small amount of air leakage is considered normal. The OD hydraulic clutch circuit bleed orifice connects to the Reverse input clutch hydraulic cavity. A small amount of air leakage into the Reverse hydraulic clutch circuit is considered normal.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Go To 9

P0734-GEAR RATIO ERROR IN 4TH (CONTINUED)

9. TRANSMISSION SOLENOID/TRS ASSEMBLY

Was there no reverse gear during the road test?

Yes >> Go To 10

No >> Replace the Solenoid/TRS Assembly per the Service Information.

---

10. CHECK ROAD TEST RESULTS

During the road test, was there no 2nd gear and no 4th gear, but 3rd gear (limp-in) was OK?

Yes >> Go To 11

No >> Go To 12

---

11. CHECK FOR BROKEN REVERSE SUN GEAR WELD

Working through the windows in the bottom of the case, check for a broken Reverse Sun gear weld to the reaction carrier as follows:

(1) Hold the Transmission Output Shaft by holding the Transmission Manual Lever in the park position.

(2) Rotate the Input Annulus gear and drive shell, (the drum that encloses the two rearmost carriers).

(3) Check to see if the reaction carrier (the frontmost carrier, whose outer shell is splined to the 2C clutch) is rotating faster than the drive shell is being turned.

Is the reaction carrier turning faster than the drive shell?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the reaction carrier per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

12. CHECK FOR NO REVERSE

Remove the Transmission per the Service Information and inspect the weld on the reverse carrier hub.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Disassemble and inspect the input clutch assembly. Check the OD and Reverse clutch seals, discs, and bleed orifice (in the OD/Reverse clutch piston). Check the OD hub and shaft. Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0735-GEAR RATIO ERROR IN 5TH

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
LOW FLUID LEVEL
INPUT SPEED SENSOR OR WIRING
VALVE BODY ACCUMULATOR COVER FAILED
CUT OD OR 2C ACCUMULATOR SEAL
CRACKED OD OR 2C ACCUMULATOR PISTON
BROKEN OR MISSING OD BLEED ORIFICE IN MAIN VALVE BODY
CUT 2C TOWER SEAL
TRANSMISSION SOLENOID/TRS ASSEMBLY
CUT OR MISSING #5, #6, OR #7 CHECK BALL
WORN SOLENOID SWITCH VALVE OR PLUGS
CUT OD OR 2C PISTON SEAL
STUCK MAIN REGULATOR VALVE
BURNED OD OR 2C CLUTCH
BROKEN OR MISSING 2C BLEED ORIFICE IN 2C/4C RETAINER
BROKEN REACTION SHAFT SUPPORT SEAL RING
POOR MACHINING ON PUMP VALVE BODY FACE
LOOSE / MISSING DRIBBLER ORIFICE ASSEMBLY IN REACTION SHAFT SUPPORT
CRACKED / LOOSE / MISSING OD/REVERSE PISTON BLEED ORIFICE
BROKEN REVERSE CARRIER HUB WELD
BROKEN REVERSE SUN GEAR WELD TO REACTION CARRIER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

P0735-GEAR RATIO ERROR IN 5TH (CONTINUED)

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

If any of these DTC's are present, perform their respective tests first.

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If any of these DTCs are present, they may cause a Speed Ratio Error. Perform the test for P0944 first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK EATX DTC EVENT DATA

With the scan tool, read and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA display information for the DTC P0735?

Yes >> Go To 4

No >> Go To 3

---

3. CHECK TARTET GEAR

In the EATX DTC EVENT DATA recorded earlier, does the DTC EVENT DATA show the DTC P1790, with Target gear = 5th, or with both the 2C and OD clutches applying?

Yes >> Go To 4

No >> Go To 6

---

4. CHECK INPUT RPM

In the EATX DTC EVENT DATA recorded earlier, does the Input RPM read zero?

Yes >> Refer to the Transmission category and perform the diagnostic procedure for P0715 (Input Speed Sensor Error). Diagnose the DTC as if it is set and current.

No >> Go To 5

P0735-GEAR RATIO ERROR IN 5TH (CONTINUED)

5. CHECK LINE PRESSURE READING

In the EATX DTC EVENT DATA recorded earlier, is the line pressure reading more than 10 PSI below the desired line pressure reading?

Yes >> Remove the Transmission Oil pan and check the Transmission Oil filter for improper installation or plugged, if Primary oil filter is OK, check the main regulator valve in pump. If excessive debris is in the oil pan, check clutches and repair as necessary. Refer to the Service Information for proper repair procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

---

6. CHECK TRANSMISSION FOR SLIPPAGE

Erase DTCs and road test the vehicle.

Check the transmission operation in reverse and all forward gears.

During the road test, was there any obvious slippage noted in 5th gear or a runaway during the 4–5 shift?

Yes >> Go To 8

No >> Go To 7

---

7. CHECK IF DTC RESET

With the scan tool, check for Transmission DTCs after the road test.

Did the DTC P0735 reset?

Yes >> Go To 8

No >> Test Complete.

---

8. CHECK INTERNAL TRANSMISSION

Remove the Transmission Oil Pan and Valve Body, per the Service Information, and check for the following:

— Excessive clutch and or metal debris in the oil pan.

— If the accumulator cover is intact and the 2C tower seal is not cut or split.

— OD and 2C accumulator pistons for cracks or cut seals.

— Solenoid Switch Valve and its plugs for stickiness or wear.

— Cut or missing #5, #6, or #7 check ball.

— OD bleed orifice on top of the valve body.

— Air check the OD and 2C hydraulic clutch circuits for excessive leakage. Refer to the Service information.

NOTE: Both the OD and 2C hydraulic clutch circuits contain a small bleed orifice. A small amount of air leakage is considered normal. The OD hydraulic clutch circuit bleed orifice connects to the Reverse input clutch hydraulic cavity. A small amount of air leakage into the Reverse hydraulic clutch circuit is considered normal.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.

P0736-GEAR RATIO ERROR IN REVERSE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL

Possible Causes
LOW FLUID LEVEL
CUT LR TOWER SEAL ON MAIN VALVE BODY
CUT LR CLUTCH PISTON SEALS
BROKEN OR MISSING LR CLUTCH BLEED ORIFICE (IN LR CLUTCH RETAINER)
CUT LR ACCUMULATOR PISTON SEAL IN MAIN VALVE BODY
CRACKED LR ACCUMULATOR PISTON IN MAIN VALVE BODY
CUT OD/REV PISTON SEALS
BROKEN OR MISSING OD/REV BLEED ORIFICE (IN OD/REV CLUTCH PISTON)
BROKEN REVERSE CARRIER HUB WELD
BROKEN REVERSE SUN GEAR WELD TO THE REACTION CARRIER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) Once in a particular gear, if the gear ratio varies from the correct gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent may result in the DTCs P0715 and/or P0720 being set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the pulses from the input speed sensor when at a stop in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Are there any Transmission; solenoid, line pressure, speed sensor, and/or loss of prime DTC's present?

Yes >> Refer to appropriate symptom in the Transmission category. Perform the test for P0944–LOSS OF PRIME first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0736-GEAR RATIO ERROR IN REVERSE (CONTINUED)

2. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, perform the Reverse Gear Clutch test. Follow the instructions on the scan tool.

Increase the throttle angle, TPS degree, to 30°, for no more than a few seconds.

CAUTION: Do not overheat the transmission.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Did the clutch test pass, input speed remain at zero?

Yes >> Go To 3

No >> Go To 4

---

3. CHECK DTC EVENT DATA

The conditions necessary to set this DTC are not currently present.

With the scan tool, check the DTC EVENT DATA to help identify the conditions in which the DTC was set.

Does the DTC EVENT DATA show an input speed reading of zero?

Yes >> Go To 8

No >> Go To 4

---

4. POSSIBLE INTERNAL TRANSMISSION CAUSES

Remove the Transmission Oil Pan and Valve Body and check the following per the Service Information:

Clutch or metal debris in the pan

LR clutch tower seal on the main valve body or cuts and the LR accumulator piston and seals.

Air check the Reverse and LR Hydraulic Clutch circuits (in the case) for excessive air leakage.

NOTE: Both Hydraulic Clutch circuits contain a small bleed orifice , a small amount of air leakage is normal. The Reverse hydraulic clutch circuit bleed orifice connects to the OD hydraulic clutch cavity. A small amount of air leakage into the OD hydraulic clutch circuit is considered normal.

Were there any problems found?

Yes >> Repair as necessary. If clutch debris is present, remove the transmission and inspect the Reverse and LR clutches, and inspect the Transmission Oil Pump and Main Regulator Valve for damage or sticking in its bore.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CLUTCH TEST FAILURE

Did the clutch test fail in reverse?

Yes >> Go To 6

No >> Test complete.

P0736-GEAR RATIO ERROR IN REVERSE (CONTINUED)

6. CHECK FOR BROKEN REVERSE SUN GEAR WELD

Working through the windows in the bottom of the case, check for a broken Reverse Sun gear weld to the reaction carrier as follows:

(1) Hold the Transmission Output Shaft by holding the Transmission Manual Lever in the park position.

(2) Rotate the Input Annulus gear and drive shell, (the drum that encloses the two rearmost carriers).

(3) Check to see if the reaction carrier (the frontmost carrier, whose outer shell is splined to the 2C clutch) is rotating faster than the drive shell is being turned.

Is the reaction carrier turning faster than the drive shell?

Yes >> Go To 7

No >> Replace the reaction carrier per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

7. CHECK REVERSE CARRIER HUB

Remove the Transmission per the Service Information and inspect the weld on the reverse carrier hub.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Disassemble and inspect the input clutch assembly. Check the Reverse clutch reaction plate snap ring. Check the OD and Reverse clutch seals, discs, and bleed orifice (in the OD/Reverse clutch piston). Check the Reverse hub and shaft. Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

8. CHECK FOR INTERMITTENT OPERATION

Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Remove the Starter Relay

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.
Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test complete.

P0740–TCC OUT OF RANGE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS) .

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  During Electronically Modulated Converter Clutch (EMCC) Operation.
- **Set Condition:**
  Transmission must be in EMCC, with input speed greater than 1750 RPM. TCC-L/R Solenoid achieves the maximum duty cycle and can not pull engine speed within 60 RPM of input speed. Also when the transmission is in FEMCC and the engine slips TCC less than 100 RPM for 10 seconds. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
RELATED DTC P0750 PRESENT
L/R SOLENOID
TORQUE CONVERTER AND/OR INTERNAL TRANSMISSION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

When in 2nd, 2nd Prime, 3rd, or 4th gear, the torque converter clutch (TCC) can be engaged when certain conditions are met. The TCC piston is electronically modulated by increasing the duty cycle of the LR Solenoid until the torque converter slip difference (difference between engine and transmission input speed) is within 60 RPM. Then the LR solenoid is fully energized (FEMCC / 100% duty cycle). Torque converter slip is monitored in FEMCC to ensure adequate clutch capacity.

Diagnostic Test

1. DETERMINING IF RELATED DTC P0750 IS PRESENT

With the scan tool, read transmission DTC's

Is the DTC P0750 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0740–TCC OUT OF RANGE (CONTINUED)

2. CHECK TO SEE IF DTC P0740 IS CURRENT

With the scan tool, Read and RECORD ALL Transmission DTC's. After recording DTC's, erase DTC's.

Drive the vehicle until the transmission temperature is at least 43° C or 110° F and the engine temperature at least 49° C or 120° F.

Perform the following steps 3 times.

Drive the vehicle to the speed of at least 88 km/h or 55 MPH.

Allow 4th gear to engage for at least 10 seconds.

Close the throttle.

Tip back into the throttle until the TPS angle is between 25 and 29 degrees.

NOTE: If the throttle angle goes over 30 degrees, you must close the throttle and try again.

Did the TCC engage during any of the attempts, Engine speed approximately equal to input speed?

Yes >> Go To 3

No >> Go To 4

---

3. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time. Using the schematics as a guide, inspect the wiring and connectors specific to this circuit. Wiggle the wires while checking for shorts and open circuits.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorts and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

---

4. LR SOLENOID

With the scan tool, check for other transmission DTC's.

Are the DTCs P1775 and P0841 present also?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0740–TCC OUT OF RANGE (CONTINUED)

5. TORQUE CONVERTER AND/OR INTERNAL TRANSMISSION

Repair internal transmission as necessary.

Check for the following possible causes. Refer to the Service information for the proper repair procedures.

Inspect the Transmission Oil Pump.

If no problems are found, replace the Transmission Solenoid/TRS Assembly.

Check the Torque Converter Switch Valve and the Torque Converter Clutch Control Valve for sticking in the bore.

Check the Teflon seal rings on the input shaft.

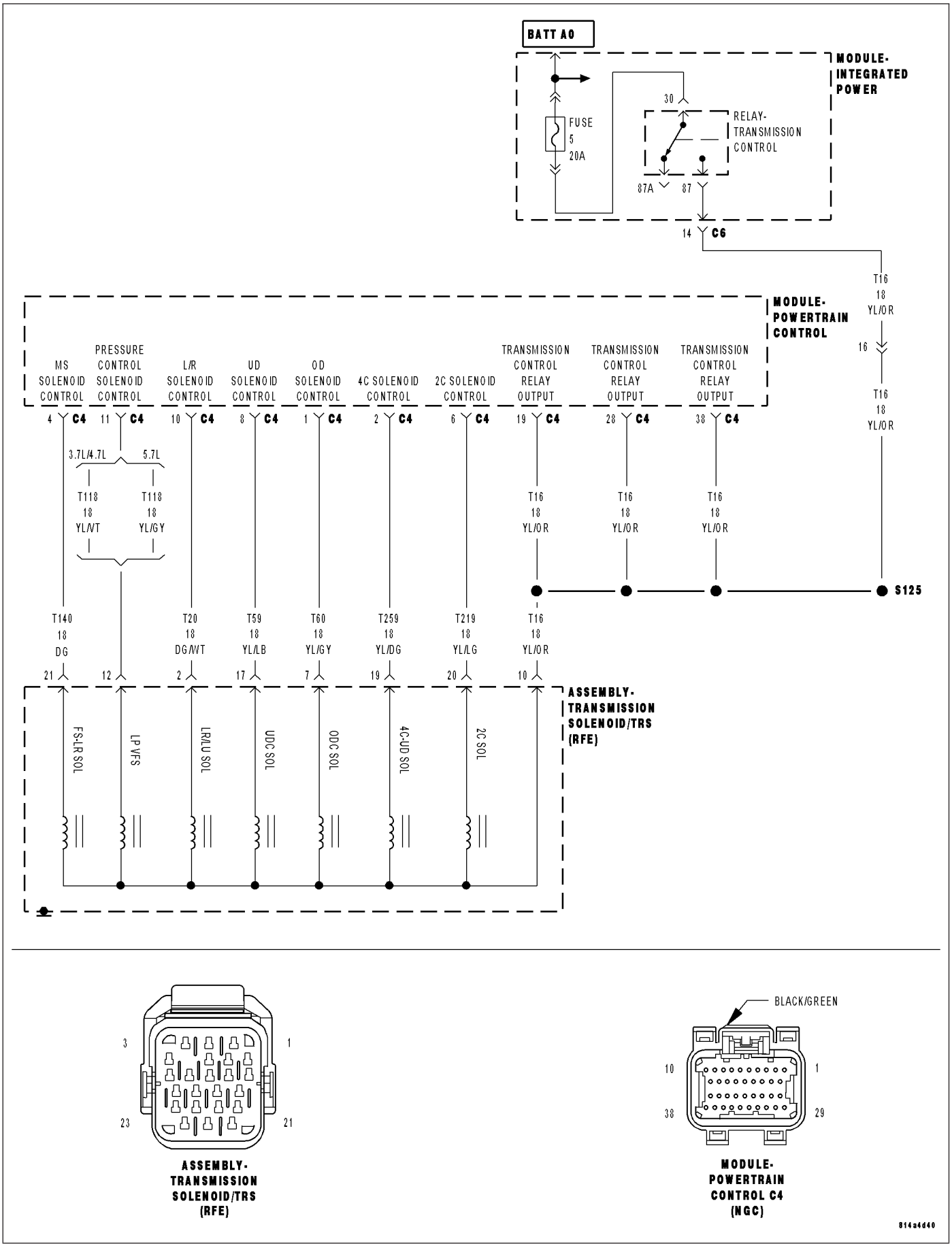
View repair.

Repair

In all cases, replace the Torque Converter. Make sure to check all other possible causes in addition to the Torque Converter.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0750-LR SOLENOID CIRCUIT



ASSEMBLY-
TRANSMISSION
SOLENOID/TRS
(RFE)

MODULE-
POWERTRAIN
CONTROL C4
(NGC)

814a4d40

P0750-LR SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T20) LR SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T20) LR SOLENOID CONTROL CIRCUIT OPEN
(T20) LR SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0750-LR SOLENOID CIRCUIT (CONTINUED)

2. CHECK TO SEE IF P0750 IS PRESENT

Ignition on, engine not running.

With the scan tool, erase all Transmission DTC's.

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the LR Solenoid.

Monitor the LR Solenoid LED on the Transmission Simulator.

Did the LR Solenoid LED on the Transmission Simulator blink on and off?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the LR Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P0750 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

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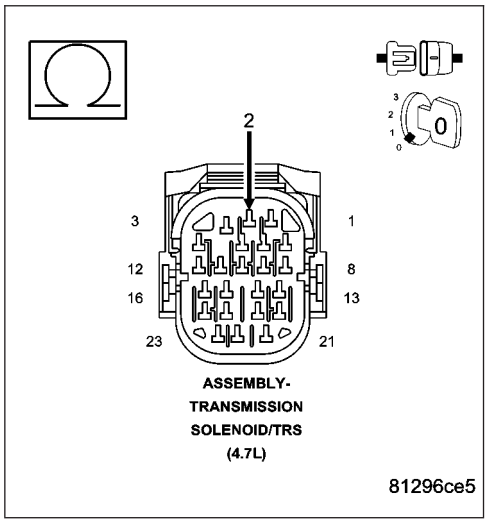
4. (T20) LR SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T20) LR Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T20) LR Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T20) LR Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0750-LR SOLENOID CIRCUIT (CONTINUED)

5. (T20) LR SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

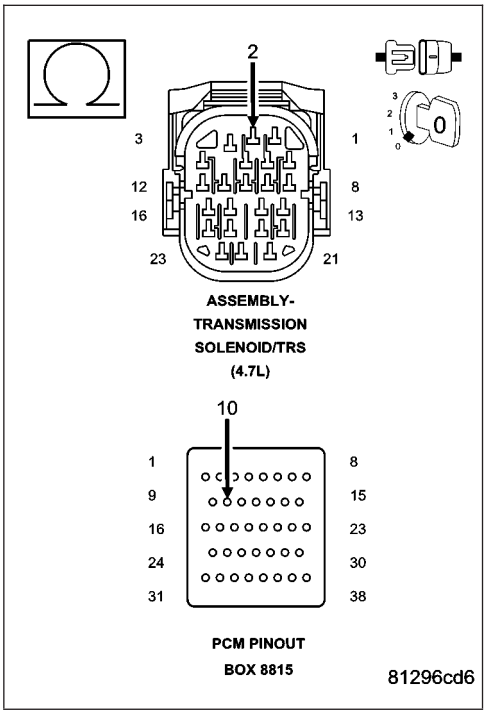
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T20) LR Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T20) LR Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



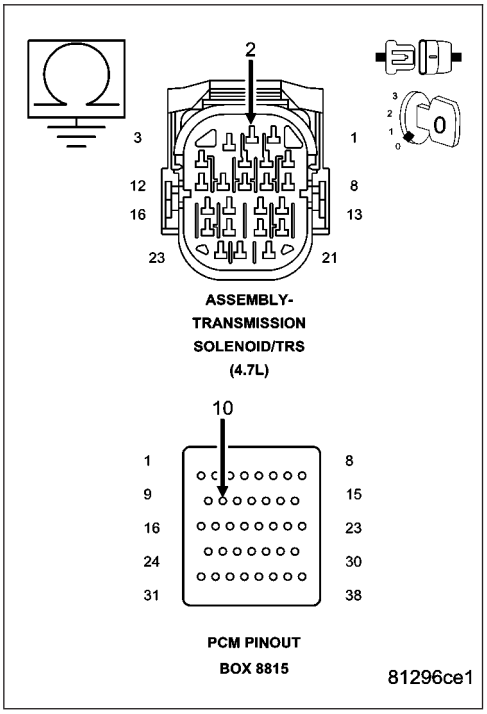
6. (T20) LR SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T20) LR Solenoid Control circuit.

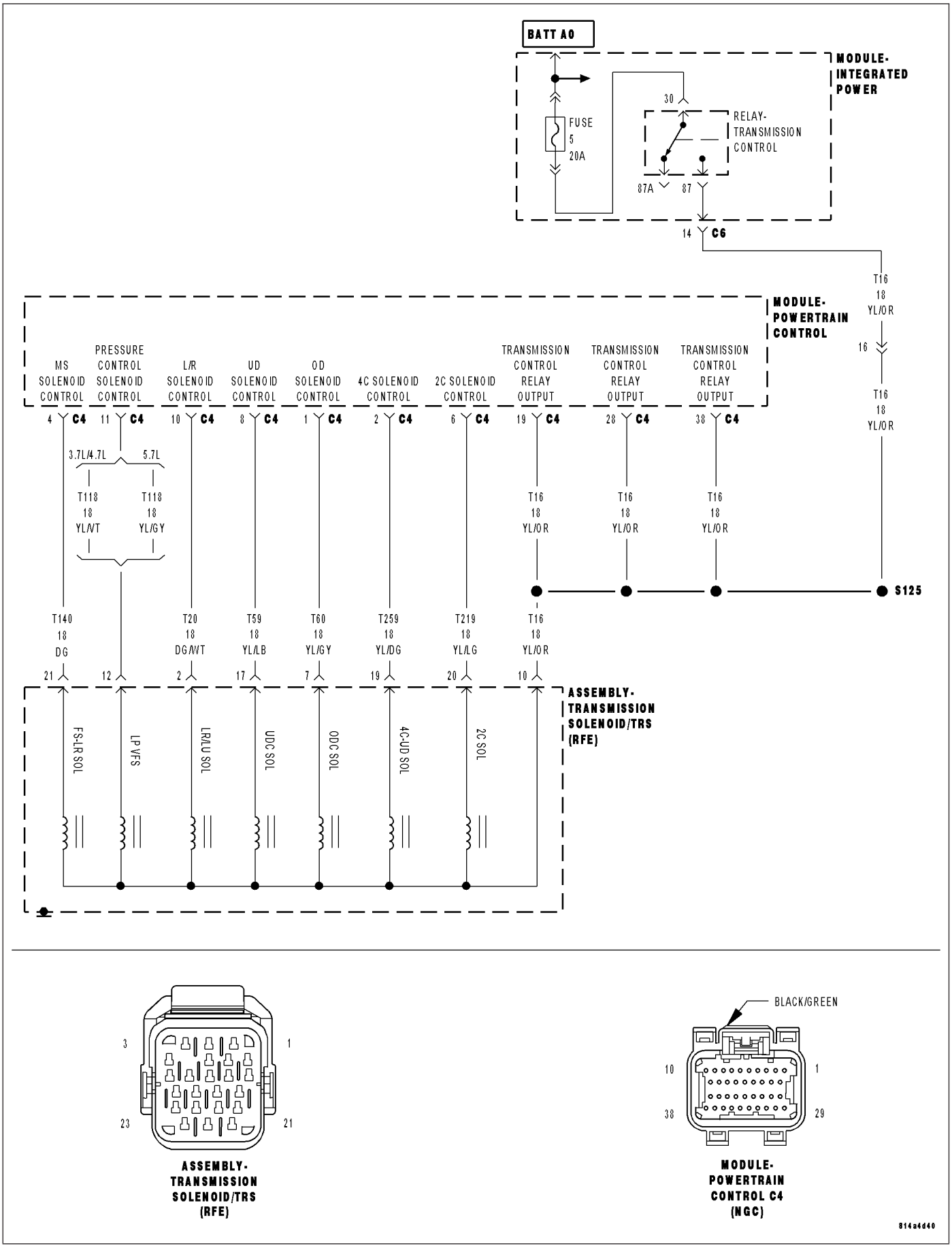
Is the resistance below 5.0 ohms?

Yes >> Repair the (T20) LR Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0755-2C SOLENOID CIRCUIT



P0755-2C SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T219) 2C SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T219) 2C SOLENOID CONTROL CIRCUIT OPEN
(T219) 2C SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0755-2C SOLENOID CIRCUIT (CONTINUED)

2. CHECK TO SEE IF P0755 IS PRESENT

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the 2C Solenoid.

Did the 2C Solenoid LED blink on and off on the Transmission Simulator?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the 2C Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P0755 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

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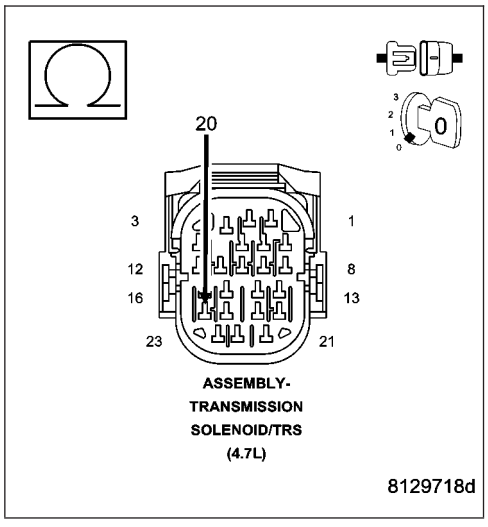
4. (T219) 2C SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T219) 2C Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T219) 2C Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T219) 2C Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0755-2C SOLENOID CIRCUIT (CONTINUED)

5. (T219) 2C SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

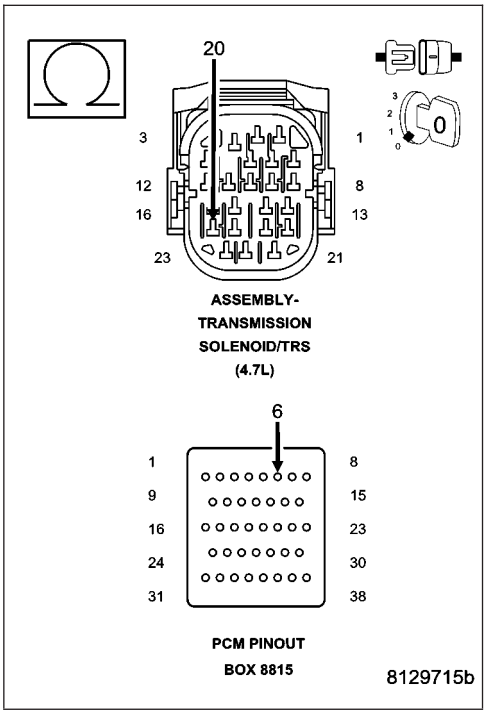
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T219) 2C Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T219) 2C Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



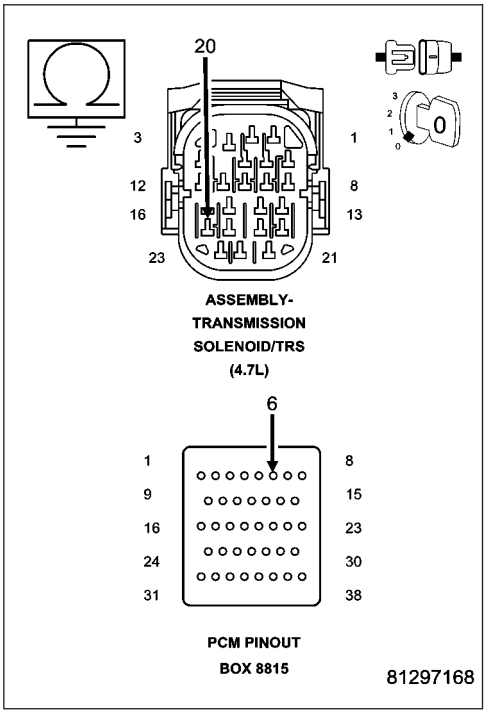
6. (T219) 2C SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T219) 2C Solenoid Control circuit.

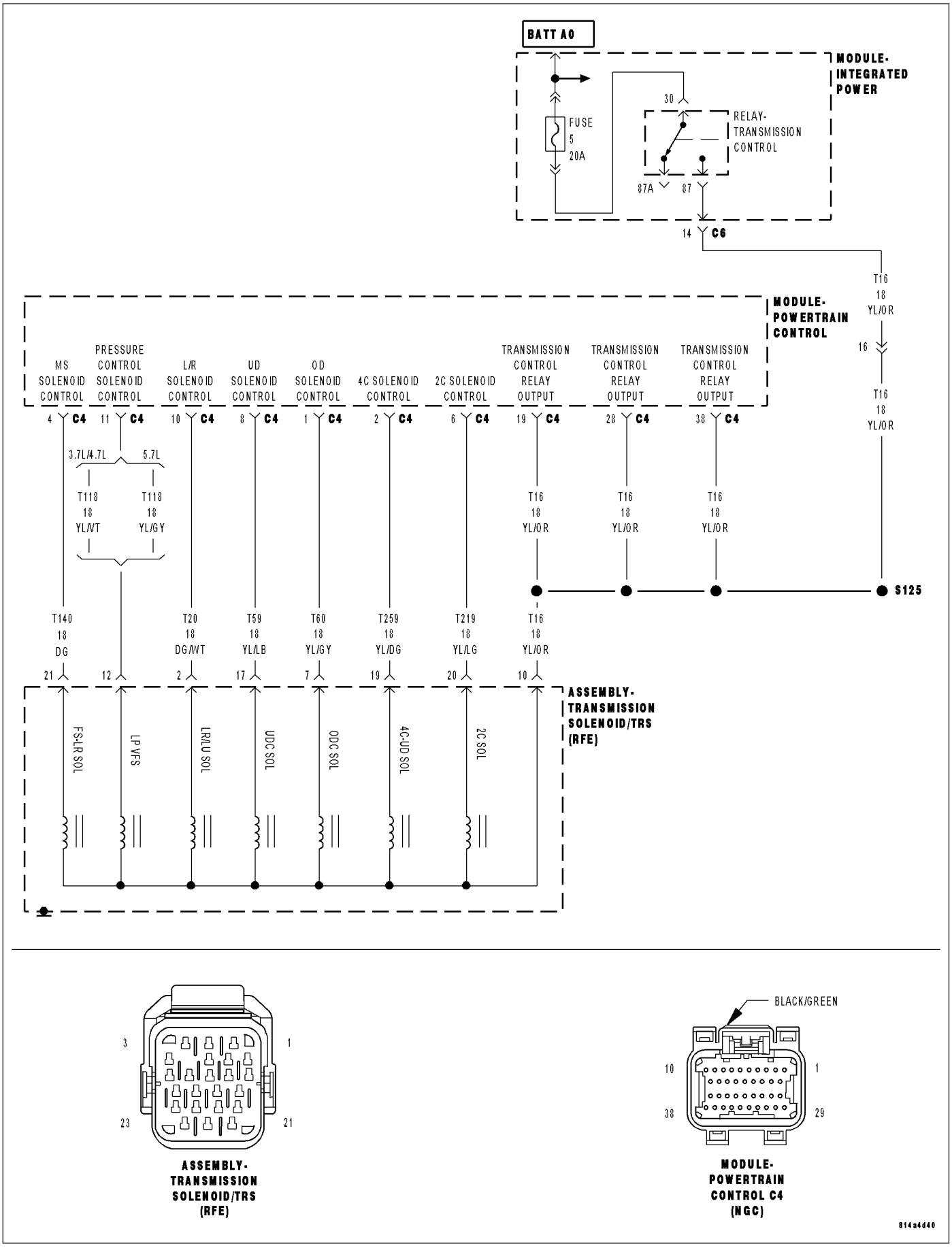
Is the resistance below 5.0 ohms?

Yes >> Repair the (T219) 2C Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0760-OD SOLENOID CIRCUIT



ASSEMBLY-
TRANSMISSION
SOLENOID/TRS
(RFE)

MODULE-
POWERTRAIN
CONTROL C4
(NGC)

814a4d40

P0760-OD SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS) .

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T60) OD SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T60) OD SOLENOID CONTROL CIRCUIT OPEN
(T60) OD SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0760-OD SOLENOID CIRCUIT (CONTINUED)

2. CHECK TO SEE IF P0760 IS PRESENT

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the OD Solenoid.

Monitor the OD Solenoid LED on the Transmission Simulator.

Did the OD Solenoid LED on the Transmission Simulator blink on and off?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the OD Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P0760 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

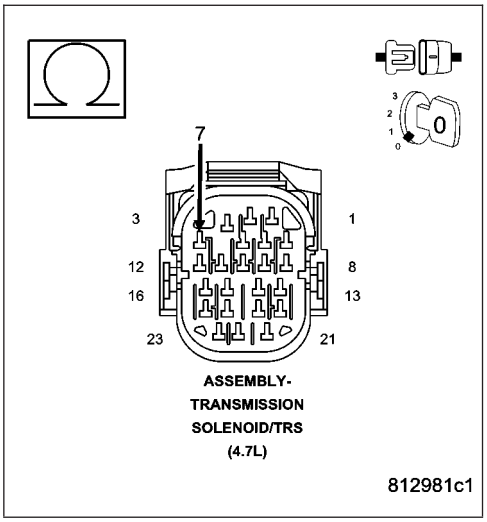
4. (T60) OD SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T60) OD Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T60) OD Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T60) OD Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0760-OD SOLENOID CIRCUIT (CONTINUED)

5. (T60) OD SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

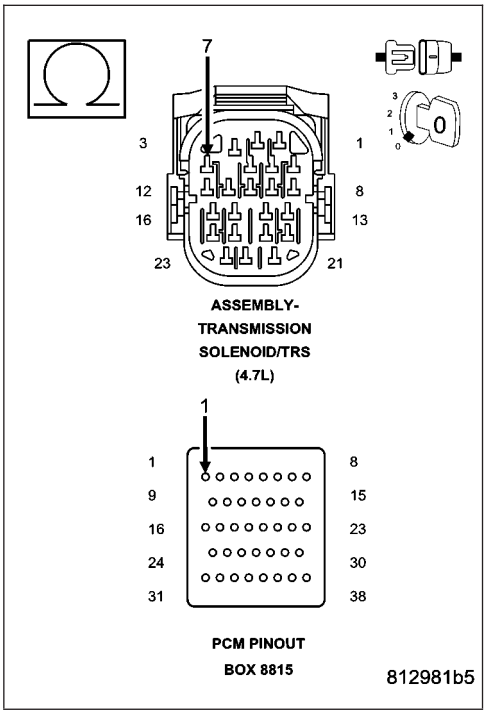
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller special tool #8815 to perform diagnosis.

Measure the resistance of the (T60) OD Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T60) OD Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



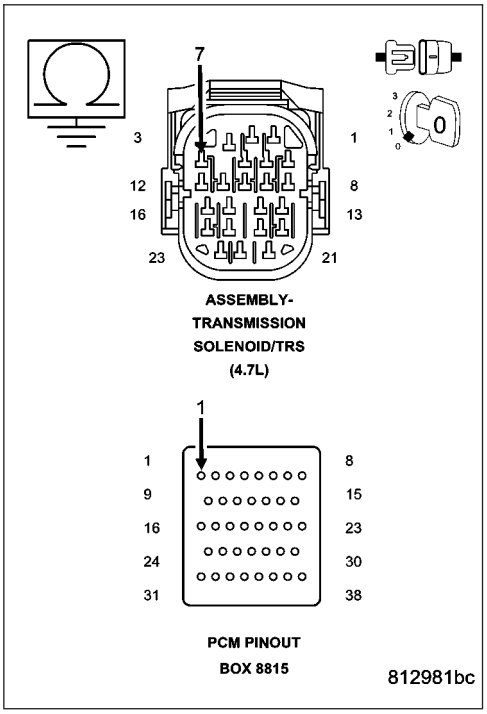
6. (T60) OD SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T60) OD Solenoid Control circuit.

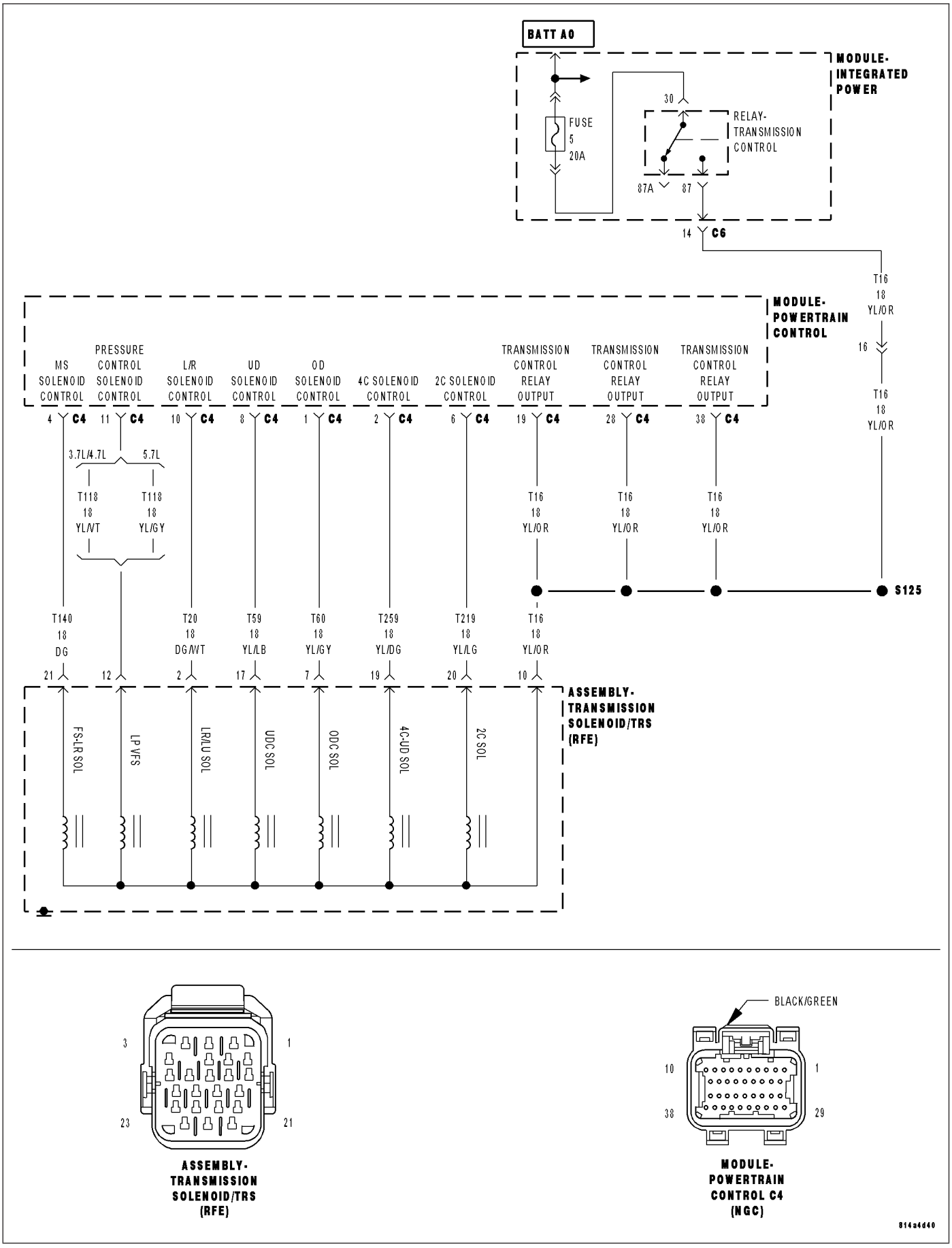
Is the resistance below 5.0 ohms?

Yes >> Repair the (T60) OD Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0765-UD SOLENOID CIRCUIT



ASSEMBLY-
TRANSMISSION
SOLENOID/TRS
(RFE)

MODULE-
POWERTRAIN
CONTROL C4
(NGC)

814a4d40

P0765-UD SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T59) UD SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T59) UD SOLENOID CONTROL CIRCUIT OPEN
(T59) UD SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0765-UD SOLENOID CIRCUIT (CONTINUED)

2. CHECK TO SEE IF P0765 IS PRESENT

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the UD Solenoid.

Monitor the UD Solenoid LED on the Transmission Simulator.

Did the UD Solenoid LED on the Transmission Simulator blink on and off?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the UD Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P0765 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

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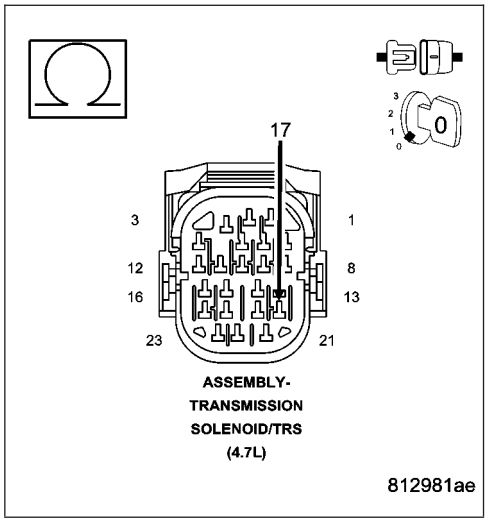
4. (T59) UD SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T59) UD Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T59) UD Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T59) UD Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0765-UD SOLENOID CIRCUIT (CONTINUED)

5. (T59) UD SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

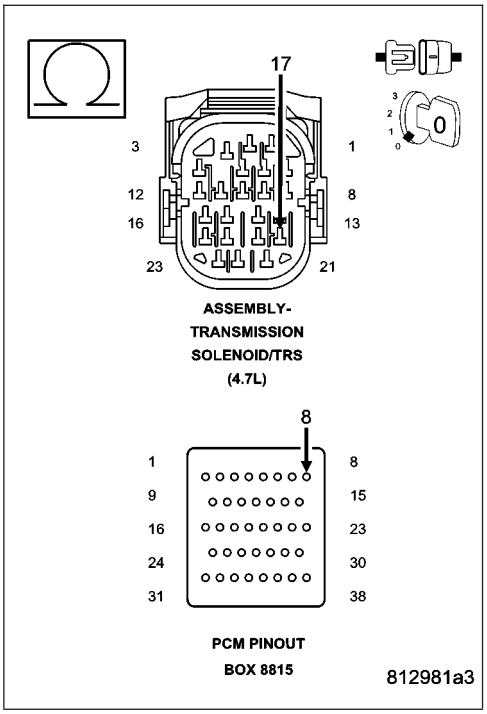
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T59) UD Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T59) UD Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



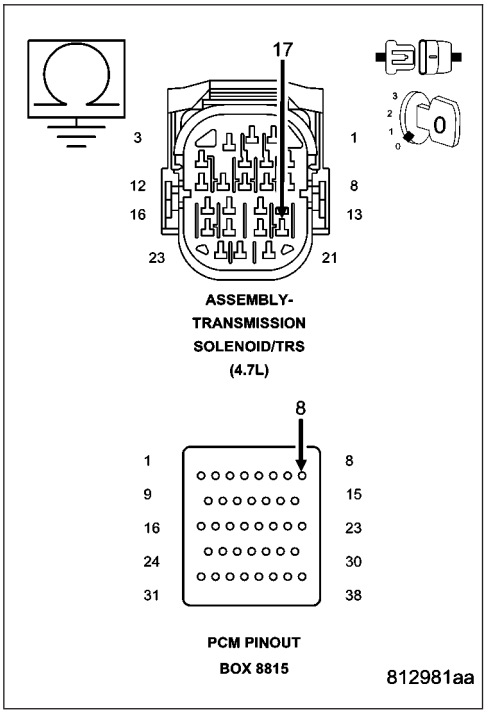
6. (T59) UD SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T59) UD Solenoid Control circuit.

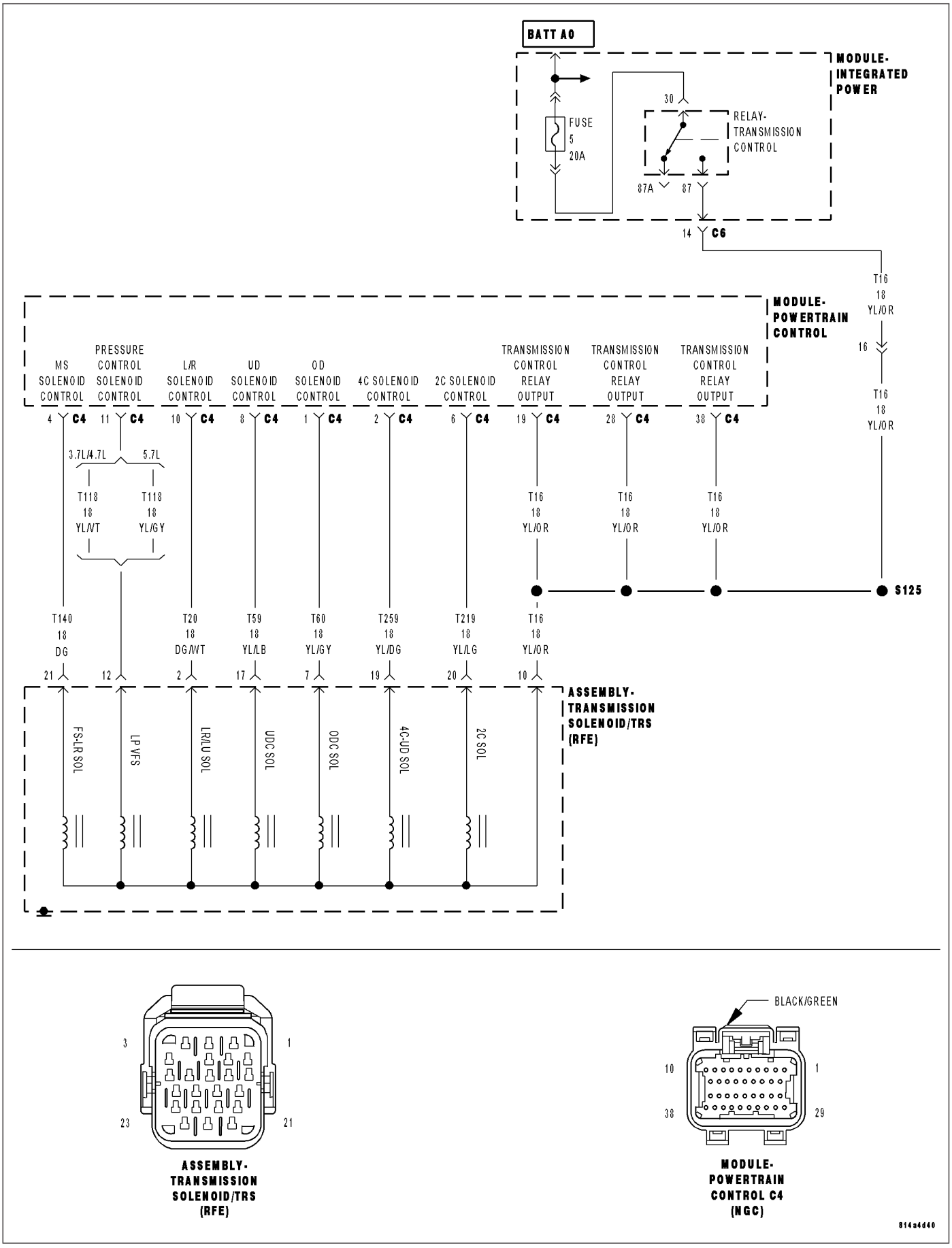
Is the resistance below 5.0 ohms?

Yes >> Repair the (T59) UD Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0770-4C SOLENOID CIRCUIT



ASSEMBLY-
TRANSMISSION
SOLENOID/TRS
(RFE)

MODULE-
POWERTRAIN
CONTROL C4
(NGC)

814a4d40

P0770-4C SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T259) 4C SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T259) 4C SOLENOID CONTROL CIRCUIT OPEN
(T259) 4C SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0770-4C SOLENOID CIRCUIT (CONTINUED)

2. CHECK TO SEE IF P0770 IS PRESENT

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the 4C Solenoid.

Monitor the 4C Solenoid LED on the Transmission Simulator.

Did the 4C Solenoid LED on the Transmission Simulator blink on and off?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the 4C Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P0770 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

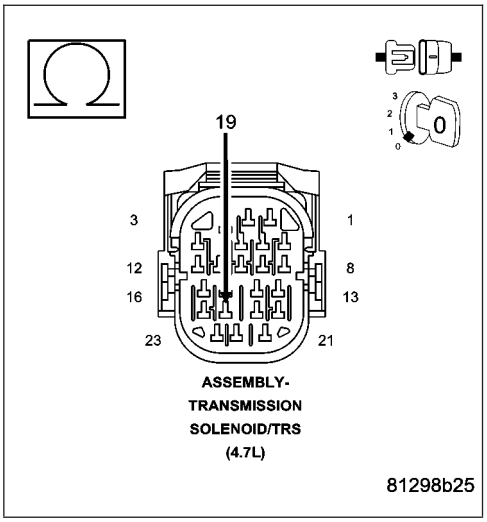
4. (T259) 4C SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM harness connectors.

Measure the resistance between the (T259) 4C Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T259) 4C Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T259) 4C Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0770-4C SOLENOID CIRCUIT (CONTINUED)

5. (T259) 4C SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

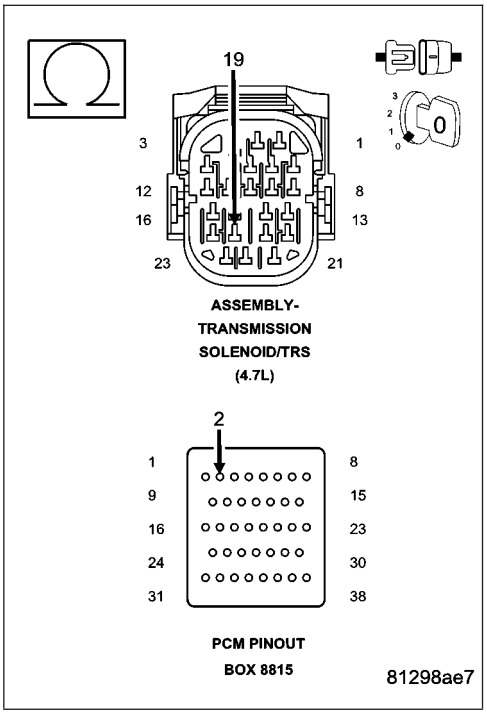
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller special tool #8815 to perform diagnosis.

Measure the resistance of the (T259) 4C Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T259) 4C Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



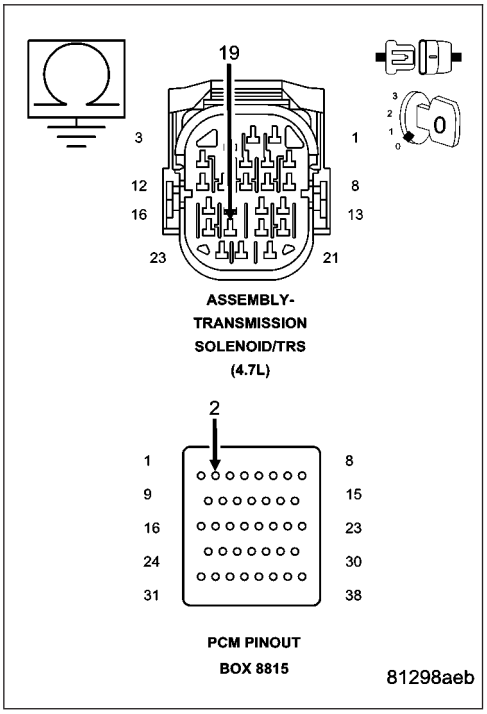
6. (T259) 4C SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T259) 4C Solenoid Control circuit.

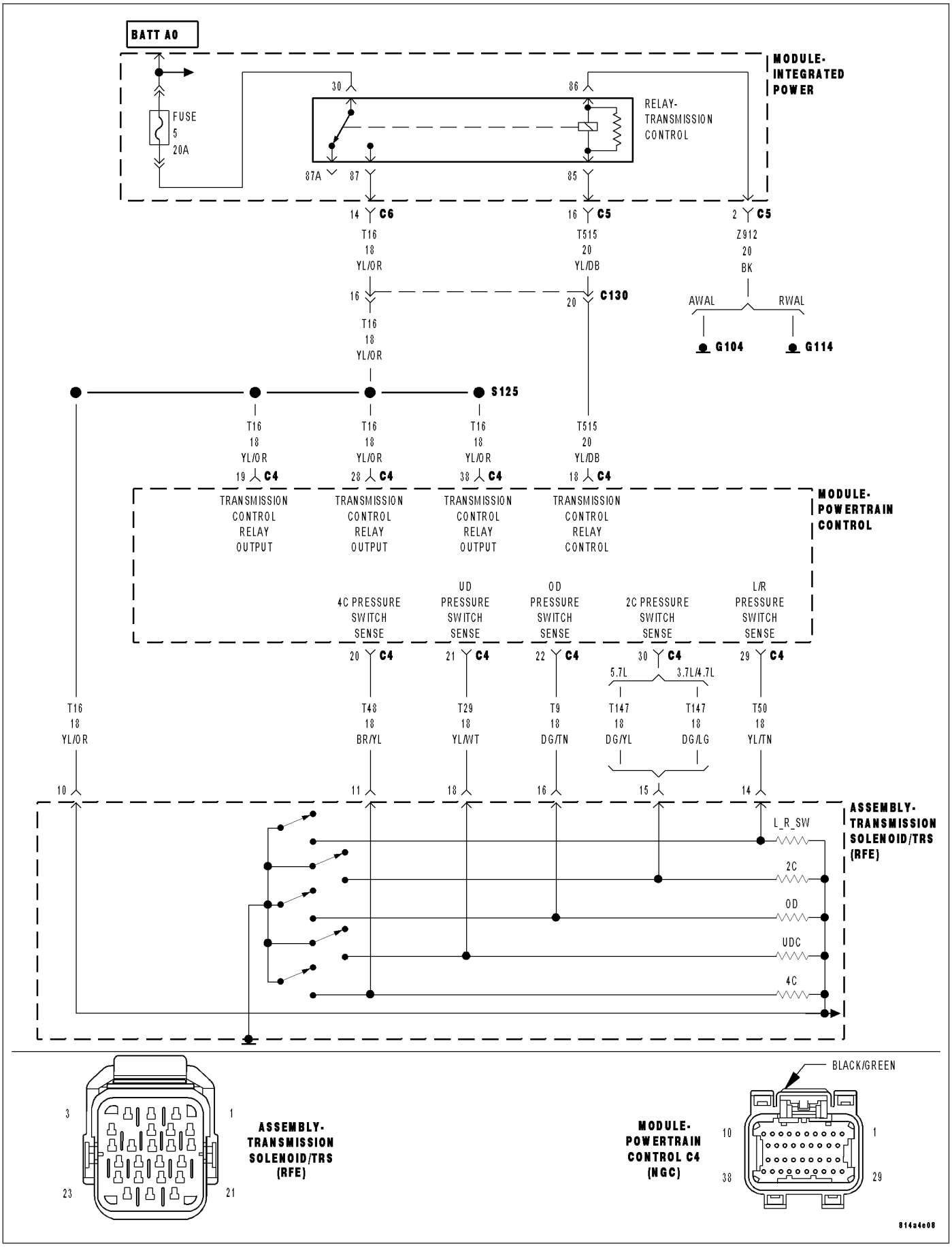
Is the resistance below 5.0 ohms?

Yes >> Repair the (T259) 4C Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0841-LR PRESSURE SWITCH RATIONALITY



P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The DTC will set if the LR Pressure Switch reads open or closed at the wrong time in a given gear.

Possible Causes
LOSS OF PRIME AND/OR TRANSMISSION CONTROL RELAY DTC PRESENT
LOW FLUID LEVEL
LOW LINE PRESSURE
REVERSE CARRIER SNAP RING DISLODGED
CRACKED OR MISINSTALLED PRIMARY OIL FILTER OR FILTER SEAL
STICKING MAIN REGULATOR VALVE IN PUMP VALVE BODY
NO. 1 CHECK BALL CUT OR DAMAGED
WIRING AND CONNECTORS
(T50) LR PRESSURE SWITCH SENSE CIRCUIT OPEN
(T50) LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T50) LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission system uses five pressure switches to monitor the fluid pressure in the LR, 2C, 4C, UD, and OD clutch circuits. The pressure switches are continuously monitored for the correct states in each gear as shown.

GEAR	L/R	2C	4C	UD	OD
REVERSE	OPEN	OPEN	OPEN	OPEN	OPEN
P/N	CLOSED**	OPEN	OPEN	OPEN	OPEN
1ST	CLOSED*	OPEN	OPEN	CLOSED	OPEN
2ND	OPEN	CLOSED	OPEN	CLOSED	OPEN
2ND PRIME	OPEN	OPEN	CLOSED	CLOSED	OPEN
3RD	OPEN	OPEN	OPEN	CLOSED	CLOSED
4TH	OPEN	OPEN	CLOSED	OPEN	CLOSED
5TH	OPEN	CLOSED	OPEN	OPEN	CLOSED

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is closed in Manual 1.

**May be open when rolling in Neutral or at low oil temperatures.

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

Diagnostic Test

1. OTHER RELATED DTC'S PRESENT

Ignition on, engine not running.

With the scan tool, check for other transmission DTC's.

Are there any Loss of Prime and/or Transmission Control Relay related DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If the DTC P0944 is present, perform its respective test first.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CONDITION P0841 PRESENT

With the scan tool, check the EATX DTC EVENT DATA for P0841.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the DTC P0841?

Yes >> Go To 3

No >> Refer to the Symptom Catagory and perform diagnostics for the DTC reported in the EATX DTC EVENT DATA.

---

3. DTC SET IN REVERSE

Does the EATX DTC EVENT DATA show the DTC P0841 set while in Reverse?

Yes >> Go To 10

No >> Go To 4

---

4. LR PRESSURE SWITCH CLOSED

Does the EATX DTC EVENT DATA show the LR Pressure Switch reading CLOSED when the DTC P0841 was set?

Yes >> Go To 5

No >> Go To 14

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

5. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

Turn the Pressure Switch selector to LR on the Transmission Simulator.

With the scan tool, monitor the LR Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the LR Pressure Switch state change from open to closed while pressing the Pressure Switch Test button on the Transmission Simulator?

Yes >> Go To 6

No >> Go To 10

---

6. POOR WIRING AND CONNECTIONS

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

---

7. DTC SET IN FIRST GEAR

With the EATX DTC EVENT DATA recorded earlier, check what gear the transmission was in when the DTC P0841 was set.

Does the EATX DTC EVENT DATA show the Present Gear as first gear when the DTC P0841 was set ?

Yes >> Go To 8

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

8. NO. 1 CHECK BALL CUT OR DAMAGED

Turn the ignition off to the lock position.

Remove the Transmission Valve Body per the Service Information.

Check the No. 1 Check Ball for any possible cuts or damage.

Is the No. 1 Check Ball cut or damaged?

Yes >> Replace the No. 1 Check Ball and check for clutch debris in the transmission oil pan. If there is excessive debris, perform internal repairs to the LR Clutch assembly. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

9. REVERSE CARRIER SNAP RING DISLODGED OR TRANSMISSION SOLENOID/TRS ASSEMBLY

Looking through the windows in the bottom of the case, check whether the snap ring at the front of the Reverse (center) Carrier has dislodged.

NOTE: It may be necessary to pry the Input Annulus Gear Shell rearward to check this snap ring.

Is the Reverse Carrier Snap Ring dislodged?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

10. (T50) LR PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

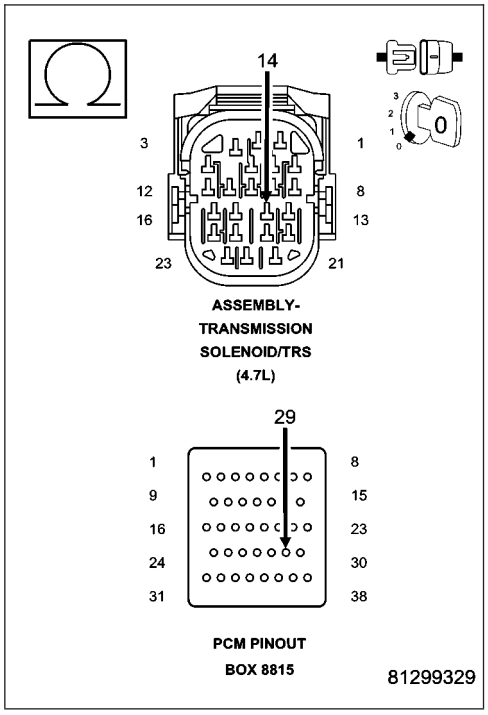
Disconnect the Transmission Simulator, Miller tool #8333 if connected in a previous step or disconnect the Transmission Solenoid /TRS Assembly harness connector.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T50) LR Pressure Switch Sense circuit from the Solenoid/TRS Assembly harness connector to the appropriate terminal of the Miller tool #8815.



Is the resistance above 5.0 ohms?

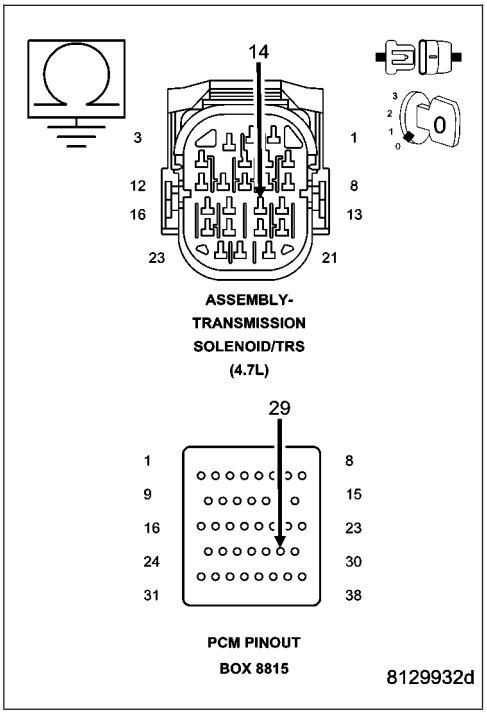
Yes >> Repair the (T50) LR Pressure Switch Sense circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 11

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

11. (T50) LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T50) LR Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T50) LR Pressure Switch Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 12

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12. PCM POWERS AND GROUNDS

Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

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13. ROAD TEST THE VEHICLE

With the scan tool, clear the DTC and road test the vehicle.

Try to duplicate the conditions in which the DTC originally set using the EATX DTC EVENT DATA recorded earlier.

Did the DTC P0841 reset?

Yes >> Replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 17

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

14. LOW LINE PRESSURE

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check for low fluid level. Check the Primary Oil Filter seal for a split, crack, or improperly installed. Refer to the Service Information for the proper installation procedure. If the fluid level and Primary Oil Filter are OK, check the Main Regulator Valve in the Oil Pump per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15

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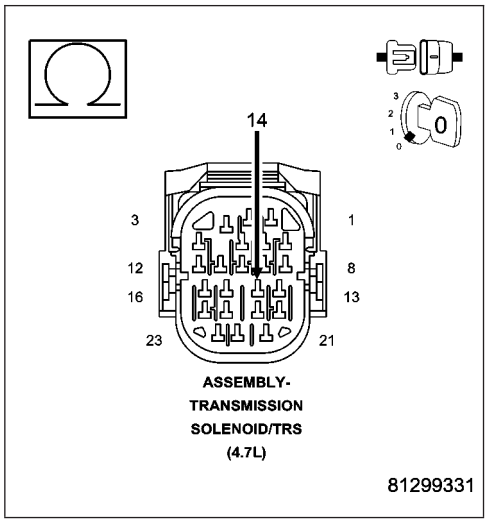
15. (T50) LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

Disconnect all PCM harness connectors.

Measure the resistance between the (T50) LR Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T50) LR Pressure Switch Sense circuit and all other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T50) LR Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16

---

16. ROAD TEST THE VEHICLE

With the scan tool, clear the DTC and road test the vehicle.

Try to duplicate the conditions in which the DTC originally set using the EATX DTC EVENT DATA recorded earlier.

Did the DTC P0841 reset?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 17

P0841-LR PRESSURE SWITCH RATIONALITY (CONTINUED)

17. INTERMITTENT WIRING AND CONNECTORS

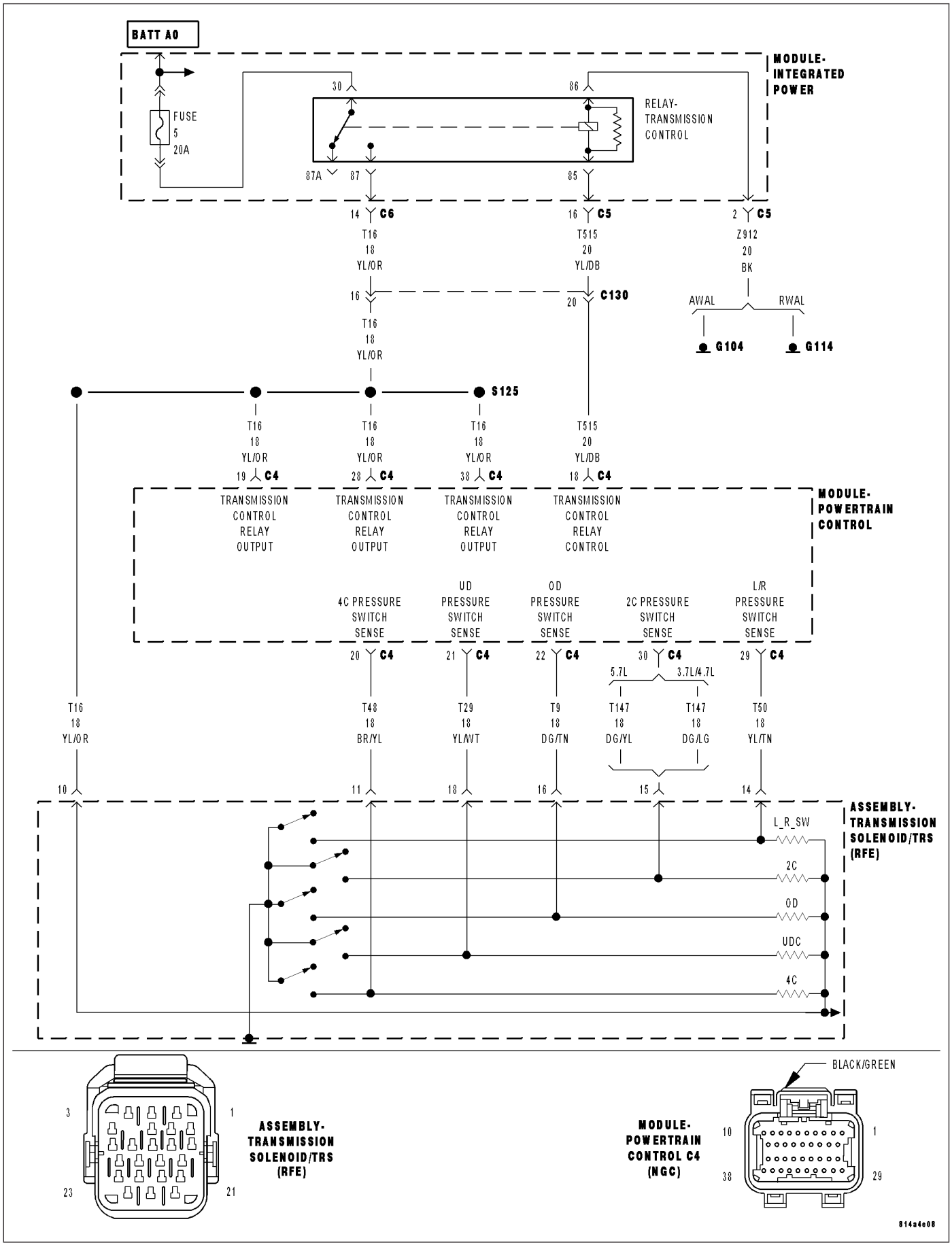
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0845-2C HYDRAULIC PRESSURE TEST



P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.
- **Set Condition:**
  After a shift into a forward gear, with engine speed above 1000 RPM, the PCM momentarily turns on element pressure to the Clutch circuits that don't have pressure to identify the correct Pressure Switch closes. If the Pressure Switch does not close 2 times, the DTC sets.

Possible Causes
LINE PRESSURE SENSOR
TRANSMISSION FLUID CONTAMINATION
RELATED DTC'S PRESENT
TRANSMISSION SOLENOID/TRS ASSEMBLY
EXCESSIVE DEBRIS IN OIL PAN
POOR LINE PRESSURE SENSOR CONNECTION
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY DTCS PRESENT
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System tests the pressure switches when they are off. The test verifies that the switches are operational (They will close with pressure applied). The Transmission Control System verifies that the switch closes when the corresponding element is applied. If a switch fails to close, it is re-tested. If it fails the second test, the DTC will set, the MIL will illuminate and the transmission system will default to the orderly Shutdown routine.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is there any Loss of Prime, Transmission Control Relay, and/or Line Pressure Sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If the DTC, P0944-LOSS OF PRIME is present, perform its respective test first.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

2. DTC P0755 PRESENT

With the scan tool, check Transmission DTCs.

Is the DTC P0755 also present?

Yes >> Refer to the symptom list and perform diagnostics for P0755–2C SOLENOID CIRCUIT.

No >> Go To 3

---

3. DTCS P0732, P0735 AND/OR P0846 PRESENT

With the scan tool, check for other transmission DTC's

Are the DTCs P0732, P0735, and/or P0846 present also?

Yes >> Go To 12

No >> Go To 4

---

4. CHECK TO SEE IF DTC P0845 IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0845.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 5

No >> Go To 17

---

5. LINE PRESSURE STAYS THE SAME

Start the engine.

Warm the transmission to 82° C or 180° F.

Firmly apply the brakes.

With the scan tool, monitor the Line Pressure during the following step.

Move the shift lever to each gear position, pausing momentarily in each position and record the line pressure reading. Allow the pressure to stabilize for at least 5 seconds in each range.

Did the line pressure remain at a steady value between 585 and 655 kPa or 85 and 95 PSI in each position?

Yes >> Go To 6

No >> Go To 10

---

6. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, **engine not running.**

With the scan tool, monitor the Line Pressure while firmly pushing the Transmission Line Pressure Sensor connector inwards towards the Transmission.

Did the Line Pressure reading on the scan tool change to about 207 kPa or 30 PSI when the connector was pushed inward?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

7. LINE PRESSURE SENSOR OPERATION

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while turning the Pressure Switch selector to each of the 3 line pressure positions on the Transmission Simulator.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the scan tool Line Pressure readings match the specified readings on the Transmission Simulator and remain steady in all three positions?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

---

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

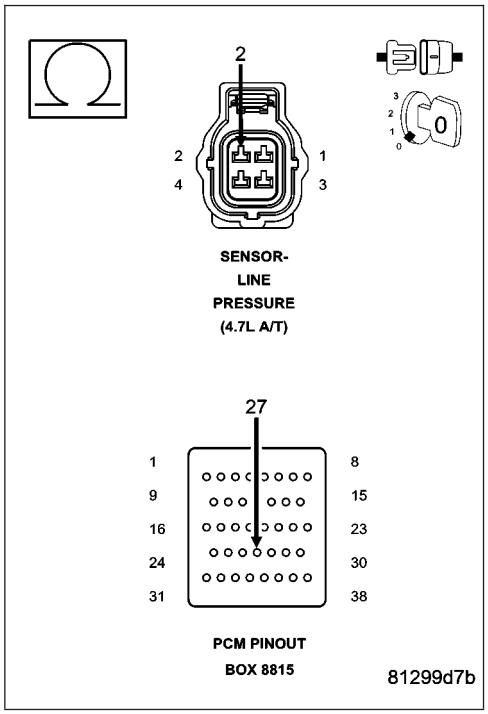
Turn the ignition off to the lock position.

Disconnect Transmission Simulator.

Disconnect the PCM C1 harness connector and connect Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.



Is the resistance above 5.0 ohms?

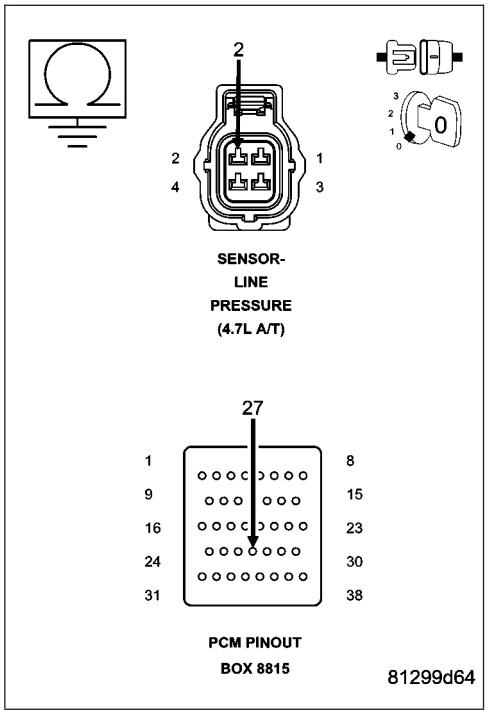
Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

10. COMPARE SCAN TOOL TO PRESSURE GAUGE

Turn the ignition off to the lock position.

Connect the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP. Refer to the Service Information for proper installation procedure.

CAUTION: Apply parking brake.

Start the engine.

In the following steps, compare the scan tool Line Pressure to the Pressure Gauge readings in each gear.

CAUTION: Do not overheat transmission.

With the gear selector in park, raise the RPM to 1500, and compare line pressure readings.

Firmly apply the brakes, move the gear selector into reverse, raise the RPM to 1500, and compare the line pressure readings.

Firmly apply the brakes, move the gear selector into drive, raise the RPM to 1500, and compare the line pressure readings.

Did the scan tool Line Pressure readings match the Pressure Gauge readings ± 10 psi?

Yes >> Go To 11

No >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

11. WIRING AND CONNECTORS

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Remove the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP.

Install the Transmission Simulator, Miller tool #8333.

On the Transmission Simulator, turn the Pressure Switch selector switch to 2C.

Ignition on, engine not running.

With the scan tool, monitor the 2C Pressure Switch state while pressing and holding the Pressure Switch test button and wiggling the wire harness and connectors that pertain to the 2C Pressure Switch.

Did the 2C Pressure Switch state change to closed and remain closed while wiggling the wires?

Yes >> Go To 12

No >> Go To 14

---

12. CHECK FOR EXCESSIVE DEBRIS

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Remove and inspect the Transmission Oil Pan per the Service Information.

Does the Transmission Oil Pan contain excessive debris or contamination?

Yes >> Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

---

13. CHECK 2C HYDRAULIC CLUTCH CIRCUIT

Remove the Valve Body and air check the 2C clutch hydraulic circuit, in the 2C/4C clutch retainer, for leakage per the Service Information.

NOTE: The 2C hydraulic clutch circuit contains a small bleed orifice, a small amount of air leakage is normal.

Was there excessive air leakage noticed during the air check?

Yes >> Repair as necessary. Check the 2C clutch piston, piston seals and bleed orifice assembly.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Disassemble and inspect the Valve Body and repair as necessary. Inspect the 2C Accumulator piston and seals. Check for an extra check ball downstream from the #7 check ball pocket and repair as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

14. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

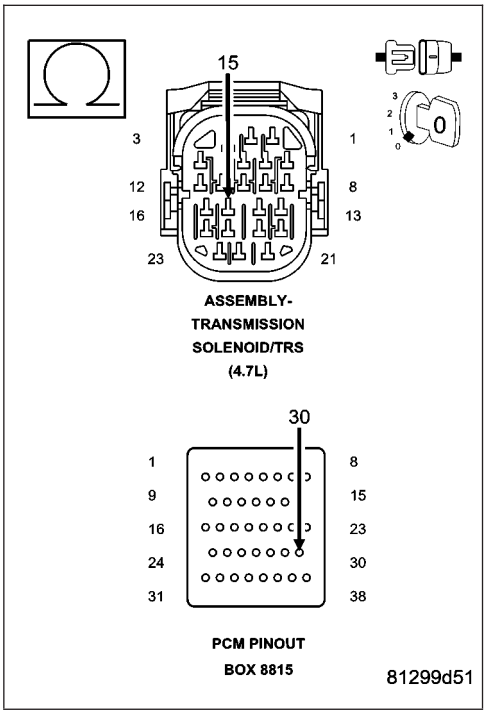
Measure the resistance of the (T147) 2C Pressure Switch Sense circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15



15. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

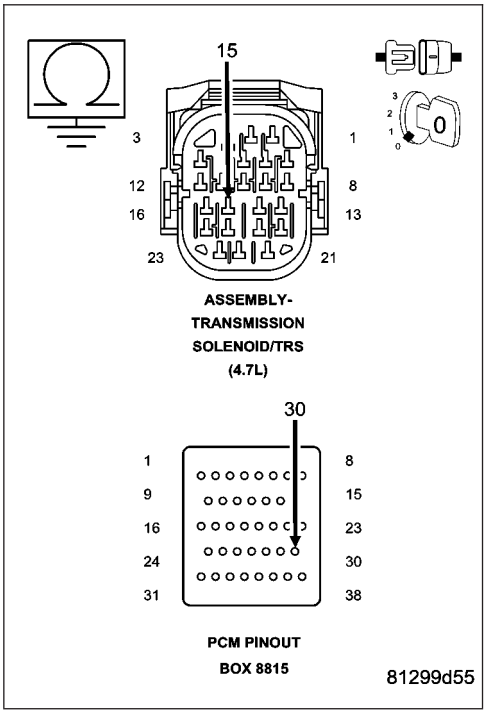
Measure the resistance between ground and the (T147) 2C Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16



P0845-2C HYDRAULIC PRESSURE TEST (CONTINUED)

16. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

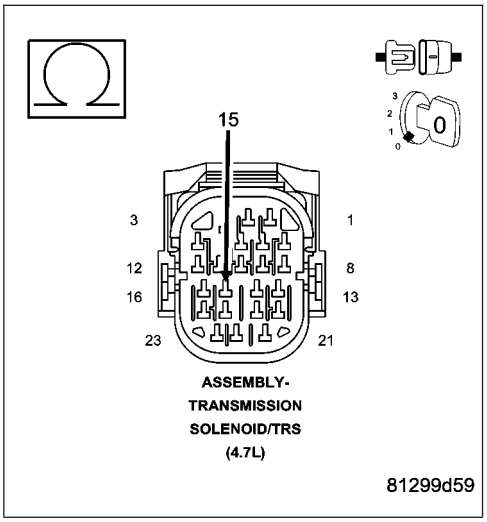
Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

NOTE: Make sure the Transmission Solenoid/TRS Assembly harness connector is disconnected.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (T147) 2C Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T147) 2C Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

17. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

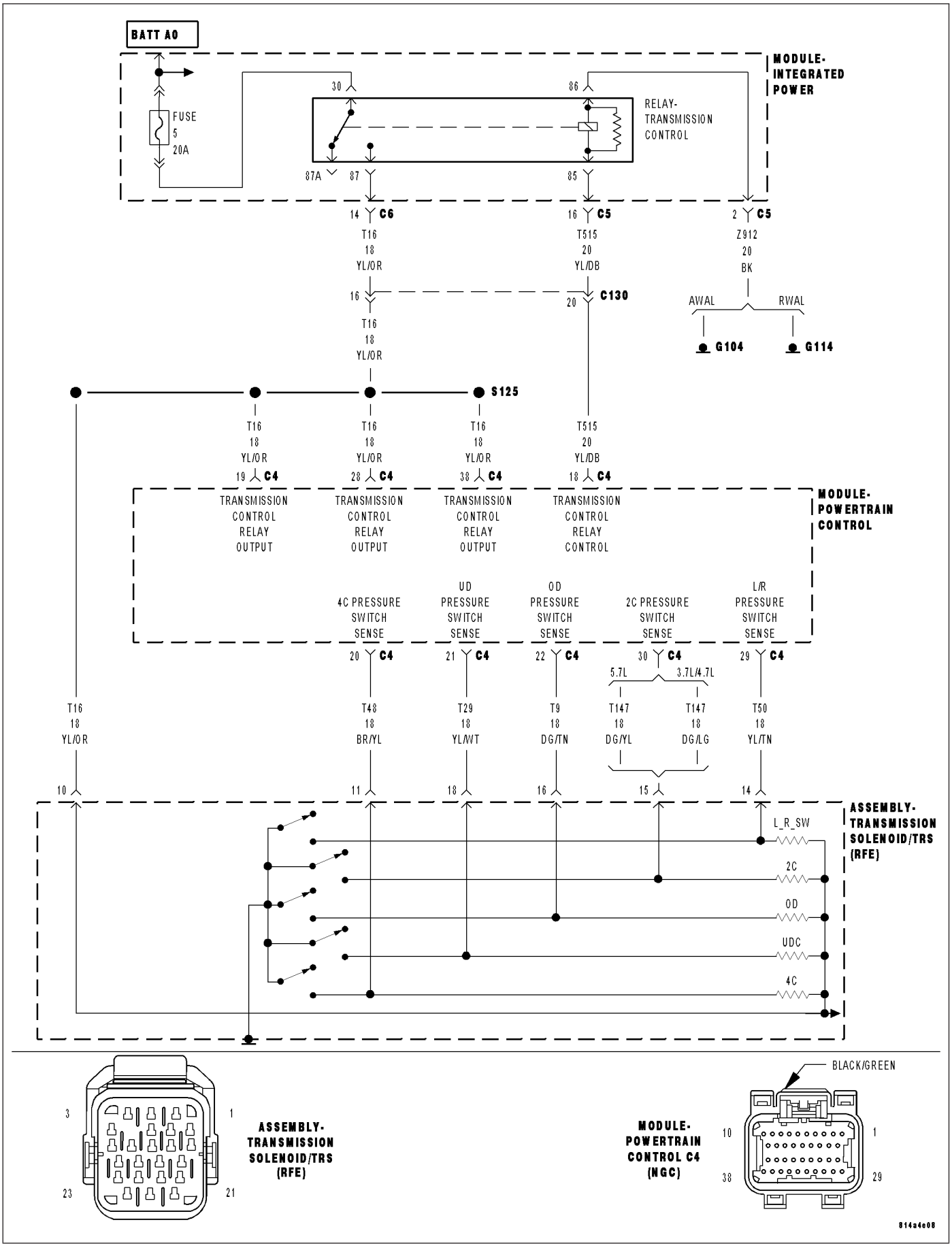
If the EATX DTC EVENT DATA shows the DTC P0845 set while the Line Pressure was significantly below the Desired Line Pressure reading, check for causes of low line pressure (low fluid level, broken or mis-installed primary oil filter or filter seal, sticking Main Regulator Valve in the Pump Valve Body etc.). If the data shows the DTC set while the Line Pressure reading was significantly higher than the Desired Line Pressure, check the Line Pressure Sensor and related wiring.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0846-2C PRESSURE SWITCH RATIONALITY



P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  The DTC is set if the 2C Pressure Switch reads open or closed at the wrong time in a given gear.

Possible Causes
RELATED RELAY DTC'S PRESENT
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT OPEN
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS
EXCESSIVE FLUID LEAKAGE IN 2C CLUTCH CIRCUIT
NO. 5 AND/OR NO. 7 CHECK BALL CUT OR DAMAGED
EXTRA CHECK BALL DOWNSTREAM OF THE NO. 7 CHECK BALL SOCKET
LOW LINE PRESSURE
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE
WIRING AND CONNECTORS

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission system uses five pressure switches to monitor the fluid pressure in the LR, 2C, 4C, UD, and OD clutch circuits. The pressure switches are continuously monitored for the correct states in each gear as shown.

GEAR	L/R	2C	4C	UD	OD
REVERSE	OPEN	OPEN	OPEN	OPEN	OPEN
P/N	CLOSED**	OPEN	OPEN	OPEN	OPEN
1ST	CLOSED*	OPEN	OPEN	CLOSED	OPEN
2ND	OPEN	CLOSED	OPEN	CLOSED	OPEN
2ND PRIME	OPEN	OPEN	CLOSED	CLOSED	OPEN
3RD	OPEN	OPEN	OPEN	CLOSED	CLOSED
4TH	OPEN	OPEN	CLOSED	OPEN	CLOSED
5TH	OPEN	CLOSED	OPEN	OPEN	CLOSED

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is closed in Manual 1.

**May be open when rolling in Neutral or at low oil temperatures.

P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED RELAY DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay related DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. EATX DTC DATA SHOW CURRENT DTC

With the scan tool, check the EATX DTC EVENT DATA.

Does the EATX DTC EVENT DATA show data for DTC P0846?

Yes >> Go To 3

No >> Refer to the Transmission category and perform the appropriate symptom shown in the EATX DTC EVENT DATA.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

3. MULTIPLE DTCS PRESENT

With the scan tool, check for other transmission DTC's.

Are there two or more related pressure switch rationality DTCs present in addition to P0846?

Yes >> Go To 4

No >> Go To 7

---

4. RELATED DTC PRESENT

With the scan tool, check the EATX DTC EVENT DATA for P0846.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Do all the pressure switches read CLOSED in the EATX DTC EVENT DATA for P0846?

Yes >> Refer to Transmission category and perform diagnostics for P0888.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. EATX DTC EVENT DATA READ OPEN

In the EATX DTC EVENT DATA recorded earlier, read the state of all pressure switches.

Do all the pressure switches read OPEN?

Yes >> Go To 6

No >> Go To 7

P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

6. LOW LINE PRESSURE

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter seal for a split, crack, or improperly installed. If the filter and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

7. EATX DTC EVENT DATA READ PARK REVERSE OR NEUTRAL

With the scan tool, check the EATX DTC EVENT DATA for P0846.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the DTC P0846 set in Park, Neutral, or Reverse?

Yes >> Go To 12

No >> Go To 8

---

8. EATX DTC EVENT DATA READ CLOSED

With the scan tool, check the EATX DTC EVENT DATA for P0846.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the 2C Pressure Switch reading CLOSED?

Yes >> Go To 10

No >> Go To 9

---

9. PRIMARY OIL FILTER SEAL

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter seal for a split, crack, or improperly installed. If the filter and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15

P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

10. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to the 2C position.

With the scan tool, monitor the 2C Pressure Switch while pressing the Pressure Switch test button on the Transmission Simulator.

Did the state of the 2C Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Go To 11

No >> Go To 12

---

11. TRANSMISSION SOLENOID/TRS ASSEMBLY

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

12. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Connect Miller tool #8815 to the PCM C4 harness connector.

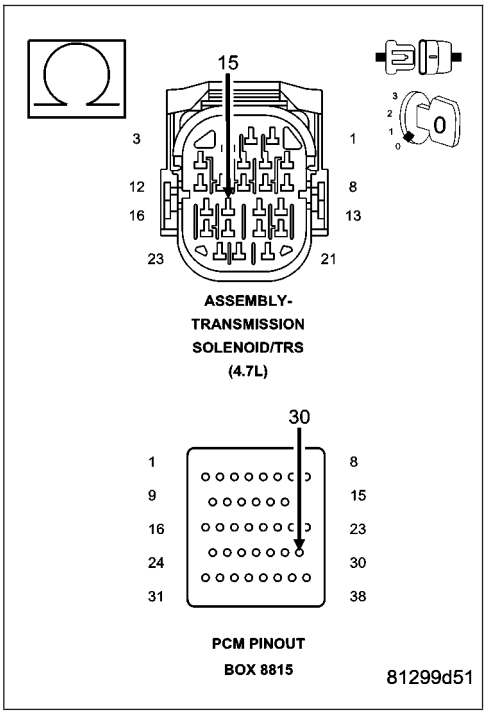
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T147) 2C Pressure Switch Sense circuit from the appropriate terminal of Miller tool #8815 to the Transmission Solenoid/TRS Assembly harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

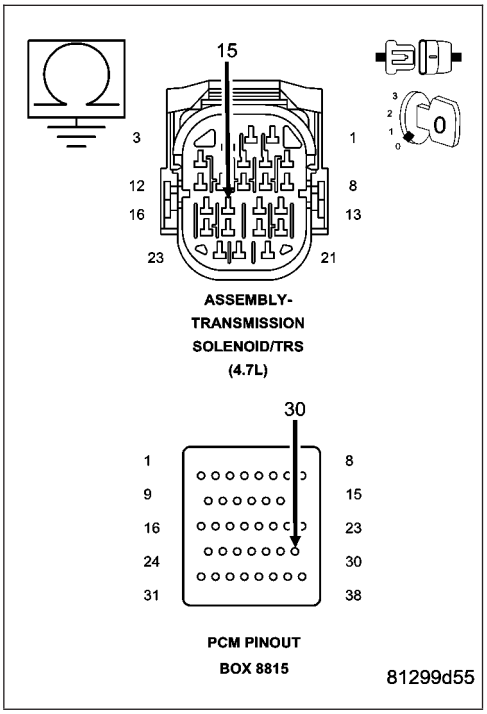
No >> Go To 13



P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

13. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T147) 2C Pressure Switch Sense circuit.



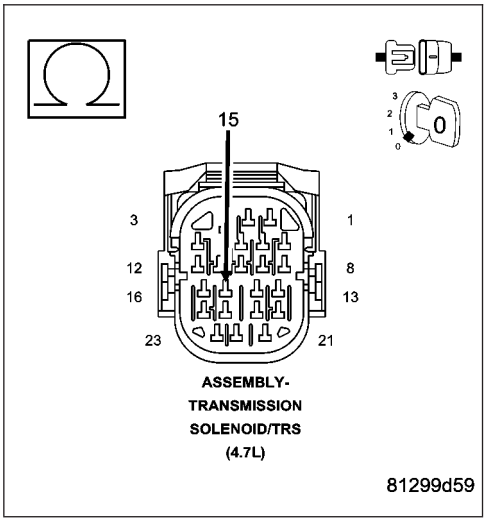
Is the resistance below 5.0 ohms?

Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 14

14. (T147) 2C PRESSURE SWITCH SENSE CIRCUIT SHORT TO ANOTHER CIRCUIT

Measure the resistance between the (T147) 2C Pressure Switch Sense circuit and all the other circuits in the Transmission Solenoid/ TRS Assembly harness connector.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T147) 2C Pressure Switch Sense circuit for a short to another circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Powertrain Control Module per the Service Information. With the scan tool, perform the QUICK LEARN procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0846-2C PRESSURE SWITCH RATIONALITY (CONTINUED)

15. #5 AND/OR #7 CHECK BALL CUT OR DAMAGED

Turn the Ignition off to the lock position.

Remove the Valve Body Assembly per the Service Information.

Inspect the #5 and #7 check balls for any cuts or damage.

Inspect the 2C accumulator piston and seals and also the 2C tower seal on top of the valve body. Refer to the Service Information.

Where there any problems found?

Yes >> Repair as necessary. Check for excessive clutch debris in the transmission oil pan. If excessive clutch debris is present, repair 2C clutch as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16

---

16. EXCESSIVE FLUID LEAKAGE WITH 2C CLUTCH CIRCUIT

Air check the 2C Clutch hydraulic circuit. Refer to the Service Information.

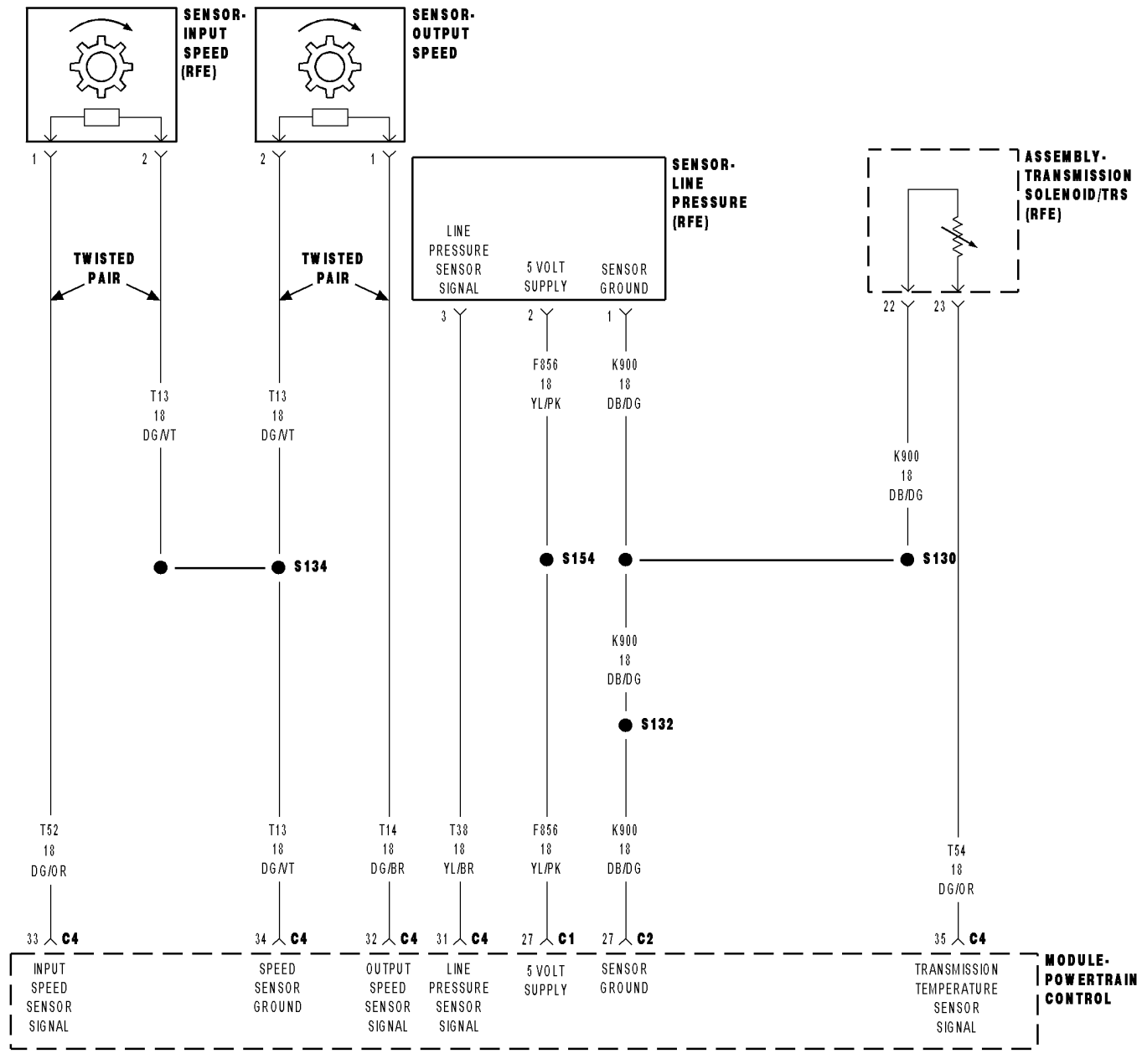
NOTE: This hydraulic clutch circuit contains a small bleed orifice. Small leakage is considered normal.

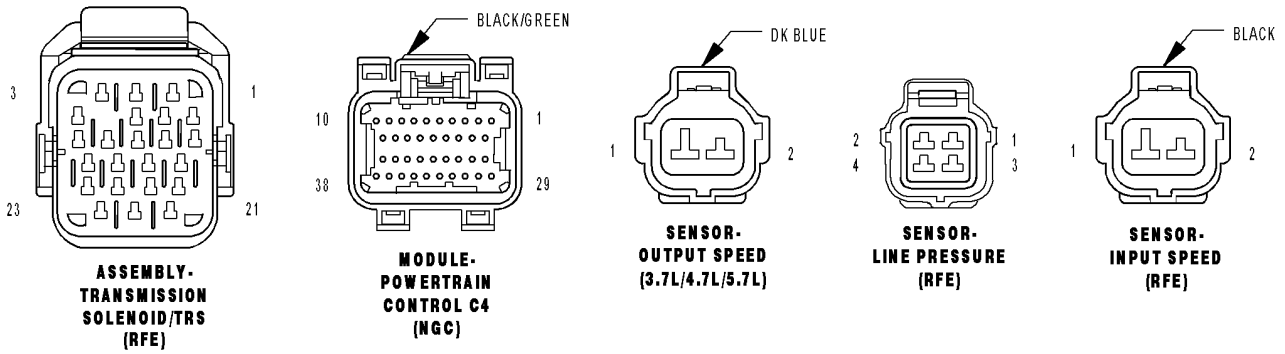
Was there excessive air leakage in the 2C Clutch hydraulic circuit?

Yes >> Repair as necessary. Refer to the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0868-LINE PRESSURE LOW





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P0868-LINE PRESSURE LOW (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously while driving in a forward gear.
- **Set Condition:**
  The PCM continuously monitors Actual Line Pressure and compares it to Desired Line Pressure. If the Actual Line Pressure is more than 10 PSI below Desired Line Pressure, this DTC will set.

Possible Causes
CHECK FOR RELATED DTC'S
LOW FLUID LEVEL
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
POOR LINE PRESSURE SENSOR CONNECTION
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO VOLTAGE
(T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
INTERNAL TRANSMISSION
LINE PRESSURE SENSOR
CRACKED, PLUGGED, OR MISINSTALLED PRIMARY OIL FILTER
STUCK OR STICKING MAIN REGULATOR VALVE
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Line pressure is measured by the Line Pressure Sensor (LPS) and regulation is achieved by changing the duty cycle of the Pressure Control Solenoid (PCS) controlled by the Transmission Control System. (5% duty cycle = solenoid off = max line pressure, 62% duty cycle = solenoid on = min line pressure). The Transmission Control System calculates the desired line pressure based on inputs from both the engine and transmission.

The Transmission Control System calculates torque input to the transmission and uses it as the primary input to the desired line pressure calculation. This is called Torque Based Line Pressure. In addition, the line pressure is set to a preset level 827 or 931kPa (120 or 135 PSI) during shifts and in Park and Neutral to ensure consistent shift quality. The desired line pressure is continuously being compared to the actual line pressure. If the actual line pressure is consistently lower than the target while driving, the line pressure low DTC P0868 will set.

Diagnostic Test

1. CHECK FOR RELATED DTC'S

With the scan tool, check for other transmission DTC's

Is the DTC P0932 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0868-LINE PRESSURE LOW (CONTINUED)

2. CONDITION P0868 PRESENT

With the scan tool, check the STARTS SINCE SET counter for P0868.

NOTE: This counter only applies to the last DTC set.

Is the START SINCE SET COUNTER 2 or less?

Yes >> Go To 3

No >> Go To 11

---

3. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, **engine not running.**

With the scan tool, monitor the Line Pressure, firmly push the Line Pressure Sensor harness connector towards the Transmission.

Did the Line Pressure change to about 207 kPa or 30 PSI when the connector was pushed?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure during the following steps.

Using the Transmission Simulator, set the rotary knob to each of the 3 line pressure positions.

NOTE: All three scan tool Line Pressure readings should be steady and ± 14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the Line Pressure read within ± 14 kPa or 2.0 PSI in all three positions?

Yes >> Go To 5

No >> Go To 7

P0868-LINE PRESSURE LOW (CONTINUED)

5. LINE PRESSURE SENSOR

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333 and reconnect all previously disconnected connectors.

Install the Line Pressure Adaptor, Miller tool #8259, and the Pressure Gauge, Miller tool #C-3293, 0 to 2000 kPa or 0 to 300 PSI.

Start the engine in park.

Monitor the line pressure readings of both the scan tool and the pressure gauge and compare the two readings.

Is the line pressure gauge reading within 34 kPa or 5 PSI of the scan tool reading?

Yes >> Go To 6

No >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. PLUGGED TRANSMISSION OIL FILTER

Turn the ignition off to the lock position.

Remove and inspect the Transmission Oil Pan for excessive debris per the Service Information.

Remove and inspect the Primary Oil Filter per the Service Information.

NOTE: Make sure the Primary Transmission Oil Filter and/or O-ring is not cracked or split.

Does the Oil Pan contain excessive debris and/or is the Primary Oil Filter cracked or plugged?

Yes >> Repair the plugged, cracked, or split Primary Transmission Oil Filter and/or O-ring. If the Primary Transmission Oil Filter is plugged refer to the Service Information for the proper Hydraulic repair procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair internal transmission and inspect the Transmission Oil Pump per the Service Information and replace if necessary. If no problem is found, replace the Solenoid/TRS Assembly.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

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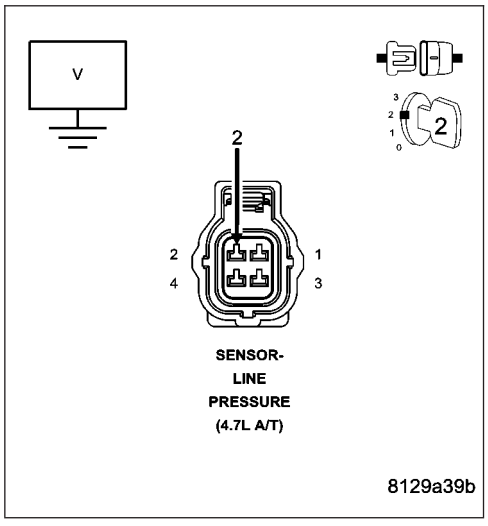
7. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO VOLTAGE

Disconnect the Transmission Simulator, Miller tool #8333.

Reconnect all previously disconnected connectors except the Line Pressure Sensor harness connector.

Ignition on, engine not running.

Measure the voltage of the (F856) 5-volt Supply circuit in the Line Pressure Sensor harness connector.



Is the voltage above 5.5 volts?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to voltage.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

P0868-LINE PRESSURE LOW (CONTINUED)

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the PCM C1 harness connector and connect Miller tool #8815.

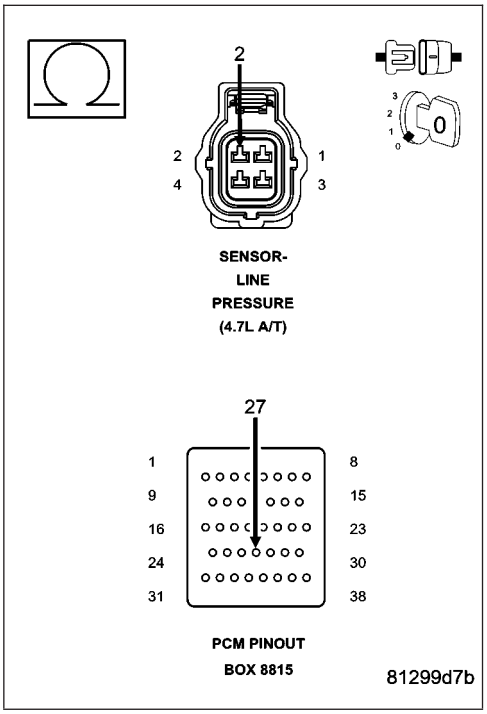
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



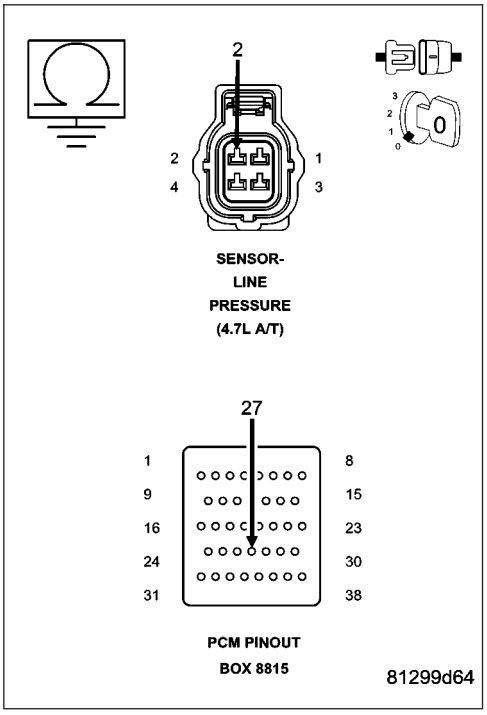
9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 10



P0868-LINE PRESSURE LOW (CONTINUED)

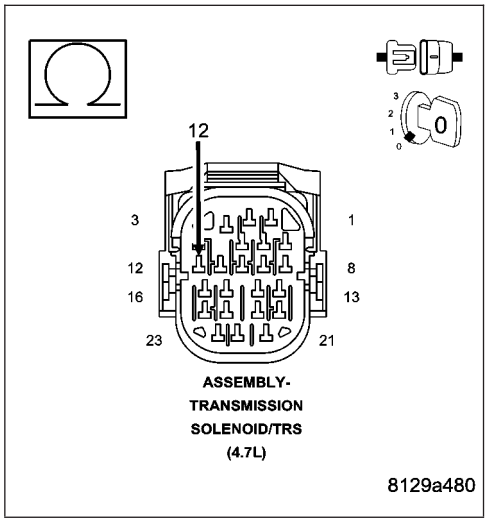
10. (T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

Disconnect all PCM harness connectors.

Measure the resistance between the (T140) Pressure Control Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T140) Pressure Control Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T140) Pressure Control Solenoid Control circuit for a short to another circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

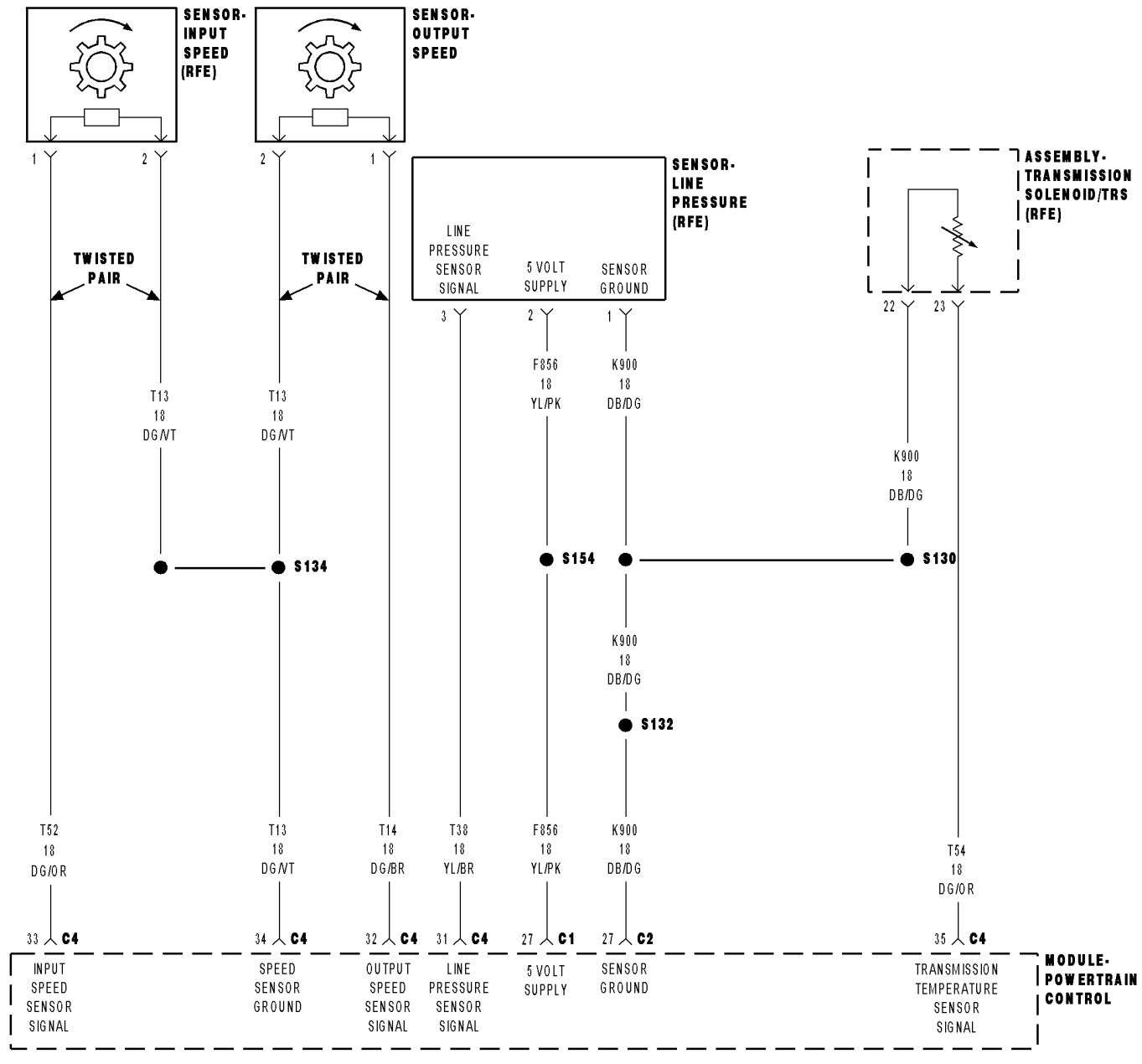
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

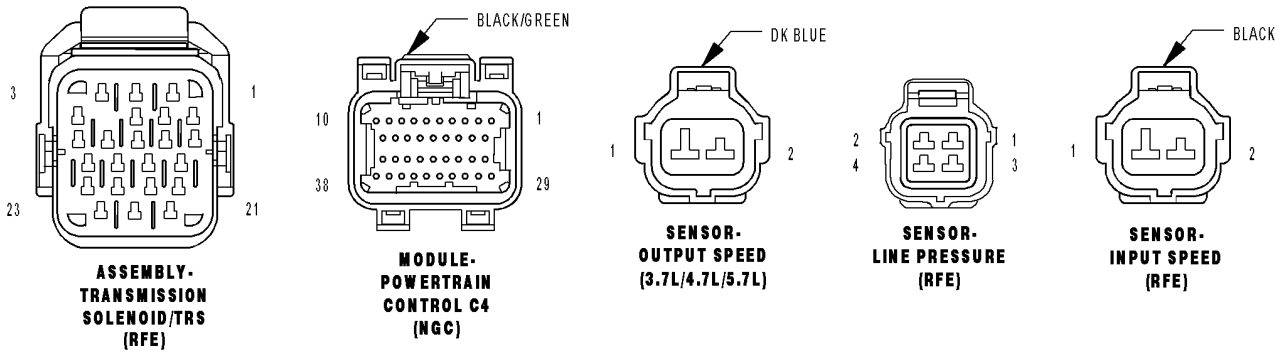
Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0869-LINE PRESSURE HIGH





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P0869-LINE PRESSURE HIGH (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously while driving in a forward gear.
- **Set Condition:**
  The PCM continuously monitors Actual Line Pressure. If the Actual Line Pressure reading is greater than the highest Desired Line Pressure ever used in the current gear, while the Pressure Control Solenoid duty cycle is at or near its maximum value (which should result in minimum line pressure), the DTC will set.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
LINE PRESSURE SENSOR CONNECTION
(T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT SHORT TO GROUND
ITRANSMISSION CONTROL RELAY OUTPUT CIRCUIT
LINE PRESSURE SENSOR
STUCK OR STICKING MAIN REGULATOR VALVE
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Line pressure is measured by the Line Pressure Sensor (LPS) and regulation is achieved by changing the duty cycle of the Pressure Control Solenoid (PCS) controlled by the Transmission Control System. (5% duty cycle = solenoid off = max line pressure, 62% duty cycle = solenoid on = min line pressure). The Transmission Control System calculates the desired line pressure based on inputs from both the engine and transmission.

The Transmission Control System calculates torque input to the transmission and uses it as the primary input to the desired line pressure calculation. This is called Torque Based Line Pressure. In addition, the line pressure is set to a preset level 827 or 931kPa (120 or 135 PSI) during shifts and in Park and Neutral to ensure consistent shift quality. The desired line pressure is continuously being compared to the actual line pressure. If the actual line pressure is consistently higher than the highest desired line pressure ever used in the current gear, the line pressure high DTC P0869 will set.

Diagnostic Test

1. CHECK FOR RELATED DTC'S

With the scan tool, check for other Transmission DTC's

Is the DTC P0932 or P0888 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0869-LINE PRESSURE HIGH (CONTINUED)

2. CONDITION P0869 PRESENT

With the scan tool, check the STARTS SINCE SET counter for P0869.

Is the STARTS SINCE SET COUNTER 2 or less?

Yes >> Go To 3

No >> Go To 10

---

3. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, engine not running.

With the scan tool, monitor the Transmission Line Pressure.

Firmly push the Line Pressure Sensor harness connector inward towards the Transmission.

Did the Line Pressure change to about 207 kPa or 30 PSI when the sensor connector was pushed?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure during the following step.

Using the Transmission Simulator, set the rotary switch to each of the 3 line pressure positions.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the Line Pressure read within ±14 kPA or 2.0 PSI in all three positions?

Yes >> Go To 5

No >> Go To 6

P0869-LINE PRESSURE HIGH (CONTINUED)

5. CHECK LINE PRESSURE SENSOR CALIBRATION

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333 and reconnect all previously disconnected connectors.

Install the Line Pressure Adaptor, Miller tool #8259, and Pressure Gauge, Miller tool #C-3293, 0 to 2000 kPa or 0 to 300 PSI.

Start the engine in park.

Monitor the Line Pressure readings on the scan tool and the pressure gauge.

Compare the Line Pressure readings between the scan tool and the pressure gauge.

Is the pressure gauge reading within 34 kPa or 5 PSI of the scan tool reading?

Yes >> Repair the internal transmission and inspect the Transmission Oil Pump per the Service Information and replace if necessary. If no problem is found, replace the Transmission Solenoid/TRS Assembly, possible cause is a stuck Pressure Control Solenoid.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Line Pressure Sensor per the Service information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

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6. (T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT OPEN

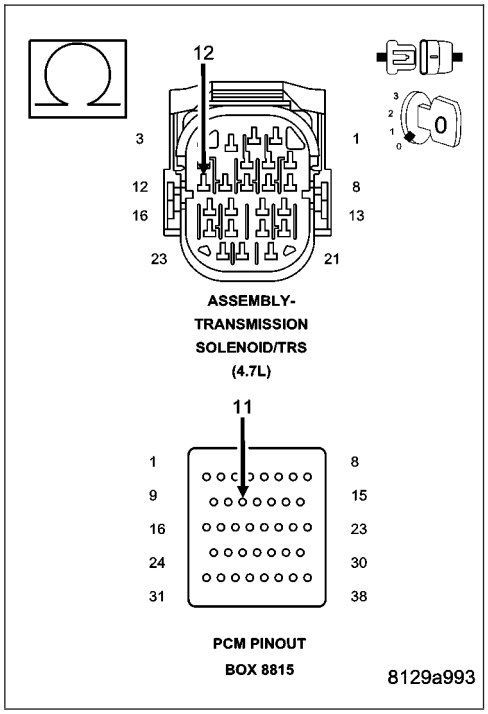
Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the Powertrain Control Module C4 harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T140) Pressure Control Solenoid Control circuit from the appropriate terminal of Miller tool #8815 to the Solenoid/TRS harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T140) Pressure Control Solenoid Control circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0869-LINE PRESSURE HIGH (CONTINUED)

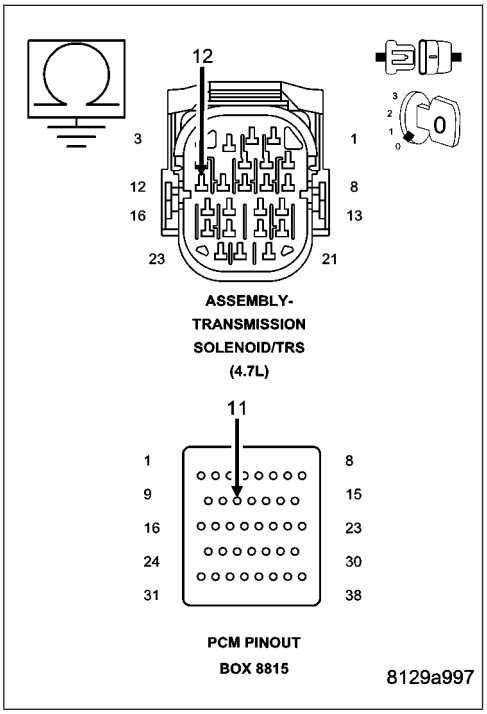
7. (T140) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T140) Pressure Control Solenoid Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T140) Pressure Control Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



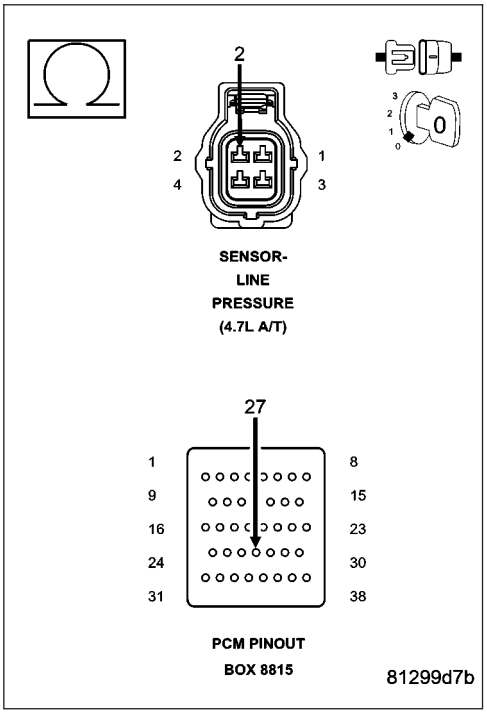
8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

Measure the resistance of the (F856) 5-volt Supply circuit between the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



P0869-LINE PRESSURE HIGH (CONTINUED)

9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Disconnect the PCM C1 harness connector.

Disconnect the Line Pressure Sensor harness connector.

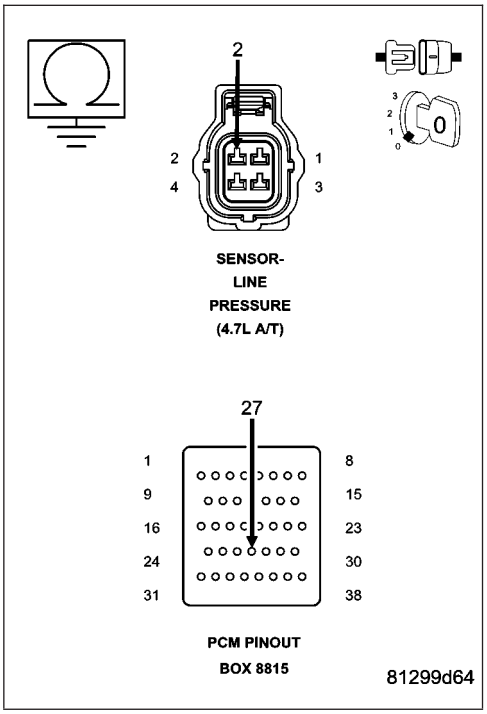
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance between ground and the (F856) 5-volt Supply circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Powertrain Control Module per the Service Information. With the scan tool perform the QUICK LEARN procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

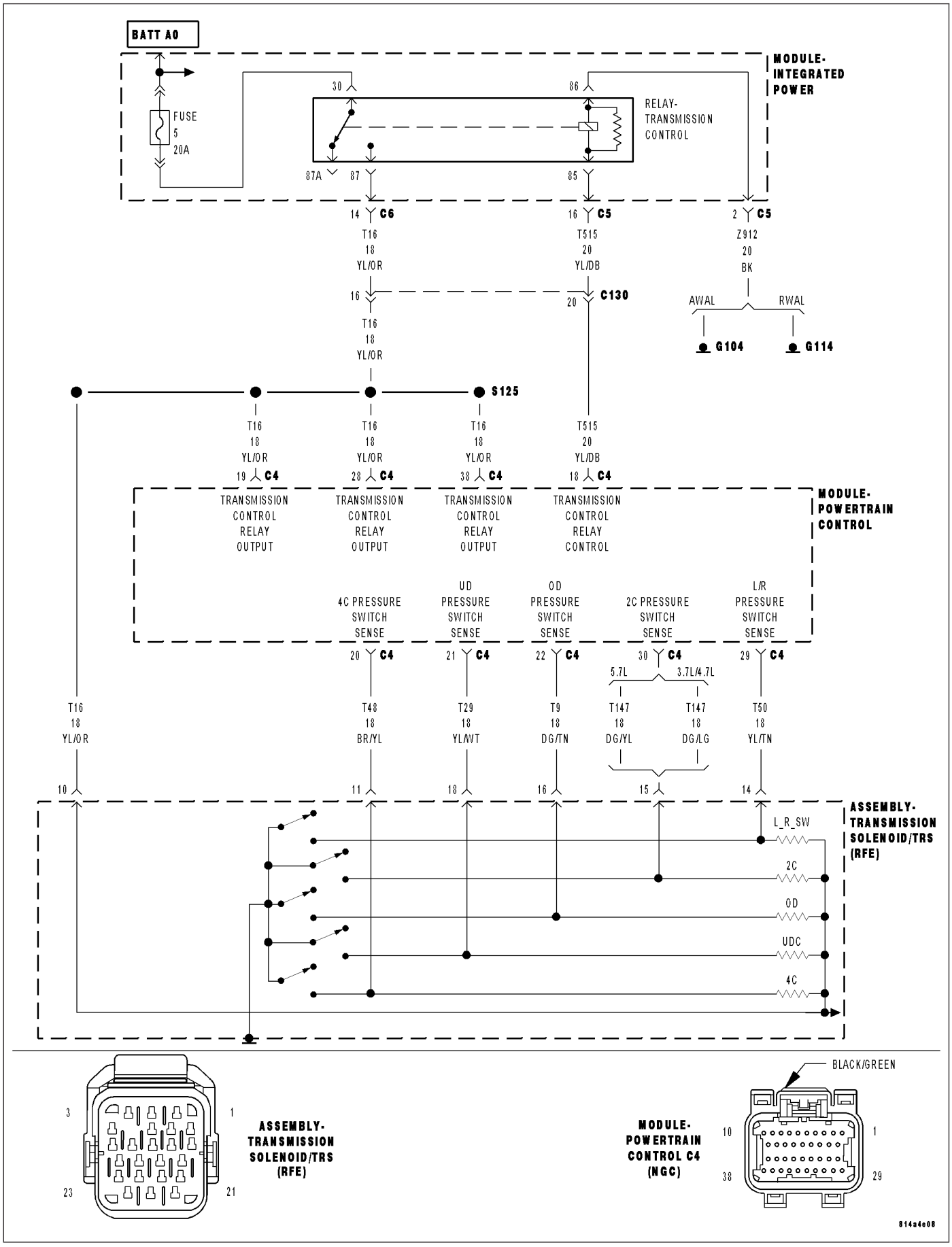
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0870-OD HYDRAULIC PRESSURE TEST



P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.
- **Set Condition:**
  After a shift into a forward gear, with engine speed above 1000 RPM, the PCM momentarily turns on element pressure to the Clutch circuits that don't have pressure to identify the correct Pressure Switch closes. If the Pressure Switch does not close 2 times, the DTC sets.

Possible Causes
LINE PRESSURE SENSOR
TRANSMISSION FLUID CONTAMINATION
RELATED DTC'S PRESENT
TRANSMISSION SOLENOID/TRS ASSEMBLY
EXCESSIVE DEBRIS IN OIL PAN
POOR LINE PRESSURE SENSOR CONNECTION
(T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY DTCS PRESENT
(T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION SOLENOID/TRS ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System tests the pressure switches when they are off. The test verifies that the switches are operational (They will close with pressure applied). The Transmission Control System verifies that the switch closes when the corresponding element is applied. If a switch fails to close, it is re-tested. If it fails the second test, the DTC will set, the MIL will illuminate and the transmission system will default to the orderly Shutdown routine.

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is there any Loss of Prime, Transmission Control Relay, and/or Line Pressure Sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If the DTC, P0944-LOSS OF PRIME is present, perform its respective test first.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. DTC P0760 PRESENT

With the scan tool, check Transmission DTCs.

Is the DTC P0760 also present?

Yes >> Refer to the symptom list and perform diagnostics for P0760–OD SOLENOID CIRCUIT.

No >> Go To 3

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3. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTC's

Are any of the DTCs, P0733, P0734 ,P0735 and/or P0871 present also?

Yes >> Go To 12

No >> Go To 4

---

4. CHECK TO SEE IF DTC P0870 IS CURRENT

With the scan tool, check the STARTS SINCE SET counter for P0870.

Is the STARTS SINCE SET COUNTER 2 or less?

Yes >> Go To 5

No >> Go To 17

---

5. LINE PRESSURE STAYS THE SAME

Start the engine.

Warm the transmission to 82° C or 180° F.

Firmly apply the brakes.

With the scan tool, monitor the Line Pressure during the following step.

Move the shift lever to each gear position, pausing momentarily in each position and record the line pressure reading. Allow the pressure to stabilize for at least 5 seconds in each range.

Did the line pressure remain at a steady value between 585 and 655 kPa or 85 and 95 PSI in each position?

Yes >> Go To 6

No >> Go To 10

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

6. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, **engine not running.**

With the scan tool, monitor the Line Pressure while firmly pushing the Transmission Line Pressure Sensor connector inwards towards the Transmission.

Did the Line Pressure reading on the scan tool change to about 207 kPa or 30 PSI when the connector was pushed inward?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

---

7. LINE PRESSURE SENSOR OPERATION

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while turning the Pressure Switch selector to each of the 3 line pressure positions on the Transmission Simulator.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the scan tool Line Pressure readings match the specified readings on the Transmission Simulator and remain steady in all three positions?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect Transmission Simulator.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

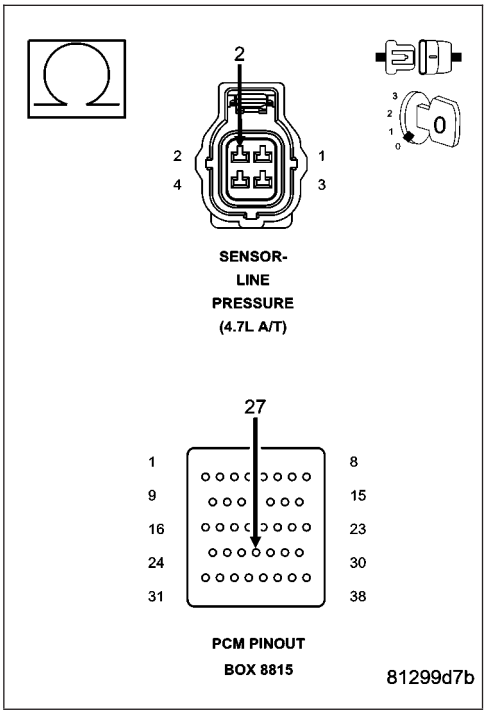
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9



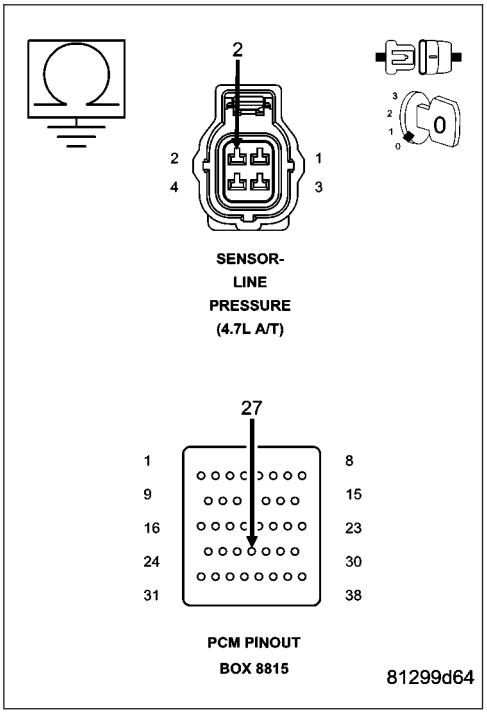
9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

10. COMPARE SCAN TOOL TO PRESSURE GAUGE

Turn the ignition off to the lock position.

Connect the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP. Refer to the Service Information for proper installation procedure.

CAUTION: Apply parking brake.

Start the engine.

In the following steps, compare the scan tool Line Pressure to the Pressure Gauge readings in each gear.

CAUTION: Do not overheat transmission.

With the gear selector in park, raise the RPM to 1500, and compare line pressure readings.

Firmly apply the brakes, move the gear selector into reverse, raise the RPM to 1500, and compare the line pressure readings.

Firmly apply the brakes, move the gear selector into drive, raise the RPM to 1500, and compare the line pressure readings.

Did the scan tool Line Pressure readings match the Pressure Gauge readings ± 10 psi?

Yes >> Go To 11

No >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

11. WIRING AND CONNECTORS

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Remove the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP.

Install the Transmission Simulator, Miller tool #8333.

On the Transmission Simulator, turn the Pressure Switch selector switch to OD.

Ignition on, engine not running.

With the scan tool, monitor the OD Pressure Switch state while pressing and holding the Pressure Switch test button and wiggling the wire harness and connectors that pertain to the OD Pressure Switch.

Did the OD Pressure Switch state change to closed and remain closed while wiggling the wires?

Yes >> Go To 12

No >> Go To 14

---

12. CHECK FOR EXCESSIVE DEBRIS

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Remove and inspect the Transmission Oil Pan per the Service Information.

Does the Transmission Oil Pan contain excessive debris or contamination?

Yes >> Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

13. CHECK OD HYDRAULIC CLUTCH CIRCUIT

Remove the Valve Body and air check the OD hydraulic clutch circuit (in the case) for leakage per the Service Information.

NOTE: The OD hydraulic clutch circuit contains a small bleed orifice which connects to the Reverse hydraulic clutch circuit. A small amount of air leakage is normal.

Was there excessive air leakage noticed during the air check?

Yes >> Repair as necessary. Check the OD/Rev clutch piston seals, bleed orifice assembly, reaction shaft support seal rings, and machining of the main mating faces on the pump housing, pump valve boday, and reaction shaft support..

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Disassemble and inspect the Valve Body and repair as necessary. Inspect the OD Accumulator piston and seals. Check for an extra check ball downstream from the #6 check ball pocket and repair as necessary. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

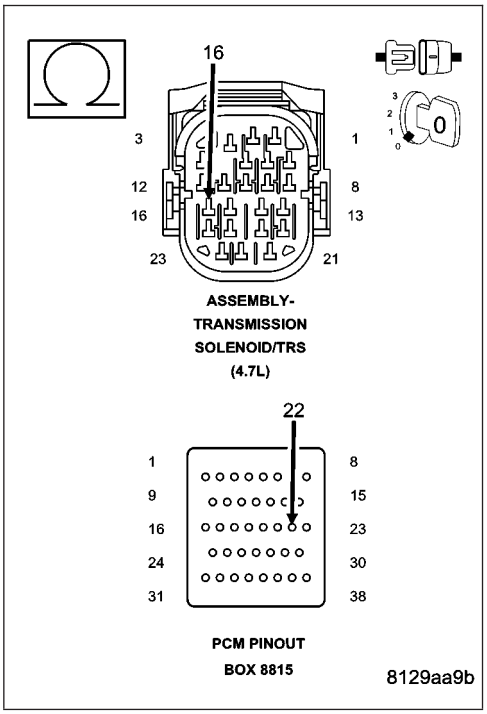
14. (T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Measure the resistance of the (T9) OD Pressure Switch Sense circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

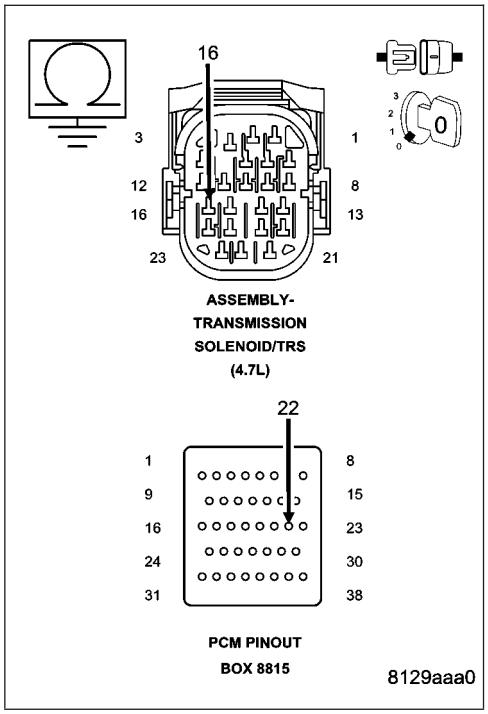
15. OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T9) OD Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16



16. OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

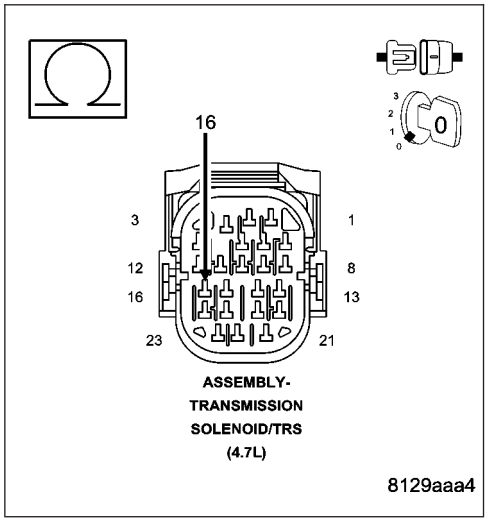
NOTE: Make sure the Transmission Solenoid/TRS Assembly harness connector is disconnected.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (T9) OD Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.

Is the resistance below 5.0 ohms between the (T9) OD Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0870-OD HYDRAULIC PRESSURE TEST (CONTINUED)

17. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

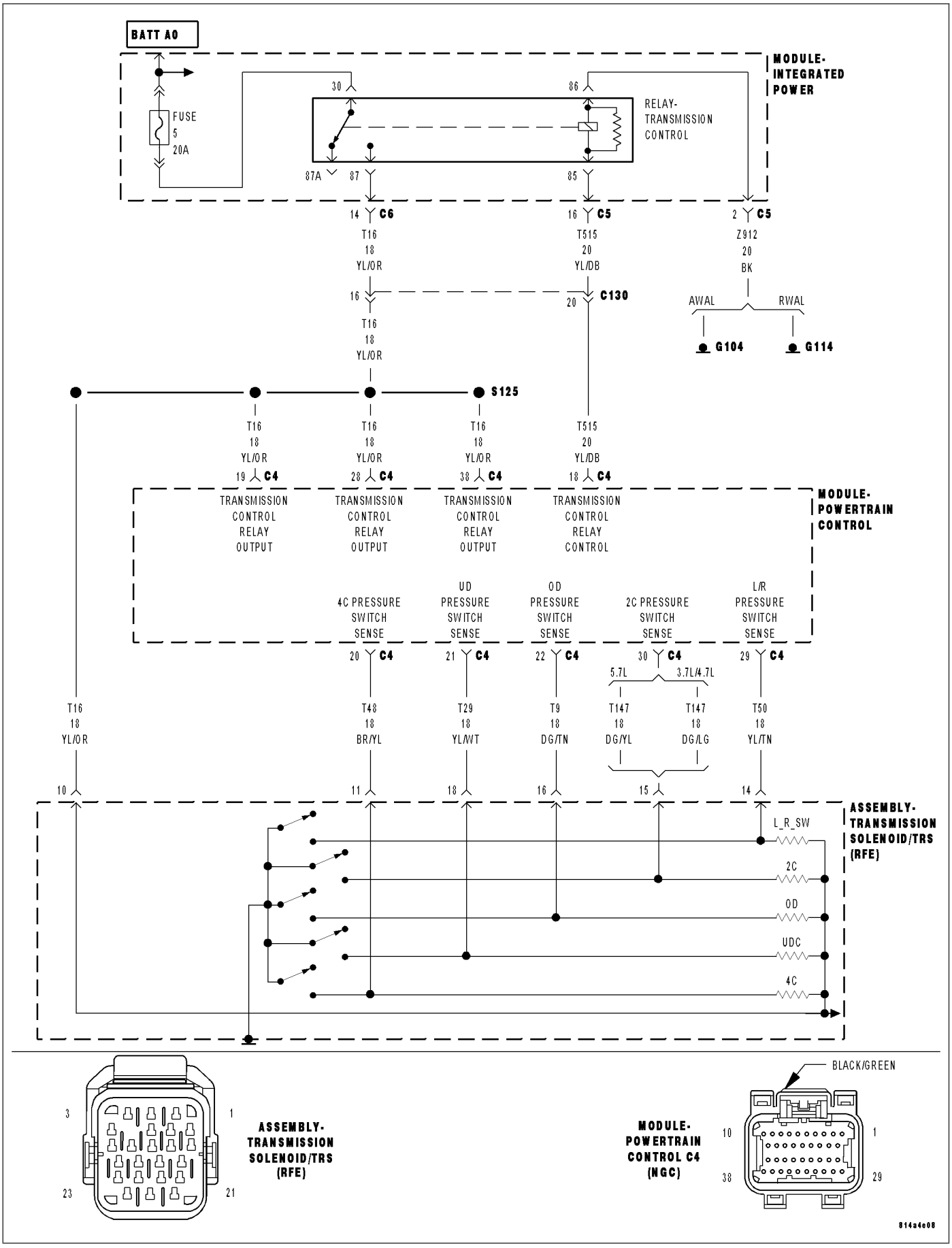
If the EATX DTC EVENT DATA shows the DTC P0870 set while the Line Pressure was significantly below the Desired Line Pressure reading, check for causes of low line pressure (low fluid level, broken or mis-installed primary oil filter or filter seal, sticking Main Regulator Valve in the Pump Valve Body etc.). If the data shows the DTC set while the Line Pressure reading was significantly higher than the Desired Line Pressure, check the Line Pressure Sensor and related wiring.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0871-OD PRESSURE SWITCH RATIONALITY



P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The appropriate DTC is set if one of the pressure switches are open or closed at the wrong time in a given gear.

Possible Causes
RELATED RELAY DTC'S PRESENT
LINE PRESSURE DTCS PRESENT
NO. 4 OR 6 CHECK BALL CUT OR DAMAGED
(T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS
LOW LINE PRESSURE
WIRING AND CONNECTORS
CUT OD/REV PISTON SEAL
BROKEN OR MISSING DO/REV PISTON BLEED ORIFICE
BROKEN REACTION SHAFT SUPPORT SEAL RING
POOR MACHINING ON PUMP VALVE BODY FACE
BROKEN OR MISSING DRIBBLER ORIFICE ASSEMBLY IN REACTION SHAFT SUPPORT
TRANSMISSION SOLENOID/TRS ASSEMBLY
CUT OD ACCUMULATOR PISTON SEAL
CRACKED OD ACCUMULATOR PISTON
BROKEN OR MISSING OD BLEED ORIFICE IN MAIN VALVE BODY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

Theory of Operation

The Transmission system uses five pressure switches to monitor the fluid pressure in the LR, 2C, 4C, UD, and OD clutch circuits. The pressure switches are continuously monitored for the correct states in each gear as shown.

GEAR	L/R	2C	4C	UD	OD
REVERSE	OPEN	OPEN	OPEN	OPEN	OPEN
P/N	CLOSED**	OPEN	OPEN	OPEN	OPEN
1ST	CLOSED*	OPEN	OPEN	CLOSED	OPEN
2ND	OPEN	CLOSED	OPEN	CLOSED	OPEN
2ND PRIME	OPEN	OPEN	CLOSED	CLOSED	OPEN
3RD	OPEN	OPEN	OPEN	CLOSED	CLOSED
4TH	OPEN	OPEN	CLOSED	OPEN	CLOSED
5TH	OPEN	CLOSED	OPEN	OPEN	CLOSED

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is closed in Manual 1.

**May be open when rolling in Neutral or at low oil temperatures.

Diagnostic Test

1. DETERMINING IF RELATED RELAY DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay related DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. LINE PRESSURE DTCS PRESENT

With the scan tool, read Transmission DTCs.

Are there any Line Pressure DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. CHECK FOR OTHER PRESSURE SWITCH DTCS

With the scan tool, check Transmission DTCs.

Are there two or more other pressure switch rationality DTCs present in addition to P0871?

Yes >> Go To 5

No >> Go To 4

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

4. CHECK IF DTC IS CURRENT

With the scan tool, check and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show data for P0871

Yes >> Go To 8

No >> Refer to the Transmission Category and perform the appropriate symptom.

---

5. RELATED DTC PRESENT

With the scan tool, check and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Do all the pressure switches read CLOSED in the EATX DTC EVENT DATA?

Yes >> Refer to the Transmission category and perform diagnostics for P0888. Follow instructions as if the DTC is current.

No >> Go To 6

---

6. CHECK IF PRESSURE SWITCHES READ OPEN

In the EATX DTC EVENT DATA recorded earlier, read the state of all pressure switches.

Do all the pressure switches read open?

Yes >> Go To 7

No >> Go To 8

---

7. CHECK FOR LOW LINE PRESSURE

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure to the Desired Line Pressure.

Is the Line Pressure less than 40 PSI, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter weal for a spit, crack , or improperly installed. If the filer and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

8. CHECK IF IN PARK, NEUTRAL, OR REVERSE

Ignition on, engine not running.

With the scan tool, read and record the EATX DTC EVENT DATA for P0871.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the OD Pressure Switch DTC set while in Park, Neutral, or Reverse?

Yes >> Go To 18

No >> Go To 9

---

9. OD PRESSURE SWITCH OPEN

Refer to the EATX DTC EVENT DATA recorded earlier for P0871.

Did the OD Pressure Switch read OPEN?

Yes >> Go To 10

No >> Go To 15

---

10. LOW LINE PRESSURE

Refer to the EATX DTC EVENT DATA recorded earlier and compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check the fluid level. Check the Primary Oil Filter seal for a split, crack, or improperly installed. Refer to the Service Information for the proper installation procedure. If the fluid level and filter are OK, check the Main Regulator Valve in the Oil Pump.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 11

---

11. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

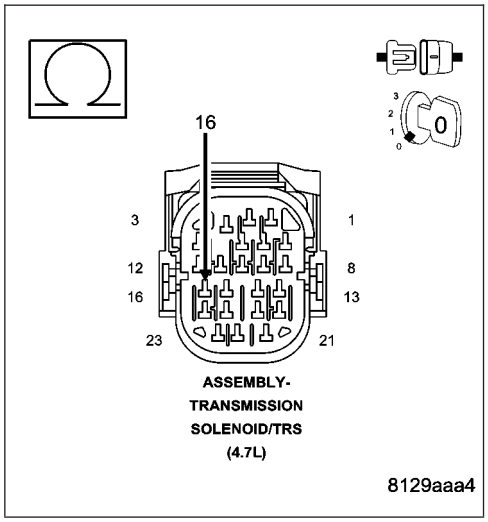
Turn the ignition off to the lock position.

Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (T9) OD Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T9) OD Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to other circuit(s).

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 12

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

12. CHECK TO SEE IF DTC RESETS

Reconnect all previously disconnected connectors.

With the scan too, erase transmission DTCs.

Test drive the vehicle, use the EATX DTC EVENT DATA recored earlier to help duplicate the conditions when the DTC originality set.

Does the DTC P0871 reset?

Yes >> Go To 13

No >> Go To 22

---

13. POWERTRAIN CONTROL MODULE

Remove the Transmission Control Relay.

Operate the vehicle in Drive.

Is the transmission slipping while in Drive?

Yes >> Go To 14

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

14. INTERNAL TRANSMISSION

Perform an Air Check Transmission Clutch Operation procedure per the Service Information.

NOTE: The OD/Rev piston contains a small bleed orifice, a small amount of leakage between the OD and Reverse hydraulic clutch circuits is considered normal.

Is there excessive air leakage in any clutch circuit?

Yes >> Check the OD/Rev piston seals and bleed orifice, reaction shaft support seal rings, dribbler orifice assemblies in the reaction shaft support and for poor machine on the pump valve body faces. Refer to the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair the Valve Body. Check the OD Accumulator piston and seals, OD bleed orifice, and No.6 check ball cuts or damage. If no problems are found in the Valve Body, replace the Transmission Solenoid/ TRS Assembly. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

15. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to OD.

With the scan tool, monitor the OD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the state of the OD Pressure Switch change from OPEN to CLOSED while pressing the Test button?

Yes >> Go To 16

No >> Go To 18

---

16. NO. 4 AND/OR NO. 6 CHECK BALL CUT OR DAMAGED

With the scan tool, erase previously stored DTC's and test drive the vehicle, use the EATX DTC EVENT DATA to help duplicate the conditions when the DTC originality set. Note any DTCs that may set.

Remove the Transmission Valve Body per the Service Information.

Check the No. 4 and No. 6 Check Balls for cuts or damage.

Is the No. 4 and/or No. 6 Check Ball cut or damaged?

Yes >> Replace the No. 4 and/or No. 6 Check Ball and check for clutch debris in the transmission oil pan. If there is excessive debris, perform internal repairs to the OD Clutch Assembly. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 17

---

17. TRANSMISSION SOLENOID/TRS ASSEMBLY

Did the DTC P0871 reset during the test drive in the previous step?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 22

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

18. (T9) OD PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

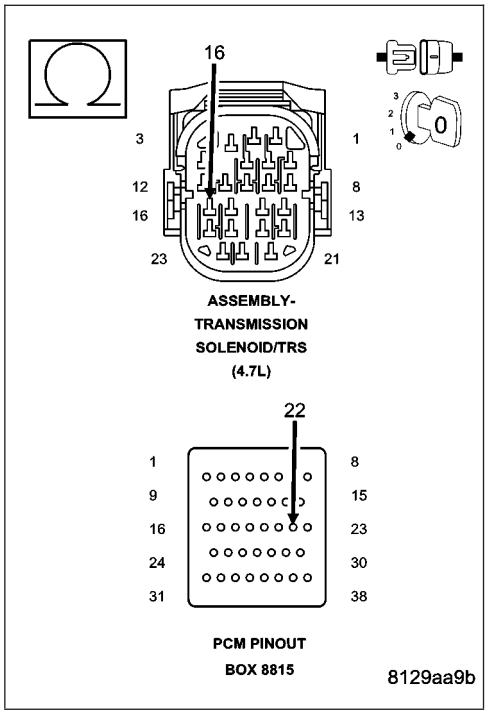
Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Disconnect the Transmission Solenoid /TRS Assembly harness connector

NOTE: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T9) OD Pressure Switch Sense circuit from the appropriate terminal of Miller tool #8815 to the Solenoid/TRS Assembly harness connector.



Is the resistance above 5.0 ohms?

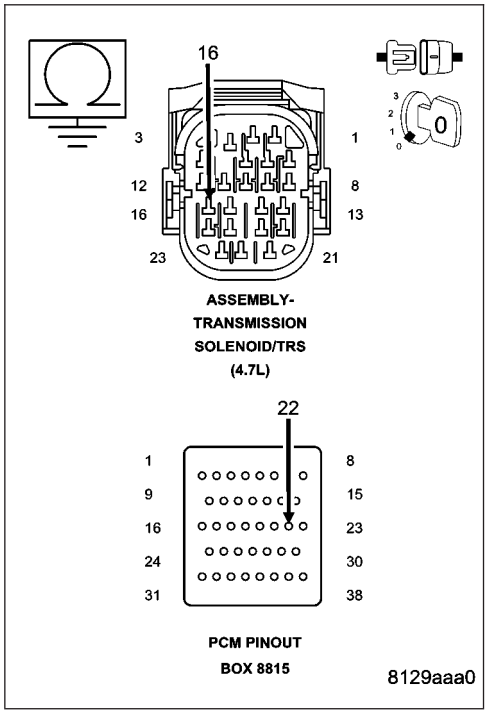
Yes >> Repair the (T9) OD Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 19

19. (T9) OD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T9) OD Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T9) OD Pressure Switch Sense circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 20

P0871-OD PRESSURE SWITCH RATIONALITY (CONTINUED)

20. WIRING AND CONNECTORS

Using the schematics as a guide, inspect the wiring and connectors. Pay particular attention to all power and ground circuits.

Were there any problems found

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 21

---

21. POWERTRAIN CONTROL MODULE

Reconnect all previously disconnected connectors.

Make sure all EATX DTC EVENT DATA is recorded.

With the scan tool, erase previously stored DTC's and test drive the vehicle, use the EATX DTC EVENT DATA to help duplicate the conditions when the DTC originality set.

Does the DTC P0871 reset?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 22

---

22. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

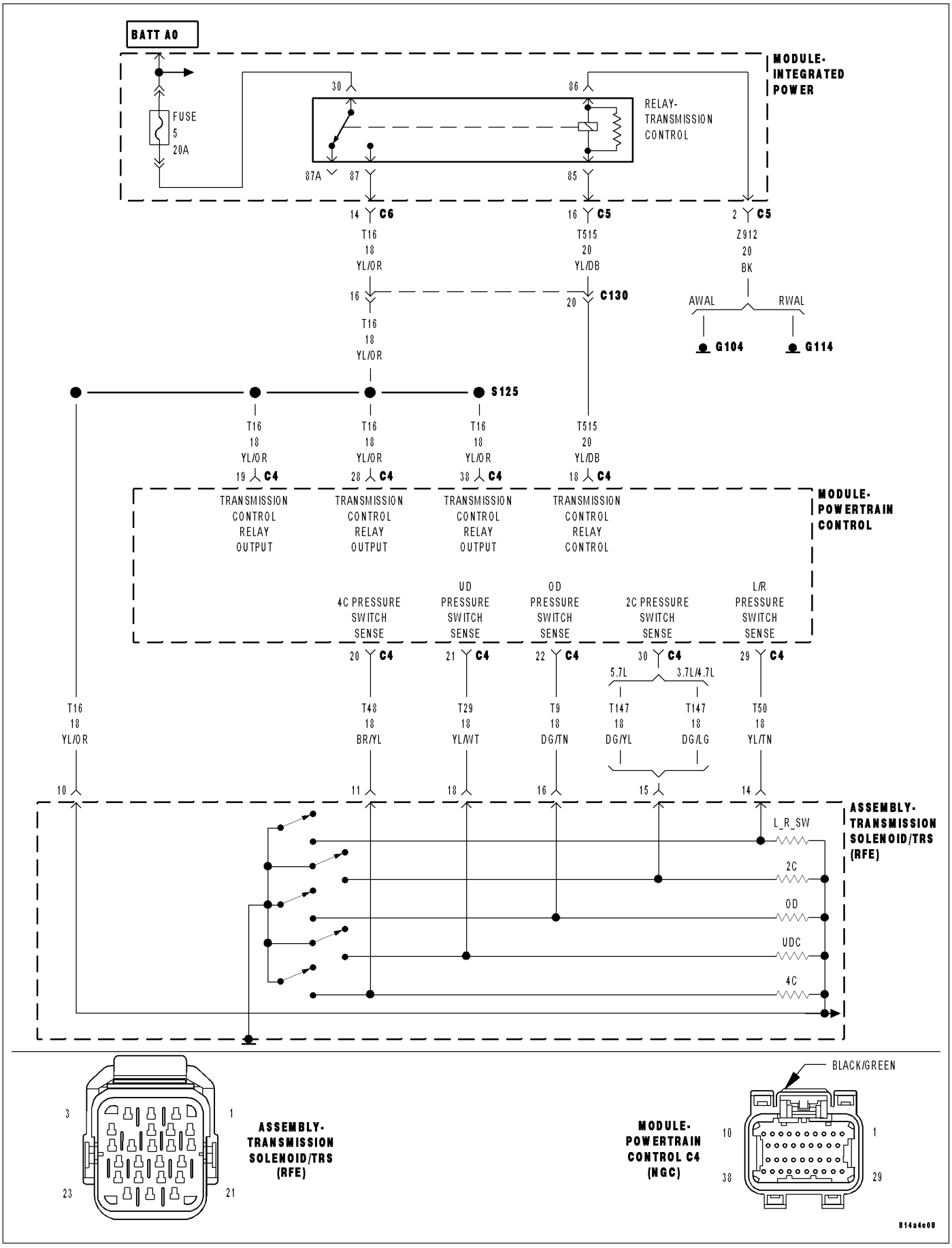
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0875-UD HYDRAULIC PRESSURE TEST



P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.
- **Set Condition:**
  After a shift into a forward gear, with engine speed above 1000 RPM, the PCM momentarily turns on element pressure to the Clutch circuits that don't have pressure to identify the correct Pressure Switch closes. If the Pressure Switch does not close 2 times, the DTC sets.

Possible Causes
LINE PRESSURE SENSOR
TRANSMISSION FLUID CONTAMINATION
RELATED DTC'S PRESENT
TRANSMISSION SOLENOID/TRS ASSEMBLY
EXCESSIVE DEBRIS IN OIL PAN
POOR LINE PRESSURE SENSOR CONNECTION
(T29) UD PRESSURE SWITCH SENSE CIRCUIT OPEN
TRANSMISSION CONTROL RELAY DTCS PRESENT
(T29) UD PRESSURE SWITCH SENSE CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System tests the pressure switches when they are off. The test verifies that the switches are operational (They will close with pressure applied). The Transmission Control System verifies that the switch closes when the corresponding element is applied. If a switch fails to close, it is re-tested. If it fails the second test, the DTC will set, the MIL will illuminate and the transmission system will default to the orderly Shutdown routine.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is there any Loss of Prime, Transmission Control Relay, and/or Line Pressure Sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If the DTC, P0944-LOSS OF PRIME is present, perform its respective test first.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

2. DTC P0765 PRESENT

With the scan tool, check Transmission DTCs.

Is the DTC P0765 also present?

Yes >> Refer to the symptom list and perform diagnostics for P0765–UD SOLENOID CIRCUIT.

No >> Go To 3

---

3. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTC's

Are any of the DTCs, P0731, P0732, P0733, P0876, and/or P1736 present also?

Yes >> Go To 12

No >> Go To 4

---

4. CHECK TO SEE IF DTC P0875 IS CURRENT

With the scan tool, check the STARTS SINCE SET counter for P0875.

Is the STARTS SINCE SET COUNTER 2 or less?

Yes >> Go To 5

No >> Go To 17

---

5. LINE PRESSURE STAYS THE SAME

Start the engine.

Warm the transmission to 82° C or 180° F.

Firmly apply the brakes.

With the scan tool, monitor the Line Pressure during the following step.

Move the shift lever to each gear position, pausing momentarily in each position and record the line pressure reading. Allow the pressure to stabilize for at least 5 seconds in each range.

Did the line pressure remain at a steady value between 585 and 655 kPa or 85 and 95 PSI in each position?

Yes >> Go To 6

No >> Go To 10

---

6. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, **engine not running.**

With the scan tool, monitor the Line Pressure while firmly pushing the Transmission Line Pressure Sensor connector inwards towards the Transmission.

Did the Line Pressure reading on the scan tool change to about 207 kPa or 30 PSI when the connector was pushed inward?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

7. LINE PRESSURE SENSOR OPERATION

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while turning the Pressure Switch selector to each of the 3 line pressure positions on the Transmission Simulator.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the scan tool Line Pressure readings match the specified readings on the Transmission Simulator and remain steady in all three positions?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

---

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

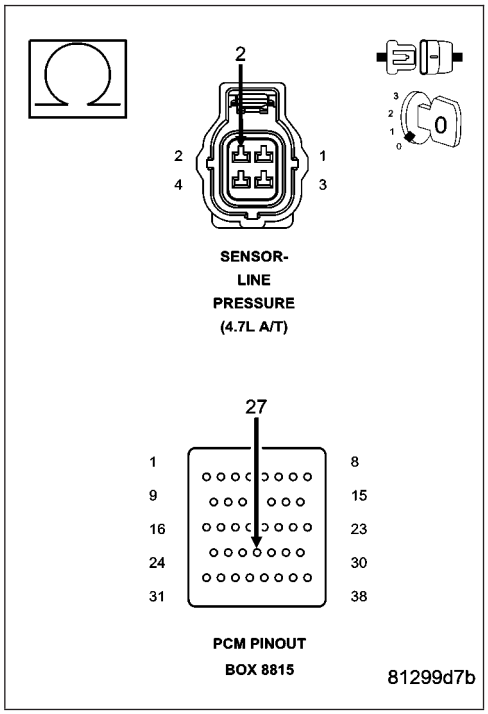
Turn the ignition off to the lock position.

Disconnect Transmission Simulator.

Disconnect the PCM C1 harness connector and connect Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.



Is the resistance above 5.0 ohms?

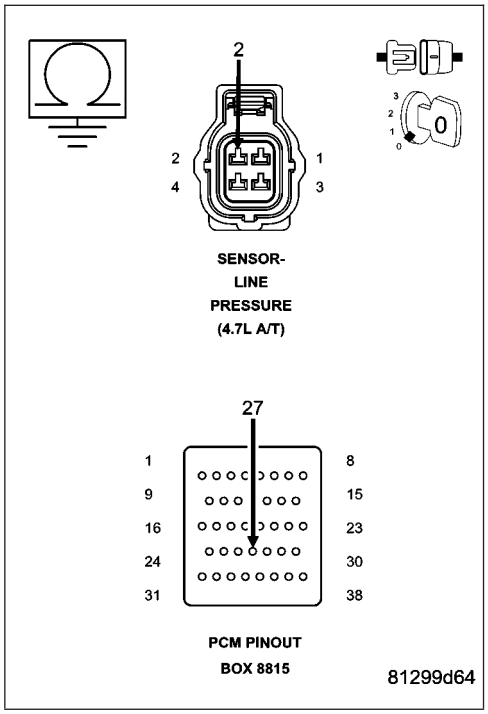
Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

10. COMPARE SCAN TOOL TO PRESSURE GAUGE

Turn the ignition off to the lock position.

Connect the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP. Refer to the Service Information for proper installation procedure.

CAUTION: Apply parking brake.

Start the engine.

In the following steps, compare the scan tool Line Pressure to the Pressure Gauge readings in each gear.

CAUTION: Do not overheat transmission.

With the gear selector in park, raise the RPM to 1500, and compare line pressure readings.

Firmly apply the brakes, move the gear selector into reverse, raise the RPM to 1500, and compare the line pressure readings.

Firmly apply the brakes, move the gear selector into drive, raise the RPM to 1500, and compare the line pressure readings.

Did the scan tool Line Pressure readings match the Pressure Gauge readings ± 10 psi?

Yes >> Go To 11

No >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

11. WIRING AND CONNECTORS

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Remove the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP.

Install the Transmission Simulator, Miller tool #8333.

On the Transmission Simulator, turn the Pressure Switch selector switch to UD.

Ignition on, engine not running.

With the scan tool, monitor the UD Pressure Switch state while pressing and holding the Pressure Switch test button and wiggling the wire harness and connectors that pertain to the UD Pressure Switch.

Did the UD Pressure Switch state change to closed and remain closed while wiggling the wires?

Yes >> Go To 12

No >> Go To 14

---

12. CHECK FOR EXCESSIVE DEBRIS

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Remove and inspect the Transmission Oil Pan per the Service Information.

Does the Transmission Oil Pan contain excessive debris or contamination?

Yes >> Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

---

13. CHECK UD HYDRAULIC CLUTCH CIRCUIT

Remove the Valve Body and air check the UD hydraulic clutch circuit (in the case) for leakage per the Service Information.

NOTE: The UD hydraulic clutch circuit contains a small bleed orifice. A small amount of air leakage is normal.

Was there excessive air leakage noticed during the air check?

Yes >> Repair as necessary. Check the UD clutch piston, piston seals and bleed orifice, reaction shaft wupport seal rings, and machining of the main mationg faces of the pump housing, pump valve boday, and reaction shaft support.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Disassemble and inspect the Valve Body and repair as necessary. Inspect the UD Accumulator piston and seals. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

14. (T29) UD PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

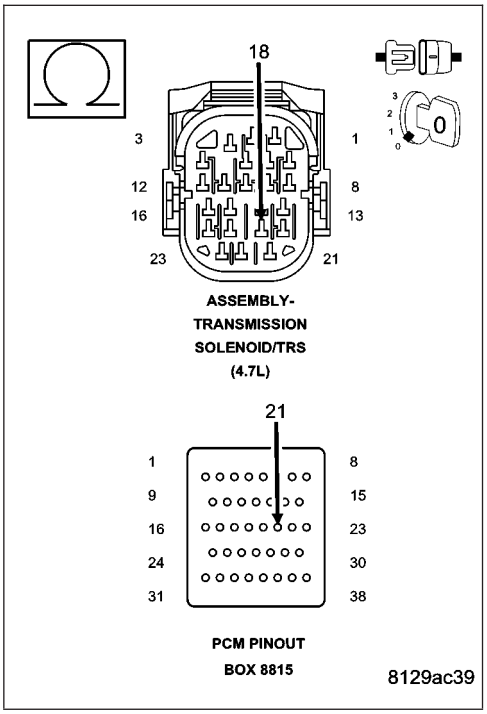
Measure the resistance of the (T29) UD Pressure Switch Sense circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15



15. (T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

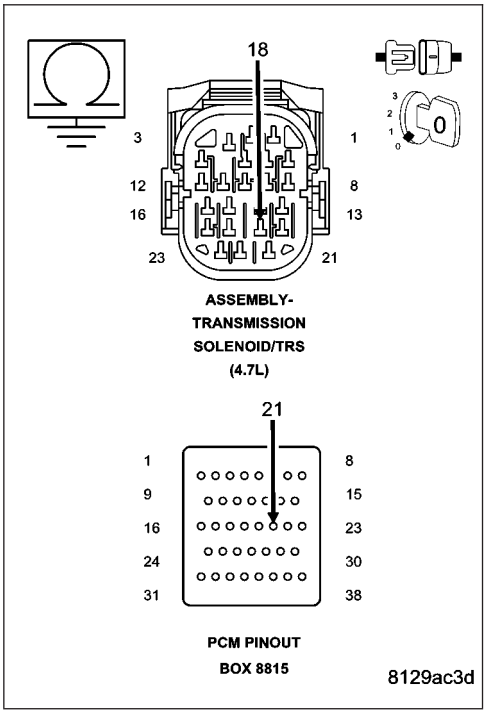
Measure the resistance between ground and the (T29) UD Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16



P0875-UD HYDRAULIC PRESSURE TEST (CONTINUED)

16. (T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

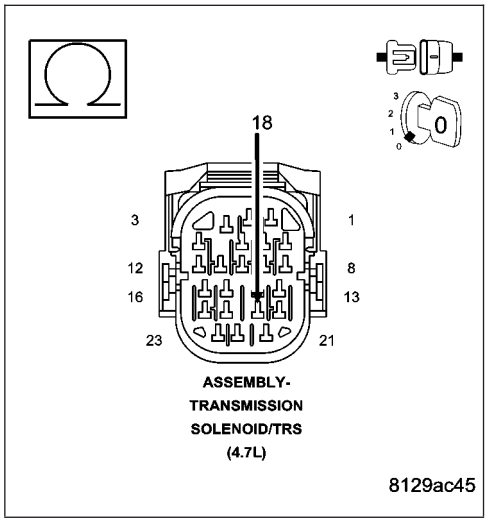
Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

NOTE: Make sure the Transmission Solenoid/TRS Assembly harness connector is disconnected.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (T29) UD Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T29) UD Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

17. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

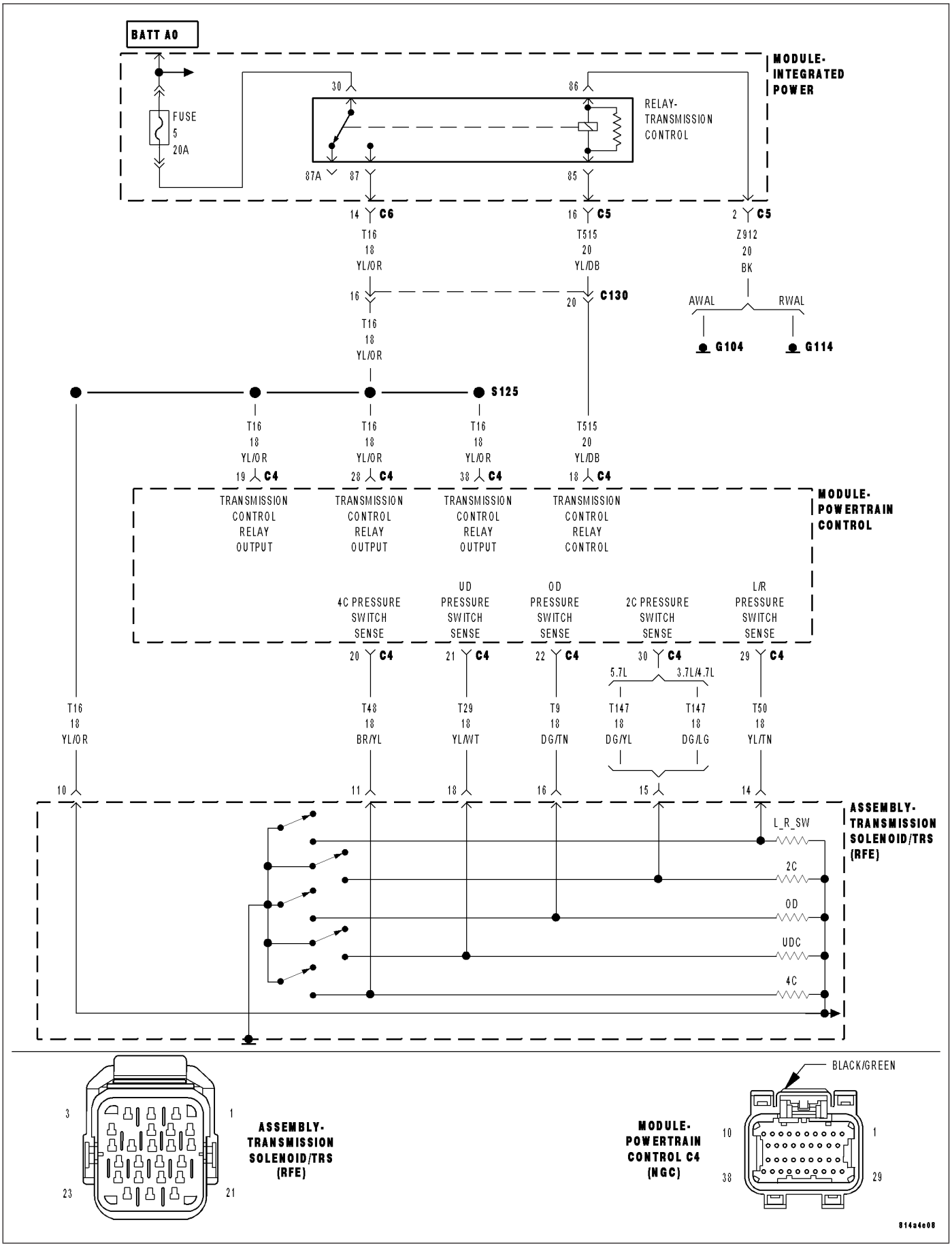
If the EATX DTC EVENT DATA shows the DTC P0875 set while the Line Pressure was significantly below the Desired Line Pressure reading, check for causes of low line pressure (low fluid level, broken or mis-installed primary oil filter or filter seal, sticking Main Regulator Valve in the Pump Valve Body etc.). If the data shows the DTC set while the Line Pressure reading was significantly higher than the Desired Line Pressure, check the Line Pressure Sensor and related wiring.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0876-UD PRESSURE SWITCH RATIONALITY



P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC is set if the UD pressure switch is in the wrong state for the current gear. For example, this code would be set if the UD pressure switch remained off while the transmission was in second gear.

Possible Causes
RELATED RELAY DTC'S PRESENT
LOW FLUID LEVEL
NO. 2 CHECK BALL CUT OR DAMAGED
LOW LINE PRESSURE
CRACKED OR MISINSTALLED SUMP FILTER OR SEAL
STICKING MAIN REGULATOR VALVE IN PUMP VALVE BODY
(T29) UD PRESSURE SWITCH SENSE CIRCUIT OPEN
(T29) UD PRESSURE SWITCH CIRCUIT SHORT TO GROUND
(T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO ANOTHER CIRCUITS
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission system uses five pressure switches to monitor the fluid pressure in the LR, 2C, 4C, UD, and OD clutch circuits. The pressure switches are continuously monitored for the correct states in each gear as shown.

GEAR	L/R	2C	4C	UD	OD
REVERSE	OPEN	OPEN	OPEN	OPEN	OPEN
P/N	CLOSED**	OPEN	OPEN	OPEN	OPEN
1ST	CLOSED*	OPEN	OPEN	CLOSED	OPEN
2ND	OPEN	CLOSED	OPEN	CLOSED	OPEN
2ND PRIME	OPEN	OPEN	CLOSED	CLOSED	OPEN
3RD	OPEN	OPEN	OPEN	CLOSED	CLOSED
4TH	OPEN	OPEN	CLOSED	OPEN	CLOSED
5TH	OPEN	CLOSED	OPEN	OPEN	CLOSED

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is closed in Manual 1.

**May be open when rolling in Neutral or at low oil temperatures.

P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

Diagnostic Test

1. CHECK IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay, Line Pressure, and/or Loss of Prime DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If a Loss of Prime DTC is present, perform its respective test first.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK FOR PRESSURE SWITCH DTCS

Are there two or more other pressure switch rationality DTC's present in addition to P0876?

Yes >> Go To 3

No >> Go To 4

---

3. CHECK IF ALL PRESSURE SWITCHES READ CLOSED

With the scan tool, read and record all EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show all pressure switches reading CLOSED?

Yes >> Refer to the symptom category and perform diagnostics for P0888. Diagnose the symptom as if the DTC is current.

No >> Go To 4

---

4. CHECK FOR OTHER DTCS

With the scan tool, check for other transmission DTC's.

Is the DTC P2704 present also?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. CHECK EATX DTC EVENT DATA

With the scan tool, read and record the DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the DTC EVENT DATA display information for the DTC P0876?

Yes >> Go To 6

No >> Refer to the symptom list and perform diagnostics for the DTC listed in the EATX DTC EVENT DATA.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

6. CHECK IF DTC EVENT DATA WAS SET IN PARK, NEUTRAL OR REVERSE

Refer to the DTC EVENT DATA recorded earlier.

Did the DTC P0876 set in Park, Neutral, or Reverse?

Yes >> Go To 10

No >> Go To 7

---

7. CHECK FOR UD PRESSURE SWITCH STATUS

Refer to the DTC EVENT DATA recorded earlier.

Did the DTC P0876 set with the UD Pressure Switch closed?

Yes >> Go To 10

No >> Go To 8

---

8. CHECK LINE PRESSURE

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 PSI, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter seal for a split, crack, or improperly installed. If the filter and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

---

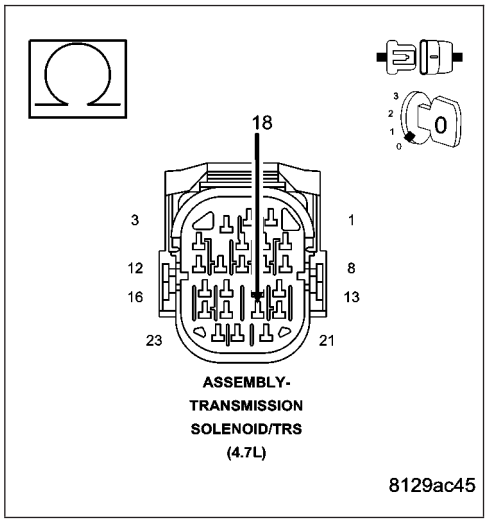
9. (T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

Measure the resistance between the (T29) UD Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T29) UD Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for a short to other circuit(s).

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

10. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to the UD position.

With the scan tool, monitor the UD Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the state of the UD Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Go To 14

No >> Go To 11

---

11. (T29) UD PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

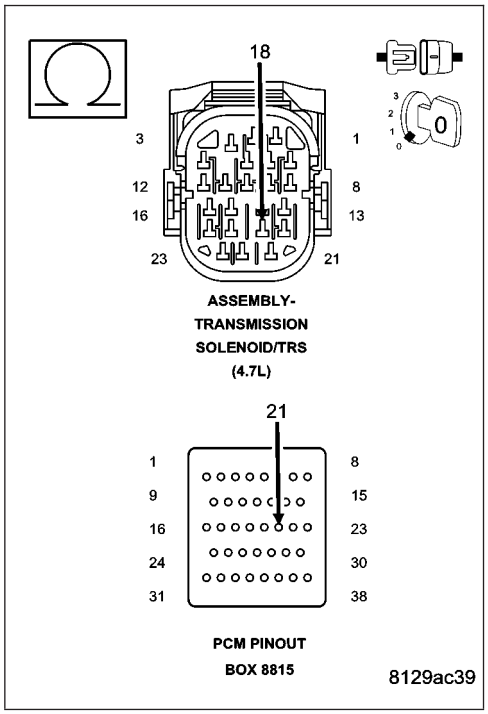
Measure the resistance of the (T29) UD Pressure Switch Sense circuit from the Transmission Solenoid/TRS Assembly harness connector and the appropriate terminal of the special tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 12



P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

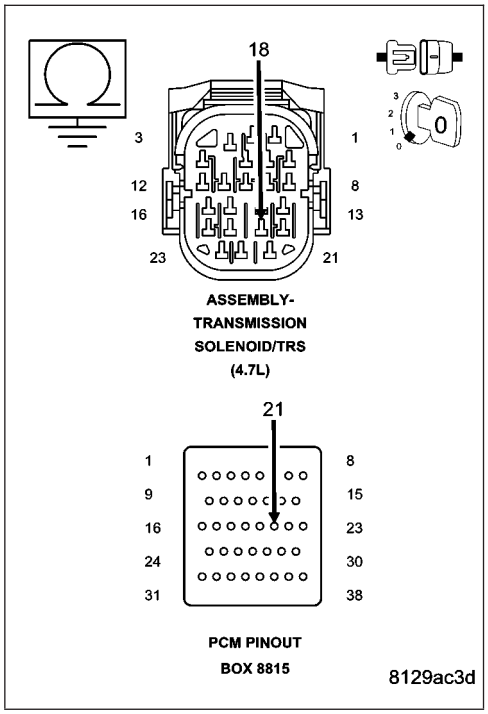
12. (T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T29) UD Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13



13. (T29) UD PRESSURE SWITCH SENSE CIRCUIT SHORT TO ANOTHER CIRCUIT

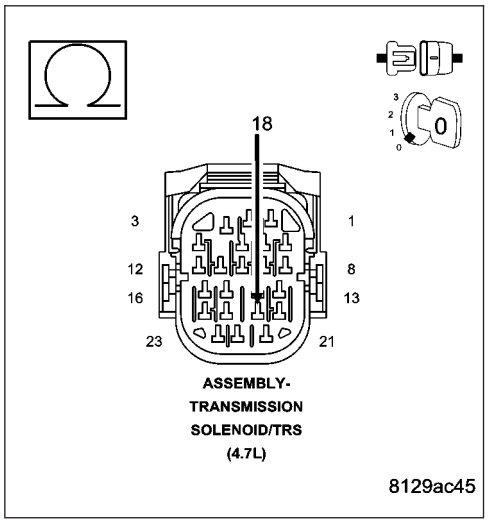
Disconnect all PCM harness connectors.

NOTE: Make sure the Transmission Solenoid/TRS Assembly harness connector is disconnected.
Measure the resistance between the (T29) UD Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.

Is the resistance below 5.0 ohms between the (T29) UD Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T29) UD Pressure Switch Sense circuit for a short to another circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

14. WIGGLE TEST WITH SIMULATOR

Perform the steps in the previous test while wiggling the wiring harness and connectors pertaining to the UD Pressure Switch.

Did the state of the UD Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Repair the wiring harness and/or connectors as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15

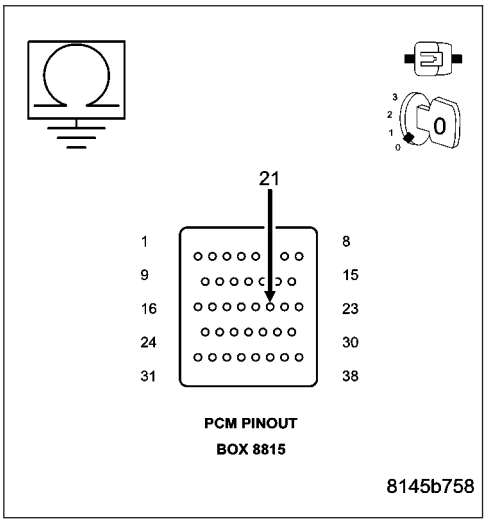
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15. CHECK FOR TRANSMISSION SOLENOID/TRS ASSEMBLY FOR A SHORT TO GROUND

Disconnect the Transmission Simulator and reconnect the Transmission Solenoid/TRS Assembly harness connector.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Measure the resistance between ground and the (T29) UD Pressure Switch Sense circuit in the appropriate terminal of Miller tool #8815.



Is the resistance below 5.0 ohms?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16

---

16. CHECK IF DTC RESETS

Reconnect all previously disconnected connectors.

With the scan tool, erase all transmission DTCs.

Test drive the vehicle. Using the EATX DTC EVENT DATA recorded earlier, try to duplicate the conditions in which the DTC originally set.

Does the DTC P0876 reset?

Yes >> Go To 17

No >> Go To 18

P0876-UD PRESSURE SWITCH RATIONALITY (CONTINUED)

17. CHECK FOR CUT NO. 2 CHECK BALL

Remove the Valve Body per the Service Information.

Check the No. 2 check ball for cuts or damage.

Is the No. 2 check ball cut or damaged?

Yes >> Replace the No. 2 check ball. Check for excessive clutch debris in the oil pan. If excessive debris is present, check the UD Clutch and repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information. Check for excessive clutch debris in the oil pan. If excessive debris is present, check the UD Clutch and repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

18. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

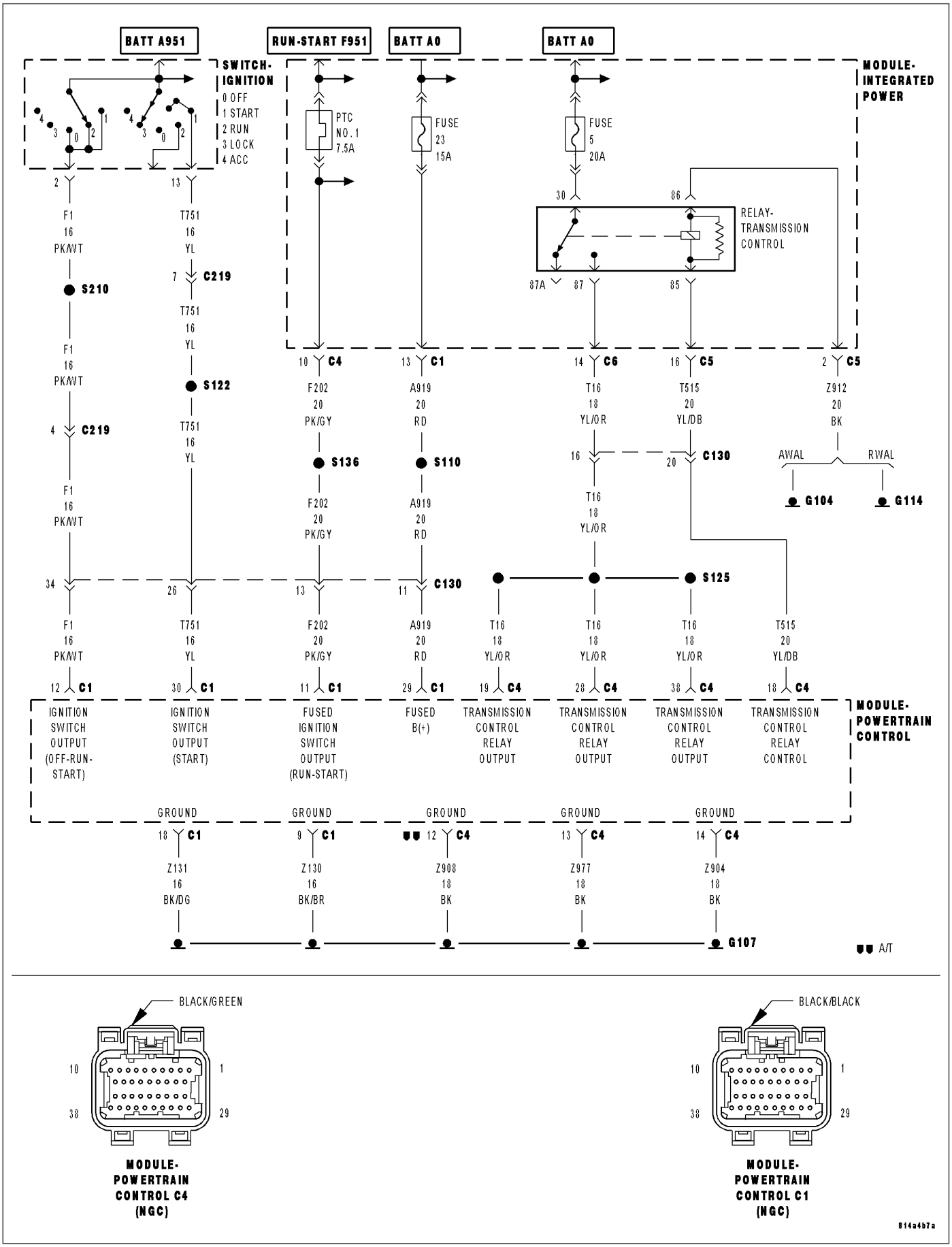
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0884-POWER UP AT SPEED



MODULE-POWERTRAIN CONTROL C4 (NGC)

MODULE-POWERTRAIN CONTROL C1 (NGC)

814a4b7a

P0884-POWER UP AT SPEED (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When Powertrain Control Module initially powers up. Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has its own specific power and ground circuits.
- **Set Condition:**
  This DTC will set if the PCM powers up and senses the vehicle in a valid forward gear, with no PRNDL DTCs, and an output speed above 800 RPM, approximately 32Km/h or 20 MPH.

Possible Causes
POWER UP AT SPEED

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

If a vehicle loses power to the Transmission Control System, the solenoids (LR, 2C, OD, UD, 4C) will go to their respective power off state. Some solenoids are normally vented and some are normally applied in their power off state. The transmission is designed to be in 3rd gear with all of the solenoids in this state. However, if power is restored, the Transmission Control System will power-up and normal operation will be restored.

This code identifies that power to the Transmission Control System was restored when the gear selector was in a ″Drive″ position while the vehicle was moving at speeds above 32 km/h (20 MPH). **This DTC does not indicate a problem with the transmission or Transmission Control System,** instead, it suggests intermittent problems in the fused ignition switch output, fused B(+), or ground circuits to the TCM. Alternately, if a person performs a rolling restart maneuver, the DTC can be set. Therefore it is critical that this DTC be investigated if the vehicle is experiencing intermittent 3rd gear operation and a subsequent return to normal operation.

Diagnostic Test

1. CHECK FOR INTERMITTENT POWER AND GROUND CIRCUITS

This DTC is set when the Transmission portion of the Powertrain Control Module is initialized while the vehicle is moving down the road in a valid forward gear.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

NOTE: Due to the integration of the Powertrain and Transmission Control Modules, the transmission part of the PCM has its own specific power and ground circuits.

Check all of the Fused B+, Fused Ignition Switch Output, and ground circuits to the PCM for an intermittent open or short to ground.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

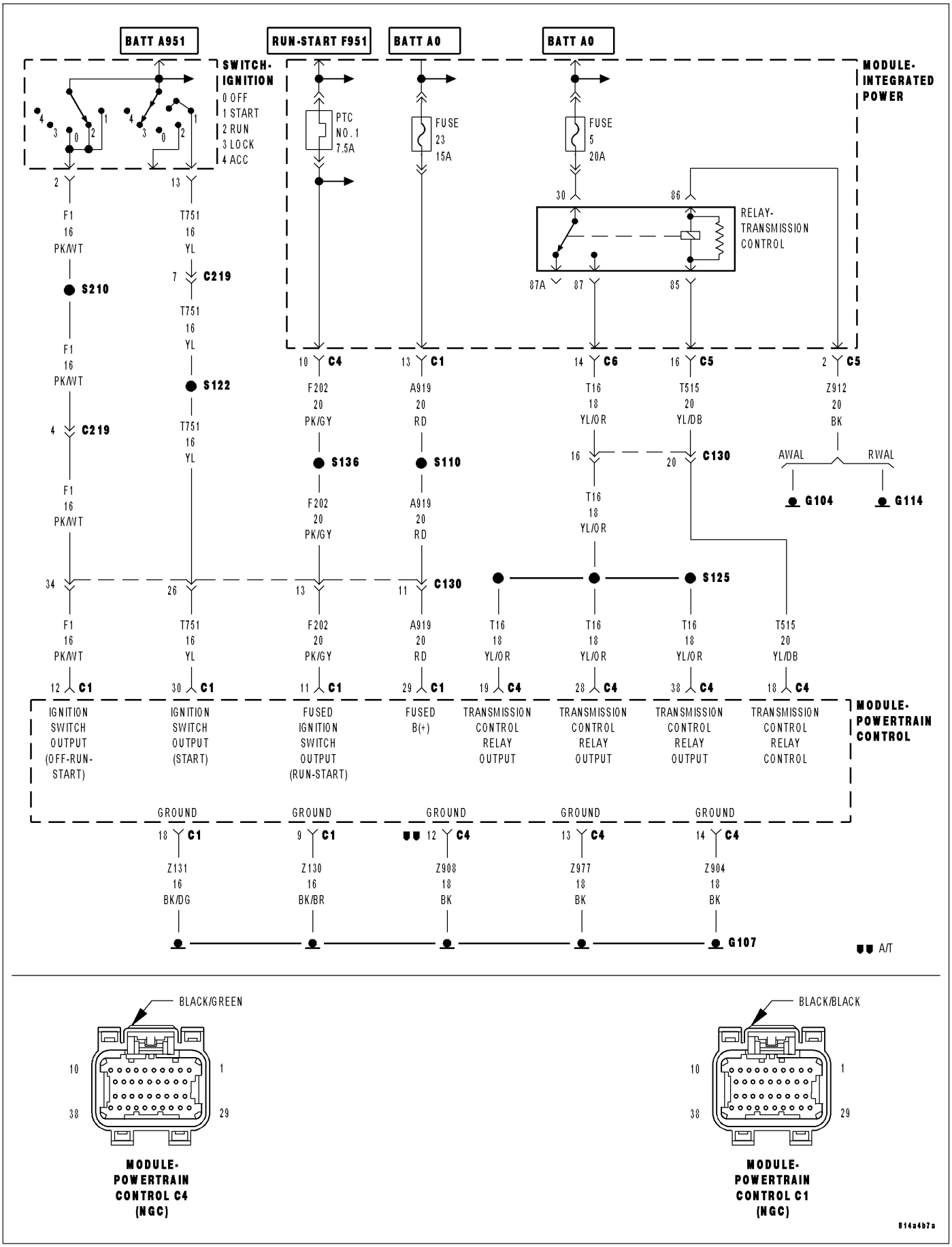
If there are no possible causes remaining, view repair.

Repair

Check all power and ground circuits to the PCM and repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0888-TRANSMISSION RELAY ALWAYS OFF



MODULE-POWERTRAIN CONTROL C4 (NGC)

MODULE-POWERTRAIN CONTROL C1 (NGC)

814a4b7a

P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  When the ignition is turned from ″OFF″ position to ″RUN″ position and/or the ignition is turned from ″START″ position to ″RUN″ position.
- **Set Condition:**
  This DTC is set when less than 3.0 volts are present at the transmission control relay output circuits at the Powertrain Control Module when the PCM is energizing the relay.

Possible Causes
(A104) FUSED B+ CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND
(T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT OPEN
(T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND
(Z915) TRANSMISSION CONTROL RELAY GROUND CIRCUIT OPEN
TRANSMISSION CONTROL RELAY STUCK OPEN
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission control relay is used to supply power to the solenoids and pressure switches when the transmission is in normal operating mode. The relay output is fed back to the TCM through pins 16, 17, and 36. It is referred to as ″Transmission Control Relay Output″. This circuit does not supply power to the TCM, it is only a sense circuit. When the relay is off, no power is supplied to the solenoids and pressure switches, and the transmission is in ″limp-in″ or ″default″ mode. **Note: Inadequate Transmission Control Relay Output voltage can also cause DTCs P0846, P0869, P0871, P0876 or P0988 to set. This does not indicate an internal transmission or solenoid/TRS problem. Repairing the P0888 fault should also eliminate the related DTCs.**

Diagnostic Test

1. CHECK TO SEE IF DTC P0888 IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0888.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter equal to 0?

Yes >> Go To 2

No >> Go To 9

P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

2. (A104) FUSED B+ CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

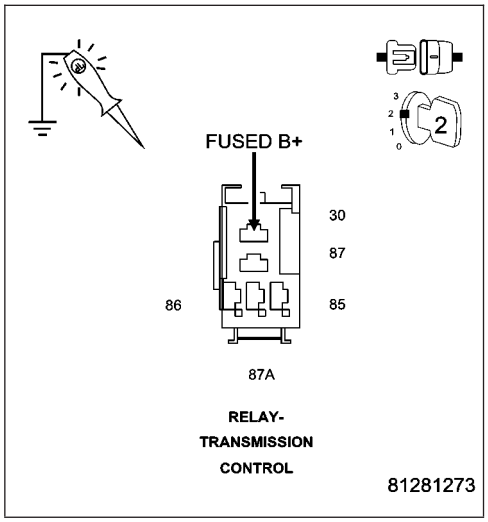
Using a 12-volt test light connected to ground, check the (A104) Fused B+ circuit in the Transmission Control Relay connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 3

No >> Repair the (A104) Fused B+ circuit for an open. If the fuse is open make sure to check for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



3. (Z915) TRANSMISSION CONTROL RELAY GROUND CIRCUIT OPEN

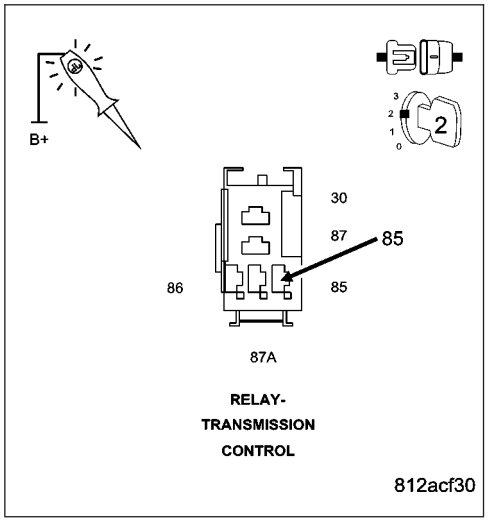
Turn the ignition off to the lock position.

Using a 12-volt test light connected to 12-volts, check the (Z915) Transmission Control Relay Ground circuit in the Transmission Control Relay connector.

Does the test light illuminate brightly?

Yes >> Repair the (Z915) Transmission Control Relay Ground circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4



4. TRANSMISSION CONTROL RELAY

Install a substitute relay in place of the Transmission Control Relay.

Start the vehicle.

With the scan tool, check transmission DTCs.

Did the DTC P0888 reset?

Yes >> Replace the Transmission Control Relay.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

5. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

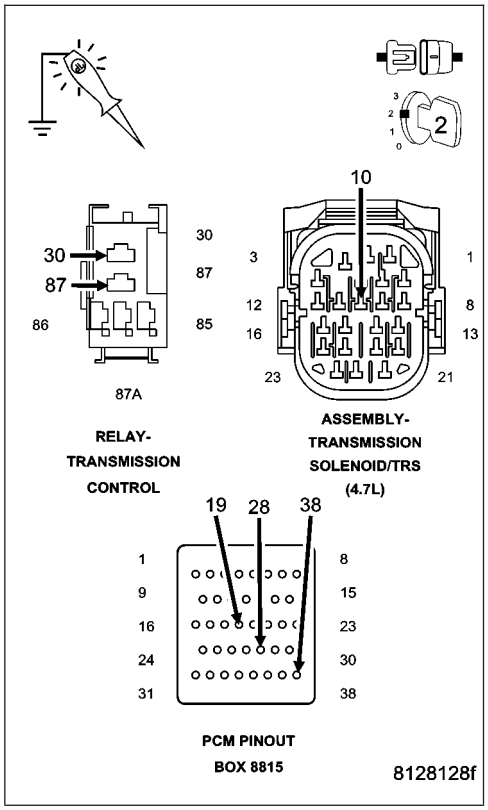
Disconnect the Transmission Solenoid/TRS Assembly harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Connect a jumper wire between the (A104) Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check all four (T16) Transmission Control Relay Output circuits in the PCM C4 harness connector and Transmission Solenoid/TRS Assembly harness connector.



Does the test light illuminate brightly on all four (T16) Transmission Control Relay Output circuits?

Yes >> Go To 6

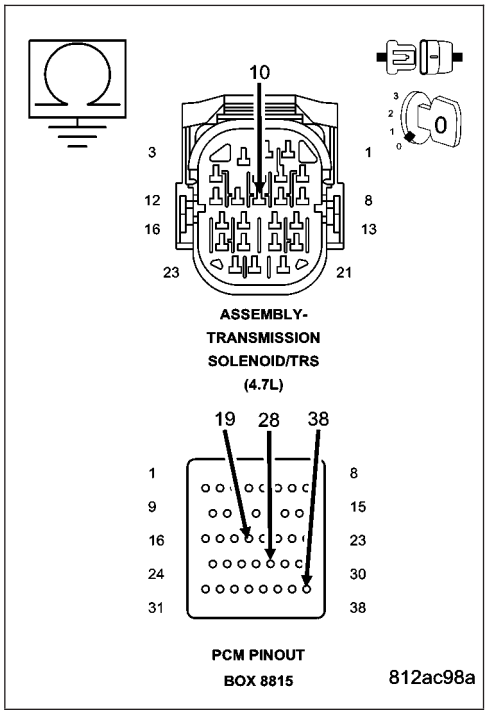
No >> Repair the (T16) Transmission Control Relay Output circuit(s) for an open or high resistance.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

6. (T16) TRANSMISSION RELAY OUTPUT CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.

Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T16) Transmission Control Relay Output circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

7. (T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND

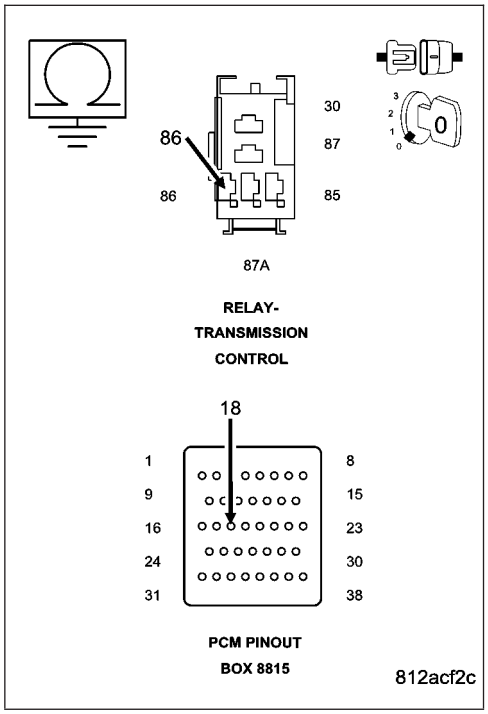
Measure the resistance between ground and the (T15) Transmission Control Relay Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T15) Transmission Control Relay Control circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8



8. (T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT OPEN

Measure the resistance of the (T15) Transmission Control Relay Control circuit between the Transmission Control Relay connector and the appropriate terminal of Miller tool #8815.

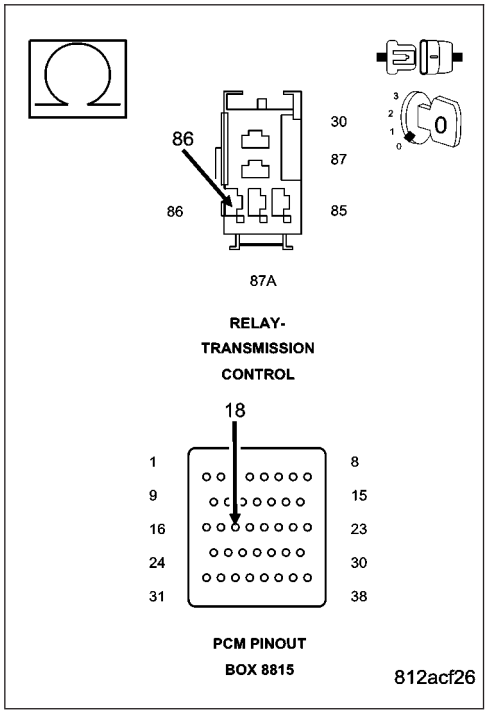
Is the resistance above 5.0 ohms?

Yes >> Repair the (T15) Transmission Control Relay Control circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0888-TRANSMISSION RELAY ALWAYS OFF (CONTINUED)

9. INTERMITTENT WIRING AND CONNECTORS

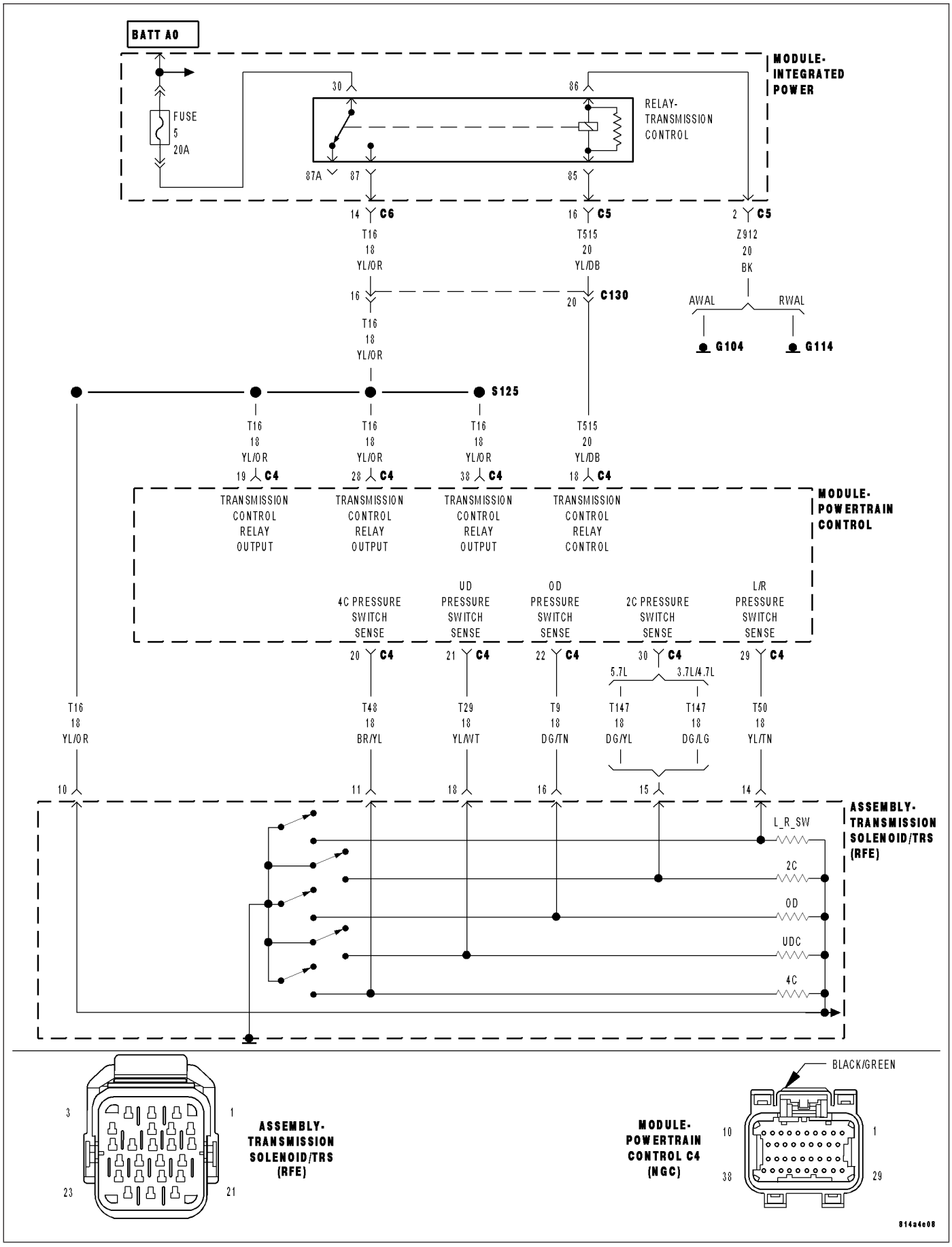
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0890-SWITCHED BATTERY



P0890-SWITCHED BATTERY (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the ignition is turned from ″OFF″ position to ″RUN″ position and/or the ignition is turned from ″START″ position to ″RUN″ position.
- **Set Condition:**
  This DTC is set if the Powertrain Control Module senses voltage on any of the pressure switch inputs prior to the Transmission Control Relay being energized.

Possible Causes
PRESSURE SWITCH SENSE CIRCUITS SHORT TO VOLTAGE
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission control relay is used to supply power to the solenoids and pressure switches (Transmission Solenid/TRS Assembly) when the transmission is in normal operating mode. When the relay is off, no power is supplied and the transmission is in ″limp-in″ mode. The relay output is fed back to the PCM through pins C4–19, C4–28 and C4–38 and are referred to as ″Transmission Control Relay Output″.

Immediately after a controller reset (ignition key turned to the ″run″ position or after cranking engine), the TCM verifies that the relay contacts are open by checking for no voltage at the transmission control relay output terminals. After this is verified, the voltage at the pressure switches are checked. There should be no voltage on the pressure switches at this time. The PCM will then activate the relay.

Diagnostic Test

1. CHECK TO SEE IF DTC P0890 IS PRESENT

With the scan tool, Check the STARTS SINCE SET counter for P0890.

NOTE: This counter only applies to the last DTC set.

Is the ″Starts Since Set″ counter set at 0?

Yes >> Go To 2

No >> Go To 4

P0890-SWITCHED BATTERY (CONTINUED)

2. PRESSURE SWITCH SENSE CIRCUITS SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

Remove the Transmission Control Relay.

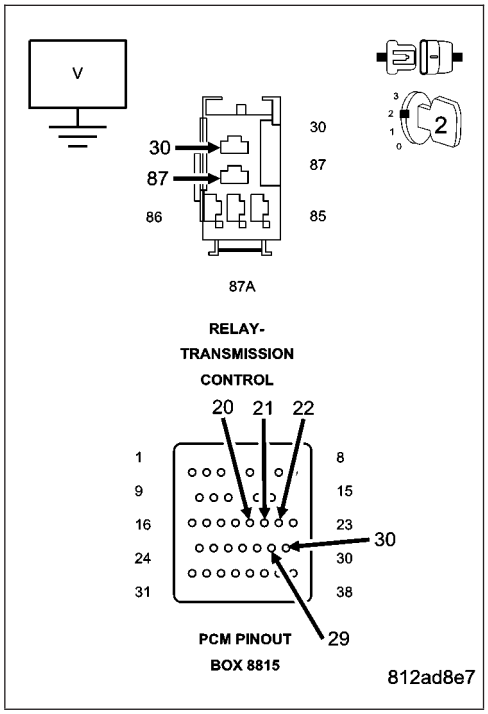
NOTE: Note: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Connect a jumper wire between the Fused B+ circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Measure the voltage of the (T147) 2C, (T48) 4C, (T50) LR, (T9) OD, and (T29) UD Pressure Switch Sense circuits in Miller tool #8815.



Is the voltage above 0.5 volt on any of the measured circuits?

Yes >> Repair the (T147) 2C, (T48) 4C, (T50) LR, (T9) OD, and/or (T29) UD Pressure Switch Sense circuit(s) for a short to voltage.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

Turn the ignition off.

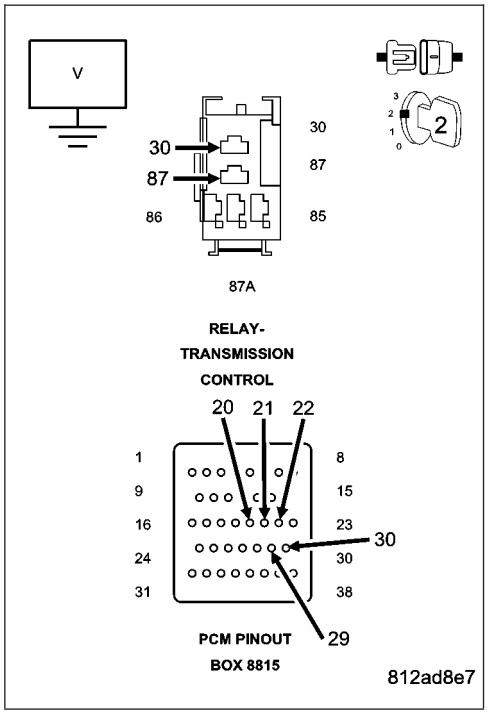
Remove the jumper wire.

NOTE: Do not reinstall the Transmission Relay.

Reconnect the Transmission Solenoid/TRS Assembly harness connector.

Ignition on, engine not running.

Measure the voltage of the (T147) 2C, (T48) 4C, (T50) LR, (T9) OD, and (T29) UD Pressure Switch Sense circuits in Miller tool #8815.



Is the voltage above 0.5 volts on any of the sense circuits?

Yes >> Replace the Transmission Solenoid/TRS Assembly.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0890-SWITCHED BATTERY (CONTINUED)

4. INTERMITTENT WIRING AND CONNECTORS

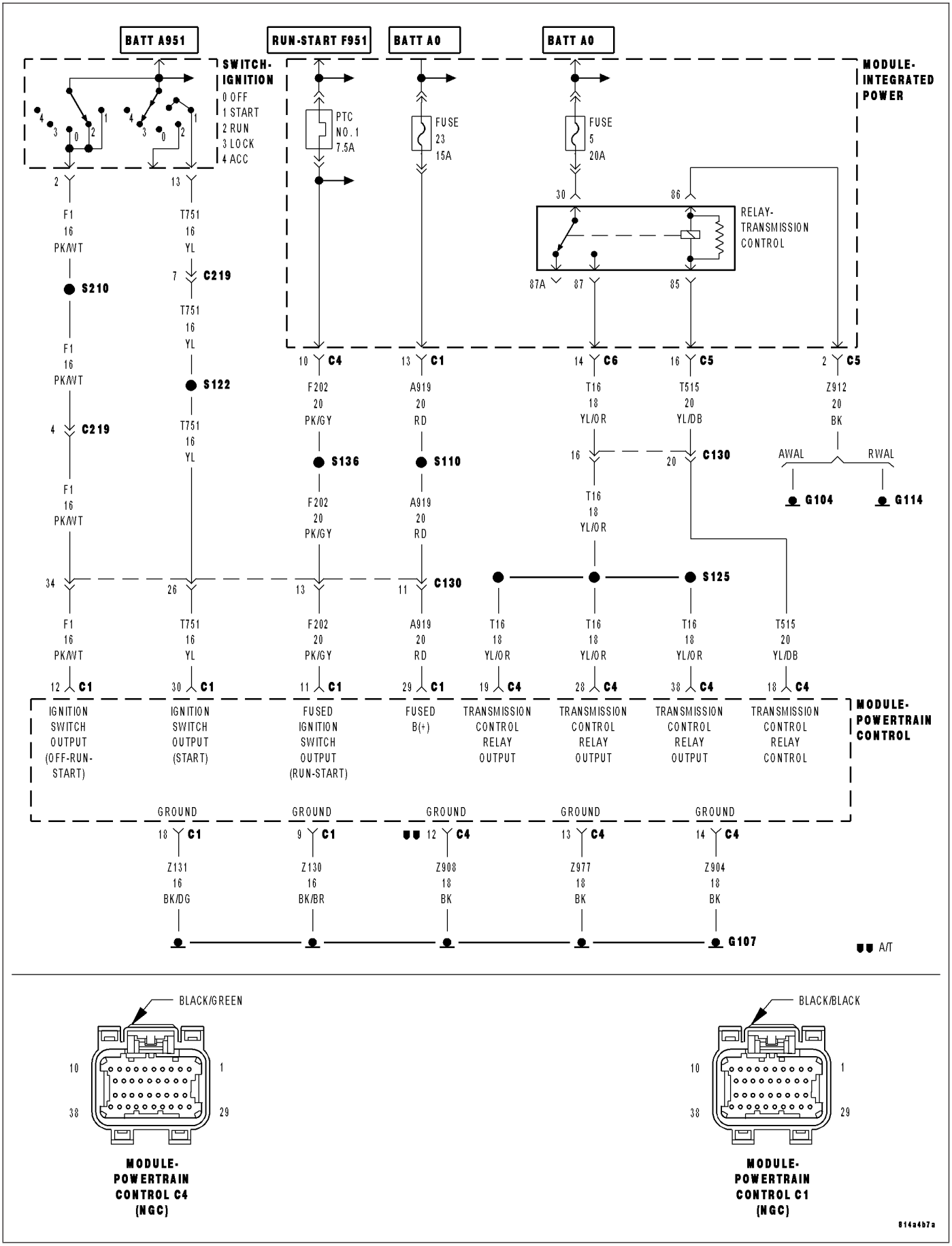
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0891-TRANSMISSION RELAY ALWAYS ON



MODULE-POWERTRAIN CONTROL C4 (NGC)

MODULE-POWERTRAIN CONTROL C1 (NGC)

814a4b7a

P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the ignition is turned from ″OFF″ position to ″RUN″ position and/or the ignition is turned from ″START″ position to ″RUN″ position.
- **Set Condition:**
  This DTC is set if the Powertrain Control Module senses greater than 3.0 volts on the Transmission Control Relay Output circuits prior to a request from the PCM to energize the Transmission Control Relay.

Possible Causes
(T15) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO VOLTAGE
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT VOLTAGE
TRANSMISSION CONTROL RELAY
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control Relay is used to supply power (Transmission Control Relay Output) to the Transmission Solenoid/TRS Assembly when in normal operating mode and to pins C4–19, C4–28 and C4–38 of the PCM. The purpose of the Transmission Control Relay is to allow the PCM to turn off the power to the Transmission Solenoid/TRS Assembly in event that the transmission should need to be placed into “limp-in” mode due to a DTC.

After a PCM reset, (ignition switch turned to the run position, or after cranking engine) the PCM verifies that the Transmission Control Relay contacts are open by checking for voltage on the Transmission Control Relay Output circuit before the Transmission Control Relay is energized. If voltage is detected, the DTC will set.

Diagnostic Test

1. CHECK TO SEE IF DTC P0891 IS CURRENT

With the scan tool, check the STARTS SINCE SET counter.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter set to 0?

Yes >> Go To 2

No >> Go To 6

P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)

2. TRANSMISSION CONTROL RELAY

Turn the ignition off to the lock position.

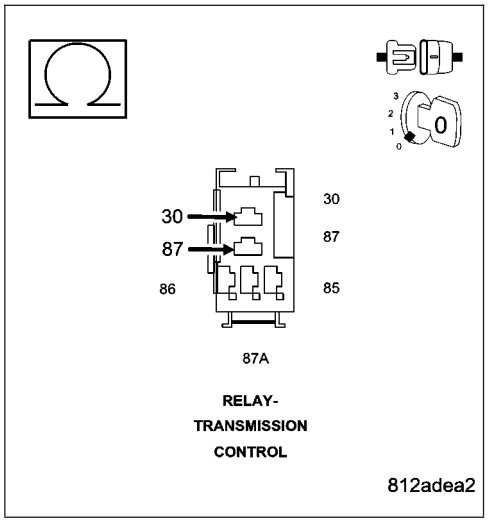
Disconnect the Transmission Control Relay.

NOTE: Note: Check connectors - Clean/repair as necessary.
Measure the resistance between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output Circuit of the Transmission Control Relay.

Is the resistance above 5.0 ohms?

Yes >> Go To 3

No >> Replace the Transmission Control Relay.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



3. (T16) TRANSMISSION RELAY OUTPUT CIRCUIT SHORT TO VOLTAGE

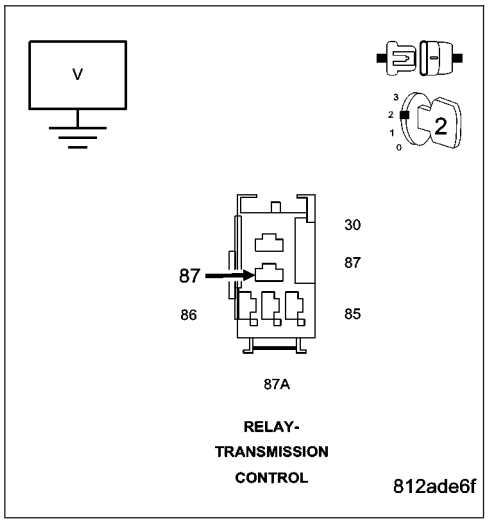
Ignition on, engine not running.

Measure the voltage at the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Is the voltage above 0.5 volts?

Yes >> Go To 4

No >> Go To 5



P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)

4. TRANSMISSION SOLENOID/TRS ASSEMBLY

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

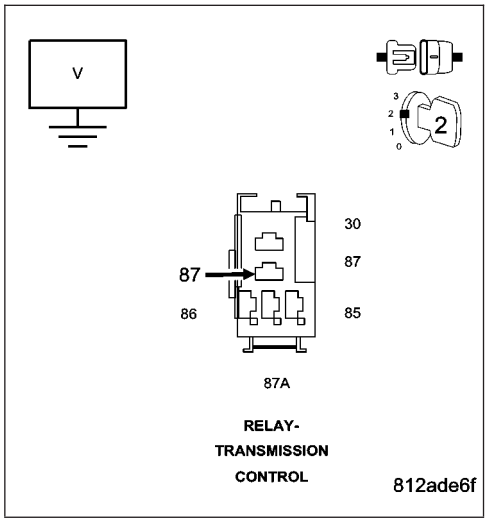
NOTE: NOTE: Check connectors - Clean/repair as necessary.
Ignition on, engine not running.

Measure the voltage at the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Is the voltage above 0.5 volts?

Yes >> Repair the (T16) Transmission Control Relay Output circuit for a short to voltage.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



5. (T15)TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.
Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

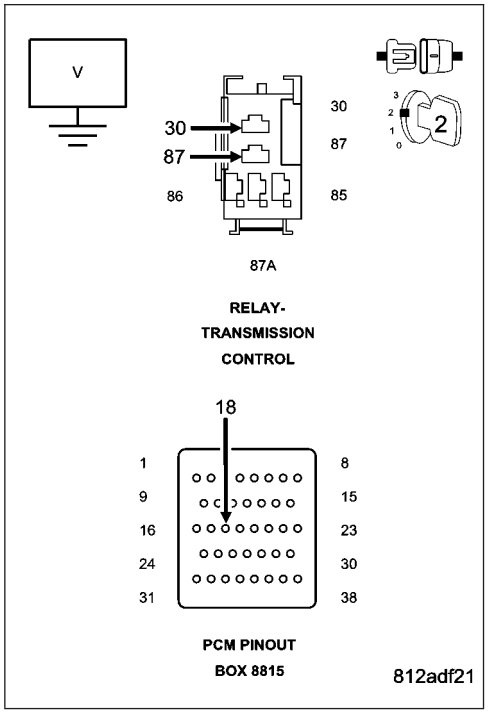
Ignition on, engine not running.

Measure the voltage of the (T15) Transmission Control Relay Control circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T15) Transmission Control Relay Control circuit for a short to voltage.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0891-TRANSMISSION RELAY ALWAYS ON (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

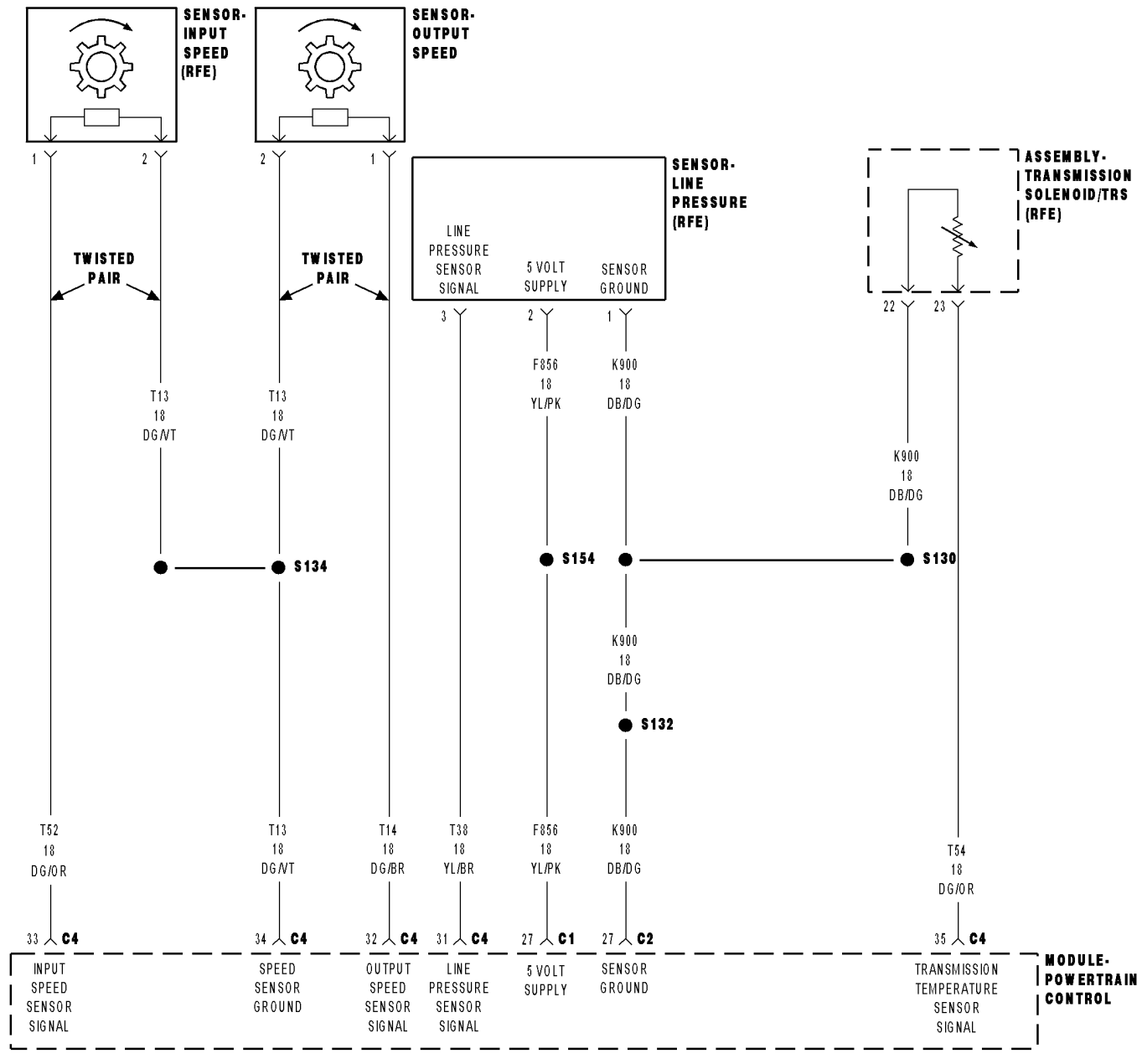
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0932-LINE PRESSURE SENSOR CIRCUIT



P0932-LINE PRESSURE SENSOR CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  The PCM continuously monitors Actual Line Pressure and compares it to Desired Line Pressure. If the Actual Line Pressure reading is more than 172.4 kPa (25 psi) higher than the Desired Line Pressure, but is less than the highest Line Pressure ever used in the current gear, the DTC sets.

Possible Causes
RELATED DTC'S PRESENT
LINE PRESSURE CONNECTOR AND WIRING
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Line pressure is electronically controlled by the Transmission Control System and is measured by the Line Pressure Sensor (LPS). The desired line pressure is continuously being compared to the actual line pressure and is regulated by electronically changing the duty cycle of the Pressure Control Solenoid (PCS). (5% duty cycle = solenoid off = max line pressure, 62% duty cycle = solenoid on = min line pressure).

The Transmission Control System calculates the desired line pressure based on inputs from the transmission and engine. A calculated torque input to the transmission is used as the primary input of the desired line pressure calculation and is called Torque Based Line Pressure. In addition, the line pressure is set to a preset level 827 to 931kPa (120 to 135 PSI) during shifts and in Park and Neutral to ensure consistent shift quality.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's.

Are there any other line pressure related DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. Perform the test for P0934 and/or P0935 first if present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0932-LINE PRESSURE SENSOR CIRCUIT (CONTINUED)

2. CONDITION P0932 PRESENT

CAUTION: Apply Parking Brake
Start the engine.

CAUTION: Firmly apply the brakes.
With the scan tool, monitor the Line Pressure, Desired Line Pressure and the TPS degrees.

While firmly applying the brakes, place the shifter in reverse, then slowly press the accelerator pedal to a TPS degree of 15°.

Compare the Line Pressure reading to the Desired Line Pressure reading on the scan tool.

Does the Line Pressure stay within ± 34 kPa or 5 PSI of the Desired Line Pressure?

No >> Go To 3

Yes >> Go To 5

---

3. CHECK LINE PRESSURE CONNECTOR AND WIRING

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure Sensor voltage while wiggling the wiring harness and connectors pertaining to the Line Pressure Sensor and the Transmission Solenoid/TRS Assembly.

Did the voltage remain steady while wiggling the wiring harness and connectors?

Yes >> Go To 4

No >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

4. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure during the following step.

With the Transmission Simulator, turn the selector switch to each of the 3 Line Pressure positions.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Does the Line Pressure on the scan tool fluctuate up and down more than 69 kPa or 10 PSI at any of the 3 line pressure positions on the Transmission Simulator?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair internal transmission and inspect the oil pump per the Service information and replace if necessary. If no problems are found, replace the Transmission Solenoid/TRS Assembly — possible cause is the Pressure Control Solenoid is stuck.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0932-LINE PRESSURE SENSOR CIRCUIT (CONTINUED)

5. INTERMITTENT WIRING AND CONNECTORS

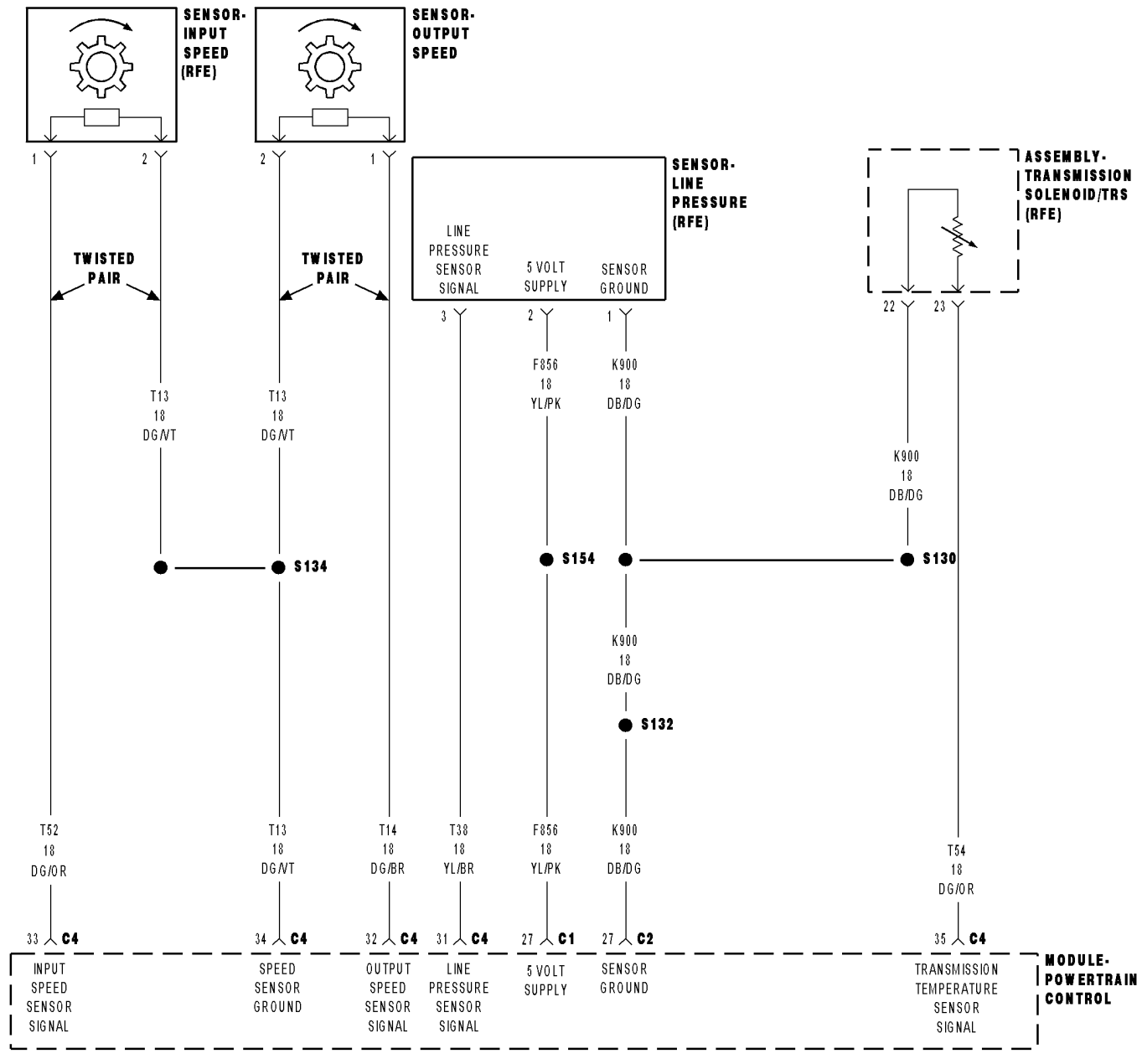
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0934-LINE PRESSURE SENSOR CIRCUIT LOW



P0934-LINE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  This DTC will set when the monitored Line Pressure Sensor voltage is less than or equal to 0.35 volts for 0.18 seconds.

Possible Causes
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
LINE PRESSURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Line pressure is electronically controlled by the Transmission Control System and is measured by the Line Pressure Sensor (LPS). The desired line pressure is continuously being compared to the actual line pressure and is regulated by electronically changing the duty cycle of the Pressure Control Solenoid (PCS). (5% duty cycle = solenoid off = max line pressure, 62% duty cycle = solenoid on = min line pressure).

The Transmission Control System calculates the desired line pressure based on inputs from the transmission and engine. A calculated torque input to the transmission is used as the primary input of the desired line pressure calculation and is called Torque Based Line Pressure. In addition, the line pressure is set to a preset level 827 to 931 kPa (120 to 135 PSI) during shifts and in Park and Neutral to ensure consistent shift quality.

The monitored Line Pressure Sensor voltage should always be between 0.35 and 4.75 volts. Any monitored voltages outside these parameters indicate an Line Pressure Sensor or wiring problem and will cause either DTC P0934 or P0935 to set.

Diagnostic Test

1. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, check the STARTS SINCE SET counter for P0934.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 6

P0934-LINE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

2. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

Ignition on, engine not running.

With the scan tool, under Transmission Sensors, monitor the Line Pressure.

Using the Transmission Simulator, set the rotary switch to each of the 3 line pressure positions.

NOTE: The readings should be within ±14 kPa or 2.0 PSI on the scan tool to the pressure readings specified on Transmission Simulator.

Does the Line Pressure on the scan tool match the line pressures on the Transmission Simulator?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform (NGC) 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. (T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND

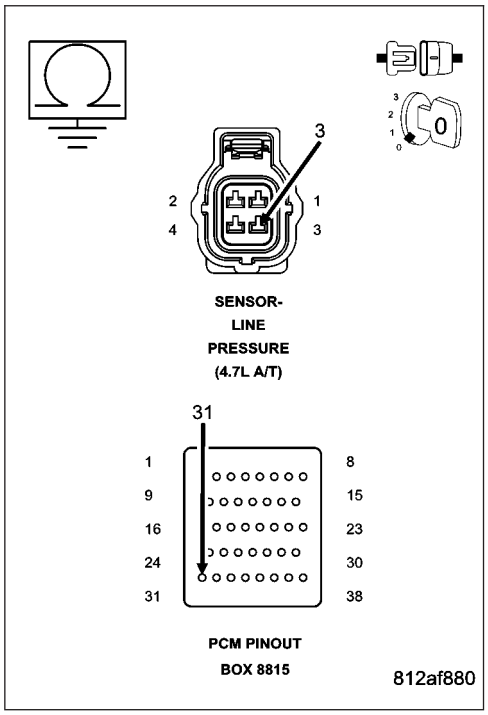
Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Disconnect the Transmission Simulator, Miller tool #8333.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance between ground and the (T38) Line Pressure Sensor Signal circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T38) Line Pressure Sensor Signal circuit for a short to ground.
Perform (NGC) 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

P0934-LINE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

4. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

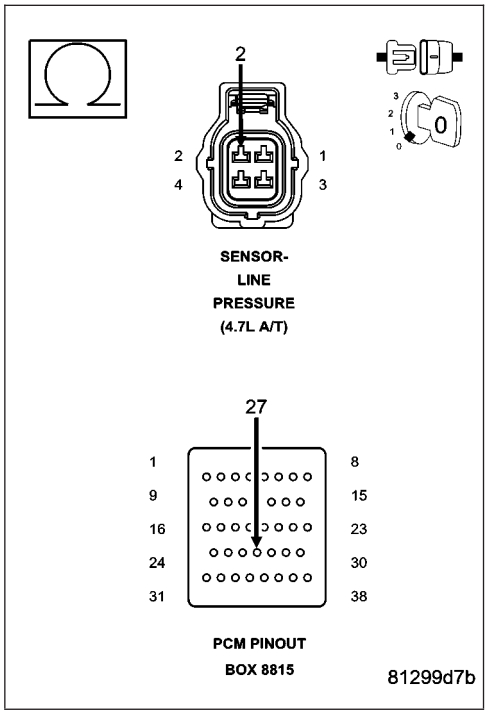
Disconnect the PCM C1 harness connector and connect Miller tool #8815.

Measure the resistance of the (F856) 5-volt Supply circuit between Line Pressure sensor harness connector and the appropriate terminal of Miller tool #8815.

Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



5. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

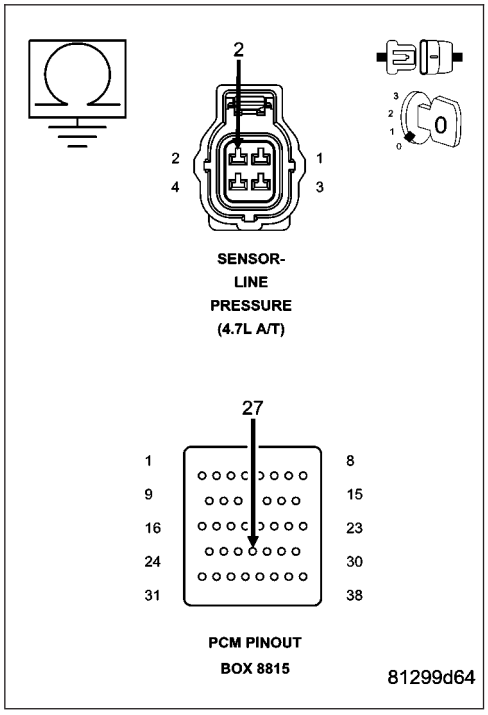
Disconnect the PCM C1 harness connector and connect Miller tool #8815.

Measure the resistance between ground and the (F856) 5-volt Supply circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform (NGC) 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0934-LINE PRESSURE SENSOR CIRCUIT LOW (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

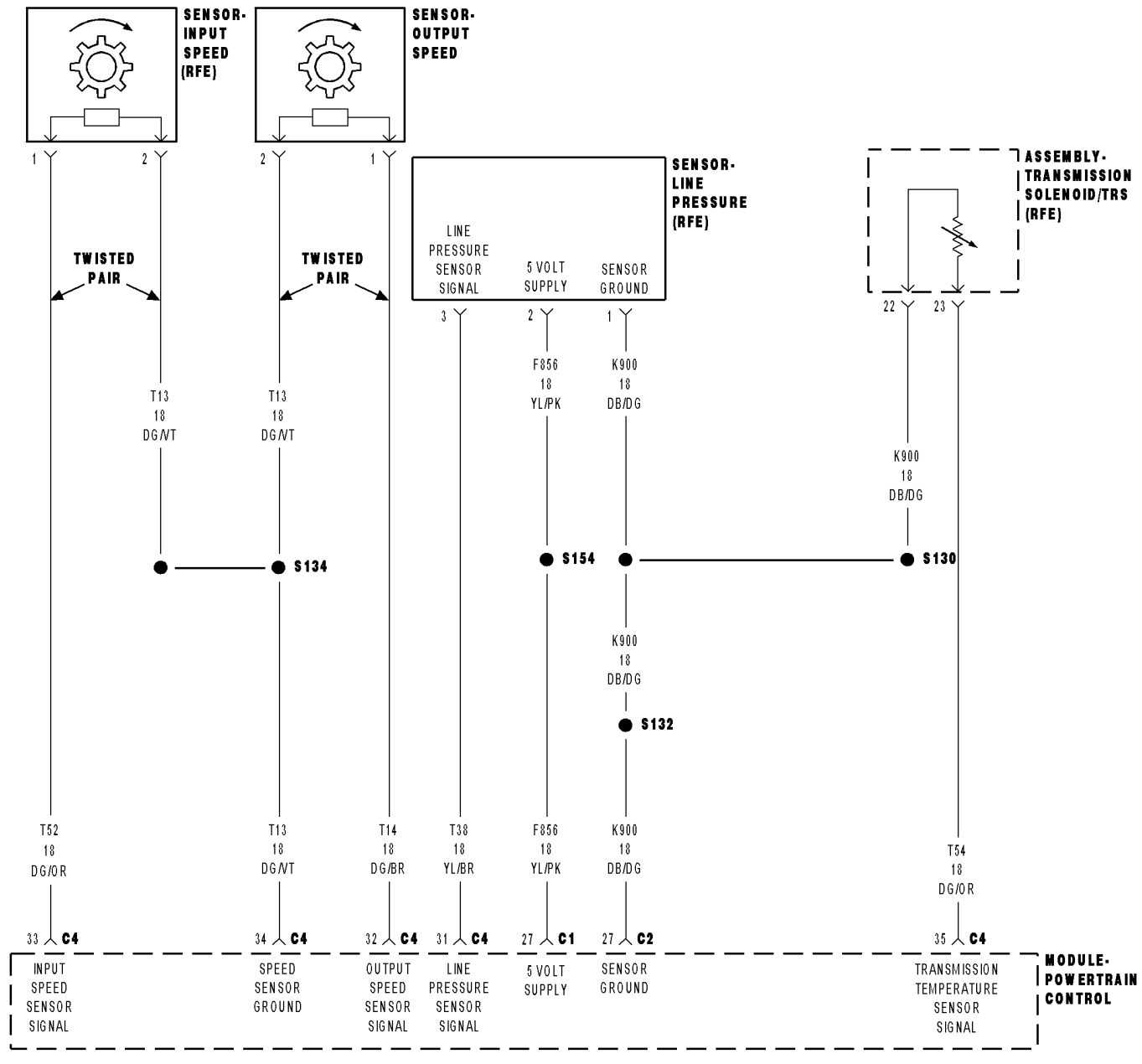
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

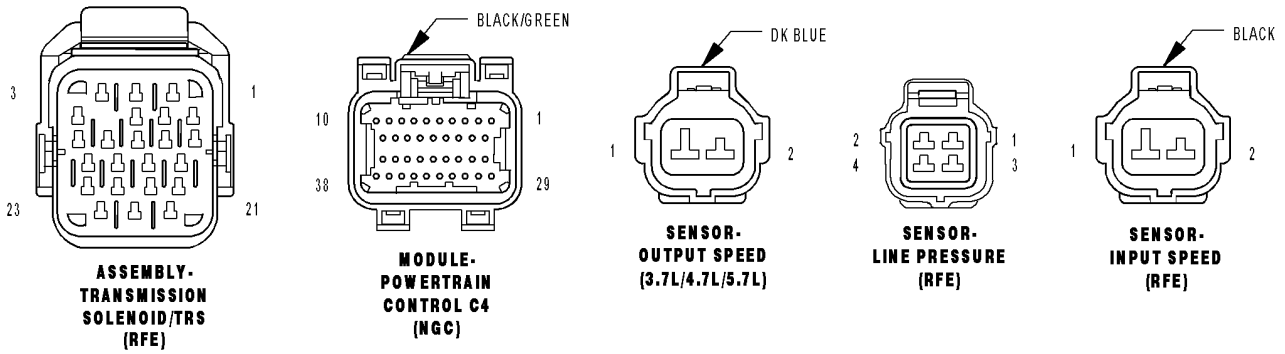
Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0935-LINE PRESSURE SENSOR CIRCUIT HIGH





814a4ba3

P0935-LINE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with ignition on and engine running.
- **Set Condition:**
  This DTC will set if the monitored Line Pressure Sensor voltage is greater than or equal to 4.75 volts for the period of 0.18 seconds

Possible Causes
(T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
(T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
LINE PRESSURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

Line pressure is electronically controlled by the Transmission Control System and is measured by the Line Pressure Sensor (LPS). The desired line pressure is continuously being compared to the actual line pressure and is regulated by electronically changing the duty cycle of the Pressure Control Solenoid (PCS). (5% duty cycle = solenoid off = max line pressure, 62% duty cycle = solenoid on = min line pressure).

The Transmission Control System calculates the desired line pressure based on inputs from the transmission and engine. A calculated torque input to the transmission is used as the primary input of the desired line pressure calculation and is called Torque Based Line Pressure. In addition, the line pressure is set to a preset level 827 to 931 kPa (120 to 135 PSI) during shifts and in Park and Neutral to ensure consistent shift quality.

The monitored Line Pressure Sensor voltage should always be between 0.35 and 4.75 volts. Any monitored voltages outside these parameters indicate an Line Pressure Sensor or wiring problem and will cause either DTC P0934 or P0935 to set.

Diagnostic Test

1. CHECK TO SEE IF DTC IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter for P0935.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 2

No >> Go To 6

P0935-LINE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

2. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure.

Using the Transmission Simulator, set the rotary switch to each of the 3 line pressure positions.

NOTE: The readings should be within ±14 kPa or 2.0 PSI on the scan tool of the pressure reading specified on Transmission Simulator.

Does the 3 line pressures on the scan tool match the Line pressure readings on the Transmission Simulator?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. (K900) SENSOR GROUND CIRCUIT OPEN

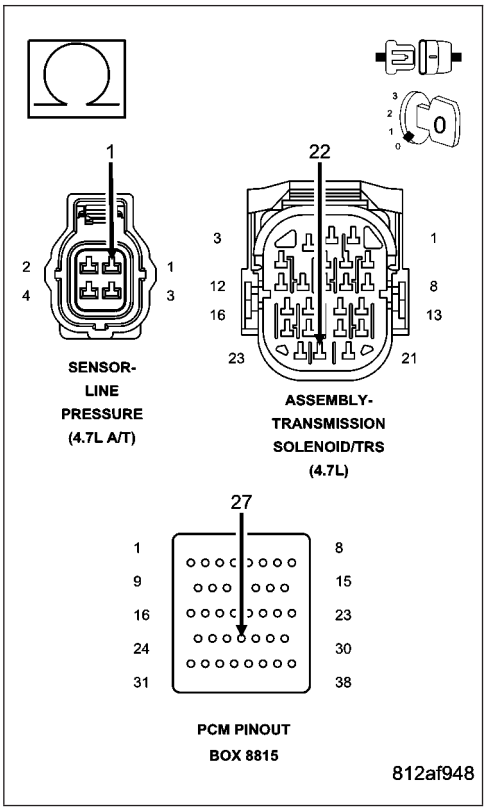
Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C2 harness connector and connect Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (K900) Sensor Ground circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.



Is the resistance above 5.0 ohms?

Yes >> Repair the (K900) Sensor Ground circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

P0935-LINE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

4. (T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT OPEN

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

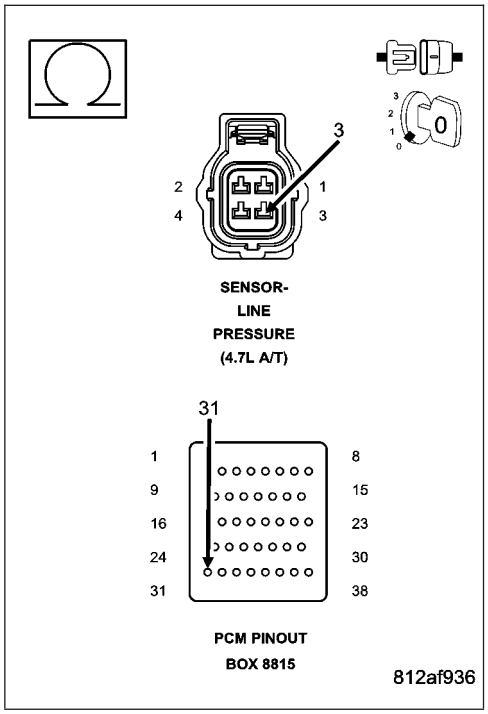
Measure the resistance of the (T38) Line Pressure Sensor Signal circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T38) Line Pressure Sensor Signal circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



5. (T38) LINE PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE

Remove the Transmission Control Relay.

Connect a jumper wire between the (A104) Fused B+ circuit and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Measure the voltage of the (T38) Line Pressure Sensor Signal circuit.

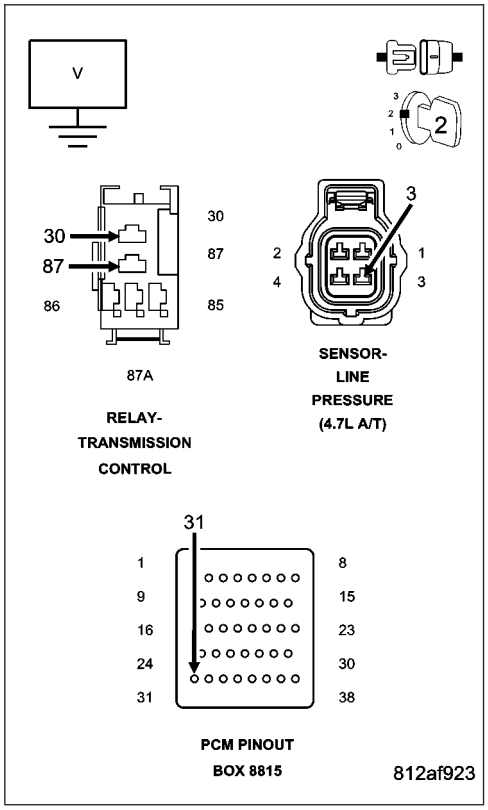
Is the voltage above 5.5 volts?

Yes >> Repair the (T38) Line Pressure Sensor Signal circuit for a short to voltage.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P0935-LINE PRESSURE SENSOR CIRCUIT HIGH (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0944-LOSS OF HYDRAULIC PUMP PRIME

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  If the transmission is slipping in any forward gear and all the pressure switches are not indicating pressure, a loss of prime test is run.
- **Set Condition:**
  If the transmission begins to slip in a forward gear and all the pressure switch(s) that should be closed are open a loss of prime test begins. Available elements are turned on by the PCM to see if pump prime exists. The DTC sets if no pressure switch(s) respond.

Possible Causes
SHIFT LEVER OUT OF ADJUSTMENT
INPROPER FLUID LEVEL
CRACKED OR IMPROPERLY INSTALLED PRIMARY OIL FILTER OR SEAL
LOOSE COOLER RETURN FILTER
STUCK OR STICKING MAIN REGULATOR VALVE
TRANSMISSION OIL PUMP

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Loss of prime test is used to prevent transmission defaults and erroneous fault codes during temporary loss of pump prime that may occur with low transmission fluid under severe braking conditions, start-up, etc. and to point towards more subtle problems such as a plugged or cracked oil filter.

The Loss of Prime DTC is set by a loss of hydraulic pressure in the transmission system. This condition, if sustained, will result in the vehicle being unable to move.

Diagnostic Test

1. SHIFT LEVER POSITION TEST

Using the scan tool, perform a Shift Lever Position test. Follow the instructions on the scan tool.

Did the Shift Lever Position Test pass?

Yes >> Go To 2

No >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0944-LOSS OF HYDRAULIC PUMP PRIME (CONTINUED)

2. CHECK TO SEE IF DTC P0944 IS CURRENT

Place the gear selector in Park.

Start the engine.

The transmission must be at operating temperature prior to checking pressure. A cold transmission will give higher readings.

Run the engine at 1500 RPM.

With the scan tool, monitor the Transmission Line Pressure.

Does the Line Pressure match the Desired Line Pressure within ± 5 psi?

No >> Go To 6

Yes >> Go To 3

---

3. CHECK LINE PRESSURE IN DRIVE AND REVERSE

Firmly apply the brake and repeat the previous test in both Drive and the Reverse gear positions.

With the scan tool, monitor the Transmission Line Pressure.

Does the Line Pressure match the Desired Line Pressure within ± 5 psi in all gear ranges?

Yes >> Go To 4

No >> Go To 5

---

4. REVIEW CUSTOMER COMMENTS

The conditions necessary to set this DTC are not present at this time.

Verify with the customer if a delayed engagement and/or an intermittent ″No Drive″ condition has occurred.

If the customers answer is ″No″ erase the DTC and return the vehicle to the customer.

Make sure to check for any TSBs or controller flash updates that my apply.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Has the customer experienced any delayed engagement and/or ″No Drive″ conditions?

Yes >> Repair internal transmission as necessary. Replace the Transmission Oil Pump if inspection reveals no signs of internal seal leakage. Refer to the Service Information for the proper repair procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

---

5. DTC VERIFICATION

Read and record the DTC and the EATX DTC EVENT DATA information.

Test drive the vehicle and attempt to operate the vehicle within the parameters in which the DTC set.

With the scan tool, read DTCs.

Did any following DTCs set, P0868, P0944, P0841, P0846, P0871, P0876, or P0988?

Yes >> Go To 6

No >> Test Complete.

P0944-LOSS OF HYDRAULIC PUMP PRIME (CONTINUED)

6. CHECK TRANSMISSION OIL FILTER

Remove and inspect the Transmission Oil Pan per the Service Information.

Remove and inspect the Primary Oil Filter per the Service Information.

Inspect the oil filter seal for damage and proper installation.

Does the Oil Pan contain excessive debris and/or is the Oil Filter plugged or seal damaged?

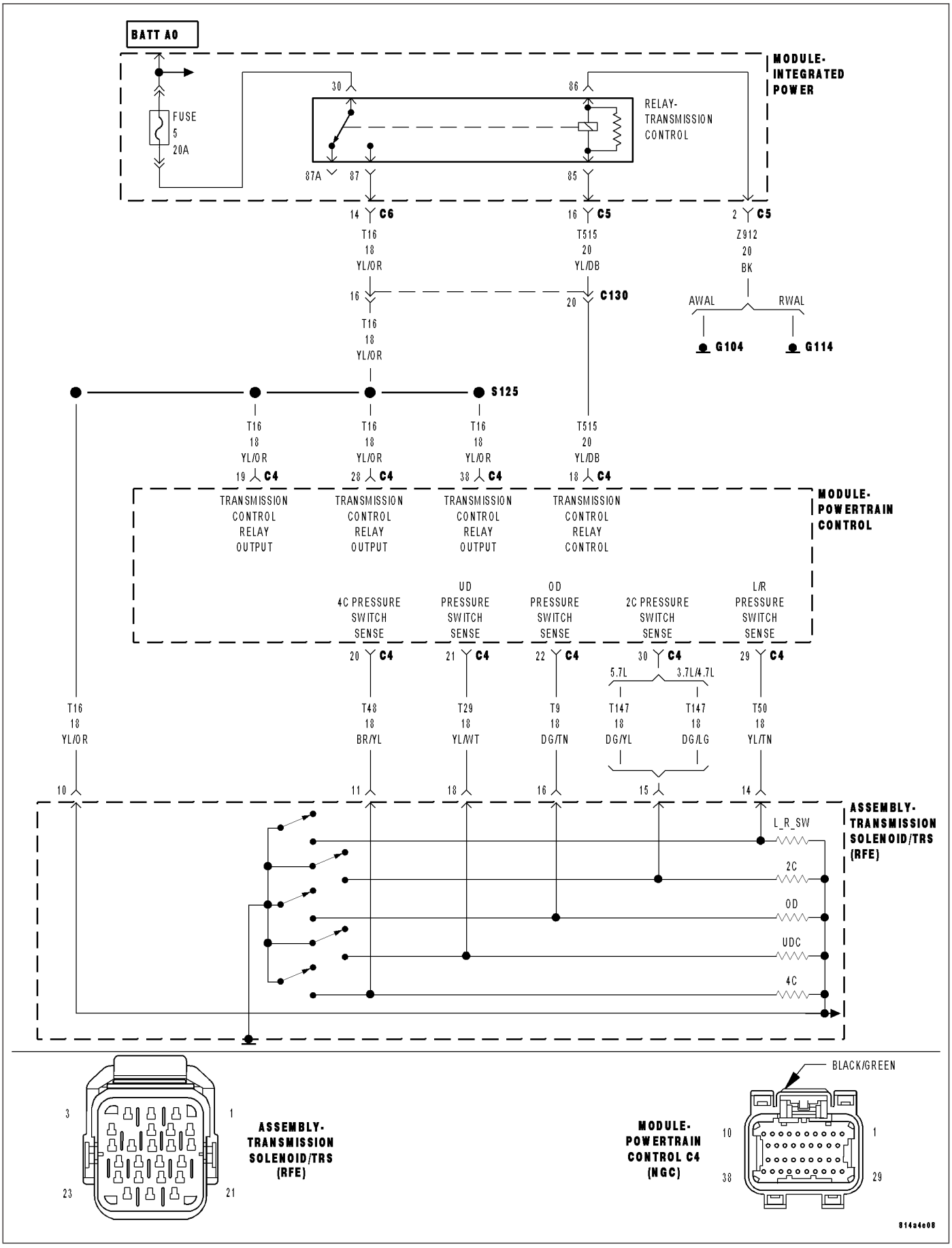
Yes >> Repair the cause of the plugged transmission oil filter or excessive debris. Check the Transmission Oil Filter seal for improper installation onto filter neck instead of into the pump bore, not fully seated against pump housing, filter neck not engaged into pump. Repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair the Transmission Oil Pump as necessary. Check for a stuck main regulator valve and clean if necessary. Refer to the Service Information for the proper repair procedure.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0987-4C HYDRAULIC PRESSURE TEST



P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  In any forward gear with engine speed above 1000 RPM shortly after a shift and every minute thereafter.
- **Set Condition:**
  After a shift into a forward gear, with engine speed above 1000 RPM, the PCM momentarily turns on element pressure to the Clutch circuits that don't have pressure to identify the correct Pressure Switch closes. If the Pressure Switch does not close 2 times, the DTC sets.

Possible Causes
LINE PRESSURE SENSOR
TRANSMISSION FLUID CONTAMINATION
RELATED DTC'S PRESENT
TRANSMISSION SOLENOID/TRS ASSEMBLY
EXCESSIVE DEBRIS IN OIL PAN
POOR LINE PRESSURE SENSOR CONNECTION
TRANSMISSION CONTROL RELAY DTCS PRESENT
(T48) 4C PRESSURE SWITCH SENSE CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
(F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND
(T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHERS
TRANSMISSION SOLENOID/TRS ASSEMBLY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System tests the pressure switches when they are off. The test verifies that the switches are operational (They will close with pressure applied). The Transmission Control System verifies that the switch closes when the corresponding element is applied. If a switch fails to close, it is re-tested. If it fails the second test, the DTC will set, the MIL will illuminate and the transmission system will default to the orderly Shutdown routine.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is there any Loss of Prime, Transmission Control Relay, and/or Line Pressure Sensor DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom. If the DTC P0944 is present, perform its respective test first.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

2. DTC P0770 PRESENT

With the scan tool, check Transmission DTCs.

Is the DTC P0770 also present?

Yes >> Refer to the symptom list and perform diagnostics for P0770.

No >> Go To 3

---

3. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTC's

Are the DTCs P0988 and/or P1736 present also?

Yes >> Go To 12

No >> Go To 4

---

4. CHECK TO SEE IF DTC P0987 IS CURRENT

With the scan tool, check if the DTC P0987-4C HYDRAULIC PRESSURE TEST FAILURE is active or stored.

Is the DTC P0987-4C HYDRAULIC PRESSURE TEST FAILURE active?

Yes >> Go To 5

No >> Go To 17

---

5. LINE PRESSURE STAYS THE SAME

Start the engine.

Warm the transmission to 82° C or 180° F.

Firmly apply the brakes.

With the scan tool, monitor the Line Pressure during the following step.

Move the shift lever to each gear position, pausing momentarily in each position and record the line pressure reading. Allow the pressure to stabilize for at least 5 seconds in each range.

Did the line pressure remain at a steady value between 585 and 655 kPa or 85 and 95 PSI in each position?

Yes >> Go To 6

No >> Go To 10

---

6. CHECK LINE PRESSURE SENSOR CONNECTION

Ignition on, **engine not running.**

With the scan tool, monitor the Line Pressure while firmly pushing the Transmission Line Pressure Sensor connector inwards towards the Transmission.

Did the Line Pressure reading on the scan tool change to about 207 kPa or 30 PSI when the connector was pushed inward?

Yes >> Disconnect and properly reconnect the Line Pressure Sensor connector. Inspect terminals and repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

7. LINE PRESSURE SENSOR OPERATION

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

With the Transmission Simulator select the ″OFF″ position on the ″Input/Output Speed″ switch.

Ignition on, engine not running.

With the scan tool, monitor the Line Pressure while turning the Pressure Switch selector to each of the 3 line pressure positions on the Transmission Simulator.

NOTE: All three scan tool Line Pressure readings should be steady and ±14 kPa or 2.0 PSI of the reading specified on the Transmission Simulator.

Did the scan tool Line Pressure readings match the specified readings on the Transmission Simulator and remain steady in all three positions?

Yes >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

---

8. (F856) 5-VOLT SUPPLY CIRCUIT OPEN

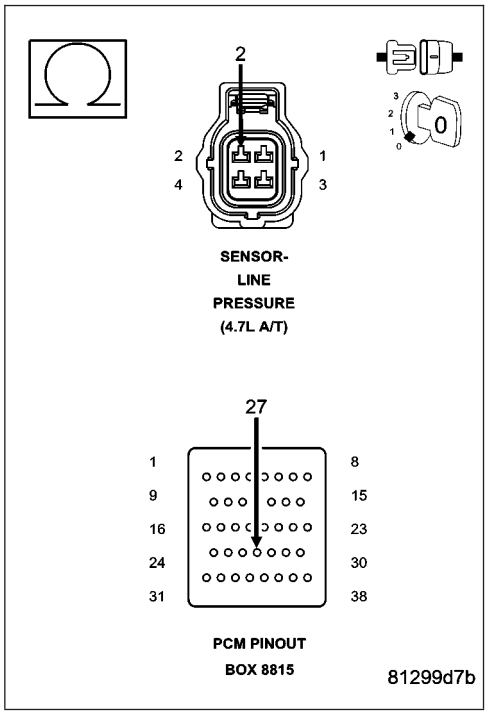
Turn the ignition off to the lock position.

Disconnect Transmission Simulator.

Disconnect the PCM C1 harness connector and connect Miller tool #8815.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (F856) 5-volt Supply circuit from the Line Pressure Sensor harness connector to the appropriate terminal of Miller tool #8815.



Is the resistance above 5.0 ohms?

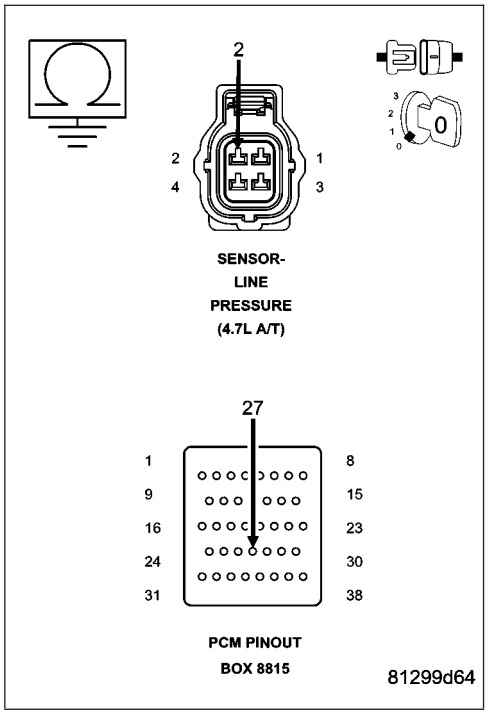
Yes >> Repair the (F856) 5-volt Supply circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 9

P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

9. (F856) 5-VOLT SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

10. COMPARE SCAN TOOL TO PRESSURE GAUGE

Turn the ignition off to the lock position.

Connect the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP. Refer to the Service Information for proper installation procedure.

CAUTION: Apply parking brake.

Start the engine.

In the following steps, compare the scan tool Line Pressure to the Pressure Gauge readings in each gear.

CAUTION: Do not overheat transmission.

With the gear selector in park, raise the RPM to 1500, and compare line pressure readings.

Firmly apply the brakes, move the gear selector into reverse, raise the RPM to 1500, and compare the line pressure readings.

Firmly apply the brakes, move the gear selector into drive, raise the RPM to 1500, and compare the line pressure readings.

Did the scan tool Line Pressure readings match the Pressure Gauge readings ± 10 psi?

Yes >> Go To 11

No >> Replace the Line Pressure Sensor per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

11. WIRING AND CONNECTORS

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Failure to remove the Starter Relay can cause a Transmission - No Response condition.

Remove the Line Pressure Adapter, Miller tool #8259 and 0-300 psi Test Gauge, Miller tool #C-3293-SP.

Install the Transmission Simulator, Miller tool #8333.

On the Transmission Simulator, turn the Pressure Switch selector switch to 4C.

Ignition on, engine not running.

With the scan tool, monitor the 4C Pressure Switch state while pressing and holding the Pressure Switch test button and wiggling the wire harness and connectors that pertain to the 4C Pressure Switch.

Did the 4C Pressure Switch state change to closed and remain closed while wiggling the wires?

Yes >> Go To 12

No >> Go To 14

---

12. CHECK FOR EXCESSIVE DEBRIS

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333.

Remove and inspect the Transmission Oil Pan per the Service Information.

Does the Transmission Oil Pan contain excessive debris or contamination?

Yes >> Repair the cause of the excessive debris in the Transmission Oil Pan. Refer to the Service Information for the proper procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

---

13. CHECK 4C HYDRAULIC CLUTCH CIRCUIT

Remove the Valve Body and air check the 4C hydraulic clutch circuit (in the case) for leakage per the Service Information.

NOTE: The 4C hydraulic clutch circuit contains a small bleed orifice. A small amount of air leakage is normal.

Was there excessive air leakage noticed during the air check?

Yes >> Repair as necessary. Check the 4C clutch piston, piston seals and bleed orifice assembly.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Disassemble and inspect the Valve Body and repair as necessary. Inspect the 4C Accumulator piston and seals. If no problems are found in the Valve Body, replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

14. (T48) 4C PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Simulator, Miller tool #8333 and connect Miller tool #8815.

Disconnect the PCM C4 harness connector.

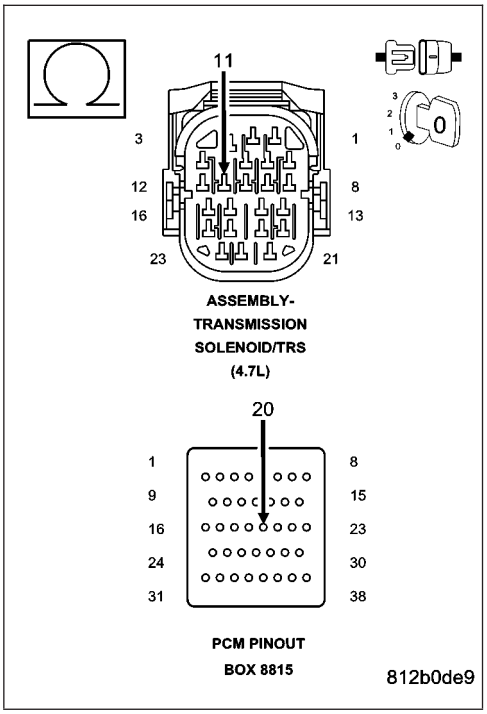
Measure the resistance of the (T48) 4C Pressure Switch Sense circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T48) 4C Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15



15. (T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

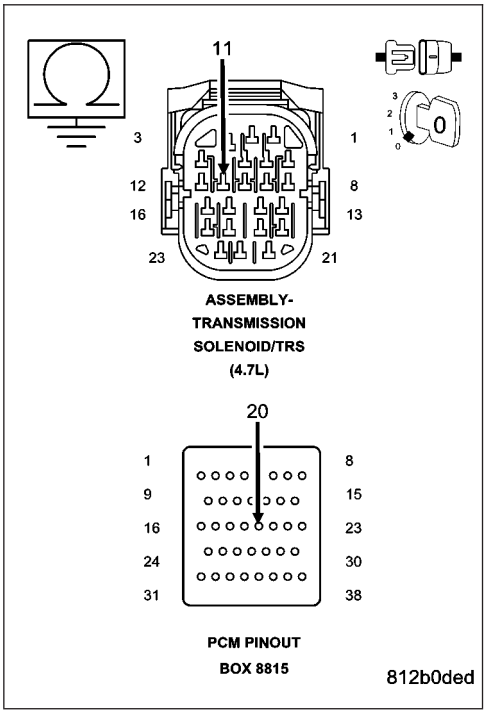
Measure the resistance between ground and the (T48) 4C Pressure Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T48) 4C Pressure Switch Sense circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16



P0987-4C HYDRAULIC PRESSURE TEST (CONTINUED)

16. (T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

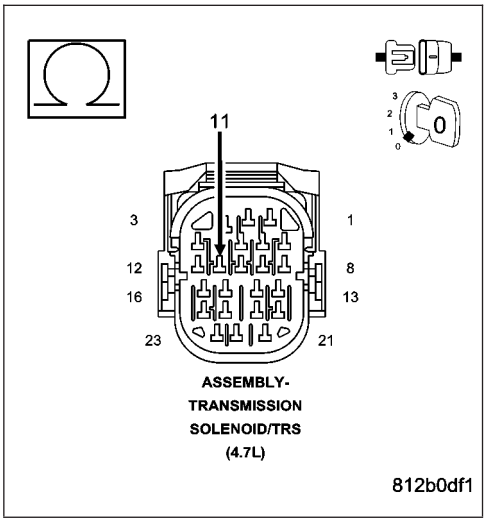
Disconnect all PCM harness connectors.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

NOTE: Make sure the Transmission Solenoid/TRS Assembly harness connector is disconnected.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (T48) 4C Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T48) 4C Pressure Switch Sense circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T48) 4C Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

17. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

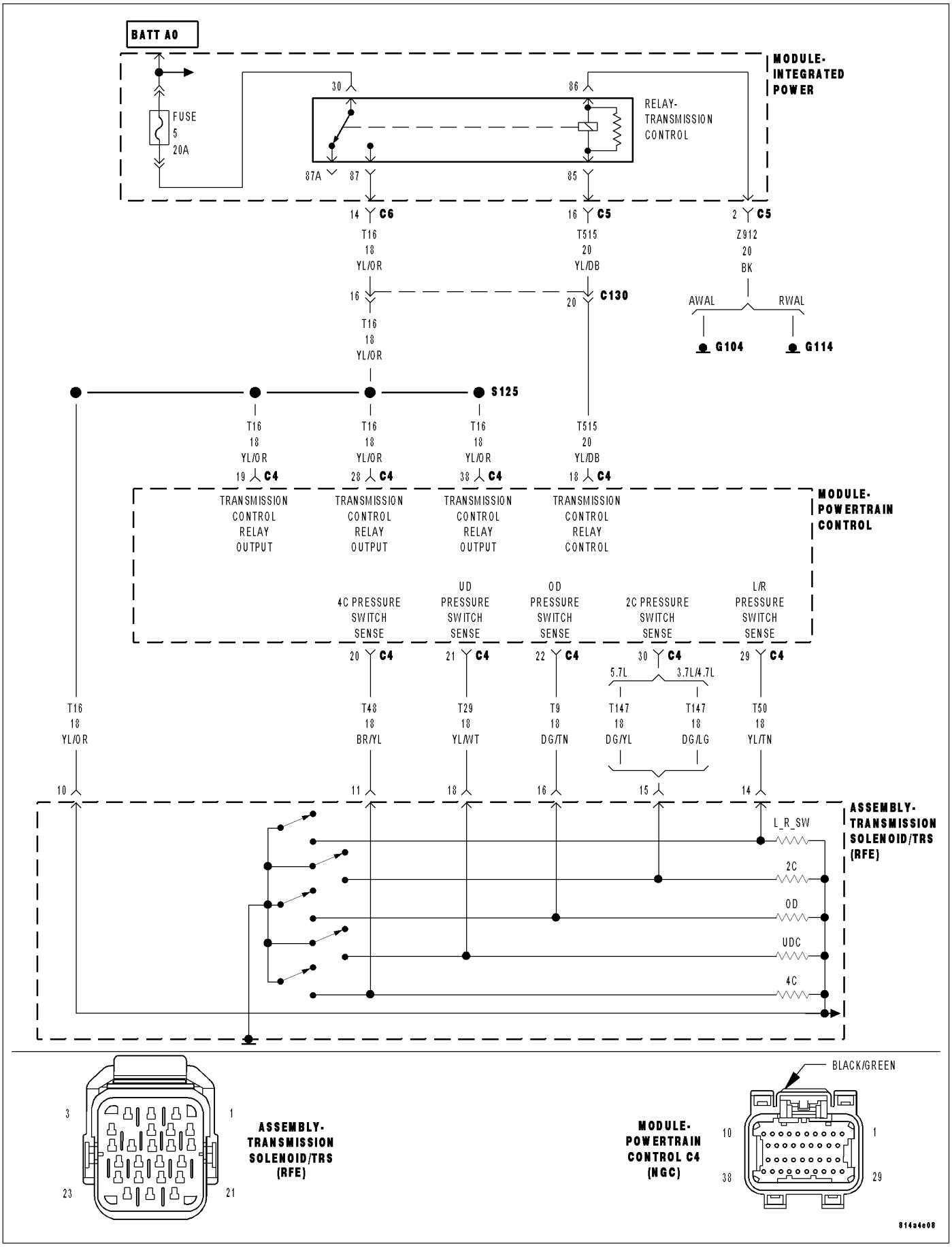
If the EATX DTC EVENT DATA shows the DTC P0987 set while the Line Pressure was significantly below the Desired Line Pressure reading, check for causes of low line pressure (low fluid level, broken or mis-installed primary oil filter or filter seal, sticking Main Regulator Valve in the Pump Valve Body etc.). If the data shows the DTC set while the Line Pressure reading was significantly higher than the Desired Line Pressure, check the Line Pressure Sensor and related wiring.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P0988-4C PRESSURE SWITCH RATIONALITY



P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

For the Transmission circuit diagram (Refer to)(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  The DTC is set if the 4C Pressure Switch reads open or closed at the wrong time in a given gear.

Possible Causes
RELATED RELAY DTC'S PRESENT
DTC P0871 ALSO PRESENT
LOSS OF 12-VOLT FEED
(T48) 4C PRESSURE SWITCH SENSE CIRCUIT OPEN
(T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
EXCESSIVE FLUID LEAKAGE WITH 2C CLUTCH CIRCUIT
#5 AND/OR #7 CHECK BALL CUT OR DAMAGED
LOW LINE PRESSURE
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE
WIRING AND CONNECTORS

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission system uses five pressure switches to monitor the fluid pressure in the LR, 2C, 4C, UD, and OD clutch circuits. The pressure switches are continuously monitored for the correct states in each gear as shown.

GEAR	L/R	2C	4C	UD	OD
REVERSE	OPEN	OPEN	OPEN	OPEN	OPEN
P/N	CLOSED	OPEN	OPEN	OPEN	OPEN
1ST	CLOSED*	OPEN	OPEN	CLOSED	OPEN
2ND	OPEN	CLOSED	OPEN	CLOSED	OPEN
2ND PRIME	OPEN	OPEN	CLOSED	CLOSED	OPEN
DRIVE	OPEN	OPEN	OPEN	CLOSED	CLOSED
4TH	OPEN	OPEN	CLOSED	OPEN	CLOSED
5TH	OPEN	CLOSED	OPEN	OPEN	CLOSED

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is open in Manual 1.

P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED RELAY DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay related DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. EATX DTC DATA SHOW CURRENT DTC

With the scan tool, check the EATX DTC EVENT DATA.

Does the EATX DTC EVENT DATA show data for DTC P0988?

Yes >> Go To 3

No >> Refer to the Transmission category and perform the appropriate symptom shown in the EATX DTC EVENT DATA.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

3. MULTIPLE DTCS PRESENT

With the scan tool, check for other transmission DTC's.

Are there two or more related Pressure Switch Sense DTCs present in addition to P0988?

Yes >> Go To 4

No >> Go To 7

---

4. RELATED DTC PRESENT

With the scan tool, check the EATX DTC EVENT DATA for P0988.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Do all the pressure switches read CLOSED in the EATX DTC EVENT DATA for P0988?

Yes >> Refer to Transmission category and perform diagnostics for the DTC P0888.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5

---

5. EATX DTC EVENT DATA READ OPEN

In the EATX DTC EVENT DATA recorded earlier, read the state of all pressure switches.

Do all the pressure switches read OPEN?

Yes >> Go To 6

No >> Go To 7

P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

6. LOW LINE PRESSURE

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter seal for a split, crack, or improperly installed. If the filter and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

7. DTC P0871 ALSO PRESENT

With the scan tool, check Transmission DTCs.

Is the DTC P0871 also present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

---

8. EATX DTC EVENT DATA READ PARK REVERSE OR NEUTRAL

With the scan tool, check the EATX DTC EVENT DATA for P0988.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the DTC set in Park, Neutral, or Reverse for P0988?

Yes >> Go To 13

No >> Go To 9

---

9. EATX DTC EVENT DATA READ CLOSED

With the scan tool, check the EATX DTC EVENT DATA for P0988.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA show the 4C Pressure Switch reading CLOSED?

Yes >> Go To 11

No >> Go To 10

P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

10. PRIMARY OIL FILTER SEAL

In the EATX DTC EVENT DATA recorded earlier, compare the Line Pressure and the Desired Line Pressure.

Is the Line Pressure less than 40 psi, and significantly below the Desired Line Pressure?

Yes >> Repair as necessary to correct low line pressure. Check fluid level and adjust as necessary. If fluid level is OK, check the Primary Oil Filter seal for a split, crack, or improperly installed. If the filter and seal are OK, check the Main Regulator Valve in the Oil Pump. Refer to the Service Information for the above procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 15

---

11. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to the 4C position.

With the scan tool, monitor the 4C Pressure Switch while pressing the Pressure Switch test button on the Transmission Simulator.

Did the state of the 4C Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Go To 12

No >> Go To 13

---

12. TRANSMISSION SOLENOID/TRS ASSEMBLY

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

13. (T48) 4C PRESSURE SWITCH SENSE CIRCUIT OPEN

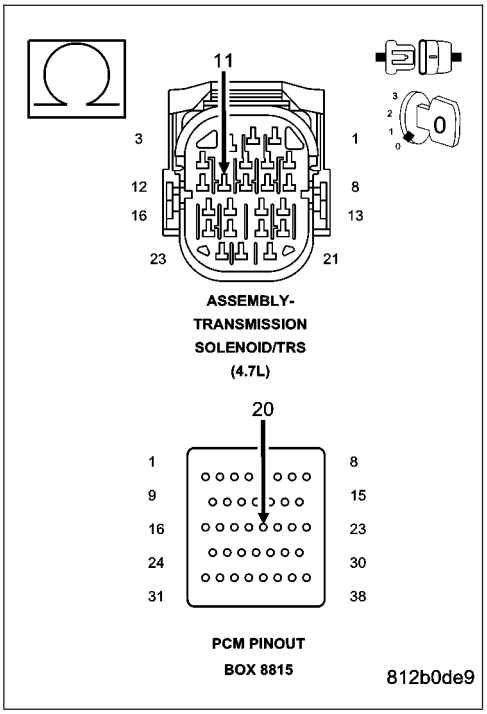
Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector.

NOTE: Check connectors - Clean/repair as necessary.
Connect Miller tool #8815 to the PCM C4 harness connector.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.
Measure the resistance of the (T48) 4C Pressure Switch Sense circuit from the appropriate terminal of Miller tool #8815 to the Transmission Solenoid/TRS Assembly harness connector.



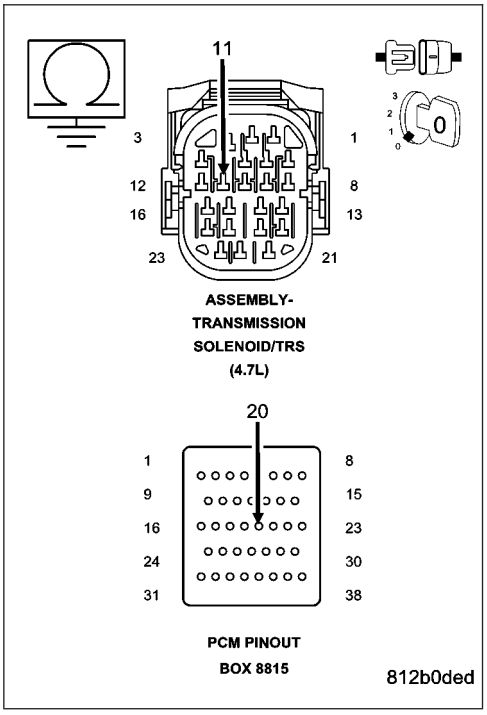
Is the resistance above 5.0 ohms?

Yes >> Repair the (T48) 4C Pressure Switch Sense circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 14

14. (T48) 4C PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T48) 4C Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T48) 4C Pressure Switch Sense circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Powertrain Control Module per the Service Information. With the scan tool, perform the QUICK LEARN procedure.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P0988-4C PRESSURE SWITCH RATIONALITY (CONTINUED)

15. #5 AND/OR #7 CHECK BALL CUT OR DAMAGED

Turn the Ignition off to the lock position.

Remove the Valve Body Assembly per the Service Information.

Inspect the #5 and #7 check balls for any cuts or damage.

Inspect the 4C accumulator piston and seals and also the 4C tower seal on top of the valve body. Refer to the Service Information.

Where there any problems found?

Yes >> Repair as necessary. Check for excessive clutch debris in the transmission oil pan. If excessive clutch debris is present, repair 4C clutch as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 16

---

16. EXCESSIVE FLUID LEAKAGE WITH 4C CLUTCH CIRCUIT

Air check the 4C Clutch hydraulic circuit. Refer to the Service Information.

NOTE: This hydraulic clutch circuit contains a small bleed orifice. Small leakage is considered normal.

Was there excessive air leakage in the 4C Clutch hydraulic circuit?

Yes >> Repair as necessary. Refer to the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1684-BATTERY WAS DISCONNECTED

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the ignition is in the Run/Start position.
- **Set Condition:**
  This DTC will set whenever Powertrain Control Module is disconnected from Fused B+ or ground. It will also be set during the DRBIII® Battery Disconnect and/or Quick Learn procedure.

Possible Causes
BATTERY WAS DISCONNECTED
SCAN TOOL BATTERY DISCONNECT PERFORMED
PCM WAS REPLACED OR DISCONNECTED
QUICK LEARN WAS PERFORMED

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The PCM uses a battery backed RAM (Random Access Memory) is used to maintain some learned values. When the battery B(+) is disconnected, the memory is lost. When the B(+) is restored, this memory loss is detected by the Transmission Control System. The DTC is set and the learned values are initialized to known constants or previously learned values from EEPROM (Electronic Erasable Programmable Read Only Memory). This results in the reinitialization of some parameters.

Diagnostic Test

1. POSSIBLE CAUSES

This DTC is an informational DTC only.

This DTC is set due to a momentary loss of power and/or the ground circuits to the PCM.

Below are a list of possible causes associated with this DTC.

Battery was disconnected.

The BATTERY DISCONNECT feature on the scan tool was performed.

The QUICK LEARN feature on the scan tool was performed.

PCM was replaced or disconnected.

Were any of the above possible causes performed?

Yes >> This is the cause of the DTC. Erase the DTC and return vehicle to customer. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P1684-BATTERY WAS DISCONNECTED (CONTINUED)

2. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

NOTE: Check all power and ground circuits to the PCM for a intermittent or high resistance condition.
Wiggle the wires while checking for shorted and open circuits.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1715-RESTRICTED MANUAL VALVE IN T3 RANGE

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Whenever the PRNDL code indicates Temp3.
- **Set Condition:**
  This DTC sets when conditions for the DTC P1776 are satisfied or 3 unsuccessful attempts to engage 1st gear while the shifter is in the temp3 zone. This indicates a restricted port at the manual valve because the shifter is not fully engaged in the drive position.

Possible Causes
RELATED TRANSMISSION DTC'S PRESENT
CUSTOMER DRIVING HABITS
MISADJUSTED SHIFTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Are any of the following DTC's P0731, P0732, P0733, P0734, P1736 or P0715 present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK SHIFTER ADJUSTMENT

Check Shifter adjustment per the Service Information.

Is the shifter properly adjusted?

Yes >> Go To 3

No >> Adjust the Shifter Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1715-RESTRICTED MANUAL VALVE IN T3 RANGE (CONTINUED)

3. CHECK CUSTOMER DRIVING HABIT

This DTC can be set if the customer rests their hand on the shift lever while they are driving. The transmission can be put in the T3 position if just enough forward pressure is exerted on the shift lever.

When this occurs, the feed port to the clutch is restricted, the transmission will declare neutral, and this DTC will be set. The customer should be informed not to rest their hand on the shifter while driving.

This DTC can also be set by simply bumping the shift lever toward neutral while accelerating.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

If there are no possible causes remaining, view repair.

Repair

This DTC can be set by putting too much forward pressure on the shift lever while it is in the OD position. Make sure the customer is informed.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1736-GEAR RATIO ERROR IN 2ND PRIME

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on, engine running, with the transmission in gear.
- **Set Condition:**
  If the ratio of the Input RPM to the Output RPM does not match the current gear ratio. This DTC can take up to five minutes of problem identification before illuminating the MIL

Possible Causes
RELATED DTC'S PRESENT
INPUT SPEED SENSOR OR WIRING
LOW FLUID LEVEL
CRACKEC OR MISINSTALLED PRIMARY OIL FILTER OR SEAL
WORN SOLENOID SWITCH VALVE OR PLUGS
STUCK OR STICKING MAIN REGULATOR VALVE
BURNED UD OR 4C CLUTCH
CUT 4C OR UD PISTON SEAL
BROKEN 4C PISTON CASTING
BROKEN OR MISSING 4C BLEED ORIFICE
BROKEN OR MISSING UD BLEED ORIFICE
CUT 4C OR UD ACCUMULATOR PISTON SEAL
CRACKED 4C OR UD ACCUMULATOR PISTON
EXTRA CHECK BALL IN PASSAGE DOWNSTREAM OF #7 CHECK BALL POCKET
TRANSMISSION SOLENOID/TRS ASSEMBLY
BROKEN WELD - REACTION CARRIER TO REVERSE SUN GEAR
MISSING TEETH ON INPUT CLUTCH HUB TONE WHEEL

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent which may result in the DTCs P0715 and/or P0720 to set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the signal from the input speed sensor at idle in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set when at a stop.

P1736-GEAR RATIO ERROR IN 2ND PRIME (CONTINUED)

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Are any Transmission: solenoid, line pressure, speed sensor, or loss of prime DTC's present?

Yes >> Refer to appropriate symptom in the Transmission category. Perform the test for P0944–LOSS OF PRIME first if it is present.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK EATX DTC EVENT DATA

With the scan tool, read and record the EATX DTC EVENT DATA.

NOTE: Make sure to record all EATX DTC EVENT DATA stored in the scan tool for future reference in this test procedure.

Does the EATX DTC EVENT DATA display information for the DTC P1736?

Yes >> Go To 3

No >> Go To 6

---

3. CHECK RPM IN EATX DTC EVENT DATA

Refer to the EATX DTC EVENT DATA recorded earlier.

Does the Input RPM read zero?

Yes >> Check the input speed sensor and wiring. Refer to test P0715 and diagnose as if the DTC is current. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. CHECK LINE PRESSURE READING

Refer to the EATX DTC EVENT DATA recorded earlier.

Is the line pressure reading more than 10 psi below the desired line pressure?

Yes >> Go To 5

No >> Go To 6

P1736-GEAR RATIO ERROR IN 2ND PRIME (CONTINUED)

5. PLUGGED TRANSMISSION OIL FILTER

Turn the ignition off to the lock position.

Remove and inspect the Transmission Oil Pan for excessive debris per the Service Information.

Remove and inspect the Primary Oil Filter per the Service Information.

NOTE: Make sure the Primary Transmission Oil Filter and/or seal is not cracked or split.

Does the Oil Pan contain excessive debris and/or is the Primary Oil Filter cracked or plugged?

Yes >> Repair the plugged, cracked, or split Primary Transmission Oil Filter and/or seal. If the Primary Transmission Oil Filter is plugged, refer to the Service Information for the proper hydraulic clutch repair procedure.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Remove the Transmission Oil Pump per the Service Information. Check the main Regulator Valve for sticking in its bore, scoring, and/or damage and clean and repair as necessary. If no problem is found, replace the Transmission Solenoid/TRS Assembly.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. CHECK TO SEE IF DTC P1736 IS CURRENT

With the scan tool, perform the 2nd Prime Gear Clutch Test. Follow the instructions on the scan tool.

Increase the throttle angle, TPS Degree, to 30° for no more than a few seconds.

CAUTION: Do not overheat the transmission.

NOTE: If the 4C clutch is faulty, the overrunning clutch will hold and the slip test will pass. The 2nd Prime gear clutch test will not detect a faulty 4C clutch. However, it will detect a faulty UD clutch.

Did the clutch test pass, did the Input Speed remain at zero?

Yes >> Go To 7

No >> Go To 9

---

7. CHECK FOR INTERMITTENT OPERATION

Check the Shifter adjustment per the Service Information.

Intermittent gear ratio DTCs can be set by problems in the Input and Output Speed Sensor circuits and/or Speed Sensor Ground circuit.

Check the Speed Sensor wiring and connectors for good connection, then perform a wiggle test using the Transmission Simulator, Miller tool #8333.

Were there any problems found?

Yes >> Repair as necessary.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 8

---

8. CHECK FOR SLIPPAGE

With the scan tool, erase Transmission DTCs.

Road test the vehicle.

Durning the road test, operate in 4th gear, and perform kickdown shifts from 4th to 2nd (prime) gears.

Is there an obvious slippage noticed in 4th or 2nd prime gears, or runaway on the 4-2 shift?

Yes >> Go To 11

No >> Go To 14

P1736-GEAR RATIO ERROR IN 2ND PRIME (CONTINUED)

9. UD CLUTCH HYDRAULIC CIRCUIT

Remove Transmission Oil Pan and check for excessive debris.

Remove the Valve Body and air check the UD clutch hydraulic circuit (in the case) per the Service Information.

NOTE: The UD clutch passage contains a small bleed orifice, a small amount of air leakage is normal.

Were there any problems found, excessive debris and/or excessive air leakage in the UD clutch hydraulic circuit?

Yes >> Repair as necessary. Check the UD clutch piston seals and the dribbler assembly, reaction shaft support seal rings, and the flatness of the pump valve body and pump housing faces. Check main regulator valve for sticking in the bore.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 10

---

10. UD ACCUMULATOR PISTON

Check the UD bleed orifice, accumulator piston, and accumulator piston seal in the main valve body.

Were there any problems found?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

11. EXCESSIVE DEBRIS

Remove the Transmission Oil Pan and check for excessive debris.

Remove the valve body and air check the 4C clutch hydraulic circuit per the Service Information.

NOTE: The 4C clutch passage contains a small bleed orifice, a small amount of air leakage is normal.

Were there any problems found, excessive debris, improperly assembled 4C clutch and/or excessive air leakage in the 4C clutch hydraulic circuit?

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures. Note: Check the 4C piston seals and bleed orifice.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 12

---

12. 4C ACCUMULATOR

Check the 4C Accumulator piston for cracks or a cut seal.

Check for a cut or missing #7 or #5 check balls.

Check the Solenoid Switch Valve and its plugs for sticking in its bore or excessive wear.

Were there any problems found

Yes >> Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 13

P1736-GEAR RATIO ERROR IN 2ND PRIME (CONTINUED)

13. CHECK FOR BROKEN REVERSE SUN GEAR WELD

Working through the windows in the bottom of the case, check for a broken Reverse Sun gear weld to the reaction carrier as follows:

(1) Hold the Transmission Output Shaft by holding the Transmission Manual Lever in the park position.

(2) Rotate the Input Annulus gear and drive shell, (the drum that encloses the two rearmost carriers).

(3) Check to see if the reaction carrier (the frontmost carrier, whose outer shell is splined to the 4C clutch) is rotating faster than the drive shell is being turned.

Is the reaction carrier turning faster than the drive shell?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the reaction carrier per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

14. CHECK IF DTC RESET

Did the DTC P1736 reset during the road test?

Yes >> Go To 15

No >> Go To 16

---

15. LIST OF POSSIBLE CAUSES

If any other DTC's set during the road test, refer to the appropriate symptom in the Transmission category.

If no other DTC's set during the road test, below is a list of possible causes, but not strictly limited to those:

Check for excessive debris in the Transmission Oil pan, plugged, cracked, or split Primary Transmission Oil Filter and/or seal.

Check for cuts or missing #7 and #5 check balls in the main valve body.

Check the 4C and UD accumulator pistons and seals, UD bleed orifice, and the Solenoid Switch Valve and Plugs in the main valve body.

Check the UD clutch piston seals, reaction shaft support seal rings, and the flatness of the pump valve body and pump housing faces.

Check the 4C clutch piston seals, and bleed orifice.

Check the UD clutch piston seals, reaction shaft support seal rings, and dribbler assemblies, and the flatness of the pump valve body and pump housing faces.

View repair

Repair

Repair as necessary. Refer to the Service Information for proper repair procedures.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1736-GEAR RATIO ERROR IN 2ND PRIME (CONTINUED)

16. INTERMITTENT DTC

The conditions necessary to set this DTC are not present at this time.

Use the EATX DTC EVENT DATA to help identify the conditions and/or possible causes that may have caused the DTC to set.

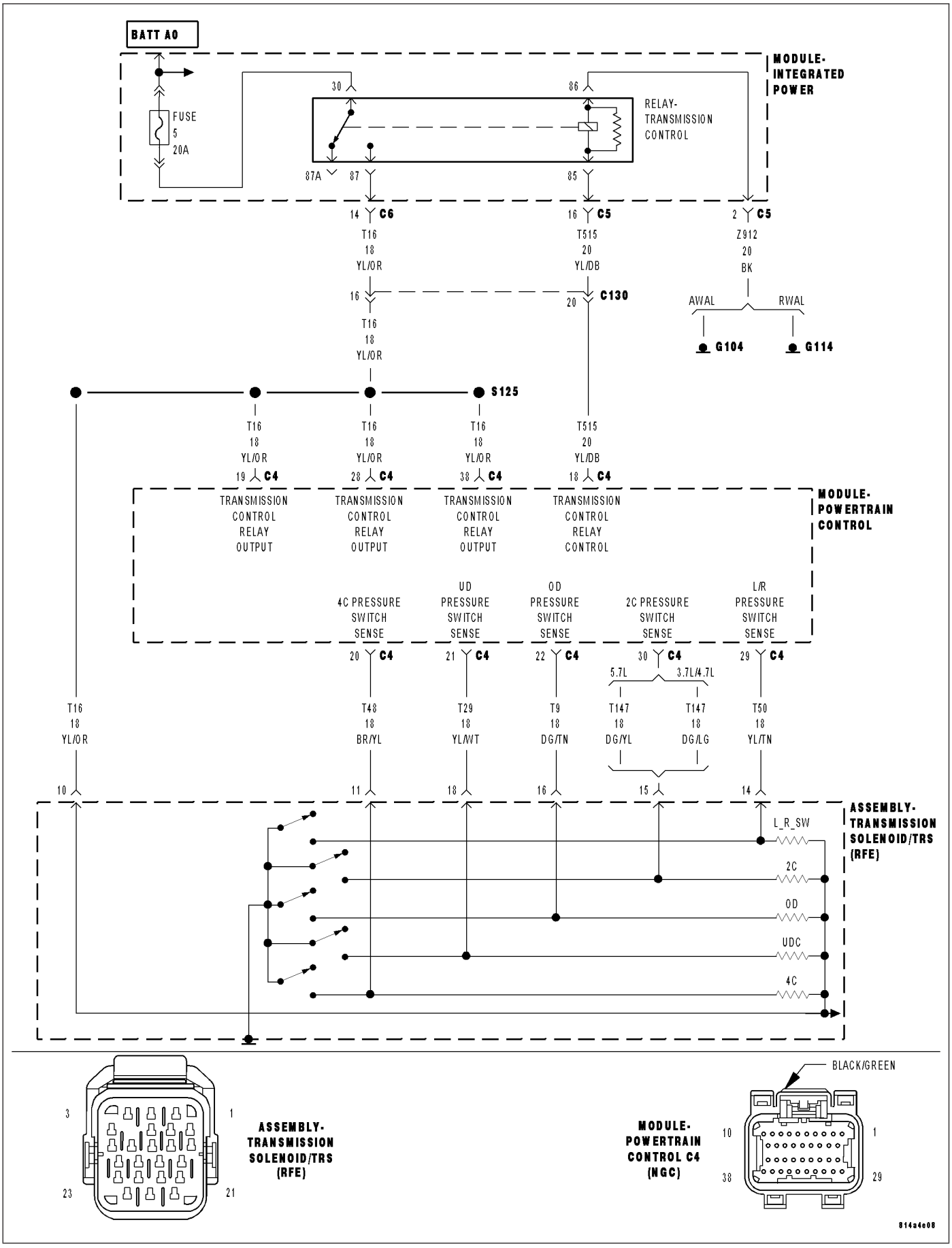
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION



P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  During an attempted shift into 1st gear.
- **Set Condition:**
  This DTC is set if three unsuccessful attempts are made to shift the Solenoid Switch Valve (SSV) into the downshifted position in one given ignition start. This DTC can take up to five minutes to mature before illuminating the MIL.

Possible Causes
RELATED DTC P0841 PRESENT
SOLENOID SWITCH VALVE STICKING
L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Solenoid Switch Valve (SSV) controls the direction of the transmission fluid when the L/R Solenoid is energized. The SSV will be in the downshifted position in 1st gear, thus directing the fluid to the L/R clutch circuit. In 2nd through 5th gears, it will be in the upshifted position and directing the fluid into the torque converter clutch (TCC).

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R Pressure Switch is monitored to confirm SSV movement. If movement is not confirmed (the L/R pressure switch does not close), EMCC is inhibited until SSV operation is confirmed.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is the DTC P0841 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK TO SEE IF DTC P1775 IS CURRENT

Perform a visual inspection of all connectors, wiring, and cooler connections before proceeding. Repair as necessary.

With the scan tool, Check the STARTS SINCE SET counter.

NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter for P1775 at 2 or less?

Yes >> Go To 3

No >> Go To 6

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to L/R.

With the scan tool, monitor the L/R Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the state of the L/R Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Go To 4

No >> Go To 5

---

4. SOLENOID SWITCH VALVE STICKING

Turn the ignition off to the lock position.

Remove the Transmission Oil Pan per the Service Information.

Remove the Transmission Valve body per the Service Information.

Inspect the Solenoid Switch Valve and Plugs for sticking.

Is the Solenoid Switch Valve or Plugs sticking?

Yes >> Clean and inspect per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1775-SOLENOID SWITCH VALVE LATCHED IN TCC POSITION (CONTINUED)

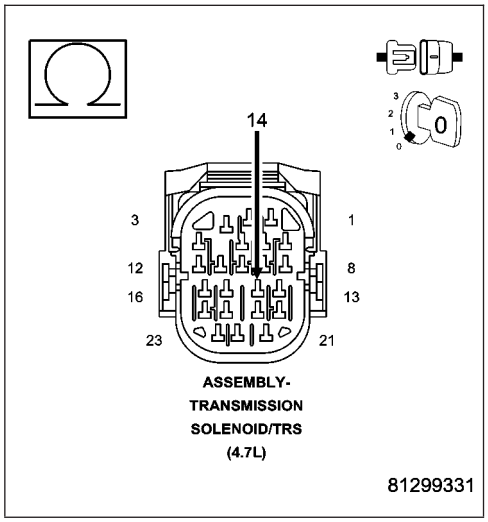
5. L/R PRESSURE SWITCH SENSE CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid/TRS Assembly harness connector.

Disconnect all PCM harness connectors.

Measure the resistance between the (T50) L/R Pressure Switch Sense circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.



Is the resistance below 5.0 ohms between the (T50) L/R Pressure Switch Sense circuit and all other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T50) L/R Pressure Switch Sense circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

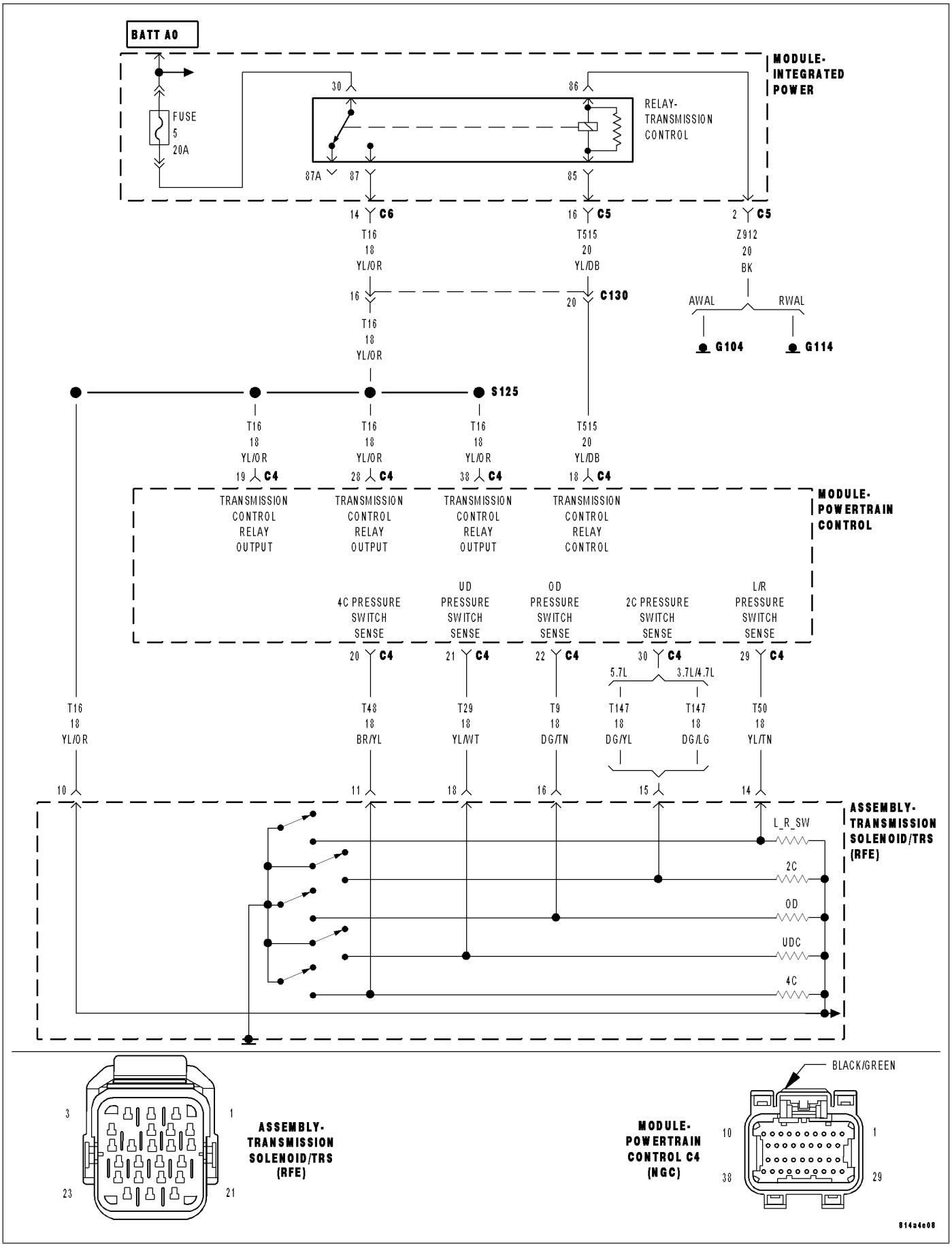
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION



P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously when performing partial or full EMCC - PEMCC or FEMCC.
- **Set Condition:**
  If the transmission senses the L/R pressure switch closing while performing PEMCC or FEMCC. This DTC will set after two unsuccessful attempts to perform PEMCC or FEMCC. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
RELATED DTC P0841 PRESENT
LR PRESSURE SWITCH SENSE CIRCUIT OPEN
LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND
SOLENOID SWITCH VALVE
POWERTRAIN CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Solenoid Switch Valve (SSV) controls the direction of the transmission fluid when the L/R Solenoid is energized. The SSV will be in the downshifted position in 1st gear, thus directing the fluid to the L/R clutch circuit. In 2nd through 5th gears, it will be in the upshifted position and directing the fluid into the torque converter clutch (TCC).

When in 2nd, 2nd Prime, 3rd, 4th, or 5th gear, the Torque Converter Clutch (TCC) can be engaged when certain conditions are met. The TCC piston is electronically modulated by increasing the duty cycle of the L/R solenoid until the torque converter slip difference (difference between engine and transmission input speed) is within 60 RPM. Then the L/R solenoid is fully energized (FEMCC / 100% duty cycle). Torque converter slip is monitored in FEMCC to ensure adequate clutch capacity.

Diagnostic Test

1. DETERMINING IF RELATED DTC'S ARE PRESENT

With the scan tool, check for other transmission DTC's

Is the DTC P0841 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

2. CHECK TO SEE IF DTC P1776 IS CURRENT

With the scan tool, Check the STARTS SINCE SET counter.

NOTE: NOTE: This counter only applies to the last DTC set.

Is the STARTS SINCE SET counter 2 or less?

Yes >> Go To 3

No >> Go To 7

---

3. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the Transmission Simulator, turn the Pressure Switch selector switch to the LR position.

With the scan tool, monitor the LR Pressure Switch state while pressing the Pressure Switch Test button on the Transmission Simulator.

Did the state of the LR Pressure Switch change while pressing the Pressure Switch Test button?

Yes >> Go To 4

No >> Go To 5

---

4. SOLENOID SWITCH VALVE

Remove the Valve Body per the Service Information.

Inspect the Solenoid Switch Valve and plugs for sticking in the bore and/or wear.

Were there any problems found?

Yes >> Clean and repair as necessary per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 7

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

5. LR PRESSURE SWITCH SENSE CIRCUIT OPEN

Turn the ignition off to the lock position.

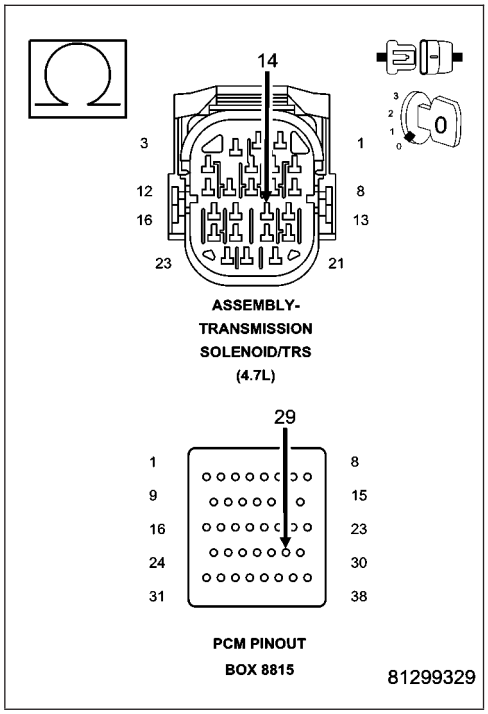
Disconnect the Transmission Simulator, Miller tool #8333.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

NOTE: Note: Check connectors - Clean/repair as necessary.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T50) LR Pressure Switch Sense circuit between the appropriate terminal of Miller tool #8815 to the Solenoid/ TRS Assembly harness connector.



Is the resistance above 5.0 ohms?

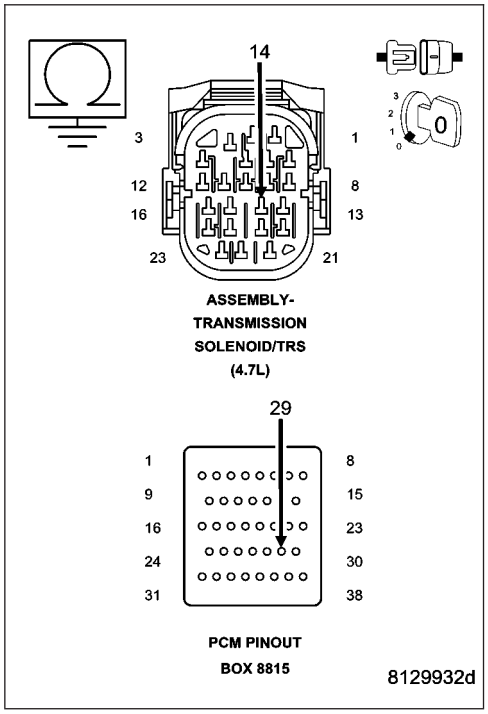
Yes >> Repair the (T50) LR Pressure Switch Sense circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6

6. (T50) LR PRESSURE SWITCH SENSE CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T50) LR Pressure Switch Sense circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T50) LR Pressure Switch Sense circuit for a short to ground.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1776-SOLENOID SWITCH VALVE LATCHED IN LR POSITION (CONTINUED)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle the wires while checking for shorted and open circuits.

This DTC can also be set by the Solenoid Switch Valve intermittently sticking in it's bore under extreame temperature conditions, or by a worn Solenid Switch Valve or plugs.

With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P1790-FAULT IMMEDIATELY AFTER SHIFT

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  After a speed ratio error is stored.
- **Set Condition:**
  This DTC is set if the associated speed ratio DTC is stored within 1.3 seconds after a shift.

Possible Causes
FAULT AFTER SHIFT

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

This DTC will only be stored along with a gear ratio DTC. If this DTC is set, it indicates a probable hydraulic (line pressure) or mechanical problem exists. Diagnosing the transmission should be based on the associated speed ratio DTC and mechanical causes should be considered first.

INTENDED GEAR	CLUTCHES APPLYING	RECOMENDED DTC
REVERSE	UD** - MS	P0738
1ST	UD - LR*	P0731
2ND	UD - 2C	P0732
2ND PRIME	UD - 4C	P1736
3RD	UD - OD/MS	P0733
4TH	OD/MS - 2C	P0734
5TH	OD/MS - 2C	P0735

* L/R is used only up to 150 output RPM in 1st gear. ** UD will show as applied in Reverse but the UD clutch is actually released. OD/MS is OD and/or MS.

Diagnostic Test

1. INTENDED GEAR TO APPLIED CLUTCH

With the scan tool, check the EATX DTC EVENT DATA to determine in which gear the slippage occurred and the clutches that were applied.

With the EATX DTC EVENT DATA, use the information provided above to determine the proper symptom for diagnosis.

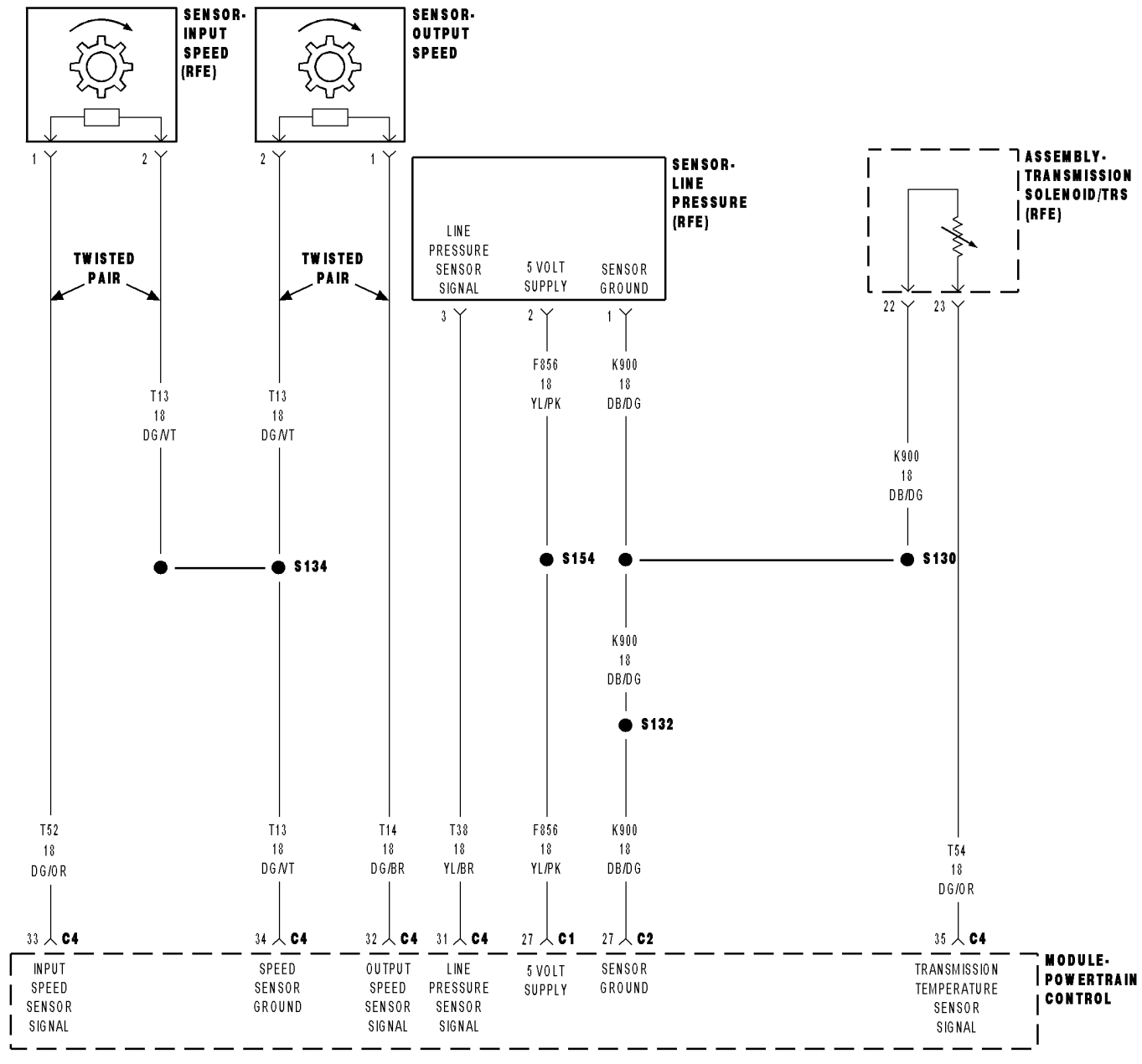
View repair

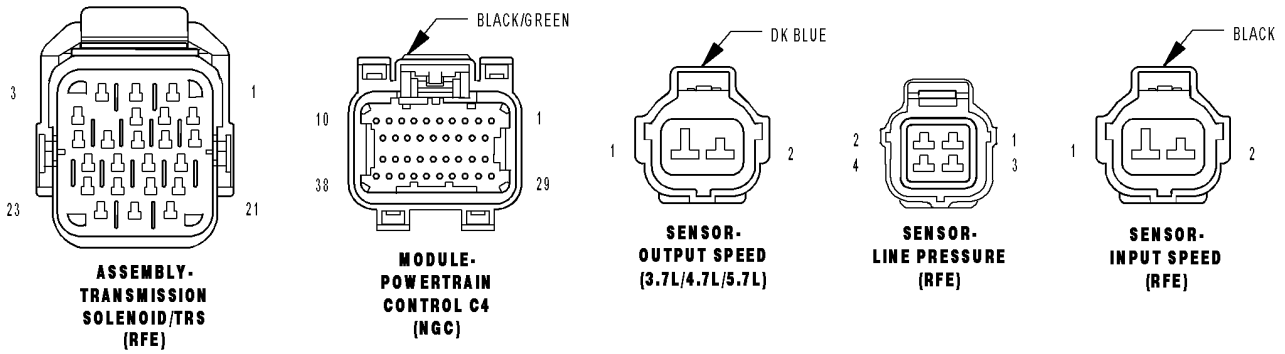
Repair

Refer to the Transmission category and perform the appropriate symptom identified from the EATX DTC EVENT DATA, intended gear, and applied clutches.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

P1794-SPEED SENSOR GROUND ERROR





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P1794-SPEED SENSOR GROUND ERROR (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  The gear ratio is monitored continuously while the Transmission is in gear.
- **Set Condition:**
  After a controller reset in neutral and a ratio of input to output, of 1 to 2. This DTC can take up to five minutes of problem identification before illuminating the MIL.

Possible Causes
(T13) SPEED SENSOR GROUND CIRCUIT OPEN
(T13) SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND
(T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The transmission system uses two speed sensors, one to measure input RPM and one to measure output RPM. These inputs are essential for proper transmission operation. Therefore, the integrity of this data is verified through the following checks:

1) When in gear, if the gear ratio does not compare to a known gear ratio, the corresponding in-gear trouble code is set (DTCs P0731–36).

2) An excessive change in input or output speeds indicating signal intermittent which may result in the DTCs P0715 and/or P0720 to set.

3) If the common speed sensor ground circuit is lost, both sensor inputs will read the signal from the input speed sensor at idle in neutral. Since the input speed sensor reads 60 teeth from the input clutch hub and the output speed sensor reads 30 teeth from the park gear, the result is an apparent speed ratio of 1:2 and may cause the DTC P1794 to set when at a stop.

Diagnostic Test

1. CHECK TO SEE IF DTC P1794 IS CURRENT

Engine Running, Shift lever in park.

With the scan tool, read the Transmission Output and Input Speed Sensor states.

Is the Output Speed Sensor reading twice the Input Speed Sensor reading?

Yes >> Go To 2

No >> Go To 6

P1794-SPEED SENSOR GROUND ERROR (CONTINUED)

2. PCM AND WIRING

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install the Transmission Simulator, Miller tool 8333.

NOTE: Check connectors - Clean/repair as necessary.

With the Transmission Simulator, set the Input/Output Speed selector switch to the ″3000/1000″ position. Turn the Input/Output Speed switch to ″ON″.

Ignition on, engine not running.

With the scan tool, monitor the Input and Output Speed Sensor state.

Does the Input speed read 3000 RPM and the Output speed read 1000 RPM, within 50 RPM?

Yes >> Go To 6

No >> Go To 3

---

3. (T13) SPEED SENSOR GROUND CIRCUIT OPEN

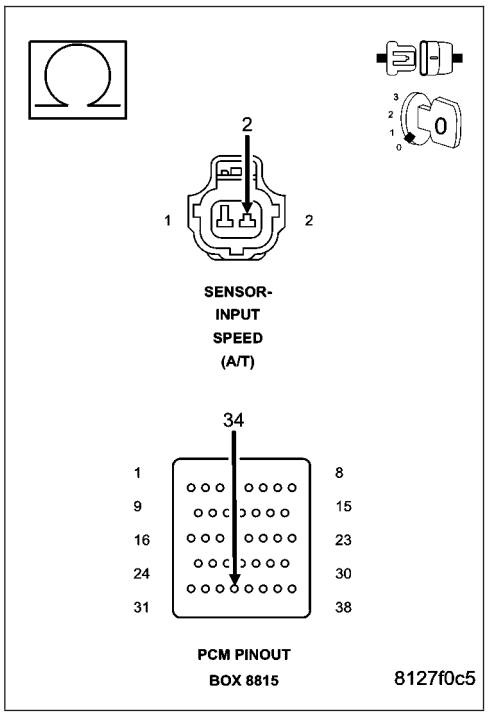
Turn the ignition off to the lock position.

Disconnect the PCM C4 harness connector and connect Miller tool #8815.

Disconnect the Transmission Simulator, Miller tool #8333.

CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller tool #8815 to perform diagnosis.

Measure the resistance of the (T13) Speed Sensor Ground circuit from the appropriate terminal of Miller tool #8815 to the Transmission Solenoid/TRS Assembly and both Input and Output Speed Sensor harness connectors.



Is the resistance above 5.0 ohms on any of the above measurements?

Yes >> Repair the (T13) Speed Sensor Ground circuit for an open.

Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

P1794-SPEED SENSOR GROUND ERROR (CONTINUED)

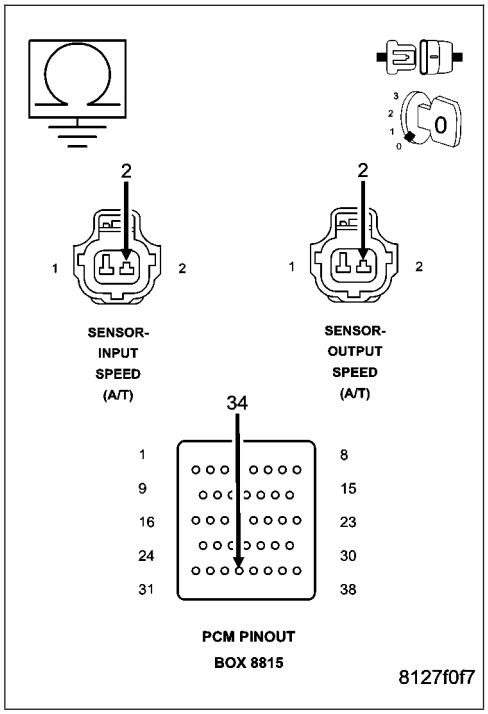
4. (T13) SPEED SENSOR GROUND CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T13) Speed Sensor Ground circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T13) Speed Sensor Ground circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



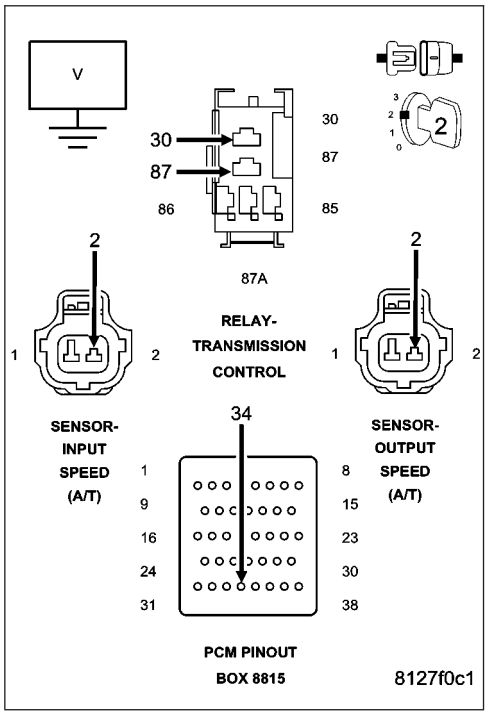
5. (T13) SPEED SENSOR GROUND CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.
Measure the voltage of the (T13) Speed Sensor Ground circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (T13) Speed Sensor Ground circuit for a short to voltage.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



P1794-SPEED SENSOR GROUND ERROR (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle the wires while checking for shorted and open circuits.
With the scan tool, check the EATX DTC EVENT DATA to help identify the conditions in which the DTC was set.

Where there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P2700-INADEQUATE ELEMENT VOLUME LR

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running. The LR clutch volume index (CVI) is updated during a 3-1 or 2-1 manual downshift with throttle angle below 5 degrees. Transmission temperature must be at least 43° C (110° F).
- **Set Condition:**
  When the LR clutch volume index (CVI) falls below 16.

Possible Causes
HYDRAULIC LEAK IN THE VALVE BODY
BROKEN L/R CLUTCH PISTON RETURN SPRING OR SPRING RETAINERS
BROKEN L/R ACCUMULATOR SPRING(S)
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The volumes of the transmission fluid needed to apply the friction elements are continuously monitored and learned for adaptive controls. As the clutch friction material wears, the volume of fluid needed to apply the clutch increases. Certain transmission mechanical problems can cause near-zero learned volumes resulting in setting a DTC. The DTC will usually set with other DTC's, which indicates an internal transmission problem.

Diagnostic Test

1. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTCs.

Are there any Pressure Switch Sense circuit DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK LR CLUTCH VOLUME INDEX

With the scan tool, erase DTCs.

Start the engine and warm the transmission.

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.
Drive the vehicle and perform at least ten 3-1 manual downshifts at closed throttle from speeds of about 32 Kmh or 20 MPH.

With the scan tool, read the LR CL VOL INDEX.

Is the LR CL VOL INDEX below 20?

Yes >> Go To 3

No >> Go To 5

P2700-INADEQUATE ELEMENT VOLUME LR (CONTINUED)

3. L/R CLUTCH CIRCUIT LEAKS IN THE VALVE BODY

Turn the ignition off to the lock position.
Remove the transmission oil pan per the Service Information.
Remove the valve body per the service information.
Check condition of the L/R accumulator springs.
Look for possible leak paths into the L/R clutch hydraulics circuit within the valve body.

Were any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. AIR CHECK L/R CLUTCH CIRCUITS

Perform an air check on the L/R Clutch circuit per the Service Information.
Watch and listen for L/R Clutch piston movement.

Does the L/R piston stroke and return properly?

Yes >> Replace the Transmission/TRS Solenoid Assembly per the service information. With the scan tool, perform Quick Learn.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair internal transmission as necessary. Pay attention to the components related to the L/R clutch. A broken or weak L/R clutch return spring, Accumulator Spring, and/or dislocated snap ring could cause this problem.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. VERIFY PCM OPERATION

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.
Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 Kmh or 50 MPH, then brake lightly to a stop. Turn off engine.
With the scan tool, record the CL VOL INDEX (CVI) for all clutches
With the scan tool, perform a BATTERY DISCONNECT.
With the scan tool, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT.

Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P2701-INADEQUATE ELEMENT VOLUME 2C

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running. The 2C clutch volume index (CVI) is updated during a 3-2 kickdown with throttle angle between 10 and 54 degrees. Transmission temperature must be at least 43° C (110° F).
- **Set Condition:**
  When the 2C CVI falls below 5.

Possible Causes
HYDRAULIC LEAK IN THE VALVE BODY
BROKEN 2C CLUTCH PISTON RETURN SPRING / DISLODGED SNAP RING
BROKEN ACCUMULATOR SPRING(S)
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The volumes of the transmission fluid needed to apply the friction elements are continuously monitored and learned for adaptive controls. As the clutch friction material wears, the volume of fluid needed to apply the clutch increases. Certain transmission mechanical problems can cause near-zero learned volumes resulting in setting a DTC. The DTC will usually set with other DTC's, which indicates an internal transmission problem.

Diagnostic Test

1. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTCs.

Are there any Pressure Switch Sense circuit DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK 2C CLUTCH VOLUME INDEX

With the scan tool, erase Transmission DTCs.

Drive the vehicle at about 80 Kmh or 50 MPH, then depress the OD off button. This will put the vehicle into third gear.

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.
Perform at least ten 3-2 kickdowns by depressing the throttle between 10 and 54 TPS DEGREES at speeds of about 80 Kmh or 50 MPH.

With the scan tool, read the 2C CL VOL INDEX.

Is the 2C CL VOL INDEX below 10?

Yes >> Go To 3

No >> Go To 5

P2701-INADEQUATE ELEMENT VOLUME 2C (CONTINUED)

3. 2C CLUTCH CIRCUIT LEAKS IN THE VALVE BODY

Turn the ignition off to the lock position.

Remove the transmission oil pan per the Service Information.

Remove the valve body per the service information.

Check condition of the 2C accumulator springs.

Look for possible leak paths into the 2C clutch hydraulics circuit within the valve body.

Were any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. AIR CHECK 2C CLUTCH CIRCUIT

Turn the ignition off to the lock position.

Perform an air check on the 2C Clutch circuit per the Service Information.

Watch and listen for 2C Clutch piston movement.

Dose the piston stroke and return properly?

Yes >> Replace the Transmission/TRS Solenoid Assembly per the service information. With the scan tool, perform Quick Learn.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Repair internal transmission as necessary. Pay attention to the components related to the 2C clutch. A broken or dislodged 2C return spring, snap ring or broken 2C Accumulator Spring could cause this problem.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. VERIFY PCM OPERATION

NOTE: NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.

Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 Kmh or 50 MPH, then brake lightly to a stop. Turn off engine.

With the scan tool, record the CL VOL INDEX (CVI) for all clutches

With the scan tool, perform a BATTERY DISCONNECT.

With the scan tool, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT.

Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P2702-INADEQUATE ELEMENT VOLUME OD

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running. The OD clutch volume index (CVI) is updated during a 2-3 upshift with throttle angle between 10 and 54 degrees. Transmission temperature must be at least 43° C (110° F).
- **Set Condition:**
  When the OD CVI falls below 5.

Possible Causes
HYDRAULIC LEAK IN THE VALVE BODY
BROKEN OD ACCUMULATOR SPRING
BROKEN OD/REV PISTON BELLEVILLE SPRING OR DISLODGED SNAP RING
INTERNAL LEAKAGE IN PUMP ASSEMBLY
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The volumes of the transmission fluid needed to apply the friction elements are continuously monitored and learned for adaptive controls. As the clutch friction material wears, the volume of fluid needed to apply the clutch increases. Certain transmission mechanical problems can cause near-zero learned volumes resulting in setting a DTC. The DTC will usually set with other DTC's, which indicates an internal transmission problem.

Diagnostic Test

1. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTCs.

Are there any Pressure Switch Sense circuit DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK THE OD CLUTCH VOLUME INDEX

With the scan tool, erase DTCs.

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.
Drive the vehicle and perform at least ten 2-3 upshifts with the TPS degree between 10 and 54.
With the scan tool, read the OD CL VOL INDEX.

Is the OD CL VOL INDEX below 10?

Yes >> Go To 3

No >> Go To 5

P2702-INADEQUATE ELEMENT VOLUME OD (CONTINUED)

3. OD CLUTCH CIRCUIT LEAKS IN THE VALVE BODY

Turn the ignition off to the lock position.

Remove the transmission oil pan per the Service Information.

Remove the valve body per the service information.

Check condition of the OD accumulator spring.

Look for possible leak paths into the OD clutch hydraulics circuit within the valve body.

Were any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. AIR CHECK OD CLUTCH CIRCUIT

Perform an air check on the OD Clutch circuit per the Service Information.

Watch and listen for OD Clutch piston movement.

Air check all other pump passages and watch for air leakage into the OD clutch passage.

NOTE: There is a bleed orifice between the OD and Reverse Clutch passages, so a small amount of air leakage from Reverse to OD is normal.

Were any problems found?

Yes >> Repair internal transmission. Pay attention to the OD Clutch. Broken or weak return spring or a dislocated snap ring could cause this problem. If no problems were found in the OD clutch, or if leakage into the OD passage was noted, replace Pump Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission/TRS Solenoid Assembly per the service information. With the scan tool, perform Quick Learn.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. VERIFY PCM OPERATION

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.

Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 Kmh or 50 MPH, then brake lightly to a stop. Turn off engine.

With the scan tool, record the CL VOL INDEX (CVI) for all clutches.

With the scan tool, perform a BATTERY DISCONNECT.

With the scan tool, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT.

Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P2703- INADEQUATE ELEMENT VOLUME UD

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running. The UD clutch volume index (CVI) is updated during a 4-3 kickdown with throttle angle between 10 and 54 degrees. Transmission temperature must be at least 43° C (110° F).
- **Set Condition:**
  When the UD CVI falls below 11.

Possible Causes
BROKEN UD ACCUMULATOR SPRING(S)
BROKEN UD CLUTCH PISTON SPRING OR DISLODGED SNAP RING
INTERNAL LEAKAGE IN PUMP OR VALVE BODY ASSEMBLIES
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The volumes of the transmission fluid needed to apply the friction elements are continuously monitored and learned for adaptive controls. As the clutch friction material wears, the volume of fluid needed to apply the clutch increases. Certain transmission mechanical problems can cause near-zero learned volumes resulting in setting a DTC. The DTC will usually set with other DTC's, which indicates an internal transmission problem.

Diagnostic Test

1. OTHER DTCS PRESENT

With the scan tool, check for other transmission DTCs.

Are there any Pressure Switch Sense circuit DTCs present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

---

2. CHECK UD CLUTCH VOLUME INDEX

With the scan tool, erase Transmission DTCs.

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.
Drive the vehicle and perform at least ten 4-3 kickdowns by depressing the throttle between 30 and 54 TPS degrees at speeds about 80 Kmh or 50 MPH.

With the scan tool, read the UD clutch volume index (CVI).

Is the UD CVI below 10?

Yes >> Go To 3

No >> Go To 5

P2703- INADEQUATE ELEMENT VOLUME UD (CONTINUED)

3. UD CLUTCH CIRCUIT LEAKS IN THE VALVE BODY

Turn the ignition off to the lock position.

Remove the transmission oil pan and valve body per the Service Information.

Check the condition of the UD accumulator springs.

Look for possible leak paths into the UD clutch hydraulics circuit within the valve body.

Were there any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. AIR CHECK UD CLUTCH CIRCUIT

Perform an air check on the UD Clutch circuit per the Service Information.

Watch and listen for UD Clutch piston movement.

Air check all other pump passages for air leakage into the UD Clutch circuit.

Were any problems found?

Yes >> Repair internal transmission. Pay attention to components related to the UD clutch. Broken or weak return spring or a dislocated snap ring. If no trouble is found in UD clutch component or UD clutch leakage was noted in the clutch passage, replace the Pump Assembly.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission/TRS Solenoid Assembly per the service information. With the scan tool, perform Quick Learn.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. VERIFY PCM OPERATION

NOTE: The TRANS TEMP DEG must be at least 43° C or 110° F before performing the following steps.

Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 80 Kmh or 50 MPH, then brake lightly to a stop. Turn off engine.

With the scan tool, record the clutch volume index (CVI) for all clutches.

With the scan tool, perform a BATTERY DISCONNECT.

With the scan tool, read the CVI's and compare them to the readings recorded before the BATTERY DISCONNECT.

Are any of the CVI's less than 5 or different than before the BATTERY DISCONNECT?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P2704-INADEQUATE ELEMENT VOLUME 4C

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Whenever the engine is running. The 4C clutch volume index (CVI) is updated during a 3-4 upshift with throttle angle between 10 and 54 degrees. Transmission temperature must be at least 43° C (110° F).
- **Set Condition:**
  When the 4C CVI falls below 5.

Possible Causes
BROKEN 4C RETURN SPRING OR DISLODGED SNAP RING
BROKEN 4C ACCUMULATOR SPRING(S)
HYDRAULIC LEAK IN THE VALVE BODY
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The volumes of the transmission fluid needed to apply the friction elements are continuously monitored and learned for adaptive controls. As the clutch friction material wears, the volume of fluid needed to apply the clutch increases. Certain transmission mechanical problems can cause near-zero learned volumes resulting in setting a DTC. The DTC will usually set with other DTC's, which indicates an internal transmission problem.

Diagnostic Test

1. CHECK THE 4C CLUTCH VOLUME

With the scan tool, record the 4C clutch volume index (CVI) and erase DTC's.

Perform at least 10, 3-4 upshifts with the throttle between 10 and 54 degrees. The Transmission temperature must be at least 43° C or 110° F.

With the scan tool, read the 4C CVI.

Is the current 4C CVI below 10?

Yes >> Go To 2

No >> Go To 5

---

2. DTC P0876 PRESENT

With the scan tool, read DTCs.

NOTE: The DTC P0876 must also be set with P2704 in order for this test to be valid.

Is the DTC P0876 also present?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information. Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

P2704-INADEQUATE ELEMENT VOLUME 4C (CONTINUED)

3. 4C CLUTCH CIRCUIT LEAKS IN THE VALVE BODY

Turn the ignition off to the lock position.
Remove the transmission oil pan per the Service Information.
Remove the valve body per the Service Information.
Check condition of the 4C accumulator springs.
Look for possible leak paths into the 4C clutch hydraulics circuit within the valve body.

Were any problems found?

Yes >> Repair as necessary.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 4

---

4. AIR CHECK 4C CLUTCH CIRCUIT

Perform an air check on the 4C Clutch circuit per the Service Information.
Listen for proper 4C Clutch piston movement.

Were any problems found?

Yes >> Repair Internal transmission as necessary. Pay attention to the mechanical components related to the 4th clutch. A broken or weak return spring or a dislocated snap ring could cause this problem.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Replace the Transmission Solenoid/TRS Assembly per the service information. With the scan tool, perform Quick Learn.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

---

5. VERIFY PCM OPERATION

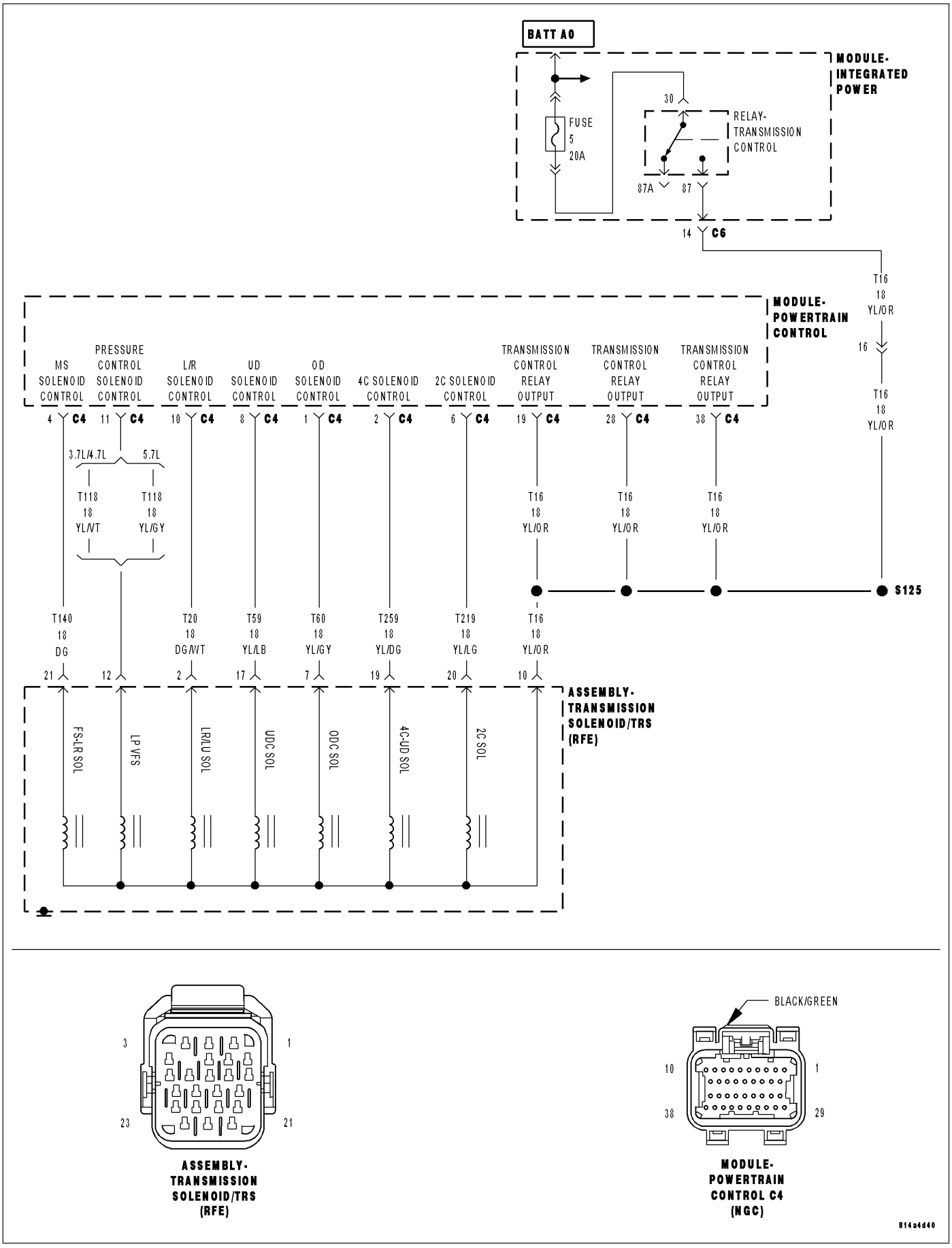
Perform eight learnable starts. A learnable start is defined as follows: Start engine. From a standstill, accelerate lightly to 50 MPH, then brake lightly to a stop. Turn off engine.
With the scan tool, record Transmission CL VOL INDEX (CVI) for all clutches.
With the scan tool, perform a BATTERY DISCONNECT.
With the scan tool, read the CVI's and compare them to the reading recorded before the BATTERY DISCONNECT.

Are any of the CVI's less than 5 or are they different than before the battery disconnect?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Test Complete.

P2706-MS SOLENOID CIRCUIT



ASSEMBLY-
TRANSMISSION
SOLENOID/TRS
(RFE)

MODULE-
POWERTRAIN
CONTROL C4
(NGC)

814a4d40

P2706-MS SOLENOID CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to)(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Initially at power-up, then every 10 seconds thereafter. The solenoid circuits will also be tested immediately after a gear ratio or pressure switch error is detected.
- **Set Condition:**
  After three consecutive solenoid continuity test failures, or one failure if test is run in response to a gear ratio or pressure switch error. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Possible Causes
RELATED RELAY DTC'S PRESENT
(T118) MS SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
(T118) MS SOLENOID CONTROL CIRCUIT OPEN
(T118) MS SOLENOID CONTROL CIRCUIT SHORT TO GROUND
TRANSMISSION SOLENOID/TRS ASSEMBLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - DIAGNOSIS AND TESTING).

Theory of Operation

The Transmission Control System uses six electronically controlled solenoids that allow hydraulic fluid to be applied to various friction elements (clutches), which enables the gear requested. The continuity of each solenoid circuit is periodically tested. Each inactive solenoid is turned on for a few milliseconds, then off. Each active solenoid is turned off for a few milliseconds, then on. This pulsing of voltage to the solenoid causes an inductive spike which can be sensed by the Transmission Control System. If an inductive spike is not sensed by the Transmission Control System during the continuity check, it is tested again. If the test fails three consecutive times, the appropriate Diagnostic Trouble Code (DTC) is set. If the solenoid test is run in response to a gear ratio or pressure switch error, one failure will result in setting the appropriate DTC. **Note: This DTC is strictly an electrical fault and does not apply to any internal transmission failures.**

Diagnostic Test

1. RELATED TRANSMISSION RELAY DTC'S PRESENT

With the scan tool, check for other transmission DTC's.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category and perform the appropriate symptom.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 2

P2706-MS SOLENOID CIRCUIT (CONTINUED)

2. TRANSMISSION SOLENOID/TRS ASSEMBLY

Turn the ignition off to the lock position.

Remove the Starter Relay.

NOTE: Removal of the Starter Relay is to prevent a Transmission, NO RESPONSE, condition and disable the starter.

Install Transmission Simulator, Miller tool #8333.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the MS Solenoid.

Monitor the MS Solenoid LED on the Transmission Simulator.

Did the MS Solenoid LED on the Transmission Simulator blink on and off?

Yes >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 3

---

3. TRANSMISSION SOLENOID/TRS ASSEMBLY

With the scan tool, continue to actuate the MS Solenoid for the period of 2 minutes with the Transmission Simulator still connected.

After 2 minutes of actuation, with the scan tool, stop the actuation and check for transmission DTCs.

Did the DTC P2706 reset during the actuation test?

Yes >> Go To 4

No >> Replace the Transmission Solenoid/TRS Assembly per the Service Information.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

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4. (T118) MS SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Turn the ignition off to the lock position.

Disconnect the Transmission Simulator, Miller tool #8333.

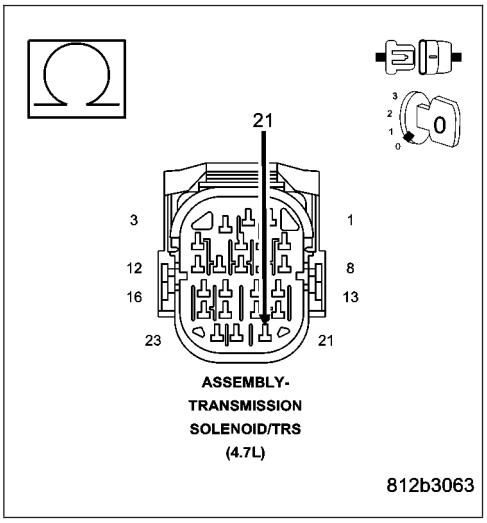
Disconnect the PCM harness connectors.

Measure the resistance between the (T118) MS Solenoid Control circuit and all other circuits in the Transmission Solenoid/TRS Assembly harness connector.

Is the resistance below 5.0 ohms between the (T118) MS Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid/TRS Assembly harness connector?

Yes >> Repair the (T118) MS Solenoid Control circuit for a short to other circuit(s).
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 5



P2706-MS SOLENOID CIRCUIT (CONTINUED)

5. (T118) MS SOLENOID CONTROL CIRCUIT OPEN

Connect Miller tool #8815 to the PCM C4 harness connector.

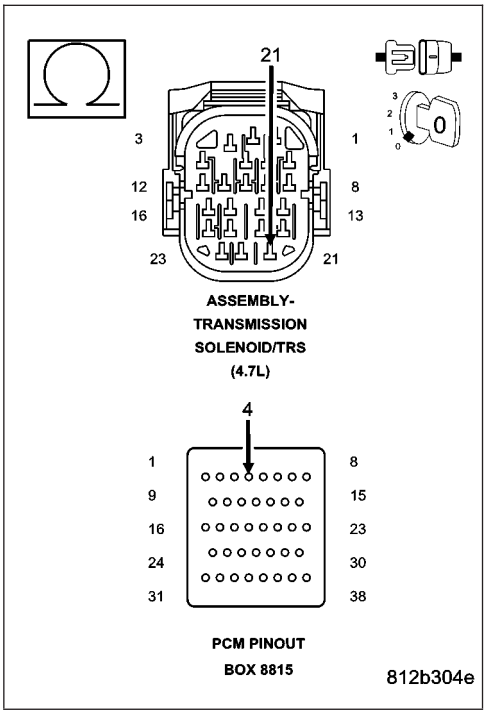
CAUTION: Do not probe the PCM harness connectors. Probing the PCM harness connectors will damage the PCM terminals resulting in poor terminal to pin connection. Install Miller special tool #8815 to perform diagnosis.

Measure the resistance of the (T118) MS Solenoid Control circuit from the Transmission Solenoid/TRS Assembly harness connector to the appropriate terminal of Miller tool #8815.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T118) MS Solenoid Control circuit for an open.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Go To 6



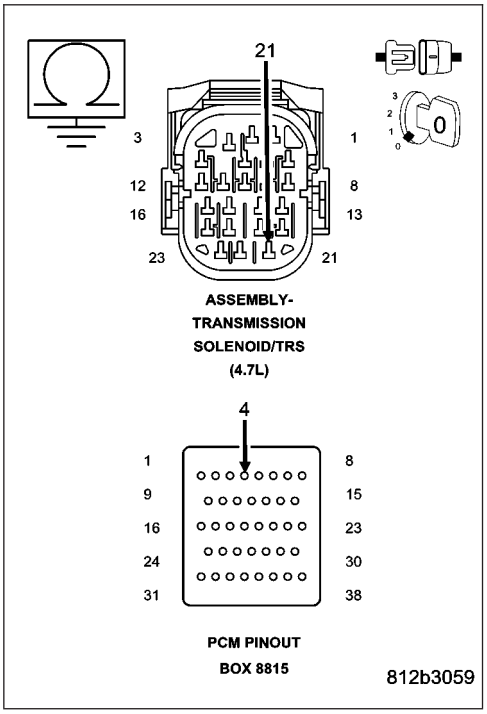
6. (T118) MS SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (T118) MS Solenoid Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T118) MS Solenoid Control circuit for a short to ground.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) terminals for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace the PCM per the Service Information. With the scan tool, perform QUICK LEARN.
Perform 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1.



45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1

For the Transmission circuit diagram (Refer to)(Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W**.

45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1

1. 45RFE/545RFE TRANSMISSION VERIFICATION TEST - VER 1

1. After completion of the Transmission Verification Test, the Powertrain Verification Test must be performed.

2. Connect the scan tool to the Data Link Connector (DLC).

3. Reconnect any disconnected components.

4. If the PCM has been replaced or reflashed, or the transmission has been repaired or replaced, it is necessary to perform the scan tool Quick Learn Procedure.

5. With the scan tool, erase all Transmission and Engine DTC's.

6. With the scan tool, display Transmission Temperature. Start and run the engine until the Transmission Temperature is HOT.

7. Check the Transmission fluid level and adjust if necessary. Refer to the Service Information for the Fluid Fill procedure. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 45RFE/545RFE/FLUID - STANDARD PROCEDURE)

8. Road test the vehicle.

9. Perform the following shifts from a standing start with a constant throttle opening of 20 to 25 degrees to the speeds of 97 Km/h or 60 MPH; make fifteen to twenty 1 to 2, 2 to 3, 3 to 4 upshifts and for 545RFE, 4 to 5.

10. Perform the following shifts with speeds below 40 Km/h or 25 MPH; make five to eight wide open throttle kickdowns to 1st gear. Allow at least 5 seconds each in 2nd and 3rd gear between each kickdown.

11. Check for DTC's during the road test.

12. Use the EATX OBDII task manager to run Good Trip time in each gear, this will confirm the repair and to ensure that the DTC has not re-matured.

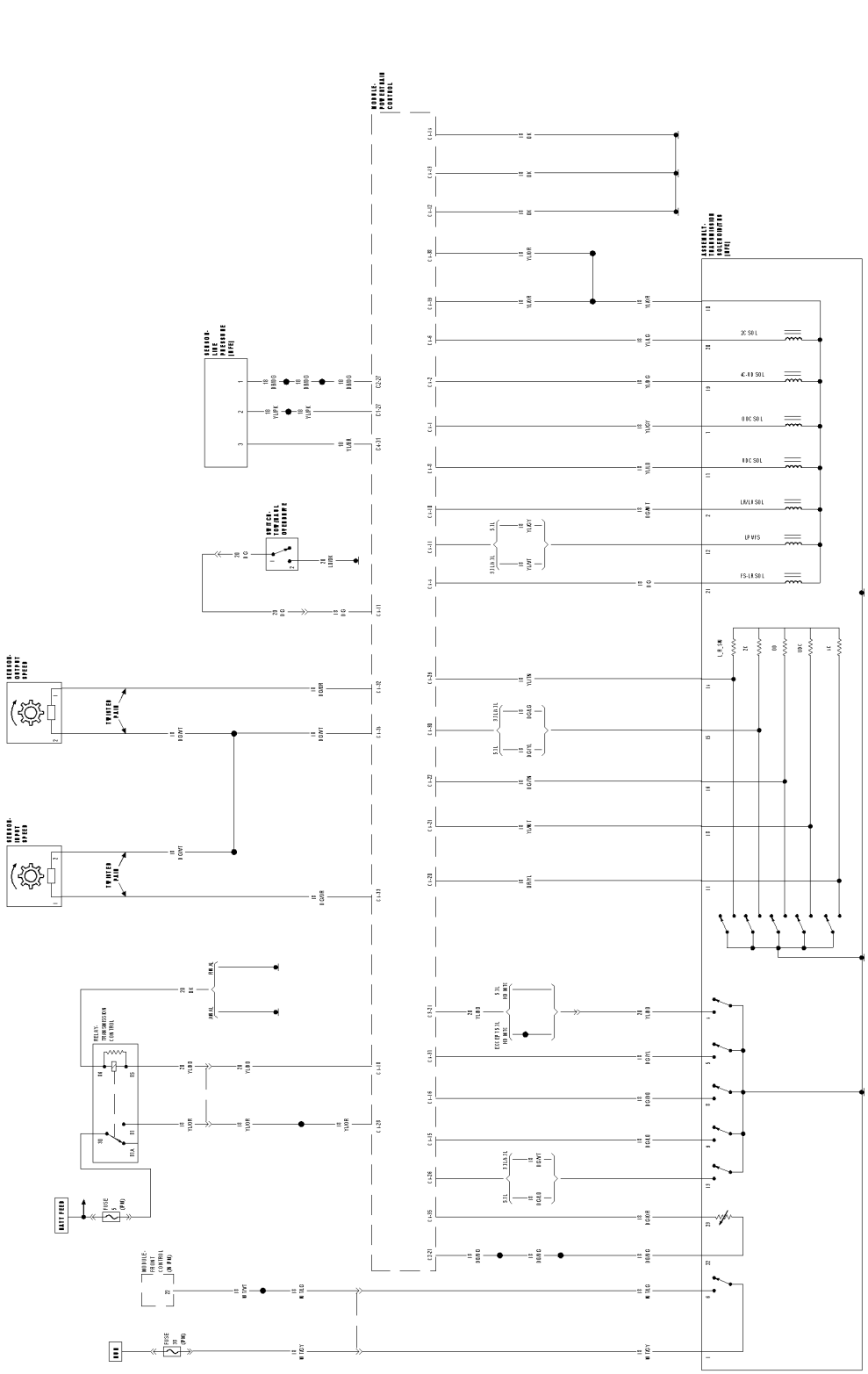
13. With the scan tool, perform a BATTERY DISCONNECT, this will clear the EATX DTC EVENT DATA

Were there any Diagnostic Trouble Codes (DTCs) set during the road test?

Yes >> Refer to the Symptom List for the appropriate diagnostic tests.

No >> Repair is complete.

SCHEMATICS AND DIAGRAMS



RFE TRANSMISSION CIRCUIT DIAGRAM

AUTOMATIC TRANSMISSION - 45RFE/545RFE - SERVICE INFORMATION

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AUTOMATIC TRANSMISSION - 45RFE/545RFE - SERVICE INFORMATION

DESCRIPTION

The 45RFE/545RFE automatic transmissions is a sophisticated, multi-range, electronically controlled transmission which combines optimized gear ratios for responsive performance, state of the art efficiency features and low NVH. Other features include driver adaptive shifting and three planetary gear sets to provide wide ratio capability with precise ratio steps for optimum driveability. The three planetary gear sets also make available a unique alternate second gear ratio. The primary 2nd gear ratio fits between 1st and 3rd gears for normal through-gear accelerations. The alternate second gear ratio (2prime) allows smoother 4-2 kickdowns at high speeds to provide 2nd gear passing performance over a wider highway cruising range.

The hydraulic portion of the transmission consists of the transmission fluid, fluid passages, hydraulic valves, and various line pressure control components.

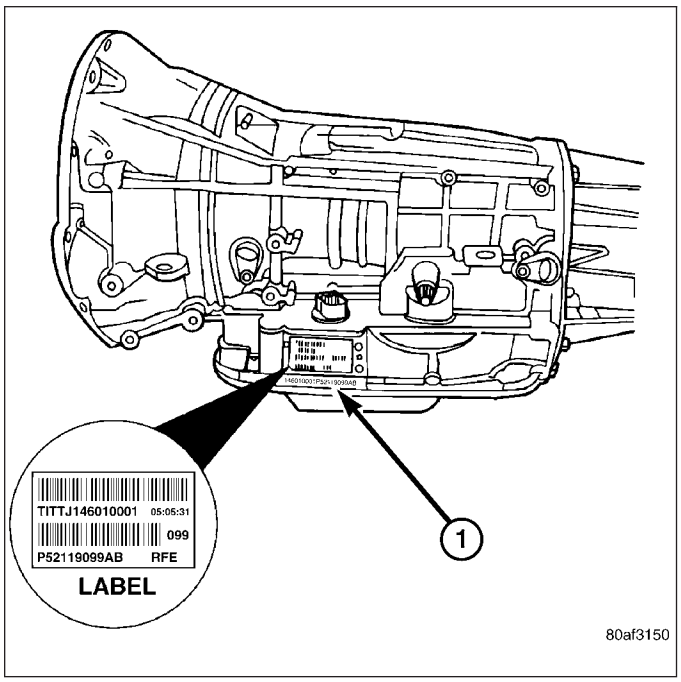
The primary mechanical components of the transmission consist of the following:

- Three multiple disc input clutches
- Three multiple disc holding clutches
- Five hydraulic accumulators
- Three planetary gear sets
- Dual Stage Hydraulic oil pump
- Valve body
- Solenoid pack

The Transmission Control Module (TCM) is the “heart” or “brain” of the electronic control system and relies on information from various direct and indirect inputs (sensors, switches, etc.) to determine driver demand and vehicle operating conditions. Depending on the vehicle configuration, the TCM may be a standalone module or it it may be housed along with the Powertrain Control Module (PCM) in a single module. With this information, the TCM can calculate and perform timely and quality shifts through various output or control devices (solenoid pack, transmission control relay, etc.).

TRANSMISSION IDENTIFICATION

Transmission identification numbers are stamped (1) on the left side of the case just above the oil pan sealing surface. Refer to this information when ordering replacement parts. A label is attached to the transmission case above the stamped numbers. The label gives additional information which may also be necessary for identification purposes.



GEAR RATIOS

The 45RFE gear ratios are:

1st	3.00:1
2nd	1.67:1
2nd Prime	1.50:1
3rd	1.00:1
4th	0.75:1
Reverse	3.00:1

GEAR RATIOS

The 545RFE gear ratios are:

1st	3.00:1
2nd	1.67:1
2nd Prime	1.50:1
3rd	1.00:1
4th	0.75:1
5th	0.67:1
Reverse	3.00:1

OPERATION

The 45RFE/545RFE offers full electronic control of all automatic up and downshifts, and features real-time adaptive closed-loop shift and pressure control. Electronic shift and torque converter clutch controls help protect the transmission from damage due to high temperatures, which can occur under severe operating conditions. By altering shift schedules, line pressure, and converter clutch control, these controls reduce heat generation and increase transmission cooling.

To help reduce efficiency-robbing parasitic losses, the transmissions includes a dual-stage transmission fluid pump with electronic output pressure control. Under most driving conditions, pump output capacity greatly exceeds that which is needed to keep the clutches applied. The 45RFE/545RFE pump-pressure control system monitors input torque and adjusts the pump pressure accordingly. The primary stage of the pump works continuously; the second stage is bypassed when demand is low. The control system also monitors input and output speed and, if incipient

clutch slip is observed, the pressure control solenoid duty cycle is varied, increasing pressure in proportion to demand.

A high-travel torque converter damper assembly allows earlier torque converter clutch engagement to reduce slippage. Needle-type thrust bearings reduce internal friction. The 45RFE/545RFE is packaged in a one-piece die-cast aluminum case. To reduce NVH, the case has high lateral, vertical and torsional stiffness. It is also designed to maximize the benefit of the structural dust cover that connects the bottom of the bell housing to the engine bedplate, enhancing overall power train stiffness. Dual filters protect the pump and other components. A cooler return filter is added to the customary main sump filter. Independent lubrication and cooler circuits assure ample pressure for normal transmission operation even if the cooler is obstructed or the fluid cannot flow due to extremely low temperatures.

The hydraulic control system design (without electronic assist) provides the transmission with PARK, REVERSE, NEUTRAL, SECOND, and THIRD gears, based solely on driver shift lever selection. This design allows the vehicle to be driven (in “limp-in” mode) in the event of a electronic control system failure, or a situation that the Transmission Control Module (TCM) recognizes as potentially damaging to the transmission.

The TCM also performs certain self-diagnostic functions and provides comprehensive information (sensor data, DTC’s, etc.) which is helpful in proper diagnosis and repair. This information can be viewed with the DRB® scan tool.

DIAGNOSIS AND TESTING

AUTOMATIC TRANSMISSION

CAUTION: Before attempting any repair on a RFE automatic transmission, check for Diagnostic Trouble Codes with the scan tool.

Transmission malfunctions may be caused by these general conditions:

- Poor engine performance
- Improper adjustments
- Hydraulic malfunctions
- Mechanical malfunctions
- Electronic malfunctions

Diagnosis of these problems should always begin by checking the easily accessible variables: fluid level and condition, gearshift cable adjustment. Then perform a road test to determine if the problem has been corrected or if more diagnosis is necessary. If the problem persists after the preliminary tests and corrections are completed, hydraulic pressure checks should be performed.

PRELIMINARY

Two basic procedures are required. One procedure for vehicles that are drivable and an alternate procedure for disabled vehicles (will not back up or move forward).

VEHICLE IS DRIVABLE

1. Check for transmission fault codes using scan tool.
2. Check fluid level and condition.
3. Adjust gearshift cable if complaint was based on delayed, erratic, or harsh shifts.
4. Road test and note how transmission upshifts, downshifts, and engages.
5. Perform hydraulic pressure test if shift problems were noted during road test.
6. Perform air-pressure test to check clutch operation.

VEHICLE IS DISABLED

1. Check fluid level and condition.
2. Check for broken or disconnected gearshift cable.
3. Check for cracked, leaking cooler lines, or loose or missing pressure-port plugs.
4. Raise and support vehicle on safety stands, start engine, shift transmission into gear, and note following:

a. If propeller shaft turns but wheels do not, problem is with differential or axle shafts.

b. If propeller shaft does not turn and transmission is noisy, stop engine. Remove oil pan, and check for debris. If pan is clear, remove transmission and check for damaged driveplate, converter, oil pump, or input shaft.

c. If propeller shaft does not turn and transmission is not noisy, perform hydraulic-pressure test to determine if problem is hydraulic or mechanical.

ROAD TESTING

Before road testing, be sure the fluid level and control cable adjustments have been checked and adjusted if necessary. Verify that all diagnostic trouble codes have been resolved.

Observe engine performance during the road test. A poorly tuned engine will not allow accurate analysis of transmission operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage indicated by engine flare, usually means clutch, overrunning clutch, or line pressure problems.

A slipping clutch can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch Application charts provide a basis for analyzing road test results.

45RFE CLUTCH APPLICATION CHART

SLP	UD	OD	R	2C	4C	L/R	OVERRUNNING
P–PARK						ON	
R–REVERSE			ON			ON	
N-NEUTRAL						ON	
D-FIRST	ON					ON*	ON
D-SECOND	ON			ON			
D-SECOND PRIME	ON				ON		
D-THIRD	ON	ON					
D-FOURTH		ON			ON		
D-LIMP-IN	ON	ON					
2–FIRST	ON					ON*	ON
2–SECOND	ON			ON			
2–LIMP-IN	ON			ON			
1–LOW	ON					ON	ON

*L/R clutch is on only with the output shaft speed below 150 rpm.

545RFE CLUTCH APPLICATION CHART

SLP	UD	OD	R	2C	4C	L/R	OVERRUNNING
P–PARK						ON	
R–REVERSE			ON			ON	
N-NEUTRAL						ON	
D–FIRST	ON					ON*	ON
D–SECOND	ON			ON			
D–SECOND PRIME	ON				ON		
D–THIRD	ON	ON					
D–FOURTH		ON			ON		
D–FIFTH		ON		ON			
D–LIMP-IN	ON	ON					
2–FIRST	ON					ON*	ON
2–SECOND	ON			ON			
2–LIMP-IN	ON			ON			
1–LOW	ON					ON	ON

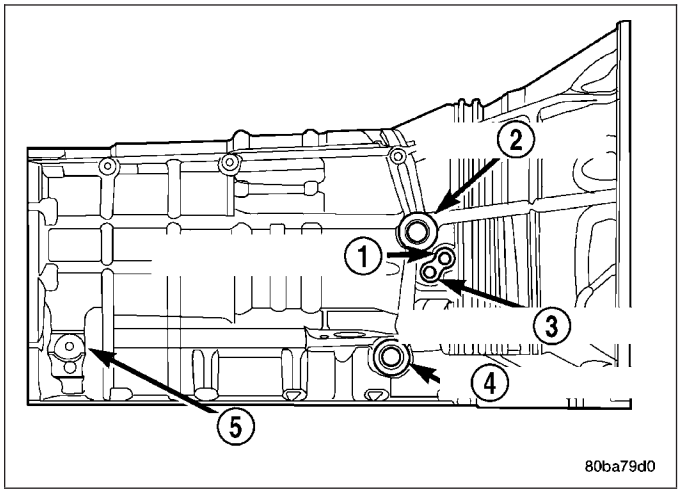
*L/R clutch is on only with the output shaft speed below 150 rpm.

HYDRAULIC PRESSURE TEST

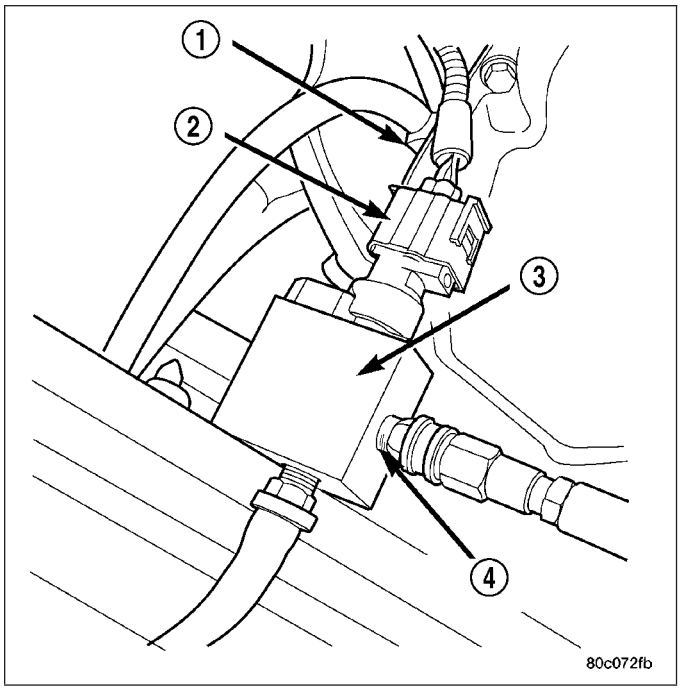
An accurate tachometer and pressure test gauges are required. Test Gauge C-3293-SP has a 300 psi range and is used at all locations where pressures exceed 100 psi.

Pressure Test Port Locations

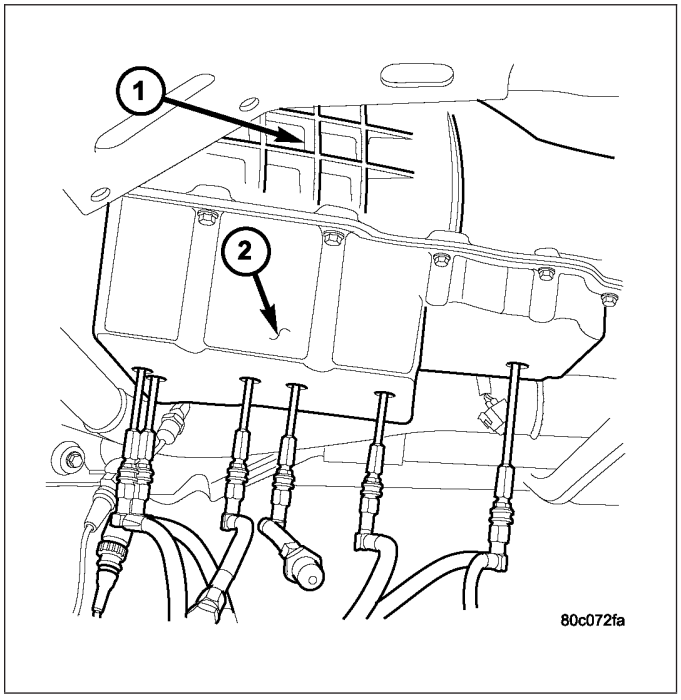
Only two pressure ports are supplied on the transmission case. The torque converter clutch apply (3) and release (1) ports are located on the right side of the transmission case.



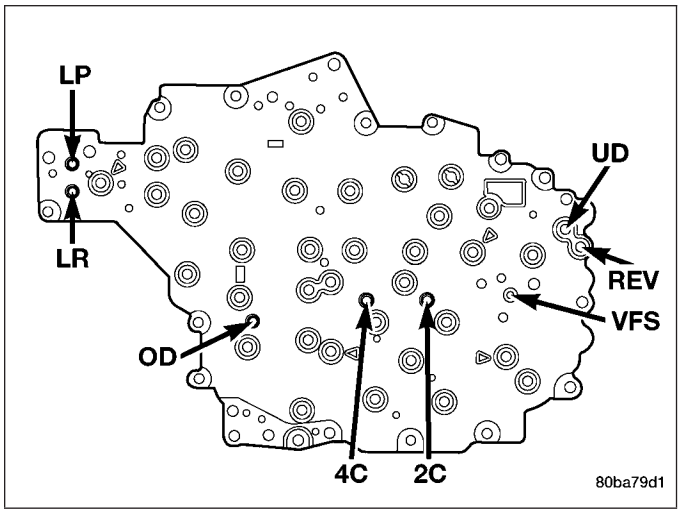
To determine the line pressure, there are two available methods. The scan tool can be used to read line pressure from the line pressure sensor. The second method is to install Line Pressure Adapter 8259 (3) into the transmission case and then install the pressure gauge and the original sensor (2) into the adapter. This will allow a comparison of the scan tool readings and the gauge reading to determine the accuracy of the line pressure sensor. The scan tool line pressure reading should match the gauge reading within ±10 psi.



In order to access any other pressure tap locations, the transmission oil pan must be removed, the pressure port plugs removed and Valve Body Pressure Tap Adapter 8258-A (2) installed. The extensions supplied with Adapter 8258-A will allow the installation of pressure gauges to the valve body.



Refer to the Pressure Tap Locations graphic for correct pressure tap location identification.



TEST PROCEDURE

All pressure readings should be taken with the transmission fluid level full, transmission oil at the normal operating temperature, and the engine at 1500 rpm. Check the transmission for proper operation in each gear position that is in question or if a specific element is in question, check the pressure readings in at least two gear positions that employ that element. Refer to the Hydraulic Schematics at the rear of this section to determine the correct pressures for each element in a given gear position.

NOTE: The 45RFE/545RFE utilizes closed loop control of pump line pressure. The pressure readings may therefore vary greatly but should always follow line pressure.

Some common pressures that can be measured to evaluate pump and clutch performance are the upshift/downshift pressures, garage shift pressures, and TCC pressure. The upshift/downshift pressure for all shifts are shown in UPSHIFT PRESSURES and DOWNSHIFT PRESSURES . In-gear maximum pressure for each gear position is shown in IN-GEAR PRESSURES . The garage shift pressure when performing a N-R shift is 220 psi for 3.7L/4.7L equipped vehicles and 250 psi for 5.7L equipped vehicles. The garage shift pressure for the R-N shift is 120 psi. The garage shift pressure for the N-1 shift is 135 psi for 3.7L/4.7L equipped vehicles and 165 psi for 5.7L equipped vehicles. Torque converter lock-up pressure is 120 psi for 3.7L/4.7L equipped vehicles and 125 psi for 5.7L equipped vehicles.

UPSHIFT PRESSURES

ENGINE	1-2	2-3	2prime-3	3-4	2prime-4	2-5	3-5	4-5
5.7L	150	125	125	135	135	135	135	135
3.7L/4.7L	120	120	120	120	120	120	120	130

DOWNSHIFT PRESSURES

ENGINE	5-4	5-3	5-2	4-3	4-2prime	3-2	3-2prime	2prime-1	2-1	3-1
5.7L	135	135	135	135	135	135	135	135	135	135
3.7L/ 4.7L	120	120	120	120	120	120	120	120	120	120

IN-GEAR PRESSURES

ENGINE	1	2	2prime	3	4	5	NEUTRAL	REVERSE
5.7L	160	135	135	135	135	135	120	250
3.7L/4.7L	135	120	120	120	120	120	120	220

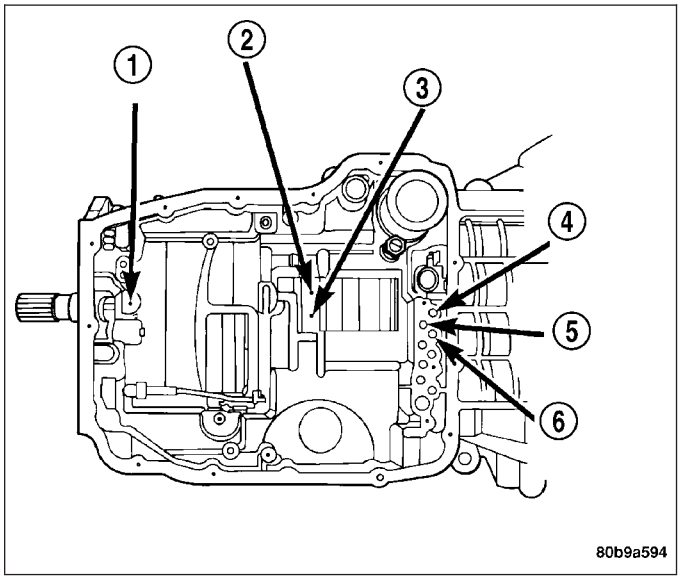
AIR CHECKING TRANSMISSION CLUTCH OPERATION

Air-pressure testing can be used to check transmission clutch operation. The test can be conducted with the transmission either in the vehicle or on the work bench, as a final check.

Air-pressure testing requires that the oil pan and valve body be removed from the transmission. The clutch apply passages are shown in the Air Pressure Test Passages graphic.

NOTE: The air supply which is used must be free of moisture and dirt. Use a pressure of 30 psi to test clutch operation.

Apply air pressure at each port. If the clutch is functioning, a soft thump will be heard as the clutch is applied. The clutch application can also be felt by touching the appropriate element while applying air pressure. As the air pressure is released, the clutch should also release.



1 - LOW REVERSE CLUTCH
2 - 4TH CLUTCH
3 - 2ND CLUTCH
4 - OVERDRIVE CLUTCH
5 - UNDERDRIVE CLUTCH
6 - REVERSE CLUTCH

CONVERTER HOUSING FLUID LEAK

When diagnosing converter housing fluid leaks, two items must be established before repair.

1. Verify that a leak condition actually exists.
2. Determined the true source of the leak.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair. Torque converter seal leaks tend to move along the drive hub and onto the rear of the converter. Pump cover seal leaks tend to run down the cover and the inside surface of the bellhousing.

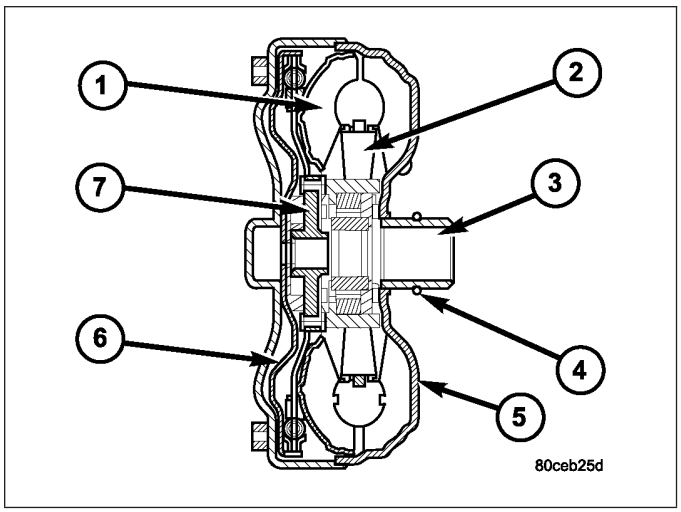
Some leaks, or suspected leaks, may be particularly difficult to locate. If necessary, a Mopar® approved dye should be used to locate and confirm a leak.

TORQUE CONVERTER LEAK POINTS

Possible sources of converter leaks are:

1. Leaks at the weld joint around the outside diameter weld.
2. Leaks at the converter hub weld.

In most cases, a torque converter which is wet from transmission fluid indicates a leak at one of these areas.



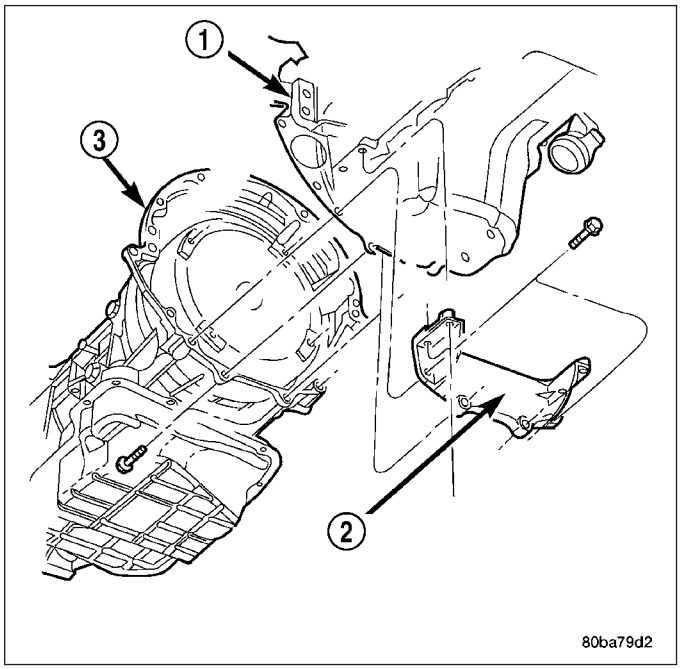
STANDARD PROCEDURE - ALUMINUM THREAD REPAIR

Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils™, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil™ tap, or equivalent, and installing a Heli-Coil™ insert, or equivalent, into the hole. This brings the hole back to its original thread size.

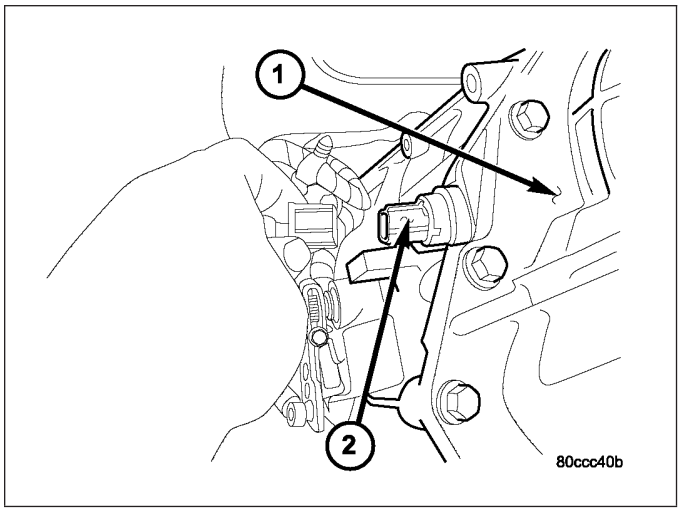
Heli-Coil™, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

REMOVAL

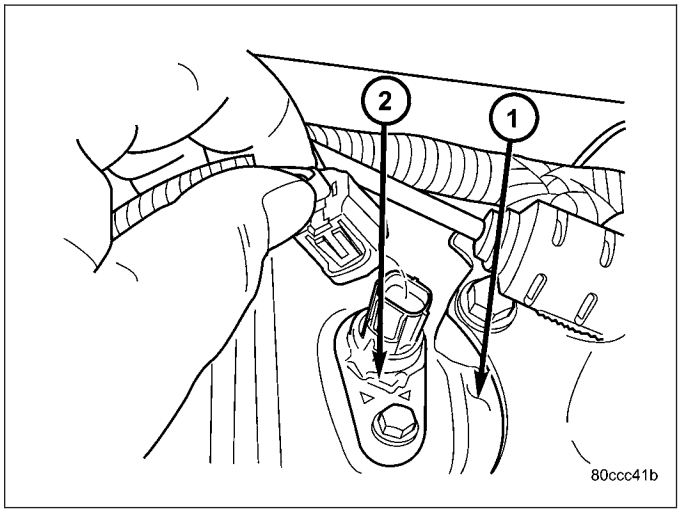
1. Disconnect the negative battery cable.
2. Raise and support the vehicle
3. Remove any necessary skid plates. (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - REMOVAL)
4. Mark propeller shaft and axle companion flanges for assembly alignment.
5. Remove the rear propeller shaft
6. Remove the front propeller shaft, if necessary.
7. Remove the engine (1) to transmission (3) structural dust cover (2).



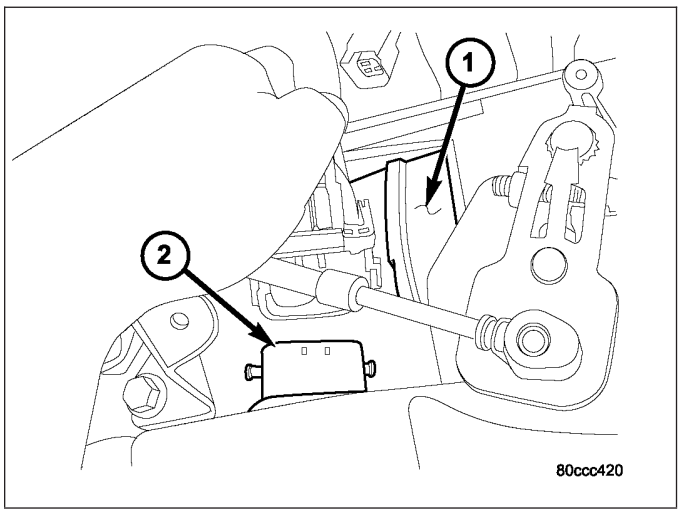
8. Remove the exhaust support bracket from the rear of the transmission.
9. Disconnect and lower or remove any necessary exhaust components.
10. Remove the starter motor.
11. Rotate crankshaft in clockwise direction until converter bolts are accessible. Then remove bolts one at a time. Rotate crankshaft with socket wrench on dampener bolt.
12. Disengage the output speed sensor connector from the output speed sensor (2).



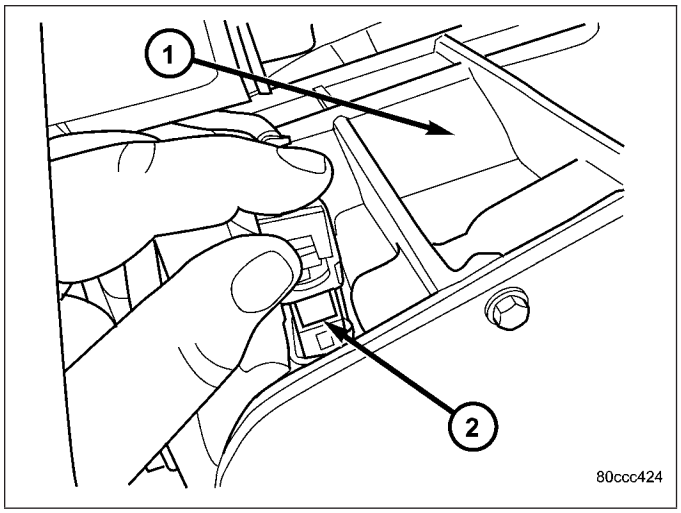
13. Disengage the input speed sensor connector from the input speed sensor (2).



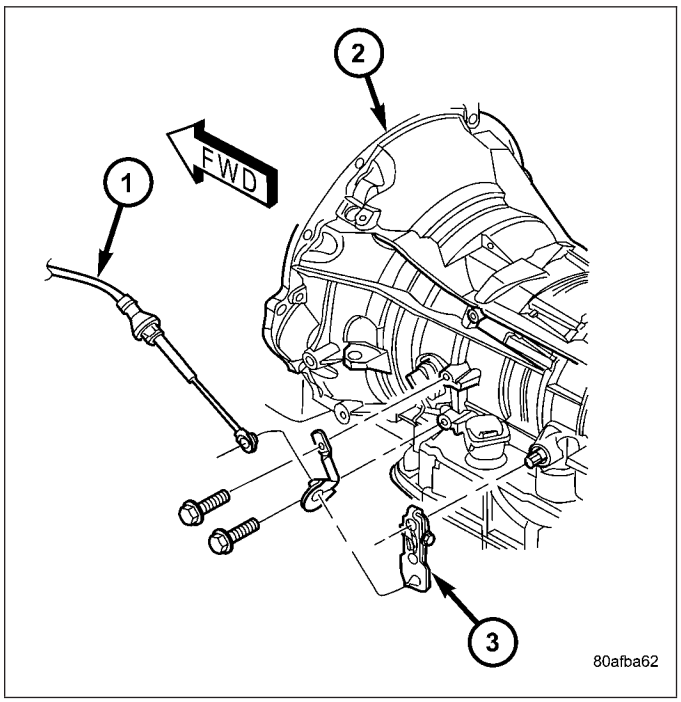
14. Disengage the transmission solenoid/TRS assembly connector from the transmission solenoid/TRS assembly (2).



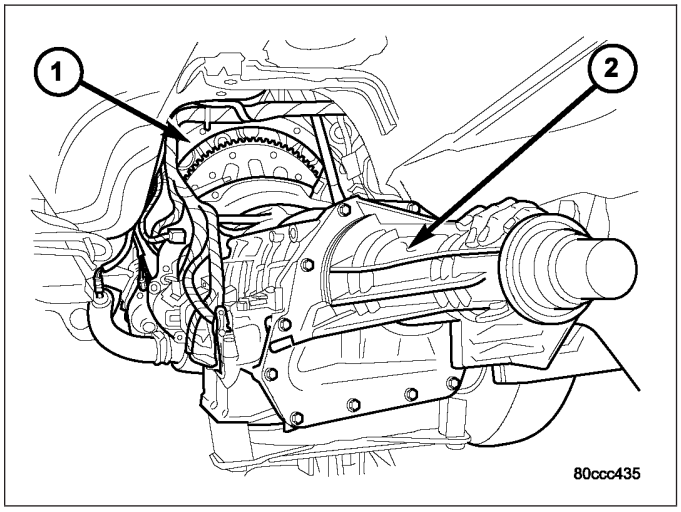
15. Disengage the line pressure sensor connector from the line pressure sensor (2).



16. Disconnect gearshift cable (1) from transmission manual valve lever (3).



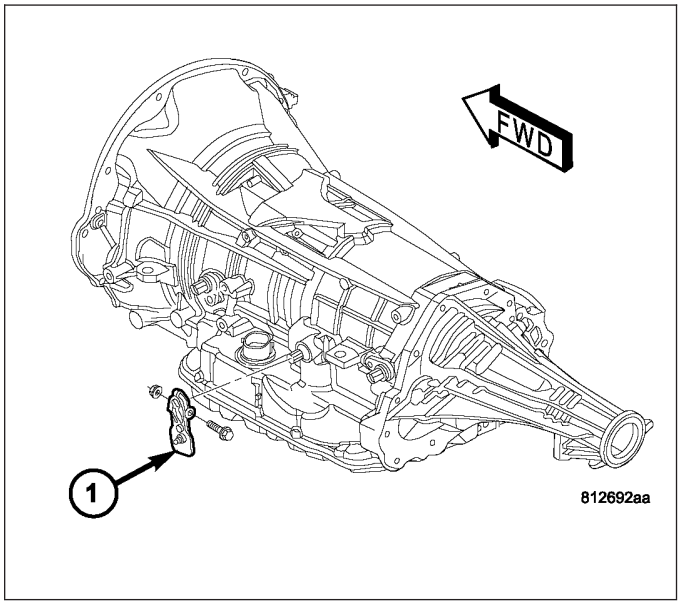
17. Disconnect the transmission vent hose from the transmission.
18. Support rear of engine with safety stand or jack.
19. Raise transmission slightly with service jack to relieve load on crossmember and supports.
20. Remove bolts securing rear support and cushion to transmission and crossmember.
21. Remove transfer case, if necessary.
22. Disconnect transmission fluid cooler lines at transmission fittings and clips.
23. Remove all remaining converter housing bolts.
24. Carefully work transmission and torque converter assembly rearward off engine block dowels.



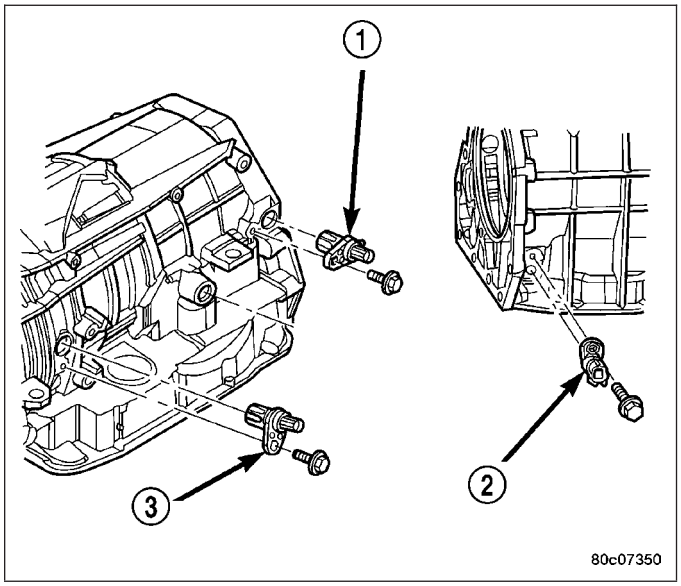
25. Hold torque converter in place during transmission removal.
26. Lower transmission (2) and remove assembly from under the vehicle.
27. To remove torque converter, carefully slide torque converter out of the transmission.

DISASSEMBLY

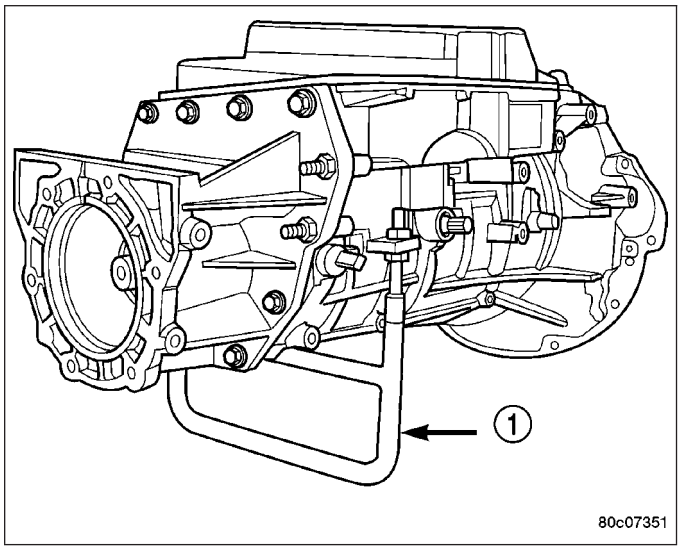
1. Drain fluid from transmission.
2. Clean exterior of transmission with suitable solvent or pressure washer.
3. Remove the torque converter from the transmission.
4. Remove the manual shift lever (1) from the transmission.



5. Remove the input (3), output (1), and line pressure sensors (2) from the transmission case.
6. Inspect the ends of the sensors for debris, which may indicate the nature of the transmission failure.

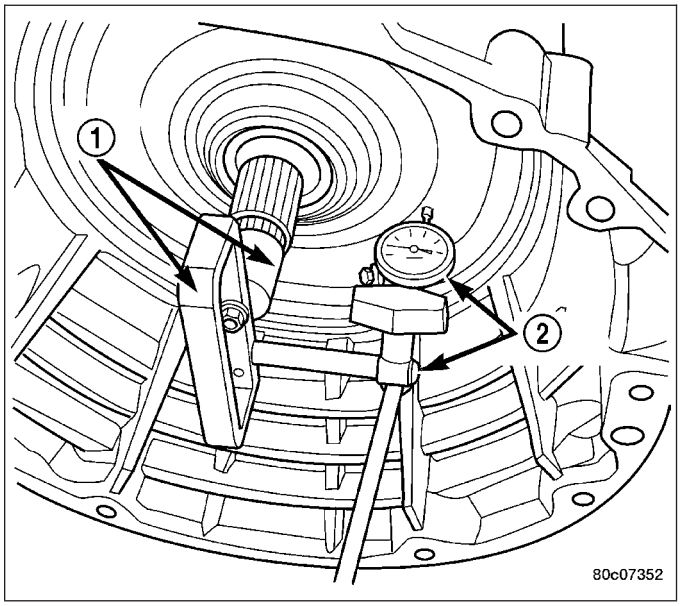


7. Install Support Stand 8257 (1) onto the transmission case.

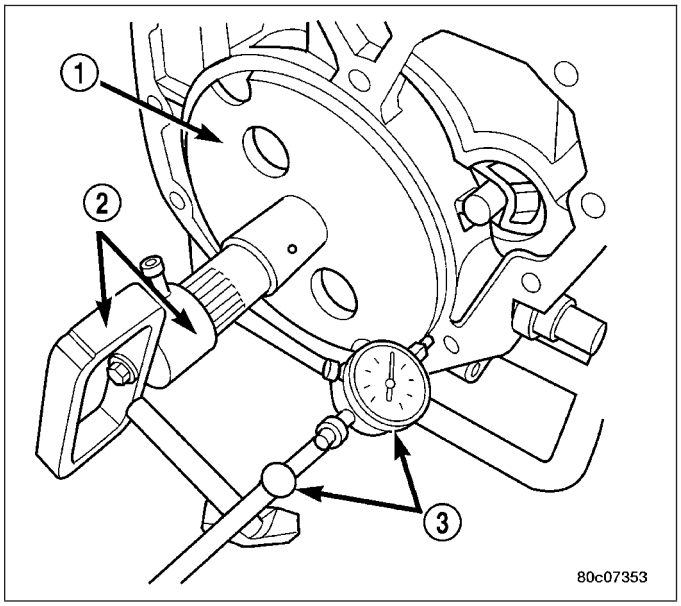


8. Using Adapter 8266-1 from End-Play Tool Set 8266 (1) and Dial Indicator C-3339 (2), measure and record the input shaft end-play.

NOTE: When measuring the input shaft end-play, two ″stops″ will be felt. When the input shaft is pushed inward and the dial indicator zeroed, the first ″stop″ felt when the input shaft is pulled outward is the movement of the input shaft in the input clutch housing hub. This value should not be included in the end-play measured value and therefore must be recorded and subtracted from the dial indicator reading.

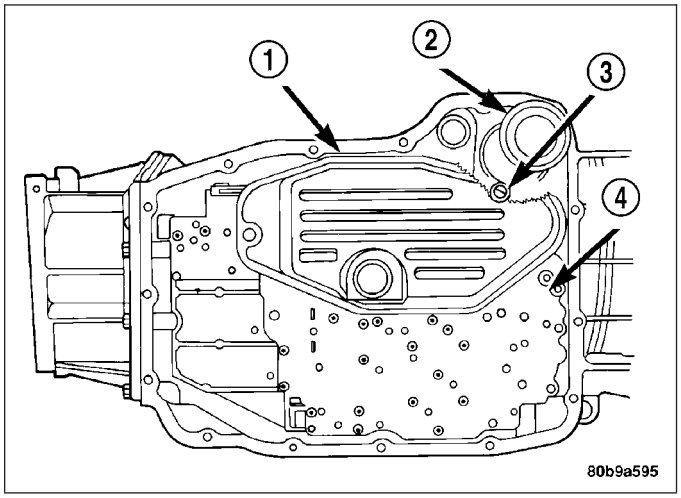


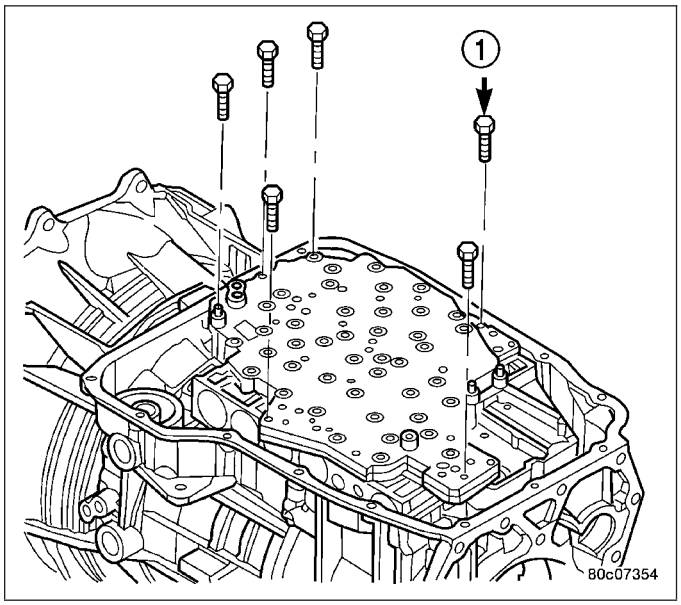
9. Remove the bolts holding the transmission extension/adapter housing to the transmission case.
10. Remove the extension/adapter housing from the transmission case.
11. Using Alignment Plate 8261 (1), Adapter 8266-17 from End-Play Tool Set 8266 (2) and Dial Indicator C-3339 (3), measure and record the output shaft end-play.



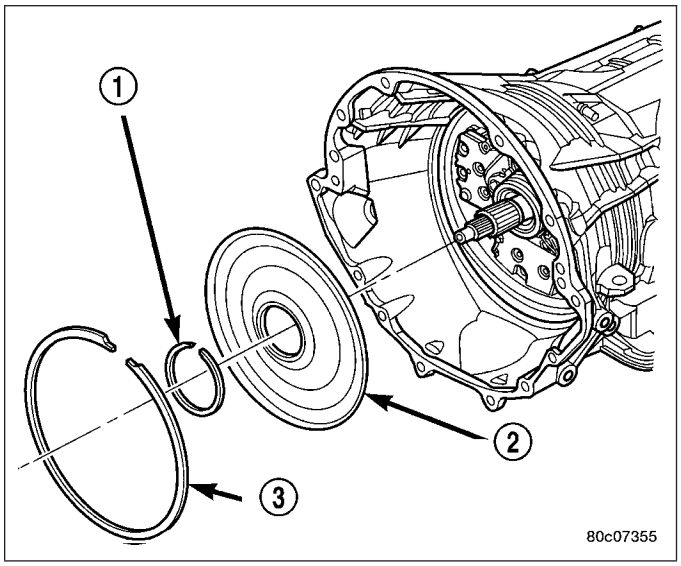
12. Remove the bolts holding the transmission oil pan to the transmission case.
13. Remove the transmission oil pan from the transmission case.
14. Remove the primary oil filter (1) and the oil cooler return filter (2).
15. Remove the cooler return filter bypass valve (3).

16. Remove the bolts (1) holding the valve body to the transmission case.
17. Remove the valve body from the transmission case.



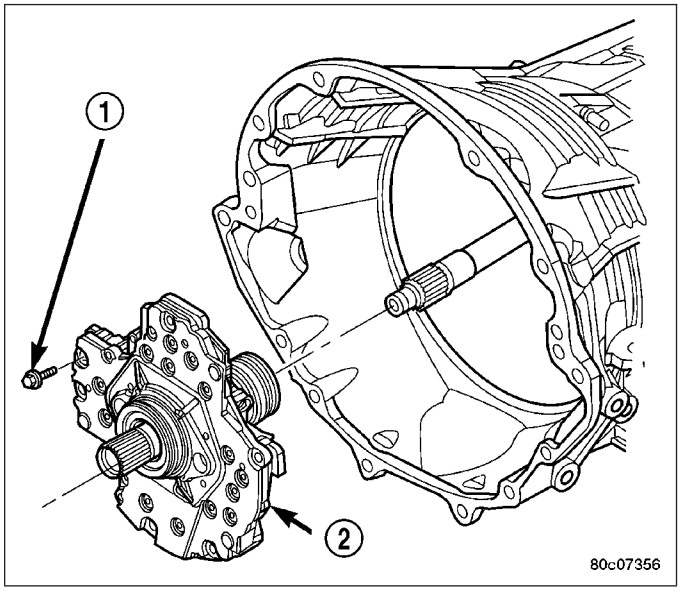


18. Remove the outer snap-ring (3) securing the transmission front cover (2) into the transmission case.
19. Remove the inner snap-ring (1) securing the transmission front cover to the oil pump.
20. Reaching through a case opening in the valve body area with a long blunted tool, remove the transmission front cover from the transmission case.

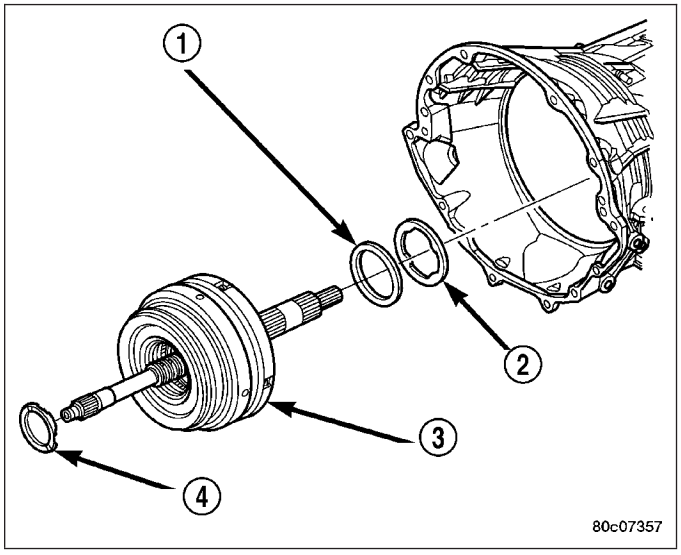


21. Remove the bolts (1) holding the oil pump into the transmission case.
22. Remove the oil pump (2). Hold inward on the input shaft to prevent pulling the input clutch assembly with the oil pump.

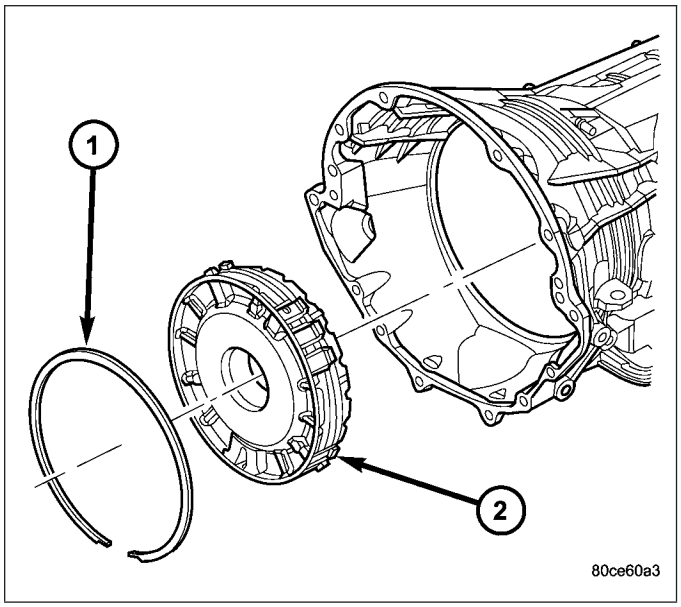
CAUTION: If the input shaft is not held during oil pump removal, the input clutch assembly will attempt to move forward with the oil pump and the numbers 2, 3, or 4 bearings inside the input clutch assembly may become dislodged.



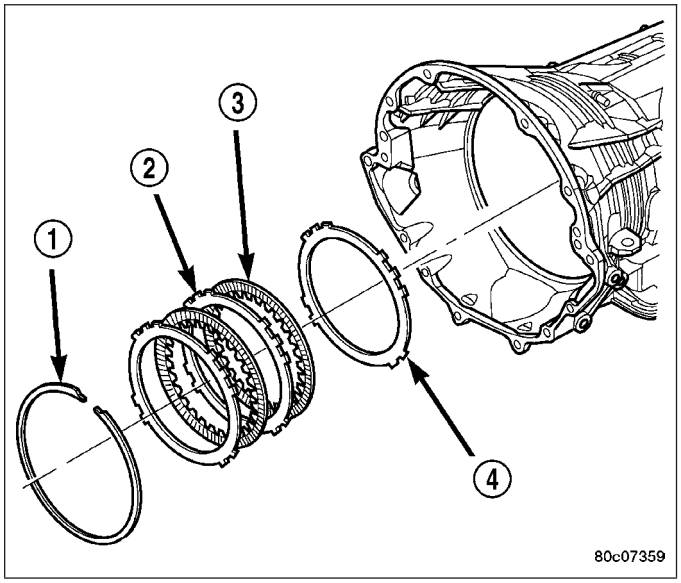
23. Remove the number 1 thrust bearing (4) from the input clutch assembly.
24. Remove the input clutch assembly (3) from the transmission case.
25. Remove the number 5 thrust bearing (1) and selective thrust plate (2) from the input clutch assembly (3) , or the 4C clutch retainer/bulkhead.

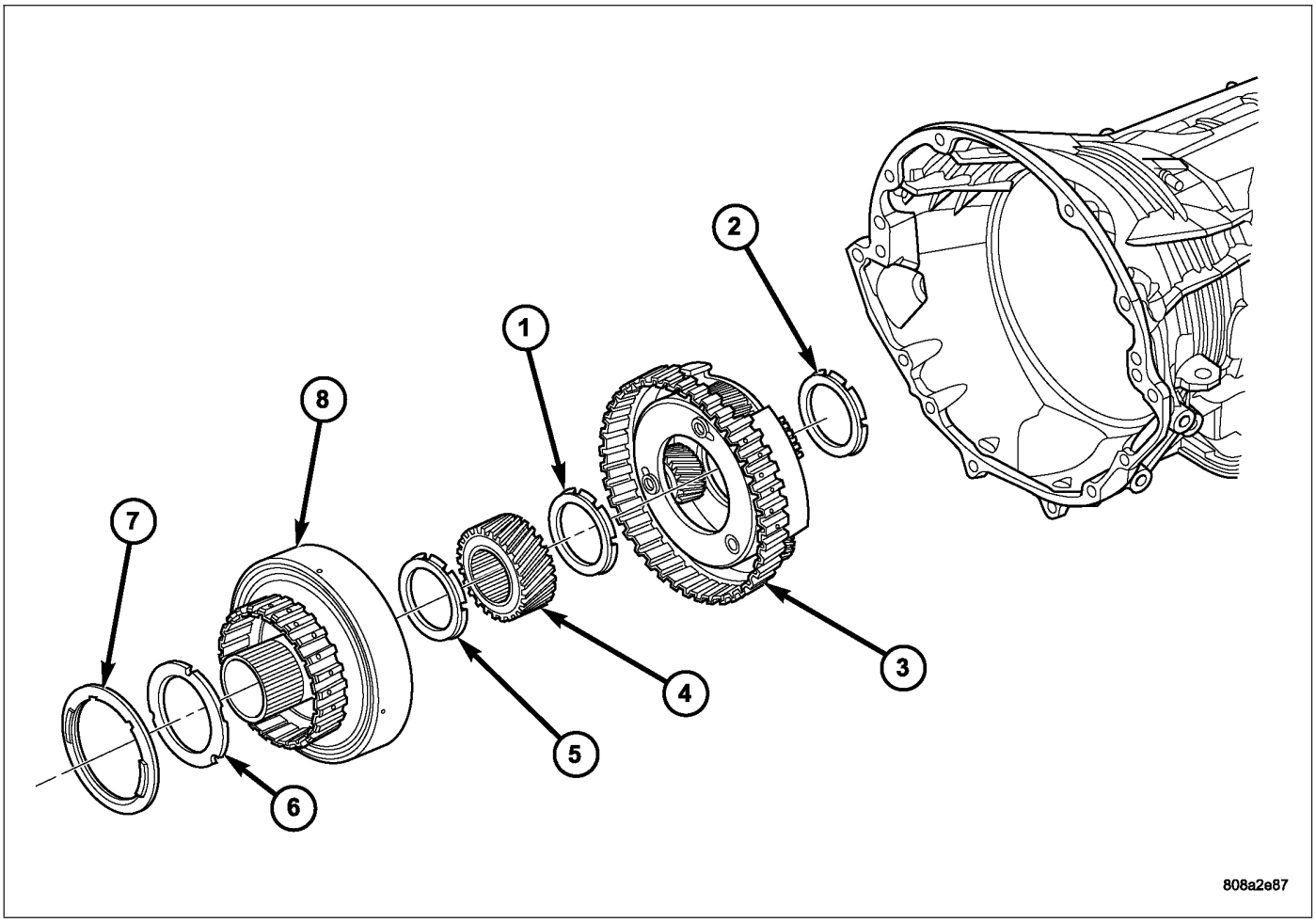


26. Remove the 4C clutch retainer/bulkhead tapered snap-ring (1) from the transmission case.
27. Remove the 4C clutch retainer/bulkhead (2) from the transmission case.



28. Remove the front 2C clutch pack snap-ring (1) from the transmission case.
29. Remove the 2C clutch pack (2, 3, 4) from the transmission case.



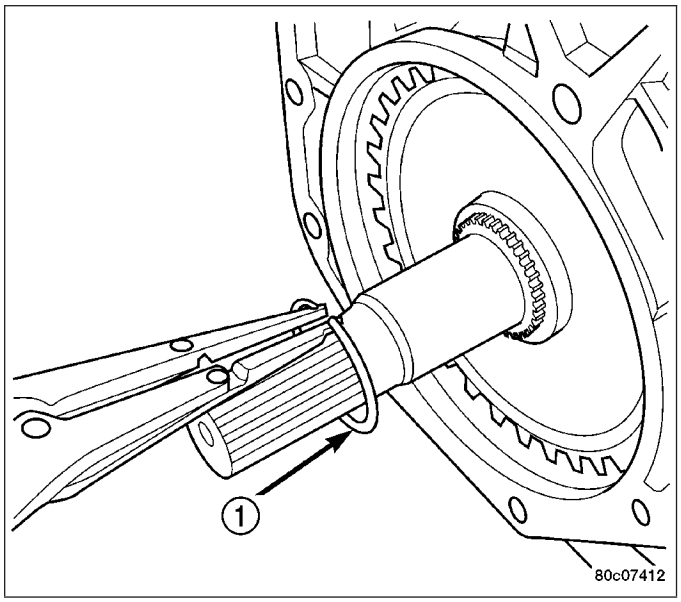


Remove Reaction Annulus and Carrier

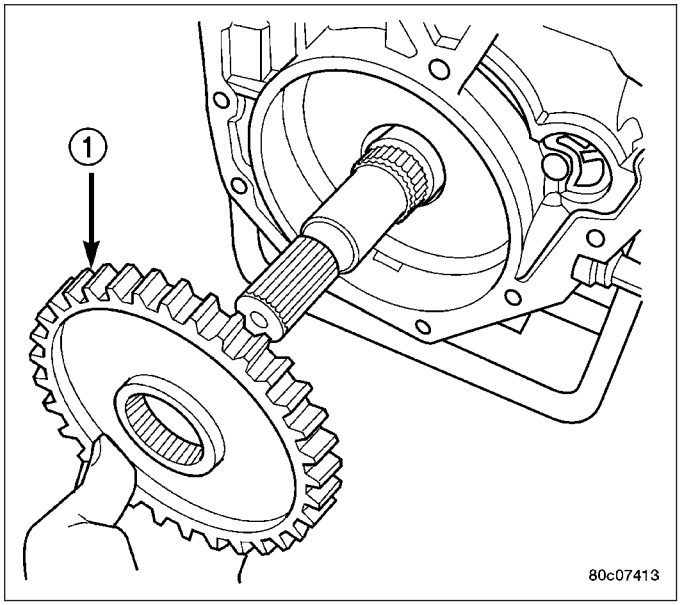
1 - THRUST BEARING NUMBER 8
2 - THRUST BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - THRUST BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - THRUST BEARING NUMBER 6
8 - REACTION ANNULUS

30. Remove the rear selective plate (6) and number 6 thrust bearing (7) from the reaction annulus (8).
31. Remove the reaction annulus (8) from the reaction planetary carrier (3).
32. Remove the number 7 thrust bearing (5).
33. Remove the reaction sun gear (4).
34. Remove the number 8 thrust bearing (1) from the reaction planetary carrier (3).
35. Remove the reaction planetary carrier (3). Note that this planetary gear set has three pinion gears.
36. Remove the number 9 thrust bearing (2) from the reverse planetary gear set.

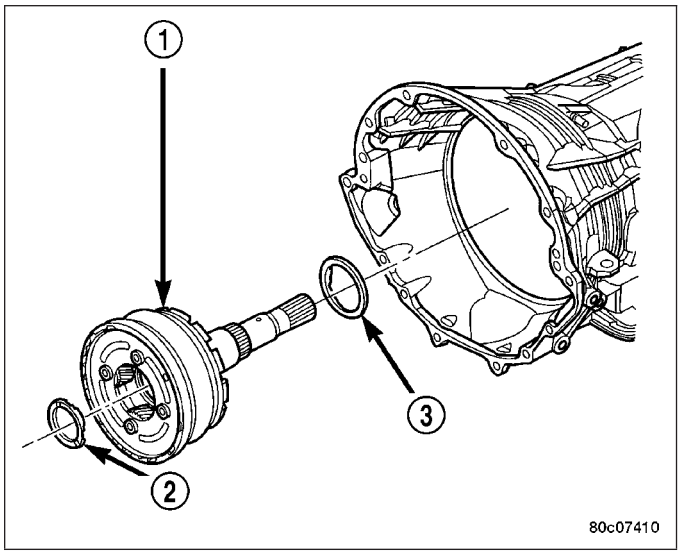
37. Remove the snap-ring (1) holding the park sprag gear onto the output shaft.



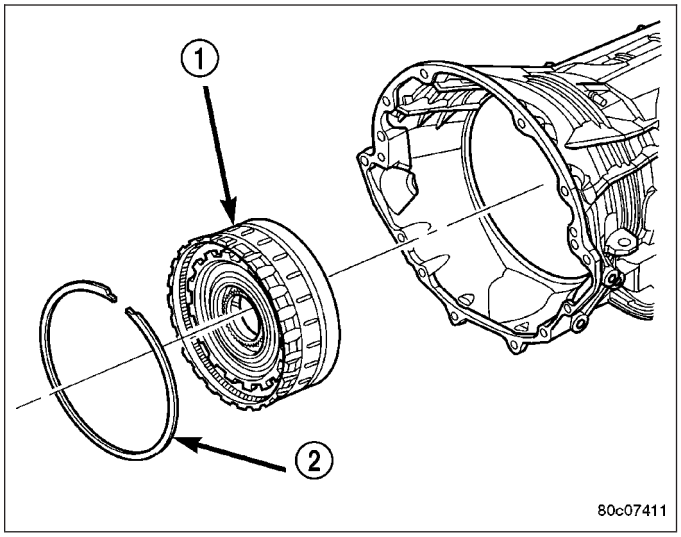
38. Remove the park sprag gear (1) from the output shaft.



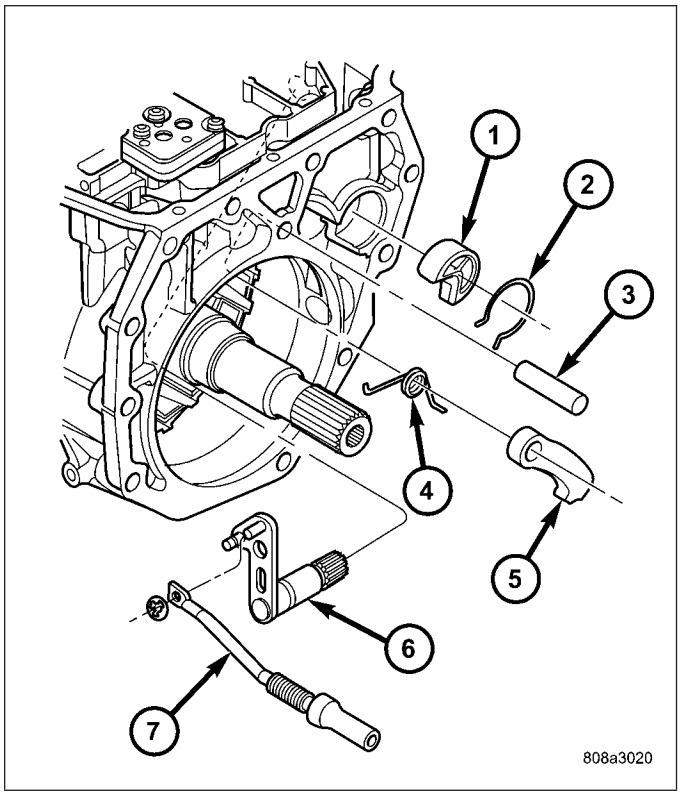
39. Remove the input/reverse planetary assembly (1).
40. Remove the number 12 thrust bearing (3) from the input/reverse planetary assembly (1).



41. Remove the snap-ring (2) holding the low/reverse clutch retainer (1) into the transmission case.
42. Remove the low/reverse clutch retainer (1) from the transmission case.



43. Remove the park rod (7) and e-clip.
44. Remove the park rod guide snap-ring (2).
45. Remove the park rod guide (1).
46. Remove the park pawl pivot shaft (3), park pawl (5), and spring (4).
47. Remove the manual selector shaft (6).
48. Remove the manual selector shaft seal.
49. Remove the dipstick tube seal.



CLEANING

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on shafts, or valves, use extreme care to avoid rounding off sharp edges. Sharp edges are vital as they prevent foreign matter from getting between the valve and valve bore.

Do not reuse oil seals, gaskets, seal rings, or O-rings during overhaul. Replace these parts as a matter of course. Also do not reuse snap rings or E-clips that are bent or distorted. Replace these parts as well.

Lubricate transmission parts with Mopar® ATF +4, Automatic Transmission Fluid, during overhaul and assembly. Use petroleum jelly, Mopar® Door Ease, or Ru-Glyde to prelubricate seals, O-rings, and thrust washers. Petroleum jelly can also be used to hold parts in place during reassembly.

Clean the case in a solvent tank. Flush the case bores and fluid passages thoroughly with solvent. Dry the case and all fluid passages with compressed air. Be sure all solvent is removed from the case and that all fluid passages are clear.

NOTE: Do not use shop towels or rags to dry the case (or any other transmission component) unless they are made from lint-free materials. Lint will stick to case surfaces and transmission components and circulate throughout the transmission after assembly. A sufficient quantity of lint can block fluid passages and interfere with valve body operation.

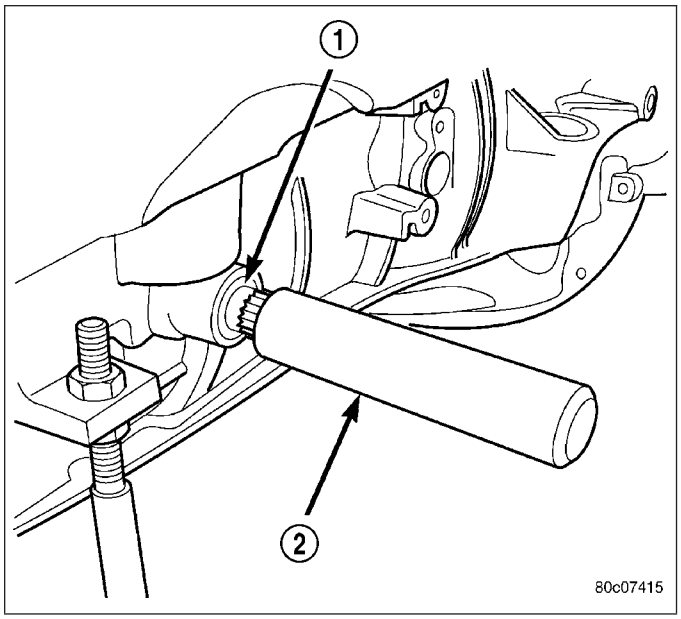
INSPECTION

Inspect the case for cracks, porous spots, worn bores, or damaged threads. Damaged threads can be repaired with Helicoil® thread inserts. However, the case will have to be replaced if it exhibits any type of damage or wear.

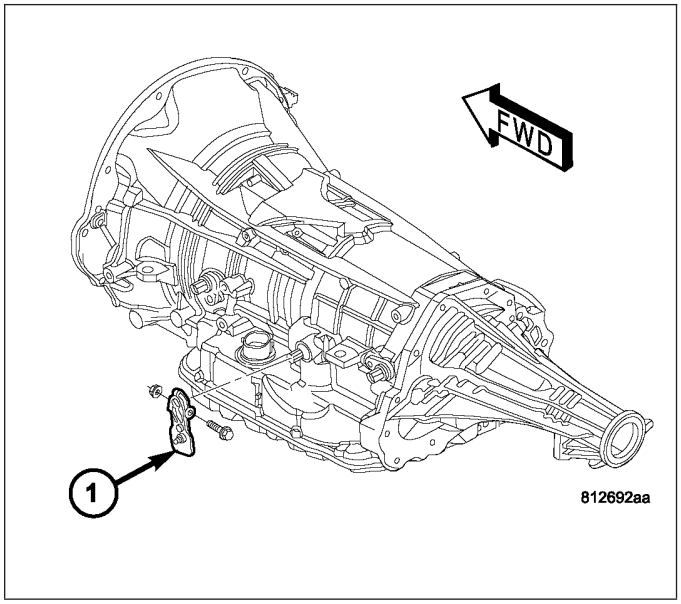
ASSEMBLY

NOTE: Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

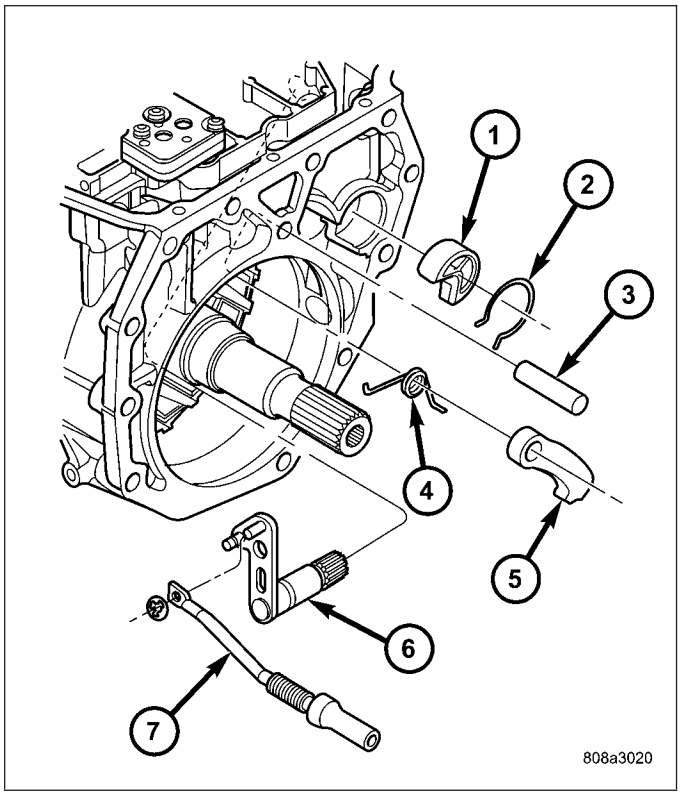
1. Install the cooler filter bypass valve. Torque the bypass valve to specification. The valve uses a tapered pipe thread and excessive torque can damage the transmission case. Tighten the cooler filter bypass valve to 4.5 N·m (40 in.lbs.).
2. Install a new selector shaft seal (1) using Seal Installer 8253 (2).



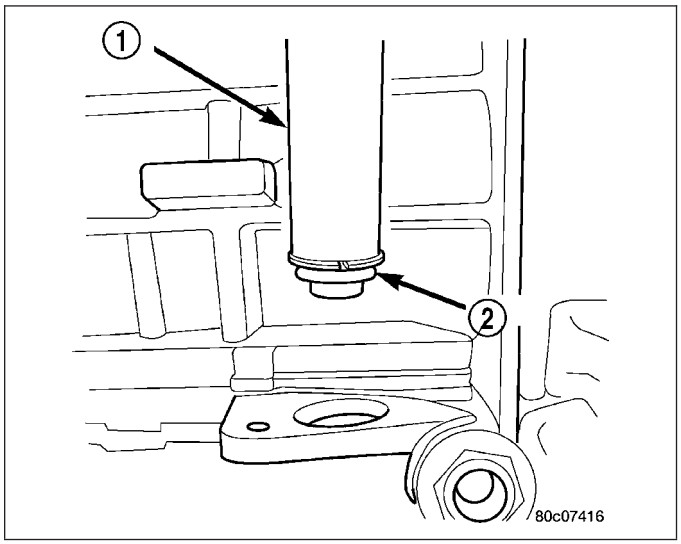
3. Install the manual selector shaft and retaining screw. Tighten the manual selector shaft retaining screw to 28 N·m (250 in.lbs.).
4. Install the manual shift lever (1) onto the manual selector shaft. Torque the retaining cross-bolt to 16 N·m (140 in.lbs.).



5. Install the park pawl (5), spring (4), and shaft (3).
6. Install the park rod (7) and e-clip.
7. Install the park rod guide (1) and snap-ring (2).

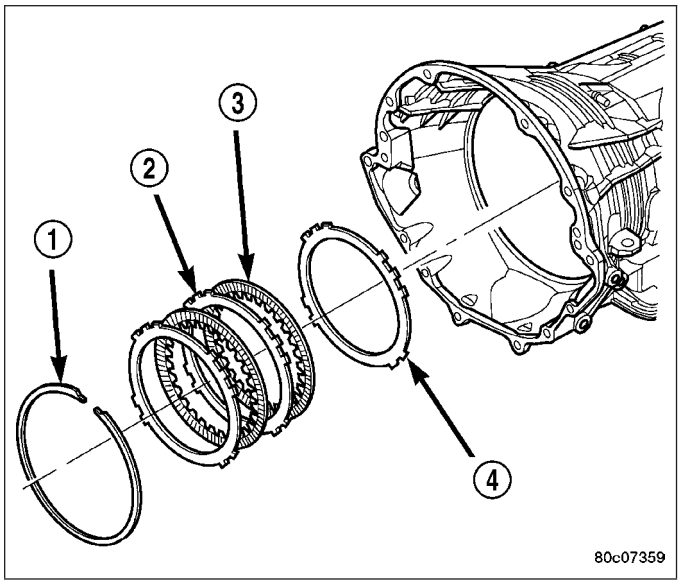


8. Install a new dipstick tube seal (2) using Seal Installer 8254 (1).

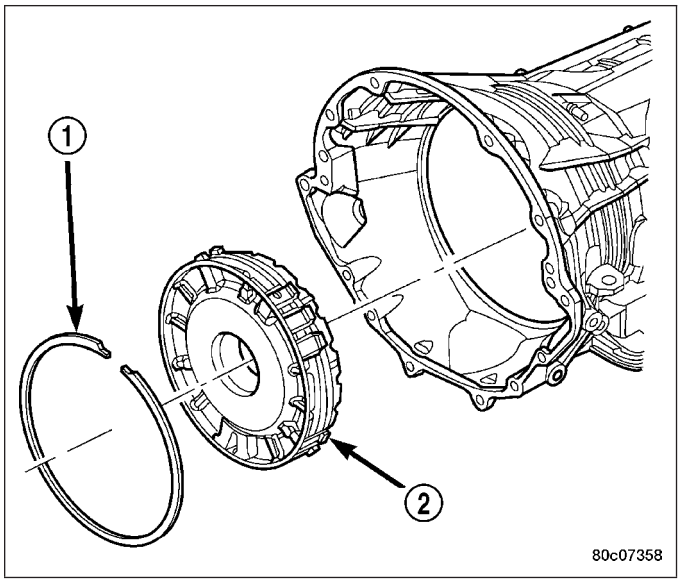


NOTE: Before final assembly of transmission centerline, the 2C/4C clutch components should be installed into position and measured as follows:

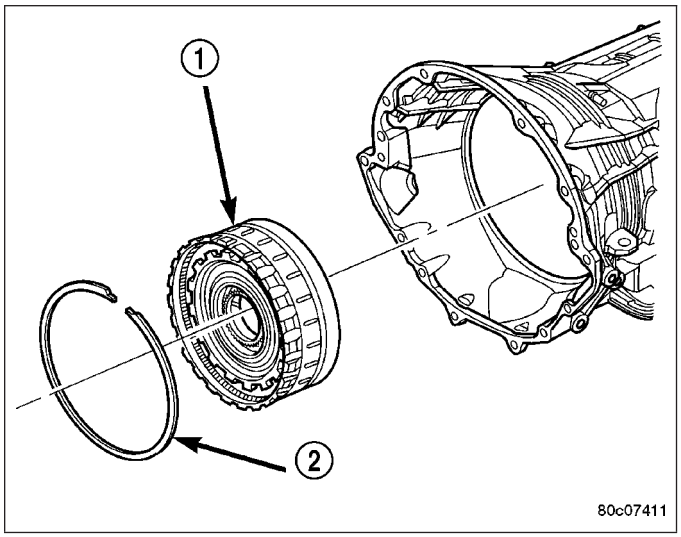
9. Install the 2C reaction plate (4) into the transmission case.
10. Install the 2C clutch pack (2, 3) into the transmission case.
11. Install the flat 2C clutch snap-ring (1) into the transmission case.



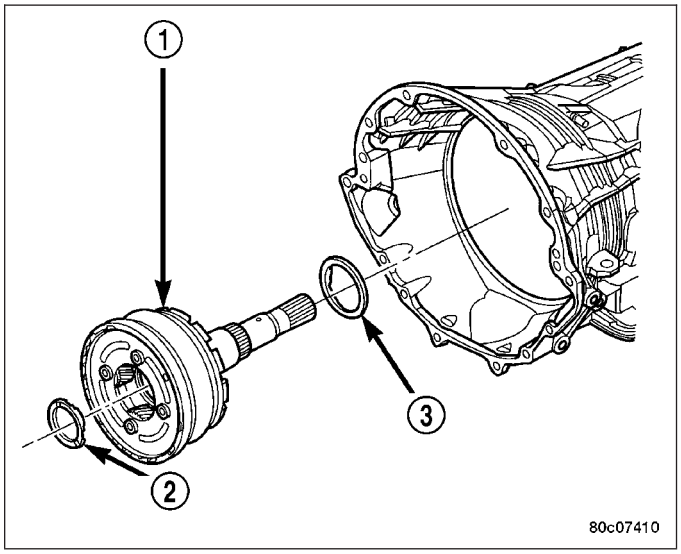
12. Install the 4C retainer/bulkhead (2) into the transmission case. Make sure that the oil feed holes are pointing toward the valve body area.
13. Install the 4C retainer/bulkhead tapered snap-ring (1) into the transmission case. Make sure that the open ends of the snap-ring are located in the case opening toward the valve body area.
14. Using a feeler gauge through the opening in the rear of the transmission case, measure the 2C clutch pack clearance between the 2C reaction plate and the transmission case at four different points. The average of these measurements is the 2C clutch pack clearance. The correct clutch clearance is 0.455-1.335 mm (0.018-0.053 in.). The reaction plate is not selective. If the clutch pack clearance is not within specification, the reaction plate, all the friction discs, and steels must be replaced.
15. Remove the 4C retainer/bulkhead and all of the 2C clutch components from the transmission case.



16. Install the low/reverse clutch assembly (1). Make sure that the oil feed hole points toward the valve body area and that the bleed orifice is aligned with the notch in the rear of the transmission case.
17. Install the snap-ring (2) to hold the low/reverse clutch retainer into the transmission case. The snap-ring is tapered and must be installed with the tapered side forward. Once installed, verify that the snap-ring is fully seated in the snap-ring groove.
18. Air check the low/reverse clutch and verify correct overrunning clutch operation.

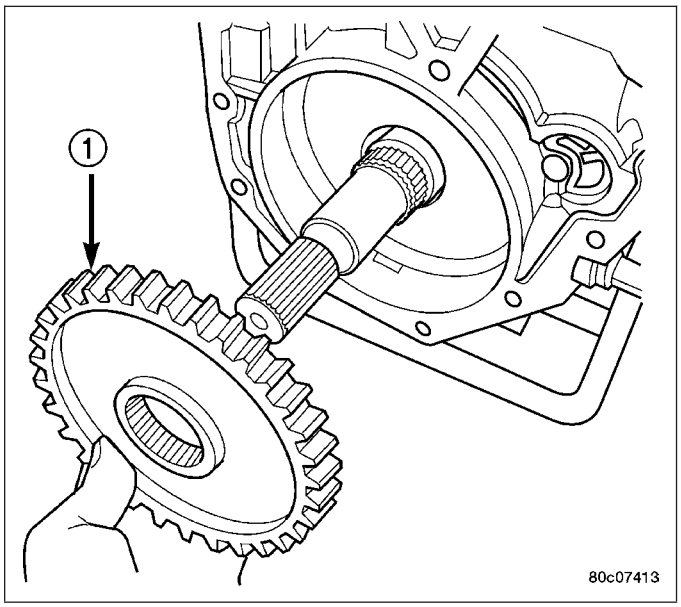


19. Install the number 12 thrust bearing (3) over the output shaft and against the rear planetary gear set. The flat side of the bearing goes toward the planetary gearset and the raised tabs on the inner race should face the rear of the transmission.

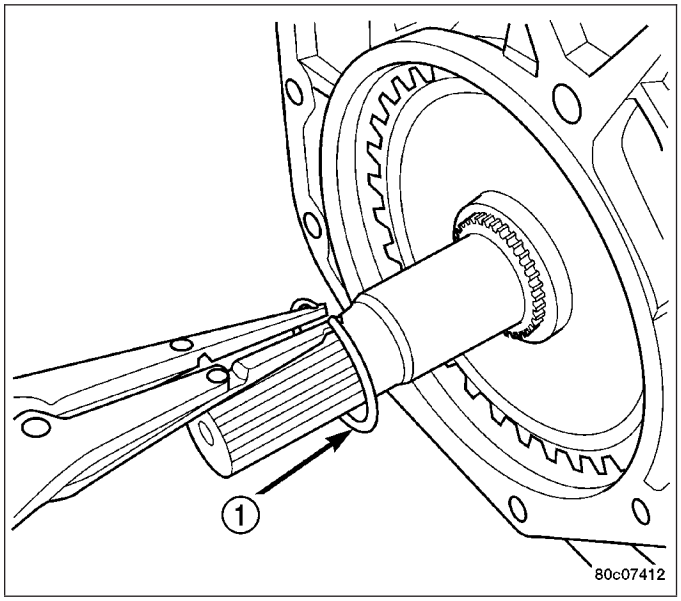


20. Install the reverse/input planetary assembly (1) through the low/reverse clutch assembly.

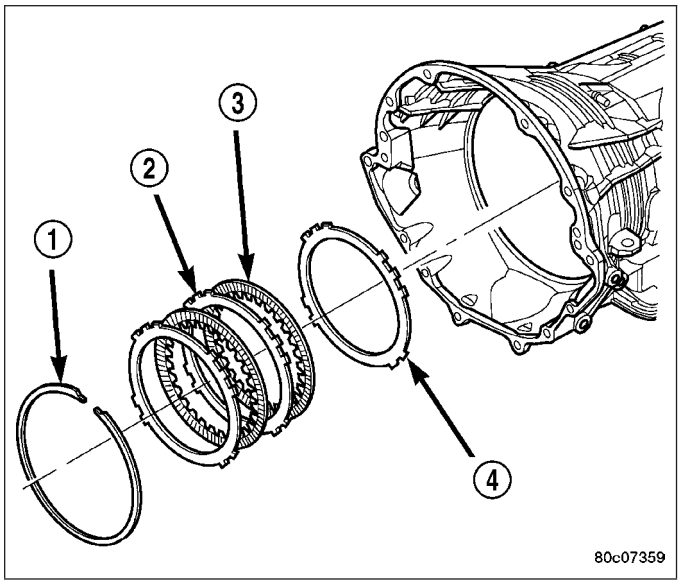
21. Install the park sprag gear (1) onto the output shaft.

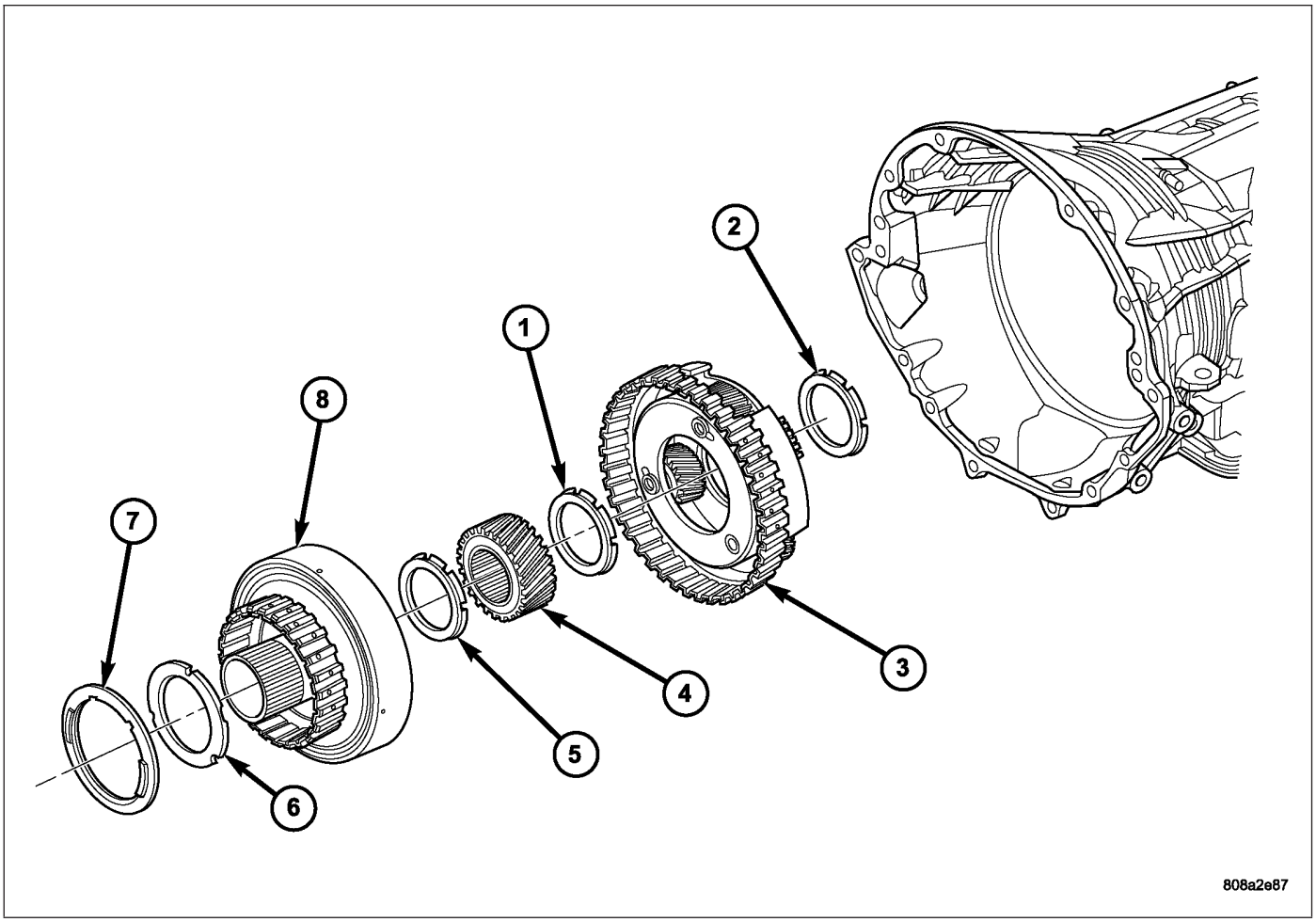


22. Install the snap-ring (1) to hold the park sprag onto the output shaft.



23. Install the 2C reaction plate (4) into the transmission case.
24. Install the 2C clutch pack (2, 3, 4) into the transmission case.

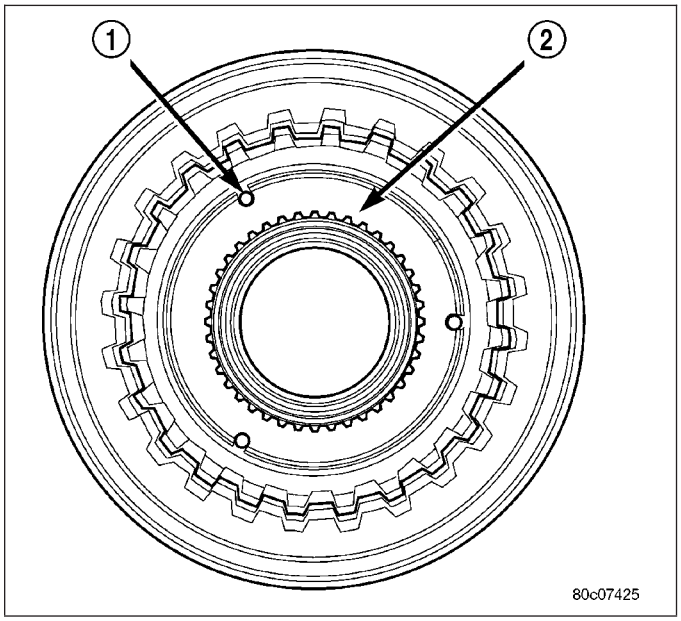




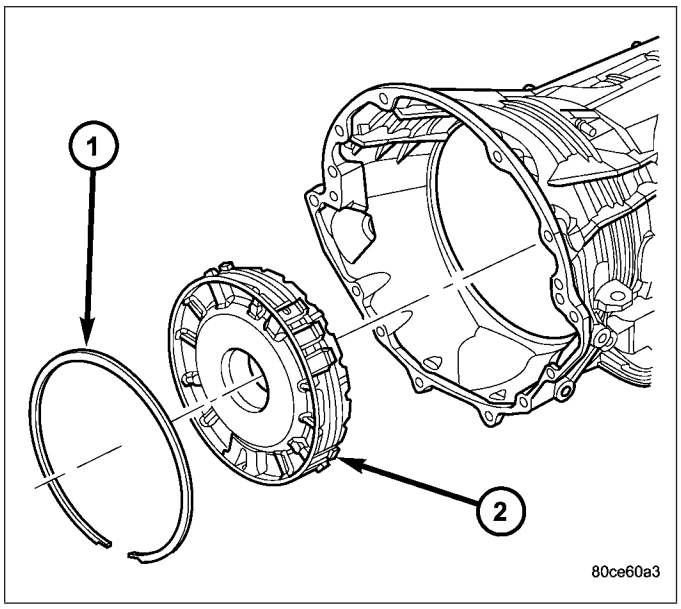
Install Reaction Annulus and Carrier

1 - THRUST BEARING NUMBER 8
2 - THRUST BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - THRUST BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - THRUST BEARING NUMBER 6
8 - REACTION ANNULUS

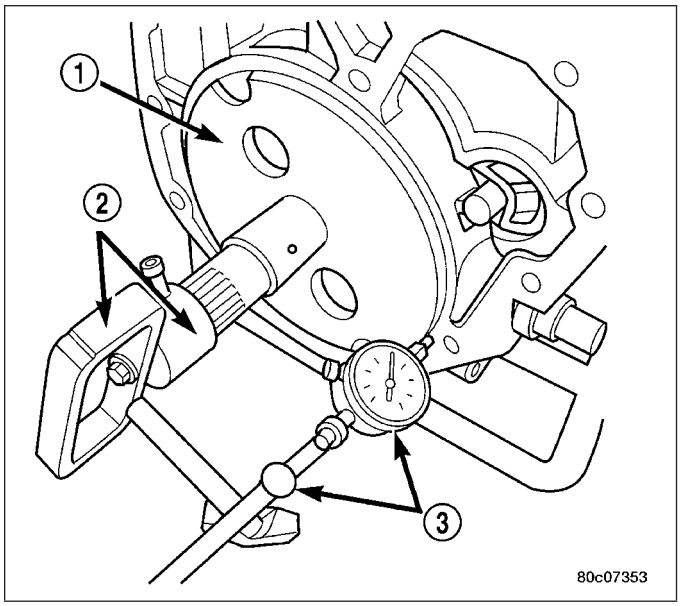
25. Install the number 8 thrust bearing (1) inside the reaction carrier with the outer race against the reaction planetary carrier (3).
26. Install the reaction planetary gear set and the number 9 thrust bearing (2), with the inner race against the reaction planetary carrier (3), into the transmission case.
27. Install the flat 2C clutch snap-ring into the transmission case.
28. Install the reaction sun gear (4) into the reaction planetary gear set. **Make sure** the small shoulder is facing the front of the transmission.
29. Install the number 7 thrust bearing (5) onto the reaction sun gear (4) with the inner race against the sun gear.
30. Install the output shaft selective thrust plate (2) onto the reaction annulus with the oil grooves facing the annulus gear and the lugs (1) and notches aligned as shown.
31. Install the number 6 thrust bearing (7) against the output shaft selective thrust plate (6) with the flat side against the thrust plate and the raised tabs on the inner race facing the front of the transmission.
32. Install the reaction annulus (8) into the reaction planetary gear set.



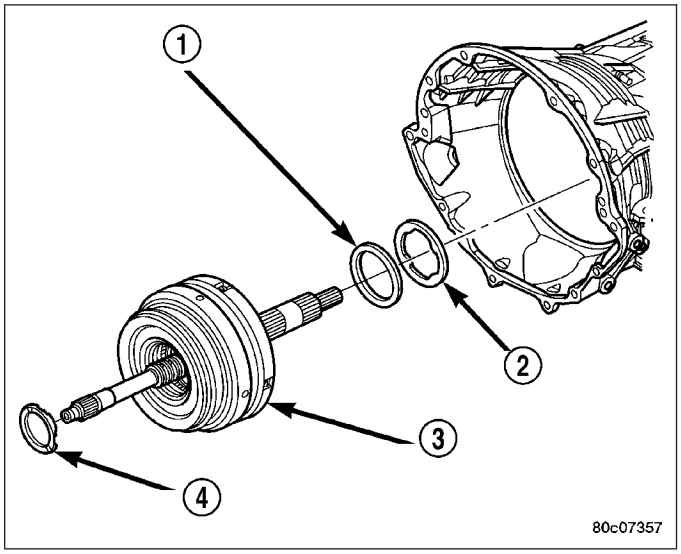
33. Install the 4C retainer/bulkhead (2) into the transmission case. Make sure that the oil feed holes are pointing toward the valve body area. Rotate the reaction annulus during the installation of the 4C retainer/bulkhead to ease installation.
34. Install the 4C retainer/bulkhead tapered snap-ring (1) into the transmission case with the taper toward the front of the case. Make sure that the open ends of the snap-ring are located in the case opening toward the valve body area.
35. Air check the 2C and 4C clutch operation.



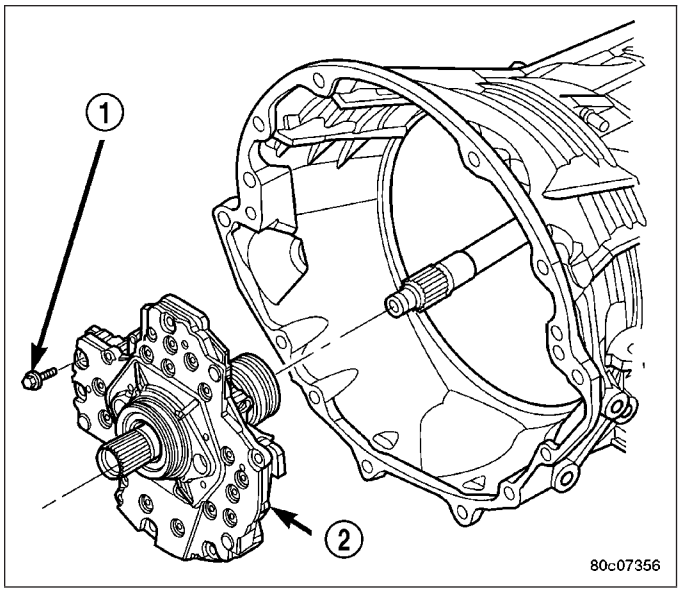
36. Using Alignment Plate 8261 (1), Adapter 8266-17 from End-Play Tool Set 8266 (2) and Dial Indicator C-3339 (3), measure and record the output shaft end-play. The correct output shaft end-play is 0.22-0.55 mm (0.009-0.021 in.). Adjust as necessary. Install the chosen output shaft selective thrust plate and re-measure end-play to verify selection.
37. Apply a bead of RTV silicone and install the extension/adapter housing onto the transmission case.
38. Install and torque the bolts to hold the extension/adapter housing onto the transmission case. The correct torque is 54 N·m (40 ft.lbs.).



39. Install the number 5 thrust bearing (1) and selective thrust plate (2) onto the 4C retainer/bulkhead. Be sure that the outer race of the bearing is against the thrust plate.
40. Install the input clutch assembly (3) into the transmission case. Make sure that the input clutch assembly is fully installed by performing a visual inspection through the input speed sensor hole. If the tone wheel teeth on the input clutch assembly are centered in the hole, the assembly is fully installed.
41. Install the number 1 thrust bearing (4) with the outer race up in the pocket of the input clutch assembly.

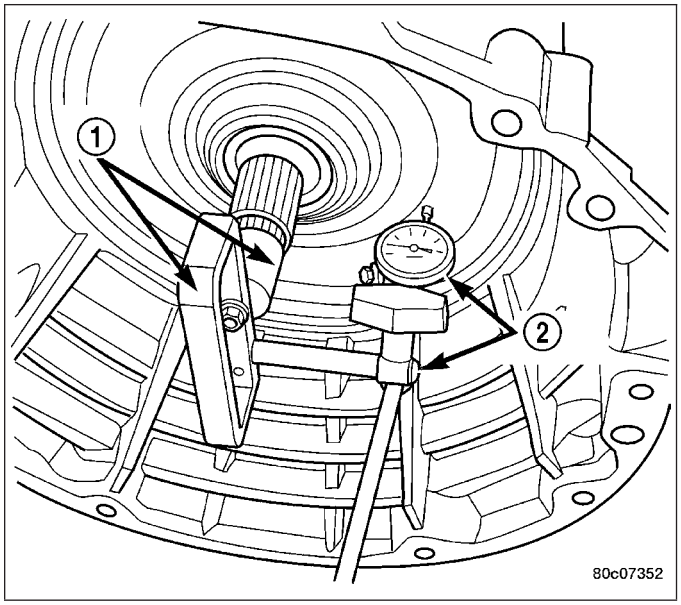


42. Install the oil pump (2) into the transmission case.
43. Install the bolts (1) to hold the oil pump into the transmission case. Tighten the oil pump bolts to 28 N·m (250 in.lbs.).

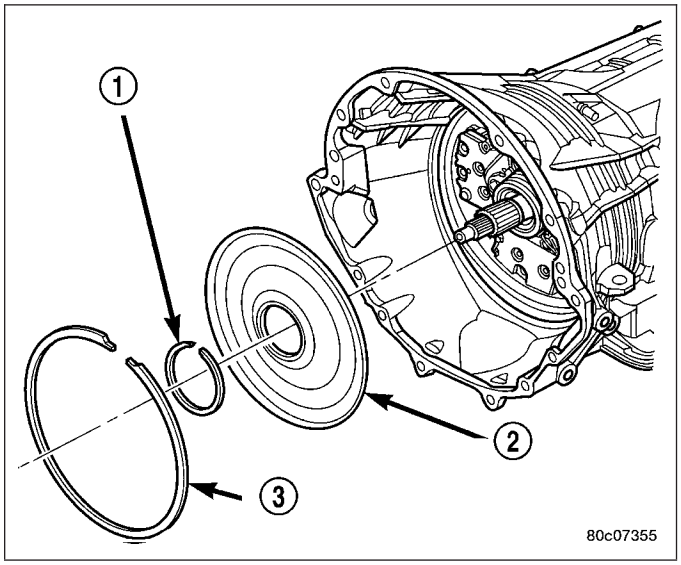


44. Using Adapter 8266-1 from End-Play Tool Set 8266 (1) and Dial Indicator C-3339 (2), measure and record the input shaft end-play. The correct end-play is 0.46-0.89 mm (0.018-0.035 in.). Adjust as necessary. Install the chosen thrust plate on the number 5 thrust bearing and re-measure end-play to verify selection.

NOTE: When measuring the input shaft end-play, two ″stops″ will be felt. When the input shaft is pushed inward and the dial indicator zeroed, the first ″stop″ felt when the input shaft is pulled outward is the movement of the input shaft in the input clutch housing hub. This value should not be included in the end-play measured value and therefore must be recorded and subtracted from the dial indicator reading.

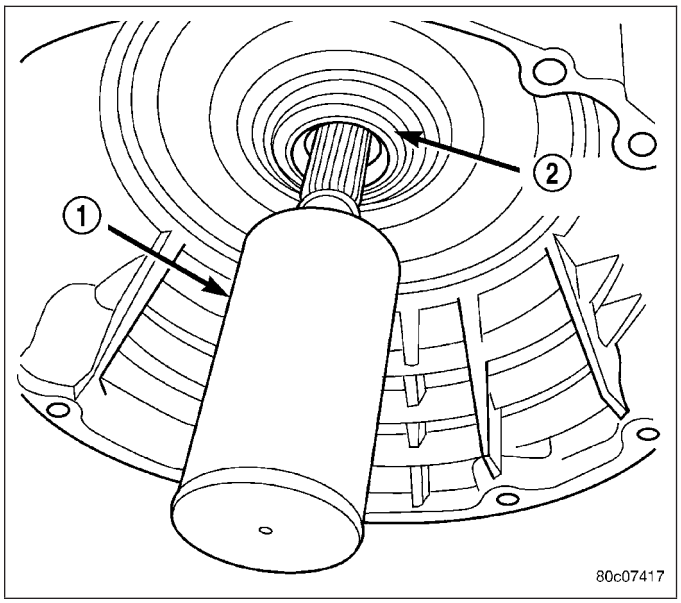


45. Install the transmission front cover (2) into the transmission case.
46. Install the outer snap-ring (3) to hold the transmission front cover (2) into the transmission case.

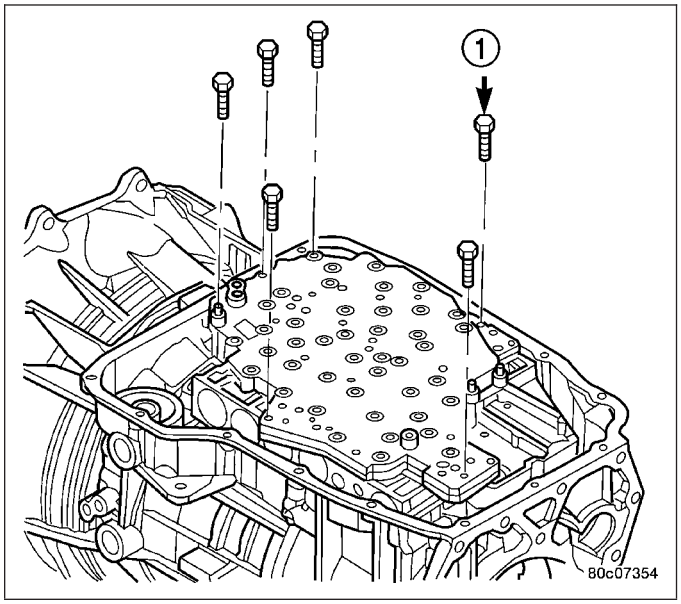


47. Partially install the inner transmission front cover snap-ring (1) onto the oil pump.

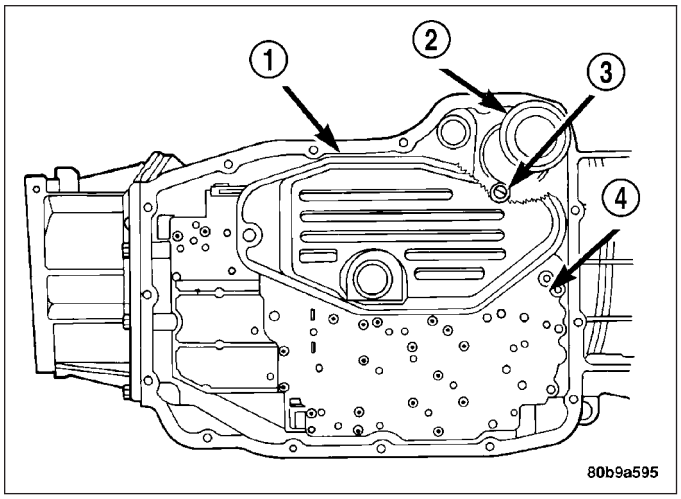
48. Using Installer 8255 (1), install the inner transmission front cover snap-ring (2) the remainder of the way onto the oil pump.



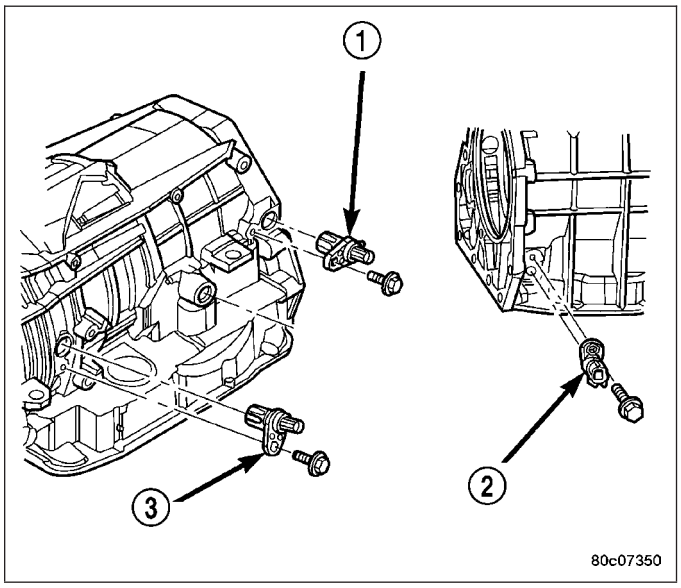
49. Install the valve body. Verify that the pin on the manual lever has properly engaged the TRS selector plate. Tighten the valve body to transmission case bolts (1) to 12 N·m (105 in.lbs.).



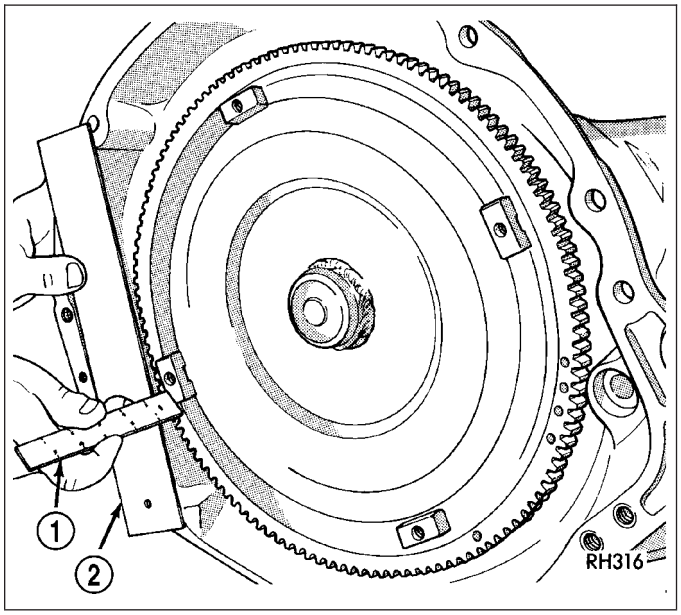
CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.



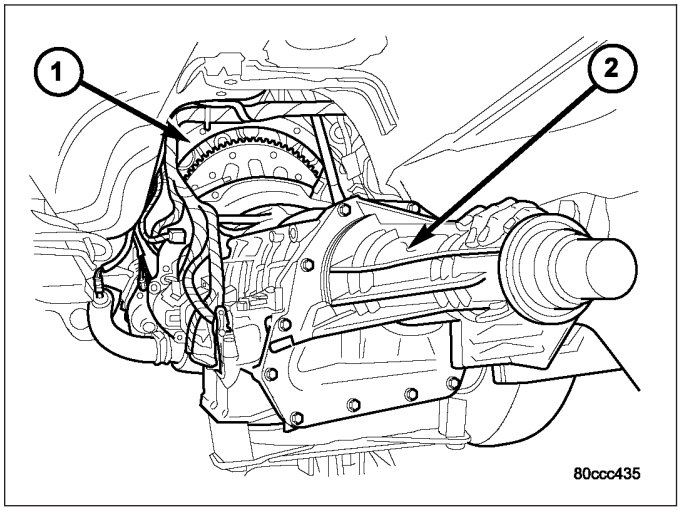
50. Install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with the butt end of a hammer, or other suitable tool.
51. Install the primary oil filter (1) and the oil cooler return filter (2). Tighten the screw to hold the primary oil filter to the valve body to 4.5 N·m (40 in.lbs.). Using Oil Filter Wrench 8321, tighten the cooler return oil filter to the transmission case to 14 N·m (125 in.lbs.).
52. Apply RTV silicone to the oil pan and install the transmission oil pan. Tighten the bolts to 12 N·m (105 in.lbs.).
53. Install the input (3), output (1), and line pressure sensors (2). Tighten the bolts to 12 N·m (105 in.lbs.).



INSTALLATION

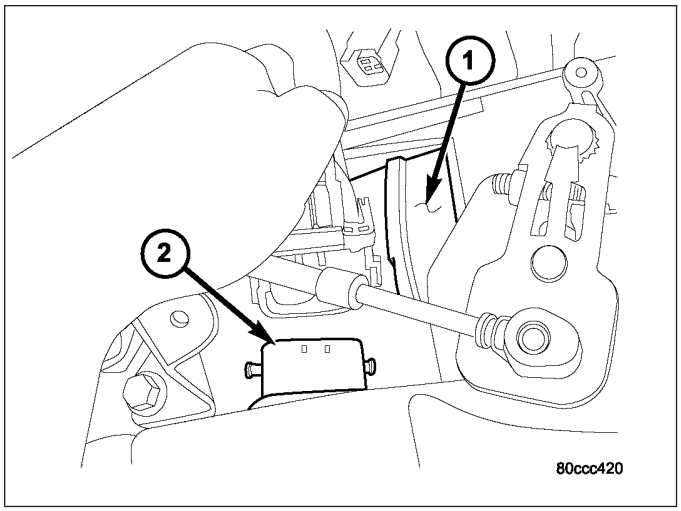


1. Check torque converter hub and hub drive flats for sharp edges burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper and crocus cloth if necessary. Verify that the converter hub o-ring is properly installed and is free of any debris. The hub must be smooth to avoid damaging pump seal at installation.
2. If a replacement transmission is being installed, transfer any components necessary, such as the manual shift lever and shift cable bracket, from the original transmission onto the replacement transmission.
3. Lubricate oil pump seal lip with transmission fluid.
4. Align converter and oil pump.
5. Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.
6. Check converter seating with steel scale (1) and straightedge (2). Surface of converter lugs should be at least 13mm (1/2 in.) to rear of straightedge when converter is fully seated.
7. Temporarily secure converter with C-clamp.

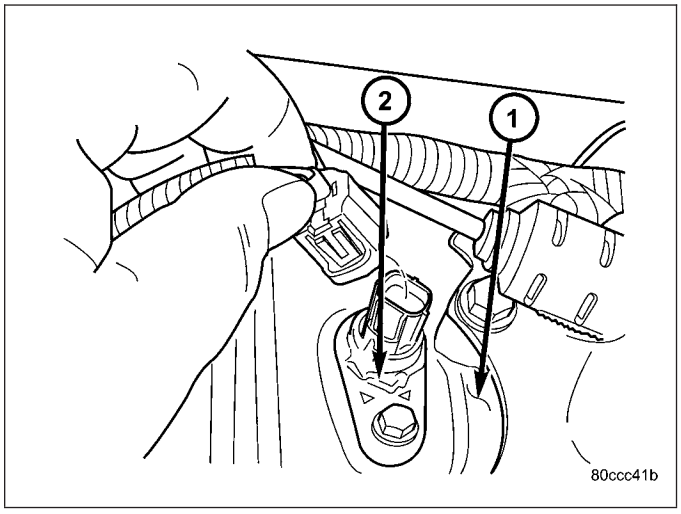


8. Position transmission on jack and secure it with chains.
9. Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**
10. Apply a light coating of Mopar® High Temp Grease to the torque converter hub pocket in the rear pocket of the engine's crankshaft.
11. Raise transmission (2) and align the torque converter with the drive plate and transmission converter housing with the engine block.

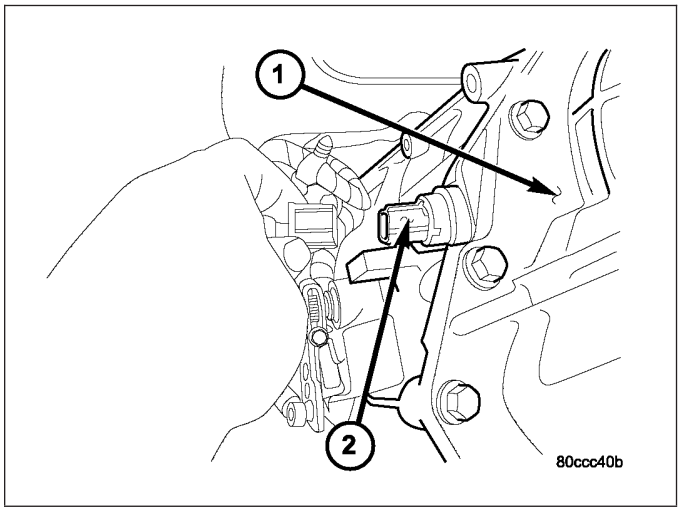
12. Move transmission forward. Then raise, lower or tilt transmission to align the converter housing with engine block dowels.
13. Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft. Verify that no wires, or the transmission vent hose, have become trapped between the engine block and the transmission.
14. Install two bolts to attach the transmission to the engine.
15. Install remaining torque converter housing to engine bolts. Tighten to 68 N·m (50 ft.lbs.).
16. Install transfer case, if equipped. Tighten transfer case nuts to 35 N·m (26 ft.lbs.).
17. Install rear support to transmission. Tighten bolts to 47 N·m (35 ft.lbs.).



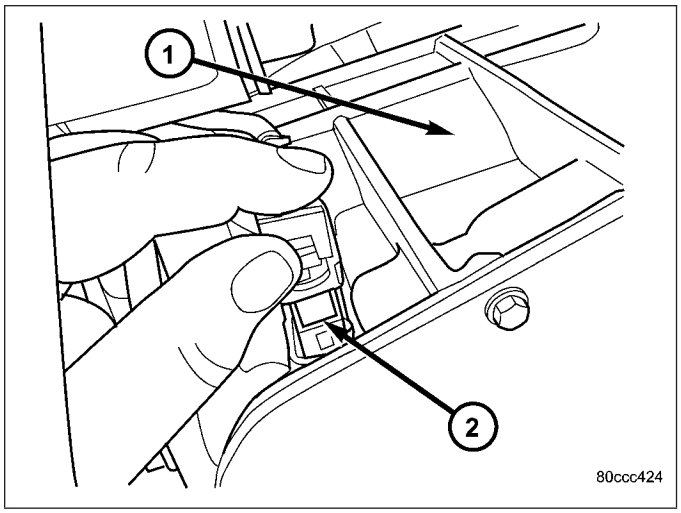
18. Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember. Tighten clevis bracket to crossmember bolts to 47 N·m (35 ft.lbs.). Tighten the clevis bracket to rear support bolt to 68 N·m (50 ft.lbs.).
19. Remove engine support fixture.
20. Connect gearshift cable to transmission.
21. Connect wires to solenoid and pressure switch assembly (2) connector.
22. Connect wires to input speed sensor (2).



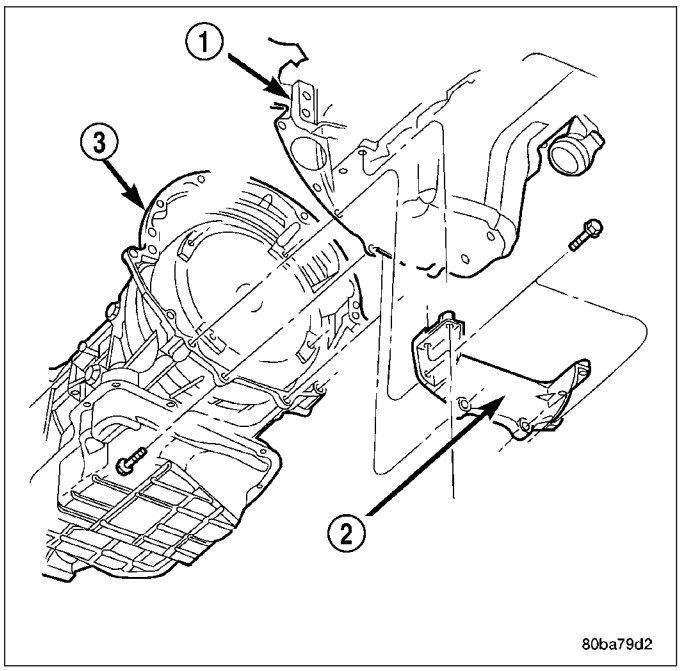
23. Connect wires to output speed sensor (2).



24. Connect wires to line pressure sensor (2). Be sure transmission harnesses are properly routed.



CAUTION: It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

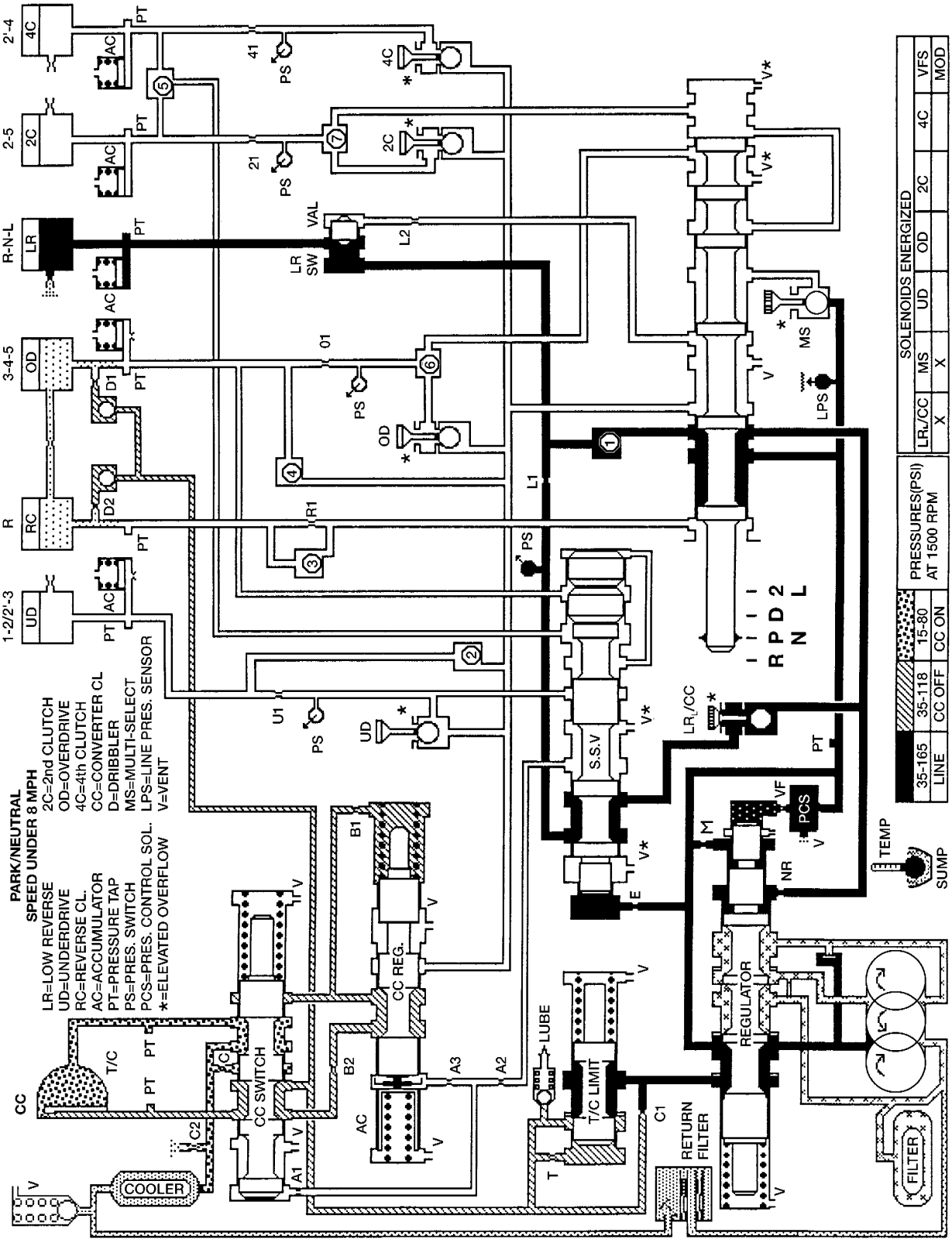


25. Install torque converter-to-driveplate bolts. Tighten bolts to 31 N·m (270 in. lbs.).
26. Install starter motor and cooler line bracket.
27. Connect cooler lines to transmission.
28. Install transmission fill tube.
29. Install exhaust components, if necessary.
30. Install the structural dust cover (2) (Refer to 9 - ENGINE/ENGINE BLOCK/STRUCTURAL COVER - INSTALLATION) onto the transmission and the engine.
31. Align and connect propeller shaft(s).
32. Adjust gearshift cable if necessary.
33. Install any skid plates removed previously. (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - INSTALLATION)
34. Lower vehicle.
35. Fill transmission with Mopar® ATF +4, Automatic Transmission Fluid.

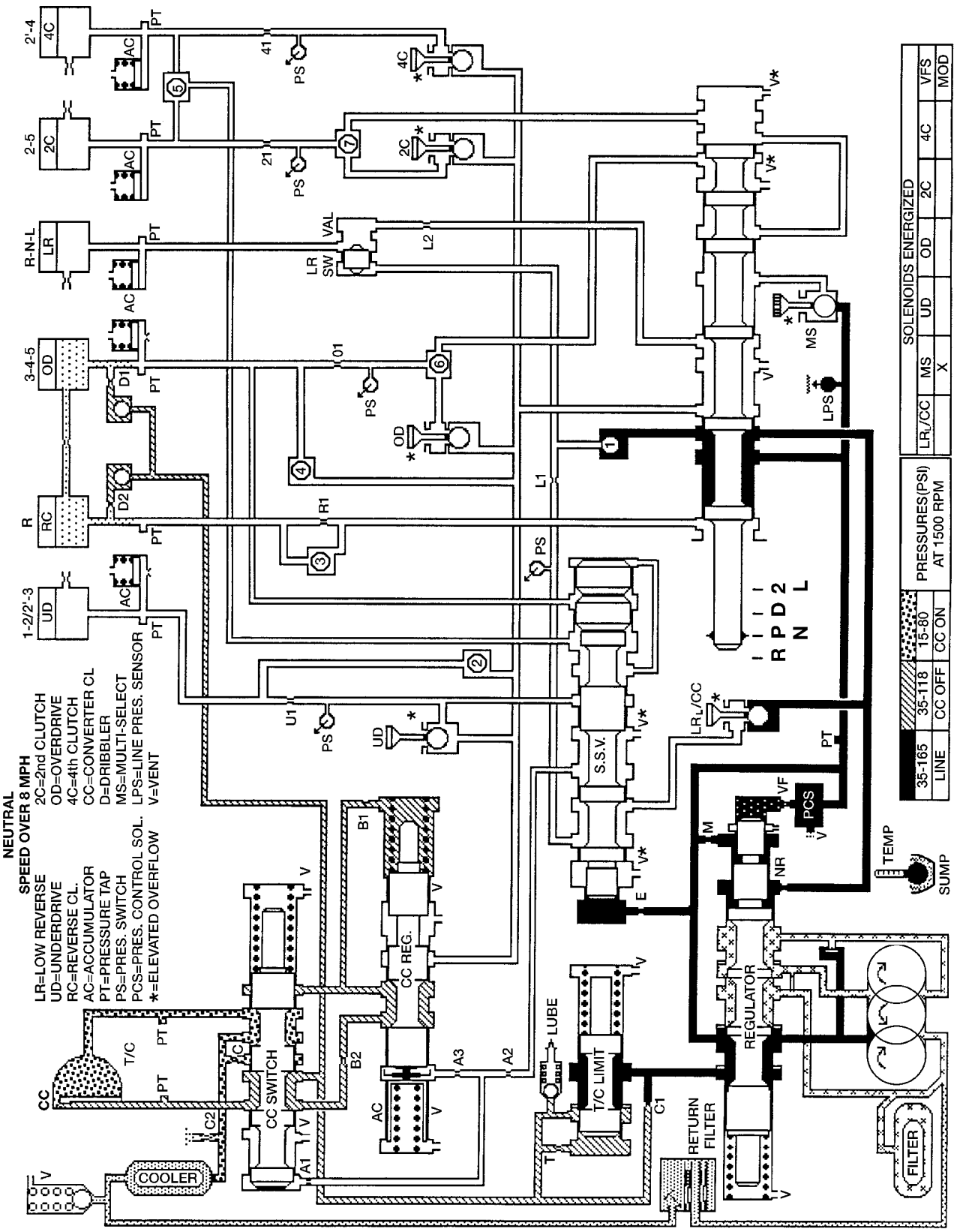
SCHEMATICS AND DIAGRAMS

HYDRAULIC SCHEMATICS

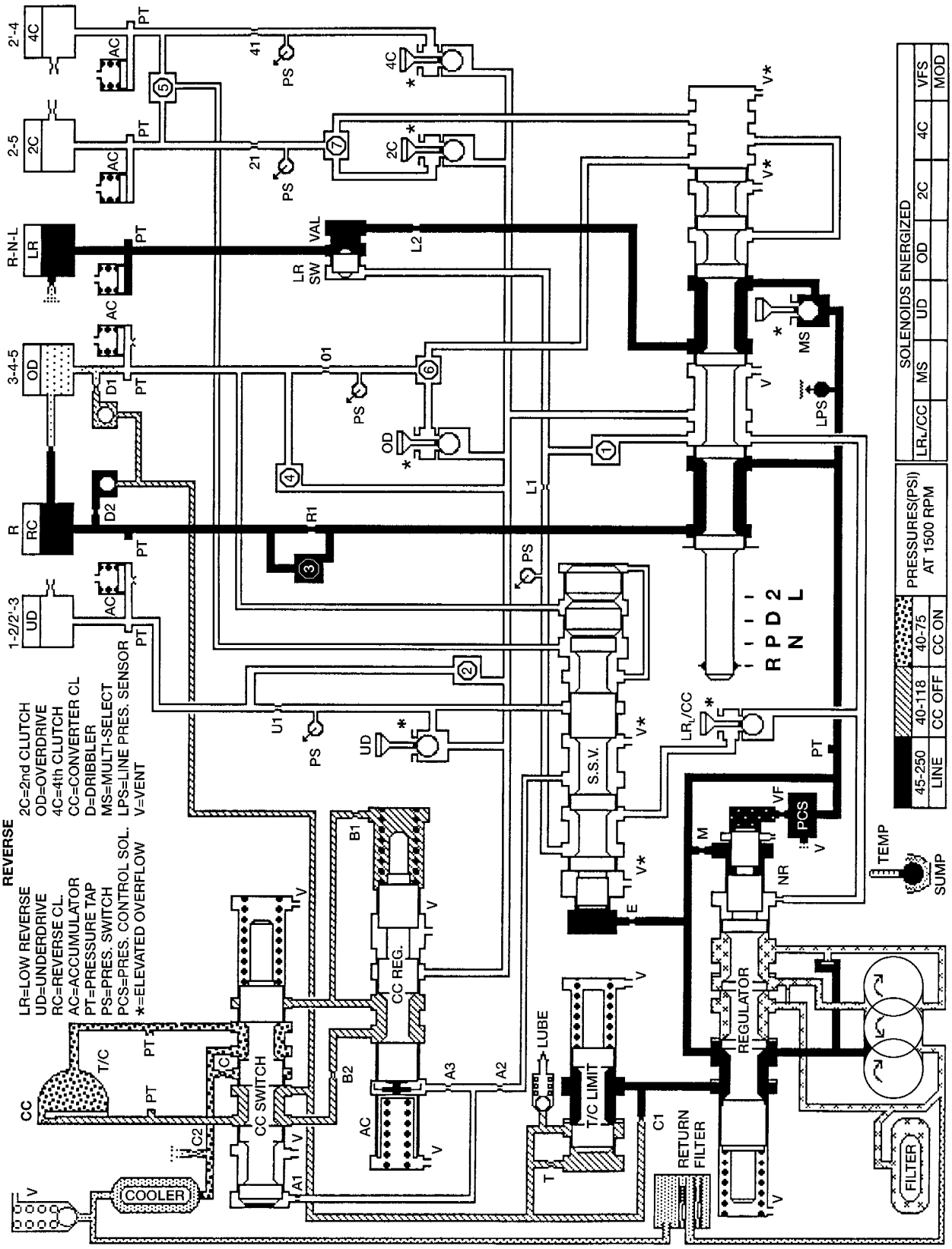
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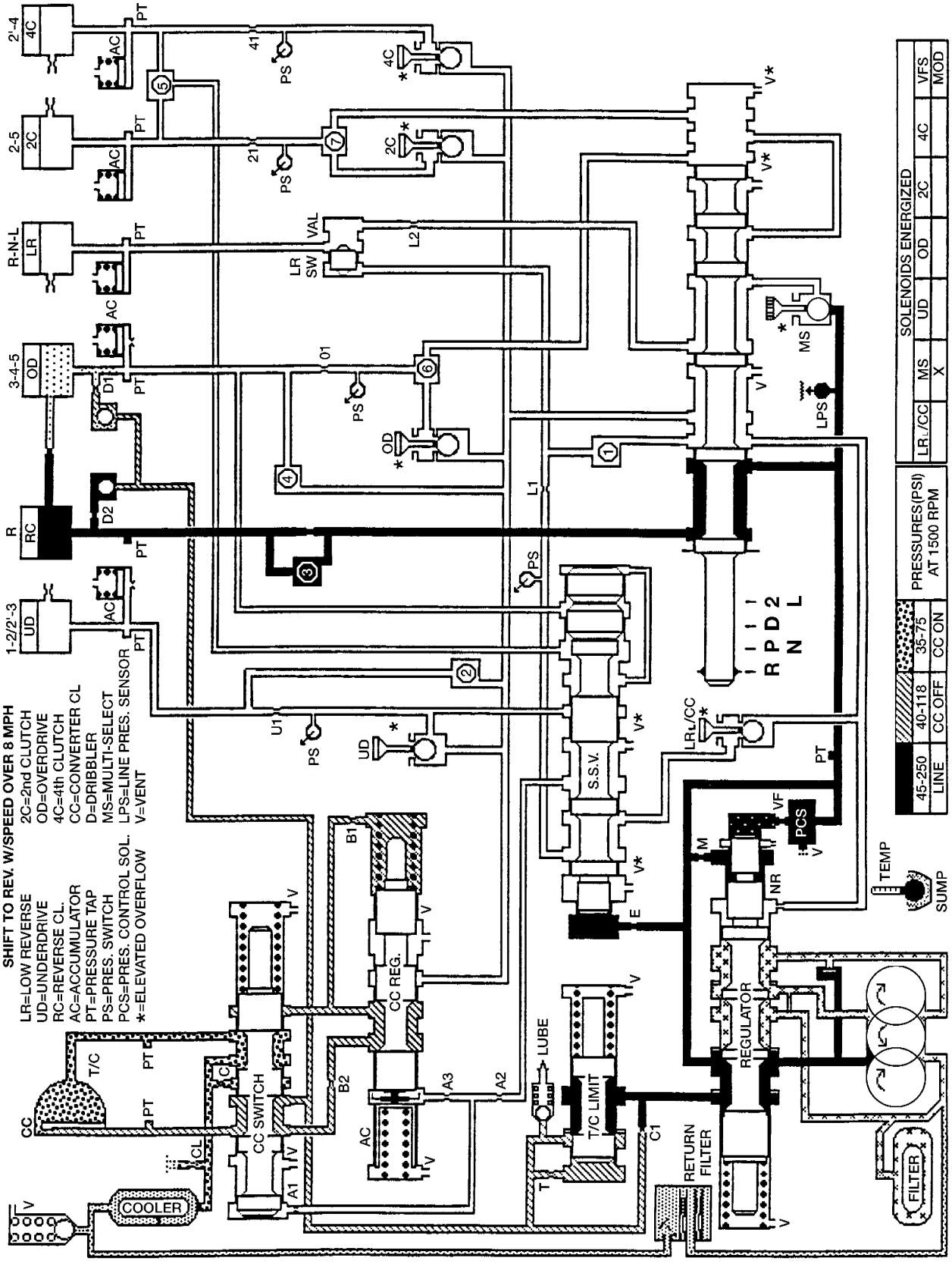


HYDRAULIC FLOW IN PARK/NEUTRAL

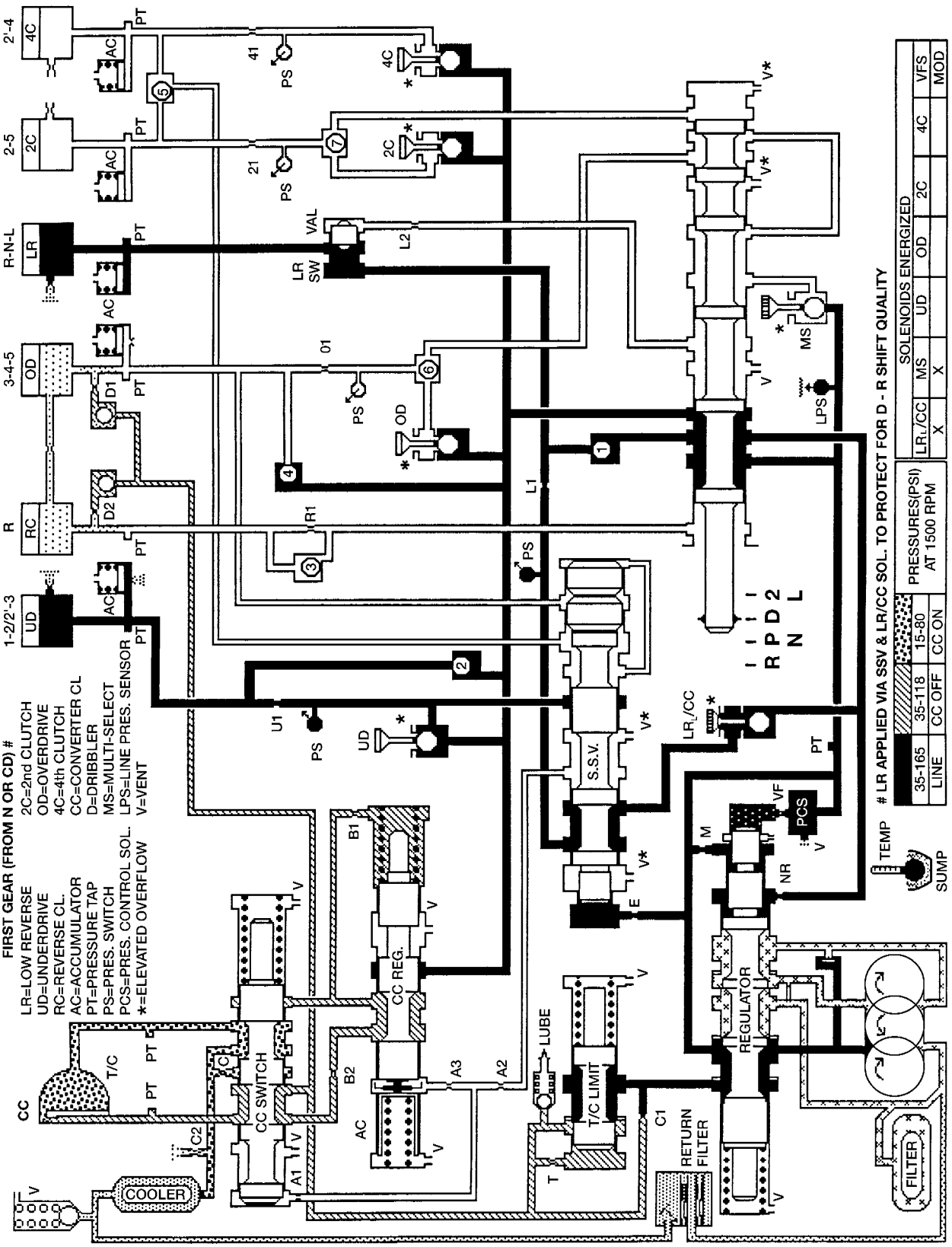


HYDRAULIC FLOW IN NEUTRAL OVER 8MPH

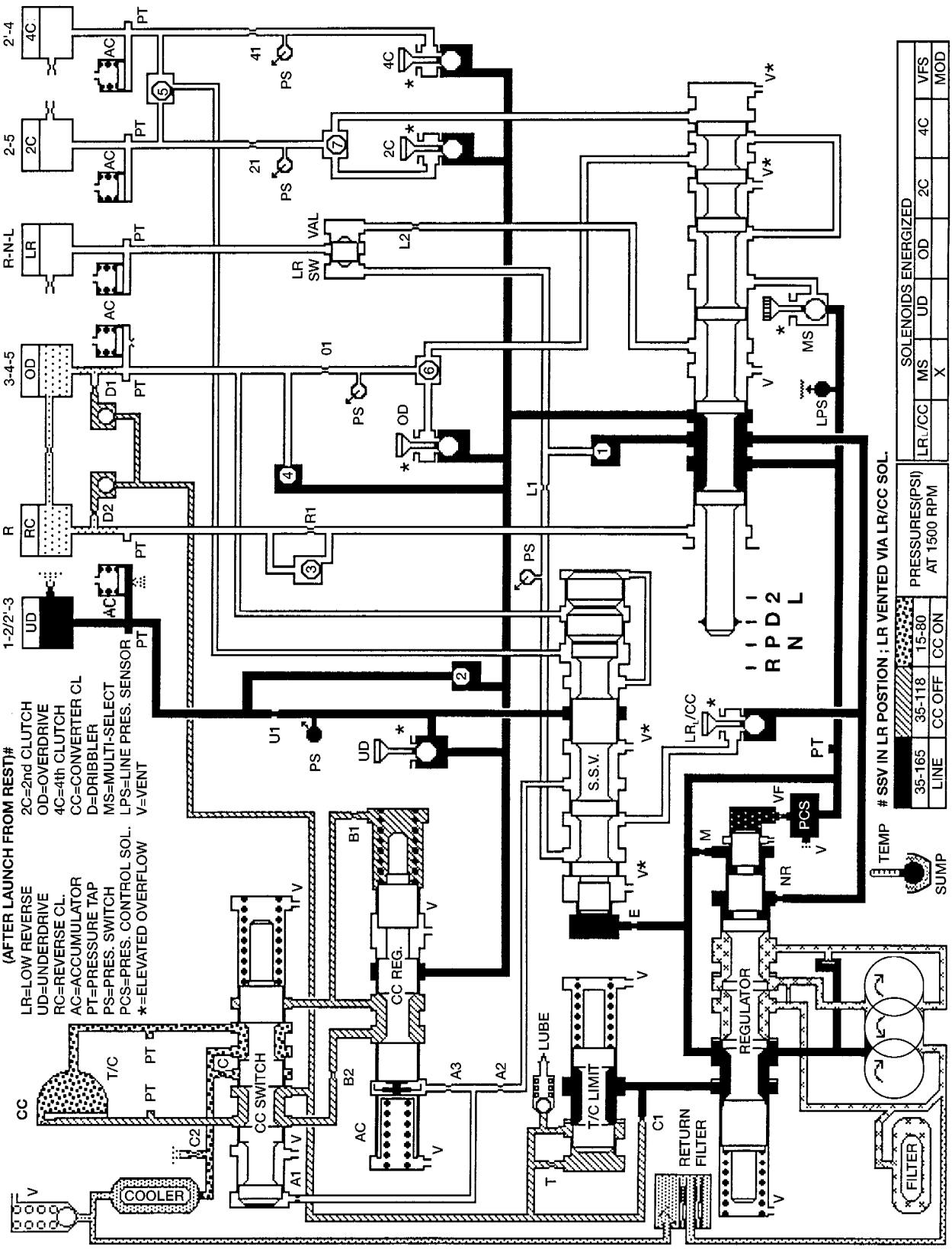

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REVERSE
LR=LOW REVERSE
UD=UNDERDRIVE
RC=REVERSE CL.
AC=ACCUMULATOR
PT=PRESSURE TAP
PS=PRES. SWITCH
PCS=PRES. CONTROL SOL.
*=ELEVATED OVERFLOW
2C=2nd CLUTCH
OD=OVERDRIVE
4C=4th CLUTCH
CC=CONVERTER CL
D=DRIBBLER
MS=MULTI-SELECT
LPS=LINE PRES. SENSOR
V=VENT
SOLENOIDS ENERGIZED
LR/CC
MS
UD
OD
2C
4C
VFS
MOD
PRESSURES(PSI)
AT 1500 RPM
45-250
LINE
40-118
CC OFF
40-75
CC ON
R P D 2
N L
2'-4
2-5
R-N-L
3-4-5
R
1-2/2'-3
4C
2C
LR
OD
RC
UD
AC
PT
D1
D2
VAL
LR SW
L1
L2
R1
01
41
21
U1
PS
OD
MS
LPS
S.S.V.
LR/CC
VF
PCS
M
NR
E
TEMP
SUMP
LUBE
T/C
CC
C
C2
CC SWITCH
A1
B1
B2
CC REG.
A2
A3
AC
T/C LIMIT
T
C1
RETURN FILTER
REGULATOR
FILTER
COOLER
V
HYDRAULIC FLOW IN REVERSE



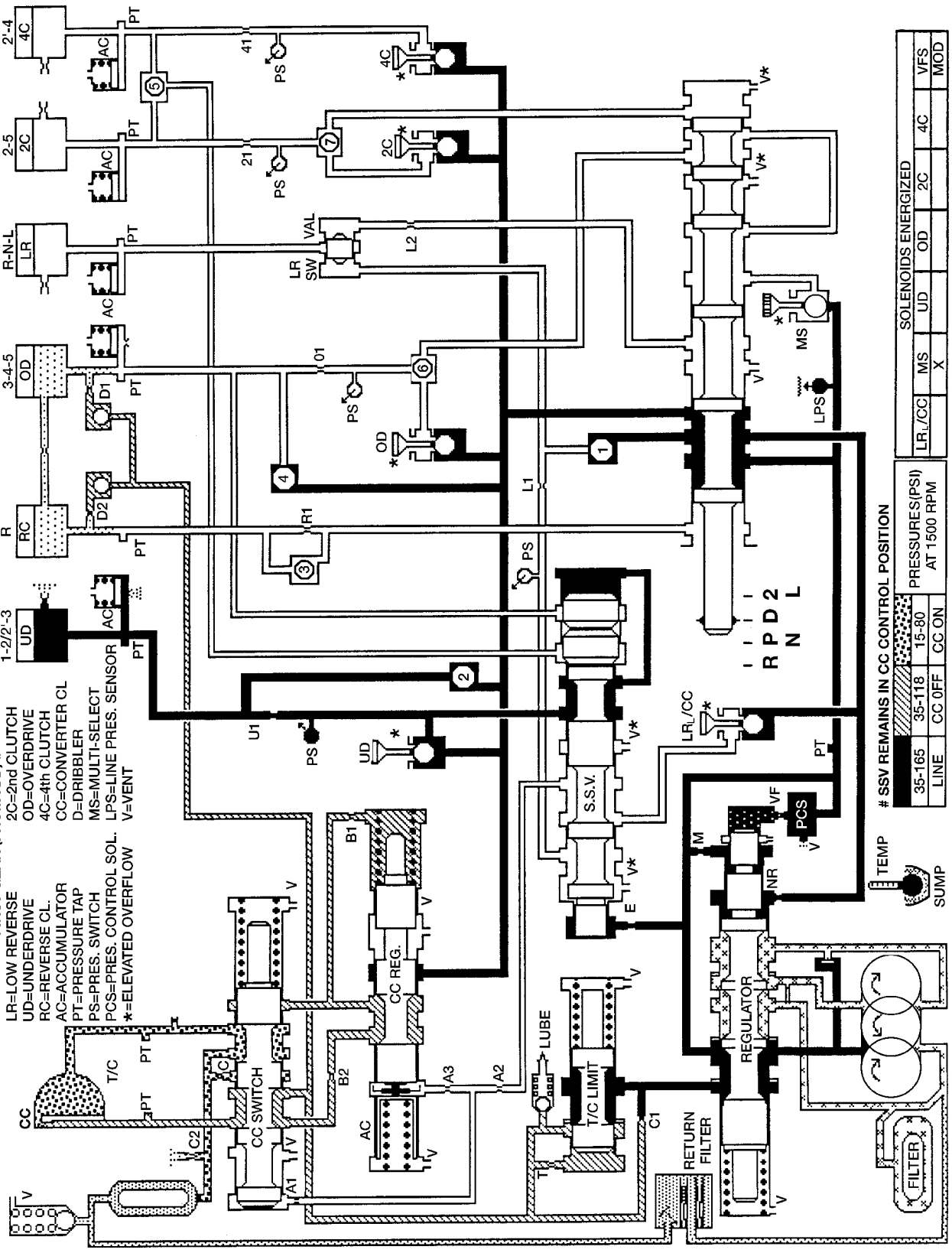
HYDRAULIC FLOW IN REVERSE BLOCK



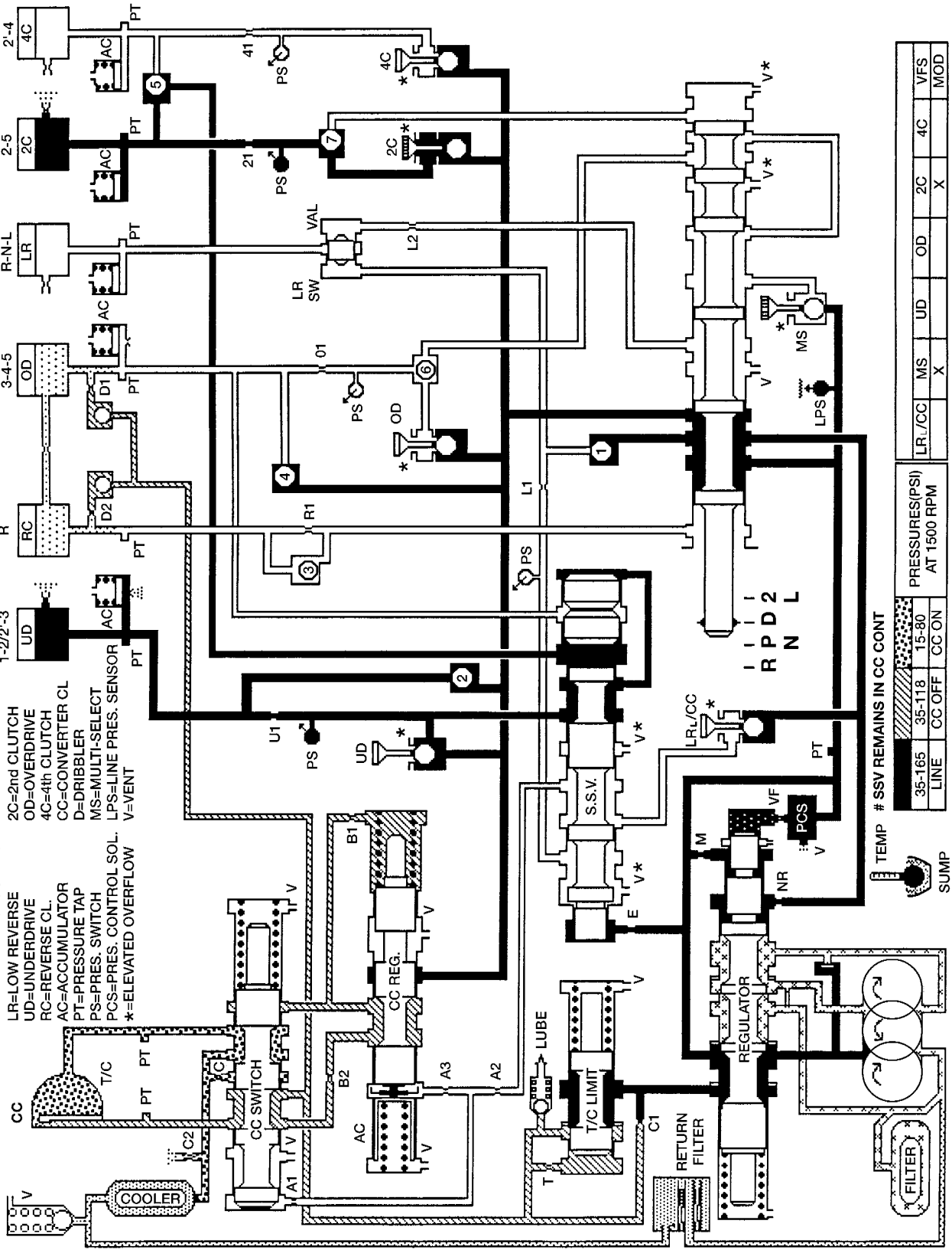
HYDRAULIC FLOW IN FIRST GEAR (FROM N OR OD)



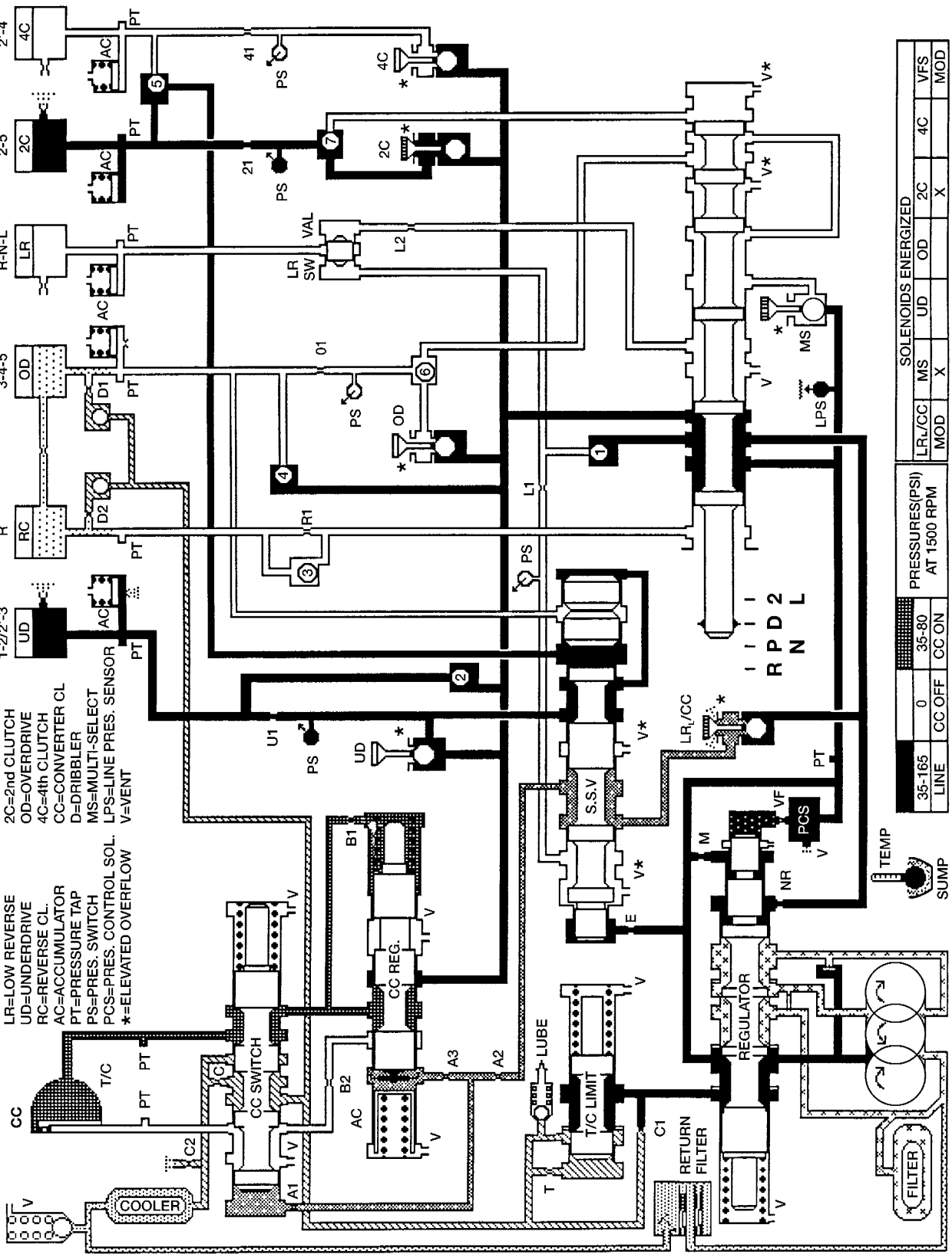
HYDRAULIC FLOW IN FIRST GEAR (AFTER LAUNCH FROM REST)



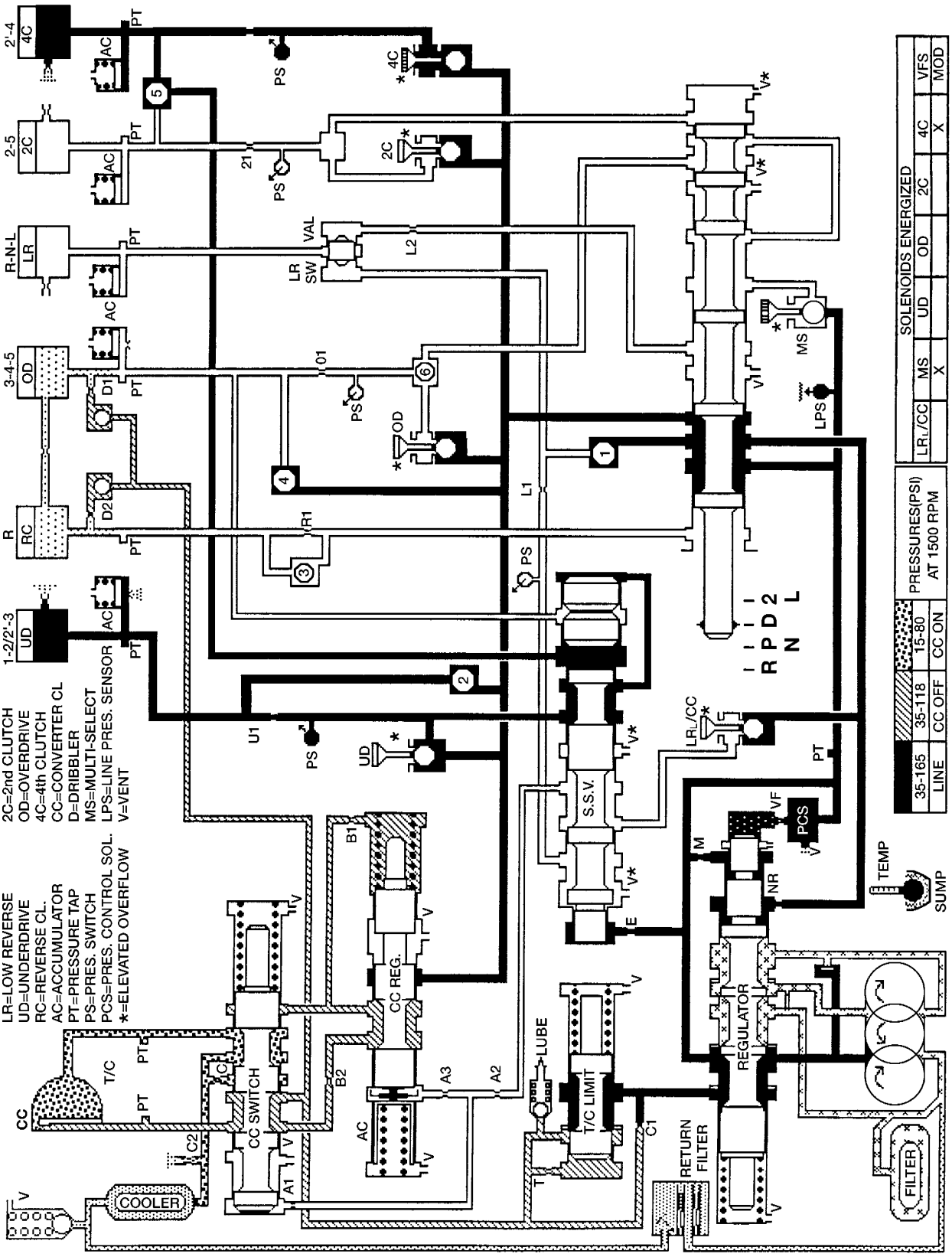
HYDRAULIC FLOW IN FIRST GEAR (FROM K/D)



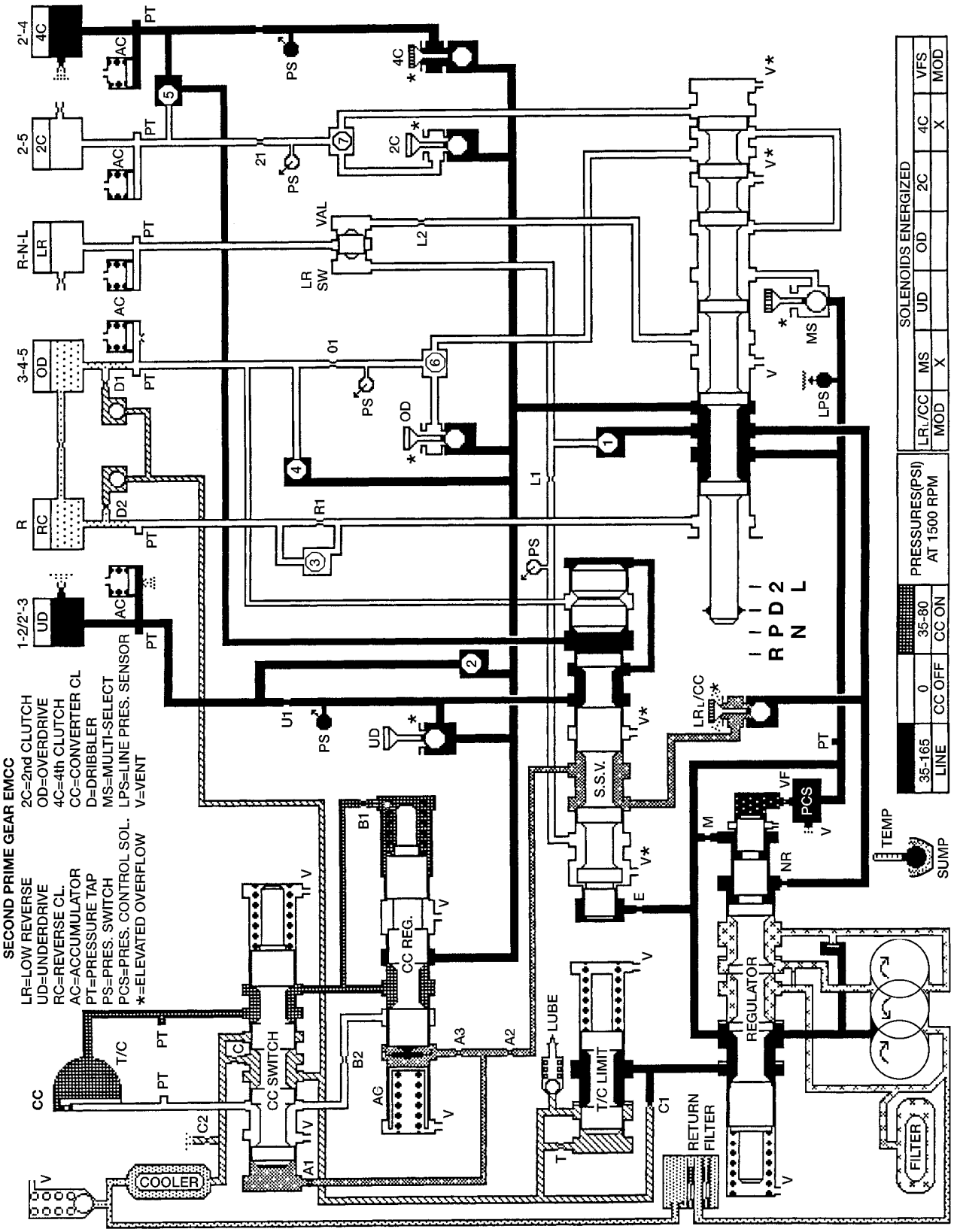
HYDRAULIC FLOW IN SECOND GEAR



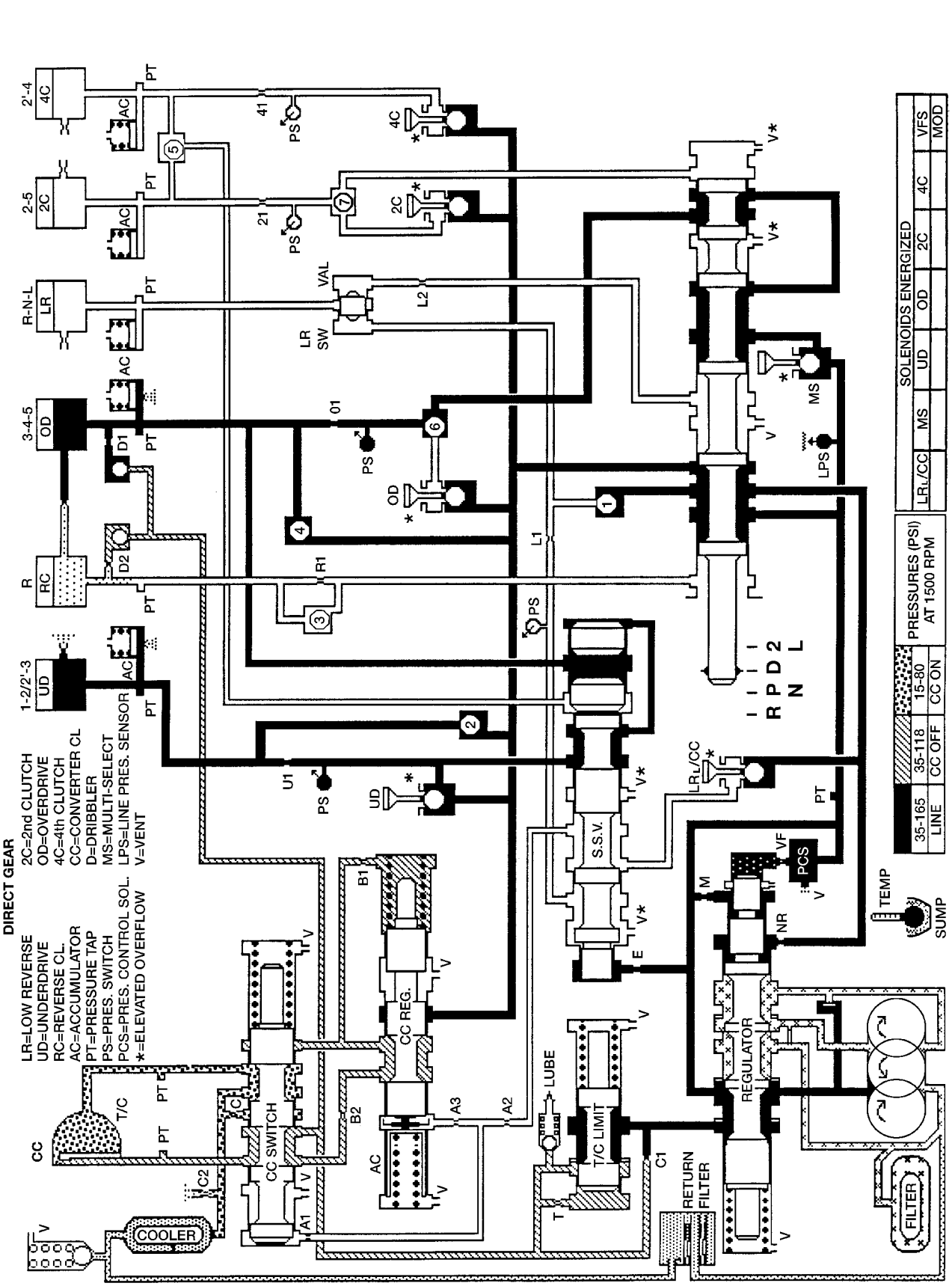
HYDRAULIC FLOW IN SECOND GEAR EMCC



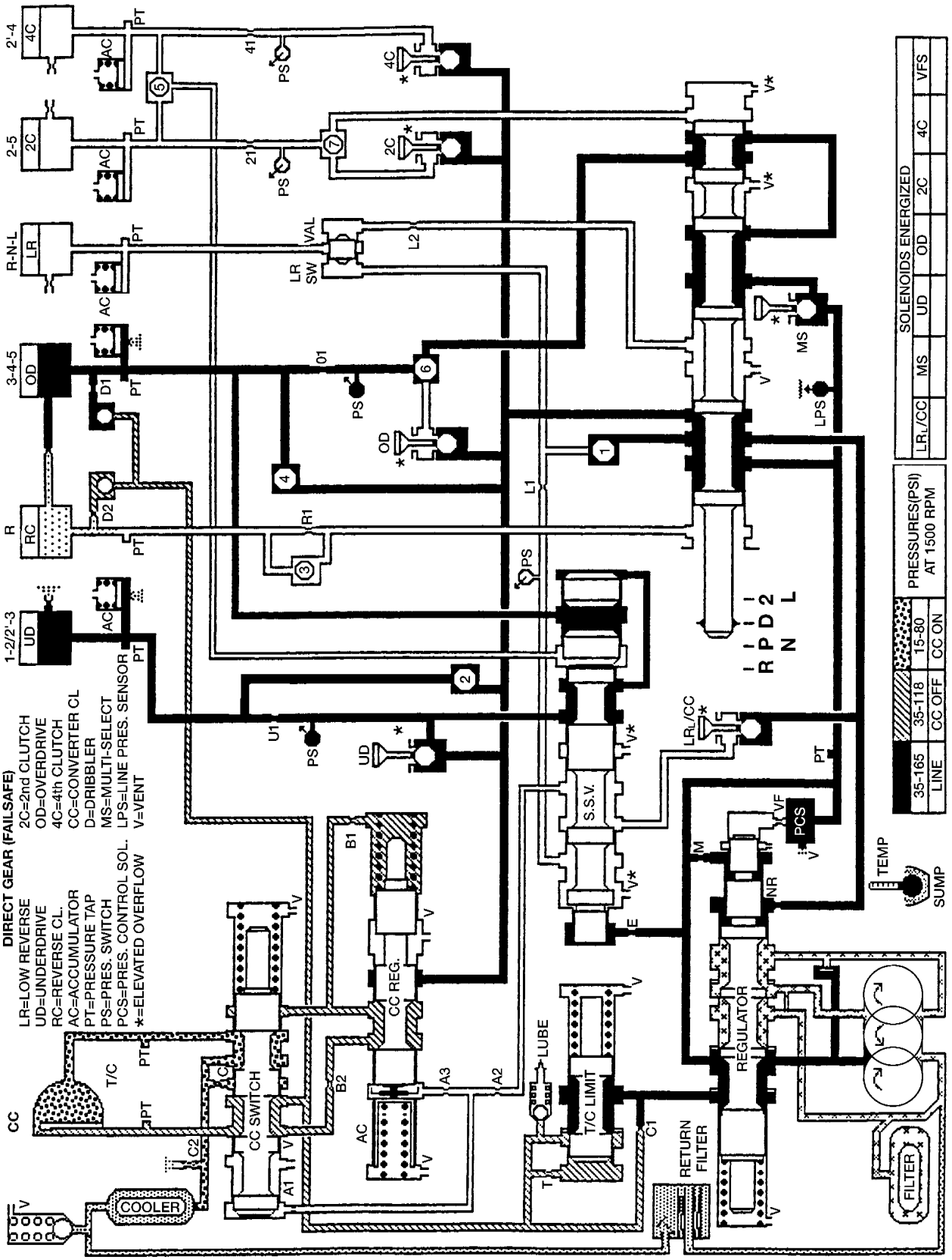
HYDRAULIC FLOW IN SECOND PRIME GEAR



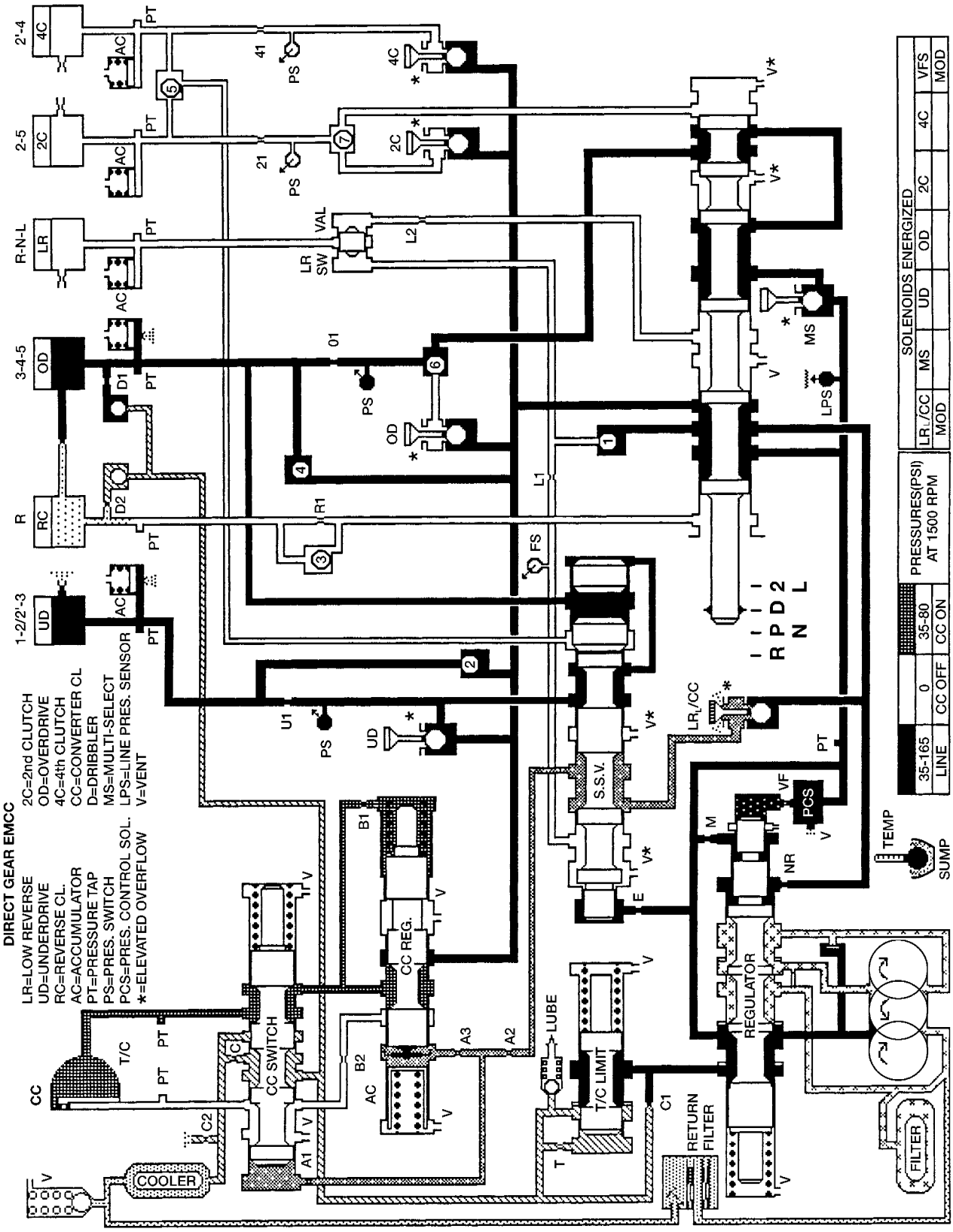
HYDRAULIC FLOW IN SECOND PRIME GEAR EMCC



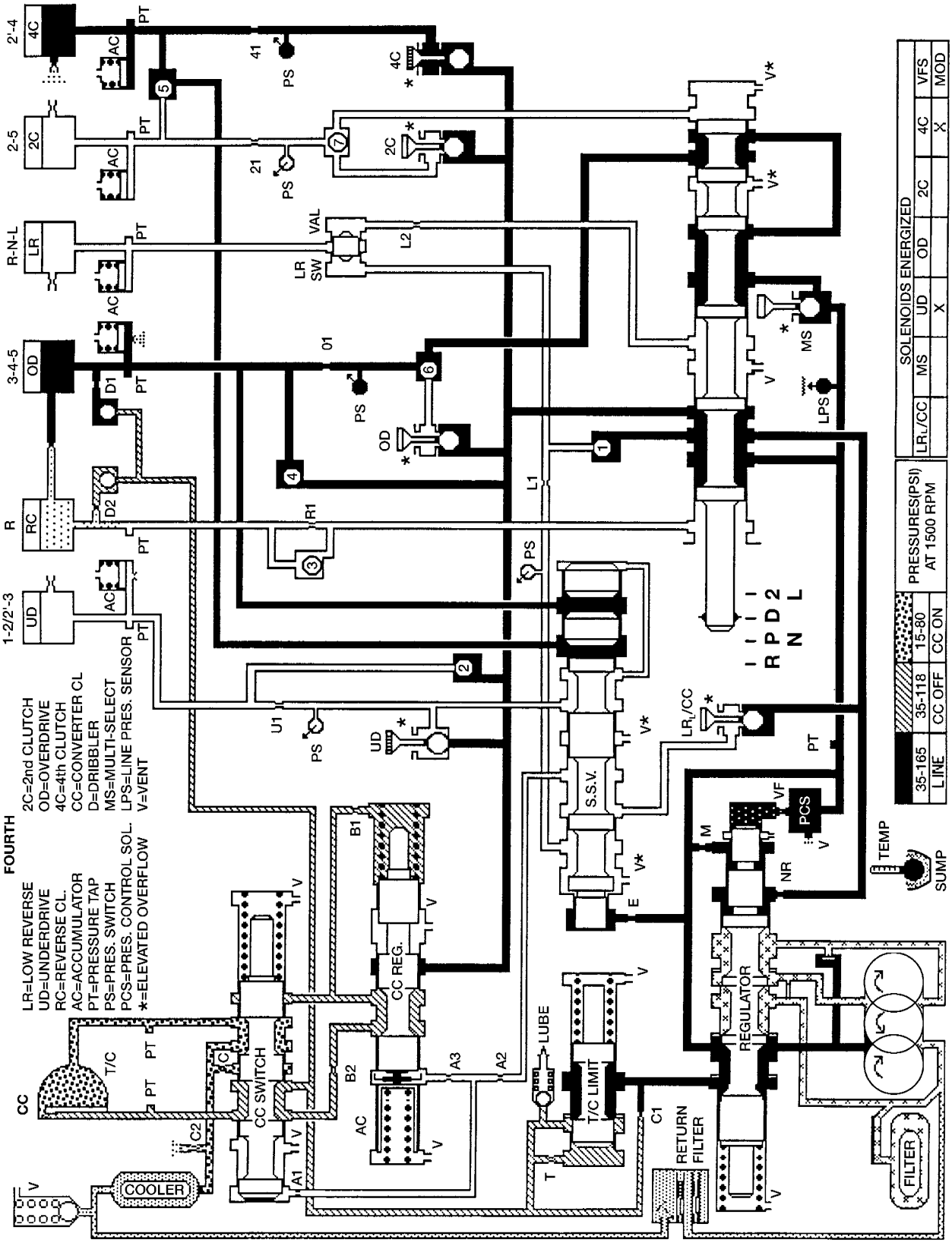
HYDRAULIC FLOW IN DIRECT GEAR



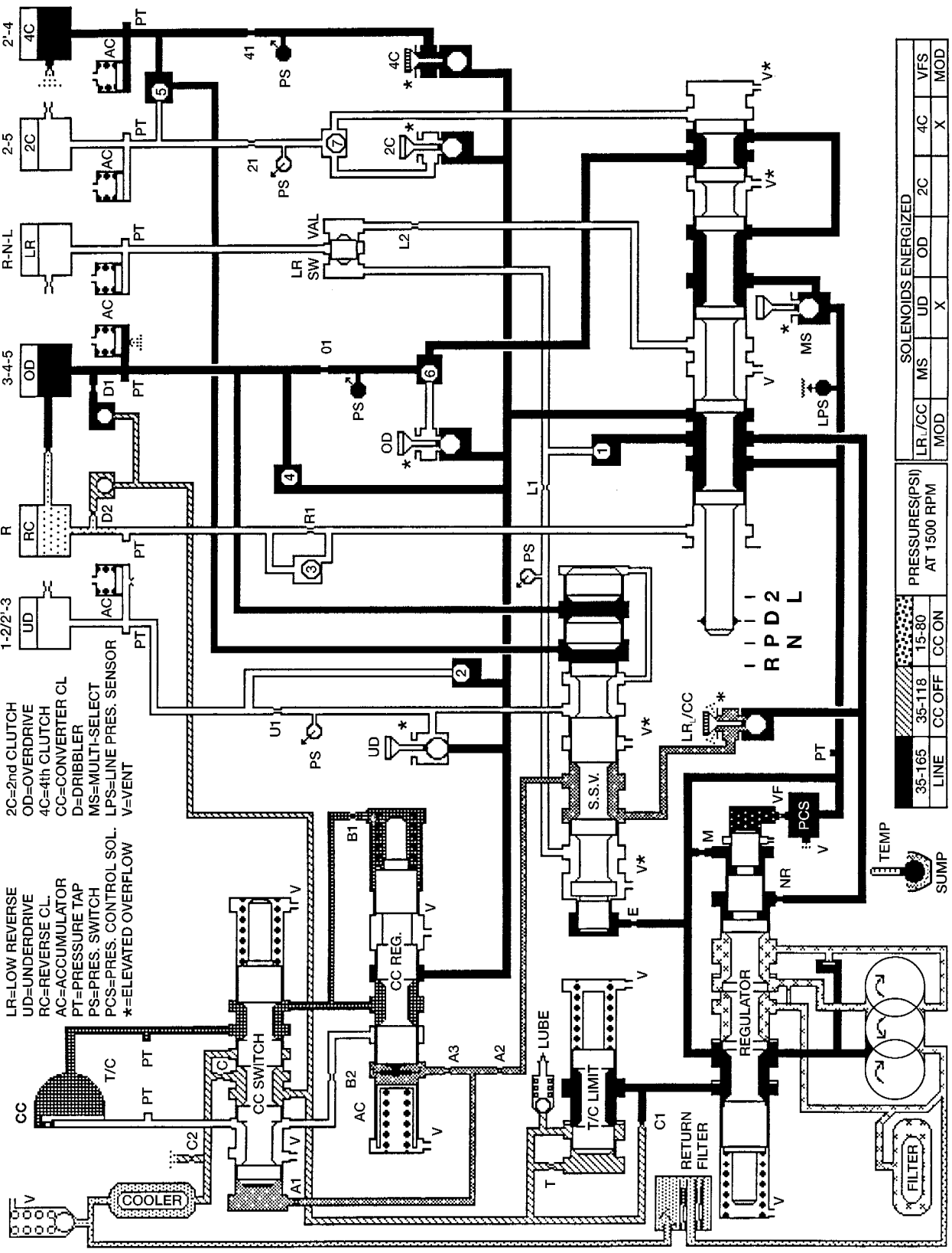
HYDRAULIC FLOW IN DIRECT GEAR (FAILSAFE)



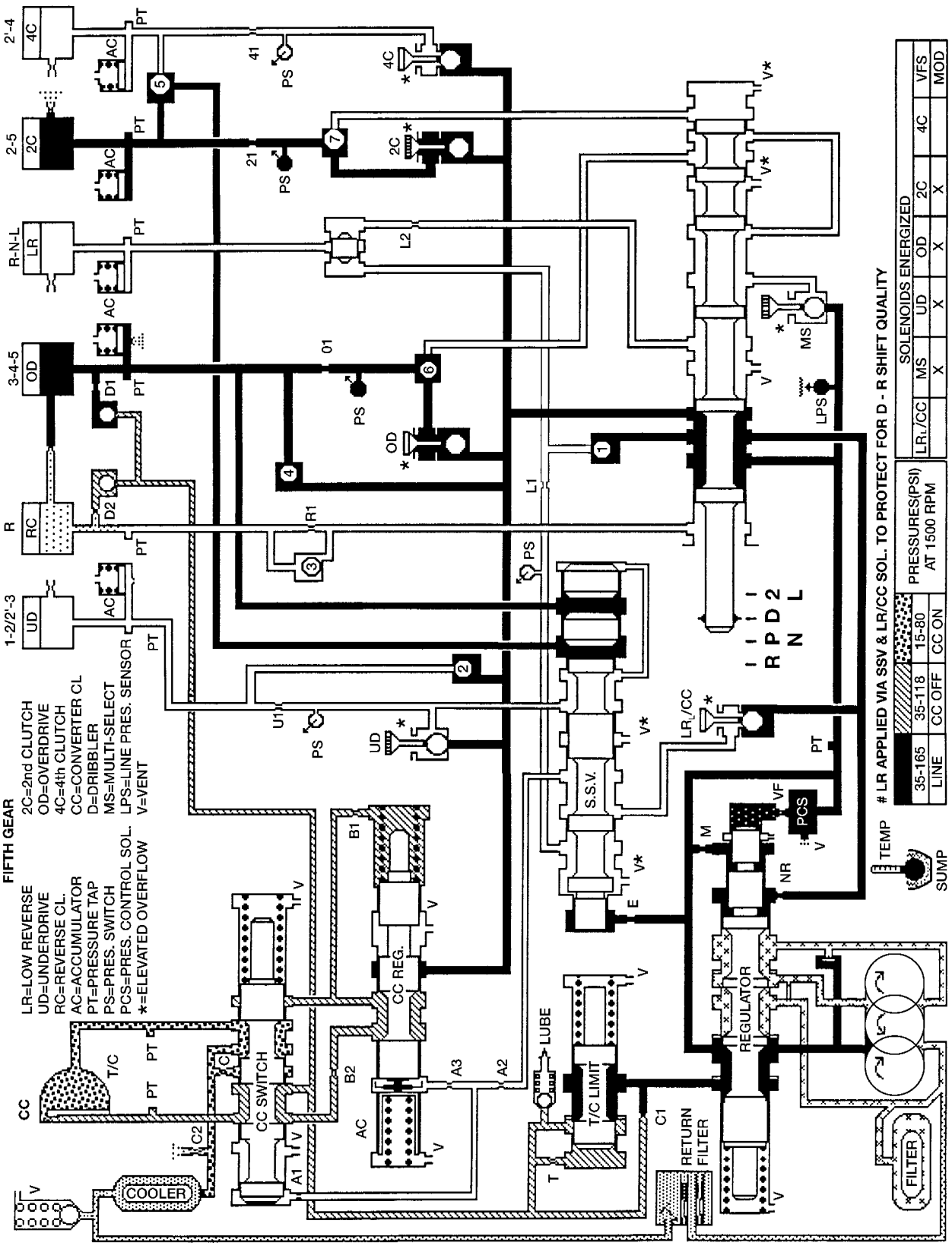
HYDRAULIC FLOW IN DIRECT GEAR EMCC



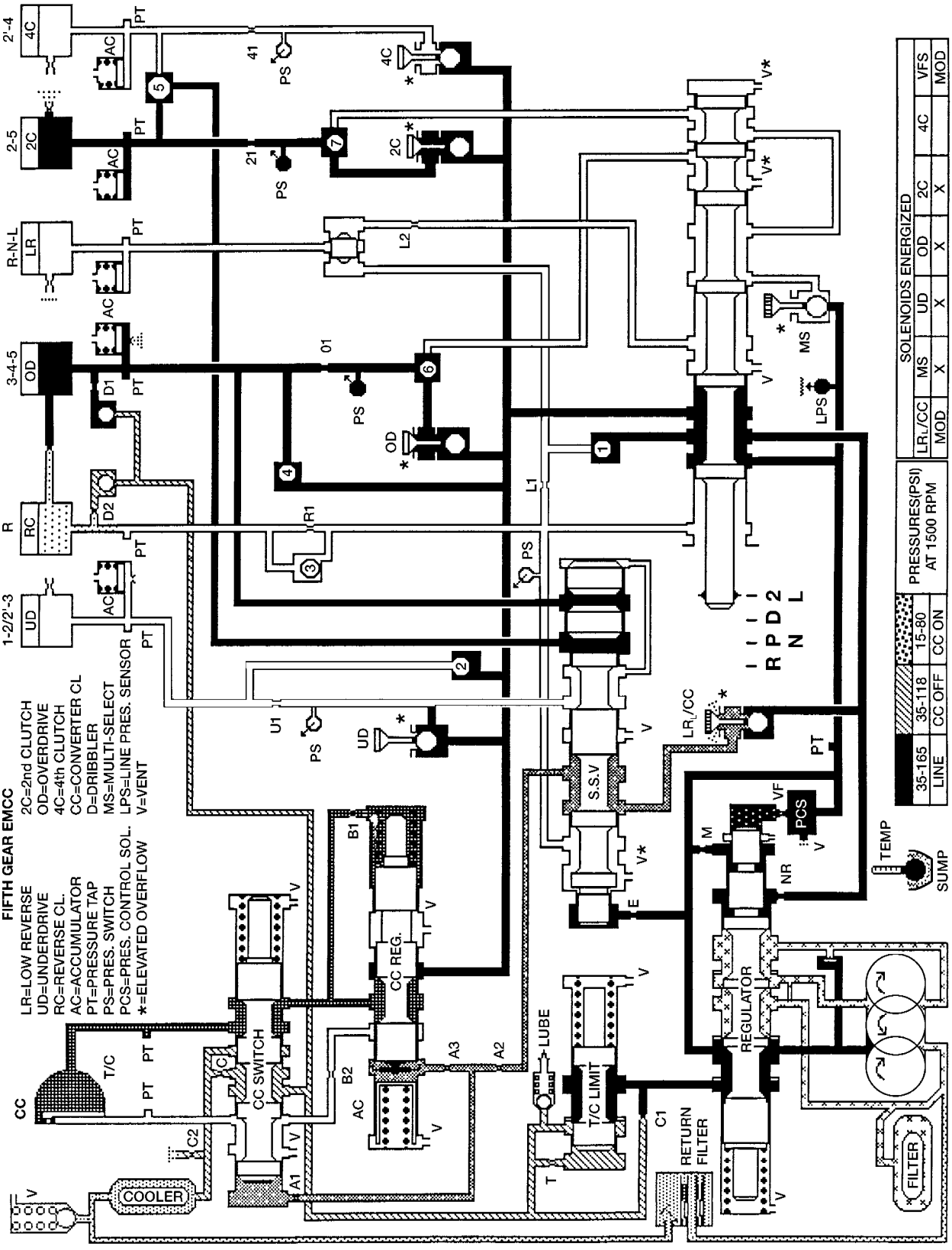
HYDRAULIC FLOW IN FOURTH

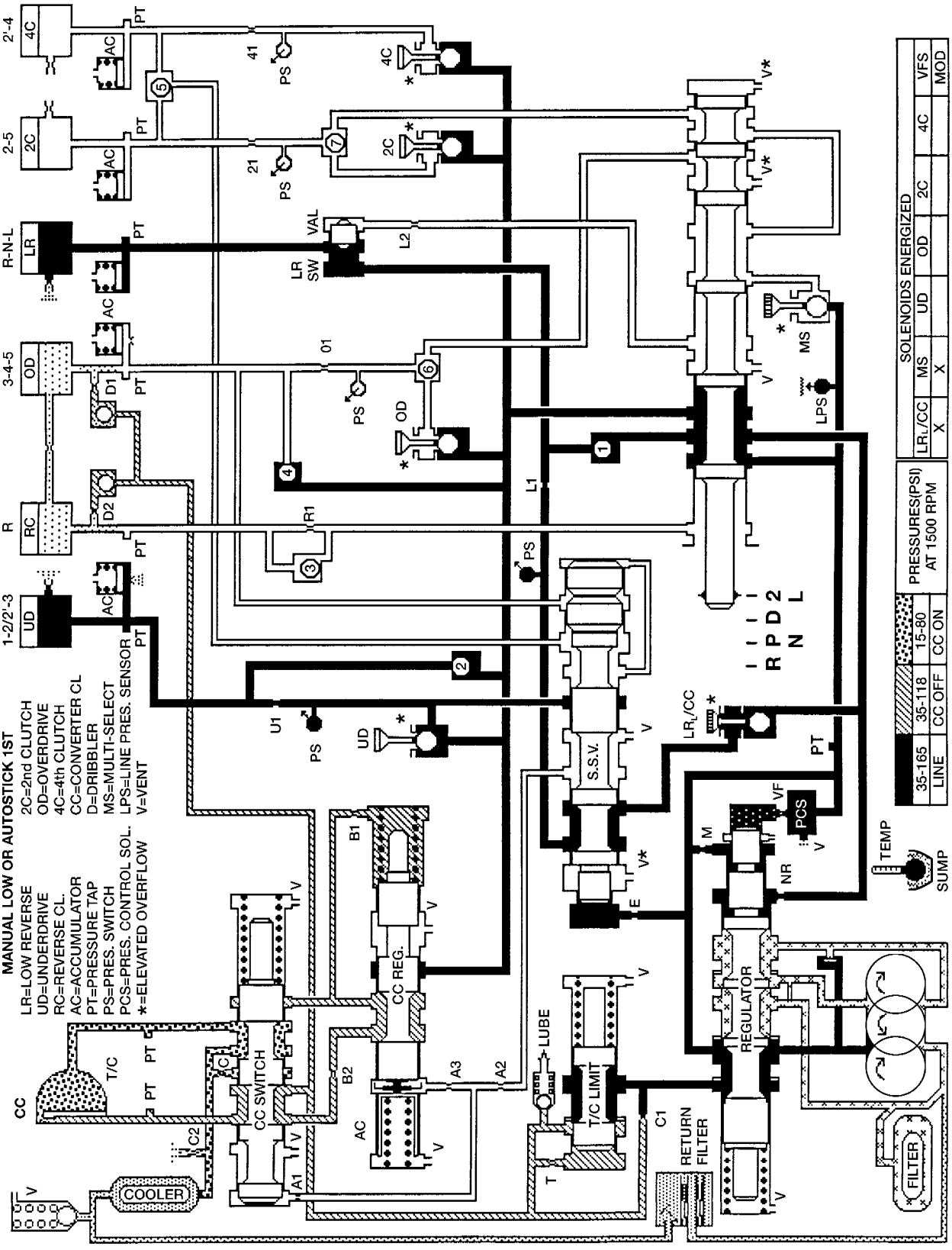


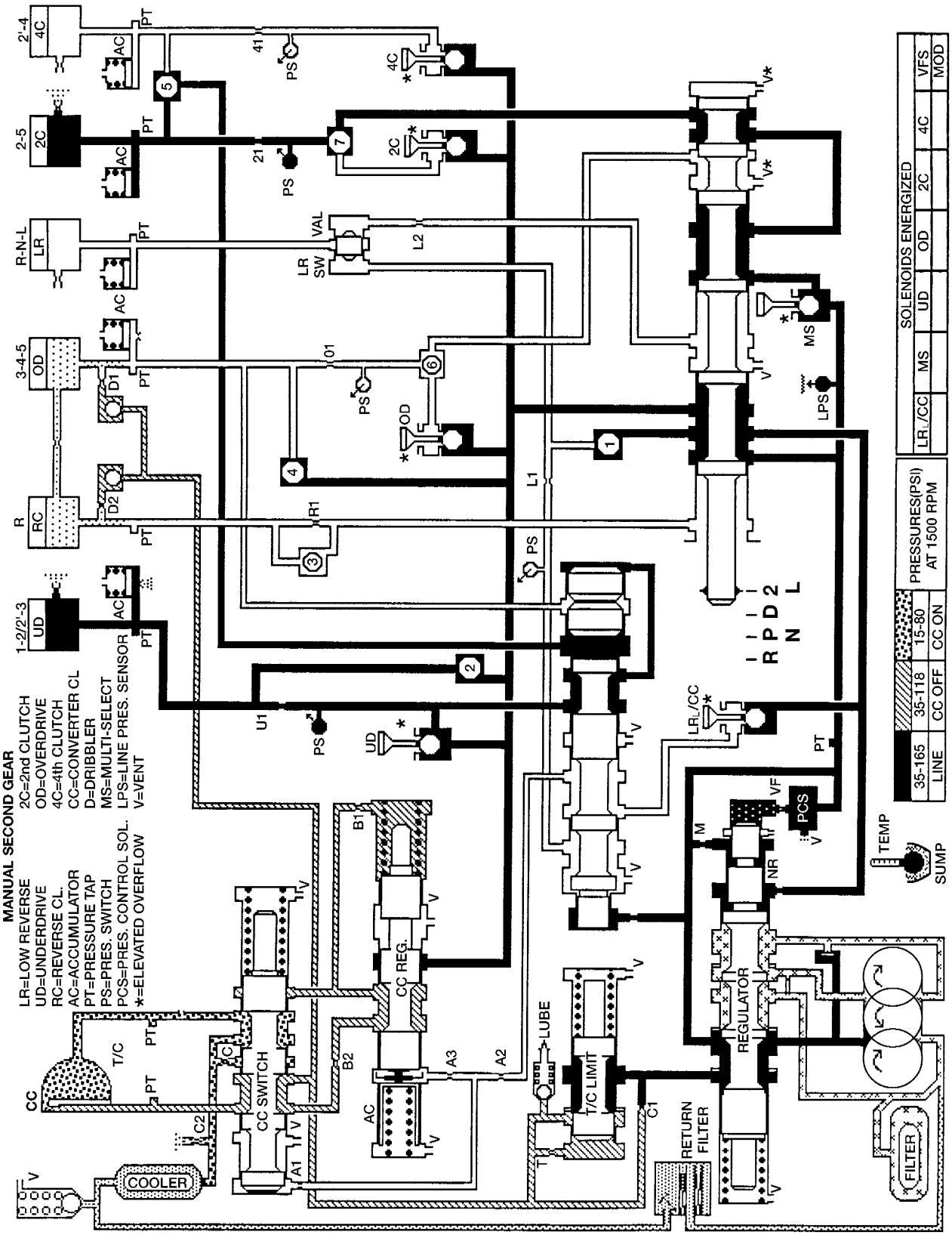
HYDRAULIC FLOW IN FOURTH EMCC



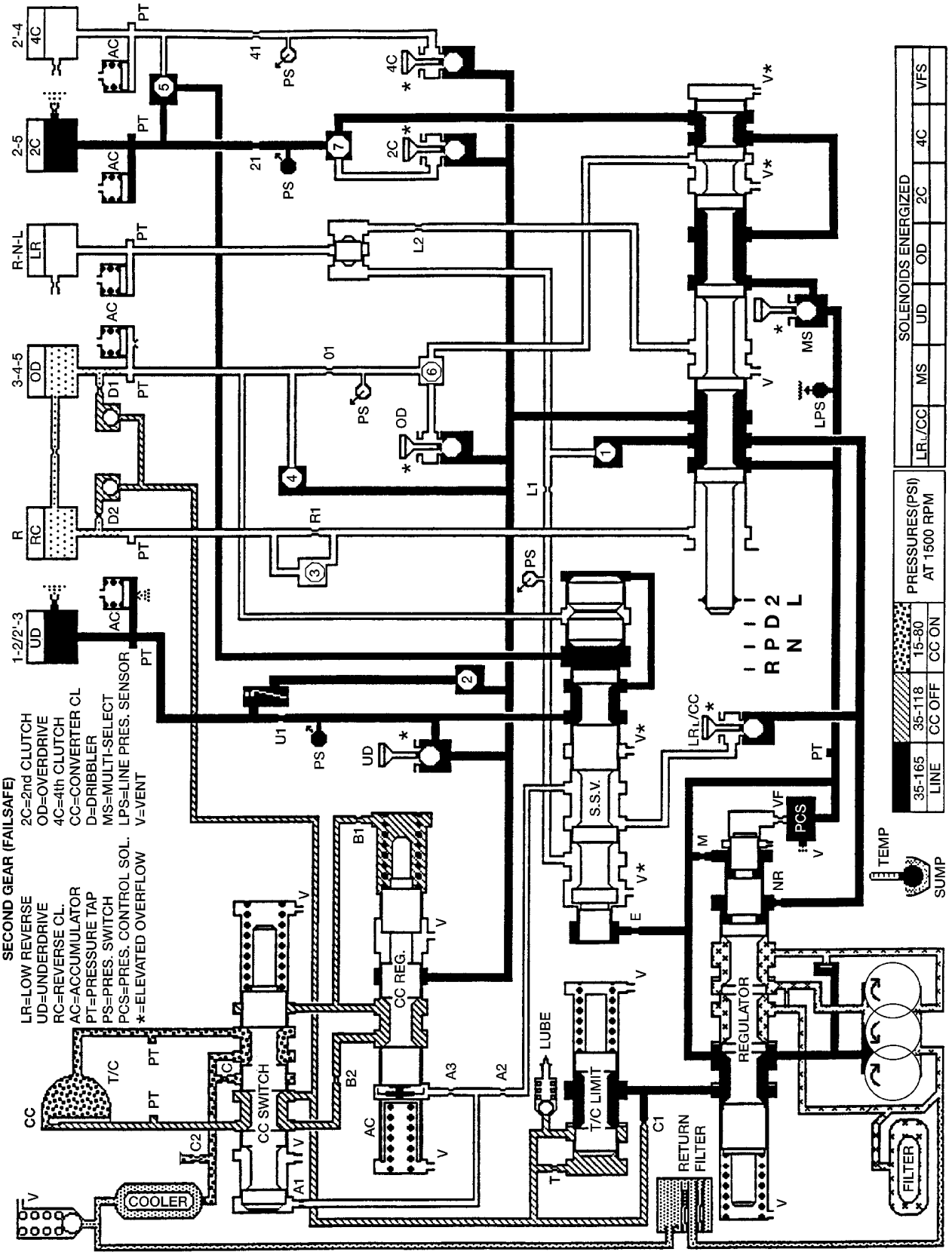
HYDRAULIC FLOW IN FIFTH


80a0e555
FIFTH GEAR EMCC
LR=LOW REVERSE
UD=UNDERDRIVE
RC=REVERSE CL.
AC=ACCUMULATOR
PT=PRESSURE TAP
PS=PRES. SWITCH
PCS=PRES. CONTROL SOL.
*=ELEVATED OVERFLOW
2C=2nd CLUTCH
OD=OVERDRIVE
4C=4th CLUTCH
CC=CONVERTER CL
D=DRIBBLER
MS=MULTI-SELECT
LPS=LINE PRES. SENSOR
V=VENT
PRESSURES(PSI) AT 1500 RPM
35-165 LINE
35-118 CC OFF
15-80 CC ON
SOLENOIDS ENERGIZED
LR/CC MOD
MS X
UD X X
OD X X
2C X
4C
VFS MOD
HYDRAULIC FLOW IN FIFTH EMCC


80a0e3c7
MANUAL LOW OR AUTOSTICK 1ST
LR=LOW REVERSE
UD=UNDERDRIVE
RC=REVERSE CL.
AC=ACCUMULATOR
PT=PRESSURE TAP
PS=PRES. SWITCH
PCS=PRES. CONTROL SOL.
*=ELEVATED OVERFLOW
2C=2nd CLUTCH
OD=OVERDRIVE
4C=4th CLUTCH
CC=CONVERTER CL
D=DRIBBLER
MS=MULTI-SELECT
LPS=LINE PRES. SENSOR
V=VENT
PRESSURES(PSI) AT 1500 RPM
35-165 LINE
35-118 CC OFF
15-80 CC ON
SOLENOIDS ENERGIZED
LR/CC
MS
UD
OD
2C
4C
VFS
MOD
HYDRAULIC FLOW IN MANUAL LOW OR AUTOSTICK 1ST



HYDRAULIC FLOW IN MANUAL SECOND



HYDRAULIC FLOW IN MANUAL SECOND (FAILSAFE)

SPECIFICATIONS

TRANSMISSION

GENERAL

Component	Metric	Inch
Output Shaft End Play	0.22-0.55 mm	0.009-0.021 in.
Input Shaft End Play	0.46-0.89 mm	0.018-0.035 in.
2C Clutch Pack Clearance	0.455-1.335 mm	0.018-0.053 in.
4C Clutch Pack Clearance	0.770-1.390 mm	0.030-0.055 in.
L/R Clutch Pack Clearance	1.00-1.74 mm	0.039-0.069 in.
OD Clutch Pack Clearance	1.103-1.856 mm	0.043-0.073 in.
UD Clutch Pack Clearance	0.84-1.54 mm	0.033-0.061 in.
Reverse Clutch Pack Clearance	0.81-1.24 mm	0.032-0.049 in.
Recommended fluid	Mopar® ATF +4	

GEAR RATIOS

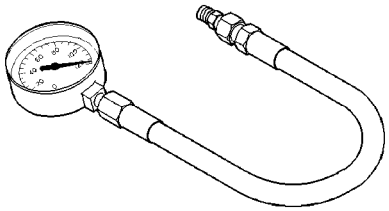
1ST	3.00:1
2ND	1.67:1
2ND Prime	1.50:1
3RD	1.0:1
4TH	0.75:1
5TH	0.67:1
REVERSE	3.00:1

TORQUE SPECIFICATIONS

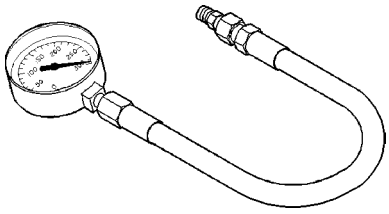
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fitting, cooler line at trans	17.5	-	155
Bolt, torque convertor	31	23	-
Bolt/nut, crossmember	68	50	-
Bolt, driveplate to crankshaft	75	55	-
Bolt, oil pan	11.8	-	105
Screw, primary fluid filter	4.5	-	40
Bolt, oil pump	28.2	-	250
Bolt, oil pump body to cover	4.5	-	40
Screw, plate to oil pump body	4.5	-	40
Bolt, valve body to case	11.8	-	105
Plug, pressure test port	5.1	-	45
Bolt, reaction shaft support	11.8	-	105
Screw, valve body to transfer plate	5.6	-	50
Screw, solenoid module to transfer plate	5.7	-	50
Screw, accumulator cover	7	-	60
Screw, detent spring	4.5	-	40
Bolt, input speed sensor	11.8	-	105
Bolt, output speed sensor	11.8	-	105
Bolt, line pressure sensor	11.8	-	105
Bolt, extension housing	54	40	-
Valve, cooler return filter bypass	4.5	-	40
Screw, manual valve cam retaining	4.5	-	40
Bolt, manual lever	28.2	-	250

SPECIAL TOOLS

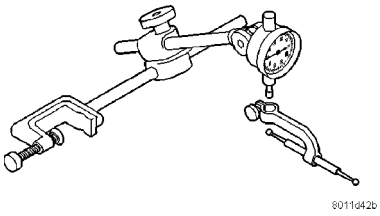
AUTOMATIC TRANSMISSION - RFE



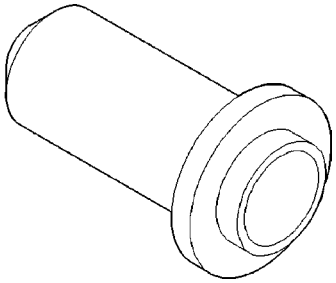
Gauge, Oil Pressure - C-3292



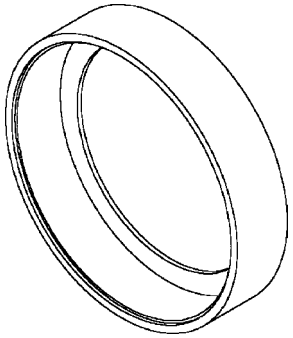
Gauge, Oil Pressure - C-3293SP



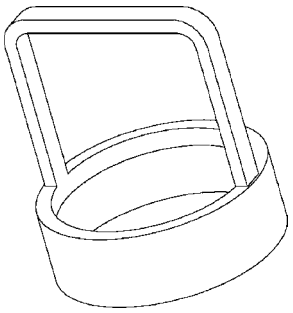
Dial Indicator - C-3339



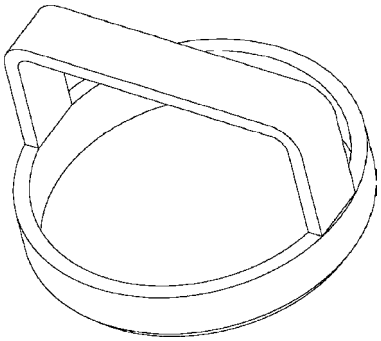
Installer, Seal - C-3860-A



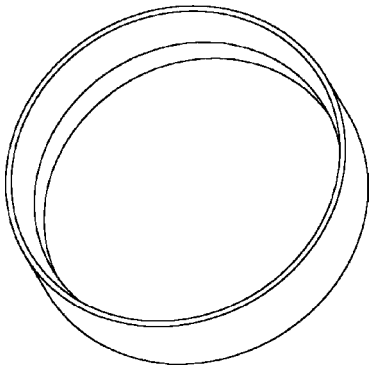
Compressor, Spring - 8249



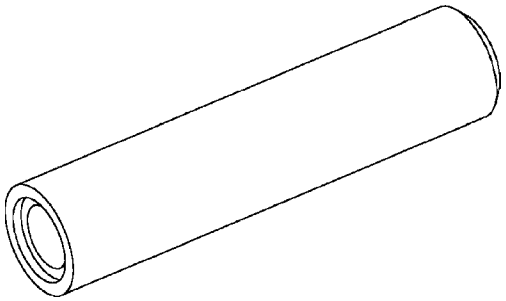
Compressor, Spring - 8250



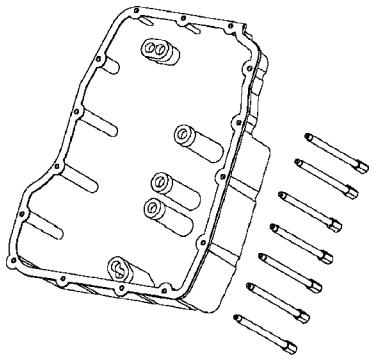
Compressor, Spring - 8251



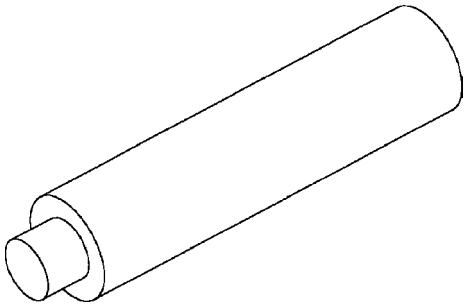
Installer, Piston - 8252



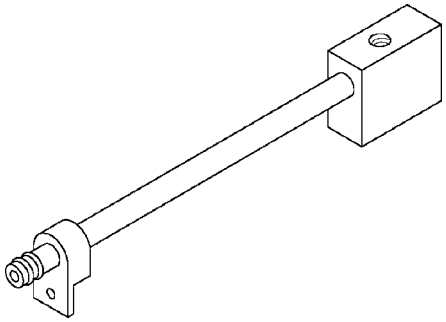
Installer, Seal - 8253



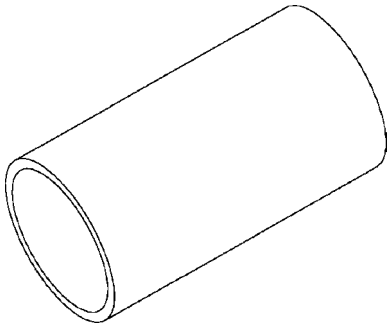
Adapter, Pressure Tap - 8258-A



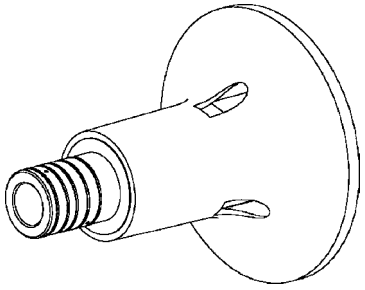
Installer, Seal - 8254



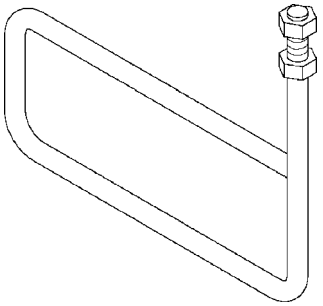
Adapter, Line Pressure - 8259



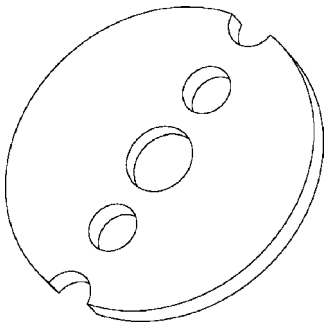
Installer, Snap-ring - 8255



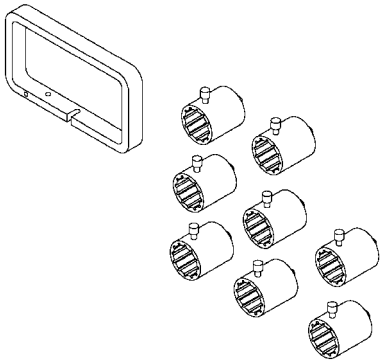
Fixture, Input Clutch Pressure - 8260



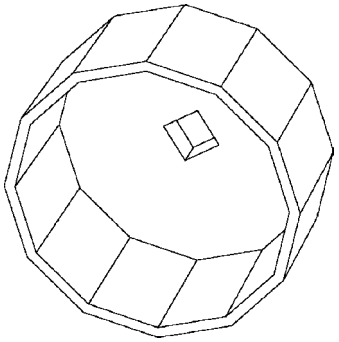
Stand, Support - 8257



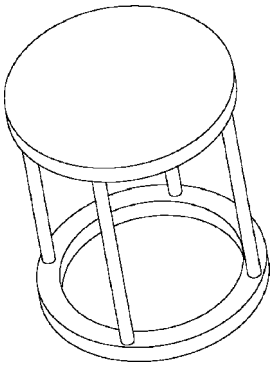
Plate, Alignment - 8261



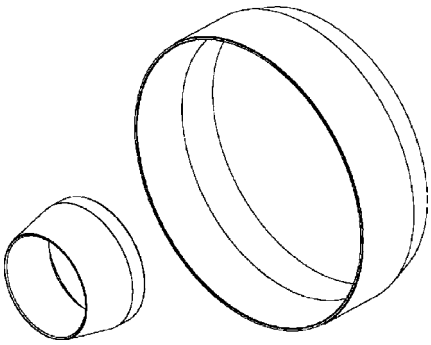
End Play Set - 8266



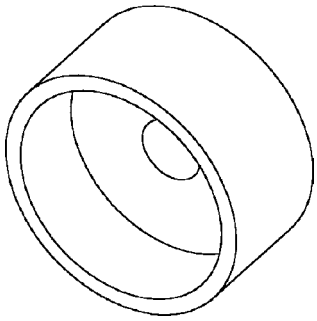
Wrench, Filter - 8321



Compressor, Spring - 8285



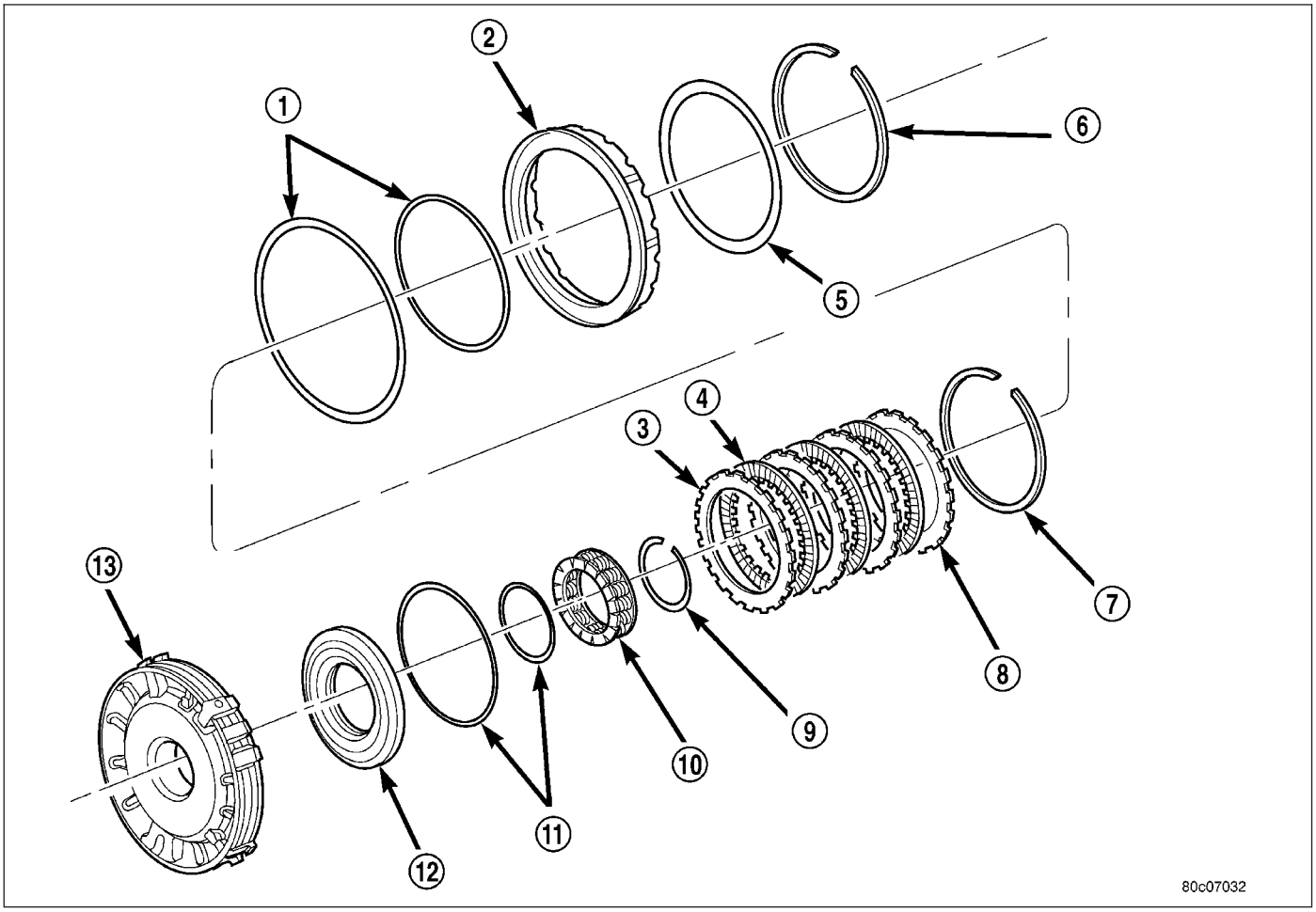
Installer, Piston - 8504



Installer, Bearing - 8320

RETAINER/BULKHEAD-4C

DISASSEMBLY

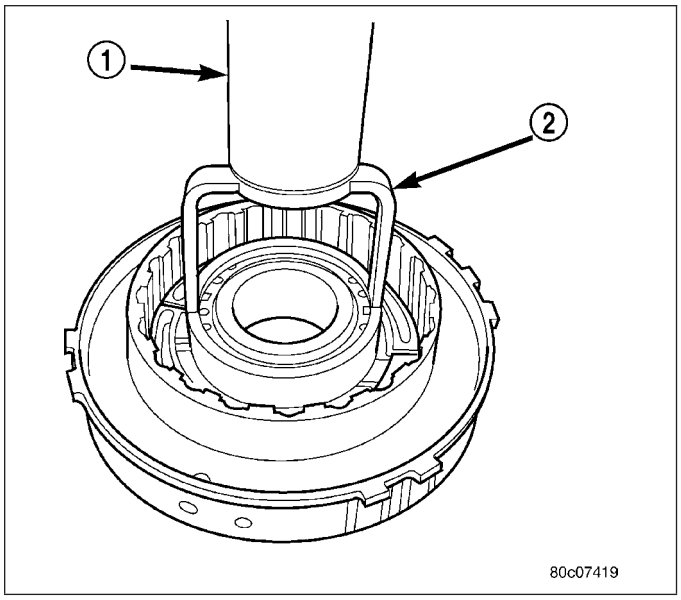


4C Retainer/Bulkhead Components

1 - SEAL
2 - 2C PISTON
3 - PLATE
4 - DISC
5 - 2C BELLEVILLE SPRING
6 - SNAP-RING
7 - SNAP-RING (SELECT)
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

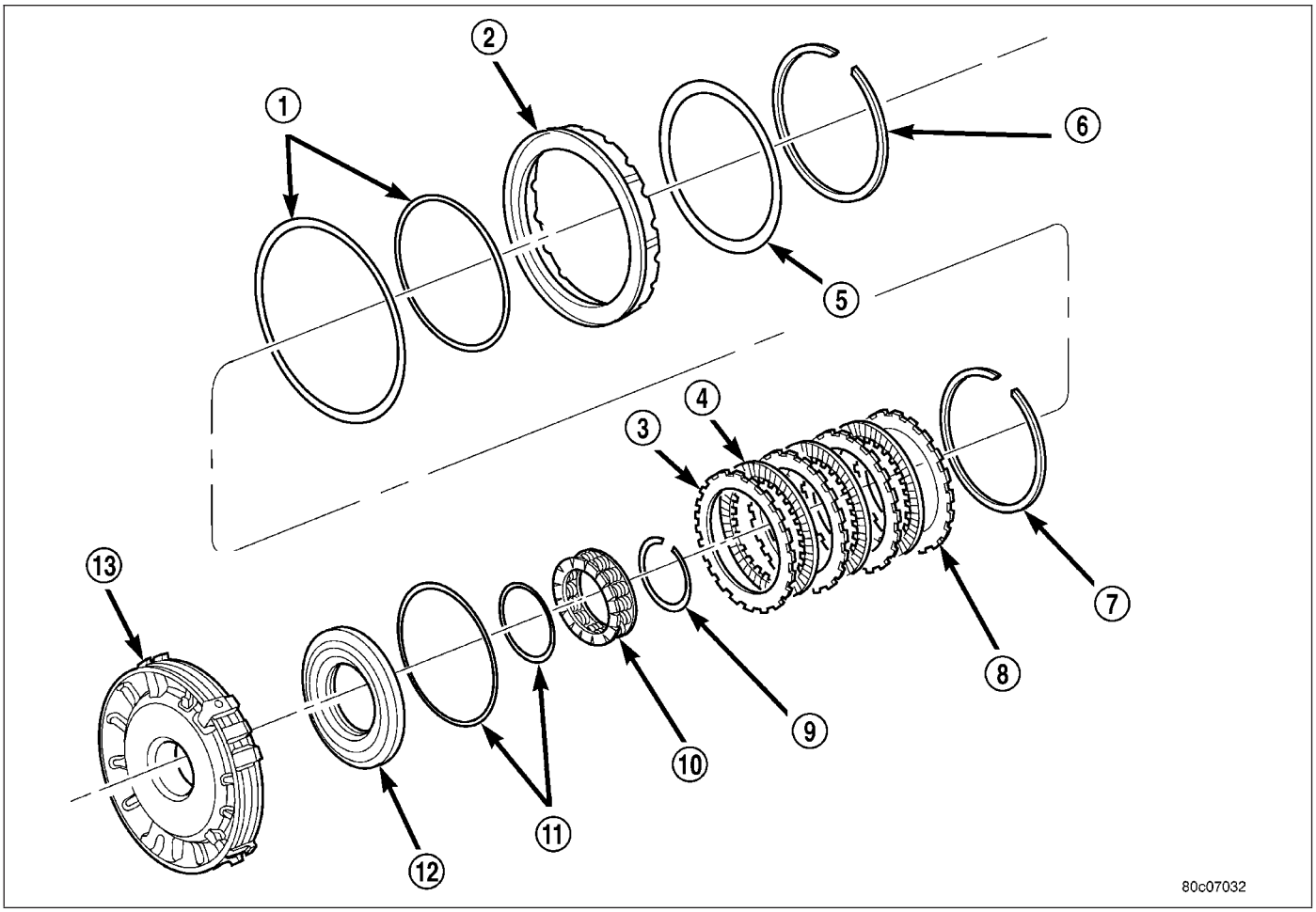
1. Remove the 2C piston Belleville spring snap-ring (6) from the 4C retainer /bulkhead (13).
2. Remove the 2C piston Belleville spring (5) from the retainer/bulkhead (13).
3. Remove the 2C piston (2) from the retainer/bulkhead (13). Use 20 psi of air pressure to remove the piston if necessary.
4. Remove the 4C clutch snap-ring (7) from the retainer/bulkhead (13).
5. Remove the 4C clutch pack (3, 4, 8) from the retainer/bulkhead (13).

6. Using Spring Compressor 8250 (2) and a suitable shop press (1), compress the 4C piston return spring (10) and remove the snap-ring (9).
7. Remove the 4C piston return spring (10) and piston (12) from the retainer/bulkhead (13). Use 20 psi of air pressure to remove the piston if necessary.



ASSEMBLY

NOTE: Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.

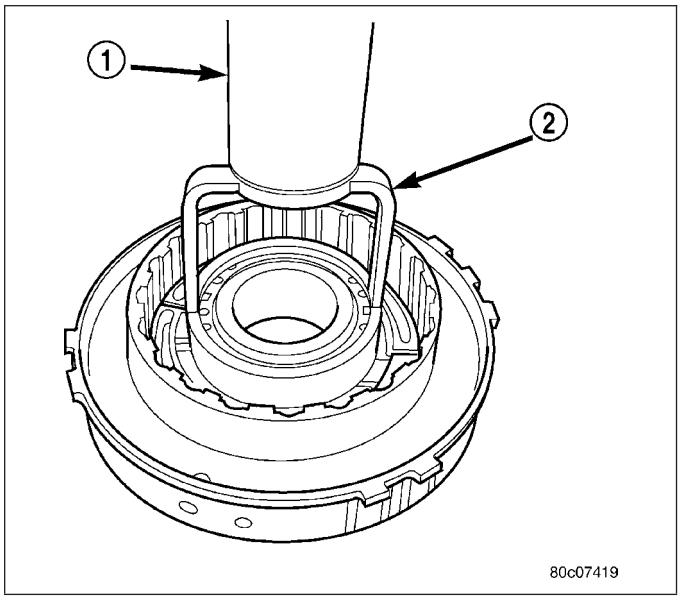


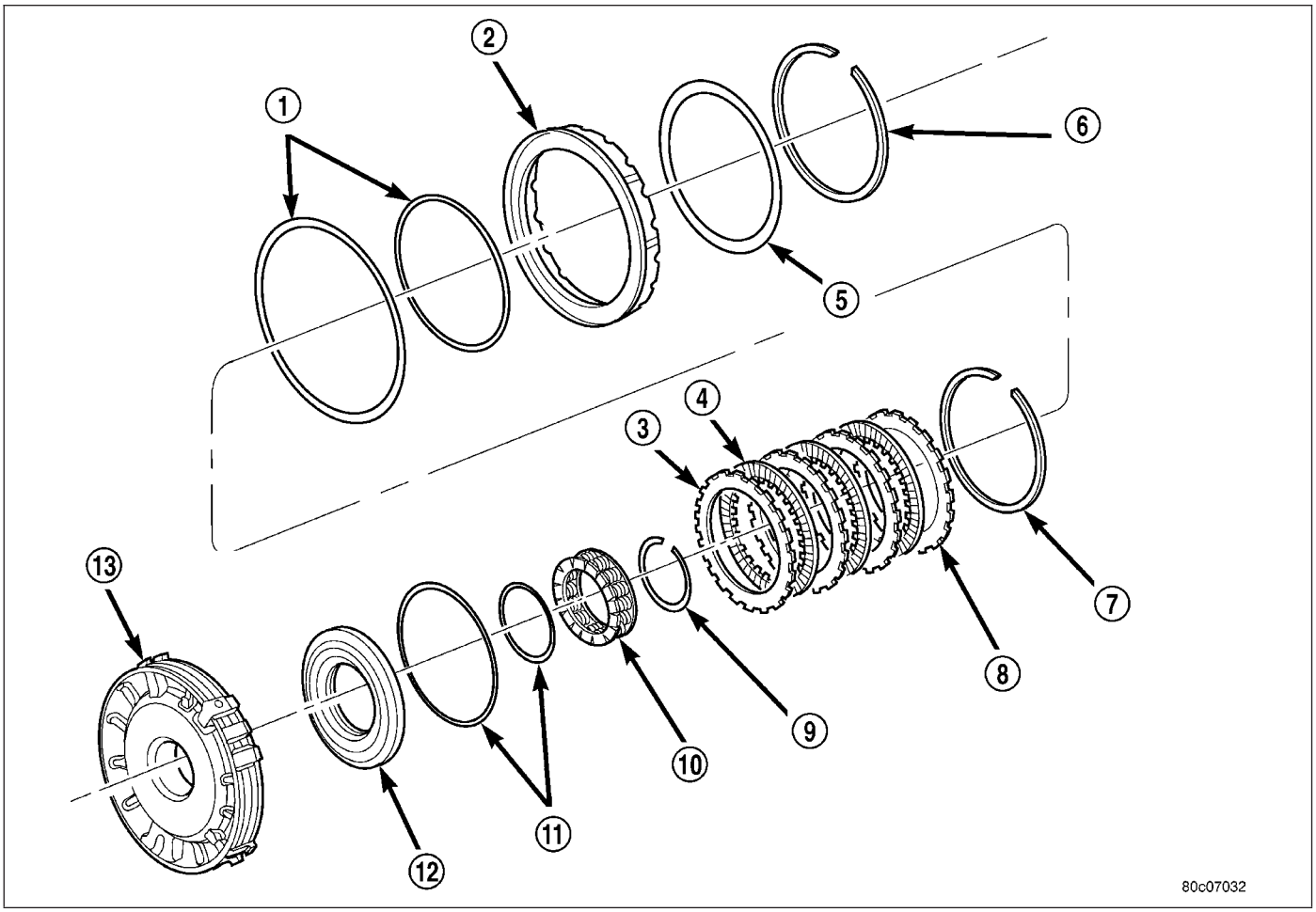
4C Retainer/Bulkhead Components

1 - SEAL
2 - 2C PISTON
3 - PLATE
4 - DISC
5 - 2C BELLEVILLE SPRING
6 - SNAP-RING
7 - SNAP-RING (SELECT)
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

1. Install new seals (1, 11) on the 2C and 4C pistons or in the piston retainers.
2. Lubricate all seals with Mopar® ATF +4 prior to installation.
3. Install the 4C piston (12) into the 4C retainer/bulkhead (13).
4. Position the 4C piston return spring (10) onto the 4C piston (12).

5. Using Spring Compressor 8250 (2) and a suitable shop press (1), compress the 4C piston return spring and install the snap-ring.



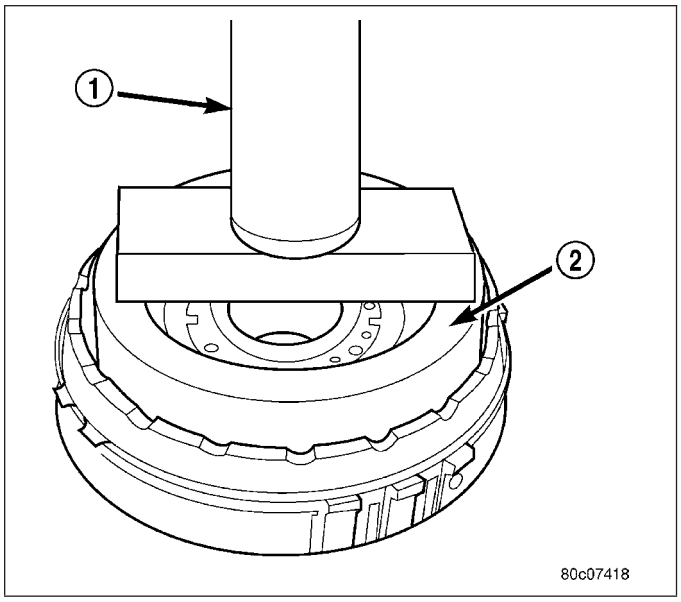


4C Retainer/Bulkhead Components

1 - SEAL
2 - 2C PISTON
3 - PLATE
4 - DISC
5 - 2C BELLEVILLE SPRING
6 - SNAP-RING
7 - SNAP-RING (SELECT)
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

6. Assemble and install the 4C clutch pack (3, 4) into the retainer/bulkhead (13) with the steel separator plate against the piston.
7. Install the 4C reaction plate (8) and snap-ring (7) into the retainer/bulkhead (13). The 4C reaction plate is non-directional.
8. Measure the 4C clutch clearance. The correct clutch clearance is 0.77-1.39 mm (0.030-0.055 in.). The snap-ring (7) is selectable. Install the chosen snap-ring and re-measure to verify the selection.
9. Install the 2C piston (2) into the retainer/bulkhead (13).
10. Position the 2C Belleville spring (5) onto the 2C piston (2).
11. Position the 2C Belleville spring snap-ring (6) onto the 2C Belleville spring (5).

12. Using Spring Compressor 8249 (2) and a suitable shop press (1), compress the Belleville spring (5) until the snap-ring (6) is engaged with the snap-ring groove in the retainer/bulkhead.



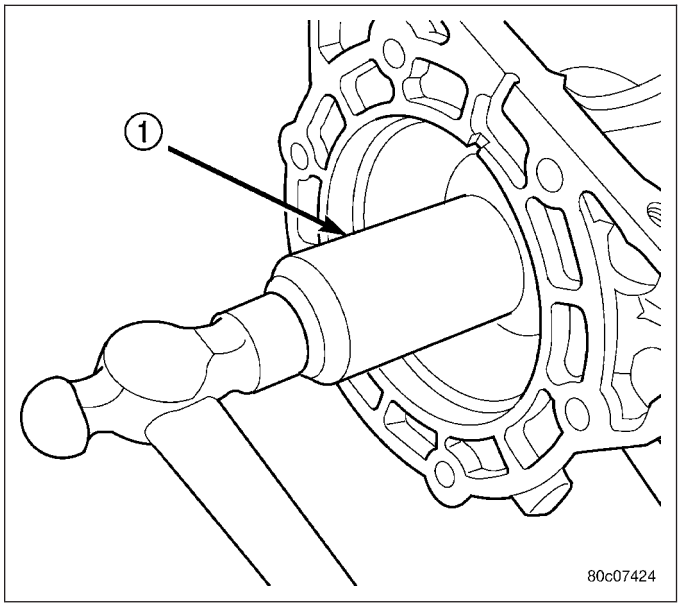
SEAL-ADAPTER HOUSING

REMOVAL

1. Remove the transfer case from the transmission.
2. Using a screw mounted on a slide hammer, remove the adapter housing seal.

INSTALLATION

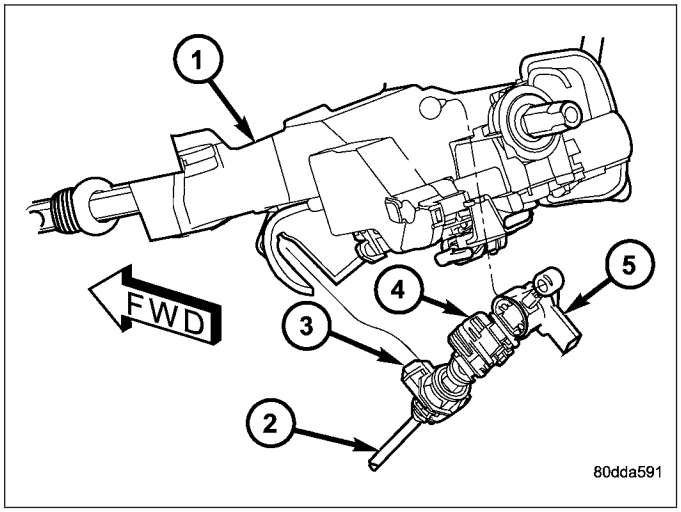
1. Clean the adapter seal bore in the adapter housing of any residue or particles remaining from the original seal.
2. Install new oil seal in the adapter housing using Seal Installer C-3860-A (1). A properly installed seal is flush to the face of the seal bore.
3. Install the transfer case onto the transmission.



SYSTEM-BRAKE TRANSMISSION SHIFT INTERLOCK

DESCRIPTION

The Brake Transmission Shifter Interlock (BTSI), is a solenoid operated system. It consists of a solenoid permanently mounted on the gearshift cable.



OPERATION

The system locks the shifter into the PARK position. The interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed approximately one-half an inch. A magnetic holding device in line with the park lock cable is energized when the ignition is in the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position, unless the shifter is fully locked into the PARK position.

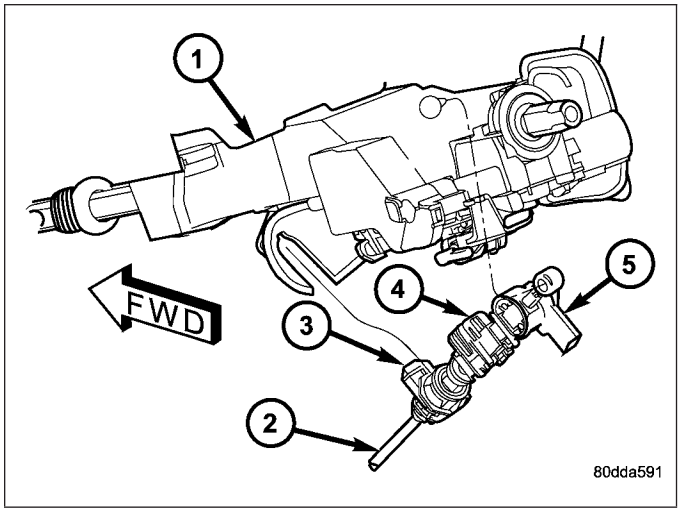
DIAGNOSIS AND TESTING - BRAKE TRANSMISSION SHIFT INTERLOCK

1. Verify that the key can only be removed in the PARK position.
2. When the shift lever is in PARK And the shift handle pushbutton is in the “OUT” position, the ignition key cylinder should rotate freely from OFF to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.
3. Shifting out of PARK should not be possible when the ignition key cylinder is in the OFF position.
4. Shifting out of PARK should not be possible while applying normal pushbutton force and ignition key cylinder is in the RUN or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).
5. Shifting out of PARK should not be possible when the ignition key cylinder is in the ACCESSORY or LOCK positions.
6. Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in RUN or START positions.

ADJUSTMENTS - BRAKE TRANSMISSION SHIFT INTERLOCK

Correct cable adjustment is important to proper interlock operation. The gearshift cable must be correctly adjusted in order to shift out of PARK.

ADJUSTMENT PROCEDURE



1. Remove the steering column trim as necessary for access to the brake transmission shift interlock.
2. Shift the transmission into the PARK position.
3. Pull upward on both the BTSI lock tab (4) and the gearshift cable lock tab (3).
4. Verify that the shift lever is in the PARK position.
5. Verify positive engagement of the transmission park lock by attempting to rotate the propeller shaft. The shaft will not rotate when the park lock is engaged.
6. Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**
7. Ensure that the cable is free to self-adjust by pushing cable rearward and releasing.
8. Push the gearshift cable lock tab (3) down until it snaps in place.
9. Locate the BTSI alignment hole in the bottom of the BTSI mechanism between the BTSI lock tab and the BTSI connector.
10. Move the BTSI assembly up or down on the gearshift cable until an appropriate size drill bit can be inserted into the alignment hole and through the assembly.
11. Push the BTSI lock tab (4) down until it snaps into place and remove the drill bit.
12. Install any steering column trim previously removed.

BTSI FUNCTION CHECK

1. Verify removal of ignition key allowed in PARK position only.
2. When the shift lever is in PARK, the ignition key cylinder should rotate freely from off to lock. When the shifter is in any other position, the ignition key should not rotate from off to lock.
3. Shifting out of PARK should be possible when the ignition key cylinder is in the off position.
4. Shifting out of PARK should not be possible while applying normal force, and ignition key cylinder is in the run or start positions, unless the foot brake pedal is depressed approximately 1/2 inch (12mm).
5. Shifting out of PARK should not be possible when the ignition key cylinder is in the accessory or lock position.
6. Shifting between any gear and NEUTRAL, or PARK, may be done without depressing foot brake with ignition switch in run or start positions.
7. Engine starts must be possible with shifter lever in PARK or NEUTRAL positions only. Engine starts must not be possible in any position other than PARK or NEUTRAL.
8. With shifter lever in the:
   - PARK position - Apply upward force on the shift arm and remove pressure. Engine starts must be possible.
   - PARK position - Apply downward force on the shift arm and remove pressure. Engine starts must be possible.
   - NEUTRAL position - Normal position. Engine starts must be possible.
   - NEUTRAL position - Engine running and brakes applied, apply upward force on the shift arm. Transmission shall not be able to shift from neutral to reverse.

FLUID AND FILTER

DIAGNOSIS AND TESTING

EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation, and varnish buildup which interferes with valve and clutch operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has three primary causes.

1. Internal clutch slippage, usually caused by low line pressure, inadequate clutch apply pressure, or clutch seal failure.
2. A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged oil cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.
3. Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to replace contaminated converter after repair

The use of non-recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission, an overhaul is necessary.

The torque converter should also be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

STANDARD PROCEDURE

FLUID LEVEL CHECK

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. As in any hydraulic system, air bubbles make the fluid spongy, therefore, pressures will be low and build up slowly.

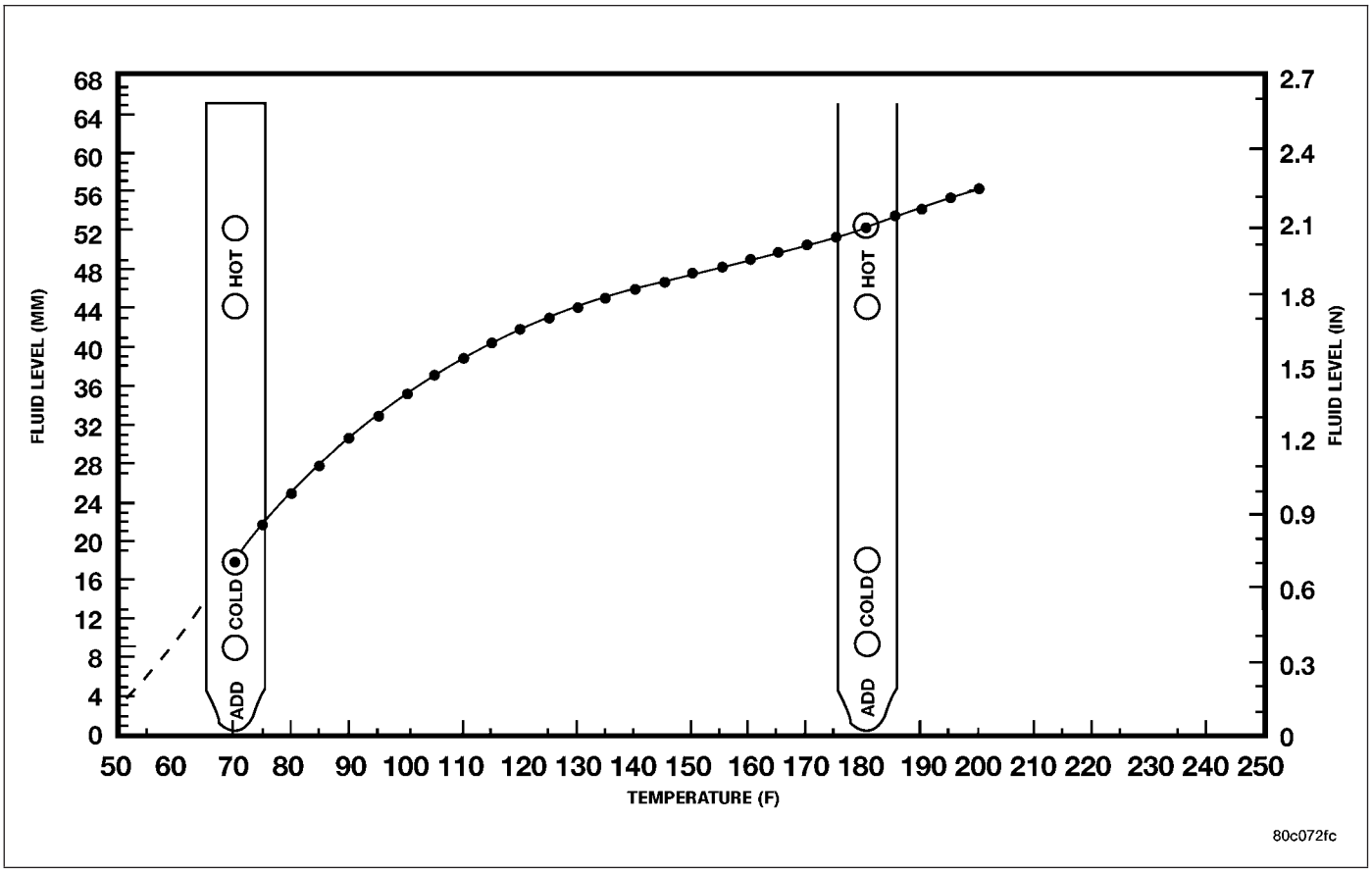
Improper filling can also raise the fluid level too high. When the transmssion has too much fluid, the geartrain churns up foam and cause the same conditions which occur with a low fluid level.

In either case, air bubbles can cause overheating and/or fluid oxidation, and varnishing. This can interfere with normal valve, clutch, and accumulator operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a leak.

After the fluid has been checked, seat the dipstick fully to seal out water and dirt.

The transmission has a dipstick to check oil level. It is located on the right side of the engine. Be sure to wipe all dirt from dipstick handle before removing.

The torque converter fills in both the P (PARK) and N (NEUTRAL) positions. Place the selector lever in P (PARK) to be sure that the fluid level check is accurate. **The engine should be running at idle speed for at least one minute, with the vehicle on level ground.** At normal operating temperature (approximately 82 C. or 180 F.), the fluid level is correct if it is in the HOT region (cross-hatched area) on the oil level indicator. The fluid level will be approximately at the upper COLD hole of the dipstick at 70° F fluid temperature.



NOTE: Engine and Transmission should be at normal operating temperature before performing this procedure.

1. Start engine and apply parking brake.
2. Shift the transmission into DRIVE for approximately 2 seconds.
3. Shift the transmission into REVERSE for approximately 2 seconds.
4. Shift the transmission into PARK.
5. Hook up scan tool and select transmission.
6. Select sensors.
7. Read the transmission temperature value.
8. Compare the fluid temperature value with the chart.
9. Adjust transmission fluid level shown on the dipstick according to the Transmission Fluid Temperature Chart.

NOTE: After adding any fluid to the transmission, wait a minimum of 2 minutes for the oil to fully drain from the fill tube into the transmission before rechecking the fluid level.

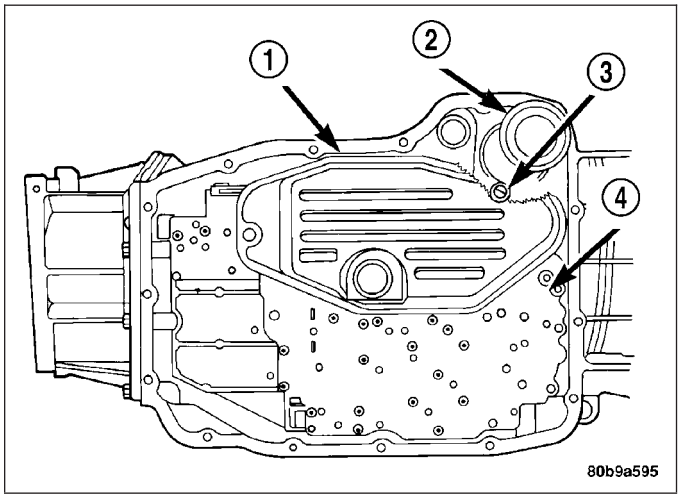
10. Check transmission for leaks.

FLUID AND FILTER REPLACEMENT

For proper service intervals (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION).

REMOVAL

1. Hoist and support vehicle on safety stands.
2. Place a large diameter shallow drain pan beneath the transmission pan.
3. Remove bolts holding front and sides of pan to transmission.
4. Loosen bolts holding rear of pan to transmission.
5. Slowly separate front of pan away from transmission allowing the fluid to drain into drain pan.
6. Hold up pan and remove remaining bolts holding pan to transmission.
7. While holding pan level, lower pan away from transmission.
8. Pour remaining fluid in pan into drain pan.
9. Remove the screw holding the primary oil filter (1) to valve body.
10. Separate filter from valve body and oil pump and pour fluid in filter into drain pan.
11. Inspect the oil filter seal in the bottom of the oil pump. If the seal is not installed completely in the oil pump, or is otherwise damaged, then remove and discard the oil filter seal from the bottom of the oil pump. If the seal is installed correctly and is in good condition, it can be reused.
12. If replacing the cooler return filter (2), use Oil Filter Wrench 8321 to remove the filter from the transmission.
13. Dispose of used trans fluid and filter(s) properly.



INSPECTION

Inspect bottom of pan and magnet for excessive amounts of metal. A light coating of clutch material on the bottom of the pan does not indicate a problem unless accompanied by a slipping condition or shift lag. If fluid and pan are contaminated with excessive amounts of debris, refer to the diagnosis section of this group.

CLEANING

1. Using a suitable solvent, clean pan and magnet.
2. Using a suitable gasket scraper, clean original sealing material from surface of transmission case and the transmission pan.

INSTALLATION

CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.

1. If necessary, install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with a suitable tool (appropriately sized drift or socket, the butt end of a hammer, or other suitable tool).
2. Place replacement filter in position on valve body and into the oil pump.
3. Install screw to hold the primary oil filter (1) to valve body. Tighten screw to 4.5 N·m (40 in. lbs.) torque.
4. Install new cooler return filter (2) onto the transmission, if necessary. Torque the filter to 14.12 N·m (125 in.lbs.).

5. Place bead of Mopar® RTV sealant onto the transmission case sealing surface.
6. Place pan in position on transmission.
7. Install bolts to hold pan to transmission. Tighten bolts to 11.8 N·m (105 in. lbs.) torque.
8. Lower vehicle and fill transmission with Mopar® ATF +4.

TRANSMISSION FILL

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

1. Remove dipstick and insert clean funnel in transmission fill tube.
2. Add following initial quantity of Mopar® ATF +4 to transmission:
   a. If only fluid and filter were changed, add **10 pints (5 quarts)** of ATF +4 to transmission.
   b. If transmission was completely overhauled and the torque converter was replaced or drained, add **24 pints (12 quarts)** of ATF +4 to transmission.
3. Check the transmission fluid (Refer to 21 - TRANSMISSION/AUTOMATIC - RFE/FLUID - STANDARD PROCEDURE) and adjust as required.

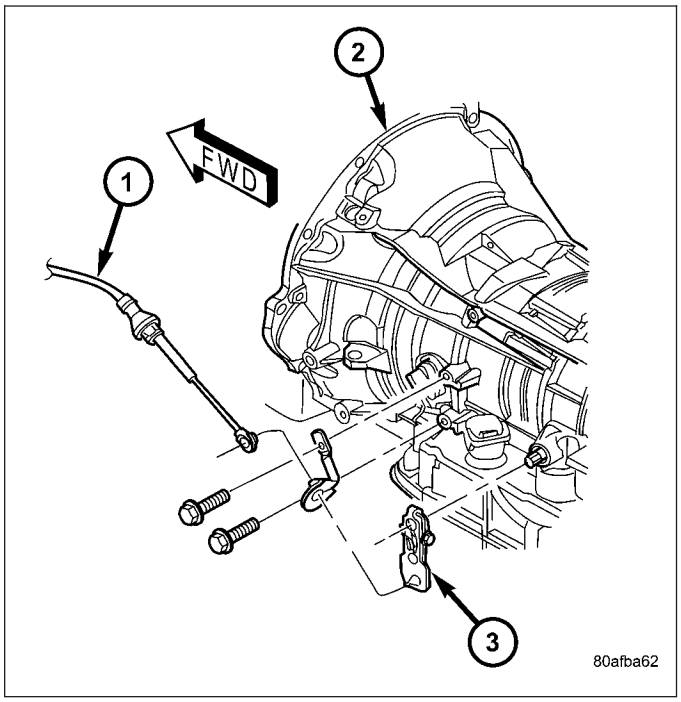
CABLE-GEARSHIFT

DIAGNOSIS AND TESTING - GEARSHIFT CABLE

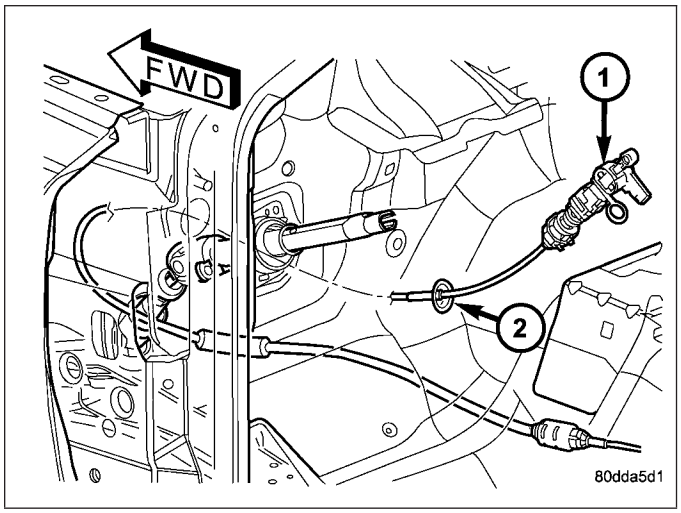
1. Engine starts must be possible with shift lever in PARK or NEUTRAL positions only. Engine starts must not be possible in any other gear position.
2. With the shift lever in the:
   a. PARK position - Apply upward force on the shift arm and remove pressure. Engine starts must be possible.
   b. PARK position - Apply downward force on the shift arm and remove pressure. Engine starts must be possible.
   c. NEUTRAL position - Normal position. Engine starts must be possible.
   d. NEUTRAL position - Engine running and brakes applied, apply upward force on the shift arm. Transmission shall not be able to shift from neutral to reverse.

REMOVAL

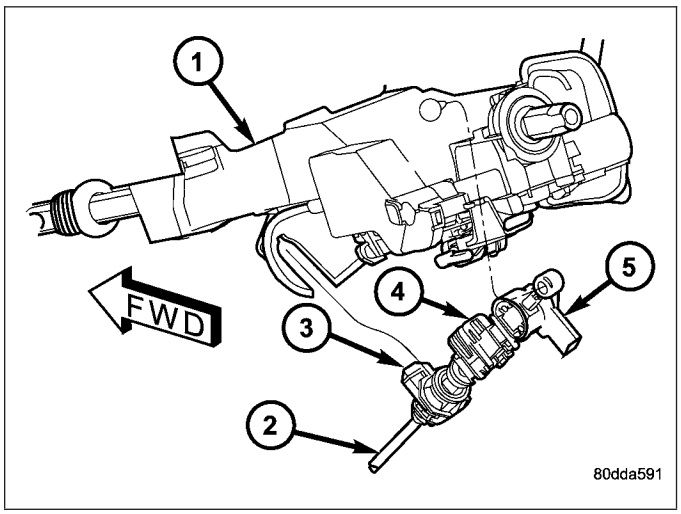
1. Shift transmission into PARK.
2. Raise vehicle.
3. Disengage cable (1) eyelet at transmission manual shift lever (3) and pull cable adjuster out of mounting bracket.



4. Lower the vehicle.
5. Remove the dash panel insulation pad as necessary to access the gearshift cable grommet (2).
6. Remove grommet (2) from the dash panel.

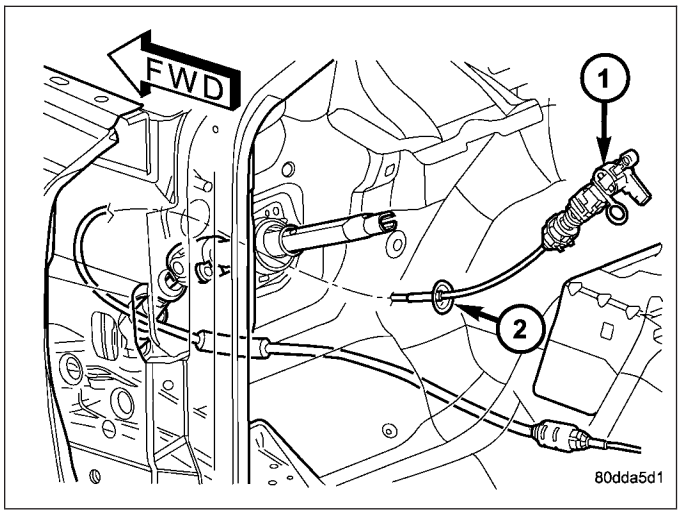


7. Remove any steering column (1) trim necessary to access the gearshift cable (2) and BTSI mechanism.
8. Disconnect the BTSI wiring connector (5).
9. Disconnect cable at lower column bracket and shift lever pin and pull the cable through the dash panel opening into the vehicle.
10. Remove gearshift cable (2) from vehicle.

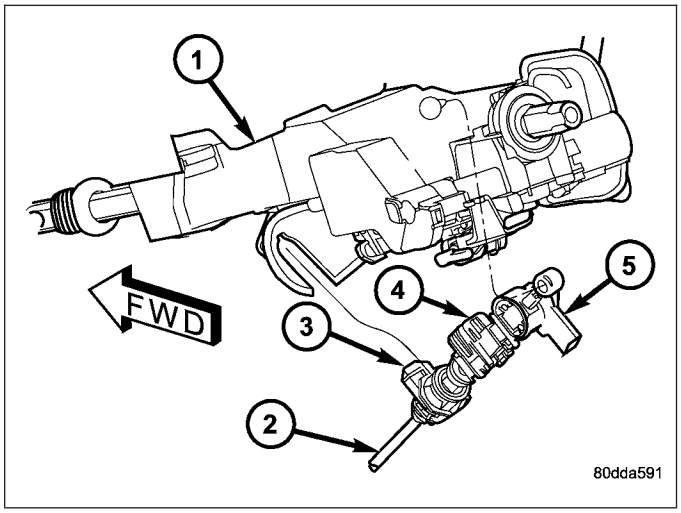


INSTALLATION

1. Route the transmission end of the gearshift cable (1) through the opening in the dash panel.



2. Seat the cable grommet (2) into the dash panel opening.
3. Snap the cable into the steering column (1) bracket so the retaining ears are engaged and snap the cable eyelet onto the shift lever ball stud.
4. Raise the vehicle.
5. Place the transmission manual shift lever in the “PARK” detent (rearmost) position and rotate prop shaft to ensure transmission is in PARK.
6. Route the gearshift cable through the transmission mounting bracket and secure the cable by snapping the cable retaining ears into the transmission bracket and snapping the cable eyelet on the manual shift lever ball stud.
7. Lower vehicle.
8. Lock the shift cable adjustment by pressing the cable adjuster lock tab (3) downward until it snaps into place.



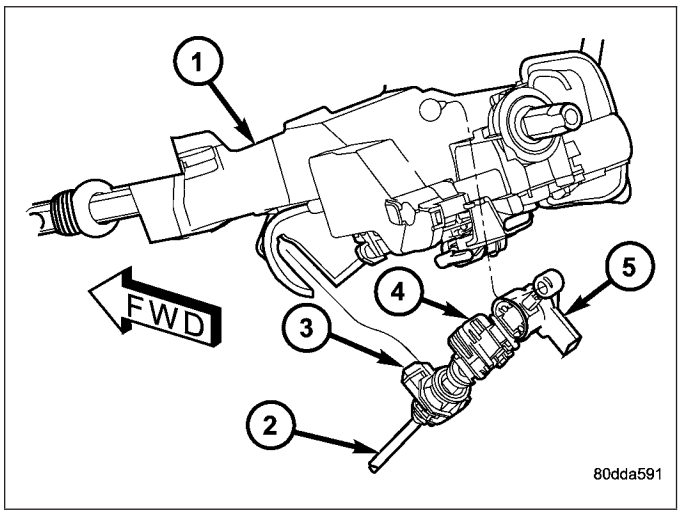
9. Check for proper operation of the transmission range sensor.
10. Adjust the gearshift cable (Refer to 21 - TRANSMISSION/AUTOMATIC/GEAR SHIFT CABLE - ADJUSTMENTS) and BTSI mechanism (Refer to 21 - TRANSMISSION/AUTOMATIC/BRAKE TRANSMISSION SHIFT INTERLOCK SYSTEM - ADJUSTMENTS) as necessary.

ADJUSTMENTS - GEARSHIFT CABLE

Check adjustment by starting the engine in PARK and NEUTRAL. Adjustment is CORRECT if the engine starts only in these positions. Adjustment is INCORRECT if the engine starts in one but not both positions. If the engine starts in any position other than PARK or NEUTRAL, or if the engine will not start at all, the transmission range sensor may be faulty.

Gearshift Adjustment Procedure

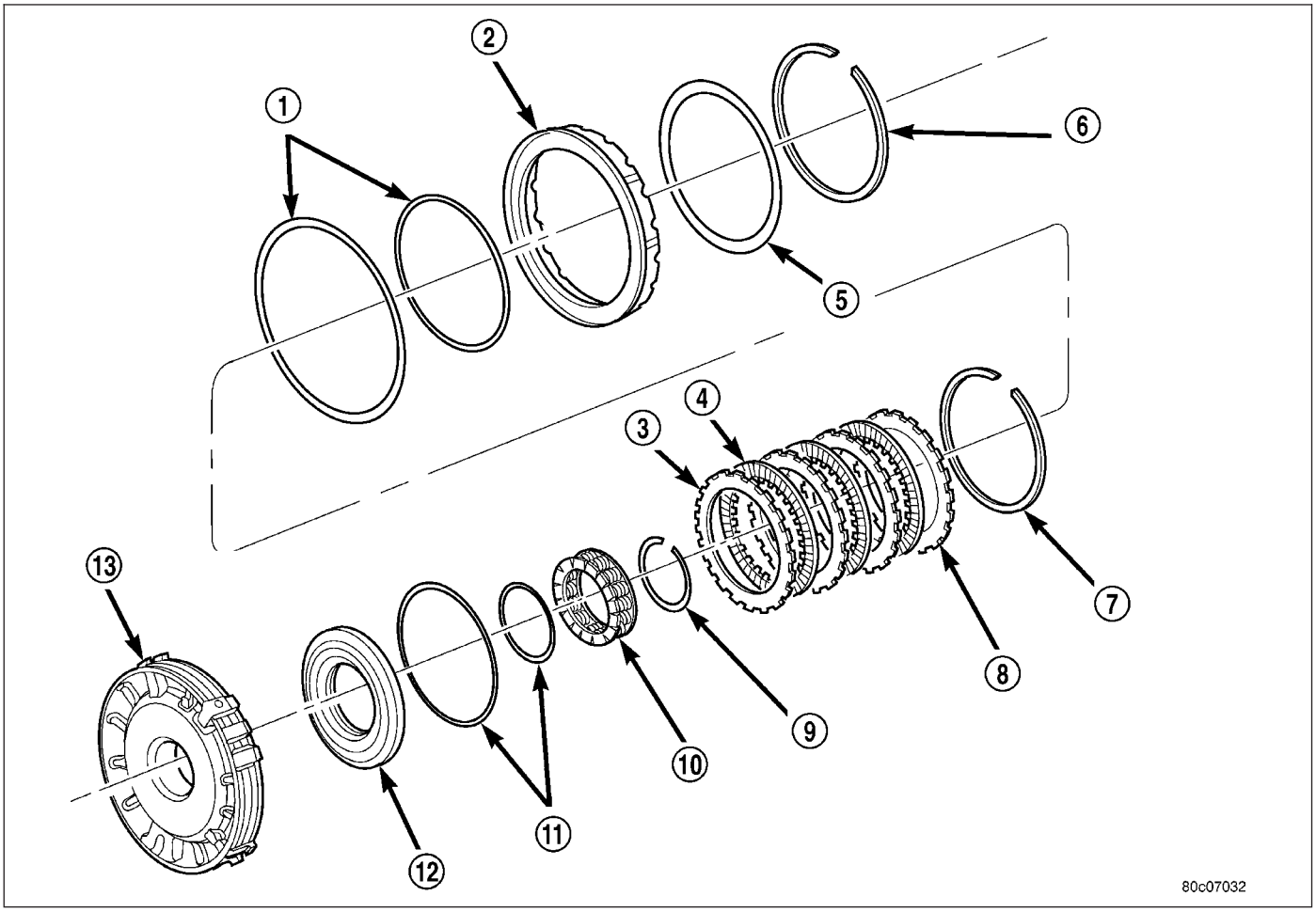
1. Shift transmission into PARK.
2. Release cable adjuster lock tab (3) (underneath the steering column) to unlock cable.
3. Raise vehicle.
4. Disengage the cable eyelet from the transmission manual shift lever.
5. Verify transmission shift lever is in PARK detent by moving lever fully rearward. Last rearward detent is PARK position.
6. Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
7. Snap the cable eyelet onto the transmission manual shift lever.
8. Lower vehicle.



9. Lock shift cable by pressing cable adjuster lock tab (3) downward until it snaps into place.
10. Check engine starting. Engine should start only in PARK and NEUTRAL.

CLUTCHES-HOLDING

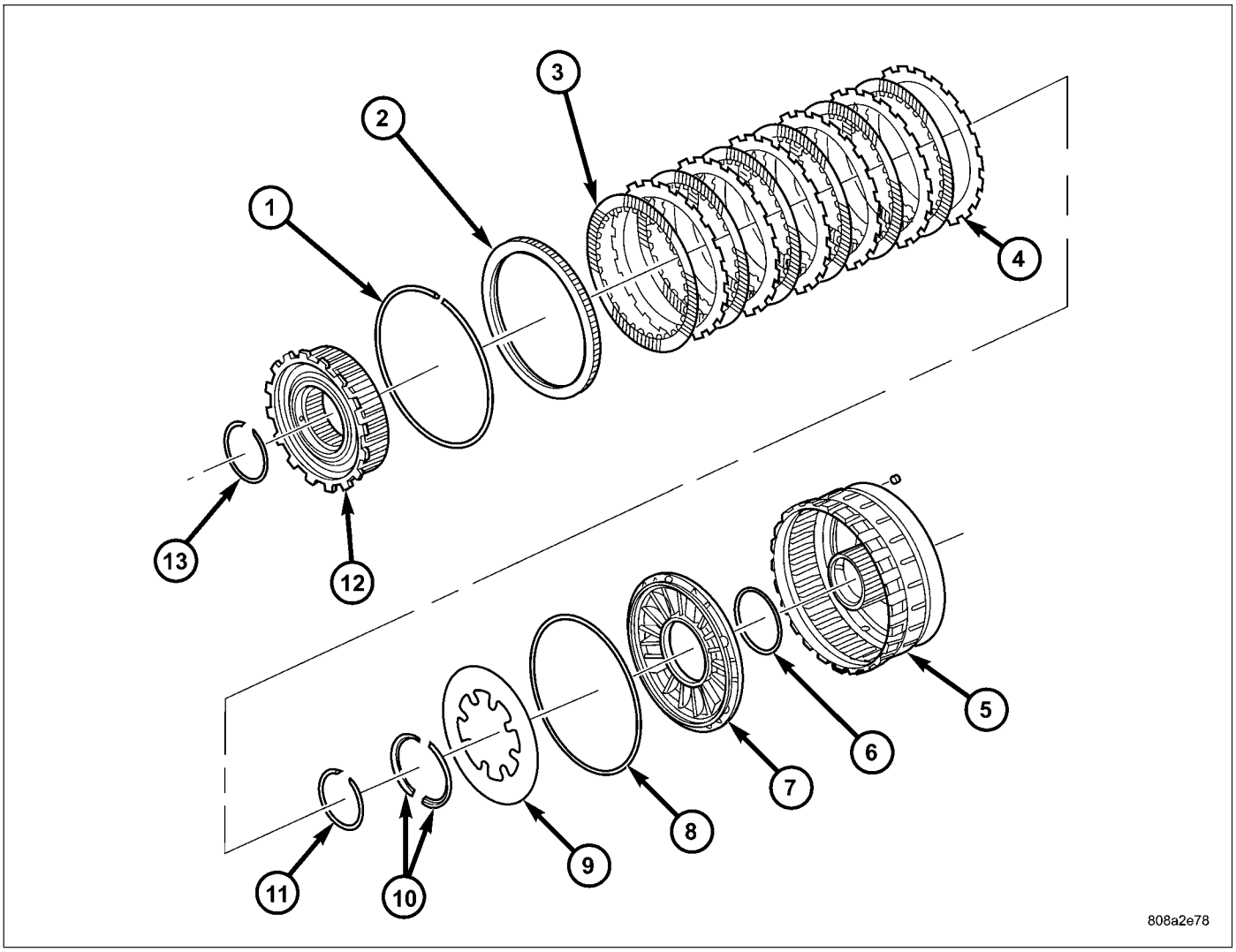
DESCRIPTION



2C and 4C Clutches

1 - SEAL
2 - 2C PISTON
3 - PLATE
4 - DISC
5 - 2C BELLEVILLE SPRING
6 - SNAP-RING
7 - SNAP-RING (SELECT)
8 - REACTION PLATE
9 - SNAP-RING
10 - RETURN SPRING
11 - SEAL
12 - 4C PISTON
13 - 4C RETAINER/BULKHEAD

Three hydraulically applied multi-disc clutches are used to hold some planetary geartrain components stationary while the input clutches drive others. The 2C, 4C, and Low/Reverse clutches are considered holding clutches. The 2C and 4C clutches are located in the 4C retainer/bulkhead (13).



Low/Reverse Clutch

1 - SNAP-RING (SELECT)
2 - REACTION PLATE
3 - DISC
4 - PLATE
5 - L/R CLUTCH RETAINER
6 - SEAL
7 - PISTON
8 - SEAL
9 - BELLEVILLE SPRING
10 - RETAINER
11 - SNAP-RING
12 - OVERRUNNING CLUTCH
13 - SNAP-RING

The Low/Reverse clutch is located at the rear of the transmission case.

OPERATION

2C CLUTCH

The 2C clutch is hydraulically applied in second and fifth gear by pressurized fluid against the 2C piston. When the 2C clutch is applied, the reverse sun gear assembly is held or grounded to the transmission case by holding the reaction planetary carrier.

4C CLUTCH

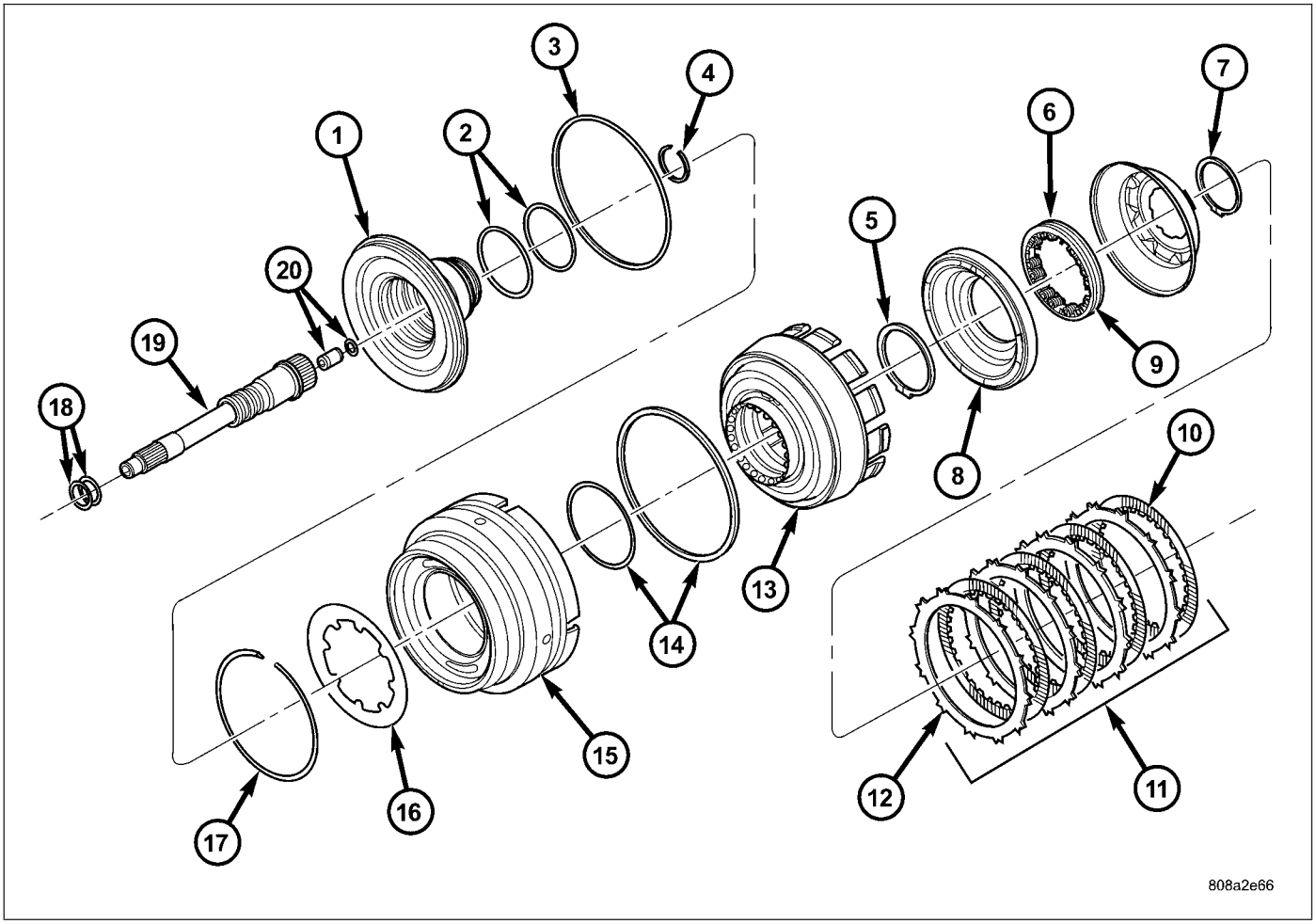
The 4C clutch is hydraulically applied in second prime and fourth gear by pressurized fluid against the 4C clutch piston. When the 4C clutch is applied, the reaction annulus gear is held or grounded to the transmission case.

LOW/REVERSE CLUTCH

The Low/Reverse clutch is hydraulically applied in park, reverse, neutral, and first gear, only at low speeds, by pressurized fluid against the Low/Reverse clutch piston. When the Low/Reverse clutch is applied, the input annulus assembly is held or grounded to the transmission case.

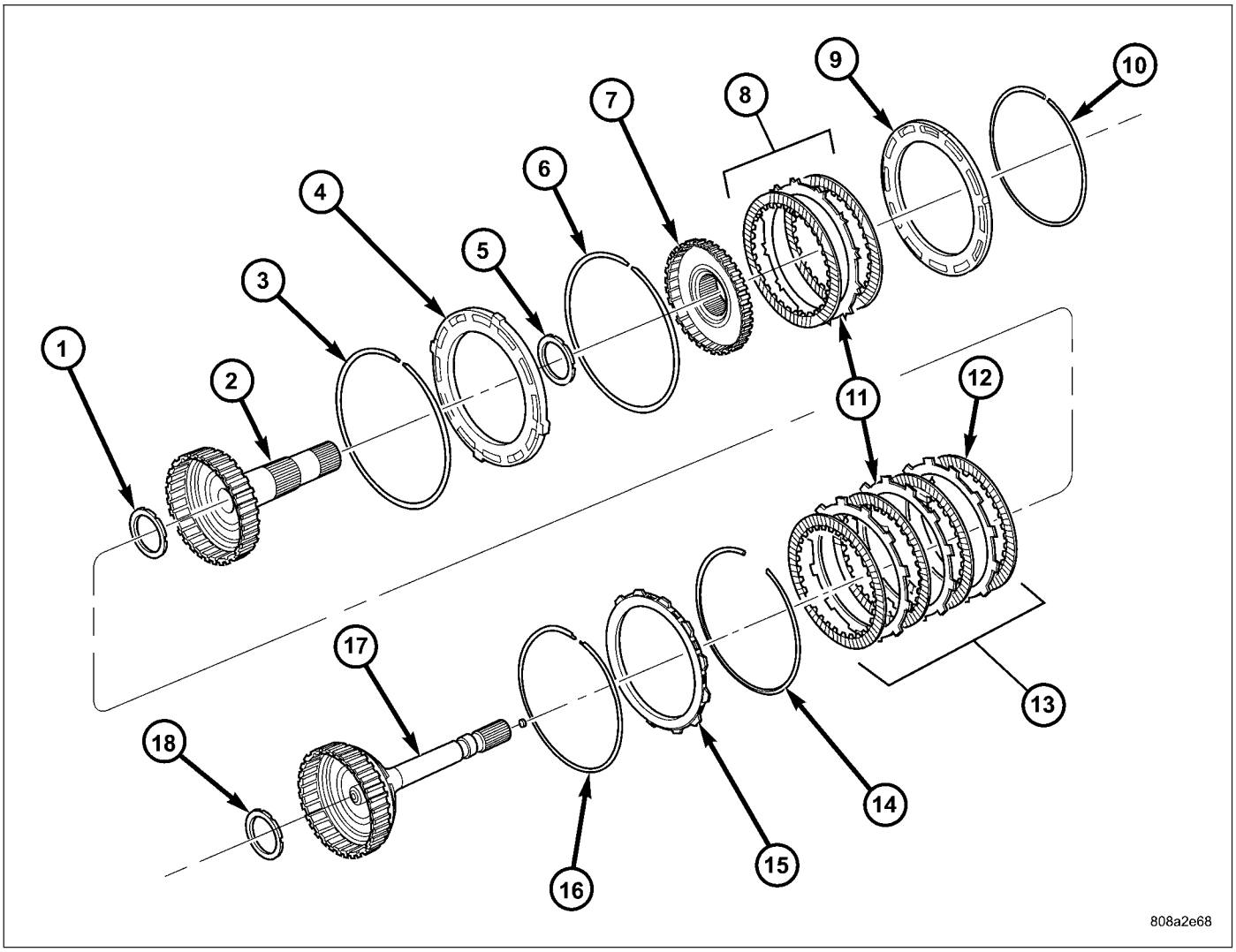
ASSEMBLY-INPUT CLUTCH

DESCRIPTION



Input Clutch Assembly - Part 1

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING



Input Clutch Assembly - Part 2

1 - THRUST BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - THRUST BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - THRUST BEARING NUMBER 2

Three hydraulically applied input clutches are used to drive planetary components. The underdrive, overdrive, and reverse clutches are considered input clutches and are contained within the input clutch assembly.

The input clutch assembly also contains:

- Input shaft
- Input hub
- Clutch retainer
- Underdrive piston
- Overdrive/reverse piston
- Overdrive hub
- Underdrive hub

OPERATION

The three input clutches are responsible for driving different components of the planetary geartrain.

UNDERDRIVE CLUTCH

The underdrive clutch is hydraulically applied in first, second, second prime, and third (direct) gears by pressurized fluid against the underdrive piston. When the underdrive clutch is applied, the underdrive hub drives the input sun gear.

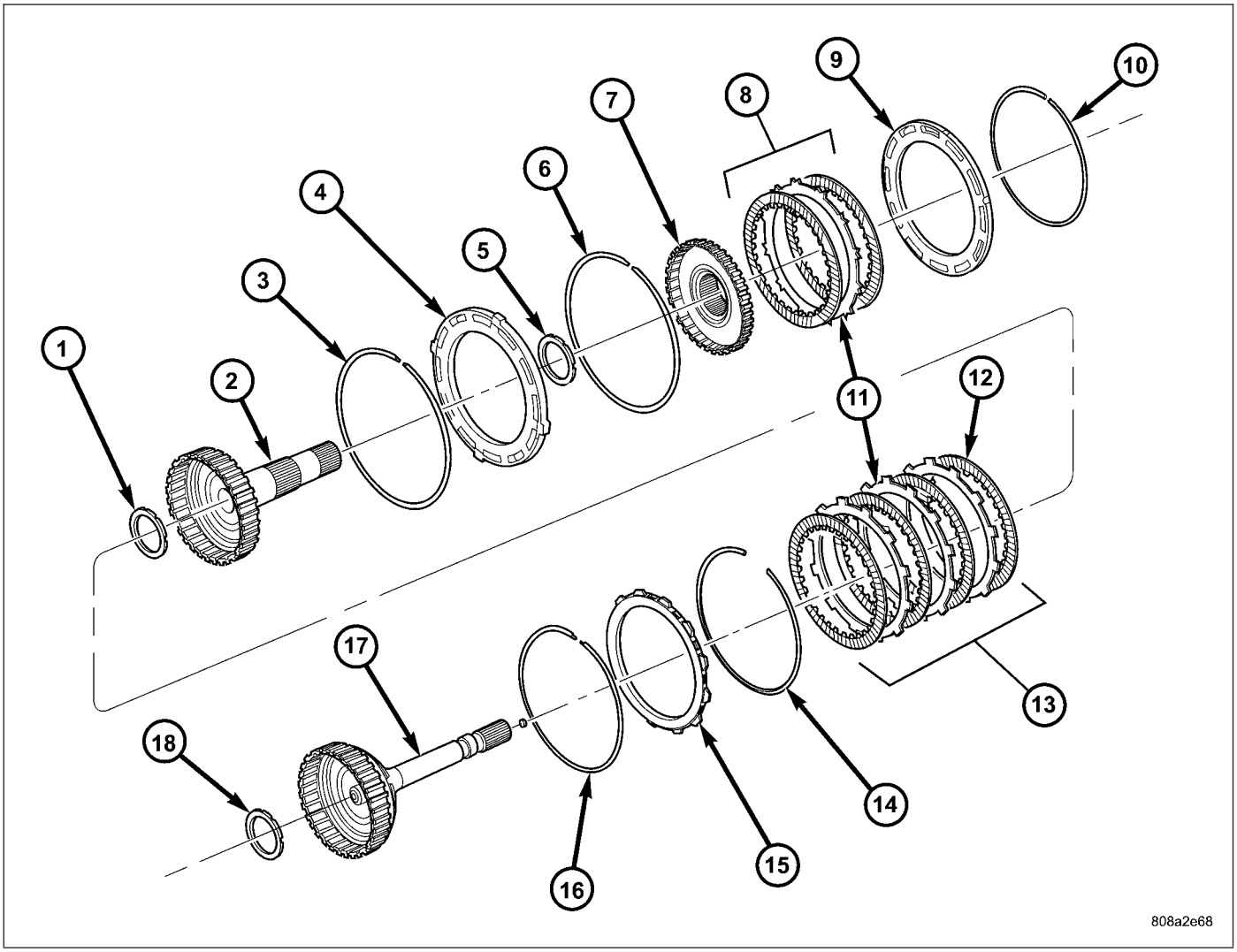
OVERDRIVE CLUTCH

The overdrive clutch is hydraulically applied in third (direct), fourth, and fifth gears by pressurized fluid against the overdrive/reverse piston. When the overdrive clutch is applied, the overdrive hub drives the reverse carrier/input annulus assembly.

REVERSE CLUTCH

The reverse clutch is hydraulically applied in reverse gear by pressurized fluid against the overdrive/reverse piston. When the reverse clutch is applied, the reaction annulus gear is driven.

DISASSEMBLY



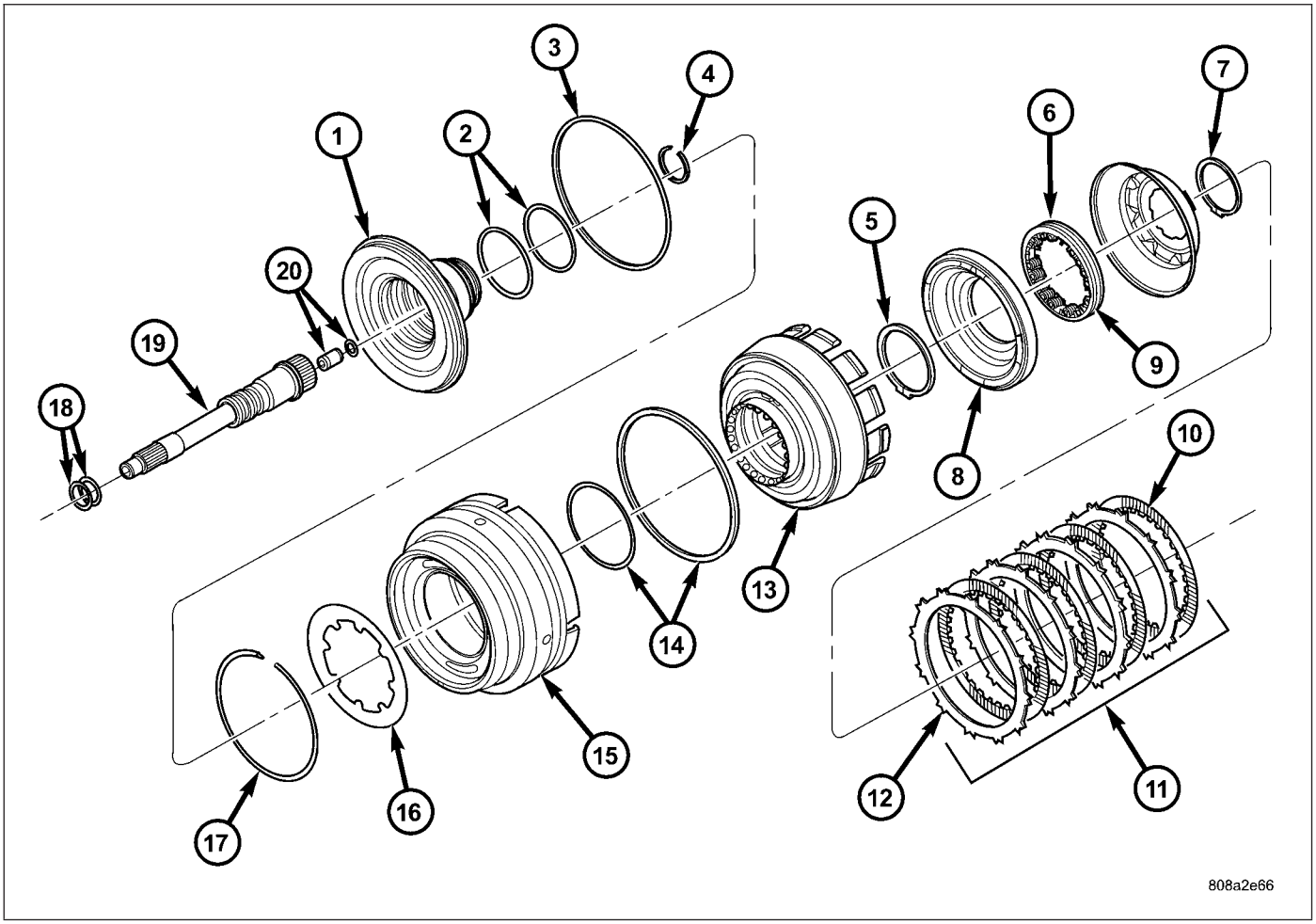
Input Clutch Assembly - Part 2

1 - THRUST BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - THRUST BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - THRUST BEARING NUMBER 2

1. Remove the reverse reaction plate selective snap-ring (10) from the input clutch retainer (13).
2. Remove the reverse reaction plate (9) from the input clutch retainer (13).
3. Remove the reverse hub (7) and reverse clutch pack (8) from the input clutch retainer (13).
4. Remove the number 4 thrust bearing (5) from the overdrive hub (2).
5. Remove the overdrive hub (2) from the input clutch retainer (13).
6. Remove the number 3 thrust bearing (1) from the underdrive hub (17).
7. Remove the OD/reverse reaction plate snap-ring (6) from the input clutch retainer (13).
8. Remove the underdrive hub (17), overdrive clutch (13), and overdrive reaction plate (15) from the input clutch retainer (13).

NOTE: The overdrive friction discs and steel discs are thicker than the matching components in the underdrive and reverse clutches.

9. Remove the number 2 thrust bearing (18) from the input clutch hub (1).
10. Remove the overdrive clutch wave snap-ring (3) from the input clutch retainer (13).
11. Remove the UD/OD reaction plate tapered snap-ring (14) from the input clutch retainer (13).
12. Remove the UD/OD reaction plate (15) from the input clutch retainer (13).
13. Remove the UD/OD reaction plate flat snap-ring (16) from the input clutch retainer (13).

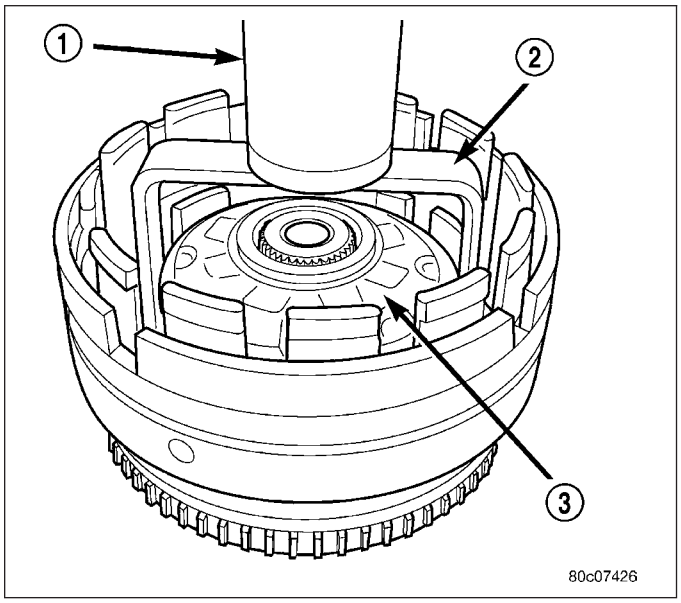


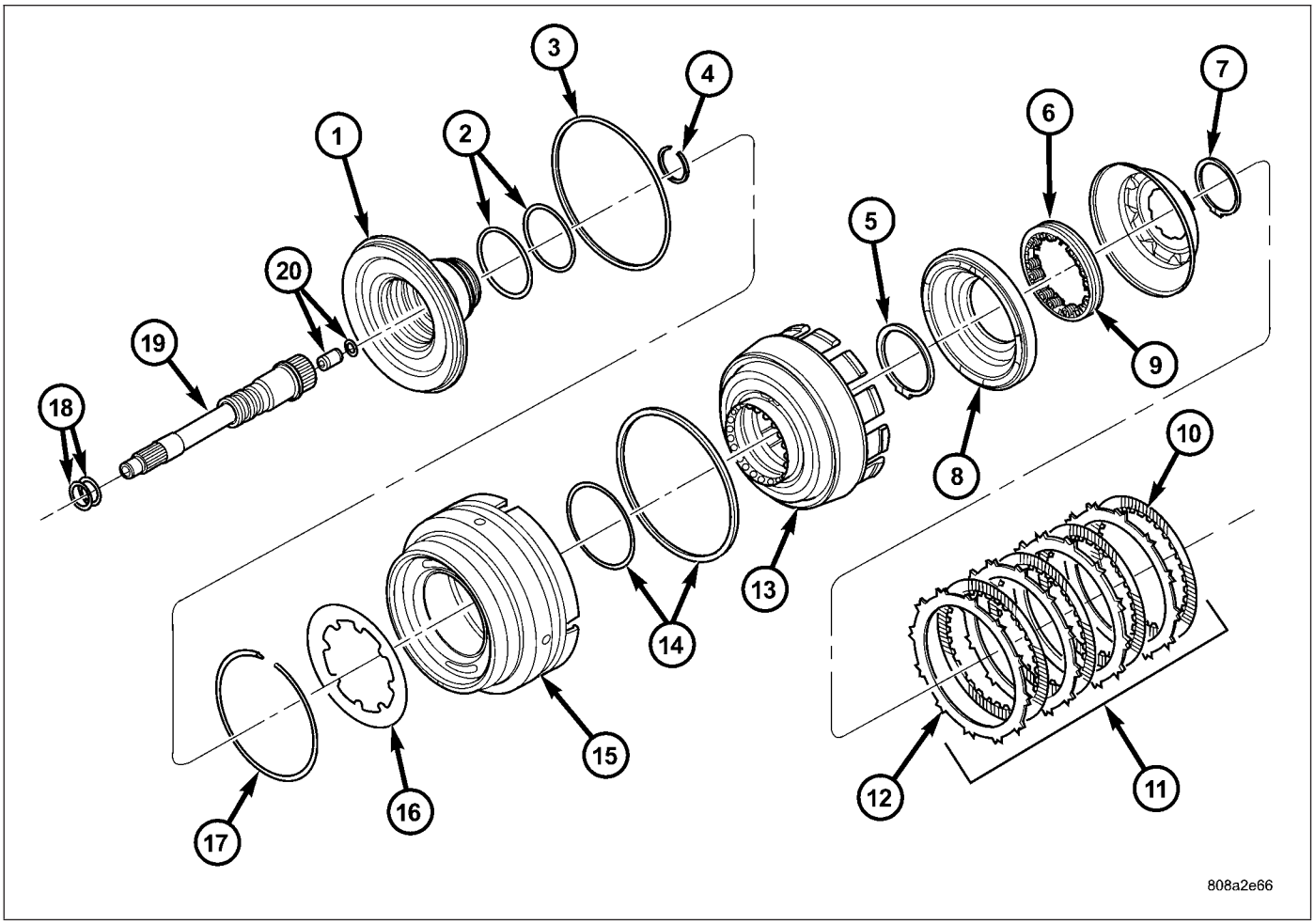
Input Clutch Assembly - Part 1

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING

14. Remove the underdrive clutch pack (11) from the input clutch retainer (13).

15. Using Spring Compressor 8251 (2) , compress the UD/OD balance piston (3) and remove the snap-ring from the input clutch hub (1).





Input Clutch Assembly - Part 1

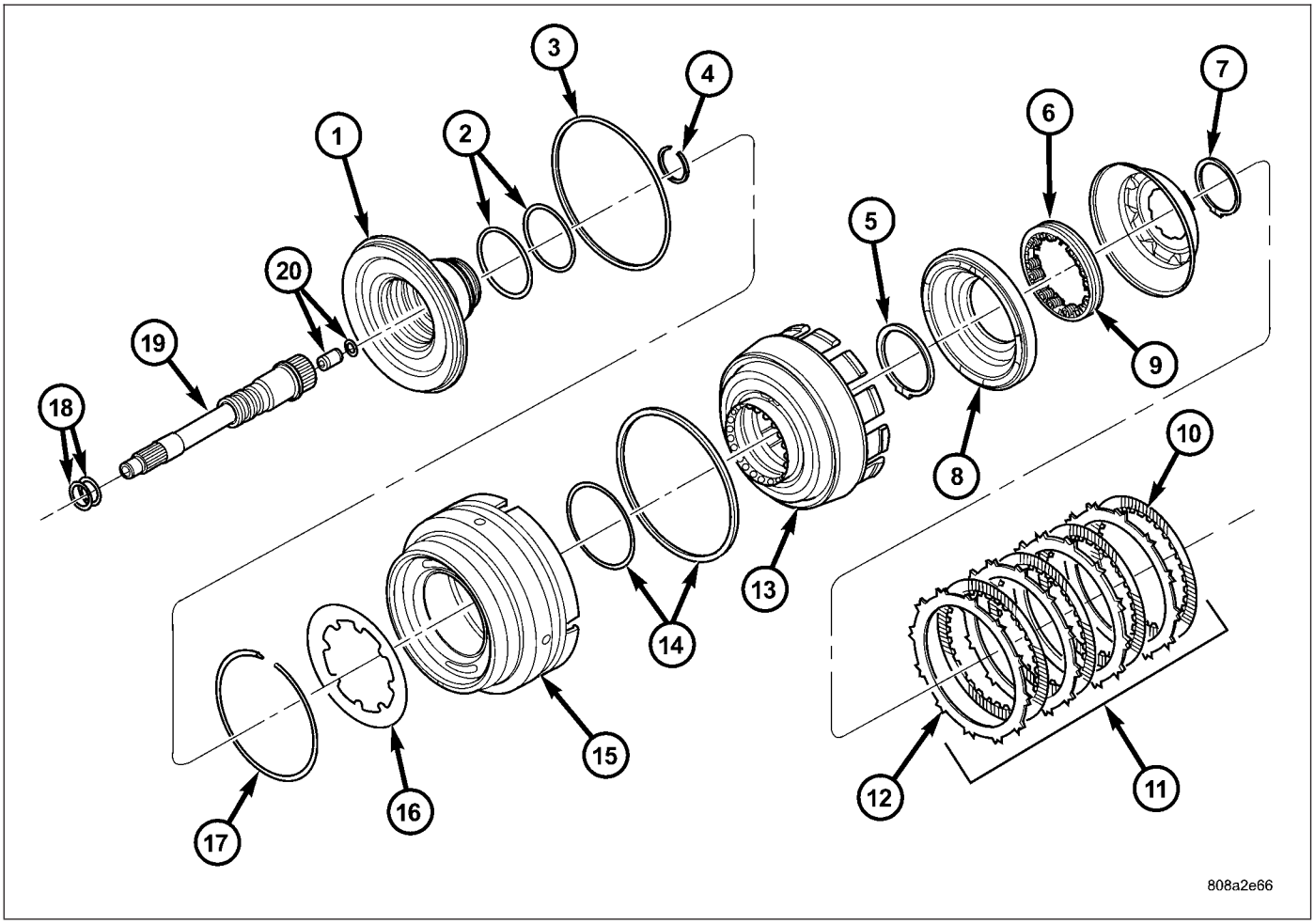
1 - INPUT CLUTCH HUB	11 - UD CLUTCH
2 - O-RING SEALS	12 - PLATE
3 - SEAL	13 - CLUTCH RETAINER
4 - SNAP-RING	14 - SEAL
5 - SNAP-RING	15 - OD/REV PISTON
6 - UD BALANCE PISTON	16 - BELLEVILLE SPRING
7 - SNAP-RING	17 - SNAP-RING
8 - UD PISTON	18 - SEAL RINGS
9 - SPRING	19 - INPUT SHAFT
10 - DISC	20 - LUBRICATION CHECK VALVE AND SNAP-RING

16. Remove the UD/OD balance piston (6) and piston return spring (9) from the input clutch retainer (13).
17. Remove the underdrive piston (8) from the input clutch retainer (13).

NOTE: Both the UD/OD balance piston and the underdrive piston have seals molded onto them. If the seal is damaged, do not attempt to install a new seal onto the piston. The piston/seal must be replaced as an assembly.

18. Remove the input clutch retainer tapered snap-ring (5).
19. Separate input clutch retainer (13) from input clutch hub (1).
20. Separate OD/reverse piston (15) from input clutch hub retainer (13).
21. Remove all seals and o-rings from the input shaft and input hub. The o-rings on the input hub are color coded. Be sure to make note of which o-ring belongs in which location.

ASSEMBLY



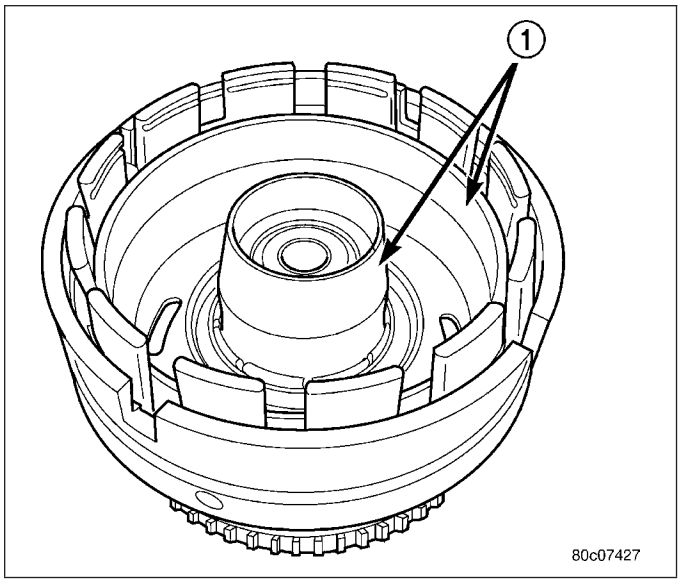
Input Clutch Assembly - Part 1

1 - INPUT CLUTCH HUB
2 - O-RING SEALS
3 - SEAL
4 - SNAP-RING
5 - SNAP-RING
6 - UD BALANCE PISTON
7 - SNAP-RING
8 - UD PISTON
9 - SPRING
10 - DISC
11 - UD CLUTCH
12 - PLATE
13 - CLUTCH RETAINER
14 - SEAL
15 - OD/REV PISTON
16 - BELLEVILLE SPRING
17 - SNAP-RING
18 - SEAL RINGS
19 - INPUT SHAFT
20 - LUBRICATION CHECK VALVE AND SNAP-RING

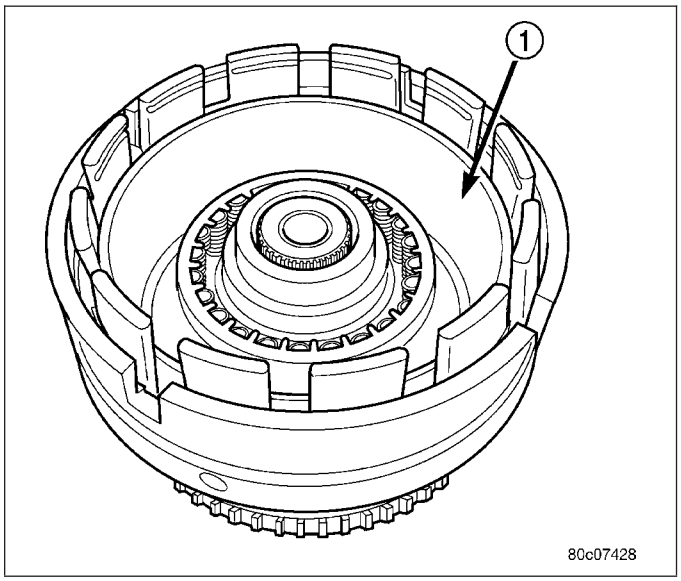
NOTE: Install all new seals and o-rings onto the input shaft and input hub. The o-rings on the input hub are color coded. Be sure to install the correct o-ring in the correct location.

1. Check the transmission lubrication check valve (20) located in the input shaft using shop air. The valve should only allow air flow in one direction. If the valve allows no air flow, or air flow in both directions, the valve will need to be replaced.
2. Lubricate all seals with Mopar® ATF +4, Automatic Transmission Fluid, prior to installation.
3. Assemble the OD/reverse piston (15) onto the input clutch hub (1).
4. Assemble the input clutch retainer (13) onto the input clutch hub (1).
5. Install the input clutch retainer tapered snap-ring (5) with tapered side up onto the input clutch hub (1).

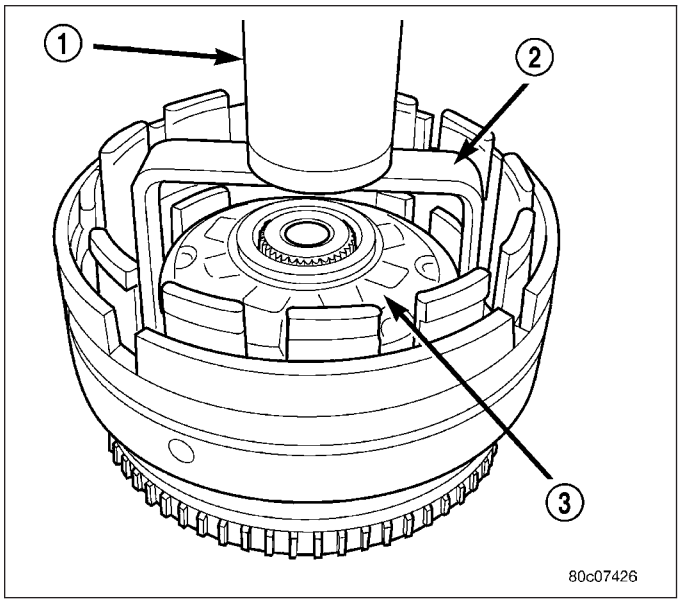
6. Install Piston Guides 8504 (1) into the input clutch retainer (13) and onto the input clutch hub (1) to guide the inner and outer underdrive piston (8) seals into position.
7. Install the underdrive piston (8) into the input clutch retainer (13) and over the input clutch hub (1).

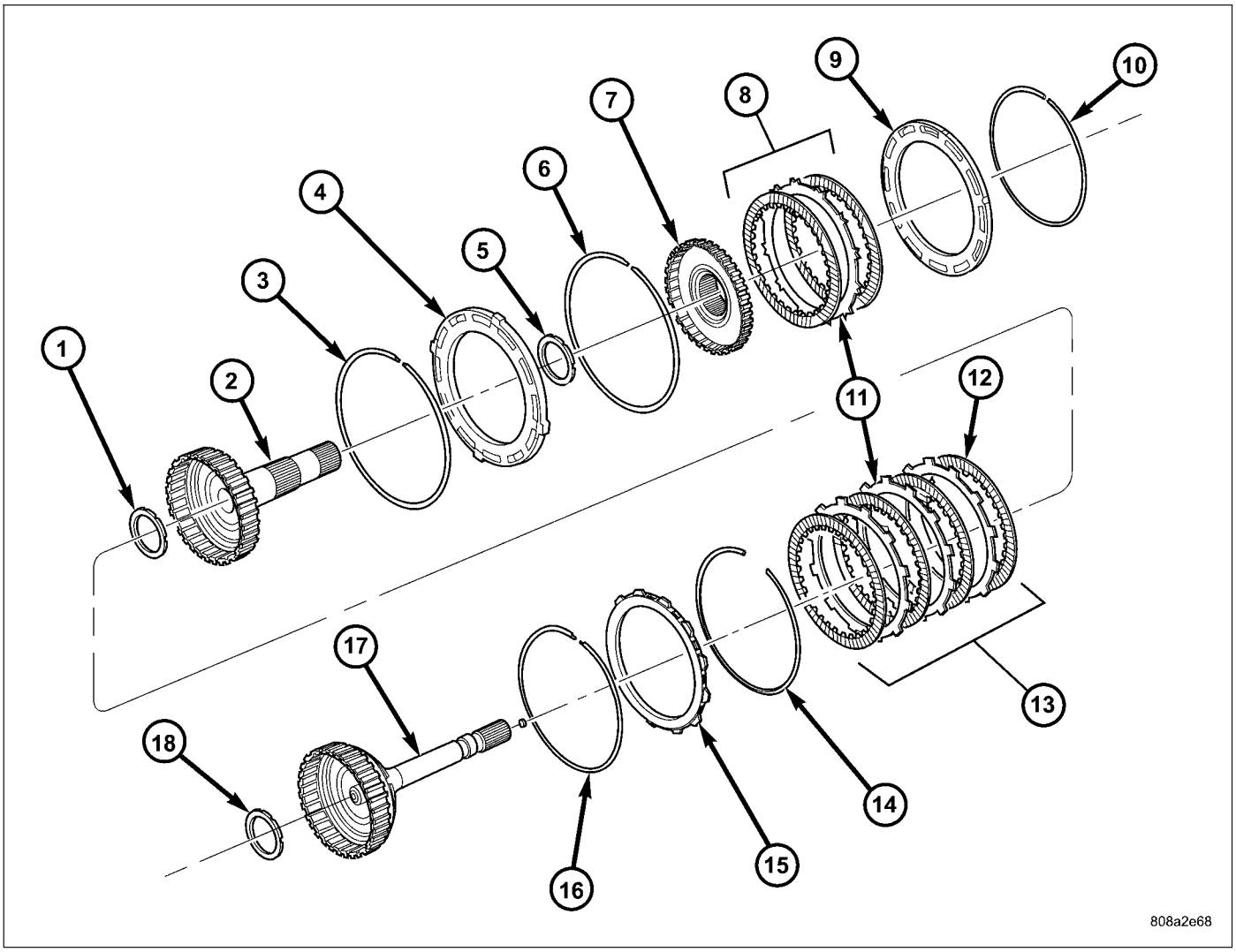


8. Install the UD/OD balance piston return spring pack (9) into the input clutch retainer (13).
9. Install Piston Guide 8252 (1) into the input clutch retainer (13) to guide the UD/OD balance piston (6) seal into position inside the underdrive piston (8).



10. Install the UD/OD balance piston (3) into the input clutch retainer and the underdrive piston.
11. Using Spring Compressor 8251 (2), compress the UD/OD return spring pack and secure the piston in place with the snap-ring.
12. Install the underdrive clutch pack (11) into the input clutch retainer.



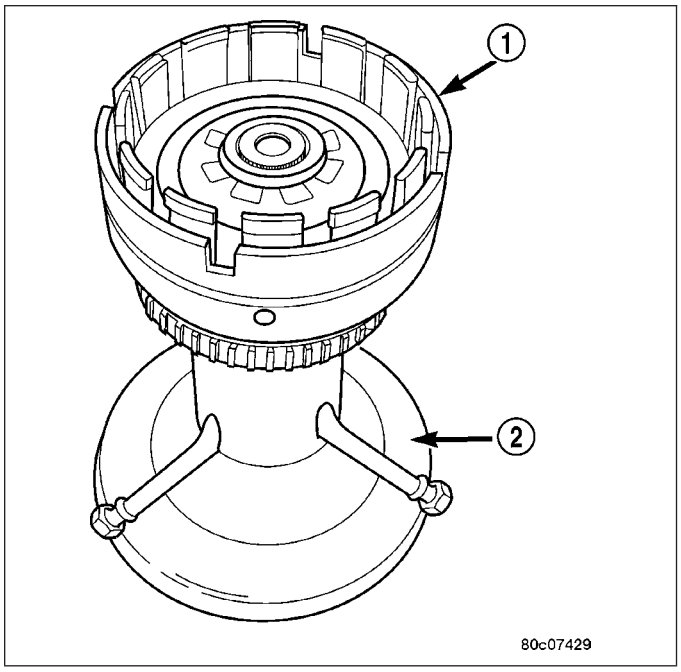


Input Clutch Assembly - Part 2

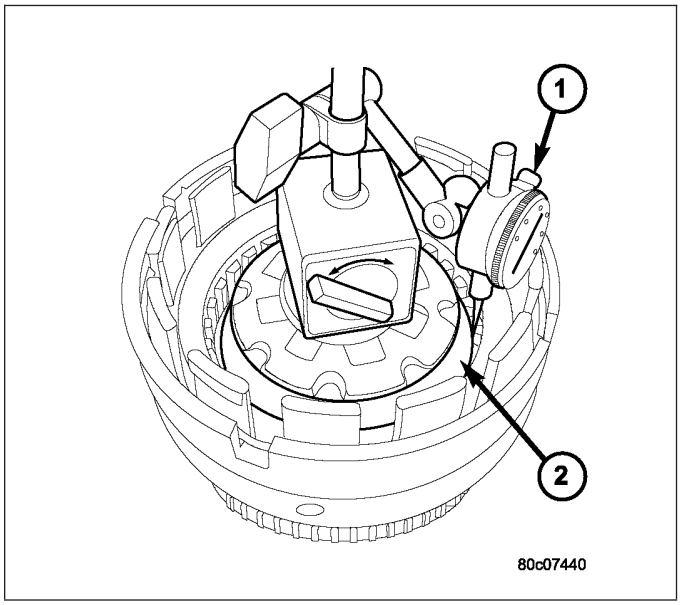
1 - THRUST BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - THRUST BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - THRUST BEARING NUMBER 2

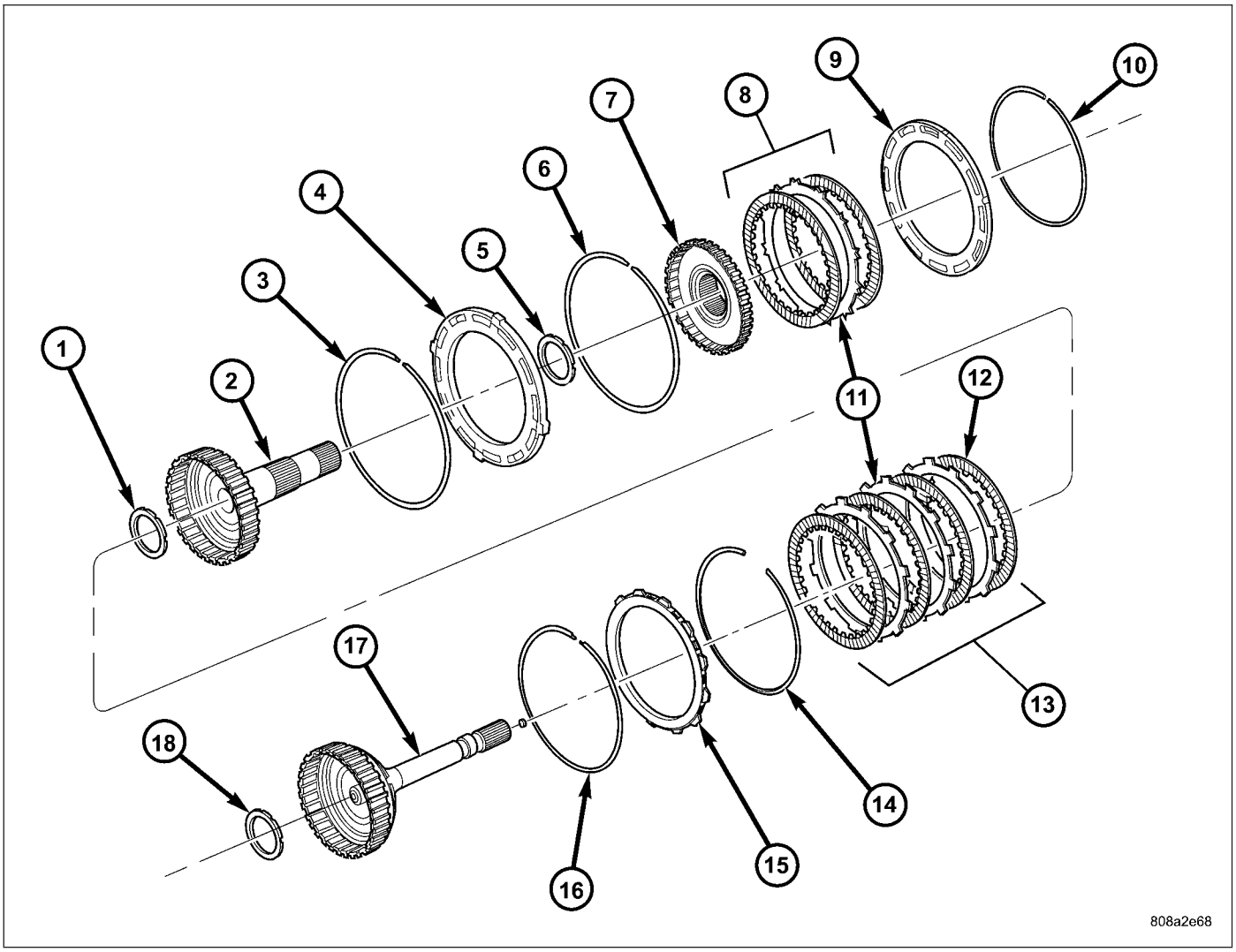
13. Install the UD/OD reaction plate lower flat snap-ring (16). The correct snap-ring can be identified by the two tabbed ears.
14. Install the UD/OD reaction plate (15) into the input clutch retainer. The reaction plate is to be installed with the big step down.
15. Install the UD/OD reaction plate upper tapered snap-ring (14) with tapered side up.

16. Install the input clutch assembly into Input Clutch Pressure Fixture 8260 (2).



17. Mount a dial indicator to the assembly, push down on the clutch discs and zero the indicator against the underdrive clutch discs. Apply 20 psi of air pressure to the underdrive clutch and record the dial indicator reading. Measure and record UD clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with UD clutch pack clearance specification. The correct clutch clearance is 0.84-1.54 mm (0.033-0.061 in.). The reaction plate is not selective. If the clutch clearance is not within specification, replace the reaction plate along with all the friction and steel discs.



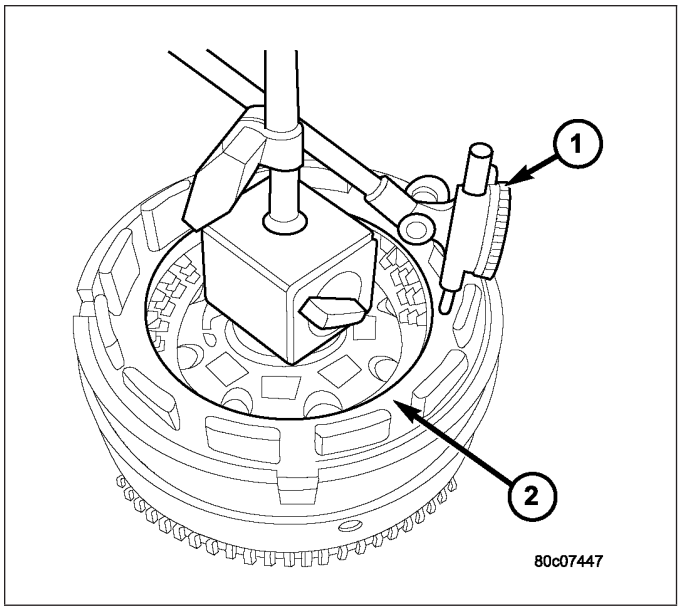


Input Clutch Assembly - Part 2

1 - THRUST BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - THRUST BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - THRUST BEARING NUMBER 2

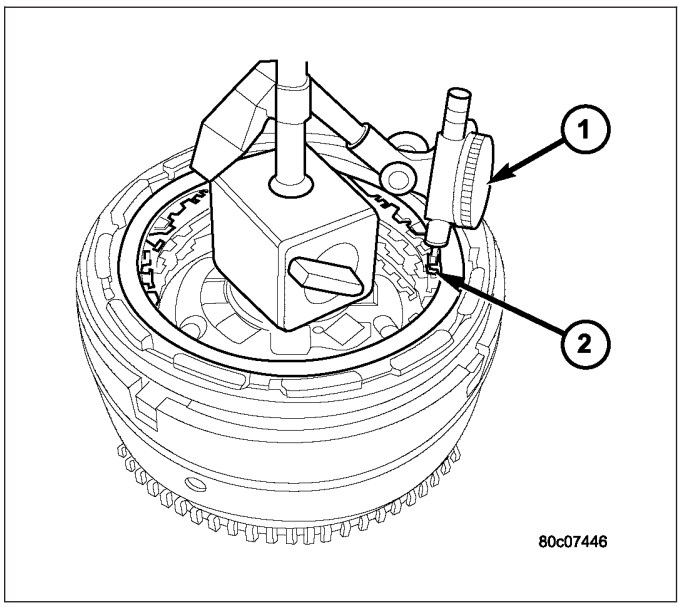
18. Install the overdrive clutch pack (13) into the input clutch retainer. The overdrive steel separator plates can be identified by the lack of the half-moon cuts in the locating tabs.
19. Install the overdrive clutch wavy snap-ring (3) with the two tabbed ears into the input clutch retainer.
20. Install the OD/reverse reaction plate (4) into the input clutch retainer. The reaction plate is non-directional.
21. Install the OD/reverse reaction plate flat snap-ring (6) into the input clutch retainer.

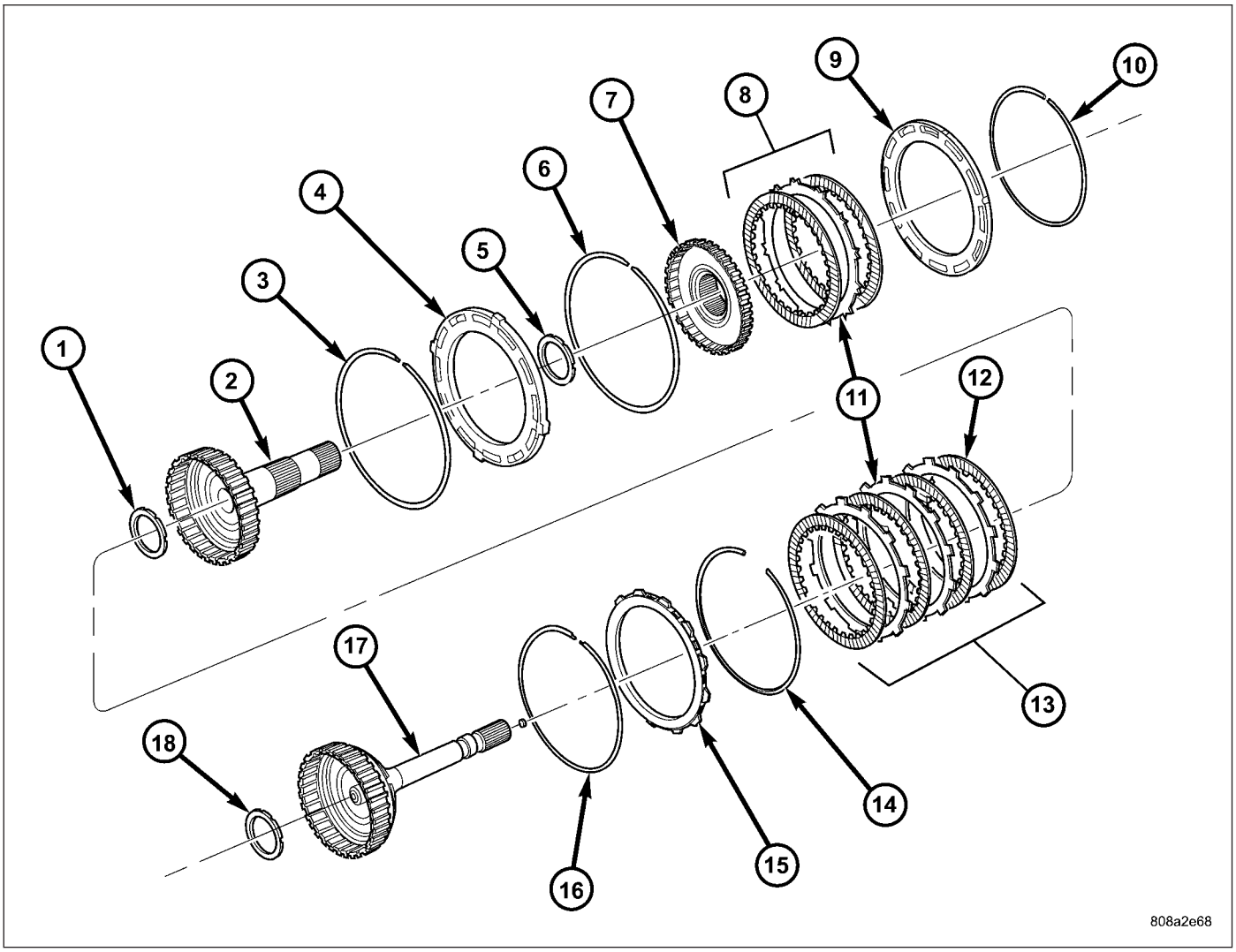
22. Mount a dial indicator to the assembly and zero the indicator against the OD/reverse reaction plate (2). Apply 20 psi of air pressure to the overdrive clutch and record the dial indicator reading. Measure and record OD clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with OD clutch pack clearance specification.Verify that the clutch clearance is 1.103-1.856 mm (0.043-0.073 in.). The reaction plate is not selective. If the clutch clearance is not within specification, replace the reaction plate along with all the friction and steel discs.



23. Install the reverse clutch pack (8) into the input clutch retainer.
24. Install the reverse reaction plate(9) into the input clutch retainer.
25. Install the reverse reaction plate selective snap-ring (10) into the input clutch retainer.

26. Mount a dial indicator to the assembly, push down on the clutch discs, pull up on the reaction plate to ensure the plate is properly seated and zero the indicator against the reverse clutch discs (2). Apply 20 psi of air pressure to the reverse clutch and record the dial indicator reading. Measure and record Reverse clutch pack measurement in four (4) places, 90° apart. Take average of four measurements and compare with Reverse clutch pack clearance specification. The correct clutch clearance is 0.58-1.47 mm (0.023-0.058 in.). Adjust as necessary. Install the chosen snap-ring and re-measure to verify selection.





Input Clutch Assembly - Part 2

1 - THRUST BEARING NUMBER 3
2 - OD HUB/SHAFT
3 - SNAP-RING (WAVE)
4 - REV/OD REACTION PLATE
5 - THRUST BEARING NUMBER 4
6 - SNAP-RING (FLAT)
7 - REVERSE HUB/SHAFT
8 - REVERSE CLUTCH
9 - REVERSE REACTION PLATE
10 - SNAP-RING (SELECT)
11 - PLATE
12 - DISC
13 - OD CLUTCH
14 - SNAP-RING (TAPERED)
15 - UD/OD REACTION PLATE
16 - SNAP-RING (FLAT)
17 - UD HUB/SHAFT
18 - THRUST BEARING NUMBER 2

27. Remove the reverse clutch pack (8) from the input clutch retainer.
28. Install the number 2 thrust bearing (18) onto the underdrive hub (17) with outer race against the hub with petroleum jelly.
29. Install the underdrive hub (17) into the input clutch retainer.
30. Install the number 3 thrust bearing (1) into the overdrive hub (2) with the outer race against the hub with petroleum jelly.
31. Install the overdrive hub (2) into the input clutch retainer.
32. Install the number 4 thrust bearing (5) into the reverse hub with outer race against the hub with petroleum jelly.
33. Install the reverse hub (7) into the input clutch retainer.
34. Install the complete reverse clutch pack (8).
35. Install the reverse reaction plate (9) and snap-ring (10).
36. Push up on reaction plate to allow reverse clutch to move freely.

SENSOR-INPUT SPEED

DESCRIPTION

The Input and Output Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

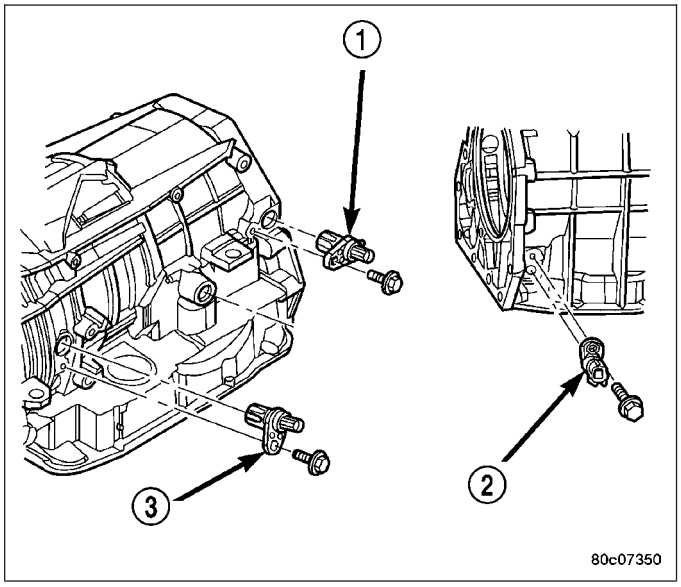
- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

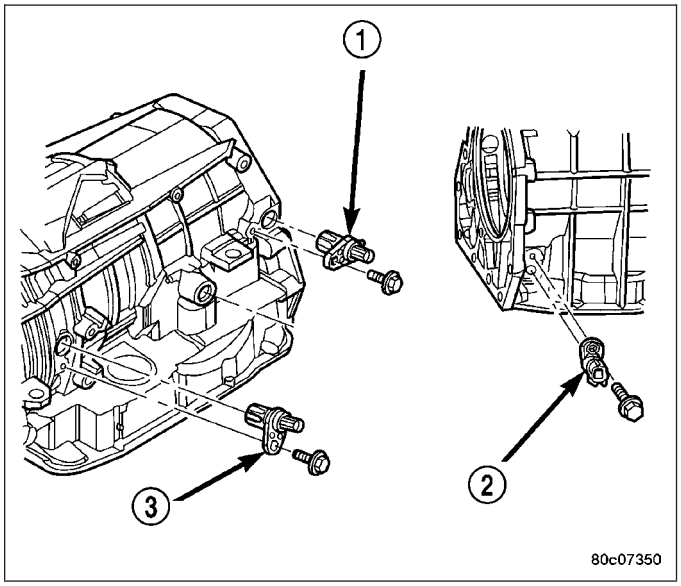
REMOVAL

1. Raise vehicle.
2. Place a suitable fluid catch pan under the transmission.
3. Remove the wiring connector from the input speed sensor (3).
4. Remove the bolt holding the input speed sensor to the transmission case.
5. Remove the input speed sensor (3) from the transmission case.



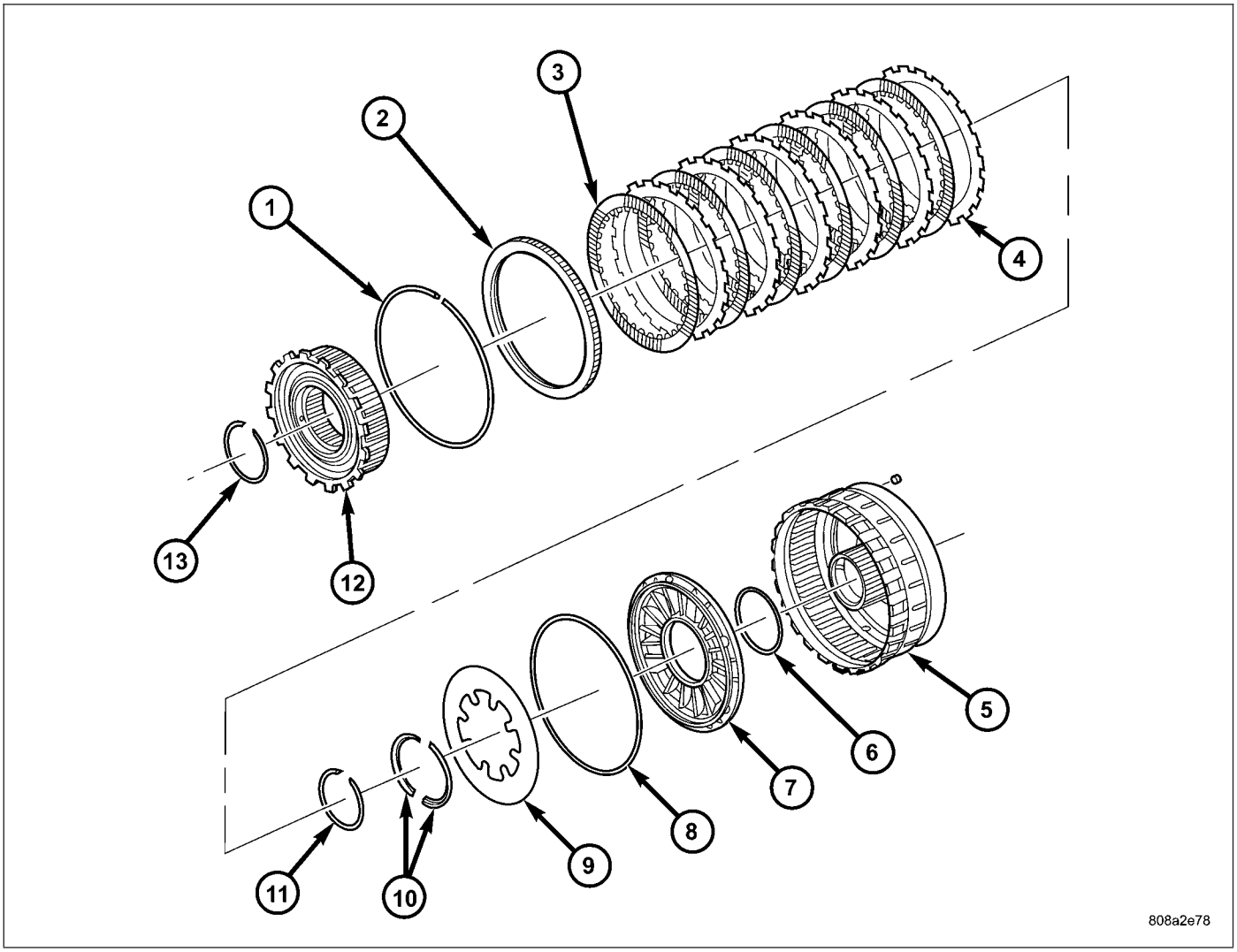
INSTALLATION

1. Install the input speed sensor (3) into the transmission case.
2. Install the bolt to hold the input speed sensor (3) into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).
3. Install the wiring connector onto the input speed sensor.
4. Verify the transmission fluid level. Add fluid as necessary.
5. Lower vehicle.



CLUTCH-LOW/REVERSE

DISASSEMBLY

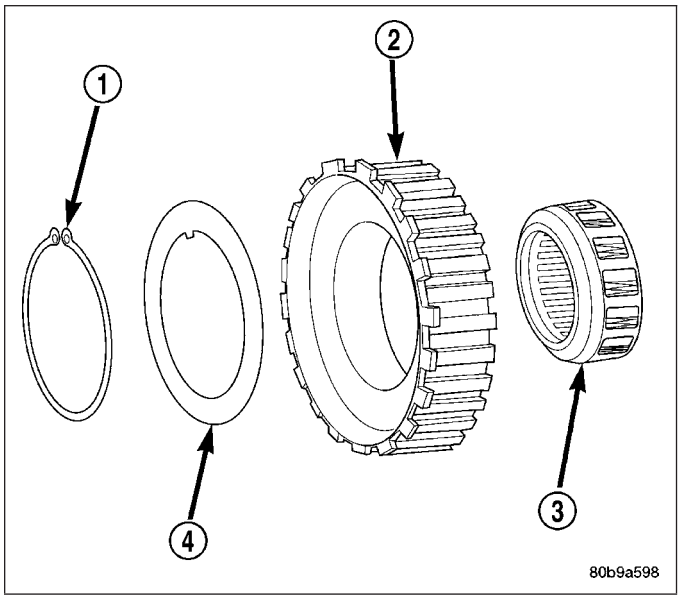


Low/Reverse Clutch Assembly

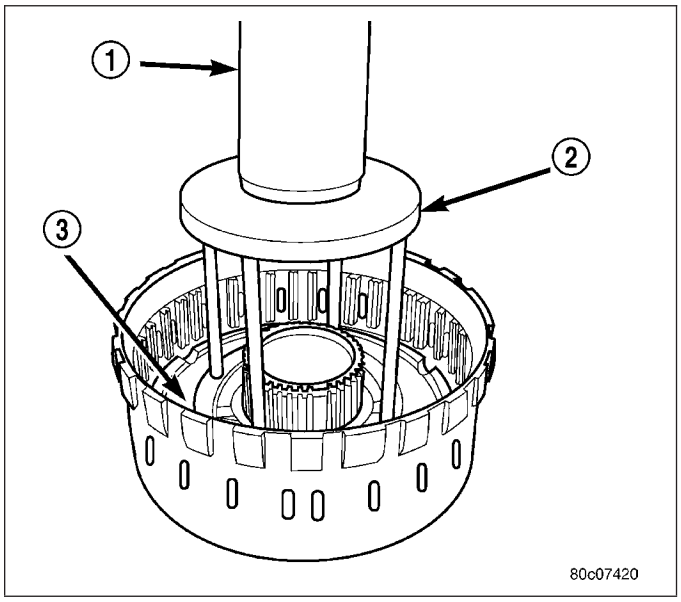
1 - SNAP-RING (SELECT)
2 - REACTION PLATE
3 - DISC
4 - PLATE
5 - L/R CLUTCH RETAINER
6 - SEAL
7 - PISTON
8 - SEAL
9 - BELLEVILLE SPRING
10 - RETAINER
11 - SNAP-RING
12 - OVERRUNNING CLUTCH
13 - SNAP-RING

1. Remove the inner overrunning clutch snap-ring (13) from the low/reverse clutch retainer (5).
2. Remove the outer low/reverse reaction plate flat snap-ring (1.
3. Remove the low/reverse clutch (3, 4) and the overrunning clutch (12) from the low/reverse clutch retainer (5) as an assembly.
4. Separate the low/reverse clutch (3, 4) from the overrunning clutch (12).

5. Remove the overrunning clutch snap-ring (1).
6. Remove the spacer (4) from the overrunning clutch (3).
7. Separate the inner and outer races (2) of the overrunning clutch (3).
8. Remove the overrunning clutch lower snap-ring.



9. Using Spring Compressor 8285 (2) and a suitable shop press (1), compress the low/reverse piston Belleville spring (3) and remove the split retaining ring holding the Belleville spring into the low/reverse clutch retainer.
10. Remove the low/reverse clutch Belleville spring (3) and piston from the low/reverse clutch retainer. Use 20 psi of air pressure to remove the piston if necessary.



CLEANING

Clean the overrunning clutch assembly, clutch cam, and low-reverse clutch retainer. Dry them with compressed air after cleaning.

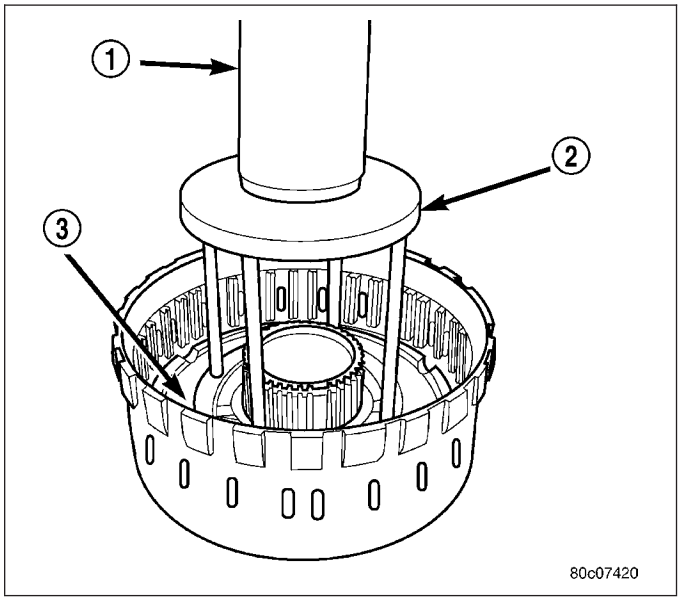
INSPECTION

Inspect condition of each clutch part after cleaning. Replace the overrunning clutch roller and spring assembly if any rollers or springs are worn or damaged, or if the roller cage is distorted, or damaged. Replace the cam if worn, cracked or damaged.

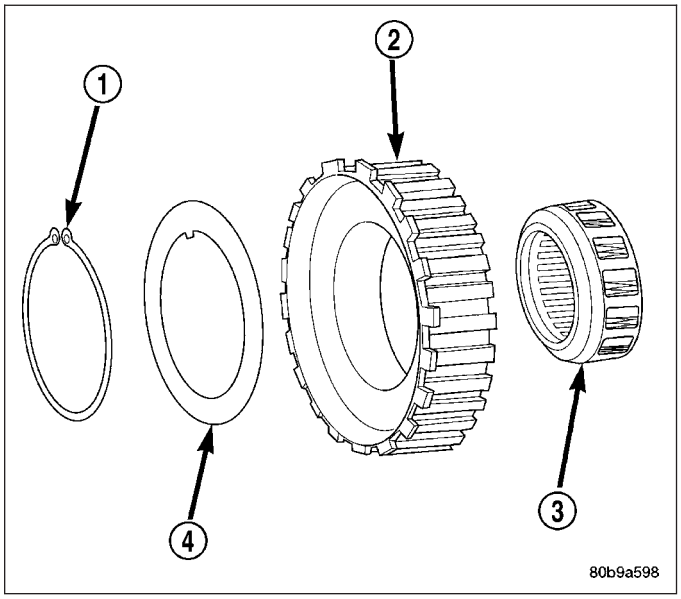
Replace the low-reverse clutch retainer if the clutch race, roller surface or inside diameter is scored, worn or damaged.

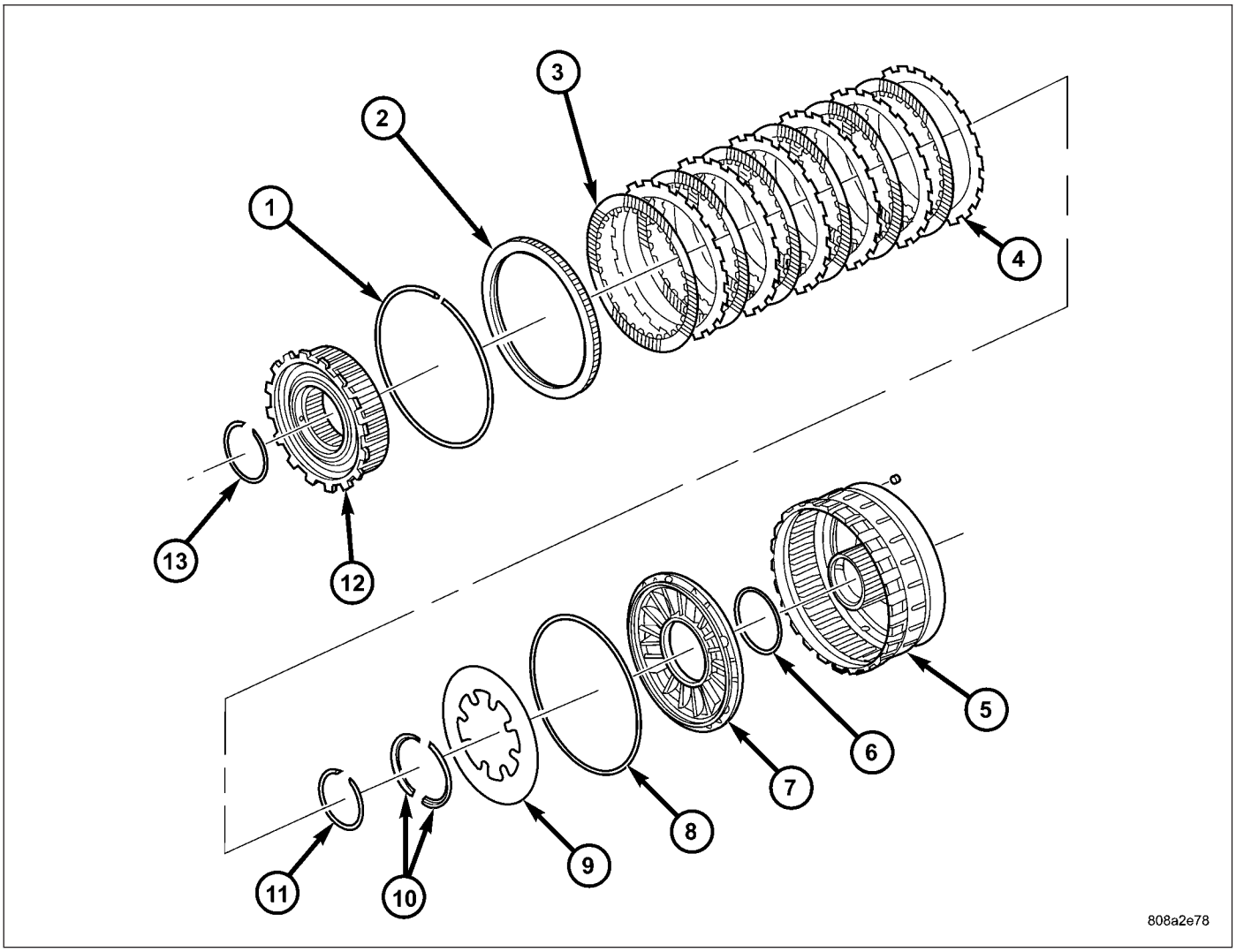
ASSEMBLY

1. Check the bleed orifice to ensure that it is not plugged or restricted.
2. Install a new seal on the low/reverse piston. Lubricate the seal with Mopar® ATF +4, Automatic Transmission Fluid, prior to installation.
3. Install the low/reverse piston into the low/reverse clutch retainer.
4. Position the low/reverse piston Belleville spring (3) on the low/reverse piston.
5. Using Spring Compressor 8285 (2) and a suitable shop press (1), compress the low/reverse piston Belleville spring (3) and install the split retaining ring to hold the Belleville spring into the low/reverse clutch retainer.



6. Install the lower overrunning clutch snap-ring.
7. Assemble the inner and outer races (2) of the overrunning clutch (3).
8. Position the overrunning clutch spacer (4) on the overrunning clutch (3).
9. Install the upper overrunning clutch snap-ring (1).





Low/Reverse Clutch Assembly

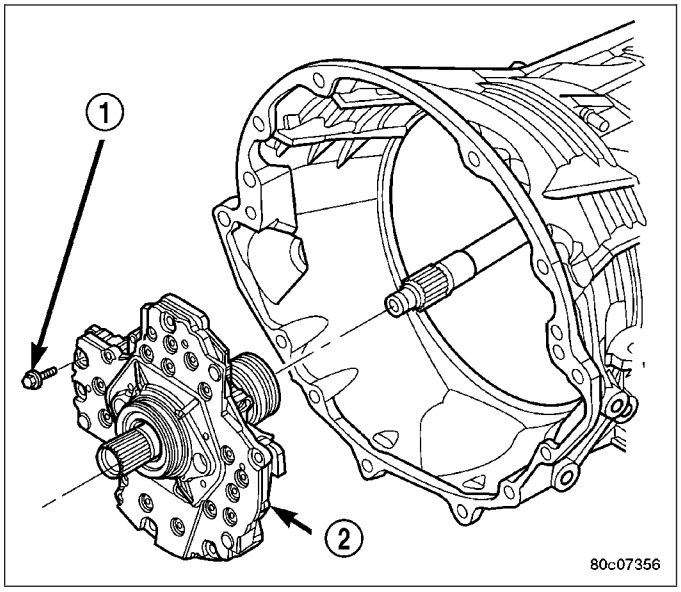
1 - SNAP-RING (SELECT)
2 - REACTION PLATE
3 - DISC
4 - PLATE
5 - L/R CLUTCH RETAINER
6 - SEAL
7 - PISTON
8 - SEAL
9 - BELLEVILLE SPRING
10 - RETAINER
11 - SNAP-RING
12 - OVERRUNNING CLUTCH
13 - SNAP-RING

10. Assemble and install the low/reverse clutch pack (3, 4) into the low/reverse clutch retainer (5).
11. Install the low/reverse reaction plate (2) into the low/reverse clutch retainer (5). The reaction plate is directional and must be installed with the flat side down.
12. Install the low/reverse clutch pack snap-ring (1). The snap-ring is selectable and should be chosen to give the correct clutch pack clearance.
13. Measure the low/reverse clutch pack clearance and adjust as necessary. The correct clutch clearance is 1.00-1.74 mm (0.039-0.075 in.).
14. Install the overrunning clutch (12) into the low/reverse clutch retainer (5) making sure that the index splines are aligned with the retainer.
15. Install the overrunning clutch inner snap-ring (13).

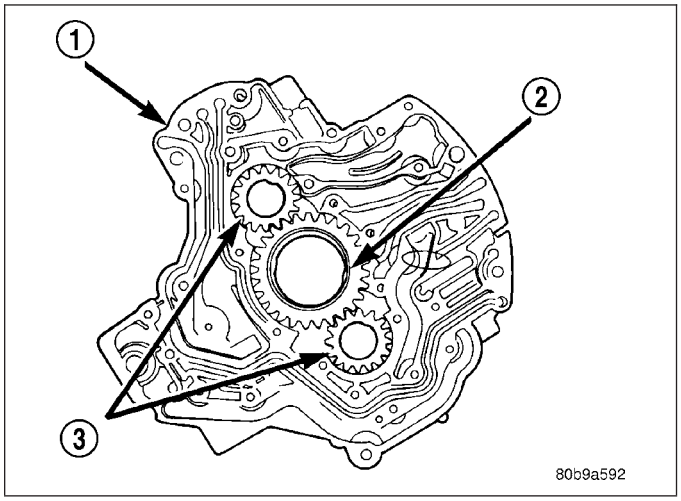
PUMP-OIL

DESCRIPTION

The oil pump (2) is located at the front of the transmission inside the bell housing and behind the transmission front cover.



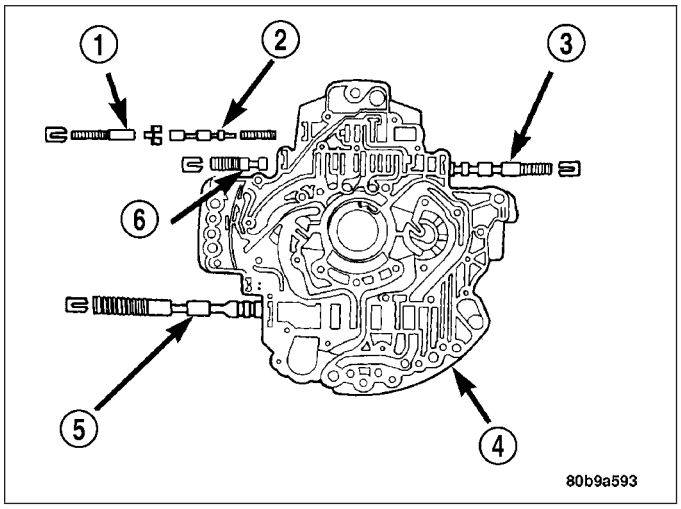
The oil pump consists of two independent pumps.

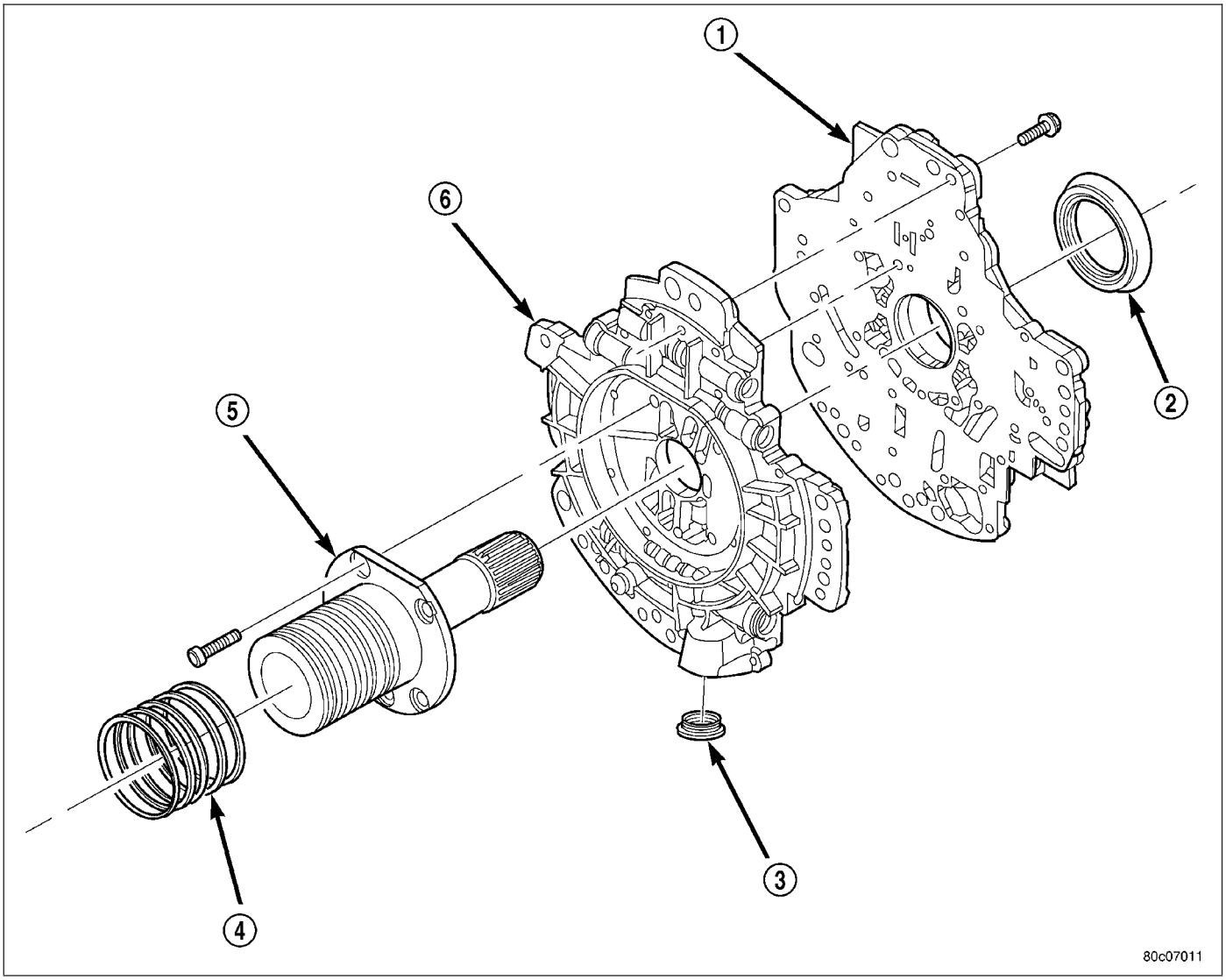


Oil Pump Gears

1 - PUMP HOUSING
2 - DRIVE GEAR
3 - DRIVEN GEARS

The oil pump also contains a number of valves. The converter clutch switch (3) and control valves (2), pressure regulator valve (5), and converter pressure limit valve (6) are all located in the oil pump valve body.





Oil Pump Reaction Shaft

1 - PUMP HOUSING
2 - SEAL
3 - OIL FILTER SEAL
4 - SEAL RING (5)
5 - REACTION SHAFT SUPPORT
6 - PUMP VALVE BODY

A front seal (2), and a bolt on reaction shaft (5) complete the oil pump assembly.

OPERATION

As the torque converter rotates, the converter hub rotates the oil pump drive gear. As the drive gear rotates both driven gears, a vacuum is created when the gear teeth come out of mesh. This suction draws fluid through the pump inlet from the oil pan. As the gear teeth come back into mesh, pressurized fluid is forced into the pump outlet and to the oil pump valves.

At low speeds, both sides of the pump supply fluid to the transmission. As the speed of the torque converter increases, the flow from both sides increases until the flow from the primary side alone is sufficient to meet system demands. At this point, the check valve located between the two pumps closes. The secondary side is shut down and the primary side supplies all the fluid to the transmission.

CONVERTER CLUTCH SWITCH VALVE

The converter clutch switch valve is used to control the hydraulic pressure supplied to the front (OFF) side of the torque converter clutch.

CONVERTER CLUTCH REGULATOR VALVE

The converter clutch regulator valve is used to control the hydraulic pressure supplied to the back (ON) side of the torque converter clutch.

TORQUE CONVERTER LIMIT VALVE

The torque converter limit valve serves to limit the available line pressure to the torque converter clutch.

STANDARD PROCEDURE - OIL PUMP VOLUME CHECK

Measuring the oil pump output volume will determine if sufficient oil flow to the transmission oil cooler exists, and whether or not an internal transmission failure is present.

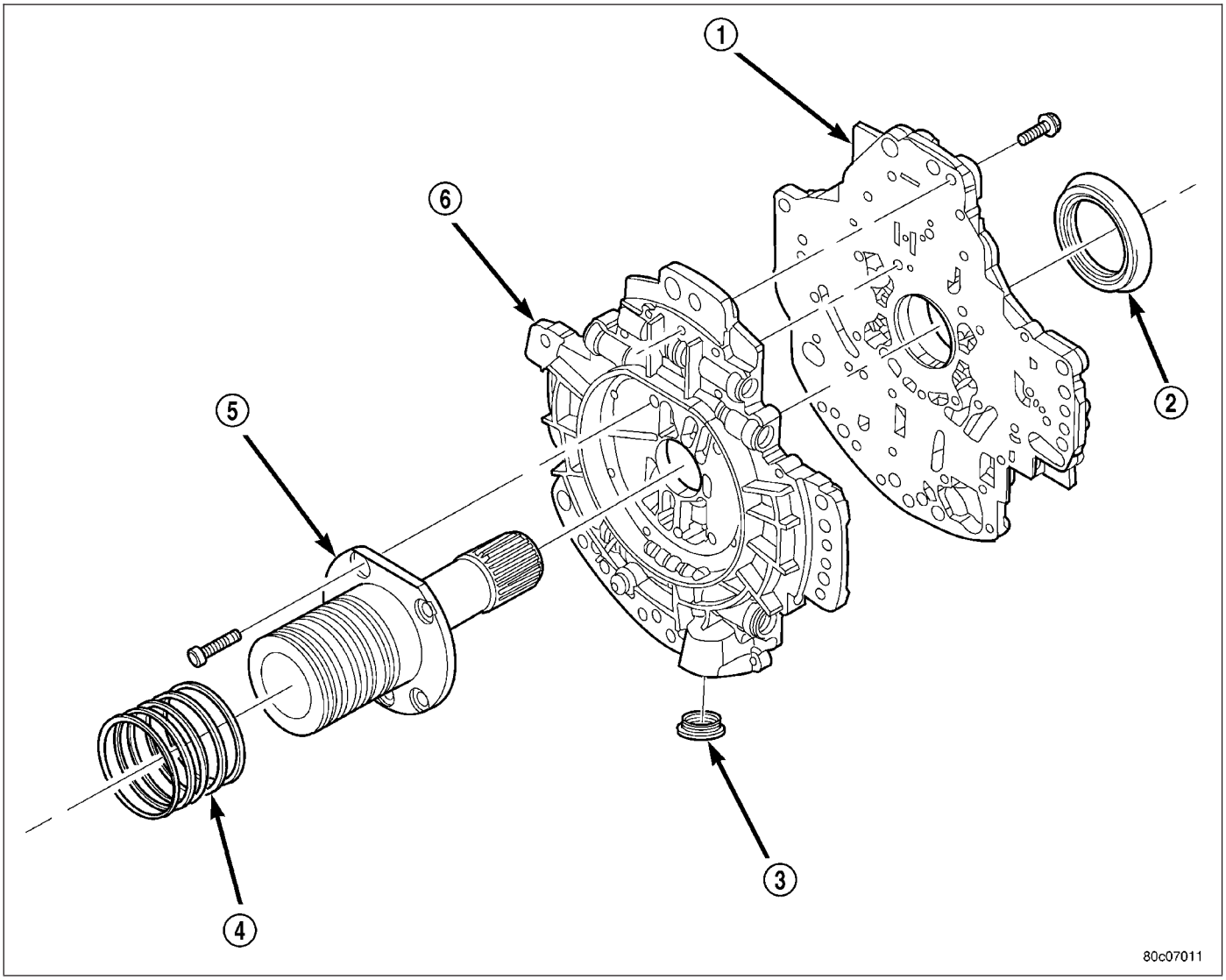
Verify that the transmission fluid is at the proper level. Refer to the Fluid Level Check procedure in this section. If necessary, fill the transmission to the proper level with Mopar® ATF +4, Automatic Transmission Fluid.

1. Disconnect the **To cooler** line at the cooler inlet and place a collecting container under the disconnected line.

CAUTION: With the fluid set at the proper level, fluid collection should not exceed (1) quart or internal damage to the transmission may occur.

2. Run the engine **at 1800 rpm**, with the shift selector in neutral. Verify that the transmission fluid temperature is below 104.5° C (220° F) for this test.
3. If one quart of transmission fluid is collected in the container in 30 seconds or less, oil pump flow volume is within acceptable limits. If fluid flow is intermittent, or it takes more than 30 seconds to collect one quart of fluid, refer to the Hydraulic Pressure tests in this section for further diagnosis.
4. Re-connect the **To cooler** line to the transmission cooler inlet.
5. Refill the transmission to proper level.

DISASSEMBLY

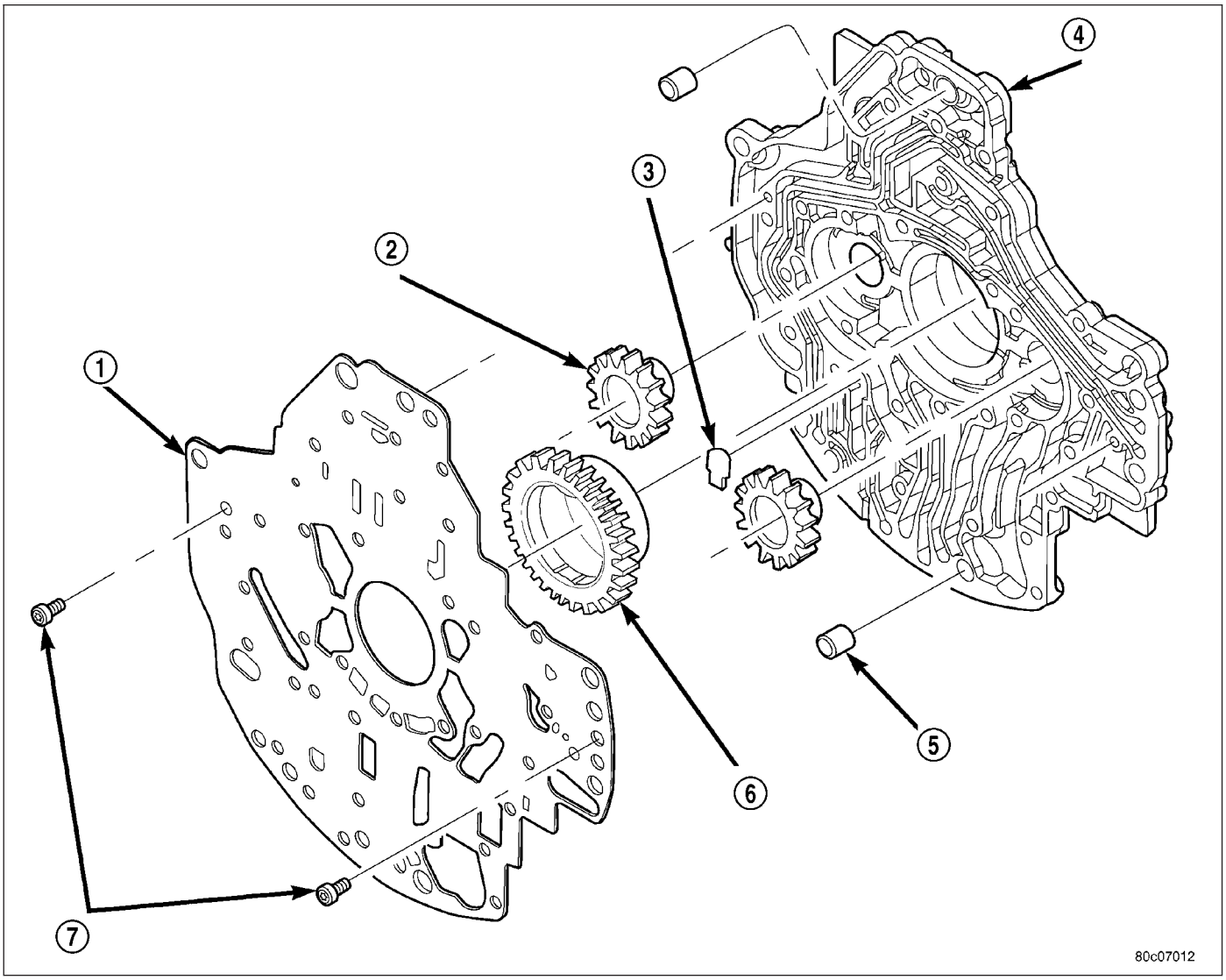


Oil Pump Assembly

1 - PUMP HOUSING
2 - SEAL
3 - OIL FILTER SEAL
4 - SEAL RING (5)
5 - REACTION SHAFT SUPPORT
6 - PUMP VALVE BODY

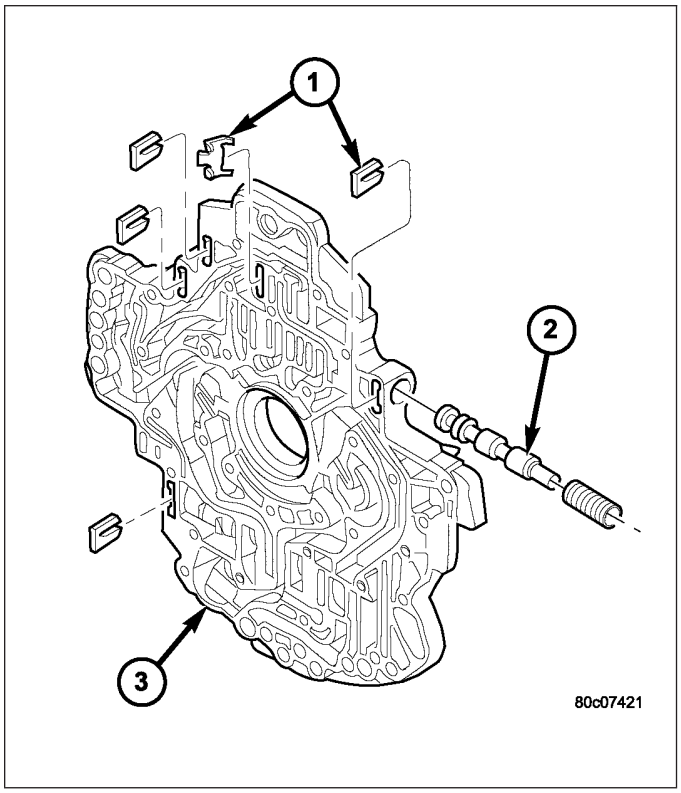
1. Remove the bolts holding the reaction shaft support (5) to the oil pump.
2. Remove the reaction shaft support (5) from the oil pump.
3. Remove all bolts holding the oil pump halves together.
4. Using suitable prying tools, separate the oil pump sections by inserting the tools in the supplied areas and prying the halves apart.

NOTE: The oil pump halves are aligned to each other through the use of two dowels. Be sure to pry upward evenly to prevent damage to the oil pump components.

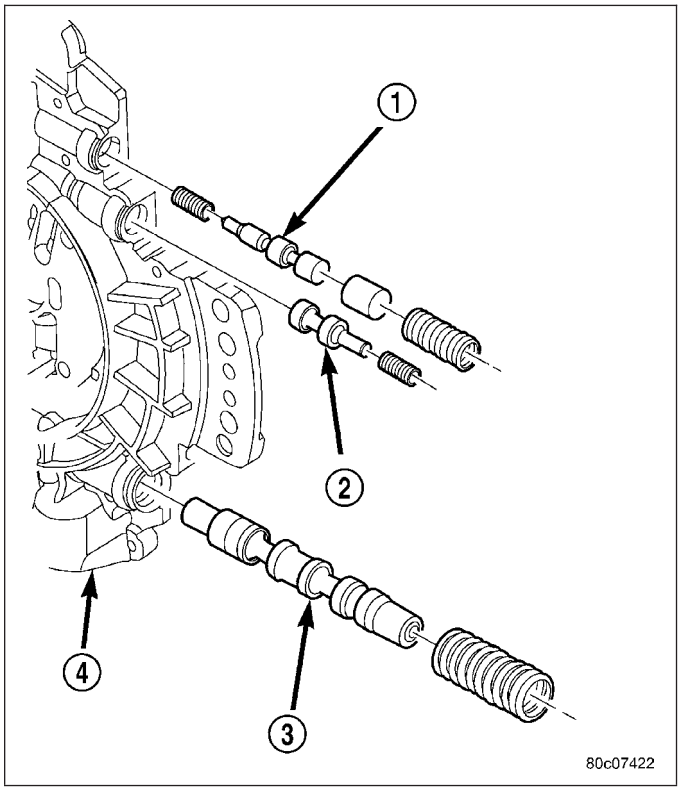


5. Remove the screws (7) holding the separator plate (1) onto the oil pump housing (4).
6. Remove the separator plate (1) from the oil pump housing (4).
7. Mark all gears for location. The gears are select fit and if the oil pump is to be reused, the gears must be returned to their original locations.
8. Remove the oil pump gears (2, 6) from the oil pump housing (4).

9. Remove the oil pump valve retainers (1) and associated valve (2) and spring one at a time. Mark the combination of components as a group and tag them as to the location from which they were removed.



10. Remove the T/C regulator valve (1), T/C limit valve (2), and regulator valve (3).



CLEANING

Clean pump and support components with solvent and dry them with compressed air.

INSPECTION

Check condition of the seal rings and thrust washer on the reaction shaft support. The seal rings do not need to be replaced unless cracked, broken, or severely worn.

Inspect the pump and support components. Replace the pump or support if the seal ring grooves or machined surfaces are worn, scored, pitted, or damaged. Replace the pump gears if pitted, worn chipped, or damaged.

Inspect the pump reaction shaft support bushings. Replace either bushing only if heavily worn, scored or damaged. It is not necessary to replace the bushings unless they are actually damaged.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.** Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

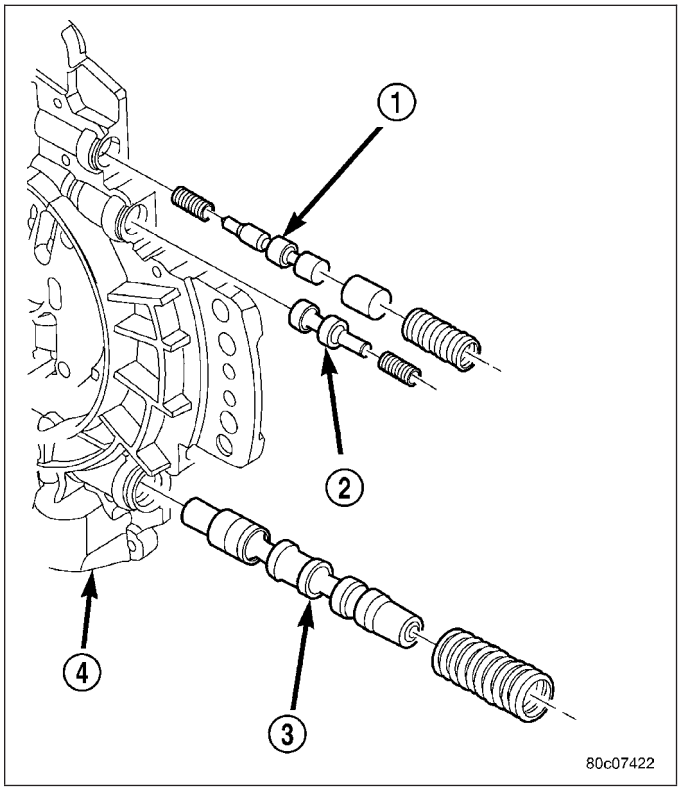
Inspect all the valve and plug bores in the oil pump cover. Use a penlight to view the bore interiors. Replace the oil pump if any bores are distorted or scored. Inspect all of the valve springs. The springs must be free of distortion, warpage or broken coils.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.

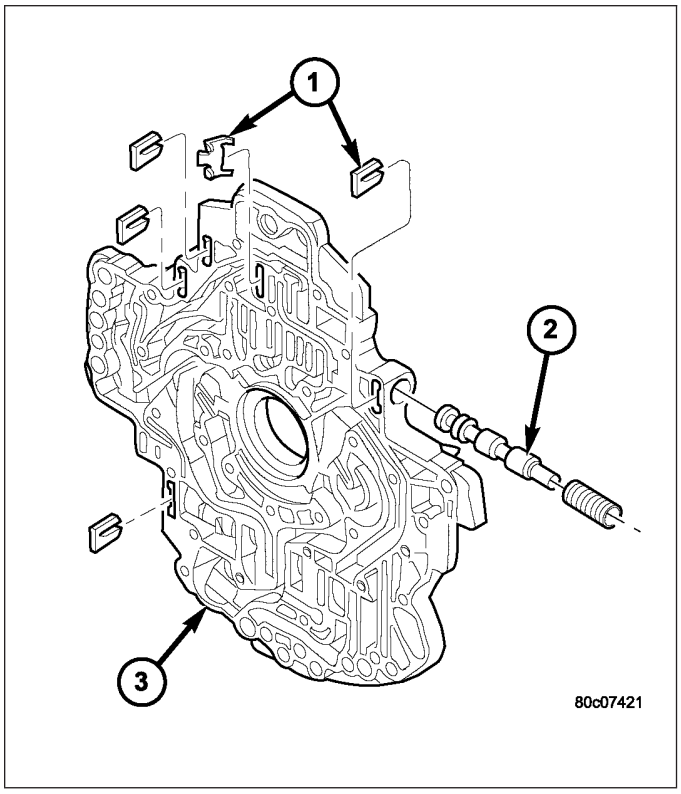
ASSEMBLY

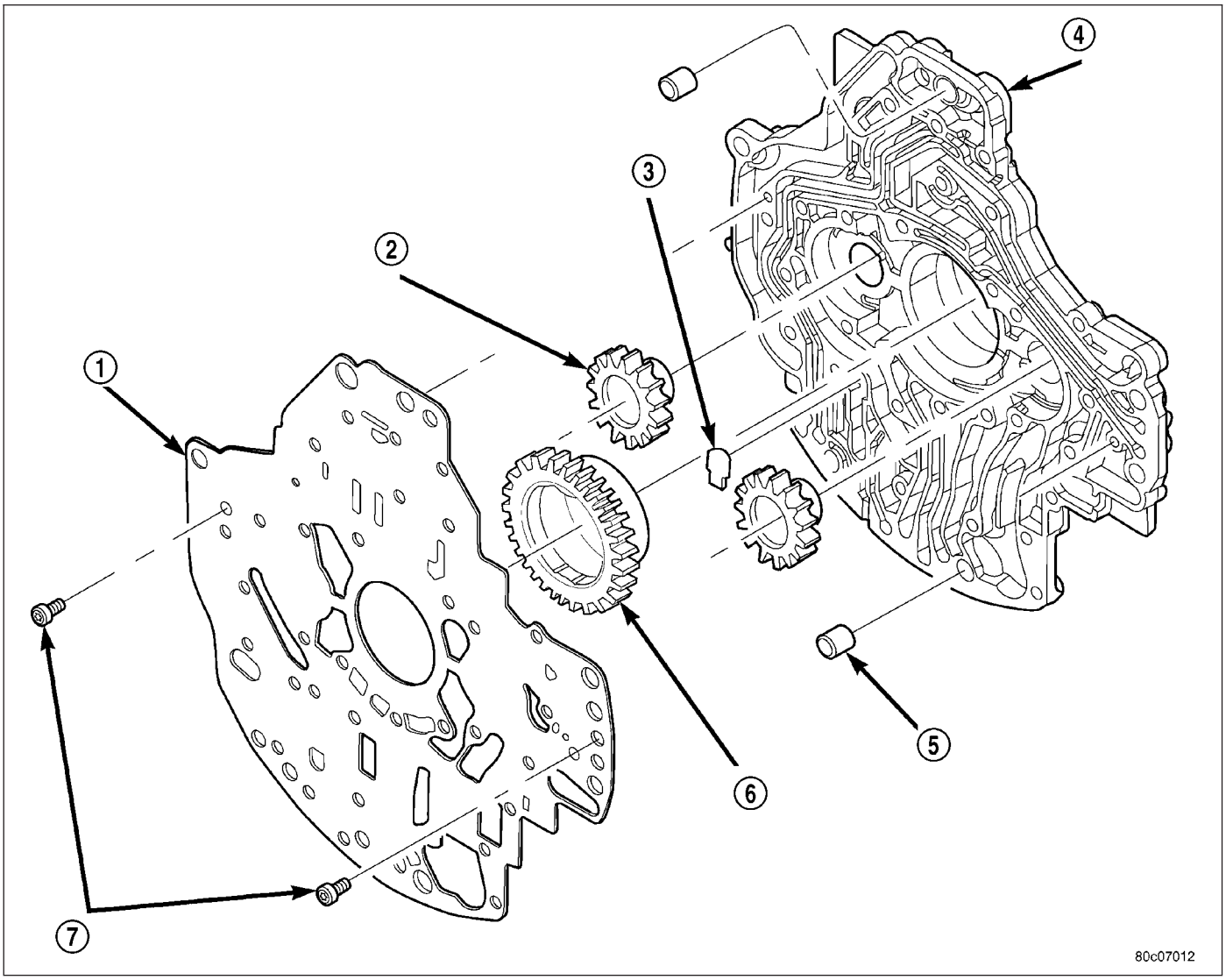
NOTE: Clean and inspect all components. Make sure that all passages are thoroughly cleaned and are free from dirt or debris. Make sure that all valves move freely in their proper bore. Make sure that all gear pockets and bushings are free from excessive wear and scoring. Replace the oil pump if any excessive wear or scoring is found.

1. Install the T/C regulator valve (1), T/C limit valve (2), and regulator valve (3).

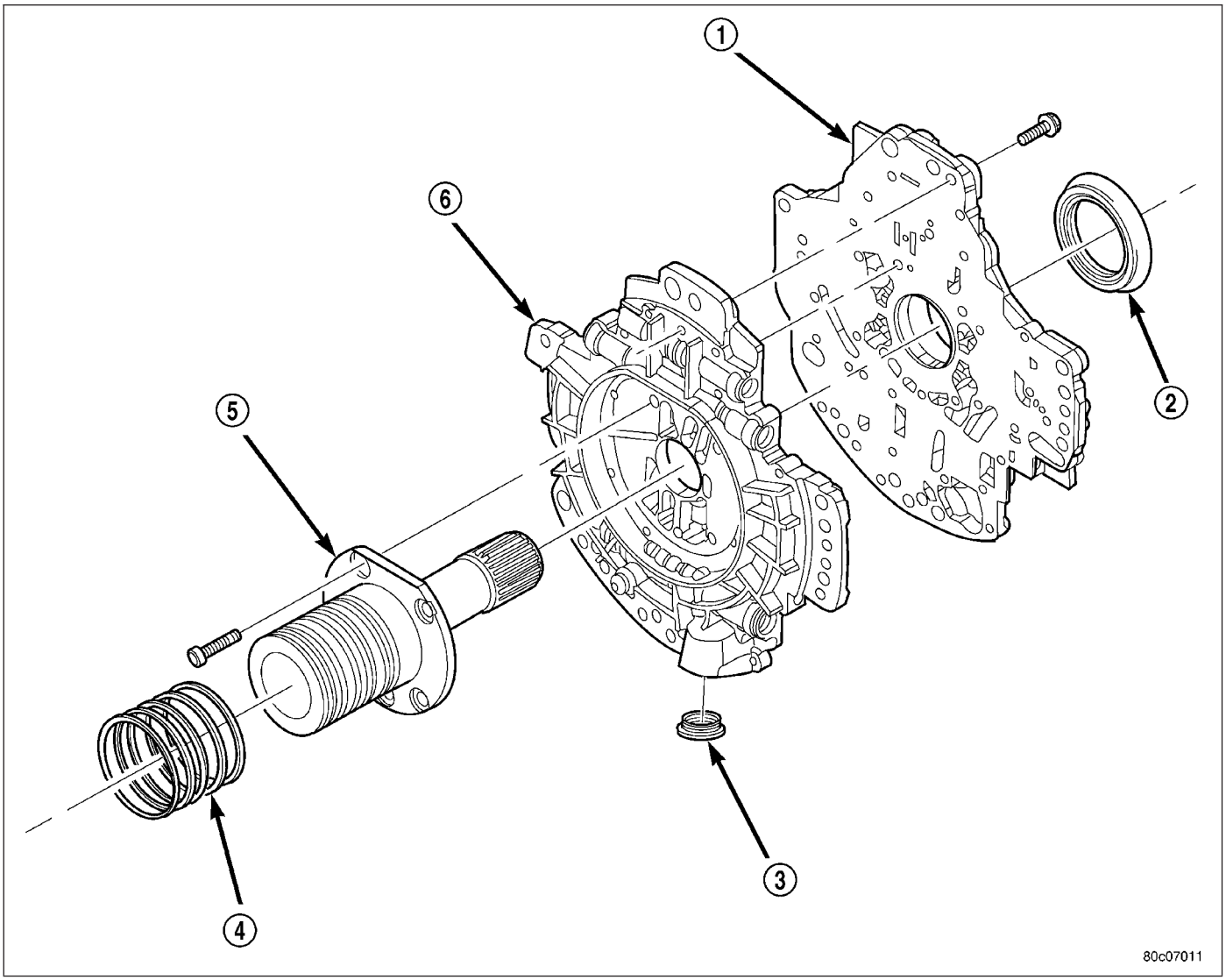


2. Lubricate the oil pump valves with Mopar® ATF +4 and install the valve (2), spring, and retainer (1) into the appropriate oil pump valve body (3) bore.





3. Coat the gears (2, 6) with Mopar® ATF +4 and install into their original locations.
4. Place the separator plate (1) onto the oil pump housing (4).
5. Install the screws(7) to hold the separator plate (1) onto the oil pump housing (4). Tighten the screws to 4.5 N·m (40 in.lbs.).



Oil Pump Assembly

1 - PUMP HOUSING	4 - SEAL RING (5)
2 - SEAL	5 - REACTION SHAFT SUPPORT
3 - OIL FILTER SEAL	6 - PUMP VALVE BODY

6. Position the oil pump valve body (6) onto the locating dowels.
7. Seat the two oil pump halves together and install all bolts finger tight.
8. Torque all bolts down slowly starting in the center and working outward. The correct torque is 4.5 N·m (40 in.lbs.).
9. Verify that the oil pump gears rotate freely and smoothly.
10. Position the reaction shaft support (5) onto the oil pump valve body (6).
11. Install and torque the bolts to hold the reaction shaft support (5) to the oil pump valve body (6). The correct torque is 12 N·m (105 in.lbs.).

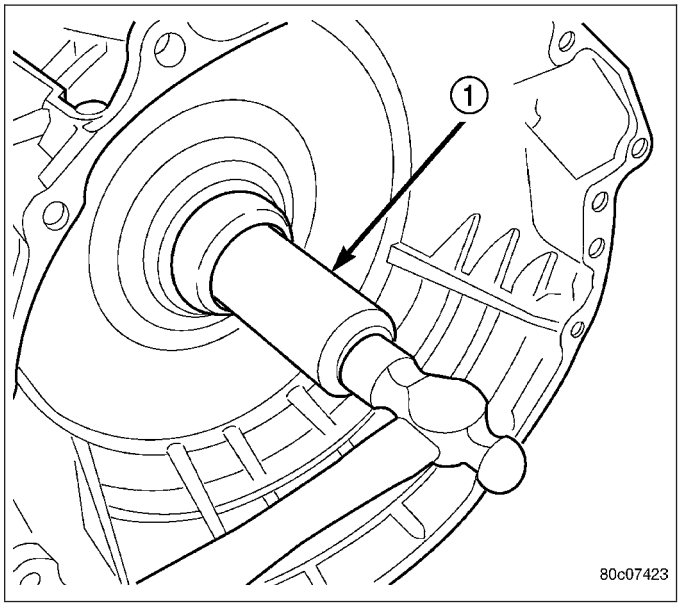
SEAL-OIL PUMP FRONT

REMOVAL

1. Remove transmission from the vehicle.
2. Remove the torque converter from the transmission.
3. Using a screw mounted in a slide hammer, remove the oil pump front seal.

INSTALLATION

1. Clean seal bore of the oil pump of any residue or particles from the original seal.
2. Install new oil seal in the oil pump housing using Seal Installer C-3860-A (1).



SENSOR-OUTPUT SPEED

DESCRIPTION

The Input and Output Speed Sensors are two-wire magnetic pickup devices that generate AC signals as rotation occurs. They are mounted in the left side of the transmission case and are considered primary inputs to the Transmission Control Module (TCM).

OPERATION

The Input Speed Sensor provides information on how fast the input shaft is rotating. As the teeth of the input clutch hub pass by the sensor coil, an AC voltage is generated and sent to the TCM. The TCM interprets this information as input shaft rpm.

The Output Speed Sensor generates an AC signal in a similar fashion, though its coil is excited by rotation of the rear planetary carrier lugs. The TCM interprets this information as output shaft rpm.

The TCM compares the input and output speed signals to determine the following:

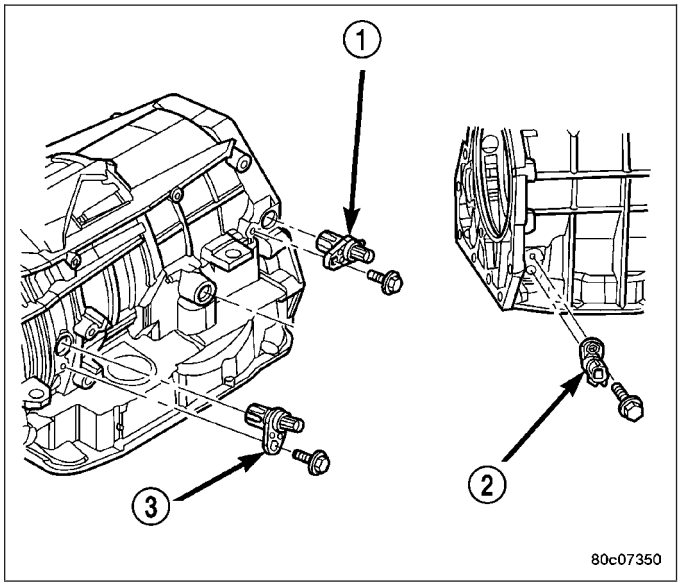
- Transmission gear ratio
- Speed ratio error detection
- CVI calculation

The TCM also compares the input speed signal and the engine speed signal to determine the following:

- Torque converter clutch slippage
- Torque converter element speed ratio

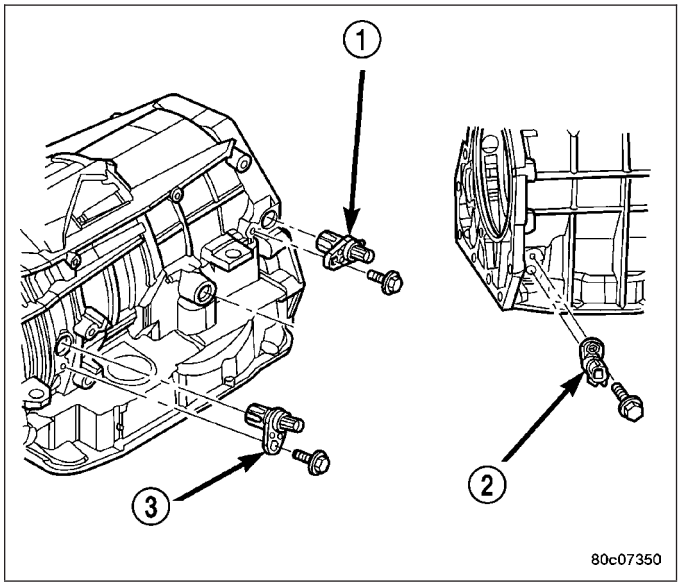
REMOVAL

1. Raise vehicle.
2. Place a suitable fluid catch pan under the transmission.
3. Remove the wiring connector from the output speed sensor (1).
4. Remove the bolt holding the output speed sensor (1) to the transmission case.
5. Remove the output speed sensor (1) from the transmission case.



INSTALLATION

1. Install the output speed sensor (1) into the transmission case.
2. Install the bolt to hold the output speed sensor (1) into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).
3. Install the wiring connector onto the output speed sensor (1).
4. Verify the transmission fluid level. Add fluid as necessary.
5. Lower vehicle.



SENSOR-LINE PRESSURE

DESCRIPTION

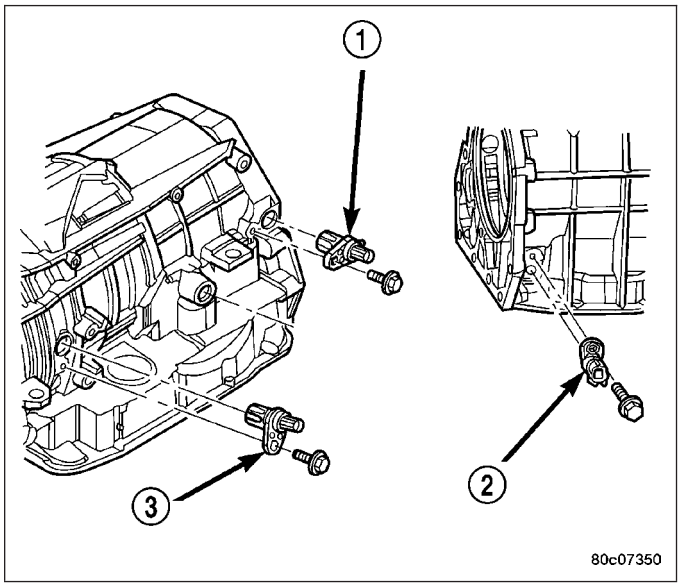
The TCM utilizes a closed-loop system to control transmission line pressure. The system contains a variable force style solenoid, the Pressure Control Solenoid, mounted on the side of the solenoid and pressure switch assembly. The solenoid is duty cycle controlled by the TCM to vent the unnecessary line pressure supplied by the oil pump back to the sump. The system also contains a variable pressure style sensor, the Line Pressure Sensor, which is a direct input to the TCM. The line pressure solenoid monitors the transmission line pressure and completes the feedback loop to the TCM. The TCM uses this information to adjust its control of the pressure control solenoid to achieve the desired line pressure.

OPERATION

The TCM calculates the desired line pressure based upon inputs from the transmission and engine. The TCM calculates the torque input to the transmission and uses that information as the primary input to the calculation. The line pressure is set to a predetermined value during shifts and when the transmission is in the PARK and NEUTRAL positions. This is done to ensure consistent shift quality. During all other operation, the actual line pressure is compared to the desired line pressure and adjustments are made to the pressure control solenoid duty cycle.

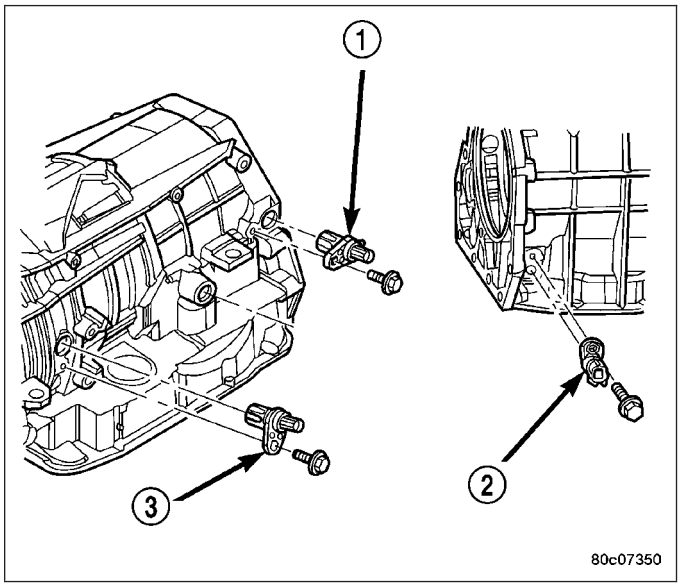
REMOVAL

1. Raise vehicle.
2. Place a suitable fluid catch pan under the transmission.
3. Remove the wiring connector from the line pressure sensor (2).
4. Remove the bolt holding the line pressure sensor (2) to the transmission case.
5. Remove the line pressure sensor (2) from the transmission case.



INSTALLATION

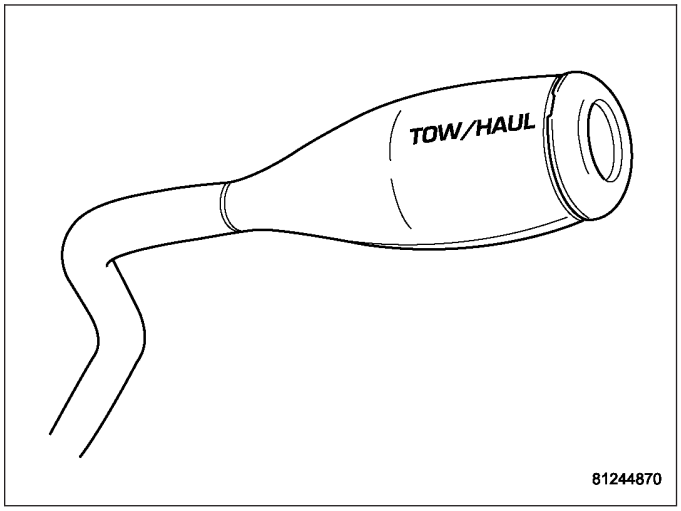
1. Install the line pressure sensor (2) into the transmission case.
2. Install the bolt to hold the line pressure sensor (2) into the transmission case. Tighten the bolt to 11.9 N·m (105 in.lbs.).
3. Install the wiring connector onto the line pressure sensor (2).
4. Verify the transmission fluid level. Add fluid as necessary.
5. Lower vehicle.



SWITCH-TOW/HAUL OVERDRIVE

DESCRIPTION

The tow/haul overdrive OFF (control) switch is located in the shift lever arm. The switch is a momentary contact device that signals the PCM to toggle current status of the overdrive function.

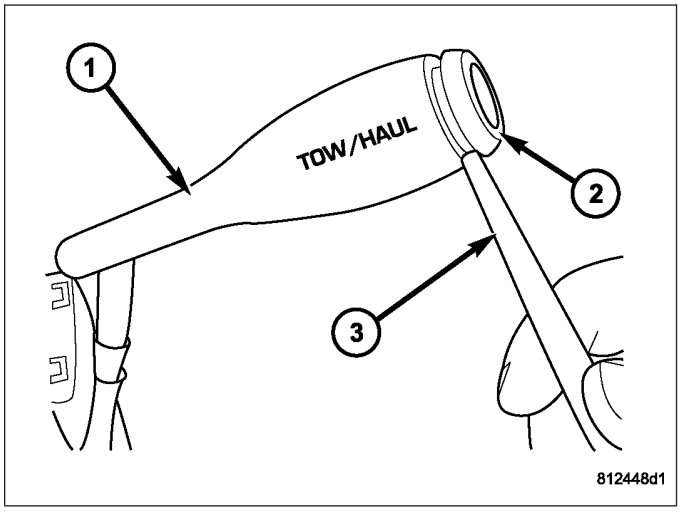


OPERATION

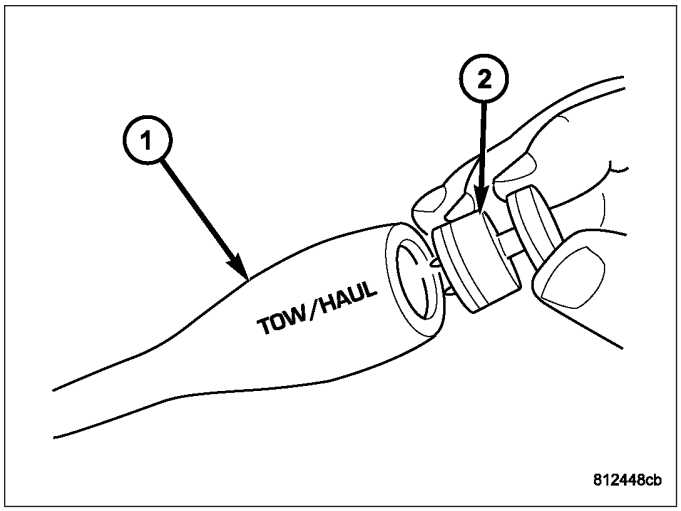
At key-on, overdrive operation is allowed. Pressing the switch once causes the tow/haul overdrive OFF mode to be entered and the Tow/Haul lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the tow/haul lamp to be turned off. The tow/haul overdrive OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoid and allow a 3-4 upshift. The control switch indicator light illuminates only when the tow/haul overdrive switch is turned to the OFF position, or when illuminated by the transmission control module.

REMOVAL

1. Using a plastic trim tool, remove the tow/haul overdrive off switch retainer (2) from the shift lever (1).



2. Pull the switch (2) outwards to release it from the connector in the lever (1)



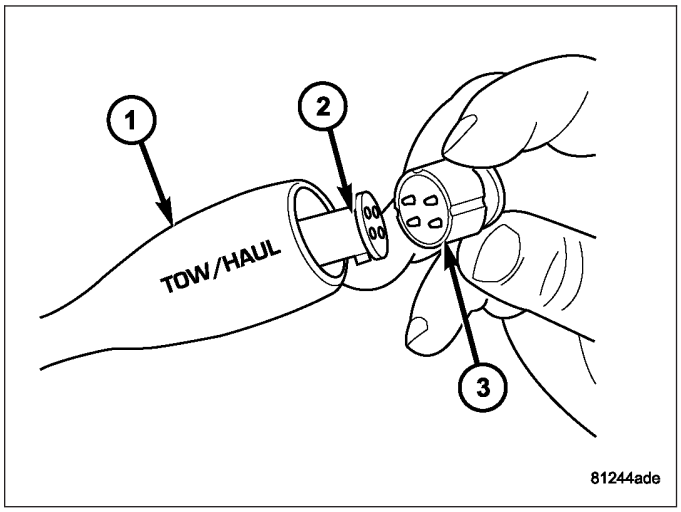
INSTALLATION

NOTE: There is enough slack in the wire to pull out the connector from the lever.

1. Pull the connector (2) out of the lever (1) just enough to grasp it.

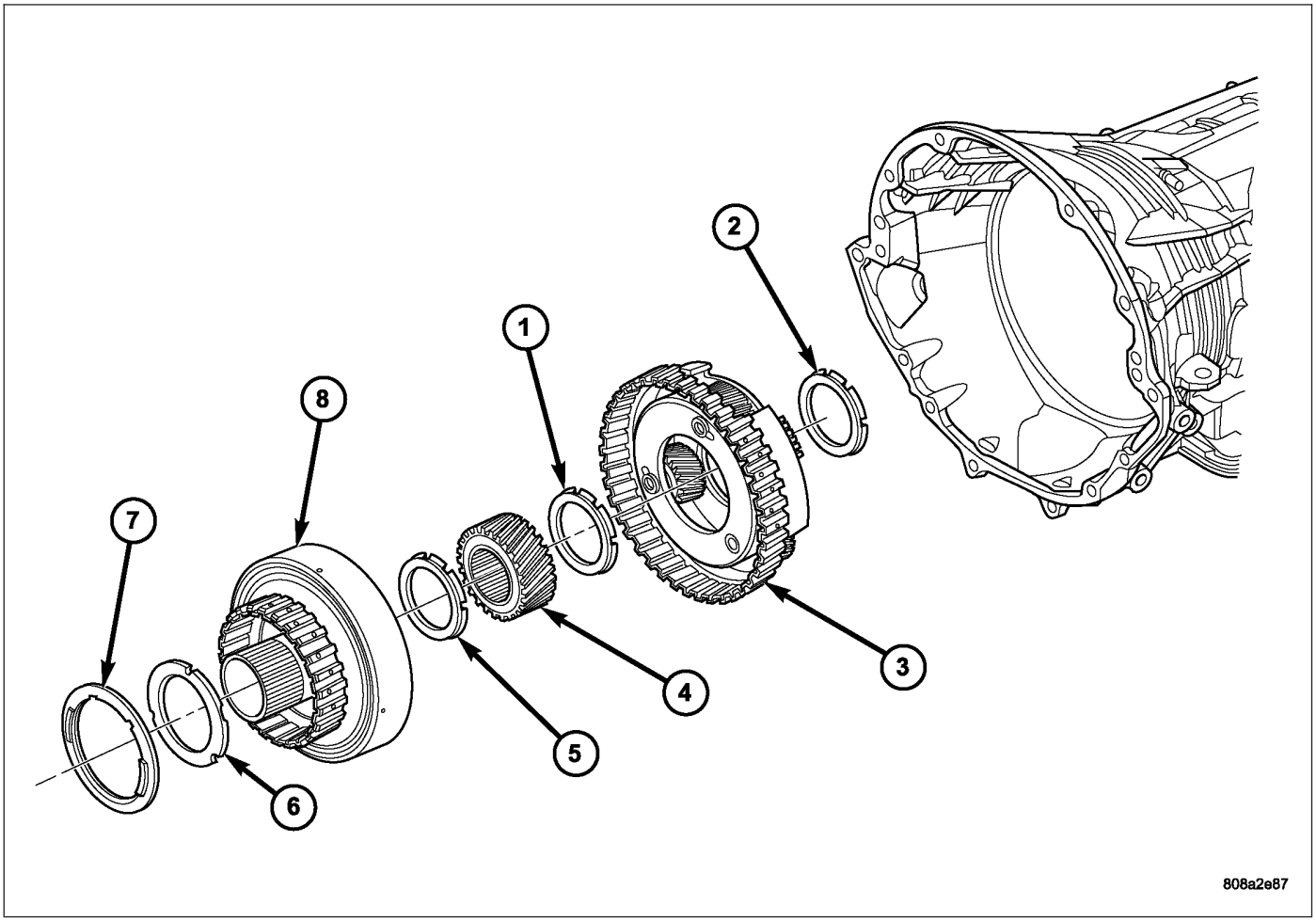
CAUTION: Be careful not to bend the pins on the tow/haul overdrive off switch. Use care when installing the switch, as it is not indexed, and can be accidentally installed incorrectly.

2. Install the tow/haul overdrive off switch (3) into the connector (2)
3. Push the tow/haul overdrive off switch (3) and wiring into the shift lever (1).
4. Install the tow/haul overdrive off switch retainer onto the shift lever.



GEARTRAIN-PLANETARY

DESCRIPTION

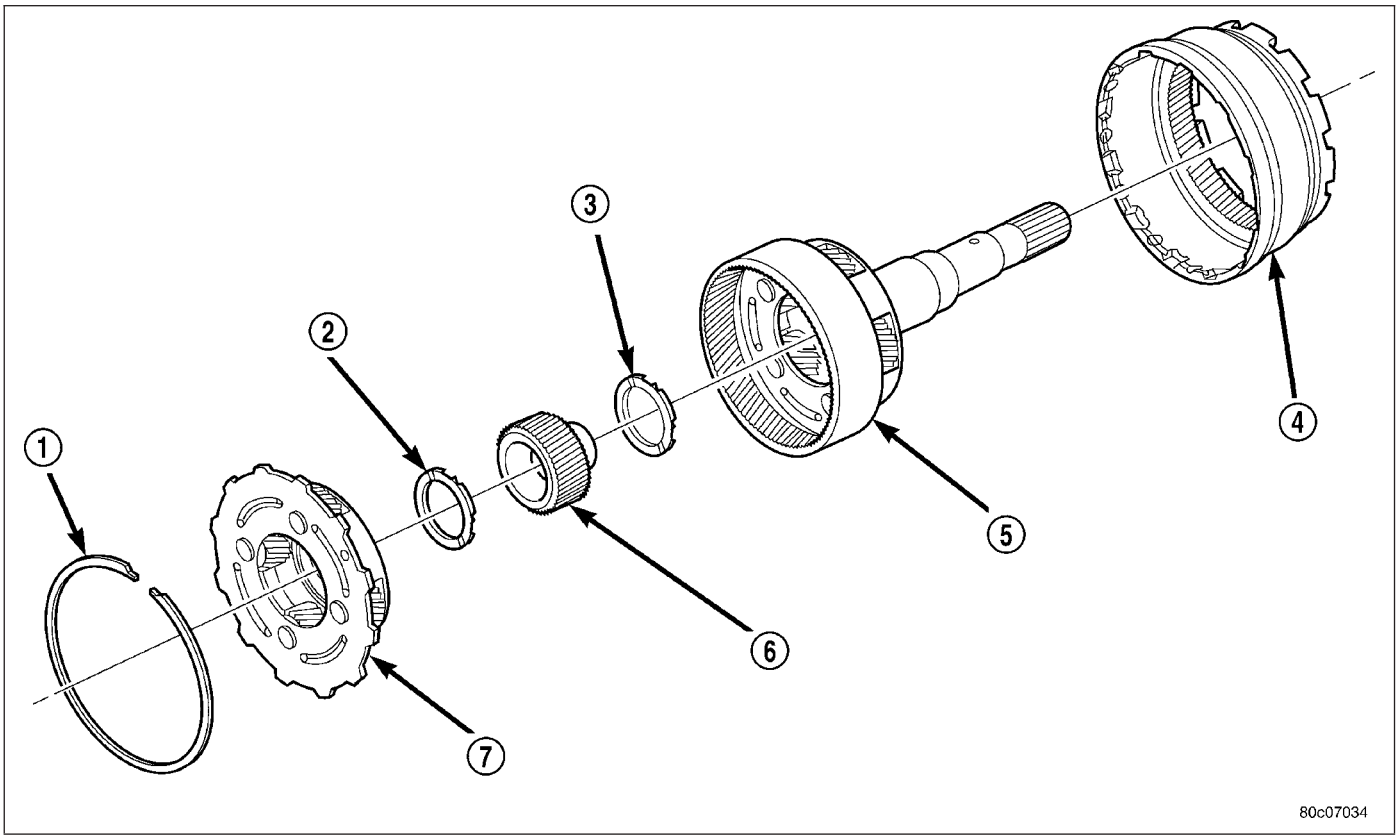


Reaction Planetary Geartrain

1 - THRUST BEARING NUMBER 8
2 - THRUST BEARING NUMBER 9
3 - REACTION PLANETARY CARRIER
4 - REACTION SUN GEAR
5 - THRUST BEARING NUMBER 7
6 - THRUST PLATE (SELECT)
7 - THRUST BEARING NUMBER 6
8 - REACTION ANNULUS

The planetary geartrain is located behind the 4C retainer/bulkhead, toward the rear of the transmission. The planetary geartrain consists of three primary assemblies:

- Reaction (3, 4, 8).



Reverse/Input Planetary Geartrain

1 - SNAP-RING
2 - THRUST BEARING NUMBER 10
3 - THRUST BEARING NUMBER 11
4 - INPUT ANNULUS
5 - INPUT PLANETARY CARRIER
6 - INPUT SUN GEAR
7 - REVERSE PLANETARY CARRIER

- Reverse (7).
- Input (4, 5, 6).

OPERATION

REACTION PLANETARY GEARTRAIN

The reaction planetary carrier and reverse sun gear of the reaction planetary geartrain are a single component which is held by the 2C clutch when required. The reaction annulus gear is a stand alone component that can be driven by the reverse clutch or held by the 4C clutch. The reaction sun gear is driven by the overdrive clutch.

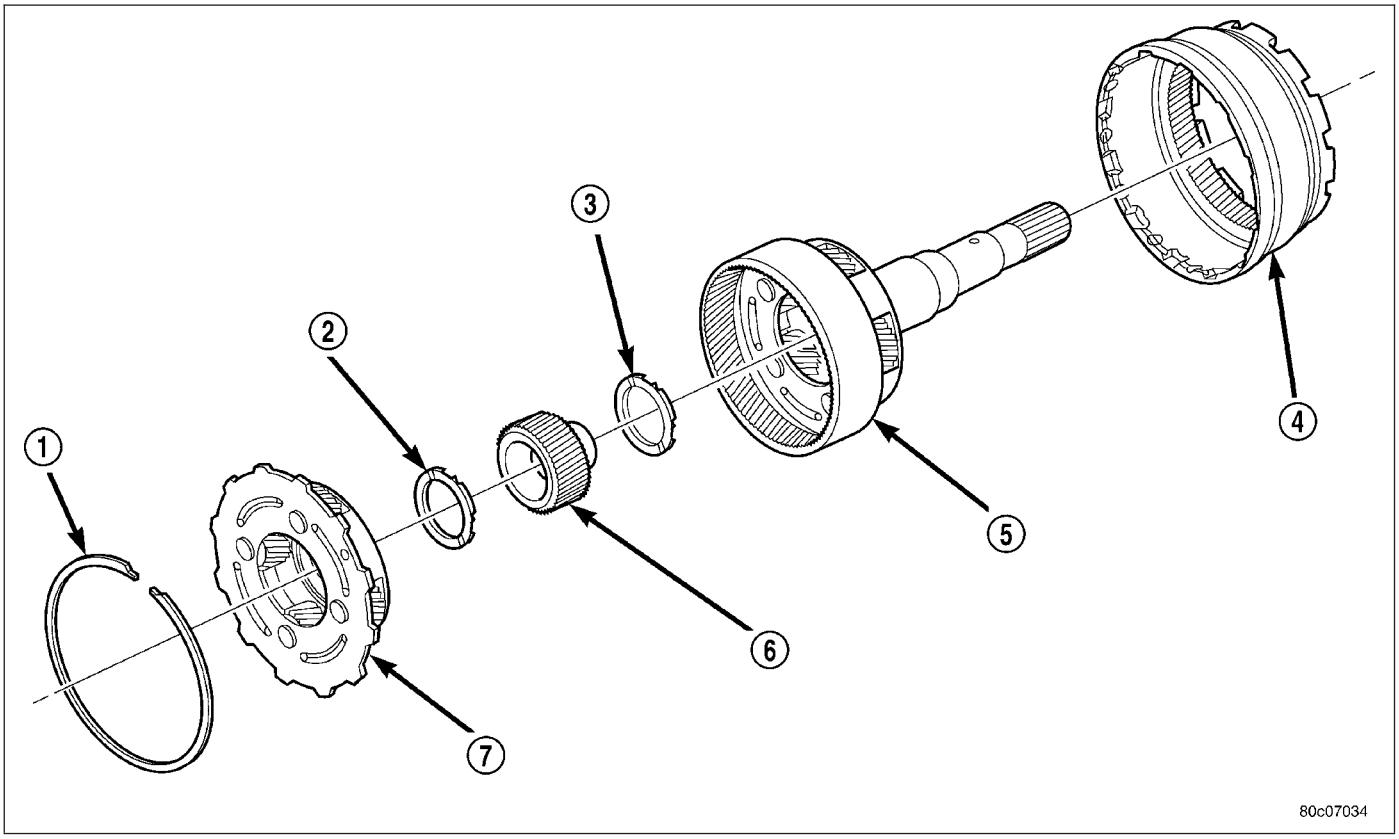
REVERSE PLANETARY GEARTRAIN

The reverse planetary geartrain is the middle of the three planetary sets. The reverse planetary carrier can be driven by the overdrive clutch as required. The reverse planetary carrier is also splined to the input annulus gear, which can be held by the low/reverse clutch. The reverse planetary annulus, input planetary carrier, and output shaft are all one piece.

INPUT PLANETARY GEARTRAIN

The input sun gear of the input planetary geartrain is driven by the underdrive clutch.

DISASSEMBLY



Reverse/Input Planetary Carrier Assembly

1 - SNAP-RING
2 - THRUST BEARING NUMBER 10
3 - THRUST BEARING NUMBER 11
4 - INPUT ANNULUS
5 - INPUT PLANETARY CARRIER
6 - INPUT SUN GEAR
7 - REVERSE PLANETARY CARRIER

1. Remove the snap-ring (1) holding the input annulus (4) into the input carrier (5).
2. Remove the input annulus (4) from the input carrier (5).
3. Remove the number 9 thrust bearing from the reverse planetary carrier. Note that this planetary carrier has four pinion gears.
4. Remove the reverse planetary gear carrier (7).
5. Remove the number 10 thrust bearing (2) from the input sun gear (6).
6. Remove the input sun gear (6) from the input carrier (5).
7. Remove the number 11 thrust bearing (3) from the input carrier (5).

CLEANING

Clean the planetary components in solvent and dry them with compressed air.

INSPECTION

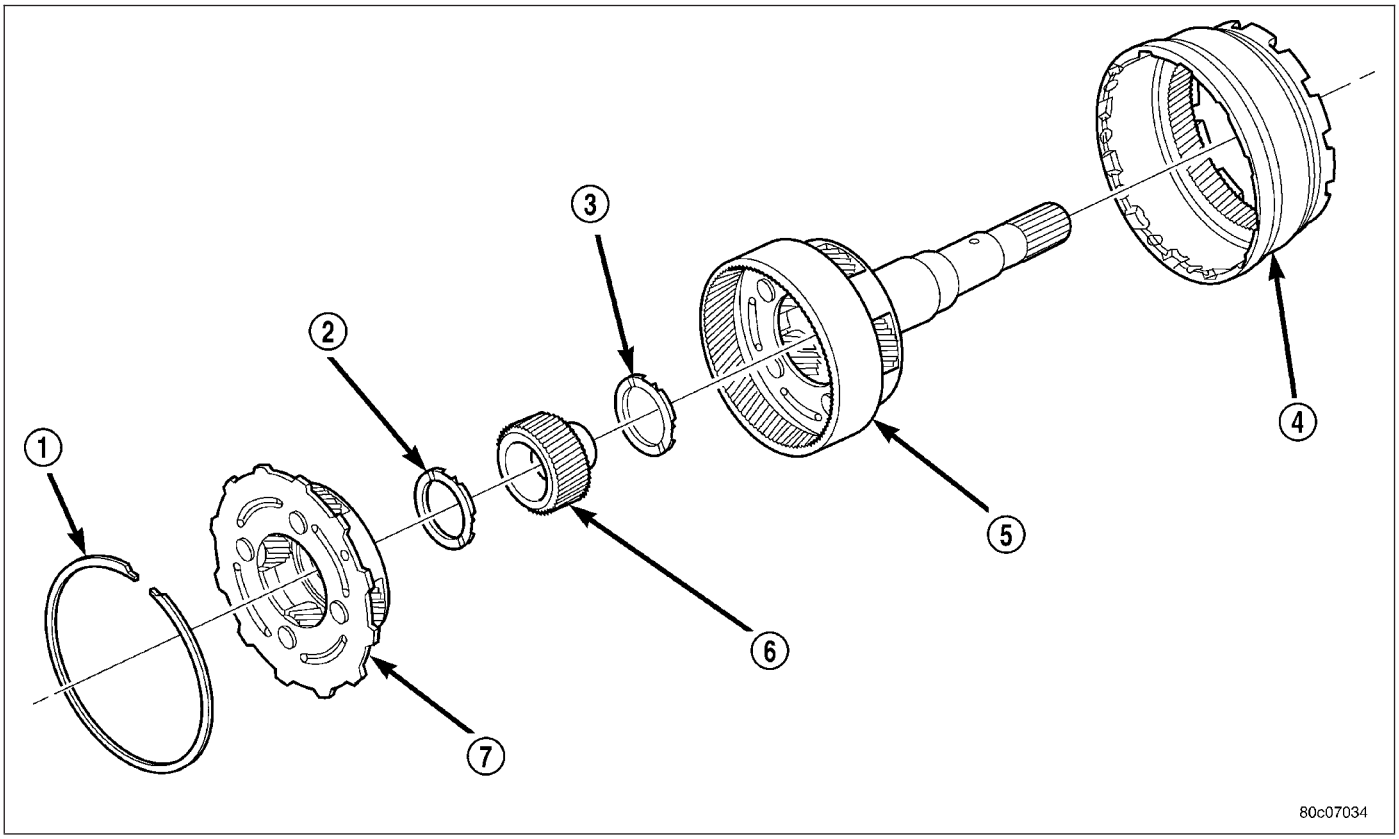
Check sun gear and driving shell condition. Replace the gear if damaged or if the bushings are scored or worn. The bushings are not serviceable. Replace the driving shell if worn, cracked or damaged.

Replace planetary gear sets if gears, pinion pins, or carrier are damaged in any way. Replace the annulus gears and supports if either component is worn or damaged.

Replace the output shaft if the machined surfaces are scored, pitted, or damaged in any way. Also replace the shaft if the splines are damaged, or exhibits cracks at any location.

ASSEMBLY

NOTE: Clean and inspect all components. Replace any components which show evidence of excessive wear or scoring.



Reverse/Input Planetary Carrier Assembly

1 - SNAP-RING
2 - THRUST BEARING NUMBER 10
3 - THRUST BEARING NUMBER 11
4 - INPUT ANNULUS
5 - INPUT PLANETARY CARRIER
6 - INPUT SUN GEAR
7 - REVERSE PLANETARY CARRIER

1. Install the number 11 thrust bearing (3) into the input planetary carrier (5) so that the inner race will be toward the front of the transmission.
2. Install the input sun gear (6) into the input carrier (5).
3. Install the number 10 thrust bearing (2) onto the rear of the reverse planetary carrier (7) with the inner race toward the carrier.
4. Install the number 9 thrust bearing onto the front of the reverse planetary carrier (7) with the outer race toward the carrier and the inner race facing upward.
5. Install the reverse planetary gear carrier (7) into the input carrier (5).
6. Install the input annulus gear (4) into the input carrier (5).
7. Install the snap-ring (1) to hold the input annulus gear (4) into the input carrier (5).

MECHANISM-SHIFT

DESCRIPTION

The gear shift mechanism provides six shift positions which are:

- Park (P)
- Reverse (R)

- Neutral (N)
- Drive (D)
- Manual second (2)
- Manual low (1)

OPERATION

MANUAL LOW (1) range provides first gear only. Overrun braking is also provided in this range. MANUAL SECOND (2) range provides first and second gear only.

DRIVE range provides FIRST, SECOND, THIRD, OVERDRIVE FOURTH, and OVERDRIVE FIFTH (if applicable) gear ranges. The shift into OVERDRIVE FOURTH and FIFTH (if applicable) gear ranges occurs only after the transmission has completed the shift into D THIRD gear range. No further movement of the shift mechanism is required to complete the 3-4 or 4-5 (if applicable) shifts.

The FOURTH and FIFTH (if applicable) gear upshifts occur automatically when the overdrive selector switch is in the ON position. No upshift to FOURTH or FIFTH (if applicable) gears will occur if any of the following are true:

- The transmission fluid temperature is below 10° C (50° F) or above 121° C (250° F).
- The shift to THIRD is not yet complete.
- Vehicle speed is too low for the 3-4 or 4-5 (if applicable) shifts to occur.

Upshifts into FOURTH or FIFTH (if applicable) will be delayed when the transmission fluid temperature is below 4.5° C (40° F) or above 115.5° C (240° F).

VALVE-SOLENOID SWITCH

DESCRIPTION

The Solenoid Switch Valve (SSV) is located in the valve body and controls the direction of the transmission fluid when the L/R-TCC solenoid is energized.

OPERATION

The Solenoid Switch Valve controls line pressure from the LR-TCC solenoid. In 1st gear, the SSV will be in the downshifted position, thus directing fluid to the L/R clutch circuit. In 2nd, 3rd, 4th, and 5th (if applicable) gears, the solenoid switch valve will be in the upshifted position and directs the fluid into the torque converter clutch (TCC) circuit.

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R pressure switch is monitored to confirm SSV movement. If the movement is not confirmed (the L/R pressure switch does not close), 2nd gear is substituted for 1st. A DTC will be set after three unsuccessful attempts are made to get into 1st gear in one given key start.

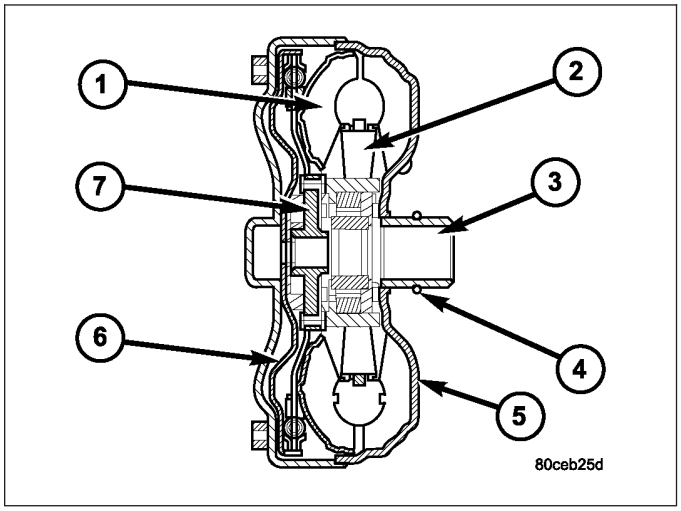
CONVERTER-TORQUE

DESCRIPTION

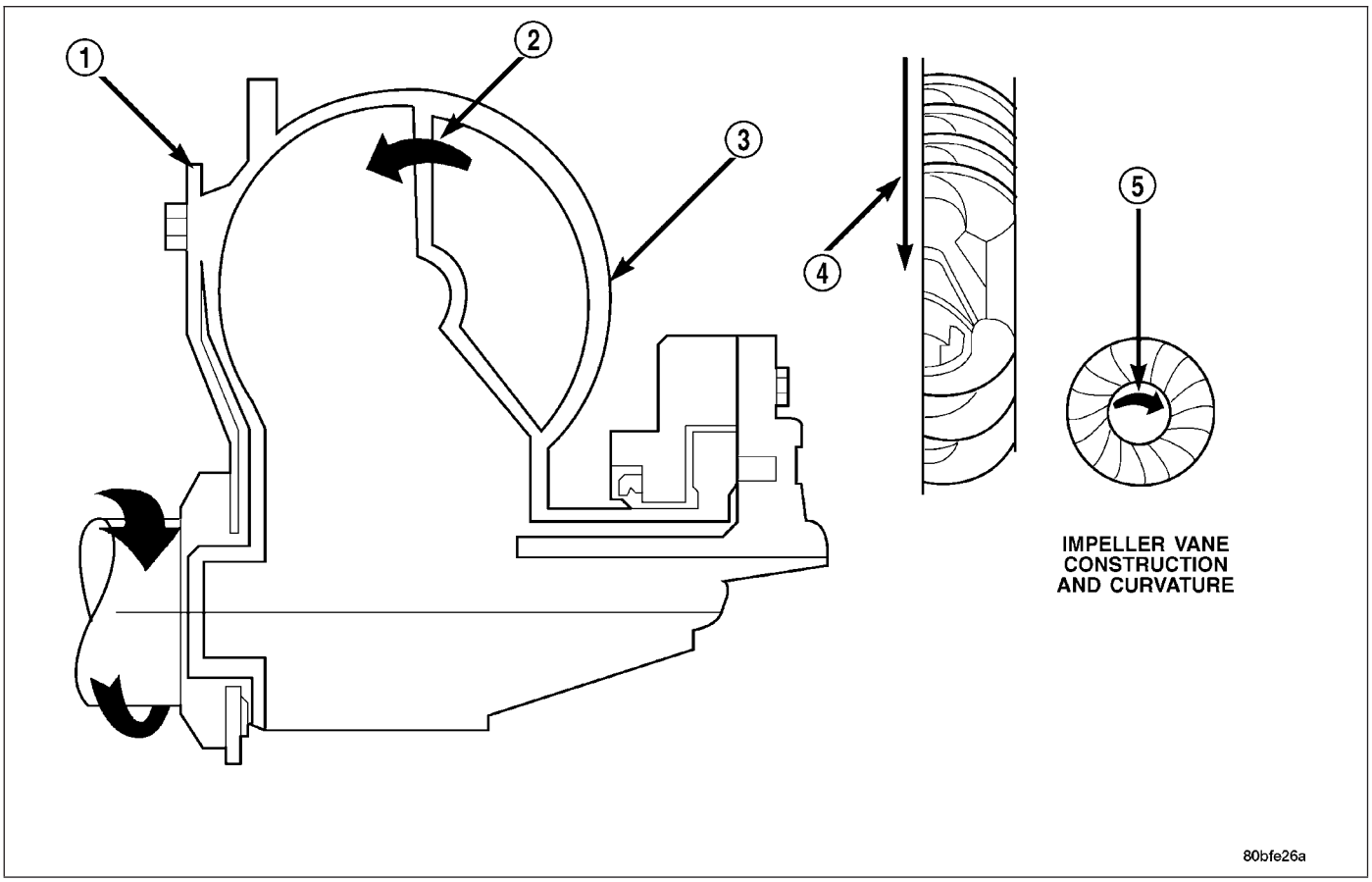
The torque converter is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine (1), a stator (2), an overrunning clutch, an impeller (5), and an electronically applied converter clutch (6). The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The torque converter hub (3) drives the transmission oil (fluid) pump and contains an o-ring seal (4) to better control oil flow.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid.



IMPELLER

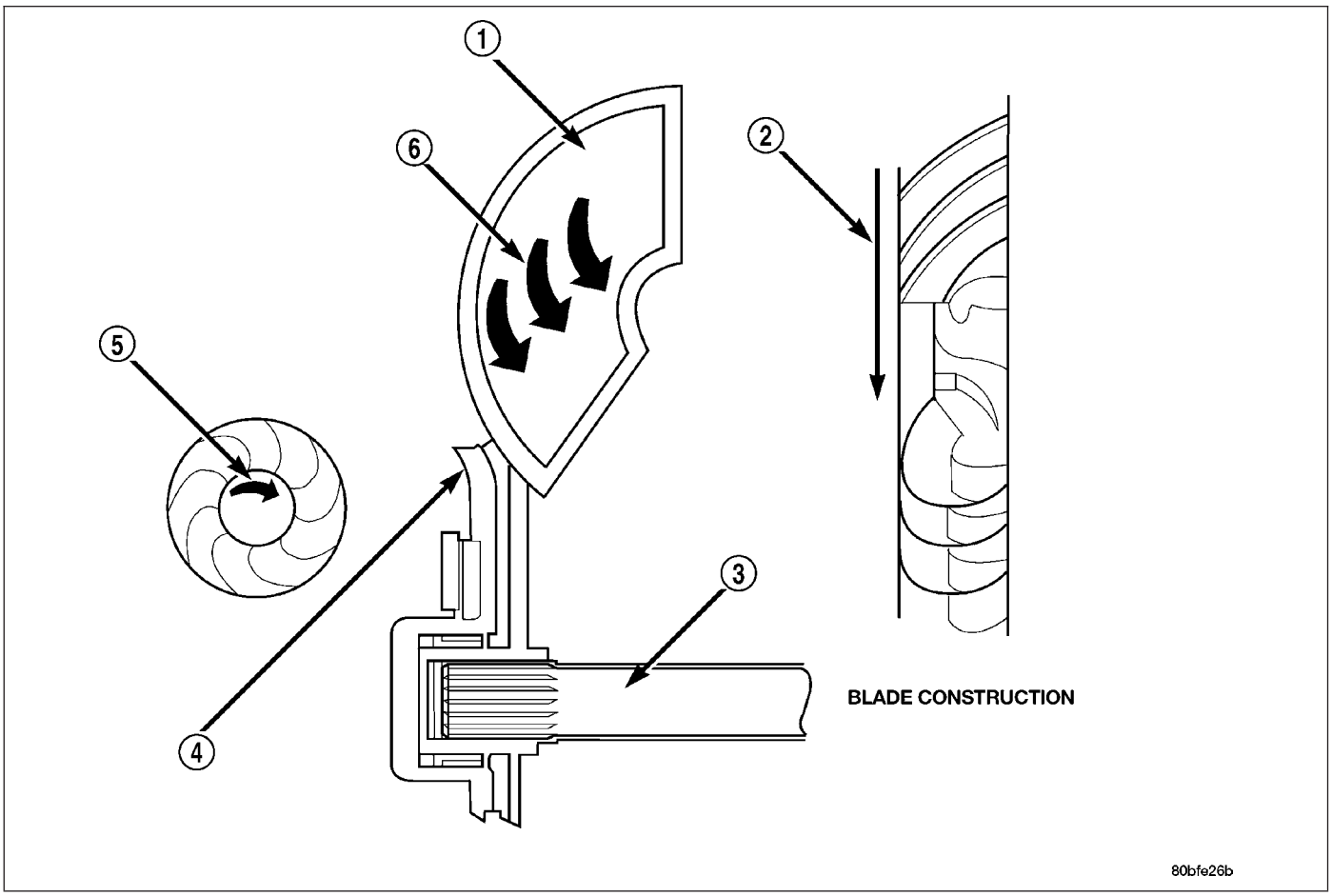


Impeller

1 - ENGINE FLEXPLATE
2 - OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
3 - IMPELLER VANES AND COVER ARE INTEGRAL
4 - ENGINE ROTATION
5 - ENGINE ROTATION

The impeller is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving members of the system.

TURBINE



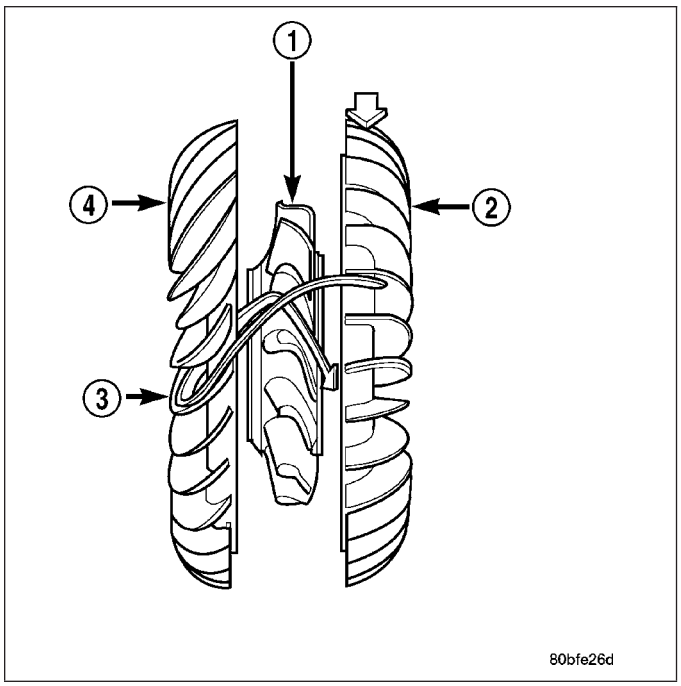
Turbine

1 - TURBINE VANE
2 - ENGINE ROTATION
3 - INPUT SHAFT
4 - PORTION OF TORQUE CONVERTER COVER
5 - ENGINE ROTATION
6 - OIL FLOW WITHIN TURBINE SECTION

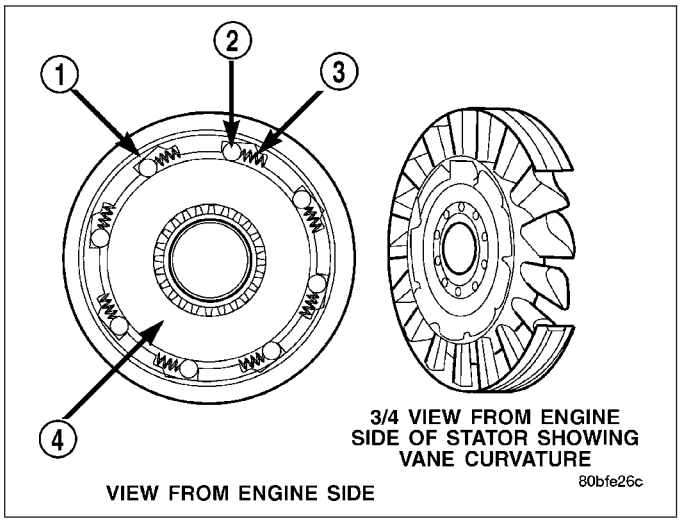
The turbine is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

STATOR

The stator assembly is mounted on a stationary shaft which is an integral part of the oil pump. The stator (1) is located between the impeller (2) and the turbine (4) within the torque converter case.



The stator contains an over-running clutch (1-4), which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.

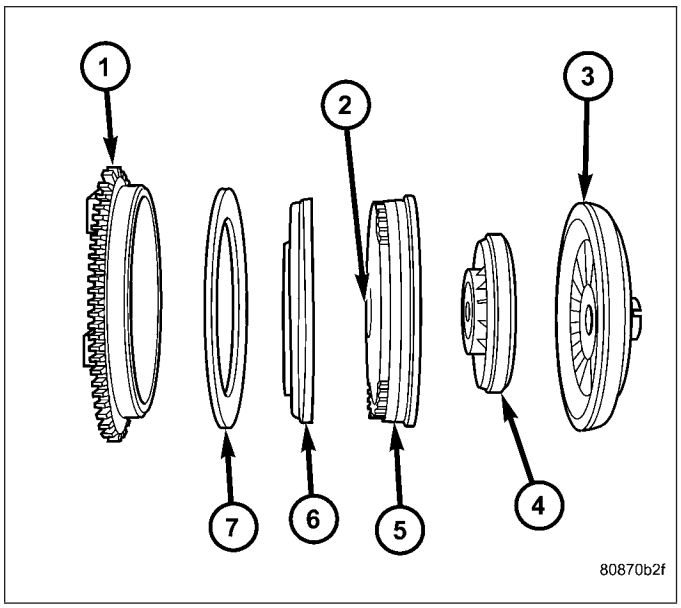


TORQUE CONVERTER CLUTCH (TCC)

The TCC was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock-free power transfer, it is natural for all fluid couplings to slip. If the impeller (3) and turbine (5) were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston (6) with friction material (7) was added to the turbine assembly (5) to provide this mechanical lock-up.

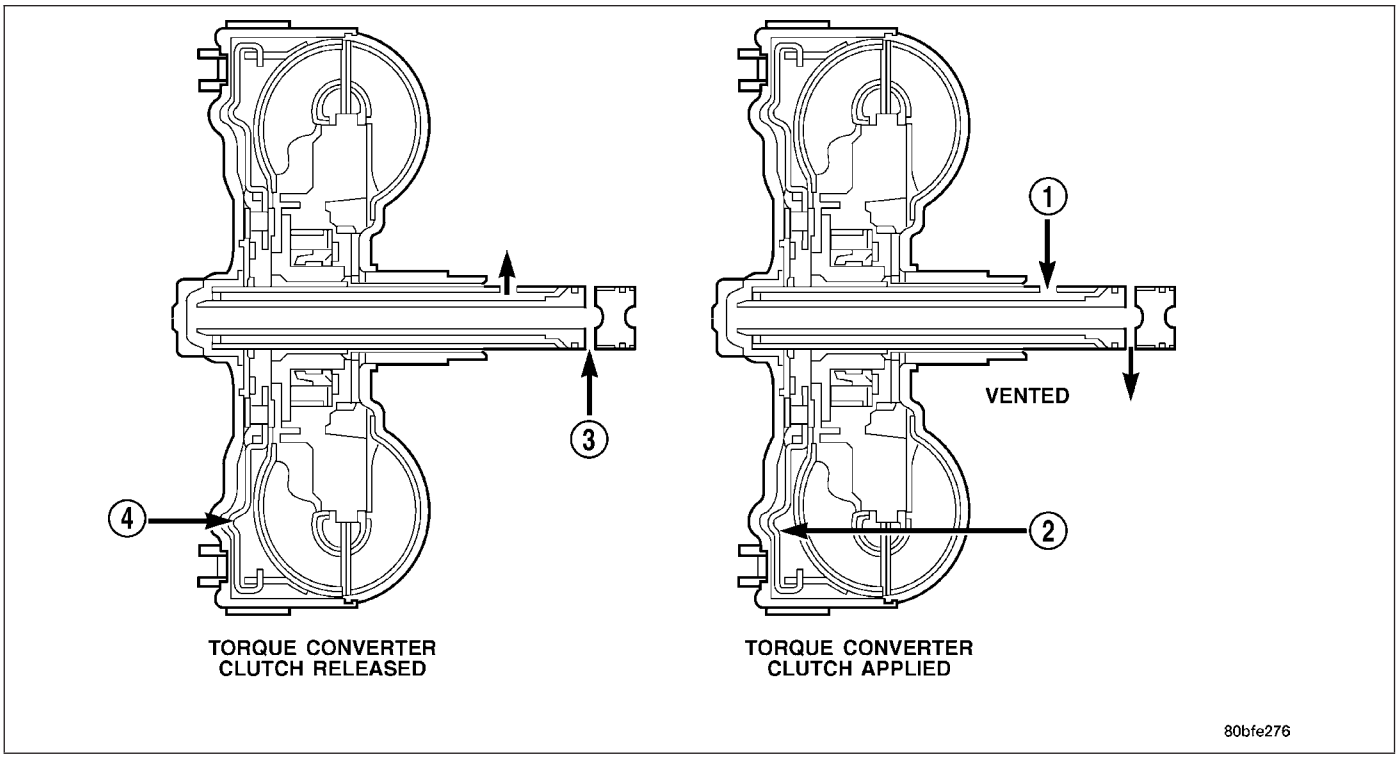
In order to reduce heat build-up in the transmission and buffer the powertrain against torsional vibrations, the TCM can duty cycle the L/R-CC Solenoid to achieve a smooth application of the torque converter clutch. This function, referred to as Electronically Modulated Converter Clutch (EMCC) can occur at various times depending on the following variables:

- Shift lever position
- Current gear range
- Transmission fluid temperature
- Engine coolant temperature
- Input speed
- Throttle angle
- Engine speed



OPERATION

The converter impeller (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.



Torque Converter Fluid Operation - Typical

1 - APPLY PRESSURE
2 - THE PISTON MOVES SLIGHTLY FORWARD
3 - RELEASE PRESSURE
4 - THE PISTON MOVES SLIGHTLY REARWARD

TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in such a direction that it would tend to slow it down.

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft. Under stall conditions (the turbine is stationary), the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counterclockwise direction. When this happens the over-running clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 2.4:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such as way as to cause it to lock-up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.

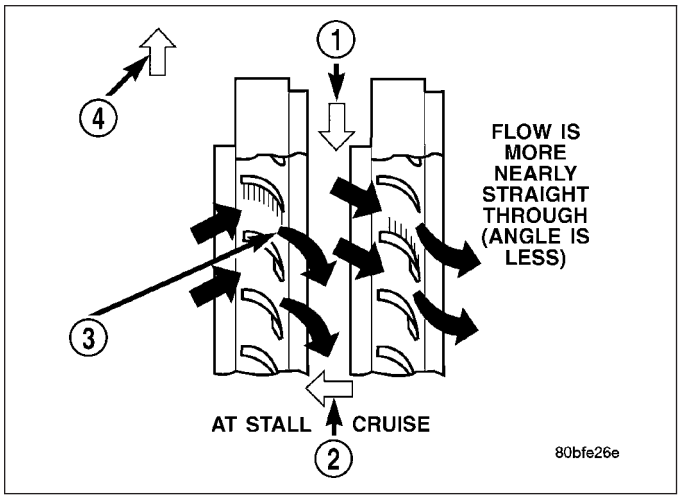
TORQUE CONVERTER CLUTCH (TCC)

In a standard torque converter, the impeller and turbine are rotating at about the same speed and the stator is freewheeling, providing no torque multiplication. By applying the turbine's piston and friction material to the front cover, a total converter engagement can be obtained. The result of this engagement is a direct 1:1 mechanical link between the engine and the transmission.

The clutch can be engaged in second, third, fourth, and fifth (if appicable) gear ranges depending on overdrive control switch position. If the overdrive control switch is in the normal ON position, the clutch will engage after the shift to fourth gear. If the control switch is in the OFF position, the clutch will engage after the shift to third gear.

The TCM controls the torque converter by way of internal logic software. The programming of the software provides the TCM with control over the L/R-CC Solenoid. There are four output logic states that can be applied as follows:

- No EMCC
- Partial EMCC
- Full EMCC
- Gradual-to-no EMCC



Stator Operation

1 - DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
2 - FRONT OF ENGINE
3 - INCREASED ANGLE AS OIL STRIKES VANES
4 - DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

NO EMCC

Under No EMCC conditions, the L/R Solenoid is OFF. There are several conditions that can result in NO EMCC operations. No EMCC can be initiated due to a fault in the transmission or because the TCM does not see the need for EMCC under current driving conditions.

PARTIAL EMCC

Partial EMCC operation modulates the L/R Solenoid (duty cycle) to obtain partial torque converter clutch application. Partial EMCC operation is maintained until Full EMCC is called for and actuated. During Partial EMCC some slip does occur. Partial EMCC will usually occur at low speeds, low load and light throttle situations.

FULL EMCC

During Full EMCC operation, the TCM increases the L/R Solenoid duty cycle to full ON after Partial EMCC control brings the engine speed within the desired slip range of transmission input speed relative to engine rpm.

GRADUAL-TO-NO EMCC

This operation is to soften the change from Full or Partial EMCC to No EMCC. This is done at mid-throttle by decreasing the L/R Solenoid duty cycle.

REMOVAL

1. Remove transmission and torque converter from vehicle. (Refer to 21 - TRANSMISSION/AUTOMATIC - 45RFE/545RFE - REMOVAL)
2. Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition. The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

3. Pull the torque converter forward until the center hub clears the oil pump seal.

4. Separate the torque converter from the transmission.

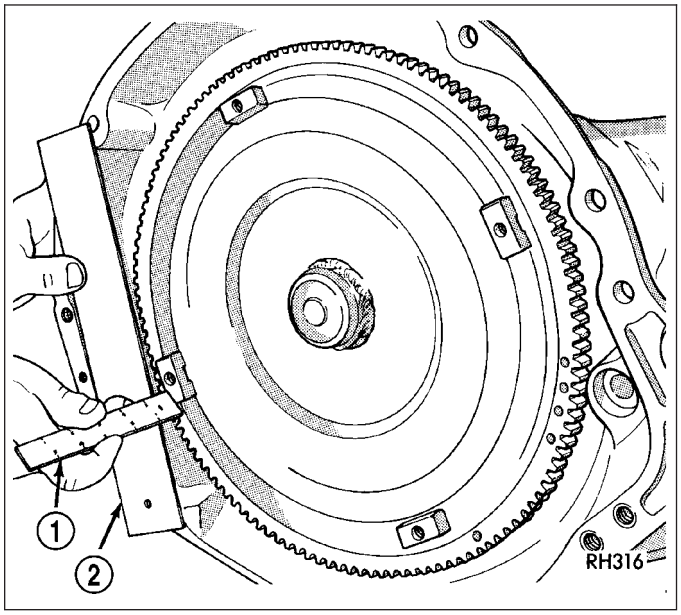
INSTALLATION

NOTE: Check converter hub and drive flats for sharp edges, burrs, scratches, or nicks. Polish the hub and flats with 320/400 grit paper or crocus cloth if necessary. Verify that the converter hub o-ring is properly installed and is free from debris. The hub must be smooth to avoid damaging the pump seal at installation.

1. Lubricate oil pump seal lip with transmission fluid.
2. Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or converter hub o-ring while inserting torque converter into the front of the transmission.

3. Align torque converter to oil pump seal opening.
4. Insert torque converter hub into oil pump.
5. While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.
6. Check converter seating with a scale (1) and straightedge (2). Surface of converter lugs should be at least 13 mm (1/2 in.) to rear of straightedge when converter is fully seated.
7. If necessary, temporarily secure converter with C-clamp attached to the converter housing.
8. Install the transmission in the vehicle.
9. Fill the transmission with the recommended fluid.



RELAY-TRANSMISSION CONTROL

DESCRIPTION

The relay is supplied fused B+ voltage, energized by the TCM, and is used to supply power to the solenoid pack when the transmission is in normal operating mode.

OPERATION

When the relay is “off”, no power is supplied to the solenoid pack and the transmission is in “limp-in” mode. After a controller reset, the TCM energizes the relay. Prior to this, the TCM verifies that the contacts are open by checking for no voltage at the switched battery terminals. After this is verified, the voltage at the solenoid pack pressure switches is checked. After the relay is energized, the TCM monitors the terminals to verify that the voltage is greater than 3 volts.

SENSOR-TRANSMISSION RANGE

DESCRIPTION

The Transmission Range Sensor (TRS) is part of the solenoid module, which is mounted to the top of the valve body inside the transmission.

The Transmission Range Sensor (TRS) has five switch contact pins that:

- Determine shift lever position
- Supply ground to the Starter Relay in Park and Neutral only.
- Supply +12 V to the backup lamps in Reverse only.

The TRS also has an integrated temperature sensor (thermistor) that communicates transmission temperature to the TCM and PCM.

OPERATION

The Transmission Range Sensor (TRS) communicates shift lever position to the TCM as a combination of open and closed switches. Each shift lever position has an assigned combination of switch states (open/closed) that the TCM receives from four sense circuits. The TCM interprets this information and determines the appropriate transmission gear position and shift schedule.

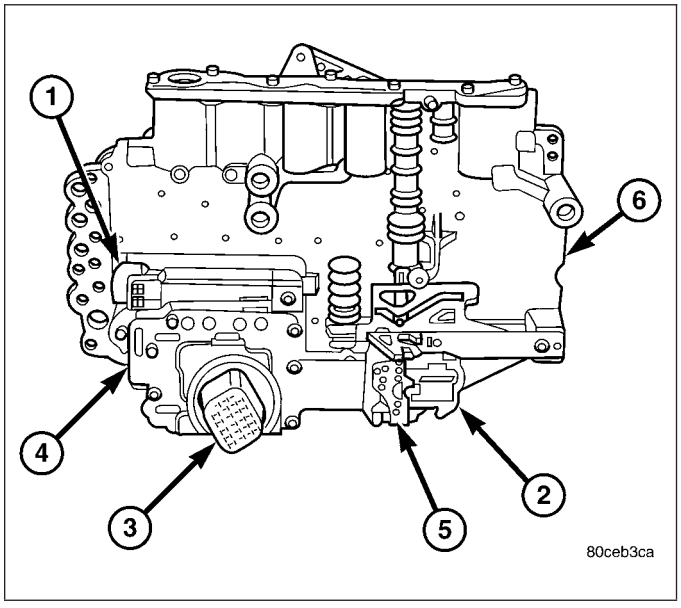
There are many possible combinations of open and closed switches (codes). Seven of these possible codes are related to gear position and five are recognized as “between gear” codes. This results in many codes which should **never occur**. These are called “invalid” codes. An invalid code will result in a DTC, and the TCM will then determine the shift lever position based on pressure switch data. This allows reasonably normal transmission operation with a TRS failure.

GEAR	C5	C4	C3	C2	C1
Park	CL	OP	OP	CL	CL
Temp 1	CL	OP	OP	CL	OP
Reverse	OP	OP	OP	CL	OP
Temp 2	OP	OP	CL	CL	OP
Neutral 1	OP	OP	CL	CL	CL
Neutral 2	OP	CL	CL	CL	CL
Temp 3	OP	CL	CL	CL	OP
Drive	OP	CL	CL	OP	OP
Temp 4	OP	CL	OP	OP	OP
Manual 2	CL	CL	OP	OP	OP
Temp 5	CL	OP	OP	OP	OP
Manual 1	CL	OP	CL	OP	OP

ASSEMBLY-TRANSMISSION SOLENOID/TRS

DESCRIPTION

The transmission solenoid/TRS assembly is internal to the transmission and mounted on the valve body assembly. The assembly consists of six solenoids that control hydraulic pressure to the six friction elements (transmission clutches), and the torque converter clutch. The pressure control solenoid is located on the side of the solenoid/TRS assembly. The solenoid/TRS assembly also contains five pressure switches that feed information to the TCM.



OPERATION

SOLENOIDS

Solenoids are used to control the L/R, 2C, 4C, OD, and UD friction elements. The reverse clutch is controlled by line pressure and the position of the manual valve in the valve body. All the solenoids are contained within the Solenoid and Pressure Switch Assembly. The solenoid and pressure switch assembly contains one additional solenoid, Multi-Select (MS), which serves primarily to provide 2nd and 3rd gear limp-in operation.

The solenoids receive electrical power from the Transmission Control Relay through a single wire. The TCM energizes or operates the solenoids individually by grounding the return wire of the solenoid as necessary. When a solenoid is energized, the solenoid valve shifts, and a fluid passage is opened or closed (vented or applied), depending on its default operating state. The result is an apply or release of a frictional element.

The MS and UD solenoids are normally applied to allow transmission limp-in in the event of an electrical failure.

The continuity of the solenoids and circuits are periodically tested. Each solenoid is turned on or off depending on its current state. An inductive spike should be detected by the TCM during this test. If no spike is detected, the circuit is tested again to verify the failure. In addition to the periodic testing, the solenoid circuits are tested if a speed ratio or pressure switch error occurs.

PRESSURE SWITCHES

The TCM relies on five pressure switches to monitor fluid pressure in the L/R, 2C, 4C, UD, and OD hydraulic circuits. The primary purpose of these switches is to help the TCM detect when clutch circuit hydraulic failures occur. The switches close at 23 psi and open at 11 psi, and simply indicate whether or not pressure exists. The switches are continuously monitored by the TCM for the correct states (open or closed) in each gear as shown in the following charts 45RFE PRESSURE SWITCH STATES and 545RFE PRESSURE SWITCH STATES :

45RFE PRESSURE SWITCH STATES

GEAR	L/R	2C	4C	UD	OD
R	OP	OP	OP	OP	OP
P/N	CL	OP	OP	OP	OP
1ST	CL*	OP	OP	CL	OP
2ND	OP	CL	OP	CL	OP
2ND PRIME	OP	OP	CL	CL	OP
D	OP	OP	OP	CL	CL
FOURTH	OP	OP	CL	OP	CL

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is open in Manual 1.

545RFE PRESSURE SWITCH STATES

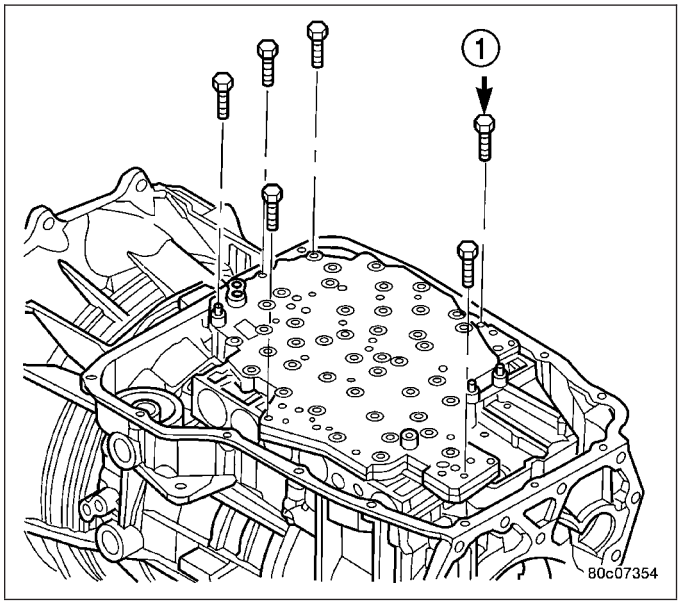
GEAR	L/R	2C	4C	UD	OD
R	OP	OP	OP	OP	OP
P/N	CL	OP	OP	OP	OP
1ST	CL*	OP	OP	CL	OP
2ND	OP	CL	OP	CL	OP
2ND PRIME	OP	OP	CL	CL	OP
D	OP	OP	OP	CL	CL
4TH	OP	OP	CL	OP	CL
5TH	OP	CL	OP	OP	CL

*L/R is closed if output speed is below 100 rpm in Drive and Manual 2. L/R is open in Manual 1.

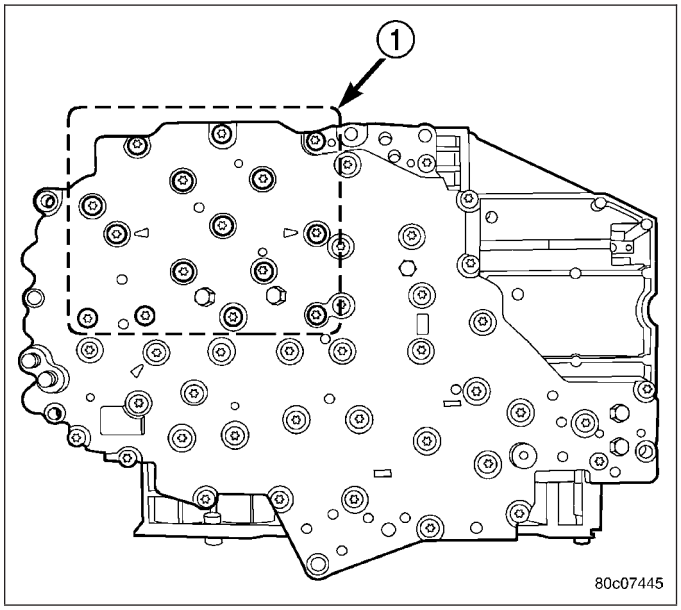
A Diagnostic Trouble Code (DTC) will set if the TCM senses any switch open or closed at the wrong time in a given gear.

REMOVAL

1. Remove the valve body from the transmission. (Refer to 21 - TRANSMISSION/AUTOMATIC - 45RFE/545RFE/VALVE BODY - REMOVAL)

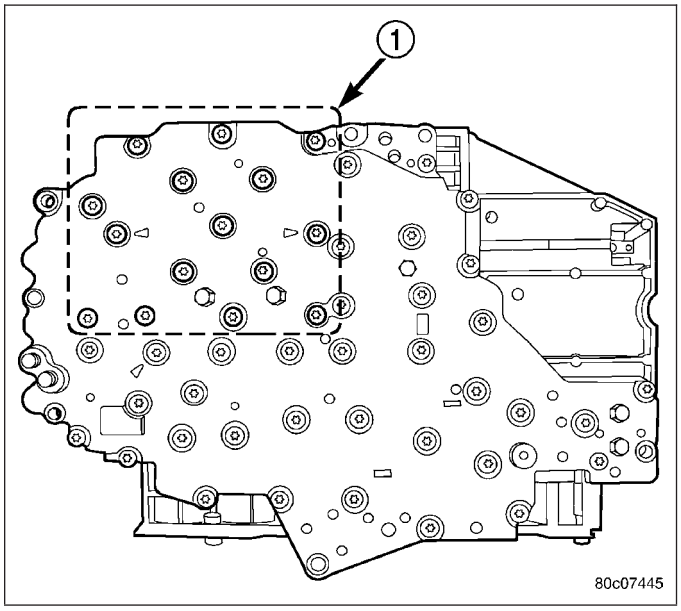


2. Remove the bolts (1) holding the transmission solenoid/TRS assembly onto the valve body.
3. Separate the transmission solenoid/TRS assembly from the valve body.



INSTALLATION

1. Place TRS selector plate in the PARK position.
2. Position the transmission solenoid/TRS assembly onto the valve body. Be sure that both alignment dowels are fully seated in the valve body and that the TRS switch contacts are properly positioned in the selector plate
3. Install the bolts (1) to hold the transmission solenoid/TRS assembly onto the valve body.
4. Tighten the solenoid assembly screws adjacent to the arrows cast into the bottom of the valve body first. Tighten the screws to 5.7 N·m (50 in.lbs.).
5. Tighten the remainder of the solenoid assembly screws to 5.7 N·m (50 in.lbs.).
6. Install the valve body into the transmission.



SENSOR-TRANSMISSION TEMPERATURE

DESCRIPTION

The transmission temperature sensor is a thermistor that is integral to the Transmission Range Sensor (TRS).

OPERATION

The transmission temperature sensor is used by the TCM to sense the temperature of the fluid in the sump. Since fluid temperature can affect transmission shift quality and convertor lock up, the TCM requires this information to determine which shift schedule to operate in.

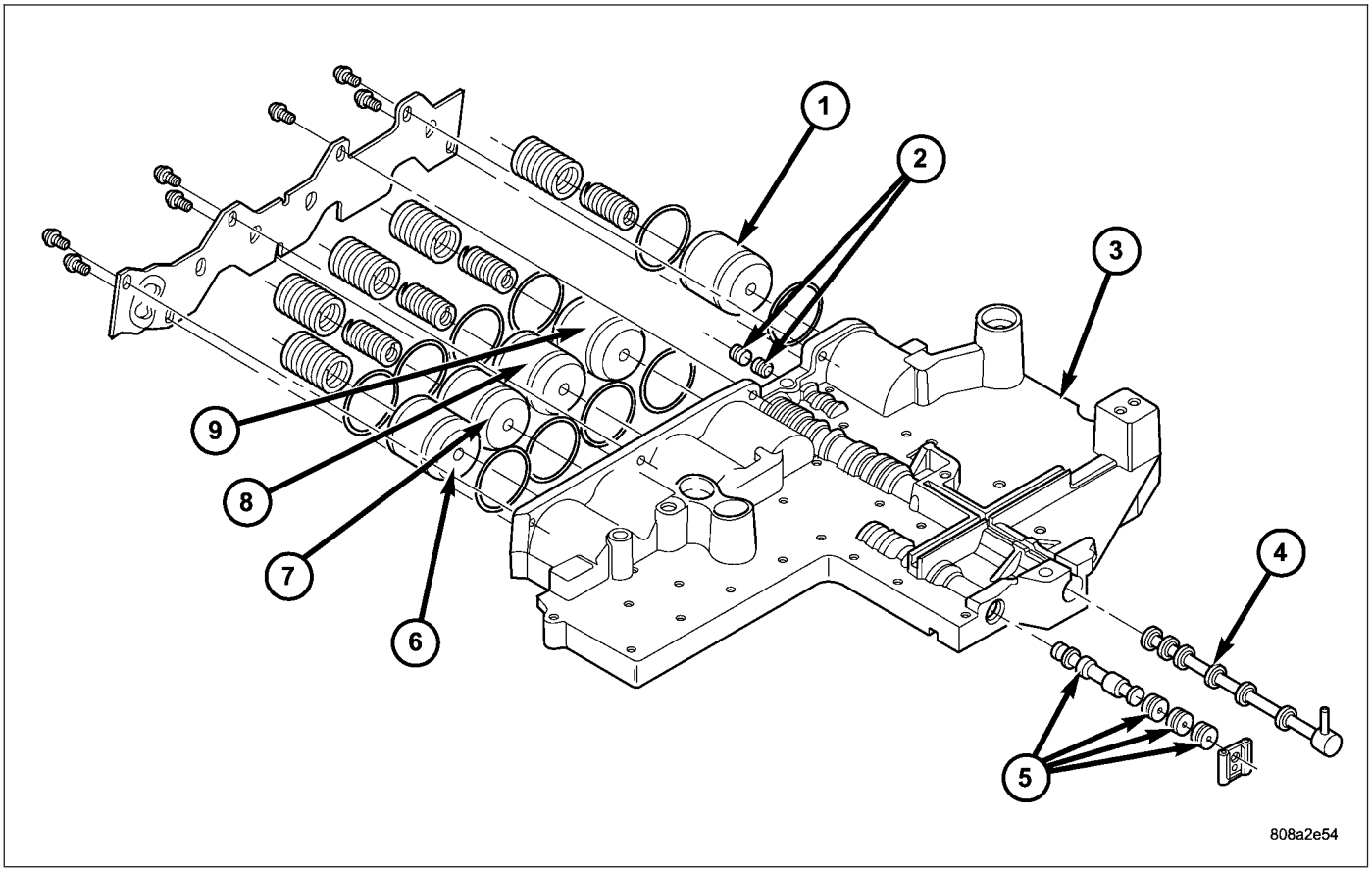
Calculated Temperature

A failure in the temperature sensor or circuit will result in calculated temperature being substituted for actual temperature. Calculated temperature is a predicted fluid temperature which is calculated from a combination of inputs:

- Battery (ambient) temperature
- Engine coolant temperature
- In-gear run time since start-up

BODY-VALVE

DESCRIPTION



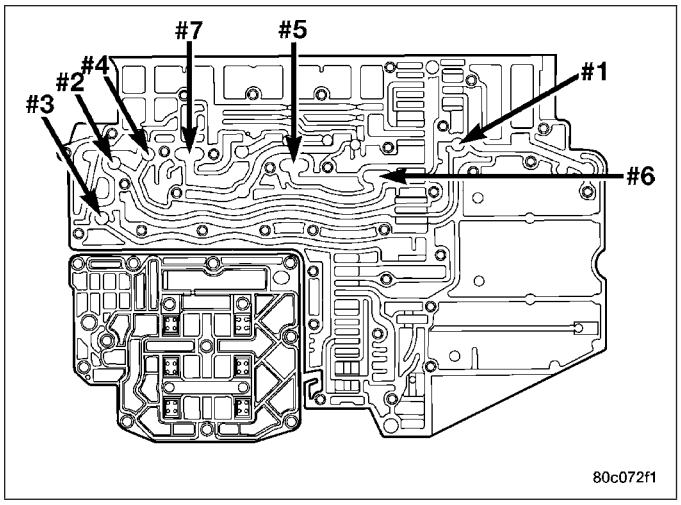
Valve Body Components

1 - LOW/REVERSE ACCUMULATOR
2 - LOW/REVERSE SWITCH VALVE
3 - UPPER VALVE BODY
4 - MANUAL VALVE
5 - SOLENOID SWITCH VALVE
6 - OVERDRIVE ACCUMULATOR
7 - UNDERDRIVE ACCUMULATOR
8 - 4C ACCUMULATOR
9 - 2C ACCUMULATOR

The valve body consists of a cast aluminum valve body, a separator plate, and a transfer plate. The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, bands, and frictional clutches. The valve body contains the following components :

- Solenoid switch valve
- Manual valve
- Low/reverse switch valve
- 5 Accumulators

- 7 check balls



OPERATION

NOTE: Refer to the Hydraulic Schematics for a visual aid in determining valve location, operation and design.

SOLENOID SWITCH VALVE

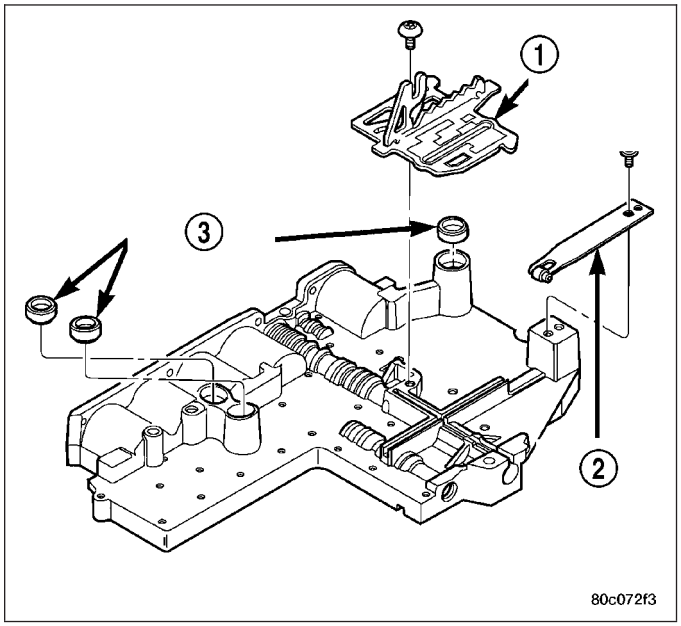
The Solenoid Switch Valve (SSV) controls the direction of the transmission fluid when the L/R-TCC solenoid is energized.

The Solenoid Switch Valve controls line pressure from the LR-TCC solenoid. In 1st gear, the SSV will be in the downshifted position, thus directing fluid to the L/R clutch circuit. In 2nd, 3rd, 4th, and fifth gears, the solenoid switch valve will be in the upshifted position and directs the fluid into the torque converter clutch (TCC) circuit.

When shifting into 1st gear, a special hydraulic sequence is performed to ensure SSV movement into the downshifted position. The L/R pressure switch is monitored to confirm SSV movement. If the movement is not confirmed (the L/R pressure switch does not close), 2nd gear is substituted for 1st. A DTC will be set after three unsuccessful attempts are made to get into 1st gear in one given key start.

MANUAL VALVE

The manual valve is a relay valve. The purpose of the manual valve is to direct fluid to the correct circuit needed for a specific gear or driving range. The manual valve, as the name implies, is manually operated by the driver with a lever located on the top of the valve body. The valve is connected mechanically by a cable to the gearshift mechanism. The valve is held in each of its positions by a roller detent spring (2) that engages the “roostercomb” of the TRS selector plate (1).



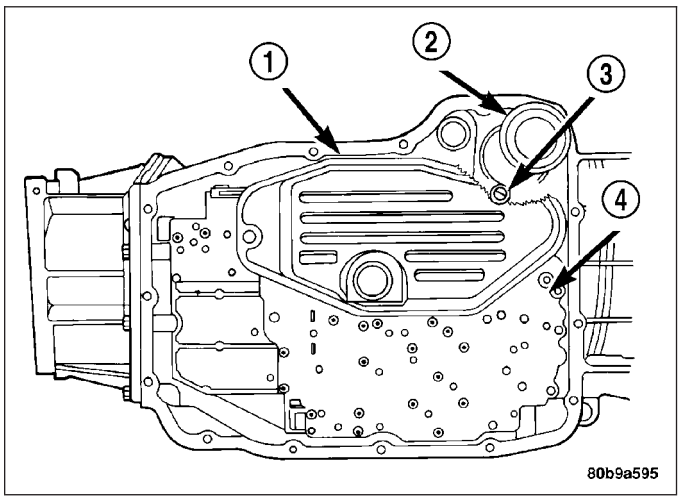
LOW/REVERSE SWITCH VALVE

The low/reverse switch valve allows the low/reverse clutch to be operated by either the LR/CC solenoid or the MS solenoid.

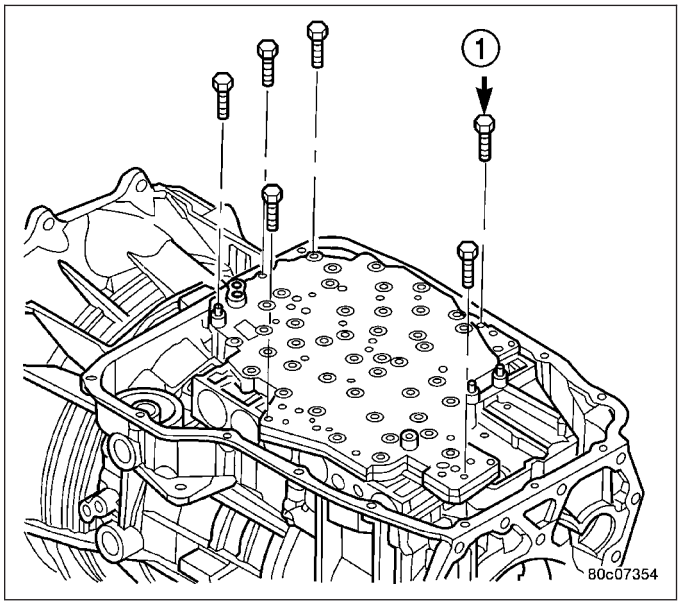
REMOVAL

NOTE: The valve body can be removed for service without having to remove the transmission assembly. The valve body can be disassembled for cleaning and inspection of the individual components. (Refer to 21 - TRANSMISSION/AUTOMATIC - 45RFE/VALVE BODY - DISASSEMBLY)

1. Shift transmission into PARK.
2. Raise vehicle.
3. Disconnect wires at the solenoid and pressure switch assembly connector.
4. Position drain pan under transmission oil pan.
5. Remove transmission oil pan.
6. Remove the primary oil filter (1) from valve body.

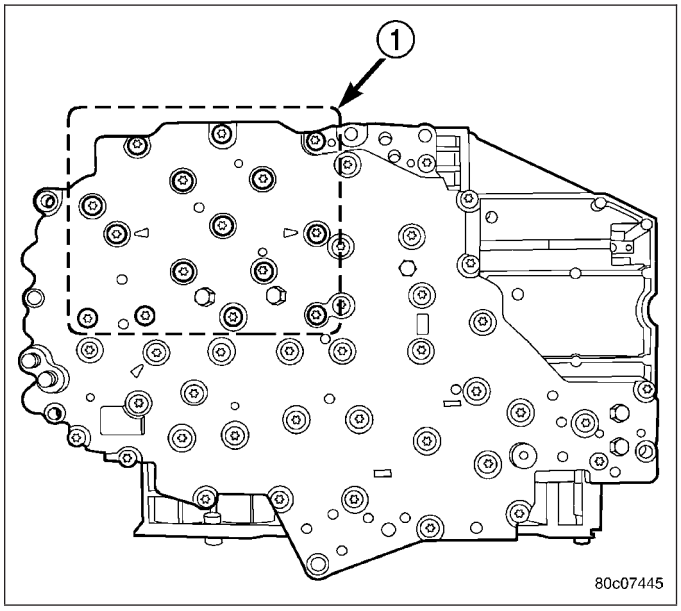


7. Remove bolts (1) attaching valve body to transmission case.
8. Lower the valve body and work the electrical connector out of transmission case.
9. Separate the valve body from the transmission.

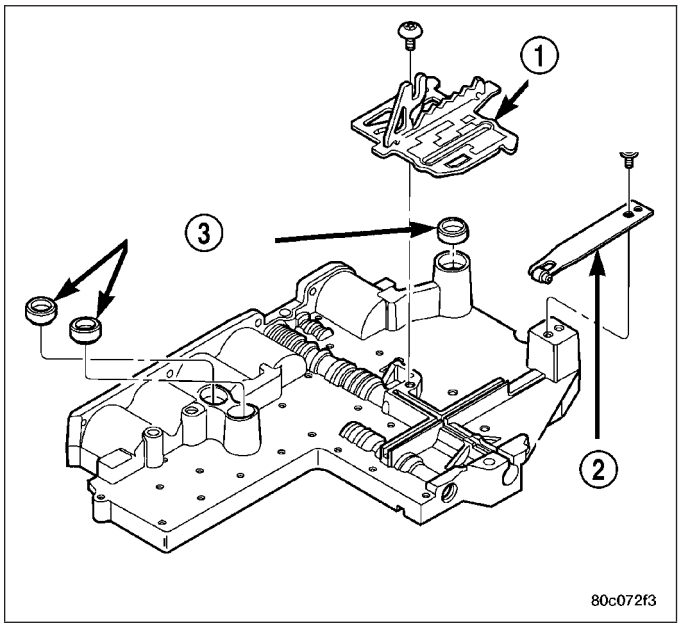


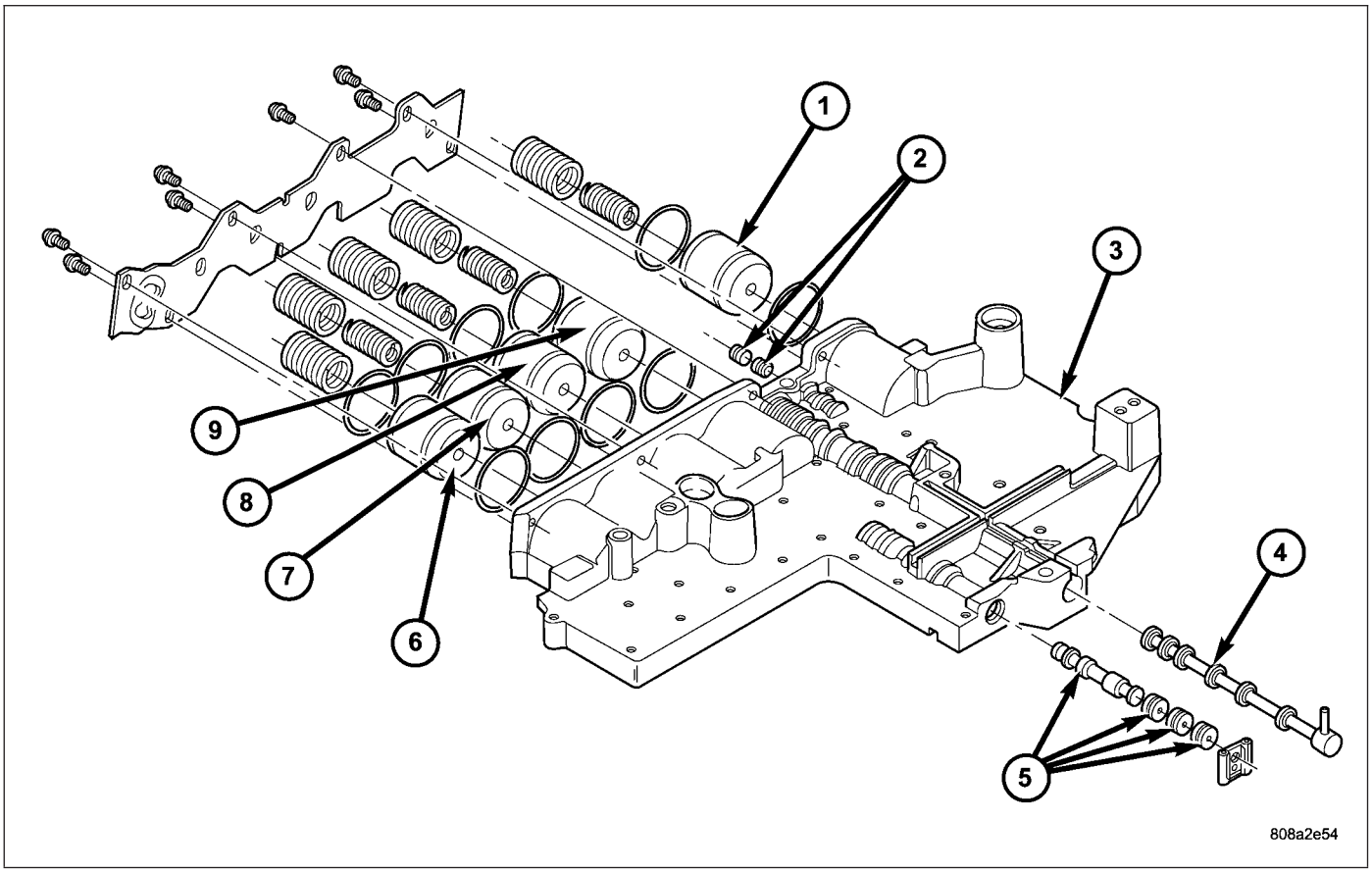
DISASSEMBLY

1. Remove the bolts (1) holding the solenoid and pressure switch assembly to the valve body. Do not remove the screws on the top of the solenoid and pressure switch assembly.
2. Separate the solenoid and pressure switch assembly from the valve body.



3. Remove the screw holding the detent spring (2) onto the valve body.
4. Remove the detent spring (2) from the valve body.
5. Remove the TRS selector plate (1) from the valve body and the manual valve.
6. Remove the clutch passage seals (3) from the valve body, if necessary.





Valve Body Components

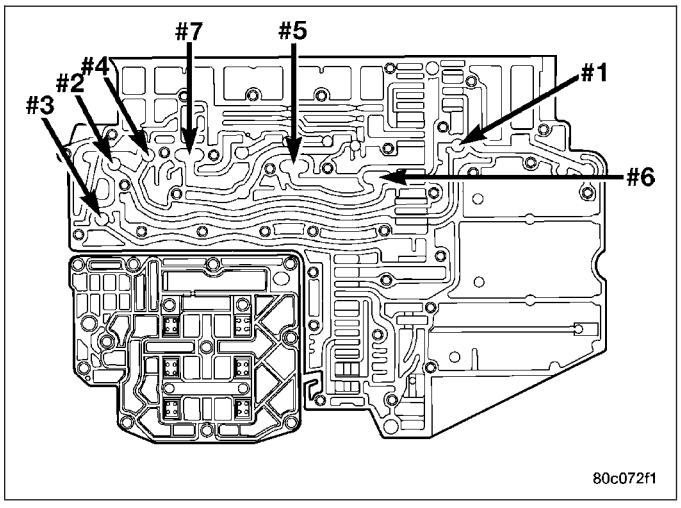
1 - LOW/REVERSE ACCUMULATOR
2 - LOW/REVERSE SWITCH VALVE
3 - UPPER VALVE BODY
4 - MANUAL VALVE
5 - SOLENOID SWITCH VALVE
6 - OVERDRIVE ACCUMULATOR
7 - UNDERDRIVE ACCUMULATOR
8 - 4C ACCUMULATOR
9 - 2C ACCUMULATOR

7. Remove the screws holding the accumulator cover onto the valve body.
8. Remove the accumulator springs and pistons (1, 6-9) from the valve body. Note which accumulator piston and spring belong in each location.

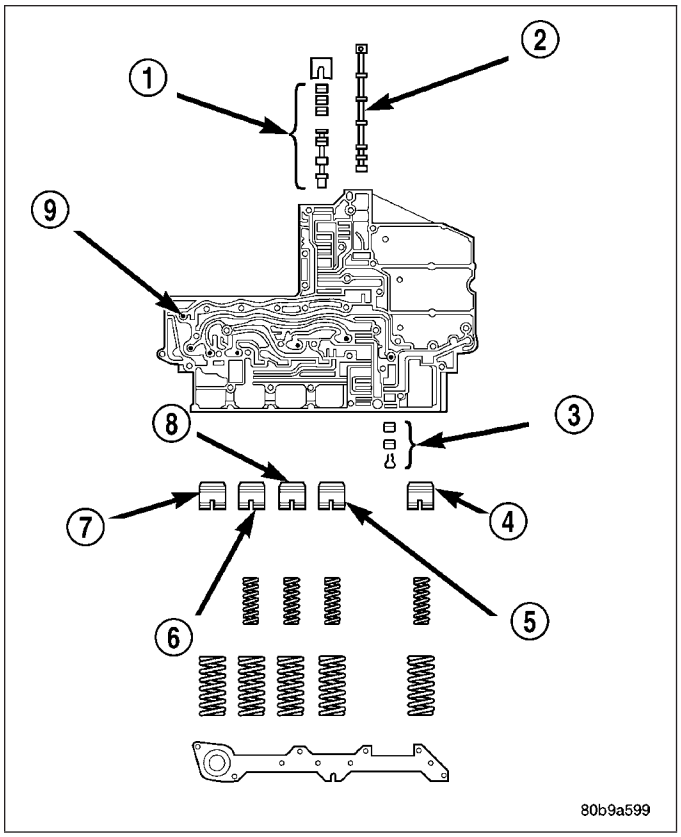
9. Place the valve body on the bench with the transfer plate upward.

NOTE: The valve body contains seven check balls. The transfer plate must be placed upward to prevent losing the check balls when the transfer plate is removed from the valve body.

10. Remove the screws holding the valve body to the valve body transfer plate.
11. Remove the transfer plate from the valve body. Note the location of all check balls.
12. Remove the check balls from the valve body.



13. Remove the retainers securing the solenoid switch valve (1), manual valve (2), and the low/reverse switch valve (3) from the valve body and remove the associated valve and spring. Tag each valve and spring combination with location information to aid in assembly.

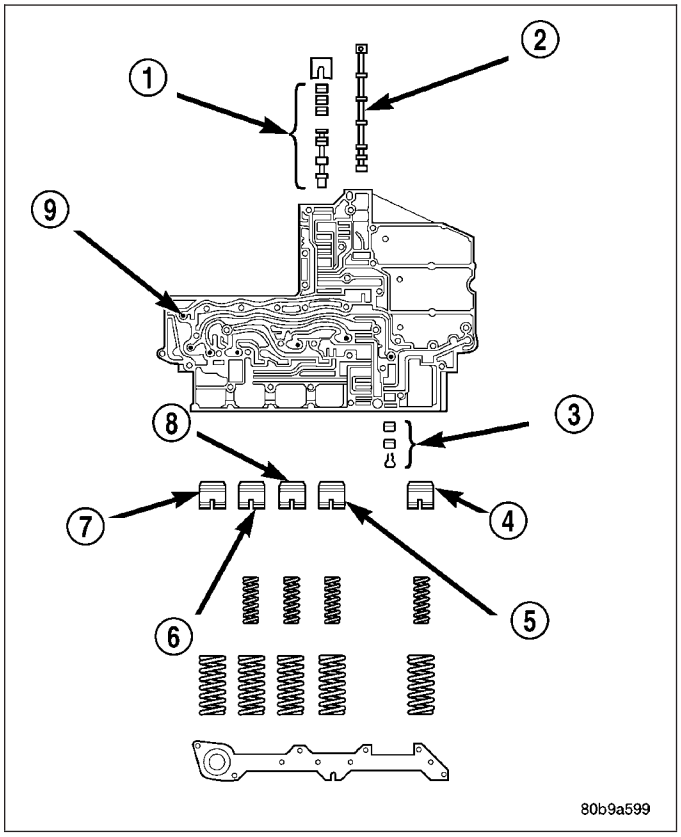


CLEANING

Clean the valve housings, valves, plugs, springs, and separator plates with a standard parts cleaning solution only. Do not use gasoline, kerosene, or any type of caustic solution.

Do not immerse any of the electrical components in cleaning solution. Clean the electrical components by wiping them off with dry shop towels only.

Dry all except the electrical parts with compressed air. Make sure all passages are clean and free from obstructions. **Do not use rags or shop towels to dry or wipe off valve body components. Lint from these materials can stick to valve body parts, interfere with valve operation, and clog filters and fluid passages.**



INSPECTION

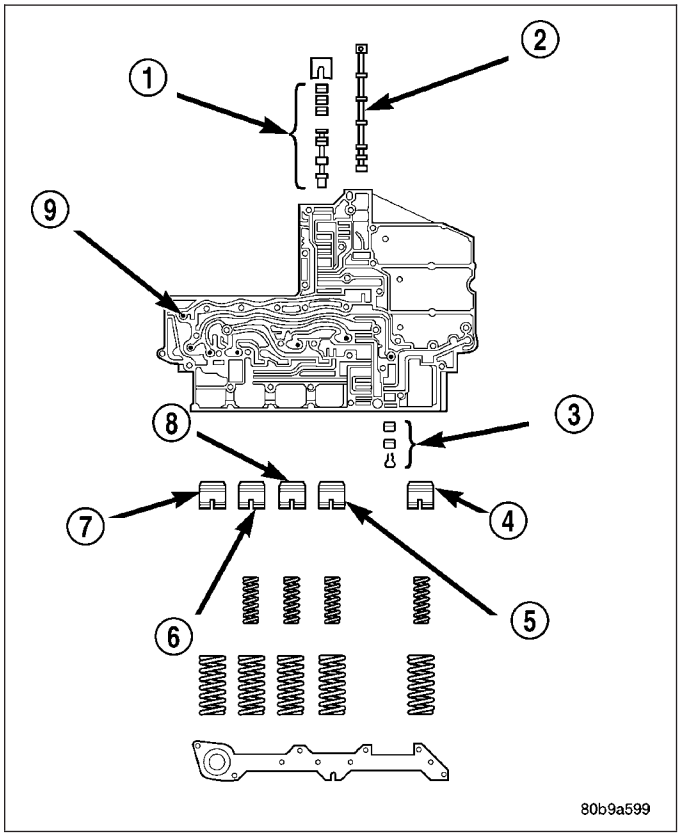
Inspect all of the valve body mating surfaces for scratches, nicks, burrs, or distortion. Use a straight-edge to check surface flatness. Minor scratches may be removed with crocus cloth using only very light pressure.

Minor distortion of a valve body mating surface may be corrected by smoothing the surface with a sheet of crocus cloth. Position the crocus cloth on a surface plate, sheet of plate glass or equally flat surface. If distortion is severe or any surfaces are heavily scored, the valve body will have to be replaced.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.** Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

Inspect all the valve and plug bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the valve body springs. The springs must be free of distortion, warpage or broken coils.

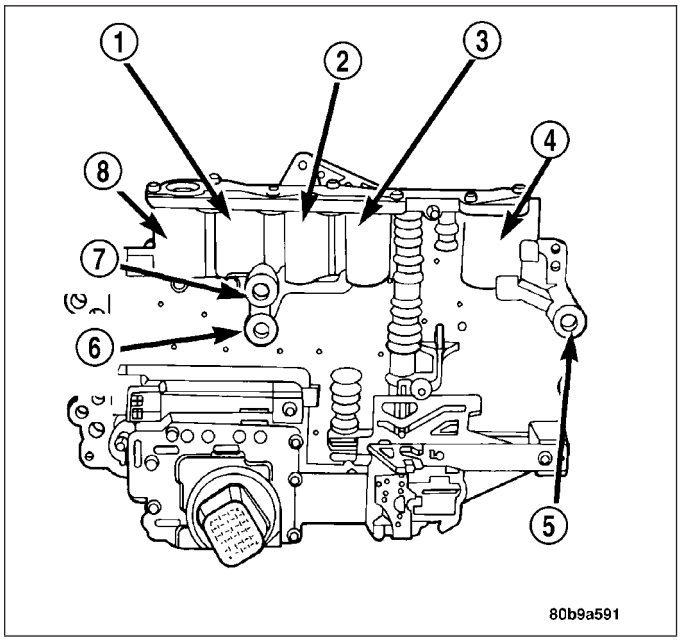
Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.



Valve body bores do not change dimensionally with use. If the valve body functioned correctly when new, it will continue to operate properly after cleaning and inspection. It should not be necessary to replace a valve body assembly unless it is damaged in handling.

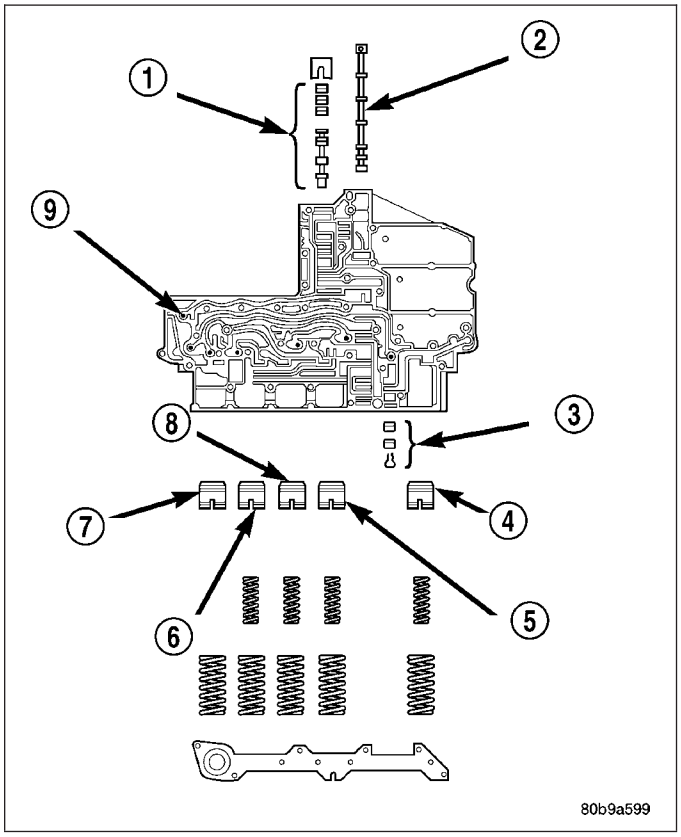
Inspect all the accumulator bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the accumulator springs. The springs must be free of distortion, warpage or broken coils.

Inspect all the fluid seals on the valve body. Replace any seals that are cracked, distorted, or damaged in any way. These seals pass fluid pressure directly to the clutches. Any pressure leak at these points, may cause transmission performance problems.

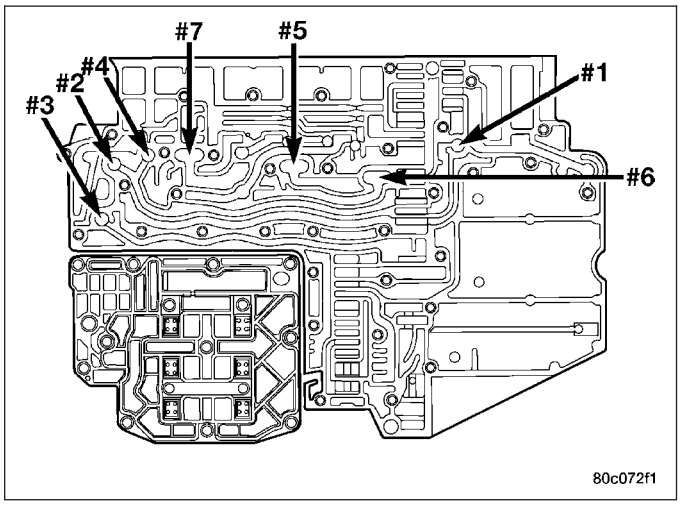


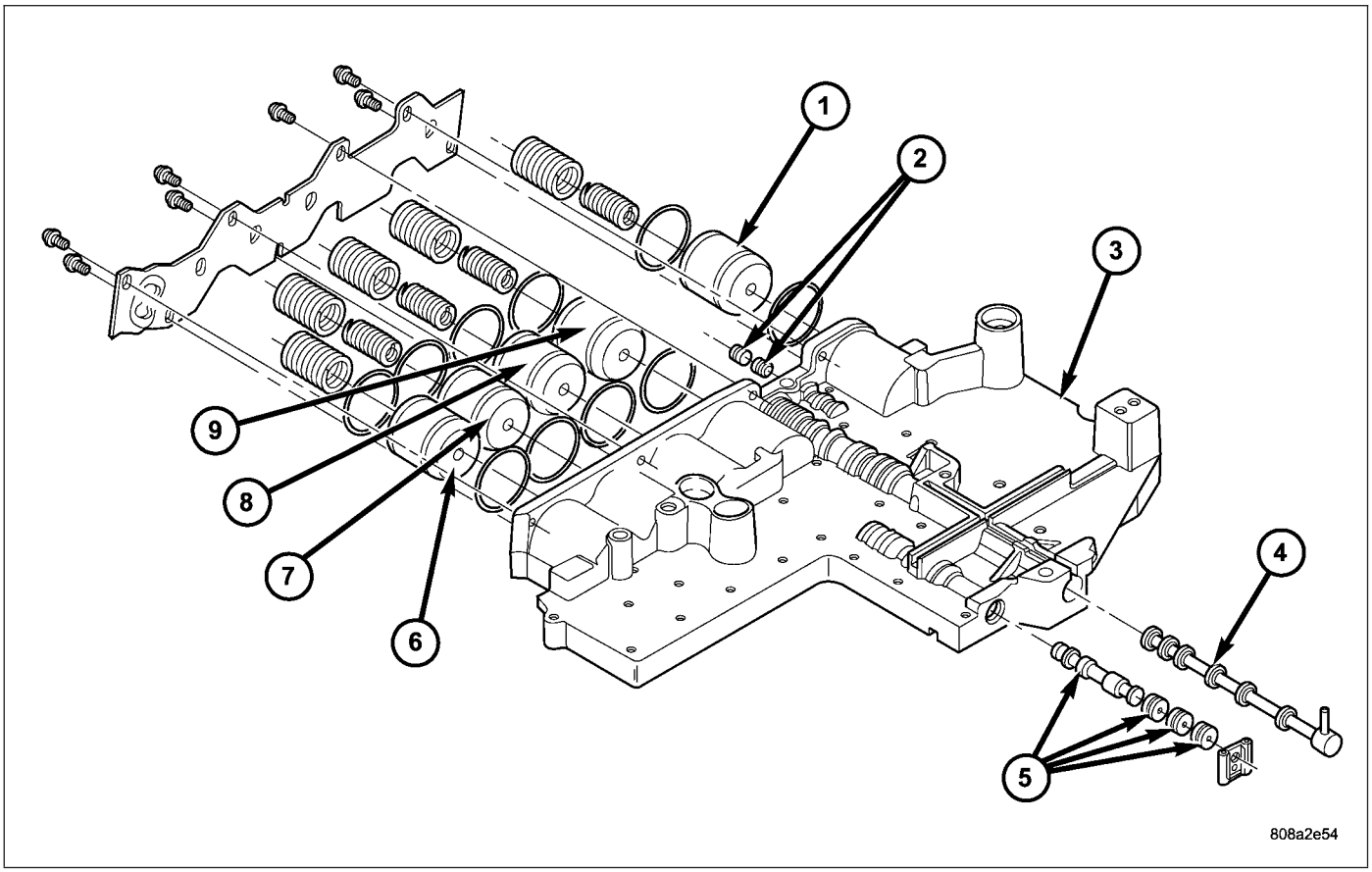
ASSEMBLY

1. Lubricate valves, springs, and the housing valve bores with clean transmission fluid.
2. Install solenoid switch valve (1), manual valve (2), and the low/reverse switch valve (3) into the valve body.
3. Install the retainers to hold each valve into the valve body.



4. Install the valve body check balls into their proper locations.
5. Position the transfer plate onto the valve body.
6. Install the screws to hold the transfer plate to the valve body. Tighten the screws to 5.6 N·m (50 in. lbs.).



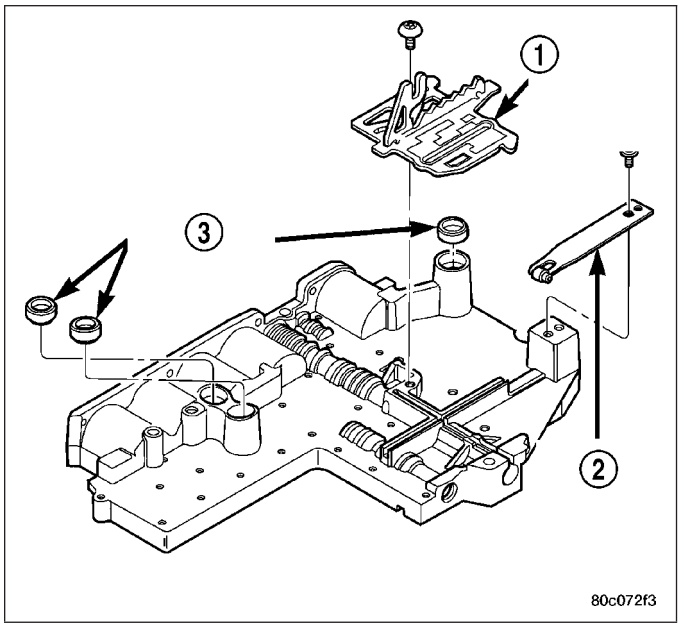


Valve Body Components

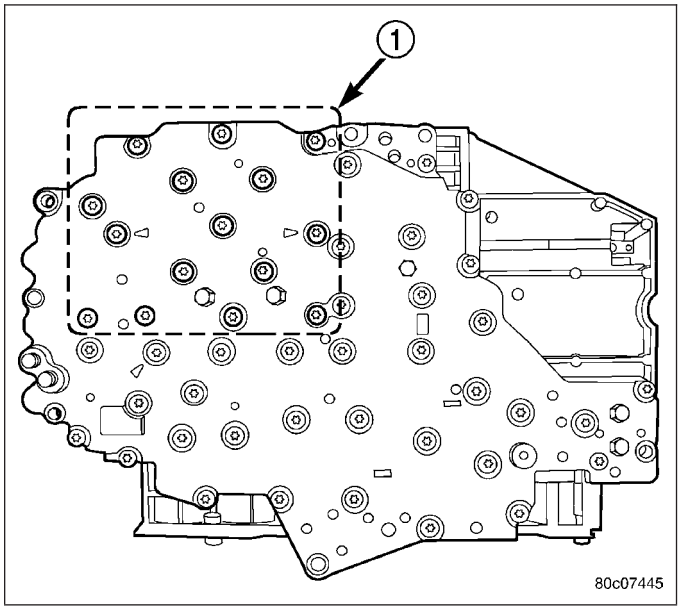
1 - LOW/REVERSE ACCUMULATOR
2 - LOW/REVERSE SWITCH VALVE
3 - UPPER VALVE BODY
4 - MANUAL VALVE
5 - SOLENOID SWITCH VALVE
6 - OVERDRIVE ACCUMULATOR
7 - UNDERDRIVE ACCUMULATOR
8 - 4C ACCUMULATOR
9 - 2C ACCUMULATOR

7. Install the accumulator pistons (1, 6-9) and springs into the valve body in the location from which they were removed. Note that all accumulators except the overdrive have two springs. The overdrive accumulator piston (6) has only one spring.
8. Position the accumulator cover onto the valve body.
9. Install the screws to hold the accumulator cover onto the valve body. Tighten the screws to 7 N·m (60 in. lbs.).

10. Install the TRS selector plate (1) onto the valve body and the manual valve.
11. Position the detent spring (2) onto the valve body.
12. Install the screw to hold the detent spring (2) onto the valve body. Tighten the screw to 4.5 N·m (40 in. lbs.).
13. Install new clutch passage seals (3) onto the valve body, if necessary.

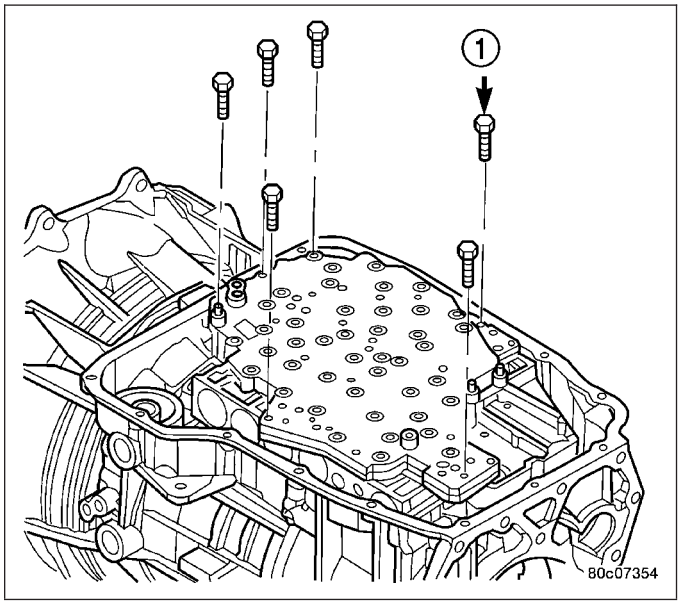


14. Install the solenoid and pressure switch assembly onto the valve body.
15. Install the bolts (1) to hold the solenoid and pressure switch assembly onto the valve body. Tighten the bolts to 5.7 N·m (50 in. lbs.). Tighten the bolts adjacent to the arrows cast into the bottom of the transfer plate first.



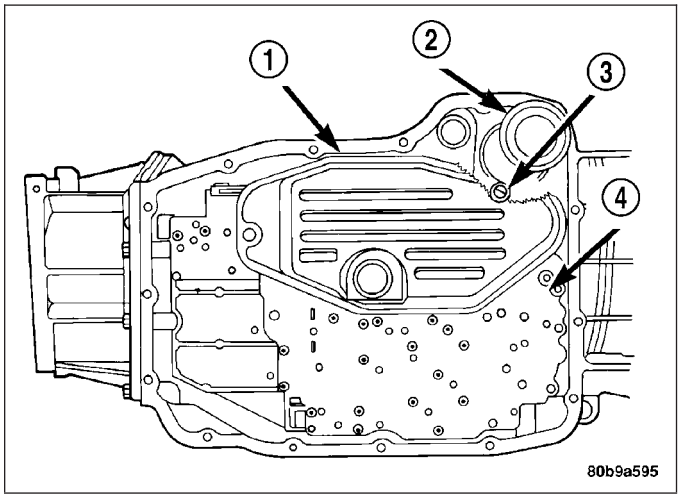
INSTALLATION

1. Check condition of seals on valve body and the solenoid and pressure switch assembly. Replace seals if cut or worn.
2. Place TRS selector plate in the PARK position.
3. Place the transmission in the PARK position.
4. Lubricate seal on the solenoid and pressure switch assembly connector with petroleum jelly.
5. Position valve body in transmission and align the manual lever on the valve body to the pin on the transmission manual shift lever.
6. Seat valve body in case and install one or two bolts to hold valve body in place.
7. Tighten valve body bolts alternately and evenly to 12 N·m (105 in. lbs.) torque.



CAUTION: The primary oil filter seal MUST be fully installed flush against the oil pump body. DO NOT install the seal onto the filter neck and attempt to install the filter and seal as an assembly. Damage to the transmission will result.

8. Install a new primary oil filter seal in the oil pump inlet bore. Seat the seal in the bore with the butt end of a hammer, or other suitable tool.
9. Place replacement filter (1) in position on valve body and into the oil pump.
10. Install screw to hold filter to valve body. Tighten screw to 4.5 N·m (40 in. lbs.) torque.
11. Connect the solenoid and pressure switch assembly connector.



12. Install oil pan. Tighten pan bolts to 12 N·m (105 in. lbs.) torque.
13. Lower vehicle and fill transmission with Mopar® ATF +4.
14. Check and adjust gearshift cable, if necessary.

AUTOMATIC TRANSMISSION - 48RE - GAS - ELECTRICAL DIAGNOSTICS

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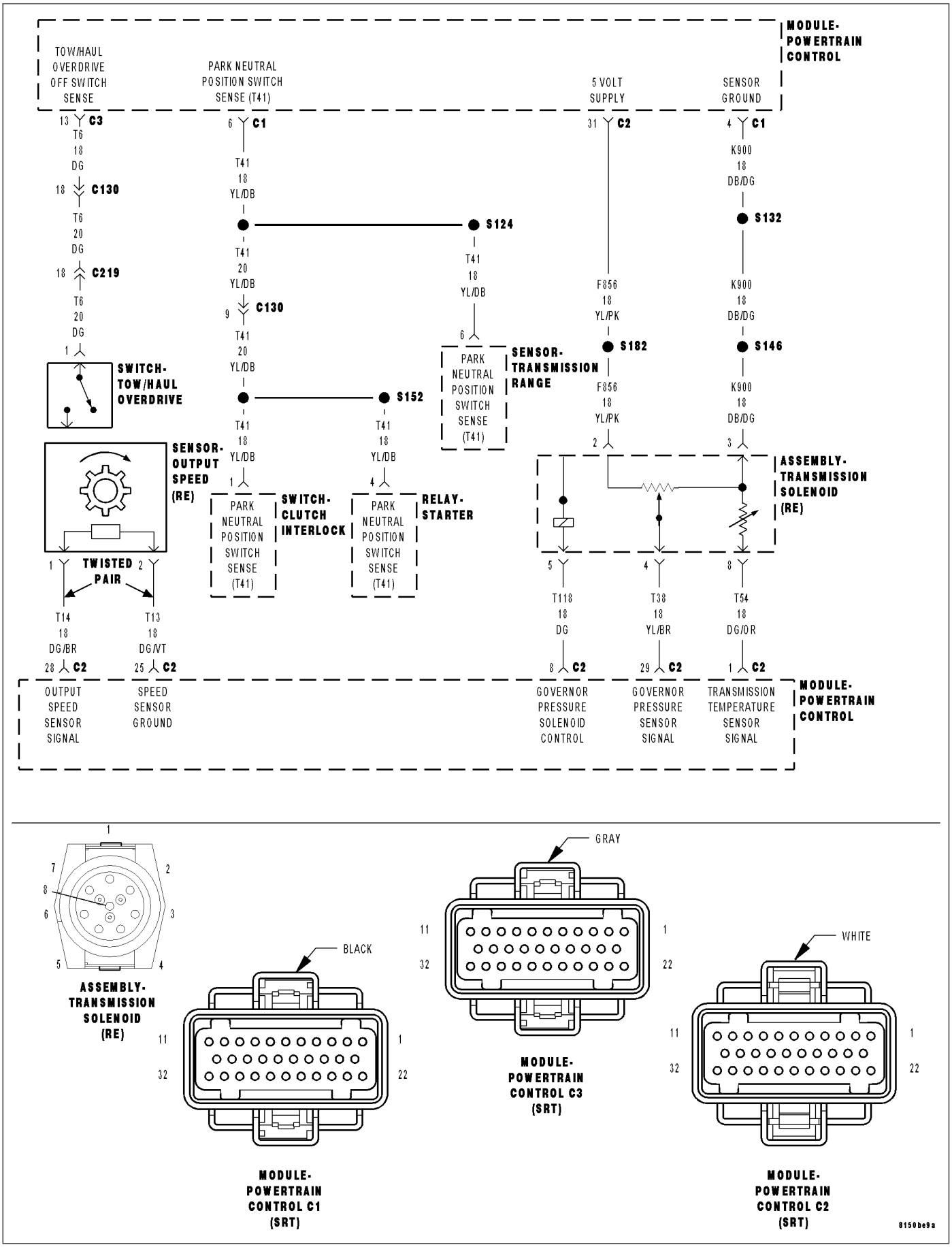
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AUTOMATIC TRANSMISSION - 48RE - GAS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

P0711-TRANS TEMP SENSOR, NO TEMP RISE AFTER START (GAS)



P0711-TRANS TEMP SENSOR, NO TEMP RISE AFTER START (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Theory of Operation

The Transmission Temperature Sensor is used to sense when the transmission temperature is too hot or too cold to operate overdrive and/or the torque convertor clutch. When the transmission sensor detects a temperature below 0° C (32° F), overdrive and the torque convertor clutch are disabled. When the detected temperature is above 127° C (260° F), overdrive is disabled and 3rd gear with TCC is engaged, this strategy is used to increase transmission fluid flow to help cool the transmission.

- **When Monitored:**
  Continuously with the ignition on and the engine running.
- **Set Condition:**
  The DTC will set after two consecutive trips in which the transmission oil temperature is greater than 5° C (40° F) and the transmission oil temperature does not rise more than 8° C (16° F) after 20 minutes of run time with a vehicle speed greater than 48 Kmh (30 mph). The DTC will also set if the engine temperature is greater than 38° C (100° F) with the transmission oil temperature greater than 127° C (260° F).

Possible Causes
OTHER TRANSMISSION DTC'S SET
INTERMITTENT TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION TEMPERATURE SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.
With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 6

---

2. CHECK FOR OTHER TRANSMISSION DTCS

Does the scan tool show any Park/Neutral DTCs?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 3

P0711-TRANS TEMP SENSOR, NO TEMP RISE AFTER START (GAS) (CONTINUED)

3. COMPARE THE TRANSMISSION TEMPERATURE TO ENGINE COOLANT TEMPERATURE

NOTE: To test the transmission temperature sensor, the engine and transmission temperature must be at or below 29.4° C (85° F).

With the scan tool, read the Transmission and Engine temperatures.

Is the transmission temperature within 5° C (9° F) of the engine coolant temperature?

Yes >> Go To 4

No >> Go To 5

---

4. CHECK IF THE TRANSMISSION TEMPERATURE INCREASES 15 DEGREES OVER 10 MINUTE PERIOD

NOTE: To test the transmission temperature sensor, the engine and transmission temperature must be at or below 29.4° C (85° F).

CAUTION: Apply the parking brake.

Start the engine, firmly apply the brakes and allow the engine to idle in Drive.

With the scan tool, monitor the Transmission Temperature.

NOTE: If the transmission temperature sensor is working properly, the transmission temperature should rise at least 8° C (15° F) within a ten minute period.

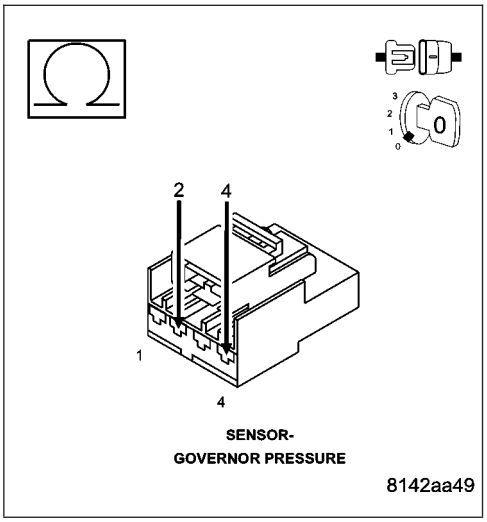
Did the transmission temperature increase at a steady rate and rise at least 8° C (15° F) over a 10 minute period?

Yes >> Go To 6

No >> Go To 5

P0711-TRANS TEMP SENSOR, NO TEMP RISE AFTER START (GAS) (CONTINUED)

5. CHECK THE TRANSMISSION TEMPERATURE SENSOR



TYPICAL VALUES FOR TRANSMISSION TEMPERATURE SENSOR

TEMPERATURE	MIN TO MAX OHM RANGE
-40° C (-40° F)	1094 to 1176 ohms
0.0° C (32° F)	1587 to 1672 ohms
25° C (77° F)	1960 to 2040 ohms
70° C (158° F)	2709 to 2860 ohms
0° C (212° F)	3284 to 3500 ohms
120° C (120° F)	3684 to 3950 ohms
150° C (302° F)	4110 to 4450 ohms

Turn the ignition off to the lock position.

Remove the Transmission Oil Pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure Sensor harness connector internal to the transmission.

NOTE: Check connectors - Clean/repair as necessary

Measure the resistance of the Transmission Temperature Sensor between the (T54) Transmission Temperature Sensor Signal circuit and the (K900) Sensor Ground circuit.

Using the chart at the chart above, compare the Temperature Sensor temperature to the correlating resistance value.

Is the resistance within the specified range when the sensor is at the given temperature?

Yes >> Test Complete.

No >> Replace the Governor Pressure/Transmission Temperature Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0711-TRANS TEMP SENSOR, NO TEMP RISE AFTER START (GAS) (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

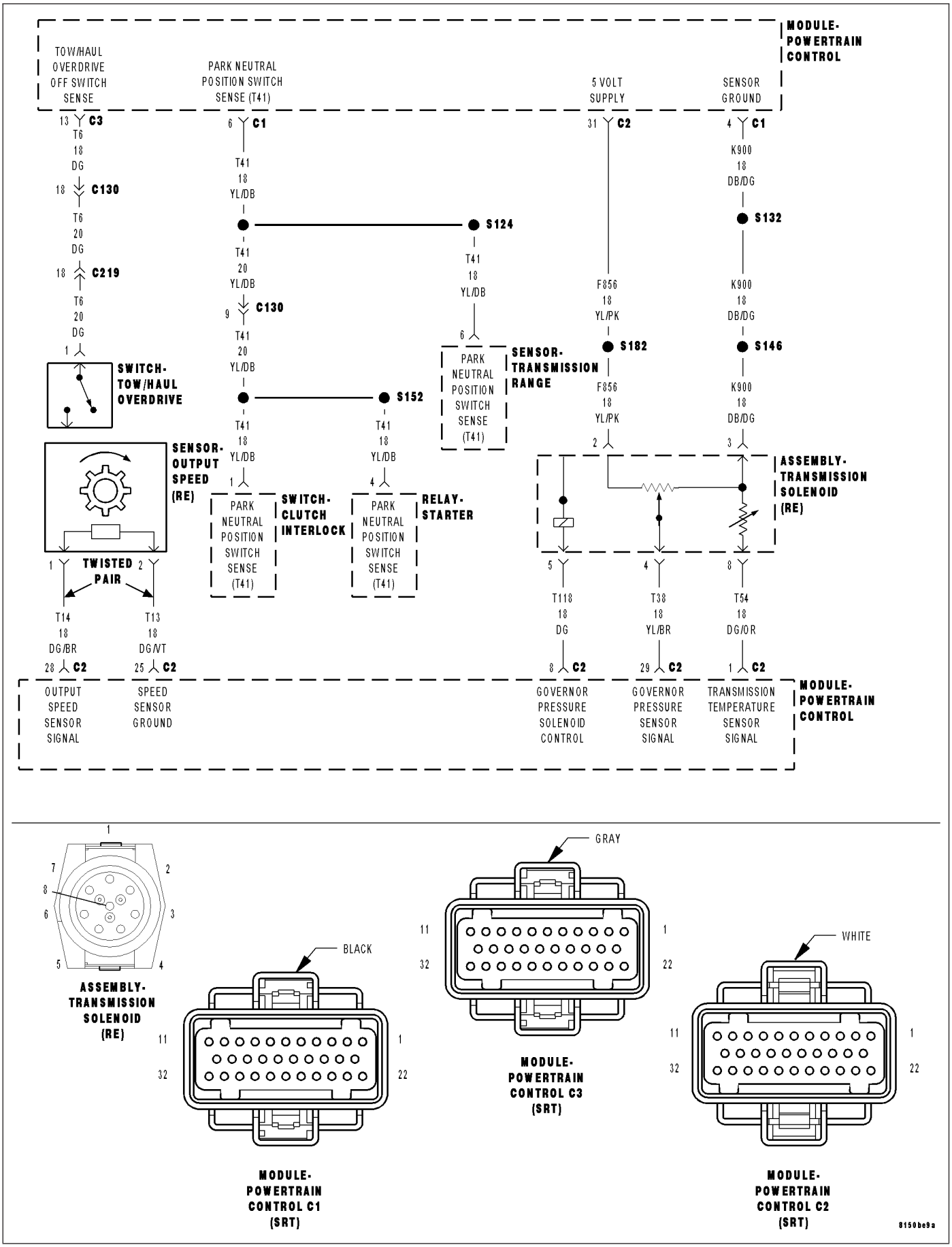
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (GAS)



P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Transmission Temperature Sensor is used to sense when the transmission temperature is too hot or too cold to operate overdrive and/or the torque convertor clutch. When the transmission sensor detects a temperature below 0° C (32° F), overdrive and the torque convertor clutch are disabled. When the detected temperature is above 127° C (260° F), overdrive is disabled and 3rd gear with TCC is engaged, this strategy is used to increase transmission fluid flow to help cool the transmission.

- **When Monitored:**
  Continuously with the ignition on and the engine running.
- **Set Condition:**
  The DTC will set if the monitored Transmission Temperature Sensor Signal circuit drops below 1.55 volts for the period of 2.25 seconds.

Possible Causes
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO (K900) SENSOR GROUND CIRCUIT
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND INSIDE TRANSMISSION
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO THE (K900) SENSOR GROUND CIRCUIT INSIDE TRANSMISSION
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 8

P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (GAS) (CONTINUED)

2. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the PCM C2 harness connector.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary

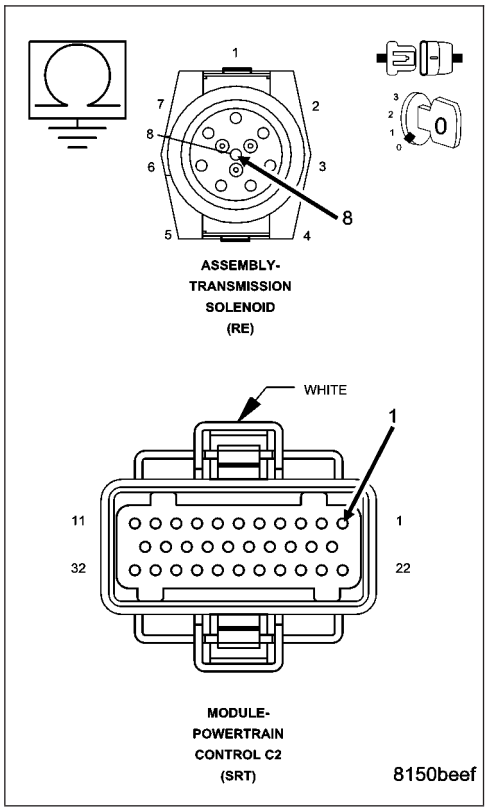
Measure the resistance between ground and the (T54) Transmission Temperature Sensor Signal circuit.

Is the resistance above 100k ohms?

Yes >> Go To 3

No >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



3. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (K900) SENSOR GROUND CIRCUIT

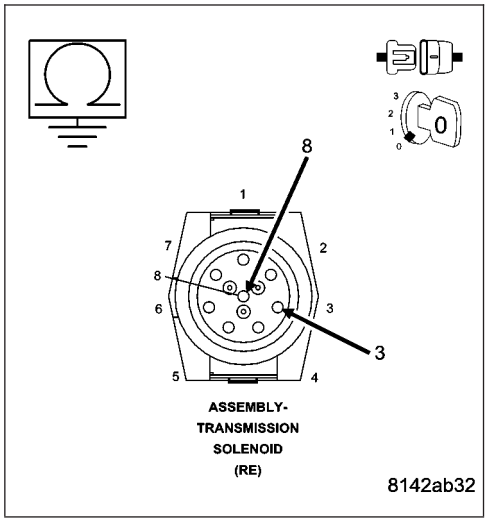
Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and (K900) Sensor Ground circuit in the Transmission Solenoid Assembly harness connector.

Is the resistance above 100k ohms?

Yes >> Go To 4

No >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to the (K900) Sensor Ground circuit.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (GAS) (CONTINUED)

4. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND INSIDE TRANSMISSION

Remove the Transmission Oil Pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure Sensor connector internal to the transmission.

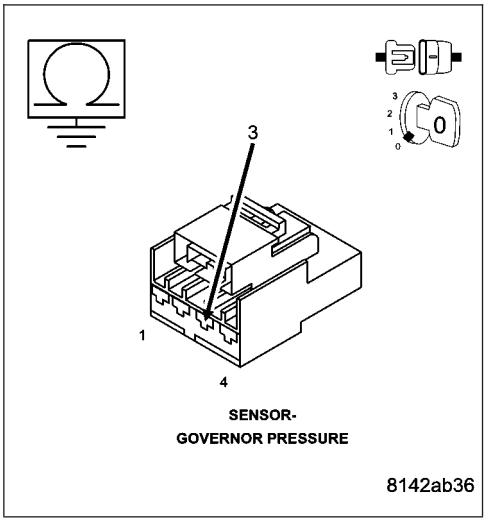
Measure the resistance between ground and the (T54) Transmission Temperature Sensor Signal circuit at the Governor Pressure Sensor connector.

Is the resistance above 100k ohms?

Yes >> Go To 5

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)



5. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (K900) SENSOR GROUND CIRCUIT INSIDE TRANSMISSION

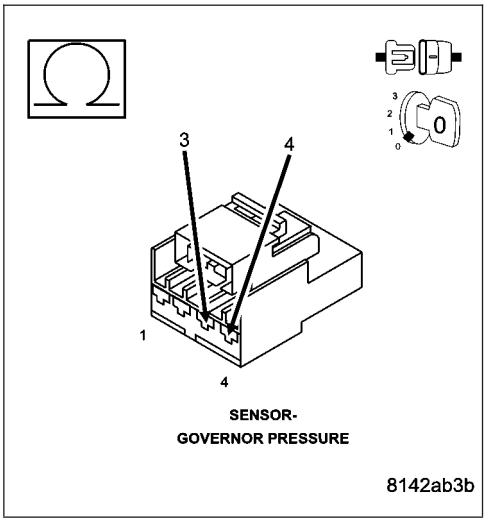
Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and (K900) Sensor Ground circuit at the Governor Pressure Sensor connector.

Is the resistance above 100k ohms?

Yes >> Go To 6

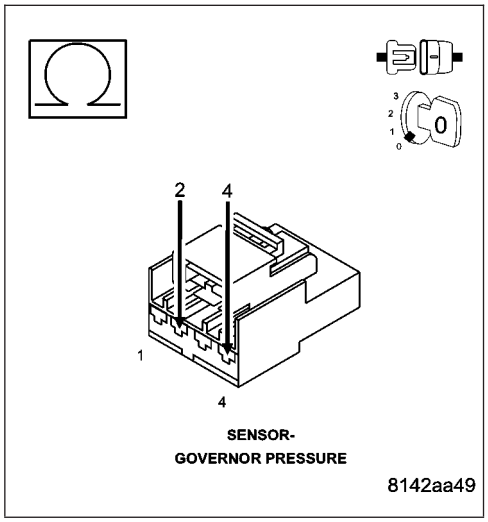
No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (GAS) (CONTINUED)

6. TRANSMISSION TEMPERATURE SENSOR



TYPICAL VALUES FOR TRANSMISSION TEMPERATURE SENSOR

TEMPERATURE	MIN TO MAX OHM RANGE
-40° C (-40° F)	1094 to 1176 ohms
0.0° C (32° F)	1587 to 1672 ohms
25° C (77° F)	1960 to 2040 ohms
70° C (158° F)	2709 to 2860 ohms
0° C (212° F)	3284 to 3500 ohms
120° C (120° F)	3684 to 3950 ohms
150° C (302° F)	4110 to 4450 ohms

Measure the resistance of the Transmission Temperature Sensor between the (T54) Transmission Temperature Sensor Signal circuit and (K900) Sensor Ground circuit.

Using the chart above, compare the Temperature Sensor temperature to the correlating resistance value.

Is the resistance below the minimum specification for the sensor temperature?

Yes >> Replace the Governor Pressure/Transmission Temperature Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 7

P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (GAS) (CONTINUED)

7. POWERTRAIN CONTROL MODULE

Reconnect the all disconnected connectors.

Ignition on, engine not running.

With the scan tool, erase Engine DTCs.

With the scan tool, monitor Engine DTC's.

Disconnect the Transmission Temperature Sensor connector.

Did the DTC P0713 set?

Yes >> Go To 8

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

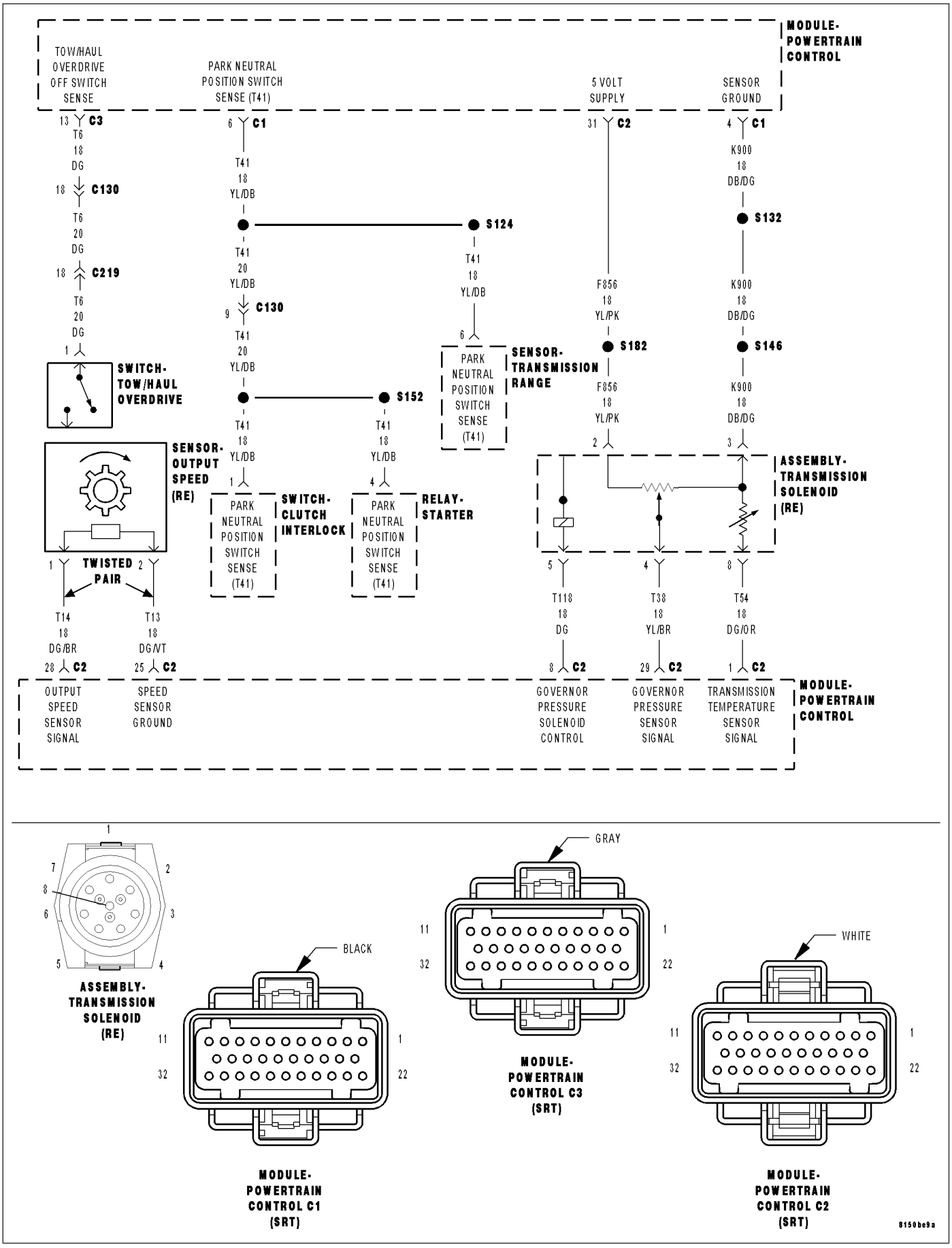
Were there any problems found?

Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (GAS)



P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Transmission Temperature Sensor is used to sense when the transmission temperature is too hot or too cold to operate overdrive and/or the torque convertor clutch. When the transmission sensor detects a temperature below 0° C (32° F), overdrive and the torque convertor clutch are disabled. When the detected temperature is above 127° C (260° F), overdrive is disabled and 3rd gear with TCC is engaged, this strategy is used to increase transmission fluid flow to help cool the transmission.

- **When Monitored:**
  Continuously with the ignition on and the engine running.
- **Set Condition:**
  This DTC will set if the (T54) Transmission Temperature Sensor Signal circuit voltage exceeds 3.76 volts for the period of 2.2 seconds.

Possible Causes
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO (F856) 5-VOLT SUPPLY CIRCUIT
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
(T54) 5-VOLT SUPPLY OPEN IN TRANSMISSION
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO (F856) 5-VOLT SUPPLY CIRCUIT INTERNAL TO THE TRANSMISSION
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN INTERNAL TO THE TRANSMISSION
(K900) SENSOR GROUND CIRCUIT OPEN INTERNAL TO THE TRANSMISSION
TRANSMISSION TEMPERATURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 12

P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (GAS) (CONTINUED)

2. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the PCM C1 and C2 harness connectors.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary

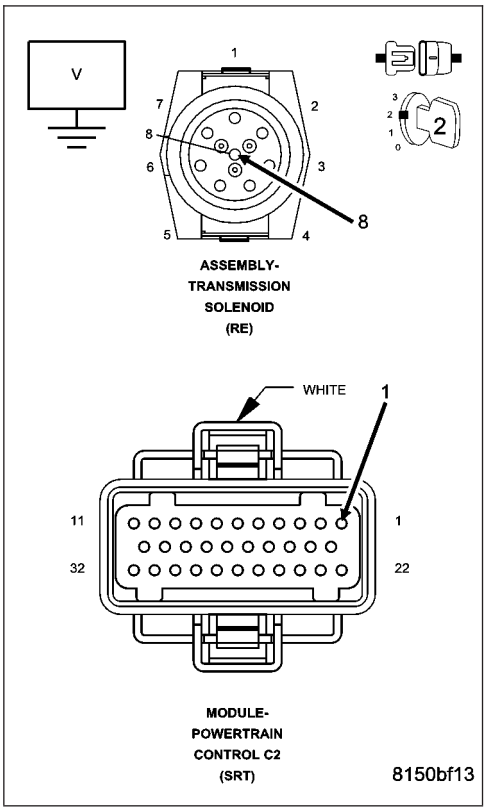
Ignition on, engine not running.

Measure the voltage of the (T54) Transmission Temperature Sensor Signal circuit in the PCM C2 harness connector.

Is the voltage above 0.5 volts?

Yes >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 3



3. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (F856) 5-VOLT SUPPLY CIRCUIT

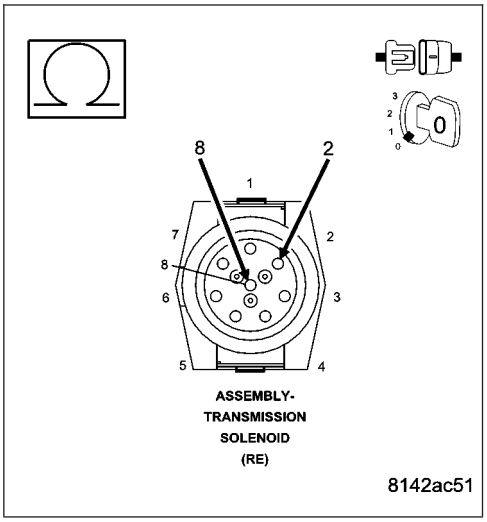
Turn the ignition off to the lock position.

Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and the (F856) 5-volt Supply circuit in the Transmission Solenoid Assembly harness connector.

Is the resistance above 100k ohms?

Yes >> Go To 4

No >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to the (F856) 5-volt Supply circuit.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (GAS) (CONTINUED)

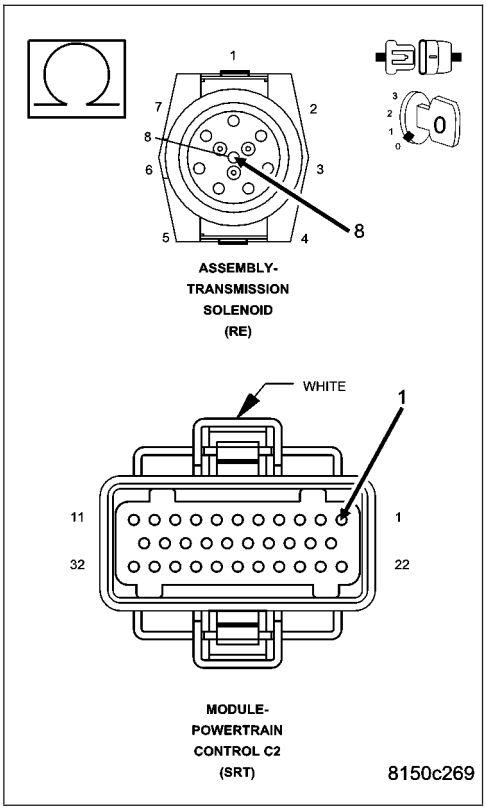
4. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN

Measure the resistance of the (T54) Transmission Temperature Sensor Signal circuit between the PCM C2 harness connector and the Transmission Solenoid Assembly harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (T54) Transmission Temperature Sensor Signal circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



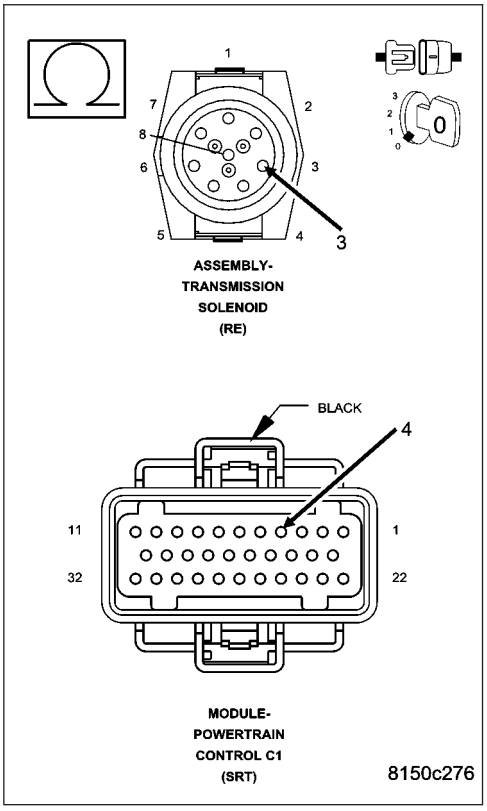
5. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (K900) Sensor Ground circuit between the PCM C1 harness connector and the Transmission Solenoid Assembly harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the (K900) Sensor Ground circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



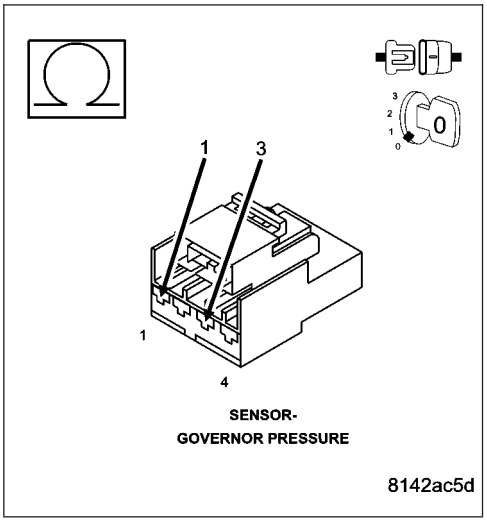
P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (GAS) (CONTINUED)

6. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO THE (F856) 5-VOLT SUPPLY CIRCUIT INTERNAL TO THE TRANSMISSION

Remove the Transmission Oil Pan. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure Sensor connector internal to the transmission.

Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and (F856) 5-volt Supply circuit in the Governor Pressure Sensor connector internal to the transmission.



Is the resistance above 100k ohms?

Yes >> Go To 7

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

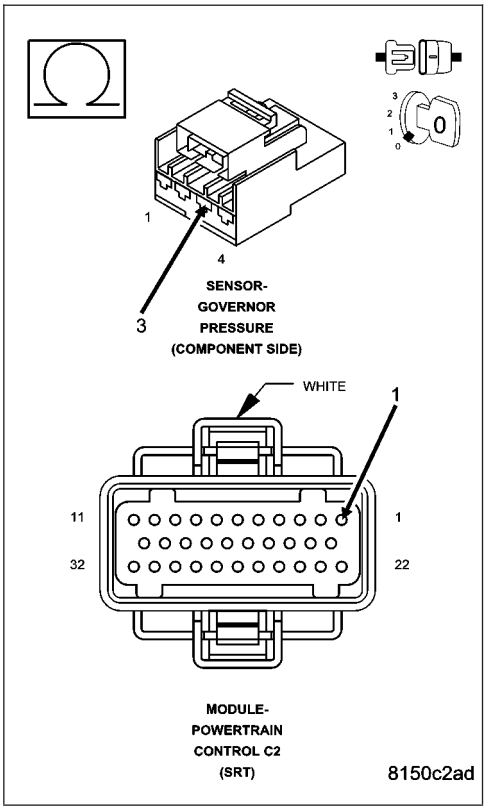
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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7. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN INTERNAL TO THE TRANSMISSION

Reconnect the Transmission Solenoid Assembly harness connector.

Measure the resistance of the (T54) Transmission Temperature Sensor Signal circuit between the PCM C2 harness connector and the Governor Pressure Sensor connector internal to the transmission.



Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (GAS) (CONTINUED)

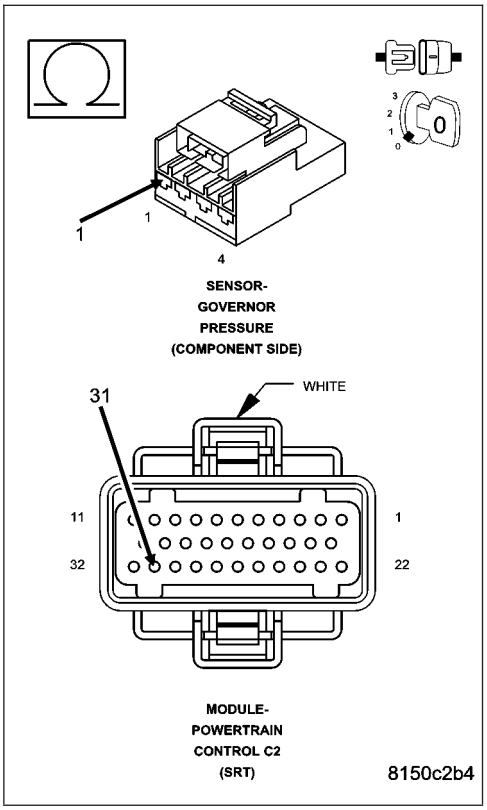
8. CHECK THE (F856) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN INTERNAL TO THE TRANSMISSION

Measure the resistance of the (F856) 5-volt Supply circuit between PCM C2 harness connector and the Governor Pressure Sensor connector internal to the transmission.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)



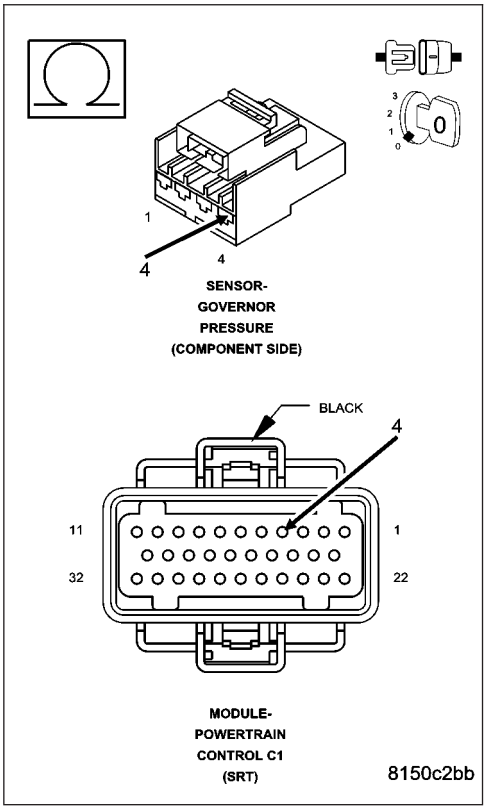
9. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN INTERNAL TO THE TRANSMISSION

Measure the resistance of the (K900) Sensor Ground circuit between the PCM C1 harness connector and the Governor Pressure Sensor connector internal to the transmission.

Is the resistance below 5.0 ohms?

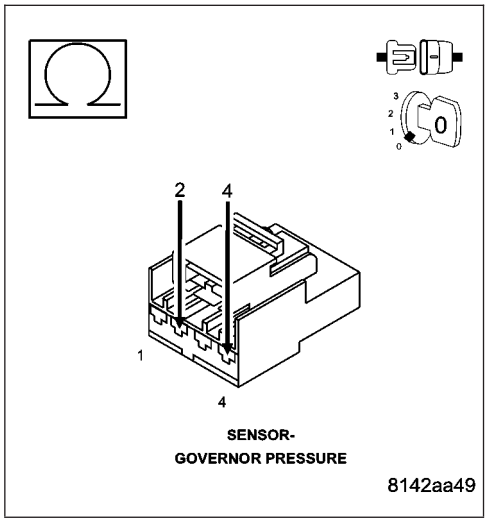
Yes >> Go To 10

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (GAS) (CONTINUED)

10. CHECK THE TRANSMISSION TEMPERATURE SENSOR



TYPICAL VALUES FOR TRANSMISSION TEMPERATURE SENSOR

TEMPERATURE	MIN TO MAX OHM RANGE
-40° C (-40° F)	1094 to 1176 ohms
0.0° C (32° F)	1587 to 1672 ohms
25° C (77° F)	1960 to 2040 ohms
70° C (158° F)	2709 to 2860 ohms
0° C (212° F)	3284 to 3500 ohms
120° C (120° F)	3684 to 3950 ohms
150° C (302° F)	4110 to 4450 ohms

Measure the resistance of the Transmission Temperature Sensor between the (T54) Transmission Temperature Sensor Signal circuit and the (K900) Sensor Ground circuit.

Using the chart above, compare the Temperature Sensor temperature to the correlating resistance value.

Is the Temperature Sensor resistance above the maximum specification listed in the chart?

Yes >> Replace the Governor Pressure/Transmission Temperature Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 11

P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (GAS) (CONTINUED)

11. CHECK THE POWERTRAIN CONTROL MODULE

Reconnect all disconnected connectors.

Ignition on, engine not running.

With the scan tool, erase Engine DTCs.

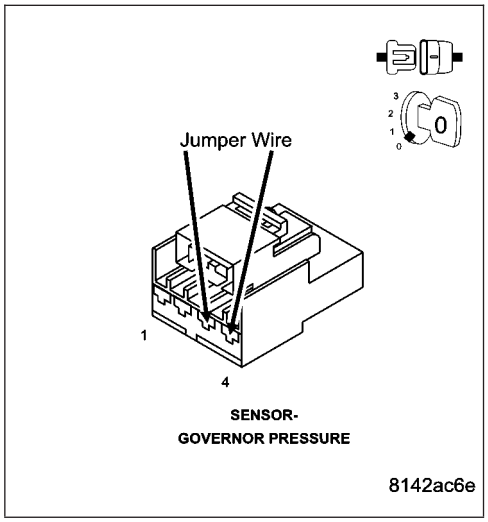
Turn the ignition off to the lock position.

Disconnect the Governor Pressure Sensor connector internal to the transmission.

Connect a jumper wire between the (T54) Transmission Temperature Sensor Signal circuit and the (K900) Sensor Ground circuit in the Transmission Solenoid Assembly harness connector.

Ignition on, engine not running.

With the scan tool, read Engine DTCs.



Did the DTC Transmission Oil Temperature Sensor Voltage Too Low set?

Yes >> Go To 12

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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12. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

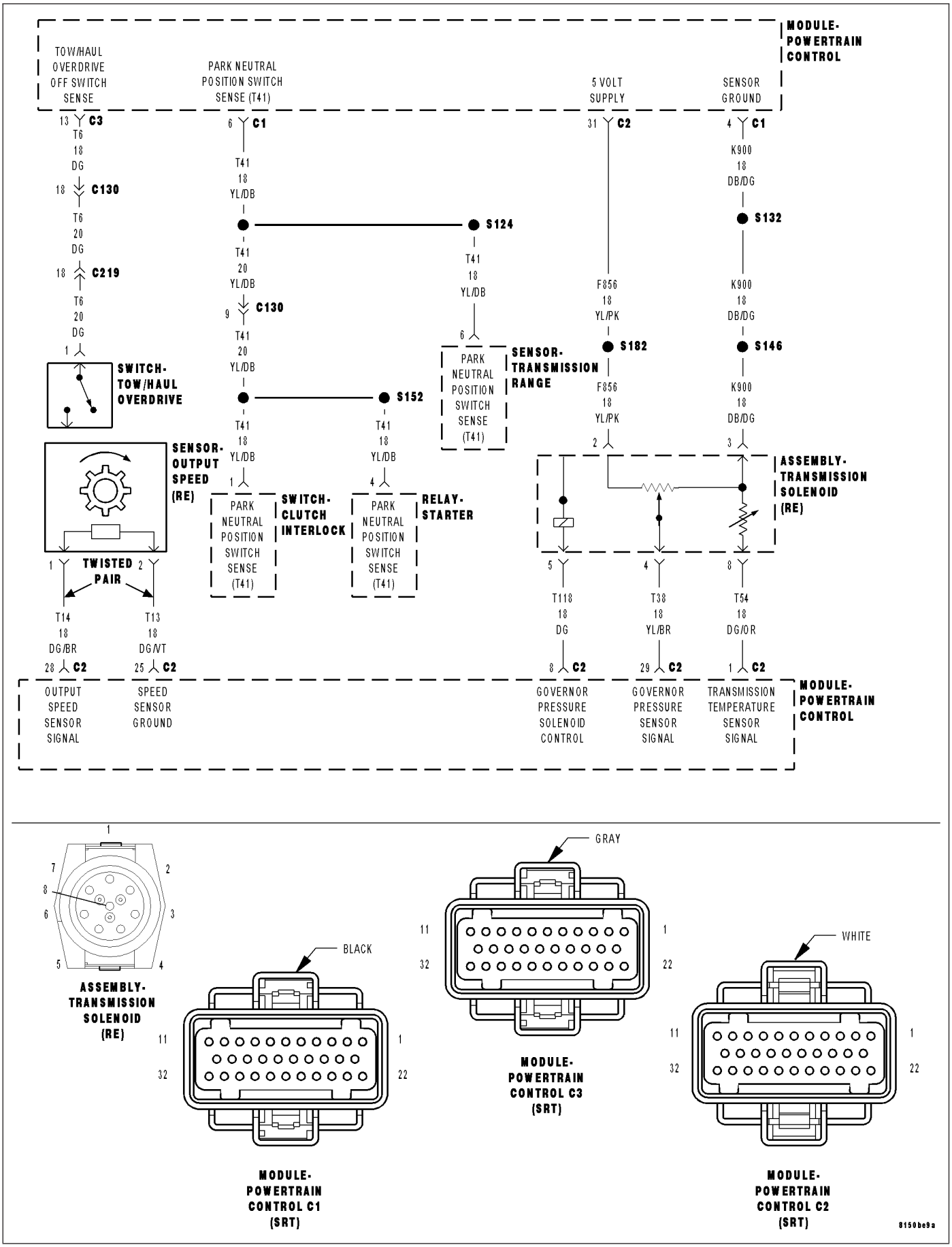
Were there any problems found?

Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (GAS)



P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on, engine running, and gear selector NOT in park or neutral.
- **Set Condition:**
  This DTC will set if the vehicle speed (reported from the CAB module) is above 24 Kmh (15 mph), and the monitored Output Shaft Speed is below 60 RPM for 2.6 seconds.

Possible Causes
PARK/NEUTRAL DTC PRESENT
(T13) SENSOR GROUND CIRCUIT OPEN
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
(T13) SENSOR GROUND CIRCUIT SHORT TO ANOTHER CIRCUIT
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO ANOTHER CIRCUIT
(T13) SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
OUTPUT SPEED SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 11

---

2. CHECK IF A PARK/NEUTRAL DTC IS PRESENT

Is there a Park/Neutral DTC present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 3

P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (GAS) (CONTINUED)

3. CHECK THE (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Disconnect the PCM C2 harness connector.

Disconnect the Output Speed Sensor harness connector.

NOTE: Check connectors - Clean/repair as necessary

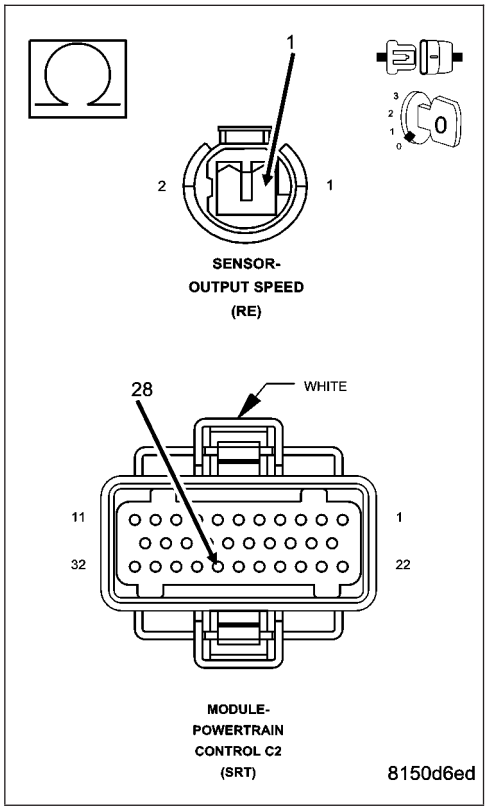
Measure the resistance of the (T14) Output Speed Sensor Signal circuit between the PCM C2 harness connector and the Output Speed Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (T14) Output Speed Sensor Signal circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



4. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR AN OPEN

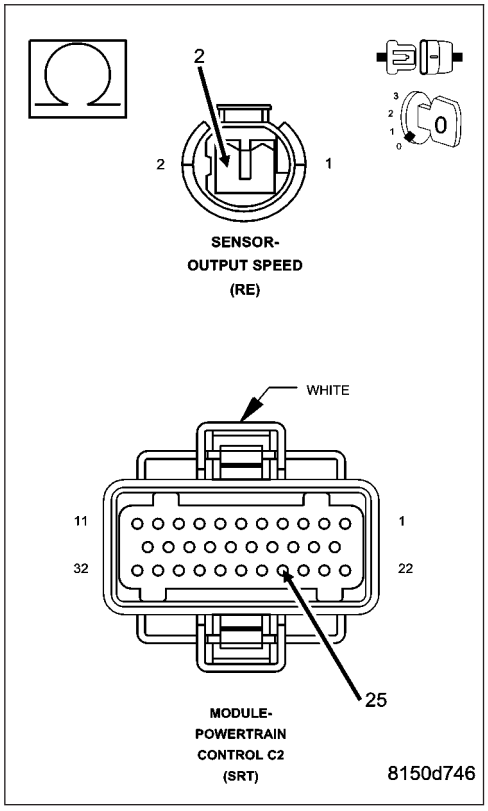
Measure the resistance of the (T13) Sensor Ground circuit between the PCM C2 harness connector and the Output Speed Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (T13) Sensor Ground circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (GAS) (CONTINUED)

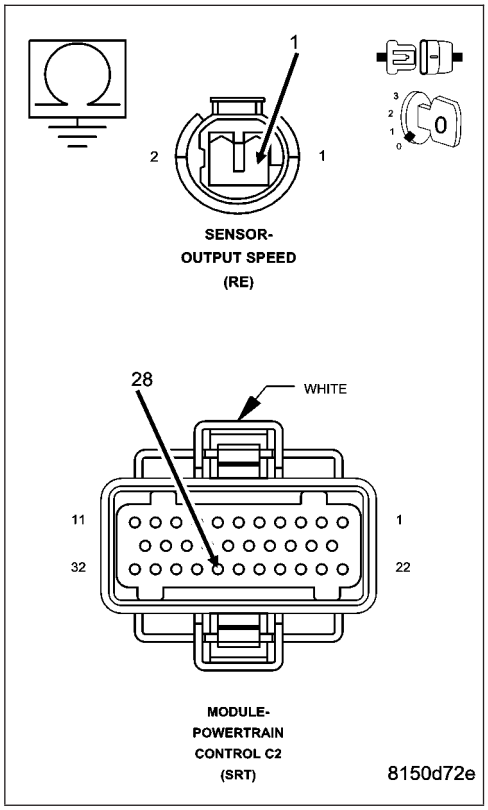
5. CHECK THE (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (T14) Output Speed Sensor Signal circuit.

Is the resistance greater than 100K ohms?

Yes >> Go To 6

No >> Repair the (T14) Output Speed Sensor Signal circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



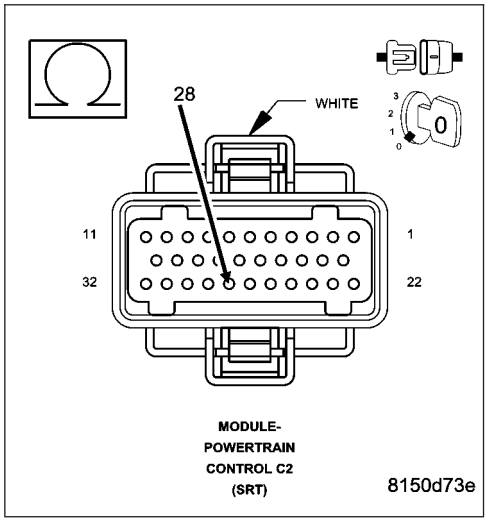
6. CHECK THE (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Measure the resistance between the (T14) Output Speed Sensor Signal circuit and all other circuits in the PCM C2 harness connector.

Is the resistance greater than 100K ohms between the (T14) Output Speed Sensor Signal circuit and any other circuit(s) in the PCM C2 harness connector?

Yes >> Go To 7

No >> Repair the (T14) Output Speed Sensor Signal circuit for a short to another circuit(s).
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (GAS) (CONTINUED)

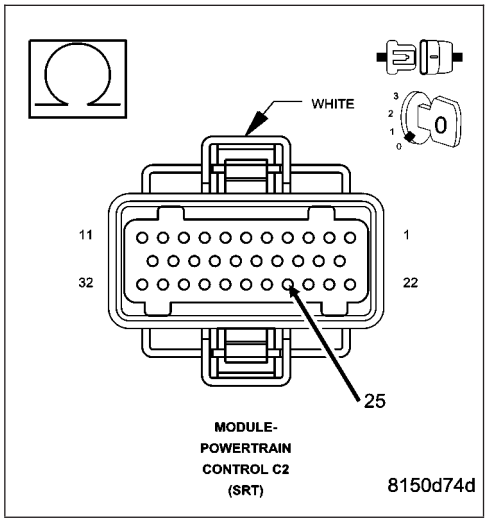
7. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Measure the resistance between the (T13) Sensor Ground circuit and all other circuits in the PCM C2 harness connector.

Is the resistance greater than 100K ohms?

Yes >> Go To 8

No >> Repair the (T13) Sensor Ground circuit for a short to another circuit(s).
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



8. CHECK THE (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

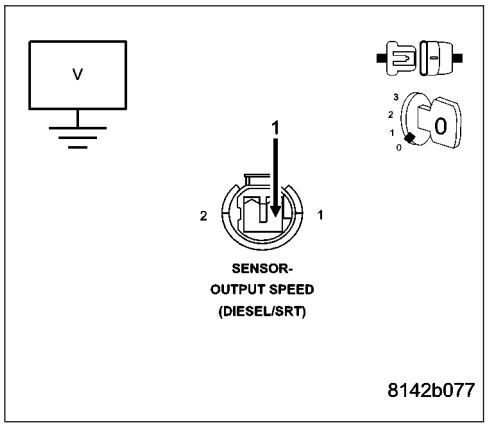
Ignition on, engine not running.

Measure the voltage of the (T14) Output Speed Sensor Signal circuit in the Output Speed Sensor harness connector.

Is there any voltage present?

Yes >> Repair the (T14) Output Speed Sensor Signal circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 9



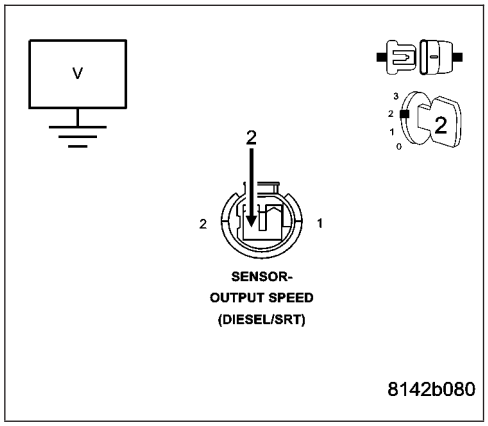
9. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE

Measure the voltage of the (T13) Sensor Ground circuit in the Output Speed Sensor harness connector.

Is there any voltage present?

Yes >> Repair the (T13) Sensor Ground circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

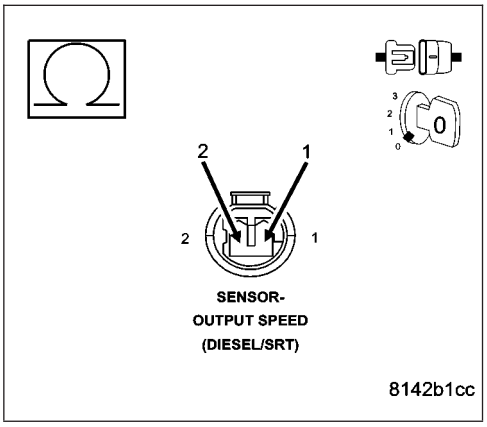
No >> Go To 10



P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (GAS) (CONTINUED)

10. CHECK THE OUTPUT SPEED SENSOR

Measure the resistance between the terminals of the Output Speed Sensor.



Is the resistance between 300.0 and 1200.0 ohms?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Replace the Output Speed Sensor.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

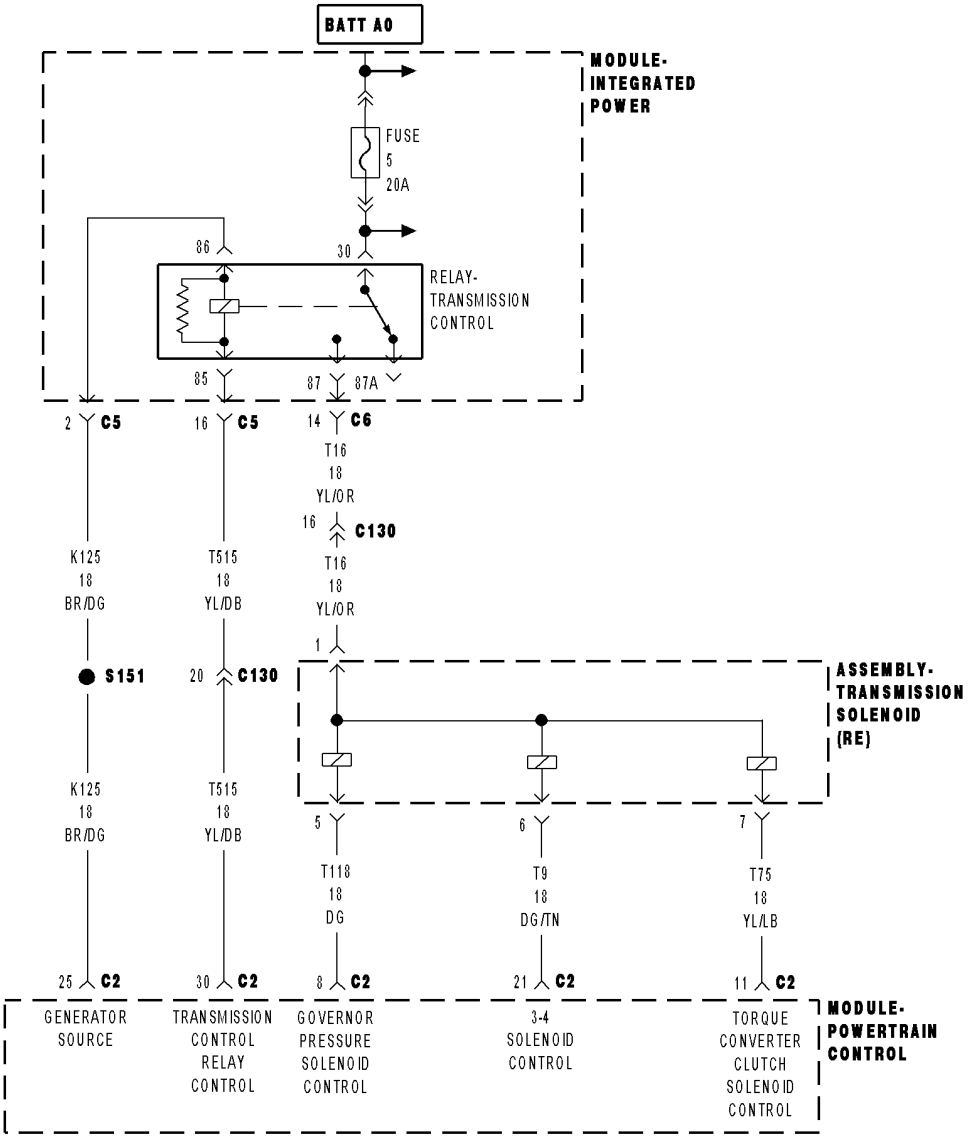
Were there any problems found?

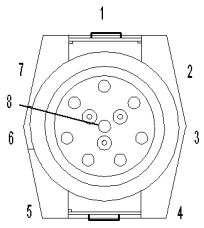
Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

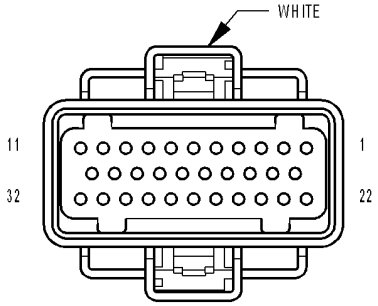
No >> Test Complete.

P0740-TORQ CON CLU, NO RPM DROP AT LOCKUP (GAS)





ASSEMBLY-
TRANSMISSION
SOLENOID
(RE)



MODULE-
POWERTRAIN
CONTROL C2
(SRT)

81511462

P0740-TORQ CON CLU, NO RPM DROP AT LOCKUP (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Torque Converter Clutch (TCC) solenoid is used to engage the TCC which improves fuel economy.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  This DTC will set if the Torque Convertor Clutch (TCC) can not achieve the desired engine RPM drop when the TCC Solenoid is near the maximum duty cycle after three consecutive test failures.

Possible Causes
TRANSMISSION FLUID LEVEL LOW OR CONTAMINATED
WORN OR DAMAGED REACTION SHAFT, INPUT SHAFT OR INPUT SHAFT SEALS
BLOCKED OR LEAK IN THE TCC HYDRAULIC CIRCUIT IN THE VALVE BODY
TORQUE CONVERTER CLUTCH SOLENOID
TORQUE CONVERTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

1. CHECK IF THERE ANY ENGINE DTCS PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Is the DTC P0743 also present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

---

2. CHECK TRANSMISSION FLUID LEVEL

Check the transmission fluid level.

Is the Transmission fluid level low?

Yes >> Inspect the transmission, cooler, and lines for leakage and repair as necessary. With the scan tool read and record the Freeze Frame data for the reported DTC. Erase DTCs and test drive the vehicle to the conditions in which the DTC originally set. Recheck for DTCs. If the DTC resets, follow the “No” path in this test procedure and proceed to the next step.

If the DTC does not reset, test is complete, perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 3

P0740-TORQ CON CLU, NO RPM DROP AT LOCKUP (GAS) (CONTINUED)

3. CHECK TRANSMISSION FLUID

Check the transmission fluid for contamination or a burnt condition.

Is the Transmission fluid contaminated or burnt?

Yes >> Remove the valve body and inspect the components related to the Torque Converter Clutch. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL) Check the valves for sticking or binding in its bore, internal valve body leakage, or the TCC hydraulic circuits plugged with debris. Repair as necessary. If no problems are found in the Valve Body, replace the Torque Convertor. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/TORQUE CONVERTER - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 4

---

4. CHECK IF THE DTC IS CURRENT

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 5

No >> Go To 9

---

5. PERFORM TCC SYSTEM TEST

With the scan tool, perform the TCC System Test.

Follow the instructions on the screen.

Did the engine stall?

Yes >> Go To 6

No >> Go To 7

---

6. PERFORM GOV AND 3-4 SHIFT VALVE SYSTEM TEST

With the scan tool, perform the Gov and 3-4 Shift Valve System Test.

Follow the instructions on the screen.

Did the engine stall?

Yes >> Go To 8

No >> Go To 7

P0740-TORQ CON CLU, NO RPM DROP AT LOCKUP (GAS) (CONTINUED)

7. CHECK THE COOLER OUT PRESSURE

Turn the ignition off to the lock position.

Connect a pressure gauge to the transmission cooler out port with a “T” connector. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

Start the engine, with the scan tool, perform the TCC System Test.

Did the cooler out pressure on the gauge increase when the TCC was actuated?

Yes >> Remove the transmission oil pump and inspect the reaction shaft, input shaft and input shaft seals for damage or wear and repair or replace as necessary. Replace the Torque Convertor.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Remove the Valve Body and inspect for an internal blockage or an internal leak in the TCC hydraulic circuit. Repair as necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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8. TCC SOLENOID

Turn the ignition off to the lock position.

Replace the TCC Solenoid per the Service Information (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL).

With the scan tool, perform the Gov and 3-4 Shift Valve System Test.

Follow the instructions on the screen.

Did the engine stall?

Yes >> Repair internal transmission as necessary. Check for blocked or cross linked passages in the Valve Body. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

9. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any technical service bulletins that may apply.

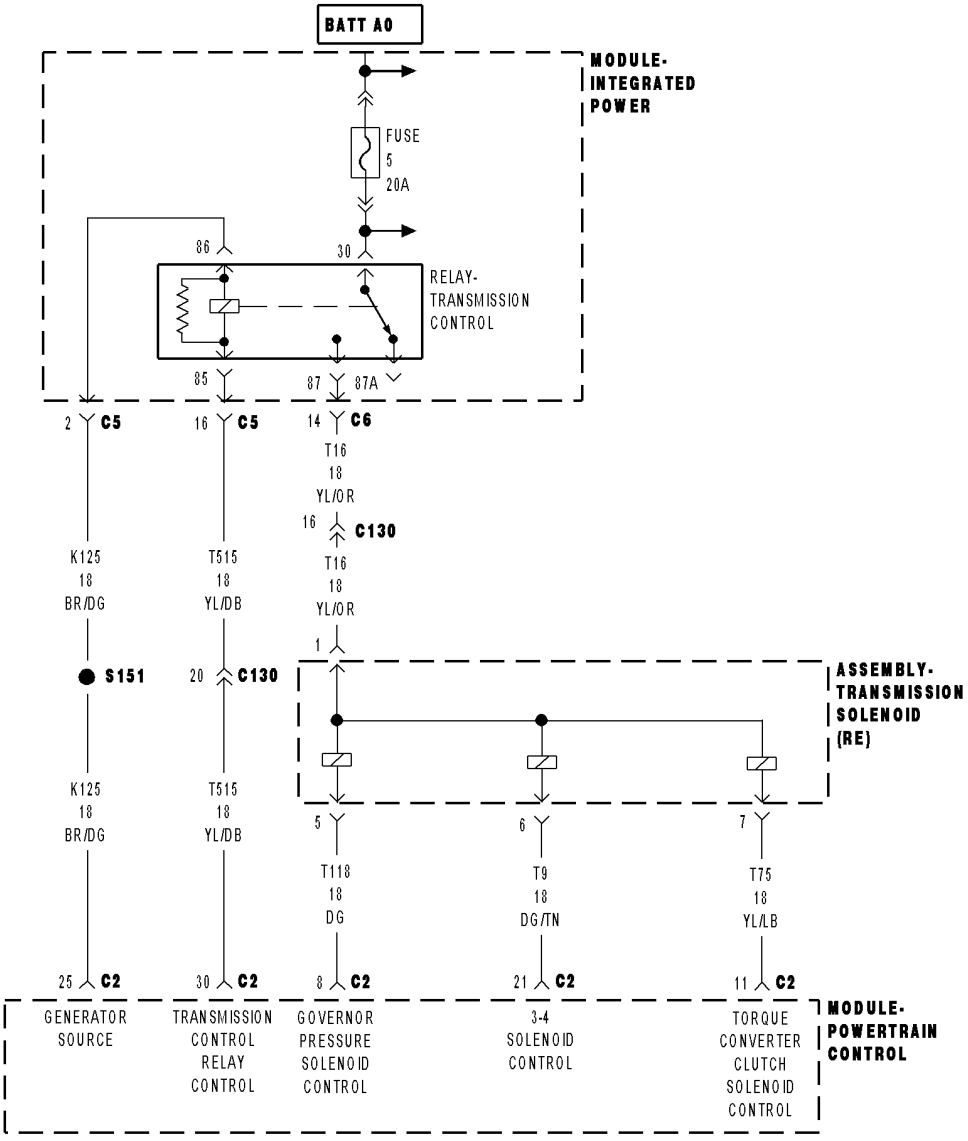
Were there any problems found?

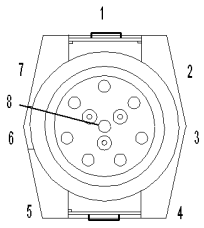
Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

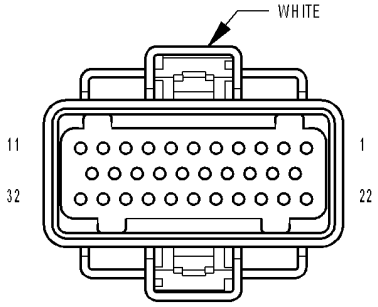
No >> Test Complete.

P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS





ASSEMBLY-
TRANSMISSION
SOLENOID
(RE)



MODULE-
POWERTRAIN
CONTROL C2
(SRT)

81511462

P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Torque Converter Clutch (TCC) solenoid is used to engage the TCC which improves fuel economy.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  This DTC will set if the voltage detected by the PCM for the Torque Converter Clutch Solenoid Control circuit is different than the expected voltage. Note: To clear this DTC it is necessary to drive the vehicle at a sustained speed which would allow the TCC and/or Overdrive Clutch to operate.

Possible Causes
TRANSMISSION CONTROL RELAY DTCS PRESENT
(F941) FUSED IGNITION SWITCH OUTPUT CIRCUIT (RUN-START) OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND
(T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION CONTROL RELAY - POOR CONTACTS
TORQUE CONVERTER CLUTCH SOLENOID
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THERE ANY TRANSMISSION CONTROL RELAY DTCS PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are there any Transmission Control Relay DTCs also present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS (CONTINUED)

2. CHECK IF THE DTC IS CURRENT

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 3

No >> Go To 11

---

3. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the Transmission Control Relay.

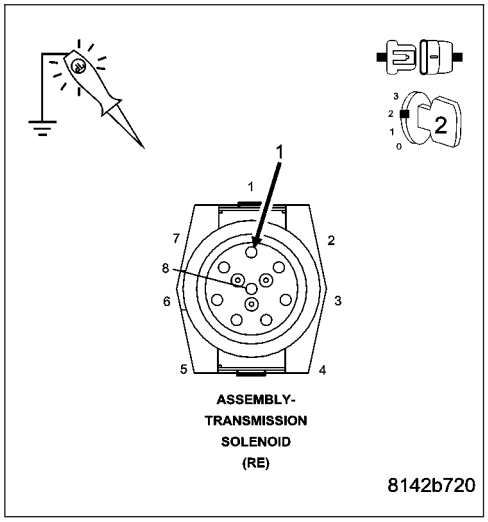
Using a 12-volt test light connected to ground, check the (T16) Transmission Control Relay Output circuit in the Transmission Solenoid Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light cycle on and off and illuminate brightly?

Yes >> Go To 4

No >> Go To 8



P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS (CONTINUED)

4. CHECK THE (T75) TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT

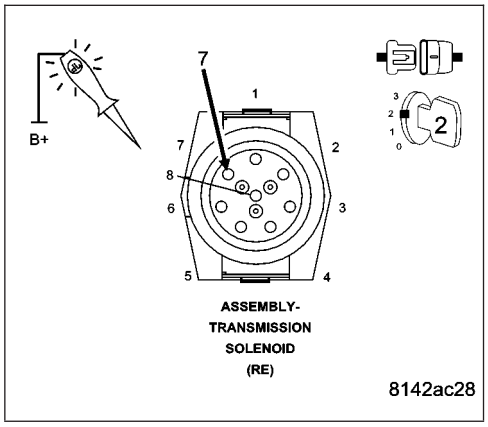
Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

Ignition on, engine not running.

With the scan tool, actuate the TCC Solenoid.

Using a 12-volt test light connected to 12-volts, check the (T75) TCC Solenoid Control circuit in the Transmission Solenoid Assembly harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light cycle on and off and illuminate brightly?

Yes >> Check all internal wiring pertaining to the (T75) TCC Solenoid for an open, short, and bent or broken terminals. If no internal wiring problems are found, replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 5

---

5. (T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.

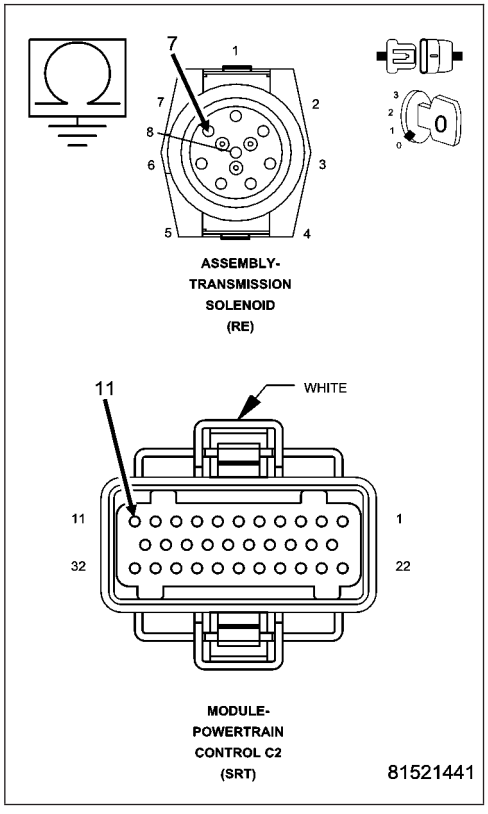
Disconnect the PCM harness connectors.

Measure the resistance between ground and the (T75) TCC Solenoid Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T75) TCC Solenoid Control circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6



P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS (CONTINUED)

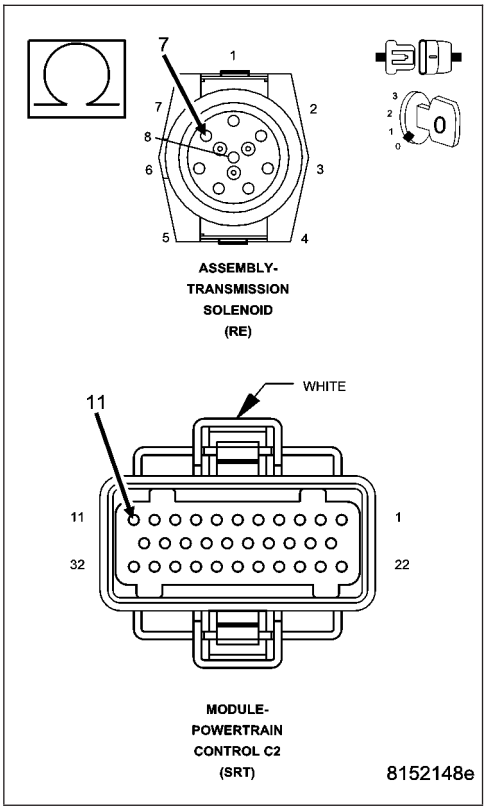
6. (T75) TCC SOLENOID CONTROL CIRCUIT OPEN

Measure the resistance of the (T75) TCC Solenoid Control circuit between the PCM C2 harness connector and the Transmission Solenoid Assembly harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T75) TCC Solenoid Control circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 7



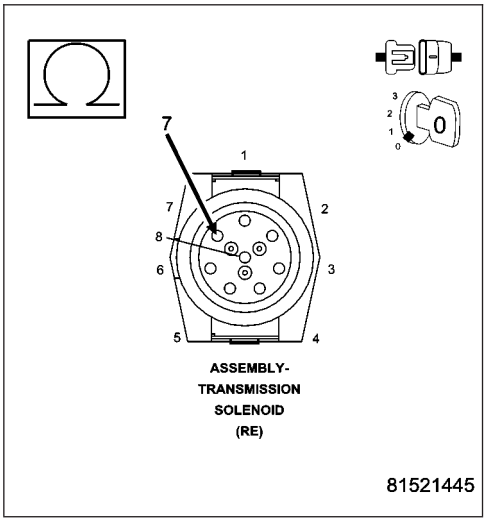
7. (T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Measure the resistance between the (T75) TCC Solenoid Control circuit and all other circuits in the Transmission Solenoid Assembly harness connector.

Is the resistance below 5.0 ohms between the (T75) TCC Solenoid Control circuit and any other circuit in the Transmission Solenoid Assembly harness connector?

Yes >> Repair the (T75) TCC Solenoid Control circuit for a short to another circuit(s).
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS (CONTINUED)

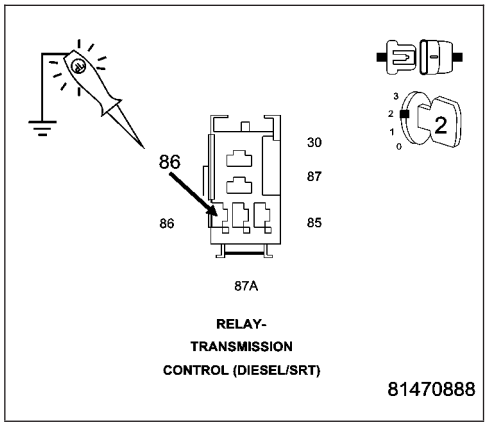
8. (941) FUSED IGNITION SWITCH OUPUT (RUN-START) CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the (F941) Fused Ignition Swich Output (Run-Start) circuit in the Transmission Control Relay connector.



Does the test light illuminate brightly?

Yes >> Go To 9

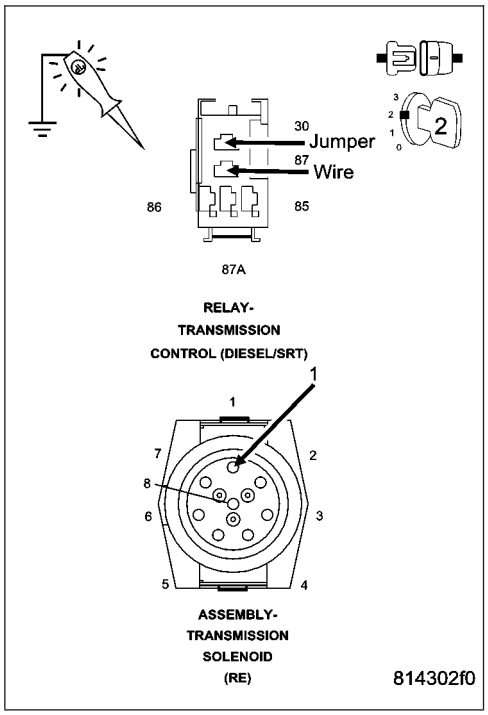
No >> Repair the (F941) Fused Ignition Swich Output (Run-Start) circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

9. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN

Connect a jumper wire between the Fused B(+) circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Using a 12-volt test light connected to ground, check the Fused Transmission Relay Control Output circuit in the Transmission Solenoid Assembly harness connector.



Does the test light illuminate brightly?

Yes >> Go To 10

No >> Repair the (T16) Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground.

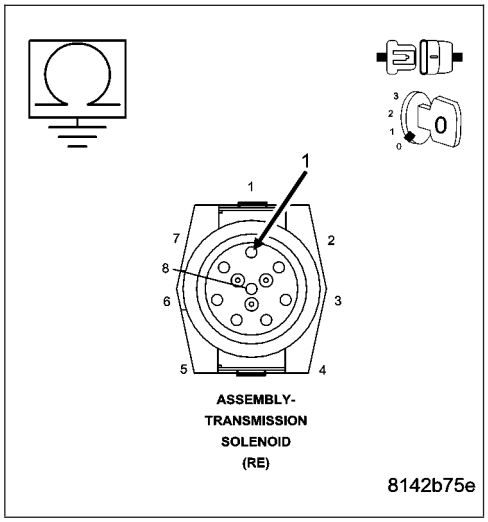
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0743-TORQUE CONVERTER CLUTCH SOLENOID/TRANS RELAY CIRCUITS (CONTINUED)

10. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.

Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.



Is the resistance above 100k ohms?

Yes >> Replace the Transmission Control Relay.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Repair the (T16) Transmission Control Relay Output circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

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11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

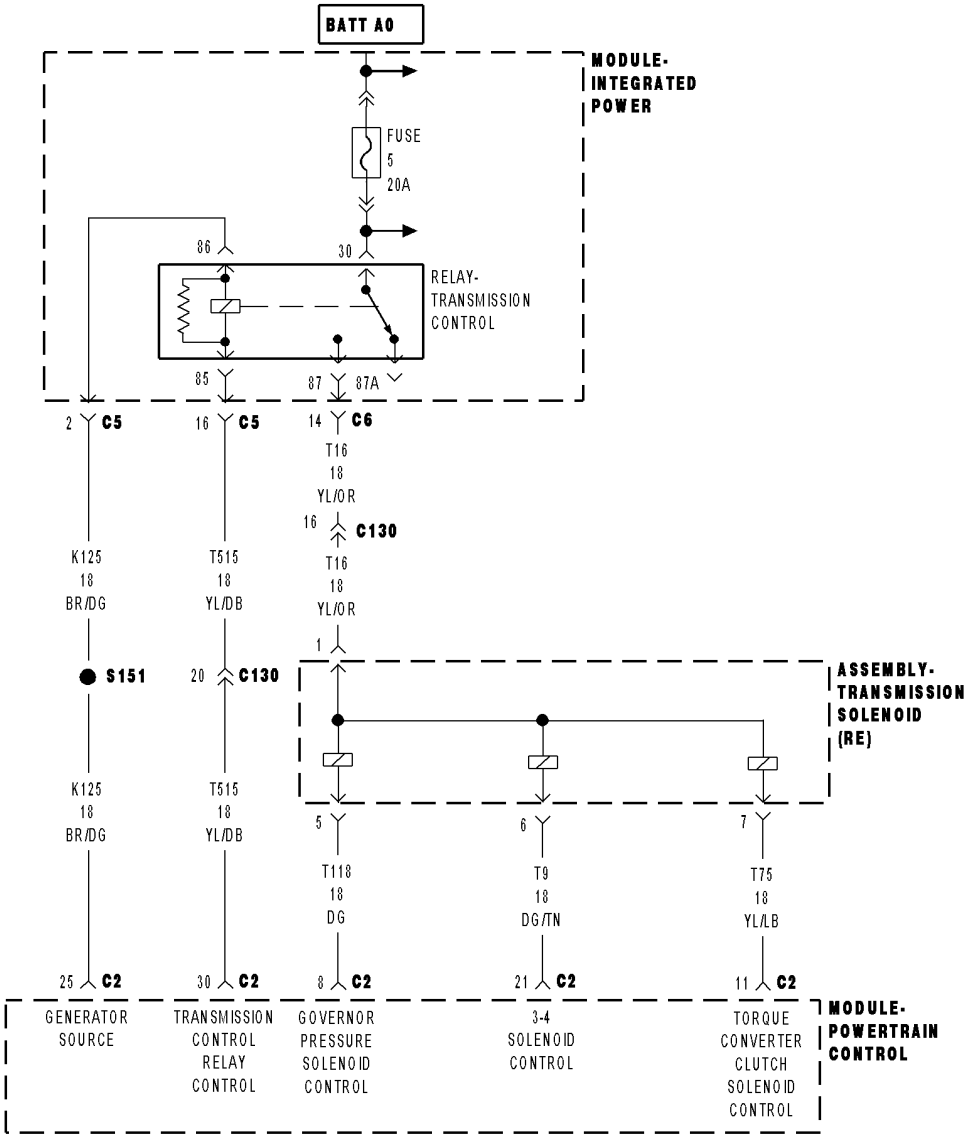
Refer to any technical service bulletins that may apply.

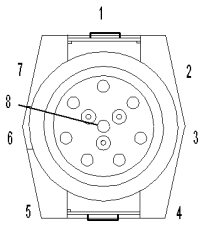
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

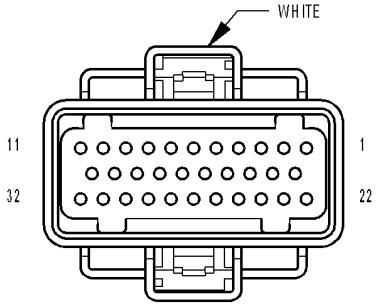
No >> Test Complete.

P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (GAS)





ASSEMBLY-
TRANSMISSION
SOLENOID
(RE)



MODULE-
POWERTRAIN
CONTROL C2
(SRT)

81511462

P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Solenoid is used to control governor pressure. Governor pressure is used to shift between first, second, and third gear.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  This DTC will set if the PCM monitored voltage detected on the Governor Pressure Solenoid Control circuit is different than the expected voltage. Note: To clear this DTC, it is necessary to drive the vehicle at a sustained speed which would allow the TCC and/or Overdrive Clutch to operate.

Possible Causes
FUSED B+ CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND
(T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT OPEN
(T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
(T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
TRANSMISSION CONTROL RELAY - POOR CONTACTS
GOVERNOR PRESSURE SOLENOID
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC P0882 IS PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Is the DTC P0882 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

2. CHECK IF THE DTC IS CURRENT

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 3

No >> Go To 12

---

3. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the Transmission Control Relay.

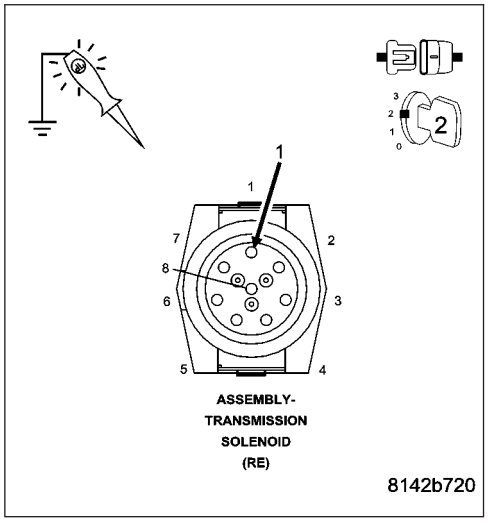
Using a 12-volt test light connected to ground, check the (T16) Transmission Control Relay Output circuit in the Transmission Solenoid Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light cycle on and off and illuminate brightly?

Yes >> Go To 4

No >> Go To 9



P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

4. CHECK THE (T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connectors.

Disconnect the PCM C2 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

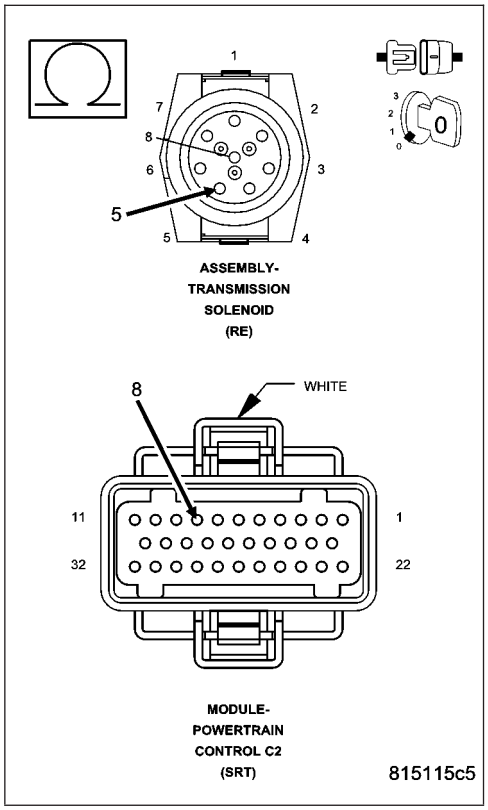
Measure the resistance of the (T118) Governor Pressure Solenoid Control circuit between the Transmission Solenoid Assembly harness connector and the PCM C2 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (T118) Governor Pressure Solenoid Control circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

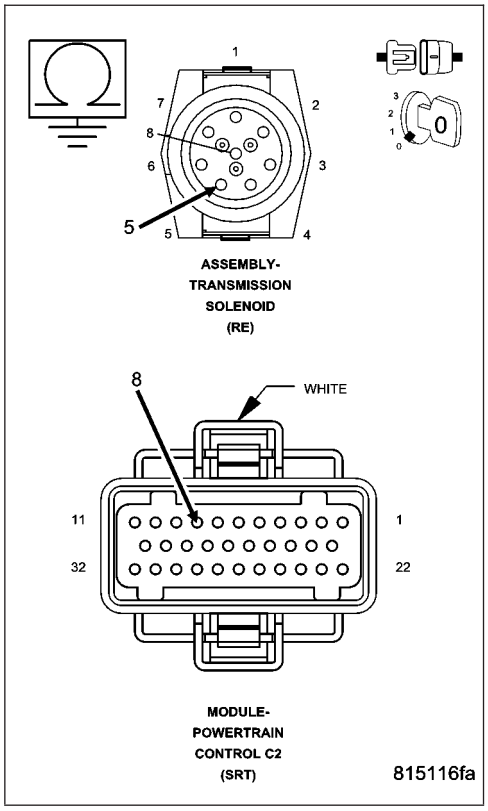
5. CHECK THE (T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (T118) Governor Pressure Solenoid Control circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T118) Governor Pressure Solenoid Control circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6



6. CHECK THE (T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE

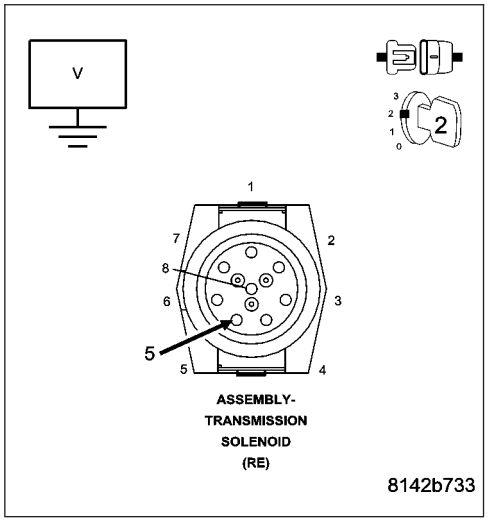
Ignition on, engine not running.

Measure the voltage of the (T118) Governor Pressure Solenoid Control circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (T118) Governor Pressure Solenoid Control circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 7



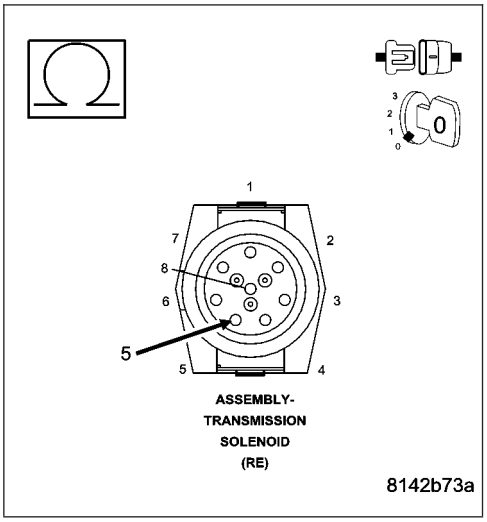
P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

7. CHECK THE (T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Measure the resistance between the (T118) Governor Pressure Solenoid Control circuit and all other circuits in the Transmission Solenoid Assembly harness connector.



Is the resistance below 5.0 ohms between the (T118) Governor Pressure Solenoid Control circuit and any other circuit in the Transmission Solenoid Assembly harness connector?

Yes >> Repair the (T118) Governor Pressure Solenoid Control circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 8

---

8. CHECK THE GOVERNOR PRESSURE SOLENOID

Remove the Transmission Oil Pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Check all internal wiring pertaining to the Governor Pressure Solenoid for an open, short, and bent or broken terminals.

If no internal wiring problems are found, replace the Governor Pressure Solenoid per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Drive the vehicle performing multiple upshifts and downshifts.

With the scan tool, read Transmission DTCs.

Does the DTC reset?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

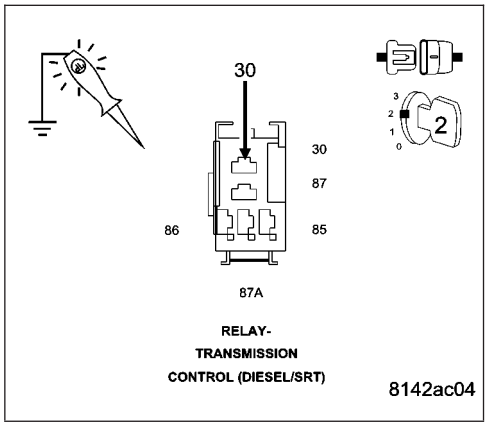
9. CHECK THE FUSED B(+) CIRCUIT

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the Fused B(+) circuit in the Transmission Control Relay connector.



Does the test light illuminate brightly?

Yes >> Go To 10

No >> Repair the Fused B(+) circuit for an open. If the fuse is open, make sure to check for a short to ground.

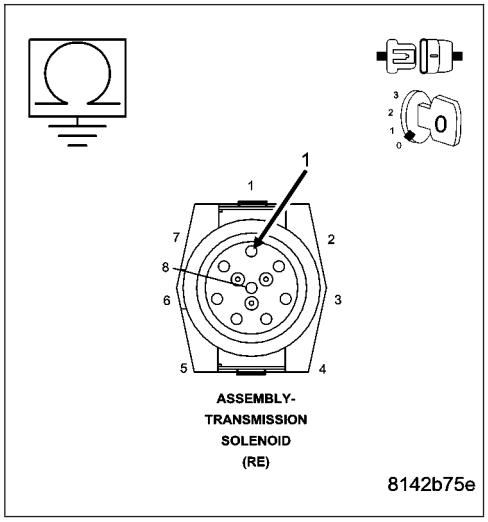
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

10. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T16) Transmission Control Relay Output circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 11

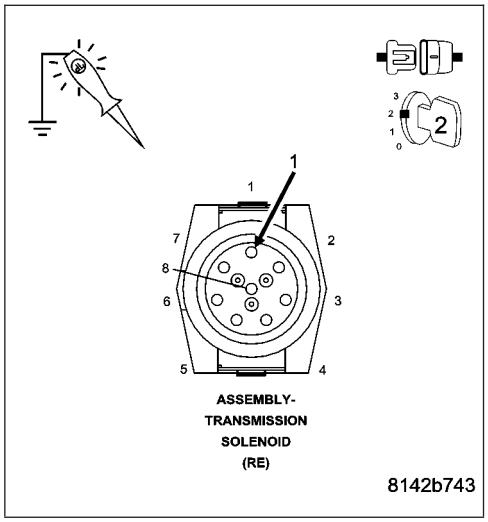
P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

11. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN

Connect a jumper wire between Fused B(+) and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Relay Output circuit in the Transmission Solenoid Assembly harness connector.



Does the test light illuminate brightly?

Yes >> Replace the Transmission Control Relay.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Replace the (T16) Transmission Control Relay Output circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

12. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

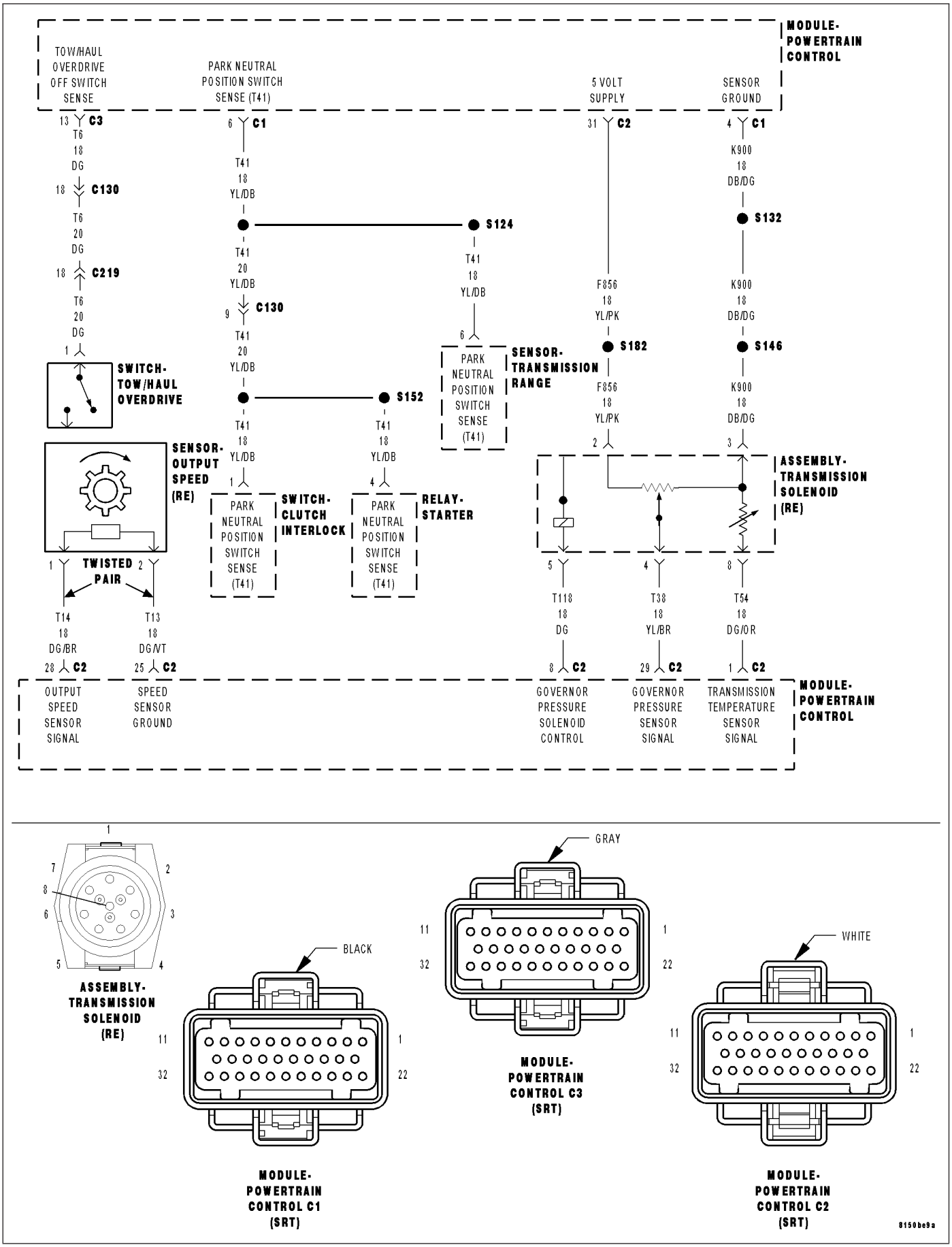
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P0751-O/D SWITCH PRESSED (LO) MORE THAN 5 MINUTES



P0751-O/D SWITCH PRESSED (LO) MORE THAN 5 MINUTES (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Tow/haul Overdrive OFF (control) Switch is located in the shift lever arm. The switch is a momentary contact device that signals the ECM/PCM to toggle current status of the overdrive function. At ignition on, overdrive operation is allowed. Pressing the Tow/Haul Overdrive Off switch once causes the Tow/haul Overdrive OFF mode to be entered and the Tow/Haul lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the Tow/haul lamp to be turned off. The Tow/haul Overdrive OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoid and allow a 3-4 upshift. The control switch indicator light illuminates only when the Tow/haul Overdrive Off switch is turned to the OFF position, or when illuminated by the transmission control module.

- **When Monitored:**
  The engine must have been running for at minimum of 10 seconds. The circuit is tested every 440ms.
- **Set Condition:**
  This DTC will set if the Tow/Haul Overdrive Off Switch Sense circuit is held low for 5 minutes or more from the time of switch closure or ignition on with the engine running.

Possible Causes
TOW/HAUL OVERDRIVE OFF SWITCH SENSE CIRCUIT SHORT TO GROUND
TOW/HAUL OVERDRIVE OFF SWITCH
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. TOW/HAUL OVERDRIVE OFF SWITCH SENSE CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the PCM C3 harness connector.

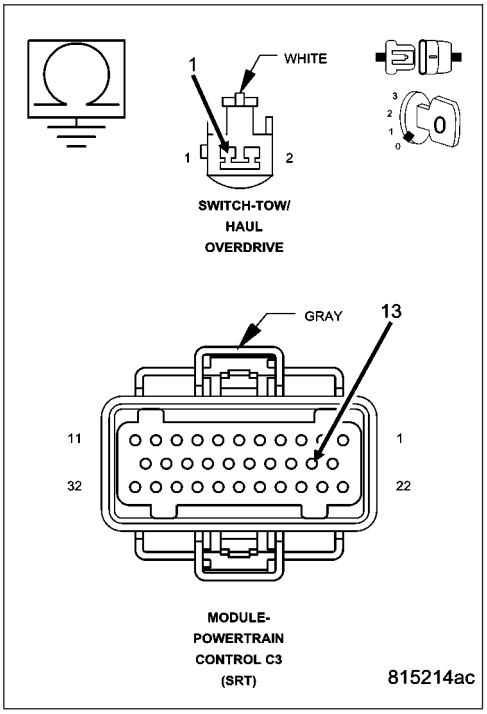
Disconnect the Tow/Haul Overdrive Off switch harness connector.

Measure the resistance between ground and the Tow/Haul Overdrive Off switch sense circuit in the PCM C3 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the Tow/Haul Overdrive Off switch sense circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 2



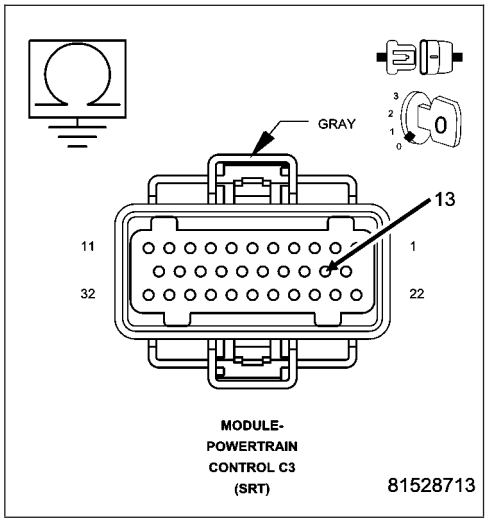
P0751-O/D SWITCH PRESSED (LO) MORE THAN 5 MINUTES (CONTINUED)

2. CHECK THE TOW/HAUL OVERDRIVE OFF SWITCH

Reconnect the Tow/Haul Overdrive Off switch harness connector.

Measure the resistance between ground and the O/D Tow/Haul Switch Sense circuit in the PCM C3 harness connector.

Press the Tow/Haul Overdrive Off switch button.



Does the resistance change from above 5.0 ohms to below 5.0 ohms while pressing the Tow/Haul Overdrive Off switch button?

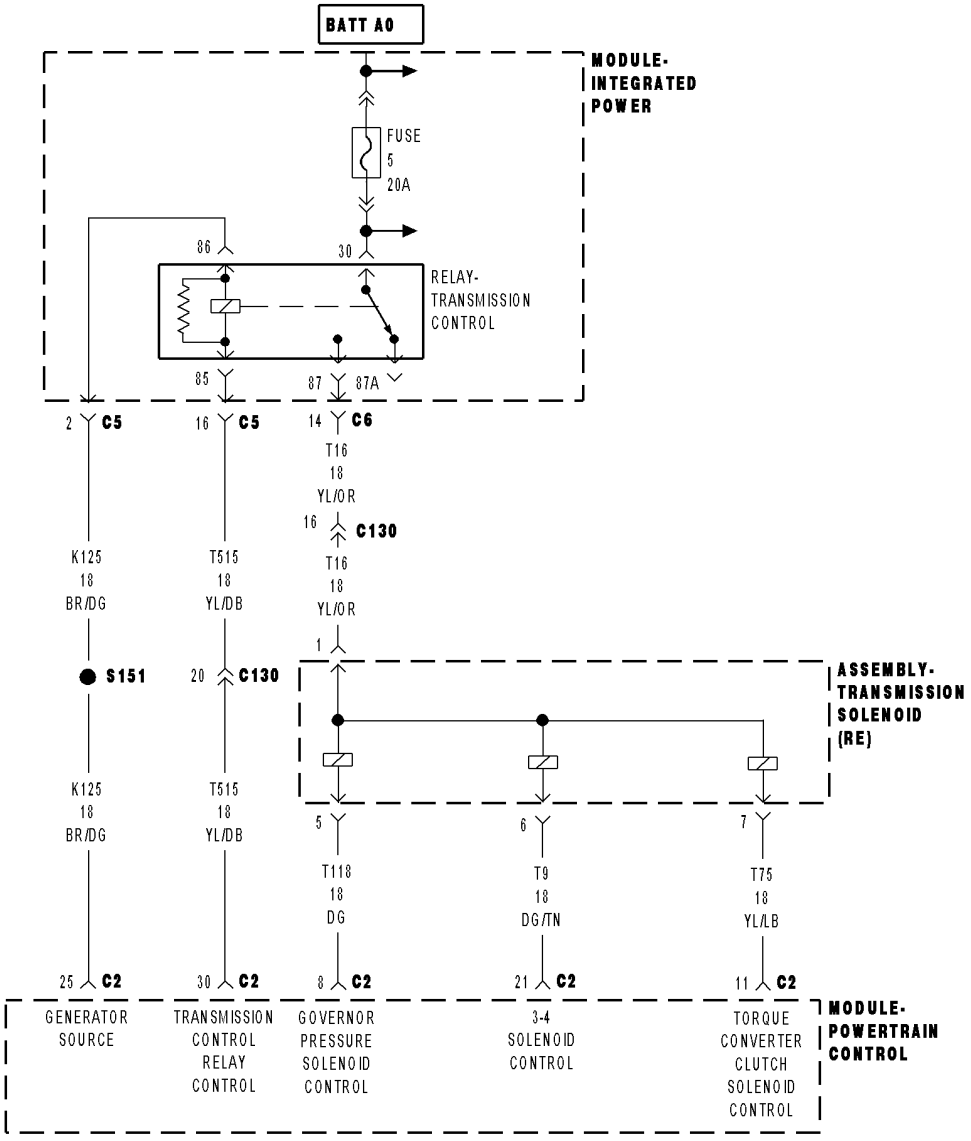
Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

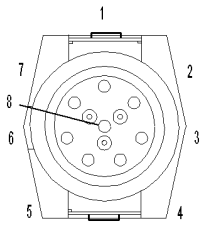
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Replace the Tow/Haul Overdrive Off switch per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/OVERDRIVE SWITCH - REMOVAL)

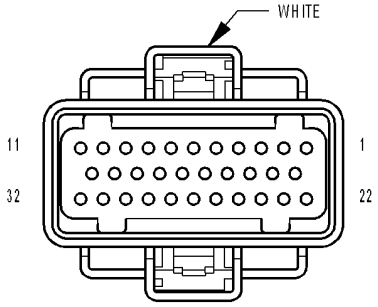
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0753-TRANS 3-4 SHIFT SOL/TRANS RELAY CIRCUITS (GAS)





ASSEMBLY-
TRANSMISSION
SOLENOID
(RE)



MODULE-
POWERTRAIN
CONTROL C2
(SRT)

81511462

P0753-TRANS 3-4 SHIFT SOL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The 3-4 Solenoid is used the engage the gear change form 3rd gear to 4th gear.

The solenoids used in transmission applications are attached to valves which can be classified as normally open or normally closed. The normally open solenoid valve is defined as a valve which allows hydraulic flow when no current or voltage is applied to the solenoid. The normally closed solenoid valve is defined as a valve which does not allow hydraulic flow when no current or voltage is applied to the solenoid. These valves perform hydraulic control functions for the transmission and must therefore be durable and tolerant of dirt particles. For these reasons, the valves have hardened steel poppets and ball valves. The solenoids operate the valves directly, which means that the solenoids must have very high outputs to close the valves against the sizable flow areas and line pressures found in current transmissions. Fast response time is also necessary to ensure accurate control.

- **When Monitored:**
  Continuously with ignition on.
- **Set Condition:**
  This DTC will set if the voltage detected on the 3-4 Shift Solenoid Control circuit at the PCM is different then the expected voltage. Note: To clear this DTC it is necessary to drive the vehicle at a sustained speed which would allow the TCC and/or Overdrive Clutch to operate

Possible Causes
TRANSMISSION CONTROL RELAY DTC PRESENT
(T9) 3-4 SOLENOID CONTROL CIRCUIT OPEN
FUSED B+ CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T9) 3-4 SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
(T9) 3-4 SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T16) TRANSMISSION RELAY OUTPUT CIRCUIT SHORT TO GROUND
(T9) 3-4 SOLENOID CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION CONTROL RELAY - POOR CONTACTS
3-4 SHIFT SOLENOID
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK FOR TRANSMISSION CONTROL RELAY DTCS

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are there any Transmission Control Relay DTCs present?

Yes >> Refer to the Transmission category, and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

P0753-TRANS 3-4 SHIFT SOL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

2. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 3

No >> Go To 13

---

3. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the Transmission Control Relay.

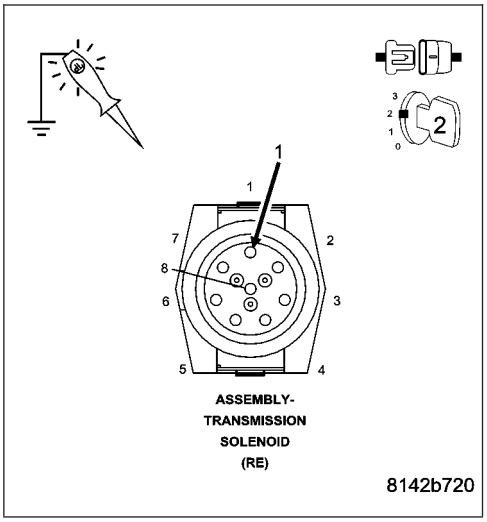
Using a 12-volt test light connected to ground, check the (T16) Transmission Control Relay Output circuit in the Transmission Solenoid Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light cycle on and off and illuminate brightly?

Yes >> Go To 4

No >> Go To 10

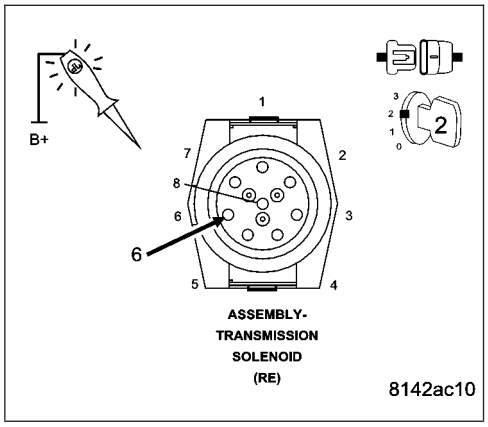


P0753-TRANS 3-4 SHIFT SOL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

4. CHECK THE 3-4 SHIFT SOLENOID

With the scan tool, actuate the Overdrive (3-4) Solenoid.

Using a 12-volt test light connected to 12-volts, check the (T9) 3-4 Shift Solenoid Control circuit in the Transmission Solenoid Assembly harness connector.



Does the test light cycle on and off and illuminate brightly?

Yes >> Check all internal wiring pertaining to the 3-4 Shift Solenoid for an open, short, and bent or broken terminals. If no internal wiring problems are found, replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 5

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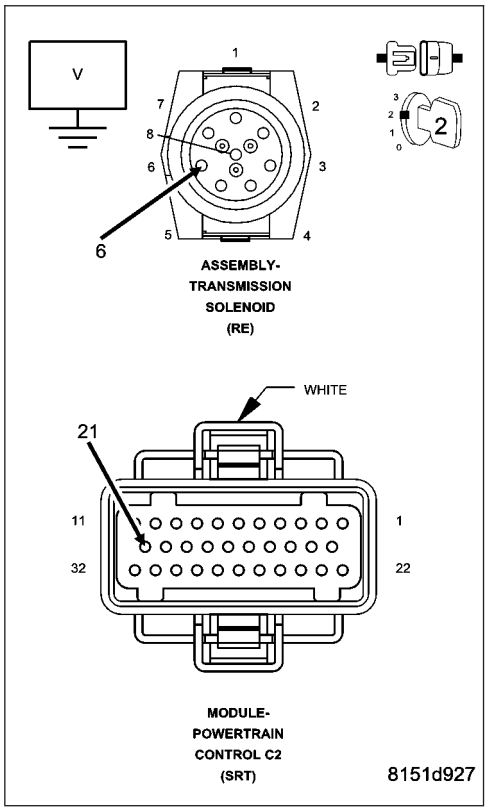
5. CHECK THE (T9) 3-4 SOLENOID CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the PCM C1 and C2 harness connectors.

Ignition on, engine not running.

Measure the voltage of the (T9) 3-4 Solenoid Control circuit.



Is the voltage above 0.5 volts?

Yes >> Repair the (T9) 3-4 Solenoid Control circuit for a short to voltage.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6

P0753-TRANS 3-4 SHIFT SOL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

6. CHECK THE (T9) 3-4 SOLENOID CONTROL CIRCUIT FOR AN OPEN

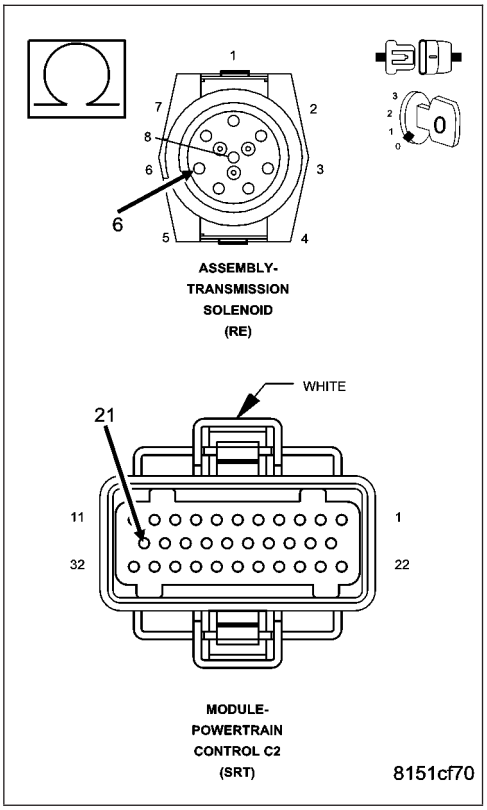
Turn the ignition off to the lock position.

Measure the resistance of the (T9) 3-4 Solenoid Control circuit between the Transmission Solenoid Assembly harness connector and the PCM C2 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the (T9) 3-4 Solenoid Control circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



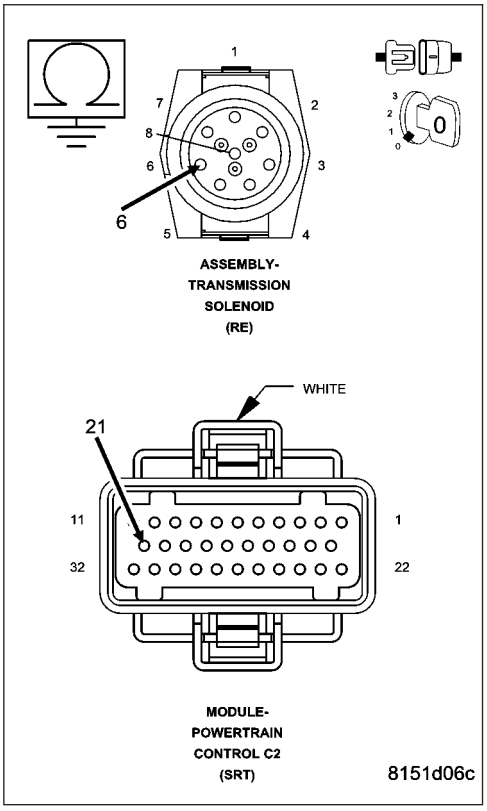
7. CHECK THE (T9) 3-4 SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (T9) 3-4 Solenoid Control circuit.

Is the resistance above 100k ohms?

Yes >> Go To 8

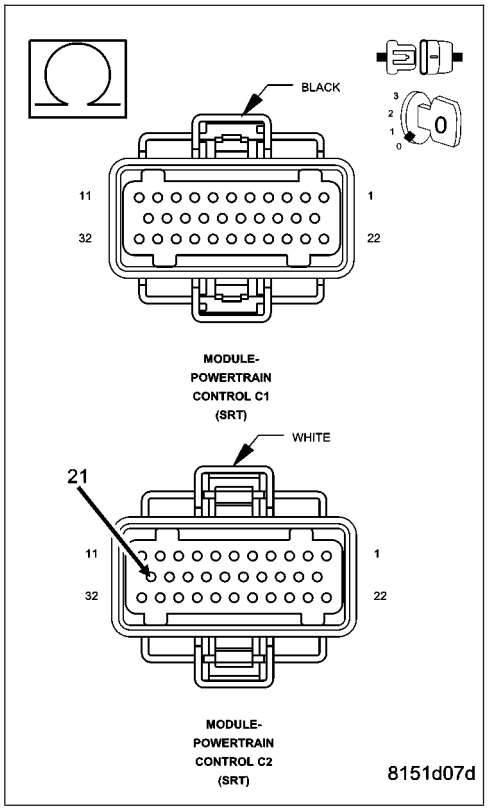
No >> Repair the (T9) 3-4 Solenoid Control circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0753-TRANS 3-4 SHIFT SOL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

8. CHECK THE (T9) 3-4 SHIFT SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Measure the resistance between the (T9) 3-4 Solenoid Control circuit and all other circuits in the PCM C1 and C2 harness connectors.



Is the resistance above 100k ohms between the (T9) 3-4 Solenoid Control circuit and any other circuit(s) in the PCM C1 or C2 harness connectors?

Yes >> Go To 9

No >> Repair the (T9) 3-4 Shift Solenoid Control circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

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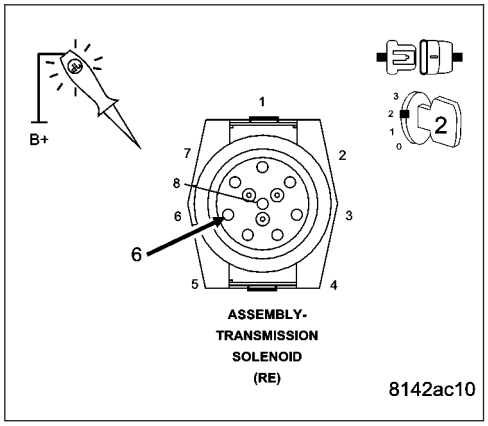
9. CHECK THE POWERTRAIN CONTROL MODULE

Reconnect the PCM harness connectors.

Turn the ignition on, engine not running.

With the scan tool, actuate the 3-4 (Overdrive) Solenoid.

Using a 12-volt test light connected to 12-volts, check the (T9) 3-4 Solenoid Control circuit in the Transmission Solenoid Assembly harness connector.



Does the test Light cycle on and off and illuminate brightly?

Yes >> Go To 13

No >> Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0753-TRANS 3-4 SHIFT SOL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

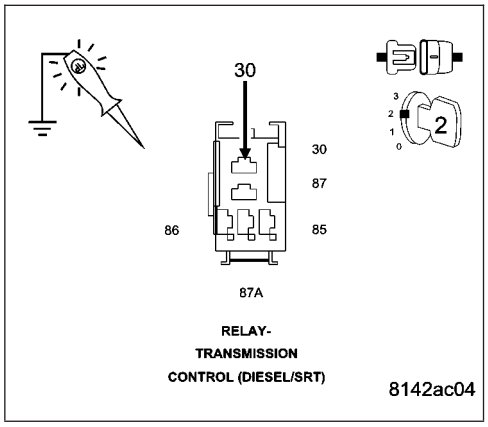
10. CHECK THE FUSED B(+) CIRCUIT

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the Fused B(+) circuit in the Transmission Control Relay connector.



Does the test light illuminate brightly?

Yes >> Go To 11

No >> Repair the Fused B(+) circuit for an open. Note: if the fuse is open, check for a short to ground.

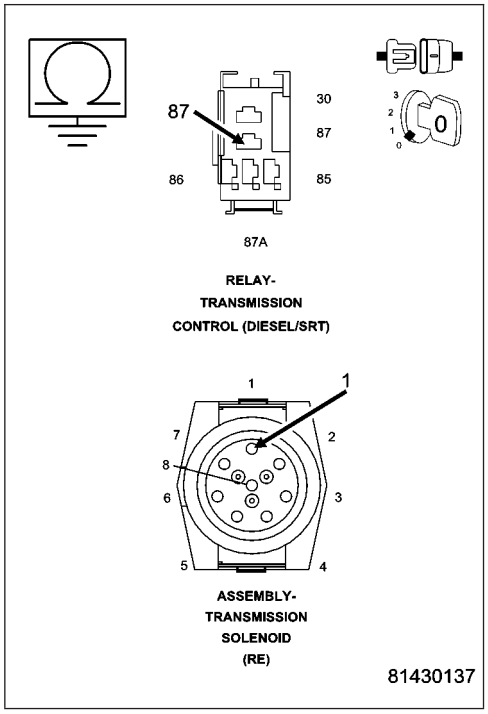
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

11. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT FOR A SHORT TO GROUND

Turn ignition off to the lock position.

Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the Fused Transmission Control Relay Output circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 12

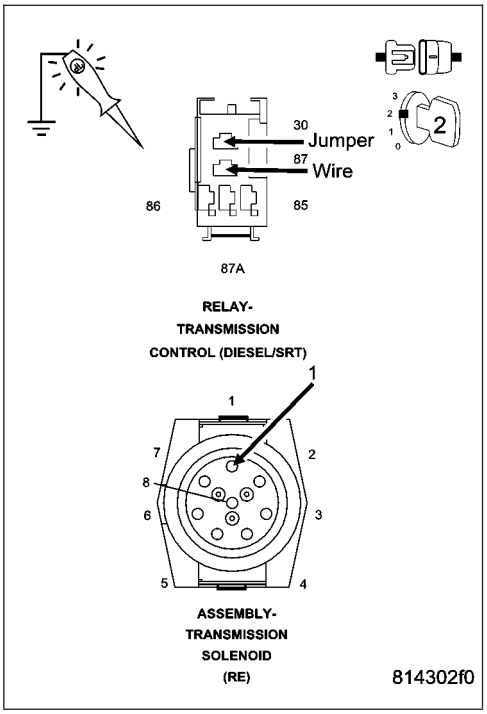
P0753-TRANS 3-4 SHIFT SOL/TRANS RELAY CIRCUITS (GAS) (CONTINUED)

12. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT FOR AN OPEN

Ignition on, engine not running.

Connect a jumper wire between the Fused B(+) circuit and the (T16) Transmission Relay Output circuit in the Transmission Relay connector.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Relay Output circuit in the Transmission Solenoid Assembly harness connector.



Does the test light illuminate brightly?

Yes >> Replace the Transmission Control Relay.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Repair the (T16) Transmission Control Relay Output circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

13. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

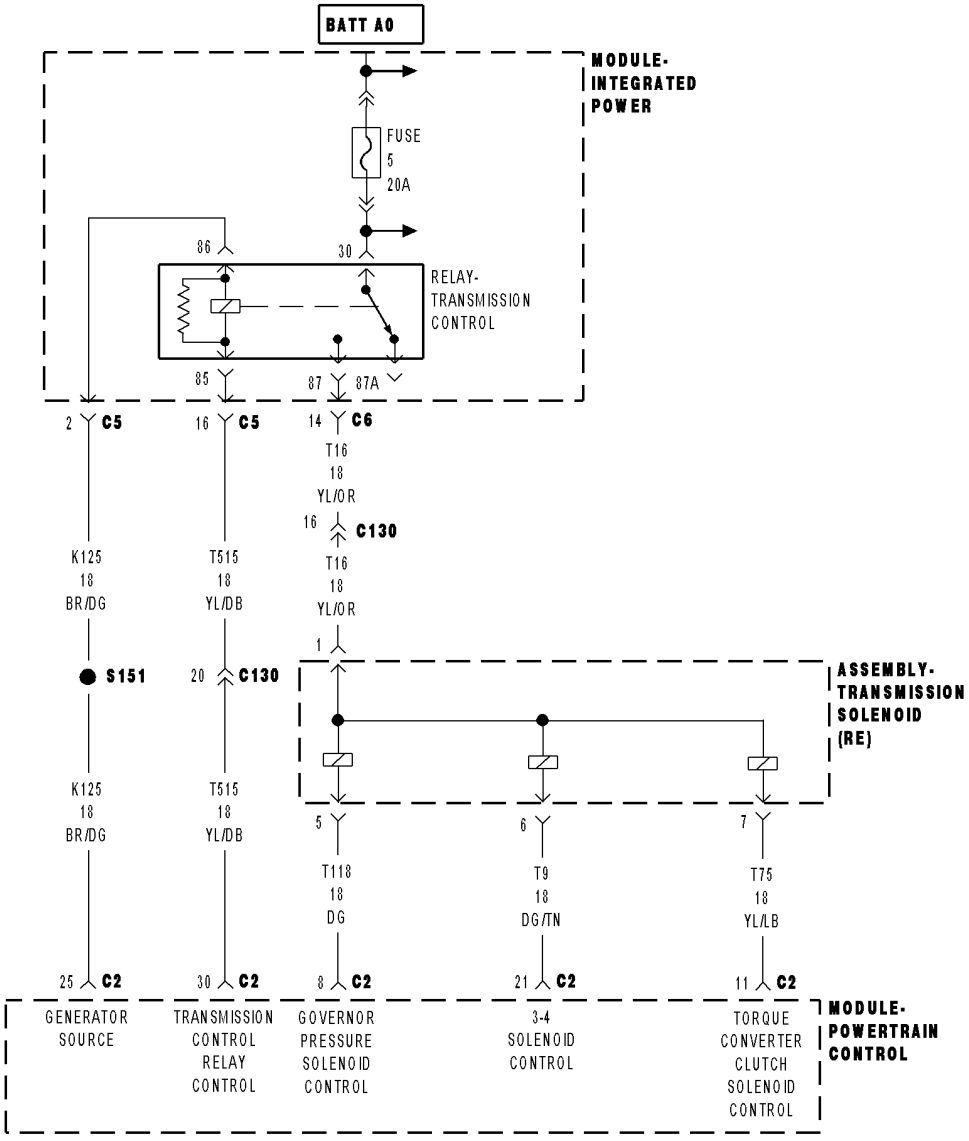
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

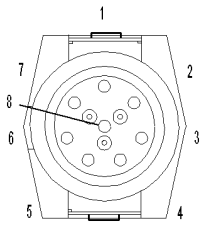
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

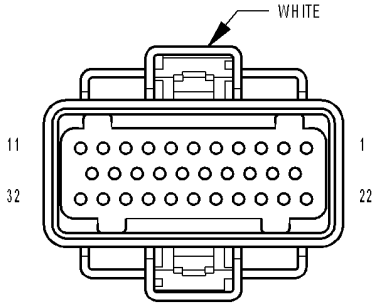
No >> Test Complete.

P0783-3-4 SHIFT SOL, NO RPM DROP AT LOCKUP (GAS)





ASSEMBLY-
TRANSMISSION
SOLENOID
(RE)



MODULE-
POWERTRAIN
CONTROL C2
(SRT)

81511462

P0783-3-4 SHIFT SOL, NO RPM DROP AT LOCKUP (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Torque Converter Clutch (TCC) Solenoid is used to engage the TCC which improves fuel economy. The Overdrive Solenoid is used to engage the gear change from third to Overdrive.

- **When Monitored:**
  Continuously with the ignition on and the engine running.
- **Set Condition:**
  This DTC will set if the expected engine RPM drop does not occur within 4 seconds of the gear change being requested by the PCM three consecutive failed tests.

Possible Causes
FLUID LEVEL AND CONDITION - EXCESSIVE DEBRIS OR BURNT
3-4 SHIFT SOLENOID
INTERNAL TRANSMISSION FAILURE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK FOR ANY TRANSMISSION CONTROL RELAY DTCS

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are there any other Transmission or Engine DTCs present?

Yes >> Refer to the Transmission or Engine category and perform the appropriate symptom(s).

No >> Go To 2

---

2. CHECK IF THE DTC IS CURRENT

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 3

No >> Go To 6

P0783-3-4 SHIFT SOL, NO RPM DROP AT LOCKUP (GAS) (CONTINUED)

3. CHECK THE GOVERNOR AND OVERDRIVE PRESSURE

Turn the ignition off to the lock position.

Connect a 0 - 2068 KPa (0 - 300 PSI) pressure gauge to the Overdrive Clutch test port.

Connect another 0 - 2068 KPa (0 - 300 PSI) pressure gauge to the Governor Pressure test port. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

Start the engine and allow the transmission temperature to rise to normal operating temperature.

CAUTION: Apply the parking brake.
Firmly apply the brakes and place the gear selector in Drive.

While observing the pressure gauges, with the scan tool, select 4th gear from the Gov and 3-4 Shift Valve Test.

NOTE: The governor pressure should rise above 138 kPa (20 PSI). Shortly after the O/D pressure should rise above 276 kPa (40 PSI).

Did the pressures act as previously described?

Yes >> Go To 4

No >> Go To 5

---

4. CHECK THE TRANSMISSION OIL CONDITION

Turn the ignition off to the lock position.

Remove the transmission oil pan and inspect for excessive debris and burnt oil.

Is the oil burnt or does the transmission oil pan contain excessive debris?

Yes >> Repair the transmission as necessary. Refer to the Service Informtion for the proper repair procedures. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6

---

5. CHECK THE GOVERNOR AND OVERDRIVE PRESSURE AFTER REPLACEMENT OF THE 3-4 SHIFT SOLENOID

Turn the ignition off to the lock position.

Replace the 3-4 Shift Solenoid per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - DISASSEMBLY)

With the pressure gauges still attached, start the engine and allow the transmission temperature to rise to normal operating temperature.

CAUTION: Apply the parking brake.
Firmly apply the brakes and place the gear selector in Drive.

While observing the pressure gauges, with the scan tool, select 4th gear from the Gov and 3-4 Shift Valve Test.

NOTE: The governor pressure should rise to above 138 kPa (20 PSI). Shortly after the O/D pressure should rise above 276 kPa (40 PSI).

Did the pressures act as previously described?

Yes >> Test Complete.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Overhaul the transmission per the Service Informtion. Pay attention to seals and clutches related to the OD clutch.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0783-3-4 SHIFT SOL, NO RPM DROP AT LOCKUP (GAS) (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

The vehicle must be driven (road load) to set this code. Drive the vehicle 4 times from 0 to 89 kmh (0 to 55 MPH) with a constant 20 % throttle position through all gears. Stop the vehicle, shut the engine off and then repeat the procedure.

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1740-TCC O/D SOL PERFORMANCE (GAS)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Torque Converter Clutch (TCC) Solenoid is used to engage the TCC which improves fuel economy.

- **When Monitored:**
  The Torque Convertor Clutch (TCC) and Overdrive Clutch (OD) will be tested each time the PCM requests TCC engagement in 3rd gear and OD.
- **Set Condition:**
  The DTC will set if the expected RPM drop is not achieved while attempting to engage TCC or OD. This indicates a malfunctioning torque convertor or overdrive clutch.

Possible Causes
ENGINE DTCS PRESENT
TRANSMISSION DTCS PRESENT
TRANSMISSION TEMPERATURE TOO COLD
OIL PAN CONTAINS EXCESSIVE DEBRIS
3-4 SHIFT SOLENOID
SHAFT OR SEAL DAMAGE
TCC SOLENOID
TORQUE CONVERTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. ENGINE DTCS PRESENT

Ignition on, engine not running.
With the scan tool, read Engine DTCs.

Are there any Engine Temperature, Cam, Engine RPM, Misfire, P/N, or TPS DTC's present?

Yes >> Refer to 9 - ENGINE ELECTRICAL DIAGNOSTICS - DIESEL and perform the appropriate symptom.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 2

---

2. CHECK FOR OTHER TRANSMISSION DTCS PRESENT

Are any of the DTCs P0720, P0973, P0974, P2769, and/or P2770, also present?

Yes >> Refer to the Transmission category, and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 3

P1740-TCC O/D SOL PERFORMANCE (GAS) (CONTINUED)

3. CHECK IF THE DTC IS CURRENT

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 4

No >> Go To 14

---

4. VERIFY THE TOW/ HAUL OVERDRIVE FEATURE

NOTE: The transmission fluid temperature must be above 0.0° C (32° F) before proceeding.

With the scan tool, build a custom display using: Engine RPM, Output Shaft Speed, TCC Solenoid, O/D Solenoid and TPS.

NOTE: This display will monitor the operation of the components.

Start the engine, turn off Overdrive or Tow Haul and test drive the vehicle.

Attain a steady speed of 88.5 Km/h or 55 MPH with a minimum of 1.15 volts throttle opening for 20 seconds.

NOTE: Check the Shift pattern as the vehicle upshifts to speeds of 88.5 Km/h or 55 MPH.

Is the Engine RPM within 60 RPM of the Output Shaft Speed RPM?

Yes >> Go To 10

No >> Go To 5

---

5. CHECK IF THE OUTPUT SPEED IS GREATER THAN ENGINE RPM

In the previous test, is the Output Shaft Speed greater than Engine RPM?

Yes >> Go To 6

No >> Go To 10

---

6. CALCULATE EXPECTED ENGINE RPM

With the scan tool, build a custom display using: Engine RPM, Output Shaft Speed, TCC Solenoid, O/D Solenoid and TPS.

NOTE: This display will monitor the operation of the components.

Start the engine, turn off Overdrive or Tow Haul and test drive the vehicle.

Attain a steady speed of 88.5 Km/h or 55 MPH with a minimum of 1.15 volts throttle opening for 20 seconds.

With the scan tool, verify the 3-4 Solenoid (O/D) Solenoid is on and the TCC solenoid is locked

NOTE: Use this formula, Output Shaft Speed x 0.69 = expected Engine RPM.

Did the Engine RPM drop to 0.69 of the Output Shaft Speed RPM?

Yes >> Go To 10

No >> Go To 7

P1740-TCC O/D SOL PERFORMANCE (GAS) (CONTINUED)

7. GOVERNOR PRESSURE SYSTEM TEST

Turn the ignition off to the lock position.

Connect a 0 to 2068 kPa or 0 to 300 PSI pressure gauge to the Overdrive Clutch Test Port.

Connect a 0 to 2068 kPa or 0 to 300 PSI pressure gauge to the Governor Test Port.

Start the engine.

NOTE: Allow the transmission temperature to rise to normal operating temperature.
While observing both pressure gauges, select 4th Gear from Gov and 3-4 System Test.

NOTE: The Governor pressure should rise to above 137.8 kPa or 20 PSI, shortly after the OD pressure should rise above 275.7 kPa or 40 PSI.

Did the pressures act as described?

Yes >> Go To 8

No >> Go To 9

---

8. CHECK IF THE OIL PAN CONTAINS EXCESSIVE DEBRIS

Remove the transmission oil pan per the Service information.

Is the transmission fluid burnt or does the transmission oil pan contain excessive debris?

Yes >> Repair internal transmission as necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 10

---

9. CHECK THE 3-4 SHIFT SOLENOID

Turn the ignition off to the lock position.

Replace the 3-4 Solenoid per the Service information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Connect a 0 to 2068 kPa or 0 to 300 PSI pressure gauge to the Overdrive Clutch Test Port.

Connect a 0 to 2068 kPa or 0 to 300 PSI pressure gauge to the Governor Test Port.

Start the engine.

NOTE: Allow the transmission temperature to rise to normal operating temperature.
While observing both pressure gauges, select 4th gear from the Governor 3-4 shift valve system test.

NOTE: The Governor pressure should rise above 137.8 kPa or 20 PSI, shortly after the OD pressure should rise above 275.7 kPa or 40 PSI.

Did the pressures act as described?

Yes >> Test Complete.

No >> Overhaul the transmission per the Service Information. Carefully inspect the seals and clutches related to the OD Clutch. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1740-TCC O/D SOL PERFORMANCE (GAS) (CONTINUED)

10. TORQUE CONVERTER CLUTCH

Turn the ignition on.

With the scan tool, perform the Torque Converter Clutch test.

Did the engine stall?

Yes >> Go To 11

No >> Go To 13

---

11. GOVERNOR/3-4 SHIFT VALVE

Start the engine.

Perform the Governor and 3-4 Shift Valve System Test, select 4th gear.

Did the engine stall?

Yes >> Go To 12

No >> Go To 13

---

12. TCC SOLENOID

Replace the TCC Solenoid. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

With the scan tool, perform the Governor and 3-4 Solenoid test, select 4th gear.

Did the engine stall?

Yes >> Repair internal transmission as necessary. Check for blocked passages. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

13. SHAFT OR SEAL DAMAGE

Remove the Transmission Oil Pump per the Service information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/OIL PUMP - DISASSEMBLY)

Inspect the Reaction shaft, Input Shaft and Input seal.

Are any of the parts damaged or worn?

Yes >> Repair as necessary, also replace the Torque Converter.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Replace the Torque Converter. NOTE: Inspect the Reaction Shaft, Input Shaft and Input Seal. Replace as necessary if any of the parts are damaged or worn.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1740-TCC O/D SOL PERFORMANCE (GAS) (CONTINUED)

14. INTERMITTENT WIRING & CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

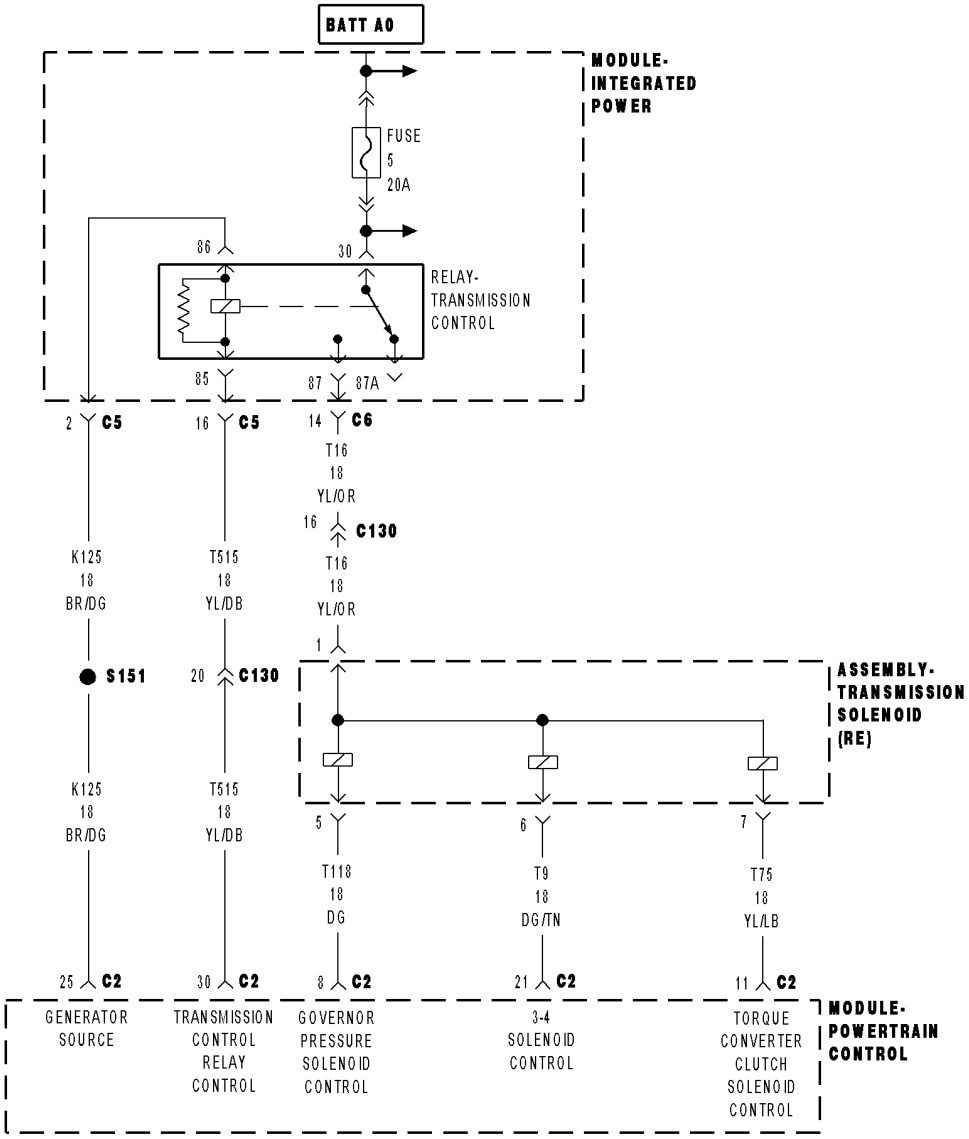
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

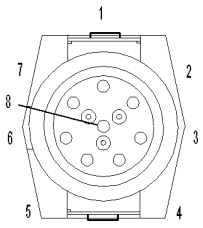
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

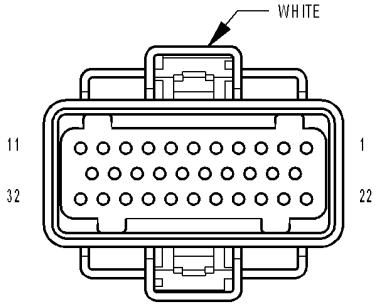
No >> Test Complete.

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (GAS)





ASSEMBLY-
TRANSMISSION
SOLENOID
(RE)



MODULE-
POWERTRAIN
CONTROL C2
(SRT)

81511462

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Control System is used to regulate the governor pressure which controls the shifts for first, second, and third gear. The Governor Pressure Control System test verifies that the requested pressure and the actual pressure are within a predetermined tolerance.

- **When Monitored:**
  While driving and the commanded governor pressure is equal to the pressure required for third gear.
- **Set Condition:**
  If the governor pressure sensor output is less than 407 kPa (60 psi) or greater than 621 kPa (80 psi) when the requested pressure is 407 - 621 kPa (60 - 80 psi) for 2.2 seconds. This DTC will set if there are two trips of five consecutive bad 2.2 second tests with the transmission oil temperature between 23.5 - 88° C (74 - 190° F).

Possible Causes
OTHER TRANSMISSION DTCS PRESENT
(F856) 5-VOLT SUPPLY CIRCUIT OPEN
(F856) 5-VOLT SUPPLY CIRCUIT OPEN - INTERNAL
GOVERNOR PRESSURE SENSOR
VALVE BODY
INTERNAL TRANSMISSION
POWERTRAIN CONTROL MODULE
TRANSMISSION - INTERNAL DAMAGE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF OTHER TRANSMISSION DTCS ARE PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are any other transmission DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (GAS) (CONTINUED)

2. CHECK IF THE GOVERNOR PRESSURE IS ABOVE 3 PSI IN DRIVE

CAUTION: Apply the parking brake.
Start the engine and allow the transmission to reach normal operating temperature above 43° C (110° F).

CAUTION: Apply the brakes.
With the engine at idle, place the gear selector in Drive.
With the scan tool, read the Governor Pressure.

Is the Governor Pressure above 21 kPa (3 psi)?

Yes >> Go To 3

No >> Go To 4

---

3. CHECK IF THE GOVERNOR PRESSURE IS BELOW 3 PSI

Turn the ignition off to the lock position.
Install a pressure gauge at the Governor Pressure test port. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

NOTE: Use the appropriate pressure gauge for the pressure range measured.

CAUTION: Apply the parking brake.
Start the engine and allow the transmission to reach normal operating temperature above 43° C (110° F).

CAUTION: Apply the brakes.
With the engine at idle, place the gear selector in Drive.
Read the governor pressure on the pressure gauge.

Is the governor pressure on the pressure gauge below 21 kPa (3 psi) with the engine at idle and the gear selector in Drive?

Yes >> The Governor Pressure Solenoid is functioning properly. Go To 7

No >> Go To 10

---

4. GOVERNOR PRESSURE BETWEEN 40-55 WITH RELAY REMOVED

Place the gear selector in Park.
With the engine still running, remove the Transmission Control Relay.

WARNING: Do not wear loose clothing or jewelry when working on or near a running engine. Failure to follow these instructions can result in personal injury or death.

NOTE: Relay removal may set various DTCs. Disregard any DTC that may set due to relay removal.

CAUTION: Apply the brakes.
Place the gear selector in Drive and allow the engine to idle for 30 seconds.
With the scan tool, read the Actual Governor Pressure at idle.

Is the governor pressure on the scan tool between 276 - 379 kPa (40 - 55 psi)?

Yes >> Go To 5

No >> Go To 6

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (GAS) (CONTINUED)

5. GOVERNOR PRESSURE SOLENOID

Turn the ignition off to the lock position.

Replace the Governor Pressure Solenoid per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Start the engine and allow the transmission to reach normal operating temperature above 43° C (110° F).

With the scan tool, monitor the target governor pressure and actual governor pressure.

Drive the vehicle at a constant speed 40 - 48 Kmh (25 - 30 MPH).

NOTE: The Actual Governor Pressure should be within 21 kPa (3 psi) of the Target Governor Pressure within 3 seconds.

Is the Actual Governor Pressure within 21 kPa (3 psi) of the Target Governor Pressure?

Yes >> Go To 13

No >> Repair internal transmission leak. Inspect all components pertaining to the Governor Pressure Sensor and the Governor Pressure Solenoid. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

6. CHECK GAUGE PRESSURE 40-55 WITH RELAY OUT

Place the gear selector in Park.

With the engine still running, remove the Transmission Control Relay.

WARNING: Do not wear loose clothing or jewelry when working on or near a running engine. Failure to follow these instructions can result in personal injury or death.

NOTE: Relay removal may set various codes. Disregard any DTC that may set due to relay removal.

CAUTION: Apply the brakes.

Place the gear selector in Drive with the engine at idle.

Read the governor pressure on the pressure gauge.

Is the governor pressure on the pressure gauge read between 276 - 379 kPa (40 - 55 psi)?

Yes >> Go To 7

No >> Go To 10

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (GAS) (CONTINUED)

7. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN - EXTERNAL

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

Disconnect the PCM harness connectors.

NOTE: Check connectors - Clean/repair as necessary

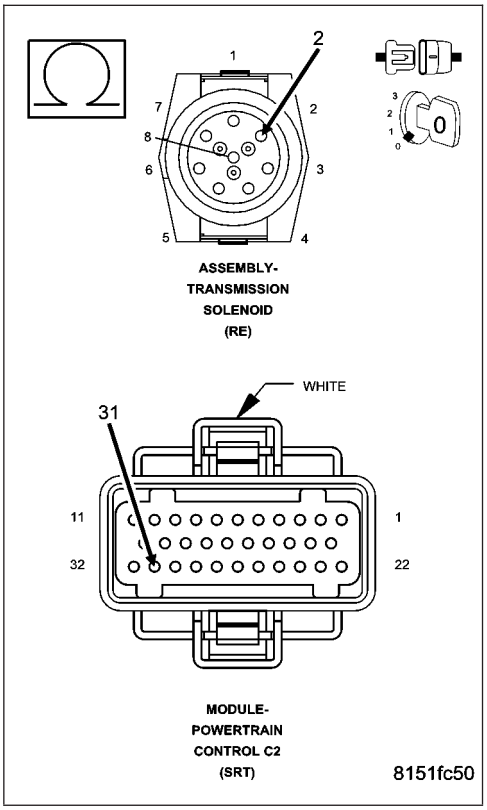
Measure the resistance of the 5-volt Supply circuit between the Transmission Solenoid Assembly harness connector and the PCM C2 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Repair the 5-volt Supply circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



8. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN - INTERNAL

Remove the transmission oil pan. (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Reconnect the Transmission Solenoid Assembly harness connector.

Disconnect the Governor Pressure Sensor connector internal to the transmission.

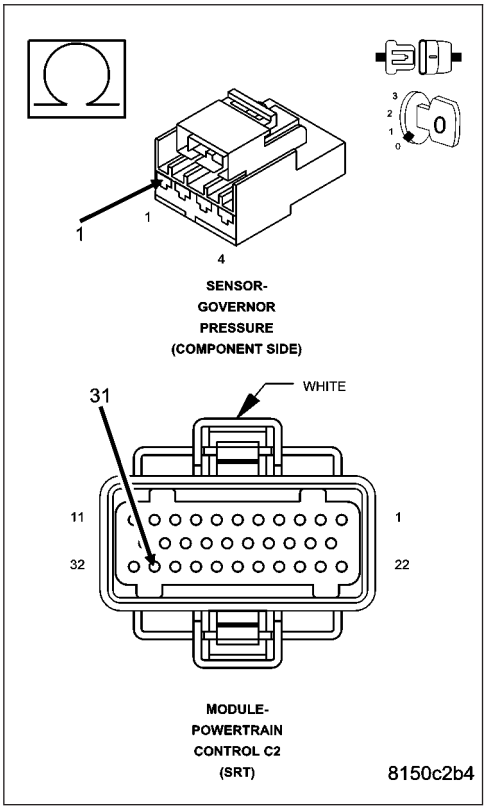
Measure the resistance of the 5-volt Supply circuit between the PCM C2 harness connector and the Governor Pressure sensor connector internal to the transmission.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair or replace the 5-volt Supply circuit for an open internal to the transmission.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (GAS) (CONTINUED)

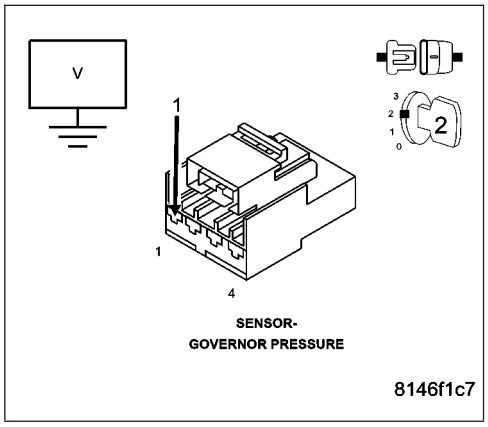
9. GOVERNOR PRESSURE SENSOR

Reconnect the PCM harness connectors.

NOTE: The PCM harness connectors must not be disconnected during this test.

Ignition on, engine not running.

Measure the voltage of the 5-volt Supply circuit at the Governor Pressure Sensor connector internal to the transmission.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Replace the Governor Pressure/Transmission Temperature Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

10. TRANSMISSION - INTERNAL DAMAGE

Turn the ignition off to the lock position.

Remove the transmission oil pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Inspect the transmission oil pan for burnt transmission fluid and/or excessive debris.

Is the transmission fluid burnt and/or contain excessive debris?

Yes >> Repair the internal transmission per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 11

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (GAS) (CONTINUED)

11. CHECK THE VALVE BODY

Replace the Governor Pressure Solenoid per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Install a pressure gauge at the governor pressure test port. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

Start the engine.

Warm the transmission to normal operating temperature.

CAUTION: Apply the brakes.

Place the gear selector in Drive and allow the engine to idle.

Read the governor pressure on the pressure gauge in Drive.

Is the governor pressure on the gauge below 21 kPa (3 psi)?

Yes >> Go To 12

No >> Repair or replace the Valve Body per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

12. VERIFY OPERATION - TEST DRIVE

Remove the pressure gauge from the transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

Test drive the vehicle.

Be sure to drive the vehicle at a constant speed of 40-48 Kmh or 25-30 MPH during the drive cycle.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (GAS) (CONTINUED)

13. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

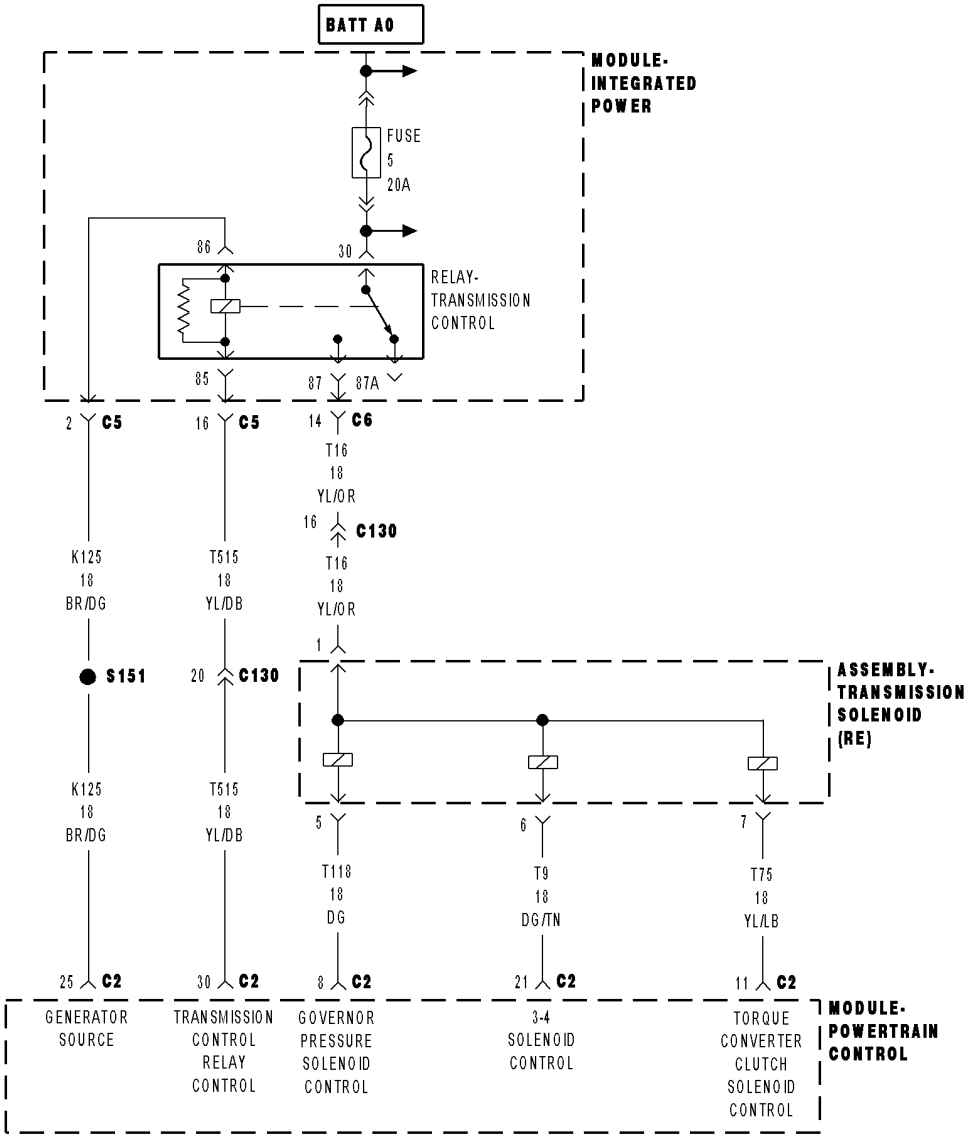
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

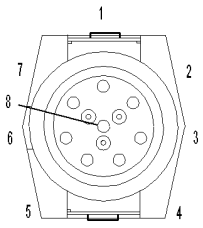
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

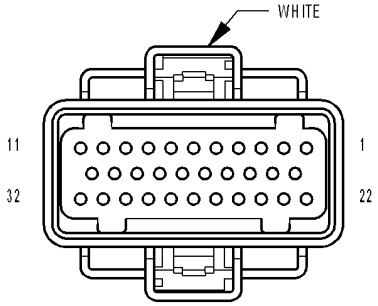
No >> Test Complete.

P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (GAS)





ASSEMBLY-
TRANSMISSION
SOLENOID
(RE)



MODULE-
POWERTRAIN
CONTROL C2
(SRT)

81511462

P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Control System is used to regulate the governor pressure which controls the shifts for first, second, and third gear. The Governor Pressure Control System test verifies that the requested pressure and the actual pressure are within a predetermined tolerance.

- **When Monitored:**
  While the engine is running and the gear selector is in the Drive position.
- **Set Condition:**
  This DTC will set if the monitored Governor Pressure is greater than 41.4 kPa (6 psi) for 5 seconds while the gear selector is in the Drive position with the road speed equal to zero - six times during a drive cycle. The transmission oil temperature must be between 23 - 88° C (73 - 190° F).

Possible Causes
OTHER TRANSMISSION DTC'S PRESENT
(F856) 5 VOLT SUPPLY CIRCUIT OPEN
(F856) 5 VOLT SUPPLY CIRCUIT OPEN INSIDE THE TRANSMISSION
TRANSMISSION OIL BURNT OR OIL PAN HAS EXCESSIVE DEBRIS - INTERNAL TRANSMISSION DAMAGE
GOVERNOR PRESSURE SENSOR
GOVERNOR PRESSURE SOLENOID
VALVE BODY
ENGINE CONTROL MODULE 5 VOLT SUPPLY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. OTHER TRANSMISSION DTC'S PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are there any other Transmission DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (GAS) (CONTINUED)

2. CHECK IF THE DTC IS CURRENT

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 3

No >> Go To 11

---

3. CHECKING FOR GOVERNOR PRESSURE ABOVE 6 PSI

Start the engine.

CAUTION: Apply the parking brake.

Warm the transmission to a normal operating temperature above 43° C (110° F).

CAUTION: Firmly apply the brakes.

With the engine RPM at idle, place the gear selector in Drive.

With the scan tool, read the governor pressure.

Is the governor pressure above 41.4 kPa (6 psi)?

Yes >> Go To 4

No >> Go To 11

---

4. GOVERNOR PRESSURE MATCH GAUGE PRESSURE

Turn the ignition off to the lock position.

Install a 700 kPa (100 psi) pressure gauge to the Governor Pressure Test Port. (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

Start the engine.

Warm the transmission to a normal operating temperature above 43° C (110° F).

CAUTION: Firmly apply the brakes.

With the engine RPM at idle, place the gear selector in Drive.

With the scan tool, read the governor pressure and compare the scan tool reading to the pressure gauge reading.

Does the scan tool Governor Pressure reading match the pressure gauge reading within 6.9 kPa (1 psi)?

Yes >> Go To 5

No >> Go To 8

P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (GAS) (CONTINUED)

5. CHECK FOR BURNT TRANSMISSION FLUID AND/OR EXCESSIVE DEBRIS IN THE TRANSMISSION OIL PAN

Turn the ignition off to the lock position.

Remove the transmission oil pan per the Service Information and inspect for burnt transmission fluid and excessive debris. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Is the transmission fluid burnt or does the transmission oil pan contain excessive debris?

Yes >> Repair internal transmission as necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6

---

6. REPLACE THE GOVERNOR PRESSURE SOLENOID AND CHECK THE VALVE BODY

Replace the Governor Pressure Solenoid per with the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Start the engine.

Warm the transmission to a normal operating temperature above 43° C (110° F).

CAUTION: Firmly apply the brakes.

With the engine RPM at idle, place the gear selector in Drive.

Read the governor pressure on the pressure gauge.

Is the governor pressure on the pressure gauge above 41.4 kPa (6 psi) with the engine RPM at idle and the gear selector in Drive?

Yes >> Replace the Valve Body per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 7

P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (GAS) (CONTINUED)

7. POWERTRAIN CONTROL MODULE

Turn the ignition off to the lock position.

Remove pressure gauge from transmission.

Install the Transmission Oil Pan and refill the transmission fluid per the service information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

With the scan tool, erase Engine DTCs.

Test drive the vehicle.

Be sure to stop the vehicle, with the vehicle in drive on six separate occurrences for at least 6 seconds each stop.

With the scan tool, read Engine DTCs.

Did the P1757 DTC reset?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 11

---

8. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN

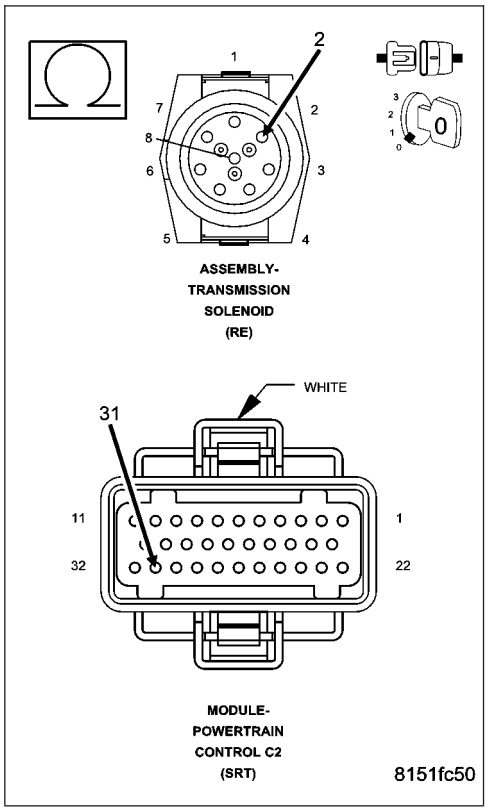
Turn the ignition off to the lock position.

Disconnect the PCM C2 harness connector.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary

Measure the resistance of the 5- volt Supply circuit between the Transmission Solenoid Assembly harness connector and the PCM C2 harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the (F856) 5-volt Supply circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (GAS) (CONTINUED)

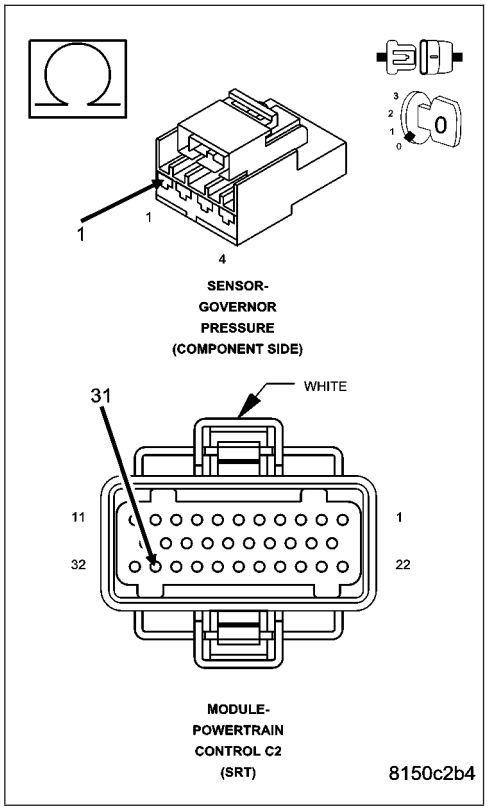
9. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN INSIDE THE TRANSMISSION

Reconnect the Transmission Solenoid Assembly harness connector.

Remove the transmission oil pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure Sensor connector internal to the transmission.

Measure the resistance of the (F856) 5-volt Supply circuit between the PCM C2 harness connector and the Transmission Solenoid Assembly connector internal to the transmission.



Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair or replace the (F856) 5-volt Supply circuit for an open internal to the transmission.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

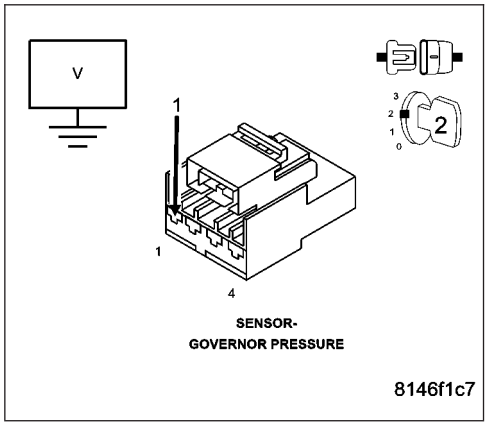
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10. CHECK THE ENGINE CONTROL MODULE - 5 VOLT SUPPLY

Reconnect the PCM harness connectors.

Ignition on, engine not running.

Measure the voltage of the (F856) 5-volt Supply circuit in the Governor Pressure Sensor connector internal to the transmission.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Replace the Governor Pressure Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (GAS) (CONTINUED)

11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

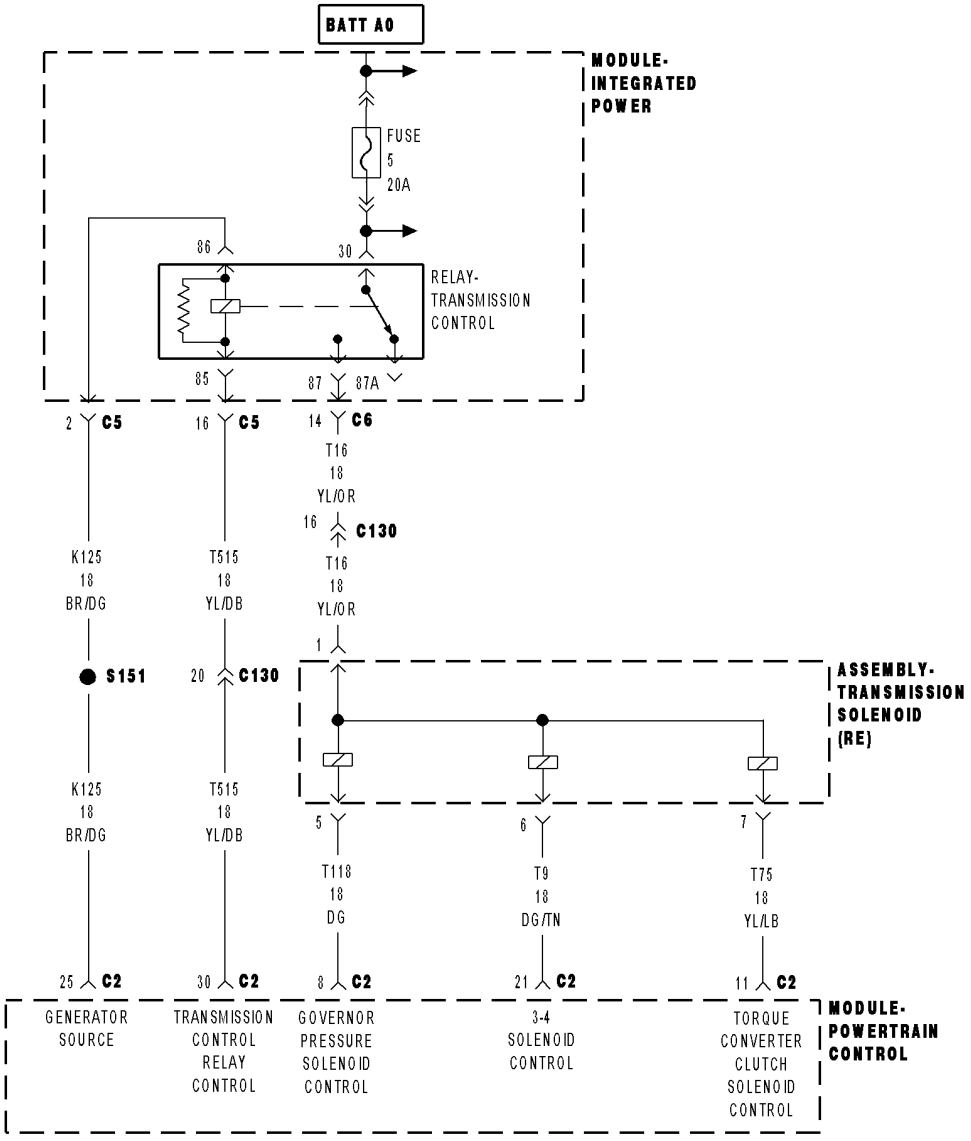
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

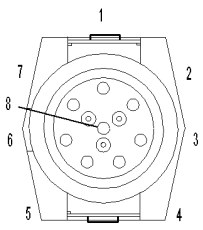
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

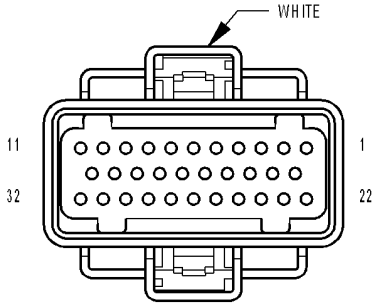
No >> Test Complete.

P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (GAS)





ASSEMBLY-
TRANSMISSION
SOLENOID
(RE)



MODULE-
POWERTRAIN
CONTROL C2
(SRT)

81511462

P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Sensors output is used as a control input to the Governor Pressure Control System. The Governor Pressure Control System is used to regulate the governor pressure which controls the shifts for first, second, and third gear.

- **When Monitored:**
  While the engine is running and the vehicle gear selector is in park or neutral for more than 3.0 seconds with the throttle position less than 10%.
- **Set Condition:**
  This DTC will set if the Governor Pressure is greater than 3 psi while the vehicle is in Park 3 times in a drive cycle.

Possible Causes
OTHER TRANSMISSION DTCS PRESENT
(F856) 5 VOLT SUPPLY CIRCUIT OPEN - EXTERNAL
(F856) 5 VOLT SUPPLY CIRCUIT OPEN - INTERNAL
GOVERNOR PRESSURE SENSOR
TRANSMISSION - INTERNAL DAMAGE
TRANSMISSION - INTERNAL LEAK
POWERTRAIN CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. OTHER TRANSMISSION DTCS PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are any other transmission DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

---

2. CHECK IF THE GOVERNOR PRESSURE IS ABOVE 21 KPA (3 PSI) IN PARK

CAUTION: Apply the parking brake.

Start the engine and allow the engine to idle.

Warm the transmission to a normal operating temperature above 43° C (110° F).

With the scan tool in Sensors, read the Governor Pressure with the Transmission Shift selector in Park.

Is the Governor Pressure reading on the scan tool above 21 kPa or 3 psi?

Yes >> Go To 3

No >> Go To 10

P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (GAS) (CONTINUED)

3. COMPARE SCAN TOOL GOVERNOR PRESSURE READING TO PRESSURE GAUGE READING

Turn the ignition off to the lock position.

Connect a 700 kPa (100 psi) Pressure Gauge to the Governor Pressure test port. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

Start the engine and allow the engine to idle.

Warm the transmission to a normal operating temperature above 43° C (110° F).

With the scan tool, read the Governor Pressure and compare the scan tool Governor Pressure reading to the Pressure Gauge reading.

Does the scan tool Governor Pressure reading match the Pressure Gauge reading within 6.9 kPa (1 psi)?

Yes >> Go To 4

No >> Go To 7

---

4. TRANSMISSION - INTERNAL DAMAGE

Turn the ignition off to the lock position.

Remove the transmission oil pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Inspect the transmission oil pan for burnt oil and/or excessive debris.

Does the transmission contain burnt oil and/or excessive debris?

Yes >> Repair internal transmission as necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 5

---

5. CHECK INTERNAL TRANSMISSION FOR A FLUID LEAK

Inspect the transmission for internal fluid leakage in the Valve Body or the Governor Pressure Solenoid. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Were there any problems found?

Yes >> Repair the internal transmission as necessary per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6

P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (GAS) (CONTINUED)

6. VERIFY OPERATION - TEST DRIVE

Remove the pressure gauge from the transmission.

Install the transmission oil pan and refill the transmission per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

With the scan tool, erase Engine DTCs.

Test drive the vehicle.

Be sure to stop the vehicle and move the gear selector into the park position for a minimum of 5 seconds at least three times during the drive cycle.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 10

---

7. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN

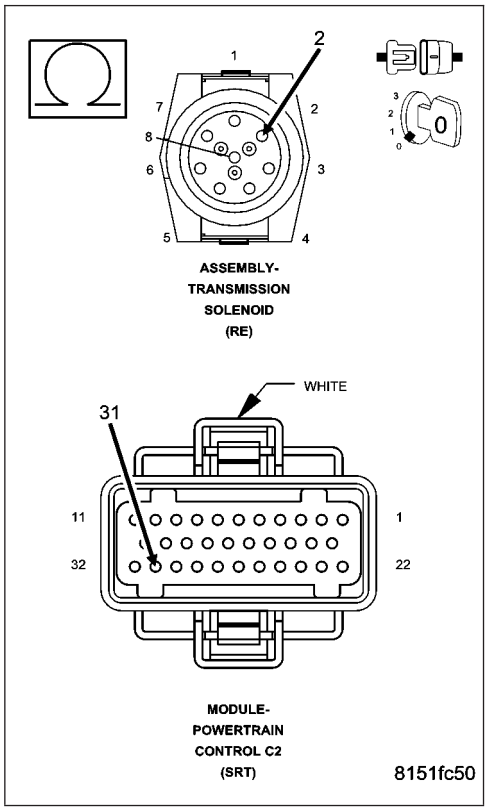
Turn the ignition off to the lock position.

Disconnect the PCM C2 harness connector.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary

Measure the resistance of the 5-volt Supply circuit between the Transmission Solenoid Assembly harness connector and the PCM C2 harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Repair 5-volt Supply circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (GAS) (CONTINUED)

8. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN - INTERNAL

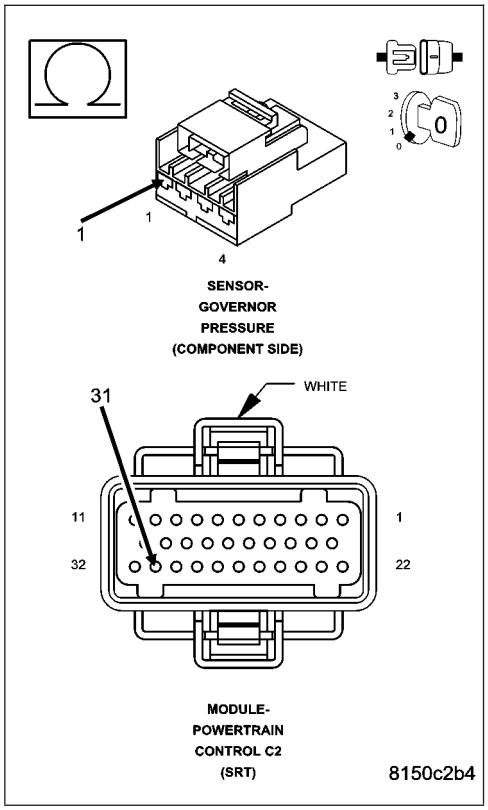
Reconnect the Transmission Solenoid Assembly harness connector.

Remove the Transmission Oil Pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure Sensor harness connector internal to the transmission.

NOTE: Check connectors - Clean/repair as necessary

Measure the resistance of the 5-volt Supply circuit between the PCM C2 harness connector and the Governor Pressure Sensor connector internal to the transmission.



Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair or replace the 5-volt Supply circuit for an open internal to the transmission.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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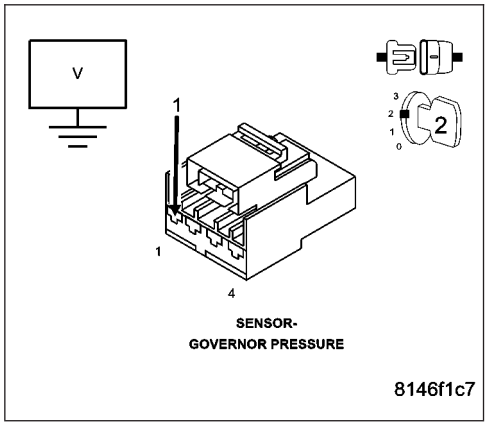
9. GOVERNOR PRESSURE SENSOR

Reconnect the PCM harness connectors.

NOTE: The PCM harness connectors must be connected during this test.

Ignition on, engine not running.

Measure the voltage of the 5-volt Supply circuit at the Governor Pressure Sensor connector internal to the transmission.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Replace the Governor Pressure Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (GAS) (CONTINUED)

10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

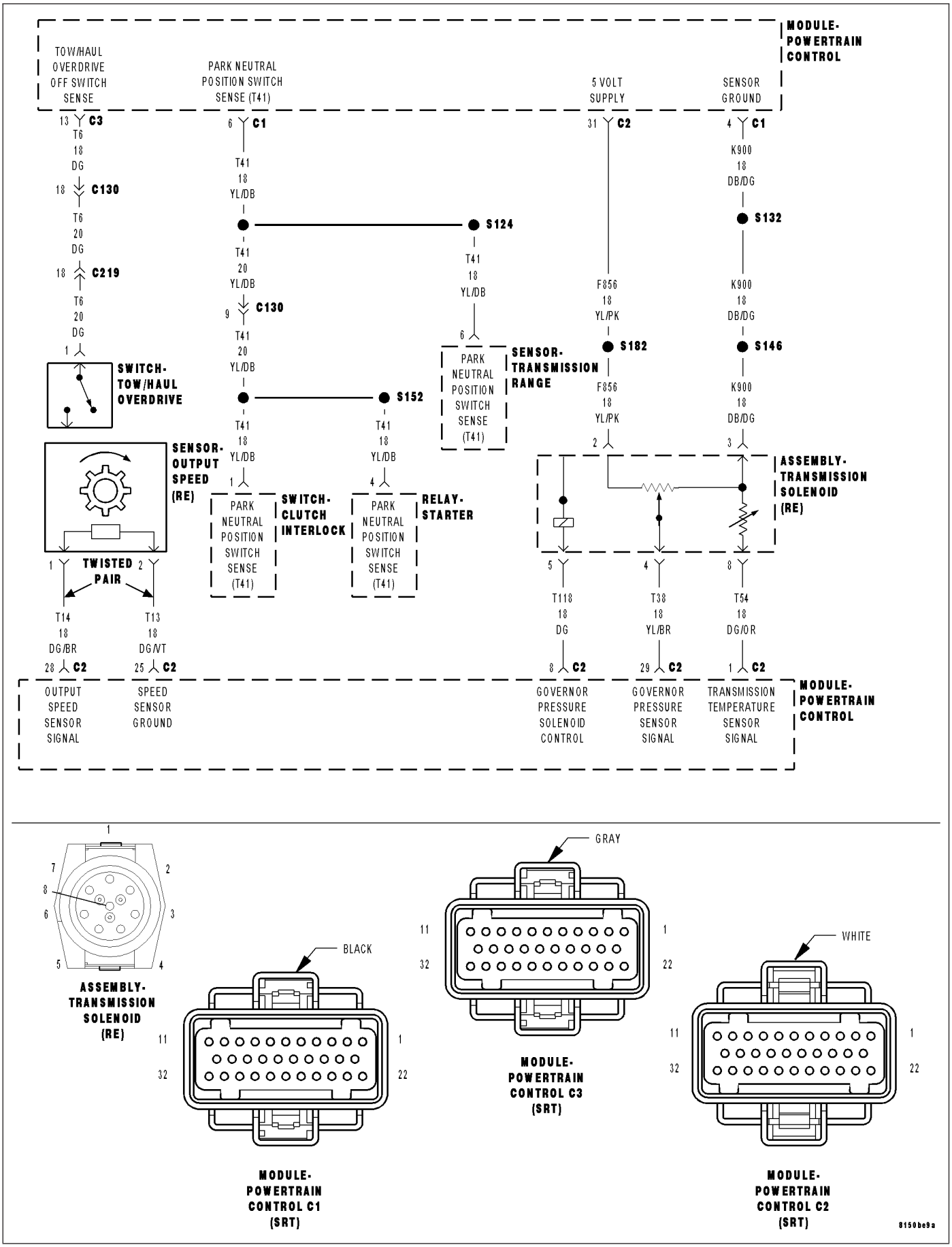
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P1763-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (GAS)



P1763-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Sensor is used by the PCM to adjust the Governor Pressure to a desired level for shifts in first, second, and third gear. If the PCM detects the monitored sense voltage is greater than or less than a predetermined specification, the PCM will set the desired DTC.

- **When Monitored:**
  Continuously with the ignition on and the engine running.
- **Set Condition:**
  This DTC will set when the monitored sense voltage from the Governor Pressure Sensor is above 4.89 volts for the period of 8.5 seconds.

Possible Causes
OTHER TRANSMISSION DTC'S PRESENT
PARK NEUTRAL DTC PRESENT
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO ANOTHER CIRCUIT
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT OPEN INSIDE TRANSMISSION
(K900) SENSOR GROUND CIRCUIT OPEN INSIDE TRANSMISSION
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE INSIDE TRANSMISSION
GOVERNOR PRESSURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 11

P1763-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (GAS) (CONTINUED)

2. CHECK FOR OTHER TRANSMISSION DTC'S PRESENT

Are there any Park/Neutral or other Transmission DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). If a Park/Neutral DTC is present, perform its respective test first. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 3

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3. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR AN OPEN

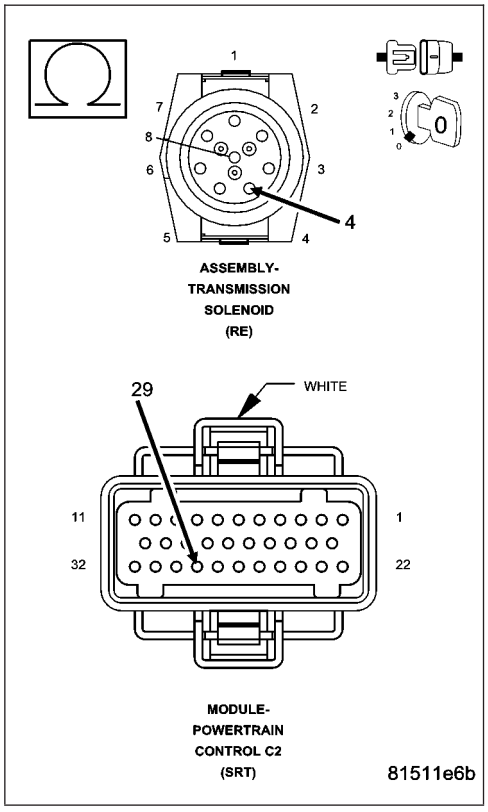
Turn the ignition off to the lock position.

Disconnect the PCM C2 harness connectors.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary

Measure the resistance of the (T38) Governor Pressure Sensor Signal circuit between the Transmission Solenoid Assembly harness connector and the PCM C2 harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (T38) Governor Pressure Sensor Signal circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1763-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (GAS) (CONTINUED)

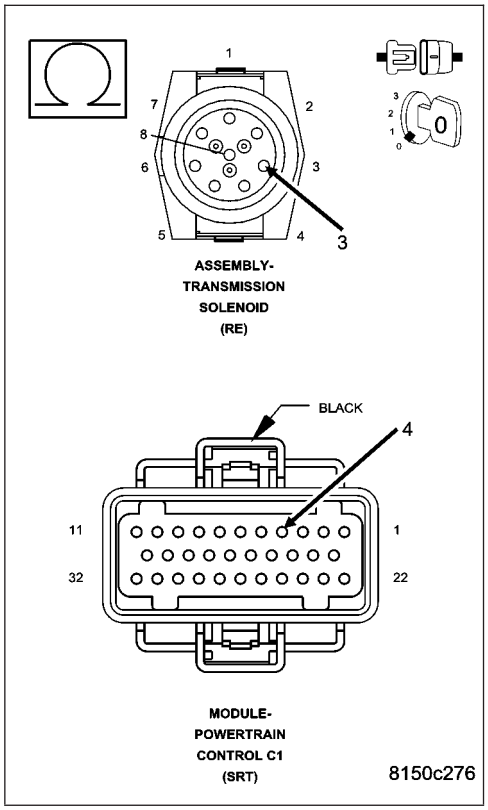
4. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (K900) Sensor Ground circuit between the Transmission Solenoid Assembly harness connector and the PCM C2 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (K900) Sensor Ground circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



5. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

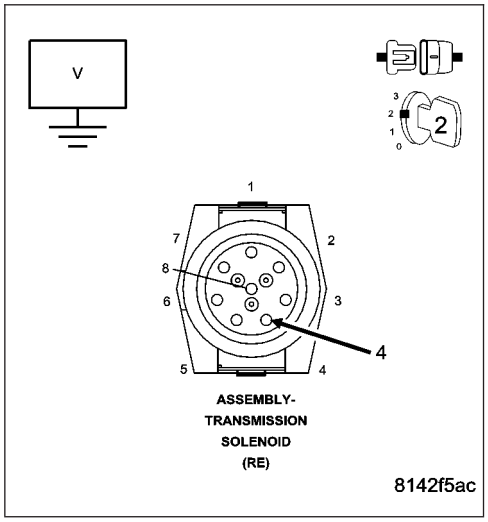
Ignition on, engine not running.

Measure the voltage of the (T38) Governor Pressure Sensor Signal circuit in the Transmission Solenoid Assembly harness connector.

Is the voltage above 0.5 volts?

Yes >> Repair the (T38) Governor Pressure Sensor Signal circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6



P1763-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (GAS) (CONTINUED)

6. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Turn the ignition off to the lock position.

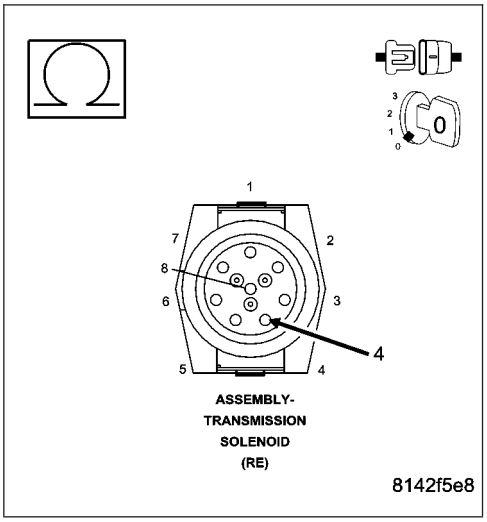
Measure the resistance between the (T38) Governor Pressure Sensor Signal circuit and all other circuits in the Transmission Solenoid Assembly harness connector.

Is the resistance below 100k ohms between the (T38) Governor Pressure Sensor Signal circuit and any other circuit(s) in the Transmission Solenoid Assembly harness connector?

Yes >> Repair the (T38) Governor Pressure Sensor Signal circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 7



7. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT OR AN OPEN INTERNAL

Remove the Transmission Oil Pan. (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Reconnect the Transmission Solenoid Assembly harness connector.

Disconnect the Governor Pressure Sensor harness connector.

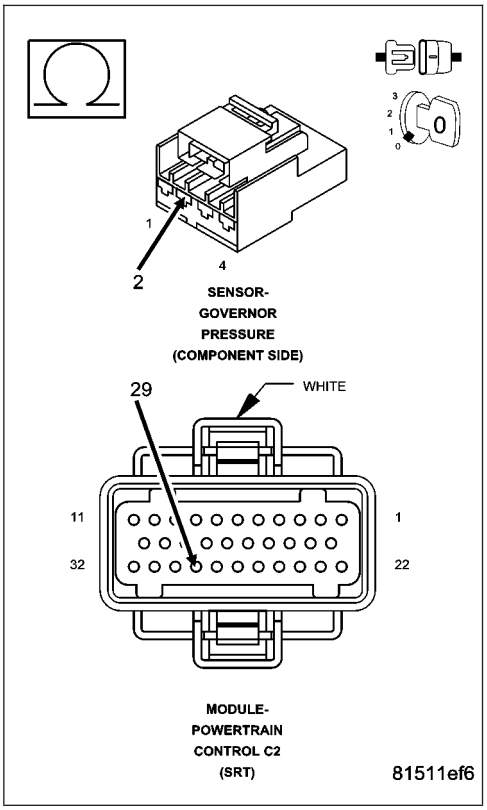
Measure the resistance of the (T38) Governor Pressure Sensor Signal circuit between the PCM C2 harness connector and the Governor Pressure Sensor harness connector internal to the transmission.

Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P1763-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (GAS) (CONTINUED)

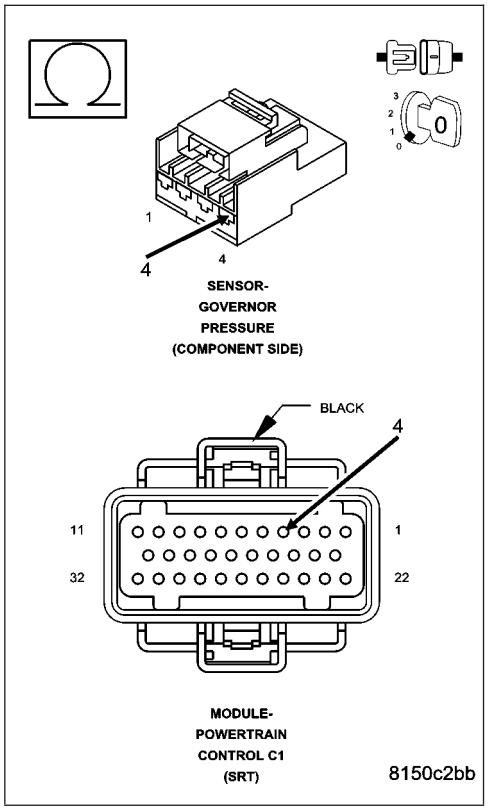
8. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN INTERNAL

Measure the resistance of the (K900) Sensor Ground circuit between the PCM C2 harness connector and the Governor Pressure Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)



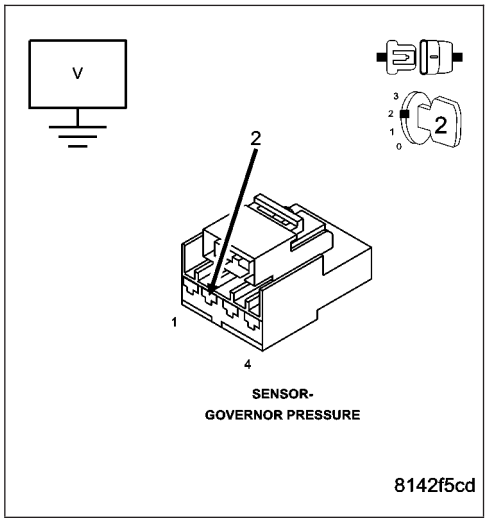
9. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE INTERNAL

NOTE: The Transmission Solenoid Assembly harness connector must be connected before proceeding.
Ignition on, engine not running.
Measure the voltage of the (T38) Governor Pressure Sensor Signal circuit in the Governor Pressure Sensor harness connector (inside transmission).

Is the voltage above 0.5 volt?

Yes >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 10



P1763-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (GAS) (CONTINUED)

10. ENGINE CONTROL MODULE

Turn the ignition off to the lock position.

Reconnect the PCM harness connector.

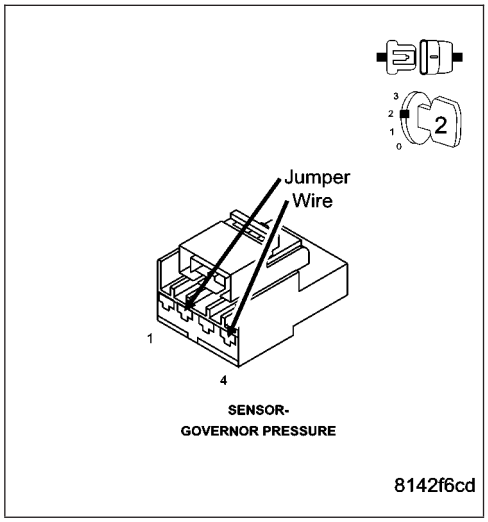
Reconnect the Transmission Solenoid Assembly harness connector.

Ignition on, engine not running.

With the scan tool, erase DTCs.

Connect a jumper wire between the (T38) Governor Pressure Sensor Signal circuit and the (K900) Sensor Ground circuit in the Transmission Governor Pressure Sensor harness connector.

With the scan tool, read DTCs.



Did the DTC P0869 set?

Yes >> Replace the Governor Pressure Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

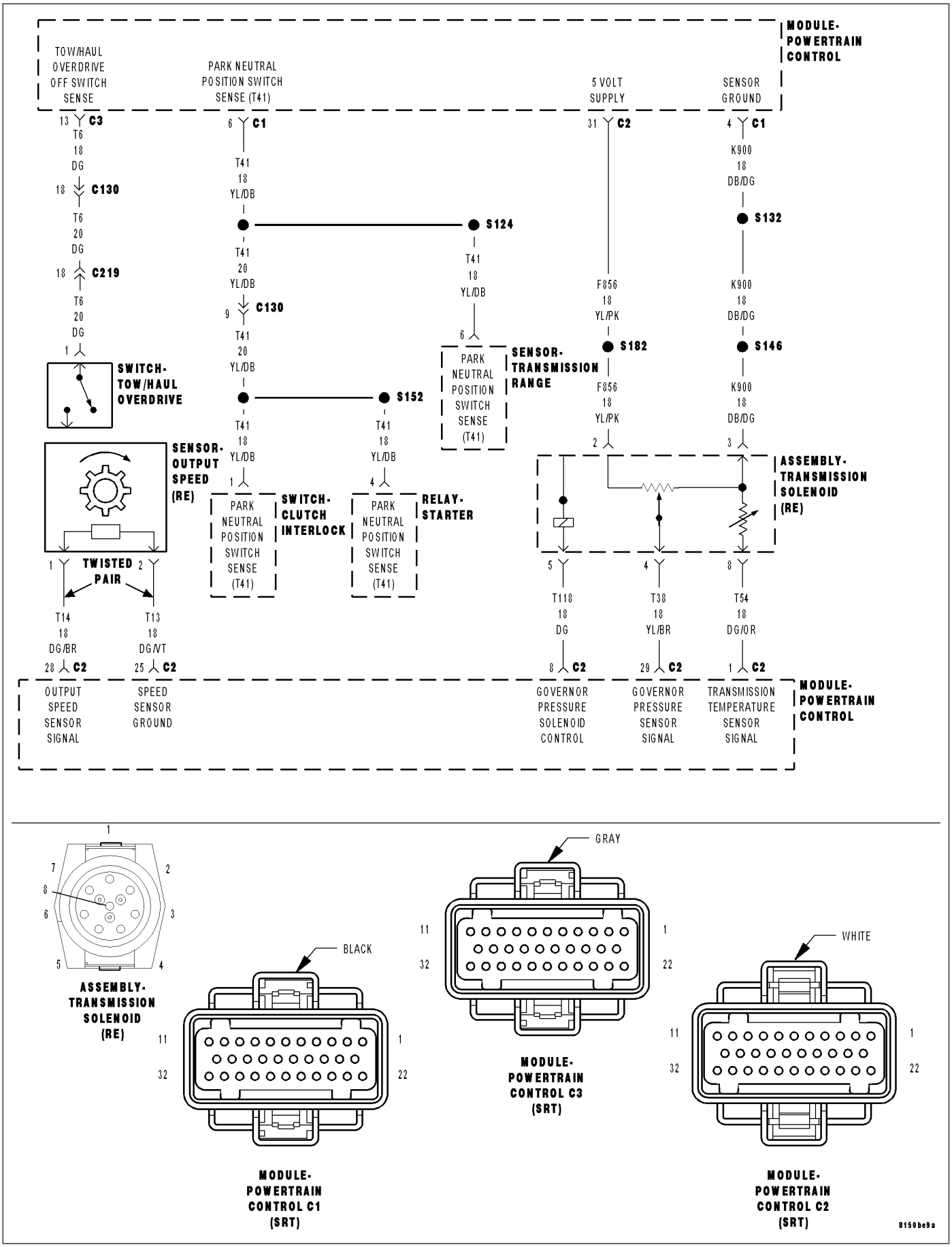
Were there any problems found?

Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P1764-GOVERNOR PRESSURE SENSOR VOLTS TOO LOW (GAS)



P1764-GOVERNOR PRESSURE SENSOR VOLTS TOO LOW (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Sensor is used by the PCM to adjust the Governor Pressure to a desired level for shifts in first, second, and third gear. If the PCM detects the monitored sense voltage is greater than or less than a predetermined specification, the PCM will set the desired DTC.

- **When Monitored:**
  Continuously with the ignition on and the engine running.
- **Set Condition:**
  This DTC will set if the monitored voltage from the Governor Pressure Sensor drops below 0.12 volts for the period of 8.5 seconds.

Possible Causes
PARK NEUTRAL DTC PRESENT OR OTHER TRANSMISSION DTC'S PRESENT
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION SOLENOID ASSEMBLY
GOVERNOR PRESSURE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.
With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 7

---

2. CHECK FOR OTHER TRANSMISSION DTC'S PRESENT

Are there any Park/Neutral or other Transmission DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). If a Park/Neutral DTC is present, perform its respective test first. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 3

P1764-GOVERNOR PRESSURE SENSOR VOLTS TOO LOW (GAS) (CONTINUED)

3. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

Disconnect the PCM C1 and C2 harness connectors.

NOTE: Check connectors - Clean/repair as necessary

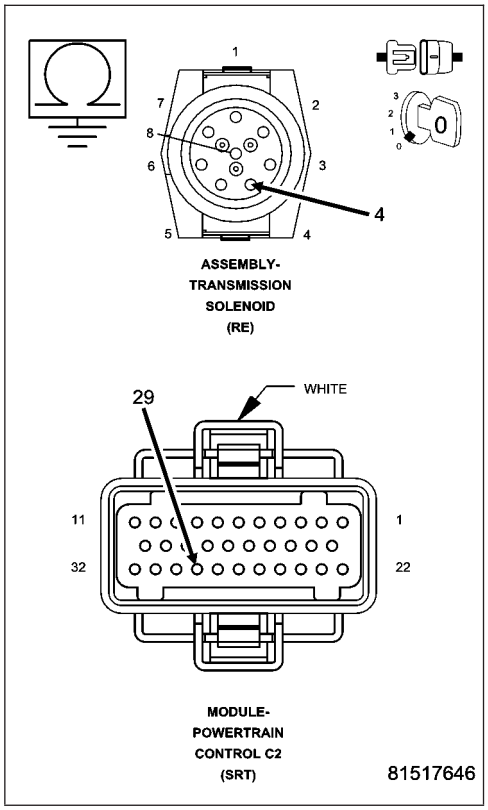
Measure the resistance between Ground and the (T38) Governor Pressure Sensor Signal circuit in the Transmission Solenoid Assembly harness connector.

Is the resistance greater than 100k ohms?

Yes >> Go To 4

No >> Repair the (T38) Governor Pressure Sensor Signal circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



4. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

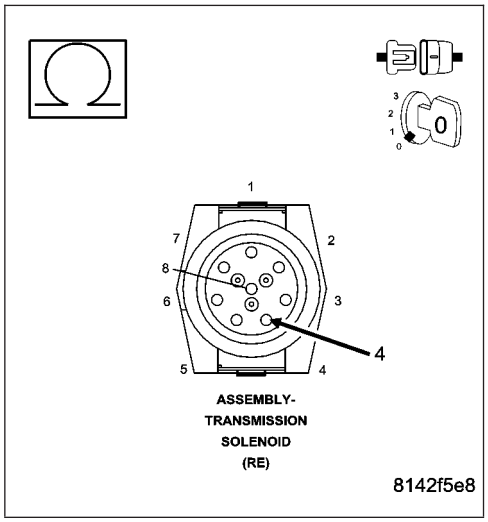
Measure the resistance between the (T38) Governor Pressure Sensor Signal circuit and all other circuits in the Transmission Solenoid Assembly harness connector.

Is the resistance below 100k ohms between the (T38) Governor Pressure Sensor Signal circuit and any other circuit(s) in the Transmission Solenoid Assembly harness connector?

Yes >> Repair the (T38) Governor Pressure Sensor Signal circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 5



P1764-GOVERNOR PRESSURE SENSOR VOLTS TOO LOW (GAS) (CONTINUED)

5. CHECK THE TRANSMISSION SOLENOID ASSEMBLY

Reconnect the Transmission Solenoid Assembly harness connector.

Remove the Transmission Oil Pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure/Transmission Temperature Sensor connector (inside transmission).

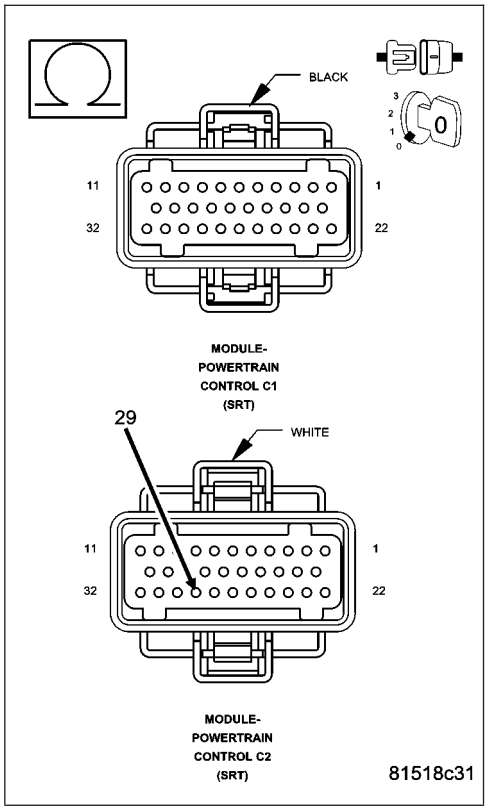
Measure the resistance between the (T38) Governor Pressure Sensor Signal circuit and all other circuits in the PCM C1 and C2 harness connectors.

Is the resistance below 100k ohms between the (T38) Governor Pressure Sensor Signal circuit any other circuit(s) in the PCM C1 or C2 harness connectors?

Yes >> Replace the Transmission Solenoid Assembly per the Service Information.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6



6. CHECK THE GOVERNOR PRESSURE SENSOR SENSOR

Turn the ignition on.

With the scan tool, erase DTCs.

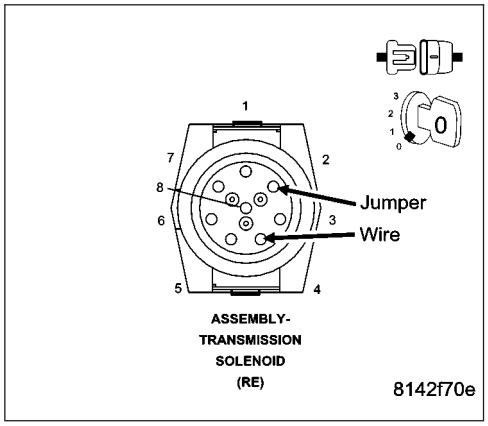
Connect a jumper wire between the (T38) Governor Pressure Sensor Signal circuit and the (F856) 5-volt Supply circuit in the Governor Pressure Sensor connector.

With the scan tool, read DTCs.

Did the DTC P0868 set?

Yes >> Inspect the Governor Pressure Sensor wiring for damage. If no problems are found, replace the Governor Pressure Sensor per the Service Information.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)



No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1764-GOVERNOR PRESSURE SENSOR VOLTS TOO LOW (GAS) (CONTINUED)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

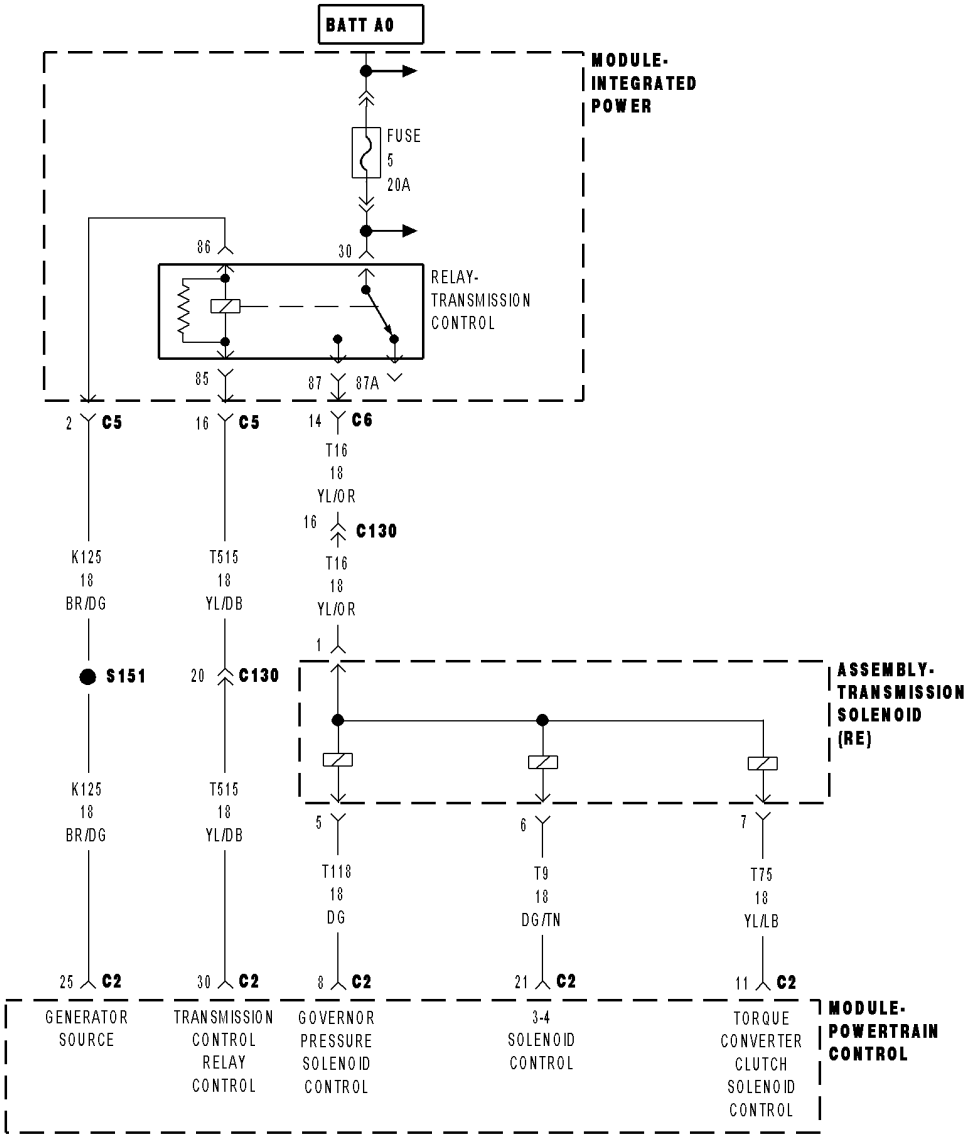
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

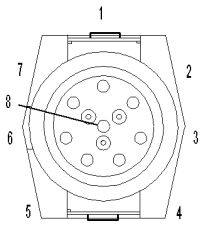
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

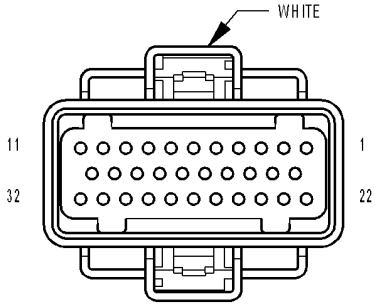
No >> Test Complete.

P1765-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT (GAS)





ASSEMBLY-
TRANSMISSION
SOLENOID
(RE)



MODULE-
POWERTRAIN
CONTROL C2
(SRT)

81511462

P1765-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Transmission Control Relay supplies power to the TCC, Overdrive, and Governor Pressure Solenoids when in normal operating mode. The Transmission Control Relay Control circuit is constantly monitored by the PCM. If the expected state of the Transmission Control Relay Control circuit is different then the expected state, a corresponding DTC will set and the PCM will de-energize the Transmission Control Relay and place the transmission in Limp-in.

- **When Monitored:**
  Continuously with the Ignition on.
- **Set Condition:**
  This DTC will set if the PCM monitored voltage of the Transmission Control Relay Control circuit is different than the expected voltage for the period 3.0 seconds.

Possible Causes
FUSED B(+) CIRCUIT OPEN
(T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT OPEN
(K125) GENERATOR SOURCE CIRCUIT OPEN
(T515) TRANSMISSION CONTROL RELAY CONTROL SHORT TO VOLTAGE
(T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND
(T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
TRANSMISSION CONTROL RELAY
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 11

P1765-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT (GAS) (CONTINUED)

2. TRANSMISSION CONTROL RELAY NOT CLICKING

With the scan tool, actuate the Transmission Control Relay.

Is the Transmission Control Relay clicking?

Yes >> Go To 11

No >> Go To 3

---

3. CHECK THE TRANSMISSION CONTROL RELAY

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Install a substitute relay in place of the Transmission Control Relay.

Ignition on, engine not running.

With the scan tool, erase DTCs.

Start the engine.

With the scan tool, read Engine DTCs.

Does the scan tool display the DTC P1765?

Yes >> Go To 4

No >> Replace the Transmission Control Relay.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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4. CHECK THE FUSED B(+) CIRCUIT FOR AN OPEN

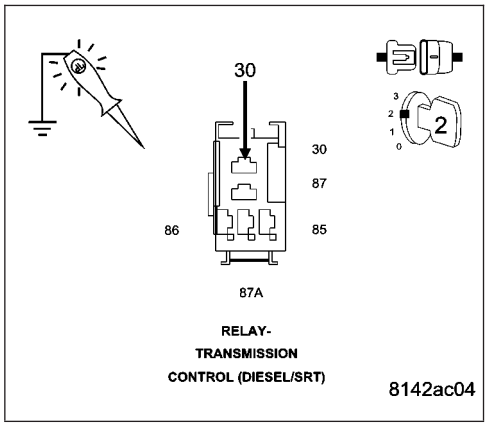
Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the Fused B(+) circuit in the Transmission Control Relay connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light illuminate brightly?

Yes >> Go To 5

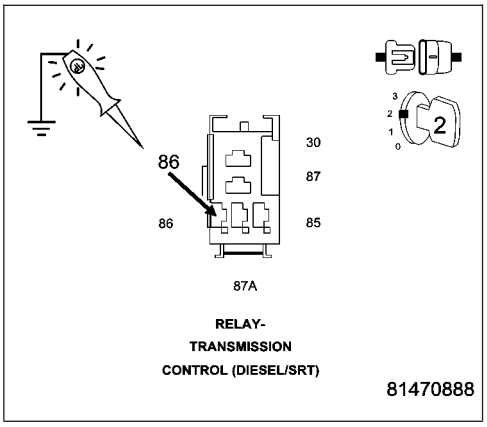
No >> Repair the Fused B(+) circuit for an open. If the fuse is open, make sure to check for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1765-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT (GAS) (CONTINUED)

5. CHECK THE (K125) GENERATOR SOURCE CIRCUIT FOR AN OPEN

Using a 12-volt test light connected to ground, check the (K125) Generator Source circuit in the Transmission Control Relay connector.



Does the test light illuminate brightly?

Yes >> Go To 6

No >> Repair the (K125) Generator Source circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

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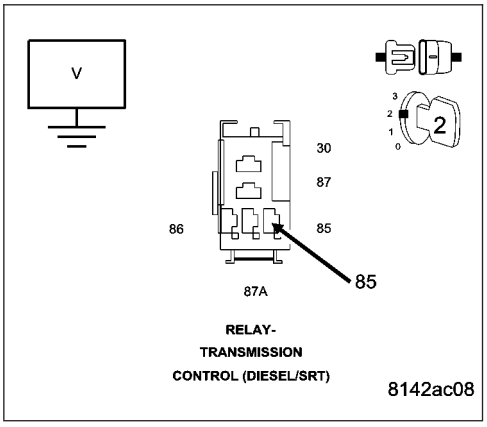
6. CHECK THE (T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the PCM C2 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T515) Transmission Control Relay Control circuit in the Transmission Control Relay connector.



Is the voltage above 1.0 volts?

Yes >> Repair the (T515) Transmission Control Relay Control circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 7

P1765-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT (GAS) (CONTINUED)

7. CHECK THE (T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT FOR AN OPEN

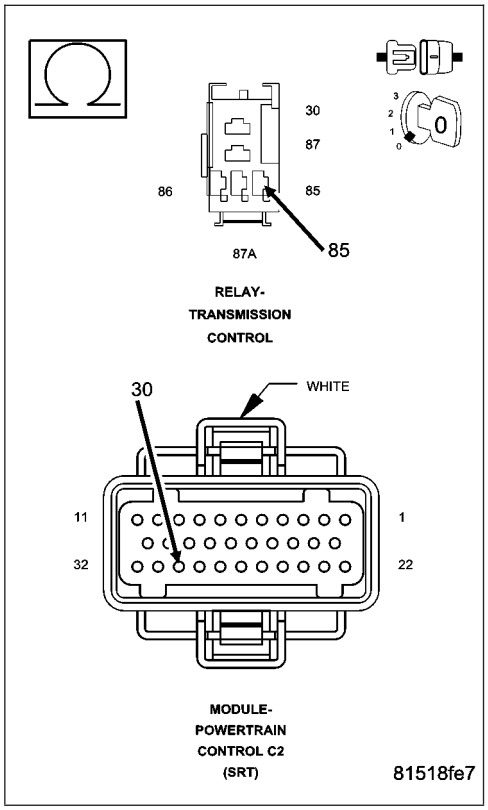
Measure the resistance of the (T515) Transmission Control Relay Control circuit between the Transmission Control Relay connector and the PCM C2 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Repair the (T515) Transmission Control Relay Control circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



8. CHECK THE (T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND

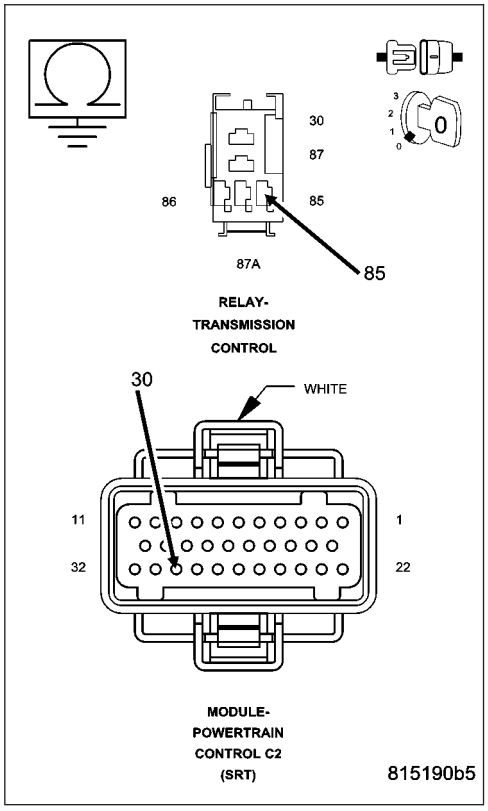
Measure the resistance between ground and the (T515) Transmission Control Relay Control circuit in the Transmission Control Relay connector.

Is the resistance above 100k ohms?

Yes >> Go To 9

No >> Repair the (T515) Transmission Control Relay Control circuit for a short to ground.

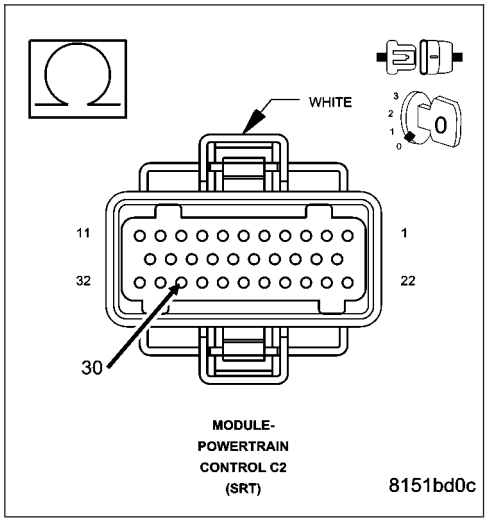
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P1765-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT (GAS) (CONTINUED)

9. CHECK THE (T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Measure the resistance between the Transmission Control Relay Control circuit and all other circuits in the PCM C2 harness connector.



Is the resistance below 100k ohms between the (T515) Transmission Control Relay Control circuit and any other circuit(s) in the PCM C2 harness connector?

Yes >> Repair the Transmission Control Relay Control circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 10

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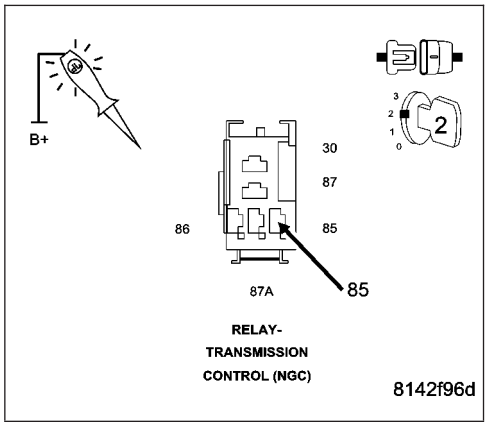
10. CHECK THE POWERTRAIN CONTROL MODULE

Turn the ignition off to the lock position.

Ignition on, engine not running.

With the scan tool, actuate the Transmission Relay.

Using a 12-volt test light connected to 12-volts, check the Transmission Control Relay Control circuit in the Transmission Control Relay Control connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the Test Light cycle on and off and illuminate brightly?

Yes >> Go To 11

No >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1765-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT (GAS) (CONTINUED)

11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

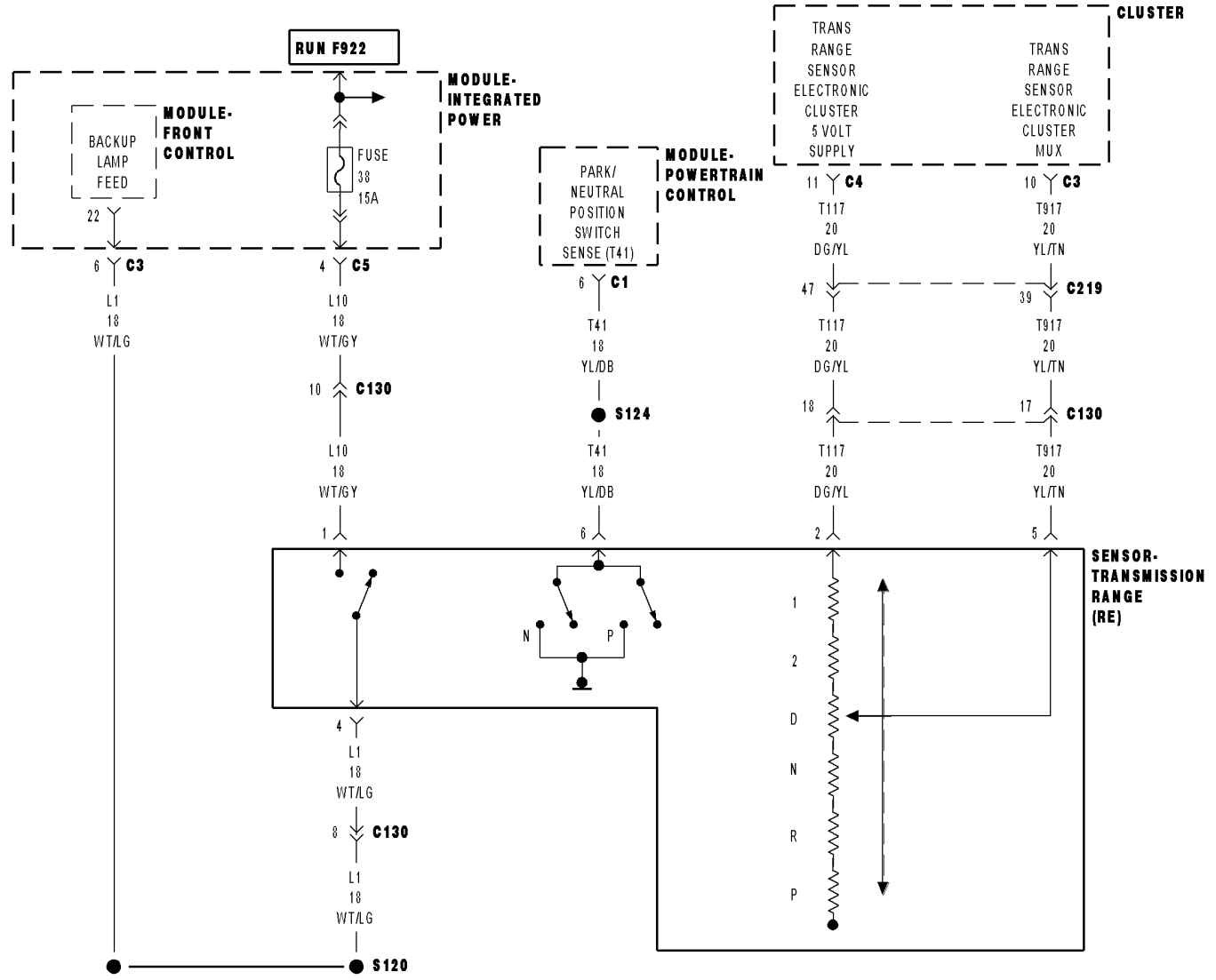
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

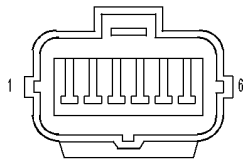
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

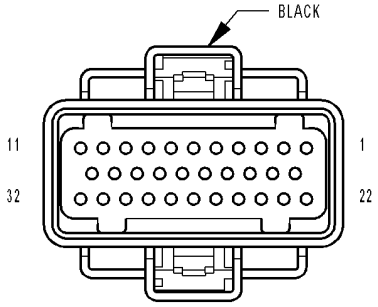
No >> Test Complete.

P0850-P/N SWITCH PERFORMANCE (GAS)





SENSOR-
TRANSMISSION RANGE
(RE)



MODULE-
POWERTRAIN
CONTROL C1
(SRT)

81511c68

P0850-P/N SWITCH PERFORMANCE (GAS) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The Transmission governor pressure set point is above a threshold while in park or the P/N switch is in drive during an engine start.

Possible Causes
TRS CONNECTOR DAMAGE OR CORROSION
PCM CONNECTOR DAMAGE OR CORROSION
(T41) P/N POSITION SWITCH SENSE CIRCUIT OPEN
(T41) P/N POSITION SWITCH SENSE CIRCUIT SHORT TO GROUND
(T41) P/N POSITION SWITCH SENSE CIRCUIT SHORT TO ANOTHER CIRCUIT
TRANSMISSION RANGE SENSOR
POWERTRAIN CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE SCAN TOOL DISPLAYS P/N AND D/R IN THE CORRECT POSITION

Ignition on, engine not running.

With the scan tool, monitor the PNP switch input state.

Move the gear selector through all gear positions Park to 1st and back to Park..

Did the scan tool display P/N and D/R in the correct gear positions?

Yes >> Go To 8

No >> Go To 2

---

2. CHECK THE TRS CONNECTOR FOR DAMAGE OR CORROSION

Turn the ignition off to the lock position.

Disconnect the Transmission Range Sensor harness connector.

Inspect the Transmission Range Sensor harness wiring and connector for damage, pushed out pins, or corrosion, etc.

Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 3

P0850-P/N SWITCH PERFORMANCE (GAS) (CONTINUED)

3. CHECK THE PCM CONNECTOR FOR DAMAGE OR CORROSION

Disconnect the PCM C1 harness connector.

Inspect the PCM wiring and connector for damage, pushed out pins, or corrosion, etc.

Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 4

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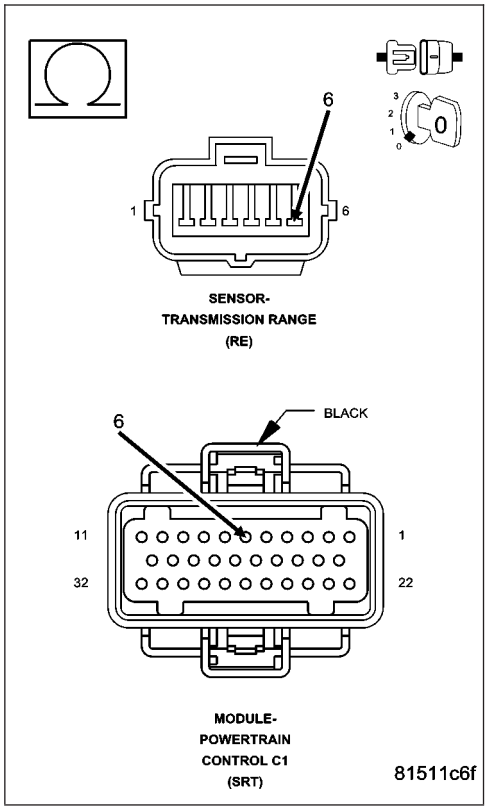
4. CHECK THE (T41) P/N POSITION SWITCH SENSE CIRCUIT FOR AN OPEN

Measure the resistance of the (T41) P/N Position Switch Sense circuit between the PCM C1 harness connector and the Transmission Range Sensor harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (T41) P/N Position Switch Sense circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0850-P/N SWITCH PERFORMANCE (GAS) (CONTINUED)

5. CHECK THE (T41) P/N POSITION SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

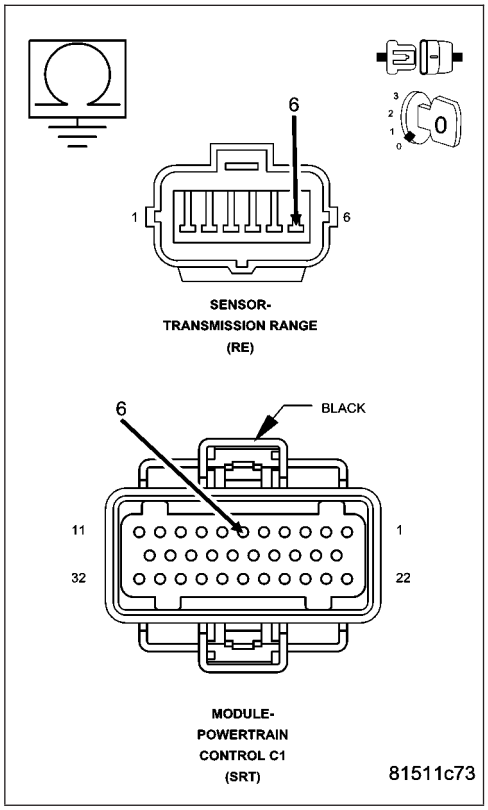
Measure the resistance between ground and the (T41) P/N Position Switch Sense circuit.

Is the resistance greater then 100k ohms?

Yes >> Go To 6

No >> Repair the (T41) P/N Position Switch Sense circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



6. CHECK THE (T41) P/N POSITION SWITCH SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

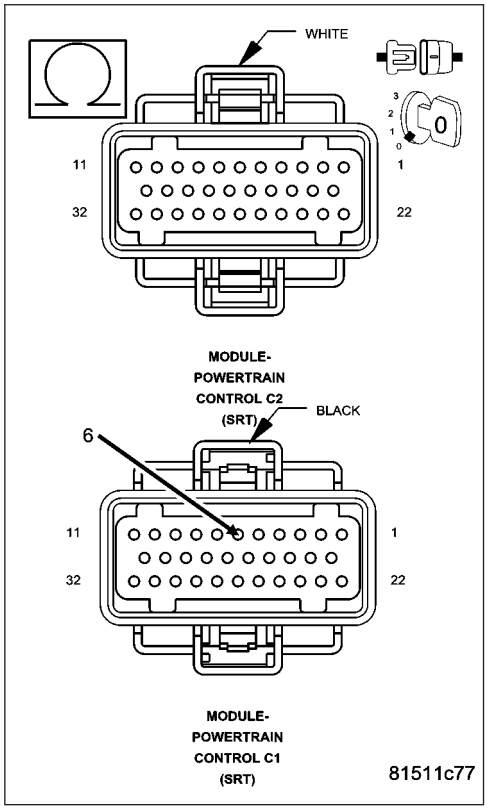
Measure the resistance between the (T41) P/N Position Switch Sense circuit and all other circuits in the PCM C1 and C2 harness connectors.

Is the resistance greater 100k ohms between the (T41) P/N Position Switch Sense circuit and any other circuit(s) in the PCM C1 and C2 harness connectors?

Yes >> Go To 7

No >> Repair the (T41) P/N Position Switch Sense circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0850-P/N SWITCH PERFORMANCE (GAS) (CONTINUED)

7. CHECK THE TRANSMISSION RANGE SENSOR

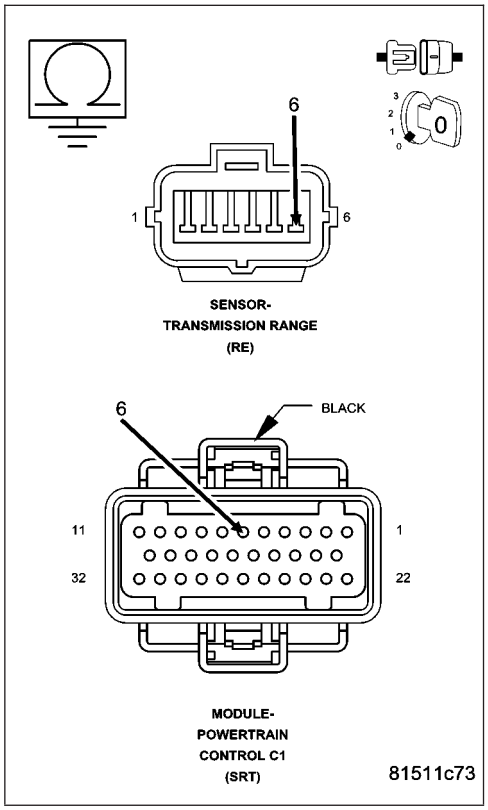
Reconnect the Transmission Range Sensor harness connector.

Move the gear selector through all gear positions, from Park to 1st and back.

While moving the gear selector through the gear positions, measure the resistance between ground and the (T41) P/N Position Switch Sense circuit in the PCM harness connector.

NOTE: The circuit is grounded in Park and Neutral and open in the other positions.

Did the display change from above 100k ohms (open) to below 5.0 ohms (grounded)?



Yes >> Using the schematics as a guide, check the Powertrain Control Module (PCM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the PCM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/POWERTRAIN CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Replace the Transmission Range Sensor per Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/TRANSMISSION RANGE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

STANDARD PROCEDURE

PRE-DIAGNOSTIC TROUBLE SHOOTING PROCEDURE - 48RE GAS

For a complete wiring diagram**Refer to Section 8W**

1.

NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.

NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.

With the scan tool, read engine DTC's. Check and repair all engine DTCs prior to performing transmission symptom diagnostics.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary.

Verify the flash level of the Powertrain Control Module. Some problems are corrected by software upgrades.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Did any of the above checks or procedures correct the symptom?

Yes >> Repair is complete.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (GAS). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

PRE-DIAGNOSTIC TROUBLE SHOOTING PROCEDURE - 48RE GAS (CONTINUED)

TRANSMISSION VERIFICATION TEST VER - 1 (GAS)

1.

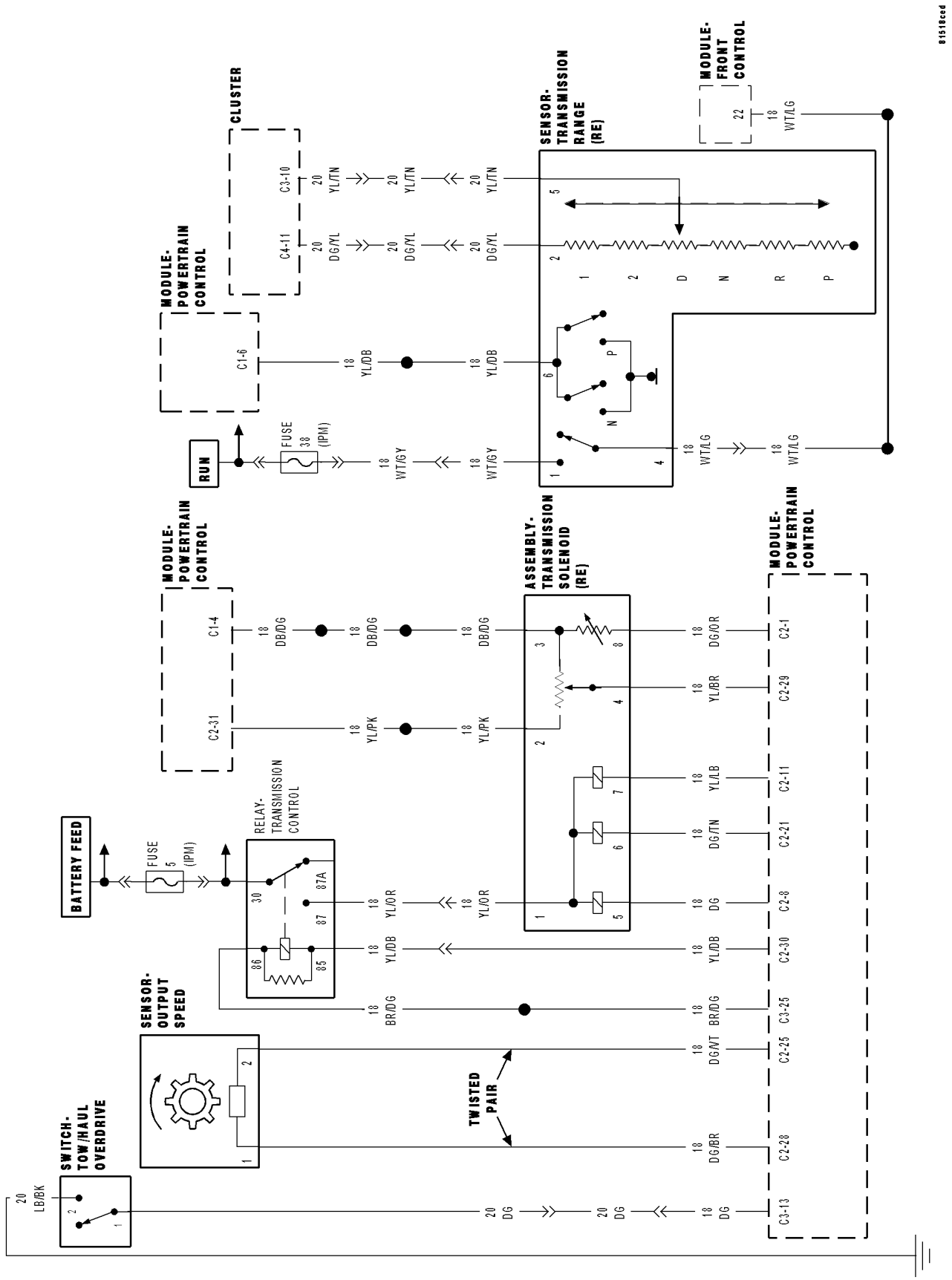
1. Inspect the vehicle to ensure that all engine and transmission components are properly installed and connected. Reassemble and reconnect components as necessary.
2. If any existing diagnostic trouble codes have not been repaired, go to Symptom List and follow path specified.
3. Connect a scan tool to the data link connector.
4. Ensure the fuel tank has at least a quarter tank of fuel. Turn off all accessories.
5. Start and run the engine until the transmission temperature is above 43°C (110°F).
6. Check the transmission fluid level per the Service Information. Adjust if necessary.
7. Road test the vehicle. Make 15 to 20 1-2, 2-3 and 3-4 up shifts. Perform these shifts from a standing start to 72 km/h (45 MPH) with a constant throttle opening of 20-25%.
8. Below 40 km/h (25 MPH), make 5 to 8 wide open throttle kick downs to 1st gear. Allow at least 5 seconds each in 2nd and 3rd between each kick down.
9. For a specific DTC, drive the vehicle in accordance with the Symptom's When Monitored and Set Conditions to verify the repair.
10. If a DTC sets during the road test, return to the Symptom List and follow the path. If no DTC sets, the repair is complete.

Are there any DTCs or symptoms remaining?

Yes >> Repair is not complete, refer to appropriate symptom.

No >> Repair is complete.

SCHEMATICS AND DIAGRAMS



RE TRANSMISSION CIRCUIT DIAGRAM (GAS)

AUTOMATIC TRANSMISSION - 48RE - DIESEL - ELECTRICAL DIAGNOSTICS

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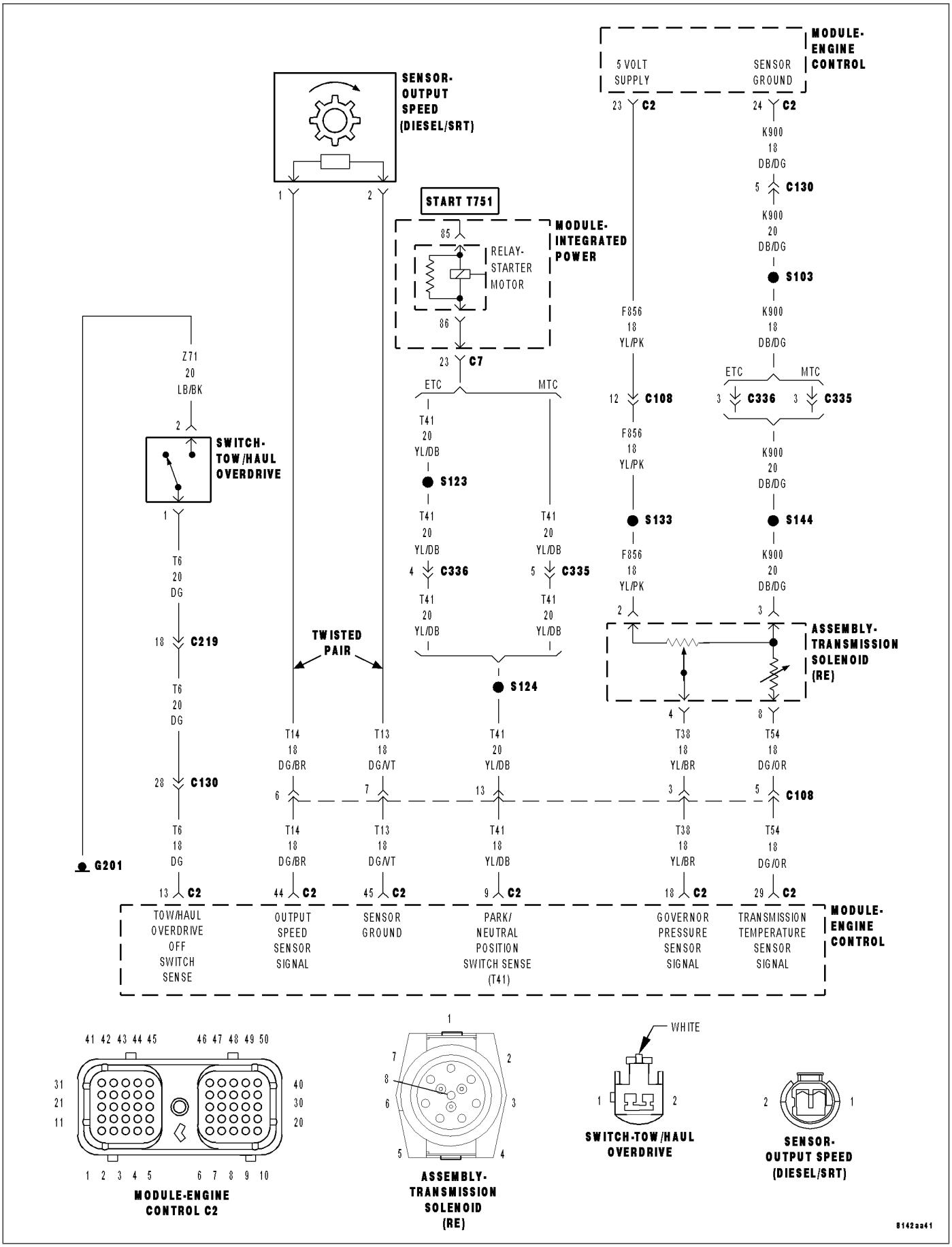
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AUTOMATIC TRANSMISSION - 48RE - DIESEL - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

P0711-TRANS TEMP SENSOR, NO TEMP RISE AFTER START (DIESEL)



P0711-TRANS TEMP SENSOR, NO TEMP RISE AFTER START (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS).

For a complete wiring diagram **Refer to Section 8W.**

Theory of Operation

The Transmission Temperature Sensor is used to sense when the transmission temperature is too hot or too cold to operate overdrive and/or the torque convertor clutch. When the transmission sensor detects a temperature below 0° C (32° F), overdrive and the torque convertor clutch are disabled. When the detected temperature is above 127° C (260° F), overdrive is disabled and 3rd gear with TCC is engaged, this strategy is used to increase transmission fluid flow to help cool the transmission.

- **When Monitored:**
  Continuously with the ignition on and the engine running.
- **Set Condition:**
  The DTC will set after two consecutive trips in which the transmission oil temperature is greater than 5° C (40° F) and the transmission oil temperature does not rise more than 8° C (16° F) after 20 minutes of run time with a vehicle speed greater than 48 Kmh (30 mph). The DTC will also set if the engine temperature is greater than 38° C (100° F) with the transmission oil temperature greater than 127° C (260° F).

Possible Causes
OTHER TRANSMISSION DTC'S SET
INTERMITTENT TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION TEMPERATURE SENSOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.
With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 6

---

2. CHECK FOR OTHER TRANSMISSION DTCS

Does the scan tool show any Park/Neutral DTCs?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 3

P0711-TRANS TEMP SENSOR, NO TEMP RISE AFTER START (DIESEL) (CONTINUED)

3. COMPARE THE TRANSMISSION TEMPERATURE TO ENGINE COOLANT TEMPERATURE

NOTE: To test the transmission temperature sensor, the engine and transmission temperature must be at or below 29.4° C (85° F).

With the scan tool, read the Transmission and Engine temperatures.

Is the transmission temperature within 5° C (9° F) of the engine coolant temperature?

Yes >> Go To 4

No >> Go To 5

---

4. CHECK IF THE TRANSMISSION TEMPERATURE INCREASES 15 DEGREES OVER 10 MINUTE PERIOD

NOTE: To test the transmission temperature sensor, the engine and transmission temperature must be at or below 29.4° C (85° F).

CAUTION: Apply the parking brake.

Start the engine, firmly apply the brakes and allow the engine to idle in Drive.

With the scan tool, monitor the Transmission Temperature.

NOTE: If the transmission temperature sensor is working properly, the transmission temperature should rise at least 8° C (15° F) within a ten minute period.

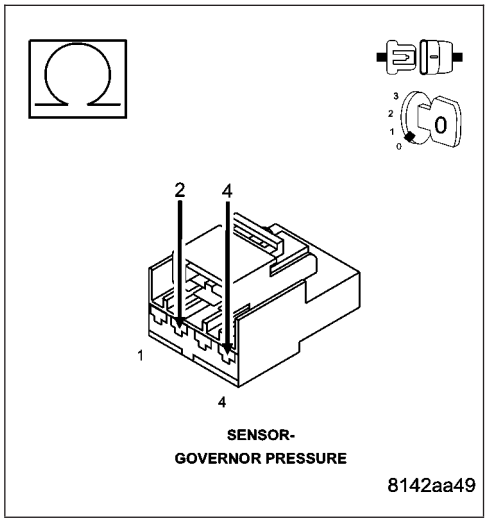
Did the transmission temperature increase at a steady rate and rise at least 8° C (15° F) over a 10 minute period?

Yes >> Go To 6

No >> Go To 5

P0711-TRANS TEMP SENSOR, NO TEMP RISE AFTER START (DIESEL) (CONTINUED)

5. CHECK THE TRANSMISSION TEMPERATURE SENSOR



TYPICAL VALUES FOR TRANSMISSION TEMPERATURE SENSOR

TEMPERATURE	MIN TO MAX OHM RANGE
-40° C (-40° F)	1094 to 1176 ohms
0.0° C (32° F)	1587 to 1672 ohms
25° C (77° F)	1960 to 2040 ohms
70° C (158° F)	2709 to 2860 ohms
0° C (212° F)	3284 to 3500 ohms
120° C (120° F)	3684 to 3950 ohms
150° C (302° F)	4110 to 4450 ohms

Turn the ignition off to the lock position.

Remove the Transmission Oil Pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure Sensor harness connector internal to the transmission.

NOTE: Check connectors - Clean/repair as necessary

Measure the resistance of the Transmission Temperature Sensor between the (T54) Transmission Temperature Sensor Signal circuit and the (K900) Sensor Ground circuit.

Using the chart at the chart above, compare the Temperature Sensor temperature to the correlating resistance value.

Is the resistance within the specified range when the sensor is at the given temperature?

Yes >> Test Complete.

No >> Replace the Governor Pressure/Transmission Temperature Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0711-TRANS TEMP SENSOR, NO TEMP RISE AFTER START (DIESEL) (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

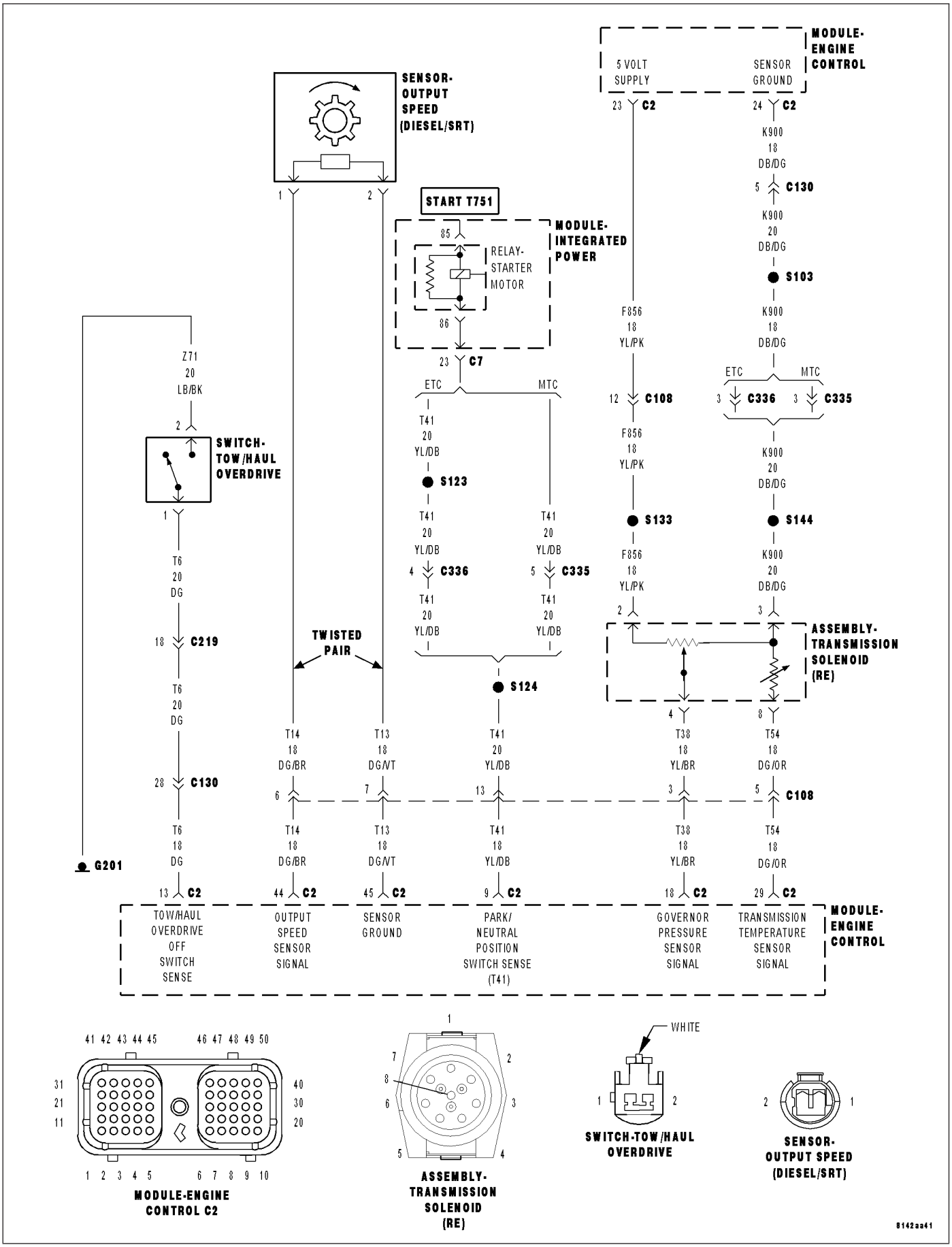
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (DIESEL)



P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Transmission Temperature Sensor is used to sense when the transmission temperature is too hot or too cold to operate overdrive and/or the torque convertor clutch. When the transmission sensor detects a temperature below 0° C (32° F), overdrive and the torque convertor clutch are disabled. When the detected temperature is above 127° C (260° F), overdrive is disabled and 3rd gear with TCC is engaged, this strategy is used to increase transmission fluid flow to help cool the transmission.

- **When Monitored:**
  Continuously with the ignition on and the engine running.
- **Set Condition:**
  The DTC will set if the monitored Transmission Temperature Sensor Signal circuit drops below 1.55 volts for the period of 2.25 seconds.

Possible Causes
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO (K900) SENSOR GROUND CIRCUIT
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND INSIDE TRANSMISSION
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO THE (K900) SENSOR GROUND CIRCUIT INSIDE TRANSMISSION
TRANSMISSION TEMPERATURE SENSOR
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 8

P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (DIESEL) (CONTINUED)

2. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the ECM C2 harness connector.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary

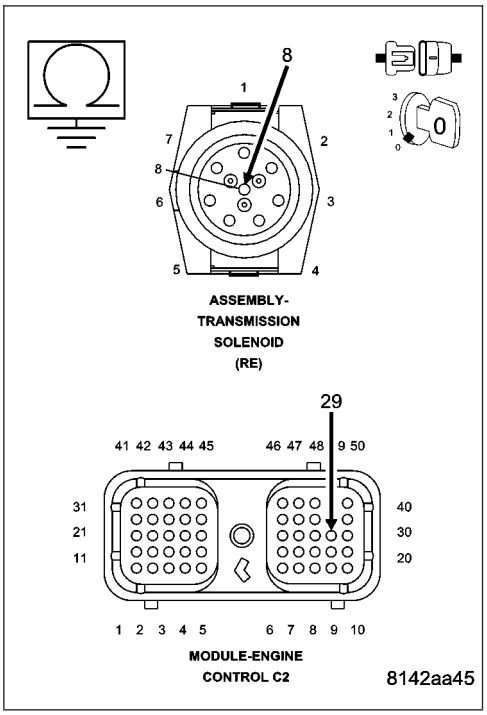
Measure the resistance between ground and the (T54) Transmission Temperature Sensor Signal circuit in the Transmission Solenoid Assembly harness connector.

Is the resistance above 100k ohms?

Yes >> Go To 3

No >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



3. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (K900) SENSOR GROUND CIRCUIT

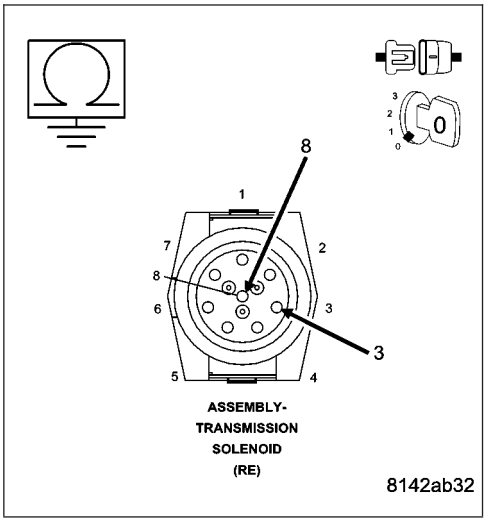
Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and (K900) Sensor Ground circuit in the Transmission Solenoid Assembly harness connector.

Is the resistance above 100k ohms?

Yes >> Go To 4

No >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to the (K900) Sensor Ground circuit.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (DIESEL) (CONTINUED)

4. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND INSIDE TRANSMISSION

Remove the Transmission Oil Pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure Sensor connector interal to the transmission.

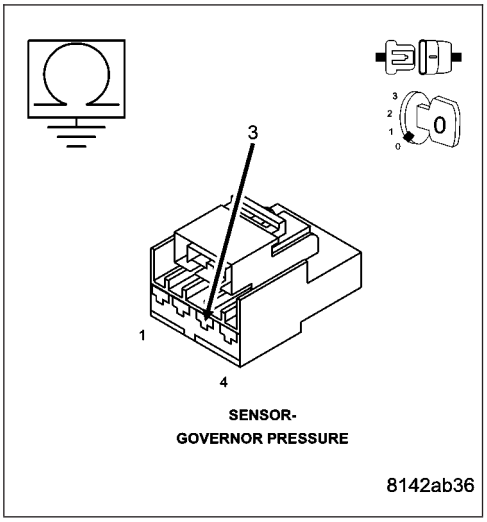
Measure the resistance between ground and the (T54) Transmission Temperature Sensor Signal circuit at the Governor Pressure Sensor connector.

Is the resistance above 100k ohms?

Yes >> Go To 5

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)



5. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (K900) SENSOR GROUND CIRCUIT INSIDE TRANSMISSION

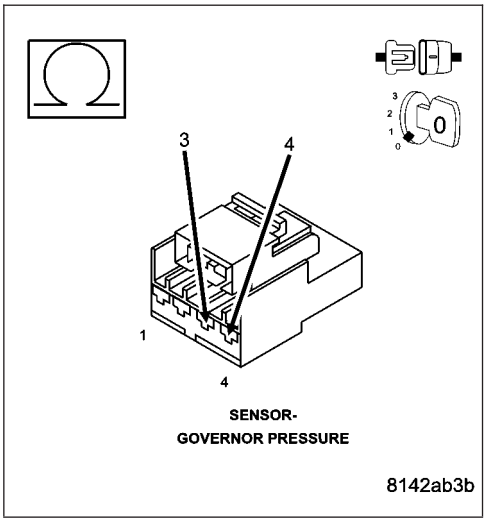
Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and (K900) Sensor Ground circuit at the Governor Pressure Sensor connector.

Is the resistance above 100k ohms?

Yes >> Go To 6

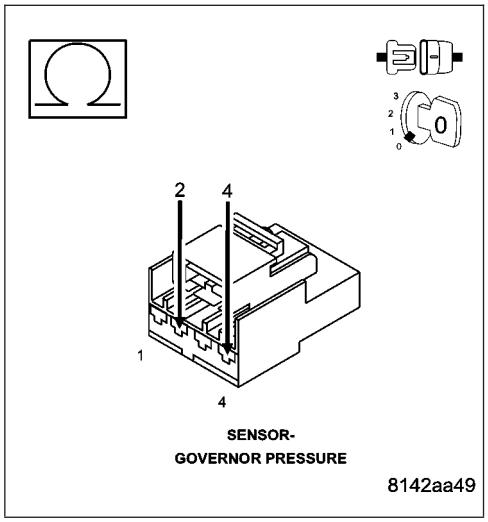
No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (DIESEL) (CONTINUED)

6. TRANSMISSION TEMPERATURE SENSOR



TYPICAL VALUES FOR TRANSMISSION TEMPERATURE SENSOR

TEMPERATURE	MIN TO MAX OHM RANGE
-40° C (-40° F)	1094 to 1176 ohms
0.0° C (32° F)	1587 to 1672 ohms
25° C (77° F)	1960 to 2040 ohms
70° C (158° F)	2709 to 2860 ohms
0° C (212° F)	3284 to 3500 ohms
120° C (120° F)	3684 to 3950 ohms
150° C (302° F)	4110 to 4450 ohms

Measure the resistance of the Transmission Temperature Sensor between the (T54) Transmission Temperature Sensor Signal circuit and (K900) Sensor Ground circuit.

Using the chart above, compare the Temperature Sensor temperature to the correlating resistance value.

Is the resistance below the minimum specification for the sensor temperature?

Yes >> Replace the Governor Pressure/Transmission Temperature Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 7

P0712-TRANS TEMP SENSOR VOLTAGE TOO LOW (DIESEL) (CONTINUED)

7. ENGINE CONTROL MODULE

Reconnect the all disconnected connectors.

Ignition on, engine not running.

With the scan tool, erase Engine DTCs.

With the scan tool, monitor Engine DTC's.

Disconnect the Transmission Temperature Sensor connector.

Did the DTC P0713 set?

Yes >> Go To 8

No >> Replace and program the Engine Control Module per the Service Information.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC origionaly set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

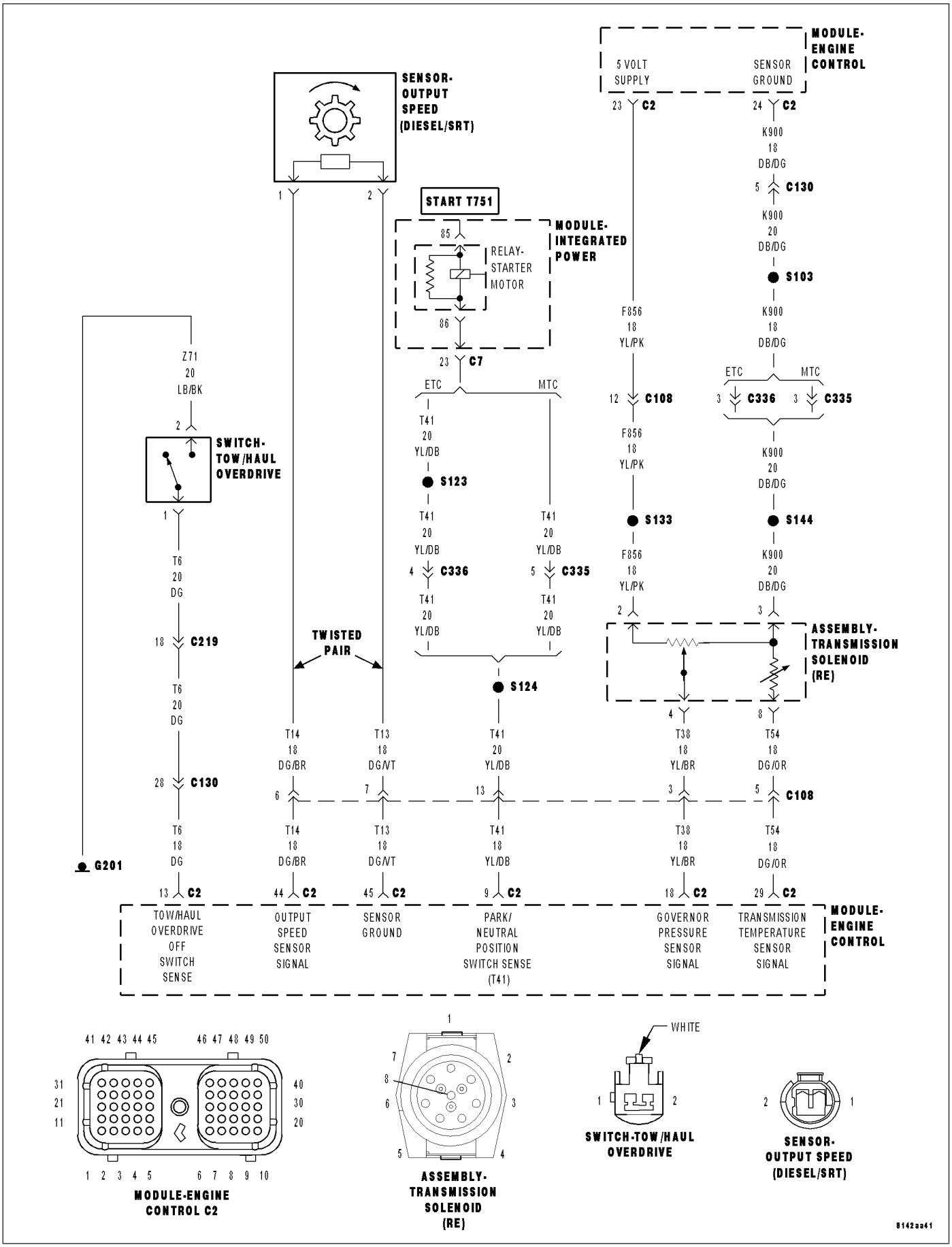
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH



P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram **Refer to Section 8W**

Theory of Operation

The Transmission Temperature Sensor is used to sense when the transmission temperature is too hot or too cold to operate overdrive and/or the torque convertor clutch. When the transmission sensor detects a temperature below 0° C (32° F), overdrive and the torque convertor clutch are disabled. When the detected temperature is above 127° C (260° F), overdrive is disabled and 3rd gear with TCC is engaged, this strategy is used to increase transmission fluid flow to help cool the transmission.

- **When Monitored:**
  Continuously with the ignition on and the engine running.
- **Set Condition:**
  This DTC will set if the (T54) Transmission Temperature Sensor Signal circuit voltage exceeds 3.76 volts for the period of 2.2 seconds.

Possible Causes
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO (F856) 5-VOLT SUPPLY CIRCUIT
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
(T54) 5-VOLT SUPPLY OPEN IN TRANSMISSION
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT SHORT TO (F856) 5-VOLT SUPPLY CIRCUIT INTERNAL TO THE TRANSMISSION
(T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN INTERNAL TO THE TRANSMISSION
(K900) SENSOR GROUND CIRCUIT OPEN INTERNAL TO THE TRANSMISSION
TRANSMISSION TEMPERATURE SENSOR
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 12

P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (CONTINUED)

2. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

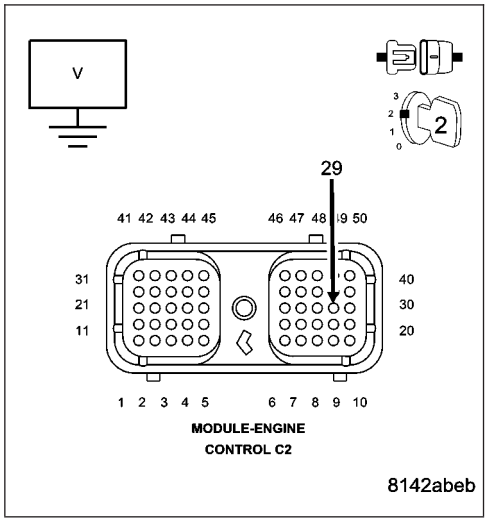
Disconnect the ECM C2 harness connector.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary

Ignition on, engine not running.

Measure the voltage of the (T54) Transmission Temperature Sensor Signal circuit in the ECM C2 harness connector.



Is the voltage above 0.5 volts?

Yes >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to voltage.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

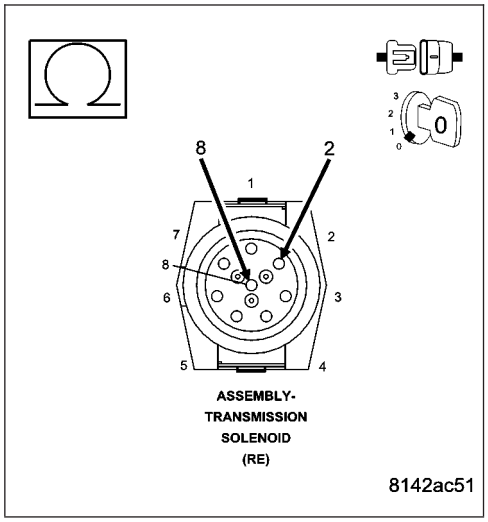
No >> Go To 3

---

3. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO (F856) 5-VOLT SUPPLY CIRCUIT

Turn the ignition off to the lock position.

Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and the (F856) 5-volt Supply circuit in the Transmission Solenoid Assembly harness connector.



Is the resistance above 100k ohms?

Yes >> Go To 4

No >> Repair the (T54) Transmission Temperature Sensor Signal circuit for a short to the (F856) 5-volt Supply circuit.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (CONTINUED)

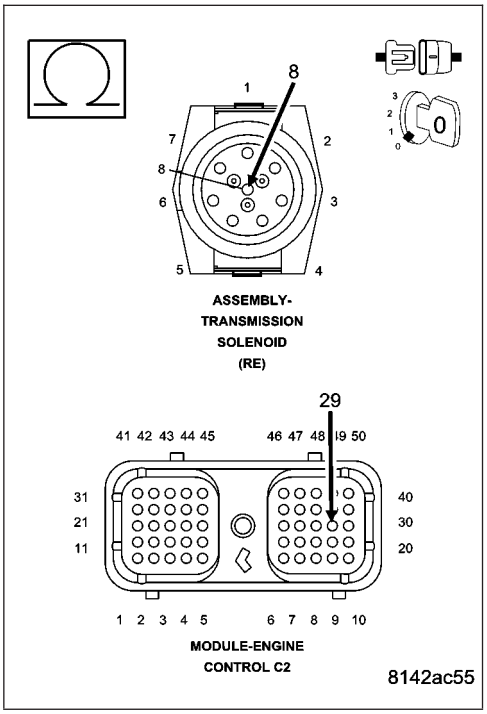
4. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN

Measure the resistance of the (T54) Transmission Temperature Sensor Signal circuit between the ECM C2 harness connector and the Transmission Solenoid Assembly harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (T54) Transmission Temperature Sensor Signal circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



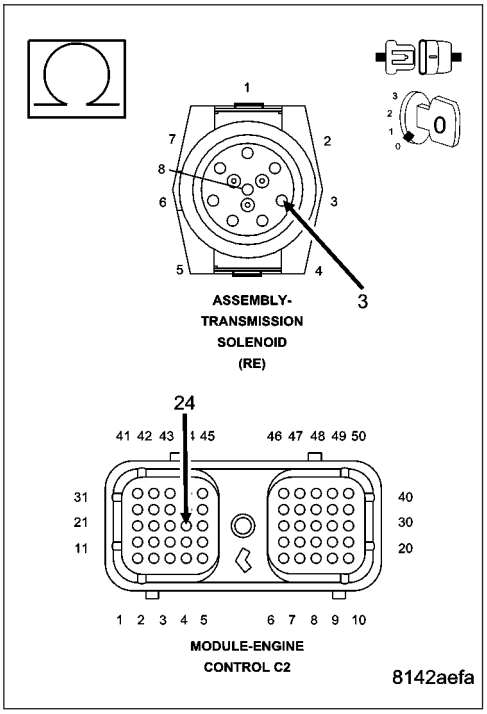
5. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (K900) Sensor Ground circuit between the ECM C2 harness connector and the Transmission Solenoid Assembly harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the (K900) Sensor Ground circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



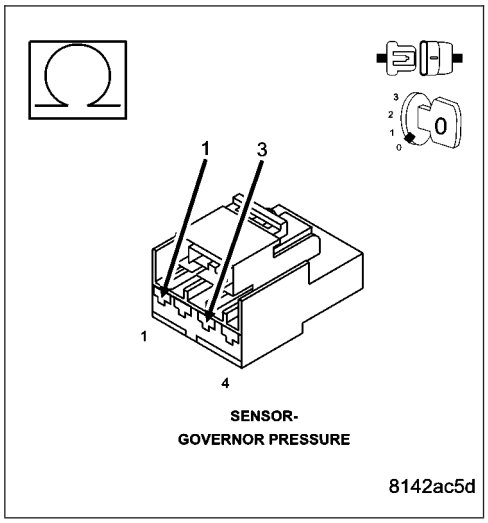
P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (CONTINUED)

6. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO THE (F856) 5-VOLT SUPPLY CIRCUIT INTERNAL TO THE TRANSMISSION

Remove the Transmission Oil Pan. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure Sensor connector internal to the transmission.

Measure the resistance between the (T54) Transmission Temperature Sensor Signal circuit and (F856) 5-volt Supply circuit in the Governor Pressure Sensor connector internal to the transmission.



Is the resistance above 100k ohms?

Yes >> Go To 7

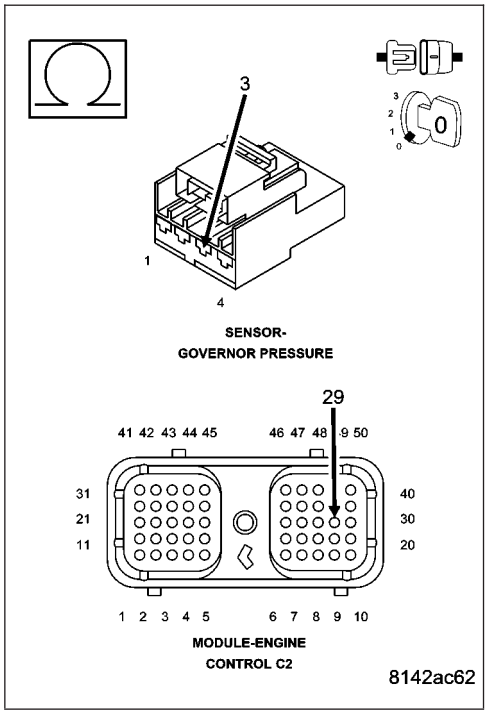
No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

7. CHECK THE (T54) TRANSMISSION TEMPERATURE SENSOR SIGNAL CIRCUIT FOR AN OPEN INTERNAL TO THE TRANSMISSION

Reconnect the Transmission Solenoid Assembly harness connector.

Measure the resistance of the (T54) Transmission Temperature Sensor Signal circuit between the ECM C2 harness connector and the Governor Pressure Sensor connector internal to the transmission.



Is the resistance below 5.0 ohms?

Yes >> Go To 8

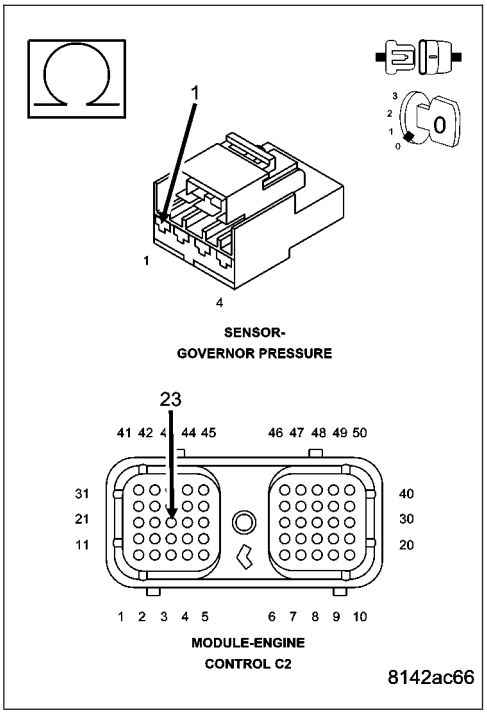
No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (CONTINUED)

8. CHECK THE (F856) 5-VOLT SUPPLY CIRCUIT FOR AN OPEN INTERNAL TO THE TRANSMISSION

Measure the resistance of the (F856) 5-volt Supply circuit between ECM C2 harness connector and the Governor Pressure Sensor connector internal to the transmission.



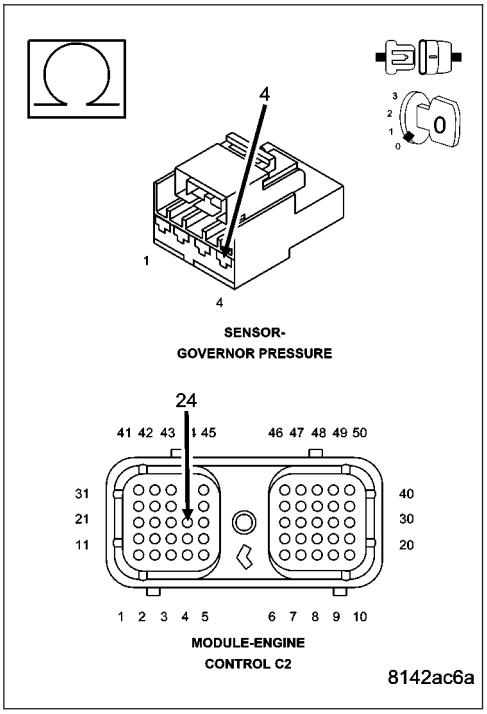
Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

9. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN INTERNAL TO THE TRANSMISSION

Measure the resistance of the (K900) Sensor Ground circuit between the ECM C2 harness connector and the Governor Pressure Sensor connector internal to the transmission.



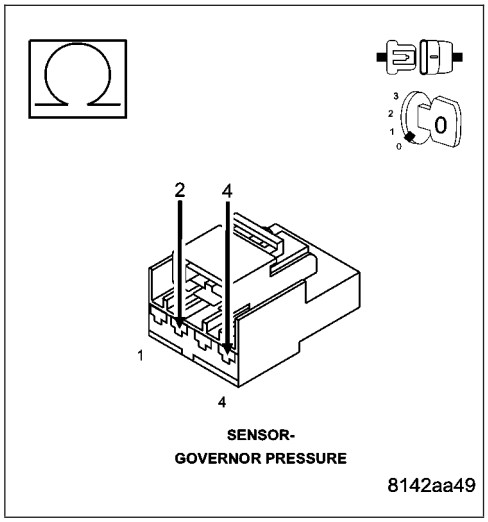
Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (CONTINUED)

10. CHECK THE TRANSMISSION TEMPERATURE SENSOR



TYPICAL VALUES FOR TRANSMISSION TEMPERATURE SENSOR

TEMPERATURE	MIN TO MAX OHM RANGE
-40° C (-40° F)	1094 to 1176 ohms
0.0° C (32° F)	1587 to 1672 ohms
25° C (77° F)	1960 to 2040 ohms
70° C (158° F)	2709 to 2860 ohms
0° C (212° F)	3284 to 3500 ohms
120° C (120° F)	3684 to 3950 ohms
150° C (302° F)	4110 to 4450 ohms

Measure the resistance of the Transmission Temperature Sensor between the (T54) Transmission Temperature Sensor Signal circuit and the (K900) Sensor Ground circuit.

Using the chart above, compare the Temperature Sensor temperature to the correlating resistance value.

Is the Temperature Sensor resistance above the maximum specification listed in the chart?

Yes >> Replace the Governor Pressure/Transmission Temperature Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 11

P0713-TRANS TEMP SENSOR VOLTAGE TOO HIGH (CONTINUED)

11. CHECK THE ENGINE CONTROL MODULE

Reconnect all disconnected connectors.

Ignition on, engine not running.

With the scan tool, erase Engine DTCs.

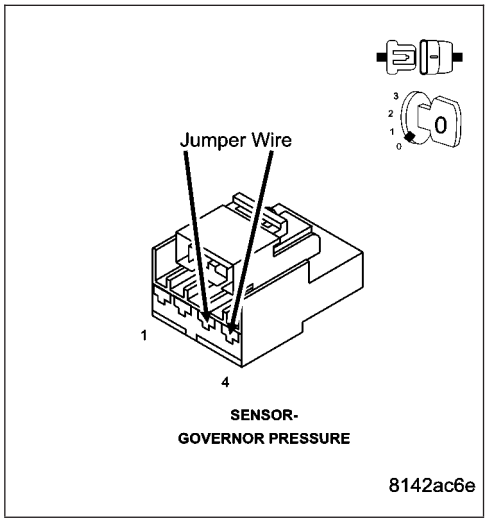
Turn the ignition off to the lock position.

Disconnect the Governor Pressure Sensor connector internal to the transmission.

Connect a jumper wire between the (T54) Transmission Temperature Sensor Signal circuit and the (K900) Sensor Ground circuit in the Transmission Solenoid Assembly harness connector.

Ignition on, engine not running.

With the scan tool, read Engine DTCs.



Did the DTC Transmission Oil Temperature Sensor Voltage Too Low set?

Yes >> Go To 12

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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12. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

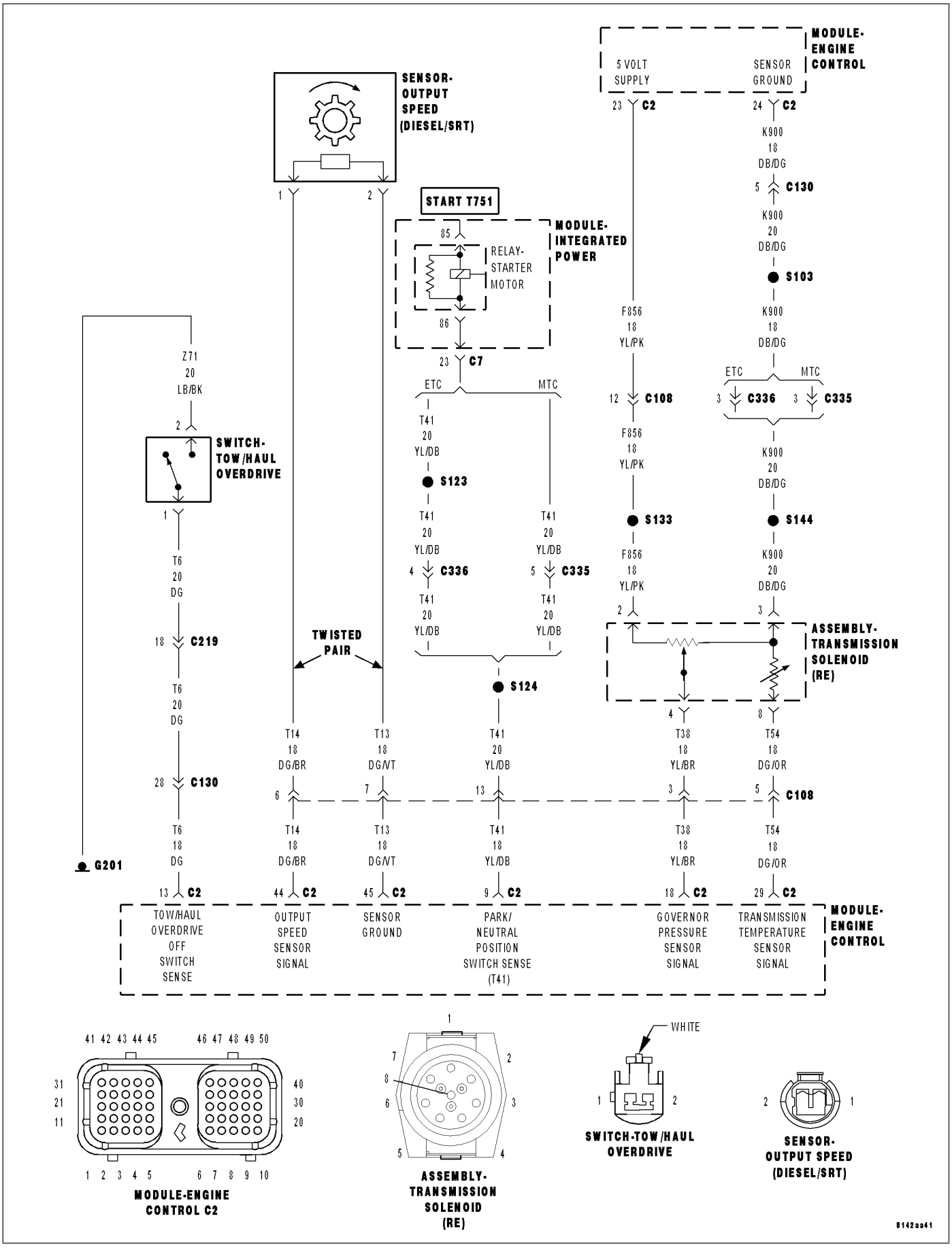
Were there any problems found?

Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (DIESEL)



P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

- **When Monitored:**
  Continuously with the ignition on, engine running, and gear selector NOT in park or neutral.
- **Set Condition:**
  This DTC will set if the vehicle speed (reported from the CAB module) is above 24 Kmh (15 mph), and the monitored Output Shaft Speed is below 60 RPM for 2.6 seconds.

Possible Causes
PARK/NEUTRAL DTC PRESENT
(T13) SENSOR GROUND CIRCUIT OPEN
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT OPEN
(T13) SENSOR GROUND CIRCUIT SHORT TO ANOTHER CIRCUIT
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO ANOTHER CIRCUIT
(T13) SENSOR GROUND CIRCUIT SHORT TO VOLTAGE
(T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
OUTPUT SPEED SENSOR
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.
With the scan tool, read Engine DTCs.
Record the Freeze Frame data for the reported DTC.
With the scan tool, erase DTCs.
Turn the ignition off to the lock position.
Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.
With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2
No >> Go To 11

P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (DIESEL) (CONTINUED)

2. CHECK IF A PARK/NEUTRAL DTC IS PRESENT

Is there a Park/Neutral DTC present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 3

---

3. CHECK THE (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR AN OPEN

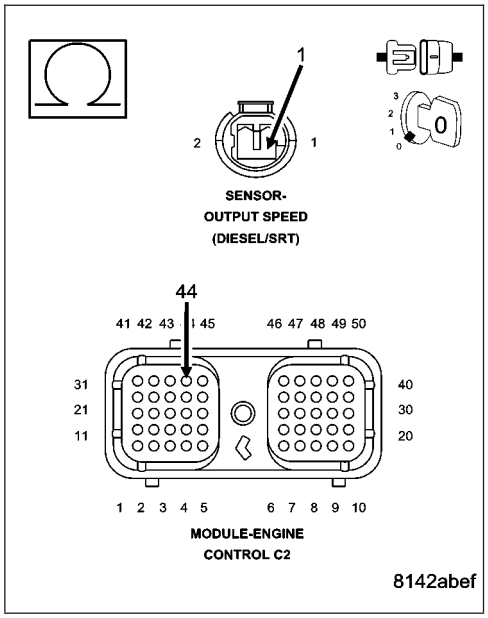
Turn the ignition off to the lock position.

Disconnect the ECM C2 harness connector.

Disconnect the Output Speed Sensor harness connector.

NOTE: Check connectors - Clean/repair as necessary

Measure the resistance of the (T14) Output Speed Sensor Signal circuit between the ECM C2 harness connector and the Output Speed Sensor harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

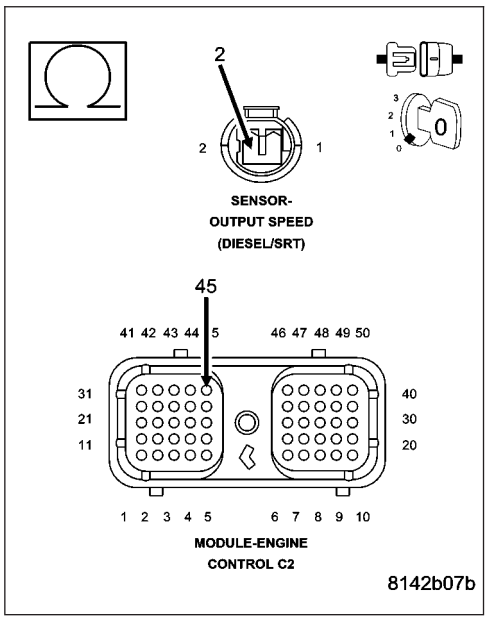
No >> Repair the (T14) Output Speed Sensor Signal circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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4. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (T13) Sensor Ground circuit between the ECM C2 harness connector and the Output Speed Sensor harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (T13) Sensor Ground circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (DIESEL) (CONTINUED)

5. CHECK THE (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

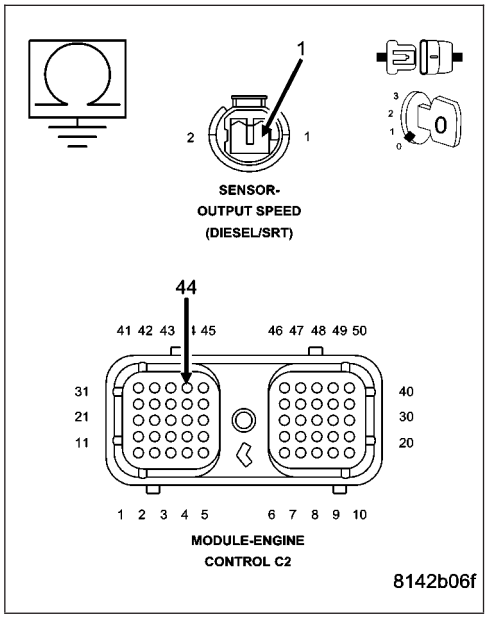
Measure the resistance between ground and the (T14) Output Speed Sensor Signal circuit.

Is the resistance greater than 100K ohms?

Yes >> Go To 6

No >> Repair the (T14) Output Speed Sensor Signal circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



6. CHECK THE (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

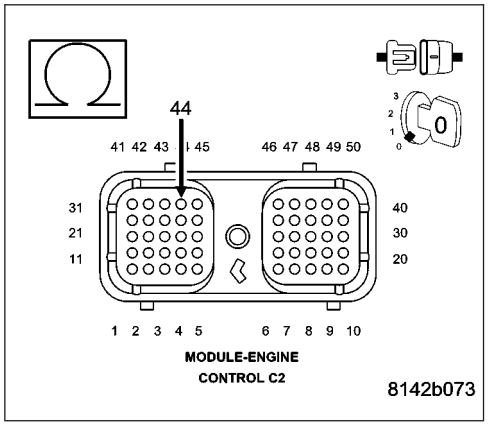
Measure the resistance between the (T14) Output Speed Sensor Signal circuit and all other circuits in the ECM C2 harness connector.

Is the resistance greater than 100K ohms between the (T14) Output Speed Sensor Signal circuit and any other circuit(s) in the ECM C2 harness connector?

Yes >> Go To 7

No >> Repair the (T14) Output Speed Sensor Signal circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (DIESEL) (CONTINUED)

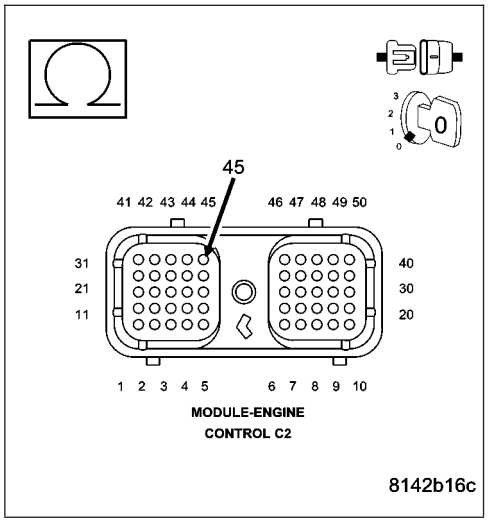
7. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Measure the resistance between the (T13) Sensor Ground circuit and all other circuits in the ECM C2 harness connector.

Is the resistance greater than 100K ohms?

Yes >> Go To 8

No >> Repair the (T13) Sensor Ground circuit for a short to another circuit(s).
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



8. CHECK THE (T14) OUTPUT SPEED SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

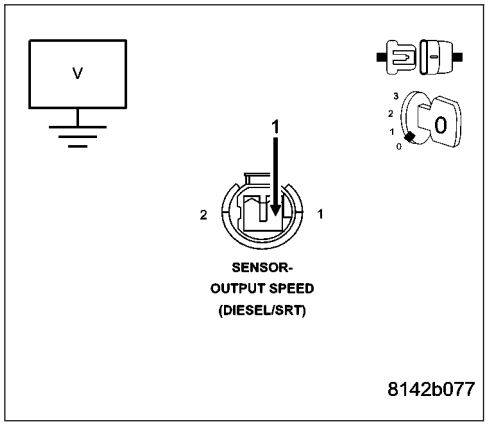
Ignition on, engine not running.

Measure the voltage of the (T14) Output Speed Sensor Signal circuit in the Output Speed Sensor harness connector.

Is there any voltage present?

Yes >> Repair the (T14) Output Speed Sensor Signal circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 9



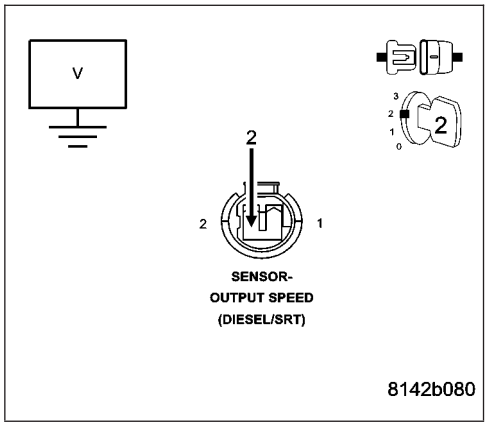
9. CHECK THE (T13) SENSOR GROUND CIRCUIT FOR A SHORT TO VOLTAGE

Measure the voltage of the (T13) Sensor Ground circuit in the Output Speed Sensor harness connector.

Is there any voltage present?

Yes >> Repair the (T13) Sensor Ground circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

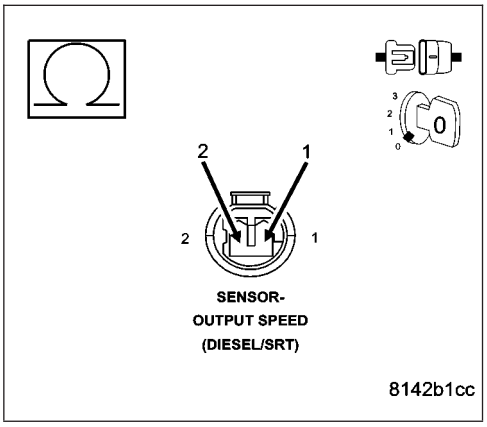
No >> Go To 10



P0720-LOW OUTPUT SPEED SENSOR - RPM ABOVE 15 MPH (DIESEL) (CONTINUED)

10. CHECK THE OUTPUT SPEED SENSOR

Measure the resistance between the terminals of the Output Speed Sensor.



Is the resistance between 300.0 and 1200.0 ohms?

Yes >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Replace the Output Speed Sensor.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

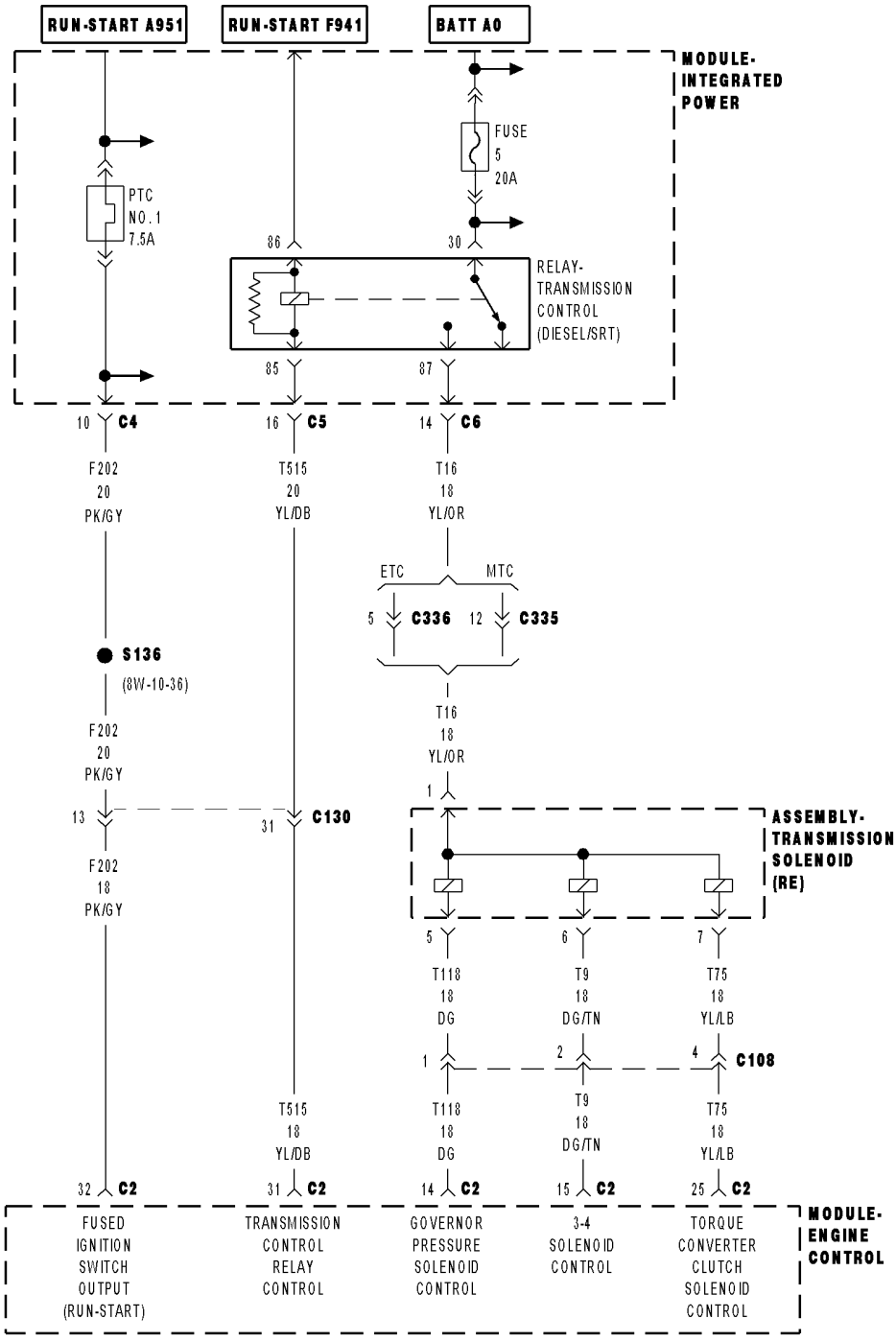
Were there any problems found?

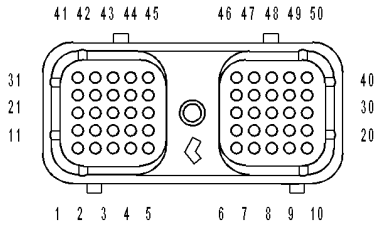
Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

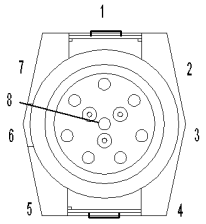
No >> Test Complete.

P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (DIESEL)





MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION SOLENOID (RE)

8142abf3

P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Solenoid is used to control governor pressure. Governor pressure is used to shift between first, second, and third gear.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  This DTC will set if the ECM monitored voltage detected on the Governor Pressure Solenoid Control circuit is different than the expected voltage. Note: To clear this DTC, it is necessary to drive the vehicle at a sustained speed which would allow the TCC and/or Overdrive Clutch to operate.

Possible Causes
FUSED B+ CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND
(T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT OPEN
(T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
(T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
TRANSMISSION CONTROL RELAY - POOR CONTACTS
GOVERNOR PRESSURE SOLENOID
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC P0882 IS PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Is the DTC P0882 present also?

Yes >> Refer to the Transmission category and perform the appropriate symptom. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (DIESEL) (CONTINUED)

2. CHECK IF THE DTC IS CURRENT

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 3

No >> Go To 12

---

3. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the Transmission Control Relay.

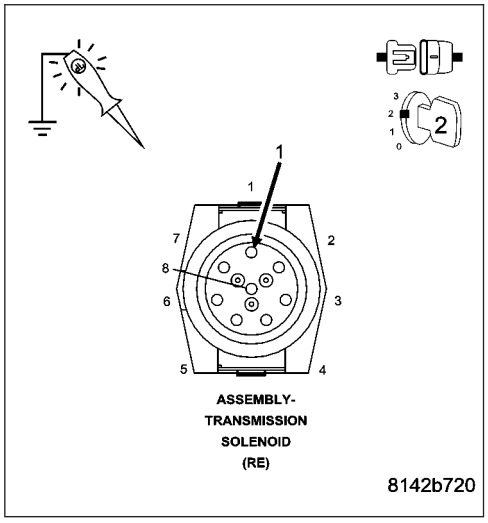
Using a 12-volt test light connected to ground, check the (T16) Transmission Control Relay Output circuit in the Transmission Solenoid Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light cycle on and off and illuminate brightly?

Yes >> Go To 4

No >> Go To 9



P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (DIESEL) (CONTINUED)

4. CHECK THE (T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT FOR AN OPEN

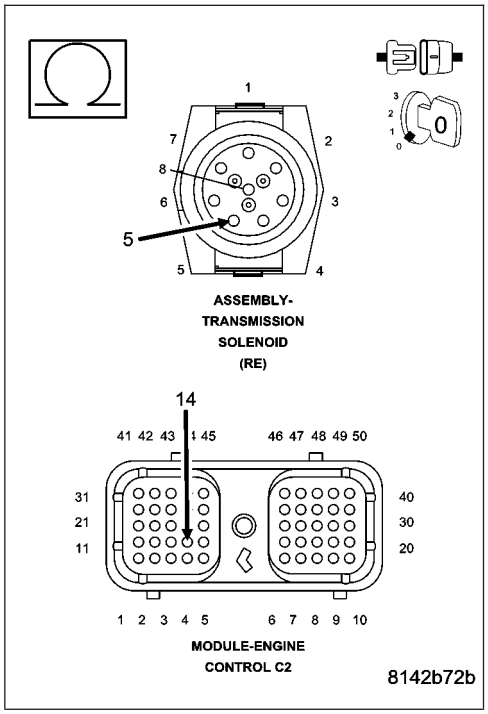
Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connectors.

Disconnect the ECM C2 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance of the (T118) Governor Pressure Solenoid Control circuit between the Transmission Solenoid Assembly harness connector and the ECM C2 harness connector.



Is the resistance below 5.0 ohms?

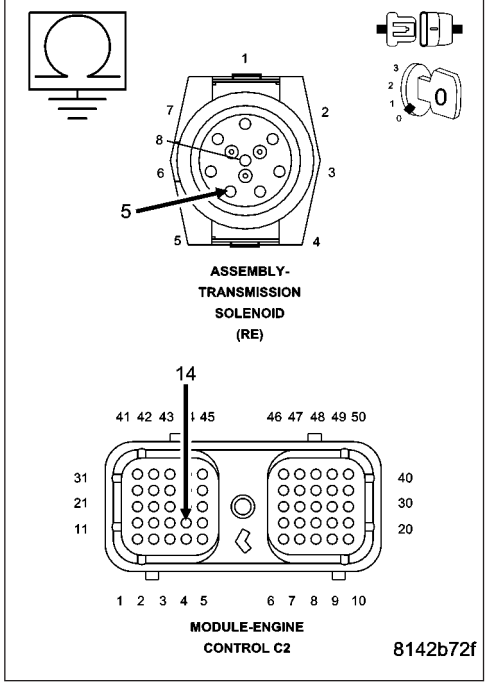
Yes >> Go To 5

No >> Repair the (T118) Governor Pressure Solenoid Control circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

5. CHECK THE (T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (T118) Governor Pressure Solenoid Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T118) Governor Pressure Solenoid Control circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6

P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (DIESEL) (CONTINUED)

6. CHECK THE (T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.

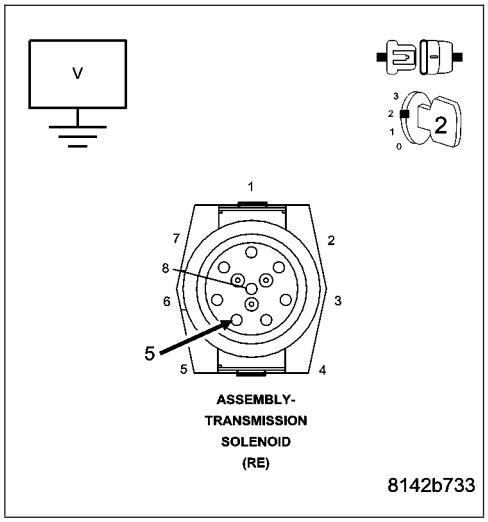
Measure the voltage of the (T118) Governor Pressure Solenoid Control circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (T118) Governor Pressure Solenoid Control circuit for a short to voltage.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 7



7. CHECK THE (T118) GOVERNOR PRESSURE SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

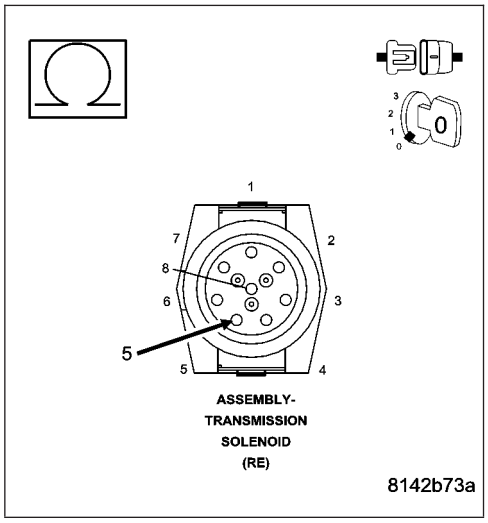
Measure the resistance between the (T118) Governor Pressure Solenoid Control circuit and all other circuits in the Transmission Solenoid Assembly harness connector.

Is the resistance below 5.0 ohms between the (T118) Governor Pressure Solenoid Control circuit and any other circuit in the Transmission Solenoid Assembly harness connector?

Yes >> Repair the (T118) Governor Pressure Solenoid Control circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 8



P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (DIESEL) (CONTINUED)

8. CHECK THE GOVERNOR PRESSURE SOLENOID

Remove the Transmission Oil Pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Check all internal wiring pertaining to the Governor Pressure Solenoid for an open, short, and bent or broken terminals.

If no internal wiring problems are found, replace the Governor Pressure Solenoid per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Drive the vehicle performing multiple upshifts and downshifts.

With the scan tool, read Transmission DTCs.

Does the DTC reset?

Yes >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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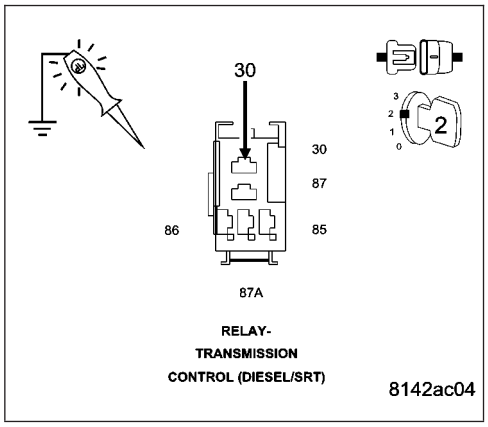
9. CHECK THE FUSED B(+) CIRCUIT

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the Fused B(+) circuit in the Transmission Control Relay connector.



Does the test light illuminate brightly?

Yes >> Go To 10

No >> Repair the Fused B(+) circuit for an open. If the fuse is open, make sure to check for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

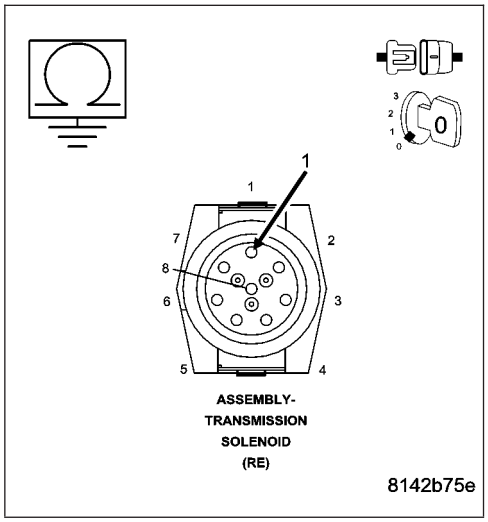
P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (DIESEL) (CONTINUED)

10. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T16) Transmission Control Relay Output circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

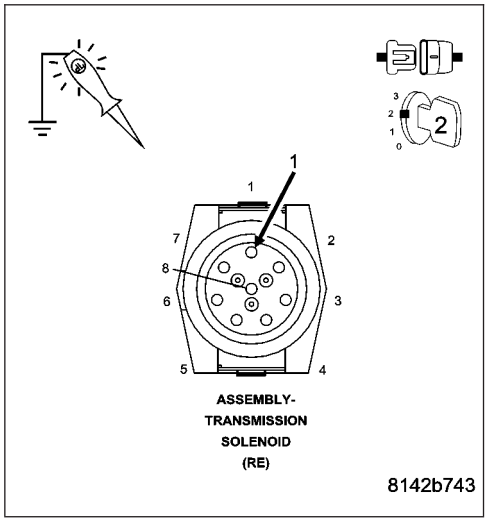
No >> Go To 11

11. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN

Connect a jumper wire between Fused B(+) and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Relay Output circuit in the Transmission Solenoid Assembly harness connector.



Does the test light illuminate brightly?

Yes >> Replace the Transmission Control Relay.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Replace the (T16) Transmission Control Relay Output circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0748-PRESSURE SOL CONTROL/TRANS RELAY CIRCUITS (DIESEL) (CONTINUED)

12. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

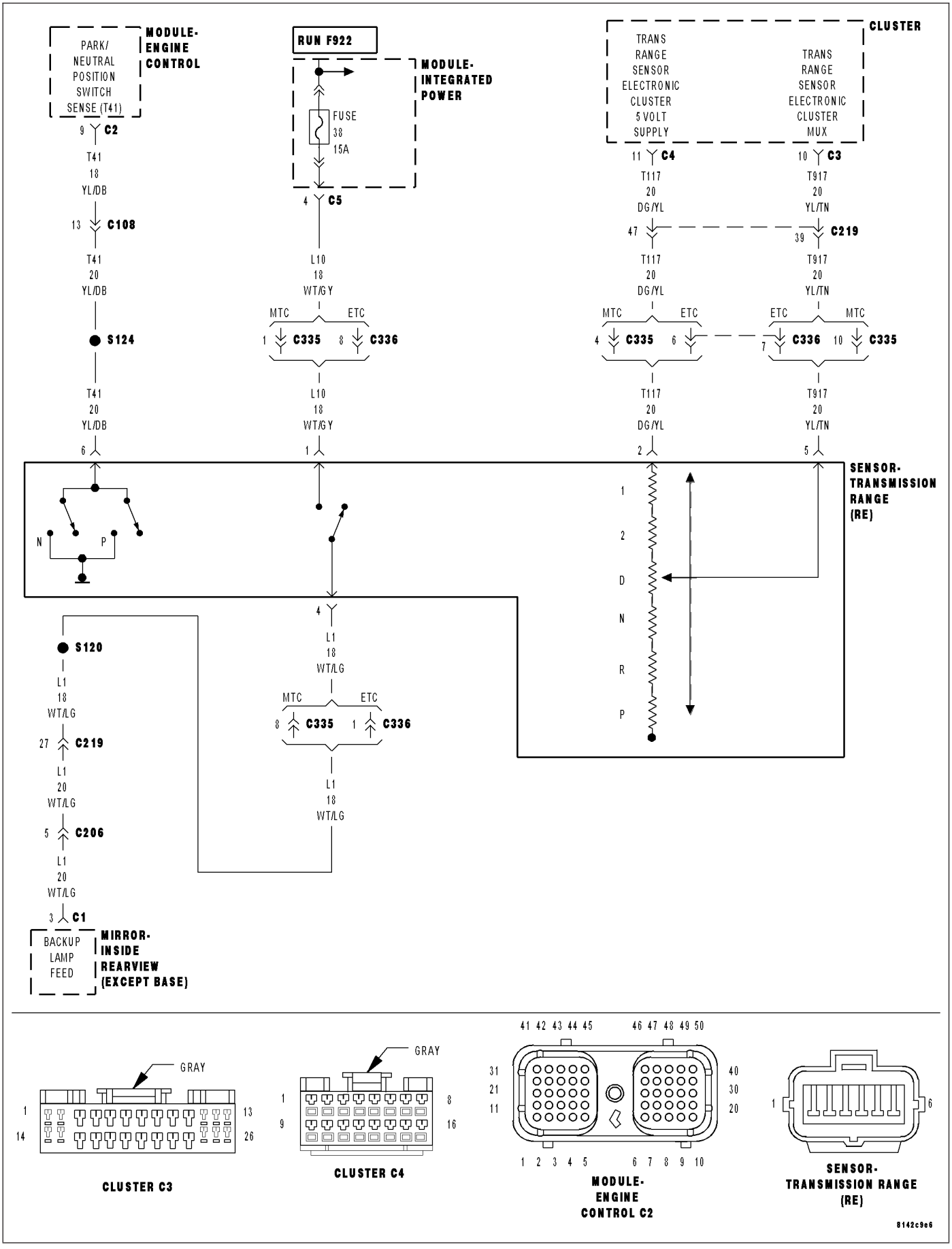
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P0850-P/N SWITCH PERFORMANCE (DIESEL)



P0850-P/N SWITCH PERFORMANCE (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

- **When Monitored:**
  Continuously with the ignition on and engine running.
- **Set Condition:**
  The Transmission governor pressure set point is above a threshold while in park or the P/N switch is in drive during an engine start.

Possible Causes
TRS CONNECTOR DAMAGE OR CORROSION
ECM CONNECTOR DAMAGE OR CORROSION
(T41) P/N POSITION SWITCH SENSE CIRCUIT OPEN
(T41) P/N POSITION SWITCH SENSE CIRCUIT SHORT TO GROUND
(T41) P/N POSITION SWITCH SENSE CIRCUIT SHORT TO ANOTHER CIRCUIT
TRANSMISSION RANGE SENSOR
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE SCAN TOOL DISPLAYS P/N AND D/R IN THE CORRECT POSITION

Ignition on, engine not running.

With the scan tool, monitor the PNP switch input state.

Move the gear selector through all gear positions Park to 1st and back to Park..

Did the scan tool display P/N and D/R in the correct gear positions?

Yes >> Go To 8

No >> Go To 2

---

2. CHECK THE TRS CONNECTOR FOR DAMAGE OR CORROSION

Turn the ignition off to the lock position.

Disconnect the Transmission Range Sensor harness connector.

Inspect the Transmission Range Sensor harness wiring and connector for damage, pushed out pins, or corrosion, etc.

Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 3

P0850-P/N SWITCH PERFORMANCE (DIESEL) (CONTINUED)

3. CHECK THE ECM CONNECTOR FOR DAMAGE OR CORROSION

Disconnect the ECM C2 harness connector.

Inspect the ECM wiring and connector for damage, pushed out pins, or corrosion, etc.

Were there any problems found?

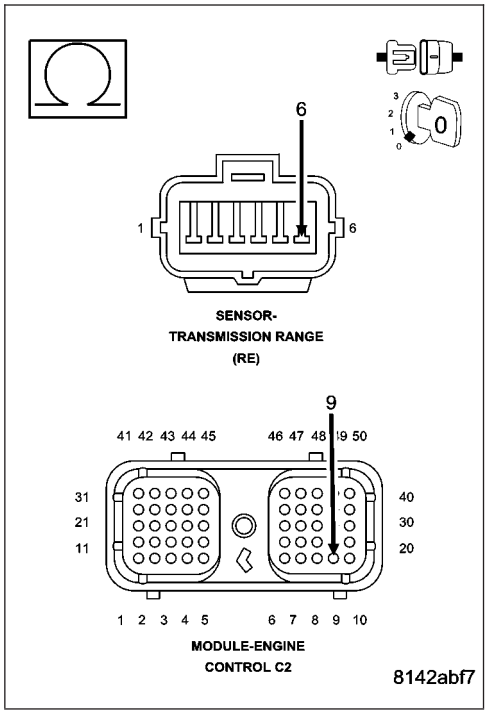
Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 4

---

4. CHECK THE (T41) P/N POSITION SWITCH SENSE CIRCUIT FOR AN OPEN

Measure the resistance of the (T41) P/N Position Switch Sense circuit between the ECM C2 harness connector and the Transmission Range Sensor harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (T41) P/N Position Switch Sense circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0850-P/N SWITCH PERFORMANCE (DIESEL) (CONTINUED)

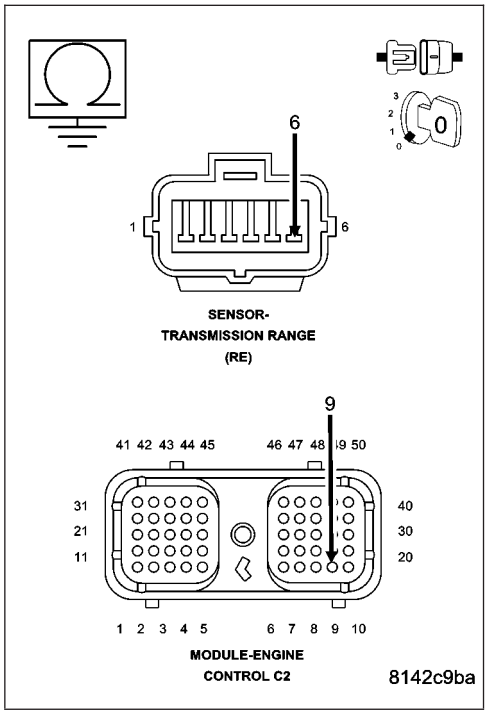
5. CHECK THE (T41) P/N POSITION SWITCH SENSE CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (T41) P/N Position Switch Sense circuit.

Is the resistance greater then 100k ohms?

Yes >> Go To 6

No >> Repair the (T41) P/N Position Switch Sense circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



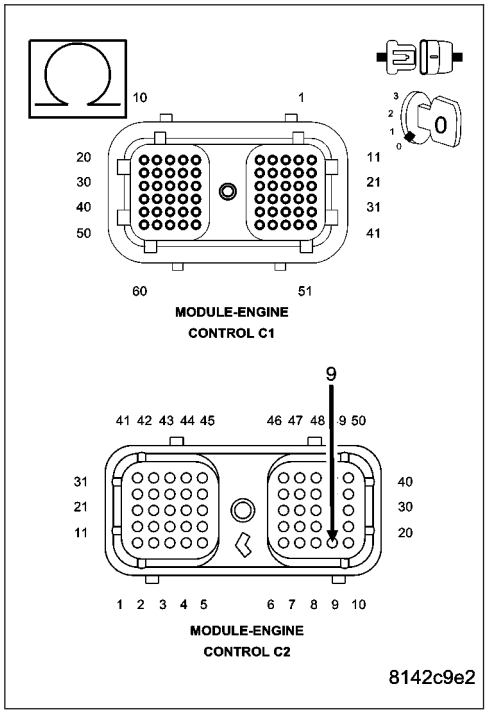
6. CHECK THE (T41) P/N POSITION SWITCH SENSE CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Measure the resistance between the (T41) P/N Position Switch Sense circuit and all other circuits in the ECM C1 and C2 harness connectors.

Is the resistance greater 100k ohms between the (T41) P/N Position Switch Sense circuit and any other circuit(s) in the ECM C1 and C2 harness connectors?

Yes >> Go To 7

No >> Repair the (T41) P/N Position Switch Sense circuit for a short to another circuit(s).
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0850-P/N SWITCH PERFORMANCE (DIESEL) (CONTINUED)

7. CHECK THE TRANSMISSION RANGE SENSOR

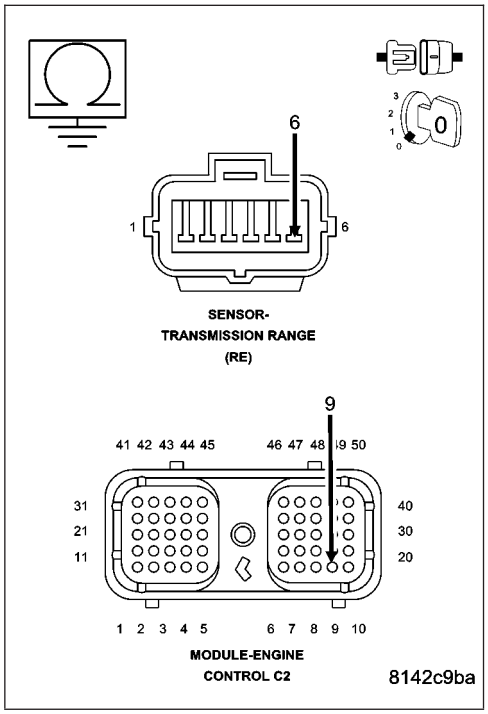
Reconnect the Transmission Range Sensor harness connector.

Move the gear selector through all gear positions, from Park to 1st and back.

While moving the gear selector through the gear positions, measure the resistance between ground and the (T41) P/N Position Switch Sense circuit in the ECM harness connector.

NOTE: The circuit is grounded in Park and Neutral and open in the other positions.

Did the display change from above 100k ohms (open) to below 5.0 ohms (grounded)?



Yes >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Replace the Transmission Range Sensor per Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/TRANSMISSION RANGE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

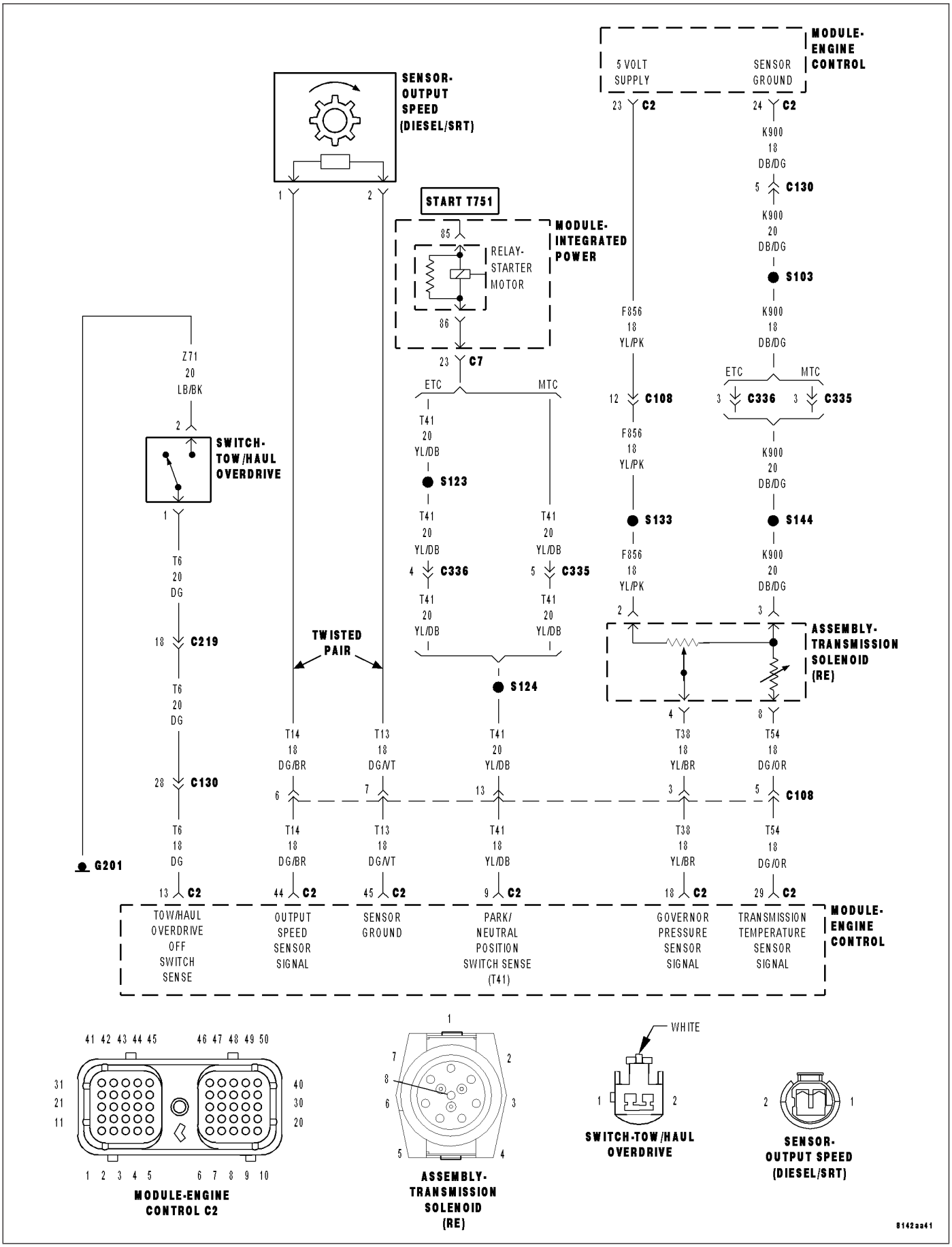
Were there any problems found?

Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P0868-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (DIESEL)



P0868-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Sensor is used by the ECM to adjust the Governor Pressure to a desired level for shifts in first, second, and third gear. If the ECM detects the monitored sense voltage is greater than or less than a predetermined specification, the ECM will set the desired DTC.

- **When Monitored:**
  Continuously with the ignition on and the engine running.
- **Set Condition:**
  This DTC will set when the monitored sense voltage from the Governor Pressure Sensor is above 4.89 volts for the period of 8.5 seconds.

Possible Causes
OTHER TRANSMISSION DTC'S PRESENT
PARK NEUTRAL DTC PRESENT
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT OPEN
(K900) SENSOR GROUND CIRCUIT OPEN
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO ANOTHER CIRCUIT
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT OPEN INSIDE TRANSMISSION
(K900) SENSOR GROUND CIRCUIT OPEN INSIDE TRANSMISSION
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE INSIDE TRANSMISSION
GOVERNOR PRESSURE SENSOR
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 11

P0868-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (DIESEL) (CONTINUED)

2. CHECK FOR OTHER TRANSMISSION DTC'S PRESENT

Are there any Park/Neutral or other Transmission DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). If a Park/Neutral DTC is present, perform its respective test first. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 3

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3. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR AN OPEN

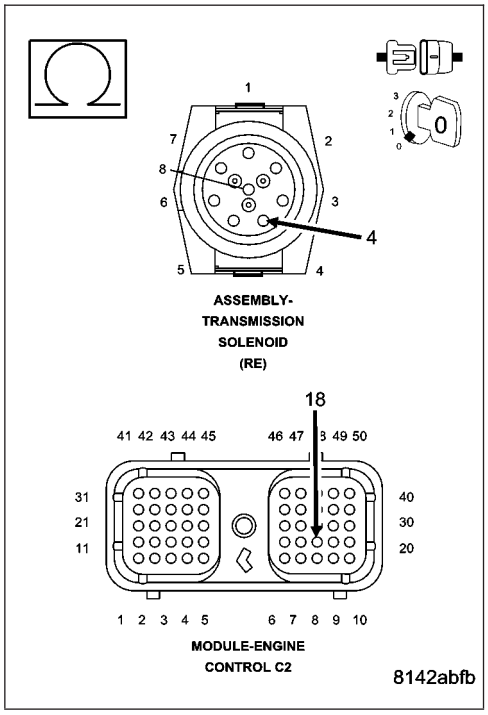
Turn the ignition off to the lock position.

Disconnect the ECM C2 harness connectors.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary

Measure the resistance of the (T38) Governor Pressure Sensor Signal circuit between the Transmission Solenoid Assembly harness connector and the ECM C2 harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 4

No >> Repair the (T38) Governor Pressure Sensor Signal circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0868-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (DIESEL) (CONTINUED)

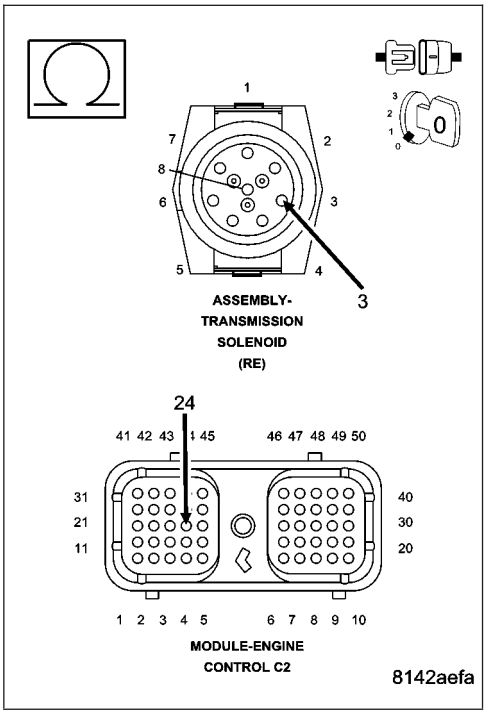
4. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN

Measure the resistance of the (K900) Sensor Ground circuit between the Transmission Solenoid Assembly harness connector and the ECM C2 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (K900) Sensor Ground circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



5. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

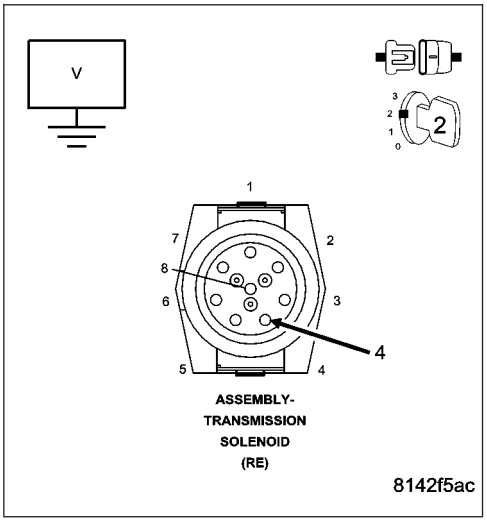
Ignition on, engine not running.

Measure the voltage of the (T38) Governor Pressure Sensor Signal circuit in the Transmission Solenoid Assembly harness connector.

Is the voltage above 0.5 volts?

Yes >> Repair the (T38) Governor Pressure Sensor Signal circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6



P0868-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (DIESEL) (CONTINUED)

6. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Turn the ignition off to the lock position.

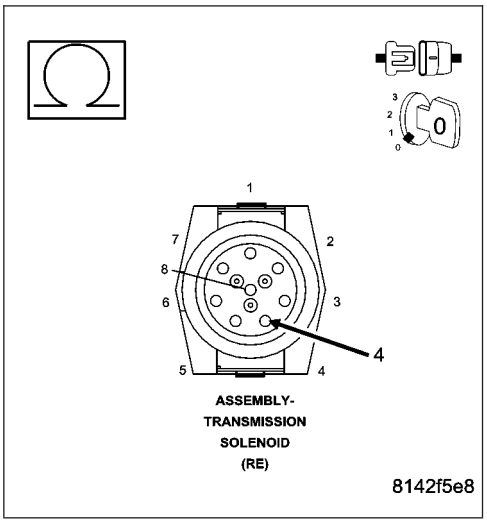
Measure the resistance between the (T38) Governor Pressure Sensor Signal circuit and all other circuits in the Transmission Solenoid Assembly harness connector.

Is the resistance below 100k ohms between the (T38) Governor Pressure Sensor Signal circuit and any other circuit(s) in the Transmission Solenoid Assembly harness connector?

Yes >> Repair the (T38) Governor Pressure Sensor Signal circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 7



7. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT OR AN OPEN INTERNAL

Remove the Transmission Oil Pan. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Reconnect the Transmission Solenoid Assembly harness connector.

Disconnect the Governor Pressure Sensor harness connector.

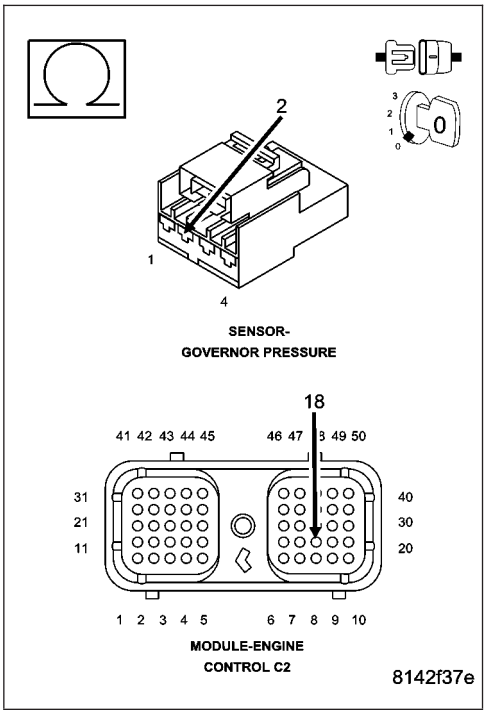
Measure the resistance of the (T38) Governor Pressure Sensor Signal circuit between the ECM C2 harness connector and the Governor Pressure Sensor harness connector internal to the transmission.

Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

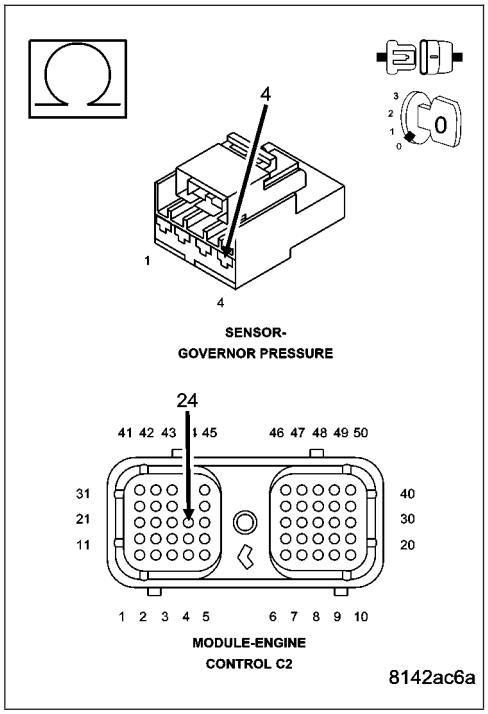
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0868-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (DIESEL) (CONTINUED)

8. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN INTERNAL

Measure the resistance of the (K900) Sensor Ground circuit between the ECM C2 harness connector and the Governor Pressure Sensor harness connector.



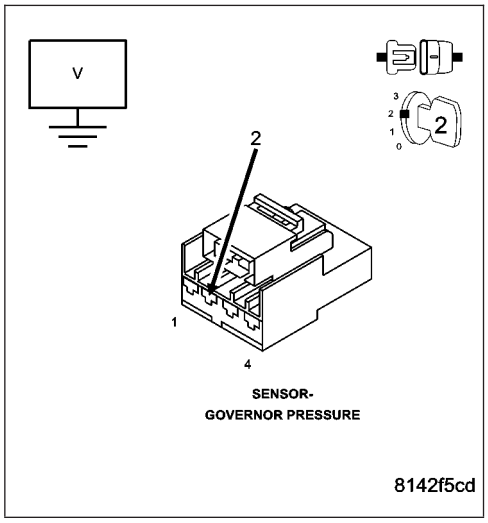
Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

9. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE INTERAL

NOTE: The Transmission Solenoid Assembly harness connector must be connected before proceeding.
Ignition on, engine not running.
Measure the voltage of the (T38) Governor Pressure Sensor Signal circuit in the Governor Pressure Sensor harness connector (inside transmission).



Is the voltage above 0.5 volt?

Yes >> Replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 10

P0868-GOVERNOR PRESSURE SENSOR VOLTS TOO HI (DIESEL) (CONTINUED)

10. ENGINE CONTROL MODULE

Turn the ignition off to the lock position.

Reconnect the ECM harness connector.

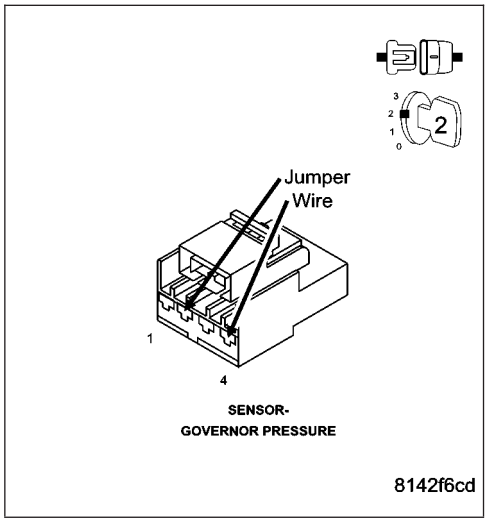
Reconnect the Transmission Solenoid Assembly harness connector.

Ignition on, engine not running.

With the scan tool, erase DTCs.

Connect a jumper wire between the (T38) Governor Pressure Sensor Signal circuit and the (K900) Sensor Ground circuit in the Transmission Governor Pressure Sensor harness connector.

With the scan tool, read DTCs.



Did the DTC P0869 set?

Yes >> Replace the Governor Pressure Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

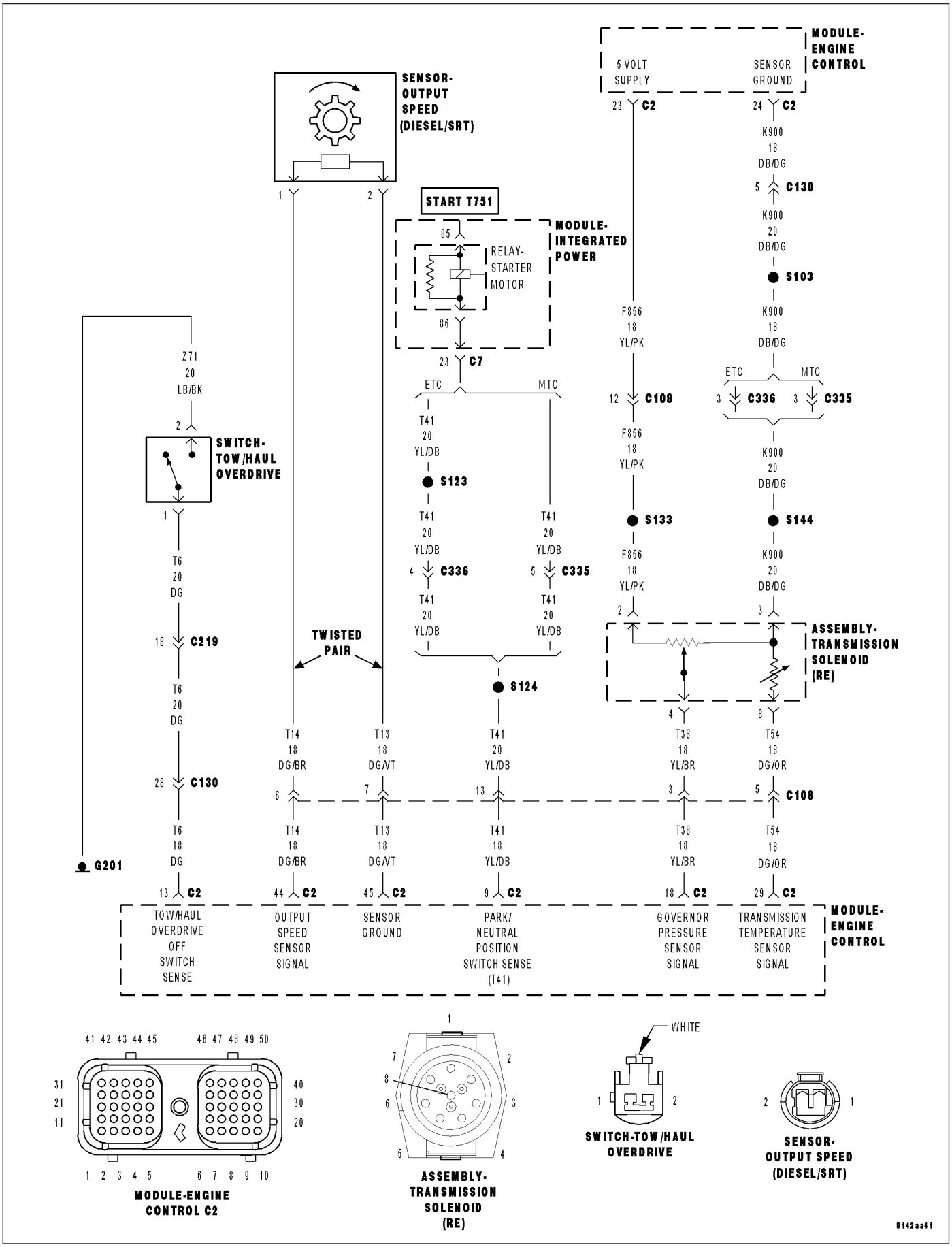
Were there any problems found?

Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P0869-GOVERNOR PRESSURE SENSOR VOLTS TOO LOW (DIESEL)



P0869-GOVERNOR PRESSURE SENSOR VOLTS TOO LOW (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Sensor is used by the ECM to adjust the Governor Pressure to a desired level for shifts in first, second, and third gear. If the ECM detects the monitored sense voltage is greater than or less than a predetermined specification, the ECM will set the desired DTC.

- **When Monitored:**
  Continuously with the ignition on and the engine running.
- **Set Condition:**
  This DTC will set if the monitored voltage from the Governor Pressure Sensor drops below 0.12 volts for the period of 8.5 seconds.

Possible Causes
PARK NEUTRAL DTC PRESENT OR OTHER TRANSMISSION DTC'S PRESENT
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION SOLENOID ASSEMBLY
GOVERNOR PRESSURE SENSOR
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.
With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 7

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2. CHECK FOR OTHER TRANSMISSION DTC'S PRESENT

Are there any Park/Neutral or other Transmission DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). If a Park/Neutral DTC is present, perform its respective test first. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 3

P0869-GOVERNOR PRESSURE SENSOR VOLTS TOO LOW (DIESEL) (CONTINUED)

3. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

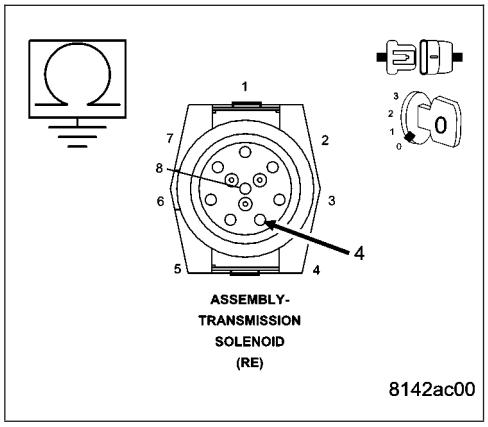
Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

Disconnect the ECM C1 and C2 harness connectors.

NOTE: Check connectors - Clean/repair as necessary

Measure the resistance between Ground and the (T38) Governor Pressure Sensor Signal circuit in the Transmission Solenoid Assembly harness connector.



Is the resistance greater than 100k ohms?

Yes >> Go To 4

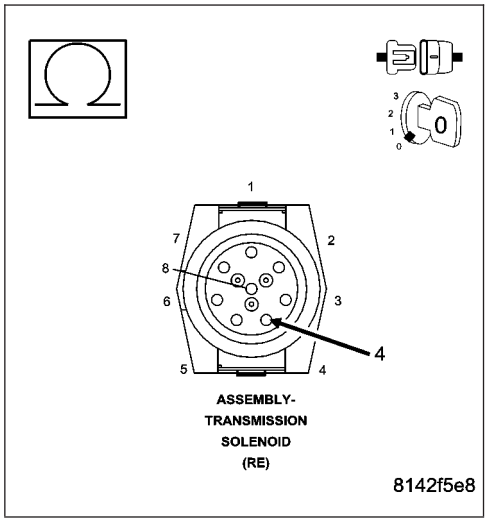
No >> Repair the (T38) Governor Pressure Sensor Signal circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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4. CHECK THE (T38) GOVERNOR PRESSURE SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Measure the resistance between the (T38) Governor Pressure Sensor Signal circuit and all other circuits in the Transmission Solenoid Assembly harness connector.



Is the resistance below 100k ohms between the (T38) Governor Pressure Sensor Signal circuit and any other circuit(s) in the Transmission Solenoid Assembly harness connector?

Yes >> Repair the (T38) Governor Pressure Sensor Signal circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 5

P0869-GOVERNOR PRESSURE SENSOR VOLTS TOO LOW (DIESEL) (CONTINUED)

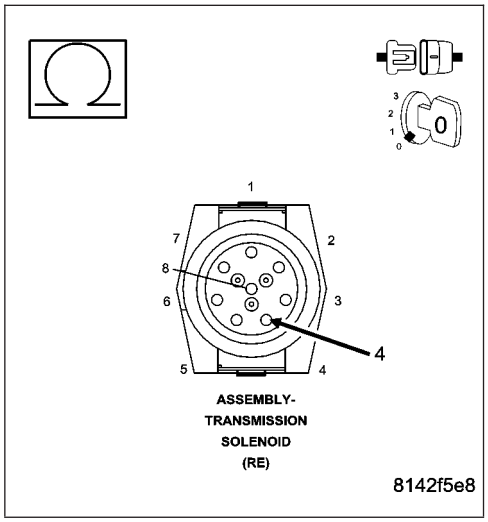
5. CHECK THE TRANSMISSION SOLENOID ASSEMBLY

Reconnect the Transmission Solenoid Assembly harness connector.

Remove the Transmission Oil Pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure/Transmission Temperature Sensor connector (inside transmission).

Measure the resistance between the (T38) Governor Pressure Sensor Signal circuit and all other circuits in the ECM C1 and C2 harness connectors.



Is the resistance below 100k ohms between the (T38) Governor Pressure Sensor Signal circuit any other circuits in the ECM C2 harness connector?

Yes >> Replace the Transmission Solenoid Assembly per the Service Information.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6

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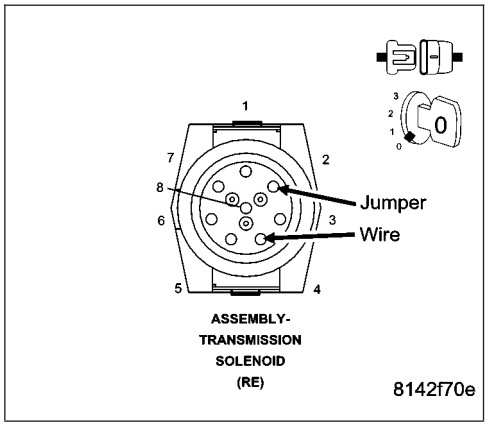
6. CHECK THE GOVERNOR PRESSURE SENSOR SENSOR

Turn the ignition on.

With the scan tool, erase DTCs.

Connect a jumper wire between the (T38) Governor Pressure Sensor Signal circuit and the (F856) 5-volt Supply circuit in the Governor Pressure Sensor connector.

With the scan tool, read DTCs.



Did the DTC P0868 set?

Yes >> Inspect the Governor Pressure Sensor wiring for damage. If no problems are found, replace the Governor Pressure Sensor per the Service Information.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0869-GOVERNOR PRESSURE SENSOR VOLTS TOO LOW (DIESEL) (CONTINUED)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

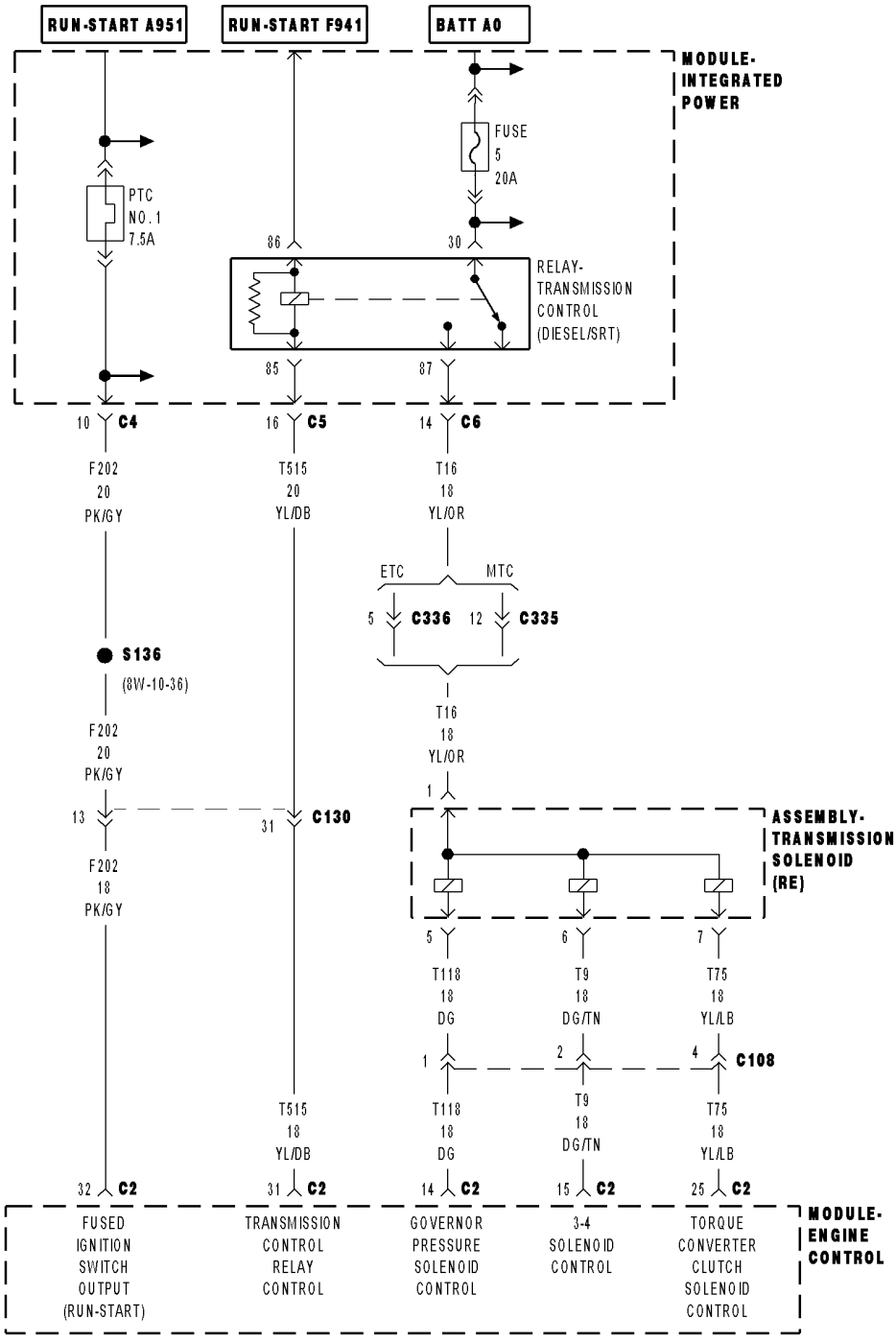
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

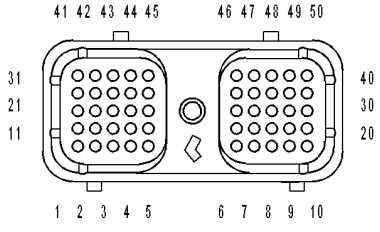
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

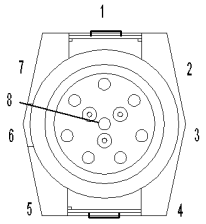
No >> Test Complete.

P0882-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT LOW (DIESEL)





MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION SOLENOID (RE)

8142abf3

P0882-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT LOW (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Transmission Control Relay supplies power to the TCC, Overdrive, and Governor Pressure Solenoids when in normal operating mode. The Transmission Control Relay Control circuit is constantly monitored by the ECM. If the expected state of the Transmission Control Relay Control circuit is different then the expected state, a corresponding DTC will set and the ECM will de-energize the Transmission Control Relay and place the transmission in Limp-in.

- **When Monitored:**
  Continuously with the Ignition on.
- **Set Condition:**
  This DTC will set if the ECM monitored voltage of the Transmission Control Relay Control circuit is different than the expected voltage for the period 3.0 seconds.

Possible Causes
FUSED B(+) CIRCUIT OPEN
(T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT OPEN
FUSED B(+) CIRCUIT SHORT TO GROUND
(T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND
(T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
TRANSMISSION CONTROL RELAY
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 10

P0882-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT LOW (DIESEL) (CONTINUED)

2. TRANSMISSION CONTROL RELAY NOT CLICKING

With the scan tool, actuate the Transmission Control Relay.

Is the Transmission Control Relay clicking?

Yes >> Go To 10

No >> Go To 3

---

3. CHECK THE TRANSMISSION CONTROL RELAY

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Install a substitute relay in place of the Transmission Control Relay.

Ignition on, engine not running.

With the scan tool, erase DTCs.

Start the engine.

With the scan tool, read Engine DTCs.

Does the scan tool display the DTC P0882?

Yes >> Go To 4

No >> Replace the Transmission Control Relay.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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4. CHECK THE FUSED B(+) CIRCUIT FOR AN OPEN

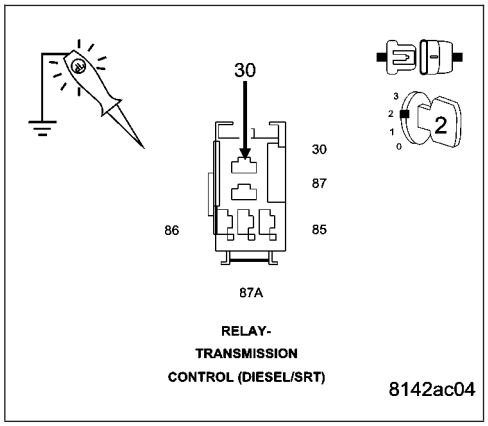
Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the Fused B(+) circuit in the Transmission Control Relay connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light illuminate brightly?

Yes >> Go To 4

No >> Repair the Fused B(+) circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0882-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT LOW (DIESEL) (CONTINUED)

5. CHECK THE FUSED B(+) CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the ECM C2 harness connector.

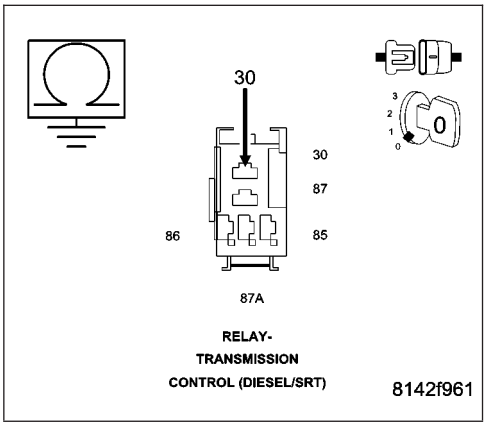
Measure the resistance between ground and the Fused B(+) circuit in the Transmission Control Relay connector.

Is the resistance above 100k ohms?

Yes >> Go To 6

No >> Repair the Fused B(+) circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



6. CHECK THE (T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT FOR AN OPEN

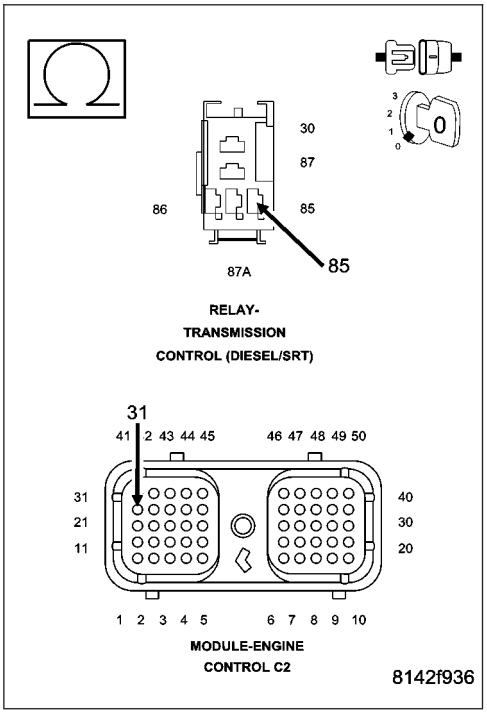
Measure the resistance of the (T515) Transmission Control Relay Control circuit between the Transmission Control Relay connector and the ECM C2 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 7

No >> Repair the (T515) Transmission Control Relay Control circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0882-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT LOW (DIESEL) (CONTINUED)

7. CHECK THE (T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO GROUND

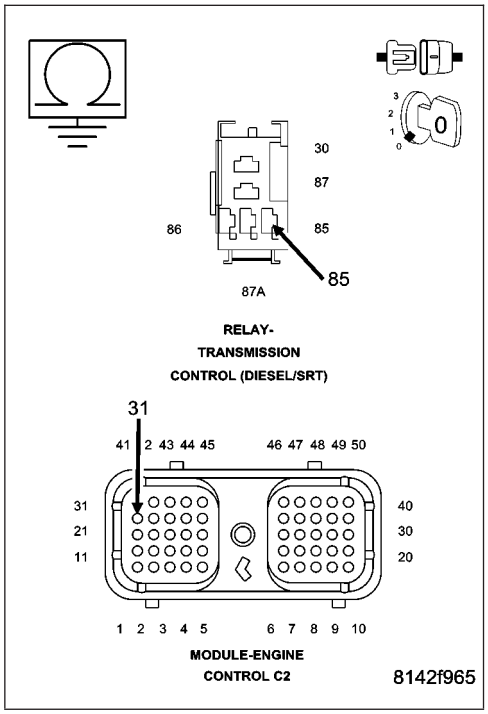
Measure the resistance between ground and the (T515) Transmission Control Relay Control circuit in the Transmission Control Relay connector.

Is the resistance above 100k ohms?

Yes >> Go To 8

No >> Repair the (T515) Transmission Control Relay Control circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



8. CHECK THE (T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

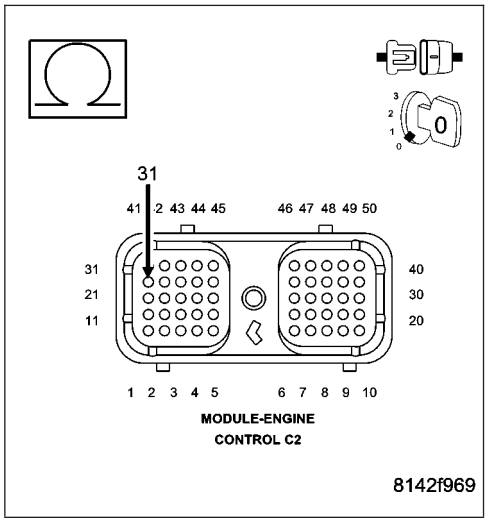
Measure the resistance between the Transmission Control Relay Control circuit and all other circuits in the ECM C2 harness connector.

Is the resistance below 100k ohms between the (T515) Transmission Control Relay Control circuit and any other circuit(s) in the ECM C2 harness connector?

Yes >> Repair the Transmission Control Relay Control circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 9



P0882-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT LOW (DIESEL) (CONTINUED)

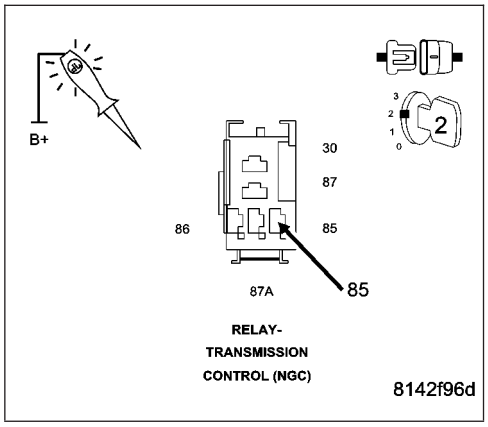
9. CHECK THE ENGINE CONTROL MODULE

Turn the ignition off to the lock position.

Ignition on, engine not running.

With the scan tool, actuate the Transmission Relay.

Using a 12-volt test light connected to 12-volts, check the Transmission Control Relay Control circuit in the Transmission Control Relay Control connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the Test Light cycle on and off and illuminate brightly?

Yes >> Go To 10

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

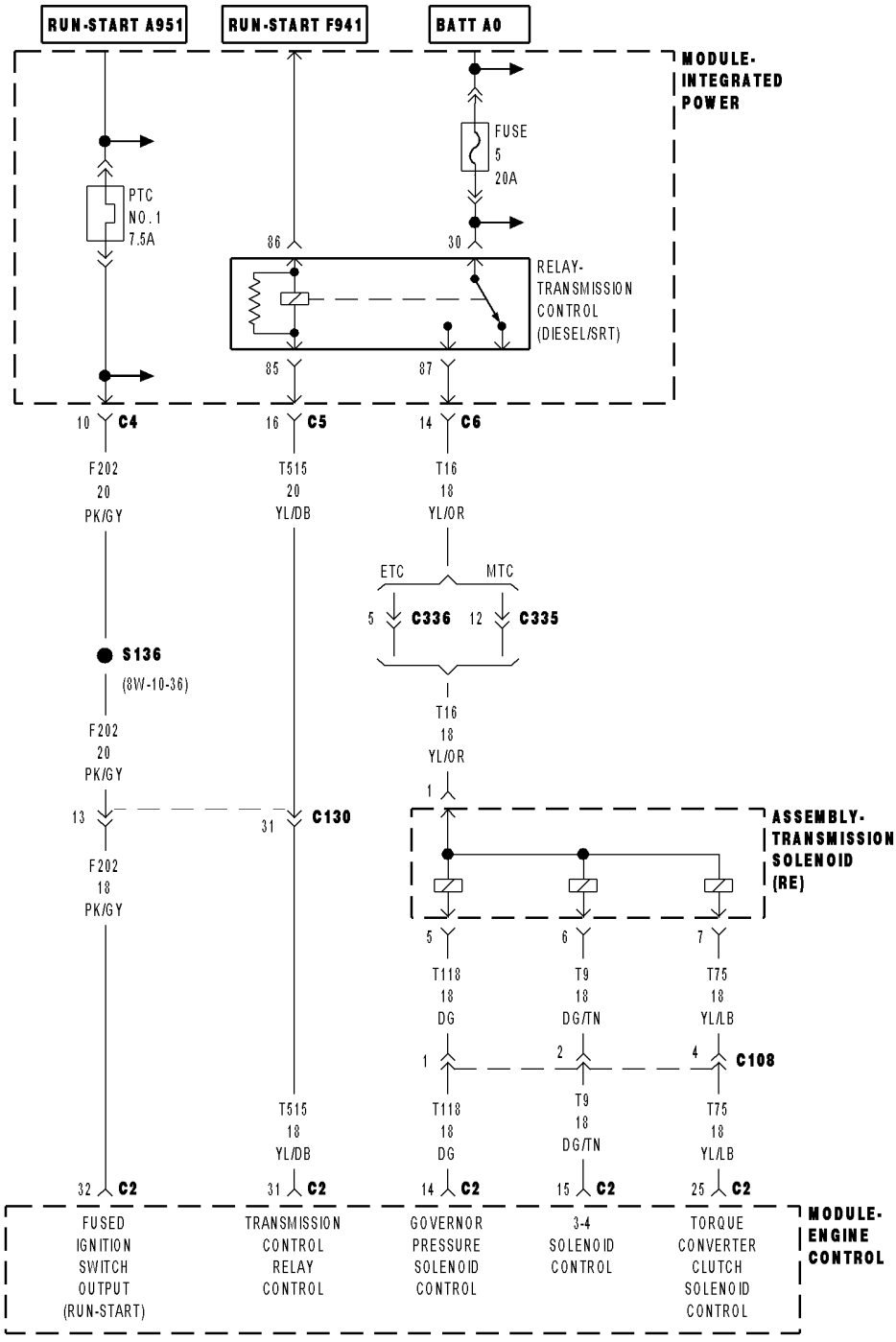
Were there any problems found?

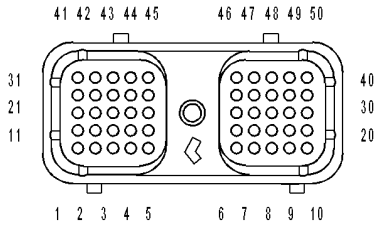
Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

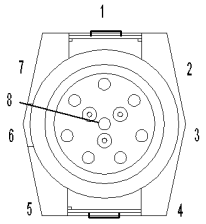
No >> Test Complete.

P0883-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT HIGH (DIESEL)





MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION SOLENOID (RE)

8142abf3

P0883-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT HIGH (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Transmission Control Relay supplies power to the TCC, Overdrive, and Governor Pressure Solenoids when in normal operating mode. The Transmission Control Relay Control circuit is constantly monitored by the ECM. If the expected state of the Transmission Control Relay Control circuit is different then the expected state, a corresponding DTC will set and the ECM will de-energize the Transmission Control Relay and place the transmission in Limp-in.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  This DTC will set if the ECM monitored voltage of the Transmission Control Relay Control circuit is different than the expected voltage for the period 3.0 seconds.

Possible Causes
(T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO VOLTAGE
(T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
TRANSMISSION CONTROL RELAY
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 7

---

2. CHECK IF THE TRANSMISSION CONTROL RELAY IS CLICKING

With the scan tool, actuate the Transmission Control Relay.

Is the Transmission Control Relay clicking?

Yes >> Go To 7

No >> Go To 3

P0883-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT HIGH (DIESEL) (CONTINUED)

3. CHECK THE TRANSMISSION CONTROL RELAY

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

NOTE: Check connectors - Clean/repair as necessary.

Install a substitute relay in place of the Transmission Control Relay.

Ignition on, engine not running.

With the scan tool, actuate the Transmission Control Relay.

Is the Transmission Control Relay Clicking?

Yes >> Replace the Transmission Control Relay.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 4

---

4. CHECK THE (T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

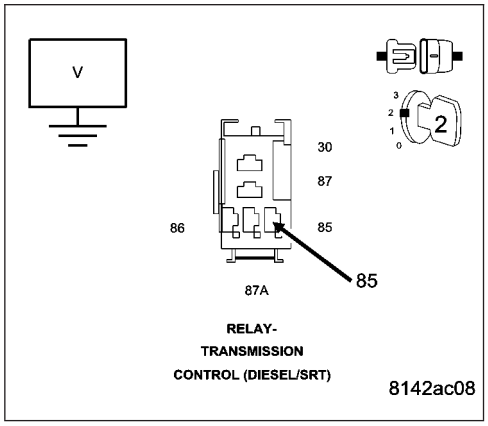
Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Disconnect the ECM C2 harness connector.

Ignition on, engine not running.

Measure the voltage of the (T515) Transmission Control Relay Control circuit in the Transmission Control Relay connector.



Is the voltage above 1.0 volts?

Yes >> Repair the (T515) Transmission Control Relay Control circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

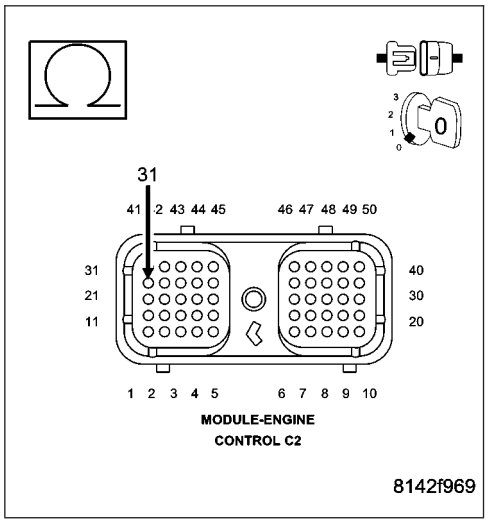
No >> Go To 5

---

5. CHECK THE (T515) TRANSMISSION CONTROL RELAY CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Turn the ignition off to the lock position.

Measure the resistance between the (T515) Transmission Control Relay Control Circuit and all other circuits in the ECM C2 harness connector.



Is the resistance below 100k ohms between the Transmission Control Relay Control Circuit and any other circuit(s) in the ECM C2 harness connector?

Yes >> Repair the (T515) Transmission Control Relay Control circuit for a short to another circuit(s).
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6

P0883-TRANS 12 VOLT SUPPLY RELAY CONTROL CIRCUIT HIGH (DIESEL) (CONTINUED)

6. CHECK THE ENGINE CONTROL MODULE

Turn the ignition off to the lock position.

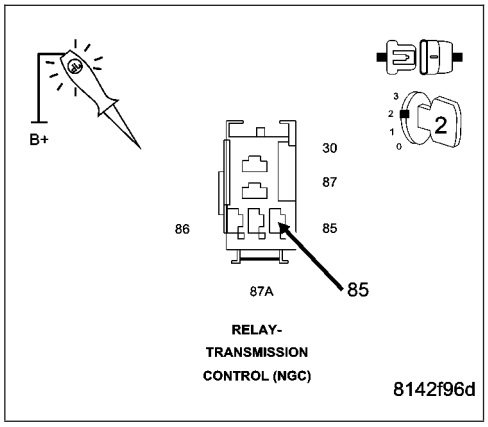
Remove the Transmission Relay.

Reconnect the ECM harness connectors.

With the scan tool, actuate the Transmission Relay.

Using a 12-volt test light connected to 12-volts, check the (T515) Transmission Control Relay Control circuit in the Transmission Control Relay connector.

NOTE: NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the Test Light cycle on and off and illuminate brightly?

Yes >> Go to 7

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

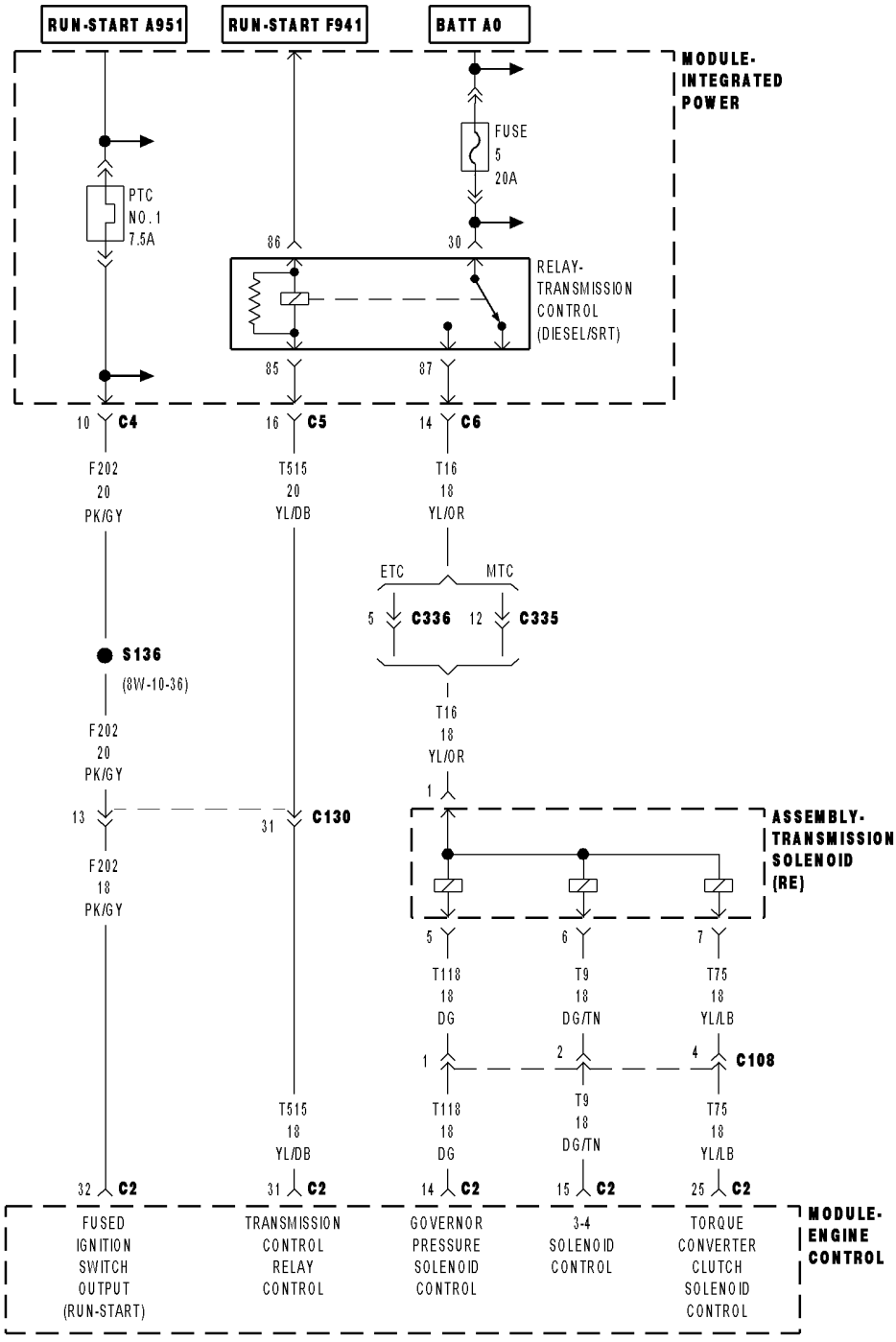
Were there any problems found?

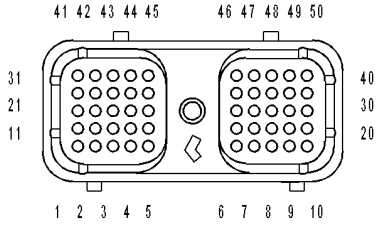
Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

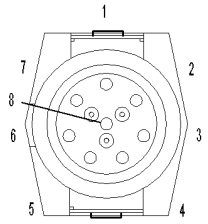
No >> Test Complete.

P0973-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO LOW (DIESEL)





MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION SOLENOID (RE)

8142abf3

P0973-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO LOW (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The 3-4 Solenoid is used the engage the gear change form 3rd gear to 4th gear.

The solenoids used in transmission applications are attached to valves which can be classified as normally open or normally closed. The normally open solenoid valve is defined as a valve which allows hydraulic flow when no current or voltage is applied to the solenoid. The normally closed solenoid valve is defined as a valve which does not allow hydraulic flow when no current or voltage is applied to the solenoid. These valves perform hydraulic control functions for the transmission and must therefore be durable and tolerant of dirt particles. For these reasons, the valves have hardened steel poppets and ball valves. The solenoids operate the valves directly, which means that the solenoids must have very high outputs to close the valves against the sizable flow areas and line pressures found in current transmissions. Fast response time is also necessary to ensure accurate control.

- **When Monitored:**
  Continuously with ignition on.
- **Set Condition:**
  This code will set if the voltage detected on the 3-4 Shift Solenoid Control circuit at the ECM is different then the expected voltage. Note: To clear this DTC it is necessary to drive the vehicle at a sustained speed which would allow the TCC and/or Overdrive Clutch to operate

Possible Causes
TRANSMISSION CONTROL RELAY DTC PRESENT
(T9) 3-4 SOLENOID CONTROL CIRCUIT OPEN
FUSED B+ CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T9) 3-4 SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T16) TRANSMISSION RELAY OUTPUT CIRCUIT SHORT TO GROUND
(T9) 3-4 SOLENOID CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION CONTROL RELAY - POOR CONTACTS
3-4 SHIFT SOLENOID
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK FOR TRANSMISSION CONTROL RELAY DTCS

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are there any Transmission Control Relay DTCs present?

Yes >> Refer to the Transmission category, and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

P0973-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO LOW (DIESEL) (CONTINUED)

2. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 3

No >> Go To 12

---

3. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

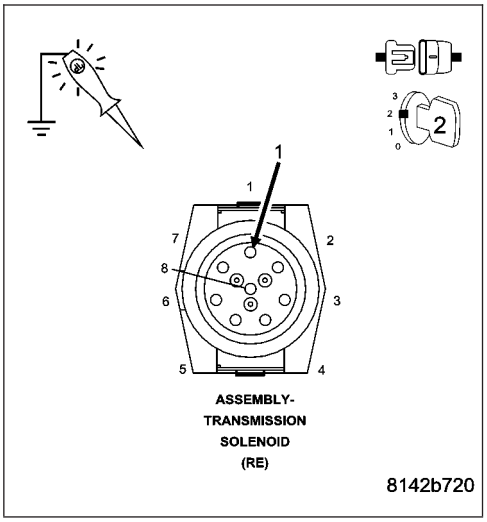
NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the Transmission Control Relay.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Relay Output circuit in the Transmission Solenoid Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light cycle on and off and illuminate brightly?

Yes >> Go To 4

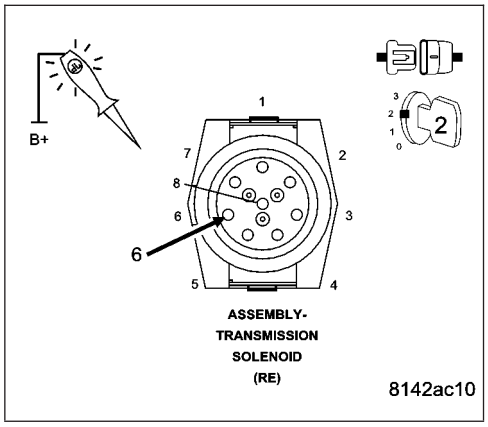
No >> Go To 9

P0973-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO LOW (DIESEL) (CONTINUED)

4. CHECK THE 3-4 SHIFT SOLENOID

With the scan tool, actuate the Overdrive (3-4) Solenoid.

Using a 12-volt test light connected to 12-volts, check the (T9) 3-4 Shift Solenoid Control circuit in the Transmission Solenoid Assembly harness connector.



Does the test light cycle on and off and illuminate brightly?

Yes >> Check all internal wiring pertaining to the 3-4 Shift Solenoid for an open, short, and bent or broken terminals. If no internal wiring problems are found, replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 5

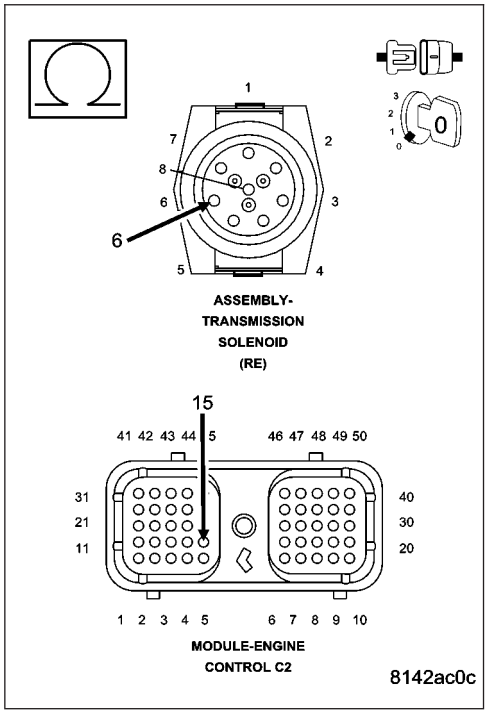
---

5. CHECK THE (T9) 3-4 SOLENOID CONTROL CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Disconnect the ECM C2 and C2 harness connectors.

Measure the resistance of the (T9) 3-4 Solenoid Control circuit between the Transmission Solenoid Assembly harness connector and the ECM C2 harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the (T9) 3-4 Solenoid Control circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0973-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO LOW (DIESEL) (CONTINUED)

6. CHECK THE (T9) 3-4 SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND

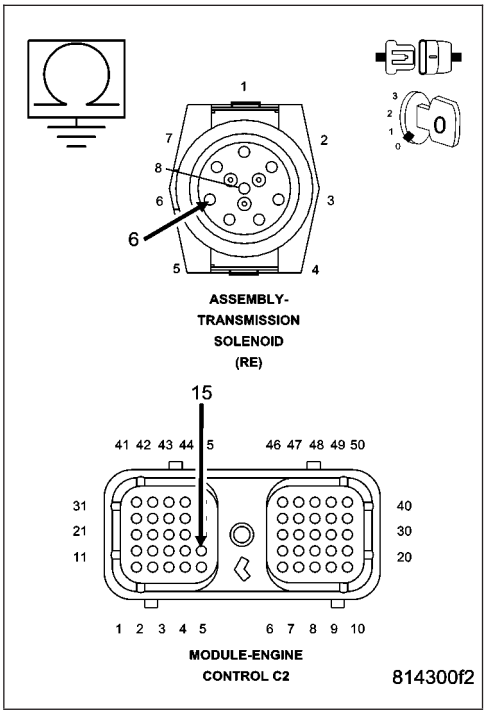
Measure the resistance between ground and the (T9) 3-4 Solenoid Control circuit.

Is the resistance above 100k ohms?

Yes >> Go To 7

No >> Repair the (T9) 3-4 Solenoid Control circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



7. CHECK THE (T9) 3-4 SHIFT SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

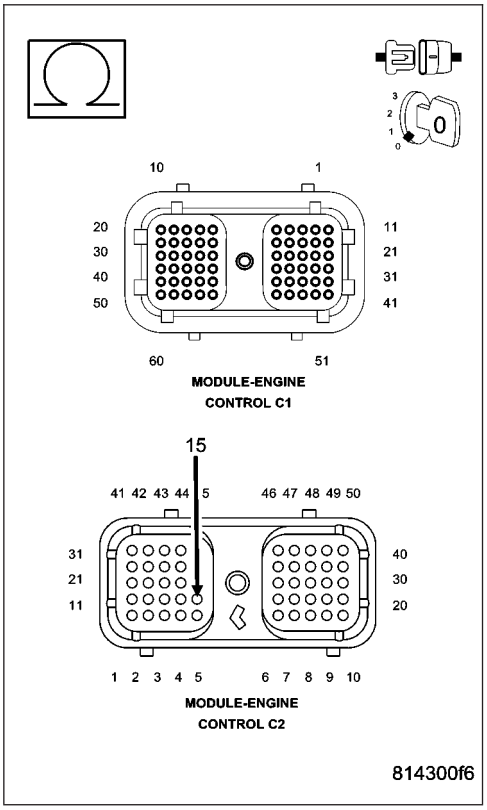
Measure the resistance between the (T9) 3-4 Solenoid Control circuit and all other circuits in the ECM C1 and C2 harness connectors.

Is the resistance above 100k ohms between the (T9) 3-4 Solenoid Control circuit and any other circuit(s) in the ECM C1 or C2 harness connectors?

Yes >> Go To 8

No >> Repair the (T9) 3-4 Shift Solenoid Control circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0973-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO LOW (DIESEL) (CONTINUED)

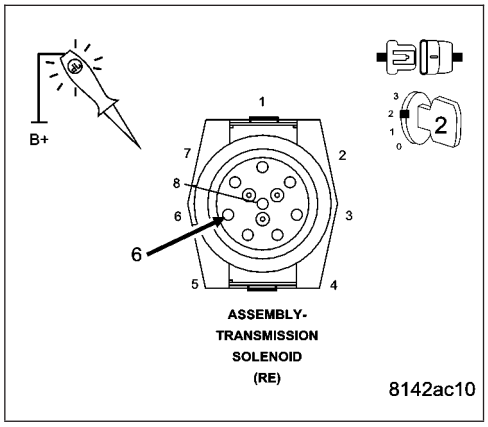
8. CHECK THE ENGINE CONTROL MODULE

Reconnect the ECM harness connectors.

Turn the ignition on, engine not running.

With the scan tool, actuate the 3-4 (Overdrive) Solenoid.

Using a 12-volt test light connected to 12-volts, check the (T9) 3-4 Solenoid Control circuit in the Transmission Solenoid Assembly harness connector.



Does the test Light cycle on and off and illuminate brightly?

Yes >> Go To 12

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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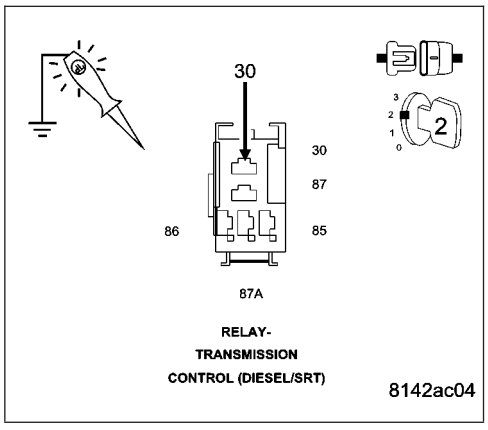
9. CHECK THE FUSED B(+) CIRCUIT

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the Fused B(+) circuit in the Transmission Control Relay connector.



Does the test light illuminate brightly?

Yes >> Go To 10

No >> Repair the Fused B(+) circuit for an open. Note: if the fuse is open, check for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P0973-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO LOW (DIESEL) (CONTINUED)

10. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT FOR A SHORT TO GROUND

Turn ignition off to the lock position.

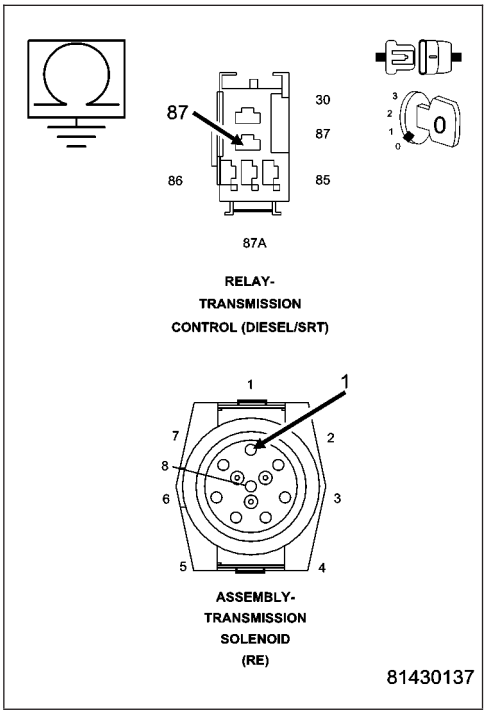
Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the Fused Transmission Control Relay Output circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 11



11. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT FOR AN OPEN

Ignition on, engine not running.

Connect a jumper wire between the Fused B(+) circuit and the (T16) Transmission Relay Output circuit in the Transmission Relay connector.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Relay Output circuit in the Transmission Solenoid Assembly harness connector.

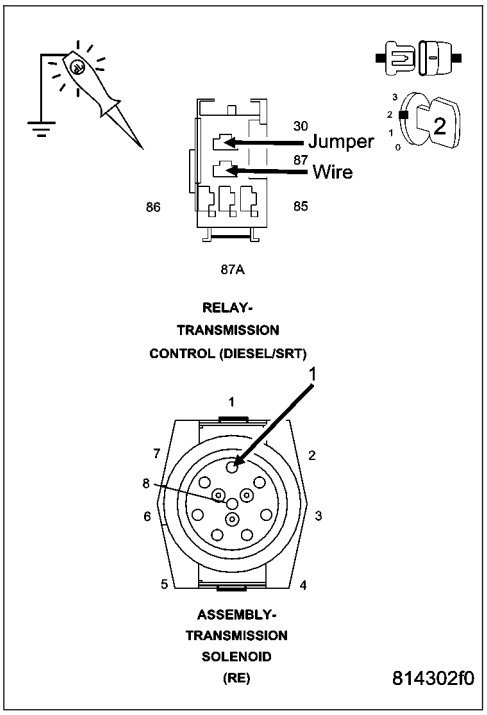
Does the test light illuminate brightly?

Yes >> Replace the Transmission Control Relay.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Repair the (T16) Transmission Control Relay Output circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P0973-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO LOW (DIESEL) (CONTINUED)

12. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

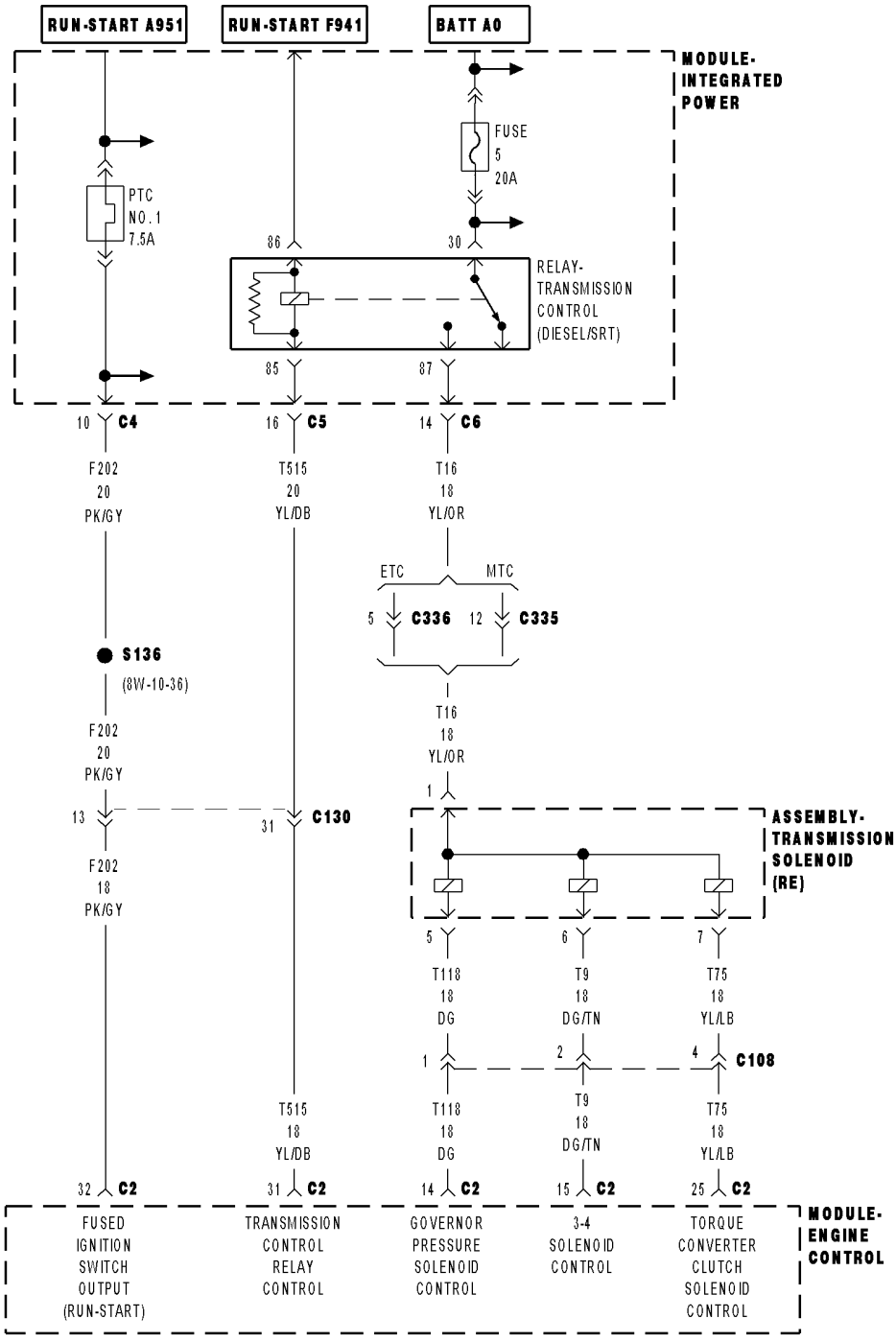
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

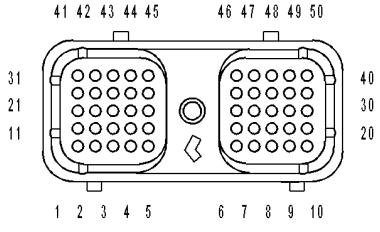
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

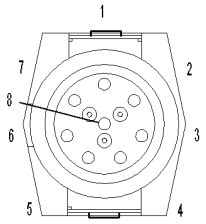
No >> Test Complete.

P0974-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO HIGH (DIESEL)





MODULE-ENGINE
CONTROL C2



ASSEMBLY-
TRANSMISSION
SOLENOID
(RE)

8142abf3

P0974-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO HIGH (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The 3-4 Solenoid is used the engage the gear change from 3rd gear to 4th gear.

The solenoids used in transmission applications are attached to valves which can be classified as normally open or normally closed. The normally open solenoid valve is defined as a valve which allows hydraulic flow when no current or voltage is applied to the solenoid. The normally closed solenoid valve is defined as a valve which does not allow hydraulic flow when no current or voltage is applied to the solenoid. These valves perform hydraulic control functions for the transmission and must therefore be durable and tolerant of dirt particles. For these reasons, the valves have hardened steel poppets and ball valves. The solenoids operate the valves directly, which means that the solenoids must have very high outputs to close the valves against the sizable flow areas and line pressures found in current transmissions. Fast response time is also necessary to ensure accurate control.

- **When Monitored:**
  Continuously with ignition on.
- **Set Condition:**
  This code will set if the voltage detected on the 3-4 Shift Solenoid Control circuit at the ECM is different then the expected voltage. Note: To clear this DTC it is necessary to drive the vehicle at a sustained speed which would allow the TCC and/or Overdrive Clutch to operate

Possible Causes
TRANSMISSION CONTROL RELAY DTC PRESENT
(T9) 3-4 SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
(T9) 3-4 SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
3-4 SOLENOID
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF ANY RELAY DTCS ARE PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are there any Transmission Control Relay DTC's present?

Yes >> Refer to the Transmission category, (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING) and perform the appropriate symptom(s).

No >> Go To 2

P0974-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO HIGH (DIESEL) (CONTINUED)

2. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 3

No >> Go To 7

---

3. CHECK THE 3-4 SOLENOID

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

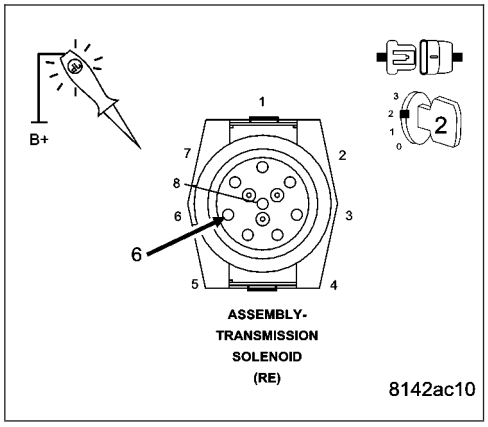
NOTE: Check connectors - Clean/repair as necessary

Ignition on, engine not running.

With the scan tool, actuate the 3-4 (Overdrive) Solenoid.

Using a 12-volt test light connected to 12-volts, check the 3-4 Solenoid Control circuit in the Transmission Solenoid Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light cycle on and off and illuminate brightly?

Yes >> Check all internal wiring pertaining to the 3-4 Solenoid for an open, short and bent or broken terminals. If no internal wiring problems are found, replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 4

P0974-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO HIGH (DIESEL) (CONTINUED)

4. CHECK TO (T9) 3-4 SOLENOID CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the ECM harness connectors.

Ignition on, engine not running.

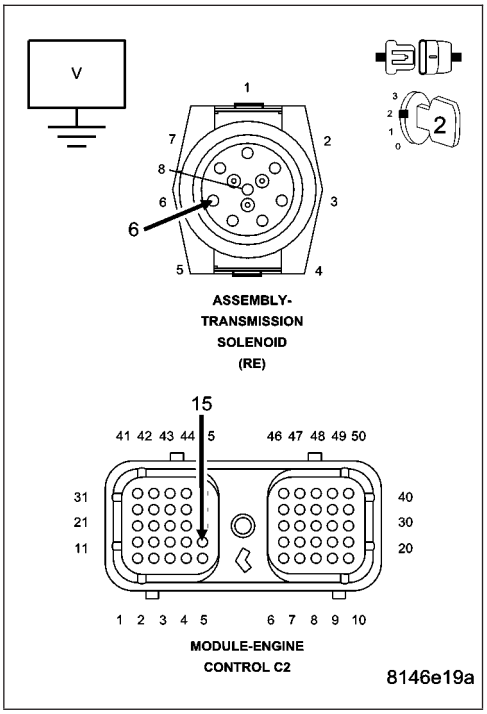
Measure the voltage of the (T9) 3-4 Solenoid Control circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (T9) 3-4 Solenoid Control circuit for a short to voltage.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 5



5. CHECK THE (T9) 3-4 SHIFT SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Turn the ignition off to the lock position.

Disconnect the ECM C1 and C2 harness connectors.

Disconnect the Transmission Solenoid Assembly harness connector.

Remove the Transmission Control Relay.

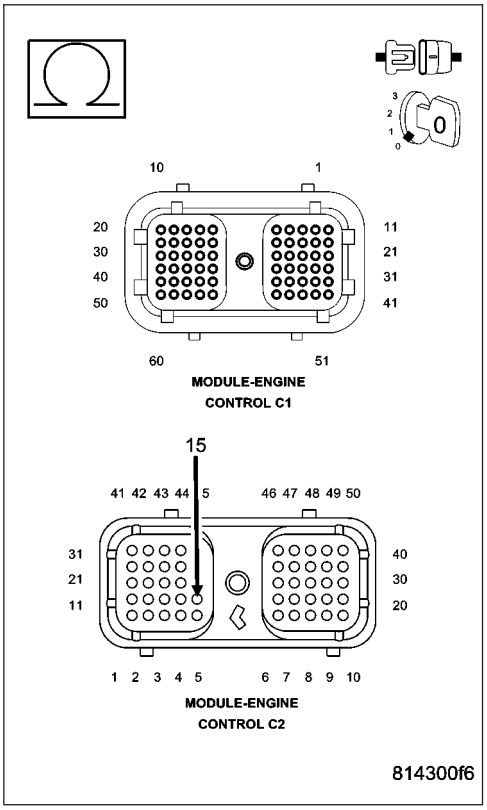
Measure the resistance between the (T9) 3-4 Shift Solenoid Control circuit and all other circuits in the Transmission Solenoid Assembly harness connector.

Is the resistance below 5.0 ohms between the (T9) 3-4 Shift Solenoid Control circuit and any other circuit(s) in the ECM C1 and C2 harness connectors?

Yes >> Repair the 3-4 Shift Solenoid Control circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6



P0974-TRANSMISSION OVERDRIVE CIRCUIT VOLTAGE TOO HIGH (DIESEL) (CONTINUED)

6. CHECK THE 3-4 SOLENOID

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

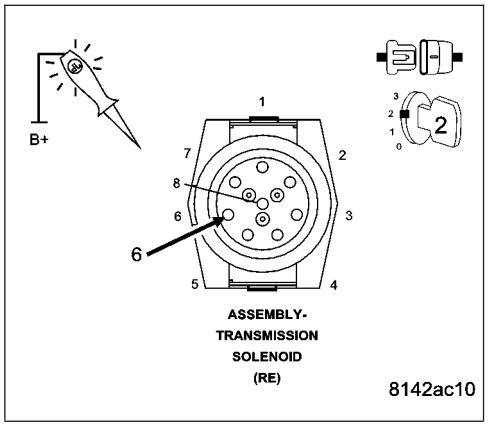
NOTE: Check connectors - Clean/repair as necessary

Ignition on, engine not running.

With the scan tool, actuate the 3-4 (Overdrive) Solenoid.

Using a 12-volt test light connected to 12-volts, check the 3-4 Solenoid Control circuit in the Transmission Solenoid Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light cycle on and off and illuminate brightly?

Yes >> Go To 7

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any technical service bulletins that may apply.

Were there any problems found?

Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

P1740-TCC O/D SOL PERFORMANCE (DIESEL)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Torque Converter Clutch (TCC) Solenoid is used to engage the TCC which inproves fuel economy.

- **When Monitored:**
  The Torque Convertor Clutch (TCC) and Overdrive Clutch (O/D) will be tested each time the ECM requests TCC engagement in 3rd gear and O/D.
- **Set Condition:**
  The DTC will set if the expected RPM drop is not achieved while attempting to engage TCC or O/D. This indicates a malfunctioning torque convertor or overdrive clutch.

Possible Causes
ENGINE DTCS PRESENT
TRANSMISSION DTCS PRESENT
TRANSMISSION TEMPERATURE TOO COLD
OIL PAN CONTAINS EXCESSIVE DEBRIS
3-4 SHIFT SOLENOID
SHAFT OR SEAL DAMAGE
TCC SOLENOID
TORQUE CONVERTER

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. ENGINE DTCS PRESENT

Ignition on, engine not running.
With the scan tool, read Engine DTCs.

Are there any Engine Temperature, Cam, Engine RPM, Misfire, P/N, or TPS DTC's present?

Yes >> Refer to 9 - ENGINE ELECTRICAL DIAGNOSTICS - DIESEL and perform the appropriate symptom. Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 2

---

2. CHECK FOR OTHER TRANSMISSION DTCS PRESENT

Are any of the DTCs P0720, P0973, P0974, P2769, and/or P2770, also present?

Yes >> Refer to the Transmission category, and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 3

P1740-TCC O/D SOL PERFORMANCE (DIESEL) (CONTINUED)

3. CHECK IF THE DTC IS CURRENT

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 4

No >> Go To 14

---

4. VERIFY THE TOW/ HAUL OVERDRIVE FEATURE

NOTE: The transmission fluid temperature must be above 0.0° C (32° F) before proceeding.

With the scan tool, build a custom display using: Engine RPM, Output Shaft Speed, TCC Solenoid, O/D Solenoid and TPS.

NOTE: This display will monitor the operation of the components.

Start the engine, turn off Overdrive or Tow Haul and test drive the vehicle.

Attain a steady speed of 88.5 Km/h or 55 MPH with a minimum of 1.15 volts throttle opening for 20 seconds.

NOTE: Check the Shift pattern as the vehicle upshifts to speeds of 88.5 Km/h or 55 MPH.

Is the Engine RPM within 60 RPM of the Output Shaft Speed RPM?

Yes >> Go To 10

No >> Go To 5

---

5. CHECK IF THE OUTPUT SPEED IS GREATER THAN ENGINE RPM

In the previous test, is the Output Shaft Speed greater than Engine RPM?

Yes >> Go To 6

No >> Go To 10

---

6. CALCULATE EXPECTED ENGINE RPM

With the scan tool, build a custom display using: Engine RPM, Output Shaft Speed, TCC Solenoid, O/D Solenoid and TPS.

NOTE: This display will monitor the operation of the components.

Start the engine, turn off Overdrive or Tow Haul and test drive the vehicle.

Attain a steady speed of 88.5 Km/h or 55 MPH with a minimum of 1.15 volts throttle opening for 20 seconds.

With the scan tool, verify the 3-4 Solenoid (O/D) Solenoid is on and the TCC solenoid is locked

NOTE: Use this formula, Output Shaft Speed x 0.69 = expected Engine RPM.

Did the Engine RPM drop to 0.69 of the Output Shaft Speed RPM?

Yes >> Go To 10

No >> Go To 7

P1740-TCC O/D SOL PERFORMANCE (DIESEL) (CONTINUED)

7. GOVERNOR PRESSURE SYSTEM TEST

Turn the ignition off to the lock position.

Connect a 0 to 2068 Kpa or 0 to 300 PSI pressure gauge to the Overdrive Clutch Test Port.

Connect a 0 to 2068 Kpa or 0 to 300 PSI pressure gauge to the Governor Test Port.

Start the engine.

NOTE: Allow the transmission temperature to rise to normal operating temperature.
While observing both pressure gauges, select 4th Gear from Gov and 3-4 System Test.

NOTE: The Governor pressure should rise to above 137.8 Kpa or 20 PSI, shortly after the OD pressure should rise above 275.7 Kpa or 40 PSI.

Did the pressures act as described?

Yes >> Go To 8

No >> Go To 9

---

8. CHECK IF THE OIL PAN CONTAINS EXCESSIVE DEBRIS

Remove the transmission oil pan per the Service information.

Is the transmissin fluid burnt or does the transmissin oil pan contain excessive debris?

Yes >> Repair internal transmission as necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 10

---

9. CHECK THE 3-4 SHIFT SOLENOID

Turn the ignition off to the lock position.

Replace the 3-4 Solenoid per the Service information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Connect a 0 to 2068 Kpa or 0 to 300 PSI pressure gauge to the Overdrive Clutch Test Port.

Connect a 0 to 2068 Kpa or 0 to 300 PSI pressure gauge to the Governor Test Port.

Start the engine.

NOTE: Allow the transmission temperature to rise to normal operating temperature.
While observing both pressure gauges, select 4th gear from the Governor 3-4 shift valve system test.

NOTE: The Governor pressure should rise above 137.8 Kpa or 20 PSI, shortly after the OD pressure should rise above 275.7 Kpa or 40 PSI.

Did the pressures act as described?

Yes >> Test Complete.

No >> Overhaul the transmission per the Service information. Carefully inspect the seals and clutches related to the OD Clutch. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1740-TCC O/D SOL PERFORMANCE (DIESEL) (CONTINUED)

10. TORQUE CONVERTER CLUTCH

Turn the ignition on.

With the scan tool, perform the Torque Converter Clutch test.

Did the engine stall?

Yes >> Go To 11

No >> Go To 13

---

11. GOVERNOR/3-4 SHIFT VALVE

Start the engine.

Perform the Governor and 3-4 Shift Valve System Test, select 4th gear.

Did the engine stall?

Yes >> Go To 12

No >> Go To 13

---

12. TCC SOLENOID

Replace the TCC Solenoid. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

With the scan tool, perform the Governor and 3-4 Solenoid test, select 4th gear.

Did the engine stall?

Yes >> Repair internal transmission as necessary. Check for blocked passages. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

13. SHAFT OR SEAL DAMAGE

Remove the Transmission Oil Pump per the Service information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/OIL PUMP - DISASSEMBLY)

Inspect the Reaction shaft, Input Shaft and Input seal.

Are any of the parts damaged or worn?

Yes >> Repair as necessary, also replace the Torque Converter.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Replace the Torque Converter. NOTE: Inspect the Reaction Shaft, Input Shaft and Input Seal. Replace as necessary if any of the parts are damaged or worn.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1740-TCC O/D SOL PERFORMANCE (DIESEL) (CONTINUED)

14. INTERMITTENT WIRING & CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

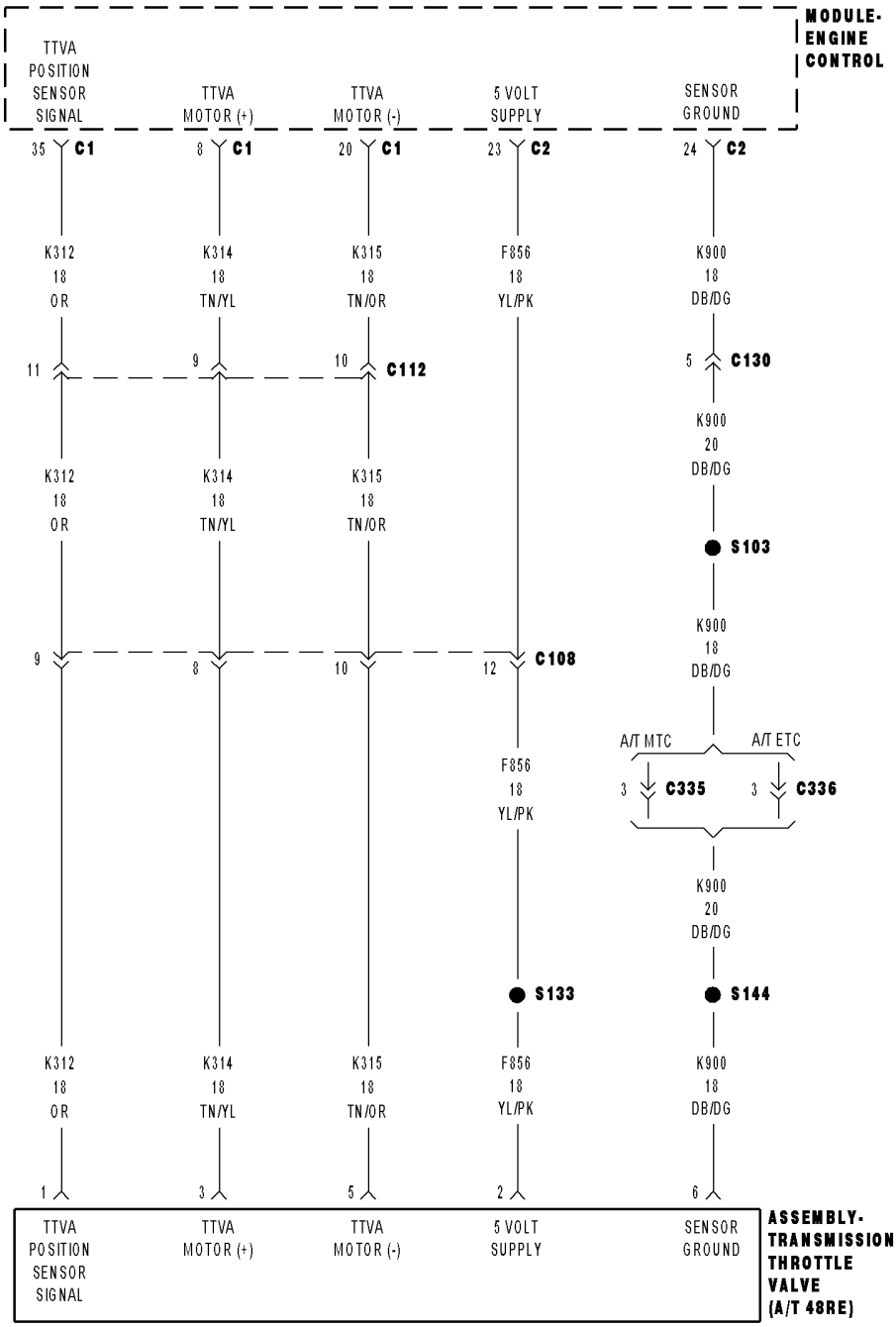
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

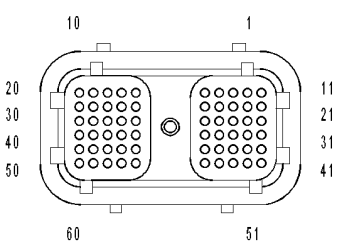
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

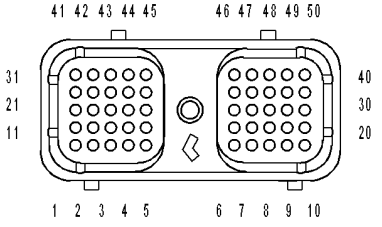
No >> Test Complete.

P1749-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT LOW

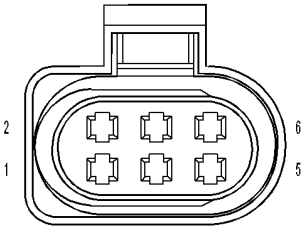




MODULE-ENGINE CONTROL C1



MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION THROTTLE VALVE (A/T 48RE)

81482a8c

P1749-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT LOW (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The transmission throttle valve cable has been replace by the transmission throttle valve actuator (TTVA). The TTVA consists of an electric DC motor, two potentiometers, and a gear drive system. The TTVA is mechanically connected to the transmission throttle valve in the valve body by the “D” shaped opening in the bottom of the TTVA shaft.

The Transmission Throttle Valve Actuator (TTVA) does not require any mechanical adjustments. All changes in throttle valve position are controlled by the Engine Control Module (ECM).

The TTVA does require an initialization period after the actuator has been removed or replaced. After the actuator has been removed or replaced, move the ignition to the ON position for thirty (30) seconds. This will allow the ECM sufficient time to perform the internal calibration procedures to learn the TTVA’s current “zero” position.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  When the Engine Control Module (ECM) detects the monitored Transmission Throttle Valve Position Sensor voltage drops below a predetermined value.

Possible Causes
(K312) TTVA POSITION SENSOR SIGNAL CIRCUIT OPEN
(K312) TTVA POSITION SENSOR SIGNAL CIRCUIT SHORT TO GROUND
(K312) TTVA POSITION SENSOR SIGNAL CIRCUIT SHORT TO ANOTHER CIRCUIT
(F856) 5 VOLT SUPPLY CIRCUIT OPEN
(F856) 5 VOLT SUPPLY CIRCUIT SHORT TO GROUND
(F856) 5 VOLT SUPPLY CIRCUIT SHORT TO ANOTHER CIRCUIT
TRANSMISSION THROTTLE VALVE ACTUATOR
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1749-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT LOW (CONTINUED)

Diagnostic Test

1. CHECK THE TTVA

Ignition on, engine not running.

With the scan tool, record and erase Engine DTCs.

Turn the ignition off to the lock position.

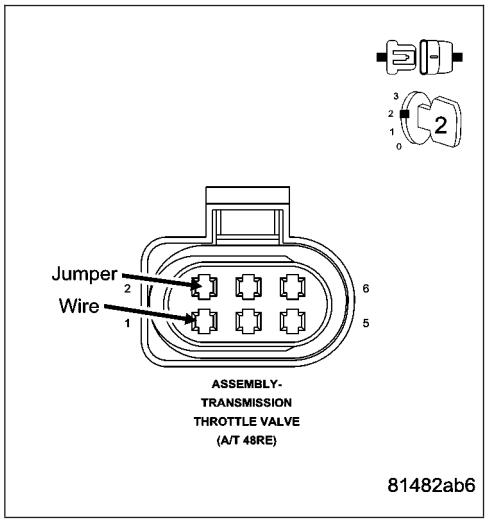
Disconnect the TTVA harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (K312) TTVA Position Sensor Signal circuit and the (F856) 5-volt Supply circuit in the TTVA harness connector.

Ignition on, engine not running.

With the scan tool, read Engine DTCs.



Did the DTC P1750-Transmission Throttle Valve Position Sensor Circuit High set?

Yes >> Replace the TTVA per the Service Information.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 2

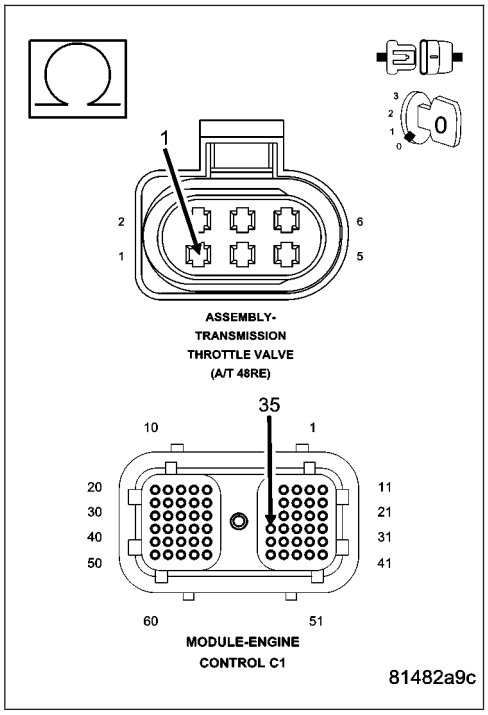
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2. CHECK THE (K312) TTVA POSITION SENSOR SIGNAL CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Disconnect the ECM C1 and C2 harness connectors.

Measure the resistance of the (K312) TTVA Position Sensor Signal circuit between the ECM C1 harness connector and the TTVA harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 3

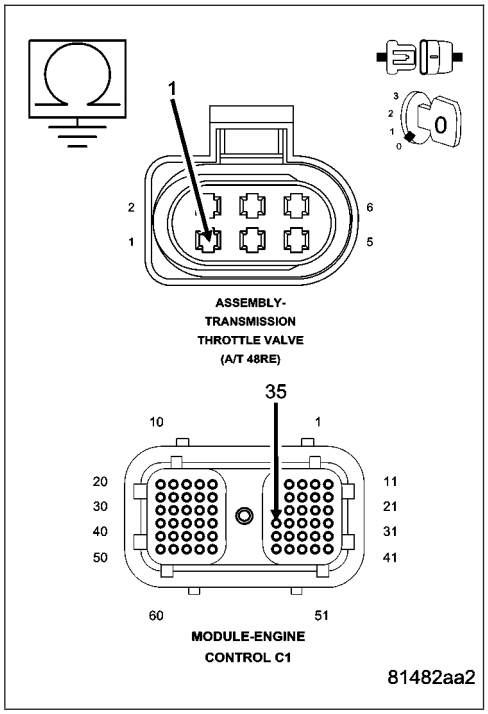
No >> Repair the (K312) TTVA Position Sensor Signal circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

P1749-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT LOW (CONTINUED)

3. CHECK THE (K312) TTVA POSITION SENSOR SIGNAL CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (K312) TTVA Position Sensor Signal circuit.



Is the resistance below 5.0 ohms?

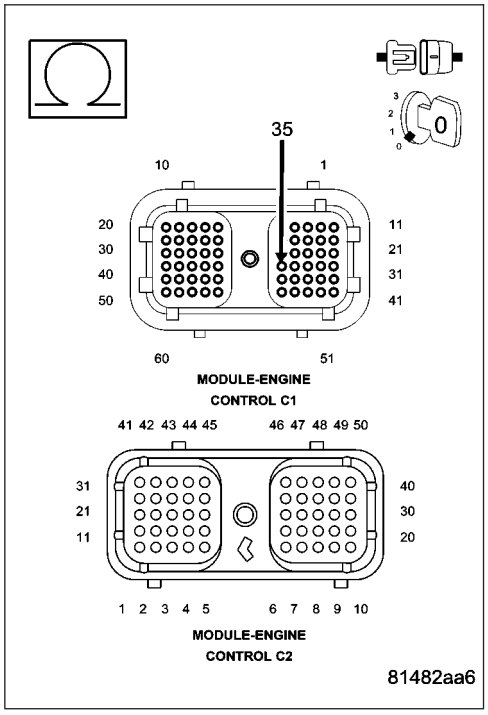
Yes >> Repair the (K312) TTVA Position Sensor Signal circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 4

4. CHECK THE (K312) TTVA POSITION SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Measure the resistance between the (K312) TTVA Position Sensor Signal circuit and all other circuits in the ECM C1 and C2 harness connectors.



Is the resistance below 100 kohms between the (K312) TTVA Position Sensor Signal circuit and any other circuit(s) in the ECM C1 or C2 harness connectors.

Yes >> Repair the (K312) TTVA Position Sensor Signal circuit for a short to another circuit(s).

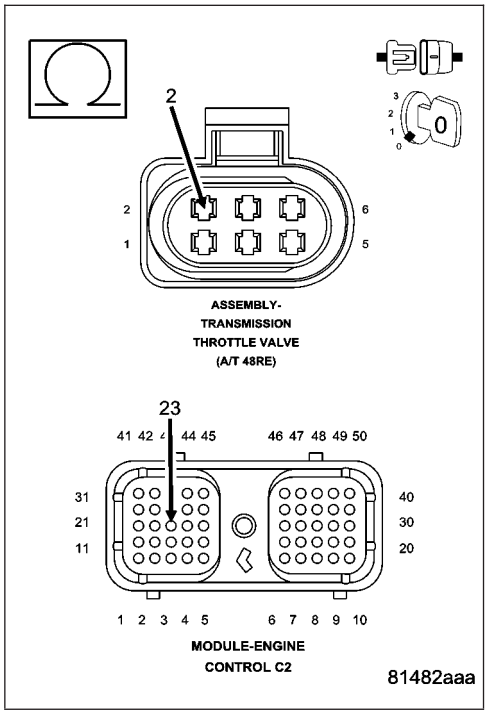
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 5

P1749-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT LOW (CONTINUED)

5. CHECK THE (F856) 5 VOLT SUPPLY CIRCUIT FOR AN OPEN

Measure the resistance of the (F856) 5-volt Supply circuit between the ECM C2 harness connector and the TTVA harness connector.



Is the resistance below 5.0 ohms?

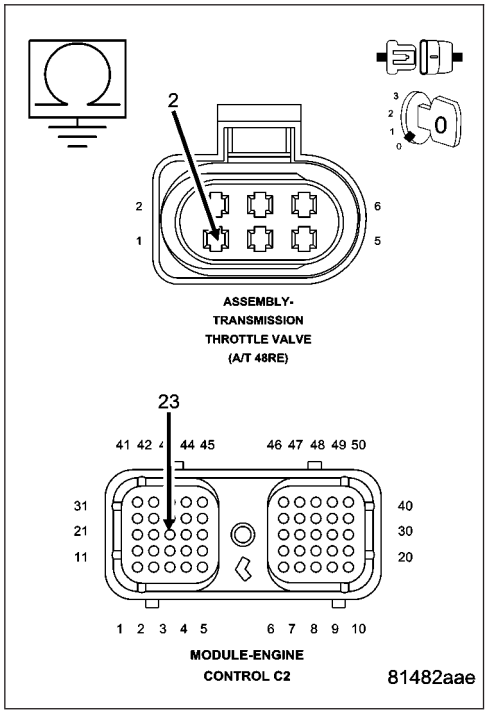
Yes >> Go To 6

No >> Repair the (F856) 5-volt Supply circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

6. CHECK THE (F856) 5 VOLT SUPPLY CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (F856) 5-volt Supply circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (F856) 5-volt Supply circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 7

P1749-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT LOW (CONTINUED)

7. (F856) 5 VOLT SUPPLY CIRCUIT SHORT TO ANOTHER CIRCUIT

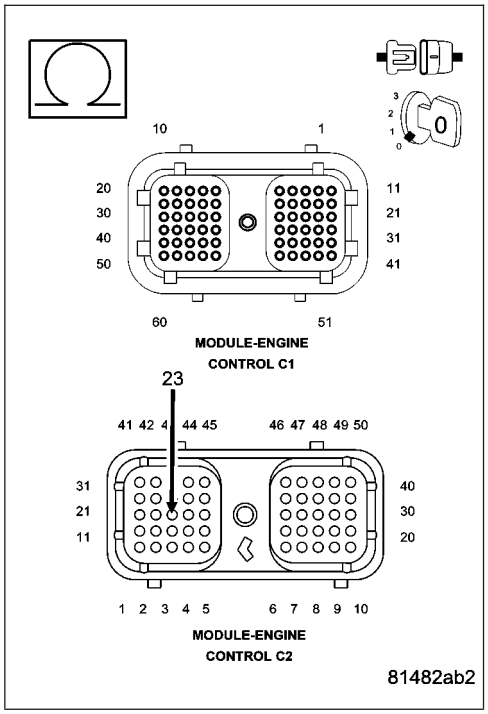
Measure the resistance between the (F856) 5-volt Supply circuit and all other circuits in the ECM C1 and C2 harness connectors.

Is the resistance below 100 kohms between the (F856) 5-volt Supply circuit and any other circuit(s) in the ECM C1 or C2 harness connectors.

Yes >> Repair the (F856) 5-volt Supply circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 8



8. CHECK THE TTVA

Ignition on, engine not running.

With the scan tool, record and erase Engine DTCs.

Turn the ignition off to the lock position.

Disconnect the TTVA harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Connect a jumper wire between the (K312) TTVA Position Sensor Signal circuit and the (F856) 5-volt Supply circuit in the TTVA harness connector.

Ignition on, engine not running.

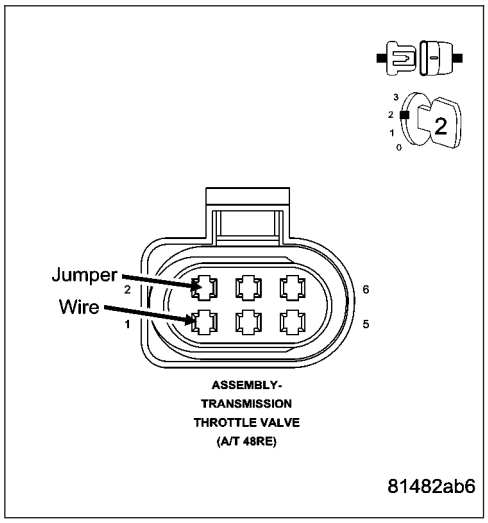
With the scan tool, read Engine DTCs.

Did the DTC P1750-Transmission Throttle Valve Position Sensor Circuit High set?

Yes >> Go To 9

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)



P1749-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT LOW (CONTINUED)

9. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

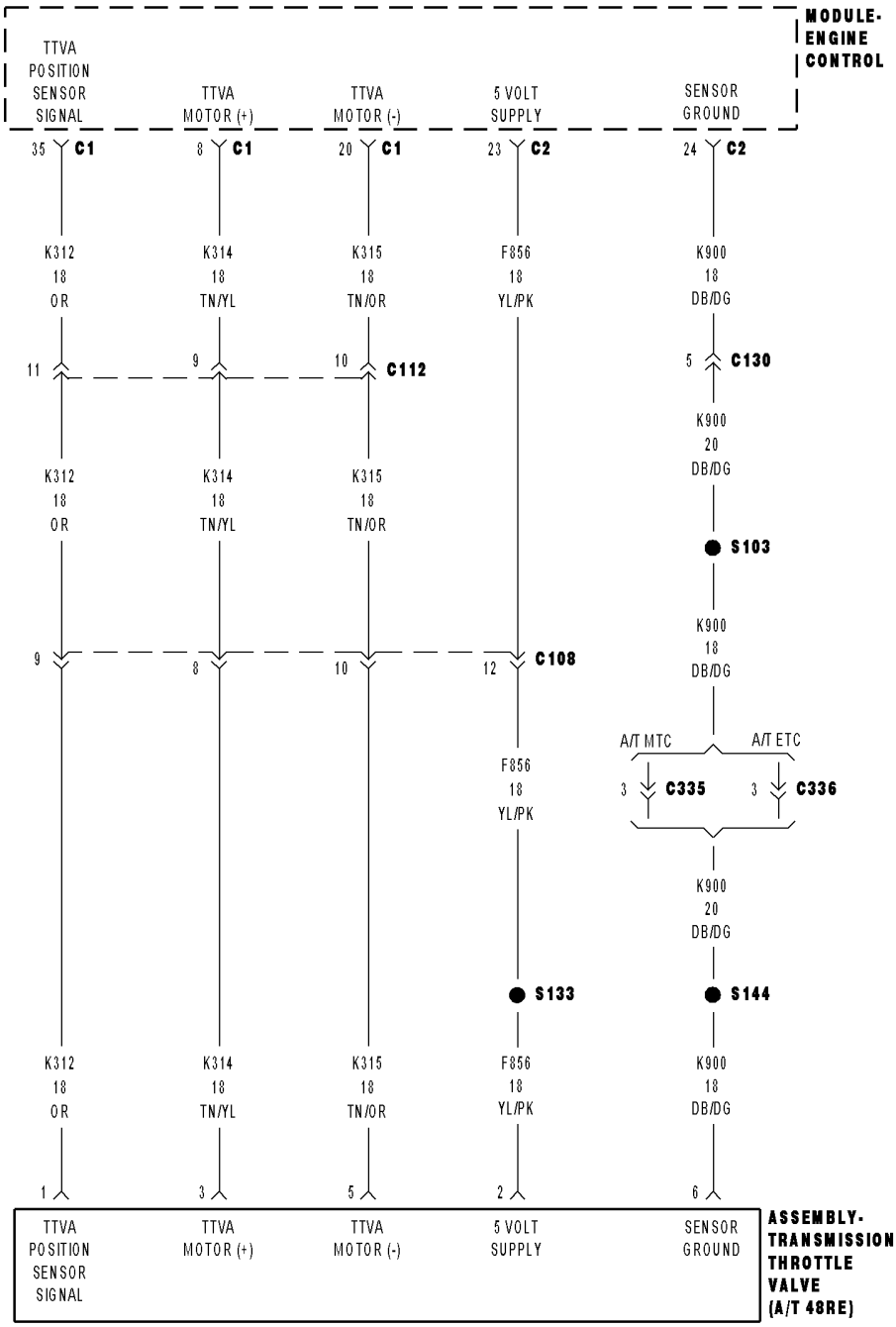
Refer to any technical service bulletins that may apply.

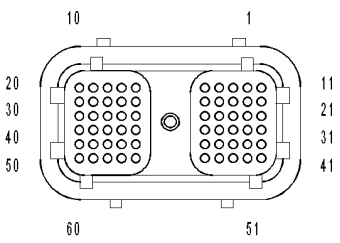
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

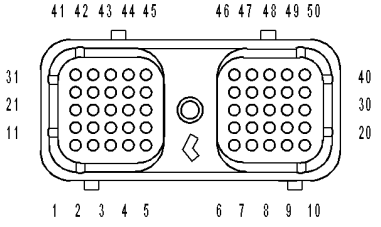
No >> Test Complete.

P1750-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT HIGH

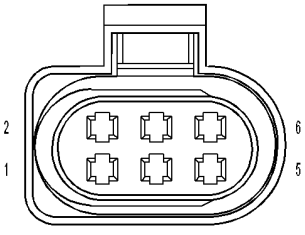




MODULE-ENGINE CONTROL C1



MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION THROTTLE VALVE (A/T 48RE)

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P1750-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT HIGH (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The transmission throttle valve cable has been replace by the transmission throttle valve actuator (TTVA). The TTVA consists of an electric DC motor, two potentiometers, and a gear drive system. The TTVA is mechanically connected to the transmission throttle valve in the valve body by the “D” shaped opening in the bottom of the TTVA shaft.

The Transmission Throttle Valve Actuator (TTVA) does not require any mechanical adjustments. All changes in throttle valve position are controlled by the Engine Control Module (ECM).

The TTVA does require an initialization period after the actuator has been removed or replaced. After the actuator has been removed or replaced, move the ignition to the ON position for thirty (30) seconds. This will allow the ECM sufficient time to perform the internal calibration procedures to learn the TTVA’s current “zero” position.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  When the Engine Control Module (ECM) detects the monitored Transmission Throttle Valve Position Sensor voltage rises above a predetermined value.

Possible Causes
(K312) TTVA POSITION SENSOR SIGNAL CIRCUIT SHORT TO VOLTAGE
(K312) TTVA POSITION SENSOR SIGNAL CIRCUIT SHORT TO ANOTHER CIRCUIT
(K900) SENSOR GROUND CIRCUIT OPEN
TRANSMISSION THROTTLE VALVE ACTUATOR
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.
With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 7

P1750-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT HIGH (CONTINUED)

2. CHECK THE TTVA

With the scan tool, record and erase Engine DTCs.
Turn the ignition off to the lock position.
Disconnect the TTVA harness connector.

NOTE: Check connectors - Clean/repair as necessary.
Ignition on, engine not running.
With the scan tool, read Engine DTCs.

Did the DTC Transmission Throttle Valve Position Sensor Circuit High set?

Yes >> Go To 4

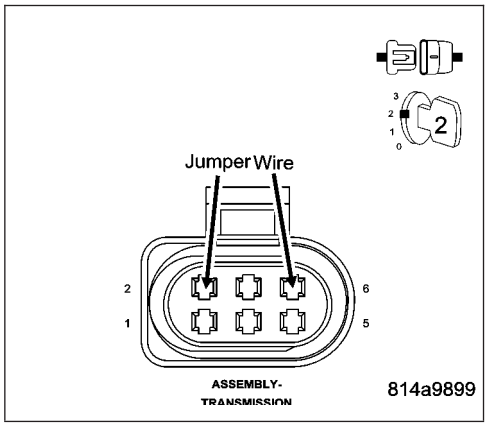
No >> Go To 3

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3. CHECK THE (K900) SENSOR GROUND CIRCUIT FOR AN OPEN

Ignition on, engine not running.
With the scan tool, record and erase Engine DTCs.
Turn the ignition off to the lock position.
Disconnect the TTVA harness connector.

NOTE: Check connectors - Clean/repair as necessary.
Connect a jumper wire between the (K900) Sensor Ground circuit and the (F856) 5-volt Supply circuit in the TTVA harness connector.
Ignition on, engine not running.
With the scan tool, read Engine DTCs.



Did either P0642 or P0652 Sensor Supply Voltage DTC set?

Yes >> Replace the TTVA per the Service Information.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Repair the (K900) TTVA Sensor Ground circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

P1750-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT HIGH (CONTINUED)

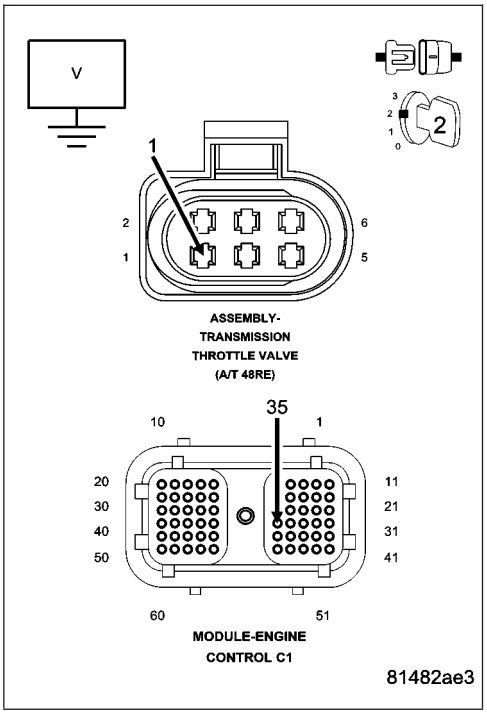
4. CHECK THE (K312) TTVA POSITION SENSOR SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.
Disconnect the ECM C1 and C2 harness connectors.
Ignition on, engine not running.
Measure the voltage of the (K312) TTVA Position Sensor Signal circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (K312) TTVA Position Sensor Signal circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 5



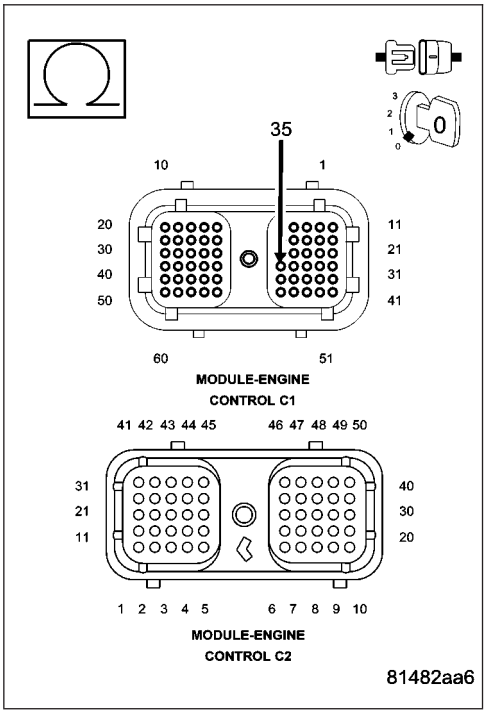
5. CHECK THE (K312) TTVA POSITION SENSOR SIGNAL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Measure the resistance between the (K312) TTVA Position Sensor Signal circuit and all other circuits in the ECM C1 and C2 harness connectors.

Is the resistance below 100 kohms between the (K312) TTVA Position Sensor Signal circuit and any other circuit(s) in the ECM C1 or C2 harness connectors.

Yes >> Repair the (K312) TTVA Position Sensor Signal circuit for a short to another circuit(s).
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 6



P1750-TRANSMISSION THROTTLE VALVE POSITION SENSOR CIRCUIT HIGH (CONTINUED)

6. CHECK THE ECM OPERATION

Turn the ignition off to the lock position.
Reconnect all previously disconnected connectors.
Ignition on, engine not running.
With the scan tool, record and erase Engine DTCs.
Turn the ignition off to the lock position.
Disconnect the TTVA harness connector.
Ignition on, engine not running.
With the scan tool, read Engine DTCs.

Did the DTC Transmission Throttle Valve Position Sensor Circuit High set?

Yes >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 7

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7. INTERMITTENT WIRING AND CONNECTORS

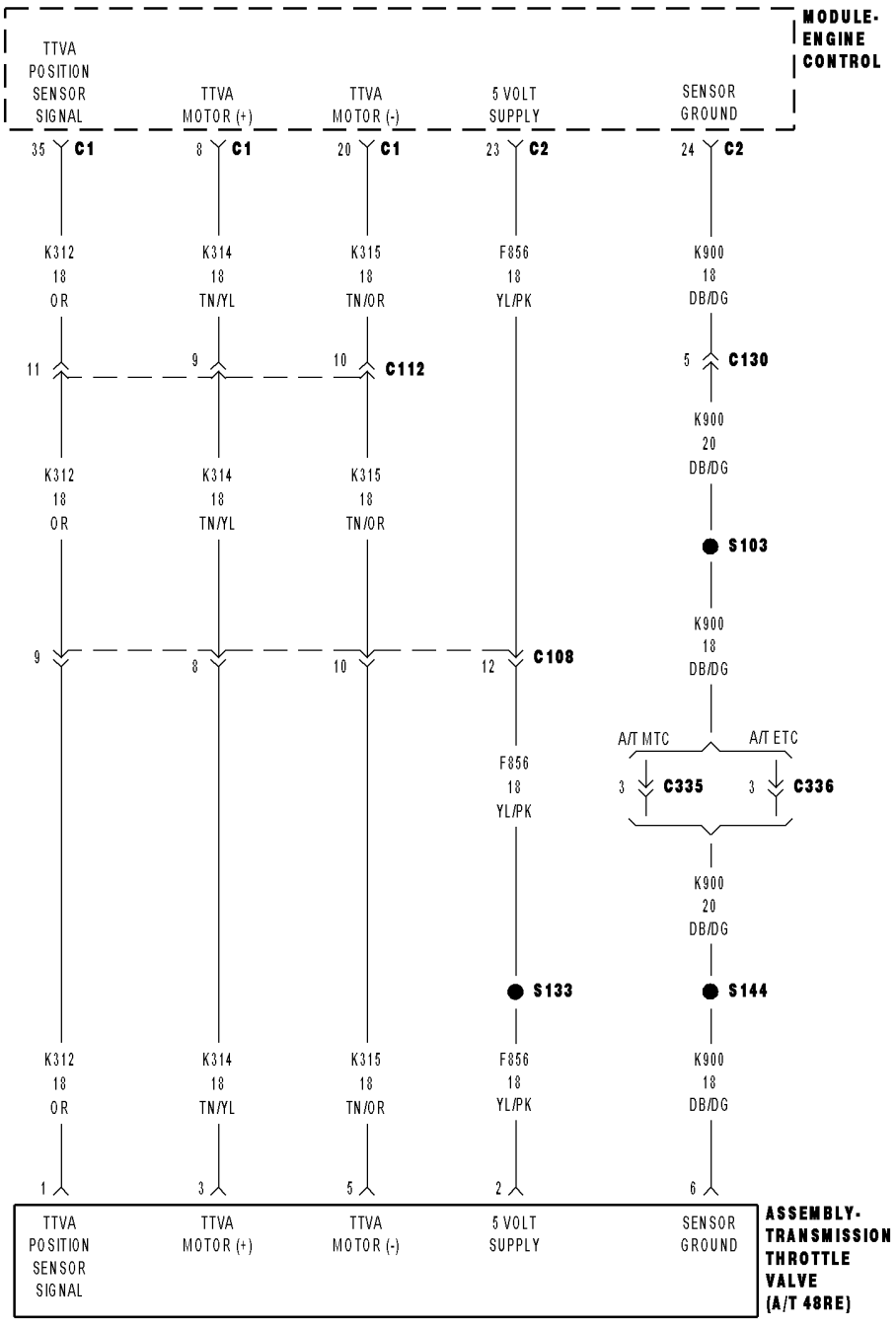
The conditions necessary set this DTC are not present at this time.
Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.
Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.
Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.
Refer to any technical service bulletins that may apply.

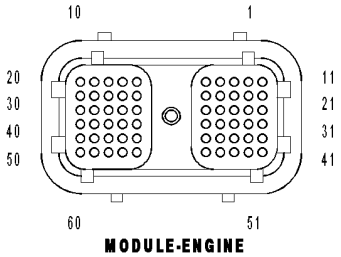
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

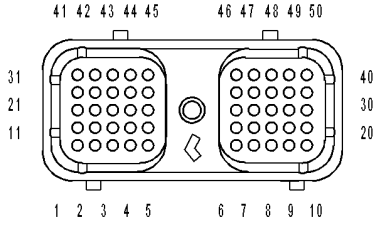
No >> Test Complete.

P1751-TRANSMISSION THROTTLE VALVE POSITION MINIMUM RANGE PERFORMANCE

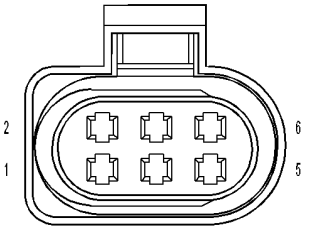




MODULE-ENGINE CONTROL C1



MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION THROTTLE VALVE (A/T 48RE)

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P1751-TRANSMISSION THROTTLE VALVE POSITION MINIMUM RANGE PERFORMANCE (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The transmission throttle valve cable has been replace by the transmission throttle valve actuator (TTVA). The TTVA consists of an electric DC motor, two potentiometers, and a gear drive system. The TTVA is mechanically connected to the transmission throttle valve in the valve body by the “D” shaped opening in the bottom of the TTVA shaft.

The Transmission Throttle Valve Actuator (TTVA) does not require any mechanical adjustments. All changes in throttle valve position are controlled by the Engine Control Module (ECM).

The TTVA does require an initialization period after the actuator has been removed or replaced. After the actuator has been removed or replaced, move the ignition to the ON position for thirty (30) seconds. This will allow the ECM sufficient time to perform the internal calibration procedures to learn the TTVA’s current “zero” position.

- **When Monitored:**
  Ignition on and with or without engine running with transmission in the park or neutral position. Note: Not monitored when either the engine is cranking or while vehicle is moving.
- **Set Condition:**
  Each time the ignition is cycled to the on position, the ECM commands a TTVA internal calibration procedure (autozero) to determine the zero position. If the TTVA does not reach a calibrated minimum position in a predetermined amount of time, the DTC will set.

Possible Causes
TRANSMISSION THROTTLE VALVE ACTUATOR BINDING
TRANSMISSION THROTTLE VALVE COMPONENTS
TRANSMISSION THROTTLE VALVE ACTUATOR

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 5

P1751-TRANSMISSION THROTTLE VALVE POSITION MINIMUM RANGE PERFORMANCE (CONTINUED)

2. CHECK TTVA FOR SIGNS OF DAMAGE

Turn the ignition off to the lock position.

Visually inspect the TTVA shaft for any signs of external damage or improperly mounted.

NOTE: It is not necessary to remove the TTVA to perform this procedure.

Is the TTVA damaged or improperly mounted?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 3

---

3. CHECK THE TTVA POSITIONS WITH THE AUTO ZERO FEATURE

NOTE: Each time the ignition is cycled to the on position, the ECM commands a TTVA internal calibration procedure (autozero) to determine the zero position. Do not press on the accelerator pedal during this test.

With the scan tool, monitor the TTVA position during the autozero test.

Ignition on, engine not running.

Is the TTVA position between 3 and 26 degrees after completion of the autozero test?

Yes >> Go To 5

No >> Go To 4

---

4. CHECK THE TRANSMISSION THROTTLE VALVE

Turn the ignition off to the lock position.

Remove the TTVA from the transmission per the Service Information.

Properly support the TTVA and reconnect the TTVA wiring harness.

Like in the previous step, with the scan tool, monitor the TTVA position during the autozero test.

Ignition on, engine not running.

Is the TTVA position between 3 and 26 degrees after completion of the autozero test?

Yes >> Repair internal transmission as necessary. Refer to the Service Information for proper repair procedures for components related to the Transmission Throttle Valve.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the TTVA per the Service Information.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

P1751-TRANSMISSION THROTTLE VALVE POSITION MINIMUM RANGE PERFORMANCE (CONTINUED)

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

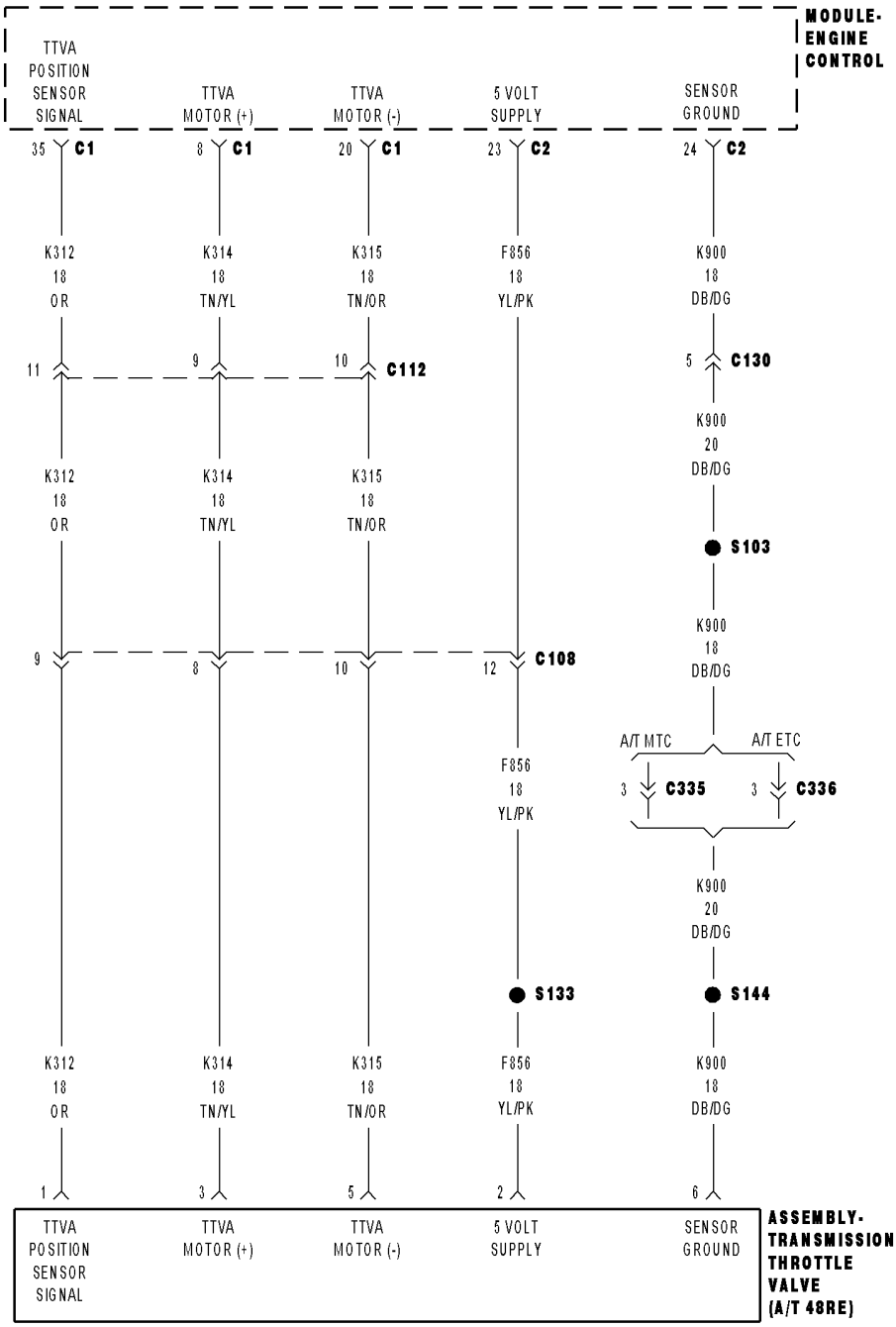
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

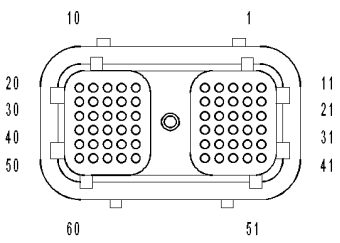
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

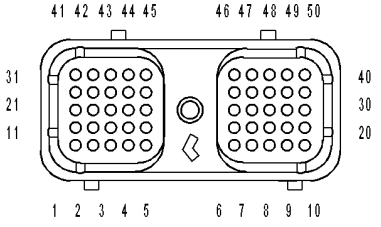
No >> Test Complete.

P1752-TRANSMISSION THROTTLE VALVE SPAN PERFORMANCE

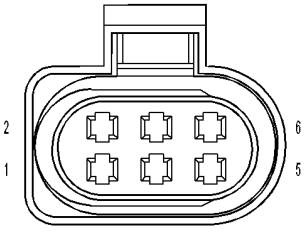




MODULE-ENGINE CONTROL C1



MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION THROTTLE VALVE (A/T 48RE)

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P1752-TRANSMISSION THROTTLE VALVE SPAN PERFORMANCE (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The transmission throttle valve cable has been replace by the transmission throttle valve actuator (TTVA). The TTVA consists of an electric DC motor, two potentiometers, and a gear drive system. The TTVA is mechanically connected to the transmission throttle valve in the valve body by the “D” shaped opening in the bottom of the TTVA shaft.

The Transmission Throttle Valve Actuator (TTVA) does not require any mechanical adjustments. All changes in throttle valve position are controlled by the Engine Control Module (ECM).

The TTVA does require an initialization period after the actuator has been removed or replaced. After the actuator has been removed or replaced, move the ignition to the ON position for thirty (30) seconds. This will allow the ECM sufficient time to perform the internal calibration procedures to learn the TTVA’s current “zero” position.

- **When Monitored:**
  Ignition on and with or without engine running with transmission in the park or neutral position. Note: Not monitored when either the engine is cranking or while vehicle is moving.
- **Set Condition:**
  Each time the ignition is cycled to the on position, the ECM commands a TTVA internal calibration procedure (autozero) to determine the zero position. After completion of the autozero procedure, the TTVA is instructed to perform a span check to record the minimum and maximum span positions. This DTC will set if the minimum total span is not achieved.

Possible Causes
TRANSMISSION THROTTLE VALVE ACTUATOR BINDING
TRANSMISSION THROTTLE VALVE
INTERNAL TRANSMISSION

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.
With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 5

P1752-TRANSMISSION THROTTLE VALVE SPAN PERFORMANCE (CONTINUED)

2. CHECK TTVA FOR SIGNS OF DAMAGE

Turn the ignition off to the lock position.

Visually inspect the TTVA shaft for any signs of external damage or improperly mounted.

NOTE: It is not necessary to remove the TTVA to perform this procedure.

Is the TTVA damaged or improperly mounted?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 3

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3. CHECK THE TTVA POSITIONS WITH THE AUTO ZERO FEATURE

NOTE: Each time the ignition is cycled to the on position, the ECM commands a TTVA internal calibration procedure (autozero) to determine the zero position.

With the scan tool, monitor the TTVA position during the autozero test.

Ignition on, engine not running.

After the autozero test is completed, record the position percentage value.

Press and hold the accelerator pedal to full throttle after completion of the autozero test and record.

After completion of the autozero test and recording the autozero value, press and hold the accelerator pedal to full throttle and record the autozero value on the scan tool.

Subtract the TTVA full throttle value from the value recorded after the autozero test.

Is the difference between the two values greater than or equal to 48 degrees?

Yes >> Go To 5

No >> Go To 4

P1752-TRANSMISSION THROTTLE VALVE SPAN PERFORMANCE (CONTINUED)

4. CHECK THE TRANSMISSION THROTTLE VALVE

Turn the ignition off to the lock position.

Remove the TTVA from the transmission per the Service Information.

Properly support the TTVA and reconnect the TTVA wiring harness.

Like in the previous step, with the scan tool, monitor the TTVA position during the autozero test.

Ignition on, engine not running.

After the autozero test is completed, record the position percentage value.

Press and hold the accelerator pedal to full throttle after completion of the autozero test and record.

After completion of the autozero test and recording the autozero value, press and hold the accelerator pedal to full throttle and record the autozero value on the scan tool.

Subtract the TTVA full throttle value from the value recorded after the autozero test.

Is the difference between the two values greater than or equal to 48 degrees?

Yes >> Repair internal transmission as necessary. Refer to the Service Information for proper repair procedures for components related to the Transmission Throttle Valve.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the TTVA per the Service Information.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

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5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

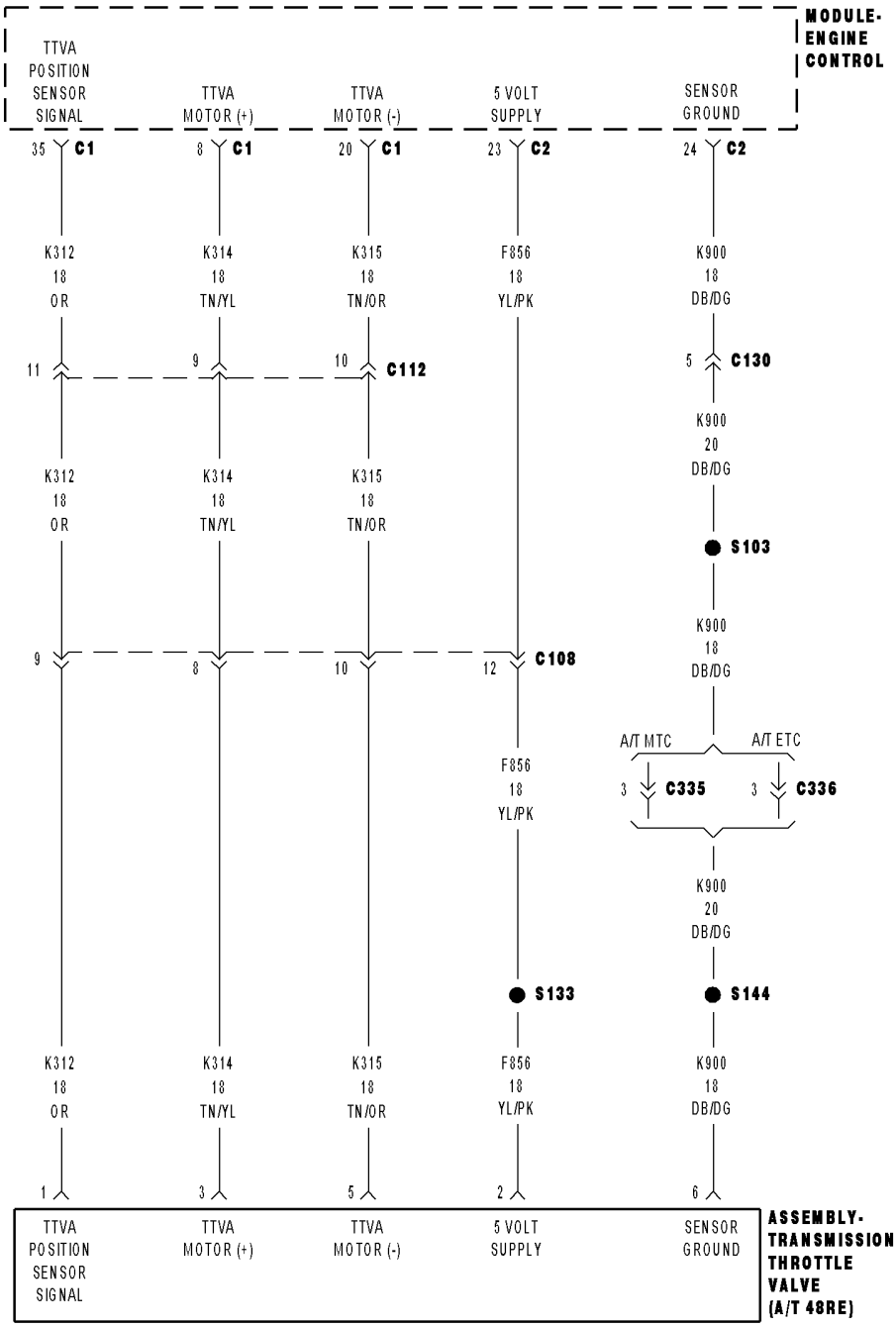
Were there any problems found?

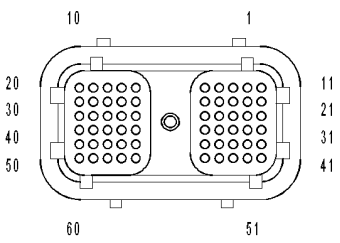
Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

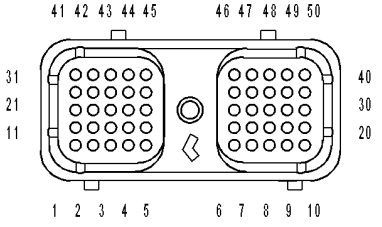
No >> Test Complete.

P1753-TRANSMISSION THROTTLE VALVE MECHANICAL PERFORMANCE

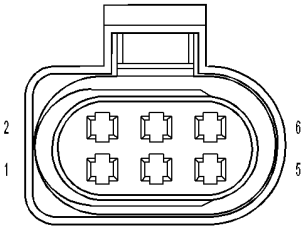




MODULE-ENGINE CONTROL C1



MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION THROTTLE VALVE (A/T 48RE)

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P1753-TRANSMISSION THROTTLE VALVE MECHANICAL PERFORMANCE (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The transmission throttle valve cable has been replace by the transmission throttle valve actuator (TTVA). The TTVA consists of an electric DC motor, two potentiometers, and a gear drive system. The TTVA is mechanically connected to the transmission throttle valve in the valve body by the “D” shaped opening in the bottom of the TTVA shaft.

The Transmission Throttle Valve Actuator (TTVA) does not require any mechanical adjustments. All changes in throttle valve position are controlled by the Engine Control Module (ECM).

The TTVA does require an initialization period after the actuator has been removed or replaced. After the actuator has been removed or replaced, move the ignition to the ON position for thirty (30) seconds. This will allow the ECM sufficient time to perform the internal calibration procedures to learn the TTVA’s current “zero” position.

- **When Monitored:**
  Ignition on, engine running in a valid forward gear with a throttle opening greater than 50% and the transmission in overdrive.
- **Set Condition:**
  When the Governor pressure is below a minimum threshold when conditions indicate that the Governor pressure should be high. This DTC indicates that the TTVA is working properly electronically but mechanically the output shaft is not moving the Throttle Valve in the transmission.

Possible Causes
BROKEN OR STRIPPED LINKAGE BETWEEN THE TTVA OUTPUT SHAFT AND THE THROTTLE VALVE
TRANSMISSION THROTTLE VALVE ACTUATOR
TRANSMISSION THROTTLE VALVE COMPONENTS

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK FOR GOVERNOR PRESSURE DTCS

Ignition on, engine not running.

With the scan tool, check Engine DTCs.

Are there any Governor Pressure related DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

P1753-TRANSMISSION THROTTLE VALVE MECHANICAL PERFORMANCE (CONTINUED)

2. CHECK TTVA FOR SIGNS OF DAMAGE

Turn the ignition off to the lock position.

Visually inspect the TTVA shaft for any signs of external damage or improperly mounted.

NOTE: It is not necessary to remove the TTVA to perform this procedure.

Is the TTVA damaged or improperly mounted?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 3

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3. CHECK IF TTVA SHAFT END IS DAMAGED

Turn the ignition off to the lock position.

Remove the TTVA from the transmission per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/THROTTLE VALVE ACTUATOR - REMOVAL)

Inspect the end of the TTVA shaft for cracks or damage.

NOTE: The end of the TTVA should be keyed or "D" shaped and fit tightly over the Throttle Valve shaft.

Is the end of the TTVA shaft undamaged and fit tightly over the Throttle Valve shaft?

Yes >> Go To 4

No >> Inspect the Throttle Valve shaft on the transmission for free movement. If the Throttle valve does not move freely, inspect internal transmission components related to the Throttle Valve and replace as necessary. Replace the TTVA in either case. Refer to the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/THROTTLE VALVE ACTUATOR - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

P1753-TRANSMISSION THROTTLE VALVE MECHANICAL PERFORMANCE (CONTINUED)

4. CHECK THE TRANSMISSION THROTTLE VALVE ACTUATOR

Properly support the TTVA to where the end of the shaft can be observed and reconnect the TTVA wiring harness.

NOTE: Each time the ignition is cycled to the on position, the ECM commands a TTVA internal calibration procedure (autozero) to determine the zero position. Do not press on the accelerator pedal during this test.
Ignition on, engine not running.

Observe the output shaft of the TTVA during the autozero procedure.

After completion of the autozero procedure, while observing the TTVA shaft, press the accelerator pedal to full throttle.

Does the TTVA internal motor move the TTVA shaft?

Yes >> Inspect the Throttle Valve shaft on the transmission for free movement. If the Throttle valve does not move freely, inspect internal transmission components related to the Throttle Valve and repair or replace as necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/THROTTLE VALVE ACTUATOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the TTVA per the Service Information.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

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5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

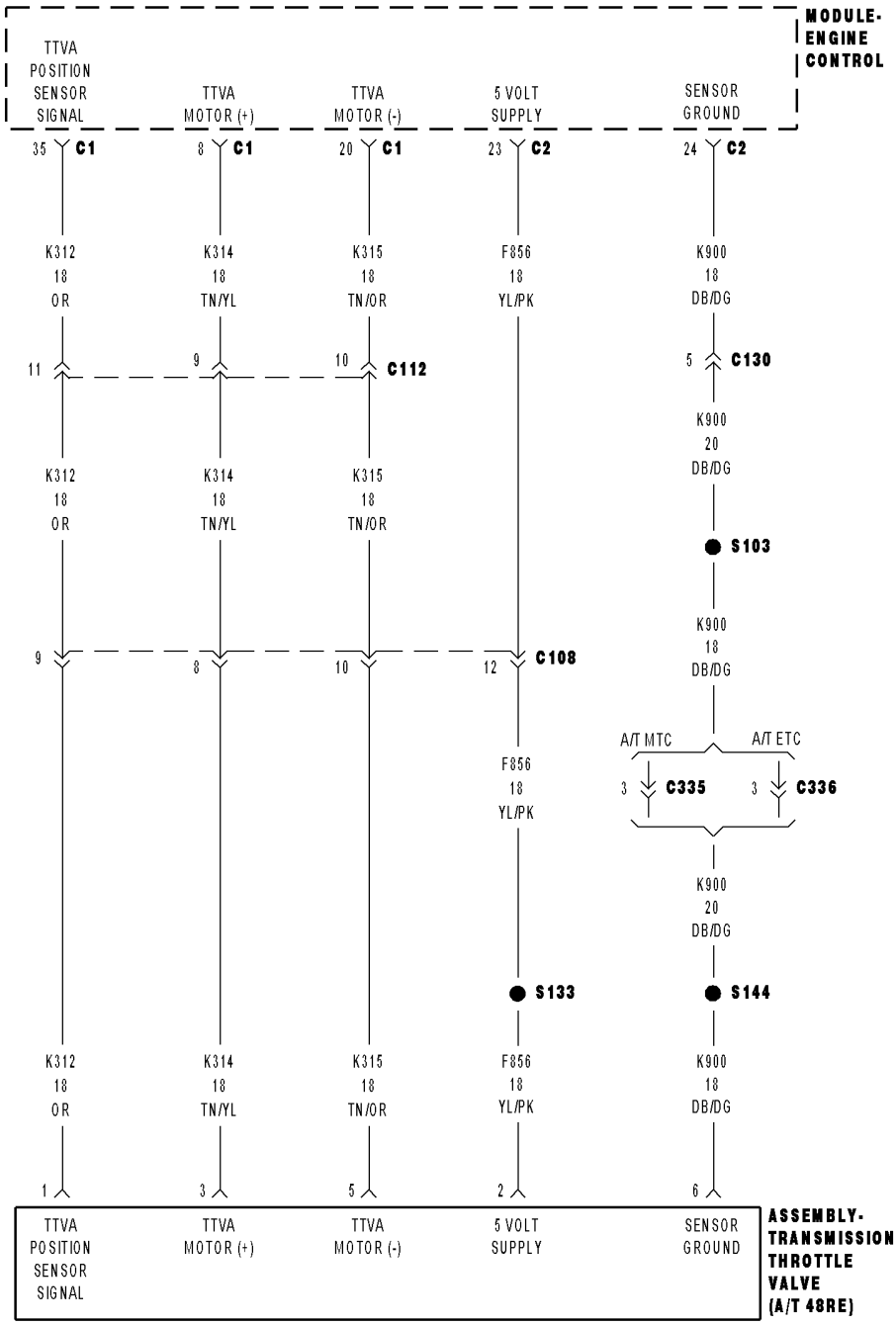
Were there any problems found?

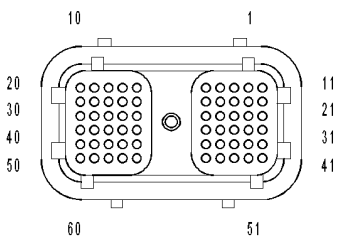
Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

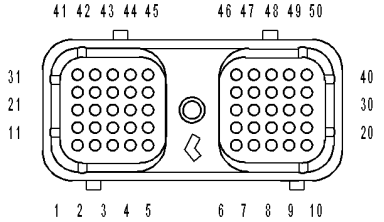
No >> Test Complete.

P1754-TRANSMISSION THROTTLE VALVE ACTUATOR STUCK

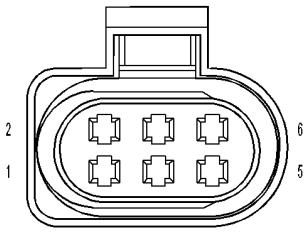




MODULE-ENGINE CONTROL C1



MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION THROTTLE VALVE (A/T 48RE)

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P1754-TRANSMISSION THROTTLE VALVE ACTUATOR STUCK (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The transmission throttle valve cable has been replace by the transmission throttle valve actuator (TTVA). The TTVA consists of an electric DC motor, two potentiometers, and a gear drive system. The TTVA is mechanically connected to the transmission throttle valve in the valve body by the “D” shaped opening in the bottom of the TTVA shaft.

The Transmission Throttle Valve Actuator (TTVA) does not require any mechanical adjustments. All changes in throttle valve position are controlled by the Engine Control Module (ECM).

The TTVA does require an initialization period after the actuator has been removed or replaced. After the actuator has been removed or replaced, move the ignition to the ON position for thirty (30) seconds. This will allow the ECM sufficient time to perform the internal calibration procedures to learn the TTVA’s current “zero” position.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The monitored TTVA position sensor does not indicate a change in position when the TTVA is commanded to change the position.

Possible Causes
(F856) 5 VOLT SUPPLY CIRCUIT OPEN
(K314) TTVA MOTOR (+) CIRCUIT OPEN
(K315) TTVA MOTOR (-) CIRCUIT OPEN
(K314) TTVA MOTOR (+) CIRCUIT SHORT TO GROUND
(K315) TTVA MOTOR (-) CIRCUIT SHORT TO GROUND
(K314) TTVA MOTOR (+) CIRCUIT SHORT TO VOLTAGE
(K315) TTVA MOTOR (-) CIRCUIT SHORT TO VOLTAGE
(K314) TTVA MOTOR (+) CIRCUIT SHORT TO ANOTHER CIRCUIT
(K315) TTVA MOTOR (-) CIRCUIT SHORT TO ANOTHER CIRCUIT
TRANSMISSION THROTTLE VALVE COMPONENTS
TRANSMISSION THROTTLE VALVE ACTUATOR
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1754-TRANSMISSION THROTTLE VALVE ACTUATOR STUCK (CONTINUED)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.
With the scan tool, read Engine DTCs.
Record the Freeze Frame data for the reported DTC.
With the scan tool, erase DTCs.
Turn the ignition off to the lock position.
Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.
With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2

No >> Go To 16

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2. CHECK THE TTVA POSITIONS WITH THE AUTO ZERO FEATURE

NOTE: Each time the ignition is cycled to the on position, the ECM commands a TTVA internal calibration procedure (autozero) to determine the zero position.
With the scan tool, monitor the TTVA position during the autozero test.
Ignition on, engine not running.
After the autozero test is completed, record the position percentage value.
Press and hold the accelerator pedal to full throttle after completion of the autozero test and record.
Subtract the TTVA full throttle value from the value recorded after the autozero test.

Is the difference between the two values greater than or equal to 48 degrees?

Yes >> Go To 16

No >> Go To 3

---

3. CHECK TTVA FOR SIGNS OF DAMAGE

Turn the ignition off to the lock position.
Visually inspect the TTVA shaft for any signs of external damage or improperly mounted.

NOTE: It is not necessary to remove the TTVA to perform this procedure.

Is the TTVA damaged or improperly mounted?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 4

P1754-TRANSMISSION THROTTLE VALVE ACTUATOR STUCK (CONTINUED)

4. CHECK THE TTVA POSITIONS WITH THE TTVA REMOVED

Turn the ignition off to the lock position.

Remove the TTVA from the transmission per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/THROTTLE VALVE ACTUATOR - REMOVAL)

NOTE: Check connectors - Clean/repair as necessary.

NOTE: Each time the ignition is cycled to the on position, the ECM commands a TTVA internal calibration procedure (autozero) to determine the zero position.

Properly support the TTVA and reconnect the TTVA wiring harness.

With the scan tool, monitor the TTVA position during the autozero test.

Ignition on, engine not running.

After the autozero test is completed, record the position percentage value.

After recording the position percentage value, press and hold the accelerator pedal to full throttle and note position percentage value.

Subtract the TTVA full throttle value from the value recorded after the autozero test.

Is the difference between the two values greater than or equal to 48 degrees?

Yes >> Repair internal transmission as necessary. Refer to the Service Information for proper repair procedures for components related to the Transmission Throttle Valve.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 5

5. CHECK THE TTVA

Turn the ignition off to the lock position.

Disconnect the TTVA harness connector

Connect a 12-volt test light between the (K314) TTVA Motor (+) circuit and the (K315) TTVA Motor (-) circuit in the TTVA harness connector.

Monitor the test light in the following step.

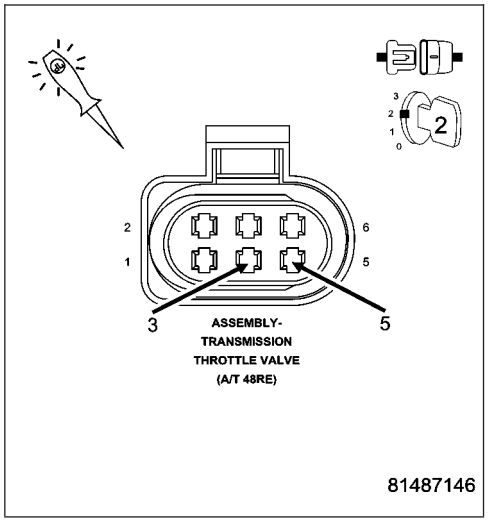
NOTE: The test light should momentarily flash brightly, one time, immediately after the ignition is turned to the on position.

Ignition on, engine not running.

Did the test light illuminate brightly one time after turning the ignition to the on position?

Yes >> Go To 6

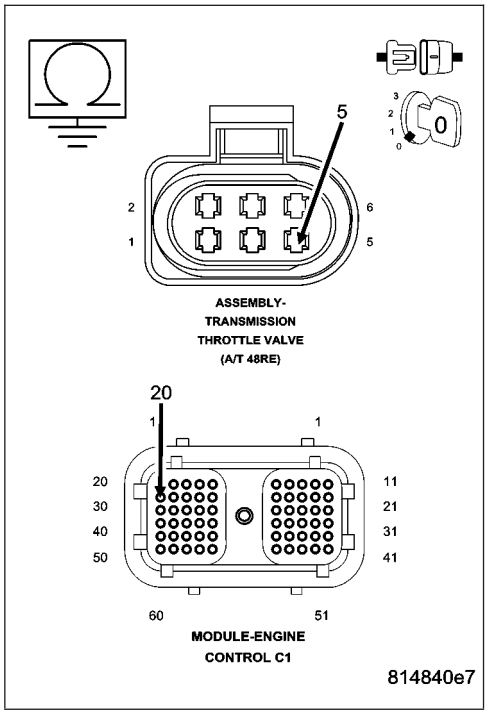
No >> Go To 7



P1754-TRANSMISSION THROTTLE VALVE ACTUATOR STUCK (CONTINUED)

6. CHECK THE (K315) TTVA MOTOR (-) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (K315) TTVA Motor (-) circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (K315) TTVA Motor (-) circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

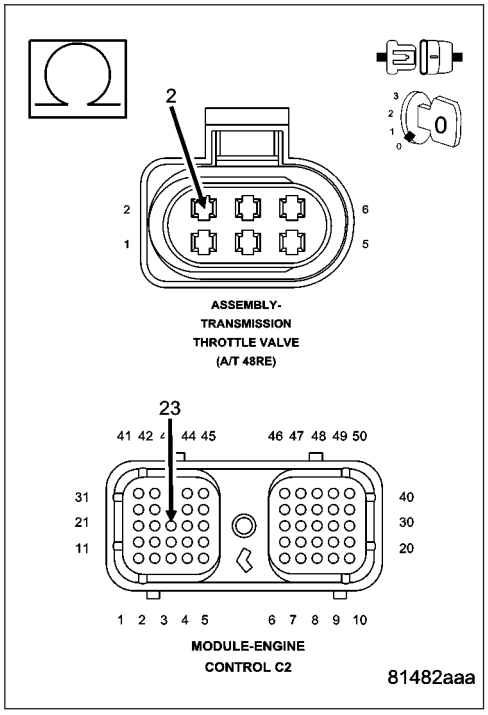
No >> Replace the TTVA per the Service Information (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/ THROTTLE VALVE ACTUATOR - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

7. CHECK THE (F856) 5 VOLT SUPPLY CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Disconnect the ECM C1 and C2 harness connectors.

Measure the resistance of the (F856) 5-volt Supply circuit between the ECM C2 harness connector and the TTVA harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Repair the (F856) 5-volt Supply circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

P1754-TRANSMISSION THROTTLE VALVE ACTUATOR STUCK (CONTINUED)

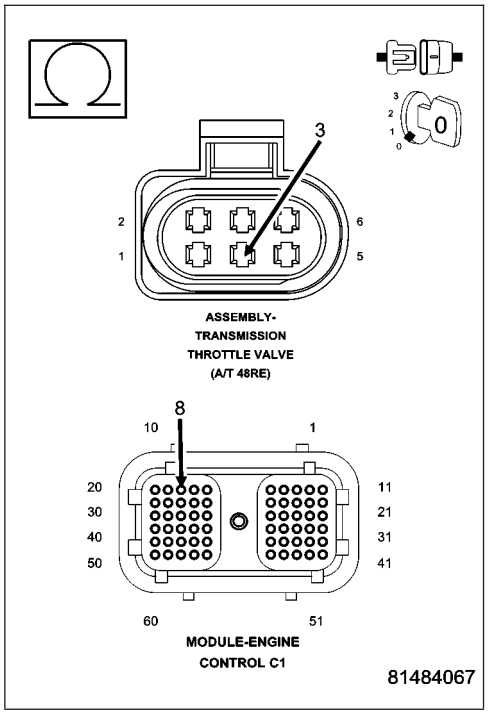
8. CHECK THE (K314) TTVA MOTOR (+) CIRCUIT FOR AN OPEN

Measure the resistance of the (K314) TTVA Motor (+) circuit between the ECM C1 harness connector and the TTVA harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the (K314) TTVA Motor (+) circuit for an open. Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)



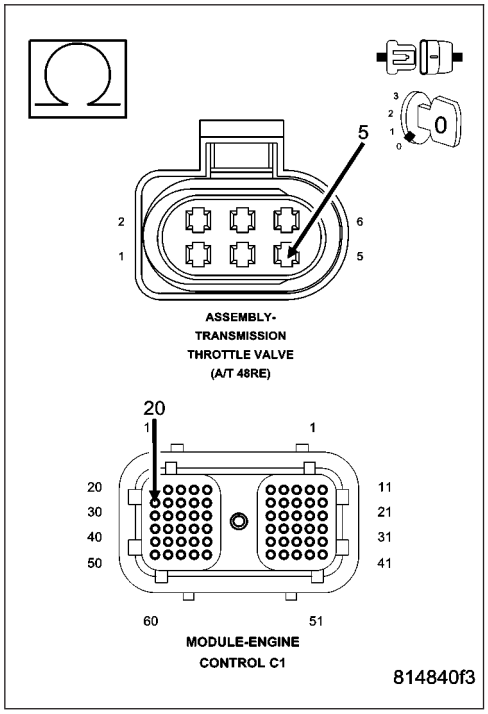
9. CHECK THE (K315) TTVA MOTOR (-) CIRCUIT FOR AN OPEN

Measure the resistance of the (K315) TTVA Motor (-) circuit between the ECM C1 harness connector and the TTVA harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 10

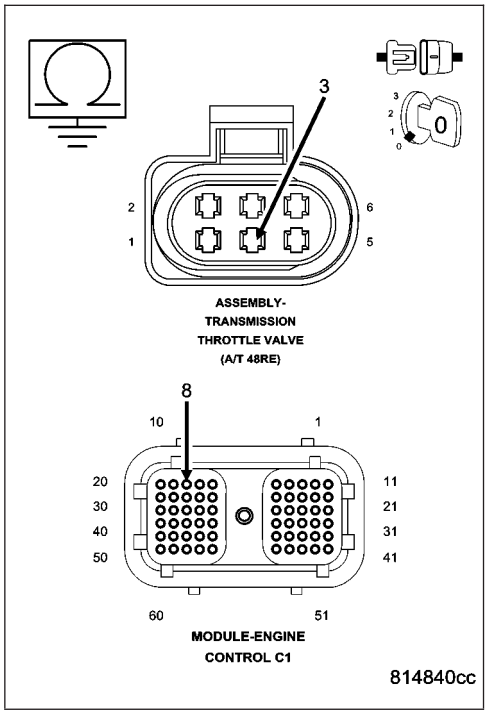
No >> Repair the (K315) TTVA Motor (-) circuit for an open. Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)



P1754-TRANSMISSION THROTTLE VALVE ACTUATOR STUCK (CONTINUED)

10. CHECK THE (K314) TTVA MOTOR (+) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (K314) TTVA Motor (+) circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (K314) TTVA Motor (+) circuit for a short to ground.

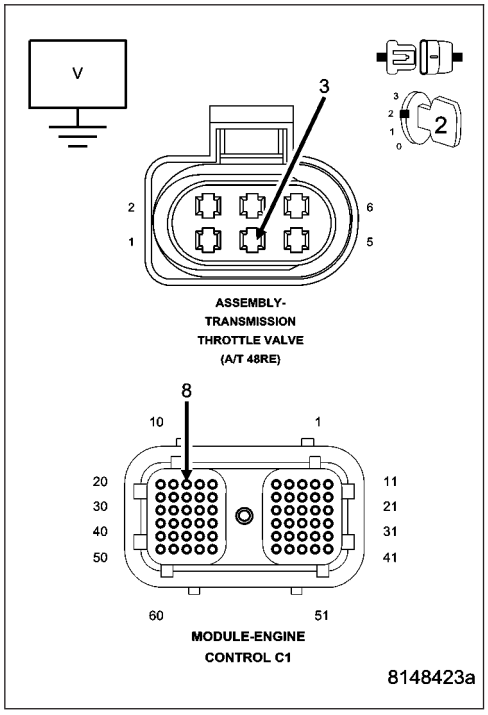
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 11

11. CHECK THE (K314) TTVA MOTOR (+) CIRCUIT FOR A SHORT TO VOLTAGE

Ignition on, engine not running.

Measure the voltage of the (K314) TTVA Motor (+) circuit.



Is the voltage above 0.5 volts?

Yes >> Repair the (K314) TTVA Motor (+) circuit for a short to voltage.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 12

P1754-TRANSMISSION THROTTLE VALVE ACTUATOR STUCK (CONTINUED)

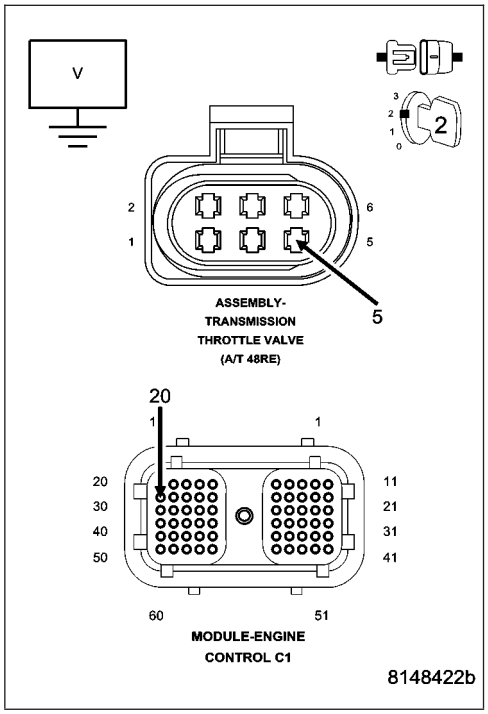
12. CHECK THE (K315) TTVA MOTOR (-) CIRCUIT FOR A SHORT TO VOLTAGE

Measure the voltage of the (K315) TTVA Motor (-) circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (K315) TTVA Motor (-) circuit for a short to voltage.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 13



13. CHECK THE (K314) TTVA MOTOR (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

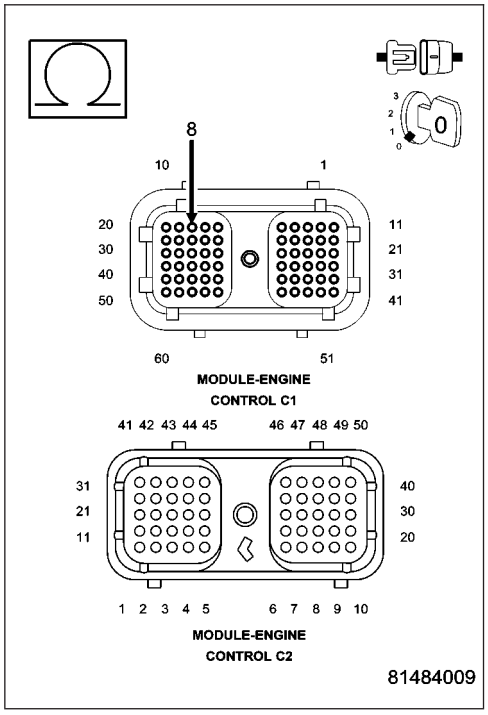
Turn the ignition off to the lock position.

Measure the resistance between the (K314) TTVA Motor (+) circuit and every other circuit in the ECM C1 and C2 harness connectors

Is the resistance below 5.0 ohms between the (K314) TTVA Motor (+) circuit and any other circuit in the ECM C1 and C2 harness connectors?

Yes >> Repair the (K314) TTVA Motor (+) for a short to another circuit(s).
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 14



P1754-TRANSMISSION THROTTLE VALVE ACTUATOR STUCK (CONTINUED)

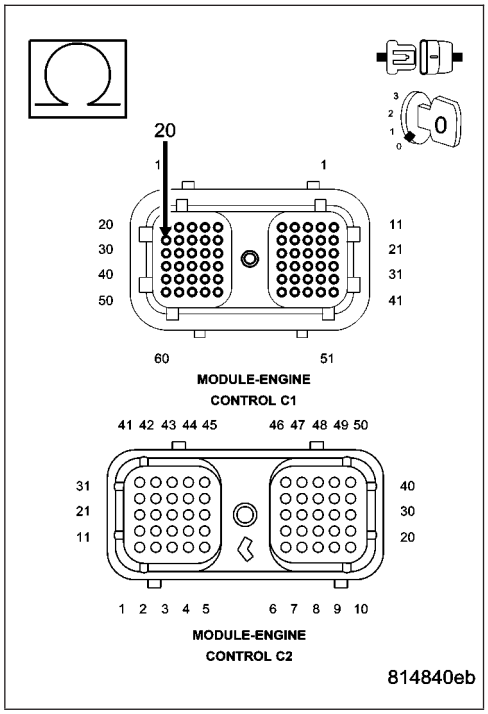
14. CHECK THE (K315) TTVA MOTOR (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Measure the resistance between the (K315) TTVA Motor (-) circuit and every other circuit in the ECM C1 and C2 harness connectors

Is the resistance below 5.0 ohms between the (K315) TTVA Motor (-) circuit and any other circuit in the ECM C1 and C2 harness connectors?

Yes >> Repair the (K315) TTVA Motor (-) for a short to another circuit(s).
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 15



15. CHECK THE ECM OPERATION

Turn the ignition off to the lock position.

Reconnect all previously disconnected connectors.

Turn the ignition on for the period of 30 seconds to allow the ECM to reset.

Turn the ignition off to the lock position.

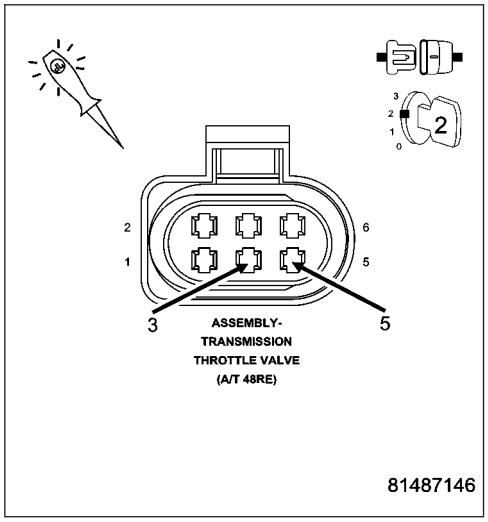
Disconnect the TTVA harness connector

Connect a 12-volt test light between the (K314) TTVA Motor (+) circuit and the (K315) TTVA Motor (-) circuit in the TTVA harness connector.

Monitor the test light in the following step.

NOTE: The test light should momentarily flash brightly, one time, immediately after the ignition is turned to the on position.
Ignition on, engine not running.

Did the test light illuminate brightly one time after turning the ignition to the on position?



Yes >> Go To 16

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

P1754-TRANSMISSION THROTTLE VALVE ACTUATOR STUCK (CONTINUED)

16. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

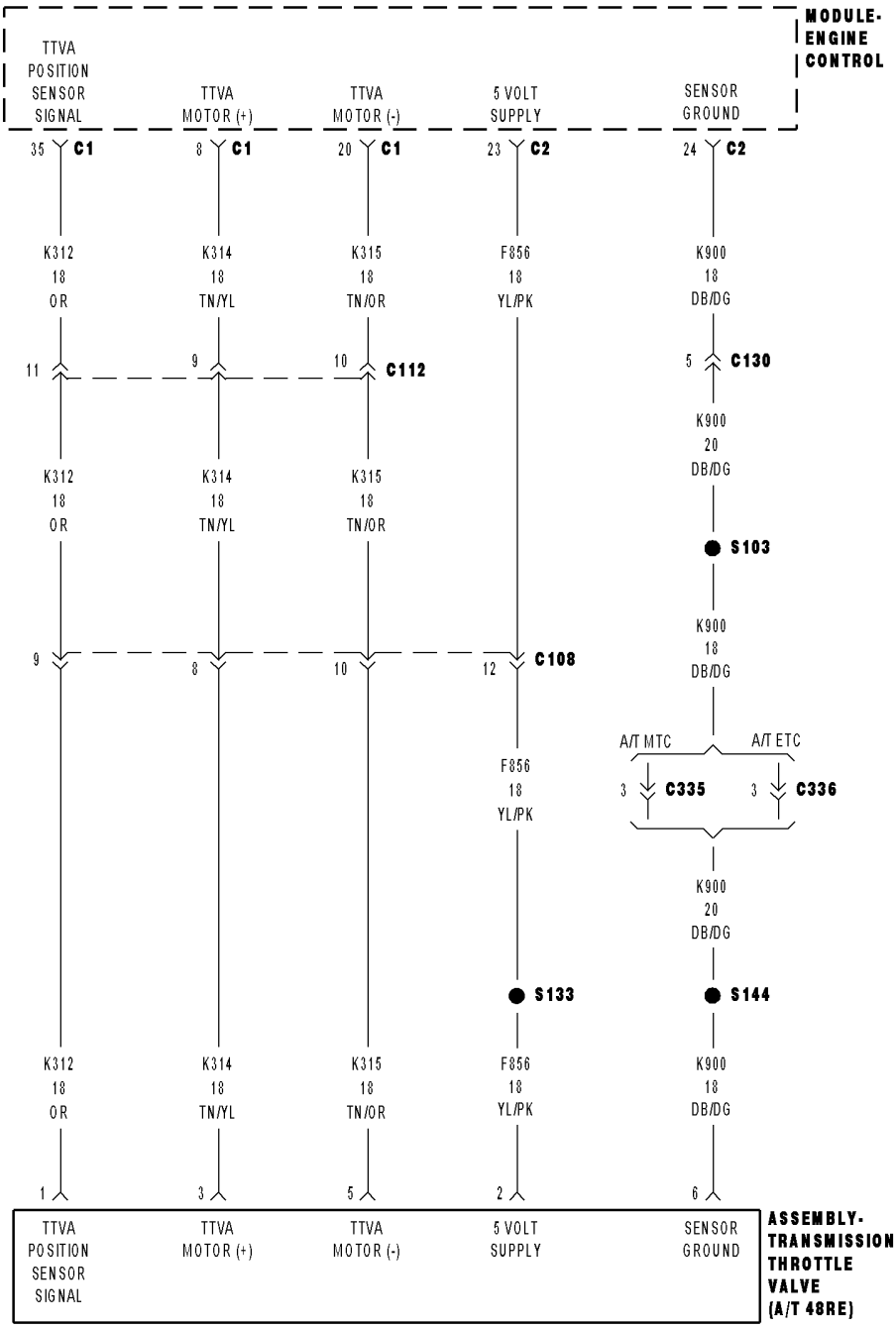
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

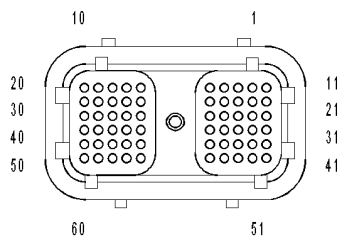
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

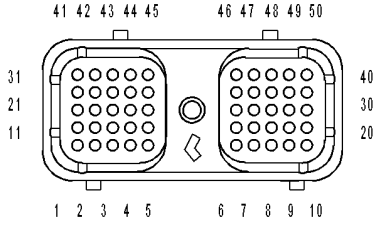
No >> Test Complete.

P1755-TRANSMISSION THROTTLE VALVE CONTROL CIRCUIT

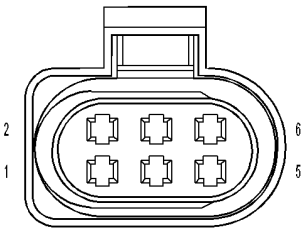




MODULE-ENGINE CONTROL C1



MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION THROTTLE VALVE (A/T 48RE)

81482a8c

P1755-TRANSMISSION THROTTLE VALVE CONTROL CIRCUIT (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The transmission throttle valve cable has been replace by the transmission throttle valve actuator (TTVA). The TTVA consists of an electric DC motor, two potentiometers, and a gear drive system. The TTVA is mechanically connected to the transmission throttle valve in the valve body by the “D” shaped opening in the bottom of the TTVA shaft.

The Transmission Throttle Valve Actuator (TTVA) does not require any mechanical adjustments. All changes in throttle valve position are controlled by the Engine Control Module (ECM).

The TTVA does require an initialization period after the actuator has been removed or replaced. After the actuator has been removed or replaced, move the ignition to the ON position for thirty (30) seconds. This will allow the ECM sufficient time to perform the internal calibration procedures to learn the TTVA’s current “zero” position.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The current detected on the TTVA circuit is greater than a threshold for a calibrated amount of time or the feedback to the controller does not match the intended state.

Possible Causes
(F856) 5 VOLT SUPPLY CIRCUIT OPEN
(K314) TTVA MOTOR (+) CIRCUIT OPEN
(K315) TTVA MOTOR (-) CIRCUIT OPEN
(K314) TTVA MOTOR (+) CIRCUIT SHORT TO GROUND
(K315) TTVA MOTOR (-) CIRCUIT SHORT TO GROUND
(K314) TTVA MOTOR (+) CIRCUIT SHORT TO VOLTAGE
(K315) TTVA MOTOR (-) CIRCUIT SHORT TO VOLTAGE
(K314) TTVA MOTOR (+) CIRCUIT SHORT TO ANOTHER CIRCUIT
(K315) TTVA MOTOR (-) CIRCUIT SHORT TO ANOTHER CIRCUIT
INTERNAL TRANSMISSION
TRANSMISSION THROTTLE VALVE ACTUATOR
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1755-TRANSMISSION THROTTLE VALVE CONTROL CIRCUIT (CONTINUED)

Diagnostic Test

1. CHECK IF THE DTC IS CURRENT

Ignition on, engine not running.
With the scan tool, read Engine DTCs.
Record the Freeze Frame data for the reported DTC.
With the scan tool, erase DTCs.
Turn the ignition off to the lock position.
Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.
With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 2
No >> Go To 12

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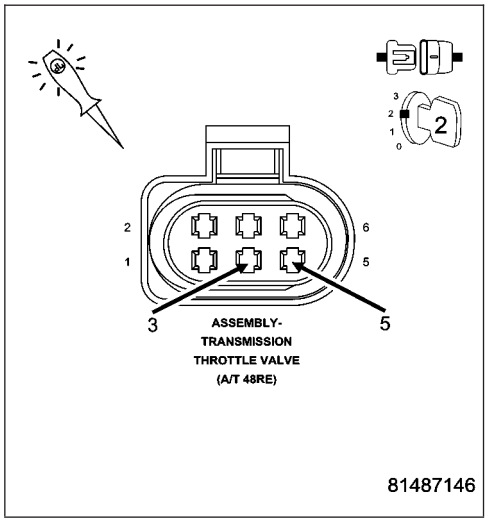
2. CHECK THE TTVA

Turn the ignition off to the lock position.
Disconnect the TTVA harness connector
Connect a 12-volt test light between the (K314) TTVA Motor (+) circuit and the (K315) TTVA Motor (-) circuit in the TTVA harness connector.
Monitor the test light in the following step.

NOTE: The test light should momentarily flash brightly, one time, immediately after the ignition is turned to the on position.
Ignition on, engine not running.

Did the test light illuminate brightly one time after turning the ignition to the on position?

Yes >> Go To 3
No >> Go To 4



P1755-TRANSMISSION THROTTLE VALVE CONTROL CIRCUIT (CONTINUED)

3. CHECK THE (K315) TTVA MOTOR (-) CIRCUIT FOR A SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the ECM C1 harness connector.

Measure the resistance between ground and the (K315) TTVA Motor (-) circuit.

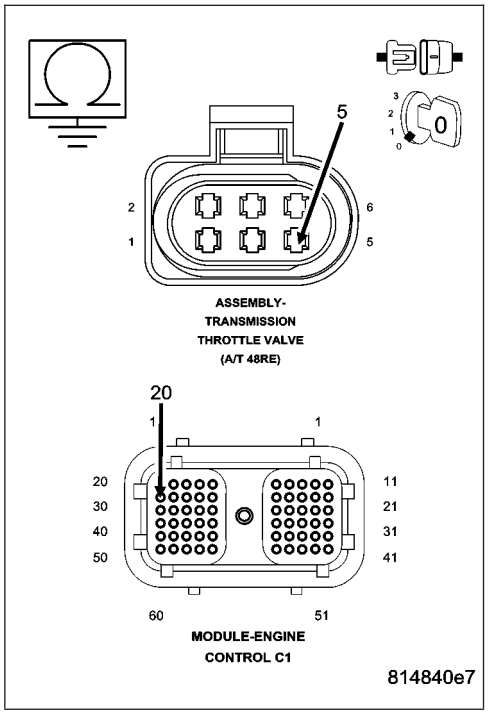
Is the resistance below 5.0 ohms?

Yes >> Repair the (K315) TTVA Motor (-) circuit for a short to ground.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Check the Transmission Throttle Valve components for proper movement or sticking. If no problems are found replace the TTVA per the Service Information (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/ THROTTLE VALVE ACTUATOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)



4. CHECK THE (K314) TTVA MOTOR (+) CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Disconnect the ECM C1 and C2 harness connectors.

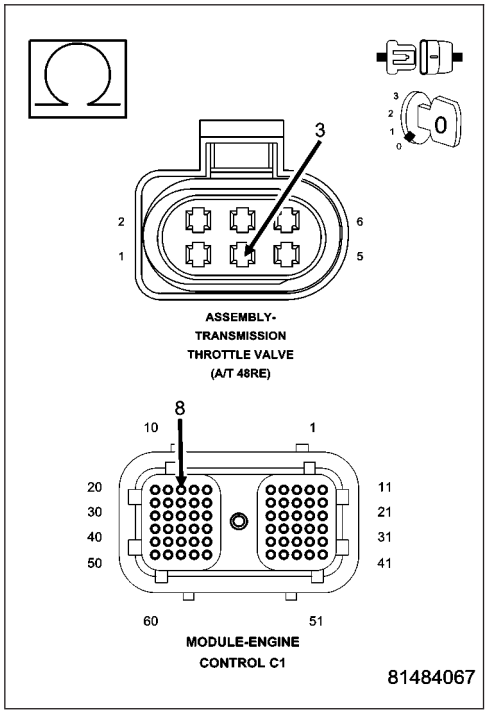
Measure the resistance of the (K314) TTVA Motor (+) circuit between the ECM C1 harness connector and the TTVA harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 5

No >> Repair the (K314) TTVA Motor (+) circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)



P1755-TRANSMISSION THROTTLE VALVE CONTROL CIRCUIT (CONTINUED)

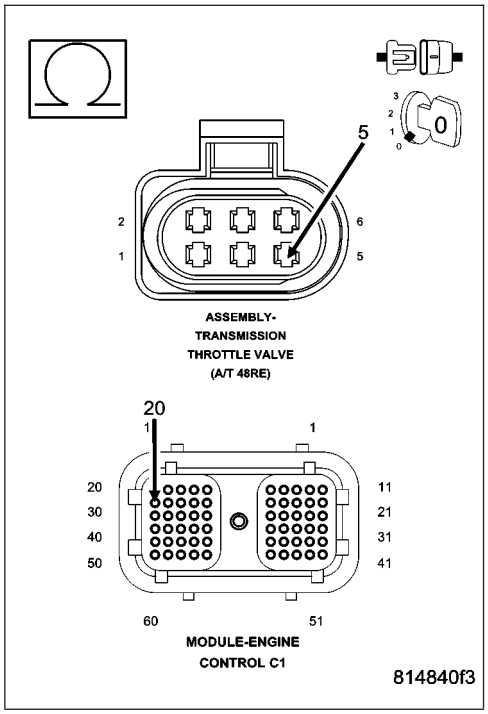
5. CHECK THE (K315) TTVA MOTOR (-) CIRCUIT FOR AN OPEN

Measure the resistance of the (K315) TTVA Motor (-) circuit between the ECM C1 harness connector and the TTVA harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the (K315) TTVA Motor (-) circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)



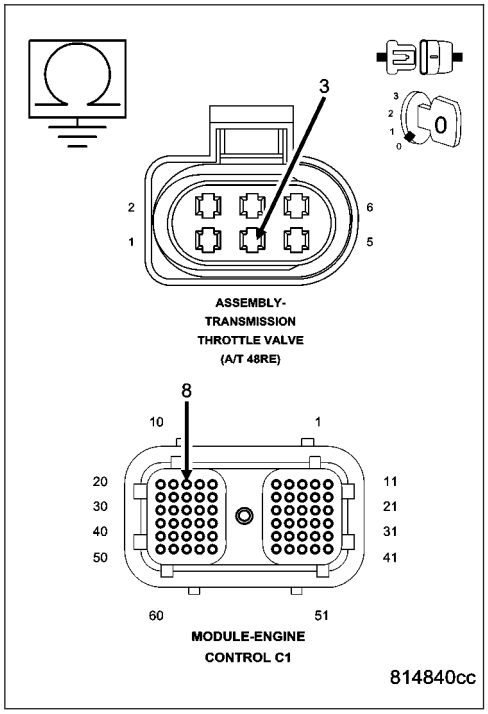
6. CHECK THE (K314) TTVA MOTOR (+) CIRCUIT FOR A SHORT TO GROUND

Measure the resistance between ground and the (K314) TTVA Motor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (K314) TTVA Motor (+) circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 7



P1755-TRANSMISSION THROTTLE VALVE CONTROL CIRCUIT (CONTINUED)

7. CHECK THE (K314) TTVA MOTOR (+) CIRCUIT FOR A SHORT TO VOLTAGE

Ignition on, engine not running.

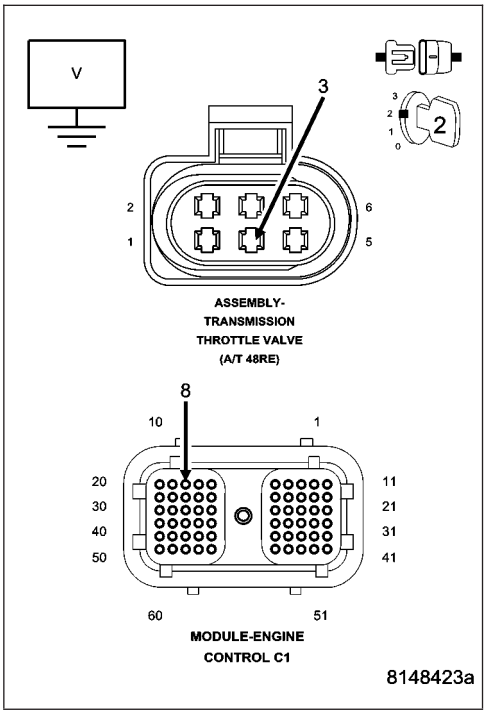
Measure the voltage of the (K314) TTVA Motor (+) circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (K314) TTVA Motor (+) circuit for a short to voltage.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 8



8. CHECK THE (K315) TTVA MOTOR (-) CIRCUIT FOR A SHORT TO VOLTAGE

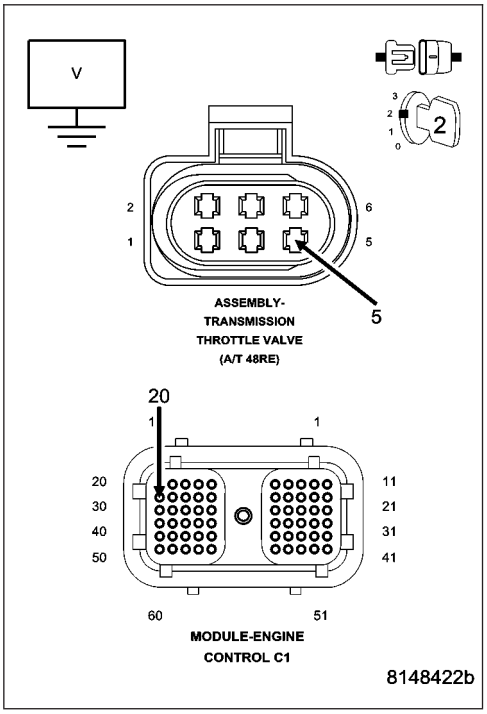
Measure the voltage of the (K315) TTVA Motor (-) circuit.

Is the voltage above 0.5 volts?

Yes >> Repair the (K315) TTVA Motor (-) circuit for a short to voltage.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 9



P1755-TRANSMISSION THROTTLE VALVE CONTROL CIRCUIT (CONTINUED)

9. CHECK THE (K314) TTVA MOTOR (+) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Turn the ignition off to the lock position.

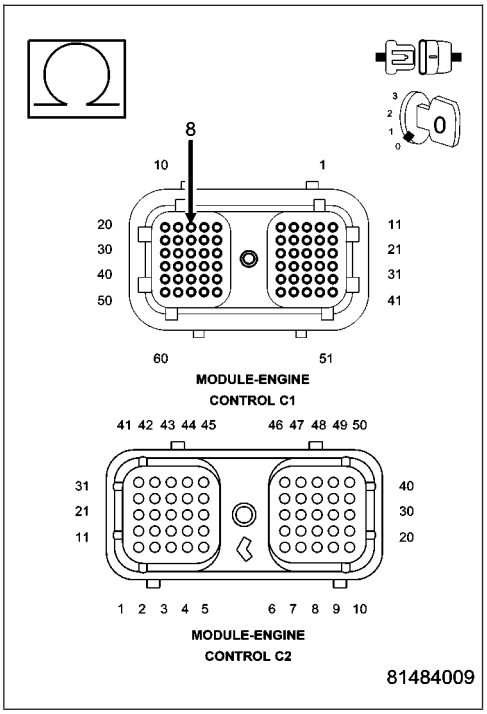
Measure the resistance between the (K314) TTVA Motor (+) circuit and every other circuit in the ECM C1 and C2 harness connectors.

Is the resistance below 5.0 ohms between the (K314) TTVA Motor (+) circuit and any other circuit in the ECM C1 and C2 harness connectors?

Yes >> Repair the (K314) TTVA Motor (+) for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 10



10. CHECK THE (K315) TTVA MOTOR (-) CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

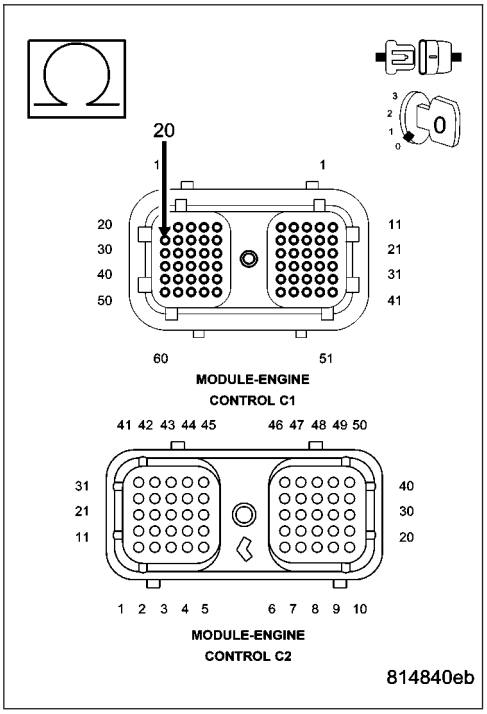
Measure the resistance between the (K315) TTVA Motor (-) circuit and every other circuit in the ECM C1 and C2 harness connectors.

Is the resistance below 5.0 ohms between the (K315) TTVA Motor (-) circuit and any other circuit in the ECM C1 and C2 harness connectors?

Yes >> Repair the (K315) TTVA Motor (-) for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Go To 11



P1755-TRANSMISSION THROTTLE VALVE CONTROL CIRCUIT (CONTINUED)

11. CHECK THE ECM OPERATION

Turn the ignition off to the lock position.

Reconnect all previously disconnected connectors.

Turn the ignition on for the period of 30 seconds to allow the ECM to reset.

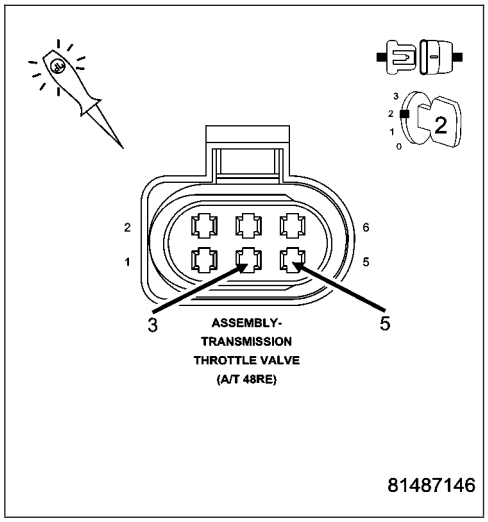
Turn the ignition off to the lock position.

Disconnect the TTVA harness connector.

Connect a 12-volt test light between the (K314) TTVA Motor (+) circuit and the (K315) TTVA Motor (-) circuit in the TTVA harness connector.

Monitor the test light in the following step.

NOTE: The test light should momentarily flash brightly, one time, immediately after the ignition is turned to the on position.
Ignition on, engine not running.



Did the test light illuminate brightly one time after turning the ignition to the on position?

Yes >> Go To 12

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

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12. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

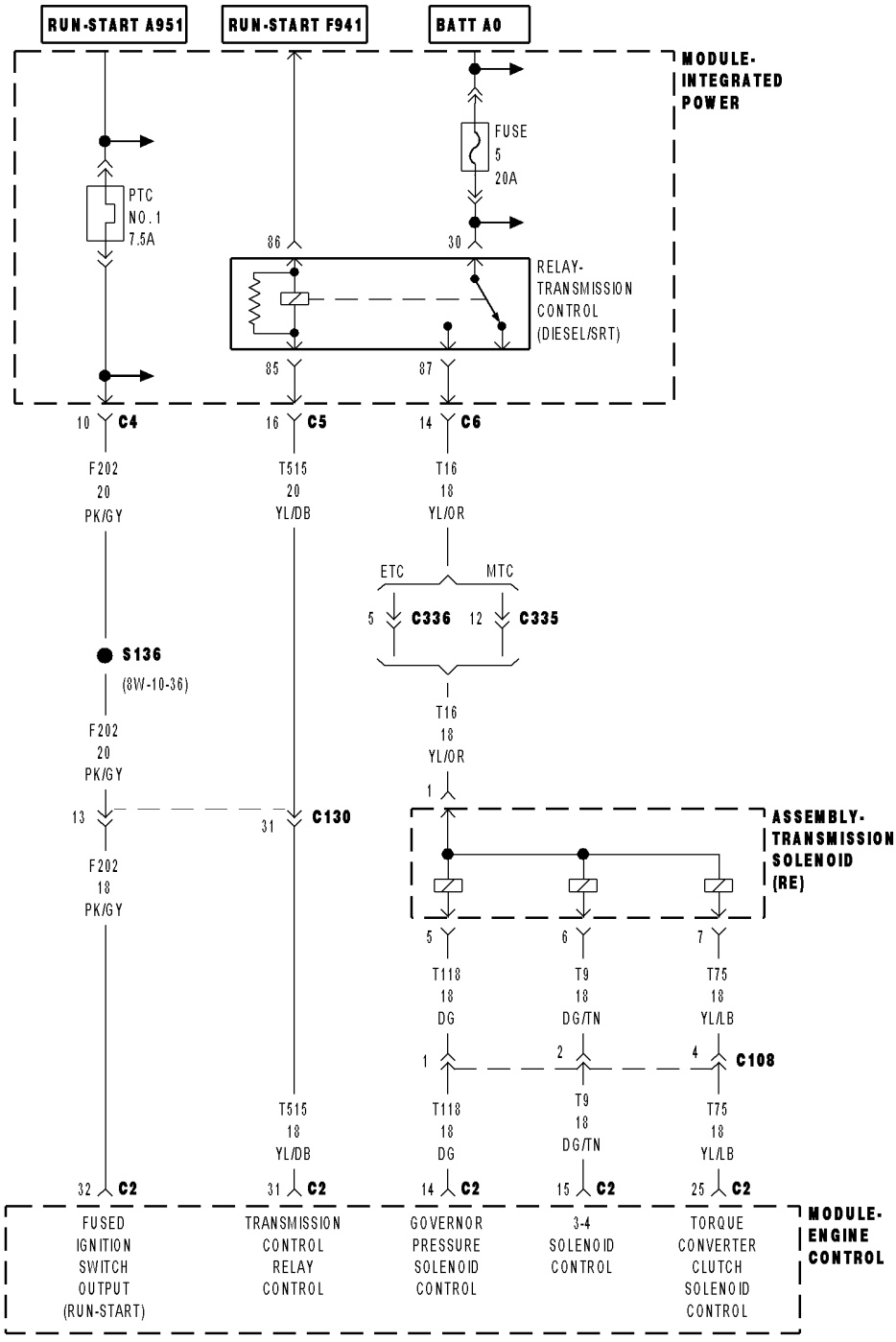
Were there any problems found?

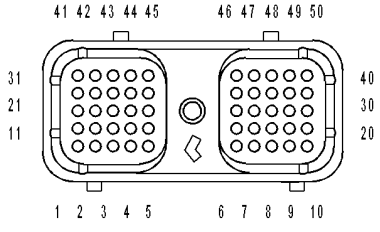
Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

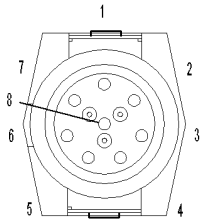
No >> Test Complete.

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (DIESEL)





MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION SOLENOID (RE)

8142abf3

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Control System is used to regulate the governor pressure which controls the shifts for first, second, and third gear. The Governor Pressure Control System test verifies that the requested pressure and the actual pressure are within a predetermined tolerance.

- **When Monitored:**
  While driving and the commanded governor pressure is equal to the pressure required for third gear.
- **Set Condition:**
  If the governor pressure sensor output is less than 407 kPa (60 psi) or greater than 621 kPa (80 psi) when the requested pressure is 407 - 621 kPa (60 - 80 psi) for 2.2 seconds. This DTC will set if there are two trips of five consecutive bad 2.2 second tests with the transmission oil temperature between 23.5 - 88° C (74 - 190° F).

Possible Causes
OTHER TRANSMISSION DTCS PRESENT
5-VOLT SUPPLY CIRCUIT OPEN - EXTERNAL
5-VOLT SUPPLY CIRCUIT OPEN - INTERNAL
GOVERNOR PRESSURE SENSOR
VALVE BODY
INTERNAL TRANSMISSION
ENGINE CONTROL MODULE
TRANSMISSION - INTERNAL DAMAGE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF OTHER TRANSMISSION DTCS ARE PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are any other transmission DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (DIESEL) (CONTINUED)

2. CHECK IF THE GOVERNOR PRESSURE IS ABOVE 3 PSI IN DRIVE

CAUTION: Apply the parking brake.
Start the engine and allow the transmission to reach normal operating temperature above 43° C (110° F).

CAUTION: Apply the brakes.
With the engine at idle, place the gear selector in Drive.
With the scan tool, read the Governor Pressure.

Is the Governor Pressure above 21 kPa (3 psi)?

Yes >> Go To 3

No >> Go To 4

---

3. CHECK IF THE GOVERNOR PRESSURE IS BELOW 3 PSI

Turn the ignition off to the lock position.
Install a pressure gauge at the Governor Pressure test port. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

NOTE: Use the appropriate pressure gauge for the pressure range measured.

CAUTION: Apply the parking brake.
Start the engine and allow the transmission to reach normal operating temperature above 43° C (110° F).

CAUTION: Apply the brakes.
With the engine at idle, place the gear selector in Drive.
Read the governor pressure on the pressure gauge.

Is the governor pressure on the pressure gauge below 21 kPa (3 psi) with the engine at idle and the gear selector in Drive?

Yes >> The Governor Pressure Solenoid is functioning properly. Go To 7

No >> Go To 10

---

4. GOVERNOR PRESSURE BETWEEN 40-55 WITH RELAY REMOVED

Place the gear selector in Park.
With the engine still running, remove the Transmission Control Relay.

WARNING: Do not wear loose clothing or jewelry when working on or near a running engine. Failure to follow these instructions can result in personal injury or death.

NOTE: Relay removal may set various DTCs. Disregard any DTC that may set due to relay removal.

CAUTION: Apply the brakes.
Place the gear selector in Drive and allow the engine to idle for 30 seconds.
With the scan tool, read the Actual Governor Pressure at idle.

Is the governor pressure on the scan tool between 276 - 379 kPa (40 - 55 psi)?

Yes >> Go To 5

No >> Go To 6

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (DIESEL) (CONTINUED)

5. GOVERNOR PRESSURE SOLENOID

Turn the ignition off to the lock position.

Replace the Governor Pressure Solenoid per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Start the engine and allow the transmission to reach normal operating temperature above 43° C (110° F).

With the scan tool, monitor the target governor pressure and actual governor pressure.

Drive the vehicle at a constant speed 40 - 48 Km/h (25 - 30 MPH).

NOTE: The Actual Governor Pressure should be within 21 kPa (3 psi) of the Target Governor Pressure within 3 seconds.

Is the Actual Governor Pressure within 21 kPa (3 psi) of the Target Governor Pressure?

Yes >> Go To 13

No >> Repair internal transmission leak. Inspect all components pertaining to the Governor Pressure Sensor and the Governor Pressure Solenoid. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

6. CHECK GAUGE PRESSURE 40-55 WITH RELAY OUT

Place the gear selector in Park.

With the engine still running, remove the Transmission Control Relay.

WARNING: Do not wear loose clothing or jewelry when working on or near a running engine. Failure to follow these instructions can result in personal injury or death.

NOTE: Relay removal may set various codes. Disregard any DTC that may set due to relay removal.

CAUTION: Apply the brakes.

Place the gear selector in Drive with the engine at idle.

Read the governor pressure on the pressure gauge.

Is the governor pressure on the pressure gauge read between 276 - 379 kPa (40 - 55 psi)?

Yes >> Go To 7

No >> Go To 10

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (DIESEL) (CONTINUED)

7. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN - EXTERNAL

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

Disconnect the ECM harness connectors.

NOTE: Check connectors - Clean/repair as necessary

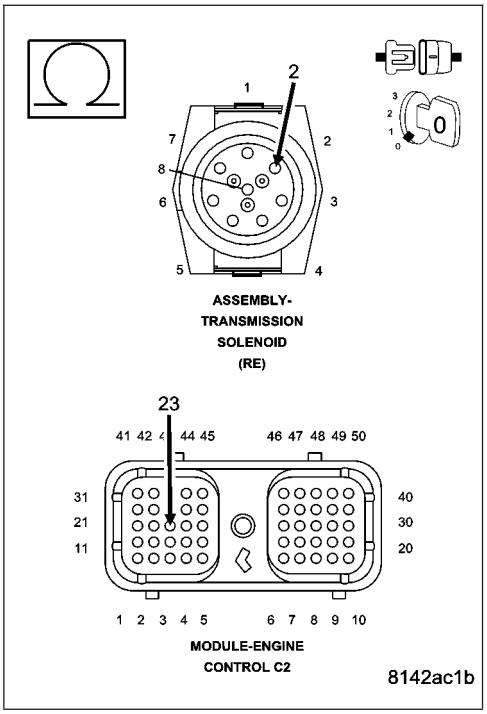
Measure the resistance of the 5-volt Supply circuit between the Transmission Solenoid Assembly harness connector and the ECM C2 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Repair the 5-volt Supply circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



8. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN - INTERNAL

Remove the transmission oil pan. (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Reconnect the Transmission Solenoid Assembly harness connector.

Disconnect the Governor Pressure Sensor connector internal to the transmission.

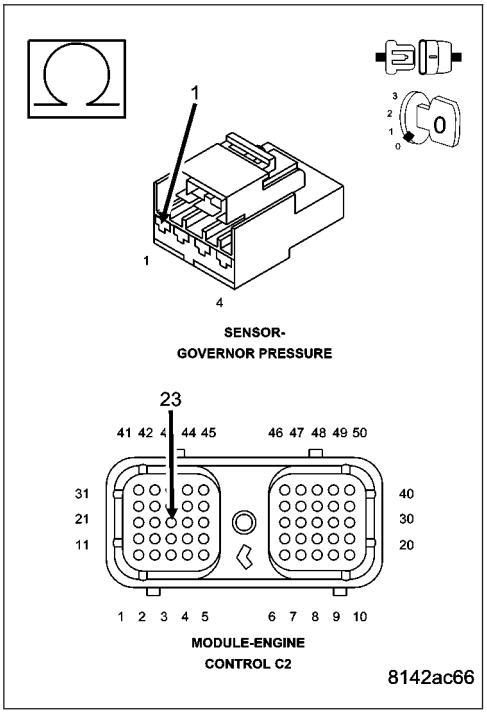
Measure the resistance of the 5-volt Supply circuit between the ECM C2 harness connector and the Governor Pressure sensor connector internal to the transmission.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair or replace the 5-volt Supply circuit for an open internal to the transmission.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (DIESEL) (CONTINUED)

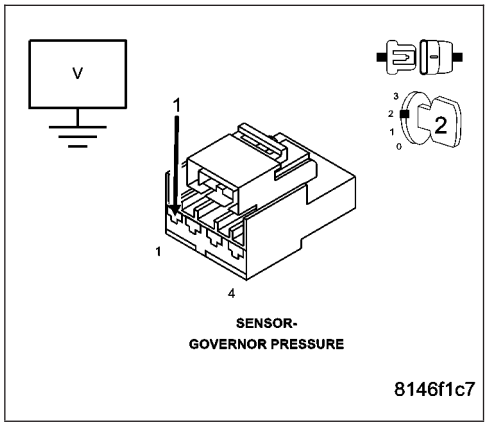
9. GOVERNOR PRESSURE SENSOR

Reconnect the ECM harness connectors.

NOTE: The ECM harness connectors must not be disconnected during this test.

Ignition on, engine not running.

Measure the voltage of the 5-volt Supply circuit at the Governor Pressure Sensor connector internal to the transmission.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Replace the Governor Pressure/Transmission Temperature Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

10. TRANSMISSION - INTERNAL DAMAGE

Turn the ignition off to the lock position.

Remove the transmission oil pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Inspect the transmission oil pan for burnt transmission fluid and/or excessive debris.

Is the transmission fluid burnt and/or contain excessive debris?

Yes >> Repair the internal transmission per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 11

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (DIESEL) (CONTINUED)

11. CHECK THE VALVE BODY

Replace the Governor Pressure Solenoid per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Install a pressure gauge at the governor pressure test port. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

Start the engine.

Warm the transmission to normal operating temperature.

CAUTION: Apply the brakes.

Place the gear selector in Drive and allow the engine to idle.

Read the governor pressure on the pressure gauge in Drive.

Is the governor pressure on the gauge below 21 kPa (3 psi)?

Yes >> Go To 12

No >> Repair or replace the Valve Body per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

---

12. VERIFY OPERATION - TEST DRIVE

Remove the pressure gauge from the transmission. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

Test drive the vehicle.

Be sure to drive the vehicle at a constant speed of 40-48 Km/h or 25-30 MPH during the drive cycle.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1756-GOV PRESS NOT EQUAL TO TARGET @ 35 - 40 PSI (DIESEL) (CONTINUED)

13. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

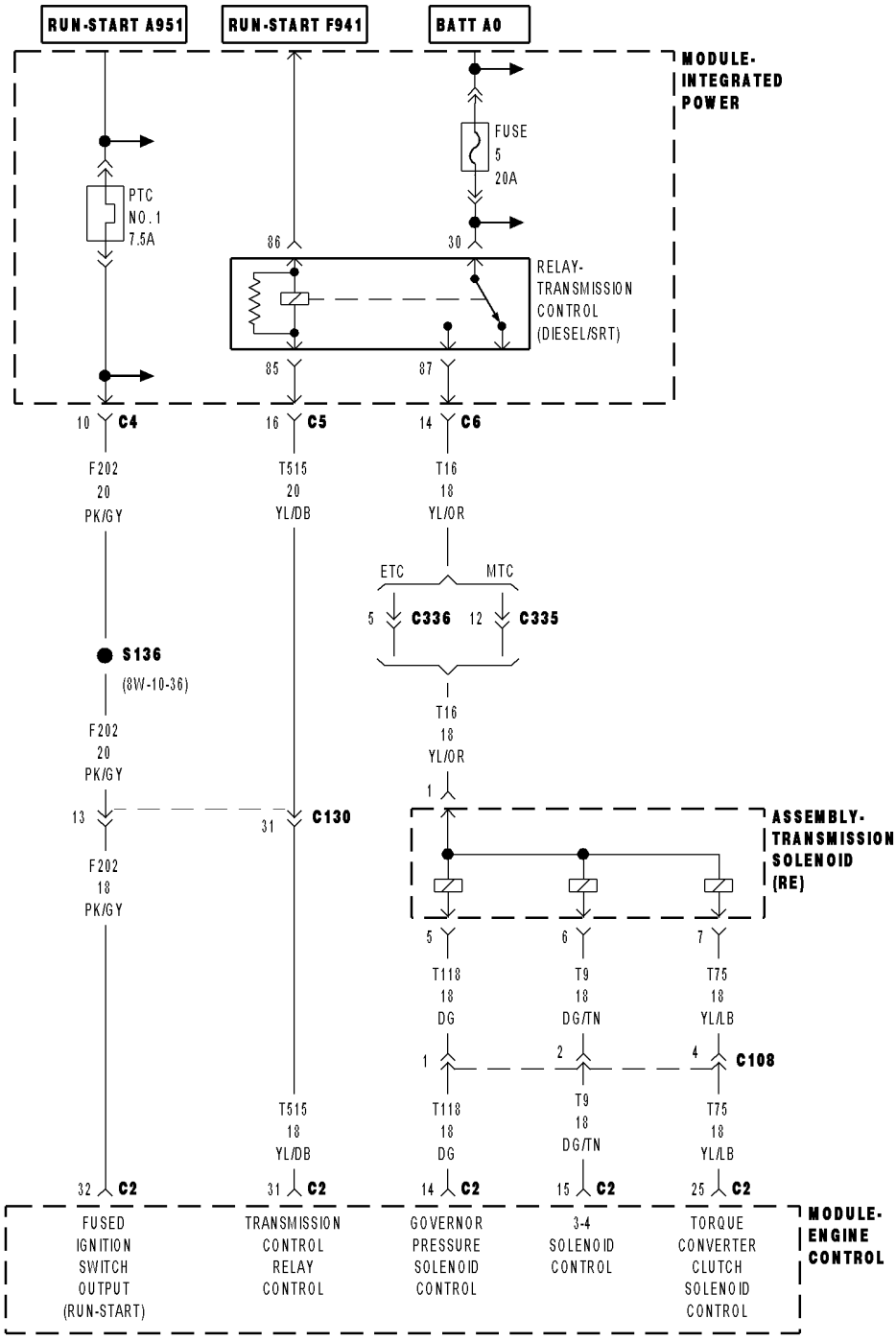
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

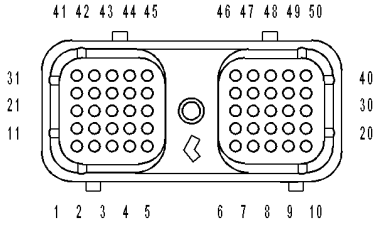
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

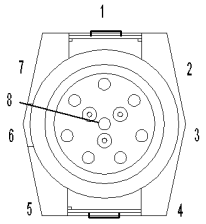
No >> Test Complete.

P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (DIESEL)





MODULE-ENGINE
CONTROL C2



ASSEMBLY-
TRANSMISSION
SOLENOID
(RE)

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P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Control System is used to regulate the governor pressure which controls the shifts for first, second, and third gear. The Governor Pressure Control System test verifies that the requested pressure and the actual pressure are within a predetermined tolerance.

- **When Monitored:**
  While the engine is running and the gear selector is in the Drive position.
- **Set Condition:**
  This DTC will set if the monitored Governor Pressure is greater than 41.4 kPa (6 psi) for 5 seconds while the gear selector is in the Drive position with the road speed equal to zero - six times during a drive cycle. The transmission oil temperature must be between 23 - 88° C (73 - 190° F).

Possible Causes
OTHER TRANSMISSION DTC'S PRESENT
5 VOLT SUPPLY CIRCUIT OPEN
5 VOLT SUPPLY CIRCUIT OPEN INSIDE THE TRANSMISSION
TRANSMISSION OIL BURNT OR OIL PAN HAS EXCESSIVE DEBRIS - INTERNAL TRANSMISSION DAMAGE
GOVERNOR PRESSURE SENSOR
GOVERNOR PRESSURE SOLENOID
VALVE BODY
ENGINE CONTROL MODULE 5 VOLT SUPPLY
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. OTHER TRANSMISSION DTC'S PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are there any other Transmission DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (DIESEL) (CONTINUED)

2. CHECK IF THE DTC IS CURRENT

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 3

No >> Go To 11

---

3. CHECKING FOR GOVERNOR PRESSURE ABOVE 6 PSI

Start the engine.

CAUTION: Apply the parking brake.

Warm the transmission to a normal operating temperature above 43° C (110° F).

CAUTION: Firmly apply the brakes.

With the engine RPM at idle, place the gear selector in Drive.

With the scan tool, read the governor pressure.

Is the governor pressure above 41.4 kPa (6 psi)?

Yes >> Go To 4

No >> Go To 11

---

4. GOVERNOR PRESSURE MATCH GAUGE PRESSURE

Turn the ignition off to the lock position.

Install a 700 kPa (100 psi) pressure gauge to the Governor Pressure Test Port. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

Start the engine.

Warm the transmission to a normal operating temperature above 43° C (110° F).

CAUTION: Firmly apply the brakes.

With the engine RPM at idle, place the gear selector in Drive.

With the scan tool, read the governor pressure and compare the scan tool reading to the pressure gauge reading.

Does the scan tool Governor Pressure reading match the pressure gauge reading within 6.9 kPa (1 psi)?

Yes >> Go To 5

No >> Go To 8

P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (DIESEL) (CONTINUED)

5. CHECK FOR BURNT TRANSMISSION FLUID AND/OR EXCESSIVE DEBRIS IN THE TRANSMISSION OIL PAN

Turn the ignition off to the lock position.

Remove the transmission oil pan per the Service Information and inspect for burnt transmission fluid and excessive debris. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Is the transmission fluid burnt or does the transmission oil pan contain excessive debris?

Yes >> Repair internal transmission as necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6

---

6. REPLACE THE GOVERNOR PRESSURE SOLENOID AND CHECK THE VALVE BODY

Replace the Governor Pressure Solenoid per with the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Start the engine.

Warm the transmission to a normal operating temperature above 43° C (110° F).

CAUTION: Firmly apply the brakes.

With the engine RPM at idle, place the gear selector in Drive.

Read the governor pressure on the pressure gauge.

Is the governor pressure on the pressure gauge above 41.4 kPa (6 psi) with the engine RPM at idle and the gear selector in Drive?

Yes >> Replace the Valve Body per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 7

---

7. ENGINE CONTROL MODULE

Turn the ignition off to the lock position.

Remove pressure gauge from transmission.

Install the Transmission Oil Pan and refill the transmission fluid per the service information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

With the scan tool, erase Engine DTCs.

Test drive the vehicle.

Be sure to stop the vehicle, with the vehicle in drive on six separate occurrences for at least 6 seconds each stop.

With the scan tool, read Engine DTCs.

Did the P1757 DTC reset?

Yes >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 11

P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (DIESEL) (CONTINUED)

8. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN

Turn the ignition off to the lock position.

Disconnect the ECM harness connectors.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary

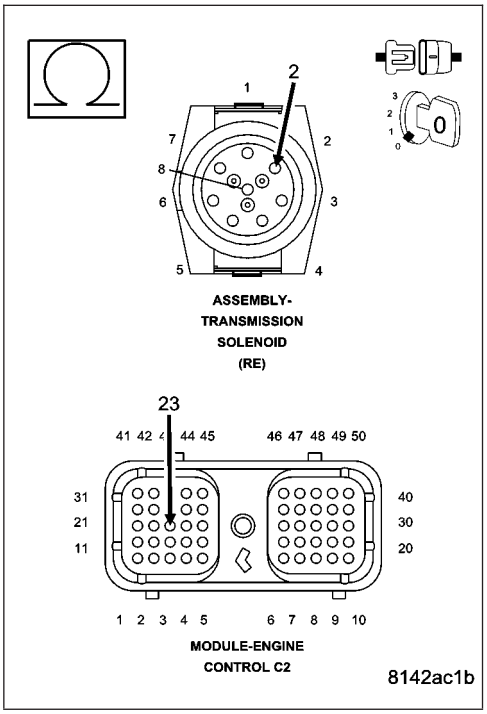
Measure the resistance of the 5- volt Supply circuit between the Transmission Solenoid Assembly harness connector and the ECM harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the 5-volt Supply circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



9. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN INSIDE THE TRANSMISSION

Reconnect the Transmission Solenoid Assembly harness connector.

Remove the transmission oil pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure Sensor connector internal to the transmission.

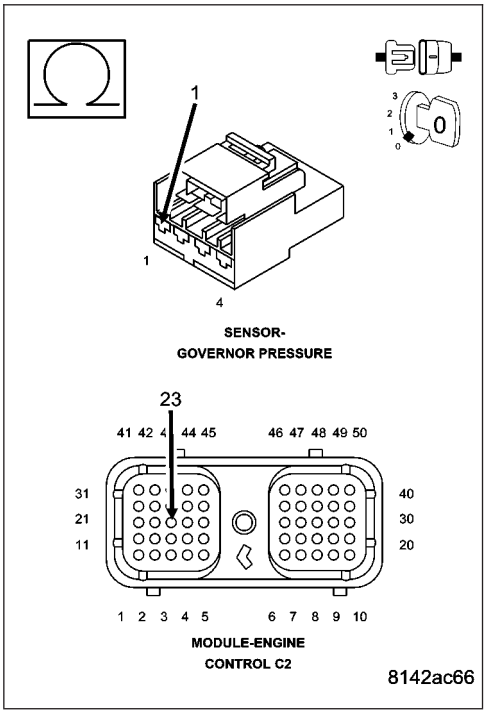
Measure the resistance of the 5-volt Supply circuit between the ECM C2 harness connector and the Transmission Solenoid Assembly connector internal to the transmission..

Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair or replace the 5-volt Supply circuit for an open internal to the transmission.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



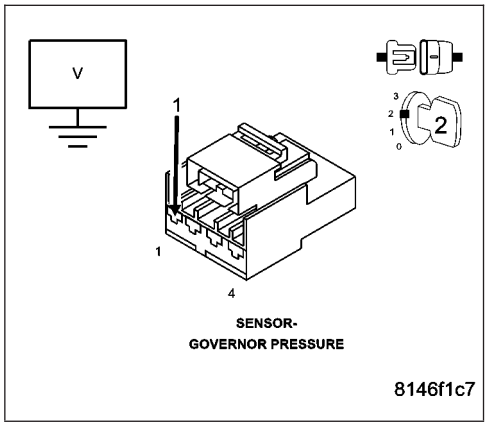
P1757-GOV PRESS ABOVE 3 PSI IN GEAR WITH 0 MPH (DIESEL) (CONTINUED)

10. CHECK THE ENGINE CONTROL MODULE - 5 VOLT SUPPLY

Reconnect the ECM harness connectors.

Ignition on, engine not running.

Measure the voltage of the 5-volt Supply circuit in the Governor Pressure Sensor connector internal to the transmission.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Replace the Governor Pressure Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

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11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

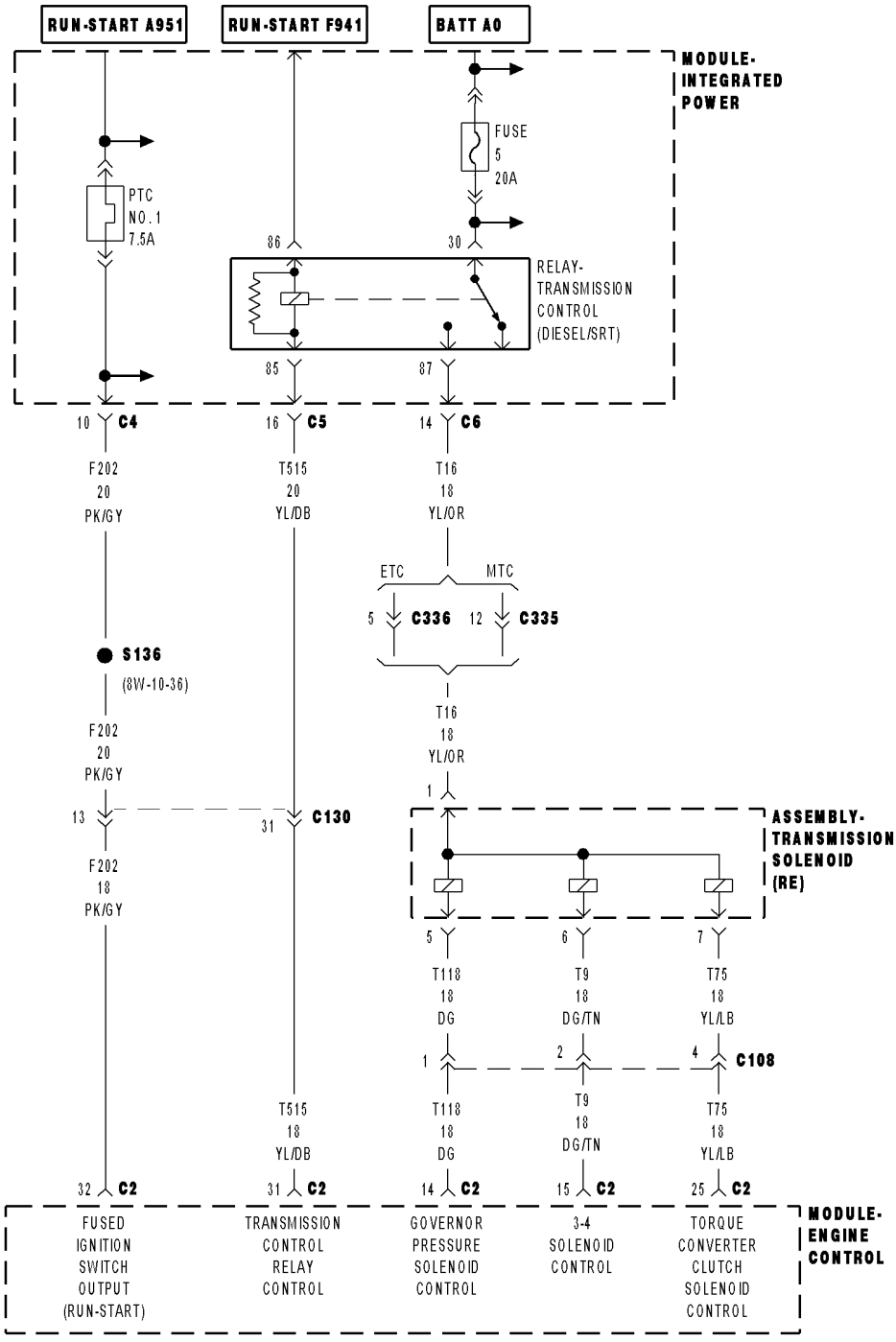
Were there any problems found?

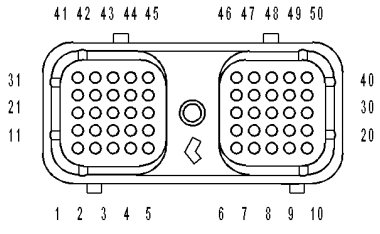
Yes >> Repair as necessary.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

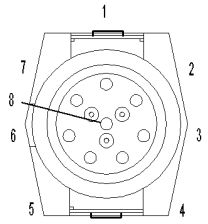
No >> Test Complete.

P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (DIESEL)





MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION SOLENOID (RE)

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P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Governor Pressure Sensors output is used as a control input to the Governor Pressure Control System. The Governor Pressure Control System is used to regulate the governor pressure which controls the shifts for first, second, and third gear.

- **When Monitored:**
  While the engine is running and the vehicle gear selector is in park or neutral for more than 3.0 seconds with the throttle position less than 10%.
- **Set Condition:**
  Thsi DTC will set if the Governor Pressure is greater than 3 psi while the vehicle is in Park 3 times in a drive cycle.

Possible Causes
OTHER TRANSMISSION DTCS PRESENT
5 VOLT SUPPLY CIRCUIT OPEN - EXTERNAL
5 VOLT SUPPLY CIRCUIT OPEN - INTERNAL
GOVERNOR PRESSURE SENSOR
TRANSMISSION - INTERNAL DAMAGE
TRANSMISSION - INTERNAL LEAK
ENGINE CONTROL MODULE
INTERMITTENT WIRING AND CONNECTORS

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. OTHER TRANSMISSION DTCS PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are any other transmission DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

---

2. CHECK IF THE GOVERNOR PRESSURE IS ABOVE 21 KPA (3 PSI) IN PARK

CAUTION: Apply the parking brake.

Start the engine and allow the engine to idle.

Warm the transmission to a normal operating temperature above 43° C (110° F).

With the scan tool in Sensors, read the Governor Pressure with the Transmission Shift selector in Park.

Is the Governor Pressure reading on the scan tool above 21 kPa or 3 psi?

Yes >> Go To 3

No >> Go To 10

P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (DIESEL) (CONTINUED)

3. COMPARE SCAN TOOL GOVERNOR PRESSURE READING TO PRESSURE GAUGE READING

Turn the ignition off to the lock position.

Connect a 700 kPa (100 psi) Pressure Gauge to the Governor Pressure test port. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

Start the engine and allow the engine to idle.

Warm the transmission to a normal operating temperature above 43° C (110° F).

With the scan tool, read the Governor Pressure and compare the scan tool Governor Pressure reading to the Pressure Gauge reading.

Does the scan tool Governor Pressure reading match the Pressure Gauge reading within 6.9 kPa (1 psi)?

Yes >> Go To 4

No >> Go To 7

---

4. TRANSMISSION - INTERNAL DAMAGE

Turn the ignition off to the lock position.

Remove the transmission oil pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Inspect the transmission oil pan for burnt oil and/or excessive debris.

Does the transmission contain burnt oil and/or excessive debris?

Yes >> Repair internal transmission as necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 5

---

5. CHECK INTERNAL TRANSMISSION FOR A FLUID LEAK

Inspect the transmission for internal fluid leakage in the Valve Body or the Governor Pressure Solenoid. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Were there any problems found?

Yes >> Repair the internal transmission as necessary per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6

P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (DIESEL) (CONTINUED)

6. VERIFY OPERATION - TEST DRIVE

Remove the pressure gauge from the transmission.

Install the transmission oil pan and refill the transmission per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

With the scan tool, erase Engine DTCs.

Test drive the vehicle.

Be sure to stop the vehicle and move the gear selector into the park position for a minimum of 5 seconds at least three times during the drive cycle.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 10

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7. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN

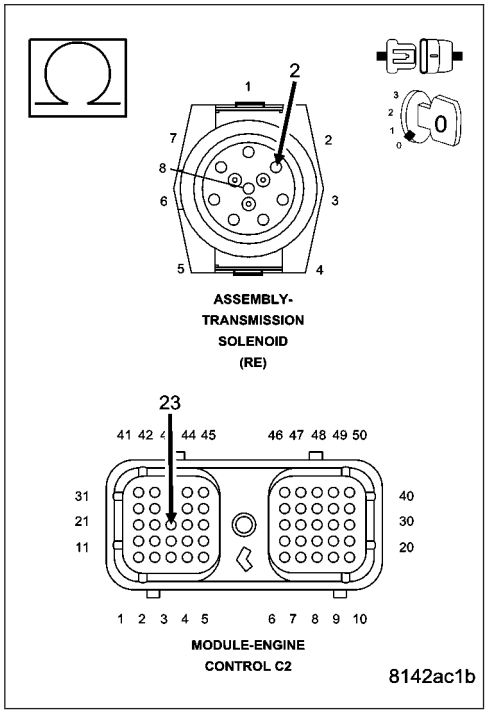
Turn the ignition off to the lock position.

Disconnect the ECM C2 harness connector.

Disconnect the Transmission Solenoid Assembly harness connector.

NOTE: Check connectors - Clean/repair as necessary

Measure the resistance of the 5-volt Supply circuit between the Transmission Solenoid Assembly harness connector and the ECM C2 harness connector.



Is the resistance below 5.0 ohms?

Yes >> Go To 8

No >> Repair 5-volt Supply circuit for an open.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (DIESEL) (CONTINUED)

8. CHECK THE 5 VOLT SUPPLY CIRCUIT FOR AN OPEN - INTERNAL

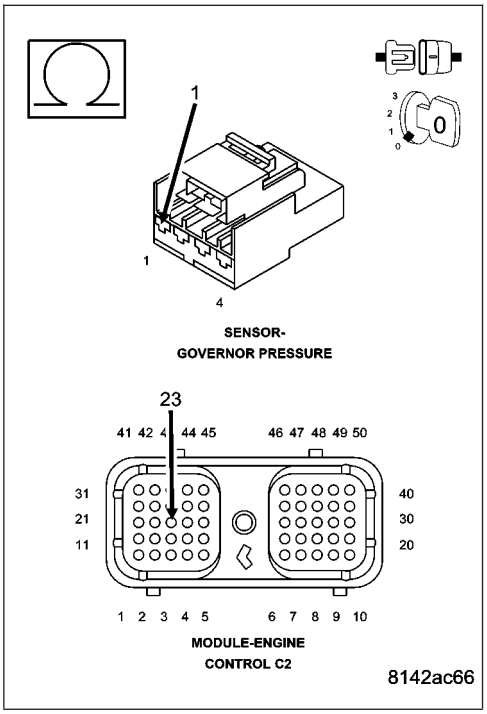
Reconnect the Transmission Solenoid Assembly harness connector.

Remove the Transmission Oil Pan per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/FLUID - STANDARD PROCEDURE)

Disconnect the Governor Pressure Sensor harness connector internal to the transmission.

NOTE: Check connectors - Clean/repair as necessary

Measure the resistance of the 5-volt Supply circuit between the ECM C2 harness connector and the Governor Pressure Sensor connector internal to the transmission.



Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair or replace the 5-volt Supply circuit for an open internal to the transmission.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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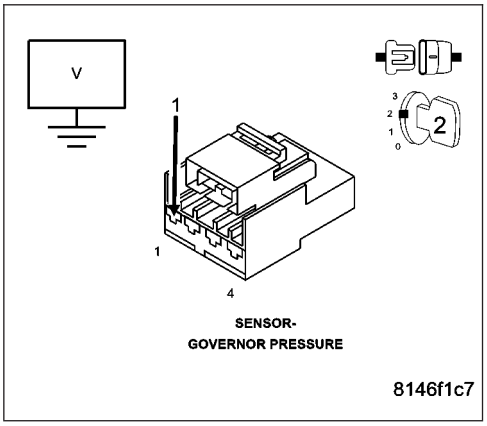
9. GOVERNOR PRESSURE SENSOR

Reconnect the ECM harness connectors.

NOTE: The ECM harness connectors must be connected during this test.

Ignition on, engine not running.

Measure the voltage of the 5-volt Supply circuit at the Governor Pressure Sensor connector internal to the transmission.



Is the voltage between 4.5 and 5.5 volts?

Yes >> Replace the Governor Pressure Sensor per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/GOVERNOR PRESSURE SENSOR - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

P1762-GOV PRESS SENSOR OFFSET VOLTS TOO LOW OR HIGH (DIESEL) (CONTINUED)

10. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

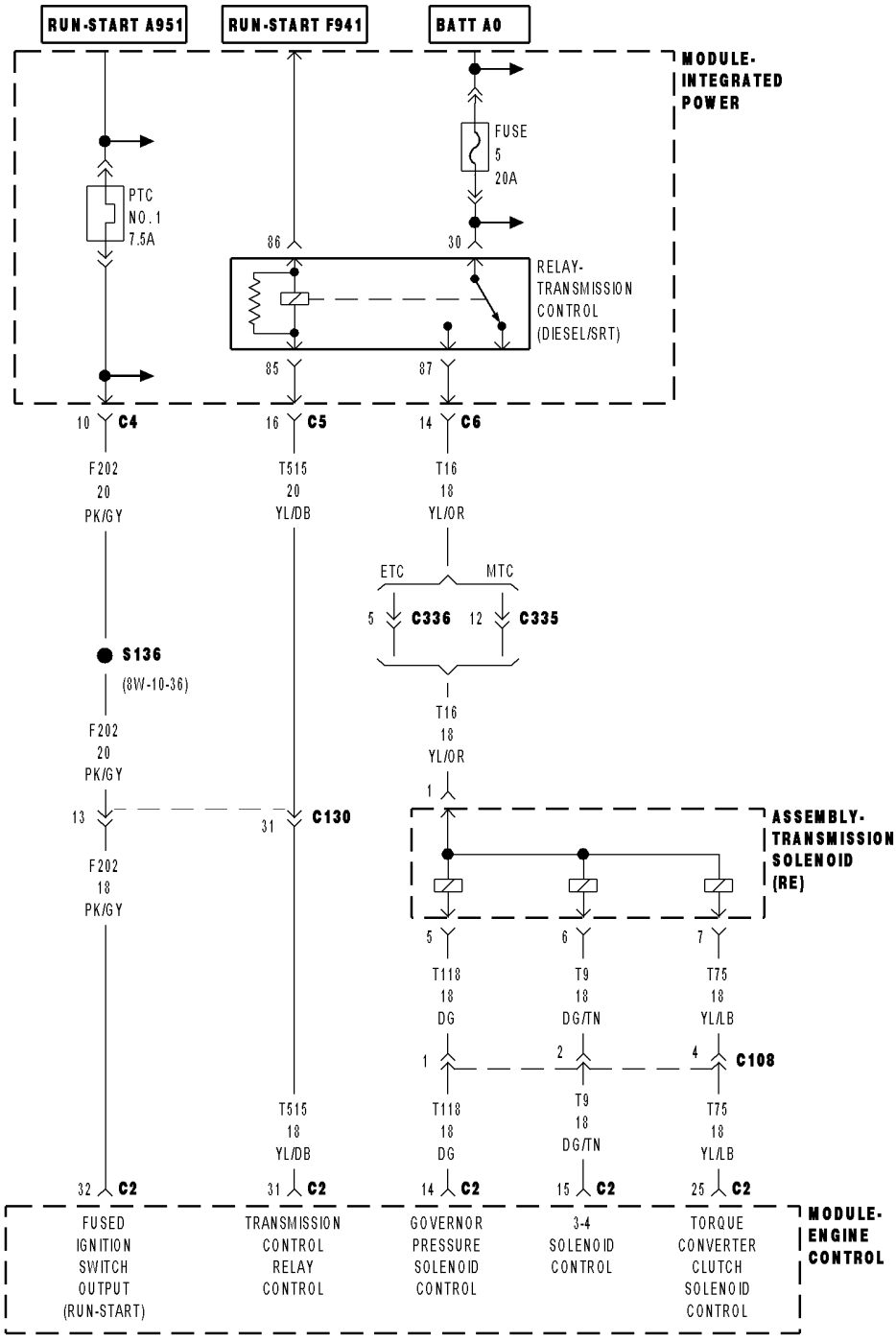
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

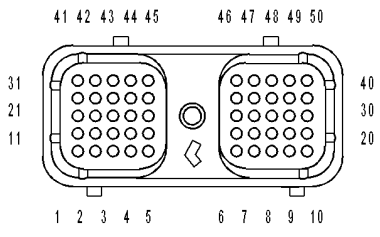
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

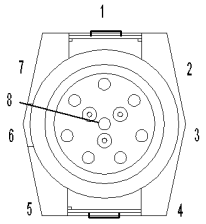
No >> Test Complete.

P2769-TRANSMISSION TCC CONTROL CIRCUIT LOW





MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION SOLENOID (RE)

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P2769-TRANSMISSION TCC CONTROL CIRCUIT LOW (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Torque Converter Clutch (TCC) solenoid is used to engage the TCC which improves fuel economy.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  This DTC will set if the voltage detected by the ECM for the Torque Converter Clutch Solenoid Control circuit is different than the expected voltage. Note: To clear this DTC it is necessary to drive the vehicle at a sustained speed which would allow the TCC and/or Overdrive Clutch to operate.

Possible Causes
TRANSMISSION CONTROL RELAY DTCS PRESENT
(F941) FUSED IGNITION SWITCH OUTPUT CIRCUIT (RUN-START) OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN
(T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND
(T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO GROUND
(T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS
TRANSMISSION CONTROL RELAY - POOR CONTACTS
TORQUE CONVERTER CLUTCH SOLENOID
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK IF THERE ANY TRANSMISSION CONTROL RELAY DTCS PRESENT

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are there any Transmission Control Relay DTCs also present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

P2769-TRANSMISSION TCC CONTROL CIRCUIT LOW (CONTINUED)

2. CHECK IF THE DTC IS CURRENT

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.

With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 3

No >> Go To 11

---

3. CHECK THE (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

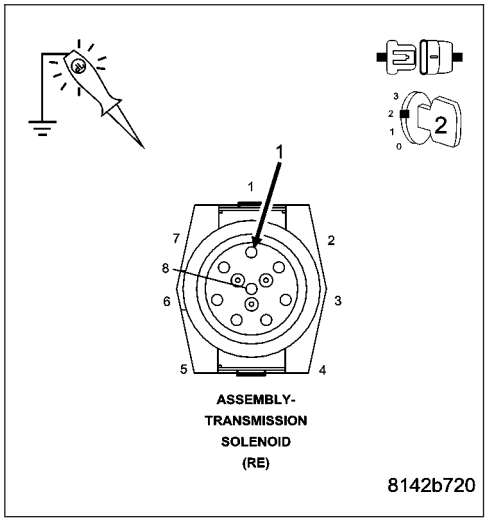
NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

With the scan tool, actuate the Transmission Control Relay.

Using a 12-volt test light connected to ground, check the (T16) Transmission Control Relay Output circuit in the Transmission Solenoid Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light cycle on and off and illuminate brightly?

Yes >> Go To 4

No >> Go To 8

P2769-TRANSMISSION TCC CONTROL CIRCUIT LOW (CONTINUED)

4. CHECK THE (T75) TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT

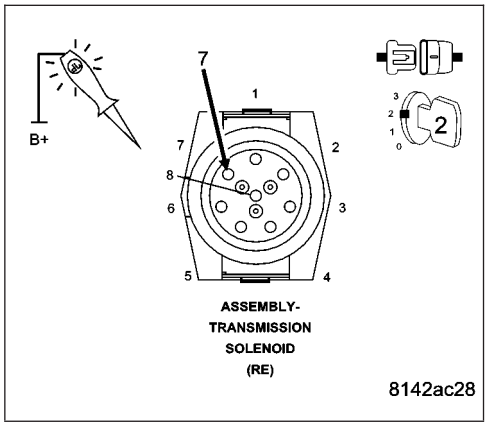
Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

Ignition on, engine not running.

With the scan tool, actuate the TCC Solenoid.

Using a 12-volt test light connected to 12-volts, check the (T75) TCC Solenoid Control circuit in the Transmission Solenoid Assembly harness connector.



NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light cycle on and off and illuminate brightly?

Yes >> Check all internal wiring pertaining to the (T75) TCC Solenoid for an open, short, and bent or broken terminals. If no internal wiring problems are found, replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 5

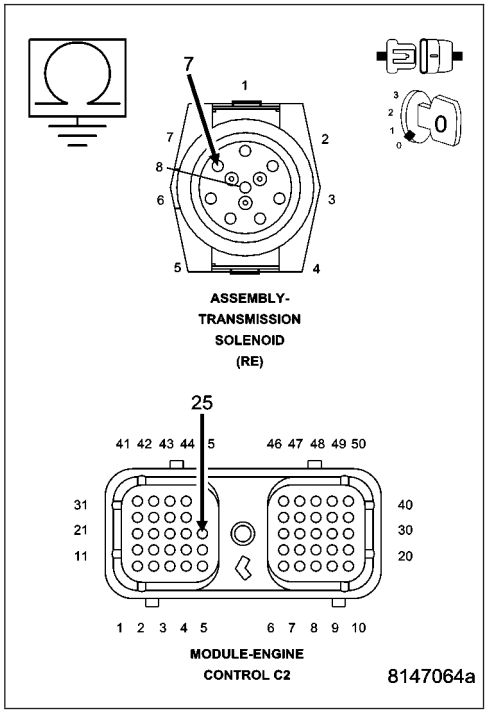
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5. (T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the ECM harness connectors.

Measure the resistance between ground and the (T75) TCC Solenoid Control circuit.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T75) TCC Solenoid Control circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6

P2769-TRANSMISSION TCC CONTROL CIRCUIT LOW (CONTINUED)

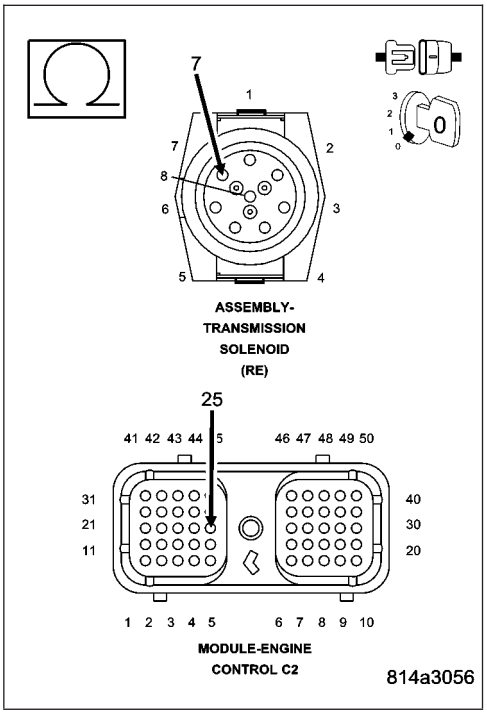
6. (T75) TCC SOLENOID CONTROL CIRCUIT OPEN

Measure the resistance of the (T75) TCC Solenoid Control circuit between the ECM C2 harness connector and the Transmission Solenoid Assembly harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T75) TCC Solenoid Control circuit for an open.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 7



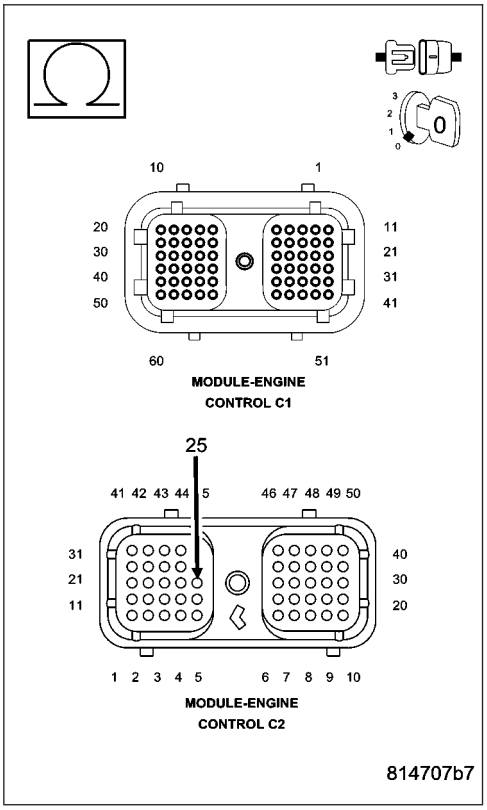
7. (T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO OTHER CIRCUITS

Measure the resistance between the (T75) TCC Solenoid Control circuit and all other circuits in the Transmission Solenoid Assembly harness connector.

Is the resistance below 5.0 ohms between the (T75) TCC Solenoid Control circuit and any other circuit in the Transmission Solenoid Assembly harness connector?

Yes >> Repair the (T75) TCC Solenoid Control circuit for a short to another circuit(s).
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)



P2769-TRANSMISSION TCC CONTROL CIRCUIT LOW (CONTINUED)

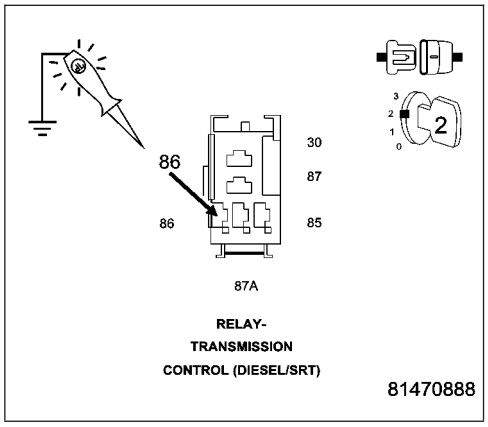
8. (941) FUSED IGNITION SWITCH OUPUT (RUN-START) CIRCUIT OPEN

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the (F941) Fused Ignition Swich Output (Run-Start) circuit in the Transmission Control Relay connector.



Does the test light illuminate brightly?

Yes >> Go To 9

No >> Repair the (F941) Fused Ignition Swich Output (Run-Start) circuit for an open.

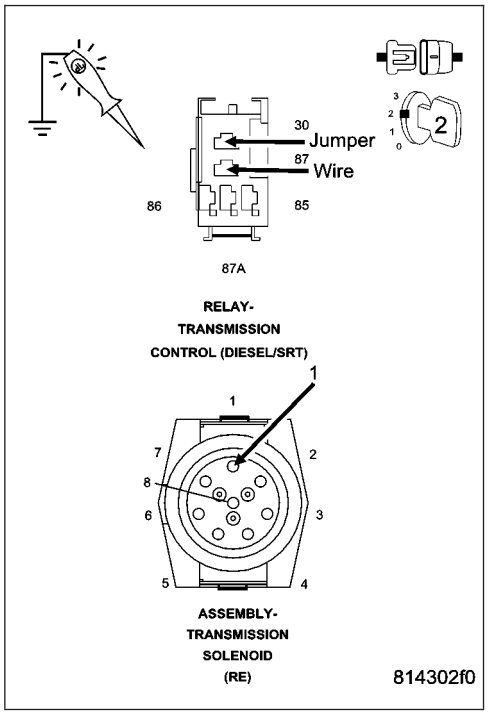
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

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9. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT OPEN

Connect a jumper wire between the Fused B(+) circuit and the Transmission Control Relay Output circuit in the Transmission Control Relay connector.

Using a 12-volt test light connected to ground, check the Fused Transmission Relay Control Output circuit in the Transmission Solenoid Assembly harness connector.



Does the test light illuminate brightly?

Yes >> Go To 10

No >> Repair the (T16) Transmission Control Relay Output circuit for an open. If the fuse is open make sure to check for a short to ground.

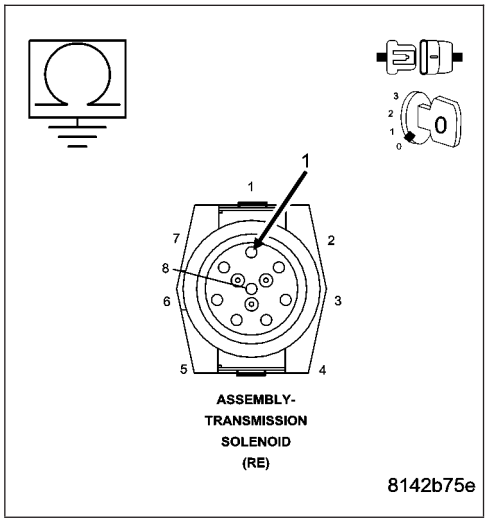
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/ AUTOMATIC - 48RE - STANDARD PROCEDURE)

P2769-TRANSMISSION TCC CONTROL CIRCUIT LOW (CONTINUED)

10. (T16) TRANSMISSION CONTROL RELAY OUTPUT CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.

Measure the resistance between ground and the (T16) Transmission Control Relay Output circuit in the Transmission Control Relay connector.



Is the resistance above 100k ohms?

Yes >> Replace the Transmission Control Relay.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Repair the (T16) Transmission Control Relay Output circuit for a short to ground.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

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11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions that set the DTC. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

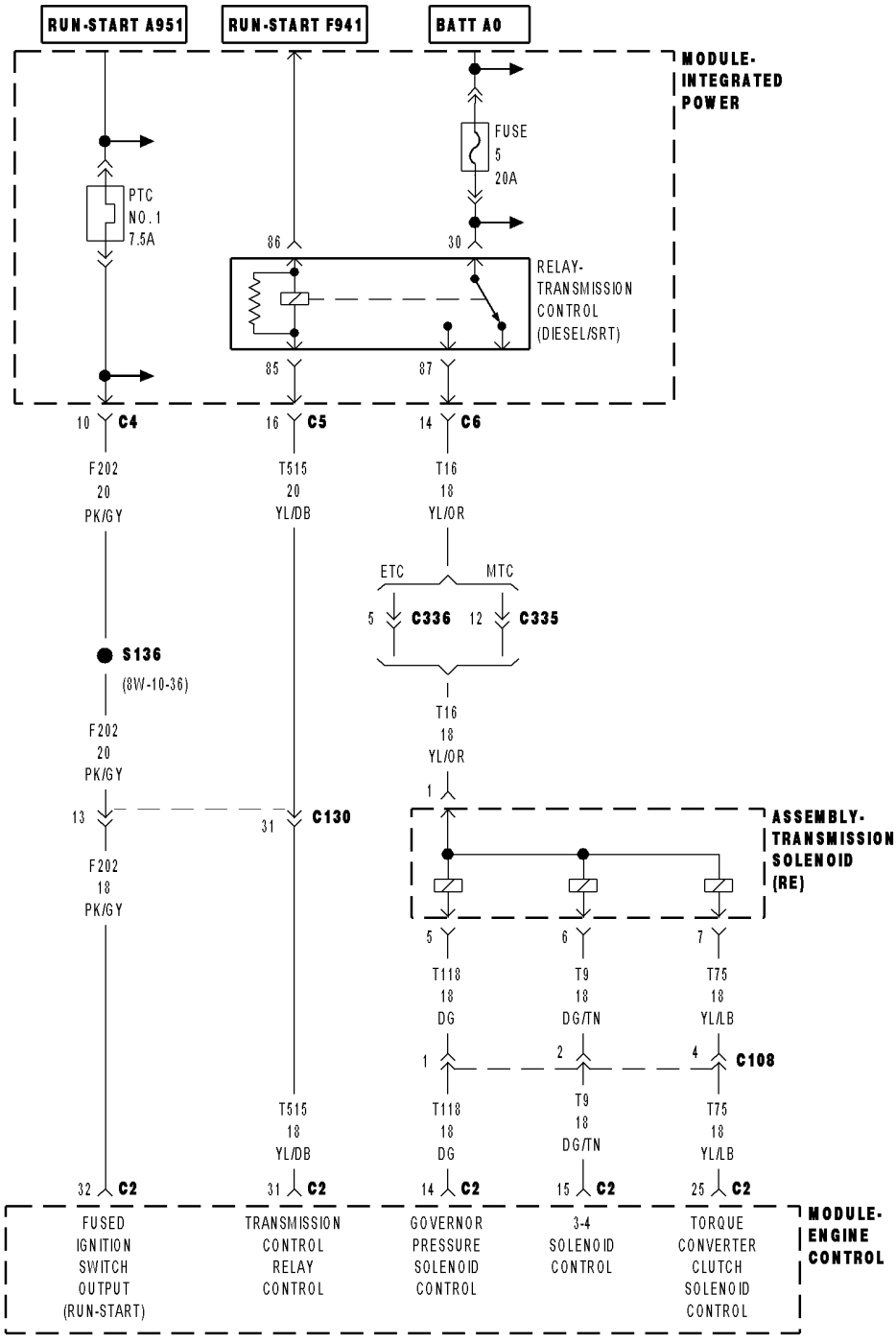
Refer to any technical service bulletins that may apply.

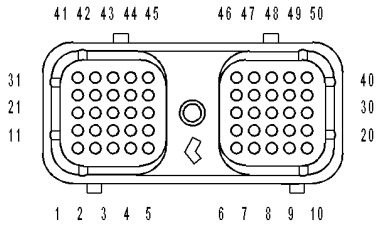
Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

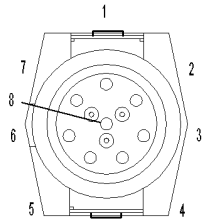
No >> Test Complete.

P2770-TRANSMISSION TCC CONTROL CIRCUIT HIGH (DIESEL)





MODULE-ENGINE CONTROL C2



ASSEMBLY-TRANSMISSION SOLENOID (RE)

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P2770-TRANSMISSION TCC CONTROL CIRCUIT HIGH (DIESEL) (CONTINUED)

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The Torque Converter Clutch (TCC) Solenoid is used to engage the TCC which improves fuel economy. The Overdrive Solenoid is used to engage the gear change from third to the Overdrive.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  This DTC will set if the voltage detected on the Torque Converter Clutch Solenoid Control circuit at the ECM is different than the expected voltage. Note: To clear this DTC it is necessary to drive the vehicle at a sustained speed which would allow the TCC and/or Overdrive Clutch to operate

Possible Causes
TRANSMISSION CONTROL RELAY DTC PRESENT
(T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO VOLTAGE
(T75) TCC SOLENOID CONTROL CIRCUIT SHORT TO ANOTHER CIRCUIT
TORQUE CONVERTER CLUTCH SOLENOID
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

Diagnostic Test

1. CHECK FOR ANY TRANSMISSION CONTROL RELAY DTCS

Ignition on, engine not running.

With the scan tool, read Engine DTCs.

Are there any Transmission Control Relay DTCs present?

Yes >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

No >> Go To 2

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2. CHECK IF THE DTC IS CURRENT

With the scan tool, read Engine DTCs.

Record the Freeze Frame data for the reported DTC.

With the scan tool, erase DTCs.

Turn the ignition off to the lock position.

Using the Freeze Frame data recorded earlier, try to duplicate the conditions in which the DTC originally set.

NOTE: It may be necessary to road test the vehicle to duplicate the original set conditions.
With the scan tool, read Engine DTCs.

Did the DTC reset?

Yes >> Go To 3

No >> Go To 7

P2770-TRANSMISSION TCC CONTROL CIRCUIT HIGH (DIESEL) (CONTINUED)

3. CHECK THE (T75) TORQUE CONVERTER CLUTCH SOLENOID CONTROL CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Transmission Solenoid Assembly harness connector.

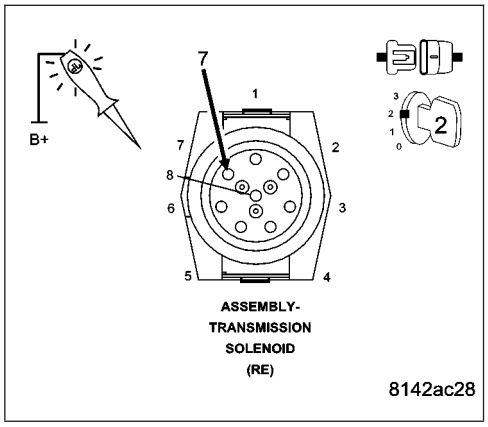
NOTE: Check connectors - Clean/repair as necessary

Ignition on, engine not running.

With the scan tool, actuate the TCC Solenoid.

Using a 12-volt test light connected to 12-volts, check the (T75) TCC Solenoid Control circuit in the Transmission Solenoid Assembly harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light cycle on and off and illuminate brightly?

Yes >> Check all internal wiring pertaining to the TCC Solenoid for an open, short, and bent or broken terminals. If no internal wiring problems are found, replace the Transmission Solenoid Assembly per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/VALVE BODY - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 4

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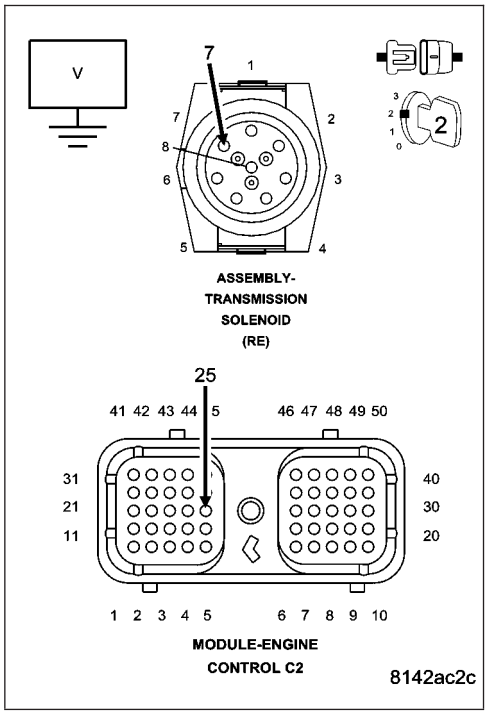
4. CHECK THE (T75) TCC SOLENOID CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the ECM harness connectors.

Ignition on, engine not running.

Measure the voltage of the (T75) TCC Solenoid Control circuit.



Is the voltage above 0.5 volts?

Yes >> Repair the (T75) TCC Solenoid Control circuit for a short to voltage.

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 5

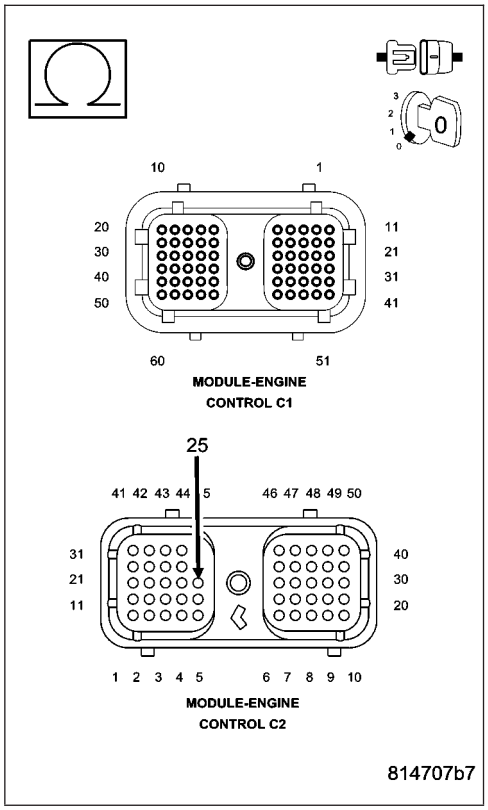
P2770-TRANSMISSION TCC CONTROL CIRCUIT HIGH (DIESEL) (CONTINUED)

5. CHECK THE (T75) TCC SOLENOID CONTROL CIRCUIT FOR A SHORT TO ANOTHER CIRCUIT

Turn the ignition off to the lock position.

Remove the Transmission Control Relay.

Measure the resistance between the (T75) TCC Solenoid Control circuit and all other circuits in the Transmission Solenoid Assembly harness connector.



Is the resistance below 5.0 ohms between the (T75) TCC Solenoid Control circuit and any other circuit(s) in the Transmission Solenoid Assembly harness connector?

Yes >> Repair the (T75) TCC Solenoid Control circuit for a short to another circuit(s).

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Go To 6

---

6. ENGINE CONTROL MODULE

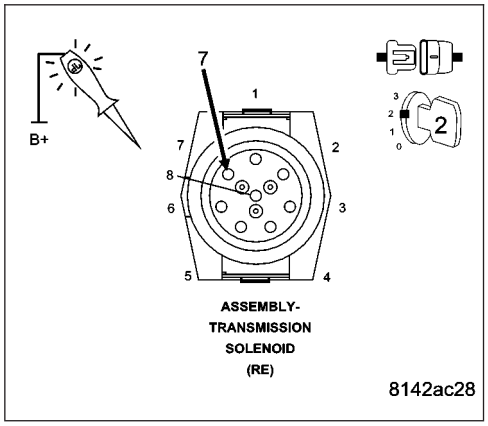
Turn the ignition off to the lock position.

Reconnect the ECM harness connectors.

Turn the ignition on, engine not running.

With the scan tool, actuate the TCC Shift Solenoid.

Using a 12-volt test light connected to 12-volts, check the (T75) TCC Solenoid Control circuit in the Transmission Solenoid Assembly harness connector.



Does the Test Light cycle on and off and illuminate brightly?

Yes >> Go To 7

No >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

P2770-TRANSMISSION TCC CONTROL CIRCUIT HIGH (DIESEL) (CONTINUED)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Use the Freeze Frame Data to help duplicate the conditions in which the DTC originally set. Pay particular attention to the DTC set conditions, such as, VSS, MAP, ECT, and Load

Using the schematics as a guide, visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Wiggle the wiring and connectors while checking for any possible open or shorted circuits.

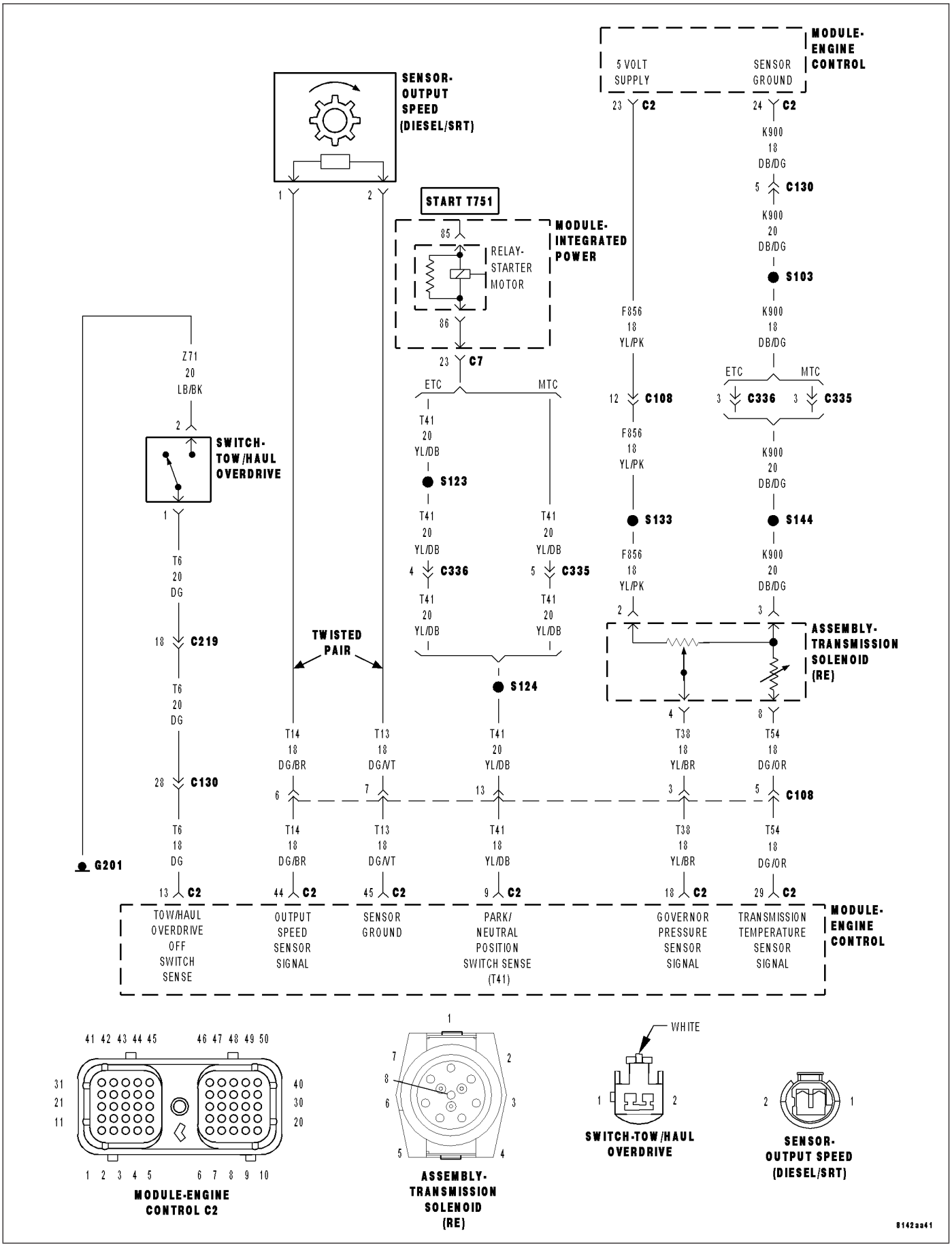
Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Were there any problems found?

Yes >> Repair as necessary.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC - 48RE - STANDARD PROCEDURE)

No >> Test Complete.

*TOW /HAUL OVERDRIVE OFF SWITCH (DIESEL)



***TOW /HAUL OVERDRIVE OFF SWITCH (DIESEL) (CONTINUED)**

For the Transmission circuit diagram (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - SCHEMATICS AND DIAGRAMS)

For a complete wiring diagram**Refer to Section 8W**

Theory of Operation

The tow/haul overdrive OFF (control) switch is located in the shift lever arm. The switch is a momentary contact device that signals the ECM/PCM to toggle current status of the overdrive function. At ignition on, overdrive operation is allowed. Pressing the Tow/Haul Overdrive Off switch once causes the Tow/haul Overdrive OFF mode to be entered and the Tow/Haul lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the Tow/haul lamp to be turned off. The Tow/haul Overdrive OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoid and allow a 3-4 upshift. The control switch indicator light illuminates only when the Tow/haul Overdrive Off switch is turned to the OFF position, or when illuminated by the transmission control module.

Possible Causes
TOW/HAUL OVERDRIVE OFF SWITCH SENSE CIRCUIT SHORT TO GROUND
TOW/HAUL OVERDRIVE OFF SWITCH
ENGINE CONTROL MODULE

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

Diagnostic Test

1. TOW/HAUL OVERDRIVE OFF SWITCH SENSE CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the ECM C2 harness connector.

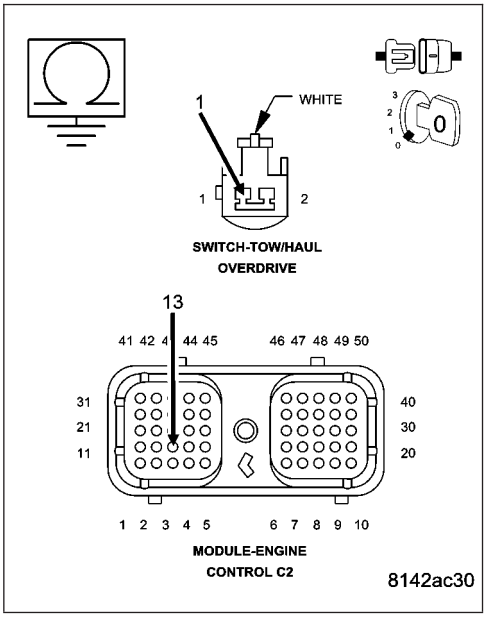
Disconnect the Tow/Haul Overdrive Off switch harness connector.

Measure the resistance between ground and the Tow/Haul Overdrive Off switch sense circuit in the ECM C2 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair the Tow/Haul Overdrive Off switch sense circuit for a short to ground.

No >> Go To 2



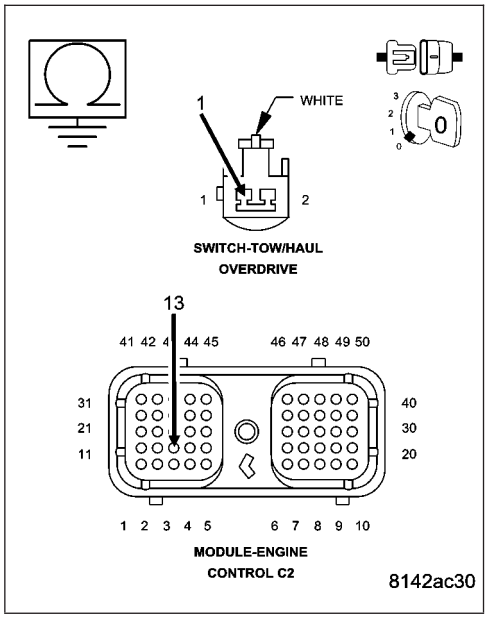
*TOW /HAUL OVERDRIVE OFF SWITCH (DIESEL) (CONTINUED)

2. CHECK THE TOW/HAUL OVERDRIVE OFF SWITCH

Reconnect the Tow/Haul Overdrive Off switch harness connector.

Measure the resistance between ground and the O/D Tow/Haul Switch Sense circuit in the ECM C2 harness connector.

Press the Tow/Haul Overdrive Off switch button.



Does the resistance change from above 5.0 ohms to below 5.0 ohms while pressing the Tow/Haul Overdrive Off switch button?

Yes >> Using the schematics as a guide, check the Engine Control Module (ECM) pins, terminals, and connectors for corrosion, damage, or terminal push out. Pay particular attention to all power and ground circuits. If no problems are found, replace and program the ECM per the Service Information. (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/ENGINE CONTROL MODULE - REMOVAL)

Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Replace the Tow/Haul Overdrive Off switch per the Service Information. (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE/OVERDRIVE SWITCH - REMOVAL)

STANDARD PROCEDURE

PRE-DIAGNOSTIC CHECKOUT (DIESEL)

For a complete wiring diagram **Refer to Section 8W**

1. PRE-DIAGNOSTIC CHECKOUT

NOTE: Always perform diagnostics with a fully charged battery to avoid false symptoms.

NOTE: Low fluid level can be the cause of many transmission problems. If the fluid level is low locate and repair the leak then check and adjust the fluid level per the Service Information.

With the scan tool, read engine DTC's. Check and repair all engine DTCs prior to performing transmission symptom diagnostics.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors. Repair as necessary.

Verify the flash level of the Engine Control Module. Some problems are corrected by software upgrades.

Check for any Service Information Tune-ups or Technical Service Bulletins that may apply.

Did any of the above checks or procedures correct the symptom?

Yes >> Repair is complete.
Perform RE TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL). (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSMISSION CONTROL MODULE - DIAGNOSIS AND TESTING)

No >> Refer to the Transmission category and perform the appropriate symptom(s). (Refer to 21 - TRANSMISSION/TRANSAXLE/AUTOMATIC - 48RE - DIAGNOSIS AND TESTING)

PRE-DIAGNOSTIC CHECKOUT (DIESEL) (CONTINUED)

TRANSMISSION VERIFICATION TEST VER - 1 (DIESEL)

1.

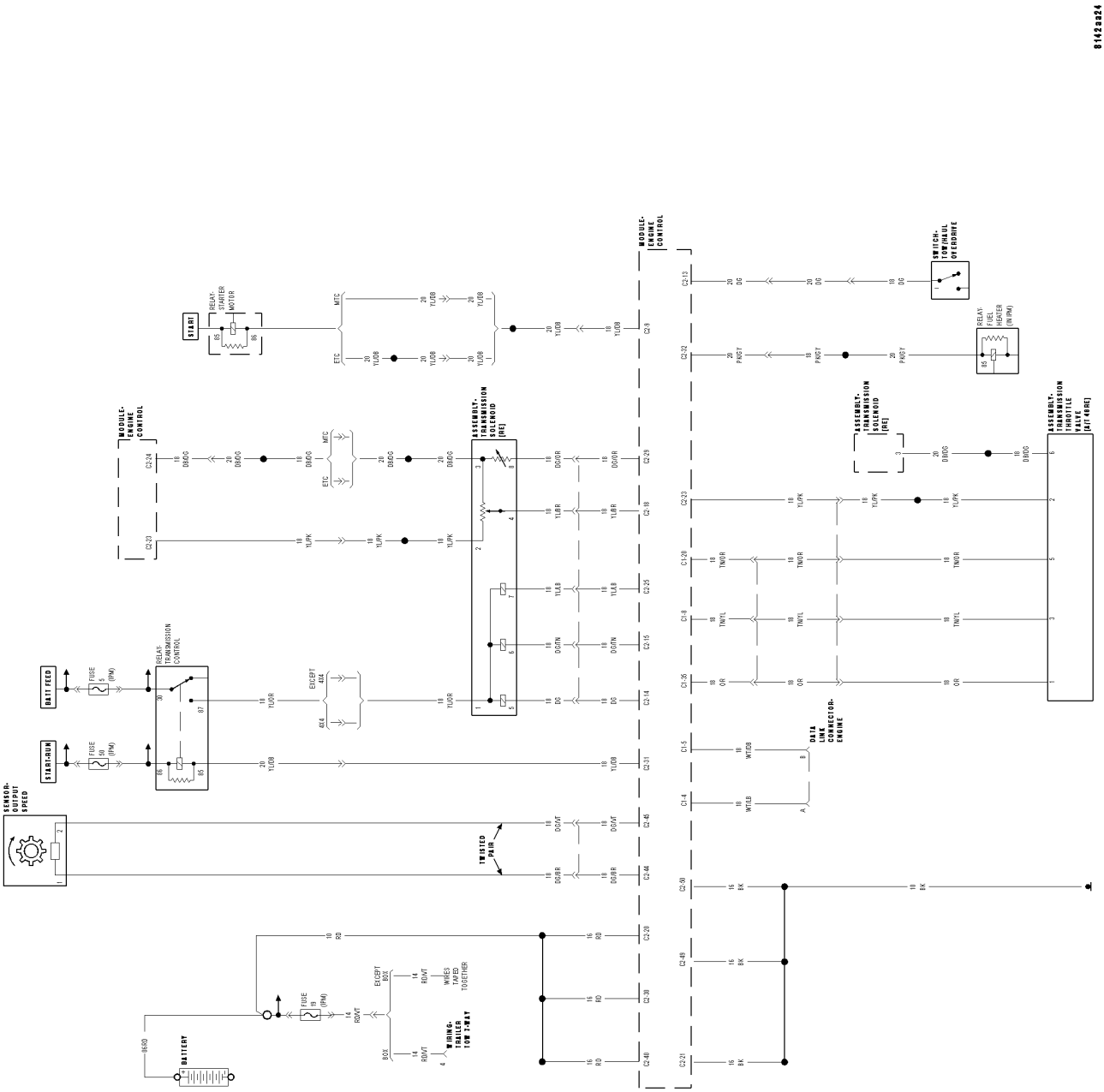
1. Inspect the vehicle to ensure that all engine and transmission components are properly installed and connected. Reassemble and reconnect components as necessary.
2. If any existing diagnostic trouble codes have not been repaired, go to Symptom List and follow path specified.
3. Connect a scan tool to the data link connector.
4. Ensure the fuel tank has at least a quarter tank of fuel. Turn off all accessories.
5. Start and run the engine until the transmission temperature is above 43°C (110°F).
6. Check the transmission fluid level per the Service Information. Adjust if necessary.
7. Road test the vehicle. Make 15 to 20 1-2, 2-3 and 3-4 up shifts. Perform these shifts from a standing start to 72 km/h (45 MPH) with a constant throttle opening of 20-25%.
8. Below 40 km/h (25 MPH), make 5 to 8 wide open throttle kick downs to 1st gear. Allow at least 5 seconds each in 2nd and 3rd between each kick down.
9. For a specific DTC, drive the vehicle in accordance with the Symptom's When Monitored and Set Conditions to verify the repair.
10. If a DTC sets during the road test, return to the Symptom List and follow the path. If no DTC sets, the repair is complete.

Are there any DTCs or symptoms remaining?

Yes >> Repair is not complete, refer to appropriate symptom.

No >> Repair is complete.

SCHEMATICS AND DIAGRAMS



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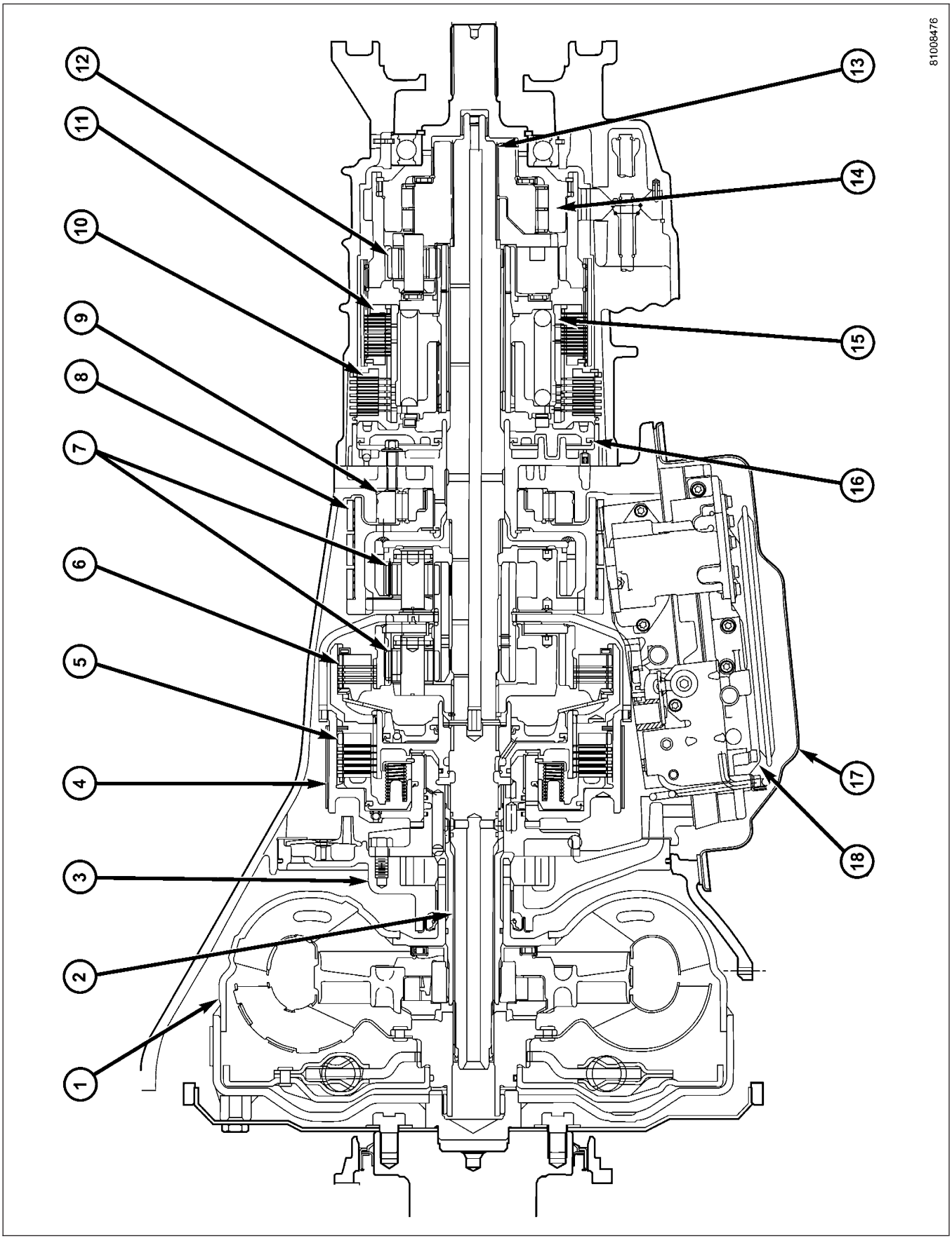
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AUTOMATIC TRANSMISSION - 48RE - SERVICE INFORMATION

DESCRIPTION



48RE Transmission

1 - TORQUE CONVERTER
2 - INPUT SHAFT
3 - OIL PUMP
4 - FRONT BAND
5 - FRONT CLUTCH
6 - REAR CLUTCH
7 - PLANETARIES
8 - REAR BAND
9 - OVERRUNNING CLUTCH
10 - OVERDRIVE CLUTCH
11 - DIRECT CLUTCH
12 - PLANETARY GEAR
13 - INTERMEDIATE SHAFT
14 - OVERDRIVE OVERRUNNING CLUTCH
15 - DIRECT CLUTCH SPRING
16 - OVERDRIVE PISTON RETAINER
17 - OIL PAN
18 - VALVE BODY

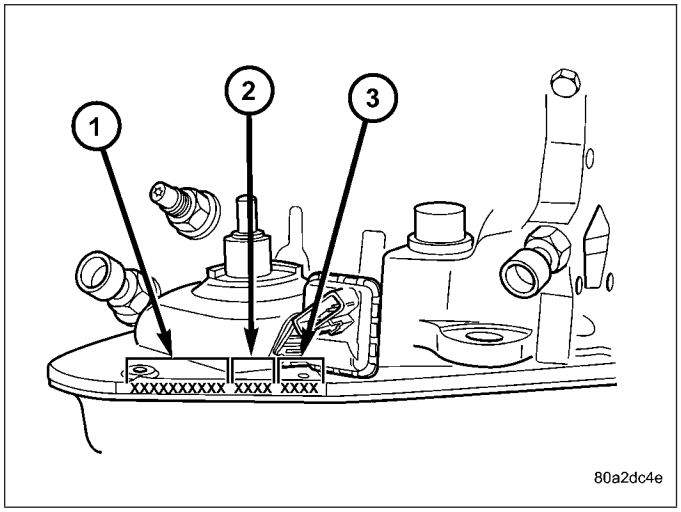
The 48RE is a four speed fully automatic transmissions with an electronic governor. The 48RE is equipped with a lock-up clutch in the torque converter. First through third gear ranges are provided by the clutches, bands, overrunning clutch, and planetary gear sets in the transmission. Fourth gear range is provided by the overdrive unit that contains an overdrive clutch, direct clutch, planetary gear set, and overrunning clutch.

The transmission contains a front, rear, and direct clutch which function as the input driving components. It also contains the kickdown (front) and the low/reverse (rear) bands which, along with the overrunning clutch and overdrive clutch, serve as the holding components. The driving and holding components combine to select the necessary planetary gear components, in the front, rear, or overdrive planetary gear set, transfer the engine power from the input shaft through to the output shaft.

The valve body is mounted to the lower side of the transmission and contains the valves to control pressure regulation, fluid flow control, and clutch/band application. The oil pump is mounted at the front of the transmission and is driven by the torque converter hub. The pump supplies the oil pressure necessary for clutch/band actuation and transmission lubrication.

IDENTIFICATION

Transmission identification numbers (1) are stamped on the left side of the case just above the oil pan gasket surface. Refer to this information when ordering replacement parts.



GEAR RATIOS

The 48RE gear ratios are:

1st	2.45:1
2nd	1.45:1
3rd	1.00:1
4th	0.69:1
Rev.	2.20:1

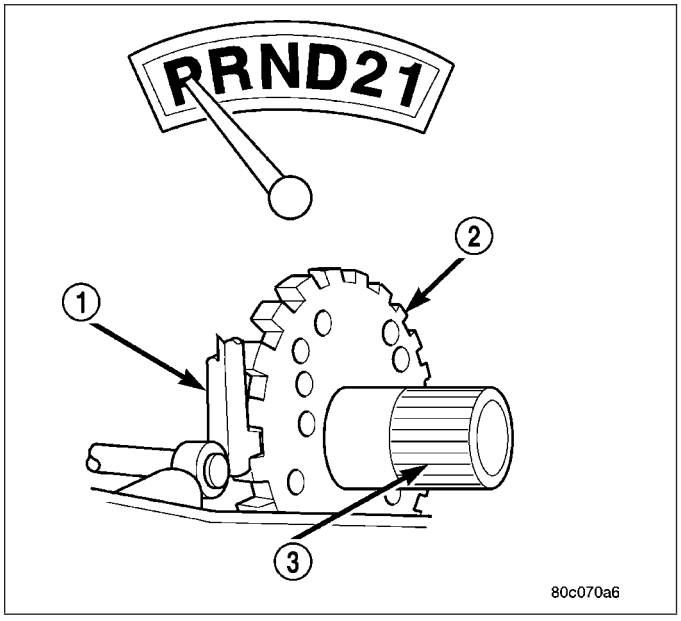
OPERATION

The application of each driving or holding component is controlled by the valve body based upon the manual lever position, throttle pressure, and governor pressure. The governor pressure is a variable pressure input to the valve body and is one of the signals that a shift is necessary. First through fourth gear are obtained by selectively applying and releasing the different clutches and bands. Engine power is thereby routed to the various planetary gear assemblies which combine with the overrunning clutch assemblies to generate the different gear ratios. The torque converter clutch is hydraulically applied and is released when fluid is vented from the hydraulic circuit by the torque converter control (TCC) solenoid on the valve body. The torque converter clutch is controlled by the Powertrain Control Module (PCM). The torque converter clutch engages in fourth gear, and in third gear under various conditions, such as when the O/D switch is OFF, when the vehicle is cruising on a level surface after the vehicle has warmed up. The torque converter clutch can also be engaged in the MANUAL SECOND gear position if high transmission temperatures are sensed by the PCM. The torque converter clutch will disengage momentarily when an increase in engine load is sensed by the PCM, such as when the vehicle begins to go uphill or the throttle pressure is increased. The torque converter clutch feature increases fuel economy and reduces the transmission fluid temperature.

Since the overdrive clutch is applied in fourth gear only and the direct clutch is applied in all ranges except fourth gear, the transmission operation for park, neutral, and first through third gear will be described first. Once these powerflows are described, the third to fourth shift sequence will be described.

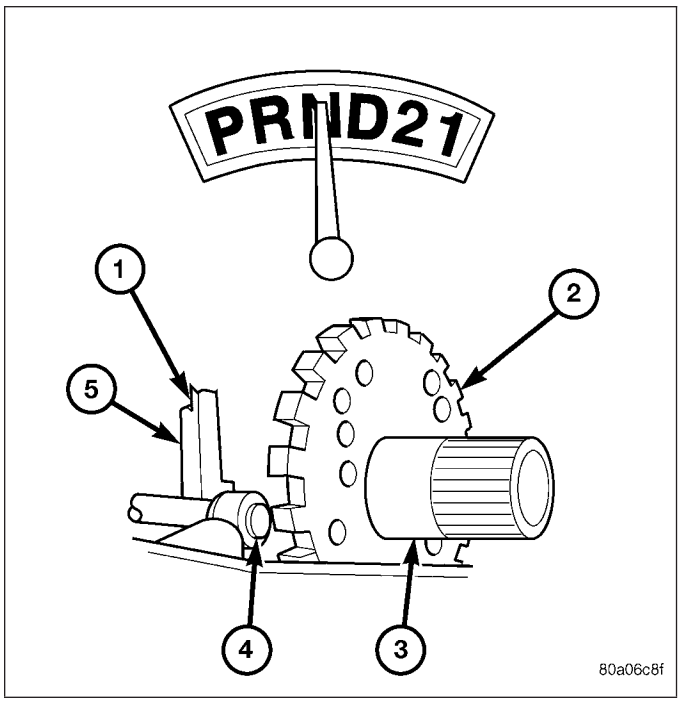
PARK POWERFLOW

As the engine is running and the crankshaft is rotating, the flexplate and torque converter, which are also bolted to it, are all rotating in a clockwise direction as viewed from the front of the engine. The notched hub of the torque converter is connected to the oil pump's internal gear, supplying the transmission with oil pressure. As the converter turns, it turns the input shaft in a clockwise direction. As the input shaft is rotating, the front clutch hub-rear clutch retainer and all their associated parts are also rotating, all being directly connected to the input shaft. The power flow from the engine through the front clutch hub and rear clutch retainer stops at the rear clutch retainer. Therefore, no power flow to the output shaft occurs because no clutches are applied. The only mechanism in use at this time is the parking sprag (1), which locks the parking gear (2) on the output shaft (3) to the transmission case.

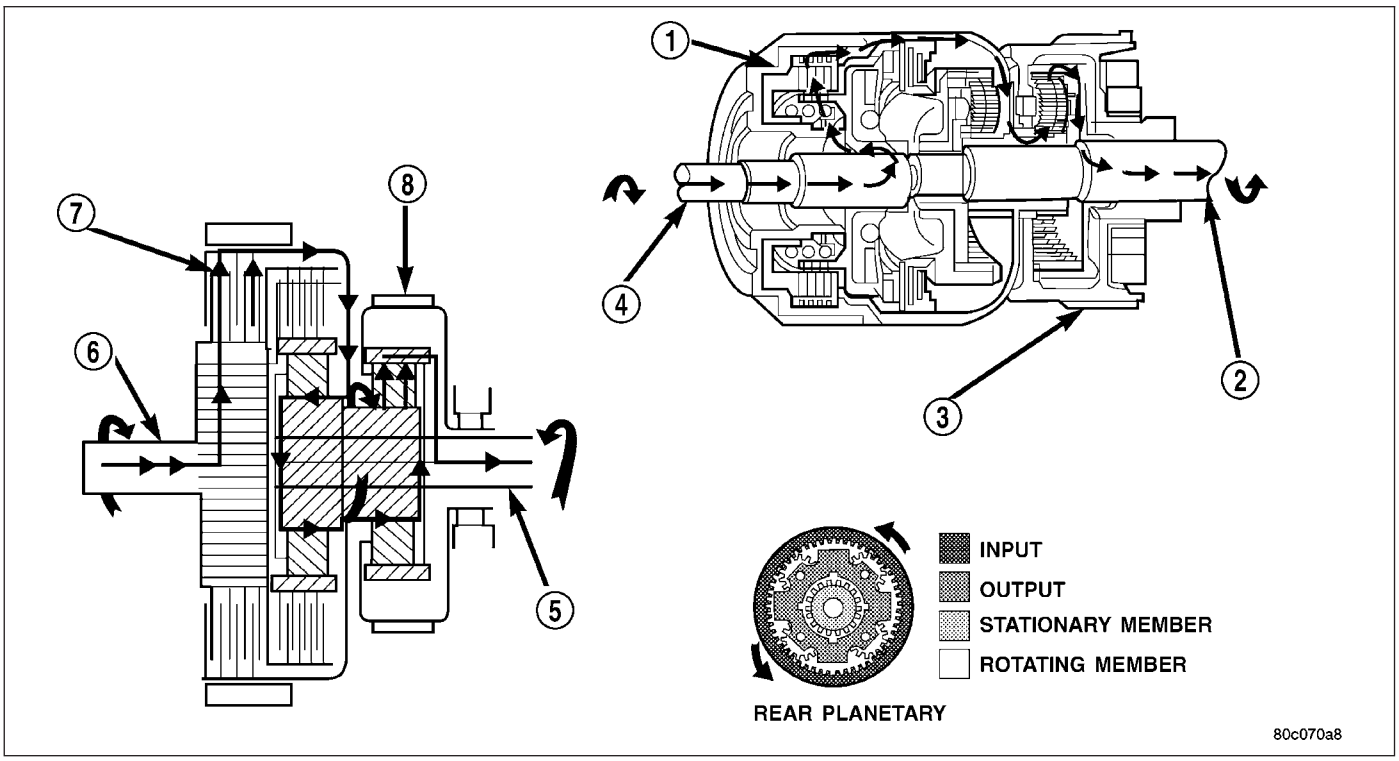


NEUTRAL POWERFLOW

With the gear selector in the NEUTRAL position, the power flow of the transmission is essentially the same as in the park position. The only operational difference is that the parking sprag (1) has been disengaged, unlocking the output shaft (3) from the transmission case and allowing it to move freely.



REVERSE POWERFLOW

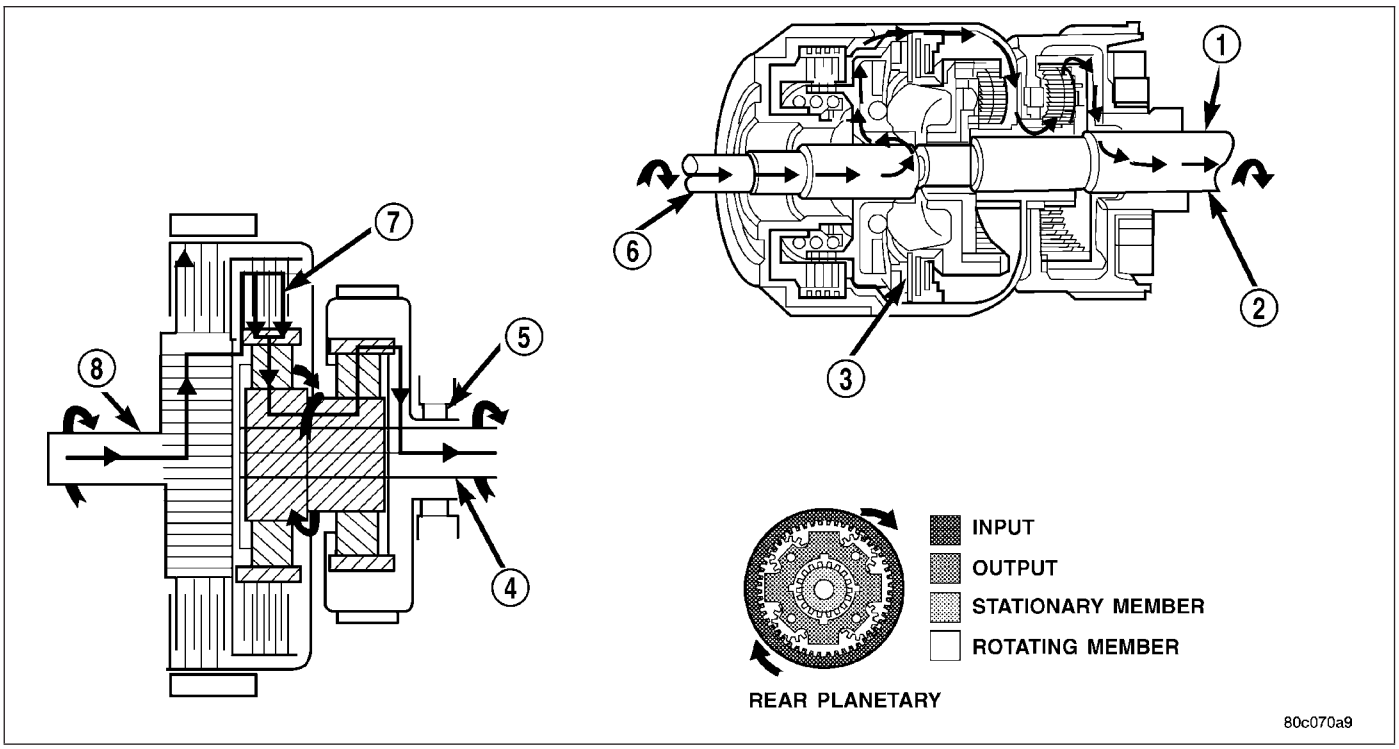


Reverse Powerflow

1 - FRONT CLUTCH ENGAGED
2 - OUTPUT SHAFT
3 - LOW/REVERSE BAND APPLIED
4 - INPUT SHAFT
5 - OUTPUT SHAFT
6 - INPUT SHAFT
7 - FRONT CLUTCH ENGAGED
8 - LOW/REVERSE BAND APPLIED

When the gear selector is moved into the REVERSE position, the front clutch (1, 7) and the rear band (3, 8) are applied. With the application of the front clutch, engine torque (4, 6) is applied to the sun gear, turning it in a clockwise direction. The clockwise rotation of the sun gear causes the rear planet pinions to rotate against engine rotation in a counterclockwise direction. The rear band is holding the low reverse drum, which is splined to the rear carrier. Since the rear carrier is being held, the torque from the planet pinions is transferred to the rear annulus gear, which is splined to the output shaft (2, 5). The output shaft in turn rotates with the annulus gear in a counterclockwise direction giving a reverse gear output. The entire transmission of torque is applied to the rear planetary gearset only. Although there is torque input to the front gearset through the sun gear, no other member of the gearset is being held. During the entire reverse stage of operation, the front planetary gears are in an idling condition.

FIRST GEAR POWERFLOW

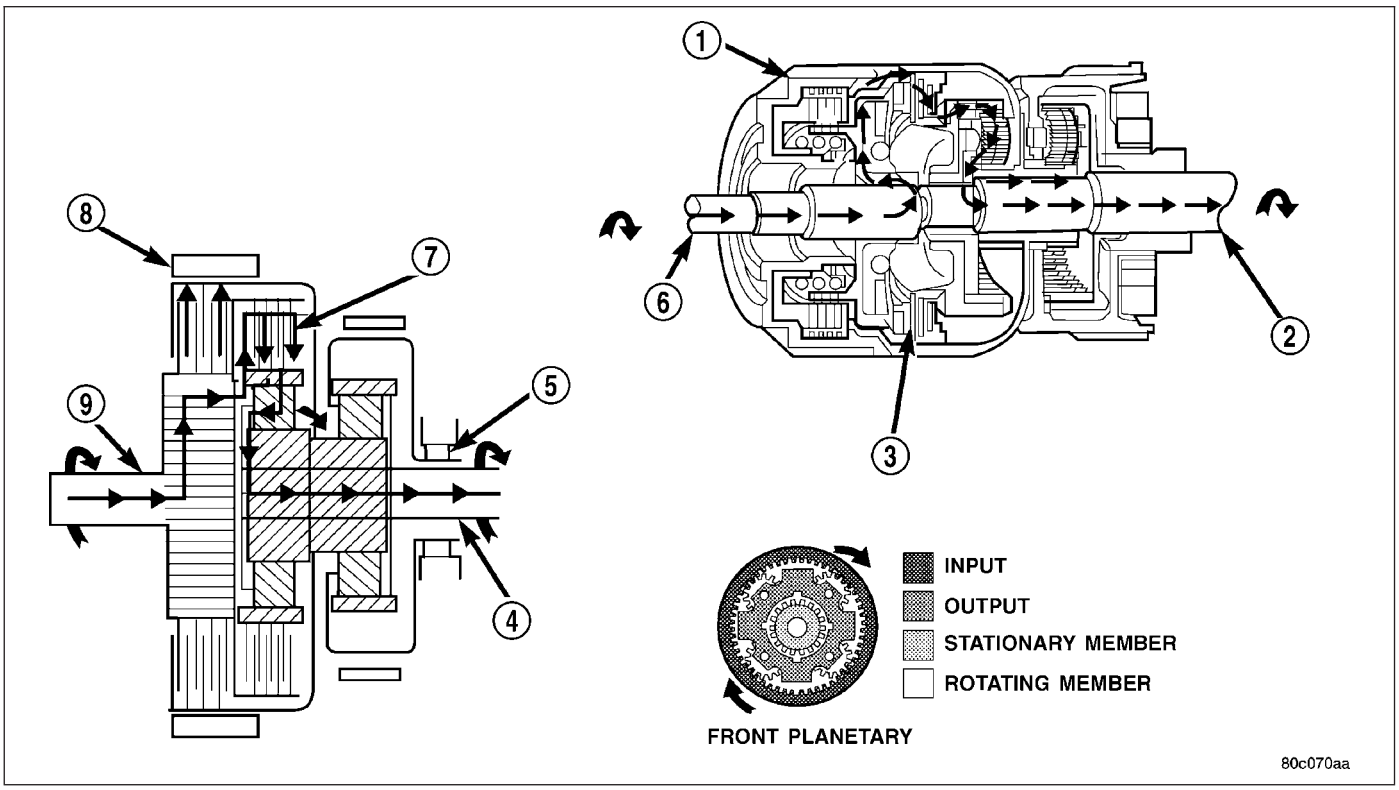


First Gear Powerflow

1 - OUTPUT SHAFT
2 - OVER-RUNNING CLUTCH HOLDING
3 - REAR CLUTCH APPLIED
4 - OUTPUT SHAFT
5 - OVER-RUNNING CLUTCH HOLDING
6 - INPUT SHAFT
7 - REAR CLUTCH APPLIED
8 - INPUT SHAFT

When the gearshift lever is moved into the DRIVE position the transmission goes into first gear. As soon as the transmission is shifted from PARK or NEUTRAL to DRIVE, the rear clutch applies (3, 7), applying the rear clutch pack to the front annulus gear. Engine torque (6, 8) is now applied to the front annulus gear turning it in a clockwise direction. With the front annulus gear turning in a clockwise direction, it causes the front planets to turn in a clockwise direction. The rotation of the front planets cause the sun to revolve in a counterclockwise direction. The sun gear now transfers its counterclockwise rotation to the rear planets which rotate back in a clockwise direction. With the rear annulus gear stationary, the rear planet rotation on the annulus gear causes the rear planet carrier to revolve in a counterclockwise direction. The rear planet carrier is splined into the low-reverse drum, and the low reverse drum is splined to the inner race of the over-running clutch (2, 5). With the over-running clutch locked, the planet carrier is held, and the resulting torque provided by the planet pinions is transferred to the rear annulus gear. The rear annulus gear is splined to the output shaft (1, 4) and rotated along with it (clockwise) in an underdrive gear reduction mode.

SECOND GEAR POWERFLOW

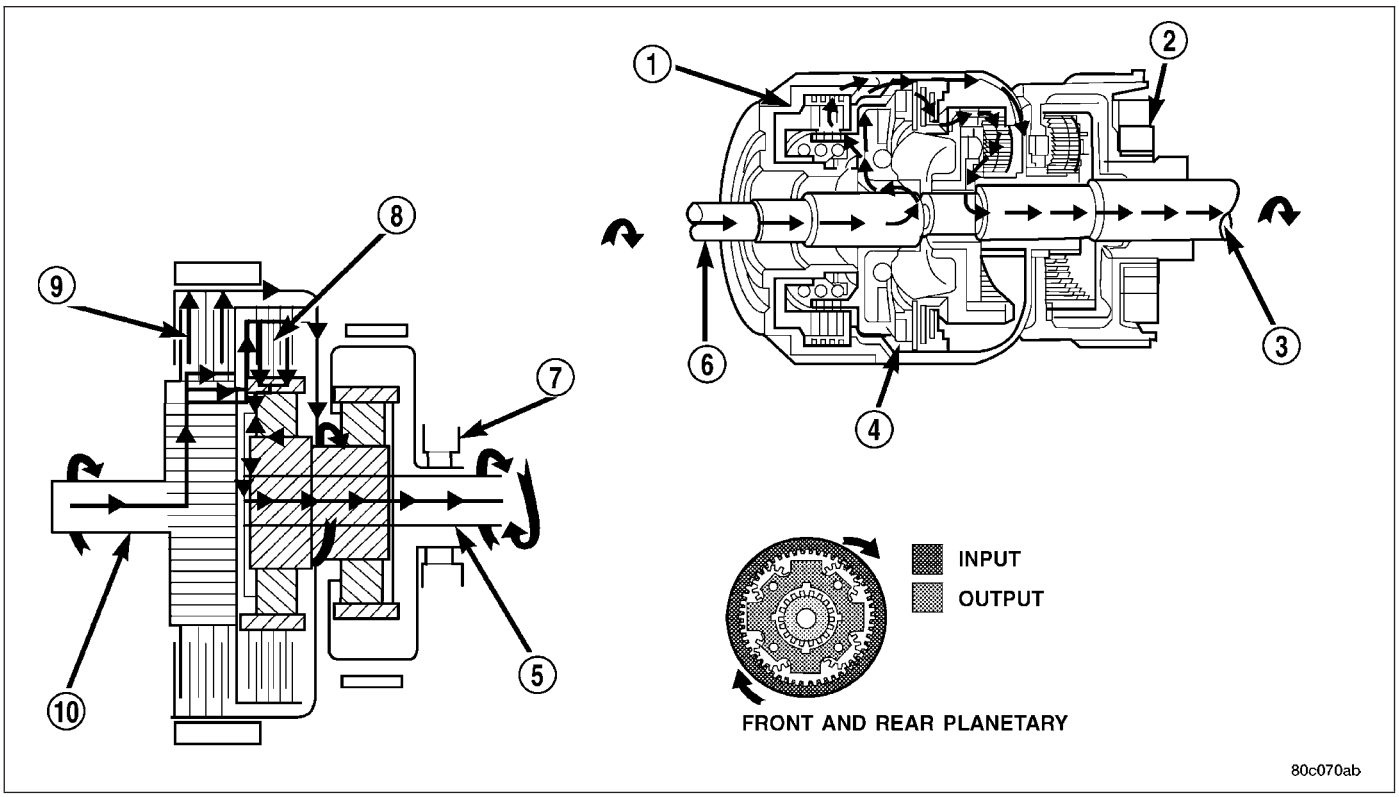


Second Gear Powerflow

1 - KICKDOWN BAND APPLIED
2 - OUTPUT SHAFT
3 - REAR CLUTCH ENGAGED
4 - OUTPUT SHAFT
5 - OVER-RUNNING CLUTCH FREE-WHEELING
6 - INPUT SHAFT
7 - REAR CLUTCH APPLIED
8 - KICKDOWN BAND APPLIED
9 - INPUT SHAFT

In DRIVE-SECOND, the same elements are applied as in MANUAL-SECOND. Therefore, the power flow will be the same, and both gears will be discussed as one in the same. In DRIVE-SECOND, the transmission has proceeded from first gear to its shift point, and is shifting from first gear to second. The second gear shift is obtained by keeping the rear clutch applied ((3, 7) and applying the front (kickdown) band (1, 8). The front band holds the front clutch retainer that is locked to the sun gear driving shell. With the rear clutch still applied, the input is still on the front annulus gear turning it clockwise at engine speed. Now that the front band is holding the sun gear stationary, the annulus rotation causes the front planets to rotate in a clockwise direction. The front carrier is then also made to rotate in a clockwise direction but at a reduced speed. This will transmit the torque to the output shaft (2, 4), which is directly connected to the front planet carrier. The rear planetary annulus gear will also be turning because it is directly splined to the output shaft. All power flow has occurred in the front planetary gear set during the drive-second stage of operation, and now the over-running clutch, in the rear of the transmission, is disengaged and freewheeling on its hub.

DIRECT DRIVE POWERFLOW



Direct Drive Powerflow

1 - FRONT CLUTCH APPLIED
2 - OVER-RUNNING CLUTCH FREE-WHEELING
3 - OUTPUT SHAFT
4 - REAR CLUTCH APPLIED
5 - OUTPUT SHAFT
6 - INPUT SHAFT
7 - OVER-RUNNING CLUTCH FREE-WHEELING
8 - REAR CLUTCH APPLIED
9 - FRONT CLUTCH APPLIED
10 - INPUT SHAFT

The vehicle has accelerated and reached the shift point for the 2-3 upshift into direct drive. When the shift takes place, the front band is released, and the front clutch is applied (1, 9). The rear clutch stays applied (4, 8) as it has been in all the forward gears. With the front clutch now applied, engine torque is now on the front clutch retainer, which is locked to the sun gear driving shell. This means that the sun gear is now turning in engine rotation (clockwise) and at engine speed. The rear clutch is still applied so engine torque (6, 10) is also still on the front annulus gear. If two members of the same planetary set are driven, direct drive results. Therefore, when two members are rotating at the same speed and in the same direction, it is the same as being locked up. The rear planetary set is also locked up, given the sun gear is still the input, and the rear annulus gear must turn with the output shaft (3, 5). Both gears are turning in the same direction and at the same speed. The front and rear planet pinions do not turn at all in direct drive. The only rotation is the input from the engine to the connected parts, which are acting as one common unit, to the output shaft.

FOURTH GEAR POWERFLOW

Fourth gear overdrive range is electronically controlled and hydraulically activated. Various sensor inputs are supplied to the powertrain control module to operate the overdrive solenoid on the valve body. The solenoid contains a check ball that opens and closes a vent port in the 3-4 shift valve feed passage. The overdrive solenoid (and check ball) are not energized in first, second, third, or reverse gear. The vent port remains open, diverting line pressure from the 2-3 shift valve away from the 3-4 shift valve. The Tow/Haul control switch must be in the ON position to transmit overdrive status to the PCM. A 3-4 upshift occurs only when the overdrive solenoid is energized by the PCM. The PCM energizes the overdrive solenoid during the 3-4 upshift. This causes the solenoid check ball to close the vent port allowing line pressure from the 2-3 shift valve to act directly on the 3-4 upshift valve. Line pressure on the 3-4 shift valve overcomes valve spring pressure moving the valve to the upshift position. This action exposes the feed passages to the 3-4 timing valve, 3-4 quick fill valve, 3-4 accumulator, and ultimately to the overdrive pis-

ton. Line pressure through the timing valve moves the overdrive piston into contact with the overdrive clutch. The direct clutch is disengaged before the overdrive clutch is engaged. The boost valve provides increased fluid apply pressure to the overdrive clutch during 3-4 upshifts, and when accelerating in fourth gear. The 3-4 accumulator cushions overdrive clutch engagement to smooth 3-4 upshifts. The accumulator is charged at the same time as apply pressure acts against the overdrive piston.

DIAGNOSIS AND TESTING

AUTOMATIC TRANSMISSION

Automatic transmission problems can be a result of poor engine performance, incorrect fluid level, incorrect linkage or cable adjustment, band or hydraulic control pressure adjustments, hydraulic system malfunctions or electrical/mechanical component malfunctions. Begin diagnosis by checking the easily accessible items such as: fluid level and condition, linkage adjustments and electrical connections. A road test will determine if further diagnosis is necessary.

PRELIMINARY

Two basic procedures are required. One procedure for vehicles that are drivable and an alternate procedure for disabled vehicles (will not back up or move forward).

VEHICLE IS DRIVEABLE

1. Check for transmission fault codes using DRB® scan tool.
2. Check fluid level and condition.
3. Adjust throttle and gearshift linkage if complaint was based on delayed, erratic, or harsh shifts.
4. Road test and note how transmission upshifts, downshifts, and engages.
5. Perform hydraulic pressure test if shift problems were noted during road test.
6. Perform air-pressure test to check clutch-band operation.

VEHICLE IS DISABLED

1. Check fluid level and condition.
2. Check for broken or disconnected gearshift or throttle linkage.
3. Check for cracked, leaking cooler lines, or loose or missing pressure-port plugs.
4. Raise and support vehicle on safety stands, start engine, shift transmission into gear, and note following:
   a. If propeller shaft turns but wheels do not, problem is with differential or axle shafts.
   b. If propeller shaft does not turn and transmission is noisy, stop engine. Remove oil pan, and check for debris. If pan is clear, remove transmission and check for damaged drive plate, converter, oil pump, or input shaft.
   c. If propeller shaft does not turn and transmission is not noisy, perform hydraulic-pressure test to determine if problem is hydraulic or mechanical.

ROAD TESTING

Before road testing, be sure the fluid level and control cable adjustments have been checked and adjusted if necessary. Verify that diagnostic trouble codes have been resolved.

Observe engine performance during the road test. A poorly tuned engine will not allow accurate analysis of transmission operation.

Operate the transmission in all gear ranges. Check for shift variations and engine flare which indicates slippage. Note if shifts are harsh, spongy, delayed, early, or if part throttle downshifts are sensitive.

Slippage indicated by engine flare, usually means clutch, band or overrunning clutch problems. If the condition is advanced, an overhaul will be necessary to restore normal operation.

A slipping clutch or band can often be determined by comparing which internal units are applied in the various gear ranges. The Clutch and Band Application chart provides a basis for analyzing road test results.

Clutch and Band Application Chart

SHIFT LEVER POSITION	TRANSMISSION CLUTCHES AND BANDS					OVERDRIVE CLUTCHES		
	FRONT CLUTCH	FRONT BAND	REAR CLUTCH	REAR BAND	OVER-RUNNING CLUTCH	OVER-DRIVE CLUTCH	DIRECT CLUTCH	OVER-RUNNING CLUTCH
Reverse	X			X			X	
Drive - First			X		X		X	X
Drive - Second		X	X				X	X
Drive - Third	X		X				X	X
Drive - Fourth	X		X			X		
Manual Second		X	X				X	X
Manual First			X	X	X		X	X

Note that the rear clutch is applied in all forward ranges (D, 2, 1). The transmission overrunning clutch is applied in first gear (D, 2 and 1 ranges) only. The rear band is applied in 1 and R range only.

Note that the overdrive clutch is applied only in fourth gear and the overdrive direct clutch and overrunning clutch are applied in all ranges except fourth gear.

For example: If slippage occurs in first gear in D and 2 range but not in 1 range, the transmission overrunning clutch is faulty. Similarly, if slippage occurs in any two forward gears, the rear clutch is slipping.

Applying the same method of analysis, note that the front and rear clutches are applied simultaneously only in D range third and fourth gear. If the transmission slips in third gear, either the front clutch or the rear clutch is slipping.

If the transmission slips in fourth gear but not in third gear, the overdrive clutch is slipping. By selecting another gear which does not use these clutches, the slipping unit can be determined. For example, if the transmission also slips in Reverse, the front clutch is slipping. If the transmission does not slip in Reverse, the rear clutch is slipping.

If slippage occurs during the 3-4 shift or only in fourth gear, the overdrive clutch is slipping. Similarly, if the direct clutch were to fail, the transmission would lose both reverse gear and overrun braking in 2 position (manual second gear).

If the transmission will not shift to fourth gear, the control switch, overdrive solenoid or related wiring may also be the problem cause.

This process of elimination can be used to identify a slipping unit and check operation. Proper use of the Clutch and Band Application Chart is the key.

Although road test analysis will help determine the slipping unit, the actual cause of a malfunction usually cannot be determined until hydraulic and air pressure tests are performed. Practically any condition can be caused by leaking hydraulic circuits or sticking valves.

Unless a malfunction is obvious, such as no drive in D range first gear, do not disassemble the transmission. Perform the hydraulic and air pressure tests to help determine the probable cause.

HYDRAULIC PRESSURE TEST

Hydraulic test pressures range from a low of one psi (6.895 kPa) governor pressure, to 300 psi (2068 kPa) at the rear servo pressure port in reverse.

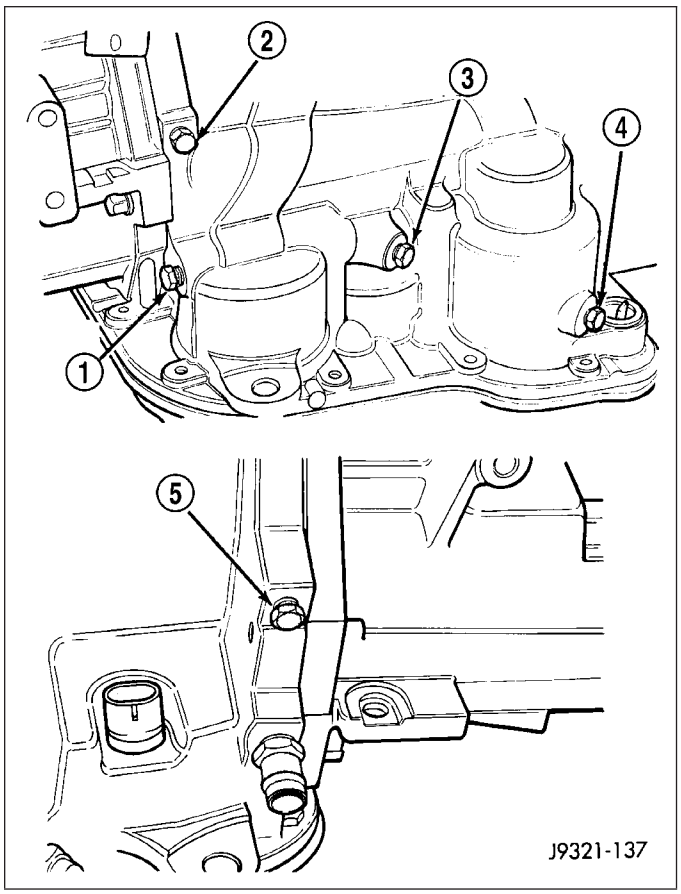
An accurate tachometer and pressure test gauges are required. Test Gauge C-3292 has a 100 psi range and is used at the accumulator, governor, and front servo ports. Test Gauge C-3293-SP has a 300 psi range and is used at the rear servo and overdrive ports where pressures exceed 100 psi.

Pressure Test Port Locations

Test ports are located at both sides of the transmission case.

Line pressure is checked at the accumulator port (3) on the right side of the case. The front servo pressure port (4) is at the right side of the case just behind the filler tube opening.

The rear servo (1) and governor pressure (2) ports are at the right rear of the transmission case. The overdrive clutch pressure port (5) is at the left rear of the case.



Test One - Transmission In Manual Low

This test checks pump output, pressure regulation, and condition of the rear clutch and servo circuit. Both test gauges are required for this test.

1. Connect tachometer to engine. Position tachometer so it can be observed from driver seat if helper will be operating engine. Raise vehicle on hoist that will allow rear wheels to rotate freely.
2. Connect 100 psi Gauge C-3292 to accumulator port. Then connect 300 psi Gauge C-3293-SP to rear servo port.
3. Disconnect throttle and gearshift cables from levers on transmission valve body manual shaft.
4. Have helper start and run engine at 1000 rpm.
5. Move transmission shift lever fully forward into 1 range.
6. Gradually move transmission throttle lever from full forward to full rearward position and note pressures on both gauges:
   - Line pressure at accumulator port should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (621-662 kPa) as throttle lever is moved rearward.
   - Rear servo pressure should be same as line pressure within 3 psi (20.68 kPa).

Test Two - Transmission In 2 Range

This test checks pump output, line pressure and pressure regulation. Use 100 psi Test Gauge C-3292 for this test.

1. Leave vehicle in place on hoist and leave Test Gauge C-3292 connected to accumulator port.
2. Have helper start and run engine at 1000 rpm.
3. Move transmission shift lever one detent rearward from full forward position. This is 2 range.
4. Move transmission throttle lever from full forward to full rearward position and read pressure on gauge.

5. Line pressure should be 54-60 psi (372-414 kPa) with throttle lever forward and gradually increase to 90-96 psi (621-662 kPa) as lever is moved rearward.

Test Three - Transmission In D Range Third Gear

This test checks pressure regulation and condition of the clutch circuits. Both test gauges are required for this test.

1. Turn OD switch off.
2. Leave vehicle on hoist and leave Gauge C-3292 in place at accumulator port.
3. Move Gauge C-3293-SP over to front servo port for this test.
4. Have helper start and run engine at 1600 rpm for this test.
5. Move transmission shift lever two detents rearward from full forward position. This is D range.
6. Read pressures on both gauges as transmission throttle lever is gradually moved from full forward to full rearward position:
   - Line pressure at accumulator in D range third gear, should be 54-60 psi (372-414 kPa) with throttle lever forward and increase as lever is moved rearward.
   - Front servo pressure in D range third gear, should be within 3 psi (21 kPa) of line pressure up to kickdown point.

Test Four - Transmission In Reverse

This test checks pump output, pressure regulation and the front clutch and rear servo circuits. Use 300 psi Test Gauge C-3293-SP for this test.

1. Leave vehicle on hoist and leave gauge C-3292 in place at accumulator port.
2. Move 300 psi Gauge C-3293-SP back to rear servo port.
3. Have helper start and run engine at 1600 rpm for test.
4. Move transmission shift lever four detents rearward from full forward position. This is Reverse range.
5. Move transmission throttle lever fully forward then fully rearward and note reading at Gauge C-3293-SP.
6. Pressure should be 145 - 175 psi (1000-1207 kPa) with throttle lever forward and increase to 230 - 280 psi (1586-1931 kPa) as lever is gradually moved rearward.

Test Five - Governor Pressure

This test checks governor operation by measuring governor pressure response to changes in vehicle speed. It is usually not necessary to check governor operation unless shift speeds are incorrect or if the transmission will not downshift. The test should be performed on the road or on a hoist that will allow the rear wheels to rotate freely.

1. Move 100 psi Test Gauge C-3292 to governor pressure port.
2. Move transmission shift lever two detents rearward from full forward position. This is D range.
3. Have helper start and run engine at curb idle speed. Then firmly apply service brakes so wheels will not rotate.
4. Note governor pressure:
   - Governor pressure should be no more than 20.6 kPa (3 psi) at curb idle speed and wheels not rotating.
   - If pressure exceeds 20.6 kPa (3 psi), a fault exists in governor pressure control system.
5. Release brakes, slowly increase engine speed, and observe speedometer and pressure test gauge (do not exceed 30 mph on speedometer). Governor pressure should increase in proportion to vehicle speed. Or approximately 6.89 kPa (1 psi) for every 1 mph.
6. Governor pressure rise should be smooth and drop back to no more than 20.6 kPa (3 psi), after engine returns to curb idle and brakes are applied to prevent wheels from rotating.
7. Compare results of pressure test with analysis chart.

Test Six - Transmission In Overdrive Fourth Gear

This test checks line pressure at the overdrive clutch in fourth gear range. Use 300 psi Test Gauge C-3293-SP for this test. The test should be performed on the road or on a chassis dyno.

1. Remove tachometer; it is not needed for this test.
2. Move 300 psi Gauge to overdrive clutch pressure test port. Then remove other gauge and reinstall test port plug.
3. Lower vehicle.

4. Turn OD switch on.
5. Secure test gauge so it can be viewed from drivers seat.
6. Start engine and shift into D range.
7. Increase vehicle speed gradually until 3-4 shift occurs and note gauge pressure.
8. Pressure should be 524-565 kPa (76-82 psi) with closed throttle and increase to 690-896 kPa (100-130 psi) at 1/2 to 3/4 throttle. Note that pressure can increase to around 965 kPa (140 psi) at full throttle.
9. Return to shop or move vehicle off chassis dyno.

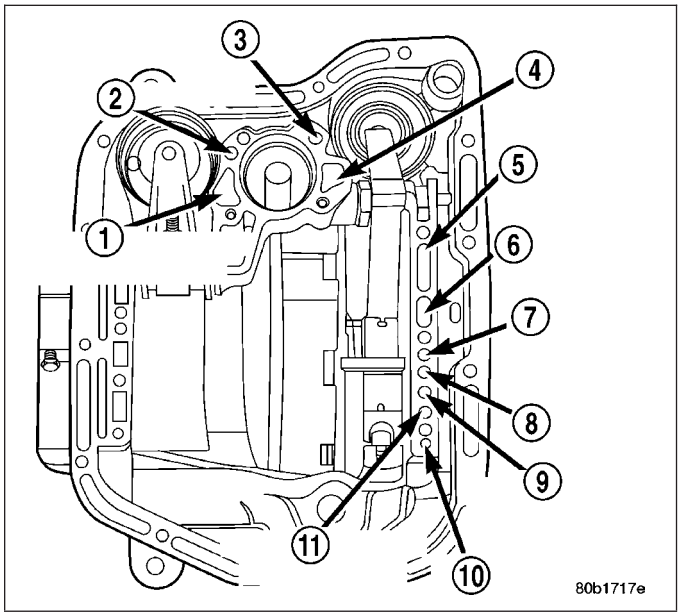
PRESSURE TEST ANALYSIS CHART

TEST CONDITION	INDICATION
Line pressure OK during any one test	Pump and regulator valve OK
Line pressure OK in R but low in D, 2, 1	Leakage in rear clutch area (seal rings, clutch seals)
Pressure low in D Fourth Gear Range	Overdrive clutch piston seal, or check ball problem
Pressure OK in 1, 2 but low in D3 and R	Leakage in front clutch area
Pressure OK in 2 but low in R and 1	Leakage in rear servo
Front servo pressure in 2	Leakage in servo; broken servo ring or cracked servo piston
Pressure low in all positions	Clogged filter, stuck regulator valve, worn or faulty pump, low oil level
Governor pressure too high at idle speed	Governor pressure solenoid valve system fault. Refer to diagnostic book.
Governor pressure low at all mph figures	Faulty governor pressure solenoid, transmission control module, or governor pressure sensor
Lubrication pressure low at all throttle positions	Clogged fluid cooler or lines, seal rings leaking, worn pump bushings, pump, clutch retainer, or clogged filter.
Line pressure high	Output shaft plugged, sticky regulator valve
Line pressure low	Sticky regulator valve, clogged filter, worn pump

AIR TESTING TRANSMISSION CLUTCH AND BAND OPERATION

Air-pressure testing can be used to check transmission front/rear clutch and band operation. The test can be conducted with the transmission either in the vehicle or on the work bench, as a final check, after overhaul.

Air-pressure testing requires that the oil pan and valve body be removed from the transmission. The servo and clutch apply passages are shown.



Front Clutch Air Test

Place one or two fingers on the clutch housing and apply air pressure through front clutch apply passage. Piston movement can be felt and a soft thump heard as the clutch applies.

Rear Clutch Air Test

Place one or two fingers on the clutch housing and apply air pressure through rear clutch apply passage. Piston movement can be felt and a soft thump heard as the clutch applies.

Front Servo Air Test

Apply air pressure to the front servo apply passage. The servo rod should extend and cause the band to tighten around the drum. Spring pressure should release the servo when air pressure is removed.

Rear Servo Air Test

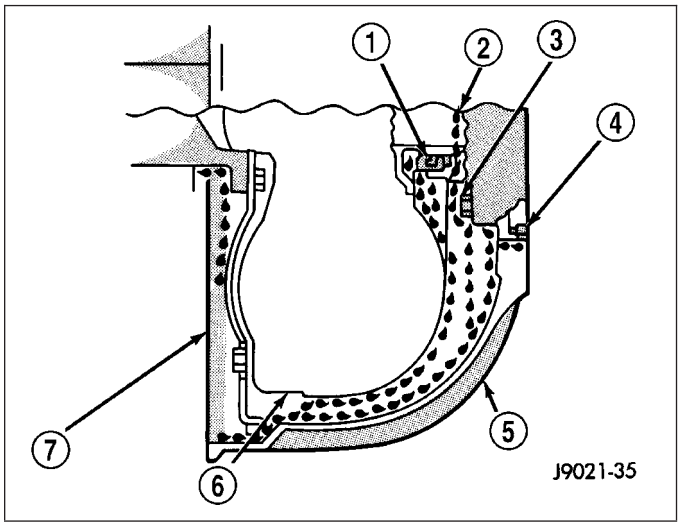
Apply air pressure to the rear servo apply passage. The servo rod should extend and cause the band to tighten around the drum. Spring pressure should release the servo when air pressure is removed.

CONVERTER HOUSING FLUID LEAK

When diagnosing converter housing fluid leaks, two items must be established before repair.

1. Verify that a leak condition actually exists.
2. Determined the true source of the leak.

Some suspected converter housing fluid leaks may not be leaks at all. They may only be the result of residual fluid in the converter housing, or excess fluid spilled during factory fill or fill after repair. Converter housing leaks have several potential sources. Through careful observation, a leak source can be identified before removing the transmission for repair. Pump seal leaks tend to move along the drive hub and onto the rear of the converter. Pump body leaks follow the same path as a seal leak. Pump vent or pump attaching bolt leaks are generally deposited on the inside of the converter housing and not on the converter itself. Pump o-ring or gasket leaks usually travel down the inside of the converter housing. Front band lever pin plug leaks are generally deposited on the housing and not on the converter.



1 - PUMP SEAL
2 - PUMP VENT
3 - PUMP BOLT
4 - PUMP GASKET
5 - CONVERTER HOUSING
6 - CONVERTER
7 - REAR MAIN SEAL LEAK

TORQUE CONVERTER LEAK POINTS

Possible sources of converter leaks are:

- Leaks at the weld joint around the outside diameter weld.
- Leaks at the converter hub weld.

CONVERTER HOUSING AREA LEAK CORRECTION

1. Remove converter.
2. Tighten front band adjusting screw until band is tight around front clutch retainer. This prevents front/rear clutches from coming out when oil pump is removed.
3. Remove oil pump and remove pump seal. Inspect pump housing drainback and vent holes for obstructions. Clear holes with solvent and wire.

4. Inspect pump bushing and converter hub. If bushing is scored, replace it. If converter hub is scored, either polish it with crocus cloth or replace converter.
5. Install new pump seal, O-ring, and gasket. Replace oil pump if cracked, porous or damaged in any way. Be sure to loosen the front band before installing the oil pump, damage to the oil pump seal may occur if the band is still tightened to the front clutch retainer.
6. Loosen kickdown lever pin access plug three turns. Apply Loctite™ 592, or Permatex® No. 2 to plug threads and tighten plug to 17 N·m (150 in. lbs.) torque.
7. Adjust front band.
8. Lubricate pump seal and converter hub with transmission fluid or petroleum jelly and install converter.
9. Install transmission and converter housing dust shield.
10. Lower vehicle.

DIAGNOSIS CHARTS

The diagnosis charts provide additional reference when diagnosing a transmission fault. The charts provide general information on a variety of transmission, overdrive unit and converter clutch fault conditions.

The hydraulic flow charts in the Schematics and Diagrams section of this group, outline fluid flow and hydraulic circuitry. Circuit operation is provided for PARK, NEUTRAL, FIRST, SECOND, THIRD, FOURTH, MANUAL FIRST, MANUAL SECOND, and REVERSE gear ranges. Normal working pressures are also supplied for each of the gear ranges.

Diagnosis Charts

CONDITION	POSSIBLE CAUSES	CORRECTION
HARSH ENGAGEMENT (FROM NEUTRAL TO DRIVE OR REVERSE)	1. Fluid Level Low.	1. Add Fluid
	2. Throttle Linkage Mis-adjusted. V-10 Only	2. Adjust linkage - setting may be too long.
	3. Mount and Driveline Bolts Loose.	3. Check engine mount, transmission mount, propeller shaft, rear spring to body bolts, rear control arms, crossmember and axle bolt torque. Tighten loose bolts and replace missing bolts.
	4. U-Joint Worn/Broken.	4. Remove propeller shaft and replace U-Joint.
	5. Axle Backlash Incorrect.	5. Check per Service Manual. Correct as needed.
	6. Hydraulic Pressure Incorrect.	6. Check pressure. Remove, overhaul or adjust valve body as needed.
	7. Band Mis-adjusted.	7. Adjust rear band.
	8. Valve Body Check Balls Missing.	8. Inspect valve body for proper check ball installation.
	9. Axle Pinion Flange Loose.	9. Replace nut and check pinion threads before installing new nut. Replace pinion gear if threads are damaged.
	10. Clutch, band or planetary component damaged.	10. Remove, disassemble and repair transmission as necessary.
	11. Converter Clutch Faulty.	11. Replace converter and flush cooler and line before installing new converter.

CONDITION	POSSIBLE CAUSES	CORRECTION
DELAYED ENGAGEMENT (FROM NEUTRAL TO DRIVE OR REVERSE)	1. Fluid Level Low.	1. Correct level and check for leaks.
	2. Filter Clogged.	2. Change filter.
	3. Gearshift Linkage Mis-adjusted.	3. Adjust linkage and repair linkage if worn or damaged.
	4. Torque Converter Drain Back (Oil drains from torque converter into transmission sump).	4. If vehicle moves normally after 5 seconds after shifting into gear, no repair is necessary. If longer, inspect pump bushing for wear. Replace pump house.
	5. Rear Band Mis-adjusted.	5. Adjust band.
	6. Valve Body Filter Plugged.	6. Replace fluid and filter. If oil pan and old fluid were full of clutch disc material and/or metal particles, overhaul will be necessary.
	7. Oil Pump Gears Worn/Damaged.	7. Remove transmission and replace oil pump.
	8. Governor Circuit and Solenoid Valve Electrical Fault.	8. Test with DRB® scan tool and repair as required.
	9. Hydraulic Pressure Incorrect.	9. Perform pressure test, remove transmission and repair as needed.
	10. Reaction Shaft Seal Rings Worn/Broken.	10. Remove transmission, remove oil pump and replace seal rings.
	11. Rear Clutch/Input Shaft, Rear Clutch Seal Rings Damaged.	11. Remove and disassemble transmission and repair as necessary.
	12. Regulator Valve Stuck.	12. Clean.
	13. Cooler Plugged.	13. Transfer case failure can plug cooler.
NO DRIVE RANGE (REVERSE OK)	1. Fluid Level Low.	1. Add fluid and check for leaks if drive is restored.
	2. Gearshift Linkage/Cable Loose/ Misadjusted.	2. Repair or replace linkage components.
	3. Rear Clutch Burnt.	3. Remove and disassemble transmission and rear clutch and seals. Repair/replace worn or damaged parts as needed.
	4. Valve Body Malfunction.	4. Remove and disassemble valve body. Replace assembly if any valves or bores are damaged.
	5. Transmission Overrunning Clutch Broken.	5. Remove and disassemble transmission. Replace overrunning clutch.
	6. Input Shaft Seal Rings Worn/ Damaged.	6. Remove and disassemble transmission. Replace seal rings and any other worn or damaged parts.
	7. Front Planetary Failed Broken.	7. Remove and repair.

CONDITION	POSSIBLE CAUSES	CORRECTION
NO DRIVE OR REVERSE (VEHICLE WILL NOT MOVE)	1. Fluid Level Low.	1. Add fluid and check for leaks if drive is restored.
	2. Gearshift Linkage/Cable Loose/ Misadjusted.	2. Inspect, adjust and reassemble linkage as needed. Replace worn/damaged parts.
	3. U-Joint/Axle/Transfer Case Broken.	3. Perform preliminary inspection procedure for vehicle that will not move. Refer to procedure in diagnosis section.
	4. Filter Plugged.	4. Remove and disassemble transmission. Repair or replace failed components as needed. Replace filter. If filter and fluid contained clutch material or metal particles, an overhaul may be necessary. Perform lube flow test. Flush oil. Replace cooler as necessary.
	5. Oil Pump Damaged.	5. Perform pressure test to confirm low pressure. Replace pump body assembly if necessary.
	6. Valve Body Malfunctioned.	6. Check and inspect valve body. Replace valve body (as assembly) if any valve or bore is damaged. Clean and reassemble correctly if all parts are in good condition.
	7. Transmission Internal Component Damaged.	7. Remove and disassemble transmission. Repair or replace failed components as needed.
	8. Park Sprag not Releasing - Check Stall Speed, Worn/Damaged/Stuck.	8. Remove, disassemble, repair.
	9. Torque Converter Damage.	9. Inspect and replace as required.
SHIFTS DELAYED OR ERRATIC (SHIFTS ALSO HARSH AT TIMES)	1. Fluid Level Low/High.	1. Correct fluid level and check for leaks if low.
	2. Fluid Filter Clogged.	2. Replace filter. If filter and fluid contained clutch material or metal particles, an overhaul may be necessary. Perform lube flow test.
	3. Throttle Linkage Mis-adjusted. V-10 Only	3. Adjust linkage as described in service section.
	4. Throttle Linkage Binding. V-10 Only	4. Check cable for binding. Check for return to closed throttle at transmission.
	5. Gearshift Linkage/Cable Mis-adjusted.	5. Adjust linkage/cable as described in service section.
	6. Clutch or Servo Failure.	6. Remove valve body and air test clutch, and band servo operation. Disassemble and repair transmission as needed.
	7. Governor Circuit Electrical Fault.	7. Test using DRB® scan tool and repair as required.
	8. Front Band Mis-adjusted.	8. Adjust band.
	9. Pump Suction Passage Leak.	9. Check for excessive foam on dipstick after normal driving. Check for loose pump bolts, defective gasket. Replace pump assembly if needed.

CONDITION	POSSIBLE CAUSES	CORRECTION
NO REVERSE (D RANGES OK)	1. Gearshift Linkage/Cable Mis-adjusted/Damaged.	1. Repair or replace linkage parts as needed.
	2. Park Sprag Sticking.	2. Replace overdrive annulus gear.
	3. Rear Band Mis-adjusted/Worn.	3. Adjust band; replace.
	4. Valve Body Malfunction.	4. Remove and service valve body. Replace valve body if any valves or valve bores are worn or damaged.
	5. Rear Servo Malfunction.	5. Remove and disassemble transmission. Replace worn/damaged servo parts as necessary.
	6. Direct Clutch in Overdrive Worn.	6. Disassemble overdrive. Replace worn or damaged parts.
	7. Front Clutch Burnt.	7. Remove and disassemble transmission. Replace worn, damaged clutch parts as required.
HAS FIRST/REVERSE ONLY (NO 1-2 OR 2-3 UPSHIFT)	1. Governor Circuit Electrical Fault.	1. Test using DRB® scan tool and repair as required.
	2. Valve Body Malfunction.	2. Repair stuck 1-2 shift valve or governor plug.
	3. Front Servo/Kickdown Band Damaged/Burned.	3. Repair/replace.
MOVES IN 2ND OR 3RD GEAR, ABRUPTLY DOWNSHIFTS TO LOW	1. Valve Body Malfunction.	1. Remove, clean and inspect. Look for stuck 1-2 valve or governor plug.
NO LOW GEAR (MOVES IN 2ND OR 3RD GEAR ONLY)	1. Governor Circuit Electrical Fault.	1. Test with DRB® scan tool and repair as required.
	2. Valve Body Malfunction.	2. Remove, clean and inspect. Look for sticking 1-2 shift valve, 2-3 shift valve, governor plug or broken springs.
	3. Front Servo Piston Cocked in Bore.	3. Inspect servo and repair as required.
	4. Front Band Linkage Malfunction	4. Inspect linkage and look for bind in linkage.

CONDITION	POSSIBLE CAUSES	CORRECTION
NO KICKDOWN OR NORMAL DOWNSHIFT	1. Throttle Linkage Mis-adjusted. V-10 Only	1. Adjust linkage.
	2. Accelerator Pedal Travel Restricted.	2. Verify floor mat is not under pedal, repair worn accelerator cable or bent brackets.
	3. Valve Body Hydraulic Pressures Too High or Too Low Due to Valve Body Malfunction or Incorrect Hydraulic Control Pressure Adjustments.	3. Perform hydraulic pressure tests to determine cause and repair as required. Correct valve body pressure adjustments as required.
	4. Governor Circuit Electrical Fault.	4. Test with DRB® scan tool and repair as required.
	5. Valve Body Malfunction.	5. Perform hydraulic pressure tests to determine cause and repair as required. Correct valve body pressure adjustments as required.
	6. TPS Malfunction.	6. Replace sensor, check with DRB® scan tool.
	7. PCM Malfunction.	7. Check with DRB® scan tool and replace if required.
	8. Valve Body Malfunction.	8. Repair sticking 1-2, 2-3 shift valves, governor plugs, 3-4 solenoid, 3-4 shift valve, 3-4 timing valve.
STUCK IN LOW GEAR (WILL NOT UPSHIFT)	1. Throttle Linkage Mis-adjusted/Stuck. V-10 Only	1. Adjust linkage and repair linkage if worn or damaged. Check for binding cable or missing return spring.
	2. Gearshift Linkage Mis-adjusted.	2. Adjust linkage and repair linkage if worn or damaged.
	3. Governor Component Electrical Fault.	3. Check operating pressures and test with DRB® scan tool, repair faulty component.
	4. Front Band Out of Adjustment.	4. Adjust Band.
	5. Clutch or Servo Malfunction.	5. Air pressure check operation of clutches and bands. Repair faulty component.
CREEPS IN NEUTRAL	1. Gearshift Linkage Mis-adjusted.	1. Adjust linkage.
	2. Rear Clutch Dragging/Warped.	2. Disassemble and repair.
	3. Valve Body Malfunction.	3. Perform hydraulic pressure test to determine cause and repair as required.
BUZZING NOISE	1. Fluid Level Low	1. Add fluid and check for leaks.
	2. Shift Cable Mis-assembled.	2. Route cable away from engine and bell housing.
	3. Valve Body Mis-assembled.	3. Remove, disassemble, inspect valve body. Reassemble correctly if necessary. Replace assembly if valves or springs are damaged. Check for loose bolts or screws.
	4. Pump Passages Leaking.	4. Check pump for porous casting, scores on mating surfaces and excess rotor clearance. Repair as required. Loose pump bolts.
	5. Cooling System Cooler Plugged.	5. Flow check cooler circuit. Repair as needed.
	6. Overrunning Clutch Damaged.	6. Replace clutch.

CONDITION	POSSIBLE CAUSES	CORRECTION
SLIPS IN REVERSE ONLY	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Gearshift Linkage Mis-adjusted.	2. Adjust linkage.
	3. Rear Band Mis-adjusted.	3. Adjust band.
	4. Rear Band Worn.	4. Replace as required.
	5. Overdrive Direct Clutch Worn.	5. Disassemble overdrive. Repair as needed.
	6. Hydraulic Pressure Too Low.	6. Perform hydraulic pressure tests to determine cause.
	7. Rear Servo Leaking.	7. Air pressure check clutch-servo operation and repair as required.
	8. Band Linkage Binding.	8. Inspect and repair as required.
SLIPS IN FORWARD DRIVE RANGES	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Fluid Foaming.	2. Check for high oil level, bad pump gasket or seals, dirt between pump halves and loose pump bolts. Replace pump if necessary.
	3. Throttle Linkage Mis-adjusted. V-10 Only	3. Adjust linkage.
	4. Gearshift Linkage Mis-adjusted.	4. Adjust linkage.
	5. Rear Clutch Worn.	5. Inspect and replace as needed.
	6. Low Hydraulic Pressure Due to Worn Pump, Incorrect Control Pressure Adjustments, Valve Body Warpage or Malfunction, Sticking, Leaking Seal Rings, Clutch Seals Leaking, Servo Leaks, Clogged Filter or Cooler Lines.	6. Perform hydraulic and air pressure tests to determine cause.
	7. Rear Clutch Malfunction, Leaking Seals or Worn Plates.	7. Air pressure check clutch-servo operation and repair as required.
	8. Overrunning Clutch Worn, Not Holding (Slips in 1 Only).	8. Replace Clutch.
SLIPS IN LOW GEAR ″D″ ONLY, BUT NOT IN MANUAL 1 POSITION	Overrunning Clutch Faulty.	Replace overrunning clutch.
GROWLING, GRATING OR SCRAPING NOISES	1. Drive Plate Broken.	1. Replace.
	2. Torque Converter Bolts Hitting Dust Shield.	2. Dust shield bent. Replace or repair.
	3. Planetary Gear Set Broken/Seized.	3. Check for debris in oil pan and repair as required.
	4. Overrunning Clutch Worn/Broken.	4. Inspect and check for debris in oil pan. Repair as required.
	5. Oil Pump Components Scored/ Binding.	5. Remove, inspect and repair as required.
	6. Output Shaft Bearing or Bushing Damaged.	6. Remove, inspect and repair as required.
	7. Clutch Operation Faulty.	7. Perform air pressure check and repair as required.
	8. Front and Rear Bands Mis-adjusted.	8. Adjust bands.

CONDITION	POSSIBLE CAUSES	CORRECTION
DRAGS OR LOCKS UP	1. Fluid Level Low.	1. Check and adjust level.
	2. Clutch Dragging/Failed	2. Air pressure check clutch operation and repair as required.
	3. Front or Rear Band Mis-adjusted.	3. Adjust bands.
	4. Case Leaks Internally.	4. Check for leakage between passages in case.
	5. Servo Band or Linkage Malfunction.	5. Air pressure check servo operation and repair as required.
	6. Overrunning Clutch Worn.	6. Remove and inspect clutch. Repair as required.
	7. Planetary Gears Broken.	7. Remove, inspect and repair as required (look for debris in oil pan).
	8. Converter Clutch Dragging.	8. Check for plugged cooler. Perform flow check. Inspect pump for excessive side clearance. Replace pump as required.
NO 4-3 DOWNSHIFT	1. Circuit Wiring and/or Connectors Shorted.	1. Test wiring and connectors with test lamp and volt/ohmmeter. Repair wiring as necessary. Replace connectors and/or harnesses as required.
	2. PCM Malfunction.	2. Check PCM operation with DRB® scan tool. Replace PCM only if faulty.
	3. TPS Malfunction	3. Check TPS with DRB® scan tool at PCM.
	4. Lockup Solenoid Not Venting.	4. Remove valve body and replace solenoid assembly if plugged or shorted.
	5. Overdrive Solenoid Not Venting.	5. Remove valve body and replace solenoid if plugged or shorted.
	6. Valve Body Valve Sticking.	6. Repair stuck 3-4 shift valve or lockup timing valve.
NO 4-3 DOWNSHIFT WHEN CONTROL SWITCH IS TURNED OFF	1. Control Switch Open/Shorted.	1. Test and replace switch if faulty.
	2. Overdrive Solenoid Connector Shorted.	2. Test solenoids and replace if seized or shorted.
	3. PCM Malfunction.	3. Test with DRB® scan tool. Replace PCM if faulty.
	4. Valve Body Stuck Valves.	4. Repair stuck 3-4, lockup or lockup timing valve.
CLUNK NOISE FROM DRIVELINE ON CLOSED THROTTLE 4-3 DOWNSHIFT	1. Transmission Fluid Low.	1. Add Fluid.
	2. Throttle Cable Mis-adjusted. V-10 Only	2. Adjust cable.
	3. Overdrive Clutch Select Spacer Wrong Spacer.	3. Replace overdrive piston thrust plate spacer.

CONDITION	POSSIBLE CAUSES	CORRECTION
3-4 UPSHIFT OCCURS IMMEDIATELY AFTER 2-3 SHIFT	1. Overdrive Solenoid Connector or Wiring Shorted.	1. Test connector and wiring for loose connections, shorts or ground and repair as needed.
	2. TPS Malfunction.	2. Test TPS and replace as necessary. Check with DRB® scan tool.
	3. PCM Malfunction.	3. Test PCM with DRB® scan tool and replace controller if faulty.
	4. Overdrive Solenoid Malfunction.	4. Replace solenoid.
	5. Valve Body Malfunction.	5. Remove, disassemble, clean and inspect valve body components. Make sure all valves and plugs slide freely in bores. Polish valves with crocus cloth if needed.
WHINE/NOISE RELATED TO ENGINE SPEED	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Shift Cable Incorrect Routing.	2. Check shift cable for correct routing. Should not touch engine or bell housing.
NO 3-4 UPSHIFT	1. O/D Switch In OFF Position.	1. Turn control switch to ON position.
	2. Overdrive Circuit Fuse Blown.	2. Replace fuse. Determine why fuse failed and repair as necessary (i.e., shorts or grounds in circuit).
	3. O/D Switch Wire Shorted/Open Cut.	3. Check wires/connections with 12V test lamp and voltmeter. Repair damaged or loose wire/connection as necessary.
	4. Distance or Coolant Sensor Malfunction.	4. Check with DRB® scan tool and repair or replace as necessary.
	5. TPS Malfunction.	5. Check with DRB® scan tool and replace if necessary.
	6. Neutral Sense to PCM Wire Shorted/Cut.	6. Test switch/sensor as described in service section and replace if necessary. Engine no start.
	7. PCM Malfunction.	7. Check with DRB® scan tool and replace if necessary.
	8. Overdrive Solenoid Shorted/Open.	8. Replace solenoid if shorted or open and repair loose or damaged wires (DRB® scan tool).
	9. Solenoid Feed Orifice in Valve Body Blocked.	9. Remove, disassemble, and clean valve body thoroughly. Check feed orifice.
	10. Overdrive Clutch Failed.	10. Disassemble overdrive and repair as needed.
	11. Hydraulic Pressure Low.	11. Pressure test transmission to determine cause.
	12. Valve Body Valve Stuck.	12. Repair stuck 3-4 shift valve, 3-4 timing valve.
	13. O/D Piston Incorrect Spacer.	13. Remove unit, check end play and install correct spacer.
	14. Overdrive Piston Seal Failure.	14. Replace both seals.
	15. O/D Check Valve/Orifice Failed.	15. Check for free movement and secure assembly (in piston retainer). Check ball bleed orifice.

CONDITION	POSSIBLE CAUSES	CORRECTION
SLIPS IN OVERDRIVE FOURTH GEAR	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Overdrive Clutch Pack Worn.	2. Remove overdrive unit and rebuild clutch pack.
	3. Overdrive Piston Retainer Bleed Orifice Blown Out.	3. Disassemble transmission, remove retainer and replace orifice.
	4. Overdrive Piston or Seal Malfunction.	4. Remove overdrive unit. Replace seals if worn. Replace piston if damaged. If piston retainer is damaged, remove and disassemble the transmission.
	5. 3-4 Shift Valve, Timing Valve or Accumulator Malfunction.	5. Remove and overhaul valve body. Replace accumulator seals. Make sure all valves operate freely in bores and do not bind or stick. Make sure valve body screws are correctly tightened and separator plates are properly positioned.
	6. Overdrive Unit Thrust Bearing Failure.	6. Disassemble overdrive unit and replace thrust bearing (NO. 1 thrust bearing is between overdrive piston and clutch hub; NO. 2 thrust bearing is between the planetary gear and the direct clutch spring plate; NO. 3 thrust bearing is between overrunning clutch hub and output shaft).
	7. O/D Check Valve/Bleed Orifice Failure.	7. Check for function/secure orifice insert in O/D piston retainer.
DELAYED 3-4 UPSHIFT (SLOW TO ENGAGE)	1. Fluid Level Low.	1. Add fluid and check for leaks.
	2. Throttle Valve Cable Mis-adjusted. V-10 Only	2. Adjust throttle valve cable.
	3. Overdrive Clutch Pack Worn/Burnt.	3. Remove unit and rebuild clutch pack.
	4. TPS Faulty.	4. Test with DRB® scan tool and replace as necessary
	5. Overdrive Clutch Bleed Orifice Plugged.	5. Disassemble transmission and replace orifice.
	6. Overdrive Solenoid or Wiring Shorted/Open.	6. Test solenoid and check wiring for loose/corroded connections or shorts/grounds. Replace solenoid if faulty and repair wiring if necessary.
	7. Overdrive Excess Clearance.	7. Remove unit. Measure end play and select proper spacer.
	8. O/D Check Valve Missing or Stuck.	8. Check for presence of check valve. Repair or replace as required.
TORQUE CONVERTER LOCKS UP IN SECOND AND/OR THIRD GEAR	Lockup Solenoid, Relay or Wiring Shorted/Open.	Test solenoid, relay and wiring for continuity, shorts or grounds. Replace solenoid and relay if faulty. Repair wiring and connectors as necessary.
HARSH 1-2, 2-3, 3-4 OR 3-2 SHIFTS	Lockup Solenoid Malfunction.	Remove valve body and replace solenoid assembly.

CONDITION	POSSIBLE CAUSES	CORRECTION
NO START IN PARK OR NEUTRAL	1. Gearshift Linkage/Cable Mis-adjusted.	1. Adjust linkage/cable.
	2. Neutral Sense Wire Open/Cut.	2. Check continuity with test lamp. Repair as required.
	3. Park/Neutral Switch, or Transmission Range Sensor Faulty.	3. Refer to service section for test and replacement procedure.
	4. Park/Neutral Switch, or Transmission Range Sensor Connection Faulty.	4. Connectors spread open. Repair.
	5. Valve Body Manual Lever Assembly Bent/Worn/Broken.	5. Inspect lever assembly and replace if damaged.
NO REVERSE (OR SLIPS IN REVERSE)	1. Direct Clutch Pack (front clutch) Worn.	1. Disassemble unit and rebuild clutch pack.
	2. Rear Band Mis-adjusted.	2. Adjust band.
	3. Front Clutch Malfunctioned/Burned.	3. Air-pressure test clutch operation. Remove and rebuild if necessary.
	4. Overdrive Thrust Bearing Failure.	4. Disassemble geartrain and replace bearings.
	5. Direct Clutch Spring Collapsed/ Broken.	5. Remove and disassemble unit. Check clutch position and replace spring.
OIL LEAKS.	1. Fluid Lines and Fittings Loose/ Leaks/Damaged.	1. Tighten fittings. If leaks persist, replace fittings and lines if necessary.
	2. Fill Tube (where tube enters case) Leaks/Damaged.	2. Replace tube seal. Inspect tube for cracks in fill tube.
	3. Pressure Port Plug Loose Loose/Damaged.	3. Tighten to correct torque. Replace plug or reseal if leak persists.
	4. Pan Gasket Leaks.	4. Tighten pan screws (150 in. lbs.). If leaks persist, replace gasket.
	5. Valve Body Manual Lever Shaft Seal Leaks/Worn.	5. Replace shaft seal.
	6. Rear Bearing Access Plate Leaks.	6. Replace gasket. Tighten screws.
	7. Gasket Damaged or Bolts are Loose.	7. Replace bolts or gasket or tighten both.
	8. Adapter/Extension Gasket Damaged Leaks/Damaged.	8. Replace gasket.
	9. Park/Neutral Switch, or Transmission Range Sensor Leaks/ Damaged.	9. Replace switch and gasket.
	10. Converter Housing Area Leaks.	10. Check for leaks at seal caused by worn seal or burr on converter hub (cutting seal), worn bushing, missing oil return, oil in front pump housing or hole plugged. Check for leaks past O-ring seal on pump or past pump-to-case bolts; pump housing porous, oil coming out vent due to overfill or leak past front band shaft access plug.
	11. Pump Seal Leaks/Worn/Damaged.	11. Replace seal.
	12. Torque Converter Weld Leak/ Cracked Hub.	12. Replace converter.
	13. Case Porosity Leaks.	13. Replace case.

CONDITION	POSSIBLE CAUSES	CORRECTION
NOISY OPERATION IN FOURTH GEAR ONLY	1. Overdrive Clutch Discs, Plates or Snap Rings Damaged.	1. Remove unit and rebuild clutch pack.
	2. Overdrive Piston or Planetary Thrust Bearing Damaged.	2. Remove and disassemble unit. Replace either thrust bearing if damaged.
	3. Output Shaft Bearings Scored/ Damaged.	3. Remove and disassemble unit. Replace either bearing if damaged.
	4. Planetary Gears Worn/Chipped.	4. Remove and overhaul overdrive unit.
	5. Overdrive Unit Overrunning Clutch Rollers Worn/Scored.	5. Remove and overhaul overdrive unit.

STANDARD PROCEDURE - ALUMINUM THREAD REPAIR

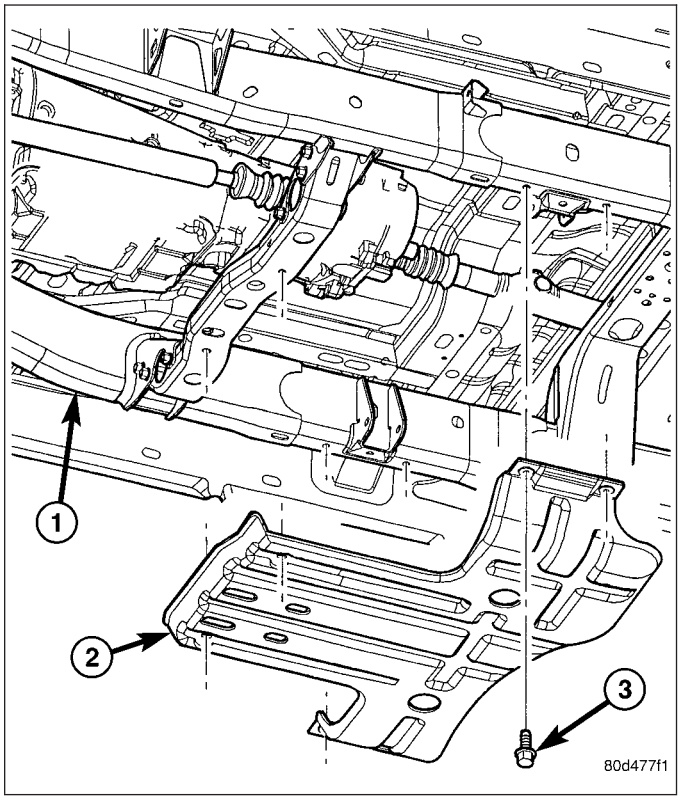
Damaged or worn threads in the aluminum transmission case and valve body can be repaired by the use of Heli-Coils™, or equivalent. This repair consists of drilling out the worn-out damaged threads. Then tap the hole with a special Heli-Coil™ tap, or equivalent, and installing a Heli-Coil™ insert, or equivalent, into the hole. This brings the hole back to its original thread size.

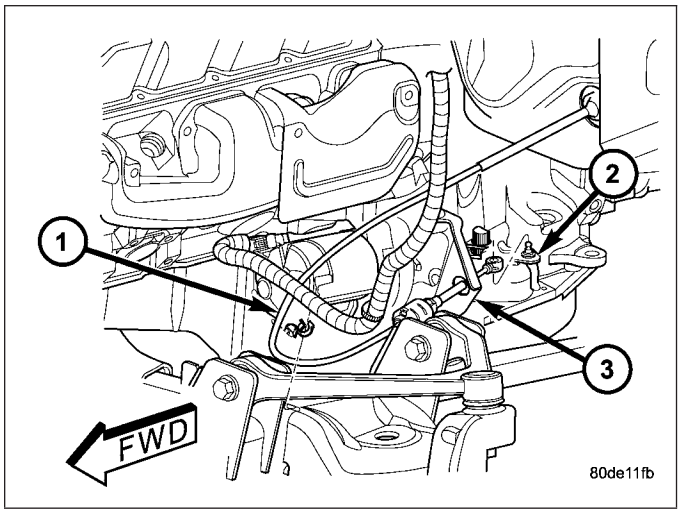
Heli-Coil™, or equivalent, tools and inserts are readily available from most automotive parts suppliers.

REMOVAL

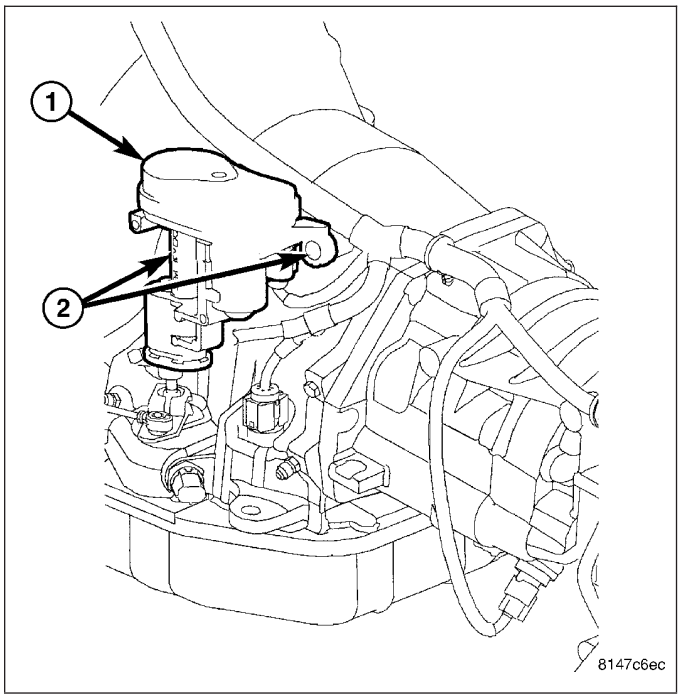
NOTE: The overdrive unit can be removed and serviced separately. It is not necessary to remove the entire transmission assembly to perform overdrive unit repairs.

1. Disconnect battery negative cable.
2. Raise vehicle.
3. Remove the transfer case skid plate (2), if equipped.



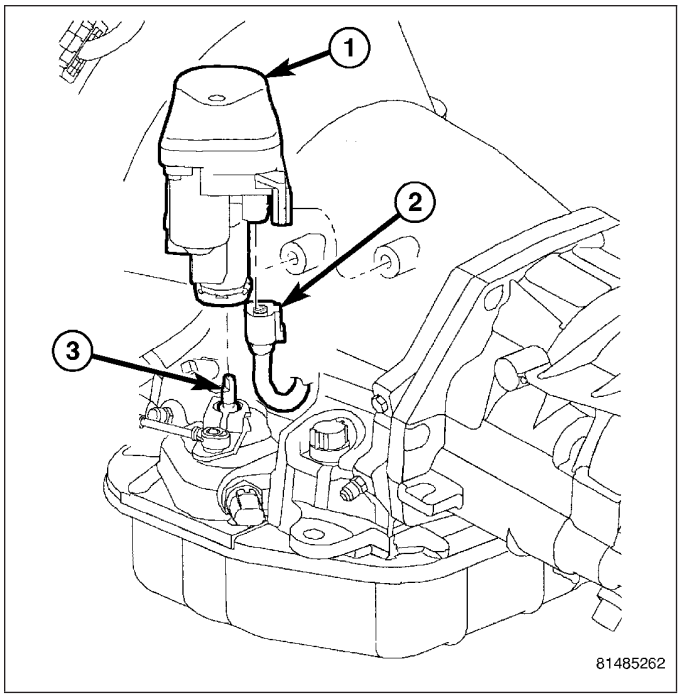


4. Disconnect and lower or remove any necessary exhaust components.
5. Remove engine-to-transmission struts.
6. Remove starter motor. (Refer to 8 - ELECTRICAL/ STARTING/STARTER MOTOR - REMOVAL)
7. Disconnect and remove the crankshaft position sensor. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/CRANKSHAFT POSITION SENSOR - REMOVAL) Retain the sensor attaching bolts.
8. If transmission is being removed for overhaul, remove transmission oil pan, drain fluid and reinstall pan.
9. Remove torque converter access cover.
10. Rotate crankshaft in clockwise direction until converter bolts are accessible. Then remove bolts one at a time. Rotate crankshaft with socket wrench on dampener bolt.
11. Mark propeller shaft and axle yokes for assembly alignment. Then disconnect and remove propeller shaft. On 4 x 4 models, remove both propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/ PROPELLER SHAFT - REMOVAL)
12. Disconnect wires from the transmission range sensor and transmission solenoid connector.
13. Disconnect gearshift cable (1) from the transmission manual lever (2).
14. For vehicles with gas engines, disconnect throttle valve cable from transmission bracket and throttle valve lever.

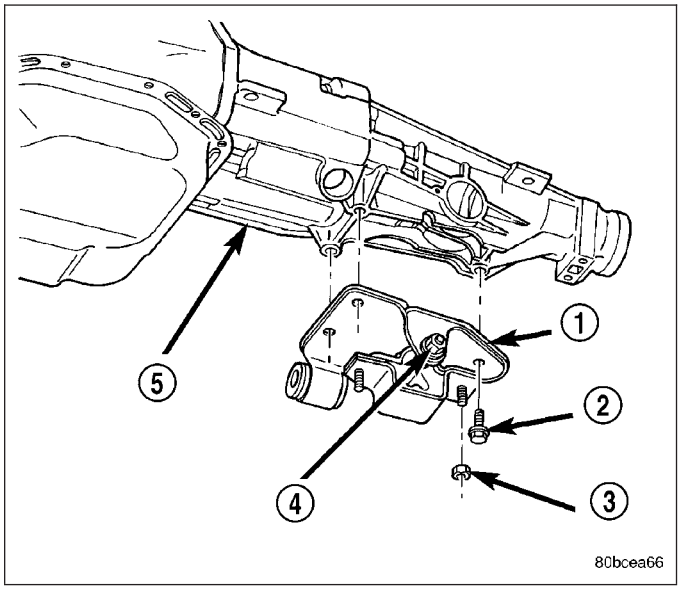


15. For vehicles with a diesel engine, remove the bolts (2) holding the transmission throttle valve actuator (TTVA) (1) to the transmission case.
16. Allow the TTVA (1) to rotate clockwise away from the transmission.

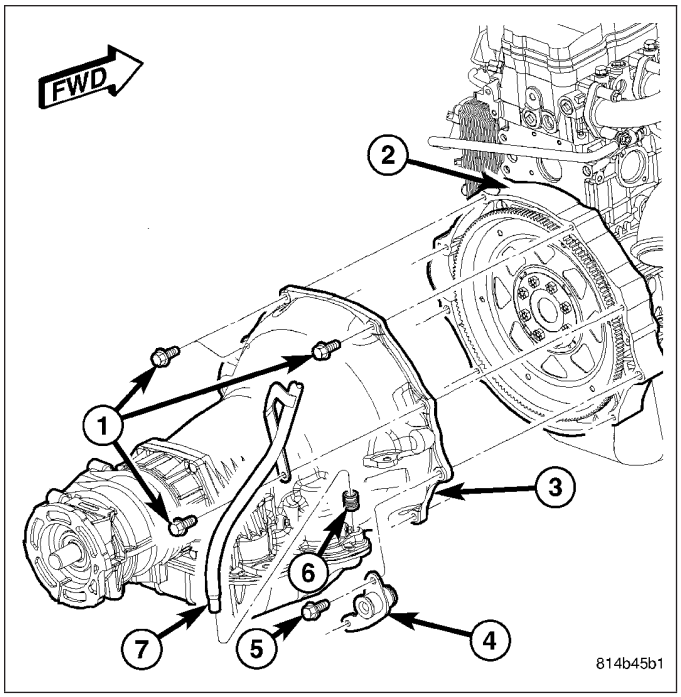
17. Remove the wiring connector (2) from the TTVA (1).
18. Lift the TTVA (1) straight upward and off the throttle valve shaft (3).



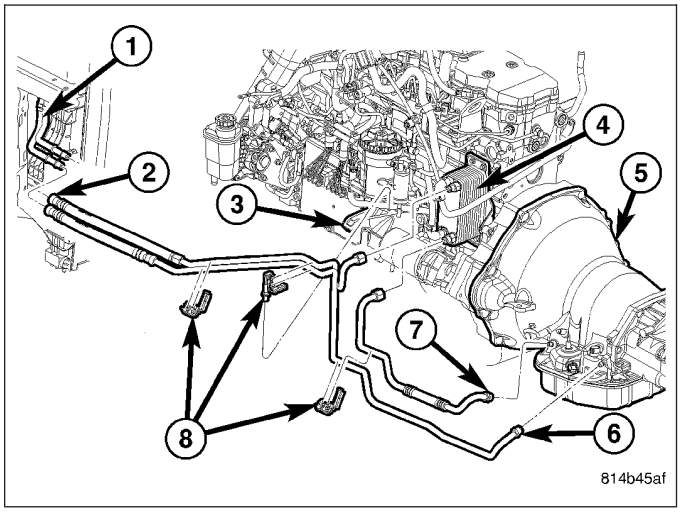
19. On 4X4 models, disconnect shift rod from transfer case shift lever.
20. Support rear of engine with safety stand or jack.
21. Raise transmission slightly with service jack to relieve load on crossmember and supports.
22. Remove the nuts (3) securing rear support (1) to the transmission crossmember.
23. Remove the bolts(2) holding the rear support (1) to the transmission (5) remove the rear support.



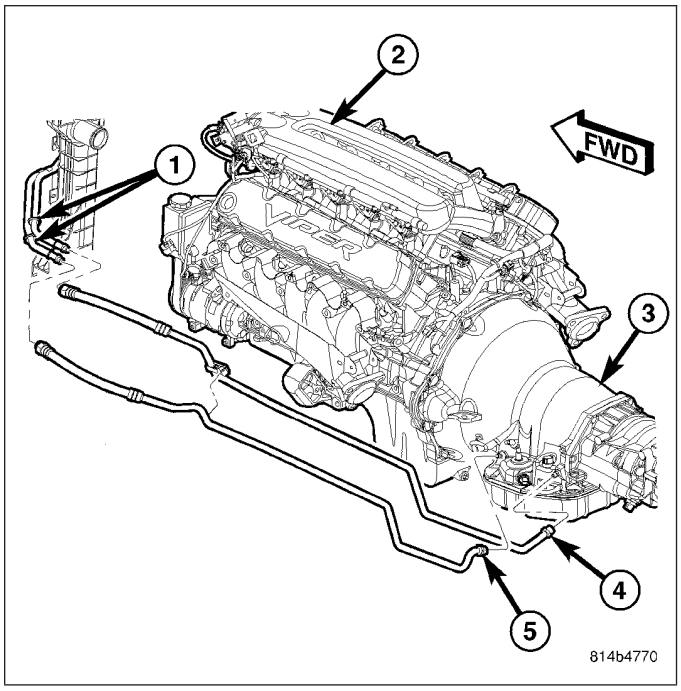
24. Remove bolts attaching crossmember to frame and remove crossmember.
25. On 4X4 models, remove transfer case. (Refer to 21 - TRANSMISSION AND TRANSFER CASE/ TRANSFER CASE - REMOVAL)
26. Remove fill tube (7) bracket bolts and pull tube out of transmission. Retain fill tube seal (6). On 4X4 models, it will also be necessary to remove bolt attaching transfer case vent tube to converter housing.



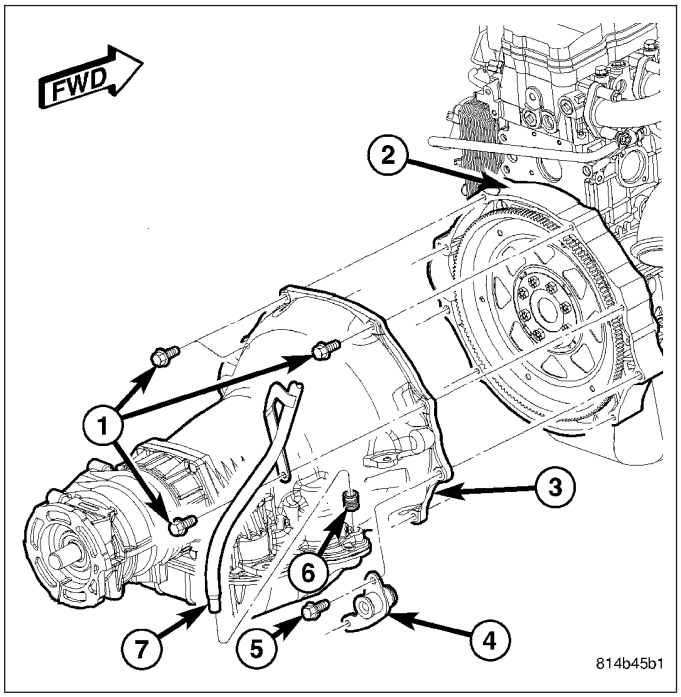
27. Disconnect fluid cooler lines (6, 7) at transmission (5), diesel engines.



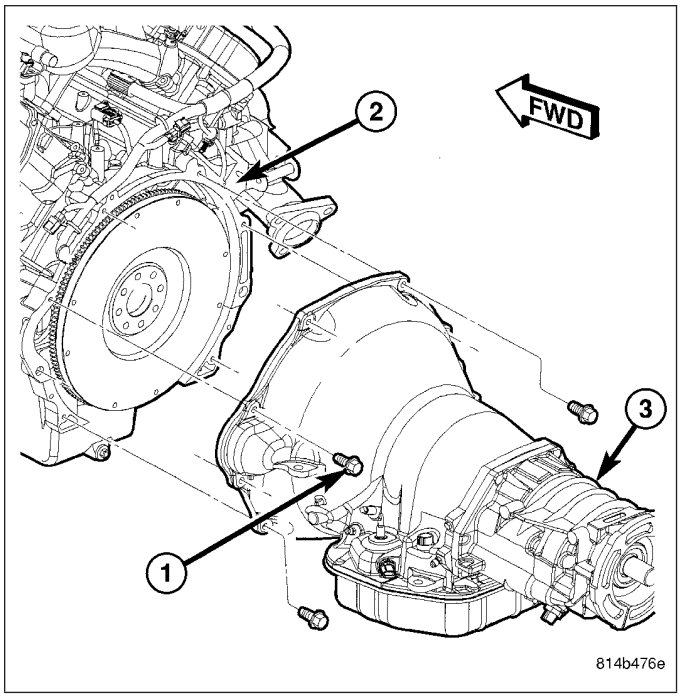
28. Disconnect fluid cooler lines (4, 5) at transmission (3), gas engines.



29. Remove all bolts (1) holding the transmission (3) to the engine adapter (2), diesel engines.
30. Carefully work transmission and torque converter assembly rearward off engine block dowels.
31. Lower transmission and remove assembly from under the vehicle.
32. To remove torque converter, remove C-clamp from edge of bell housing and carefully slide torque converter out of the transmission.

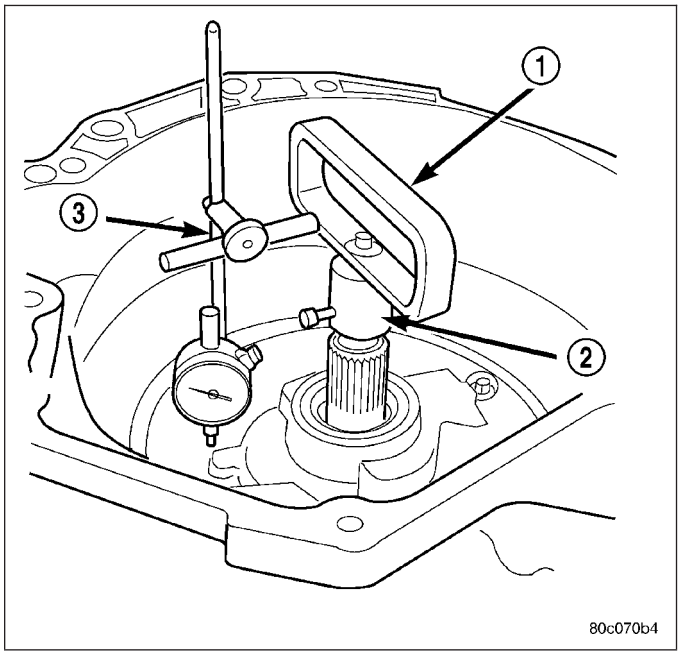


33. Remove all bolts (1) holding the transmission (3) to the engine adapter (2), gas engines.
34. Carefully work transmission and torque converter assembly rearward off engine block dowels.
35. Lower transmission and remove assembly from under the vehicle.
36. To remove torque converter, remove C-clamp from edge of bell housing and carefully slide torque converter out of the transmission.

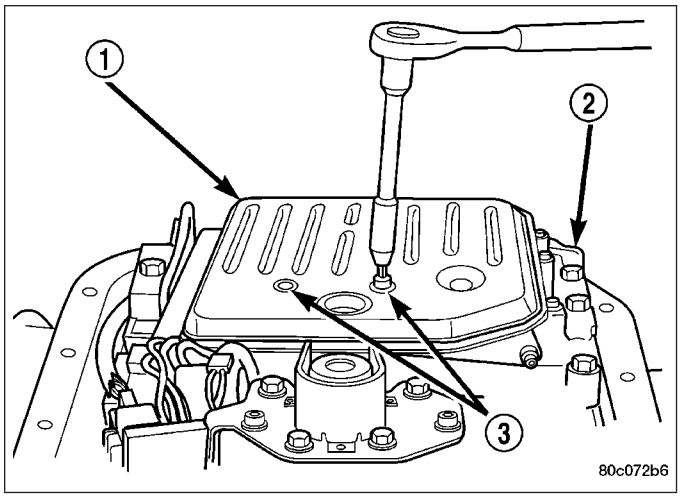


DISASSEMBLY

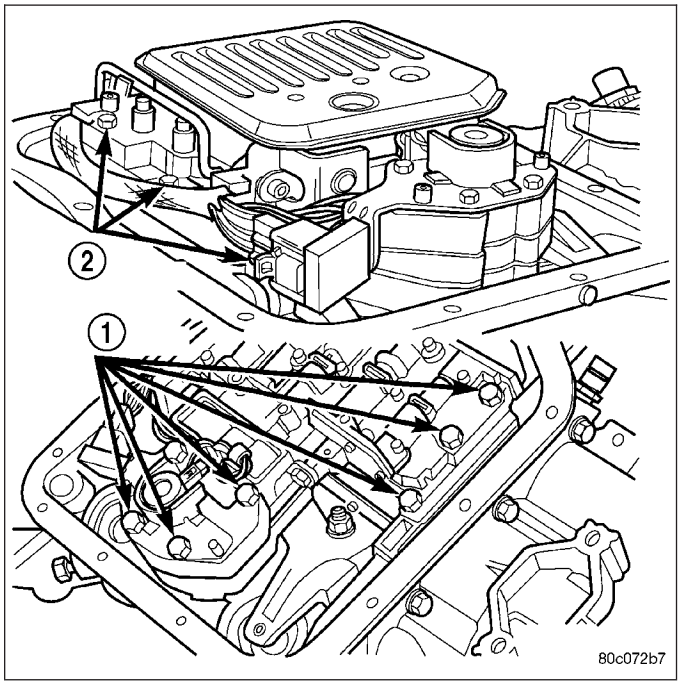
1. Clean exterior of transmission with suitable solvent or pressure washer.
2. Place transmission in vertical position.
3. Measure the input shaft end play as follows.
   a. Attach Adapter 8266-5 (2) to Handle 8266-8 (1).
   b. Attach dial indicator C-3339 (3) to Handle 8266-8 (1).
   c. Install the assembled tool onto the input shaft of the transmission and tighten the retaining screw on Adapter 8266-5 to secure it to the input shaft.
   d. Position the dial indicator plunger against a flat spot on the oil pump and zero the dial indicator.
   e. Move input shaft in and out and record reading. Record the maximum travel for assembly reference



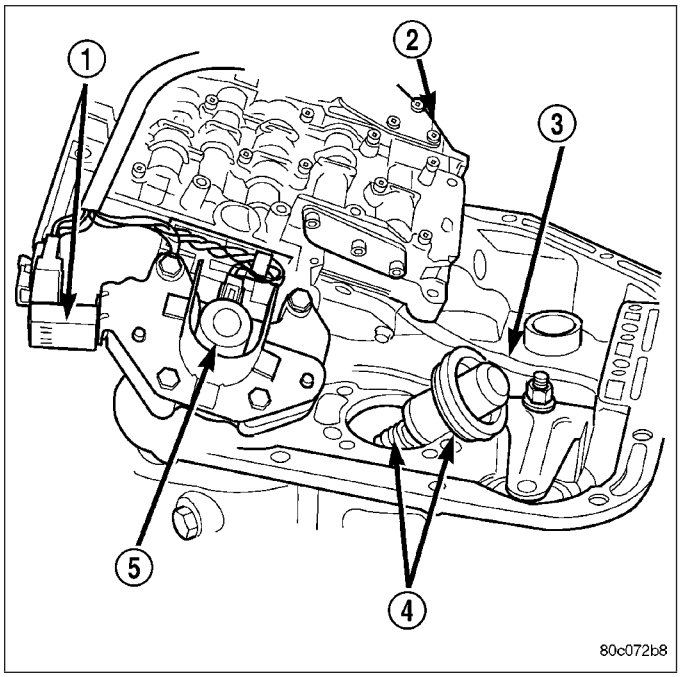
4. Remove the overdrive unit from the main transmission case. If overdrive unit is not to be serviced, install Alignment Shaft 6227-2 into the overdrive unit to prevent misalignment of the overdrive clutches during service of main transmission components.
5. Remove throttle and shift levers from valve body manual shaft and throttle lever shaft.
6. Remove transmission oil pan and gasket.
7. Remove filter (1) from valve body (2). Keep filter screws separate from other valve body screws. Filter screws are longer and should be kept with filter.



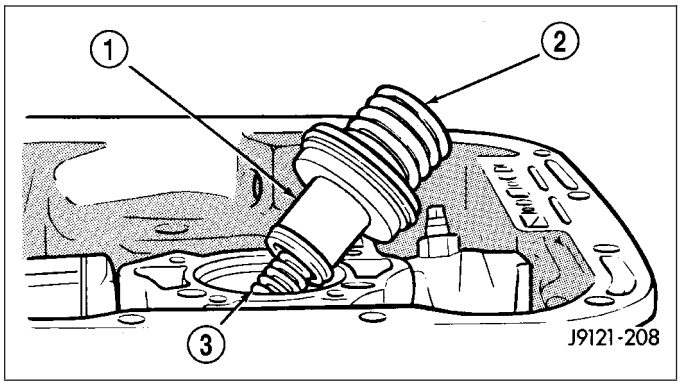
8. Remove the transmission range sensor. (Refer to 21 - TRANSMISSION/AUTOMATIC - 48RE/ TRANSMISSION RANGE SENSOR - REMOVAL)
9. Remove hex head bolts (1, 2) attaching valve body to transmission case. A total of 10 bolts are used. Note different bolt lengths for assembly reference.



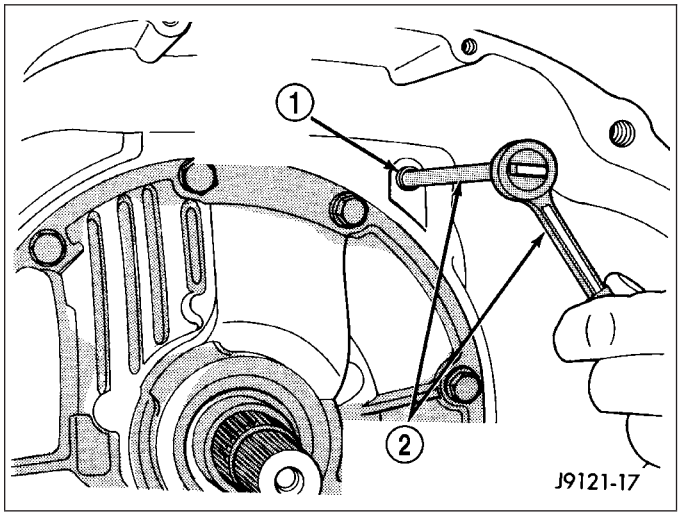
10. Remove valve body assembly (2). Push valve body harness connector out of case. Then work park rod (3) and valve body out of case.



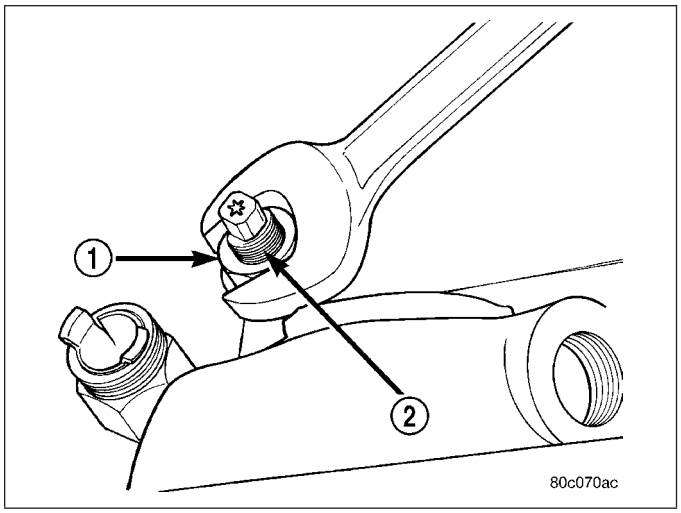
11. Remove accumulator outer spring (2)(diesel engines only), piston (1), and inner spring (3)(V-10 engine only). Note position of piston and springs for assembly reference. Remove and discard piston seals if worn or cut.



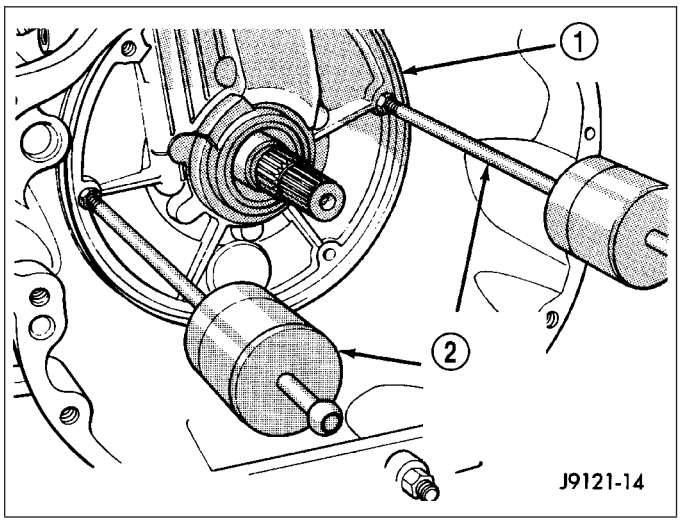
12. Remove pump oil seal with suitable pry tool or slide-hammer mounted screw.
13. Remove front band lever pin access plug (1). Use square end of 1/4 in. drive extension (2) to remove plug as shown.



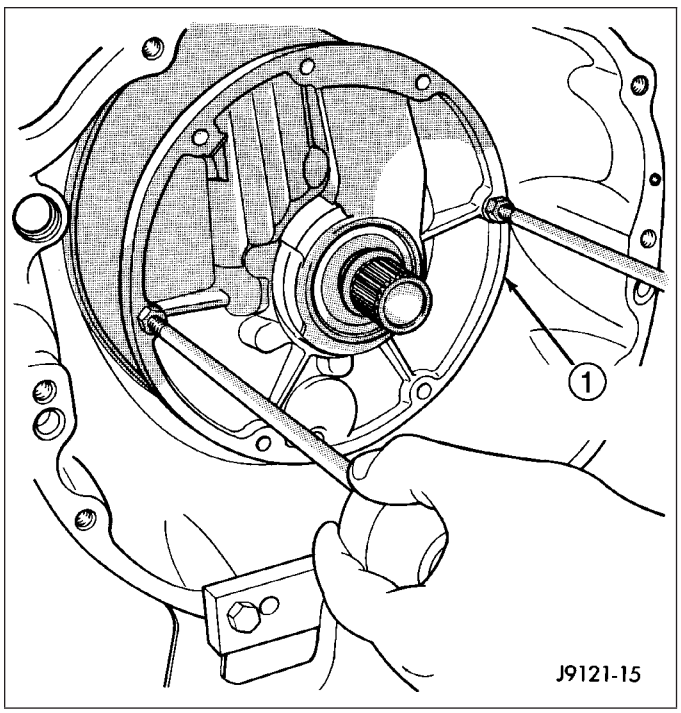
14. Begin removal of the oil pump and reaction shaft support assembly by tightening the front band adjusting screw (2) until band is tight around front clutch retainer. This will prevent retainer from coming out with pump and possibly damaging clutch or pump components.



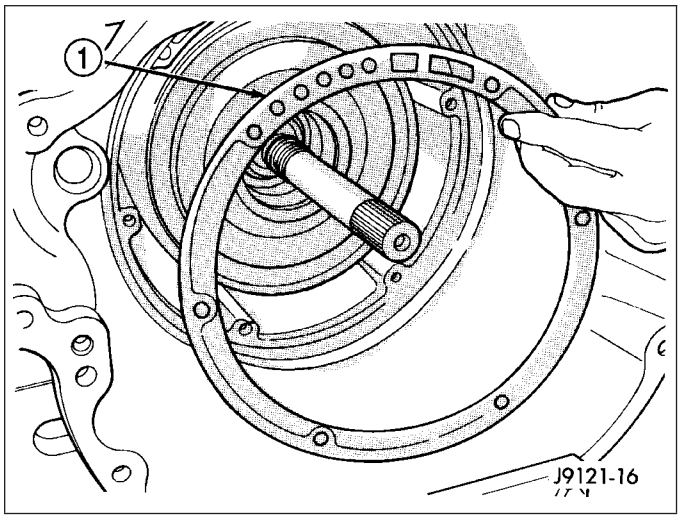
15. Remove oil pump bolts.
16. Thread Slide Hammer Tools C-3752 (2) into threaded holes in flange of oil pump housing (1).



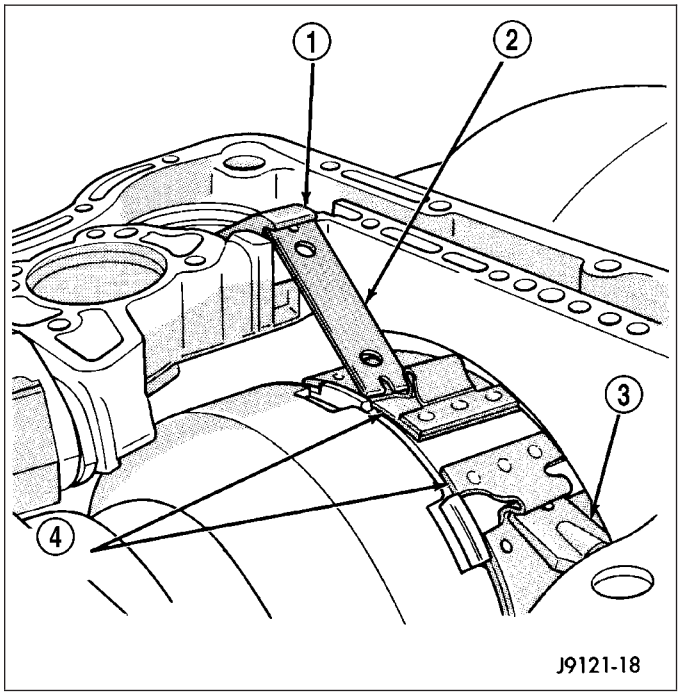
17. Remove oil pump and reaction shaft (1) support by bumping slide hammers outward alternately to pull pump from case.



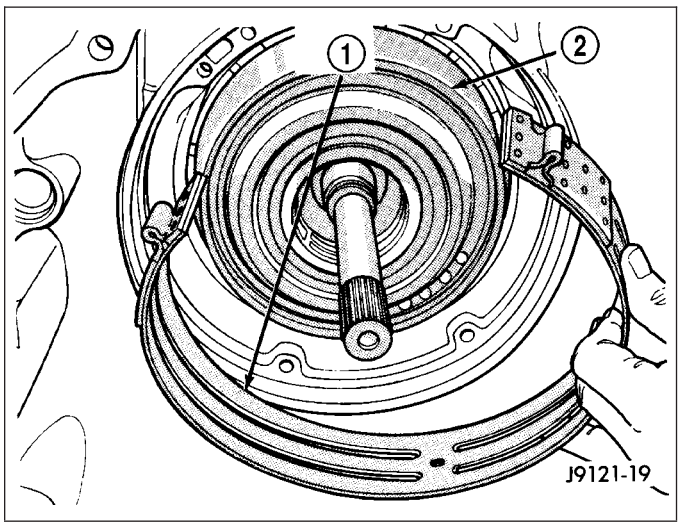
18. Remove oil pump gasket (1). Note gasket position in case for assembly reference.



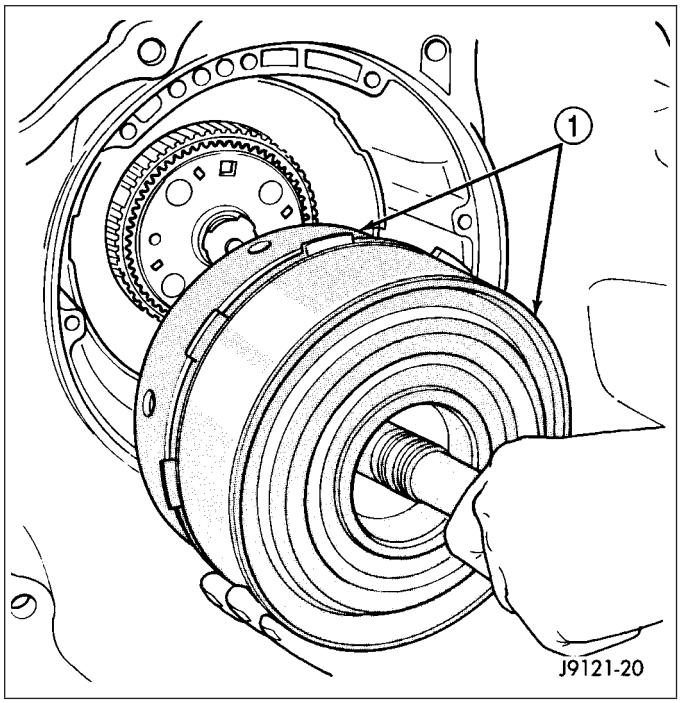
19. Loosen front band adjusting screw until band is completely loose.
20. Remove front band strut (2) and anchor (3).



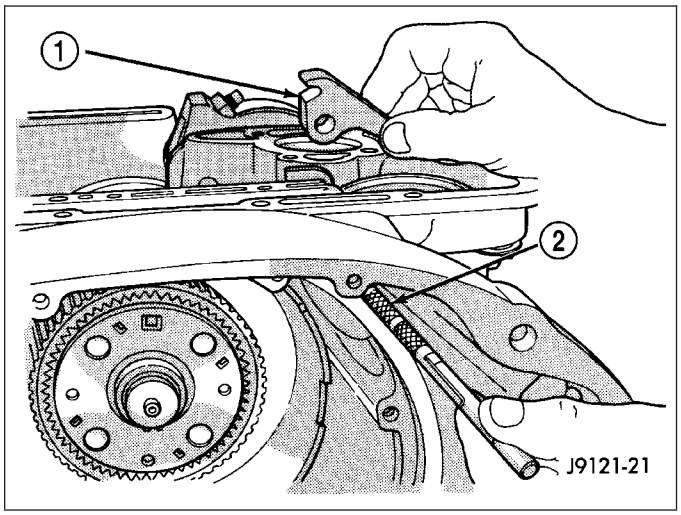
21. Squeeze front band (1) together slightly and slide band over front clutch retainer (2) and out of case.



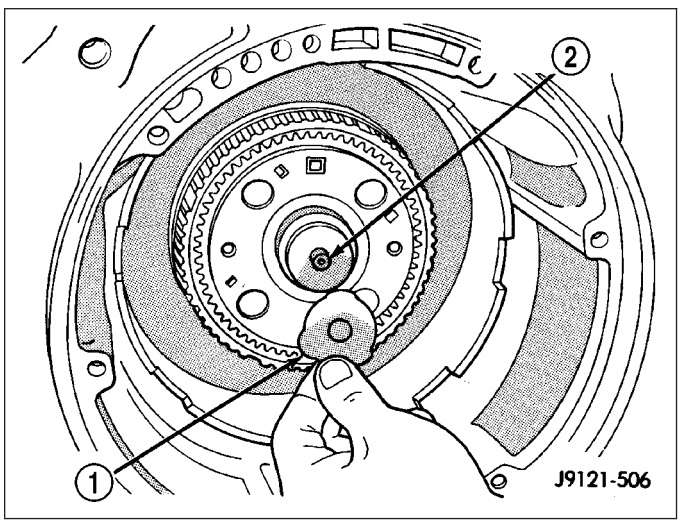
22. Remove front and rear clutch assemblies (1) as a unit.



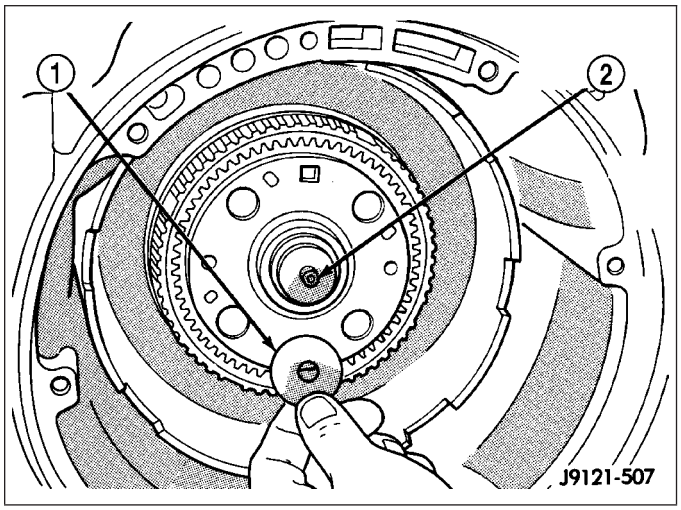
23. Remove front band reaction pin and lever (1). Start pin through lever and out of case bore with drift or punch. Then use pencil magnet to withdraw pin completely (2).



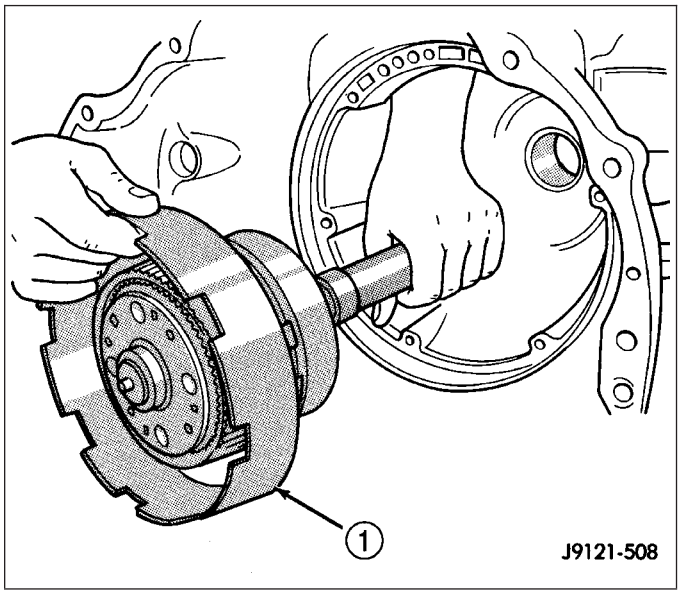
24. Remove intermediate shaft thrust washer (1). Triangular shaped washer will either be on shaft pilot hub (2) or in rear clutch retainer.



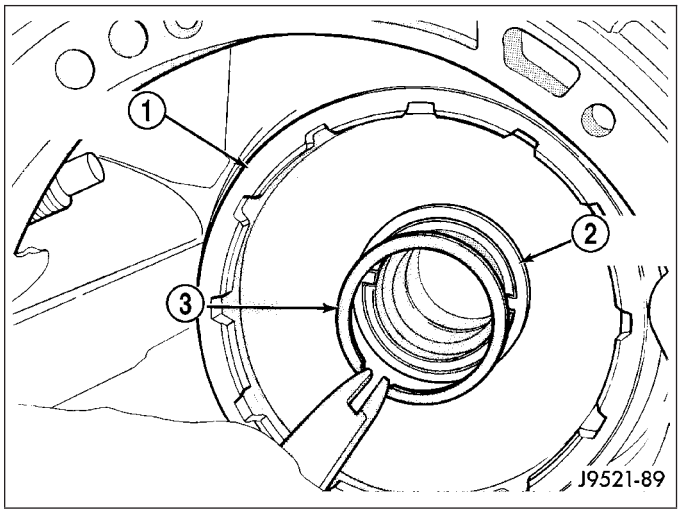
25. Remove thrust plate (1) from intermediate shaft hub (2).



26. Remove intermediate shaft-planetary geartrain assembly (1).

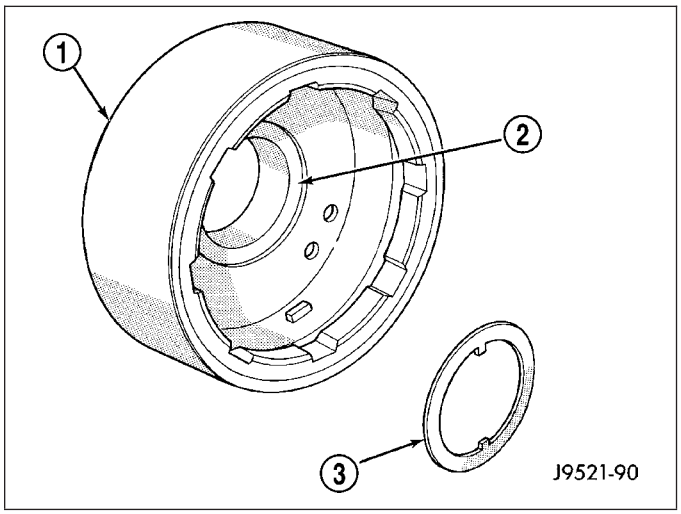


27. Loosen rear band locknut and loosen adjusting screw 3-4 turns.

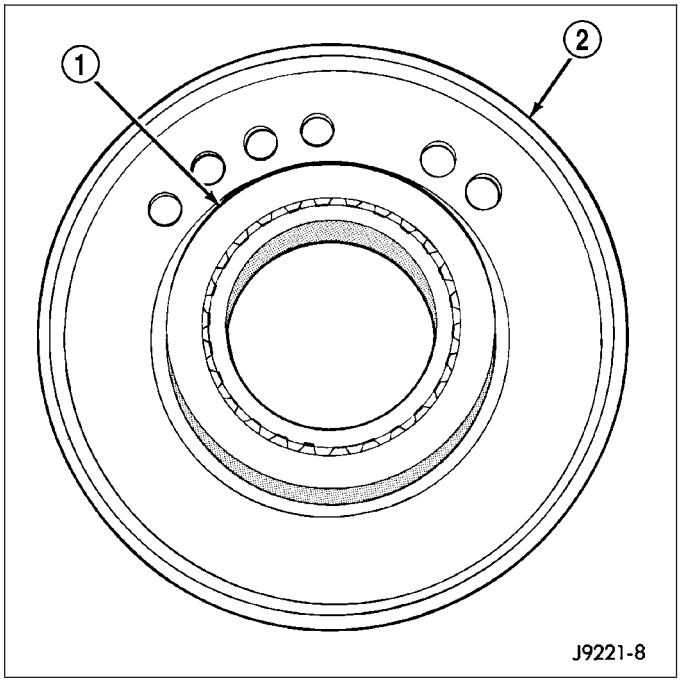


28. Remove snap-ring (3) that retains low-reverse drum (1) on overdrive piston retainer hub.

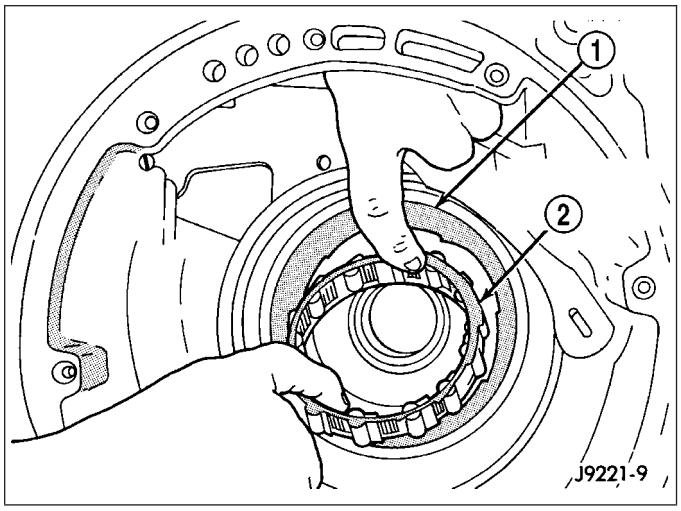
29. Slide low-reverse drum (1) and thrust washer (3) off piston retainer hub and out of rear band.



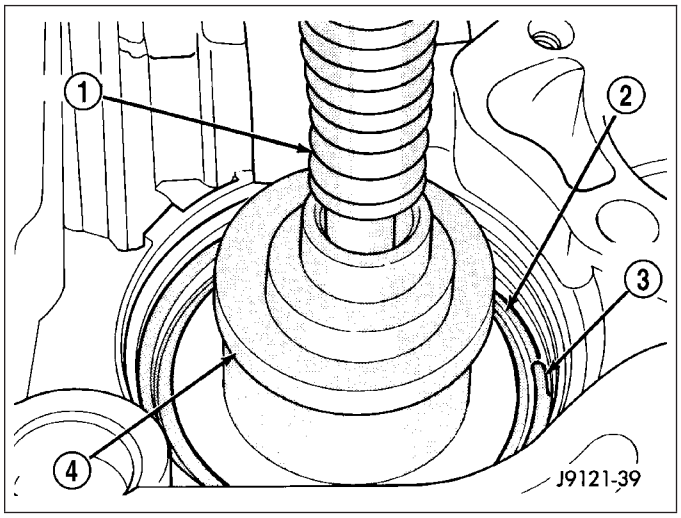
30. Note that overrunning clutch race (1) will remain on splines of low-reverse drum after removal. **The race is a permanent press fit on the hub splines. Do not attempt to remove the race.**



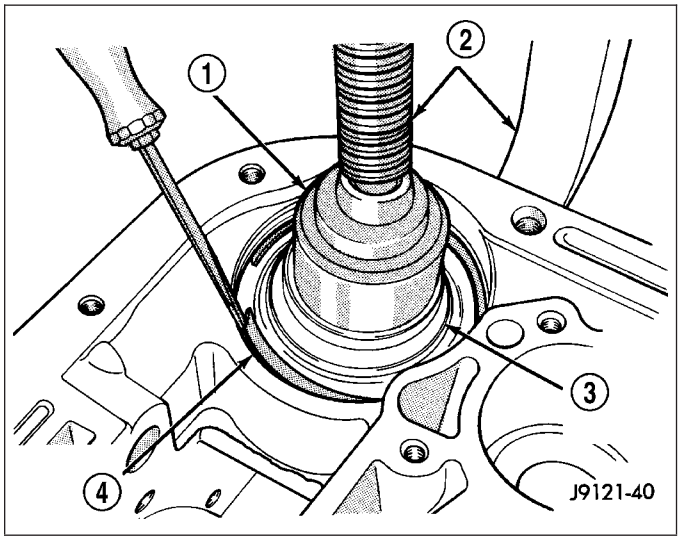
31. Remove overrunning clutch assembly (2). Assembly can be removed without displacing rollers and springs if care is exercised. Note position of rollers and springs for assembly reference.



32. Remove rear band adjusting lever and reaction pin.
33. Remove rear band.
34. Compress front servo rod guide (2) with large C-clamp (1) and Tool C-4470 (4), or Compressor Tool C-3422-B. Compress guide only enough to permit snap-ring removal (about 1/8 in.).



35. Remove servo piston snap-ring (4). Unseat one end of ring. Then carefully work removal tool around back of ring until free of ring groove. **Exercise caution when removing snap-ring. Servo bore can be scratched or nicked if care is not exercised.**
36. Remove tools and remove rear servo retainer (3), spring and piston assembly.



CLEANING

Clean the case in a solvent tank. Flush the case bores and fluid passages thoroughly with solvent. Dry the case and all fluid passages with compressed air. Be sure all solvent is removed from the case and that all fluid passages are clear.

NOTE: Do not use shop towels or rags to dry the case (or any other transmission component) unless they are made from lint-free materials. Lint will stick to case surfaces and transmission components and circulate throughout the transmission after assembly. A sufficient quantity of lint can block fluid passages and interfere with valve body operation.

Lubricate transmission parts with Mopar® ATF +4, Automatic Transmission fluid, during overhaul and assembly. Use petroleum jelly to prelubricate seals, O-rings, and thrust washers. Petroleum jelly can also be used to hold parts in place during reassembly.

INSPECTION

Inspect the case for cracks, porous spots, worn bores, or damaged threads. Damaged threads can be repaired with Helicoil thread inserts. However, the case will have to be replaced if it exhibits any type of damage or wear.

Lubricate the front band adjusting screw threads with petroleum jelly and thread the screw part-way into the case. Be sure the screw turns freely.

Inspect the transmission bushings during overhaul. Bushing condition is important as worn, scored bushings contribute to low pressures, clutch slip and accelerated wear of other components. However, do not replace bushings as a matter of course. Replace bushings only when they are actually worn, or scored.

The use of crocus cloth is permissible where necessary, providing it is used carefully. When used on shafts, or valves, use extreme care to avoid rounding off sharp edges. Sharp edges are vital as they prevent foreign matter from getting between the valve and valve bore.

Do not reuse oil seals, gaskets, seal rings, or O-rings during overhaul. Replace these parts as a matter of course. Also do not reuse snap rings or E-clips that are bent or distorted. Replace these parts as well.

ASSEMBLY

Do not allow dirt, grease, or foreign material to enter the case or transmission components during assembly. Keep the transmission case and components clean. Also make sure the tools and workbench area used for reassembly operations are equally clean.

Shop towels used for wiping off tools and your hands must be made from **lint free** materials. Lint will stick to transmission parts and could interfere with valve operation or even restrict fluid passages.

Lubricate transmission clutch and gear components with Mopar® ATF +4 during reassembly. Soak clutch discs in transmission fluid before installation.

Use petroleum jelly on piston seals and o-rings to ease installation. Petroleum jelly can also be used to lubricate and hold thrust washers and plates in position during assembly.

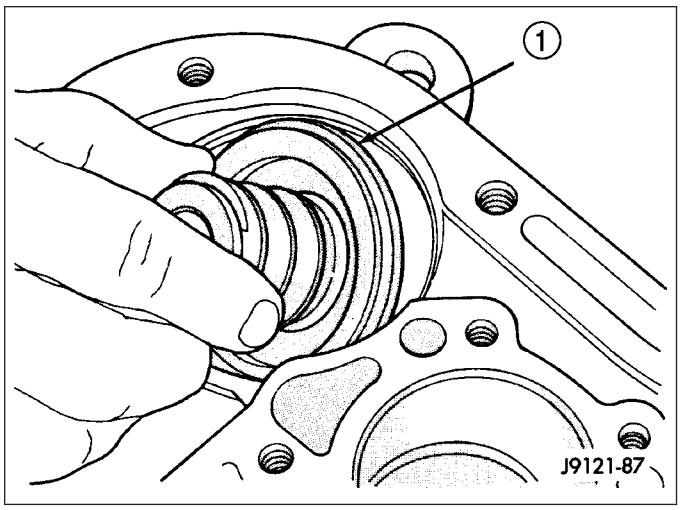
Do not use chassis grease, bearing grease, white grease, or similar lubricants on any part. These types of lubricants can eventually block or restrict fluid passages and valve operation. Use petroleum jelly only.

Do not force parts into place. The transmission components and sub-assemblies are easily installed by hand when properly aligned. If a part seems difficult to install, it is either misaligned or incorrectly assembled. Verify that thrust washers, thrust plates and seal rings are correctly positioned.

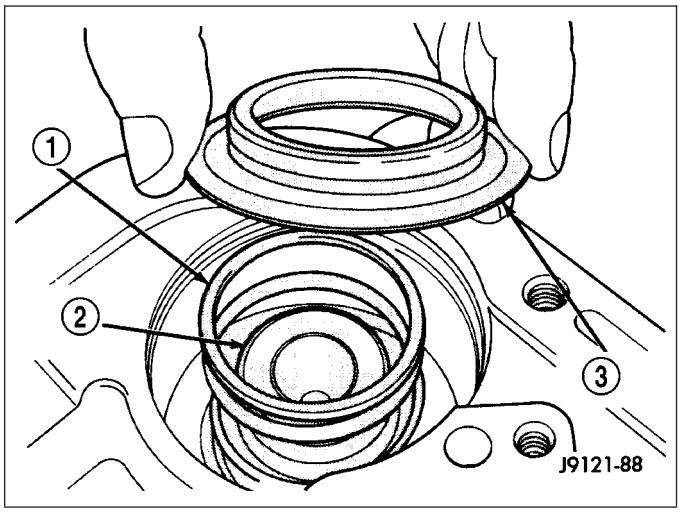
The planetary geartrain, front/rear clutch assemblies and oil pump are all much easier to install when the transmission case is upright. Either tilt the case upward with wood blocks, or cut a hole in the bench large enough for the intermediate shaft and rear support. Then lower the shaft and support into the hole and support the rear of the case directly on the bench.

FRONT/REAR SERVO

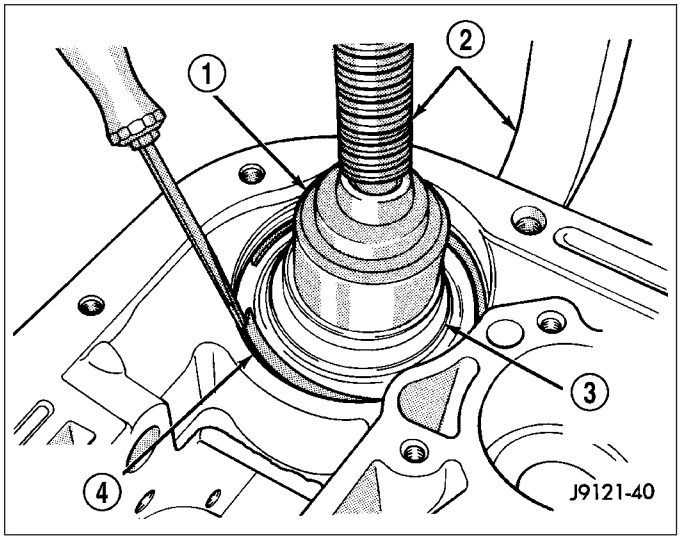
1. Lubricate rear servo piston seal with ATF +4. Lubricate servo bore in case with ATF +4.
2. Install rear servo piston (1) in case. Position piston at slight angle to bore and insert piston with twisting motion.



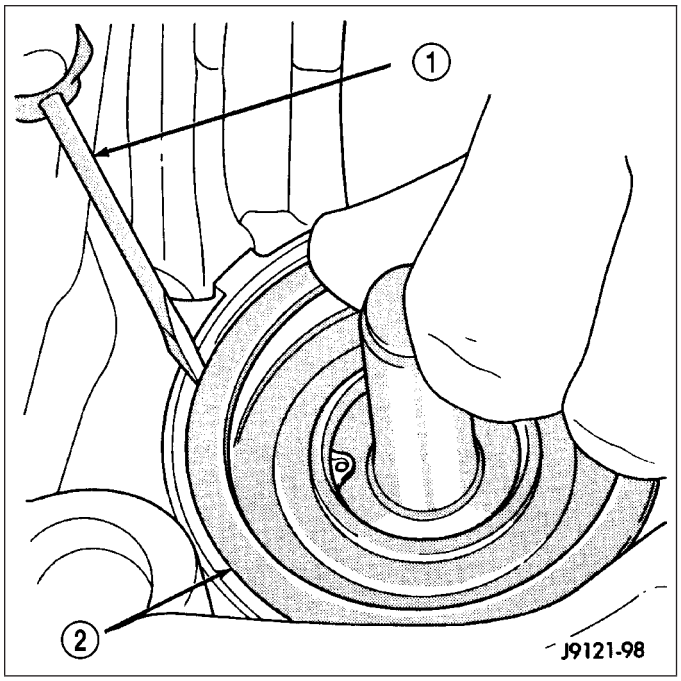
3. Install rear servo spring (1) and retainer (3) in case bore. Be sure spring (1) is seated on piston (2).



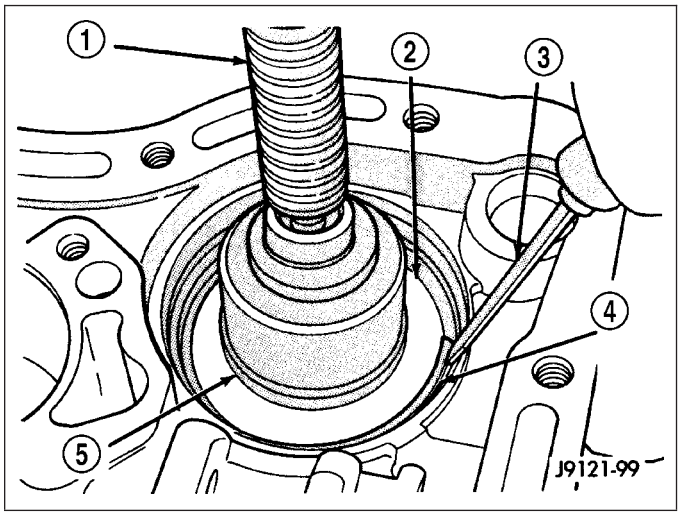
4. Compress rear servo piston with C-clamp (2) or Valve Spring Compressor C-3422-B and install servo piston snap-ring (4).



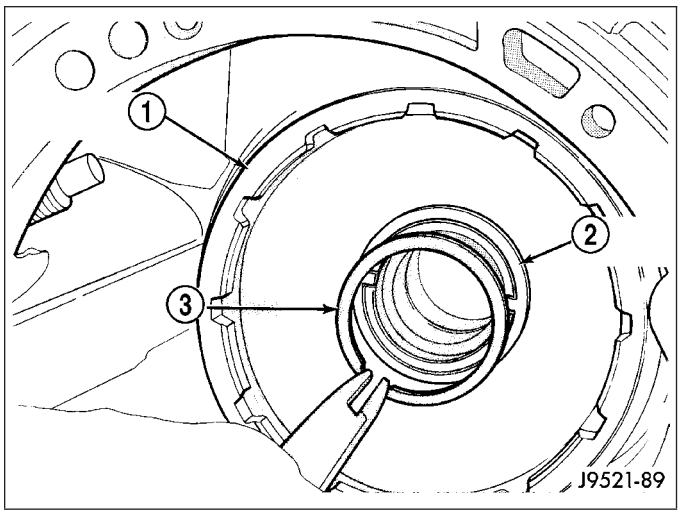
5. Lubricate front servo piston (2) components and servo bore in case with transmission fluid.
6. Install front servo piston (2) in bore. Carefully “run” small, suitable tool (1) around piston ring to press it back into groove and ease installation. Rotate piston into bore at same time. Rock piston slightly to ease piston ring past snap-ring groove and into bore.



7. Bottom front servo piston in bore and install servo spring.
8. Install front servo piston rod (2) guide as follows:
   a. Place Tool SP-5560 (or similar size tool) (5) on guide and position C-clamp on tool and case.
   b. Slowly compress rod guide while simultaneously easing seal ring into bore with suitable tool.
9. Install rod guide snap-ring (4).

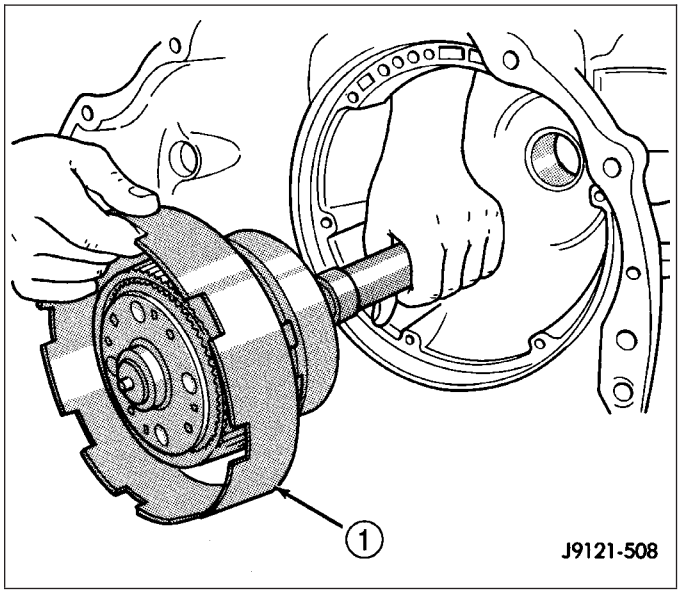


OVERRUNNING CLUTCH, REAR BAND, AND LOW-REVERSE DRUM



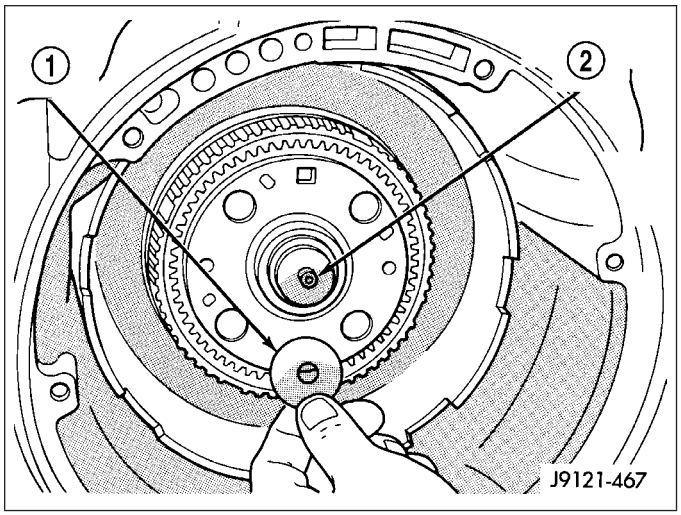
1. Install overrunning clutch components if not yet installed.
2. Position rear band reaction pin and band in case. Be sure that the twin lugs on the band are seated against the reaction pin.
3. Install low-reverse drum. Slide drum through rear band, onto piston retainer hub and into engagement with overrunning clutch and race.
4. Install thrust washer in low-reverse drum spotface (2). Use petroleum jelly to hold washer in place.
5. Install snap-ring (3) that secures low-reverse drum to piston retainer hub.
6. Insert the rear band pivot pin part way into the case.
7. Install rear band adjusting lever and pivot pin. Be sure lever and the single lug on the band are aligned and engaged before seating band pivot pin in case.

PLANETARY GEARTRAIN, FRONT/REAR CLUTCH, AND FRONT BAND

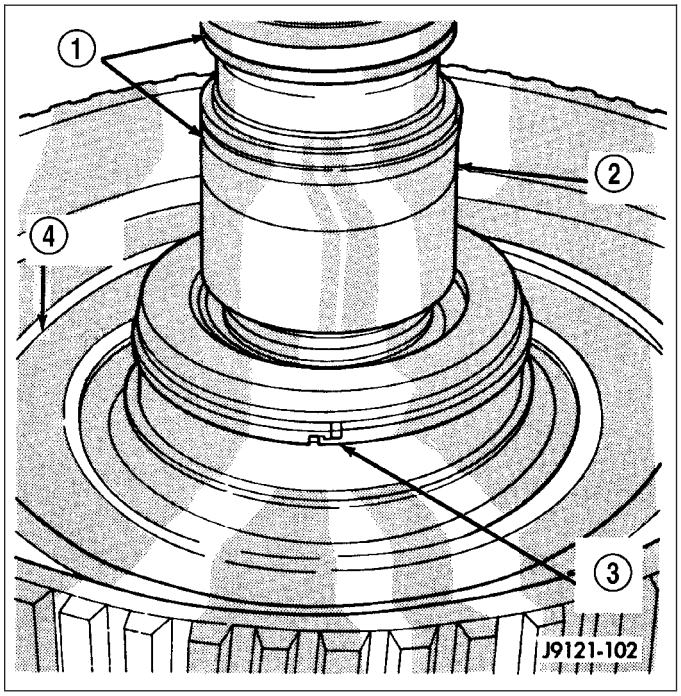


1. Remove Alignment Shaft 6227-2, if installed previously.
2. Install assembled intermediate shaft and planetary geartrain (1). **Support shaft carefully during installation. Do not allow shaft bearing/bushing surfaces to become nicked or scratched.**

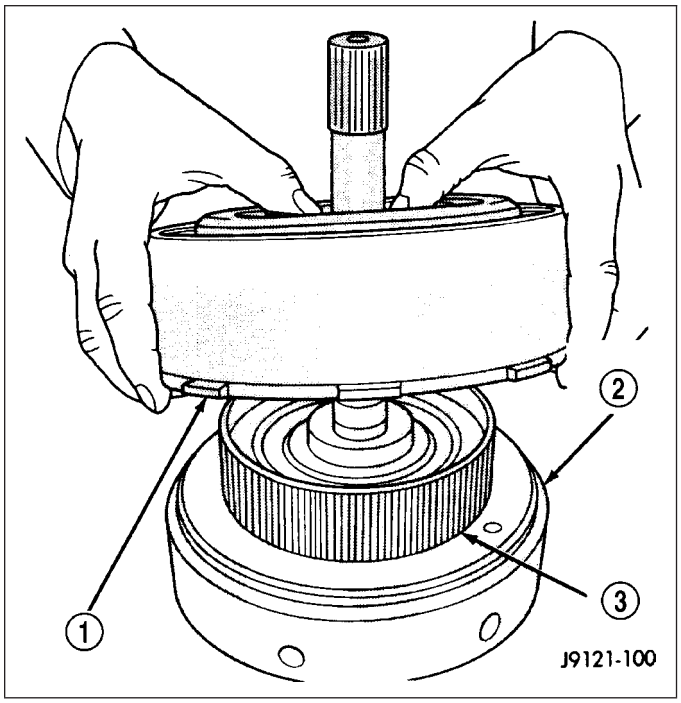
3. Lubricate intermediate shaft thrust plate (1) with petroleum jelly and install plate on shaft pilot hub (2).



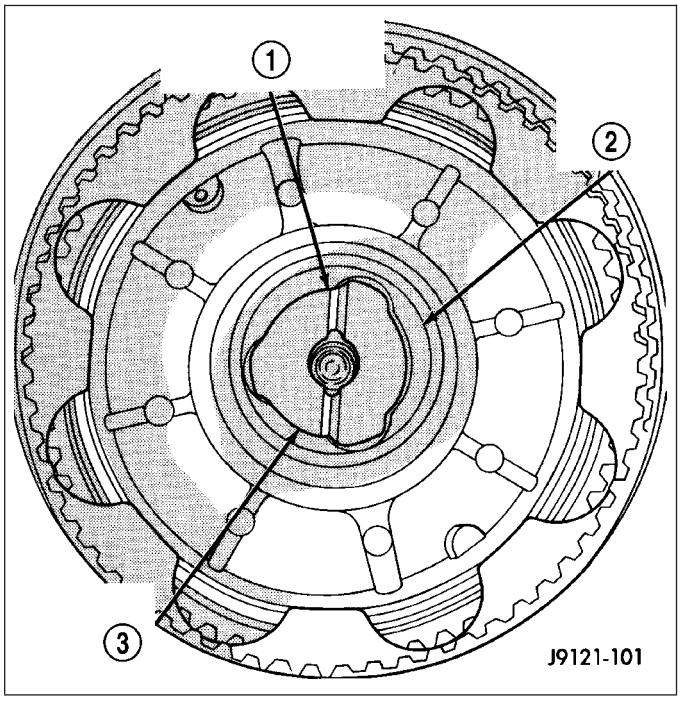
4. Check input shaft front seal rings (1), fiber thrust washer (4), and rear seal ring (3). Be sure the ends of rear seal ring are hooked together and diagonal cut ends of front seal rings are firmly seated against each other as shown. Lubricate seal rings with petroleum jelly after checking them.



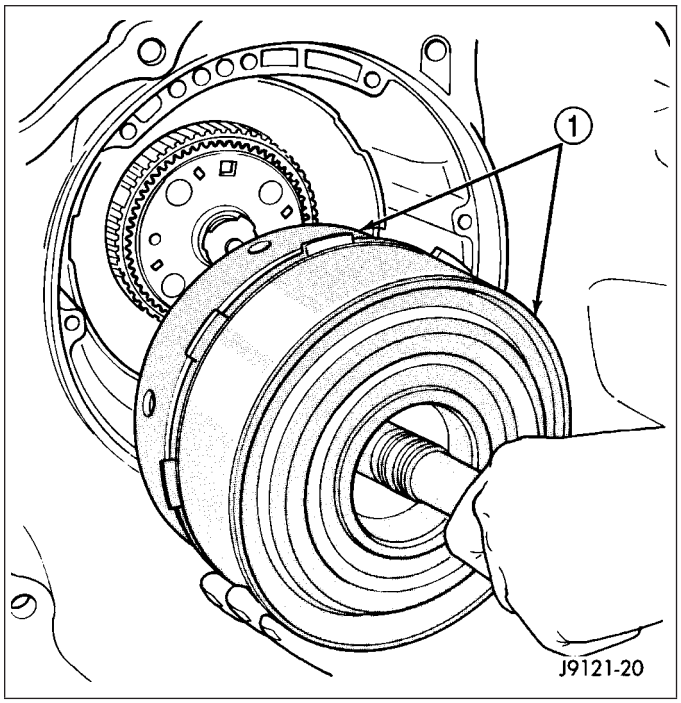
5. Assemble front (1) and rear (2) clutches. Align lugs on front clutch discs. Mount front clutch on rear clutch. Turn front clutch retainer back and forth until front clutch discs are fully seated on rear clutch splined hub.



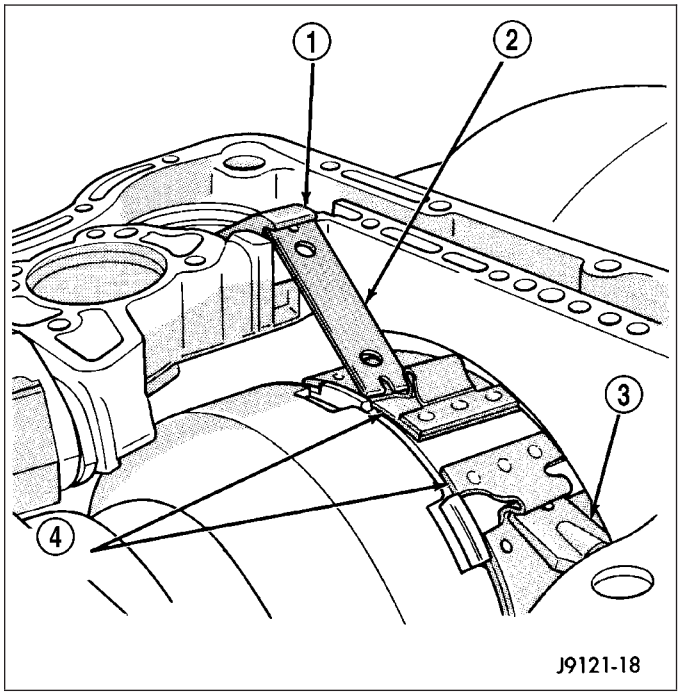
6. Install intermediate shaft thrust washer (3) in hub of rear clutch retainer (2). Use petroleum jelly to hold washer in place. Position washer so grooves are facing outward. **Washer only fits one way in clutch retainer hub.**



7. Place transmission case in upright position, or place blocks under front end of transmission repair stand to tilt case rearward. This makes it easier to install front/rear clutch assembly (1).
8. Align discs in rear clutch. Then install and engage assembly (1) in front planetary and driving shell. Turn clutch retainers back and forth until both clutches are seated.

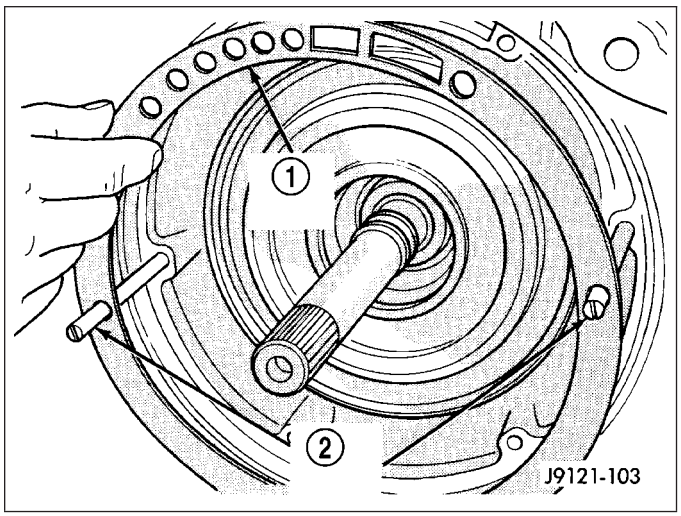


9. Position front band lever (1) in case and over servo rod guide. Then install front band lever pin in case and slide it through lever.
10. Coat threads of front band pin access plug with sealer and install it in case. Tighten plug to 17 N·m (13 ft. lbs.) torque.
11. Slide front band over front clutch retainer and install front band strut (2) and anchor (3).
12. Tighten front band adjusting screw until band is tight on clutch retainer. This will hold clutches in place while oil pump is being installed. **Verify that front/rear clutch assembly is still properly seated before tightening band.**



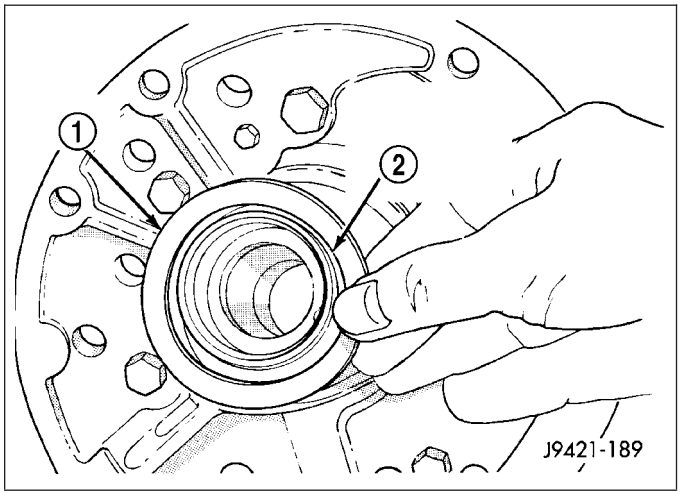
OIL PUMP

1. Install oil pump Pilot Studs C-3288-B (2) in case.
2. Install new oil pump gasket (1) on pilot studs and seat it in case. Be sure gasket is properly aligned with fluid passages in case.

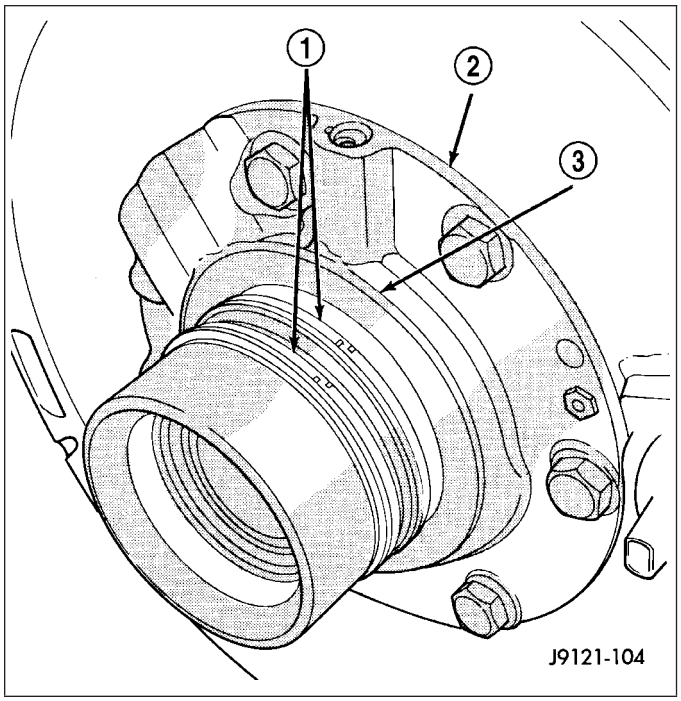


3. Coat the reaction shaft thrust washer (1) with petroleum jelly to hold it in place. Then install washer over reaction shaft hub and seat it on pump.

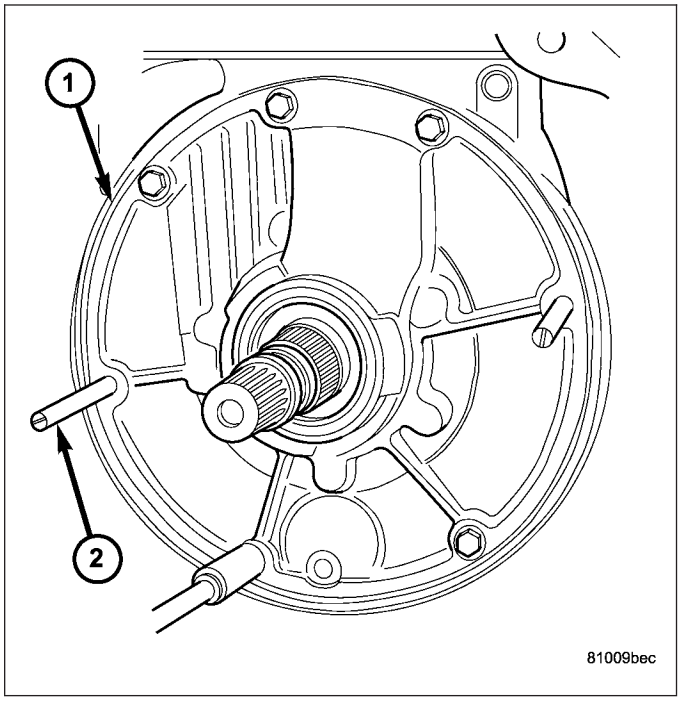
CAUTION: The thrust washer bore (I.D.), is chamfered (2) on one side. Make sure the chamfered side is installed so it faces the pump.



4. Check seal rings (1) on reaction shaft support. Be sure rings are hooked together correctly. Also be sure fiber thrust washer (3) is in position . Use extra petroleum jelly to hold washer in place if necessary.



5. Check the torque converter hub seal ring on the reaction shaft for damage. Also check that the seal ring rotates freely in the reaction shaft groove. Replace the seal if necessary.
6. Lubricate oil pump seals with petroleum Mopar® ATF +4.
7. Mount oil pump on pilot studs and slide pump into case opening (1). **Work pump into case by hand. Do not use a mallet or similar tools to seat pump.**
8. Remove pilot studs (2) and install oil pump bolts. Tighten pump bolts alternately and evenly to fully seat pump in case. Then final-tighten pump bolts to 20 N·m (15 ft. lbs.) torque.
9. Verify correct installation. Rotate input and intermediate shafts and check for bind. If bind exists, components are either mis-assembled, or not seated. Disassemble and correct as necessary before proceeding.



INPUT SHAFT END PLAY CHECK

NOTE: Overdrive unit must be installed in order to correctly measure the input shaft end-play.

1. Measure input shaft end play.

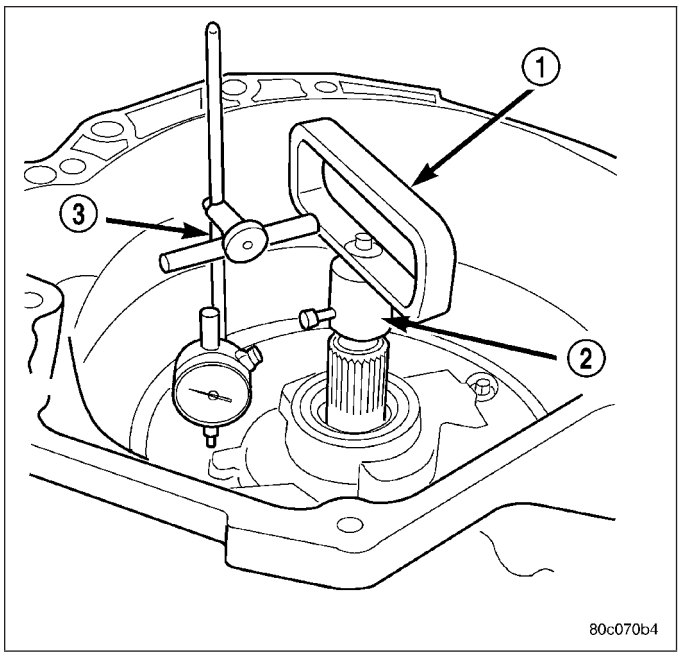
NOTE: If end play is incorrect, transmission is incorrectly assembled, or reaction shaft thrust washer is incorrect. The reaction shaft thrust washer is selective.

a. Attach Adapter 8266-5 (2) to Handle 8266-8 (1).

b. Attach dial indicator C-3339 (3) to Handle 8266-8 (1).

c. Install the assembled tool onto the input shaft of the transmission and tighten the retaining screw on Adapter 8266-5 to secure it to the input shaft.

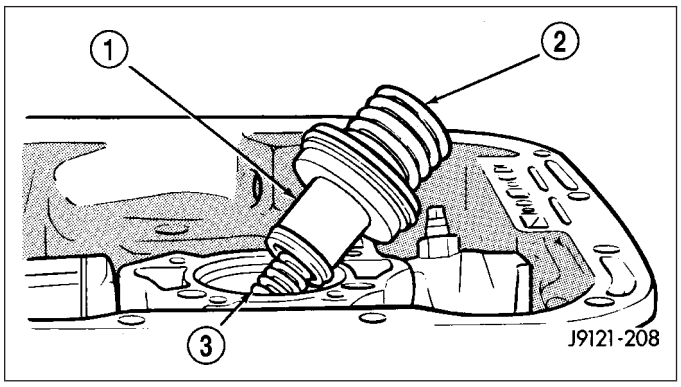
d. Position the dial indicator plunger against a flat spot on the oil pump and zero the dial indicator.



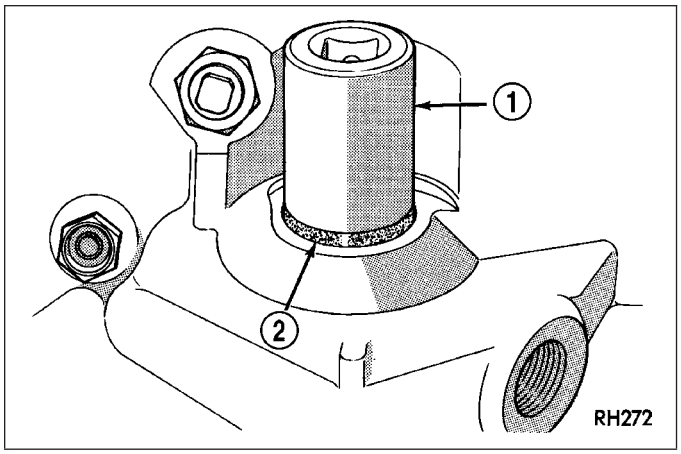
e. Move input shaft in and out and record reading. End play should be 0.86 - 2.13 mm (0.034 - 0.084 in.). Adjust as necessary.

ACCUMULATOR, VALVE BODY, OIL PAN, AND TORQUE CONVERTER

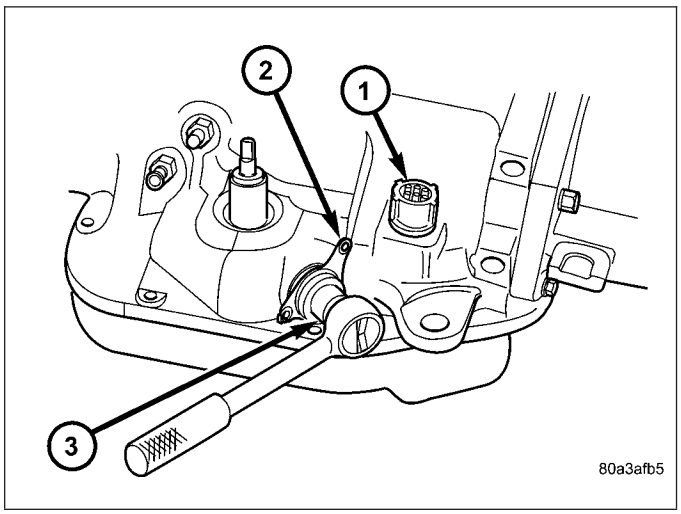
1. Install accumulator inner spring (3)(V-10 engine only), piston (1), and outer spring (2)(diesel engine only).



2. Verify that the transmission range sensor has **not** been installed in case. Valve body can not be installed if sensor is in position.
3. Install new valve body manual shaft seal (2) in case. Lubricate seal lip and manual shaft with petroleum jelly. Start seal over shaft and into case. Seat seal with 15/16 inch, deep well socket (1).



4. Install valve body as follows:
   a. Start park rod into park pawl. If rod will not slide past park pawl, pawl is engaged in park gear. Rotate overdrive output shaft with suitable size 12 point socket; this will free pawl and allow rod to engage.
   b. Align and seat valve body on case. Be sure manual lever shaft and overdrive connector are fully seated in case.
   c. Install and start all valve body attaching bolts by hand. Then tighten bolts evenly, in a diagonal pattern to 12 N·m (105 in. lbs.) torque. **Do not overtighten valve body bolts. This could result in distortion and cross leakage after installation.**.

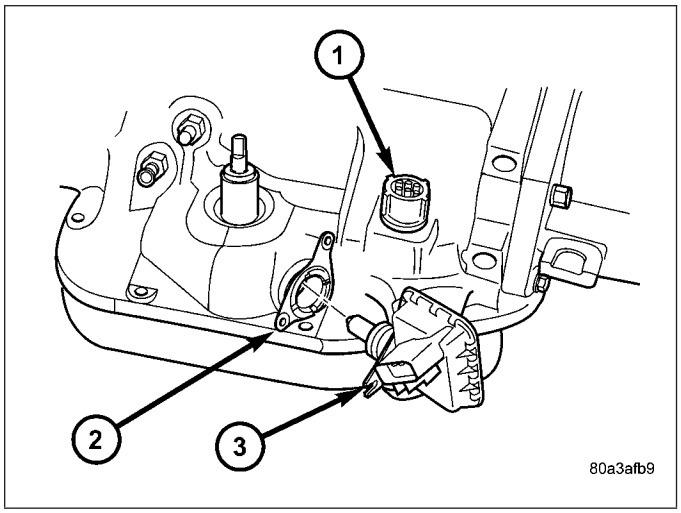


5. Install new filter on valve body. Tighten filter screws to 4 N·m (35 in. lbs.).

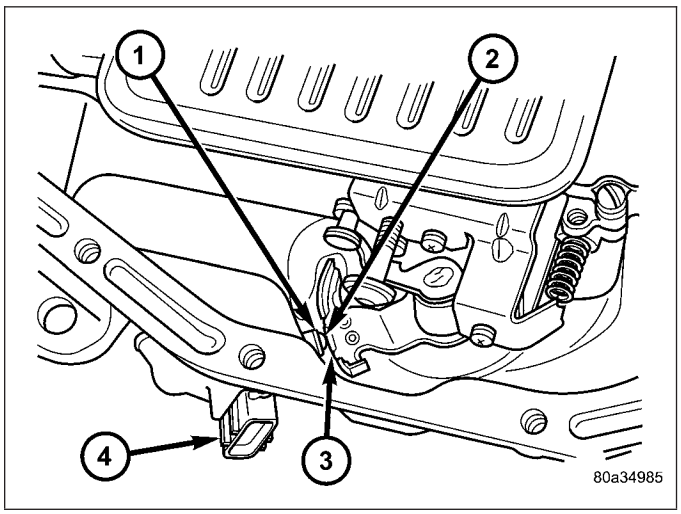
CAUTION: If the condition of the transmission before the overhaul procedure caused excessive metallic or fiber contamination in the fluid, replace the torque converter. Fluid contamination and transmission failure can result if not done.

6. Move the transmission manual shaft lever to the manual LOW position.
7. Install the TRS mounting bracket into the transmission case. Using Adapter 8581 (3), tighten the mounting bracket (2) to 34 N·m (300 in.lbs.).

8. Install the TRS into the mounting bracket with the wiring connector facing the front of the transmission.
9. Install the two screws to hold the TRS to the mounting bracket. Tighten the screws to 5 N·m (45 in.lbs.).



10. Verify proper sensor operation.
11. Move the transmission manual shaft lever to the PARK position.
12. Install torque converter. Use C-clamp or metal strap to hold converter in place for installation.



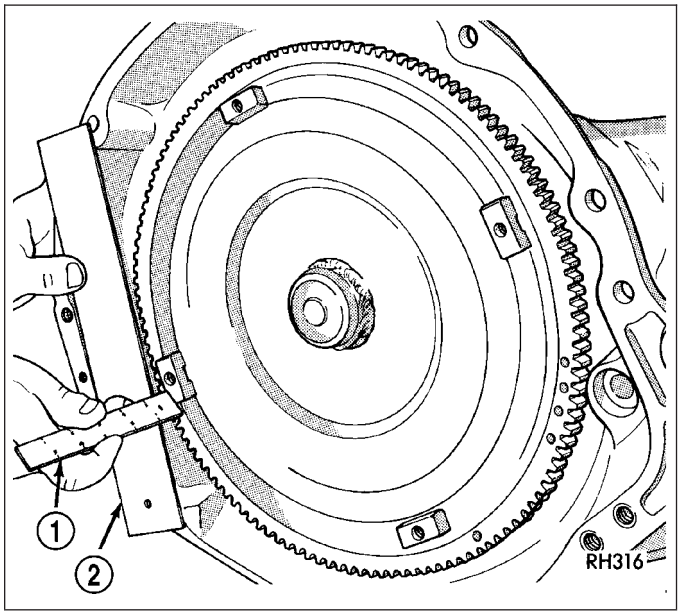
1 - NEUTRAL CONTACT
2 - MANUAL LEVER AND SENSOR PLUNGER IN REVERSE POSITION
3 - PARK CONTACT
4 - TRANSMISSION RANGE SENSOR

BAND ADJUSTMENT AND FINAL

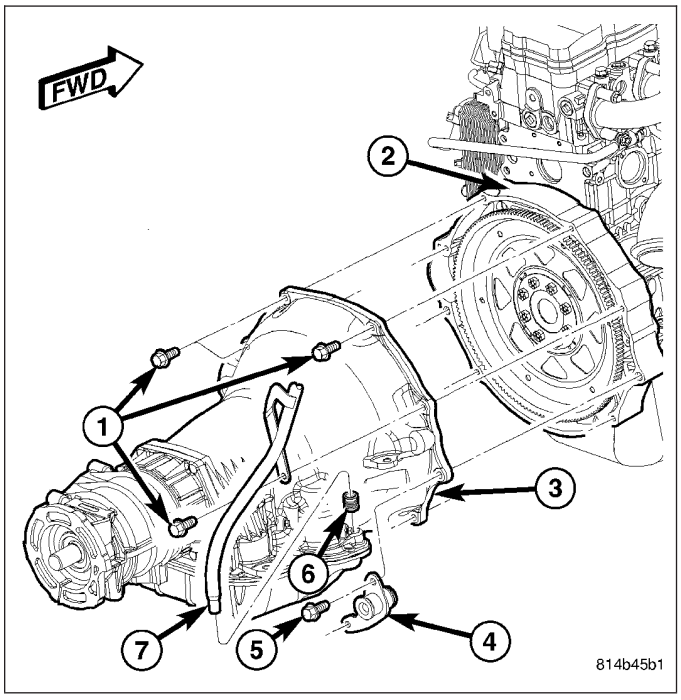
1. Adjust front and rear bands as follows:
   a. Loosen locknut on each band adjusting screw 4-5 turns.
   b. Tighten both adjusting screws to 8 N·m (72 in. lbs.).
   c. Back off front band adjusting screw 1-3/4 turns, for diesel vehicles, or 1-1/2 turns for V-10 vehicles.
   d. Back off rear band adjusting screw 3 turns.
   e. Hold each adjusting screw in position and tighten locknut to 34 N·m (25 ft. lbs.) torque.
2. Install magnet in oil pan. Magnet seats on small protrusion at corner of pan.
3. Position new oil pan gasket on case and install oil pan. Tighten pan bolts to 13.6 N·m (125 in. lbs.).
4. Install throttle valve and shift selector levers on valve body manual lever shaft.
5. Apply small quantity of dielectric grease to terminal pins of solenoid case connector and neutral switch.
6. Fill transmission with recommended fluid.

INSTALLATION

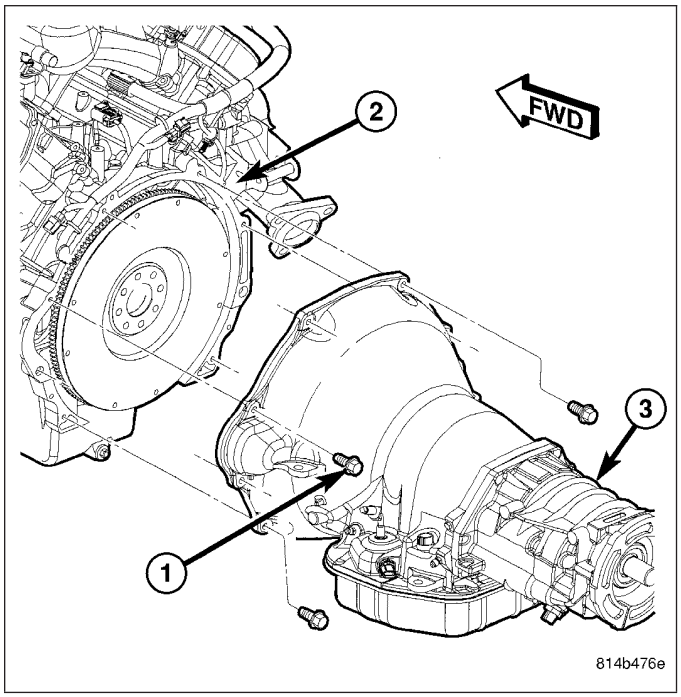
1. Check torque converter hub inner and outer diameters and hub drive notches for sharp edges burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper and crocus cloth if necessary. The hub must be smooth to avoid damaging pump seal at installation.
2. Lubricate pocket in the rear oil pump seal lip with transmission fluid.
3. Lubricate converter pilot hub of the crankshaft with a light coating of Mopar® High Temp Grease.
4. Align and install converter in oil pump.
5. Carefully insert converter in oil pump. Then rotate converter back and forth until fully seated in pump gears.
6. Check converter seating with steel scale (1) and straightedge (2). Surface of converter lugs should be 19mm (0.75 in.) to rear of straightedge when converter is fully seated.
7. Temporarily secure converter with C-clamp.



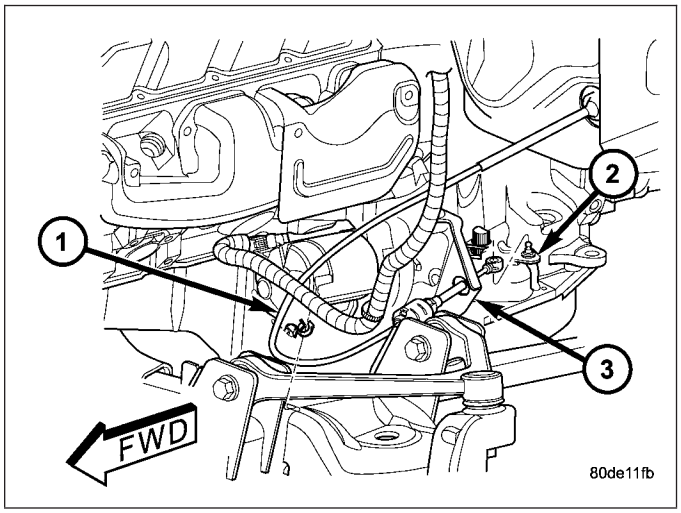
8. For vehicles equipped with a diesel engine;
   a. Position transmission on jack and secure it with chains.
   b. Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**
   c. Raise transmission and align converter with drive plate and converter housing with engine block.
   d. Move transmission forward. Then raise, lower or tilt transmission to align converter housing with engine block dowels.
   e. Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft.
   f. Install bolts (5) attaching transmission (3) to engine adapter (2).



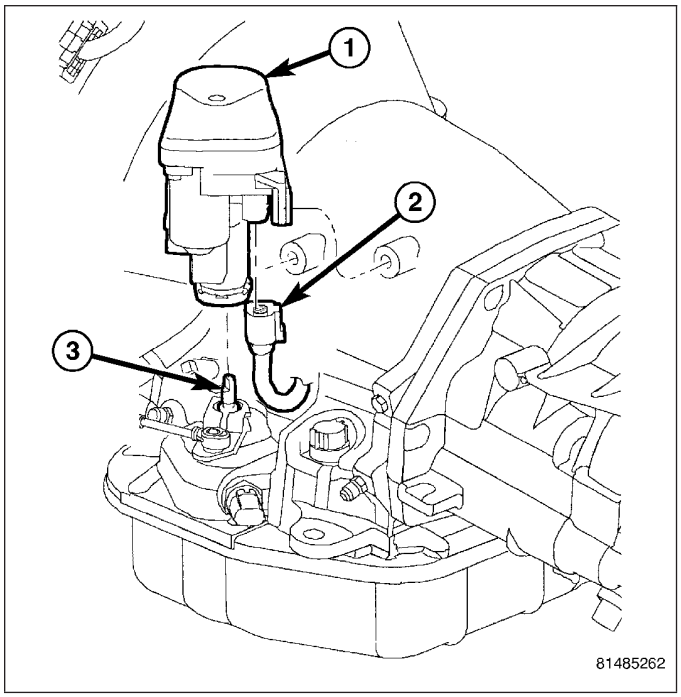
9. For vehicles equipped with a gas engine;
   a. Position transmission on jack and secure it with chains.
   b. Check condition of converter driveplate. Replace the plate if cracked, distorted or damaged. **Also be sure transmission dowel pins are seated in engine block and protrude far enough to hold transmission in alignment.**
   c. Raise transmission and align converter with drive plate and converter housing with engine block.
   d. Move transmission forward. Then raise, lower or tilt transmission to align converter housing with engine block dowels.
   e. Carefully work transmission forward and over engine block dowels until converter hub is seated in crankshaft.
   f. Install bolts (1) attaching transmission (3) to engine (2).



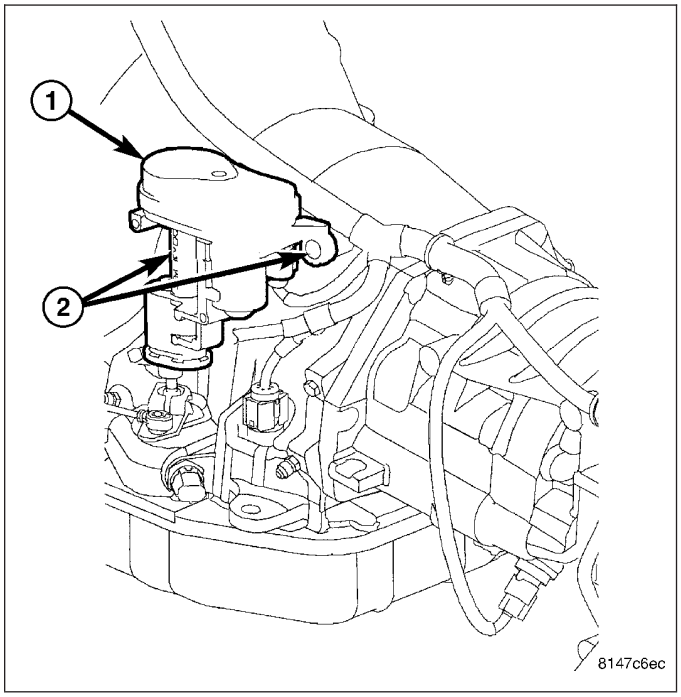
10. Install rear support.
11. Install the rear transmission crossmember.
12. Lower transmission onto crossmember and install bolts attaching transmission mount to crossmember.
13. Remove engine support fixture.
14. Install the transfer case, if equipped. (Refer to 21 - TRANSMISSION AND TRANSFER CASE/ TRANSFER CASE - INSTALLATION)
15. Install crankshaft position sensor. (Refer to 14 - FUEL SYSTEM/FUEL INJECTION/CRANKSHAFT POSITION SENSOR - INSTALLATION)
16. Connect gearshift cable (1) and throttle cable (gas engines only) to transmission.



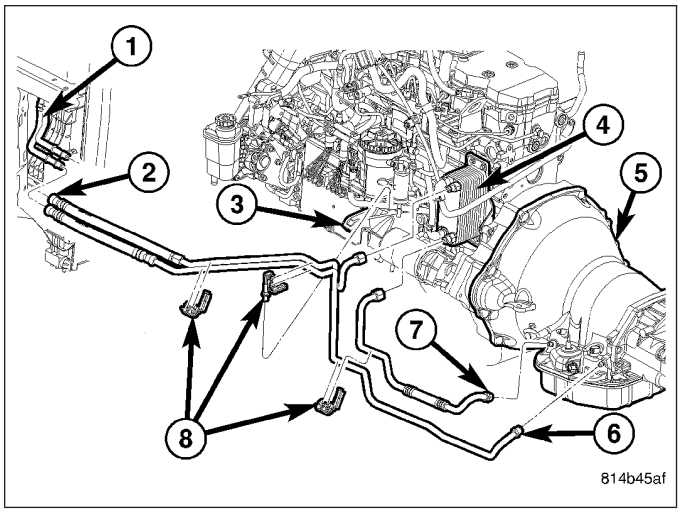
17. For vehicles equipped with a diesel engine, position the transmission throttle valve actuator (TTVA) (1) over the throttle valve shaft (3).
18. Align the D-shaped opening in the bottom of the TTVA to the throttle valve shaft and install the TTVA onto the shaft.
19. Install the wiring connector (2) to the TTVA (1).



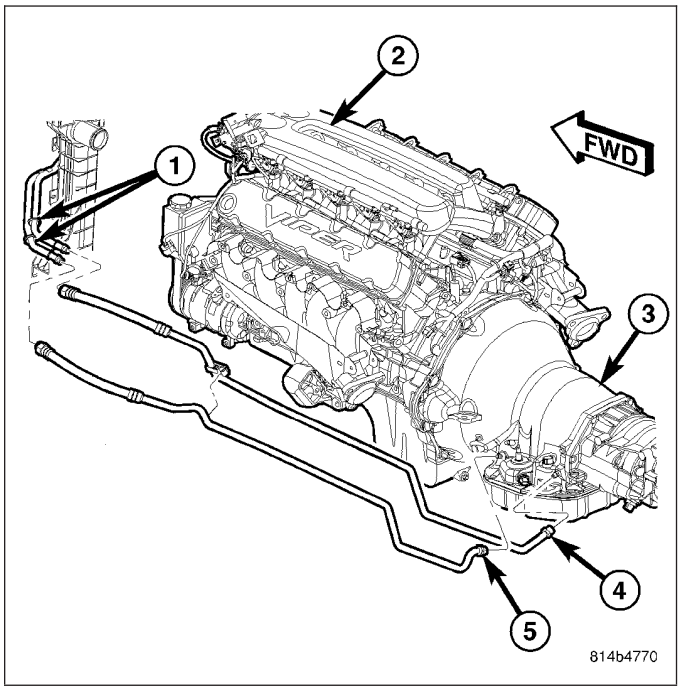
20. Rotate the TTVA (1) to the transmission case and install the bolts (2) to hold the TTVA to the transmission.
21. Tighten the bolts to 8.5 N·m (75 in.lbs.).
22. Initialize the TTVA (Refer to 21 - TRANSMISSION/AUTOMATIC - 48RE/THROTTLE VALVE ACTUATOR - ADJUSTMENTS).



23. Connect cooler lines (6, 7) to transmission (5), diesel engine.



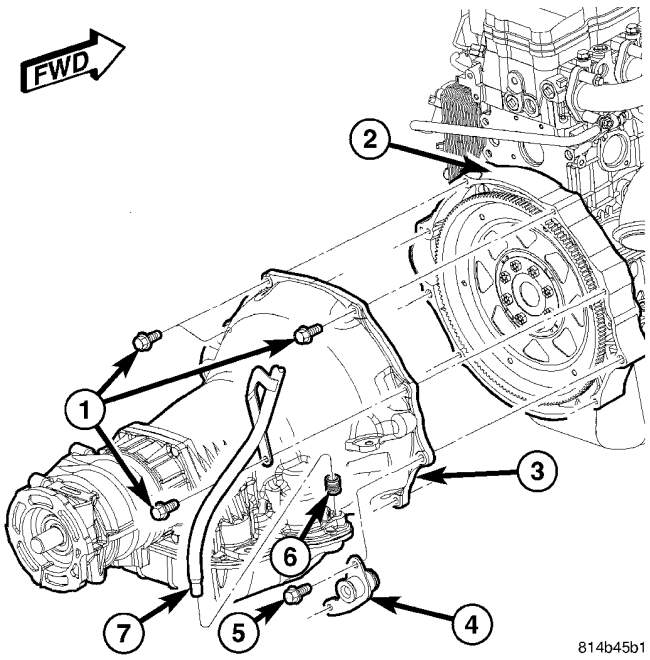
24. Connect cooler lines (4, 5) to transmission (3), gas engine.



25. Connect wires to the transmission range sensor and transmission solenoid connector. Be sure the transmission harnesses are properly routed.

CAUTION: It is essential that correct length bolts be used to attach the converter to the driveplate. Bolts that are too long will damage the clutch surface inside the converter.

26. Install torque converter-to-driveplate bolts.
27. Install converter housing access cover.
28. Install starter motor and cooler line bracket. (Refer to 8 - ELECTRICAL/STARTING/STARTER MOTOR - INSTALLATION)
29. Install transmission fill tube (7). Install new seal (6) on tube before installation.
30. Install any exhaust components previously removed.
31. Align and connect propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)

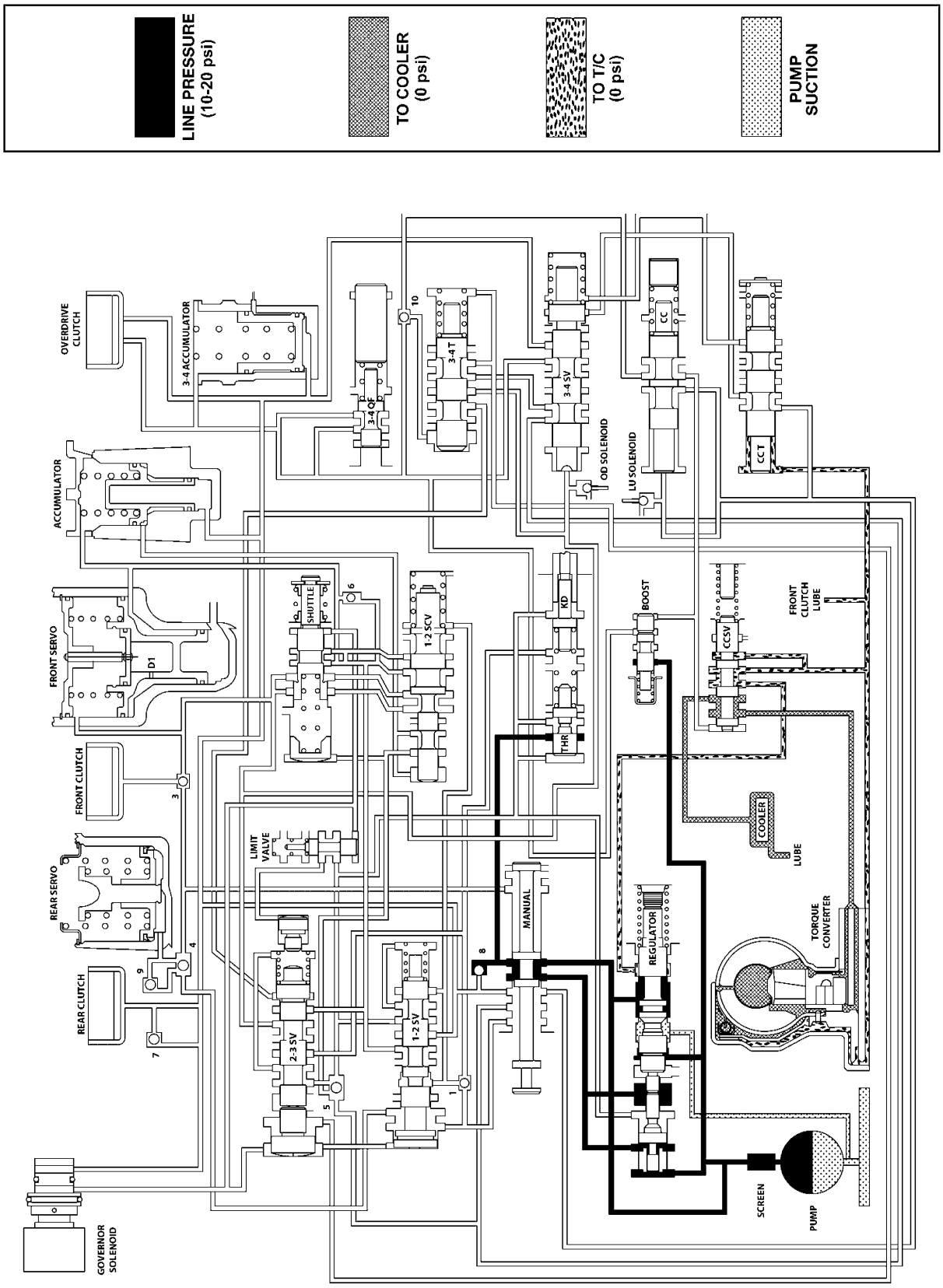


32. Adjust gearshift cable and throttle valve cable, if necessary.
33. Install the transfer case skid plate, if equipped.
34. Lower vehicle.
35. Fill transmission with Mopar® ATF +4, Automatic Transmission fluid.

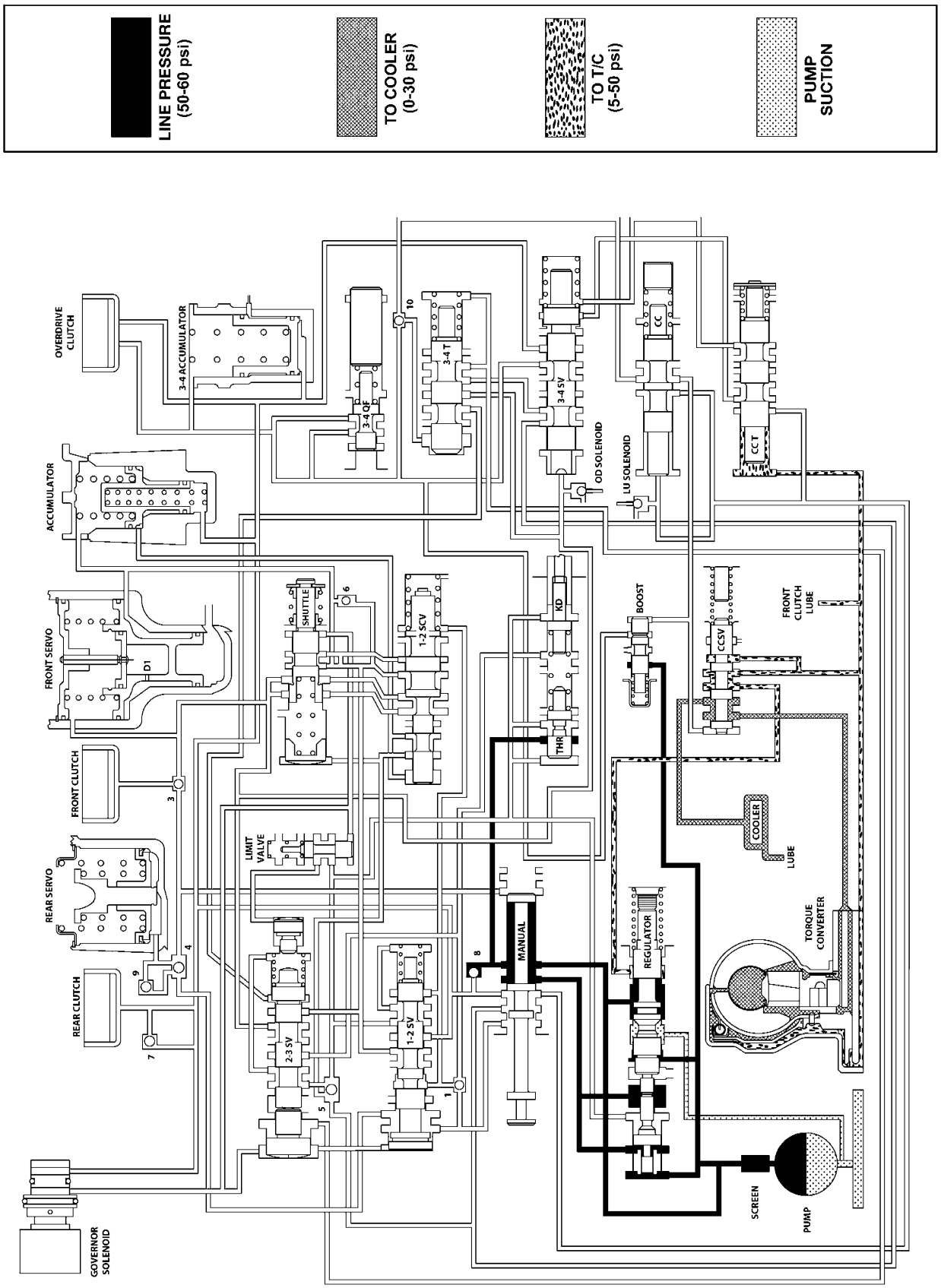
SCHEMATICS AND DIAGRAMS

HYDRAULIC SCHEMATICS

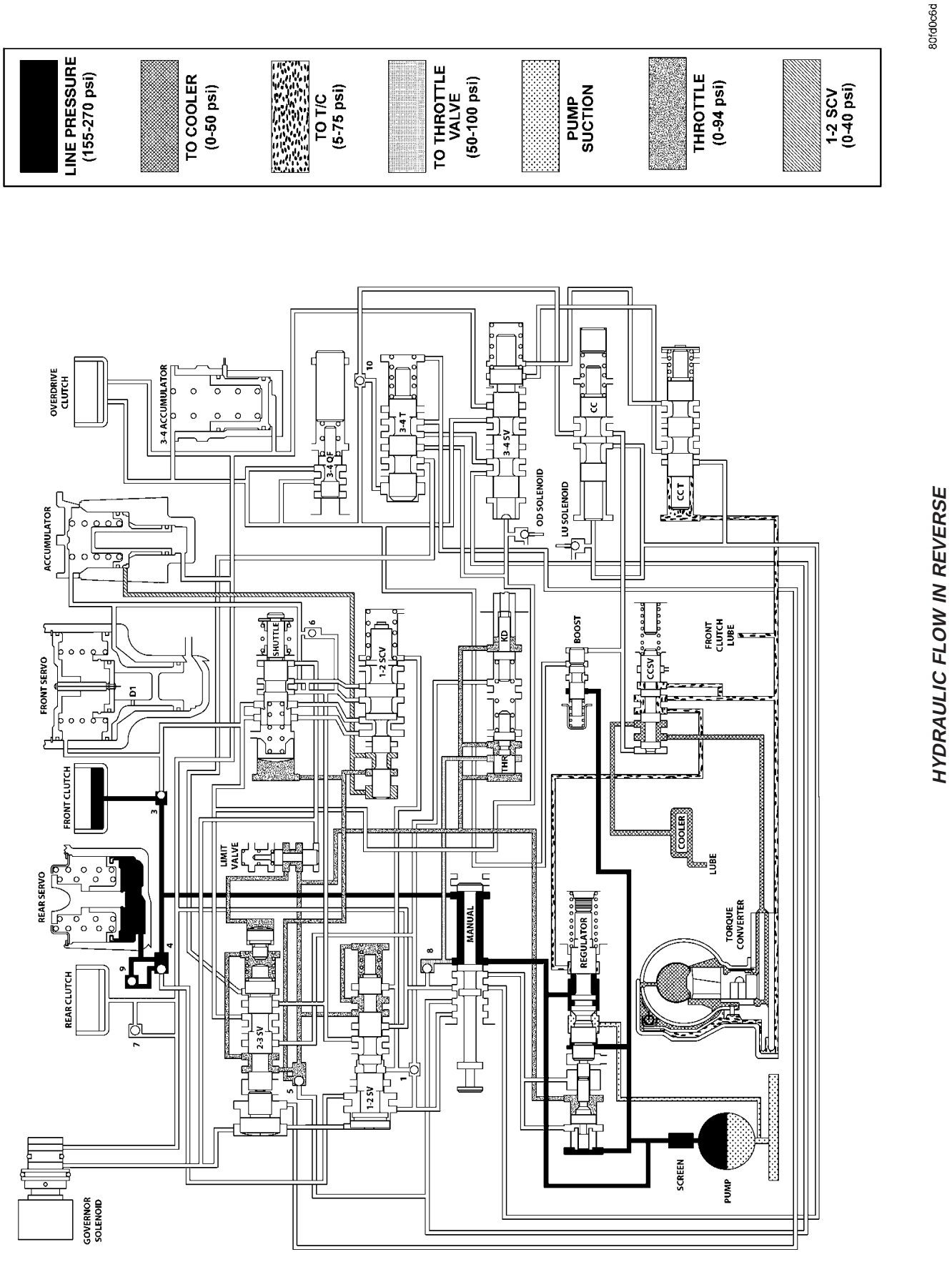
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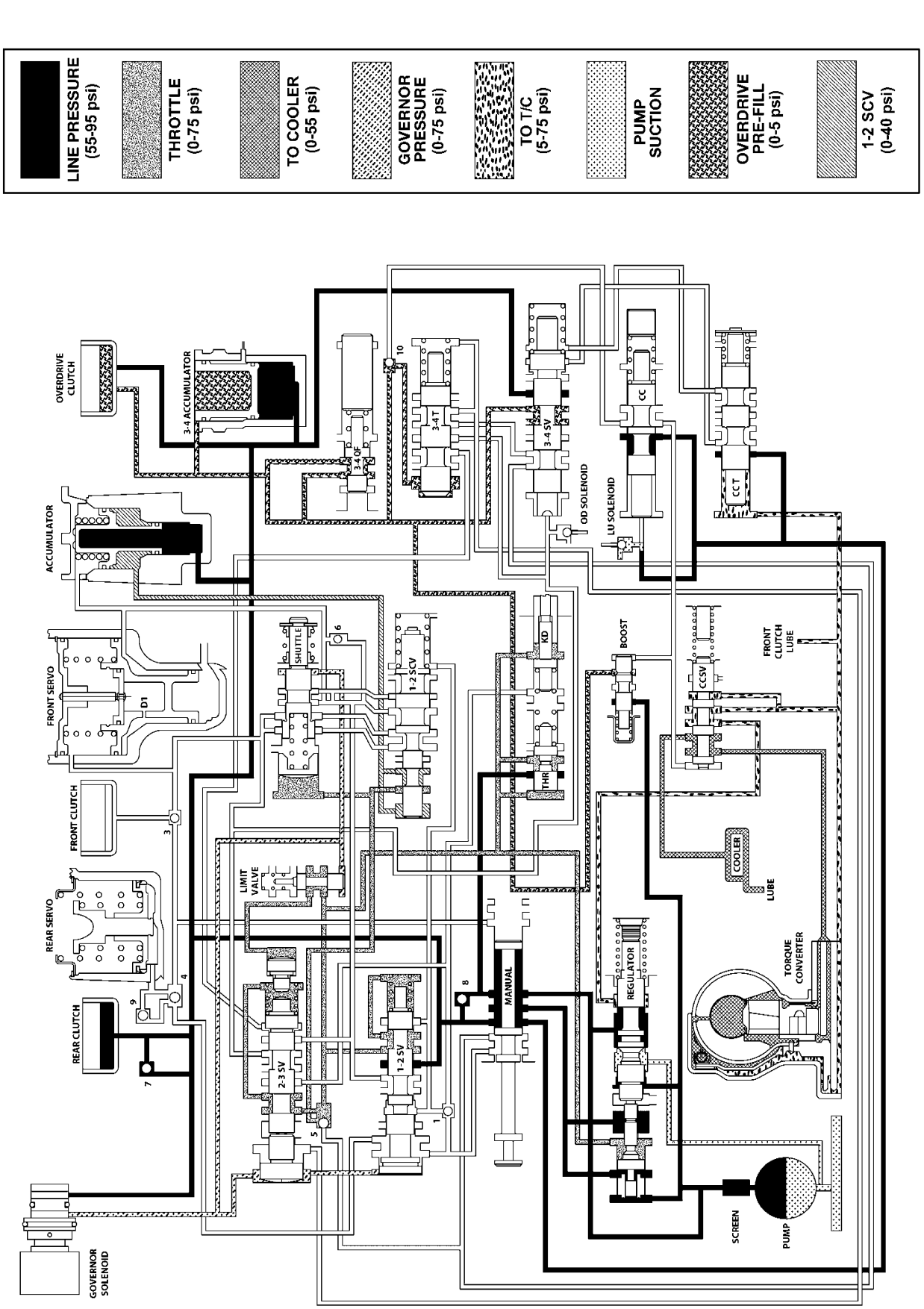
HYDRAULIC FLOW IN PARK



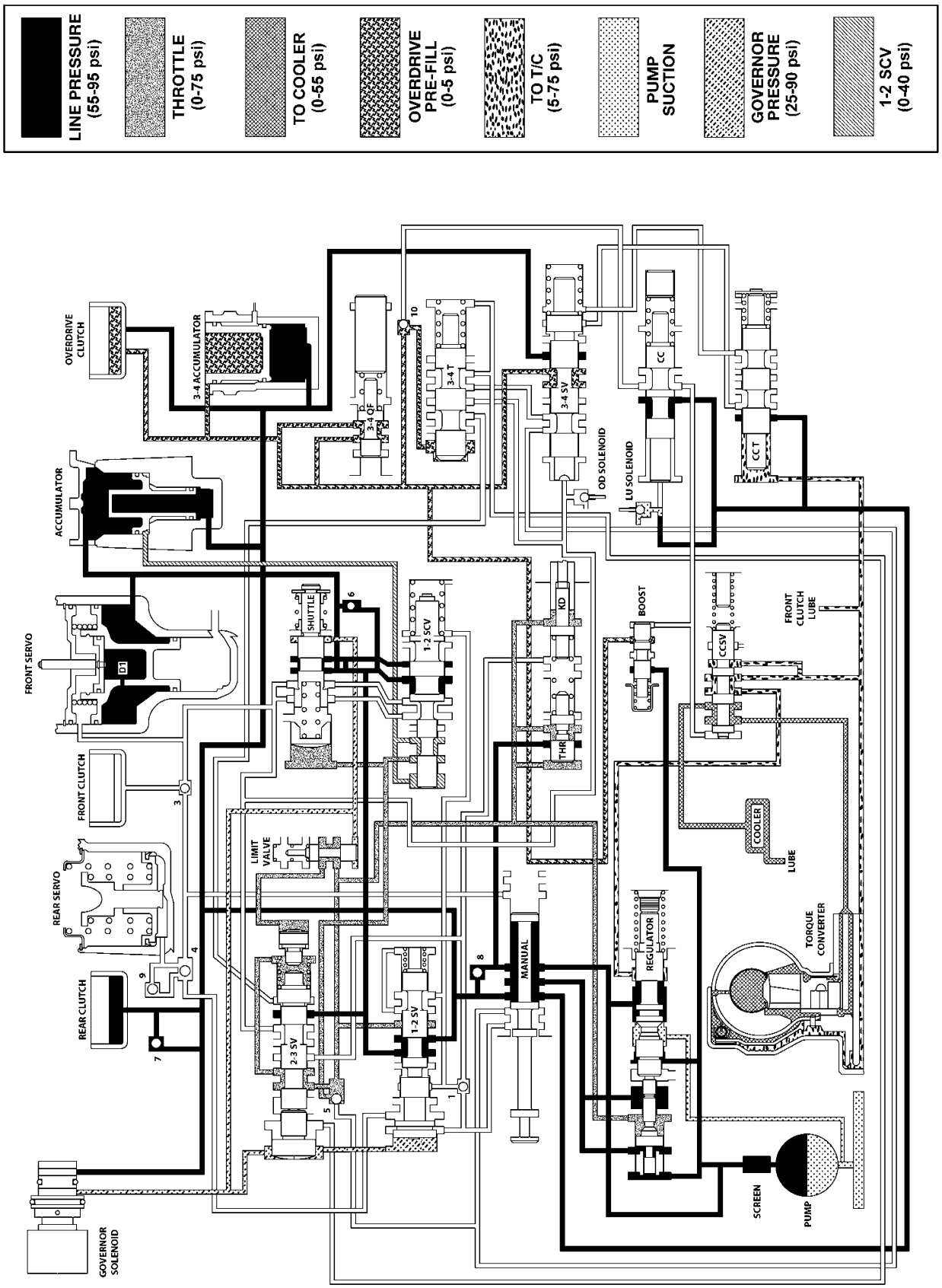
HYDRAULIC FLOW IN NEUTRAL



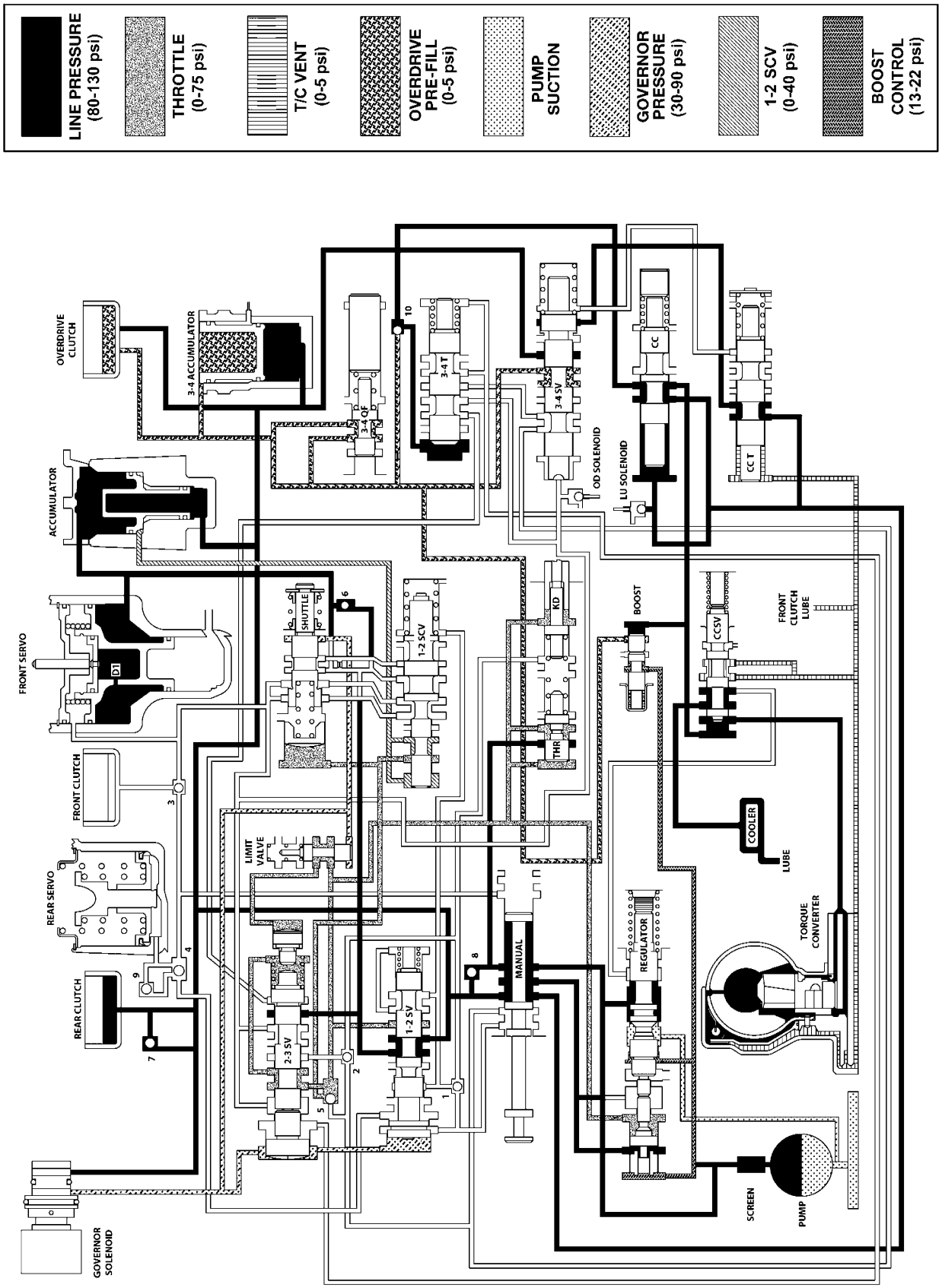
HYDRAULIC FLOW IN REVERSE



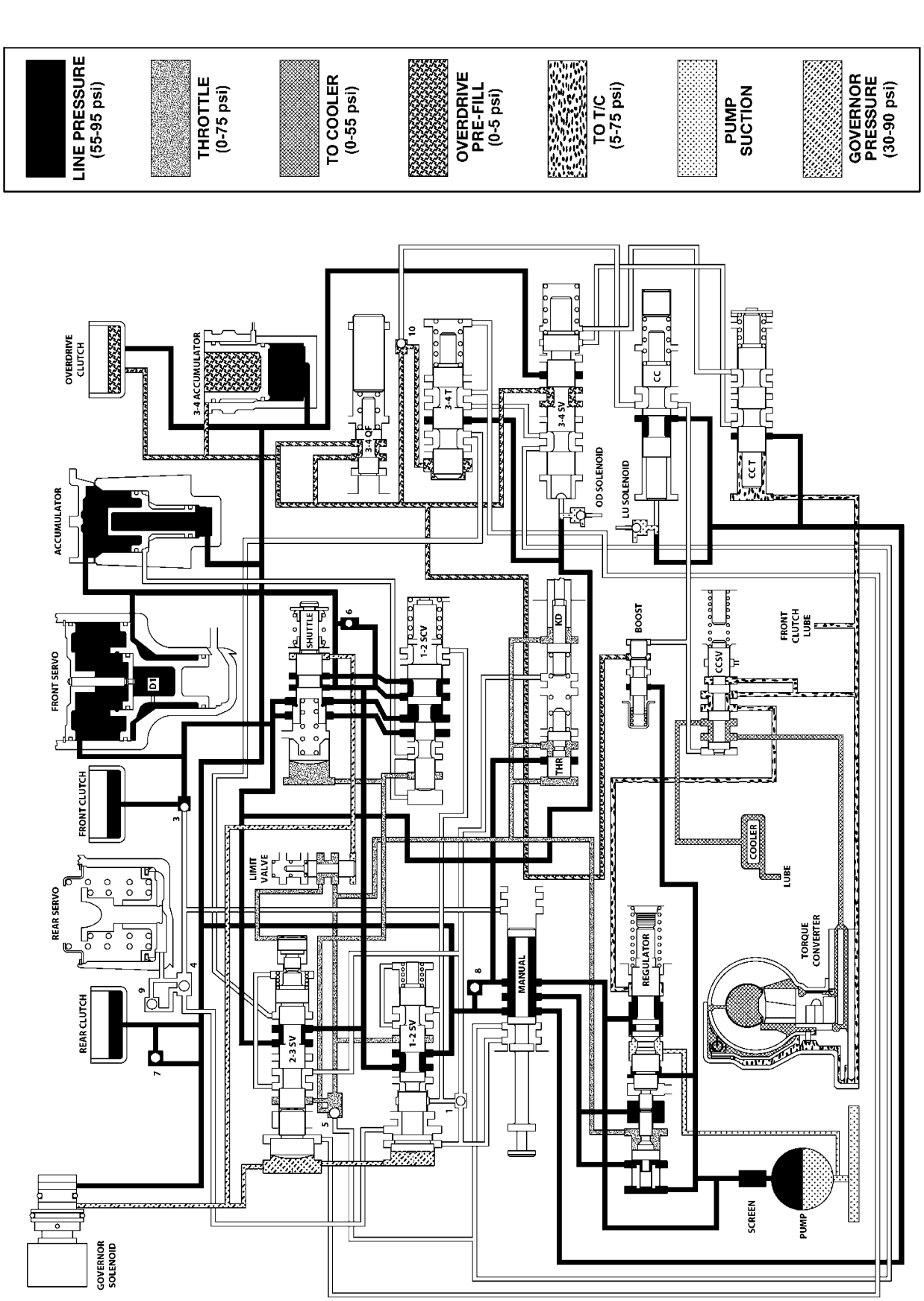
HYDRAULIC FLOW IN DRIVE FIRST GEAR



HYDRAULIC FLOW IN DRIVE SECOND GEAR (CONVERTER CLUTCH NOT APPLIED)

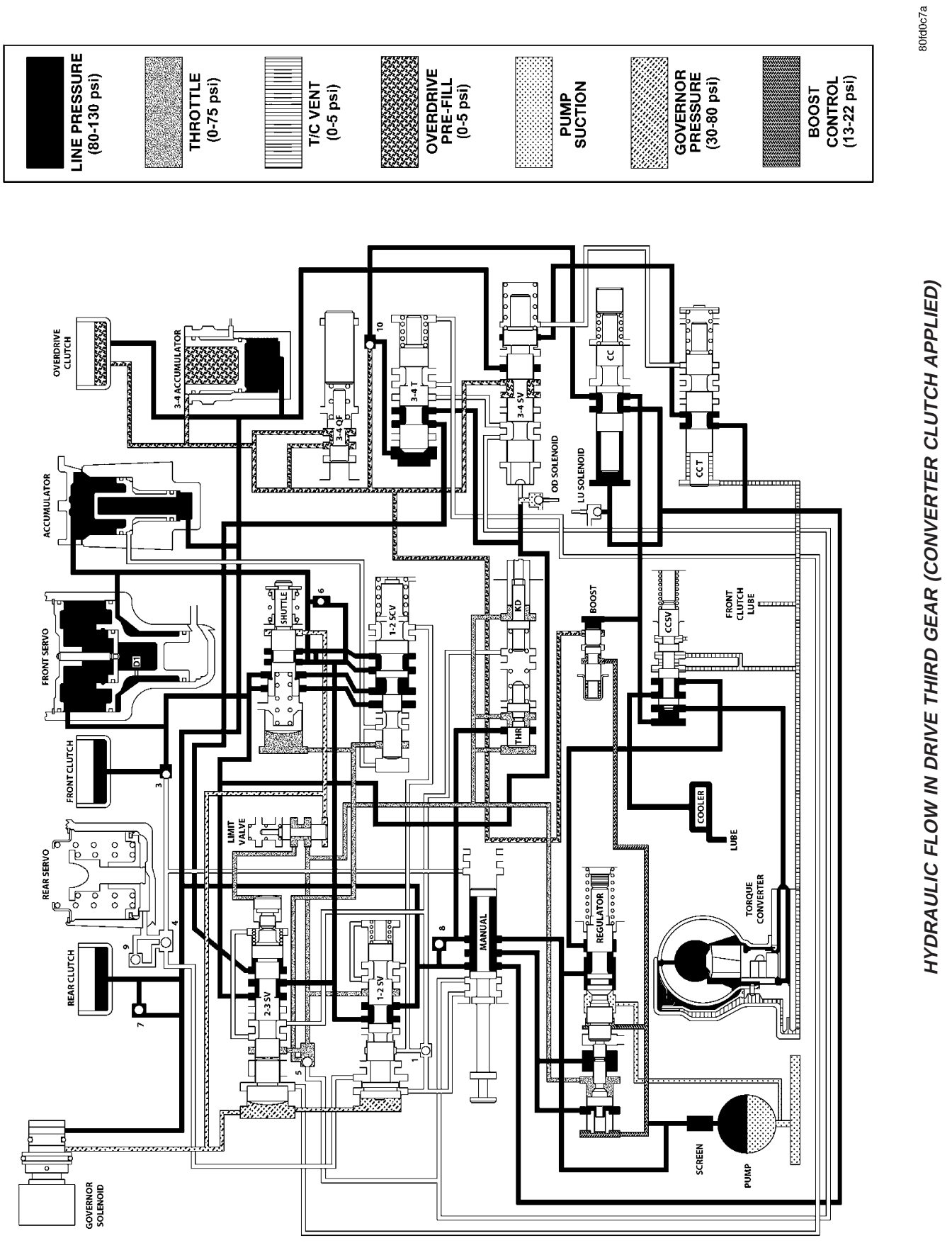


HYDRAULIC FLOW IN DRIVE SECOND GEAR (CONVERTER CLUTCH APPLIED)

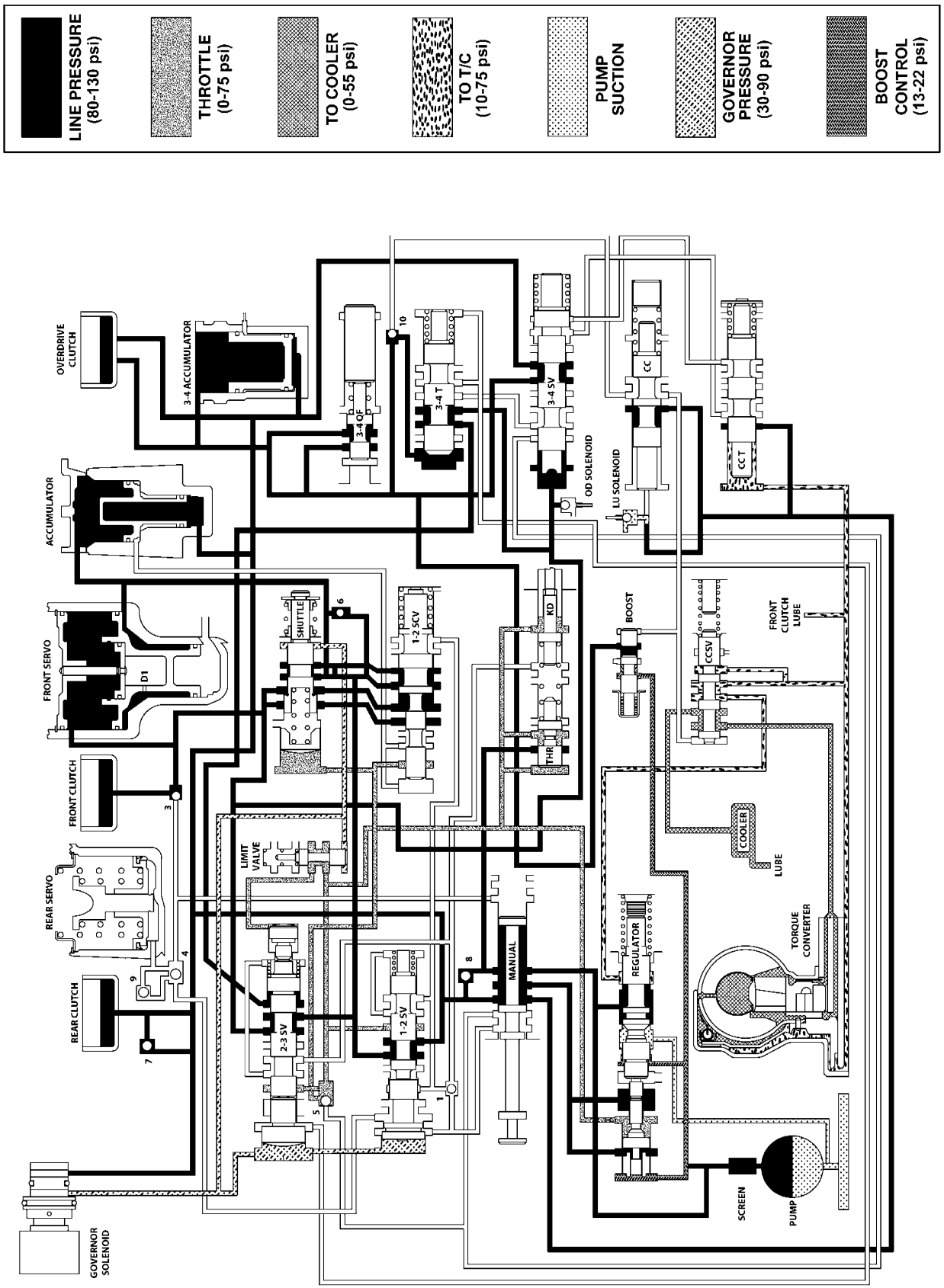


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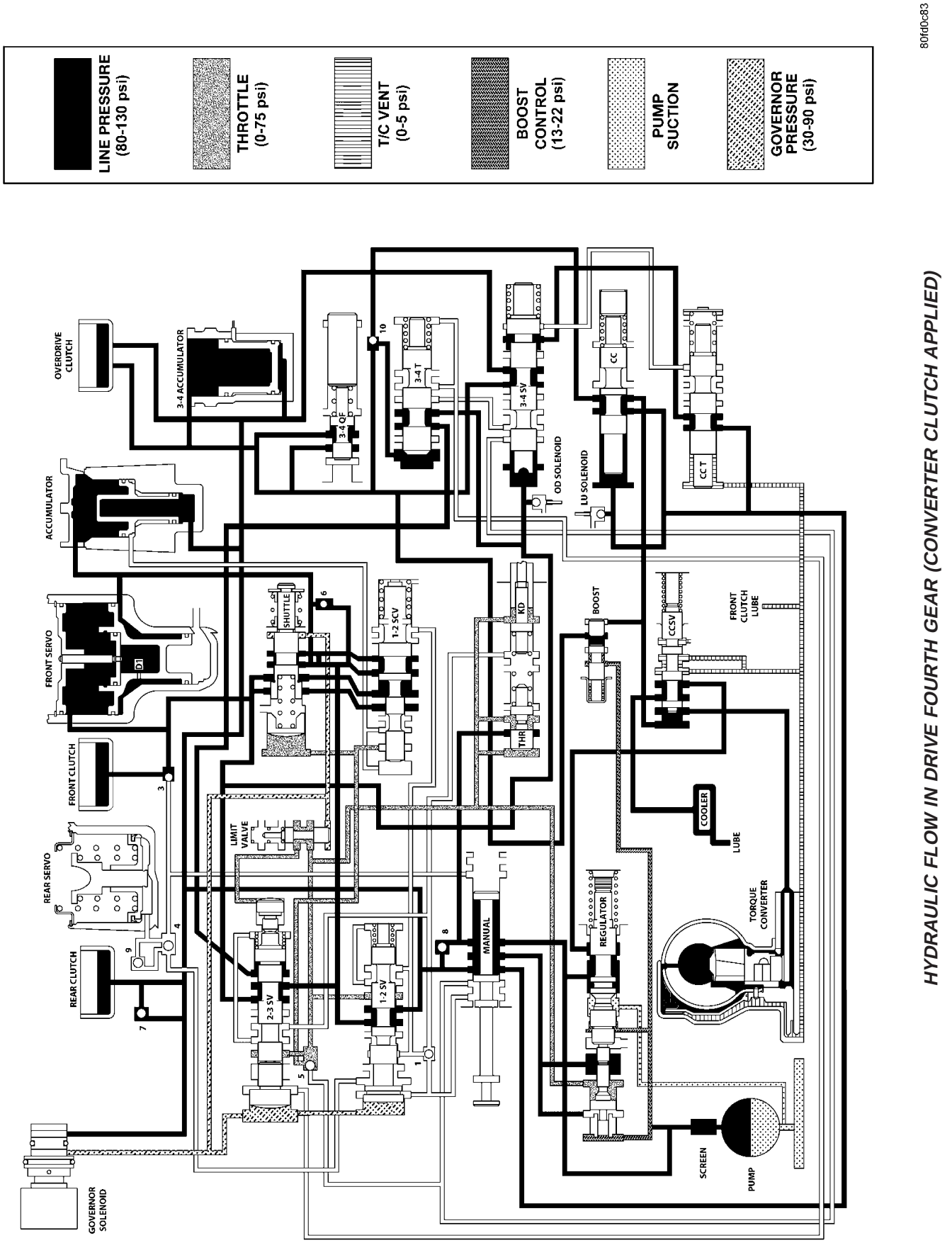
HYDRAULIC FLOW IN DRIVE THIRD GEAR (CONVERTER CLUTCH NOT APPLIED)



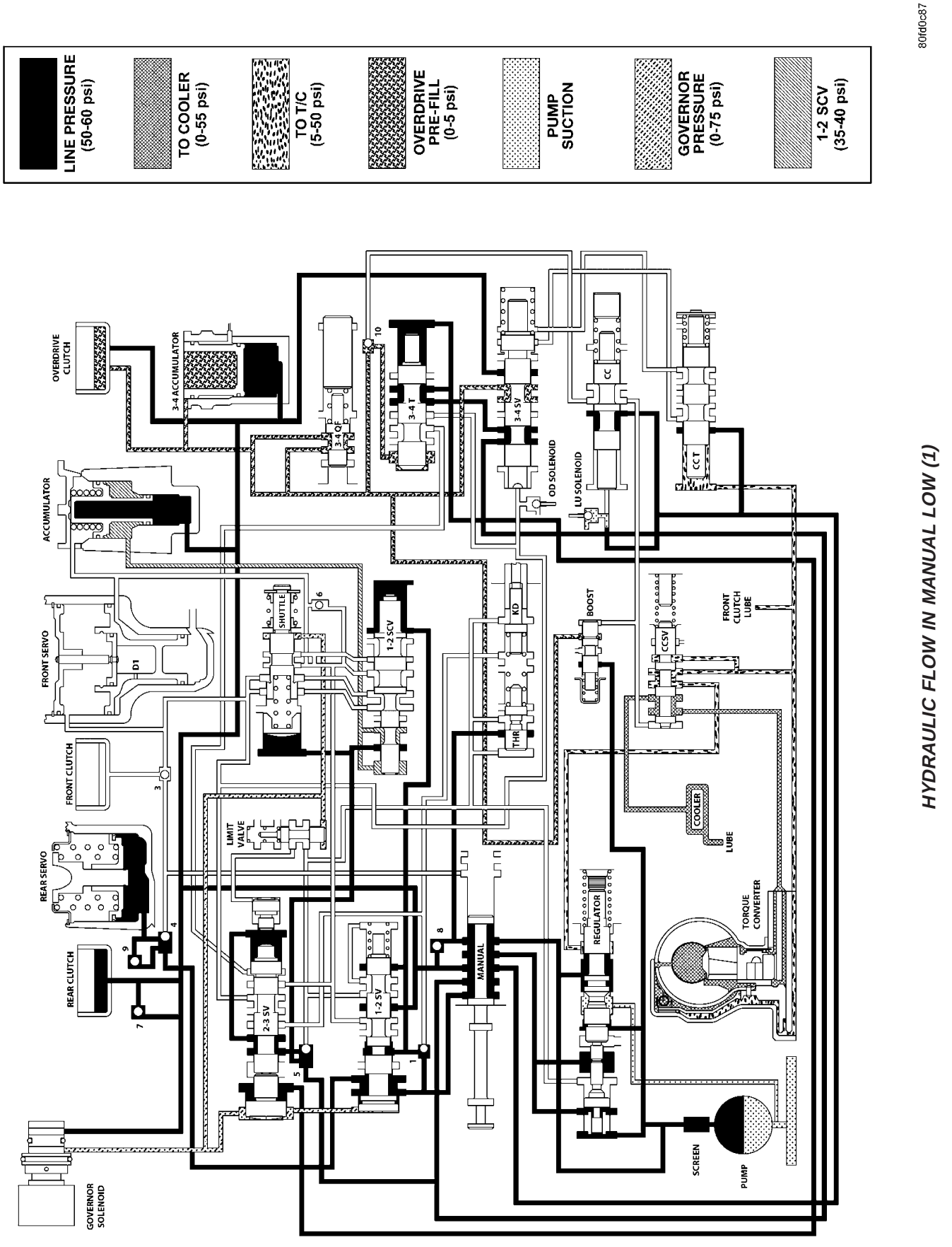
HYDRAULIC FLOW IN DRIVE THIRD GEAR (CONVERTER CLUTCH APPLIED)



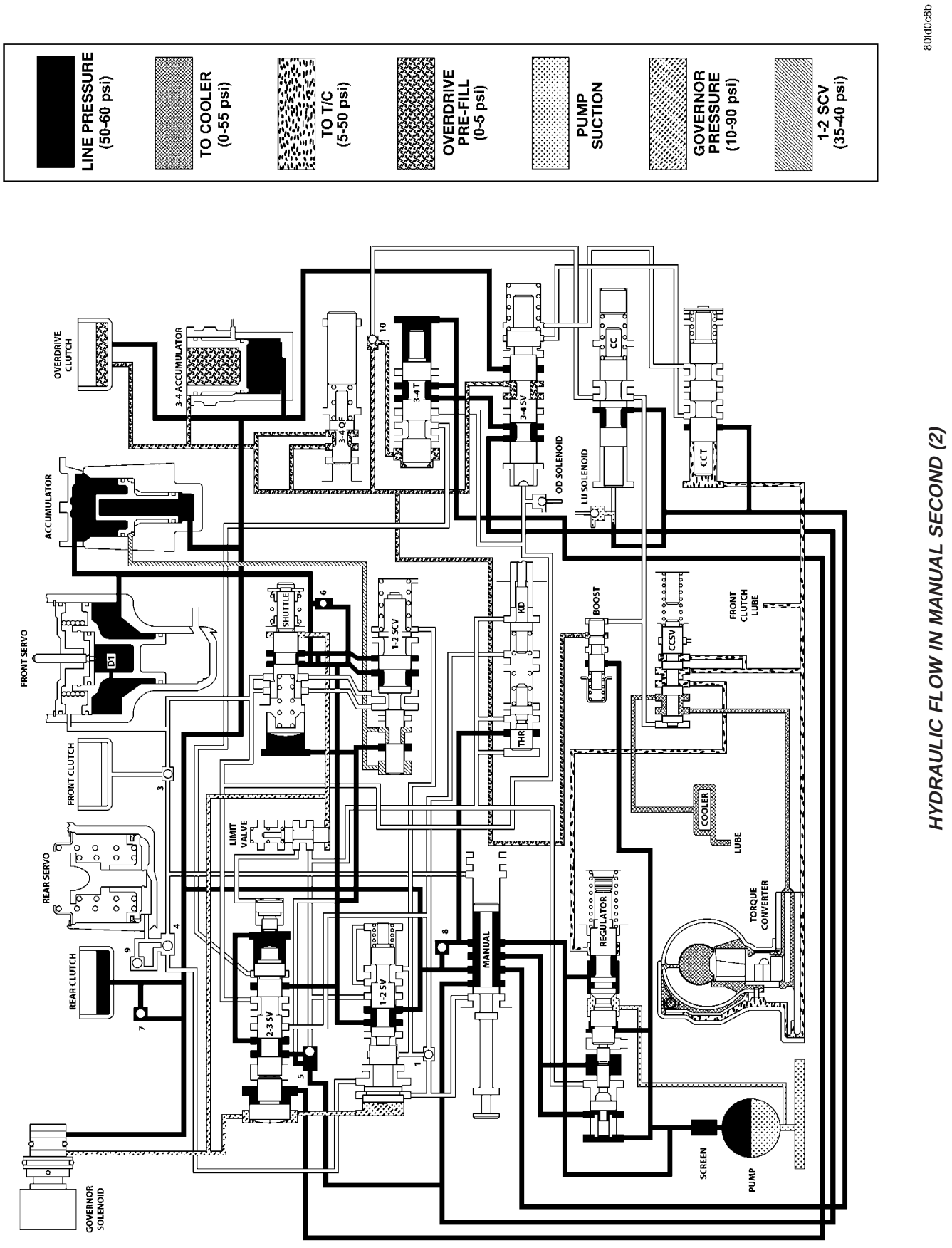
HYDRAULIC FLOW IN DRIVE FOURTH GEAR (CONVERTER CLUTCH NOT APPLIED)



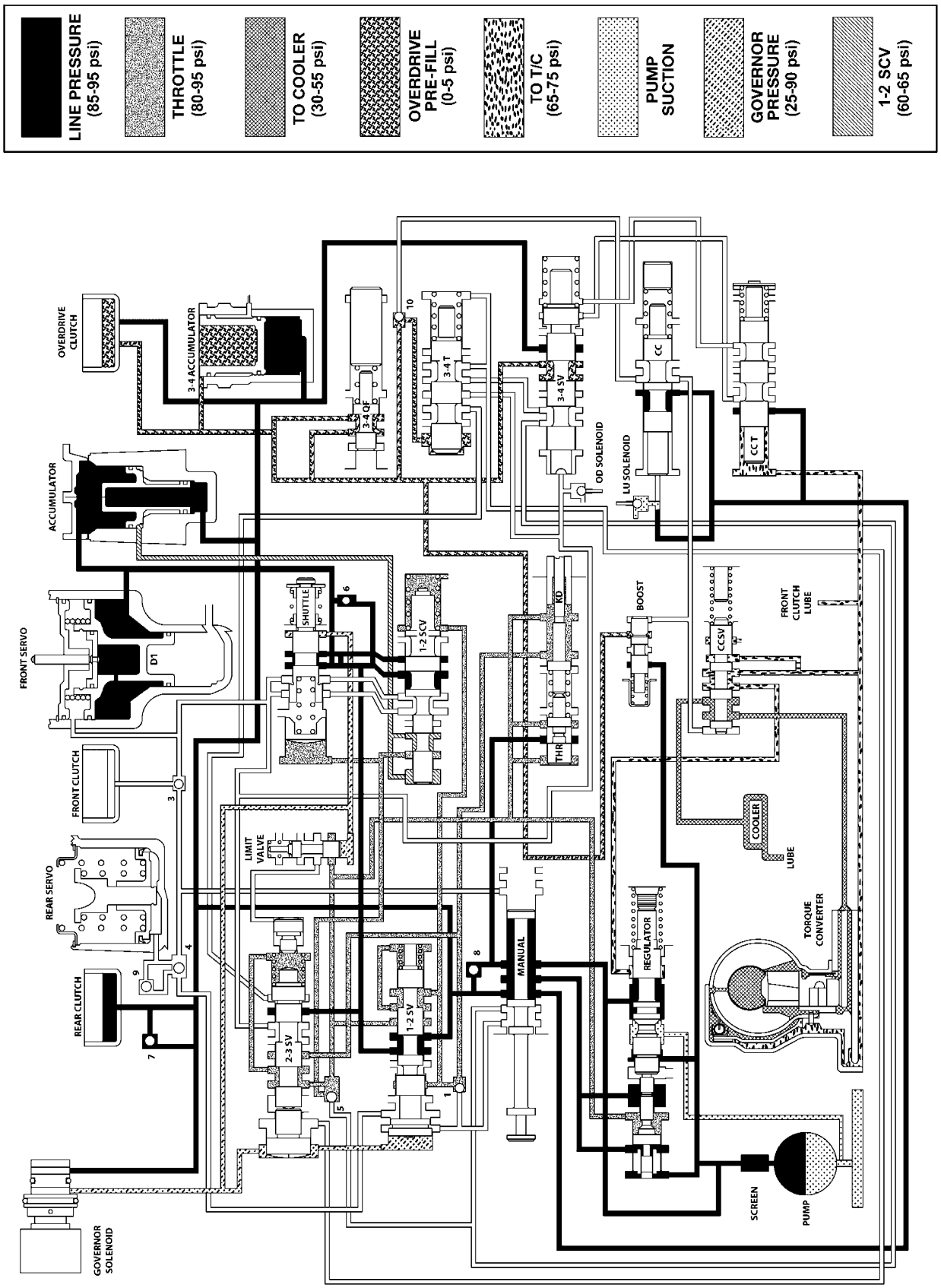
HYDRAULIC FLOW IN DRIVE FOURTH GEAR (CONVERTER CLUTCH APPLIED)



HYDRAULIC FLOW IN MANUAL LOW (1)



HYDRAULIC FLOW IN MANUAL SECOND (2)



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HYDRAULIC FLOW DURING FULL THROTTLE 3-2 DOWNSHIFT (PASSING GEAR)

SPECIFICATIONS

TRANSMISSION

GENERAL

Component	Metric	Inch
Planetary end play	0.150-1.22 mm	0.006-0.048 in.
Input shaft end play	0.86-2.13 mm	0.034-0.084 in.
Clutch pack clearance/Front.	2.5-4.09 mm	0.098-0.161 in.
Clutch pack clearance/Rear.	0.635-0.914 mm	0.025-0.036 in.
Front clutch	5 discs	
Rear clutch	4 discs	
Overdrive clutch	5(STD Diesel or V-10) OR 6(Diesel HO) discs	
Direct clutch	10 discs	
Band adjustment from 72 in. lbs. Front band - Diesel Vehicles Front band - V-10 vehicles Rear band	 Back off 1 3/4 turns Back off 1 1/2 turns Back off 3 turns	
Recommended fluid	Mopar® ATF +4	

GEAR RATIOS

1ST GEAR	2.45:1
2ND GEAR	1.45:1
3RD GEAR	1.0:1
4TH GEAR	0.69:1
REVERSE	2.20:1

THRUST WASHER/SPACER/SNAP-RING DIMENSIONS

Component	Metric	Inch
Front clutch thrust washer (reaction shaft support hub)	1.55 mm 2.15 mm 2.59 mm	0.061 in. 0.084 in. 0.102 in.
Rear clutch thrust washer (clutch retainer)	1.55 mm	0.061 in.
Intermediate shaft thrust plate (shaft hub pilot)	1.5-1.6 mm	0.060-0.063 in.
Output shaft thrust washer (rear clutch hub)	1.3-1.4 mm 1.75-1.8 mm 2.1-2.2 mm	0.052-0.054 in. 0.068-0.070 in. 0.083-0.085 in.
Rear clutch pack snap-ring	1.5-1.6 mm 1.9-1.95 mm	0.060-0.062 in. 0.074-0.076 in.
Planetary geartrain snap-ring (at front of output shaft)	1.4-1.5 mm 1.6-1.7 mm	0.055-0.059 in. 0.062-0.066 in.
Overdrive piston thrust plate	Thrust plate and spacer are select fit. Refer to size charts and selection procedures in Overdrive Unit D&A procedures	
Intermediate shaft spacer		

PRESSURE TEST

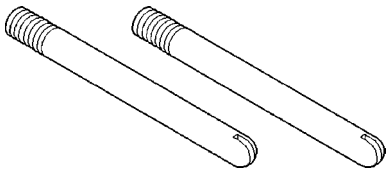
Overdrive clutch	Fourth gear only	Pressure should be 524-565 kPa (76-82 psi) with closed throttle and increase to 965 kPa (140 psi) at 1/2 to 3/4 throttle.
Line pressure (at accumulator)	Closed throttle	372-414 kPa (54-60 psi).
Front servo	Third or Fourth gear only	No more than 21 kPa (3 psi) lower than line pressure.
Rear servo	1 range R range	No more than 21 kPa (3 psi) lower than line pressure. 1103 kPa (160 psi) at idle, builds to 1862 kPa (270 psi) at 1600 rpm.
Governor	D range closed throttle	Pressure should respond smoothly to changes in mph and return to 0-7 kPa (0-1.5 psi) when stopped with transmission in D, 1, 2. Pressure above 7 kPa (1.5 psi) at stand still will prevent transmission from downshifting.

TORQUE SPECIFICATIONS

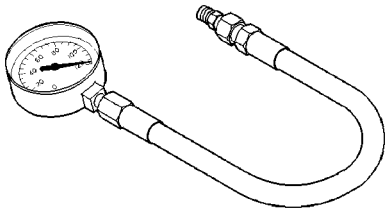
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fitting, cooler line at trans	18	13	-
Bolt, torque convertor	47	35	-
Bolt, clevis bracket to crossmember	47	35	-
Bolt, clevis bracket to rear support	68	50	-
Bolt, driveplate to crankshaft	75	55	-
Bolt, Transmission Throttle Valve Actuator	8.5	-	75
Plug, front band reaction	17	13	-
Locknut, front band adj.	34	25	-
Bolt, fluid pan	13.6	-	120
Screws, fluid filter	4	-	35
Bolt, oil pump	20	15	-
Bolt, overrunning clutch cam	17	13	-
Bolt, O/D to trans.	34	25	-
Bolt, O/D piston retainer	17	13	-
Plug, pressure test port	14	10	-
Bolt, reaction shaft support	20	15	-
Locknut, rear band	41	30	-
Bolt, valve body to case	12	-	100
Sensor, trans speed	27	20	-
Screw, solenoid wiring connector	4	-	35
Screw, solenoid to transfer plate	4	-	35
Bracket, transmission range sensor mounting	34	25	-
Screw, transmision range sensor to mounting bracket	5	-	45

SPECIAL TOOLS

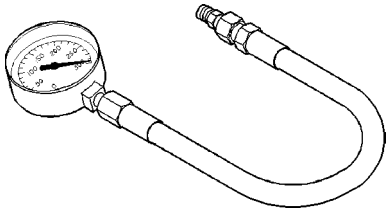
RE TRANSMISSION



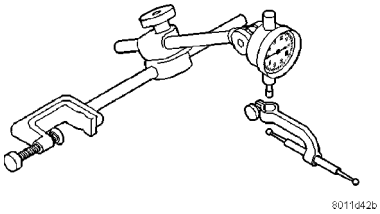
Pilot Studs C-3288-B



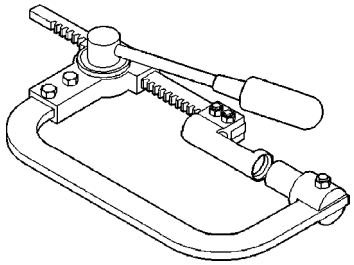
Oil Pressure Gauge - C-3292



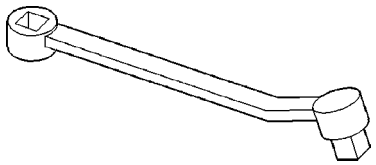
Pressure Gauge - C-3293SP



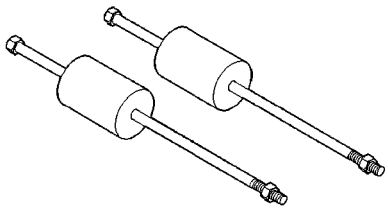
Dial Indicator C-3339



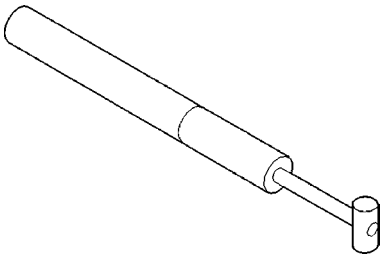
Valve Spring Compressor C-3422-B



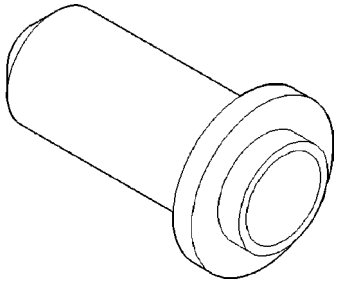
Adapter, Band Adjuster - C-3705



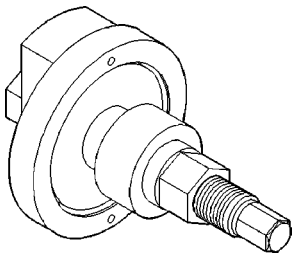
Puller/Slide Hammer, C-3752



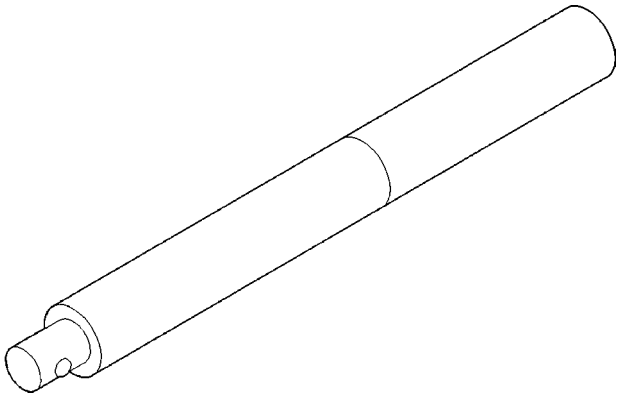
Gauge, Throttle Setting - C-3763



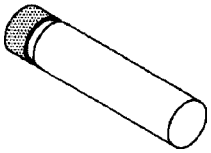
Installer C-3860-A



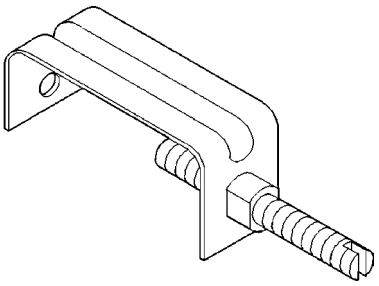
Spring Compressor - C-3863-A



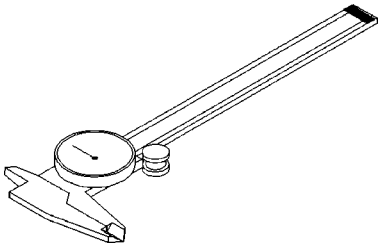
Handle C-4171



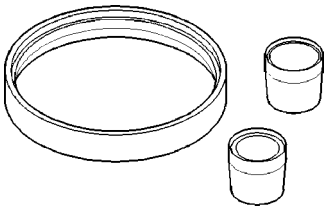
Gauge - 6312



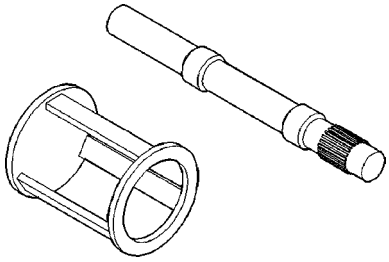
Retainer - 6583



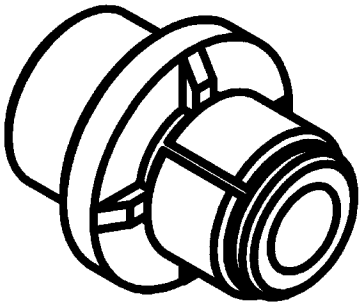
Dial Caliper - C-4962



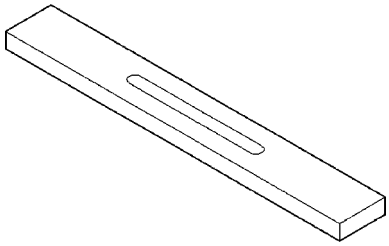
Installer - 8114



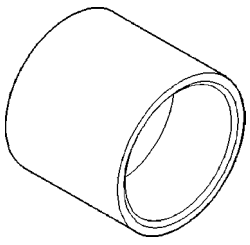
Spring Compressor and Alignment Shaft - 6227



Socket, TRS Mounting Bracket - 8581



Gauge Bar - 6311



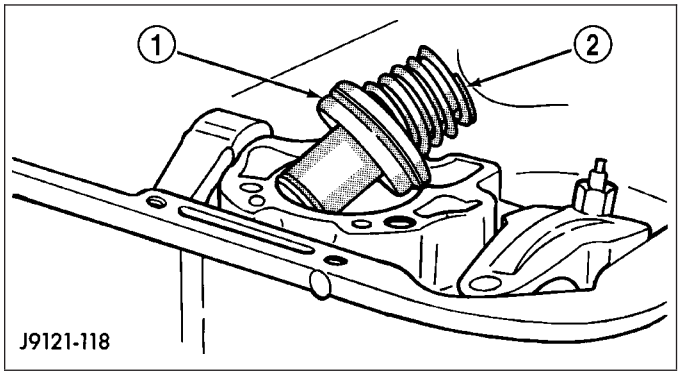
Installer, Seal - 9037

ACCUMULATOR

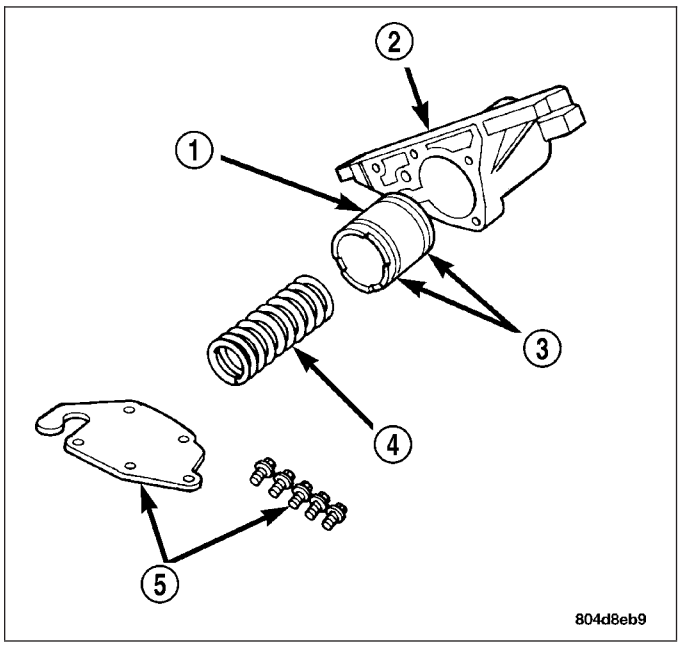
DESCRIPTION

The accumulator (1) is a hydraulic device that has the sole purpose of cushioning the application of a band or clutch. The accumulator consists of a dual-land piston (1) and a spring (2) located in a bore in the transmission case.

Diesel version shown.



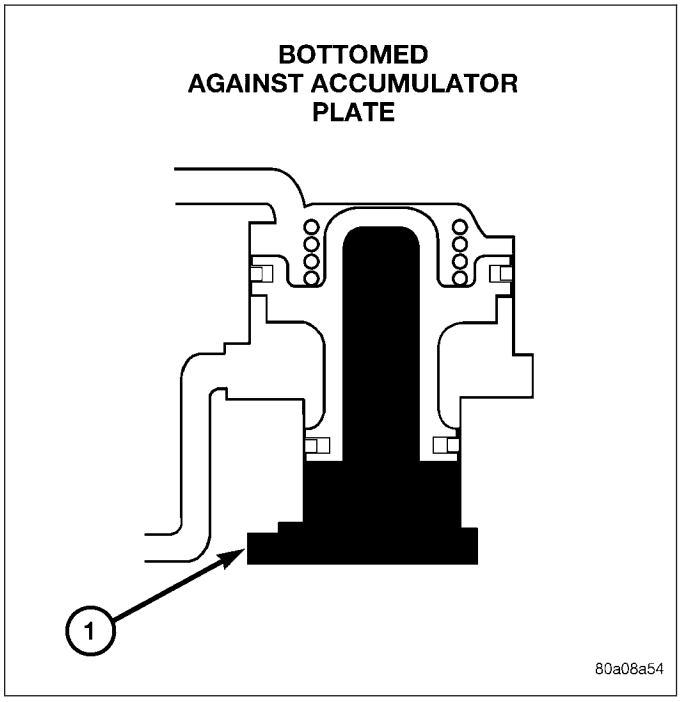
The 3-4 (1) accumulator is located in a housing (2) attached to the side of the valve body.



OPERATION

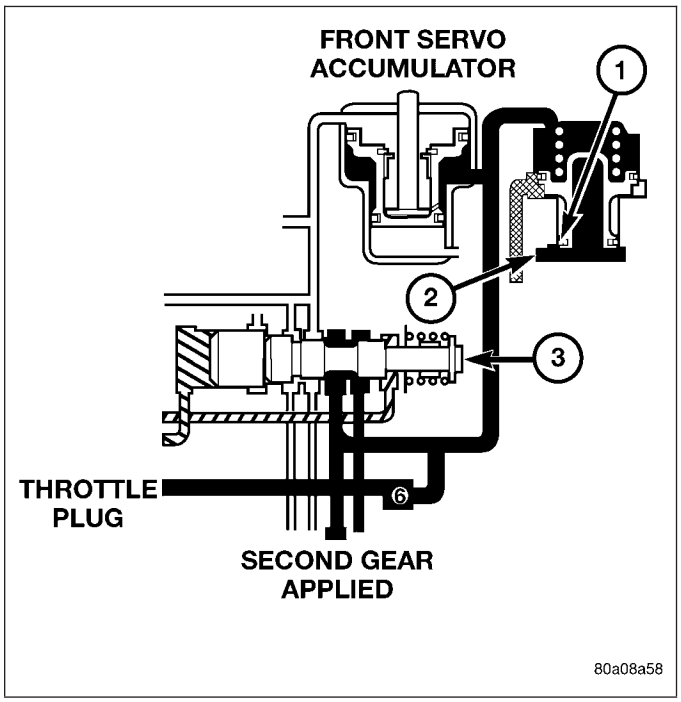
Both the accumulator and the 3-4 accumulator function the same. Line pressure (1) is directed to the small end of the piston when the transmission is placed into a DRIVE position, bottoming it against the accumulator plate.

Diesel version shown.



When the 1-2 upshift occurs, line pressure (2) is directed to the large end of the piston and then to the kickdown servo. As the line pressure reaches the accumulator, the combination of spring pressure and line pressure forces the piston away from the accumulator plate. This causes a balanced pressure situation, which results in a cushioned band application. After the kickdown servo has become immovable, line pressure will finish pushing the accumulator up into its bore (1). When the large end of the accumulator piston is seated in its bore, the band or clutch is fully applied.

NOTE: The accumulator is shown in the inverted position for illustrative purposes.



INSPECTION

Inspect the accumulator piston and seal rings. Replace the seal rings if worn or cut. Replace the piston if chipped or cracked.

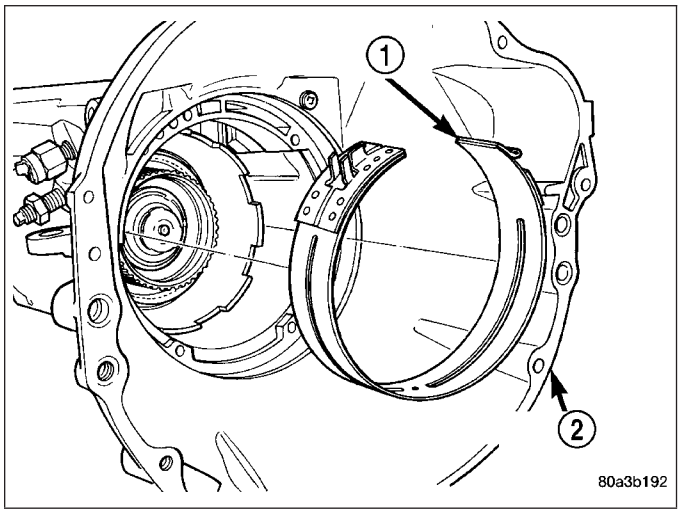
Check condition of the accumulator inner and outer springs. Replace the springs if the coils are cracked, distorted or collapsed.

BANDS

DESCRIPTION

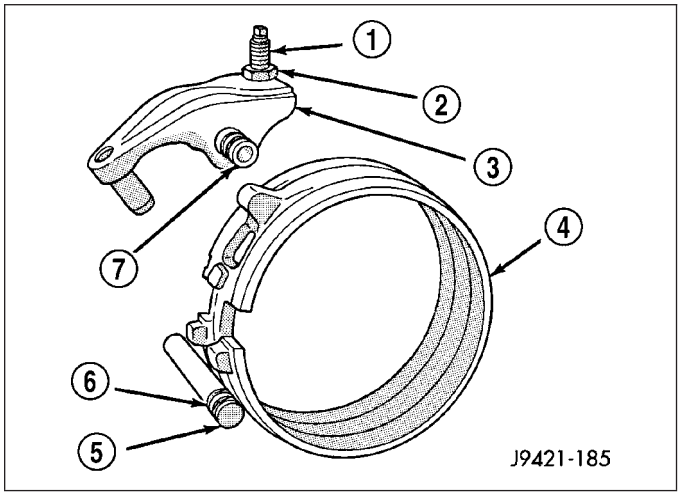
KICKDOWN (FRONT) BAND

The kickdown, or “front”, band (1) holds the common sun gear of the planetary gear sets. The front (kickdown) band is made of steel, and faced on its inner circumference with a friction-type lining. One end of the band is anchored to the transmission case, and the other is acted on with a pushing force by a servo piston. The front band is a single-wrap design (the band does not completely encompass/wrap the drum that it holds).



LOW/REVERSE (REAR) BAND

The low/reverse band, or “rear”, band (4) is similar in appearance and operation to the front band. The rear band is slightly different in that it does not use a link bar, but is acted directly on by the apply lever. This is referred to as a double-wrap band design (the drum is completely encompassed/wrapped by the band). The double-wrap band provides a greater holding power in comparison to the single-wrap design.



OPERATION

KICKDOWN (FRONT) BAND

The kickdown band holds the common sun gear of the planetary gear sets by applying and holding the front clutch retainer, which is splined to the sun gear driving shell, and in turn splined directly to the sun gear. The application of the band by the servo is typically done by an apply lever and link bar.

LOW/REVERSE (REAR) BAND

The rear band holds the rear planet carrier stationary by being mounted around and applied to the low/reverse drum.

ADJUSTMENTS

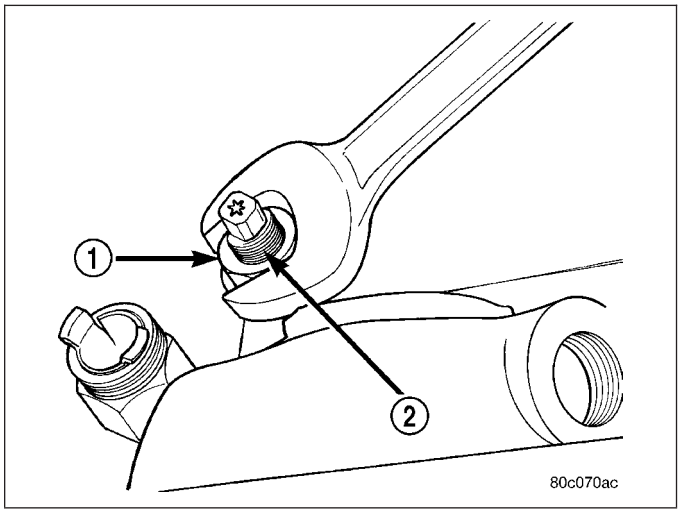
ADJUSTMENT - BANDS

FRONT BAND

The front (kickdown) band adjusting screw (2) is located on the left side of the transmission case above the manual valve and throttle valve levers.

1. Raise vehicle.
2. Loosen band adjusting screw locknut. Then back locknut (1) off 3-5 turns. Be sure adjusting screw turns freely in case. Apply lubricant to screw threads if necessary.
3. Tighten band adjusting screw to 8 N·m (72 in. lbs.) torque with an appropriate Torx™ socket.

CAUTION: If Adapter C-3705 is needed to reach the adjusting screw, tighten the screw to only 5 N·m (47-50 in. lbs.) torque.

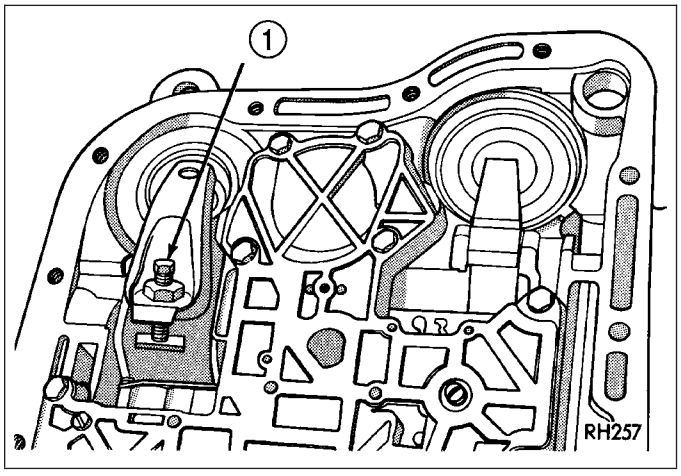


4. Back off front band adjusting screw 1-3/4 turns, for diesel vehicles, or 1-1/2 turns, for V-10 vehicles.
5. Hold adjuster screw in position and tighten locknut to 41 N·m (30 ft. lbs.) torque.
6. Lower vehicle.

REAR BAND

The transmission oil pan must be removed for access to the rear band adjusting screw (1).

1. Raise vehicle.
2. Remove transmission oil pan and drain fluid.
3. Loosen band adjusting screw locknut 5-6 turns. Be sure adjusting screw turns freely in lever.
4. Tighten adjusting screw to 8 N·m (72 in. lbs.) torque.
5. Back off adjusting screw 3 turns.
6. Hold adjusting screw in place and tighten locknut to 34 N·m (25 ft. lbs.) torque.
7. Position new gasket on oil pan and install pan on transmission. Tighten pan bolts to 17 N·m (13 ft. lbs.) torque.

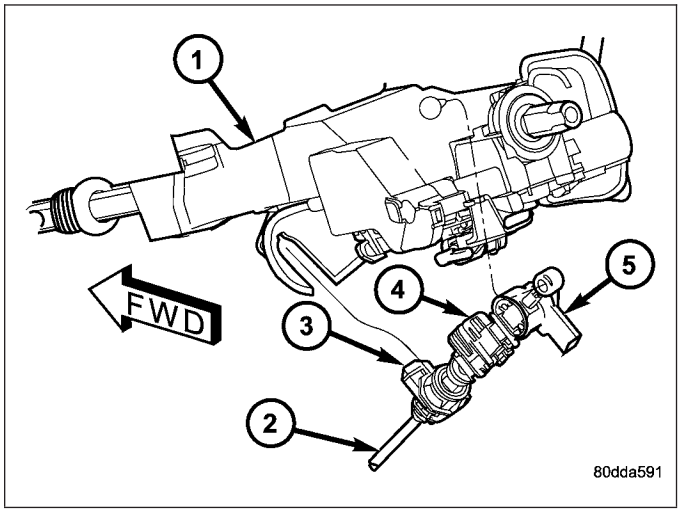


8. Lower vehicle and refill transmission with Mopar® ATF +4, Automatic Transmission fluid.

SYSTEM-BRAKE TRANSMISSION SHIFT INTERLOCK

DESCRIPTION

The Brake Transmission Shifter Interlock (BTSI), is a solenoid operated system. It consists of a solenoid permanently mounted on the gearshift cable.



OPERATION

The system locks the shifter into the PARK position. The interlock system is engaged whenever the ignition switch is in the LOCK or ACCESSORY position. An additional electrically activated feature will prevent shifting out of the PARK position unless the brake pedal is depressed approximately one-half an inch. A magnetic holding device in line with the park lock cable is energized when the ignition is in the RUN position. When the key is in the RUN position and the brake pedal is depressed, the shifter is unlocked and will move into any position. The interlock system also prevents the ignition switch from being turned to the LOCK or ACCESSORY position, unless the shifter is fully locked into the PARK position.

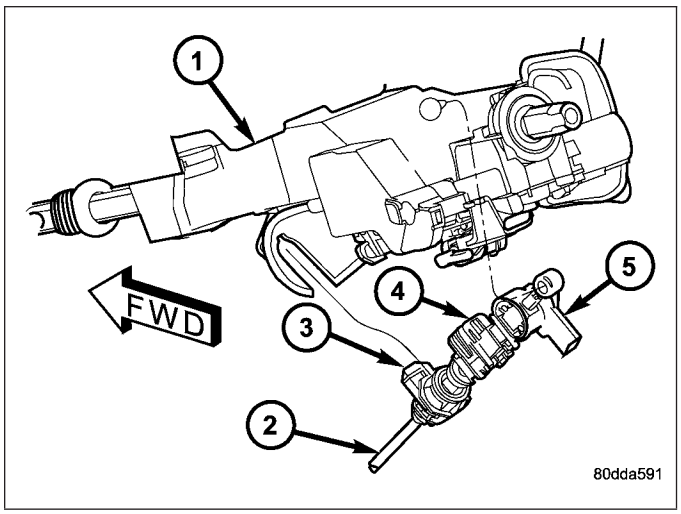
DIAGNOSIS AND TESTING - BRAKE TRANSMISSION SHIFT INTERLOCK

1. Verify that the key can only be removed in the PARK position.
2. When the shift lever is in PARK And the shift handle pushbutton is in the “OUT” position, the ignition key cylinder should rotate freely from OFF to LOCK. When the shifter is in any other gear or neutral position, the ignition key cylinder should not rotate to the LOCK position.
3. Shifting out of PARK should not be possible when the ignition key cylinder is in the OFF position.
4. Shifting out of PARK should not be possible while applying normal pushbutton force and ignition key cylinder is in the RUN or START positions unless the foot brake pedal is depressed approximately 1/2 inch (12mm).
5. Shifting out of PARK should not be possible when the ignition key cylinder is in the ACCESSORY or LOCK positions.
6. Shifting between any gears, NEUTRAL or into PARK may be done without depressing foot brake pedal with ignition switch in RUN or START positions.

ADJUSTMENTS - BRAKE TRANSMISSION SHIFT INTERLOCK

Correct cable adjustment is important to proper interlock operation. The gearshift cable must be correctly adjusted in order to shift out of PARK.

ADJUSTMENT PROCEDURE



1. Remove the steering column trim as necessary for access to the brake transmission shift interlock.
2. Shift the transmission into the PARK position.
3. Pull upward on both the BTSI lock tab (4) and the gearshift cable lock tab (3).
4. Verify that the shift lever is in the PARK position.
5. Verify positive engagement of the transmission park lock by attempting to rotate the propeller shaft. The shaft will not rotate when the park lock is engaged.
6. Turn ignition switch to LOCK position. **Be sure ignition key cylinder is in the LOCK position. Cable will not adjust correctly in any other position.**
7. Ensure that the cable is free to self-adjust by pushing cable rearward and releasing.
8. Push the gearshift cable lock tab (3) down until it snaps in place.
9. Locate the BTSI alignment hole in the bottom of the BTSI mechanism between the BTSI lock tab and the BTSI connector.
10. Move the BTSI assembly up or down on the gearshift cable until an appropriate size drill bit can be inserted into the alignment hole and through the assembly.
11. Push the BTSI lock tab (4) down until it snaps into place and remove the drill bit.
12. Install any steering column trim previously removed.

BTSI FUNCTION CHECK

1. Verify removal of ignition key allowed in PARK position only.
2. When the shift lever is in PARK, the ignition key cylinder should rotate freely from off to lock. When the shifter is in any other position, the ignition key should not rotate from off to lock.
3. Shifting out of PARK should be possible when the ignition key cylinder is in the off position.
4. Shifting out of PARK should not be possible while applying normal force, and ignition key cylinder is in the run or start positions, unless the foot brake pedal is depressed approximately 1/2 inch (12mm).
5. Shifting out of PARK should not be possible when the ignition key cylinder is in the accessory or lock position.
6. Shifting between any gear and NEUTRAL, or PARK, may be done without depressing foot brake with ignition switch in run or start positions.
7. Engine starts must be possible with shifter lever in PARK or NEUTRAL positions only. Engine starts must not be possible in any position other than PARK or NEUTRAL.
8. With shifter lever in the:
   - PARK position - Apply upward force on the shift arm and remove pressure. Engine starts must be possible.
   - PARK position - Apply downward force on the shift arm and remove pressure. Engine starts must be possible.
   - NEUTRAL position - Normal position. Engine starts must be possible.
   - NEUTRAL position - Engine running and brakes applied, apply upward force on the shift arm. Transmission shall not be able to shift from neutral to reverse.

GOVERNOR-ELECTRONIC

DESCRIPTION

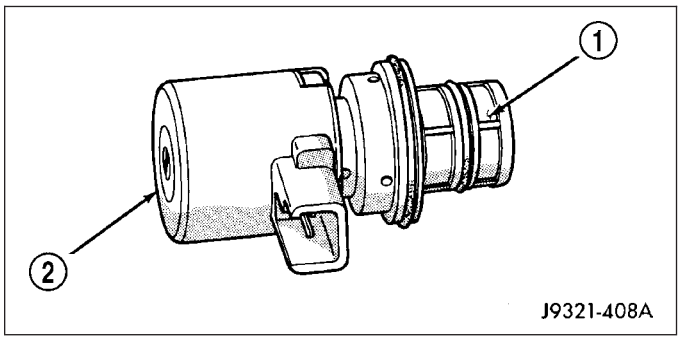
Governor pressure is controlled electronically. Components used for governor pressure control include:

- Governor body
- Valve body transfer plate

- Governor pressure solenoid valve
- Governor pressure sensor
- Fluid temperature thermistor
- Throttle position sensor (TPS)
- Transmission speed sensor
- Powertrain control module (PCM)

GOVERNOR PRESSURE SOLENOID VALVE

The solenoid valve (2) is a duty-cycle solenoid which regulates the governor pressure needed for upshifts and downshifts. It is an electro-hydraulic device located in the governor body on the valve body transfer plate.

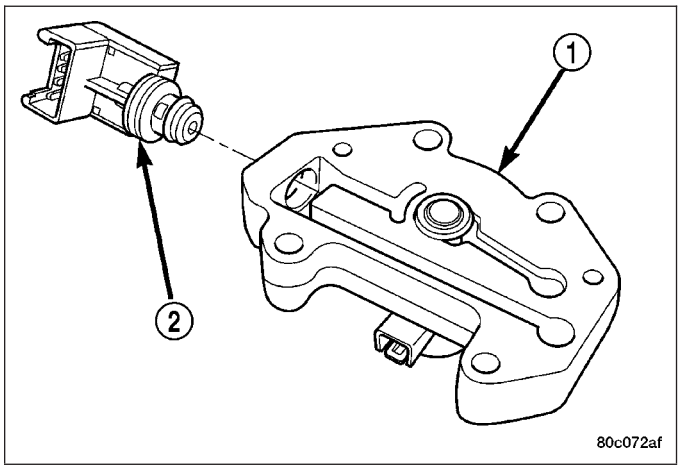


GOVERNOR BODY, TRANSFER PLATE, AND PRESSURE SENSOR

The governor pressure sensor (2) measures output pressure of the governor pressure solenoid valve.

The transfer plate is designed to supply transmission line pressure to the governor pressure solenoid valve and to return governor pressure.

The governor pressure solenoid valve is mounted in the governor body (1). The body is bolted to the lower side of the transfer plate.



GOVERNOR PRESSURE CURVES

There are four governor pressure curves programmed into the transmission control module. The different curves allow the control module to adjust governor pressure for varying conditions. One curve is used for operation when fluid temperature is at, or below, –1°C (30°F). A second curve is used when fluid temperature is at, or above, 10°C (50°F) during normal city or highway driving. A third curve is used during wide-open throttle operation. The fourth curve is used when driving with the transfer case in low range.

OPERATION

Compensation is required for performance variations of two of the input devices. Though the slope of the transfer functions is tightly controlled, offset may vary due to various environmental factors or manufacturing tolerances.

The pressure transducer is affected by barometric pressure as well as temperature. Calibration of the zero pressure offset is required to compensate for shifting output due to these factors.

Normal calibration will be performed when sump temperature is above 50 degrees F, or in the absence of sump temperature data, after the first 10 minutes of vehicle operation. Calibration of the pressure transducer offset occurs each time the output shaft speed falls below 200 RPM. Calibration shall be repeated each 3 seconds the output

shaft speed is below 200 RPM. A 0.5 second pulse of 95% duty cycle is applied to the governor pressure solenoid valve and the transducer output is read during this pulse. Averaging of the transducer signal is necessary to reject electrical noise.

Under cold conditions (below 50 degrees F sump), the governor pressure solenoid valve response may be too slow to guarantee 0 psi during the 0.5 second calibration pulse. Calibration pulses are continued during this period, however the transducer output valves are discarded. Transducer offset must be read at key-on, under conditions which promote a stable reading. This value is retained and becomes the offset during the ″cold″ period of operation.

GOVERNOR PRESSURE SOLENOID VALVE

The inlet side of the solenoid valve is exposed to normal transmission line pressure. The outlet side of the valve leads to the valve body governor circuit.

The solenoid valve regulates line pressure to produce governor pressure. The average current supplied to the solenoid controls governor pressure. One amp current produces zero kPa/psi governor pressure. Zero amps sets the maximum governor pressure.

The powertrain control module (PCM) turns on the trans control relay which supplies electrical power to the solenoid valve. Operating voltage is 12 volts (DC). The PCM controls the ground side of the solenoid using the governor pressure solenoid control circuit.

GOVERNOR PRESSURE SENSOR

The sensor output signal provides the necessary feedback to the PCM. This feedback is needed to adequately control governor pressure.

GOVERNOR BODY AND TRANSFER PLATE

The transfer plate channels line pressure to the solenoid valve through the governor body. It also channels governor pressure from the solenoid valve to the governor circuit. It is the solenoid valve that develops the necessary governor pressure.

GOVERNOR PRESSURE CURVES

LOW TRANSMISSION FLUID TEMPERATURE

When the transmission fluid is cold the conventional governor can delay shifts, resulting in higher than normal shift speeds and harsh shifts. The electronically controlled low temperature governor pressure curve is higher than normal to make the transmission shift at normal speeds and sooner. The PCM uses a temperature sensor in the transmission oil sump to determine when low temperature governor pressure is needed.

NORMAL OPERATION

Normal operation is refined through the increased computing power of the PCM and through access to data on engine operating conditions provided by the PCM that were not available with the previous stand-alone electronic module. This facilitated the development of a load adaptive shift strategy - the ability to alter the shift schedule in response to vehicle load condition. One manifestation of this capability is grade ″hunting″ prevention - the ability of the transmission logic to delay an upshift on a grade if the engine does not have sufficient power to maintain speed in the higher gear. The 3-2 downshift and the potential for hunting between gears occurs with a heavily loaded vehicle or on steep grades. When hunting occurs, it is very objectionable because shifts are frequent and accompanied by large changes in noise and acceleration.

WIDE OPEN THROTTLE OPERATION

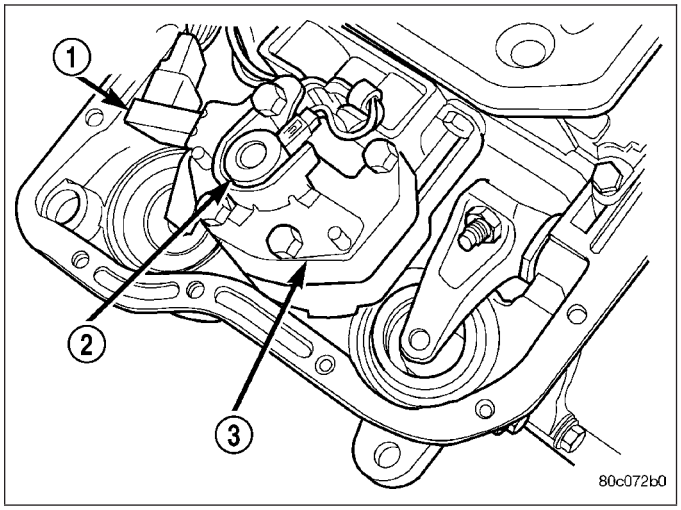
In wide-open throttle (WOT) mode, adaptive memory in the PCM assures that up-shifts occur at the preprogrammed optimum speed. WOT operation is determined from the throttle position sensor, which is also a part of the emission control system. The initial setting for the WOT upshift is below the optimum engine speed. As WOT shifts are repeated, the PCM learns the time required to complete the shifts by comparing the engine speed when the shifts occur to the optimum speed. After each shift, the PCM adjusts the shift point until the optimum speed is reached. The PCM also considers vehicle loading, grade and engine performance changes due to high altitude in determining when to make WOT shifts. It does this by measuring vehicle and engine acceleration and then factoring in the shift time.

TRANSFER CASE LOW RANGE OPERATION

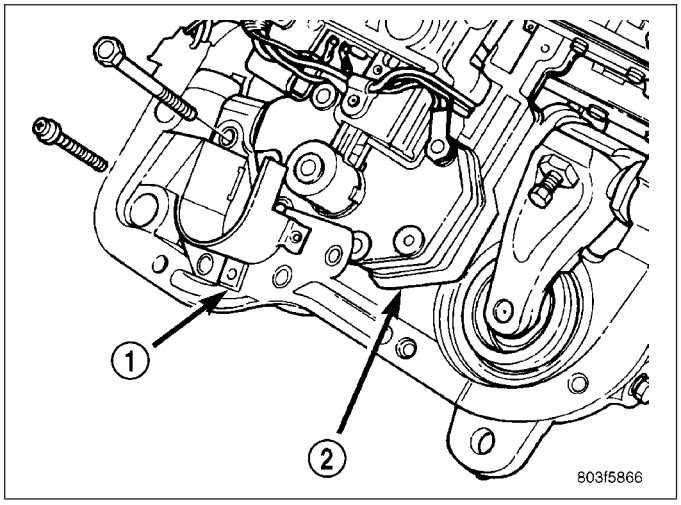
On four-wheel drive vehicles operating in low range, the engine can accelerate to its peak more rapidly than in Normal range, resulting in delayed shifts and undesirable engine ″flare.″ The low range governor pressure curve is also higher than normal to initiate upshifts sooner. The PCM compares electronic vehicle speed signal used by the speedometer to the transmission output shaft speed signal to determine when the transfer case is in low range.

REMOVAL

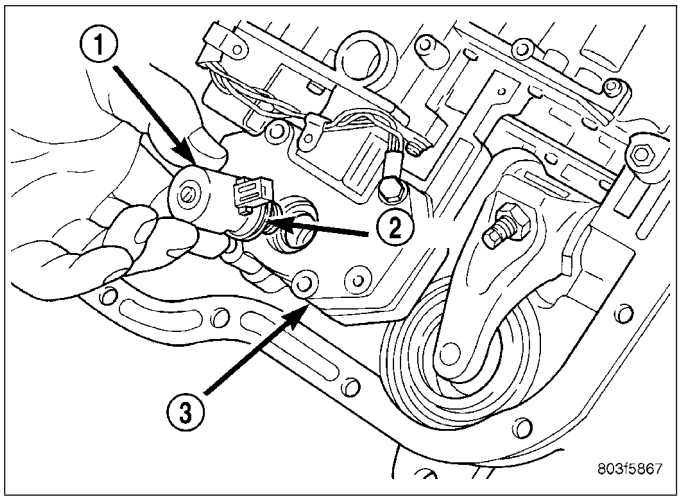
1. Hoist and support vehicle on safety stands.
2. Remove transmission fluid pan and filter.
3. Disengage wire connectors from pressure sensor (1) and solenoid (2).



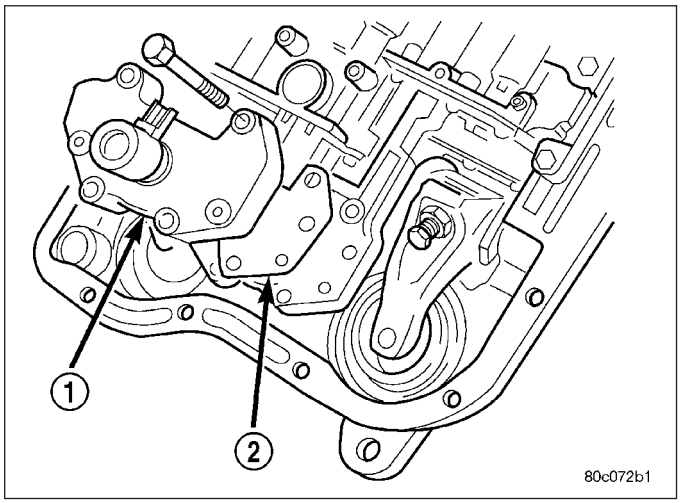
4. Remove screws holding pressure solenoid retainer (1) to governor body (2).
5. Separate solenoid retainer from governor.



6. Pull solenoid (1) from governor body (3).
7. Pull pressure sensor from governor body.
8. Remove bolts holding governor body to valve body.



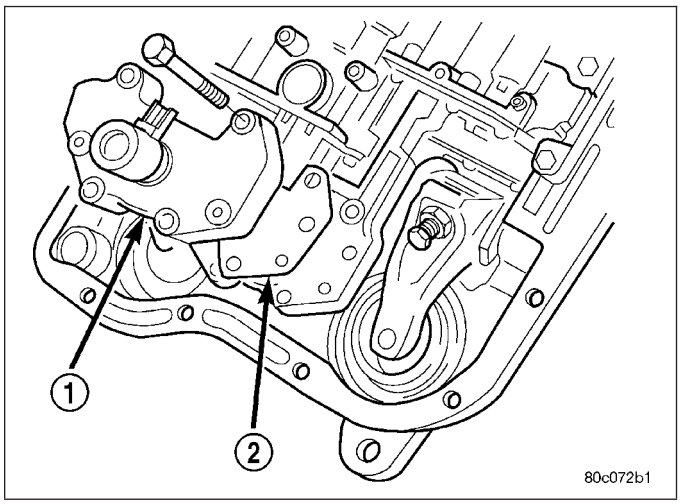
9. Separate governor body (1) from valve body.
10. Remove governor body gasket.



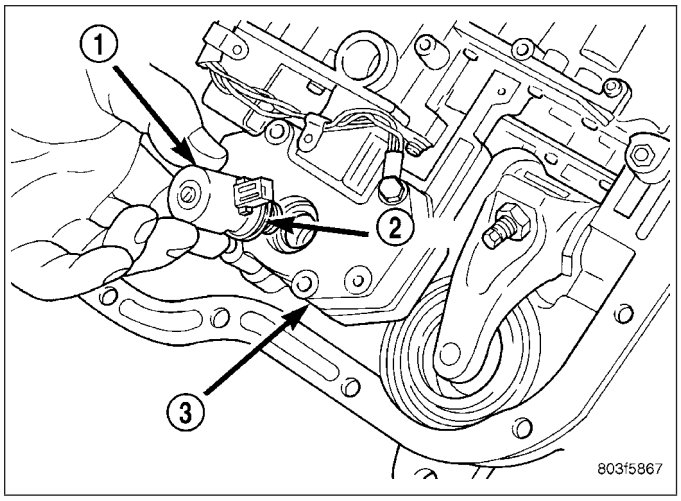
INSTALLATION

Before installing the pressure sensor and solenoid in the governor body, replace o-ring seals, clean the gasket surfaces and replace gasket.

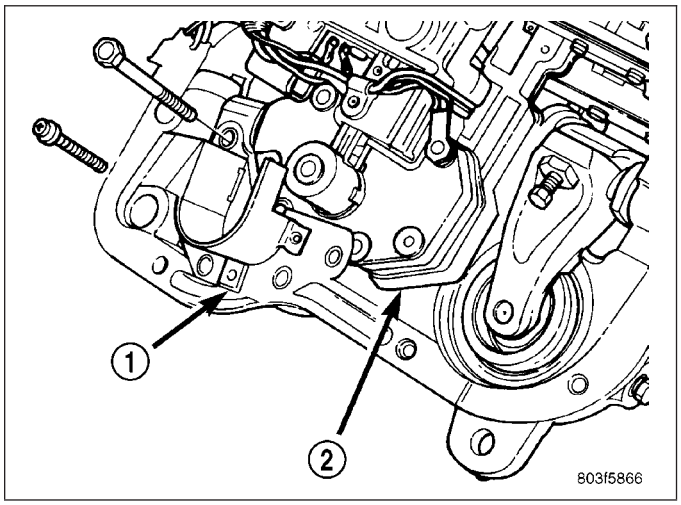
1. Place gasket (2) in position on back of governor body (1).
2. Place governor body in position on valve body.
3. Install bolts to hold governor body to valve body.



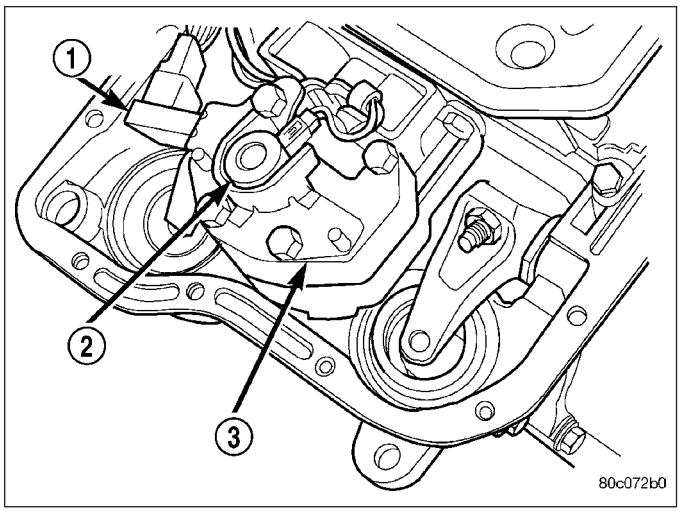
4. Lubricate o-ring on pressure sensor with transmission fluid.
5. Align pressure sensor to bore in governor body.
6. Push pressure sensor into governor body.
7. Lubricate o-ring (2), on pressure solenoid (1), with transmission fluid.
8. Align pressure solenoid (1) to bore in governor body (3).
9. Push solenoid into governor body.



10. Place solenoid retainer (1) in position on governor (2).
11. Install screws to hold pressure solenoid retainer to governor body.



12. Engage wire connectors into pressure sensor (1) and solenoid (2).
13. Install transmission fluid pan and (new) filter.
14. Lower vehicle and road test to verify repair.



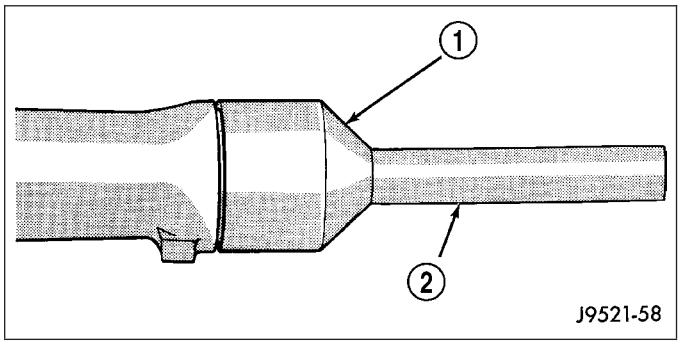
SEAL-EXTENSION HOUSING

REMOVAL

1. Raise vehicle.
2. Mark propeller shaft and axle yoke for alignment reference.
3. Disconnect and remove propeller shaft.
4. Remove old seal with a screw mounted in a slide hammer.

INSTALLATION

1. Place seal in position on overdrive housing.
2. Drive seal into overdrive housing with Seal Installer 9037 (1) and Handle C-4171.
3. Carefully guide propeller shaft slip yoke into housing and onto output shaft splines. Align marks made at removal and connect propeller shaft to rear axle pinion yoke.



FLUID AND FILTER

DIAGNOSIS AND TESTING

EFFECTS OF INCORRECT FLUID LEVEL

A low fluid level allows the pump to take in air along with the fluid. Air in the fluid will cause fluid pressures to be low and develop slower than normal. If the transmission is overfilled, the gears churn the fluid into foam. This aerates the fluid and causing the same conditions occurring with a low level. In either case, air bubbles cause fluid overheating, oxidation, and varnish buildup which interferes with valve and clutch operation. Foaming also causes fluid expansion which can result in fluid overflow from the transmission vent or fill tube. Fluid overflow can easily be mistaken for a leak if inspection is not careful.

CAUSES OF BURNT FLUID

Burnt, discolored fluid is a result of overheating which has two primary causes.

1. A result of restricted fluid flow through the main and/or auxiliary cooler. This condition is usually the result of a faulty or improperly installed drainback valve, a damaged oil cooler, or severe restrictions in the coolers and lines caused by debris or kinked lines.
2. Heavy duty operation with a vehicle not properly equipped for this type of operation. Trailer towing or similar high load operation will overheat the transmission fluid if the vehicle is improperly equipped. Such vehicles should have an auxiliary transmission fluid cooler, a heavy duty cooling system, and the engine/axle ratio combination needed to handle heavy loads.

FLUID CONTAMINATION

Transmission fluid contamination is generally a result of:

- adding incorrect fluid
- failure to clean dipstick and fill tube when checking level
- engine coolant entering the fluid
- internal failure that generates debris
- overheat that generates sludge (fluid breakdown)
- failure to replace contaminated converter after repair

The use of non-recommended fluids can result in transmission failure. The usual results are erratic shifts, slippage, abnormal wear and eventual failure due to fluid breakdown and sludge formation. Avoid this condition by using recommended fluids only.

The dipstick cap and fill tube should be wiped clean before checking fluid level. Dirt, grease and other foreign material on the cap and tube could fall into the tube if not removed beforehand. Take the time to wipe the cap and tube clean before withdrawing the dipstick.

Engine coolant in the transmission fluid is generally caused by a cooler malfunction. The only remedy is to replace the radiator as the cooler in the radiator is not a serviceable part. If coolant has circulated through the transmission, an overhaul is necessary.

The torque converter should also be replaced whenever a failure generates sludge and debris. This is necessary because normal converter flushing procedures will not remove all contaminants.

STANDARD PROCEDURE

FLUID LEVEL CHECK

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. As in any hydraulic system, air bubbles make the fluid spongy, therefore, pressures will be low and build up slowly.

Improper filling can also raise the fluid level too high. When the transmssion has too much fluid, the geartrain churns up foam and cause the same conditions which occur with a low fluid level.

In either case, air bubbles can cause overheating and/or fluid oxidation, and varnishing. This can interfere with normal valve, clutch, and accumulator operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a leak.

After the fluid has been checked, seat the dipstick fully to seal out water and dirt.

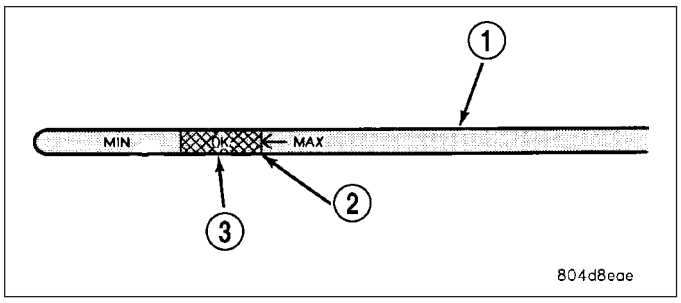
The transmission has a dipstick to check oil level. It is located on the right side of the engine. Be sure to wipe all dirt from dipstick handle before removing.

Fluid level is checked with the engine running at curb idle speed, the transmission in NEUTRAL and the transmission fluid at normal operating temperature. **The engine should be running at idle speed for at least one minute, with the vehicle on level ground.**

The transmission fluid level can be checked two ways.

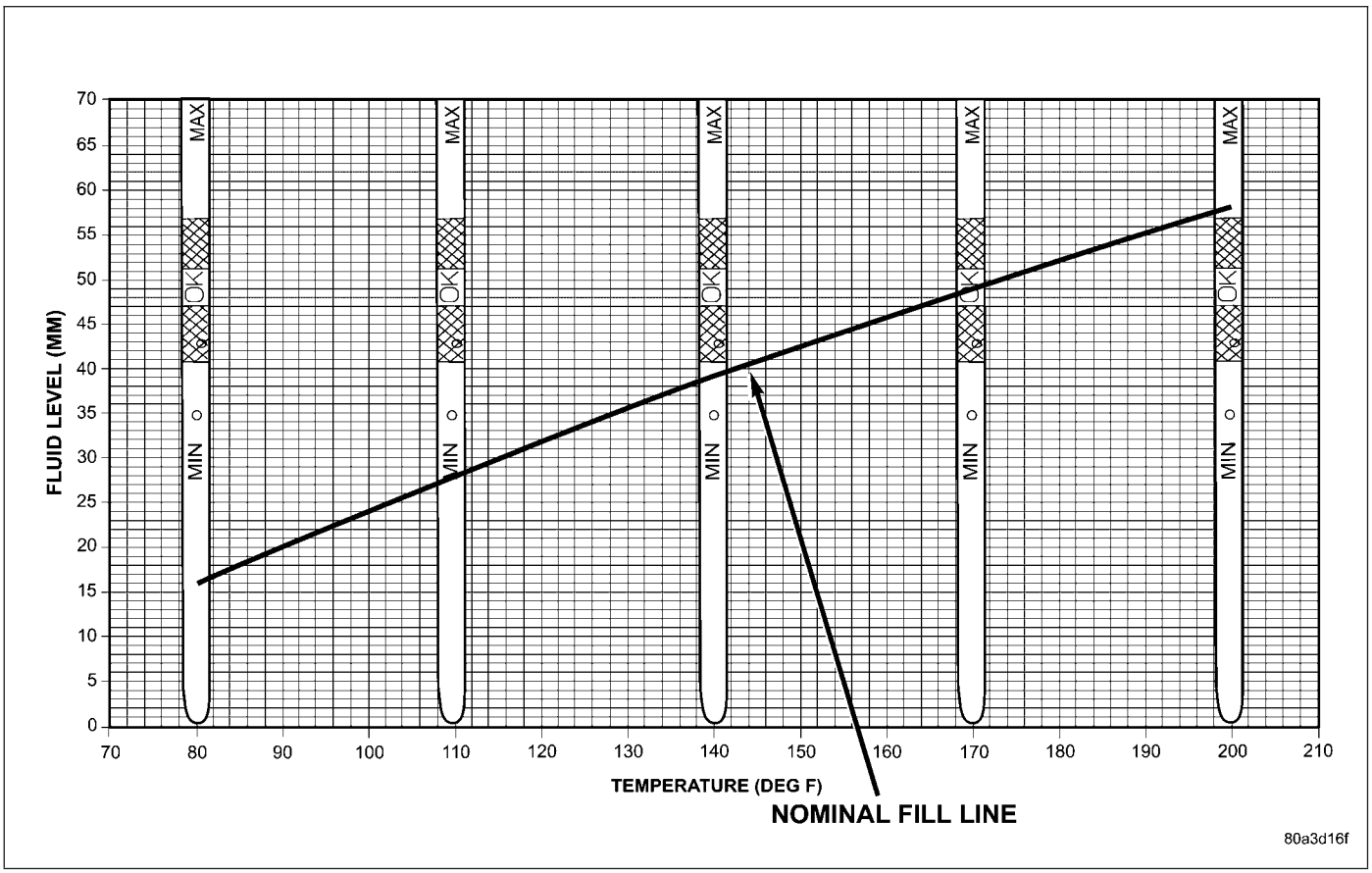
PROCEDURE ONE

1. Transmission fluid must be at normal operating temperature for accurate fluid level check. Drive vehicle if necessary to bring fluid temperature up to normal hot operating temperature of 82°C (180°F).
2. Position vehicle on level surface.
3. Start and run engine at curb idle speed.
4. Apply parking brakes.
5. Shift transmission momentarily into all gear ranges. Then shift transmission back to NEUTRAL.



6. Clean top of filler tube and dipstick to keep dirt from entering tube.
7. Remove dipstick (1) and check fluid level as follows:
   a. Correct acceptable level is in crosshatch area.
   b. Correct maximum level is to MAX arrow mark.
   c. Incorrect level is at or below MIN line.
   d. If fluid is low, add only enough Mopar® ATF +4 to restore correct level. Do not overfill.

PROCEDURE TWO



1. Start engine and apply parking brake.
2. Shift the transmission into DRIVE for approximately 2 seconds.
3. Shift the transmission into REVERSE for approximately 2 seconds.
4. Shift the transmission into PARK.
5. Hook up DRB® scan tool and select engine.
6. Select sensors.
7. Read the transmission temperature value.
8. Compare the fluid temperature value with the chart.
9. Adjust transmission fluid level shown on the dipstick according to the chart.

NOTE: After adding any fluid to the transmission, wait a minimum of 2 minutes for the oil to fully drain from the fill tube into the transmission before rechecking the fluid level.

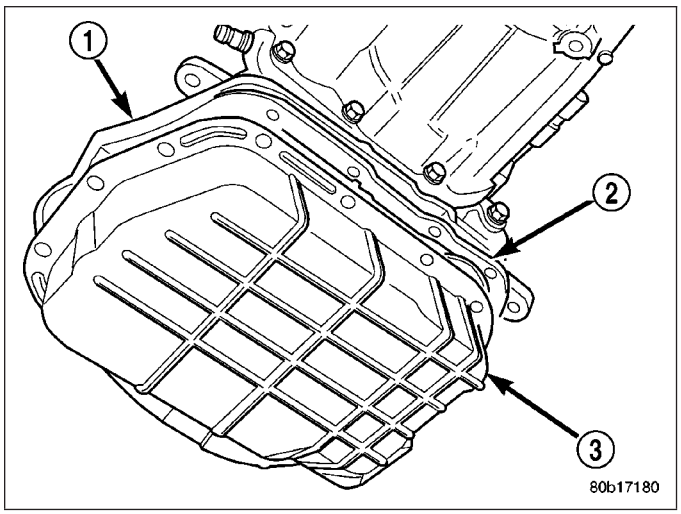
10. Check transmission for leaks.

FLUID AND FILTER REPLACEMENT

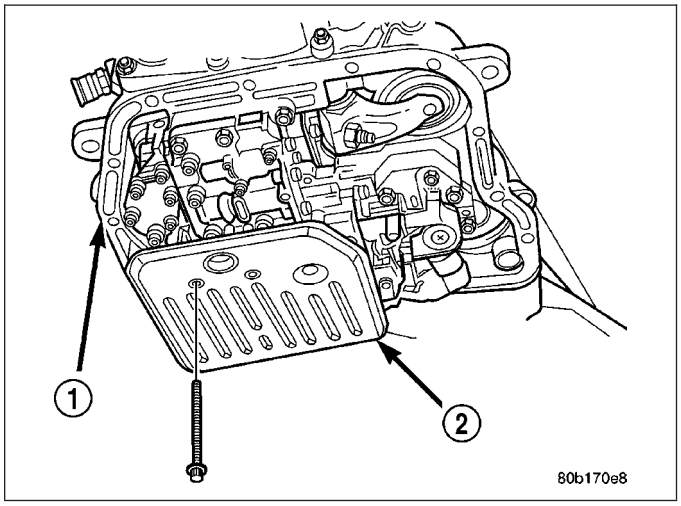
For proper service intervals (Refer to LUBRICATION & MAINTENANCE/MAINTENANCE SCHEDULES - DESCRIPTION). The service fluid fill after a filter change is approximately 3.8 liters (4.0 quarts).

REMOVAL

1. Hoist and support vehicle on safety stands.
2. Place a large diameter shallow drain pan beneath the transmission pan (3).
3. Remove bolts holding front and sides of pan to transmission (1).
4. Loosen bolts holding rear of pan to transmission.
5. Slowly separate front of pan and reusable gasket (2) away from transmission allowing the fluid to drain into drain pan.
6. Hold up pan and remove remaining bolt holding pan to transmission.
7. While holding pan level, lower pan and gasket away from transmission.
8. Pour remaining fluid in pan into drain pan.

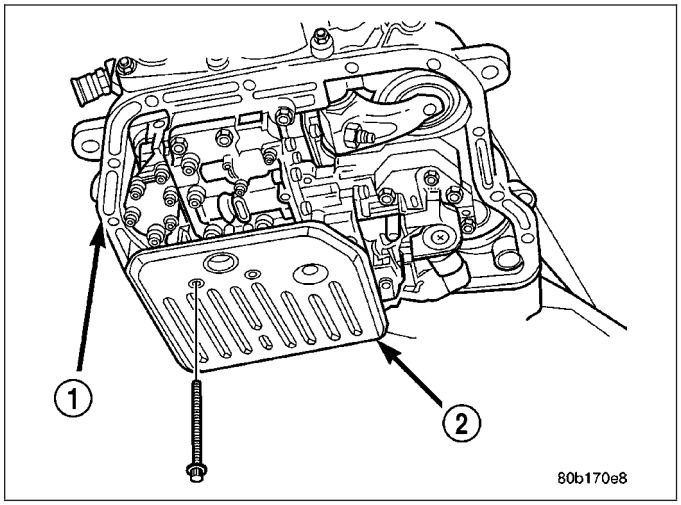


9. Remove screws holding filter (2) to valve body.
10. Separate filter from valve body and pour fluid in filter into drain pan.
11. Dispose of used trans fluid and filter properly.



INSTALLATION

1. Position a new transmission oil filter (2) onto the valve body.

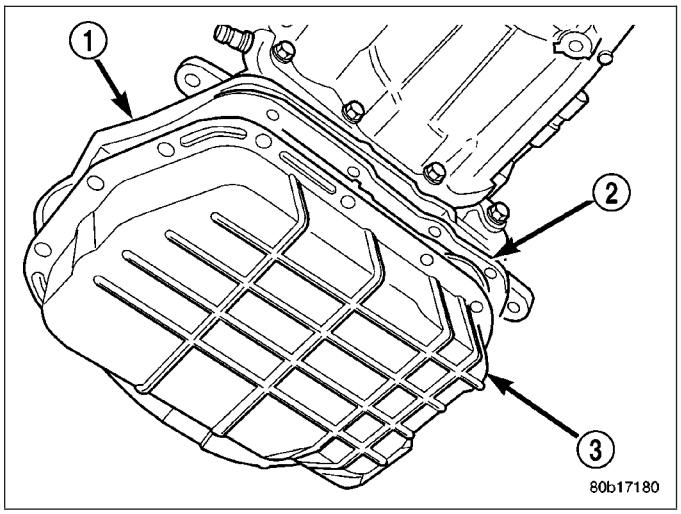


2. Install the screws to hold the filter to the valve body. Tighten the screws to 4 N·m (35 in.lbs.).

3. Clean the gasket surfaces of the transmission oil pan (3) and transmission pan rail.

NOTE: The transmission pan oil gasket(2) is reusable. Inspect the sealing surfaces of the gasket. If the sealing ribs on both surfaces appear to be in good condition, clean the gasket of any foreign material and reinstall.

4. Position the oil pan gasket (2) onto the oil pan (3).
5. Position the oil pan and gasket onto the transmission and install several bolts to hold the pan and gasket to the transmission.
6. Install the remainder of the oil pan bolts. Tighten the bolts to 13.6 N·m (125 in.lbs.).
7. Lower vehicle and fill transmission. (Refer to 21 - TRANSMISSION/AUTOMATIC/FLUID - STANDARD PROCEDURE)



TRANSMISSION FILL

To avoid overfilling transmission after a fluid change or overhaul, perform the following procedure:

1. Remove dipstick and insert clean funnel in transmission fill tube.
2. Add following initial quantity of Mopar® ATF +4 to transmission:
   a. If only fluid and filter were changed, add **3 pints (1-1/2 quarts)** of ATF +4 to transmission.
   b. If transmission was completely overhauled, torque converter was replaced or drained, and cooler was flushed, add **12 pints (6 quarts)** of ATF +4 to transmission.
3. Apply parking brakes.
4. Start and run engine at normal curb idle speed.
5. Apply service brakes, shift transmission through all gear ranges then back to NEUTRAL, set parking brake, and leave engine running at curb idle speed.
6. Remove funnel, insert dipstick and check fluid level. If level is low, **add fluid to bring level to MIN mark on dipstick.** Check to see if the oil level is equal on both sides of the dipstick. If one side is noticably higher than the other, the dipstick has picked up some oil from the dipstick tube. Allow the oil to drain down the dipstick tube and re-check.
7. Drive vehicle until transmission fluid is at normal operating temperature.
8. With the engine running at curb idle speed, the gear selector in NEUTRAL, and the parking brake applied, check the transmission fluid level.

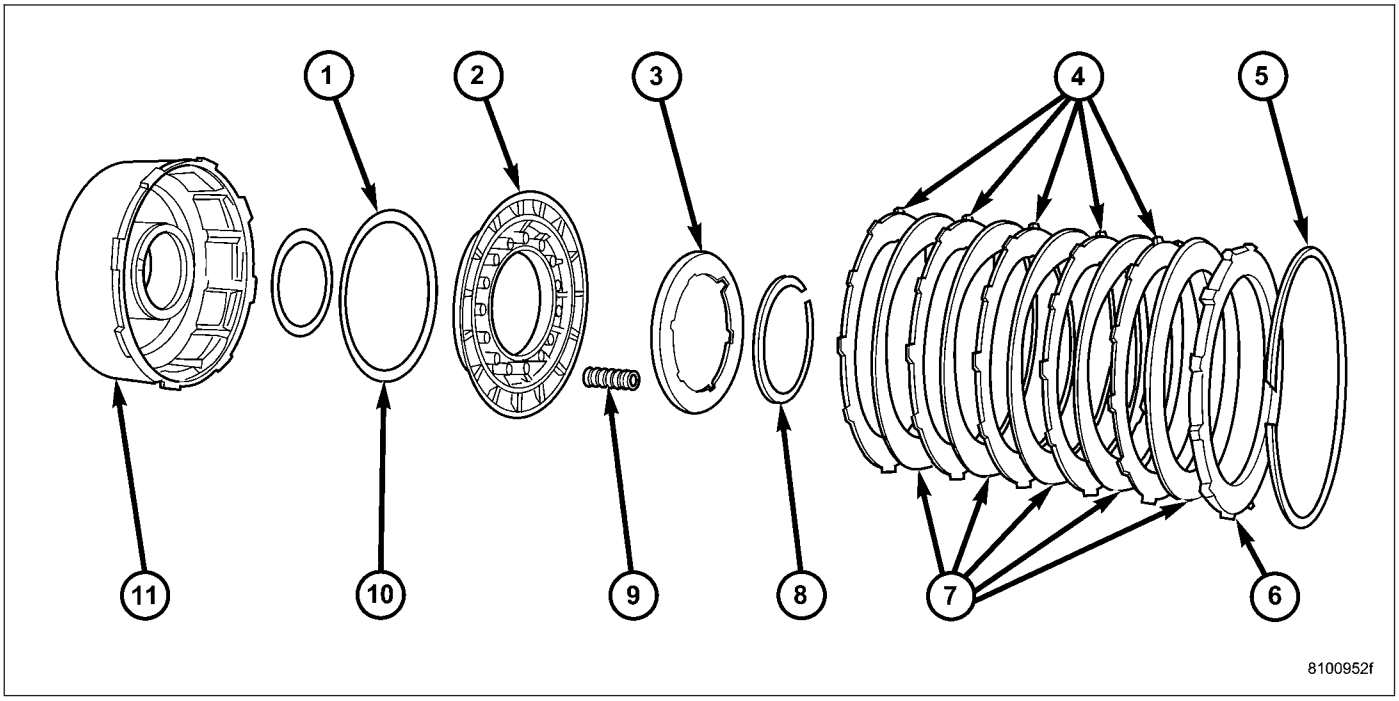
CAUTION: Do not overfill transmission, fluid foaming and shifting problems can result.

9. Add fluid to bring level up to MAX arrow mark.

When fluid level is correct, shut engine off, release park brake, remove funnel, and install dipstick in fill tube.

CLUTCH-FRONT

DESCRIPTION



48RE Front Clutch Components

1 - INNER PISTON SEAL
2 - CLUTCH PISTON
3 - CLUTCH PISTON SPRING RETAINER
4 - CLUTCH PLATES
5 - CLUTCH PACK SNAP-RING (WAVED)
6 - REACTION PLATE
7 - CLUTCH DISCS
8 - RETAINER SNAP-RING
9 - CLUTCH PISTON SPRINGS
10 - OUTER PISTON SEAL
11 - FRONT CLUTCH RETAINER

The front clutch assembly is composed of the front clutch retainer (11), pressure plate, clutch plates (4), driving discs (7), piston (2), piston return spring (9), return spring retainer (3), and snap-rings (5, 8). The front clutch is the forward-most component in the transmission geartrain and is directly behind the oil pump and is considered a driving component.

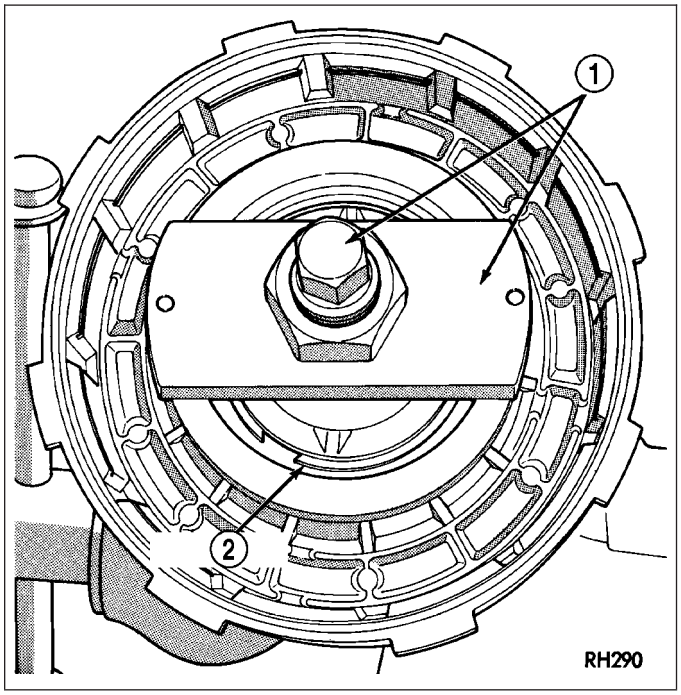
OPERATION

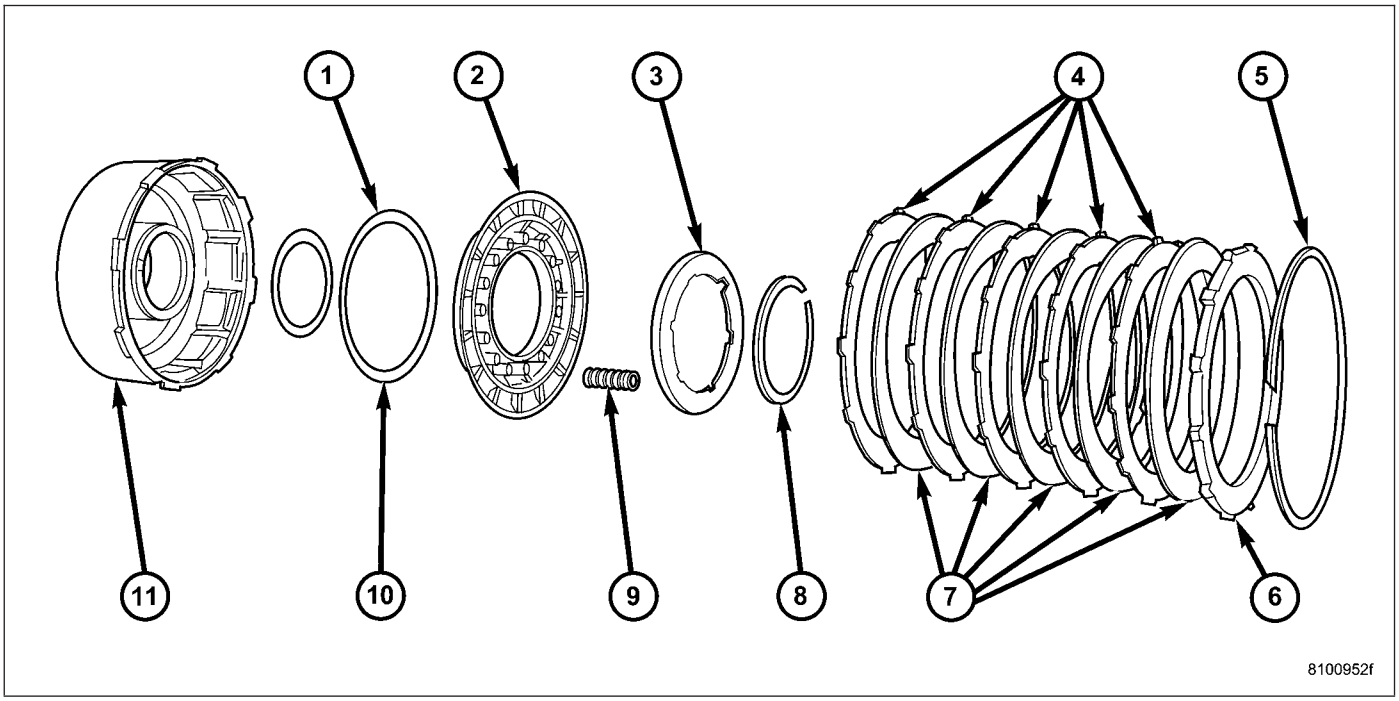
To apply the clutch, pressure is applied between the clutch retainer and piston. The fluid pressure is provided by the oil pump, transferred through the control valves and passageways, and enters the clutch through the hub of the reaction shaft support. With pressure applied between the clutch retainer and piston, the piston moves away from the clutch retainer and compresses the clutch pack. This action applies the clutch pack, allowing torque to flow through the input shaft into the driving discs, and into the clutch plates and pressure plate that are lugged to the clutch retainer. The waved snap-ring is used to cushion the application of the clutch pack.

When pressure is released from the piston, the spring returns the piston to its fully released position and disengages the clutch. The release spring also helps to cushion the application of the clutch assembly. When the clutch is in the process of being released by the release spring, fluid flows through a vent and one-way ball-check-valve located in the clutch retainer. The check-valve is needed to eliminate the possibility of plate drag caused by centrifugal force acting on the residual fluid trapped in the clutch piston retainer.

DISASSEMBLY

1. Remove the waved snap-ring, reaction plate, clutch plates, and clutch discs.
2. Compress clutch piston retainer and piston springs with Compressor Tool C-3863-A (1).
3. Remove retainer snap-ring and remove compressor tool.





48RE Front Clutch Components

1 - INNER PISTON SEAL
2 - CLUTCH PISTON
3 - CLUTCH PISTON SPRING RETAINER
4 - CLUTCH PLATES
5 - CLUTCH PACK SNAP-RING (WAVED)
6 - REACTION PLATE
7 - CLUTCH DISCS
8 - RETAINER SNAP-RING
9 - CLUTCH PISTON SPRINGS
10 - OUTER PISTON SEAL
11 - FRONT CLUTCH RETAINER

4. Remove clutch piston springs (9). Note position and number of piston springs for assembly reference.
5. Remove clutch piston (2) from retainer (11) with a twisting motion.

6. Remove and discard clutch piston inner (1) and outer seals (10).

INSPECTION

Inspect the front clutch components. Replace the clutch discs if warped, worn, scored, burned or charred, the lugs are damaged, or if the facing is flaking off. Replace the steel plates and reaction plate if heavily scored, warped, or broken. Be sure the driving lugs on the discs and plate are also in good condition. The lugs must not be bent, cracked or damaged in any way.

Replace the piston springs and spring retainer if either are distorted, warped or broken.

Check the lug grooves in the clutch piston retainer. The steel plates should slide freely in the slots. Replace the piston retainer if the grooves are worn or damaged. Also check action of the check ball in the piston retainer. The ball must move freely and not stick.

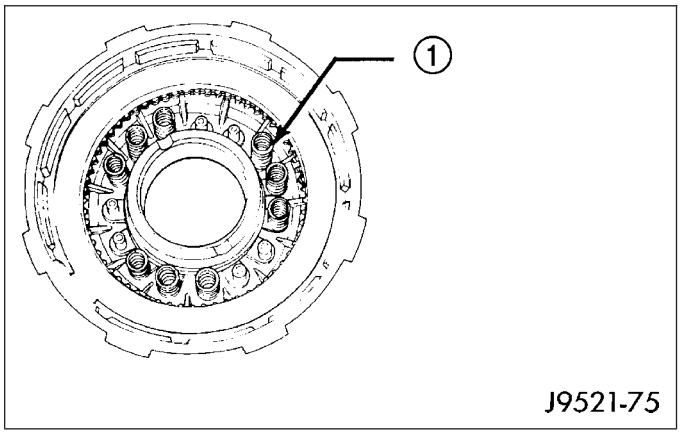
Replace the retainer bushing if worn, scored, or there is any doubt about bushing condition.

Inspect the piston and retainer seal surfaces for nicks or scratches. Minor scratches can be removed with crocus cloth. However, replace the piston and/or retainer if the seal surfaces are seriously scored.

Check the clutch piston check ball. The ball should be securely in place. Replace the piston if the ball is missing, or seized in place.

ASSEMBLY

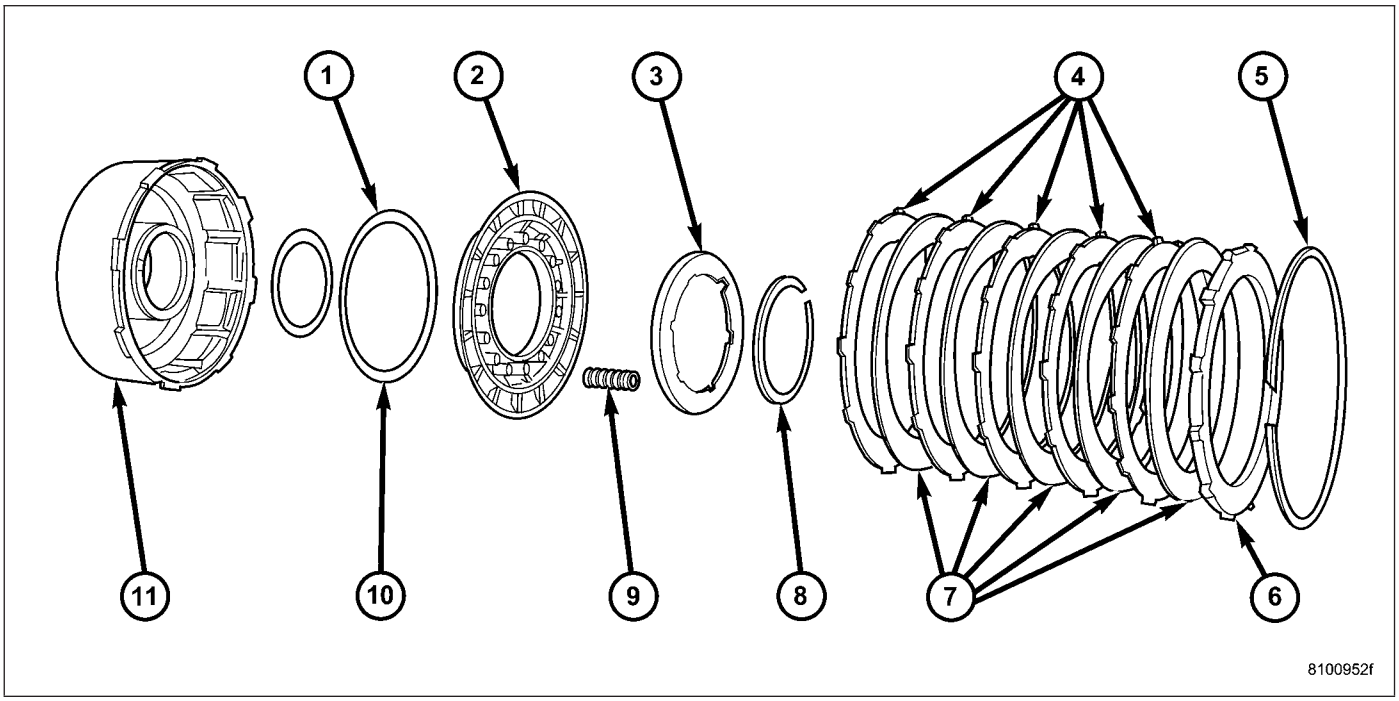
NOTE: The 48RE transmission uses five plates and discs for the front clutch.



1. Soak clutch discs in transmission fluid.
2. Install new inner piston seal onto the outer diameter of the clutch retainer inner hub.
3. Install new outer seal onto the clutch piston. Be sure seal lips of both seals face the interior of the retainer.
4. Lubricate new inner and outer piston seals with petroleum jelly.
5. Install clutch piston in retainer. Use twisting motion to seat piston in bottom of retainer. A thin strip of plastic (about 0.015 - 0.020 in. thick), can be used to guide seals into place if necessary.

CAUTION: Never push the clutch piston straight in. This will fold the seals over causing leakage and clutch slip. In addition, never use any type of metal tool to help ease the piston seals into place. Metal tools will cut, shave, or score the seals.

6. Install and position nine clutch piston springs (1).

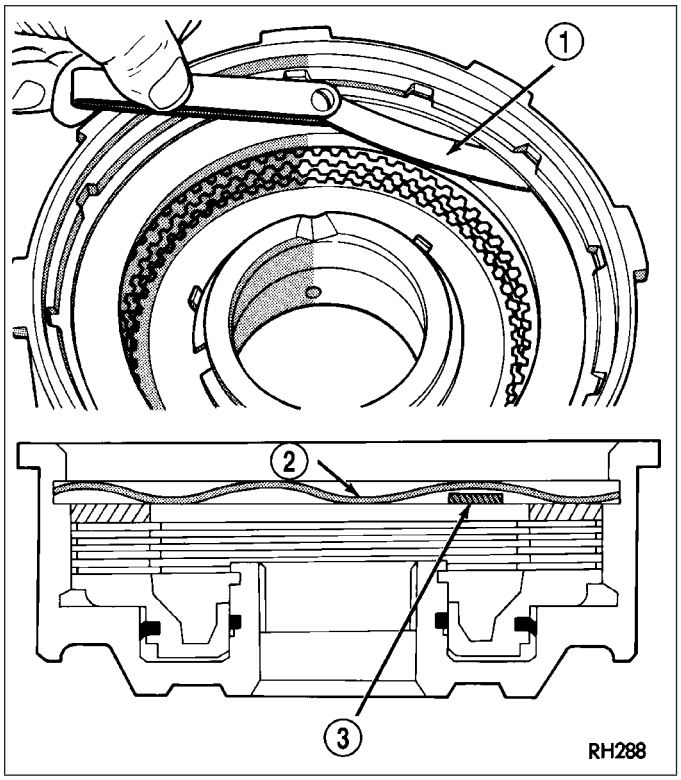


48RE Front Clutch Components

1 - INNER PISTON SEAL
2 - CLUTCH PISTON
3 - CLUTCH PISTON SPRING RETAINER
4 - CLUTCH PLATES
5 - CLUTCH PACK SNAP-RING (WAVED)
6 - REACTION PLATE
7 - CLUTCH DISCS
8 - RETAINER SNAP-RING
9 - CLUTCH PISTON SPRINGS
10 - OUTER PISTON SEAL
11 - FRONT CLUTCH RETAINER

7. Install spring retainer (3) on top of piston springs (9).
8. Compress spring retainer and piston springs with Tool C-3863-A.
9. Install spring retainer snap-ring (8) and remove compressor tool.
10. Install clutch plates and discs (4, 7). Five clutch discs, five steel plates and one reaction plate are required.
11. Install reaction plate (6) followed by waved snap-ring (5).

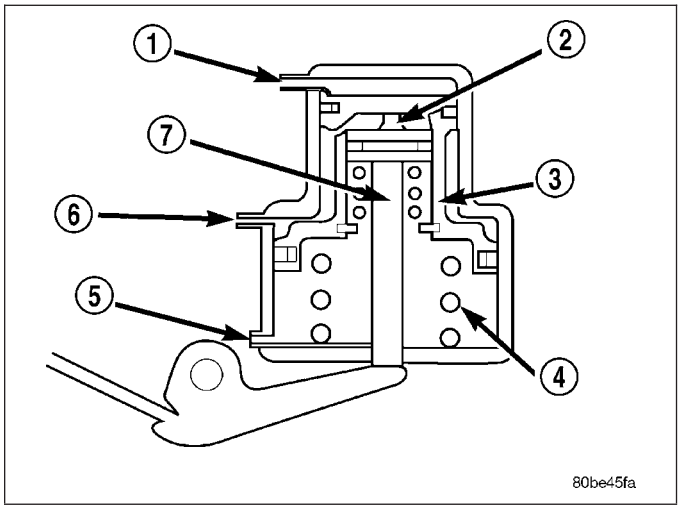
12. Check clutch pack clearance with feeler gauge (3). Clearance between waved spring and pressure plate should 2.5-4.09 mm (0.098-0.161 in.). If clearance is incorrect, clutch plates, clutch discs, snap-ring, or pressure plate may have to be changed.



SERVO-FRONT

DESCRIPTION

The kickdown servo consists of a two-land piston (3) with an inner piston (2), a piston rod (7) and guide, and a return spring (4). The dual-land piston uses seal rings on its outer diameters and an O-ring for the inner piston.

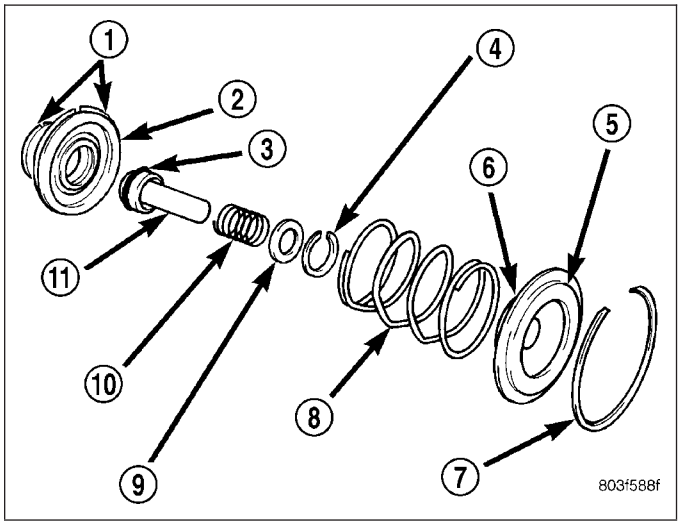


OPERATION

The application of the piston is accomplished by applying pressure between the two lands of the piston. The pressure acts against the larger lower land to push the piston downward, allowing the piston rod to extend though its guide against the apply lever. Release of the servo at the 2-3 upshift is accomplished by a combination of spring and line pressure, acting on the bottom of the larger land of the piston. The small piston is used to cushion the application of the band by bleeding oil through a small orifice in the larger piston, diesel engine only. The release timing of the kickdown servo is very important to obtain a smooth but firm shift. The release has to be very quick, just as the front clutch application is taking place. Otherwise, engine runaway or a shift hesitation will occur. To accomplish this, the band retains its holding capacity until the front clutch is applied, giving a small amount of overlap between them.

DISASSEMBLY

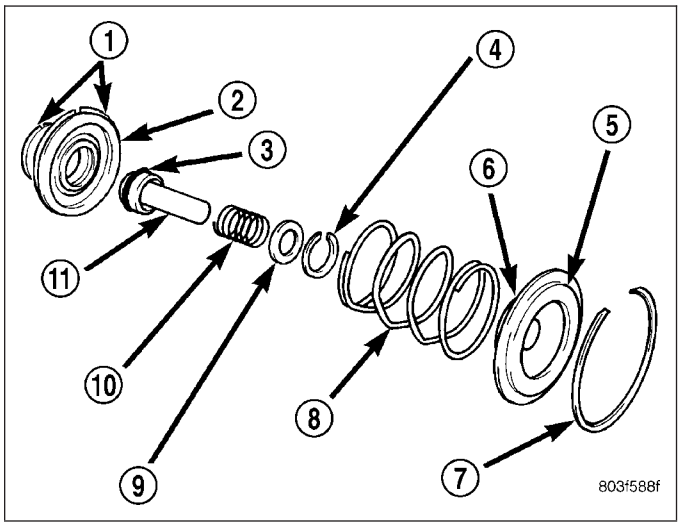
1. Remove seal ring (6) from rod guide (5).
2. Remove small snap-ring (7) from servo piston rod (11). Then remove piston rod (11), spring (10), and washer (9) from piston (2).
3. Remove and discard servo component O-ring (3) and seal rings (1, 6).



1 - PISTON RINGS
2 - SERVO PISTON
3 - O-RING
4 - SNAP-RING
5 - PISTON ROD GUIDE
6 - SEAL RING
7 - SNAP-RING
8 - SERVO SPRING
9 - WASHER
10 - SPRING
11 - PISTON ROD

CLEANING

Clean the servo piston components with solvent and dry them with compressed air.



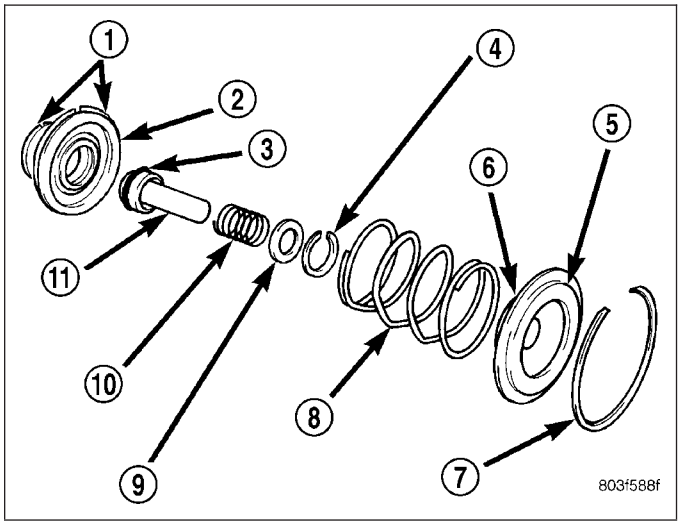
1 - PISTON RINGS
2 - SERVO PISTON
3 - O-RING
4 - SNAP-RING
5 - PISTON ROD GUIDE
6 - SEAL RING
7 - SNAP-RING
8 - SERVO SPRING
9 - WASHER
10 - SPRING
11 - PISTON ROD

INSPECTION

Inspect the servo components (1-11). Replace the springs if collapsed, distorted or broken. Replace the guide, rod and piston if cracked, bent, or worn. Discard the servo snap-ring if distorted or warped.

Check the servo piston bore for wear. If the bore is severely scored, or damaged, it will be necessary to replace the case.

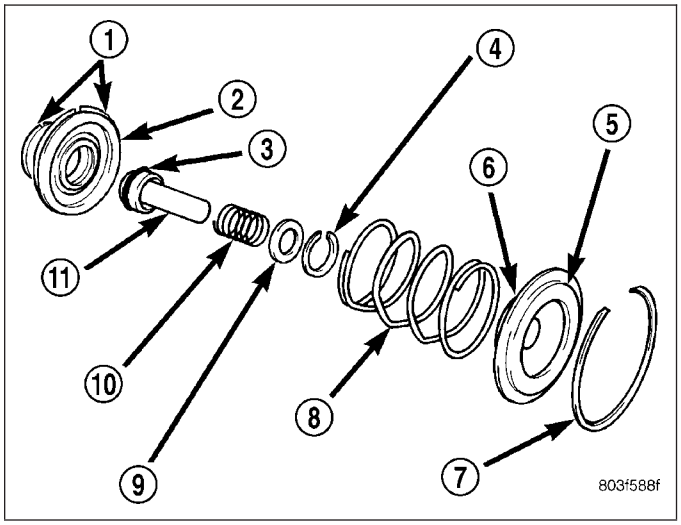
Replace any servo component if doubt exists about condition. Do not reuse suspect parts.



ASSEMBLY

Clean and inspect front servo components.

1. Lubricate new o-ring (3) and seal rings (1, 6) with petroleum jelly and install them on piston (2), guide (5), and rod (11).
2. Install rod in piston. Install spring (8) and washer (9) on rod. Compress spring (8) and install snap-ring (7).



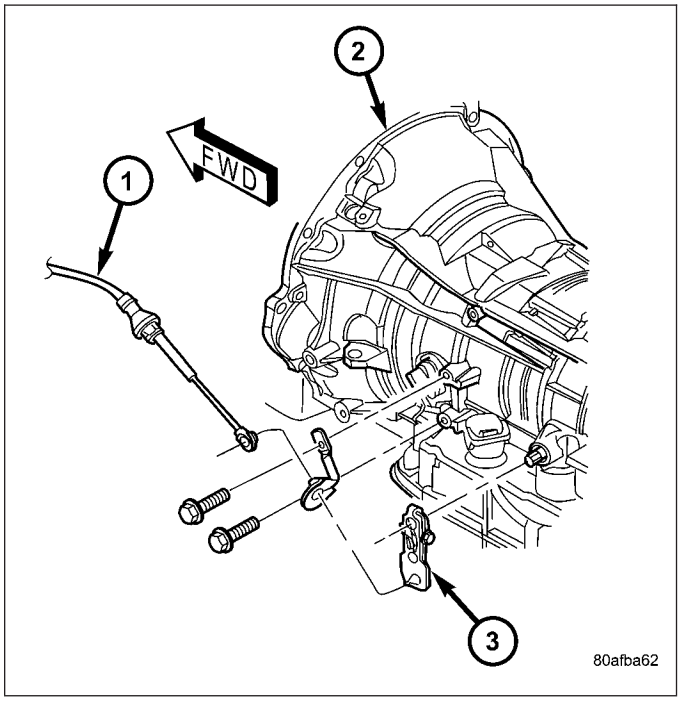
CABLE-GEARSHIFT

DIAGNOSIS AND TESTING - GEARSHIFT CABLE

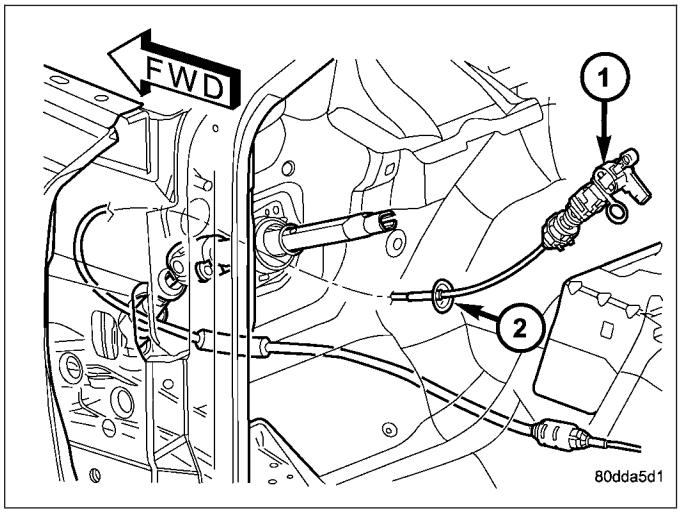
1. Engine starts must be possible with shift lever in PARK or NEUTRAL positions only. Engine starts must not be possible in any other gear position.
2. With the shift lever in the:
   a. PARK position - Apply upward force on the shift arm and remove pressure. Engine starts must be possible.
   b. PARK position - Apply downward force on the shift arm and remove pressure. Engine starts must be possible.
   c. NEUTRAL position - Normal position. Engine starts must be possible.
   d. NEUTRAL position - Engine running and brakes applied, apply upward force on the shift arm. Transmission shall not be able to shift from neutral to reverse.

REMOVAL

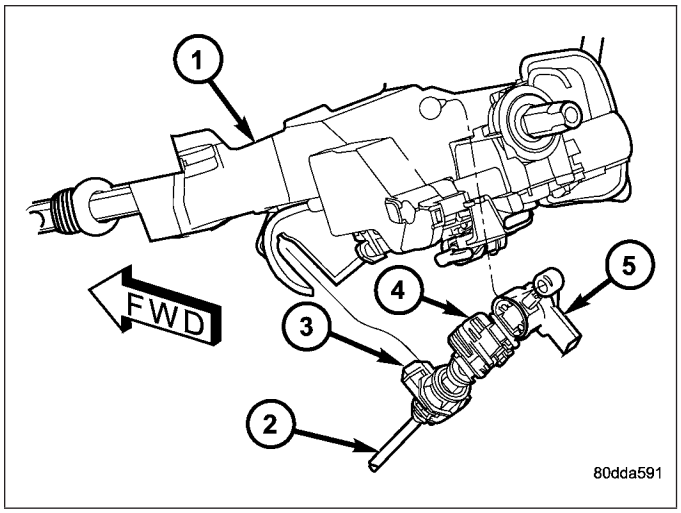
1. Shift transmission into PARK.
2. Raise vehicle.
3. Disengage cable (1) eyelet at transmission manual shift lever (3) and pull cable adjuster out of mounting bracket.



4. Lower the vehicle.
5. Remove the dash panel insulation pad as necessary to access the gearshift cable grommet (2).
6. Remove grommet (2) from the dash panel.

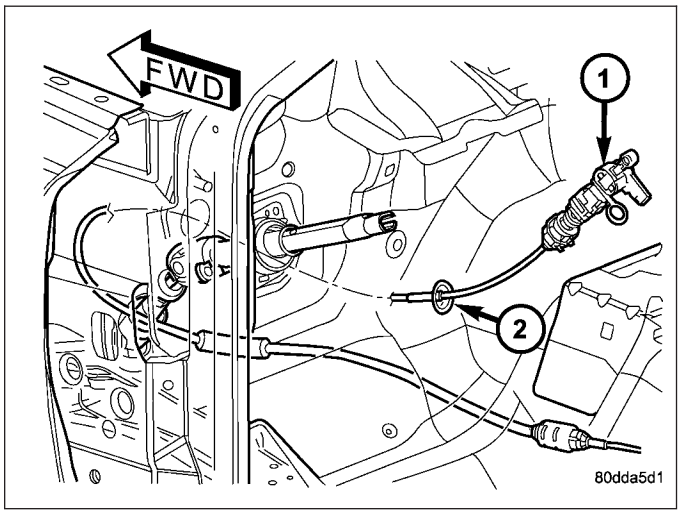


7. Remove any steering column (1) trim necessary to access the gearshift cable (2) and BTSI mechanism.
8. Disconnect the BTSI wiring connector (5).
9. Disconnect cable at lower column bracket and shift lever pin and pull the cable through the dash panel opening into the vehicle.
10. Remove gearshift cable (2) from vehicle.

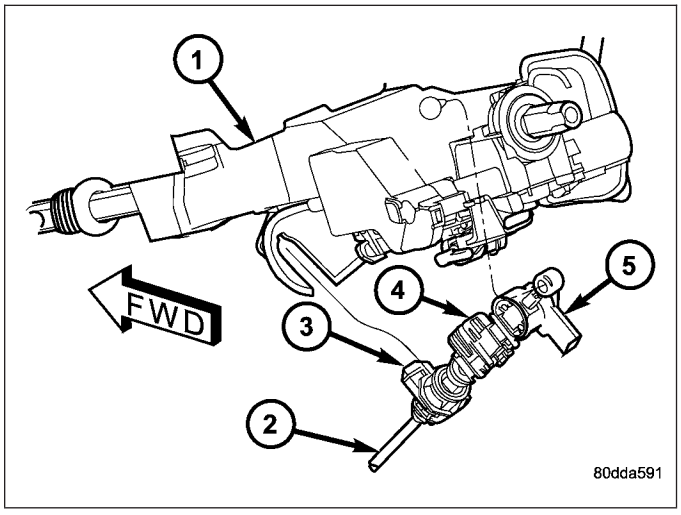


INSTALLATION

1. Route the transmission end of the gearshift cable (1) through the opening in the dash panel.
2. Seat the cable grommet (2) into the dash panel opening.



3. Snap the cable into the steering column (1) bracket so the retaining ears are engaged and snap the cable eyelet onto the shift lever ball stud.
4. Raise the vehicle.
5. Place the transmission manual shift lever in the “PARK” detent (rearmost) position and rotate prop shaft to ensure transmission is in PARK.
6. Route the gearshift cable through the transmission mounting bracket and secure the cable by snapping the cable retaining ears into the transmission bracket and snapping the cable eyelet on the manual shift lever ball stud.
7. Lower vehicle.
8. Lock the shift cable adjustment by pressing the cable adjuster lock tab (3) downward until it snaps into place.



9. Check for proper operation of the transmission range sensor.

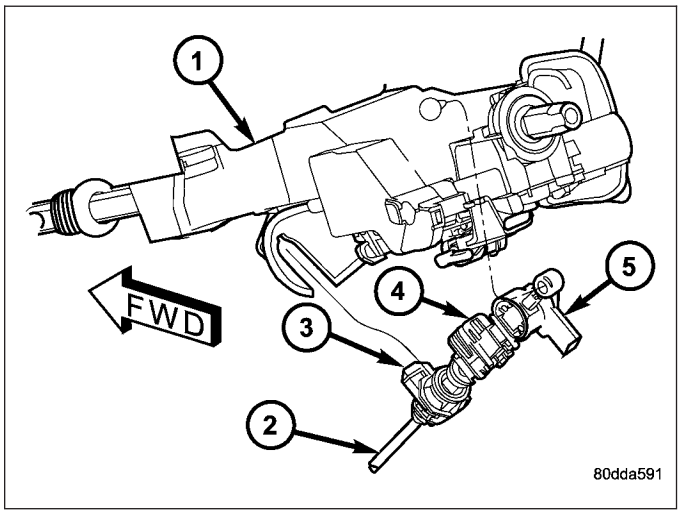
10. Adjust the gearshift cable (Refer to 21 - TRANSMISSION/AUTOMATIC/GEAR SHIFT CABLE - ADJUSTMENTS) and BTSI mechanism (Refer to 21 - TRANSMISSION/AUTOMATIC/BRAKE TRANSMISSION SHIFT INTERLOCK SYSTEM - ADJUSTMENTS) as necessary.

ADJUSTMENTS - GEARSHIFT CABLE

Check adjustment by starting the engine in PARK and NEUTRAL. Adjustment is CORRECT if the engine starts only in these positions. Adjustment is INCORRECT if the engine starts in one but not both positions. If the engine starts in any position other than PARK or NEUTRAL, or if the engine will not start at all, the transmission range sensor may be faulty.

Gearshift Adjustment Procedure

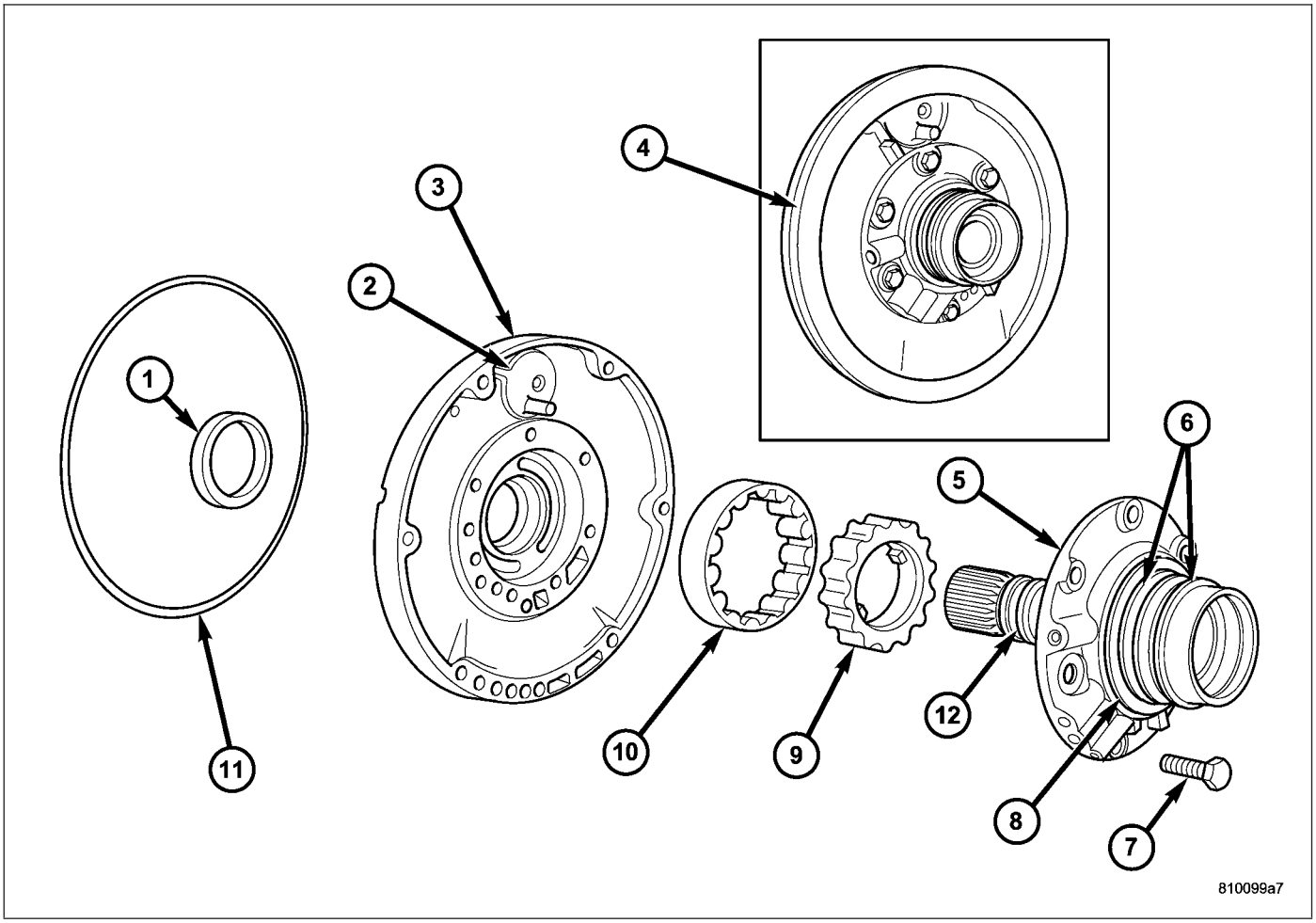
1. Shift transmission into PARK.
2. Release cable adjuster lock tab (3) (underneath the steering column) to unlock cable.
3. Raise vehicle.
4. Disengage the cable eyelet from the transmission manual shift lever.
5. Verify transmission shift lever is in PARK detent by moving lever fully rearward. Last rearward detent is PARK position.
6. Verify positive engagement of transmission park lock by attempting to rotate propeller shaft. Shaft will not rotate when park lock is engaged.
7. Snap the cable eyelet onto the transmission manual shift lever.
8. Lower vehicle.



9. Lock shift cable by pressing cable adjuster lock tab (3) downward until it snaps into place.
10. Check engine starting. Engine should start only in PARK and NEUTRAL.

PUMP-OIL

DESCRIPTION



Oil Pump Assembly

1 - OIL SEAL
2 - VENT BAFFLE
3 - OIL PUMP BODY
4 - GASKET
5 - REACTION SHAFT SUPPORT
6 - SEAL RINGS
7 - BOLTS (6)
8 - #1 THRUST WASHER (SELECTIVE)
9 - INNER GEAR
10 - OUTER GEAR
11 - "O" RING
12 - TORQUE CONVERTER SEAL RING

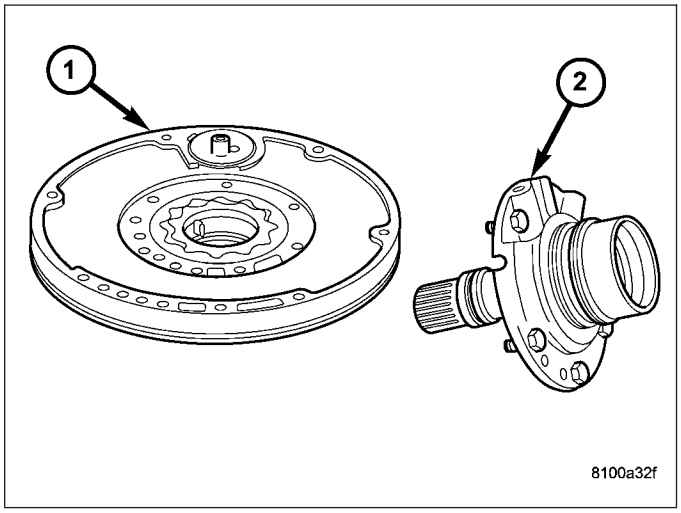
The oil pump is located in the pump housing inside the bell housing of the transmission case. The oil pump consists of an inner gear (9), outer gear (10), a housing (3), and a reaction shaft support (5).

OPERATION

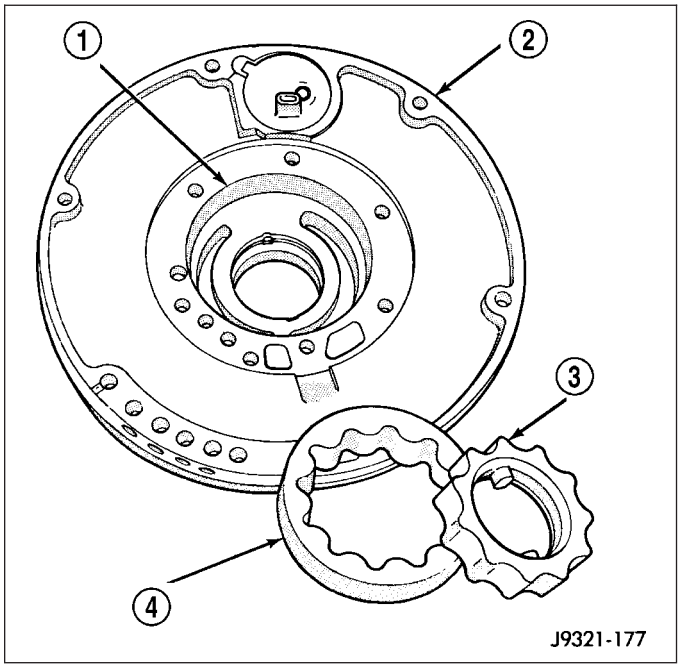
As the torque converter rotates, the converter hub rotates the inner and outer gears. As the gears rotate, the clearance between the gear teeth increases in the crescent area, and creates a suction at the inlet side of the pump. This suction draws fluid through the pump inlet from the oil pan. As the clearance between the gear teeth in the crescent area decreases, it forces pressurized fluid into the pump outlet and to the valve body.

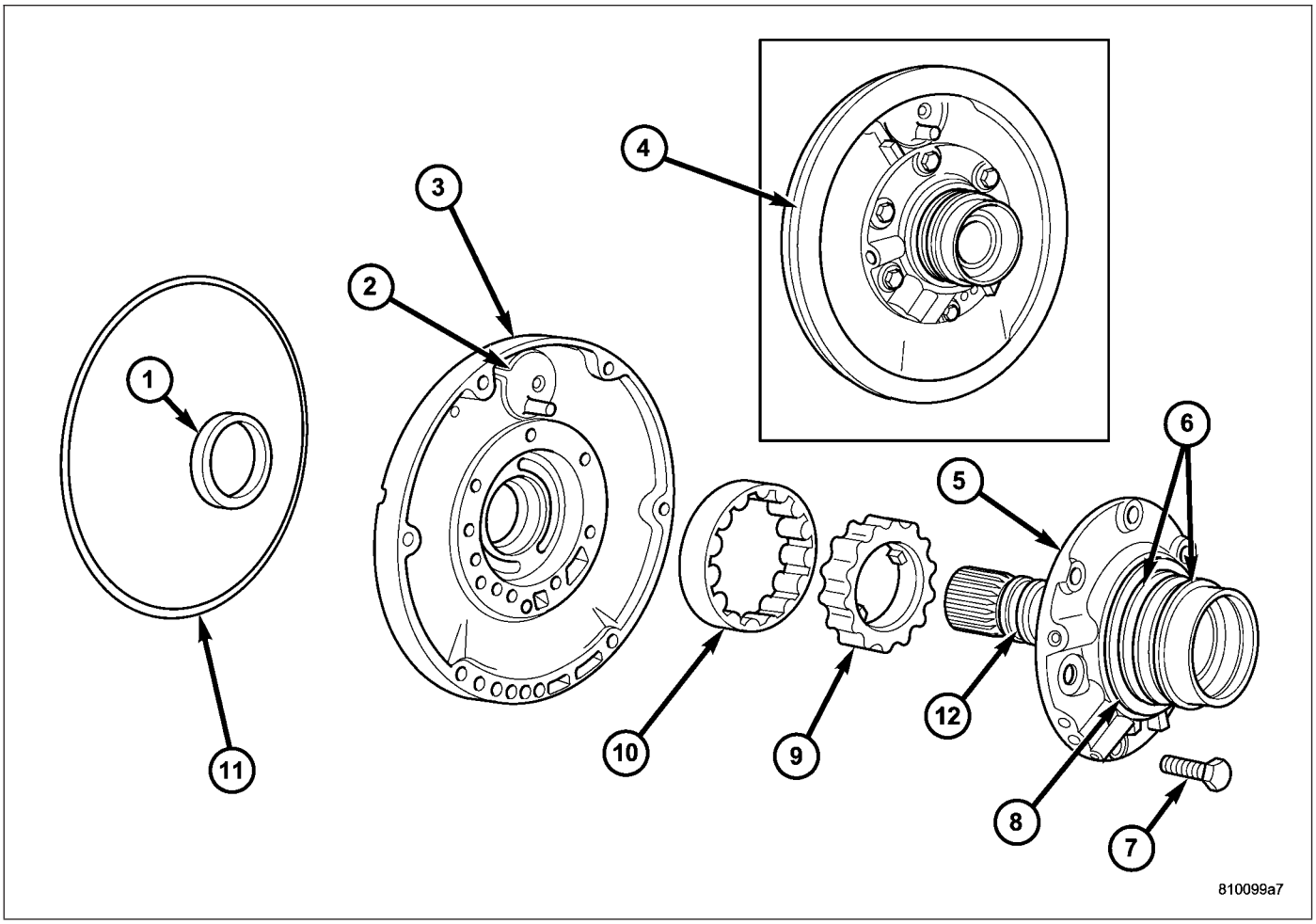
DISASSEMBLY

1. Mark position of support (2) in oil pump body (1) for assembly alignment reference. Use scriber or paint to make alignment marks.
2. Place pump body on two wood blocks.
3. Remove reaction shaft support bolts and separate support (2) from pump body (1).



4. Remove pump inner (3) and outer gears (4).





Oil Pump Assembly

1 - OIL SEAL
2 - VENT BAFFLE
3 - OIL PUMP BODY
4 - GASKET
5 - REACTION SHAFT SUPPORT
6 - SEAL RINGS
7 - BOLTS (6)
8 - #1 THRUST WASHER (SELECTIVE)
9 - INNER GEAR
10 - OUTER GEAR
11 - "O" RING
12 - TORQUE CONVERTER SEAL RING

5. Remove o-ring seal (11) from pump body. Discard seal after removal.
6. Remove oil pump seal (1). Discard seal after removal.

CLEANING

Clean pump and support components with solvent and dry them with compressed air.

INSPECTION

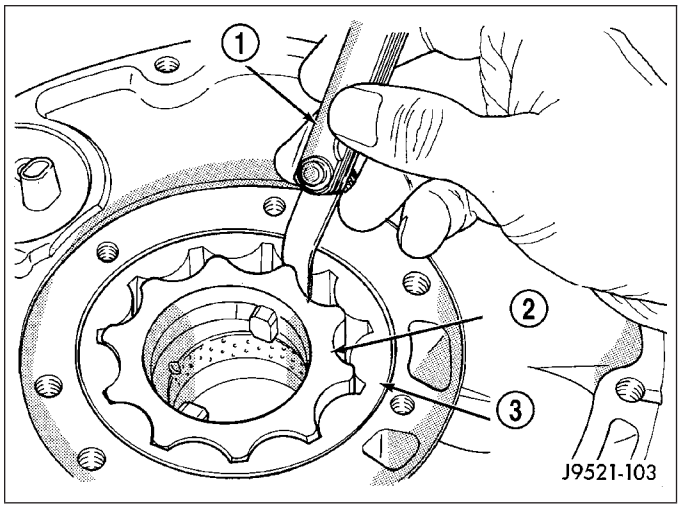
Check condition of the seal rings and thrust washer on the reaction shaft support. The seal rings do not need to be replaced unless cracked, broken, or severely worn.

Inspect the pump and support components. Replace the pump or support if the seal ring grooves or machined surfaces are worn, scored, pitted, or damaged. Replace the pump gears if pitted, worn chipped, or damaged.

Inspect the pump bushing. Then check the reaction shaft support bushing. Replace either bushing only if heavily worn, scored or damaged. It is not necessary to replace the bushings unless they are actually damaged.

Clearance between outer gear and reaction shaft housing should be 0.010 to 0.063 mm (0.0004 to 0.0025 in.). Clearance between inner gear and reaction shaft housing should be 0.010 to 0.063 mm (0.0004 to 0.0025 in.). Both clearances can be measured at the same time by installing the gears in the pump body and measure pump component clearances as follows:

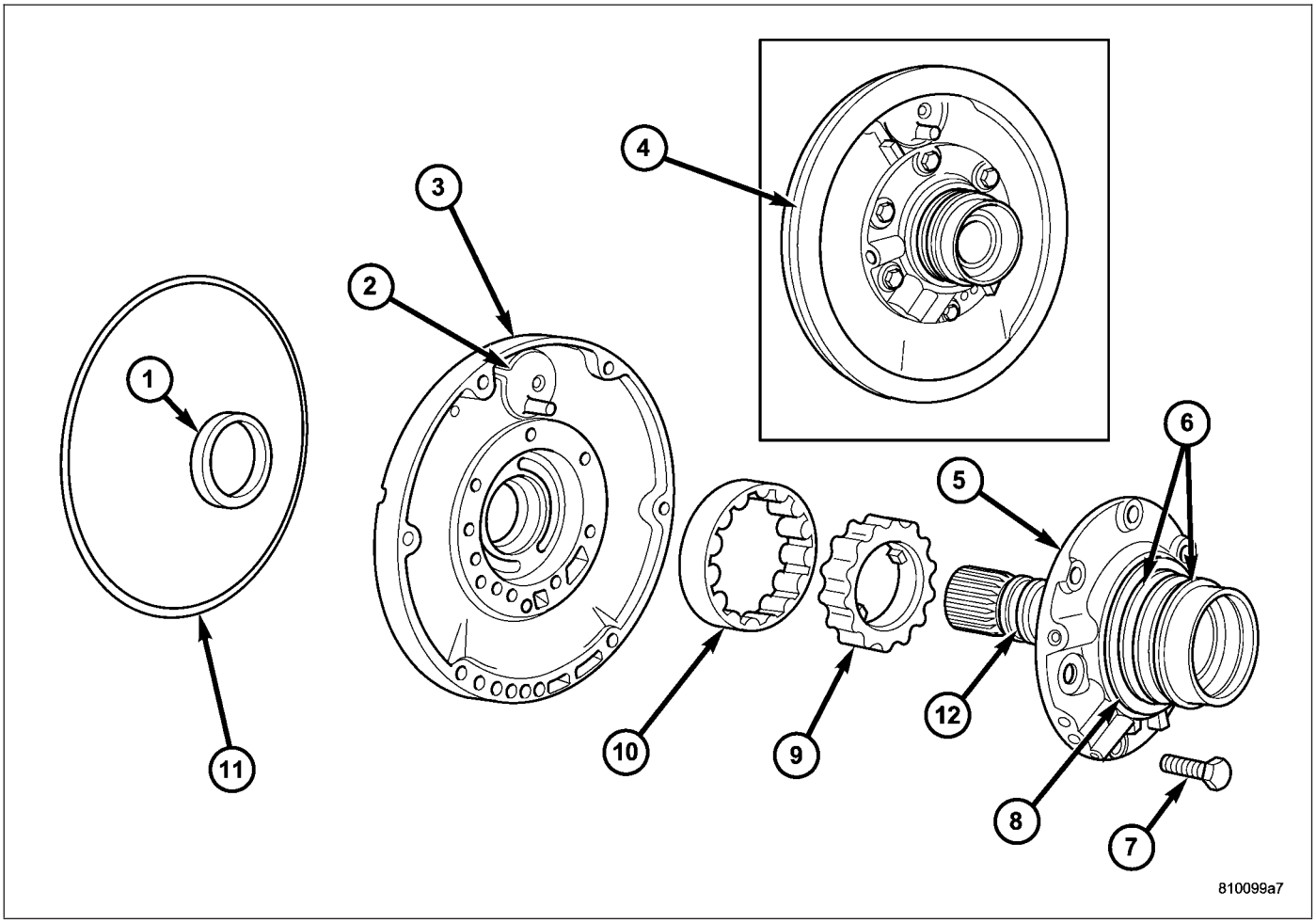
1. Position an appropriate piece of Plastigage™ across both gears.
2. Align the plastigage to a flat area on the reaction shaft housing.
3. Install the reaction shaft to the pump housing.
4. Separate the reaction shaft housing from the pump housing and measure the Plastigage™ following the instructions supplied with it.



Clearance between inner gear tooth (2) and outer gear (3) should be 0.051 to 0.19 mm (0.002 to 0.0075 in.). Measure clearance with an appropriate feeler gauge (1).

Clearance between outer gear and pump housing should be 0.10 to 0.229 mm (0.004 to 0.009 in.). Measure clearance with an appropriate feeler gauge.

ASSEMBLY



Oil Pump Assembly

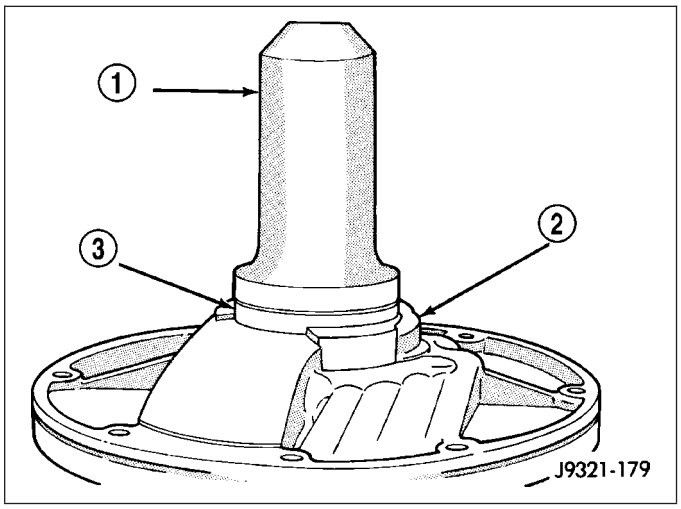
1 - OIL SEAL	7 - BOLTS (6)
2 - VENT BAFFLE	8 - #1 THRUST WASHER (SELECTIVE)
3 - OIL PUMP BODY	9 - INNER GEAR
4 - GASKET	10 - OUTER GEAR
5 - REACTION SHAFT SUPPORT	11 - “O” RING
6 - SEAL RINGS	12 - TORQUE CONVERTER SEAL RING

1. Lubricate pump gears (9, 10) with transmission fluid and install them in pump body (3).
2. Install thrust washer (8) on reaction shaft (5) support hub. Lubricate washer with petroleum jelly or transmission fluid before installation.
3. If reaction shaft seal rings (6) are being replaced, install new seal rings on support hub. Lubricate seal rings with transmission fluid or petroleum jelly after installation. Squeeze each ring until ring ends are securely hooked together.

CAUTION: The reaction shaft support seal rings will break if overspread, or twisted. If new rings are being installed, spread them only enough for installation. Also be very sure the ring ends are securely hooked together after installation. Otherwise, the rings will either prevent pump installation, or break during installation.

4. Align and install reaction shaft support (5) on pump body (3).
5. Install bolts (7) attaching reaction shaft support to pump. Tighten bolts to 20 N·m (175 in. lbs.) torque.

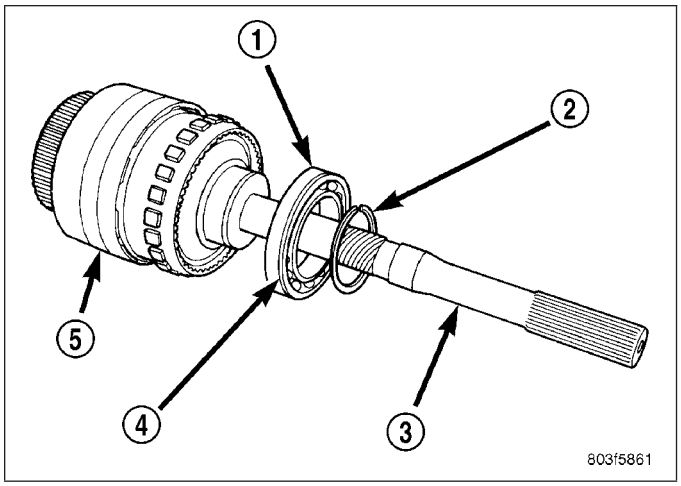
6. Install new o-ring (11) on pump body. Lubricate oil seal and o-ring with petroleum jelly.
7. Install new pump seal (3) with Installer Tool C-3860-A (1). Use hammer or mallet to tap seal into place.



BEARING-OUTPUT SHAFT FRONT

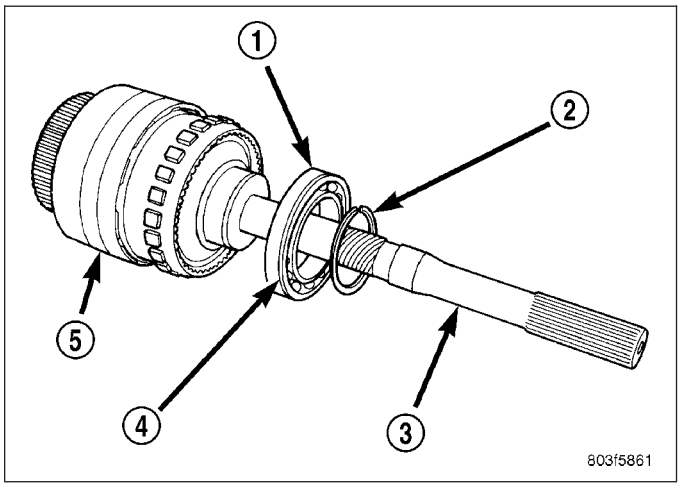
REMOVAL

1. Remove overdrive unit from the vehicle.
2. Remove overdrive geartrain (5) from housing.
3. Remove snap-ring (2) holding output shaft front bearing (1) to overdrive geartrain (5).
4. Pull bearing (1) from output shaft (3).



INSTALLATION

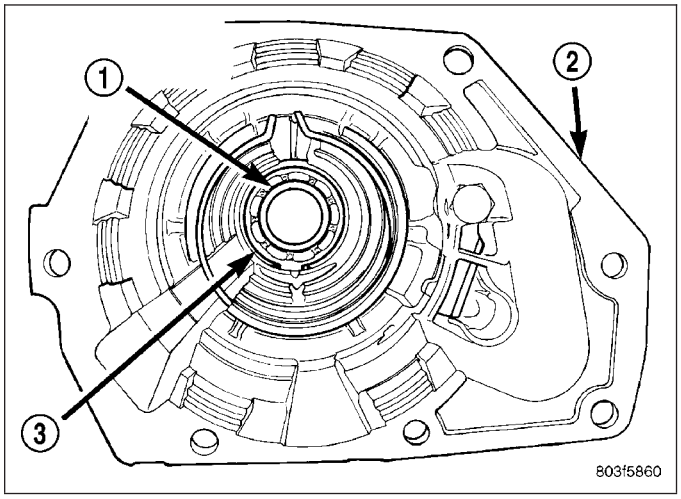
1. Place replacement bearing (1) in position on geartrain (5) with locating retainer groove toward the rear.
2. Push bearing (1) onto output shaft (3) until the snap-ring groove is visible.
3. Install snap-ring (2) to hold bearing onto output shaft (3).
4. Install overdrive geartrain (5) into housing.
5. Install overdrive unit in vehicle.



BEARING-OUTPUT SHAFT REAR

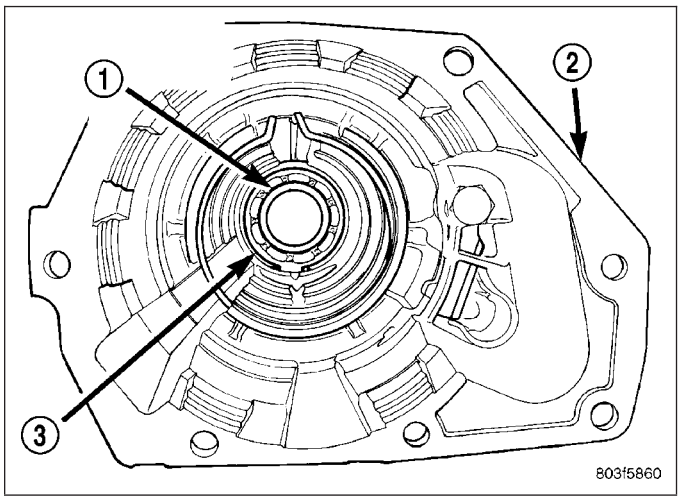
REMOVAL

1. Remove overdrive unit from the vehicle. (Refer to 21 - TRANSMISSION/AUTOMATIC/OVERDRIVE - REMOVAL)
2. Remove overdrive geartrain from housing.
3. Remove snap-ring (3) holding output shaft rear bearing (1) into overdrive housing (2).
4. Using a suitable driver inserted through the rear end of housing, drive bearing from housing.



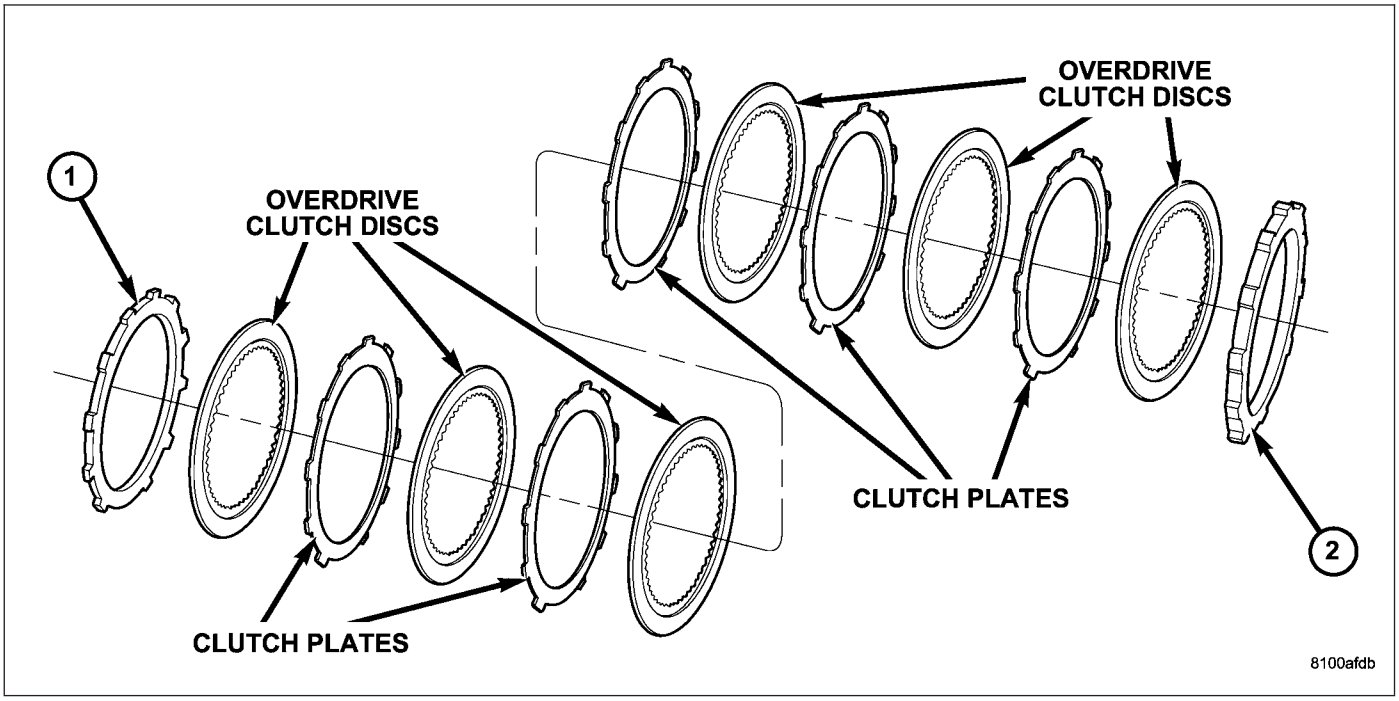
INSTALLATION

1. Place replacement bearing (1) in position in housing (2).
2. Using a suitable driver, drive bearing (1) into housing (2) until the snap-ring groove is visible.
3. Install snap-ring (3) to hold bearing into housing.
4. Install overdrive geartrain into housing.
5. Install overdrive unit in vehicle.



CLUTCH-OVERDRIVE

DESCRIPTION



Overdrive Clutch

1 - REACTION PLATE
2 - PRESSURE PLATE

The overdrive clutch is composed of the pressure plate (2), clutch plates, holding discs, overdrive piston retainer, piston, piston spacer, and snap-rings. The overdrive clutch is the forwardmost component in the transmission overdrive unit and is considered a holding component. The overdrive piston retainer, piston, and piston spacer are located on the rear of the main transmission case.

NOTE: The number of discs and plates may vary with each engine and vehicle combination.

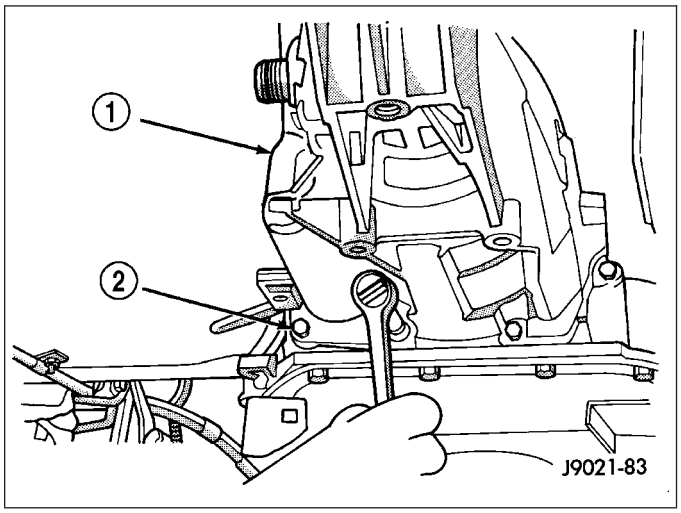
OPERATION

To apply the clutch, pressure is applied between the piston retainer and piston. The fluid pressure is provided by the oil pump, transferred through the control valves and passageways, and enters the clutch through passages at the lower rear portion of the valve body area. With pressure applied between the piston retainer and piston, the piston moves away from the piston retainer and compresses the clutch pack. This action applies the clutch pack, allowing torque to flow through the intermediate shaft into the overdrive planetary gear set. The overdrive clutch discs are attached to the overdrive clutch hub while the overdrive clutch plates, reaction plate, and pressure plate are lugged to the overdrive housing. This allows the intermediate shaft to transfer the engine torque to the planetary gear and overrunning clutch. This drives the planetary gear inside the annulus, which is attached to the overdrive clutch drum and output shaft, creating the desired gear ratio. The waved snap-ring is used to cushion the application of the clutch pack for the 5 disc version of the overdrive clutch. The 6 disc overdrive clutch does not use a waved snap-ring.

UNIT-OVERDRIVE

REMOVAL

1. Shift transmission into PARK.
2. Raise vehicle.
3. Remove transfer case, if equipped.
4. Mark propeller shaft universal joint(s) and axle pinion yoke, or the companion flange and flange yoke, for alignment reference at installation, if necessary.
5. Disconnect and remove the rear propeller shaft, if necessary. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
6. Remove transmission oil pan, remove gasket, drain oil and reinstall pan.
7. If overdrive unit had malfunctioned, or if fluid is contaminated, remove entire transmission. If diagnosis indicated overdrive problems only, remove just the overdrive unit.
8. Support transmission with transmission jack.
9. Remove bolts (2) attaching overdrive unit (1) to transmission.

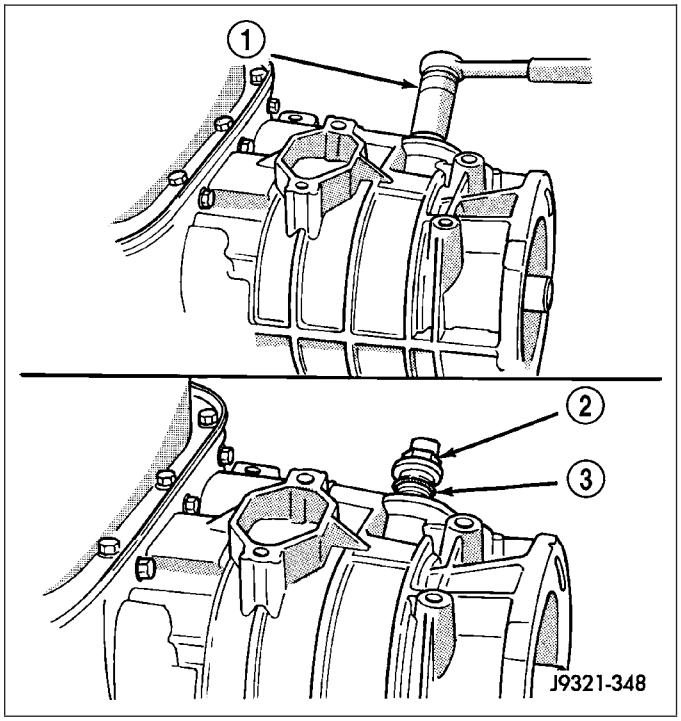


CAUTION: Support the overdrive unit with a jack before moving it rearward. This is necessary to prevent damaging the intermediate shaft. Do not allow the shaft to support the entire weight of the overdrive unit.

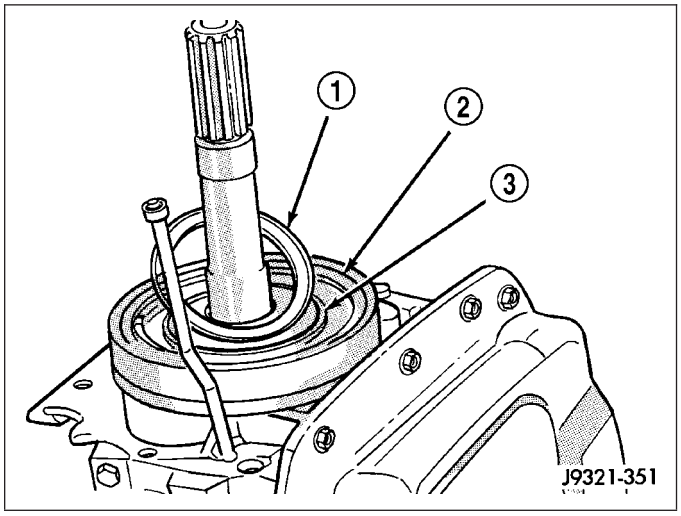
10. Carefully work overdrive unit off intermediate shaft. Do not tilt unit during removal. Keep it as level as possible.
11. If overdrive unit does not require service, immediately insert Alignment Tool 6227-2 in splines of planetary gear and overrunning clutch to prevent splines from rotating out of alignment. If misalignment occurs, overdrive unit will have to be disassembled in order to realign splines.
12. Remove and retain overdrive piston thrust bearing. Bearing may remain on piston or in clutch hub during removal.
13. Position drain pan on workbench.
14. Place overdrive unit over drain pan. Tilt unit to drain residual fluid from case.
15. Examine fluid for clutch material or metal fragments. If fluid contains these items, overhaul will be necessary.
16. If overdrive unit does not require any service, leave alignment tool in position. Tool will prevent accidental misalignment of planetary gear and overrunning clutch splines.

DISASSEMBLY

1. Remove transmission speed sensor (2) and o-ring seal (3) from overdrive case.

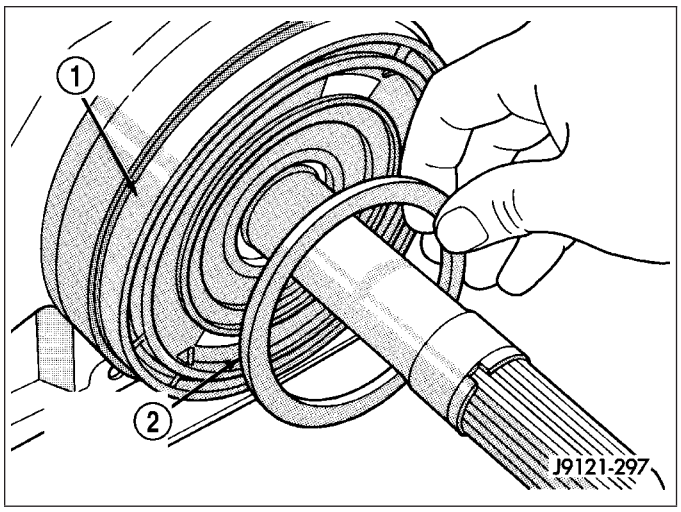


2. Remove overdrive piston thrust bearing (1).

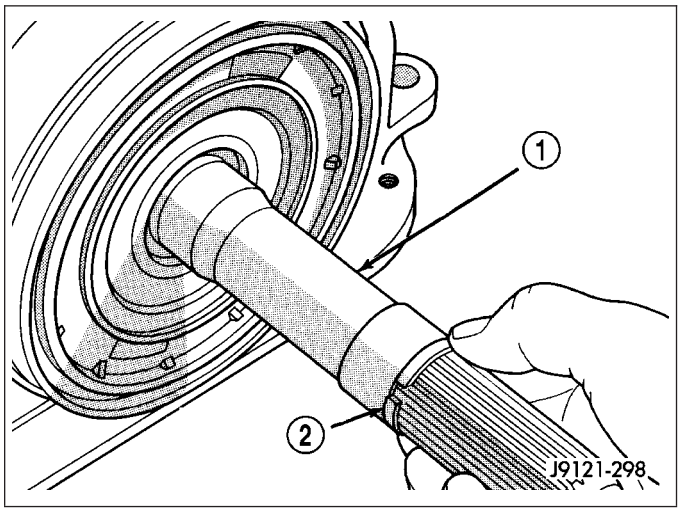


OVERDRIVE PISTON

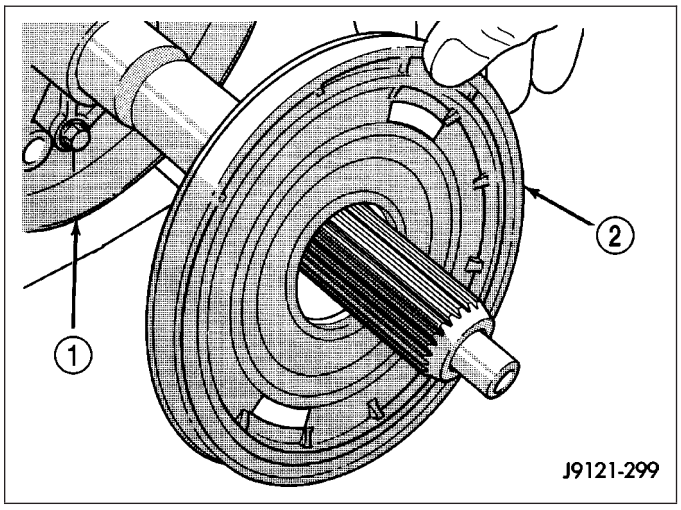
1. Remove overdrive piston thrust plate (2). Retain thrust plate. It is a select fit part and may possibly be reused.



2. Remove intermediate shaft spacer (2). Retain spacer. It is a select fit part and may possibly be reused.

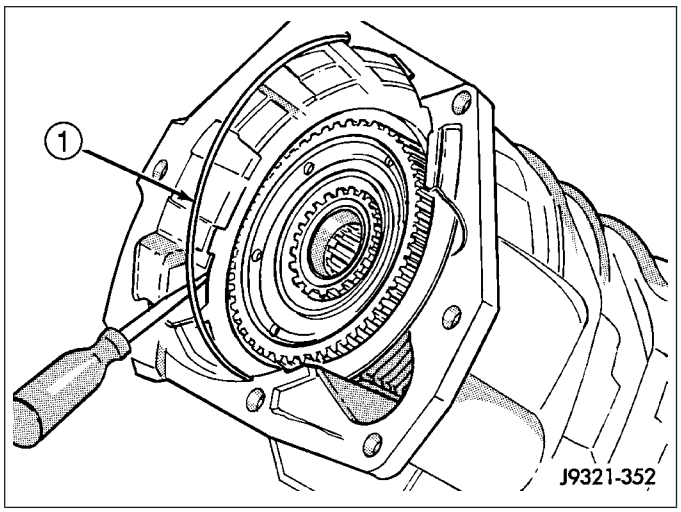


3. Remove overdrive piston (2) from retainer (1).

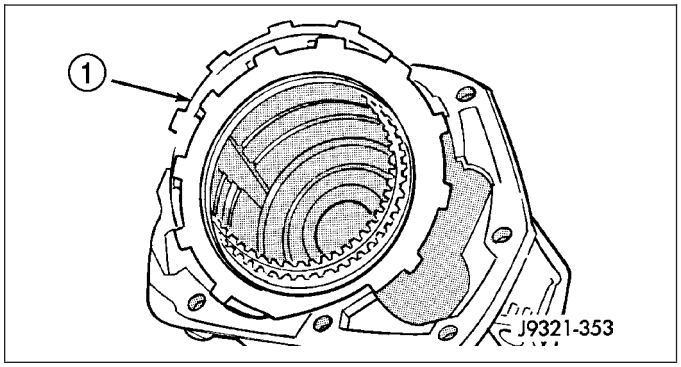


OVERDRIVE CLUTCH PACK

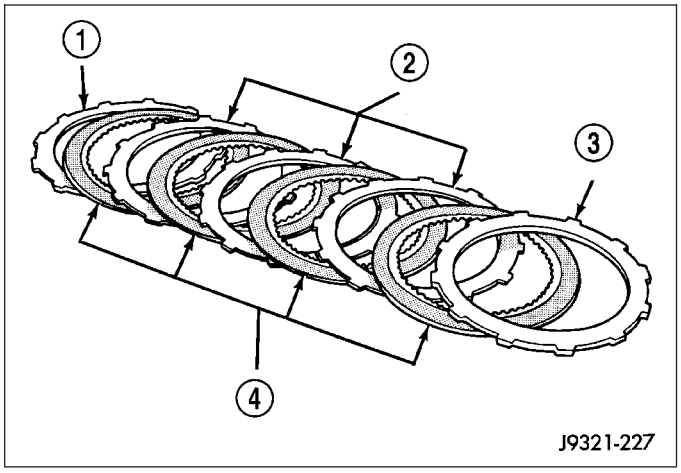
1. Remove overdrive clutch pack wire retaining ring (1).



2. Remove overdrive clutch pack (1).

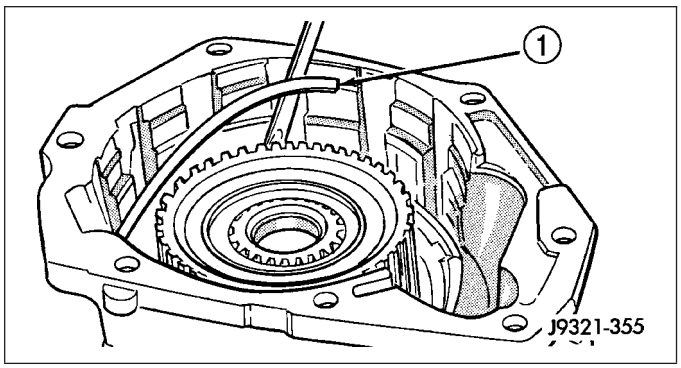


3. Note position of clutch pack components for assembly reference (1-4).

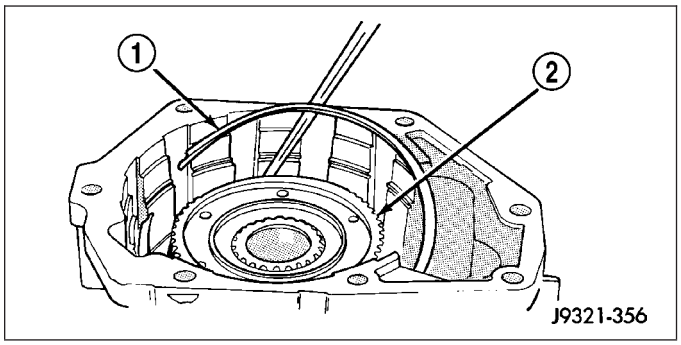


OVERDRIVE GEARTRAIN

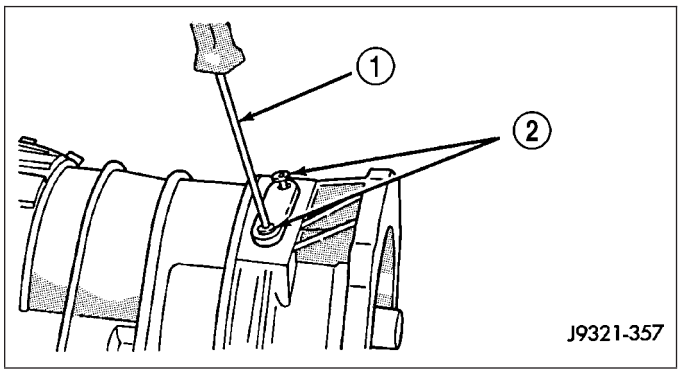
1. Remove overdrive clutch wave spring (1), 5 disc clutch only.



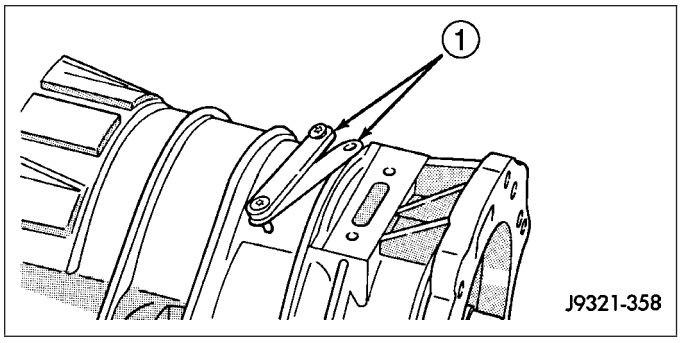
2. Remove overdrive clutch reaction snap-ring (1). Note that snap-ring is located in same groove as wave spring.



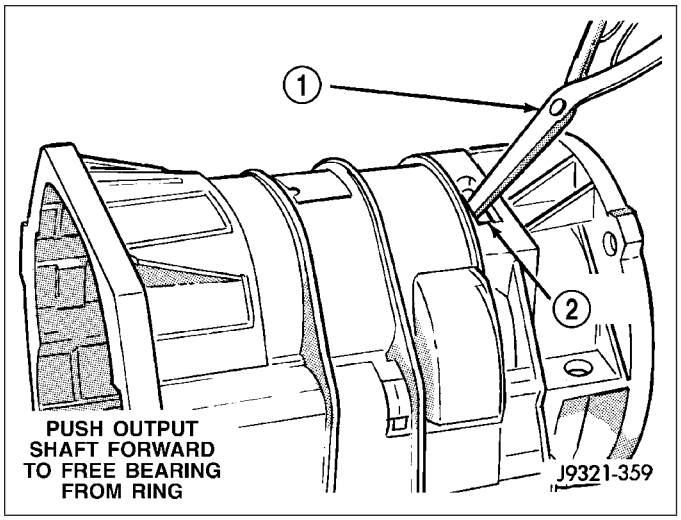
3. Remove Torx™ head screws (1) attach access cover and gasket to overdrive case.



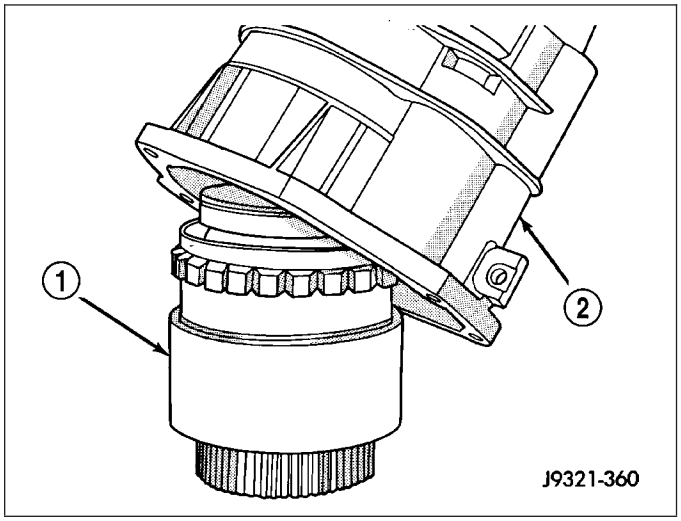
4. Remove access cover and gasket (1).



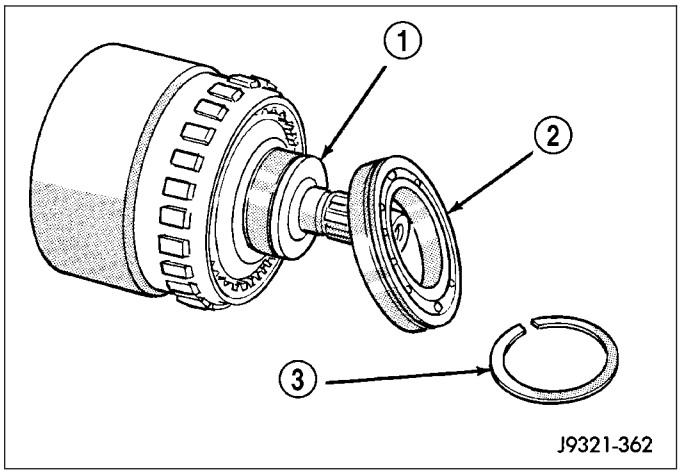
5. Expand output shaft bearing snap-ring (1) with expanding-type snap-ring pliers. Then push output shaft forward to release shaft bearing from locating ring.



6. Lift gear case (2) up and off geartrain assembly (1).



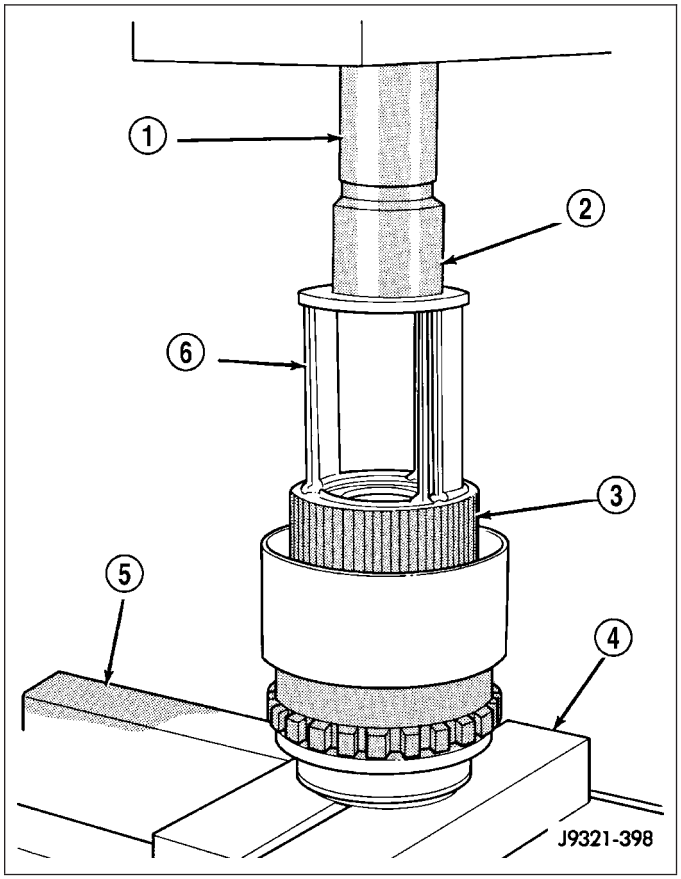
7. Remove snap-ring (3) that retains rear bearing (2) on output shaft (1).
8. Remove rear bearing from output shaft.



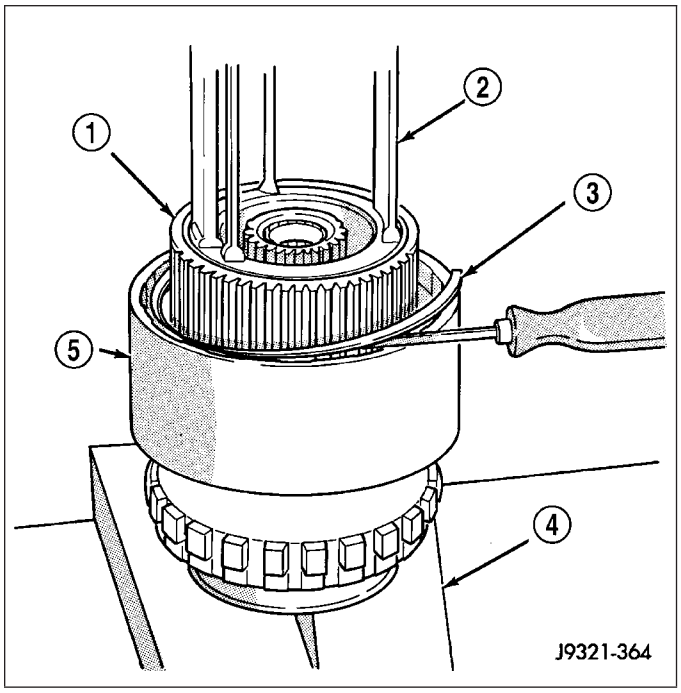
DIRECT CLUTCH, HUB AND SPRING

WARNING: THE NEXT STEP IN DISASSEMBLY INVOLVES COMPRESSING THE DIRECT CLUTCH SPRING. IT IS EXTREMELY IMPORTANT THAT PROPER EQUIPMENT BE USED TO COMPRESS THE SPRING AS SPRING FORCE IS APPROXIMATELY 830 POUNDS. USE SPRING COMPRESSOR TOOL 6227-1 AND A HYDRAULIC SHOP PRESS WITH A MINIMUM RAM TRAVEL OF 5-6 INCHES. THE PRESS MUST ALSO HAVE A BED THAT CAN BE ADJUSTED UP OR DOWN AS REQUIRED. RELEASE CLUTCH SPRING TENSION SLOWLY AND COMPLETELY TO AVOID PERSONAL INJURY.

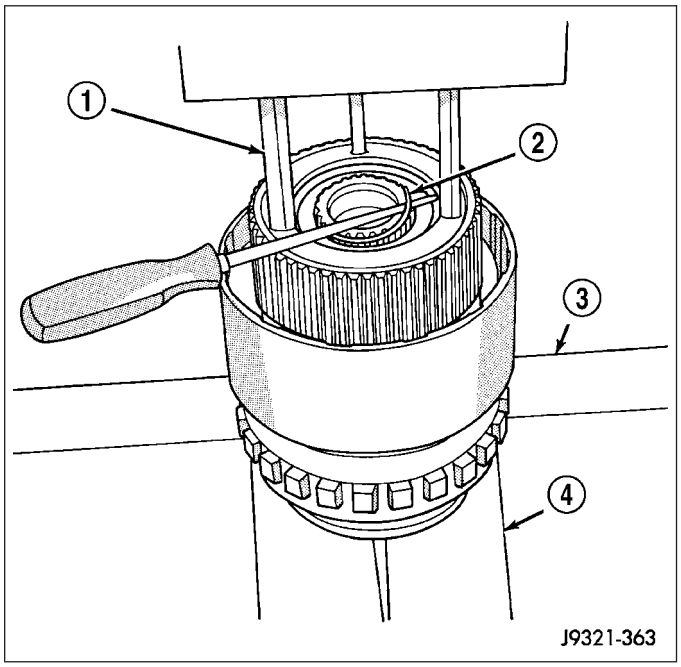
1. Mount geartrain assembly in shop press (1, 5).
2. Position Compressor Tool 6227-1 (6) on clutch hub (3). Support output shaft flange with steel press plates (4) as shown and center assembly under press ram (1).



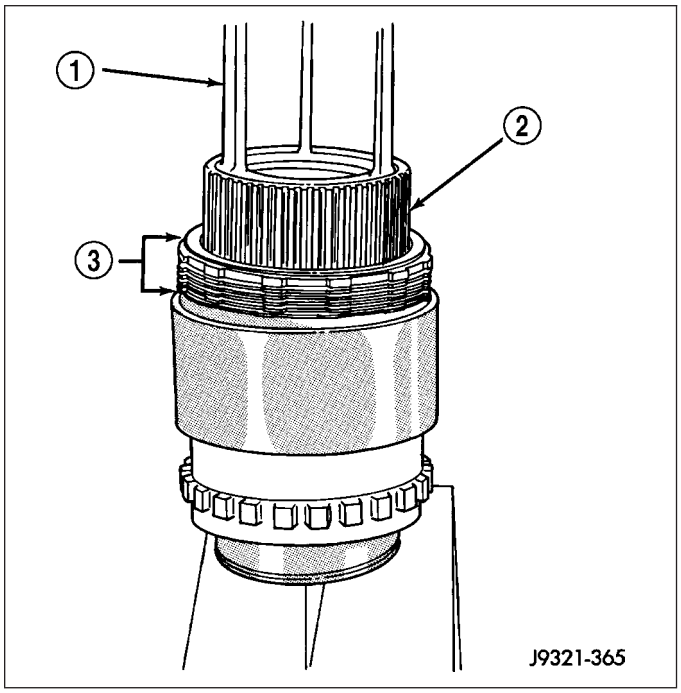
3. Apply press pressure slowly. Compress hub and spring far enough to expose clutch hub retaining ring (3) and relieve spring pressure on clutch pack snap-ring.
4. Remove direct clutch pack snap-ring (3).



5. Remove direct clutch hub retaining ring (2).

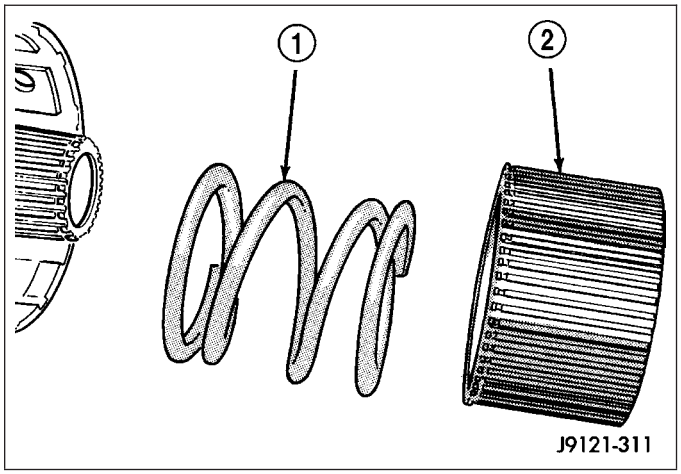


6. Release press load slowly and completely.
7. Remove Special Tool 6227-1 (1). Then remove clutch pack (3) from hub (2). Note the orientation of the clutch discs. The clutch pack consists of 10 double-sided friction discs and they must be installed in the same orientation as they were removed.

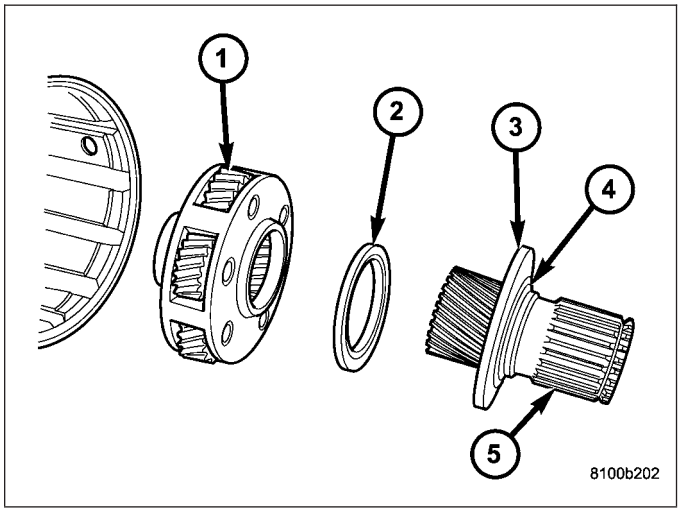


GEARTRAIN

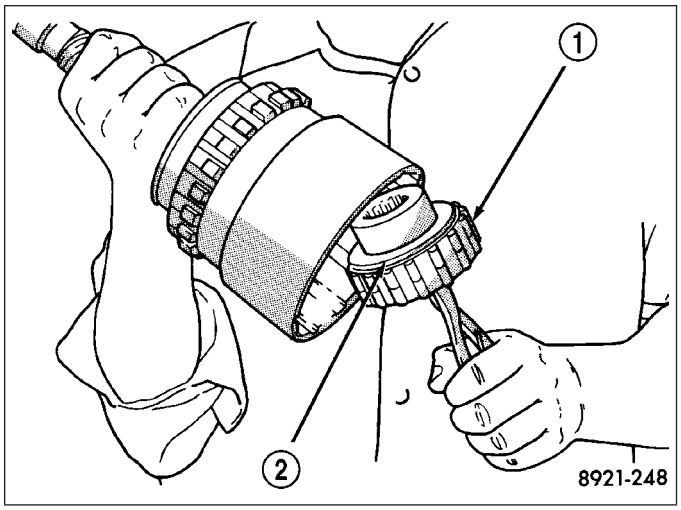
1. Remove direct clutch hub (2) and spring (1).



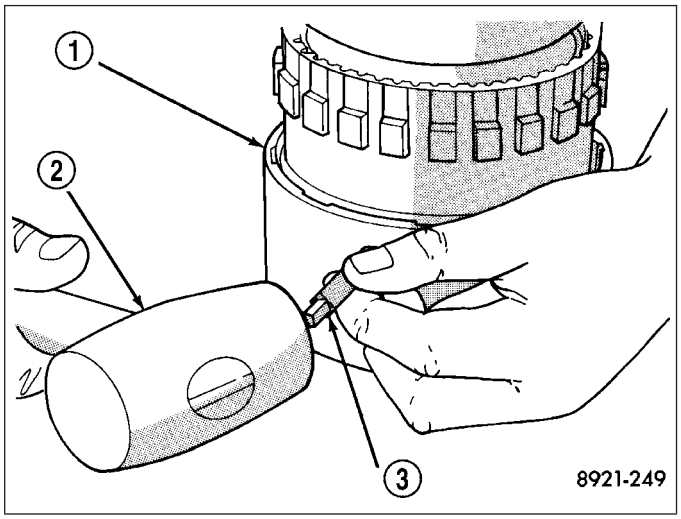
2. Remove sun gear (5) and spring plate (3). Then remove planetary thrust bearing (2) and planetary gear (1).



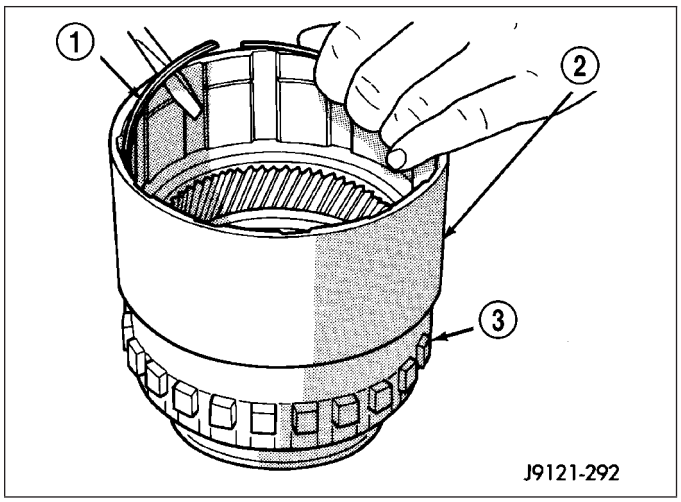
3. Remove overrunning clutch assembly (1) with expanding type snap-ring pliers. Insert pliers into clutch hub. Expand pliers to grip hub splines and remove clutch with counterclockwise, twisting motion.



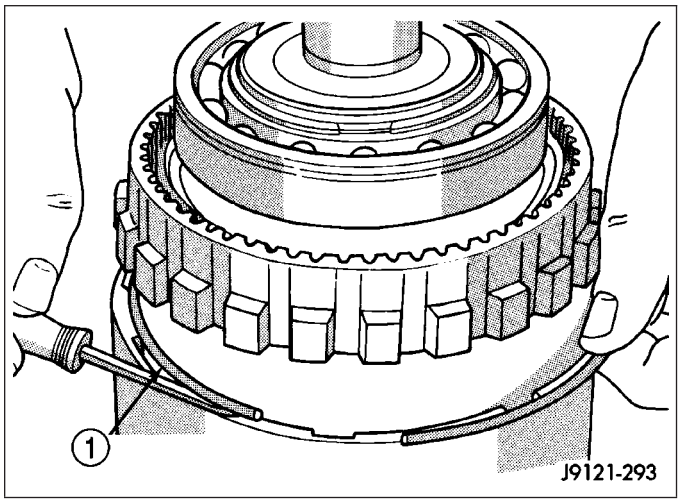
4. Remove thrust bearing from overrunning clutch hub.
5. Remove overrunning clutch from hub.
6. Mark position of annulus gear and direct clutch drum (1) for assembly alignment reference. Use small center punch (3) or scriber to make alignment marks.



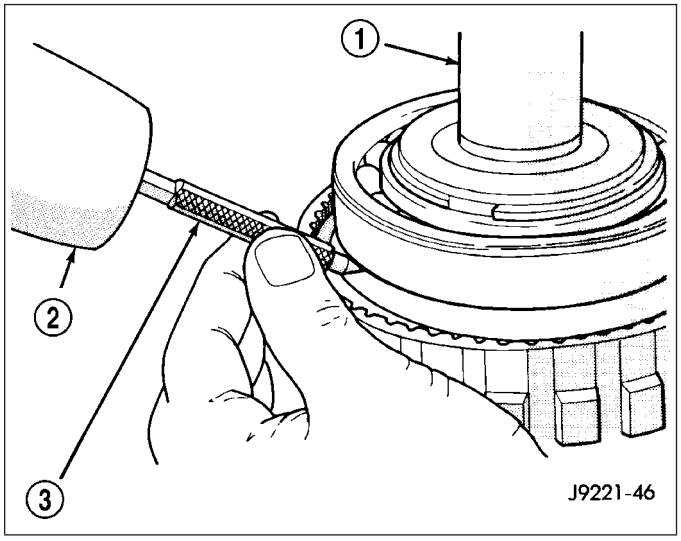
7. Remove direct clutch drum (2) rear retaining ring (1).



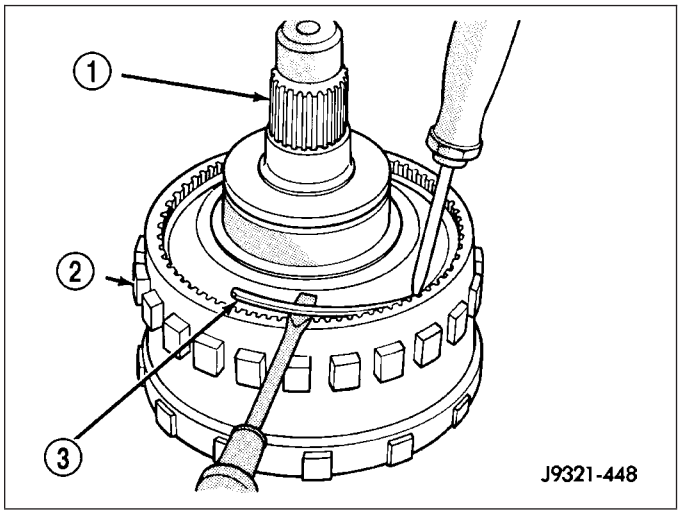
8. Remove direct clutch drum outer retaining ring (1).



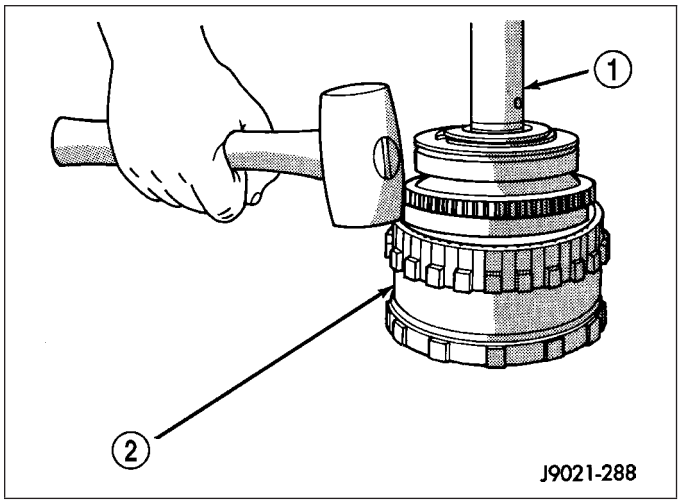
9. Mark annulus gear and output shaft (1) for assembly alignment reference. Use punch (3) or scriber to mark gear and shaft.



10. Remove snap-ring (3) that secures annulus gear (2) on output shaft (1). Use two screwdrivers to unseat and work snap-ring out of groove as shown.



11. Remove annulus gear (2) from output shaft (1). Use rawhide or plastic mallet to tap gear off shaft.



GEAR CASE AND PARK LOCK

1. Remove locating ring from gear case.
2. Remove park pawl shaft retaining bolt and remove shaft, pawl and spring.
3. Remove reaction plug snap-ring and remove reaction plug.
4. Remove output shaft seal.

CLEANING

Clean the geartrain and case components with solvent. Dry all parts except the bearings with compressed air. Allow bearings to air dry.

Do not use shop towels for wiping parts dry unless the towels are made from a lint-free material. A sufficient quantity of lint (from shop towels, cloths, rags, etc.) could plug the transmission filter and fluid passages.

Discard the old case gasket and seals. Do not attempt to salvage these parts. They are not reusable. Replace any of the overdrive unit snap-rings if distorted or damaged.

Minor nicks or scratches on components can be smoothed with crocus cloth. However, do not attempt to reduce severe scoring on any components with abrasive materials. Replace severely scored components; do not try to salvage them.

INSPECTION

Check condition of the park lock components and the overdrive case.

Check the bushings in the overdrive case. Replace the bushings if severely scored or worn. Also replace the case seal if loose, distorted, or damaged.

Examine the overdrive and direct clutch discs and plates. Replace the discs if the facing is worn, severely scored, or burned and flaking off. Replace the clutch plates if worn, heavily scored, or cracked. Check the lugs on the clutch plates for wear. The plates should slide freely in the drum. Replace the plates or drum if binding occurs.

Check condition of the annulus gear, direct clutch hub, clutch drum and clutch spring. Replace the gear, hub and drum if worn or damaged. Replace the spring if collapsed, distorted, or cracked.

Be sure the splines and lugs on the gear, drum and hub are in good condition. The clutch plates and discs should slide freely in these components.

Inspect the thrust bearings and spring plate. Replace the plate if worn or scored. Replace the bearings if rough, noisy, brinnelled, or worn.

Inspect the planetary gear assembly and the sun gear and bushings. If either the sun gear or the bushings are damaged, replace the gear and bushings as an assembly. The gear and bushings are not serviced separately.

The planetary carrier and pinions must be in good condition. Also be sure the pinion pins are secure and in good condition. Replace the carrier if worn or damaged.

Inspect the overrunning clutch and race. The race surface should be smooth and free of scores. Replace the overrunning clutch assembly or the race if either assembly is worn or damaged in any way.

Replace the shaft pilot bushing and inner bushing if damaged. Replace either shaft bearing if rough or noisy. Replace the bearing snap-rings if distorted or cracked.

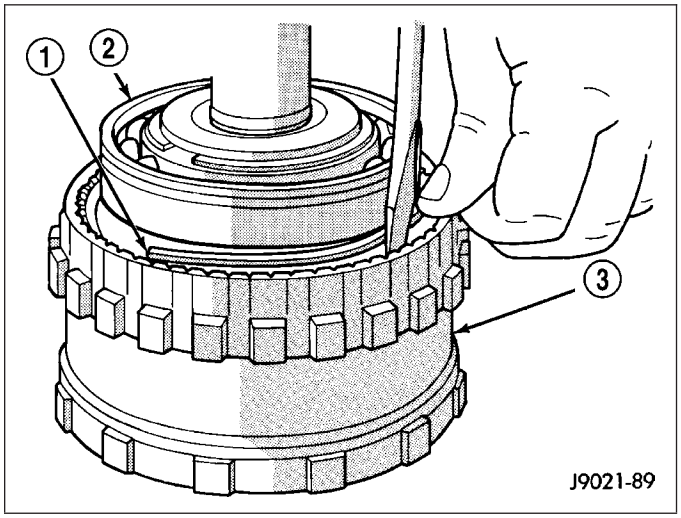
Check the machined surfaces on the output shaft. These surfaces should clean and smooth. Very minor nicks or scratches can be smoothed with crocus cloth. Replace the shaft if worn, scored or damaged in any way.

Inspect the output shaft bushings. The small bushing is the intermediate shaft pilot bushing. The large bushing is the overrunning clutch hub bushing. Replace either bushing if scored, pitted, cracked, or worn.

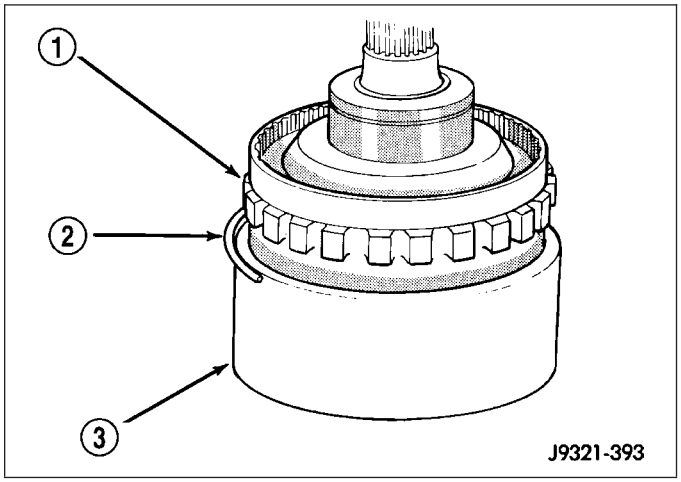
ASSEMBLY

GEARTRAIN AND DIRECT CLUTCH

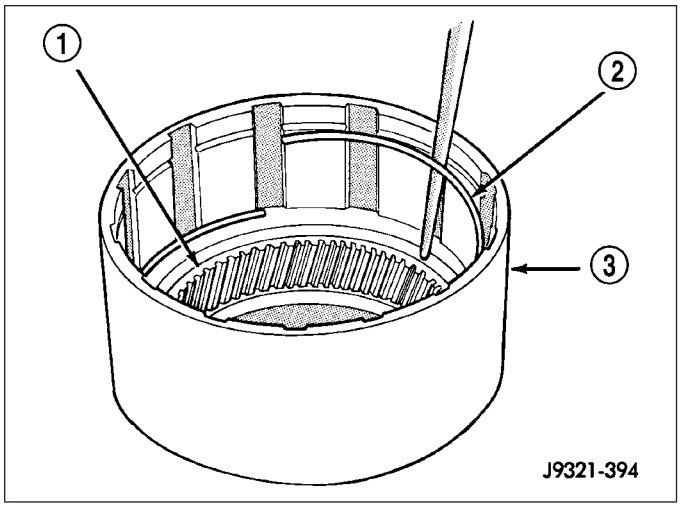
1. Soak direct clutch and overdrive clutch discs in Mopar® ATF +4, Automatic Transmission fluid. Allow discs to soak for 10-20 minutes.
2. Install annulus gear (3) on output shaft, if removed. Then install annulus gear retaining snap-ring (1).



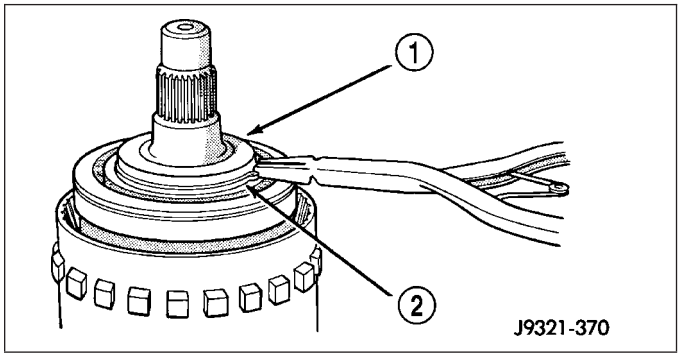
3. Align and install clutch drum (3) on annulus gear (1). Be sure drum is engaged in annulus gear lugs.
4. Install clutch drum outer retaining ring (2).



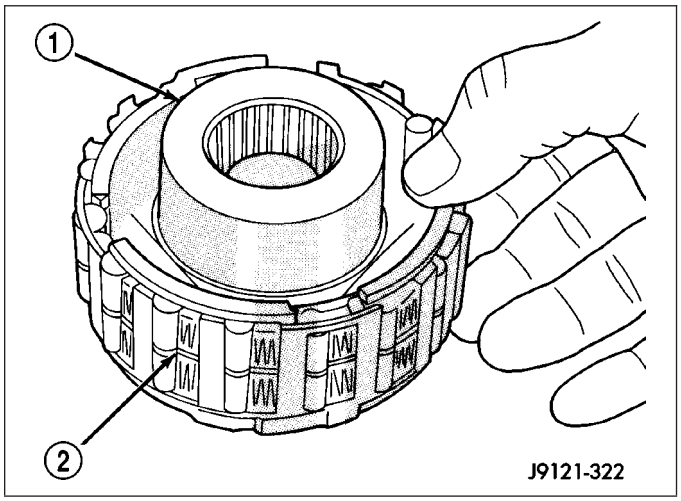
5. Slide clutch drum (3) forward and install inner retaining ring (2).



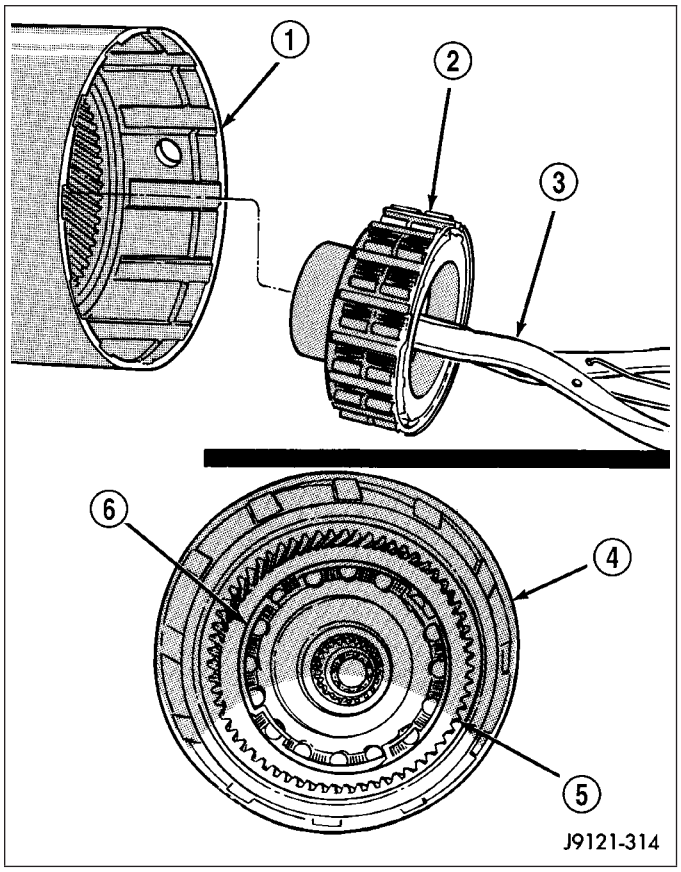
6. Install rear bearing (1) and snap-ring (2) on output shaft. Be sure locating ring groove in bearing is toward rear.



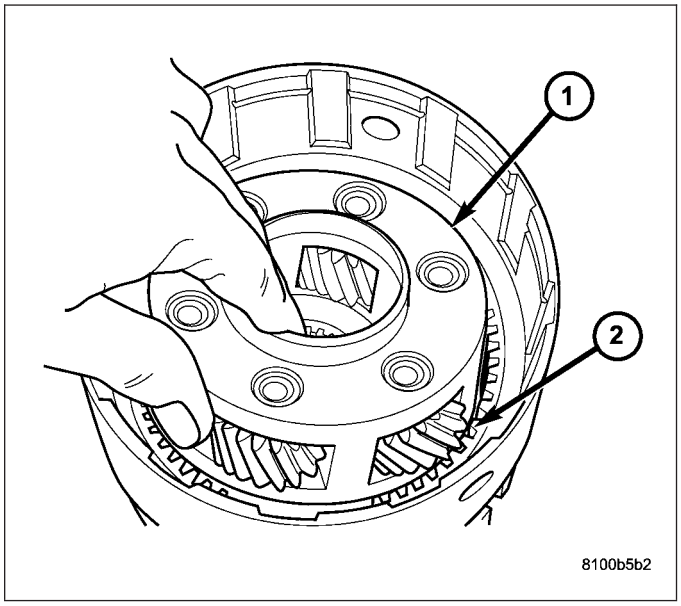
7. Install overrunning clutch (2) on hub (1). Note that clutch only fits one way. Shoulder on clutch should seat in small recess at edge of hub.
8. Install thrust bearing on overrunning clutch hub. Use generous amount of petroleum jelly to hold bearing in place for installation. Bearing fits one way only. Be sure bearing is seated squarely against hub. Reinstall bearing if it does not seat squarely.



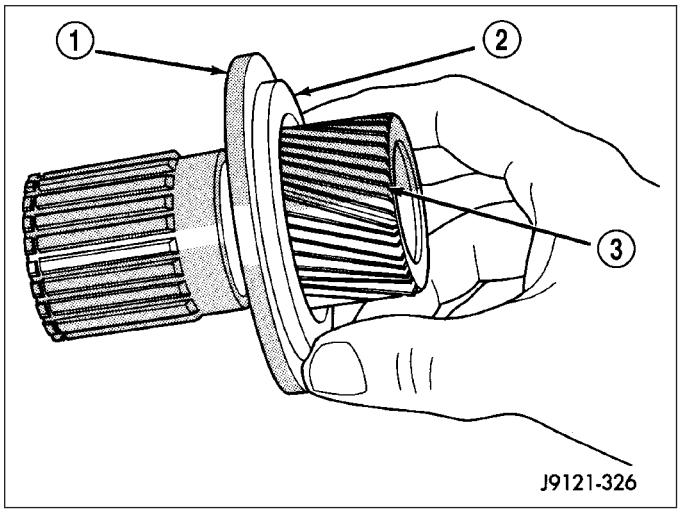
9. Install overrunning clutch (2) in output shaft (6). Insert snap-ring pliers in hub splines. Expand pliers to grip hub. Then install assembly with counter-clockwise, twisting motion.



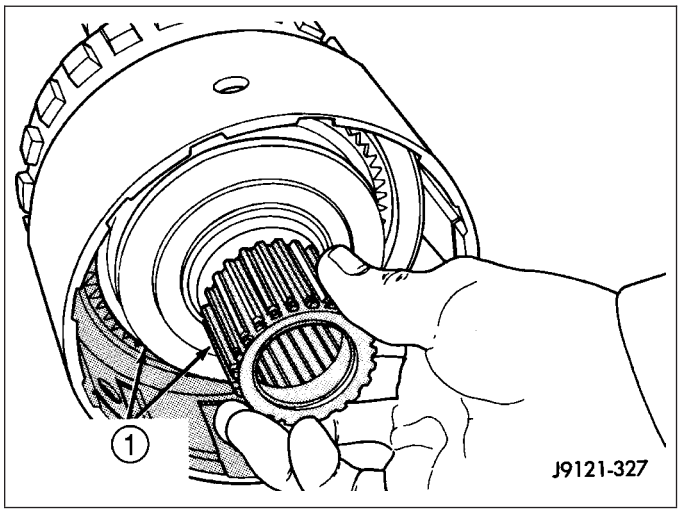
10. Install planetary gear (1) in annulus gear (2). Be sure planetary pinions are fully seated in annulus gear before proceeding.



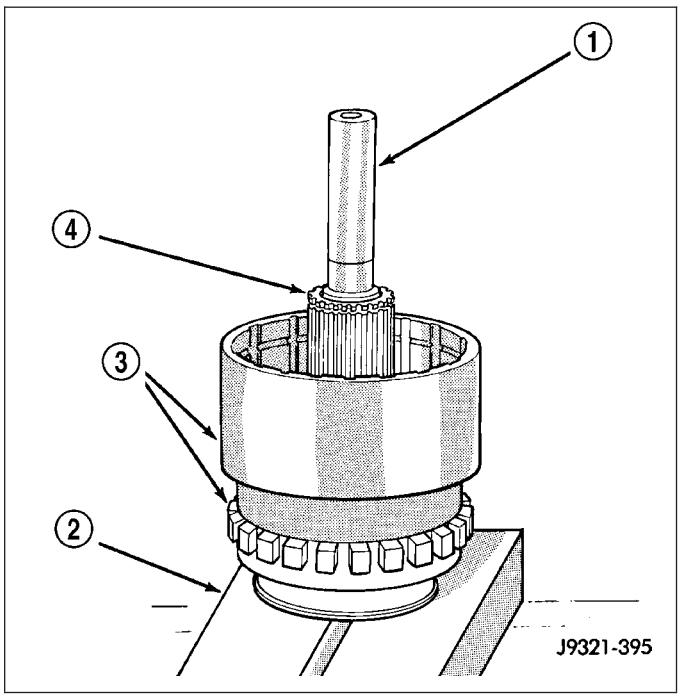
11. Coat planetary thrust bearing (2) and bearing contact surface of spring plate with generous amount of petroleum jelly. This will help hold bearing in place during installation.
12. Install planetary thrust bearing (2) on sun gear (3). Slide bearing onto gear and seat it against spring plate as shown. Bearing fits one way only. If it does not seat squarely against spring plate, remove and reposition bearing.



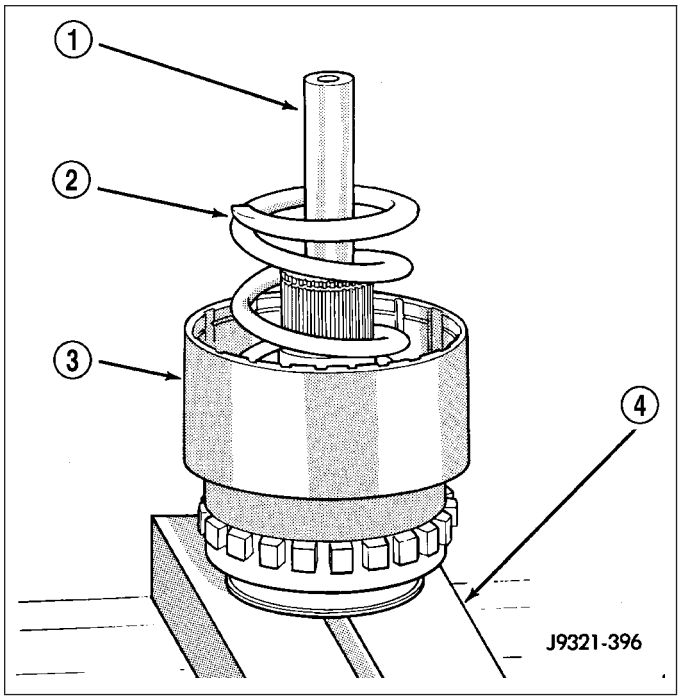
13. Install assembled sun gear, spring plate, and thrust bearing (1). Be sure sun gear and thrust bearing are fully seated before proceeding.



14. Mount assembled output shaft, annulus gear, and clutch drum in shop press (3). Direct clutch spring, hub and clutch pack are easier to install with assembly mounted in press.
15. Align splines in hubs of planetary gear and overrunning clutch with Alignment tool 6227-2 (1). Insert tool through sun gear and into splines of both hubs. Be sure alignment tool is fully seated before proceeding.

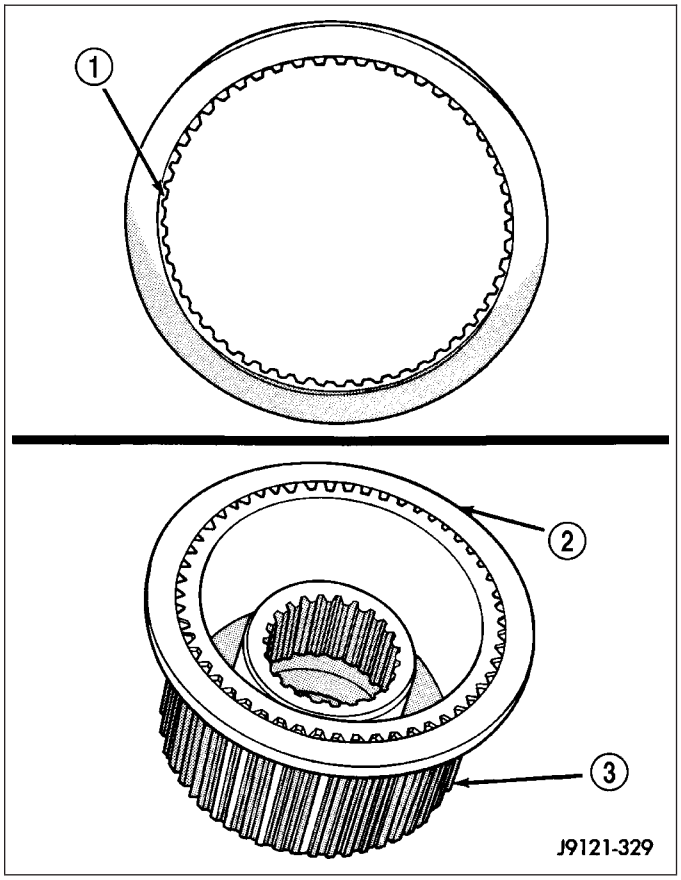


16. Install direct clutch spring (2). Be sure spring is properly seated on spring plate (4).

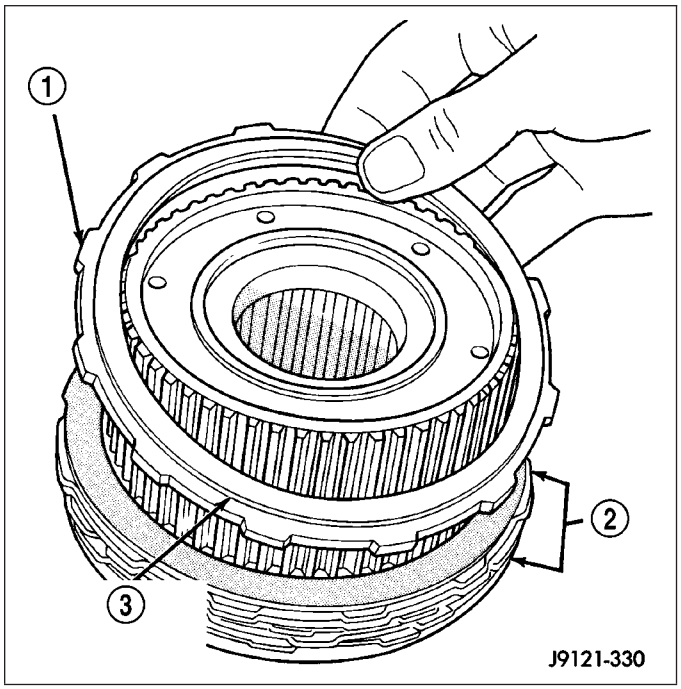


NOTE: The direct clutch in a 48RE transmission uses 10 double-sided clutch discs.

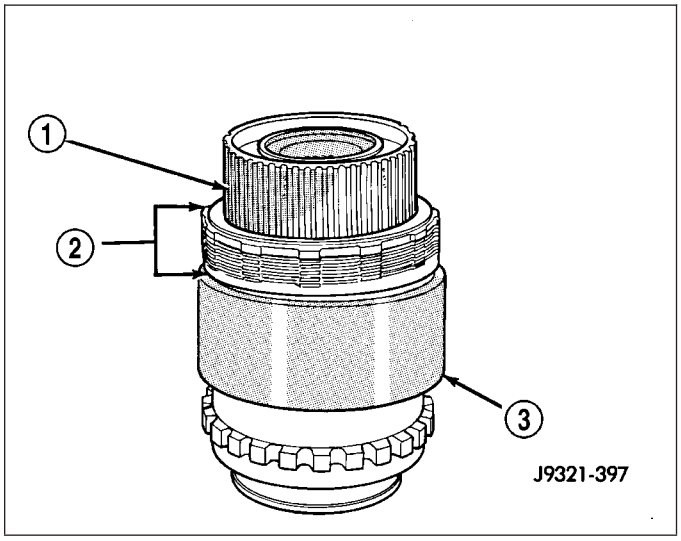
17. Assemble and install direct clutch pack on hub as follows:
    a. Install direct clutch reaction plate (2) on clutch hub first. Note that one side of reaction plate is counterbored (1). Be sure this side faces rearward. Splines at rear of hub (3) are raised slightly. Counterbore in plate fits over raised splines. Plate should be flush with this end of hub (3).
    b. Install first friction disc with internal splines, followed by a steel seperator disc with external lugs. Continue alternating internal and external discs until all discs have been installed.



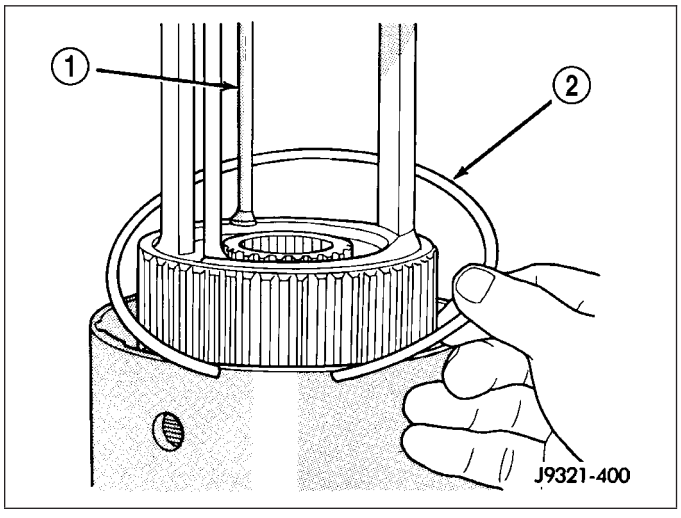
18. Install pressure plate (1). This is last clutch pack (2)item to be installed. Be sure plate is installed with shoulder side facing upward (3).



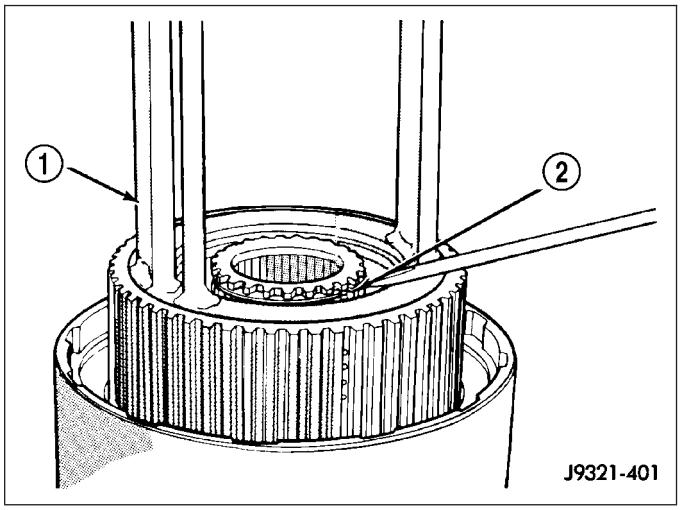
19. Install clutch hub (1) and clutch pack (2) on direct clutch spring. Be sure hub is started on sun gear splines before proceeding.



WARNING: THE NEXT STEP IN GEARTRAIN ASSEMBLY INVOLVES COMPRESSING THE DIRECT CLUTCH HUB AND SPRING. IT IS EXTREMELY IMPORTANT THAT PROPER EQUIPMENT BE USED TO COMPRESS THE SPRING AS SPRING FORCE IS APPROXIMATELY 830 POUNDS. USE COMPRESSOR TOOL C-6227-1 AND A HYDRAULIC-TYPE SHOP PRESS WITH A MINIMUM RAM TRAVEL OF 6 INCHES. THE PRESS MUST ALSO HAVE A BED THAT CAN BE ADJUSTED UP OR DOWN AS REQUIRED. RELEASE CLUTCH SPRING TENSION SLOWLY AND COMPLETELY TO AVOID PERSONAL INJURY.

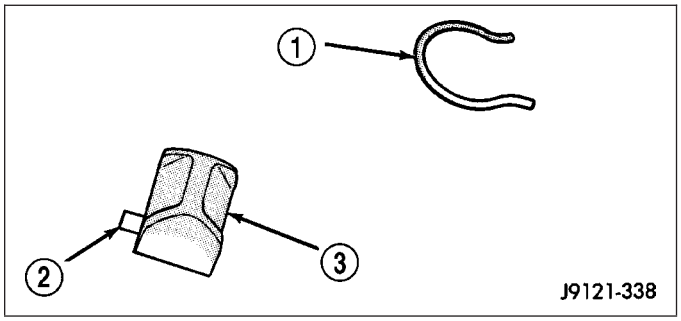


20. Position Compressor Tool 6227-1 (1) on clutch hub.
21. Compress clutch hub and spring just enough to place tension on hub and hold it in place.
22. Slowly compress clutch hub and spring. Compress spring and hub only enough to expose ring grooves for clutch pack snap-ring and clutch hub retaining ring.
23. Realign clutch pack on hub and seat clutch discs and plates in clutch drum.
24. Install direct clutch pack snap-ring (2). **Be very sure snap-ring is fully seated in clutch drum ring groove.**
25. Install clutch hub retaining ring (2). Be very sure retaining ring is fully seated in sun gear ring groove.
26. Slowly release press ram, remove compressor tools and remove geartrain assembly.

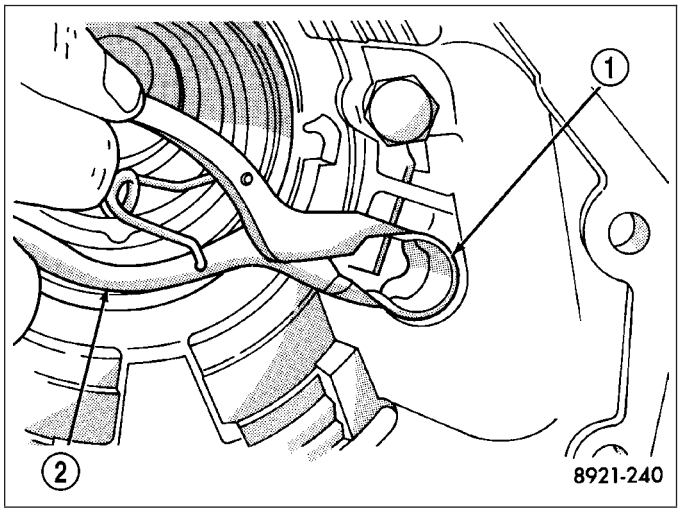


GEAR CASE

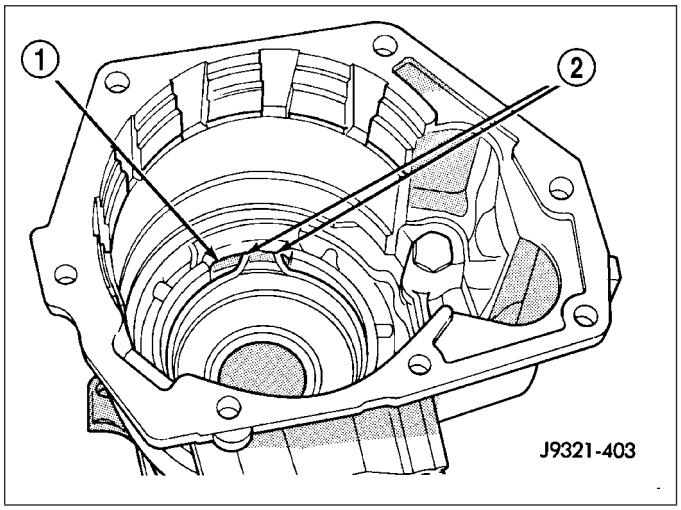
1. Position park pawl and spring in case and install park pawl shaft. Verify that end of spring with 90° bend is hooked to pawl and straight end of spring is seated against case.
2. Install pawl shaft retaining bolt. Tighten bolt to 27 N·m (20 ft. lbs.) torque.
3. Install park lock reaction plug (3). Note that plug has locating pin (2) at rear. Be sure pin is seated in hole in case before installing snap-ring (1).



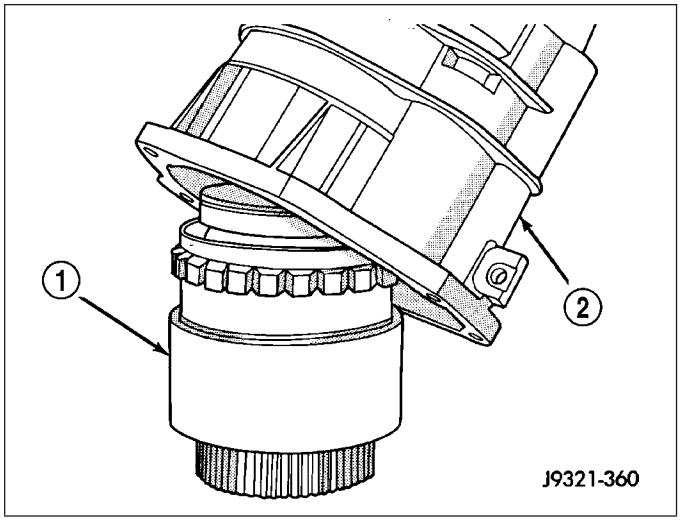
4. Install reaction plug snap-ring (1). Compress snap-ring only enough for installation; do not distort it.



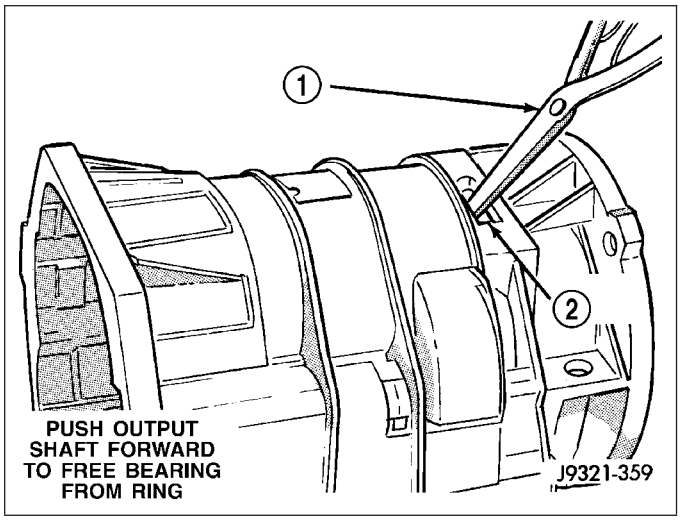
5. Verify that tab ends of rear bearing locating ring (2) extend into access hole (1) in gear case.



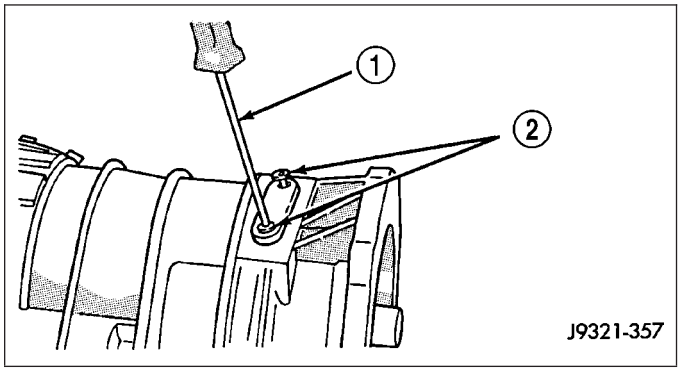
6. Support geartrain on Tool 6227-1. Be sure tool is securely seated in clutch hub.
7. Install overdrive gear case (2) on geartrain (1).



8. Expand front bearing locating ring with snap-ring pliers (1). Then slide case downward until locating ring locks in bearing groove and release snap-ring.



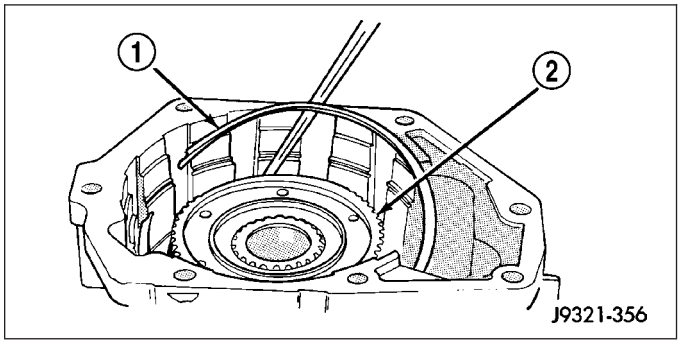
9. Install locating ring access cover, gasket and screws (2) in overdrive unit case.



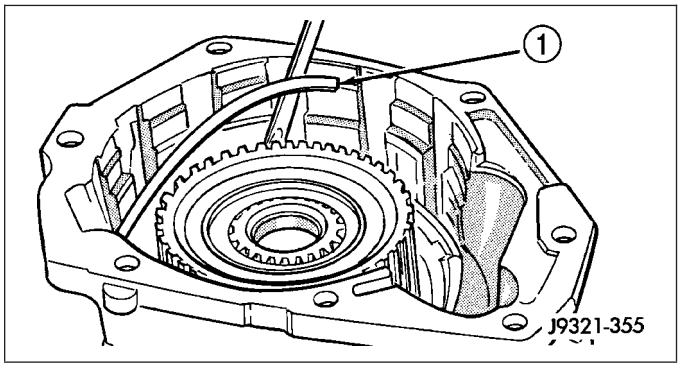
OVERDRIVE CLUTCH

NOTE: The overdrive clutch in a 48RE transmission uses 5 or 6 clutch discs depending on the application.

1. Install overdrive clutch reaction ring (1) first. Reaction ring is flat with notched ends.

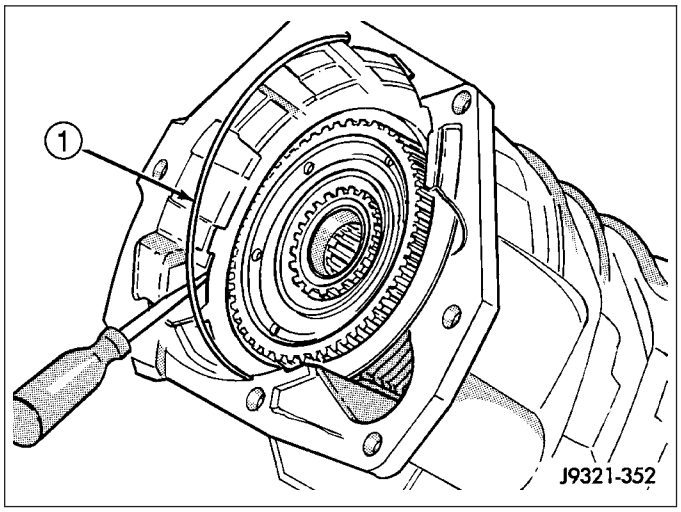


2. For 5 disc overdrive clutch versions, install wave spring (1) on top of reaction ring. Reaction ring and wave ring both fit in same ring groove. Use screwdriver to seat each ring securely in groove. Also ensure that the ends of the two rings are offset from each other.
3. Assemble overdrive clutch pack.
4. Install overdrive clutch reaction plate first.



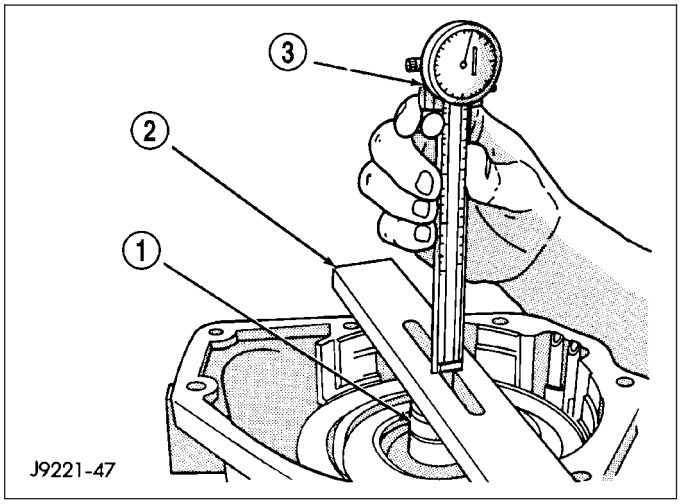
5. Install first clutch disc followed by first clutch plate. Then install remaining clutch discs and plates in same order.
6. Install clutch pack pressure plate.

7. Install clutch pack wire-type retaining ring (1).



INTERMEDIATE SHAFT SPACER SELECTION

1. Place overdrive unit in vertical position. Mount it on blocks, or in workbench with appropriate size mounting hole cut into it. Be sure unit is facing upward for access to direct clutch hub. Also be sure output shaft is not loaded and internal components are moved rearward for accurate measurement.
2. Determine correct thickness intermediate shaft spacer as follows:
   a. Insert Special Tool 6312 (1) through sun gear, planetary gear and into pilot bushing in output shaft. Be sure tool bottoms against planetary shoulder.
   b. Position Gauge Tool 6311 (2) across face of overdrive case. Then position Dial Caliper over gauge tool.



   c. Extend sliding scale of dial caliper downward through gauge tool slot until scale contacts end of Gauge Alignment Tool 6312 (1). Lock scale in place. Remove dial caliper tool and note distance measured.

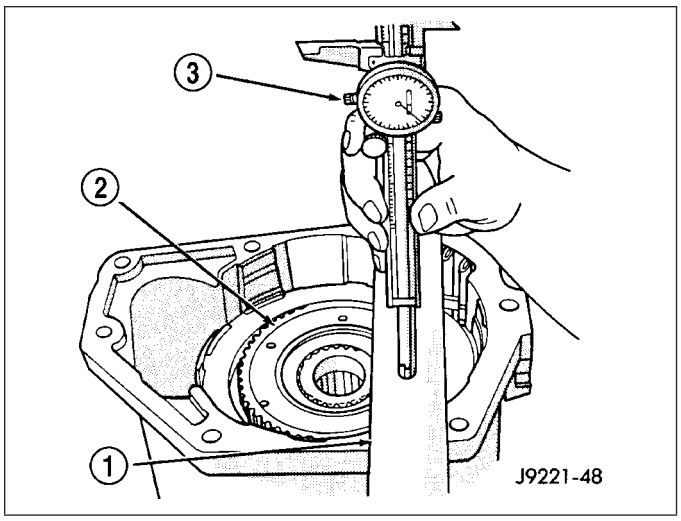
3. Select proper thickness end play spacer from spacer chart based on distance measured.
4. Remove Gauge Alignment Tool 6312.

End Play Measurement (Inches)	Spacer Thickness (Inches)
.7336 - .7505	.158 - .159
.7506 - .7675	.175 - .176
.7676 - .7855	.193 - .194
.7856 - .8011	.211 - .212

J9121-341

OD THRUST PLATE SELECTION

1. Place overdrive unit in vertical position. Mount it on blocks, or in workbench with appropriate size mounting hole cut into it. Be sure unit is facing upward for access to direct clutch hub. Also be sure output shaft is not loaded and internal components are moved rearward for accurate measurement.
2. Determine correct thickness overdrive piston thrust plate as follows:
   a. Position Gauge Tool 6311 (1) across face of overdrive case. Then position Dial Caliper over gauge tool.
   b. Measure distance to clutch hub thrust bearing seat (2) at four points 90° apart. Then average measurements by adding them and dividing by 4.



3. Select and install required thrust plate from information in thrust plate chart.
4. Leave Alignment Tool 6227-2 in place. Tool will keep planetary and clutch hub splines in alignment until overdrive unit is ready for installation on transmission.
5. Transmission speed sensor can be installed at this time if desired. However, it is recommended that sensor not be installed until after overdrive unit is secured to transmission.

End Play Measurement (Inches)	Spacer Thickness (Inches)
1.7500 - 1.7649	.108 - .110
1.7650 - 1.7799	.123 - .125
1.7800 - 1.7949	.138 - .140
1.7950 - 1.8099	.153 - .155
1.8100 - 1.8249	.168 - .170
1.8250 - 1.8399	.183 - .185
1.8400 - 1.8549	.198 - .200
1.8550 - 1.8699	.213 - .215
1.8700 - 1.8849	.228 - .230
1.8850 - 1.8999	.243 - .245

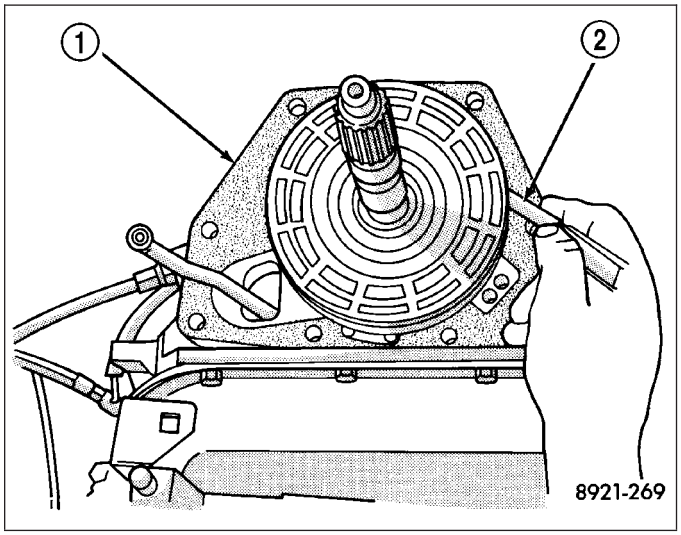
J9121-342

OVERDRIVE PISTON

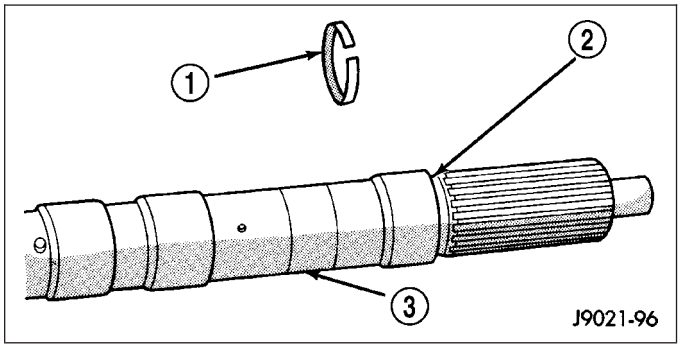
1. Install new seals on overdrive piston.
2. Stand transmission case upright on bellhousing.
3. Position Guide Ring 8114-1 on outer edge of overdrive piston retainer.
4. Position Seal Guide 8114-3 on inner edge of overdrive piston retainer.
5. Install overdrive piston in overdrive piston retainer by:
   a. Aligning locating lugs on overdrive piston to the two mating holes in retainer.
   b. Lubricate overdrive piston seals with Mopar® ATF+4.
   c. Install piston over Seal Guide 8114-3 and inside Guide Ring 8114-1.
   d. Push overdrive piston into position in retainer.
   e. Verify that the locating lugs entered the lug bores in the retainer.
6. Install intermediate shaft spacer on intermediate shaft.
7. Install overdrive piston thrust plate on overdrive piston.
8. Install overdrive piston thrust bearing on overdrive piston.
9. Install transmission speed sensor and o-ring seal in overdrive case.

INSTALLATION

1. Be sure overdrive unit Alignment Tool 6227-2 is fully seated before moving unit. If tool is not seated and gear splines rotate out of alignment, overdrive unit will have to be disassembled in order to realign splines.
2. If overdrive piston retainer was not removed during service and original case gasket is no longer reusable, prepare new gasket by trimming it.
3. Cut out old case gasket (1) around piston retainer with razor knife (2).
4. Use old gasket as template and trim new gasket to fit.
5. Position new gasket over piston retainer and on transmission case. Use petroleum jelly to hold gasket in place if necessary. Do not use any type of sealer to secure gasket. Use petroleum jelly only.



6. Install selective spacer (1) on intermediate shaft (3), if removed. Spacer goes in groove just rearward of shaft rear splines.



7. Install thrust bearing in overdrive unit sliding hub. Use petroleum jelly to hold bearing in position.

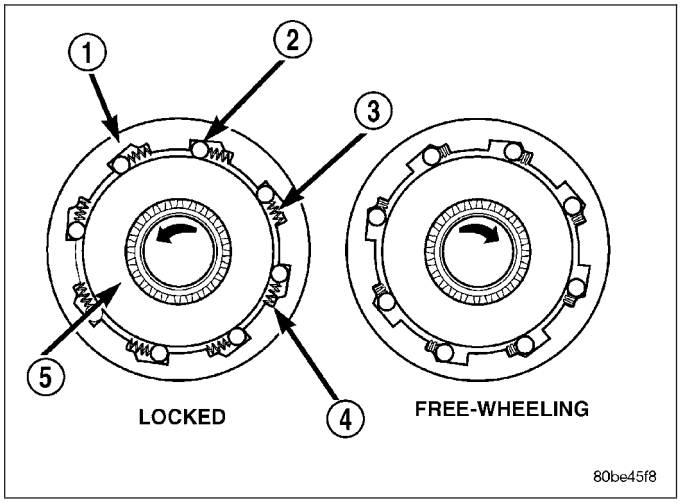
CAUTION: Be sure the shoulder on the inside diameter of the bearing is facing forward.

8. Verify that splines in overdrive planetary gear and overrunning clutch hub are aligned with Alignment Tool 6227-2. Overdrive unit cannot be installed if splines are not aligned. If splines have rotated out of alignment, unit will have to be disassembled to realign splines.
9. Carefully slide Alignment Tool 6227-2 out of overdrive planetary gear and overrunning clutch splines.
10. Raise overdrive unit and carefully slide it straight onto intermediate shaft. Insert park rod into park lock reaction plug at same time. Avoid tilting overdrive during installation as this could cause planetary gear and overrunning clutch splines to rotate out of alignment. If this occurs, it will be necessary to remove and disassemble overdrive unit to realign splines.
11. Work overdrive unit forward on intermediate shaft until seated against transmission case.
12. Install bolts attaching overdrive unit to transmission unit. Tighten bolts in diagonal pattern to 34 N·m (25 ft-lbs).
13. Connect the transmission speed sensor and overdrive wiring connectors.
14. Install the transfer case, if equipped. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - INSTALLATION)
15. Align and install rear propeller shaft, if necessary. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)

RETAINER-OVERRUNNING CLUTCH CAM/OVERDRIVE PISTON

DESCRIPTION

The overrunning clutch consists of an inner race (5), an outer race (or cam) (1), rollers (2) and springs (3), and the spring retainer (4). The number of rollers and springs depends on what transmission and which overrunning clutch is being dealt with.

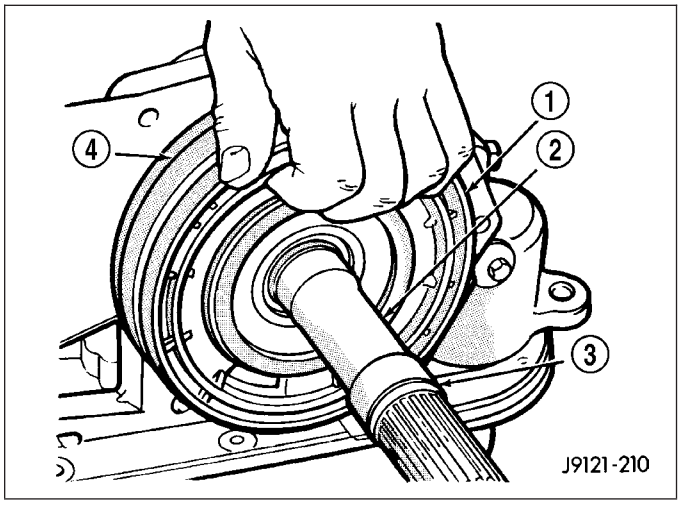


OPERATION

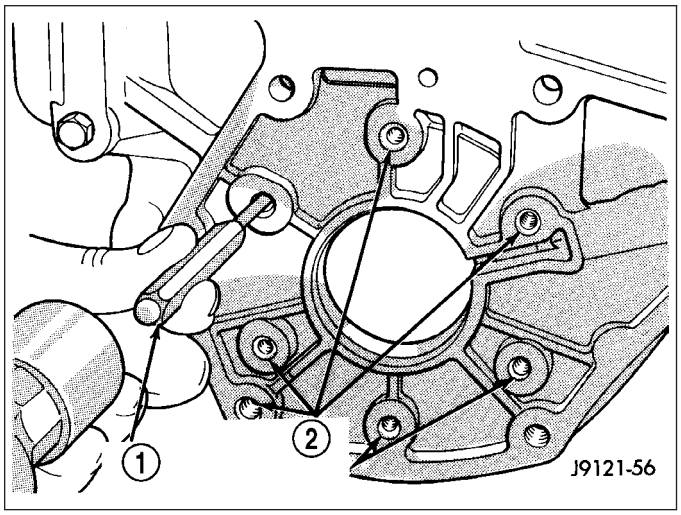
As the inner race is rotated in a clockwise direction (as viewed from the front of the transmission), the race causes the rollers to roll toward the springs, causing them to compress against their retainer. The compression of the springs increases the clearance between the rollers and cam. This increased clearance between the rollers and cam results in a freewheeling condition. When the inner race attempts to rotate counterclockwise, the action causes the rollers to roll in the same direction as the race, aided by the pushing of the springs. As the rollers try to move in the same direction as the inner race, they are wedged between the inner and outer races due to the design of the cam. In this condition, the clutch is locked and acts as one unit.

DISASSEMBLY

1. Remove the overdrive piston (1).
2. Remove the overdrive piston retainer bolts.
3. Remove overdrive piston retainer (4).
4. Remove case gasket.



5. Tap old cam out of case with pin punch (1). Insert punch through bolt holes (2) at rear of case. Alternate position of punch to avoid cocking cam during removal.
6. Clean clutch cam bore and case. Be sure to remove all chips/shavings generated during cam removal.



CLEANING

Clean the overrunning clutch assembly, clutch cam, low-reverse drum, and overdrive piston retainer in solvent. Dry them with compressed air after cleaning.

INSPECTION

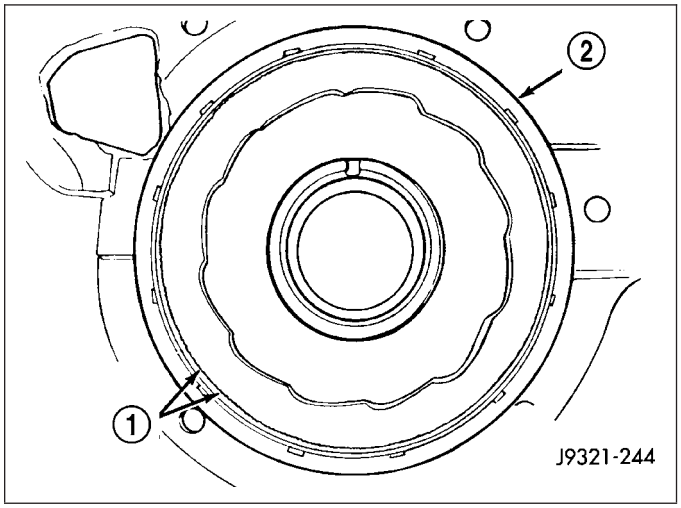
Inspect condition of each clutch part after cleaning. Replace the overrunning clutch roller and spring assembly if any rollers or springs are worn or damaged, or if the roller cage is distorted, or damaged. Replace the cam if worn, cracked or damaged.

Replace the low-reverse drum if the clutch race, roller surface or inside diameter is scored, worn or damaged. **Do not remove the clutch race from the low-reverse drum under any circumstances. Replace the drum and race as an assembly if either component is damaged.**

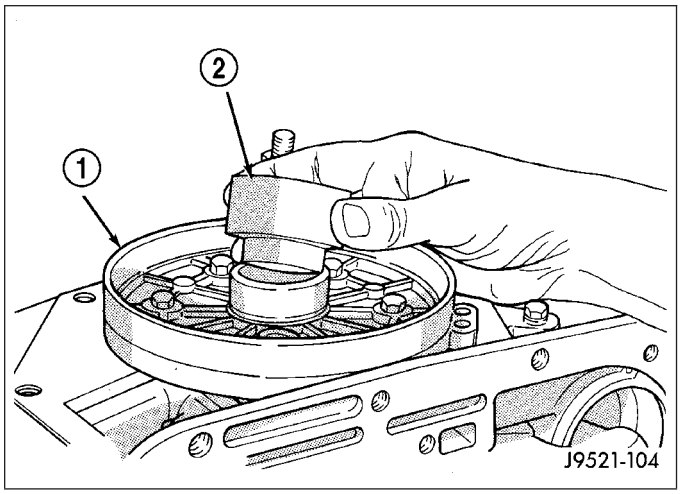
Examine the overdrive piston retainer carefully for wear, cracks, scoring or other damage. Be sure the retainer hub is a snug fit in the case and drum. Replace the retainer if worn or damaged.

ASSEMBLY

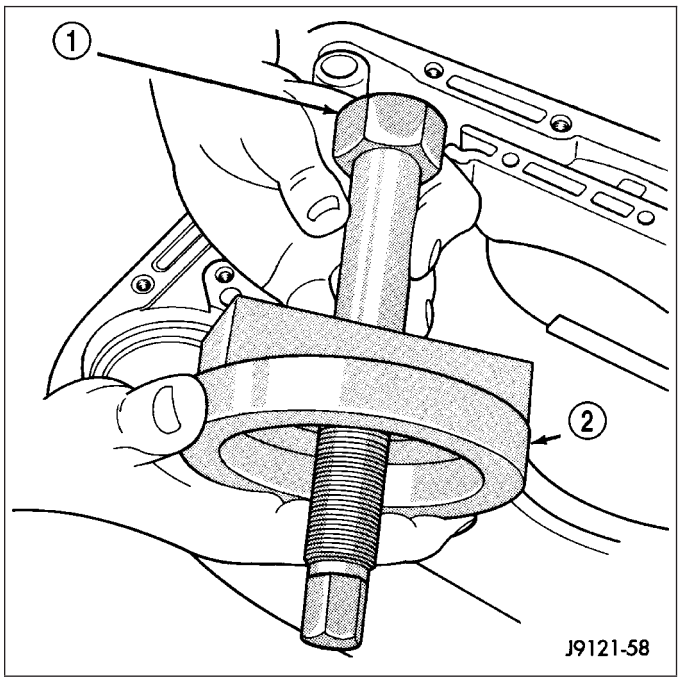
1. Temporarily install overdrive piston retainer in case. Use 3-4 bolts to secure retainer.
2. Align and start new clutch cam (2) in the transmission case. Be sure serrations on cam and in case (1) are aligned. Then tap cam into case just enough to hold it in place.
3. Verify that cam is correctly positioned before proceeding any further. Narrow ends of cam ramps should be to left when cam is viewed from front end of case.



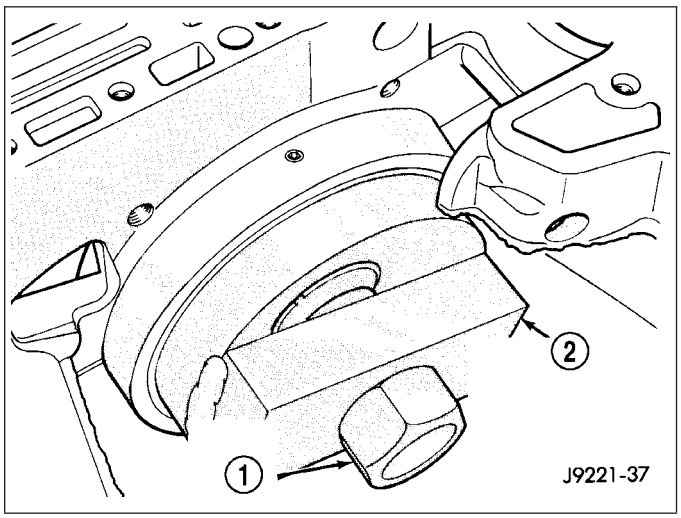
4. Insert Adapter Tool SP-5124 (2) from Installer/Remover C-3863-A into piston retainer (1).



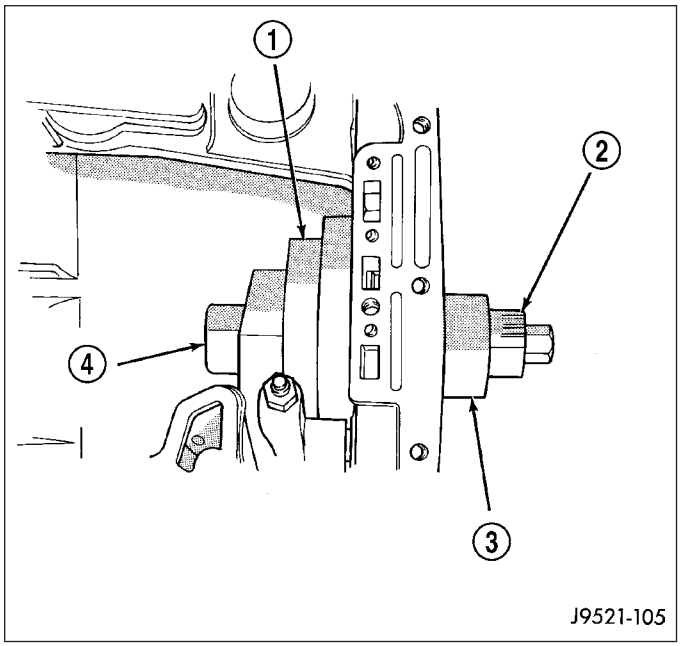
5. Assemble Puller Bolt SP-3701 (1) and Press Plate SP-3583-A (2).



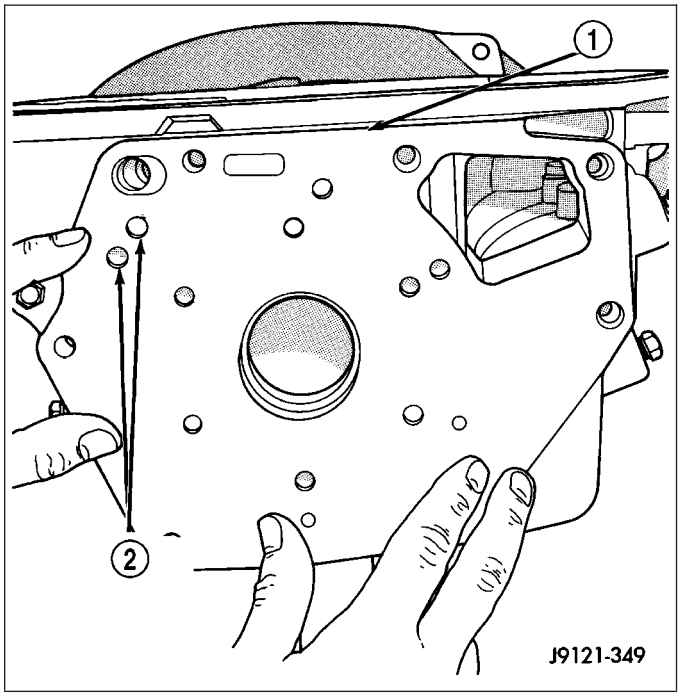
6. Install assembled puller plate and bolt (1). Insert bolt through cam, case and adapter tool. Be sure plate is seated squarely on cam (2).



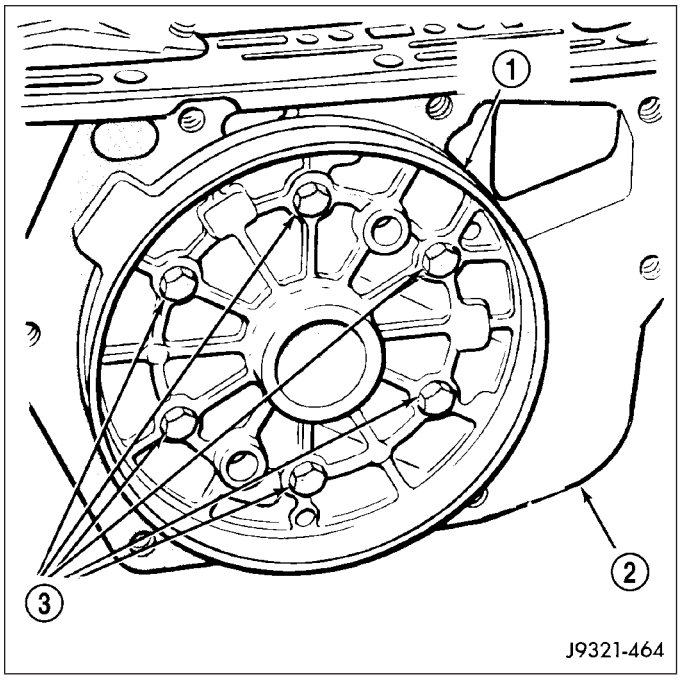
7. Hold puller plate and bolt in place and install puller nut SP-3701 (4) on puller bolt.
8. Tighten puller nut (2) to press clutch cam into case. Be sure cam is pressed into case evenly and does not become cocked.
9. Remove clutch cam installer tools.



10. Stake case in 14 places around clutch cam to help secure cam in case. Use blunt punch or chisel to stake case.
11. Remove piston retainer from case. Cover retainer with plastic sheeting, or paper to keep it dust free.
12. Clean case and cam thoroughly. Be sure any chips/shavings generated during cam installation are removed from case.
13. Install new gasket (1) at rear of transmission case. Use petroleum jelly to hold gasket in place. Be sure to align governor feed holes in gasket with feed passages in case (2). Also install gasket before overdrive piston retainer. Center hole in gasket is smaller than retainer and cannot be installed over retainer.



14. Position overdrive piston retainer (1) on transmission case and align bolt holes in retainer (1), gasket (2), and case. Then install and tighten retainer bolts (3)to 17 N·m (13 ft. lbs.) torque.
15. Install new seals on overdrive piston.
16. Stand transmission case upright on bellhousing.
17. Position Guide Ring 8114-1 on outer edge of overdrive piston retainer.
18. Position Seal Guide 8114-3 on inner edge of overdrive piston retainer.
19. Install overdrive piston in overdrive piston retainer by: aligning locating lugs on overdrive piston to the two mating holes in retainer.
    a. Aligning locating lugs on overdrive piston to the two mating holes in retainer.
    b. Lubricate overdrive piston seals with Mopar® Door Ease, or equivalent.
    c. Install piston over Seal Guide 8114-3 and inside Guide Ring 8114-1.
    d. Push overdrive piston into position in retainer.
    e. Verify that the locating lugs entered the lug bores in the retainer.



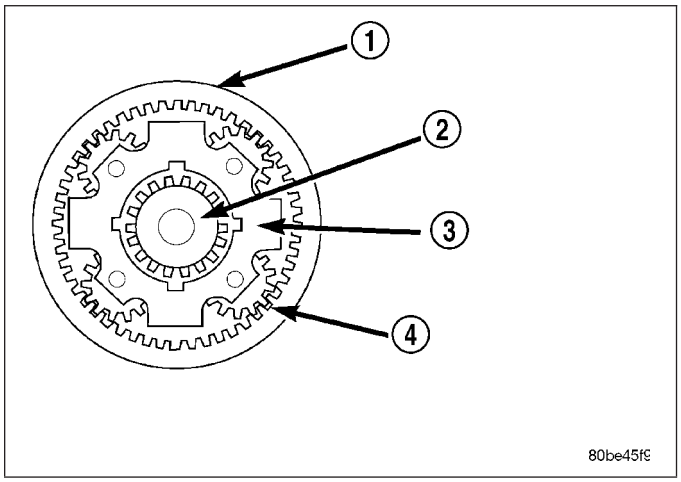
SHAFT-PLANETARY GEARTRAIN/OUTPUT

DESCRIPTION

The planetary gearsets are designated as the front, rear, and overdrive planetary gear assemblies and located in such order. A simple planetary gearset consists of three main members:

- The sun gear (2) which is at the center of the system.
- The planet carrier (3) with planet pinion gears (4) which are free to rotate on their own shafts and are in mesh with the sun gear.
- The annulus gear (1), which rotates around and is in mesh with the planet pinion gears.

NOTE: The number of pinion gears does not affect the gear ratio, only the duty rating.



OPERATION

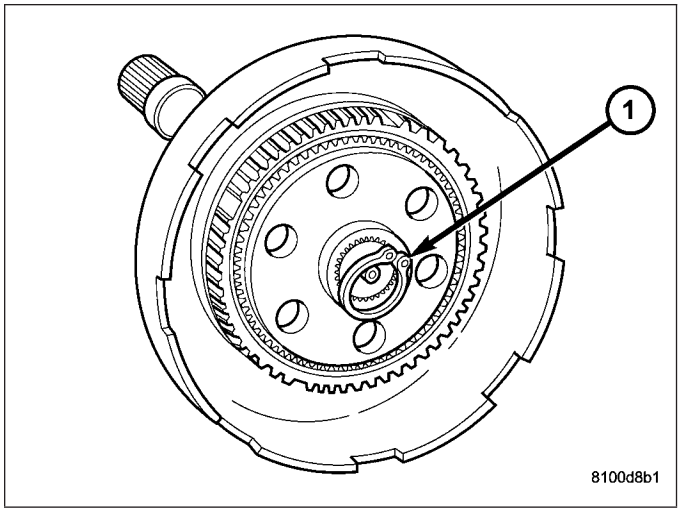
With any given planetary gearset, several conditions must be met for power to be able to flow:

- One member must be held.
- Another member must be driven or used as an input.
- The third member may be used as an output for power flow.
- For direct drive to occur, two gear members in the front planetary gearset must be driven.

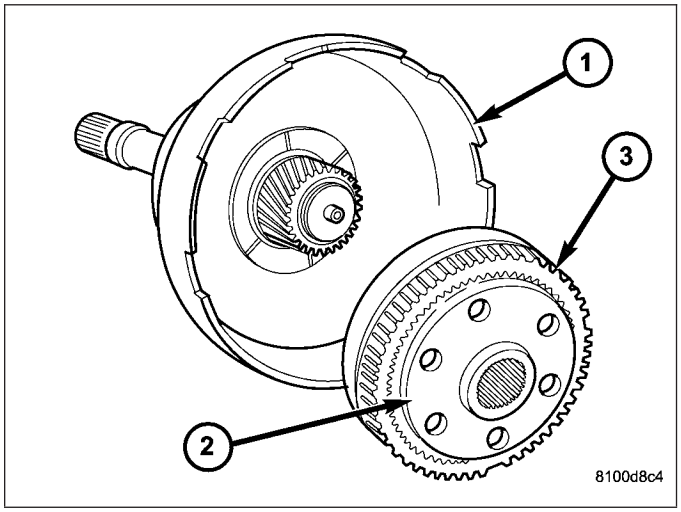
NOTE: Gear ratios are dependent on the number of teeth on the annulus and sun gears.

DISASSEMBLY

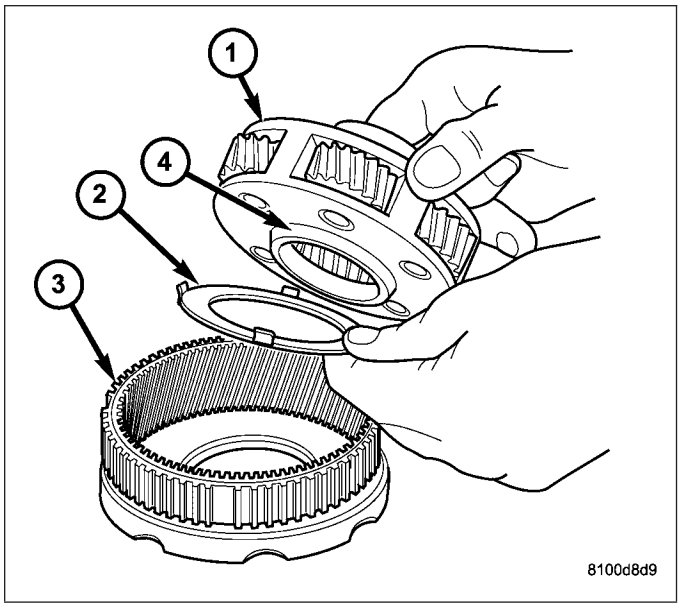
1. Remove planetary snap-ring (1) from intermediate shaft. Discard snap-ring as it is not reusable.



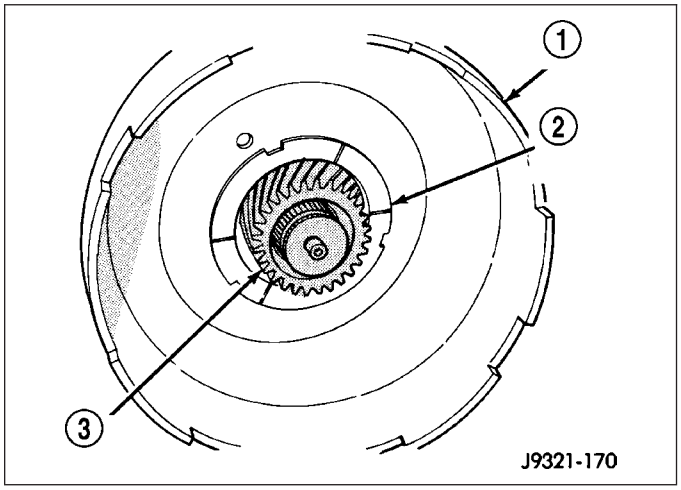
2. Remove front planetary gear (3) and front annulus gear (2) as assembly.



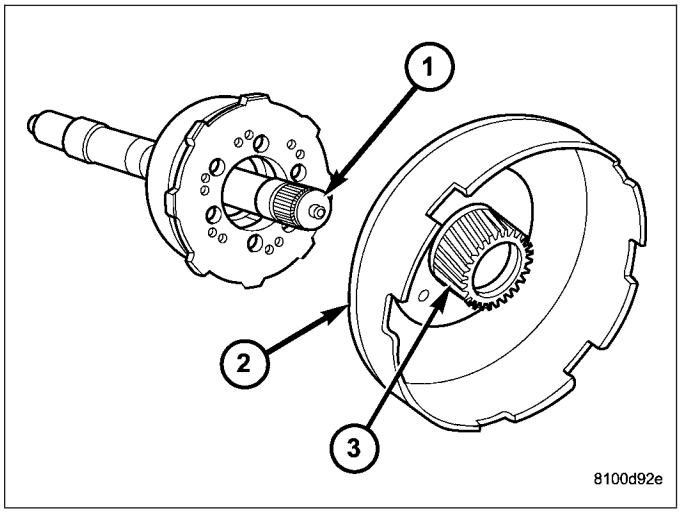
3. Remove front planetary gear (1) and thrust washer (2) from front annulus gear (3). Note thrust washer position for assembly reference.



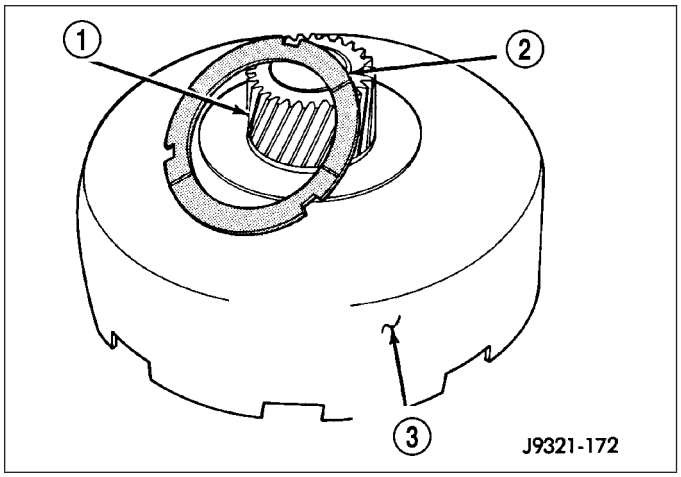
4. Remove tabbed thrust washer (2) from driving shell (1). Note washer position for assembly reference.



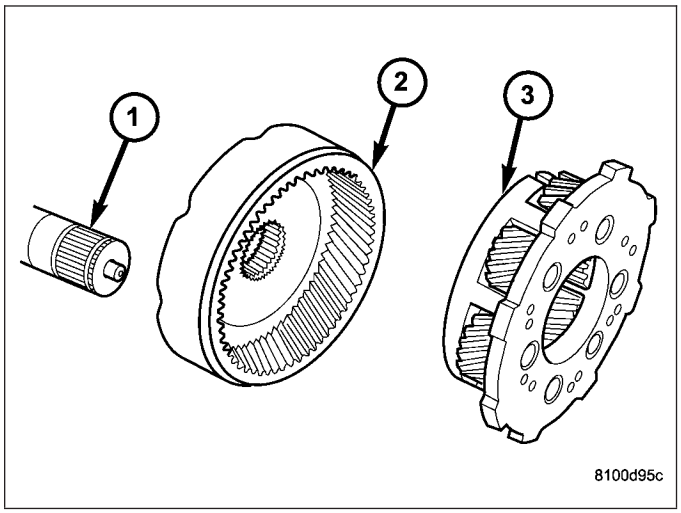
5. Remove sun gear (3) and driving shell (2) as assembly.



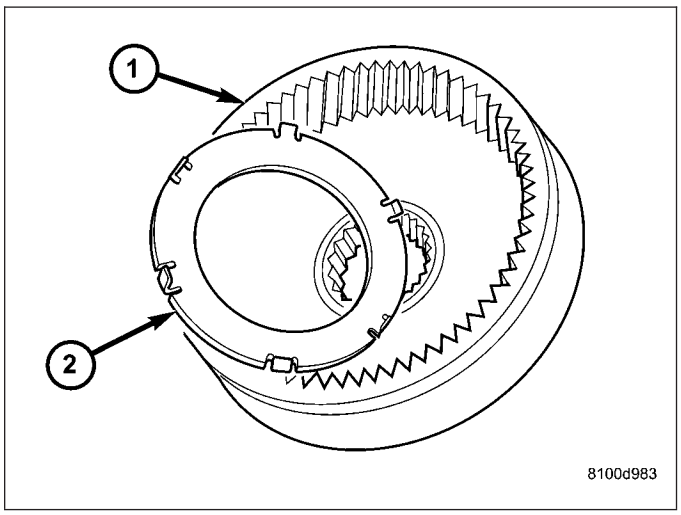
6. Remove tabbed thrust washer (2) from rear planetary sun gear (1). Note washer position on gear for assembly reference.



7. Remove rear planetary gear (3) and rear annulus gear (2) from intermediate shaft (1).



8. Remove thrust washer (2) from rear planetary annulus gear (1).



INSPECTION

Inspect the planetary gear sets and annulus gears. The planetary pinions, shafts, washers, and retaining pins are serviceable. However, if a pinion carrier is damaged, the entire planetary gear set must be replaced as an assembly.

Replace the annulus gears if the teeth are chipped, broken, or worn, or the gear is cracked. Replace the planetary thrust plates and the tabbed thrust washers if cracked, scored or worn.

Inspect the machined surfaces of the intermediate shaft. Be sure the oil passages are open and clear. Replace the shaft if scored, pitted, or damaged.

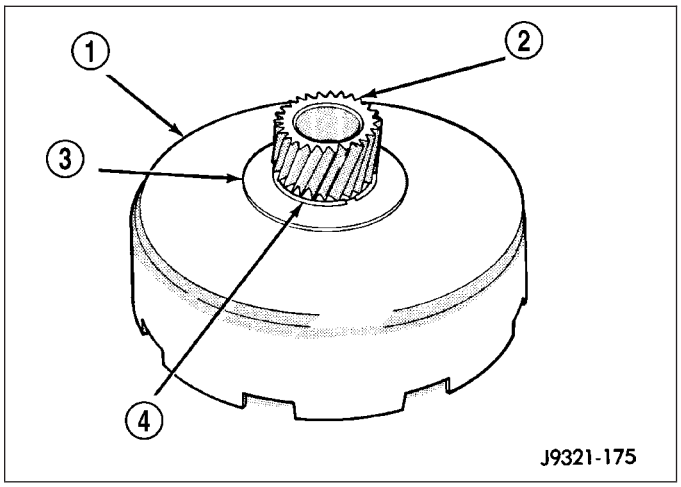
Inspect the sun gear and driving shell. If either component is worn or damaged, remove the sun gear rear retaining ring and separate the sun gear and thrust plate from the driving shell. Then replace the necessary component.

Replace the sun gear as an assembly if the gear teeth are chipped or worn. Also replace the gear as an assembly if the bushings are scored or worn. The sun gear bushings are not serviceable. Replace the thrust plate if worn, or severely scored. Replace the driving shell if distorted, cracked, or damaged in any way.

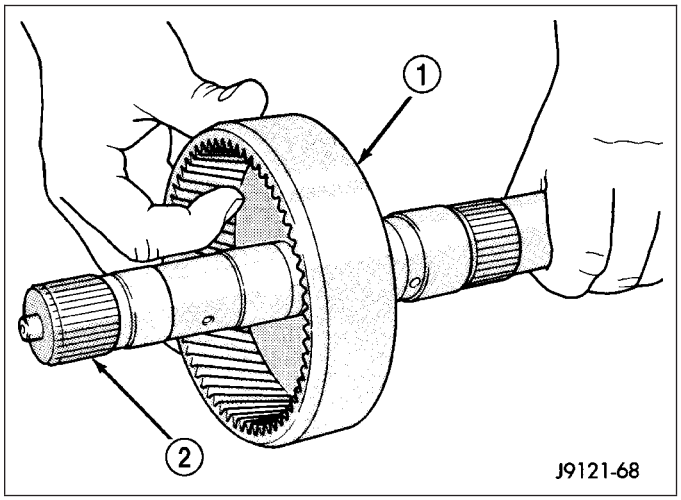
Replace all snap-rings during geartrain assembly. Reusing snap-rings is not recommended.

ASSEMBLY

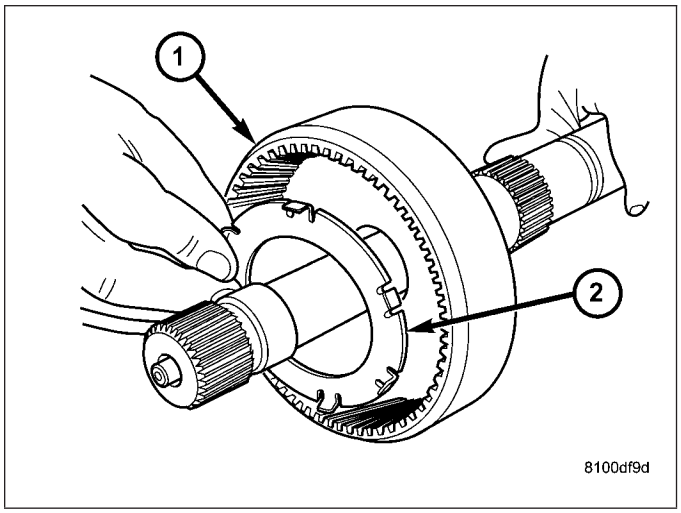
1. Lubricate sun gear (2) and planetary gears with transmission fluid during assembly. Use petroleum jelly to lubricate intermediate shaft bushing surfaces, thrust washers and thrust plates (3) and to hold these parts in place during assembly.
2. Install front snap-ring on sun gear (2) and install gear in driving shell. Then install thrust plate (3) over sun gear and against rear side of driving shell (1). Install rear snap-ring (4) to secure sun gear and thrust plate in driving shell. Note that the large ID chamfer on the sun gear goes forward.



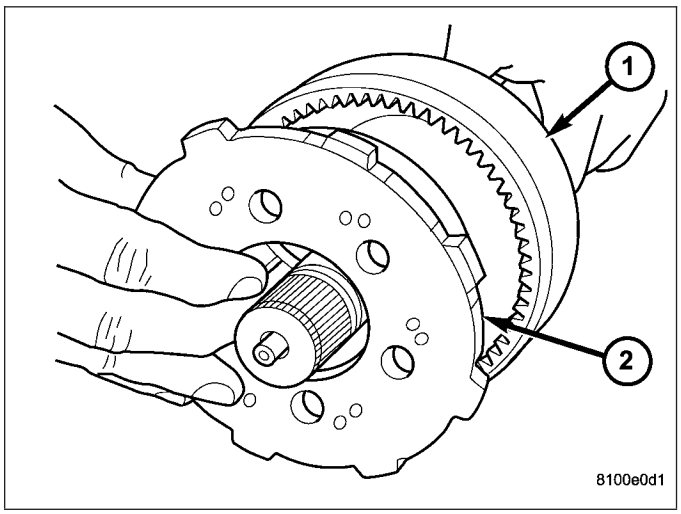
3. Install rear annulus gear (1) on intermediate shaft (2).



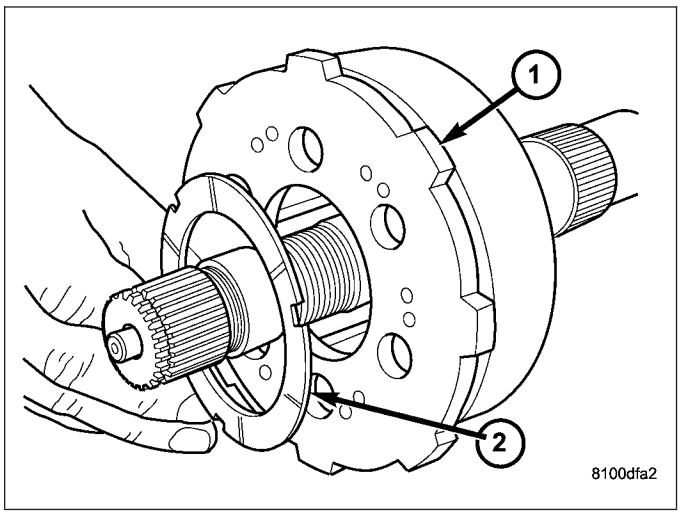
4. Install thrust washer (2) to rear planetary annulus gear (1) using petroleum jelly. Be sure washer is seated against corner witht teh tabs completely in the locating holes.



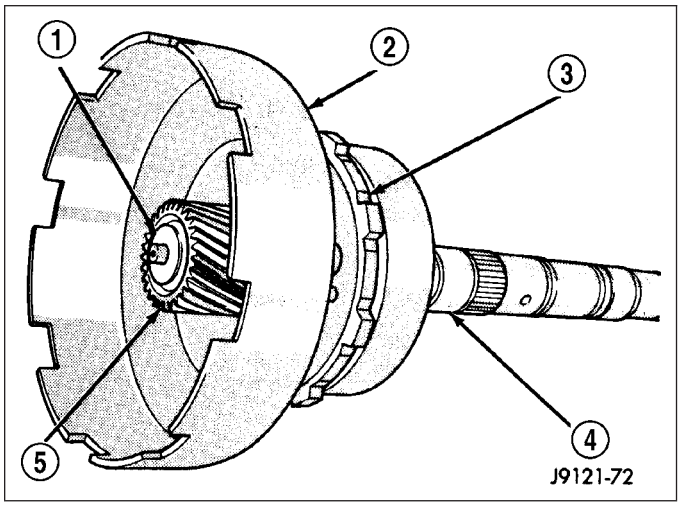
5. Install rear planetary gear (2) in rear annulus gear (1). Be sure planetary carrier is seated against annulus gear.



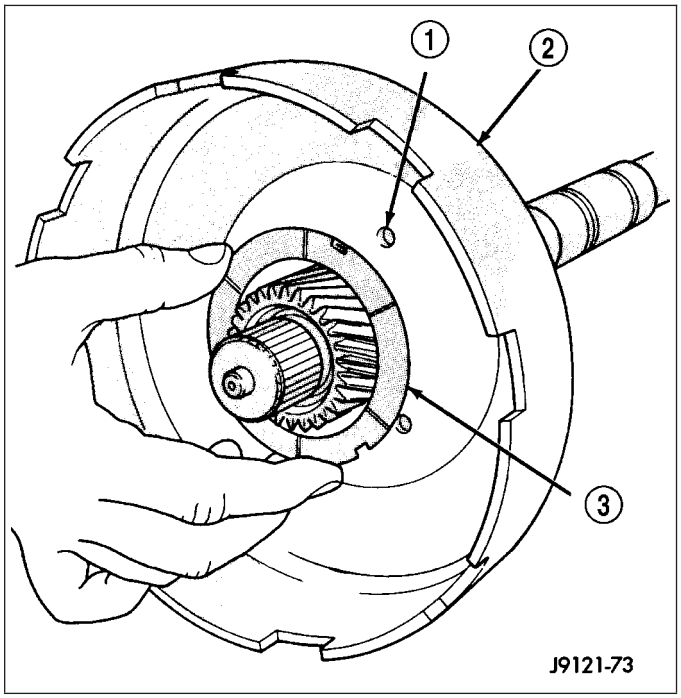
6. Install tabbed thrust washer (2) on front face of rear planetary gear (1). Seat washer tabs in matching slots in face of gear carrier. Use extra petroleum jelly to hold washer in place if desired.



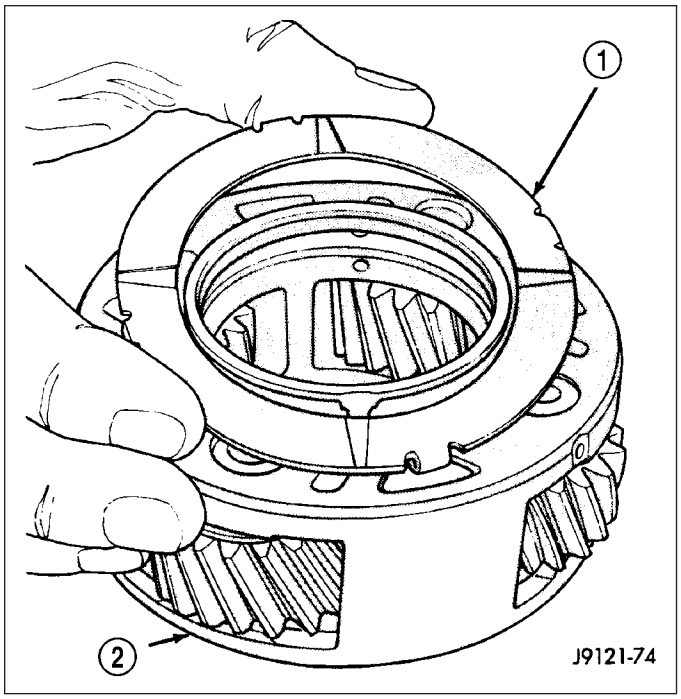
7. Lubricate sun gear bushings with petroleum jelly or transmission fluid.
8. Install sun gear (5) and driving shell (2) on intermediate shaft (1). Seat shell against rear planetary gear. Verify that thrust washer on planetary gear was not displaced during installation.



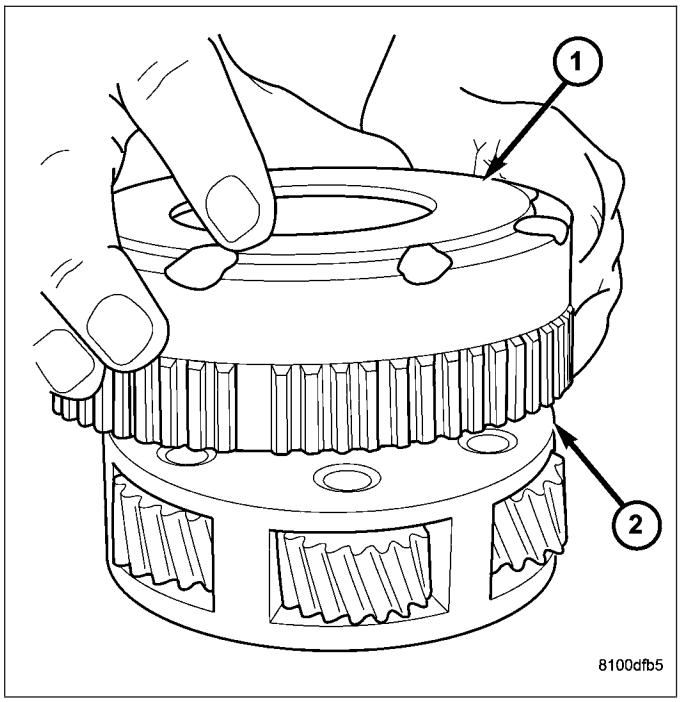
9. Install tabbed thrust washer (3) in driving shell (2), be sure washer tabs are seated in tab slots of driving shell. Use extra petroleum jelly to hold washer in place if desired.



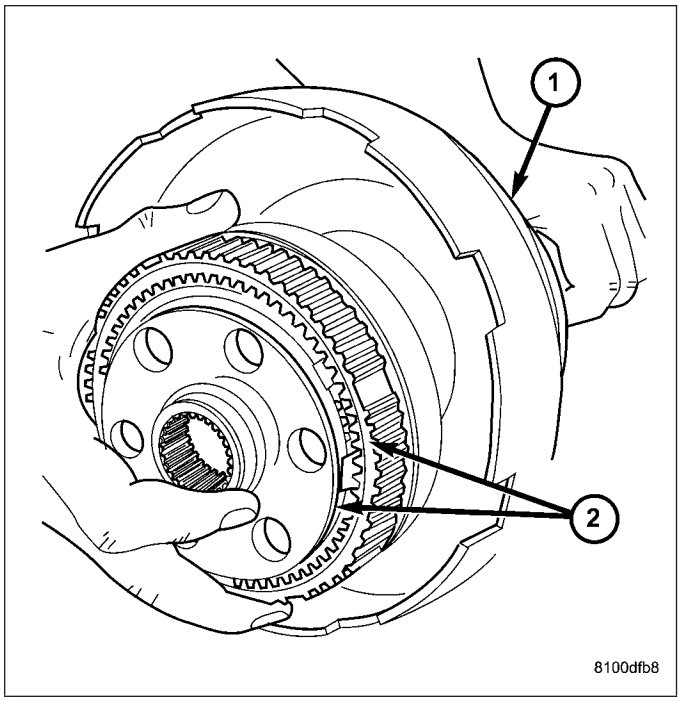
10. Install tabbed thrust washer (1) on front planetary gear (2). Seat washer tabs in matching slots in face of gear carrier. Use extra petroleum jelly to hold washer in place if desired.
11. Install the torlon bushing onto the front planetary carrier hub.



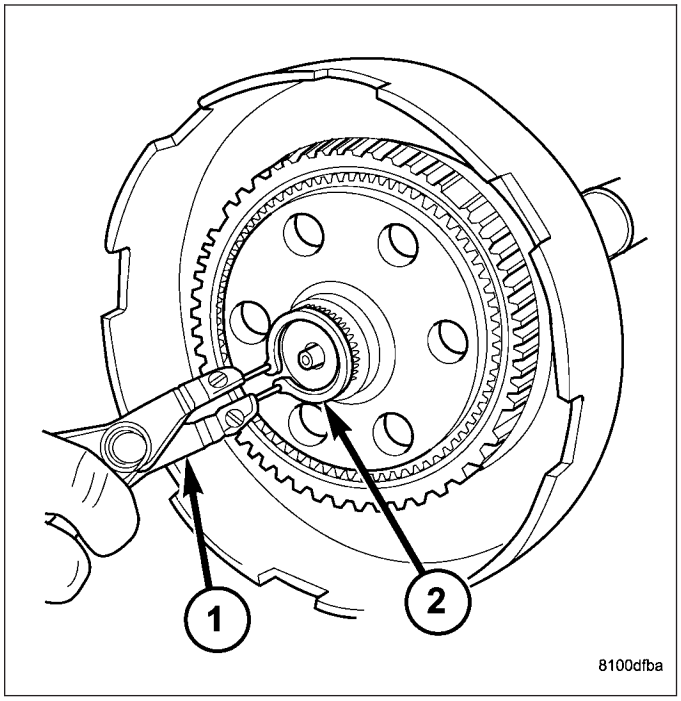
12. Install front annulus gear (1) over and onto front planetary gear (2). Be sure gears are fully meshed and seated.



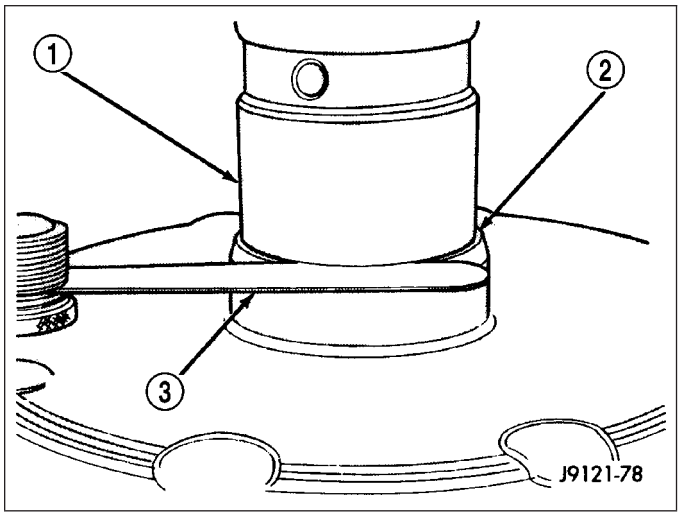
13. Install front planetary and annulus gear assembly (2). Hold gears together and slide them onto shaft. Be sure planetary pinions are seated on sun gear and that planetary carrier is seated on intermediate shaft.



14. Place geartrain in upright position. Rotate gears to be sure all components are seated and properly assembled. Snap-ring groove at forward end of intermediate shaft will be completely exposed when components are assembled correctly.
15. Install new planetary snap-ring (2) in groove at end of intermediate shaft.

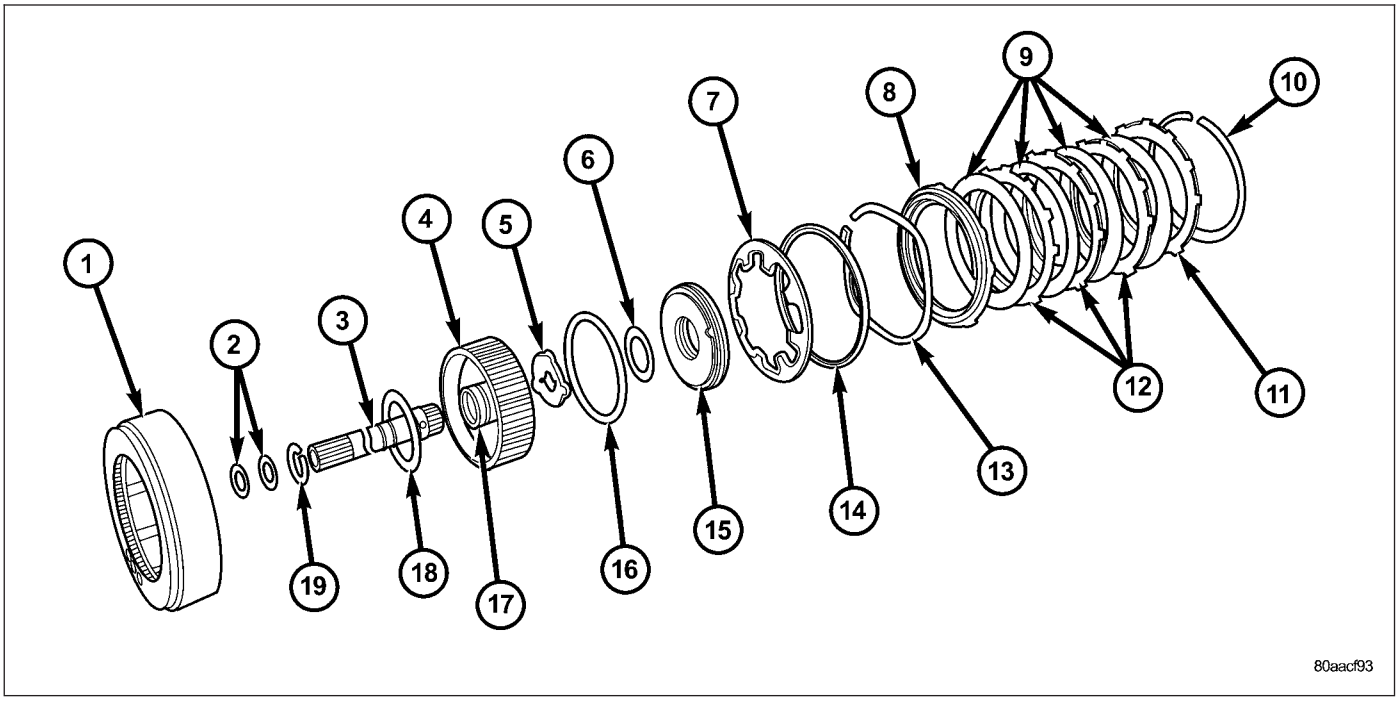


16. Turn planetary geartrain over. Position wood block under front end of intermediate shaft and support geartrain on shaft. Be sure all geartrain parts have moved forward against planetary snap-ring. This is important for accurate end play check.
17. Check planetary geartrain end play with feeler gauge (3). Insert gauge between rear annulus gear (2) and shoulder on intermediate shaft (1) as shown. End play should be 0.15 to 1.22 mm (0.006 to 0.048 in.).
18. If end play is incorrect, install thinner/thicker planetary snap-ring as needed.



CLUTCH-REAR

DESCRIPTION



Rear Clutch Components

1 - REAR CLUTCH RETAINER
2 - TORLON™ SEAL RINGS
3 - INPUT SHAFT
4 - PISTON RETAINER
5 - OUTPUT SHAFT THRUST WASHER
6 - INNER PISTON SEAL
7 - PISTON SPRING
8 - PRESSURE PLATE
9 - CLUTCH DISCS
10 - SNAP-RING (SELECTIVE)
11 - REACTION PLATE
12 - CLUTCH PLATES
13 - WAVE SPRING
14 - SPACER RING
15 - PISTON
16 - OUTER PISTON SEAL
17 - REAR SEAL RING
18 - FIBER THRUST WASHER
19 - RETAINING RING

The rear clutch assembly is composed of the rear clutch retainer (1), pressure plate (8), clutch plates (12), driving discs (9), piston (15), Belleville spring (7), and snap-rings (10). The Belleville spring acts as a lever to multiply the force applied on to it by the apply piston. The increased apply force on the rear clutch pack, in comparison to the

front clutch pack, is needed to hold against the greater torque load imposed onto the rear pack. The rear clutch is directly behind the front clutch and is considered a driving component.

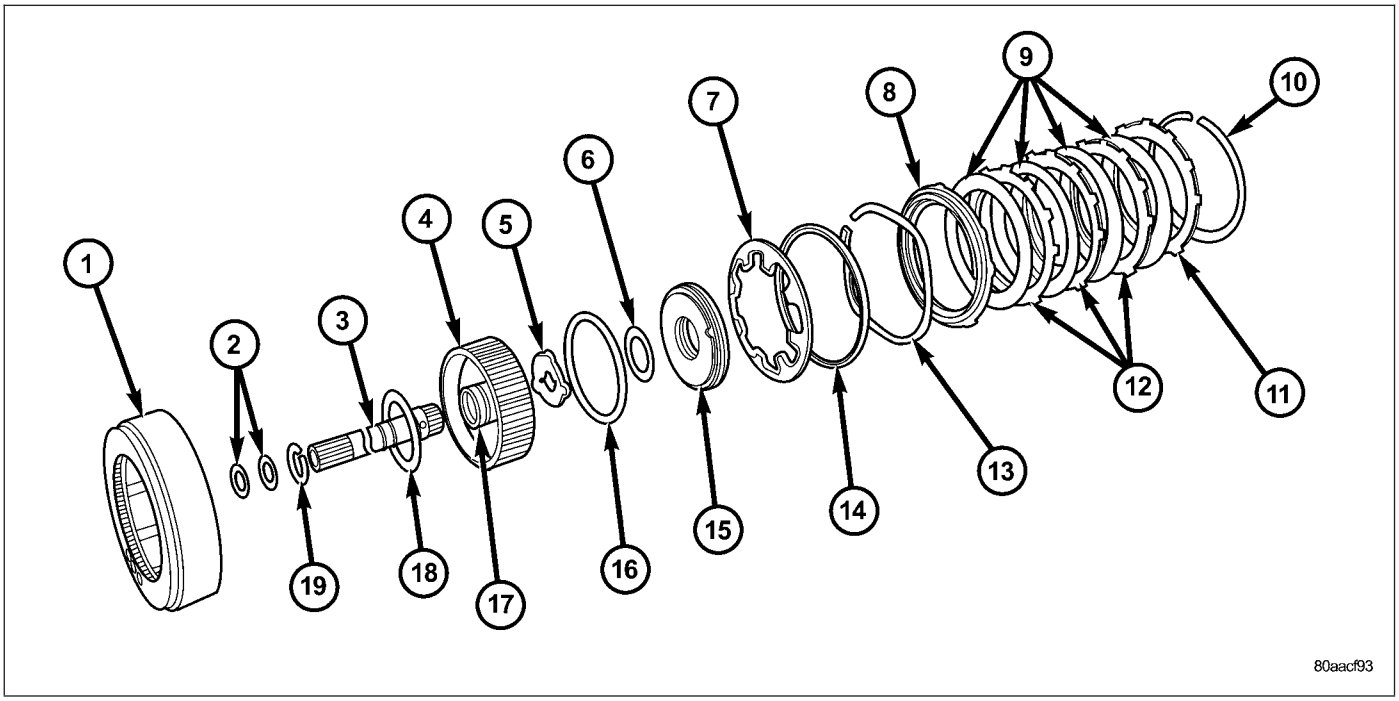
NOTE: The number of discs and plates may vary with each engine and vehicle combination.

OPERATION

To apply the clutch, pressure is applied between the clutch retainer and piston. The fluid pressure is provided by the oil pump, transferred through the control valves and passageways, and enters the clutch through the hub of the reaction shaft support. With pressure applied between the clutch retainer and piston, the piston moves away from the clutch retainer and compresses the clutch pack. This action applies the clutch pack, allowing torque to flow through the input shaft into the driving discs, and into the clutch plates and pressure plate that are lugged to the clutch retainer. The waved spring is used to cushion the application of the clutch pack. The snap-ring is selective and used to adjust clutch pack clearance.

When pressure is released from the piston, the spring returns the piston to its fully released position and disengages the clutch. The release spring also helps to cushion the application of the clutch assembly. When the clutch is in the process of being released by the release spring, fluid flows through a vent and one-way ball-check-valve located in the piston. The check-valve is needed to eliminate the possibility of plate drag caused by centrifugal force acting on the residual fluid trapped in the clutch piston retainer.

DISASSEMBLY



Rear Clutch Components

1 - REAR CLUTCH RETAINER
2 - TORLON™ SEAL RINGS
3 - INPUT SHAFT
4 - PISTON RETAINER
5 - OUTPUT SHAFT THRUST WASHER
6 - INNER PISTON SEAL
7 - PISTON SPRING
8 - PRESSURE PLATE
9 - CLUTCH DISCS
10 - SNAP-RING (SELECTIVE)
11 - REACTION PLATE
12 - CLUTCH PLATES
13 - WAVE SPRING
14 - SPACER RING
15 - PISTON
16 - OUTER PISTON SEAL
17 - REAR SEAL RING
18 - FIBER THRUST WASHER
19 - RETAINING RING

1. Remove fiber thrust washer (18) from forward side of clutch retainer (1).
2. Remove input shaft front and rear seal rings (2).
3. Remove selective clutch pack snap-ring (10).

4. Remove the reaction plate (11), clutch discs (9), steel plates (12), pressure plate (8), wave spring (13), spacer ring (14), and piston spring (7).
5. Remove clutch piston (15) with rotating motion.
6. Remove and discard piston seals (6, 16).
7. Remove input shaft retaining ring (19). It may be necessary to press the input shaft in slightly to relieve tension on the retaining ring
8. Press input shaft out of retainer with shop press and suitable size press tool. Use a suitably sized press tool to support the retainer as close to the input shaft as possible.

CLEANING

Clean the clutch components with solvent and dry them with compressed air. Do not use rags or shop towels to dry any of the clutch parts. Lint from such materials will adhere to component surfaces and could restrict or block fluid passages after assembly.

INSPECTION

Replace the clutch discs if warped, worn, scored, burned/charred, the lugs are damaged, or if the facing is flaking off. Replace the top and bottom pressure plates if scored, warped, or cracked. Be sure the driving lugs on the pressure and clutch plates are also in good condition. The lugs must not be bent, cracked or damaged in any way.

Replace the piston spring and wave spring if either part is distorted, warped or broken.

Check the lug grooves in the clutch retainer. The clutch and pressure plates should slide freely in the slots. Replace the retainer if the grooves are worn or damaged. Also check action of the check balls in the retainer and piston. Each check ball must move freely and not stick.

Replace the retainer bushing if worn, scored, or doubt exists about bushing condition.

Inspect the piston and retainer seal surfaces for nicks or scratches. Minor scratches can be removed with crocus cloth. However, replace the piston and/or retainer if the seal surfaces are seriously scored.

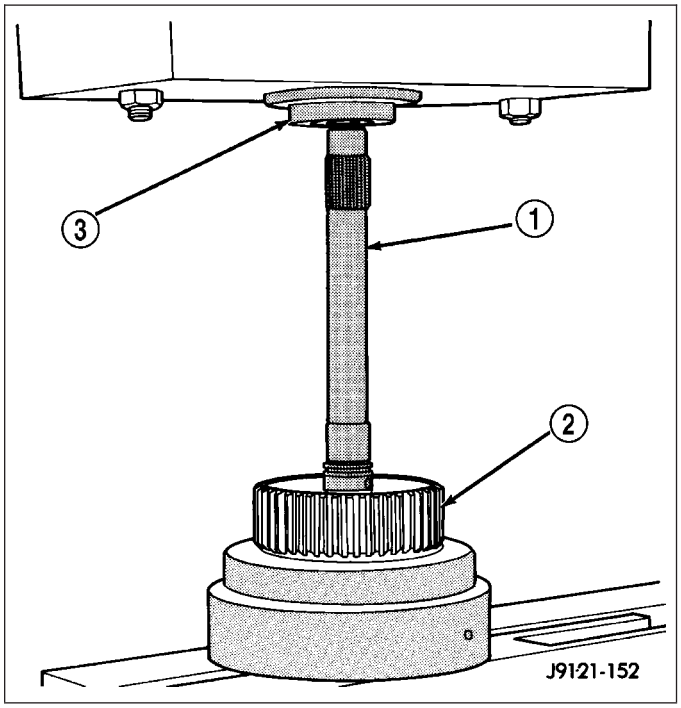
Check condition of the fiber thrust washer and metal output shaft thrust washer. Replace either washer if worn or damaged.

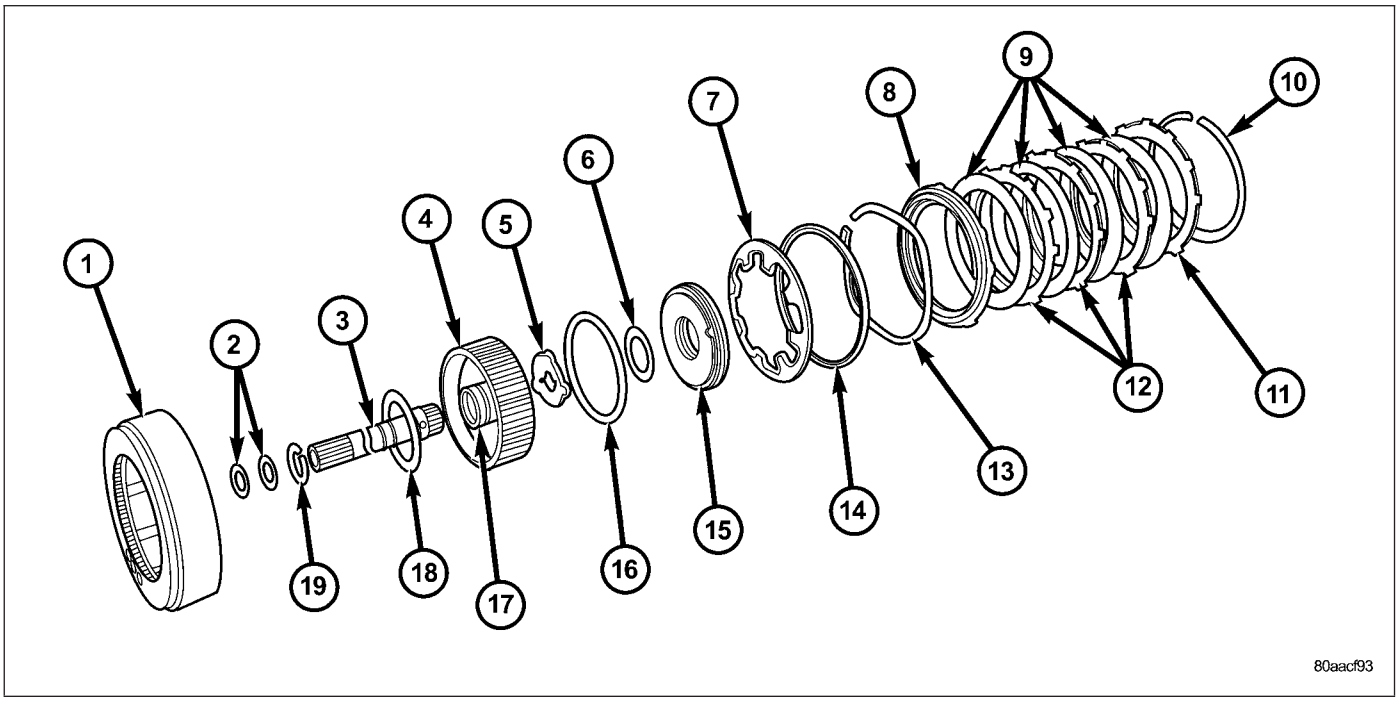
Check condition of the seal rings on the input shaft and clutch retainer hub. Replace the seal rings only if worn, distorted, or damaged. The input shaft front seal ring is teflon with chamfered ends. The rear ring is metal with interlocking ends.

Check the input shaft for wear, or damage. Replace the shaft if worn, scored or damaged in any way.

ASSEMBLY

1. Soak clutch discs in transmission fluid while assembling other clutch parts.
2. Install new seal rings on clutch retainer hub and input shaft if necessary.
   a. Be sure clutch hub seal ring is fully seated in groove and is not twisted.
3. Lubricate splined end of input shaft and clutch retainer with transmission fluid. Then partially press input shaft (1) into retainer (2). Use a suitably sized press tool to support retainer as close to input shaft as possible.
4. Install input shaft retaining ring.
5. Press the input shaft the remainder of the way into the clutch retainer.





Rear Clutch Components

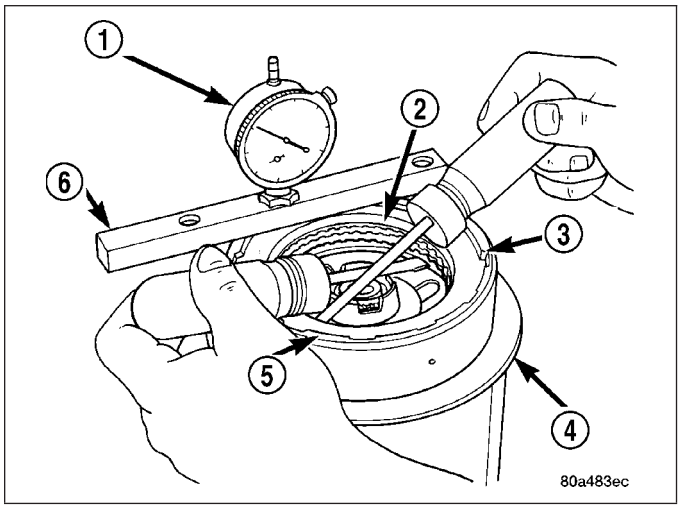
1 - REAR CLUTCH RETAINER
2 - TORLON™ SEAL RINGS
3 - INPUT SHAFT
4 - PISTON RETAINER
5 - OUTPUT SHAFT THRUST WASHER
6 - INNER PISTON SEAL
7 - PISTON SPRING
8 - PRESSURE PLATE
9 - CLUTCH DISCS
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14 - SPACER RING
15 - PISTON
16 - OUTER PISTON SEAL
17 - REAR SEAL RING
18 - FIBER THRUST WASHER
19 - RETAINING RING

6. Install new seals (6, 16) on clutch piston (15). Be sure lip of each seal faces interior of clutch retainer.
7. Lubricate lip of piston seals with generous quantity of Mopar® Door Ease. Then lubricate retainer (1) hub and bore with light coat of transmission fluid.
8. Install clutch piston (15) in retainer (1). Use twisting motion to seat piston in bottom of retainer. A thin strip of plastic (about 0.020″ thick), can be used to guide seals into place if necessary.

CAUTION: Never push the clutch piston straight in. This will fold the seals over causing leakage and clutch slip. In addition, never use any type of metal tool to help ease the piston seals into place. Metal tools will cut, shave, or score the seals.

9. Install piston spring (7) in retainer (1) and on top of piston (15). Concave side of spring faces downward (toward piston).
10. Install the spacer ring (14) and wave spring (13) into the retainer. Be sure spring is completely seated in retainer groove.
11. Install pressure plate (8). Ridged side of plate faces downward (toward piston) and flat side toward clutch pack.
12. Install first clutch disc (9) in retainer on top of pressure plate. Then install a clutch plate (12) followed by a clutch disc until entire clutch pack is installed (4 discs and 3 plates are required) .
13. Install the reaction plate (11).
14. Install selective snap-ring (10). Be sure snap-ring is fully seated in retainer groove.

15. Using a suitable gauge bar (6) and dial indicator (1), measure clutch pack clearance.
    a. Position gauge bar across the clutch drum (5) with the dial indicator pointer on the pressure plate (2).
    b. Using two small screw drivers, lift the pressure plate and release it.
    c. Zero the dial indicator.
    d. Lift the pressure plate until it contacts the snap-ring and record the dial indicator reading.

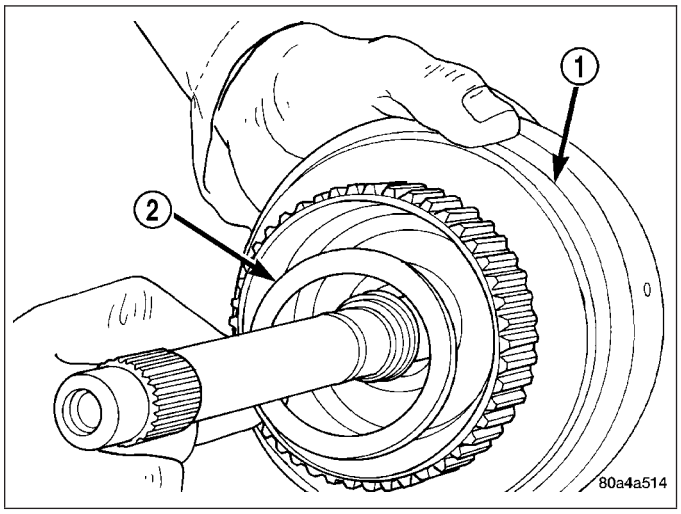


Clearance should be 0.635 - 0.914 mm (0.025 - 0.036 in.). If clearance is incorrect, steel plates, discs, selective snap ring and pressure plates may have to be changed.

The selective snap ring thicknesses are:

- 0.107 - 0.109 in.
- 0.098 - 0.100 in.
- 0.095 - 0.097 in.
- 0.083 - 0.085 in.
- 0.076 - 0.078 in.
- 0.071 - 0.073 in.
- 0.060 - 0.062 in.

16. Coat rear clutch thrust washer (2) with petroleum jelly and install washer over input shaft and into clutch retainer (1). Use enough petroleum jelly to hold washer in place.



SERVO-REAR

DESCRIPTION

The rear (low/reverse) servo consists of a single stage or diameter piston and a spring loaded plug. The spring is used to cushion the application of the rear (low/reverse) band.

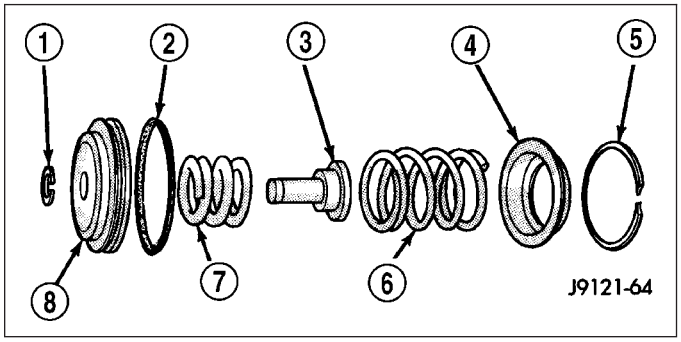
OPERATION

While in the de-energized state (no pressure applied), the piston is held up in its bore by the piston spring. The plug is held down in its bore, in the piston, by the plug spring. When pressure is applied to the top of the piston, the plug is forced down in its bore, taking up any clearance. As the piston moves, it causes the plug spring to compress, and the piston moves down over the plug. The piston continues to move down until it hits the shoulder of the plug and

fully applies the band. The period of time from the initial application, until the piston is against the shoulder of the plug, represents a reduced shocking of the band that cushions the shift.

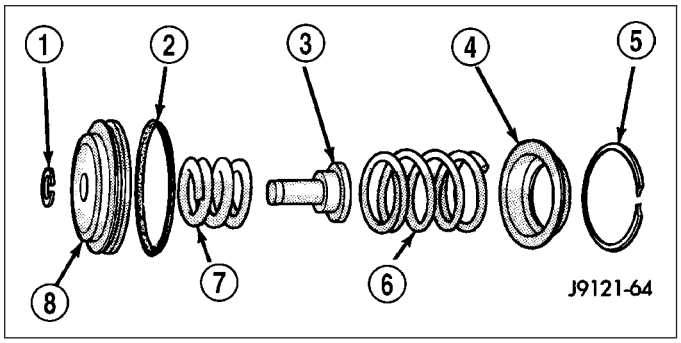
DISASSEMBLY

1. Remove small snap-ring (1) and remove plug (3) and spring (7) from servo piston (8).
2. Remove and discard servo piston seal ring (2).



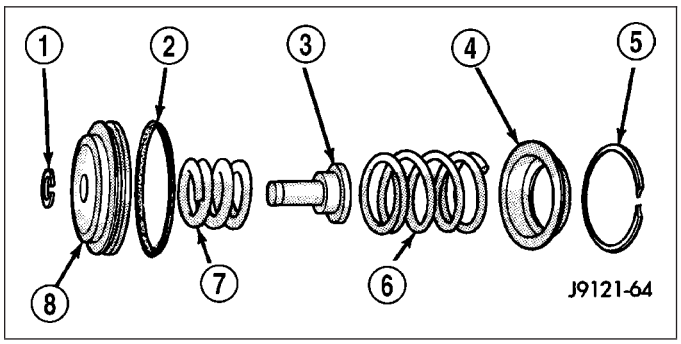
CLEANING

Remove and discard the servo piston seal ring (2). Then clean the servo components with solvent and dry with compressed air. Replace either spring (6, 7) if collapsed, distorted or broken. Replace the plug (3) and piston (8) if cracked, bent, or worn. Discard the servo snap-rings (1, 5) and use new ones at assembly.



ASSEMBLY

1. Lubricate piston (8) and guide seals (2) with petroleum jelly. Lubricate other servo parts with Mopar® ATF +4, Automatic Transmission fluid.
2. Install new seal ring (2) on servo piston.
3. Assemble piston (8), plug (3), spring (6, 7), and new snap-ring (1).
4. Lubricate piston seal lip with petroleum jelly.



MECHANISM-SHIFT

DESCRIPTION

The gear shift mechanism provides six shift positions which are:

- PARK (P)
- REVERSE (R)
- NEUTRAL (N)
- DRIVE (D)
- Manual SECOND (2)
- Manual LOW (1)

OPERATION

Manual LOW (1) range provides first gear only. Overrun braking is also provided in this range. Manual SECOND (2) range provides first and second gear only.

DRIVE range provides first, second, third, and overdrive fourth gear ranges. The shift into overdrive fourth gear range occurs only after the transmission has completed the shift into D third gear range. No further movement of the shift mechanism is required to complete the 3-4 shift.

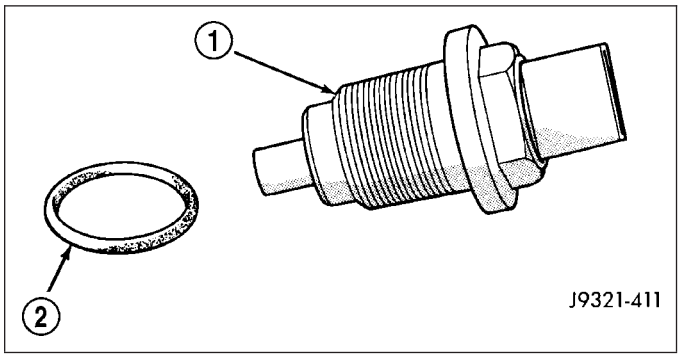
The fourth gear upshift occurs automatically when the overdrive selector switch is in the ON position. No upshift to fourth gear will occur if any of the following are true:

- The transmission fluid temperature is below 10° C (50° F) or above 121° C (250° F).
- The shift to third is not yet complete.
- Vehicle speed is too low for the 3-4 shift to occur.
- Battery temperature is below -5° C (23° F).

SENSOR-SPEED

DESCRIPTION

The speed sensor (1) is located in the overdrive gear case. The sensor is positioned over the park gear and monitors transmission output shaft rotating speed.



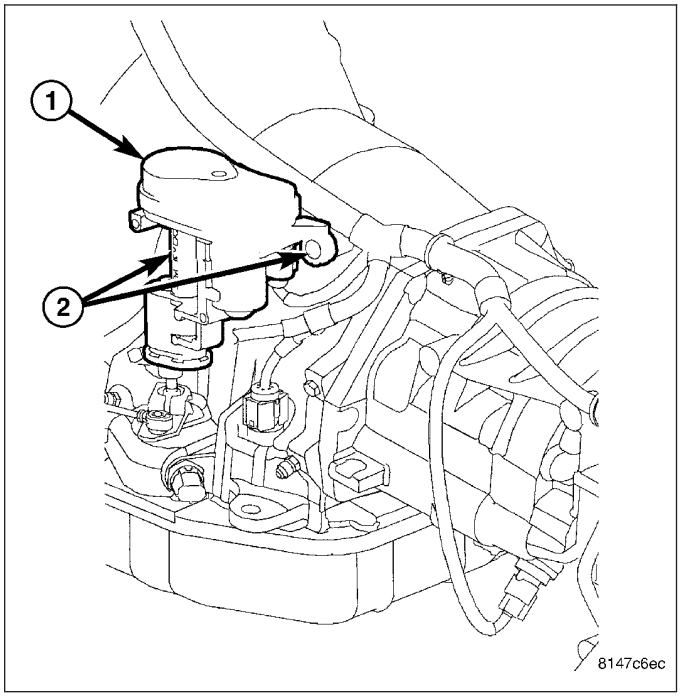
OPERATION

Speed sensor signals are triggered by the park gear lugs as they rotate past the sensor pickup face. Input signals from the sensor are sent to the transmission control module for processing. Signals from this sensor are shared with the powertrain control module.

ACTUATOR-THROTTLE VALVE

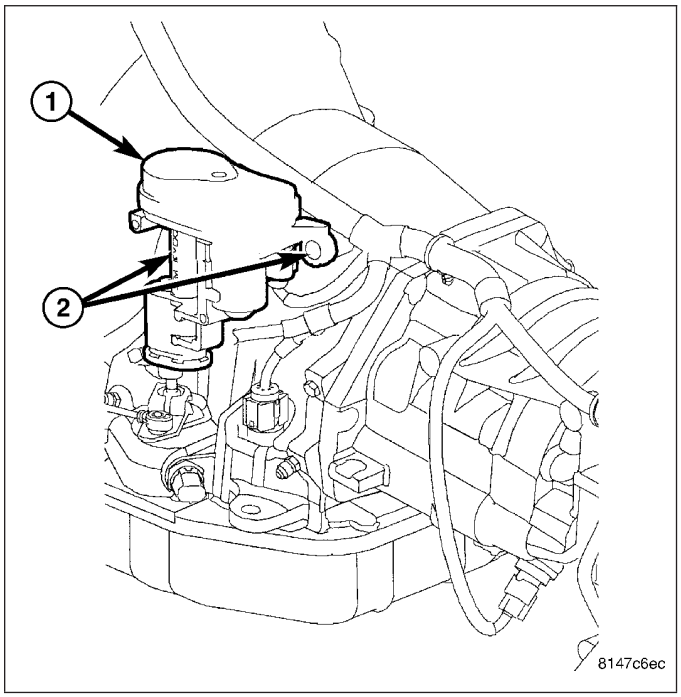
DESCRIPTION

On vehicles equipped with a Cummins diesel engine, the transmission throttle valve cable has been replace by the transmission throttle valve actuator (TTVA). The TTVA consists of an electric DC motor, two potentiometers, and a gear drive system. The TTVA is mechanically connected to the transmission throttle valve in the valve body by the “D” shaped opening in the bottom of the TTVA shaft. Changes in the TTVA position are therefore transferred to the throttle valve and cause changes in the transmission throttle pressure.

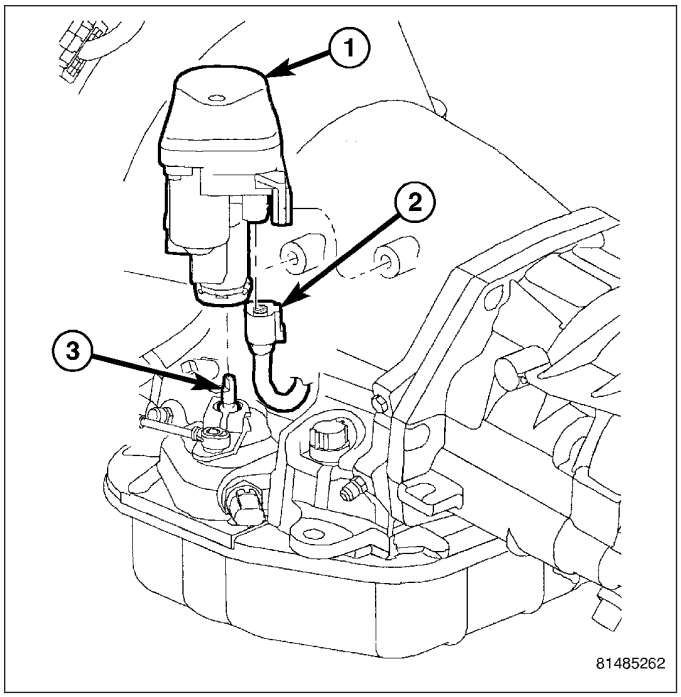


REMOVAL

1. Remove the bolts (2) holding the transmission throttle valve actuator (TTVA) (1) to the transmission case.
2. Allow the TTVA (1) to rotate clockwise away from the transmission.

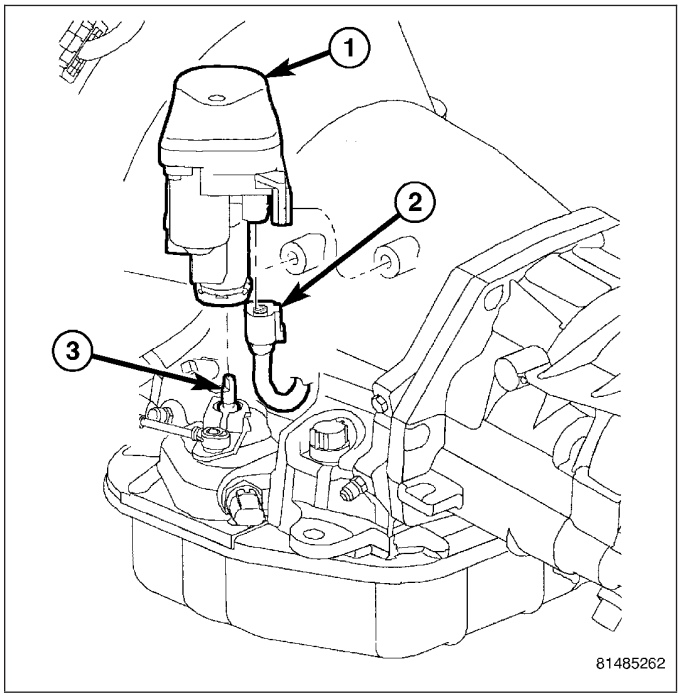


3. Remove the wiring connector (2) from the TTVA (1).
4. Lift the TTVA (1) straight upward and off the throttle valve shaft (3).

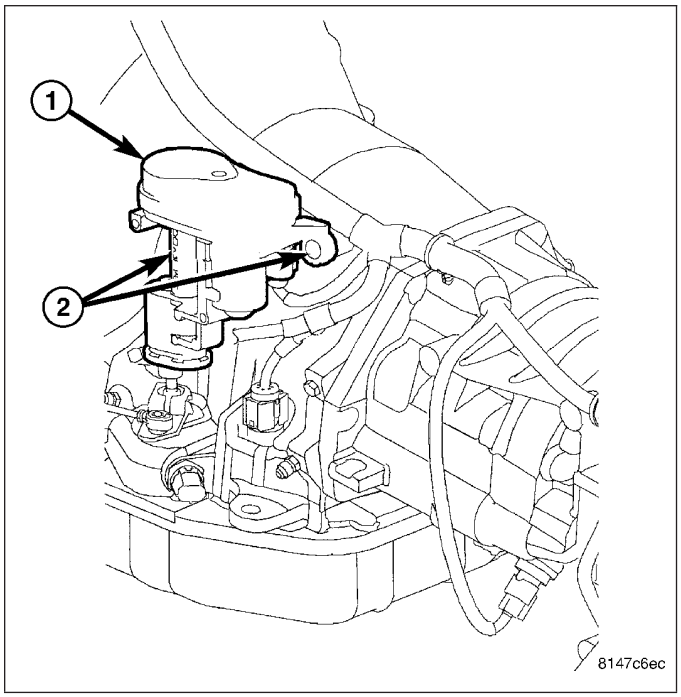


INSTALLATION

1. Position the transmission throttle valve actuator (TTVA) (1) over the throttle valve shaft (3).
2. Align the D-shaped opening in the bottom of the TTVA to the throttle valve shaft and install the TTVA onto the shaft.
3. Install the wiring connector (2) to the TTVA (1).



4. Rotate the TTVA (1) to the transmission case and install the bolts (2) to hold the TTVA to the transmission.
5. Tighten the bolts to 8.5 N·m (75 in.lbs.).
6. Initialize the TTVA (Refer to 21 - TRANSMISSION/ AUTOMATIC - 48RE/THROTTLE VALVE ACTUATOR - ADJUSTMENTS).



ADJUSTMENTS

ADJUSTMENT

The Transmission Throttle Valve Actuator (TTVA) does not require any mechanical adjustments. All changes in throttle valve position are controlled by the Engine Control Module (ECM).

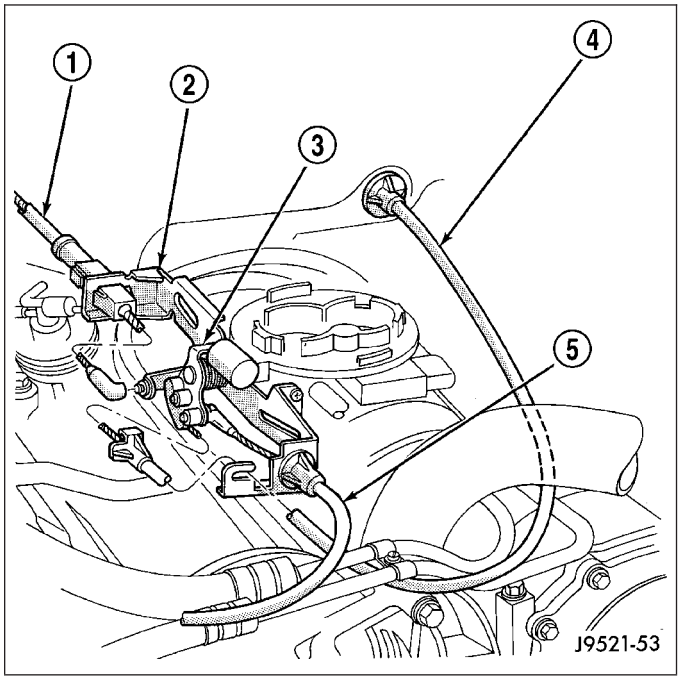
The TTVA does require an initialization period after the actuator has been removed or replaced. After the actuator has been removed or replaced, move the iginition to the ON position for thirty (30) seconds. This will allow the ECM sufficient time to perform the internal calibration procedures to learn the TTVA's current "zero" position. Once this is done, check the ECM for diagnostic trouble codes (DTCs). If no DTCs are set relating to the TTVA, the TTVA is fully calibrated and ready for use.

CABLE-THROTTLE VALVE

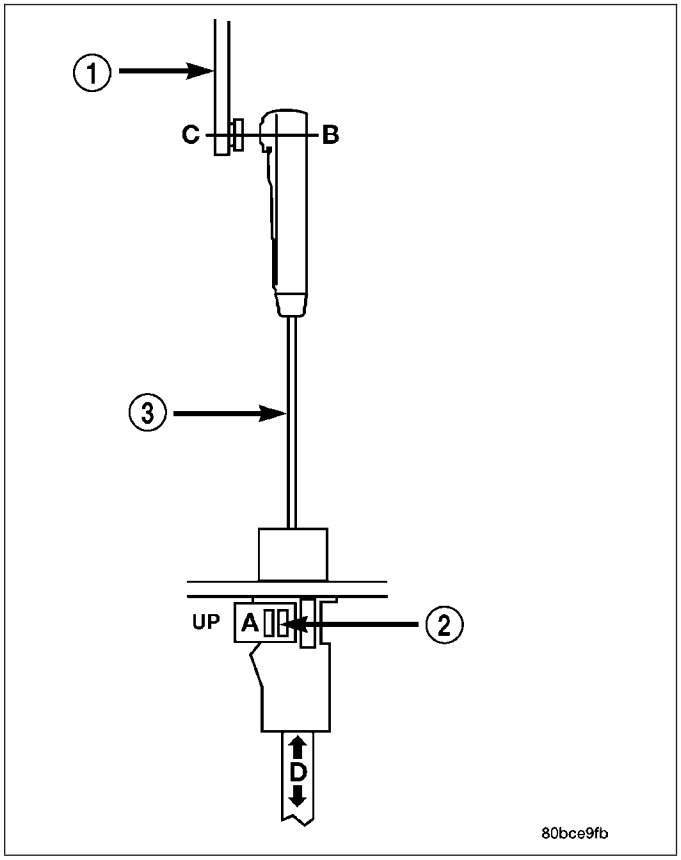
DESCRIPTION

Transmission throttle valve cable (1) adjustment is extremely important to proper operation. This adjustment positions the throttle valve, which controls shift speed, quality, and part-throttle downshift sensitivity.

If cable setting is too loose, early shifts and slippage between shifts may occur. If the setting is too tight, shifts may be delayed and part throttle downshifts may be very sensitive.

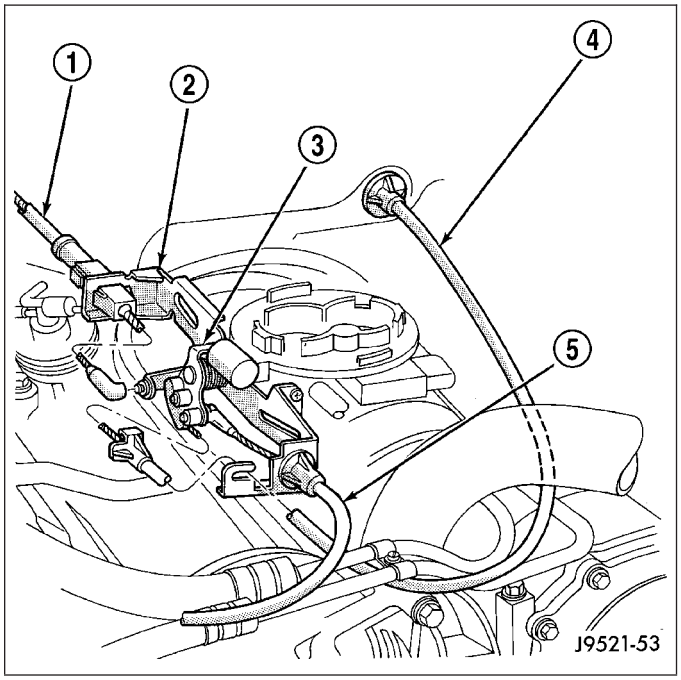


The transmission throttle valve is operated by a cam on the throttle lever. The throttle lever is operated by an adjustable cable (3). The cable is attached to an arm mounted on the throttle lever shaft. A retaining clip (2) at the engine-end of the cable is removed to provide for cable adjustment. The retaining clip is then installed back onto the throttle valve cable to lock in the adjustment.



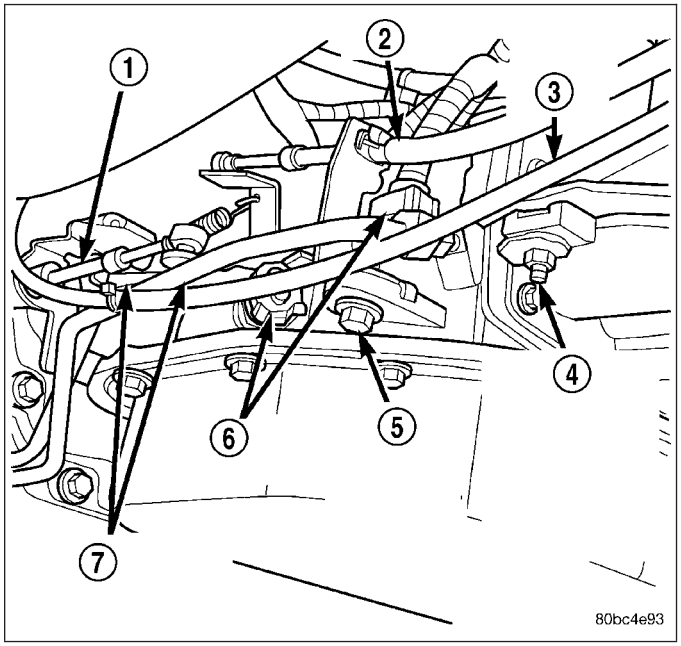
ADJUSTMENTS - THROTTLE VALVE CABLE

A correctly adjusted throttle valve cable (1) will cause the throttle lever on the transmission to move simultaneously with the throttle body lever (3) from the idle position. Proper adjustment will allow simultaneous movement without causing the transmission throttle lever to either move ahead of, or lag behind the lever on the throttle body.

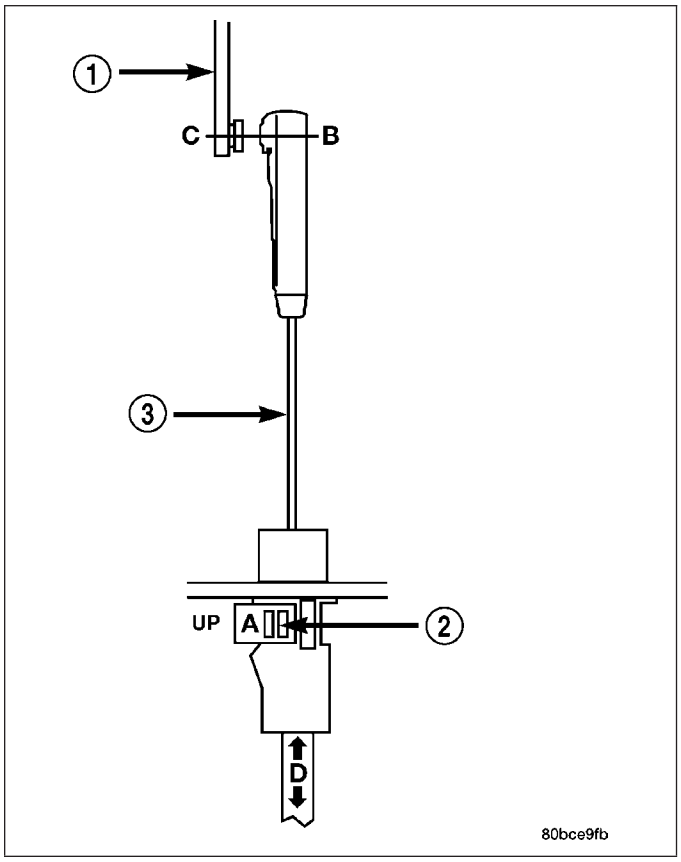


ADJUSTMENT VERIFICATION

1. Turn ignition key to OFF position.
2. Remove air cleaner.
3. Verify that lever on throttle body is at curb idle position. Then verify that the transmission throttle lever is also at idle (fully forward) position.

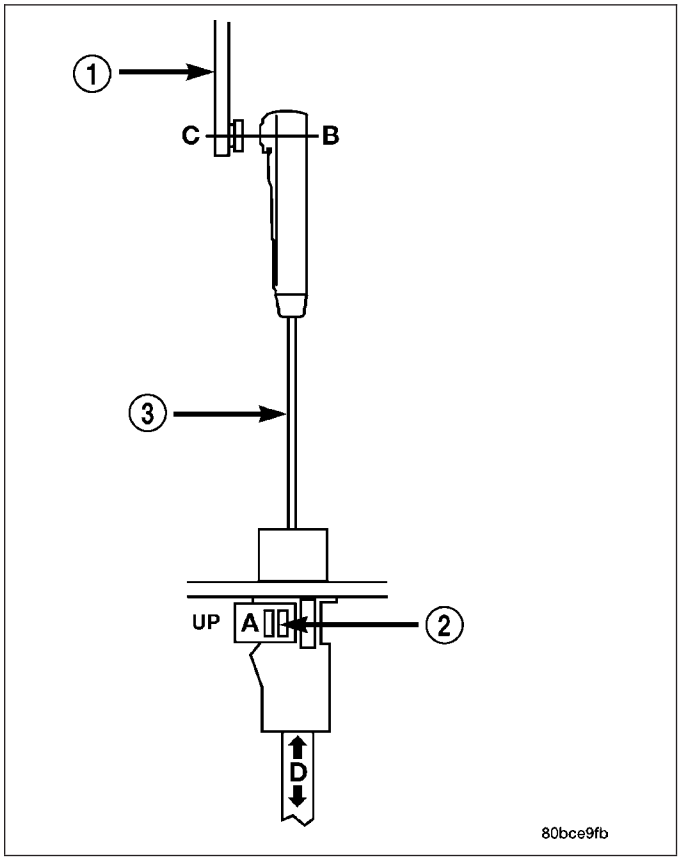


4. Slide cable off attachment stud on throttle body lever.
5. Compare position (B) of cable end to attachment stud on throttle body lever:
   - Cable end and attachment stud should be aligned (or centered on one another) to within 1 mm (0.039 in.) in either direction (B).
   - If cable end and attachment stud are misaligned (off center), cable will have to be adjusted as described in Throttle Valve Cable Adjustment procedure.
6. Reconnect cable end to attachment stud. Then with aid of a helper, observe movement of transmission throttle lever and lever on throttle body.
   - If both levers move simultaneously from idle to half-throttle and back to idle position, adjustment is correct.
   - If transmission throttle lever moves ahead of, or lags behind throttle body lever, cable adjustment will be necessary. Or, if throttle body lever prevents transmission lever from returning to closed position, cable adjustment will be necessary.



ADJUSTMENT PROCEDURE

1. Turn ignition switch to OFF position.
2. Remove air cleaner if necessary.
3. Disconnect cable end (3) from attachment stud on throttle lever (1). **Carefully slide cable off stud. Do not pry or pull cable off.**
4. Verify that transmission throttle lever is in fully closed position. Then be sure lever on throttle body is at curb idle position.
5. Pry the T.V. cable lock (A) into the UP position. This will unlock the cable and allow for readjustment.
6. Apply just enough tension on the T.V. cable (B) to remove any slack in the cable.**Pulling too tight will cause the T.V. lever on the transmission to move out of its idle position, which will result in an incorrect T.V. cable adjustment.** Slide the sheath of the T.V. cable (D) back and forth until the centerlines of the T.V. cable end (B) and the throttle bell crank lever (C) are aligned within one millimeter (1mm).
7. While holding the T.V. cable in the set position push the T.V. cable lock (A) into the down position. This will lock the present T.V. cable adjustment.



NOTE: Be sure that as the cable is pulled forward and centered on the throttle lever stud, the cable housing moves smoothly with the cable. Due to the angle at which the cable housing enters the spring housing, the cable housing may bind slightly and create an incorrect adjustment.

8. Reconnect the T.V. cable (B) to the throttle bellcrank lever (C).
9. Check cable adjustment. Verify transmission throttle lever and lever on throttle body move simultaneously.

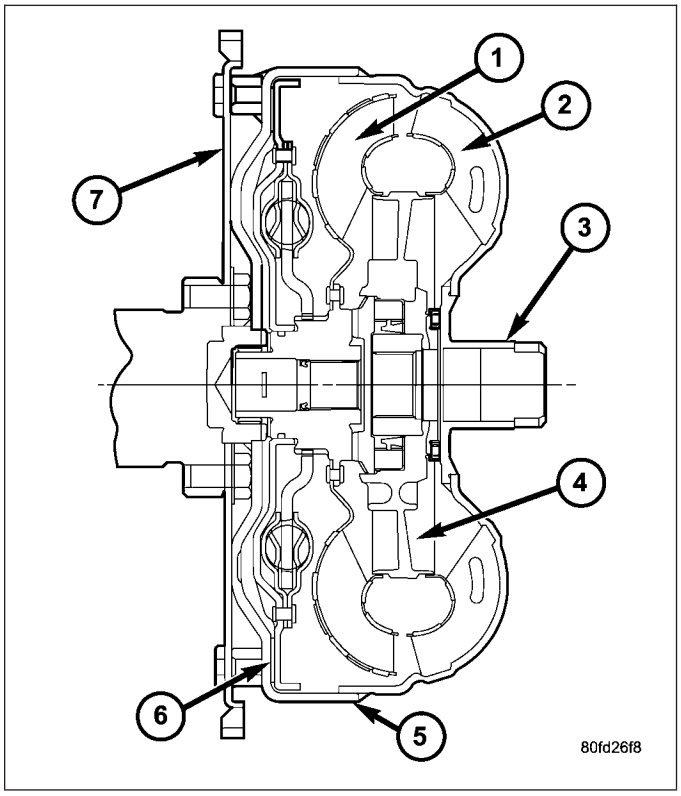
CONVERTER-TORQUE

DESCRIPTION

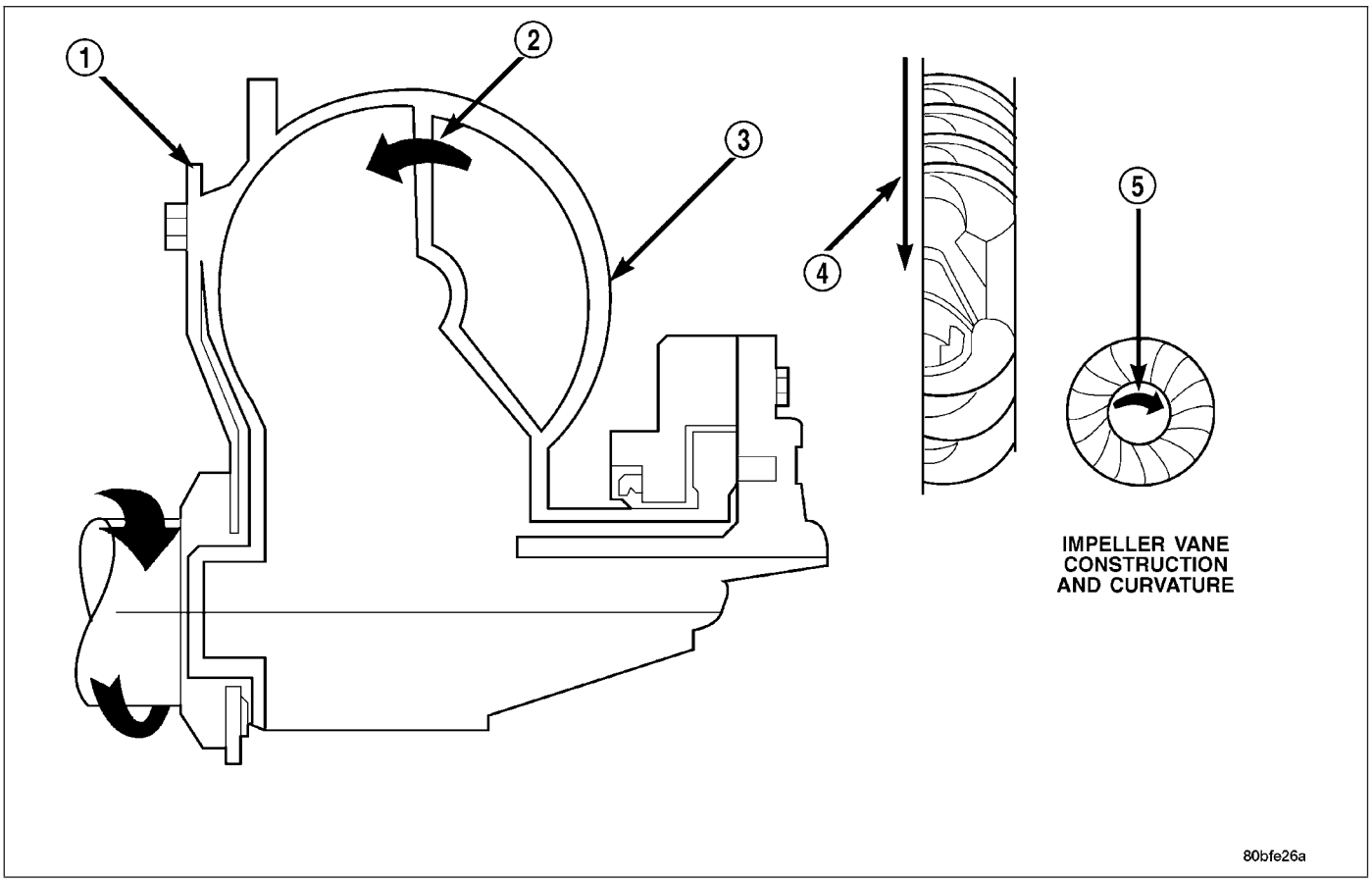
The torque converter is a hydraulic device that couples the engine crankshaft to the transmission. The torque converter consists of an outer shell with an internal turbine (1), a stator (4), an overrunning clutch, an impeller (2), and an electronically applied converter clutch (6). The converter clutch provides reduced engine speed and greater fuel economy when engaged. Clutch engagement also provides reduced transmission fluid temperatures. The torque converter hub drives the transmission oil (fluid) pump.

The torque converter is a sealed, welded unit that is not repairable and is serviced as an assembly.

CAUTION: The torque converter must be replaced if a transmission failure resulted in large amounts of metal or fiber contamination in the fluid.



IMPELLER

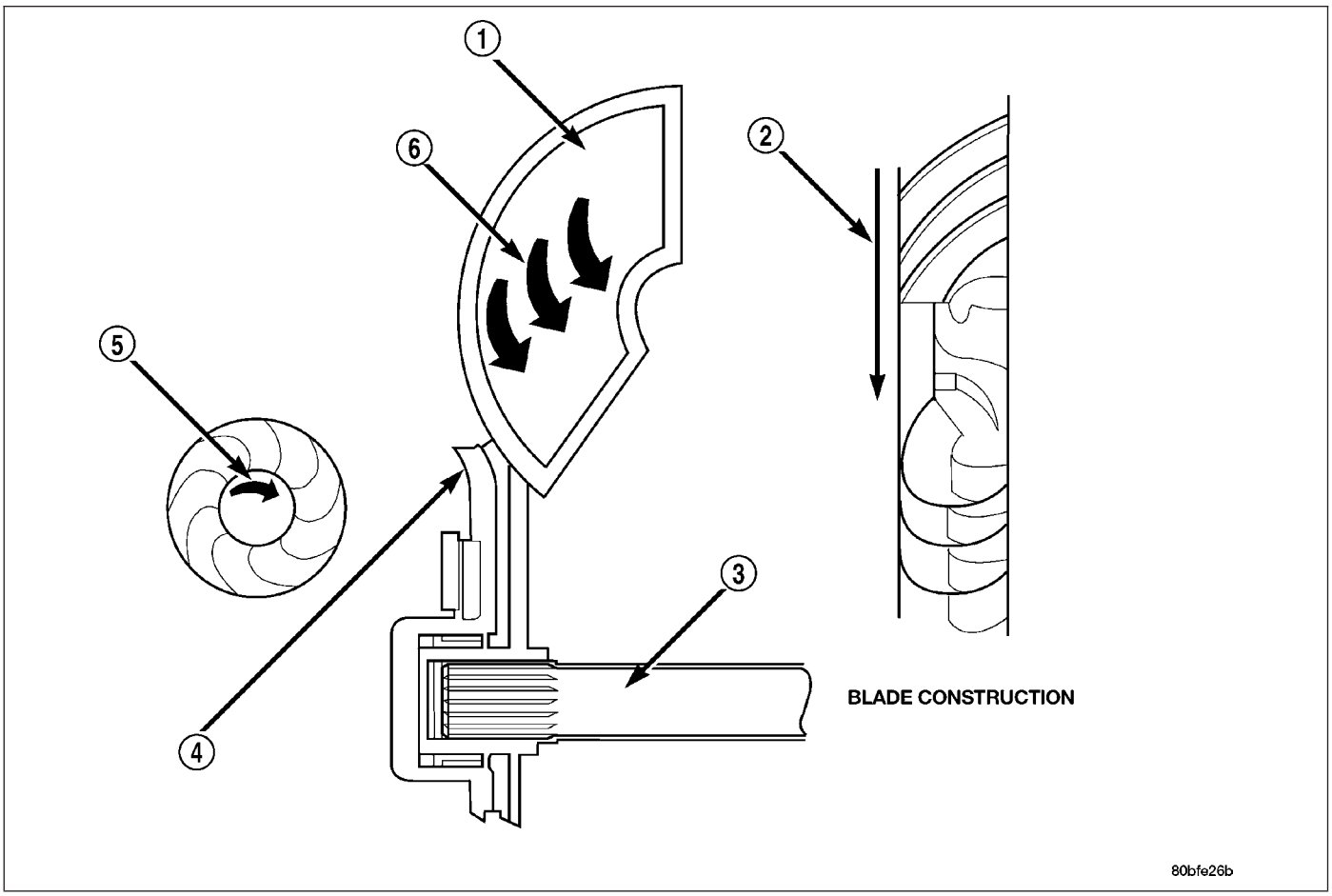


Impeller

1 - ENGINE FLEXPLATE
2 - OIL FLOW FROM IMPELLER SECTION INTO TURBINE SECTION
3 - IMPELLER VANES AND COVER ARE INTEGRAL
4 - ENGINE ROTATION
5 - ENGINE ROTATION

The impeller is an integral part of the converter housing. The impeller consists of curved blades placed radially along the inside of the housing on the transmission side of the converter. As the converter housing is rotated by the engine, so is the impeller, because they are one and the same and are the driving members of the system.

TURBINE



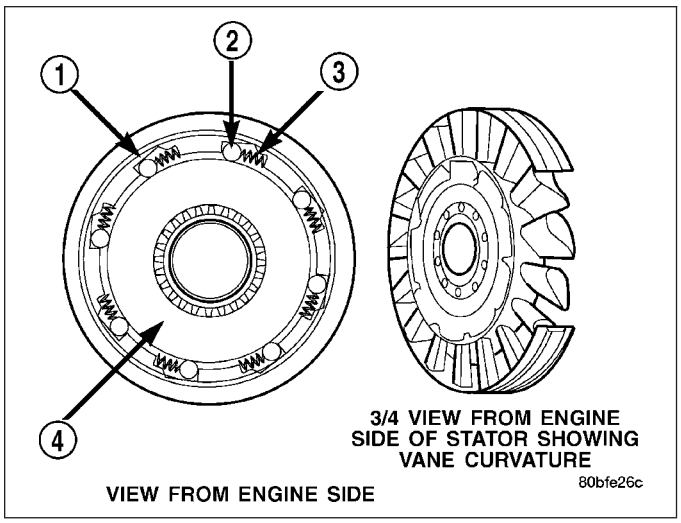
Turbine

1 - TURBINE VANE
2 - ENGINE ROTATION
3 - INPUT SHAFT
4 - PORTION OF TORQUE CONVERTER COVER
5 - ENGINE ROTATION
6 - OIL FLOW WITHIN TURBINE SECTION

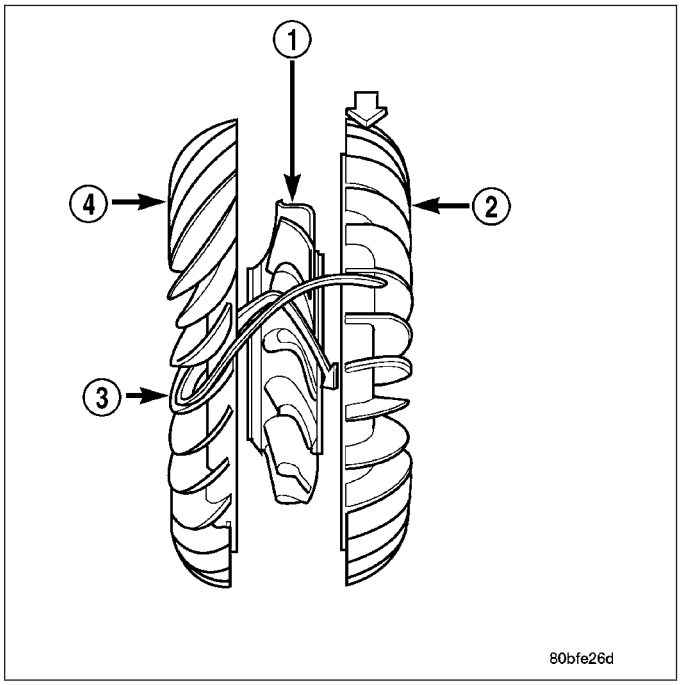
The turbine is the output, or driven, member of the converter. The turbine is mounted within the housing opposite the impeller, but is not attached to the housing. The input shaft is inserted through the center of the impeller and splined into the turbine. The design of the turbine is similar to the impeller, except the blades of the turbine are curved in the opposite direction.

STATOR

The stator assembly is mounted on a stationary shaft which is an integral part of the oil pump. The stator contains an over-running clutch (1-4), which allows the stator to rotate only in a clockwise direction. When the stator is locked against the over-running clutch, the torque multiplication feature of the torque converter is operational.

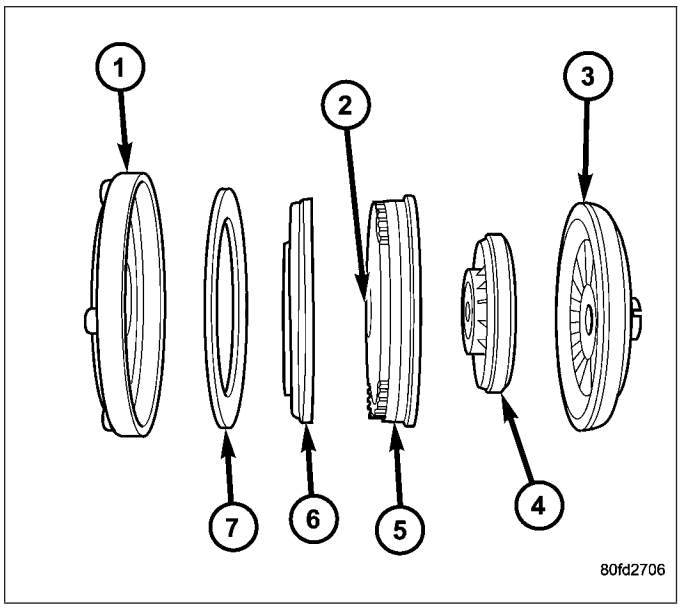


The stator (1) is located between the impeller (2) and turbine (4) within the torque converter case.

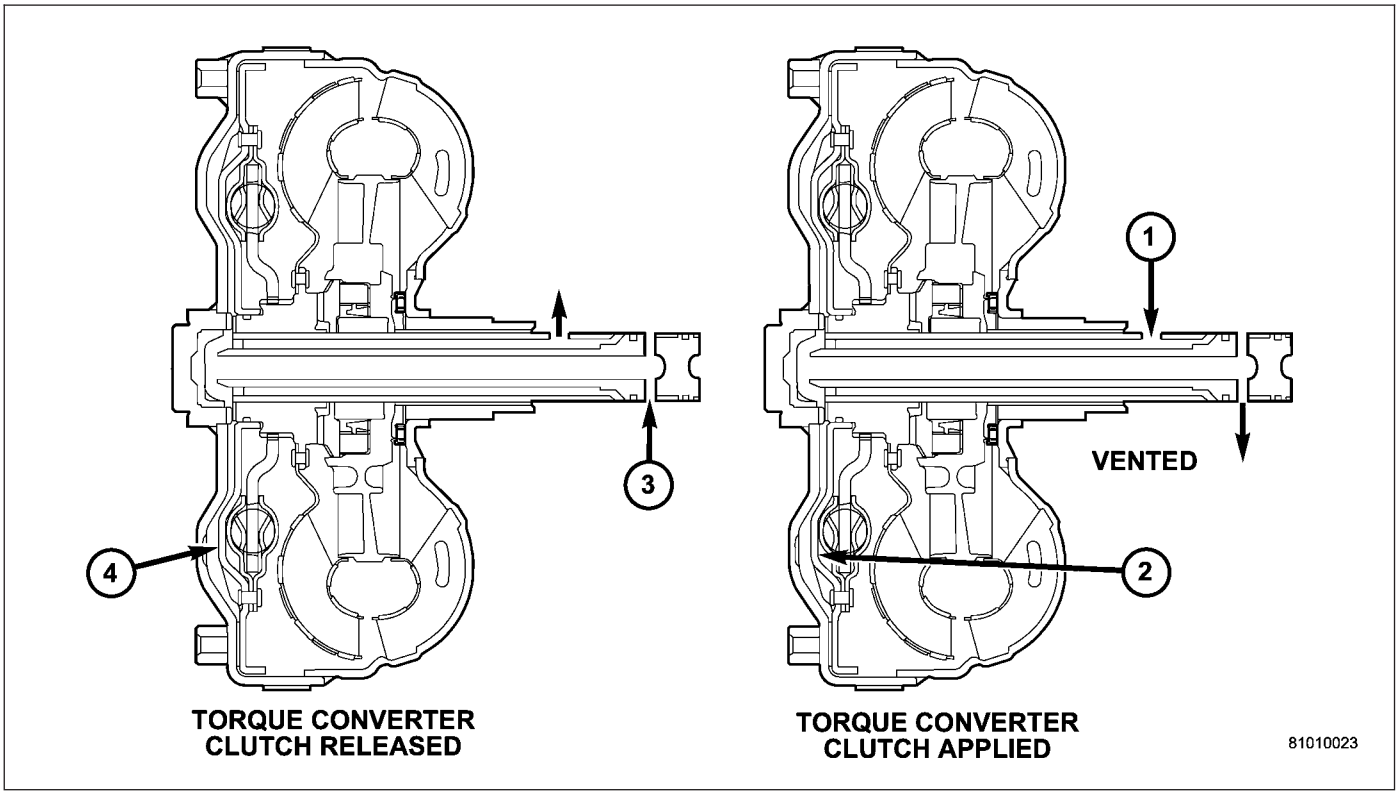


TORQUE CONVERTER CLUTCH (TCC)

The TCC was installed to improve the efficiency of the torque converter that is lost to the slippage of the fluid coupling. Although the fluid coupling provides smooth, shock-free power transfer, it is natural for all fluid couplings to slip. If the impeller and turbine were mechanically locked together, a zero slippage condition could be obtained. A hydraulic piston (6) was added to the turbine (5), and a friction material (7) was added to the inside of the front cover (1) to provide this mechanical lock-up.



OPERATION



Torque Converter Fluid Operation

1 - APPLY PRESSURE
2 - THE PISTON MOVES SLIGHTLY FORWARD
3 - RELEASE PRESSURE
4 - THE PISTON MOVES SLIGHTLY REARWARD

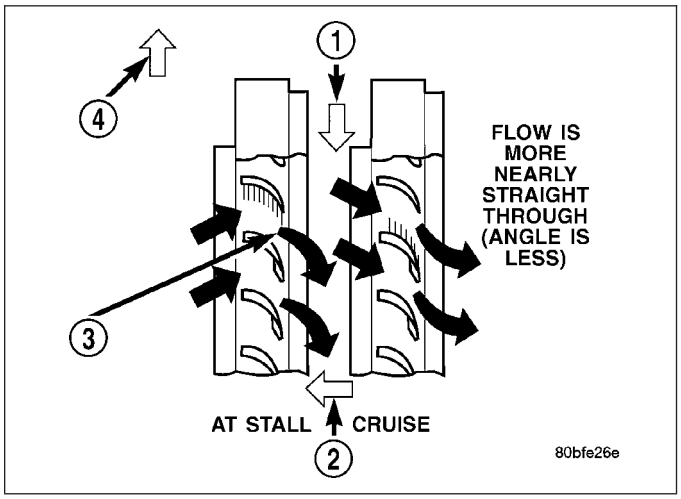
The converter impeller (driving member), which is integral to the converter housing and bolted to the engine drive plate, rotates at engine speed. The converter turbine (driven member), which reacts from fluid pressure generated by the impeller, rotates and turns the transmission input shaft.

TURBINE

As the fluid that was put into motion by the impeller blades strikes the blades of the turbine, some of the energy and rotational force is transferred into the turbine and the input shaft. This causes both of them (turbine and input shaft) to rotate in a clockwise direction following the impeller. As the fluid is leaving the trailing edges of the turbine's blades it continues in a "hindering" direction back toward the impeller. If the fluid is not redirected before it strikes the impeller, it will strike the impeller in a direction that would tend to slow it down.

STATOR

Torque multiplication is achieved by locking the stator's over-running clutch to its shaft. Under stall conditions the turbine is stationary and the oil leaving the turbine blades strikes the face of the stator blades and tries to rotate them in a counterclockwise direction. When this happens the overrunning clutch of the stator locks and holds the stator from rotating. With the stator locked, the oil strikes the stator blades (1) and is redirected into a "helping" direction before it enters the impeller. This circulation of oil from impeller to turbine, turbine to stator, and stator to impeller, can produce a maximum torque multiplication of about 1.75:1. As the turbine begins to match the speed of the impeller, the fluid that was hitting the stator in such as way as to cause it to lock-up is no longer doing so. In this condition of operation, the stator begins to free wheel and the converter acts as a fluid coupling.



Stator Operation

1 - DIRECTION STATOR WILL FREE WHEEL DUE TO OIL PUSHING ON BACKSIDE OF VANES
2 - FRONT OF ENGINE
3 - INCREASED ANGLE AS OIL STRIKES VANES
4 - DIRECTION STATOR IS LOCKED UP DUE TO OIL PUSHING AGAINST STATOR VANES

TORQUE CONVERTER CLUTCH (TCC)

The torque converter clutch is hydraulically applied or released when fluid is feed or vented from the hydraulic circuit by the torque converter control (TCC) solenoid on the valve body. The torque converter clutch is controlled by the Powertrain Control Module (PCM). The torque converter clutch engages in FOURTH gear, and in THIRD gear under various conditions, such as when the O/D switch is OFF, or when the vehicle is cruising on a level surface after the vehicle has warmed up. The torque converter clutch can also be engaged in the MANUAL SECOND gear position if high transmission temperatures are sensed by the PCM. The torque converter clutch may disengage momentarily when an increase in engine load is sensed by the PCM, such as when the vehicle begins to go uphill or the throttle pressure is increased.

REMOVAL

1. Remove transmission and torque converter from vehicle. (Refer to 21 - TRANSMISSION/AUTOMATIC - 45RFE/545RFE - REMOVAL)
2. Place a suitable drain pan under the converter housing end of the transmission.

CAUTION: Verify that transmission is secure on the lifting device or work surface, the center of gravity of the transmission will shift when the torque converter is removed creating an unstable condition. The torque converter is a heavy unit. Use caution when separating the torque converter from the transmission.

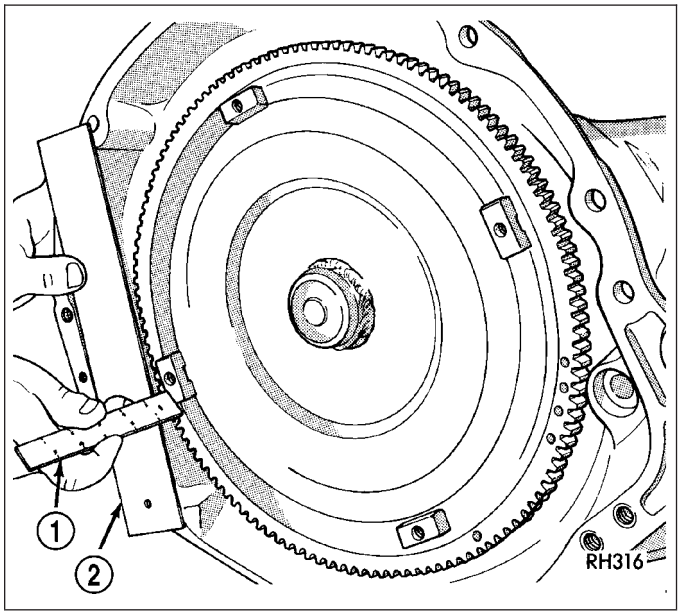
3. Pull the torque converter forward until the center hub clears the oil pump seal.
4. Separate the torque converter from the transmission.

INSTALLATION

Check converter hub and drive notches for sharp edges, burrs, scratches, or nicks. Polish the hub and notches with 320/400 grit paper or crocus cloth if necessary. The hub must be smooth to avoid damaging the pump seal at installation.

1. Lubricate oil pump seal lip with transmission fluid.
2. Place torque converter in position on transmission.

CAUTION: Do not damage oil pump seal or bushing while inserting torque converter into the front of the transmission.



3. Align torque converter to oil pump seal opening.
4. Insert torque converter hub into oil pump.
5. While pushing torque converter inward, rotate converter until converter is fully seated in the oil pump gears.
6. Check converter seating with a scale (1) and straightedge (2). Surface of converter lugs should be 19mm (0.75 in.) to the rear of the straightedge when converter is fully seated.
7. If necessary, temporarily secure converter with C-clamp attached to the converter housing.
8. Install the transmission in the vehicle.
9. Fill the transmission with the recommended fluid.

VALVE-TORQUE CONVERTER DRAINBACK

DESCRIPTION

GAS ENGINES

The drainback valve is located in the transmission cooler outlet (pressure) line.

DIESEL ENGINE

The converter drainback check valve is located in the in the TOC pressure - supply line, between the engine mounted TOC and the air to oil TOC.

OPERATION

GAS ENGINES

The valve prevents fluid from draining from the converter into the cooler and lines when the vehicle is shut down for lengthy periods. Production valves have a hose nipple at one end, while the opposite end is threaded for a flare fitting. All valves have an arrow (or similar mark) to indicate direction of flow through the valve.

DIESEL ENGINE

The valve prevents fluid from draining from the converter into the cooler and lines when the vehicle is shut down for lengthy periods. Production valves have pipe thread on one end, while the opposite end is threaded for a flare fitting, and are threaded into the oil cooler mounted on the side of the engine. All valves have an arrow (or similar mark) to indicate direction of flow through the valve.

STANDARD PROCEDURE

GAS ENGINES

The converter drainback check valve is located in the cooler outlet (pressure) line near the radiator tank. The valve prevents fluid drainback when the vehicle is parked for lengthy periods. The valve check ball is spring loaded and has an opening pressure of approximately 2 psi.

The valve is serviced as an assembly; it is not repairable. Do not clean the valve if restricted, or contaminated by sludge, or debris. If the valve fails, or if a transmission malfunction occurs that generates significant amounts of sludge and/or clutch particles and metal shavings, the valve must be replaced.

If the valve is restricted, installed backwards, or in the wrong line, it will cause an transmission overheating condition and possible transmission failure.

CAUTION: The drainback valve is a one-way flow device. It must be properly oriented in terms of flow direction for the cooler to function properly. The valve must be installed in the pressure line. Otherwise flow will be blocked and would cause an transmission overheating condition and eventual transmission failure.

DIESEL ENGINE

The converter drainback check valve is located in the in the TOC pressure - supply line, between the engine mounted transmission oil cooler and the air to oil transmission oil cooler. The valve prevents fluid drainback when the vehicle is parked for lengthy periods. The valve check ball is spring loaded and has an opening pressure of approximately 2 psi.

The valve is serviced as an assembly; it is not repairable. Do not clean the valve if restricted, or contaminated by sludge, or debris. If the valve fails, or if a transmission malfunction occurs that generates significant amounts of sludge and/or clutch particles and metal shavings, the valve must be replaced.

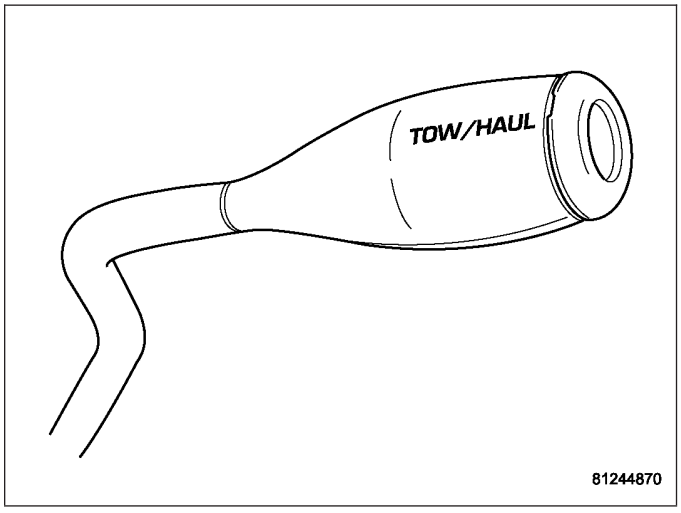
If the valve is restricted, installed backwards, or in the wrong line, it will cause an transmission overheating condition and possible transmission failure.

CAUTION: The drainback valve is a one-way flow device. It must be properly oriented in terms of flow direction for the cooler to function properly. The valve must be installed in the pressure line. Otherwise flow will be blocked and would cause an transmissionn overheating condition and eventual transmission failure.

SWITCH-TOW/HAUL OVERDRIVE

DESCRIPTION

The tow/haul overdrive OFF (control) switch is located in the shift lever arm. The switch is a momentary contact device that signals the PCM to toggle current status of the overdrive function.



OPERATION

At key-on, overdrive operation is allowed. Pressing the switch once causes the tow/haul overdrive OFF mode to be entered and the Tow/Haul lamp to be illuminated. Pressing the switch a second time causes normal overdrive operation to be restored and the tow/haul lamp to be turned off. The tow/haul overdrive OFF mode defaults to ON after the ignition switch is cycled OFF and ON. The normal position for the control switch is the ON position. The switch must be in this position to energize the solenoid and allow a 3-4 upshift. The control switch indicator light illuminates only when the tow/haul overdrive switch is turned to the OFF position, or when illuminated by the transmission control module.

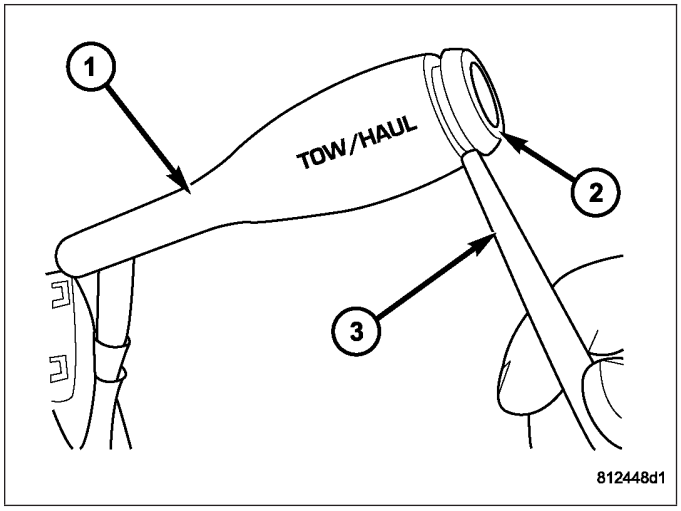
DIAGNOSIS AND TESTING - OVERDRIVE ELECTRICAL CONTROLS

The tow/haul overdrive off switch, valve body solenoid, case connectors and related wiring can all be tested with a 12 volt test lamp or a volt/ohmmeter. Check continuity of each component when diagnosis indicates this is necessary.

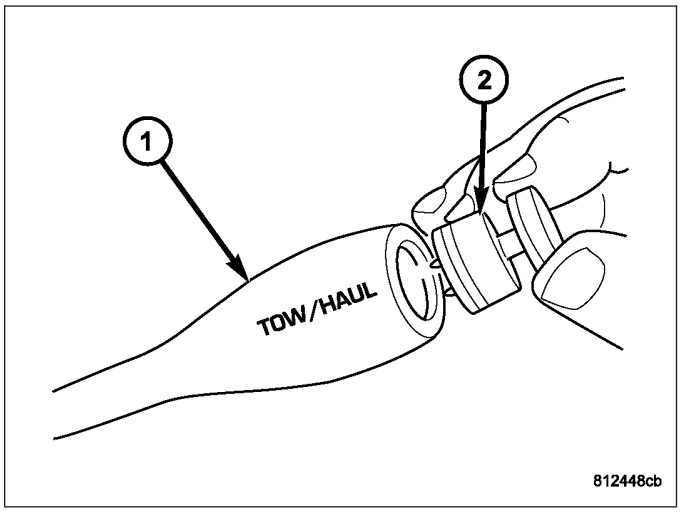
Switch and solenoid continuity should be checked whenever the transmission fails to shift into fourth gear range.

REMOVAL

1. Using a plastic trim tool, remove the tow/haul overdrive off switch retainer (2) from the shift lever (1).



2. Pull the switch (2) outwards to release it from the connector in the lever (1)



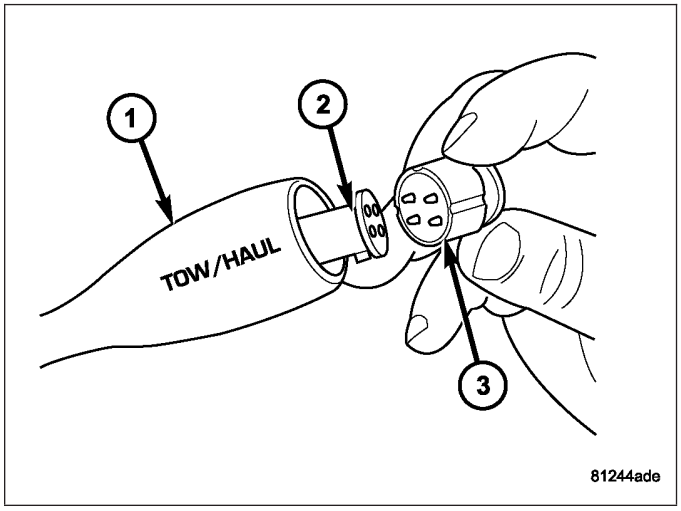
INSTALLATION

NOTE: There is enough slack in the wire to pull out the connector from the lever.

1. Pull the connector (2) out of the lever (1) just enough to grasp it.

CAUTION: Be careful not to bend the pins on the tow/haul overdrive off switch. Use care when installing the switch, as it is not indexed, and can be accidentally installed incorrectly.

2. Install the tow/haul overdrive off switch (3) into the connector (2)
3. Push the tow/haul overdrive off switch (3) and wiring into the shift lever (1).
4. Install the tow/haul overdrive off switch retainer onto the shift lever.



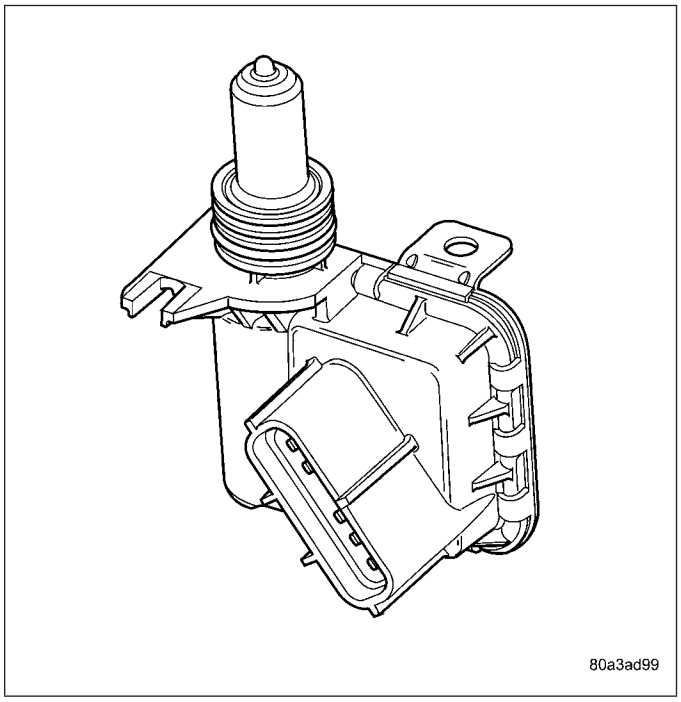
SENSOR-TRANSMISSION RANGE

DESCRIPTION

The Transmission Range Sensor (TRS) has 3 primary functions:

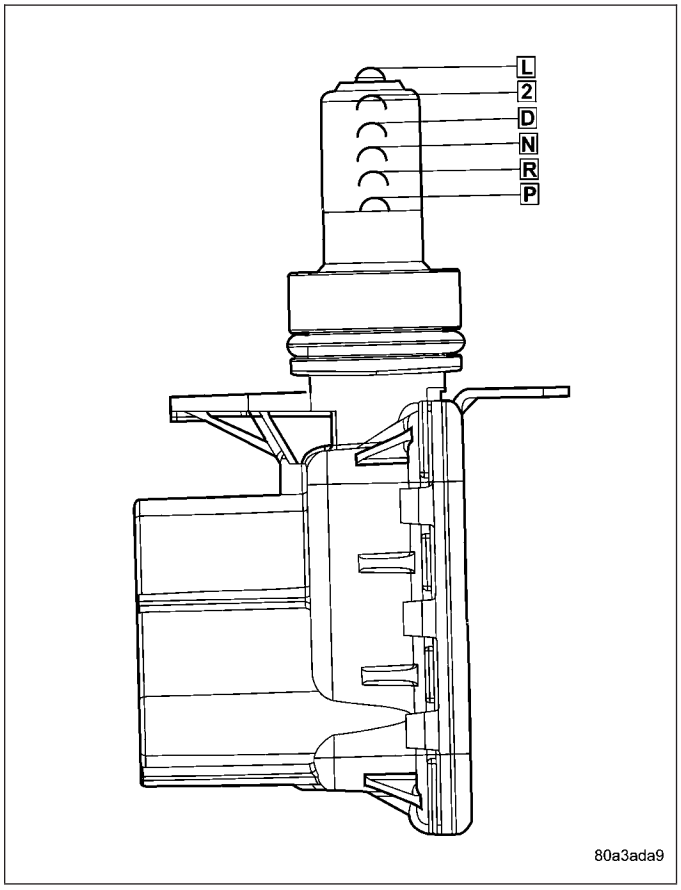
- Provide a PARK/NEUTRAL start signal to the engine controller and the starter relay.
- Turn the Back-up lamps on when the transmission is in REVERSE and the engine (ignition) is on.
- Provide a transmission range signal to the instrument cluster.

The sensor is mounted in the transmission housing near the valve body, just above the pan rail. It's in the same position as the Park/Neutral switch on other transmissions. The TRS contacts a cammed surface on the manual valve lever. The cammed surface translates the rotational motion of the manual lever into the linear motion of the sensor. The cammed surface on the manual lever is comprised of two parts controlling the TRS signal: The insulator portion contacts the switch poppet when the manual lever is not in PARK or NEUTRAL. The manual lever itself contacts the poppet when the lever is in PARK or NEUTRAL; providing a ground for the signal from the starter relay and the appropriate engine controller.



OPERATION

As the switch moves through its linear motion contacts slide across a circuit board which changes the resistance between the range sensing pins of the switch. A power supply on the instrument cluster provides a regulated voltage signal to the switch. The return signal is decoded by the cluster, which then controls the PRNDL display to correspond with the correct transmission range. A bus message of transmission range is also sent by the cluster. In REVERSE range a second contact set closes the circuit providing power to the reverse lamps.



Indicated Gear Position			Transmission Status	Column Shifter Position
Mechanical State	Electronic Display (Ignition Unlocked)	Electronic Display (Ignition On)		
P	P	P	Vehicle is in PARK with the pawl engaged.	In the PARK gate.
	R		The PARK pawl is disengaged and the vehicle is free to roll, but REVERSE is not engaged.	Between the PARK and REVERSE gates.
R	R	R	The transmission is hydraulically in REVERSE.	In the REVERSE gate.
	N		The transmission is transitioning between REVERSE and NEUTRAL.	Between the REVERSE and NEUTRAL gates.
N	N	N	The vehicle is in NEUTRAL.	In the NEUTRAL gate.

Indicated Gear Position			Transmission Status	Column Shifter Position
Mechanical State	Electronic Display (Ignition Unlocked)	Electronic Display (Ignition On)		
	N		The transmission is transitioning between NEUTRAL and DRIVE, but is not in DRIVE.	Between the NEUTRAL and DRIVE gates.
D	D	D	The transmission is hydraulically in DRIVE.	In the DRIVE gate,
2	2	2	The transmission is hydraulically in Manual SECOND.	In the SECOND gate.
1	1	1	The transmission is hydraulically in Manual FIRST.	In the FIRST gate.

DIAGNOSIS AND TESTING - TRANSMISSION RANGE SENSOR (TRS)

NOTE: For all circuit identification in the following steps, Refer to the appropriate Wiring Information.

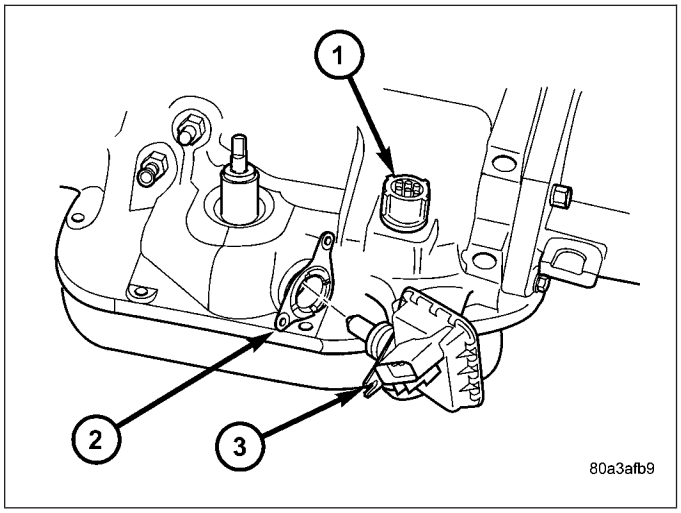
1. Raise vehicle on suitable hoist.
2. Disconnect the vehicle's shift cable from the manual lever.
3. With the manual lever in the PARK position (the PARK position is with the manual lever moved to the full rearward position), measure the resistance between the Park/Neutral Position Sense pin of the TRS and the transmission case. The resistance should be less than 5 ohms.
4. With the manual lever in the NEUTRAL position (the NEUTRAL position is with the manual lever moved two detents forward of the full rearward position), measure the resistance between the Park/Neutral Position Sense pin of the TRS and the transmission case. The resistance should be less than 5 ohms.
5. If the resistance is greater than 5 ohms in either of the previous steps, check for a dirty contact between the tip of the TRS rod and the valve body manual lever. If the contact is OK, replace the TRS.
6. With the manual lever in the REVERSE position (the REVERSE position is with the manual lever moved one detent forward of the full rearward position), measure the resistance between the Fused Ignition Switch Output and the Back-up Lamp feed pins of the TRS. The resistance should be less than 5 ohms. If the resistance is greater than 5 ohms, replace the TRS.
7. With the manual lever in the PARK position (the PARK position is with the manual lever moved to the full rearward position), measure the resistance between the Transmission Range Sensor MUX and the Transmission Range Sensor 5V Supply pins of the TRS. The resistance should be 522.2 ohms. If the resistance is not correct, replace the TRS.
8. With the manual lever in the REVERSE position (the REVERSE position is with the manual lever moved one detent forward of the full rearward position), measure the resistance between the Transmission Range Sensor MUX and the Transmission Range Sensor 5V Supply pins of the TRS. The resistance should be 206.2 ohms. If the resistance is not correct, replace the TRS.
9. With the manual lever in the NEUTRAL position (the NEUTRAL position is with the manual lever moved two detents forward of the full rearward position), measure the resistance between the Transmission Range Sensor MUX and the Transmission Range Sensor 5V Supply pins of the TRS. The resistance should be 108.6 ohms. If the resistance is not correct, replace the TRS.
10. With the manual lever in the DRIVE position (the DRIVE position is with the manual lever moved three detents forward of the full rearward position), measure the resistance between the Transmission Range Sensor MUX and the Transmission Range Sensor 5V Supply pins of the TRS. The resistance should be 59.9 ohms. If the resistance is not correct, replace the TRS.
11. With the manual lever in the SECOND position (the SECOND position is with the manual lever moved one detent rearward of the full forward position), measure the resistance between the Transmission Range Sensor

MUX and the Back-up Lamp feed pins of the TRS. The resistance should be 31.9 ohms. If the resistance is not correct, replace the TRS.

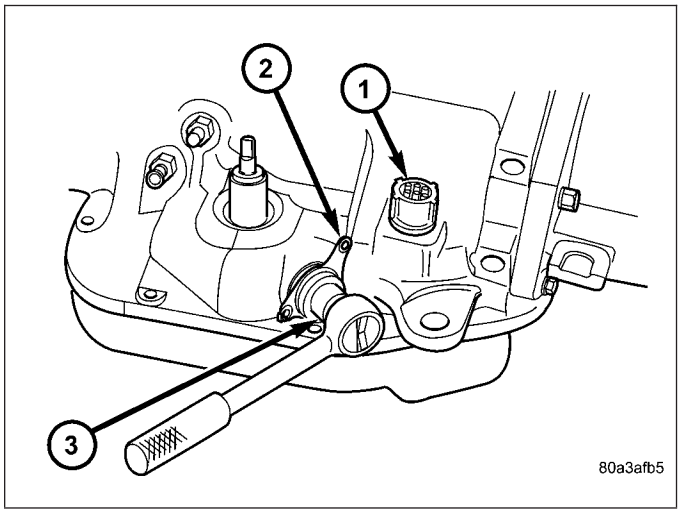
12. With the manual lever in the LOW position (the LOW position is with the manual lever moved to the full forward position), measure the resistance between the Transmission Range Sensor MUX and the Back-up Lamp feed pins of the TRS. The resistance should be 13.7 ohms. If the resistance is not correct, replace the TRS.

REMOVAL

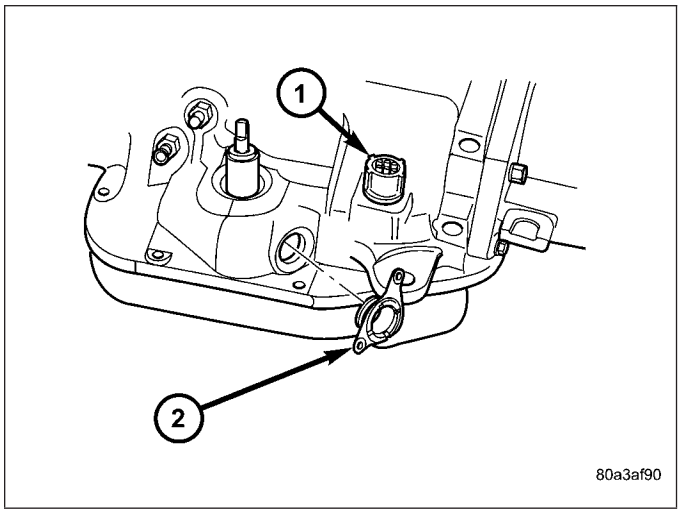
1. Raise vehicle and position drain pan under the transmission range sensor (TRS).
2. Move the transmission manual lever to the manual LOW position. The manual LOW position is with the manual lever in the forward-most detent.
3. Disengage the wiring connector from the TRS.
4. Remove the two screws holding the TRS to the TRS mounting bracket.
5. Remove the TRS (3) from the TRS mounting bracket by pulling it straight out of the bracket.



6. If necessary, loosen the TRS mounting bracket (2) in the transmission case using Adapter 8581 (3).

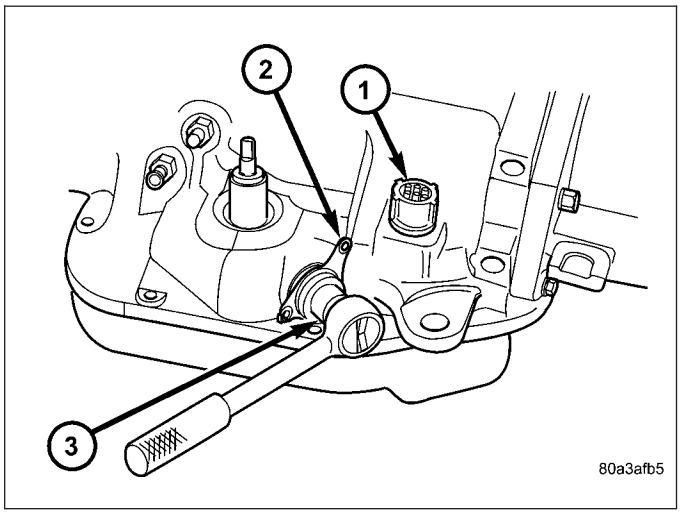


7. If necessary, remove the TRS mounting bracket (2) from the transmission case.

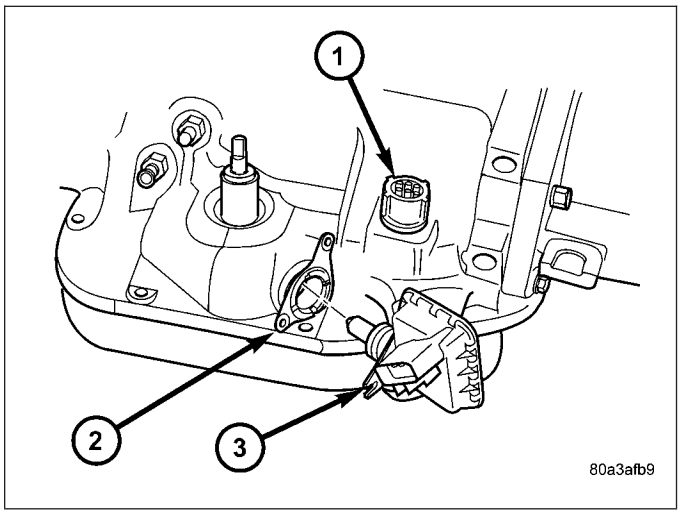


INSTALLATION

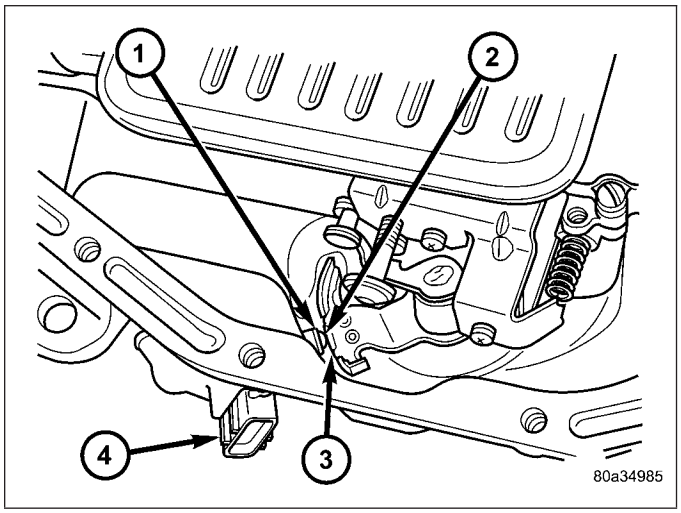
1. Move the transmission manual shaft lever to the manual LOW position.
2. If necessary, install the TRS mounting bracket (2) into the transmission case. Using Adapter 8581 (3), tighten the mounting bracket to 34 N·m (300 in.lbs.).



3. Install the TRS (3) into the mounting bracket (2) with the wiring connector facing the front of the transmission.



4. Install the two screws to hold the TRS to the mounting bracket. Tighten the screws to 5 N·m (45 in.lbs.).
5. Verify proper sensor operation (1-4).
6. Move the transmission manual shaft lever to the PARK position.
7. Connect TRS wiring connector to the TRS and lower vehicle.
8. Refill the transmission fluid to the correct level.



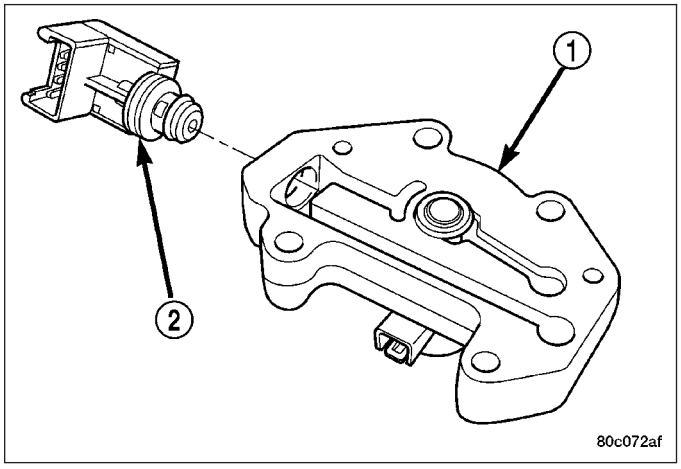
1 - NEUTRAL CONTACT
2 - MANUAL LEVER AND SENSOR PLUNGER IN REVERSE POSITION
3 - PARK CONTACT
4 - TRANSMISSION RANGE SENSOR

SENSOR-TRANSMISSION TEMPERATURE

DESCRIPTION

Transmission fluid temperature readings are supplied to the transmission control module by the thermistor. The temperature readings are used to control engagement of the fourth gear overdrive clutch, the converter clutch, and governor pressure. Normal resistance value for the thermistor at room temperature is approximately 2000 ohms.

The thermistor is part of the governor pressure sensor assembly (2) and is immersed in transmission fluid at all times.



OPERATION

The PCM prevents engagement of the converter clutch and overdrive clutch, when fluid temperature is below approximately 10°C (50°F).

If fluid temperature exceeds 126°C (260°F), the PCM causes a 4-3 downshift and engage the converter clutch. Engagement is according to the third gear converter clutch engagement schedule.

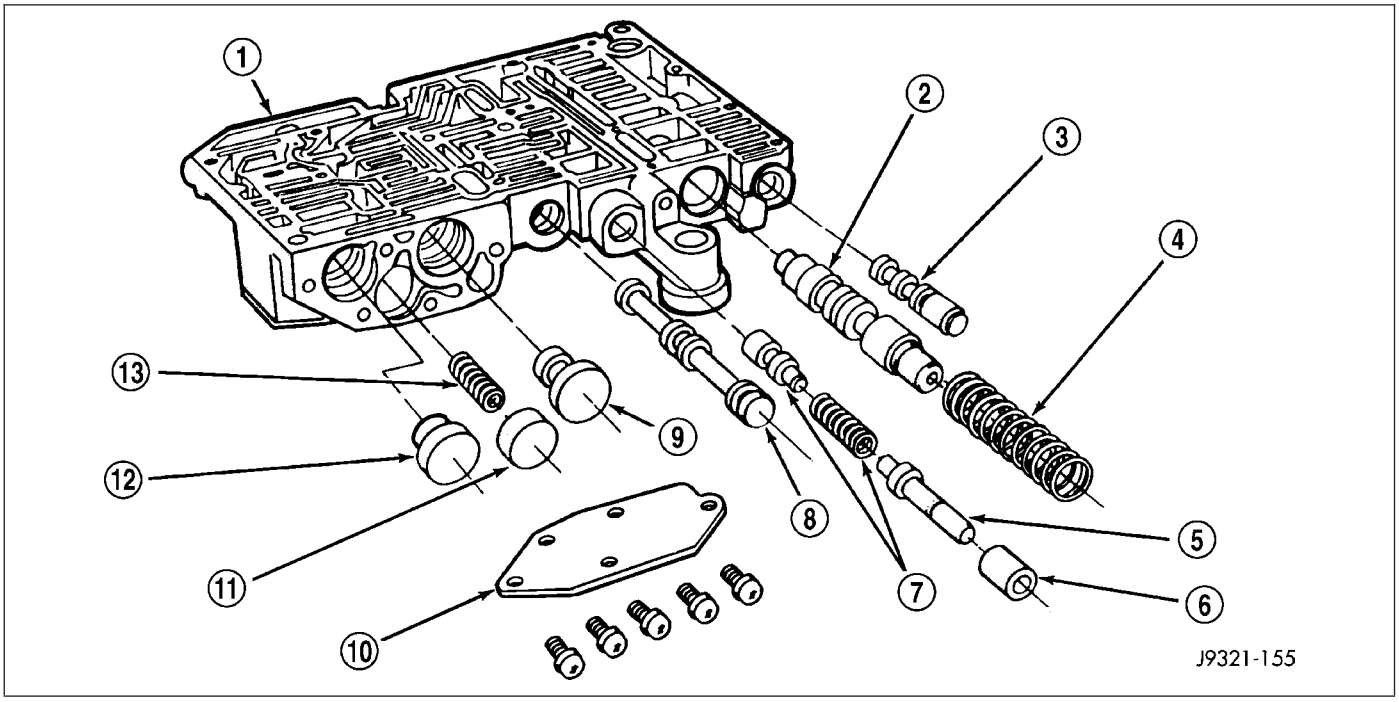
The Tow/Haul lamp in the instrument panel illuminates when the shift back to third occurs. The transmission will not allow fourth gear operation until fluid temperature decreases to approximately 110°C (230°F).

BODY-VALVE

DESCRIPTION

The valve body consists of a cast aluminum valve body, a separator plate, and transfer plate. The valve body contains valves and check balls that control fluid delivery to the torque converter clutch, bands, and frictional clutches. The valve body contains the following components.

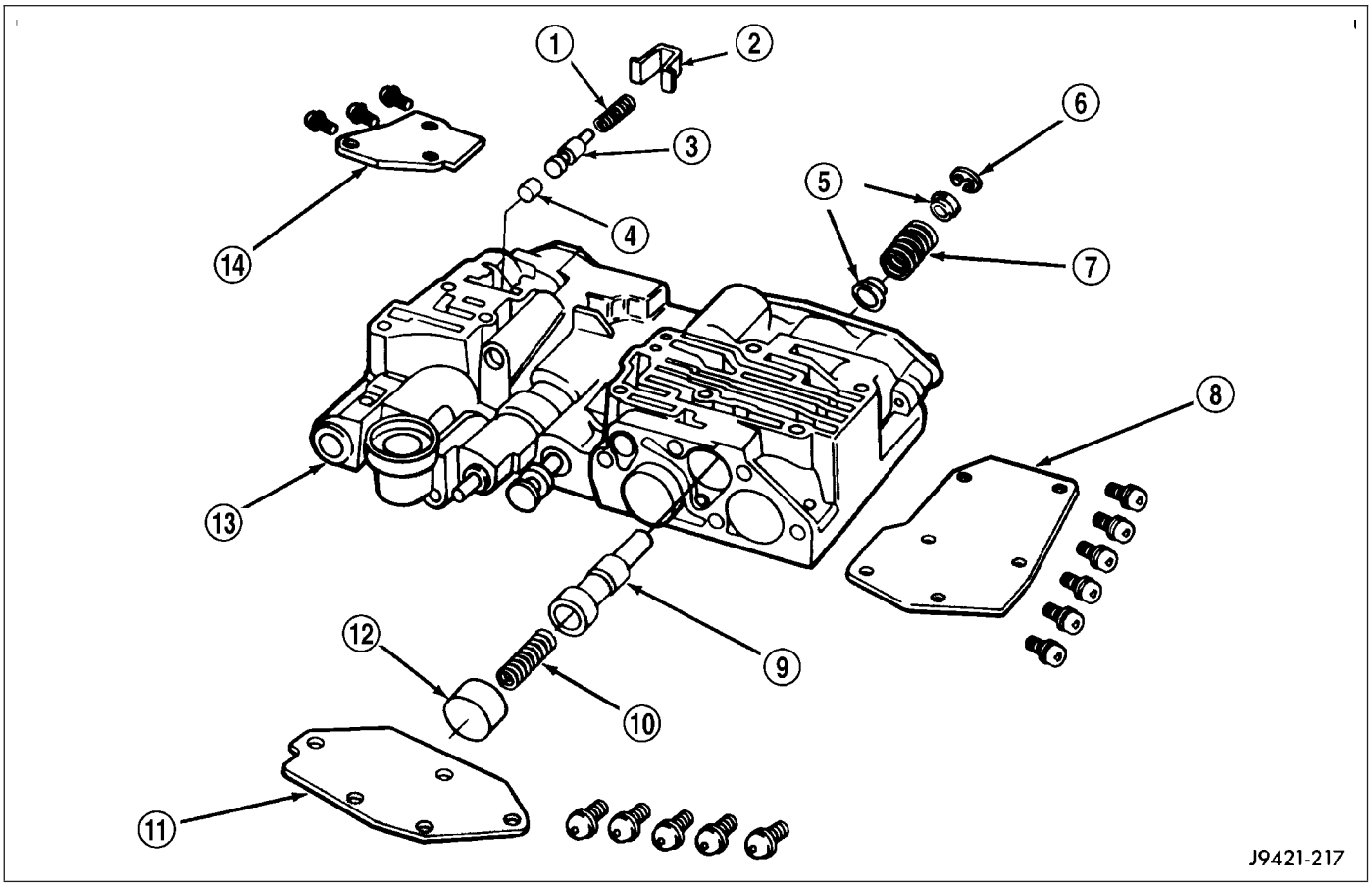
By adjusting the spring pressure acting on the regulator valve, transmission line pressure can be adjusted.



Upper Housing Control Valve Locations

1 - UPPER HOUSING
2 - REGULATOR VALVE
3 - SWITCH VALVE
4 - REGULATOR VALVE SPRING
5 - KICKDOWN VALVE
6 - KICKDOWN DETENT
7 - THROTTLE VALVE AND SPRING
8 - MANUAL VALVE
9 - 1-2 GOVERNOR PLUG
10 - GOVERNOR PLUG COVER
11 - THROTTLE PLUG
12 - 2-3 GOVERNOR PLUG
13 - SHUTTLE VALVE PRIMARY SPRING

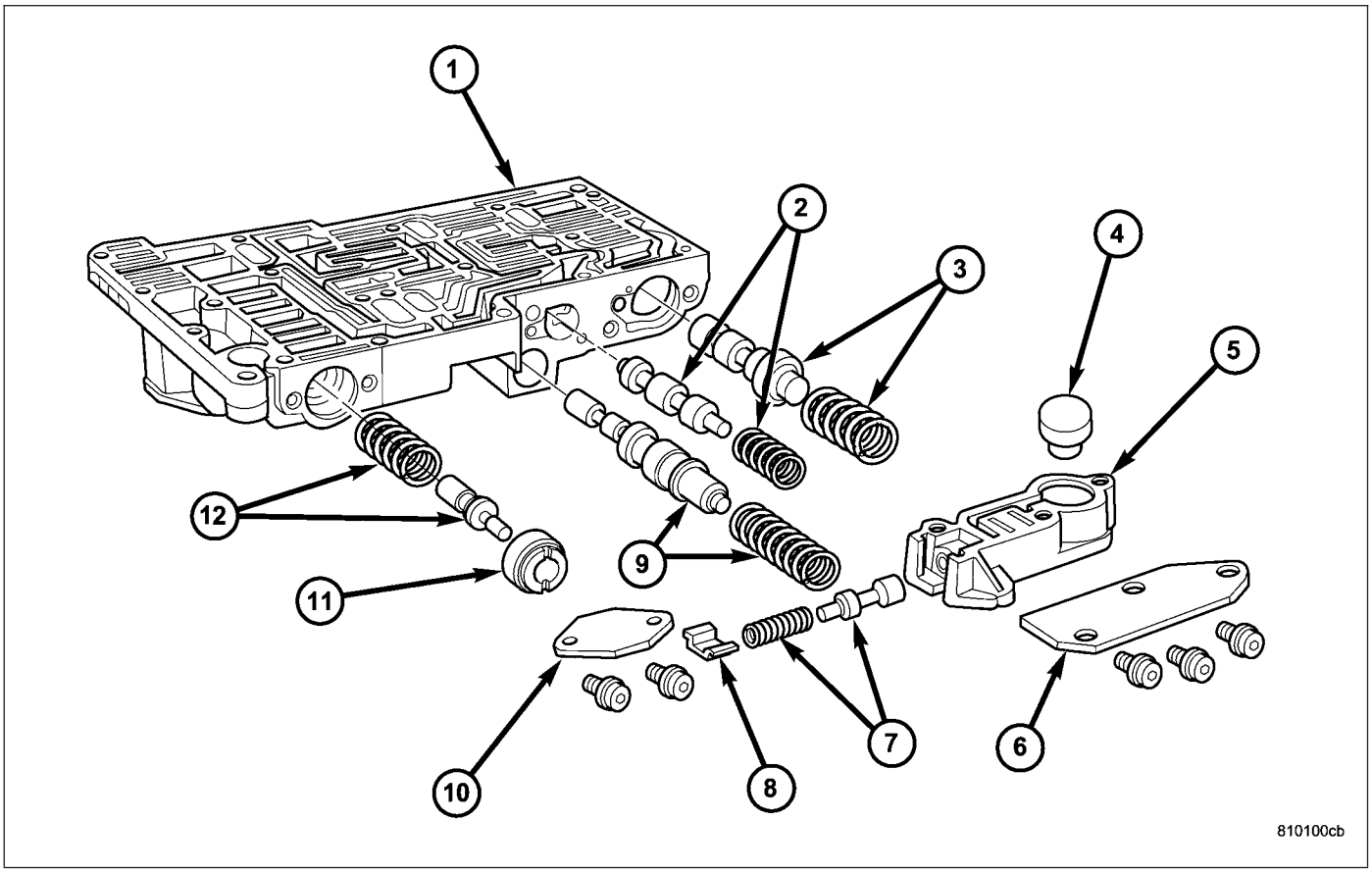
- Regulator valve (2)
- Switch valve (3)
- Regulator valve spring (4)
- Kickdown valve (5)
- Kickdown detent (6)
- Throttle valve and spring (7)
- Manual valve (8)
- 1-2 Governor plug (9)
- Throttle pressure plug (11)
- 2-3 Governor plug (12)
- Shuttle valve primary spring (13)



Shuttle and Boost Valve Locations

1 - SPRING
2 - RETAINER
3 - BOOST VALVE
4 - BOOST VALVE PLUG
5 - SPRING GUIDES
6 - E-CLIP
7 - SHUTTLE VALVE SECONDARY SPRING
8 - SHUTTLE VALVE COVER
9 - SHUTTLE VALVE
10 - SHUTTLE VALVE PRIMARY SPRING
11 - GOVERNOR PLUG COVER
12 - THROTTLE PLUG
13 - UPPER HOUSING
14 - BOOST VALVE COVER

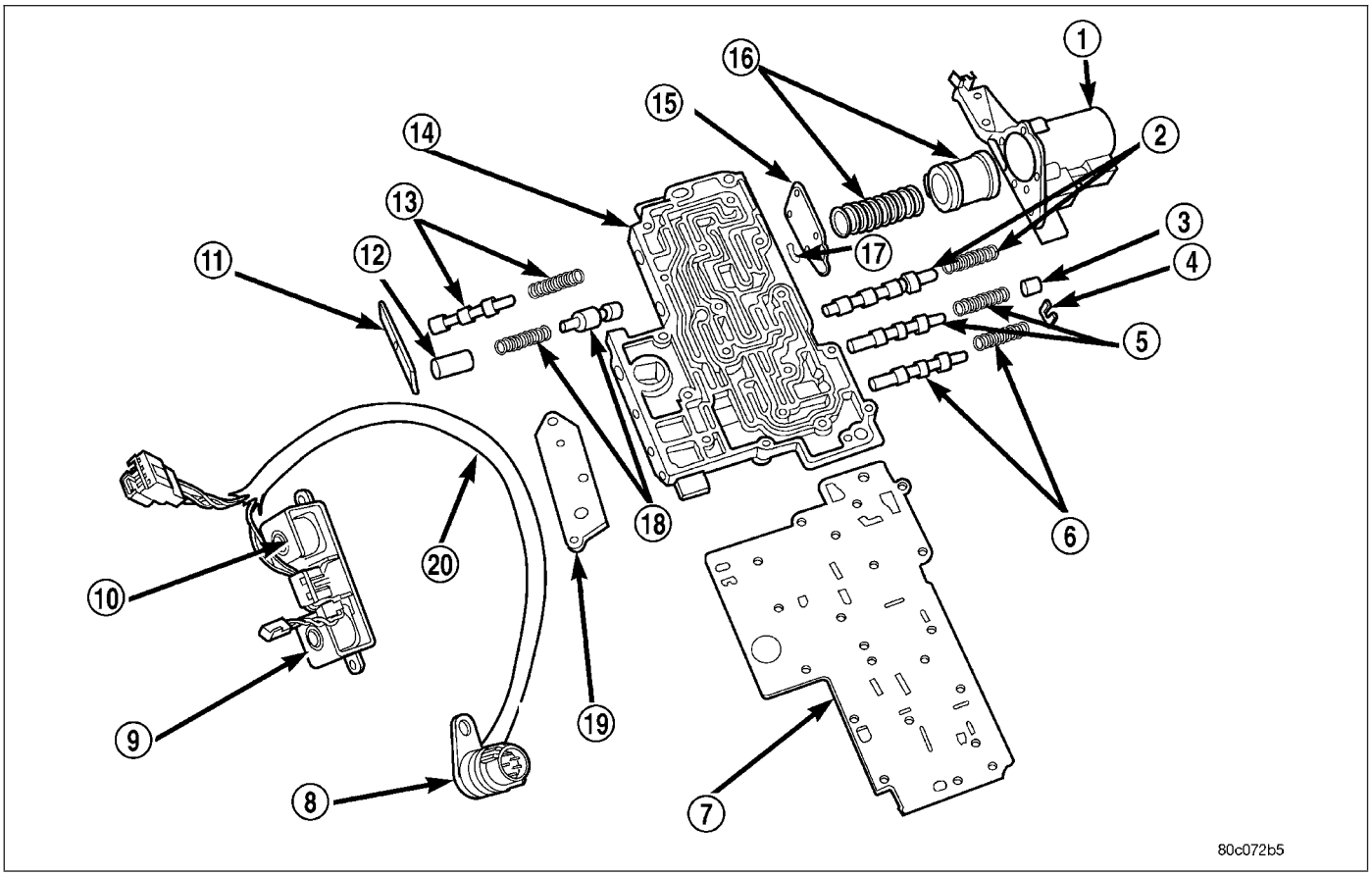
- Boost Valve (3)
- Boost valve plug (4)
- Shuttle valve (9)
- Shuttle valve throttle plug (12)



Upper Housing Shift Valve and Pressure Plug Locations

1 - UPPER HOUSING
2 - 1-2 SHIFT VALVE AND SPRING
3 - 2-3 SHIFT VALVE AND SPRING
4 - 2-3 THROTTLE PLUG
5 - LIMIT VALVE HOUSING
6 - LIMIT VALVE COVER
7 - LIMIT VALVE AND SPRING
8 - RETAINER
9 - 1-2 SHIFT CONTROL VALVE AND SPRING
10 - PRESSURE PLUG COVER
11 - PLUG SLEEVE
12 - THROTTLE PRESSURE SPRING AND PLUG

- 1-2 shift valve (2)
- 1-2 control valve
- 2-3 shift valve
- 2-3 throttle plug
- Throttle pressure plug
- Limit valve and spring



Lower Housing Shift Valves and Springs

1 - 3-4 ACCUMULATOR HOUSING
2 - 3-4 SHIFT VALVE AND SPRING
3 - PLUG
4 - SPRING RETAINER
5 - CONVERTER CLUTCH VALVE AND SPRING
6 - CONVERTER CLUTCH TIMING VALVE AND SPRING
7 - OVERDRIVE SEPARATOR PLATE
8 - CASE CONNECTOR
9 - CONVERTER CLUTCH SOLENOID
10 - OVERDRIVE SOLENOID
11 - TIMING VALVE COVER
12 - PLUG
13 - 3-4 TIMING VALVE AND SPRING
14 - LOWER HOUSING
15 - ACCUMULATOR END PLATE
16 - 3-4 ACCUMULATOR PISTON AND SPRING
17 - E-CLIP
18 - 3-4 QUICK FILL SPRING AND VALVE
19 - SOLENOID GASKET
20 - HARNESS

- 3-4 shift valve
- 3-4 timing valve
- 3-4 quick fill valve
- 3-4 accumulator
- Converter clutch lock-up valve
- Converter clutch lock-up timing Valve

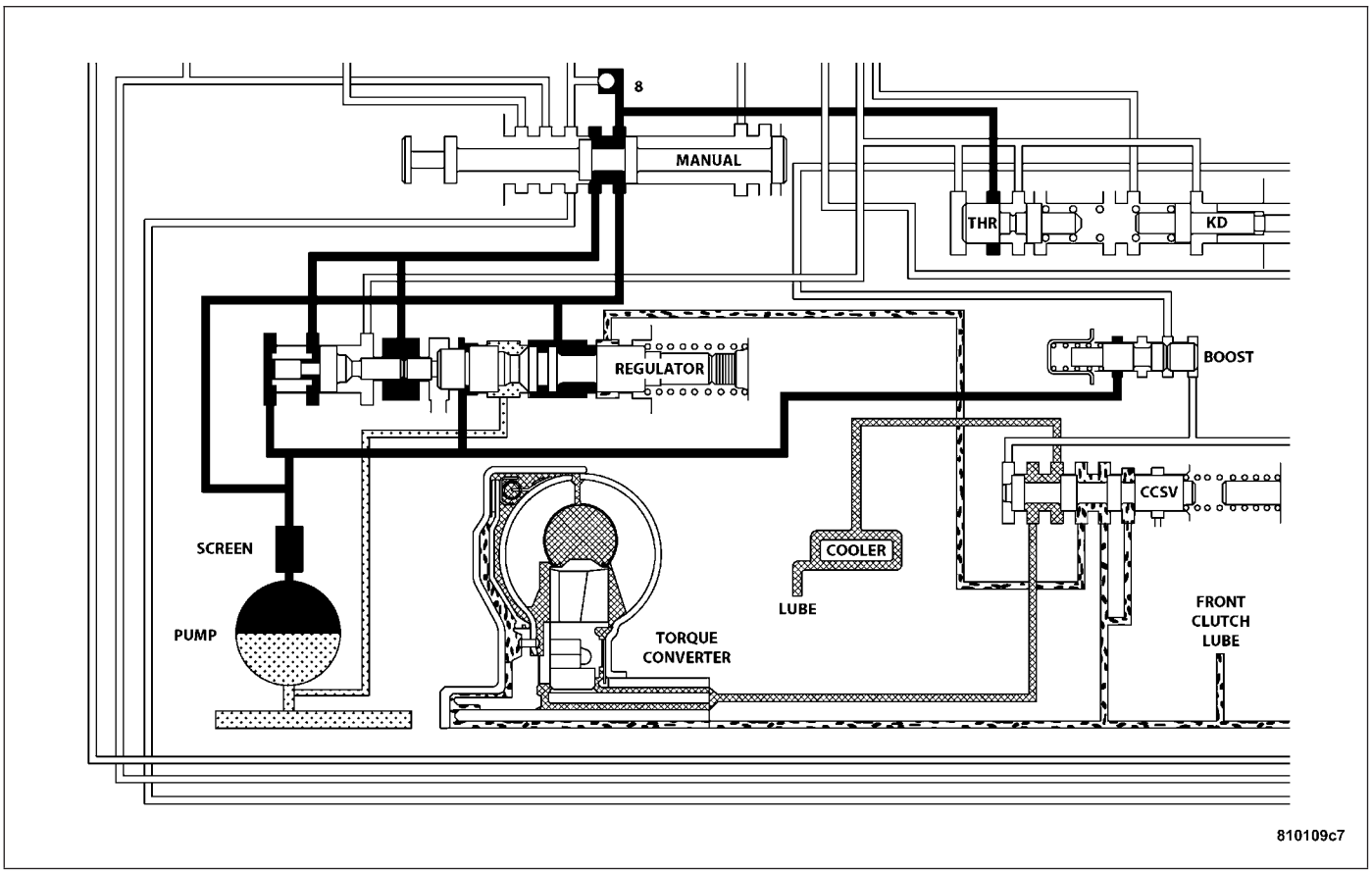
OPERATION

NOTE: Refer to the Hydraulic Schematics for a visual aid in determining valve location, operation and design.

CHECK BALLS

CHECK BALL NUMBER	DESCRIPTION
1	Allows either the manual valve to put line pressure on the 1-2 governor plug or the KD Valve to put WOT line pressure on the 1-2 governor plug.
3	Allows either the Reverse circuit or the 3rd gear circuit to pressurize the front clutch.
4	Allows either the Manual Low circuit from the Manual Valve or the Reverse from the Manual Valve circuit to pressurize the rear servo.
5	Directs line pressure to the spring end of the 2-3 shift valve in either Manual Low or Manual 2nd, forcing the downshift to 2nd gear regardless of governor pressure.
6	Provides a by-pass around the front servo orifice so that the servo can release quickly.
7	Provides a by-pass around the rear clutch orifice so that the clutch can release quickly.
8	Directs reverse line pressure through an orifice to the throttle valve eliminating the extra leakage and insuring that Reverse line pressure pressure will be sufficient.
9	Provides a by-pass around the rear servo orifice so that the servo can release quickly.
10	Allows the lockup clutch to used at WOT in 3rd gear by putting line pressure from the 3-4 Timing Valve on the interlock area of the 2-3 shift valve, thereby preventing a 3rd gear Lock-up to 2nd gear kickdown.

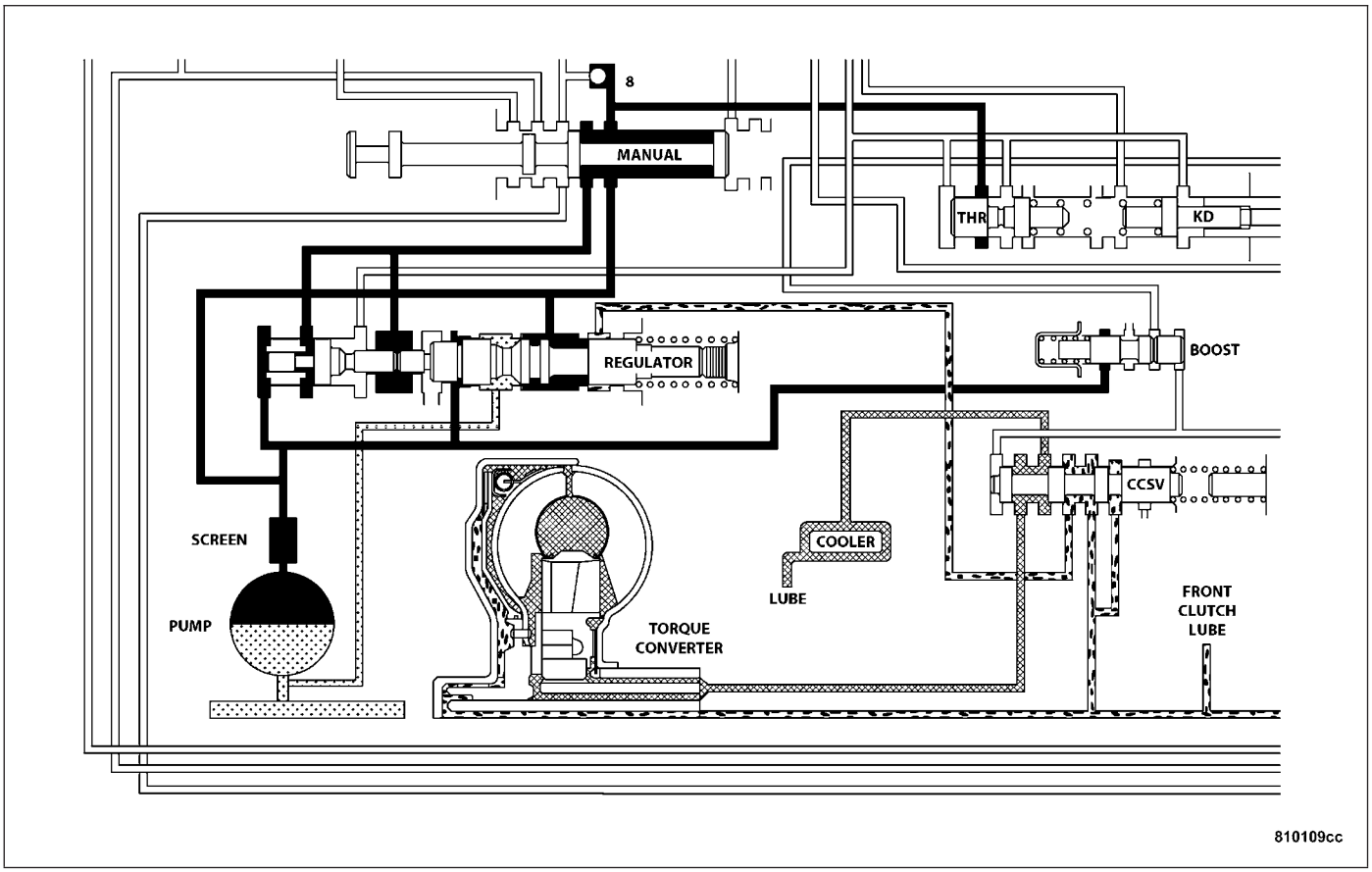
REGULATOR VALVE



Regulator Valve in Park Position

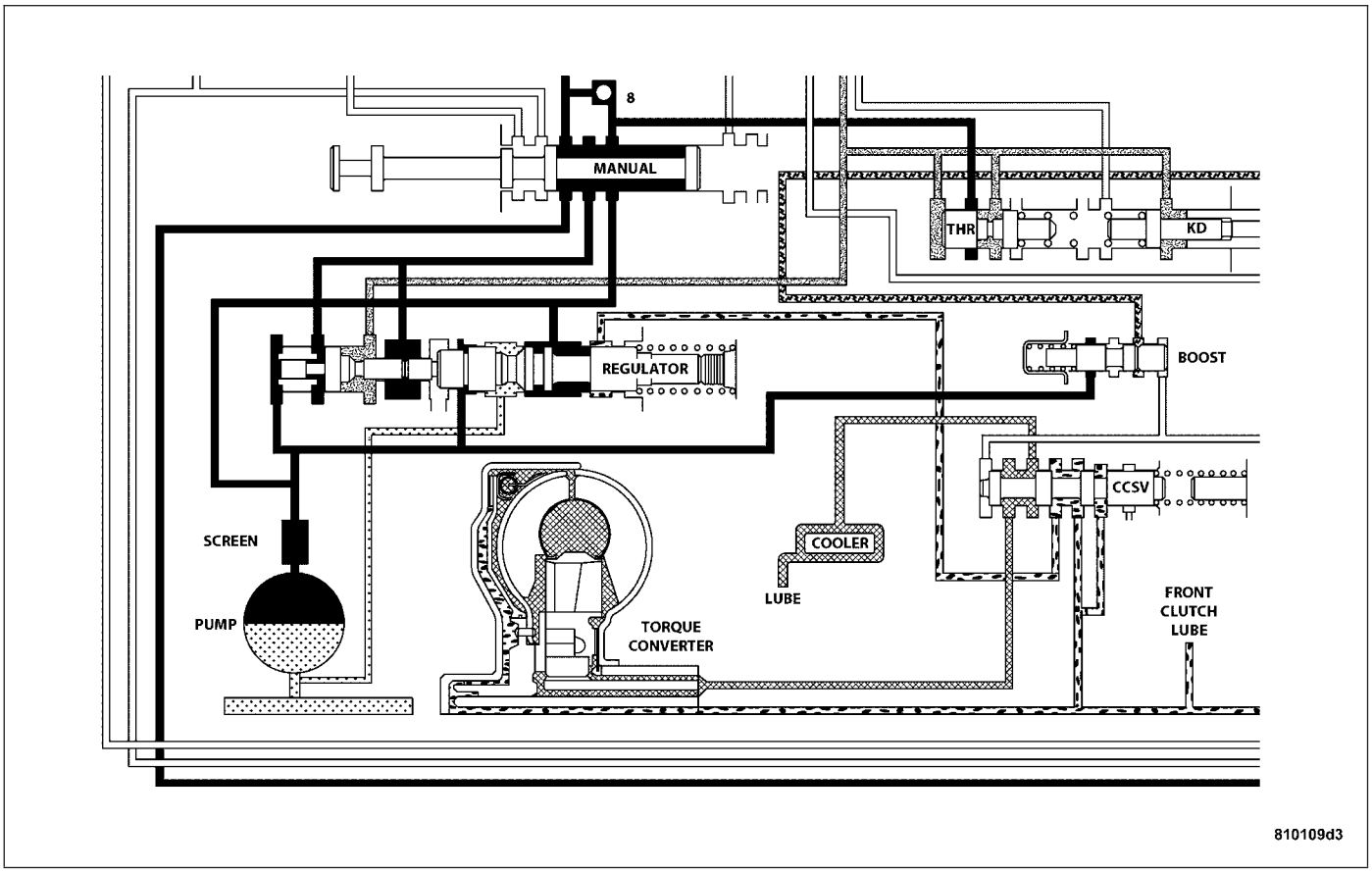
The pressure regulator valve is needed to control the hydraulic pressure within the system and reduce the amount of heat produced in the fluid. The pressure regulator valve is located in the valve body near the manual valve. The pressure regulator valve train controls the maximum pressure in the lines by metering the dumping of fluid back into the sump. Regulated pressure is referred to as “line pressure.”

The regulator valve has a spring on one end that pushes the valve to the left. This closes a dump (vent) that is used to lower pressure. The closing of the dump will cause the oil pressure to increase. Oil pressure on the opposite end of the valve pushes the valve to the right, opening the dump and lowering oil pressure. The result is spring pressure working against oil pressure to maintain the oil at specific pressures. With the engine running, fluid flows from the pump to the pressure regulator valve, manual valve, and the interconnected circuits. As fluid is sent through passages to the regulator valve, the pressure pushes the valve to the right against the large spring. It is also sent to the reaction areas on the left side of the throttle pressure plug and the line pressure plug. With the gear selector in the PARK position, fluid recirculates through the regulator and manual valves back to the sump.



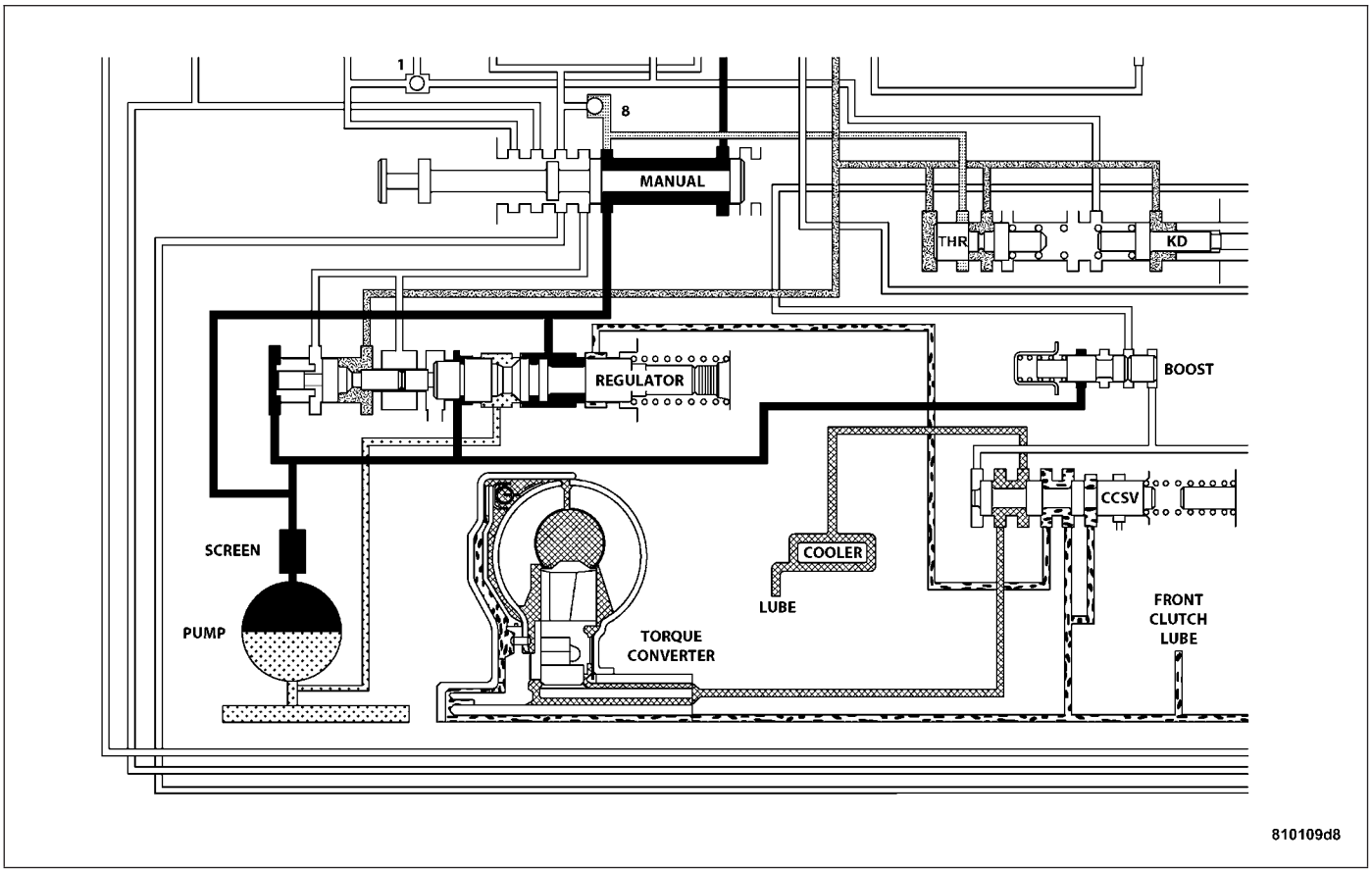
Regulator Valve in Neutral Position

Meanwhile, the torque converter is filled slowly. In all other gear positions , fluid flows between two right side lands to the switch valve and torque converter. At low pump speeds, the flow is controlled by the pressure valve groove to reduce pressure to the torque converter. After the torque converter and switch valve fill with fluid, the switch valve becomes the controlling metering device for torque converter pressure. The regulator valve then begins to control the line pressure for the other transmission circuits. The balance of the fluid pressure pushing the valve to the right and the spring pressure pushing to the left determines the size of the metering passage at land #2 (land #1 being at the far right of the valve in the diagram). As fluid leaks past the land, it moves into a groove connected to the filter or sump. As the land meters the fluid to the sump, it causes the pressure to reduce and the spring decreases the size of the metering passage. When the size of the metering passage is reduced, the pressure rises again and the size of the land is increased again. Pressure is regulated by this constant balance of hydraulic and spring pressure.



Regulator Valve in Drive Position

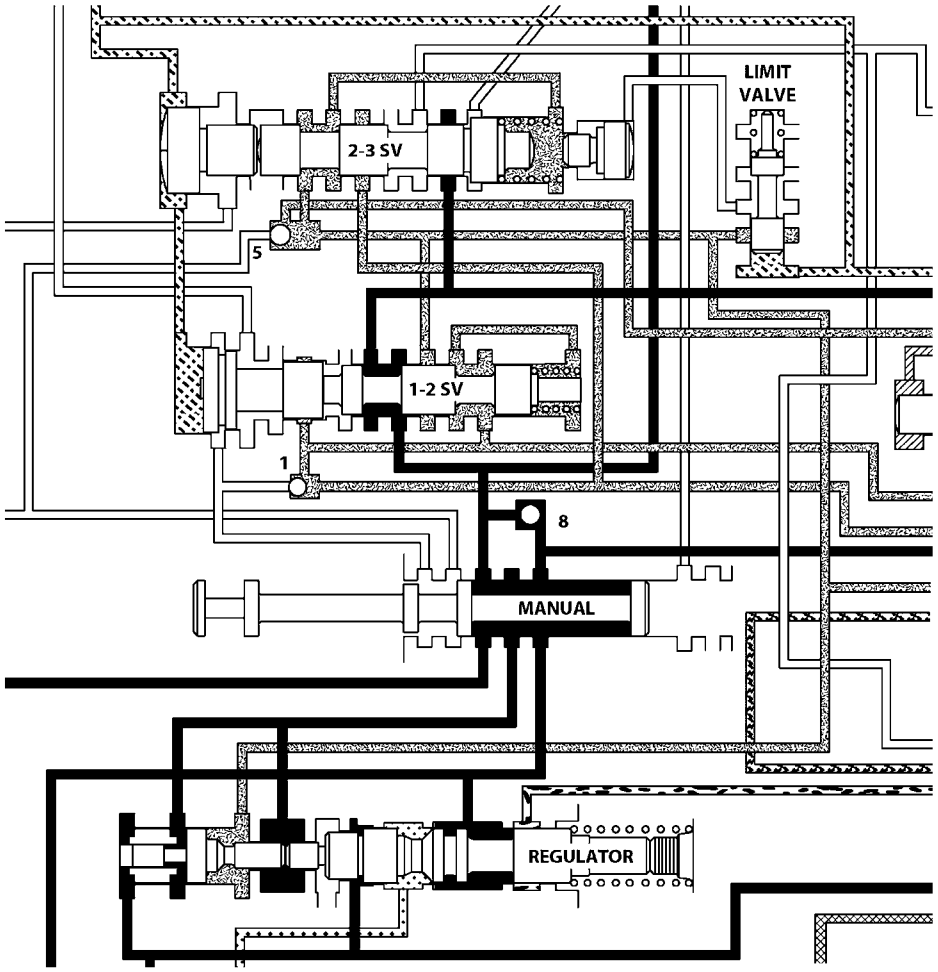
The metering at land #2 establishes the line pressure throughout the transmission. It is varied according to changes in throttle position and the transmission's internal condition within a range of 57-94 psi (except in REVERSE).



Regulator Valve in Reverse Position

The regulated line pressure in REVERSE is held at much higher pressures than in the other gear positions: 145-280 psi. The higher pressure for REVERSE is achieved by the manual valve blocking the supply of line pressure to the reaction area left of land #4. With this pressure blocked, there is less area for pressure to act on to balance the force of the spring on the right. This allows line pressure to push the valve train to the right, reducing the amount of fluid returned to the pump's inlet, increasing line pressure.

KICKDOWN VALVE

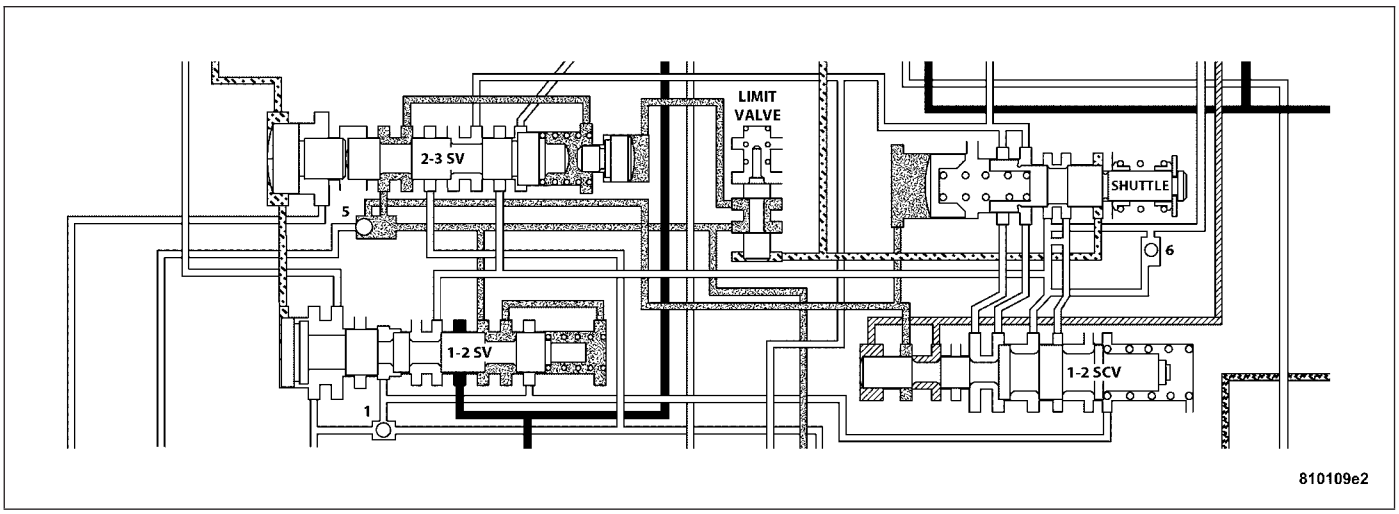


Kickdown Valve - Wide Open Throttle

When the throttle valve is as far over to the left as it can go, the maximum line pressure possible will enter the throttle pressure circuit. In this case, throttle pressure will equal line pressure. With the kickdown valve pushed into the bore as far as it will go, fluid initially flows through the annular groove of the 2-3 shift valve (which will be in the direct drive position to the right).

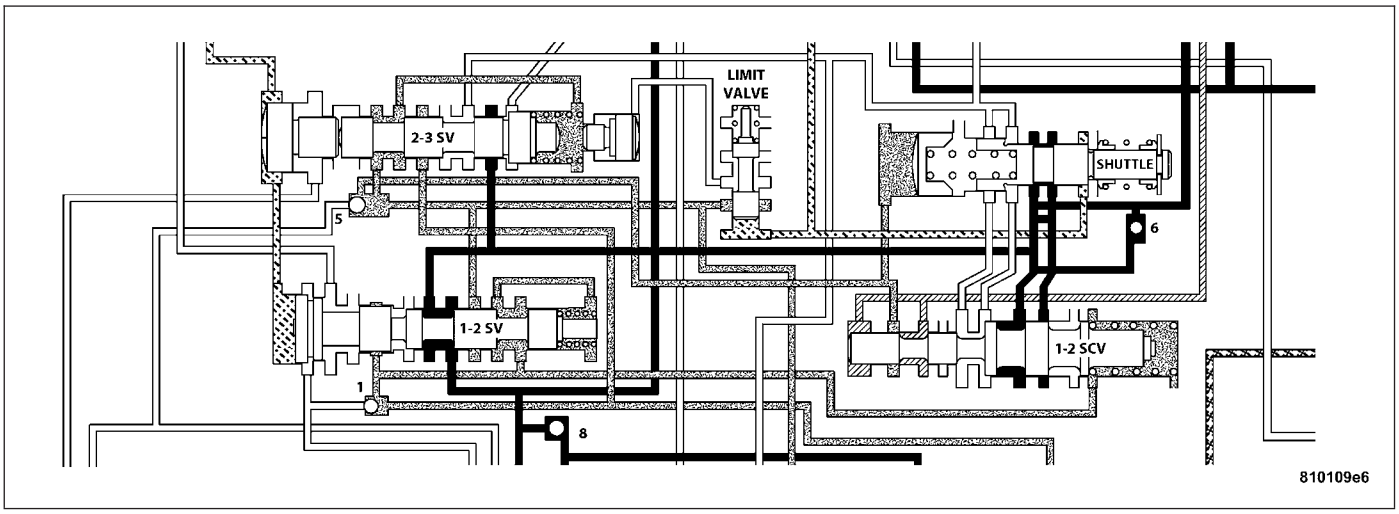
After passing the annular groove, the fluid is routed to the spring end of the 2-3 shift valve. Fluid pressure reacting on the area of land #1 overcomes governor pressure, downshifting the 2-3 shift valve into the kickdown, or second gear stage of operation. The valve is held in the kickdown position by throttle pressure routed from a seated check ball (#2). Again, if vehicle speed is low enough, throttle pressure will also push the 1-2 shift valve left to seat its governor plug, and downshift to drive breakaway.

KICKDOWN LIMIT VALVE



Kickdown Limit Valve - Low Speeds

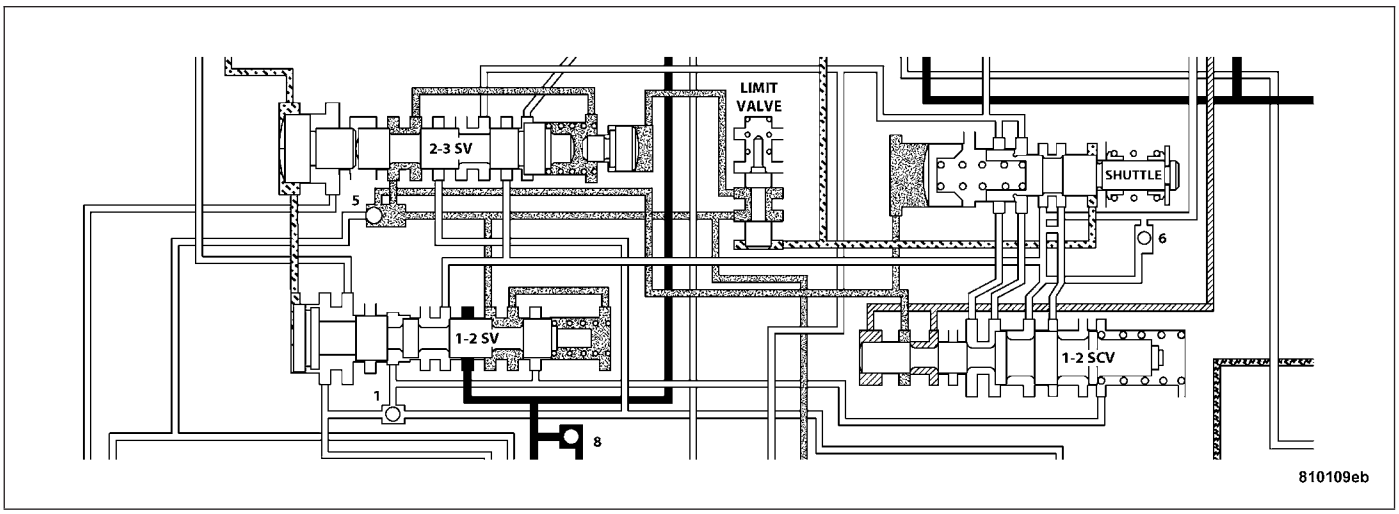
The purpose of the limit valve is to prevent a 3-2 downshift at higher speeds when a part-throttle downshift is not desirable. At these higher speeds only a full throttle 3-2 downshift will occur. At low road speeds the limit valve does not come into play and does not affect the downshifts.



Kickdown Limit Valve - High Speeds

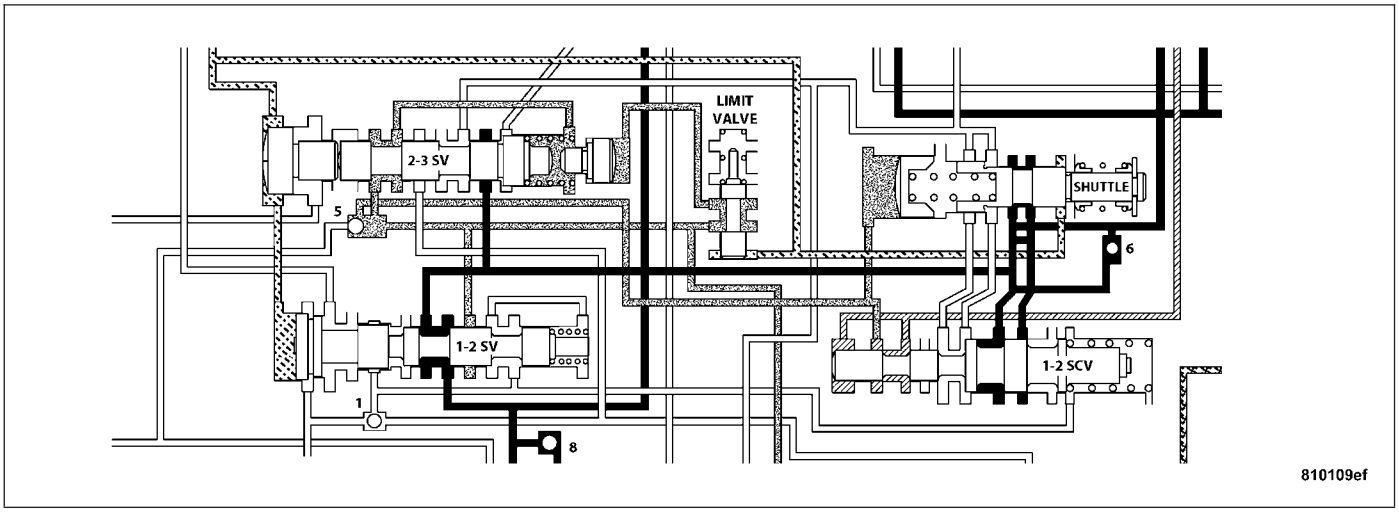
As the vehicle's speed increases , the governor pressure also increases. The increased governor pressure acts on the reaction area of the bottom land of the limit valve overcoming the spring force trying to push the valve toward the bottom of its bore. This pushes the valve upward against the spring and bottoms the valve against the top of the housing. With the valve bottomed against the housing, the throttle pressure supplied to the valve will be closed off by the bottom land of the limit valve. When the supply of throttle pressure has been shut off, the 3-2 part throttle downshift plug becomes inoperative, because no pressure is acting on its reaction area.

1-2 SHIFT VALVE



1-2 Shift Valve - Before Shift

The 1-2 shift valve assembly , or mechanism, consists of: the 1-2 shift valve, governor plug, and a spring on the end of the valve. After the manual valve has been placed into a forward gear range, line pressure is directed to the 1-2 shift valve. As the throttle is depressed, throttle pressure is applied to the right side of the 1-2 shift valve assembly. With throttle pressure applied to the right side of the valve, there is now both spring pressure and throttle pressure acting on the valve, holding it against the governor plug. As the vehicle begins to move and build speed, governor pressure is created and is applied to the left of the valve at the governor plug.



1-2 Shift Valve - After Shift

When governor pressure builds to a point where it can overcome the combined force of the spring and throttle pressure on the other side of the valve, the valve will begin to move over to the right. As the valve moves to the right, the middle land of the valve will close off the circuit supplying the throttle pressure to the right side of the valve. When the throttle pressure is closed off, the valve will move even farther to the right, allowing line pressure to enter another circuit and energize the front servo, applying the front band.

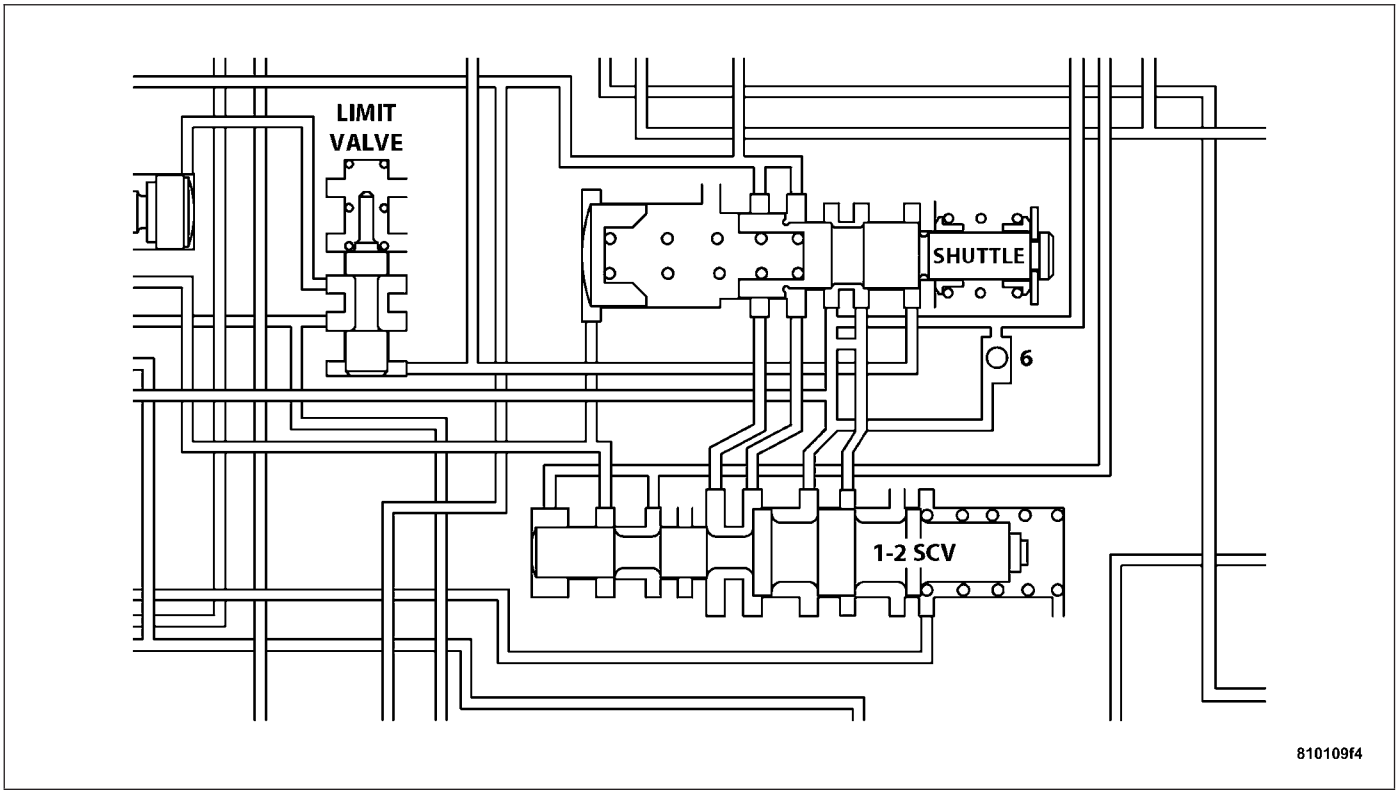
The governor plug serves a dual purpose:

- It allows the shift valves to move either left or right, allowing both upshifts and downshifts.
- When in a manual selection position, it will be hydraulically “blocked” into position so no upshift can occur.

The physical blocking of the upshift while in the manual “1” position is accomplished by the directing of line pressure between both lands of the governor plug. The line pressure reacts against the larger land of the plug, pushing the

plug back against the end plate overcoming governor pressure. With the combination of the line pressure and spring pressure, the valve cannot move, preventing any upshift.

1-2 SHIFT CONTROL VALVE



1-2 Shift Control Valve

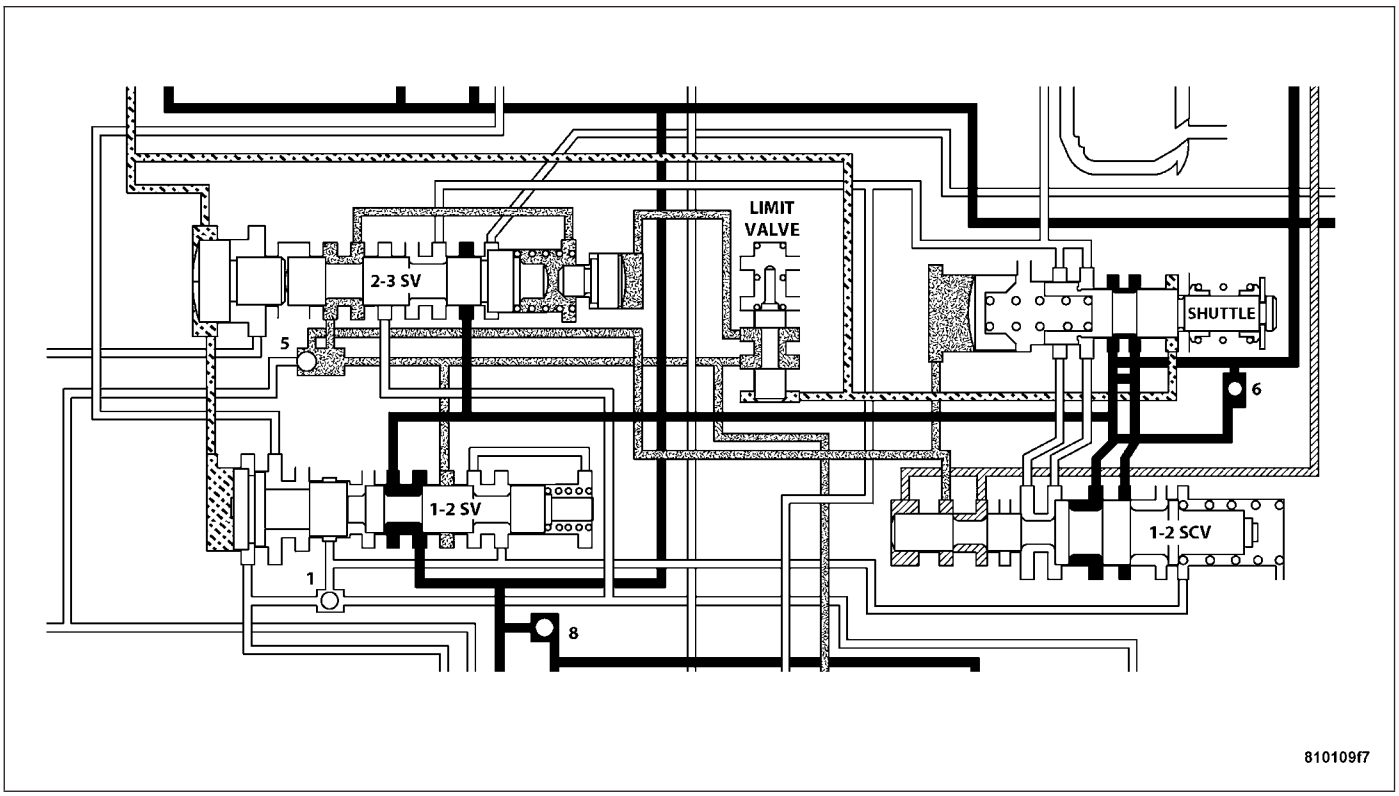
It contains a valve with four lands and a spring. It is used as both a “relay” and “balanced” valve.

The valve has two specific operations :

- Aid in quality of the 1-2 upshift.
- Aid in the quality and timing of the 3-2 kickdown ranges.

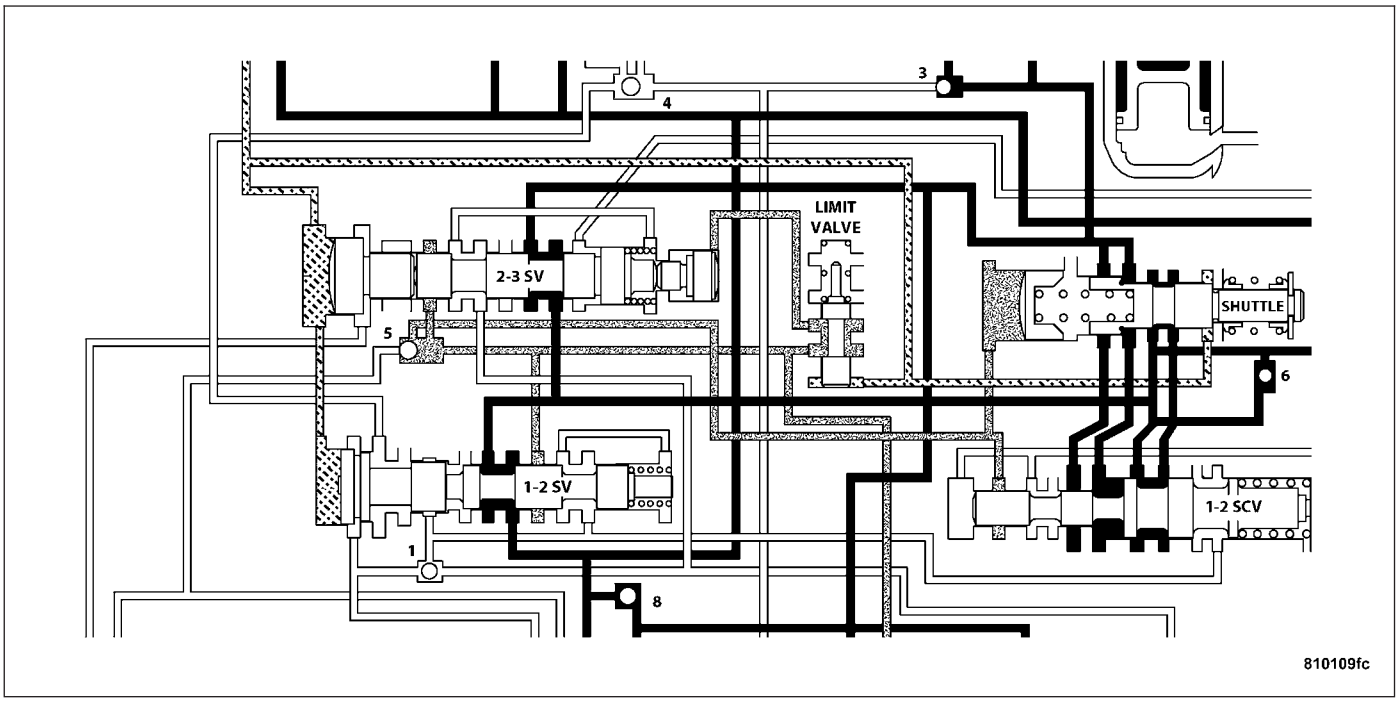
When the manual valve is set to the DRIVE position and the transmission is in the first or second gear range, 1-2 shift control or “modulated throttle pressure” is supplied to the middle of the accumulator piston by the 1-2 shift control valve. During the 1-2 upshift, this pressure is used to control the kickdown servo apply pressure that is needed to apply the kickdown and accumulator pistons. Thus, the 1-2 shift point is “cushioned” and the quality is improved. During a WOT kickdown, kickdown pressure is applied between the kickdown valve and the 1-2 shift control valve. This additional pressure is directed to the 1-2 shift control’s spring cavity, adding to the spring load on the valve. The result of this increased “modulated” throttle pressure is a firmer WOT upshift.

2-3 SHIFT VALVE



2-3 Shift Valve - Before Shift

The 2-3 shift valve mechanism consists of the 2-3 shift valve, governor plug and spring, and a throttle plug. After the 1-2 shift valve has completed its operation and applied the front band, line pressure is directed to the 2-3 shift valve through the connecting passages from the 1-2 shift valve. The line pressure will then dead–end at land #2 until the 2-3 valve is ready to make its shift. Now that the vehicle is in motion and under acceleration, there is throttle pressure being applied to the spring side of the valve and between lands #3 and #4.



2-3 Shift Valve - After Shift

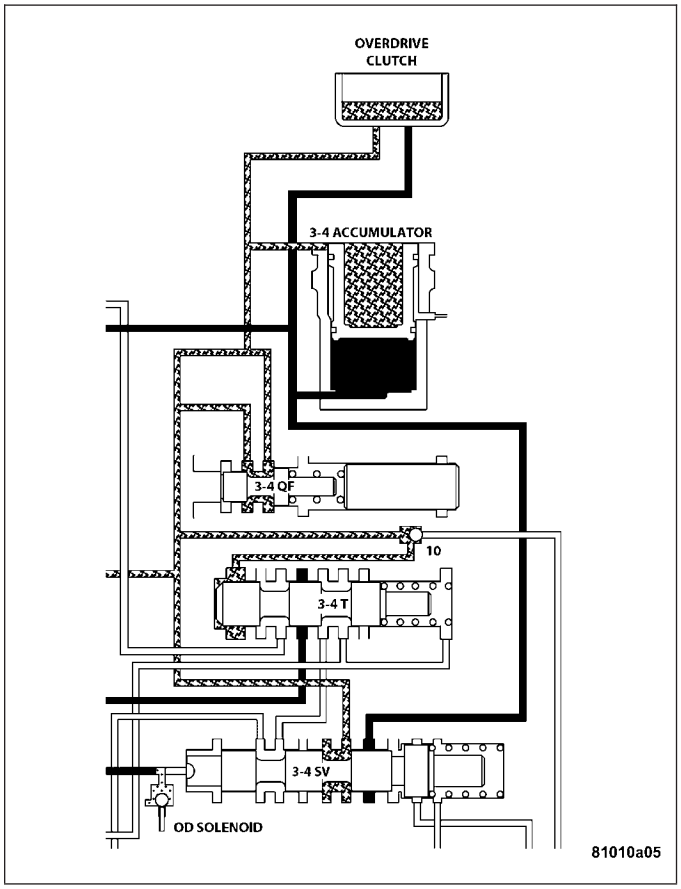
As vehicle speed increases, governor pressure increases proportionately, until it becomes great enough to overcome the combined throttle and spring pressure on the right side of the valve. Since the throttle pressure end of the 2-3 shift valve is larger in diameter than the 1-2 shift valve, the 2-3 shift will always happen at a greater speed than the 1-2 shift. When this happens, the governor plug is forced against the shift valve moving it to the right. The shift valve causes land #4 to close the passage supplying throttle pressure to the 2-3 shift valve. Without throttle pressure present in the circuit now, the governor plug will push the valve over far enough to bottom the valve in its bore. This allows land #2 to direct line pressure to the front clutch.

After the shift , line pressure is directed to the release side of the kickdown servo. This releases the front band and applies the front clutch, shifting into third gear or direct drive. The rear clutch remains applied, as it has been in the other gears. During a manual “1” or manual “2” gear selection, line pressure is sent between the two lands of the 2-3 governor plug. This line pressure at the governor plug locks the shift valve into the second gear position, preventing an upshift into direct drive. The theory for the blocking of the valve is the same as that of the 1-2 shift valve.

If the manual “2” or manual “1” gear position is selected from the drive position, the PCM will control the timing of the downshift by targeting for a high governor pressure. When a safe vehicle speed is reached, the PCM will switch to its normal control governor curve and the downshift will occur.

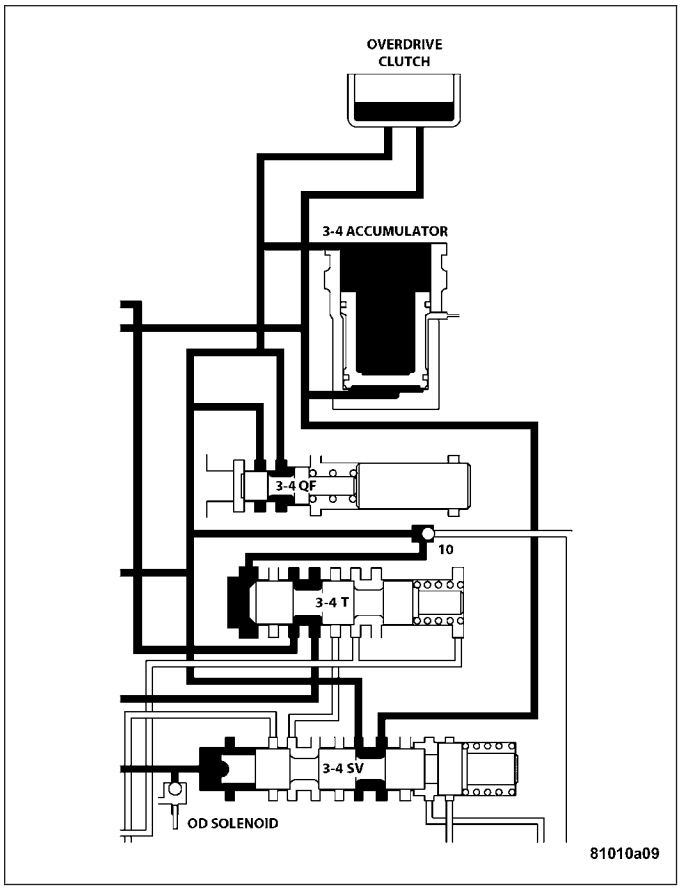
3-4 SHIFT VALVE

The PCM energizes the overdrive solenoid during the 3-4 upshift. This causes the solenoid check ball to close the vent port allowing line pressure from the 2-3 shift valve to act directly on the 3-4 upshift valve.



3-4 Shift Valve Before Shift

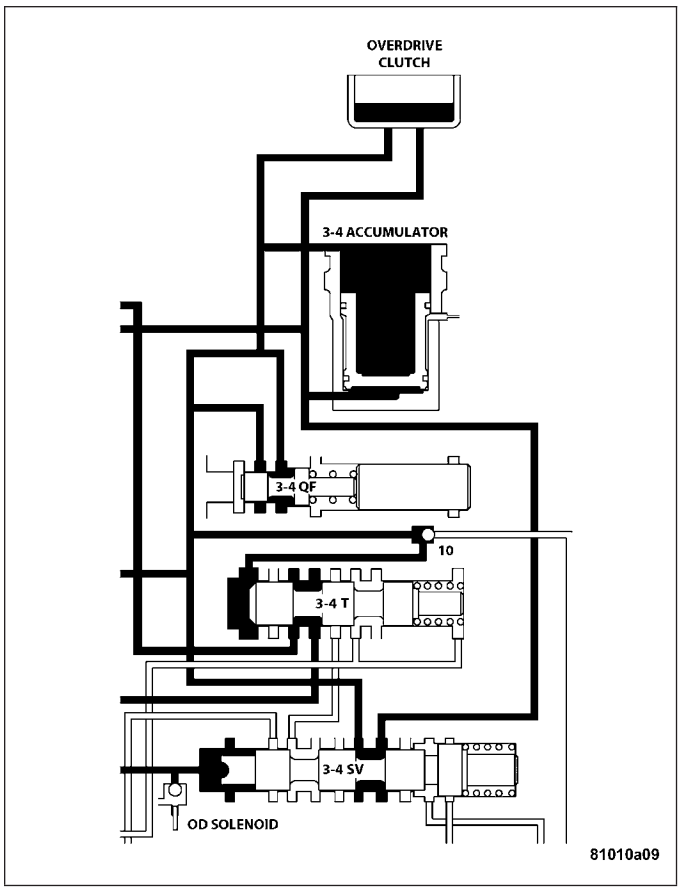
Line pressure on the 3-4 shift valve overcomes valve spring pressure moving the valve to the upshift position. This action exposes the feed passages to the 3-4 timing valve, 3-4 quick fill valve, 3-4 accumulator, and ultimately to the overdrive piston.



3-4 Shift Valve After Shift

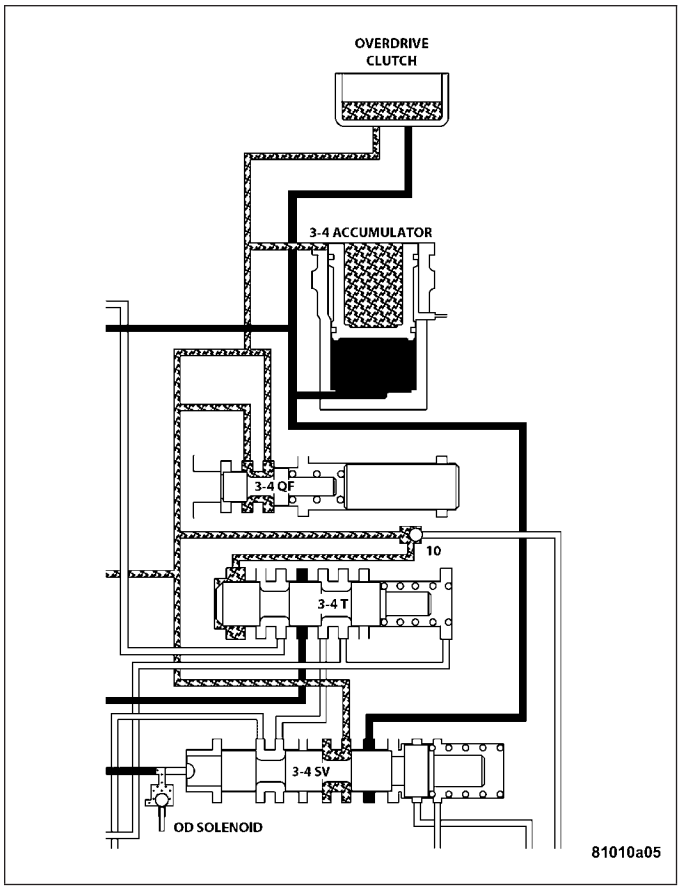
3-4 TIMING VALVE

The 3-4 timing valve is moved by line pressure coming through the 3-4 shift valve or the converter clutch valve.



3-4 Shift Valve After Shift

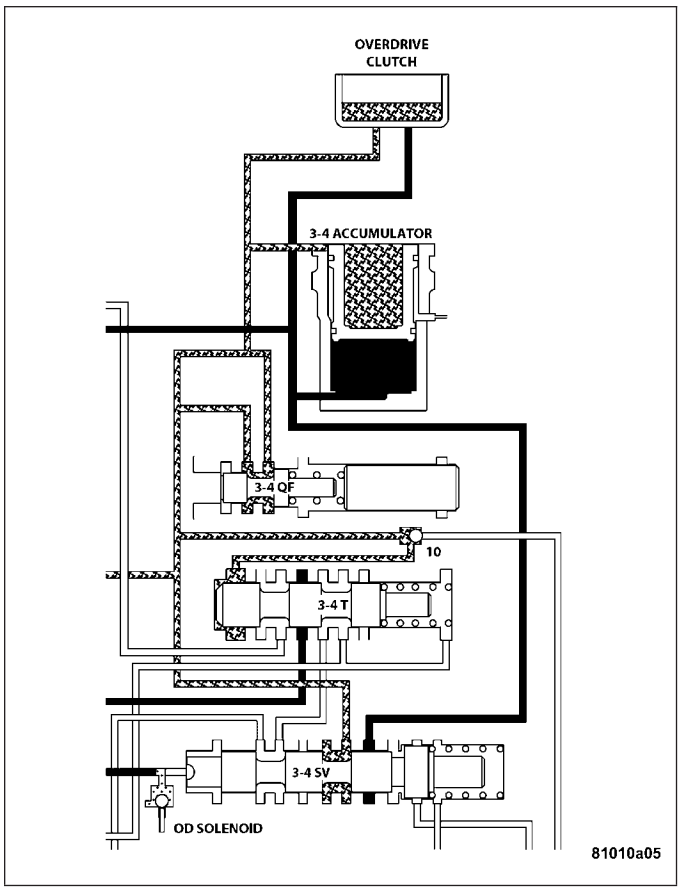
After the shift, the timing valve holds the 2-3 shift valve in an upshift position. The purpose is to prevent the 2-3 valve from downshifting while either the overdrive clutch or converter clutch is applied.



3-4 Shift Valve Before Shift

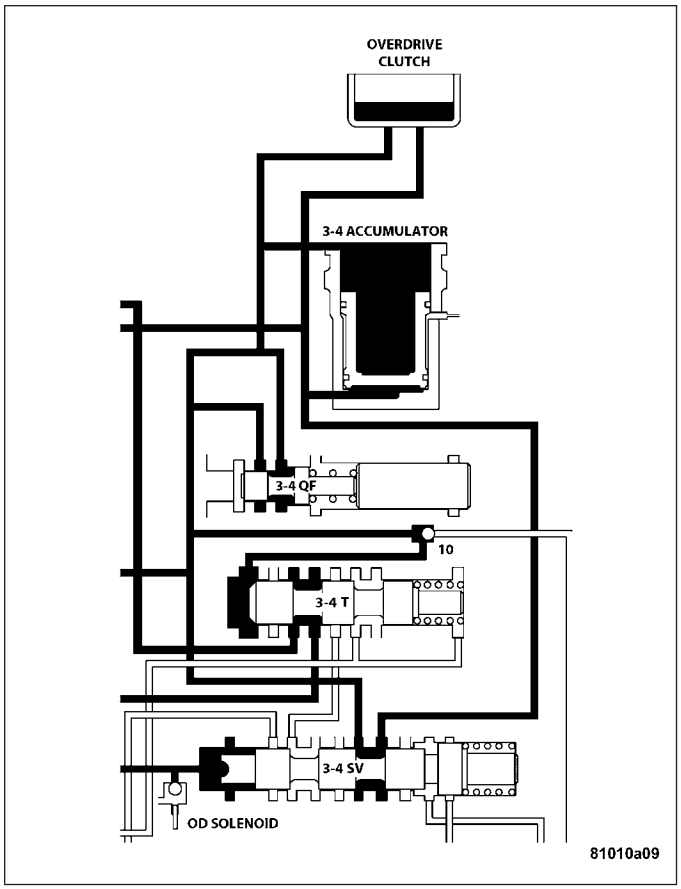
3-4 QUICK FILL VALVE

The 3-4 quick fill valve provides faster engagement of the overdrive clutch during 3-4 upshifts. The valve temporarily bypasses the clutch piston feed orifice at the start of a 3-4 upshift.



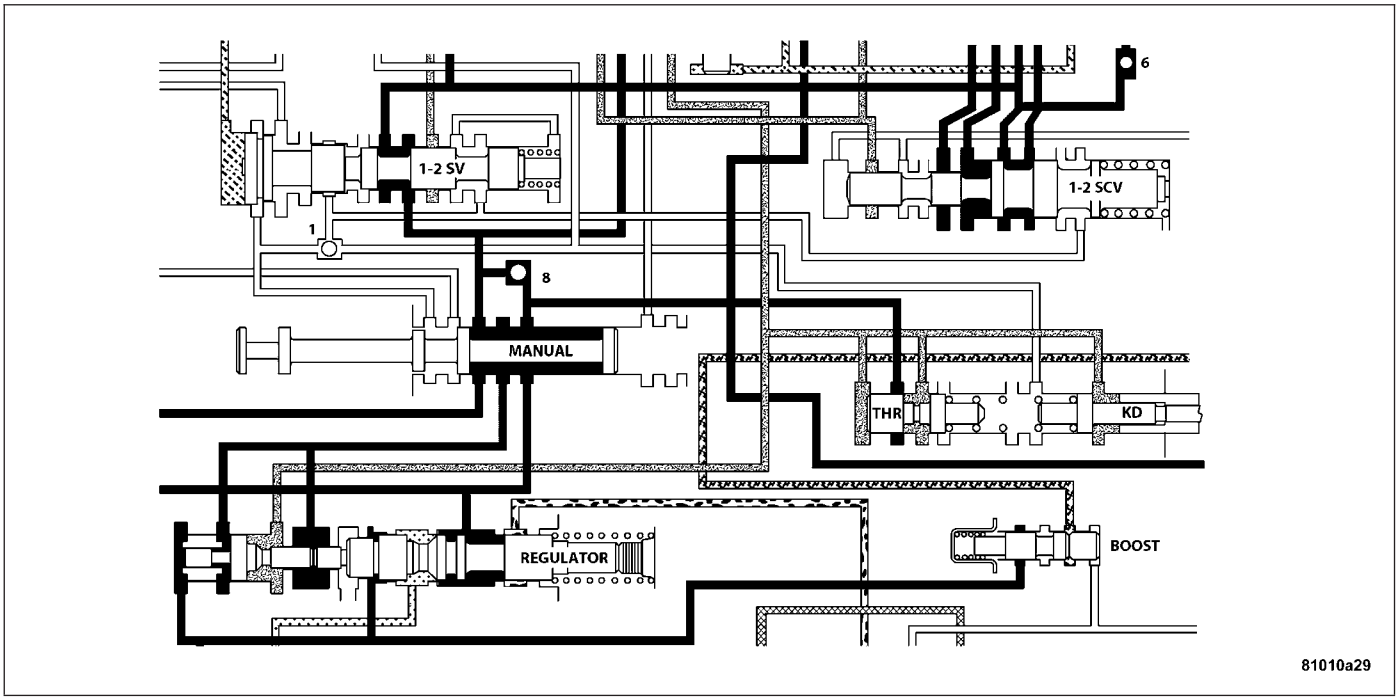
3-4 Shift Valve Before Shift

This exposes a larger passage into the piston retainer resulting in a much faster clutch fill and apply sequence. The quick fill valve does not bypass the regular clutch feed orifice throughout the 3-4 upshift. Instead, once a predetermined pressure develops within the clutch, the valve closes the bypass. Clutch fill is then completed through the regular feed orifice.



3-4 Shift Valve After Shift

THROTTLE VALVE



Throttle Valve

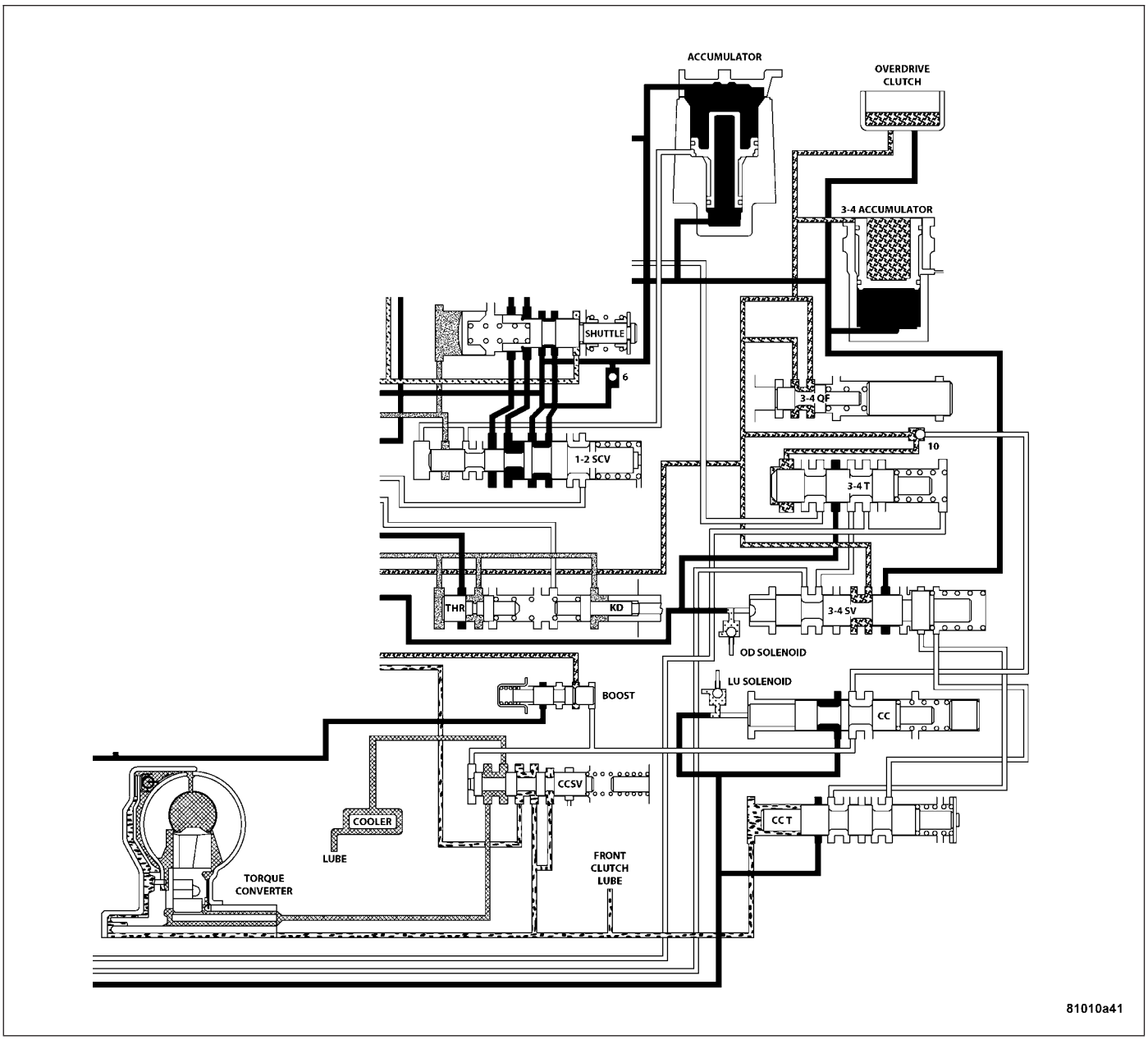
In all gear positions the throttle valve is being supplied with line pressure. The throttle valve meters and reduces the line pressure that now becomes throttle pressure. The throttle valve is moved by a spring and the kickdown valve,

which is mechanically connected to the throttle. The larger the throttle opening, the higher the throttle pressure (to a maximum of line pressure). The smaller the throttle opening, the lower the throttle pressure (to a minimum of zero at idle). As engine speed increases, the increase in pump speed increases pump output. The increase in pressure and volume must be regulated to maintain the balance within the transmission. To do this, throttle pressure is routed to the reaction area on the right side of the throttle pressure plug (in the regulator valve).

The higher engine speed and line pressure would open the vent too far and reduce line pressure too much. Throttle pressure, which increases with engine speed (throttle opening), is used to oppose the movement of the pressure valve to help control the metering passage at the vent. The throttle pressure is combined with spring pressure to reduce the force of the throttle pressure plug on the pressure valve. The larger spring at the right closes the regulator valve passage and maintains or increases line pressure. The increased line pressure works against the reaction area of the line pressure plug and the reaction area left of land #3 simultaneously moves the regulator valve train to the right and controls the metering passage.

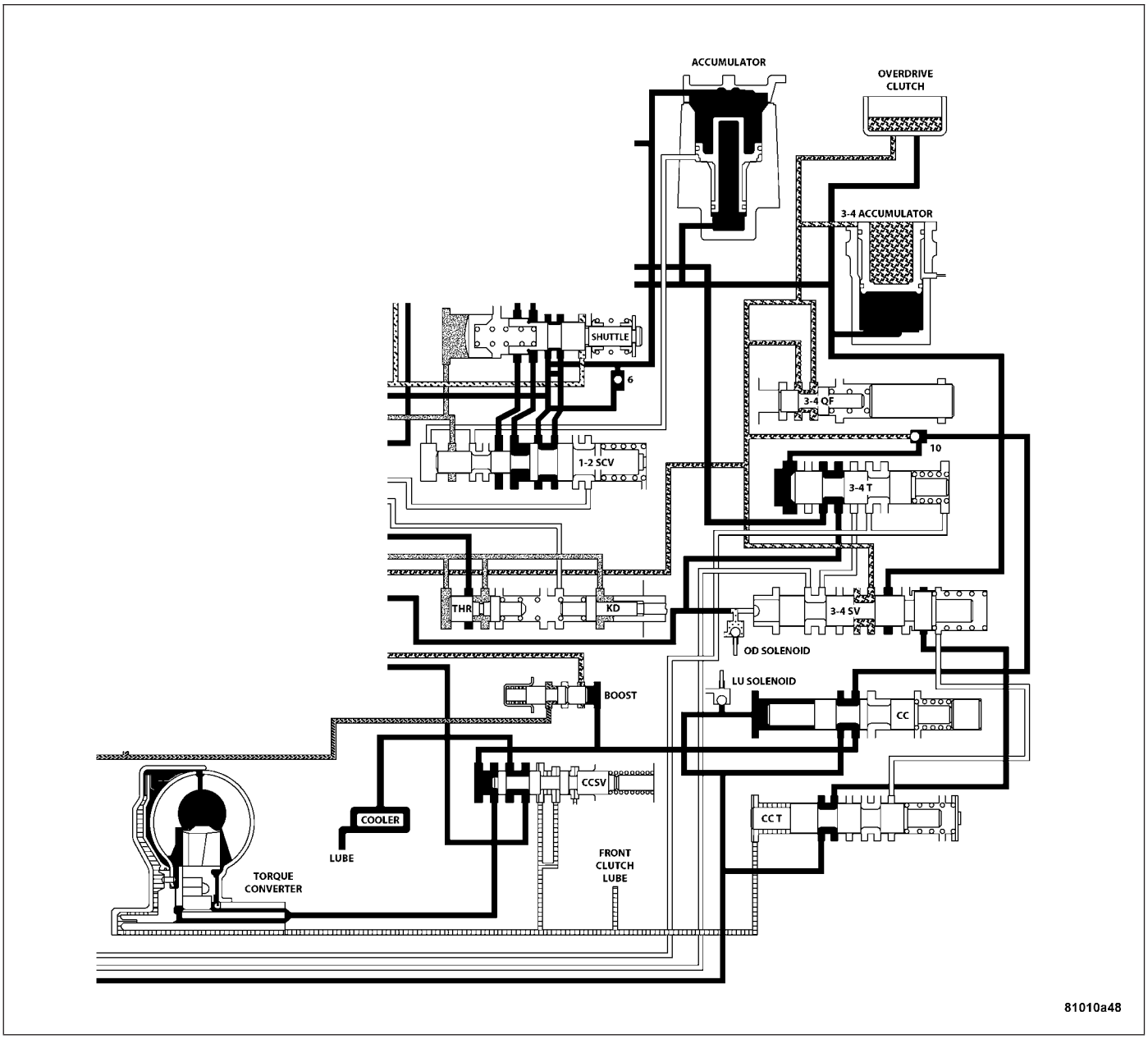
The kickdown valve, along with the throttle valve, serve to delay upshifts until the correct vehicle speed has been reached. It also controls downshifts upon driver demand, or increased engine load. If these valves were not in place, the shift points would be at the same speed for all throttle positions. The kickdown valve is actuated by a cam connected to the throttle. This is accomplished through either a linkage or a cable. The cam forces the kickdown valve toward the throttle valve compressing the spring between them and moving the throttle valve. As the throttle valve land starts to uncover its port, line pressure is “metered” out into the circuits and viewed as throttle pressure. This increased throttle pressure is metered out into the circuits it is applied to: the 1-2 and 2-3 shift valves. When the throttle pressure is high enough, a 3-2 downshift will occur. If the vehicle speed is low enough, a 2-1 downshift will occur.

SWITCH VALVE



Switch Valve - Torque Converter Unlocked

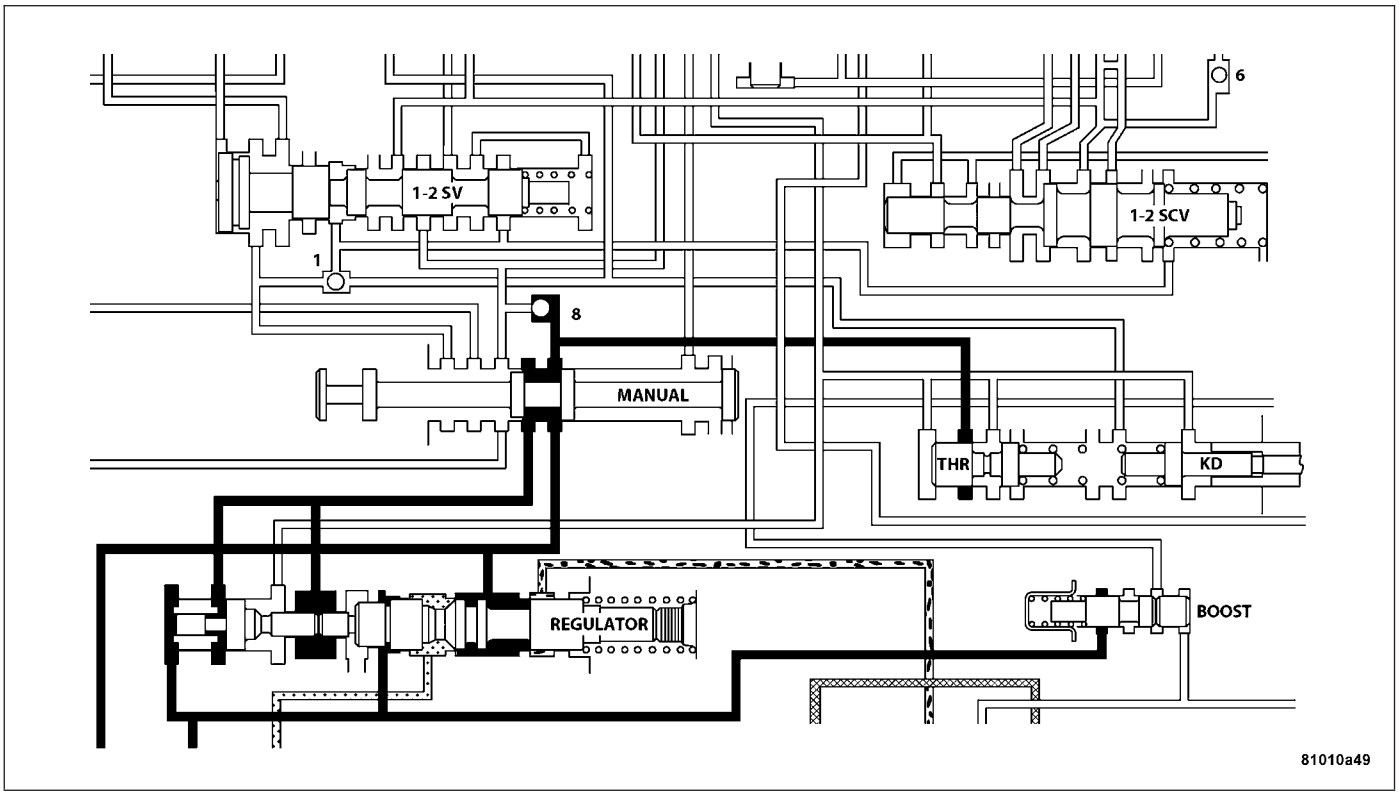
When the transmission is in Drive Second before the TCC application occurs, the pressure regulator valve is supplying torque converter pressure to the switch valve. The switch valve directs this pressure through the transmission input shaft, into the converter, through the converter, back out between the input shaft and the reaction shaft, and back up to the switch valve. From the switch valve, the fluid pressure is directed to the transmission cooler, and lubrication pressure returns from the cooler to lubricate different portions of the transmission.



Switch Valve - Torque Converter Locked

MANUAL VALVE

The manual valve is a relay valve. The purpose of the manual valve is to direct fluid to the correct circuit needed for a specific gear or driving range. The manual valve, as the name implies, is manually operated by the driver with a lever located on the side of the valve body. The valve is connected mechanically by either a cable or linkage to the gearshift mechanism. The valve is held in each of its positions by a spring-loaded roller or ball that engages the “roostercomb” of the manual valve lever.



Manual Valve

Once the TCC control valve has moved to the right, line pressure is directed to the tip of the switch valve, forcing the valve to the right. The switch valve now vents oil from the front of the piston in the torque converter, and supplies line pressure to the (rear) apply side of the torque converter piston. This pressure differential causes the piston to apply against the friction material, cutting off any further flow of line pressure oil. After the switch valve is shuttled right allowing line pressure to engage the TCC, torque converter pressure is directed past the switch valve into the transmission cooler and lubrication circuits.

CONVERTER CLUTCH LOCK-UP VALVE

The torque converter clutch (TCC) lock-up valve controls the back (ON) side of the torque converter clutch. When the PCM energizes the TCC solenoid to engage the converter clutch piston, pressure is applied to the TCC lock-up valve which moves to the right and applies pressure to the torque converter clutch.

CONVERTER CLUTCH LOCK-UP TIMING VALVE

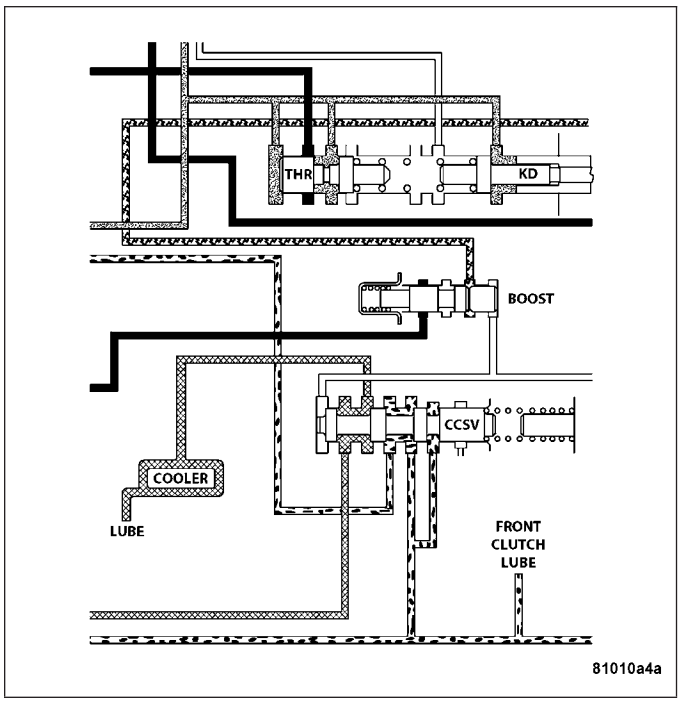
The torque converter clutch (TCC) lock-up timing valve is there to block any 4-3 downshift until the TCC is completely unlocked and the clutch is disengaged.

SHUTTLE VALVE

The assembly is contained in a bore in the valve body above the shift valves. When the manual valve is positioned in the Drive range, throttle pressure acts on the throttle plug of the shuttle valve to move it against a spring, increasing the spring force on the shuttle valve. During a part or full throttle 1-2 upshift, the throttle plug is bottomed by throttle pressure, holding the shuttle valve to the right against governor pressure, and opening a by–pass circuit. The shuttle valve controls the quality of the kickdown shift by restricting the rate of fluid discharge from the front clutch and servo release circuits. During a 3-2 kickdown, fluid discharges through the shuttle by-pass circuit. When the shuttle valve closes the by-pass circuit, fluid discharge is restricted and controlled for the application of the front band. During a 2-3 “lift foot” upshift, the shuttle valve by-passes the restriction to allow full fluid flow through the by-pass groove for a faster release of the band.

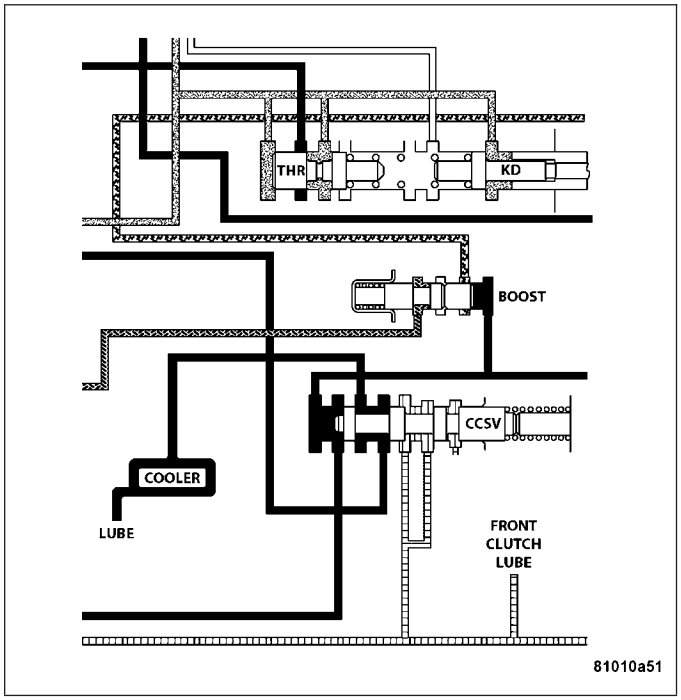
BOOST VALVE

The boost valve provides increased fluid apply pressure to the overdrive clutch during 3-4 upshifts, and when accelerating in fourth gear.



Boost Valve Before Lock-up

The boost valve also serves to increase line pressure during torque converter lock-up.



Boost Valve After Lock-up

REMOVAL

The valve body can be removed for service without having to remove the transmission assembly.

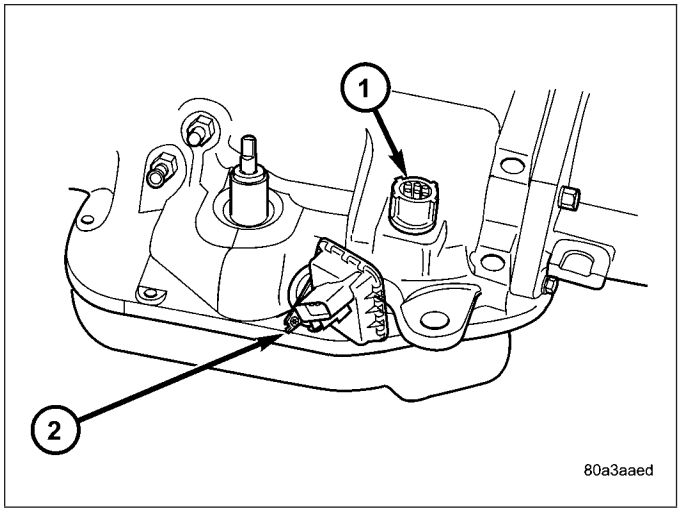
The valve body can be disassembled for cleaning and inspection of the individual components.

The only replaceable valve body components are:

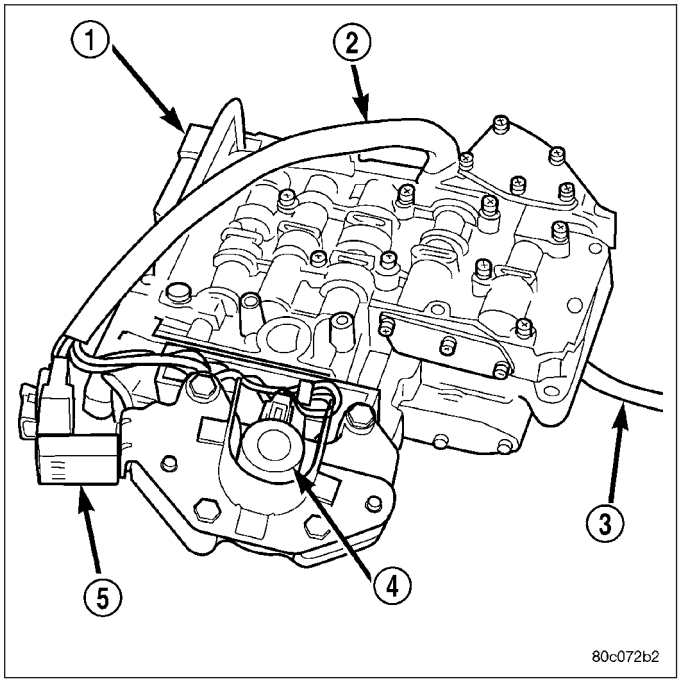
- Manual lever.

- Manual lever washer, seal, E-clip, and shaft seal.
- Manual lever detent ball.
- Throttle lever.
- Fluid filter.
- Pressure adjusting screw bracket.
- Governor pressure solenoid.
- Governor pressure sensor (includes transmission temperature thermistor).
- Converter clutch/overdrive solenoid assembly and harness.
- Governor housing gasket.
- Solenoid case connector O-rings.

1. Shift transmission into NEUTRAL.
2. Raise vehicle.
3. Remove gearshift and throttle levers from shaft of valve body manual lever.
4. Disconnect wires at solenoid case connector (1).
5. Remove the transmission range sensor (2) (Refer to 21 - TRANSMISSION/AUTOMATIC/TRANSMISSION RANGE SENSOR - REMOVAL).



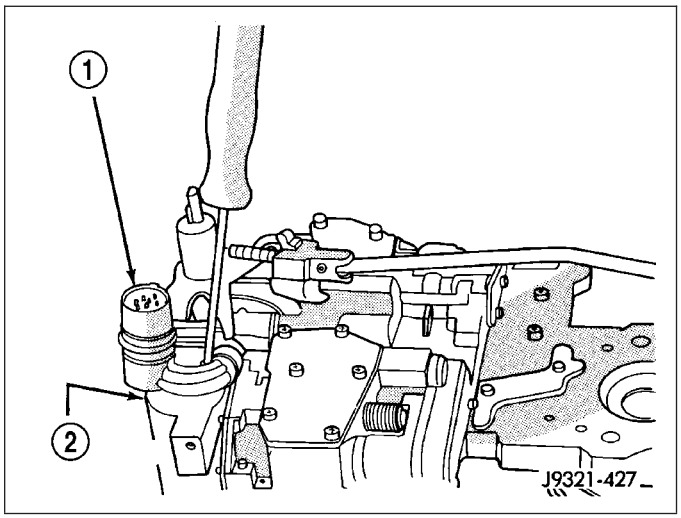
6. Position drain pan under transmission oil pan.
7. Remove transmission oil pan and gasket.
8. Remove fluid filter from valve body.
9. Remove bolts attaching valve body to transmission case.
10. Lower valve body enough to remove accumulator piston and springs.
11. Work manual lever shaft and electrical connector out of transmission case.
12. Lower valve body (1), rotate valve body away from case, pull park rod (3) out of sprag, and remove valve body.



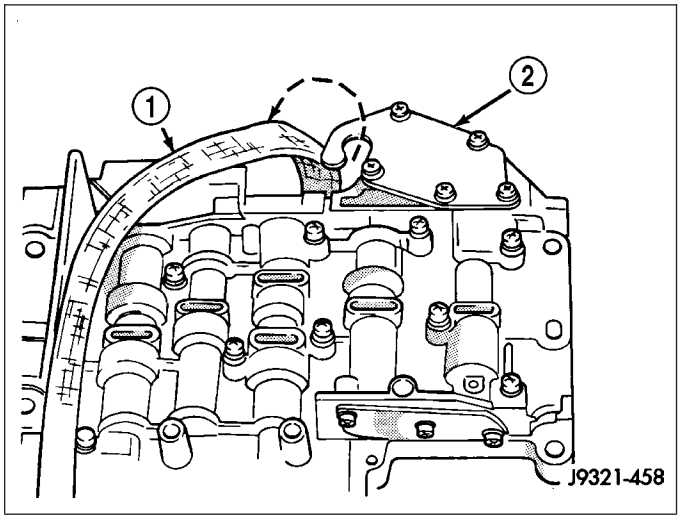
DISASSEMBLY

CAUTION: Do not clamp any valve body component in a vise. This practice can damage the component resulting in unsatisfactory operation after assembly and installation. Do not use pliers to remove any of the valves, plugs or springs and do not force any of the components out or into place. The valves and valve body housings will be damaged if force is used. Tag or mark the valve body springs for reference as they are removed. Do not allow them to become intermixed.

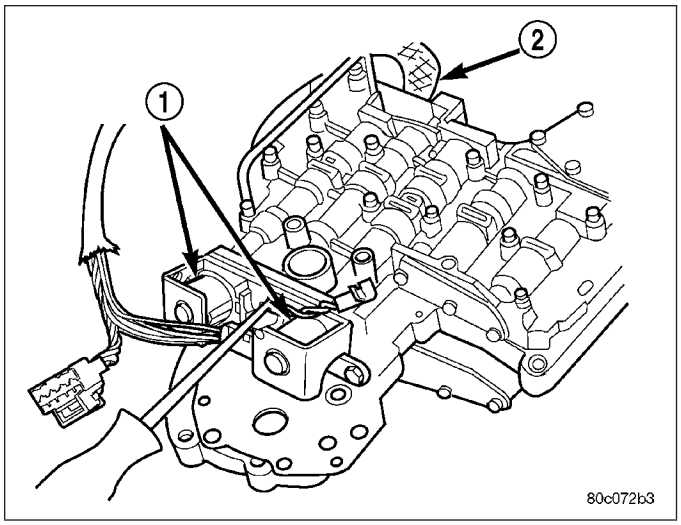
1. Disconnect wires from governor pressure sensor and solenoid.
2. Remove screws attaching governor body and retainer plate to transfer plate.
3. Remove retainer plate, governor body and gasket from transfer plate.
4. Remove governor pressure sensor from governor body.
5. Remove governor pressure solenoid by pulling it straight out of bore in governor body. Remove and discard solenoid O-rings if worn, cut, or torn.
6. Remove small shoulder bolt that secures solenoid harness case connector (1) to 3-4 accumulator housing (2). Retain shoulder bolt. Either tape it to harness or thread it back into accumulator housing after connector removal.



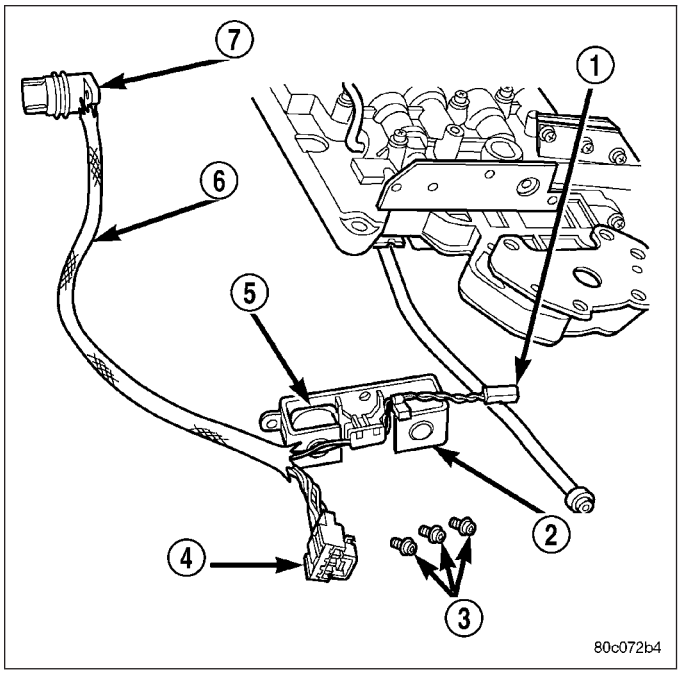
7. Unhook overdrive/converter solenoid harness (1) from 3-4 accumulator cover plate (2)
.



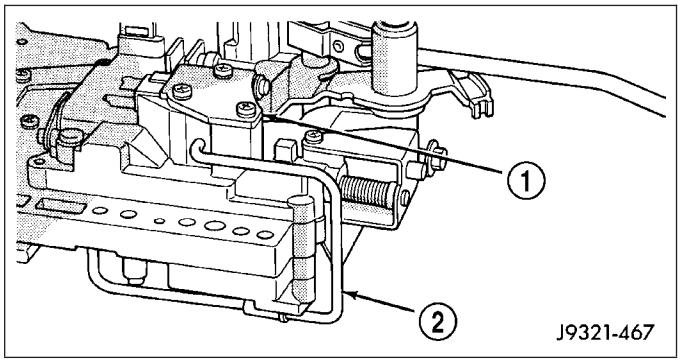
8. Turn valve body over and remove screws that attach overdrive/converter solenoid assembly (1) to valve body.



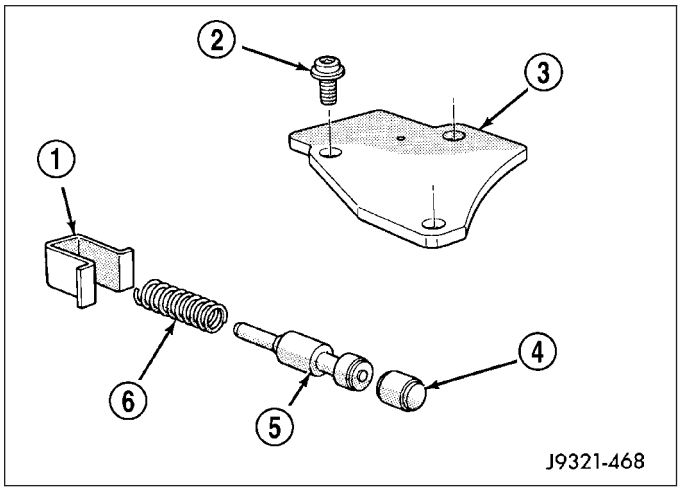
9. Remove solenoid and harness (6) assembly from valve body.



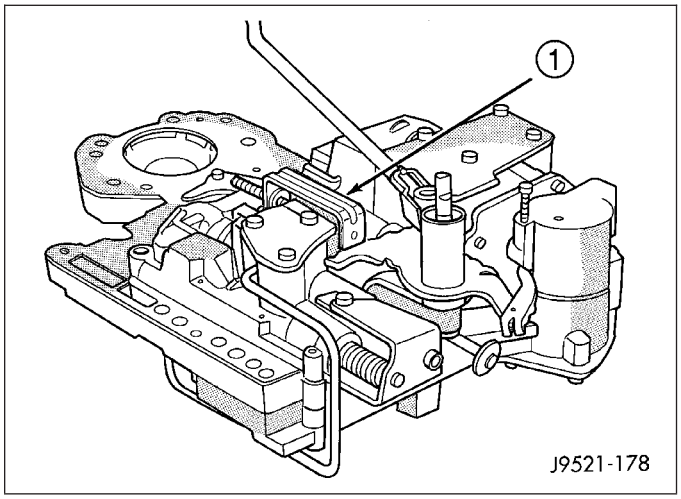
10. Remove boost valve cover (1).



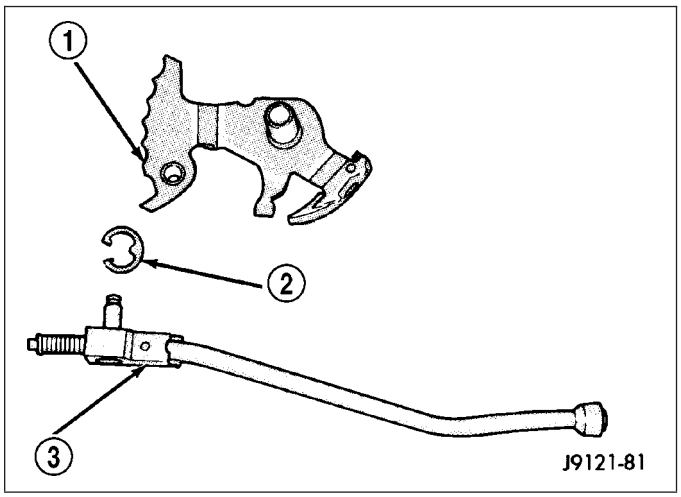
11. Remove boost valve retainer (1), valve spring (6),and boost valve (5).



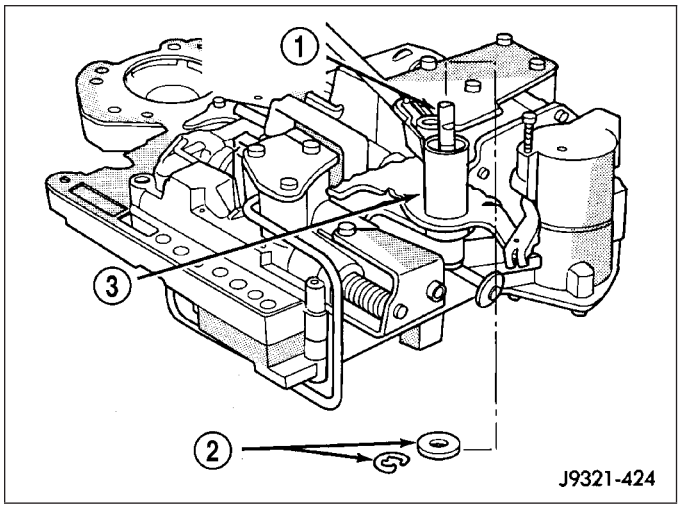
12. Secure detent ball and spring with Retainer Tool 6583 (1).



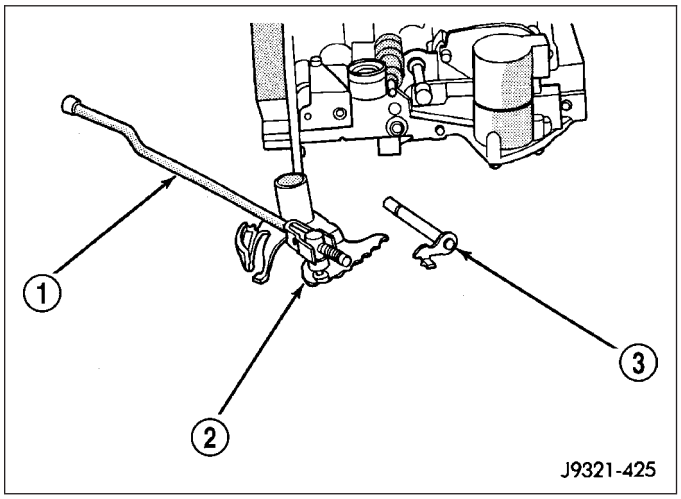
13. Remove park rod E-clip (2) and separate rod (3) from manual lever (1).



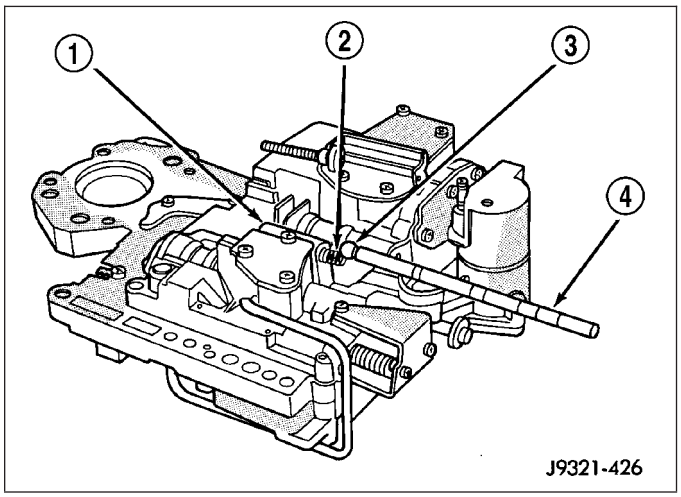
14. Remove E-clip and washer (2) that retains throttle lever shaft (1) in manual shaft (3).



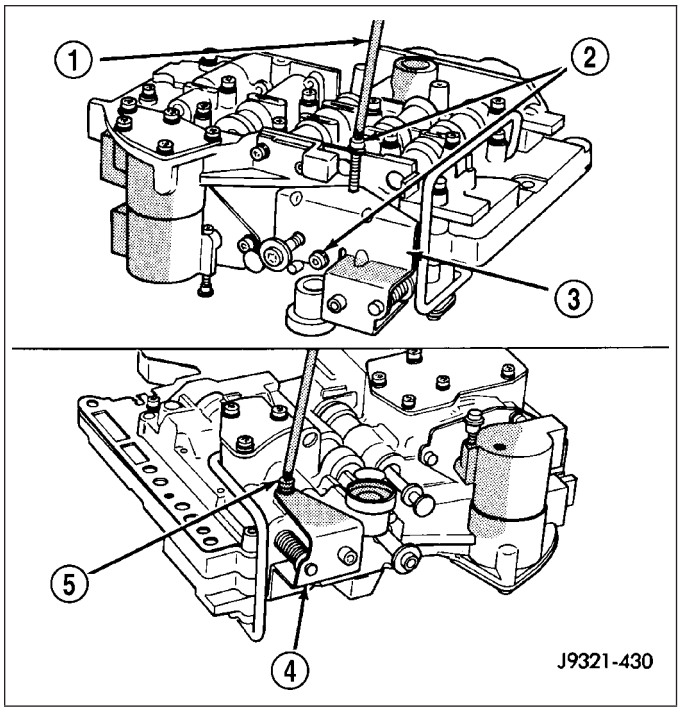
15. Remove manual lever (2) and throttle lever (3). Rotate and lift manual lever off valve body and throttle lever shaft. Then slide throttle lever out of valve body.



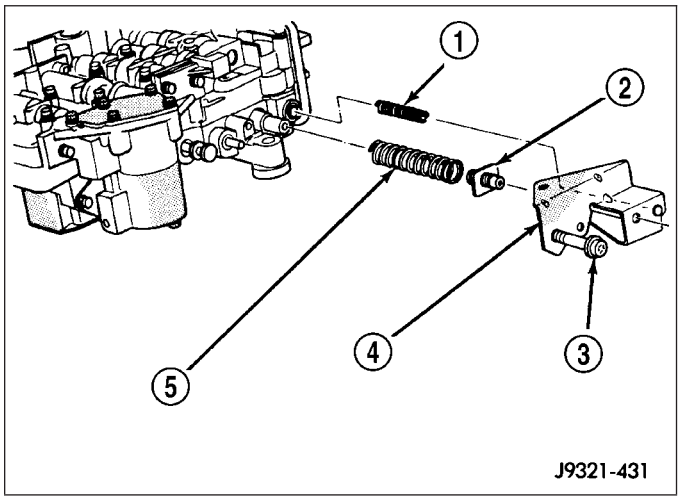
16. Position pencil magnet (4) next to detent housing to catch detent ball and spring. Then carefully remove Retainer Tool 6583 and remove detent ball (3) and spring (2).

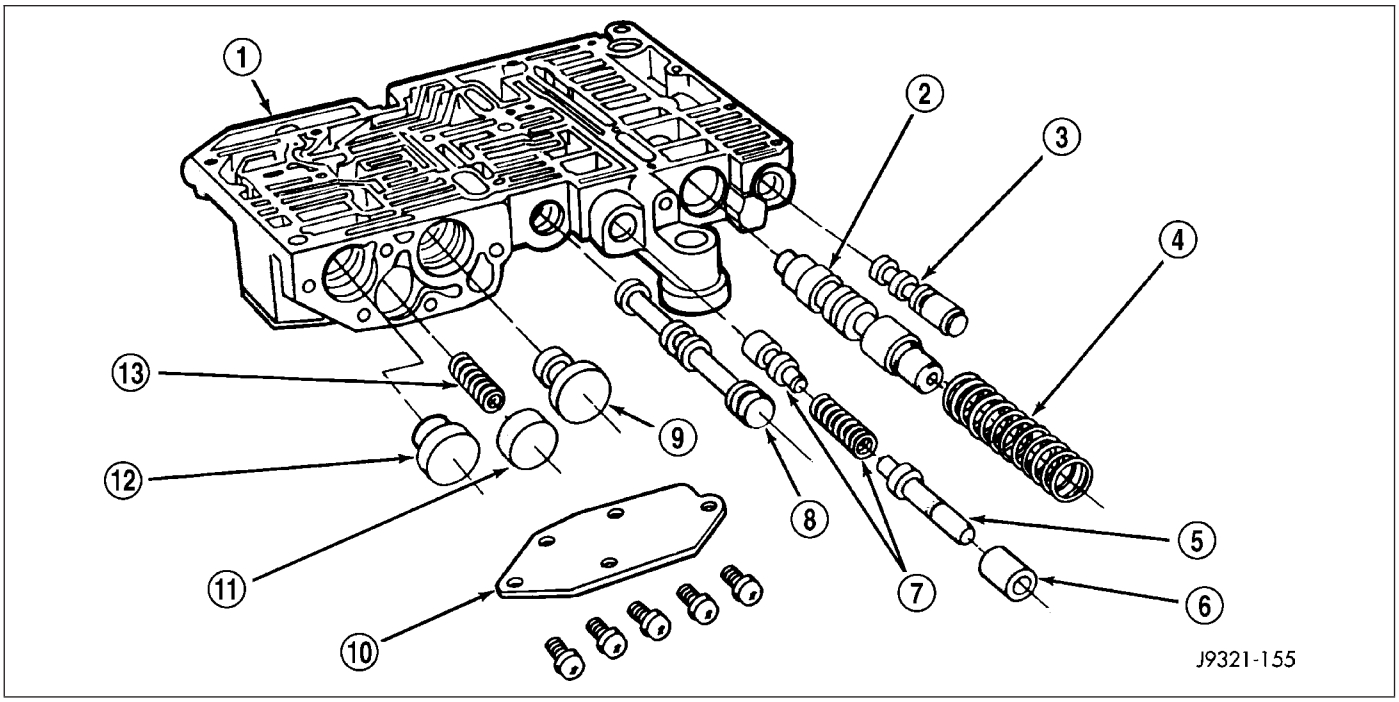


17. Remove screws (2) attaching pressure adjusting screw bracket (3) to valve body and transfer plate. Hold bracket (5) firmly against spring tension while removing last screw (5).



18. Remove adjusting screw bracket (4), line pressure adjusting screw (2), pressure regulator valve spring (5), and switch valve spring (1). Do not remove throttle pressure adjusting screw from bracket and do not disturb setting of either adjusting screw during removal.



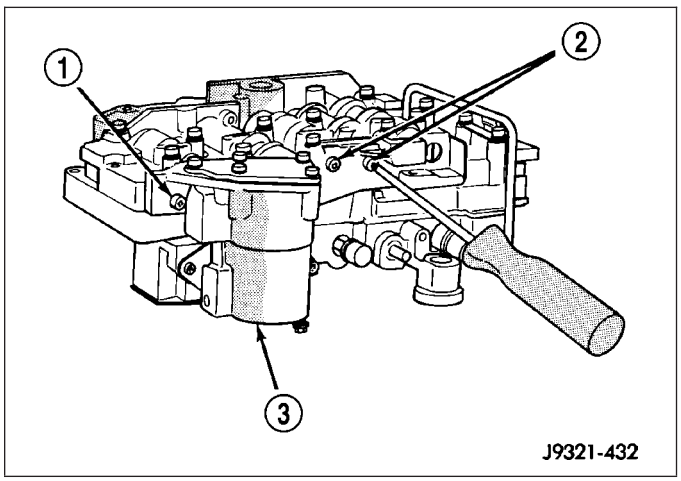


Upper Housing Control Valve Locations

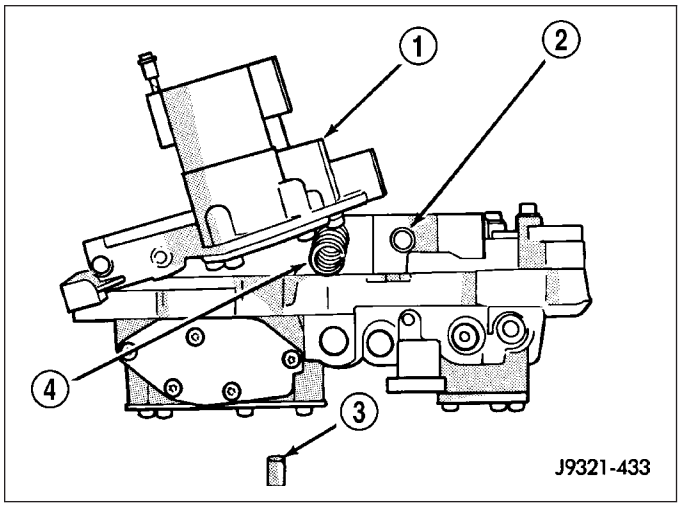
1 - UPPER HOUSING
2 - REGULATOR VALVE
3 - SWITCH VALVE
4 - REGULATOR VALVE SPRING
5 - KICKDOWN VALVE
6 - KICKDOWN DETENT
7 - THROTTLE VALVE AND SPRING
8 - MANUAL VALVE
9 - 1-2 GOVERNOR PLUG
10 - GOVERNOR PLUG COVER
11 - THROTTLE PLUG
12 - 2-3 GOVERNOR PLUG
13 - SHUTTLE VALVE PRIMARY SPRING

19. Turn upper housing (1) over and remove switch valve (3), regulator valve (2) and spring (4), and manual valve (8).
20. Remove kickdown detent (6), kickdown valve (5), and throttle valve and spring (7).

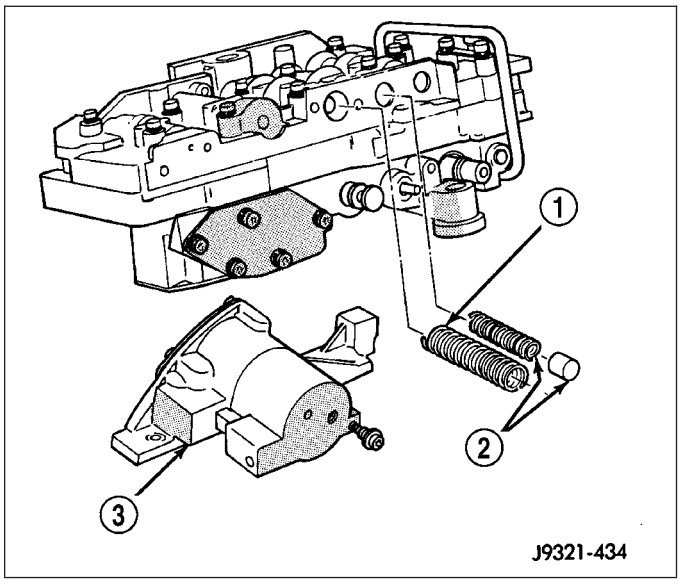
21. Loosen left-side 3-4 accumulator housing (3) attaching screw (1) about 2-3 threads. Then remove center and right-side housing attaching screws (2).



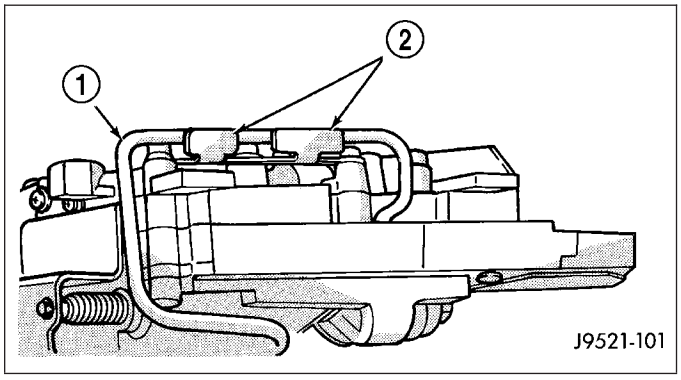
22. Carefully rotate 3-4 accumulator housing upward and remove 3-4 shift valve spring and converter clutch valve plug and spring.



23. Remove left-side screw and remove 3-4 accumulator housing (3) from valve body.

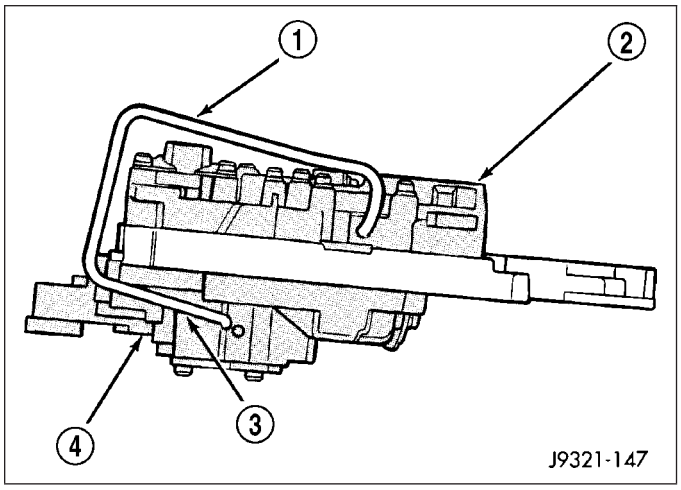


24. Bend back tabs on boost valve tube brace (2).

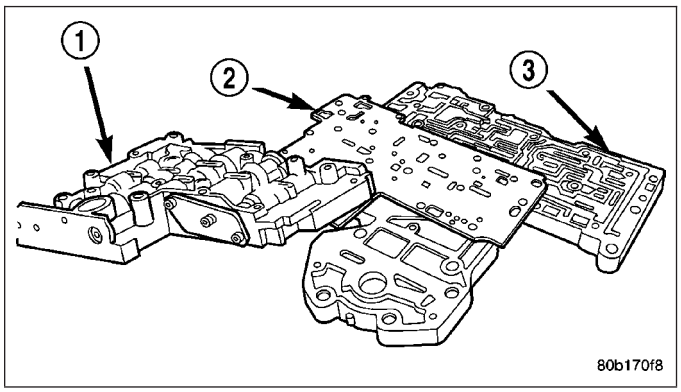


25. Remove boost valve connecting tube (1). Disengage tube from upper housing port first. Then rock opposite end of tube back and forth to work it out of lower housing.

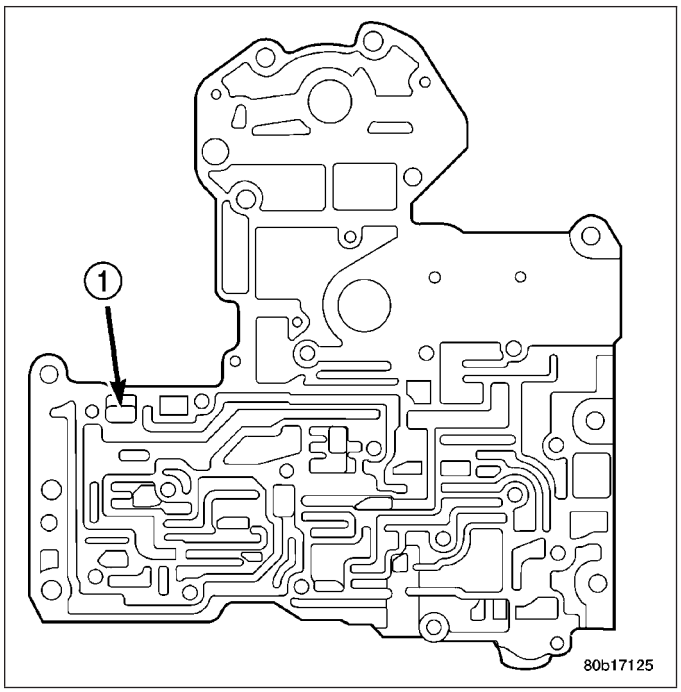
CAUTION: Do not use tools to loosen or pry the connecting tube out of the valve body housings. Loosen and remove the tube by hand only.



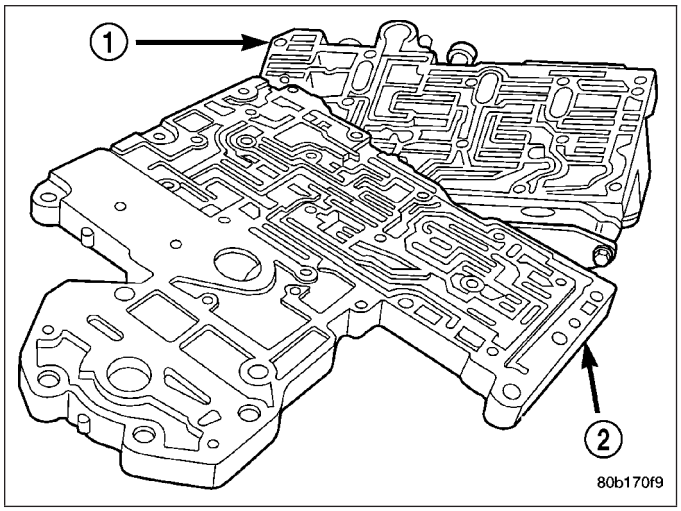
26. Turn valve body over so lower housing (1) is facing upward. In this position, the two check balls in upper housing will remain in place and not fall out when lower housing and separator plate are removed.
27. Remove screws attaching valve body lower housing (1) to upper housing and transfer plate (3). Note position of boost valve tube brace for assembly reference.
28. Remove lower housing and overdrive separator plate (2) from transfer plate (3).



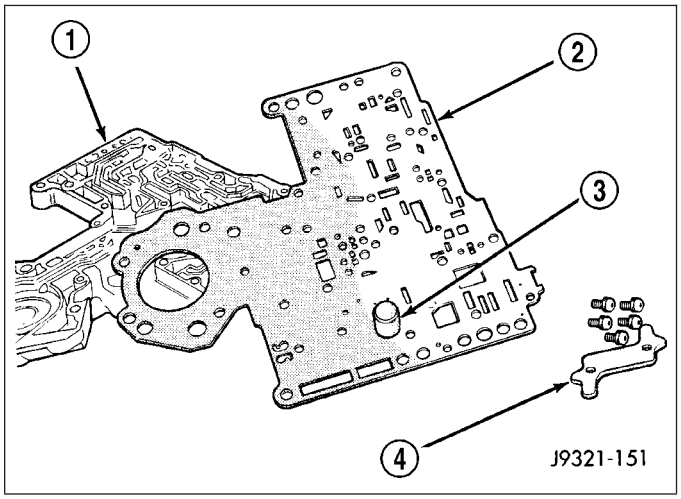
29. Remove the Number 10 check ball (1) from the transfer plate. The check ball is approximately 4.8 mm (3/16 in.) in diameter.



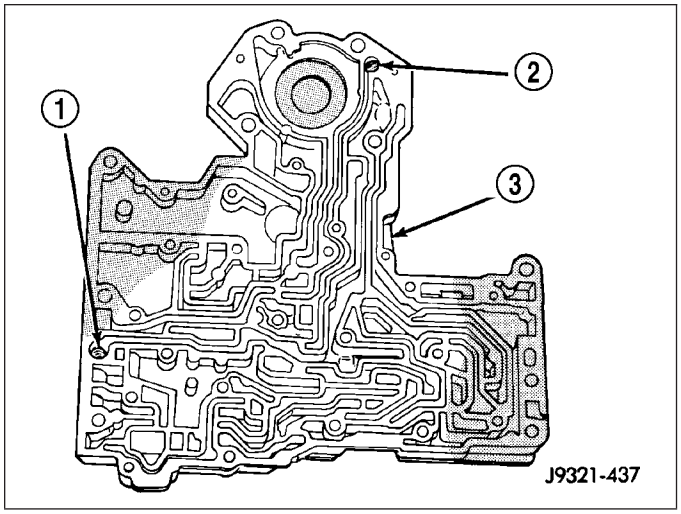
30. Remove transfer plate (2) from upper housing (1).



31. Turn transfer plate (1) over so upper housing separator plate (2) is facing upward.
32. Remove upper housing separator plate (2) from transfer plate (1). Note position of filter screen (3) in separator plate for assembly reference.

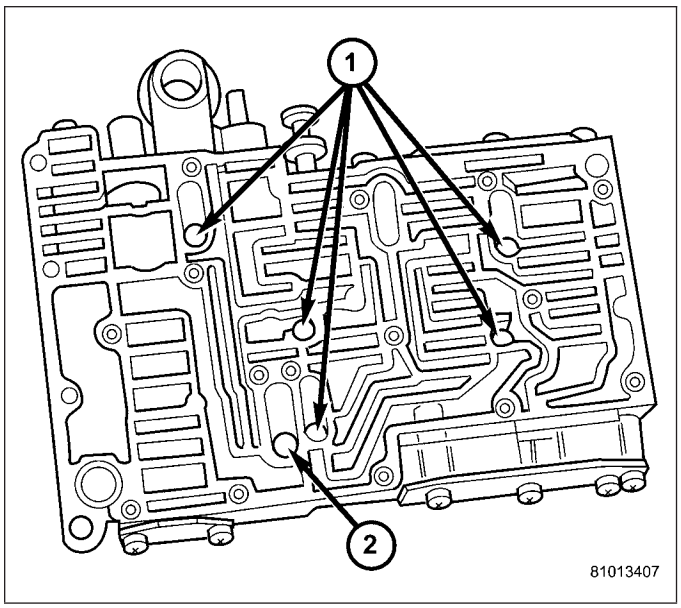


33. Remove rear clutch (1) and rear servo check balls (2) from transfer plate (3). Note check ball location for assembly reference.

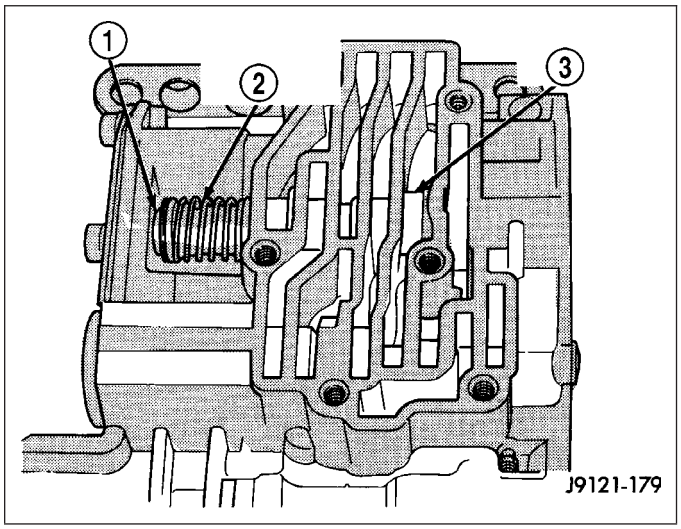


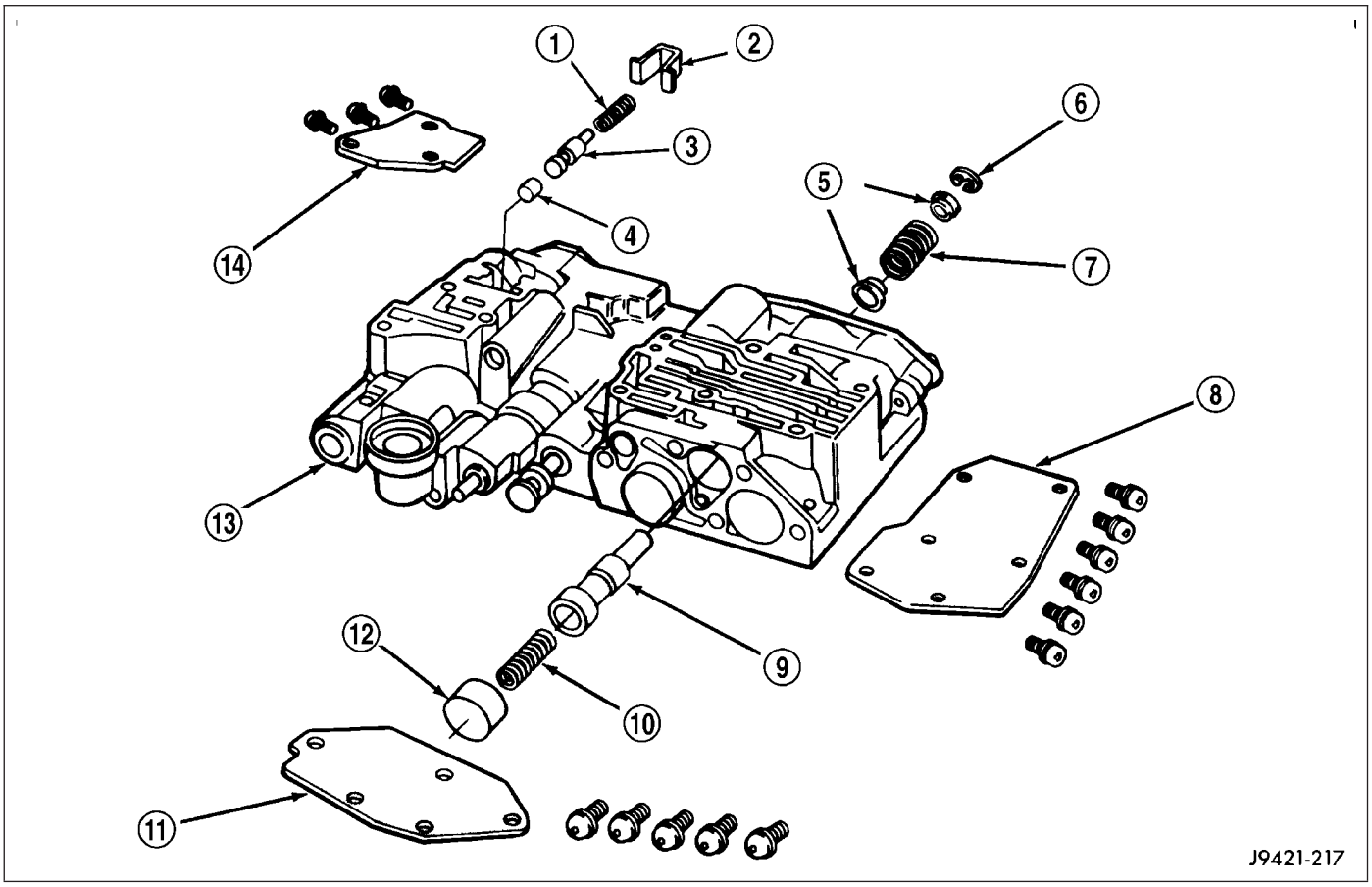
VALVE BODY UPPER HOUSING

1. Note location of check balls (1, 2) in valve body upper housing. Then remove the one large diameter (2) and the five smaller diameter (1) check balls.



2. Remove E-clip (1) that secures shuttle valve secondary spring (2) on valve stem (3).

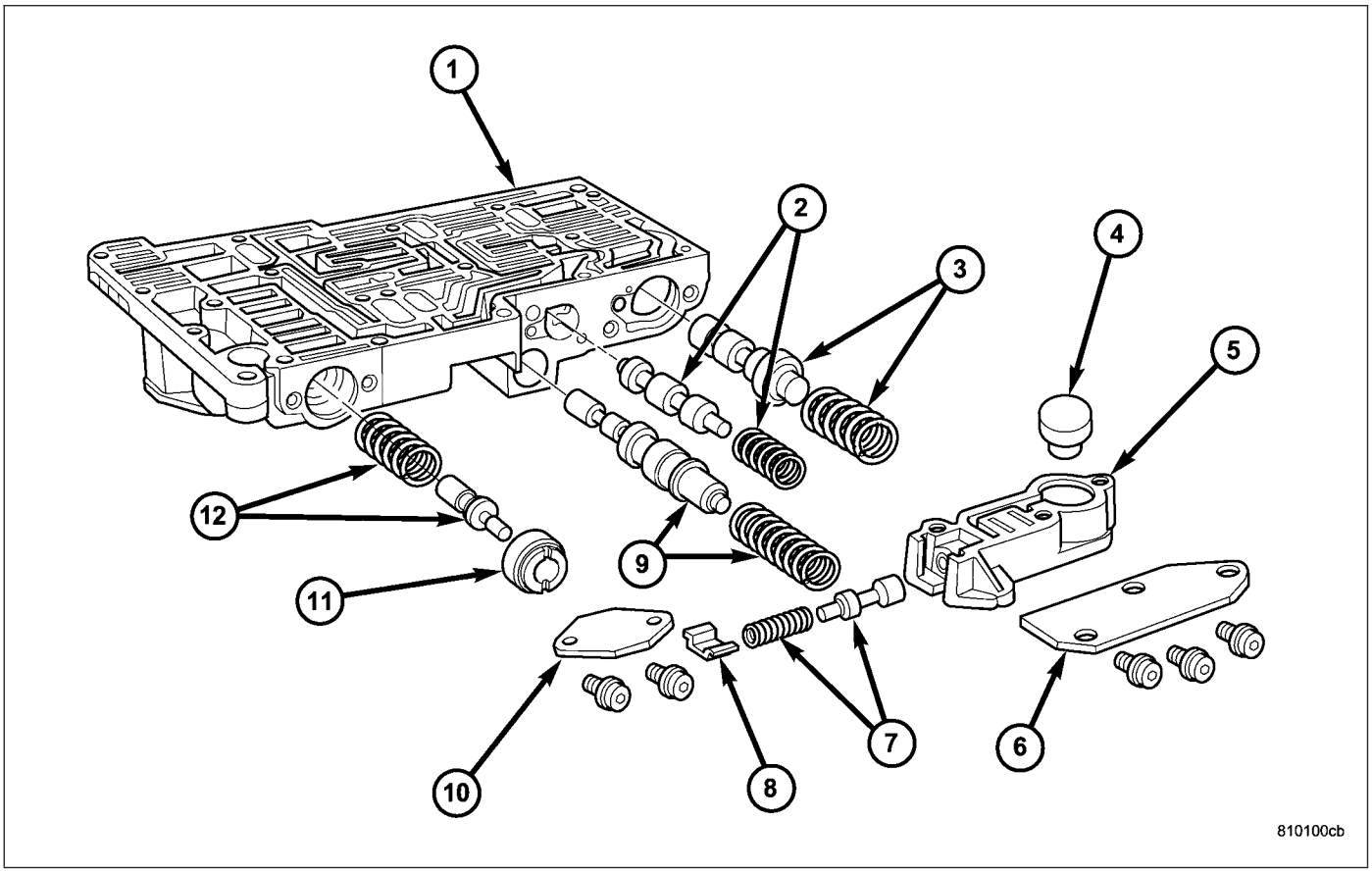




Shuttle and Boost Valve Location

1 - SPRING
2 - RETAINER
3 - BOOST VALVE
4 - BOOST VALVE PLUG
5 - SPRING GUIDES
6 - E-CLIP
7 - SHUTTLE VALVE SECONDARY SPRING
8 - SHUTTLE VALVE COVER
9 - SHUTTLE VALVE
10 - SHUTTLE VALVE PRIMARY SPRING
11 - GOVERNOR PLUG COVER
12 - THROTTLE PLUG
13 - UPPER HOUSING
14 - BOOST VALVE COVER

3. Remove governor plug and shuttle valve covers (8).
4. Remove throttle plug (12), primary spring (10), shuttle valve (9), secondary spring (7), and spring guides (5).
5. Remove boost valve retainer, spring and valve if not previously removed.

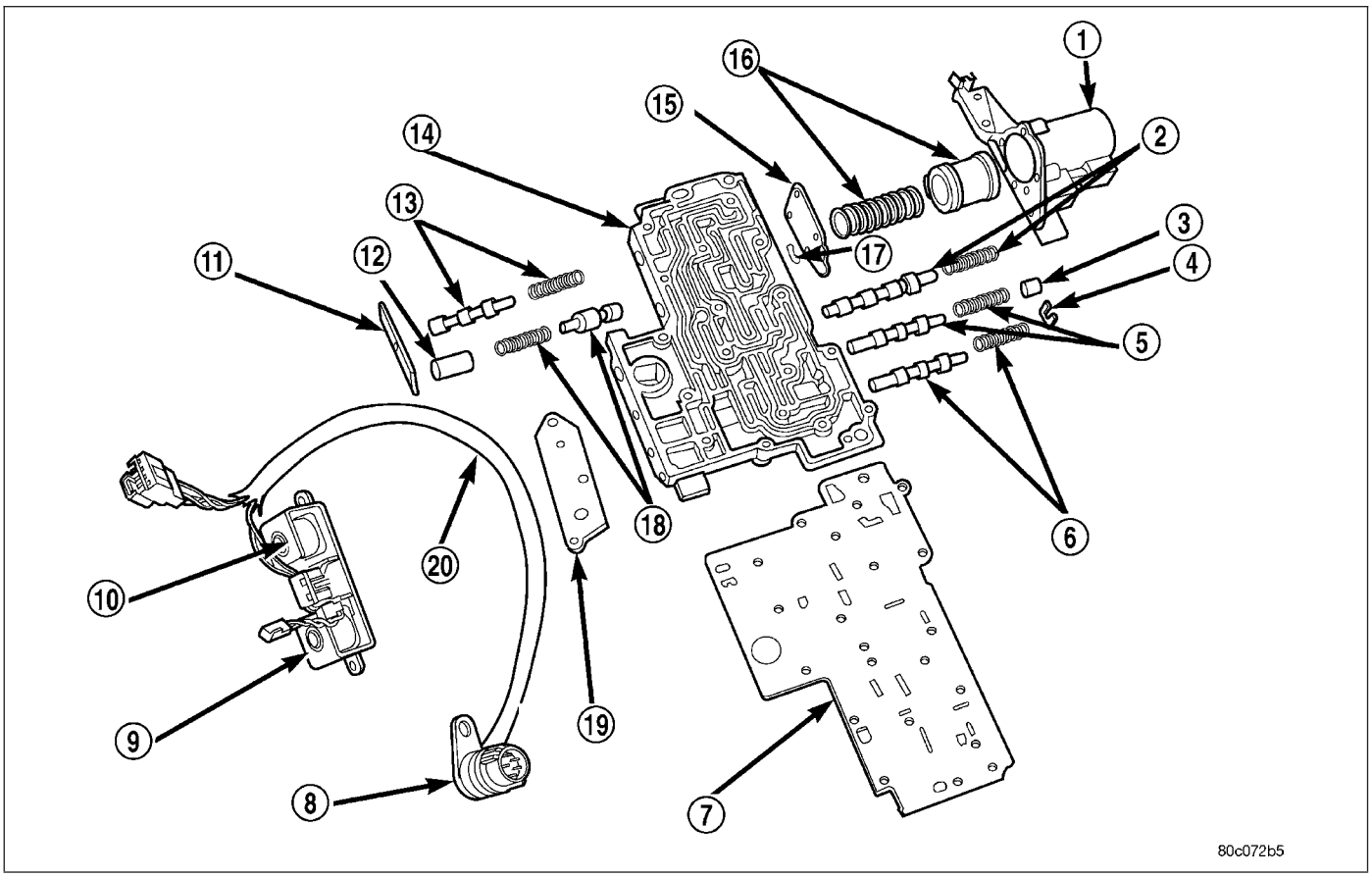


Upper Housing Shift Valve and Pressure Plug Locations

1 - UPPER HOUSING
2 - 1-2 SHIFT VALVE AND SPRING
3 - 2-3 SHIFT VALVE AND SPRING
4 - 2-3 THROTTLE PLUG
5 - LIMIT VALVE HOUSING
6 - LIMIT VALVE COVER
7 - LIMIT VALVE AND SPRING
8 - RETAINER
9 - 1-2 SHIFT CONTROL VALVE AND SPRING
10 - PRESSURE PLUG COVER
11 - PLUG SLEEVE
12 - THROTTLE PRESSURE SPRING AND PLUG

6. Remove throttle plug and 1-2 and 2-3 governor plugs.
7. Turn upper housing (1) around and remove limit valve (6) and shift valve covers.
8. Remove limit valve housing (5). Then remove retainer, spring, limit valve (7), and 2-3 throttle plug (4) from limit valve housing (5).
9. Remove 1-2 shift control valve and spring (9).
10. Remove 1-2 shift valve and spring (2).
11. Remove 2-3 shift valve and spring (3) from valve body.
12. Remove pressure plug cover (10).
13. Remove throttle pressure plug and spring (12).

VALVE BODY LOWER HOUSING



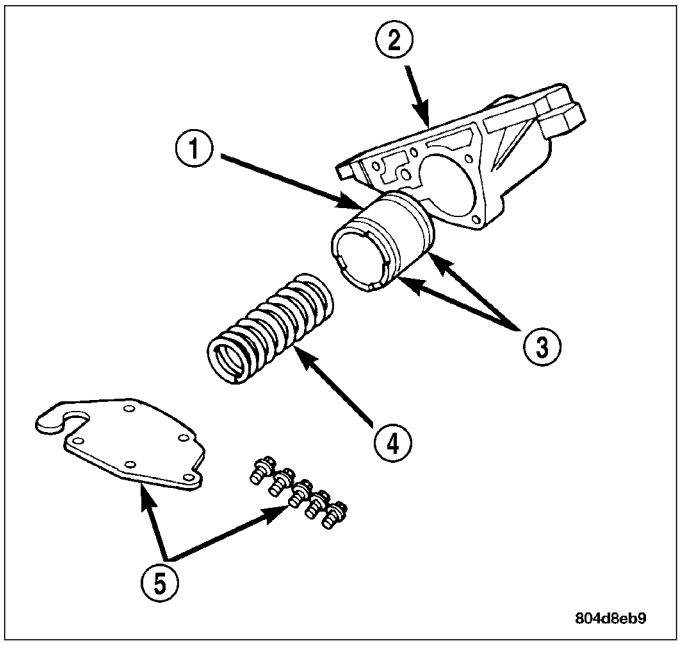
Lower Housing Shift Valves and Springs

1 - 3-4 ACCUMULATOR HOUSING
2 - 3-4 SHIFT VALVE AND SPRING
3 - PLUG
4 - SPRING RETAINER
5 - CONVERTER CLUTCH VALVE AND SPRING
6 - CONVERTER CLUTCH TIMING VALVE AND SPRING
7 - OVERDRIVE SEPARATOR PLATE
8 - CASE CONNECTOR
9 - CONVERTER CLUTCH SOLENOID
10 - OVERDRIVE SOLENOID
11 - TIMING VALVE COVER
12 - PLUG
13 - 3-4 TIMING VALVE AND SPRING
14 - LOWER HOUSING
15 - ACCUMULATOR END PLATE
16 - 3-4 ACCUMULATOR PISTON AND SPRING
17 - E-CLIP
18 - 3-4 QUICK FILL SPRING AND VALVE
19 - SOLENOID GASKET
20 - HARNESS

3-4 ACCUMULATOR HOUSING

1. Remove end plate from housing.
2. Remove piston spring.
3. Remove piston. Remove and discard piston seals.

4. Remove timing valve cover.
5. Remove 3-4 timing valve and spring.
6. Remove 3-4 quick fill valve, spring and plug.
7. Remove 3-4 shift valve and spring.
8. Remove converter clutch valve, spring and plug.
9. Remove converter clutch timing valve, retainer and valve spring.



CLEANING

Clean the valve housings, valves, plugs, springs, and separator plates with a standard parts cleaning solution only. Do not use gasoline, kerosene, or any type of caustic solution.

Do not immerse any of the electrical components in cleaning solution. Clean the governor solenoid and sensor and the dual solenoid and harness assembly by wiping them off with dry shop towels only.

Dry all except the electrical parts with compressed air. Make sure all passages are clean and free from obstructions. **Do not use rags or shop towels to dry or wipe off valve body components. Lint from these materials can stick to valve body parts, interfere with valve operation, and clog filters and fluid passages.**

Wipe the governor pressure sensor and solenoid valve with dry, lint free shop towels only. The O-rings on the sensor and solenoid valve are the only serviceable components. Be sure the vent ports in the solenoid valve are open and not blocked by dirt or debris. Replace the valve and/or sensor only when DRB scan tool diagnosis indicates this is necessary. Or, if either part has sustained physical damage (dented, deformed, broken, etc.).

CAUTION: Do not turn the small screw at the end of the solenoid valve for any reason. Turning the screw in either direction will ruin solenoid calibration and result in solenoid failure. In addition, the filter on the solenoid valve is NOT serviceable. Do not try to remove the filter as this will damage the valve housing.

INSPECTION

Inspect the throttle and manual valve levers and shafts. Do not attempt to straighten a bent shaft or correct a loose lever. Replace these components if worn, bent, loose or damaged in any way.

Inspect all of the valve body mating surfaces for scratches, nicks, burrs, or distortion. Use a straightedge to check surface flatness. Minor scratches may be removed with crocus cloth using only very light pressure.

Minor distortion of a valve body mating surface may be corrected by smoothing the surface with a sheet of crocus cloth. Position the crocus cloth on a surface plate, sheet of plate glass or equally flat surface. If distortion is severe or any surfaces are heavily scored, the valve body will have to be replaced.

CAUTION: Many of the valves and plugs, such as the throttle valve, shuttle valve plug, 1-2 shift valve and 1-2 governor plug, are made of coated aluminum. Aluminum components are identified by the dark color of the special coating applied to the surface (or by testing with a magnet). Do not sand aluminum valves or plugs under any circumstances. This practice could damage the special coating causing the valves/plugs to stick and bind.

Inspect the valves and plugs for scratches, burrs, nicks, or scores. Minor surface scratches on steel valves and plugs can be removed with crocus cloth but **do not round off the edges of the valve or plug lands.**Maintaining sharpness of these edges is vitally important. The edges prevent foreign matter from lodging between the valves and plugs and the bore.

Inspect all the valve and plug bores in the valve body. Use a penlight to view the bore interiors. Replace the valve body if any bores are distorted or scored. Inspect all of the valve body springs. The springs must be free of distortion, warpage or broken coils.

Check the two separator plates for distortion or damage of any kind. Inspect the upper housing, lower housing, 3-4 accumulator housing, and transfer plate carefully. Be sure all fluid passages are clean and clear. Check condition of the upper housing and transfer plate check balls as well. The check balls and ball seats must not be worn or damaged.

Trial fit each valve and plug in its bore to check freedom of operation. When clean and dry, the valves and plugs should drop freely into the bores.

Valve body bores do not change dimensionally with use. If the valve body functioned correctly when new, it will continue to operate properly after cleaning and inspection. It should not be necessary to replace a valve body assembly unless it is damaged in handling.

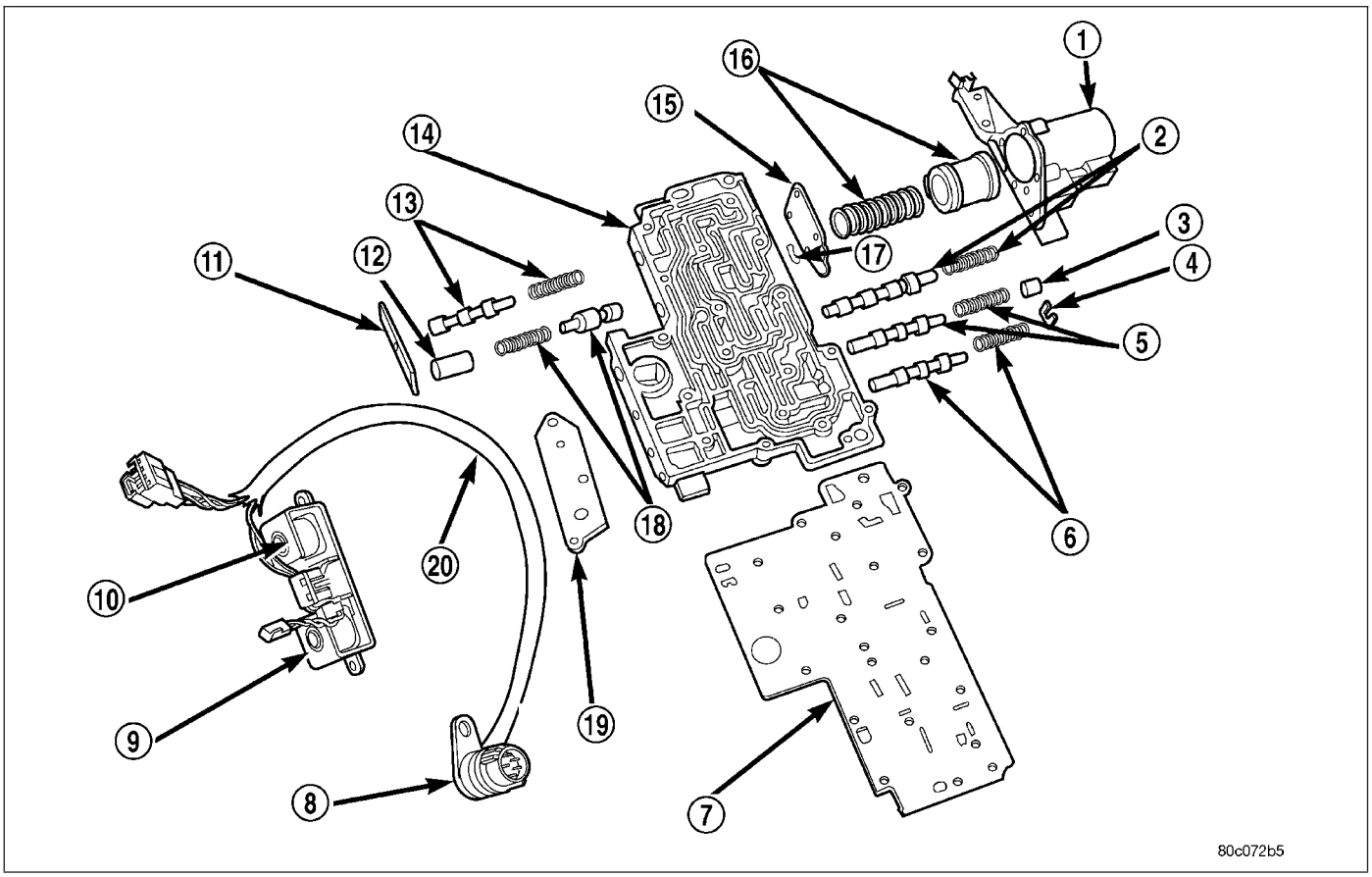
The only serviceable valve body components are listed below. The remaining valve body components are serviced only as part of a complete valve body assembly. Serviceable parts are:

- dual solenoid and harness assembly
- solenoid gasket
- solenoid case connector O-rings and shoulder bolt
- switch valve and spring
- pressure adjusting screw and bracket assembly
- throttle lever
- manual lever and shaft seal
- throttle lever shaft seal, washer, and E-clip
- fluid filter and screws
- detent ball and spring
- valve body screws
- governor pressure solenoid
- governor pressure sensor and retaining clip
- park lock rod and E-clip

ASSEMBLY

CAUTION: Do not force valves or plugs into place during reassembly. If the valve body bores, valves and plugs are free of distortion or burrs, the valve body components should all slide into place easily. In addition, do not overtighten the transfer plate and valve body screws during reassembly. Overtightening can distort the housings resulting in valve sticking, cross leakage and unsatisfactory operation. Tighten valve body screws to recommended torque only.

LOWER HOUSING



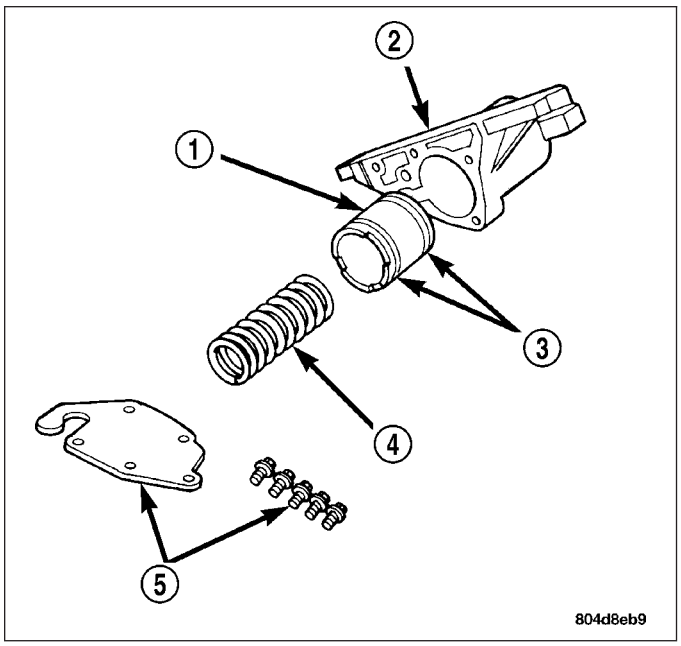
Lower Housing Shift Valves and Springs

1 - 3-4 ACCUMULATOR HOUSING
2 - 3-4 SHIFT VALVE AND SPRING
3 - PLUG
4 - SPRING RETAINER
5 - CONVERTER CLUTCH VALVE AND SPRING
6 - CONVERTER CLUTCH TIMING VALVE AND SPRING
7 - OVERDRIVE SEPARATOR PLATE
8 - CASE CONNECTOR
9 - CONVERTER CLUTCH SOLENOID
10 - OVERDRIVE SOLENOID
11 - TIMING VALVE COVER
12 - PLUG
13 - 3-4 TIMING VALVE AND SPRING
14 - LOWER HOUSING
15 - ACCUMULATOR END PLATE
16 - 3-4 ACCUMULATOR PISTON AND SPRING
17 - E-CLIP
18 - 3-4 QUICK FILL SPRING AND VALVE
19 - SOLENOID GASKET
20 - HARNESS

1. Lubricate valves, springs, and the housing valve and plug bores with clean transmission fluid.
2. Install 3-4 timing valve spring and valve (13) in lower housing.
3. Install 3-4 quick fill valve (18) in lower housing.
4. Install 3-4 quick fill valve spring (18) and plug (12) in housing.
5. Install timing valve end plate (11). Tighten end plate screws to 4 N·m (35 in. lbs.) torque.

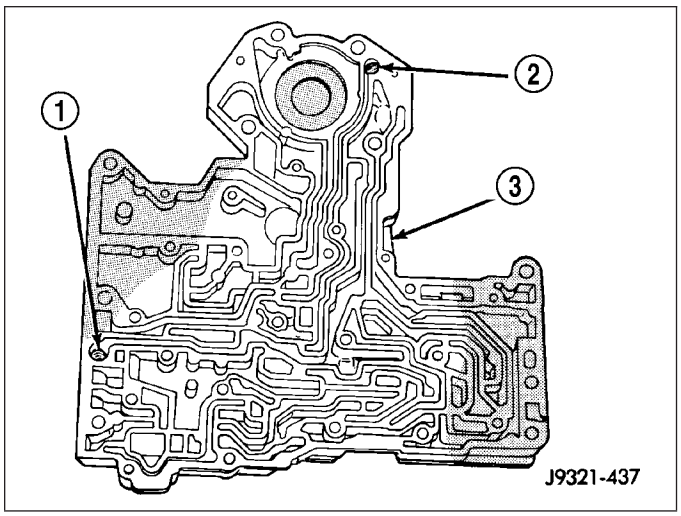
3-4 ACCUMULATOR

1. Lubricate accumulator piston, seals and housing piston bore with clean transmission fluid.
2. Install new seal rings (3) on accumulator piston.
3. Install piston (1) and spring (4) in housing.
4. Install end plate on housing (5).

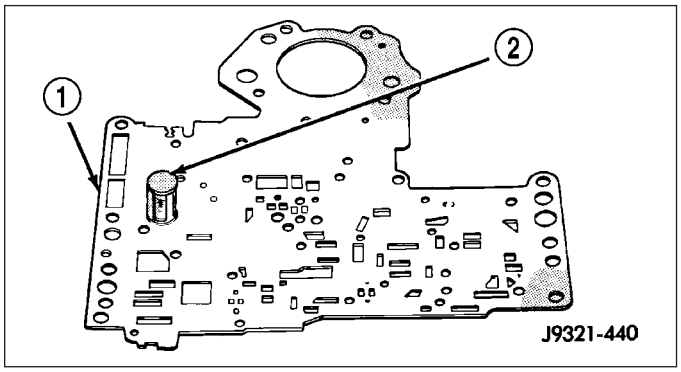


TRANSFER PLATE

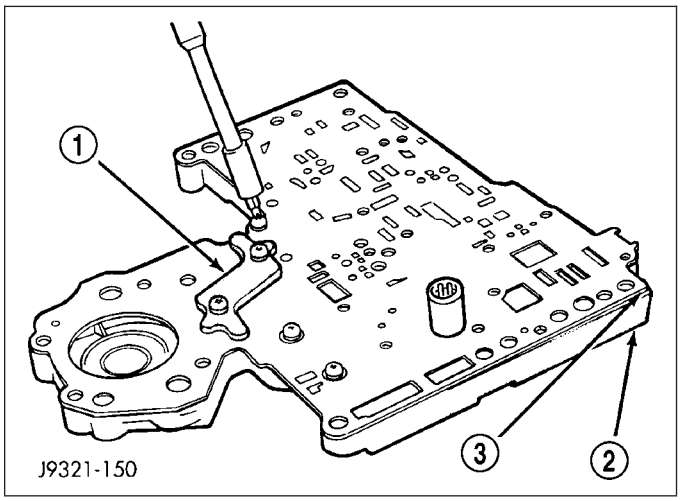
1. Install rear clutch (1) and rear servo (2) check balls in transfer plate (3).



2. Install filter screen (2) in upper housing separator plate (1).

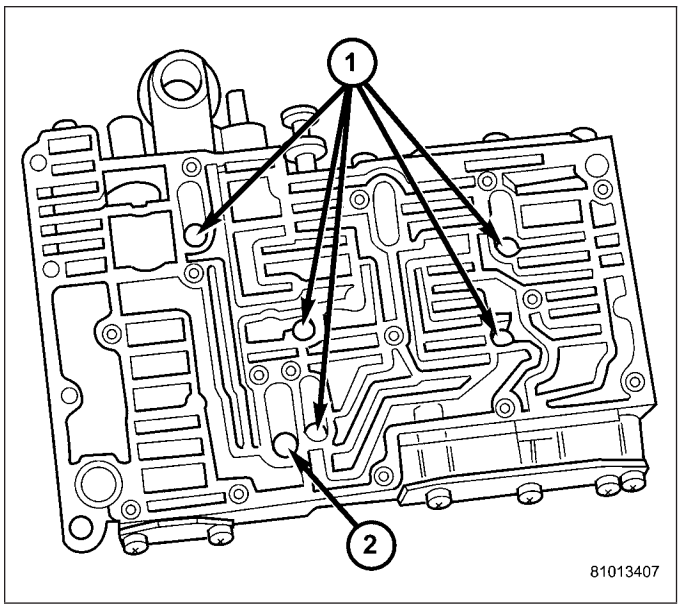


3. Align and position upper housing separator plate (3) on transfer plate (2).
4. Install brace plate (1). Tighten brace attaching screws to 4 N·m (35 in. lbs.) torque.
5. Install remaining separator plate attaching screws. Tighten screws to 4 N·m (35 in. lbs.) torque.

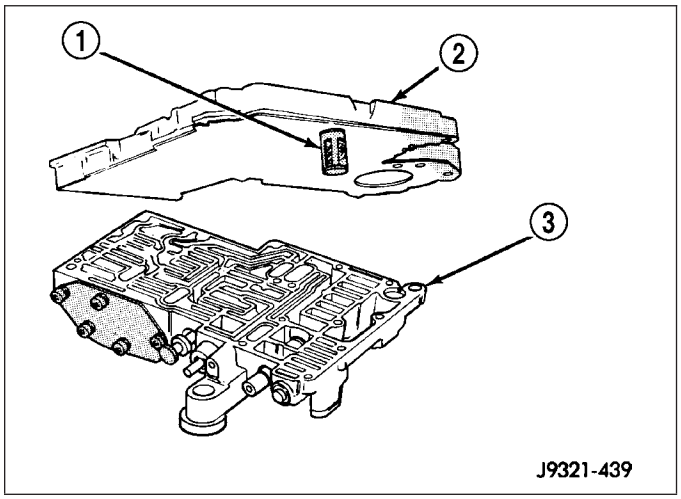


UPPER AND LOWER HOUSING

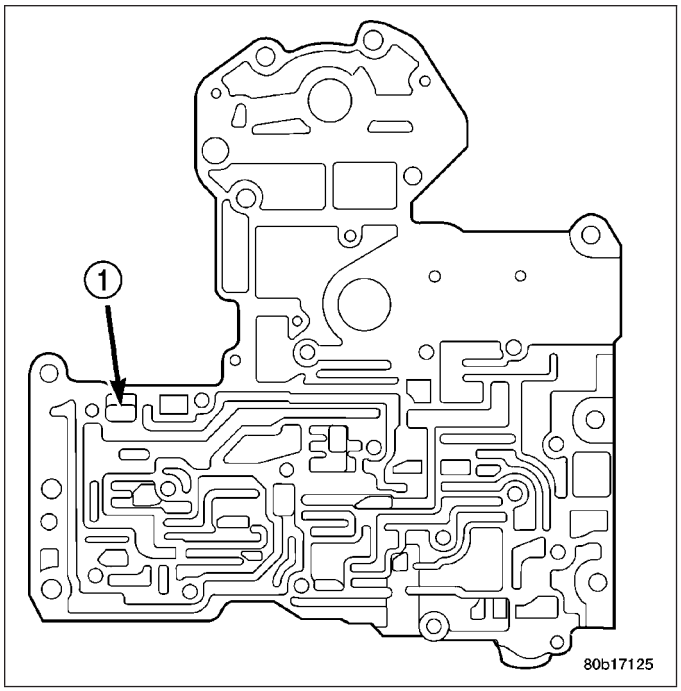
1. Position upper housing so internal passages and check ball seats are facing upward. Then install check balls in housing (1, 2). Seven check balls are used. The single large check ball (2) is approximately 8.7 mm (11/32 in.) diameter. The single small check ball is approximately 4.8 mm (3/16 in.) in diameter. The remaining 5 check balls are approximately 6.3 mm (1/4 in.) in diameter.



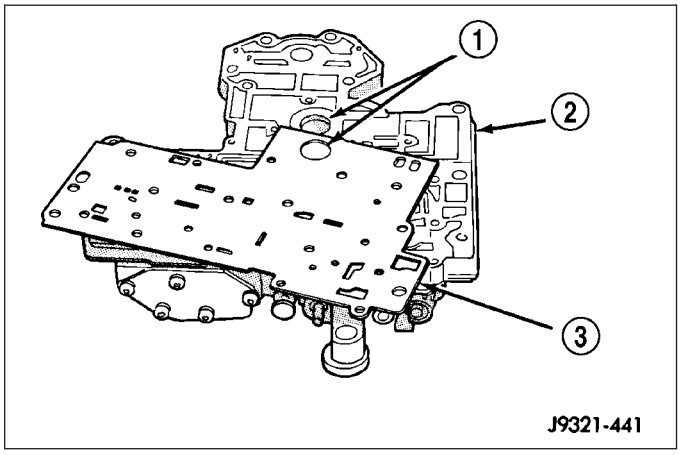
2. Position assembled transfer plate and upper housing separator plate (2) on upper housing. Be sure filter screen (1) is seated in proper housing recess.



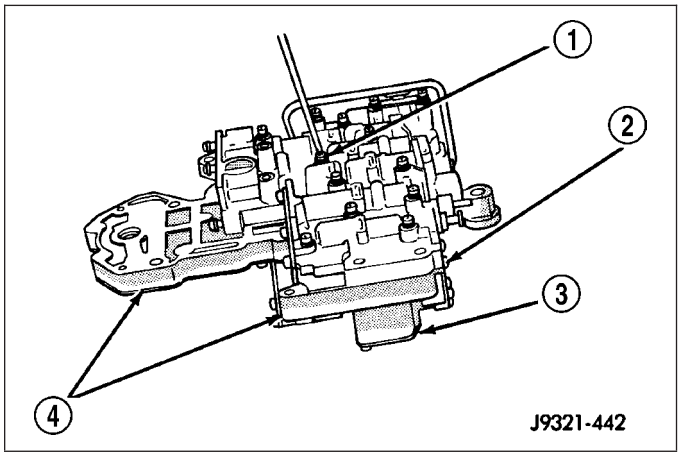
3. Install the Number 10 check ball (1) into the transfer plate. The check ball is approximately 4.8 mm (3/16 in.) in diameter.



4. Position lower housing separator plate (3) on transfer plate (2).

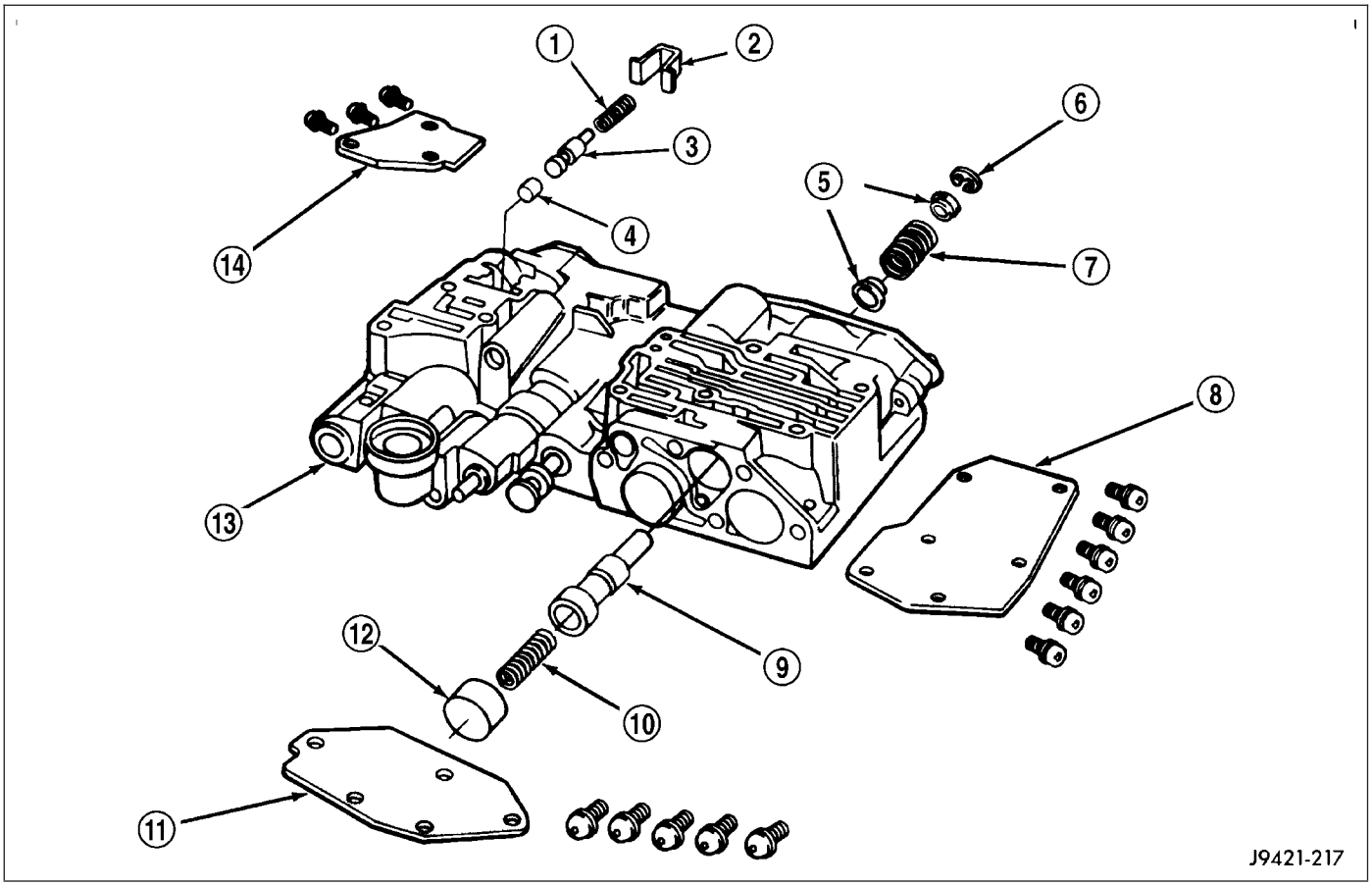


5. Install lower housing (2) on assembled transfer plate (4) and upper housing (3).
6. Install and start all valve body screws by hand except for the screws to hold the boost valve tube brace. Save those screws for later installation. Then tighten screws evenly to 4 N·m (35 in. lbs.) torque. Start at center and work out to sides when tightening screws (1).

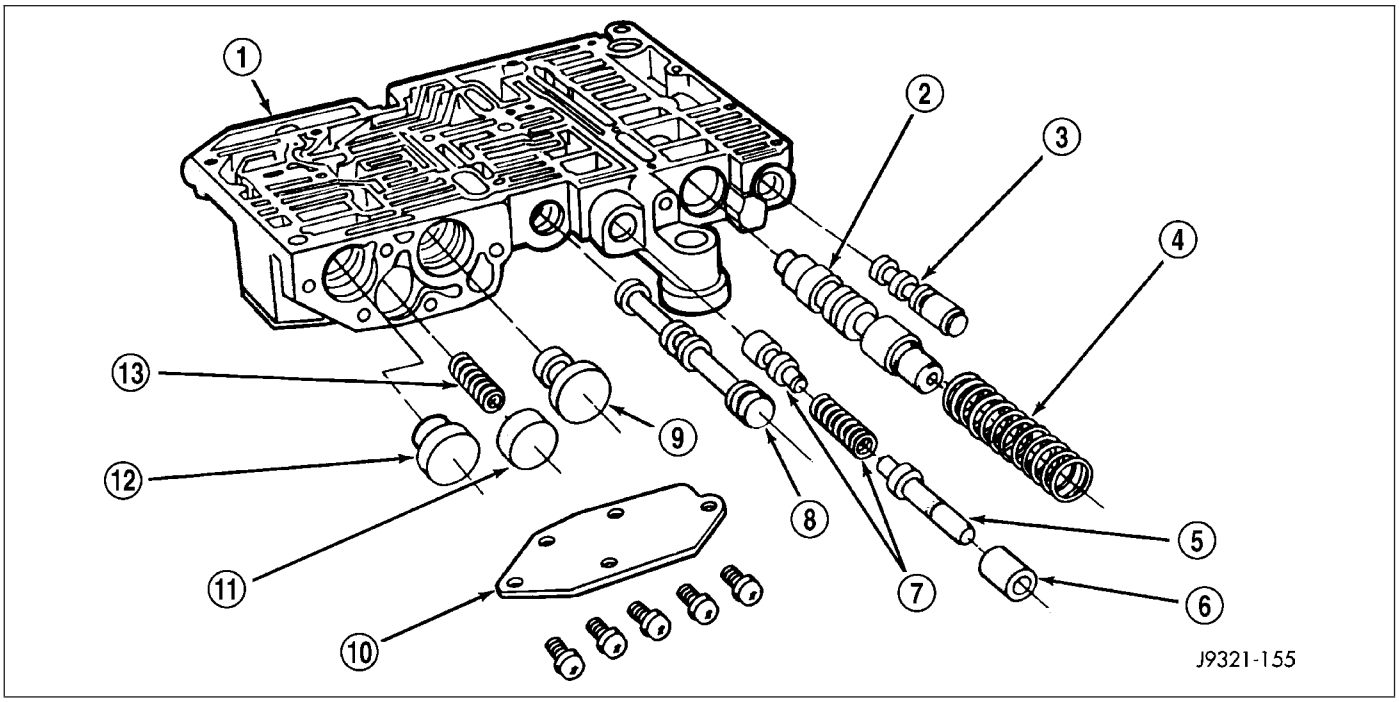


UPPER HOUSING VALVE AND PLUG

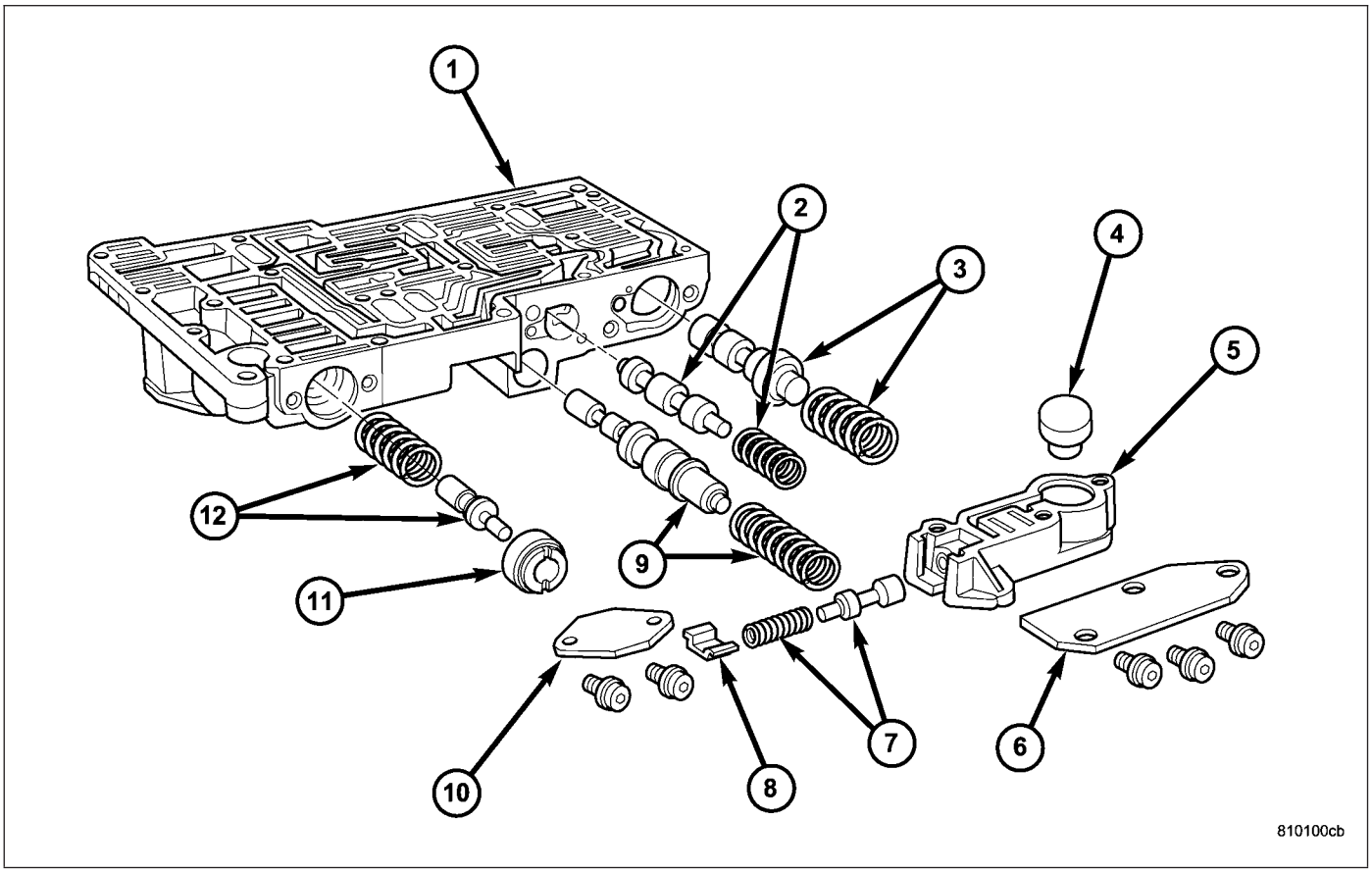
Refer to the following graphics , and to perform the following steps.



1. Lubricate valves, plugs, springs with clean transmission fluid.
2. Install the boost valve plug (4), boost valve (3), spring (1), and retainer (2) into the housing.
3. Install the boost valve cover (14). Tighten cover plate screws to 4 N·m (35 in. lbs.) torque.
4. Install shuttle valve as follows:
   a. Insert plastic guides (5) in shuttle valve secondary spring (7) and install spring on end of shuttle valve (9).
   b. Install shuttle valve (9) into housing.
   c. Hold shuttle valve in place.
   d. Compress secondary spring (7) and install E-clip (6) in groove at end of shuttle valve.
   e. Verify that spring and E-clip are properly seated before proceeding.
5. Install shuttle valve cover plate (8). Tighten cover plate screws to 4 N·m (35 in. lbs.) torque.



6. Install 1-2 (9) and 2-3 (12) valve governor plugs in valve body.
7. Install shuttle valve primary spring (13) and throttle plug (11).
8. Align and install governor plug cover (11). Tighten cover screws to 4 N·m (35 in. lbs.) torque.
9. Install the switch valve (3).
10. Install the throttle valve and spring (7), kickdown (5), and kickdown detent (6).
11. Install the manual valve (8).
12. Assemble regulator valve (2) and spring (4). Insert assembly in upper housing.



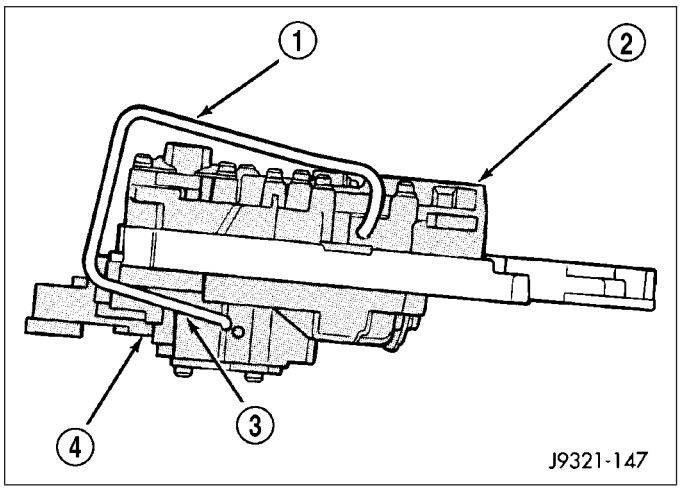
Upper Housing Shift Valve and Pressure Plug Locations

1 - UPPER HOUSING
2 - 1-2 SHIFT VALVE AND SPRING
3 - 2-3 SHIFT VALVE AND SPRING
4 - 2-3 THROTTLE PLUG
5 - LIMIT VALVE HOUSING
6 - LIMIT VALVE COVER
7 - LIMIT VALVE AND SPRING
8 - RETAINER
9 - 1-2 SHIFT CONTROL VALVE AND SPRING
10 - PRESSURE PLUG COVER
11 - PLUG SLEEVE
12 - THROTTLE PRESSURE SPRING AND PLUG

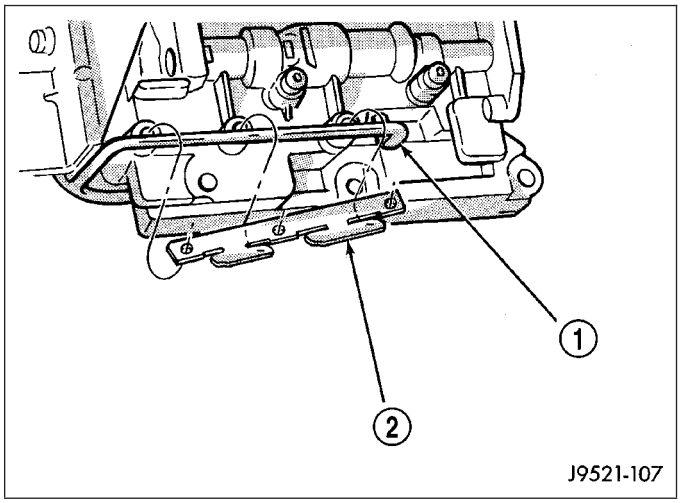
13. Install 1-2 (2) and 2-3 (3) shift valves and springs.
14. Install 1-2 shift control valve and spring (9).
15. Install retainer (8), limit valve and spring (7), and 2-3 throttle plug (4) into the limit valve housing (5).
16. Install the throttle pressure spring and plug (12) and plug sleeve (11).
17. Install pressure plug cover (10) and cover plate (6). Tighten screws to 4 N·m (35 in. lbs.).
18. Install limit valve housing (5) and cover plate (6). Tighten screws to 4 N·m (35 in. lbs.).

BOOST VALVE TUBE AND BRACE

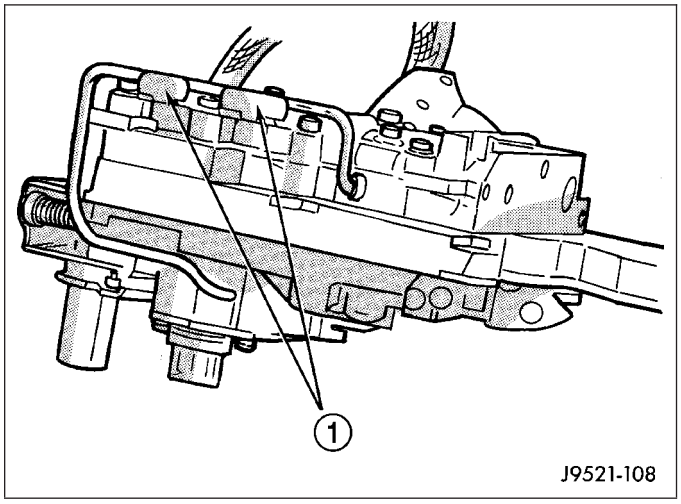
1. Position valve body assembly so lower housing (2) is facing upward.
2. Lubricate tube ends and housing ports with transmission fluid or petroleum jelly.
3. Start tube in lower housing port first. Then swing tube downward and work opposite end of tube into upper housing port.
4. Insert and seat each end of tube in housings.



5. Slide tube brace (2) under tube and into alignment with valve body screw holes.
6. Install and finger tighten three screws that secure tube brace to valve body housings.

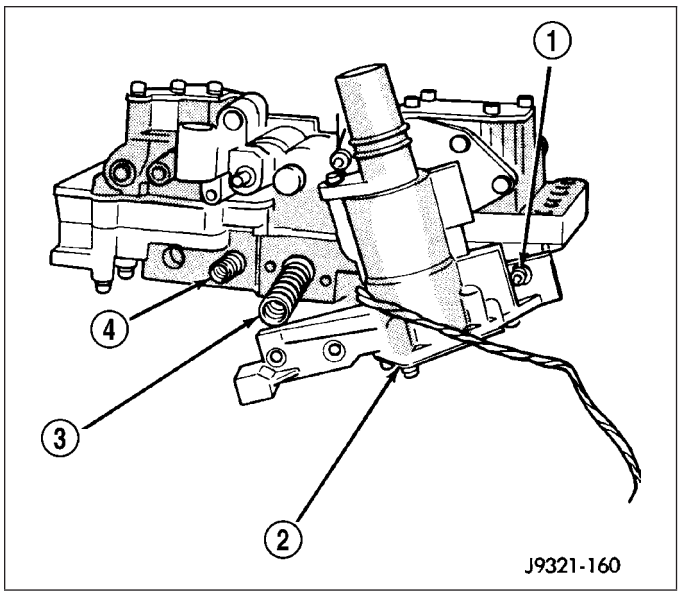


7. Bend tube brace tabs up and against tube to hold it in position.
8. Tighten all valve body housing screws to 4 N·m (35 in. lbs.) torque after tube and brace are installed. Tighten screws in diagonal pattern starting at center and working outward.

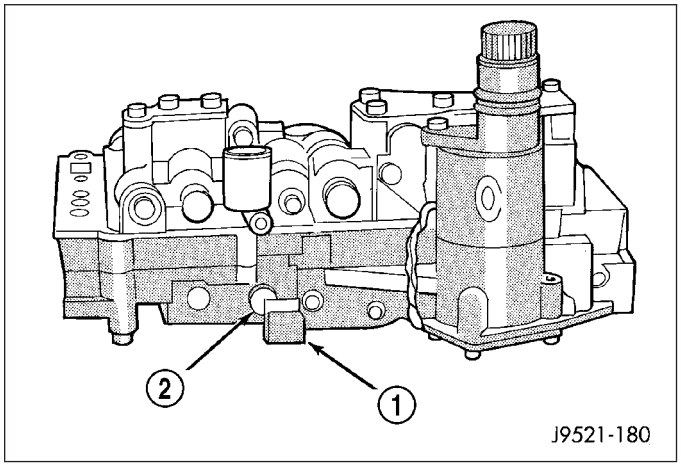


3-4 ACCUMULATOR

1. Position converter clutch valve (4) and 3-4 shift valve (3) springs in housing.
2. Loosely attach accumulator housing (2) with right-side screw (1). Install only one screw at this time as accumulator must be free to pivot upward for ease of installation.
3. Install 3-4 shift valve and spring (3).

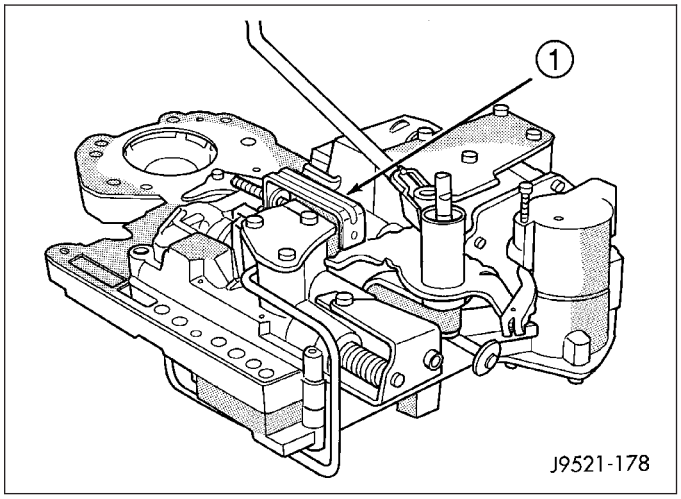


4. Position plug (2) on end of converter clutch valve spring. Then compress and hold springs and plug in place with fingers of one hand.
5. Swing accumulator housing upward over valve springs and plug.
6. Hold accumulator housing firmly in place and install remaining two attaching screws. Be sure springs and clutch valve plug are properly seated. Tighten screws to 4 N·m (35 in. lbs.).

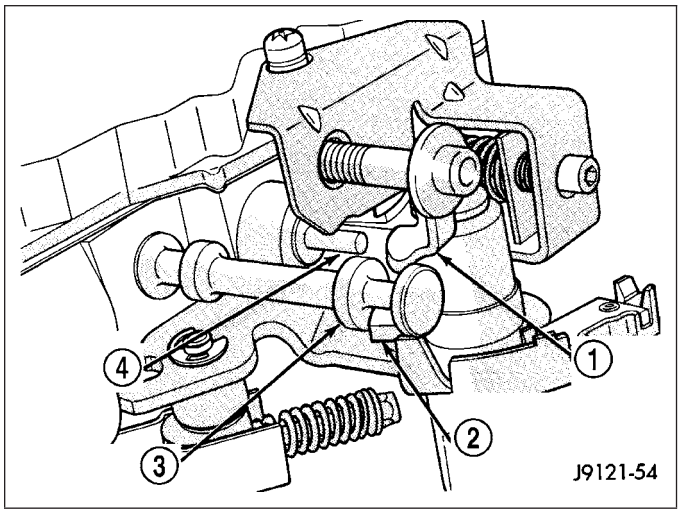


VALVE BODY FINAL

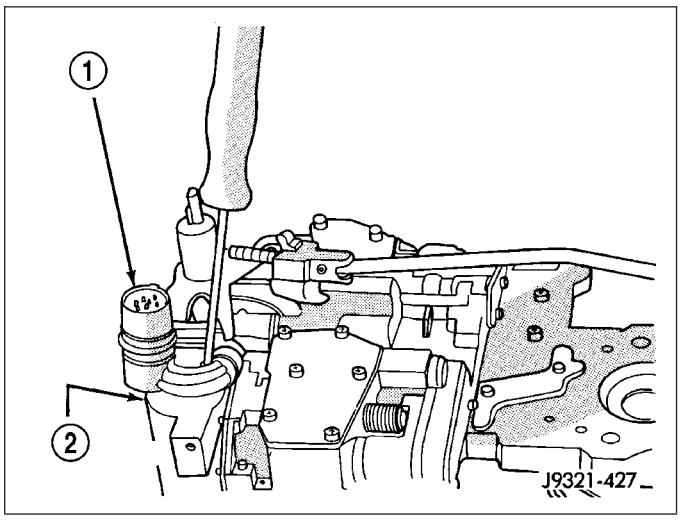
1. Insert manual lever detent spring in upper housing.
2. Position detent ball on end of spring. Then hold detent ball and spring in detent housing with Retainer Tool 6583 (1).



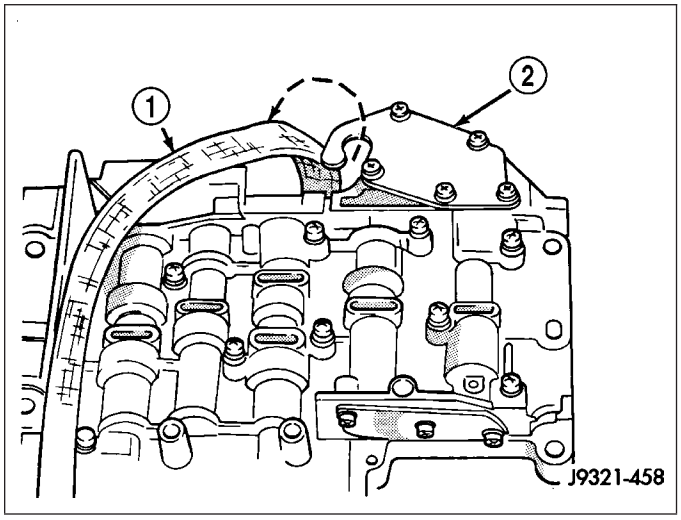
3. Install throttle lever (1) in upper housing. Then install manual lever (2) over throttle lever and start manual lever into housing.
4. Align manual lever with detent ball and manual valve (3). Hold throttle lever upward. Then press down on manual lever until fully seated. Remove detent ball retainer tool after lever is seated.
5. Then install manual lever seal, washer and E-clip.
6. Verify that throttle lever is aligned with end of kick-down valve (4) stem and that manual lever arm is engaged in manual valve.



7. Lubricate solenoid case connector (1) O-rings and shaft of manual lever with light coat of petroleum jelly.
8. Attach solenoid case connector to 3-4 accumulator with shoulder-type screw. Connector has small locating tang that fits in dimple at top of accumulator housing (2). Seat tang in dimple before tightening connector screw.
9. Install solenoid assembly and gasket. Tighten solenoid attaching screws to 8 N·m (72 in. lbs.) torque.



10. Verify that solenoid wire harness is properly routed. Solenoid harness must be clear of manual lever and park rod and not be pinched between accumulator housing and cover.
11. Position line pressure adjusting screw in adjusting screw bracket.
12. Install switch valve spring on tang at end of adjusting screw bracket.
13. Position adjusting screw bracket on valve body. Align valve springs and press bracket into place. Install short, upper bracket screws first and long bottom screw last. Verify that valve springs and bracket are properly aligned. Then tighten all three bracket screws to 4 N·m (35 in. lbs.) torque.
14. Perform Line Pressure and Throttle Pressure adjustments. (Refer to 21 - TRANSMISSION/ TRANSAXLE/AUTOMATIC/VALVE BODY - ADJUSTMENTS)

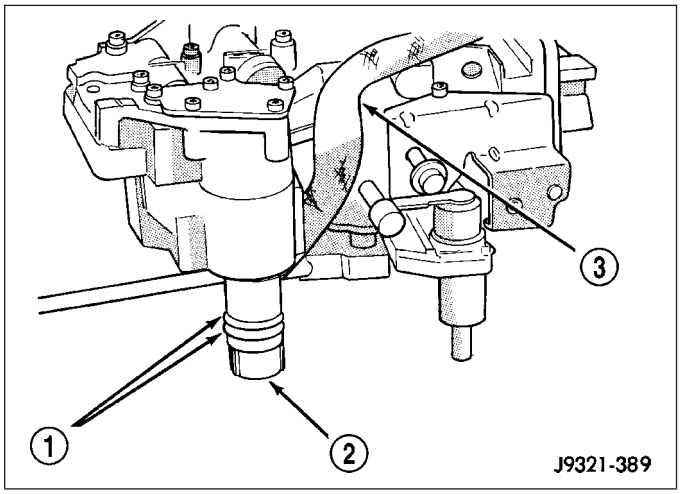


GOVERNOR BODY, SENSOR AND SOLENOID

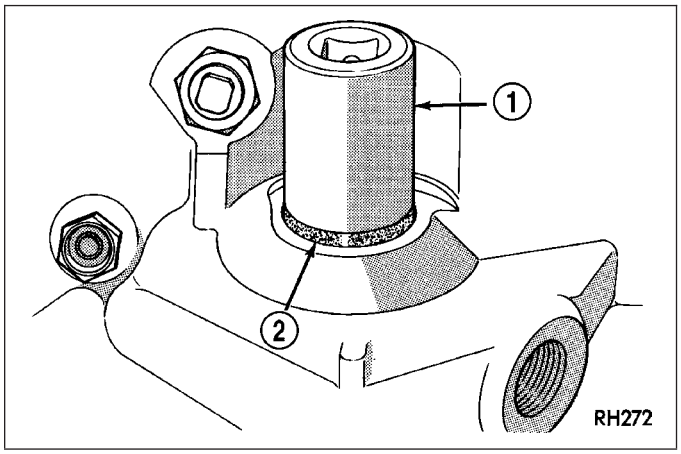
1. Turn valve body assembly over so accumulator side of transfer plate is facing down.
2. Install new O-rings on governor pressure solenoid and sensor.
3. Lubricate solenoid and sensor O-rings with clean transmission fluid.
4. Install governor pressure sensor in governor body.
5. Install governor pressure solenoid in governor body. Push solenoid in until it snaps into place in body.
6. Position governor body gasket on transfer plate.
7. Install retainer plate on governor body and around solenoid. Be sure solenoid connector is positioned in retainer cutout.
8. Align screw holes in governor body and transfer plate. Then install and tighten governor body screws to 4 N·m (35 in. lbs.) torque.
9. Connect harness wires to governor pressure solenoid and governor pressure sensor.
10. Install fluid filter and pan.
11. Lower vehicle.
12. Fill transmission with recommended fluid and road test vehicle to verify repair.

INSTALLATION

1. Check condition of O-ring seals (1) on valve body harness connector (2). Replace seals on connector body if cut or worn.



2. Check condition of manual lever shaft seal (2) in transmission case. Replace seal if lip is cut or worn. Install new seal with 15/16 deep well socket (1).



3. Check condition of seals on accumulator piston. Install new piston seals, if necessary.
4. Place valve body manual lever in low (1 position) so ball on park lock rod will be easier to install in sprag.

5. Lubricate shaft of manual lever with petroleum jelly. This will ease inserting shaft through seal in case.
6. Lubricate seal rings on valve body harness connector with petroleum jelly.
7. Position valve body in case and work end of park lock rod into and through pawl sprag. Turn propeller shaft to align sprag and park lock teeth if necessary. The rod will click as it enters pawl. Move rod to check engagement.

CAUTION: It is possible for the park rod to displace into a cavity just above the pawl sprag during installation. Make sure the rod is actually engaged in the pawl and has not displaced into this cavity.

8. Install accumulator spring and piston into case. Then swing valve body over piston and outer spring to hold it in place.
9. Align accumulator piston and outer spring, manual lever shaft and electrical connector in case.
10. Then seat valve body in case and install one or two bolts to hold valve body in place.
11. Tighten valve body bolts alternately and evenly to 11 N·m (100 in. lbs.) torque.
12. Install new fluid filter on valve body. Tighten filter screws to 4 N·m (35 in. lbs.) torque.
13. Install throttle and gearshift levers on valve body manual lever shaft.
14. Check and adjust front and rear bands if necessary.
15. Install the transmission range sensor (Refer to 21 - TRANSMISSION/AUTOMATIC/TRANSMISSION RANGE SENSOR - INSTALLATION).
16. Connect solenoid case connector wires.
17. Install oil pan and new gasket. Tighten pan bolts to 13.6 N·m (125 in. lbs.) torque.
18. Lower vehicle and fill transmission with Mopar® ATF +4, Automatic Transmission fluid.
19. Check and adjust gearshift and throttle valve cables, if necessary.

ADJUSTMENTS - VALVE BODY

CONTROL PRESSURE ADJUSTMENTS

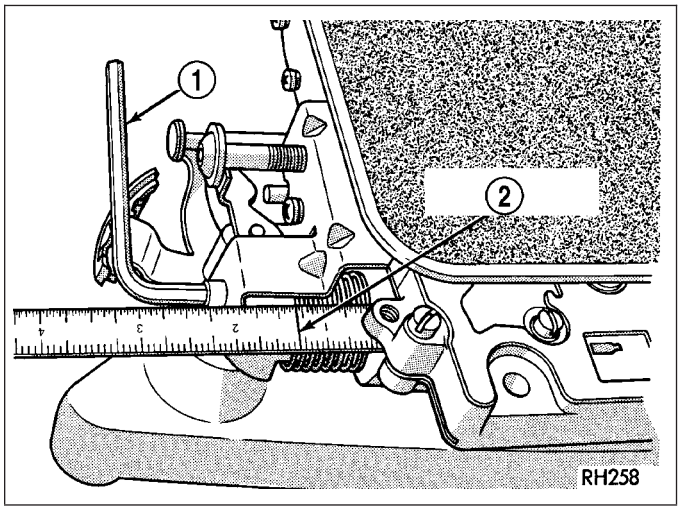
There are two control pressure adjustments on the valve body;

- Line Pressure
- Throttle Pressure

Line and throttle pressures are interdependent because each affects shift quality and timing. As a result, both adjustments must be performed properly and in the correct sequence. Adjust line pressure first and throttle pressure last.

LINE PRESSURE ADJUSTMENT

1. Measure distance (2) from the valve body to the inner edge of the adjusting screw with an accurate steel scale. Distance should be 33.4 mm (1-5/16 in.). If adjustment is required, turn the adjusting screw in, or out, to obtain required distance setting.



NOTE: The 33.4 mm (1-5/16 in.) setting is an approximate setting. Manufacturing tolerances may make it necessary to vary from this dimension to obtain desired pressure.

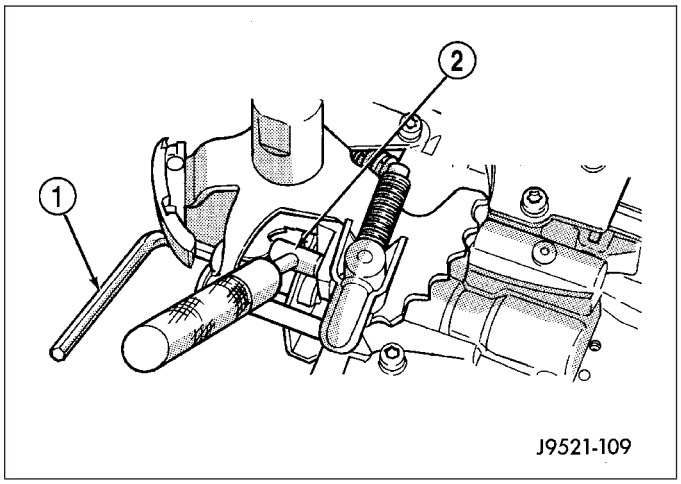
One complete turn of the adjusting screw changes line pressure approximately 1-2/3 psi (9 kPa).

Turning the adjusting screw counterclockwise increases pressure while turning the screw clockwise decreases pressure.

THROTTLE PRESSURE ADJUSTMENT

1. Insert Gauge Tool C-3763 between the throttle lever cam and the kickdown valve stem (2).
2. Push the gauge tool inward to compress the kickdown valve against the spring and bottom the throttle valve.
3. Maintain pressure against kickdown valve spring. Turn throttle lever stop screw until the screw head touches throttle lever tang and the throttle lever cam touches gauge tool.

NOTE: The kickdown valve spring must be fully compressed and the kickdown valve completely bottomed to obtain correct adjustment.



TRANSFER CASE - ELECTRICAL DIAGNOSTICS (ETC)

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TRANSFER CASE - ELECTRICAL DIAGNOSTICS (ETC)

DIAGNOSIS AND TESTING

TRANSFER CASE VERIFICATION TEST VER 1

Diagnostic Test

1. TRANSFER CASE VERIFICATION TEST— VER 1

Disconnect all jumper wires and reconnect all previously disconnected components and connectors.

With the scan tool, clear all DTCs.

Make sure that all accessories are turned off and that the battery is fully charged.

Using the appropriate Service Information as a guide, test drive the vehicle in each Transfer Case range and verify proper operation in each range.

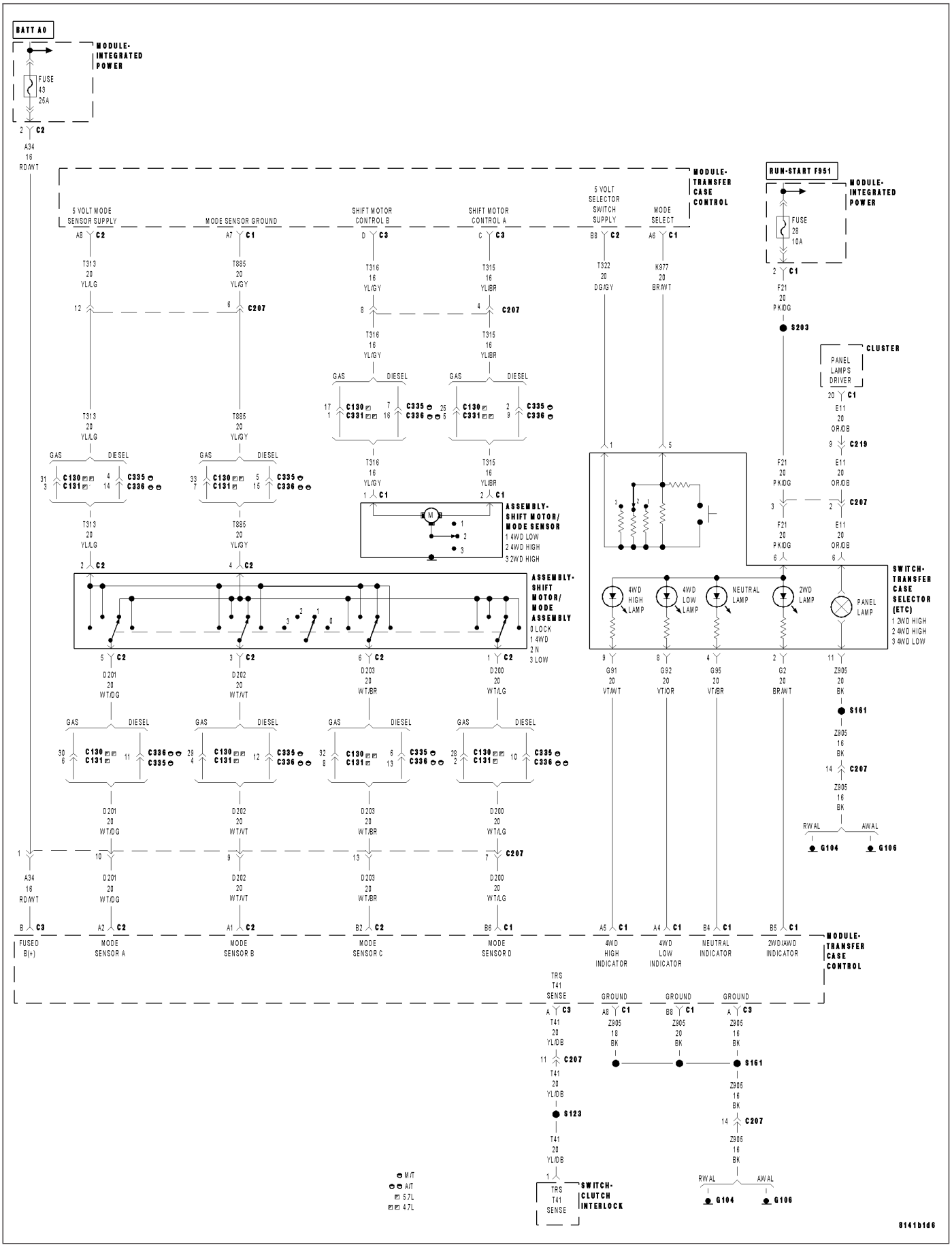
With the scan tool, read DTCs in the Transfer Case Control Module.

Are there any DTCs present?

Yes >> Return to the symptom list and perform the appropriate diagnostic test.

No >> Repair is complete.

12 VOLT OVER VOLTAGE



12 VOLT OVER VOLTAGE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects the Fused B+ voltage rises above 16.0 volts for 2 seconds.

Possible Causes
CHARGING SYSTEM DTCS PRESENT
TRANSFER CASE CONTROL MODULE

1. CHARGING SYSTEM DTCS PRESENT

With the DRBIII®, read Engine DTCs.

Are there any Charging System related DTCs present?

Yes >> Refer to the symptom list and perform the appropriate diagnostic procedure(s) as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 2

---

2. TRANSFER CASE CONTROL MODULE

Using the schematics as a guide, inspect the wiring and connectors. Pay particular attention to all power and ground circuits. Repair as necessary.

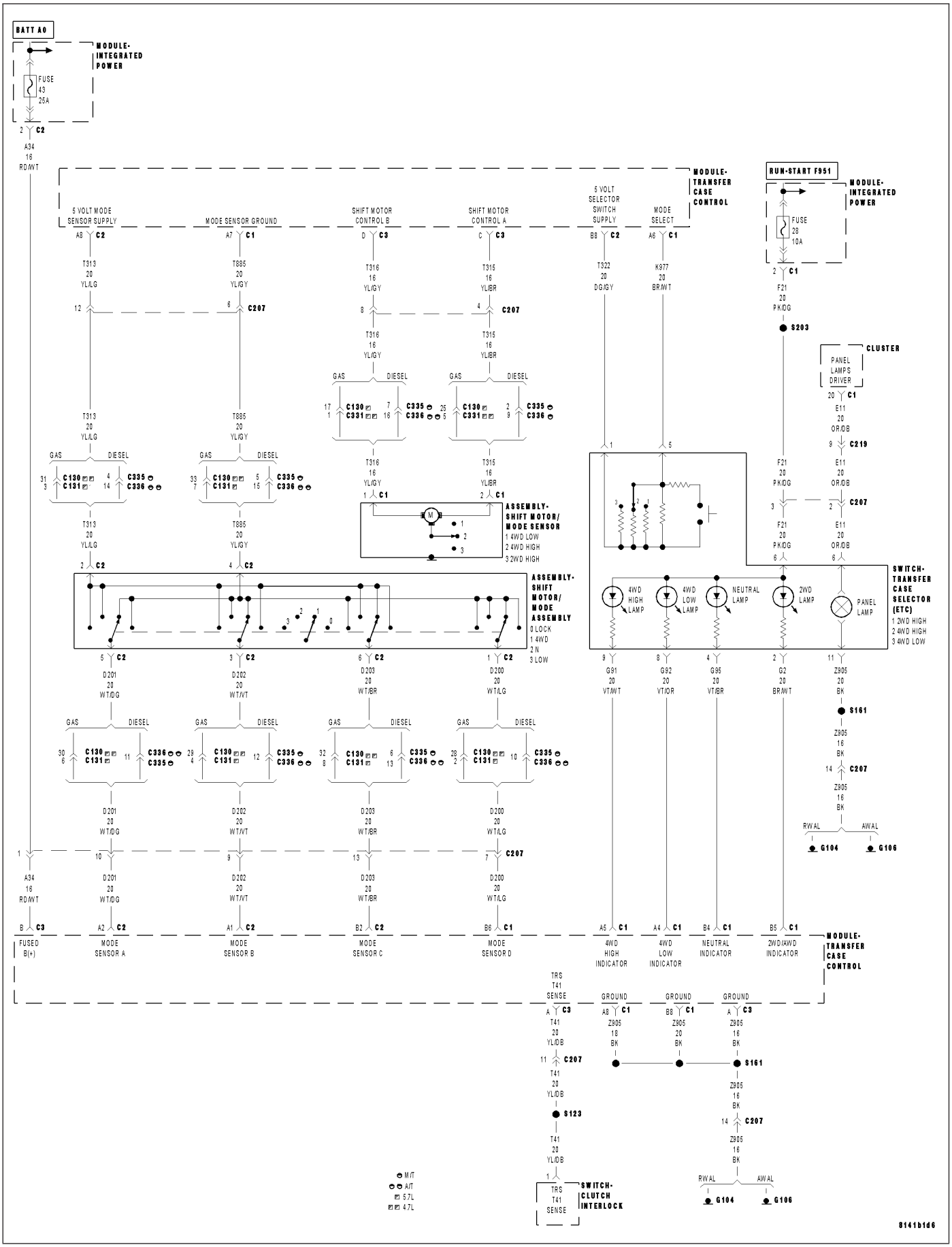
If there are no Charging System related DTCs or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

12 VOLT UNDER VOLTAGE



12 VOLT UNDER VOLTAGE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects the Fused B+ voltage drops below 9.0 volts for 2 seconds.

Possible Causes
INTERMITTENT 12 VOLT UNDER VOLTAGE
CHARGING SYSTEM DTCS PRESENT
(A34) FUSED B+ CIRCUIT SHORT TO GROUND
(A34) FUSED B+ CIRCUIT OPEN
TRANSFER CASE CONTROL MODULE

1. CHARGING SYSTEM DTCS PRESENT

With the DRBIII®, read Engine DTCs.

Are there any Charging System related DTCs present?

Yes >> Refer to the symptom list and perform the appropriate diagnostic procedure(s) as necessary. Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 2

---

2. 12 VOLT UNDER VOLTAGE PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and cycle the Transfer Case Selector Switch through all positions.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display 12 VOLT UNDER VOLTAGE?

Yes >> Go To 3

No >> Go To 6

---

12 VOLT UNDER VOLTAGE (CONTINUED)

3. (A34) FUSED B+ CIRCUIT SHORT TO GROUND

Turn the ignition off to the lock position.

Disconnect the Transfer Case Control Module C3 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

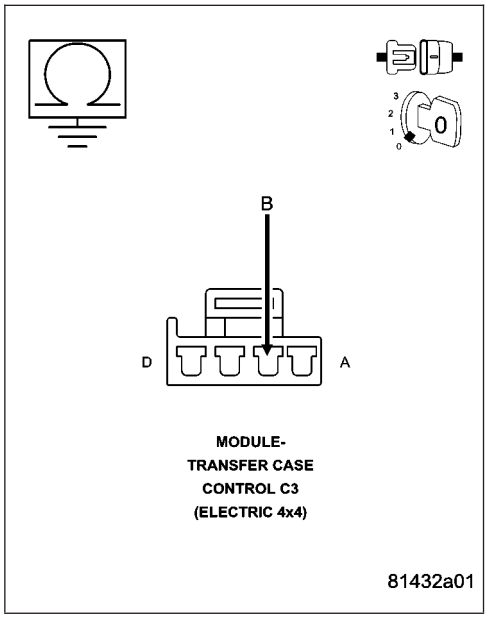
Measure the resistance between ground and the Fused B+ circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (A34) FUSED B+ CIRCUIT for a short to ground.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



4. (A34) FUSED B+ CIRCUIT OPEN

Ignition on, engine not running.

Using a 12-volt test light connected to ground, check the (A34) FUSED B+ CIRCUIT at the Transfer Case Control Module C3 harness connector.

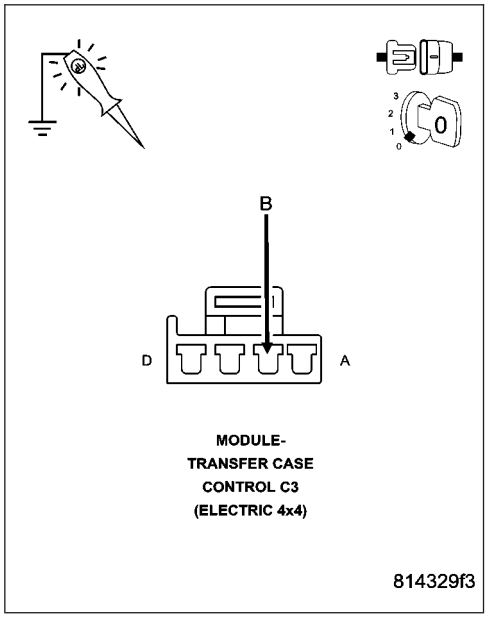
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (A34) FUSED B+ CIRCUIT for an open circuit or high resistance. If the fuse is open, check the circuit for a short to ground.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)



12 VOLT UNDER VOLTAGE (CONTINUED)

5. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Charging System related DTCs or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

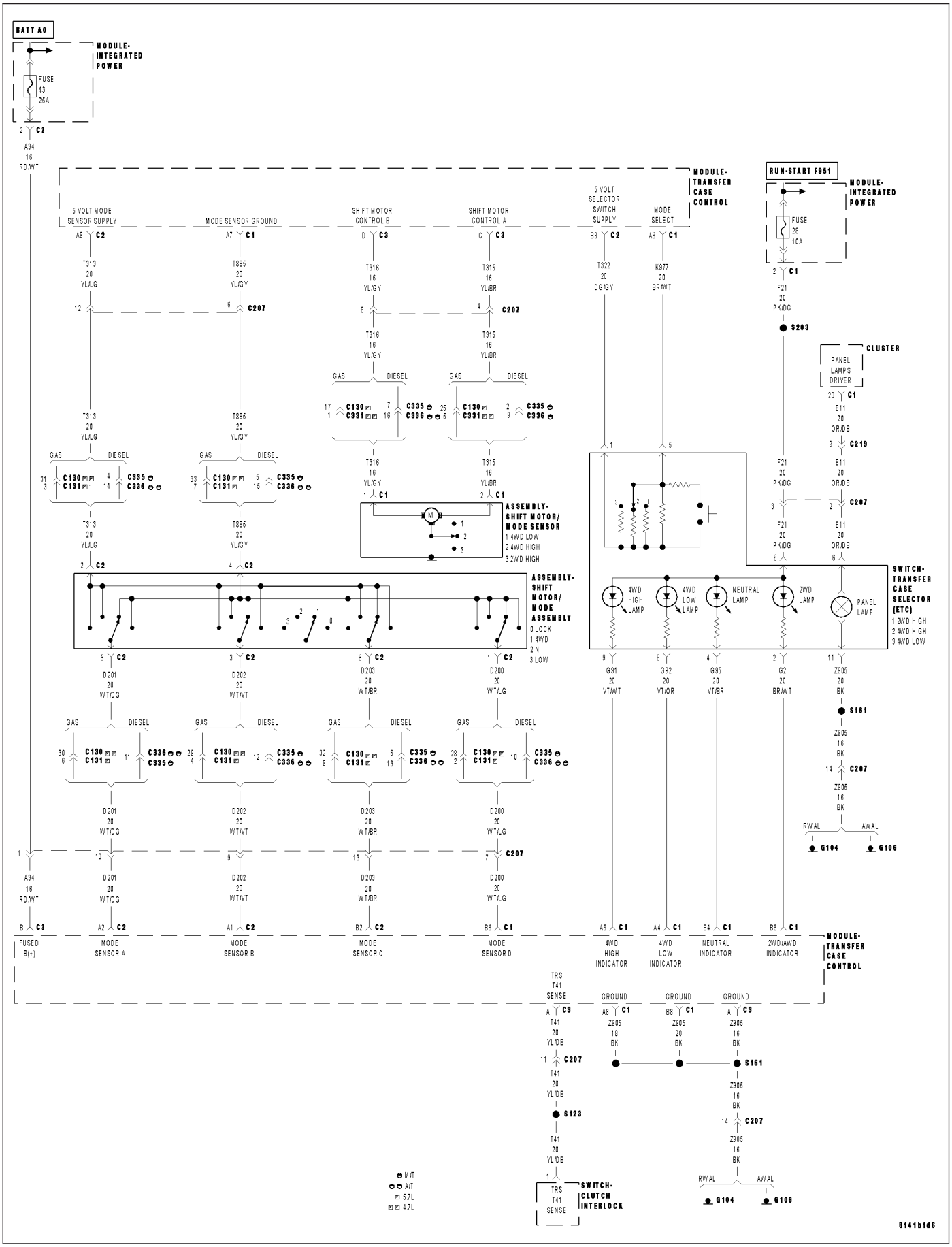
Were there any problems found?

Yes >> Repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

2WD/AWD INDICATOR OPEN



2WD/AWD INDICATOR OPEN (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects an open circuit or high voltage on the (G2) 2WD/AWD Indicator circuit.

Possible Causes
INTERMITTENT 2WD/AWD INDICATOR OPEN
(G2) 2WD/AWD INDICATOR CIRCUIT OPEN
(G2) 2WD/AWD INDICATOR CIRCUIT SHORT TO VOLTAGE
(F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
TRANSFER CASE SELECTOR SWITCH
TRANSFER CASE CONTROL MODULE

1. 2WD/AWD INDICATOR OPEN DTC IS PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and move the Transfer Case Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display 2WD/AWD INDICATOR OPEN?

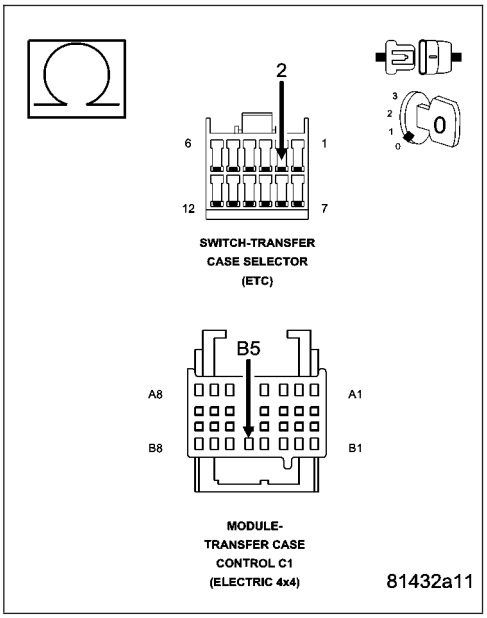
Yes >> Go To 2
No >> Go To 7

---

2. (G2) 2WD/AWD INDICATOR CIRCUIT OPEN

Turn the ignition off to the lock position.
Disconnect the Transfer Case Control Module C1 harness connector.
Disconnect the Transfer Case Selector Switch harness connector.

NOTE: Note: Check connectors - Clean/repair as necessary.
Measure the resistance of the (G2) 2WD/AWD Indicator circuit from the Transfer Case Control Module C1 harness connector to the Transfer Case Selector Switch harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (G2) 2WD/AWD Indicator circuit for an open. Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)
No >> Go To 3

2WD/AWD INDICATOR OPEN (CONTINUED)

3. (G2) 2WD/AWD INDICATOR CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.

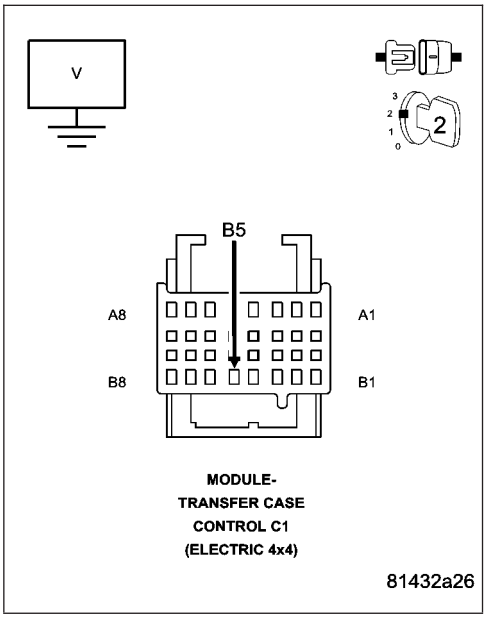
Measure the voltage of the (G2) 2WD/AWD Indicator circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (G2) 2WD/AWD Indicator circuit for a short to voltage.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



4. (F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN

Using a 12-volt test light connected to ground, check the (F21) Fused Ignition Switch Output Circuit.

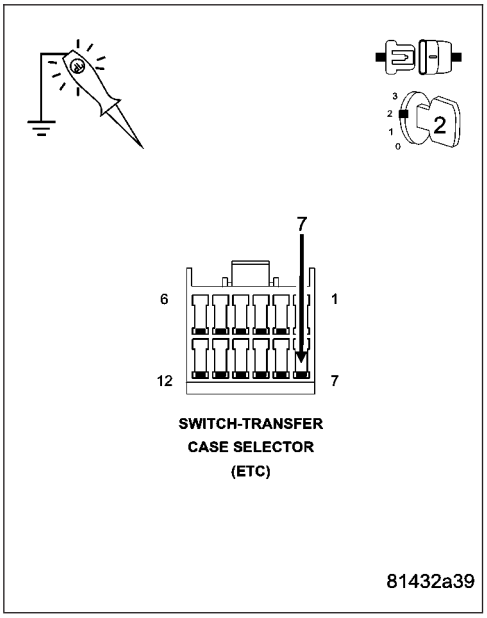
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (F21) Fused Ignition Switch Output Circuit for an open circuit or for high resistance. If the fuse is open make sure to check for a short to ground and repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)



2WD/AWD INDICATOR OPEN (CONTINUED)

5. TRANSFER CASE SELECTOR SWITCH

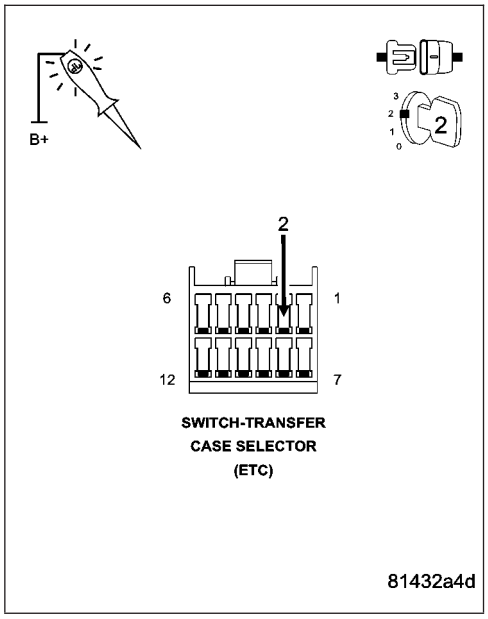
Turn the ignition off to the lock position.

Connect the Transfer Case Control Module C1 harness connector.

Ignition on, engine not running.

With the DRBIII®, actuate the 2WD LED.

With a 12–volt test light connected to B+, check the (G2) 2WD/AWD Indicator circuit in the Transfer Case Selector Switch harness connector.



Does the test light illuminate when the circuit is actuated?

Yes >> Replace the Transfer Case Selector Switch in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 6

6. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Charging System related DTCs or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

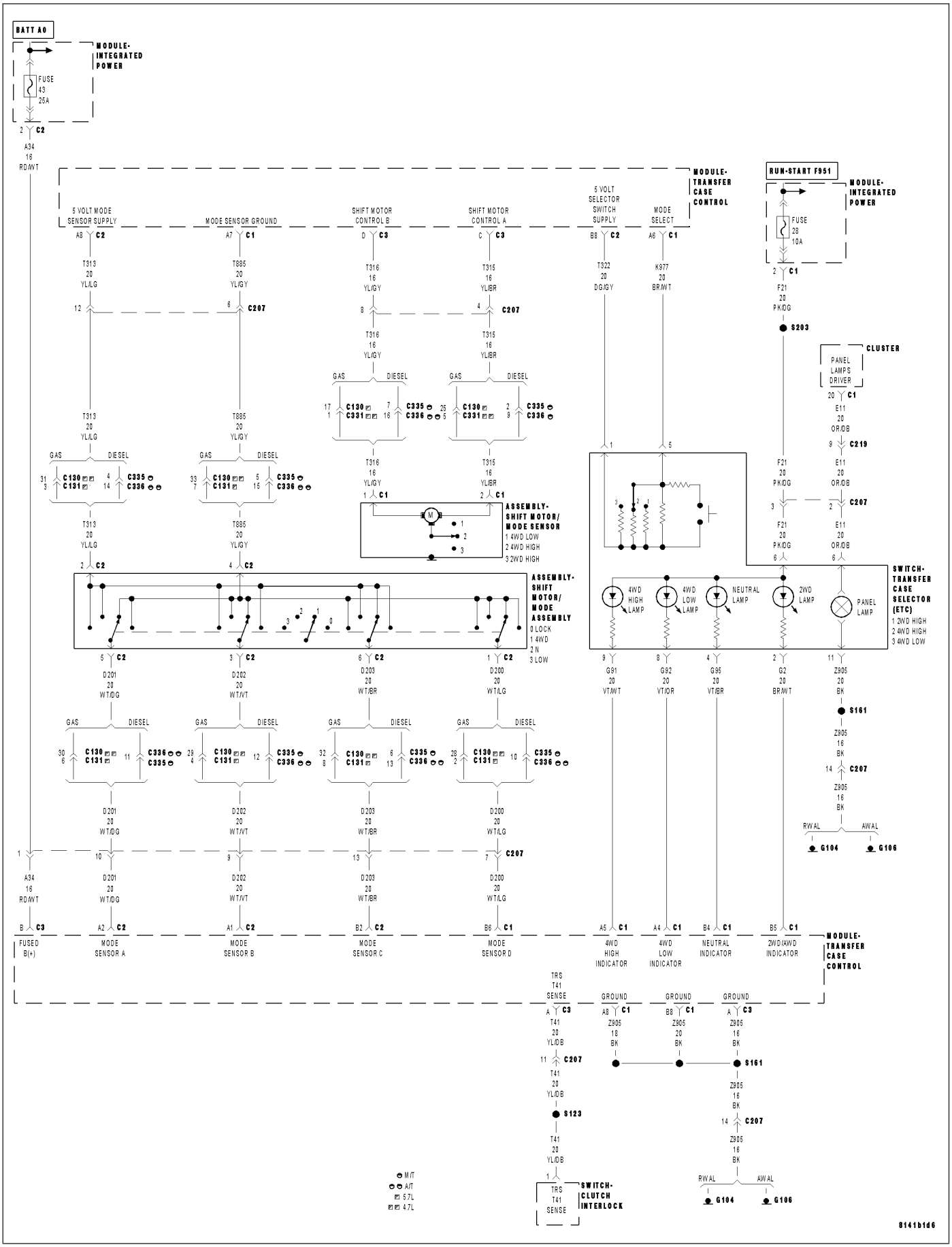
Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

2WD/AWD INDICATOR SHORTED



2WD/AWD INDICATOR SHORTED (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects a short to ground on the (G2) 2WD/AWD Indicator circuit.

Possible Causes
INTERMITTENT 2WD/AWD INDICATOR SHORTED
(G2) 2WD/AWD INDICATOR CIRCUIT OPEN
(G2) 2WD/AWD INDICATOR CIRCUIT SHORT TO GROUND
(G2) 2WD/AWD INDICATOR CIRCUIT SHORT TO VOLTAGE
TRANSFER CASE SELECTOR SWITCH
TRANSFER CASE CONTROL MODULE

1. 2WD/AWD INDICATOR SHORTED DTC IS PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and move the Transfer Case Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display 2WD/AWD INDICATOR SHORTED?

Yes >> Go To 2

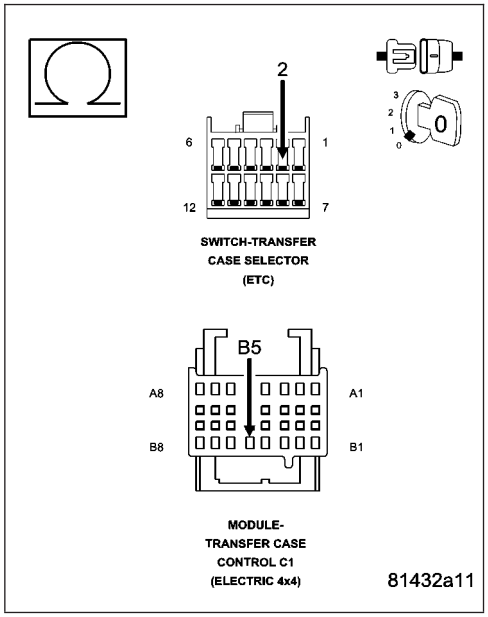
No >> Go To 7

---

2. (G2) 2WD/AWD INDICATOR CIRCUIT OPEN

Turn the ignition off to the lock position.
Disconnect the Transfer Case Control Module C1 harness connector.
Disconnect the Transfer Case Selector Switch harness connector.

NOTE: Note: Check connectors - Clean/repair as necessary.
Measure the resistance of the (G2) 2WD/AWD Indicator circuit from the Transfer Case Control Module C1 harness connector to the Transfer Case Selector Switch harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (G2) 2WD/AWD Indicator circuit for an open. Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3

2WD/AWD INDICATOR SHORTED (CONTINUED)

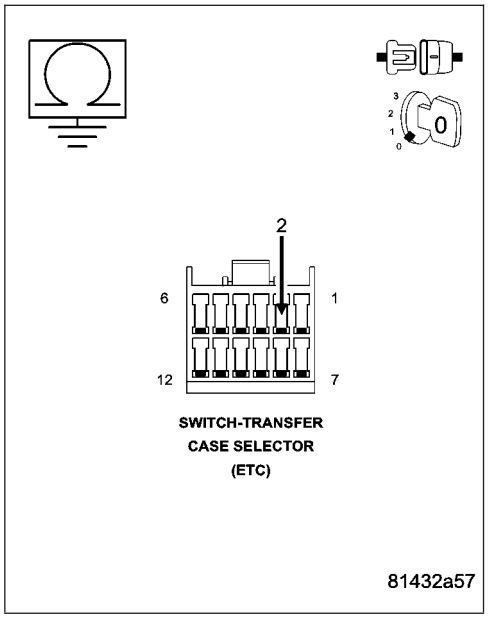
3. (G2) 2WD/AWD INDICATOR CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (G2) 2WD/AWD Indicator circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (G2) 2WD/AWD Indicator circuit for a short to ground.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



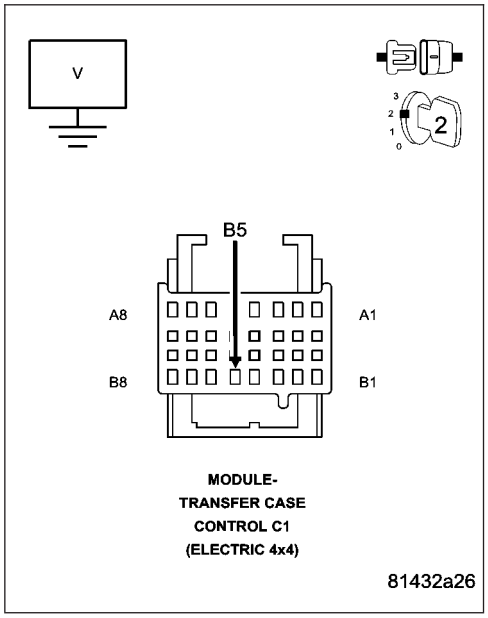
4. (G2) 2WD/AWD INDICATOR CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.
Measure the voltage of the (G2) 2WD/AWD Indicator circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (G2) 2WD/AWD Indicator circuit for a short to voltage.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 5



2WD/AWD INDICATOR SHORTED (CONTINUED)

5. TRANSFER CASE SELECTOR SWITCH

Turn the ignition off to the lock position.

Connect the Transfer Case Control Module C1 harness connector.

Ignition on, engine not running.

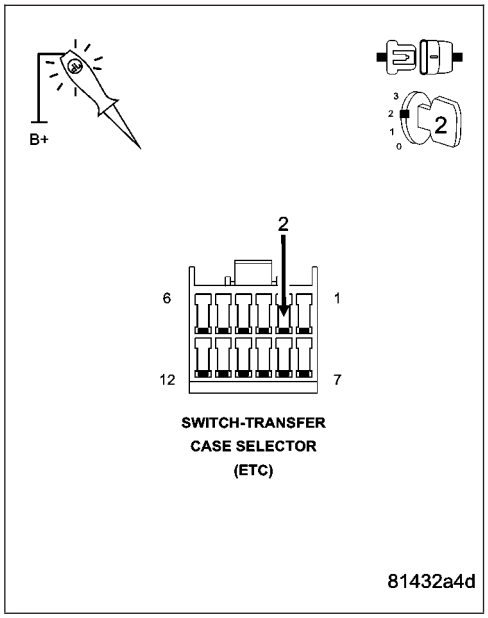
With a 12–volt test light connected to B+, check the (G2) 2WD/AWD Indicator circuit in the Transfer Case Selector Switch harness connector.

NOTE: The test light should not be illuminated.

With the DRBIII®, actuate the 2WD LED.

With a 12–volt test light connected to B+, check the (G2) 2WD/AWD Indicator circuit in the Transfer Case Selector Switch harness connector.

NOTE: The test light should be illuminated during the actuation.



Does the test light illuminate when the circuit is actuated and remain off otherwise?

Yes >> Replace the Transfer Case Selector Switch in accordance with the Service Information.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 6

---

6. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Charging System related DTCs or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module in accordance with the Service Information.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

---

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

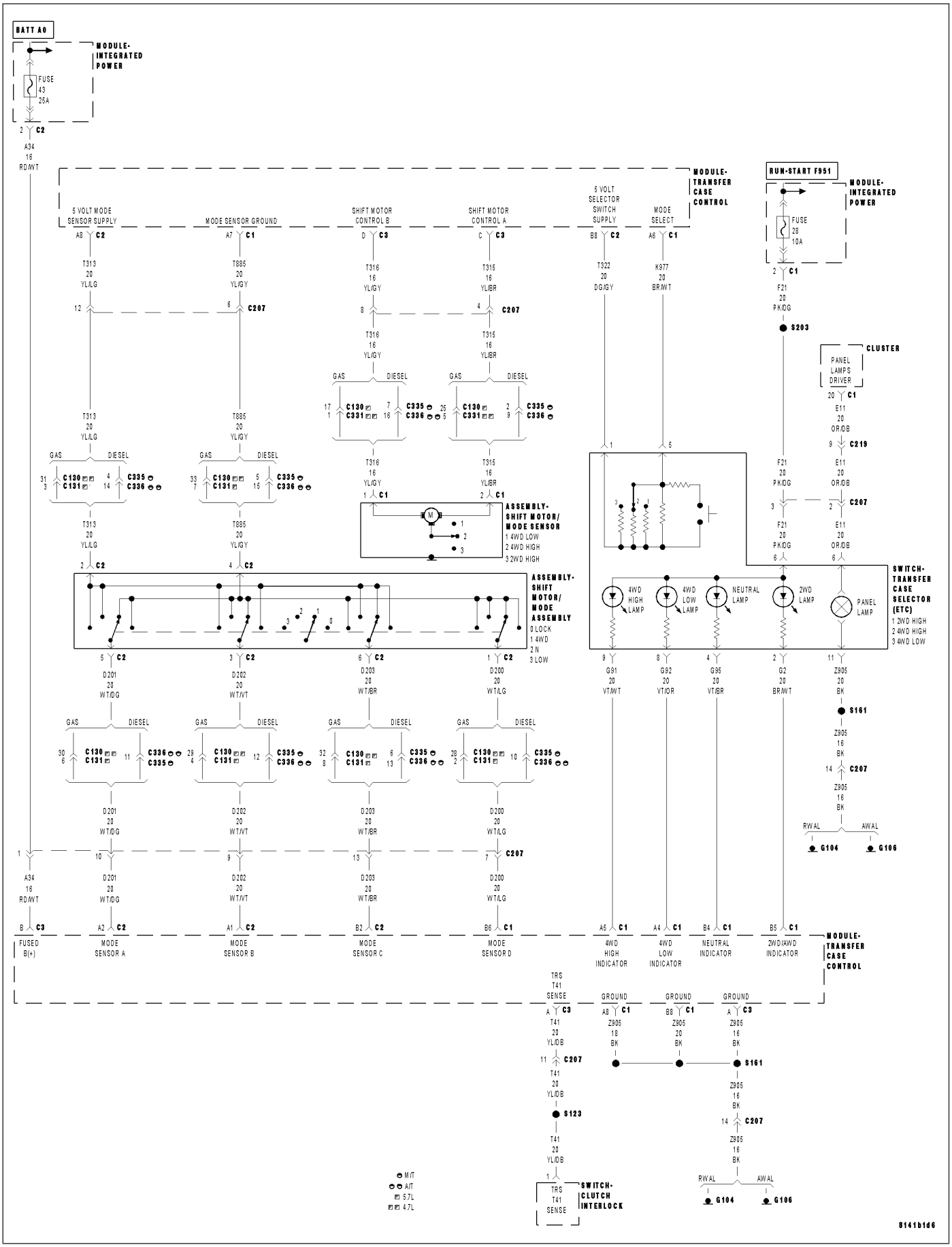
Were there any problems found?

Yes >> Repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

4WD HI INDICATOR OPEN



4WD HI INDICATOR OPEN (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects an open circuit or high voltage on the (G91) 4WD High Indicator circuit.

Possible Causes
INTERMITTENT 4WD HI INDICATOR OPEN
(G91) 4WD HIGH INDICATOR CIRCUIT OPEN
(G91) 4WD HIGH INDICATOR CIRCUIT SHORT TO VOLTAGE
(F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
TRANSFER CASE SELECTOR SWITCH
TRANSFER CASE CONTROL MODULE

1. 4WD HI INDICATOR OPEN DTC IS PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and move the Transfer Case Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display 4WD HI INDICATOR OPEN?

Yes >> Go To 2

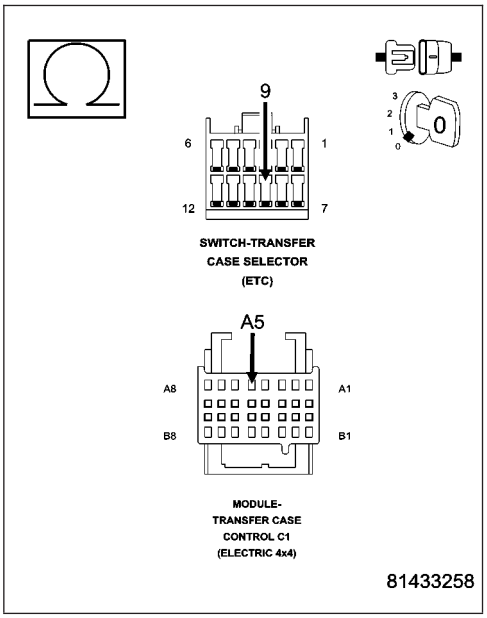
No >> Go To 7

---

2. (G91) 4WD HIGH INDICATOR CIRCUIT OPEN

Turn the ignition off to the lock position.
Disconnect the Transfer Case Control Module C1 harness connector.
Disconnect the Transfer Case Selector Switch harness connector.

NOTE: Note: Check connectors - Clean/repair as necessary.
Measure the resistance of the (G91) 4WD High Indicator circuit from the Transfer Case Control Module C1 harness connector to the Transfer Case Selector Switch harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (G91) 4WD High Indicator circuit for an open. Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3

4WD HI INDICATOR OPEN (CONTINUED)

3. (G91) 4WD HIGH INDICATOR CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.

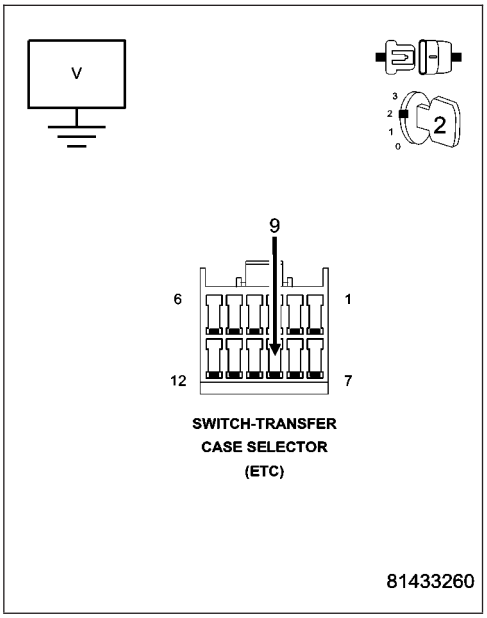
Measure the voltage of the (G91) 4WD High Indicator circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (G91) 4WD High Indicator circuit for a short to voltage.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



4. (F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN

Using a 12-volt test light connected to ground, check the (F21) Fused Ignition Switch Output circuit.

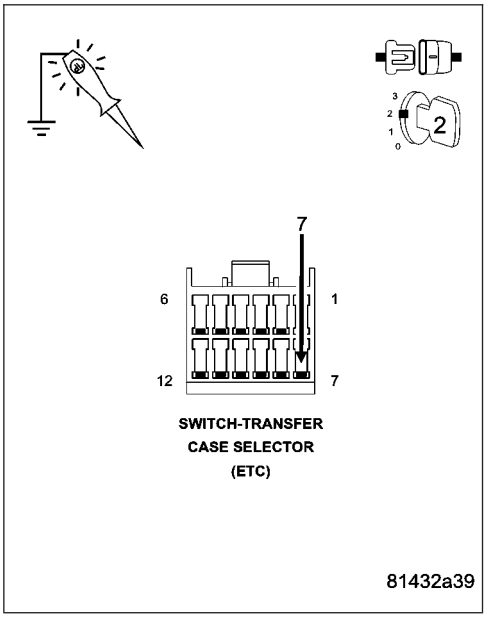
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (F21) Fused Ignition Switch Output circuit for an open circuit or for high resistance. If the fuse is open make sure to check for a short to ground and repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)



4WD HI INDICATOR OPEN (CONTINUED)

5. TRANSFER CASE SELECTOR SWITCH

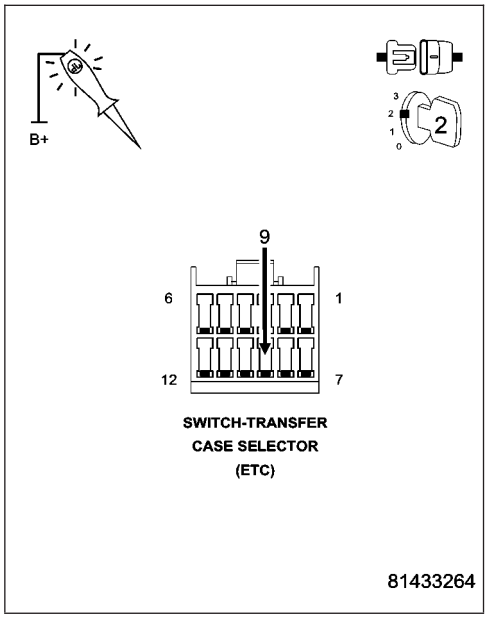
Turn the ignition off to the lock position.

Connect the Transfer Case Control Module C1 harness connector.

Ignition on, engine not running.

With the DRBIII®, actuate the 4HI LED.

With a 12–volt test light connected to B+, check the (G91) 4WD High Indicator circuit in the Transfer Case Selector Switch harness connector.



Does the test light illuminate when the circuit is actuated?

Yes >> Replace the Transfer Case Selector Switch in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 6

6. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

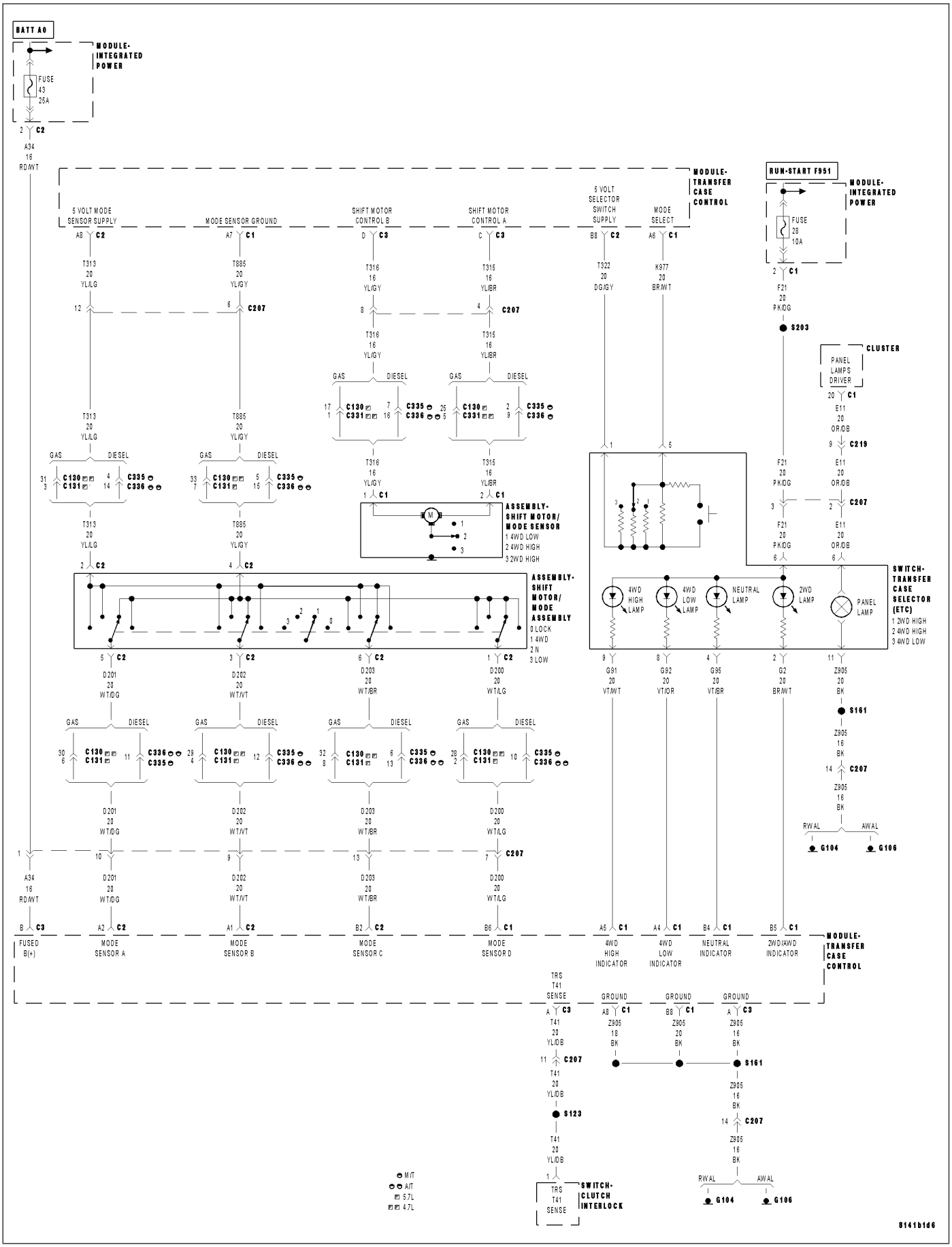
Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

4WD HI INDICATOR SHORT TO GROUND



4WD HI INDICATOR SHORT TO GROUND (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects a short to ground on the (G91) 4WD High Indicator circuit.

Possible Causes
INTERMITTENT 4WD HI INDICATOR SHORT TO GROUND
(G91) 4WD HIGH INDICATOR CIRCUIT OPEN
(G91) 4WD HIGH INDICATOR CIRCUIT SHORT TO GROUND
(G91) 4WD HIGH INDICATOR CIRCUIT SHORT TO VOLTAGE
TRANSFER CASE SELECTOR SWITCH
TRANSFER CASE CONTROL MODULE

1. 4WD HI INDICATOR SHORT TO GROUND DTC IS PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and move the Transfer Case Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display 4WD HI INDICATOR SHORT TO GROUND?

Yes >> Go To 2

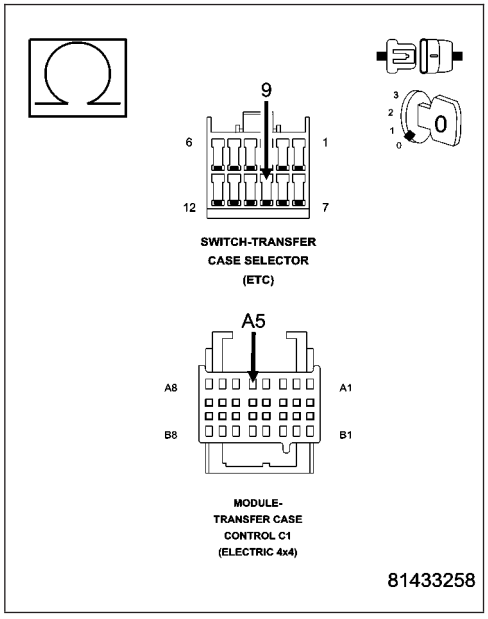
No >> Go To 7

---

2. (G91) 4WD HIGH INDICATOR CIRCUIT OPEN

Turn the ignition off to the lock position.
Disconnect the Transfer Case Control Module C1 harness connector.
Disconnect the Transfer Case Selector Switch harness connector.

NOTE: Note: Check connectors - Clean/repair as necessary.
Measure the resistance of the (G91) 4WD High Indicator circuit from the Transfer Case Control Module C1 harness connector to the Transfer Case Selector Switch harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (G91) 4WD High Indicator circuit for an open. Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3

4WD HI INDICATOR SHORT TO GROUND (CONTINUED)

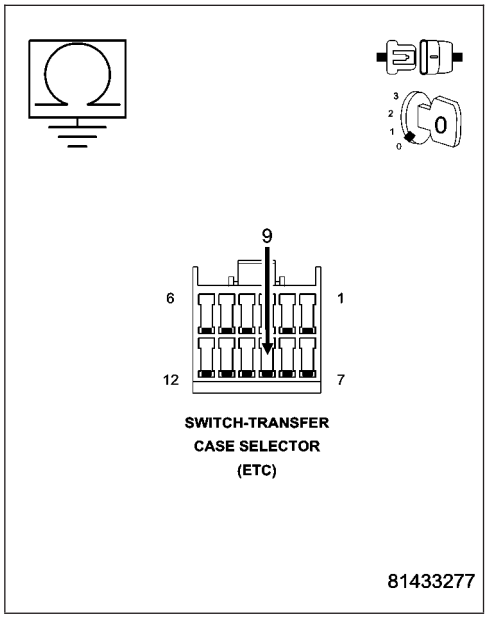
3. (G91) 4WD HIGH INDICATOR CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (G91) 4WD High Indicator circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (G91) 4WD High Indicator circuit for a short to ground.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



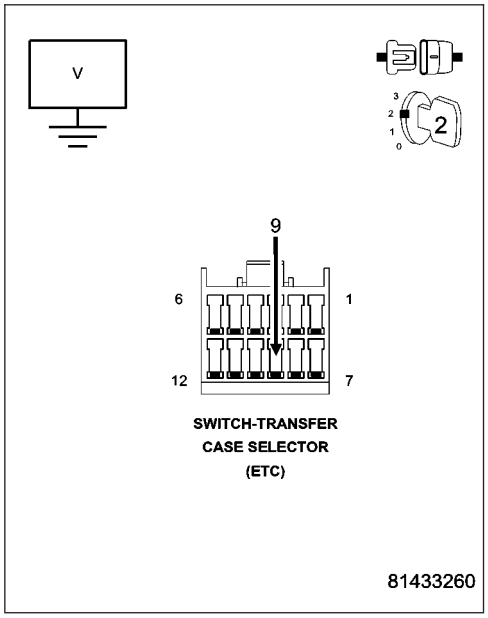
4. (G91) 4WD HIGH INDICATOR CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.
Measure the voltage of the (G91) 4WD High Indicator circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (G91) 4WD High Indicator circuit for a short to voltage.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 5



4WD HI INDICATOR SHORT TO GROUND (CONTINUED)

5. TRANSFER CASE SELECTOR SWITCH

Turn the ignition off to the lock position.

Connect the Transfer Case Control Module C1 harness connector.

Ignition on, engine not running.

With a 12–volt test light connected to B+, check the (G91) 4WD High Indicator circuit in the Transfer Case Selector Switch harness connector.

NOTE: The test light should not be illuminated.

With the DRBIII®, actuate the 4HI LED.

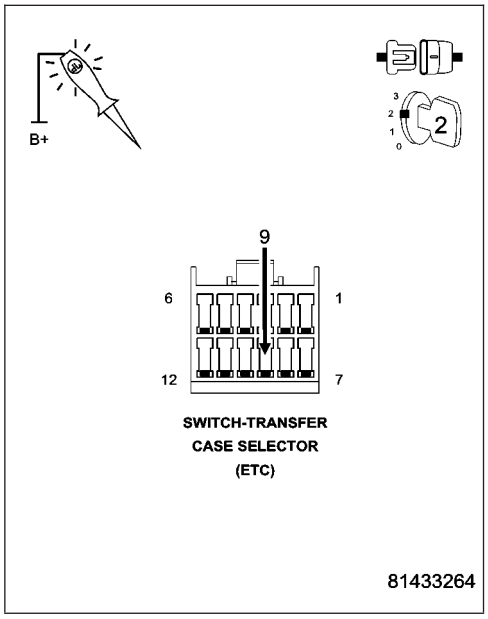
With a 12–volt test light connected to B+, check the (G91) 4WD High Indicator circuit in the Transfer Case Selector Switch harness connector.

NOTE: The test light should be illuminated during the actuation.

Does the test light illuminate when the circuit is actuated and remain off otherwise?

Yes >> Replace the Transfer Case Selector Switch in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 6



6. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Charging System related DTCs or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

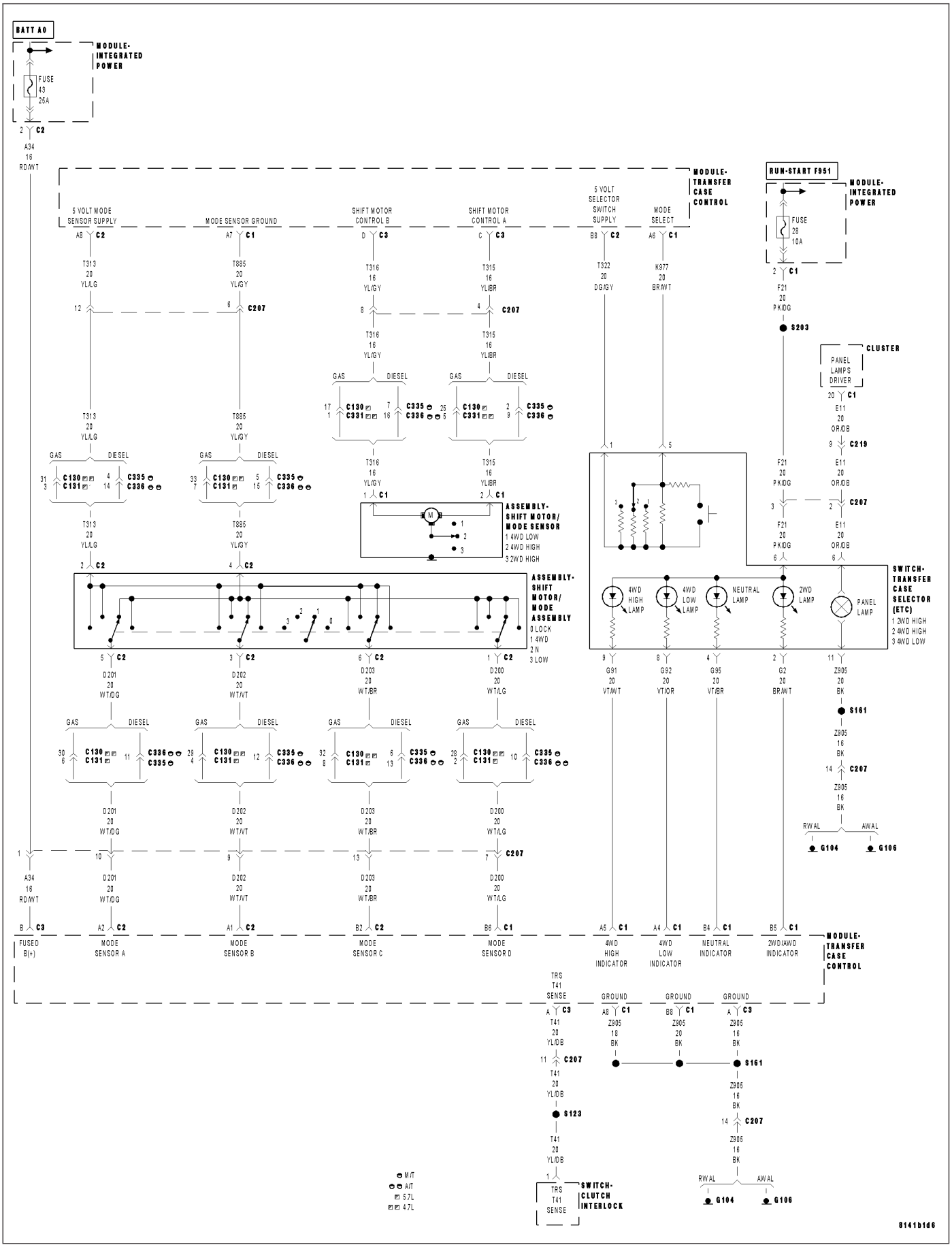
Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

4WD LO INDICATOR OPEN



4WD LO INDICATOR OPEN (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects an open circuit or high voltage on the 4WD Low Indicator circuit.

Possible Causes
INTERMITTENT 4WD LO INDICATOR OPEN
(G92) 4WD LOW INDICATOR CIRCUIT OPEN
(G92) 4WD LOW INDICATOR CIRCUIT SHORT TO VOLTAGE
(F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
TRANSFER CASE SELECTOR SWITCH
TRANSFER CASE CONTROL MODULE

1. 4WD LO INDICATOR OPEN DTC IS PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and move the Transfer Case Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display 4WD LO INDICATOR OPEN?

Yes >> Go To 2

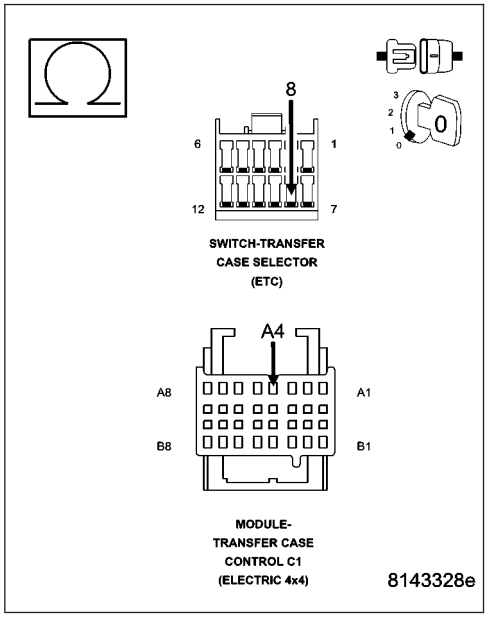
No >> Go To 7

---

2. (G92) 4WD LOW INDICATOR CIRCUIT OPEN

Turn the ignition off to the lock position.
Disconnect the Transfer Case Control Module C1 harness connector.
Disconnect the Transfer Case Selector Switch harness connector.

NOTE: Note: Check connectors - Clean/repair as necessary.
Measure the resistance of the (G92) 4WD Low Indicator circuit from the Transfer Case Control Module C1 harness connector to the Transfer Case Selector Switch harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (G92) 4WD Low Indicator circuit for an open. Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3

4WD LO INDICATOR OPEN (CONTINUED)

3. (G92) 4WD LOW INDICATOR CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.

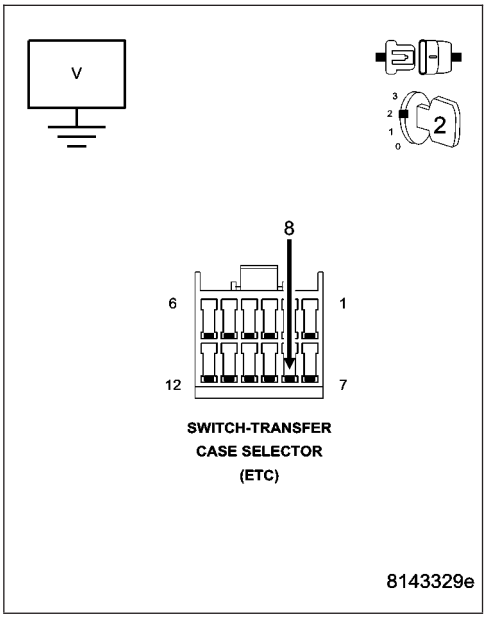
Measure the voltage of the (G92) 4WD Low Indicator circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (G92) 4WD Low Indicator circuit for a short to voltage.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



4. (F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN

Using a 12-volt test light connected to ground, check the (F21) Fused Ignition Switch Output circuit.

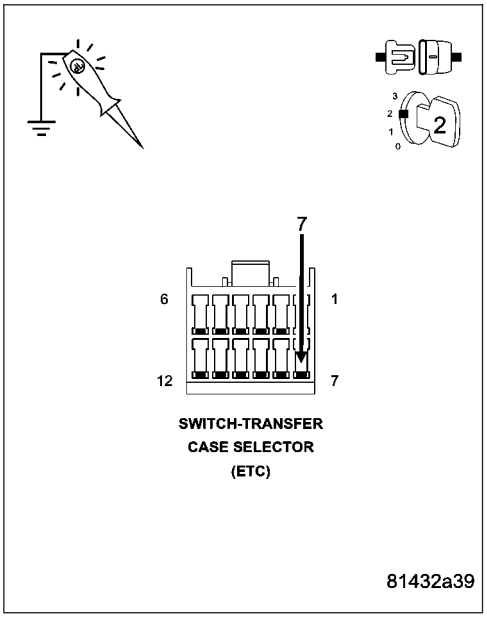
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (F21) Fused Ignition Switch Output circuit for an open circuit or for high resistance. If the fuse is open make sure to check for a short to ground and repair as necessary. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

Perform TRANSFER CASE VERIFICATION TEST.



4WD LO INDICATOR OPEN (CONTINUED)

5. TRANSFER CASE SELECTOR SWITCH

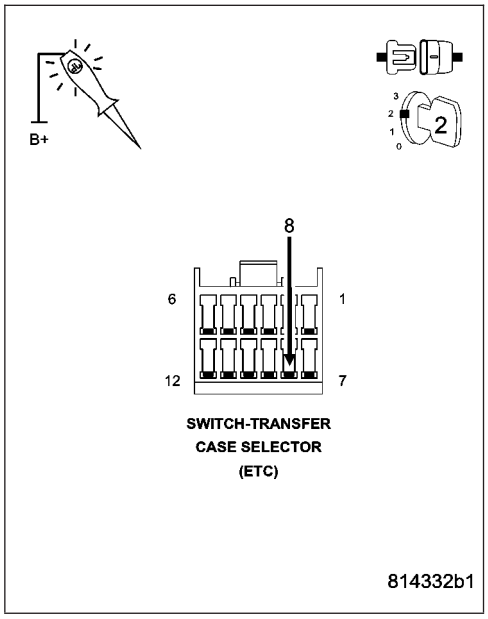
Turn the ignition off to the lock position.

Connect the Transfer Case Control Module C1 harness connector.

Ignition on, engine not running.

With the DRBIII®, actuate the 4LO LED.

With a 12–volt test light connected to B+, check the 4WD Low Indicator circuit in the Transfer Case Selector Switch harness connector.



Does the test light illuminate when the circuit is actuated?

Yes >> Replace the Transfer Case Selector Switch in accordance with the Service Information.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 6

6. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module in accordance with the Service Information.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

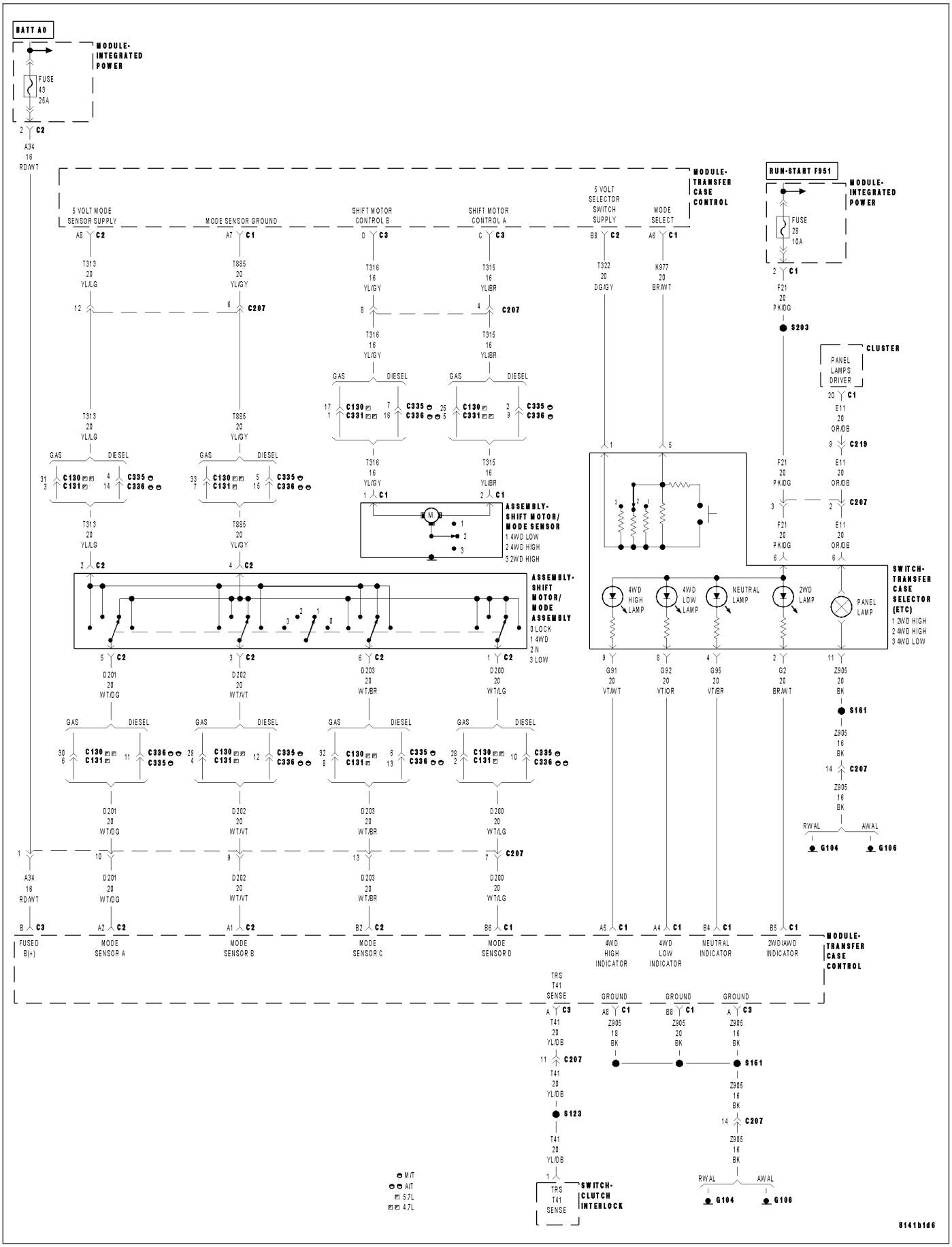
Were there any problems found?

Yes >> Repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

4WD LO INDICATOR SHORT TO GROUND



4WD LO INDICATOR SHORT TO GROUND (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects a short to ground on the (G92) 4WD Low Indicator circuit.

Possible Causes
INTERMITTENT 4WD LO INDICATOR SHORT TO GROUND
(G92) 4WD LO INDICATOR CIRCUIT OPEN
(G92) 4WD LO INDICATOR CIRCUIT SHORT TO GROUND
(G92) 4WD LO INDICATOR CIRCUIT SHORT TO VOLTAGE
TRANSFER CASE SELECTOR SWITCH
TRANSFER CASE CONTROL MODULE

1. 4WD LO INDICATOR SHORT TO GROUND DTC IS PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and move the Transfer Case Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display 4WD LO INDICATOR SHORT TO GROUND?

Yes >> Go To 2

No >> Go To 7

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2. (G92) 4WD LO INDICATOR CIRCUIT OPEN

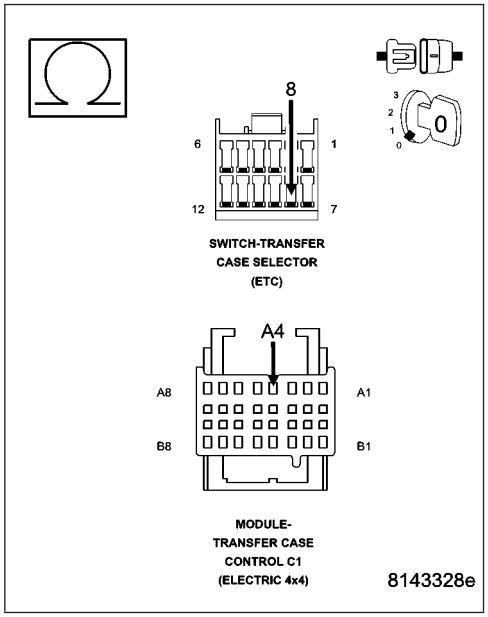
Turn the ignition off to the lock position.
Disconnect the Transfer Case Control Module C1 harness connector.
Disconnect the Transfer Case Selector Switch harness connector.

NOTE: Note: Check connectors - Clean/repair as necessary.
Measure the resistance of the (G92) 4WD Low Indicator circuit from the Transfer Case Control Module C1 harness connector to the Transfer Case Selector Switch harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (G92) 4WD Low Indicator circuit for an open. Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3



4WD LO INDICATOR SHORT TO GROUND (CONTINUED)

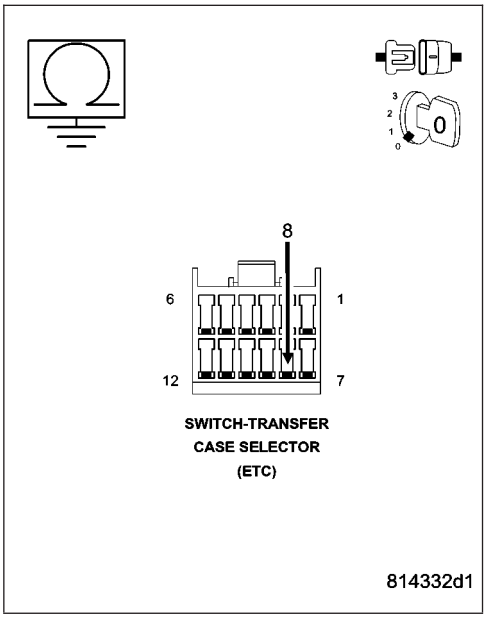
3. (G92) 4WD LO INDICATOR CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (G92) 4WD Low Indicator circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (G92) 4WD Low Indicator circuit for a short to ground.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



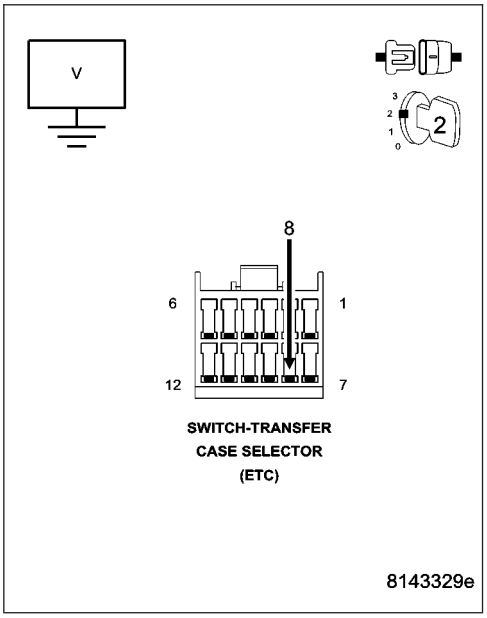
4. (G92) 4WD LO INDICATOR CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.
Measure the voltage of the (G92) 4WD Low Indicator circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (G92) 4WD Low Indicator circuit for a short to voltage.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 5



4WD LO INDICATOR SHORT TO GROUND (CONTINUED)

5. TRANSFER CASE SELECTOR SWITCH

Turn the ignition off to the lock position.

Connect the Transfer Case Control Module C1 harness connector.

Ignition on, engine not running.

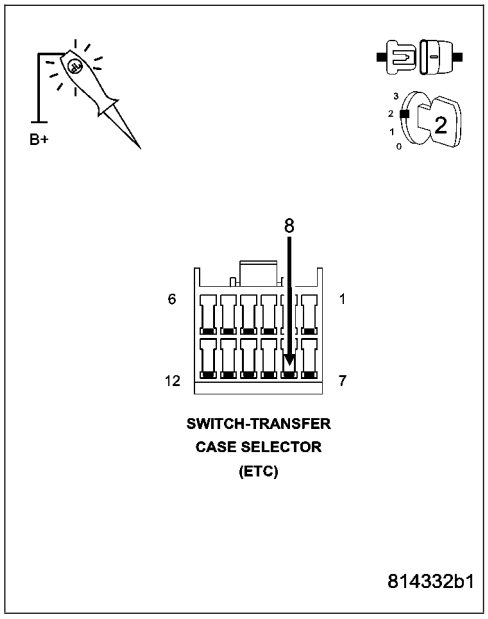
With a 12–volt test light connected to B+, check the (G92) 4WD Low Indicator circuit in the Transfer Case Selector Switch harness connector.

NOTE: The test light should not be illuminated.

With the DRBIII®, actuate the 4LO LED.

With a 12–volt test light connected to B+, check the (G92) 4WD Low Indicator circuit in the Transfer Case Selector Switch harness connector.

NOTE: The test light should be illuminated during the actuation.



Does the test light illuminate when the circuit is actuated and remain off otherwise?

Yes >> Replace the Transfer Case Selector Switch in accordance with the Service Information.

No >> Go To 6

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

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6. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Charging System related DTCs or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module in accordance with the Service Information.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

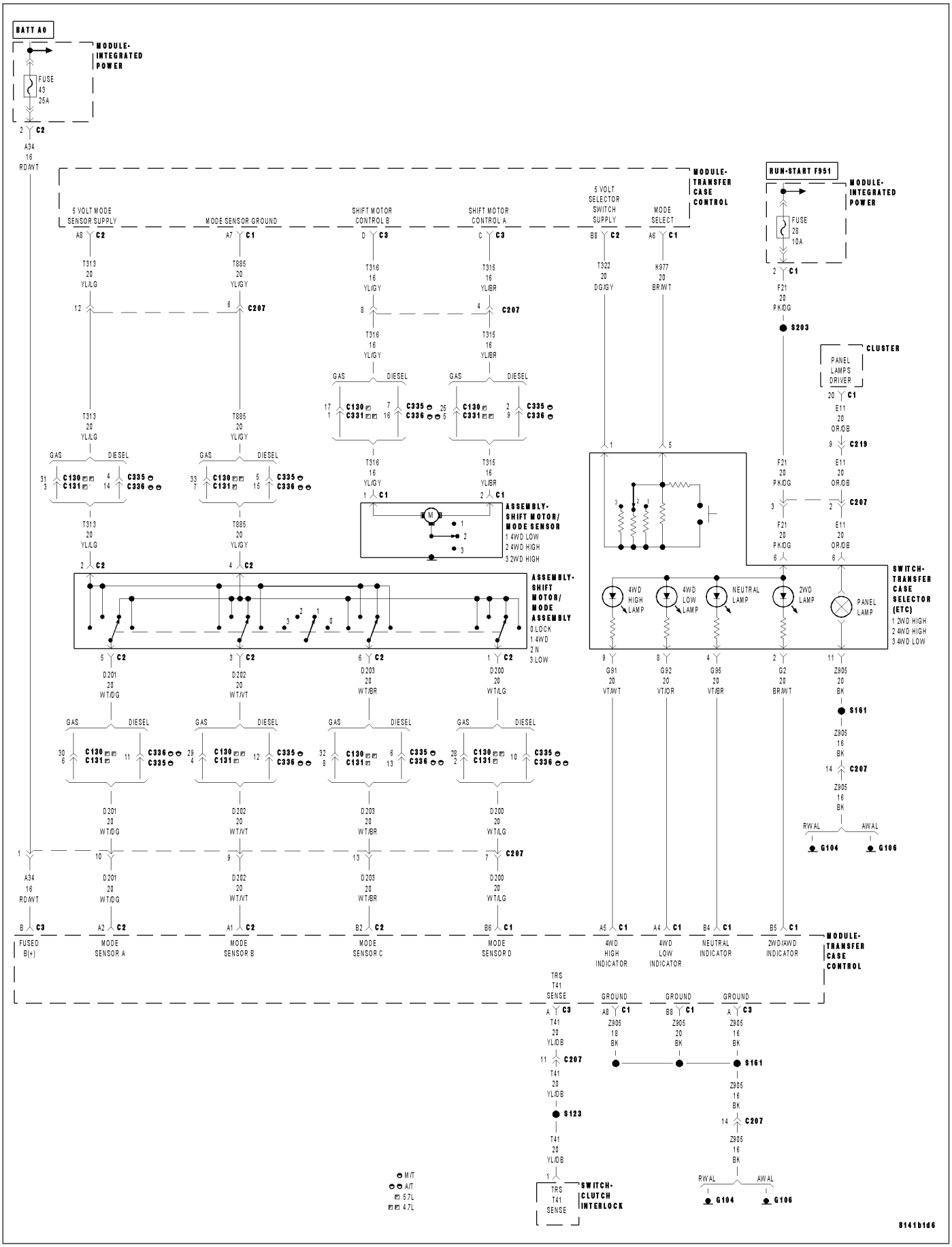
Yes >> Repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

---

5 VOLT OVER VOLTAGE



5 VOLT OVER VOLTAGE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects that the 5 Volt Supply circuit voltage goes above 6.0 volts for 2 seconds.

Possible Causes
INTERMITTENT 5 VOLT OVER VOLTAGE
CHARGING SYSTEM DTCS PRESENT
5 VOLT SUPPLY CIRCUIT(S) SHORTED TO VOLTAGE
(T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT SHORTED TO (T315) SHIFT MOTOR CONTROL A CIRCUIT
(T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT SHORTED TO (T316) SHIFT MOTOR CONTROL B CIRCUIT
(T313) 5 VOLT MODE SENSOR SUPPLY CIRCUIT SHORTED TO (T315) SHIFT MOTOR CONTROL A CIRCUIT
(T313) 5 VOLT MODE SENSOR SUPPLY CIRCUIT SHORTED TO (T316) SHIFT MOTOR CONTROL B CIRCUIT
TRANSFER CASE CONTROL MODULE

1. CHARGING SYSTEM DTCS PRESENT

With the DRBIII®, read Engine DTCs.

Are there any Charging System related DTCs present?

Yes >> Refer to the symptom list and perform the appropriate diagnostic procedure(s) as necessary.

No >> Go To 2

---

2. 5 VOLT OVER VOLTAGE DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and cycle the Transfer Case Selector Switch through all positions.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display 5 VOLT OVER VOLTAGE?

Yes >> Go To 3

No >> Go To 9

---

5 VOLT OVER VOLTAGE (CONTINUED)

3. 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off to the lock position.

Disconnect the Shift Motor/Mode Sensor C2 harness connector.

Disconnect the Transfer Case Selector Switch harness connector.

Disconnect the Transfer Case Control Module C2 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Turn the ignition on.

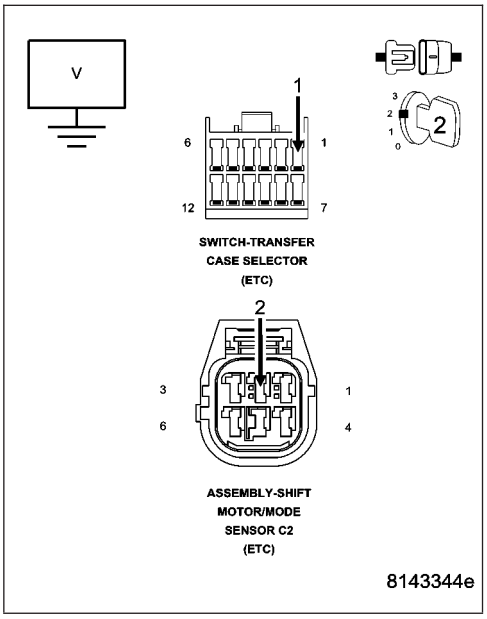
Measure the voltage of the (T322) 5 Volt Selector Switch Supply circuit in the Transfer Case Selector Switch harness connector.

Measure the voltage of the (T313) 5 Volt Mode Sensor Supply circuit in the Shift Motor/Mode Sensor C2 harness connector.

Is there any voltage present in the 5 Volt Supply circuit at either connector?

Yes >> Repair the 5 Volt Supply circuit(s) for a short to voltage.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



4. (T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT SHORTED TO (T315) SHIFT MOTOR CONTROL A CIRCUIT

Turn the ignition off to the lock position.

Disconnect the Shift Motor/Mode Sensor C1 harness connector.

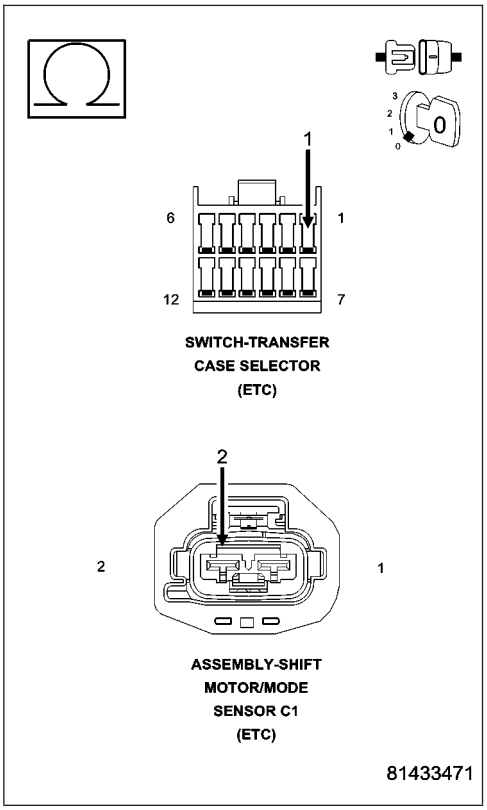
NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (T322) 5 Volt Selector Switch Supply circuit in the Transfer Case Selector Switch harness connector and the (T315) Shift Motor Control A circuit in the Shift Motor/Mode Sensor C1 harness connector.

Is the resistance below 5.0 ohms between the 5 Volt Supply circuit and the Shift Motor Control circuit?

Yes >> Repair the 5 Volt Supply circuit for short to the Shift Motor Control circuit.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 5



5 VOLT OVER VOLTAGE (CONTINUED)

5. (T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT SHORTED TO (T316) SHIFT MOTOR CONTROL B CIRCUIT

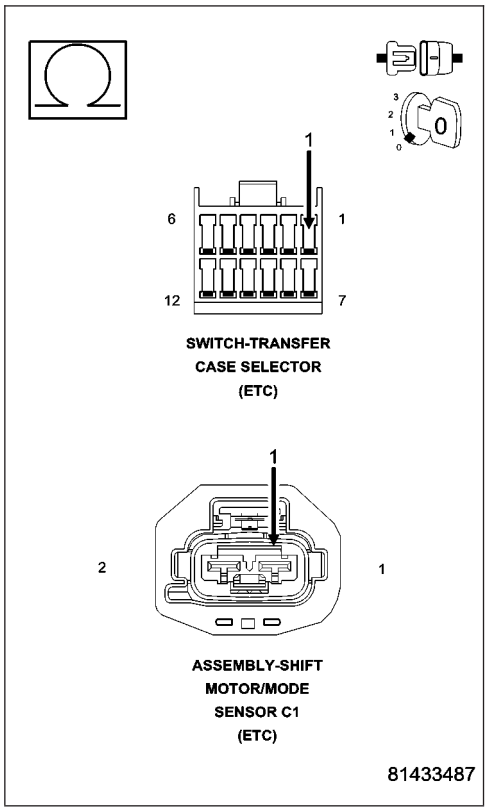
Measure the resistance between the (T322) 5 Volt Selector Switch Supply circuit in the Transfer Case Selector Switch harness connector and the (T316) Shift Motor Control B circuit in the Shift Motor/Mode Sensor C1 harness connector.

Is the resistance below 5.0 ohms between the 5 Volt Supply circuit and the Shift Motor Control circuit?

Yes >> Repair the 5 Volt Supply circuit for short to the Shift Motor Control circuit.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

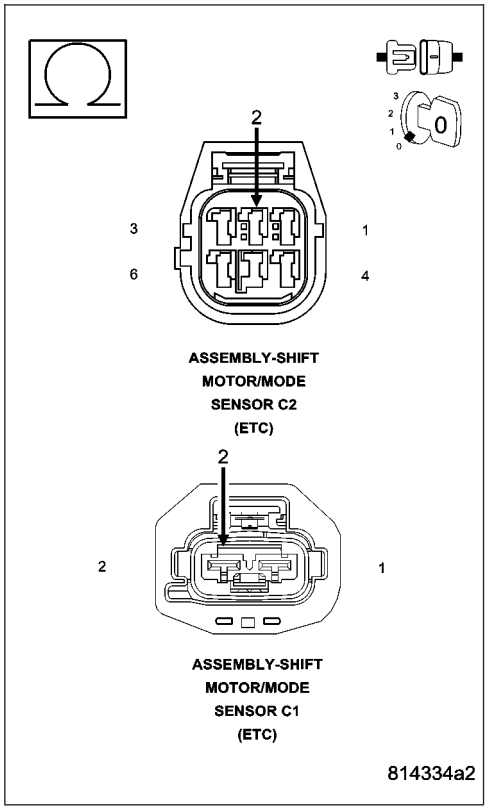
No >> Go To 6



5 VOLT OVER VOLTAGE (CONTINUED)

6. (T313) 5 VOLT MODE SENSOR SUPPLY CIRCUIT SHORTED TO (T315) SHIFT MOTOR CONTROL A CIRCUIT

Measure the resistance between the (T313) 5 Volt Mode Sensor Supply circuit in the Motor/Mode Sensor C2 harness connector and the (T315) Shift Motor Control A circuit in the Shift Motor/Mode Sensor C1 harness connector.



Is the resistance below 5.0 ohms between the 5 Volt Supply circuit and the Shift Motor Control circuit?

Yes >> Repair the 5 Volt Supply circuit for short to the Shift Motor Control circuit.

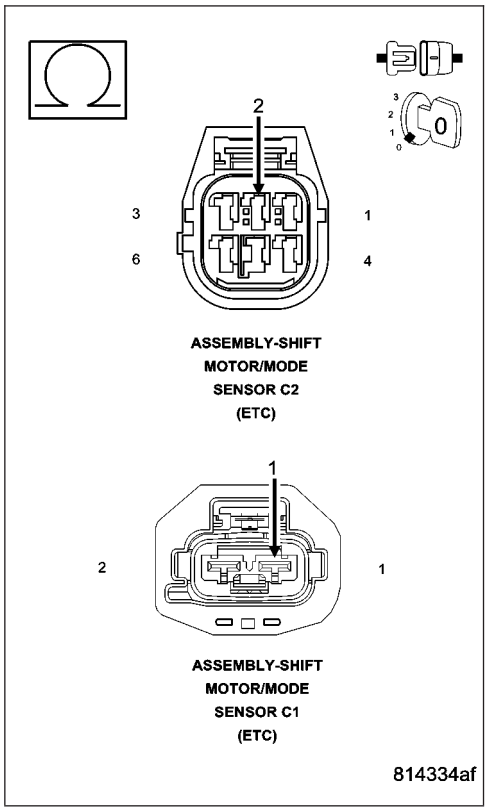
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 7

5 VOLT OVER VOLTAGE (CONTINUED)

7. (T313) 5 VOLT MODE SENSOR SUPPLY CIRCUIT SHORTED TO (T316) SHIFT MOTOR CONTROL B CIRCUIT

Measure the resistance between the (T313) 5 Volt Mode Sensor Supply circuit in the Motor/Mode Sensor C2 harness connector and the (T316) Shift Motor Control B circuit in the Shift Motor/Mode Sensor C1 harness connector.



Is the resistance below 5.0 ohms between the 5 Volt Supply circuit and the Shift Motor Control circuit?

Yes >> Repair the 5 Volt Supply circuit for short to the Shift Motor Control circuit.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 8

---

8. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Charging System related DTCs or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

---

9. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

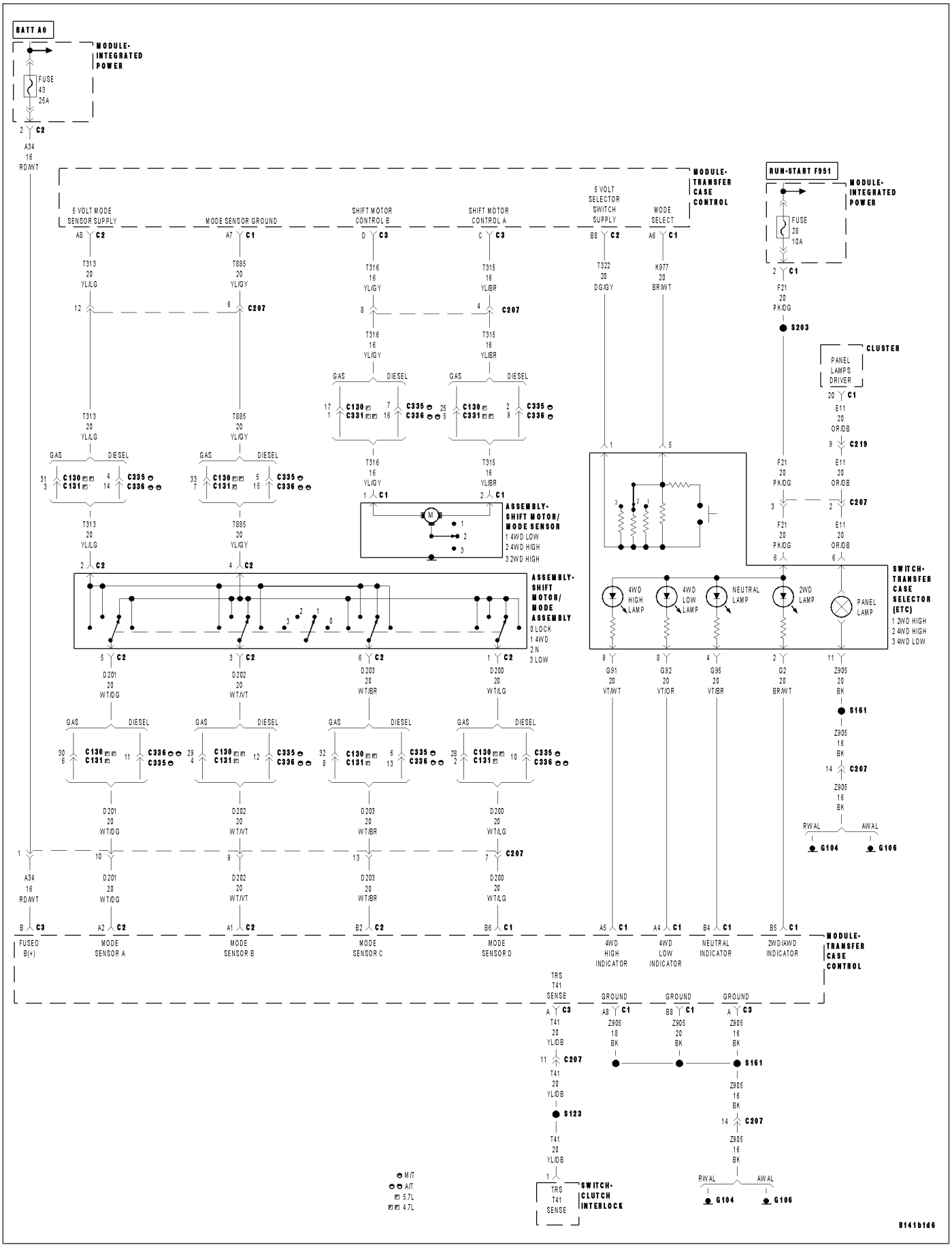
Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

---

5 VOLT UNDER VOLTAGE



5 VOLT UNDER VOLTAGE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects the 5 Volt Supply circuit voltage drops below 4.0 volts for 2 seconds.

Possible Causes
INTERMITTENT 5 VOLT UNDER VOLTAGE
(T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT SHORT TO GROUND
(T313) 5 VOLT MODE SENSOR SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE
(T313) 5 VOLT MODE SENSOR SUPPLY CIRCUIT SHORT TO GROUND
TRANSFER CASE SELECTOR SWITCH
SHIFT MOTOR/MODE SENSOR ASSEMBLY
TRANSFER CASE CONTROL MODULE

1. 5 VOLT UNDER VOLTAGE DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and cycle the Transfer Case Selector Switch through all positions.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display 5 VOLT UNDER VOLTAGE?

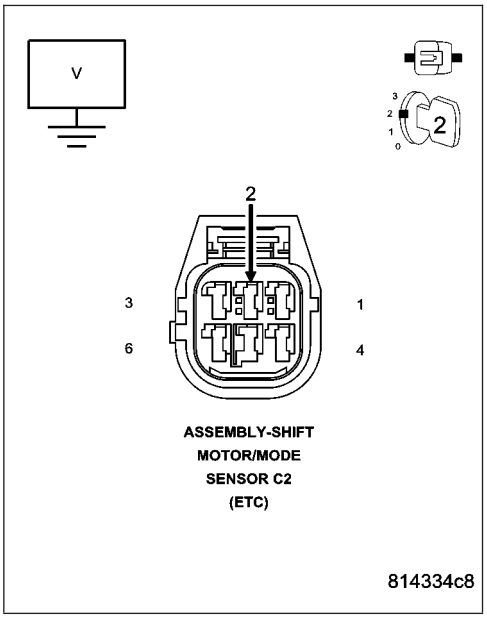
Yes >> Go To 2
No >> Go To 11

2. (T313) 5 VOLT MODE SENSOR SUPPLY CIRCUIT VOLTAGE BELOW 4.0 VOLTS

Ignition on, engine not running.
Measure the voltage of the (T313) 5 Volt Mode Sensor Supply circuit by backprobing the Shift Motor/Mode Sensor harness connector.

Is the voltage below 4.0 volts?

Yes >> Go To 3
No >> Go To 6



5 VOLT UNDER VOLTAGE (CONTINUED)

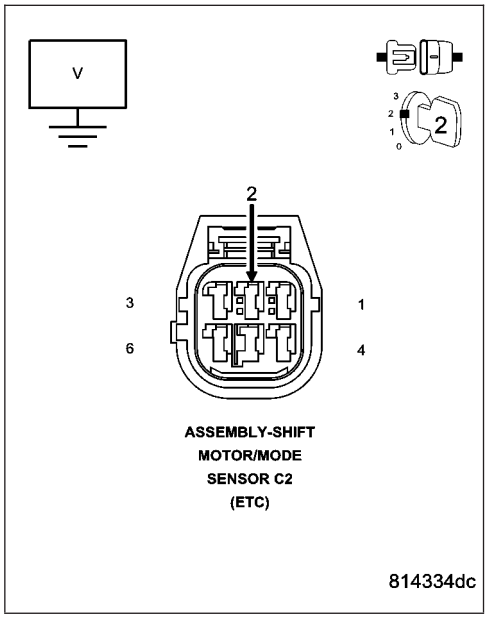
3. SHIFT MOTOR/MODE SENSOR ASSEMBLY

Turn the ignition off to the lock position.
Disconnect the Shift Motor/Mode Sensor C2 harness connector.
Turn the ignition on.
Measure the voltage of the (T313) 5 Volt Mode Sensor Supply circuit.

Is the voltage above 4.0 volts?

Yes >> Replace the Shift Motor/Mode Sensor assembly in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



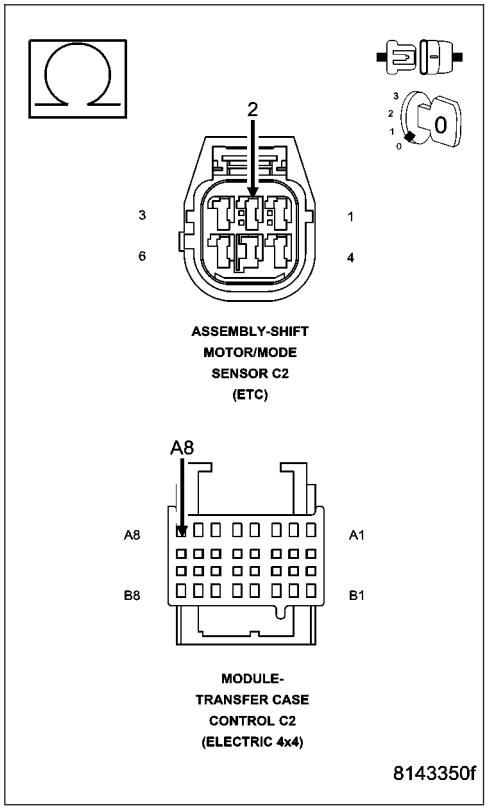
4. (T313) 5 VOLT MODE SENSOR SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off to the lock position.
Disconnect the Transfer Case Control Module C2 harness connector.
Measure the resistance of the (T313) 5 Volt Mode Sensor Supply circuit between the Shift Motor/Mode Sensor harness connector and the Transfer Case Control Module C2 harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T313) 5 Volt Mode Sensor Supply circuit for an open or high resistance.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 5



5 VOLT UNDER VOLTAGE (CONTINUED)

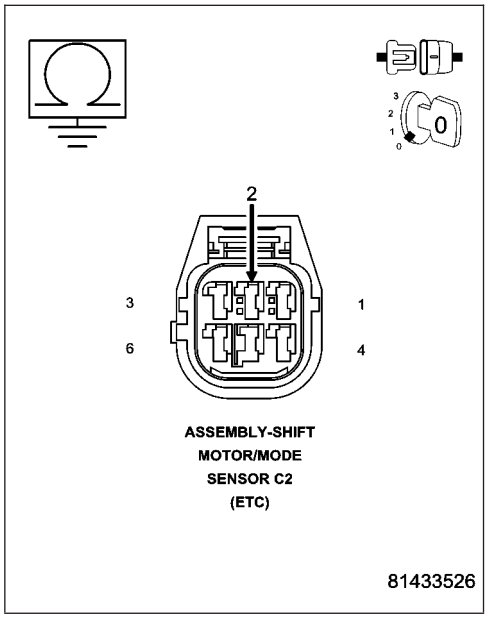
5. (T313) 5 VOLT MODE SENSOR SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between the (T313) 5 Volt Mode Sensor Supply circuit and ground.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T313) 5 Volt Mode Sensor Supply circuit for a short to ground.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 10



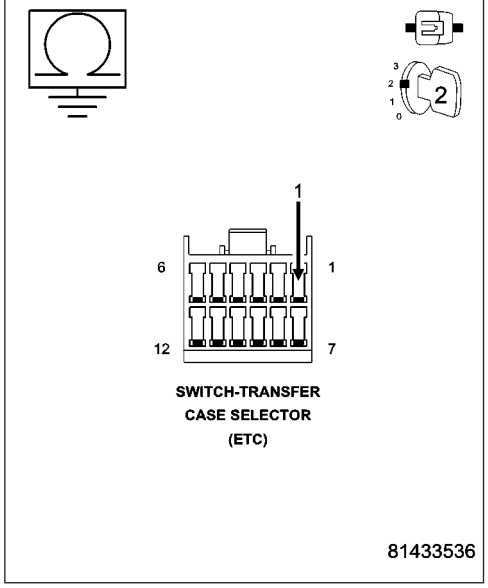
6. (T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT VOLTAGE BELOW 4.0 VOLTS

Measure the voltage of the (T322) 5 Volt Selector Switch Supply circuit by backprobing the Transfer Case Selector Switch harness connector.

Is the voltage below 4.0 volts?

Yes >> Go To 7

No >> Go To 10



5 VOLT UNDER VOLTAGE (CONTINUED)

7. TRANSFER CASE SELECTOR SWITCH

Turn the ignition off to the lock position.

Disconnect the Transfer Case Selector Switch harness connector.

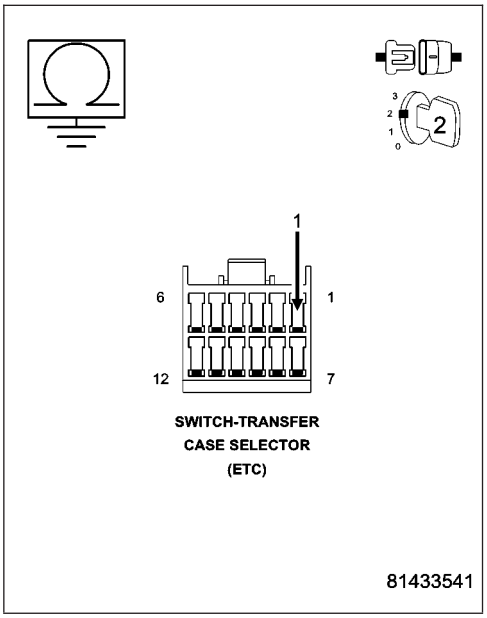
Turn the ignition on.

Measure the voltage of the (T322) 5 Volt Selector Switch Supply circuit.

Is the voltage above 4.0 volts?

Yes >> Replace the Transfer Case Selector Switch in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 8



8. (T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off to the lock position.

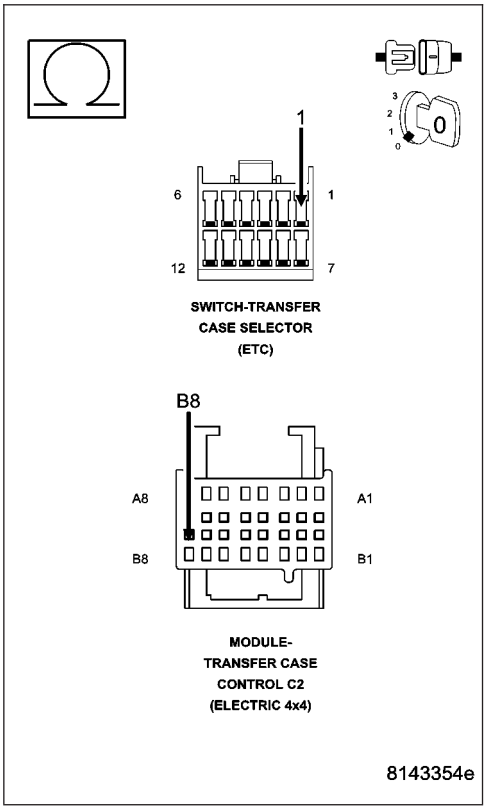
Disconnect the Transfer Case Control Module C2 harness connector.

Measure the resistance of the (T322) 5 Volt Selector Switch Supply circuit between the Transfer Case Selector Switch harness connector and the Transfer Case Control Module C2 harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T322) 5 Volt Selector Switch Supply circuit for an open or high resistance.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

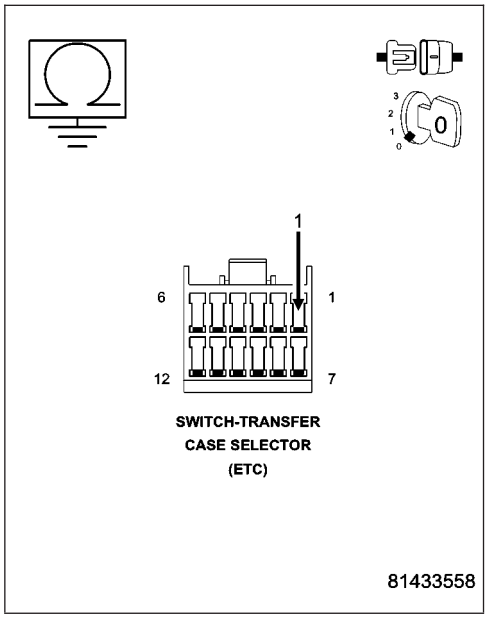
No >> Go To 9



5 VOLT UNDER VOLTAGE (CONTINUED)

9. (T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT SHORT TO GROUND

Measure the resistance between the (T322) 5 Volt Selector Switch Supply circuit and ground.



Is the resistance below 5.0 ohms?

Yes >> Repair the (T322) 5 Volt Selector Switch Supply circuit for a short to ground.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 10

---

10. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

---

11. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

INTERNAL ERROR

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  An internal error has been detected in the Transfer Case Control Module.

Possible Causes
TRANSFER CASE CONTROL MODULE

1. TRANSFER CASE CONTROL MODULE

The Transfer Case Control Module is reporting an internal error.

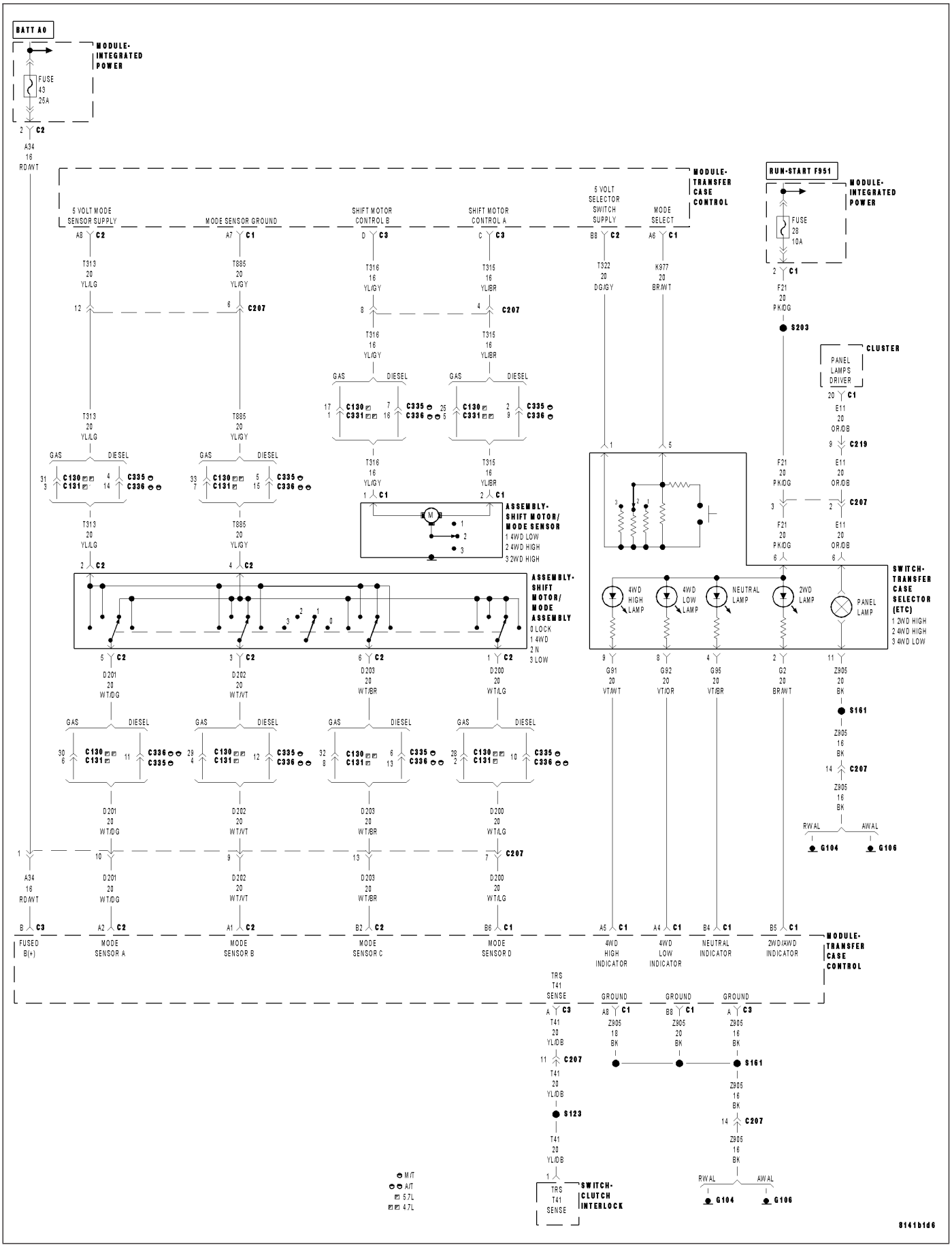
View repair.

Repair

Replace the Transfer Case Control Module.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

MISSING BRAKE INPUT



MISSING BRAKE INPUT (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module receives no Brake status bus message for 5 seconds.

Possible Causes
PCM COMMUNICATION DTC PRESENT
INTERMITTENT MISSING BRAKE INPUT DTC
TRANSFER CASE CONTROL MODULE

1. COMMUNICATION DTC PRESENT IN PCM

Ignition on, engine not running.
With the DRBIII® under Engine, read DTCs.

Are there any Communication DTCs present in the PCM?

Yes >> Refer to the Communication category and perform the appropriate diagnostic procedure.
Perform TRANSFER CASE VERIFICATION TEST.

No >> Go To 2

---

2. MISSING BRAKE INPUT DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and allow it to idle for at least 10 seconds.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display MISSING BRAKE INPUT?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Communication DTCs present or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

MISSING BRAKE INPUT (CONTINUED)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

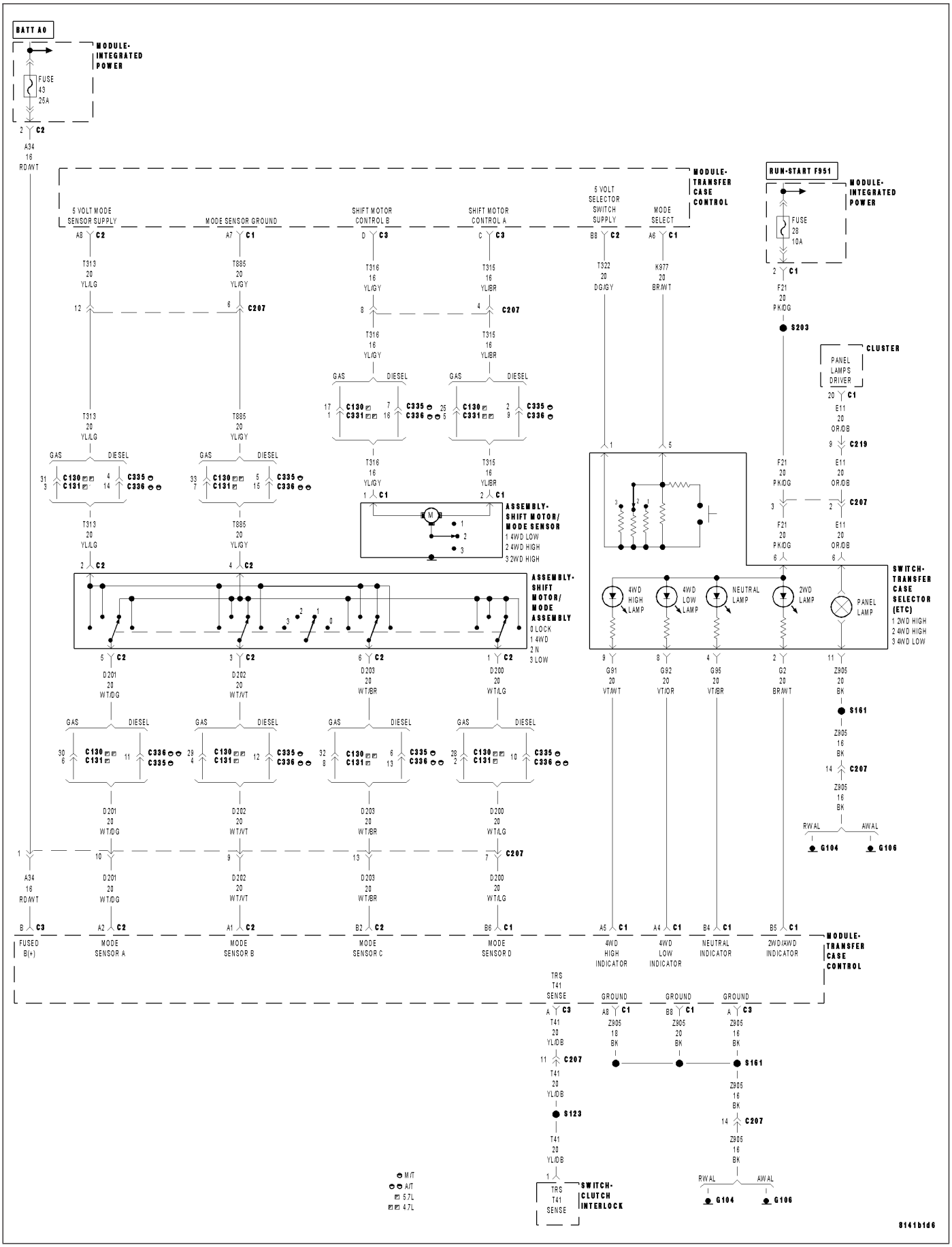
Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

MISSING ENGINE RPM INPUT



MISSING ENGINE RPM INPUT (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module receives no Engine RPM bus message for 5 seconds.

Possible Causes
PCM COMMUNICATION DTC PRESENT
INTERMITTENT MISSING ENGINE RPM INPUT DTC
TRANSFER CASE CONTROL MODULE

1. COMMUNICATION DTC PRESENT IN PCM

Ignition on, engine not running.
With the DRBIII® under Engine, read DTCs.

Are there any Communication DTCs present in the PCM?

Yes >> Refer to the Communication category and perform the appropriate diagnostic procedure.
Perform TRANSFER CASE VERIFICATION TEST.

No >> Go To 2

---

2. MISSING ENGINE RPM INPUT DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and allow it to idle for at least 10 seconds.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display MISSING ENGINE RPM INPUT?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Communication DTCs present or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

MISSING ENGINE RPM INPUT (CONTINUED)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

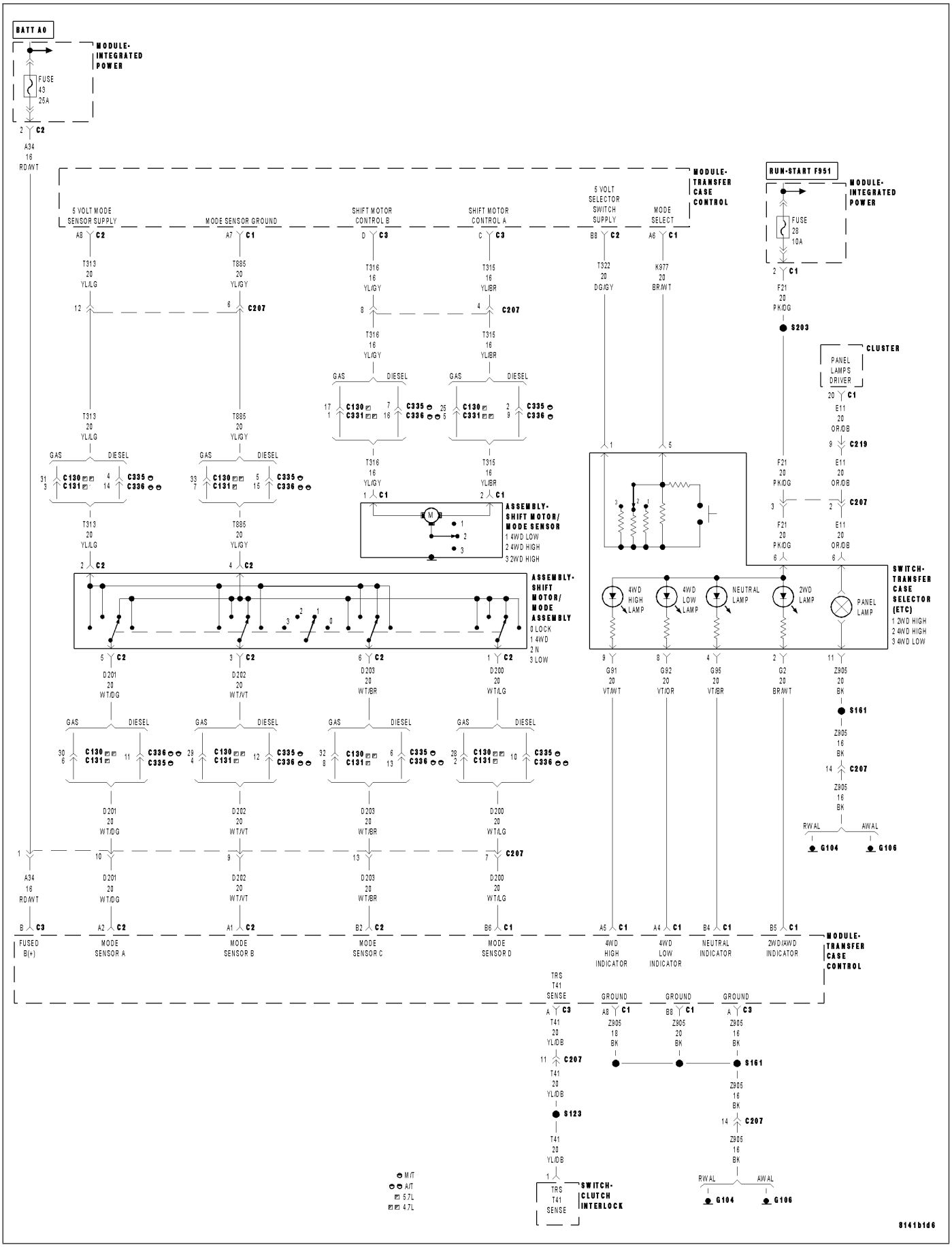
Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

MISSING IGNITION MESSAGE



MISSING IGNITION MESSAGE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module receives no Ignition status bus message for 5 seconds.

Possible Causes
CLUSTER COMMUNICATION DTC PRESENT
INTERMITTENT MISSING IGNITION MESSAGE DTC
TRANSFER CASE CONTROL MODULE

1. COMMUNICATION DTC PRESENT IN CLUSTER

Ignition on, engine not running.
With the DRBIII® under Cluster, read DTCs.

Are there any Communication DTCs present in the Cluster?

Yes >> Refer to the Communication category and perform the appropriate diagnostic procedure. Perform TRANSFER CASE VERIFICATION TEST.

No >> Go To 2

---

2. MISSING IGNITION MESSAGE DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and allow it to idle for at least 10 seconds.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display MISSING IGNITION MESSAGE?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Communication DTCs present or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

MISSING IGNITION MESSAGE (CONTINUED)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

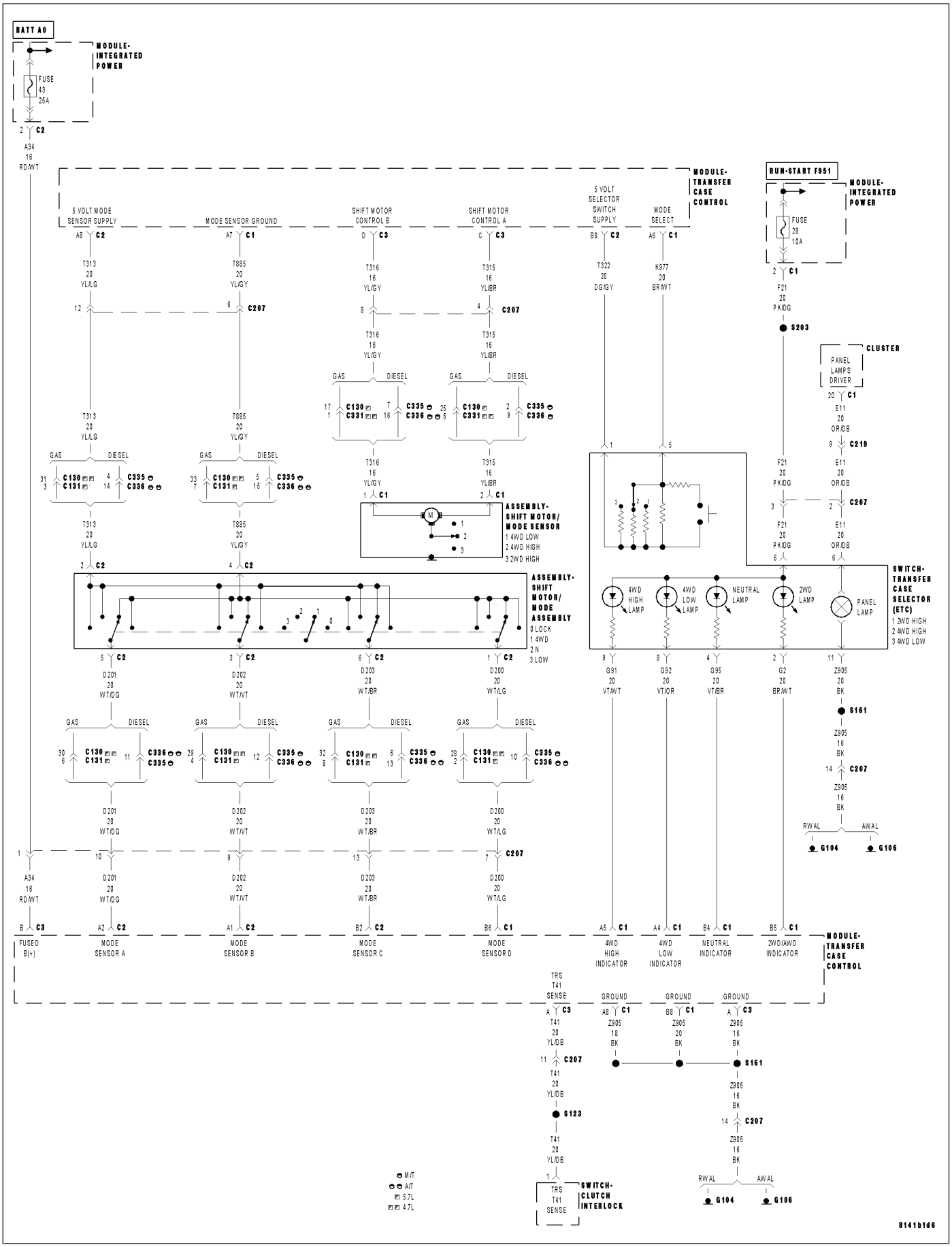
Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

MISSING LAMP DIMMING MESSAGE



MISSING LAMP DIMMING MESSAGE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module receives no Lamp Dimming bus message for 5 seconds. If this DTC sets, the lamps will illuminate at daytime brightness.

Possible Causes
CLUSTER COMMUNICATION DTC PRESENT
INTERMITTENT MISSING LAMP DIMMING MESSAGE DTC
TRANSFER CASE CONTROL MODULE

1. COMMUNICATION DTC PRESENT IN CLUSTER

Ignition on, engine not running.
With the DRBIII® under Cluster, read DTCs.

Are there any Communication DTCs present in the Cluster?

Yes >> Refer to the Communication category and perform the appropriate diagnostic procedure. Perform TRANSFER CASE VERIFICATION TEST.

No >> Go To 2

---

2. MISSING LAMP DIMMING MESSAGE DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and allow it to idle for at least 10 seconds.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display MISSING LAMP DIMMING MESSAGE?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Communication DTCs present or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

MISSING LAMP DIMMING MESSAGE (CONTINUED)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

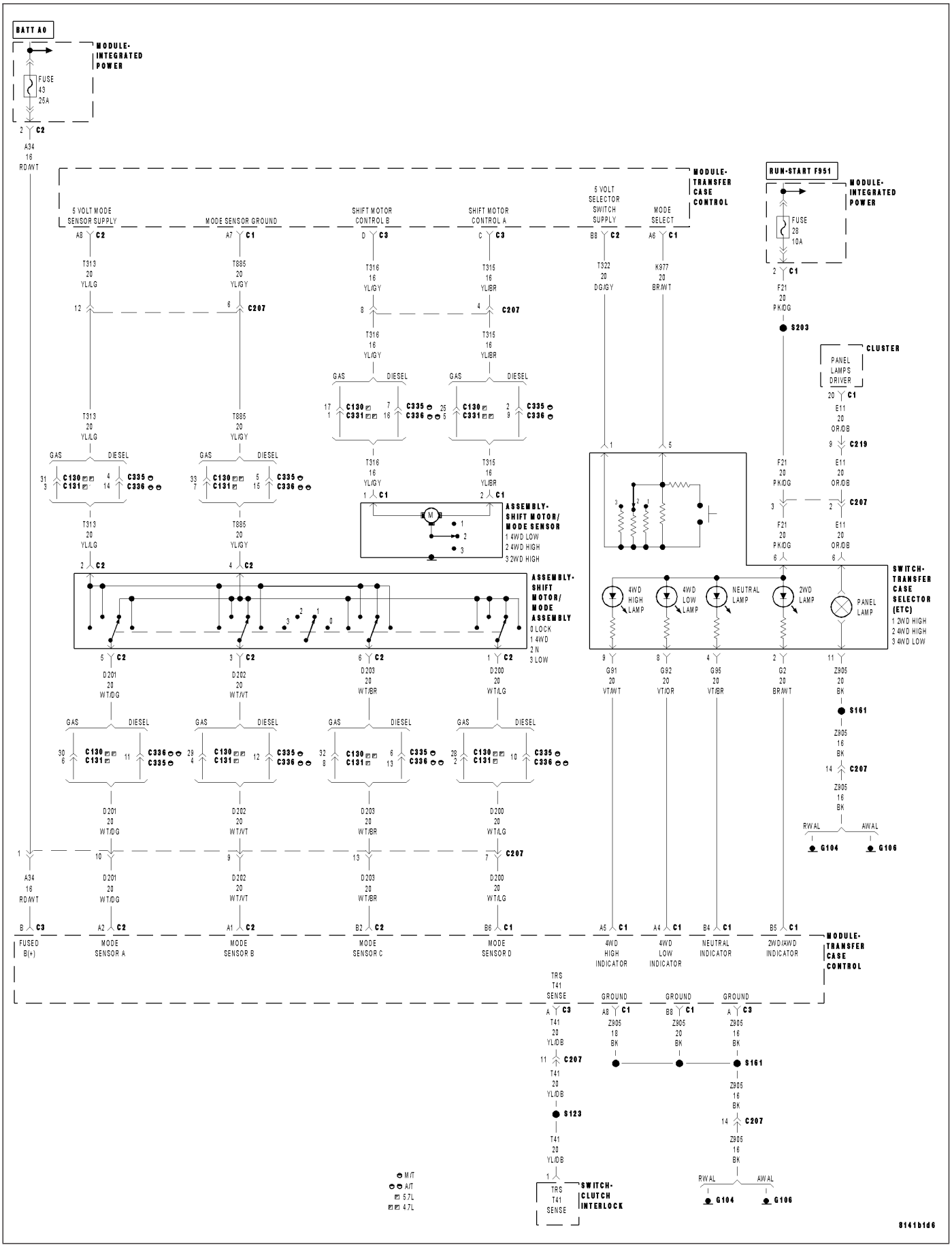
Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

MISSING SPEED DIFFERENCE MESSAGE



MISSING SPEED DIFFERENCE MESSAGE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  When the Transfer Case Control Module receives a request to shift while vehicle speed is greater than 0 m.p.h.
- **Set Condition:**
  The Transfer Case Control Module receives no ABS bus message for 5 seconds.

Possible Causes
COMMUNICATION DTCS PRESENT
ABS DTCS PRESENT
INTERMITTENT MISSING SPEED DIFFERENCE MESSAGE DTC
TRANSFER CASE CONTROL MODULE

1. COMMUNICATION DTCS PRESENT

Ignition on, engine not running.
With the DRBIII®, read DTCs in all modules.

Are there any Communication DTCs present?

Yes >> Refer to the Communication category and perform the appropriate diagnostic procedure.
Perform TRANSFER CASE VERIFICATION TEST.

No >> Go To 2

---

2. ABS DTCS PRESENT

With the DRBIII®, read ABS DTCs.

Are there any DTCs present in the ABS module?

Yes >> Perform the appropriate diagnostic procedure.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3

---

3. MISSING SPEED DIFFERENCE MESSAGE DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and allow it to idle for at least 10 seconds.
Move the Transfer Case Mode Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display MISSING SPEED DIFFERENCE MESSAGE?

Yes >> Go To 4

No >> Go To 5

MISSING SPEED DIFFERENCE MESSAGE (CONTINUED)

4. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Communication DTCs present or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

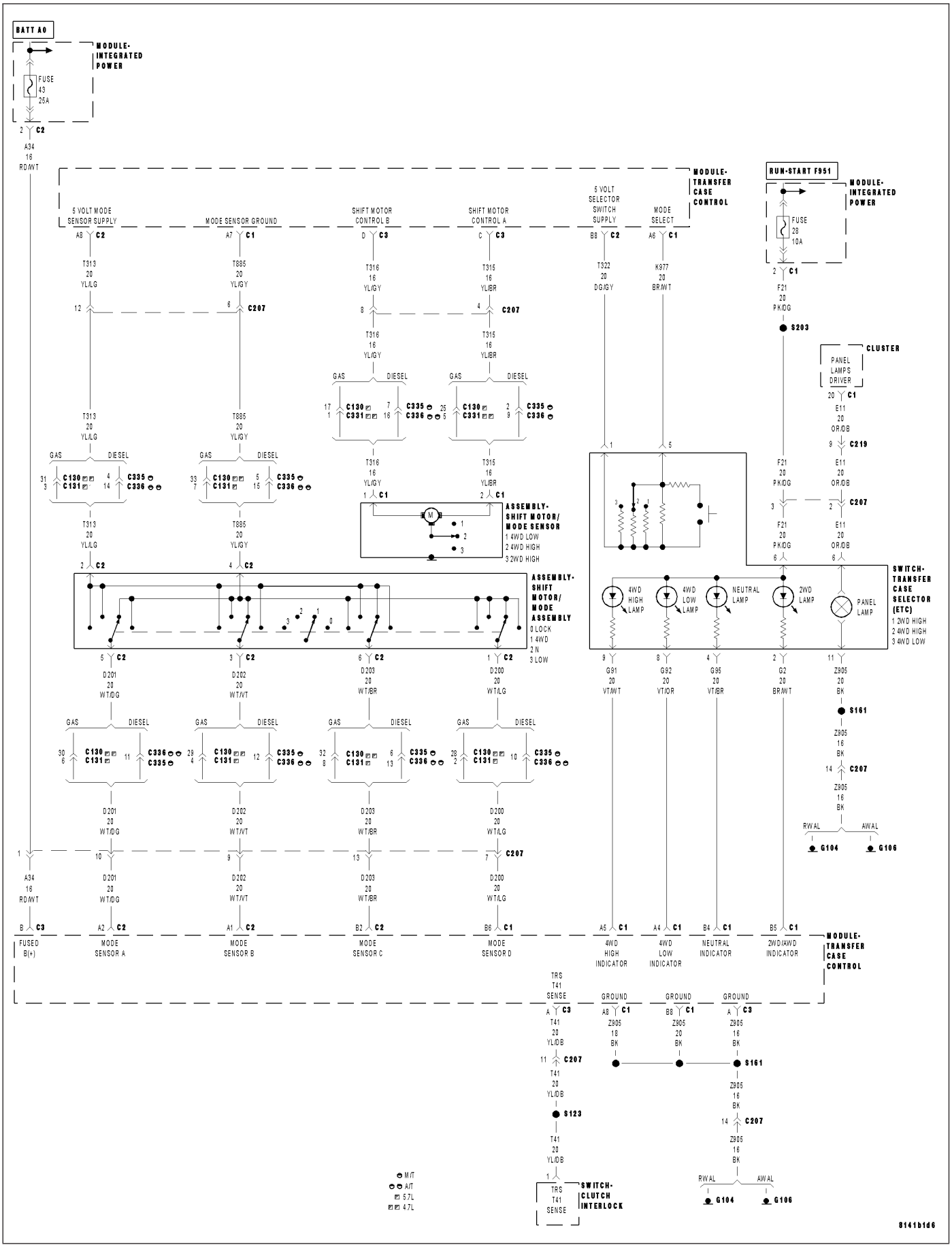
Were there any problems found?

Yes >> Repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

MISSING TRANSFER CASE TYPE



MISSING TRANSFER CASE TYPE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module receives no bus message identifying the transfer case type for 5 seconds.

Possible Causes
PCM COMMUNICATION DTC PRESENT
INTERMITTENT MISSING TRANSFER CASE TYPE DTC
TRANSFER CASE CONTROL MODULE

1. COMMUNICATION DTC PRESENT IN PCM

Ignition on, engine not running.
With the DRBIII® under Engine, read DTCs.

Are there any Communication DTCs present in the PCM?

Yes >> Refer to the Communication category and perform the appropriate diagnostic procedure.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 2

---

2. MISSING TRANSFER CASE TYPE DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and allow it to idle for at least 10 seconds.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display MISSING TRANSFER CASE TYPE?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Communication DTCs present or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

MISSING TRANSFER CASE TYPE (CONTINUED)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

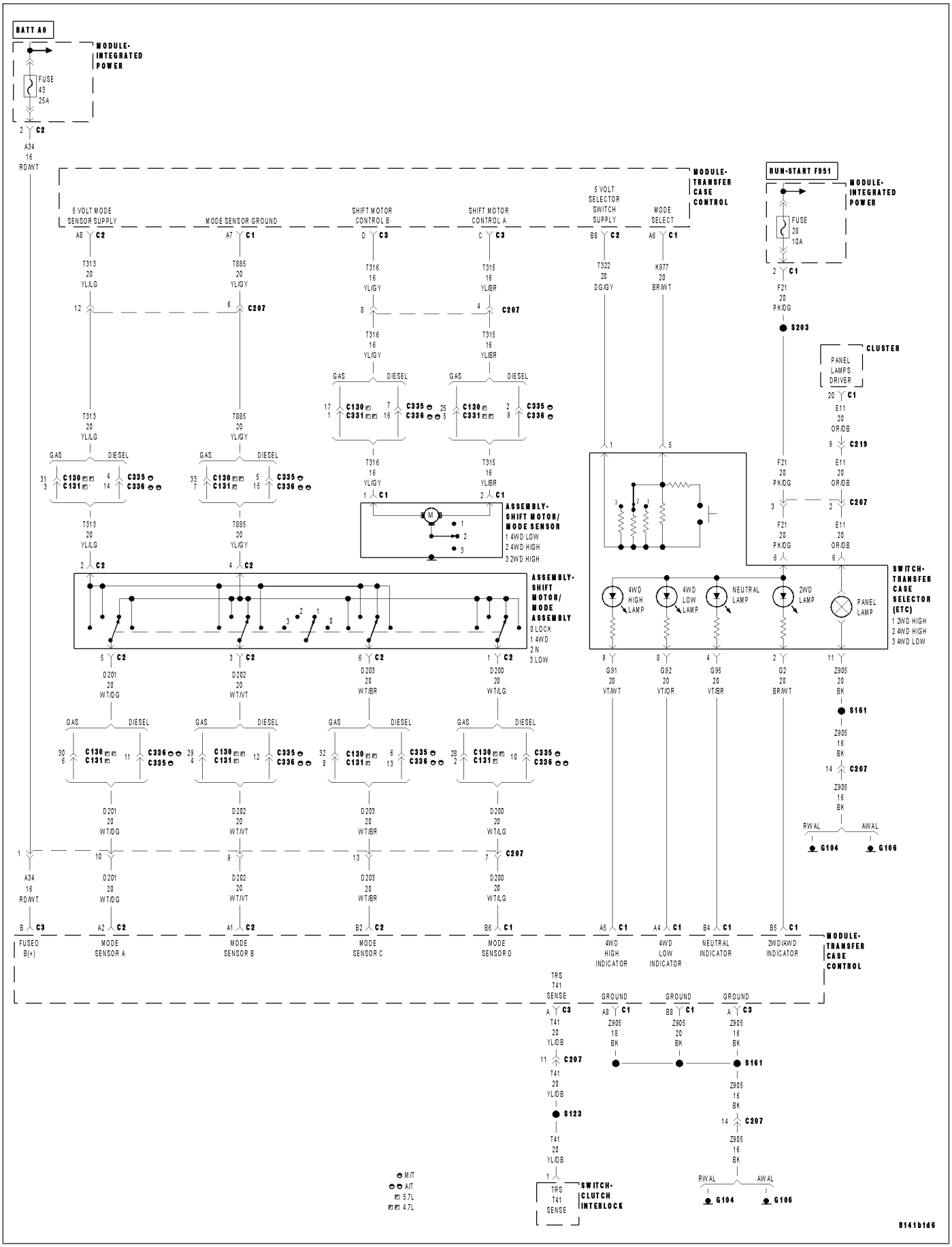
Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

MISSING TRANSMISSION POSITION INPUT



MISSING TRANSMISSION POSITION INPUT (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module receives no Transmission Position bus message for 5 seconds.

Possible Causes
COMMUNICATION DTC PRESENT
CLUSTER DTC PRESENT
TRANSMISSION DTC PRESENT
INTERMITTENT MISSING TRANSMISSION POSITION INPUT DTC
TRANSFER CASE CONTROL MODULE

1. COMMUNICATION DTCS PRESENT

Ignition on, engine not running.
With the DRBIII®, read Engine DTCs.

Are there any Communication DTCs present?

Yes >> Refer to the Communication category and perform the appropriate diagnostic procedure.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 2

---

2. CLUSTER DTCS PRESENT

With the DRBIII®, read Cluster DTCs.

Are there any DTCs present in the Instrument Cluster?

Yes >> Perform the appropriate diagnostic procedure.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3

---

3. TRANSMISSION DTCS PRESENT

With the DRBIII®, read Transmission DTCs.

Are there any DTCs present in the Transmission module?

Yes >> Perform the appropriate diagnostic procedure.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4

MISSING TRANSMISSION POSITION INPUT (CONTINUED)

4. MISSING TRANSMISSION POSITION INPUT DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and allow it to idle for at least 10 seconds.
Move the Transfer Case Mode Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display MISSING TRANSMISSION POSITION INPUT?

Yes >> Go To 5

No >> Go To 6

---

5. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Communication DTCs present or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

6. INTERMITTENT WIRING AND CONNECTORS

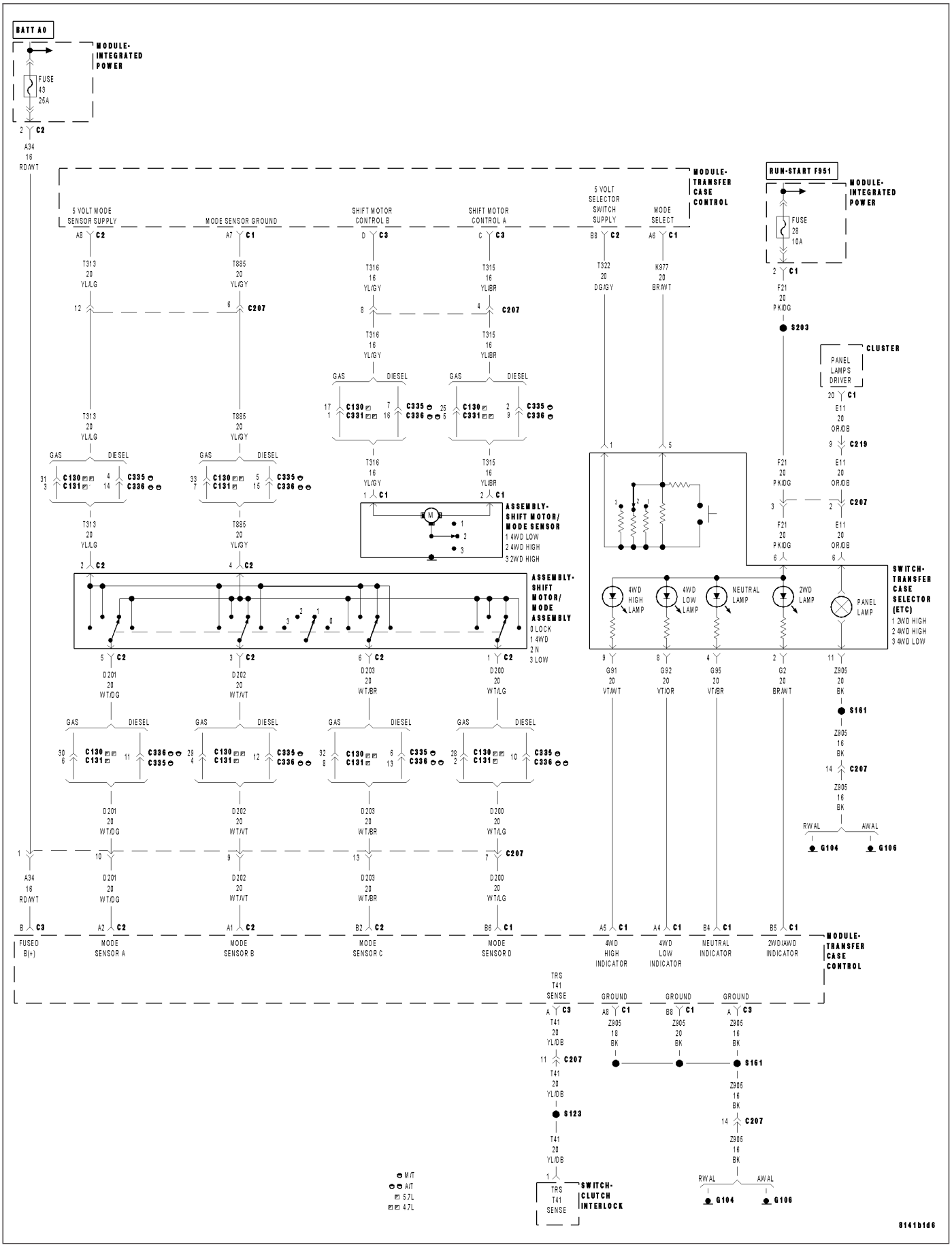
The conditions necessary to set this DTC are not present at this time.
Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.
Wiggle test the wiring harness and connectors while checking for shorted and open circuits.
Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

MISSING TRANSMISSION TYPE



MISSING TRANSMISSION TYPE (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module receives no ABS bus message for 5 seconds.

Possible Causes
COMMUNICATION DTCS PRESENT
INTERMITTENT MISSING TRANSMISSION TYPE DTC
TRANSFER CASE CONTROL MODULE

1. COMMUNICATION DTCS PRESENT

Ignition on, engine not running.
With the DRBIII®, read DTCs in all modules.

Are there any Communication DTCs present?

Yes >> Refer to the Communication category and perform the appropriate diagnostic procedure.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 2

---

2. MISSING TRANSMISSION TYPE DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and allow it to idle for at least 10 seconds.
Move the Transfer Case Mode Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display MISSING TRANSMISSION TYPE?

Yes >> Go To 3

No >> Go To 4

---

3. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Communication DTCs present or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

MISSING TRANSMISSION TYPE (CONTINUED)

4. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

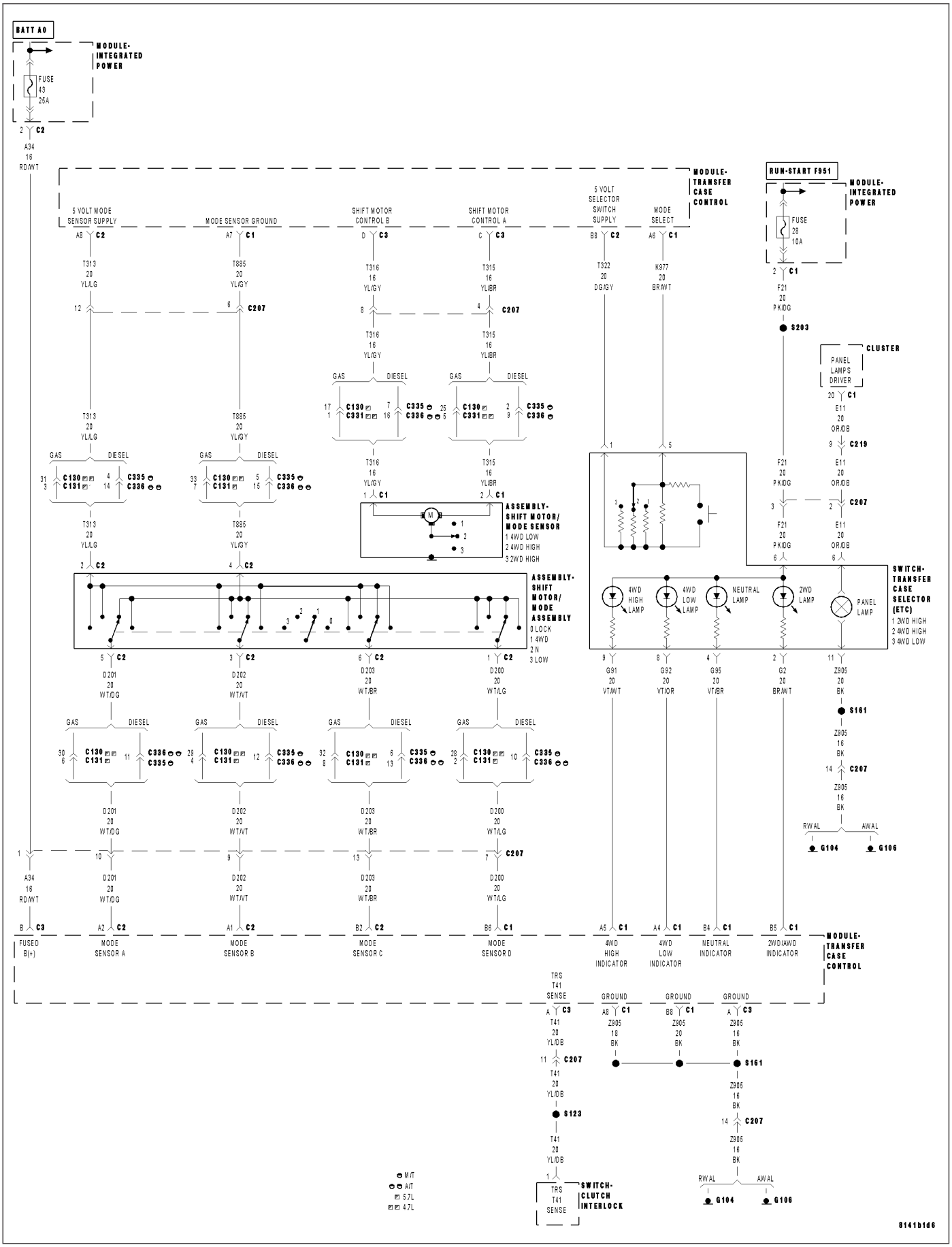
Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

MISSING VEHICLE SPEED INPUT



MISSING VEHICLE SPEED INPUT (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module receives no Vehicle Speed bus message for 5 seconds.

Possible Causes
VERIFY CLUSTER CALIBRATION POINTS
PCM COMMUNICATION DTCS PRESENT
INTERMITTENT MISSING VEHICLE SPEED INPUT DTC
TRANSFER CASE CONTROL MODULE

1. VERIFY CLUSTER CALIBRATION POINTS

Ignition on, engine not running.

With the DRBIII® under System Tests, select CLUSTER CALIBRATION POINTS, and perform the test for the Speedometer.

Verify the Speedometer calibration at each of the test points.

Does the Speedometer respond correctly at each of the calibration points?

Yes >> Go To 2

No >> Replace the Instrument Cluster in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

2. PCM COMMUNICATION DTCS PRESENT

With the DRBIII®, read PCM DTCs.

Are there any Communication DTCs present?

Yes >> Refer to the Communication category and perform the appropriate diagnostic procedure.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3

---

3. MISSING VEHICLE SPEED INPUT DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.

With the DRBIII®, erase Transfer Case DTCs.

Start the engine and allow it to idle for at least 10 seconds.

Move the Transfer Case Mode Selector Switch to each position.

With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display MISSING VEHICLE SPEED INPUT?

Yes >> Go To 4

No >> Go To 5

MISSING VEHICLE SPEED INPUT (CONTINUED)

4. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Communication DTCs present or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

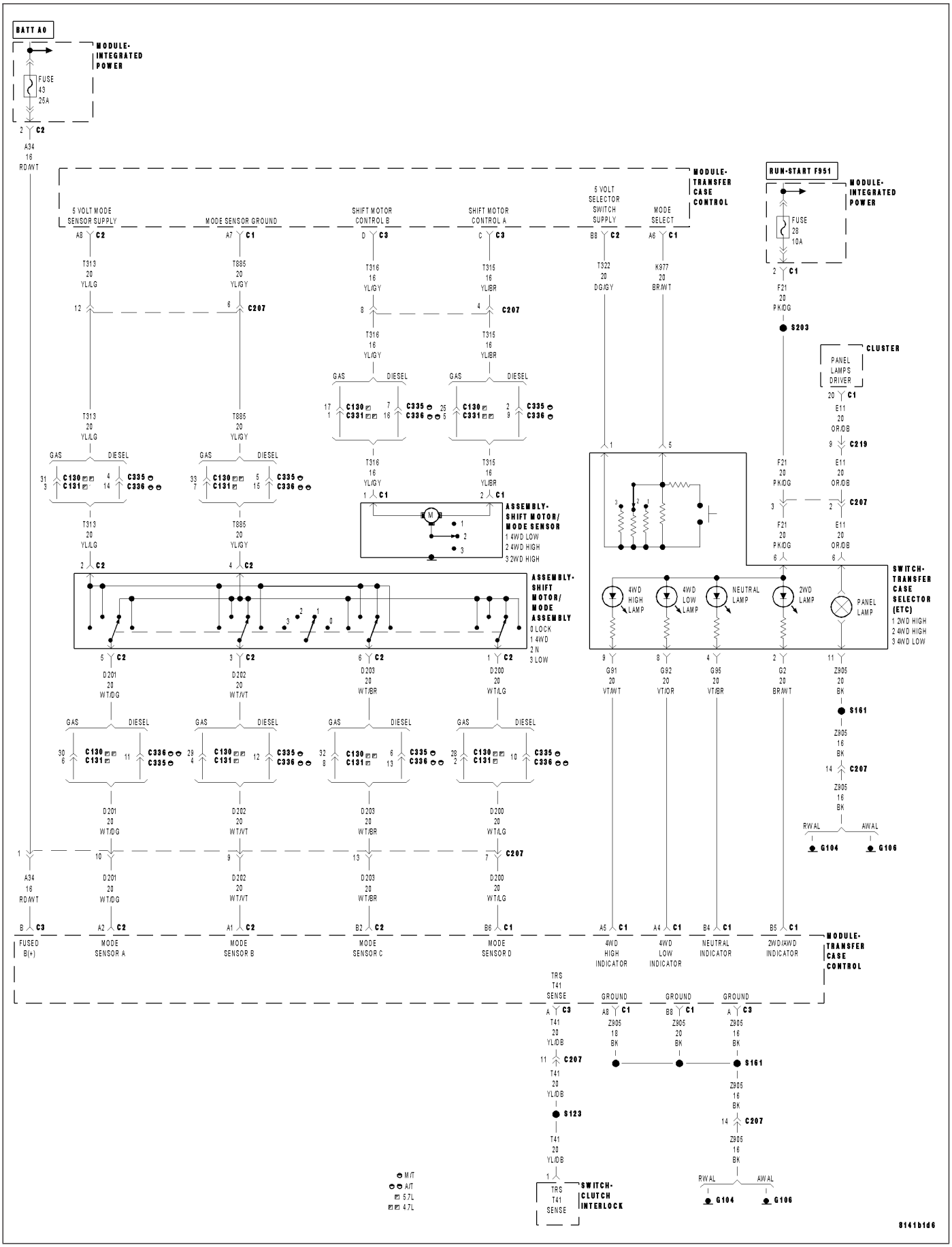
Were there any problems found?

Yes >> Repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

NEUTRAL INDICATOR OPEN



NEUTRAL INDICATOR OPEN (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects an open circuit or high voltage on the (G95) Neutral Indicator circuit.

Possible Causes
INTERMITTENT NEUTRAL INDICATOR OPEN
(G95) NEUTRAL INDICATOR CIRCUIT OPEN
(G95) NEUTRAL INDICATOR CIRCUIT SHORT TO VOLTAGE
(F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN
TRANSFER CASE SELECTOR SWITCH
TRANSFER CASE CONTROL MODULE

1. NEUTRAL INDICATOR OPEN DTC IS PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and move the Transfer Case Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display NEUTRAL INDICATOR OPEN?

Yes >> Go To 2
No >> Go To 7

NEUTRAL INDICATOR OPEN (CONTINUED)

2. (G95) NEUTRAL INDICATOR CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transfer Case Control Module C1 harness connector.

Disconnect the Transfer Case Selector Switch harness connector.

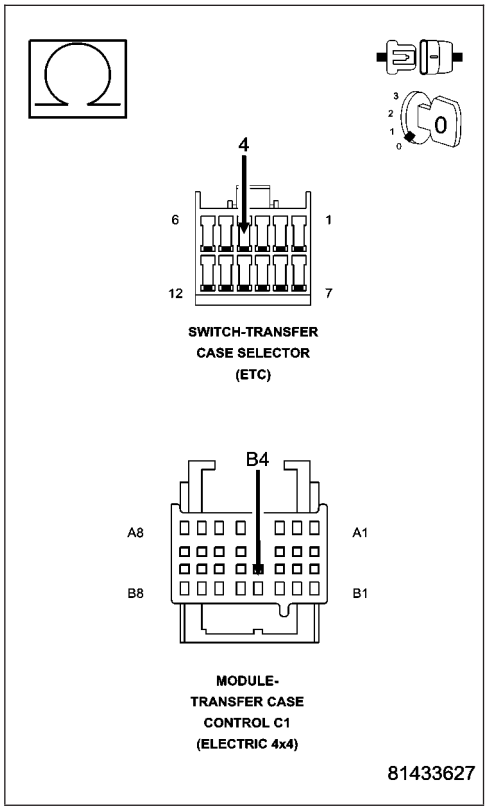
NOTE: Note: Check connectors - Clean/repair as necessary.

Measure the resistance of the (G95) Neutral Indicator circuit from the Transfer Case Control Module C1 harness connector to the Transfer Case Selector Switch harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (G95) Neutral Indicator circuit for an open.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3



3. (G95) NEUTRAL INDICATOR CIRCUIT SHORT TO VOLTAGE

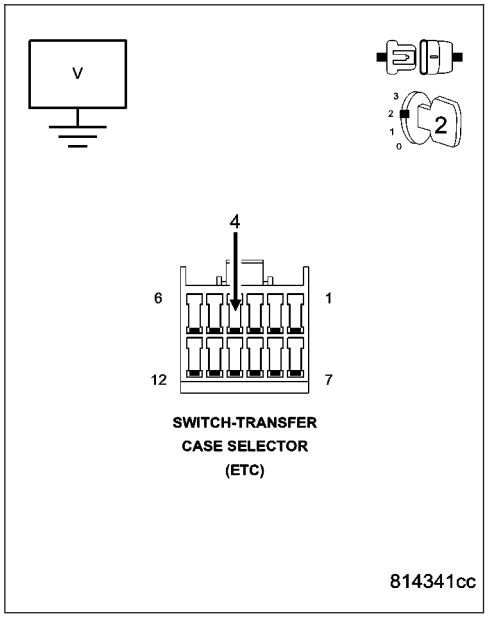
Ignition on, engine not running.

Measure the voltage of the (G95) Neutral Indicator circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (G95) Neutral Indicator circuit for a short to voltage.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



NEUTRAL INDICATOR OPEN (CONTINUED)

4. (F21) FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN

Using a 12-volt test light connected to ground, check the (F21) Fused Ignition Switch Output circuit.

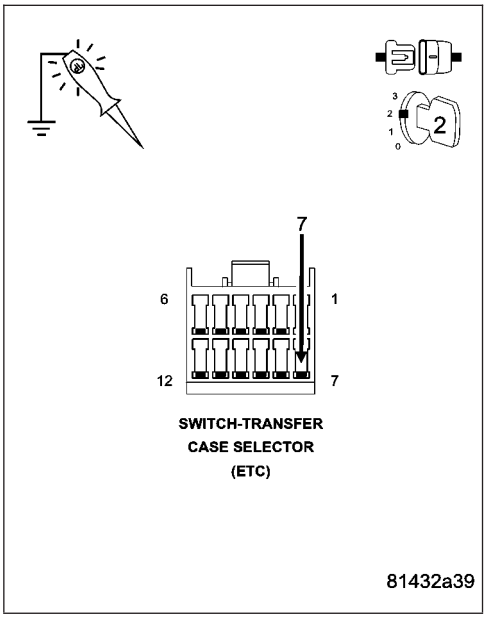
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go To 5

No >> Repair the (F21) Fused Ignition Switch Output circuit for an open circuit or for high resistance. If the fuse is open make sure to check for a short to ground and repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)



5. TRANSFER CASE SELECTOR SWITCH

Turn the ignition off to the lock position.

Connect the Transfer Case Control Module C1 harness connector.

Ignition on, engine not running.

With the DRBIII®, actuate the Neutral LED.

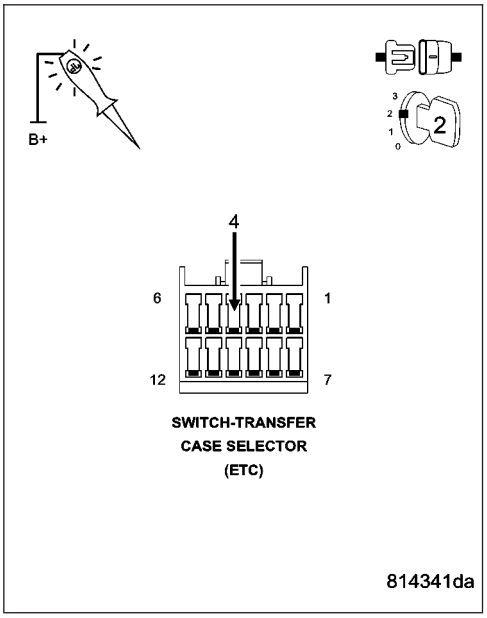
With a 12–volt test light connected to B+, check the (G95) Neutral Indicator circuit in the Transfer Case Selector Switch harness connector.

Does the test light illuminate when the circuit is actuated?

Yes >> Replace the Transfer Case Selector Switch in accordance with the Service Information.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 6



NEUTRAL INDICATOR OPEN (CONTINUED)

6. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module in accordance with the Service Information.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

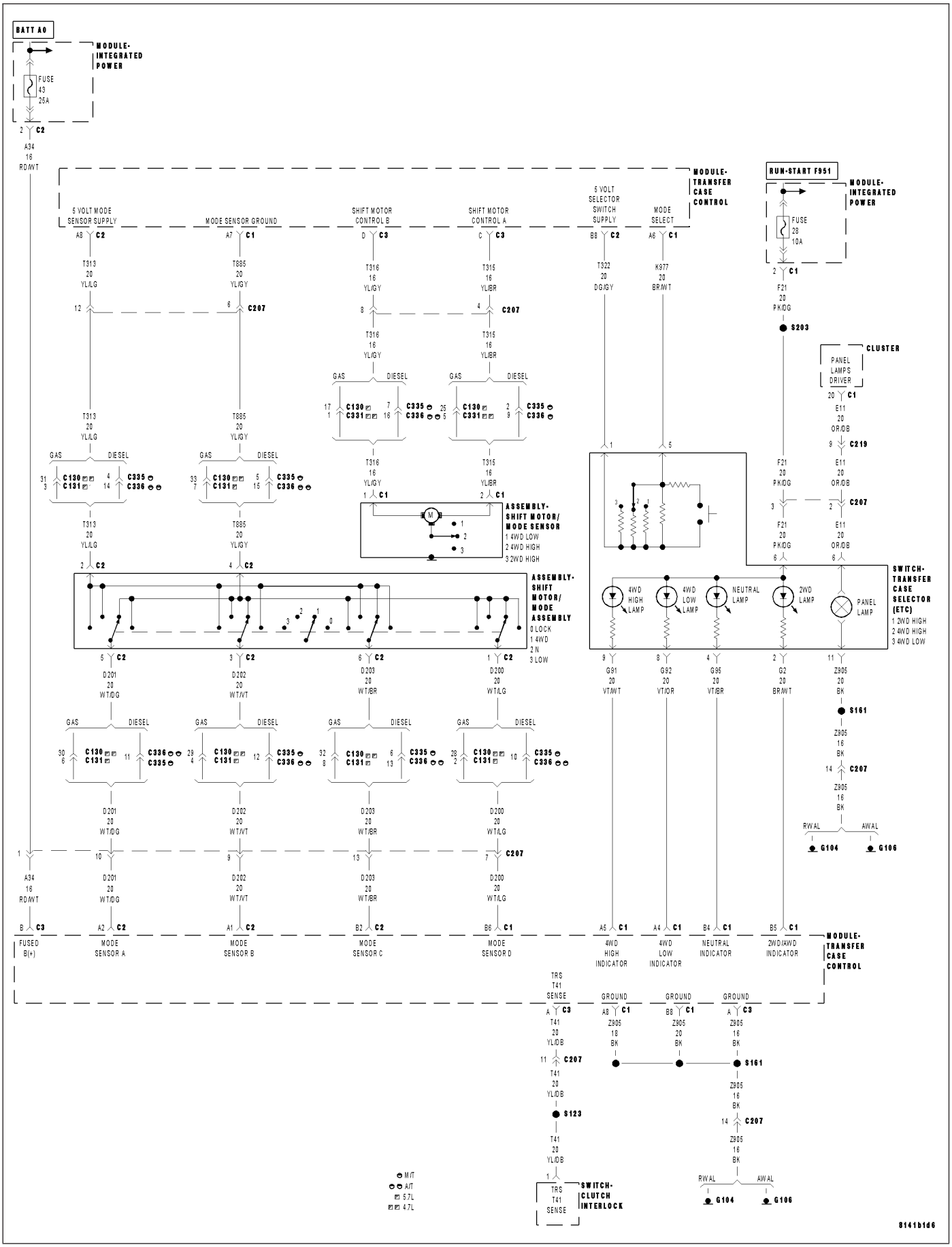
Were there any problems found?

Yes >> Repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

NEUTRAL INDICATOR SHORT TO GROUND



NEUTRAL INDICATOR SHORT TO GROUND (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  The Transfer Case Control Module detects a short to ground on the (G95) Neutral Indicator circuit.

Possible Causes
INTERMITTENT NEUTRAL INDICATOR SHORT TO GROUND
(G95) NEUTRAL INDICATOR CIRCUIT OPEN
(G95) NEUTRAL INDICATOR CIRCUIT SHORT TO GROUND
(G95) NEUTRAL INDICATOR CIRCUIT SHORT TO VOLTAGE
TRANSFER CASE SELECTOR SWITCH
TRANSFER CASE CONTROL MODULE

1. NEUTRAL INDICATOR SHORT TO GROUND DTC IS PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and move the Transfer Case Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display NEUTRAL INDICATOR SHORT TO GROUND?

Yes >> Go To 2
No >> Go To 7

NEUTRAL INDICATOR SHORT TO GROUND (CONTINUED)

2. (G95) NEUTRAL INDICATOR CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transfer Case Control Module C1 harness connector.

Disconnect the Transfer Case Selector Switch harness connector.

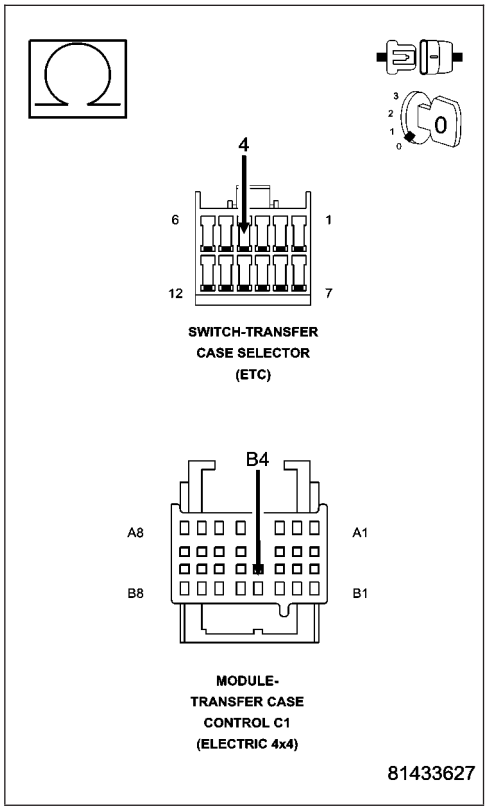
NOTE: Note: Check connectors - Clean/repair as necessary.

Measure the resistance of the (G95) Neutral Indicator circuit from the Transfer Case Control Module C1 harness connector to the Transfer Case Selector Switch harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (G95) Neutral Indicator circuit for an open.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3



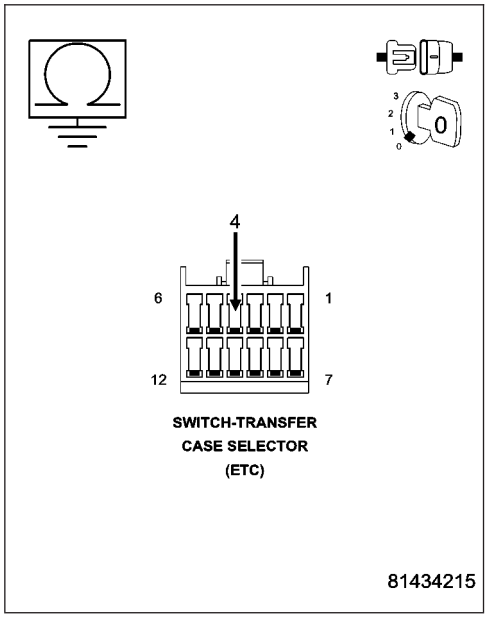
3. (G95) NEUTRAL INDICATOR CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (G95) Neutral Indicator circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (G95) Neutral Indicator circuit for a short to ground.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



NEUTRAL INDICATOR SHORT TO GROUND (CONTINUED)

4. (G95) NEUTRAL INDICATOR CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.

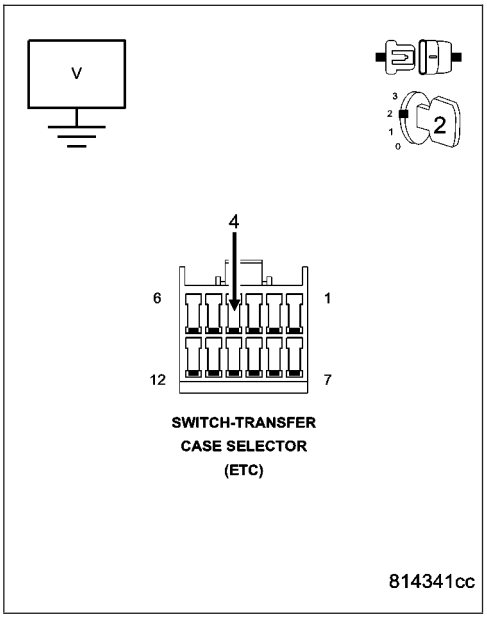
Measure the voltage of the (G95) Neutral Indicator circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (G95) Neutral Indicator circuit for a short to voltage.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 5



5. TRANSFER CASE SELECTOR SWITCH

Turn the ignition off to the lock position.

Connect the Transfer Case Control Module C1 harness connector.

Ignition on, engine not running.

With the DRBIII® under Inputs/Outputs, monitor the Neutral Lamp state.

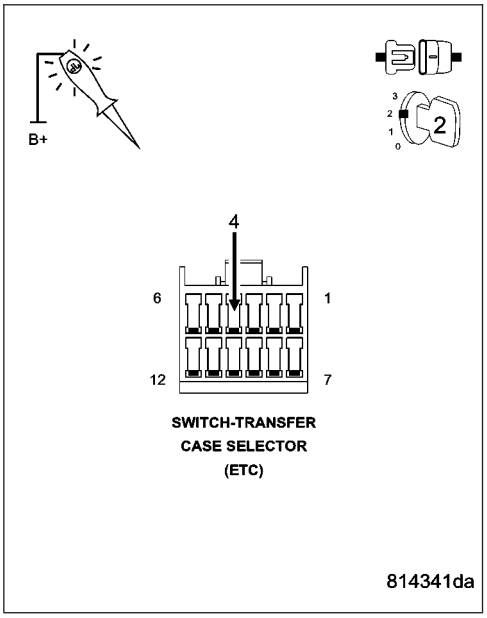
Connect a jumper wire between (G95) Neutral Indicator circuit in the Transfer Case Control Module harness connector and ground.

Does the Neutral Lamp state change from Off with the jumper wire removed to On with the jumper wire in place?

Yes >> Replace the Transfer Case Selector Switch in accordance with the Service Information.

No >> Go To 6

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)



NEUTRAL INDICATOR SHORT TO GROUND (CONTINUED)

6. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Charging System related DTCs or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module in accordance with the Service Information.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

7. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

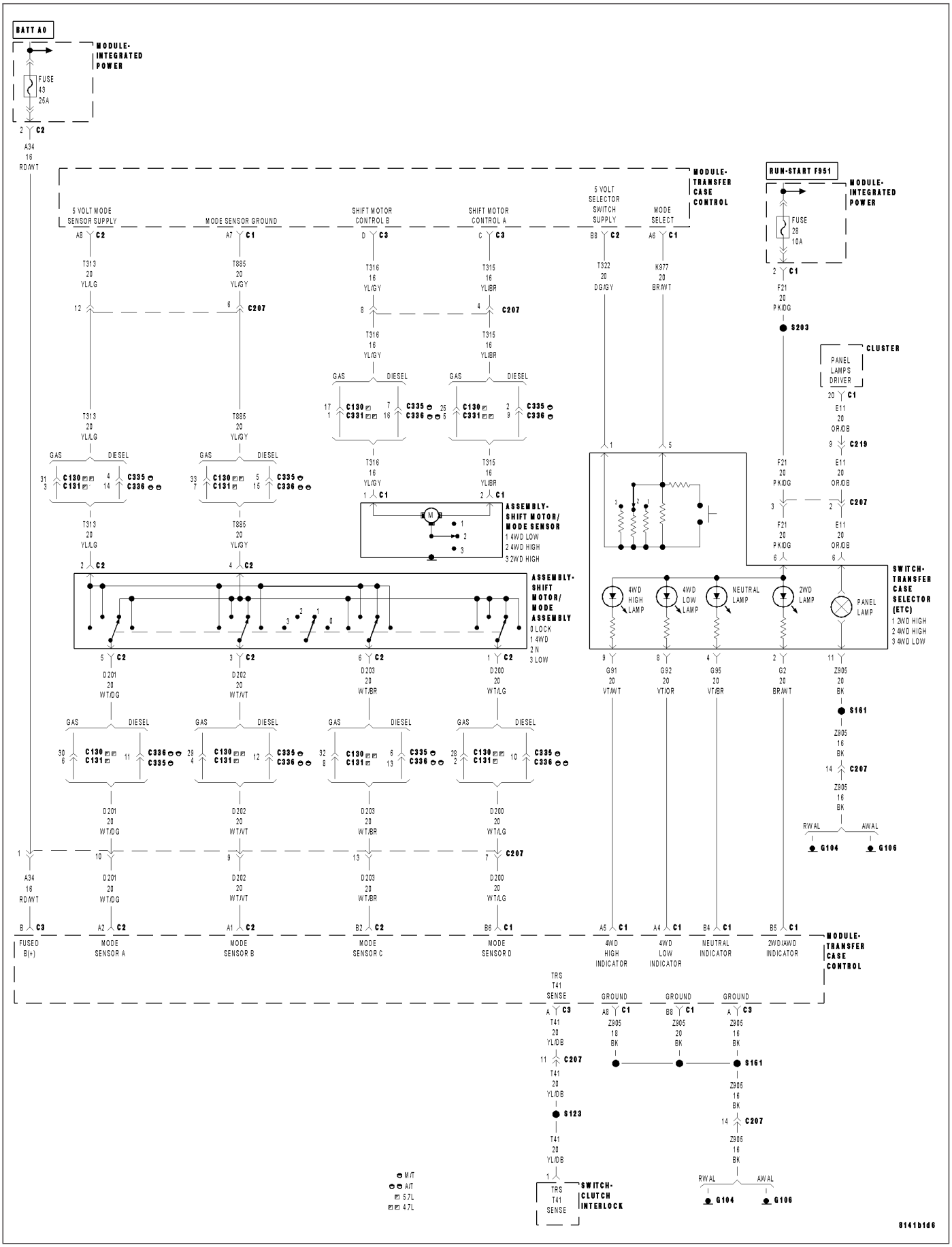
Were there any problems found?

Yes >> Repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

SELECTOR SWITCH/TRANSFER CASE—MISMATCH



SELECTOR SWITCH/TRANSFER CASE—MISMATCH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  With the ignition on and the engine running.
- **Set Condition:**
  When the 2WD/AWD position is selected, the Transfer Case Control Module performs a diagnostic routine to verify that the correct Transfer Case Selector Switch is in place.

Possible Causes
INTERMITTENT SELECTOR SWITCH/TRANSFER CASE - MISMATCH
CHARGING SYSTEM DTCS PRESENT
VERIFY MODULE TYPE 233/2WD
VERIFY MODULE TYPE 244/AWD
VERIFY SELECTOR SWITCH 233/2WD
VERIFY SELECTOR SWITCH 244/AWD
(T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT OPEN
(K977) MODE SELECT CIRCUIT OPEN
TRANSFER CASE SELECTOR SWITCH 233/2WD
TRANSFER CASE SELECTOR SWITCH 244/AWD
TRANSFER CASE CONTROL MODULE

1. CHARGING SYSTEM DTCS PRESENT

With the DRBIII®, read Engine DTCs.

Are there any Charging System related DTCs present?

Yes >> Refer to the symptom list and perform the appropriate diagnostic procedure(s) as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 2

---

2. SELECTOR SWITCH/TRANSFER CASE — MISMATCH DTC PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.

NOTE: If there are any other Transfer Case Control Module DTCs present, perform the applicable diagnostic procedures before continuing with this test.

With the DRBIII®, erase Transfer Case DTCs.

Start the engine and cycle the Transfer Case Selector Switch through all positions.

With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display SELECTOR SWITCH/TRANSFER CASE — MISMATCH?

Yes >> Go To 3

No >> Go To 13

SELECTOR SWITCH/TRANSFER CASE—MISMATCH (CONTINUED)

3. VERIFY TRANSFER CASE TYPE

Identify the Transfer Case type using the Transfer Case Identification Tag.

Select the Transfer Case type as indicated by the Identification Tag:

233/2WD
Go To 4

244/AWD
Go To 7

---

4. VERIFY MODULE TYPE 233/2WD

Identify the Transfer Case type using the DRBIII®.

Compare the Transfer Case type as identified by both the Identification Tag and the DRBIII®.

Do both identify the Transfer Case as 233/2WD?

Yes >> Go To 5

No >> Reprogram the Transfer Case Control Module as type 233/2WD in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

5. VERIFY SELECTOR SWITCH TYPE 233/2WD

Visually identify the Transfer Case Selector Switch type.

Does the Selector Switch display 2WD/4HI/4LO?

Yes >> Go To 6

No >> Replace the Transfer Case Selector Switch type 233/2WD in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

6. TRANSFER CASE SELECTOR SWITCH 233/2WD

Turn the ignition off to the lock position.

Disconnect the Transfer Case Selector Switch harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (K977) Mode Select circuit and the (T322) 5 Volt Selector Switch Supply circuit in the Transfer Case Selector Switch.

Is the resistance between 5200 and 5950 ohms?

Yes >> Go To 10

No >> Replace the 233/2WD Transfer Case Selector Switch in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

SELECTOR SWITCH/TRANSFER CASE—MISMATCH (CONTINUED)

7. VERIFY MODULE TYPE 244/AWD

Identify the Transfer Case type using the DRBIII®.

Compare the Transfer Case type as identified by both the Identification Tag and the DRBIII®.

Do both identify the Transfer Case as 244/AWD?

Yes >> Go To 8

No >> Reprogram the Transfer Case Control Module as type 244/AWD in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

8. VERIFY SELECTOR SWITCH TYPE 244/AWD

Visually identify the Transfer Case Selector Switch type.

Does the Selector Switch display AWD/4HI/4LO?

Yes >> Go To 9

No >> Replace the Transfer Case Selector Switch type 244/AWD in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

9. TRANSFER CASE SELECTOR SWITCH 244/AWD

Turn the ignition off to the lock position.

Disconnect the Transfer Case Selector Switch harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Measure the resistance between the (K977) Mode Select circuit and the (T322) 5 Volt Selector Switch Supply circuit in the Transfer Case Selector Switch.

Is the resistance between 3050 and 3600 ohms?

Yes >> Go To 10

No >> Replace the 244/AWD Transfer Case Selector Switch in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

SELECTOR SWITCH/TRANSFER CASE—MISMATCH (CONTINUED)

10. (T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transfer Case Control Module C2 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

Ignition on, engine not running.

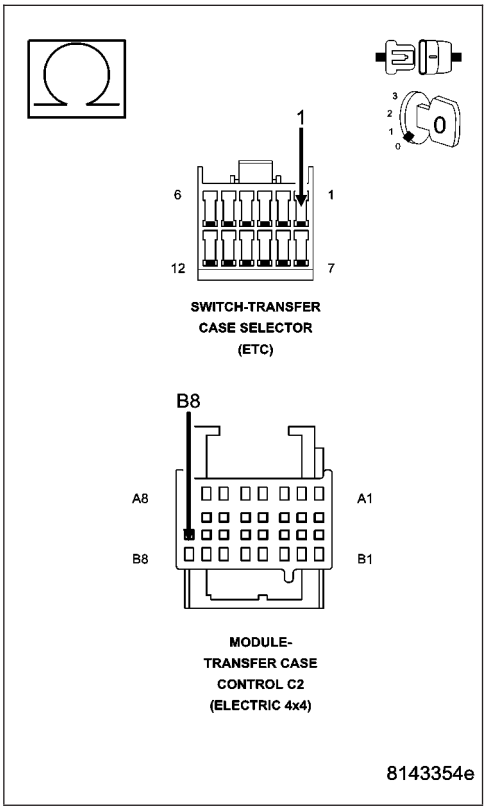
Measure the resistance of the (T322) 5 Volt Selector Switch Supply circuit from the Transfer Case Selector Switch harness connector to the Transfer Case Control Module C2 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 11

No >> Repair the (T322) 5 Volt Selector Switch Supply circuit for an open circuit or high resistance.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)



11. (K977) MODE SELECT CIRCUIT OPEN

Disconnect the Transfer Case Control Module C1 harness connector.

NOTE: Check connectors - Clean/repair as necessary.

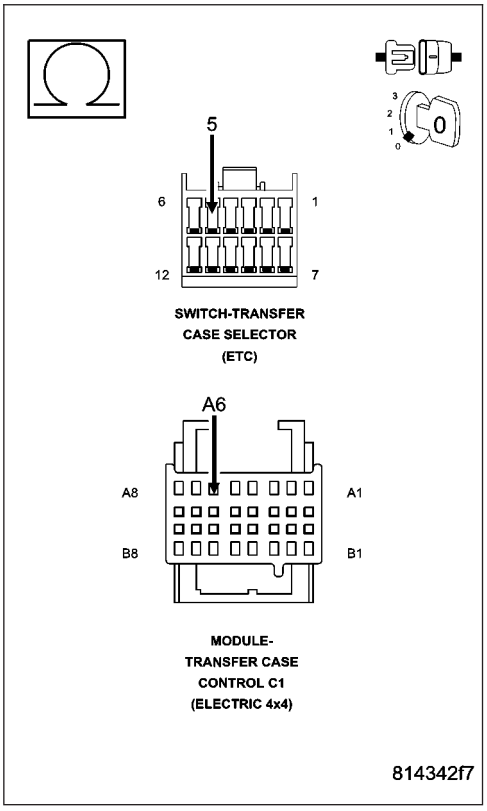
Measure the resistance of the (K977) Mode Select circuit from the Transfer Case Selector Switch harness connector to the Transfer Case Control Module C1 harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 12

No >> Repair the (K977) Mode Select circuit for an open circuit or high resistance.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)



SELECTOR SWITCH/TRANSFER CASE—MISMATCH (CONTINUED)

12. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no Charging System related DTCs or other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

---

13. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

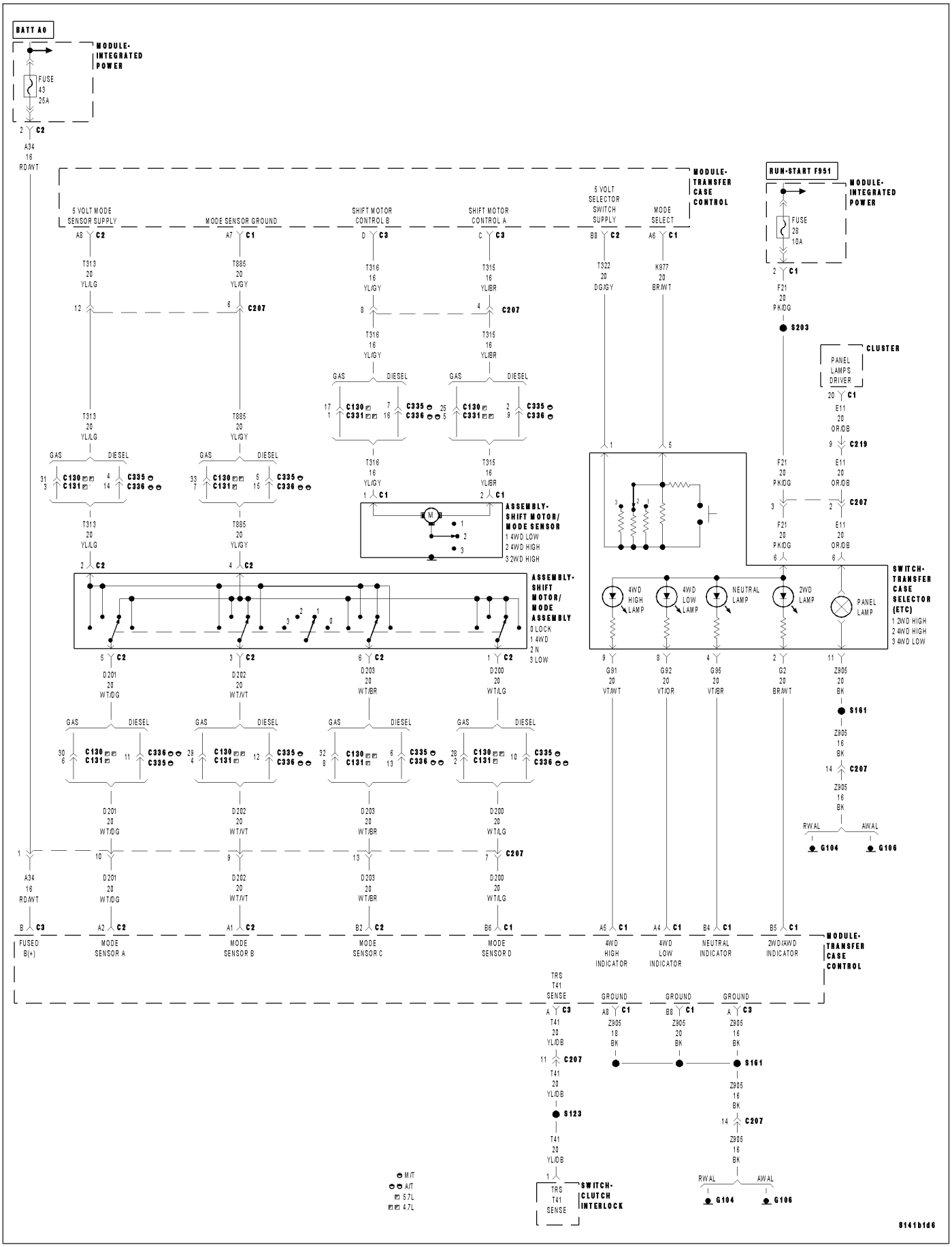
Were there any problems found?

Yes >> Repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

TRANSFER CASE MODE SENSOR ERROR



TRANSFER CASE MODE SENSOR ERROR (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  Whenever the Transfer Case Control Module detects any of the following errors:
  1. An invalid Mode Sensor position.
  2. The Mode Sensor has an incorrect transition during a shift, then attempts and fails twice and defaults to a 4WD Hi position.
  3. The Mode Sensor has four failed transitions during an ignition cycle.

Possible Causes
INTERMITTENT TRANSFER CASE MODE SENSOR ERROR
MODE SENSOR CIRCUIT OPEN
MODE SENSOR CIRCUIT SHORT TO GROUND
MODE SENSOR CIRCUIT SHORT TO VOLTAGE
(T885) MODE SENSOR GROUND CIRCUIT OPEN
(T313) 5 VOLT MODE SENSOR SUPPLY CIRCUIT OPEN
TRANSFER CASE MODE SENSOR
TRANSFER CASE CONTROL MODULE

1. TRANSFER CASE MODE SENSOR ERROR DTC IS PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and move the Transfer Case Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display TRANSFER CASE MODE SENSOR ERROR?

Yes >> Go To 2

No >> Go To 9

TRANSFER CASE MODE SENSOR ERROR (CONTINUED)

2. MODE SENSOR CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transfer Case Control Module C1 and C2 harness connectors.

Disconnect the Shift Motor/Mode Sensor C2 harness connector.

NOTE: Note: Check connectors - Clean/repair as necessary.

A. Measure the resistance of the (D201) Mode Sensor A circuit from the Transfer Case Control Module C1 harness connector to the Shift Motor/Mode Sensor C2 harness connector.

B. Measure the resistance of the (D202) Mode Sensor B circuit from the Transfer Case Control Module C1 harness connector to the Shift Motor/Mode Sensor C2 harness connector.

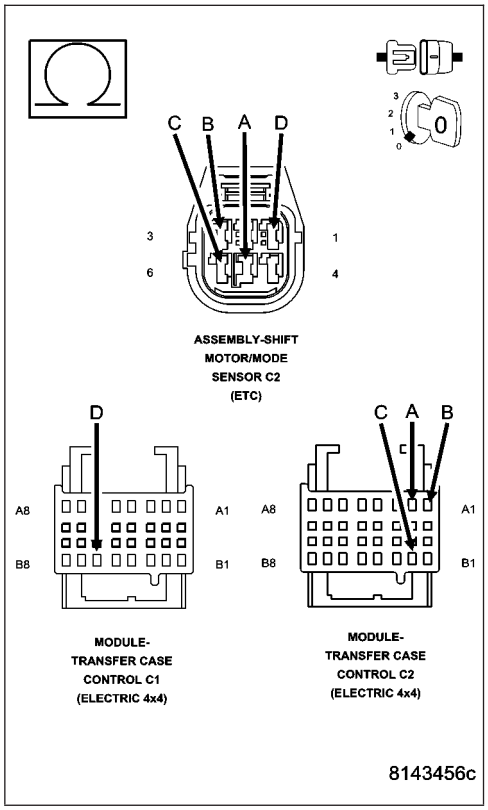
C. Measure the resistance of the (D203) Mode Sensor C circuit from the Transfer Case Control Module C1 harness connector to the Shift Motor/Mode Sensor C2 harness connector.

D. Measure the resistance of the (D200) Mode Sensor D circuit from the Transfer Case Control Module C2 harness connector to the Shift Motor/Mode Sensor C2 harness connector.

Is the resistance above 5.0 ohms for any of the circuits?

Yes >> Repair the open Mode Sensor circuit.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3



3. MODE SENSOR CIRCUIT SHORT TO GROUND

A. Measure the resistance between ground and the (D201) Mode Sensor A circuit.

B. Measure the resistance between ground and the (D202) Mode Sensor B circuit.

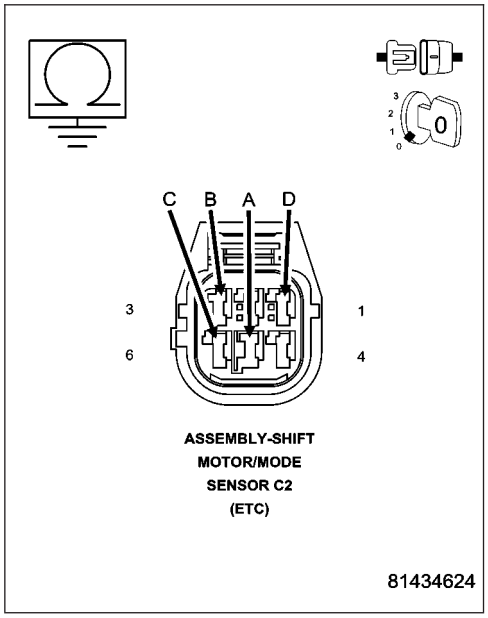
C. Measure the resistance between ground and the (D203) Mode Sensor C circuit.

D. Measure the resistance between ground and the (D200) Mode Sensor D circuit.

Is the resistance below 5.0 ohms between any of the Mode sensor circuits and ground?

Yes >> Repair the Mode Sensor circuit for a short to ground.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



TRANSFER CASE MODE SENSOR ERROR (CONTINUED)

4. MODE SENSOR CIRCUIT SHORT TO VOLTAGE

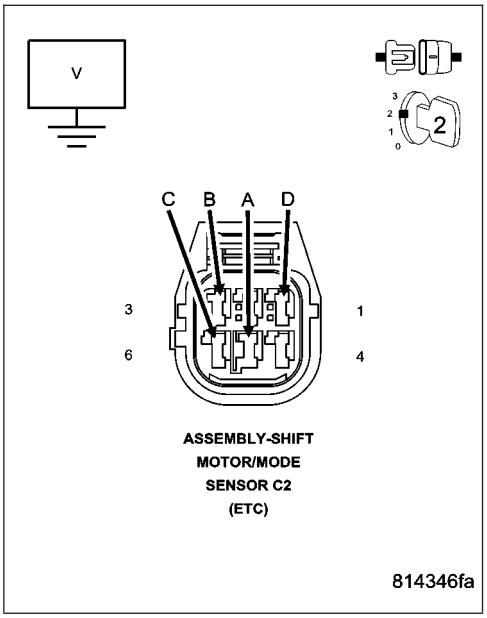
Ignition on, engine not running.

A. Measure the voltage of the (D201) Mode Sensor A circuit.
B. Measure the voltage of the (D202) Mode Sensor B circuit.
C. Measure the voltage of the (D203)Mode Sensor C circuit.
D. Measure the voltage of the (D200) Mode Sensor D circuit.

Is there voltage present on any of the Mode Sensor circuits?

Yes >> Repair the Mode Sensor circuit for a short to voltage.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 5



5. (T885) MODE SENSOR GROUND CIRCUIT OPEN

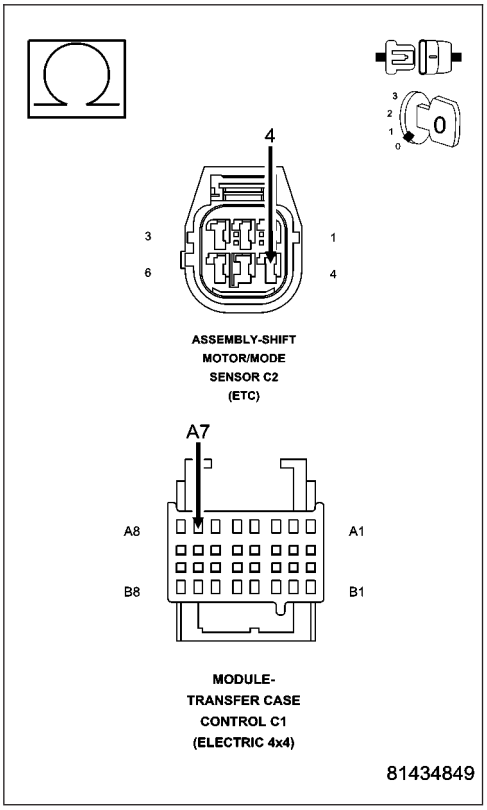
Turn the ignition off to the lock position.

Measure the resistance of the (T885) Mode Sensor Ground circuit from the Transfer Case Control Module C1 harness connector to the Shift Motor/Mode Sensor C2 harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T885) Mode Ground Sensor circuit for an open.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

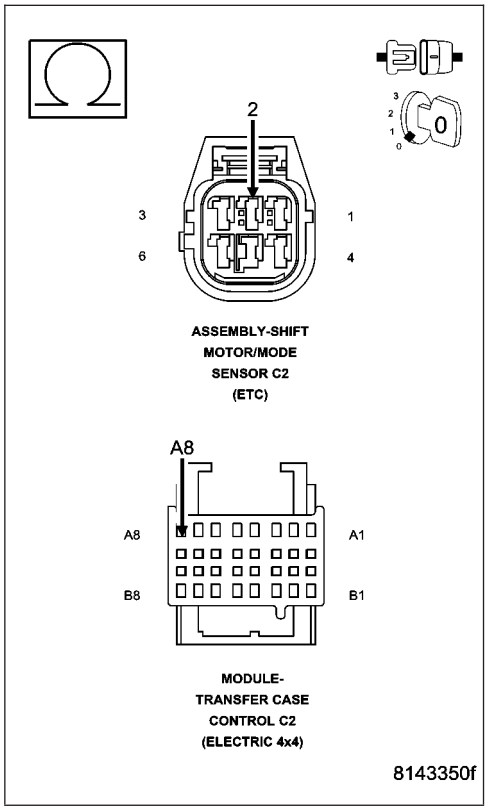
No >> Go To 6



TRANSFER CASE MODE SENSOR ERROR (CONTINUED)

6. (T313) 5 VOLT MODE SENSOR SUPPLY CIRCUIT OPEN

Measure the resistance of the (T313) 5 Volt Mode Sensor Supply circuit from the Transfer Case Control Module harness C2 connector to the Shift Motor/Mode Sensor C2 harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T313) 5 Volt Mode Sensor 'Supply circuit for an open.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 7

---

7. SHIFT MOTOR/MODE SENSOR

Replace the Shift Motor/Mode Sensor in accordance with the Service Information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and move the Transfer Case Selector Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display TRANSFER CASE MODE SENSOR ERROR?

Yes >> Go To 8

No >> Test Complete.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

---

8. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module in accordance with the Service Information.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

TRANSFER CASE MODE SENSOR ERROR (CONTINUED)

9. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

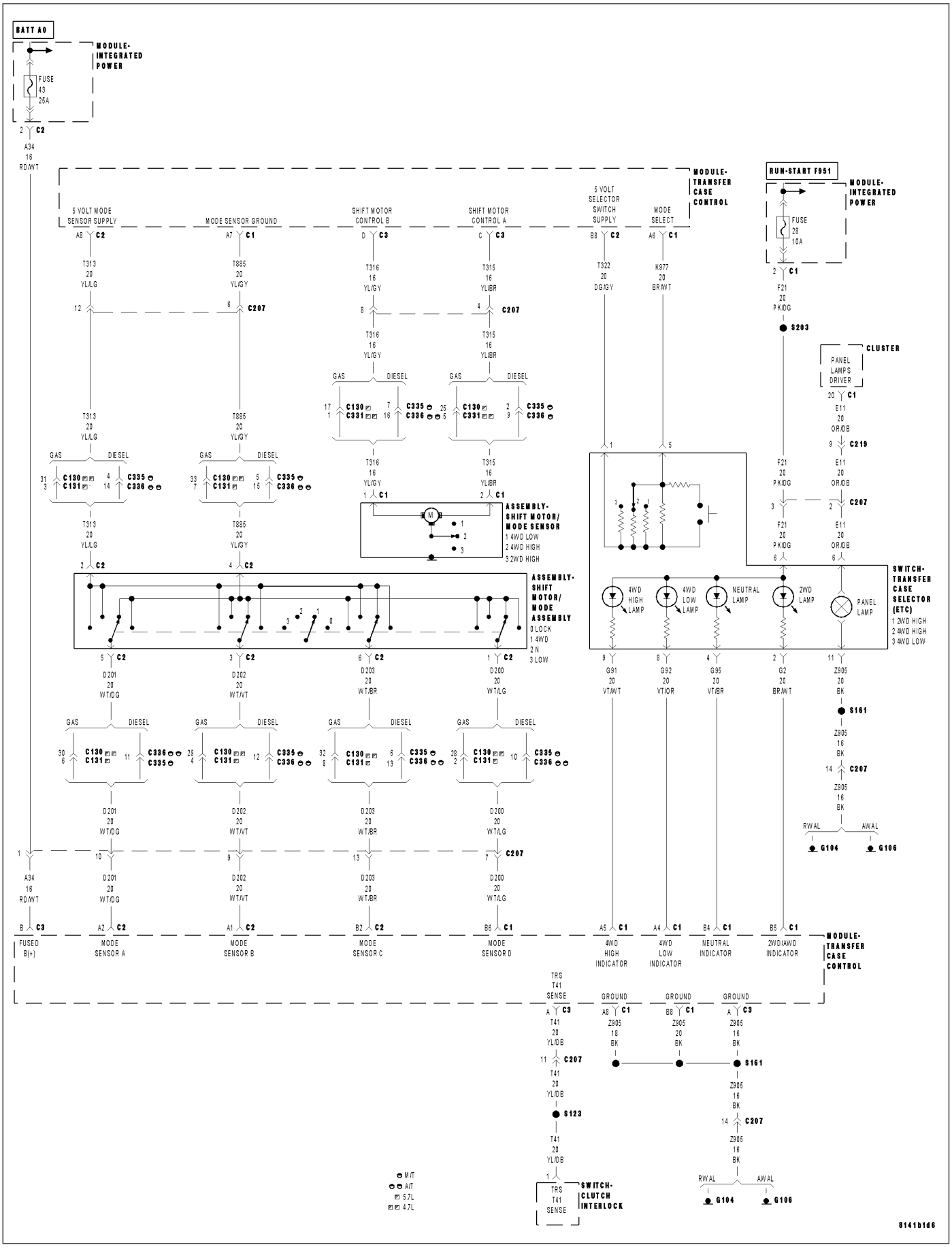
Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/ TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

TRANSFER CASE SELECTOR SWITCH ERROR



TRANSFER CASE SELECTOR SWITCH ERROR (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  Continuously with the ignition on.
- **Set Condition:**
  Whenever the Transfer Case Control Module detects any of the following errors:
  1. Selector Switch input of less than 250 ohms or more than 14.5k ohms.
  2. Selector Switch input voltage less than .25 volts or greater than 5.0 volts.

Possible Causes
INTERMITTENT TRANSFER CASE SELECTOR SWITCH ERROR
(K977) MODE SELECT CIRCUIT OPEN
(K977) MODE SELECT CIRCUIT SHORT TO GROUND
(K977) MODE SELECT CIRCUIT SHORT TO VOLTAGE
(T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT OPEN
TRANSFER CASE SELECTOR SWITCH
TRANSFER CASE CONTROL MODULE

1. TRANSFER CASE SELECTOR SWITCH ERROR DTC IS PRESENT

With the DRBIII®, read Transfer Case DTCs. Record all DTC information.
With the DRBIII®, erase Transfer Case DTCs.
Start the engine and move the Transfer Case Select Switch to each position.
With the DRBIII®, read Transfer Case DTCs.

Does the DRBIII® display TRANSFER CASE SELECTOR SWITCH ERROR?

Yes >> Go To 2

No >> Go To 8

TRANSFER CASE SELECTOR SWITCH ERROR (CONTINUED)

2. (K977) MODE SELECT CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transfer Case Control Module C1 harness connector.

Disconnect the Transfer Case Selector Switch harness connector.

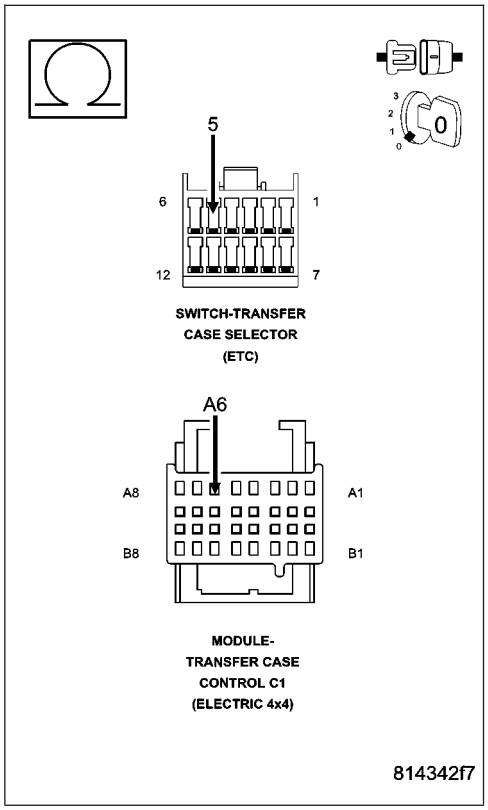
NOTE: Note: Check connectors - Clean/repair as necessary.

Measure the resistance of the (K977) Mode Select circuit from the Transfer Case Control Module harness connector to the Transfer Case Selector Switch harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (K977) Mode Select circuit for an open.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 3



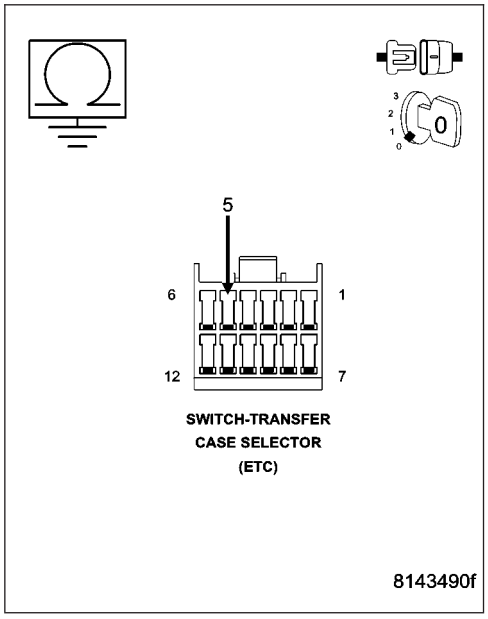
3. (K977) MODE SELECT CIRCUIT SHORT TO GROUND

Measure the resistance between ground and the (K977) Mode Select circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the (K977) Mode Select circuit for a short to ground.
Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 4



TRANSFER CASE SELECTOR SWITCH ERROR (CONTINUED)

4. (K977) MODE SELECT CIRCUIT SHORT TO VOLTAGE

Ignition on, engine not running.

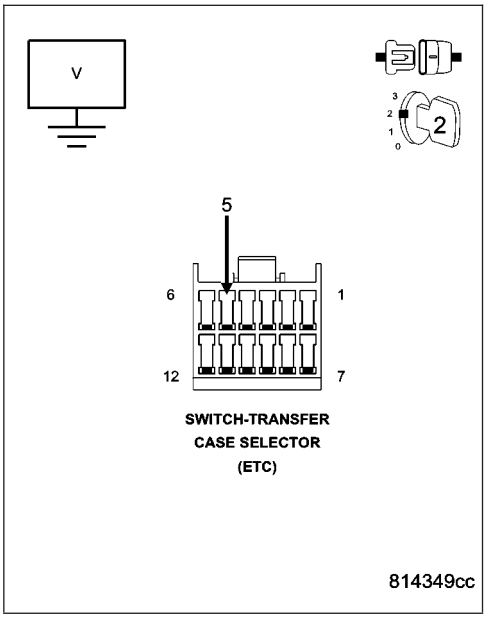
Measure the voltage of the (K977) Mode Select circuit.

Is the voltage above 0.5 volt?

Yes >> Repair the (K977) Mode Select circuit for a short to voltage.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 5



5. (T322) 5 VOLT SELECTOR SWITCH SUPPLY CIRCUIT OPEN

Turn the ignition off to the lock position.

Disconnect the Transfer Case Control Module C2 harness connector.

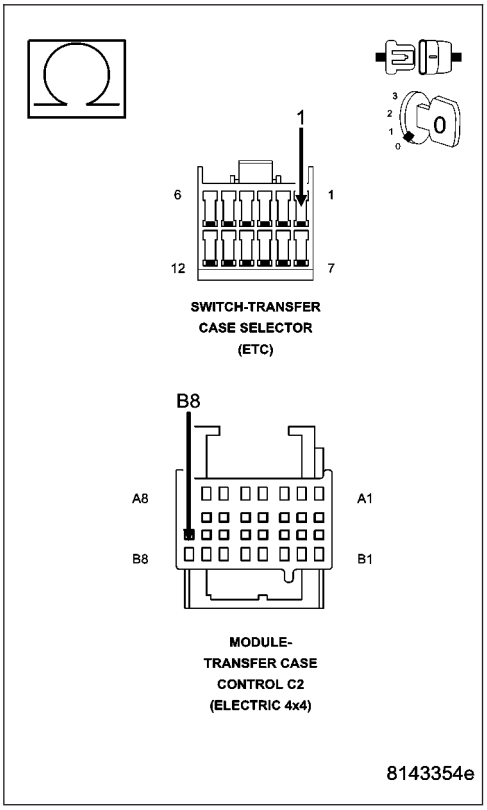
Measure the resistance of the (T322) 5 Volt Selector Switch Supply circuit from the Transfer Case Control Module C2 harness connector to the Transfer Case Selector Switch harness connector.

Is the resistance above 5.0 ohms?

Yes >> Repair the (T322) 5 Volt Selector Switch Supply circuit for an open.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Go To 6

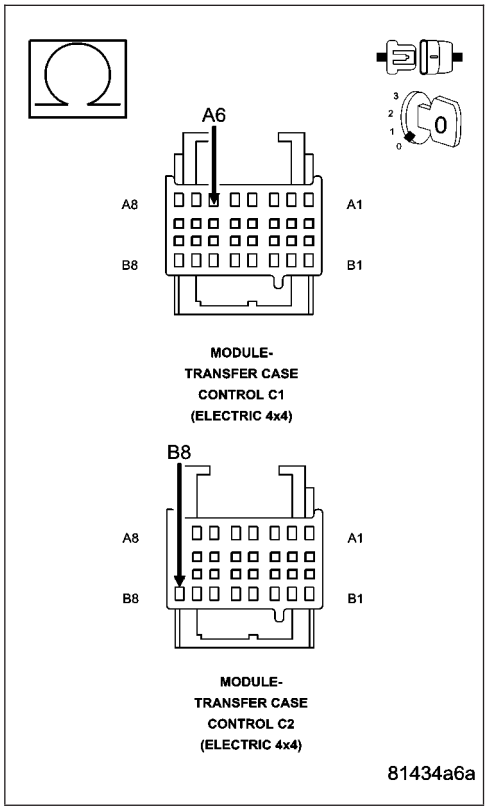


TRANSFER CASE SELECTOR SWITCH ERROR (CONTINUED)

6. TRANSFER CASE SELECTOR SWITCH

Connect the Transfer Case Select Switch harness connector.

Measure the resistance between the (T322) 5 Volt Selector Switch Supply circuit in the Transfer Case Control Module C2 harness connector and the (K977) Mode Select circuit in the Transfer Case Control Module C1 harness connector.



Is the resistance between 200 ohms and 15.5k ohms in all Selector Switch ranges?

Yes >> Go To 7

No >> Replace the Transfer Case Selector Switch in accordance with the Service Information.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

---

7. TRANSFER CASE CONTROL MODULE

Using the wiring diagram as a guide, inspect the wiring and connectors relative to this DTC. Inspect all power and ground circuits. Repair as necessary.

If there are no other possible causes remaining, view repair.

Repair

Replace the Transfer Case Control Module in accordance with the Service Information.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

---

8. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the schematics as a guide, inspect the wiring and connectors specific to this circuit.

Wiggle test the wiring harness and connectors while checking for shorted and open circuits.

Using the DRBIII®, monitor the data related to this circuit while performing the wiggle test. Look for the data to change or for the DTC to reset.

Were there any problems found?

Yes >> Repair as necessary.

Perform TRANSFER CASE VERIFICATION TEST. (Refer to 21 - TRANSMISSION/TRANSAXLE/TRANSFER CASE - DIAGNOSIS AND TESTING)

No >> Test Complete.

TRANSFER CASE - ELECTRICAL DIAGNOSTICS (POWER WAGON)

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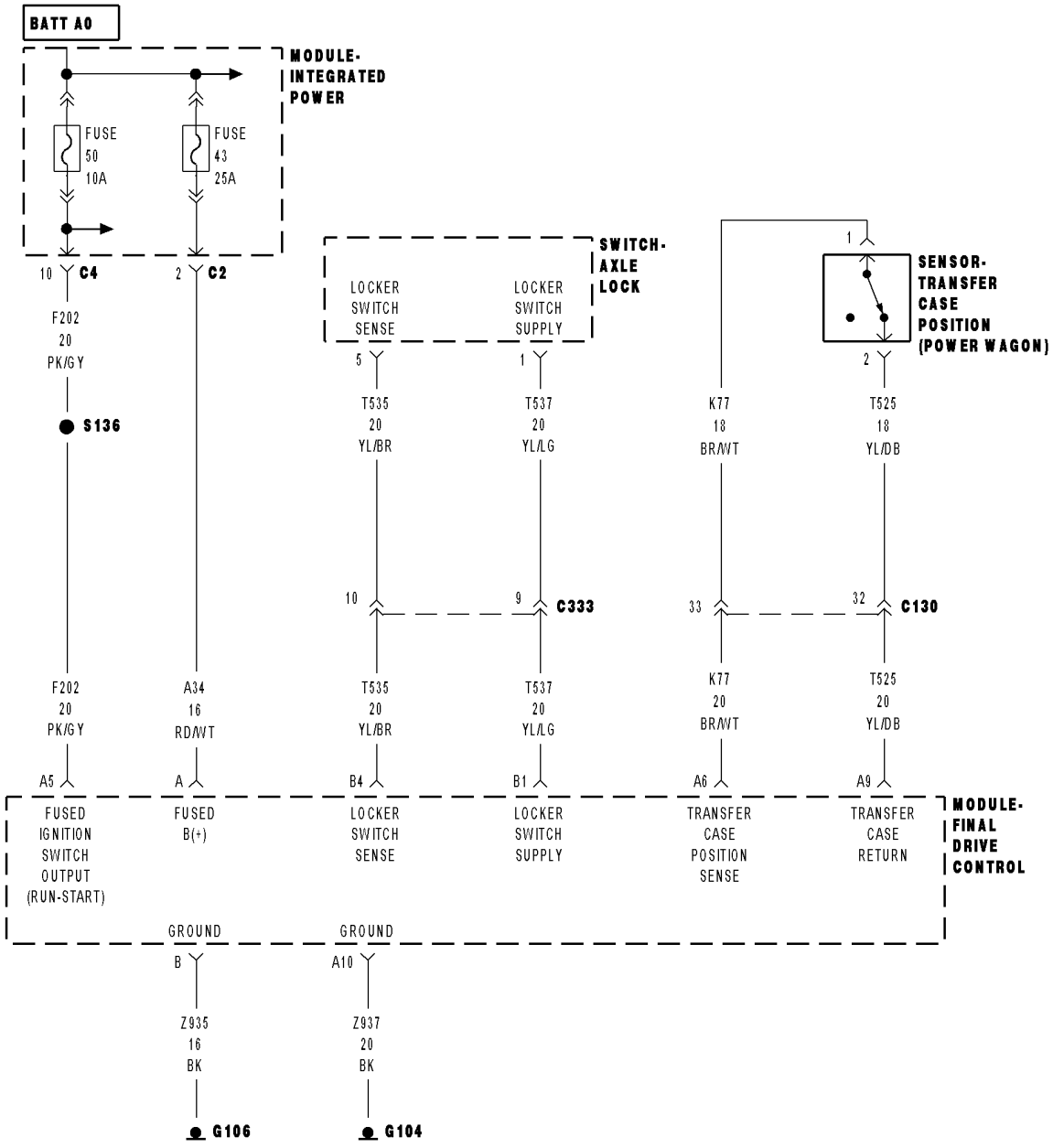
page

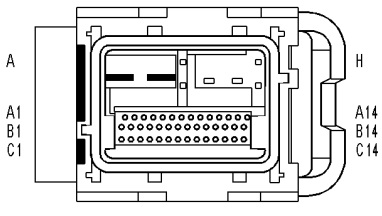
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TRANSFER CASE - ELECTRICAL DIAGNOSTICS (POWER WAGON)

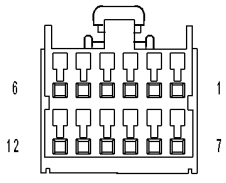
DIAGNOSIS AND TESTING

C1400-TRANSFER CASE RANGE SELECT SWITCH PERFORMANCE

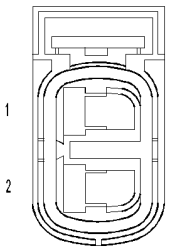




MODULE-
FINAL
DRIVE
CONTROL
(5.7L HD)



SWITCH-
AXLE
LOCK



SENSOR-
TRANSFER
CASE
POSITION
(POWER WAGON)

814584b2

C1400-TRANSFER CASE RANGE SELECT SWITCH PERFORMANCE (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and no system undervoltage or overvoltage condition present.
- **Set Condition:**
  The Final Drive Control Module is not receiving a valid voltage for any switch position.

Possible Causes
INTERMITTENT TRANSFER CASE RANGE SELECT SWITCH PERFORMANCE
(K77) TRANSFER CASE POSITION SENSE CIRCUIT OPEN
(K77) TRANSFER CASE POSITION SENSE CIRCUIT SHORTED TO GROUND
(T525) TRANSFER CASE RETURN CIRCUIT OPEN
(T525) TRANSFER CASE RETURN CIRCUIT SHORT TO GROUND
TRANSFER CASE POSITION SENSOR
FINAL DRIVE CONTROL MODULE

Diagnostic Test

1. DTC IS ACTIVE

Ignition on, engine not running.

NOTE: Repair any system undervoltage or overvoltage DTCs that are set in this module before proceeding.
With the scan tool, select View DTCs in the Final Drive Control Module.

Is the status Active for this DTC?

Yes >> Go To 2

No >> Go To 9

---

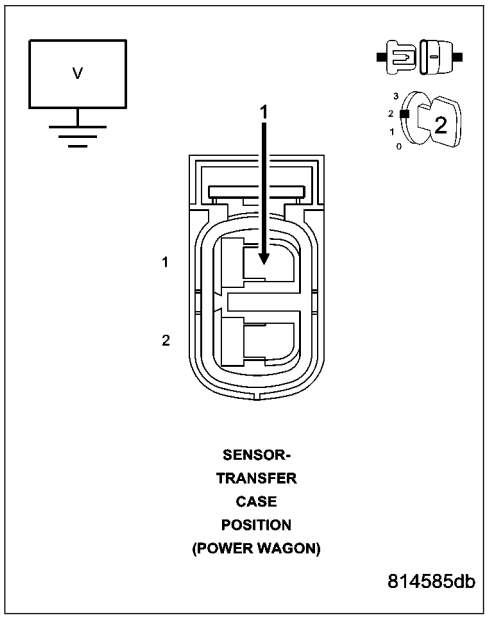
2. (K77) TRANSFER CASE POSITION SENSE CIRCUIT VOLTAGE

Turn the ignition off.
Disconnect the Transfer Case Position Sensor harness connector.
Turn the ignition on.
Measure the voltage of the (K77) Transfer Case Position Sense circuit.

Is the voltage between 4.7 and 5.2 volts?

Yes >> Go To 5

No >> Go To 3



C1400-TRANSFER CASE RANGE SELECT SWITCH PERFORMANCE (CONTINUED)

3. (K77) TRANSFER CASE POSITION SENSE CIRCUIT OPEN

Turn the ignition off.

Disconnect the Final Drive Control Module harness connector.

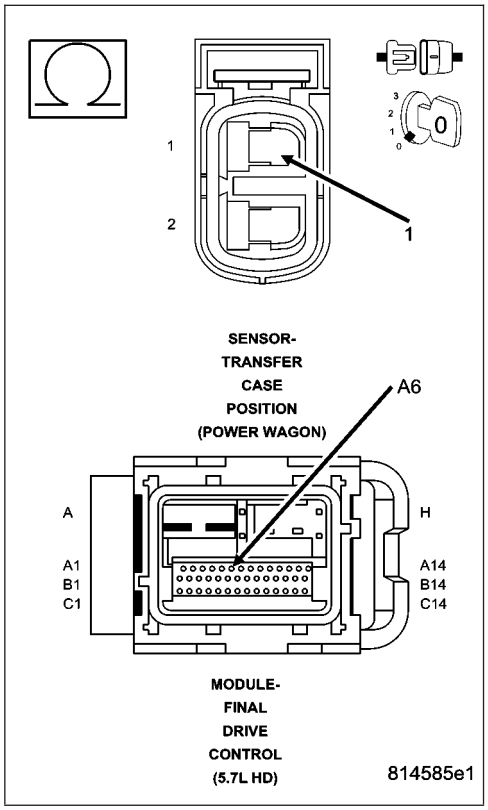
Measure the resistance of the (K77) Transfer Case Position Sense circuit.

Is the resistance greater than 5.0 ohms?

Yes >> Repair the (K77) Transfer Case Position Sense circuit for an open.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go To 4



4. (K77) TRANSFER CASE POSITION SENSE CIRCUIT SHORTED TO GROUND

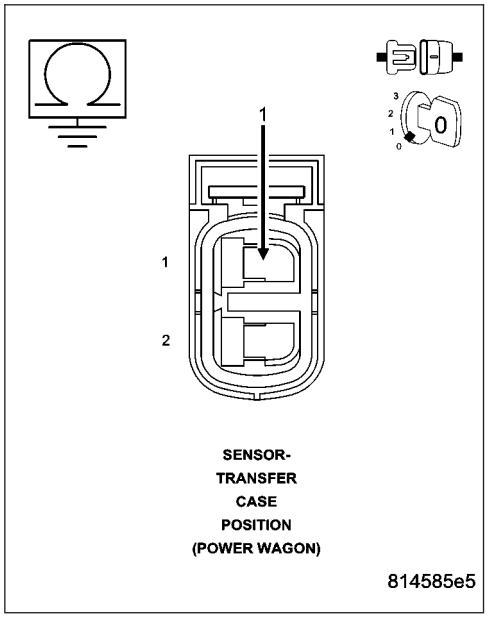
Measure the resistance between the (K77) Transfer Case Position Sense circuit and ground.

Is the resistance less than 5.0 ohms?

Yes >> Repair the (K77) Transfer Case Position Sense circuit for a short to ground. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

Perform the FDCM VERIFICATION TEST.

No >> Go To 8



C1400-TRANSFER CASE RANGE SELECT SWITCH PERFORMANCE (CONTINUED)

5. TRANSFER CASE POSITION SENSOR

Ignition on, engine not running.

With the scan tool in Data Display, read the 4wd Range Switch Voltage with the Transfer Case Position Sensor harness connector disconnected.

The switch voltage should be approximately 0 volts.

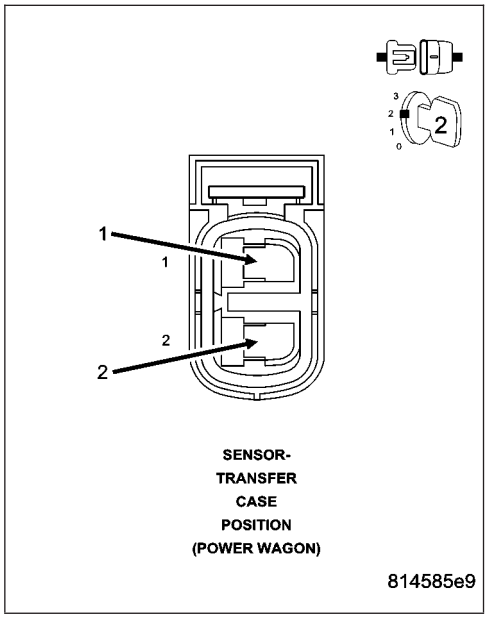
Turn the ignition off.

Connect a jumper wire between the (K77) Transfer Case Position Sense circuit and the (T525) Transfer Case Return circuit in the Transfer Case Position Sensor harness connector.

Ignition on, engine not running.

With the scan tool in Data Display, read the 4wd Range Switch Voltage.

The switch voltage should be approximately 5 volts.



Does the voltage display as described?

Yes >> Replace the Transfer Case Position Sensor.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go To 6

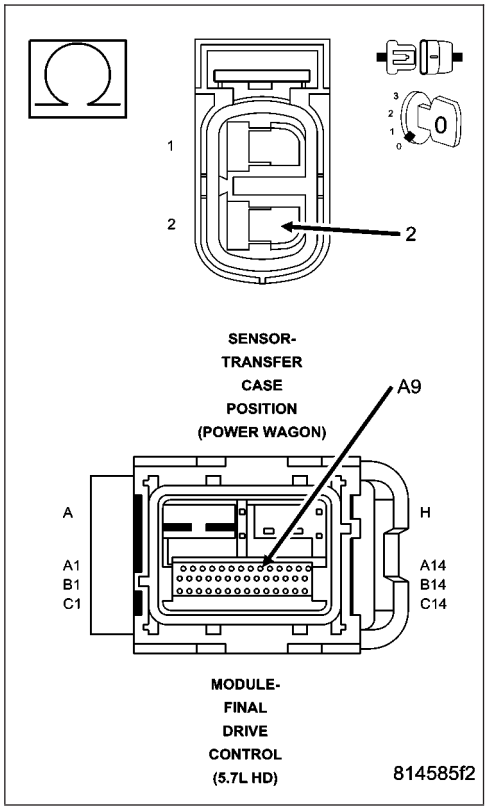
---

6. (T525) TRANSFER CASE RETURN CIRCUIT OPEN

Turn the ignition off.

Disconnect the Final Drive Control Module harness connector.

Measure the resistance of the (T525) Transfer Case Return circuit between the Transfer Case Position Sensor harness connector and the Final Drive Control Module harness connector.



Is the resistance above 5.0 ohms?

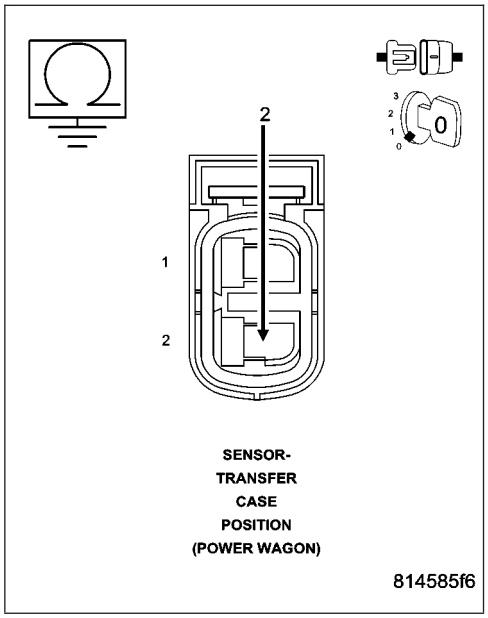
Yes >> Repair the (T525) Transfer Case Return circuit for an open.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go To 7

C1400-TRANSFER CASE RANGE SELECT SWITCH PERFORMANCE (CONTINUED)

7. (T525) TRANSFER CASE RETURN CIRCUIT SHORT TO GROUND

Measure the resistance between the (T525) Transfer Case Return circuit and ground.



Is the resistance less than 5.0 ohms?

Yes >> Repair the (T525) Transfer Case Return circuit for a short to ground.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go To 8

---

8. FINAL DRIVE CONTROL MODULE

View repair.

Repair

Replace the Final Drive Control Module in accordance with the Service Information.
Perform the FDCM VERIFICATION TEST (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

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9. INTERMITTENT TRANSFER CASE RANGE SELECT SWITCH PERFORMANCE

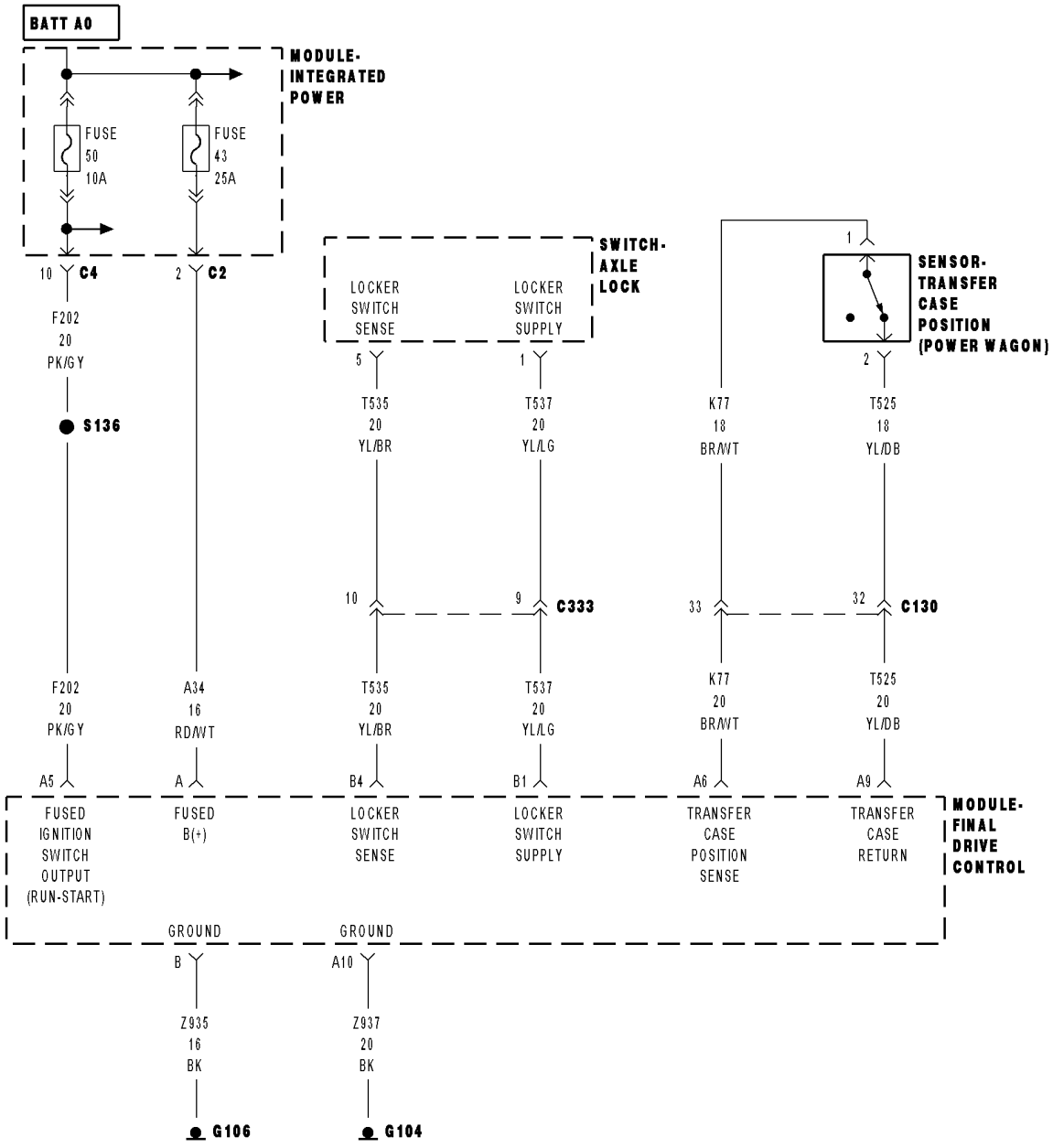
The conditions necessary to set this DTC are not present at this time.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.
Look for the data to change or for the DTC to reset during the wiggle test.
While monitoring the scan tool data relative to this circuit, move the selector switch to each position several times. Look for the data to change other than as expected or for the DTC to reset.

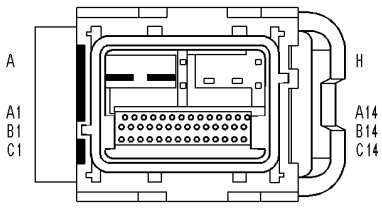
Were any problems found?

Yes >> Repair as necessary.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

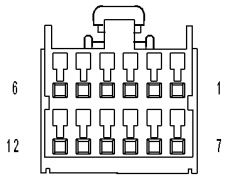
No >> Test complete.

C1401-TRANSFER CASE RANGE SELECT SWITCH CIRCUIT LOW

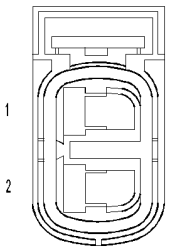




MODULE-
FINAL
DRIVE
CONTROL
(5.7L HD)



SWITCH-
AXLE
LOCK



SENSOR-
TRANSFER
CASE
POSITION
(POWER WAGON)

814584b2

C1401-TRANSFER CASE RANGE SELECT SWITCH CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and no system undervoltage or overvoltage or supply voltage low conditions present.
- **Set Condition:**
  The sensed voltage is below a specified value for a calibrated amount of time.

Possible Causes
INTERMITTENT TRANSFER CASE RANGE SELECT SWITCH CIRCUIT LOW
(K77) TRANSFER CASE POSITION SENSE CIRCUIT SHORTED TO GROUND
(K77) TRANSFER CASE POSITION SENSE CIRCUIT OPEN
(T525) TRANSFER CASE RETURN CIRCUIT SHORT TO GROUND
(T525) TRANSFER CASE RETURN CIRCUIT OPEN
TRANSFER CASE POSITION SENSOR
FINAL DRIVE CONTROL MODULE

Diagnostic Test

1. 4WD RANGE SWITCH VOLTAGE LESS THAN 0.2 VOLTS

Ignition on, engine not running.

NOTE: Repair any system undervoltage or overvoltage DTCs that are set in this module before proceeding.
With the scan tool under Data Display, read the 4WD Range Switch Voltage.

Is the voltage less than 0.2 volts?

Yes >> Go To 2

No >> Go To 9

---

2. TRANSFER CASE POSITION SENSOR

Turn the ignition off.

Disconnect the Transfer Case Position Sensor harness connector.

Connect a jumper wire between the (K77) Transfer Case Position Sense circuit and the (T525) Transfer Case Return circuit in the Transfer Case Position Sensor harness connector.

Ignition on, engine not running.

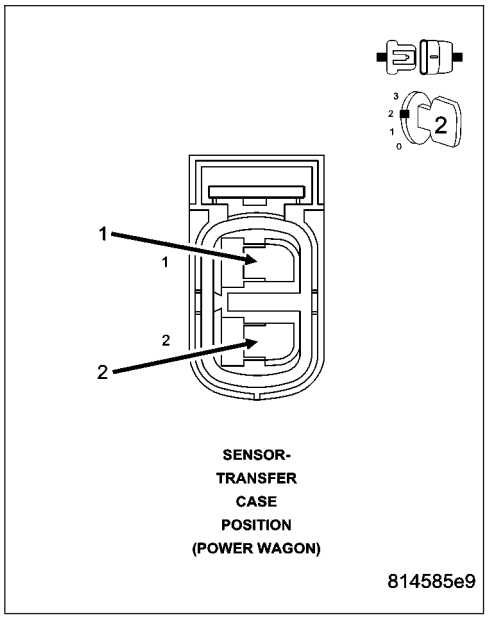
With the scan tool under Data Display, read the 4WD Range Switch Voltage.

The switch voltage should be approximately 5.0 volts.

Does the voltage display as described?

Yes >> Replace the Transfer Case Position Sensor.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go To 3



SENSOR-TRANSFER CASE POSITION (POWER WAGON)

814585e9

C1401-TRANSFER CASE RANGE SELECT SWITCH CIRCUIT LOW (CONTINUED)

3. (K77) TRANSFER CASE POSITION SENSE CIRCUIT VOLTAGE

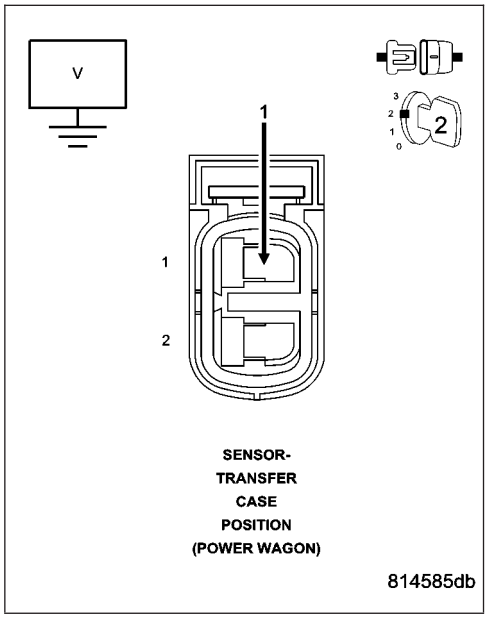
Turn the ignition on.

Measure the voltage of the (K77) Transfer Case Position Sense circuit. The voltage should be approximately 5.0 volts.

Does the voltage display as described?

Yes >> Go To 6

No >> Go To 4



4. (K77) TRANSFER CASE POSITION SENSE CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Final Drive Control Module harness connector.

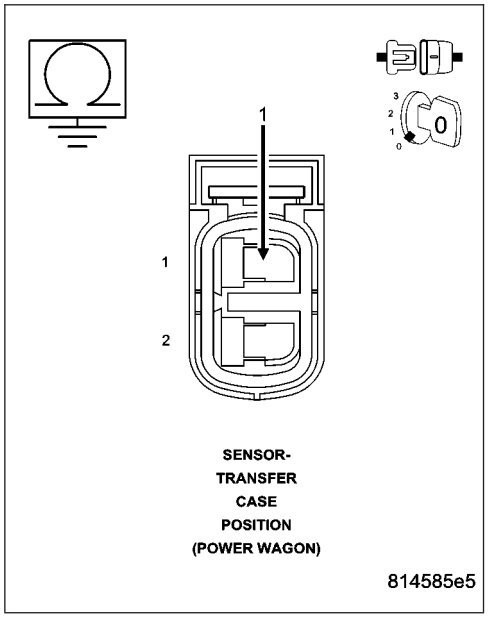
Measure the resistance between the (K77) Transfer Case Position Sense circuit and ground.

Is the resistance less than 5.0 ohms?

Yes >> Repair the (K77) Transfer Case Position Sense circuit for a short to ground.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go To 5



C1401-TRANSFER CASE RANGE SELECT SWITCH CIRCUIT LOW (CONTINUED)

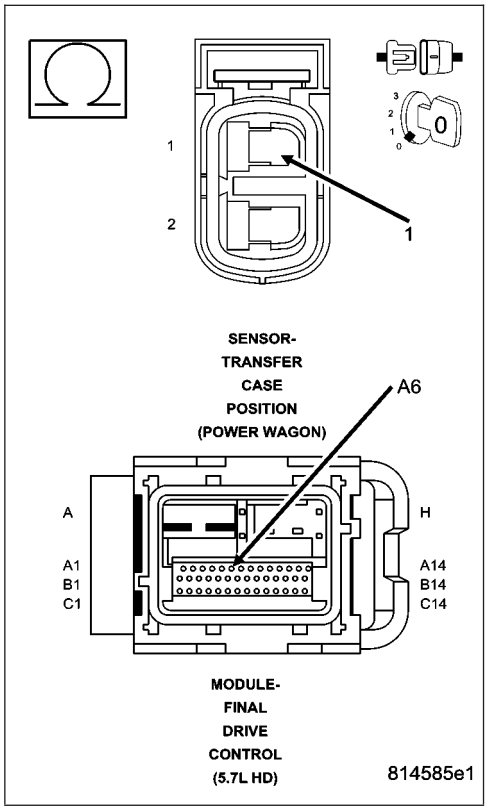
5. (K77) TRANSFER CASE POSITION SENSE CIRCUIT OPEN

Measure the resistance of the (K77) Transfer Case Position Sense circuit between the Transfer Case Position Sensor harness connector and the Final Drive Control Module harness connector.

Is the resistance greater than 5.0 ohms?

Yes >> Repair the (K77) Transfer Case Position Sense circuit for an open.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go To 8



6. (T525) TRANSFER CASE RETURN CIRCUIT SHORT TO GROUND

Turn the ignition off.

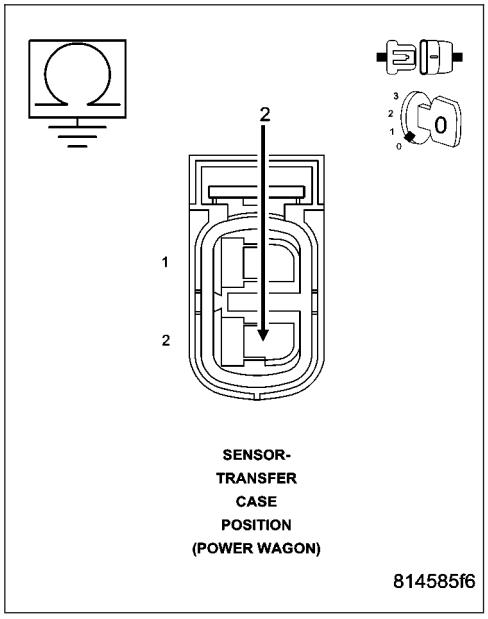
Disconnect the Final Drive Control Module harness connector.

Measure the resistance between the (T525) Transfer Case Return circuit and ground.

Is the resistance less than 5.0 ohms?

Yes >> Repair the (T525) Transfer Case Return circuit for a short to ground.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

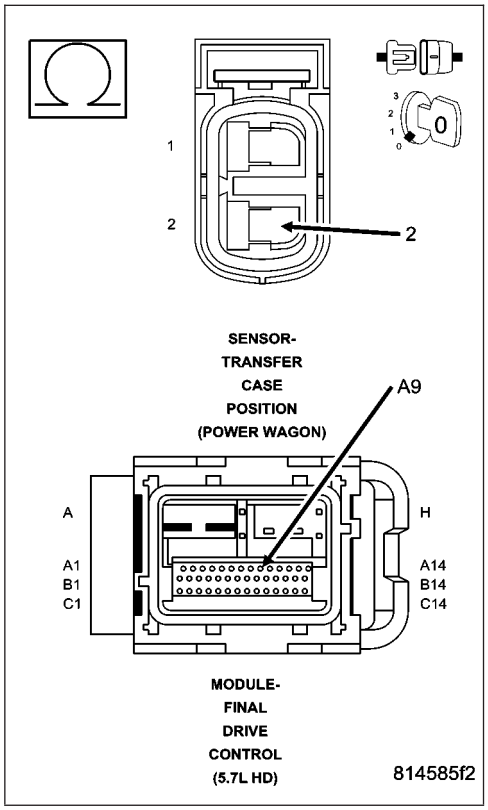
No >> Go To 7



C1401-TRANSFER CASE RANGE SELECT SWITCH CIRCUIT LOW (CONTINUED)

7. (T525) TRANSFER CASE RETURN CIRCUIT OPEN

Measure the resistance of the (T525) Transfer Case Return circuit between the Transfer Case Position Sensor harness connector and the Final Drive Control Module harness connector.



Is the resistance above 5.0 ohms?

Yes >> Repair the (T525) Transfer Case Return circuit for an open.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go To 8

---

8. FINAL DRIVE CONTROL MODULE

View repair.

Repair

Replace the Final Drive Control Module in accordance with the Service Information.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

---

9. INTERMITTENT WIRING AND CONNECTORS

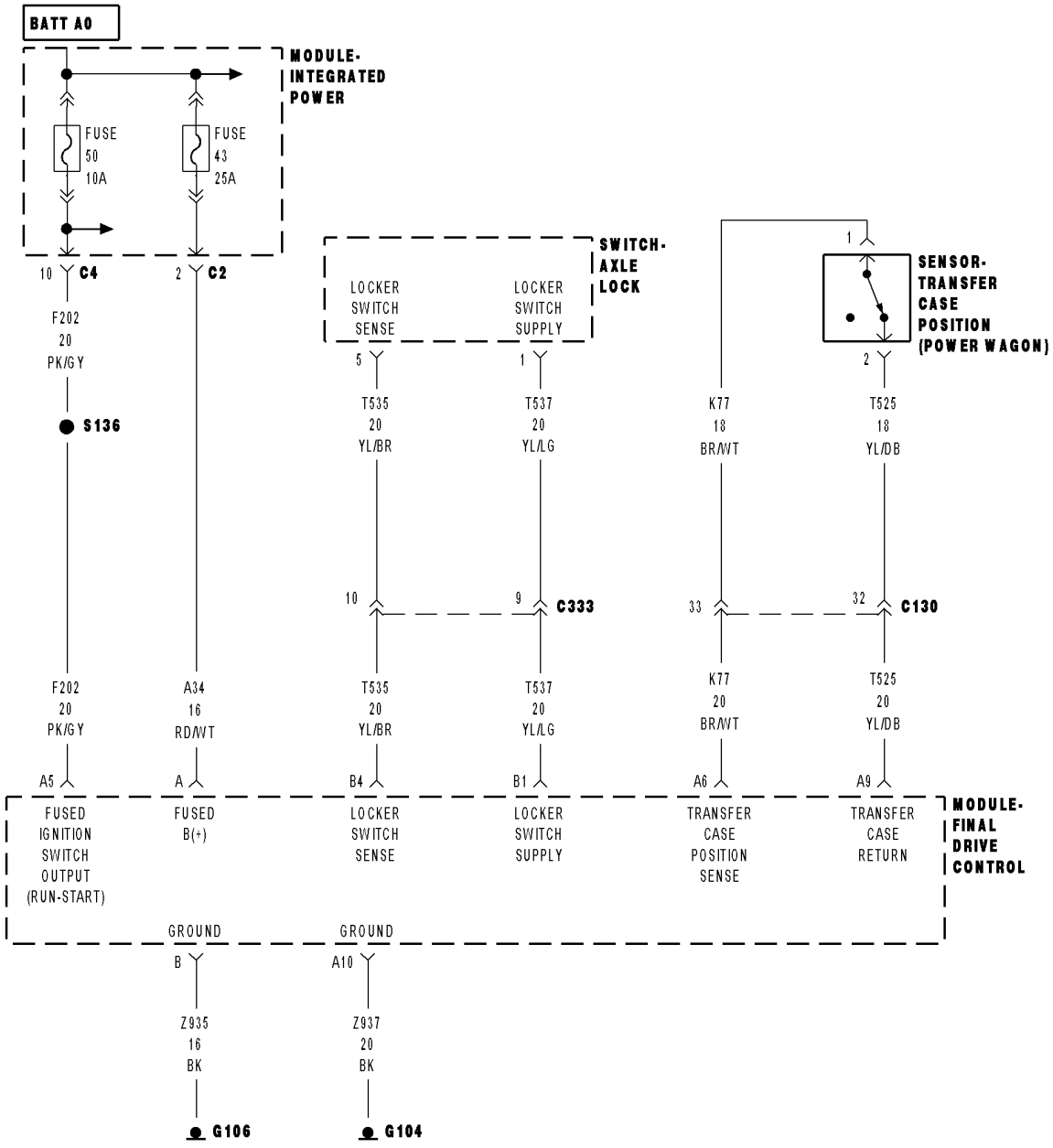
The conditions necessary to set this DTC are not present at this time.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.
Look for the data to change or for the DTC to reset during the wiggle test.
While monitoring the scan tool data relative to this circuit, move the selector switch to each position several times.
Look for the data to change other than as expected or for the DTC to reset.

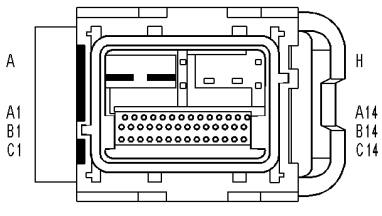
Were any problems found?

Yes >> Repair as necessary.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

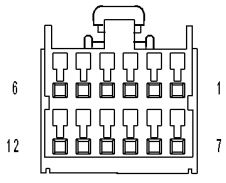
No >> Test complete.

C1402-TRANSFER CASE RANGE SELECT SWITCH CIRCUIT HIGH

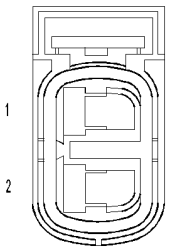




MODULE-
FINAL
DRIVE
CONTROL
(5.7L HD)



SWITCH-
AXLE
LOCK



SENSOR-
TRANSFER
CASE
POSITION
(POWER WAGON)

814584b2

C1402-TRANSFER CASE RANGE SELECT SWITCH CIRCUIT HIGH (CONTINUED)
For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and no system undervoltage or overvoltage condition present.
- **Set Condition:**
  The sensed voltage is greater than a specified voltage for a calibrated amount of time.

Possible Causes
INTERMITTENT TRANSFER CASE RANGE SELECTOR SWITCH CIRCUIT HIGH
(K77) TRANSFER CASE POSITION SENSE CIRCUIT SHORTED TO VOLTAGE
(T525) TRANSFER CASE RETURN CIRCUIT SHORTED TO VOLTAGE
TRANSFER CASE POSITION SENSOR
FINAL DRIVE CONTROL MODULE

Diagnostic Test

1. 4WD RANGE SWITCH VOLTAGE ABOVE 4.5 VOLTS

Ignition on, engine not running.

NOTE: Repair any system undervoltage or overvoltage DTCs that are set in this module before proceeding.
With the scan tool under Data Display, read the 4WD Range Switch voltage.

Is the volage above 4.5 volts?

Yes >> Go To 2

No >> Go to 6

---

2. TRANSFER CASE POSITION SENSOR

Turn the ignition off.
Disconnect the Transfer Case Position Sensor harness connector.
Ignition on, engine not running.
With the scan tool under Data Display, read the 4WD Range Switch voltage.

Is the voltage equal to 0 volts?

Yes >> Replace the Transfer Case Position Sensor.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go to 3

C1402-TRANSFER CASE RANGE SELECT SWITCH CIRCUIT HIGH (CONTINUED)

3. (K77) TRANSFER CASE POSITION SENSE CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

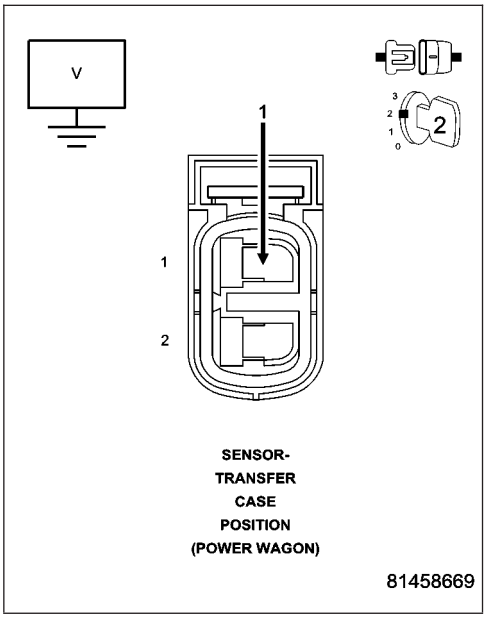
Measure the voltage of the (K77) Transfer Case Position Sense circuit.

Is the voltage above 5.5 volts?

Yes >> Repair the (K77) Transfer Case Position Sense circuit for a short to voltage.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go to 4



4. (T525) TRANSFER CASE RETURN CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Disconnect the Final Drive Control Module harness connector.

Turn the ignition on.

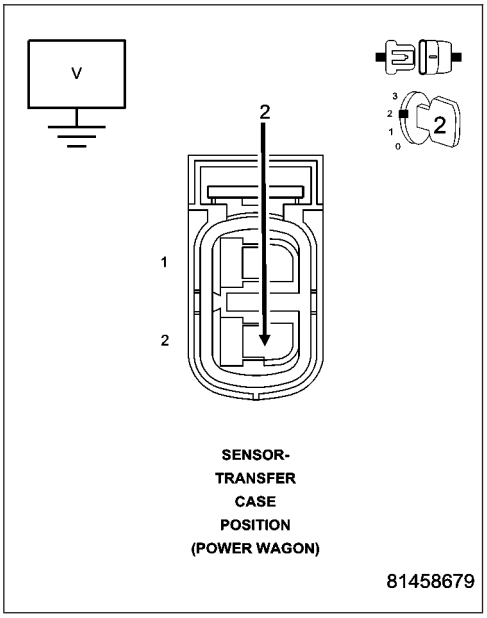
Measure the voltage of the (T525) Transfer Case Return circuit.

Is there any voltage present?

Yes >> Repair the (T525) Transfer Case Return circuit for a short to voltage.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go to 5



5. FINAL DRIVE CONTROL MODULE

Repair

Replace the Final Drive Control Module in accordance with the Service Information.

Perform the FDCM VERIFICATION TEST.

C1402-TRANSFER CASE RANGE SELECT SWITCH CIRCUIT HIGH (CONTINUED)

6. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.
Look for the data to change or for the DTC to reset during the wiggle test.
While monitoring the scan tool data relative to this circuit, move the selector switch to each position several times.
Look for the data to change other than as expected or for the DTC to reset.

Were any problems found?

Yes >> Repair as necessary.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Test complete.

C2100–BATTERY VOLTAGE LOW (FDCM)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The Final Drive Control Module detects that system voltage is below 9.0 volts for 60 seconds.

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW
CHARGING SYSTEM DTCS PRESENT
FINAL DRIVE CONTROL MODULE POWER CIRCUITS OPEN OR HIGH RESISTANCE
FINAL DRIVE CONTROL MODULE

Diagnostic Test

1. CHARGING SYSTEM DTCS PRESENT

Ignition on.

With the scan tool, select View DTCs in the Powertrain Control Module.

Are there any Charging System or related voltage DTCs present?

Yes >> Refer to the symptom list and perform any Charging System DTC diagnostic procedures before continuing with this test.

No >> Go to 2

---

2. DTC IS ACTIVE

With the scan tool, select View DTCs in the Final Drive Control Module.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Go to 5

C2100–BATTERY VOLTAGE LOW (FDCM) (CONTINUED)

3. (A34) FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Final Drive Control Module harness connector.

Turn the ignition on.

With a 12–volt test light connected to ground, check the (A34) Fused B+ circuit in the Final Drive Control Module harness connector.

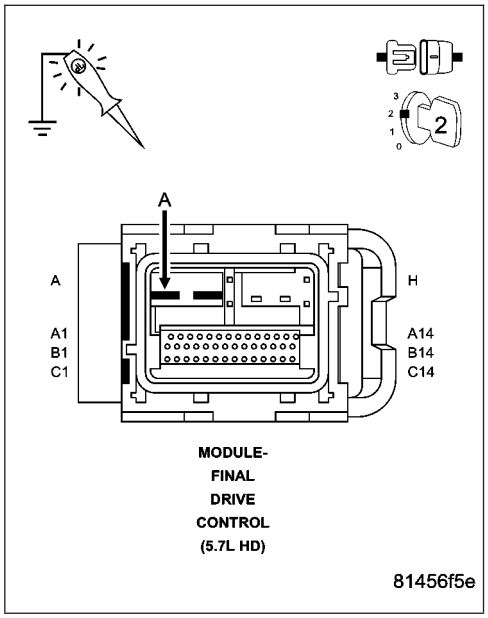
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly?

Yes >> Go to 4

No >> Repair the (A34) Fused B+ circuit for an open circuit or high resistance.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)



---

4. FINAL DRIVE CONTROL MODULE

View repair.

Repair

Replace the Final Drive Control Module in accordance with the Service information.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

---

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

Were any problems found?

Yes >> Repair as necessary.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Test complete.

C2101–BATTERY VOLTAGE HIGH (FDCM)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The Final Drive Control Module detects that system voltage is above 16.0 volts for 10 seconds with engine RPM greater than 350.

Possible Causes
INTERMITTENT BATTERY VOLTAGE HIGH
CHARGING SYSTEM DTCS PRESENT
FINAL DRIVE CONTROL MODULE GROUND CIRCUITS OPEN OR HIGH RESISTANCE
FINAL DRIVE CONTROL MODULE

Diagnostic Test

1. CHARGING SYSTEM DTCS PRESENT

Ignition on.
With the scan tool, select View DTCs in the Powertrain Control Module.

Are there any Charging System or related voltage DTCs present?

Yes >> Refer to the symptom list and perform any Charging System DTC diagnostic procedures before continuing with this test.

No >> Go to 2

---

2. DTC IS ACTIVE

With the scan tool, select View DTCs in the Final Drive Control Module.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Go to 5

C2101–BATTERY VOLTAGE HIGH (FDCM) (CONTINUED)

3. FINAL DRIVE CONTROL MODULE GROUND CIRCUITS OPEN OR HIGH RESISTANCE

Turn the ignition off.

Disconnect the Final Drive Control Module harness connector.

Turn the ignition on.

With a 12–volt test light connected to B+, check the Ground circuits in the Final Drive Control Module harness connector.

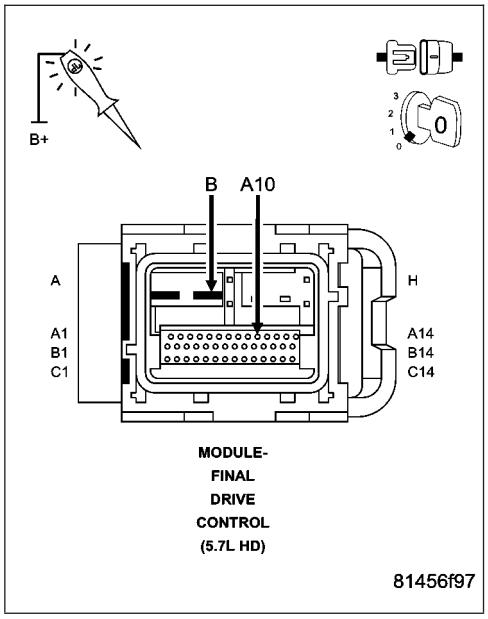
NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.

Does the test light illuminate brightly for each of the Ground circuits?

Yes >> Go to 4

No >> Repair the Ground circuit(s) for an open circuit or high resistance.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)



4. FINAL DRIVE CONTROL MODULE

View repair.

Repair

Replace the Final Drive Control Module in accordance with the Service information.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

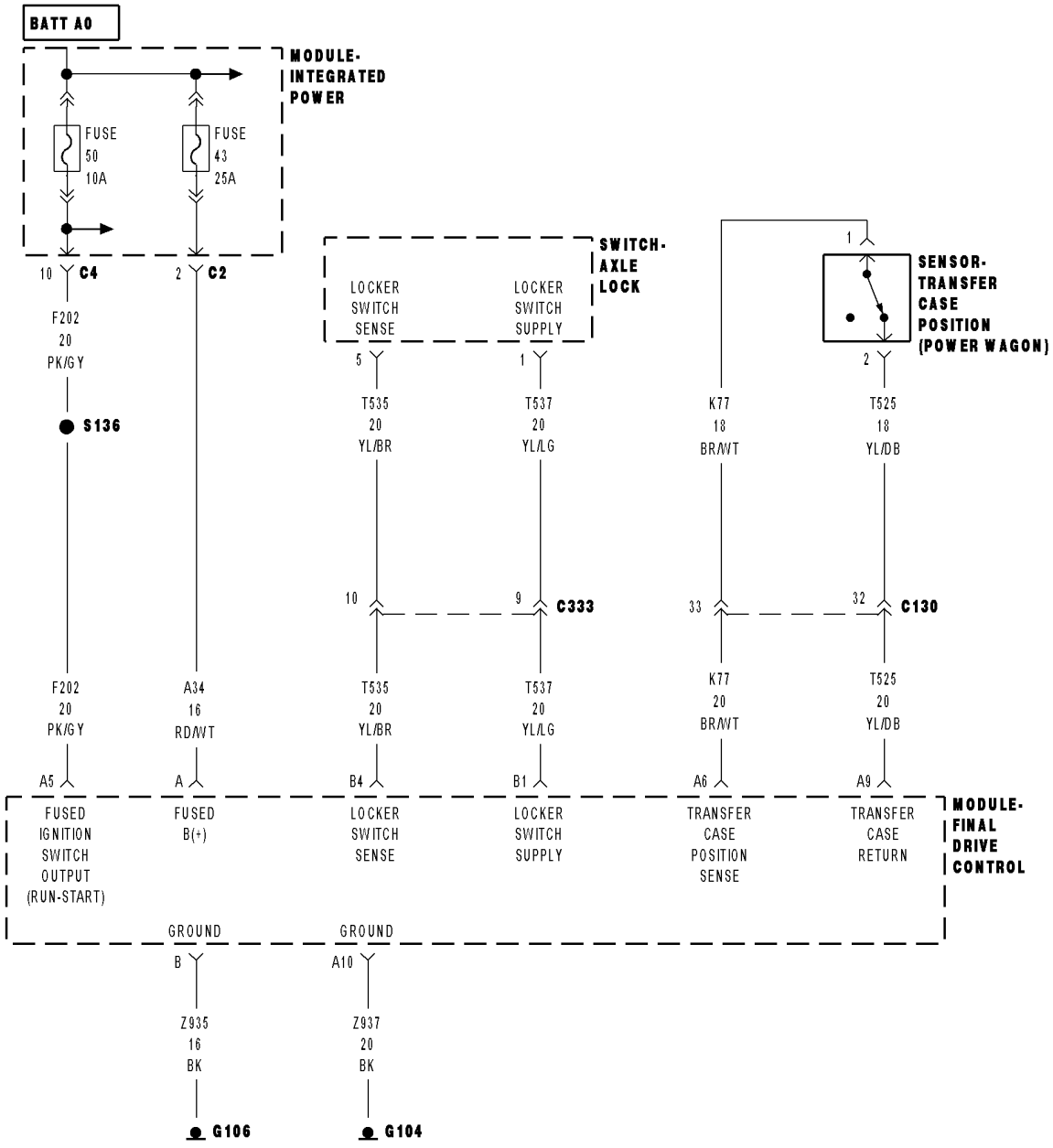
Were any problems found?

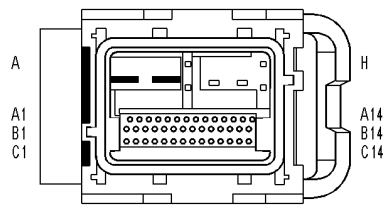
Yes >> Repair as necessary.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

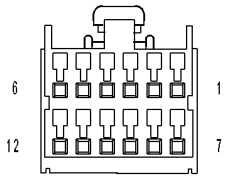
No >> Test complete.

C211B—IGNITION RUN/START INPUT CIRCUIT PERFORMANCE (FDCM)

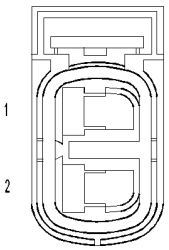




MODULE-
FINAL
DRIVE
CONTROL
(5.7L HD)



SWITCH-
AXLE
LOCK



SENSOR-
TRANSFER
CASE
POSITION
(POWER WAGON)

814584b2

C211B—IGNITION RUN/START INPUT CIRCUIT PERFORMANCE (FDCM) (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  Continuously.
- **Set Condition:**
  The Final Drive Control Module detects erratic voltage on the (F202) Fused Ignition Switch Output (Run-Start) circuit.

Possible Causes
INTERMITTENT IGNITION RUN/START INPUT CIRCUIT PERFORMANCE DTC
CHARGING SYSTEM DTCS PRESENT
(F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE
FINAL DRIVE CONTROL MODULE

Diagnostic Test

1. CHARGING SYSTEM DTCS PRESENT

Ignition on.

With the scan tool, select View DTCs in the Powertrain Control Module.

Are there any Charging System or related voltage DTCs present?

Yes >> Refer to the symptom list and perform any Charging System DTC diagnostic procedures before continuing with this test.

No >> Go to 2

---

2. DTC IS ACTIVE

With the scan tool, select View DTCs in the Final Drive Control Module.

Is the status Active for this DTC?

Yes >> Go to 3

No >> Go to 5

C211B—IGNITION RUN/START INPUT CIRCUIT PERFORMANCE (FDCM) (CONTINUED)

3. (F202) FUSED IGNITION SWITCH OUTPUT (RUN-START) CIRCUIT OPEN OR HIGH RESISTANCE

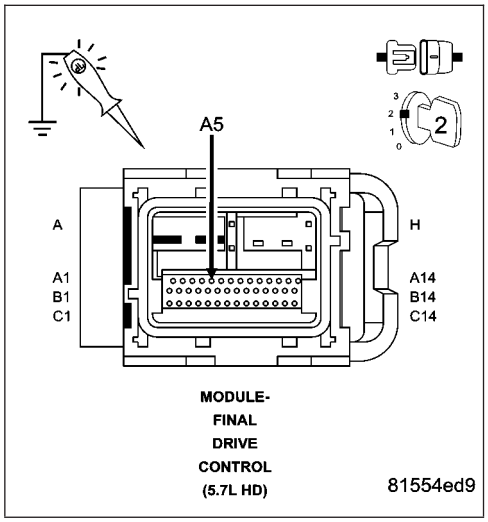
Turn the ignition off.

Disconnect the Final Drive Control Module harness connector.

Turn the ignition on.

With a 12–volt test light connected to ground, check the (F202) Fused Ignition Switch Output (Run-Start) circuit in the Final Drive Control Module harness connector.

NOTE: The test light must illuminate brightly. Compare the brightness to that of a direct connection to the battery.



Does the test light illuminate brightly?

Yes >> Go to 4

No >> Repair the (F202) Fused Ignition Switch Output (Run-Start) circuit for an open circuit or high resistance.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

---

4. FINAL DRIVE CONTROL MODULE

View repair.

Repair

Replace the Final Drive Control Module in accordance with the Service information.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

---

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.

Look for the data to change or for the DTC to reset during the wiggle test.

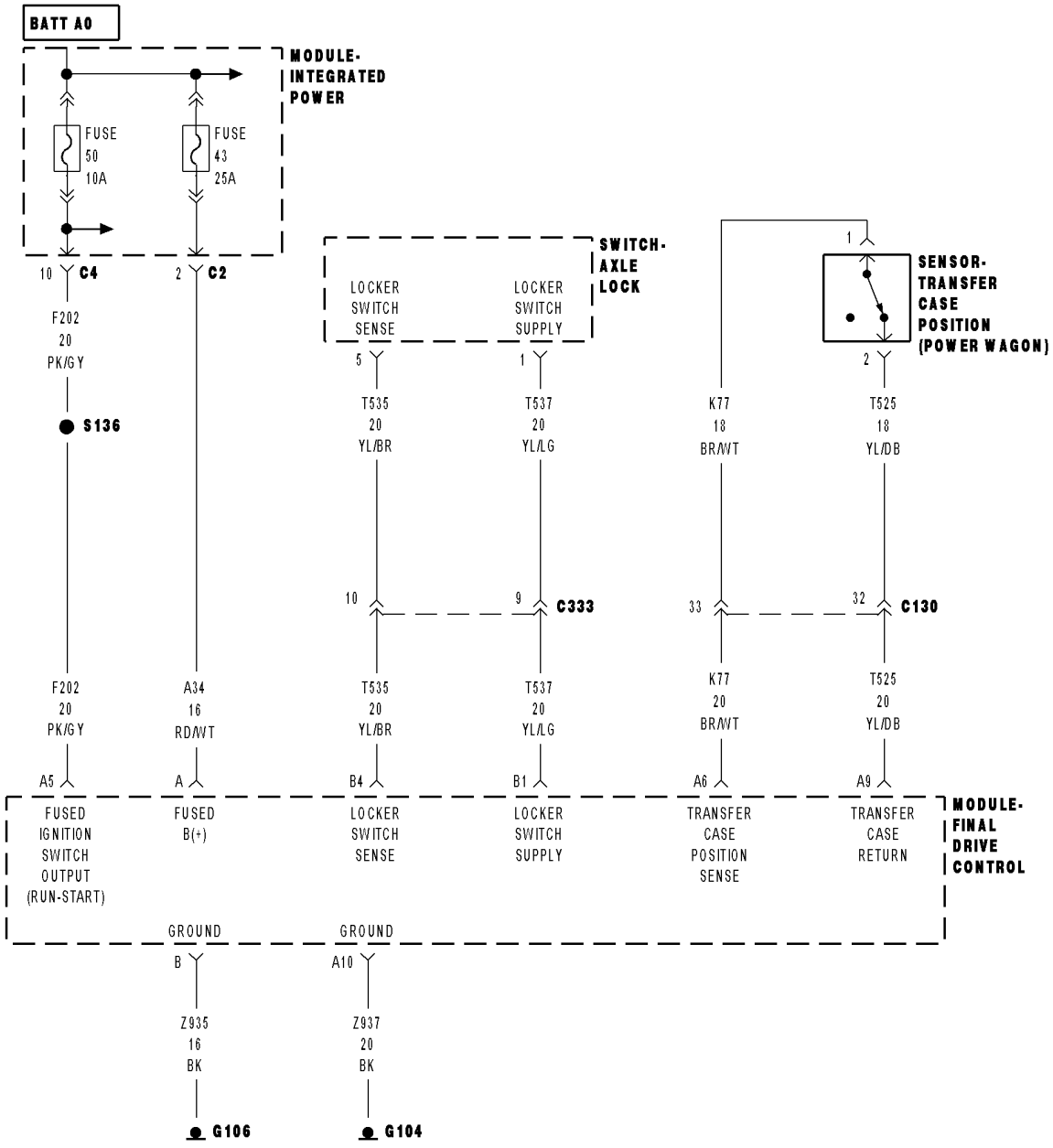
Were any problems found?

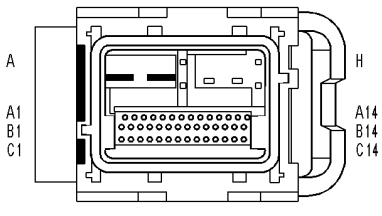
Yes >> Repair as necessary.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

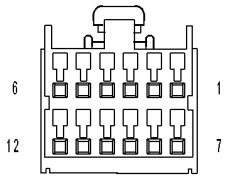
No >> Test complete.

C2122–T-CASE/DIFFERENTIAL SWITCH SUPPLY VOLTAGE CIRCUIT LOW

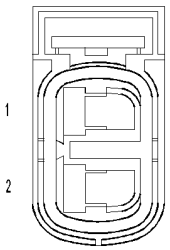




MODULE-
FINAL
DRIVE
CONTROL
(5.7L HD)



SWITCH-
AXLE
LOCK



SENSOR-
TRANSFER
CASE
POSITION
(POWER WAGON)

814584b2

C2122–T-CASE/DIFFERENTIAL SWITCH SUPPLY VOLTAGE CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and no system undervoltage or overvoltage condition present.
- **Set Condition:**
  The Final Drive Control Module detects that the Drivetrain Sensor Supply voltage is below 4.75 volts for 300 mS.

Possible Causes
INTERMITTENT T-CASE/DIFFERENTIAL SWITCH SUPPLY VOLTAGE CIRCUIT LOW
(K77) TRANSFER CASE POSITION SENSE CIRCUIT SHORT TO GROUND
(T537) LOCKER SWITCH SUPPLY CIRCUIT SHORT TO GROUND
TRANSFER CASE SELECTOR SWIITCH
AXLE LOCK SWITCH
FINAL DRIVE CONTROL MODULE

Diagnostic Test

1. TRANSFER CASE POSITION SENSE VOLTAGE EQUAL TO 0 VOLTS

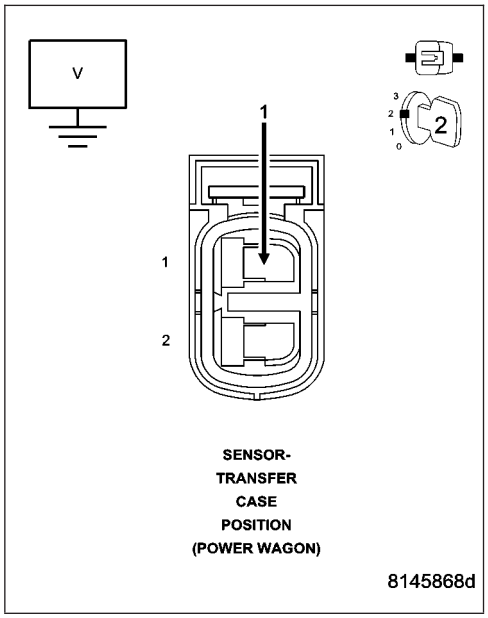
Turn the ignition on.

Measure the voltage of the Transfer Case Position Sense circuit by backprobing the Transfer Case Position Sensor harness connector.

Is the voltage equal to 0 volts?

Yes >> Go to 2

No >> Go to 7



C2122–T-CASE/DIFFERENTIAL SWITCH SUPPLY VOLTAGE CIRCUIT LOW (CONTINUED)

2. TRANSFER CASE POSITION SENSOR

Turn the ignition off.

Disconnect the Transfer Case Position Sensor harness connector.

Turn the ignition on.

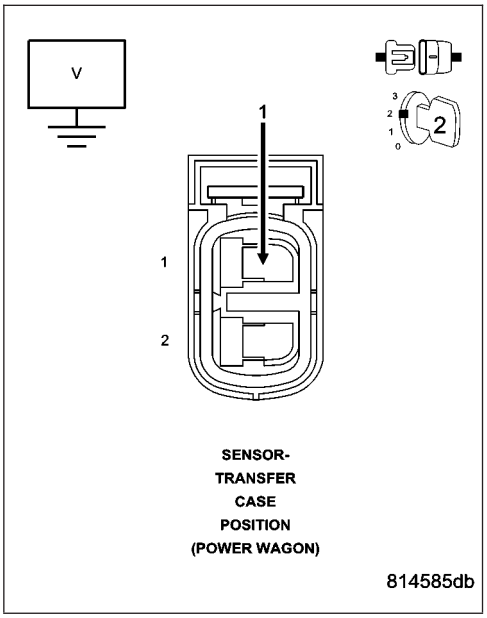
Measure the voltage of the (K77) Transfer Case Position Sense circuit at the Transfer Case Position Sensor harness connector.

Is the voltage above 4.75 volts?

Yes >> Replace the Transfer Case Position Sensor in accordance with the Service Information.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go to 3



3. AXLE LOCK SWITCH

Turn the ignition off.

Disconnect the Axle Lock Switch harness connector.

Turn the ignition on.

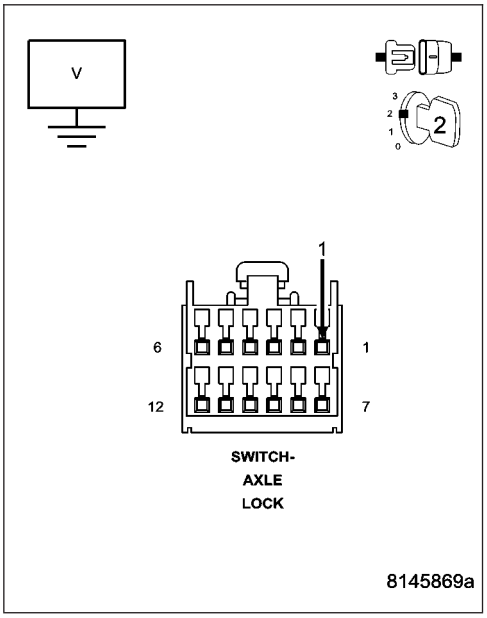
Measure the voltage of the (T537) Locker Switch Supply circuit at the Axle Lock Switch harness connector.

Is the voltage above 4.75 volts?

Yes >> Replace the Axle Lock Switch in accordance with the Service Information.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go to 4



C2122–T-CASE/DIFFERENTIAL SWITCH SUPPLY VOLTAGE CIRCUIT LOW (CONTINUED)

4. (K77) TRANSFER CASE POSITION SENSE CIRCUIT SHORT TO GROUND

Turn the ignition off.

Disconnect the Final Drive Control Module harness connector.

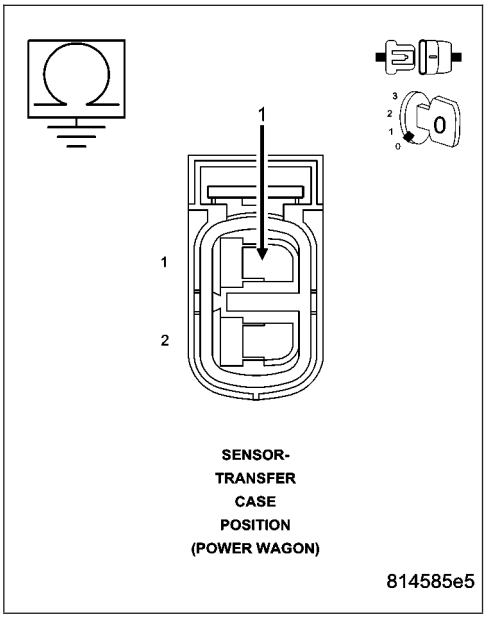
Measure the resistance between the (K77) Transfer Case Position Sense circuit at the Transfer Case Position Sensor harness connector and ground.

Is the resistance below 5.0 ohms?

Yes >> Repair the (K77) Transfer Case Position Sense circuit for a short to ground.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go to 5



5. (T537) LOCKER SWITCH SUPPLY CIRCUIT SHORT TO GROUND

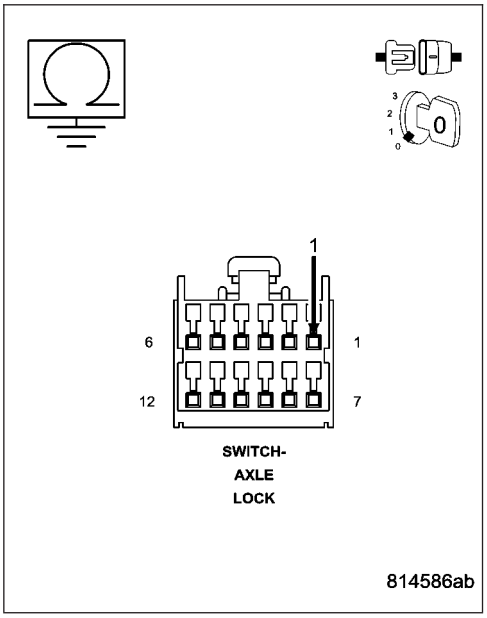
Measure the resistance between the (T537) Locker Switch Supply circuit at the Axle Lock Switch harness connector and ground.

Is the resistance below 5.0 ohms?

Yes >> Repair the (T537) Locker Switch Supply circuit for a short to ground.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go to 6



6. FINAL DRIVE CONTROL MODULE

View repair.

Repair

Replace the Final Drive Control Module in accordance with the Service information.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

C2122–T-CASE/DIFFERENTIAL SWITCH SUPPLY VOLTAGE CIRCUIT LOW (CONTINUED)

7. INTERMITTENT WIRING AND CONNECTORS

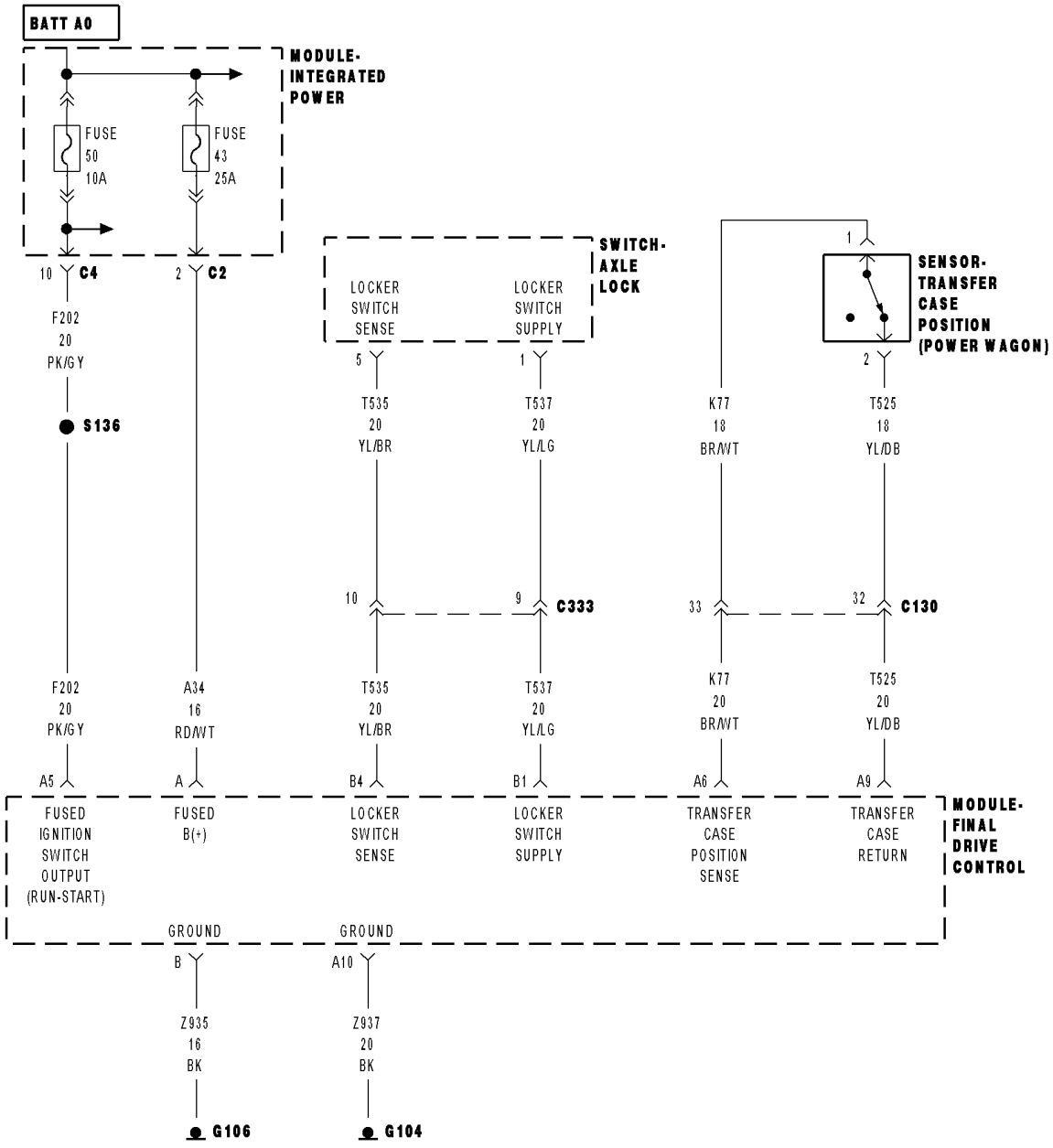
The conditions necessary to set this DTC are not present at this time.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.
Look for the data to change or for the DTC to reset during the wiggle test.

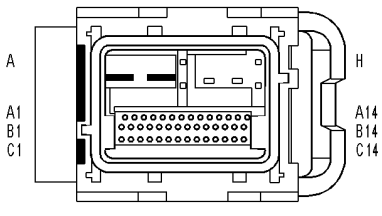
Were any problems found?

Yes >> Repair as necessary.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

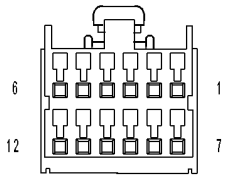
No >> Test complete.

C2123–T-CASE/DIFFERENTIAL SWITCH SUPPLY VOLTAGE CIRCUIT HIGH

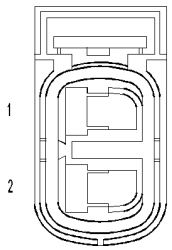




MODULE-
FINAL
DRIVE
CONTROL
(5.7L HD)



SWITCH-
AXLE
LOCK



SENSOR-
TRANSFER
CASE
POSITION
(POWER WAGON)

814584b2

C2123–T-CASE/DIFFERENTIAL SWITCH SUPPLY VOLTAGE CIRCUIT HIGH (CONTINUED)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on and no system undervoltage or overvoltage condition present.
- **Set Condition:**
  The Final Drive Control Module detects that the Locker Switch Supply voltage and the Transfer Case Position Sense voltage are greater than 5.0 volts for 10 seconds.

Possible Causes
INTERMITTENT T-CASE/DIFFERENTIAL SWITCH SUPPLY VOLTAGE CIRCUIT HIGH
(K77) TRANSFER CASE POSITION SENSE CIRCUIT SHORT TO VOLTAGE
(K537) LOCKER SWITCH SUPPLY CIRCUIT SHORT TO VOLTAGE
FINAL DRIVE CONTROL MODULE

Diagnostic Test

1. (K77) TRANSFER CASE POSITION SENSE VOLTAGE GREATER THAN 5.0 VOLTS

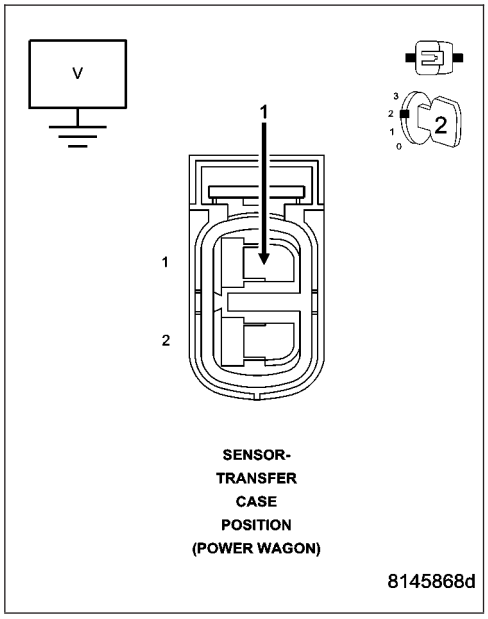
Turn the ignition on.

Measure the voltage of the (K77) Transfer Case Position Sense circuit by backprobing the Transfer Case Position Sensor harness connector.

Is the voltage greater than 5.0 volts?

Yes >> Go to 2

No >> Go to 5



C2123–T-CASE/DIFFERENTIAL SWITCH SUPPLY VOLTAGE CIRCUIT HIGH (CONTINUED)

2. (K77) TRANSFER CASE POSITION SENSE CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Transfer Case Position Sensor harness connector.

Disconnect the Final Drive Control Module harness connector.

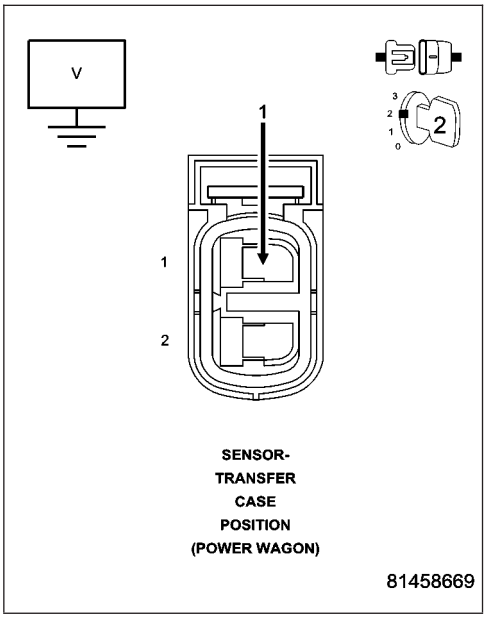
Measure the voltage of the (K77) Transfer Case Position Sense circuit at the Transfer Case Position Sensor harness connector.

Is there any voltage present?

Yes >> Repair the (K77) Transfer Case Position Sense circuit for a short to voltage.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go to 3



3. (K537) LOCKER SWITCH SUPPLY CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the Axle Lock Switch harness connector.

Turn the ignition on.

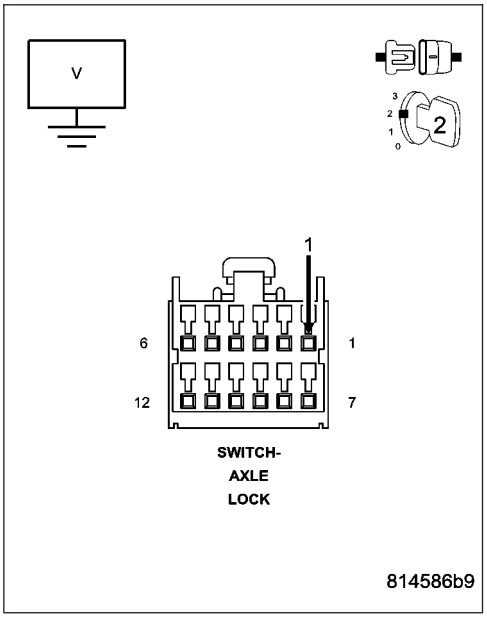
Measure the voltage of the (T537) Locker Switch Supply circuit at the Axle Lock Switch harness connector.

Is there any voltage present?

Yes >> Repair the (K537) Locker Switch Supply circuit for a short to voltage.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Go to 4



4. FINAL DRIVE CONTROL MODULE

View repair.

Repair

Replace the Final Drive Control Module in accordance with the Service information.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

C2123–T-CASE/DIFFERENTIAL SWITCH SUPPLY VOLTAGE CIRCUIT HIGH (CONTINUED)

5. INTERMITTENT WIRING AND CONNECTORS

The conditions necessary to set this DTC are not present at this time.
Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.
While monitoring the scan tool data relative to this circuit, wiggle test the wiring and connectors.
Look for the data to change or for the DTC to reset during the wiggle test.

Were any problems found?

Yes >> Repair as necessary.
Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

No >> Test complete.

C2201-FDCM ECU INTERNAL (FDCM)

For a complete wiring diagram **Refer to Section 8W**

- **When Monitored:**
  With the ignition on.
- **Set Condition:**
  The Final Drive Control Module has detected a failure internal to the controller.

Possible Causes
FINAL DRIVE CONTROL MODULE

1. FINAL DRIVE CONTROL MODULE

The Final Drive Control Module has detected an internal failure.

View repair

Repair

Replace the Final Drive Control Module in accordance with the Service Information.

Perform the FDCM VERIFICATION TEST. (Refer to 3 - DIFFERENTIAL & DRIVELINE - DIAGNOSIS AND TESTING)

U0100-LOST COMMUNICATION WITH ECM/PCM (FDCM)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the ECM/PCM for approximately 2 to 5 seconds.

Possible Causes
CAN B OR CAN C BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
ECM/PCM POWER AND GROUND
ECM/PCM
MODULE THAT SET THIS DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read all active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Index for a complete list of the symptoms.

No >> Go To 3

---

3. VERIFY THAT THE ECM/PCM IS ACTIVE ON THE BUS

Turn the ignition on.
With the scan tool, select Network Diagnostics.
Verify that the ECM/PCM is active on the bus.

Is the ECM/PCM active on the bus?

Yes >> Go To 4

No >> Refer to the No Response test procedure. Refer to the table of contents in this section.

U0100-LOST COMMUNICATION WITH ECM/PCM (FDCM) (CONTINUED)

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the ECM/PCM?

Yes >> Replace/update the ECM/PCM in accordance with the service information. Perform the appropriate VERIFICATION TEST.

No >> Replace/update the module that set this DTC in accordance with the service information. Perform the appropriate VERIFICATION TEST.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN (FDCM)

For a complete wiring diagram **Refer to Section 8W**.

- **When Monitored:**
  - With the ignition on
  - Battery voltage between 10 and 16 volts
  - IOD fuse installed
  - FCM is configured correctly
- **Set Condition:**
  Bus messages not received from the Cluster/CCN for approximately 2 to 5 seconds.

Possible Causes
CAN B BUS CIRCUITS OPEN OR SHORTED
DTCS RELATED TO BATTERY VOLTAGE, IGNITION, OR VIN MESSAGES
FCM NOT CONFIGURED CORRECTLY
CLUSTER/CCN POWER AND GROUND
CLUSTER/CCN
MODULE THAT SET THE DTC

Diagnostic Test

1. VERIFY DTC IS ACTIVE

NOTE: Ensure the IOD fuse is installed and battery voltage is between 10 and 16 volts before proceeding.
With the scan tool, read active DTCs.

Is this DTC active?

Yes >> Go To 2

No >> Refer to the Stored Lost Communication test procedure. Refer to the table of contents in this section.

---

2. CHECK FOR ANY OF THE FOLLOWING ACTIVE DTCS

With the scan tool, read active DTCs from all modules.

NOTE: Check for FCM configuration, CAN B or C hardware electrical, VIN Missing/Mismatch, battery or ignition related DTCs.

Does the scan tool display any active DTCs to the conditions listed above?

Yes >> Diagnose and repair the DTC. Refer to the Index for a complete list of the symptoms.

No >> Go To 3

---

3. VERIFY THAT THE CCN IS ACTIVE ON THE BUS

Turn the ignition on.
With the scan tool, select Network Diagnostics.
Verify that the CCN is active on the bus.

Is the CCN active on the bus?

Yes >> Go To 4

No >> Refer to the No Response test procedure. Refer to the table of contents in this section.

U0155-LOST COMMUNICATION WITH CLUSTER/CCN (FDCM) (CONTINUED)

4. CHECK FOR ADDITIONAL COMMUNICATION RELATED DTCS

With the scan tool, select Network Diagnostics.

Is there more than one module with active DTCs "Logged Against" the CCN?

Yes >> Replace/update the Cluster (CCN) in accordance with the service information. Perform BODY VERIFICATION TEST – VER 1.

No >> Replace/update the module that set this DTC in accordance with the service information. Perform the appropriate VERIFICATION TEST.

TRANSFER CASE - NV241 GENII - SERVICE INFORMATION

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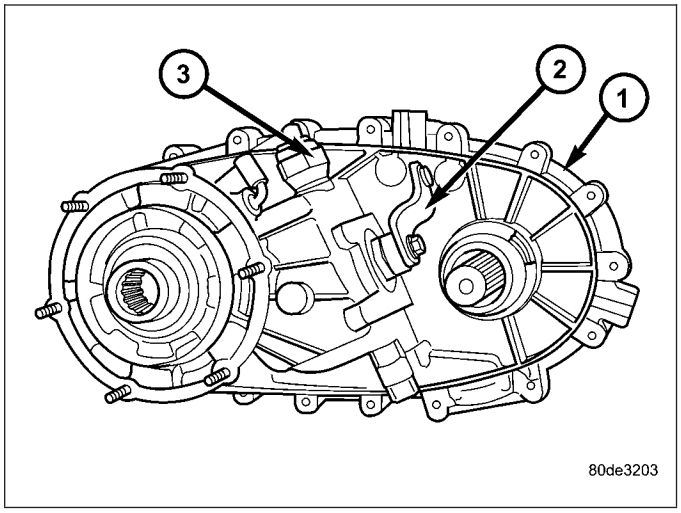
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TRANSFER CASE - NV241 GENII - SERVICE INFORMATION

DESCRIPTION

The NV241 GENII transfer case (1) is a part-time transfer case with a low-range gear system. It provides three operating ranges plus a NEUTRAL position. The low range position provides a gear reduction ratio of 2.72:1 for increased low speed torque capability.

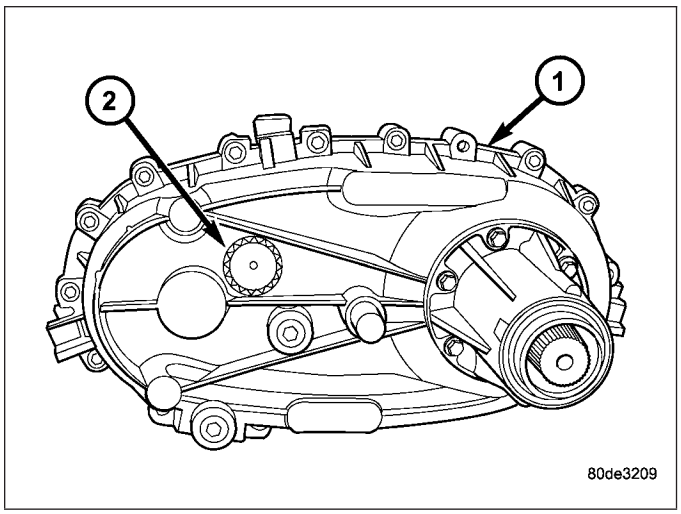
The gear cases and extension are all of aluminum. Drive sprockets and an interconnecting drive chain are used to transmit engine torque to the front/rear propeller shafts. The mainshaft, input gear and front output shaft are supported by ball and needle bearings.



IDENTIFICATION

An identification tag (2) is attached to the rear case of every transfer case. The tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.



OPERATION

OPERATING RANGE

Transfer case operating ranges are:

- 2H (2-wheel drive)
- 4H (4-wheel drive)
- 4LO (4-wheel drive low range

The 2H range is for use on any road surface at any time.

The 4H and 4LO ranges are for off road use only. They are not for use on hard surface roads. The only exception being when the road surface is covered by ice and snow.

The low range reduction gear system is operative in 4LO range only. This range is for extra pulling power in off road situations. Low range reduction ratio is 2.72:1.

SHIFT MECHANISM

The transfer case is operated by an adjustable floor mounted shift linkage. The transfer case shift lever is directly attached to the shift sector. The sector operates the range and mode forks within the transfer case.

A straight line shift pattern is used with a NEUTRAL detent. Lever range positions are imprinted in the shift knob.

SHIFTING

The transfer case can be shifted between the 2H and 4H operating ranges while the vehicle is in motion. The vehicle must have the transmission placed in NEUTRAL, or the clutch depressed in the case of a manual transmission, and be moving less than 2-3 MPH when shifting into and out of the 4L operating range.

DIAGNOSIS AND TESTING - TRANSFER CASE - NV241 GENII

Before beginning repair on a suspected transfer case malfunction, check all other driveline components beforehand.

The actual cause of a problem may be related to such items as: front hubs, axles, propeller shafts, wheels and tires, transmission, or clutch instead. If all other driveline components are in good condition and operating properly, refer to the Diagnosis Chart for further information.

DIAGNOSIS CHART

Condition	Possible Cause	Correction
Transfer Case difficult to shift or will not shift into desired range.	1) Vehicle speed too great to permit shifting.	1) Stop vehicle and shift into desired range. Or, reduce speed to below 3-4 km/h (2-3 mph) before attempting the shift.
	2) If vehicle was operated for an extended period in 4H on a dry paved surface, the driveline torque load may be causing a bind.	2) Stop vehicle and shift the transmission into neutral. Shift the transfer case to 2H and operate vehicle in 2H on dry paved surfaces.
	3) Transfer case external shift linkage binding.	3) Lubricate, repair, or replace linkage bushings, or tighten loose components as necessary.
	4) Insufficient or incorrect lubricant.	4) Drain and refill to edge of fill hole with Mopar® ATF +4, Automatic Transmission fluid.
	5) Internal components binding, worn, or damaged.	5) Disassemble the transfer case and replace worn or damaged components as necessary.
Transfer Case noisy in all operating ranges.	1) Insufficient or incorrect lubricant.	1) Drain and refill to edge of fill hole with Mopar® ATF +4, Automatic Transmission fluid.
Noisy in, or jumps out of, four wheel drive low range.	1) Transfer case not completely engaged in 4L position.	1) With the transmission in NEUTRAL, or the clutch depressed in the case of a manual transmission and the vehicle moving under 3-4 km/h (2-3 mph), shift the transfer case to NEUTRAL and then shift into the 4L position.
	2) Shift linkage out of adjustment.	2) Adjust linkage.
	3) Shift linkage loose or binding.	3) Tighten, lubricate, or repair linkage as necessary.
	4) Range fork damaged, inserts worn, or fork is binding on the shift rail.	4) Disassemble unit and repair as necessary.
	5) Low range gear worn or damaged.	5) Disassemble unit and repair as necessary.
Lubricant leaking from output shaft seal or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Vent closed or restricted.	2) Clear or replace vent as necessary.
	3) Output shaft seals damaged or installed incorrectly.	3) Replace seal as necessary. Check to ensure that another component, the propeller shaft slip yoke for example, is not causing damage to seal.
Abnormal tire wear.	1) Extended operation on hard, dry surfaces in the 4H position.	1) Operate vehicle in the 2H position on hard, dry surfaces.

REMOVAL

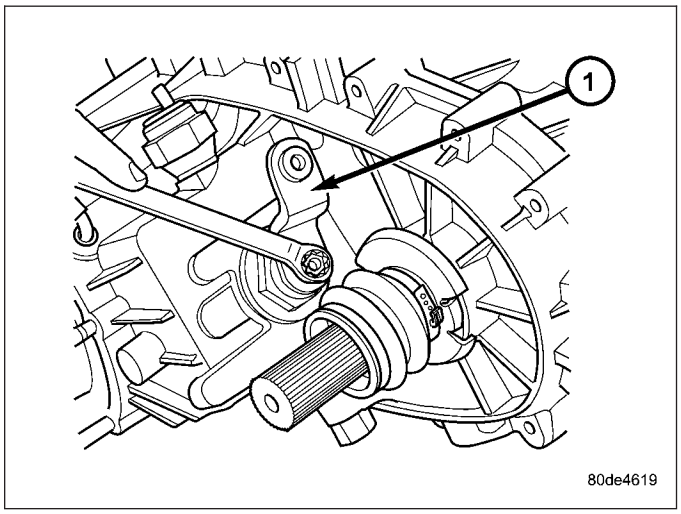
1. Raise and support vehicle.
2. Remove skid plate, if equipped. (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - REMOVAL)
3. Position drain oil container under transfer case.
4. Remove transfer case drain plug and drain lubricant into container.
5. Disconnect vent hose and transfer case position sensor connector.
6. Disconnect shift rod from grommet in transfer case shift lever, or from floor shift arm whichever provides easy access. Use channel lock style pliers to press rod out of lever grommet.
7. Support transmission with jack stand.
8. Mark front and rear propeller shafts for assembly reference.
9. Remove front and rear propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
10. Support transfer case with suitable jack. Secure transfer case to jack with safety chains.
11. Remove nuts attaching transfer case to transmission.
12. Move transfer case assembly rearward until free of transmission output shaft.
13. Lower jack and move transfer case from under vehicle.

DISASSEMBLY

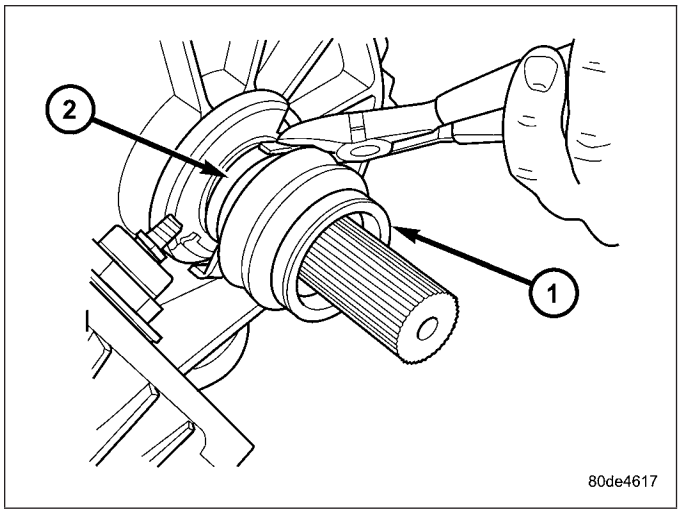
Position transfer case in a shallow drain pan. Remove drain plug and drain any remaining lubricant remaining in case.

SHIFT LEVER AND FRONT OUTPUT SHAFT SEAL

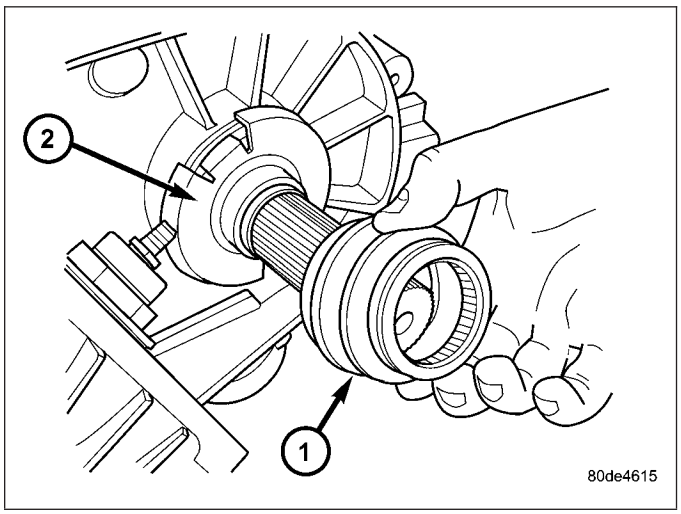
1. Shift transfer case into NEUTRAL.
2. Remove nut that retains the shift lever (1) to sector shaft. Then remove shift lever from shaft.



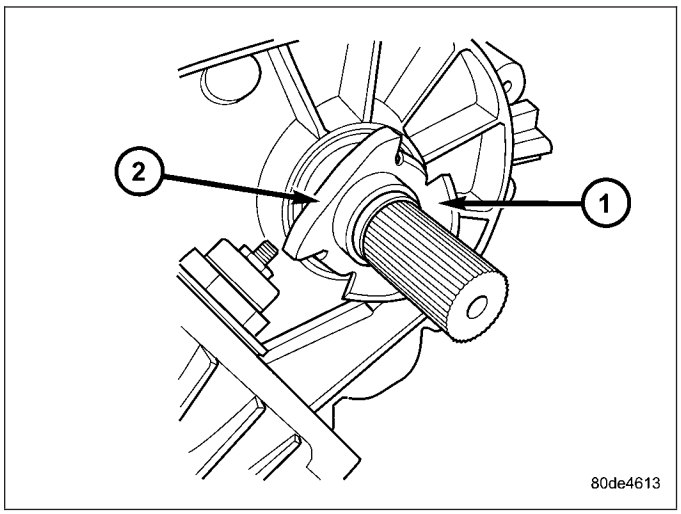
3. Remove the front propeller shaft seal boot (1) retaining clamp (2).



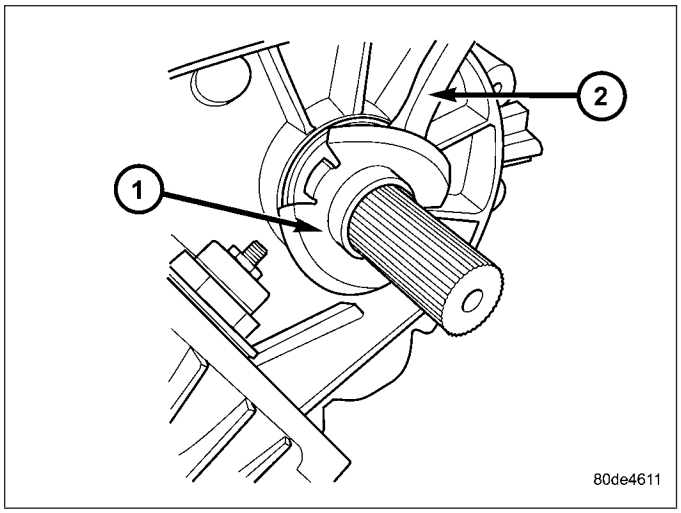
4. Remove the front propeller shaft seal boot (1).



5. Remove the front output shaft seal slinger (1) by bending (2) the slinger ears away from the transfer case.

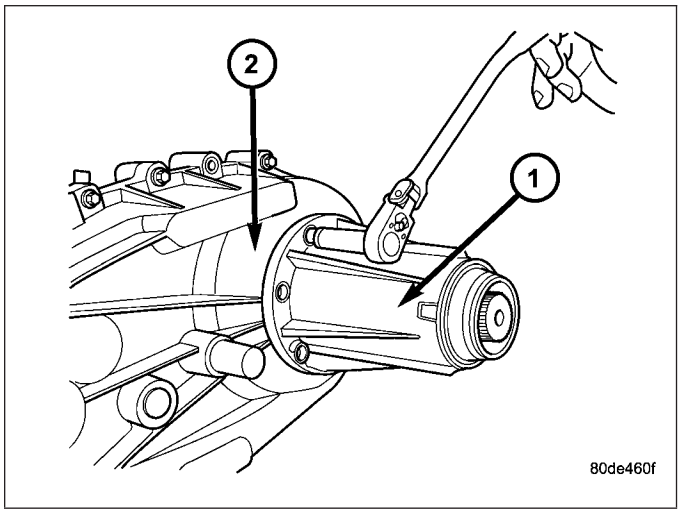


6. Using a suitable pry tool (2), remove the slinger (1) from the output shaft using care not to damage the shaft.
7. Using a screw and a slide hammer, remove the front output shaft seal.

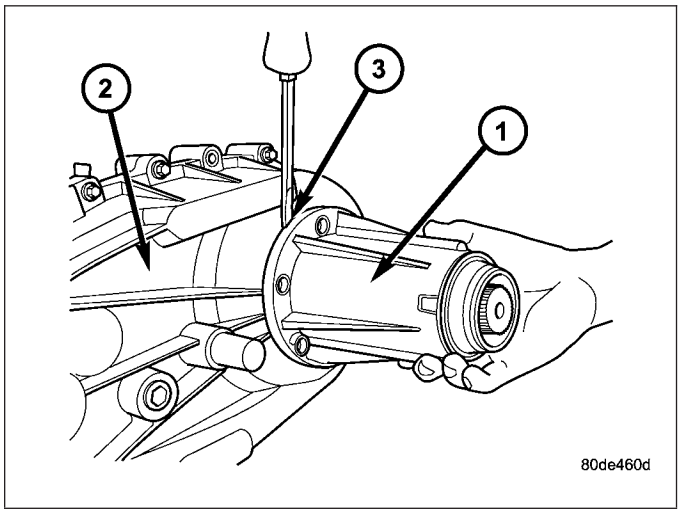


REAR EXTENSION

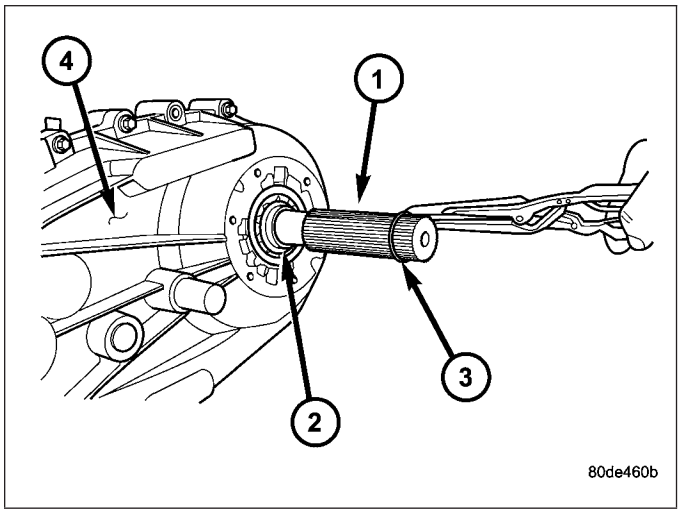
1. Remove rear extension (1) bolts.



2. Remove rear extension housing (1). Tap extension once or twice with a plastic mallet to break sealer bead and loosen it.

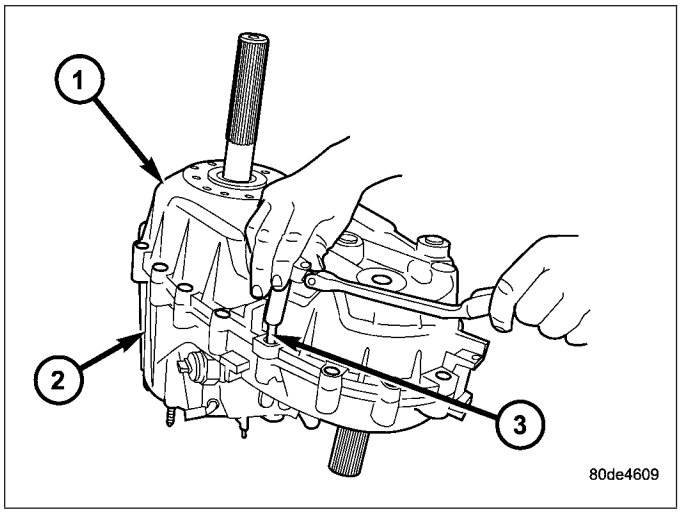


3. Remove output bearing (2) retaining ring (3) with heavy duty snap-ring pliers.

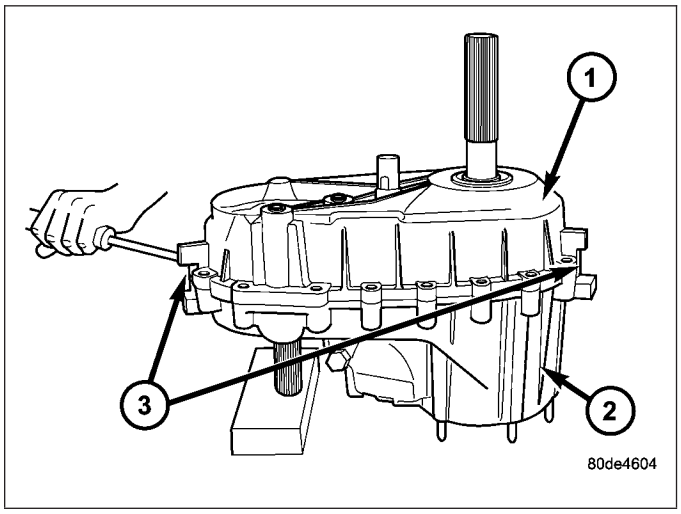


OIL PUMP AND REAR CASE

1. Remove rear case(1)-to-front case (2) bolts (3).

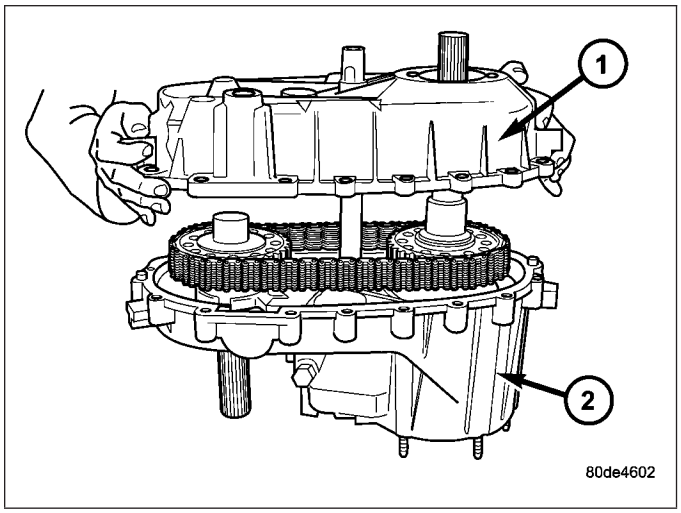


2. Loosen rear case (1) with pry tool to break sealer bead. Insert tool in slot (3) at each end of case.



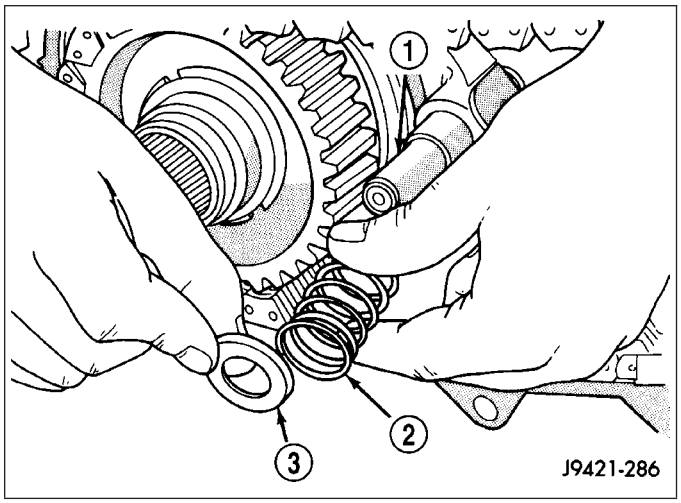
3. Unseat rear case (1) from alignment dowels.
4. Remove rear case and oil pump assembly from front case.

CAUTION: Do not remove the bolts holding the oil pump cover to the rear case half. The oil pump cover is aligned to the rear output shaft bearing inner race and will become mis-aligned if the bolts are loosened. If the transfer case failure has generated any debris which may have become trapped in the oil pump, the rear case and oil pump assembly MUST be replaced.

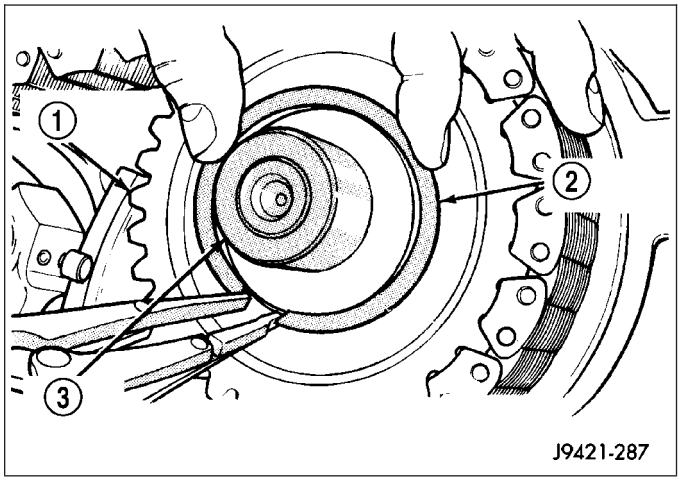


FRONT OUTPUT SHAFT AND DRIVE CHAIN

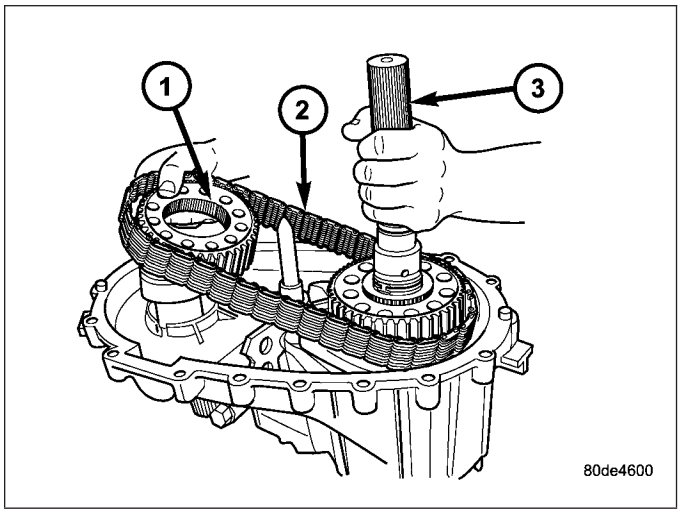
1. Remove shift rail (1) cup (3) and spring (2).



2. Remove front sprocket (1) retaining ring (2).

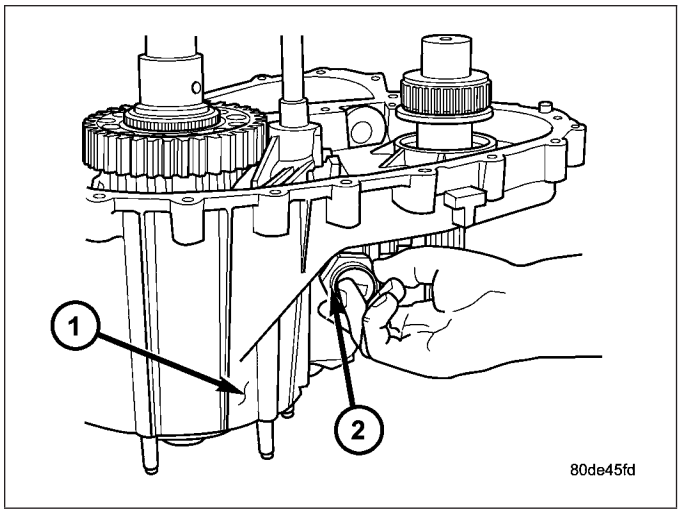


3. Pull mainshaft (3), front sprocket (1) and chain outward about 25.4 mm (1-inch) simultaneously.
4. Remove chain from mainshaft drive sprocket and remove front sprocket and chain as assembly.

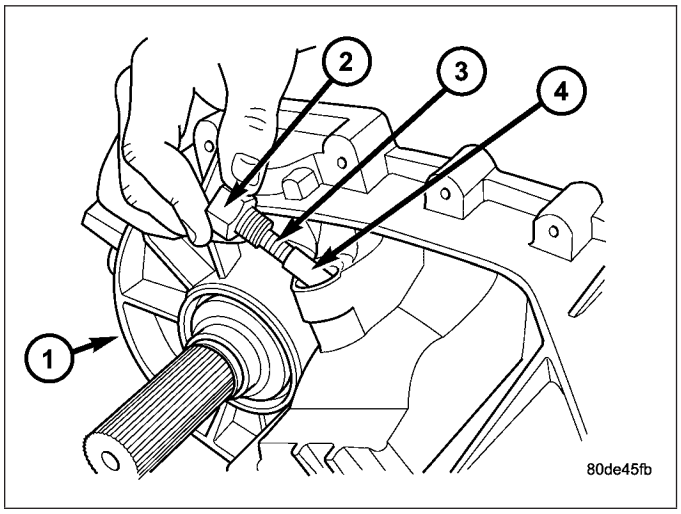


SHIFT FORKS AND MAINSHAFT

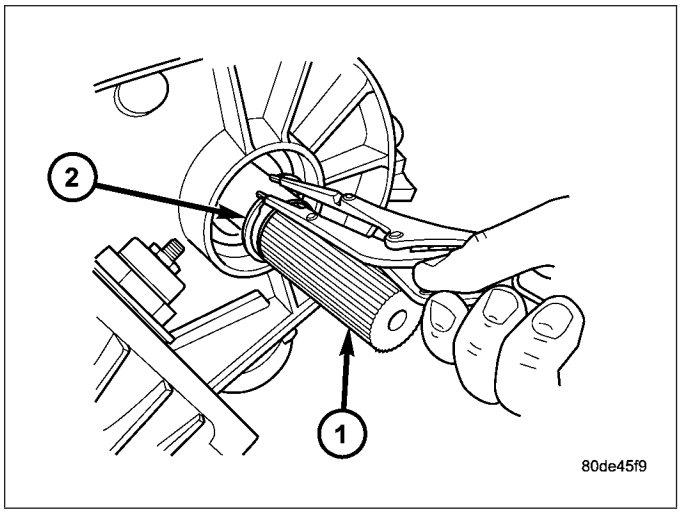
1. Remove the transfer case position switch (2).



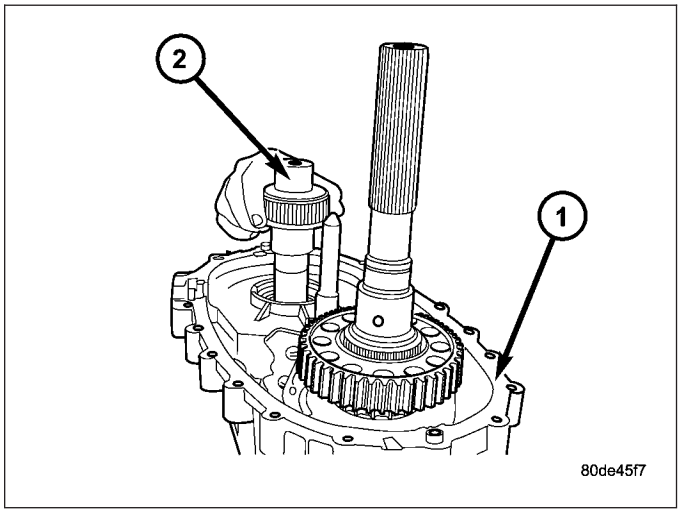
2. Loosen detent plug (2).
3. Remove detent plug (2), spring (3), and plunger (4). Note that the plug has an O-ring seal. Remove and discard this seal.



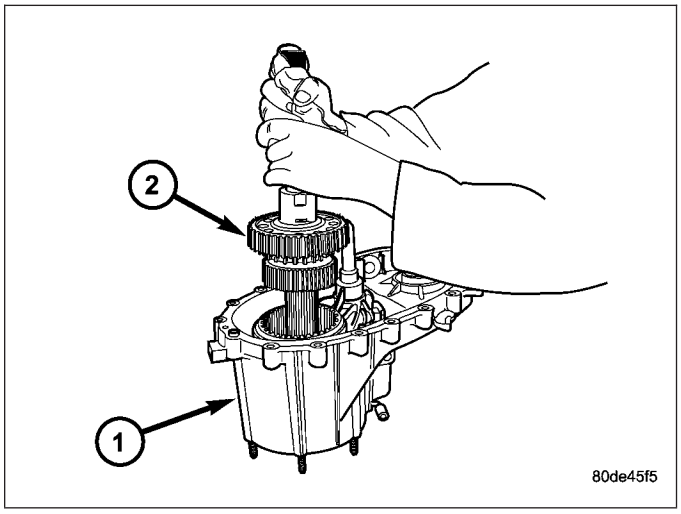
4. Remove the front output shaft (1) snap-ring (2).



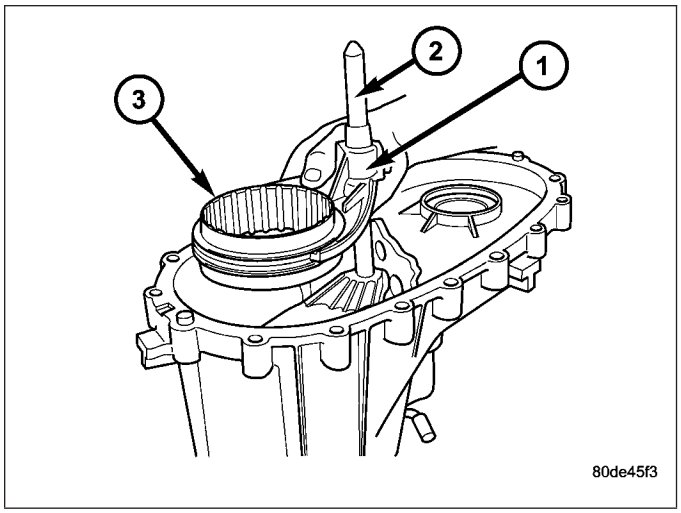
5. Remove front output shaft (2) from bearing in the front case (1).



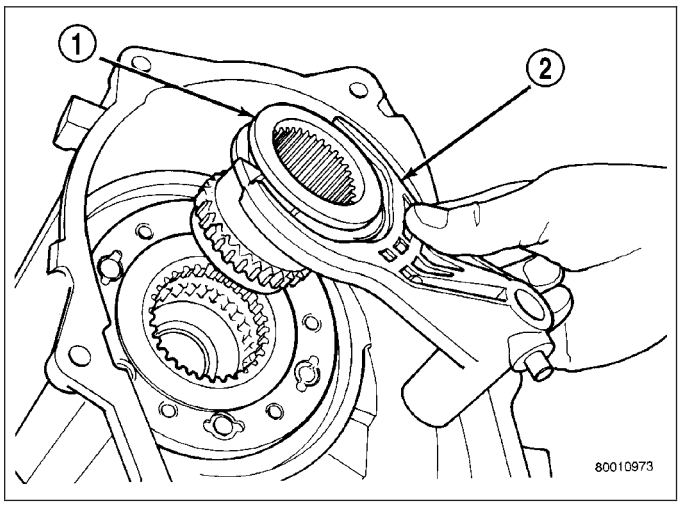
6. Pull mainshaft assembly (2) out of input gear, mode sleeve, and front case (1).



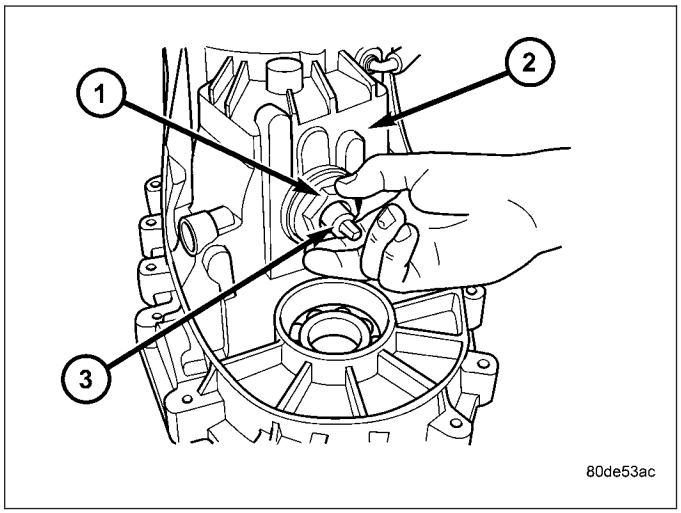
7. Remove mode fork (1), mode sleeve (3), and shift rail (2) as assembly. Note which way the sleeve fits in the fork (long side of sleeve goes to front).



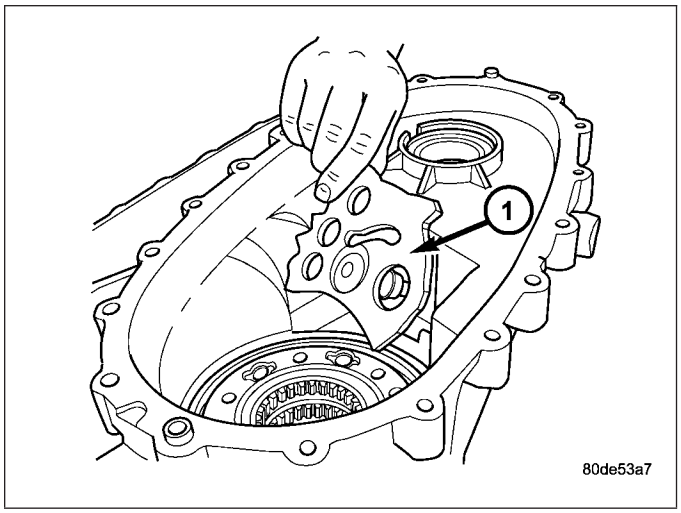
8. Remove range fork retaining ring.
9. Remove range fork (2) and hub (1) as an assembly. Note fork position for installation reference.



10. Remove the shift sector support (1).

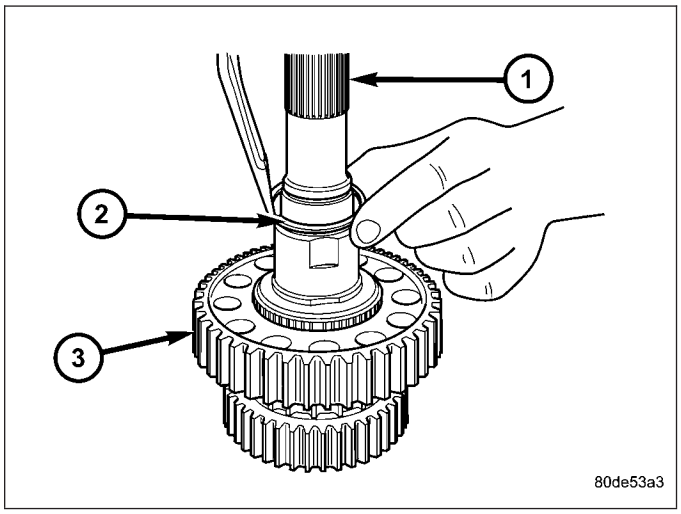


11. Remove shift sector (1).

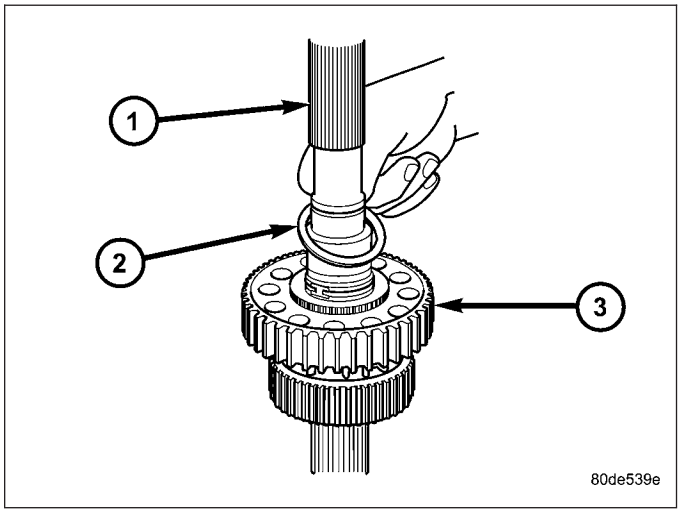


MAINSHAFT

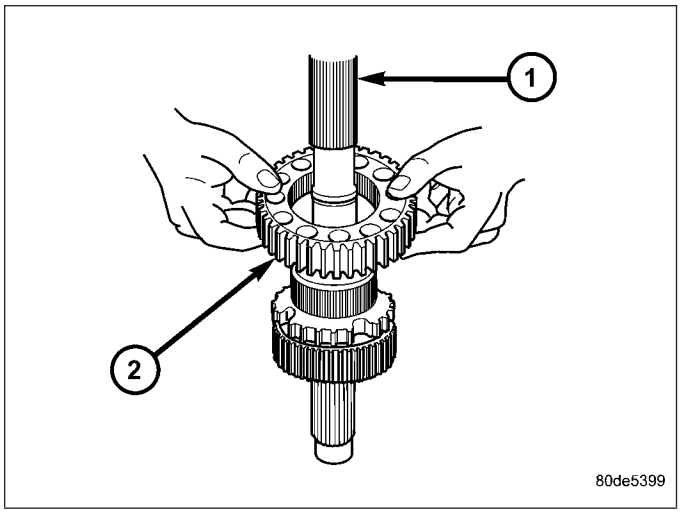
1. Remove the drive sprocket retaining ring (2) from the output shaft (1).



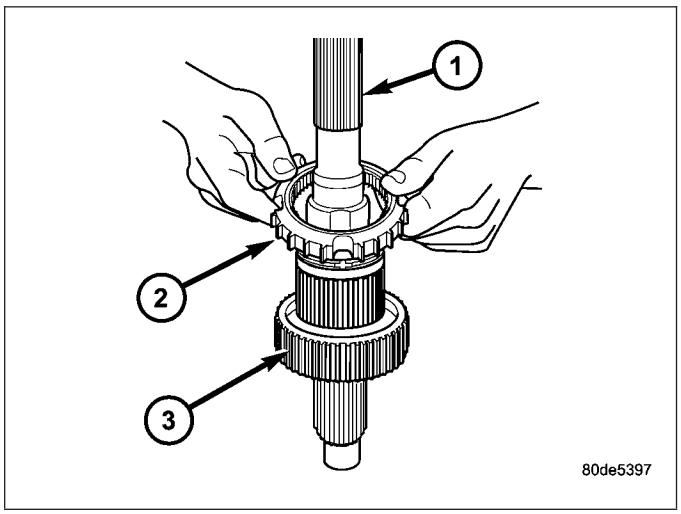
2. Remove the drive sprocket (3) thrust washer (2) from the output shaft (1).



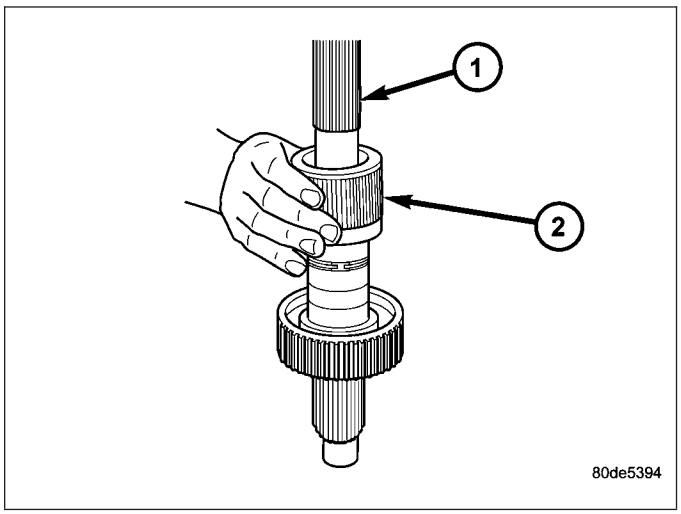
3. Remove drive sprocket (2) from the output shaft (1).



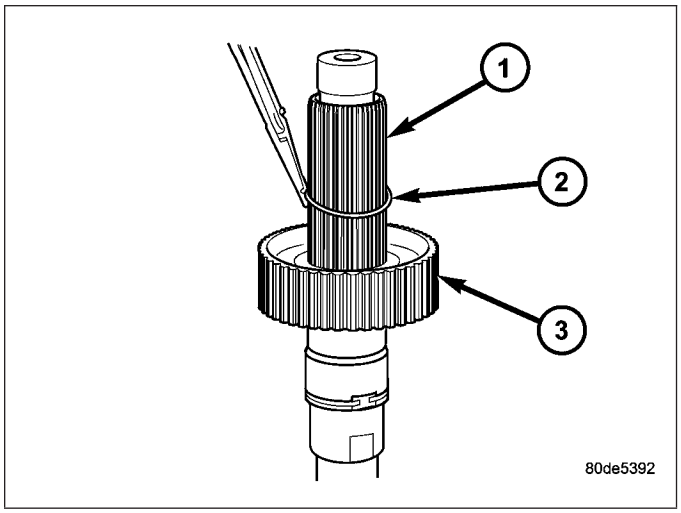
4. Remove the clutch gear (2) from the output shaft (1).



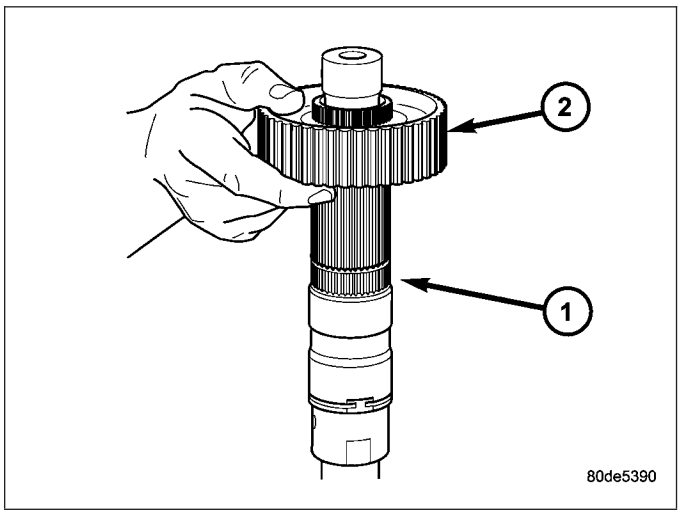
Remove the sprocket hub (2) from the output shaft (1).



5. Remove the mode hub (3) retaining ring (2) from the output shaft (1).

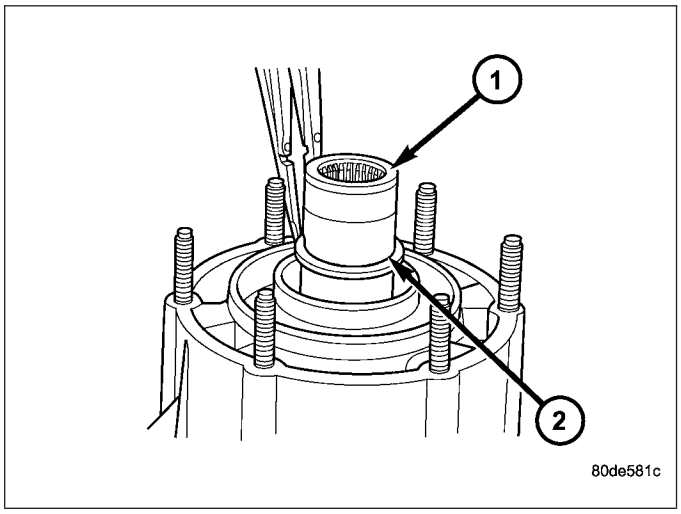


6. Remove the mode hub (2) from the output shaft (1).

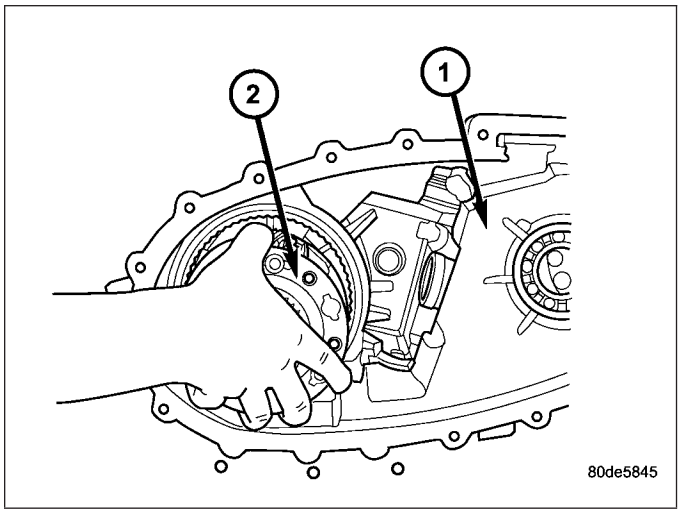


INPUT AND PLANETARY GEAR

1. Remove input gear seal with suitable screw and slide hammer.
2. Remove input gear (1) retaining ring (2) with heavy duty snap-ring pliers.

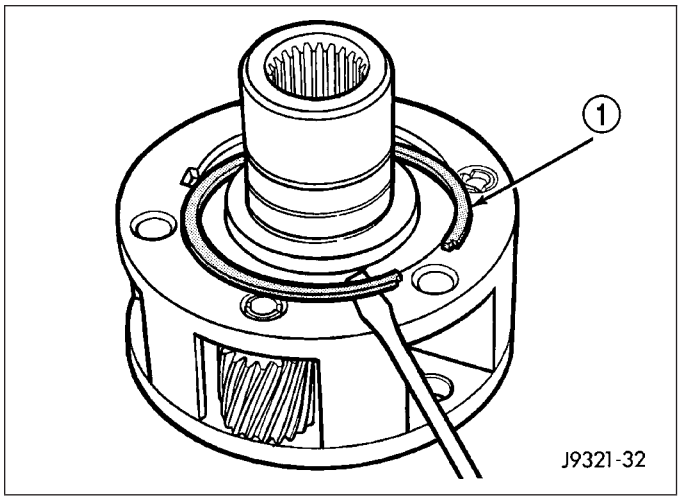


3. Place front case in horizontal position. Then remove input gear and low range gear as an assembly (2). Tap gear out of bearing with plastic mallet, if necessary.

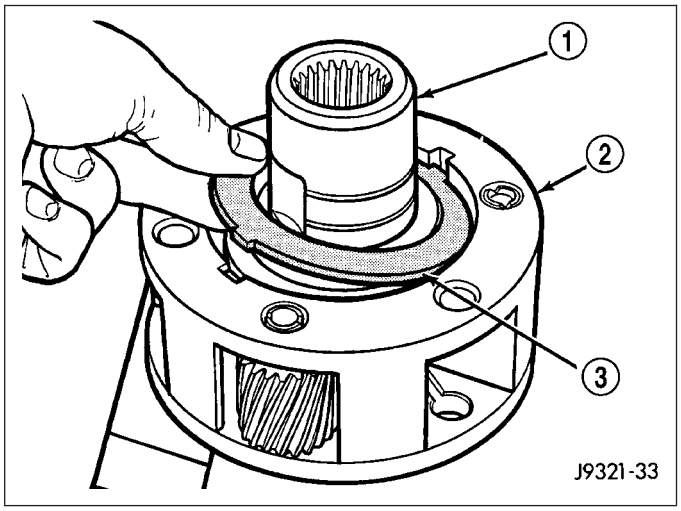


INPUT AND PLANETARY GEAR

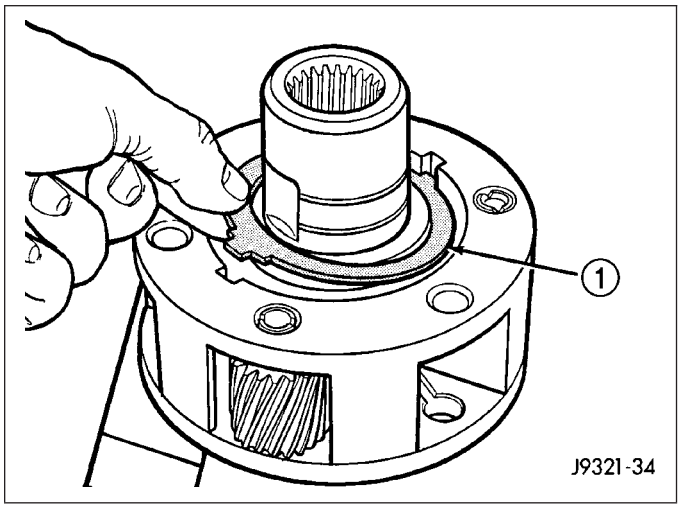
1. Remove snap-ring (1) that retains input gear in low range gear.



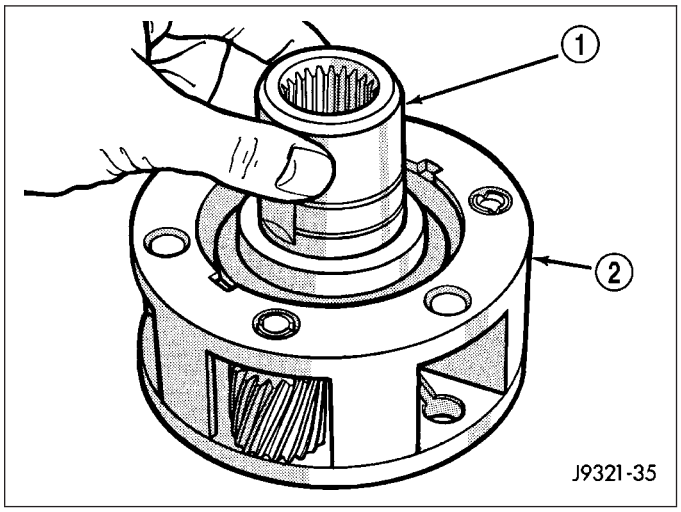
2. Remove retainer (3).



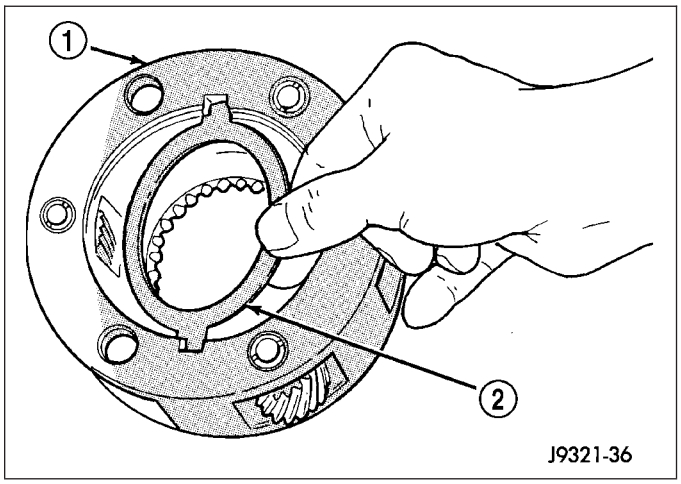
3. Remove front tabbed thrust washer (1).



4. Remove input gear (1).



5. Remove rear tabbed thrust washer (2) from low range gear (1).



CLEANING

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and 3M™ all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

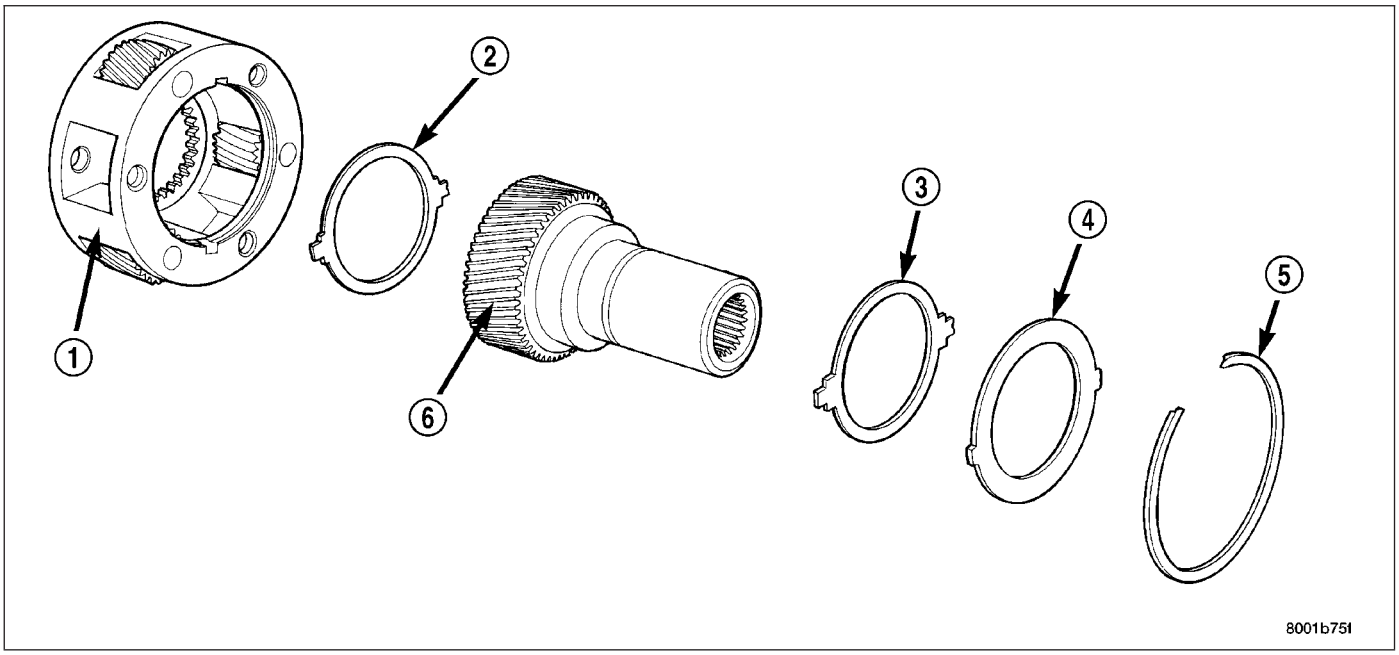
INSPECTION

MAINSHAFT/SPROCKET/HUB

Inspect the splines on the hub and shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone, however, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320-400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER



Input Gear And Carrier Components

1 - PLANETARY CARRIER
2 - REAR THRUST WASHER
3 - FRONT THRUST WASHER
4 - CARRIER LOCK RING
5 - CARRIER LOCK RETAINING RING
6 - INPUT GEAR

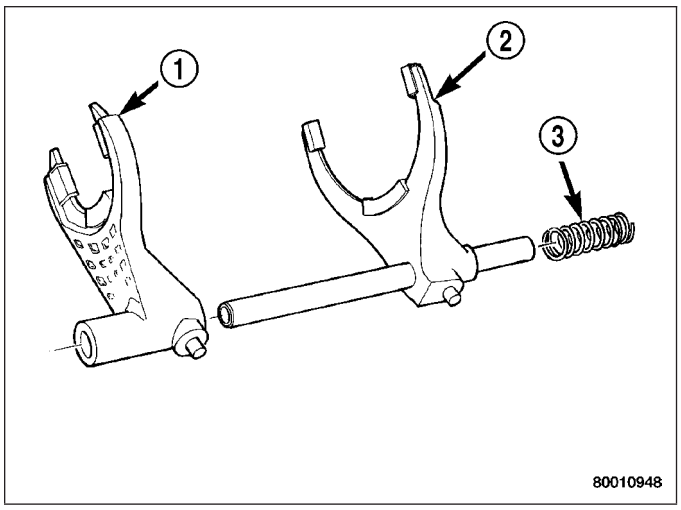
Check the teeth on the gear (6). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300-400 grit emery cloth if necessary.

Examine the carrier body (1) and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring (4) and both thrust washers (2, 3) for wear or cracks. Replace them if necessary. Also replace the lock retaining ring (5) if bent, distorted, or broken.

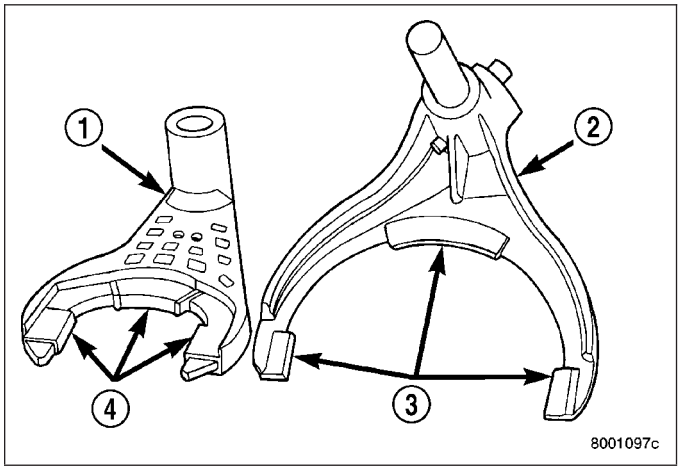
SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (2). Minor nicks on the shift rail can be smoothed with 320-400 grit emery cloth.



Inspect the shift fork wear pads (3, 4). The mode fork pads are serviceable and can be replaced if necessary. The range fork pads are not serviceable. The fork must be replaced as an assembly if the pads are worn or damaged.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.



REAR RETAINER COMPONENTS

Inspect the retainer components. Replace the bearing if rough or noisy. Check the retainer for cracks or wear in the bearing bore.

Inspect the retaining rings and washers. Replace any part if distorted, bent, or broken. Reuse is not recommended.

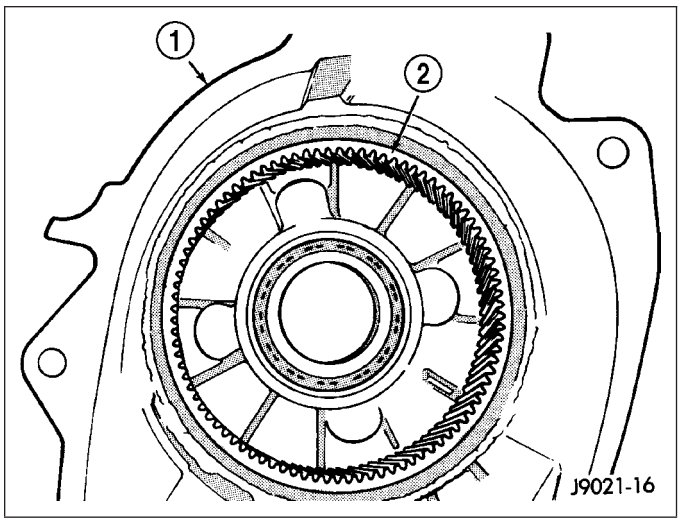
Inspect rear extension bushing. Replace if worn or scored.

DRIVE CHAIN

Examine the drive chain and shaft bearings. replace the chain if stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

LOW RANGE ANNULUS GEAR

Inspect annulus gear (2) condition carefully. The gear is only serviced as part of the front case. If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear.



FRONT CASE AND REAR CASE

Inspect the cases for wear and damage.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil™ stainless steel inserts if required.

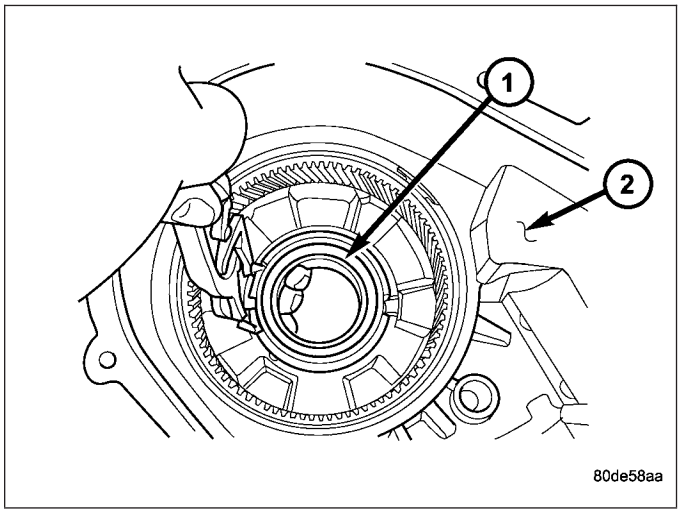
OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

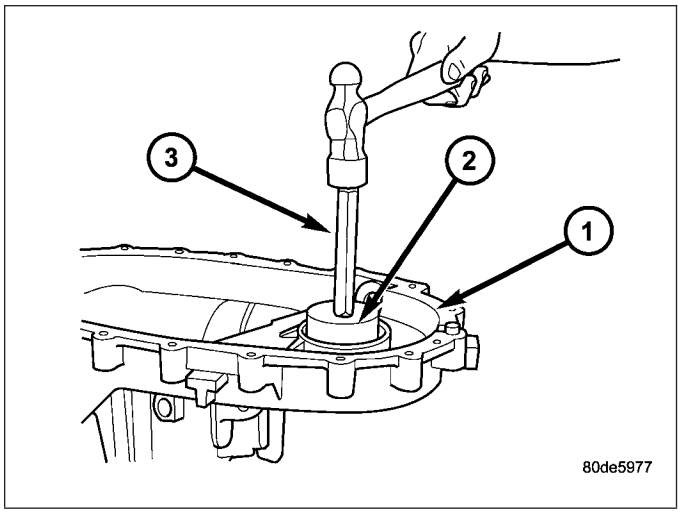
ASSEMBLY

BEARINGS AND SEALS

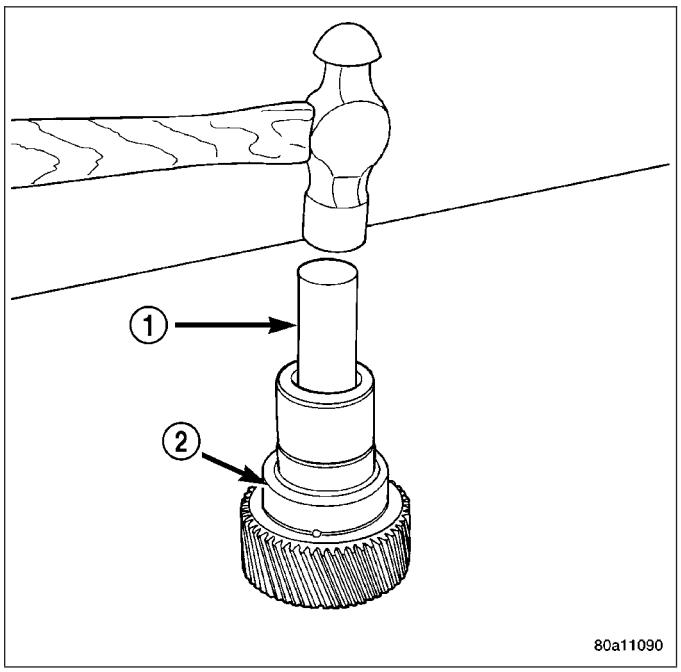
1. Remove the input shaft bearing (1) from the front case (2) with suitable snap-ring pliers.
2. Transfer the retaining ring to the new bearing if necessary and install the bearing into the front case.



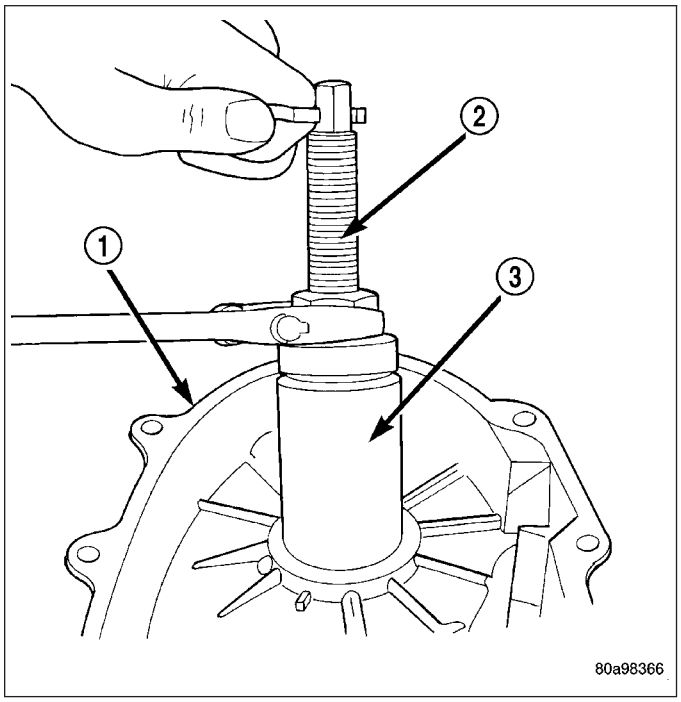
3. Using Installer 6436 (2) and Handle C-4171 (3), remove front output shaft bearing.
4. Start front output shaft bearing in case. Then seat bearing with Handle C-4171 and Installer 6953.
5. Install front output shaft bearing retaining ring.



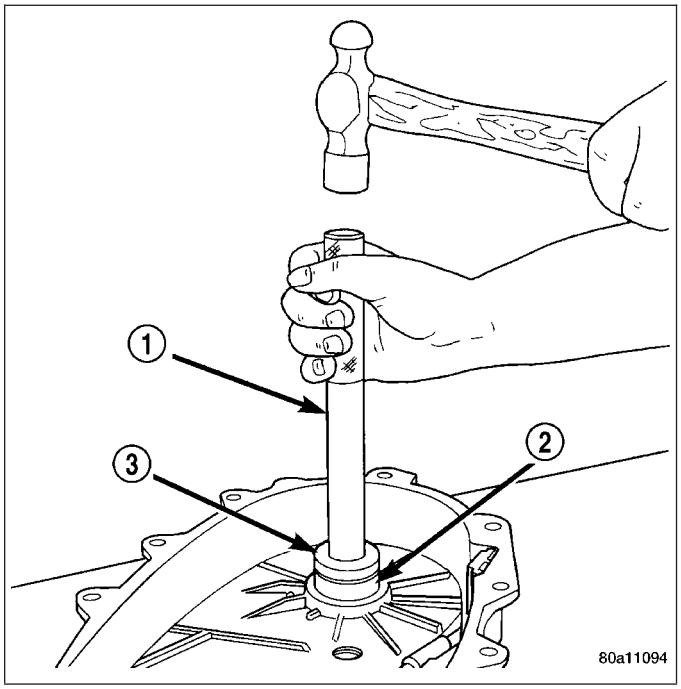
6. Remove input gear pilot bearing by inserting a suitably sized drift (1) into the splined end of the input gear (2) and driving the bearing out with the drift and a hammer.
7. Install new pilot bearing with Remover/Installer 8684.



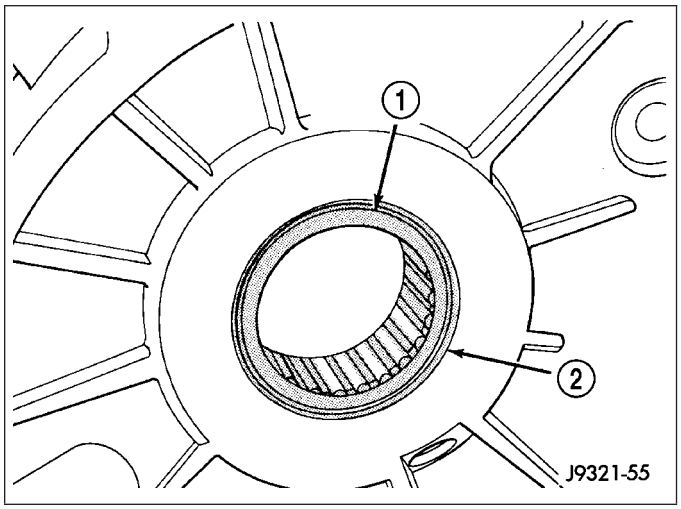
8. Remove the front output shaft rear bearing with the screw and jaws from Remover L-4454 (2) and Cup 8148 (3).



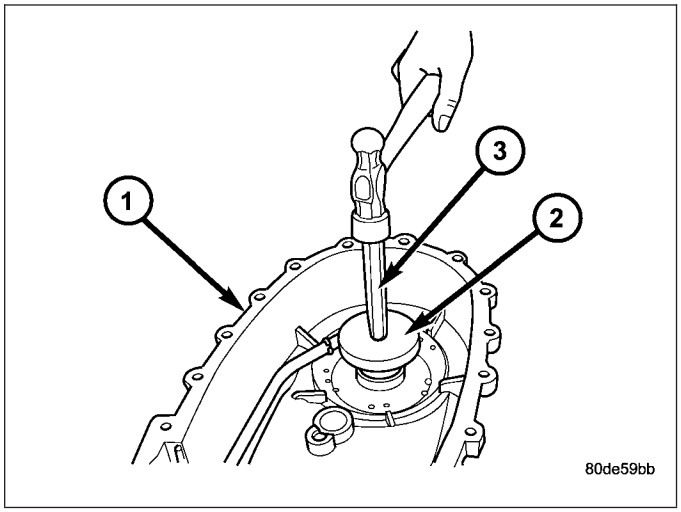
9. Install new bearing with Tool Handle C-4171 (1) and Installer 5066 (3).



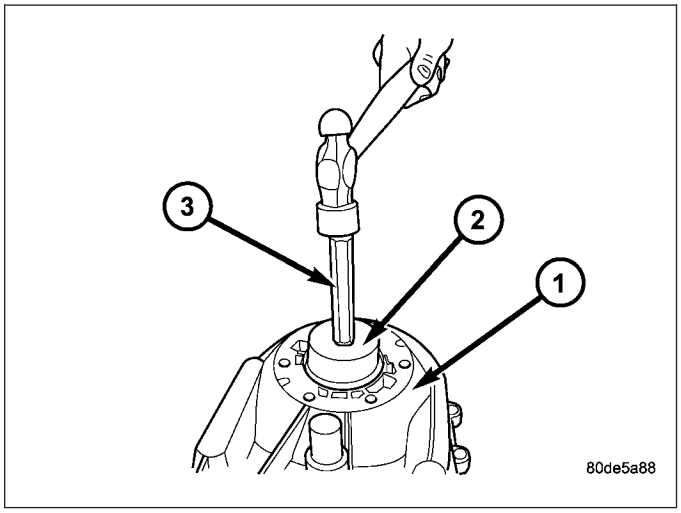
10. The bearing bore is chamfered (1) at the top. Install the bearing so it is flush with the lower edge of this chamfer.



11. Remove the rear output shaft bearing from the rear case using Remover/Installer 8684 (2) and Handle C-4171 (3).

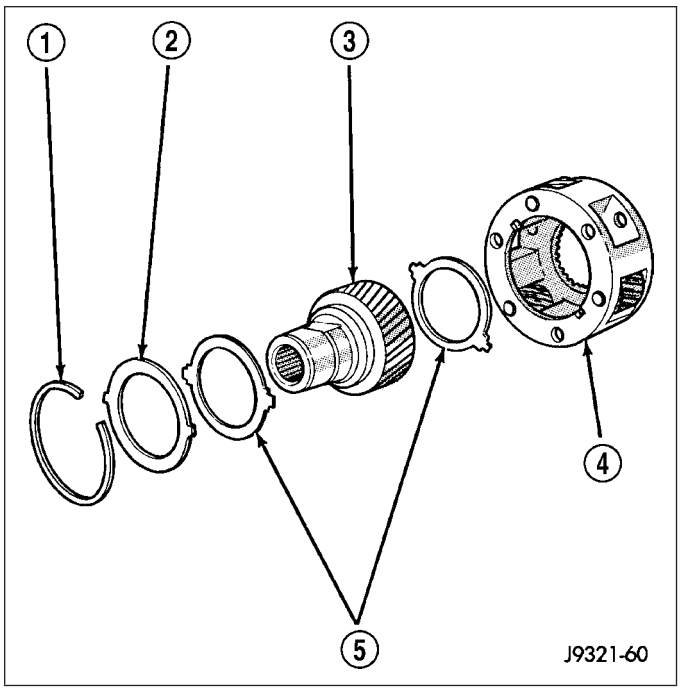


12. Install the rear output shaft bearing into the rear case (1) using Remover/Installer 6953 (2) and Handle C-4171 (3).

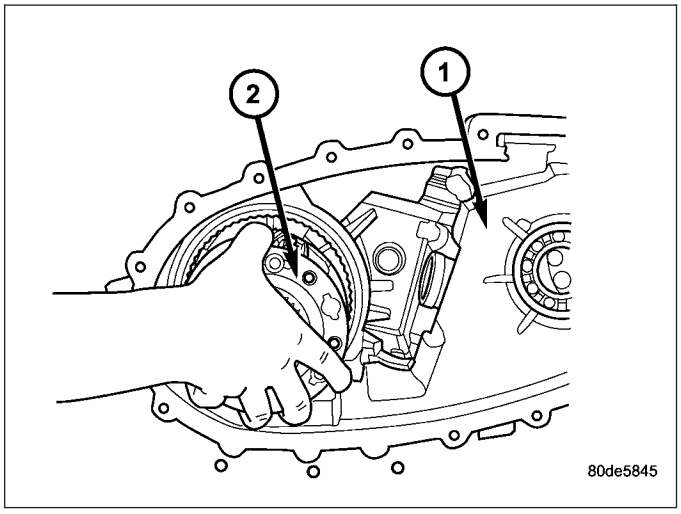


INPUT AND PLANETARY GEAR

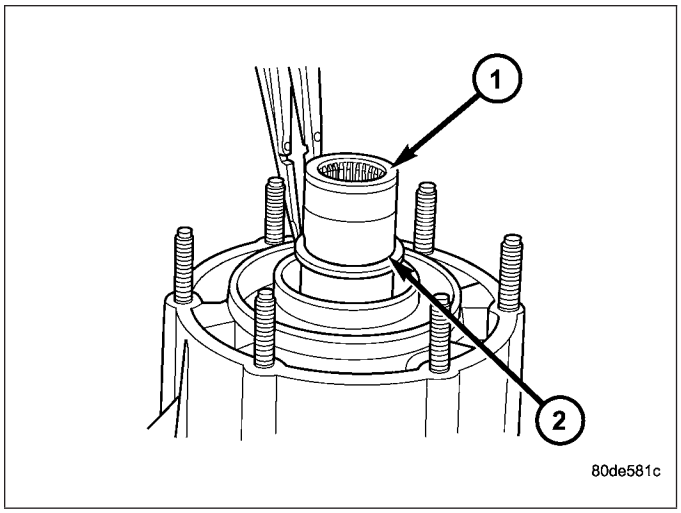
1. Lubricate gears (3, 4) and thrust washers (5) with recommended transmission fluid.
2. Install first thrust washer (5) in low range gear (3). Be sure washer tabs are properly aligned in gear notches.
3. Install input gear (3) in low range gear (4). Be sure input gear is fully seated.
4. Install remaining thrust washer (5) in low range gear (4) and on top of input gear (3). Be sure washer tabs are properly aligned in gear notches.
5. Install retainer (2) on input gear and install snap-ring (1).



6. Align and install low range/input gear assembly (2) in front case (1). Be sure low range gear pinions are engaged in annulus gear and that input gear shaft is fully seated in front bearing.

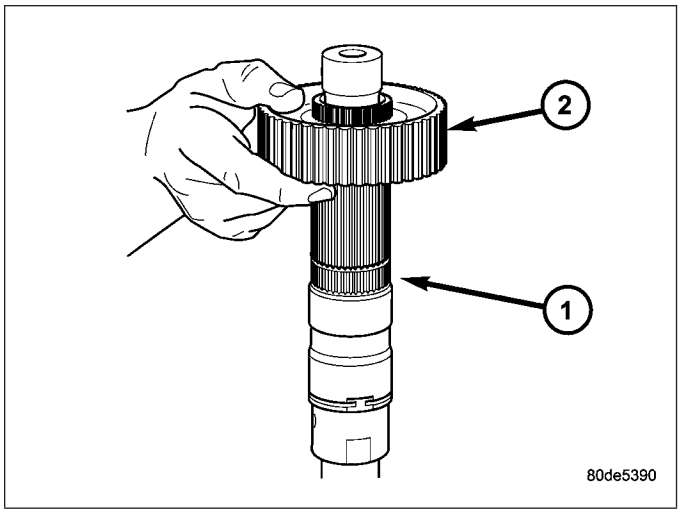


7. Install snap-ring (2) to hold input/low range gear (1) into front bearing.
8. Install a new input gear seal using Installer 8841 and Handle C-4171.

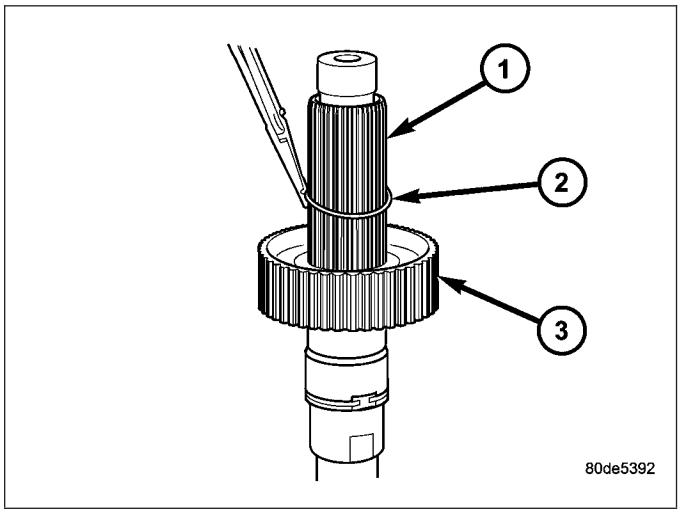


SHIFT FORKS AND MAINSHAFT

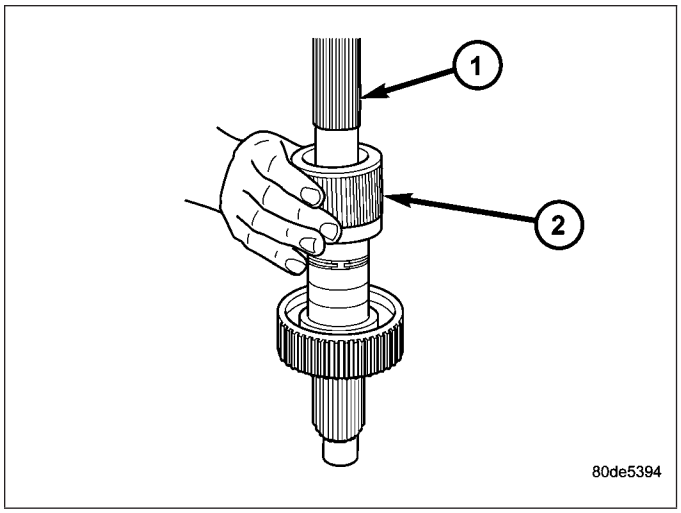
1. Lubricate mainshaft splines with recommended transmission fluid.
2. Install the mode hub (1) onto the output shaft.



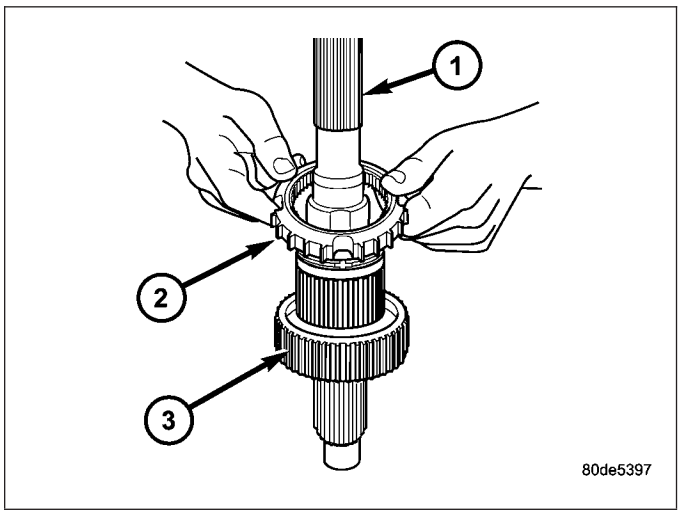
3. Install the mode hub retaining ring (2) onto the output shaft (1).



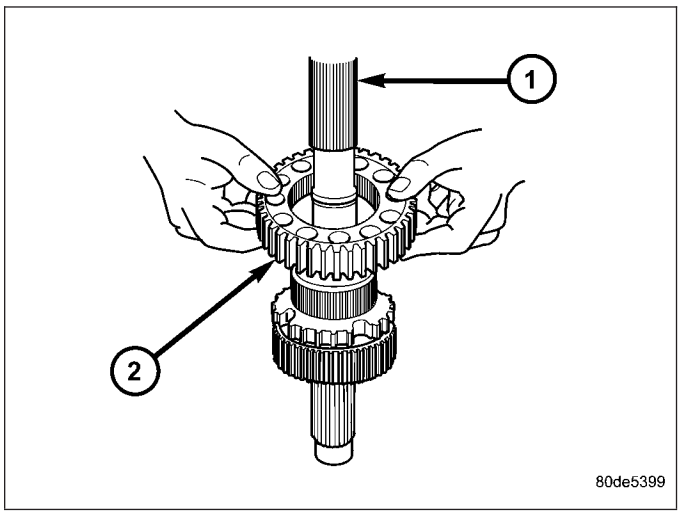
4. Install the sprocket hub (2) onto the output shaft (1).



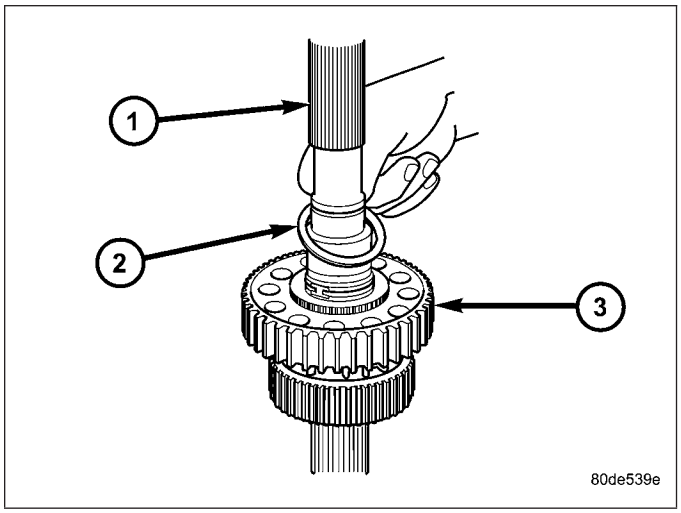
5. Install the clutch gear (2) onto the output shaft (1).



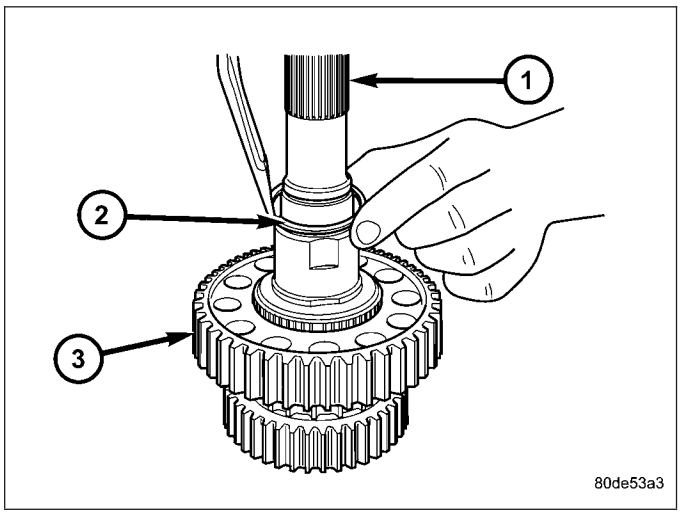
6. Install the drive sprocket (2) onto the output shaft (1).



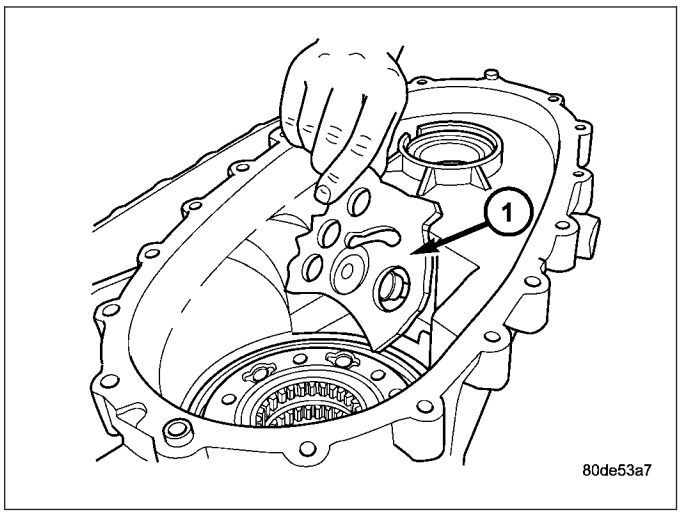
7. Install the drive sprocket (3) thrust washer (2) onto the output shaft (1).



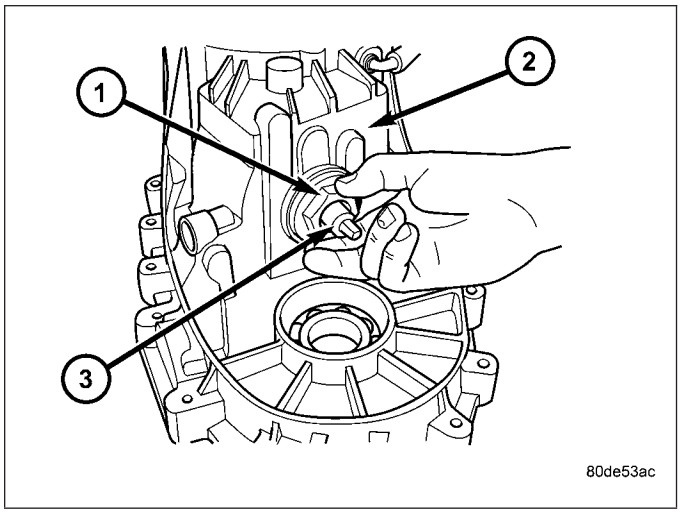
8. Install the drive sprocket retaining ring (2) onto the output shaft (1).



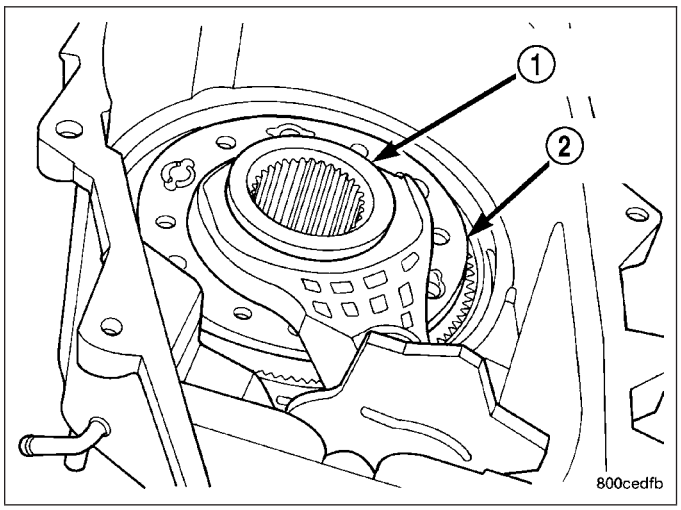
9. Lubricate sector shaft with transmission fluid and install shift sector (1) in case. Position slot in sector so it will be aligned with shift fork pin when shift forks are installed.



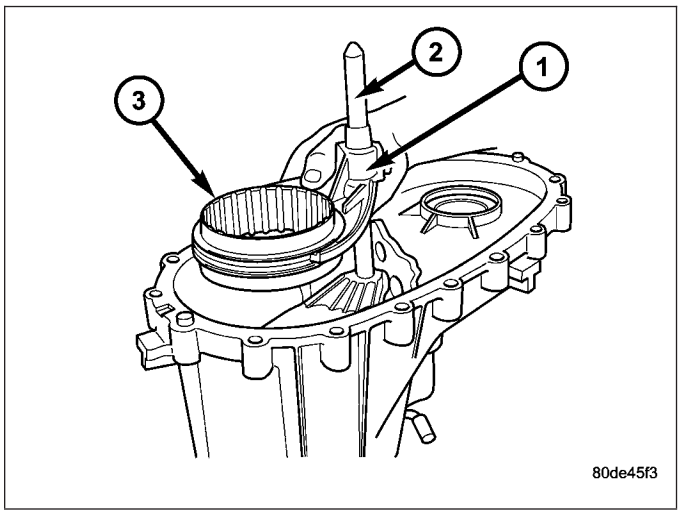
10. Install the shift sector support (1). Tighten the sector support to 27-42 N·m (20-30 ft.lbs.).



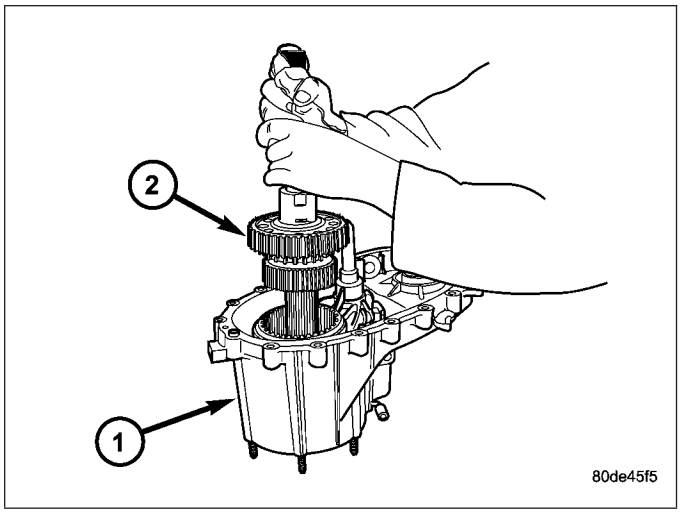
11. Assemble and install range fork (2) and hub (1). Be sure hub is properly seated in low range gear and engaged to the input gear.
12. Align and insert range fork pin in shift sector slot.
13. Install the range fork retaining ring.



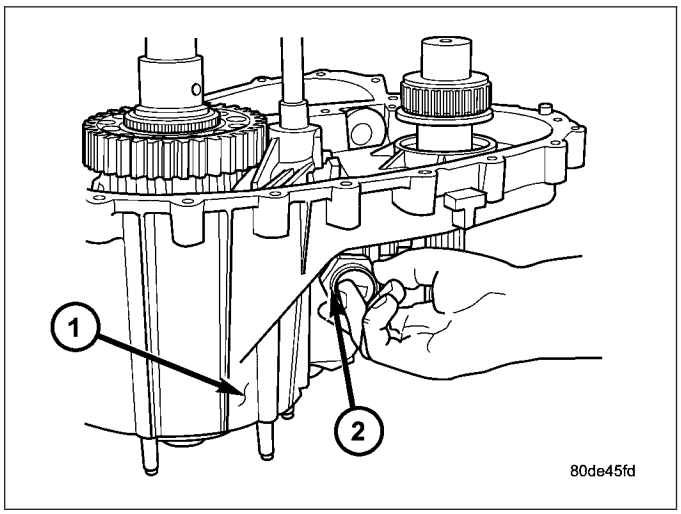
14. Install mode fork (1) and shift rail (2) onto the mode sleeve (3).
15. Install the mode fork, sleeve, and shift rail into the transfer case.



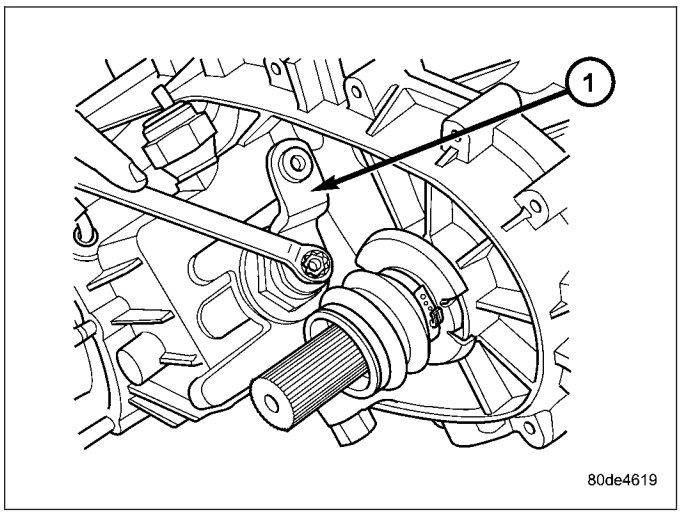
16. Install mainshaft (2) into the transfer case (1). Guide mainshaft through the mode and range sleeves and into the input gear.



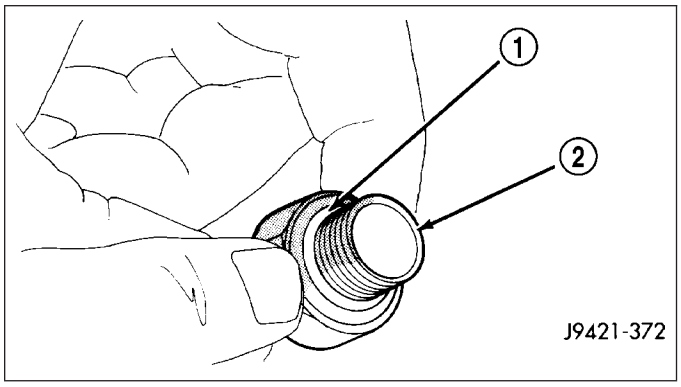
17. Install the transfer case position sensor or switch (2). Tighten the sensor or switch to 20-34 N·m (16-25 ft. lbs.) torque.



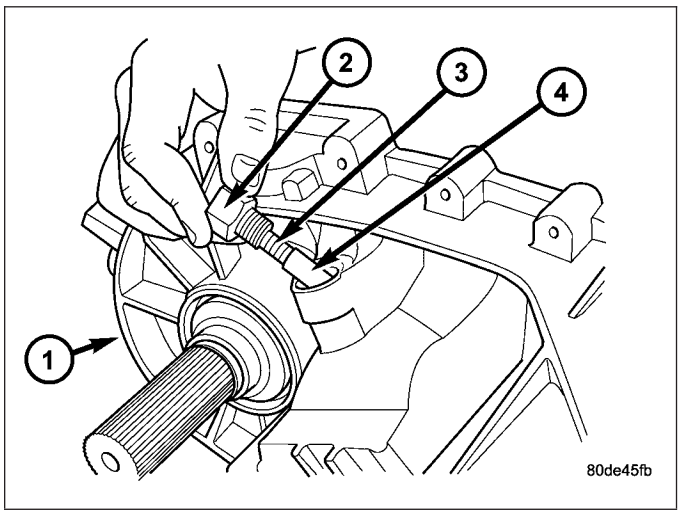
18. Install range lever (1) on sector shaft.
19. Install washer and nut on sector shaft to secure shift lever. Apply 1-2 drops Mopar® Lock N' Seal, or equivalent, to nut threads before installation. Then tighten nut to 27-34 N·m (20-25 ft. lbs.) torque.



20. Install new o-ring on detent plug (2).

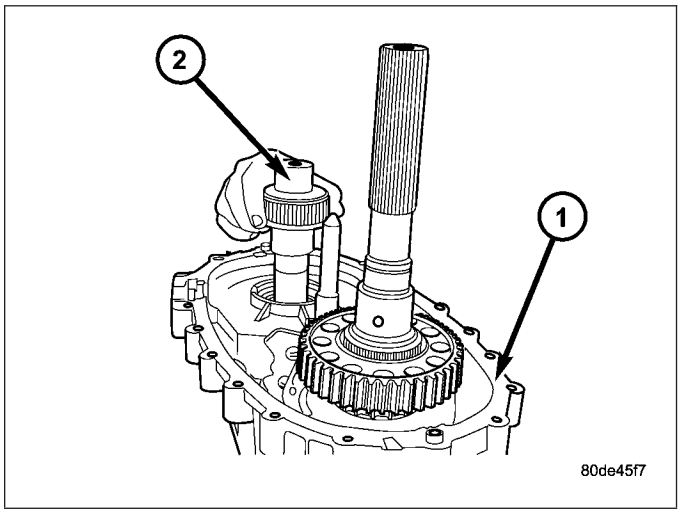


21. Install detent plunger (4), spring (3), and plug (2). Tighten the plug to 16-25 N·m (12-18 ft. lbs.).

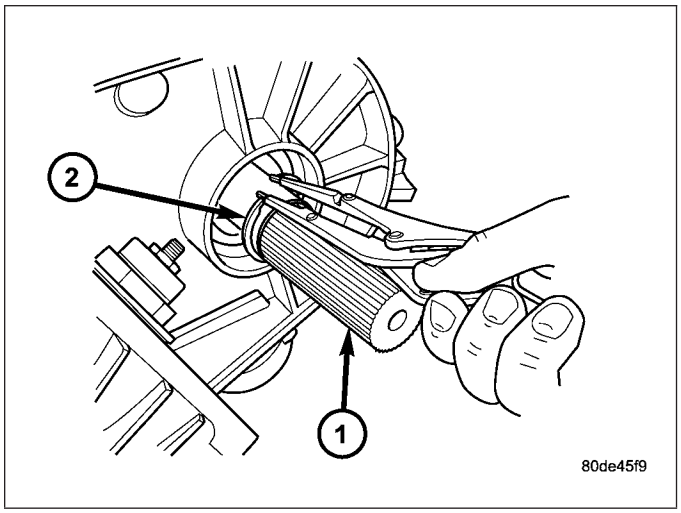


FRONT OUTPUT SHAFT AND DRIVE CHAIN

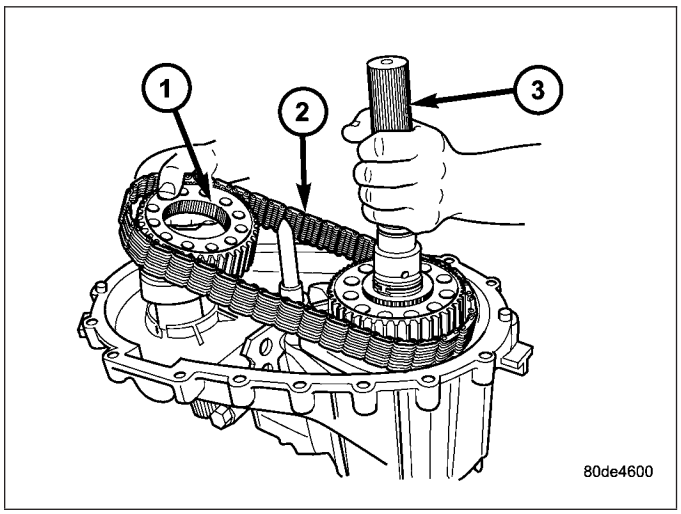
1. Install the front output shaft (2) into the front output shaft bearing.



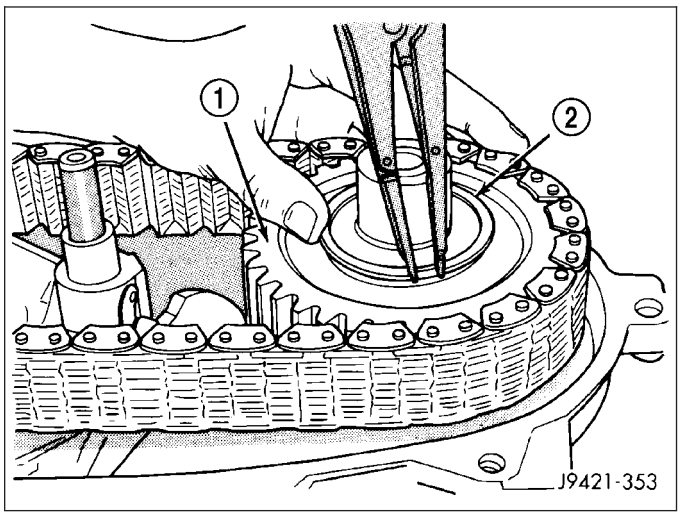
2. Install the front output shaft retaining ring (2) onto the output shaft.
3. Install the new front output shaft seal with Installer MB991168A.



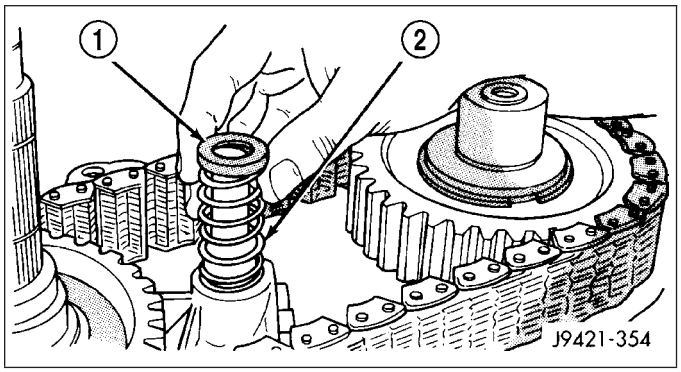
4. Insert front sprocket in drive chain.
5. Install drive chain (2) around mainshaft sprocket (1). Then position front sprocket over front shaft.
6. Raise mainshaft about 2.54 cm (one inch) and seat front sprocket on front output shaft.



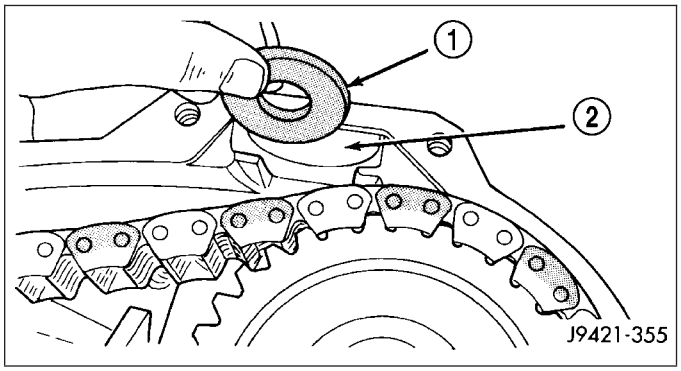
7. If mainshaft and mode sleeve were unseated during chain installation, align and reseat mainshaft in input gear and hub.
8. Install front sprocket (1) retaining ring (2).



9. Install spring (2) and cup (1) on shift rail.



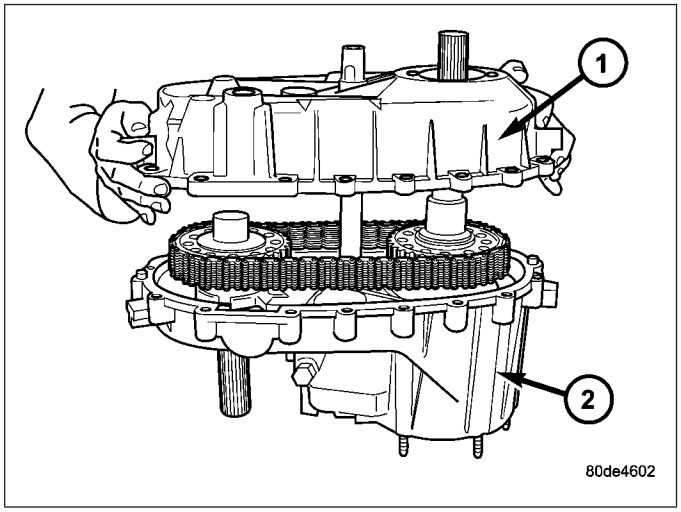
10. Insert magnet (1) in front case pocket (2).



OIL PUMP AND REAR CASE

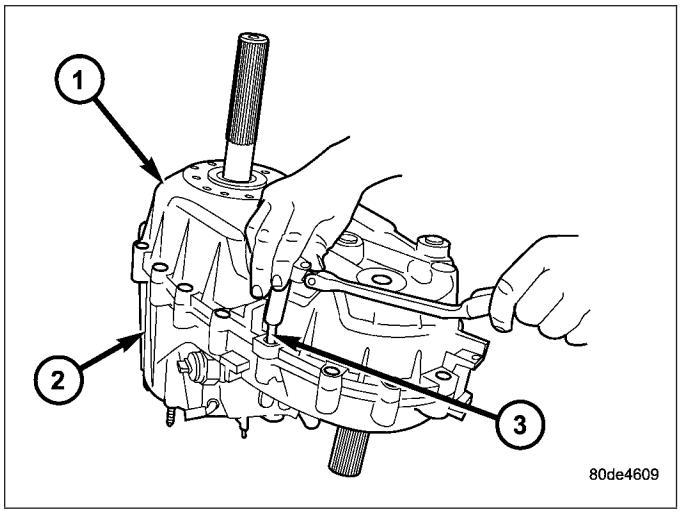
CAUTION: Do not remove the bolts holding the oil pump cover to the rear case half. The oil pump cover is aligned to the rear output shaft inner bearing race and will become mis-aligned if the bolts are loosened. If the transfer case failure has generated any debris which may have become trapped in the oil pump. the rear case and oil pump assembly MUST be replaced.

1. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of front case. Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess will be displaced into case interior.
2. Align oil pump with mainshaft and align shift rail with bore in rear case. Then install rear case (1) and oil pump assembly.

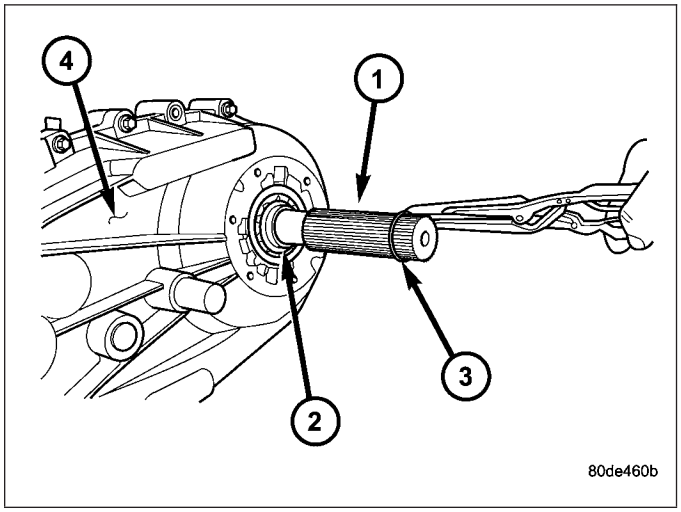


3. Install 4-5 rear case(1)-to front case (2) bolts to hold rear case in position. Tighten bolts snug but not to specified torque at this time.

CAUTION: Verify that shift rail, and case alignment dowels are seated before installing any bolts. Case could be cracked if shaft rail or dowels are misaligned.



4. Apply Loctite™ 242 to remainder of rear case-to-front case bolt threads and install bolts. Tighten bolts to 20-27 N·m (15-24 ft. lbs.),
5. Install rear output bearing (2) snap-ring (3) to output shaft.

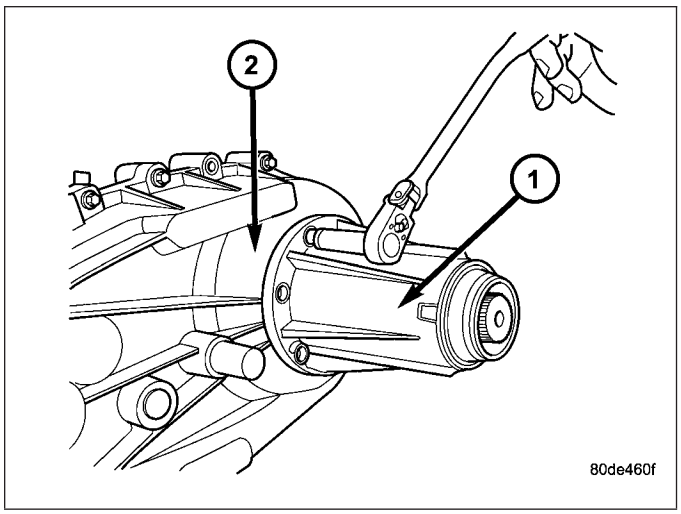


SEAL BOOT

1. Install the front output shaft seal slinger with Installer 8840. Install the slinger onto the shaft until the tool contacts the rear of the output shaft.
2. Install a new seal boot clamp onto the seal boot.
3. Install the seal boot and clamp onto the slinger hub and tighten the clamp with Crimp Tool C-4975-A.

REAR EXTENSION

1. Install new seal in rear extension housing seal with Installer D-163 and Handle C-4171..
2. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of rear extension housing. Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess could be displaced into output bearing.
3. Align and install rear extension housing (1) on retainer.
4. Apply Mopar® Silicone Sealer to threads of rear extension housing bolts. Then install and tighten bolts to 16-24 N·m (12-18 ft. lbs.) torque.



INSTALLATION

1. Align and seat transfer case on transmission. Be sure transfer case input gear splines are aligned with transmission output shaft. Align splines by rotating transfer case rear output shaft yoke if necessary. Do not install any transfer case attaching nuts until the transfer case is completely seated against the transmission.
2. Install and tighten transfer case attaching nuts. Tighten nuts to 30-41 N·m (20-30 ft.lbs.).
3. Remove jack stand from under transmission.
4. Align and connect propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)
5. Connect vent hose and transfer case position sensor connector.
6. Connect shift rod to transfer case lever or floor shift arm. Use channel lock style pliers to press rod back into lever grommet.
7. Adjust shift linkage, if necessary.
8. Fill transfer case with recommended transmission fluid and install fill plug.
9. Install skid plate, if equipped. (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - INSTALLATION)
10. Lower vehicle

SPECIFICATIONS

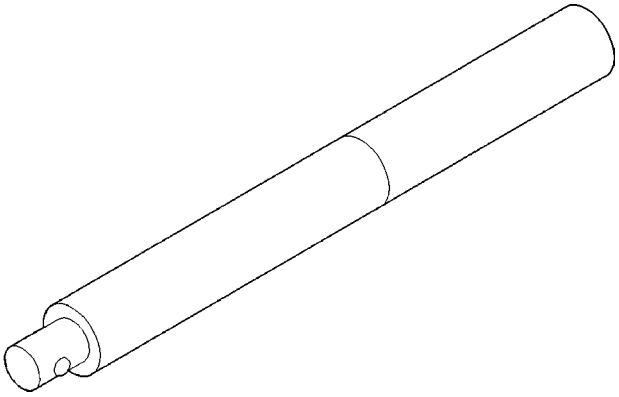
TRANSFER CASE - NV241 GENII

TORQUE SPECIFICATIONS

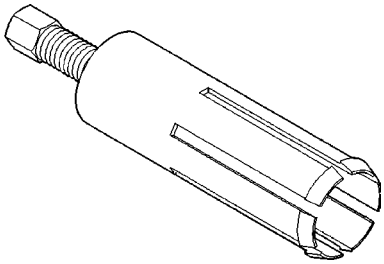
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Plug, Detent	16-24	12-18	-
Plug, Drain/Fill	20-34	15-25	-
Bolt, Extension Housing	16-24	12-18	-
Bolt, Case Half	20-27	15-24	-
Screw, Oil Pump	12-16	8-12	-
Nut, Range Lever	27-34	20-25	-
Sector Support	27-42	20-30	-
Nuts, Mounting	30-41	20-30	-
Position Sensor	20-34	16-25	-

SPECIAL TOOLS

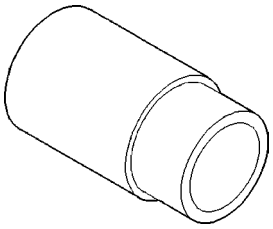
TRANSFER CASE - NV241/NV243



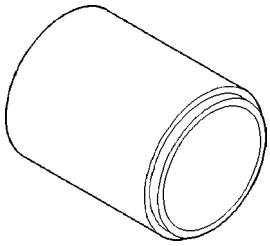
Handle, Universal - C-4171



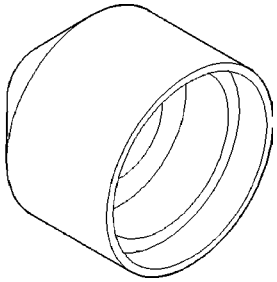
Remover, Bushing - 6957



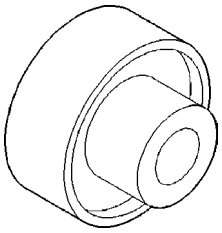
Installer, Bushing - 8157



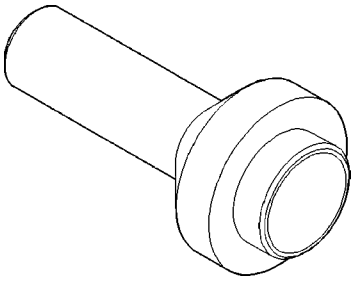
Installer, Seal - 6888



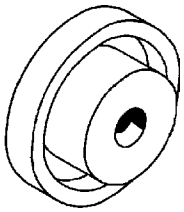
Installer, Seal - D-163



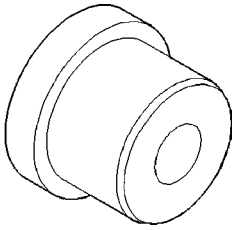
Installer, Bearing - 6953



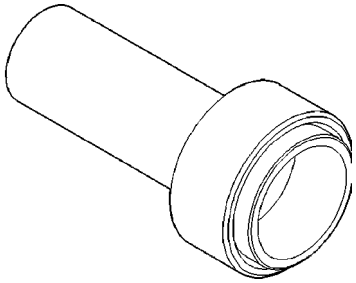
Installer, Seal - 7884



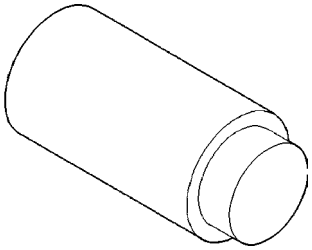
Installer, Seal - C-4210



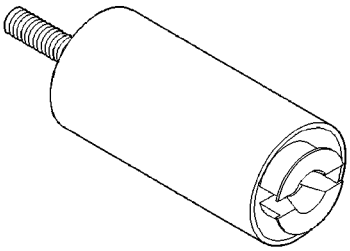
Installer, Bushing - 5066



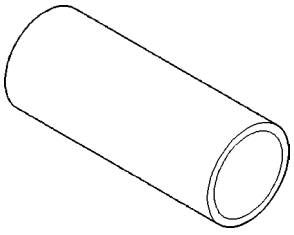
Installer, Pump Housing Seal - 7888



Plug, Extension - C-293-3



Remover - L-4454



Cup - 8148

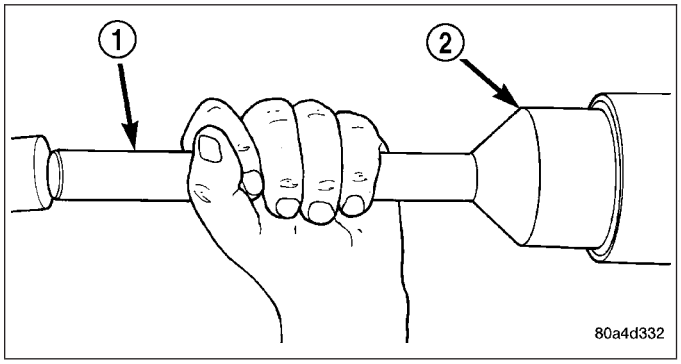
SEAL-EXTENSION HOUSING

REMOVAL

1. Raise and support vehicle.
2. Remove rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
3. Using a suitable pry tool or slide-hammer mounted screw, remove the extension housing seal.

INSTALLATION

1. Clean fluid residue from sealing surface and inspect for defects.
2. Using Installer D-163 (2) and Handle C-4171 (1), install seal in extension housing.
3. Install propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)
4. Verify proper transfer case fluid level.
5. Lower vehicle.



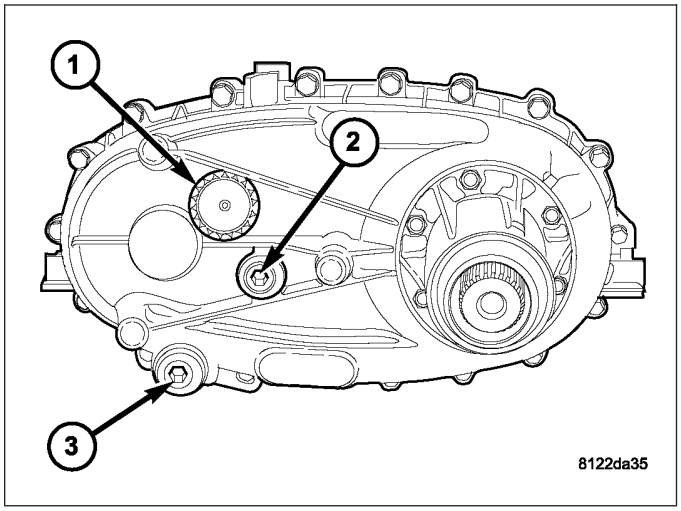
FLUID

STANDARD PROCEDURE - FLUID DRAIN AND REFILL

The fill (2) and drain (3) plugs are both in the rear case.

1. Raise vehicle.
2. Position drain pan under transfer case.

NOTE: It may be necessary to remove the exhaust y-pipe at the exhaust manifold to properly access the fill and drain plugs. Lowering the exhaust will allow the plugs to be accessed for torquing during installation. (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - REMOVAL)

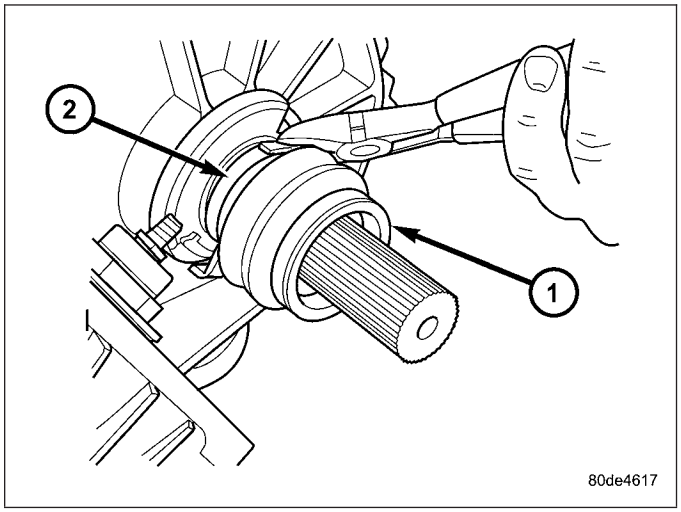


3. Remove drain and fill plugs and drain lubricant completely.
4. Install drain plug. Tighten plug to 20-34 N·m (15-25 ft. lbs.).
5. Remove drain pan.
6. Fill transfer case to bottom edge of fill plug opening with Mopar® ATF +4, Automatic Transmission fluid.
7. Install and tighten fill plug to 20-34 N·m (15-25 ft. lbs.).
8. Install the exhaust y-pipe to the exhaust manifold, if removed. (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - INSTALLATION)
9. Wipe any excess fluid that may have spilled onto the exhaust.
10. Lower vehicle.

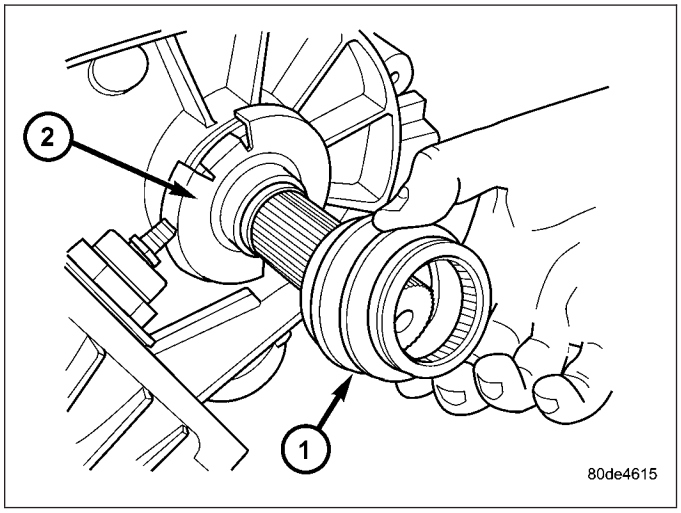
FRONT OUTPUT SHAFT SEAL

REMOVAL

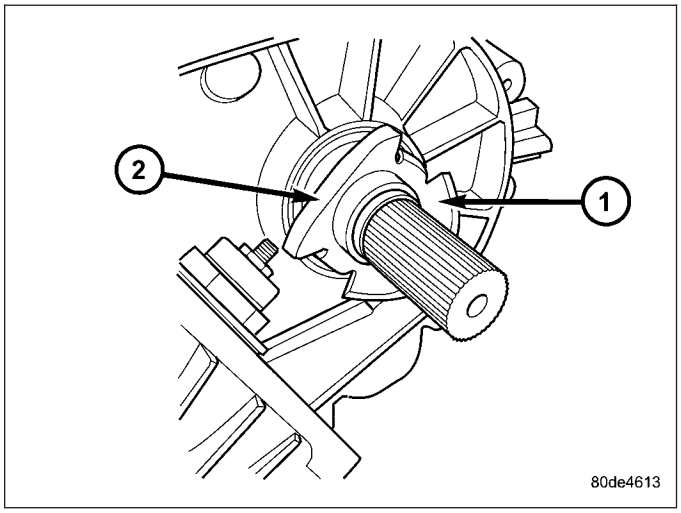
1. Remove the front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL).
2. Remove the front propeller shaft seal boot (1) retaining clamp (2).



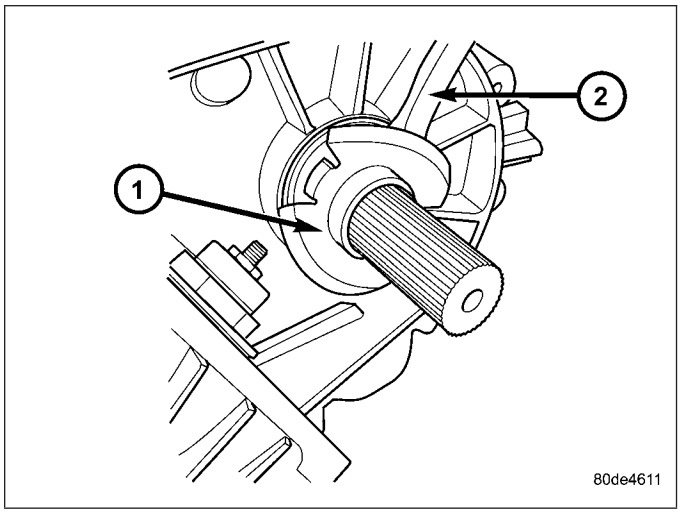
3. Remove the front propeller shaft seal boot (1).



4. Remove the front output shaft seal slinger (1) by bending (2) the slinger ears away from the transfer case.



5. Using a suitable pry tool (2), remove the slinger (1) from the output shaft using care not to damage the shaft.
6. Using a screw and a slide hammer, remove the front output shaft seal.

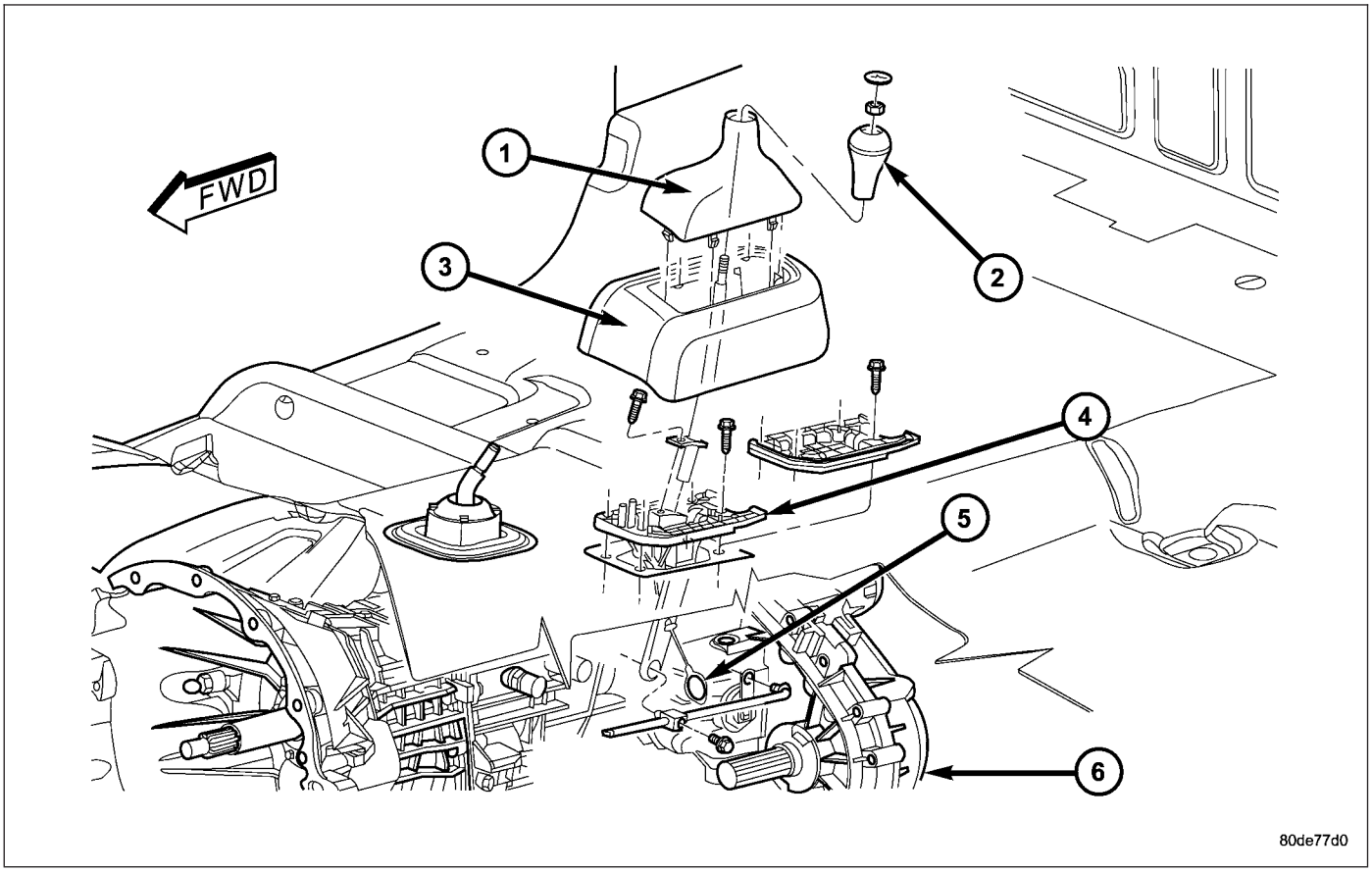


INSTALLATION

1. Install the new front output shaft seal with Installer MB991168A.
2. Install the front output shaft seal slinger with Installer 8840. Install the slinger onto the shaft until the tool contacts the rear of the output shaft.
3. Install a new seal boot clamp onto the seal boot.
4. Install the seal boot and clamp onto the slinger hub and tighten the clamp with Crimp Tool C-4975-A.
5. Install front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).

LEVER-SHIFT

REMOVAL

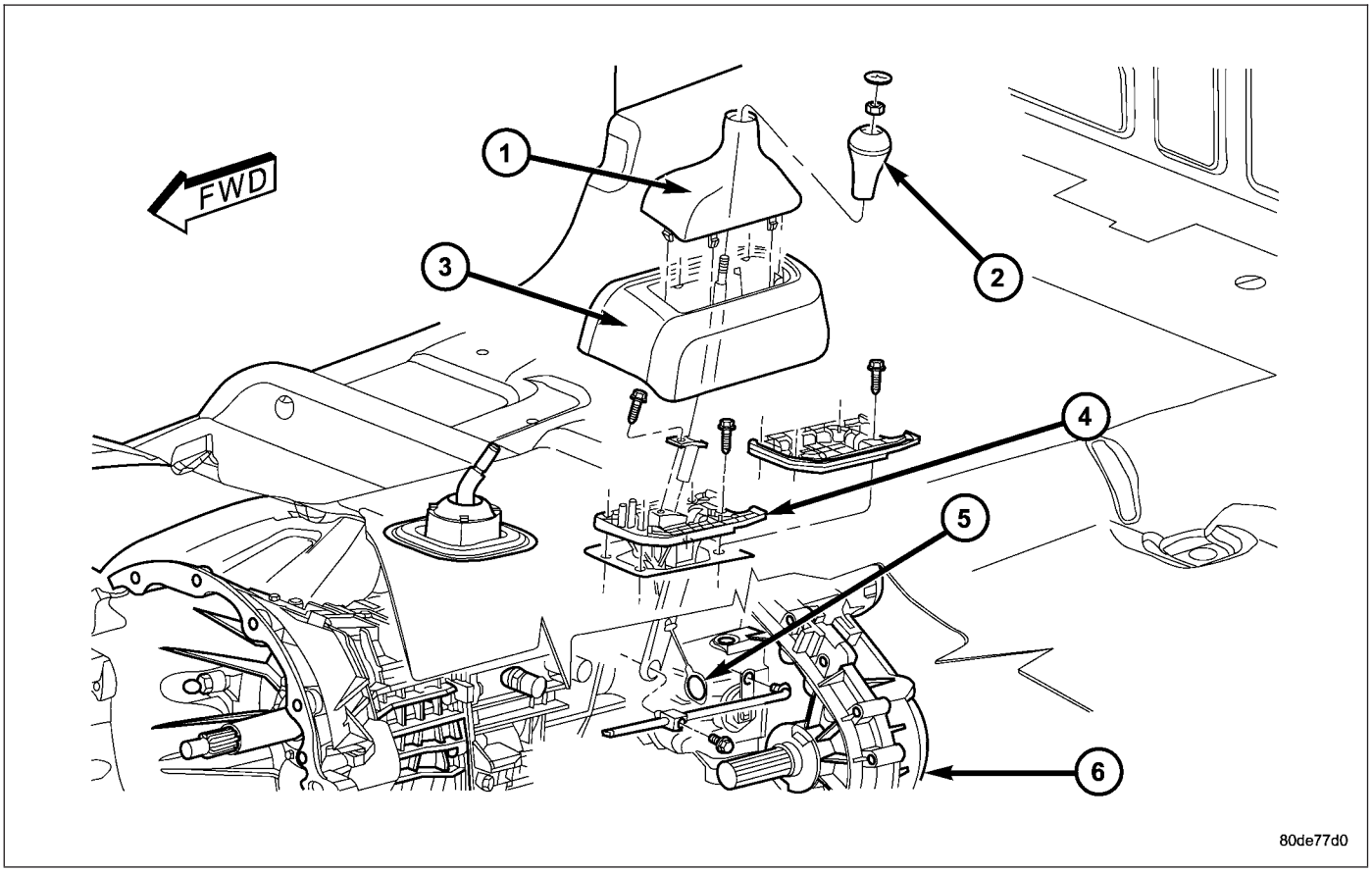


Transfer Case Shifter

1 - SHIFTER BOOT
2 - SHIFTER KNOB
3 - SHIFTER CONSOLE
4 - SHIFTER MECHANISM
5 - ALIGNMENT PIN
6 - TRANSFER CASE

1. Shift transfer case into 2H.
2. Raise and support the vehicle.
3. Loosen adjusting trunnion lock bolt and slide shift rod out of trunnion. If rod lacks enough travel to come out of trunnion, push trunnion out of shift lever.
4. Lower vehicle.
5. Remove transfer case shifter knob cap.
6. Remove nut holding shifter knob (2) to shift lever.
7. Remove shifter knob.
8. Remove the shift boot from the shifter console.
9. Remove the bolts securing the shifter mechanism to the floor pan.
10. Separate shift lever mechanism from the vehicle.

INSTALLATION



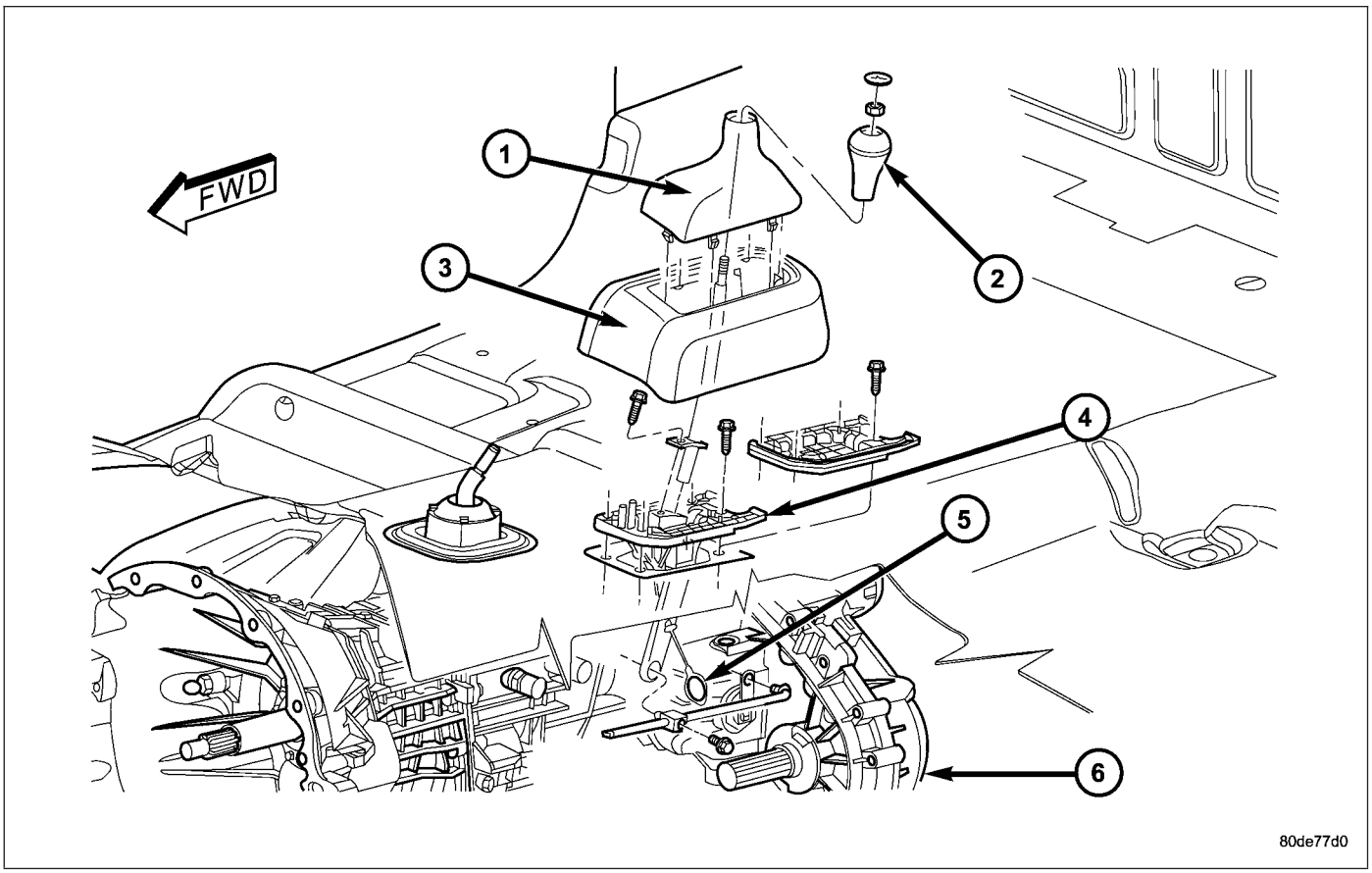
Transfer Case Shifter

1 - SHIFTER BOOT	4 - SHIFTER MECHANISM
2 - SHIFTER KNOB	5 - ALIGNMENT PIN
3 - SHIFTER CONSOLE	6 - TRANSFER CASE

1. If the shifter mechanism does not have a adjustment locating pin installed, align the adjustment channel on the shifter assembly to the locating hole in the lower shift lever and install an appropriately sized pin to retain the position.
2. Position shift lever in vehicle.
3. Install the bolts to hold the shifter mechanism (4) to the floor pan.
4. Raise vehicle.
5. Verify that the transfer case is still in the 2H position. The 2H detent position on the transfer case shift arm is the second position from full forward.
6. Install trunnion to shift lever, if necessary.
7. Install shift rod to trunnion, if necessary.
8. Tighten the shift rod lock bolt to 10 N·m (90 in.lbs.).
9. Remove the shifter adjustment locating pin from the adjustment channel and the locating hole.
10. Lower vehicle.
11. Install the transfer case shifter console.
12. Install the shifter boot and the shifter knob onto the shifter lever.
13. Install nut to hold shifter knob to shift lever.
14. Install shifter knob cap.
15. Verify transfer case operation.

ADJUSTMENTS

ADJUSTMENT - SHIFT LEVER



Transfer Case Shifter

1 - SHIFTER BOOT
2 - SHIFTER KNOB
3 - SHIFTER CONSOLE
4 - SHIFTER MECHANISM
5 - ALIGNMENT PIN
6 - TRANSFER CASE

1. Move shift lever into 2H position.
2. Raise vehicle.
3. Loosen shift rod lock bolt at trunnion.
4. Check shift rod fit in trunnion. Be sure rod does not bind in trunnion. Lubricate the shift rod and trunnion if necessary.
5. Verify that transfer case shift lever is in 2H detent position. The 2H detent position on the transfer case shift arm is the second position from full forward.
6. Align the adjustment locating hole on the lower shifter lever with the adjustment channel on the shifter bracket assembly.
7. Insert an appropriately sized pin through into the adjustment channel and through the locating hole to hold the shifter in the correct position.
8. Tighten shift rod lock bolt to 10 N·m (90 in. lbs.) torque.
9. Remove the locating pin from the adjustment channel and locating hole.
10. Check shift linkage operation. Be sure transfer case shifts into and operates properly in all ranges.

TRANSFER CASE - NV271 - SERVICE INFORMATION

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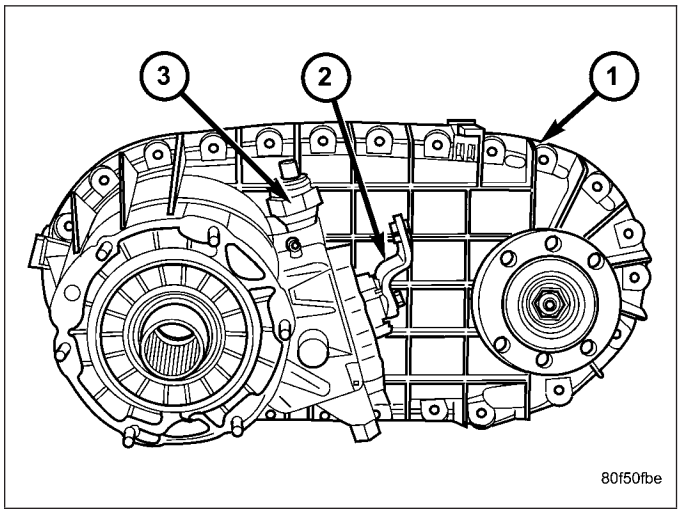
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TRANSFER CASE - NV271 - SERVICE INFORMATION

DESCRIPTION

The NV271 transfer case (1) is a part-time transfer case with a low-range gear system. It provides three operating ranges plus a NEUTRAL position. The low range position provides a gear reduction ratio of 2.72:1 for increased low speed torque capability.

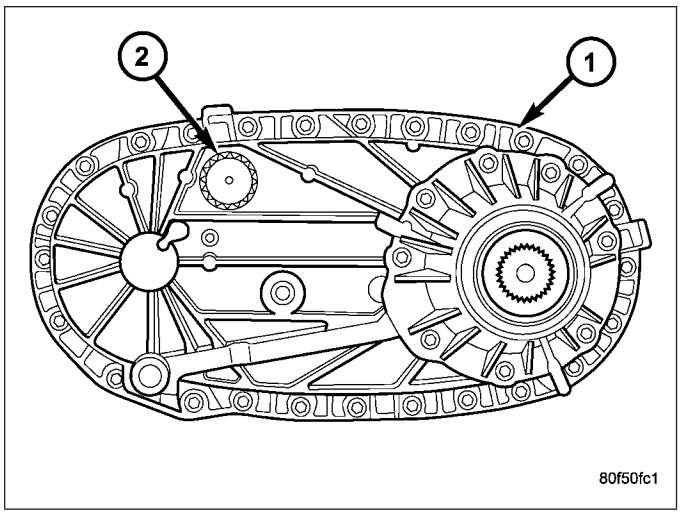
The gear cases and extension are all of aluminum. Drive sprockets and an interconnecting drive chain are used to transmit engine torque to the front/rear propeller shafts. The mainshaft, input gear and front output shaft are supported by ball and needle bearings.



IDENTIFICATION

An identification tag (2) is attached to the rear case of every transfer case. The tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.



OPERATION

OPERATING RANGE

Transfer case operating ranges are:

- 2H (2-wheel drive)
- 4H (4-wheel drive)
- 4LO (4-wheel drive low range

The 2H range is for use on any road surface at any time.

The 4H and 4LO ranges are for off road use only. They are not for use on hard surface roads. The only exception being when the road surface is covered by ice and snow.

The low range reduction gear system is operative in 4LO range only. This range is for extra pulling power in off road situations. Low range reduction ratio is 2.72:1.

SHIFT MECHANISM

The transfer case is operated by an adjustable floor mounted shift linkage. The transfer case shift lever is directly attached to the shift sector. The sector operates the range and mode forks within the transfer case.

A straight line shift pattern is used with a NEUTRAL detent. Lever range positions are imprinted in the shift knob.

SHIFTING

The transfer case can be shifted between the 2H and 4H operating ranges while the vehicle is in motion. The vehicle must have the transmission placed in NEUTRAL, or the clutch depressed in the case of a manual transmission, and be moving less than 2-3 MPH when shifting into and out of the 4L operating range.

DIAGNOSIS AND TESTING - TRANSFER CASE - NV271

Before beginning repair on a suspected transfer case malfunction, check all other driveline components beforehand.

The actual cause of a problem may be related to such items as: front hubs, axles, propeller shafts, wheels and tires, transmission, or clutch instead. If all other driveline components are in good condition and operating properly, refer to the Diagnosis Chart for further information.

DIAGNOSIS CHART

Condition	Possible Cause	Correction
Transfer Case difficult to shift or will not shift into desired range.	1) Vehicle speed too great to permit shifting.	1) Stop vehicle and shift into desired range. Or, reduce speed to below 3-4 km/h (2-3 mph) before attempting the shift.
	2) If vehicle was operated for an extended period in 4H on a dry paved surface, the driveline torque load may be causing a bind.	2) Stop vehicle and shift the transmission into neutral. Shift the transfer case to 2H and operate vehicle in 2H on dry paved surfaces.
	3) Transfer case external shift linkage binding.	3) Lubricate, repair, or replace linkage bushings, or tighten loose components as necessary.
	4) Insufficient or incorrect lubricant.	4) Drain and refill to edge of fill hole with Mopar® ATF +4, Automatic Transmission fluid.
	5) Internal components binding, worn, or damaged.	5) Disassemble the transfer case and replace worn or damaged components as necessary.
Transfer Case noisy in all operating ranges.	1) Insufficient or incorrect lubricant.	1) Drain and refill to edge of fill hole with Mopar® ATF +4, Automatic Transmission fluid.
Noisy in, or jumps out of, four wheel drive low range.	1) Transfer case not completely engaged in 4L position.	1) With the transmission in NEUTRAL, or the clutch depressed in the case of a manual transmission and the vehicle moving under 3-4 km/h (2-3 mph), shift the transfer case to NEUTRAL and then shift into the 4L position.
	2) Shift linkage out of adjustment.	2) Adjust linkage.
	3) Shift linkage loose or binding.	3) Tighten, lubricate, or repair linkage as necessary.
	4) Range fork damaged, inserts worn, or fork is binding on the shift rail.	4) Disassemble unit and repair as necessary.
	5) Low range gear worn or damaged.	5) Disassemble unit and repair as necessary.
Lubricant leaking from output shaft seal or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Vent closed or restricted.	2) Clear or replace vent as necessary.
	3) Output shaft seals damaged or installed incorrectly.	3) Replace seal as necessary. Check to ensure that another component, the propeller shaft slip yoke for example, is not causing damage to seal.
Abnormal tire wear.	1) Extended operation on hard, dry surfaces in the 4H position.	1) Operate vehicle in the 2H position on hard, dry surfaces.

REMOVAL

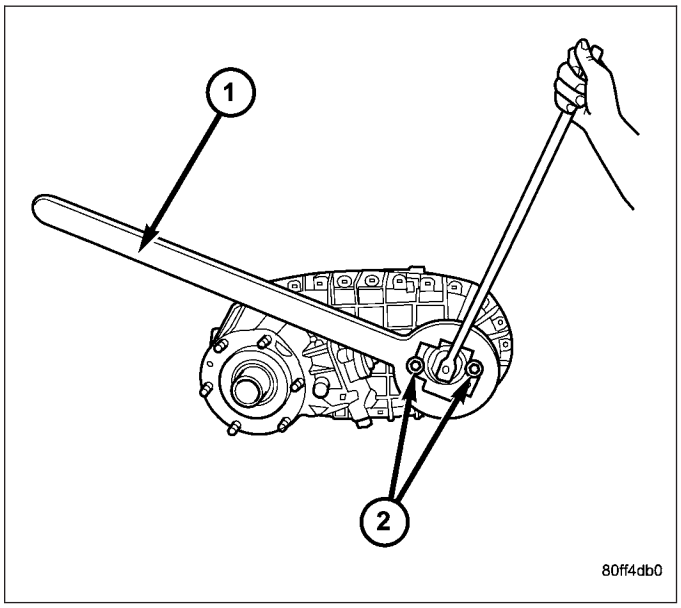
1. Raise and support vehicle.
2. Remove skid plate, if equipped. (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - REMOVAL)
3. Position drain oil container under transfer case.
4. Remove transfer case drain plug and drain lubricant into container.
5. Disconnect vent hose and transfer case position sensor connector.
6. Disconnect shift rod from grommet in transfer case shift lever, or from floor shift arm whichever provides easy access. Use channel lock style pliers to press rod out of lever grommet.
7. Support transmission with jack stand.
8. Mark front and rear propeller shafts for assembly reference.
9. Remove front and rear propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
10. Support transfer case with suitable jack. Secure transfer case to jack with safety chains.
11. Remove nuts attaching transfer case to transmission.
12. Move transfer case assembly rearward until free of transmission output shaft.
13. Lower jack and move transfer case from under vehicle.

DISASSEMBLY

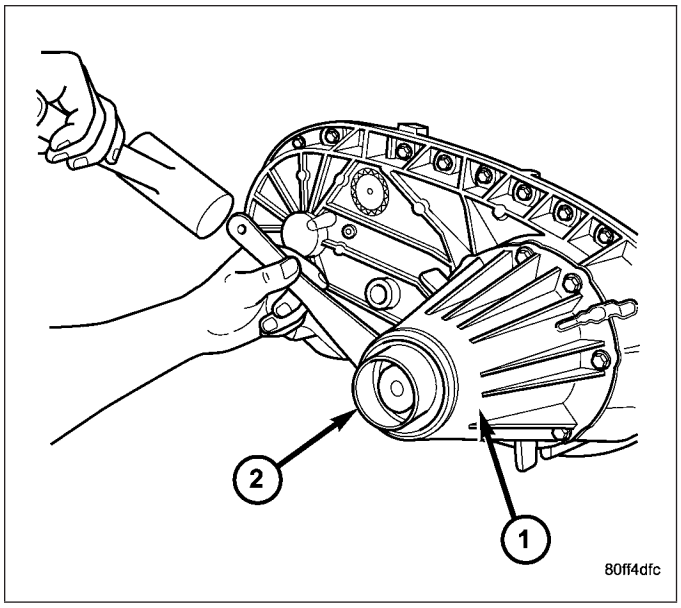
Position transfer case in a shallow drain pan. Remove drain plug and drain any remaining lubricant remaining in case.

COMPANION FLANGE AND EXTENSION HOUSING

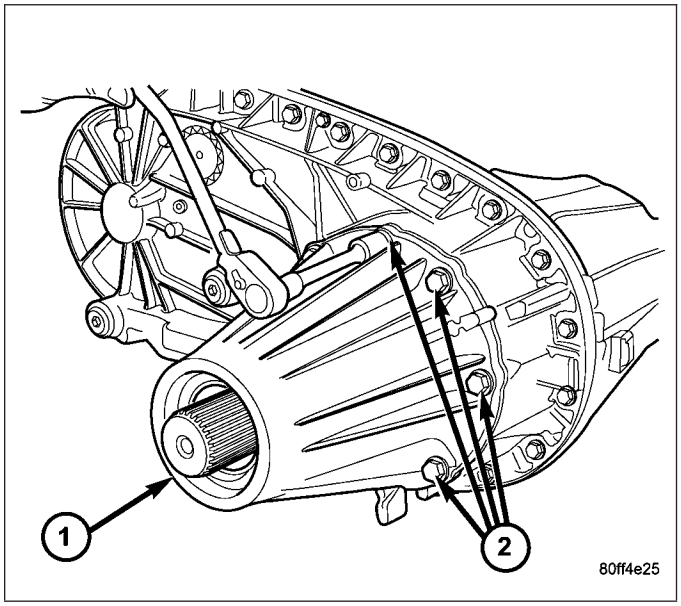
1. Install two bolts 180° apart into the front output shaft companion flange.
2. Place holder (1) over the bolts (2) and against the companion flange.
3. Remove and discard the front companion flange nut.
4. Remove the companion flange from the front output shaft. It may be necessary to use Flange puller 8992 to remove the companion flange.



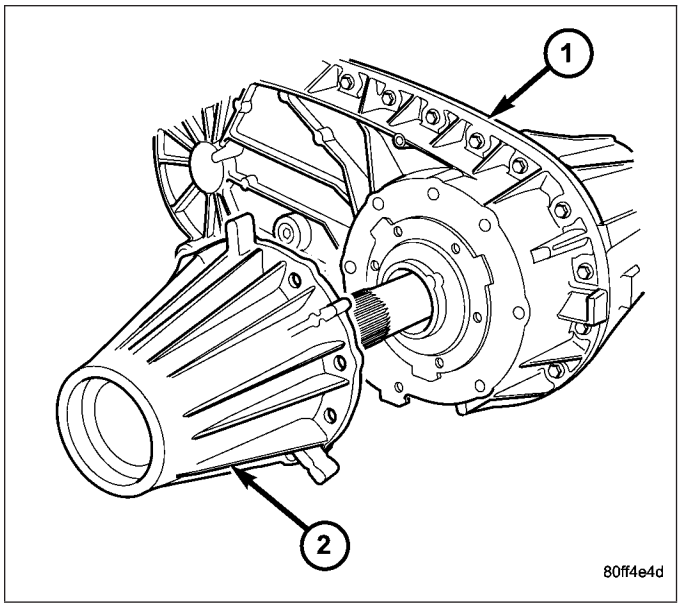
5. Use a suitable chisel or pry tool to remove the rear extension housing (1) dust boot (2).
6. Use a suitable chisel or pry tool to remove the rear extension housing seal.



7. Remove rear extension (1) bolts (2).



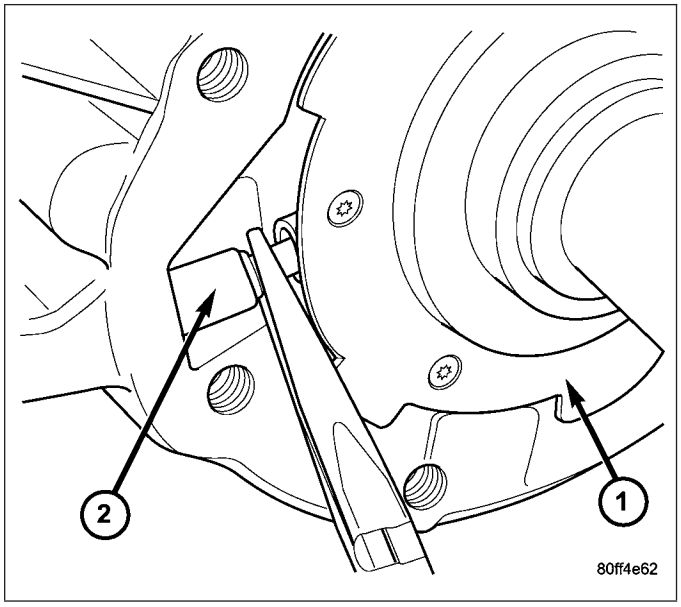
8. Remove rear extension housing (2) from the rear case half. Tap extension once or twice with a plastic mallet to break sealer bead and loosen it.



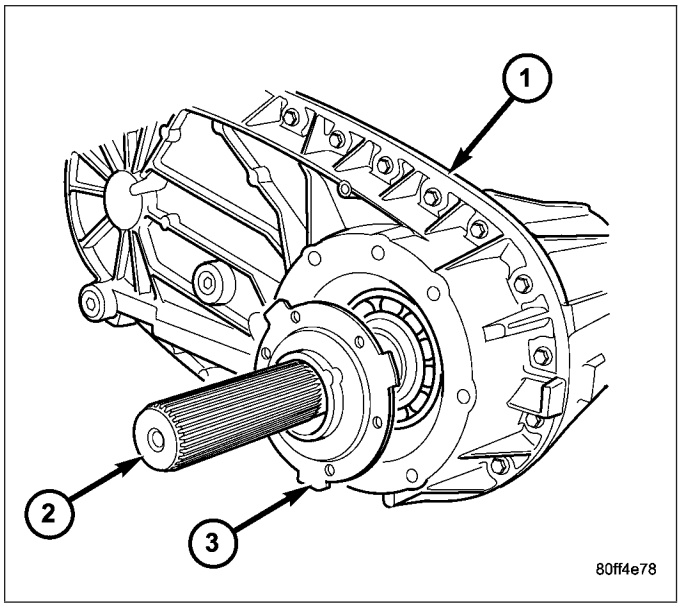
OIL PUMP AND REAR CASE

1. Disengage the oil pump pick-up tube (2) from the oil pump (1).

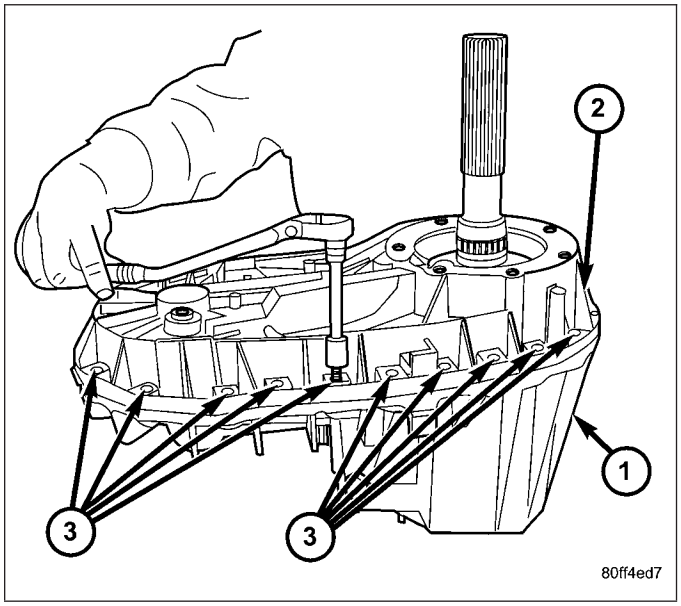
NOTE: The oil pump pick-up tube seals to the oil pump with an o-ring. Verify that the o-ring was removed with the tube and is in good condition. Replace the o-ring if necessary.



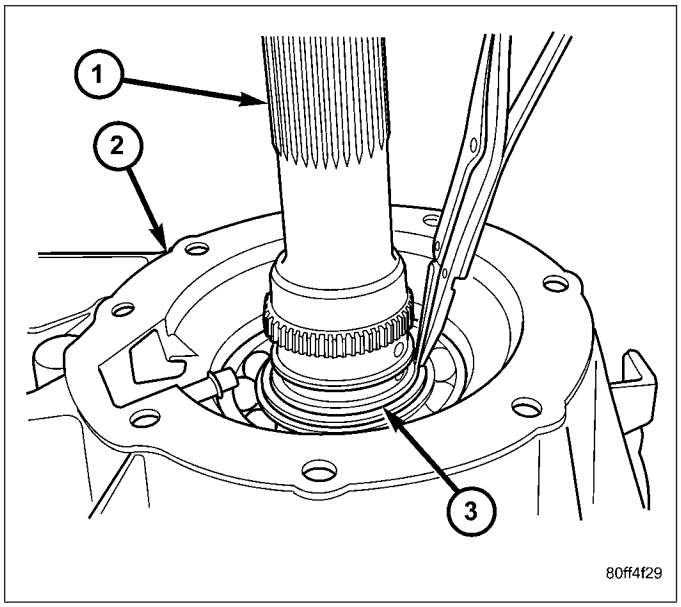
2. Remove the oil pump (3) from the rear output shaft (2).



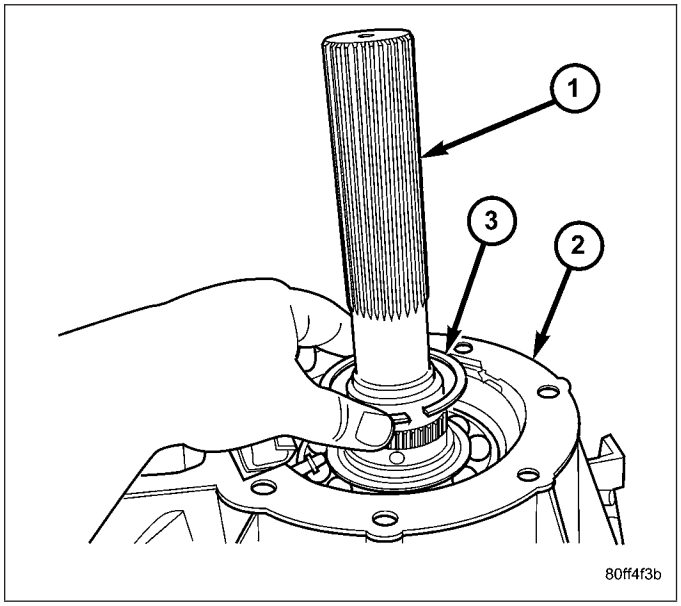
3. Remove rear case (2)-to-front case (1) bolts (3).



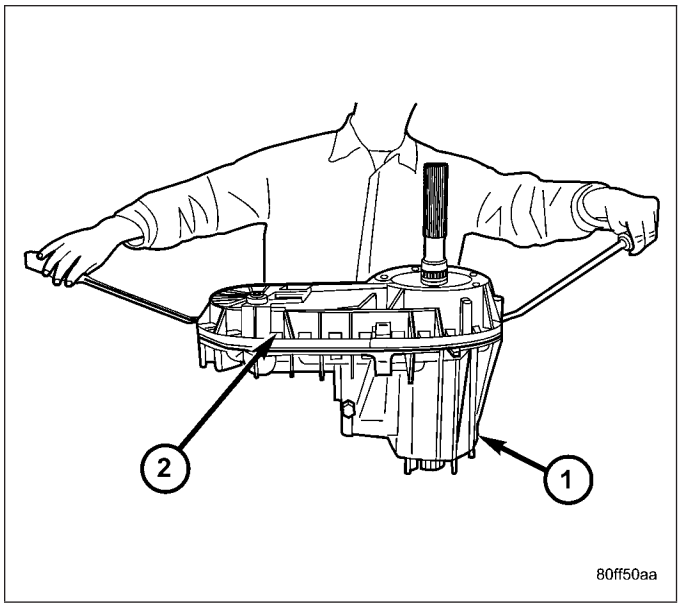
4. Remove the rear output shaft bearing inner snap-ring (3) from the output shaft (1) using suitable snap-ring pliers.



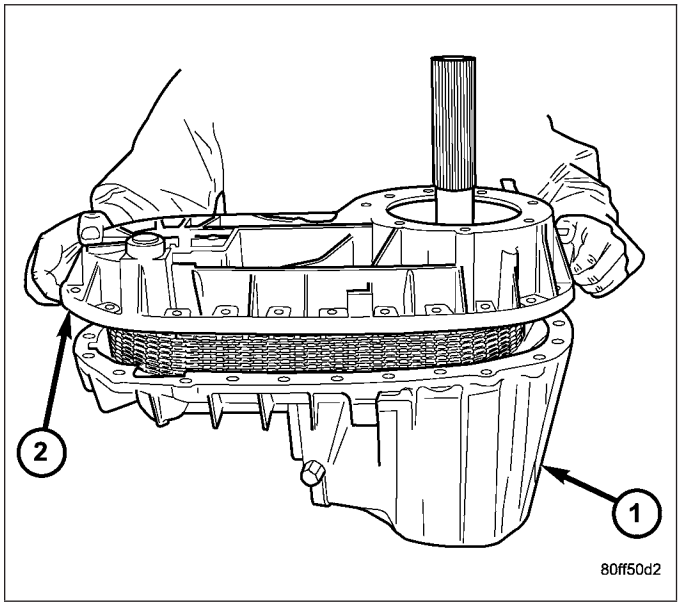
5. Remove the rear output shaft bearing inner snap-ring (3) from the output shaft (1).



6. Loosen rear case (2) with pry tool to break sealer bead. Insert tool at each end of case.

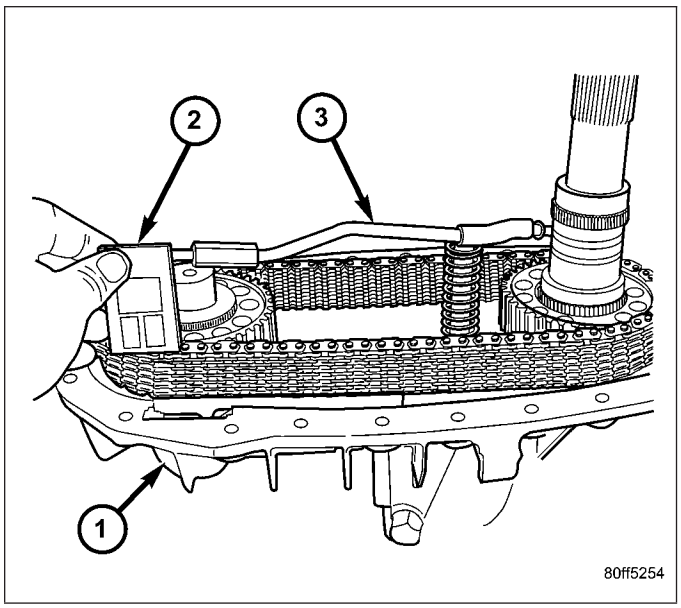


7. Unseat rear case from alignment dowels.
8. Remove the rear case (2) from the front case (1).

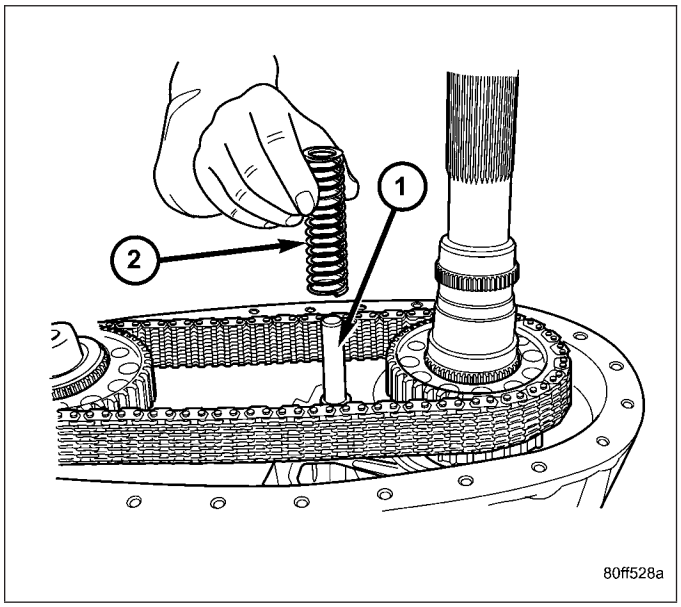


FRONT OUTPUT SHAFT AND DRIVE CHAIN

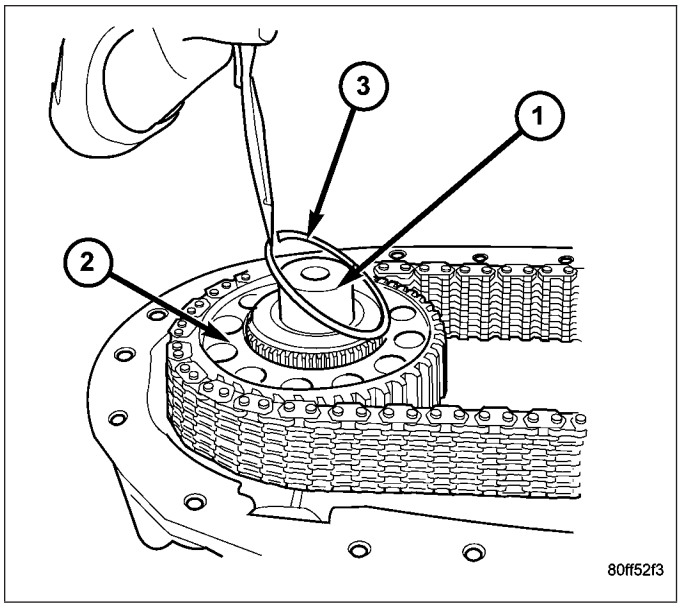
1. Remove the oil pick-up tube (3) and screen (2) from the front case half (1).



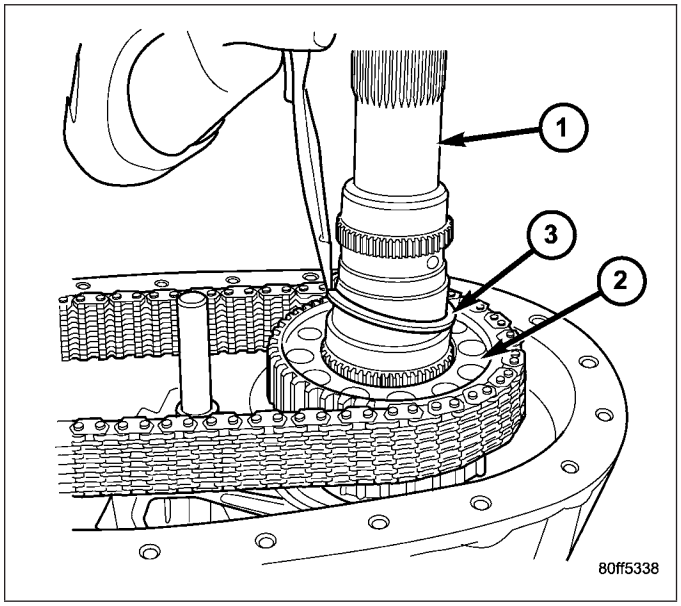
2. Remove the shift rail spring (2) from the shift rail (1).



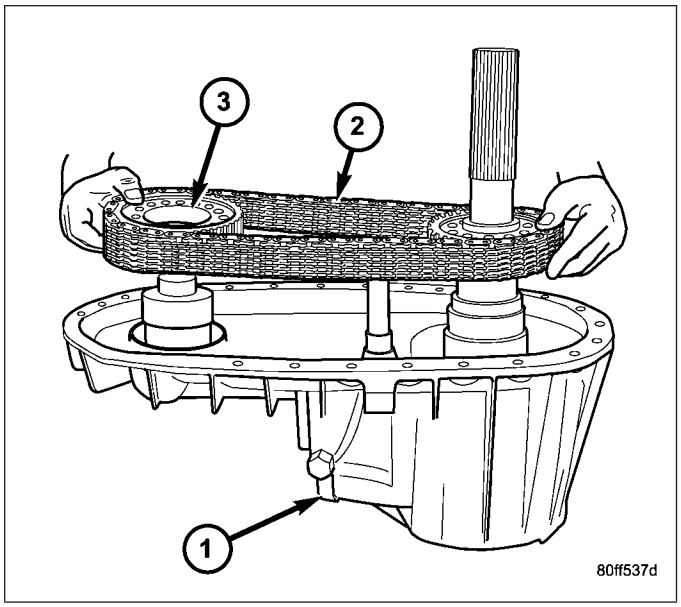
3. Remove the front output shaft (1) drive sprocket (2) retaining ring (3).



4. Remove the rear output shaft (1) drive sprocket (2) retaining ring (3).

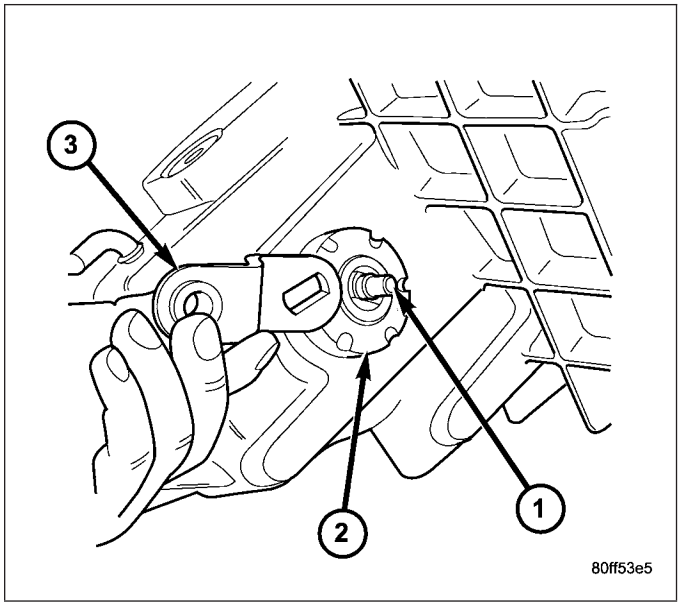


5. Pull front sprocket (3), rear sprocket, and chain (2) upward until clear of the front and rear output shaft sprocket splines.
6. Remove chain and sprockets as an assembly.

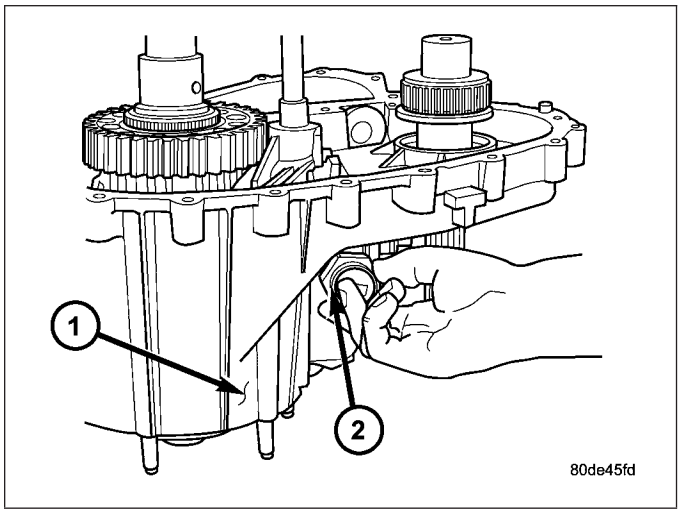


SHIFT FORKS AND MAINSHAFT

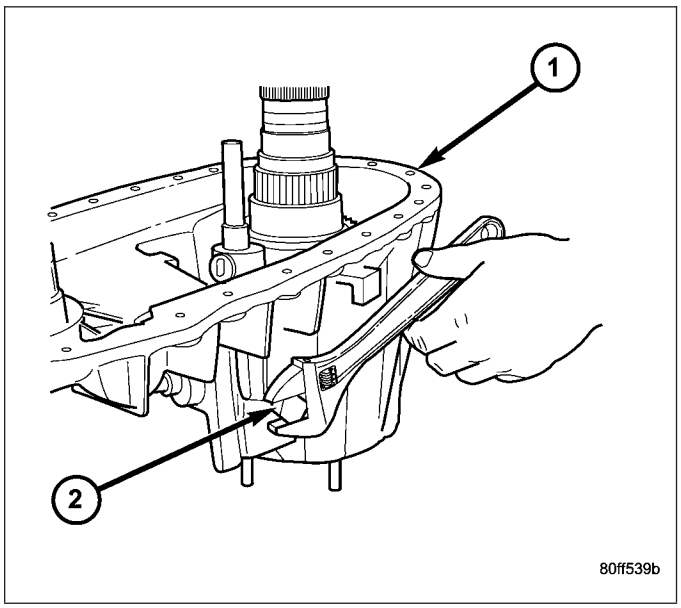
1. Shift transfer case into NEUTRAL.
2. Remove nut that retains the shift lever to sector shaft. Then remove shift lever (3) and spacer from the shaft.
3. Remove the sector support (2) with Socket 9033.



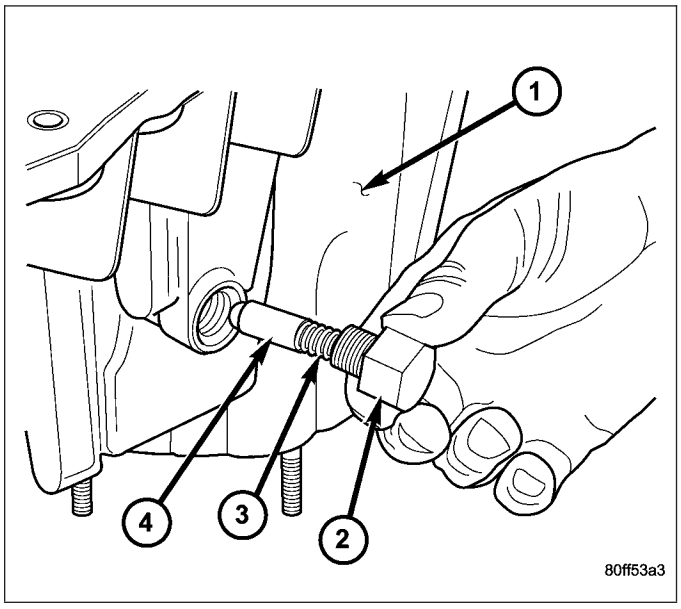
4. Remove the transfer case position sensor or switch (2) from the front case half (1).



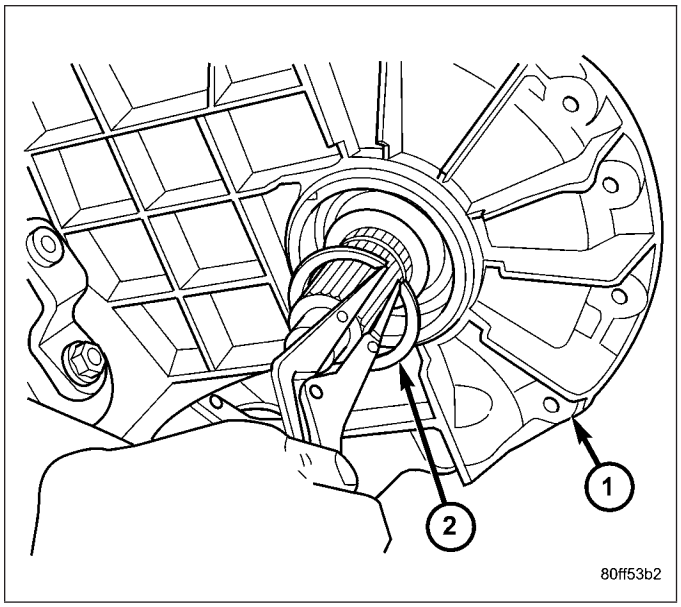
5. Loosen detent plug (2).



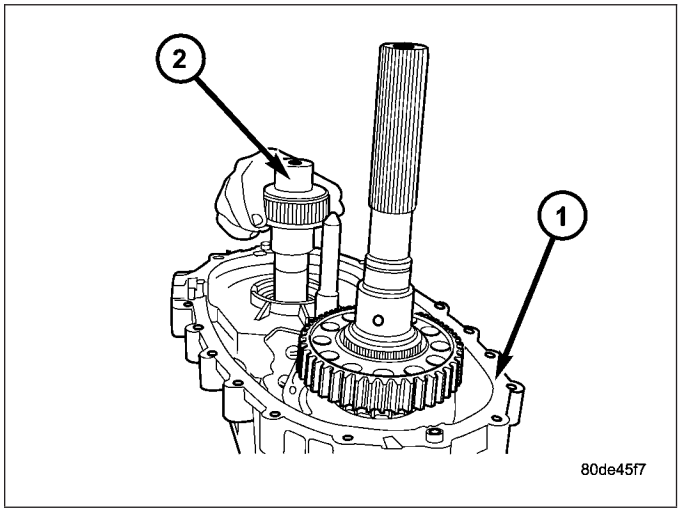
6. Remove detent plug (2), spring (3), and plunger (4). Note that the plug has an O-ring seal. Remove and discard this seal.



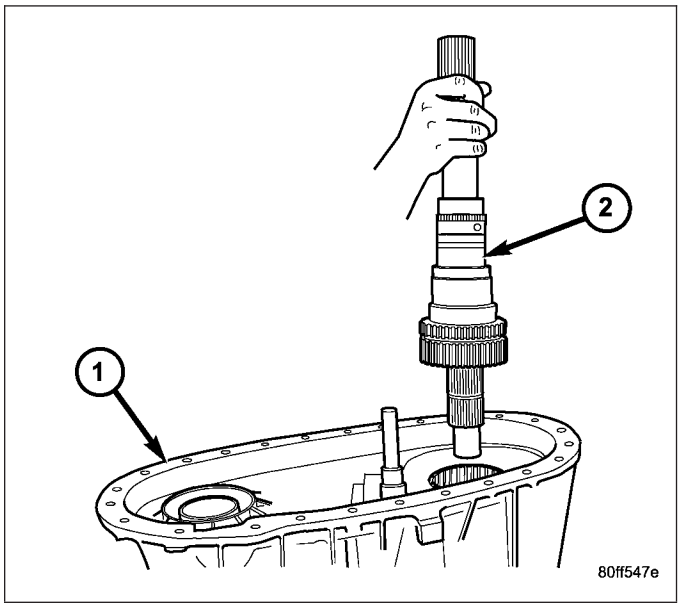
7. Using a screw mounted in a slide hammer, remove the front output shaft seal.
8. Remove the front output shaft snap-ring (2).



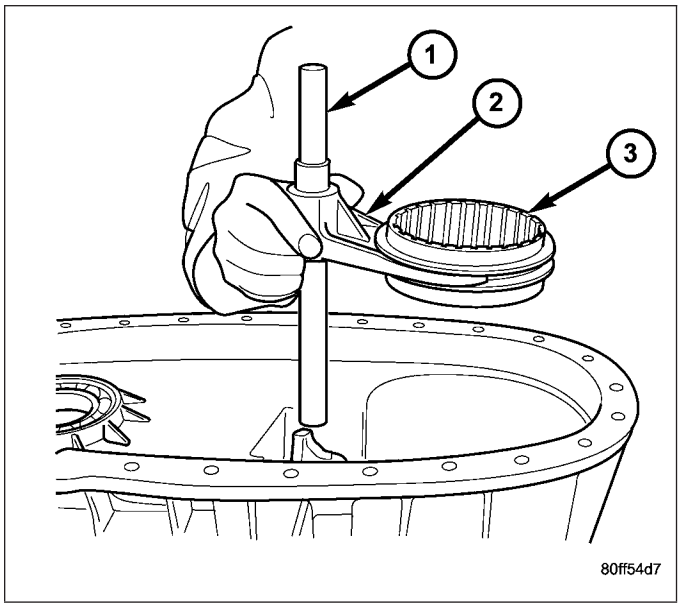
9. Remove front output shaft (2) from bearing in the front case (1).



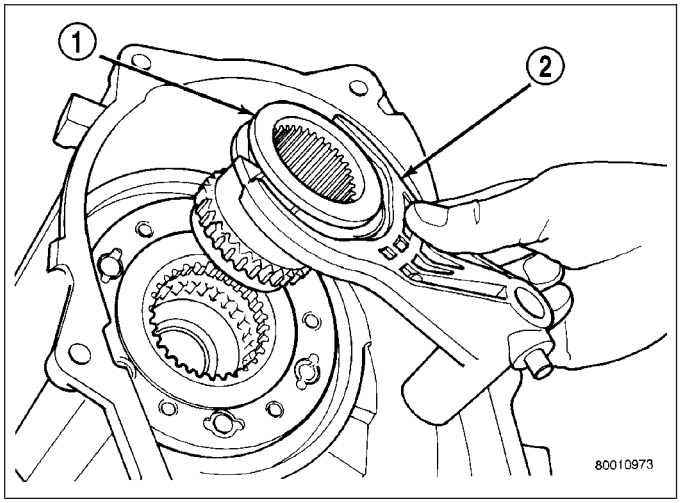
10. Pull mainshaft assembly (2) out of input gear, mode sleeve, and case.



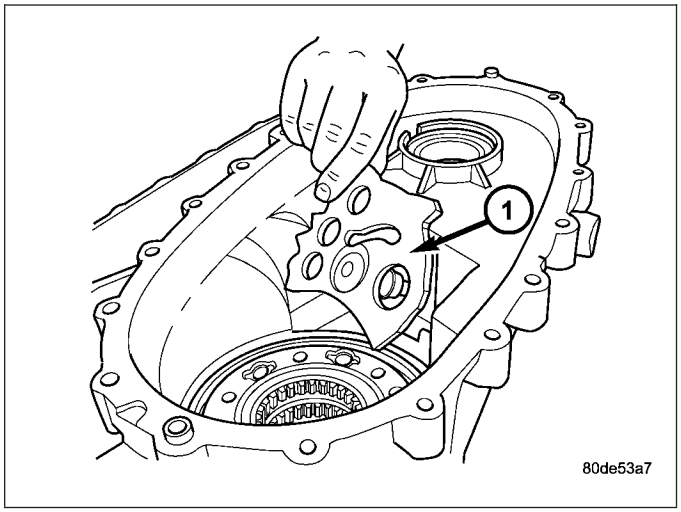
11. Remove mode fork (2), mode sleeve (3), and shift rail (1) as assembly. Note which way the sleeve fits in the fork (long side of sleeve goes to front or the points on the sleeve teeth go to the rear of case).



12. Remove range fork (2) and hub (1) as an assembly. Note fork position for installation reference.

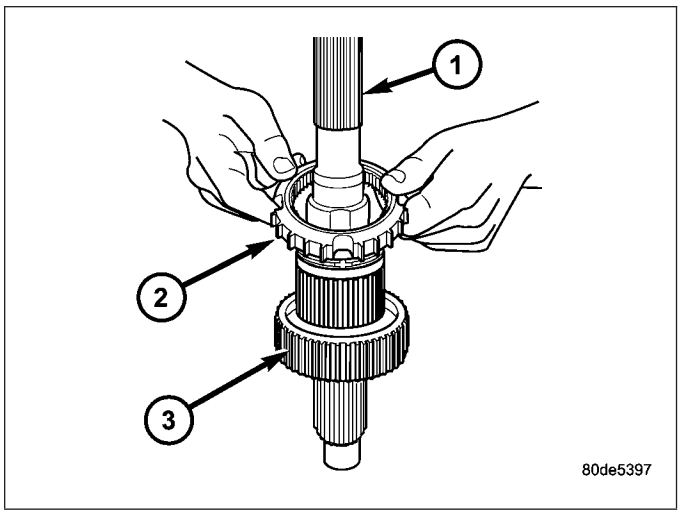


13. Remove shift sector (1).

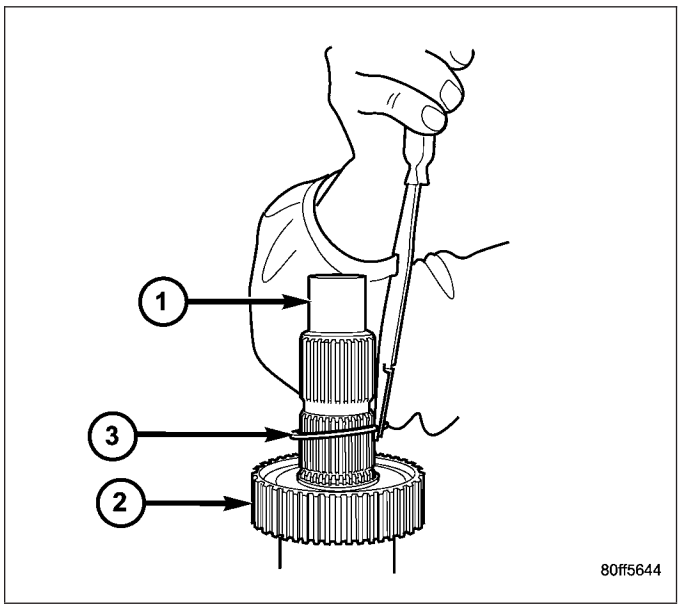


MAINSHAFT

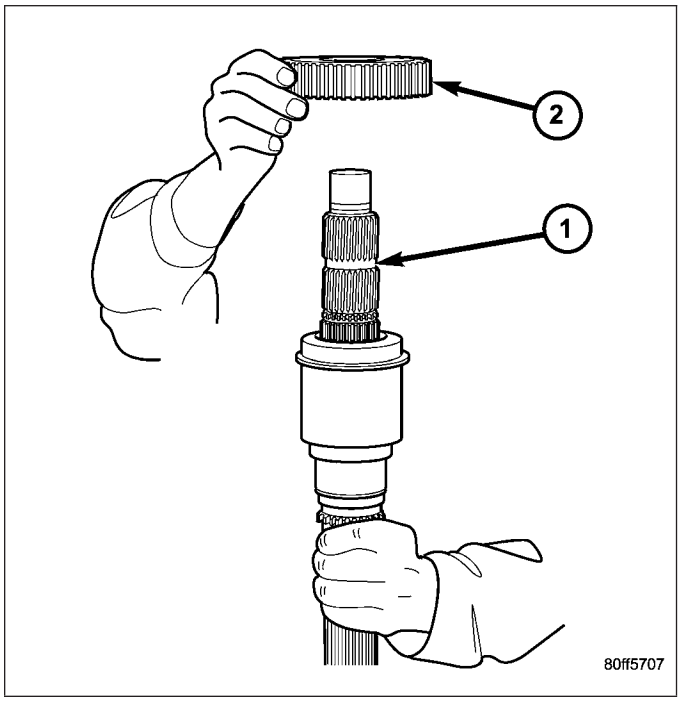
1. Remove the clutch gear (2) from the output shaft (1).



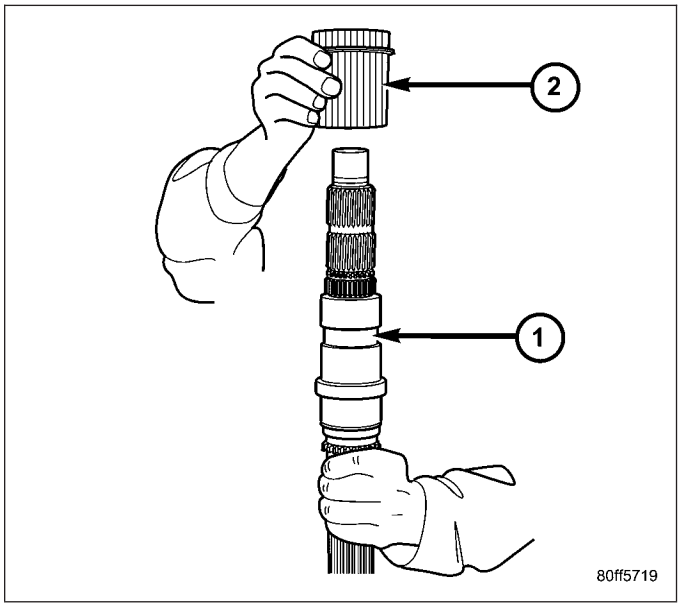
2. Remove the mode hub retaining ring (3) from the mainshaft (1).



3. Remove the mode hub (2) from the mainshaft (1).

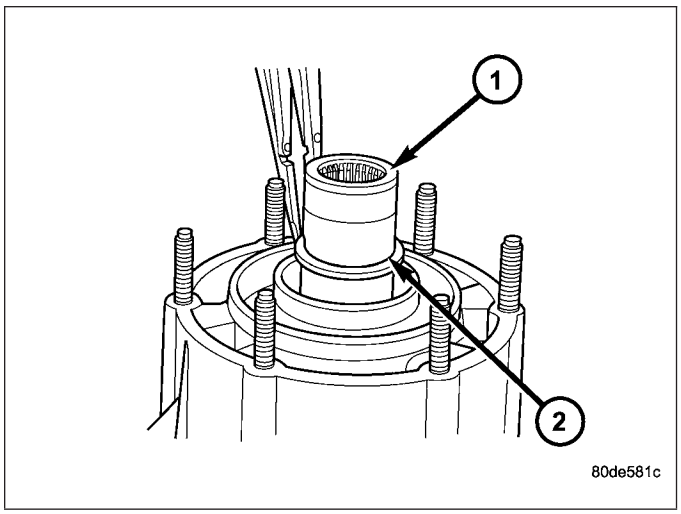


4. Remove the drive sprocket drive hub (2) from the mainshaft.

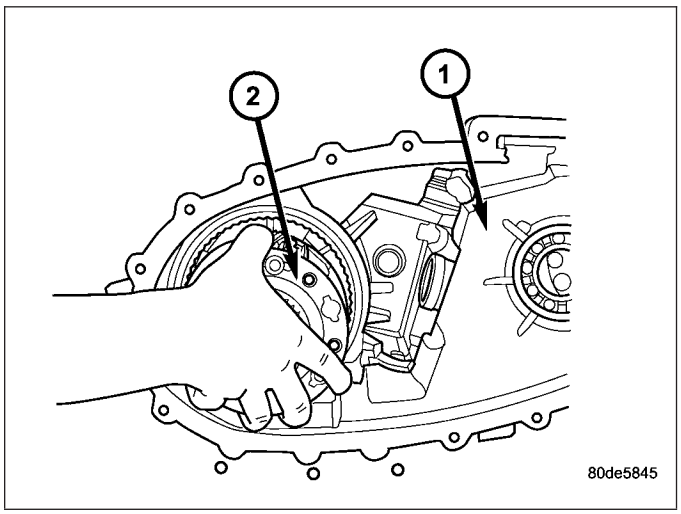


INPUT AND PLANETARY GEAR

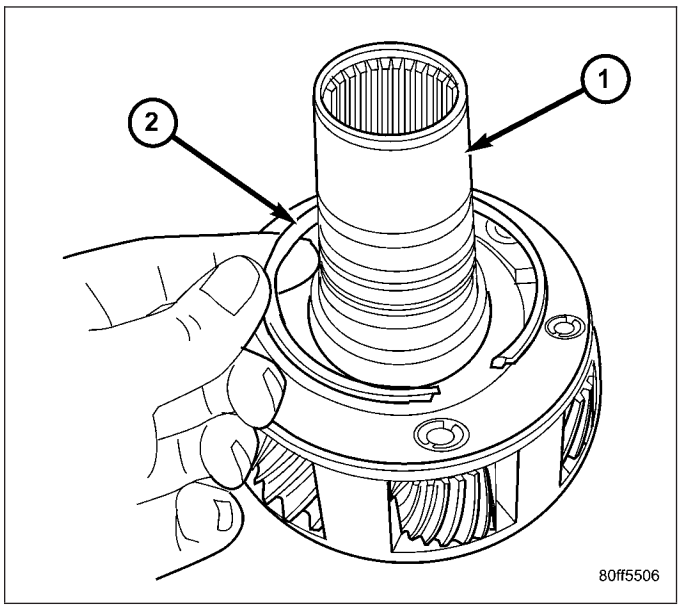
1. Remove input gear seal with suitable screw and slide hammer.
2. Remove input gear retaining ring (2) with heavy duty snap-ring pliers.



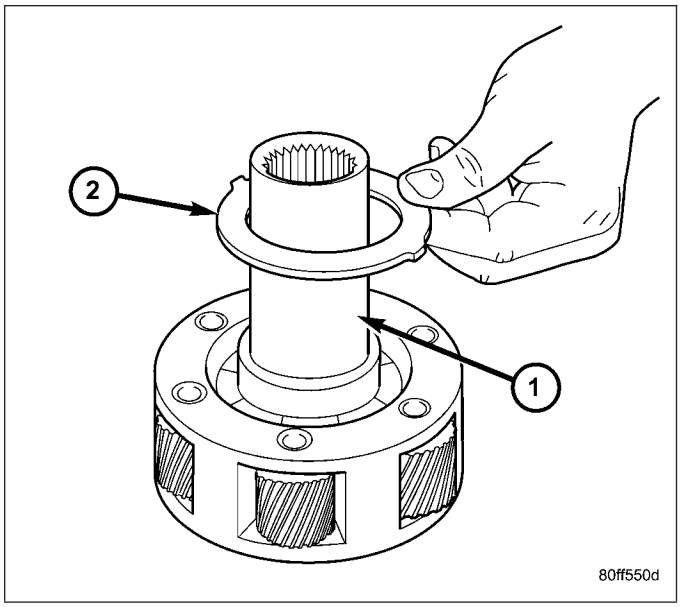
3. Place front case in horizontal position. Then remove input gear and low range gear as an assembly (2). Tap gear out of bearing with plastic mallet, if necessary.



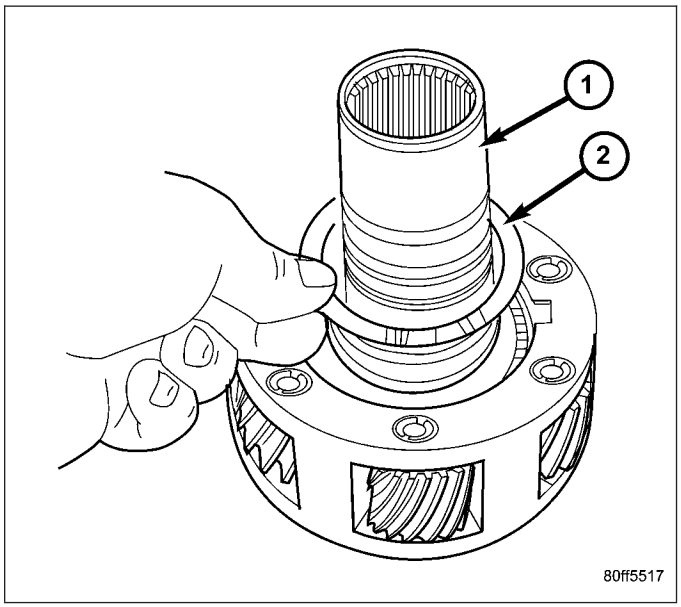
4. Remove snap-ring (2) that retains input gear in the low range gear (1).



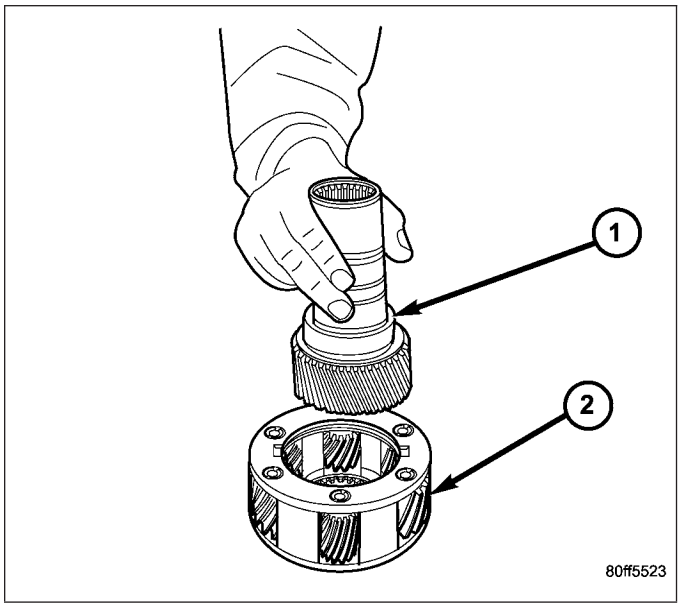
5. Remove retainer (2).



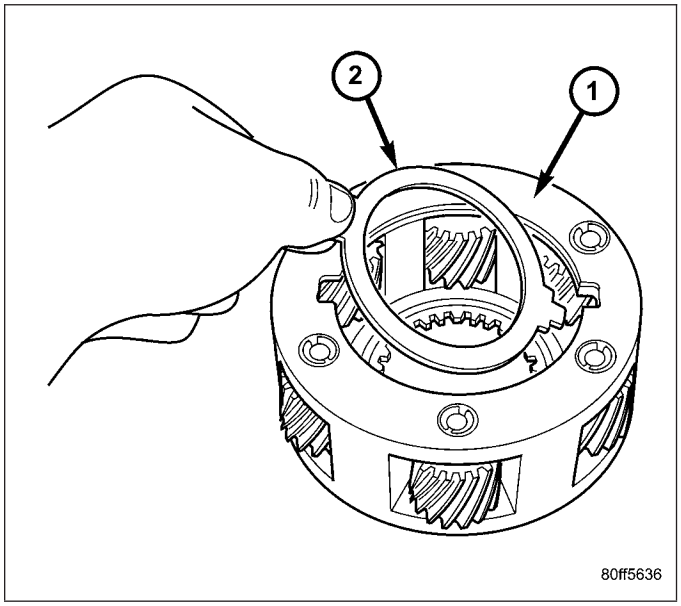
6. Remove front thrust plate (2) from the input gear (1).



7. Remove input gear (1) from the low range planetary (2).



8. Remove bottom tabbed thrust washer (2) from low range planetary (1).



CLEANING

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and 3M™ all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

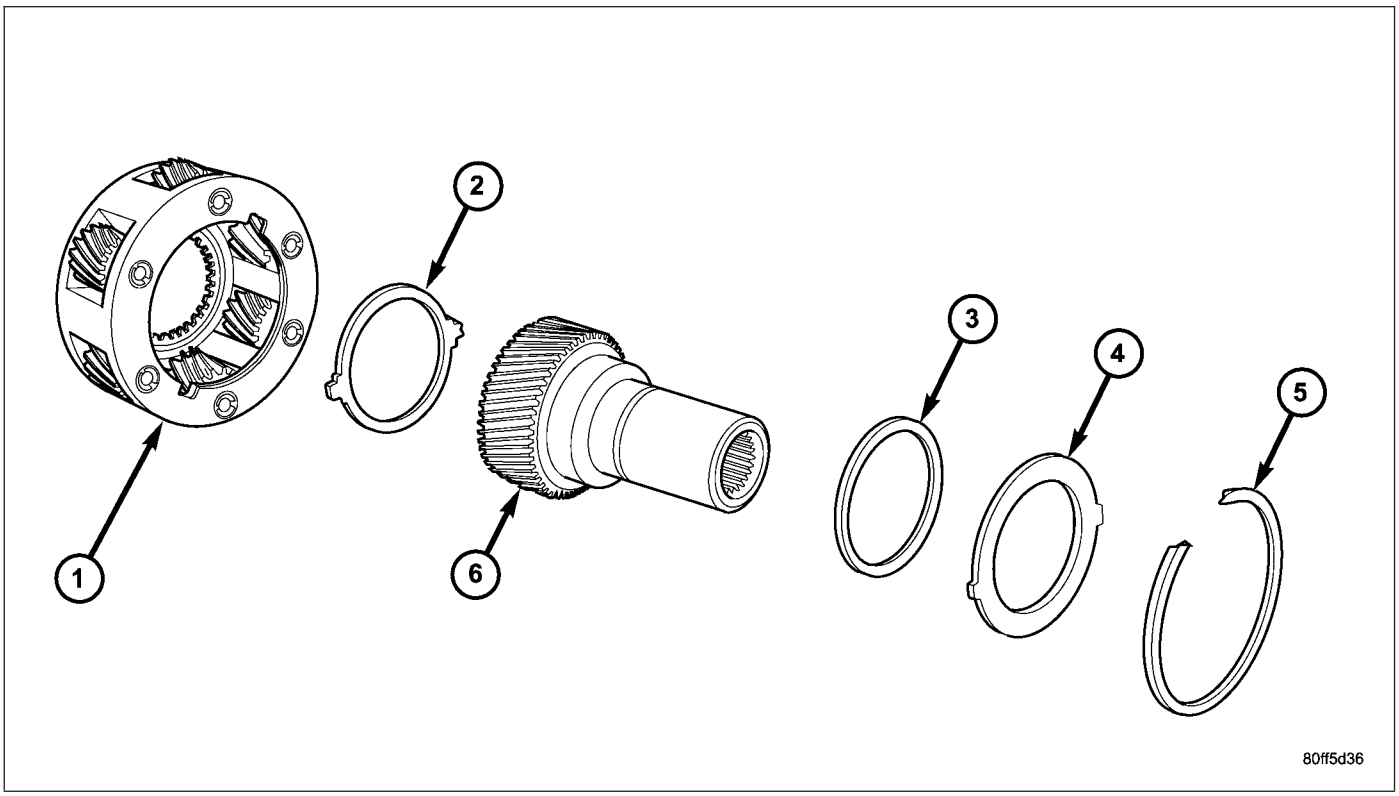
INSPECTION

MAINSHAFT/SPROCKET/HUB

Inspect the splines on the hub and shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone, however, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320-400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER



Input Gear And Carrier Components

1 - PLANETARY CARRIER
2 - REAR THRUST WASHER
3 - FRONT THRUST WASHER
4 - CARRIER LOCK RING
5 - CARRIER LOCK RETAINING RING
6 - INPUT GEAR

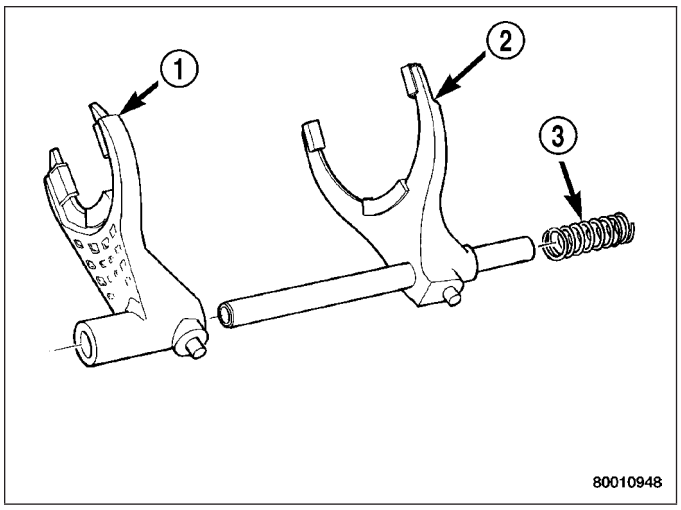
Check the teeth on the gear (6). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300-400 grit emery cloth if necessary.

Examine the carrier body and pinion gears for wear or damage. Check the pinion gear thrust washers on the pinon pins for damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

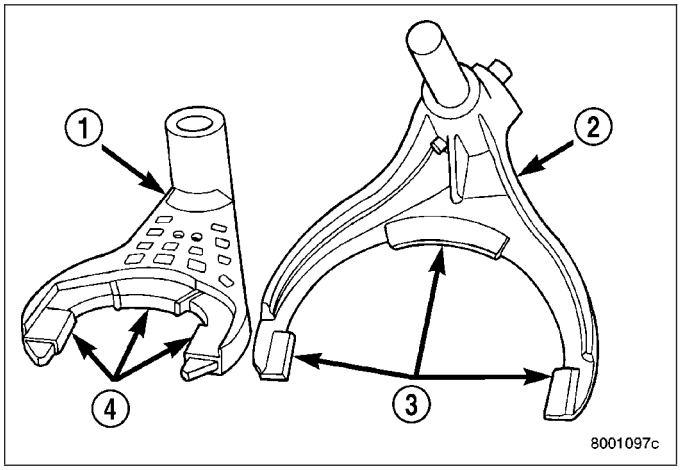
SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (2). Minor nicks on the shift rail can be smoothed with 320-400 grit emery cloth.



Inspect the shift fork wear pads (3). The mode and range fork pads are serviceable and can be replaced if necessary.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.

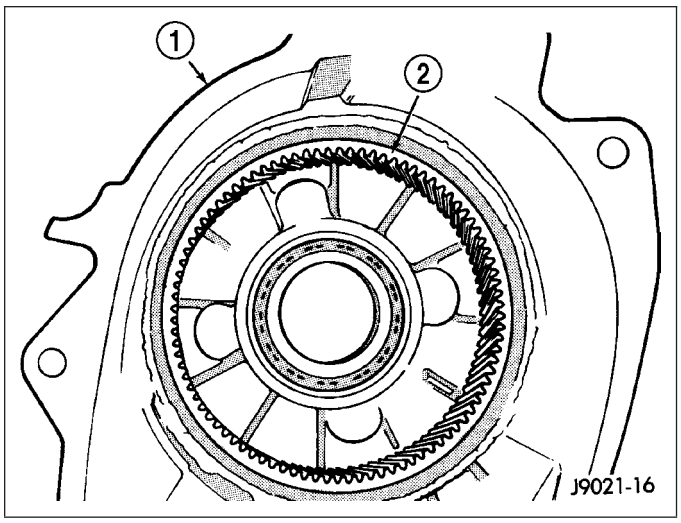


DRIVE CHAIN

Examine the drive chain and shaft bearings. replace the chain if stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

LOW RANGE ANNULUS GEAR

Inspect annulus gear (2) condition carefully. The gear is only serviced as part of the front case (1). If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear (2)



FRONT CASE AND REAR CASE

Inspect the cases for wear and damage.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil™ stainless steel inserts if required.

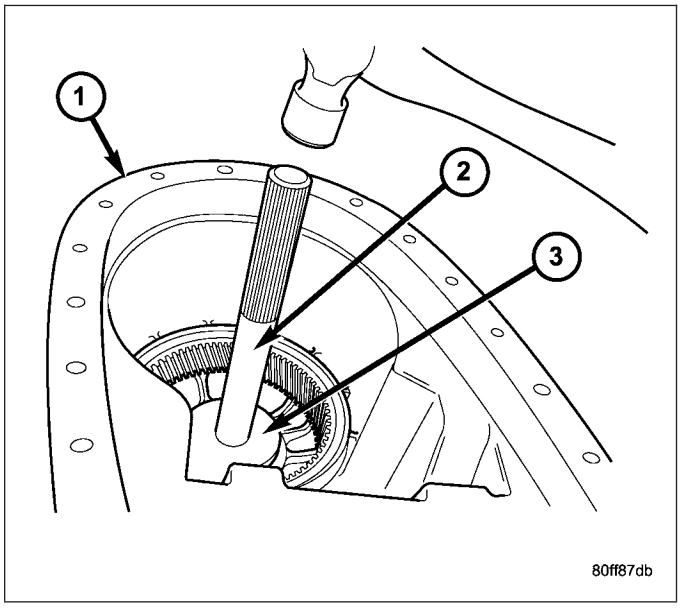
OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

ASSEMBLY

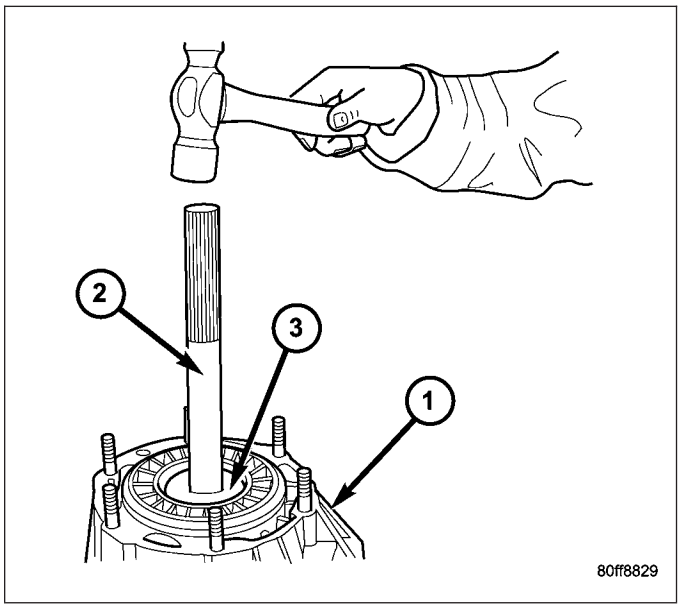
BEARINGS AND SEALS

1. Remove the input shaft bearing snap-ring from the front case half with suitable snap-ring pliers.

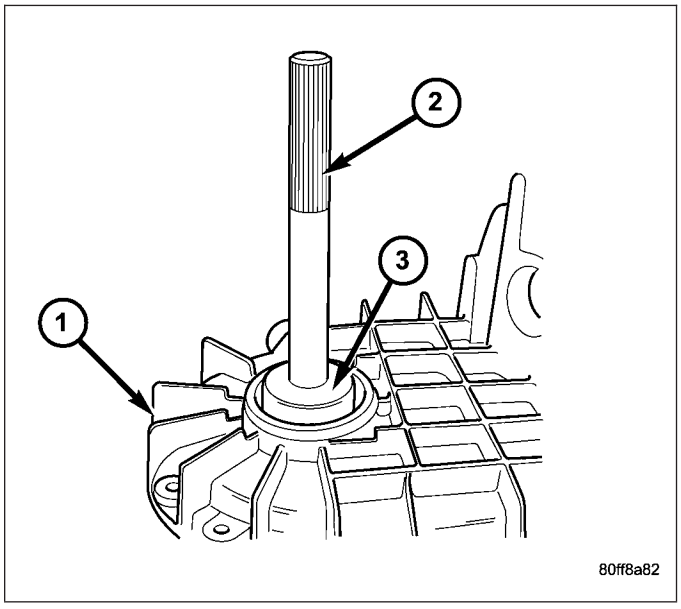


2. Remove the input shaft bearing from the front case half with Installer 6953 (3) and Handle C-4171 (2).

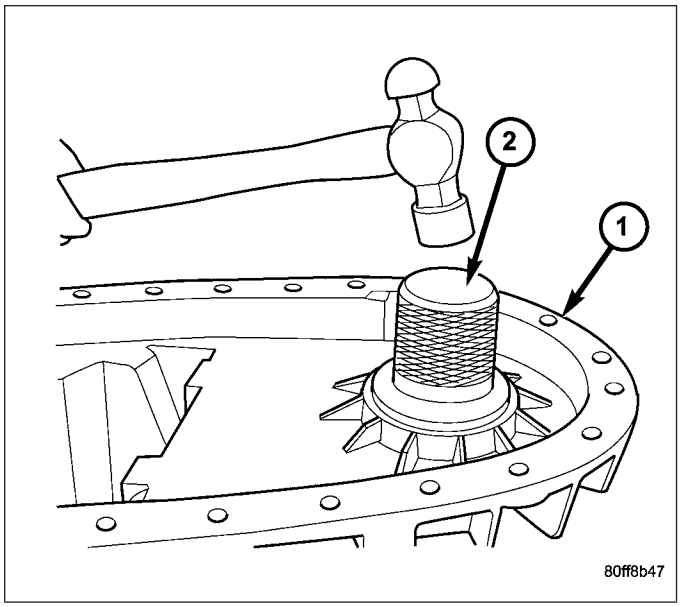
3. Install the input shaft bearing into the front case half with Installer 8151 (3) inverted on Handle C-4171 (2).
4. Install the input shaft bearing snap-ring into the front case half with suitable snap-ring pliers.



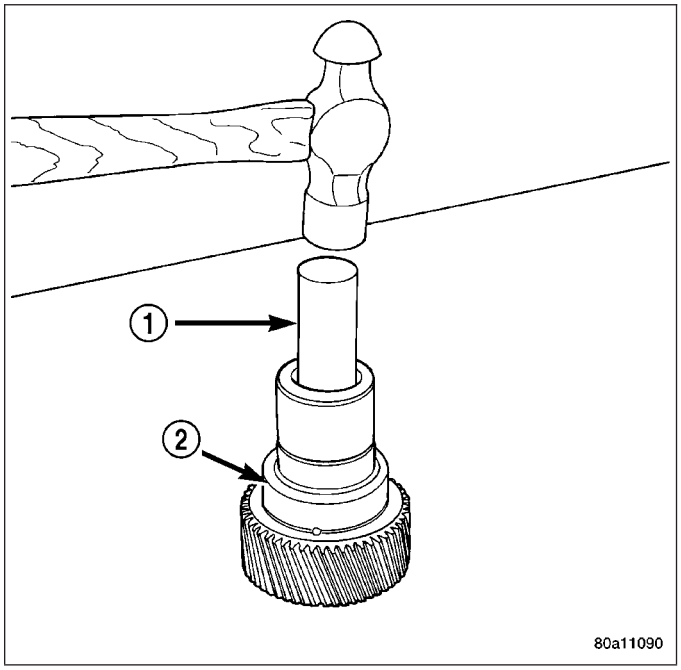
5. Remove the front output shaft front bearing snap-ring from the front case half.
6. Using Installer 6953 (3) and Handle C-4171 (2), remove the front output shaft front bearing.



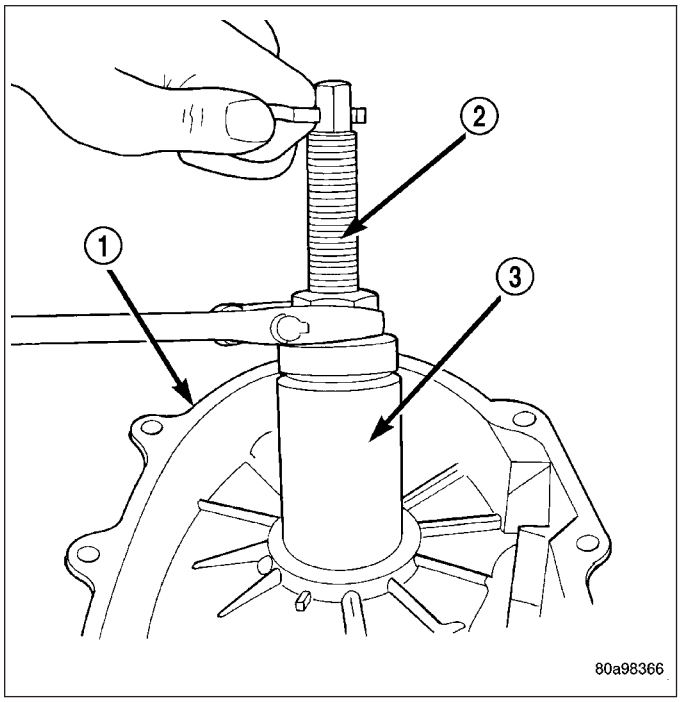
7. Start front output shaft front bearing in front case (1). Then seat bearing with Installer 8891 2).
8. Install front output shaft bearing retaining ring.



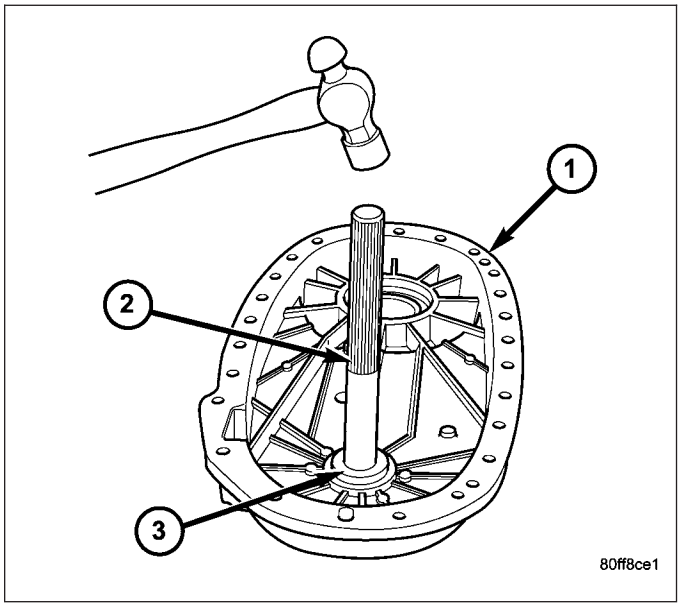
9. Remove input gear pilot bearing by inserting a suitably sized drift into the splined end of the input gear (2) and driving the bearing out with the drift (1) and a hammer.
10. Install new pilot bearing with Installer 9035.



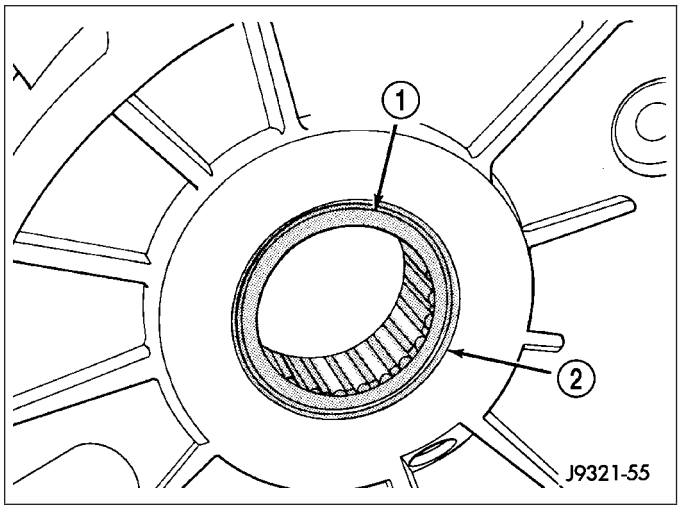
11. Remove the front output shaft rear bearing with the screw and jaws from Remover L-4454 (2) and Cup 8148 (3).



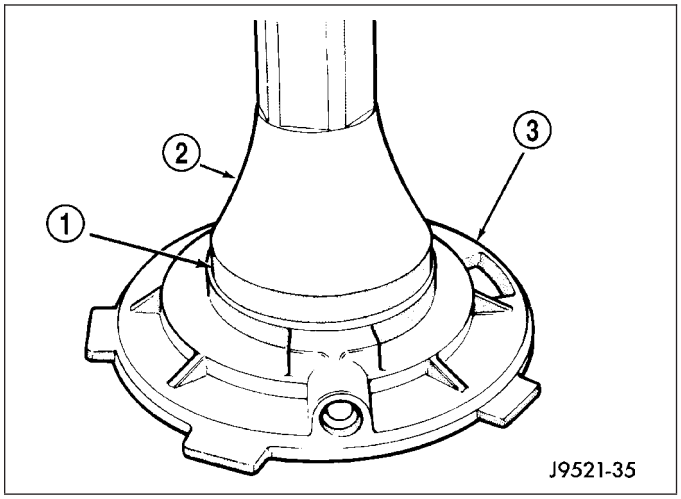
12. Install new bearing with Tool Handle C-4171 (2) and Installer 8128 (3).



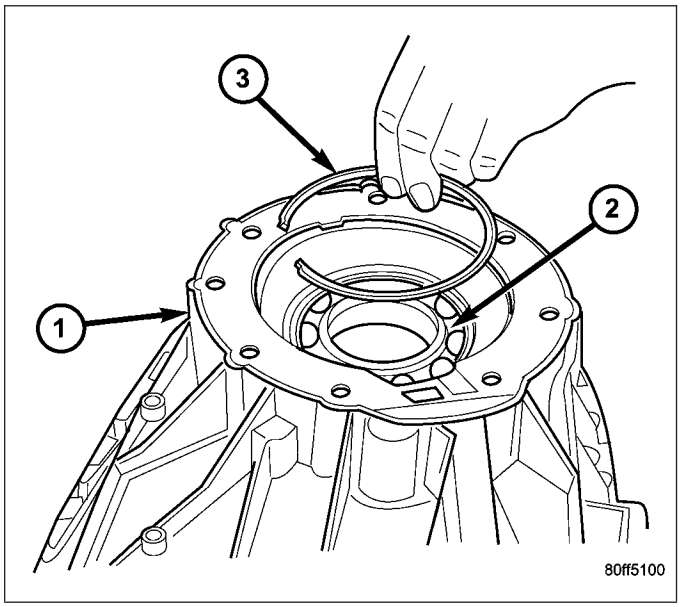
13. The bearing bore is chamfered at the top. Install the bearing (1) so it is flush with the lower edge of this chamfer (2).



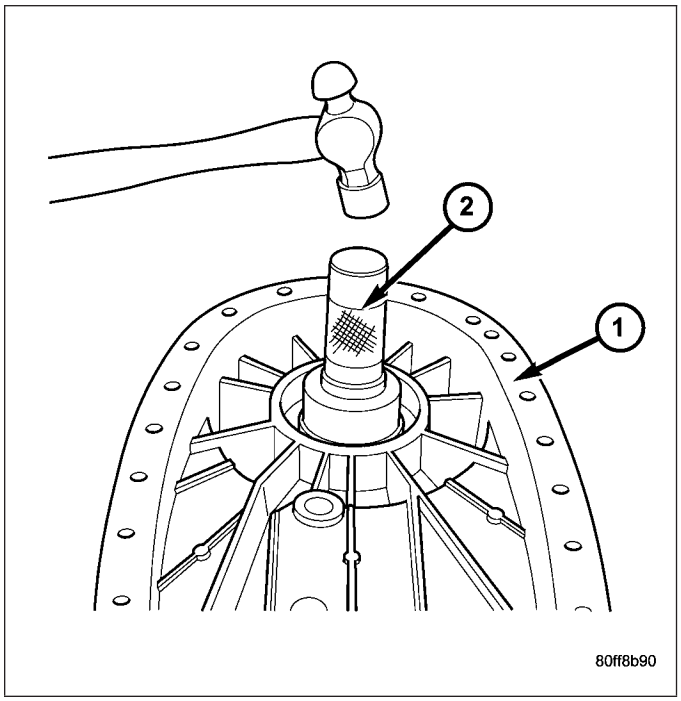
14. Remove seal from oil pump with suitable pry tool.
15. Install new seal in oil pump (3) with Installer 7888 (2).



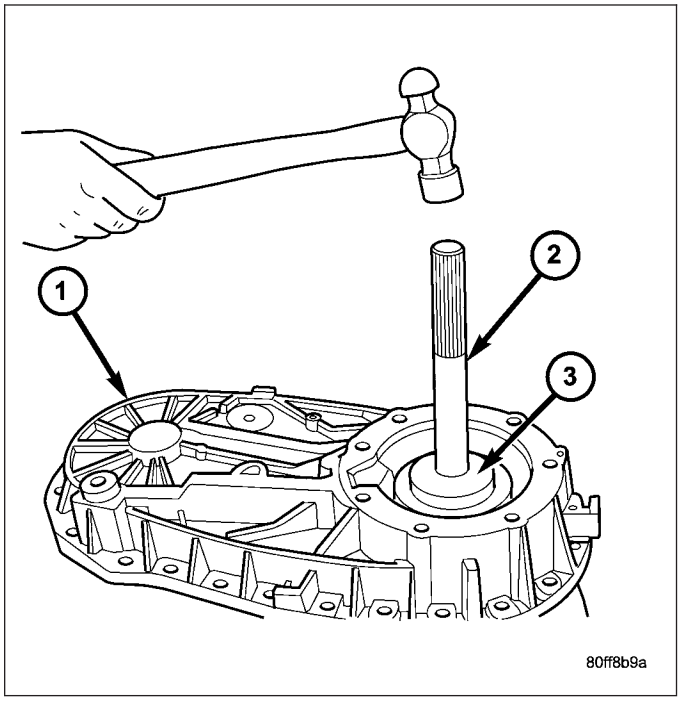
16. Remove the rear output shaft bearing snap-ring (3) from the rear case half (1).



17. Remove the rear output shaft bearing from the rear case (1) using Installer 7888 (2).

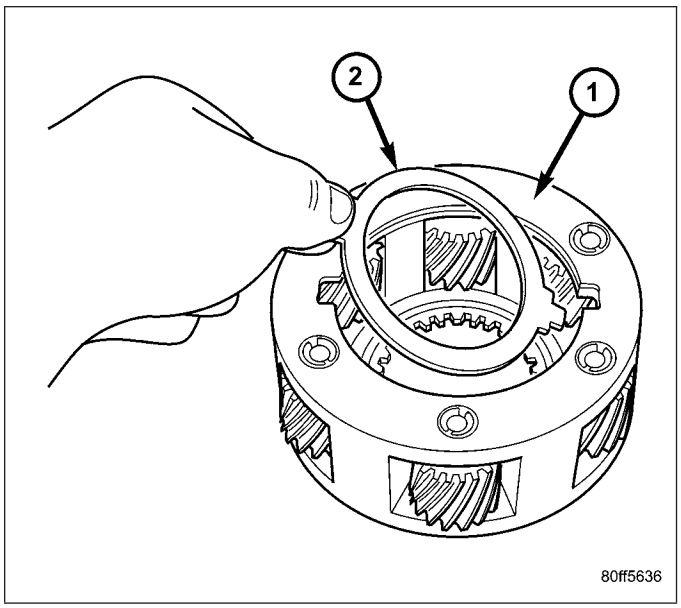


18. Install the rear output shaft bearing into the rear case (1) using Installer 8152 (3) and Handle C-4171 (2).
19. Install the rear output shaft bearing snap-ring into the rear case half.

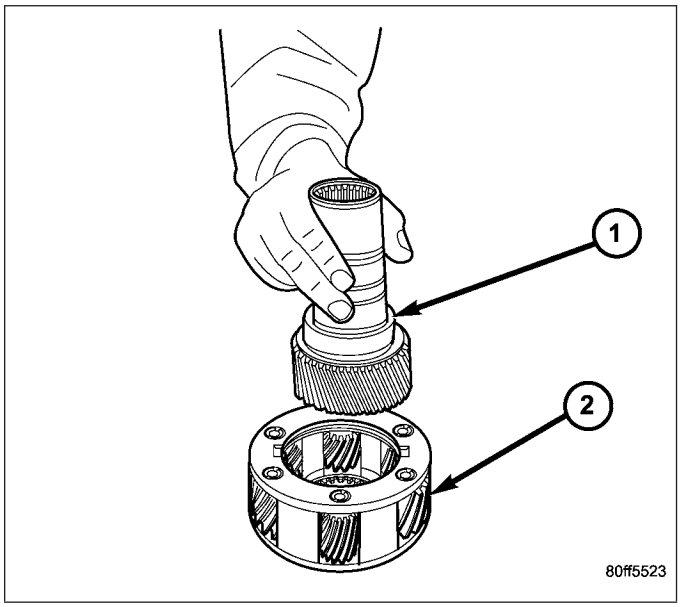


INPUT AND PLANETARY GEAR

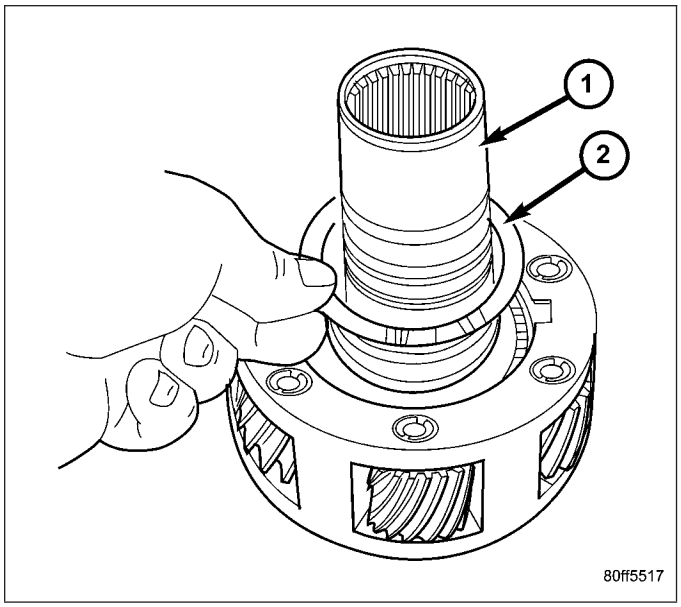
1. Lubricate gears and thrust washers with recommended transmission fluid.
2. Install bottom thrust washer (2) in low range gear planetary (1). Be sure washer tabs are properly aligned in gear notches.



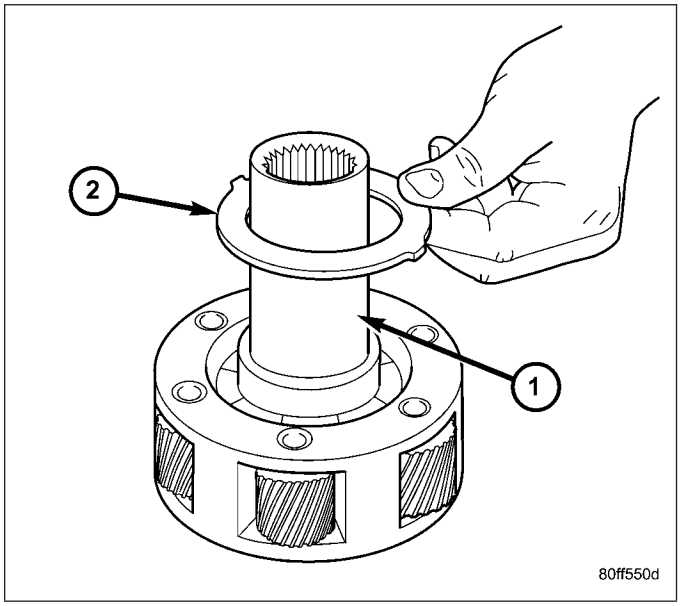
3. Install input gear (1) in low range gear (2). Be sure input gear is fully seated.



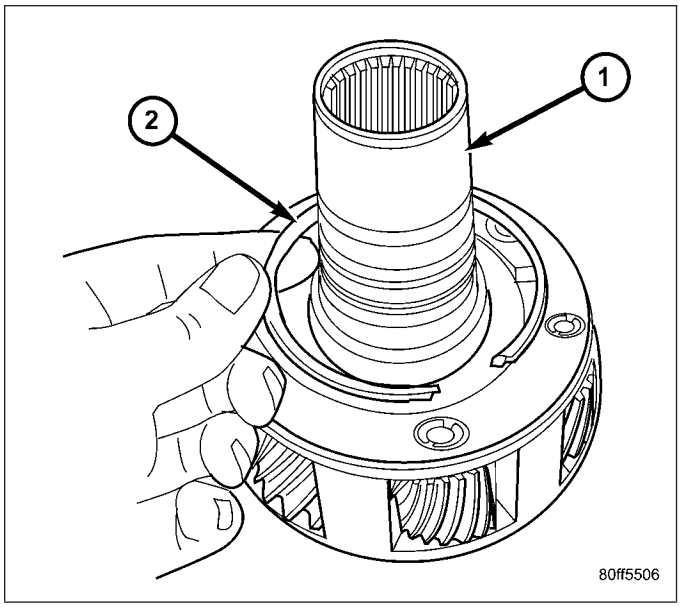
4. Install remaining thrust washer (2) in low range gear and on top of input gear (1).



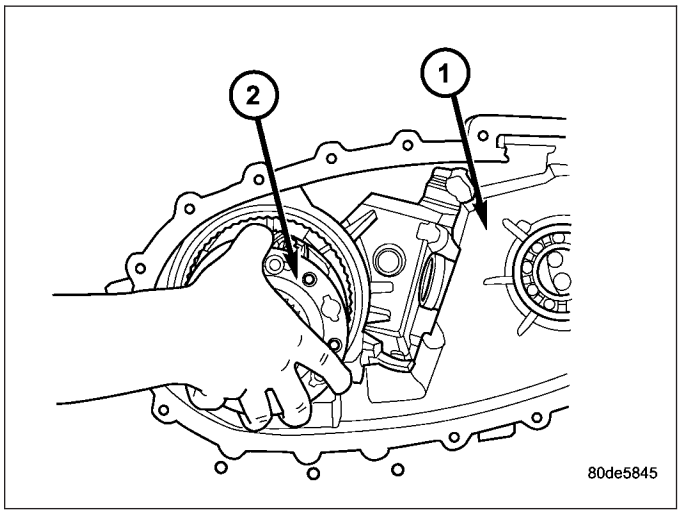
5. Install retainer (2) on input gear (1).



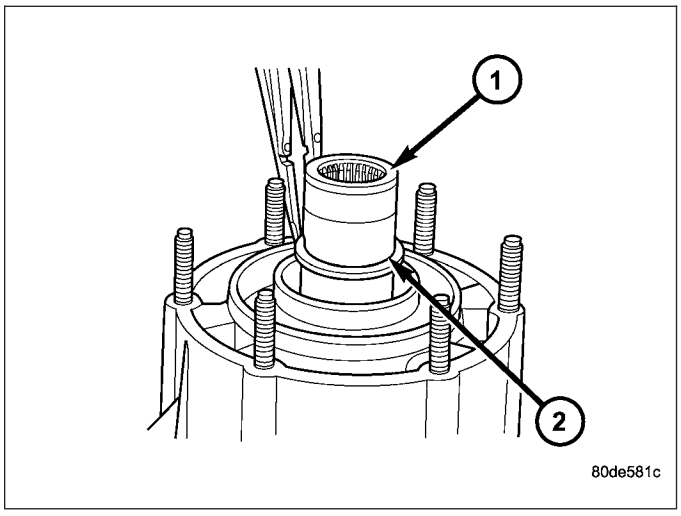
6. iinstall snap-ring (2).



7. Align and install low range/input gear assembly (2) in front case (1). Be sure low range gear pinions are engaged in annulus gear and that input gear shaft is fully seated in front bearing.

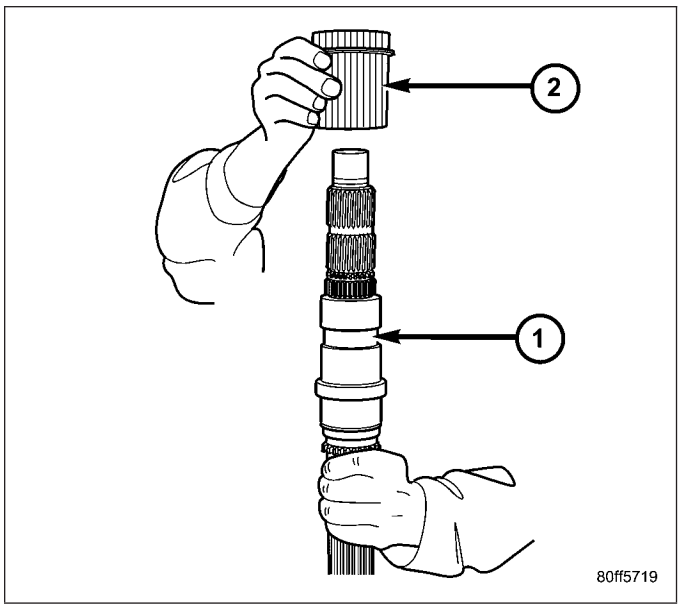


8. Install snap-ring (2) to hold input/low range gear(1) into front bearing.
9. Install a new input gear oil seal with Installer 9036 and Handle C-4171.

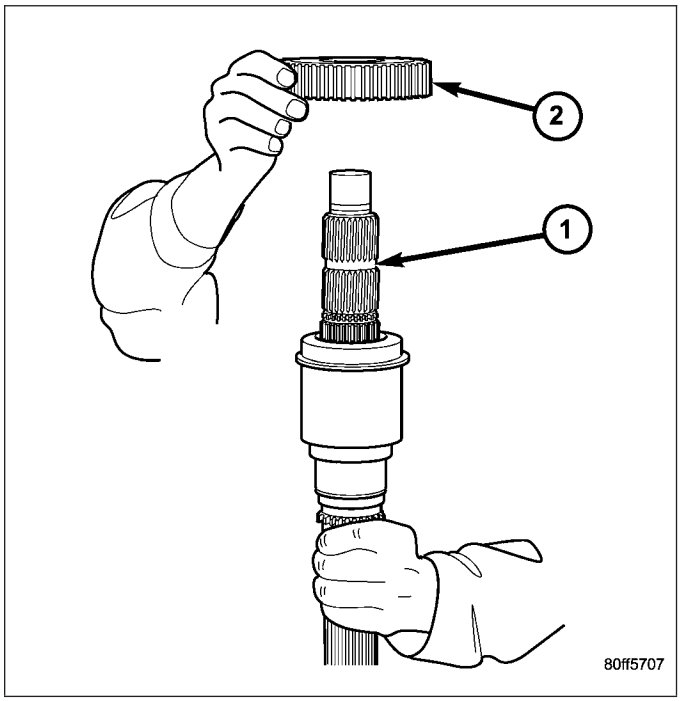


SHIFT FORKS AND MAINSHAFT

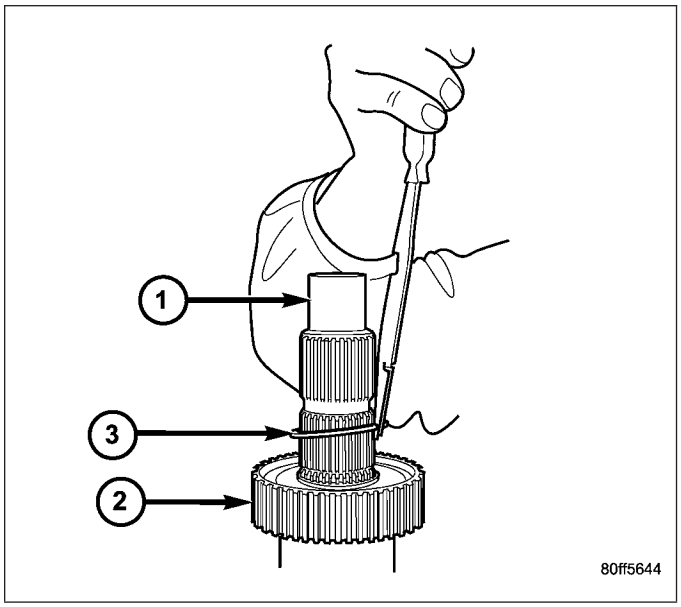
1. Lubricate mainshaft splines with recommended transmission fluid.
2. Coat the interior of the drive sprocket hub with ATF+4 and install the drive sprocket drive hub (2) onto the mainshaft (1).



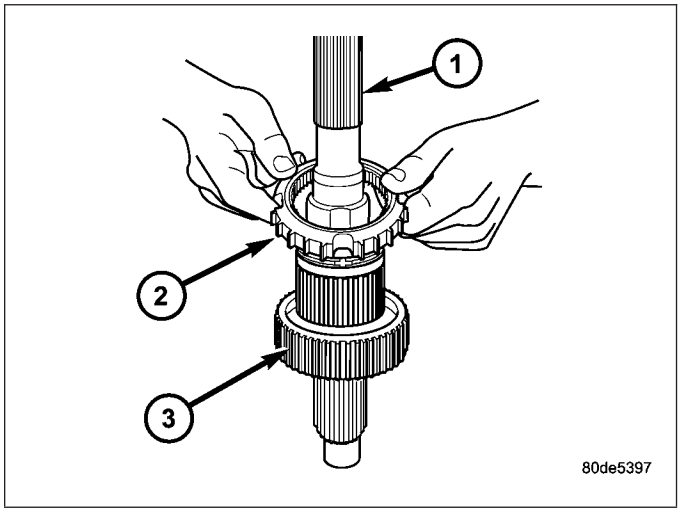
3. Install the mode hub (2) onto the mainshaft (1).



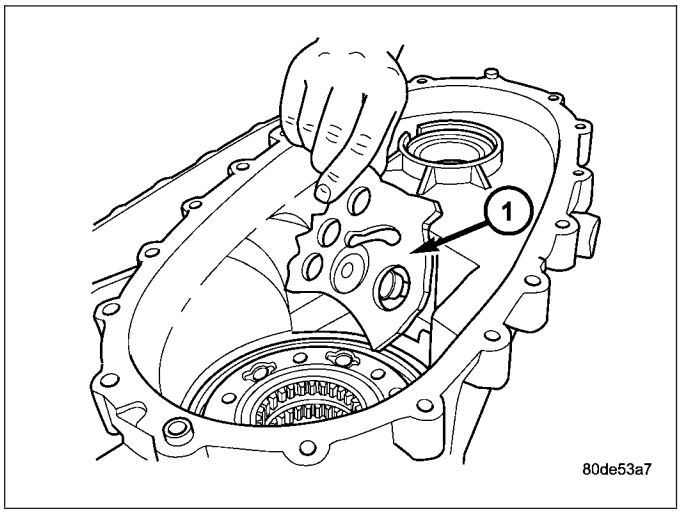
4. Install the mode hub retaining ring (3) onto the mainshaft (1).



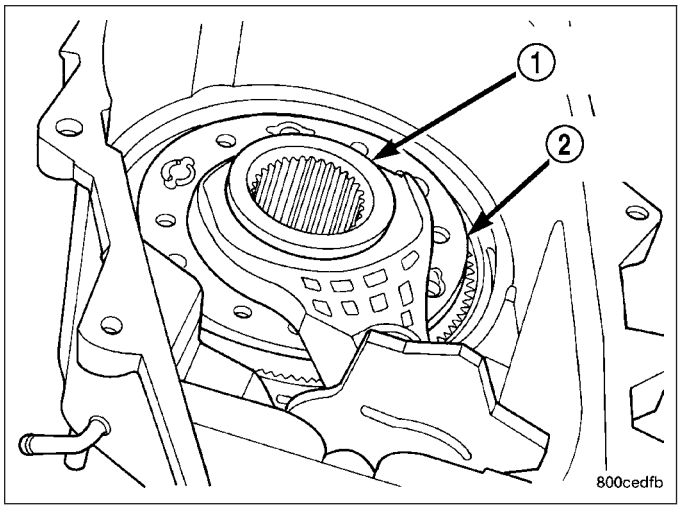
5. Install the clutch gear (2) onto the output shaft (1). Verify that the pointed ends of the clutch gear teeth are pointing to the front of the mainshaft.



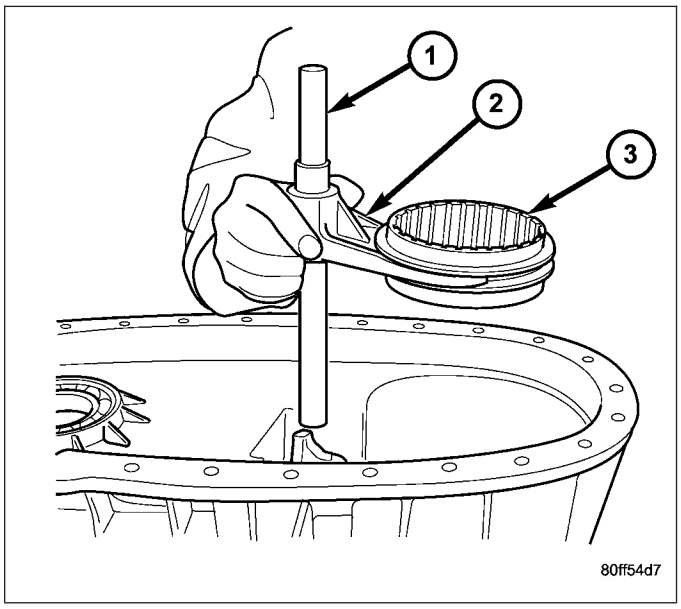
6. Lubricate sector shaft with transmission fluid and install shift sector (1) in case. Position slot in sector so it will be aligned with shift fork pin when shift forks are installed.
7. Apply Loctite™ 242, or equivalent, to the threads of the sector support to replentish the factory applied patch. Install the shift sector support. Tighten the sector support with Socket 9033 to 27-34 N·m (20-25 ft.lbs.).



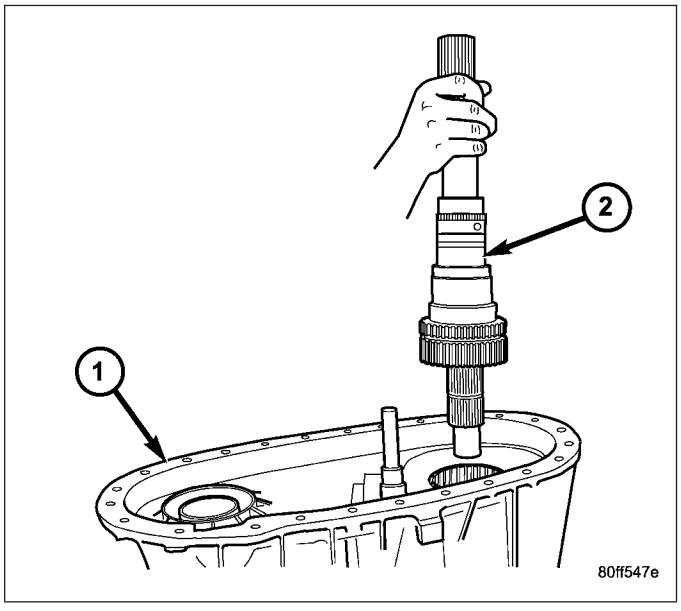
8. Assemble and install range fork (2) and hub (1). Be sure hub is properly seated in low range gear and engaged to the input gear.
9. Align and insert range fork pin in shift sector slot.



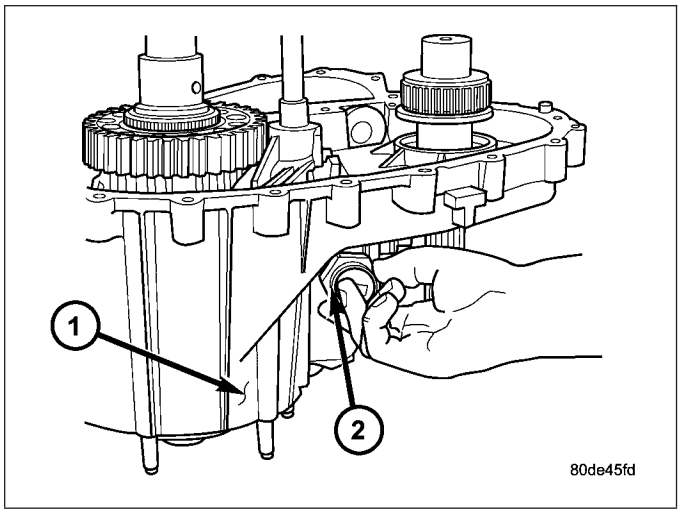
10. Install mode fork (2) and shift rail (1) onto the mode sleeve.
11. Install the mode fork (2), sleeve (3), and shift rail (1) into the transfer case.



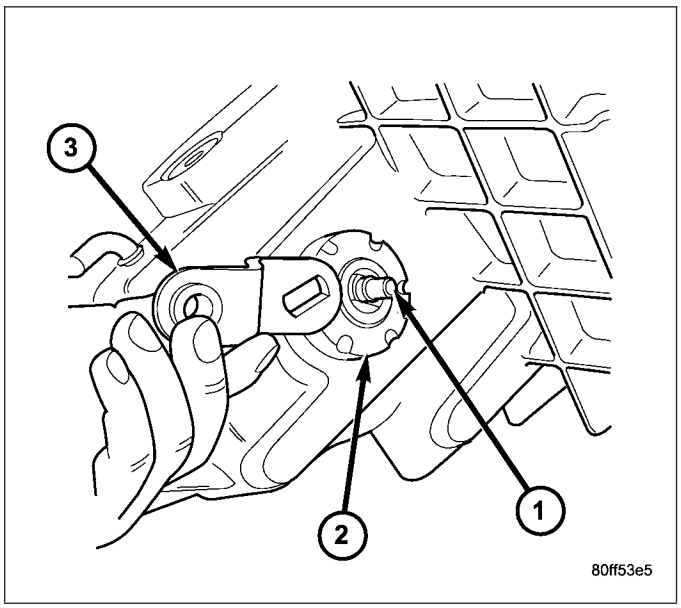
12. Install mainshaft (2) into the transfer case (1). Guide mainshaft through the mode and range sleeves and into the input gear.



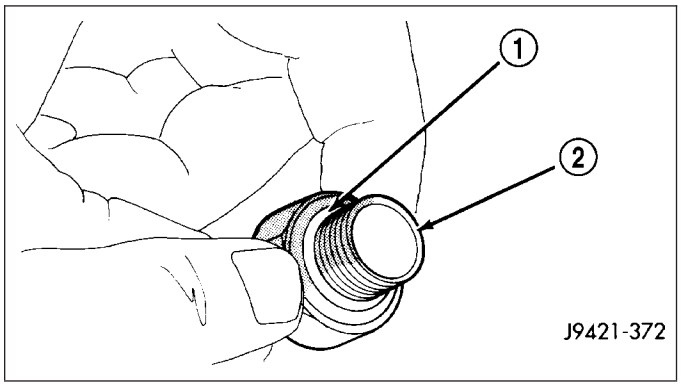
13. Install the transfer case position sensor or switch (2). Tighten the sensor or switch to 20-34 N·m (15-25 ft. lbs.) torque.



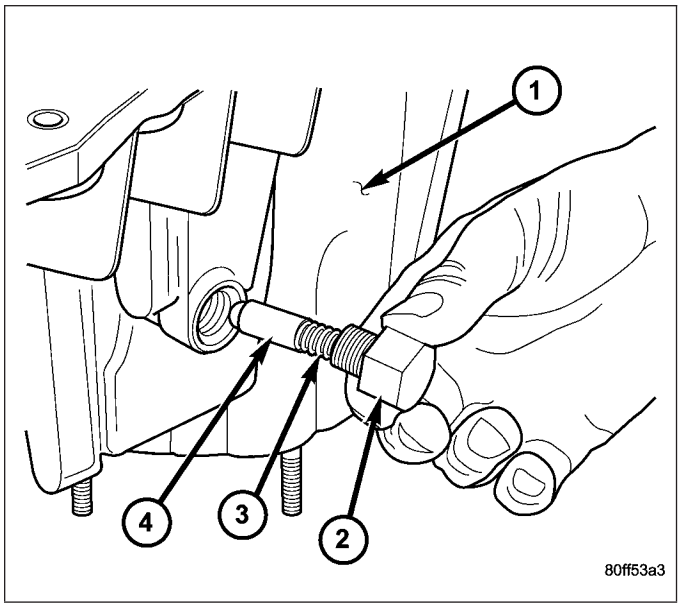
14. Install manual shift lever (3)and spacer onto sector shaft (1).
15. Install washer and nut on sector shaft to secure shift lever. Apply 1-2 drops Mopar® Lock N' Seal, or equivalent, to nut threads before installation. Then tighten nut to 27-34 N·m (20-25 ft. lbs.) torque.



16. Install new o-ring (1) on detent plug (2).

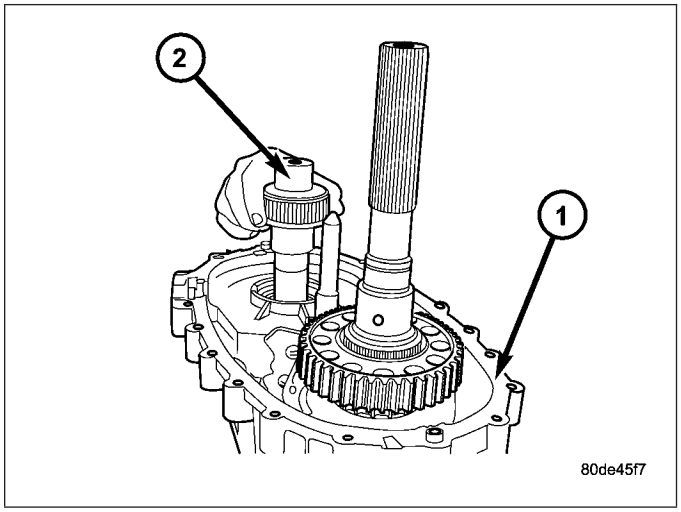


17. Install detent plunger (4), spring (3), and plug (2). Tighten the plug to 16-25 N·m (12-18 ft. lbs.).

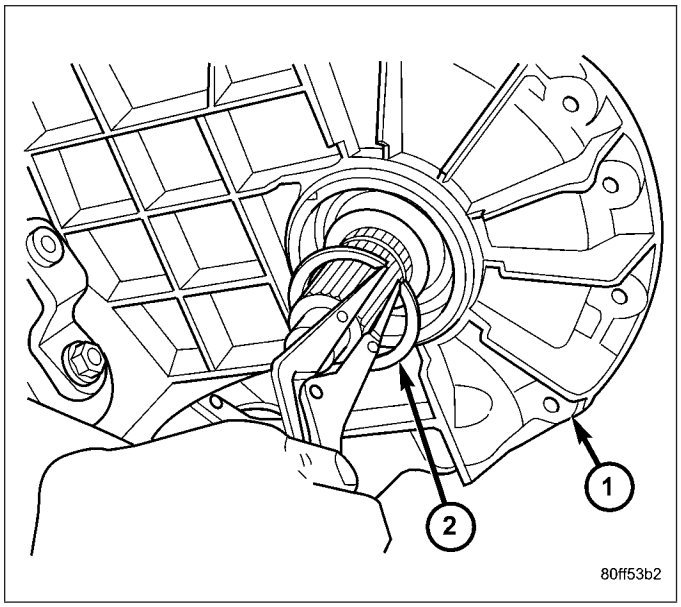


FRONT OUTPUT SHAFT AND DRIVE CHAIN

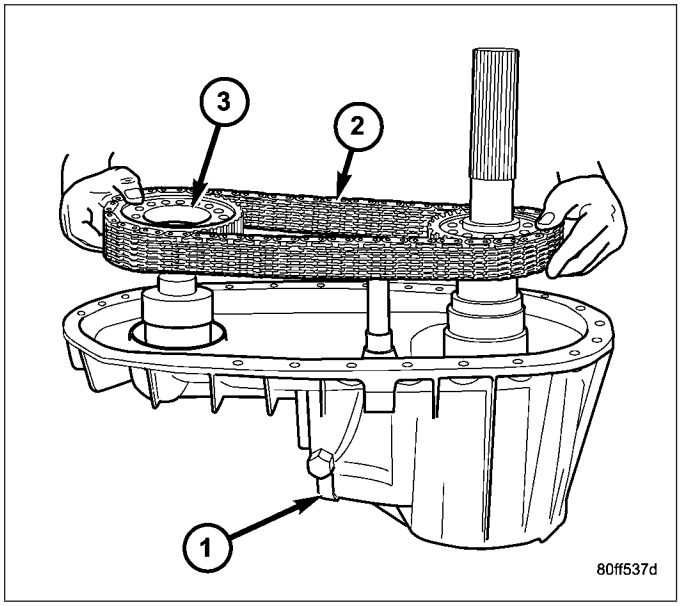
1. Install the front output shaft (2) into the front output shaft front bearing.



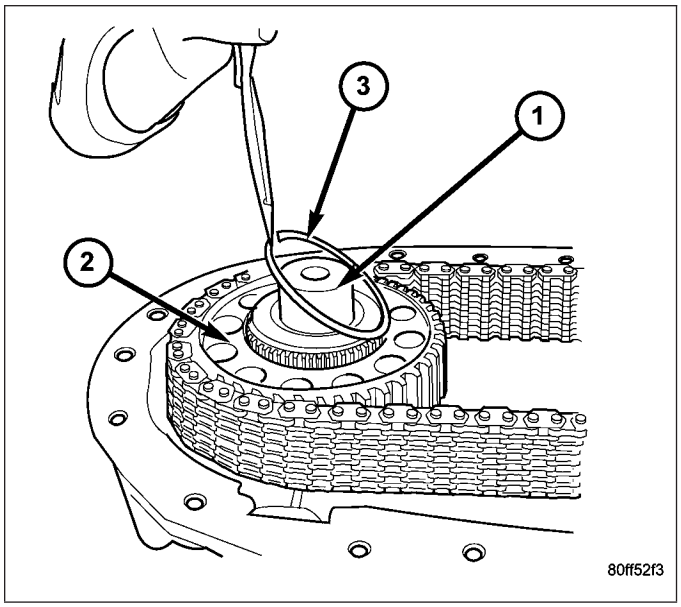
2. Install the front output shaft bearing inner snap-ring (2) onto the output shaft.
3. Install the new front output shaft seal with Installer MB991168A



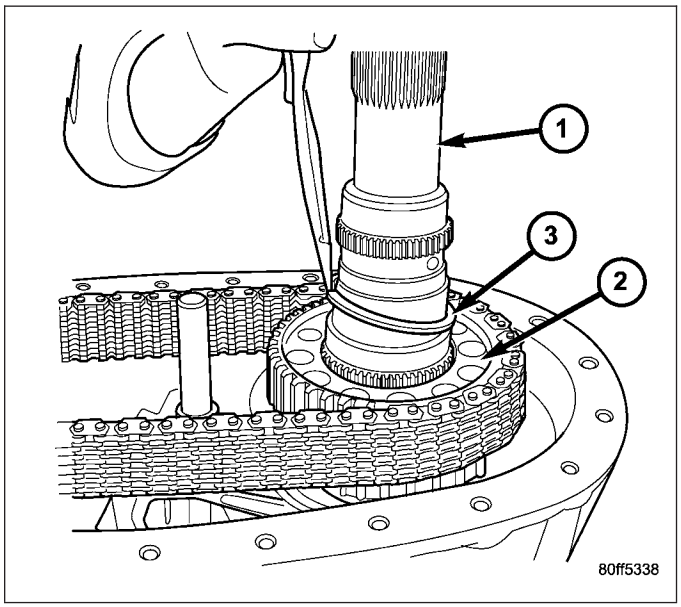
4. Insert front drive sprocket in drive chain.
5. Install drive chain around rear drive sprocket.
6. Position rear drive sprocket (3) over the output shaft and lower the sprocket and chain assembly until the front sprocket is positioned over the front output shaft.
7. Align the splines in the sprockets to the splines on the output shafts and install the sprockets onto the output shafts.



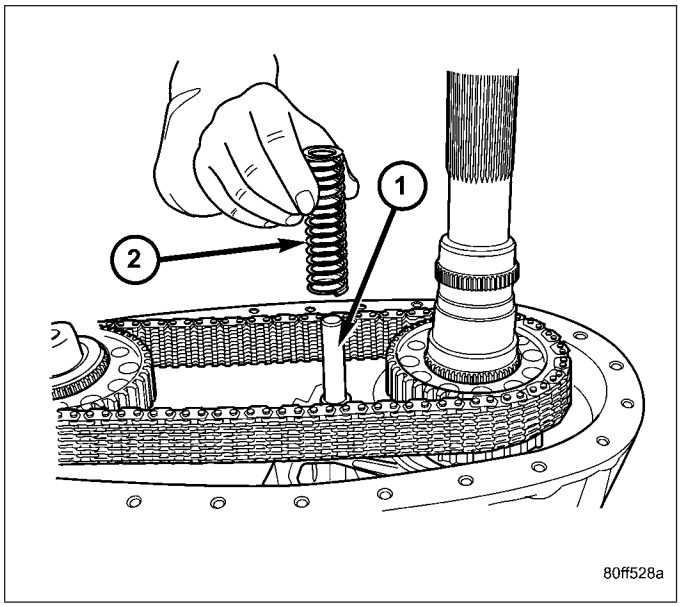
8. Install front sprocket retaining ring (3).



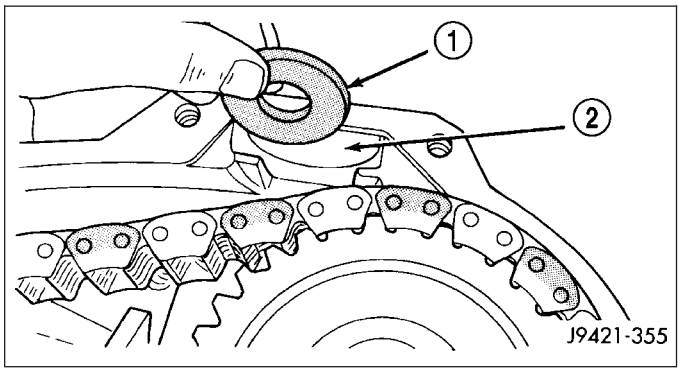
9. Install rear sprocket retaining ring (3).



10. Install spring (2) onto shift rail (1).

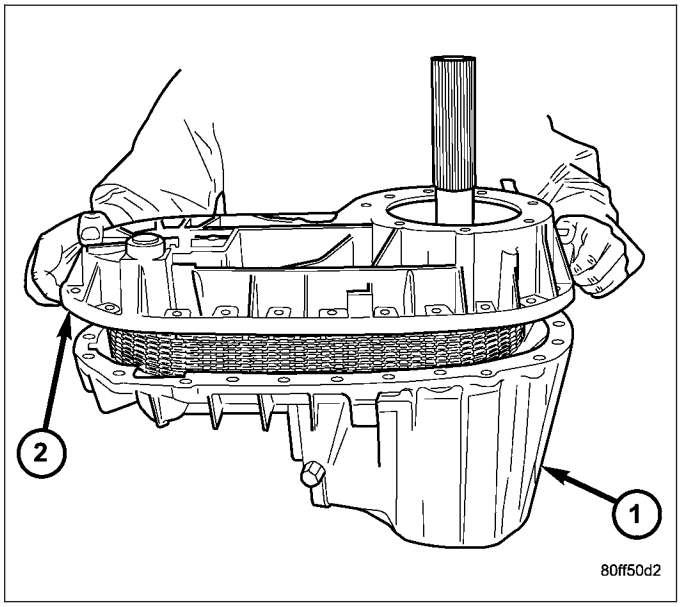


11. Insert magnet (1) in front case pocket (2).



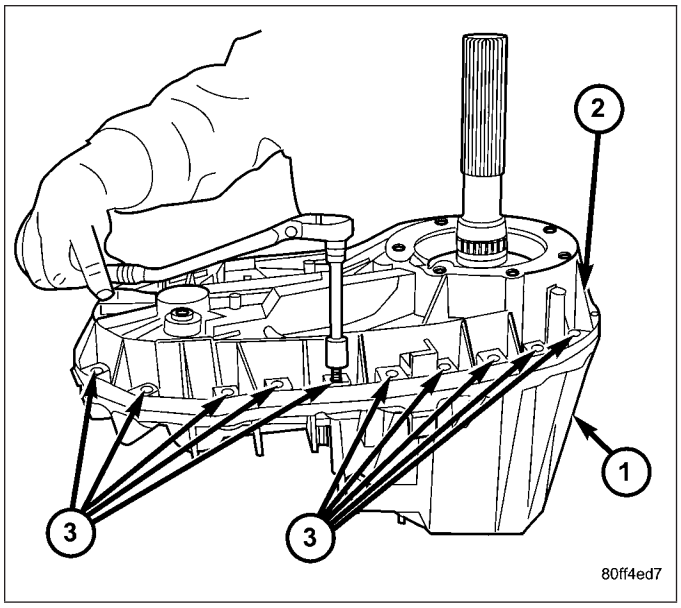
REAR CASE

1. Install the oil pick-up tube and screen into the rear case half.
2. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of front case. Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess will be displaced into case interior.
3. Align mainshaft with he rear output shaft bearing and align shift rail with bore in rear case. Then install rear case (2). Verify that the case alignment dowels correctly seat into their mating recesses.

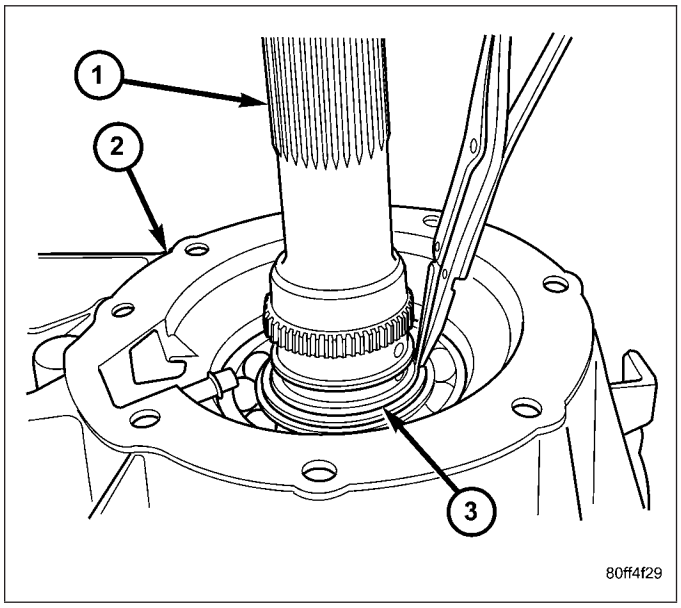


4. Install 4-5 rear case (2) -to- front case (1) bolts (3) to hold rear case in position. Tighten bolts snug but not to specified torque at this time.

CAUTION: Verify that shift rail, and case alignment dowels are seated before installing any bolts. Case could be cracked if shaft rail or dowels are misaligned.

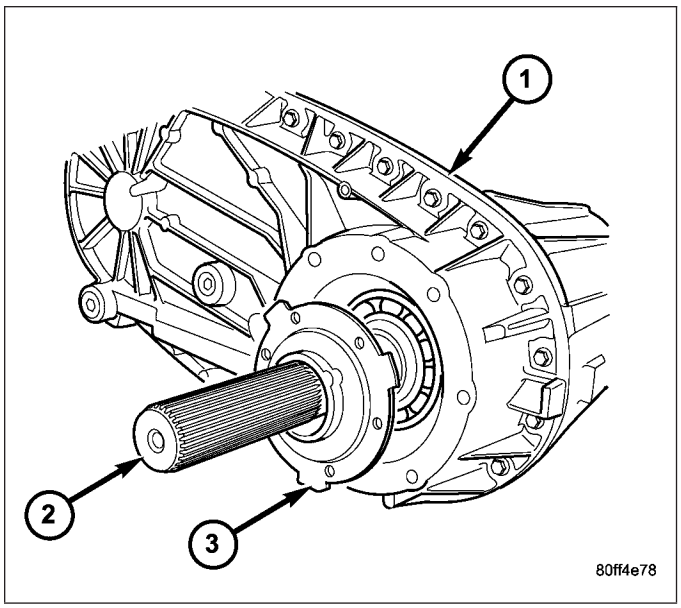


5. Tighten bolts to 27-34 N·m (20-25 ft. lbs.),
6. Install rear output bearing inner snap-ring (3) to output shaft (1).

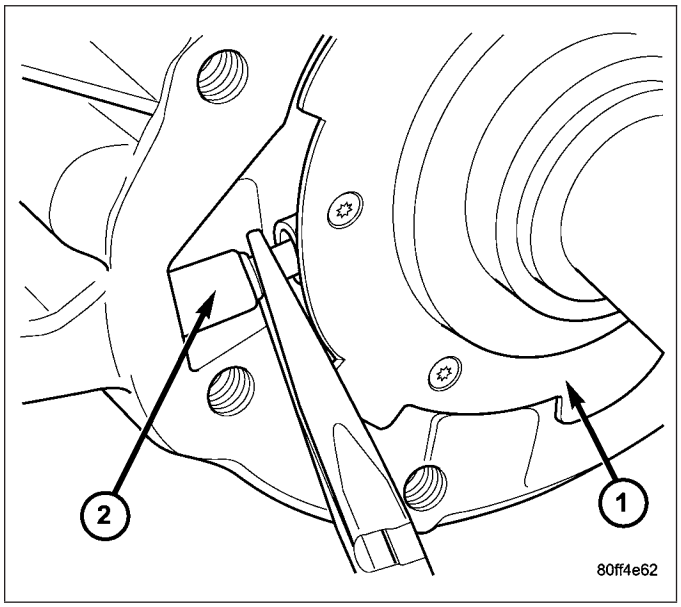


OIL PUMP AND REAR EXTENSION

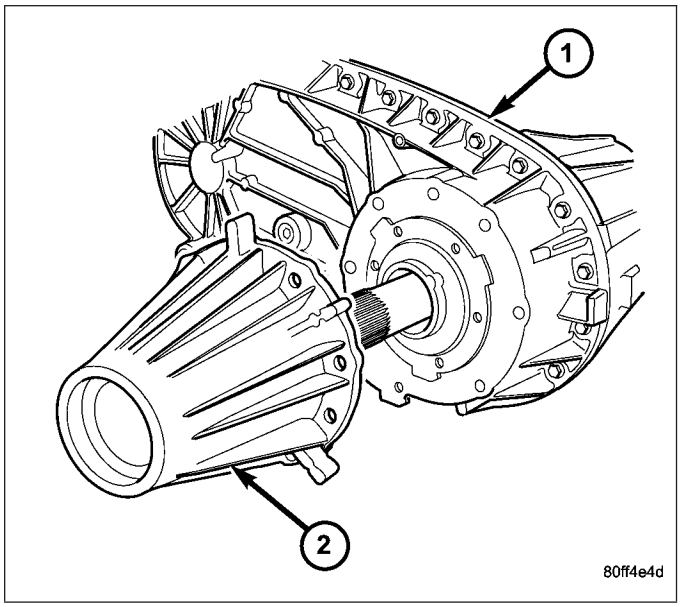
1. Install the oil pump (3) onto the output shaft (2).



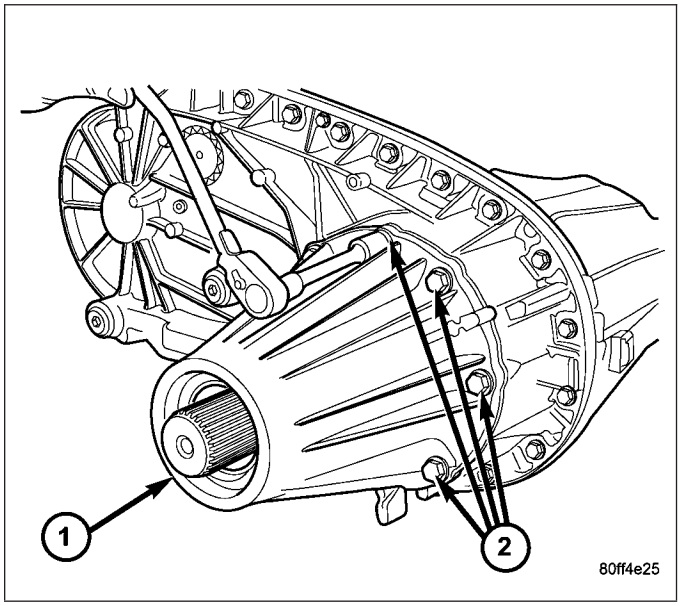
2. Engage the oil pump pick-up tube (2) into the oil pump (1). Verify that the pick-up tube o-ring is on the tube and is correctly installed to the oil pump.



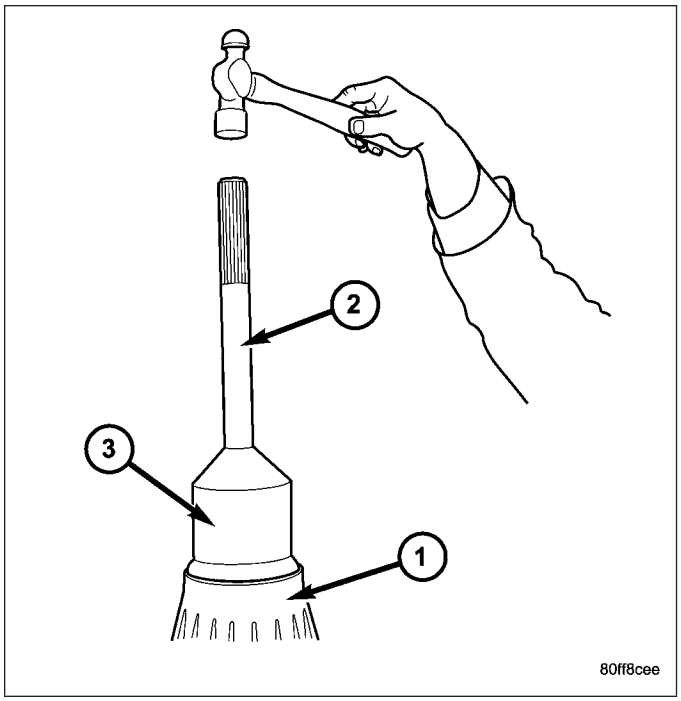
3. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of rear extension housing. Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess could be displaced into output bearing.
4. Install extension housing (2) onto the rear case half (1).



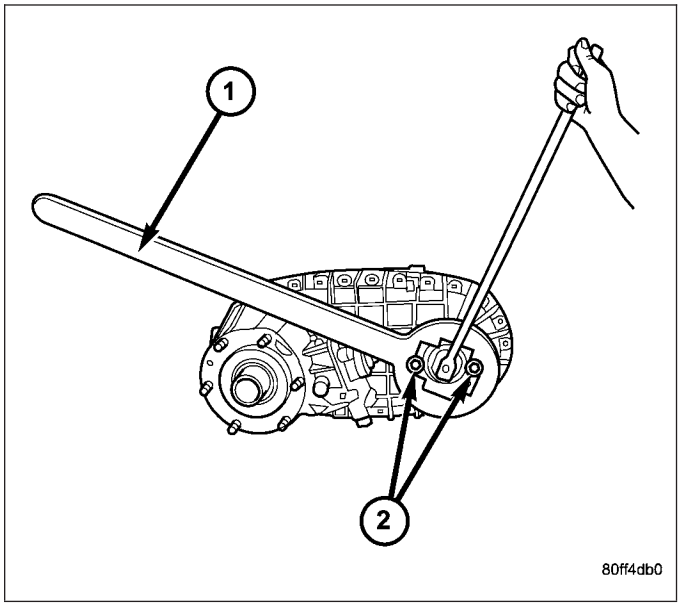
5. Install rear extension bolts (2). Tighten the bolts to 27-34 N·m (20-25 ft.lbs.).



6. Install the extension housing boot and seal assembly with Installer 9037 (3) and Handle C-4171 (2).



7. Install the front companion flange onto the front output shaft.
8. Install two bolts 180° apart into the front output shaft companion flange.
9. Place holder (1) over the bolts (2) and against the companion flange.
10. Install a new front companion flange nut. Tighten the companion flange nut to 176-271 N·m (130-200 ft.lbs.).



INSTALLATION

1. Align and seat transfer case on transmission. Be sure transfer case input gear splines are aligned with transmission output shaft. Align splines by rotating transfer case rear output shaft yoke if necessary. Do not install any transfer case attaching nuts until the transfer case is completely seated against the transmission.
2. Install and tighten transfer case attaching nuts. Tighten nuts to 30-41 N·m (20-30 ft.lbs.).
3. Remove jack stand from under transmission.
4. Align and connect propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)
5. Connect vent hose and transfer case position sensor connector.
6. Connect shift rod to transfer case lever or floor shift arm. Use channel lock style pliers to press rod back into lever grommet.
7. Adjust shift linkage, if necessary.

8. Fill transfer case with recommended transmission fluid and install fill plug.
9. Install skid plate, if equipped. (Refer to 13 - FRAMES & BUMPERS/FRAME/TRANSFER CASE SKID PLATE - INSTALLATION)
10. Lower vehicle

SPECIFICATIONS

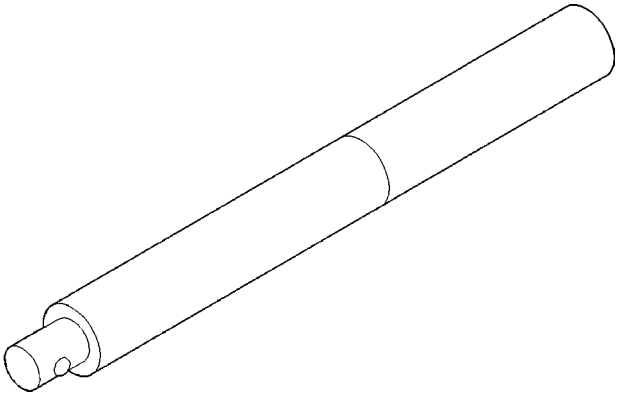
TRANSFER CASE - NV271

TORQUE SPECIFICATIONS

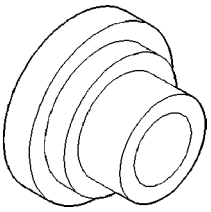
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Plug, Detent	16-25	12-18	-
Plug, Drain/Fill	20-34	15-25	-
Bolt, Extension Housing	27-34	20-25	-
Bolt, Case Half	27-34	20-25	-
Nut, Range Lever	27-34	20-25	-
Sector Support	27-34	20-25	-
Nuts, Mounting	30-41	20-30	-
Position Sensor	20-34	15-25	-
Nut, Companion Flange	176-271	130-200	-

SPECIAL TOOLS

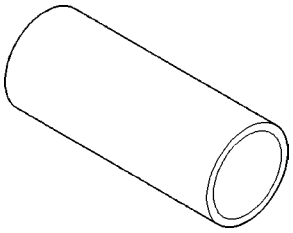
TRANSFER CASE NV271/NV273



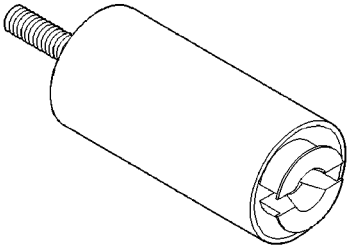
Handle, Universal - C-4171



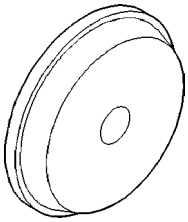
Installer, Bearing - 8128



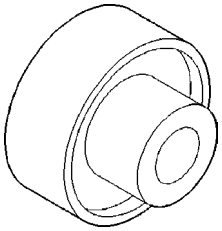
Cup - 8148



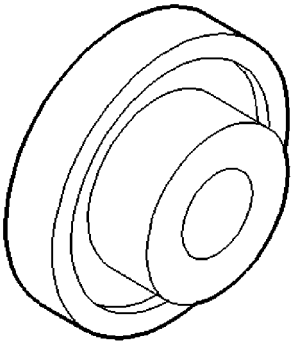
Remover - L-4454



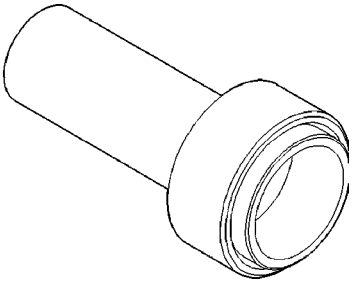
Installer - 8151



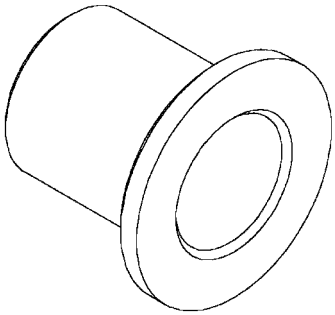
Installer, Bearing - 6953



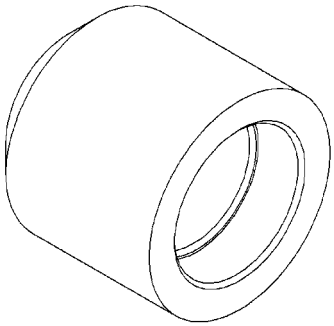
Installer - 8152



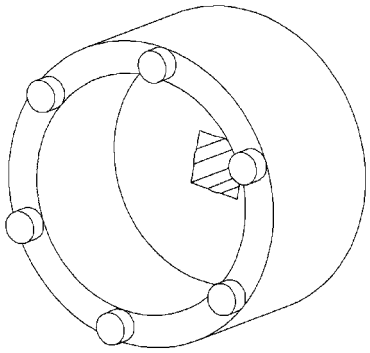
Installer, Pump Housing Seal - 7888



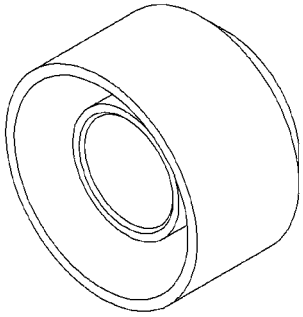
Installer - 8891



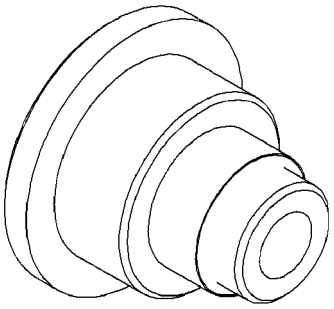
Installer, Seal - 9036



Socket - 9033



Installer, Seal - 9037

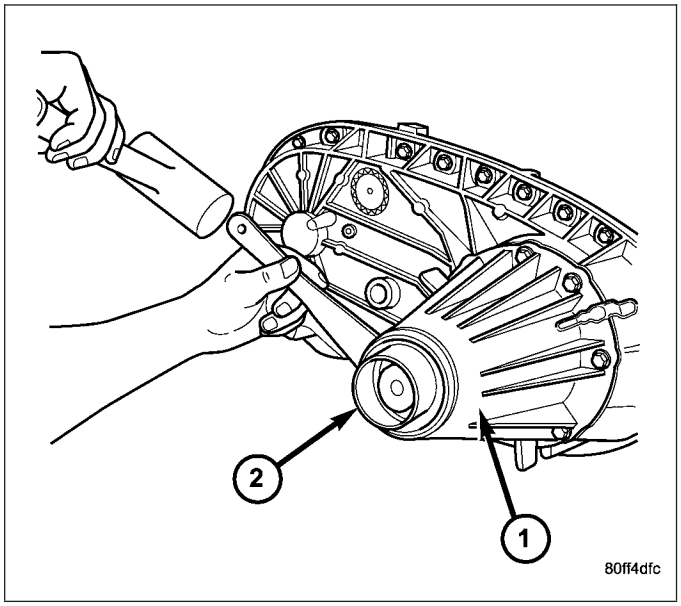


Installer, Bearing - 9035

BOOT-EXTENSION HOUSING SEAL AND DUST

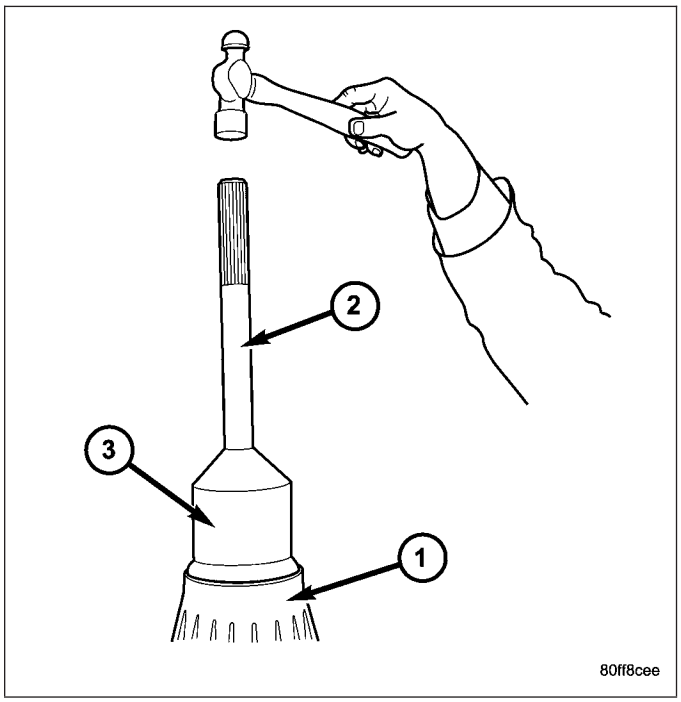
REMOVAL

1. Raise and support vehicle.
2. Remove rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
3. Use a suitable chisel or pry tool to remove the rear extension housing dust boot (2).
4. Use a suitable chisel or pry tool to remove the rear extension housing seal.



INSTALLATION

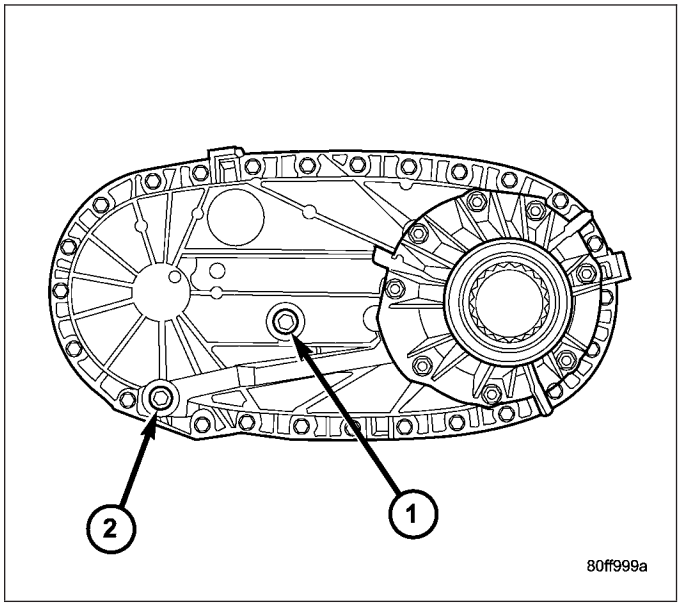
1. Clean fluid residue from sealing surface and inspect for defects.
2. Install the extension housing dust boot and seal assembly with Installer 9037 (3) and Handle C-4171 (2).
3. Install propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)
4. Verify proper transfer case fluid level.
5. Lower vehicle.



FLUID

STANDARD PROCEDURE - FLUID DRAIN AND REFILL

The fill (1) and drain (2) plugs are both in the rear case.



1. Raise vehicle.
2. Position drain pan under transfer case.

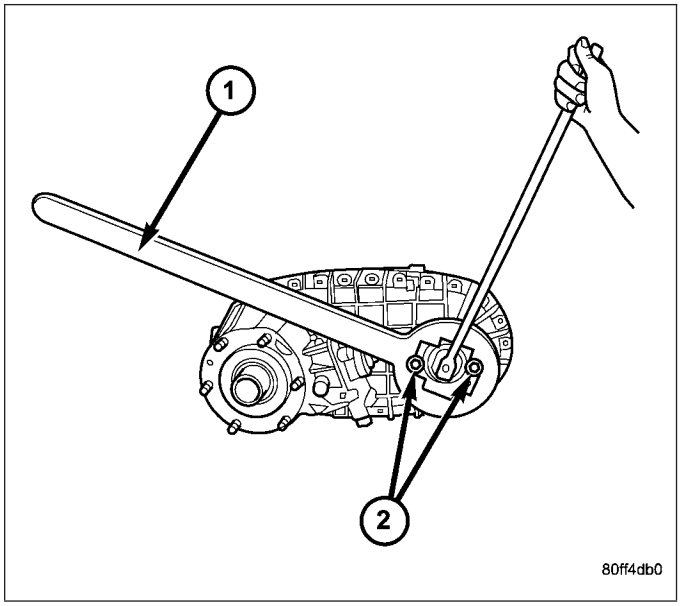
NOTE: It may be necessary to remove the exhaust y-pipe at the exhaust manifold to properly access the fill and drain plugs. Lowering the exhaust will allow the plugs to be accessed for torquing during installation. (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - REMOVAL)

3. Remove drain and fill plugs and drain lubricant completely.
4. Install drain plug. Tighten plug to 41-54 N·m (30-40 ft. lbs.).
5. Remove drain pan.
6. Fill transfer case to bottom edge of fill plug opening with Mopar® ATF +4, Automatic Transmission fluid.
7. Install and tighten fill plug to 41-54 N·m (30-40 ft. lbs.).
8. Install the exhaust y-pipe to the exhaust manifold, if removed. (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - INSTALLATION)
9. Wipe any excess fluid that may have spilled onto the exhaust.
10. Lower vehicle.

SEAL-FRONT OUTPUT SHAFT

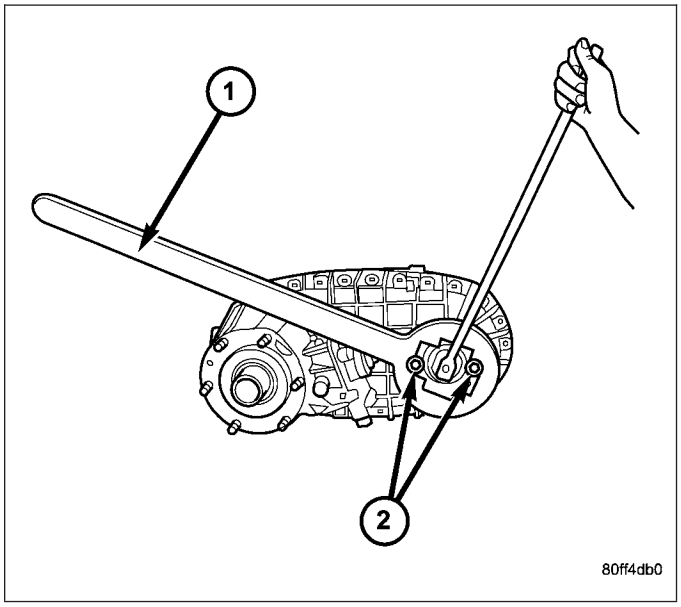
REMOVAL

1. Remove the front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL).
2. Install two bolts 180° apart into the front output shaft companion flange.
3. Place Holder 6719 (1) over the bolts (2) and against the companion flange.
4. Remove and discard the front companion flange nut.
5. Remove the companion flange from the front output shaft. It may be necessary to use Flange puller 8992 to remove the companion flange.
6. Using a screw and a slide hammer, remove the front output shaft seal.



INSTALLATION

1. Install the new front output shaft seal with Installer MB991168A.
2. Install the front companion flange onto the front output shaft.
3. Install two bolts 180° apart into the front output shaft companion flange.
4. Place Holder 6719 (1) over the bolts (2) and against the companion flange.
5. Install a new front companion flange nut. Tighten the companion flange nut to 258-312 N·m (190-230 ft.lbs.).
6. Install front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).



SENSOR-POSITION

DESCRIPTION

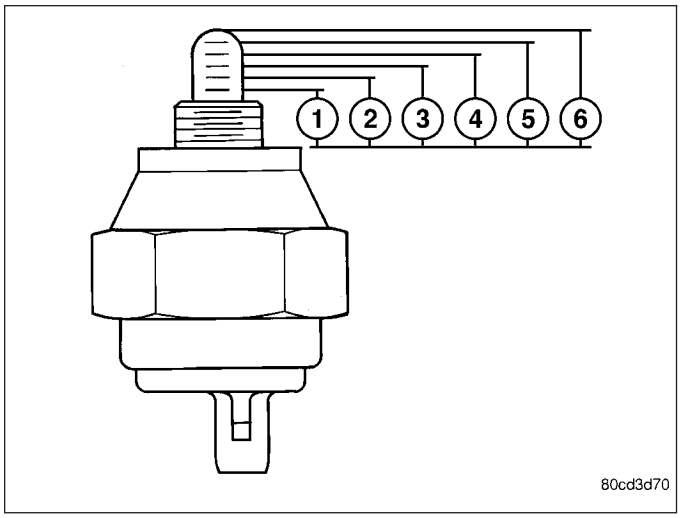
The transfer case position sensor is an electronic device whose output can be interpreted to indicate the transfer case's current operating mode. The sensor consists of a five position, resistive multiplexed circuit which returns a specific resistance value to the Powertrain Control Module (PCM) for each transfer case operating mode. The sensor is located on the top of the transfer case, just left of the transfer case centerline and rides against the sector plate roostercomb. The PCM supplies 5VDC (+/- 0.5V) to the sensor and monitors the return voltage to determine the sector plate, and therefore the transfer case, position.

OPERATION

Operating Mode Versus Resistance

SENSOR POSITION	OPERATING MODE	SENSOR RESISTANCE (ohms)
1	2H	1172-1195
2	4H	677-691
3	NEUTRAL	406-415
4	4L	208-213
5	NOT USED	60-61

During normal vehicle operation, the Powertrain Control Module (PCM) monitors the transfer case position sensor return voltage to determine the operating mode of the transfer case. Refer to the Operating Mode Versus Resistance table for the correct resistance for each position.



Position Sensor Linear Movement

1 - POSITION 1 - 10mm ±0.5mm
2 - POSITION 2 - 12mm ±0.5mm
3 - POSITION 3 - 14mm ±0.5mm
4 - POSITION 4 - 16mm ±0.5mm
5 - POSITION 5 - 18mm ±0.5mm
6 - POSITION 6 - 20mm±0.5mm - FULL EXTENSION

REMOVAL

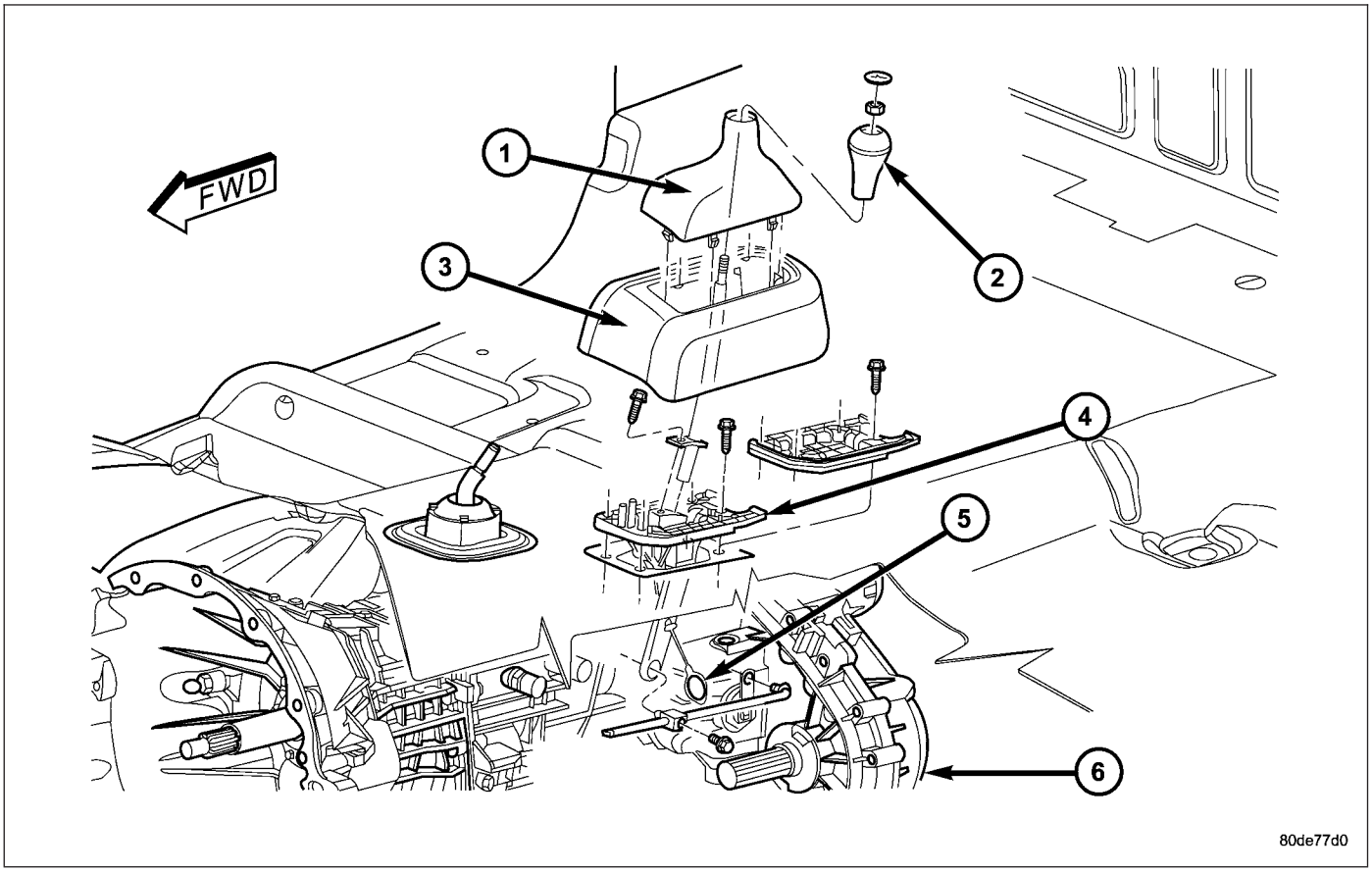
1. Raise and support the vehicle.
2. Disengage the transfer case position sensor connector from the position sensor.
3. Remove the position sensor from the transfer case.

INSTALLATION

1. Inspect the o-ring seal on the transfer case position sensor. Replace the o-ring if necessary.
2. Install the transfer case position sensor into the transfer case. Torque the sensor to 20-34 N·m (15-25 ft.lbs.).
3. Engage the transfer case position sensor connector to the position sensor.
4. Lower vehicle.
5. Verify proper sensor operation.

LEVER-SHIFT

REMOVAL

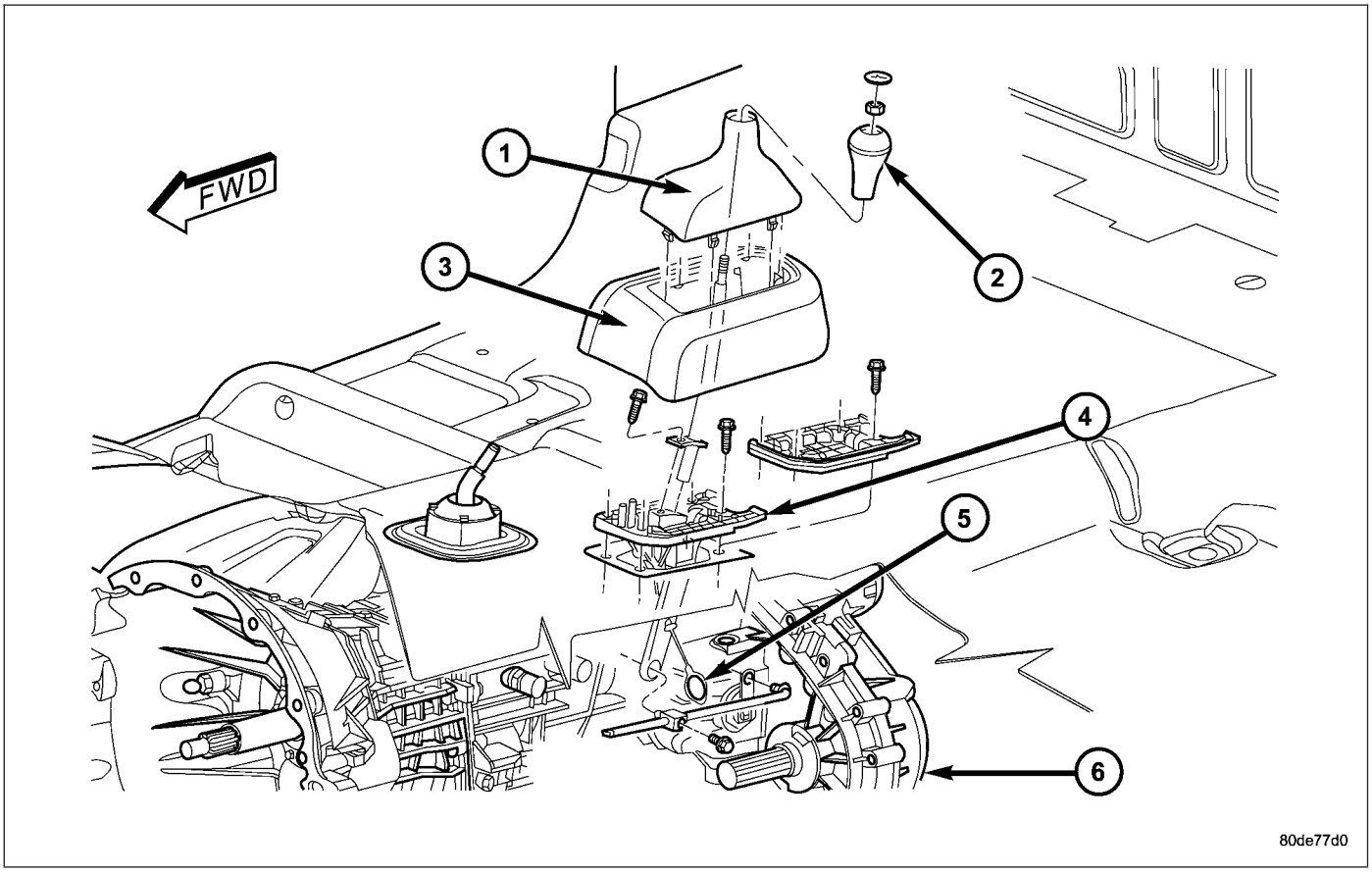


Transfer Case Shifter

1 - SHIFTER BOOT
2 - SHIFTER KNOB
3 - SHIFTER CONSOLE
4 - SHIFTER MECHANISM
5 - ALIGNMENT PIN
6 - TRANSFER CASE

1. Shift transfer case into 2H.
2. Raise and support the vehicle.
3. Loosen adjusting trunnion lock bolt and slide shift rod out of trunnion. If rod lacks enough travel to come out of trunnion, push trunnion out of shift lever.
4. Lower vehicle.
5. Remove transfer case shifter knob cap.
6. Remove nut holding shifter knob (2) to shift lever.
7. Remove shifter knob.
8. Remove the shift boot from the shifter console.
9. Remove the bolts securing the shifter mechanism to the floor pan.
10. Separate shift lever mechanism from the vehicle.

INSTALLATION



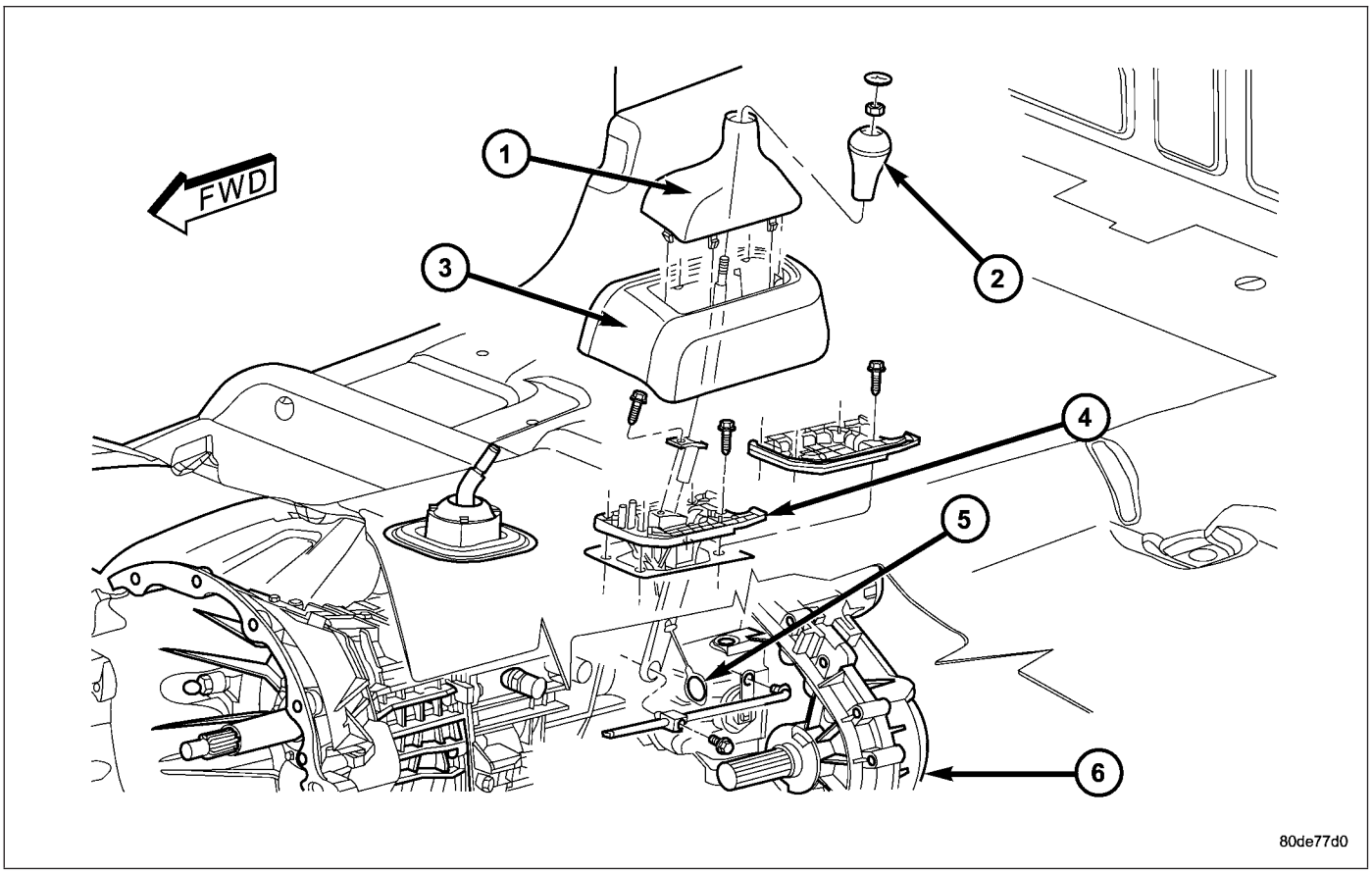
Transfer Case Shifter

1 - SHIFTER BOOT	4 - SHIFTER MECHANISM
2 - SHIFTER KNOB	5 - ALIGNMENT PIN
3 - SHIFTER CONSOLE	6 - TRANSFER CASE

1. If the shifter mechanism does not have a adjustment locating pin installed, align the adjustment channel on the shifter assembly to the locating hole in the lower shift lever and install an appropriately sized pin to retain the position.
2. Position shift lever in vehicle.
3. Install the bolts to hold the shifter mechanism (4) to the floor pan.
4. Raise vehicle.
5. Verify that the transfer case is still in the 2H position. The 2H detent position on the transfer case shift arm is the second position from full forward.
6. Install trunnion to shift lever, if necessary.
7. Install shift rod to trunnion, if necessary.
8. Tighten the shift rod lock bolt to 10 N·m (90 in.lbs.).
9. Remove the shifter adjustment locating pin from the adjustment channel and the locating hole.
10. Lower vehicle.
11. Install the transfer case shifter console.
12. Install the shifter boot and the shifter knob onto the shifter lever.
13. Install nut to hold shifter knob to shift lever.
14. Install shifter knob cap.
15. Verify transfer case operation.

ADJUSTMENTS

ADJUSTMENT - SHIFT LEVER



Transfer Case Shifter

1 - SHIFTER BOOT
2 - SHIFTER KNOB
3 - SHIFTER CONSOLE
4 - SHIFTER MECHANISM
5 - ALIGNMENT PIN
6 - TRANSFER CASE

1. Move shift lever into 2H position.
2. Raise vehicle.
3. Loosen shift rod lock bolt at trunnion.
4. Check shift rod fit in trunnion. Be sure rod does not bind in trunnion. Lubricate the shift rod and trunnion if necessary.
5. Verify that transfer case shift lever is in 2H detent position. The 2H detent position on the transfer case shift arm is the second position from full forward.
6. Align the adjustment locating hole on the lower shifter lever with the adjustment channel on the shifter bracket assembly.
7. Insert an appropriately sized pin through into the adjustment channel and through the locating hole to hold the shifter in the correct position.
8. Tighten shift rod lock bolt to 10 N·m (90 in. lbs.) torque.
9. Remove the locating pin from the adjustment channel and locating hole.
10. Check shift linkage operation. Be sure transfer case shifts into and operates properly in all ranges.

TRANSFER CASE - NV243 - SERVICE INFORMATION

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TRANSFER CASE - NV243 - SERVICE INFORMATION

DESCRIPTION

The NV243 is an electronically controlled part-time transfer case with a low range gear reduction system. The NV243 has three operating ranges plus a NEUTRAL position. The low range system provides a gear reduction ratio for increased low speed torque capability.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

OPERATING RANGES

Transfer case operating ranges are:

- 2WD (2-wheel drive)
- 4HI (4-wheel drive)
- 4LO (4-wheel drive low range)
- NEUTRAL

The 2WD range is for use on any road surface at any time.

The 4HI and 4LO ranges are for off road use only. They are not for use on hard surface roads. The only exception being when the road surface is wet or slippery or covered by ice and snow.

The low range reduction gear system is operative in 4LO range only. This range is for extra pulling power in off road situations. Low range reduction ratio is 2.72:1.

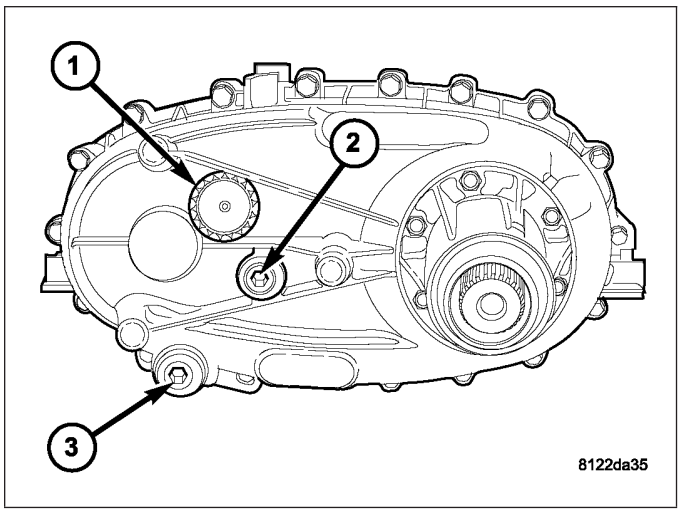
SHIFT MECHANISM

Operating ranges are selected with a dash mounted shift selector switch. The shift selector switch provides a input to the Transfer Case Control Module (TCCM) to indicate the driver's desire to change operating ranges. The TCCM uses this input, along with input from the transfer case mounted mode sensor and information from the vehicle's bus, to determine if a shift is permitted. If the TCCM decides the shift is permitted, the TCCM controls the shift motor, mounted to the exterior of the transfer case, to perform the shift.

IDENTIFICATION

A circular ID tag (1) is attached to the rear case of each transfer case. The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.



OPERATION

The input gear is splined to the transmission output shaft. The input gear drives the mainshaft through the planetary assembly and range sleeve. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchronizer mechanism for shifting.

DIAGNOSIS AND TESTING - TRANSFER CASE - NV243

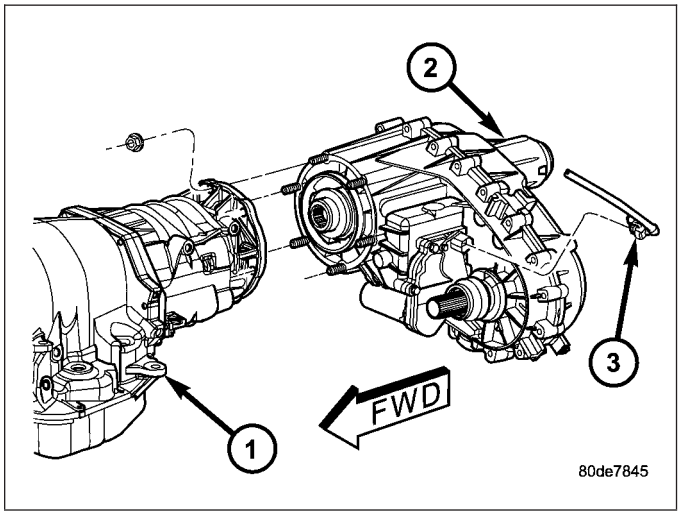
DIAGNOSIS CHART

Condition	Possible Cause	Correction
Transfer case difficult to shift or will not shift into desired range.	1) Transfer case electronically controlled shift system malfunction.	1) Verify proper operation per the appropriate diagnostic manual.
	2) If vehicle was operated for an extended period in 4HI mode on dry surface, driveline torque load may cause difficulty.	2) Drive the vehicle in a straight line and momentarily release the accelerator. The transfer case can then be shifted to the desired mode.
	3) Insufficient or incorrect lubricant.	3) Drain and refill transfer case with the correct quantity of Mopar® ATF +4, Automatic Transmission Fluid.
	4) Internal transfer case components binding, worn, or damaged.	4) Repair or replace components as necessary.
Transfer case noisy in all drive modes.	1) Insufficient or incorrect lubricant.	1) Drain and refill transfer case with the correct quantity of Mopar® ATF +4, type 9602, Automatic Transmission Fluid.
	2) Internal transfer case components binding, worn, or damaged.	2) Repair or replace components as necessary.

Condition	Possible Cause	Correction
Transfer case noisy while in, or jumps out of, 4LO mode.	1) Transfer case not completely engaged in 4LO position.	1) While rolling 2-3 MPH and the transmission in NEUTRAL, or clutch depressed on vehicles equipped with a manual transmission, shift transfer case to the 2WD or 4HI position, and then back into the 4LO position.
	2) Range fork damaged, inserts worn, or fork is binding on the shift rail.	2) Repair or replace components as necessary.
	3) Low range gear worn or damaged.	3) Repair or replace components as necessary.
Lubricant leaking from transfer case seals or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Transfer case vent closed or restricted.	2) Clean or replace vent as necessary.
	3) Transfer case seals damaged or installed incorrectly.	3) Replace suspect seal.
Abnormal tire wear.	1) Extended operation in 4HI mode on dry surfaces,	1) Operate vehicle in 2WD mode on dry surfaces.

REMOVAL

1. Shift transfer case into 2WD.
2. Raise vehicle.
3. Drain transfer case lubricant.
4. Mark front and rear propeller shafts for alignment reference.
5. Support transmission with jack stand.
6. Remove the transfer case skid plate, if equipped.
7. Disconnect front and rear propeller shafts at transfer case.
8. Disconnect transfer case shift motor and mode sensor wire connectors (3).
9. Disconnect transfer case vent hose.
10. Support transfer case with transmission jack.
11. Secure transfer case to jack with chains.
12. Remove nuts attaching transfer case (2) to transmission (1).
13. Pull transfer case and jack rearward to disengage transfer case.
14. Remove transfer case from under vehicle.

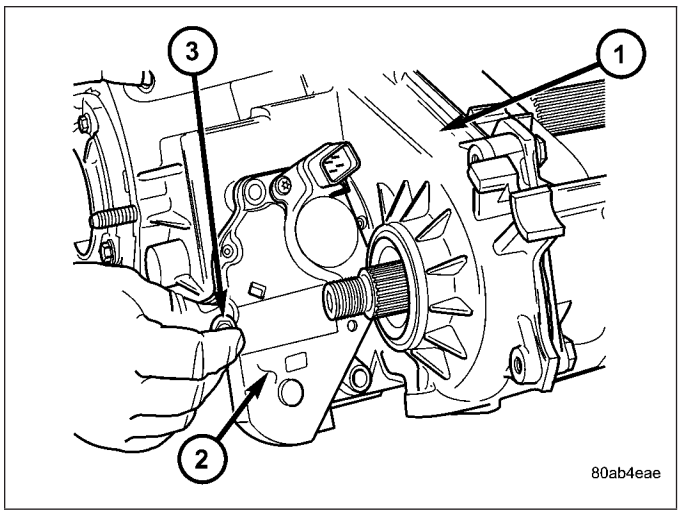


DISASSEMBLY

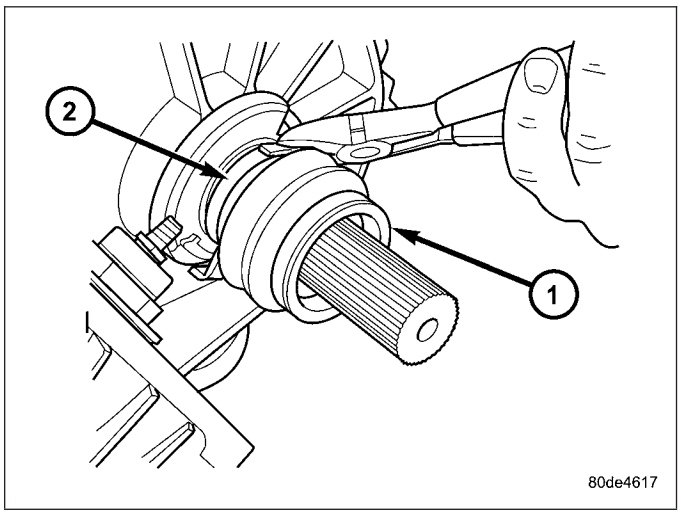
Position transfer case in a shallow drain pan. Remove drain plug and drain any remaining lubricant remaining in case.

SHIFT MOTOR ASSEMBLY AND FRONT OUTPUT SHAFT SEAL

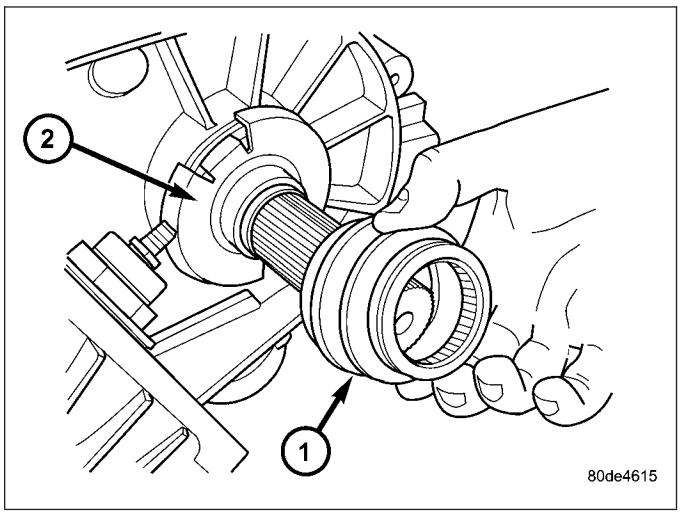
1. Remove the bolts (3) which hold the shift motor and mode sensor assembly (2) to the transfer case (1).



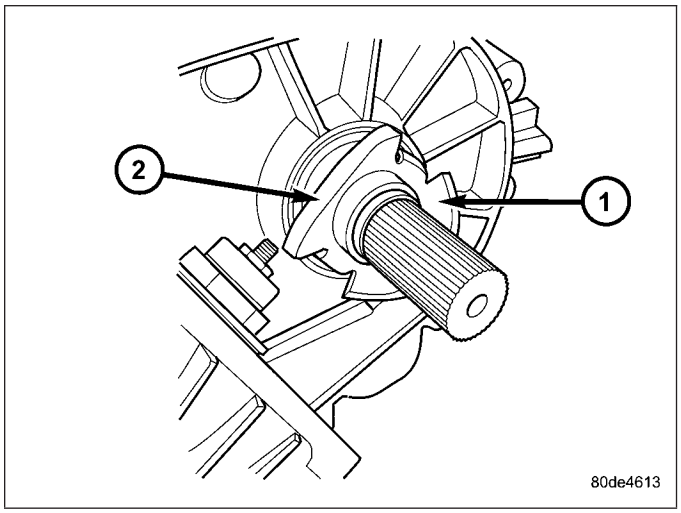
2. Remove the shift motor and mode sensor assembly from the transfer case.
3. Remove the front propeller shaft seal boot (1) retaining clamp (2).



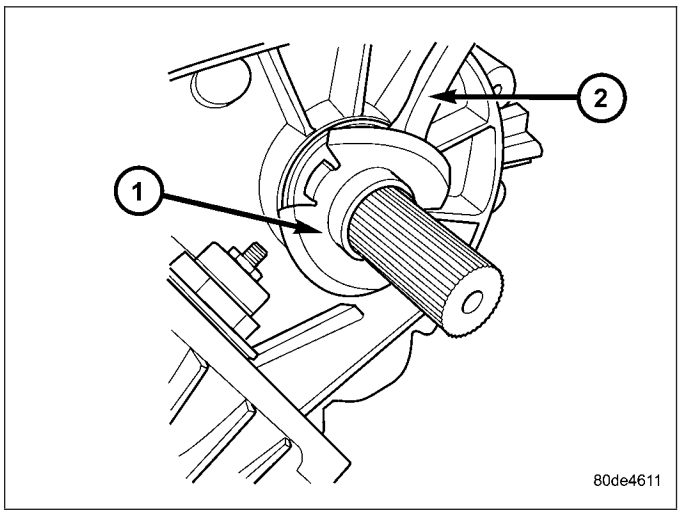
4. Remove the front propeller shaft seal boot (1).



5. Remove the front output shaft seal slinger (1) by bending (2) the slinger ears away from the transfer case.

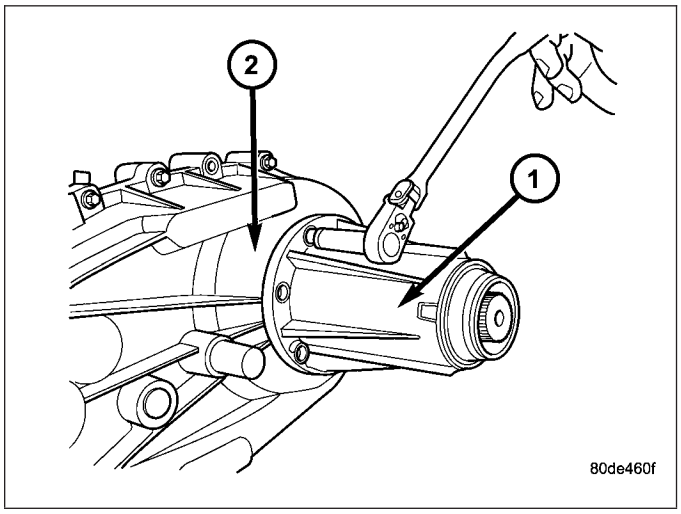


6. Using a suitable pry tool (2), remove the slinger (1) from the output shaft using care not to damage the shaft.
7. Using a screw and a slide hammer, remove the front output shaft seal.

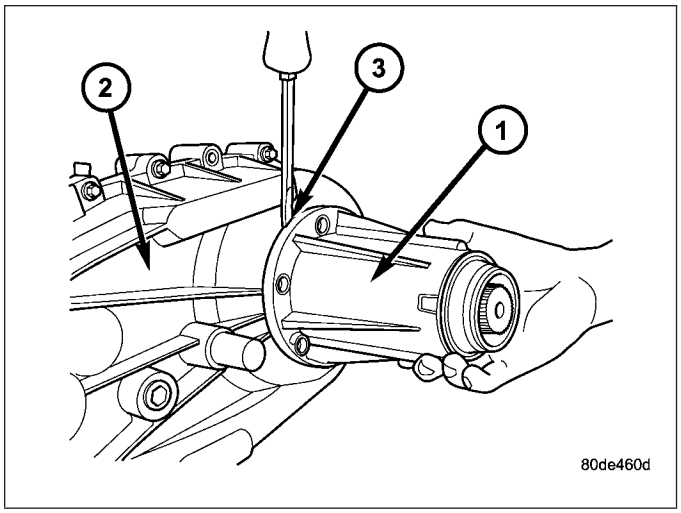


REAR EXTENSION

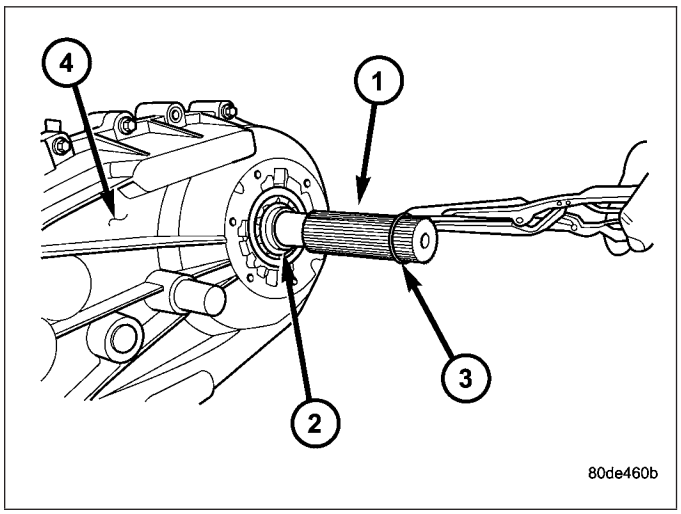
1. Remove rear extension bolts (1).



2. Remove rear extension housing (1). Tap extension once or twice with a plastic mallet to break sealer bead and loosen it.

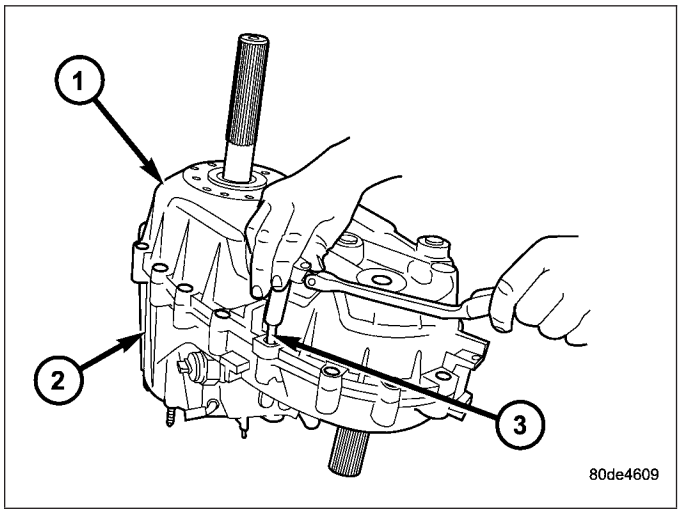


3. Remove output bearing (2) retaining ring (3) with heavy duty snap-ring pliers.

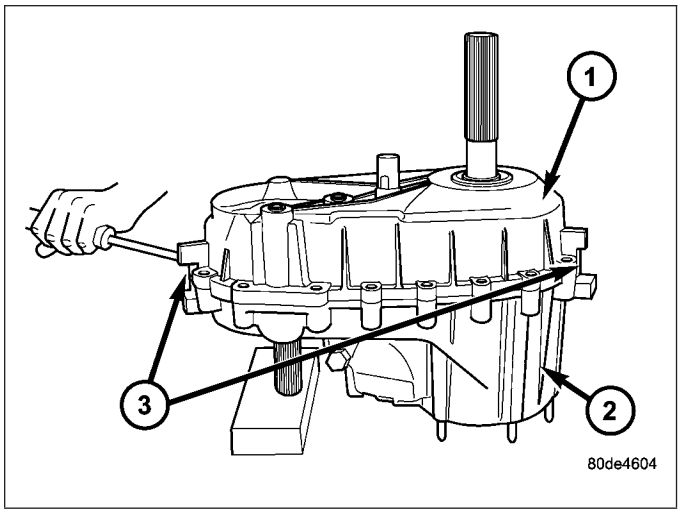


OIL PUMP AND REAR CASE

1. Remove rear case (1)-to-front case (2) bolts (3).



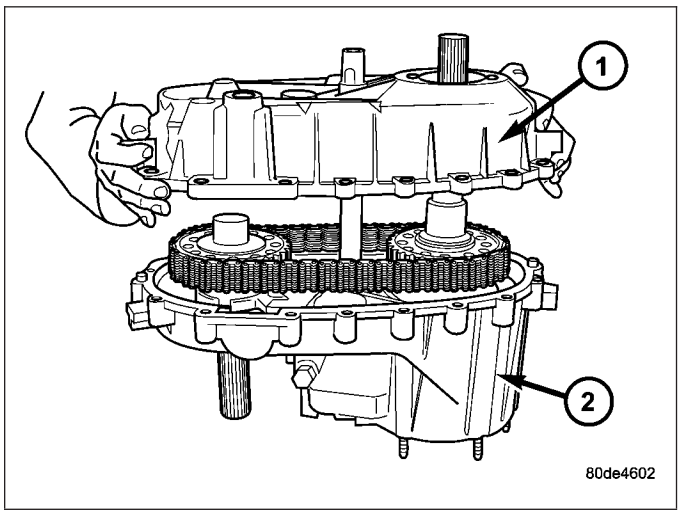
2. Loosen rear case (1) with pry tool to break sealer bead. Insert tool in slot (3) at each end of case.



3. Unseat rear case from alignment dowels.
4. Remove rear case (1) and oil pump assembly from front case (2).

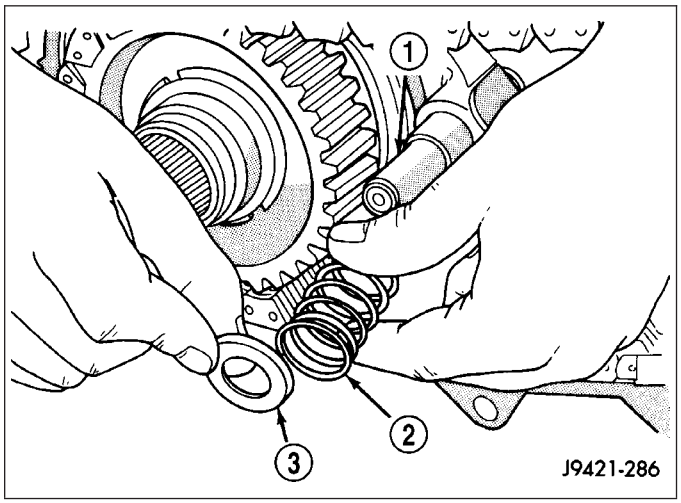
CAUTION: Do not remove the bolts holding the oil pump cover to the rear case half. The oil pump cover is aligned to the rear output shaft inner bearing race and will become mis-aligned if the bolts are loosened. If the transfer case failure has generated any debris which may have become trapped in the oil pump. the rear case and oil pump assembly MUST be replaced.

5. Remove the oil pump pickup tube.

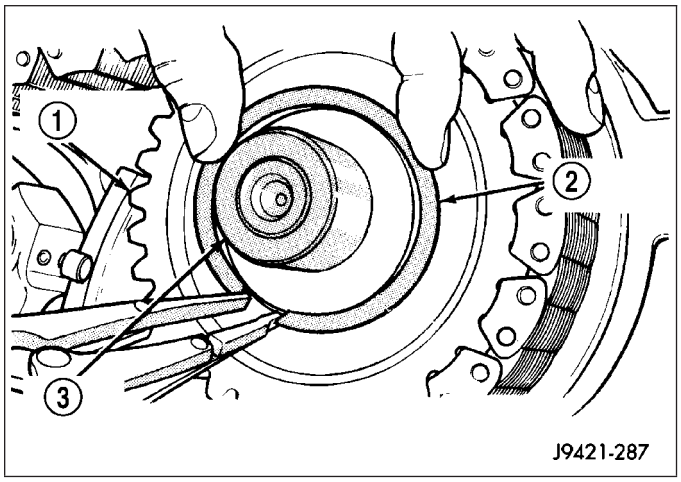


FRONT OUTPUT SHAFT AND DRIVE CHAIN

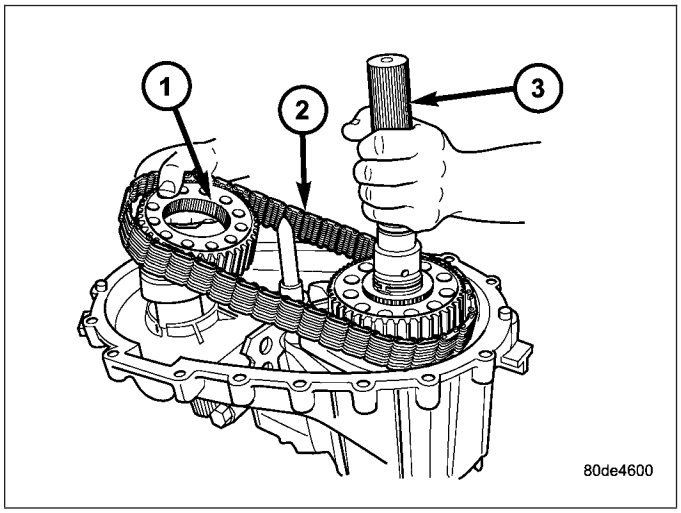
1. Remove shift rail cup (3) and spring (2).



2. Remove front sprocket (1) retaining ring (2).

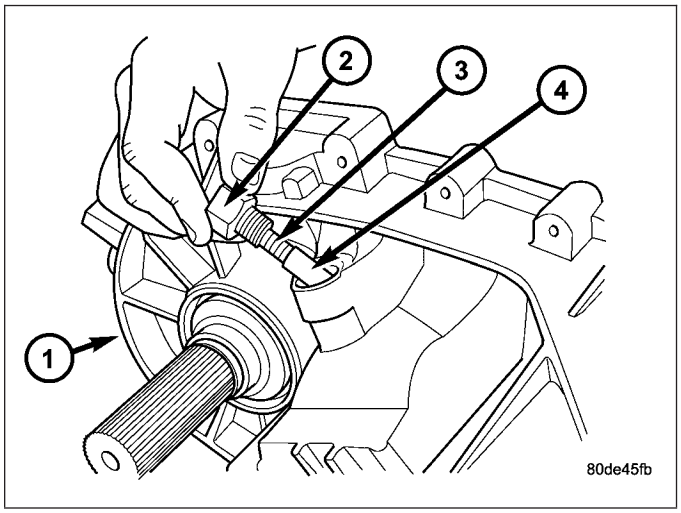


3. Pull mainshaft (3), front sprocket (1), and chain (2) outward about 25.4 mm (1-inch) simultaneously.
4. Remove chain from mainshaft drive sprocket and remove front sprocket and chain as assembly.

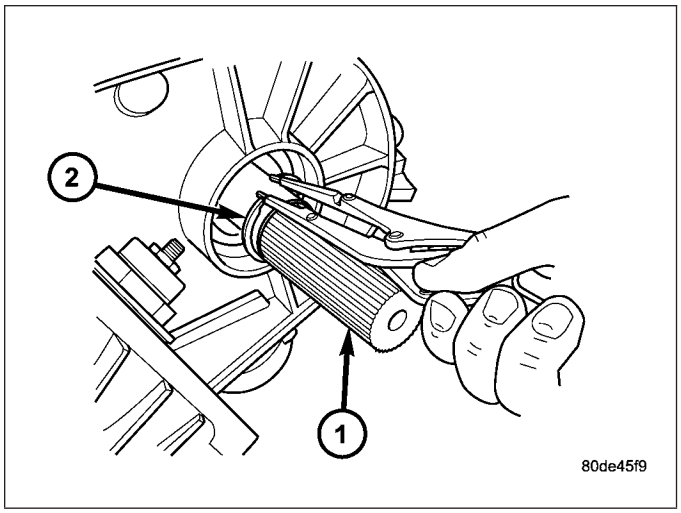


SHIFT FORKS AND MAINSHAFT

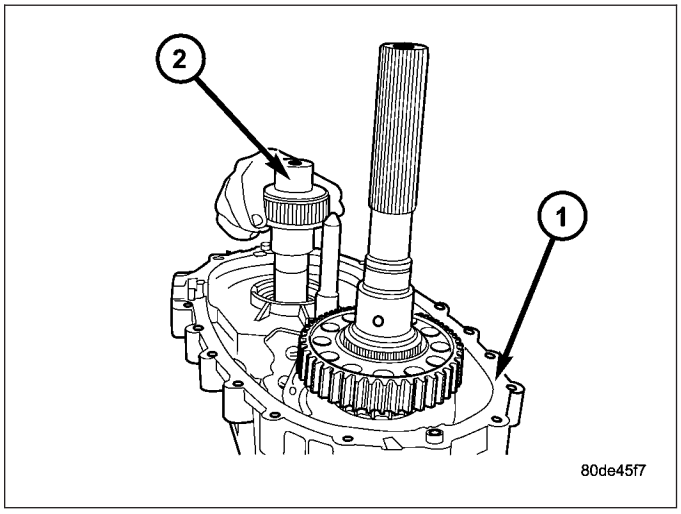
1. Loosen detent plug (2).
2. Remove detent plug (2), spring (3), and plunger (4). Note that the plug has an O-ring seal. Remove and discard this seal.



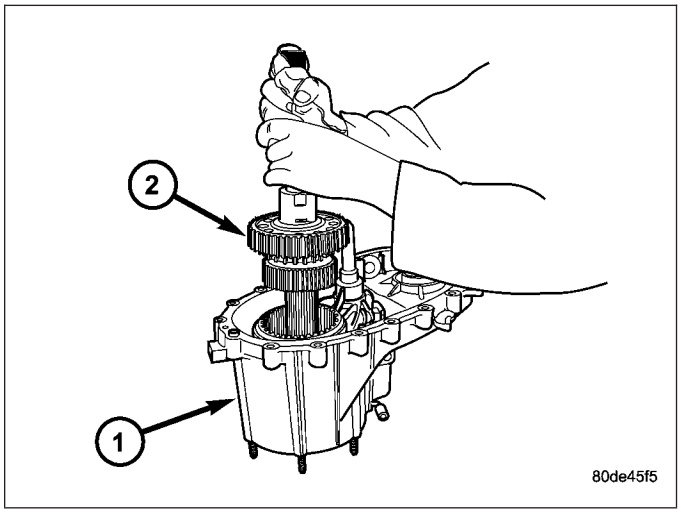
3. Remove the front output shaft (1) snap-ring (2).



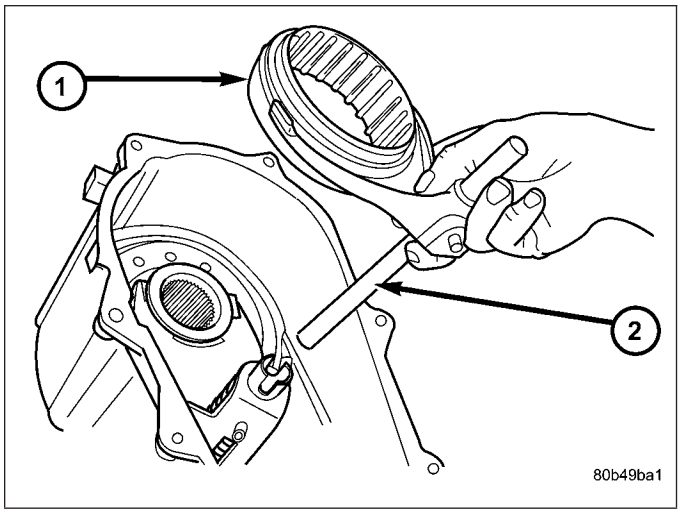
4. Remove front output shaft (2) from bearing in the front case (1).



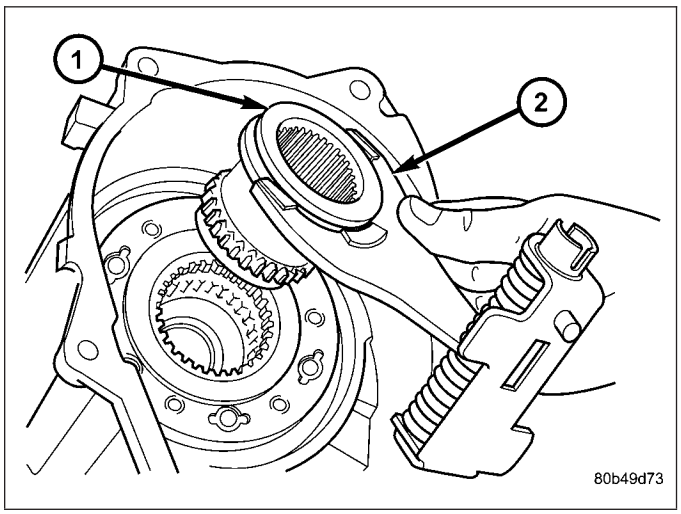
5. Pull mainshaft assembly (2) out of input gear, mode sleeve, and front case (1).



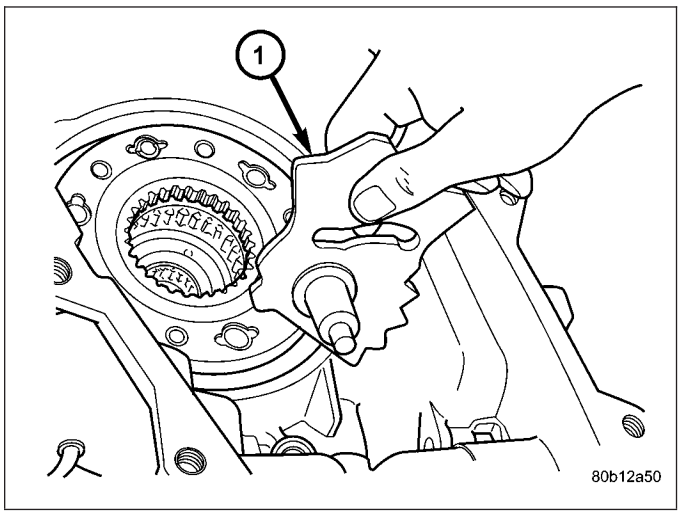
6. Remove mode fork (2), mode sleeve (1), and shift rail as assembly. Note which way the sleeve fits in the fork (long side of sleeve goes to front).



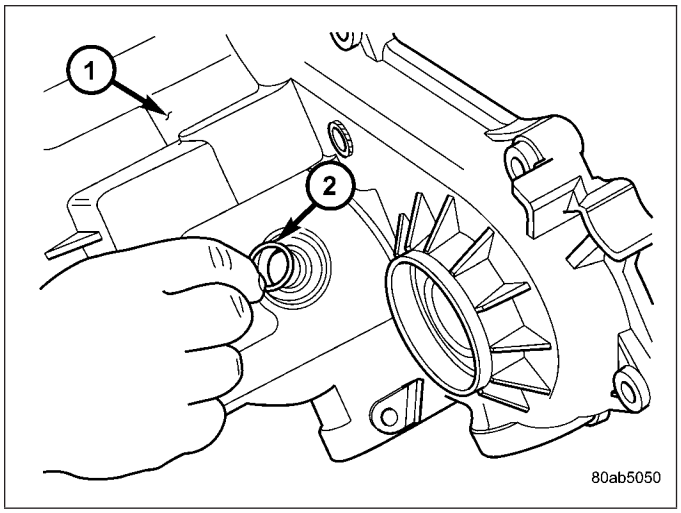
7. Remove range fork retaining ring.
8. Remove range fork (2) and hub (1) as an assembly. Note fork position for installation reference.



9. Remove shift sector (1).

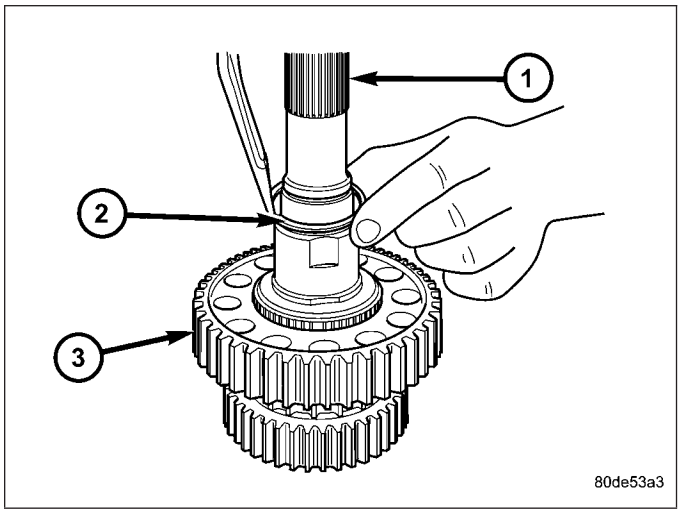


10. Remove the shift sector o-ring (2) from the front housing (1).

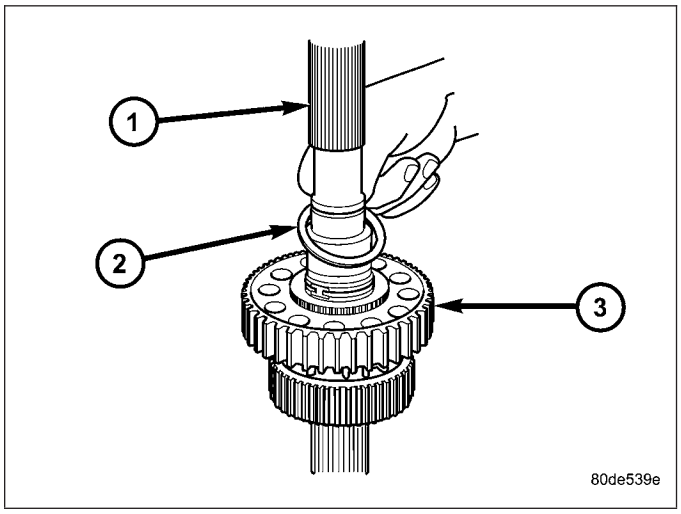


MAINSHAFT

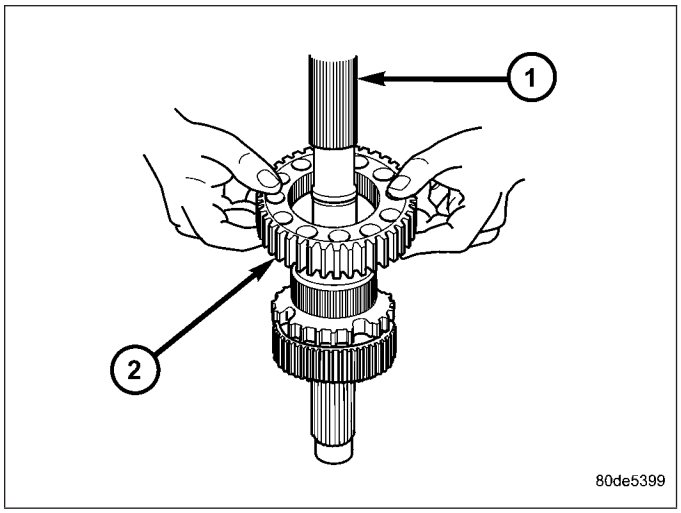
1. Remove the drive sprocket (3) retaining ring (2) from the output shaft (1).



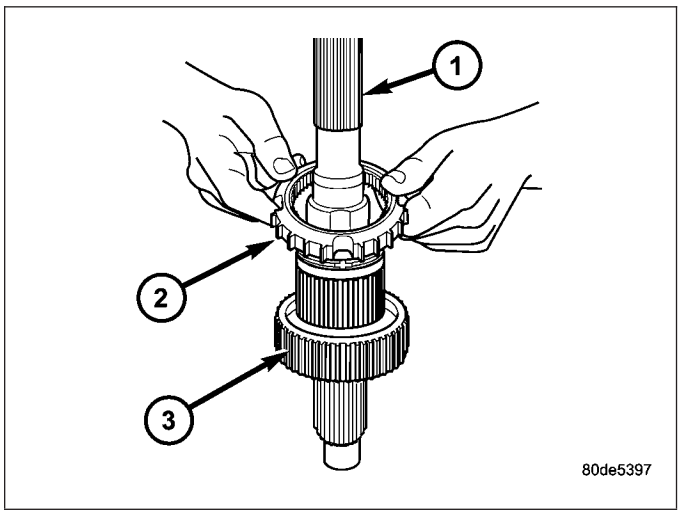
2. Remove the drive sprocket (3) thrust washer (2) from the output shaft (1).



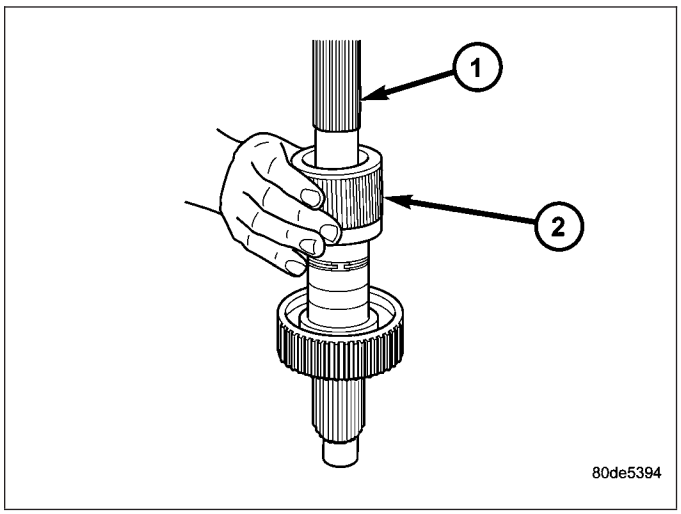
3. Remove drive sprocket (2) from the output shaft (1).



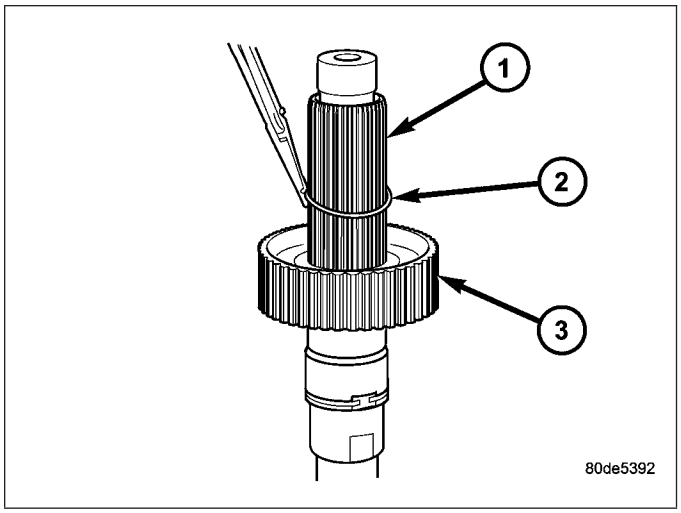
4. Remove the clutch gear (2) from the output shaft (1).



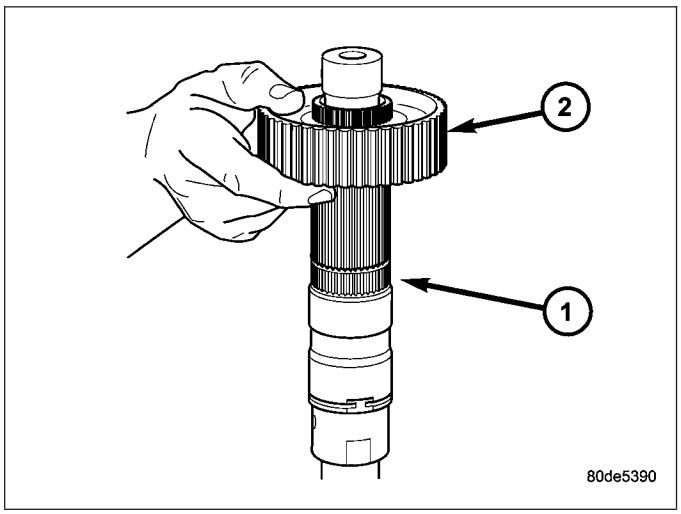
5. Remove the sprocket hub (2) from the output shaft (1).



6. Remove the mode hub retaining ring (2) from the output shaft (1).

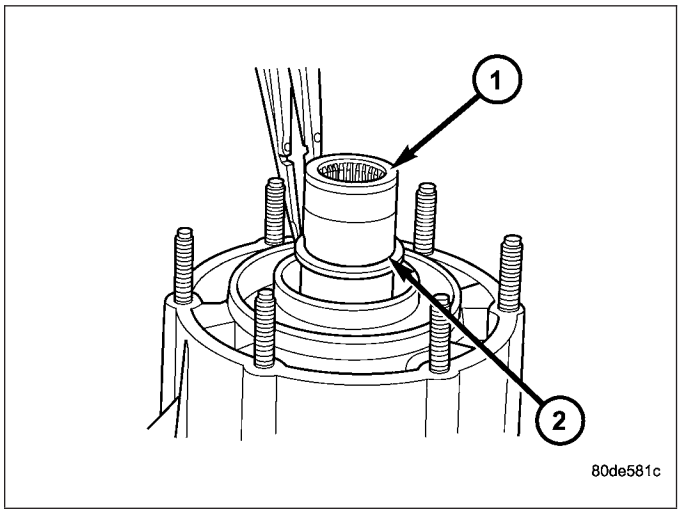


7. Remove the mode hub (2) from the output shaft (1).

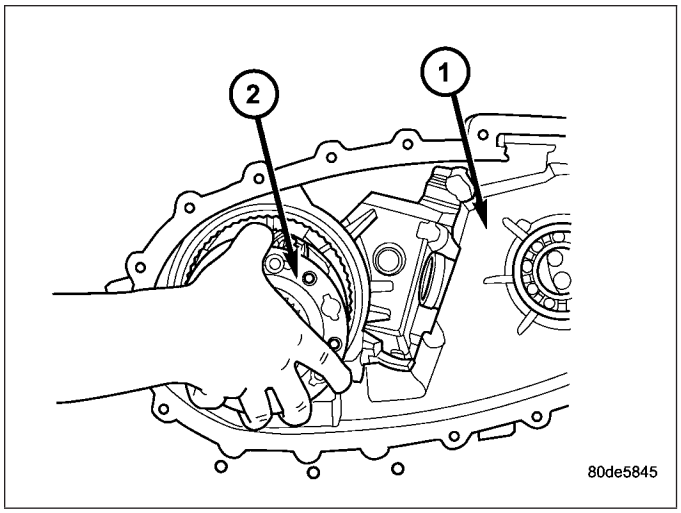


INPUT AND PLANETARY GEAR

1. Remove input gear seal with suitable screw and slide hammer.
2. Remove input gear (1) retaining ring (2) with heavy duty snap-ring pliers.

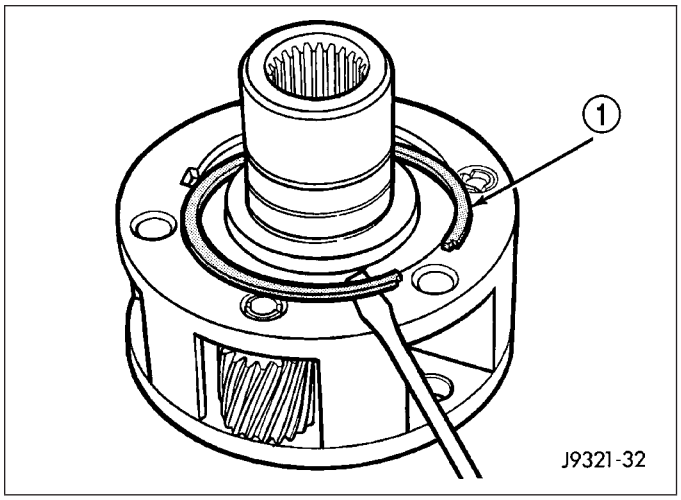


3. Place front case in horizontal position. Then remove input gear and low range gear as an assembly (2). Tap gear out of bearing with plastic mallet, if necessary.

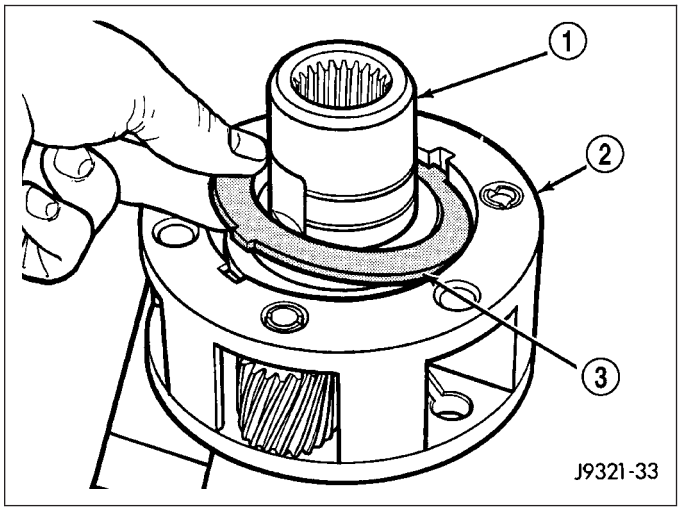


INPUT AND PLANETARY GEAR

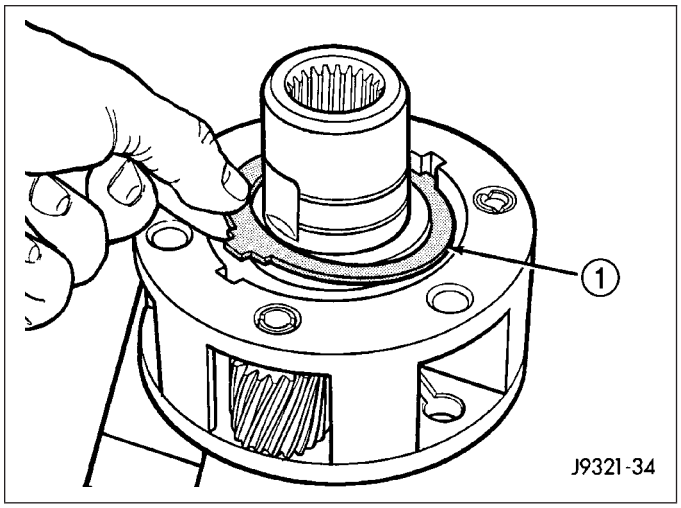
1. Remove snap-ring (1) that retains input gear in low range gear.



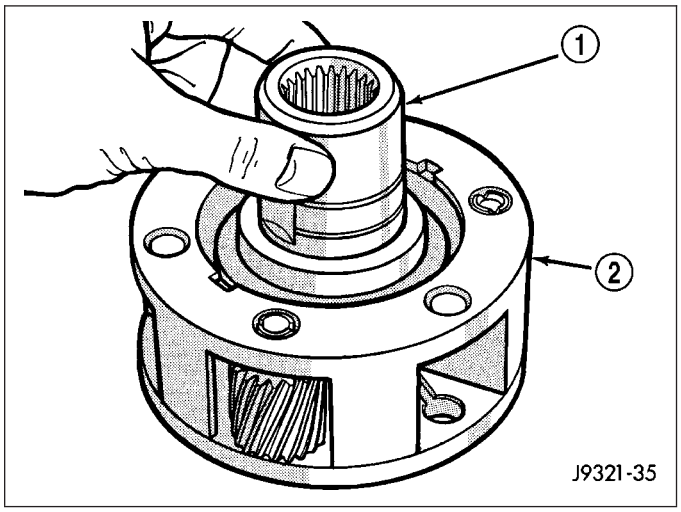
2. Remove retainer (3).



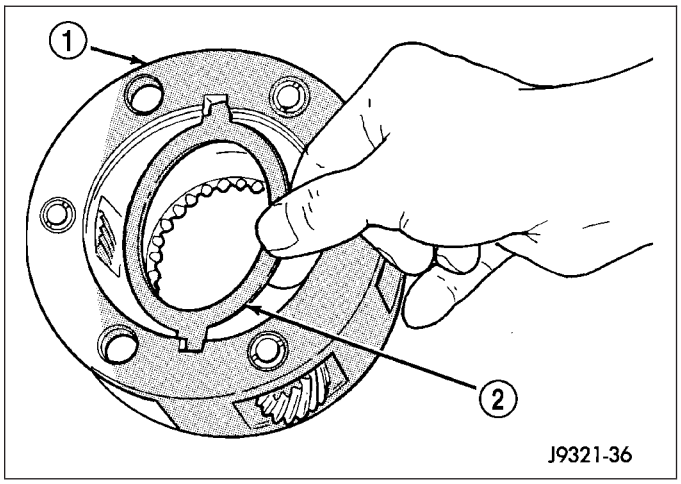
3. Remove front tabbed thrust washer (1).



4. Remove input gear (1).



5. Remove rear tabbed thrust washer (2) from low range gear (1).



CLEANING

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and 3M™ all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

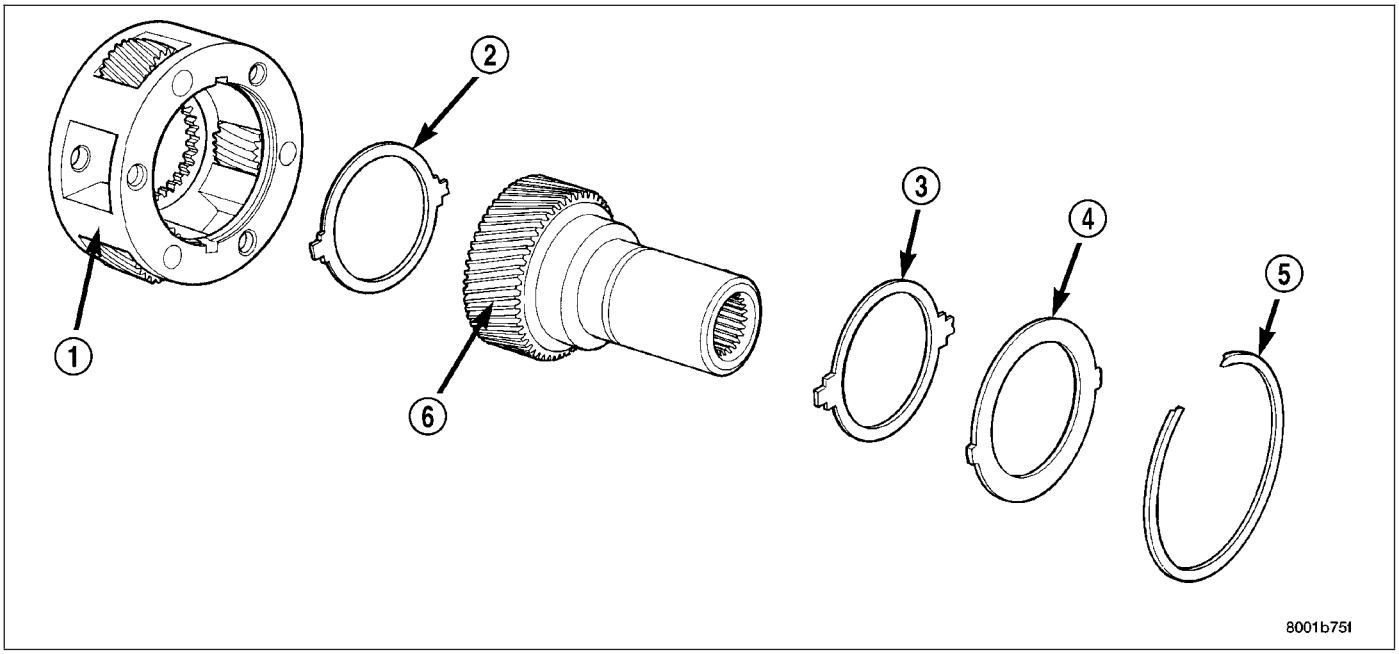
INSPECTION

MAINSHAFT/SPROCKET/HUB INSPECTION

Inspect the splines on the hub and shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone. However, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320-400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER



Input Gear and Carrier Components

1 - PLANETARY CARRIER
2 - REAR THRUST WASHER
3 - FRONT THRUST WASHER
4 - CARRIER LOCK RING
5 - CARRIER LOCK RETAINING RING
6 - INPUT GEAR

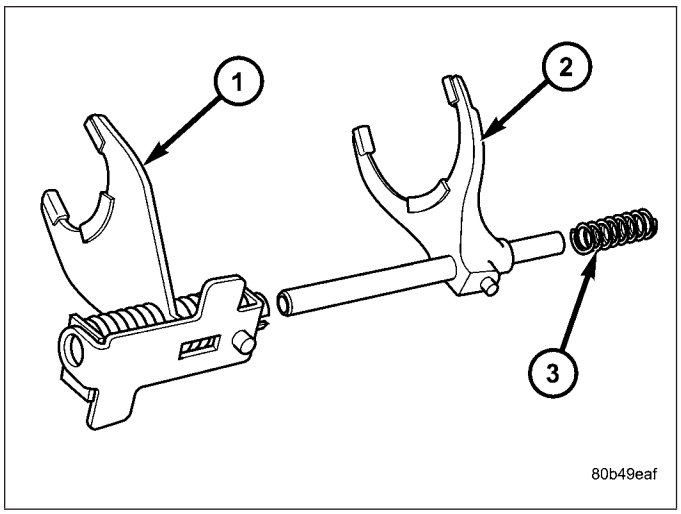
Check the teeth on the gear (6). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300-400 grit emery cloth if necessary.

Examine the carrier body (1) and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring (4) and both thrust washers (2, 3) for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

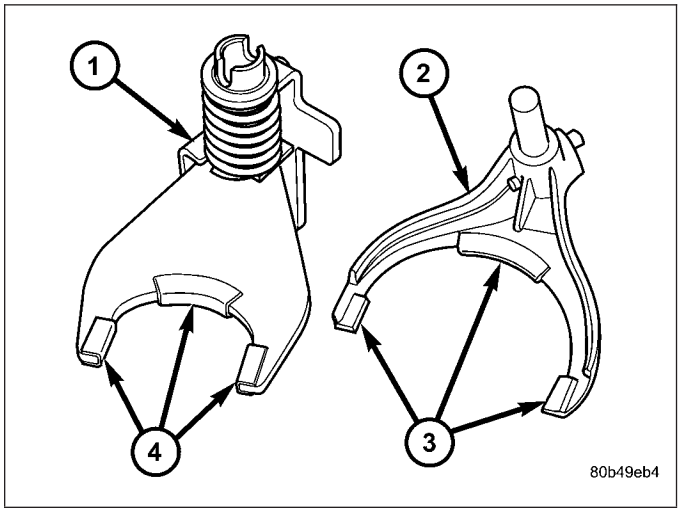
SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail (2). Minor nicks on the shift rail can be smoothed with 320-400 grit emery cloth.



Inspect the shift fork wear pads (3, 4). The mode (2) and range (1) fork pads are serviceable and can be replaced if necessary.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.



REAR EXTENSION HOUSING

Inspect the extension housing seal and bushing. Replace both components if either show any sign of wear or damage.

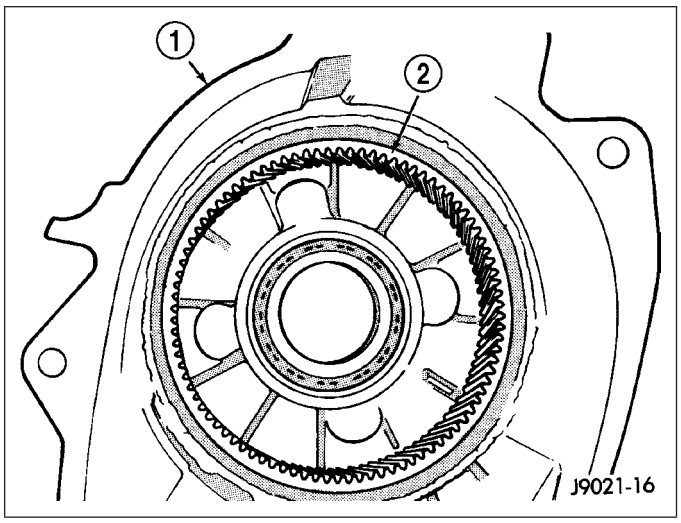
FRONT OUTPUT SHAFT AND DRIVE CHAIN

Inspect the shaft threads, sprocket teeth, and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320-400 grit emery to smooth minor scratches on the shaft bearing surfaces. Rough threads on the shaft can be chased if necessary. Replace the shaft if the threads are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. Replace the chain and both sprockets if the chain is stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

LOW RANGE ANNULUS GEAR

Inspect annulus gear (2) condition carefully. The gear is only serviced as part of the front case (1). If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear.



FRONT AND REAR CASES

Inspect the cases for wear and damage.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil® stainless steel inserts if required.

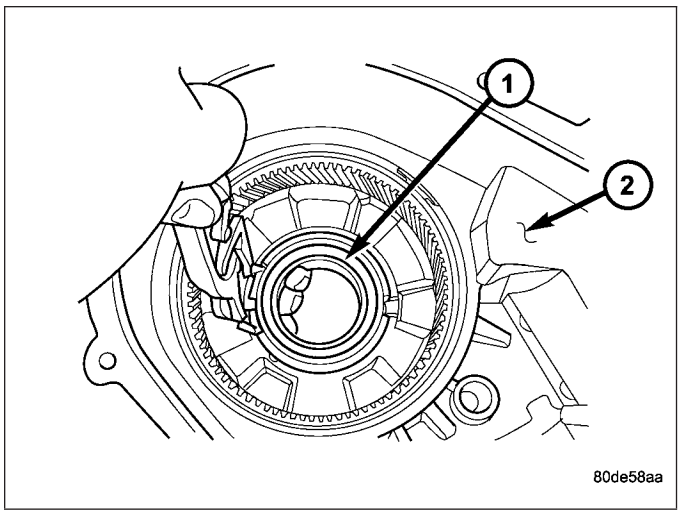
OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

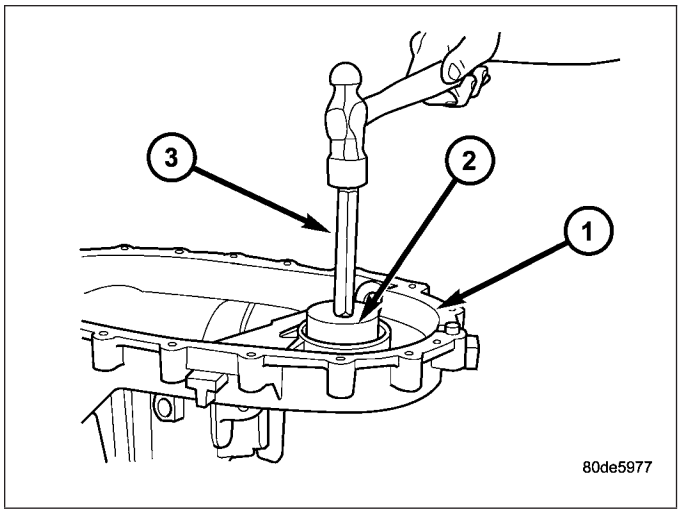
ASSEMBLY

BEARINGS AND SEALS

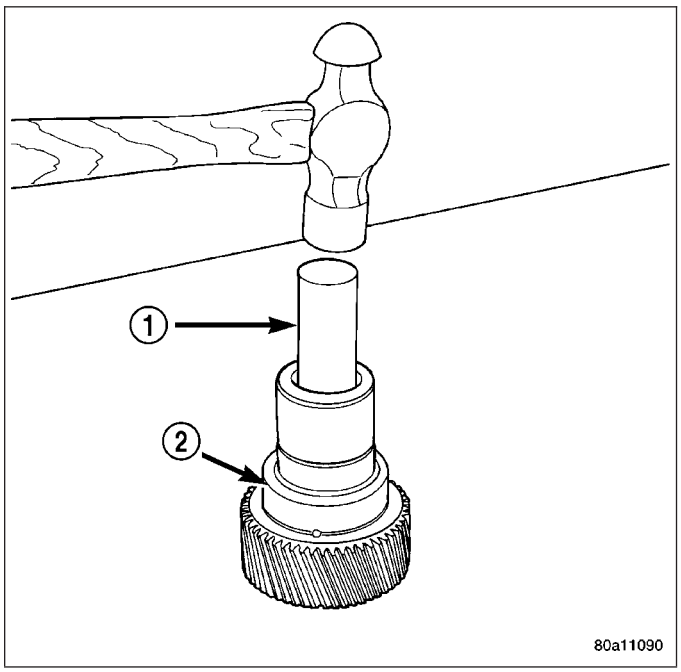
1. Remove the input shaft bearing (1) from the front case (2) with suitable snap-ring pliers.
2. Transfer the retaining ring to the new bearing if necessary and install the bearing into the front case.



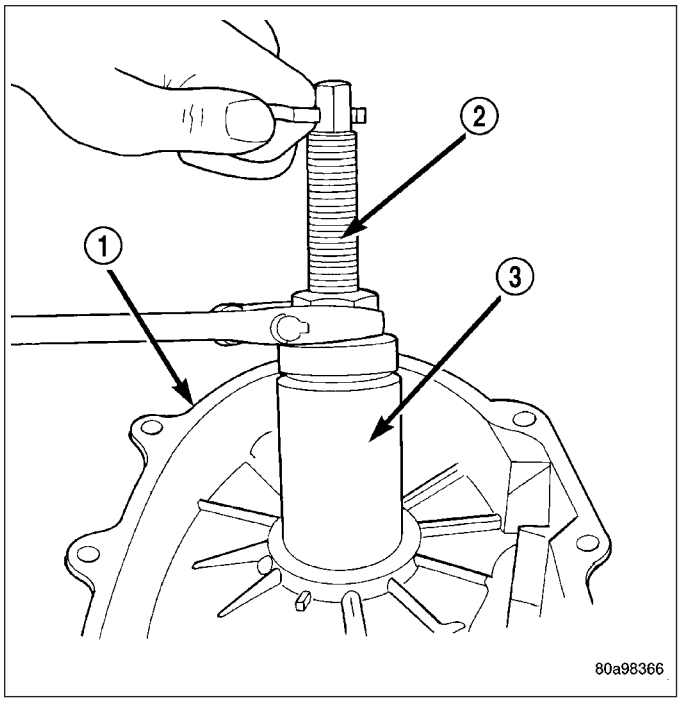
3. Using Installer 6436 (2) and Handle C-4171 (3), remove front output shaft bearing.
4. Start front output shaft bearing in case. Then seat bearing with Handle C-4171 and Installer 6953.
5. Install front output shaft bearing retaining ring.



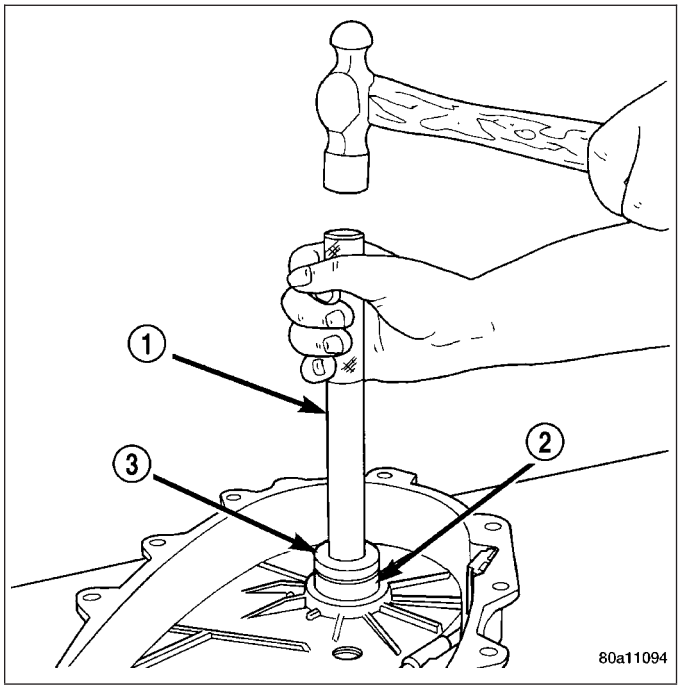
6. Remove input gear (2) pilot bearing by inserting a suitably sized drift (1) into the splined end of the input gear and driving the bearing out with the drift and a hammer.
7. Install new pilot bearing with Remover/Installer 8684.



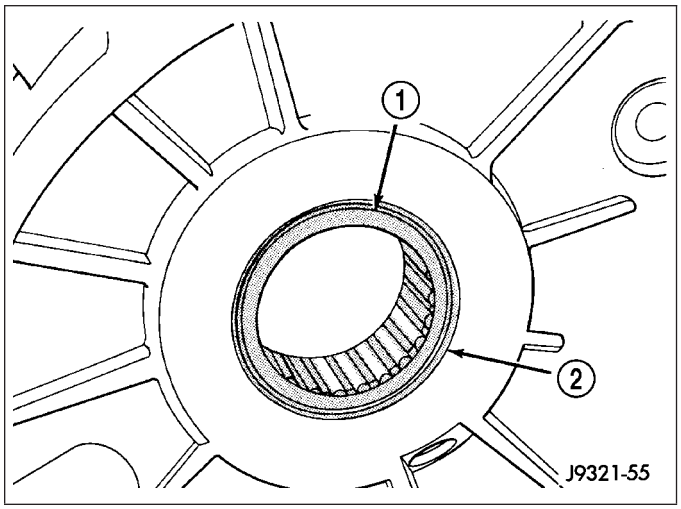
8. Remove the front output shaft rear bearing with the screw and jaws from Remover L-4454 (2) and Cup 8148 (3).



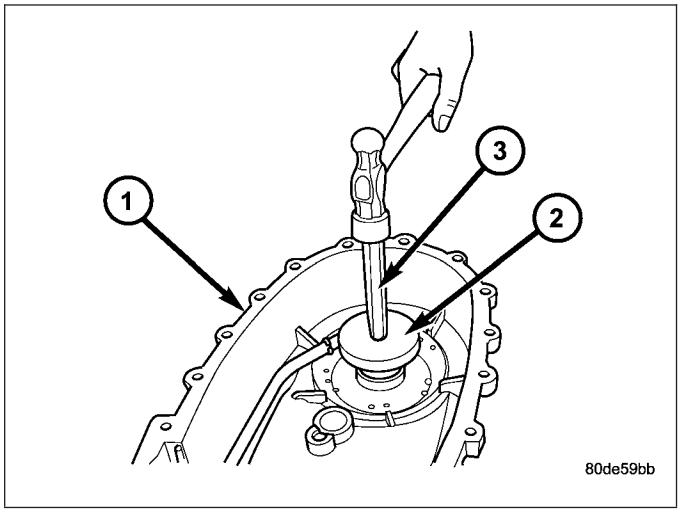
9. Install new bearing with Tool Handle C-4171 and Installer 5066.



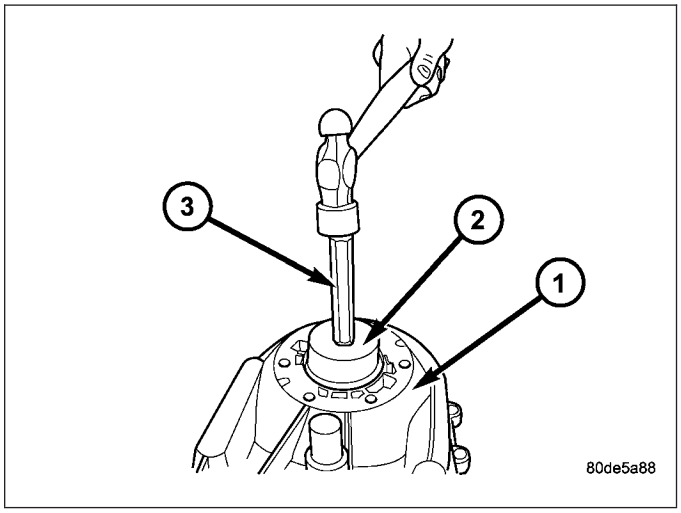
10. The bearing bore is chamfered at the top. Install the bearing (1) so it is flush with the lower edge of this chamfer (2).



11. Remove the rear output shaft bearing from the rear case (1) using Remover/Installer 8684 (2)and Handle C-4171 (3).

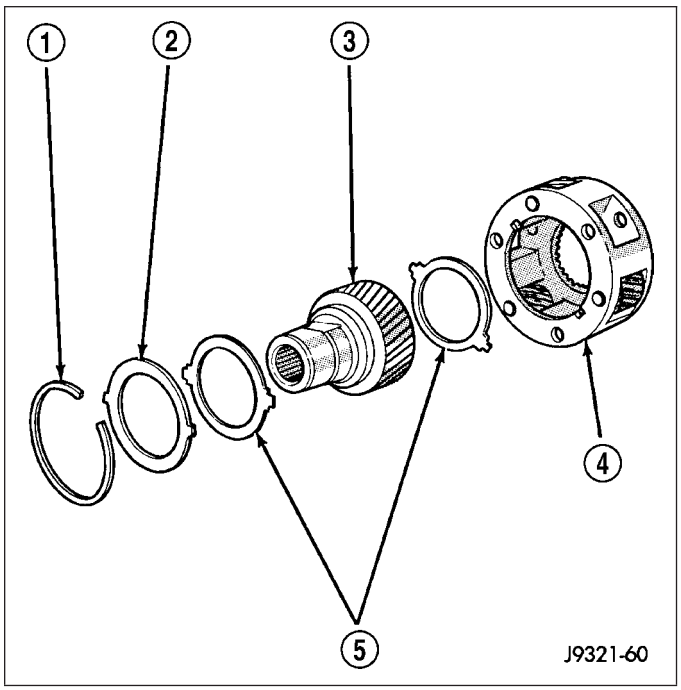


12. Install the rear output shaft bearing into the rear case (1) using Remover/Installer 6953 (2) and Handle C-4171 (3).

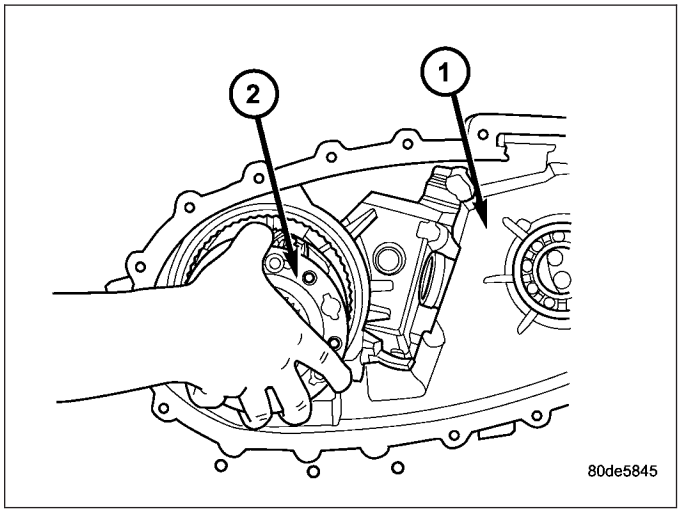


INPUT AND PLANETARY GEAR

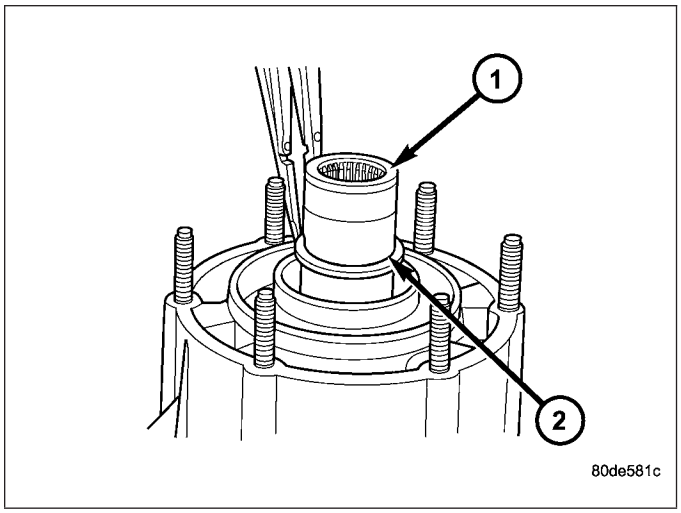
1. Lubricate gears (4) and thrust washers (5) with recommended transmission fluid.
2. Install first thrust washer in low range gear (5). Be sure washer tabs are properly aligned in gear notches.
3. Install input gear (3) in low range gear (4). Be sure input gear is fully seated.
4. Install remaining thrust washer (5) in low range gear (4) and on top of input gear (3). Be sure washer tabs are properly aligned in gear notches.
5. Install retainer (2) on input gear and install snap-ring (1).



6. Align and install low range/input gear assembly (2) in front case (1). Be sure low range gear pinions are engaged in annulus gear and that input gear shaft is fully seated in front bearing.

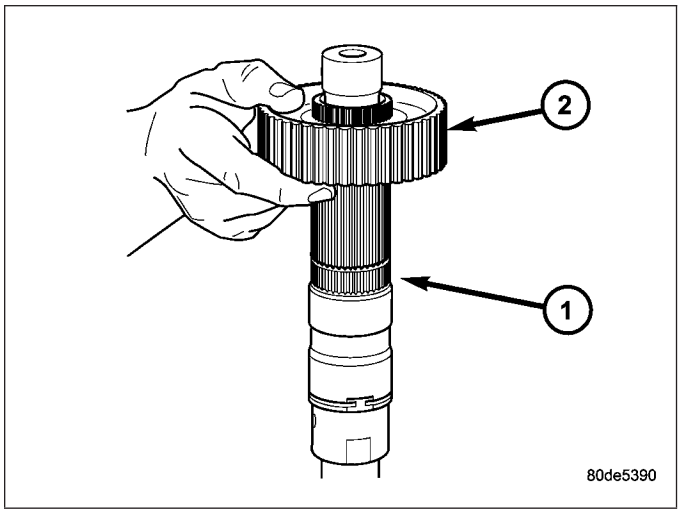


7. Install snap-ring (2) to hold input/low range gear (1) into front bearing.
8. Install a new input gear seal using Installer 8841 and Handle C-4171.

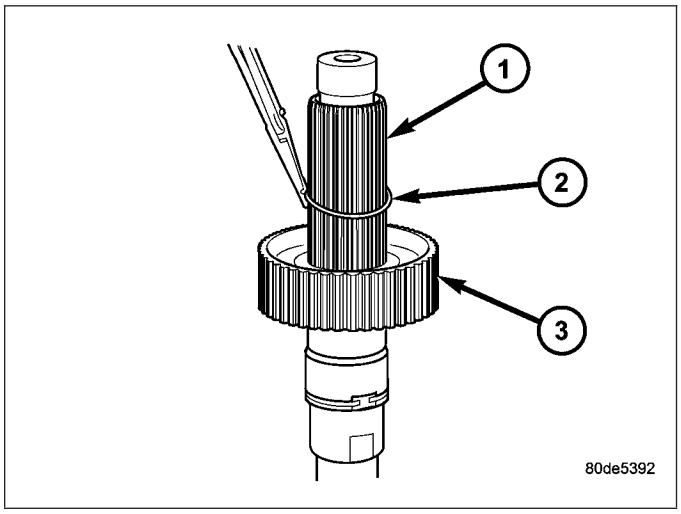


SHIFT FORKS AND MAINSHAFT

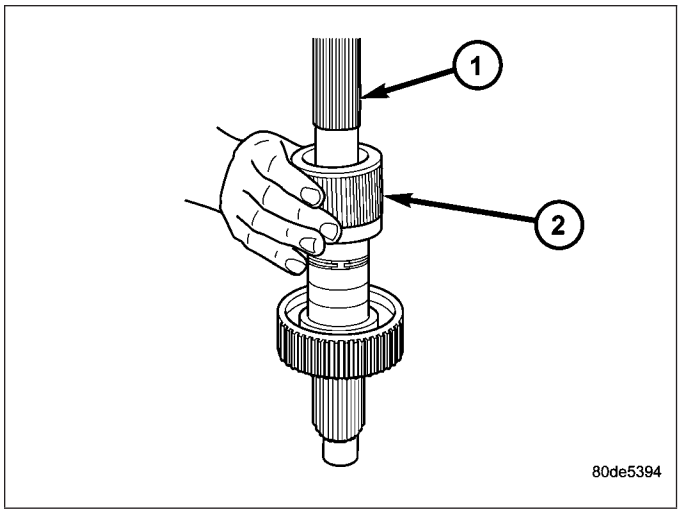
1. Lubricate mainshaft splines with recommended transmission fluid.
2. Install the mode hub (2) onto the output shaft (1).



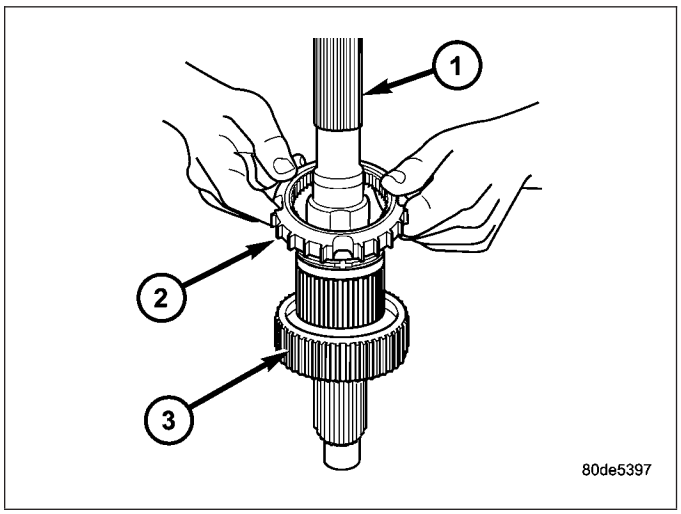
3. Install the mode hub retaining ring (2) onto the output shaft (1).



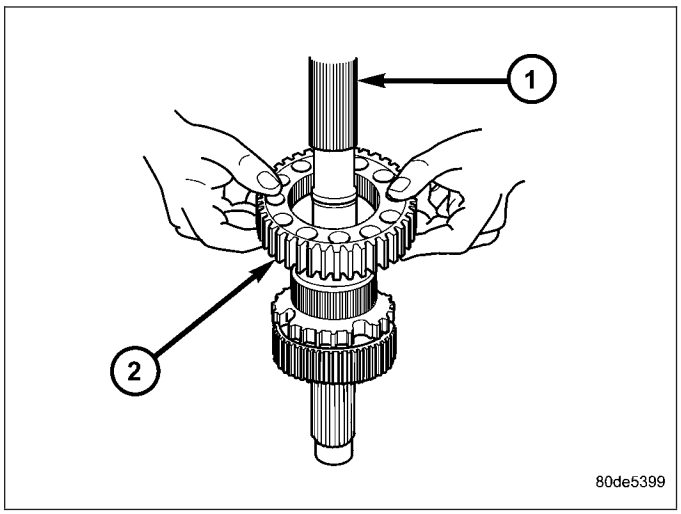
4. Install the sprocket hub (2) onto the output shaft (1).



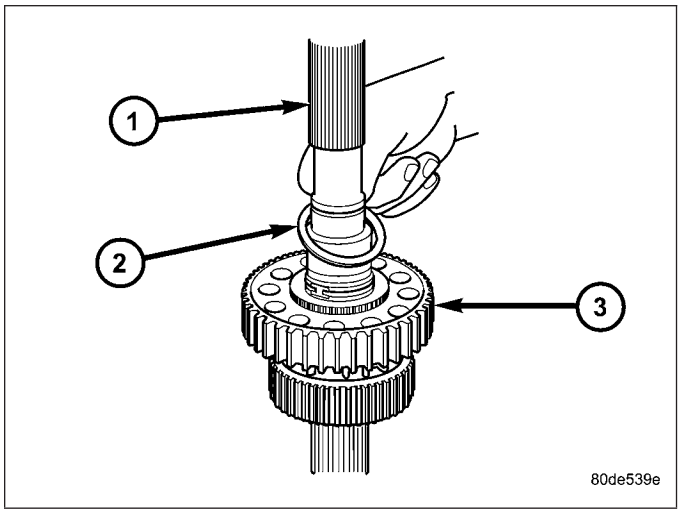
5. Install the clutch gear (2) onto the output shaft (1).



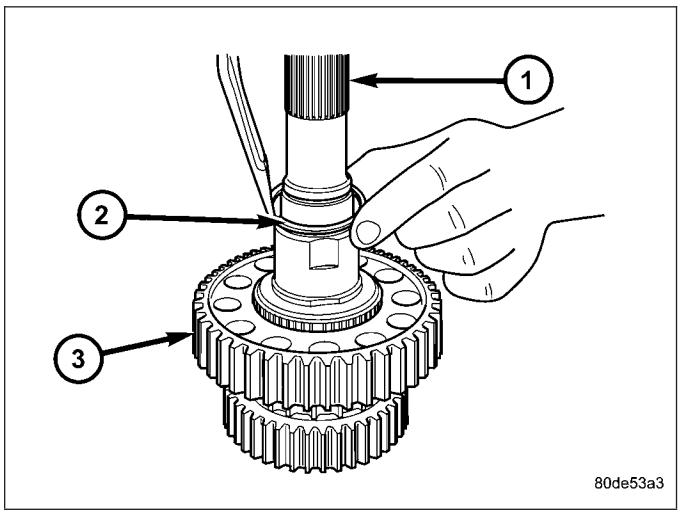
6. Install the drive sprocket (2) onto the output shaft (1).



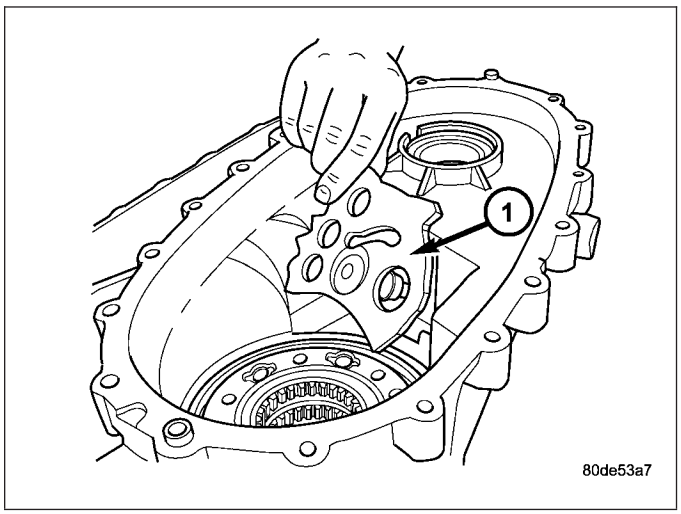
7. Install the drive sprocket (3) thrust washer (2) onto the output shaft (1).



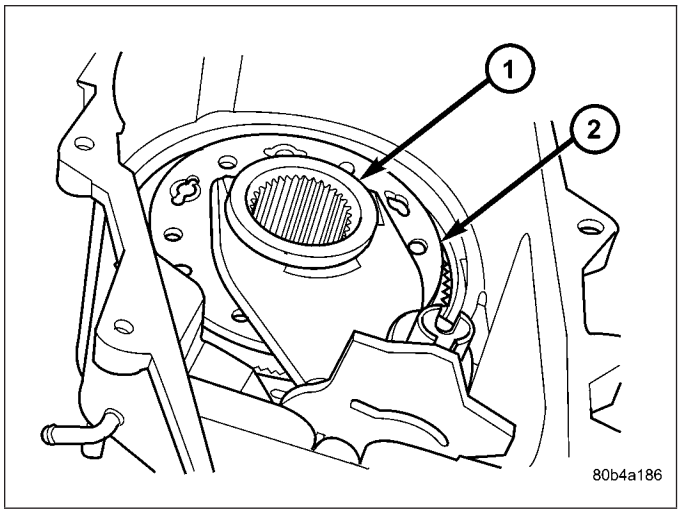
8. Install the drive sprocket (2) retaining ring (2) onto the output shaft (1).



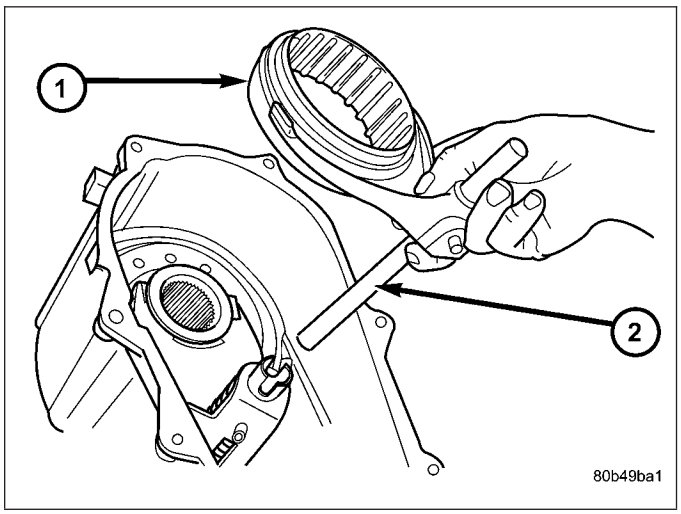
9. Lubricate sector shaft (1) with transmission fluid and install shift sector in case. Position slot in sector so it will be aligned with shift fork pin when shift forks are installed.



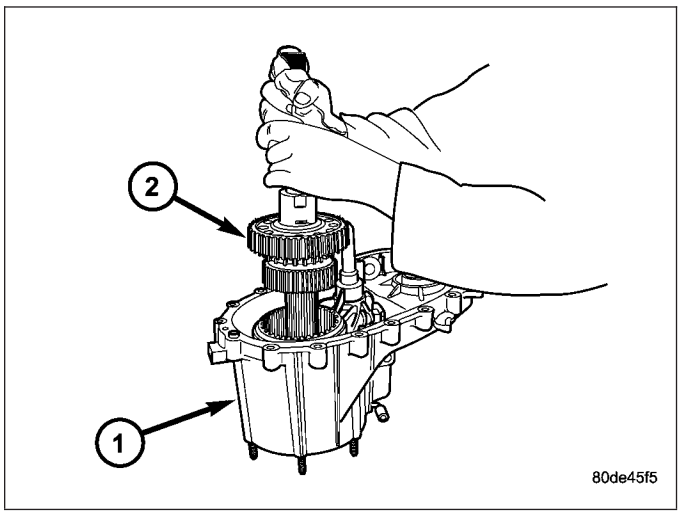
10. Install the shift sector o-ring.
11. Assemble and install range fork (2)and hub (1). Be sure hub is properly seated in low range gear and engaged to the input gear.
12. Align and insert range fork pin in shift sector slot.
13. Install the range fork retaining ring.



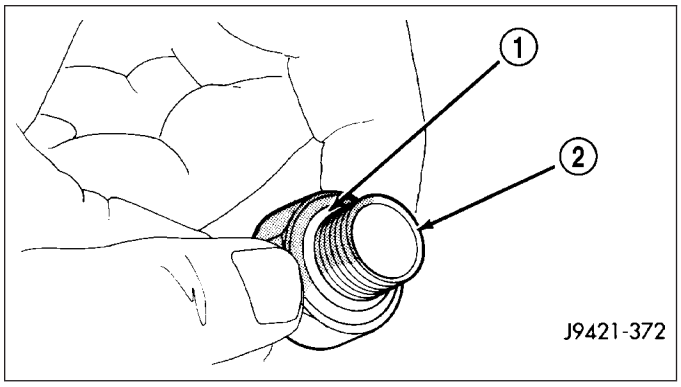
14. Install mode fork and shift rail onto the mode sleeve.
15. Install the mode fork (2), sleeve (1), and shift rail (2) into the transfer case.



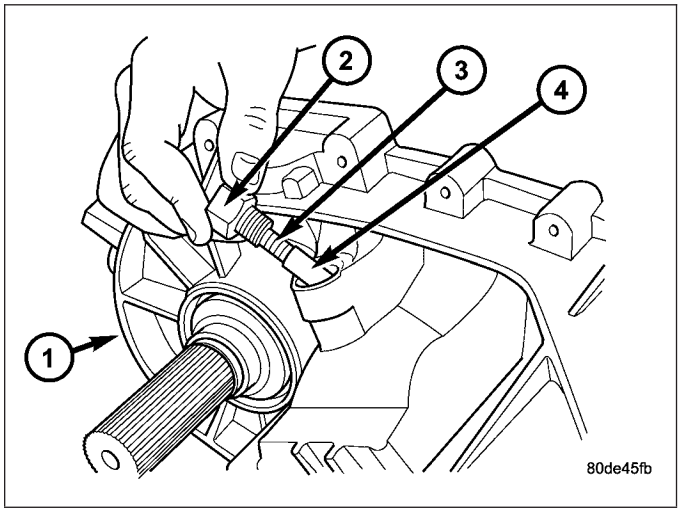
16. Install mainshaft (2) into the transfer case front housing (1). Guide mainshaft through the mode and range sleeves and into the input gear.



17. Install new o-ring (1) on detent plug (2).

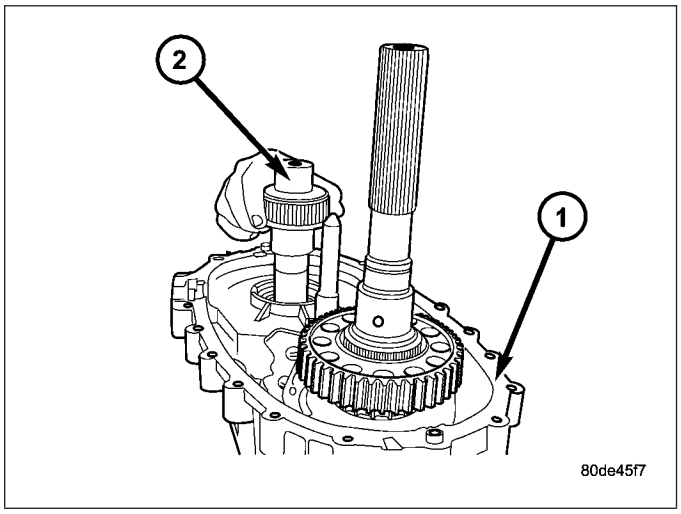


18. Install detent plunger (4), spring (3), and plug (2). Tighten the plug to 16-25 N·m (12-18 ft. lbs.).

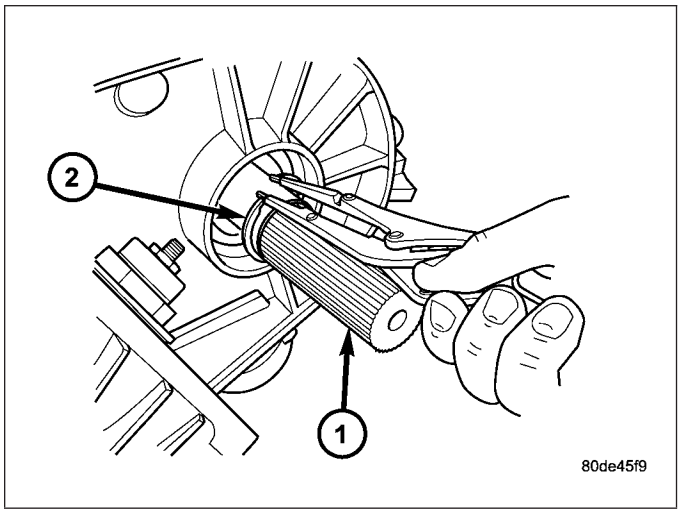


FRONT OUTPUT SHAFT AND DRIVE CHAIN

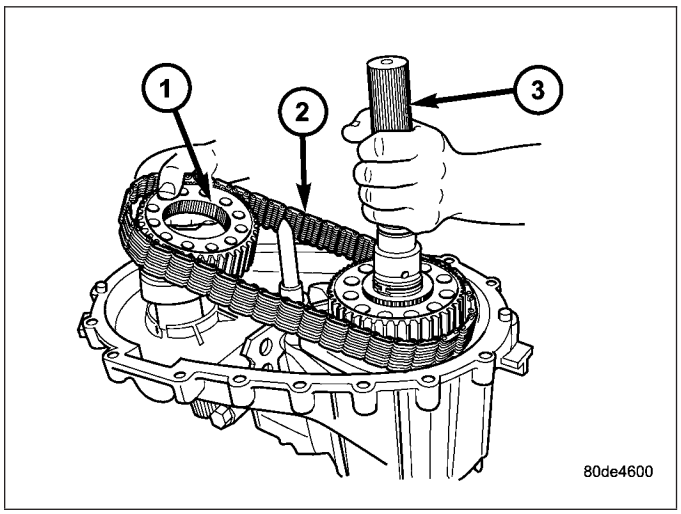
1. Install the front output shaft (2) into the front output shaft bearing.



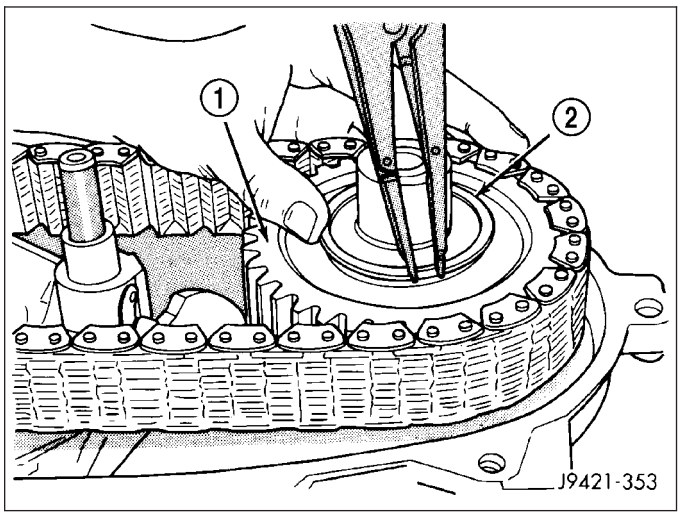
2. Install the front output shaft retaining ring (2) onto the output shaft (1).
3. Install the new front output shaft seal with Installer MB991168A.



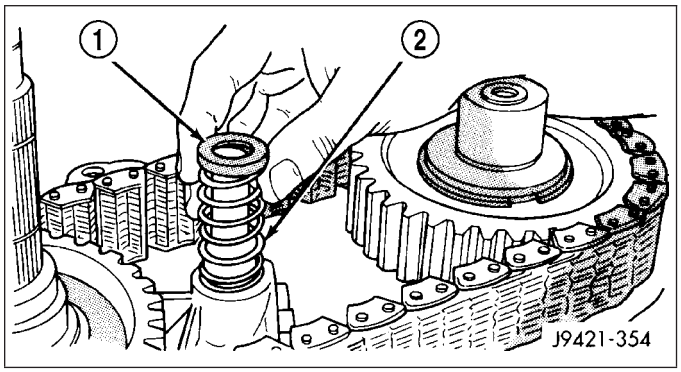
4. Insert front sprocket (1) in drive chain (2).
5. Install drive chain (2) around mainshaft sprocket. Then position front sprocket over front shaft.
6. Raise mainshaft about 2.54 cm (one inch) and seat front sprocket on front output shaft.



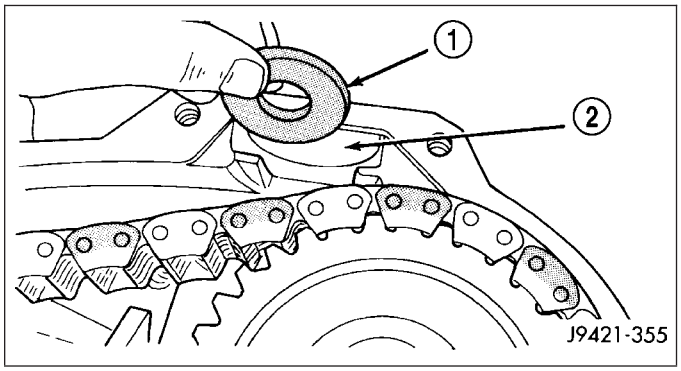
7. If mainshaft and mode sleeve were unseated during chain installation, align and reseat mainshaft in input gear and hub.
8. Install front sprocket (1) retaining ring (2).



9. Install spring (2) and cup (1) on shift rail.



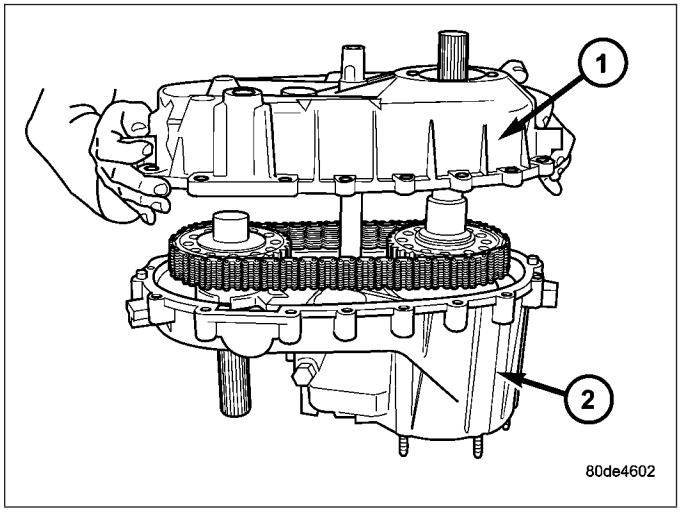
10. Insert magnet (1) in front case pocket (2).



OIL PUMP AND REAR CASE

Lubricate the oil pump components with transmission fluid before installation. Prime the oil pickup tube by pouring a little oil into the tube before installation.

CAUTION: Do not remove the bolts holding the oil pump cover to the rear case half. The oil pump cover is aligned to the rear output shaft inner bearing race and will become mis-aligned if the bolts are loosened. If the transfer case failure has generated any debris which may have become trapped in the oil pump. the rear case and oil pump assembly MUST be replaced.

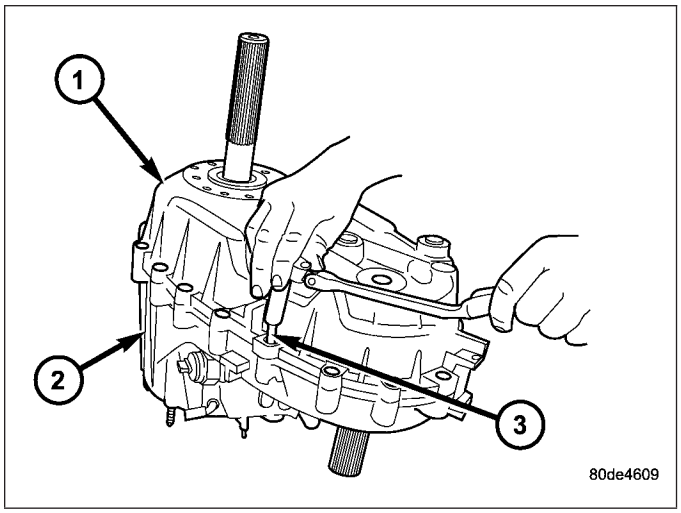


1. Install new o-ring in pickup tube inlet of oil pump.
2. Insert oil pickup tube into the oil pump.
3. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of front case. Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess will be displaced into case interior.
4. Align oil pump with mainshaft and align shift rail with bore in rear case. Then install rear case (1) and oil pump assembly onto the front case (2).

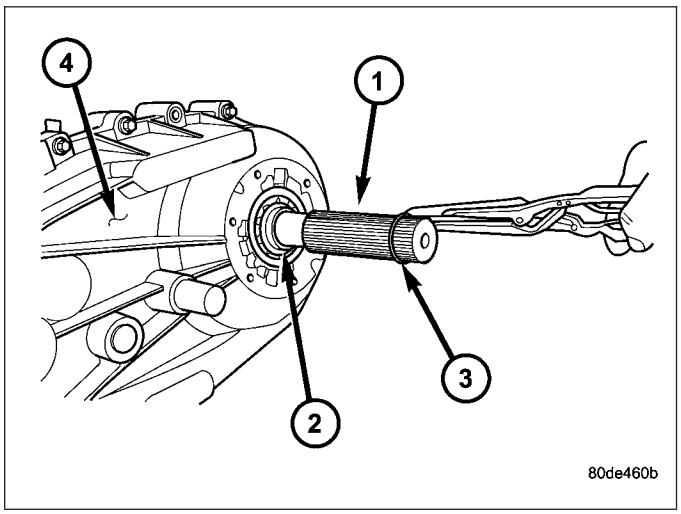
5. Install 4-5 rear case (1)-to front case (2) bolts (3) to hold rear case in position. Tighten bolts snug but not to specified torque at this time.

CAUTION: Verify that shift rail, and case alignment dowels are seated before installing any bolts. Case could be cracked if shaft rail or dowels are misaligned.

6. Apply Loctite™ 242 to remainder of rear case-to-front case bolt threads and install bolts. Tighten bolts to 20-27 N·m (15-24 ft. lbs.).



7. Install rear output bearing (2) snap-ring (3) to output shaft (1).

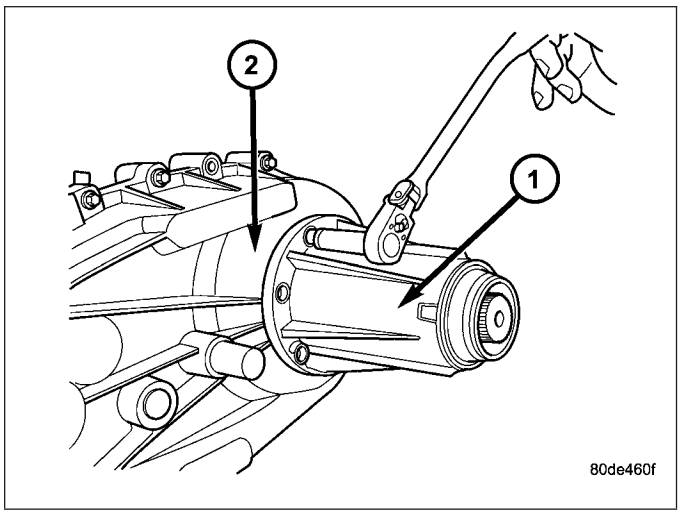


SEAL BOOT AND SHIFT MOTOR ASSEMBLY

1. Install the front output shaft seal slinger with Installer 8840. Install the slinger onto the shaft until the tool contacts the rear of the output shaft.
2. Install a new seal boot clamp onto the seal boot.
3. Install the seal boot and clamp onto the slinger hub and tighten the clamp with Crimp Tool C-4975-A.
4. Position the shift motor and mode sensor assembly onto the transfer case.
5. Install the bolts to hold the shift motor and mode sensor assembly to the transfer case. Tighten the bolts to 16-25 N·m (12-18 ft. lbs.).

REAR EXTENSION

1. Install new seal in rear extension housing seal with Installer D-163 and Handle C-4171..
2. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of rear extension housing. Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess could be displaced into output bearing.
3. Align and install rear extension (1) on the transfer case (2).
4. Apply Mopar® Silicone Sealer to threads of rear extension housing bolts. Then install and tighten bolts to 16-24 N·m (12-18 ft. lbs.) torque.



INSTALLATION

1. Mount transfer case on a transmission jack.
2. Secure transfer case to jack with chains.
3. Position transfer case under vehicle.
4. Align transfer case and transmission shafts and install transfer case onto the transmission.
5. Install and tighten transfer case attaching nuts to 27-34 N·m (20-25 ft. lbs.) torque.
6. Connect the vent hose.
7. Connect the shift motor and mode sensor wiring connectors. Secure wire harness to clips on transfer case.
8. Align and connect the propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/FRONT PROPELLER SHAFT - INSTALLATION) (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/REAR PROPELLER SHAFT - INSTALLATION)
9. Fill transfer case with correct fluid. (Refer to 21 - TRANSMISSION/TRANSFER CASE/FLUID - STANDARD PROCEDURE)
10. Install skid plate, if equipped.
11. Remove transmission jack and support stand.
12. Lower vehicle and verify transfer case shift operation.

SPECIFICATIONS

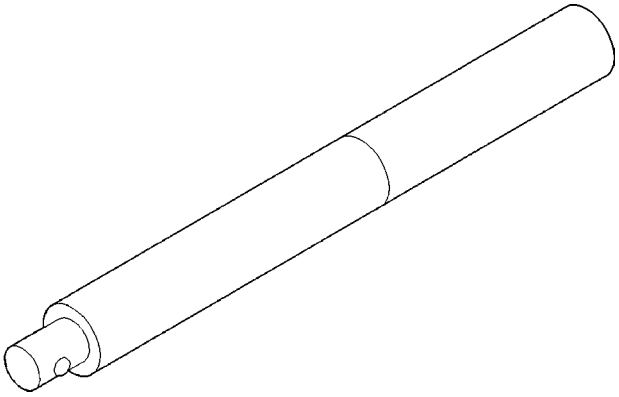
TRANSFER CASE - NV243

TORQUE SPECIFICATIONS

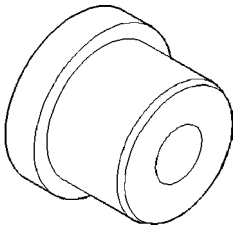
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Plug, Detent	16-24	12-18	-
Plug, Drain/Fill	20-34	15-25	-
Bolt, Extension Housing	16-24	12-18	-
Bolt, Case Half	20-27	15-24	-
Screw, Oil Pump	12-16	8-12	-
Nuts, Mounting	30-41	20-30	-
Bolts, Shift Motor and Mode Sensor Assembly	16-24	12-18	-

SPECIAL TOOLS

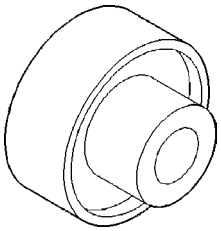
TRANSFER CASE - NV243



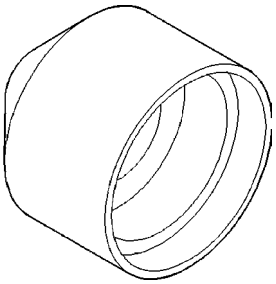
Handle - C-4171



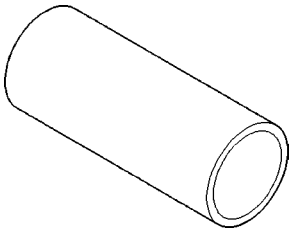
Installer, Bushing - 5066



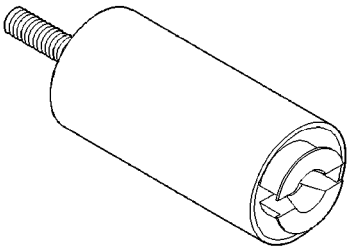
Installer, Bearing - 6953



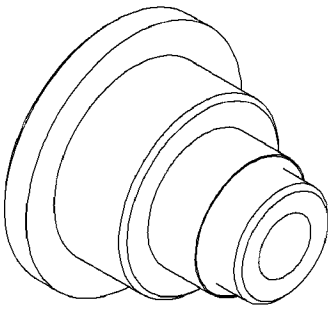
Installer, Seal - D-163



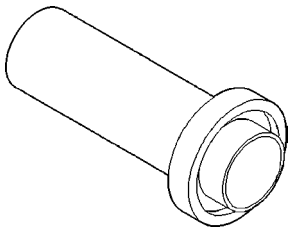
Cup - 8148



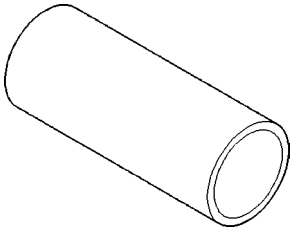
Tool Set - L-4518



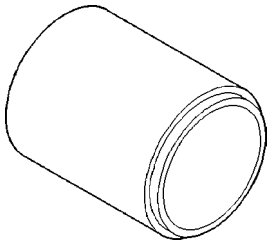
Installer, Bearing - 8684



Installer, Seal - MB991168A



Installer - 8840



Installer, Seal - 8841

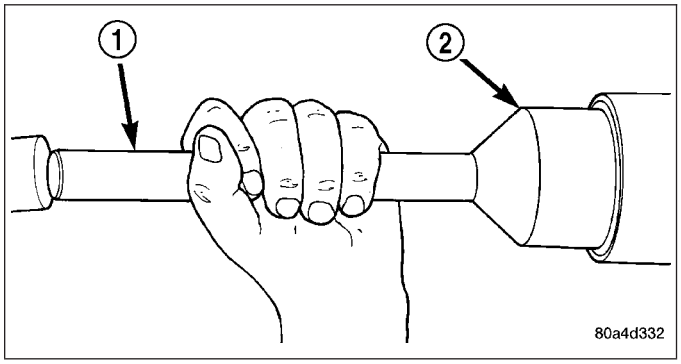
SEAL-EXTENSION HOUSING

REMOVAL

1. Raise and support vehicle.
2. Remove rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
3. Using a suitable pry tool or slide-hammer mounted screw, remove the extension housing seal.

INSTALLATION

1. Clean fluid residue from sealing surface and inspect for defects.
2. Using Installer D-163 (2) and Handle C-4171 (1), install seal in extension housing.
3. Install propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)
4. Verify proper transfer case fluid level.
5. Lower vehicle.



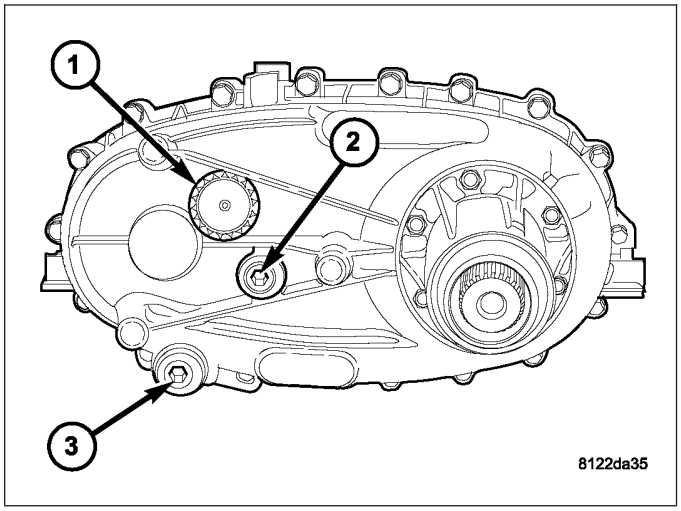
FLUID

STANDARD PROCEDURE - FLUID DRAIN AND REFILL

The fill (2) and drain (3) plugs are both in the rear case.

1. Raise vehicle.
2. Position drain pan under transfer case.

NOTE: It may be necessary to remove the exhaust y-pipe at the exhaust manifold to properly access the fill and drain plugs. Lowering the exhaust will allow the plugs to be accessed for torquing during installation. (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - REMOVAL)

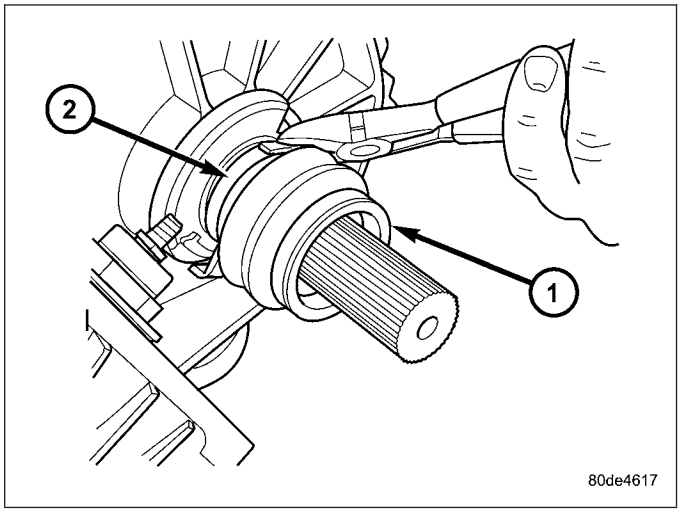


3. Remove drain and fill plugs and drain lubricant completely.
4. Install drain plug. Tighten plug to 20-34 N·m (15-25 ft. lbs.).
5. Remove drain pan.
6. Fill transfer case to bottom edge of fill plug opening with Mopar® ATF +4, Automatic Transmission fluid.
7. Install and tighten fill plug to 20-34 N·m (15-25 ft. lbs.).
8. Install the exhaust y-pipe to the exhaust manifold, if removed. (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - INSTALLATION)
9. Wipe any excess fluid that may have spilled onto the exhaust.
10. Lower vehicle.

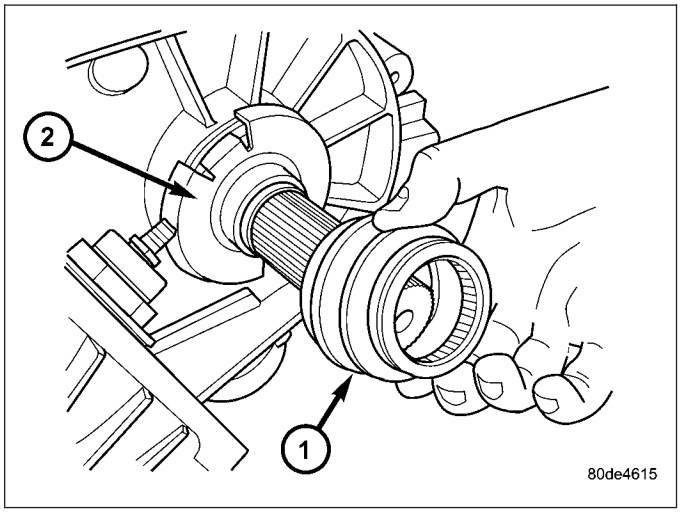
SEAL-FRONT OUTPUT SHAFT

REMOVAL

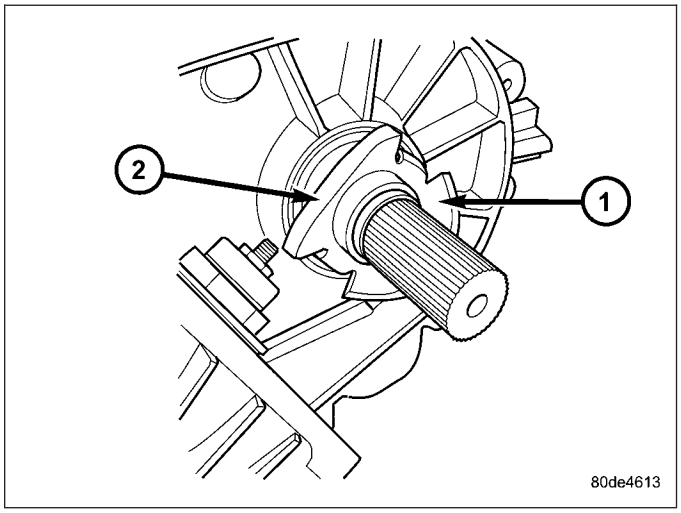
1. Remove the front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL).
2. Remove the front propeller shaft seal boot (1) retaining clamp (2).



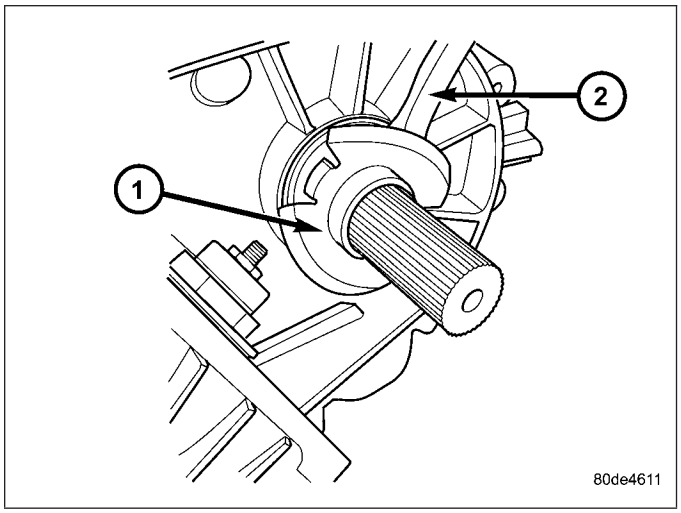
3. Remove the front propeller shaft seal boot (1).



4. Remove the front output shaft seal slinger (1) by bending (2) the slinger ears away from the transfer case.



5. Using a suitable pry tool (2), remove the slinger (1) from the output shaft using care not to damage the shaft.
6. Using a screw and a slide hammer, remove the front output shaft seal.



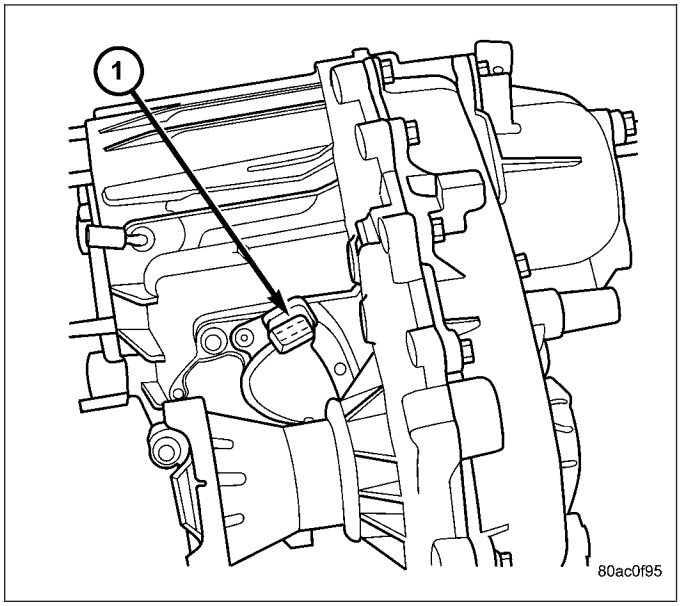
INSTALLATION

1. Install the new front output shaft seal with Installer MB991168A.
2. Install the front output shaft seal slinger with Installer 8840. Install the slinger onto the shaft until the tool contacts the rear of the output shaft.
3. Install a new seal boot clamp onto the seal boot.
4. Install the seal boot and clamp onto the slinger hub and tighten the clamp with Crimp Tool C-4975-A.
5. Install front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).

SENSOR-MODE

DESCRIPTION

The transfer case mode sensor (1) is an electronic device whose output can be interpreted to indicate the shift motor shaft's rotary position. The sensor consists of a magnetic ring and four Hall Effect Transistors to create a 4 channel digital device (non-contacting) whose output converts the motor shaft position into a coded signal. The TCCM must supply 5VDC (+/- 0.5v) to the sensor and monitor the shift motor position. The four channels are denoted A, B, C, and D. The sensor is mechanically linked to the shaft of the cam which causes the transfer case shifting. The mode sensor draws less than 53 mA.



OPERATION

During normal vehicle operation, the Transfer Case Control Module (TCCM) monitors the mode sensor outputs at least every 250 (+/-50) milliseconds when the shift motor is stationary and 400 microseconds when the shift motor is active. A mode sensor signal between 3.8 Volts and 0.8 Volts is considered to be undefined.

Refer to SECTOR ANGLES vs. TRANSFER CASE POSITION for the relative angles of the transfer case shift sector versus the interpreted transfer case gear operating mode. Refer to MODE SENSOR CHANNEL STATES for the sensor codes returned to the TCCM for each transfer case mode sensor position. The various between gears positions can also be referred as the transfer case's coarse position. These coarse positions come into play during shift attempts.

SECTOR ANGLES vs. TRANSFER CASE POSITION

Shaft Angle (Degrees)	Transfer Case Position
+40	4LO
+20	N
0	2WD/AWD
-20	4HI

MODE SENSOR CHANNEL STATES

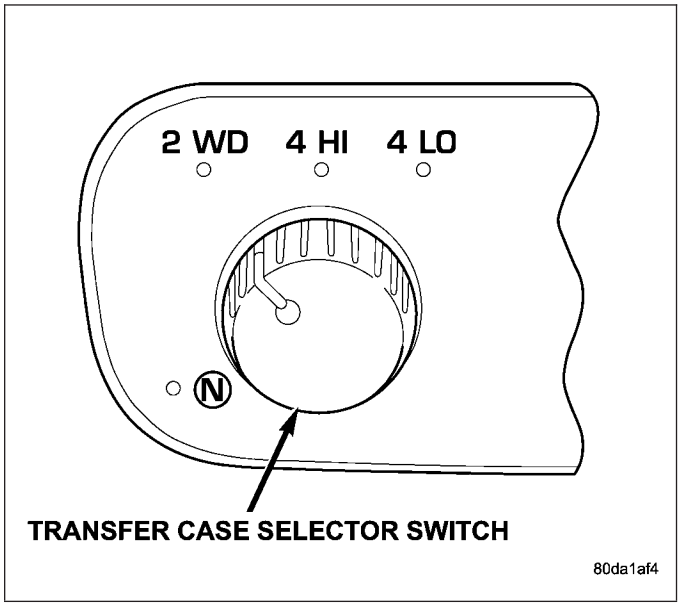
Transfer Case Angle (degrees)	Sensor Channel A	Sensor Channel B	Sensor Channel C	Sensor Channel D
Between Gears	H	H	L	H
+40 (4LO)	H	H	L	L
Between Gears	H	H	L	H
Between Gears	H	L	L	H
+20 (NEUTRAL)	H	L	L	L
Between Gears	H	L	L	H
Between Gears	H	L	H	H
0 (2WD/AWD)	H	L	H	L
Between Gears	H	L	H	H
Between Gears	L	L	H	H
-20 (4HI)	L	L	H	L
Between Gears	L	L	H	H
Between Gears	L	H	H	H

SWITCH-SELECTOR

DESCRIPTION

The selector switch assembly (1) is mounted in the left side of the vehicle's Instrument Panel (IP) and consists of a rotary knob connected to a resistive network for the mode and range shift selections. Also located in this assembly is a recessed, normally open momentary switch for making shifts into and out of transfer case NEUTRAL. A pen, or similar instrument, is used to make a NEUTRAL shift selection, thus reducing the likelihood of an inadvertent shift request.

The selector switch also contains four light emitting diode's (LED's) to indicate the transfer case position and whether a shift is in progress.



OPERATION

As the position of the selector switch varies, the resistance between the Mode Sensor supply voltage pin and the Mode Sensor output will vary. Hardware, software, and calibrations within the Transfer Case Control Module (TCCM) are provided that interpret the selector switch resistance as given in the table below: SELECTOR SWITCH INTERPRETATION

SELECTOR SWITCH INTERPRETATION

Step	Resistance Range (ohms)	Required Interpretation
A	<200	Shorted
B	400-700	NEUTRAL
C	1050-1450	4LO
D	1850-2300	4HI
E	3050-5950	2WD (Default)
F	9.5-12.5K	In between positions
G	>15.5K	Open

For resistances between the ranges B-E shown for each valid position (T-Case NEUTRAL, 4LO, 4HI, 2WD), the TCCM may interpret the resistance as:

- either of the neighboring valid positions.
- as an invalid fault position.

For resistances between the ranges E and F shown for 2WD and in-between positions, the TCCM may interpret the resistance as:

- the 2WD position.
- an invalid fault position.
- a valid in-between position.

For resistances between the ranges F and G shown for in-between positions and fault condition (open), the TCCM may interpret the resistance as:

- a valid in-between position.
- an invalid fault position.

For resistances between the ranges A and B shown for the fault condition (short) and , T-Case NEUTRAL, the TCCM may interpret the resistance as:

- the T-Case NEUTRAL position.
- an invalid fault position.

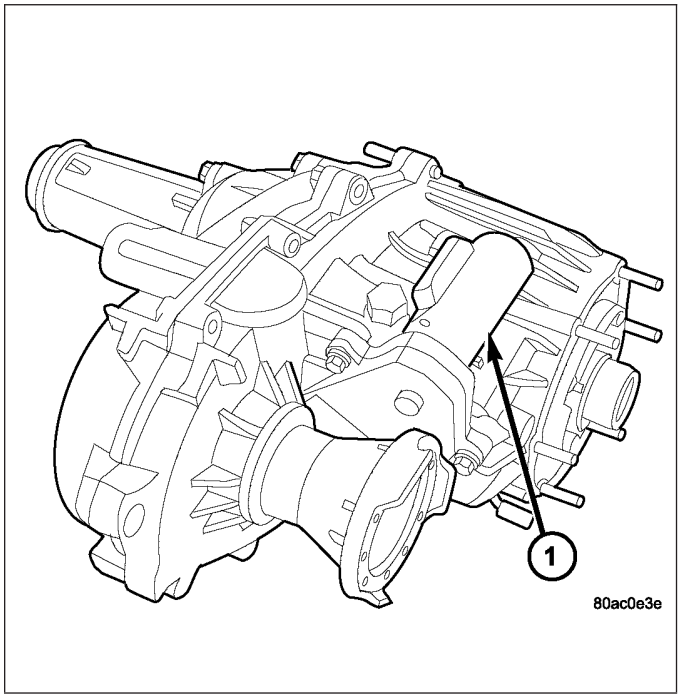
The LED's in the selector assembly are illuminated/flashed in the following manner to indicate a particular condition or state.

- A solidly illuminated LED indicates a successfully completed shift and the current operating mode of the transfer case. While a shift has been requested but not yet completed, the LED for the desired transfer case position is flashed.
- A flashing operating mode LED for the desired gear indicates that a shift to that position has been requested, but all of the driver controllable conditions have not been met. This is in an attempt to notify the driver that the transmission needs to be put into NEUTRAL, the vehicle speed is too great, or some other condition outlined (other than a diagnostic failure that would prevent this shift) elsewhere (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - OPERATION) is not met. Note that this flashing will continue indefinitely until the conditions are eventually met, or the selector switch position is changed, or if diagnostic routines no longer allow the requested shift.
- If the driver attempts to make a shift into transfer case NEUTRAL, and any of the driver controllable conditions are not met, the request will be ignored until all of the conditions are met or until the NEUTRAL select button is released. Additionally the neutral lamp will flash, or begin to flash while the button is depressed and operator controllable conditions are not being met. All of the LED's except the Neutral will flash if any of the operator controllable conditions for shifting are not met while the Neutral button is depressed. This ″toggle″ type of feature is necessary because the TCCM would interpret another request immediately after the shift into transfer case NEUTRAL has completed.
- No LED's illuminated indicate a fault in the transfer case control system.

ASSEMBLY-SHIFT MOTOR/MODE SENSOR

DESCRIPTION

The shift motor (1) consists of a permanent magnet D.C. motor with gear reduction to convert a high speed-low torque device into a low speed-high torque device. The output of the device is coupled to a shaft which internally moves the mode and range forks that change the transfer case operating ranges. The motor is rated at 25 amps maximum at 72° F with 10 volts at the motor leads.



OPERATION

The transfer case shift motor responds to the Transfer Case Control Module (TCCM) commands to move the transfer case shift sector bi-directionally, as required, to obtain the transfer case operating mode indicated by the instrument panel mounted selector switch.

REMOVAL

NOTE: New shift motor assemblies are shipped in the 2WD/AWD position. If a new shift motor assembly will be installed, it will be necessary to shift the transfer case to the 2WD/AWD position prior to motor removal.

1. Raise the vehicle on a suitable hoist.
2. Disengage the wiring connectors from the shift motor and mode sensor.
3. Remove the bolts holding the shift motor and mode sensor assembly onto the transfer case.
4. Separate the shift motor and mode sensor assembly from the transfer case.

INSTALLATION

1. Verify that the shift sector o-ring is clean and properly positioned over the shift sector and against the transfer case.

NOTE: Verify that the shift motor position and sector shaft orientation are aligned. It may be necessary to manually shift the transfer case if the shift motor and sector shaft are not aligned.

2. Position the shift motor and mode sensor assembly onto the transfer case.
3. Install the bolts to hold the assembly onto the transfer case. Tighten the bolts to 16-24 N·m (12-18 ft.lbs.).

CAUTION: If the original shift motor and mode sensor assembly bolts are reused, be sure to use Mopar® Lock & Seal or Loctite™ 242 to replenish the lock patch material originally found on the bolts

4. Engage the wiring connectors to the shift motor and mode sensor.
5. Refill the transfer case as necessary.
6. Lower vehicle and verify transfer case operation.

TRANSFER CASE - NV244 GENII - SERVICE INFORMATION

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TRANSFER CASE - NV244 GENII - SERVICE INFORMATION

DESCRIPTION

The NV244 GENII is an electronically controlled full and part-time transfer case with no two wheel drive operation.

A differential in the transfer case is used to control torque transfer to the front and rear axles. A low range gear reduction system provides increased low speed torque capability for off road operation. The low range provides a 2.72:1 reduction ratio.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

OPERATING RANGES

NV244 GENII operating ranges are:

- AWD(All-Wheel Drive)
- 4LOCK (Part-time)
- 4LO
- NEUTRAL

The AWD mode can be used at any time and on any road surface.

The 4LOCK (Part-time) and 4LO ranges are for off road use only. The only time these ranges can be used is when the road surface is covered with snow, ice, or other loose slippery material.

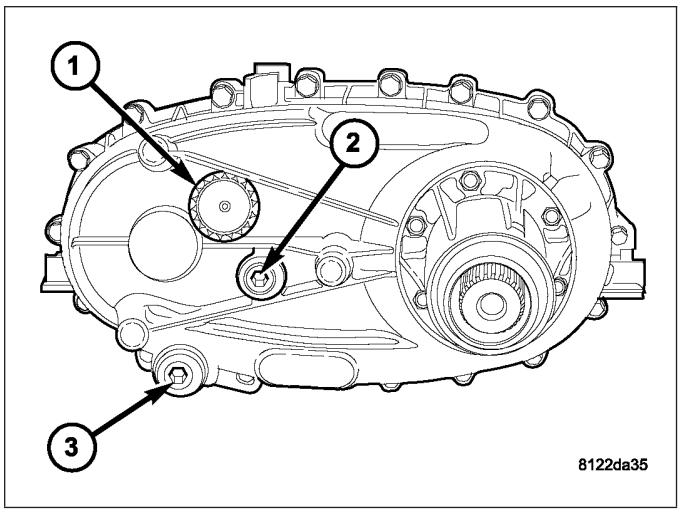
SHIFT MECHANISM

Operating ranges are selected with a dash mounted shift selector switch. The shift selector switch provides a input to the Transfer Case Control Module (TCCM) to indicate the driver's desire to change operating ranges. The TCCM uses this input, along with the input from the transfer case mounted mode sensor and information from the vehicle's bus, to determine if a shift is permitted. If the TCCM decides the shift is permitted, the TCCM controls the shift motor, mounted to the exterior of the transfer case, to perform the shift.

IDENTIFICATION

A circular ID (1) tag is attached to the rear case of each transfer case. The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.



OPERATION

The input gear is splined to the transmission output shaft. The input gear drives the mainshaft through the planetary assembly and range sleeve. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is splined to a differential assembly. Depending on the position of the mode fork and sleeve, the front output shaft is driven directly by the mainshaft or through the differential. The mode fork operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchronizer mechanism for shifting.

DIAGNOSIS AND TESTING

TRANSFER CASE - NV244

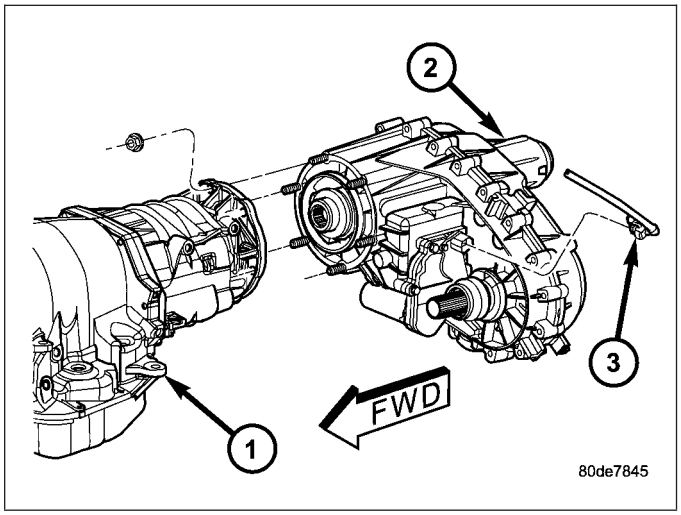
DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Transfer case difficult to shift or will not shift into desired range.	1) Transfer case electronically controlled shift system malfunction.	1) Verify proper operation per the appropriate diagnostic manual.
	2) Insufficient or incorrect lubricant.	2) Drain and refill transfer case with the correct quantity of Mopar® ATF +4, Automatic Transmission Fluid.
	3) Internal transfer case components binding, worn, or damaged.	3) Repair or replace components as necessary.
Transfer case noisy in all drive modes.	1) Insufficient or incorrect lubricant.	1) Drain and refill transfer case with the correct quantity of Mopar® ATF +4, Automatic Transmission Fluid.
	2) Internal transfer case components binding, worn, or damaged.	2) Repair or replace components as necessary.

CONDITION	POSSIBLE CAUSE	CORRECTION
Transfer case noisy while in, or jumps out of, 4LO.	1) Transfer case not completely engaged in 4LO position.	1) While rolling 2-3 MPH and the transmission in NEUTRAL, or the clutch depressed on vehicles equipped with a manual transmission, shift the transfer case to the AWD or 4LOCK position, and then back into the 4LO position.
	2) Range fork damaged, inserts worn, or fork is binding on the shift rail.	2) Repair or replace components as necessary.
	3) Low range gear worn or damaged.	3) Repair or replace components as necessary.
Lubricant leaking from transfer case seals or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Transfer case vent closed or restricted.	2) Clean or replace vent as necessary.
	3) Transfer case seals damaged or installed incorrectly.	3) Replace suspect seal.
Transfer case will not shift through 4LOCK (Part-time) range.	1) Incomplete shift due to drivetrain torque load.	1) Drive in a straight line and momentarily release the accelerator pedal to complete the shift.
	2) Incorrect tire pressure.	2) Correct tire pressure as necessary.
	3) Excessive tire wear.	3) Correct tire condition as necessary.
	4) Excessive vehicle loading.	4) Correct as necessary.

REMOVAL

1. Shift transfer case into AWD.
2. Raise vehicle.
3. Drain transfer case lubricant.
4. Mark front and rear propeller shafts for alignment reference.
5. Support transmission with jack stand.
6. Remove the transfer case skid plate, if equipped.
7. Disconnect front and rear propeller shafts at transfer case.
8. Disconnect transfer case shift motor and mode sensor wire connectors (3).
9. Disconnect transfer case vent hose.
10. Support transfer case with transmission jack.
11. Secure transfer case to jack with chains.
12. Remove nuts attaching transfer case to transmission (1).
13. Pull transfer case and jack rearward to disengage transfer case.
14. Remove transfer case from under vehicle.

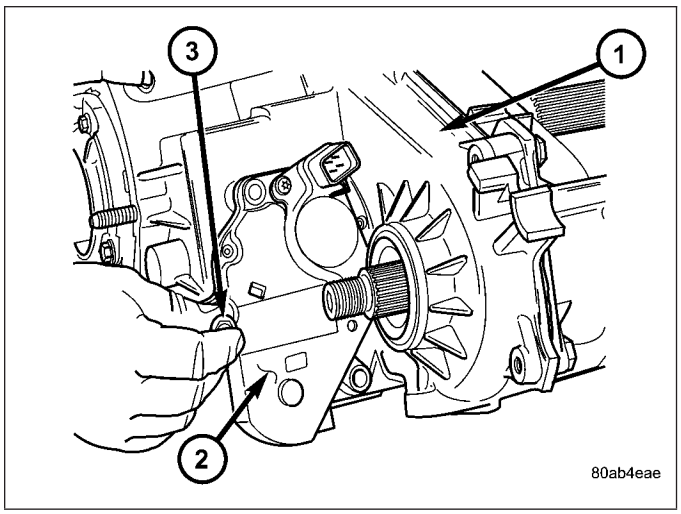


DISASSEMBLY

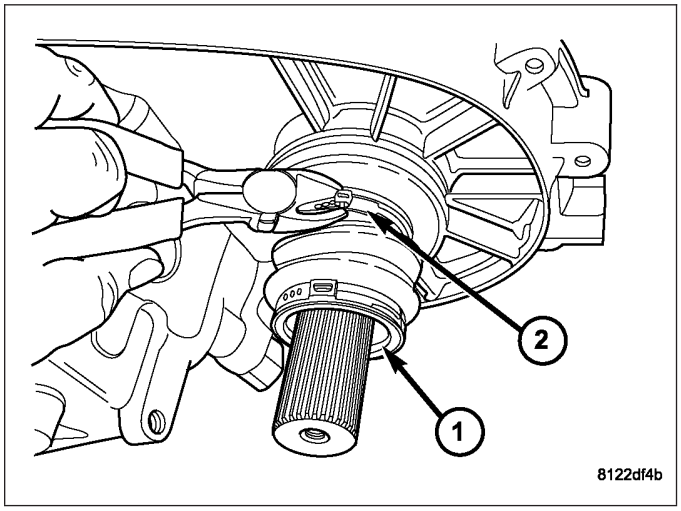
Position transfer case in a shallow drain pan. Remove drain plug and drain any remaining lubricant remaining in case.

SHIFT MOTOR ASSEMBLY AND FRONT OUTPUT SHAFT SEAL

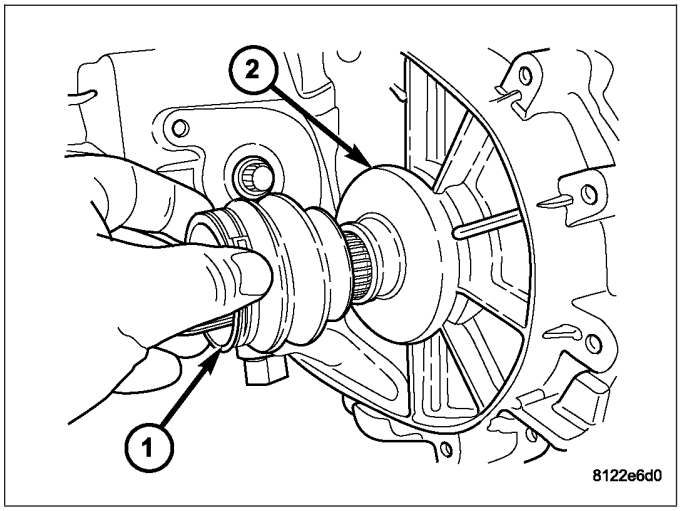
1. Remove the bolts (3) which hold the shift motor and mode sensor assembly (2) to the transfer case (1).
2. Remove the shift motor and mode sensor assembly from the transfer case.



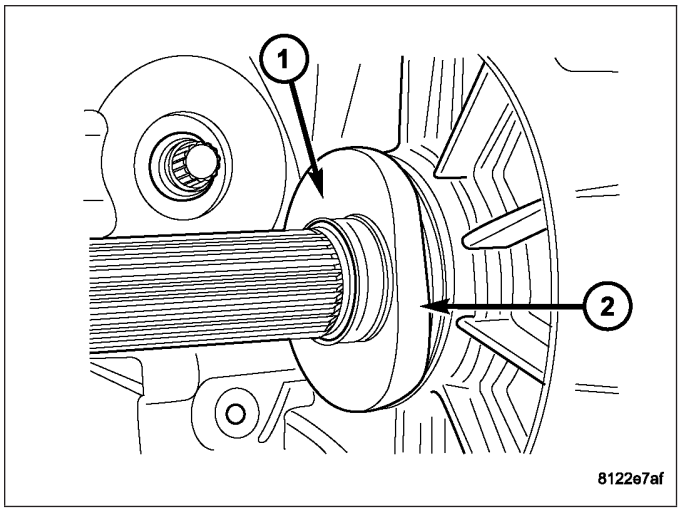
3. Remove the front propeller shaft seal boot (1) retaining clamp (2).



4. Remove the front propeller shaft seal boot (1).

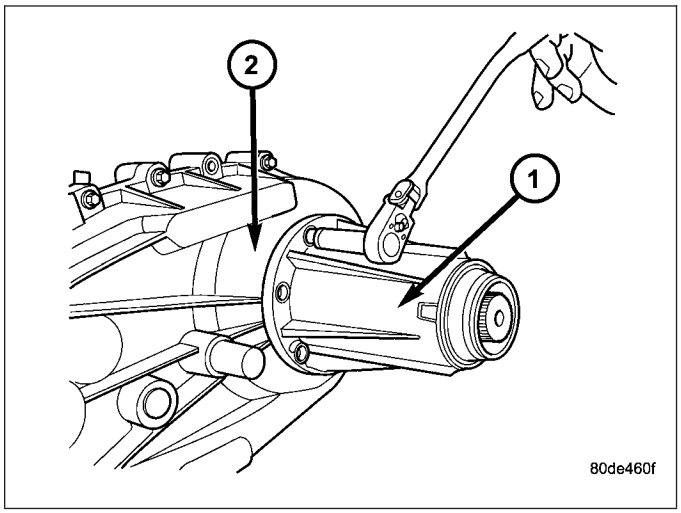


5. Remove the front output shaft seal slinger (1) by bending (2) the slinger away from the transfer case.
6. Using a suitable pry tool, remove the slinger from the output shaft using care not to damage the shaft.
7. Using a screw and a slide hammer, remove the front output shaft seal.

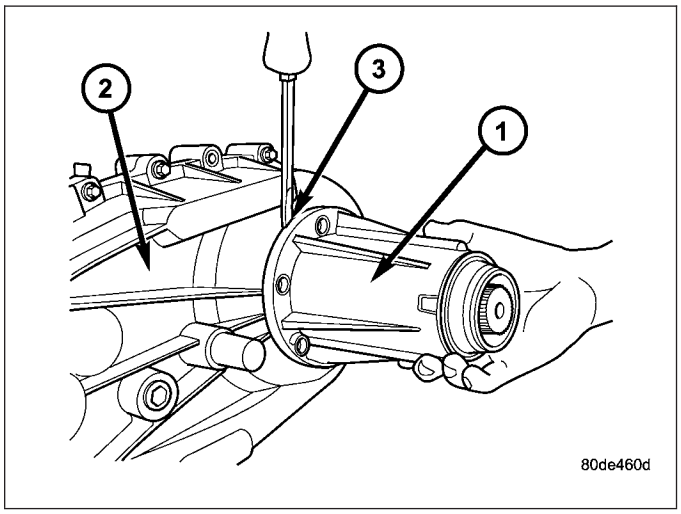


REAR EXTENSION

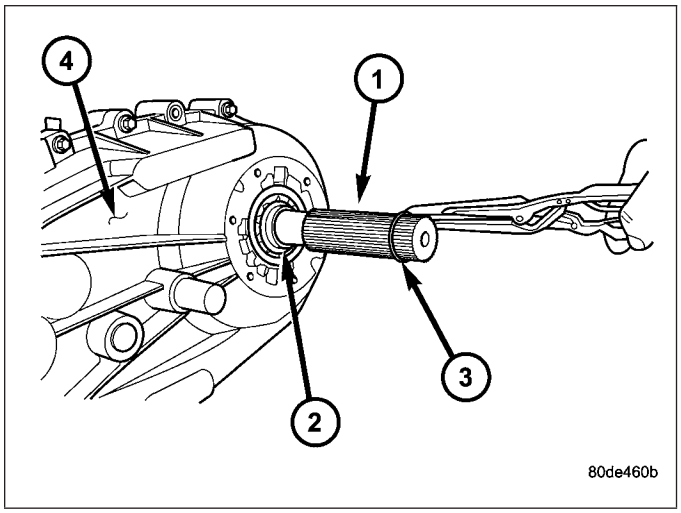
1. Remove rear extension housing (1) bolts.



2. Remove rear extension housing (1). Tap extension once or twice with a plastic mallet to break sealer bead and loosen it.

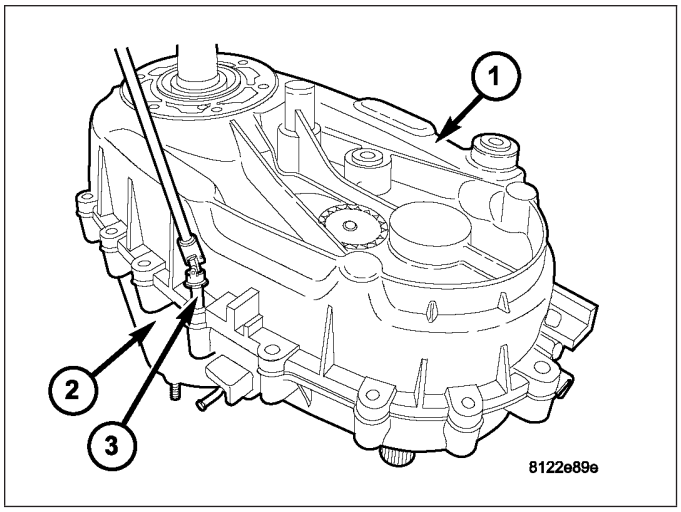


3. Remove output shaft bearing (2) retaining ring (3) with heavy duty snap-ring pliers.

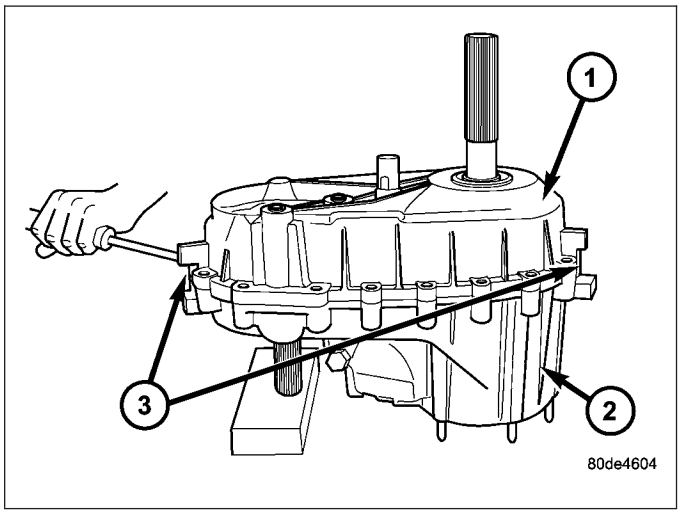


OIL PUMP AND REAR CASE

1. Remove rear case (1) -to-front case (2) bolts (3).

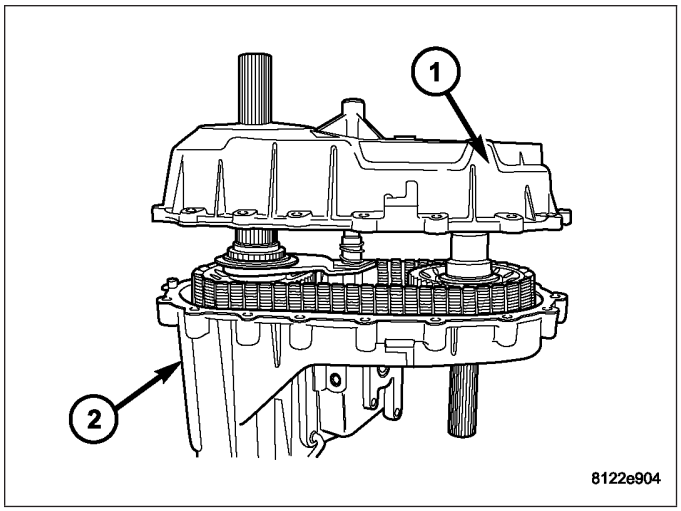


2. Loosen rear case (1) with pry tool to break sealer bead. Insert tool in slot (3) at each end of case.
3. Unseat rear case from alignment dowels.



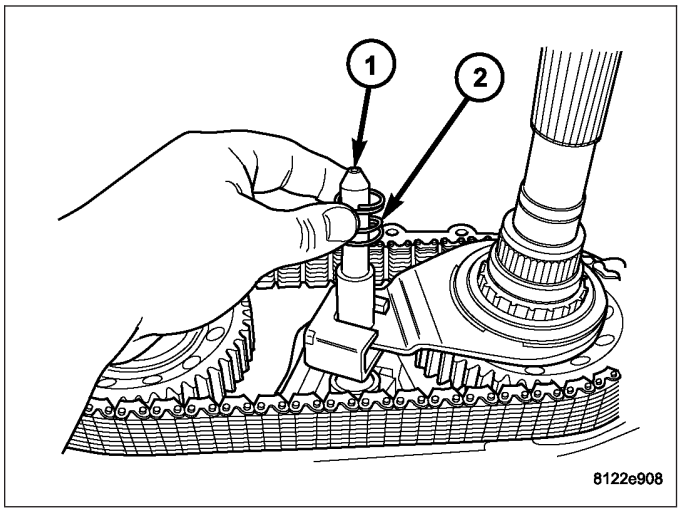
CAUTION: Do not remove the bolts holding the oil pump cover to the rear case half. The oil pump cover is aligned to the rear output shaft inner bearing race and will become mis-aligned if the bolts are loosened. If the transfer case failure has generated any debris which may have become trapped in the oil pump. the rear case and oil pump assembly MUST be replaced.

4. Remove rear case (1) and oil pump assembly from front case (2).
5. Remove the oil pump pickup tube.

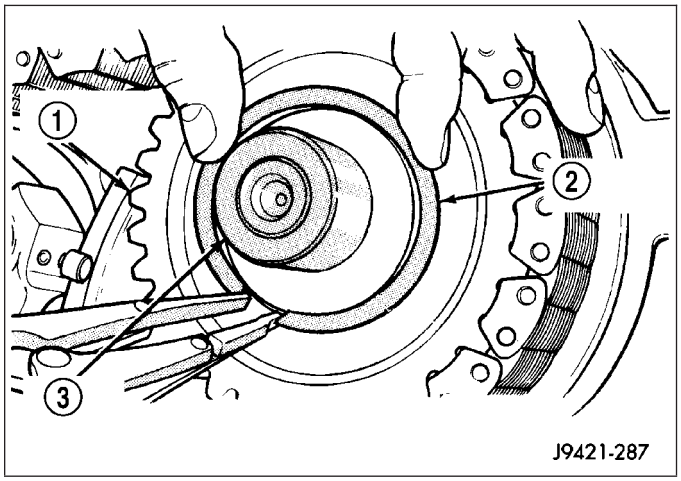


FRONT OUTPUT SHAFT AND DRIVE CHAIN

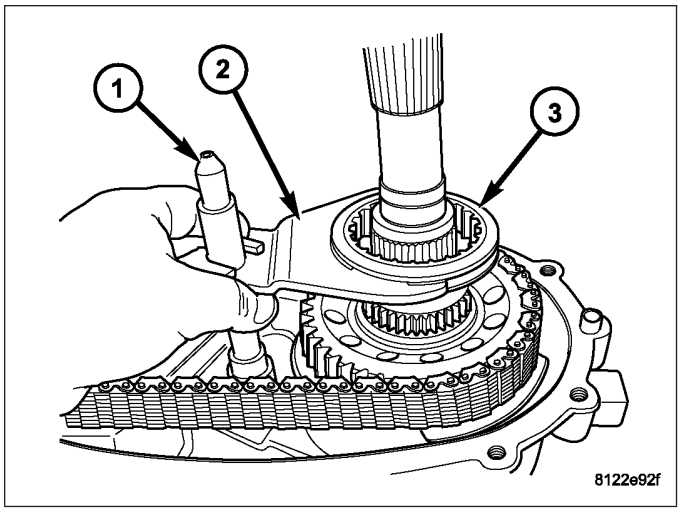
1. Remove shift rail (1) spring (2).



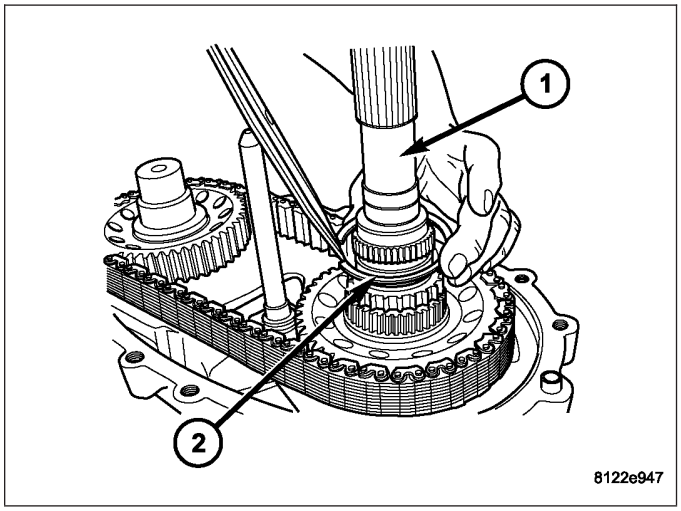
2. Remove front sprocket (1) retaining ring (2).



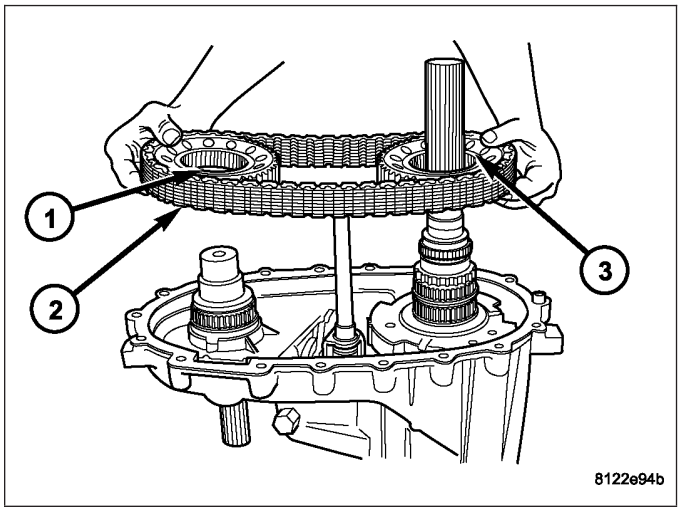
3. Remove the mode fork (2) and sleeve (3) from the shift rail (1) and mainshaft.



4. Remove the rear output shaft retaining ring (2) from the output shaft (1).

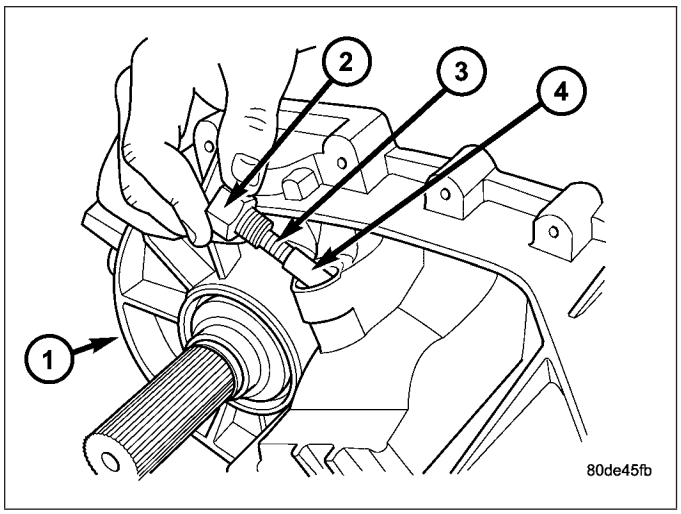


5. Pull front sprocket (1), rear sprocket (3), and chain (2) outward simultaneously.
6. Remove front sprocket, rear sprocket, and chain as an assembly.

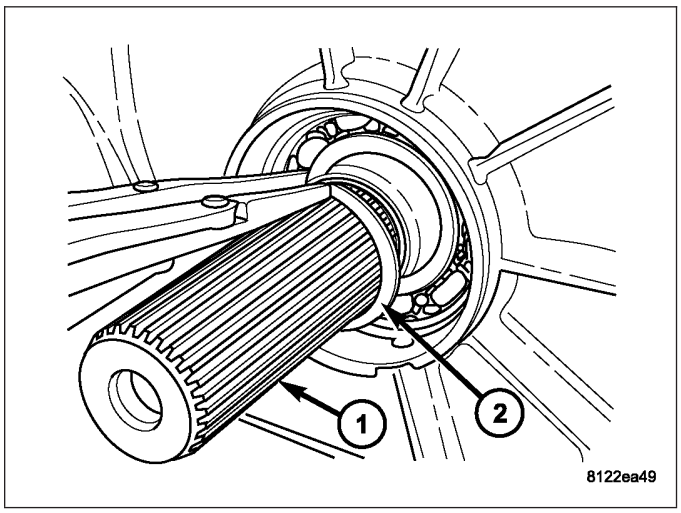


SHIFT FORKS AND MAINSHAFT

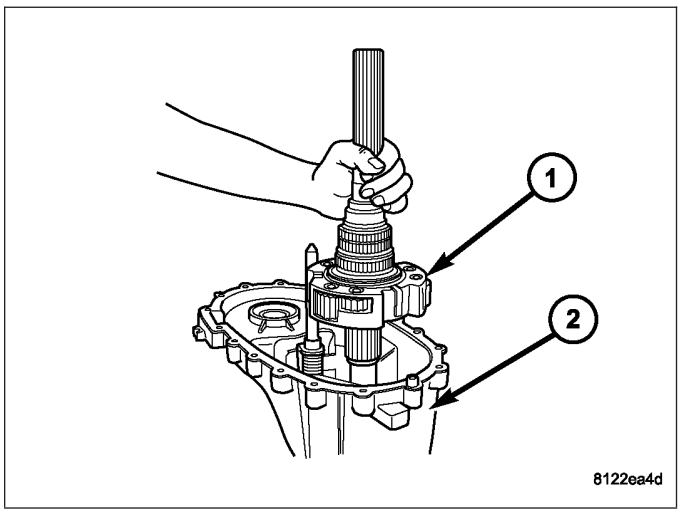
1. Loosen detent plug (2).
2. Remove detent plug (2), spring (3), and plunger (4). Note that the plug has an O-ring seal. Remove and discard this seal.



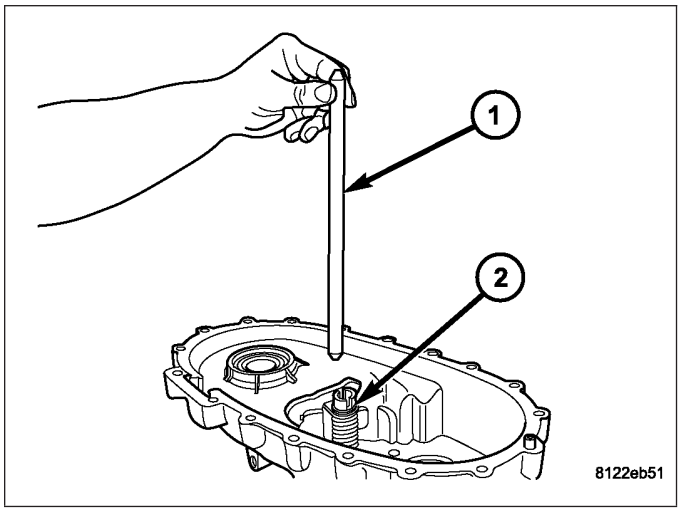
3. Remove the front output shaft (1)snap-ring (2).
4. Remove front output shaft from bearing in case.



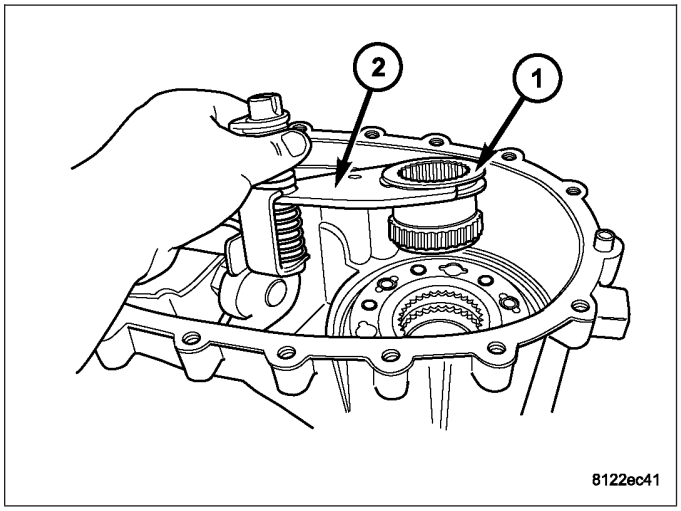
5. Remove the mainshaft and differential assembly (2) from the input gear and transfer case (1).



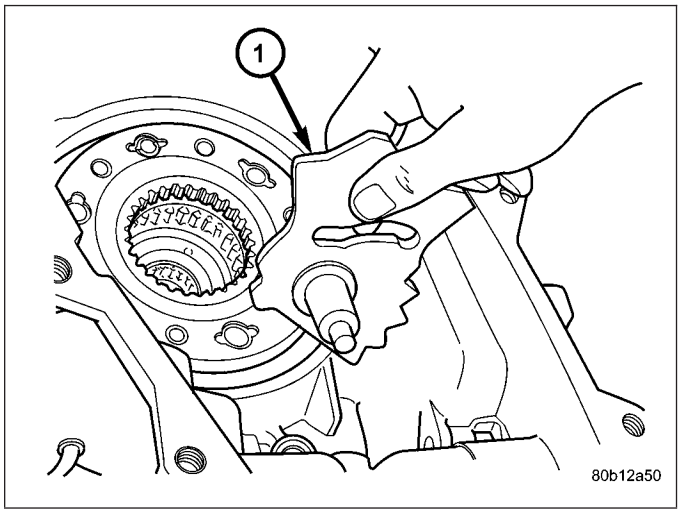
6. Remove the shift rail (1) from the range fork assembly (2) and the front case.



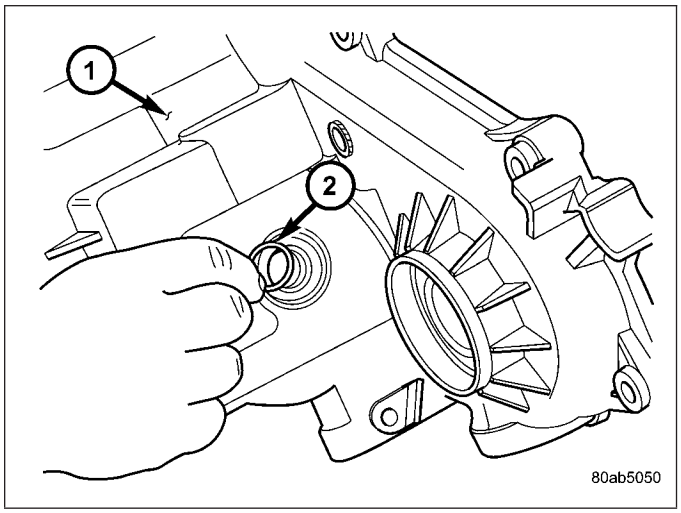
7. Remove range fork (2) and hub (1) as an assembly. Note fork position for installation reference.



8. Remove shift sector (1).

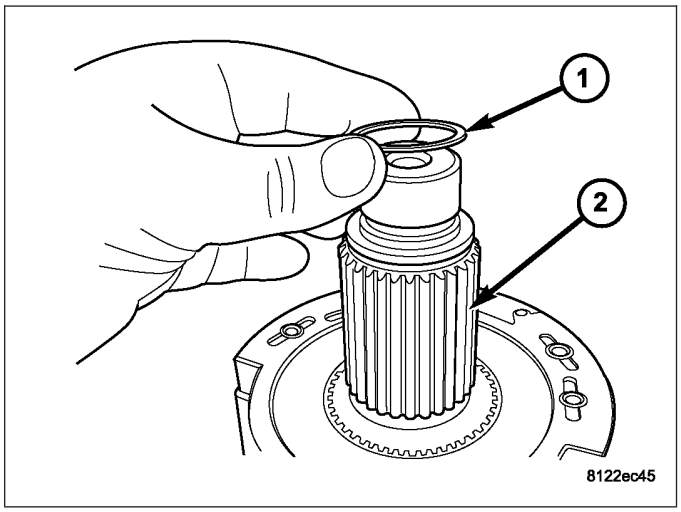


9. Remove the shift sector o-ring (2).

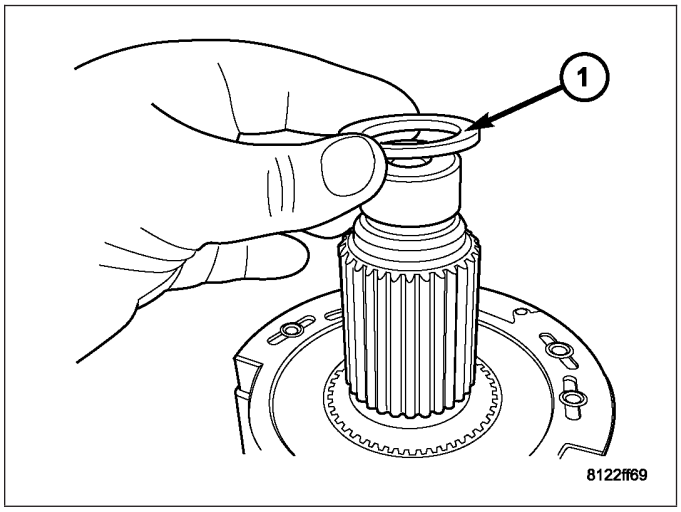


MAINSHAFT

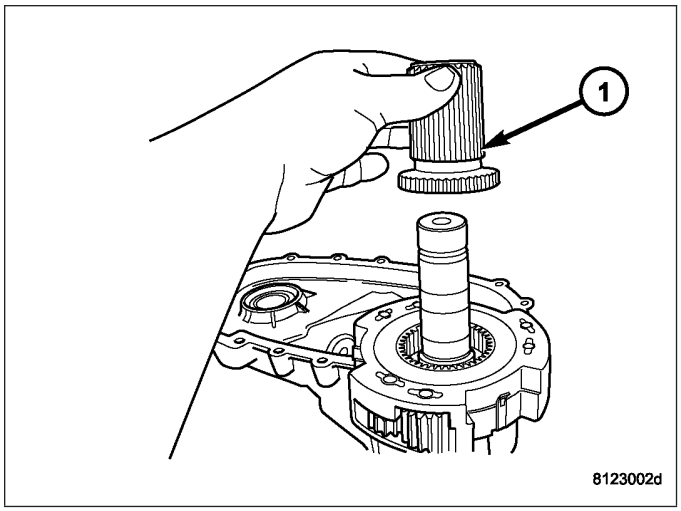
1. Remove intermediate clutch shaft (2) snap-ring (1).



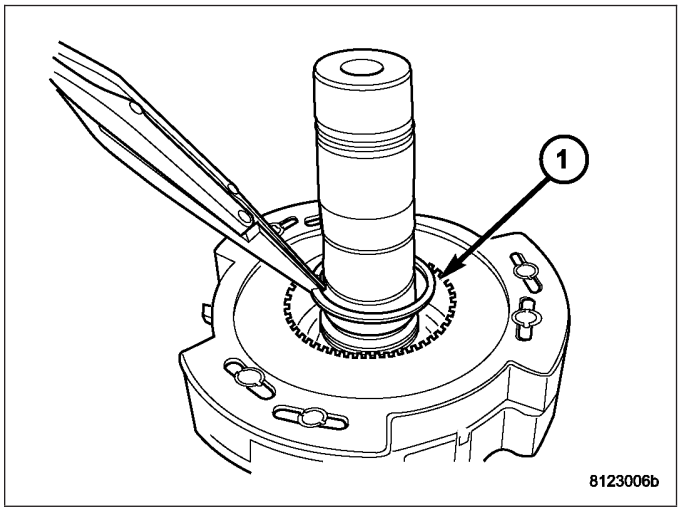
2. Remove the intermediate clutch shaft thrust ring (1).



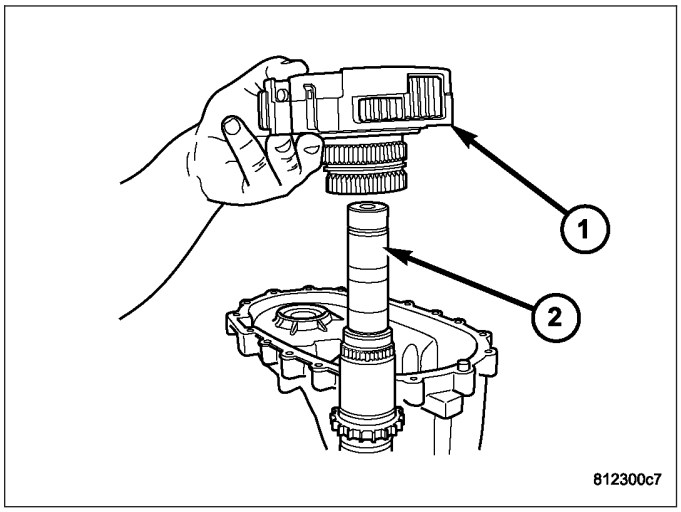
3. Remove the intermediate clutch shaft (1).



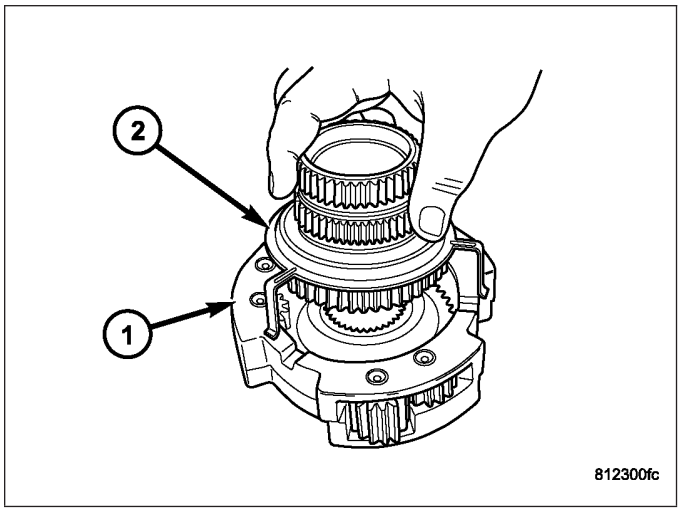
4. Remove the differential snap-ring (1).



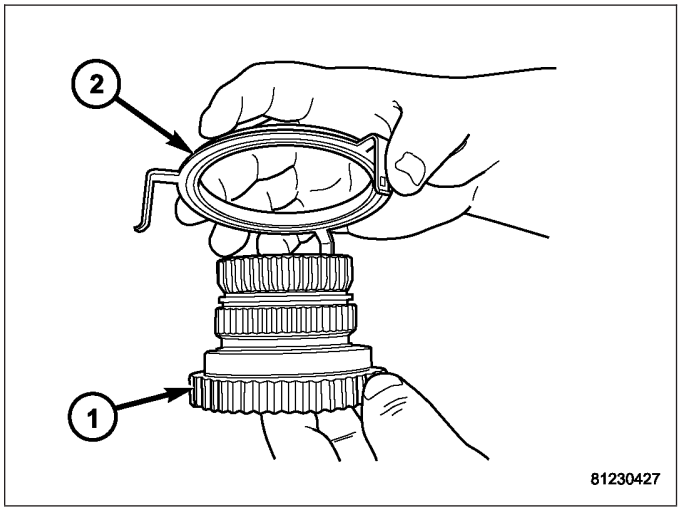
5. Remove the differential assembly (1) from the mainshaft (2).



6. Remove the mode hub (2) and mode hub retainer from the differential assembly (1).

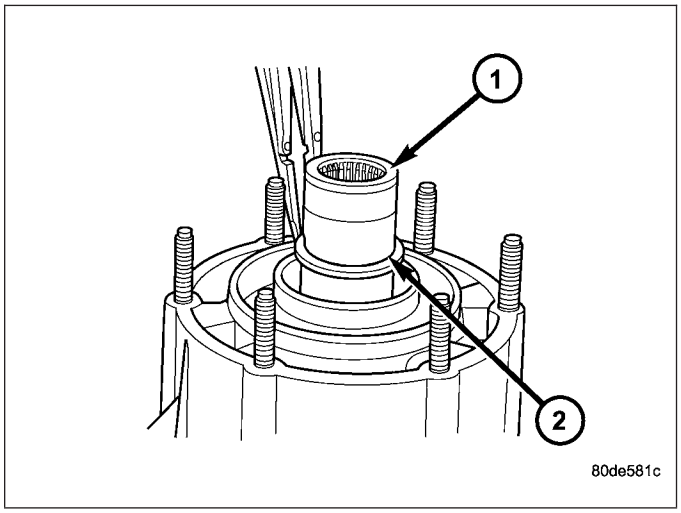


7. Remove the mode hub retainer (1) from the mode hub (2).

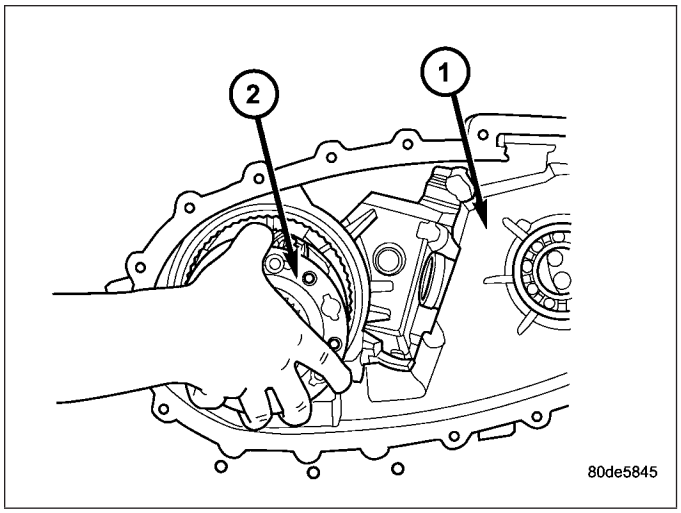


INPUT AND PLANETARY GEAR

1. Remove input gear seal with suitable screw and slide hammer.
2. Remove input gear retaining ring (2) with heavy duty snap-ring pliers.

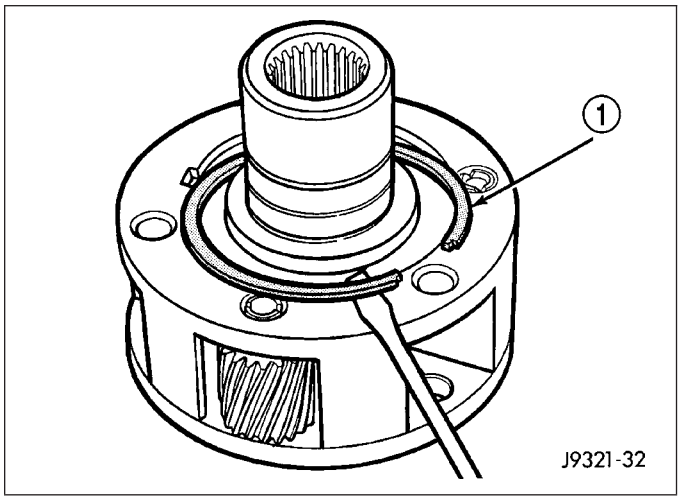


3. Place front case in horizontal position. Then remove input gear and low range gear as an assembly (2). Tap gear out of bearing with plastic mallet, if necessary.

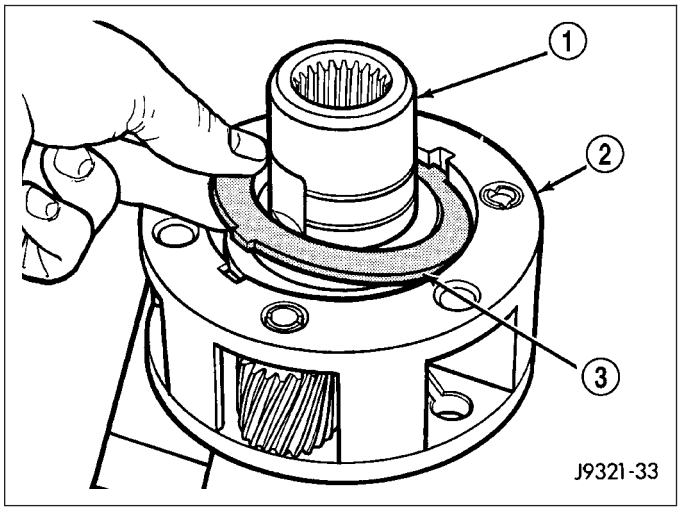


INPUT AND PLANETARY GEAR

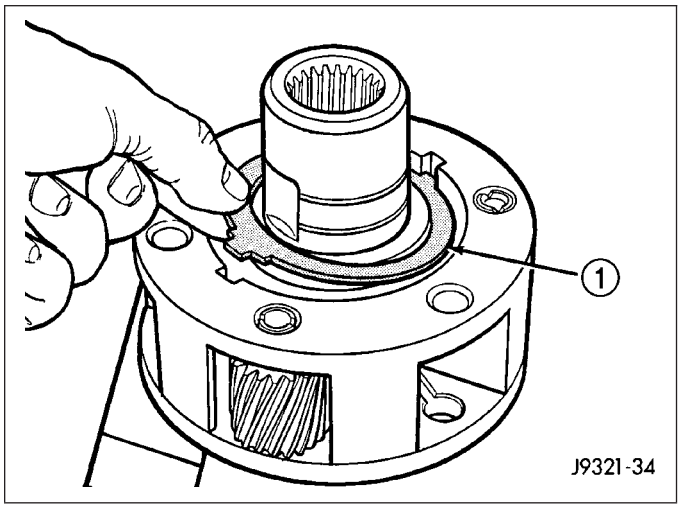
1. Remove snap-ring (1) that retains input gear in low range gear.



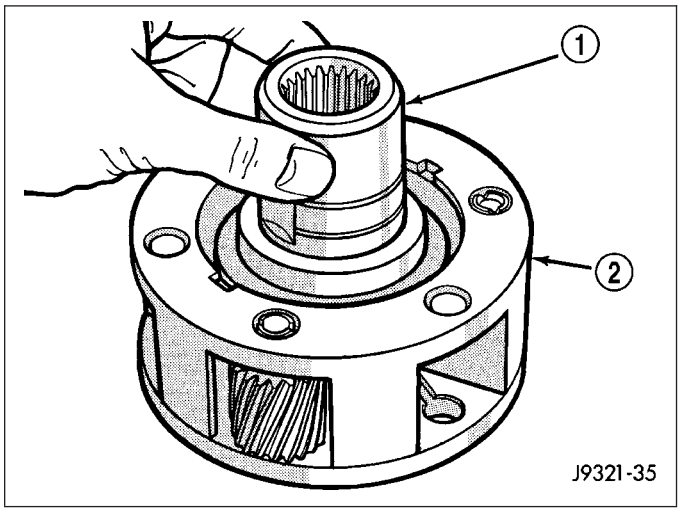
2. Remove retainer (3).



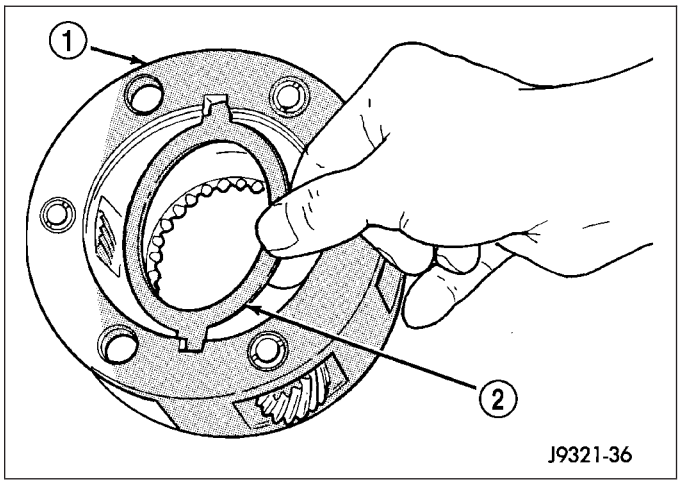
3. Remove front tabbed thrust washer (1).



4. Remove input gear (1).



5. Remove rear tabbed thrust washer (2) from low range gear (1).



CLEANING

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and 3M™ all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

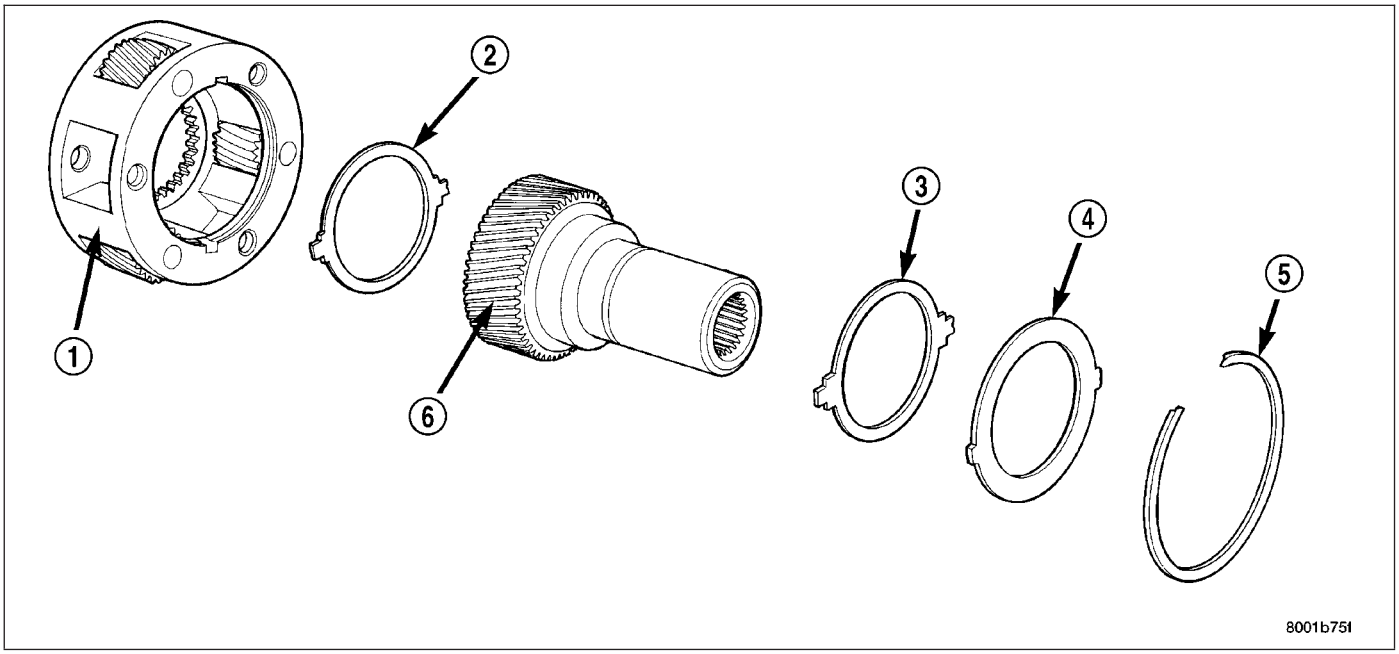
INSPECTION

MAINSHAFT/SPROCKET/HUB INSPECTION

Inspect the splines on the hub and shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone. However, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320-400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER



Input Gear and Carrier Components

1 - PLANETARY CARRIER
2 - REAR THRUST WASHER
3 - FRONT THRUST WASHER
4 - CARRIER LOCK RING
5 - CARRIER LOCK RETAINING RING
6 - INPUT GEAR

Check the teeth on the gear. Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300-400 grit emery cloth if necessary.

Examine the carrier body and pinion gears for wear or damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

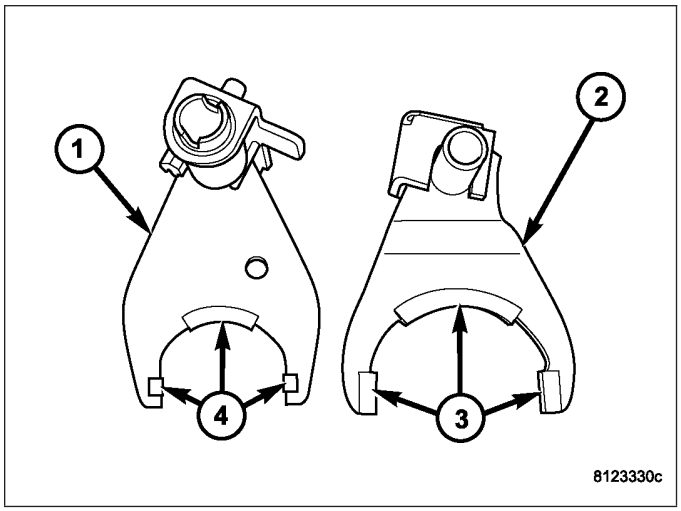
Check the lock ring and both thrust washers for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks and mode fork shift rail. Minor nicks on the shift rail can be smoothed with 320-400 grit emery cloth.

Inspect the shift fork wear pads (3, 4). The mode (2) and range (1) fork pads are serviceable and can be replaced if necessary.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.



REAR EXTENSION HOUSING

Inspect the extension housing seal and bushing. Replace both components if either show any sign of wear or damage.

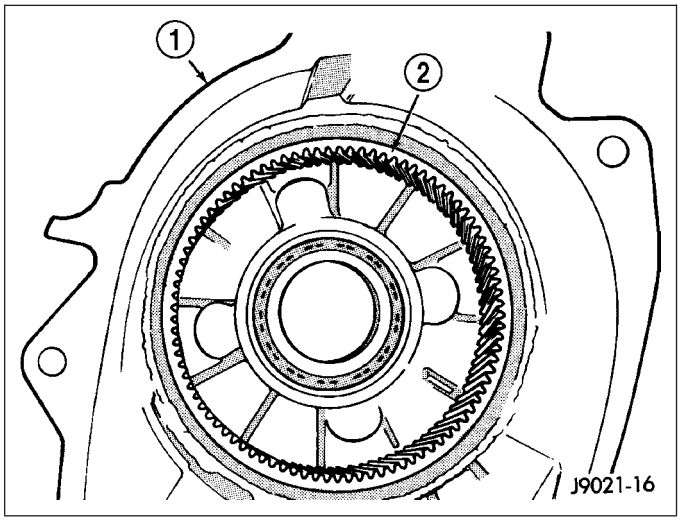
FRONT OUTPUT SHAFT AND DRIVE CHAIN

Inspect the shaft splines and bearing surfaces. Minor nicks on the splines can be smoothed with an oilstone. Use 320-400 grit emery to smooth minor scratches on the shaft bearing surfaces. Replace the shaft if the bearing surfaces are scored or if any of the splines are cracked or broken.

Examine the drive chain and shaft bearings. Replace the chain and both sprockets if the chain is stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

LOW RANGE ANNULUS GEAR

Inspect annulus gear (2) condition carefully. The gear is only serviced as part of the front case (1). If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear.



FRONT AND REAR CASES

Inspect the cases for wear and damage.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the

rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil® stainless steel inserts if required.

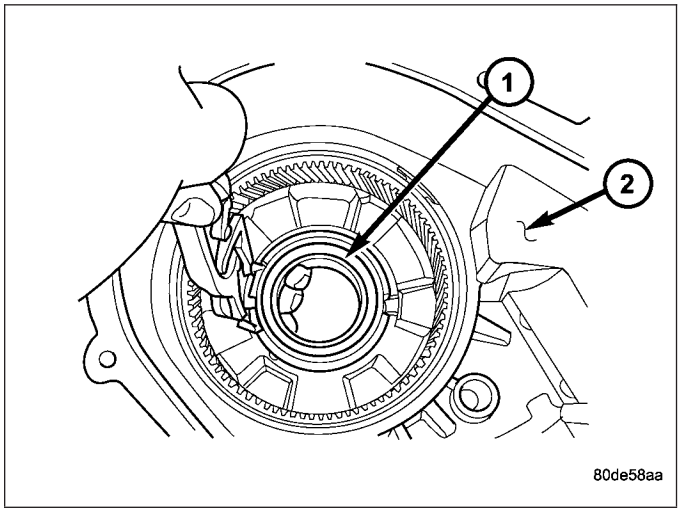
OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

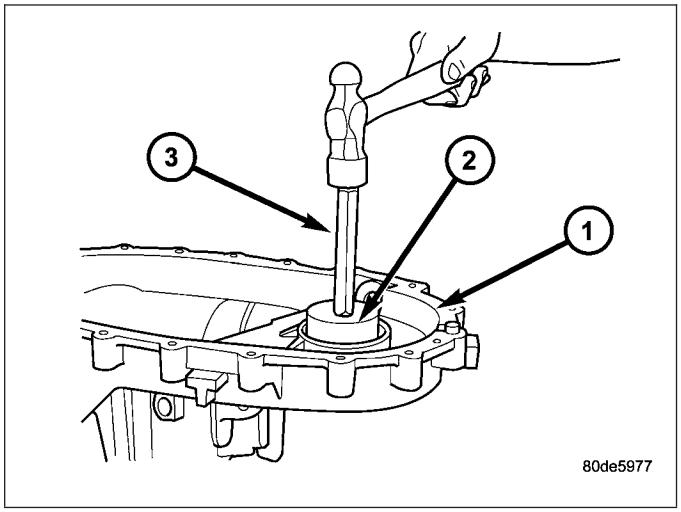
ASSEMBLY

BEARINGS AND SEALS

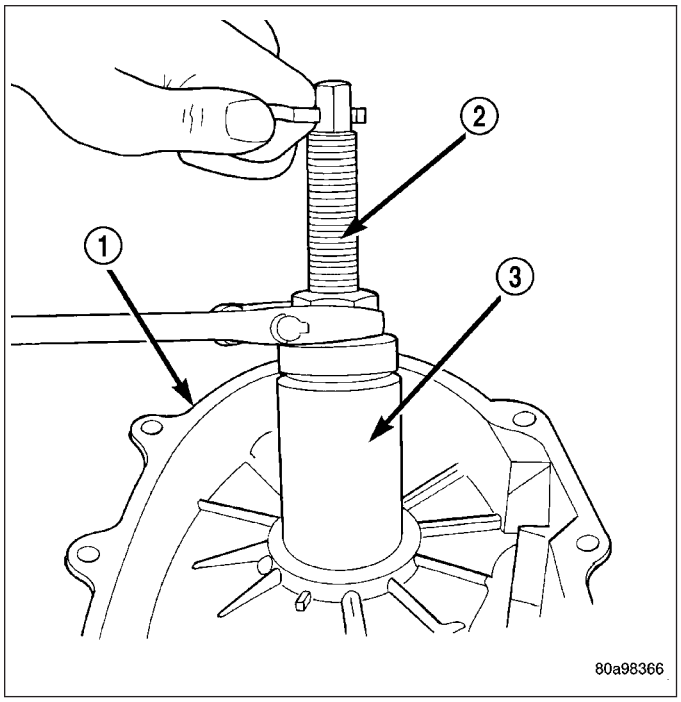
1. Remove the input shaft bearing (1) from the front case (2) with suitable snap-ring pliers.
2. Transfer the retaining ring to the new bearing if necessary and install the bearing into the front case.



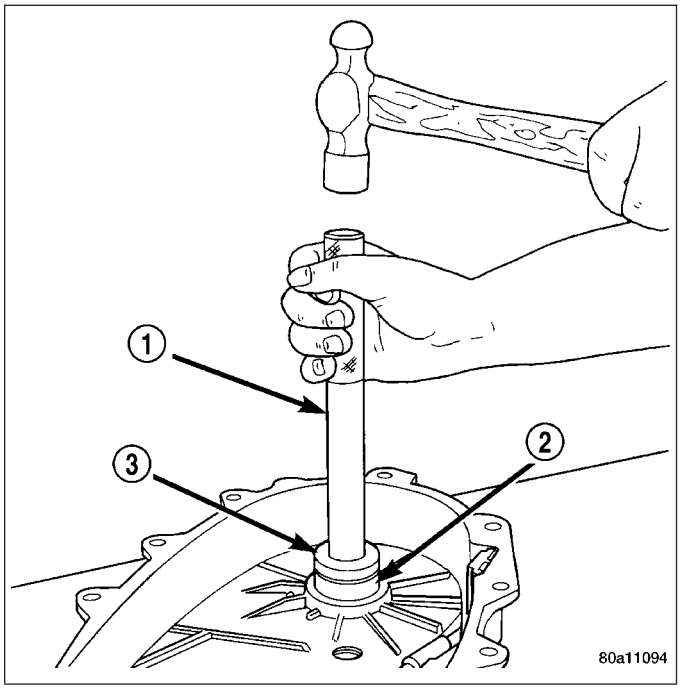
3. Remove the front output shaft bearing retaining ring from inside the front case half.
4. Using Installer 6436 and Handle C-4171, remove front output shaft bearing.
5. Start front output shaft bearing in case. Then seat bearing with Handle C-4171 (3) and Installer 6953 (2).
6. Install front output shaft bearing retaining ring.



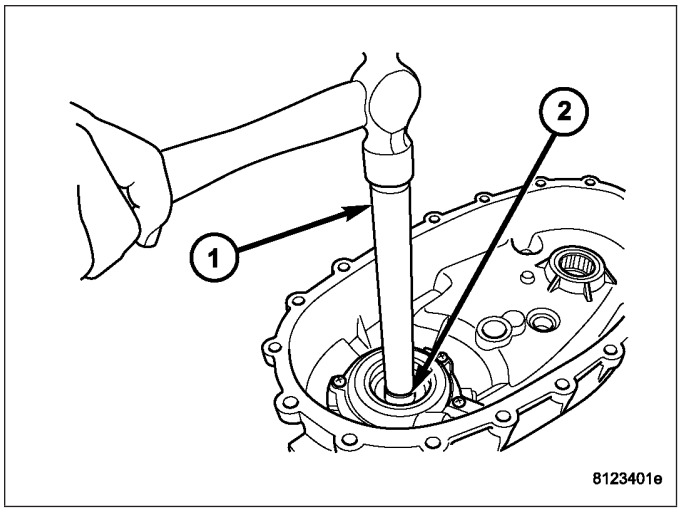
7. Remove the front output shaft rear bearing with the screw and jaws from Remover L-4454 (2) and Cup 8148 (3).



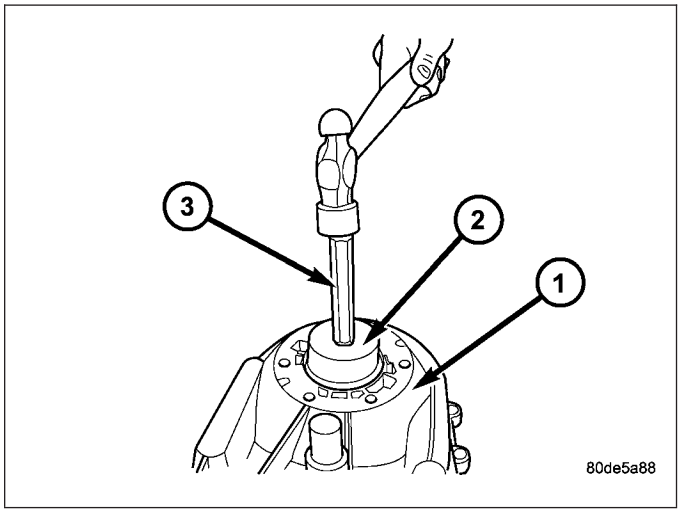
8. Install new bearing with Tool Handle C-4171 (1) and Installer 5066 (3).



9. Remove the rear output shaft bearing from the rear case using Installer 5065 (2) and Handle C-4171 (1).

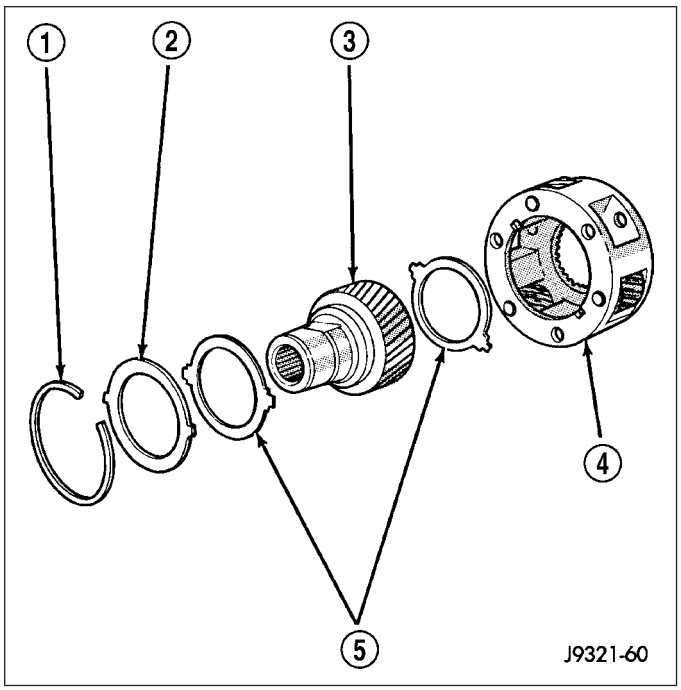


10. Install the rear output shaft bearing into the rear case using Remover/Installer 6953 (2) and Handle C-4171 (3).

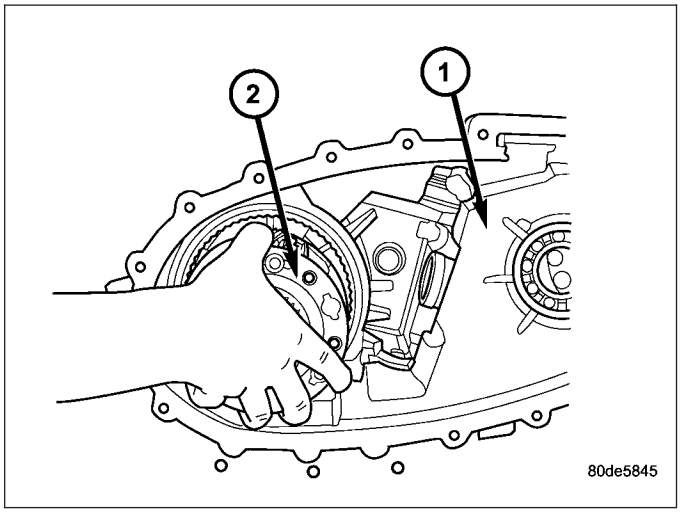


INPUT AND PLANETARY GEAR

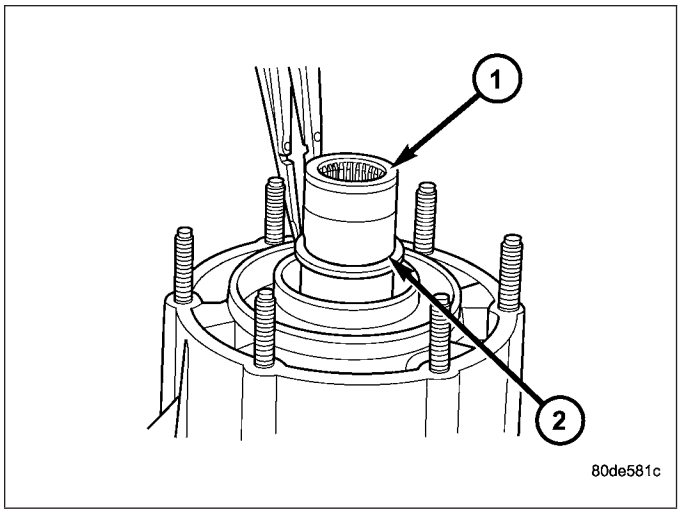
1. Lubricate gears and thrust washers (5) with recommended transmission fluid.
2. Install first thrust washer in low range gear (4). Be sure washer tabs are properly aligned in gear notches.
3. Install input gear (3) in low range gear (4). Be sure input gear is fully seated.
4. Install remaining thrust washer (5) in low range gear (4) and on top of input gear (3). Be sure washer tabs are properly aligned in gear notches.
5. Install retainer (2) on input gear and install snap-ring (1).



6. Align and install low range/input gear assembly (2) in front case (1). Be sure low range gear pinions are engaged in annulus gear and that input gear shaft is fully seated in front bearing.



7. Install snap-ring (2) to hold input/low range gear (1) into front bearing.
8. Install a new input gear seal using Installer 8841 and Handle C-4171.

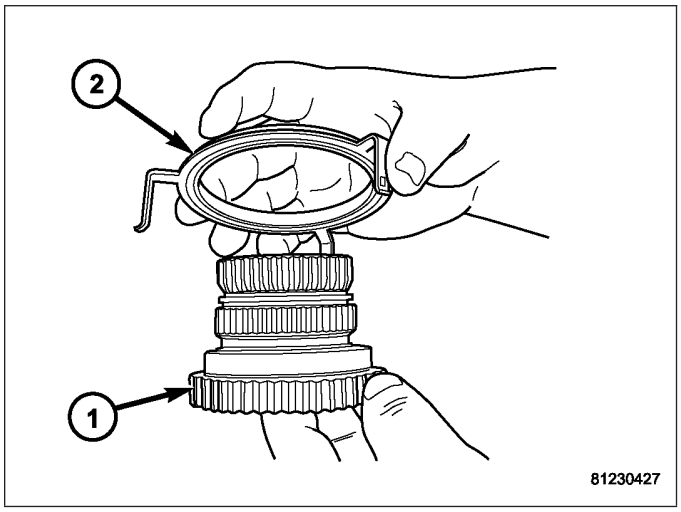


SHIFT FORKS AND MAINSHAFT

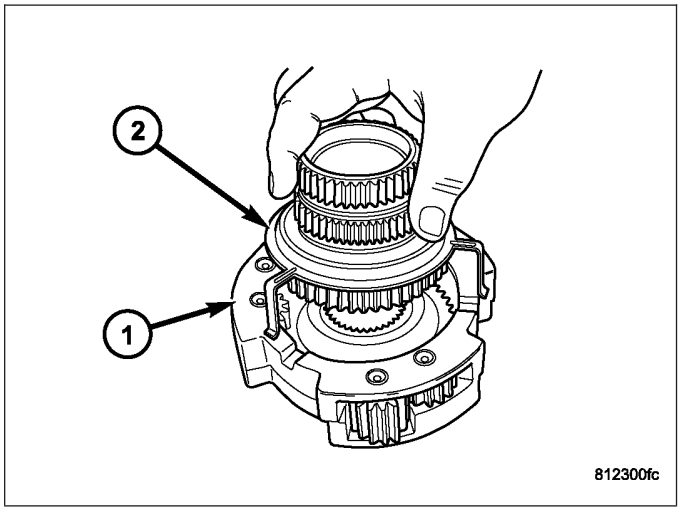
1. Lubricate mainshaft splines with recommended transmission fluid.

NOTE: Replace the mode hub retainer if the legs were distorted during removal.

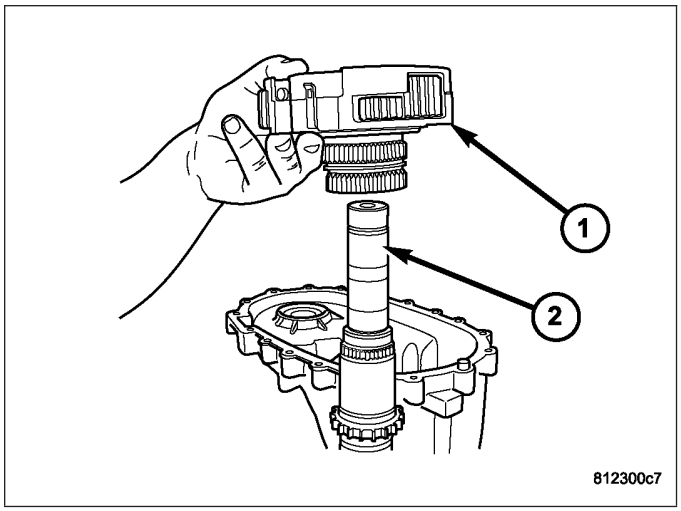
2. Install the mode hub retainer (1) onto the mode hub (2).



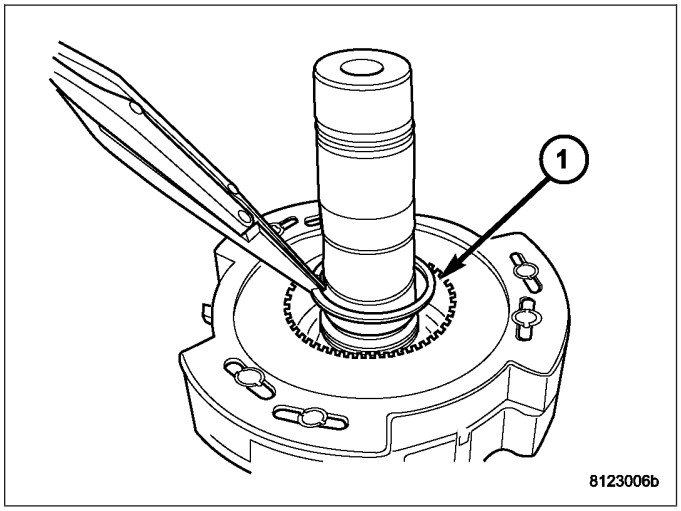
3. Install the mode hub (2) and mode hub retainer onto the differential assembly (1). Make sure the retainer is fully seated onto the differential.



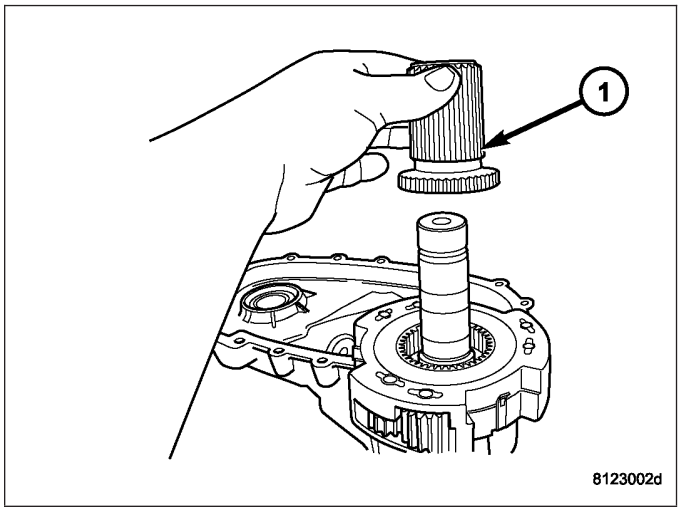
4. Install the differential assembly (1) onto the mainshaft (2).



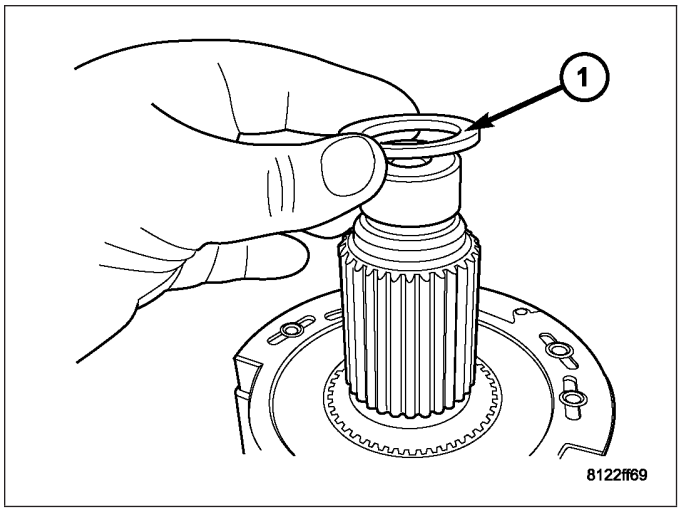
5. Install the differential snap-ring (1).



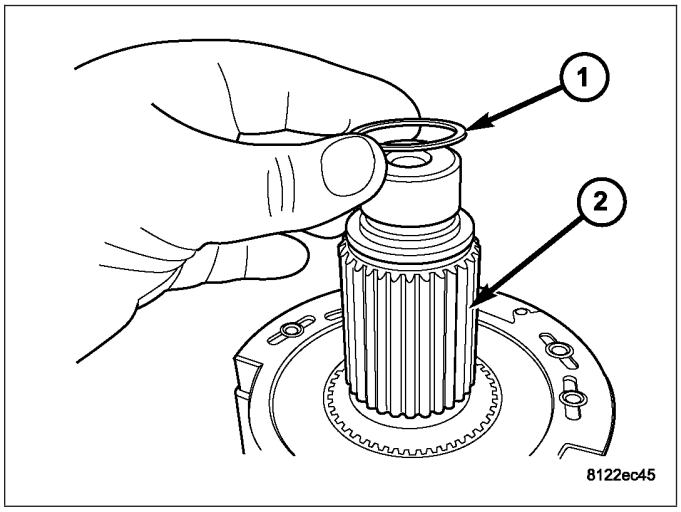
6. Install the intermediate clutch shaft (1).



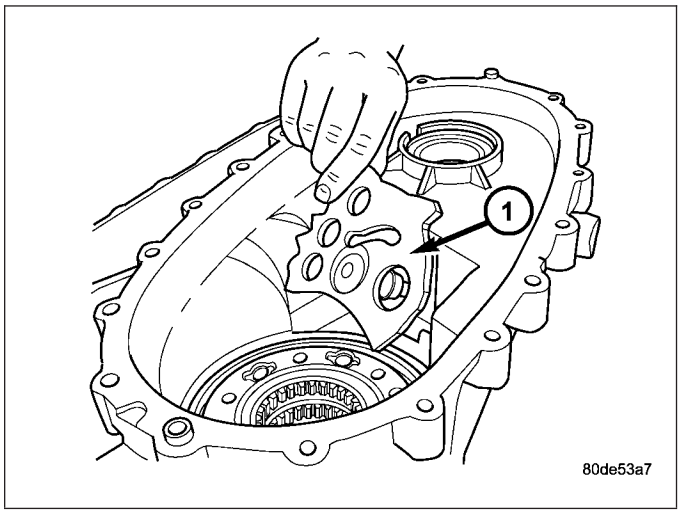
7. Install the clutch shaft thrust ring (1).



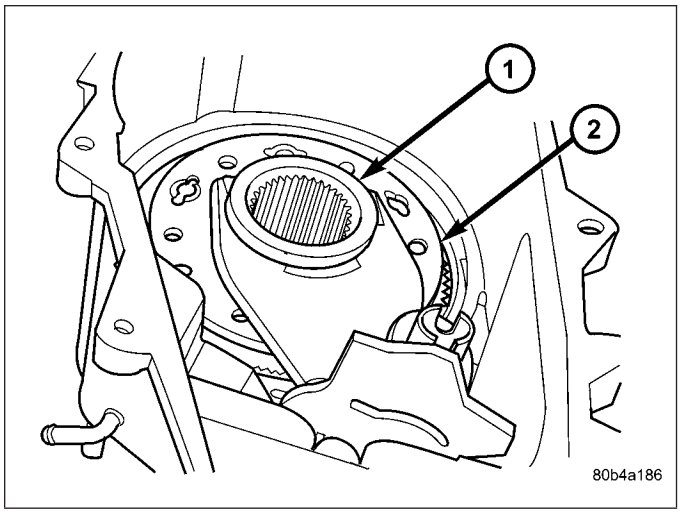
8. Install clutch shaft (2) snap-ring (1).



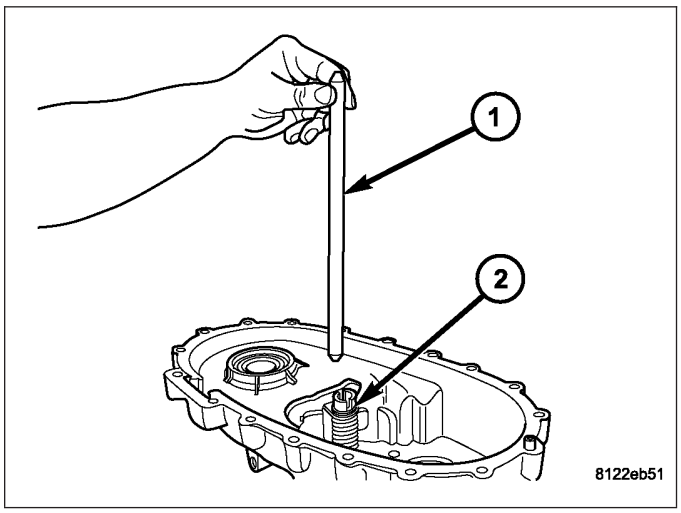
9. Lubricate sector shaft with transmission fluid and install shift sector (1) in case. Position slot in sector so it will be aligned with shift fork pin when shift forks are installed.
10. Install the shift sector o-ring.



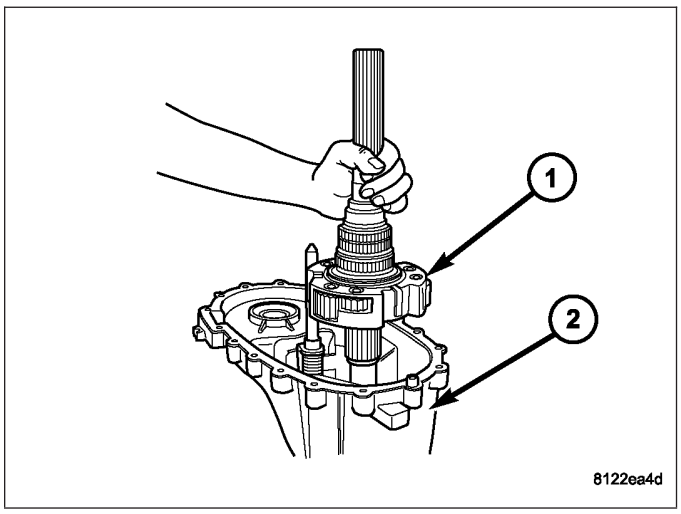
11. Assemble and install range fork (2) and hub (1). Be sure hub is properly seated in low range gear and engaged to the input gear.
12. Align and insert range fork pin in shift sector slot.



13. Install the shift rail (1) into the range fork assembly (2) and the front case.

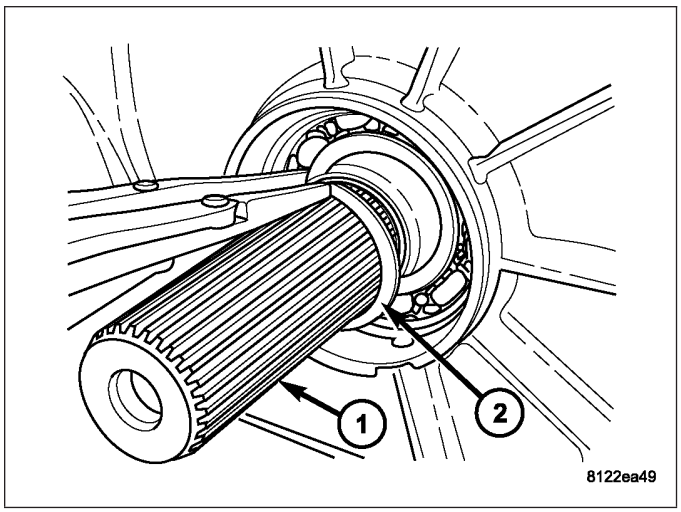


14. Install the mainshaft and differential assembly (2) into the input gear and transfer case (1).

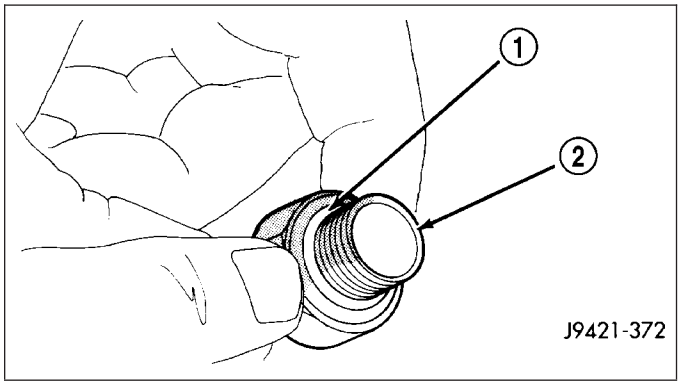


FRONT OUTPUT SHAFT AND DRIVE CHAIN

1. Install the front output shaft into the front output shaft bearing.
2. Install the front output shaft snap-ring (2) onto the output shaft (1).
3. Install the new front output shaft seal with Installer MB991168A

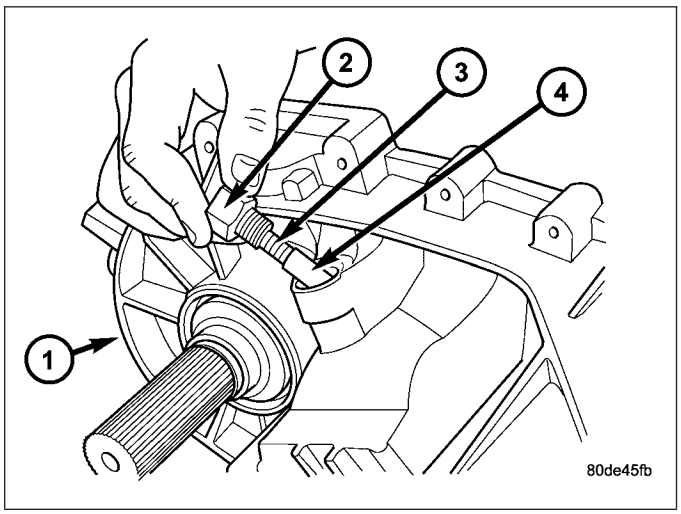


4. Install new o-ring (1) on detent plug (2).

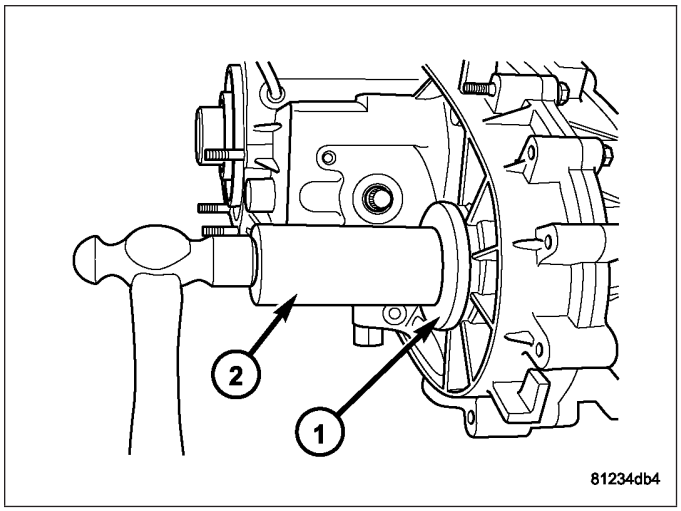


NOTE: Shift the transfer case to the same range/ mode position it was in when the shift motor was removed prior to installing the shift detent components.

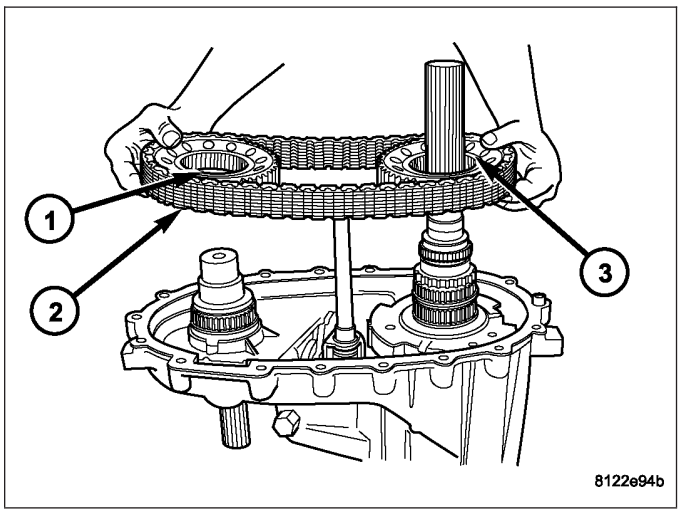
5. Install detent plunger (4), spring (3), and plug (2). Tighten the plug to 16-25 N·m (12-18 ft. lbs.).



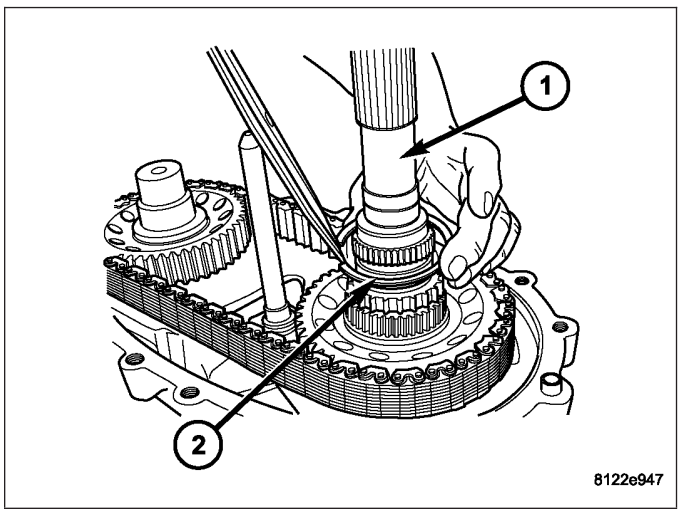
6. Install the new front output shaft seal slinger (1) with Installer 8840 (2). Install the slinger onto the shaft until the tool contacts the front of the output shaft.



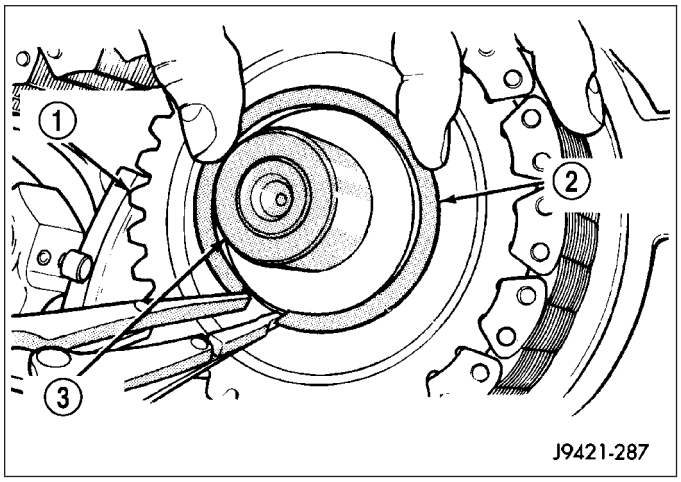
7. Install the front sprocket (1), rear sprocket (3), and chain (2) as an assembly.
8. Lower the front sprocket, rear sprocket, and chain over the front and rear output shafts simultaneously until fully seated on both splines.



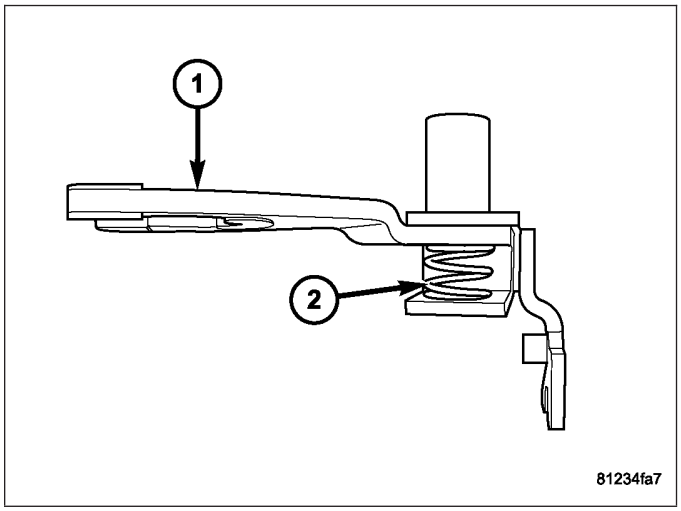
9. Install the rear output shaft retaining ring (2) onto the output shaft (1).



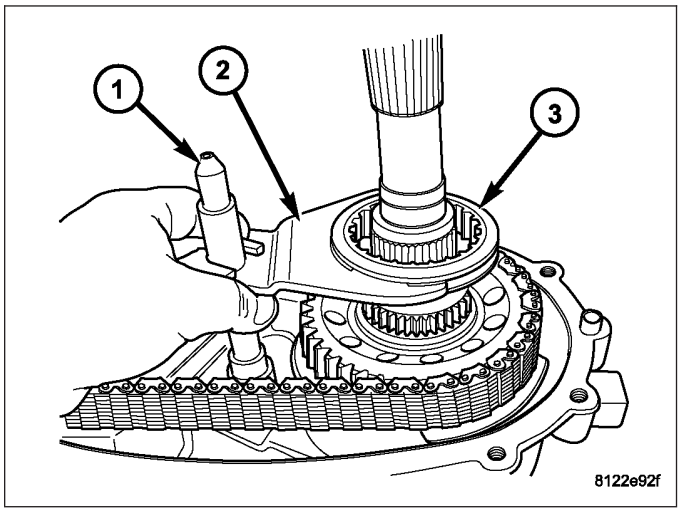
10. Install the front sprocket (1) retaining ring (2).



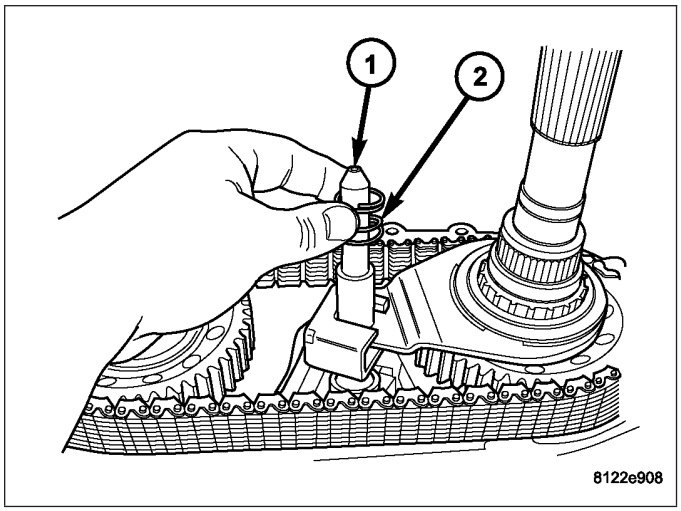
11. Inspect mode fork assembly (1). Replace pads if necessary. Also check springs and slider bracket. Replace worn or damaged components.



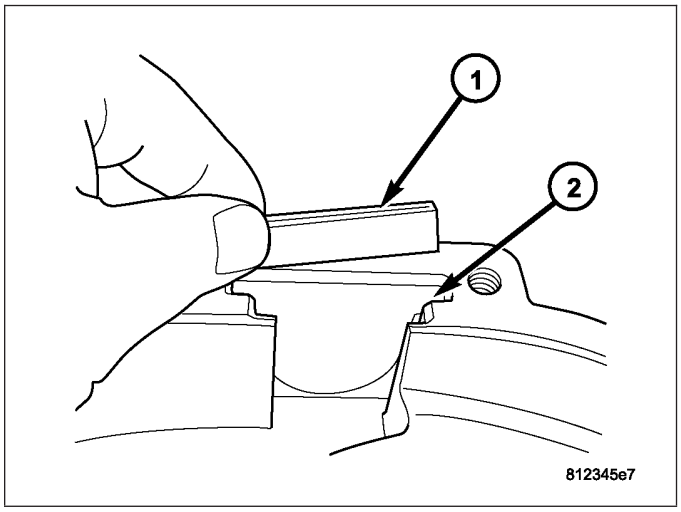
12. Install the mode fork (2) and sleeve (3) over the shift rail (1) and mainshaft.



13. Install spring (2) onto the shift rail (1).



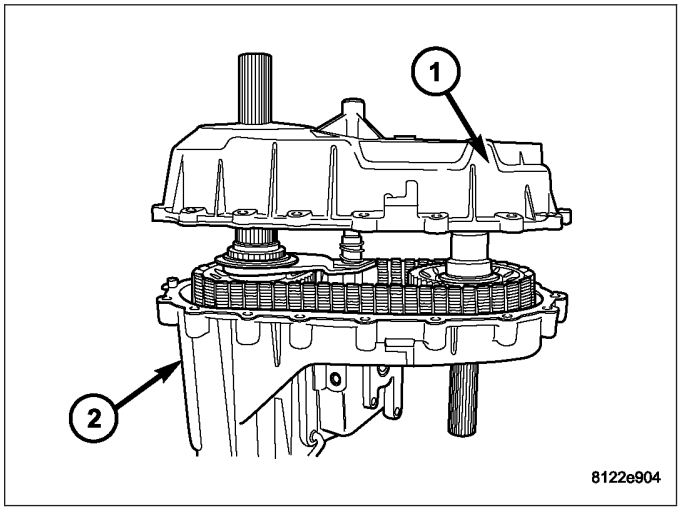
14. Insert magnet (1) in front case pocket (2).



OIL PUMP AND REAR CASE

Lubricate the oil pump components with transmission fluid before installation. Prime the oil pickup tube by pouring a little oil into the tube before installation.

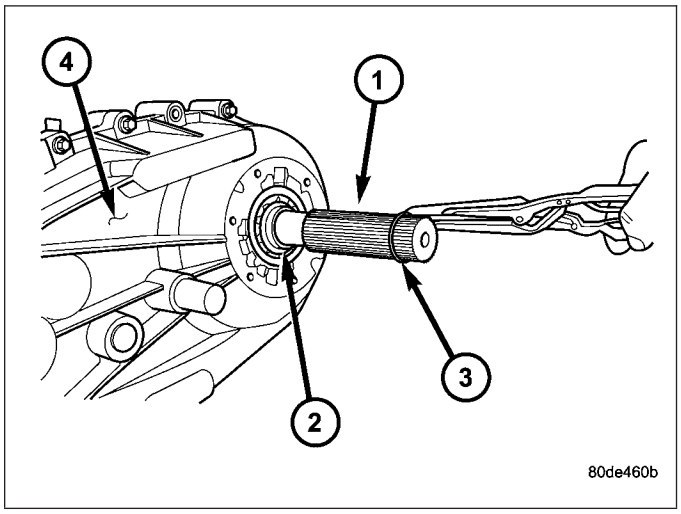
CAUTION: Do not remove the bolts holding the oil pump cover to the rear case half. The oil pump cover is aligned to the rear output shaft inner bearing race and will become mis-aligned if the bolts are loosened. If the transfer case failure has generated any debris which may have become trapped in the oil pump. the rear case and oil pump assembly MUST be replaced.



1. Install new o-ring in pickup tube inlet of oil pump, if necessary.
2. Insert oil pickup tube into the oil pump.
3. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of front case. Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess will be displaced into case interior.

4. Align oil pump with mainshaft and align shift rail with bore in rear case. Then install rear case and oil pump assembly (1).

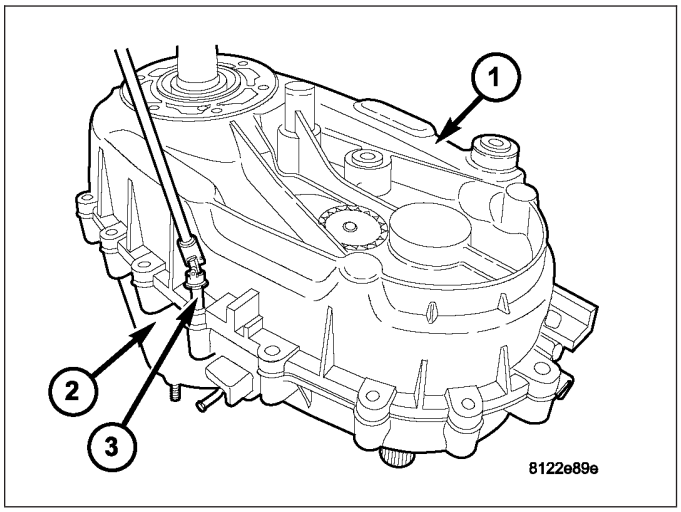
5. Install rear output bearing snap-ring (3) to output shaft (1).



6. Install 4-5 rear case-to front case bolts (3) to hold rear case (1) in position. Tighten bolts snug but not to specified torque at this time.

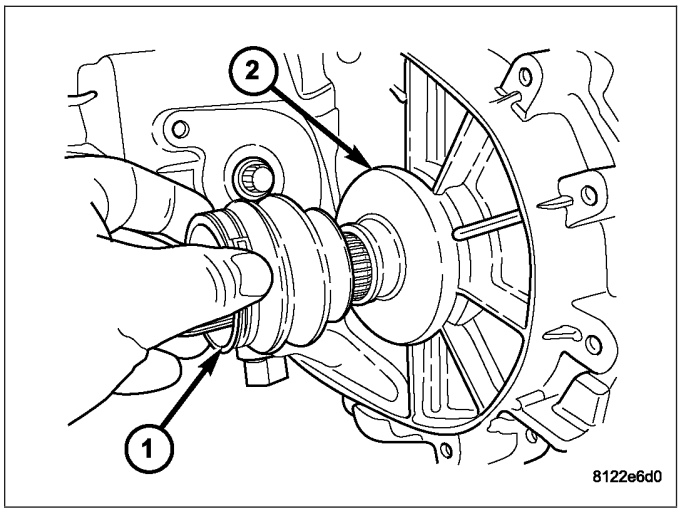
CAUTION: Verify that shift rail, and case alignment dowels are seated before installing any bolts. Case could be cracked if shaft rail or dowels are misaligned.

7. Apply Mopar® Lock 'n Seal Adhesive to remainder of rear case-to-front case bolt threads and install bolts. Tighten bolts to 25-28 N·m (18-21 ft. lbs.),

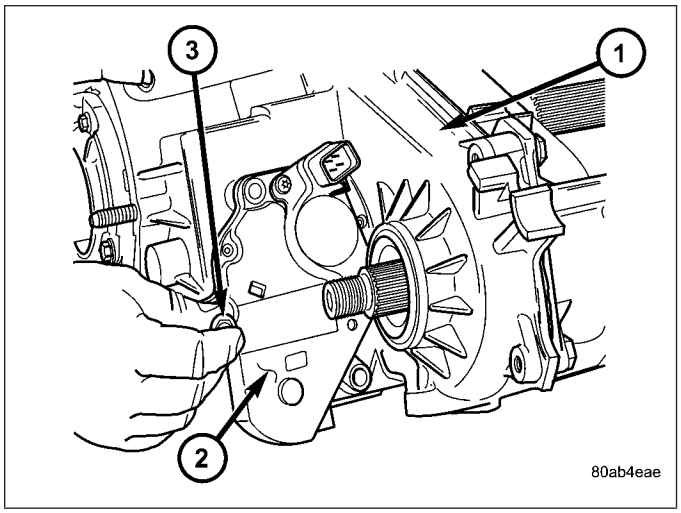


SEAL BOOT AND SHIFT MOTOR ASSEMBLY

1. Install a new seal boot clamp onto the seal boot.
2. Install the seal boot (2) and clamp onto the slinger (2) hub and tighten the clamp with Crimp Tool C-4975-A.

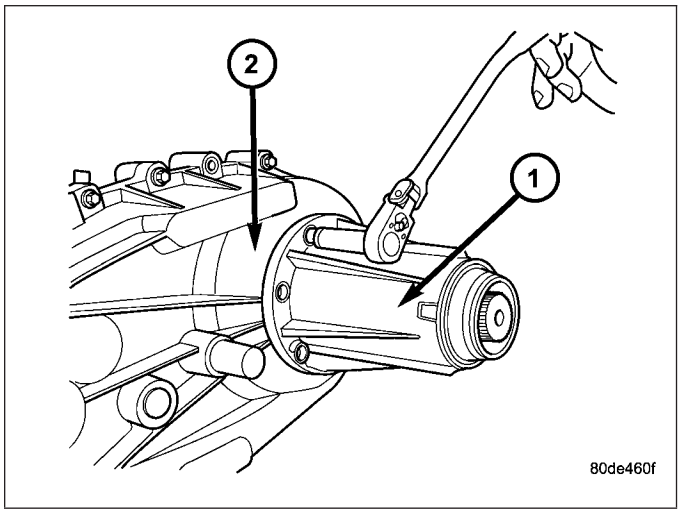


3. Position the shift motor and mode sensor assembly onto the transfer case.
4. Install the bolts (3) to hold the shift motor and mode sensor assembly (2) to the transfer case (1). Tighten the bolts to 16-25 N·m (12-18 ft. lbs.).



REAR EXTENSION

1. Install new seal in rear extension housing seal with Installer D-163 and Handle C-4171. Verify that the weep hole in the rubber is oriented downward.
2. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of rear extension housing. Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess could be displaced into output bearing.
3. Align and install rear extension (1) on the transfer case (2).
4. Apply Mopar® Silicone Sealer to threads of rear extension housing bolts. Then install and tighten bolts to 16-24 N·m (12-18 ft. lbs.) torque.



INSTALLATION

1. Mount transfer case on a transmission jack.
2. Secure transfer case to jack with chains.
3. Position transfer case under vehicle.
4. Align transfer case and transmission shafts and install transfer case onto the transmission.
5. Install and tighten transfer case attaching nuts to 27-34 N·m (20-25 ft. lbs.) torque.
6. Connect the vent hose.
7. Connect the shift motor and mode sensor wiring connectors. Secure wire harness to clips on transfer case.
8. Align and connect the propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/FRONT PROPELLER SHAFT - INSTALLATION) (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/REAR PROPELLER SHAFT - INSTALLATION)
9. Fill transfer case with correct fluid. (Refer to 21 - TRANSMISSION/TRANSFER CASE/FLUID - STANDARD PROCEDURE)
10. Install skid plate, if equipped.
11. Remove transmission jack and support stand.

12. Lower vehicle and verify transfer case shift operation.

SPECIFICATIONS

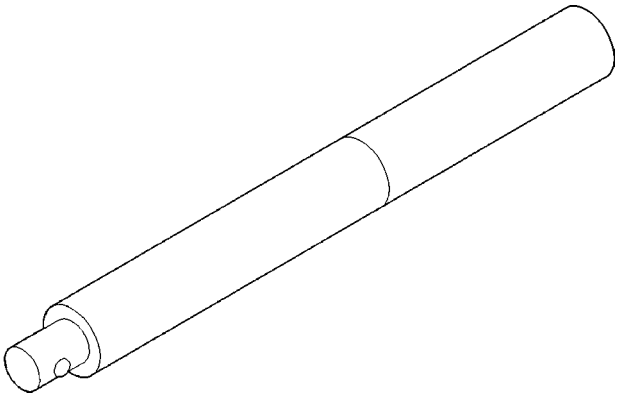
TRANSFER CASE - NV244 GENII

TORQUE SPECIFICATIONS

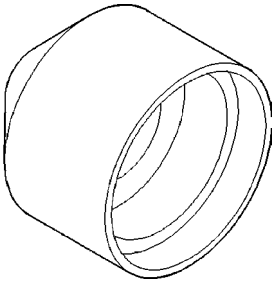
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Plug, Detent	16-24	12-18	-
Plug, Drain/Fill	20-34	15-25	-
Bolt, Extension Housing	16-24	12-18	-
Bolt, Case Half	25-28	18-21	-
Screw, Oil Pump	14-19	10-14	-
Nuts, Mounting	30-41	20-30	-
Bolts, Shift Motor and Mode Sensor Assembly	16-24	12-18	-

SPECIAL TOOLS

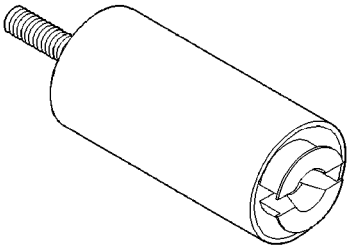
TRANSFER CASE - NV244 GENII



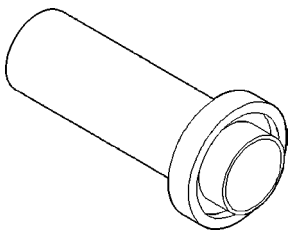
Handle, Universal - C-4171



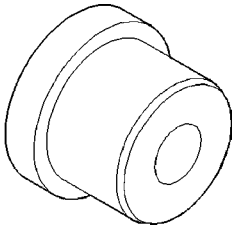
Installer, Seal - D-163

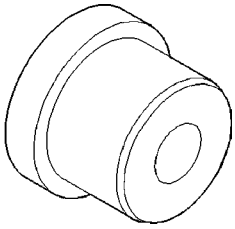


Remover - L-4454

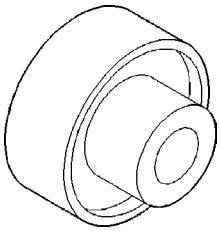


Installer, Seal - MB991168A

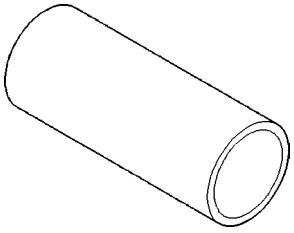




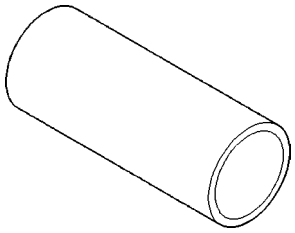
Installer, Bushing - 5066



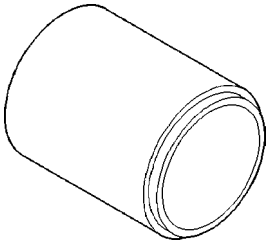
Installer, Bearing - 6953



Cup - 8148



Installer - 8840



Installer, Seal - 8841

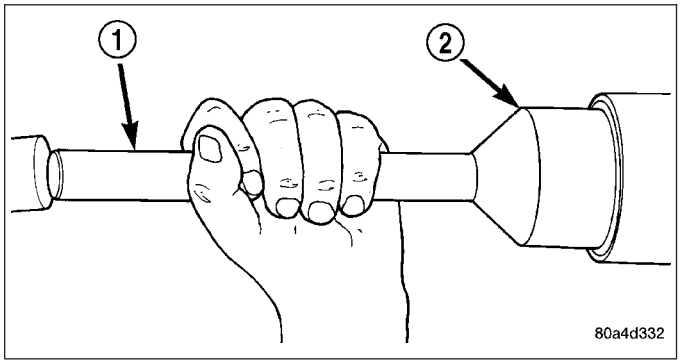
SEAL-EXTENSION HOUSING

REMOVAL

1. Raise and support vehicle.
2. Remove rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
3. Using a suitable pry tool or slide-hammer mounted screw, remove the extension housing seal.

INSTALLATION

1. Clean fluid residue from sealing surface and inspect for defects.
2. Using Installer D-163 (2) and Handle C-4171 (1), install seal in extension housing.
3. Install propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)
4. Verify proper transfer case fluid level.
5. Lower vehicle.



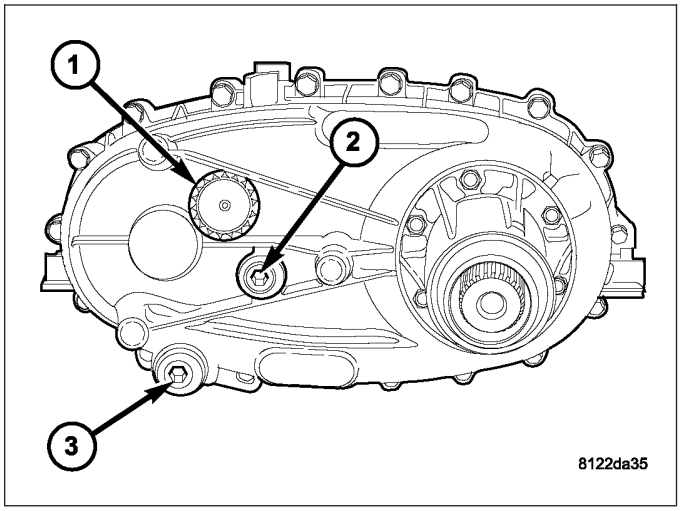
FLUID

STANDARD PROCEDURE - FLUID DRAIN AND REFILL

NOTE: The fill (2) and drain (3) plugs are both in the rear case.

1. Raise vehicle.
2. Position drain pan under transfer case.

NOTE: It may be necessary to remove the exhaust y-pipe at the exhaust manifold to properly access the fill and drain plugs. Lowering the exhaust will allow the plugs to be accessed for torquing during installation. (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - REMOVAL)

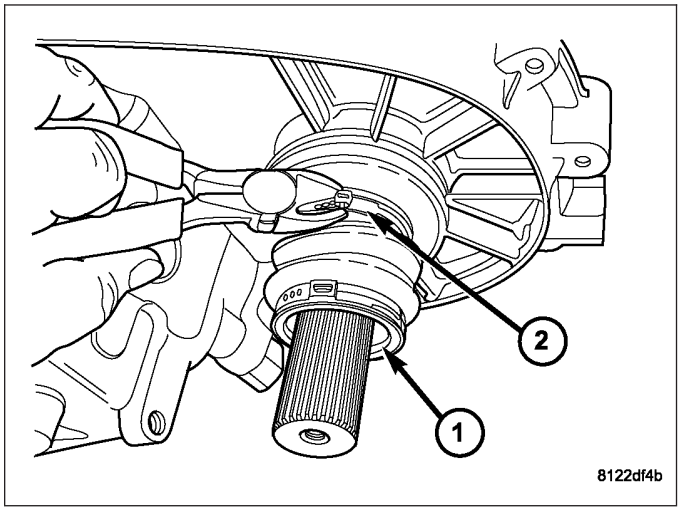


3. Remove drain (3) and fill (2) plugs and drain lubricant completely.
4. Install drain plug (3). Tighten plug to 20-34 N·m (15-25 ft. lbs.).
5. Remove drain pan.
6. Fill transfer case to bottom edge of fill plug opening with Mopar® ATF +4, Automatic Transmission fluid.
7. Install and tighten fill plug (2) to 20-34 N·m (15-25 ft. lbs.).
8. Install the exhaust y-pipe to the exhaust manifold, if removed. (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - INSTALLATION)
9. Wipe any excess fluid that may have spilled onto the exhaust.
10. Lower vehicle.

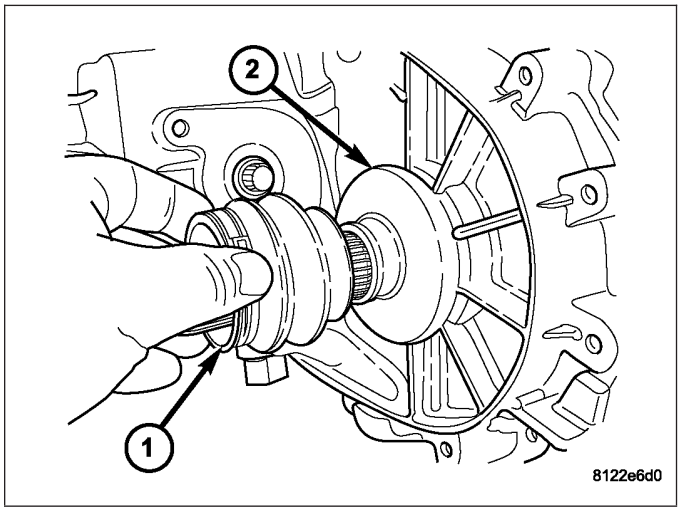
SEAL-FRONT OUTPUT SHAFT

REMOVAL

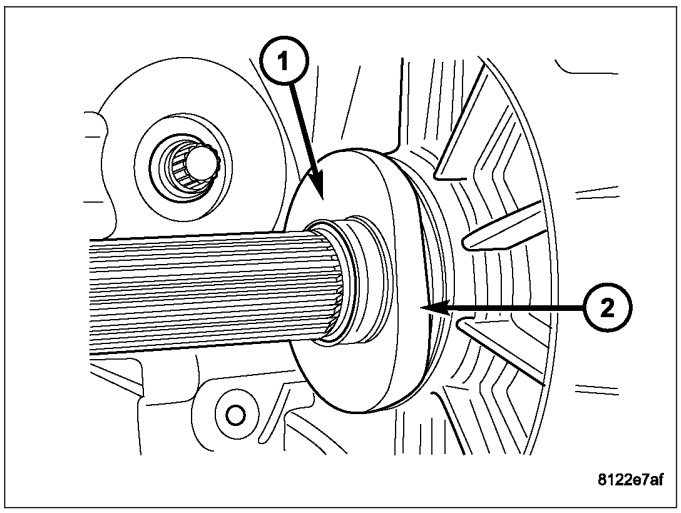
1. Remove the front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL).
2. Remove the front propeller shaft seal boot retaining clamp (2).



3. Remove the front propeller shaft seal boot (1) from the front output shaft seal slinger.



4. Remove the front output shaft seal slinger (1) by bending the slinger away (2) from the transfer case.
5. Using a suitable pry tool, remove the slinger from the output shaft using care not to damage the shaft.
6. Using a screw and a slide hammer, remove the front output shaft seal.



INSTALLATION

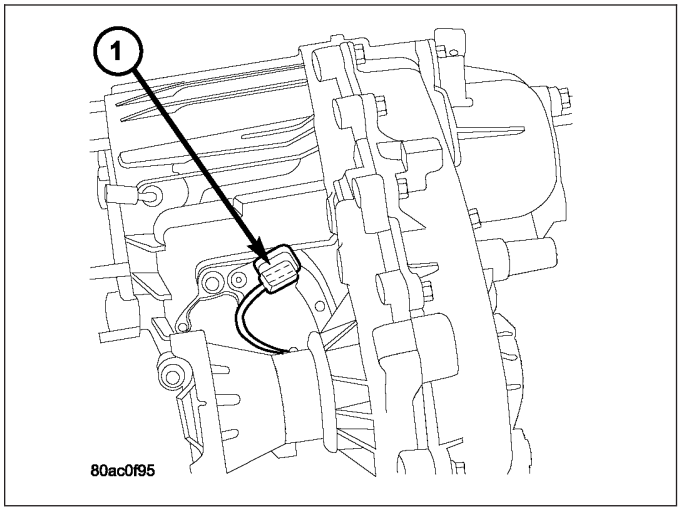
1. Install the new front output shaft seal with Installer MB991168A.
2. Install the front output shaft seal slinger with Installer 8840. Install the slinger onto the shaft until the tool contacts the rear of the output shaft.
3. Install a new seal boot clamp onto the seal boot.
4. Install the seal boot and clamp onto the slinger hub and tighten the clamp with Crimp Tool C-4975-A.
5. Install front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).

SENSOR-MODE

DESCRIPTION

The transfer case mode sensor is an electronic device whose output can be interpreted to indicate the shift motor shaft's rotary position. The sensor consists of a magnetic ring and four Hall Effect Transistors to create a 4 channel digital device (non-contacting) whose output converts the motor shaft position into a coded signal. The TCCM must supply 5VDC (+/- 0.5v) to the sensor and monitor the shift motor position. The four channels are denoted A, B, C, and D. The sensor is mechanically linked to the shaft of the cam which causes the transfer case shifting. The mode sensor draws less than 53 mA.

OPERATION



During normal vehicle operation, the Transfer Case Control Module (TCCM) monitors the mode sensor outputs at least every 250 (+/-50) milliseconds when the shift motor is stationary and 400 microseconds when the shift motor is active. A mode sensor signal between 3.8 Volts and 0.8 Volts is considered to be undefined.

Refer to SECTOR ANGLES vs. TRANSFER CASE POSITION for the relative angles of the transfer case shift sector versus the interpreted transfer case gear operating mode. Refer to MODE SENSOR CHANNEL STATES for the sensor codes returned to the TCCM for each transfer case mode sensor position. The various between gears positions can also be referred as the transfer case's coarse position. These coarse positions come into play during shift attempts.

SECTOR ANGLES vs. TRANSFER CASE POSITION

Shaft Angle (Degrees)	Transfer Case Position
+40	4LO
+20	N
0	2WD/AWD
-20	4HI

MODE SENSOR CHANNEL STATES

Transfer Case Angle (degrees)	Sensor Channel A	Sensor Channel B	Sensor Channel C	Sensor Channel D
Between Gears	H	H	L	H
+40 (4LO)	H	H	L	L
Between Gears	H	H	L	H
Between Gears	H	L	L	H
+20 (NEUTRAL)	H	L	L	L
Between Gears	H	L	L	H
Between Gears	H	L	H	H
0 (2WD/AWD)	H	L	H	L
Between Gears	H	L	H	H
Between Gears	L	L	H	H
-20 (4HI)	L	L	H	L
Between Gears	L	L	H	H
Between Gears	L	H	H	H

SWITCH-TRANSFER CASE SELECTOR

DESCRIPTION

The selector switch assembly is mounted in the left side of the vehicle's Instrument Panel (IP) and consists of a rotary knob connected to a resistive network for the mode and range shift selections. Also located in this assembly is a recessed, normally open momentary switch for making shifts into and out of transfer case NEUTRAL. A pen, or similar instrument, is used to make a NEUTRAL shift selection, thus reducing the likelihood of an inadvertent shift request.

The selector switch also contains light emitting diode's (LED's) to indicate the transfer case position and whether a shift is in progress.

OPERATION

As the position of the selector switch varies, the resistance between the Mode Sensor supply voltage pin and the Mode Sensor output will vary. Hardware, software, and calibrations within the Transfer Case Control Module (TCCM) are provided that interpret the selector switch resistance as given in the table below: SELECTOR SWITCH INTERPRETATION

SELECTOR SWITCH INTERPRETATION

Step	Resistance Range (ohms)	Required Interpretation
A	<200	Shorted
B	400-700	NEUTRAL
C	1050-1450	4LO
D	1850-2300	4H
E	3050-5950	AWD (Default)
F	9.5-12.5K	In between positions
G	>15.5K	Open

For resistances between the ranges B-E shown for each valid position (T-Case NEUTRAL, 4LO, 4HI, AWD), the TCCM may interpret the resistance as:

- either of the neighboring valid positions.
- as an invalid fault position.

For resistances between the ranges E and F shown for AWD and in-between positions, the TCCM may interpret the resistance as:

- the AWD position.
- an invalid fault position.
- a valid in-between position.

For resistances between the ranges F and G shown for in-between positions and fault condition (open), the TCCM may interpret the resistance as:

- a valid in-between position.
- an invalid fault position.

For resistances between the ranges A and B shown for the fault condition (short) and , T-Case NEUTRAL, the TCCM may interpret the resistance as:

- the T-Case NEUTRAL position.
- an invalid fault position.

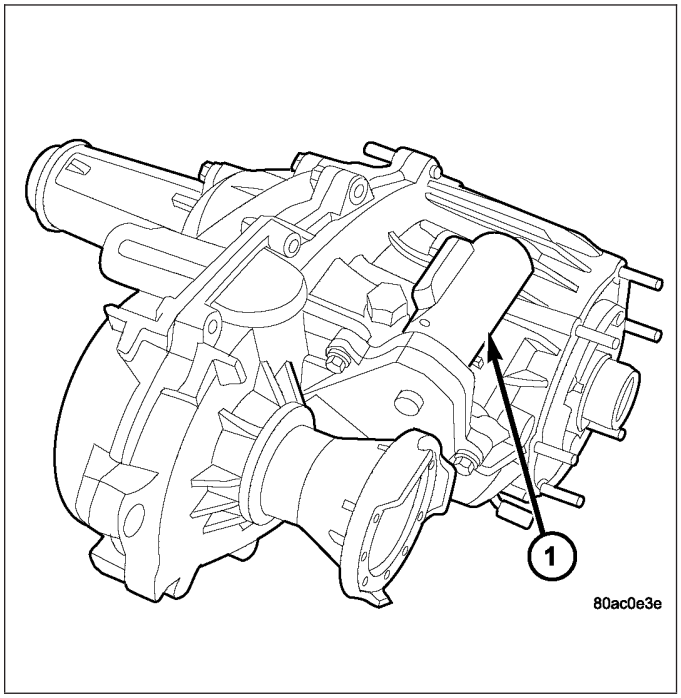
The LED's in the selector assembly are illuminated/flashed in the following manner to indicate a particular condition or state.

- A solidly illuminated LED indicates a successfully completed shift and the current operating mode of the transfer case. While a shift has been requested but not yet completed, the LED for the desired transfer case position is flashed.
- A flashing operating mode LED for the desired gear indicates that a shift to that position has been requested, but all of the driver controllable conditions have not been met. This is in an attempt to notify the driver that the transmission needs to be put into NEUTRAL, the vehicle speed is too great, or some other condition outlined (other than a diagnostic failure that would prevent this shift) elsewhere (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - OPERATION) is not met. Note that this flashing will continue indefinitely until the conditions are eventually met, or the selector switch position is changed, or if diagnostic routines no longer allow the requested shift.
- If the driver attempts to make a shift into transfer case NEUTRAL, and any of the driver controllable conditions are not met, the request will be ignored until all of the conditions are met or until the NEUTRAL select button is released. Additionally the neutral lamp will flash, or begin to flash while the button is depressed and operator controllable conditions are not being met. All of the LED's except the Neutral will flash if any of the operator controllable conditions for shifting are not met while the Neutral button is depressed. This ″toggle″ type of feature is necessary because the TCCM would interpret another request immediately after the shift into transfer case NEUTRAL has completed.
- No LED's illuminated indicate a fault in the transfer case control system.

ASSEMBLY-SHIFT MOTOR/MODE SENSOR

DESCRIPTION

The shift motor (1) consists of a permanent magnet D.C. motor with gear reduction to convert a high speed-low torque device into a low speed-high torque device. The output of the device is coupled to a shaft which internally moves the mode and range forks that change the transfer case operating ranges. The motor is rated at 25 amps maximum at 72° F with 10 volts at the motor leads.



OPERATION

The transfer case shift motor responds to the Transfer Case Control Module (TCCM) commands to move the transfer case shift sector bi-directionally, as required, to obtain the transfer case operating mode indicated by the instrument panel mounted selector switch.

REMOVAL

NOTE: New shift motor assemblies are shipped in the 2WD/AWD position. If a new shift motor assembly will be installed, it will be necessary to shift the transfer case to the 2WD/AWD position prior to motor removal.

1. Raise the vehicle on a suitable hoist.
2. Disengage the wiring connectors from the shift motor and mode sensor.
3. Remove the bolts holding the shift motor and mode sensor assembly onto the transfer case.
4. Separate the shift motor and mode sensor assembly from the transfer case.

INSTALLATION

1. Verify that the shift sector o-ring is clean and properly positioned over the shift sector and against the transfer case.

NOTE: Verify that the shift motor position and sector shaft orientation are aligned. It may be necessary to manually shift the transfer case if the shift motor and sector shaft are not aligned.

2. Position the shift motor and mode sensor assembly onto the transfer case.
3. Install the bolts to hold the assembly onto the transfer case. Tighten the bolts to 16-24 N·m (12-18 ft.lbs.).

CAUTION: If the original shift motor and mode sensor assembly bolts are reused, be sure to use Mopar® Lock & Seal or Loctite™ 242 to replenish the lock patch material originally found on the bolts

4. Engage the wiring connectors to the shift motor and mode sensor.
5. Refill the transfer case as necessary.
6. Lower vehicle and verify transfer case operation.

TRANSFER CASE - NV273 - SERVICE INFORMATION

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TRANSFER CASE - NV273 - SERVICE INFORMATION

DESCRIPTION

The NV273 is an electronically controlled part-time transfer case with a low range gear reduction system. The NV273 has three operating ranges plus a NEUTRAL position. The low range system provides a gear reduction ratio for increased low speed torque capability.

The geartrain is mounted in two aluminum case halves attached with bolts. The mainshaft front and rear bearings are mounted in aluminum case halves.

OPERATING RANGES

Transfer case operating ranges are:

- 2WD (2-wheel drive)
- 4HI (4-wheel drive)
- 4LO (4-wheel drive low range)
- NEUTRAL

The 2WD range is for use on any road surface at any time.

The 4HI and 4LO ranges are for off road use only. They are not for use on hard surface roads. The only exception being when the road surface is wet or slippery or covered by ice and snow.

The low range reduction gear system is operative in 4LO range only. This range is for extra pulling power in off road situations. Low range reduction ratio is 2.72:1.

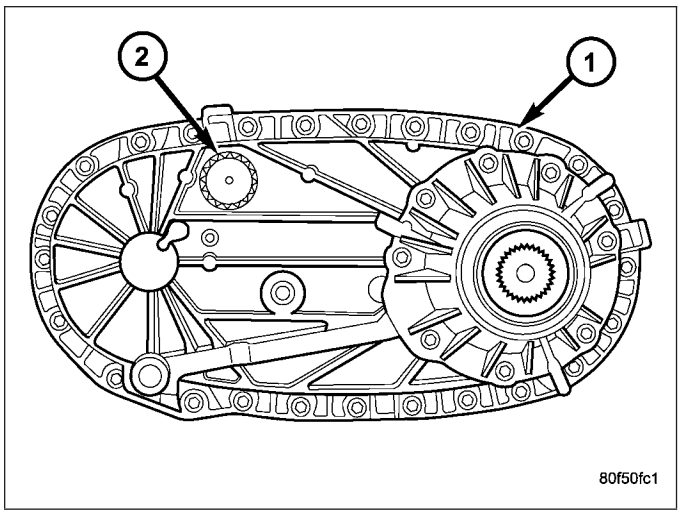
SHIFT MECHANISM

Operating ranges are selected with a dash mounted shift selector switch. The shift selector switch provides a input to the Transfer Case Control Module (TCCM) to indicate the driver's desire to change operating ranges. The TCCM uses this input, along with input from the transfer case mounted mode sensor and information from the vehicle's bus, to determine if a shift is permitted. If the TCCM decides the shift is permitted, the TCCM controls the shift motor, mounted to the exterior of the transfer case, to perform the shift.

IDENTIFICATION

A circular ID tag (2)is attached to the rear case of each transfer case. The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.



OPERATION

The input gear is splined to the transmission output shaft. The input gear drives the mainshaft through the planetary assembly and range sleeve. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchronizer mechanism for shifting.

DIAGNOSIS AND TESTING - TRANSFER CASE - NV273

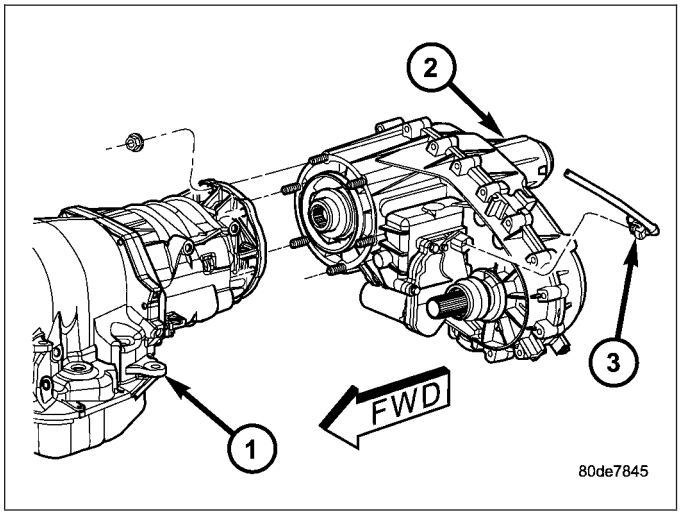
DIAGNOSIS CHART

Condition	Possible Cause	Correction
Transfer case difficult to shift or will not shift into desired range.	1) Transfer case electronically controlled shift system malfunction.	1) Verify proper operation per the appropriate diagnostic manual.
	2) If vehicle was operated for an extended period in 4HI mode on dry surface, driveline torque load may cause difficulty.	2) Drive the vehicle in a straight line and momentarily release the accelerator. The transfer case can then be shifted to the desired mode.
	3) Insufficient or incorrect lubricant.	3) Drain and refill transfer case with the correct quantity of Mopar® ATF +4, Automatic Transmission Fluid.
	4) Internal transfer case components binding, worn, or damaged.	4) Repair or replace components as necessary.
Transfer case noisy in all drive modes.	1) Insufficient or incorrect lubricant.	1) Drain and refill transfer case with the correct quantity of Mopar® ATF +4, type 9602, Automatic Transmission Fluid.
	2) Internal transfer case components binding, worn, or damaged.	2) Repair or replace components as necessary.

Condition	Possible Cause	Correction
Transfer case noisy while in, or jumps out of, 4LO mode.	1) Transfer case not completely engaged in 4LO position.	1) While rolling 2-3 MPH and the transmission in NEUTRAL, or clutch depressed on vehicles equipped with a manual transmission, shift transfer case to the 2WD or 4HI position, and then back into the 4LO position.
	2) Range fork damaged, inserts worn, or fork is binding on the shift rail.	2) Repair or replace components as necessary.
	3) Low range gear worn or damaged.	3) Repair or replace components as necessary.
Lubricant leaking from transfer case seals or vent.	1) Transfer case overfilled.	1) Drain lubricant to the correct level.
	2) Transfer case vent closed or restricted.	2) Clean or replace vent as necessary.
	3) Transfer case seals damaged or installed incorrectly.	3) Replace suspect seal.
Abnormal tire wear.	1) Extended operation in 4HI mode on dry surfaces,	1) Operate vehicle in 2WD mode on dry surfaces.

REMOVAL

1. Shift transfer case into 2WD.
2. Raise vehicle.
3. Drain transfer case lubricant.
4. Mark front and rear propeller shafts for alignment reference.
5. Support transmission with jack stand.
6. Remove the transfer case skid plate, if equipped.
7. Disconnect front and rear propeller shafts at transfer case.
8. Disconnect transfer case shift motor and mode sensor wire connectors (3).
9. Disconnect transfer case vent hose.
10. Support transfer case with transmission jack.
11. Secure transfer case to jack with chains.
12. Remove nuts attaching transfer case (2) to transmission (1).
13. Pull transfer case and jack rearward to disengage transfer case.
14. Remove transfer case from under vehicle.

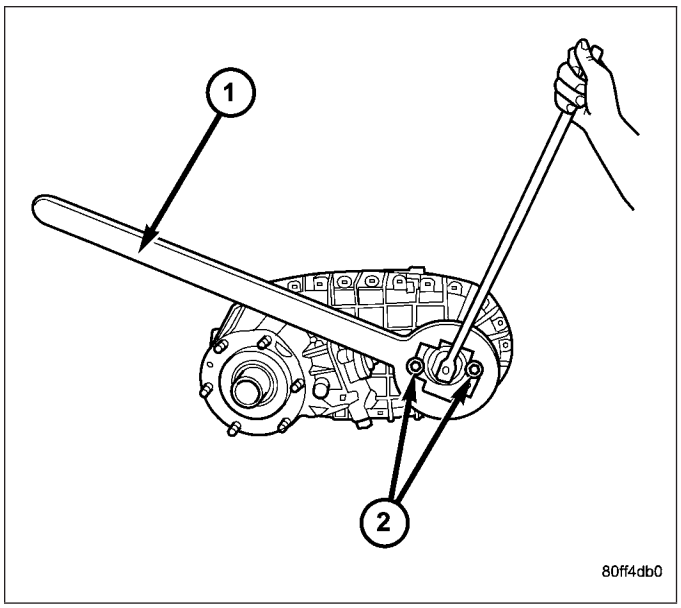


DISASSEMBLY

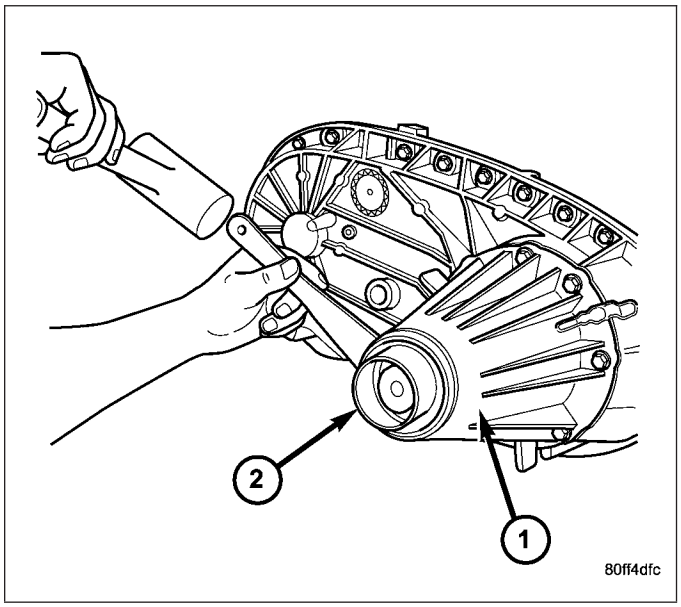
Position transfer case in a shallow drain pan. Remove drain plug and drain any remaining lubricant remaining in case.

COMPANION FLANGE AND EXTENSION HOUSING

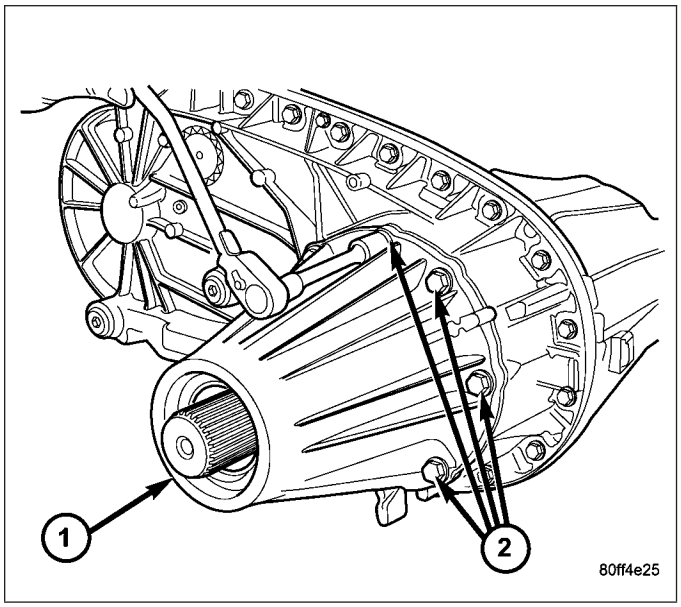
1. Install two bolts 180° apart into the front output shaft companion flange.
2. Place holder (1) over the bolts (2) and against the companion flange.
3. Remove and discard the front companion flange nut.
4. Remove the companion flange from the front output shaft. It may be necessary to use Flange puller 8992 to remove the companion flange.



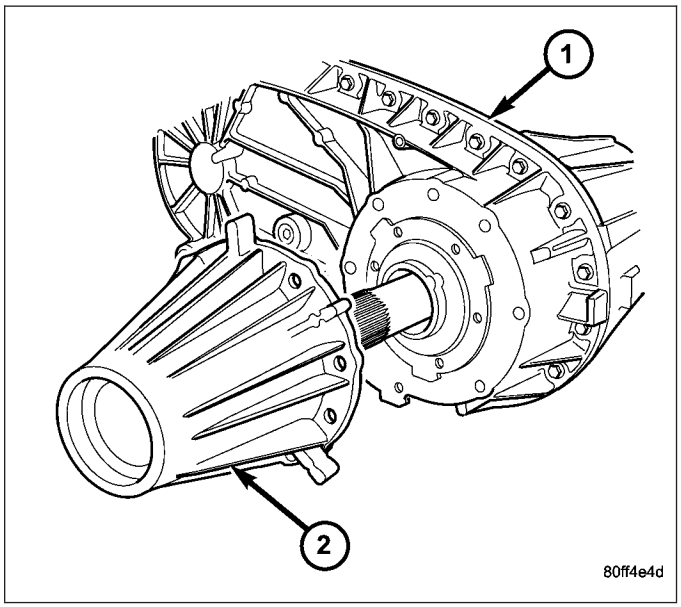
5. Use a suitable chisel or pry tool to remove the rear extension housing (1) dust boot (2).
6. Use a suitable chisel or pry tool to remove the rear extension housing seal.



7. Remove rear extension (1) bolts (2).



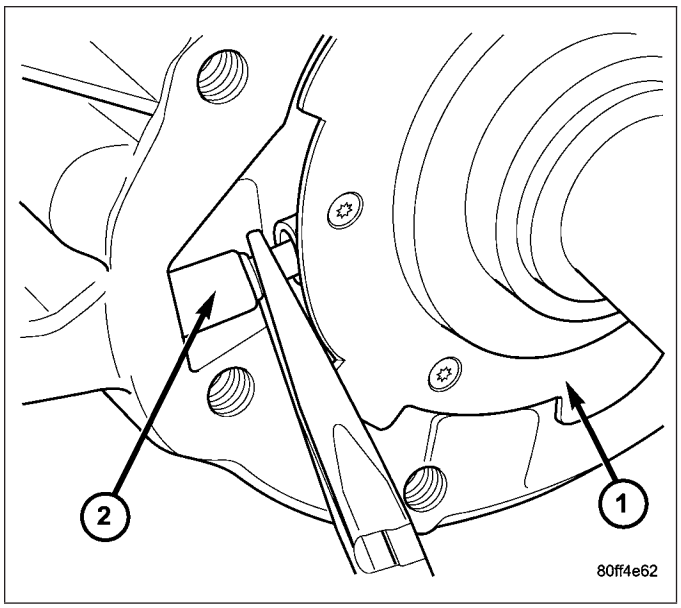
8. Remove rear extension housing (2). Tap extension once or twice with a plastic mallet to break sealer bead and loosen it.



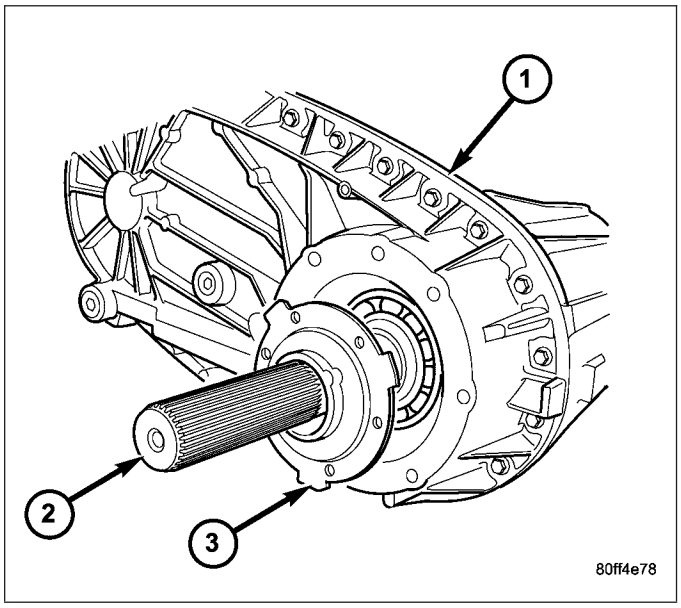
OIL PUMP AND REAR CASE

1. Disengage the oil pump pick-up tube (2) from the oil pump (1).

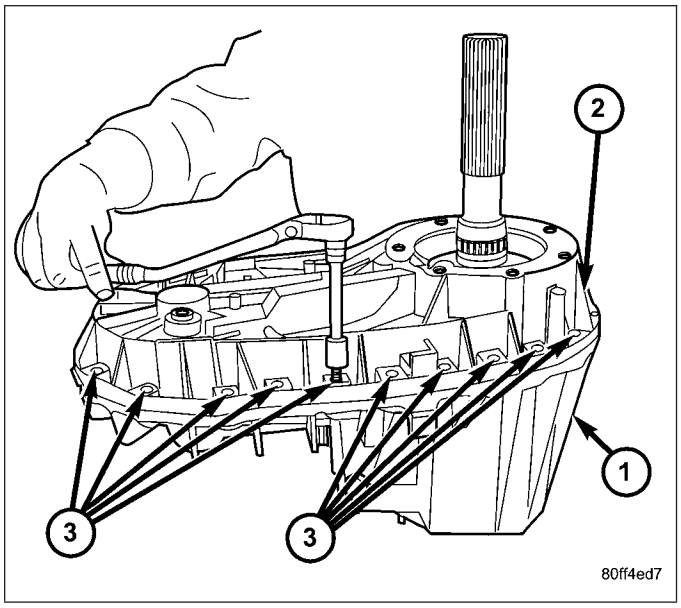
NOTE: The oil pump pick-up tube seals to the oil pump with an o-ring. Verify that the o-ring was removed with the tube and is in good condition. Replace the o-ring if necessary.



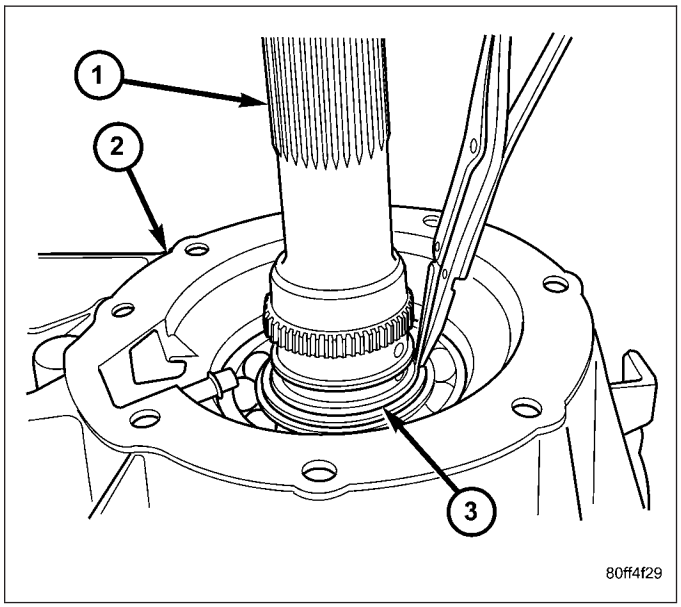
2. Remove the oil pump (3).



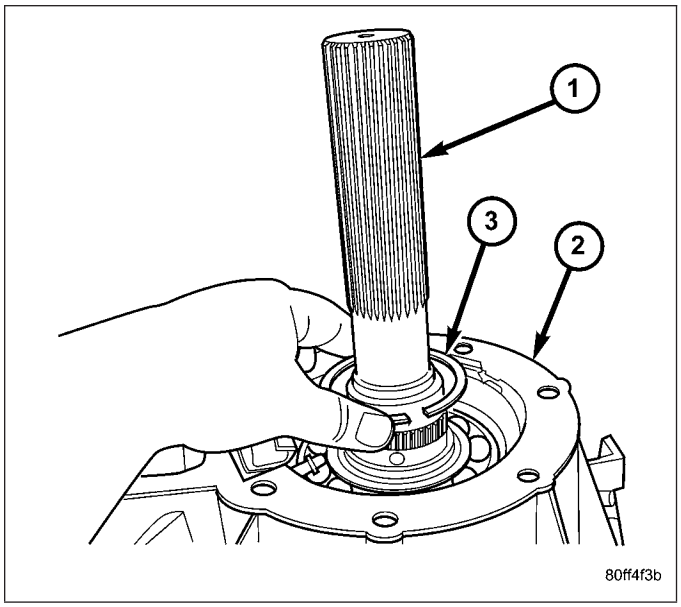
3. Remove rear case (2) -to-front case (1) bolts (3).



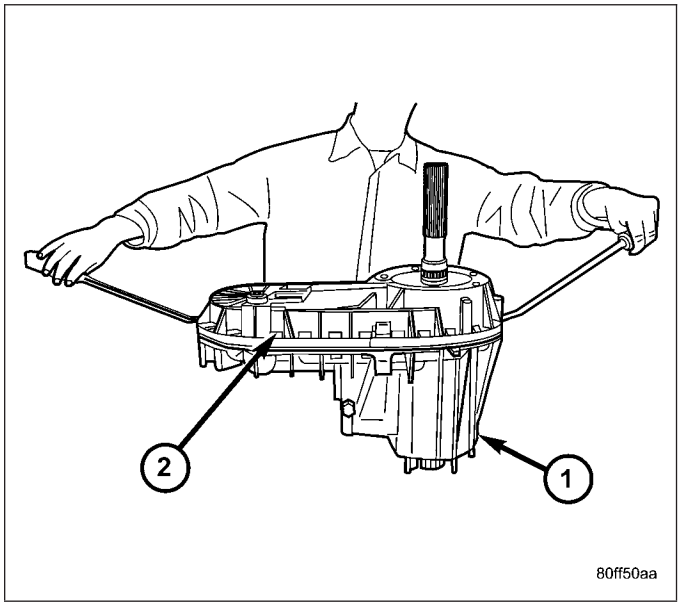
4. Remove the rear output shaft bearing inner snap-ring (3) from the output shaft (1) using suitable snap-ring pliers.



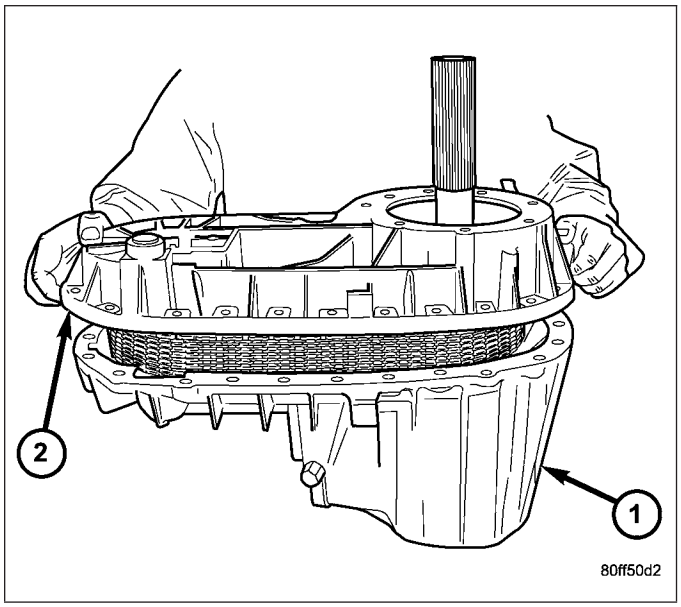
5. Remove the rear output shaft bearing inner snap-ring (3) from the output shaft (1).



6. Loosen rear case (2) from front case (1) with pry tool to break sealer bead. Insert tool at each end of case.

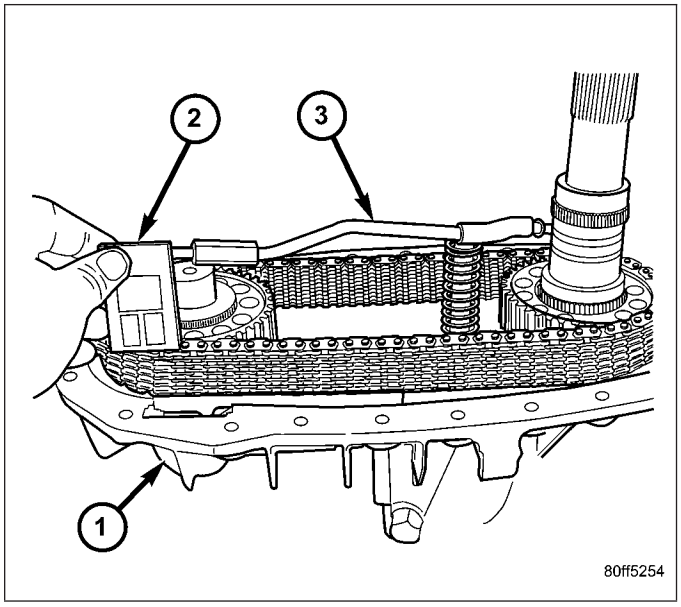


7. Unseat rear case from alignment dowels.
8. Remove the rear case (2) from the front case (1).

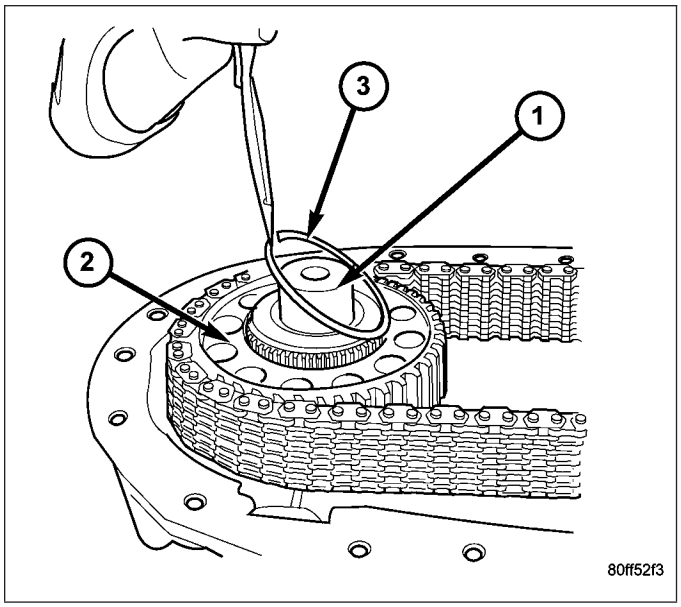


FRONT OUTPUT SHAFT AND DRIVE CHAIN

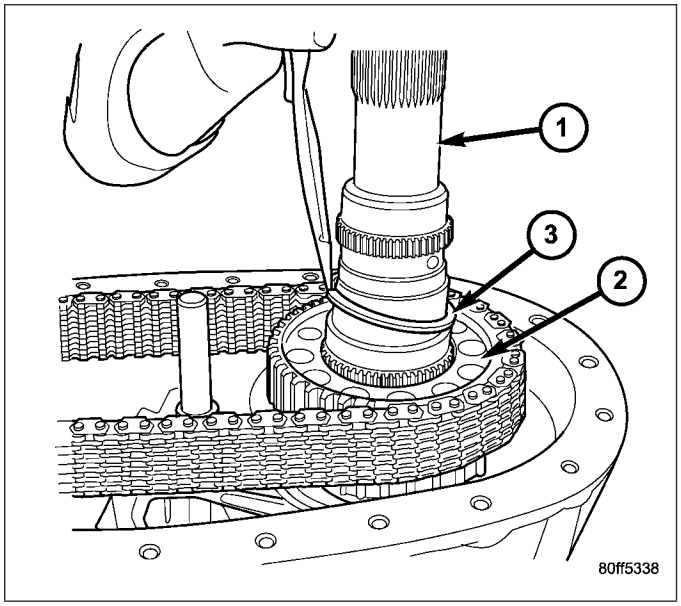
1. Remove the oil pick-up tube (3) and screen from the front case half (1).



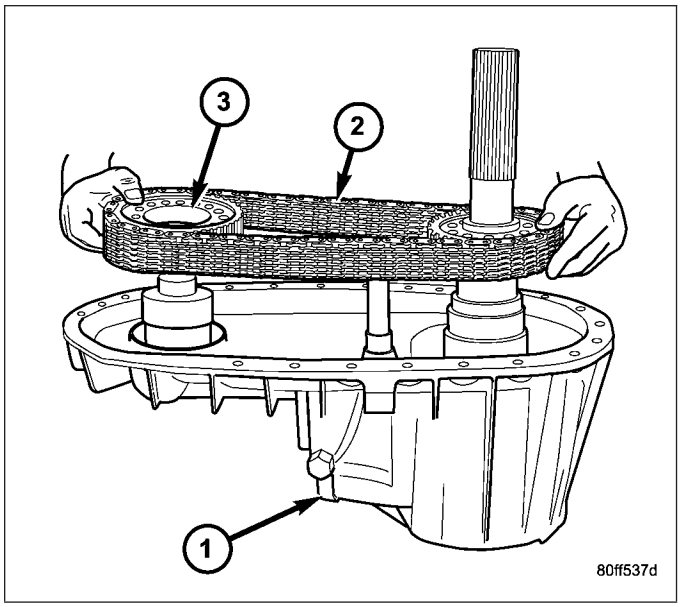
2. Remove the front output shaft (1) drive sprocket (2) retaining ring (3).



3. Remove the rear output shaft (1) drive sprocket (2) retaining ring (3).

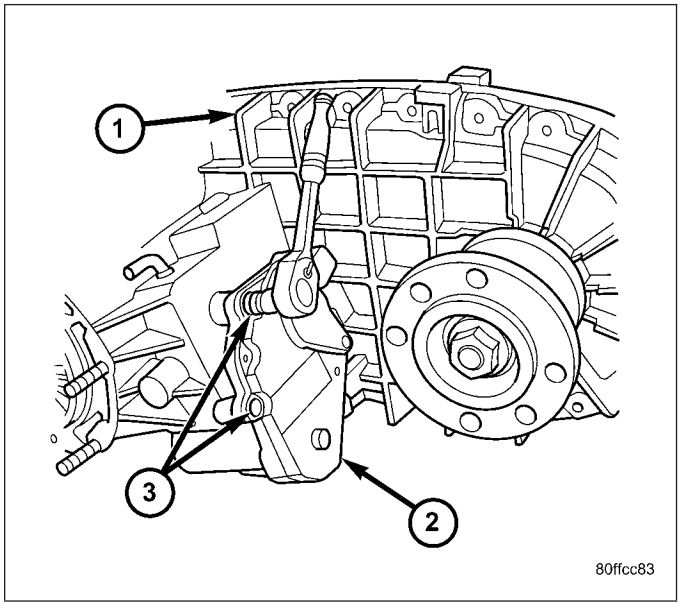


4. Pull front sprocket (3), rear sprocket, and chain (2) upward until clear of the front and rear output shaft sprocket splines.
5. Remove chain and sprockets as an assembly.

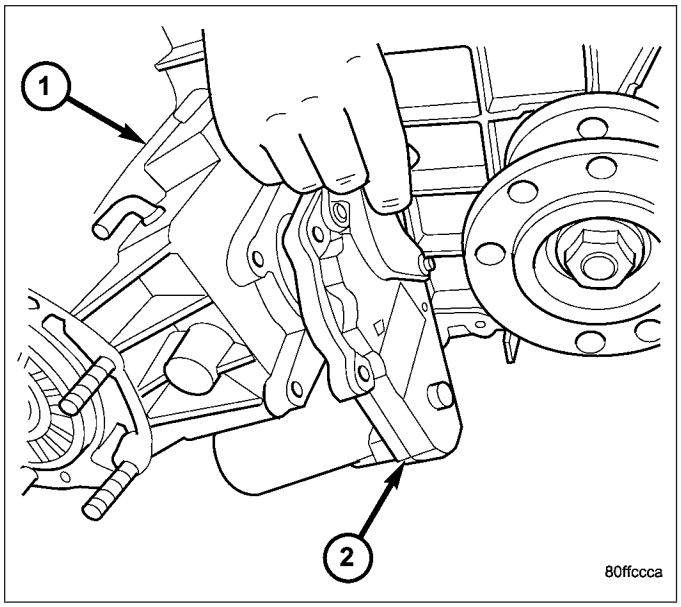


SHIFT FORKS AND MAINSHAFT

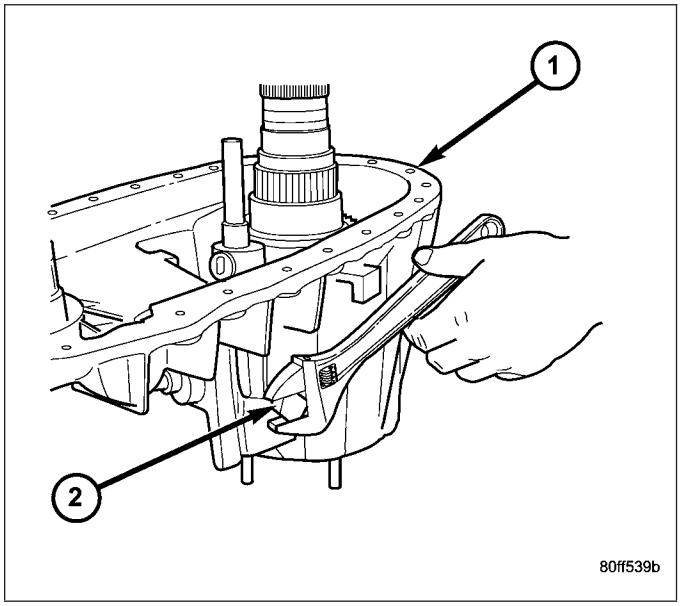
1. Remove the bolts (3) that hold the shift motor assembly (2) to the transfer case (1).



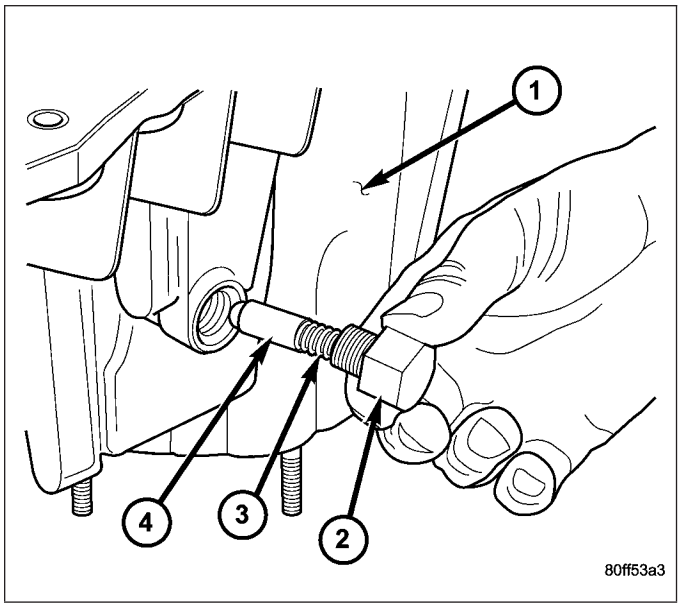
2. Remove the shift motor assembly (2) from the transfer case (1).



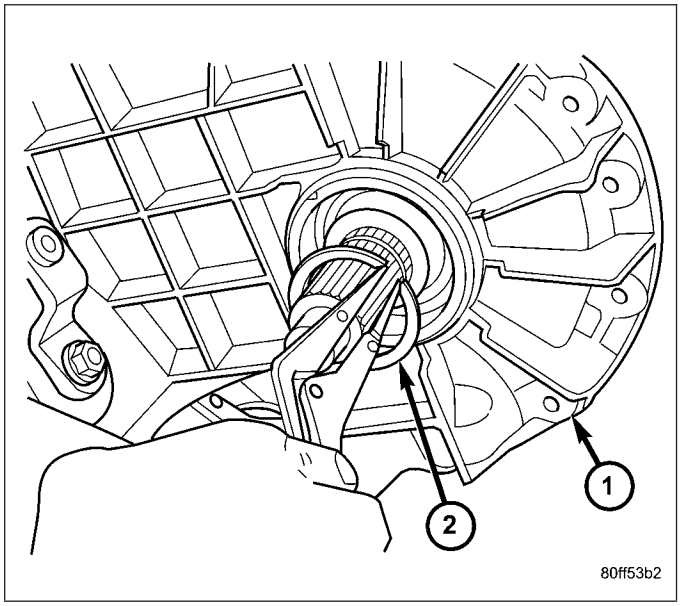
3. Remove the sector support with Socket 9033.
4. Loosen detent plug (2).



5. Remove detent plug (2), spring (3), and plunger (4). Note that the plug has an O-ring seal. Remove and discard this seal.

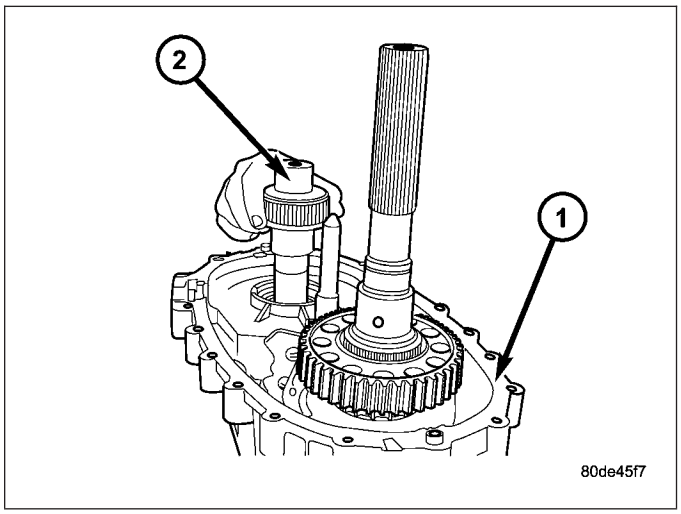


6. Using a screw mounted in a slide hammer, remove the front output shaft seal.

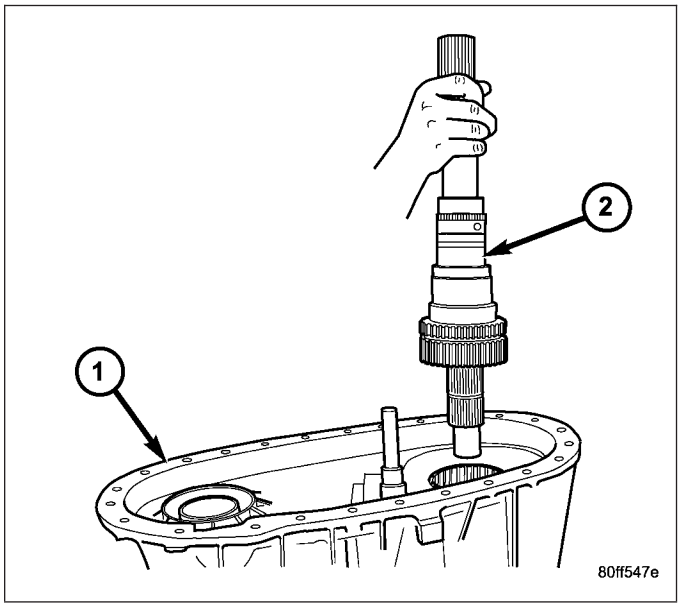


7. Remove the front output shaft snap-ring (2).

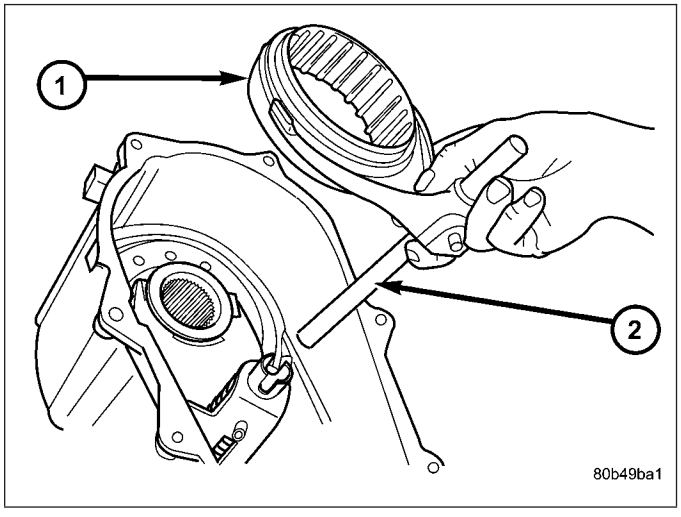
8. Remove front output shaft (2) from bearing in front case (1).



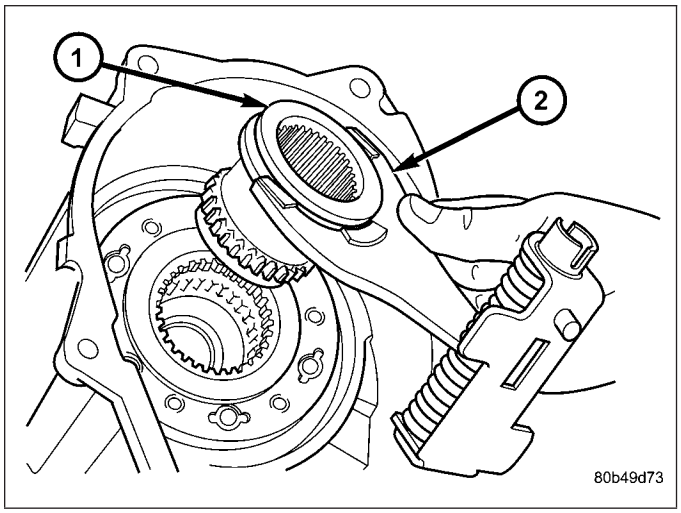
9. Pull mainshaft assembly (2) out of input gear, mode sleeve, and front case (1).



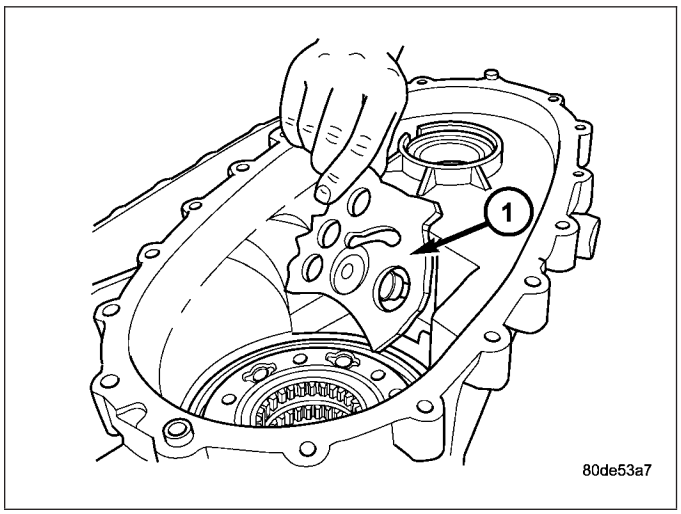
10. Remove mode fork (2), mode sleeve (1), and shift rail (2) as assembly. Note which way the sleeve fits in the fork (long side of sleeve goes to front or the points on the sleeve teeth go to the rear of case).



11. Remove range fork (2) and hub (1) as an assembly. Note fork position for installation reference.

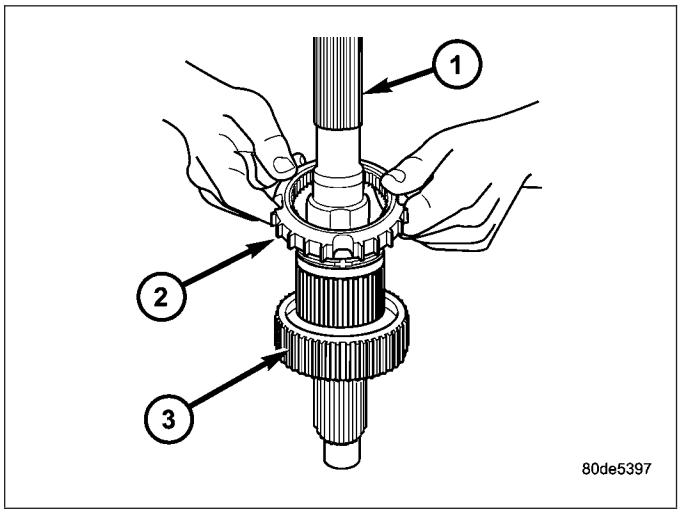


12. Remove the shift sector (1).

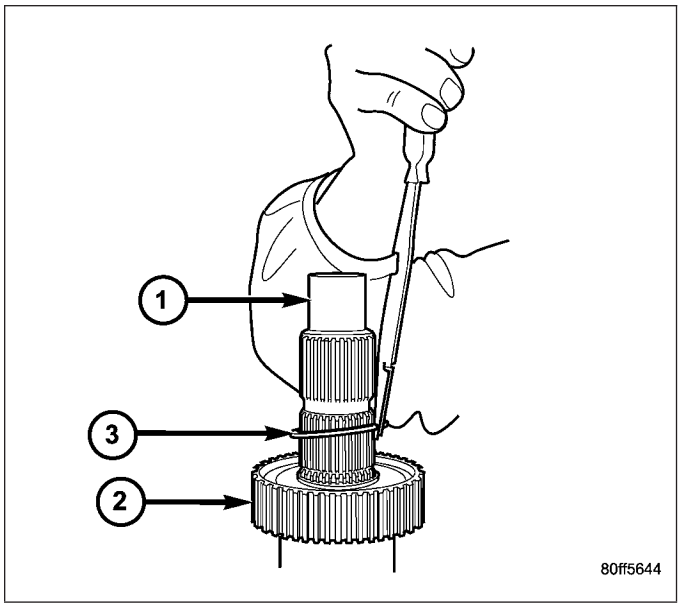


MAINSHAFT

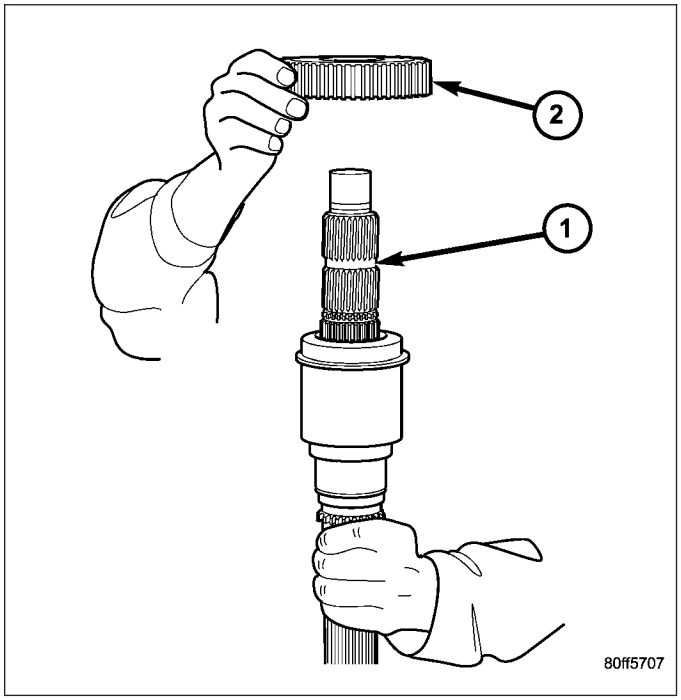
1. Remove the clutch gear (2) from the output shaft (1).



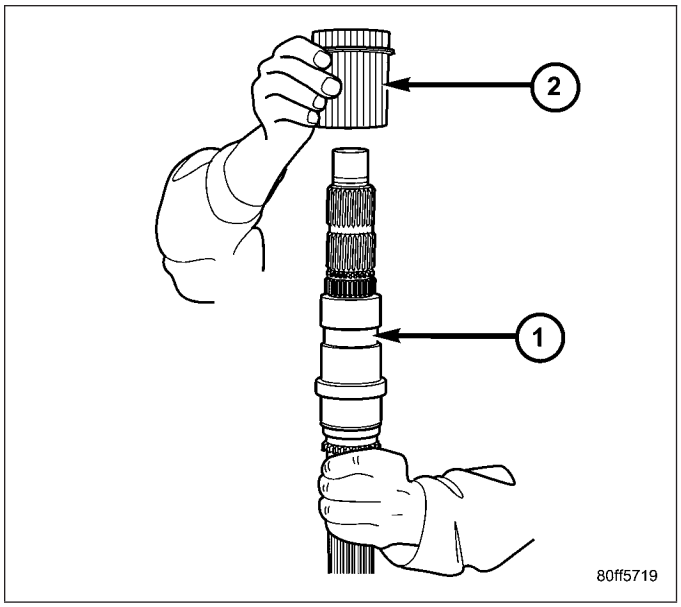
2. Remove the mode hub (2) retaining ring (3) from the mainshaft (1).



3. Remove the mode hub (2) from the mainshaft (1).

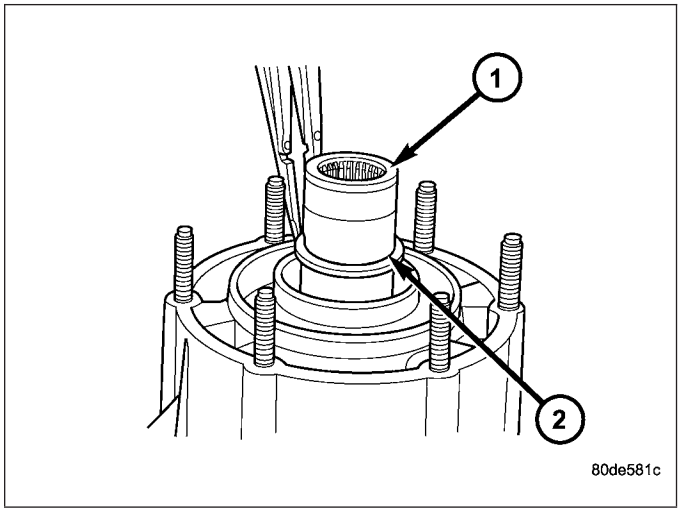


4. Remove the drive sprocket drive hub (2) from the mainshaft (1).

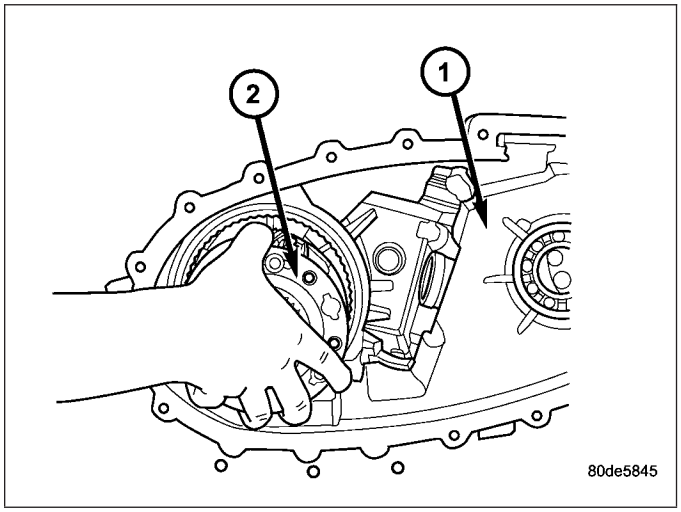


INPUT AND PLANETARY GEAR

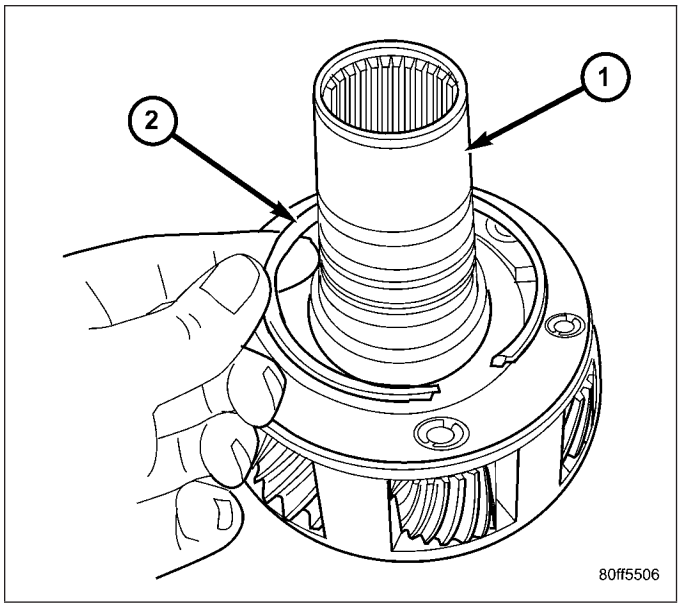
1. Remove input gear seal with suitable screw and slide hammer.
2. Remove input gear (1) retaining ring (2) with heavy duty snap-ring pliers.



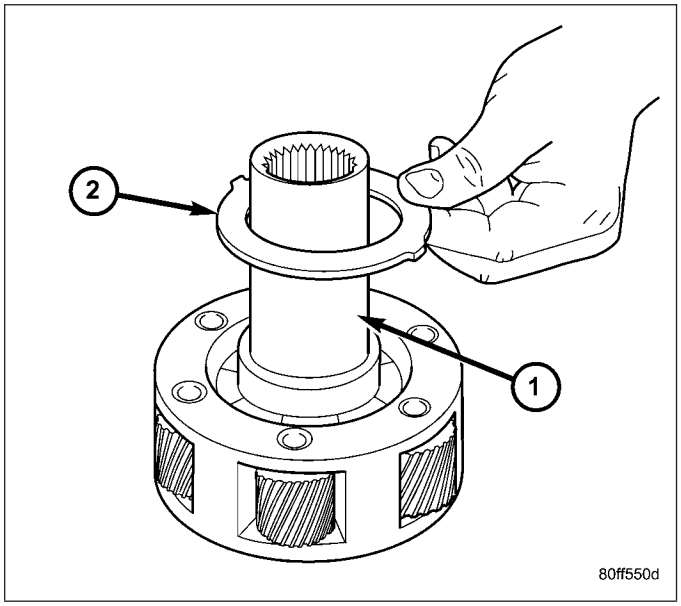
3. Place front case in horizontal position. Then remove input gear and low range gear as an assembly (2). Tap gear out of bearing with plastic mallet, if necessary.



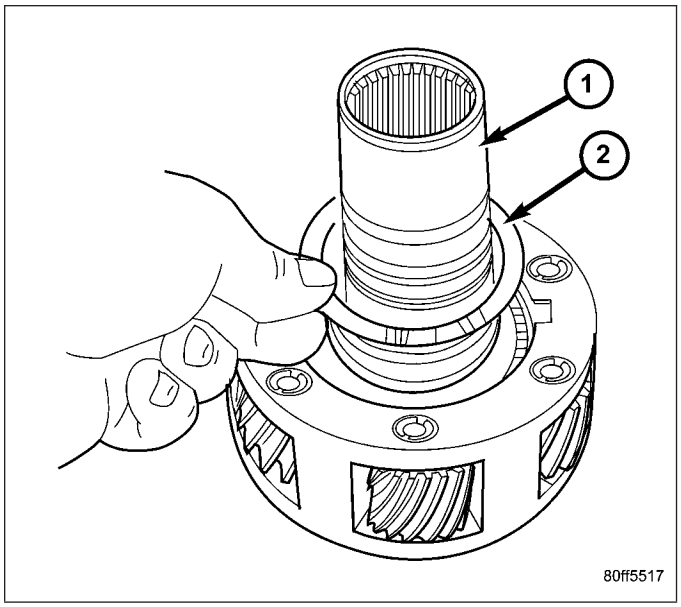
4. Remove snap-ring (2) that retains input gear (1) in the low range gear.



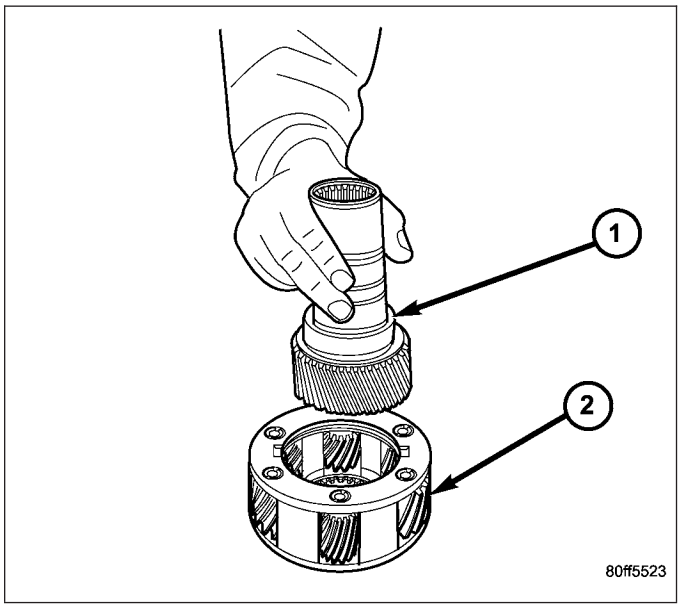
5. Remove retainer (2).



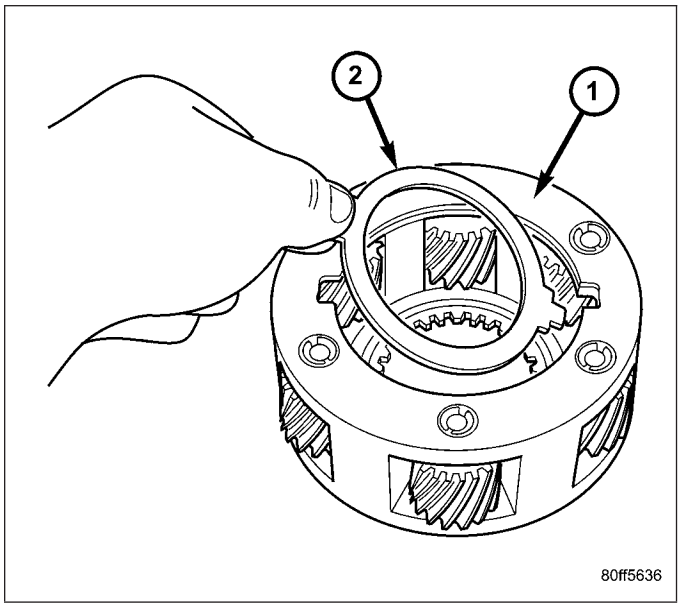
6. Remove front thrust plate (2).



7. Remove input gear (1).



8. Remove bottom tabbed thrust washer (2) from low range planetary (1).



CLEANING

Clean the transfer case parts with a standard parts cleaning solvent. Remove all traces of sealer from the cases and retainers with a scraper and 3M™ all purpose cleaner. Use compressed air to remove solvent residue from oil feed passages in the case halves, retainers, gears, and shafts.

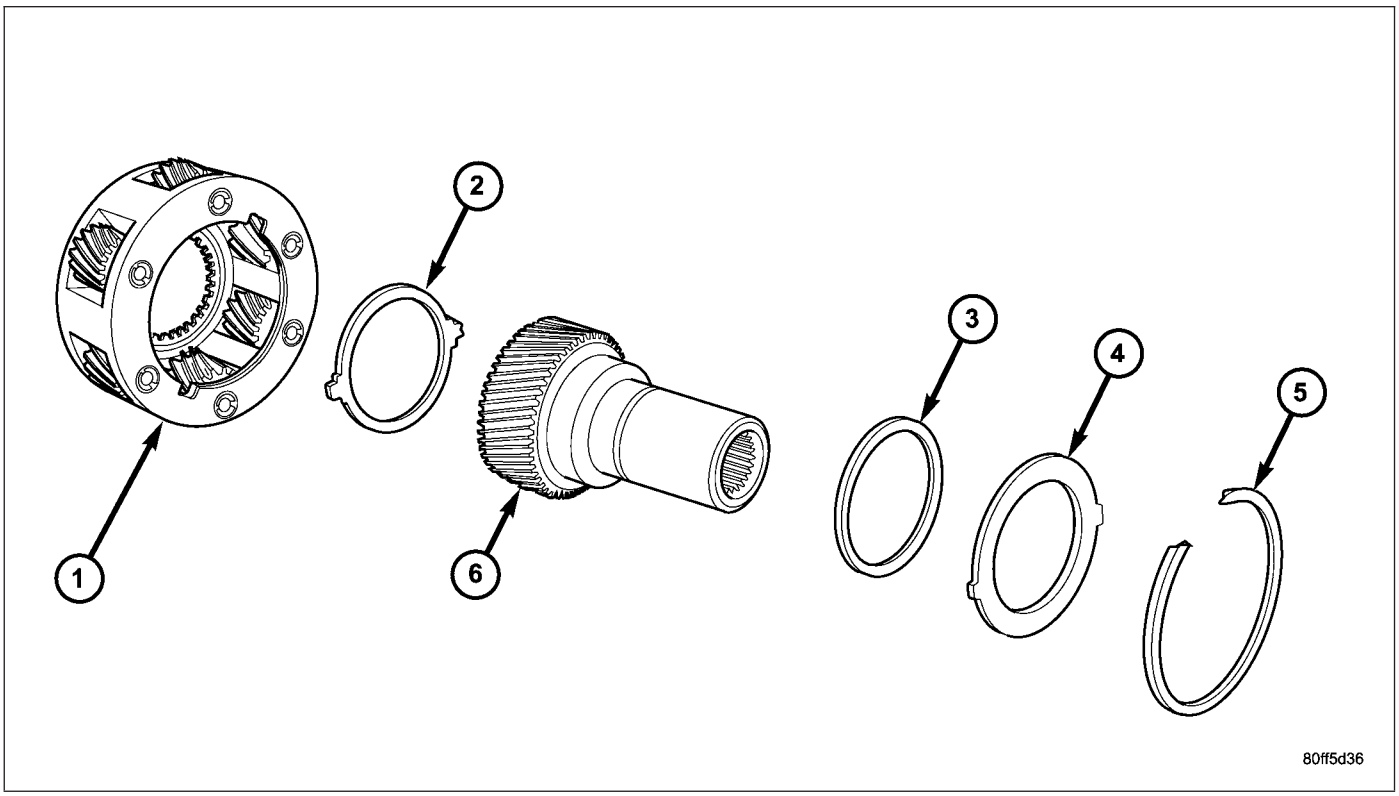
INSPECTION

MAINSHAFT/SPROCKET/HUB INSPECTION

Inspect the splines on the hub and shaft and the teeth on the sprocket. Minor nicks and scratches can be smoothed with an oilstone. However, replace any part that is damaged.

Check the contact surfaces in the sprocket bore and on the mainshaft. Minor nicks and scratches can be smoothed with 320-400 grit emery cloth but do not try to salvage the shaft if nicks or wear is severe.

INPUT GEAR AND PLANETARY CARRIER



Input Gear And Carrier Components

1 - PLANETARY CARRIER
2 - REAR THRUST WASHER
3 - FRONT THRUST WASHER
4 - CARRIER LOCK RING
5 - CARRIER LOCK RETAINING RING
6 - INPUT GEAR

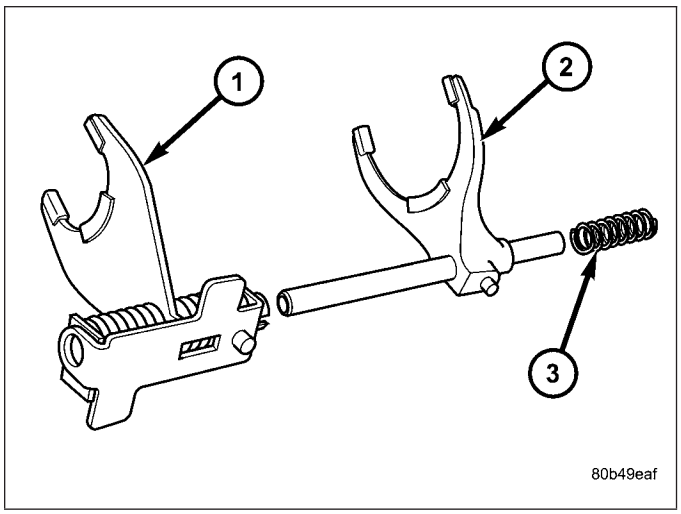
Check the teeth on the gear (6). Minor nicks can be dressed off with an oilstone but replace the gear if any teeth are broken, cracked, or chipped. The bearing surface on the gear can be smoothed with 300-400 grit emery cloth if necessary.

Examine the carrier body (1) and pinion gears for wear or damage. Check the pinion gear thrust washers on the pinon pins for damage. The carrier will have to be replaced as an assembly if the body, pinion pins, or pinion gears are damaged.

Check the lock ring (4) and both thrust washers (2, 3) for wear or cracks. Replace them if necessary. Also replace the lock retaining ring if bent, distorted, or broken.

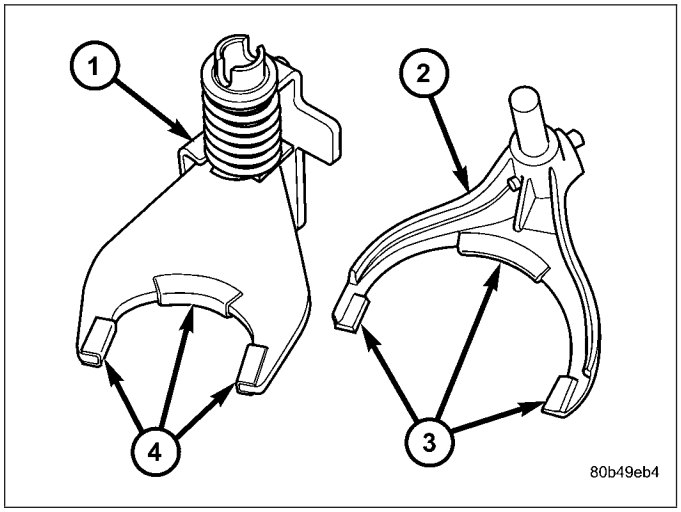
SHIFT FORKS/HUBS/SLEEVES

Check condition of the shift forks (1) and mode fork shift rail (2). Minor nicks on the shift rail can be smoothed with 320-400 grit emery cloth.



Inspect the shift fork wear pads (3, 4). The mode (2) and range fork (1) pads are serviceable and can be replaced if necessary.

Check both of the sleeves for wear or damage, especially on the interior teeth. Replace the sleeves if wear or damage is evident.



REAR EXTENSION HOUSING

Inspect the extension housing seal and bushing. Replace both components if either show any sign of wear or damage.

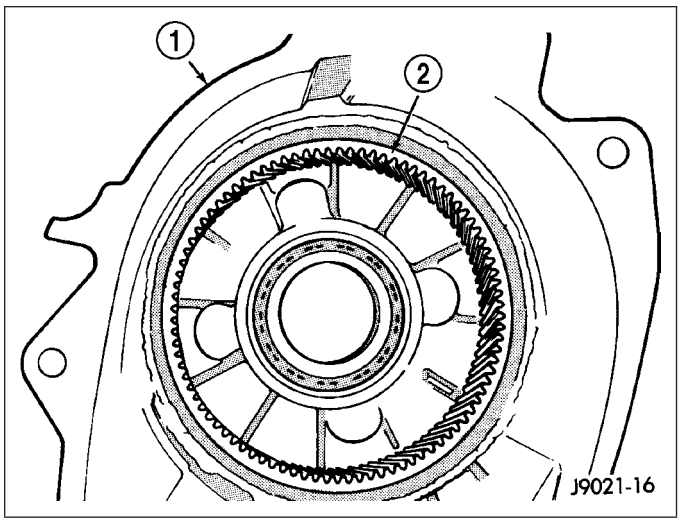
FRONT OUTPUT SHAFT AND DRIVE CHAIN

Inspect the shaft threads, sprocket teeth, and bearing surfaces. Minor nicks on the teeth can be smoothed with an oilstone. Use 320-400 grit emery to smooth minor scratches on the shaft bearing surfaces. Rough threads on the shaft can be chased if necessary. Replace the shaft if the threads are damaged, bearing surfaces are scored, or if any sprocket teeth are cracked or broken.

Examine the drive chain and shaft bearings. Replace the chain and both sprockets if the chain is stretched, distorted, or if any of the links bind. Replace the bearings if rough, or noisy.

LOW RANGE ANNULUS GEAR

Inspect annulus gear (2) condition carefully. The gear is only serviced as part of the front case (1). If the gear is damaged, it will be necessary to replace the gear and front case as an assembly. Do not attempt to remove the gear.



FRONT AND REAR CASES

Inspect the cases for wear and damage.

Check case condition. If leaks were a problem, look for gouges and severe scoring of case sealing surfaces. Also make sure the front case mounting studs are in good condition.

Check the front case mounting studs and vent tube. The tube can be secured with Loctite™ 271 or 680 if loose. The stud threads can be cleaned up with a die if necessary. Also check condition of the fill/drain plug threads in the rear case. The threads can be repaired with a thread chaser or tap if necessary. Or the threads can be repaired with Helicoil® stainless steel inserts if required.

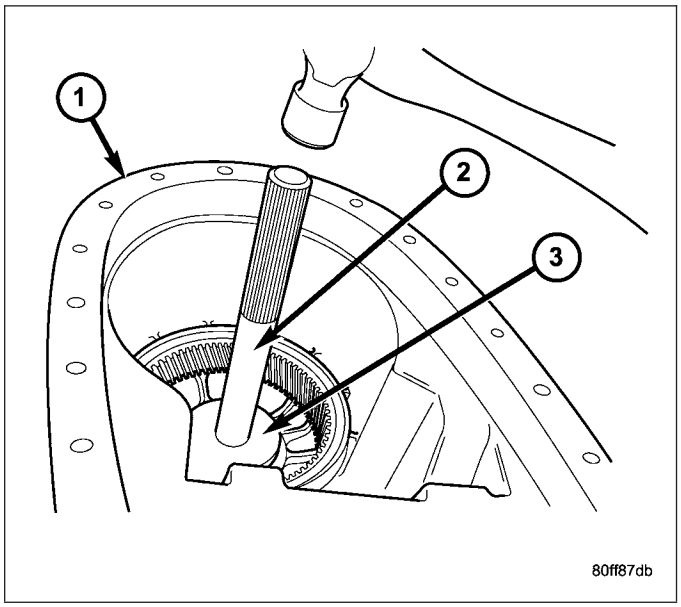
OIL PUMP/OIL PICKUP

Examine the oil pump pickup parts. Replace the pump if any part appears to be worn or damaged. Do not disassemble the pump as individual parts are not available. The pump is only available as a complete assembly. The pickup screen, hose, and tube are the only serviceable parts and are available separately.

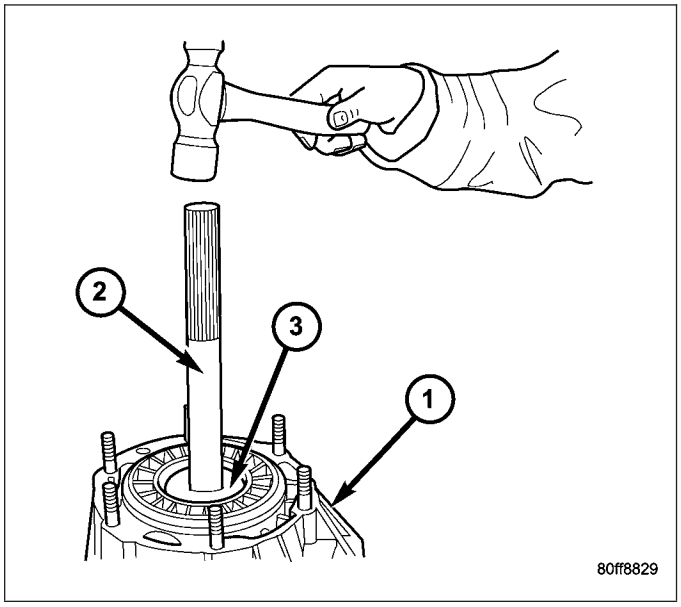
ASSEMBLY

BEARINGS AND SEALS

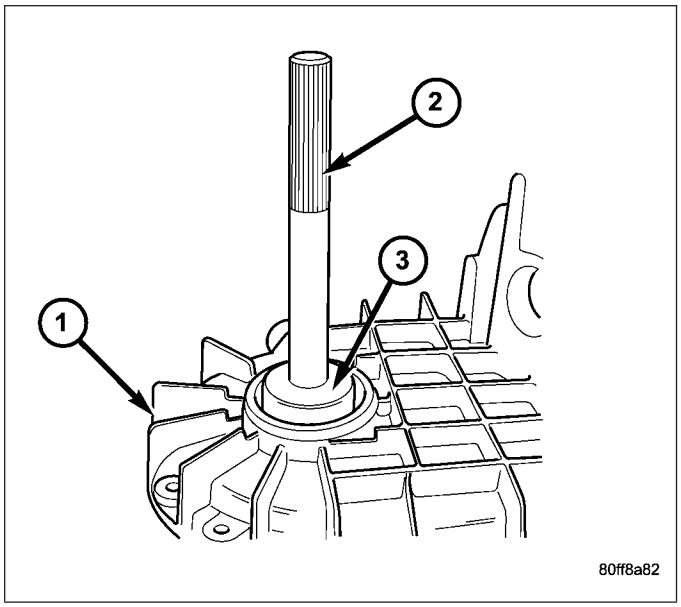
1. Remove the input shaft bearing snap-ring from the front case half with suitable snap-ring pliers.
2. Remove the input shaft bearing from the front case half with Installer 6953 (3) and Handle C-4171 (2).



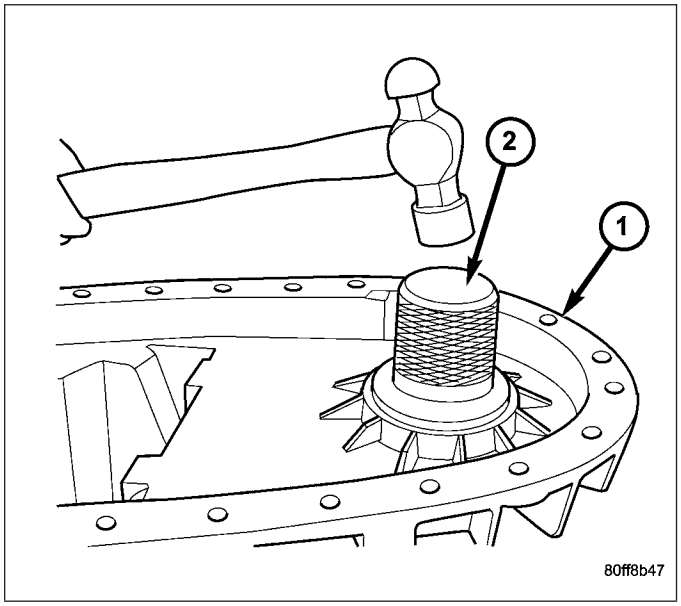
3. Install the input shaft bearing into the front case half with Installer 8151 (3) inverted on Handle C-4171 (2).
4. Install the input shaft bearing snap-ring into the front case half with suitable snap-ring pliers.



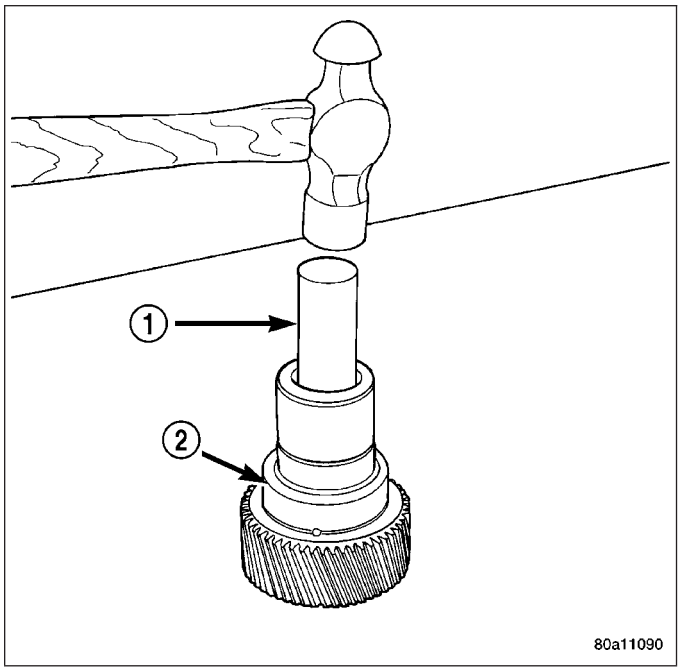
5. Remove the front output shaft front bearing snap-ring from the front case half.
6. Using Installer 6953 (3) and Handle C-4171 (2), remove the front output shaft front bearing.



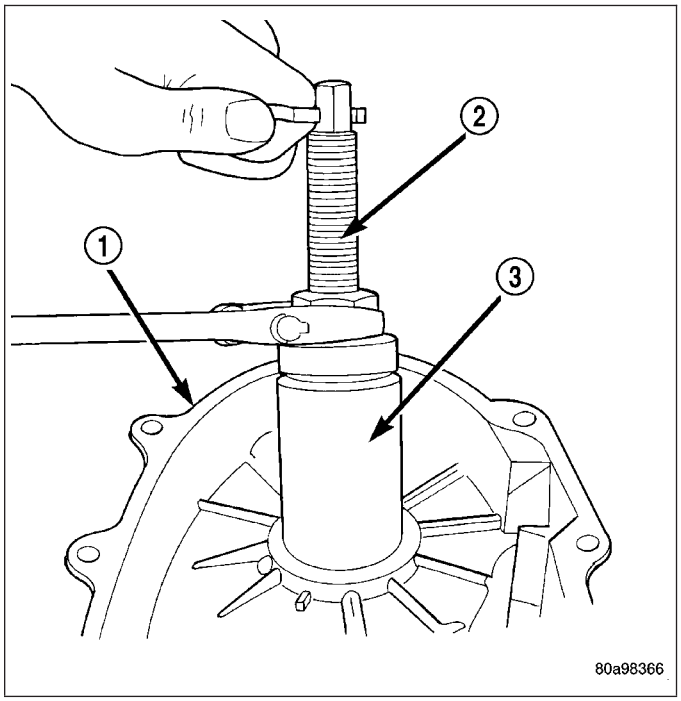
7. Start front output shaft front bearing in case. Then seat bearing with Installer 8891 (2).
8. Install front output shaft bearing retaining ring.



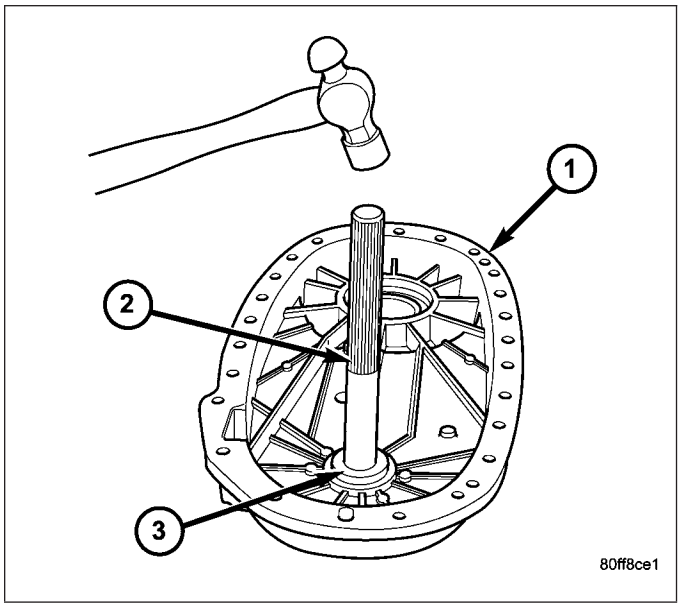
9. Remove input gear pilot bearing by inserting a suitably sized drift (1) into the splined end of the input gear (2) and driving the bearing out with the drift and a hammer.
10. Install new pilot bearing with Installer 9035.



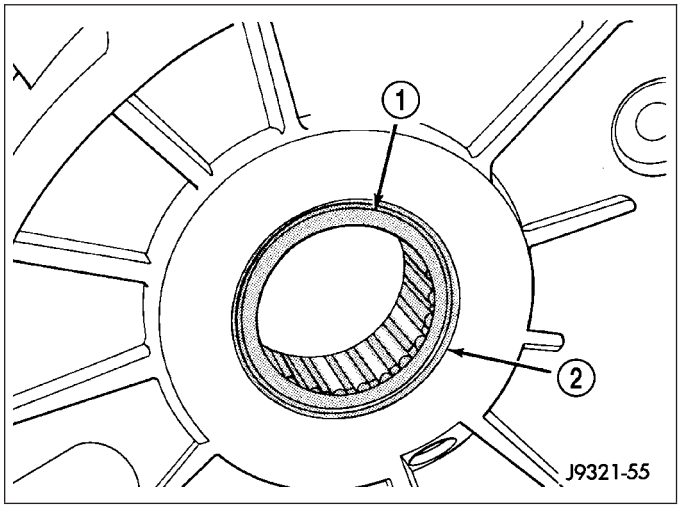
11. Remove the front output shaft rear bearing with the screw and jaws from Remover L-4454 (2) and Cup 8148 (3).



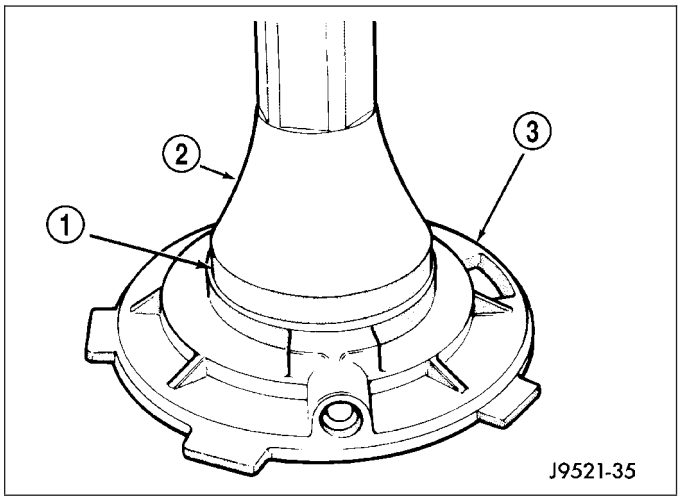
12. Install new bearing with Tool Handle C-4171 (2) and Installer 8128 (3).



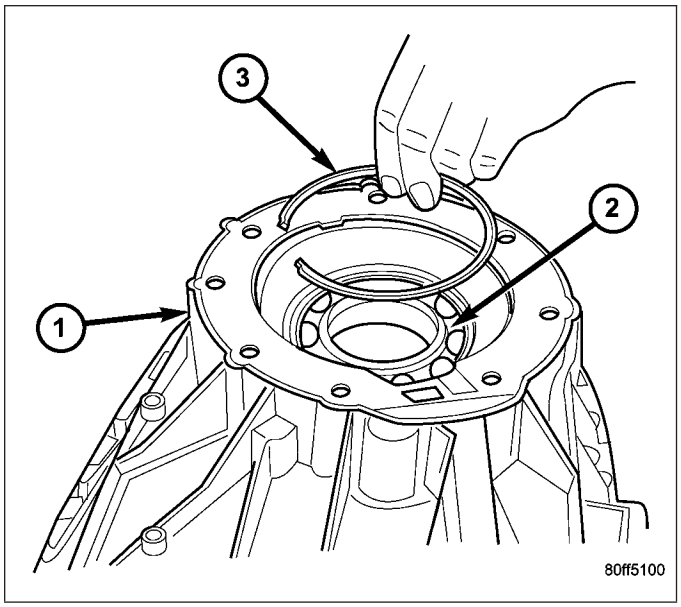
13. The bearing bore is chamfered at the top. Install the bearing so it is flush (1) with the lower edge of this chamfer (2).



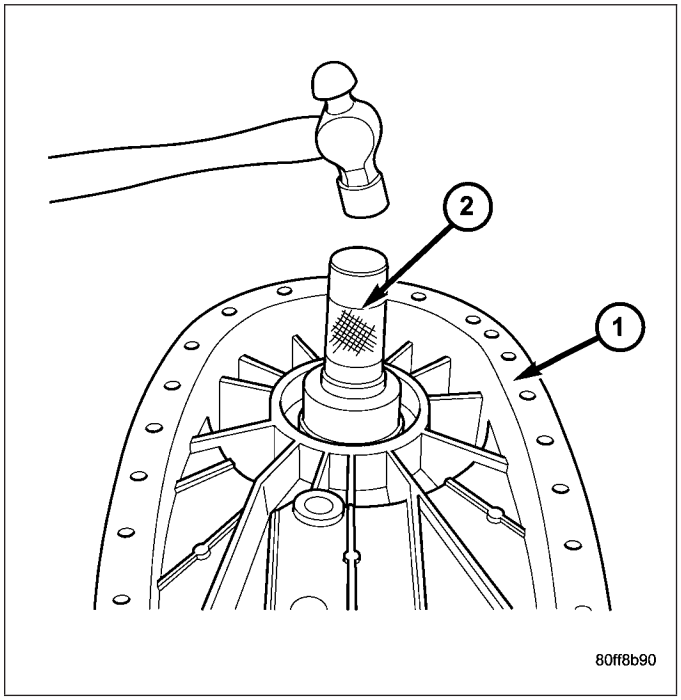
14. Remove seal from oil pump with suitable pry tool.
15. Install new seal in oil pump with Installer 7888 (2).



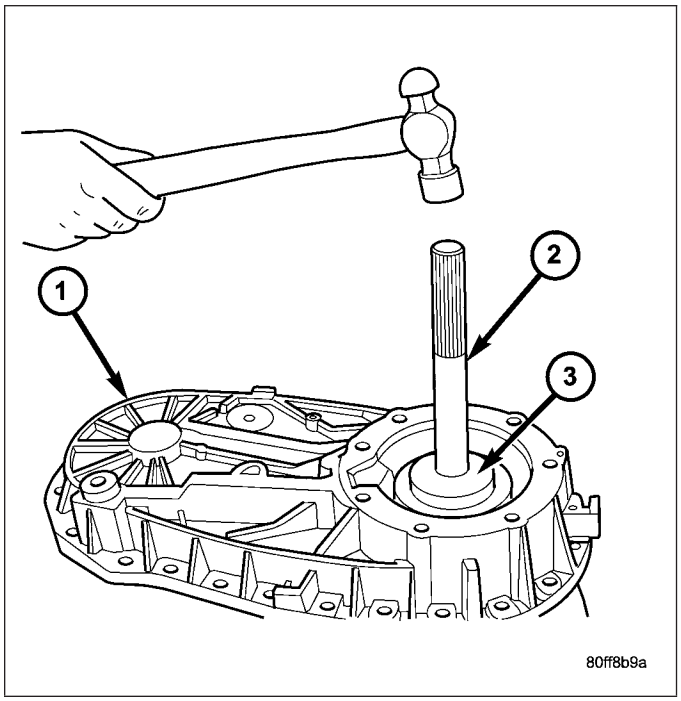
16. Remove the rear output shaft bearing (2) snap-ring (3) from the rear case half (1).



17. Remove the rear output shaft bearing from the rear case (1) using Installer 7888 (2).

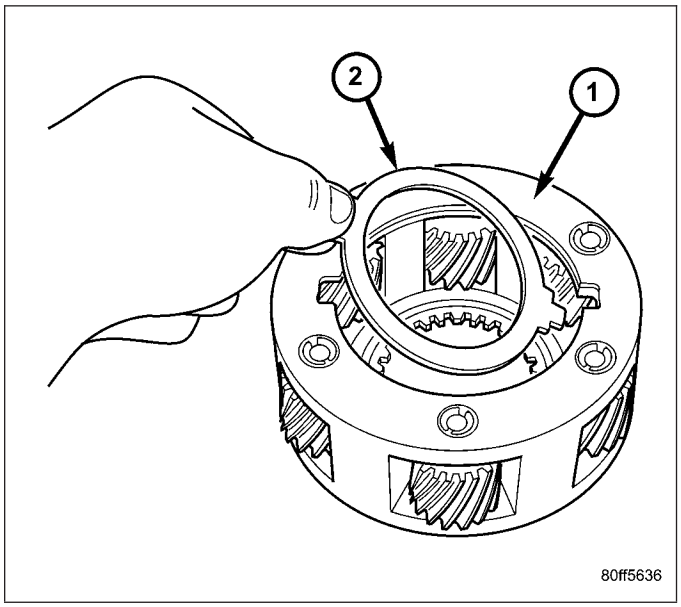


18. Install the rear output shaft bearing into the rear case (1) using Installer 8152 (3) and Handle C-4171 (2).
19. Install the rear output shaft bearing snap-ring into the rear case half.

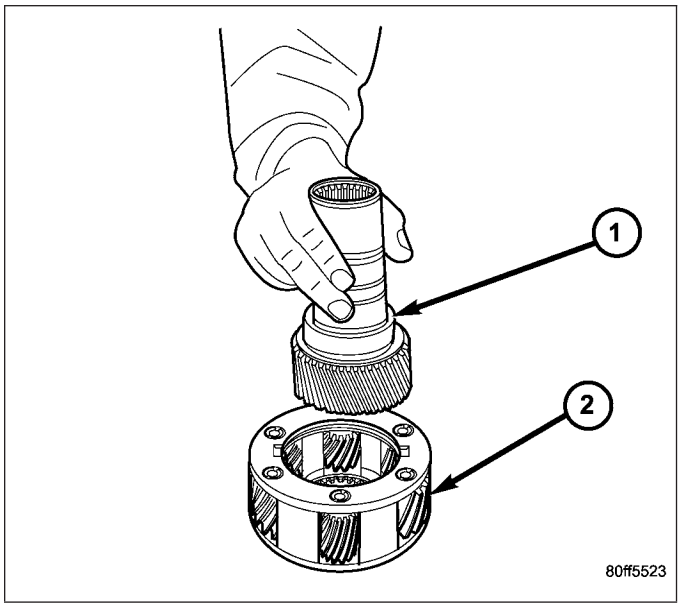


INPUT AND PLANETARY GEAR

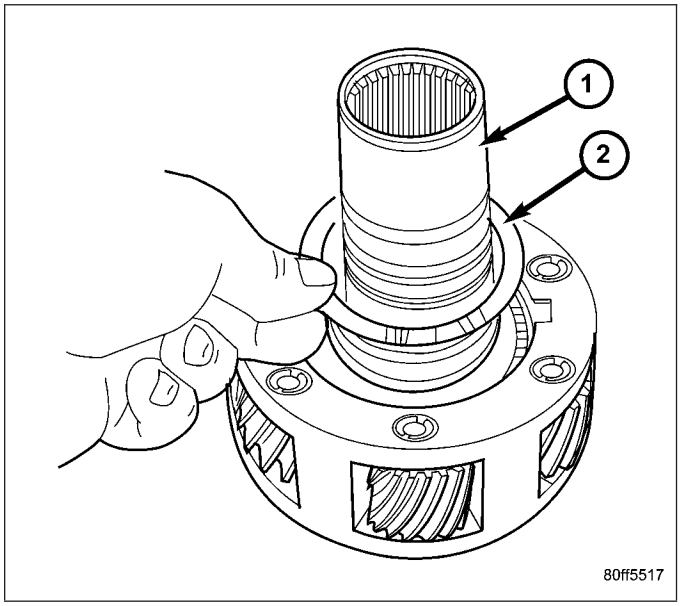
1. Lubricate gears and thrust washers with recommended transmission fluid.
2. Install bottom thrust washer (2) in low range gear planetary (1). Be sure washer tabs are properly aligned in gear notches.



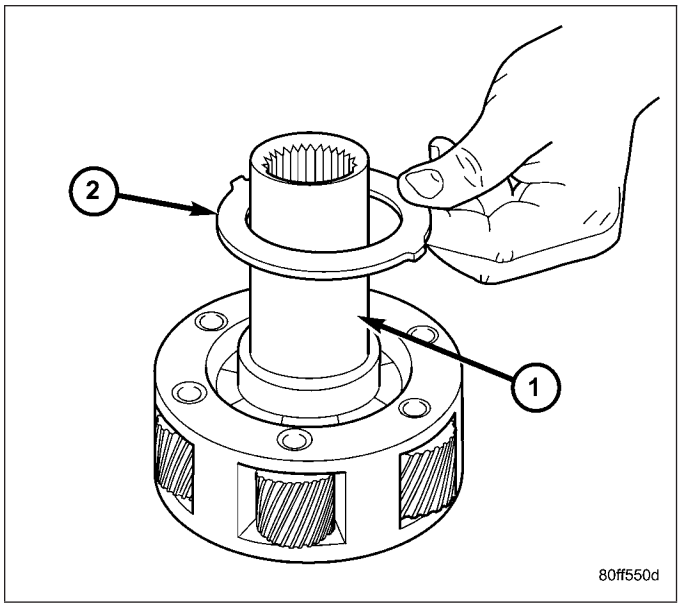
3. Install input gear (1) in low range gear (2). Be sure input gear is fully seated.



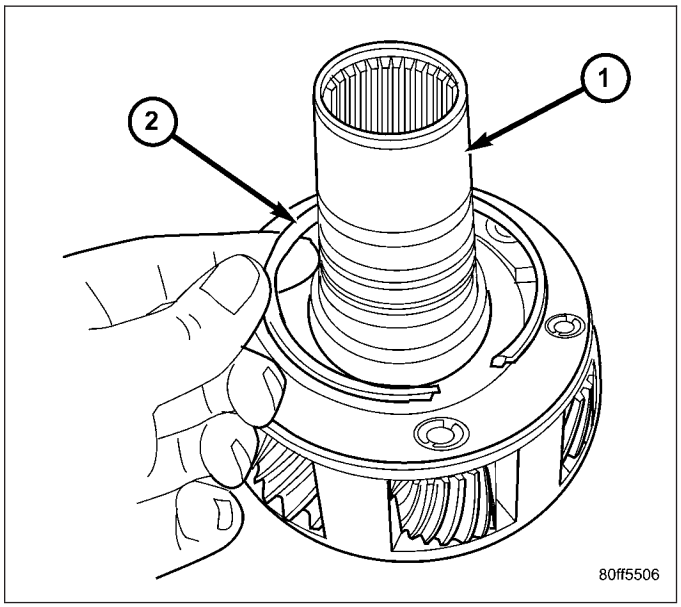
4. Install remaining thrust washer (2) in low range gear and on top of input gear (1).



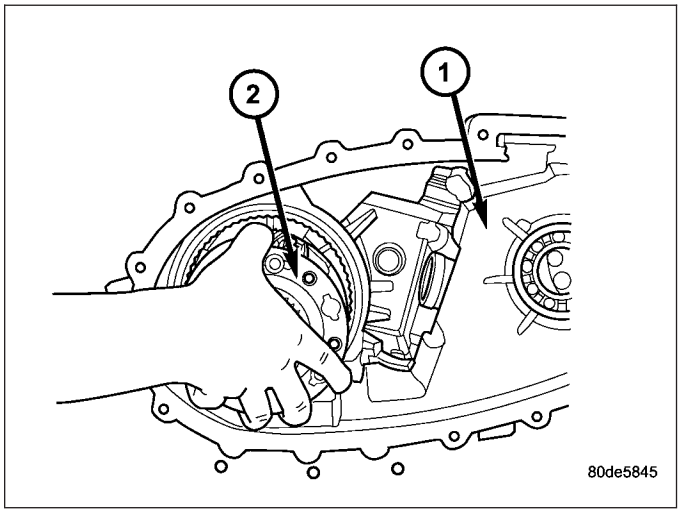
5. Install retainer (2) on input gear (1).



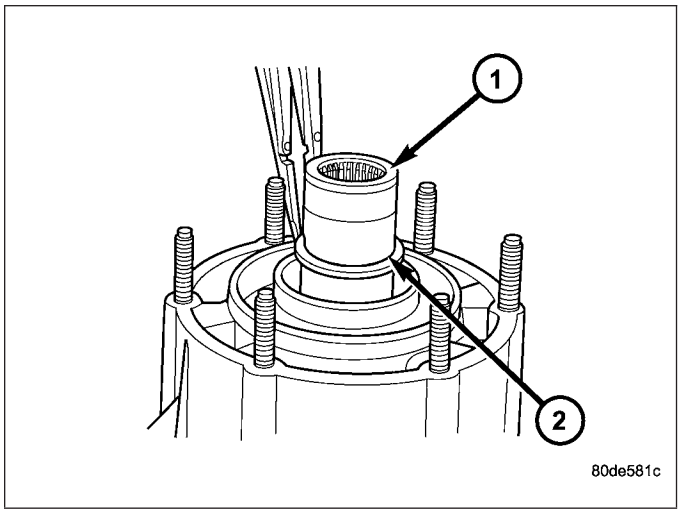
6. Install snap-ring (2).



7. Align and install low range/input gear assembly (2) in front case (1). Be sure low range gear pinions are engaged in annulus gear and that input gear shaft is fully seated in front bearing.

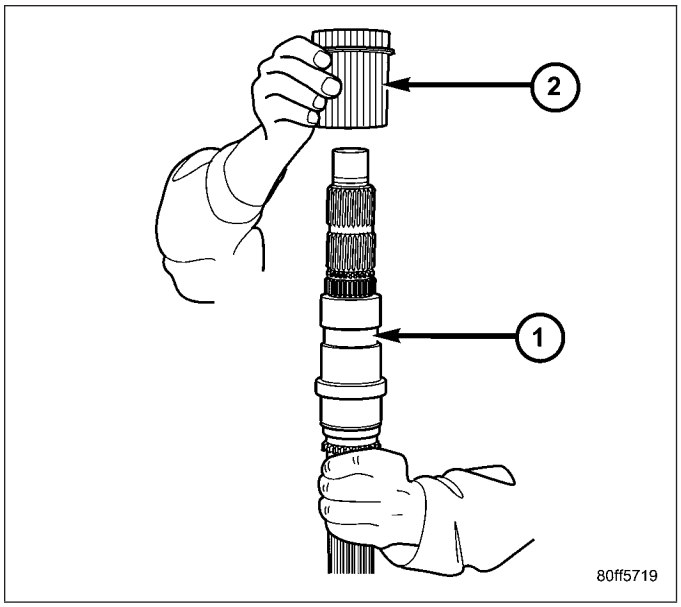


8. Install snap-ring (2) to hold input/low range gear (1) into front bearing.
9. Install a new input gear oil seal with Installer 9036 and Handle C-4171.

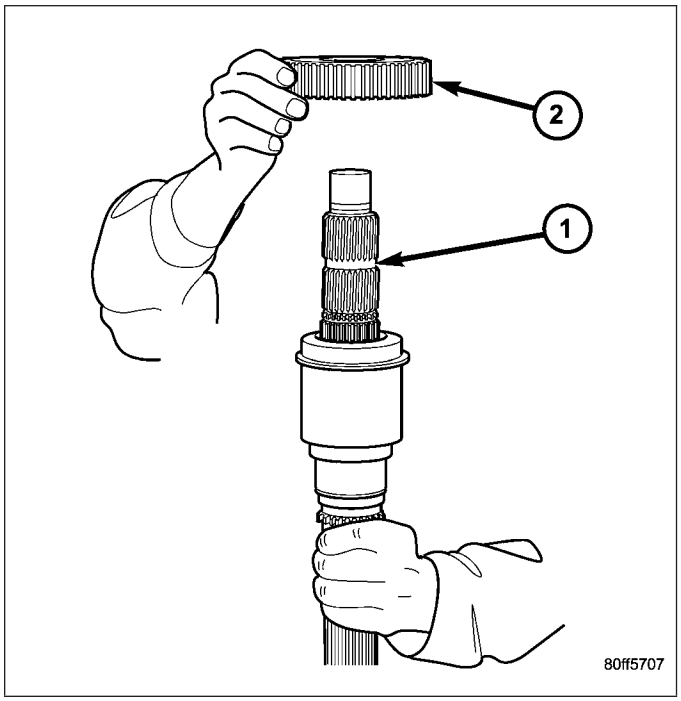


SHIFT FORKS AND MAINSHAFT

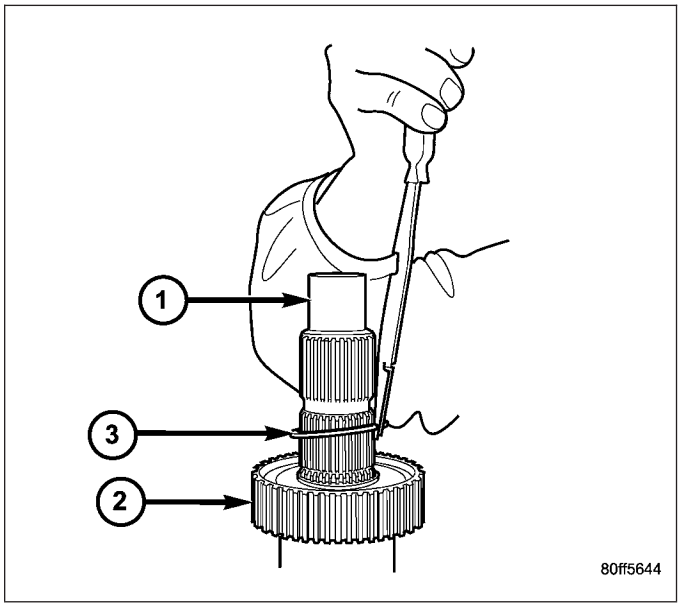
1. Lubricate mainshaft splines with recommended transmission fluid.
2. Coat the interior of the drive sprocket hub with ATF+4 and install the drive sprocket drive hub (2) onto the mainshaft (1).



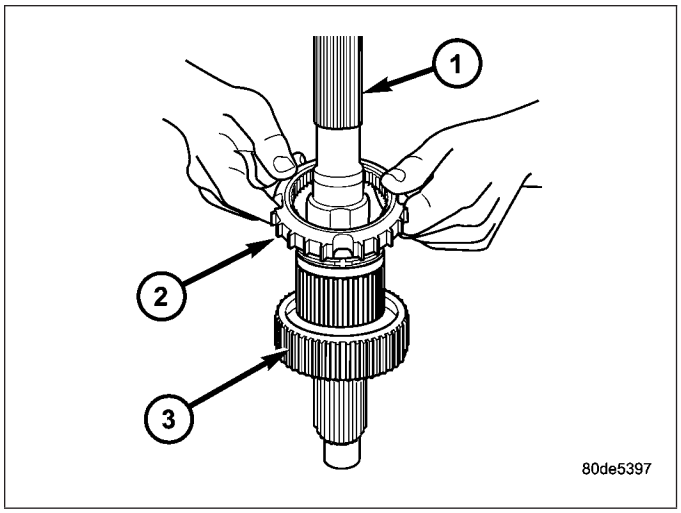
3. Install the mode hub (2) onto the mainshaft (1).



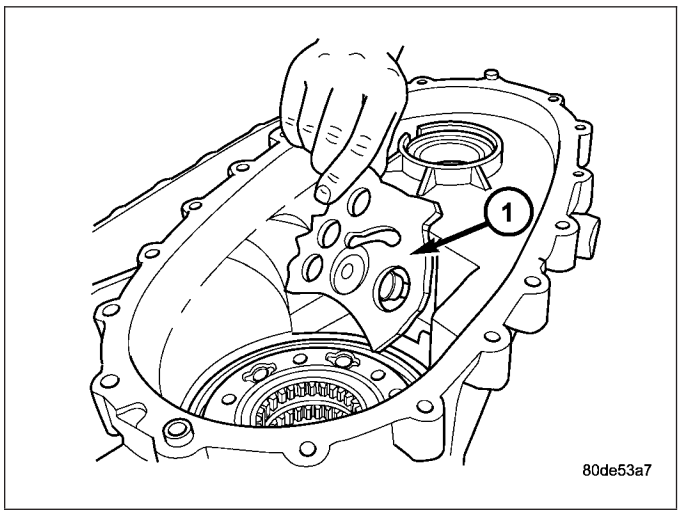
4. Install the mode hub (2) retaining ring (3) onto the mainshaft (1).



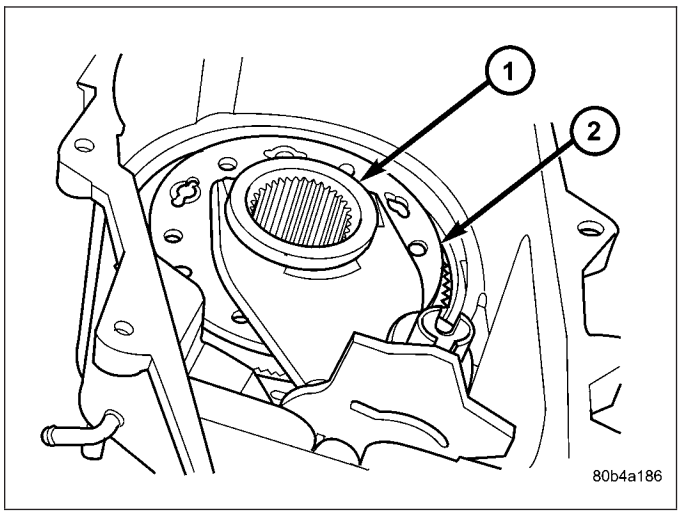
5. Install the clutch gear (2) onto the output shaft (1). Verify that the pointed ends of the clutch gear teeth are pointing to the front of the mainshaft.



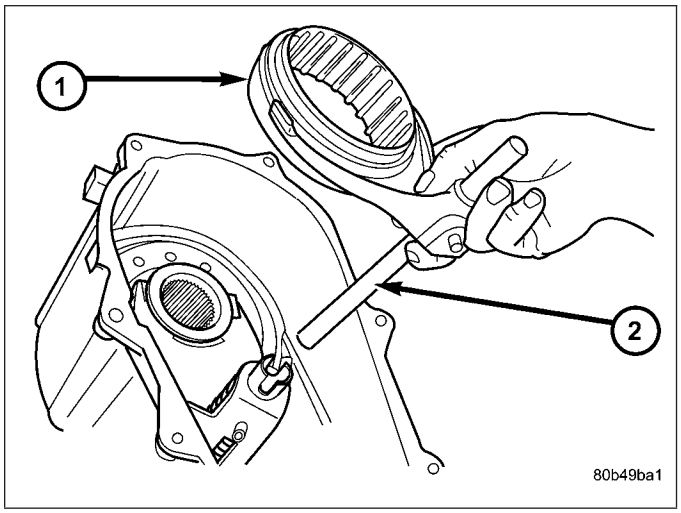
6. Lubricate sector shaft with transmission fluid and install shift sector (1) in case. Position slot in sector so it will be aligned with shift fork pin when shift forks are installed.
7. Apply Loctite™ 242, or equivalent, to the threads of the sector support to replentish the factory applied patch. Install the shift sector support. Tighten the sector support with Socket 9033 to 27-34 N·m (20-25 ft.lbs.).



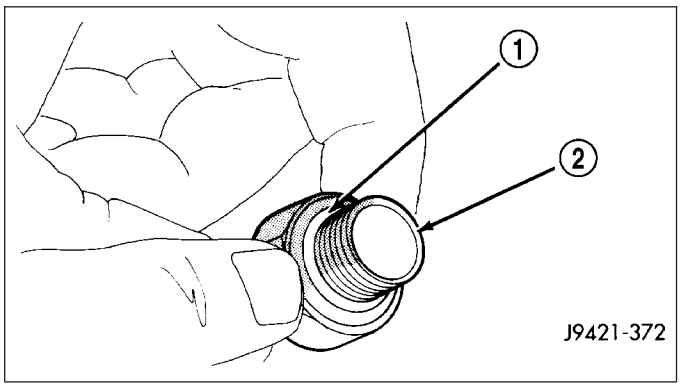
8. Assemble and install range fork (2) and hub (1). Be sure hub is properly seated in low range gear and engaged to the input gear.
9. Align and insert range fork pin in shift sector slot.



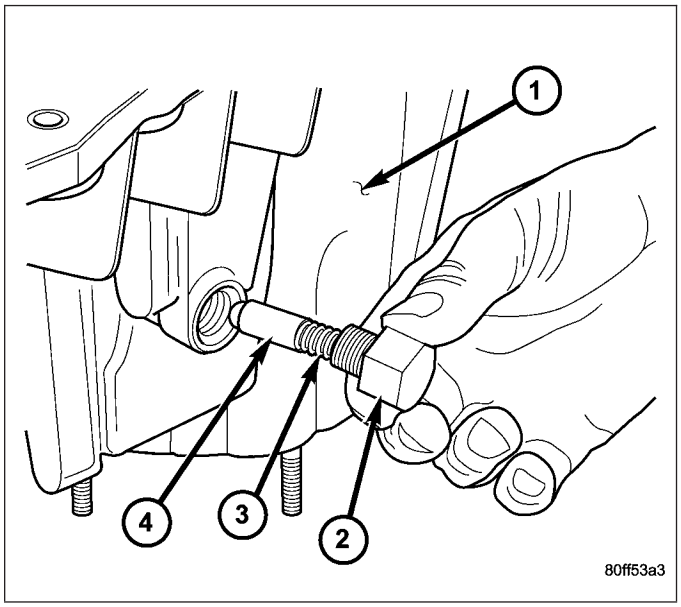
10. Install mode fork and shift rail onto the mode sleeve.
11. Install the mode fork (2), sleeve (1), and shift rail (2) into the transfer case.



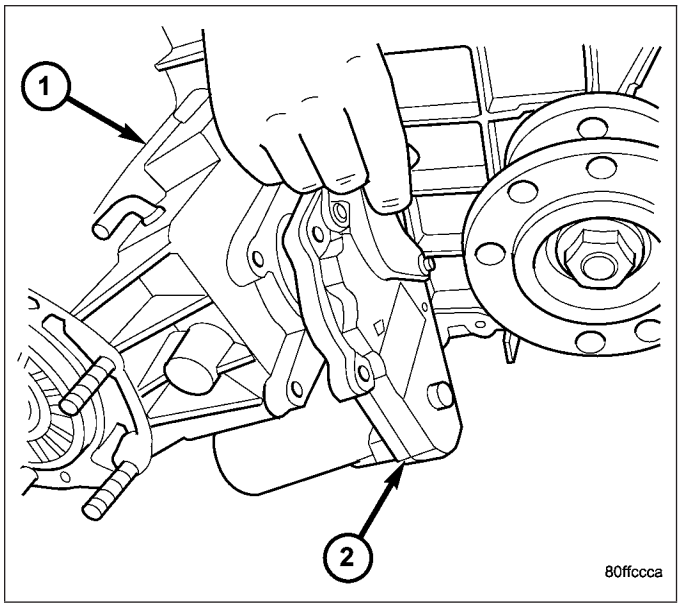
12. Install new o-ring (1) on detent plug (2).



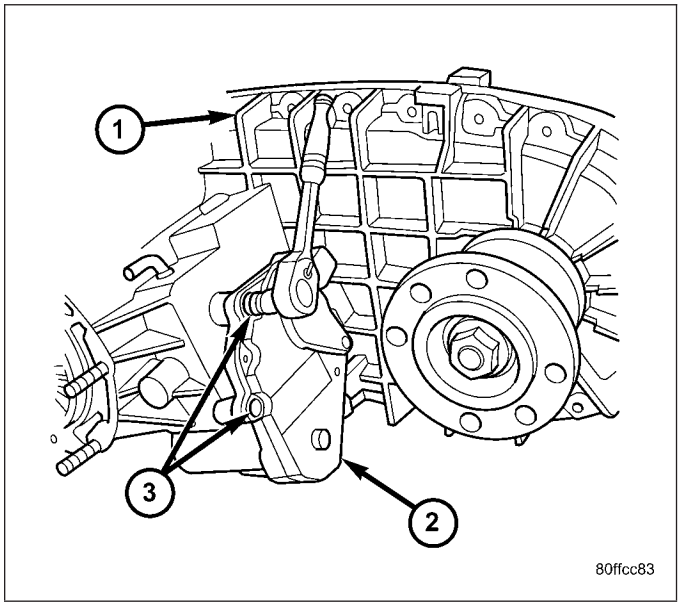
13. Install detent plunger (4), spring (3), and plug (2). Tighten the plug to 16-25 N·m (12-18 ft. lbs.).



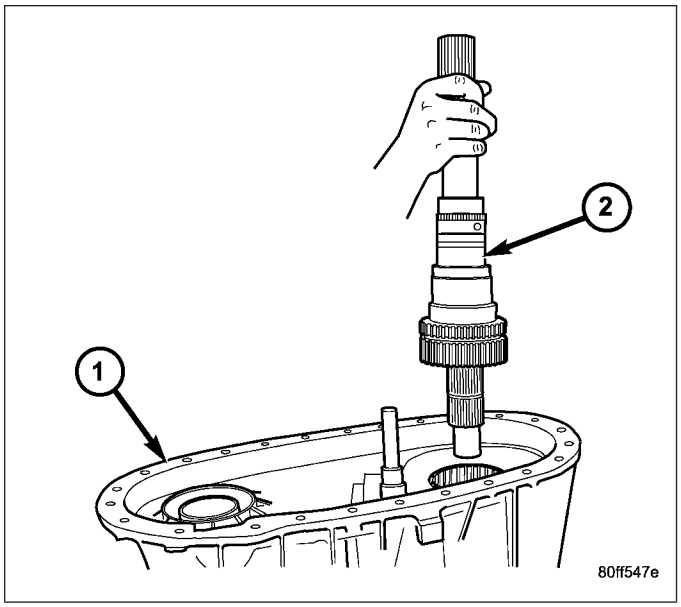
14. Position the shift motor and mode sensor assembly (2) onto the transfer case (1).



15. Install the bolts (3) to hold the shift motor and mode sensor assembly (2) to the transfer case (1). Tighten the bolts to 16-25 N·m (12-18 ft. lbs.).

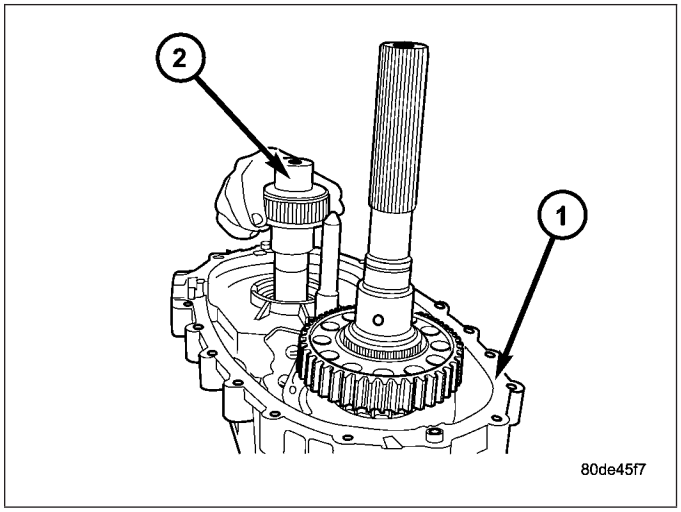


16. Install mainshaft (2)into the transfer case (1). Guide mainshaft through the mode and range sleeves and into the input gear.

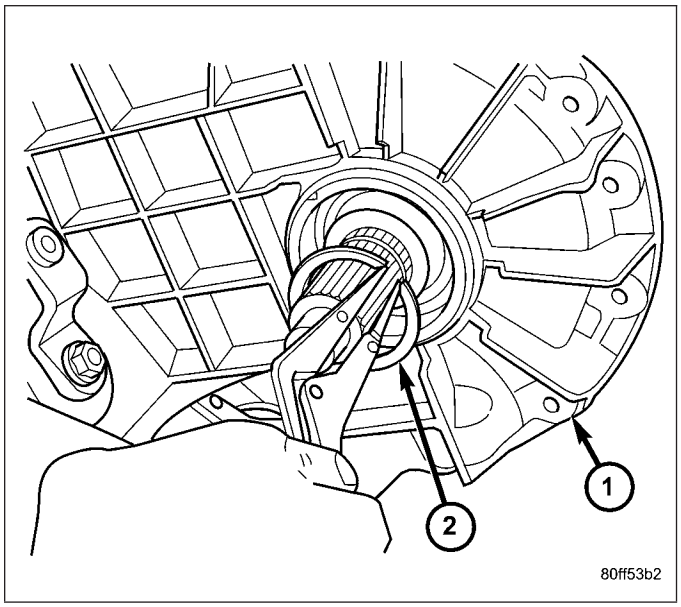


FRONT OUTPUT SHAFT AND DRIVE CHAIN

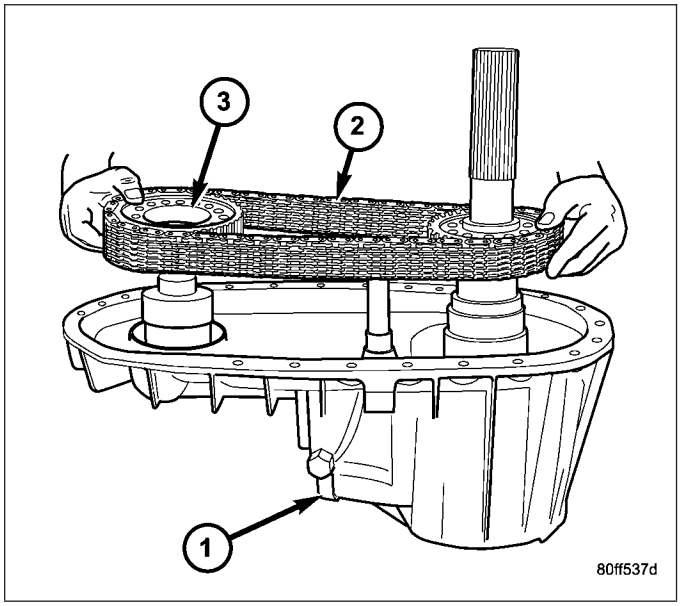
1. Install the front output shaft (2) into the front output shaft front bearing.



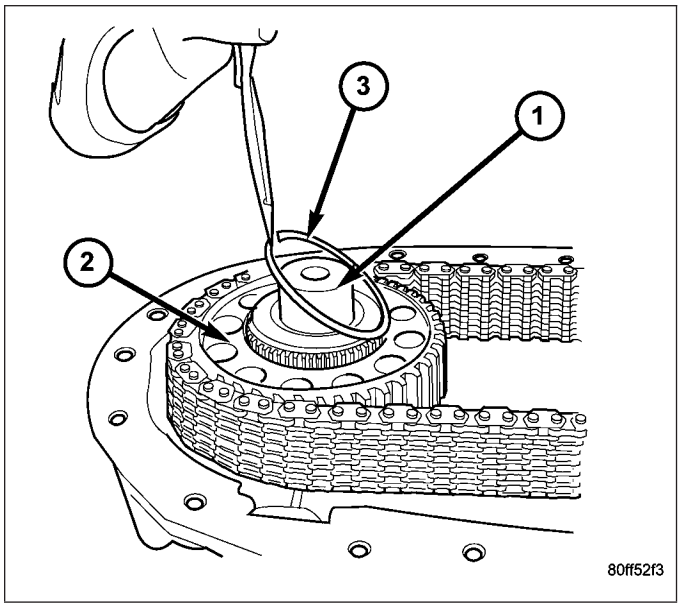
2. Install the front output shaft bearing inner snap-ring (2) onto the output shaft.
3. Install the new front output shaft seal with Installer MB991168A.



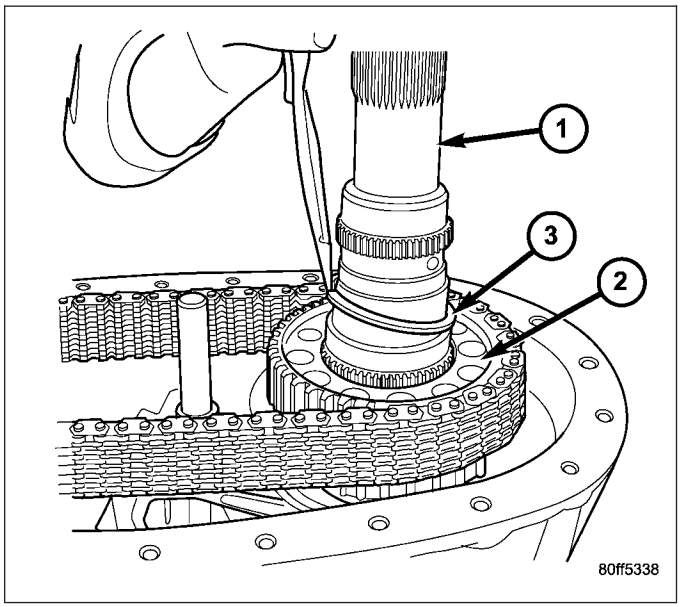
4. Insert front drive sprocket (3) in drive chain (2).
5. Install drive chain around rear drive sprocket.
6. Position rear drive sprocket over the output shaft and lower the sprocket and chain assembly until the front sprocket is positioned over the front output shaft.
7. Align the splines in the sprockets to the splines on the output shafts and install the sprockets onto the output shafts.



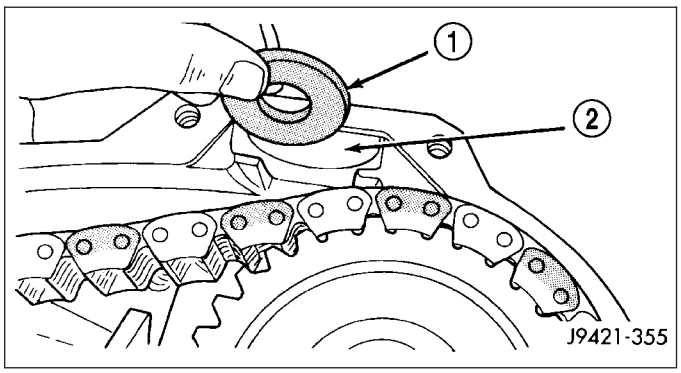
8. Install front sprocket (2) retaining ring (3).



9. Install rear sprocket (2) retaining ring (3).

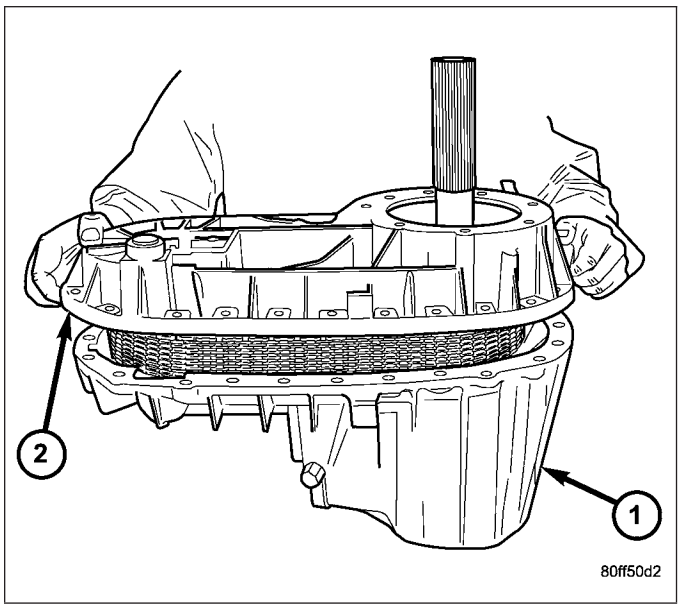


10. Insert magnet (1) in front case pocket (2).



REAR CASE

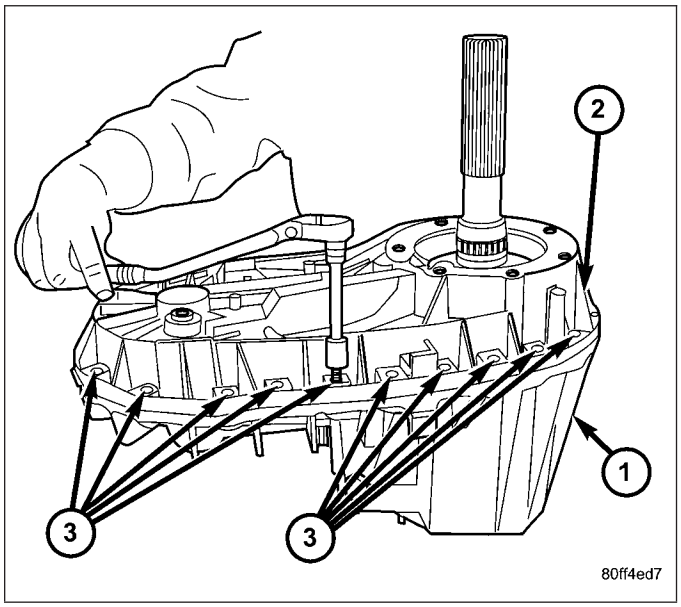
1. Install the oil pick-up tube and screen into the rear case half.
2. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of front case. Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess will be displaced into case interior.
3. Align mainshaft with the rear output shaft bearing and align shift rail with bore in rear case. Then install rear case (2). Verify that the case alignment dowels correctly seat into their mating recesses.



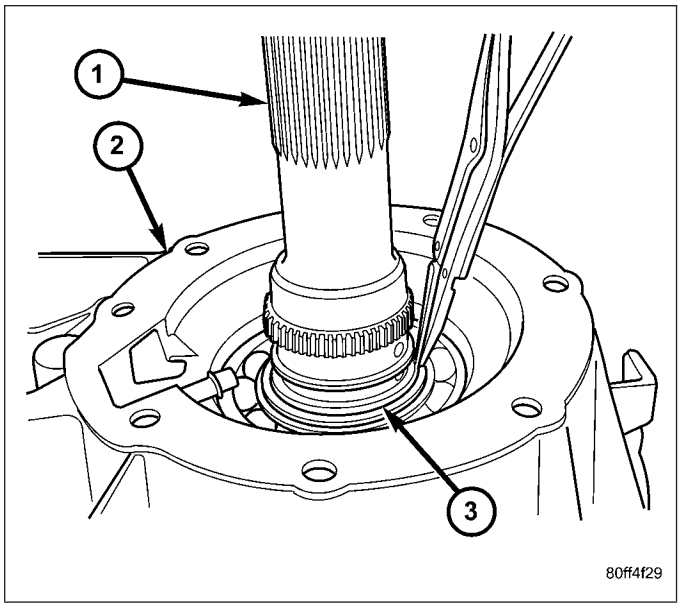
4. Install 4-5 rear case (2) to front case (1)bolts (3) to hold rear case in position. Tighten bolts snug but not to specified torque at this time.

CAUTION: Verify that shift rail, and case alignment dowels are seated before installing any bolts. Case could be cracked if shaft rail or dowels are misaligned.

5. Tighten bolts to 27-34 N·m (20-25 ft. lbs.).

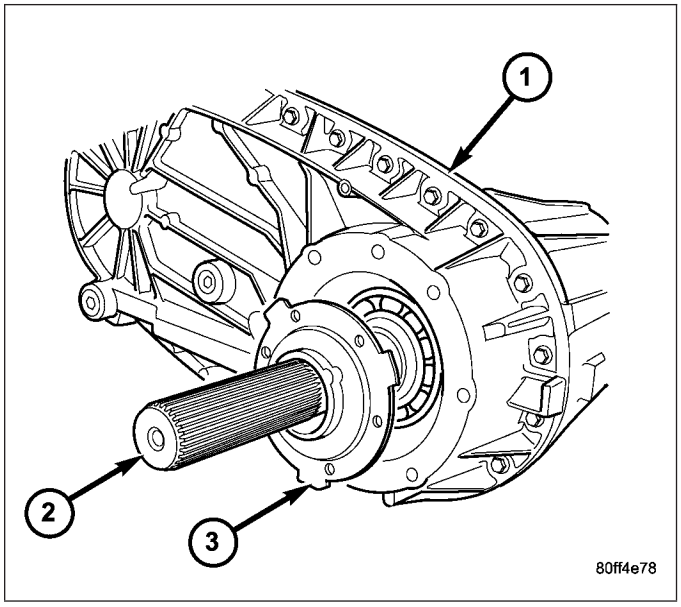


6. Install rear output bearing inner snap-ring (3) to output shaft (1).

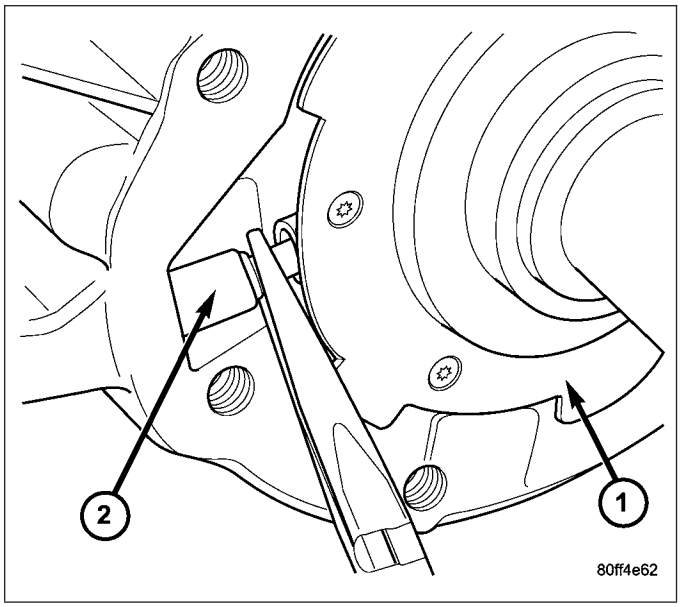


OIL PUMP AND REAR EXTENSION

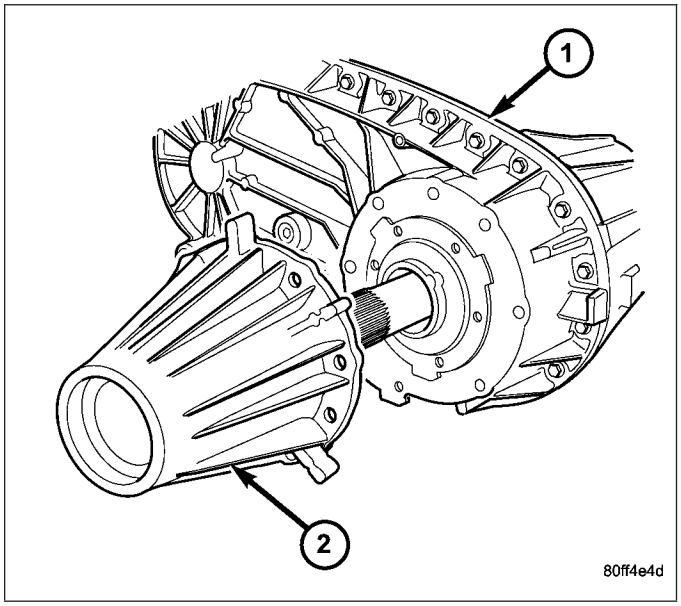
1. Install the oil pump (3) onto the output shaft (2).



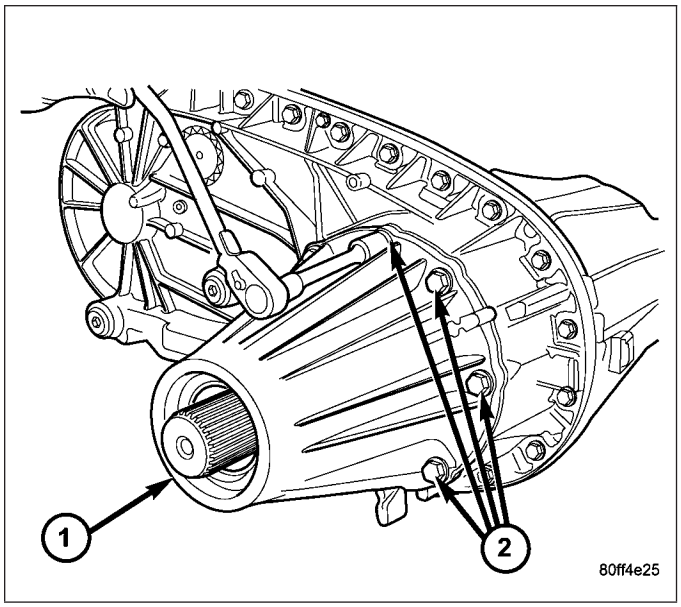
2. Engage the oil pump pick-up tube (2) into the oil pump (1). Verify that the pick-up tube o-ring is on the tube and is correctly installed to the oil pump.



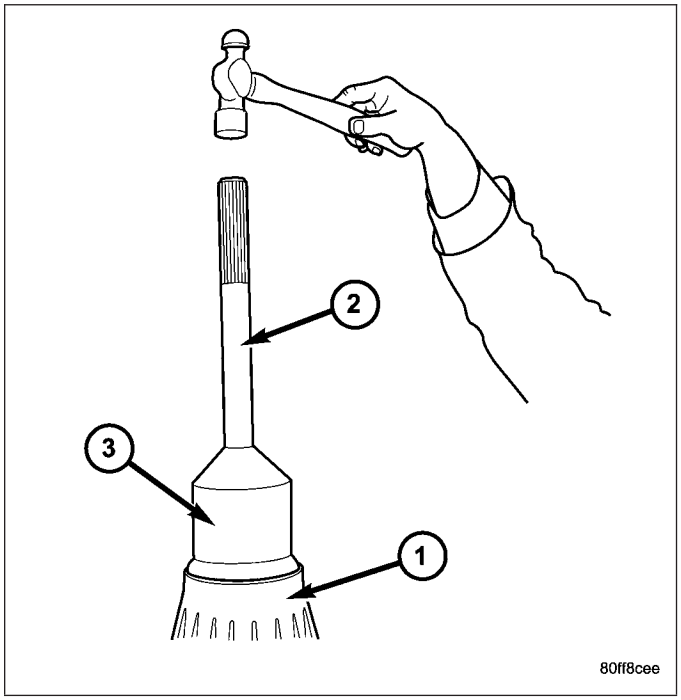
3. Apply bead of Mopar® Gasket Maker, or equivalent, to mating surface of rear extension housing. Keep sealer bead width to maximum of 3/16 inch. Do not use excessive amount of sealer as excess could be displaced into output bearing.
4. Install extension housing (2) onto the rear case half (1).



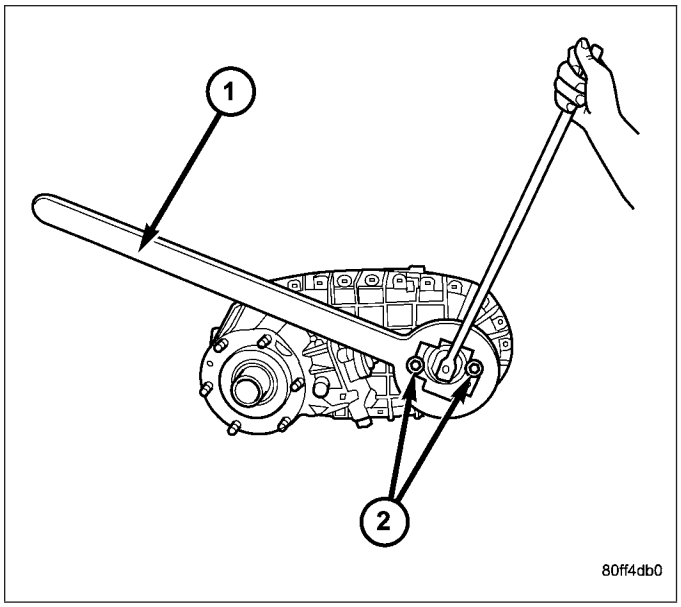
5. Install rear extension bolts (2). Tighten the bolts to 27-34 N·m (20-25 ft.lbs.).



6. Install the extension housing dust boot and seal assembly with Installer 9037 (3) and Handle C-4171 (2).



7. Install the front companion flange onto the front output shaft.
8. Install two bolts 180° apart into the front output shaft companion flange.
9. Place holder (1) over the bolts (2) and against the companion flange.
10. Install a new front companion flange nut. Tighten the companion flange nut to 176-271 N·m (130-200 ft.lbs.).



INSTALLATION

1. Mount transfer case on a transmission jack.
2. Secure transfer case to jack with chains.
3. Position transfer case under vehicle.
4. Align transfer case and transmission shafts and install transfer case onto the transmission.
5. Install and tighten transfer case attaching nuts to 27-34 N·m (20-25 ft. lbs.) torque.
6. Connect the vent hose.
7. Connect the shift motor and mode sensor wiring connectors. Secure wire harness to clips on transfer case.
8. Align and connect the propeller shafts. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/FRONT PROPELLER SHAFT - INSTALLATION) (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/REAR PROPELLER SHAFT - INSTALLATION)
9. Fill transfer case with correct fluid. (Refer to 21 - TRANSMISSION/TRANSFER CASE/FLUID - STANDARD PROCEDURE)
10. Install skid plate, if equipped.
11. Remove transmission jack and support stand.
12. Lower vehicle and verify transfer case shift operation.

SPECIFICATIONS

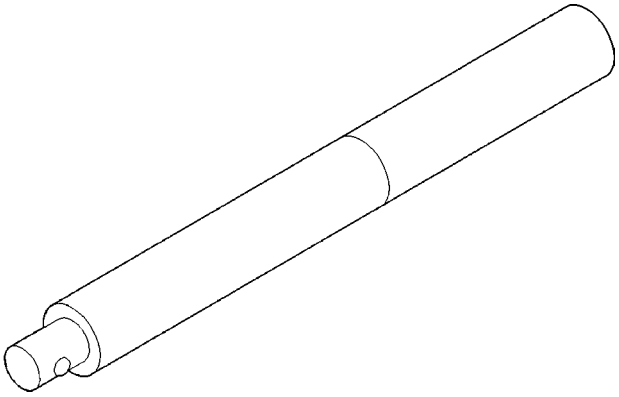
TRANSFER CASE - NV273

TORQUE SPECIFICATIONS

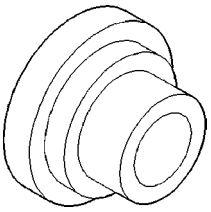
DESCRIPTION	N-m	Ft. Lbs.	In. Lbs.
Plug, Detent	16-24	12-18	-
Plug, Drain/Fill	20-34	15-25	-
Bolt, Extension Housing	27-34	20-25	-
Bolt, Case Half	27-34	20-25	-
Support, Sector	27-34	20-25	-
Nuts, Mounting	30-41	20-30	-
Bolts, Shift Motor and Mode Sensor Assembly	16-25	12-18	-
Nut, Companion Flange	176-271	130-200	-

SPECIAL TOOLS

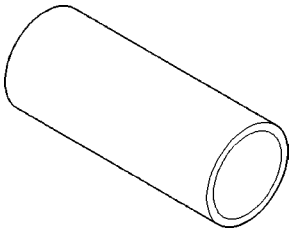
TRANSFER CASE NV271/NV273



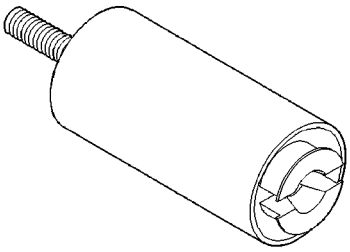
Handle, Universal - C-4171



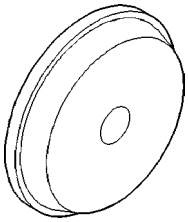
Installer, Bearing - 8128



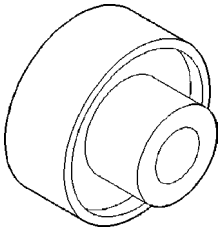
Cup - 8148



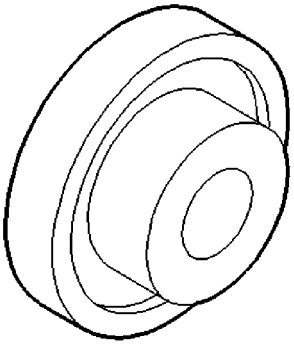
Remover - L-4454



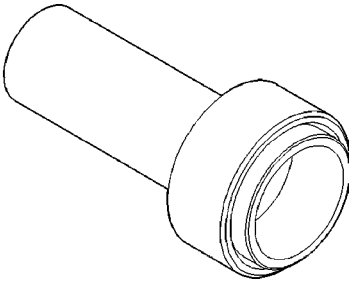
Installer - 8151



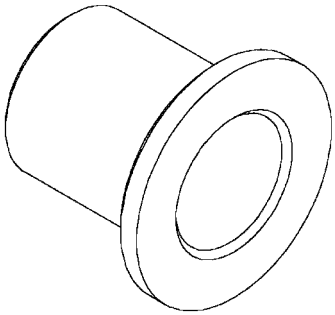
Installer, Bearing - 6953



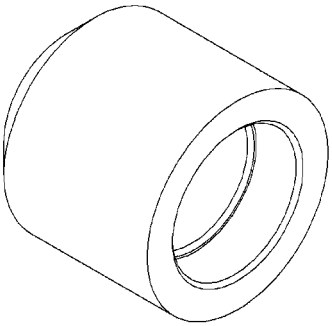
Installer - 8152



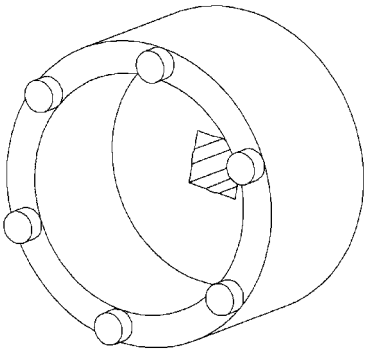
Installer, Pump Housing Seal - 7888



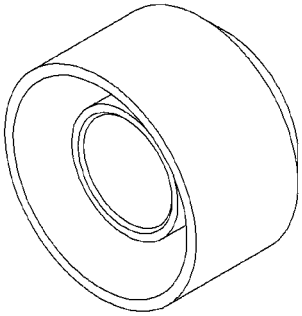
Installer - 8891



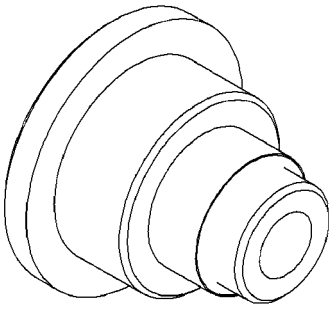
Installer, Seal - 9036



Socket - 9033



Installer, Seal - 9037

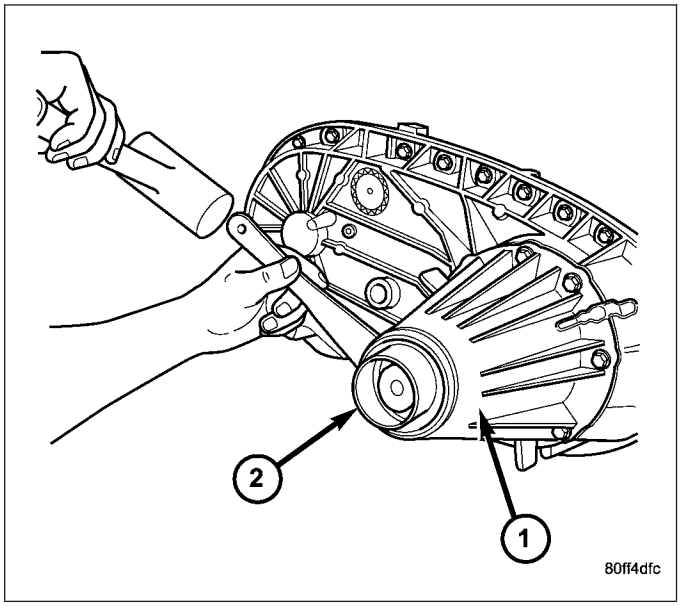


Installer, Bearing - 9035

BOOT-EXTENSION HOUSING SEAL AND DUST

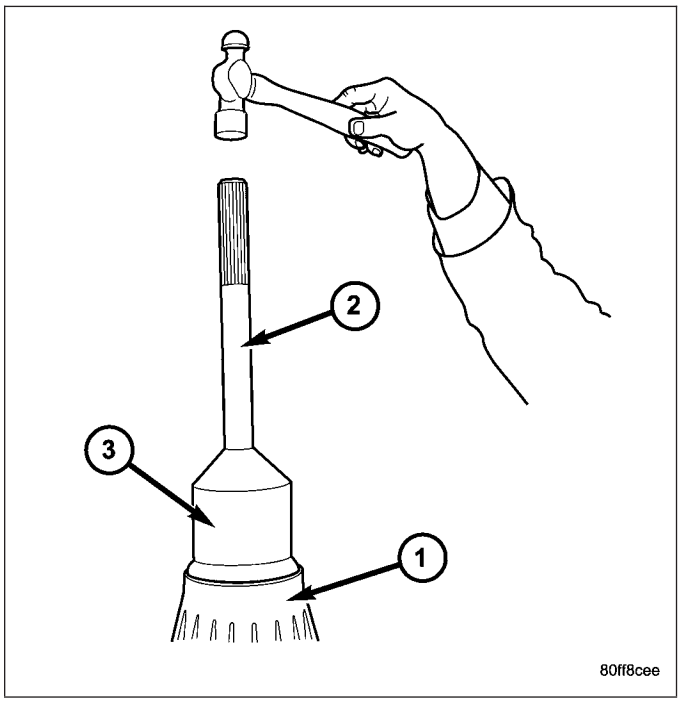
REMOVAL

1. Raise and support vehicle.
2. Remove rear propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL)
3. Use a suitable chisel or pry tool to remove the rear extension housing dust boot (2).
4. Use a suitable chisel or pry tool to remove the rear extension housing seal.



INSTALLATION

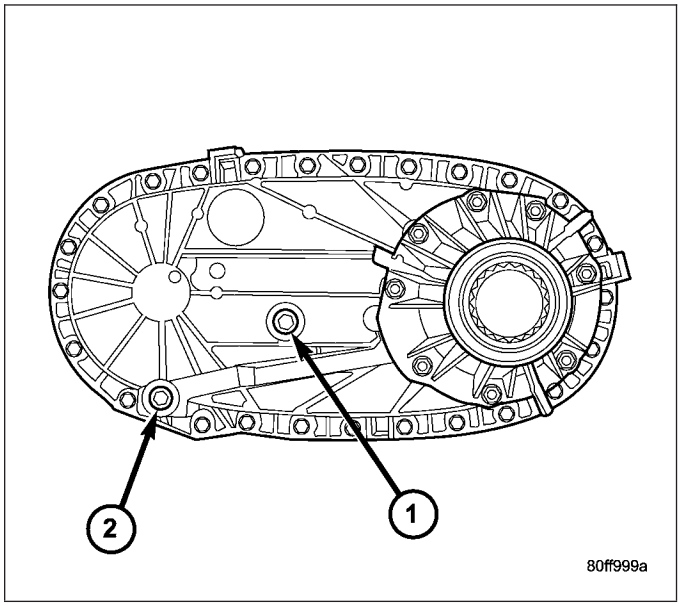
1. Clean fluid residue from sealing surface and inspect for defects.
2. Install the extension housing dust boot and seal assembly with Installer 9037 (3) and Handle C-4171 (2).
3. Install propeller shaft. (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION)
4. Verify proper transfer case fluid level.
5. Lower vehicle.



FLUID

STANDARD PROCEDURE - FLUID DRAIN AND REFILL

The fill (1) and drain (2) plugs are both in the rear case.



1. Raise vehicle.
2. Position drain pan under transfer case.

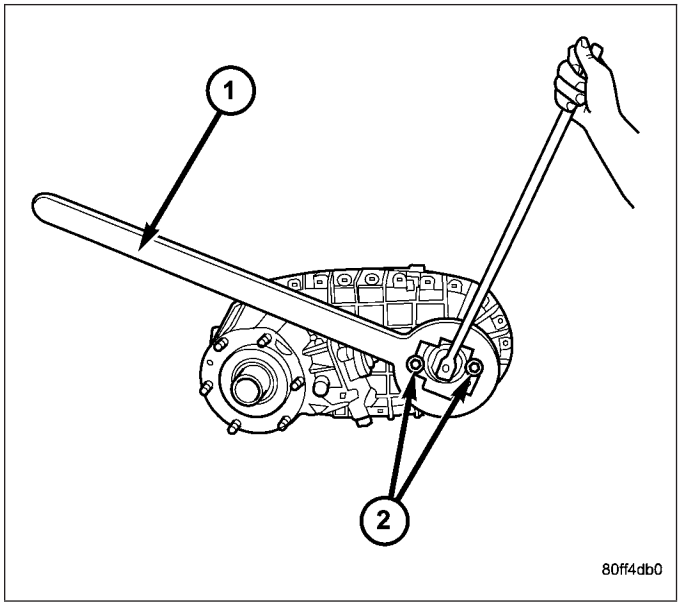
NOTE: It may be necessary to remove the exhaust y-pipe at the exhaust manifold to properly access the fill and drain plugs. Lowering the exhaust will allow the plugs to be accessed for torquing during installation. (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - REMOVAL)

3. Remove drain and fill plugs and drain lubricant completely.
4. Install drain plug. Tighten plug to 41-54 N·m (30-40 ft. lbs.).
5. Remove drain pan.
6. Fill transfer case to bottom edge of fill plug opening with Mopar® ATF +4, Automatic Transmission fluid.
7. Install and tighten fill plug to 41-54 N·m (30-40 ft. lbs.).
8. Install the exhaust y-pipe to the exhaust manifold, if removed. (Refer to 11 - EXHAUST SYSTEM/EXHAUST PIPE - INSTALLATION)
9. Wipe any excess fluid that may have spilled onto the exhaust.
10. Lower vehicle.

SEAL-FRONT OUTPUT SHAFT

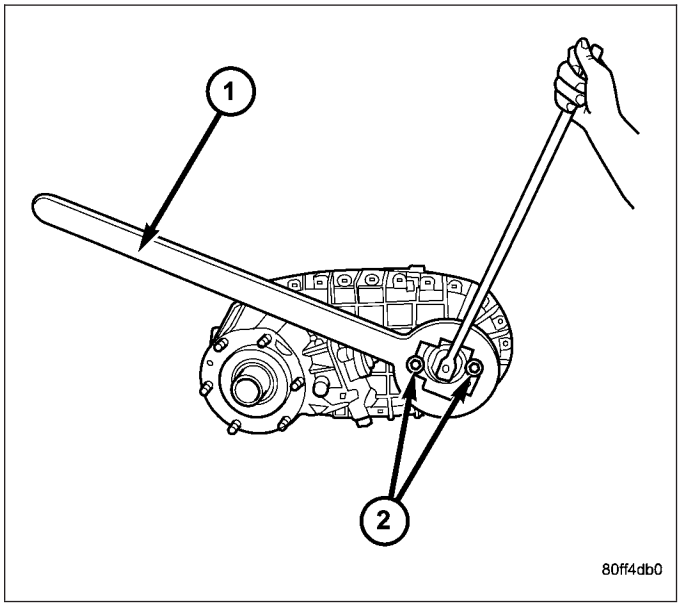
REMOVAL

1. Remove the front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - REMOVAL).
2. Install two bolts 180° apart into the front output shaft companion flange.
3. Place Holder 6719 (1) over the bolts (2) and against the companion flange.
4. Remove and discard the front companion flange nut.
5. Remove the companion flange from the front output shaft. It may be necessary to use Flange puller 8992 to remove the companion flange.
6. Using a screw and a slide hammer, remove the front output shaft seal.



INSTALLATION

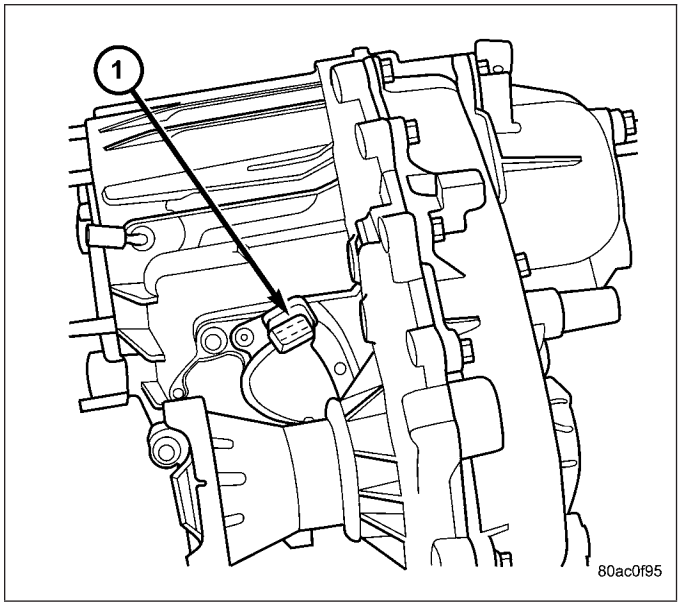
1. Install the new front output shaft seal with Installer MB991168A.
2. Install the front companion flange onto the front output shaft.
3. Install two bolts 180° apart into the front output shaft companion flange.
4. Place Holder 6719 (1) over the bolts (2) and against the companion flange.
5. Install a new front companion flange nut. Tighten the companion flange nut to 258-312 N·m (190-230 ft.lbs.).
6. Install front propeller shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/PROPELLER SHAFT/PROPELLER SHAFT - INSTALLATION).



SENSOR-MODE

DESCRIPTION

The transfer case mode sensor (1) is an electronic device whose output can be interpreted to indicate the shift motor shaft's rotary position. The sensor consists of a magnetic ring and four Hall Effect Transistors to create a 4 channel digital device (non-contacting) whose output converts the motor shaft position into a coded signal. The TCCM must supply 5VDC (+/- 0.5v) to the sensor and monitor the shift motor position. The four channels are denoted A, B, C, and D. The sensor is mechanically linked to the shaft of the cam which causes the transfer case shifting. The mode sensor draws less than 53 mA.



OPERATION

During normal vehicle operation, the Transfer Case Control Module (TCCM) monitors the mode sensor outputs at least every 250 (+/-50) milliseconds when the shift motor is stationary and 400 microseconds when the shift motor is active. A mode sensor signal between 3.8 Volts and 0.8 Volts is considered to be undefined.

Refer to SECTOR ANGLES vs. TRANSFER CASE POSITION for the relative angles of the transfer case shift sector versus the interpreted transfer case gear operating mode. Refer to MODE SENSOR CHANNEL STATES for the sensor codes returned to the TCCM for each transfer case mode sensor position. The various between gears positions can also be referred as the transfer case's coarse position. These coarse positions come into play during shift attempts.

SECTOR ANGLES vs. TRANSFER CASE POSITION

Shaft Angle (Degrees)	Transfer Case Position
+40	4LO
+20	N
0	2WD/AWD
-20	4HI

MODE SENSOR CHANNEL STATES

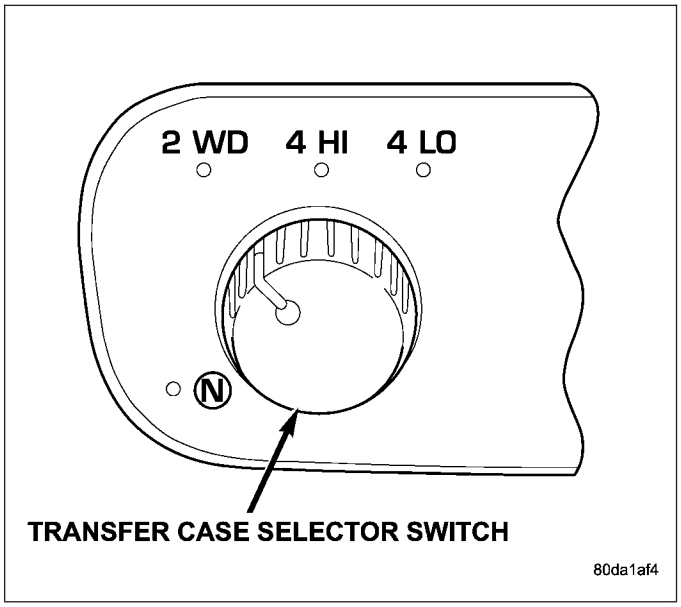
Transfer Case Angle (degrees)	Sensor Channel A	Sensor Channel B	Sensor Channel C	Sensor Channel D
Between Gears	H	H	L	H
+40 (4LO)	H	H	L	L
Between Gears	H	H	L	H
Between Gears	H	L	L	H
+20 (NEUTRAL)	H	L	L	L
Between Gears	H	L	L	H
Between Gears	H	L	H	H
0 (2WD/AWD)	H	L	H	L
Between Gears	H	L	H	H
Between Gears	L	L	H	H
-20 (4HI)	L	L	H	L
Between Gears	L	L	H	H
Between Gears	L	H	H	H

SWITCH-SELECTOR

DESCRIPTION

The selector switch assembly (1) is mounted in the left side of the vehicle's Instrument Panel (IP) and consists of a rotary knob connected to a resistive network for the mode and range shift selections. Also located in this assembly is a recessed, normally open momentary switch for making shifts into and out of transfer case NEUTRAL. A pen, or similar instrument, is used to make a NEUTRAL shift selection, thus reducing the likelihood of an inadvertent shift request.

The selector switch also contains four light emitting diode's (LED's) to indicate the transfer case position and whether a shift is in progress.



OPERATION

As the position of the selector switch varies, the resistance between the Mode Sensor supply voltage pin and the Mode Sensor output will vary. Hardware, software, and calibrations within the Transfer Case Control Module (TCCM) are provided that interpret the selector switch resistance as given in the table below: SELECTOR SWITCH INTERPRETATION

SELECTOR SWITCH INTERPRETATION

Step	Resistance Range (ohms)	Required Interpretation
A	<200	Shorted
B	400-700	NEUTRAL
C	1050-1450	4LO
D	1850-2300	4HI
E	3050-5950	2WD (Default)
F	9.5-12.5K	In between positions
G	>15.5K	Open

For resistances between the ranges B-E shown for each valid position (T-Case NEUTRAL, 4LO, 4HI, 2WD), the TCCM may interpret the resistance as:

- either of the neighboring valid positions.
- as an invalid fault position.

For resistances between the ranges E and F shown for 2WD and in-between positions, the TCCM may interpret the resistance as:

- the 2WD position.
- an invalid fault position.
- a valid in-between position.

For resistances between the ranges F and G shown for in-between positions and fault condition (open), the TCCM may interpret the resistance as:

- a valid in-between position.
- an invalid fault position.

For resistances between the ranges A and B shown for the fault condition (short) and , T-Case NEUTRAL, the TCCM may interpret the resistance as:

- the T-Case NEUTRAL position.
- an invalid fault position.

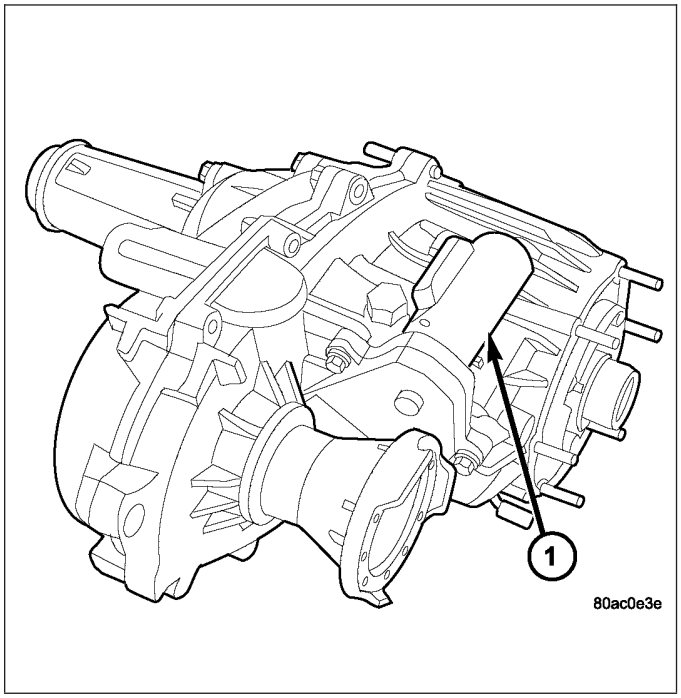
The LED's in the selector assembly are illuminated/flashed in the following manner to indicate a particular condition or state.

- A solidly illuminated LED indicates a successfully completed shift and the current operating mode of the transfer case. While a shift has been requested but not yet completed, the LED for the desired transfer case position is flashed.
- A flashing operating mode LED for the desired gear indicates that a shift to that position has been requested, but all of the driver controllable conditions have not been met. This is in an attempt to notify the driver that the transmission needs to be put into NEUTRAL, the vehicle speed is too great, or some other condition outlined (other than a diagnostic failure that would prevent this shift) elsewhere (Refer to 8 - ELECTRICAL/ELECTRONIC CONTROL MODULES/TRANSFER CASE CONTROL MODULE - OPERATION) is not met. Note that this flashing will continue indefinitely until the conditions are eventually met, or the selector switch position is changed, or if diagnostic routines no longer allow the requested shift.
- If the driver attempts to make a shift into transfer case NEUTRAL, and any of the driver controllable conditions are not met, the request will be ignored until all of the conditions are met or until the NEUTRAL select button is released. Additionally the neutral lamp will flash, or begin to flash while the button is depressed and operator controllable conditions are not being met. All of the LED's except the Neutral will flash if any of the operator controllable conditions for shifting are not met while the Neutral button is depressed. This ″toggle″ type of feature is necessary because the TCCM would interpret another request immediately after the shift into transfer case NEUTRAL has completed.
- No LED's illuminated indicate a fault in the transfer case control system.

MOTOR-SHIFT

DESCRIPTION

The shift motor (1) consists of a permanent magnet D.C. motor with gear reduction to convert a high speed-low torque device into a low speed-high torque device. The output of the device is coupled to a shaft which internally moves the mode and range forks that change the transfer case operating ranges. The motor is rated at 25 amps maximum at 72° F with 10 volts at the motor leads.



OPERATION

The transfer case shift motor responds to the Transfer Case Control Module (TCCM) commands to move the transfer case shift sector bi-directionally, as required, to obtain the transfer case operating mode indicated by the instrument panel mounted selector switch.

REMOVAL

NOTE: New shift motor assemblies are shipped in the 2WD/AWD position. If a new shift motor assembly will be installed, it will be necessary to shift the transfer case to the 2WD/AWD position prior to motor removal.

1. Raise the vehicle on a suitable hoist.
2. Disengage the wiring connectors from the shift motor and mode sensor.
3. Remove the bolts holding the shift motor and mode sensor assembly onto the transfer case.
4. Separate the shift motor and mode sensor assembly from the transfer case.

INSTALLATION

1. Verify that the shift sector o-ring is clean and properly positioned over the shift sector and against the transfer case.

NOTE: Verify that the shift motor position and sector shaft orientation are aligned. It may be necessary to manually shift the transfer case if the shift motor and sector shaft are not aligned.

2. Position the shift motor and mode sensor assembly onto the transfer case.
3. Install the bolts to hold the assembly onto the transfer case. Tighten the bolts to 16-24 N·m (12-18 ft.lbs.).

CAUTION: If the original shift motor and mode sensor assembly bolts are reused, be sure to use Mopar® Lock & Seal or Loctite™ 242 to replenish the lock patch material originally found on the bolts

4. Engage the wiring connectors to the shift motor and mode sensor.
5. Refill the transfer case as necessary.
6. Lower vehicle and verify transfer case operation.