



Supplement to Repair Manual

Fourwheel Drive - Dual Transmission FT 70 DT / 80 DT

FOREWORD

This Repair Manual Supplement provides information for the correct servicing and overhaul of the fourwheel drive-Dual transmission on Farmtrac 70 and Farmtrac 80 tractors. The NEW Farmtrac 70DT and Farmtrac 80 tractor's supplement is an essential publication for all service personnel carrying out repairs or maintenance on these tractors. We recommend that this supplement is made available for reference at all times.

All assemblies are subdivided into parts which convey information on general operating principles, detailed inspection and overhaul procedures, and where applicable, specifies on trouble shooting, special tools and specifications.

The information contained herein was correct at the time of going to print but ESCORTS policy is one of continuous improvement and the right to change prices, specifications, design at any time without notice is reserved. All data in this supplement is subject to production variations.

ESCORTS LIMITED

Agri Machinery Marketing Division
Service Department

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GENERAL INFORMATION

GENERAL INFORMATION

Manual use

End users

- Installer
- User
- Maintenance operator

Maintenance

CONSULT THIS MANUAL THOROUGHLY, as proper functioning and good efficiency of mechanical organs depends mostly on constant and correct routine and extraordinary maintenance which could promote the integrity and duration of the axle and avoid damages or any harm to the operator in case of any damages or anomalies, quick intervention of specialized personnel can avoid future impairment and lengthen the working life.

Repair

The disassembly / assembly procedures have been outlined for a total group overhauling. They have also been described in sequence through photographs with relevant explanation for specific interventions, thus obtaining a complete and safe guide for each and every phase of an operation.

Operation description presumes that the axle has already been removed from the TRACTOR.

Moreover, the attentive group inspection leads to a correct repair work estimation that could merely require dismounting only few components, and thus operating partially on the group.

Information property

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ESCORTS LIMITED declares that the subject of this manual consists with the technical and safety specifications of the axle that the manual is referred to. The manufacturer shall not be held liable for direct or indirect damages to persons, thing or animals due to an improper use of them, which does not comply with what is provided for in this manual.

Agreements and definitions

Agreements

Illustrations like pictures, drawings and components of this manual are NOT in scale, because of limited space and editing limits, therefore they are NOT reliable to obtain values about size or weight.

Illustrations are supposed to point out the various handling sequences and phases of the axle and its components, therefore they could not display exactly the same group elements.

Definitions

Left side: it is the left side of the axle considering the vehicle running conditions.

Right side: it is the right side of the axle considering the vehicle running conditions.

Typographic agreements

Note: the notes, pointed out externally to the text they refer, include important information,

Warning: warning indications point out the procedures, whose partial or complete non-observance can damage the machine or the connected equipment.

Danger: danger indications point out the procedures, whose partial or complete non-observance can injure the operator.

Measurements

This manual indicates all measurements in International System (SI). Use the following conversion table to convert imperial Measure.

CONVERSION TABLE

S.I.	S.I.
1 (mm)	0.03937 (in)
10 (mm)	0.3937 (in)
25.4 (mm)	1 (in).
6.4516 (cm ²)	1 (sq. in)
1 (m ²)	1550 (sq in)
16.378 (cm ²)	1 (cu in)
0.473 (cm ²)	1 (U.S. pint)
1 (lt)	61.02 (cu in)
1 (lt)	0.2642 (U.S. gal)
1.772 (g)	1 (oz)
0.00070308 (kg/mm ²)	1 (lsq in)
1 (bar)	14.51 (psi)
1 (kg m)	7.246 (lb. ft)
1 (daN)=10(N)=1.02(kgf)	2.24 (lbf)

GENERAL INFORMATION

SYMBOLOLOGY

<i>SYMBOLS</i>	<i>DESCRIPTION</i>
	WARNING general warning
	ADJUSTMENTS Tightning torques / measurements
	SPECIAL TOOLS
	CHECK AND REPLACE seals / gaskets
	SEALING OR LOCKING FLUIDS
	MARK OR INDICATE
	OIL FILLING OR OIL LEVEL
	OIL DRAIN

GENERAL INFORMATION

General safety recommendations

IMPORTANT:

Before proceeding with any operations please read this chapter very carefully.



Safety precautions:

Correct use and repair of axles and of their components is very important for safety and reliability.

Recommendations and all described procedures given in this manual have been experimented and hence are effective operational methods. Please follow every procedure. Use the text as well as the illustrations. Certain procedures show use of special tools, designed so that the operations can be carried out in a clear and correct manner.

Special tools must be used when a particular operation is being carried out. It is impossible to advise every working method or know all possible methodologies for carrying it out or to predict risky consequences of each operation. Hence, performing procedures or using instruments which have not been advised could be dangerous for the operator/mechanic as well as the vehicle.

Danger

Safety goggles must be worn while carrying out every assembling or disassembling operations.

Safety symbols

Recognize safety information



This is the safety alarm symbol; whenever you find it in the manual or see it on the machine, you are being warned about potential danger of accidents or harm to personnel. Follow the do's and don't's to operate in total safety.

Understanding written warnings

Written warning (DANGER, WARNING OR CAUTION) is used along with an alarm symbol.

DANGER or WARNING signs are used near danger zones, while CAUTION sign indicates general precaution.

Follow safety instructions!

Read all suggestions given in this instruction manual very carefully. Unauthorized changes could endanger the functioning,



work safety and work span. If you do not understand this instruction manual, contact the nearest sales representative

General precautions

Observe safety instructions, accident prevention rules and all general safety regulations in each and every step at work.

Before going ahead with maintenance or repair work ensure that all the tools, the supporting bench, stands, levers, extractors and spanners are in good condition so that the work can be carried out easily. Risks to various parts and components will also be reduced in this way and working condition for the operator will also be safer.

Escort Ltd. declines any responsibility in case of an accident or damage resulting due to changes made arbitrarily on product.

Safety maintenance rules



1. Operate in a clean and dry environment.
2. Do not lubricate, handle or adjust the group underway.
3. Keep off your hands, feet and clothing from moving parts.
4. Be always prepared for fires. Keep the extinguisher and the first aid kit within reach.

GENERAL INFORMATION

5. Keep the phone numbers of a doctor, of an ambulance, of a hospital and of the fire department within reach near the telephone set.
6. Wear suitable clothing and protections as overalls, safety gloves and ear safety devices.
7. Use suitable ear protections, like ear plugs, to keep out noise and prevent injury to the ears. A prolonged exposure to noise can damage your hearing.


 Warning

These residual risks and the suitable relative procedures to eliminate them completely are pointed out, in the assembly and disassembly procedures. During maintenance, follow carefully at the safety procedures indicated in the manual.

8. The operator must be very careful with the equipment. Do not use headphones to listen music while you are working on the product or on the group.

Residual risk elimination

Risk of squashing and shearing due to the presence of moving parts.

 Warning

Carry out all maintenance operations when the Tractor is stationary.

- Risk due to inhalation of poison gases that can be produced by heating the varnishes during any welding.

 Warning

Use work stations equipped with dust and fume discharging systems.

Let the fumes disperse for at least 15 minutes, before welding or reheating, or working on the group again.

- Risk of fire due to the solvents used and to the oil the axle.

 Warning

Keep off any heat sources from the working area. When solvents or paint removers are used, they should be removed with soap and water, before welding.

Remove any containers of solvent, paint remover or any other inflammable products from the working area.

- Risk due to fall, drop or violent ejection of objects or oil from the axle.

GENERAL INFORMATION

GENERAL INFORMATION

General description

The axle should be checked and/or repaired only by qualified technicians, acquainted with its peculiar features and well aware of all safety instructions.

Before performing any operation it is advisable to carry out axle cleaning accurately by removing oil/grease encrustations and accumulation, all disassembled mechanical parts must be cleaned accurately with suitable products to avoid possible damage. Parts should be replaced if damaged, worn out, cracked, seized, etc. as they could affect proper functioning of the axle.

Rotating parts (bearings, gears, shafts) and that of hardware/fasteners (O-Rings, oil seals) should be examined carefully, as they are subject to major stress, wearing and ageing.

We highly advise to replace tightening parts during every teardown or repair.

Replacing one part of the bevel gear set requires the replacement of the other part too. Use appropriate spare parts, nuts and bolts to avoid any other problems. Moreover, use metric tools for metric nuts and bolts and Imperial tools for the others. Please read the disassembly instructions very carefully because some operations are destructive for some axle components and in order to avoid the elements damage operate advertently.

General recommendations for disassembly and assembly

Operations

Before starting any disassembly and assembly operations, read carefully the following recommendations.

Shaft seal rings

Respect the following recommendations during seal ring assembly:

- Clean shaft very carefully and ensure that part in contact with the seal ring is not damaged, cut or out of roundness.
- Assemble the seal ring so that the lip is fitted towards the oil side.
- Lubricate seal ring lips (use oil) and fill % of seal ring cavity with grease.
- Use appropriate drivers. Do not use a hammer directly on the seals.
- Do not damage the seal ring while assembling the shaft.

O-Rings

Lubricate adequately before inserting them at the right place and avoid O-Ring rolling while inserting the shaft.

Adjusting shims

Use appropriate adjusting shims and measure each one separately.

Complete group measurement or stampings on the shims are not always reliable, check.

Bearings

It's advisable to heat up bearing to 80°C - 90°C before assembling them onto their respective shafts or to cool them (dry ice) before inserting them into corresponding bore. Always use suitable extractors to remove the bearings, clean, check and lubricate them.

Split pins

Before assembling elastic pins, make sure that the notch is oriented towards the stressing force. Spiral elastic pins do not need orientation.

Sealing

Use sealing as advised by specifications, Ensure that parts to be sealed are clean, dry and completely grease free.

Oil drain

Before disassembly, oil should be drained out.

WARNING

Disposal of used oil must be done according to laws

Cleaning

Wash all moving parts (gears, bearings, etc) accurately with diesel fuel or kerosene. Avoid gasoline and watery alkaline solutions. Do not wash with steam or hot water, as it will be very difficult to eliminate surface humidity.

Dry all parts with a rag or air jet to avoid scratching from abrasive residuals.

All surfaces should be covered with lubricant so as to protect it from future oxidation.

Checks

Examine accurately all bearings, external rings which may be still stuck in their position and pivot pins or which needles rotate.

Replace those which are worn out or damaged.

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Gears should not be spoiled and teething should no be excessively worn out, teeth smoothing should no be deteriorated.

Check all grooves, Assure that they are not worn out or damaged.

Replace spoiled parts with original spare parts.

Replace seals on rotating shafts, before reassembly.

Reassembly methods

In order to reassemble the group, an appropriate fixture must be used be used. In order to position the group, to disassemble and reassemble the ring gear and to support the gear housing, a lifting system is needed. To make disassembling and assembling operations easier, use a group assembly drawing.

Lubricants use

In order to lubricate the CARRARO axles correctly and operation temperature, it is important to use the recommended lubricants, keeping their level constant as indicated in this manual.

**MFD DRIVE SHAFT
AND
TRANSFER GEAR BOX**

MFD DRIVE SHAFT AND TRANSFER GEAR BOX

1. MFD DRIVE SHAFT

1.1 Removal and Installation

Support the drive shaft guard remove the retaining bolts and washers. Remove the guard from the tractor.



. STEP 1

Remove the socket head bolts and washers to disconnect the drive shaft from the MFD axle coupling.

STEP 2

Remove the socket head bolts and locknuts to disconnect the drive shaft from the transfer gearbox coupling. move the drive shaft to a clean work area.



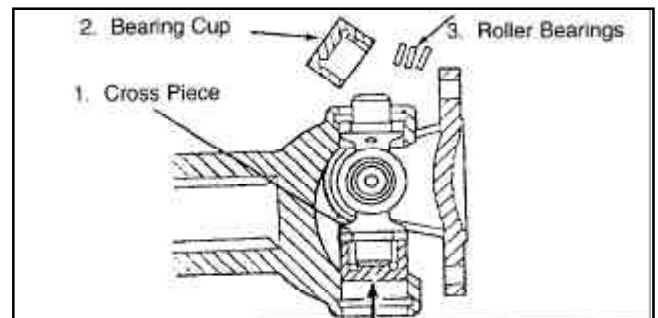
Note : For installation, follow the same procedure in reverse order. Apply anti-seizure grease onto the splines of the transfer gear box shaft.

MFD DRIVE SHAFT AND TRANSFER GEAR BOX**1.2 Servicing the Universal Joints****STEP 1**

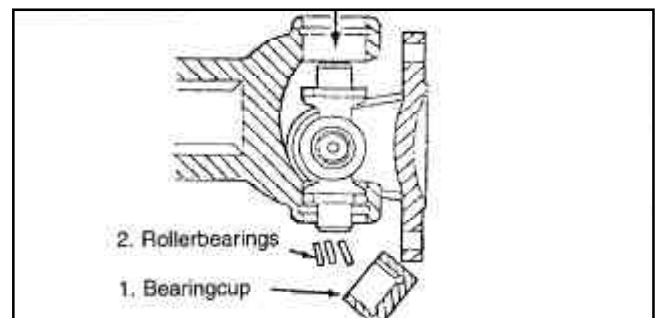
Remove the snap ring from each end of a cross piece.

**STEP 2**

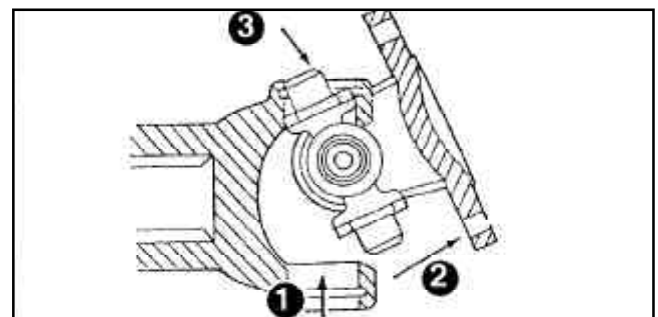
Press one end of the cross piece to remove the opposite bearing cup and roller bearings.

**STEP 3**

Press the cross piece in the opposite direction to remove the second bearing cup and roller bearings.

**STEP 4**

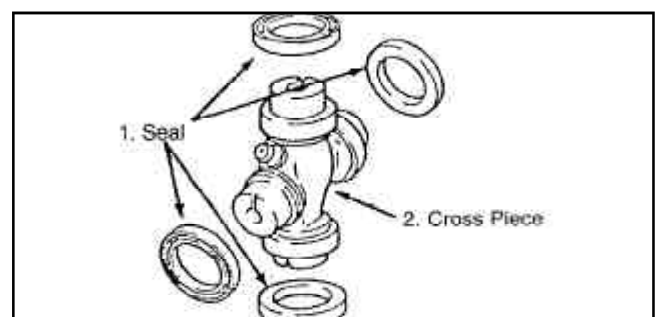
Follow the movement pattern shown to remove the cross piece. Repeat the procedure to disassemble the remainder of the universal joint.

**STEP 5**

Remove the scales from the cross pieces.

STEP 6

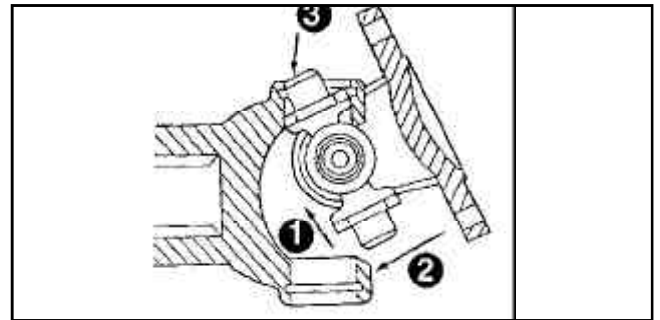
Follow the movement pattern shown to remove the cross piece. Repeat the procedure to disassemble the remainder of the universal joint.



MFD DRIVE SHAFT AND TRANSFER GEAR BOX

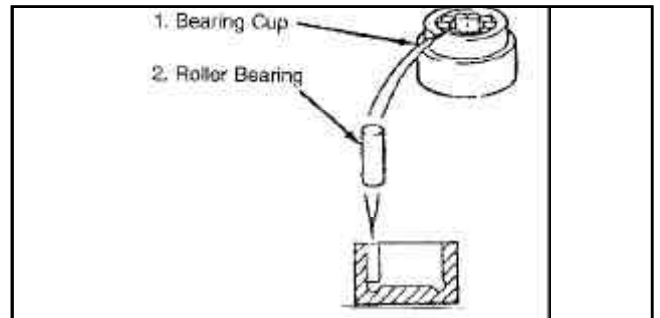
STEP 7

Install new seals onto the cross piece. The flat end face of the seals must be toward the center of the cross piece.



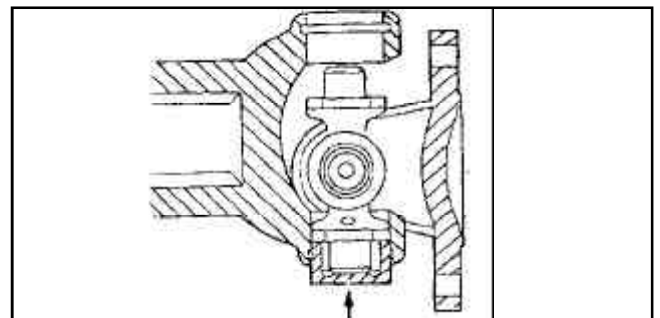
STEP 8

Follow the movement pattern shown to install the cross piece.



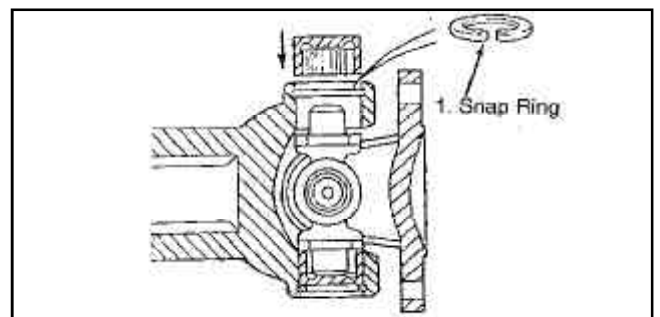
STEP 9

Put case 251 H EP grease into one of the bearing cups and install the roller bearings.



STEP 10

Install a bearing assembly onto one end of the cross piece. Press the bearing assembly into position and install the snap ring. Install the second bearing assembly and snap ring. Repeat the procedure for the other ends of the cross piece.



STEP 11

Lubricate the universal joint with Case 251 H EP grease.



MFD DRIVE SHAFT AND TRANSFER GEAR BOX

1.3 Servicing the Drive Shaft Seal

STEP 1

Turn the end cap (5) counterclockwise then separated the universal joint (1) from the drive shaft (6)

STEP 2

Remove and discard the split ring (2) felt seal (3) and the second split ring (4). Remove the end cap (5)

STEP 3

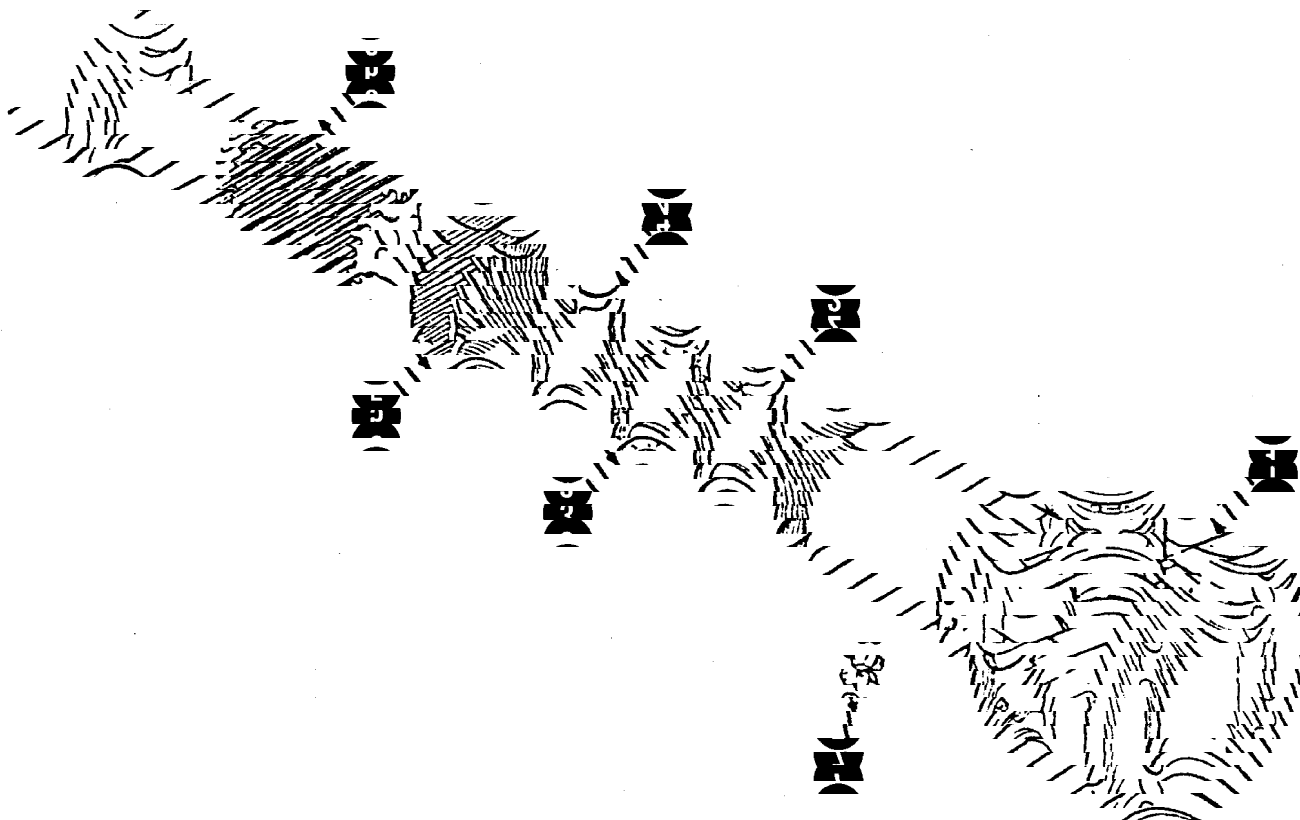
Remove the grease fitting (7) from the universal joint (1).

STEP 4

Clean all the parts in a suitable solvent and dry in compressed air. Replace all parts that are damaged.

STEP 5

Lubricate the parts with Case 251H EP grease then assemble in reverse order.



NOTE : ITEM NUMBERS ARE IN ORDER OF DISASSEMBLY.

MFD DRIVE SHAFT AND TRANSFER GEAR BOX

2. MFD TRANSFER GEAR BOX

2.1 Removal and Installation

STEP 1

Remove the guard then disconnect the MFD drive shaft and the coupling from the transfer gearbox. Refer to MFD Driveshaft Removal and Installation in this Section.

STEP 2

Put a suitable clean container under the rear of the transmission case and the transfer gearbox. Remove the drain plugs and drain the transmission oil. After the oil has drained, install and tighten the drain plugs.

NOTE : For Installation, add clean transmission oil through the filler port on top of the hydraulic housing. Refer to specifications on page 9 for correct transmission oil specifications and quantity.

STEP 3

Remove the cotter pin and washer to disconnect the operating rod from the selector lever.

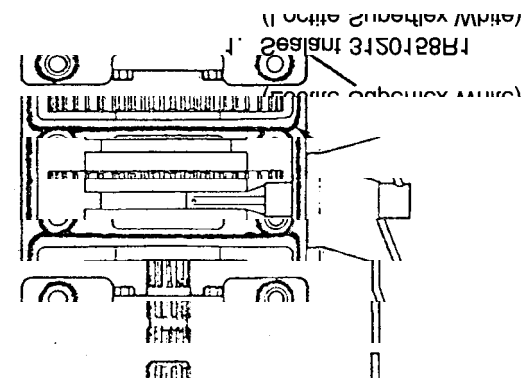
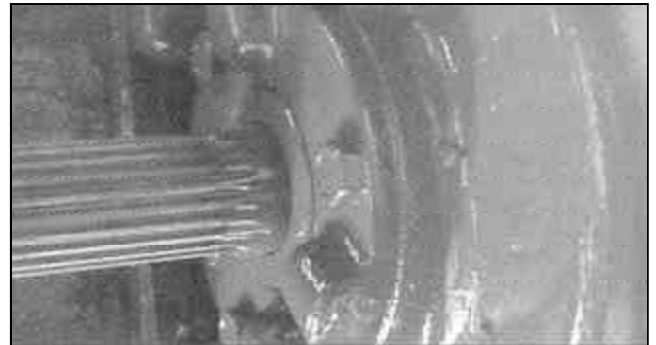
STEP 4

Use a hydraulic jack to support the transfer gearbox. Remove the retaining bolts and washers then lower the transfer gearbox clear of the transmission case.

NOTE : For Installation, follow the same procedure in reverse order. Install a new cotterin the operating rod. Refer to STEP 5 for the sealant application procedure.

STEP 5

Cleanse the joint face of the transfer gearbox and the transmission case with a suitable solvent and dry in compressed air. Apply a continuous 3 mm diameter bead of sealant 3120 158R1 (Loctite Superflex White) to the joint face on the transfer gearbox.



MFD DRIVE SHAFT AND TRANSFER GEAR BOX**2.2 Disassembly and Assembly****STEP 1**

Remove the bolts and washers (1) from the end cover (2) Lightly hit the shaft (6) with a soft faced hammer to remove the end cover. Remove the bolts and washers (3) from the seal housing (4) Hit the end cover end of the shaft to remove the seal housing.

STEP 2

Removed and discard the oil seal (5) from the seal housing (4)

NOTE : For assembly, use the bearing driver set to install a new oil seal. Make sure that the flat end face is outward

and level with the bottom of the chamfer in the seal housing bore. Lubricate the seal lips with Case 251H EP grease.

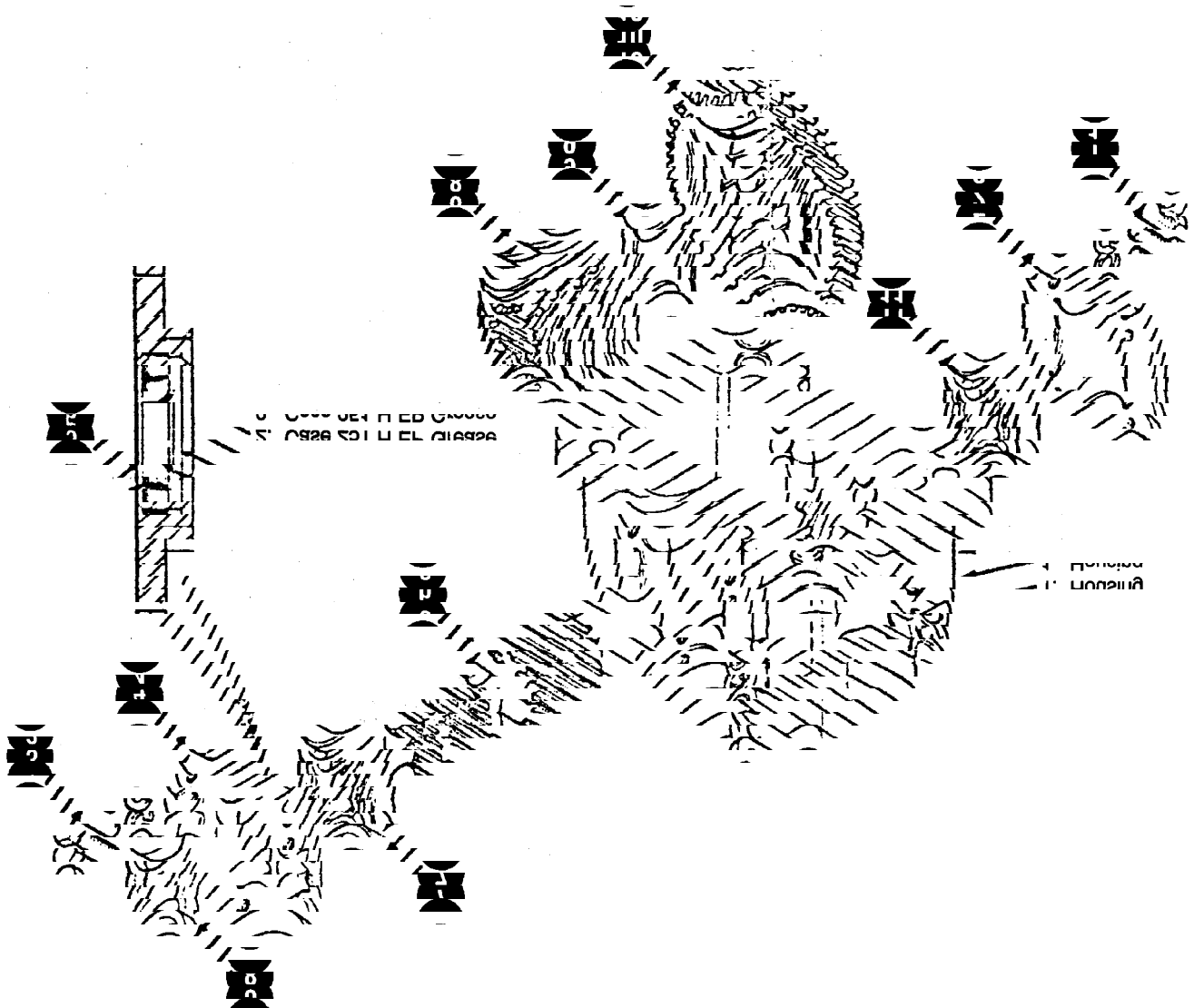
STEP 3

Use a hydraulic press to remove the shaft (6) complete with the front bearing (7) Remove the bearing from the shaft

STEP 4

Remove the clutch assembly (8) thrust washer (9) and the drive gear (10) Use the bearing driver set to remove the rear bearing (11) from the housing.

NOTE : For Assembly, install the rear bearing level with the outside of the housing.



NOTE : ITEM NUMBERS ARE IN ORDER OF DISASSEMBLY.

MFD DRIVE SHAFT AND TRANSFER GEAR BOX

STEP 5

Loosen the nut (12), then remove the screw (13), spring (14), and the outer detent ball (15).

NOTE: For assembly, apply sealant K965163 (Loctite 242) to the threads of the nut. Adjust the position of the screw for a positive shift.

STEP 6

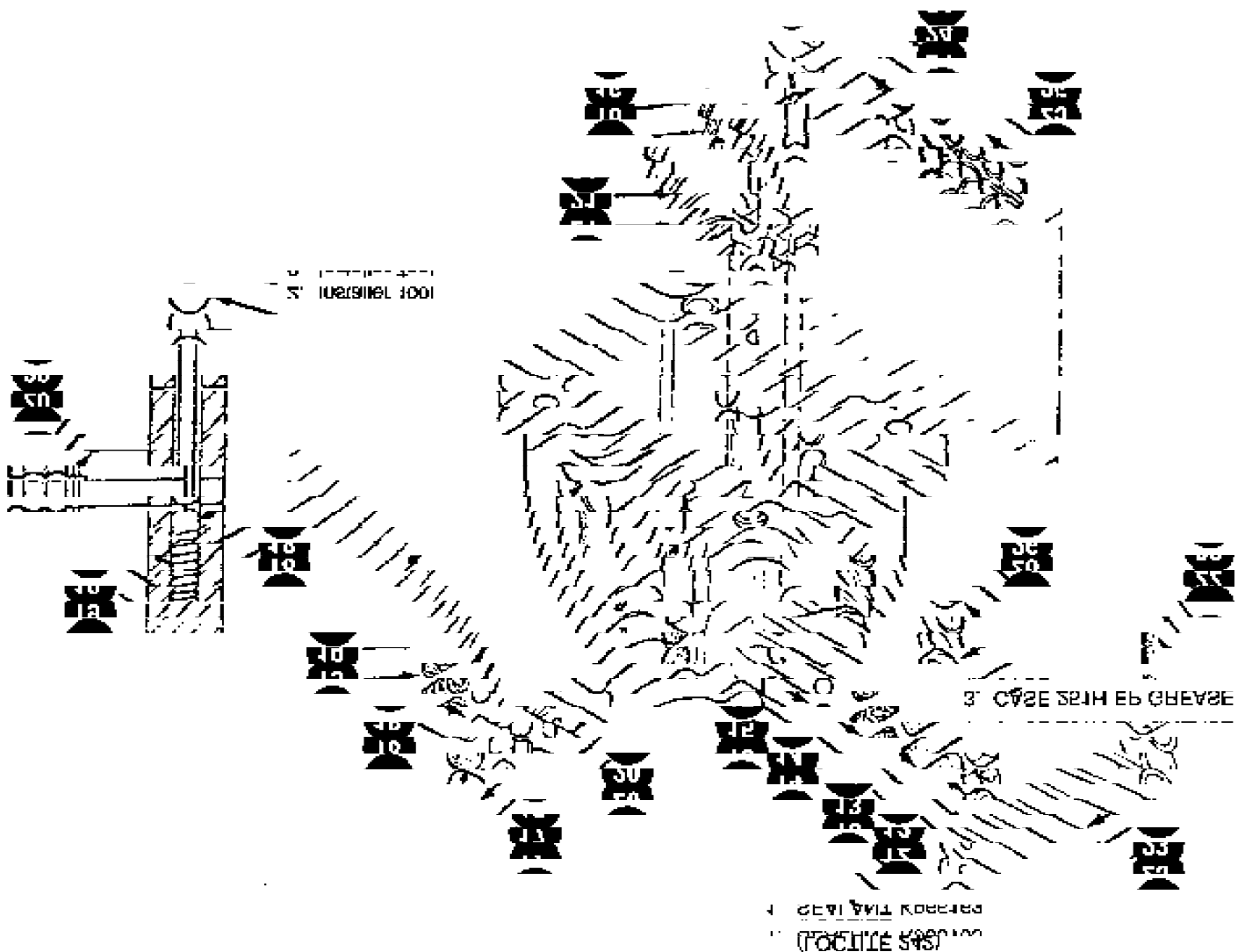
Drive out the roll pin (16) from the selector fork (21). Remove the plug (17). Use a soft metal drift to move the selector rod (20) inwards then remove the inner detent ball (18) and the spring (19). Move the selector rod in the opposite direction and remove from the housing. Remove the selector fork (21).

NOTE: For assembly, install the shortest spring and the inner detent ball. Use the installer tool (see Tool To Be Made, on page 9) to push the detent ball into its bore. Install the selector rod then remove the tool. Make sure that the flat on the selector rod is toward the outer detent ball.

STEP 7

Drive out the roll pin (22) and remove the selector lever (23). Remove the selector shaft (24) and the spring (25). Remove and discard the oil seal (26).

NOTE: For assembly, use the bearing driver set to install a new oil seal so that the flat end face is outwards. Lubricate the seal lips with Case 251 H EP grease.



NOTE : ITEM NUMBERS ARE IN ORDER OF DISASSEMBLY.

MFD DRIVE SHAFT AND TRANSFER GEAR BOX

2.3 CROSS SECTIONAL DRAWING OF THE TRANSMISSION

1. Transmission Shaft

2. Forward / Reverse Gear

3. Primary Shaft
4. Secondary Shaft

5. Pinion Shaft

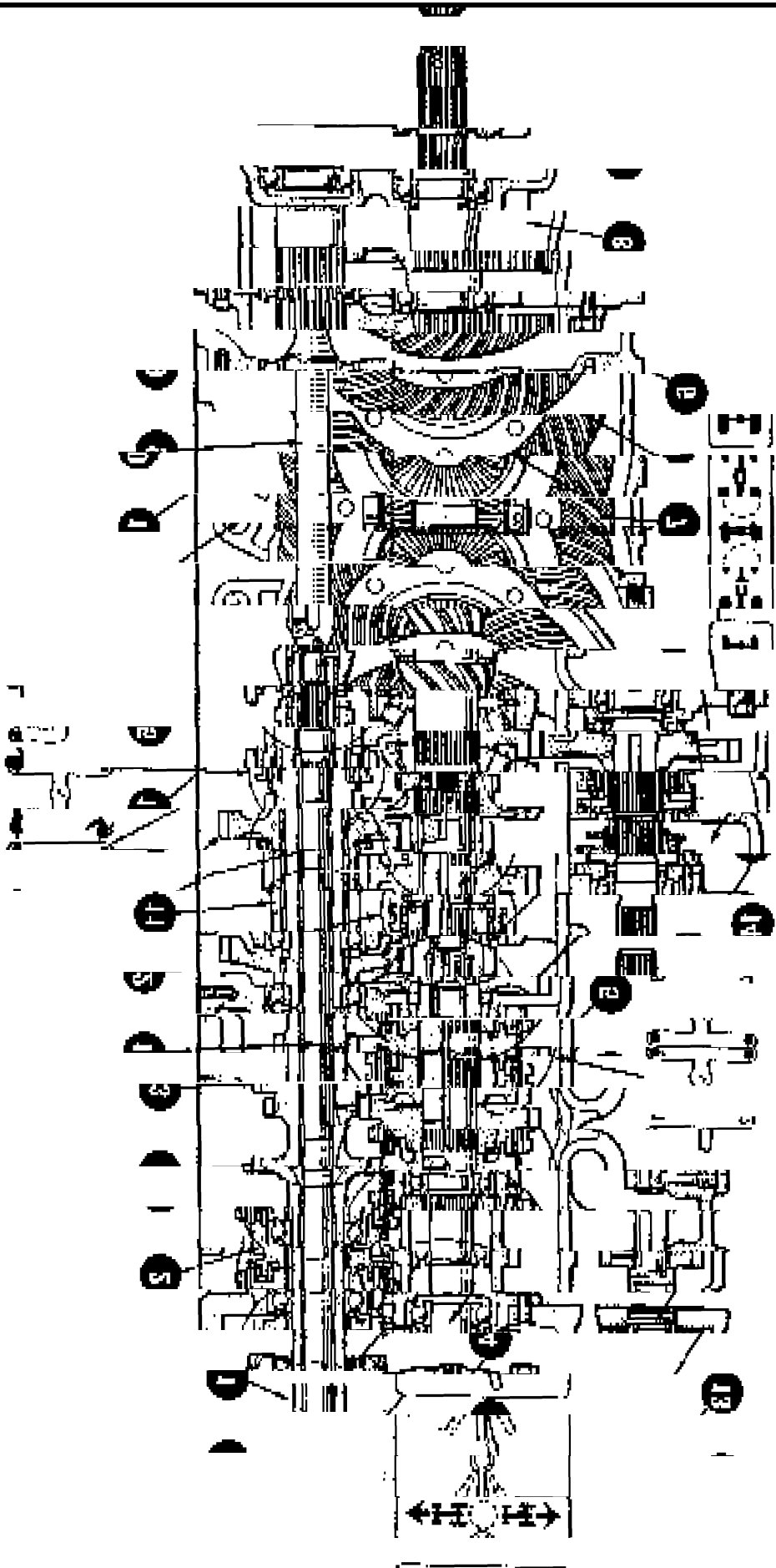
6. Differential
7. Bevel Gear

8. Single Speed PTO

9. PTO Drive Shaft
10. Differential Lock Shaft

11. Transfer Gearbox

12. Range Gear

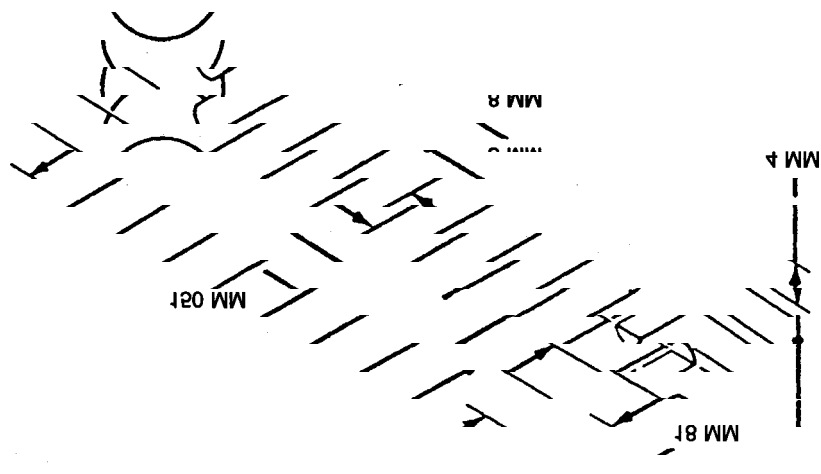


MFD DRIVE SHAFT AND TRANSFER GEAR BOX

4. SPECIFICATIONS

Transmission Oil	Gear oil API GL-5, SAE 80W 90EP, M2 C 86-B or M2C 159-B
Capacity	38 liters
Grease	Case 251H EP or and Equivalent multi-purpose lithium based grease
Gear Specification	Z=44146
Dry Weight	15 kg.
Input rotation	Clockwise and counter clockwise
Sealing Compounds and adhesive	SLASTIC 732

TOOLS TO BE MADE



DETENT BALL INSTALLATION TOOL

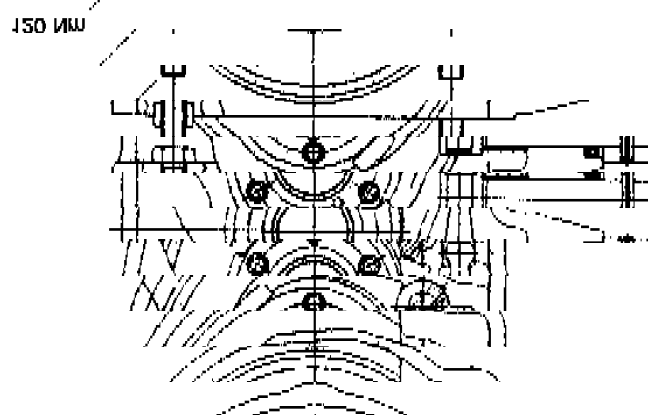
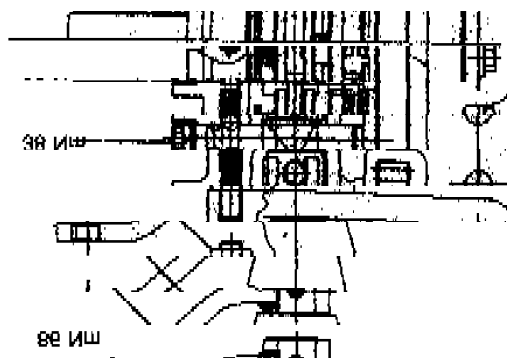
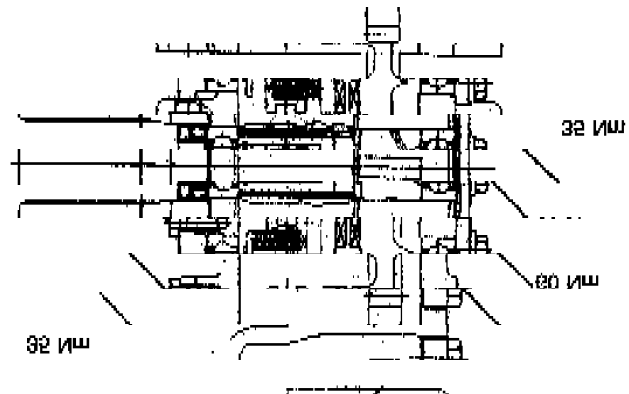
MFD DRIVE SHAFT AND TRANSFER GEAR BOX**3.0 TROUBLESHOOTING**

this is a description and explanatory guide to common problems. The guide suggests the correct repair procedures to be followed.

PROBLEM	CAUSES	ACTION
Oil leakage at the shaft	1. Radial shaft seal incorrectly mounted or damaged. 2. Running surface on the shaft damaged	1. Replace and mount radial shaft seal correctly. 2. Replace shaft or rework running surface if possible.
Oil leakage at housing cover	1. Housing cover is not sealed 2. Bolts not tightened to specified torque	1. Seal off housing cover with sealant 2. tighten bolts to specified torque
Oil leakage at the oil draining plug	1. Dirt between sealing ring and housing 2. An old sealing ring was used 3. Plug not tightened to specified torque	1. Clean 2. Use new sealing ring 3. Tighten plug to specified torque.
Oil leakage between housing and upper part	1. Sealing surface not sealed off 2. An old sealing ring was used	1. Coat surface with specified sealant 2. Use new sealing ring
Oil leak at upper part in motor compartment	1. Too much oil in transmission 2. Motor seal defective	1. Check the oil level and top up if necessary 2. Replace motor seal
Banging noise at supur-gear stage'	1. Toothing on gear damaged	1. Examine thoot flanks for impact damage and replace the damaged gear
Grinding noise torque	1. Bearing preload or backlash have not been adjusted exactly 2. Damaged bearings	1. Check the cover assembly and tighten the fastening bolts to specified 2. Replace the bearings.

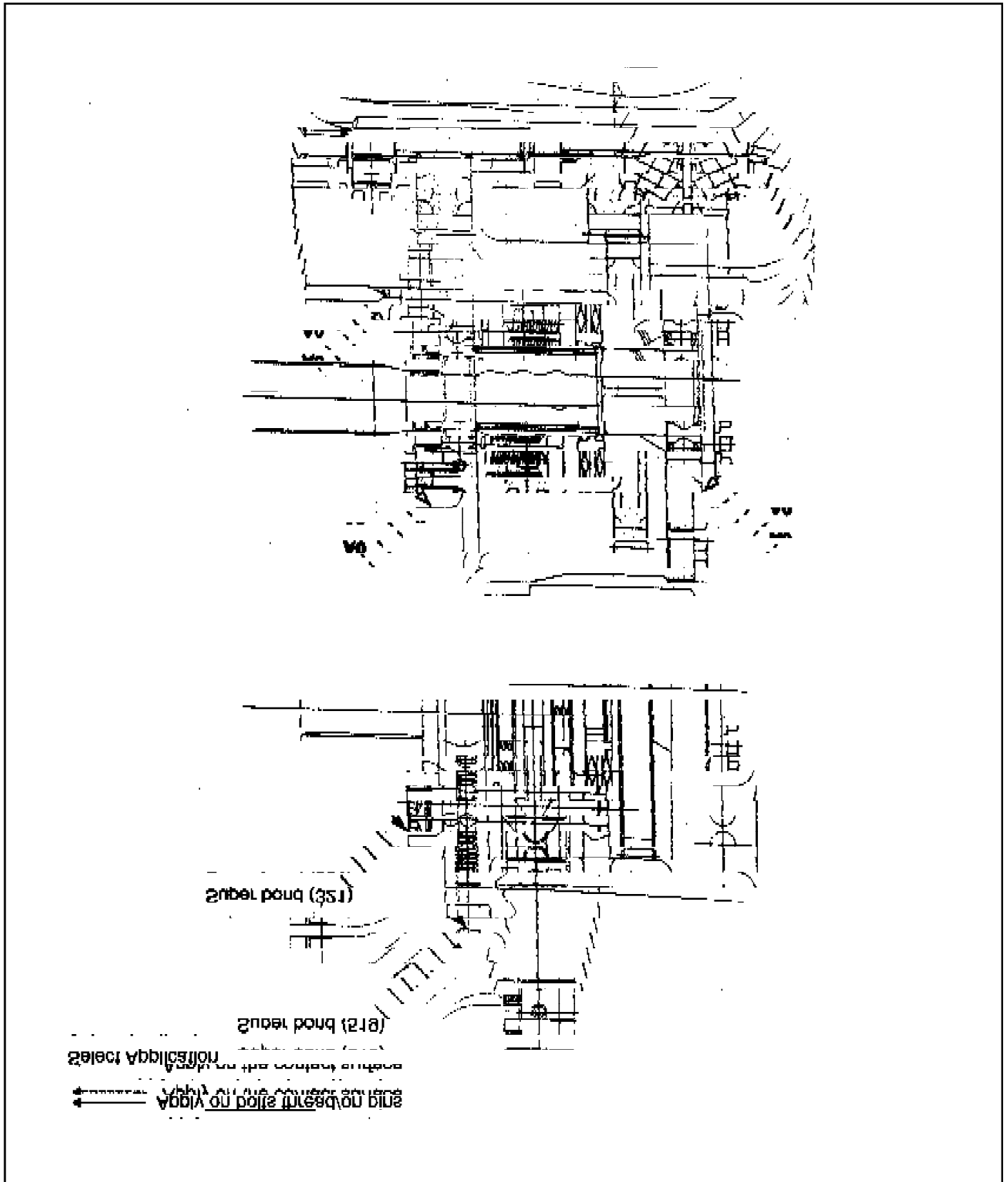
MFD DRIVE SHAFT AND TRANSFER GEAR BOX

5.0 TIGHTENING TORQUES



MFD DRIVE SHAFT AND TRANSFER GEAR BOX

5.0 SEALING COMPOUNDS AND ADHESIVES



MFD DRIVE SHAFT AND TRANSFER GEAR BOX**10.0 SPECIAL TOOLS**

The special drifts/pad used to assembly the seals bearings and bushes should always be used with the interchangeable handle FC 119033; it use is recommended together with a suitable safety handle in order to protect the hands.

FC 119033
HANDLE

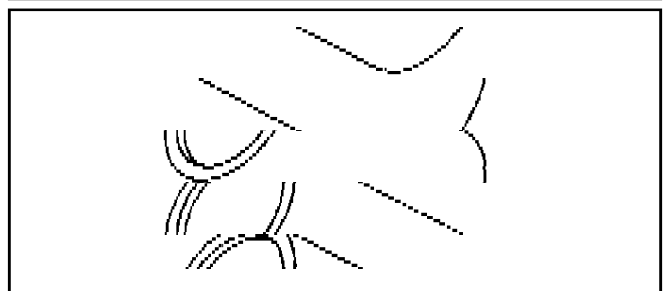
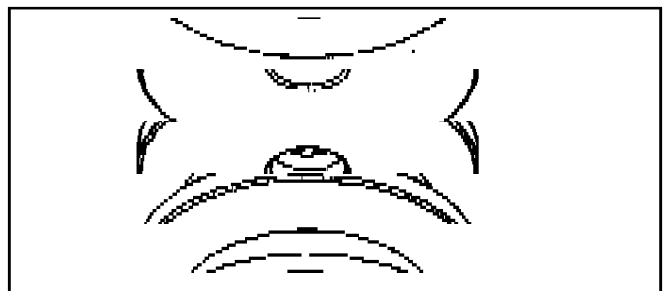
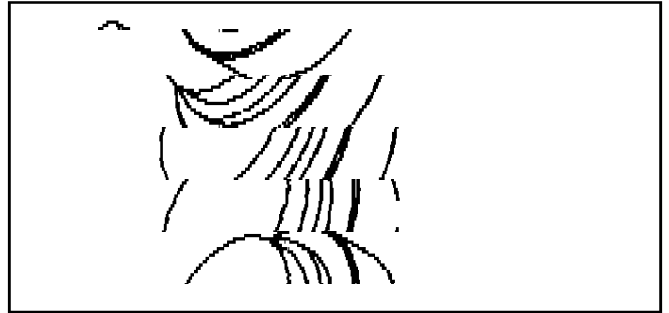
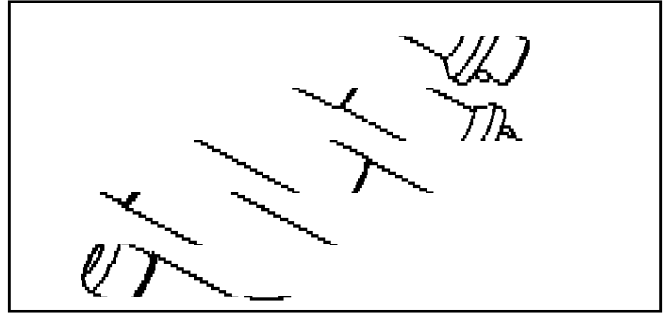
FC 715619
WRANCH

FC 715620
WRANCH

FC 715621
WRANCH

FC 715622
WRANCH

FC 715623
WRANCH

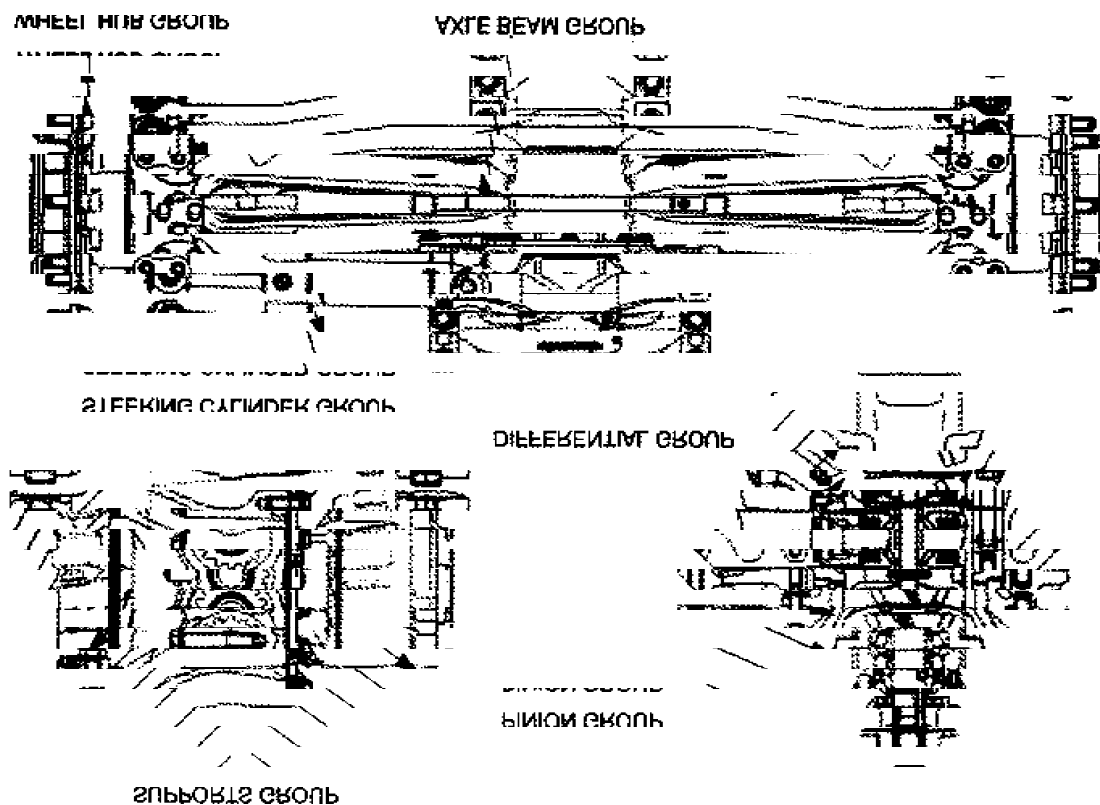


FRONT AXLE - DUAL TRANSMISSION

FRONT AXLE - DUAL TRANSMISSION

1. GENERAL DESCRIPTION

The axle described in this manual, of monolithic type. It consists of a beam casing, housing the differential in the middle and a wheel hub unit at each end. The self-locking differential, type "limited slip", is supported by two bearings mounted on a suitable structure allowing the bevel gear set to be adjusted. The ring bevel gear is adjusted by means of two rings nut located opposite each other. The position of the bevel pinion, supported by two bearings, is adjusted by inserting adjusting shims. The wheel hubs, containing the epicyclic reduction gears, are supported by two tapered roller bearings and are powered by a hydraulically-operated steering unit. The axle configuration includes a front and a rear support.



FRONT AXLE - DUAL TRANSMISSION**2. FILLING AND CHECK**

DESCRIPTION	POSITION
Differential oil filling and level plug	1
Oil breather	2
Fill, level and drain plug of epicyclic reduction gear oil	3
Differential oil drain plug	4
Greasing points	5

ROUTINE CHECKS

In the axle, lubricant should be flush with control plug (1) and (3). If not, make up level with the same oil. If leakage or any other factor determining fall in the oil level is found, then it is advisable to check immediately, in order to avoid damages to the mechanical parts. Loosen and remove the drain plug for oil draining (3 and 4).

FRONT AXLE - DUAL TRANSMISSION

2. FILLING AND CHECK

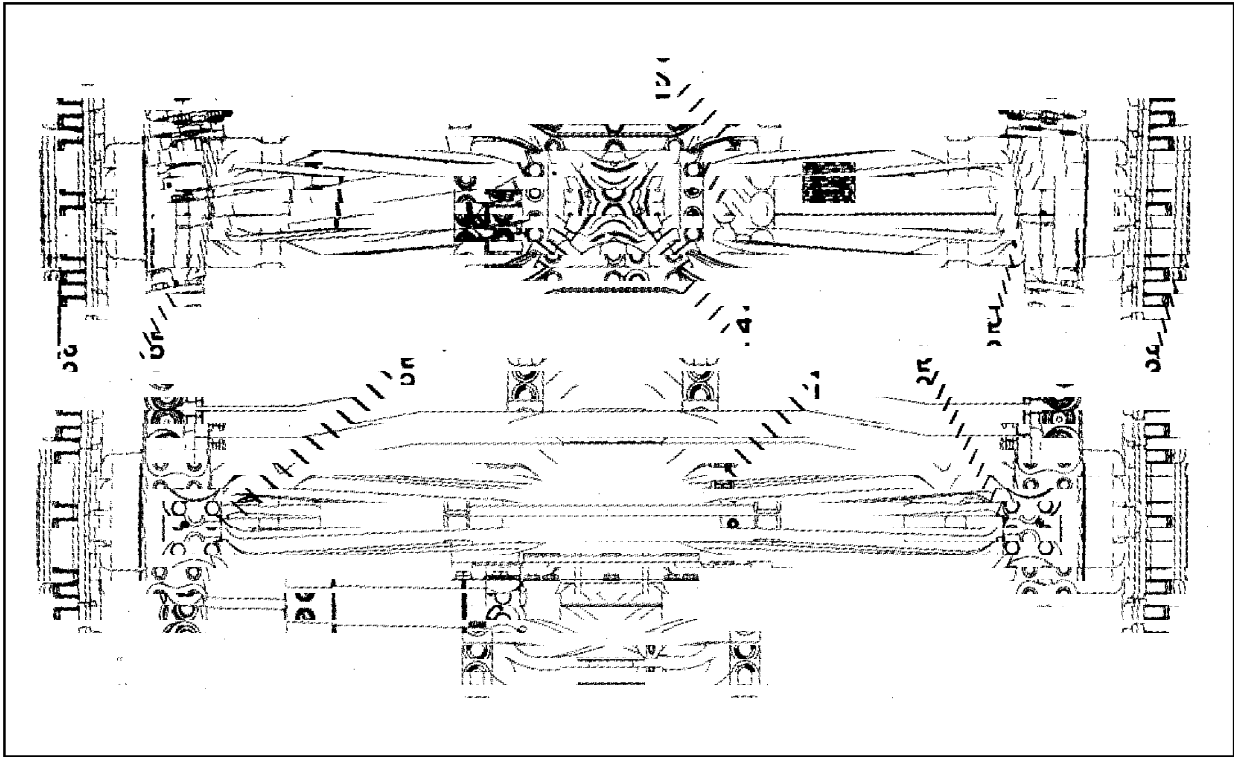
FIRST TIME		*** SEASONALLY OR EVERY 1500 OPERATING HOURS	OPERATION
150-200 hours	*	**	Axle oil change
	**	**	lubrication works
50-100 hours	**	Monthly *	CHECK AND IN CASE ADJUST all IEVEL
150-200 hours	**	Every oil change *	CLEAN MAGNETIC all PLUG
	**	Monthly *	CLEAN all BREATHER
150-200 hours	*	Weekly *	GREASING

Remarks

*Operation performed only by personnel authorized by
the manufacturer

**Operation performed only by trained personnel

***which of both conditions comes first legenda



FRONT AXLE - DUAL TRANSMISSION**4. GENERAL CHECKS AND OIL REPLACEMENT**

The disassembly/assembly instructions presume that the unit has been removed from the tractor and positioned on a suitable workbench.

Some of the following pictures may not show exactly your axle, but the procedure is the same.

STEP. 1

Before draining the oil, loosen the breather to release possible internal pressure, then tighten the plug with a torque wrench to the prescribed torque.

See Tightening Torque on Page. 50

**STEP. 2**

Drain the oil from the appropriate plug, then tighten the plug with a torque wrench to the prescribed torque (Page. 50)

**STEP. 3**

Fill with prescribed oil (Page. 45) through the hole plug. Check the oil level and if necessary top up. Close and tighten the plug with a torque wrench to the prescribed torque (Page. 50)



FRONT AXLE - DUAL TRANSMISSION

STEP. 4

Before draining the oil from the cycloidal reduction, position the wheel hub in the highest point, then loosen the plug to release possible internal pressure. Position the wheel hub in the lowest point. Unscrew and remove the plug for oil draining.



STEP. 5

Position the wheel hub with the filler hole is on the centre line of the horizontal axis. Fill with prescribed oil (Page. 45) through hole of planetary carrier.

Note: The oil level must reach the hole of the epicyclic reduction gear.

Position the plug and tighten to the prescribed torque (Page. 50) with a torque wrench.



5.0 DISASSEMBLY OPERATION

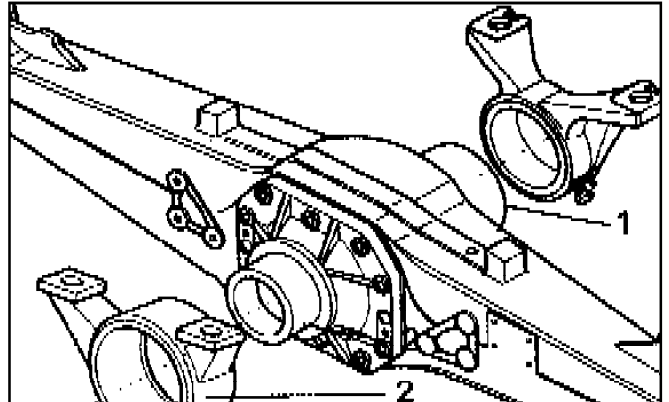
FRONT AXLE - DUAL TRANSMISSION

5.1 *Support group disassembly*

Some of the following pictures may not show exactly your axle, but the procedure is the same.

STEP. 1

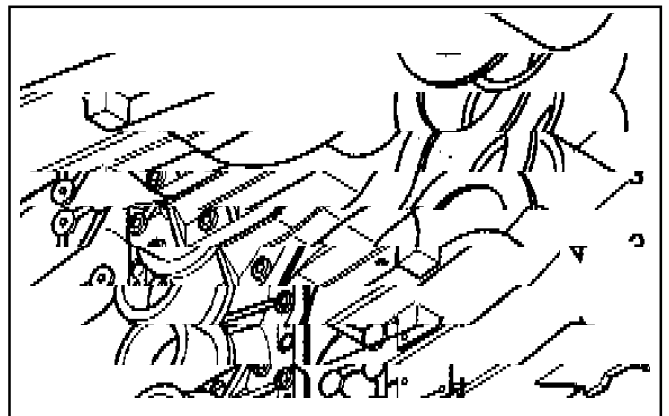
Loosen the grease nipples to make supports removal easy. Remove the front (1) and rear (2) supports.



STEP. 2

If replacement is required remove bushing (3) and washer (4) with a chisel.

Note: This is a destructive operation for the components



STEP. 3

Loosen the screw (5) and remove the bushing (6) from front support. Replace the two centering bushings (7) if necessary.



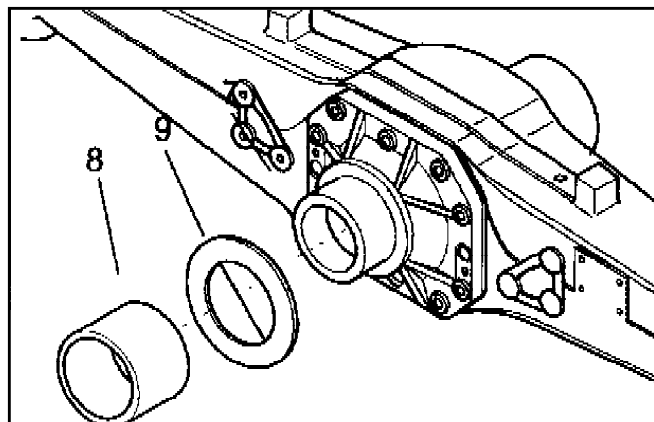
FRONT AXLE - DUAL TRANSMISSION

FRONT AXLE. DUAL TRANSMISSION

STEP. 4

If replacement is required remove bushing (8) and washer (9) with a chisel.

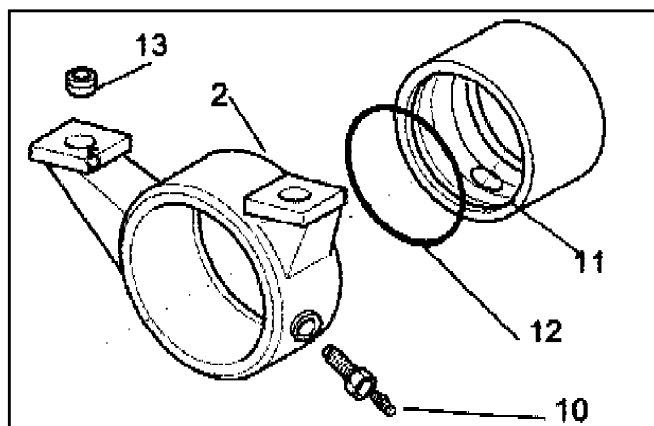
Note: This is a destructive operation for the components.



STEP. 5

Loosen the screw (10) and remove the thrust washer (11) from rear support (2). Remove O. ring (12) and replace it if required. Check bushings (13) conditions and replace them if required.

Note: This is a destructive operation for the components.

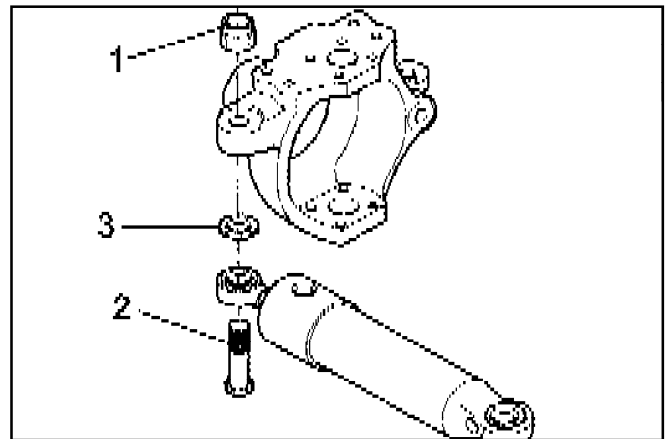


FRONT AXLE - DUAL TRANSMISSION**5.2. Steering cylinder group disassembly**

Some of the following pictures may not show exactly your axle, but the process is the same.

STEP 1

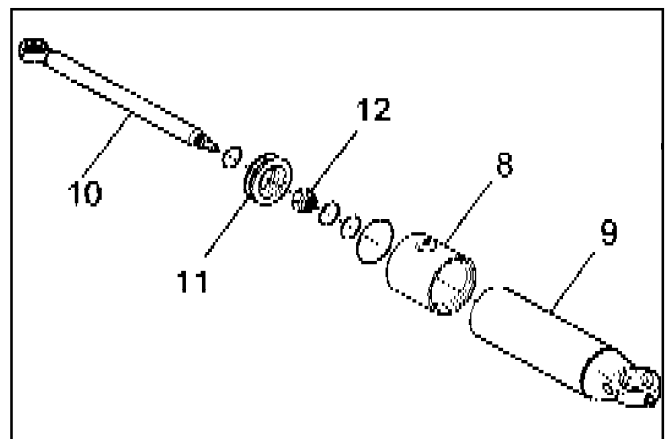
Unscrew and remove the nut (1) Slide the pin (2) and retrieve the washer (3).

**STEP 2**

Push with a punch the retaining Spirol pin (4) inside the rod pin (5) Slide the rod pin (5) from the steering cylinder and from the support and retrieve the relative spacers (6 and 7). Remove the steering cylinder. Unscrew and remove the screws and washers of the cylinder support bracket. Remove the cylinder support bracket.

**STEP 3**

Inspect the seals conditions and replace if necessary. Unscrew the cylinder head (8) from the steering cylinder body (9). Slide the rod (10) and piston (11) from the steering cylinder body (9). Unscrew the self locking nut (12) and remove the cylinder. Remove the rod (10) from the cylinder head.

**STEP 4**

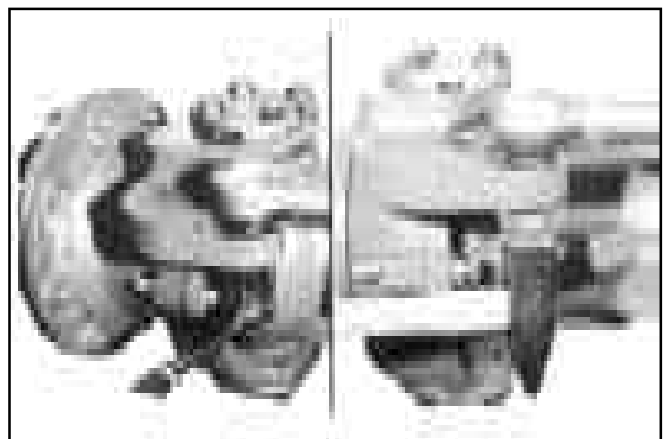
Unloose the guide rod locknut of some turns till it is over the end of the threaded pin. Beat on the nut with a hammer in order to disjoin the guide rod from the swivel housing.

Warning: don't beat on the end of the threaded pin.

Note: this is a destructive operation for the nut.

Repeat the same operation on the second end of the guide rod. Remove and check the conditions of the guide rod. Remove and check the conditions of the guide rod.

8.



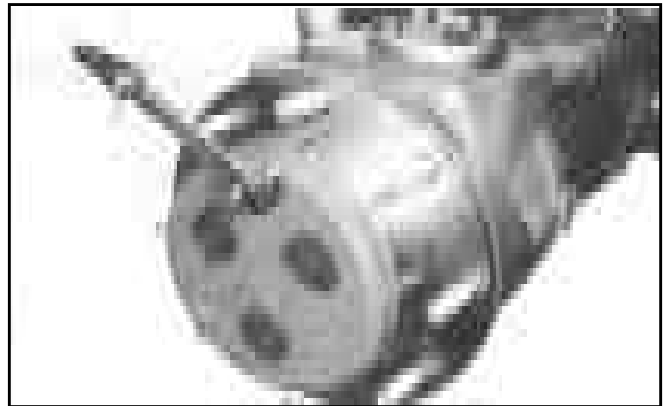
FRONT AXLE - DUAL TRANSMISSION

5.3. Epicyclic reduction gear group disassembly

Some of the following pictures may not show exactly your axle, but the process is the same.

STEP. 1

Before draining the oil, position the hub with the plug on the upper part and loosen it of some turns in order to eliminate any possible inner pressure, and then remove it completely. Turn the hub upside-down till the hole is in the lowest point. Drain the oil completely.



STEP. 2

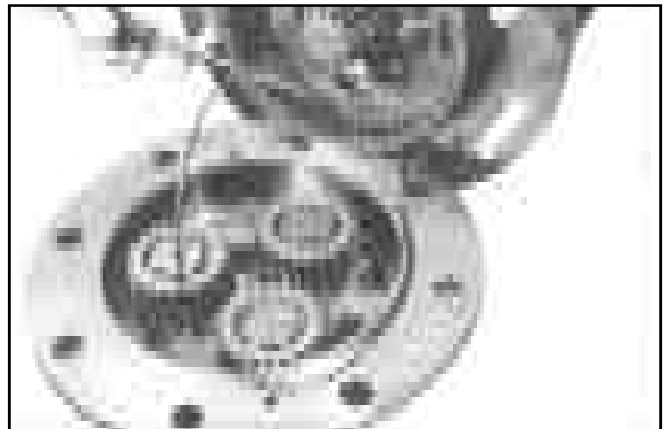
Unscrew and remove the two fastening screws of the planetary carrier with a wrench.



STEP. 3

Remove the planetary carrier from the wheel hub.

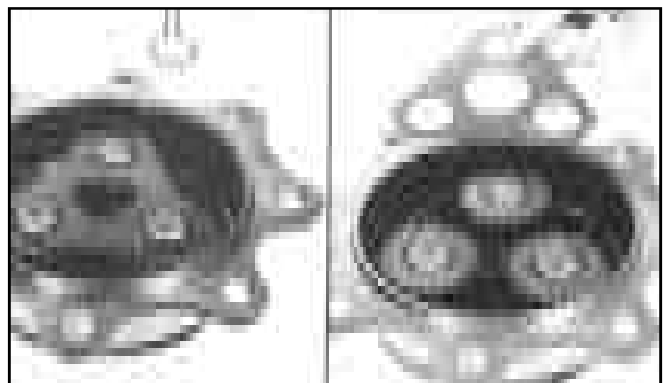
Position the planetary carrier on a table and check its wear conditions. Remove the 'O' ring and check its conditions.



STEP. 4

In FCse of gears replacement:

- remove the lock ring with a special plier:
- remove the washer.



FRONT AXLE - DUAL TRANSMISSION

STEP. 5

Remove the epicyclic gear from its seat, taking care not to lose the rollers and thrust washer inside it.

If the pins of the pinion gears and half shaft stop are in poor condition, replace the entire planetary train with prefitted pins.



FRONT AXLE - DUAL TRANSMISSION

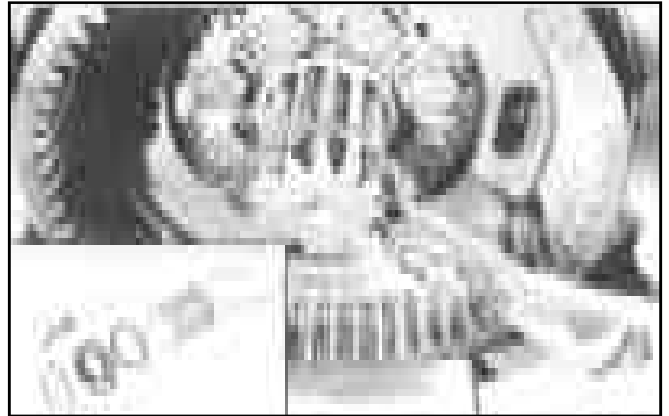
5.4. Wheel hub group disassembly

Before disassembling the wheel hub, it is advisable to secure it with a belt or a rope on a hoist or any other supporting device, in order to avoid its accidental fall that could damage either the operator or the wheel hub group.

STEP 1

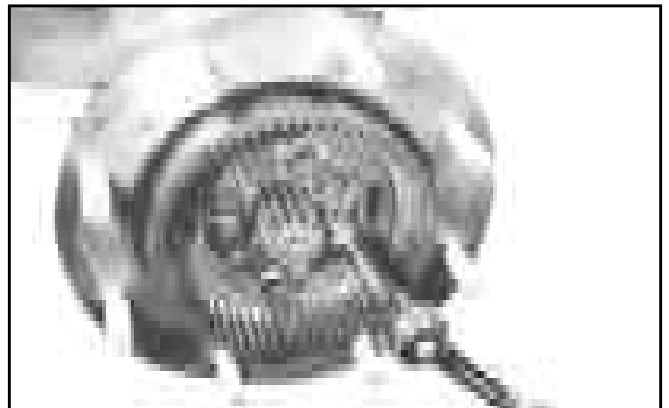
Remove the steel lock ring from the U Joint shaft using a suitable plier.

Remove and collect the axle shaft washers.



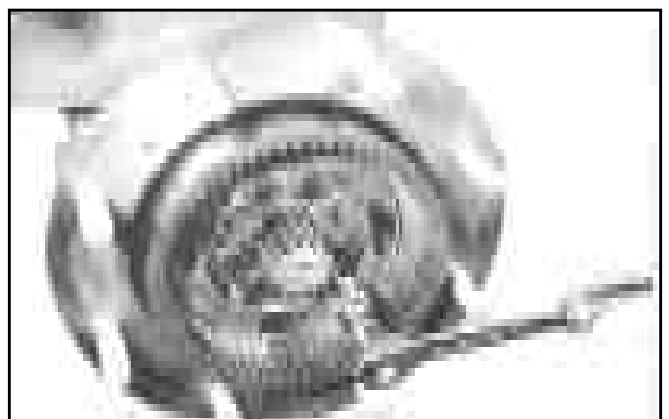
STEP 2

Unscrew and remove the fastening screws from the wheel carrier group.



STEP 3

In order to remove the wheel carrier group from its housing, screw at least two of the just removed screws in the threaded extraction holes.



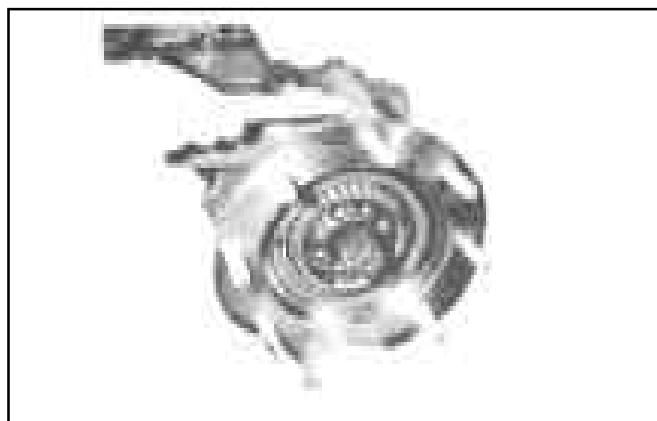
FRONT AXLE - DUAL TRANSMISSION**STEP. 4**

Extract and remove the wheel carrier together with the epicyclic ring gear. Remove the steel lock ring and disjoin the wheel carrier from the epicyclic ring gear. Check the wear conditions of the components. Only if necessary, remove the centering bushes of the hub lock ring gear with a hammer and the special tool FC715086.

**STEP. 5**

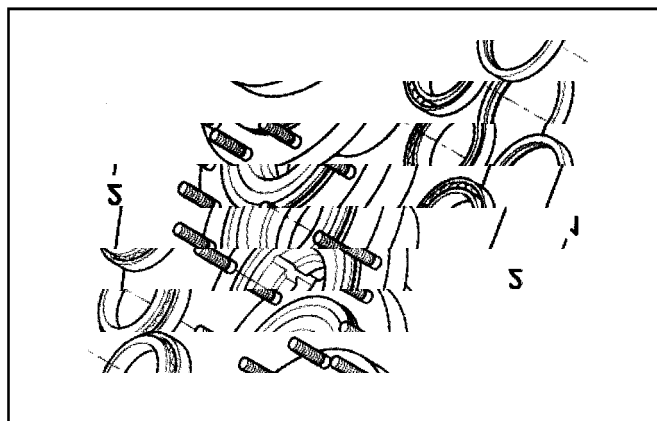
Remove the wheel hub, using levers and a hammer to facilitate the operation.

Note: collect the bearing cone.

**STEP. 6**

Position the wheel hub on a flat surface and take the seal ring (1) out with a lever.

Note: this a destructive operation for the seal ring. Take the bearing cups (2) out, on both sides of the hub, using a hammer and a suitable drift. Remove the bearing cone from the swivel housing end, using a suitable extractor.



FRONT AXLE - DUAL TRANSMISSION

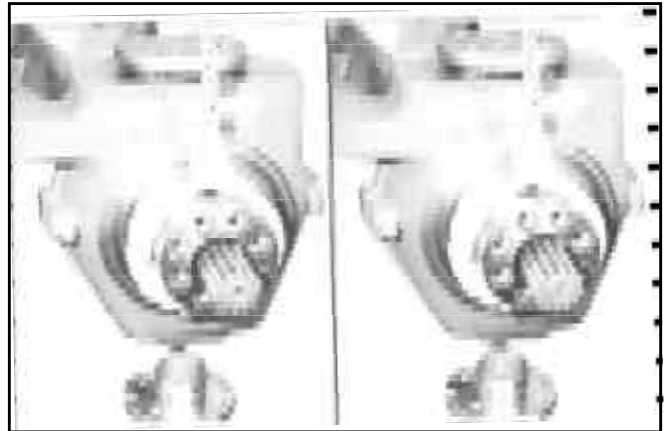
STEP. 7

Danger: before removing the king pins, secure , the sivel housing with a belt or a rope to a hoist . or any other supporting device.

Unscrew and remove the fasterning screws from the up- per and lowerking pin.

Remove the king pins.

Note: collect the belleville washers and the shim from the axle.



STEP. 8

Remove the swivel housing from the axle beam and from the short shaft of the U Joint.



STEP. 9

Position the swivel housing on a flat surface and take the seal ring out with a lever.

Note: this is a destructive operation for the seal ring.

Turn the swivel housing and take the bush out, using a drift and a hammer.



FRONT AXLE - DUAL TRANSMISSION**5.5. Axle beam group disassembly**

Some of the following pictures may not show exactly your axle, but the process is the same.

STEP. 1

Remove the U-Joint from the axle beam.

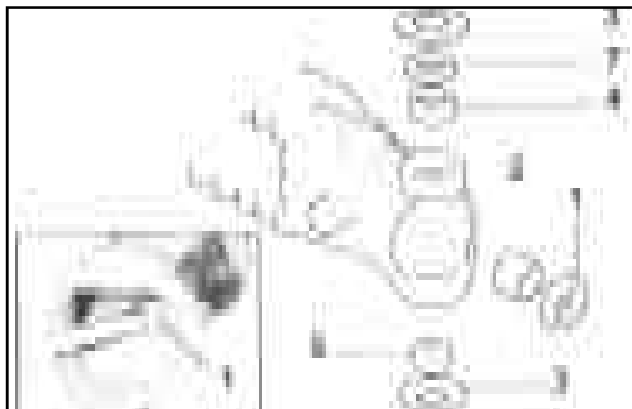
**STEP. 2**

Take the seal ring (1) out of the axle beam with a lever. Remove the cup springs (3) and the upper shims (7) from the king pin housings in the axle beam.

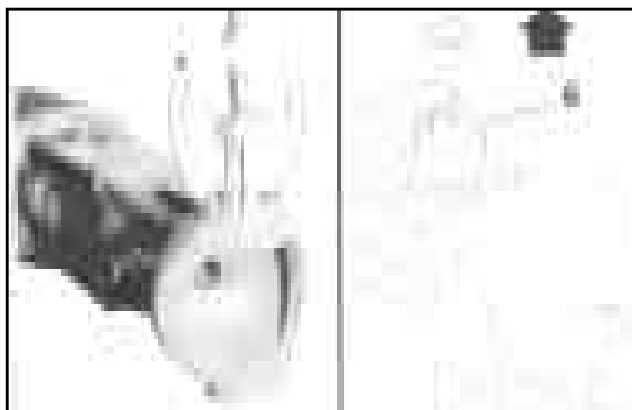
Note: this is a destructive operation for the seal ring.

In order to replace it inside the axle beam, the bushing (2) needs to be cut and destroyed with a chisel.

Note: examine the bush before the removal and replace it only if the wear conditions require this.

**STEP. 3**

Take the upper (4) and lower (5) bushes out of the king pin housings (6) and out of king pin with a suitable extractor.



FRONT AXLE - DUAL TRANSMISSION

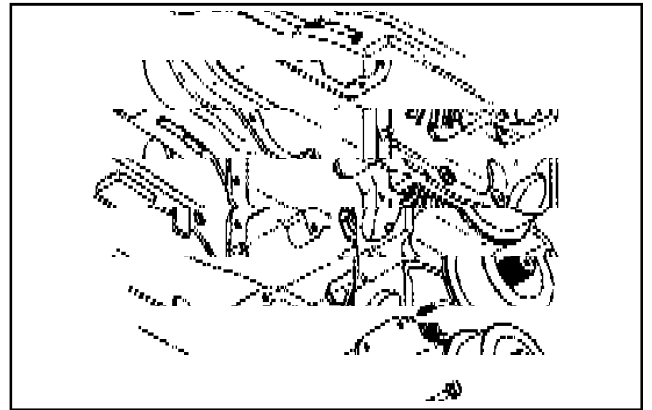
5.6. DIFFERENTIAL SUPPORT GROUP DISASSEMBLY

Some of the following pictures may not show exactly your axle, but the procedure is the same.

Note: before disassembling the differential support group, it is necessary to slide both the double U-joints (Sec 5.5)

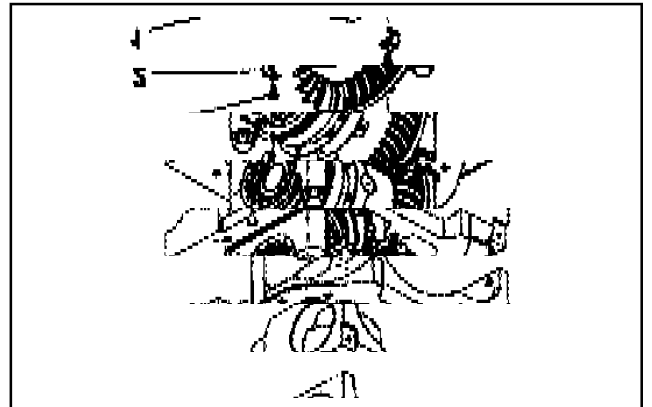


Warning: before disassembly, to hold up the differential support with a rope or other appropriate means. Unscrew and remove the fixing screws of the differential support and remove it from the central body.



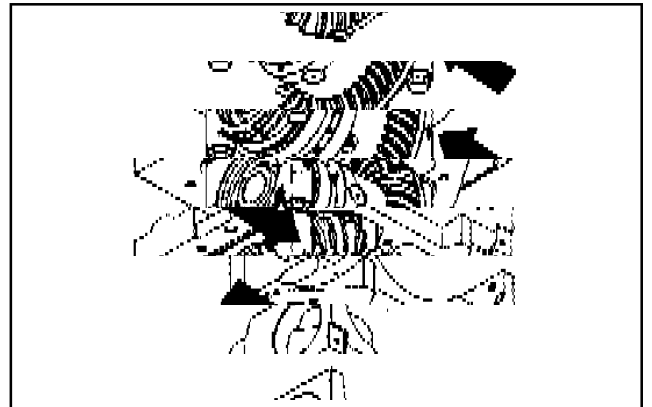
STEP 1

Remove the screws (1) for the removal the ring nut lock (2).



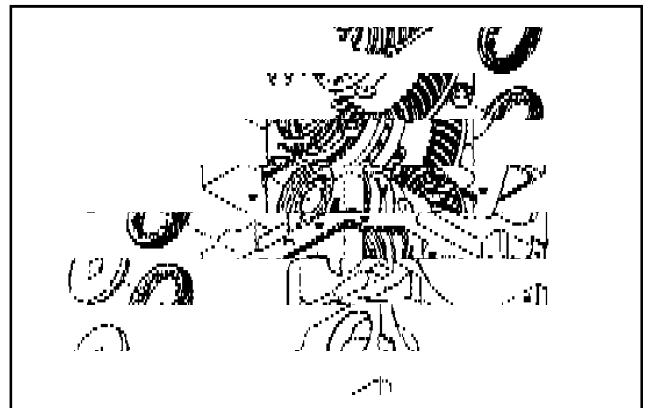
STEP 2

Before removing bolts, mark half-collar and the differential carrier with permanent reference marks to avoid inverting them when reassembling the unit. Mark the area between the ring nuts and the differential carrier as well.



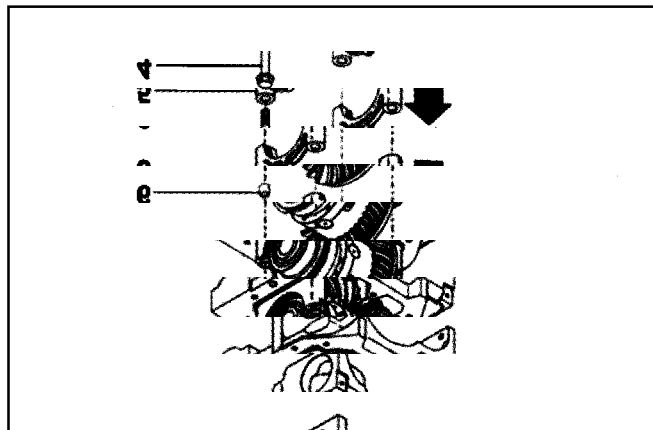
STEP 3

Unscrew the left and right adjuster rings nuts (3) using the special tool FC119030



FRONT AXLE - DUAL TRANSMISSION**STEP. 4**

Unscrew the four screw (4) and remove the two half-collar (5). retrieve the four bushes (6).

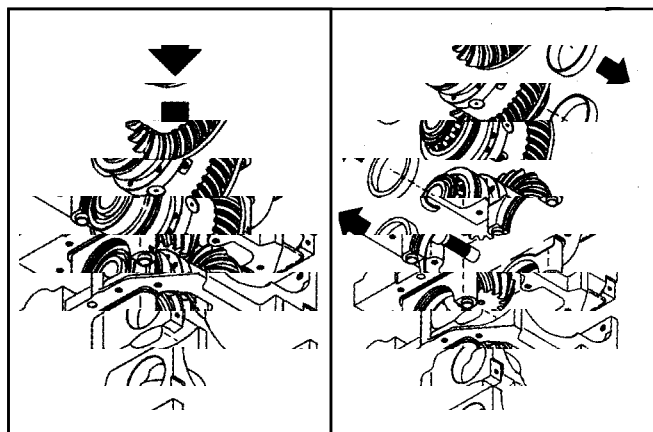
**STEP. 5**

Remove the differential housing.



Warning : not mismatch the races of the bearing if they are not to be replaced.

Retrieve the cups bearing that are removed together with the differential housing.



FRONT AXLE - DUAL TRANSMISSION

5.7 PINION GROUP DISASSEMBLY

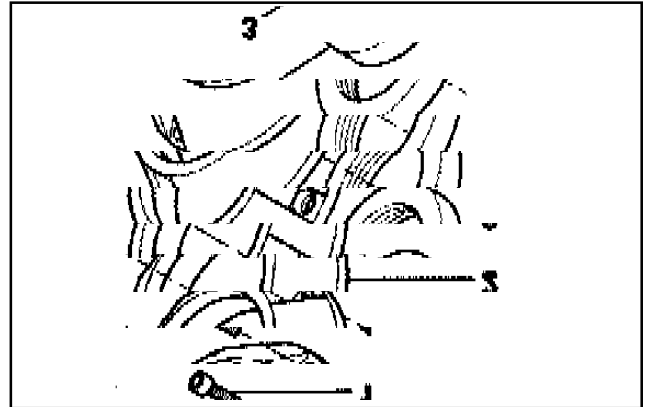
Some of the following pictures may not show exactly your axle, but the procedure is the same.

Note: before disassembling the pinion group, it is necessary to remove the differential unit (Sec. 5.6)

STEP 1

Lock the differential carrier on a vise. Unscrew and remove the four fastening screws (1) of the motion input flange (2). Withdraw the motion input flange (2).

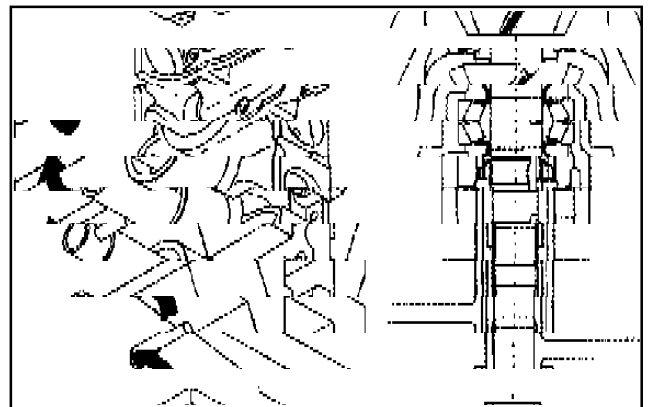
Note: this is a destructive operation for the seal rings.



STEP 2

Unscrew the ring nut with the special tools FC715081.

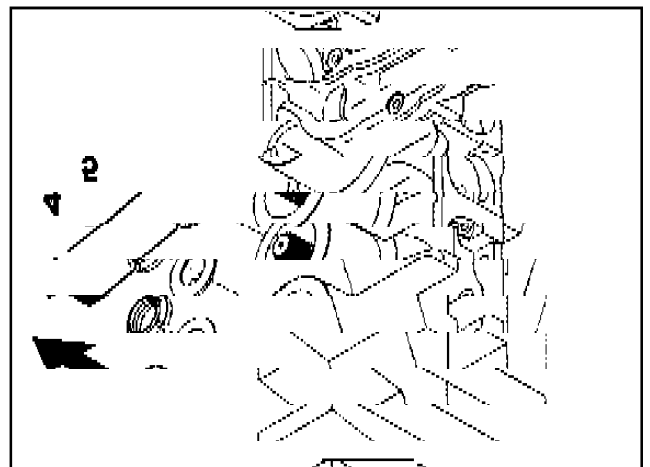
Note: this is a destructive operation for the ring nut.



STEP 3

Remove the ring nut (4) and retrieve the locking washer (5).

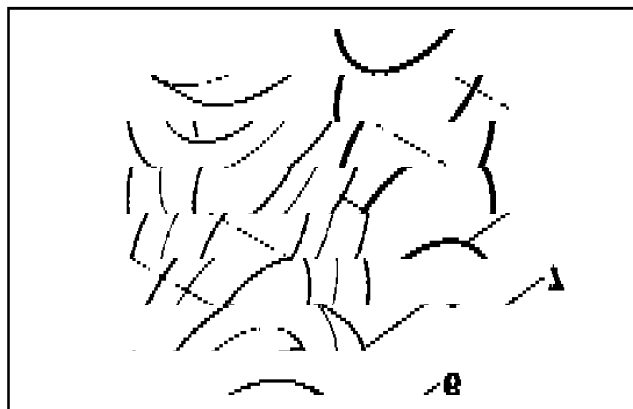
Slide the spacer (6) with the O-Ring (7). Check and replace the O-Ring if necessary.



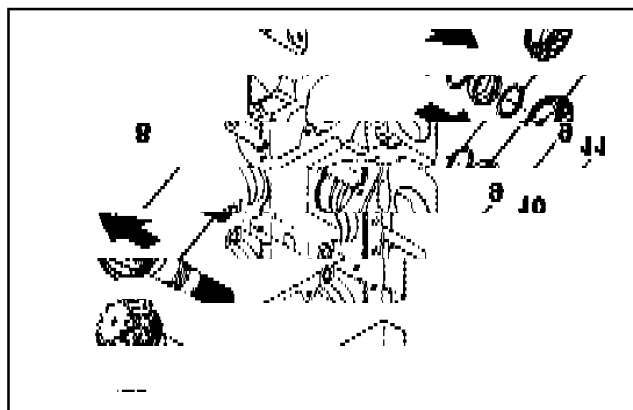
FRONT AXLE - DUAL TRANSMISSION**STEP 4**

Warning: take care not to drop the pinion.
Tap the shaft with a soft material hammer to remove the bevel gear (8).

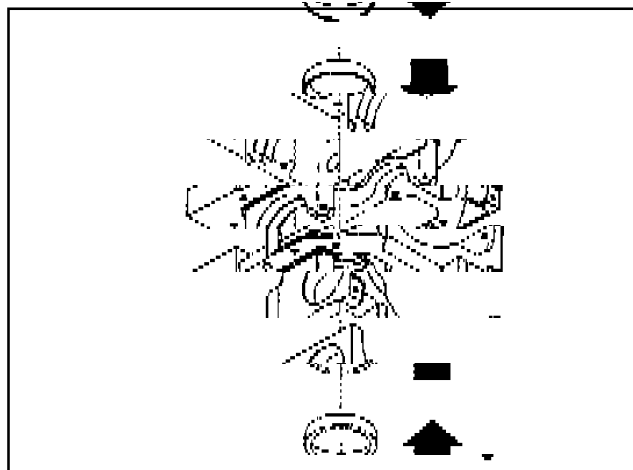
Retrieve the washers (9) the collapsible spacer (10) and the inner cone of the tapered roller bearing (11).

**STEP 5**

Place the differential carrier on a flat surface as shown in the figure and remove the outer cups of the taper roller bearing using a drift and a hammer.

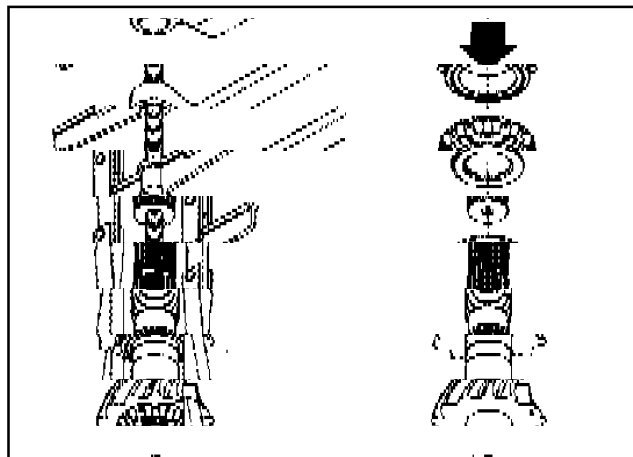
**STEP 6**

Remove the inner cone of taper end roller bearing of the pinion, use a standard extractor. Retrieve the bearing cone and the underlying shim.

**STEP 7**

Check all pinion components for wear.

Note: the ring nut, locking washer and elastic spacer when reassembling the unit, must be replaced



FRONT AXLE - DUAL TRANSMISSION

5.8 DIFFERENTIAL GROUP DISASSEMBLY

Some of the following pictures may not show exactly your axle, but the procedure is the same.

STEP. 1

Retrieve the differential and put it in a vise. Unscrew all the fastening screws of the bevel gear crown.

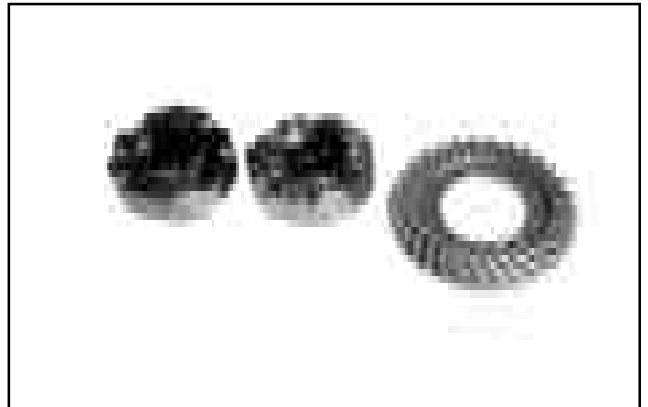
Warning: This will make both differential half boxes free, take care not to drop the internal components. Remove the bevel gear crown.



STEP. 2

Disassemble the differential box in two half boxes complete with the relative components.

Note: mark the two half boxes before disjoining them, in order to re-assemble them in the same position as the one before disassembling.



STEP. 3

Disassemble all the components. Check the operating and wear conditions of the components. Take the bearing out of the differential half box, using two levers or a threehold extractor.

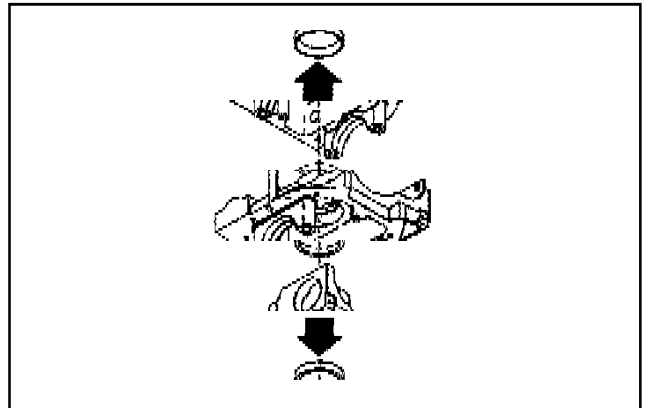


FRONT AXLE - DUAL TRANSMISSION**6. ASSEMBLY OPERATIONS****6.1. Pinion group assembly**

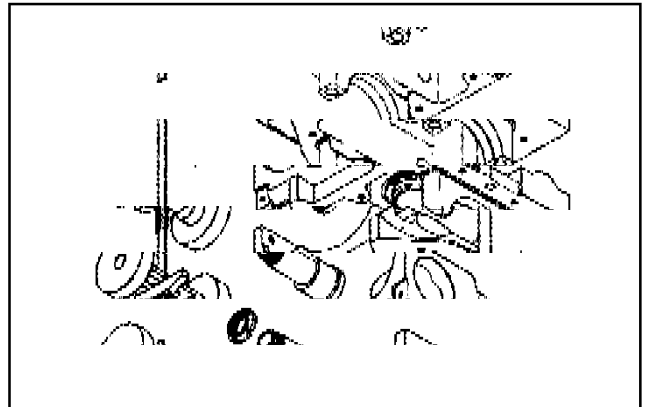
Some of the following pictures may not show exactly your axle, but the procedure is the same.

STEP. 1

Place the differential support on a stable and flat surface. Fit the outer cups of the new bearings using the special drift FC119068 and a hammer.

**STEP. 2**

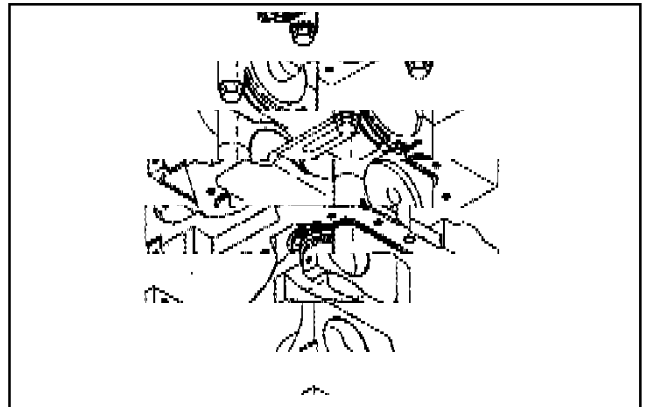
In order to measure the conic distance, is used the kit composed of the special tools called "false pinion" FC715084 and "false differential box" FC119205 and FC119206.

**STEP. 3**

Insert the false pinion FC715084, together with its bearings and its ring nut, in the just mounted housings for the bearings.

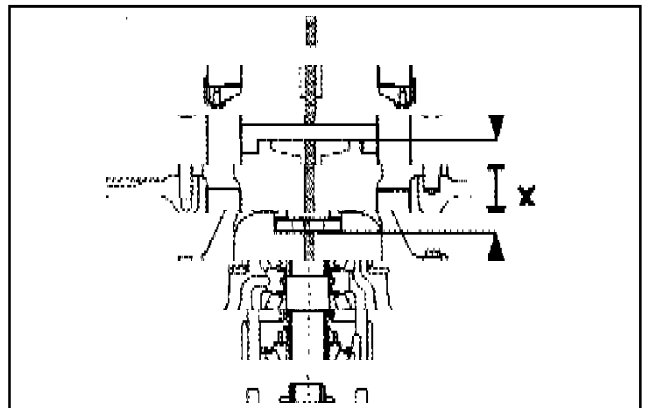
Tighten, without exceeding, till the backlash is eliminated. Install the special tools FC119205 and FC119206 to the differential

group supports and screw in the half-collar bolts (see figure).

**STEP. 4**

Assemble layout of tools FC119205 AND FC119206 on the seat of differential bearings of the differential carrier.

Measure distance (X) using a depth gauge.

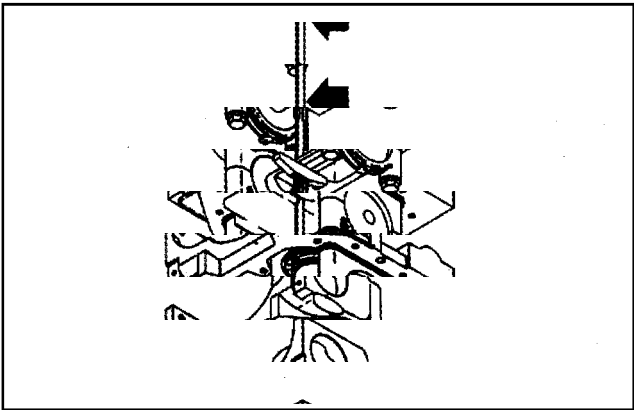


FRONT AXLE - DUAL TRANSMISSION

FRONT AXLE. DUAL TRANSMISSION

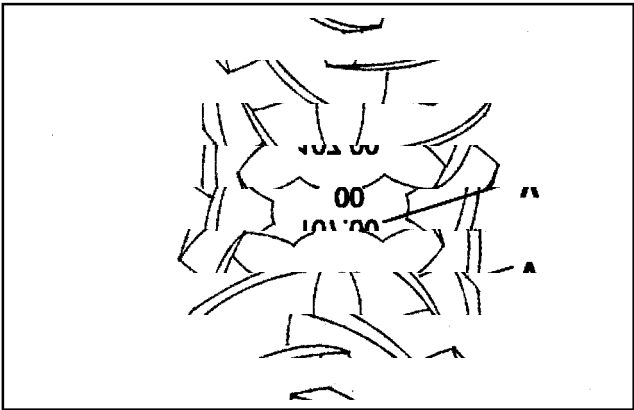
STEP 5

Use a depth gauge to measure distance (X) distance between the axis of the differential bearing and the point at which the pinion head is supported, or the base of the bearing.



$S=x-v$

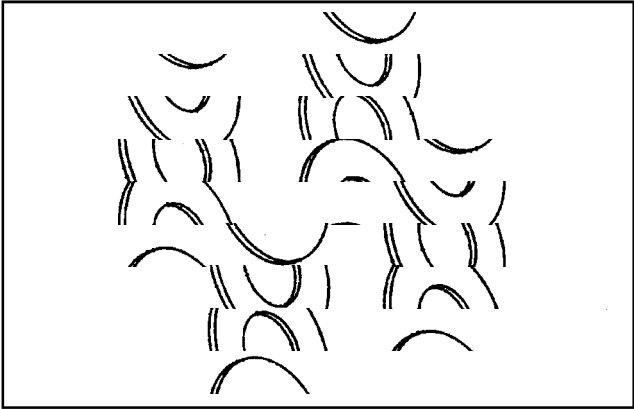
In order to determine the shim (S) necessary between the pinion and the bearing, you should subtract the (V) value stamped on the pinion head (V=requested conical distance) from the (X) value.



SHIM RANGE										
Shim	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4

Qty. - - - - - - - - - -

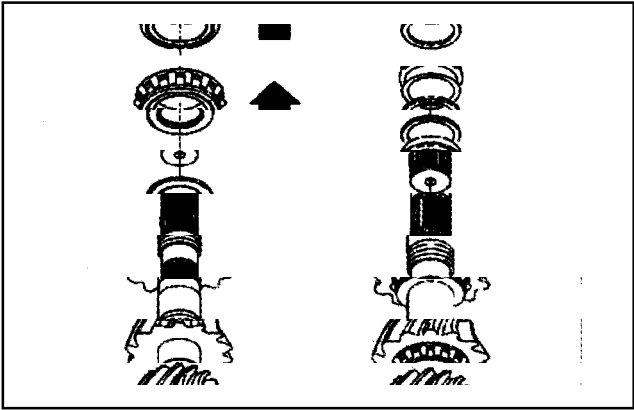
Select the thickness (S) from the range of available shims, and fit to shaft under the pinion head. Take care to assemble correctly.



Once you have choosed and inserted the suitable shim with chamfer against the gear, force the bearing into the pinion shaft and with FC715082 special tool under a press, making sure that it is well set.

Insert the shims and a new elastic spacer.

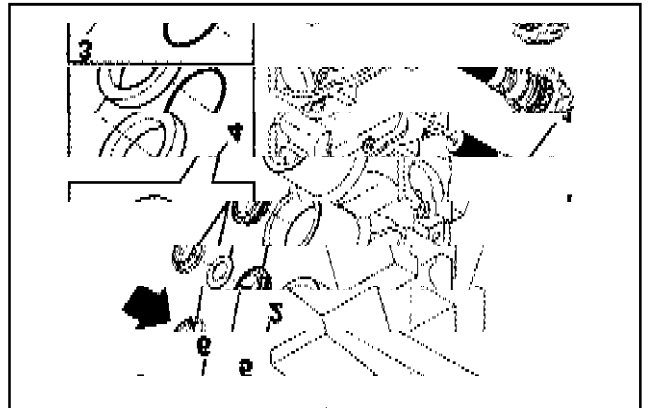
Note: use only a new elastic spacer.



FRONT AXLE - DUAL TRANSMISSION**STEP 6**

Insert the bevel pinion unit (1) into the differential support housing (from inner part) and the second bearing (2) cone into the pinion end. In order to force the second bearing into position, using the special tool FC715082 and a hammer.

It is advisable to offer resistance (for example with a sledge) to the beating force. Insert the space (3) with a new O-Ring (4)

**STEP 7**

Insert a new ring nut washer (6) and the locking ring nut (5). To screw the ring nut in, using the wrench for ring nut FC715080 and for pinion retainer FC715081.

The torque setting is given by the preloading measurement on bearings.

Tighten the ring nut step by step.

If it is tightened too much, the elastic spacer should be replaced and the procedure repeated. When you check the preloading, it is advisable to beat the pinion ends with a hammer made of soft material slightly to favour the bearing setting.

STEP 8

P=10.5-15.7 daN

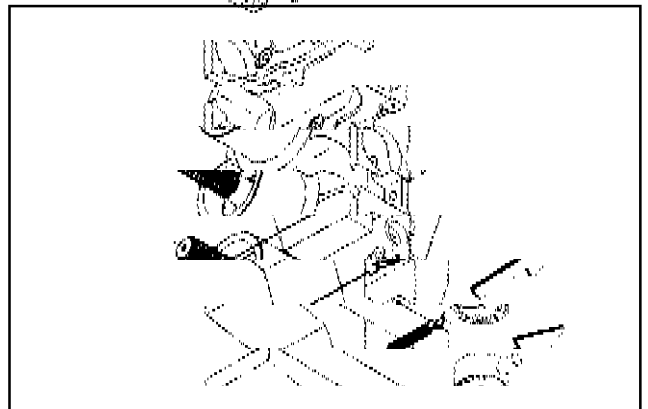
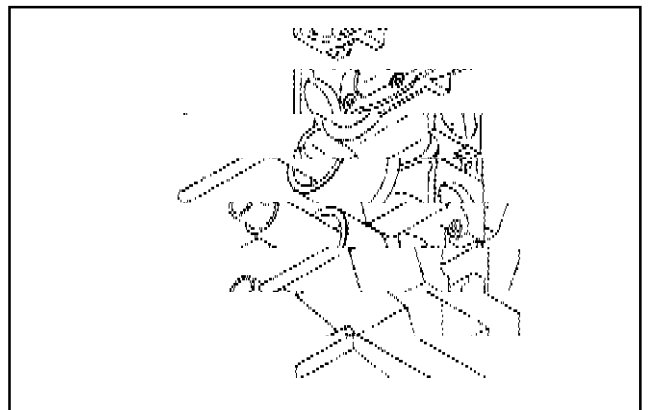
Warning: all preloadings should be measured , without the seal ring.

carry out the preloading measurement (P) of the pinion taper roller bearings, using a dynamometer whose cord is wound on the end pinion.

The adjustment is carried out by increasing the ring nut torque setting gradually, being careful not to exceed.

STEP 9

Once you got the requested preloading value caulk the ring nut, using a hammer and a chisel.



FRONT AXLE - DUAL TRANSMISSION

6.2. Differential group assembly

Some of the following pictures may not show exactly your axle, but the procedure is the same.

STEP 1

Assemble the cones of the new taper roller bearings on the differential housing and cover, using the special tool FC715083 and a hammer.



STEP 2

Position a half box on a workbench and assemble all its inner components (sun gears, planetary gears, thrust rings, pin, discs and counterdiscs) as figure. Join the two half boxes, aligning the reference marks made upon them.



STEP 3

Position the ring bevel gear, apply LOCTITE 270 on the thread and then fix the whole by tightening the screws to the requested torque (Page. 50)



FRONT AXLE - DUAL TRANSMISSION**6.3. Differential group support assembly**

Some of the following pictures may not show exactly your axle, but the procedure is the same.

Note: before assembling the differential support group, it is necessary to assemble the pinion unit (Sec,6.1)

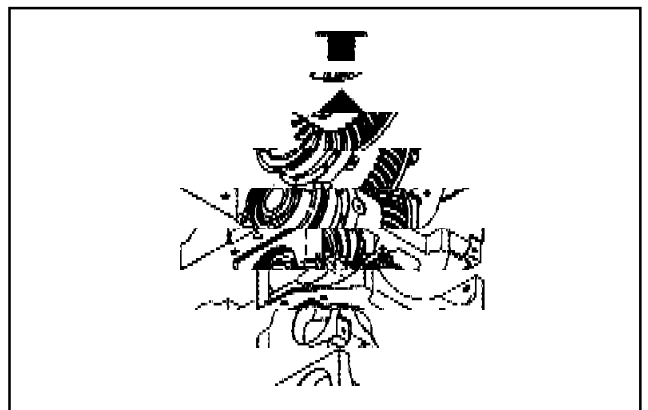
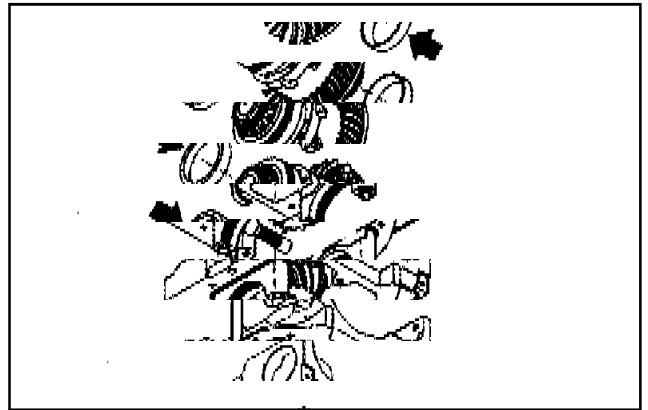
STEP. 1

Warning: take care not to invert the outer races , of the tapered roller bearings and check you are . working on the right side of the bevel crown assembly.

Position the outer races of the tapered roller bearings.

STEP. 2

Position the complete differential housing, with the outer cups of the tapered roller bearings already assembled, on the differential carrier.

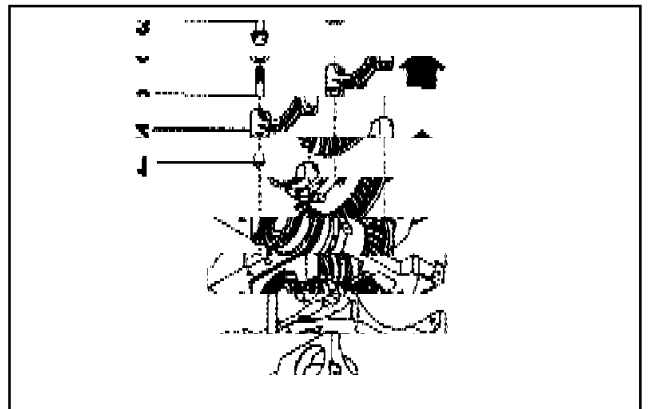
**STEP. 3**

Move the differential housing, in such a way as to rest the bevel crown on the pinion.

Place the four bushes (1) and assemble the two halfcollars (2) on the their seats.

Check the right position of the half-collars with the previously-traced reference marks.

Lock the half-collars (2) with the screws

**STEP. 4**

Assemble and screw the left and right adjusting ring nut (4) on the differential support with the special wrench FC119030.

Tighten the ring nuts until eliminating the slack and slightly preload the differential bearings.

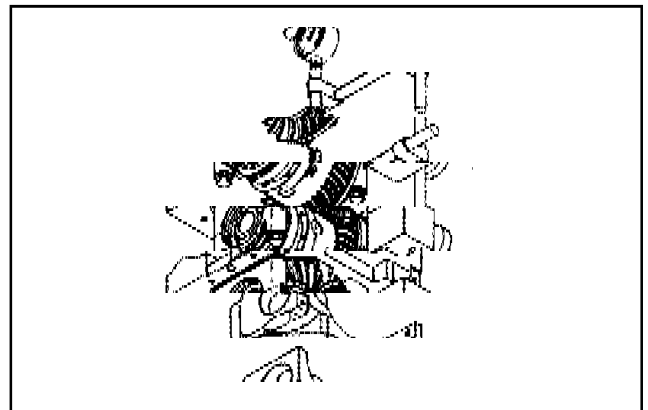
Knock lightly with a soft material hammer in order to properly set the bearings in position.



FRONT AXLE - DUAL TRANSMISSION

STEP. 5

Position a magnetic-base dial gauge on the differential support. Move the pinion end alternately and take note of the slack between pinion and crown, measured with a dial gauge, so that the feeler pin is positioned in contact and at 90° with respect to the surface of a tooth of the bevel crown. Measure the slack on two or more points (teeth), rotating the crown in such a way as to attain an average value.

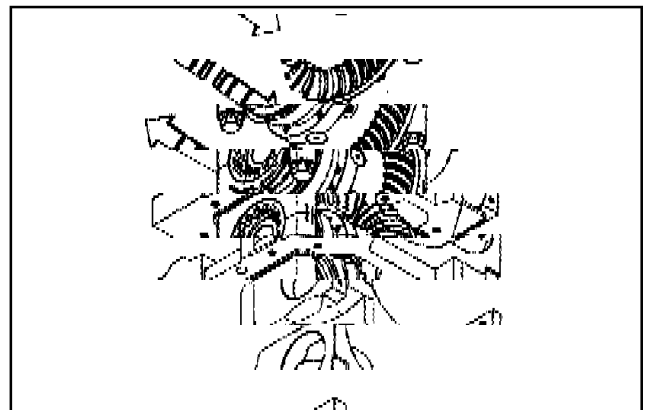


STEP. 6

Check if the measured backlash value is within the requested range.

0.16-0.22

Carry out the adjustment by operating on the two ring nut with the special wrench FC119030.

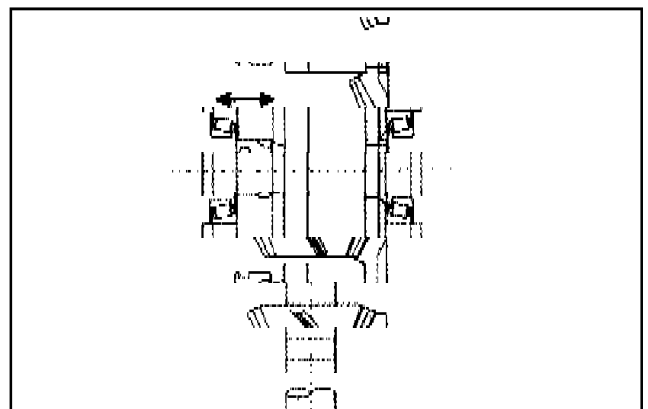


STEP. 7

Adjust the ring nuts, remembering that:

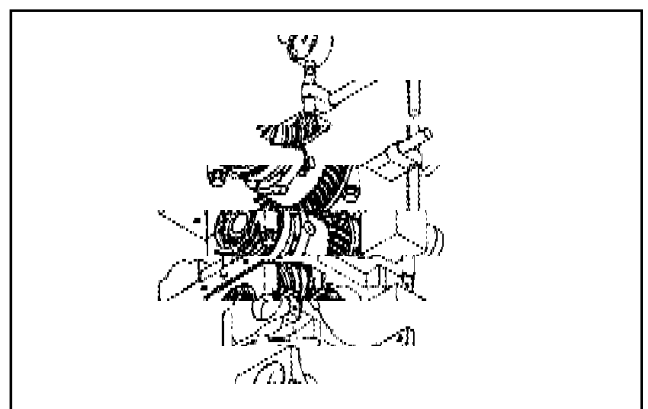
If the measured backlash is lesser than the given tolerance range, screw the ring nut from the side opposite to the ring gear and unscrew the opposite one of the same measure.

If the measured backlash is higher than the given tolerance range, screw the ring nut from the side of the ring gear and unscrew the opposite one of the same measure.



STEP. 8

Once you have carried out the adjusting of the pinionring gear backlash, check also that there is a minimum preloading on the differential housing bearing. Repeat the operations till the indicated conditions are reached.



FRONT AXLE - DUAL TRANSMISSION**STEP 9**

Warning: all the preloadings should be measured without the seal ring.

Once the pinion-ring gear backlash has been established, measure the total preloading (T) of the bearing (pinion-ring gear system), using a dynamometer whose cord is wound on the end of pinion.

The measured value should be within the following range:

$$T = (P + 3.9) \text{ f } (P + 5.9) \text{ daN}$$

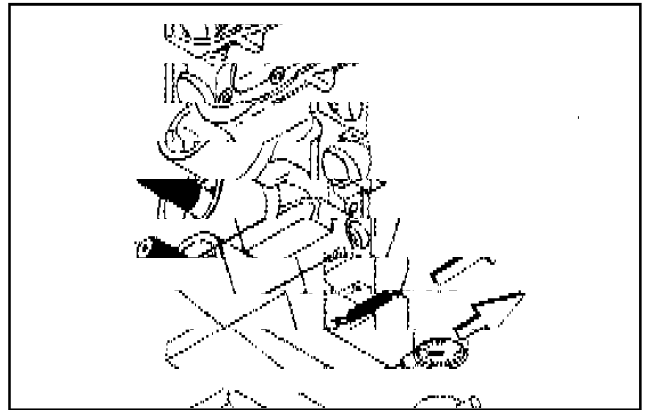
where (P) is the preloading effectively measured on the pinion (Sec. "Pinion unit assembly")

If the measurement is not within the requested range, check well the assembly of each component and operate on the adjusting ring nuts of the differential support:

if the total preloading is lesser than the given range, screw the two ring nuts of the same measure, keeping the pinion-ring gear backlash value unchanged;

if the total preloading is higher than the given range, screw the two ring nuts of the same measure, keeping the pinion-ring gear backlash value unchanged.

Note: test the marks of the bevel gear teeth, paint the ring gear with red lead paint. The marking test should be always carried out on the ring bevel gear teeth and on both sides.



FRONT AXLE - DUAL TRANSMISSION

STEP. 10

Correct contact

If the bevel gear is well adjusted, the mark on the teeth surfaces will be regular.

Excessive contact on the tooth tip (Z)

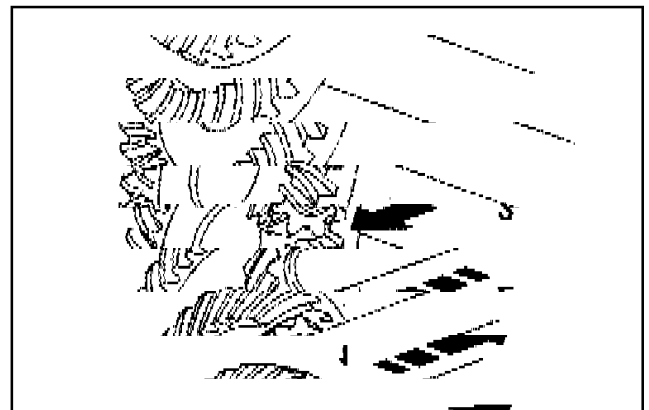
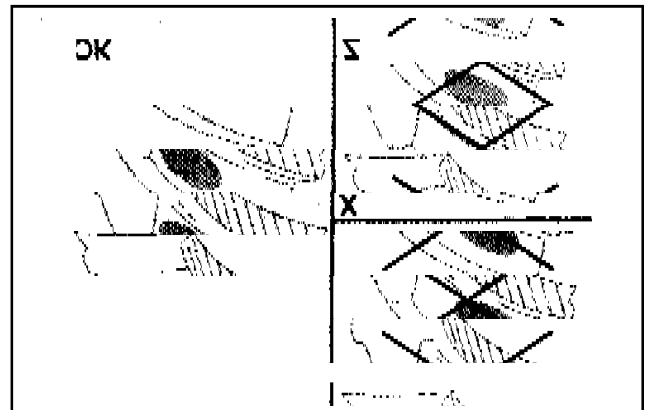
Approach the pinion to the ring bevel gear and then move the ring bevel gear away from the pinion in order to adjust the backlash.

Excessive contact at the tooth base (X)

Move the pinion away from the ring bevel gear and then approach the ring bevel gear to the pinion in order to adjust the backlash.

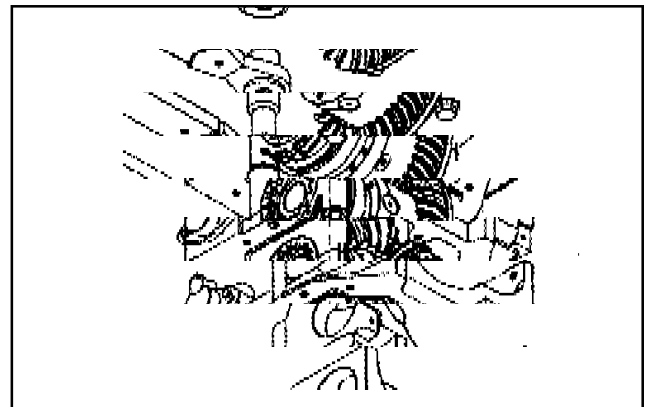
Movements to correct:

1. move the pinion for type (X) contact adjustment
2. move the pinion for type (Z) contact adjustment.



STEP. 11

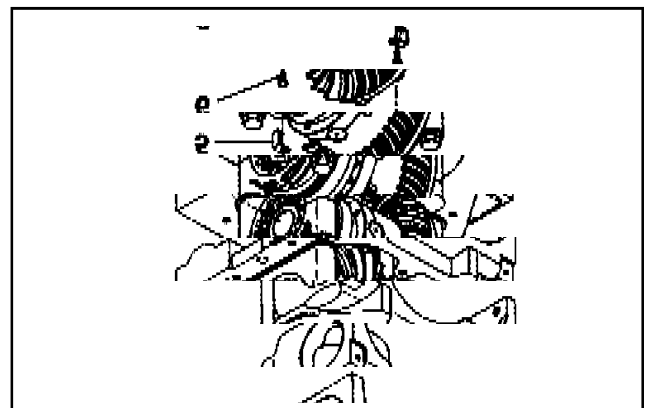
Tighten the bolts of the two bearing halfbridles to the prescribed torque value.



STEP. 12

Once all the adjusting operations have been performed, install the right and left ring nut locking plates and (5) and the relevant screws(6) tightening them with the prescribed torque (Page. 50) by means of a torque wrench.

Note: turn the ring nut slightly in order to align it to the retainer.



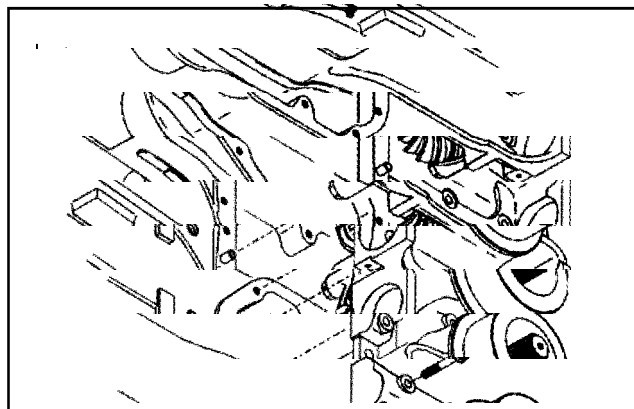
FRONT AXLE - DUAL TRANSMISSION**STEP. 13**

Before matching two surfaces make sure they are perfectly clean, degrease and clean with the appropriate cleaner.

Spread a film of LOCTITE 510 on the contact surface between the axle beam and the differential carrier.

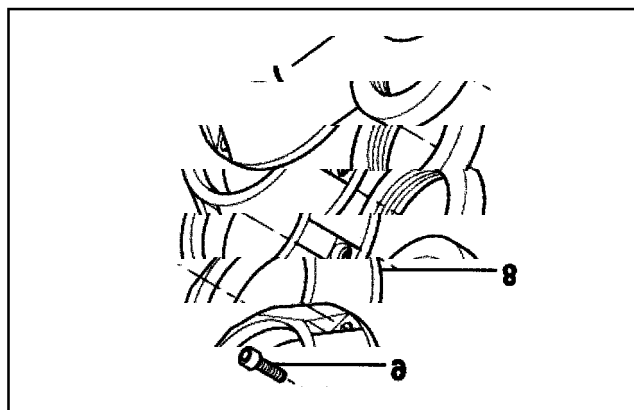
Position the differential carrier on the axle housing.

Re-place and tighten retaining screws to the prescribed torque (Page. 50) with a torque wrench.

**STEP. 14**

Warning: this operation must be performed with , care, in order to avoid damaging the seal ring . (7).

Lubricate the seal ring. Install the seal ring (7) on the flange (8) by means of the driving tool FC715227. Insert the motion input flange (8) in the pinion. Apply LOCTITE 638 on the screws (9). four screws (9) and tighten to the prescribed torque (Page.50) by means of a torque wrench.



FRONT AXLE - DUAL TRANSMISSION

6.4. Axle housing group assembly

Some of the following pictures may not show exactly your axle, but the procedure is the same.

STEP. 1



Warning: use a safety gloves.

Note: to make the assembly easier, it is necessary to cool the cup of the ball bearing at a temperature less than 100° c

Assemble the bush of the upper king pin in the axle housing with the Special tool FC715451 and a hammer. Insert the cup at the ball bearing on the lower part of the axle housing with the tool FC71545 and a hammer.

STEP. 2

Assemble the bush on the axle housing with the special tool FC119026 and a hammer. Fill 3/4 of the ring cavity with grease and apply sealing compound on its outer surface. Assemble the seal ring on the axle housing with the special tool FC715453 and a hammer.

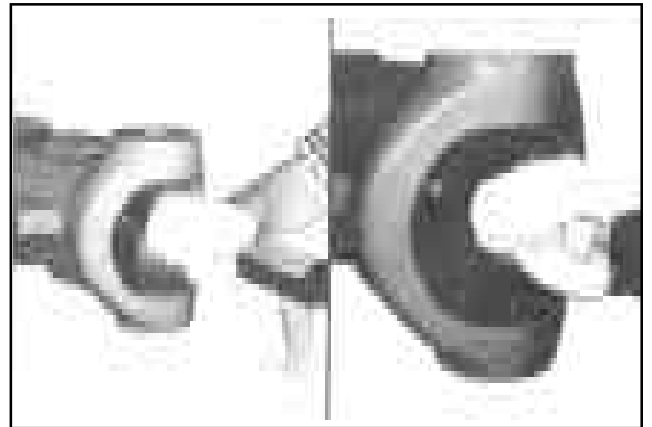
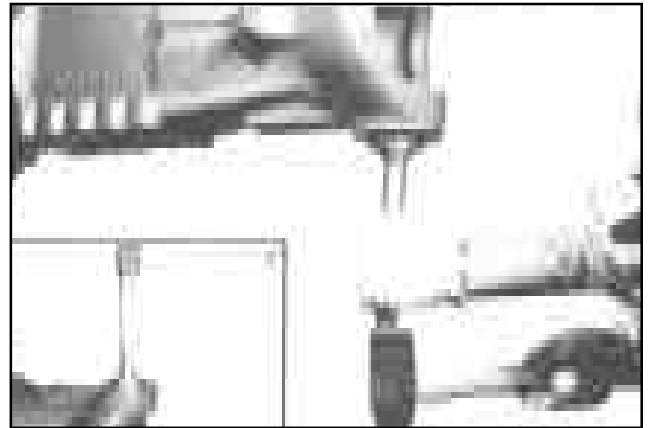
STEP. 3



Warning: be careful not to damage the seal ring.

Lubricate the bush and the sealing lips.

Insert the double U-joint inside the axle housing.



FRONT AXLE - DUAL TRANSMISSION**6.5. Wheel hub group assembly**

Some of the following picture may not show exactly your axle, but the procedure is the same.

STEP. 1

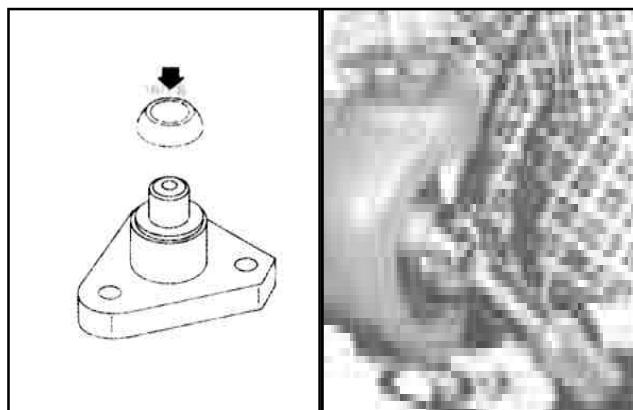
Force the bush into the swivel housing with the special tool FC 119116 and a hammer or a press.

Assemble the seal ring on the swivel housing with the special tool FC715360 and a hammer.

Fill % of the gasket cavity with grease.

**STEP. 2**

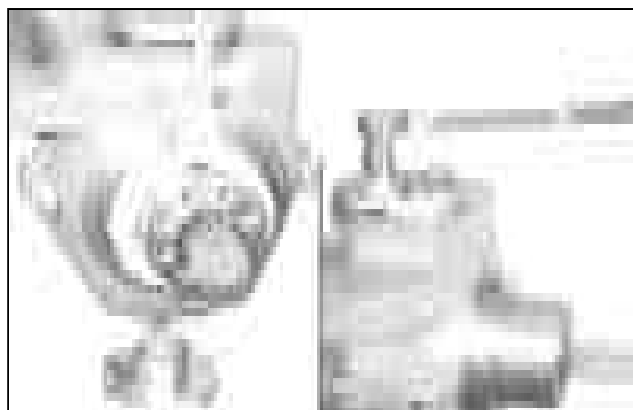
Position the lower king pin on a workbench and assemble the cone of the spherical joint with the special tool FC715474 under a press. Put the shim under the Belleville washer on the upper part. Grease well the king pin housing with specific grease position the Belleville washers on the king pin housing.

**STEP 3**

Danger: secure the swivel housing group with a rope. Lubricate the seal ring lip and protect the splined end of the axle shaft by winding it with thin adhesive tape to avoid damage to the seal ring.

After assembly, remove completely the adhesive tape. Assemble the swivel housing on the axle beam. Assemble the two king pins, the upper and the lower, and tighten the retaining screw with dynamometric wrench to the requested torque (Page. 50)

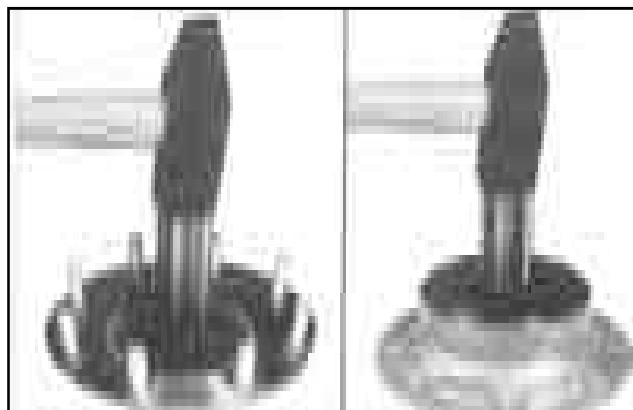
Note: make sure that the Belleville washers remain in their position.

**STEP 4**

Position the wheel hub on a workbench and force both cups of the taper roller bearing in position with the special tool FC7150885 under a press or with a hammer.

Insert the seal ring into the wheel hub with the special tool FC715099 and a hammer.

30

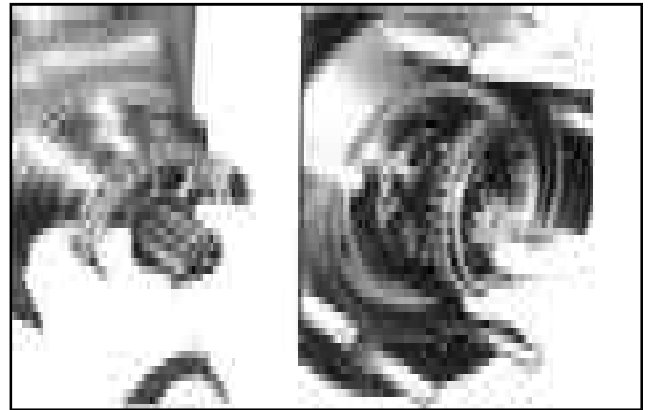


FRONT AXLE - DUAL TRANSMISSION

STEP 5

Assemble the cone of the taper roller bearing on the swivel housing end.

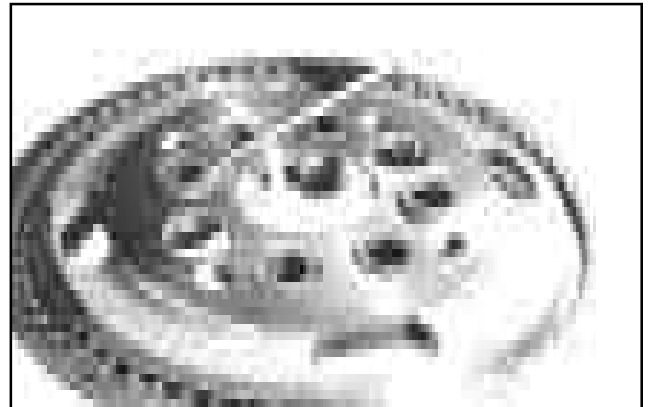
Assemble the wheel hub on the swivel housing and fit the other cone of the taper roller bearing in position.



STEP 6

Position the wheel carrier on a workbench and force the bushes to the carrier surface level with the special too FC 715086.

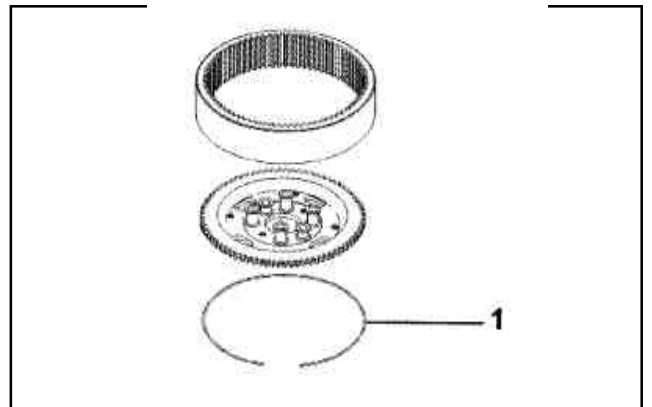
At least two bushes (diametrically-opposed) should be set slightly higher than the carrier surfaces level to be used as dowel pins.



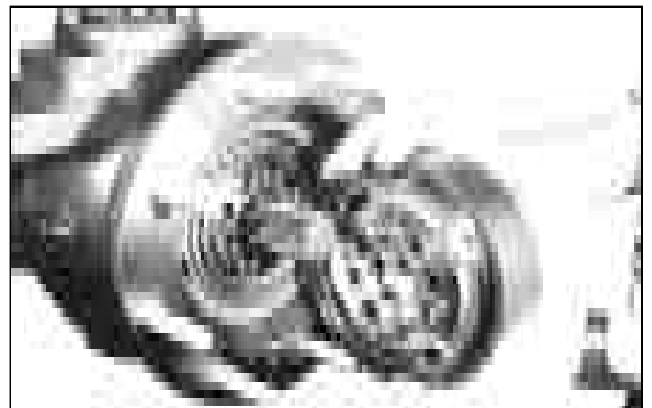
STEP 7

Preassemble the wheel carrier-epicyclic ring gear group with the special locking ring (1) shown in figure.

STEP 8



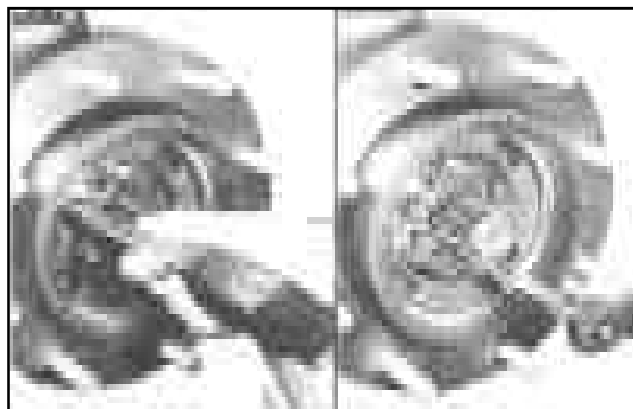
Assemble the wheel carrier group on the wheel hub using the two projecting bushes as dowel pins and screw the relative screws in order to put in contact the ring bevel gear with the wheel hub.



FRONT AXLE - DUAL TRANSMISSION**STEP. 9**

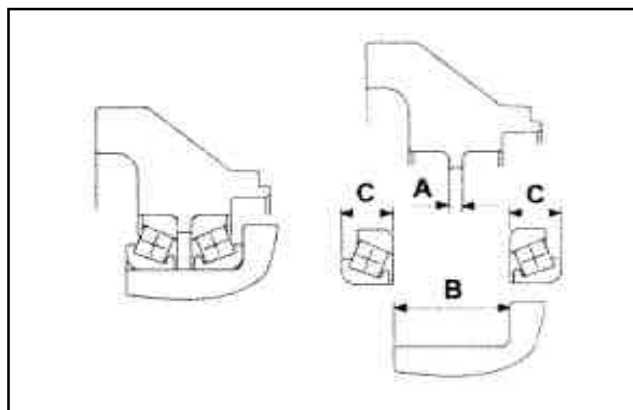
Force all the hub dowel bushes completely with the special too FC 715027 and a hammer.

Assemble the wheel carrier fastening crews and tighten to the requested torque(Page 50)

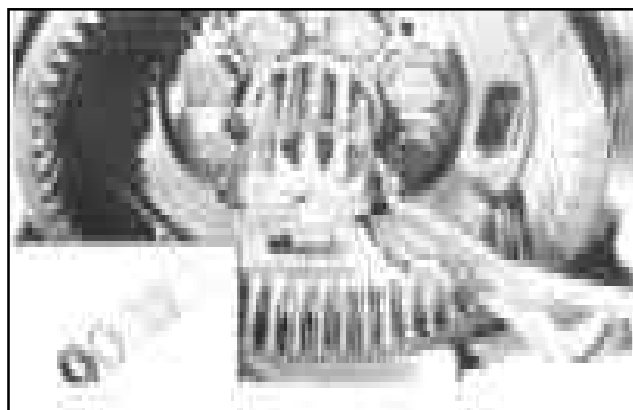
**STEP. 10**

The special operation “Set Right” of the bearings does not require specific registration of preloading or backlash. Anyway, before assembling new components check the indicated dimensions.

A=11.975 12.025 (mm) 8=52.229 52.279 (mm) C=20.000 20.100 (mm)

**STEP. 11**

Slide the washers into the U-Joint shaft and lock it with the retaining ring, inserting it at the end of the splined hub and pushing it into its housing



FRONT AXLE - DUAL TRANSMISSION

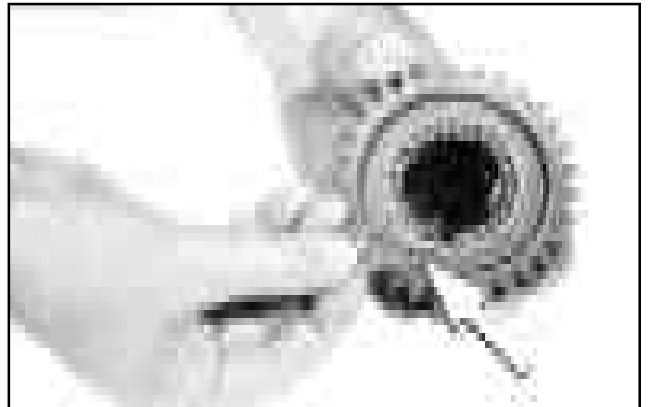
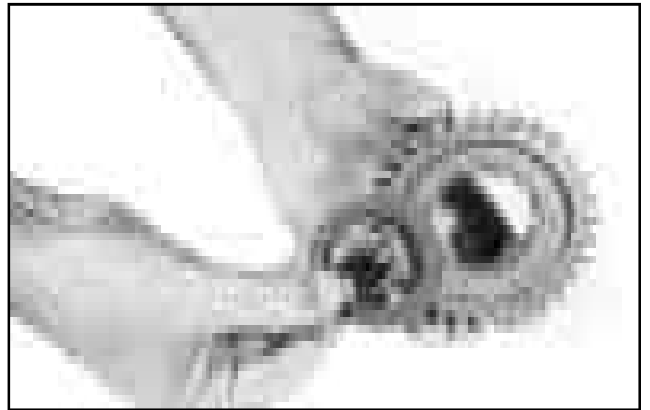
6.6 Epicyclic reduction gear group assembly

Some of the following pictures may not show exactly your axle, but the procedure is the same.

Note : before assembling the epicyclic reduction gear unit, it is necessary to assemble the wheel hub group (Sec.6.5)

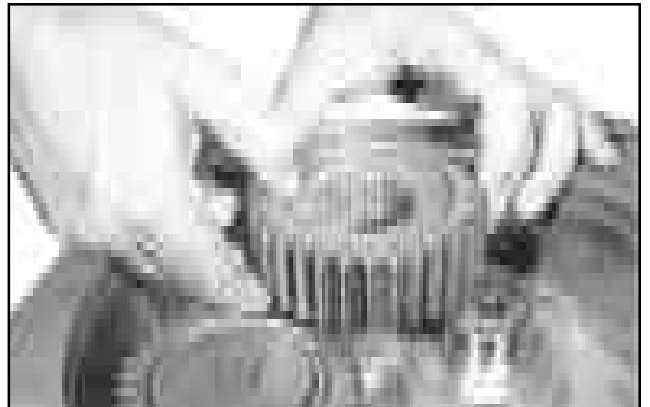
STEP. 1

Apply a thin coat of grease to the sides and inner part of the planetary gear and place the thrust washer in position.



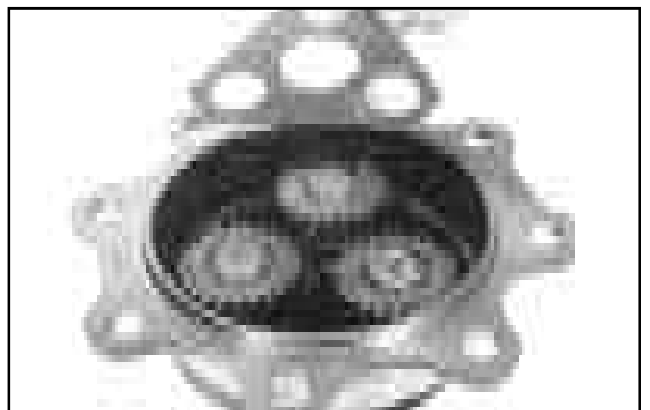
STEP. 2

Place all bearing needles into the planetary gear.



STEP. 3

Slide the pre-assembled planetary gears onto the pin of epicyclic reduction gear.

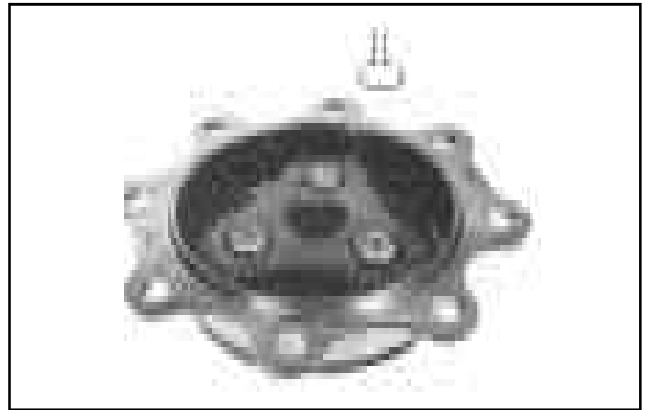


STEP. 4

Insert the triangular washer.

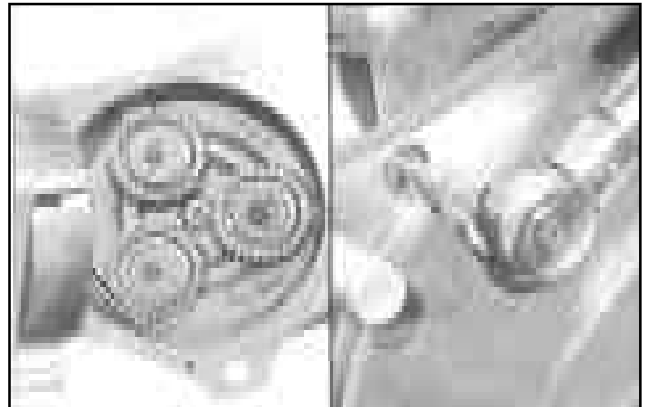
FRONT AXLE - DUAL TRANSMISSION**STEP. 5**

Insert the lock rings with a special pilar for all locking

**STEP. 6**

Insert a new O-Ring on the centering diameter of wheel hub. Fit the epicyclic reduction gear assembly to the wheel hub.

Fit and tighten the fixing screws to the epicyclic reduction gear assembly to the prescribed torque. using a torque wrench (Page. 50.)

**STEP. 7**

Fit the filling/drain and level oil plug on the epicyclic reduction gear, and tighten to the prescribed torque, using a torque wrench (page. 50.)



FRONT AXLE - DUAL TRANSMISSION

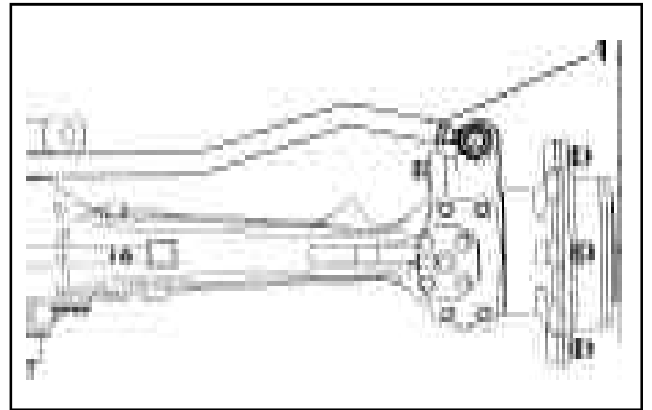
6.7. Steering cylinder group assembly

Some of the following pictures may not show exactly your axle, but the procedure is the same.

STEP. 1

Assemble all parts of the swivel housings joint rod, then screw (or unscrew) the guide rods so that the ball joints can be inserted in the swivel housings.

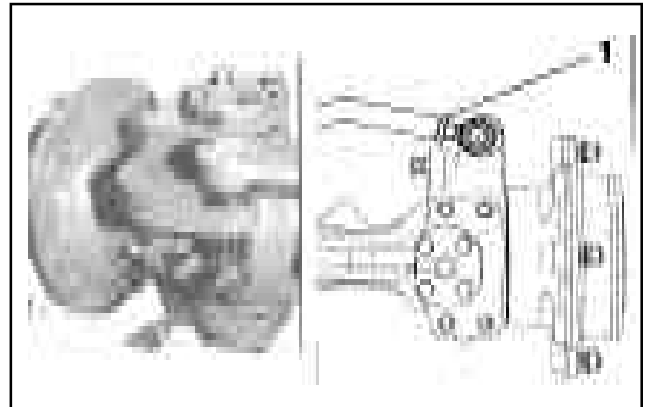
Note: it is important to unscrew the locking nut (1) to carry out this operation



STEP. 2

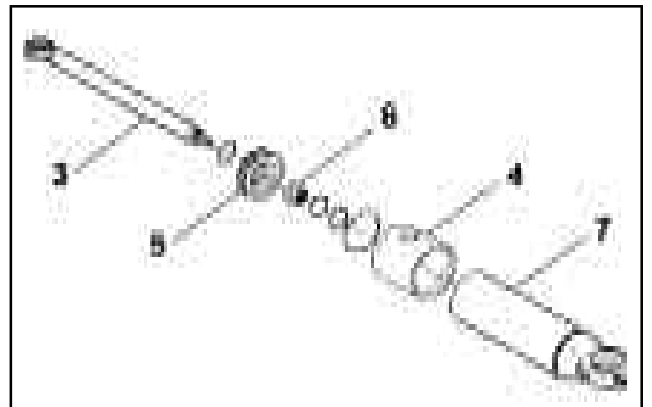
Insert the ball joints into its own housing on the swivel housings. Assemble and tighten the fixing (2) nut with dynamometric wrench to the requested torque (Page. 50)

Note: screw in the lock nut (1) of the guide rod only when the toe-in adjustment has been carried out.



STEP. 3

Install a new seal rings on the cylinder head and on the piston. Insert the rod (3) in the cylinder head (4) Install on the rod (3) the piston (5) and lock it with the self locking nut (6). Insert the rod (3) and piston (5) in the cylinder body (7). Screw the cylinder head (4) in the steering cylinder body (7).



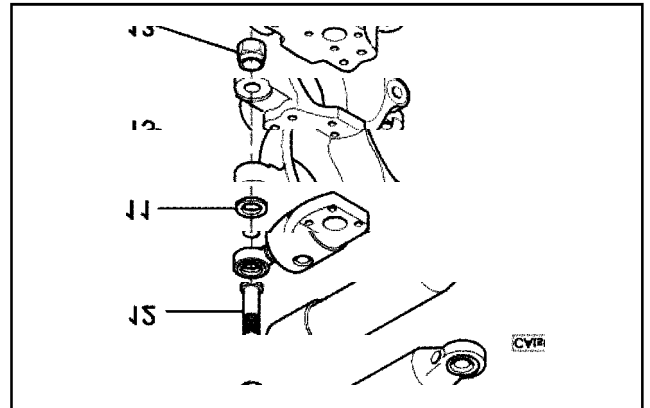
STEP. 4

Fixing the cylinder support bracket to the axle beam with the relative washers and screws and tighten to the prescribed torque with a dynamimetric wrench. Insert the steering cylinder in the housing on the support and position the relative spacers (7-8) and seal ring constraining them with the cylinder retaining rod pin (9). Push with a punch the retaining pin (10) in the rod pin hole for about the equalize protrucion on the two sides of pin.



FRONT AXLE - DUAL TRANSMISSION**STEP. 5**

Insert the head rod into its housing on the swivel housing and position the washer (11) constraining them with the cylinder retaining rod pin (12). Screw and tighten the nut (13) with dynamometric wrench to the requested torque (page. 49)



FRONT AXLE - DUAL TRANSMISSION

6.8. Toe-in adjustment

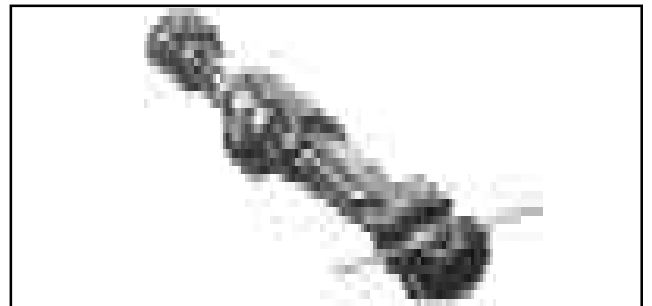
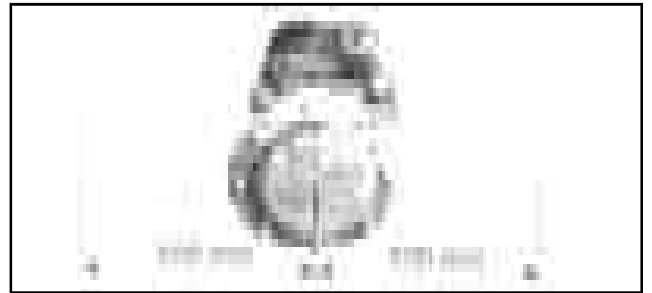
Some of the following pictures may not show exactly your axle, but the procedure is the same.

STEP. 1

Put two equal one-meter-long linear bars on the wheel sides and lock them with two nuts on the wheel hub stud bolt.

Warning: the two bars should be fixed on their middle so that they are perpendicular to the supporting surface and parallel to the pinion shaft axis. Align the two bars.

Note: keep the minimum value, swinging the measurement point.



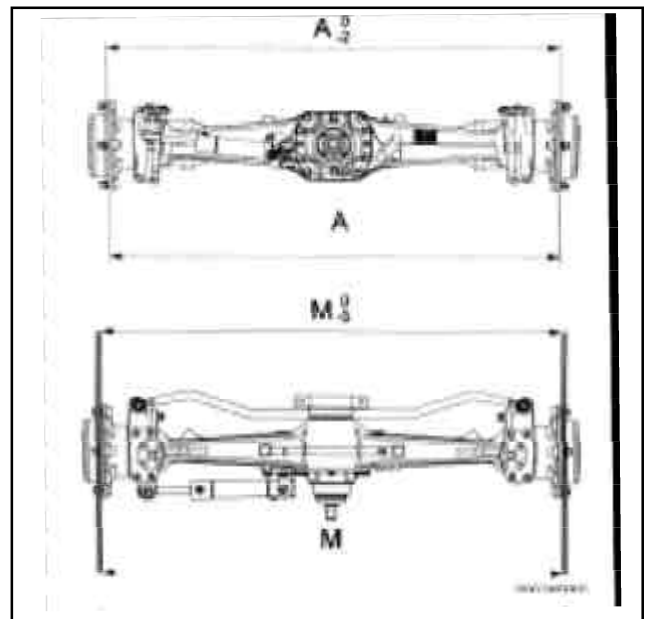
STEP. 2

Check that the difference of the measurements between the bar ends is within the requested tolerance range (See "Toe-in" in specification)

The nominal toe-in value (A) is referred to the external diameter of the wheel hubs flange, therefore the measured value (M) at the bars ends must be related to the ratio between length of the bar and flange diameter:

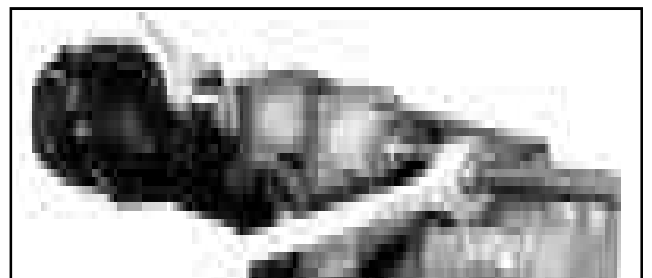
nominal toe-in = A

'measured toe-in = M - 2



STEP. 3

If toe-in is uncorrect, operate with two wrenches on the guide rods screwing in and out the two joint tie rods equally till the toe-in is within the requested tolerance.



FRONT AXLE - DUAL TRANSMISSION**STEP. 5**

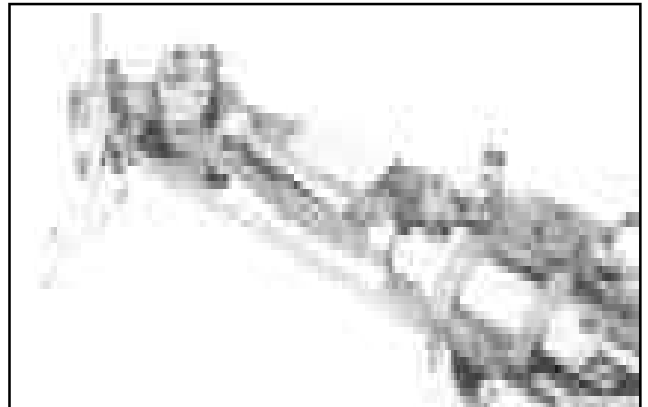
After adjusting, screw in the lock nuts of the guide rods to the requested tightening torque (Page. 50)

**6.9. Steering angle adjustment**

Some of the following pictures may not show exactly your axle, but the procedure is the same.

STEP. 1

Use the same bars assembled for the toe-in adjustment and long bar perfectly leaned over the machined part of the central body (pinon side), so that the two bars form an acute steering.

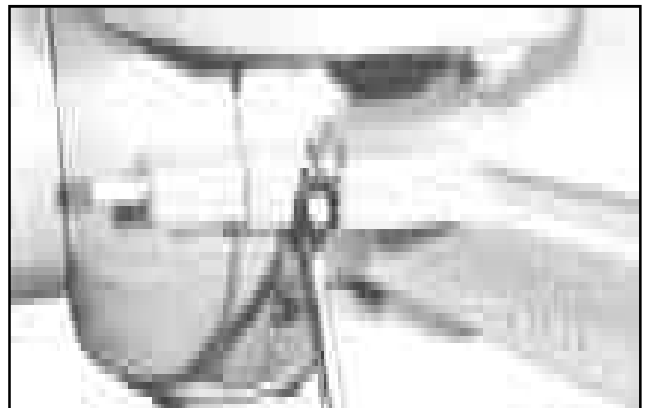
**STEP. 2**

Adjust a goniometer to the requested angle (Sec. 45) and position it on the long bar, Move a wheel side till it forms, with the two bars, the angle fixed by the goniometer.

**STEP. 3**

Adjust the steering mechanical retainer, screwing in or out the special screws in shoulder of the axle housing (see figure), locking them with a locknut to the requested tightening torque (Page. 50).

Steer completely towards the other side and repeat the same operations.



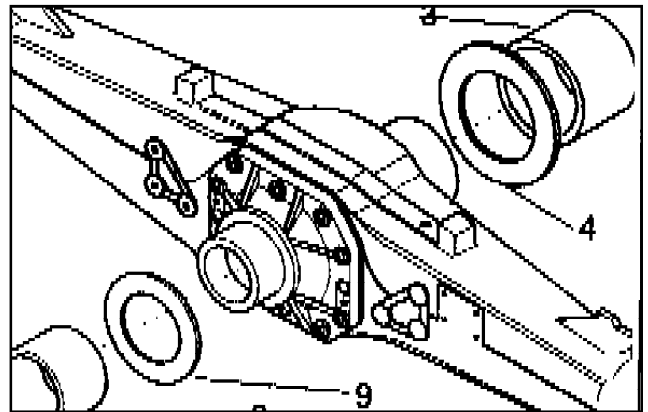
FRONT AXLE - DUAL TRANSMISSION

6.10. Supports group assembly

Some of the following pictures may not look like your axle, the procedure is the same.

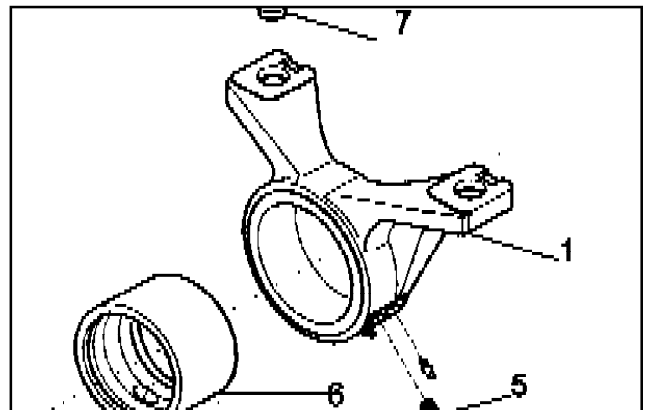
STEP. 1

Assemble washers (4) and (9) and bushings (8) and (3) on axle housing.



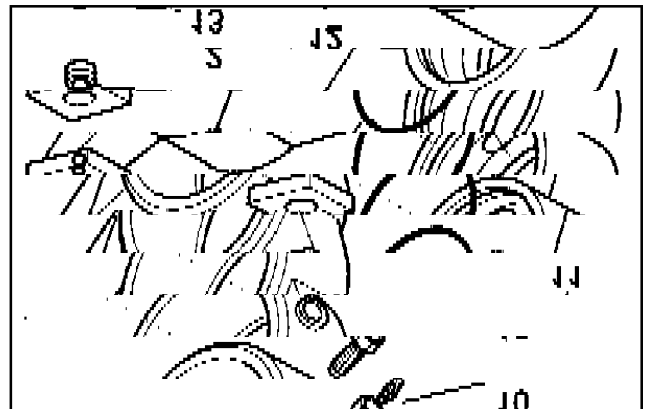
STEP. 2

Place front support (1) on a work bench and assemble bushing (6). Tighten locking bolt (5) to the prescribe torque (page . 50)



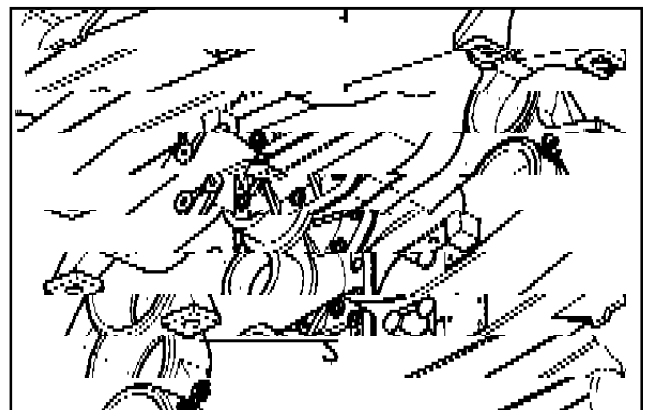
STEP. 3

Grease and install a new O-Ring (12) in the thrust bushing (11) Insert the thrust bushing into rear support (2).



STEP. 4

Assemble the front (1) and rear (2) supports on central body.



FRONT AXLE - DUAL TRANSMISSION

6.11. *Testing after assembly STEP. 1*

With engine off, lift the axle (i) so that the tyres get away from the ground.

STEP. 2

Engage the help of another person standing on the opposite side, being the assembly testing by rotating as much as possible both the wheels forward.

(Both the wheels should get blocked after awhile)

STEP. 3

With the pinion blocked, free the right wheel and rotate the left one in the line of front march.

The wheel will move freely without difficulty and the right wheel will move the opposite direction if the assembly has been carried out correctly. Repeat the same operation in the opposite direction.

(reverse gear)

IF ONE WHEEL DOES NOT ROTATE FREELY IN BOTH DIRECTIONS, then check step by step assembly operations.

Check and see that the brakes are regulated correctly and functioning properly.

FRONT AXLE - DUAL TRANSMISSION

PROBLEMS	POSSIBLE CAUSES										
	1	2	3	4	5	6	7	8	9	10	11
- Wheel vibration; front tyre resistance, halfshaft breakage.	•	•	•		•						•
- Steering is difficult, vehicle goes straight while its turning.	•	•	•	•							•
- No differential action, jamming while steering.	•			•	•						•
- No differential action, jamming while steering.	•	•	•	•	•	•					•
- Uneven wear of tyre.	•			•	•			•	•	•	•
- Friction noise.	•	•	•		•						•
- Vibration during forward drive, intermittent noise.											

1. Incorrect installation / defective axle

Correct installation or repair or replace the differential in case it does not survive anyone of the test phases.

2. Overloading/incorrect weight distribution

Remove excessive weight and redistribute load, following instructions related to the vehicle.

3. Different rotation radius of the tyres

If one tyre has a smaller radius, it will cause partial wheel slipping when force is applied. The other tyre with bigger radius will have to support all the work. Replace the tyre or adjust pressure to have same radius on both tyre.

4. Broken halfshaft

It is not advisable to operate the vehicle with a broken halfshaft. It is acceptable to move the vehicle (engine off unloaded) a few meters away only.

5. Bent half shaft

Replace halfshaft.

6. Blocked differential

Abnormal functioning of the differential. Verify assembly and all components. Vehicles with wide steering angle may proceed with kicks, have steering difficulty or cause pneumatic wearing at sharp turns. Reduce the steering angle to minimum and decelerate when the vehicle begins to kick.

7. Incorrect wheel adjustments

Verify group integrity and wheel side bearings. Adjusting according.

8. Spoiled or worn out axle parts

Check the condition of ring gear, pinion gear, bearings etc. Replace when ever necessary.

9. Contamination in the axle box or incorrect assembly of parts

Look for foreign particles. Check assembly of the various parts of the axle.

10. Incorrect adjustment of bevel gear set: Parts of the transmission worn out.(transmission gear, U joints, etc

Replace or adjust as required

11. Incorrect use of the product

See the vehicle producer's instructions once again.

FRONT AXLE - DUAL TRANSMISSION**7.1. Troubleshooting**

This chapter is a descriptive and explanatory guide to common axle problems. This guide suggests the repair correct procedures to be followed.

Problem	Cause	Action
Ring gear tooth broken at the outer side	1. Excessive gear load compared to the one foreseen 2. Incorrect gear adjustment (excessive back-lash) 3. Pinion not loosened	Replace bevel gear set Follow carefully the recommended operations for the adjustment of bevel gear set back-lash
Ring gear tooth broken side	1. Load bump 2. Incorrect gear adjustment (insufficient back-lash) 3. Pinion not loosened	Replace bevel gear set Follow carefully the recommended operations for the adjustment of bevel gear set back-lash
Pinion or ring gear teeth or worn	1. Insufficient lubrication 2. Contaminated oil 3. Incorrect lubrication or depleted additives 4. Wornout pinion bearings that cause an incorrect pinion axle back-lash and wrong contact between pinion and ring	Replace bevel gear set Follow carefully the recommended operations for the adjustment of bevel gear set back-lash. Use correct fabricant, fill up to the right levels and replace according to the recommended program.
Overbested ring and pinion teeth see if gear teeth have faded	1. Prolonged functionation at high temperatures 2. Incorrect fabrication 3. Low oil level 4. Contaminated oil	Replace level gear set. Use proper lubrication, fill up to right level and replace at recommended program.
Pinion teeth pining	1. Exercise use 2. Insufficient lubrication	Replace level gear set use correct lubrication fill up to the right level and subsflte at recommended intervals.
Axle beam body bent	1. Vehicle over loaded 2. Vehicle's accident 3. Load bump	Replace axle beam body
Worm out of fitted bearing	1. Insufficant lubrication 2. Contaminated oil 3. Excessive use 4. Normal wear out 5. Pinion not loosened	Replace bearing Use correct lubrication fill up to right level and replace at recommended intervals
Oil leakage from gasket and seals	1. Prolonged functioning at high temperature of the oil 2. Oil gasket assembled incorrectly 3. Seal lip damaged 4. Contaminated oil	Replace the gasket or seal and matching surface if damaged. Use correct lubrication and replace at recommended intervals
Excessive wearing out of input range spline	1. Exhaustive use 2. Pinion nut loosened 3. Pinion axle back-lash	Replace the flange. Check out the pinion spline is not excessively worn out. Replace bevel gear set if required Replace bevel gear set
Fatigue failure of pinion teeth see if the fracture line is well defined (wave line, beach lines)	1. Exhaustive use 2. Continous overload	
Pinion and teeth breakage	1. Crash load of different components	Oheck and lor replace other components

FRONT AXLE - DUAL TRANSMISSION

Problem	Cause	Action
Side gear spline worn out Replace all scratched washers (Excessive back-lash)	Excessive use	Replace differential gear group. Replace halfshaft if required
Thrust washer surface worn out or scratched.	1. Insufficient lubrication 2. Incorrect lubrication 3. Contaminated oil	Use correct lubrication and fill up to right level. Replace at intervals recommended Replace all scratched washers and those with 0.1 mm thickness lower than the new ones.
Inner diameter of tapered roller bearing worn out.	1. Excessive use 2. Excessive pinion axial back-lash 3. Insufficient lubrication 4. Contaminated oil	Replace bearing Check pinon axial back-lash Use proper lubrication, fill up to right level and replace at recommended intervals.
Bent or broken halfshaft	Vehicles intensively operated or overloaded	Replace
Halfshaft broken at wheel side	1. Wheel support loosened 2. Beam body bent	Replace Check that wheel support is not worn out or wrongly adjusted

FRONT AXLE - DUAL TRANSMISSION**7.2 Axle problem and diagnosis**

Problem	Cause	Action
Noise while driving	1. Excessive backlash between pinion and ring gear 2. Worn out pinion and gear ring 3. Worn out pinion bearing 4. Pinion bearing loose 5. Differential bearing loose 6. Ring gear out of alignment 7. Low lubricant level 8. Poor or wrong lubricant 9. Bent shaft	1. Adjust 2. Replace 3. Adjust 4. Replace 5. Adjust 6. Replace 7. Oil level 8. Replace 9. Replace
Noise while driving in neutral	1. Noise coming from axle is usually 2. Noise while driving in gear is usually 3. Noise while driving in gear is usually 4. Noise while driving in gear is usually 5. Noise while driving in gear is usually 6. Noise while driving in gear is usually 7. Noise while driving in gear is usually 8. Noise while driving in gear is usually 9. Noise while driving in gear is usually 10. Noise while driving in gear is usually 11. Noise while driving in gear is usually 12. Noise while driving in gear is usually 13. Noise while driving in gear is usually 14. Noise while driving in gear is usually 15. Noise while driving in gear is usually 16. Noise while driving in gear is usually 17. Noise while driving in gear is usually 18. Noise while driving in gear is usually 19. Noise while driving in gear is usually 20. Noise while driving in gear is usually 21. Noise while driving in gear is usually 22. Noise while driving in gear is usually 23. Noise while driving in gear is usually 24. Noise while driving in gear is usually 25. Noise while driving in gear is usually 26. Noise while driving in gear is usually 27. Noise while driving in gear is usually 28. Noise while driving in gear is usually 29. Noise while driving in gear is usually 30. Noise while driving in gear is usually 31. Noise while driving in gear is usually 32. Noise while driving in gear is usually 33. Noise while driving in gear is usually 34. Noise while driving in gear is usually 35. Noise while driving in gear is usually 36. Noise while driving in gear is usually 37. Noise while driving in gear is usually 38. Noise while driving in gear is usually 39. Noise while driving in gear is usually 40. Noise while driving in gear is usually 41. Noise while driving in gear is usually 42. Noise while driving in gear is usually 43. Noise while driving in gear is usually 44. Noise while driving in gear is usually 45. Noise while driving in gear is usually 46. Noise while driving in gear is usually 47. Noise while driving in gear is usually 48. Noise while driving in gear is usually 49. Noise while driving in gear is usually 50. Noise while driving in gear is usually 51. Noise while driving in gear is usually 52. Noise while driving in gear is usually 53. Noise while driving in gear is usually 54. Noise while driving in gear is usually 55. Noise while driving in gear is usually 56. Noise while driving in gear is usually 57. Noise while driving in gear is usually 58. Noise while driving in gear is usually 59. Noise while driving in gear is usually 60. Noise while driving in gear is usually 61. Noise while driving in gear is usually 62. Noise while driving in gear is usually 63. Noise while driving in gear is usually 64. Noise while driving in gear is usually 65. Noise while driving in gear is usually 66. Noise while driving in gear is usually 67. Noise while driving in gear is usually 68. Noise while driving in gear is usually 69. Noise while driving in gear is usually 70. Noise while driving in gear is usually 71. Noise while driving in gear is usually 72. Noise while driving in gear is usually 73. Noise while driving in gear is usually 74. Noise while driving in gear is usually 75. Noise while driving in gear is usually 76. Noise while driving in gear is usually 77. Noise while driving in gear is usually 78. Noise while driving in gear is usually 79. Noise while driving in gear is usually 80. Noise while driving in gear is usually 81. Noise while driving in gear is usually 82. Noise while driving in gear is usually 83. Noise while driving in gear is usually 84. Noise while driving in gear is usually 85. Noise while driving in gear is usually 86. Noise while driving in gear is usually 87. Noise while driving in gear is usually 88. Noise while driving in gear is usually 89. Noise while driving in gear is usually 90. Noise while driving in gear is usually 91. Noise while driving in gear is usually 92. Noise while driving in gear is usually 93. Noise while driving in gear is usually 94. Noise while driving in gear is usually 95. Noise while driving in gear is usually 96. Noise while driving in gear is usually 97. Noise while driving in gear is usually 98. Noise while driving in gear is usually 99. Noise while driving in gear is usually 100. Noise while driving in gear is usually	1. Adjust or replace (see above) 2. Replace
Intermittent noise	1. Pinion or input flange worn out 2. Ring gear damaged 3. Differential box bolts loosened	1. Adjust 2. Replace wear gear set 3. Tighten to torque
Constant noise	1. Ring gear teeth or pinion damaged 2. Worn out bearing 3. Pinion spline worn out 4. Bent shaft	1. Replace wear gear set 2. Replace 3. Replace 4. Replace
Noise while steering	1. Worn out differential gears 2. Worn out differential box or spider 3. Differential carrier wear 4. Differential housing wear 5. Differential housing wear 6. Differential housing wear 7. Differential housing wear 8. Differential housing wear 9. Differential housing wear 10. Differential housing wear 11. Differential housing wear 12. Differential housing wear 13. Differential housing wear 14. Differential housing wear 15. Differential housing wear 16. Differential housing wear 17. Differential housing wear 18. Differential housing wear 19. Differential housing wear 20. Differential housing wear 21. Differential housing wear 22. Differential housing wear 23. Differential housing wear 24. Differential housing wear 25. Differential housing wear 26. Differential housing wear 27. Differential housing wear 28. Differential housing wear 29. Differential housing wear 30. Differential housing wear 31. Differential housing wear 32. Differential housing wear 33. Differential housing wear 34. Differential housing wear 35. Differential housing wear 36. Differential housing wear 37. Differential housing wear 38. Differential housing wear 39. Differential housing wear 40. Differential housing wear 41. Differential housing wear 42. Differential housing wear 43. Differential housing wear 44. Differential housing wear 45. Differential housing wear 46. Differential housing wear 47. Differential housing wear 48. Differential housing wear 49. Differential housing wear 50. Differential housing wear 51. Differential housing wear 52. Differential housing wear 53. Differential housing wear 54. Differential housing wear 55. Differential housing wear 56. Differential housing wear 57. Differential housing wear 58. Differential housing wear 59. Differential housing wear 60. Differential housing wear 61. Differential housing wear 62. Differential housing wear 63. Differential housing wear 64. Differential housing wear 65. Differential housing wear 66. Differential housing wear 67. Differential housing wear 68. Differential housing wear 69. Differential housing wear 70. Differential housing wear 71. Differential housing wear 72. Differential housing wear 73. Differential housing wear 74. Differential housing wear 75. Differential housing wear 76. Differential housing wear 77. Differential housing wear 78. Differential housing wear 79. Differential housing wear 80. Differential housing wear 81. Differential housing wear 82. Differential housing wear 83. Differential housing wear 84. Differential housing wear 85. Differential housing wear 86. Differential housing wear 87. Differential housing wear 88. Differential housing wear 89. Differential housing wear 90. Differential housing wear 91. Differential housing wear 92. Differential housing wear 93. Differential housing wear 94. Differential housing wear 95. Differential housing wear 96. Differential housing wear 97. Differential housing wear 98. Differential housing wear 99. Differential housing wear 100. Differential housing wear	1. Replace 2. Replace 3. Replace 4. Replace

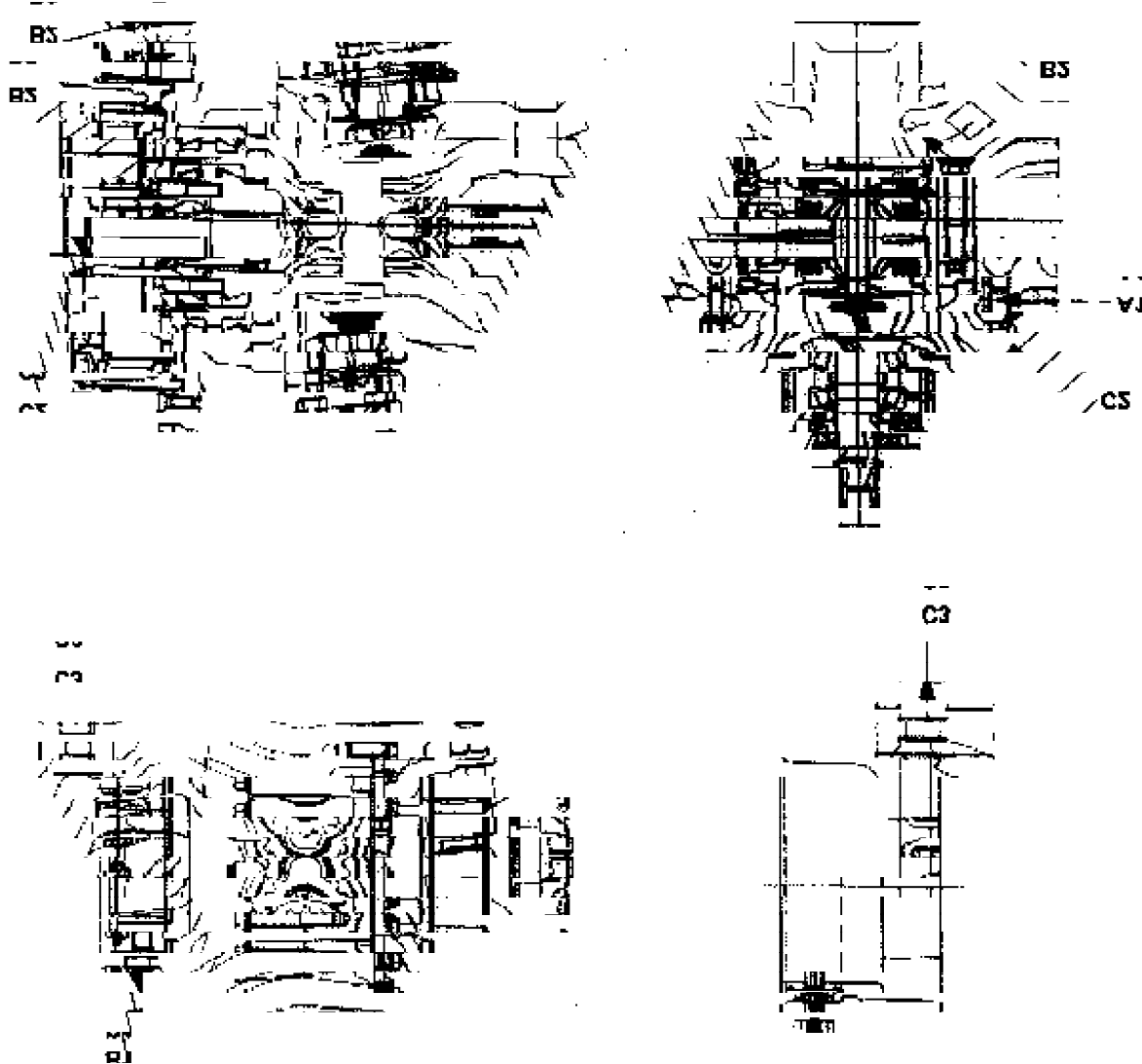
FRONT AXLE - DUAL TRANSMISSION

8.0. Technical Specification

Axle Code	C A 139642
Axle Model	20.11
Differential Type	Limited slip
Bevel Gear Ration	2.308/1
Epicyclic Ratio	6.0/1
Total Ratio	13.85/1
Dry Weight	225 Kg.
Input Rotation	Counter Clock Wise
Steering Angle	Max 50°
Toe-in	0-5°-2 mm
Oil Specification	
SAE 80 W-90EP, to comply APIC, L 5 respectively MIL-2015 and 2105D	
Differential Oil Capacity	4.5 Liter
Epicyclic Reduction Gear Oil Capacity	0.6 + 0.6 Liter
Grease Polymer 400/LDIN=KHER 1 R 1 ISO-i-XMR-XM2 and AGIP MU/EP2	
Bevel Gear set back-lash	0.16-0.22 mm
Pinion Bearings Preload (measured on 30.5 mm dia without seal ring)	10.5-15.7 da N
Pinion-Crown gear bearings total preload (T) (Measured on 30.5 mm dia whithout seal ring)	T =(P+3.9) to (P+5.9) daN

FRONT AXLE - DUAL TRANSMISSION

9.0 SEALING COMPOUNDS AND ADHESIVES

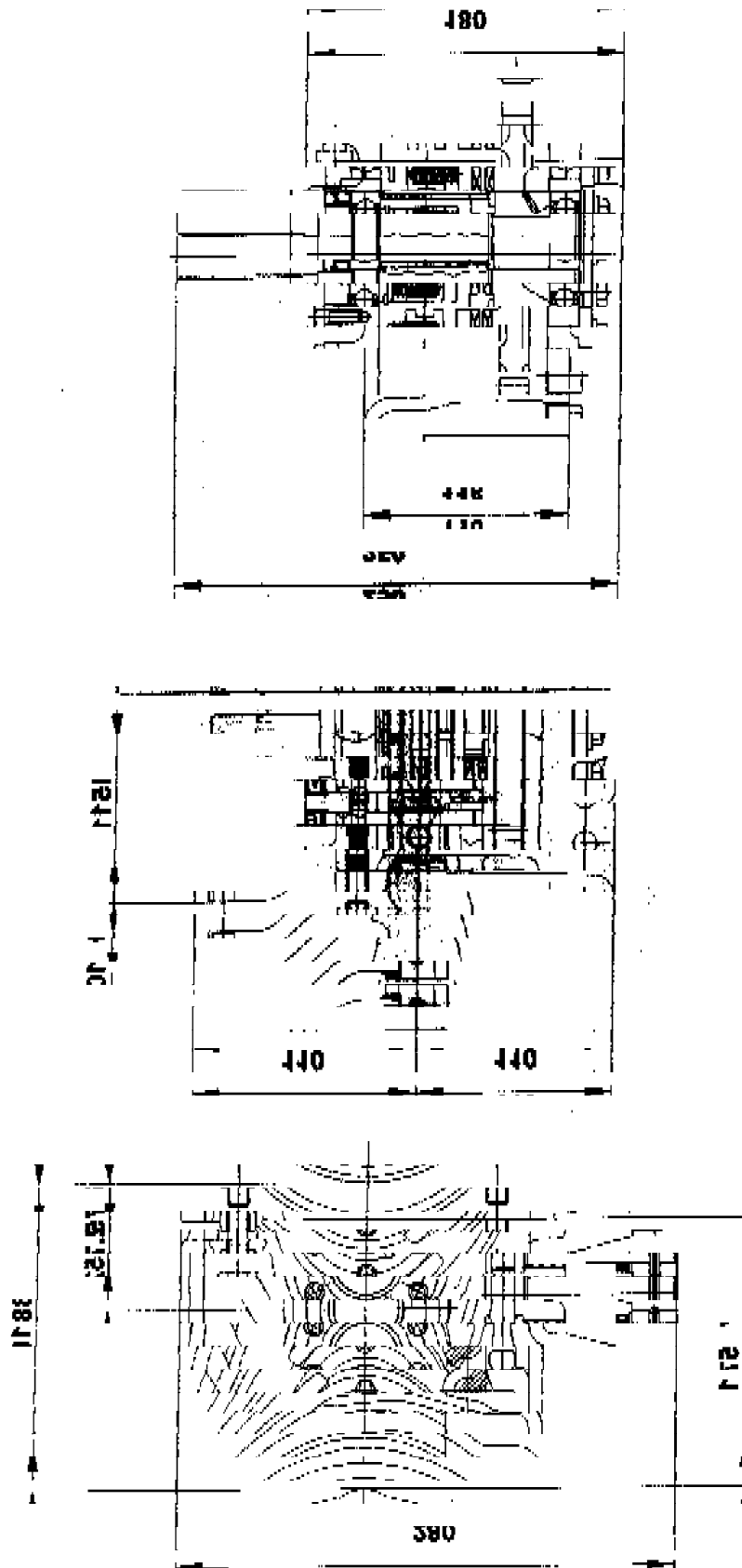


B2 = LOCTITLE 270 ← **APPLY ON CONTACT SURFACE**
C2 = LOCTITLE 638 ← **APPLY AS BOLT SCREWS/ON PINS**
C3 = LOCTITLE 542

FRONT AXLE - DUAL TRANSMISSION

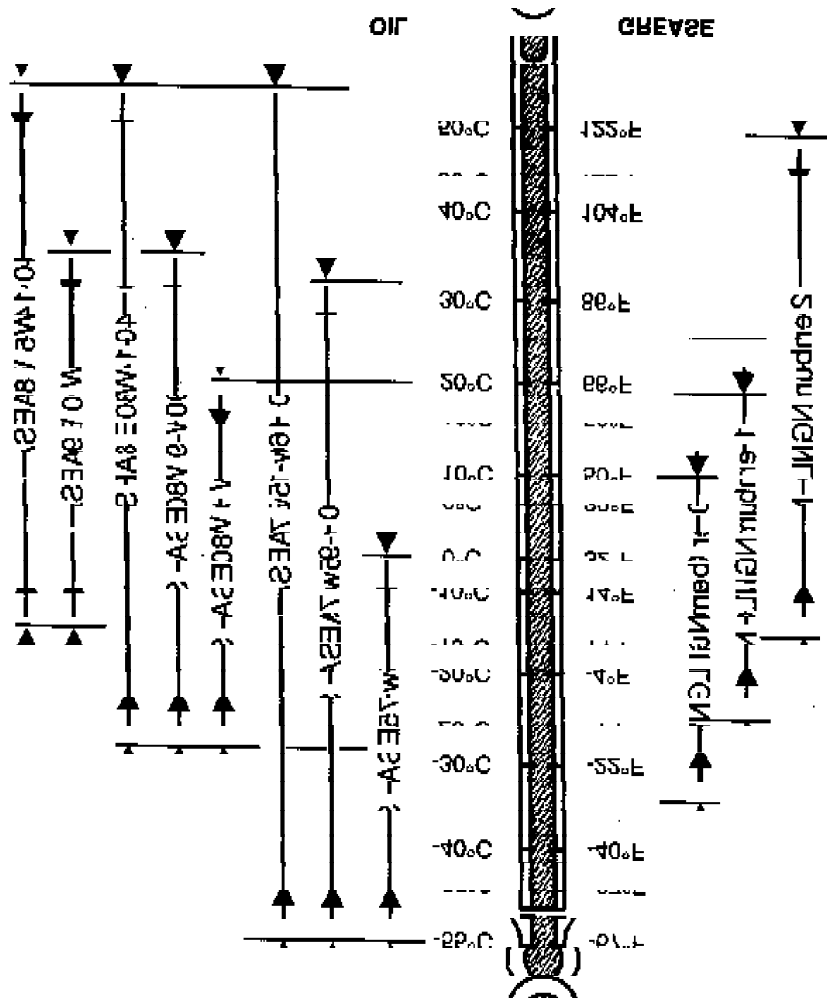
10. Over all dimension

Millimeter

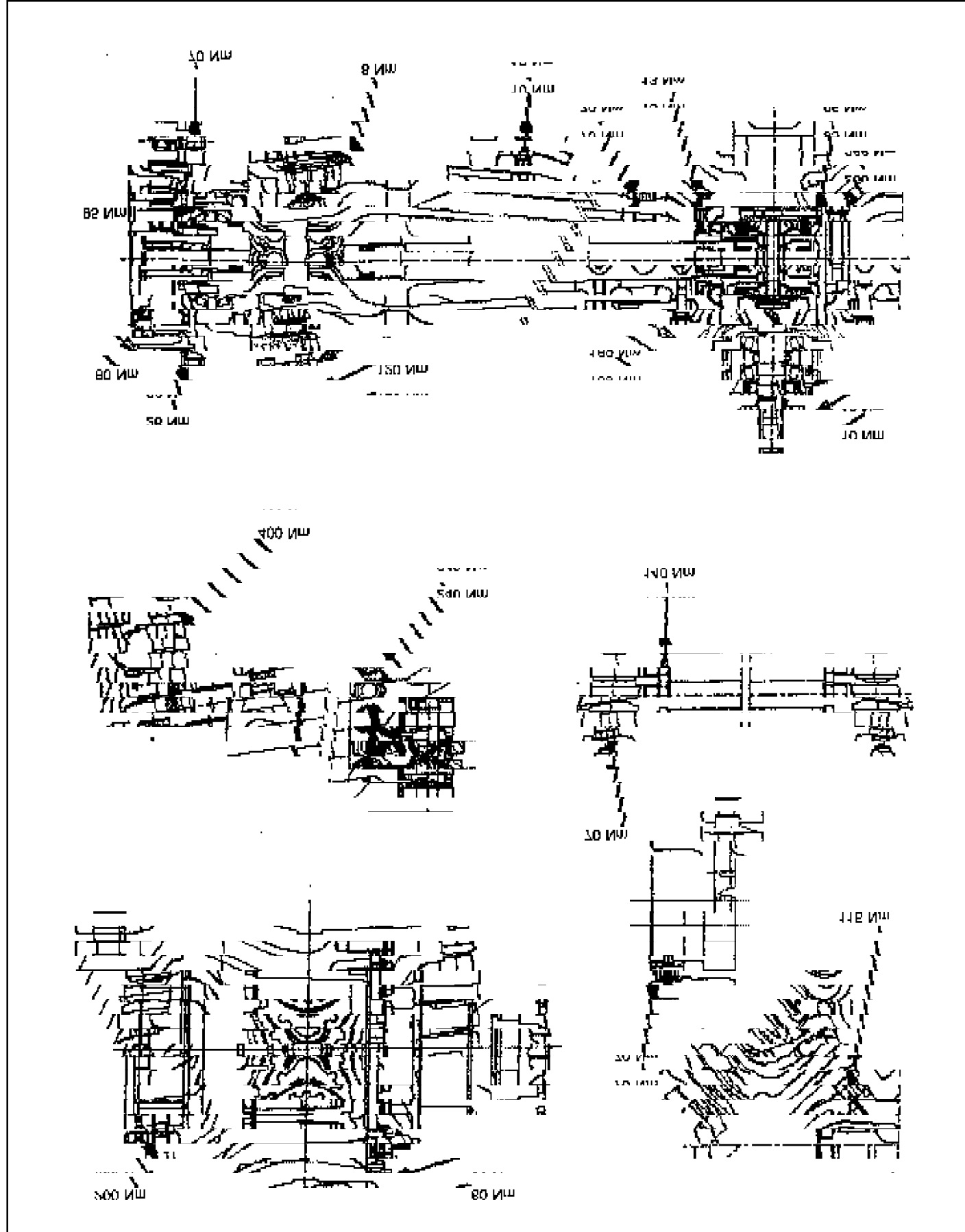


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11. Lubrication/greasing : grades and application range



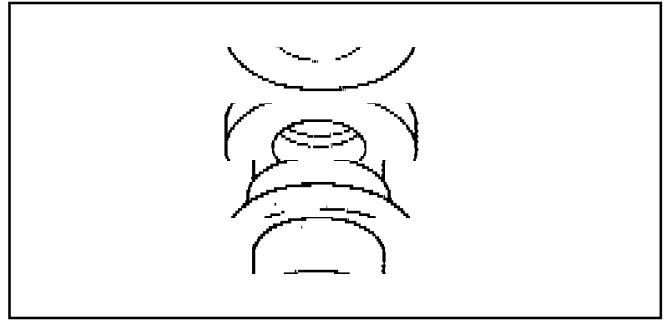
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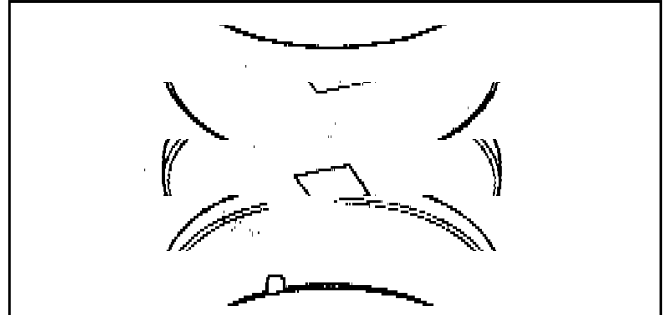
FRONT AXLE - DUAL TRANSMISSION**14.0 Special Tool**

The Special drifts/pad used to assemble the seal, bearings and bushes should always be used with the interchangeable handle FC 119033; its use is recommended together with a suitable safety handle in order to protect the hands.

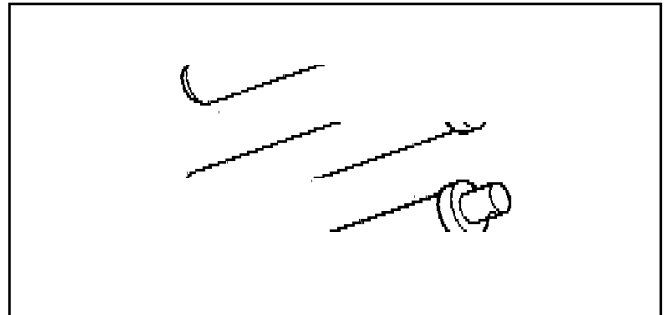
Bush driver
FC 119026



Ring nut wrench.
FC 119030



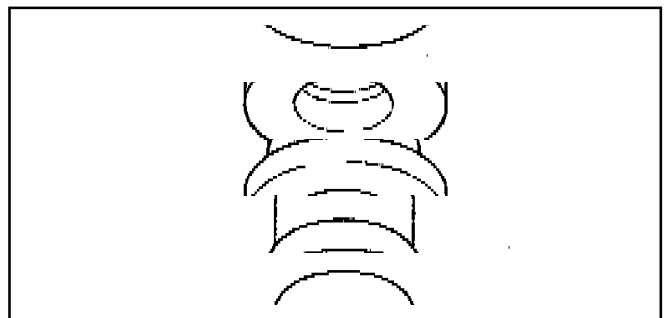
Interchangeable handle.
FC 119033



Bearing cup driver
FC 119066



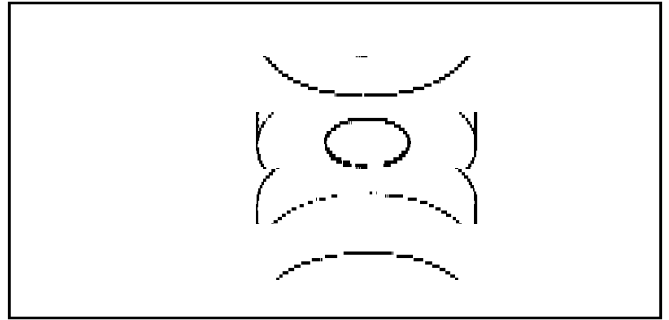
Swivel housing bush driver
FC 119116



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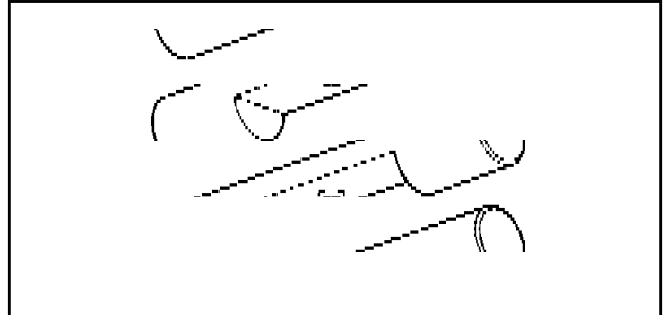
Tool for needle bearings preloading measurement

FC 119205



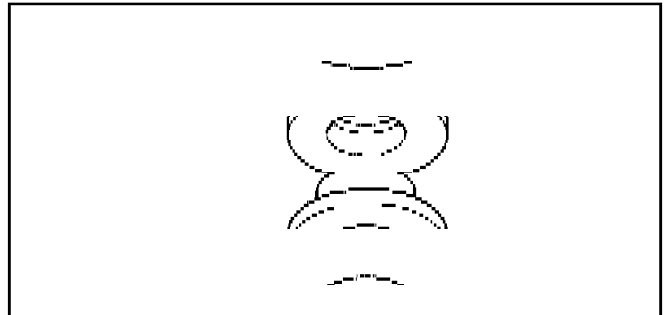
False differential box

FC 119206



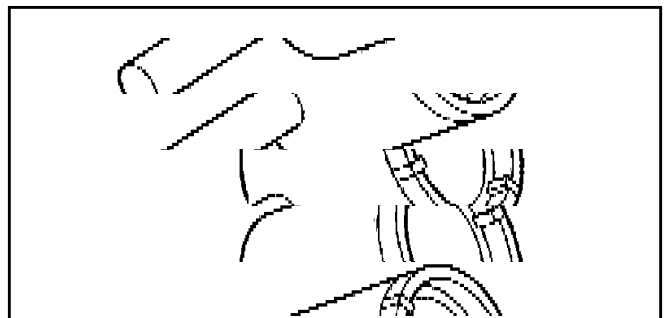
Bush driver

FC 119220



Wrench for pinion nut ring

FC715080



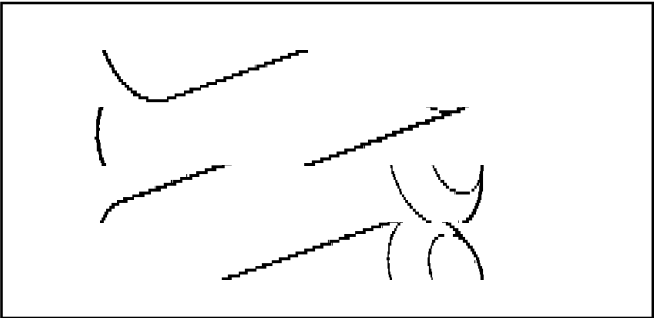
Pinion locking wrench

FC715081

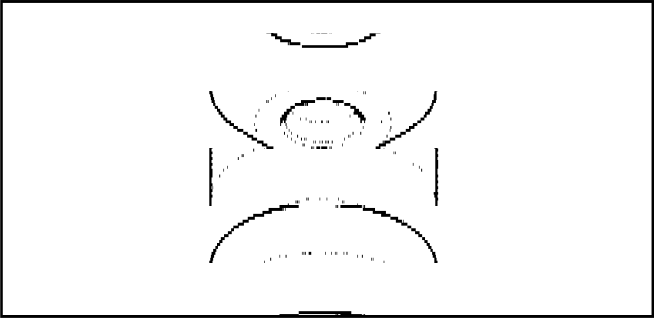


FRONT AXLE - DUAL TRANSMISSION

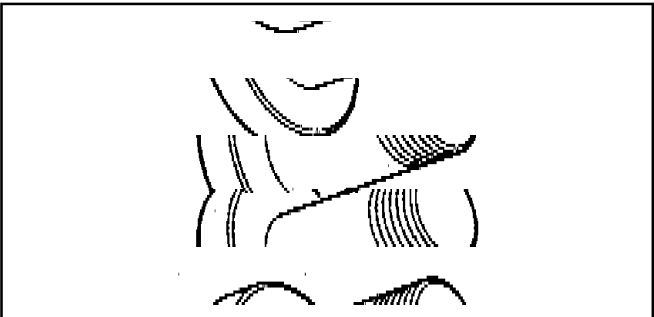
Bearing cone driver
FC 15082



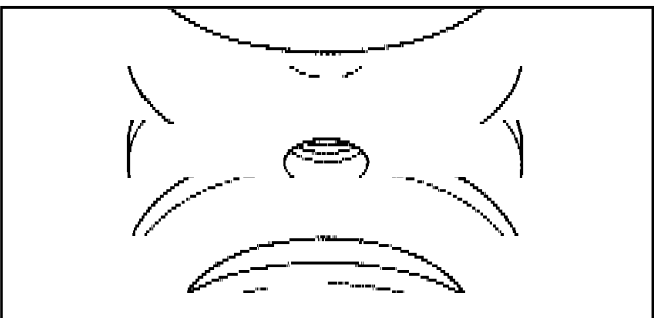
Bearing cone drive
FC 715083



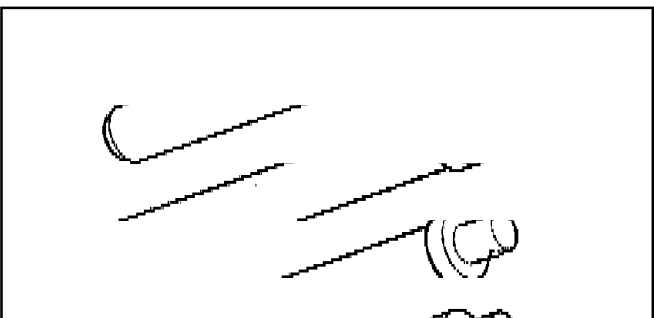
False pinion
FC715084



Bearing cup driver
FC715085

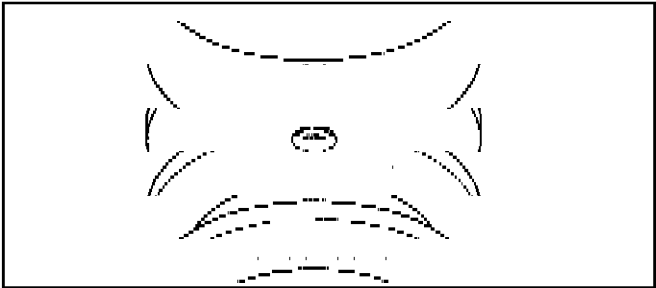


Bush driver
FC715086

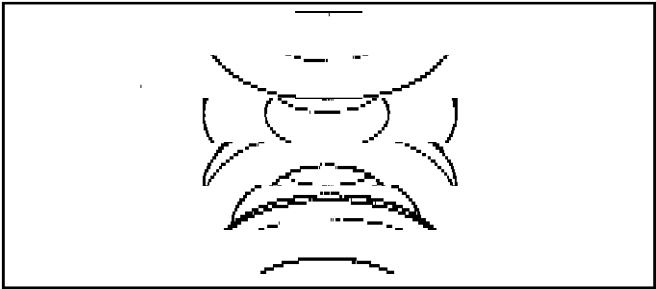


FRONT AXLE - DUAL TRANSMISSION

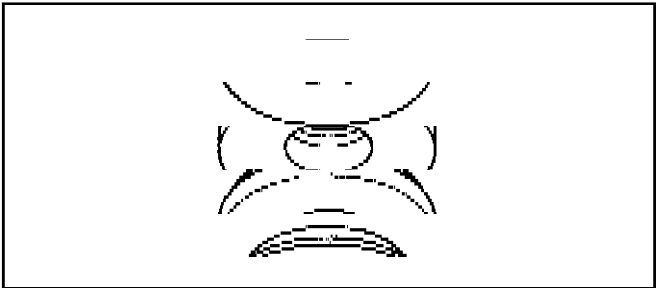
Oil seal driver
FC 7155099



Oil seal driver
FC 715227



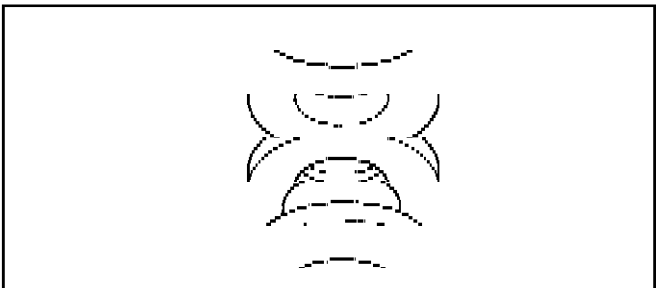
Oil seal driver
FC 715360



King pin bush driver
FC715451



Oil seal driver
FC715453



King pin bush driver
FC715474

