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Eaton Gen III Automated Transmissions TRTS0930 EN-US

January 2016

UltraShift®
AutoShift®

Powering Business Worldwide

BACKED BY Roadranger SUPPORT

Model:

F-5405B-DM3
F-6405B-DM3
FM-14D310B-LST
FM-15D310B-LST
FO-16D313E-LEP
FO-5406B-DM3
FO-6406A-AW3
FO-6406B-AW3
FO-8406A-AW3
FOM-16D313E-LEP
RTLO-14918A-AS3
RTLO-16913L-DM3
RTLO-16918A-AS3
RTO-10910B-DM3
RTO-12910B-AS3
RTO-12910B-DM3
RTO-14910B-AS3
RTO-14910B-DM3
RTO-14910C-AS3
RTO-16910B-AS3
RTO-16910B-DM3
RTO-16910C-AS3
RTO-18910B-AS3
F-5505B-DM3
F-6505B-DM3
RTLO-18918A-AS3
RTLO-20918A-AS3
RTLO-22918A-AS3
RTLOM-16913L-DM3
RTO-10910B-AS3
RTOM-16910B-DM3

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Warnings and Cautions

Warning: Follow the specified procedures in the indicated order to avoid personal injury

Caution: Follow the specified procedures in the indicated order to avoid equipment malfunction or damage.

Note: Additional relevant information not covered in the service procedure.

Before starting a vehicle:

- Ensure adequate fuel level
- Sit in the driver's seat
- Place shift lever in neutral
- Set the parking brake

Before working on a vehicle or leaving the cab with engine running:

- Ensure ignition is off while hands are within the clutch housing area.
- Place shift lever in neutral
- Set the parking brake
- Block the wheels

When parking the vehicle or leaving the cab:

- Place shift lever in neutral
- Set the parking brake

Caution: Do not release the parking brake or attempt to select a gear until the air pressure is at the correct level.

To avoid damage to the transmission during towing:

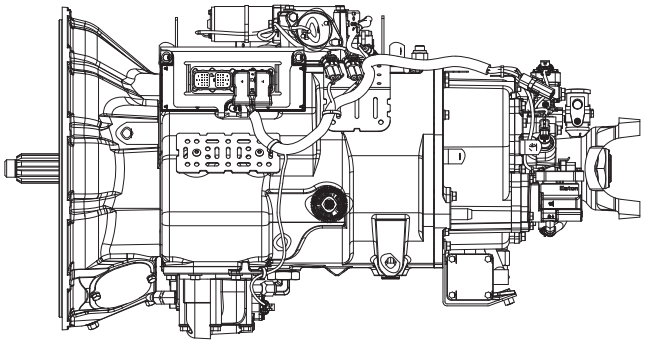
1. Place shift lever in neutral
2. Lift the drive wheels off of the ground or disconnect the driveline

Do not operate the vehicle if Alternator light is lit or if gauges indicate low voltage.

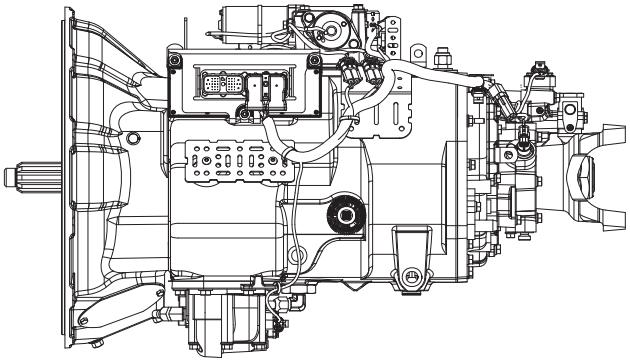
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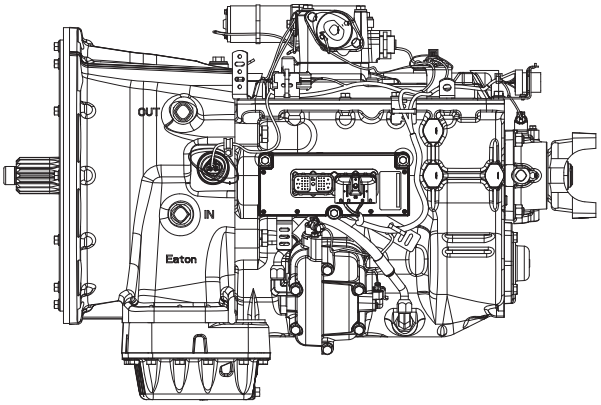
Transmission Models



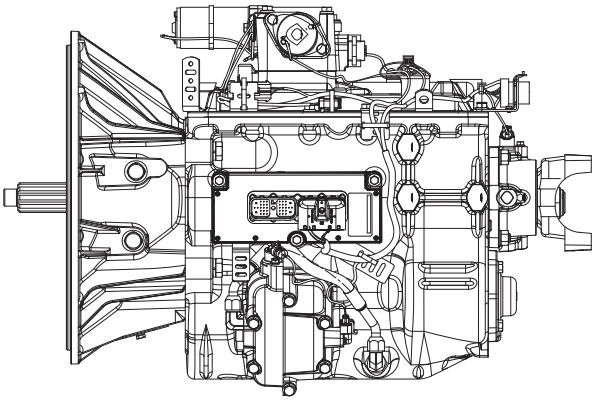
Heavy-Duty 13-Speed DM3/LEP and 18-Speed AS3



Heavy-Duty 10-Speed AS3/DM3



Medium-Duty 6- and 5-Speed DM3



Medium-Duty 6-Speed AW3

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Diagnostic Procedures

A

Purpose: *Observe the transmission gear display.*

1. Key on.
2. Observe gear display.

   Note: An “88” may show up in the dash at key on. This indicates the Transmission Electronic Control Unit (TECU) has completed power-up. If the transmission and gear display power-up at the same time, you may not see an “88”.

   - If blank gear display, go to **Step B.**
   - If “-” (1 dash) on gear display, go to **Step D.**
   - If “--” (2 dashes) or “**” (2 stars) on gear display, go to **Step D.**
   - “#” (gear number) on gear display
     - Verify shift lever or push button is in neutral.
     - Turn key off and wait 2 minutes.
     - Hold clutch half way to the floor. (If equipped)
     - Turn key on.
     - If problem continues, call 1-800-826-HELP (4357)
   - Fault Code F on gear display, go to **Step D.**
   - Neutral “N” on gear display, go to **Step B.**

B

Purpose: *Confirm that the engine will crank and start.*

1. Attempt to start engine
   - No engine crank, lever is in neutral and gear display is “N” (neutral). See “Start Enable Relay Contact Test” on page 268.
   - No engine crank, lever is in neutral and gear display is blank. See “Power-Up Sequence Test” on page 22.. If no problems found, refer to OEM for gear display problem.
   - No engine crank and lever is NOT in neutral.
     - Verify shift lever or push button is in neutral.
     - Turn key off and wait 2 minutes.
     - Hold clutch half way to the floor. (If equipped)
     - Turn key on.
     - If problem continues, call 1-800-826-HELP (4357)
   - Engine cranks and gear display is blank. Refer to OEM for gear display problem.
   - Engine cranks and gear display is “N” (neutral), go to **Step C.**

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C

Purpose: *Confirm the transmission will engage a gear from neutral.*

1. Attempt to engage a gear.
   - If gear engaged and drives, go to **Step E.**
   - If the gear display indicates a solid "gear number" but no drive or reverse, perform "Front Box Control Test" on page 282
   - If unable to engage a gear and transmission is an AutoShift, perform "AutoShift Will Not Engage a Gear from Neutral Test" on page 288
   - If unable to engage a gear and transmission is an UltraShift DM3, perform "UltraShift DM3 Will Not Engage a Gear from Neutral Test" on page 296
   - If unable to engage a gear and transmission is an UltraShift AW3, perform "UltraShift AW3 Clutch Engagement Test" on page 302

D

Purpose: *Check for active or Inactive fault codes.*

1. Check for active fault codes.

   Note: If no problem found, refer to OEM for display problem.

   - If codes are present, See "Fault Code Isolation Procedure Index" on page 8.
   - If no codes and gear display is "-" (1 dash)
     - Verify shift lever or push button is in neutral.
     - Turn key off. Wait 2 minutes.
     - Hold clutch half way to the floor. (If equipped)
     - Turn on key.
     - If problem continues, call 1-800-826-HELP (4357)

     See "Front Box Control Test" on page 282.
   - If no codes and gear display is"--" (2 dashes) or "**" (2 stars), See "Power-Up Sequence Test" on page 22.

E

Purpose: *Drive vehicle and attempt to duplicate a fault code.*

1. Record and clear Inactive fault codes.
2. Drive vehicle and attempt to reset code.
   - If no codes are present, test complete.
   - If Inactive transmission component or Fault Codes, record codes an call 1-800-826-HELP (4357).
   - If active transmission component or Fault Codes, See "Fault Code Isolation Procedure Index" on page 8.

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Fault Code Retrieval/Clearing

Retrieving Fault Codes Manually

Retrieve fault codes by enabling the system's self-diagnostic mode.

Note: You can also use a PC- based service tool, such as ServiceRanger to retrieve fault codes.

1. Place the shift lever in neutral.
2. Set the parking brake.
3. Turn key on with engine off.

Note: If the engine is already running, you may still retrieve codes; however, do not engage the starter if the engine stalls.

4. To Retrieve Active Codes: Key on. Turn key off and on 2 times within five seconds ending with the key on. After 5 seconds, the Service light begins flashing two-digit fault codes. If no faults are active, the service light will flash code 25 (no codes). This is also the procedure to enter, See "Product Diagnostic (PD) Mode" on page 11. for details.

Note: An "88" may show up in the dash at key on, which is a normal power-up test of the display.

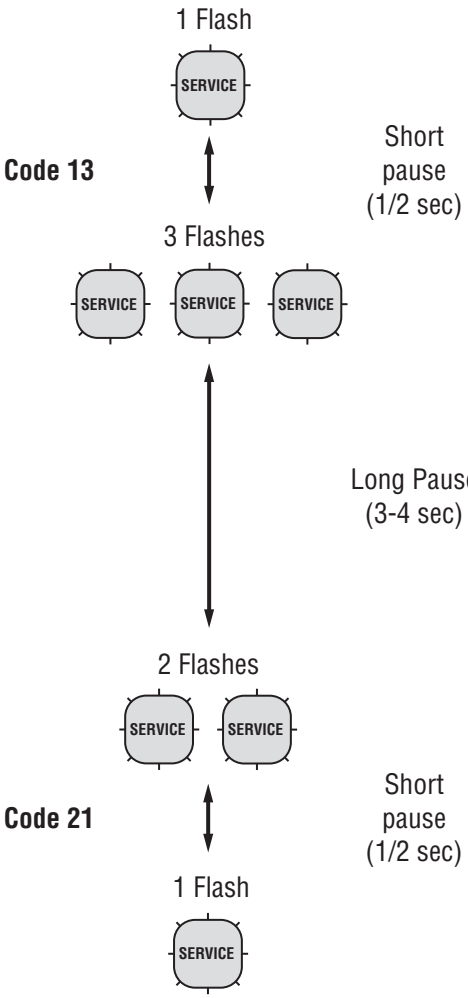


5. To Retrieve Inactive Codes: Turn key on. Turn the key off and on 4 times within five seconds ending with the key in the on position. After 5 seconds, the Service light begins flashing two-digit fault codes. If no faults are active, the service light will flash code 25 (no codes).



- Two digit fault codes will be displayed in the gear display. Some vehicle may be equipped with a service light.

6. Observe the sequence of flashes on the service light and record the codes. A 1- to 2-second pause separates each stored code, and the sequence automatically repeats after all codes have been flashed.



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Clearing Fault Codes Manually

The following procedure clears all Inactive fault codes from the TECU's memory. Active fault codes are automatically cleared when the fault has been corrected.

Note: You may use a PC-based service tool, such as ServiceRanger, to clear fault codes.

1. Place shift lever in neutral.
2. Set parking brake.
3. Turn key on with engine off.
4. Turn key off and on 6 times within 5 seconds ending with key on.



Note: If the codes have been successfully cleared, the Service light will come on and stay on for five seconds. The gear display will show 25 (no codes).

5. Turn the key off and allow the system to power down.

Retrieving Fault Codes with ServiceRanger

This section determines if the TECU is communicating on the vehicle's J1939 data link and if the component has set any fault codes. Proper system operation requires the TECU to communicate with other ECUs on the vehicle's J1939 data link.

Note: This procedure requires ServiceRanger 3.0 or later and an approved RP1210A communications adapter that supports J1939 communications.

Detecting Components

1. Connect the service PC to the vehicle's 9-way J1939 diagnostic port connector with an approved RP1210A communications adapter.
2. Start the ServiceRanger program and verify that a connection has been established with the vehicle's J1939 data link.
   - If the TECU is not detected by ServiceRanger, proceed to the Electrical Pretest procedure to ensure the TECU has power, and that all components are properly connected the vehicle's J1939 data link.

Viewing Fault Codes

View the Vehicle Fault Codes screen in ServiceRanger and verify if any Active or Inactive codes have been set.

1. If an Active code is present, record the vehicle fault information and proceed to Diagnostic Procedure in this manual for the Active code. Do not clear any codes at this time.
2. If only Inactive codes are present, record the vehicle fault information and clear all fault codes. Road test the vehicle to verify proper operation.

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Clearing Fault Codes with ServiceRanger

After all repairs have been made and the system is functioning normally, clear all vehicle codes before placing the vehicle back into service.

Clearing Fault Code

1. Connect the service PC to the vehicle and start ServiceRanger.
2. View the Vehicle Fault Codes screen and select Clear All.
3. Refresh the screen to verify all Inactive codes have been cleared, and that no Active codes are present.

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Fault Code Isolation Procedure Index

Fault Codes	SPN	PID	SID	FMI	Description
11	629		254	12	No ECU operation
12	629		254	13, 14	Improper ECU configuration
13	751		231	8, 11	J1939 Shift Control device
14 (without Park Pawl)	751		18, 19	2, 3, 4, 5	Invalid Shift Lever voltage
14 (with Park Pawl)			18, 19	2, 3, 4, 5	Invalid Shift Lever voltage (will show “F” in display)
15	751		18	9	HIL Shift Device communication
16	625		248	2	High Integrity Link (HIL)
17	1321		237	3, 4, 14	Start Enable Relay Coil
21	70	70		14	Auto Neutral Park Brake Switch
22	563	49		9, 14	ABS CAN message fault
25					NO CODES
26	522		55	10	Clutch slip
27	788		55	7, 13	Clutch disengagement
28	788		52,55	3, 4, 5, 7	Clutch system
29	969	372		4, 5	Remote throttle enable
31	1485		218	2, 3, 4, 5, 14	Momentary Engine Ignition Interrupt Relay (MEIIR)
32	158	43		2	Loss of Switch Ignition power test
33	168	168		4	Low Battery voltage supply
34	168	168		14	Weak Battery voltage supply
35	639		231	2	J1939 communication link
36	639		231	14	J1939 engine message
37	627		251	5	Power supply
41	768		35	7	Range failed to engage
41	769		36	7	Range failed to engage
42	770		37	7	Splitter failed to engage
42	771		38	7	Splitter failed to engage
43	768		35	3, 4, 5	Range High Solenoid Valve
43	769		36	3, 4, 5	Range Low Solenoid Valve
44	787		54	3, 4, 5	Inertia Brake Solenoid Coil
45	787		54	7	Intertia Brake performance
46	770		37	3, 4, 5	Splitter Direct Solenoid Valve
46	771		38	3, 4, 5	Splitter Indirect Solenoid Valve
51	60	60		2, 3, 4, 10	Rail Position Sensor

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Fault Codes	SPN	PID	SID	FMI	Description
52	59	59		2, 3, 4, 7	Gear Position Sensor
56	161	161		2, 3, 4, 5,10	Input Shaft Speed Sensor
57	160	160		2, 3, 4, 5	Main Shaft Speed Sensor
58	191	191		2, 3, 4, 5, 6, 8	Output Shaft Speed Sensor
61	772		39	1, 5, 6, 12	Rail Select Motor
63	773		40	1, 5, 6, 12	Gear Select Motor
68	520274		227	14	Grade Sensor
68	520321		227	13, 14	Grade Sensor
71	560		60	7	Unable to disengage gear
72	772		59	7	Failed to select rail
73	781		58	7	Failed to engage gear
74	518	93		7	Engine speed response fault
74	898	190		7	Engine torque response fault
75*	560		60	14	Power down in gear
81	780		47	7	Gear engagement detected
83	751		18	14	Shift Lever missing
83	752		19	7, 12	Shift Lever missing
84	751		18	13	Shift Control device not configured
84	752		19	13	Park mechanism not calibrated
85	751		18	12	Shift Control device incompatible
99	781		58	14	Direction mismatch

* This code will only be set Inactive

- J1939 Source Address (SA) for Eaton transmissions is 3
- J1587 Module Identifier (MID) for Eaton transmissions is 130

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Symptom-Driven Diagnostics Index

Symptom	Isolation Procedure
Unable to shift transmission with Up/Down button	Up/Down Button Test
Engine starting system complaint	Start Enable Relay Contact Test
No J1587 communication	J1587 Data Link Test
Gear display shows a dash	Front Box Control Test
AutoShift will not engage a gear from Neutral	AutoShift Will Not Engage a Gear from Neutral Test
UltraShift DM will not engage a gear from Neutral	UltraShift DM Will Not Engage a Gear from Neutral Test
UltraShift AW3 will not engage a gear from Neutral	UltraShift AW3 Clutch Engagement Test
AutoShift AS3 shift complaint	AutoShift AS3 Shift Complaint Test
UltraShift DM shift complaint	UltraShift DM Shift Complaint Test
UltraShift AW3 shift complaint	UltraShift AW3 Shift Complaint Test
Shift Lever back light does not work	Shift Lever Back Light Test

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Product Diagnostic (PD) Mode

Product Diagnostic (PD) Mode

PD Mode is used to help diagnose Inactive codes that may have been set during normal driving. This diagnostic mode increases the sensitivity of the fault sensing capability

This procedure tests loose, degraded and intermittent connections. Use the Active Fault Isolation Procedure to guide you to the wiring and connectors that are associated with the Inactive fault codes. Flex the wiring harness and connectors and attempt to recreate the fault after activating PD Mode.

PD Mode is only to be used by a trained service technician in an authorized dealer.

This procedure is to be used prior to performing fault isolation procedures for component-type codes when there are no Active codes present.

To enter PD Mode:

Note: Vehicle will not start in PD Mode. You must turn vehicle key off to exit PD Mode.

1. Vehicle must be stationary, engine off, set vehicle parking brake.
2. Turn the key off and on 2 times, starting with key on and ending with key on.

   Note: Dash may display an 88 at key on. This is a normal power-up test of the display.
3. The gear display will flash a 25 then a solid PD (Product Diagnostic Mode) and the mode will be activated.
4. The service light shall flash code 25 once indicating no codes. The service light shall then illuminate solid to indicate PD Mode until such time that an Active code is detected or PD Mode is exited.
5. Refer to PD Mode section in Fault Isolation procedure for the Inactive fault to be diagnosed.
6. PD will remain in gear display until an active fault has been set during the PD Mode fault isolation procedure.
   - If the fault is detected during PD Mode the gear display will display the active fault. The warning tone will only sound when the fault is active and the tone will stop when the fault is Inactive. The fault will stay in the gear display until the system is powered down.

   Note: Active codes set during PD Mode will not be stored as Inactive.
7. If a fault is detected, exit PD Mode and perform the corresponding Fault Isolation Procedure.
8. To exit PD Mode, turn the key off.

PD Mode works with the following Inactive codes:

11, 13, 14, 15,16, 17, 21, 22, 29, 33, 34, 35, 36, 43, 44, 46, 51, 52, 56, 57, 58, 61, 63, 74, and 99.

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Electrical Pretest

Overview

The pretest does not relate to any specific fault code, but must be completed before performing Fault Code Isolation table procedures. The pretest verifies the batteries are fully charged.

All Generation 3 products require the OEM to supply power to the Electronic Control Unit (ECU).

Detection

There is no detection process specifically for the basic electrical supply; however, failures of this type are generally detected by the transmission or driver as some other type of fault code or symptom.

Fallback

There is no fallback for the electrical pretest; however, it may affect other systems.

Possible Causes

The pretest can be used for:

- Low batteries
- Starter/Battery connections
- Main power harness to the Transmission Electronic Control Unit (TECU)

Additional Tools

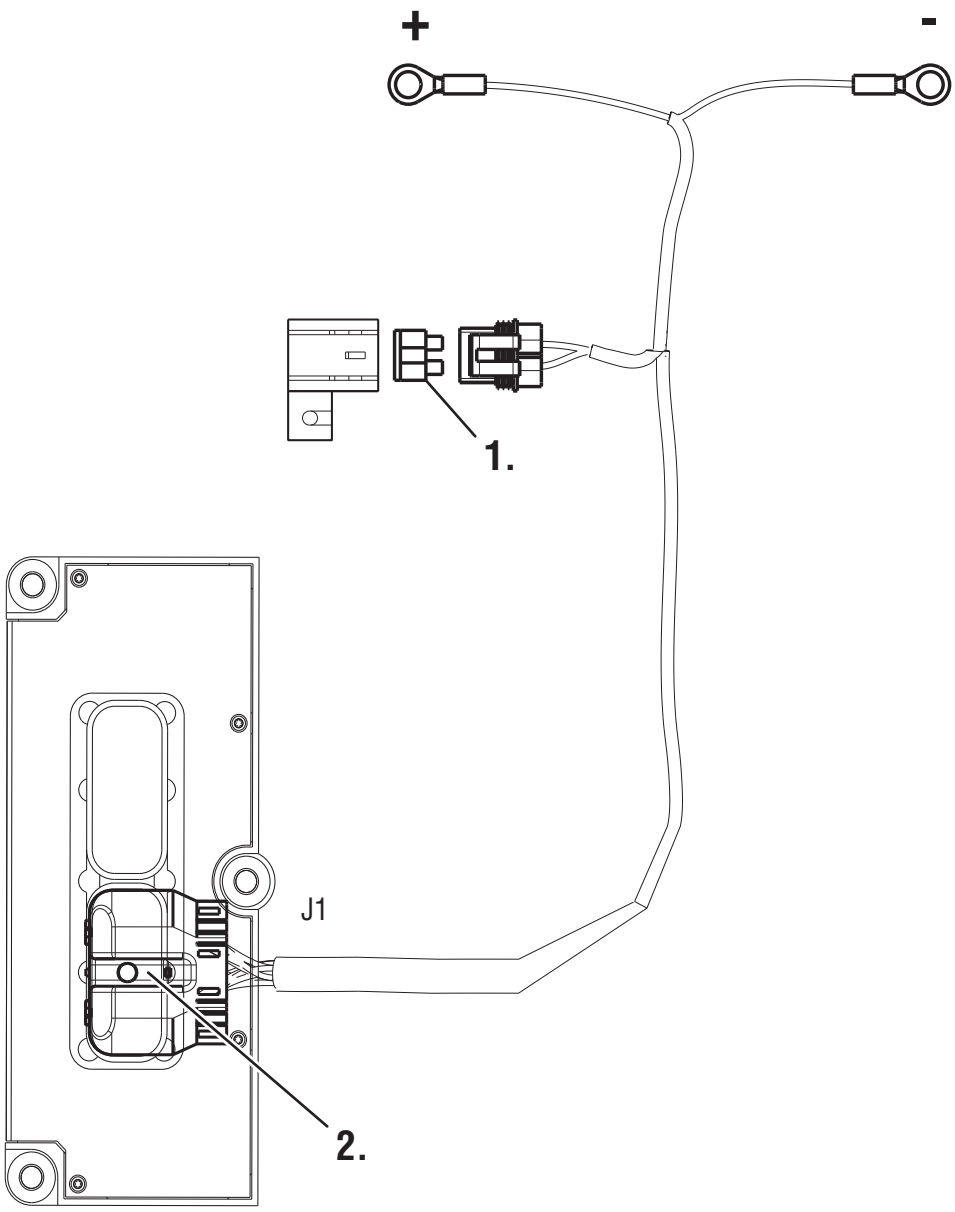
- Basic hand tools
- Eaton Test Adapter Kit
- Digital Volt/Ohm meter
- Troubleshooting Guide
- Battery Load tester
- ServiceRanger a PC-based service tool

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Component Identification

TECU Power Harness

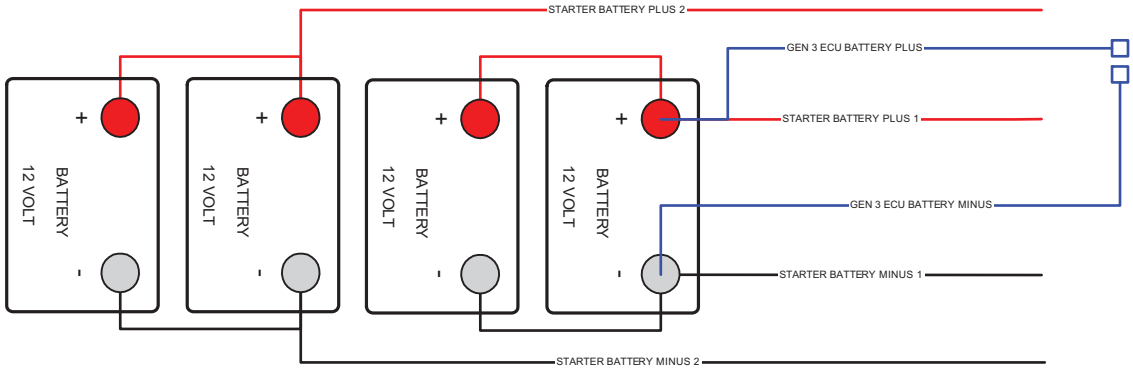
OEM is responsible for overcurrent protection on this circuit.



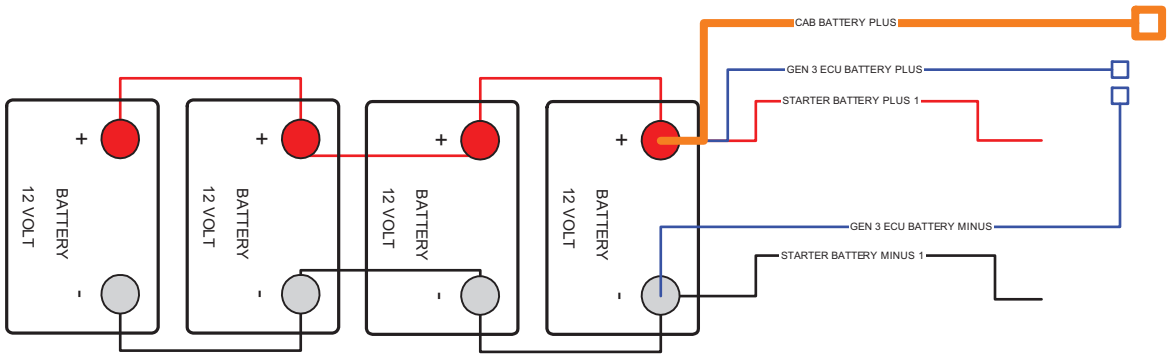
1. 30 AMP Fuse
2. TECU Connector (Vehicle Interface)

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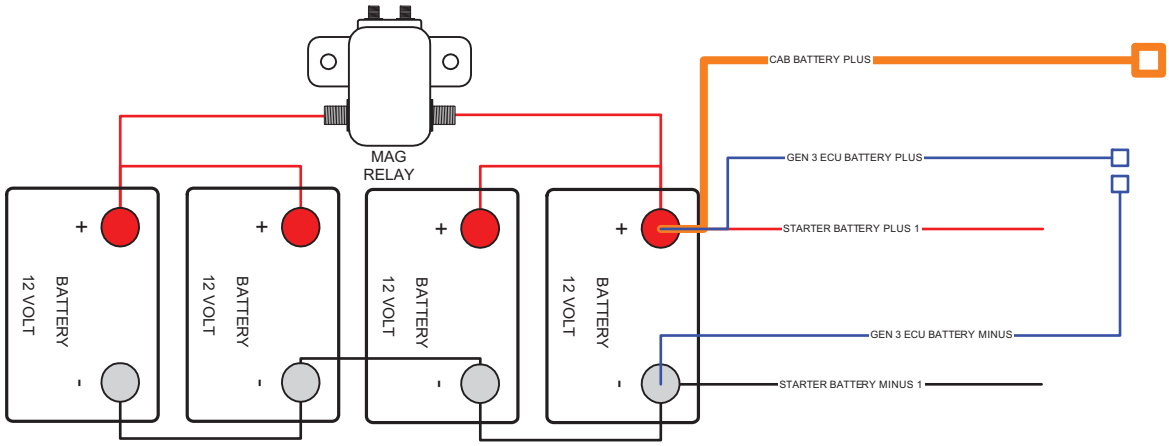
Preferred +12 Volt Connections



TWO BATTERY BANKS - TWO BATTERIES PER BANK - DUAL JUMPERS TO STARTER
BATTERIES ARE CONNECTED IN PARALLEL BY PAIRS. GEN 3 POWER SUPPLIED BY BATTERY CLOSEST TO STARTER (BOTH PLUS AND MINUS)



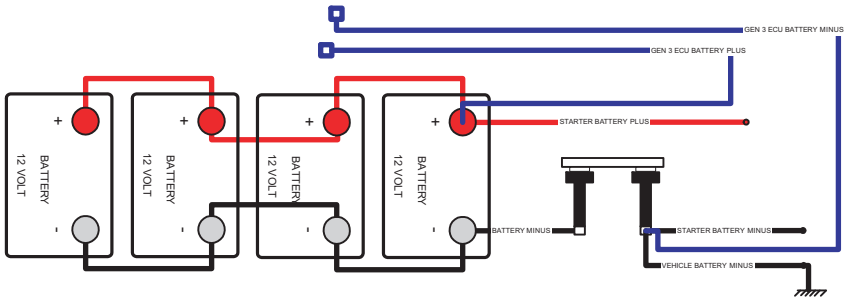
ONE BATTERY BANK - FOUR BATTERIES
BATTERIES ARE CONNECTED IN PARALLEL. GEN 3 POWER SUPPLIED FROM BATTERY CLOSEST TO STARTER WITH CAB POWER. (BOTH PLUS AND MINUS)



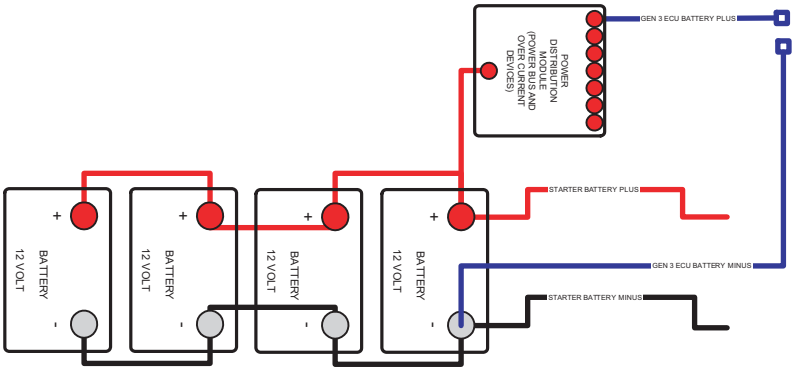
TWO BATTERY BANKS - TWO BATTERIES PER BANK WITH DISCONNECT
BATTERIES ARE CONNECTED IN PARALLEL BY PAIRS - DISCONNECT FOR CAB AND VEHICLE START - DISCONNECTED PAIR PROVIDES "DEEP DISCHARGE" CAB COMFORT AND ENTERTAINMENT CAPABILITY. GEN 3 POWER SUPPLIED FROM BATTERY SET CLOSEST TO STARTER AND COMMON TO CAB POWER

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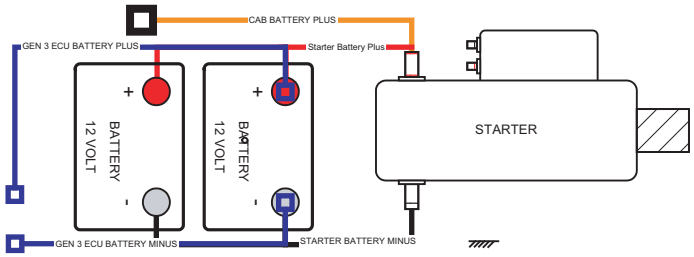
Preferred +12 Volt Connections



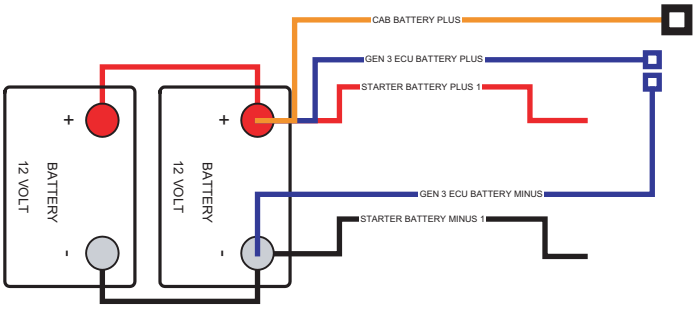
TWO BATTERY BANKS - BATTERY NEGATIVE DISCONNECT SWITCH
BATTERIES ARE DISCONNECTED AT POWER DOWN WHEN VEHICLE STORED INSIDE. GEN 3 POWER SUPPLIED FROM BATTERY CLOSEST TO THE STARTER. NEGATIVE CONNECTION AT POINT OF VEHICLE CABLE CONNECTION TO DISCONNECT SWITCH



POWER DISTRIBUTION MODULE
BATTERIES ARE CONNECTED IN PARALLEL, POWER PLUS AND MINUS CONNECTED ON BATTERY CLOSEST TO THE STARTER. CABLES SIZE AND LENGTH OPTIMIZED FOR LOW VOLTAGE DROP



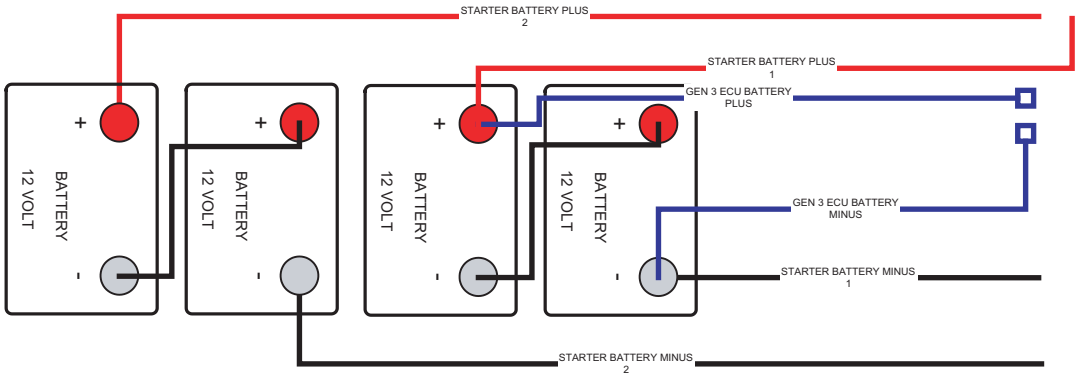
STARTER BATTERY CONNECTION
GEN 3 POWER PLUS AND MINUS CONNECTED ON BATTERY CLOSEST TO THE STARTER.



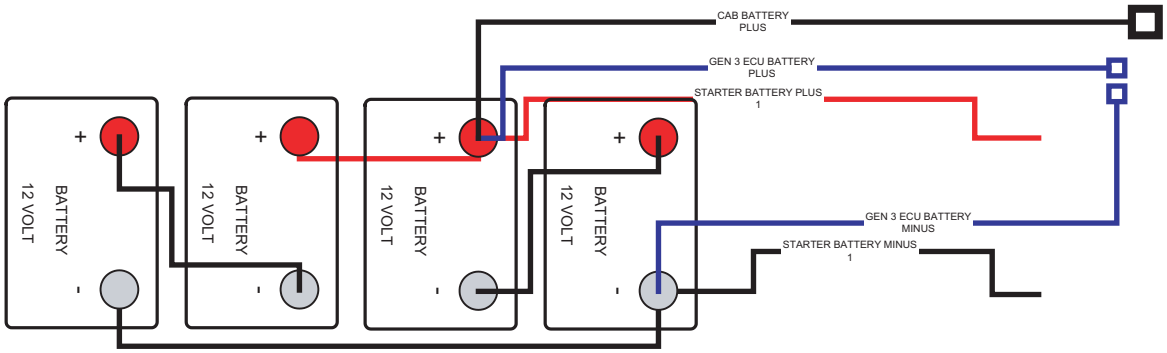
ONE BATTERY BANK - TWO BATTERIES
BATTERIES ARE CONNECTED IN PARALLEL. GEN 3 POWER SUPPLIED FROM BATTERY CLOSEST TO STARTER WITH CAB POWER. (BOTH PLUS AND MINUS)

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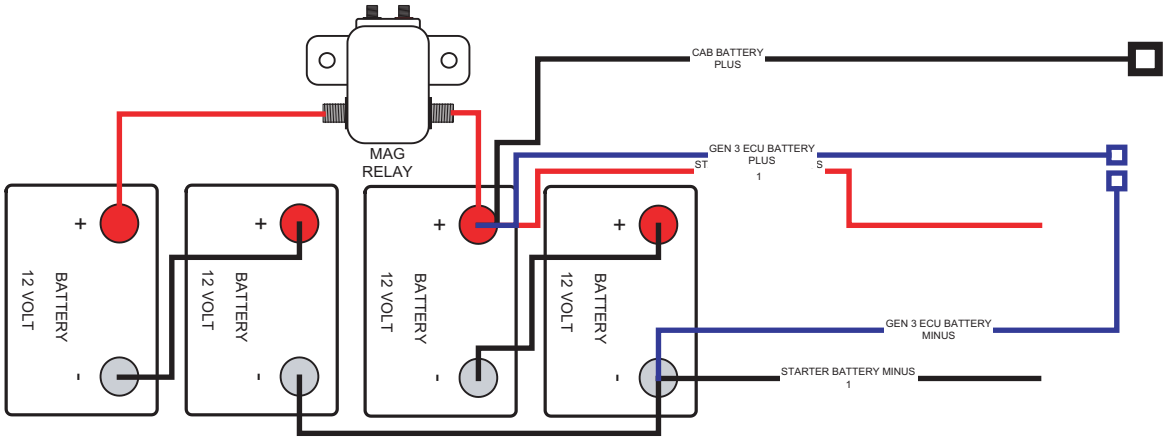
Preferred +24 Volt Connections



TWO BATTERY BANKS - TWO BATTERIES IN SERIES PER BANK - DUAL JUMPERS TO STARTER
BATTERIES ARE CONNECTED IN SERIES/PARALLEL BY PAIRS. GEN 3 POWER SUPPLIED BY BATTERY CLOSEST TO STARTER (BOTH PLUS AND MINUS)



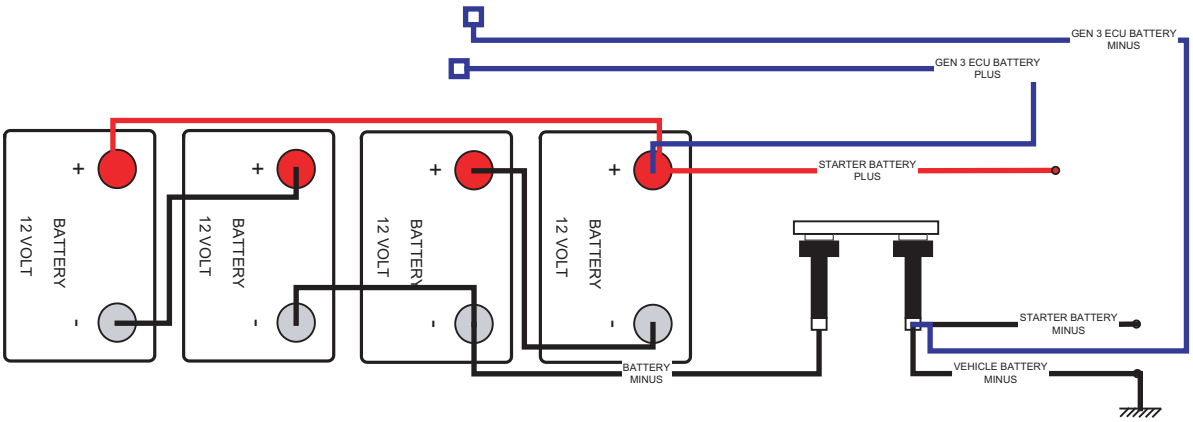
ONE BATTERY BANK - FOUR BATTERIES - ONE CABLE PAIR TO STARTER
BATTERIES ARE CONNECTED IN SERIES/PARALLEL BY PAIRS. GEN 3 POWER SUPPLIED FROM BATTERY CLOSEST TO STARTER WITH CAB POWER. (BOTH PLUS AND MINUS)



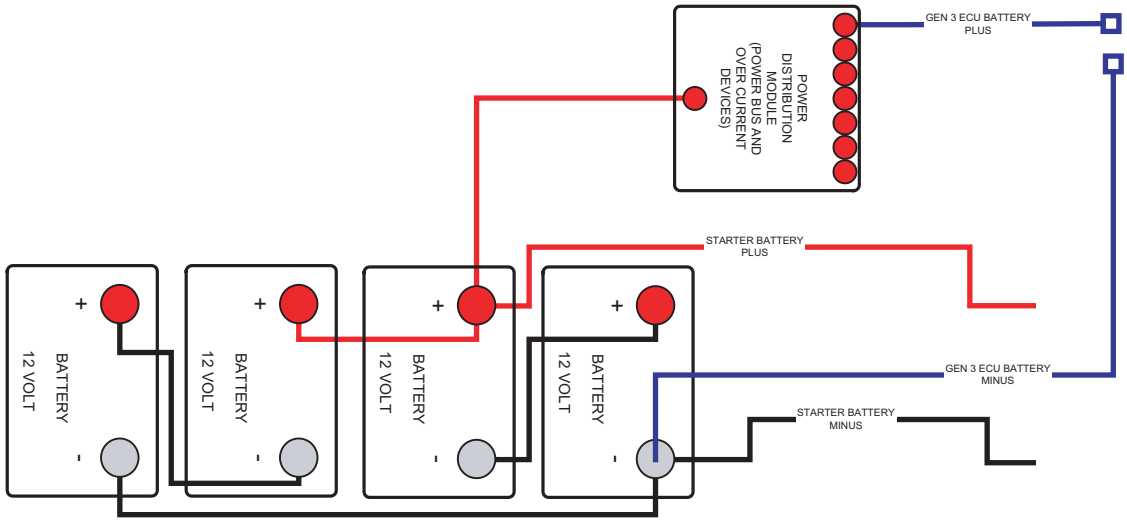
TWO BATTERY BANKS - TWO BATTERIES PER BANK WITH DISCONNECT
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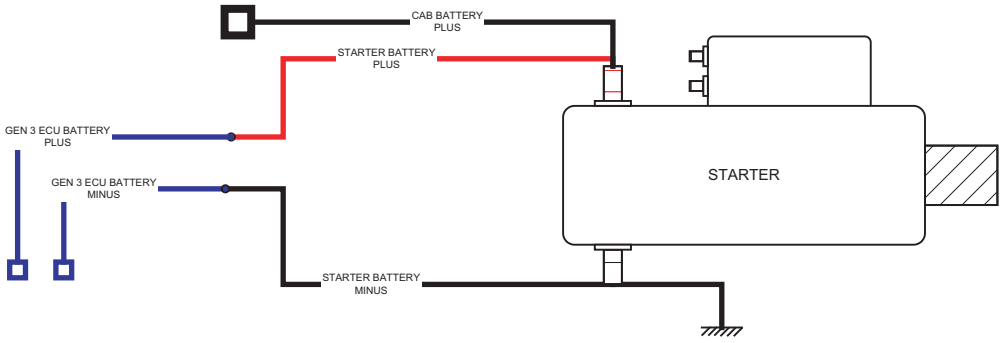
Preferred +24 Volt Connections



TWO BATTERY BANKS - BATTERY NEGATIVE DISCONNECT SWITCH
BATTERIES ARE DISCONNECTED AT POWER DOWN WHEN VEHICLE STORED INSIDE. GEN 3 POWER SUPPLIED FROM BATTERY CLOSEST TO THE STARTER. NEGATIVE CONNECTION AT POINT OF VEHICLE CABLE CONNECTION TO DISCONNECT SWITCH



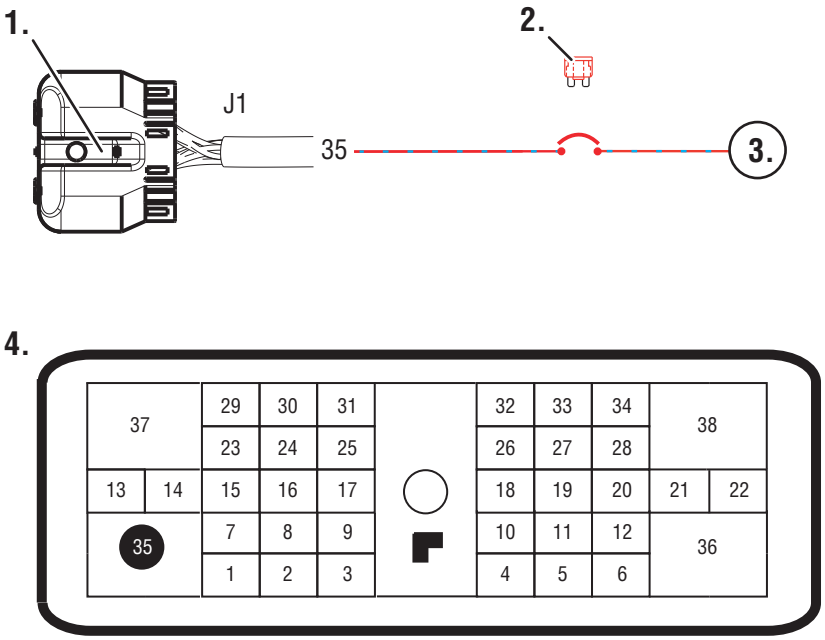
POWER DISTRIBUTION MODULE
BATTERIES ARE CONNECTED IN SERIES/PARALLEL, POWER PLUS AND MINUS CONNECTED ON BATTERY CLOSEST TO THE STARTER. CABLES SIZE AND LENGTH OPTIMIZED FOR LOW VOLTAGE DROP



STARTER BATTERY CONNECTION
GEN 3 POWER PLUS AND MINUS CONNECTED ON BATTERY CLOSEST TO THE STARTER.

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TECU Ignition Circuit



1. TECU connector (vehicle interface)
2. 10 AMP only, manual resetting circuit breaker OR 10 AMP fuse
3. Ignition Key Switch

Note: Run to main power lead that feeds the ignition bus (OEM responsible for overcurrent protection on this line)

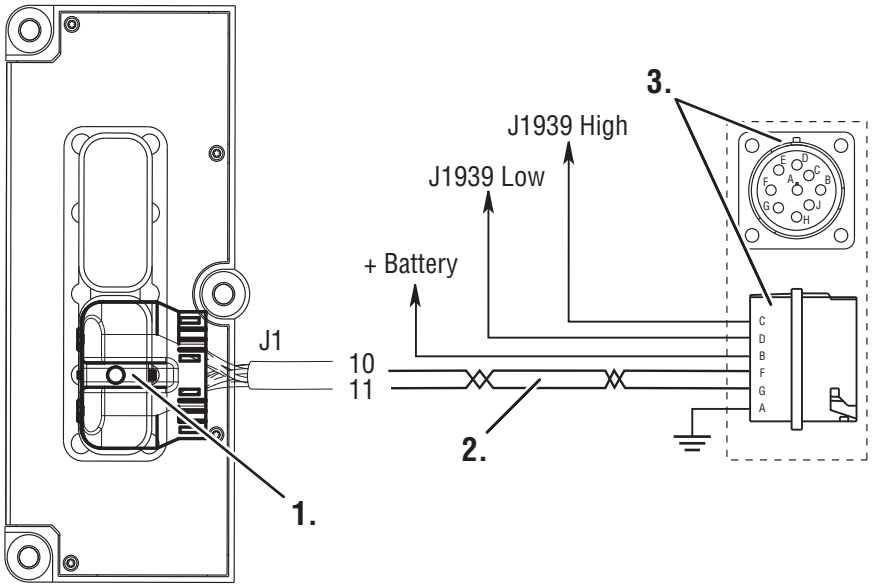
4. TECU Connector (vehicle interface) front view

From	To
J1-35	VIGN

Battery and ignition power and ground to the TECU must not be switched off during the engine start process.

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J1939 Data Link



1. TECU connector (vehicle interface)
2. J1587 Data Link
3. 9-Way, for transmission diagnostics

J1939 Troubleshooting

1. Check the resistance of the J1939 Data Link.
2. Key off. Measure resistance between the 9-way diagnostic connector Pin C and Pin D and record the reading. The reading should be 60 ohms of resistance (between 50 and 70.)
3. Check resistance between Pin C and Pin A and the resistance between Pin D and Pin A. These two readings should be 10K ohms or greater (open circuit).

Note: Pin C = J1939+, Pin D = J1939-, Pin A is a chassis ground

- If an Inactive data link fault code is being reported by the TECU, See “Product Diagnostic (PD) Mode” on page 11. PDM should be utilized before any further steps are taken.

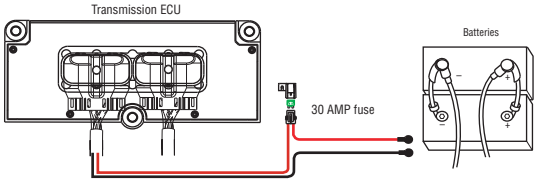
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Electrical Pretest

A

Purpose: *Measure battery voltage. Visually inspect the batteries, inline fuse and power and ground supplies at the batteries.*

1. Key off.
2. Remove and clean all battery and battery-to-frame connections.
3. Remove and clean ground supply to engine ECU.
4. Inspect starter/battery and inline 30 amp fuse holder connections for corrosion or damaged contacts.
5. Measure voltage across batteries.
   - If voltage is 11 to 13 volts on a 12- volt system or 22 to 26 on a 24 volt system, refer to OEM guidelines for battery load test. Repair or replace batteries as required. Go to **Step B.**

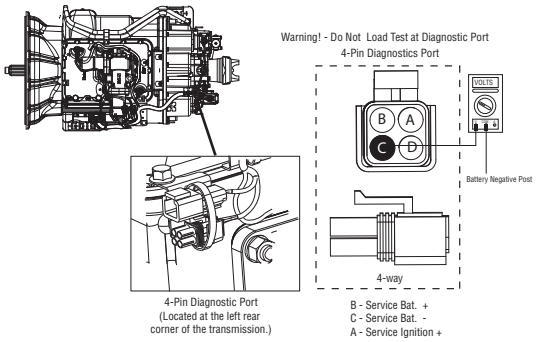


   - If voltage is outside of range, repair or replace batteries and charging system as required. Repeat this step.

B

Purpose: *Verify proper ground path between the batteries and the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.



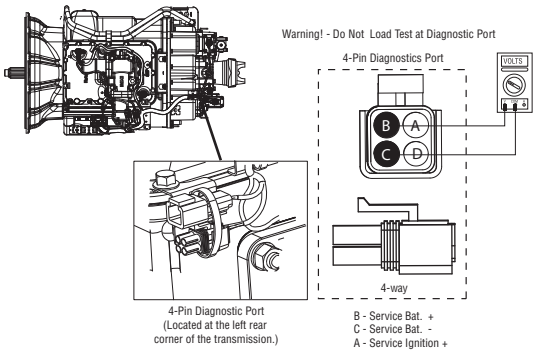
   - If voltage is 0.70 volts or less, go to **Step C.**
   - If voltage is outside of range, repair battery ground supply to Transmission Electrical Control Unit (TECU). Repeat test.

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C

Purpose: *Measure proper battery voltage at the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.



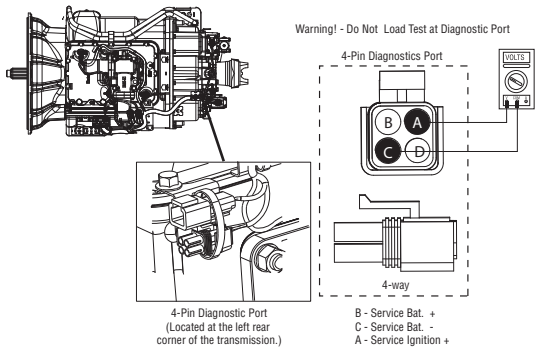
- If voltage is within 0.6 volts of battery voltage, go to **Step D.**
- If voltage is outside of range, Repair battery power supply to TECU. Fuse may be blown. Repeat test.

D

Purpose: *Measure proper ignition voltage at the transmission harness 4-way diagnostic connector.*

1. Key on.

   Warning: Do not load test at the diagnostic port.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, test complete.
- If voltage is outside of range, repair ignition power supply to TECU. Fuse may be blown. Repeat test.

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Power-Up Sequence Test

Overview
This test does not relate to any specific fault code, but must be completed if the self check fails at power-up.

Detection
The TECU checks the program memory every time the key is turned on.

Fallback
This causes an In-Place fallback while moving and a self-check failure if it occurs during power-up.

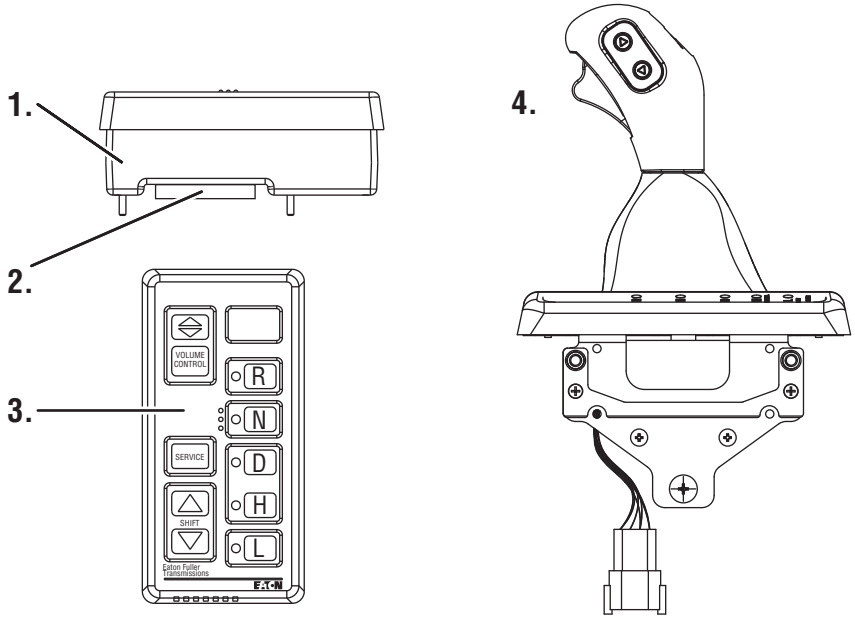
Possible Causes
This fault code can be caused by any of the following:

- Vehicle Harness
- Shift Control Device
- TECU

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Component Identification



1. Side view of pushbutton shift control
2. Transmission controller 30-way connector
3. Top view of pushbutton shift control
4. Eaton Cobra Lever

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Power-Up Sequence Test

A

Purpose: *Measure battery voltage. Visually inspect the batteries, inline fuse and power and ground supplies at the batteries.*

1. Key off.
2. Remove and clean all battery and battery-to- frame connections.
3. Remove and clean ground supply to engine ECU.
4. Inspect starter/battery and inline 30-amp fuse holder connections for corrosion or damaged contacts.
5. Measure voltage across batteries.
   - If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required. Go to **Step B.**
   - If voltage is outside of range, repair or replace batteries and charging system as required. Repeat this step.

B

Purpose: *Verify proper ground path between the batteries and the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.
   - If voltage is 0.70 volts or less, go to **Step C.**
   - If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

C

Purpose: *Measure proper battery voltage at the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.

Warning: Do not load test at the diagnostic port.

   - If voltage is within 0.6 volts of battery voltage, go to **Step D.**
   - If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

D

Purpose: *Measure proper ignition voltage at the transmission harness 4-way diagnostic connector.*

1. Key on.
2. Measure voltage between Pin A and Pin C.
   - If voltage is within 0.6 volts of battery voltage, go to **Step E.**
   - If voltage is outside of range, repair Ignition power supply to ECU. Fuse may be blown. Repeat test.

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E

Purpose: *Visually identify if the vehicle is equipped with a shift lever or push button.*

1. Is vehicle equipped with an Shift Lever?
   - If vehicle is not equipped with a Shift Lever, go to **Step F.**
   - If vehicle is equipped with a Shift Lever, go to **Step K.**

F

Purpose: *Visually identify if the push button is an Eaton built push button or an OEM built J1939 push button.*

1. Is it an Eaton Push Button or OEM J1939 Shift Device?
   - If an Eaton Push Button Shift Control, go to **Step G.**
   - If an OEM J1939 Shift Device, refer to OEM for troubleshooting procedures.

G

Purpose: *Visually observe the Service light during key-on power up.*

1. Key on.
2. Observe Service light.

   Note: If Service light is flashing, go to Diagnostics Procedure.
   - If Service light illuminates for 1 second and turns off, test complete.
   - If Service light never lights, go to **Step H.**
   - If Service light is on steady, replace **Shift Control**. Go to **Step V.**

H

Purpose: *Measure the voltage supply at the Shift Control device.*

1. Key off.
2. Disconnect Shift Control 30-way connector.
3. Key on.
4. Measure voltage between Pin C1 and Pin J3 on the Shift Control 30-way.
   - If voltage is within 1 volt of battery voltage replace **Shift Control**. Go to **Step V.**
   - If voltage is outside of range, go to **Step I.**

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I

Purpose: *Verify that a proper ground path is being supplied to the Shift Control Device through the Vehicle Harness and test for a short to ground.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect 38-way Vehicle Harness from TECU.
4. Measure resistance between TECU Pin 25 and Shift Control connector Pin J3 and from then from Pin J3 to ground.
   - If resistance from Pin 25 to J3 is 0 to 0.3 ohms and resistance from J3 to ground is OL / Open, go to **Step J.**
   - If resistance is outside of range, repair the Vehicle Harness. Go to **Step V.**

J

Purpose: *Measure the resistance of the ignition voltage supply wire to the Shift Control Device through the Vehicle Harness and test for a short to ground.*

1. Measure resistance between TECU Pin 31 and Shift Control connector Pin C1 and then from Pin C1 to ground.
   - If resistance from Pin 31 to C1 is 0 to 0.3 ohms and resistance from C1 to ground is 10K or OL, replace the TECU. Go to **Step V.**
   - If resistance is outside of range, repair the Vehicle Harness. Go to **Step V.**

K

Purpose: *Visually identify if the shift lever is an Eaton built shift lever or an OEM built shift lever.*

1. Is vehicle equipped with an Eaton supplied Shift Lever or an OEM supplied Shift Lever.
   - If Eaton Cobra Lever, go to **Step L.**
   - If OEM Shift Lever, go to **Step R.**

L

Purpose: *Visually observe the Service light during key-on power up.*

1. Key on.
2. Observe Service light.

   Note: If Service light is flashing, See “Diagnostic Procedures” on page 3.
   - If Service light illuminates for 1 second and turns off, test complete.
   - If Service light never comes on, go to **Step O.**
   - If Service light is on steady, go to **Step M.**

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M

Purpose: *Measure the voltage supply to the* Service light *during key-on power up.*

1. Disconnect Shift Lever 8-way connector.
2. Key on.
3. Measure voltage at Pin 6 and ground.
   - If voltage is within 2 volts of battery voltage for one second, then 0 volts, replace the Eaton **Cobra Lever**. Go to **Step V.**
   - If voltage is constant, go to **Step N.**

N

Purpose: *- Test the Service light voltage supply for short to power through the Vehicle Harness.*

1. Key off.
2. Disconnect negative cable.
3. Disconnect 38-way Vehicle Harness connector.
4. Measure resistance between Pin 6 and Pin 4.
   - If resistance is OL, replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If resistance is less than 10K, repair the Vehicle Harness and go to **Step V.**

O

Purpose: *Measure the voltage supply to the Service light during key-on power up.*

1. Key off.
2. Disconnect Shift Lever 8-way connector.
3. Key on.
4. Measure voltage between Pin 3 and Pin 6.
   - If within 1 volt of battery replace Eaton **Cobra Lever**, go to **Step V.**
   - If voltage is outside of range, go to **Step N.**

P

Purpose: *Verify that a proper ground path is being supplied to the Shift Lever through the Vehicle Harness and test for a short to ground.*

1. Key off
2. Disconnect 38-way Vehicle Harness connector on TECU.
3. Measure resistance between Pin 3 on the 8-way connector and Pin 25 on the 38-way connector and from Pin 25 to ground.

   Note: On Peterbilt disconnect Gear Display,
   - If resistance between Pin 3 and Pin 25 is 0 to 0.3 ohms and resistance from Pin 25 to ground is OL, go to **Step Q.**
   - If resistance is outside of range, repair the Vehicle Harness between the Vehicle Harness 38-way connector Pin 25 and Vehicle Harness 8-way connector Pin 3. Go to **Step V.**

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Q

Purpose: *Measure the resistance of the ignition voltage supply to the Shift Lever through the Vehicle Harness and test for a short to ground.*

1. Key off.
2. Measure resistance between:
   - Vehicle Harness 38-way connector Pin 31 and Vehicle Harness 8-way connector Pin 4
   - Vehicle Harness 38-way connector Pin 31 and ground
   - If resistance between Pin 31 and Pin 4 is 0 to 0.3 ohms and if resistance between Pin 31 and ground is OL, replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If any of the above conditions are not met, replace the Vehicle Harness between Vehicle Harness 38-way connector Pin 31 and Vehicle Harness 8-way connector Pin 4. Go to **Step V.**

R

Purpose: *Measure the voltage supply to the Service light during key-on power up.*

1. Key off.
2. Locate Service light connector on Vehicle Harness.
3. Key on.
4. Measure voltage across Pin A and Pin B on the Service light connector
   - If voltage is within 2 volts of battery voltage for 1 second, then 0 volts, test complete.
   - If no voltage is measured, go to **Step S.**
   - If voltage is within 2 volts of battery voltage continuously, go to **Step T.**

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S ***Purpose:*** *Measure the resistance of the service light supply wire to the Shift Lever through the Vehicle Harness and test for a short to ground.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect 38-way connector.
4. Measure resistance from Pin A of the OEM connector to Pin 23 of the 38-way and from Pin 23 to ground.
   - If resistance from Pin A to Pin 23 is 0 to 0.3 ohms and resistance to ground is 10K or greater, replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If resistance is outside of range, repair the Vehicle Harness and go to **Step V.**

T ***Purpose:*** *Test for a short to power at the Shift Lever Service light.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect TECU 38-way connector.
4. Measure voltage across Service light connector Pin A and Pin B.
   - If no voltage is measured, replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If voltage is within 2 volts of battery voltage, repair Vehicle Harness as required. Go to **Step V.**

V ***Purpose:*** *Verify that the system will properly power up.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
   - If Power-Up Sequence Test completes, test complete.
   - If Power-Up Sequence Test fails go to **Step A.** find error in testing.

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Fault Code 11 - No TECU Operation

J1939: SA 3 SPN 629 FMI 12
J1587: MID130 PID FMI 12

Overview
This fault code indicates an internal failure of the Transmission Electronic Control Unit (TECU).

Detection
The TECU checks the program memory every time the key is turned on and throughout operation. If the TECU is able to detect a failure within its own memory, it sets this fault code.

Fallback
This fault causes a vehicle In Place fallback while moving and a self-check failure if it occurs during power-up.

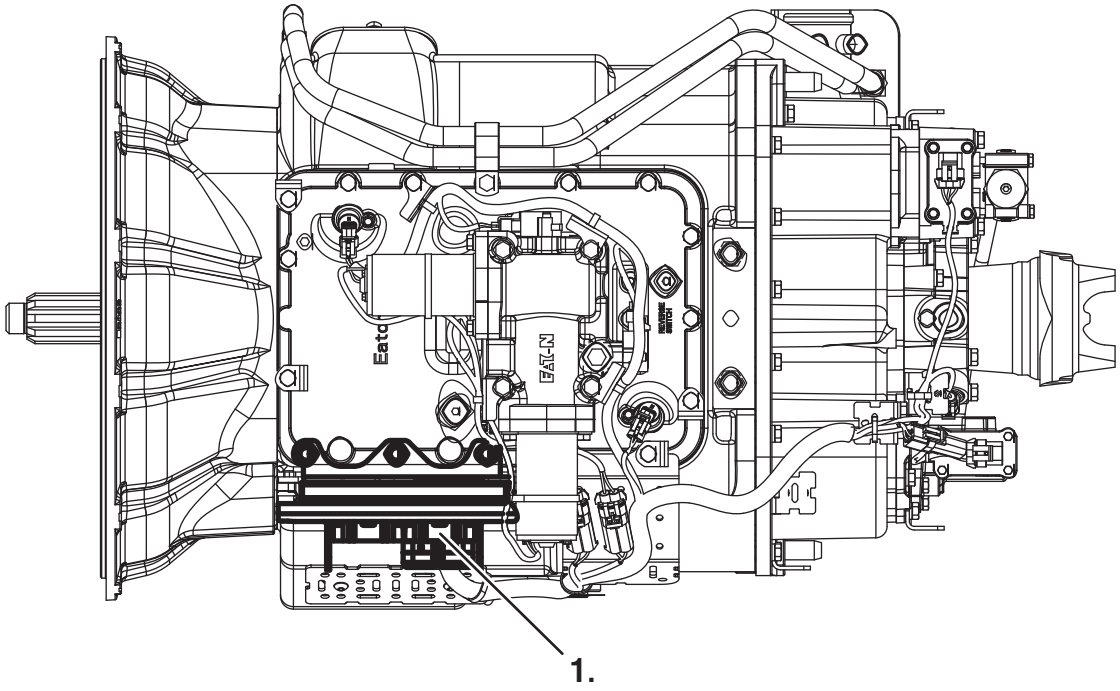
Possible Causes
This fault code can be caused by the following:

- TECU

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Component Identification



1. TECU

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Fault Code 11 - No TECU Operation

A

Purpose: *Check for active or Inactive fault codes*

1. Key on.
2. Retrieve codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 11 is Active, replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**
   - If Fault Code 11 is Inactive, test complete.

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Fault Code 12 - Improper ECU Configuration

J1939: SA 3 SPN 629 FMI 13,14

Overview

This fault code indicates the Transmission Electronic Control Unit (TECU) is not reading valid information from memory, including the transmission table and calibration values.

Detection

The TECU checks the configuration every time the key is turned on. If the transmission is not able to detect the proper configuration, it sets this fault code.

Fallback

This fault causes a power up no crank.

Possible Causes

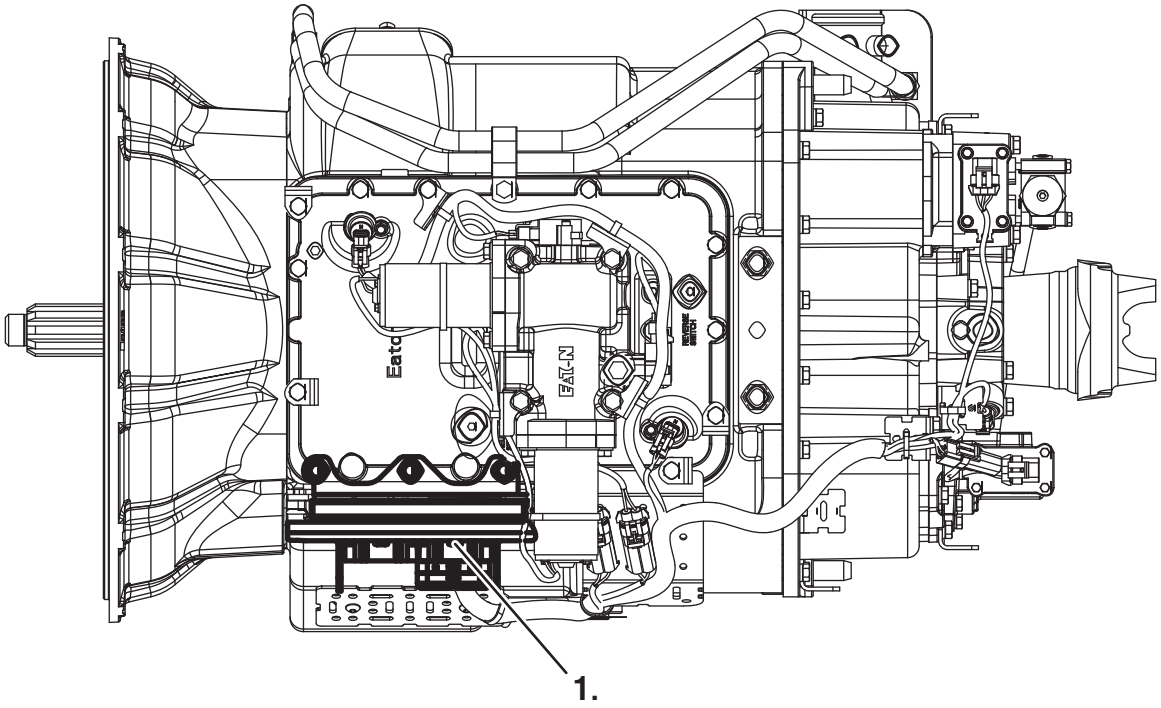
This fault code can be caused by the following:

- Improper TECU configuration software

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Component Identification



1. TECU

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Fault Code 12 - Improper ECU Configuration

A

Purpose: *Check for active or Inactive fault codes.*

1. Key on.
2. Retrieve codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 12 is Active, Customer - Call Eaton at 1-800-826-HELP (4357). CSC - Call Technician Service.
   - If Fault Code 12 is Inactive, test complete.

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Fault Code 13 - J1939 Shift Control Device

J1587: MID130 PID 231 FMI 8, 11
J1939: SA 3 SPN751 FMI 8, 11

Overview

This fault indicates communication has been lost, or does not correspond with the neutral request input from the J1939 Shift Device.

When troubleshooting an Inactive code, See “Product Diagnostic (PD) Mode” on page 11.

Detection

Starting at key on and throughout operation, the Transmission Electronic Control Unit (TECU) constantly monitors communication with the J1939 Shift Device. If a neutral request from the J1939 Shift Device does not match the neutral signal or is not received from the J1939 Shift Device, Fault Code 13 is set.

Fallback

This fault causes a downshift-only fallback. Once the transmission re-engages the start gear, there will be no upshifts as long as the code is active.

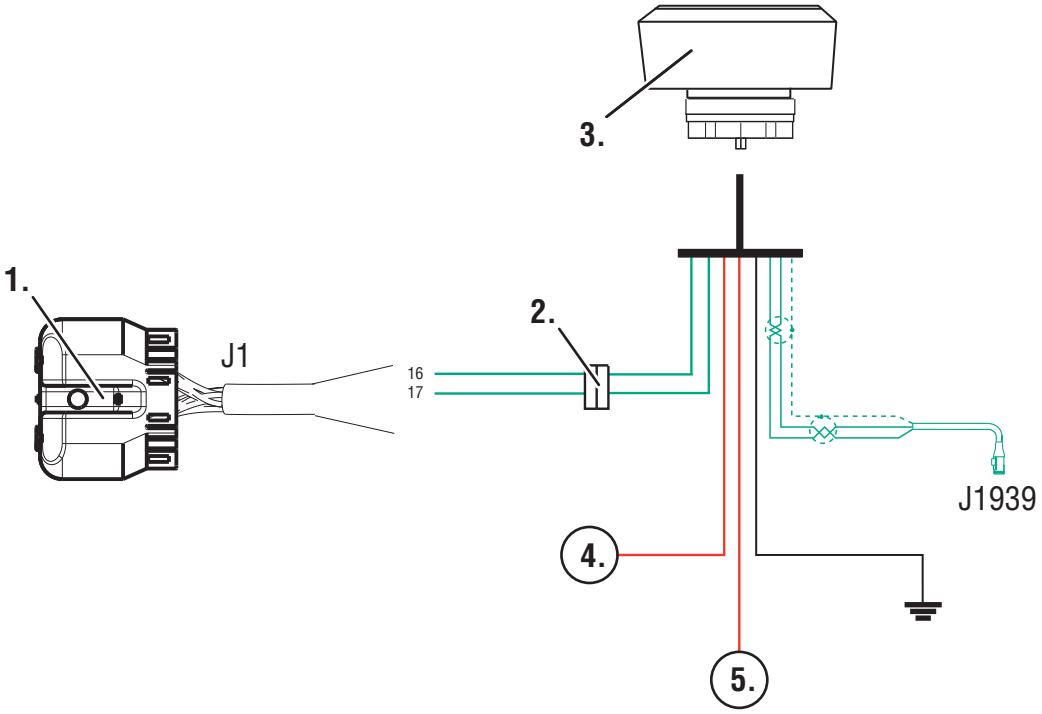
Possible Causes

This fault code can be caused by the following:

- OEM J1939 Shift Control Device
- Vehicle Harness

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Component Identification



1. TECU Connector (vehicle interface)
2. Bulkhead connector located at firewall
3. OEM J1939 Shift Device
4. Battery Power (Non-switches power run to battery or starter)
5. Switched Power

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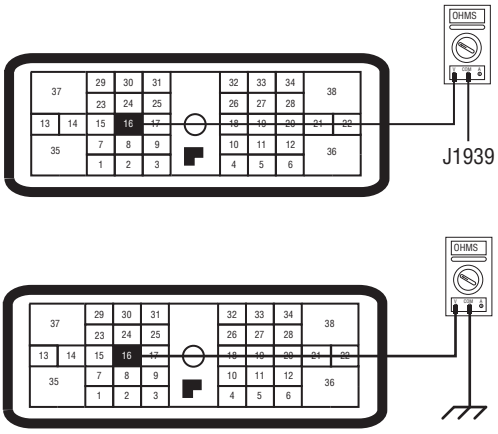
https://truckmanualshub.com/

Fault Code 13 - J1939 Shift Control Device

A

Purpose: *Verify continuity of Neutral Request Signal wire*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect Vehicle Harness 38-way connector.
4. Measure resistance between 38-way connector Pin 16 and corresponding OEM pin at J1939 Shift Device and Pin 16 and ground (see OEM wiring for correct pin location)



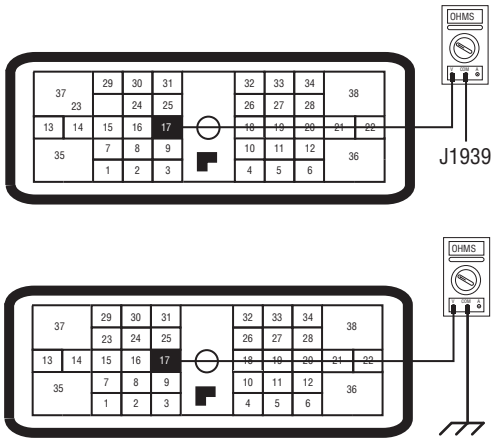
- If resistance is 0 to 0.3 ohms between Pin 16 and the corresponding OEM pin and resistance to ground is 10K ohms or greater, go to **Step B.**
- If resistance is out of range, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**

B

Purpose: *Verify continuity of Neutral Request Return wire*

1. Measure resistance between 38-way connector Pin 17 and corresponding OEM pin at J1939 Shift Device and Pin 17 and ground (see OEM wiring for correct pin location).



- If resistance is 0 to 0.3 ohms between Pin 17 and the corresponding OEM pin and resistance to ground is 10K ohms or greater, problem exists with the J1939 Shift Device, or J1939 Shift Device power, ground or data link wiring. Contact your OEM for repair strategy. Go to **Step V.**
- If resistance is out of range, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and attempt to reset the code.
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 13 appears go to **Step A.** to find error in testing.
   - If fault code other than 13 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 14 - Invalid Shift Lever Voltage (without Park Pawl)

J1587: MID 130 SID 18, 19 FMI 2, 3, 4, 5
J1939: SA 3 SPN 751 FMI 2, 3, 4, 5

Overview

This fault code indicates an electrical failure of the Eaton Cobra Lever or OEM Shift Lever.

When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

Starting at key on and throughout operation the Transmission Electronic Control Unit (TECU) constantly monitors the signal from the Park Pawl Position Sensor. The transmission monitors both sensor signals, if one signal to the TECU is out of range the code will set.

Fallback

This fault may cause a downshift only fallback mode. The transmission will re-engage the start gear when returned to a stop, but will not upshift as long as the code is active.

Possible Causes

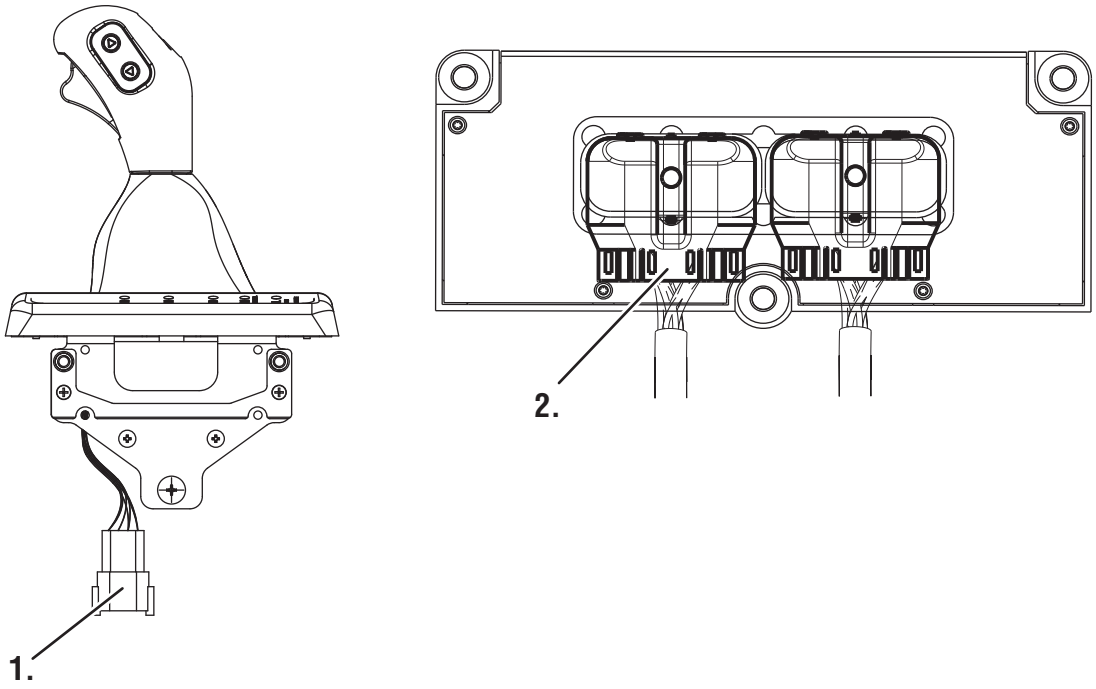
This fault code can be caused by any of the following:

- Eaton Cobra Lever or OEM Shift Lever
- Vehicle Harness
- TECU

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Component Identification



1. Eaton Cobra Lever 8-way connector
2. TECU 38-way connector

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Fault Code 14 - Invalid Shift Lever Voltage (without Park Pawl)

A

Purpose: *Visually identify the lever type: Eaton or OEM manufactured.*

1. Is vehicle equipped with an Eaton supplied Shift Lever or an OEM supplied Shift Lever?
   - If Eaton Cobra Lever, go to **Step B.**
   - If OEM Shift Lever, contact OEM for trouble-shooting procedures.

B

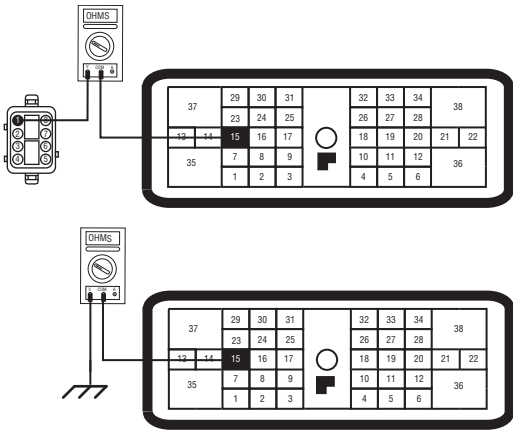
Purpose: *Install the Shift Lever tester and monitor Transmission Range in ServiceRanger. Utilize the Shift Lever Tester to verify transmission-lever interface.*

1. Key off.
2. Disconnect Shift Lever 8-way connector.
3. Connect Shift Lever tester to the 8-way Shift Lever harness.
4. Connect ServiceRanger, a PC-based Service Tool, to diagnostic port.
5. Key on.
6. Select Monitor Data.
7. Observe transmission range selected.
   - If transmission range selected equals neutral, replace **Cobra Lever** (only if fault code is Active). Go to **Step V.**
   - If transmission range selected does not equal neutral, go to **Step C.**

C

Purpose: *Verify continuity of auto mode input wire.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect TECU 38-way connector.
4. Remove tester from Shift Lever 8-way connector.
5. Measure resistance between:
   - ECU 38-way Pin 15 and Shift Lever 8-way connector Pin 1
   - ECU 38-way connector Pin 15 and ground



- If resistance between Pin 15 and Pin 1 is 0 to 0.3 ohms and resistance between Pin 15 and ground is 10K ohm or greater, go to **Step D.**
- If any of the above conditions are not met, repair the OEM Vehicle Harness between the TECU and the Eaton Cobra Lever.

  Go to **Step V.**

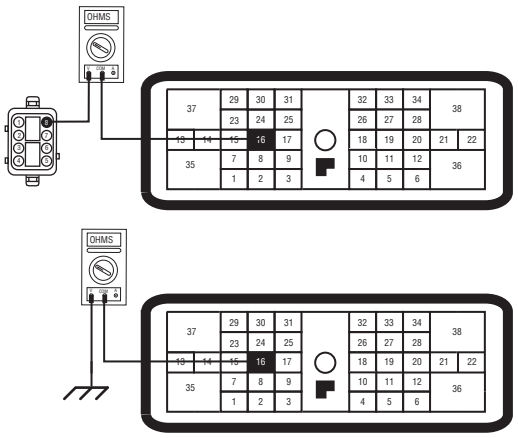
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D

Purpose: *Verify continuity of manual mode input wire.*

1. Key off.
2. Measure resistance between:
   - TECU 38-way Pin 16 and Shift Lever 8-way connector Pin 8
   - TECU 38-way connector Pin 16 and ground

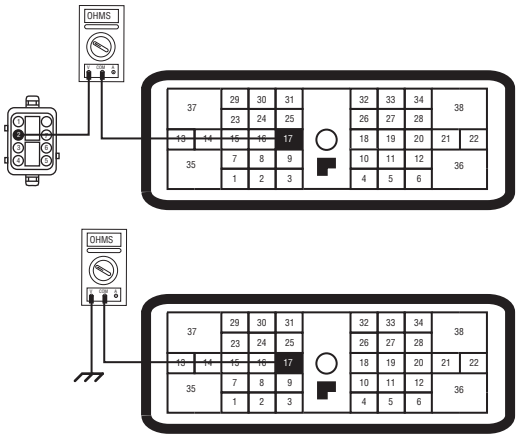


- If resistance between Pin 16 and Pin 8 is 0 to 0.3 ohms and resistance between Pin 16 and ground is 10K ohm or greater, go to **Step E.**
- If any of the above conditions are not met, repair the Vehicle Harness between the Eaton Cobra Lever and TECU. Go to **Step V.**

E

Purpose: *Verify continuity of common ground wire.*

1. Key off.
2. Measure resistance between:
   - TECU 38-way Pin 17 and Shift Lever 8-way connector Pin 2
   - TECU 38-way connector Pin 17 and ground



- If resistance between Pin 17 and Pin 2 is 0 to 0.3 ohms and resistance between Pin 17 and ground is 10K ohm or greater, go to **Step F.**
- If any of the above conditions are not met, repair the Vehicle Harness between the Eaton Cobra Lever and TECU. Go to **Step V.**

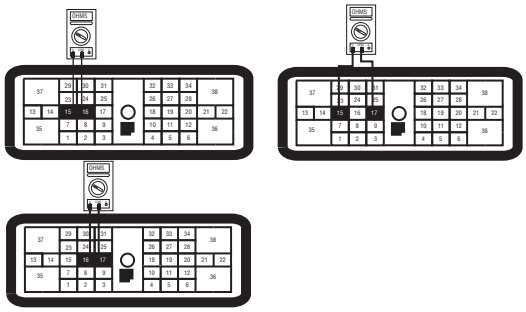
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F

Purpose: *Check for short circuits in the shift lever wiring.*

1. Key off.
2. Measure resistance between:
   - Pin 15 and Pin 16 on the TECU 38-way connector.
   - Pin 15 and Pin 17 on the TECU 38-way connector.
   - Pin 16 and Pin 17 on the TECU 38-way connector.



- If resistance on all three is 10K ohm or greater, replace Shift Lever and go to **Step V.**
- If any of the three readings is less than 10K ohm, repair the Vehicle Harness between the Eaton Cobra Lever and TECU. Go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear codes, See “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and attempt to reset the code.
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If code 14 appears, go to **Step A.** to find error in testing.
   - If code other than 14 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 14 - Invalid Shift Lever Voltage (with Park Pawl)

J1587: MID 130 SID 18, 19 FMI 2, 3, 4, 5
J1939: SA 3 SPN FMI 2, 3, 4, 5

Overview

This fault code indicates a possible failure of the Park Pawl Position Sensor or OEM circuit. The sensor is a 4 wire dual hall effect device. When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

Starting at key on and throughout operation the Transmission Electronic Control Unit (TECU) constantly monitors the signal from the Park Pawl Position Sensor. The transmission monitors both sensor signals, if one signal to the TECU is out of range the code will set.

Fallback

This fault code will cause the transmission to be stuck in the last known selected position. If the code comes active while in gear, the transmission will a down shift only fallback mode. The transmission will re-engage the start gear when returned to a stop, but will not upshift as long as the code is Active.

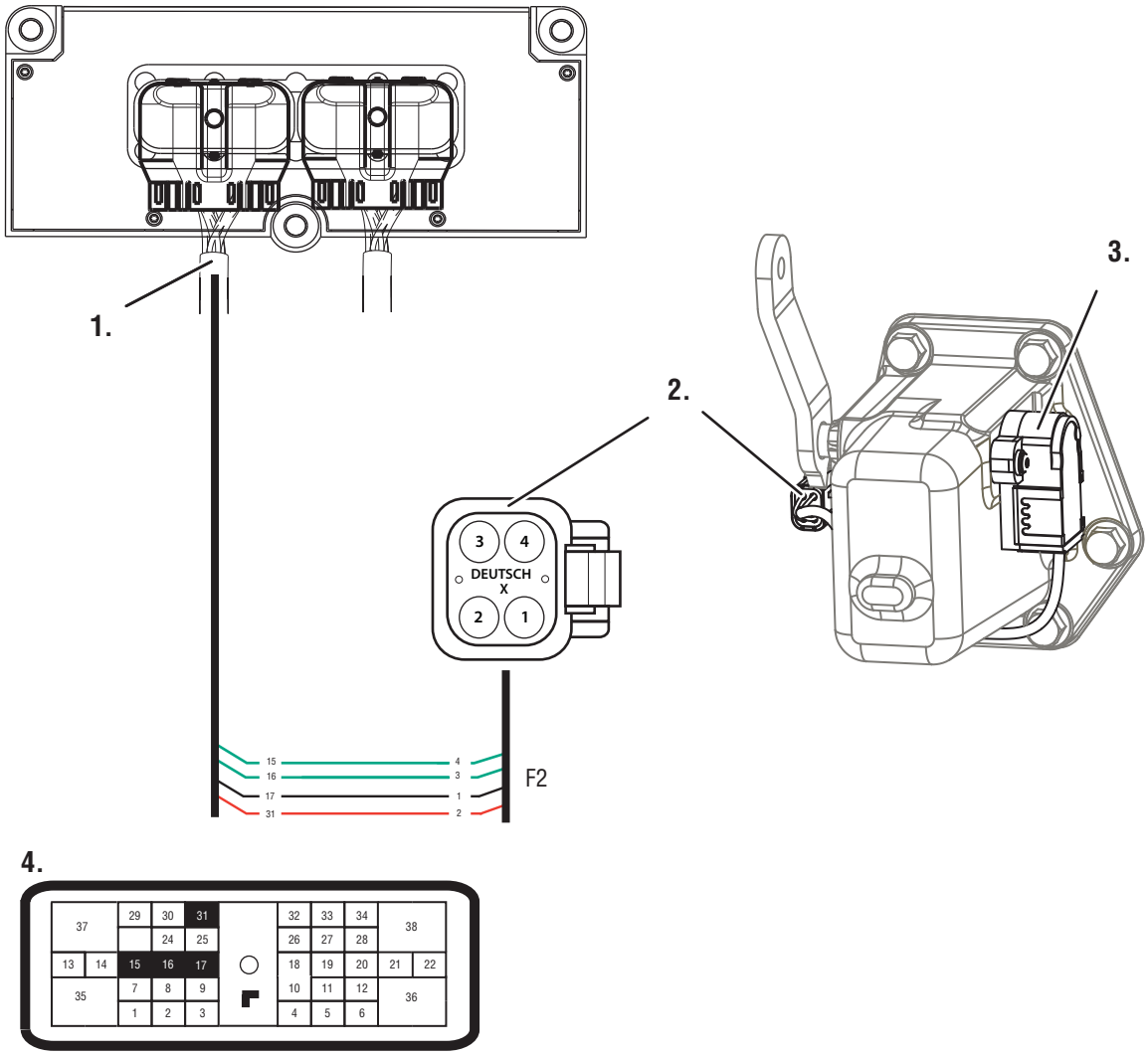
Possible Causes

This fault code can be caused by any of the following:

- Vehicle Harness
- Park Pawl Position Sensor
- TECU

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Component Identification



4.

1. Vehicle Harness 38-way Connector
2. 4-Pin Park Pawl Position Sensor Connector (DTM06-4S)
3. Park Pawl Position Sensor
4. TECU Connector Front View (Vehicle Interface)

4-Way Pin#	38-Way PIN#	Type
1	17	Ground
2	31	5 Volt Reference
3	16	Signal 1
4	15	Signal 2

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Fault Code 14 - Invalid Shift Lever Voltage (will show “F” in display)

A

Purpose: *Check for active or Inactive fault codes, noting FMI.*

1. Key on.
2. Retrieve active fault codes and FMIs with ServiceRanger using the 9-way diagnostic connector.
   - If Fault Code 14 FMI 2 is active, go to **Step B.**
   - If Fault Code 14 FMI 3, 4 or 5 is active, go to **Step D.**
   - If Fault Code 14 is Inactive, See “Product Diagnostic (PD) Mode” on page 11.

B

Purpose: *Perform Shift Cable Adjustment procedure.*

1. Key off.
2. Perform shift cable adjustment procedure per OEM guidelines.
3. Key on.
4. Retrieve active fault codes and FMIs with ServiceRanger using the 9-way diagnostic connector.
   - If Fault Code 14 FMI 2 is Inactive, go to **Step V.**
   - If Fault Code 14 FMI 2 is Active, go to **Step C.**

C

Purpose: *Perform Park Pawl Position Sensor calibration.*

1. Perform Park Pawl Position Sensor calibration
2. Key on.
3. Retrieve active fault codes and FMIs with ServiceRanger using the 9-way diagnostic connector.
   - If Fault Code 14 FMI 2 is Inactive, go to **Step V.**
   - If Fault Code 14 FMI 2 is Active, replace **Park Pawl Position Sensor**. go to **Step V.**

D

Purpose: *Measure voltage at the Park Pawl Position Sensor.*

1. Key off.
2. Disconnect the Park Pawl Position Sensor 4-way connector.
3. Key on.
4. At the Park Pawl Position Sensor 4-way connector, measure voltage between Pin 1 and Pin 2.
   - If 4.5 to 5.5 volts, go to **Step E.**
   - If less than 4.5 volts, go to **Step G.**
   - If greater than 5.5 volts, Repair the Vehicle Harness for short to power per OEM guidelines. Go to **Step V.**

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E ***Purpose:*** *Verify continuity of Park Pawl Sensor signal wire.*

1. Key off.
2. Disconnect Park Pawl Position Sensor 4-way connector.
3. Disconnect TECU 38-way Transmission Harness connector.
4. Measure resistance between Pin 15 and Pin 4.
5. Measure resistance between Pin 15 and Ground.
   - If resistance is 0.0 to 0.3 ohms between Pin 15 and Pin 4 and OL (open circuit) between Pin15 and Ground, go to **Step F.**
   - If resistance is greater than 0.3 ohms or OL (open circuit) between Pin 15 and Pin 4 or indicates resistance (short to ground) between Pin 15 and Ground, repair Vehicle Harness for excessive resistance, open or short to ground per OEM guidelines. Go to **Step V.**

F ***Purpose:*** *Verify continuity of Park Pawl Sensor signal wire.*

1. Key off.
2. Disconnect Park Pawl Position Sensor 4-way connector.
3. Disconnect TECU 38-way Transmission Harness connector.
4. Measure resistance between Pin 16 and Pin 3.
5. Measure resistance between Pin 16 and Ground.
   - If resistance is 0.0 to 0.3 ohms between Pin 16 and Pin 3 and OL (open circuit) between Pin 16 and Ground, replace the **Park Pawl Position Sensor**. Go to **Step V.**
   - If resistance is greater than 0.3 ohms or OL (open circuit) between Pin 16 and Pin 3 or indicates resistance (short to ground) between Pin 16 and Ground, repair the Vehicle Harness for excessive resistance, open or short to ground per OEM guidelines. Go to **Step V.**

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G

Purpose: *Verify continuity of Park Pawl Sensor ground wire.*

1. Key off.
2. Disconnect Park Pawl Position Sensor 4-way connector.
3. Disconnect TECU 38-way Transmission Harness connector.
4. Measure resistance between Pin 17 and Pin 1.
5. Measure resistance between Pin 17 and Ground.
   - If resistance is 0.0 to 0.3 ohms between Pin 17 and Pin 1 and OL (open circuit) between Pin 17 and Ground, go to **Step H.**
   - If resistance is greater than 0.3 ohms or OL (open circuit) between Pin 17 and Pin 1, or indicates resistance (short to ground) between Pin 17 and Ground, repair the Vehicle Harness for excessive resistance, open or short to ground per OEM guidelines. Go to **Step V.**

H

Purpose: *Verify continuity of Park Pawl Sensor voltage supply wire.*

1. Key off.
2. Disconnect Park Pawl Position Sensor 4-way connector.
3. Disconnect TECU 38-way Transmission Harness connector.
4. Measure resistance between Pin 31 and Pin 2.
5. Measure resistance between Pin 31 and Ground.
   - If resistance is 0.0 to 0.3 ohms between Pin 31 and Pin 2 and OL (open circuit) between Pin 31 and Ground, (if fault code active) replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     go to **Step V.**
   - If resistance is greater than 0.3 ohms or OL (open circuit) between Pin 31 and Pin 2, or indicates resistance (short to ground) between Pin 31 and Ground, repair the Vehicle Harness for excessive resistance, open or short to ground per OEM guidelines. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Key on.
4. Clear codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and attempt to reset code.
6. Check for codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete
   - If Fault Code 14 sets, go to **Step A.** to find error in testing.
   - If code other than Fault Code 14 sets, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 15 - HIL Shift Device Configuration

J1587: MID 130 SID 18 FMI 9
J1939: SA 3 SPN 751 FMI 9

Overview

Controller Area Network (CAN) is a high-speed twisted pair 500K proprietary data link with one 120 ohm resistor at each end of the link. The Transmission Electronic Control Unit (TECU) is connected to the CAN data link at the 38-way connector. This link is used to transmit information to the TECU as well as communicate or receive data from the other modules on the network like the HIL Shift Device. See “Product Diagnostic (PD) Mode” on page 11.

Detection

Fault Code 15 is set when the TECU fails to receive Shift Device data for 5 continuous seconds, and it is still communicating with other modules on CAN.

Fallback

This fault causes a downshift only fallback while moving. Once the transmission re-engages the start gear, there will be no upshifts as long as the code is active. If the code is active during power-up a flashing F will appear on the gear display and the TECU will not engage a gear.

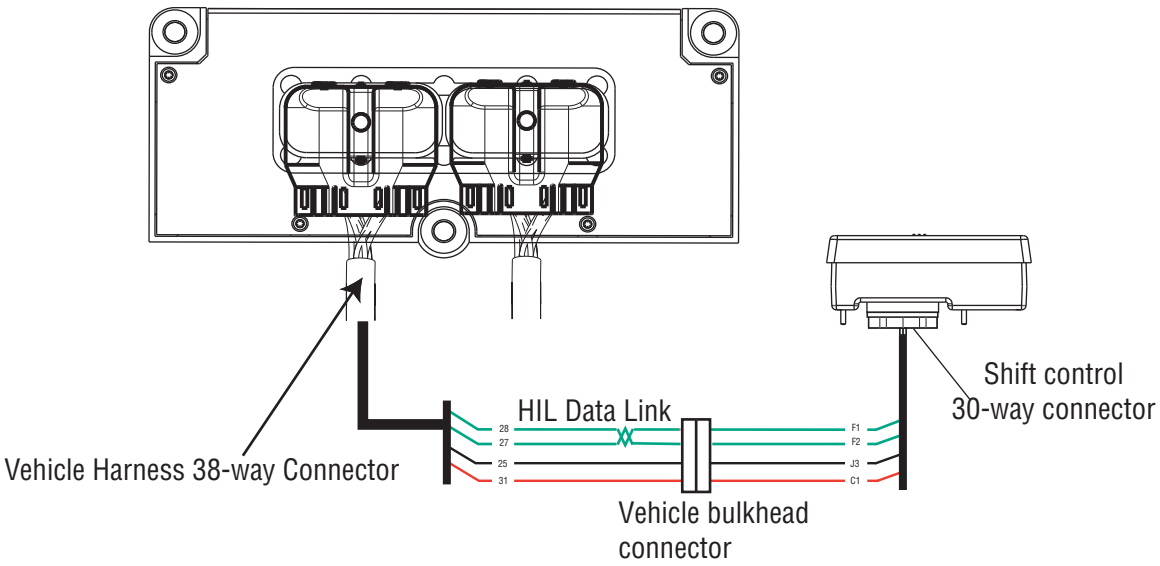
Possible Causes

This fault code can be caused by any of the following:

- CAN data link
- HIL Shift Device

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Component Identification



Shift Control ECU Legend
All OEM responsible wiring shown is "typical". Consult specific application.
(31) = +12 volt switched from TECU
(28, 27) = Communication from and to the TECU
(25) = Signal returns, grounds, and general OEM wiring

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Fault Code 15 - HIL Shift Device Configuration

A

Purpose: *Check for active and Inactive fault codes and perform electrical pretest.*

1. Key on.
2. Retrieve active fault codes and FMIs with ServiceRanger using the 9-way diagnostic connector.
3. Perform electrical pretest, see "Electrical Pretest" on page 12.
   - If no fault codes found during the electrical pretest and:
     - if equipped with a Push Button Shift Control, go to **Step B.**
     - if equipped with a Cobra Lever or an OEM shift device, configure the Driver Interface Type to the correct shift device type with ServiceRanger. Go to **Step V.**
   - If issue was repaired during electrical pretest, go to **Step V.**

B

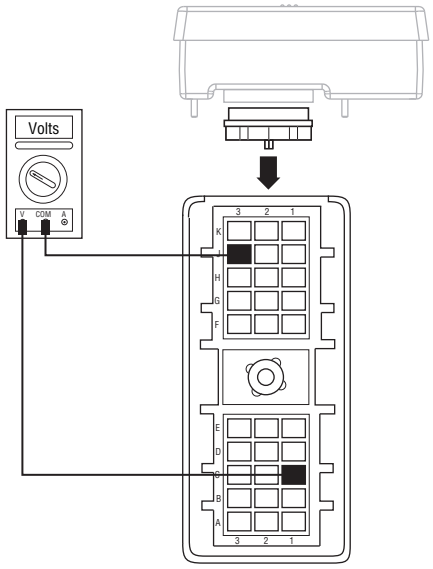
Purpose: *Visually inspect vehicle bulkhead connection (if equipped).*

1. Key off.
2. Inspect Bulkhead Connector for looseness, corrosion and contamination.
   - If Bulkhead Connector is found in serviceable condition, go to **Step C.**
   - If looseness, corrosion, or contamination is found at the Bulkhead Connector, repair or replace connector per OEM instructions. Go to **Step V.**

C

Purpose: *Measure voltage supply to Push Button Shift Controller (PBSC).*

1. Disconnect Shift Control 30-way connector.
2. Key on.
3. Measure voltage on 30-way connector Pin J3 and Pin C1



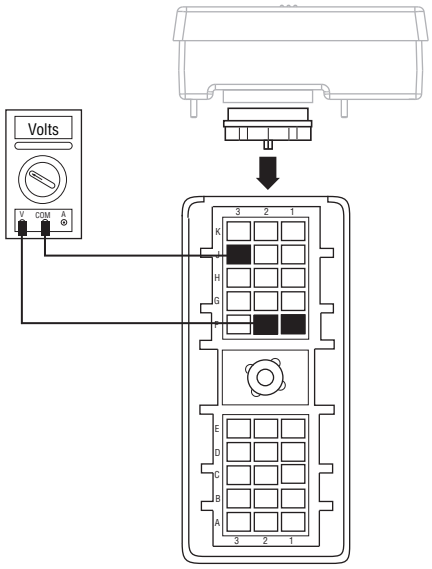
   - If voltage is within 1.2 volts of battery voltage, go to **Step D.**
   - If out of range, go to **Step F.**

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D

Purpose: *Measure signal voltages on HIL.*

1. Disconnect Shift Control 30-way connector.
2. Key on.
3. Measure voltage on the Shift Controller 30-way connector pins:
   - J3 and F1
   - J3 and F2

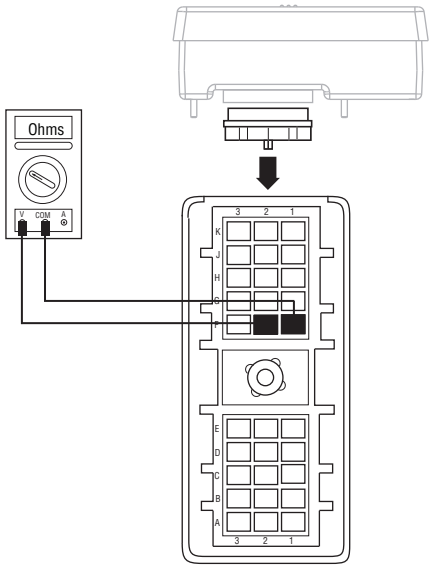


- If both readings are between 2-3 volts, go to **Step E.**
- If any of the above requirements are not met, go to **Step H.**

E

Purpose: *Confirm the presence of terminating resistors in the HIL.*

1. Key off.
2. Measure resistance between Pin F1 and Pin F2 on the Shift Controller 30-way connector.



Note: Ensure key is off for a minimum of 2 minutes before proceeding. If unsure, disconnect battery power or remove the 30-amp inline fuse.

- If resistance between Pin F1 and Pin F2 is 110-130 ohms, replace **Push Button Shift Control** (only if fault code is Active). Go to **Step V.**
- If any of the above requirements are not met, go to **Step H.**

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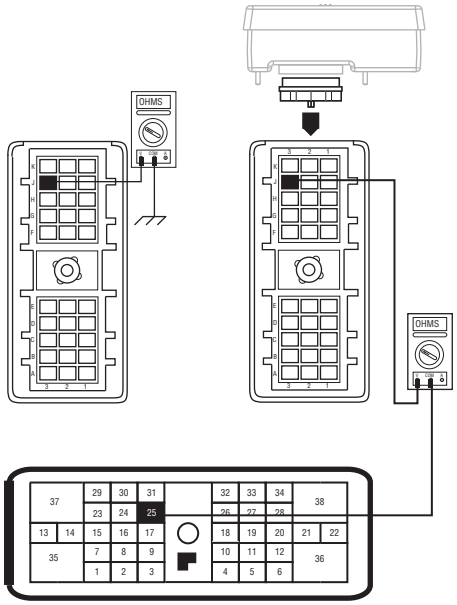
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F

Purpose: *Verify continuity of ground supply to PBSC and test for short to ground.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect Vehicle Harness 38-way connector.

   Note: On Peterbilt, disconnect Gear Display.
4. Measure resistance between:



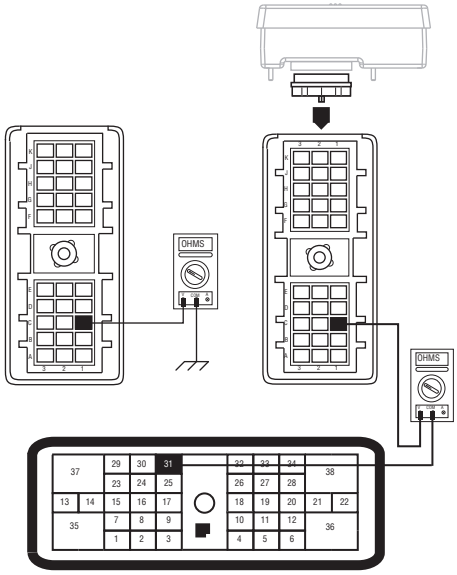
- Shift Control 30-way connector Pin J3 and Vehicle Harness 38-way connector Pin 25
- Shift Control 30-way connector Pin J3 and ground.

  - If resistance between Pin J3 and Pin 25 is 0 to 0.3 ohms and if resistance between Pin J3 and ground is OL, go to **Step G.**
  - If any of the above conditions are not met, repair the Vehicle Harness between the Shift Control and TECU. Go to **Step V.**

G

Purpose: *Verify continuity of power supply to PBSC and test for short to ground.*

1. Key off.
2. Measure resistance between:
   - Shift Control 30-way connector Pin C1 and Vehicle Harness 38-way connector Pin 31.
   - Shift Control 30-way connector Pin C1 and ground.



- If resistance between Pin C1 and Pin 31 is 0 to 0.3 ohms and resistance between Pin C1 and ground is OL, go to **Step H.**
- If any of the above conditions are not met, repair the Vehicle Harness between the Shift Control and TECU. Go to **Step V.**

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H

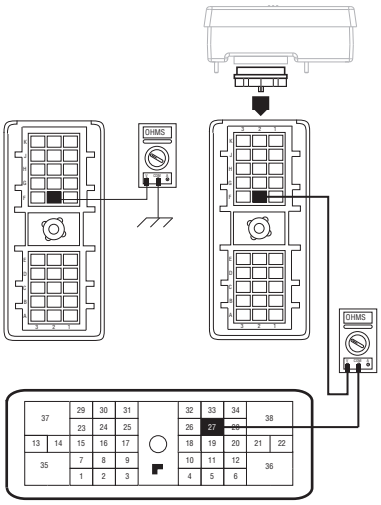
Purpose: *Verify continuity of HIL(+) connection to the PBSC.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect Vehicle Harness 38-way connector.
4. Measure resistance between:
   - Shift Control 30-way connector Pin F1 and Vehicle Harness 38-way connector Pin 28.
   - Shift Control 30-way connector Pin F1 and ground.
     - If resistance between Pin F1 and Pin 28 is 0 to 0.3 ohms and if resistance between Pin F1 and ground is OL, go to **Step I.**
     - If any of the above conditions are not met, repair the Vehicle Harness between the Shift Control and TECU. Go to **Step V.**

I

Purpose: *Verify continuity of HIL (-) connection to the PBSC.*

1. Key off.
2. Measure resistance between:
   - Shift Control 30-way connector Pin F2 and Vehicle Harness 38-way connector Pin 27
   - Shift Control 30-way connector Pin F2 and ground



- If resistance between Pin F2 and Pin 27 is 0 to 0.3 ohms and resistance between Pin F2 and ground is OL.

  If fault code is Active replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

  Go to **Step V.**
- If any of the above conditions are not met, repair the Vehicle Harness between the Shift Control and TECU. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Key on.
3. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
4. Reconnect all connectors and the negative battery cable.
5. Driving Vehicle and attempt to reset the code.
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no Fault Codes, test complete.
   - If Fault Code 15 appears, go to **Step A.** to find error in testing.
   - If fault code other than 15 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 16 - High Integrity Link (HIL)

J1587: MID 130 SID 248 FMI 2
J1939: SA 3 SPN 625 FMI 2

Overview

This fault code indicates the Transmission Electronic Control Unit (TECU) is unable to communicate with the Push Button Shift Control.

Detection

Starting at key-on and throughout operation, the TECU constantly monitors the communication with the Push Button Shift Control. If a communication fault occurs for more than 5 seconds, Fault Code 16 is set.

Fallback

This fault causes a downshift only fallback while moving. Once the transmission re-engages the start gear, there will be no upshifts as long as the code is active. If the code is active during power-up a flashing F will appear on the gear display and the TECU will not engage a gear.

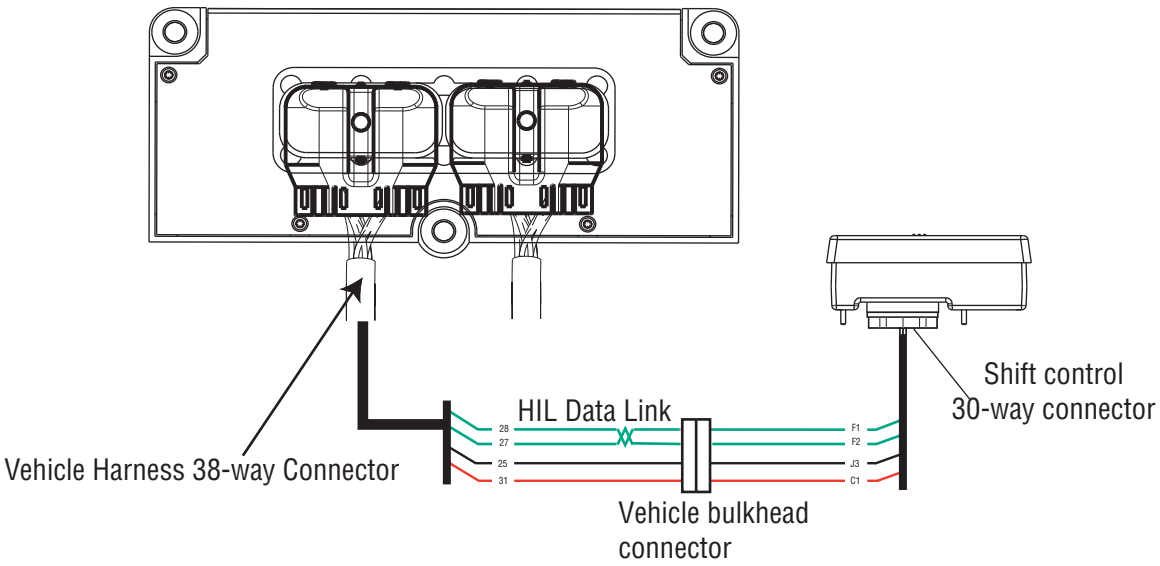
Possible Causes

This fault code can be caused by any of the following:

- Vehicle Harness
- TECU
- Push Button Shift Control
- Charging system
- Low batteries
- Corroded or loose power supply to TECU

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Component Identification



Shift Control ECU Legend
All OEM responsible wiring shown is "typical". Consult specific application.
(31) = +12 volt switched from TECU
(28, 27) = Communication from and to the TECU
(25) = Signal returns, grounds, and general OEM wiring

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Fault Code 16 - High Integrity Link (HIL)

A

Purpose: *Check for active and Inactive fault codes and perform electrical pretest.*

1. Key on.
2. Retrieve active fault codes and FMIs with ServiceRanger using the 9-way diagnostic connector.
3. Perform electrical pretest, see "Electrical Pretest" on page 12.
   - If no fault codes found during the electrical pretest and:
     - if equipped with a Push Button Shift Control, go to **Step B.**
     - if equipped with a Cobra Lever or an OEM shift device, configure the Driver Interface Type to the correct shift device type with ServiceRanger. Go to **Step V.**
   - If issue was repaired during electrical pretest, go to **Step V.**

B

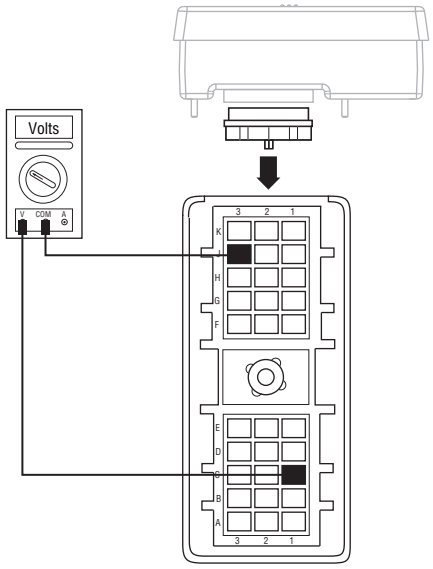
Purpose: *Visually inspect vehicle bulkhead connection (if equipped).*

1. Key off.
2. Inspect Bulkhead Connector for looseness, corrosion and contamination.
   - If Bulkhead Connector is found in serviceable condition, go to **Step C.**
   - If looseness, corrosion, or contamination is found at the Bulkhead Connector, repair or replace connector per OEM instructions. Go to **Step V.**

C

Purpose: *Measure voltage supply to Push Button Shift Controller (PBSC).*

1. Disconnect Shift Control 30-way connector.
2. Key on.
3. Measure voltage on 30-way connector Pin J3 and Pin C1



   - If voltage is within 1.2 volts of battery voltage, go to **Step D.**
   - If out of range, go to **Step F.**

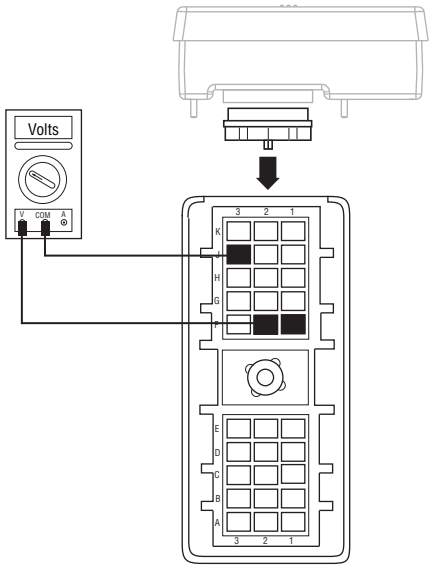
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D

Purpose: *Measure signal voltages on HIL.*

1. Disconnect Shift Control 30-way connector.
2. Key on.
3. Measure voltage on the Shift Controller 30-way connector pins:
   - J3 and F1
   - J3 and F2

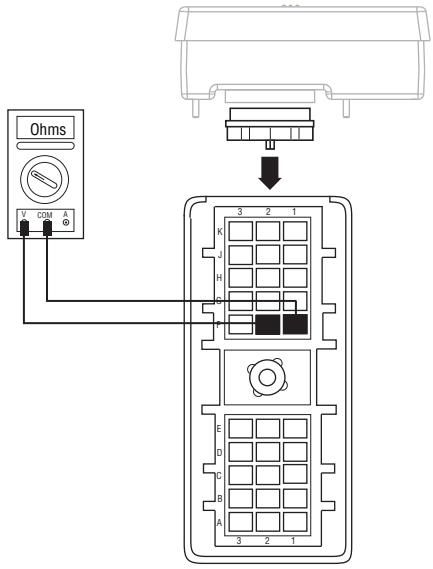


- If both readings are between 2-3 volts, go to **Step E.**
- If any of the above requirements are not met, go to **Step H.**

E

Purpose: *Confirm the presence of terminating resistors in the HIL.*

1. Key off.
2. Measure resistance between Pin F1 and Pin F2 on the Shift Controller 30-way connector.



Note: Ensure key is off for a minimum of 2 minutes before proceeding. If unsure, disconnect battery power or remove the 30-amp inline fuse.

- If resistance between Pin F1 and Pin F2 is 110-130 ohms, replace **Push Button Shift Control** (only if fault code is Active). Go to **Step V.**
- If any of the above requirements are not met, go to **Step H.**

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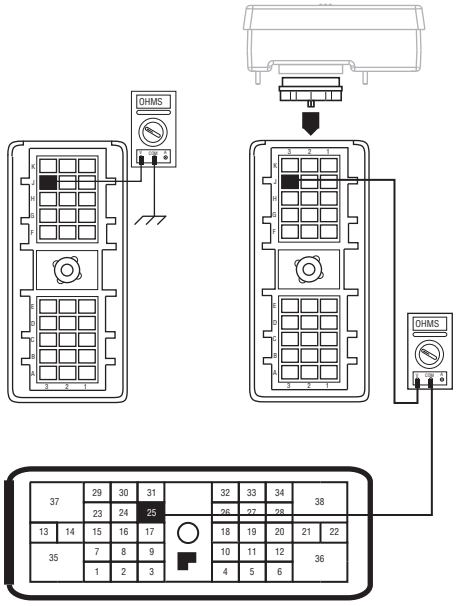
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F

Purpose: *Verify continuity of ground supply to PBSC and test for short to ground.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect Vehicle Harness 38-way connector.

   Note: On Peterbilt, disconnect Gear Display.
4. Measure resistance between:
   - Shift Control 30-way connector Pin J3 and Vehicle Harness 38-way connector Pin 25.
   - Shift Control Shift Control 30-way connector Pin J3 and ground.

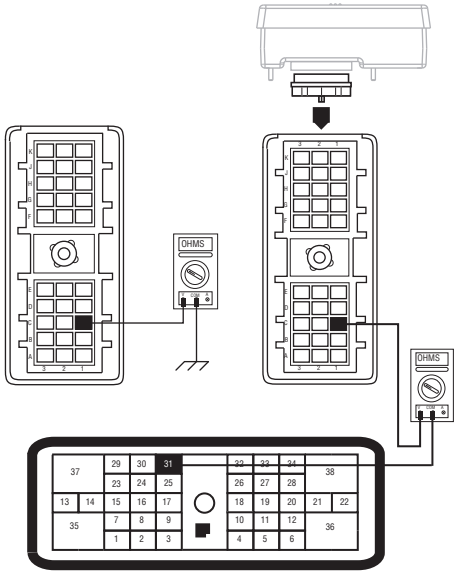


- If resistance between Pin J3 and Pin 25 is 0 to 0.3 ohms and if resistance between Pin J3 and ground is OL, go to **Step G.**
- If any of the above conditions are not met, repair the Vehicle Harness between the Shift Control and TECU. Go to **Step V.**

G

Purpose: *Verify continuity of power supply to PBSC and test for short to ground.*

1. Key off.
2. Measure resistance between:
   - Shift Control 30-way connector Pin C1 and Vehicle Harness 38-way connector Pin 31.
   - Shift Control 30-way connector Pin C1 and ground.



- If resistance between Pin C1 and Pin 31 is 0 to 0.3 ohms and resistance between Pin C1 and ground is OL, go to **Step H.**
- If any of the above conditions are not met, repair the Vehicle Harness between the Shift Control and TECU. Go to **Step V.**

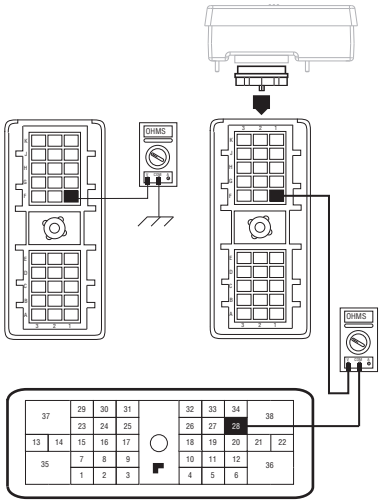
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H

Purpose: *Verify continuity of HIL(+) connection to the PBSC.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect Vehicle Harness 38-way connector.
4. Measure resistance between:
   - Shift Control 30-way connector Pin F1 and Vehicle Harness 38-way connector Pin 28.
   - Shift Control 30-way connector Pin F1 and ground.

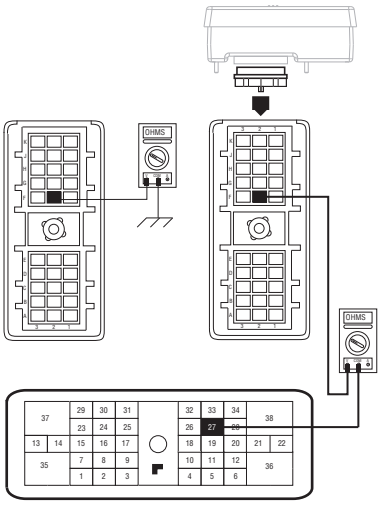


- If resistance between Pin F1 and Pin 28 is 0 to 0.3 ohms and if resistance between Pin F1 and ground is OL, go to **Step I.**
- If any of the above conditions are not met, repair the Vehicle Harness between the Shift Control and TECU. Go to **Step V.**

I

Purpose: *Verify continuity of HIL (-) connection to the PBSC.*

1. Key off.
2. Measure resistance between:
   - Shift Control 30-way connector Pin F2 and Vehicle Harness 38-way connector Pin 27
   - Shift Control 30-way connector Pin F2 and ground



- If resistance between Pin F2 and Pin 27 is 0 to 0.3 ohms and resistance between Pin F2 and ground is OL.

  If fault code is Active replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

  Go to **Step V.**
- If any of the above conditions are not met, repair the Vehicle Harness between the Shift Control and TECU. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and negative battery cable.
3. Key on.
4. Clear codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the code.
6. Check for codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 16 appears, go to **Step A.** to find error in testing.
   - If code other than 16 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 17 - Start Enable Relay (SER) Circuit

J1587: MID 130 SID 237 FMI 3, 4
J1939: SA 3 SPN 629 FMI 3, 4

Overview

This fault code indicates an electrical failure of the relay that allows the engine to start after startup conditions are met.

When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

Starting at key-on and throughout operation, the Transmission Electronic Control Unit (TECU) constantly measures the circuit. A failure mode of short to battery, short to ground or open circuit is detected.

Fallback

The start enable relay has no fallback; however, if the failure occurred before the engine was started, it is possible the engine will not start.

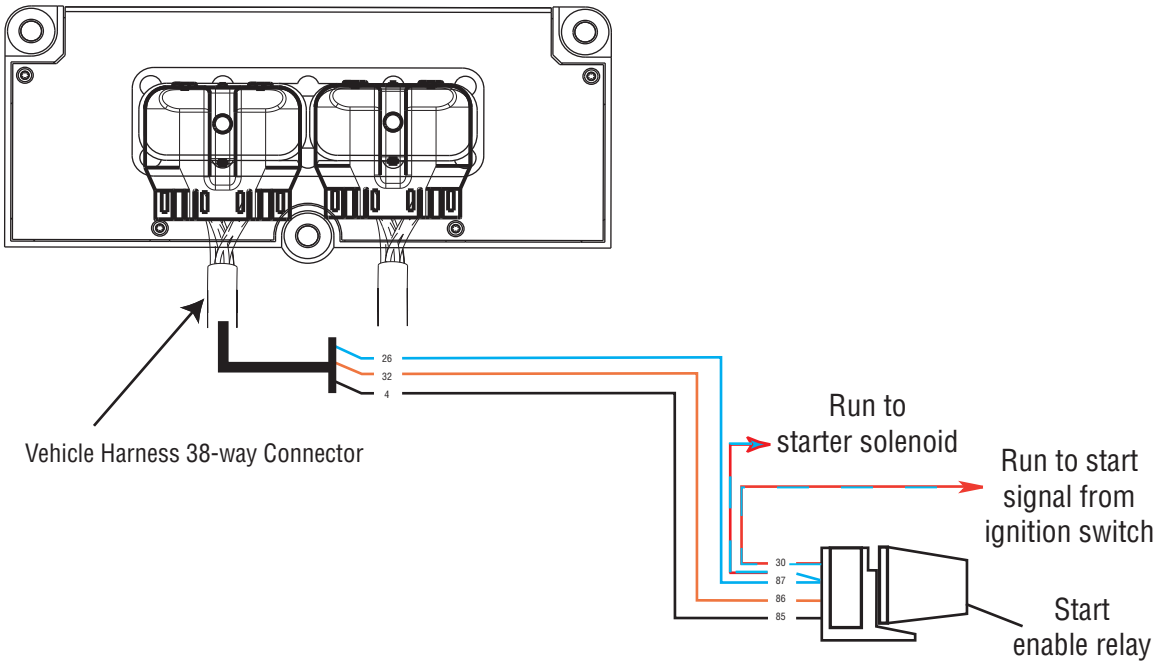
Possible Causes

This fault code can be caused by any of the following:

- Start Enable Relay
- Vehicle Harness
- TECU

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Component Identification



Trans ECU Legend

All OEM responsible wiring shown is "typical". Consult specific application.

(30, 87) = Switched ignition

(26-87) = Latch into the ECU

(4-85) = -12 volt relay source

(32-86) = +12 volt relay source

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Fault Code 17 - Start Enable Relay (SER) Circuit

A

Purpose: *Verify SER is correctly wired. Check for active or Inactive fault codes, noting FMI.*

1. Key on.

   Note: The SER must be wired according to Eaton GEN III requirements (shown on previous page) for tests to work properly. If wired differently, consult OEM for correct wiring schematic.

2. Retrieve active fault codes and FMIs with ServiceRanger using the 9-way diagnostic connector.
3. What FMIs are present?
   - If FMI 14 is present, go to **Step B.**
   - If FMI 3 or 4 are present, go to **Step C.**

B

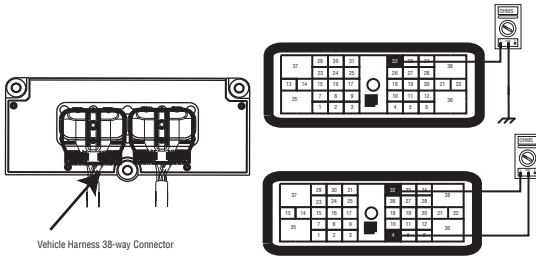
Purpose: *Visually inspect SER wiring.*

1. Inspect OEM SER breakout connector and inspect for misrouted or defective OEM wiring. Inspect per OEM guidelines.
   - If SER breakout connector is not connected to SER, repair/replace SER per OEM guidelines. Go to **Step V.**
   - If circuit has been bypassed, rewire per OEM guidelines. Go to **Step V.**
   - If harness is defective, repair the Vehicle Harness per OEM guidelines. Go to **Step V.**

C

Purpose: *Measure resistance of SER through the Transmission Harness.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect Vehicle Harness 38-way connector.
4. Measure resistance between Vehicle Harness 38-way connector Pin 32 and Pin 4 and measure resistance between Vehicle Harness 38-way connector Pin 32 and ground.



- If resistance between Pin 32 and Pin 4 is 40 to 120 ohms (12-volt system) or 140 to 480 ohms (24-volt system) and resistance between 32 and ground is OL, (if fault code is Active) replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

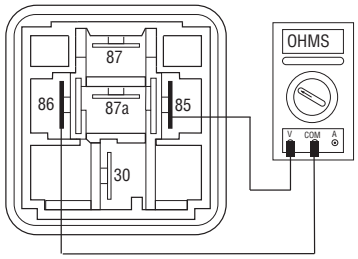
  Go to **Step V.**
- If resistance is outside of range, go to **Step B.**

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D

Purpose: *Measure resistance of SER at the relay.*

1. Remove SER from vehicle dash harness.
2. Measure resistance between SER Pin 85 and Pin 86.



- If resistance is 40 to 120 ohms (12-volt system) or 140 to 480 ohms (24-volt system), repair/replace OEM wiring from TECU to SER. Go to **Step C.**
- If resistance is outside of range, replace SER. Go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Reconnect all connectors and negative battery cable.
3. Key on.
4. Clear codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the code.
6. Check for codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 17 appears, go to **Step A.** to find error in testing.
   - If fault code other than 17 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 21 - Auto Neutral Park Brake Switch

J1587: MID 130 PID 254 FMI 14
J1939: SA 3 SPN 70 FMI 14

Overview

An auto neutral feature is provided with this transmission which forces the transmission into neutral in all instances when the parking brake is applied. The OEM installs a normally closed T pressure switch into the existing air line to the parking brake valve. The pressure switch output and return wires are connected to the vehicle interface transmission Electronic Control Unit (TECU) connector. Consult OEM for switch location.

This fault code indicates a failure of the switch that reports engagement of the park brake. When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

Fault Code 21 is set if the switch indicates the park brake is set while the truck is moving for more than 5 seconds, or if the switch state doesn't match the state broadcast on J1939, or if the switch is unstable for more than 5 seconds.

Fallback

Remote throttle is disabled, and auto neutral may not work.

Possible Causes

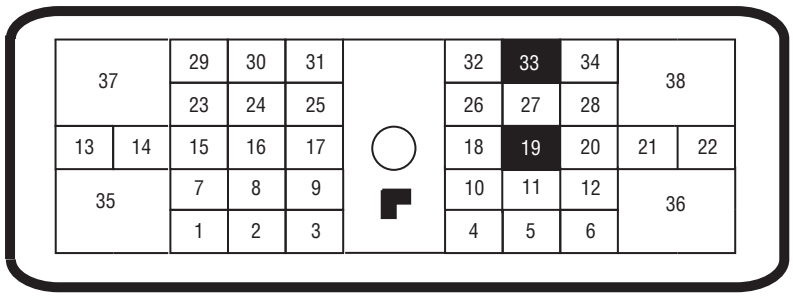
This fault code can be caused by any of the following:

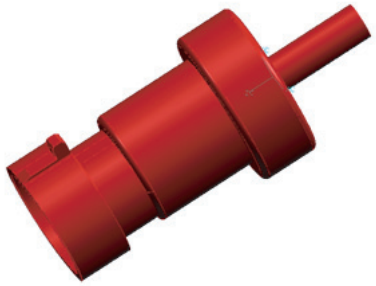
- Park brake switch
- Park brake wiring
- TECU
- Park brake hardware not installed
- J1939 reporting error

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Component Identification

Front View
Transmission ECU Connector
(Vehicle Interface)





Description	From	To
Pressure Switch Signal Wire	Pin 19	Signal Wire
Pressure Switch Return Wire	Pin 33	Return Wire

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Fault Code 21 - Auto Neutral Park Brake Switch

A

Purpose: *Check for active or Inactive fault codes and perform electrical pretest.*

1. Key on.
2. Retrieve active fault codes and FMIs with ServiceRanger using the 9-way diagnostic connector.
3. Perform electrical pretest, see "Electrical Pretest" on page 12.
   - If no issues found during electrical pretest and the fault is still active, go to **Step B.**
   - If issue was repaired during electrical pretest, go to **Step V.**

B

Purpose: *Monitor park Brake Switch in ServiceRanger.*

1. Ensure vehicle park brake is set and vehicle air system is fully charged.
2. Using the Data Monitoring function in ServiceRanger, note the status of the park brake.
   - Brake is applied, go to **Step C.**
   - Brake is released, go to **Step E.**
   - Brake is fluctuating between applied and released, go to **Step G.**

Note: If Fault Code 21 goes Inactive when park brake is released, a J1939 reporting error is highly probable. Seek OEM assistance before proceeding to Step C.

C

Purpose: *Remove Park Brake Switch and monitor Park Brake Switch status in ServiceRanger.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the switch.
4. Connect power and key on.
   - Status changes to released, repair or replace switch per OEM instructions. Go to **Step V.**
   - Status remains Applied, go to **Step D.**

D

Purpose: *Check for short circuits on Park Brake Switch Input wiring.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Vehicle Harness TECU 38-way connector.
4. Measure resistance between the Vehicle Harness 38-way connector Pin 19 and ground.
   - If resistance between Pin 19 and ground is less than 10K ohm, repair Vehicle Harness per OEM guidelines. Go to **Step V.**
   - If resistance between Pin 19 and ground is greater than 10K ohm or open, (if fault code is Active) replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**

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E ***Purpose:*** *Jump the Park Brake Switch and monitor Park Brake Switch status in ServiceRanger.*

1. Key off.
2. Disconnect negative battery cable.
3. Bypass the switch by placing a jumper at the switch connections.
4. Connect power and key on.
   - Status changed to Applied, repair or replace switch per OEM instructions. Go to **Step V.**

     Note: The requirement is for a "normally closed" switch. If the park brake status consistently reports contrary values, a "normally open switch" was possibly installed in error.
   - Status remains Released, go to **Step F.**

F ***Purpose:*** *Verify continuity of Park Brake switch status in ServiceRanger.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Vehicle Harness TECU 38-way connector.
4. Measure resistance between the Vehicle Harness 38-way connector Pin 33 and Pin 19.
   - If resistance is greater than 0.3 ohms, repair the Vehicle Harness per OEM guidelines. Go to **Step V.**
   - If resistance is 0 to 0.3 ohms, (if fault code is Active) replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**

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G

Purpose: *Monitor Park Brake Switch status in ServiceRanger.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the switch.
4. Connect power and key on.
   - Status changed to Released, repair or replace switch per OEM instructions. Go to **Step V.**
   - Status continues changing states, go to **Step H.**

H

Purpose: *Check for short circuits in the shift lever wiring.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Vehicle Harness 38-way connector.
4. Measure resistance between the Vehicle Harness 38-way connector Pin 33 and Pin 19 and measure the resistance between Pin 19 and ground.
   - If resistance between Pin 33 and ground or between Pin 33 and Pin 19 is less than 10K ohm, repair the Vehicle Harness per OEM guidelines. Go to **Step V.**
   - If resistance between Pin 33 and ground and between Pin 33 and Pin 19 are OL, (if fault code is Active) replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear fault codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and attempt to reset the fault code.
6. Check for codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 21 appears, go to **Step A.** to find error in testing.
   - If fault code other than 21 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 22 - ABS CAN Message Fault

J1587: MID 130 SID 254 FMI 9, 14
J1939: SA 3 SPN 563 FMI 9, 14

Overview

J1939 is a high-speed twisted pair 250K baud data link with one 120 ohm resistor at each end of the link. The Transmission Electronic Control Unit (TECU) is connected to the J1939 data link at the 38-way vehicle connector. This link is used to transmit information to the TECU as well as communicate or receive data from the other modules on the network like the ABS module. When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

Fault Code 22 is detected if J1939 communication from the ABS is lost for 5 seconds and other devices are present on J1939.

Fallback

No Fallback mode; however, Hill Start Aid (HSA) will not function, and the system may attempt a shift during wheel slip events.

Possible Causes

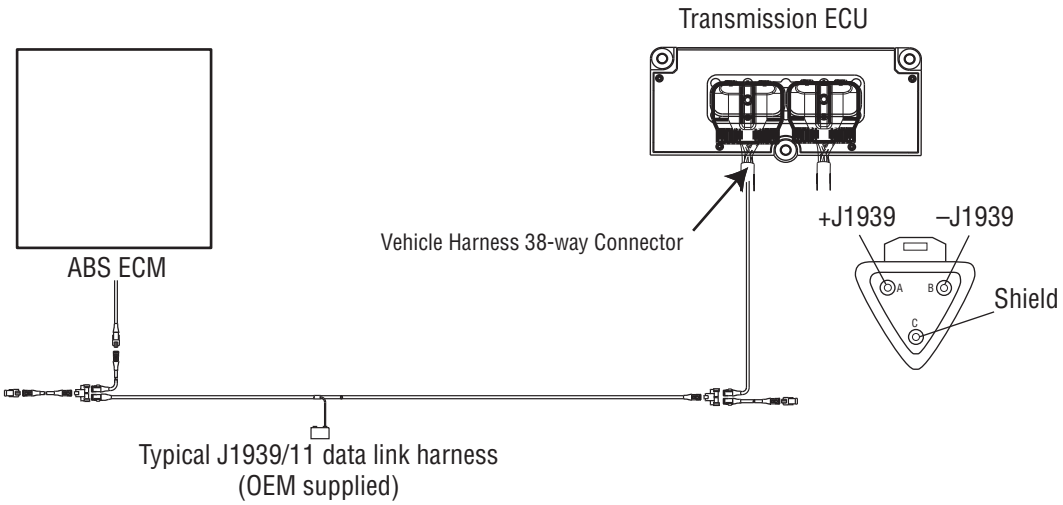
This fault code can be caused by any of the following:

- J1939 datalink
- ABS module
- ABS module does not support HSA or is not configured with HSA

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Component Identification



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Fault Code 22 - ABS CAN Message Fault

A

Purpose: *Check for active or Inactive fault codes. Contact the vehicle OEM for further directions.*

1. Key on.
2. Retrieve active fault codes and FMIs with ServiceRanger using the 9-way diagnostic connector
   - If Fault Code 22 is Active, repair ABS module or data link per OEM guidelines.
   - If Fault Code 22 is Inactive, test complete.

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Fault Code 26 - Clutch Slip

J1587: MID 130 SID 55 FMI 10
J1939: SA 3 SPN 522 FMI 10

Overview

This fault code indicates the clutch is not performing as expected. The transmission controller detected excessive clutch slip.

Detection

When the transmission is in gear and the clutch is fully engaged, engine speed and input shaft speed are compared. If the engine speed is significantly different from the input shaft speed for a period of one to two seconds, the fault code is set.

Clutch Slip Testing

Note: It is recommended that the pilot bearing be replaced whenever the clutch is replaced.

Note: Refer to Installation Guide TRIG1110 for a list of recommended pilot bearings.

Note: Secondary clutch failures resulting from conditions such as pilot bearing failures, excessive torsional vibration, or clutch abuse, are not covered under warranty.

Note: Record Vehicle Performance Analysis every time a clutch is replaced.

Fallback

This fault causes a downshift only fallback. Once the vehicle is stopped, starting gear and reverse gear can be engaged; however, the fault will clear at power down. Upshifts will be allowed until the fault is detected again.

Possible Causes

This fault code can be caused by any of the following:

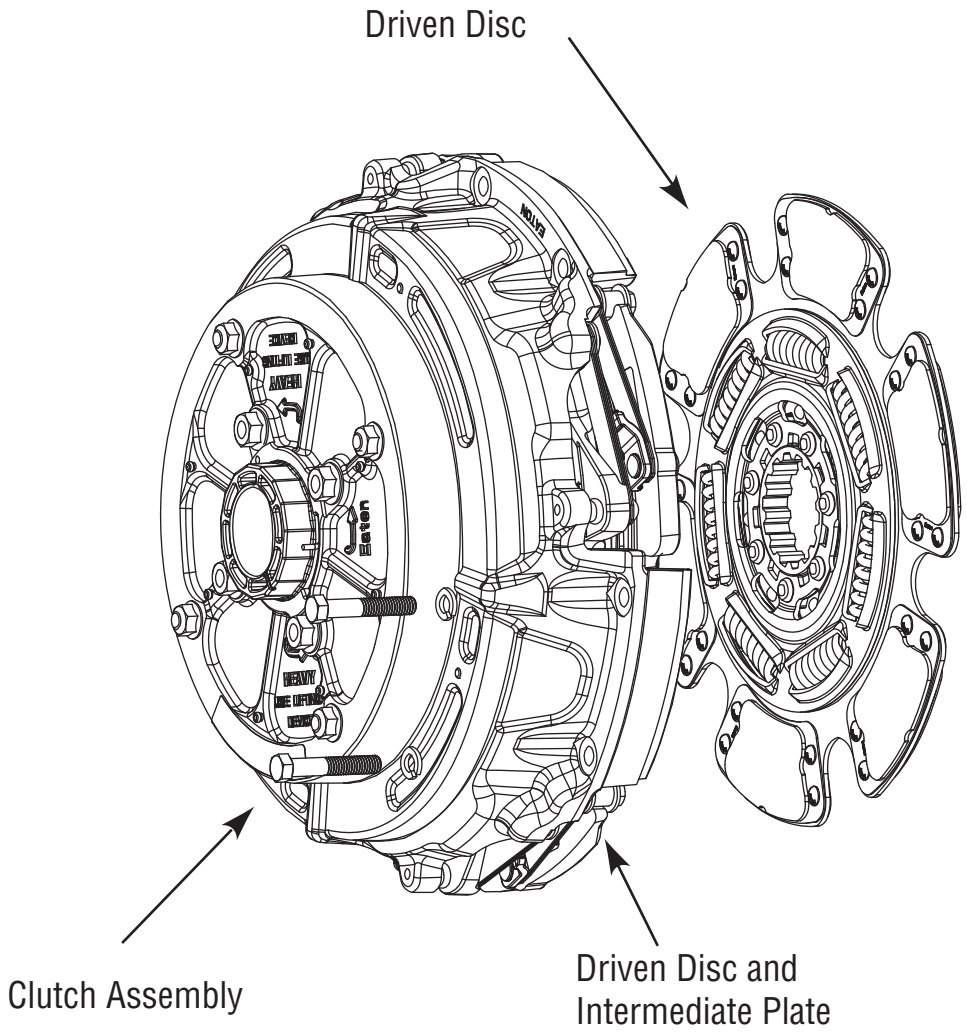
- Worn or damaged clutch
- Clutch abuse
- Low clutch torque
- Contaminated clutch disks

Additional Tools

- Clutch jack

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Component Identification



DM Clutch

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Fault Code 26 - Clutch Slip

A ***Purpose:*** *Drive vehicle under load above 1500 RPM. Check for active and Inactive fault codes.*

1. Key on.
2. Start engine.
3. Drive vehicle under load in highest gear possible with engine speed above 1500 RPM. At a steady speed, quickly and fully press and hold the throttle.
   - If Fault Code 26 is Active, replace clutch. Go to **Step V.**
   - If Fault Code 26 is Inactive, test complete. Go to **Step V.**

V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear fault codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and attempt to reset the code.
6. Check for fault codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If fault code 26 appears go to **Step A.** to find error in testing.
   - If fault code other than 26 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 27 - Clutch Disengagement

J1587: MID 130 SID 55 FMI 7, 13
J1939: SA 3 SPN 788 FMI 7, 13

Overview
The fault code indicates that the clutch has not disengaged as expected.

Detection
Starting at key on and throughout operation, the Transmission Electronic Control Unit (TECU) constantly measures engine RPM and idle torque from the engine. If the engine speed falls significantly below idle or engine torque rises significantly above idle torque upon engaging a start gear, the fault is set. If the vehicle is brought to a stop when in gear and engine speed falls significantly below idle, the fault is set.

Clutch Disengagement Test

Note: It is recommended that the pilot bearing be replaced whenever the clutch is replaced.

Note: Refer to Installation Guide TRIG1110 for a list of recommended pilot bearings.

Note: Secondary clutch failures resulting from conditions such as pilot bearing failures, excessive torsional vibration or clutch abuse are not covered under warranty.

Note: Record Vehicle Performance Analysis every time a clutch is replaced

Fallback
No gear engagement from neutral if the truck is stationary; however, if the TECU determines the vehicle is moving, it will allow a gear engagement from neutral.

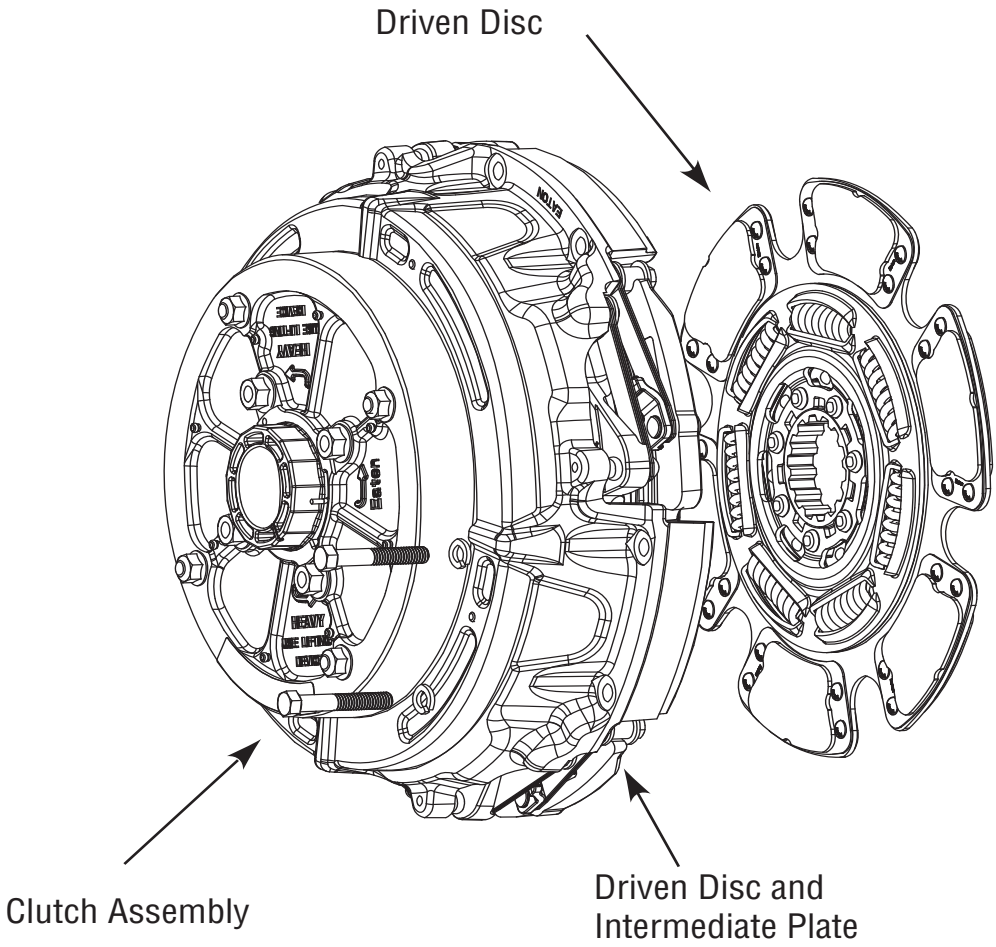
Possible Causes
This fault code can be caused by any of the following:

- Failed clutch
- Clutch thermal abuse
- Drive Disc Assembly over-speed
- Pilot Bearing failure
- Input shaft wear
- Lack of lube in Release Bearing and Bushing

Additional Tools
- Clutch jack

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Component Identification



DM Clutch

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Fault Code 27 - Clutch Disengagement

A ***Purpose:*** *Monitor and compare engine speed to transmission input shaft speed in ServiceRanger.*

1. Key on.
2. Start engine.
3. Confirm transmission is in neutral.
4. Raise engine speed above 1500 RPM and allow engine to return to idle.
5. Compare engine RPM to input shaft RPM with ServiceRanger, a PC-based Service Tool.

   Note: Engine idle must be 700 RPM or lower.

   - If the speeds match at idle and Fault Code 27 is Active, replace the clutch. Go to **Step V.**
   - If they do not match, test complete.

V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and attempt to reset the code.
6. Check for fault codes, “Fault Code Retrieval/Clearing” on page 5
   - If Fault Code 27 appears go to **Step A.** to find error in testing.
   - If code other than 27 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 28 - Clutch System

J1587: MID 130 SID 52, 55 FMI 3, 4, 5, 7
J1939: SA 3 SPN 788 FMI 3, 4, 5, 7

Overview

This fault code indicates either an electrical or mechanical failure in the WetClutch system.

Detection

Starting at key-on and throughout operation, the Transmission Electronic Control Unit (TECU) constantly monitors this circuit. A failure mode of short to battery, short to ground or open circuit is detected.

When the WetClutch is locked after urge to move, engine speed and input shaft speeds are compared. If the engine speed is significantly higher than the input shaft speed for a period of five seconds, the WetClutch is slipping.

Fallback

There is no fallback mode; however, if the failure mode is open circuit, the engine will be disengaged from the input shaft.

Possible Causes

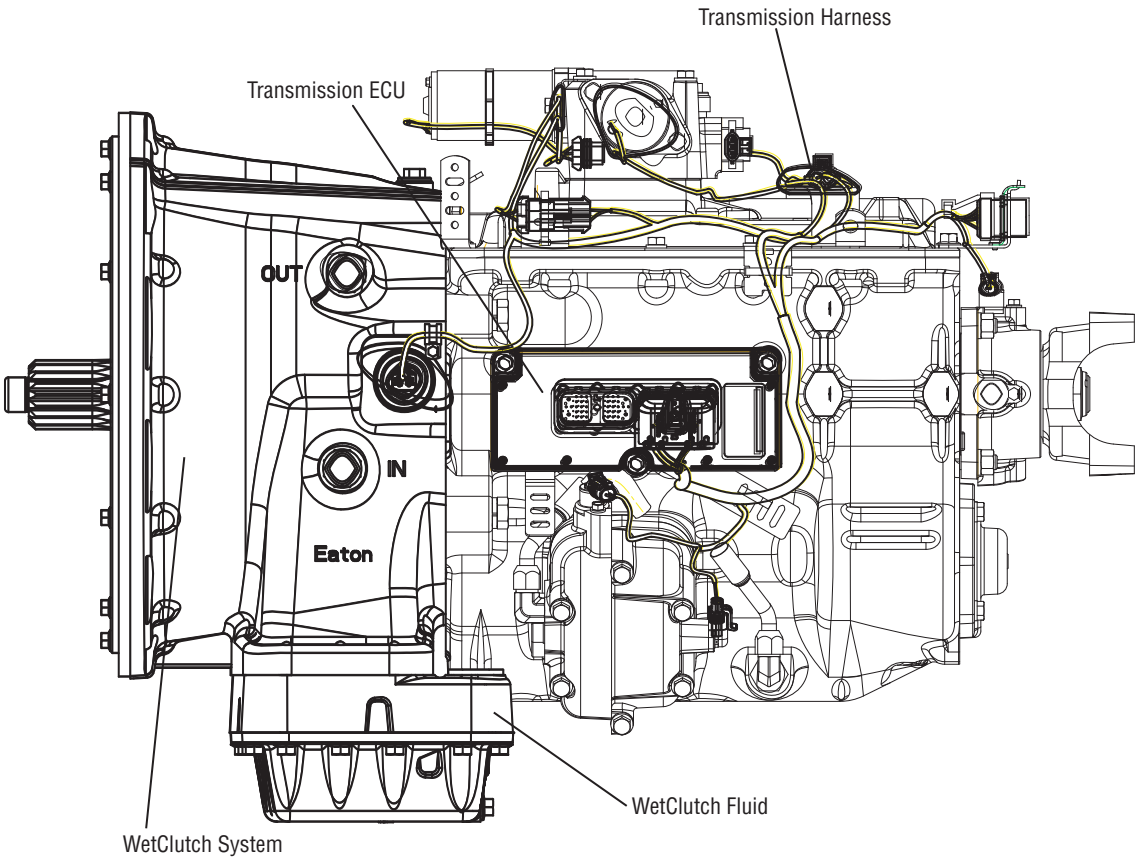
This fault code can be caused by any of the following:

- TECU
- Transmission Harness
- Low fluid level
- WetClutch system

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Component Identification



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Fault Code 28 - Clutch System

A

Purpose: *Check WetClutch fluid level.*

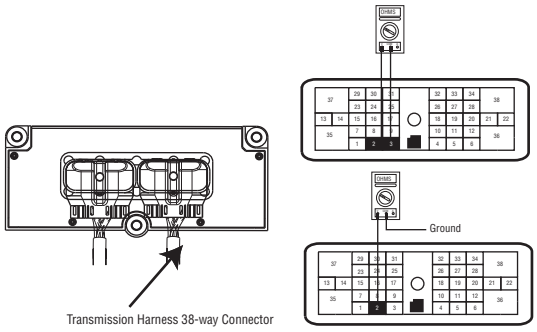
1. Key on.
2. Place the transmission in neutral.
3. Allow engine to idle at 700-800 RPM for a minimum of 2 minutes.

   Note: Ensure transmission fluid temperature is 60 to 120 degrees F (16 to 49 degrees C).
4. Check WetClutch fluid level.
   - If fluid level is at or above the COLD-FULL mark, go to **Step B.**
   - If fluid level is below the COLD-ADD mark, Correct fluid level, go to **Step V.**.

B

Purpose: *Verify continuity of the Clutch Lube Solenoid circuit.*

1. Key off.
2. Disconnect the negative battery cable.
3. Disconnect the TECU 30-way connector.
4. Measure resistance between the Transmission Harness 38-way connector Pin 2 and Pin 3 and between Pin 2 and ground.



   - If the resistance between 2 and 3 is 6.5 to 9.5 ohms and is resistance from Pin 2 to ground is OL, go to **Step C.**
   - If resistance is outside of range, go to **Step D.**

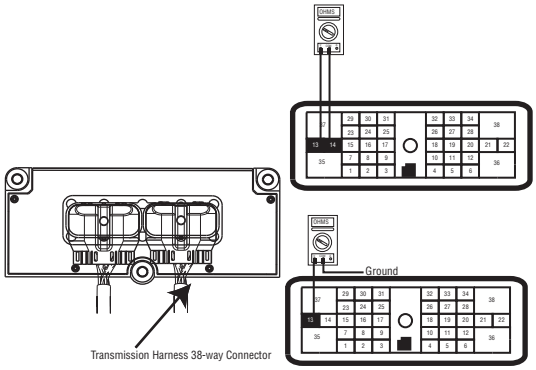
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C

Purpose: *Verify continuity of Clutch Solenoid circuit.*

1. Measure resistance between the Transmission Harness 38-way connector Pin 13 and Pin 14 and between Pin 13 and ground.



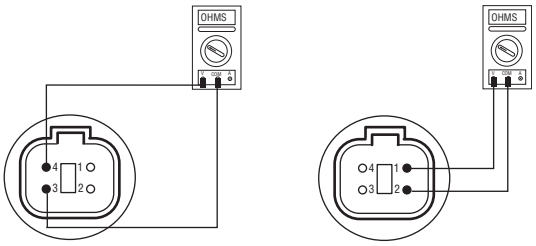
- If resistance between Pin 13 and Pin 14 is 8.5 to 12 ohms and resistance from Pin 13 to ground is [OL], Replace Transmission (Only if fault code is Active). Go to **Step V.**
- If resistance is less than 10K ohm, go to **Step D.**

D

Purpose: *Verify continuity of hydraulic manifold circuits.*

1. Disconnect Transmission Harness located on left side of WetClutch housing.

2. Measure resistance between WetClutch housing connector pins:
- 3 and 4
- 1 and 2



- If the resistance between Pin 1 and Pin 2 is 8.5 to 12 ohms and the resistance between Pin 3 and Pin 4 is 6.5 to 9.5 ohms, go to **Step E.**
- If resistance is outside of range, replace transmission, Go to **Step V.**

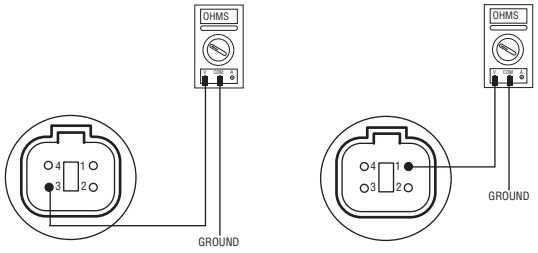
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E

Purpose: *Test the hydraulic manifold wiring for short circuits.*

1. Measure resistance between WetClutch housing connector pins:
   - 3 and ground
   - 1 and ground



- If resistance from Pin 3 to ground and Pin 1 to ground is 10K ohm or greater, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, Replace Transmission. Go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Key on.
4. Clear codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the code.
6. Check for codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If code 28 appears go to **Step A.** to find error in testing.
   - If code other than 28 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 29 - Remote Throttle Enable

J1587: MID 130 PID 372 FMI 4, 5
J1939: SA 3 SPN 969 FMI 4, 5

Overview

This fault indicates an electrical failure of the relay that allows the remote throttle to operate. The relay and wiring are installed by the OEM. When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11. for more information on troubleshooting Inactive codes.

Detection

Starting at key-on and throughout operation, the Transmission Electronic Control Unit (TECU) constantly measures the circuit. The fault is set if the TECU detects a bad (open/short) connection for 2 seconds in the wiring from the TECU to the relay.

Fallback

There is no fallback mode associated with this fault, but the remote throttle will either not work or always work when this fault is active.

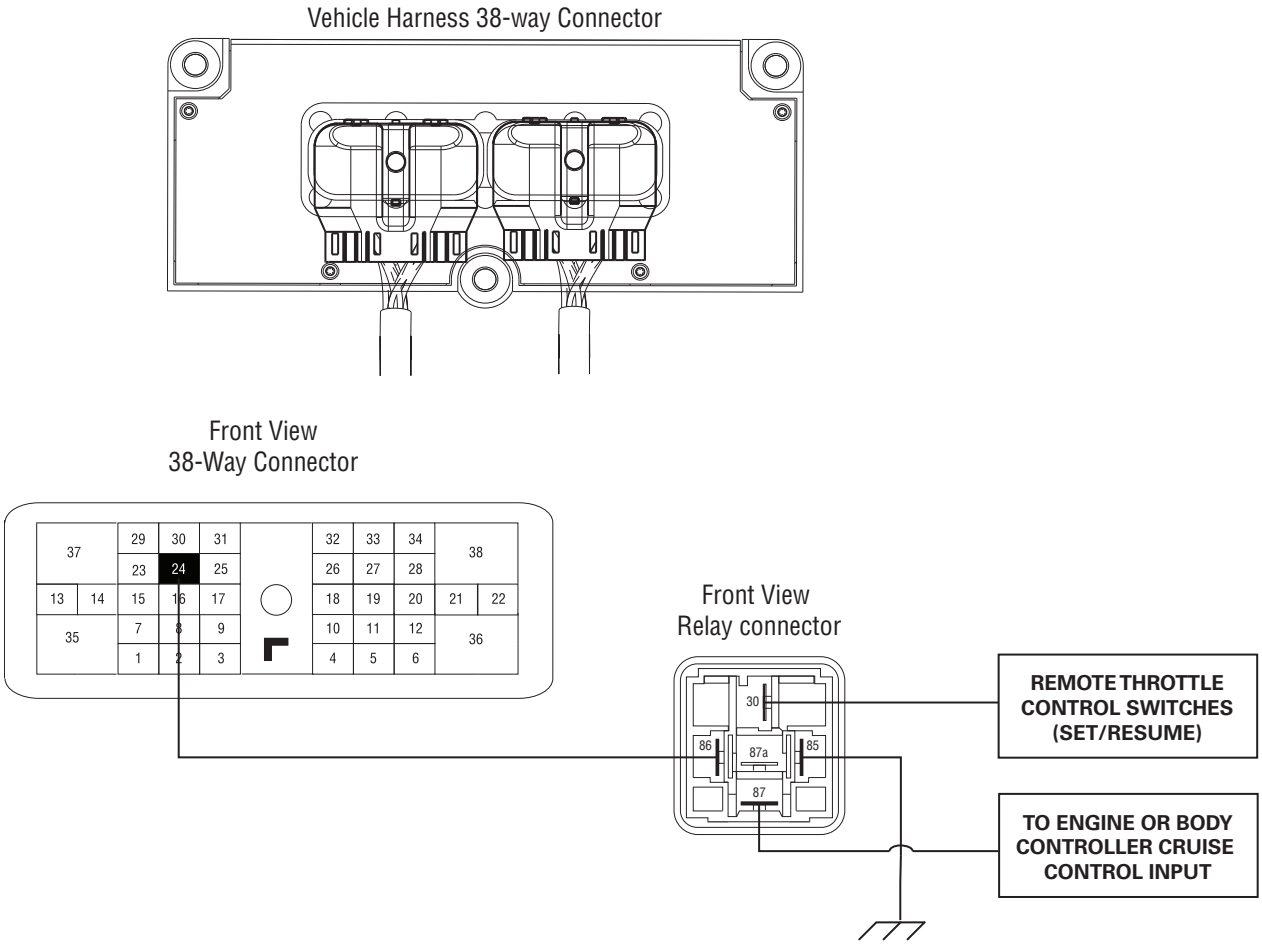
Possible Causes

This fault code can be caused by any of the following:

- Remote Throttle relay
- Harness
- TECU
- Software misconfiguration

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Component Identification



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Fault Code 29 - Remote Throttle Enable

A

Purpose: *Verify Remote Throttle Enable is functioning per OEM requirements.*

1. Follow OEM troubleshooting guidelines to ensure the Remote Throttle Enable Relay has not failed.
   - If relay is functional, go to **Step B.**.
   - If relay is not functional (faulted), test complete. Go to **Step V.**

B

Purpose: *Check for active or Inactive fault codes, noting FMI*

1. Key on.
2. Retrieve active fault codes and FMIs with ServiceRanger using the 9-way diagnostic connector.
3. What FMIs are present?

   Note: The Remote Throttle Enable relay must be wired according to Eaton Gen 3 requirements (shown on previous page) for tests to work properly. If wired differently, consult OEM for correct wiring schematic.

   - If FMI 4 is present, go to **Step C.**
   - If FMI 5 is present, go to **Step D.**

C

Purpose: *Test the Remote Throttle Relay circuit for shorts to ground.*

1. Key off.
2. Disconnect battery cable.
3. Disconnect the Vehicle Harness 38-way connector.
4. Measure the resistance between Vehicle Harness 38-way connector Pin 24 and ground.
   - If the resistance between 24 and ground is OL. (If fault code is Active) replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If resistance is out of range, repair the Vehicle Harness. Go to **Step V.**

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D ***Purpose:*** *Verify continuity of the Remote throttle relay circuit.*

1. Key off.
2. Disconnect battery cable.
3. Disconnect the Vehicle Harness 38-way connector.
4. Disconnect the Vehicle Harness from the Throttle Enable Relay.
5. Measure resistance between Vehicle Harness 38-way connector way 24 and way 86 of the Throttle Enable relay connector.
   - If resistance is 0 to 0.3 ohms, (if fault code is Active) replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If resistance is out of range, repair the Vehicle Harness and go to **Step V.**

V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Key on.
4. Clear codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the code.
6. Check for fault codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 29 appears go to **Step A.** to find error in testing.
   - If fault code other than 29 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 31 - Momentary Engine Ignition Interrupt Relay (MEIIR) Test

J1587: MID 130 SID 218 FMI 2, 3, 4, 5, 14
J1939: SA 3 SPN 1485 FMI 2, 3, 4, 5, 14

Overview

This fault code indicates an electrical failure of the MEIIR circuit.

When troubleshooting an Inactive code, See “Product Diagnostic (PD) Mode” on page 11.

Detection

The fault is detected during power-up. The Transmission Electronic Control Unit (TECU) checks the MEIIR circuit every time the system is powered up. If the electrical characteristics of the circuit are incorrect, the fault code is set.

Fallback

There is no fallback associated with this failure. However, if the engine speed flares uncontrollably while the transmission is in a gear, the transmission may not be able to achieve neutral if it is selected due to a torque lock condition.

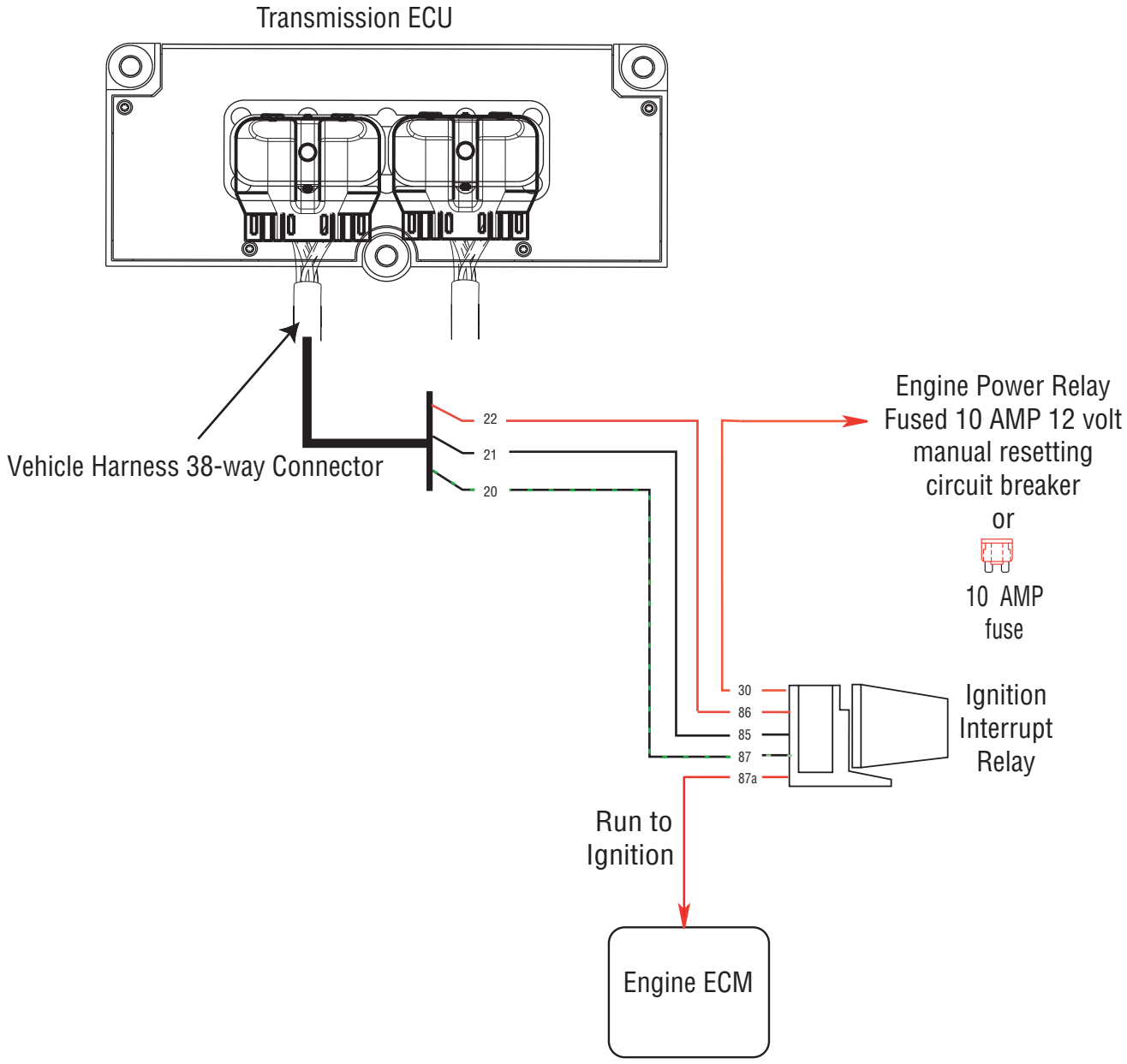
Possible Causes

This fault code can be caused by an of the following:

- OEM wiring
- Mechanical failure in the MEIIR relay
- TECU

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Component Identification



Ignition Interrupt Legend

All OEM responsible wiring shown is "typical". Consult specific application.
(30, 87a) = +12 volt switched
(20-87) **=** Signal
(21-85) = -12 volt relay source
(22-86) = +12 volt relay source

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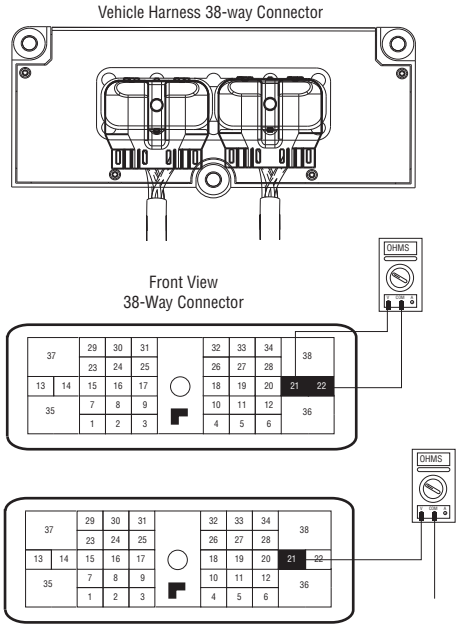
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Fault Code 31 - Momentary Engine Ignition Interrupt Relay (MEIIR) Test

A

Purpose: *Verify continuity of Momentary Engine Ignition Interrupt Relay (MEIIR) circuit and test for short to ground through Vehicle Interface Harness.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect TECU Vehicle Harness 38-way connector.
4. Measure resistance between Vehicle Harness 38-way connector pins 21 and 22 and from Pin 21 to ground.

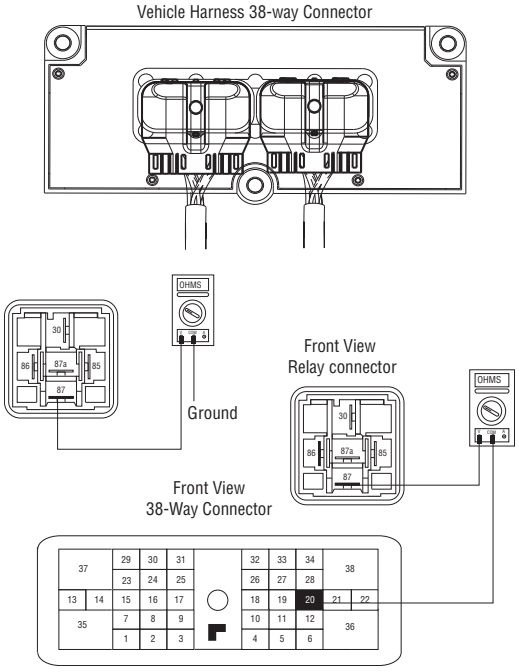


- If resistance between pins 21 and 22 is 40 to 120 ohms (24 volt system) and resistance from Pin 21 to ground is OL, go to **Step B.**
- If resistance is outside of range, go to **Step D.**

B

Purpose: *Verify continuity of MEIIR contact wire and test for short to ground.*

1. Measure resistance between Transmission Vehicle Harness 38-way connector Pin 20 and MEIIR relay connector Pin 87 and from MEIIR relay connector Pin 87 to ground.



- If resistance between pins 20 and 87 is 0 to 0.3 ohms and if resistance between Pin 87 and ground is OL, go to **Step C.**
- If resistance is outside of the range, repair the Vehicle Harness between the TECU and the MEIIR relay connector. Go to **Step V.**

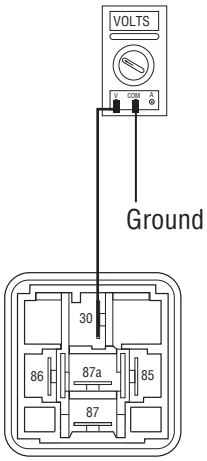
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C

Purpose: *Test the MEIIR relay for shorts to ground at the relay.*

1. Disconnect MEIIR relay from connector
2. Key on.
3. Measure voltage from Pin 30 of the MEIIR relay connector to ground.



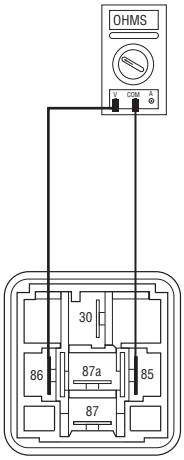
Front View
Relay connector

- If voltage is within 0.6 volts of battery voltage replace MEIIR relay. Go to **Step E.**
- If voltage is outside of range repair the Vehicle Harness. Go to **Step V.**

D

Purpose: *Measure resistance across MEIIR relay.*

1. Remove MEIIR relay from OEM dash harness.
2. Measure resistance between MEIIR relay pins 85 and 86.



Front View
Relay connector

- If resistance is 40 to 120 ohms (12 volt system) or 140 to 480 ohms (24 volt system) repair OEM wiring from the TECU to the MEIIR relay. Go to **Step V.**
- If resistance is outside of range replace MEIIR relay. Go to **Step V.**

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E ***Purpose:*** *Check for active or Inactive fault codes.*

1. Key on.
2. Retrieve codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 31 is Active, replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If Fault Code 31 is Inactive, go to **Step V.**

V ***Purpose:*** *Verify repair.*

1. Key off.
2. Key on.
3. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
4. Reconnect all connectors and the negative battery cable.
5. Drive vehicle and attempt to reset the code
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 31 appears go to **Step A.** to find error in testing.
   - If code other than 31 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 32 - Loss of Switch Ignition Power Test

J1587: MID 130 PID 43 FMI 2
J1939: SA 3 SPN 158 FMI 2

Overview

This fault code indicates a loss of Switched Ignition Power to the Transmission Electronic Control Unit.

When troubleshooting an Inactive code, See “Product Diagnostic (PD) Mode” on page 11.

Detection

The TECU monitors Ignition Power during normal operation. If Ignition power is lost to the TECU during operation a fault is logged.

Fallback

This fault causes an In-Place fallback while moving.

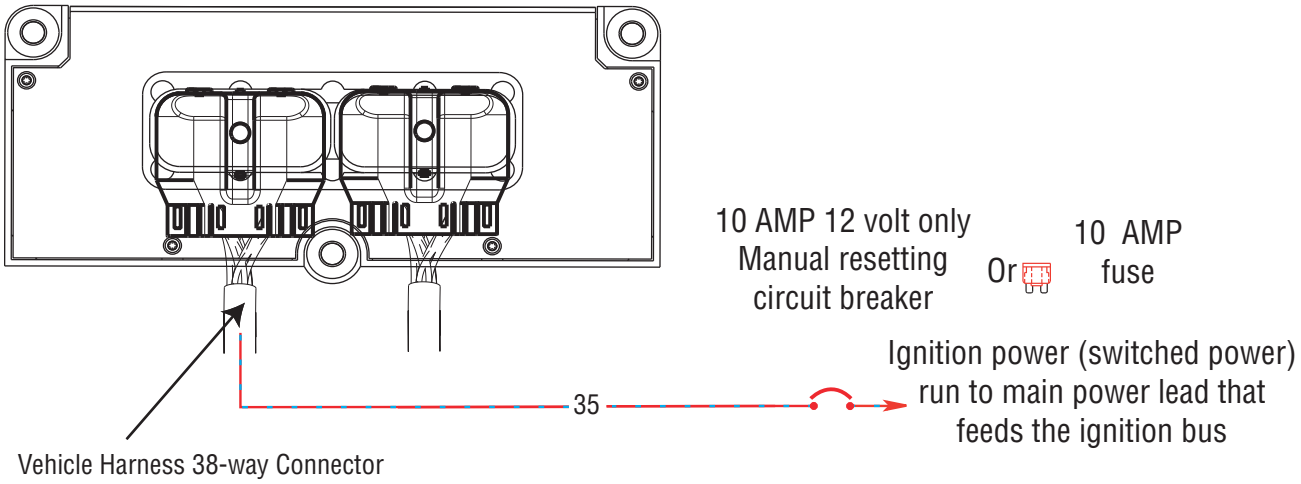
Possible Causes

This fault code can be caused by the following:

- Ignition switch is turned off during operation
- Ignition power is lost during operation

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Component Identification



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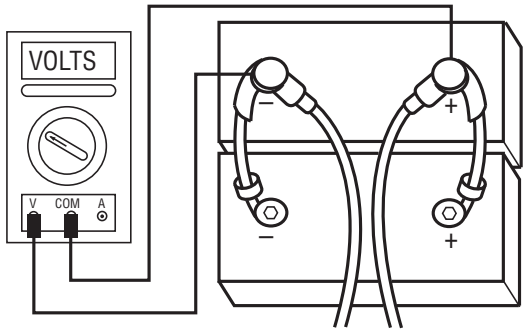
https://truckmanualshub.com/

Fault Code 32 - Loss of Switch Ignition Power Test

A

Purpose: *Measure batter voltage. Visually inspect the batteries, inline fuse, power, ground supplies to TECU.*

1. Key off.
2. Inspect starter/battery and inline fuse holder connections for integrity.
3. Measure voltage across batteries.

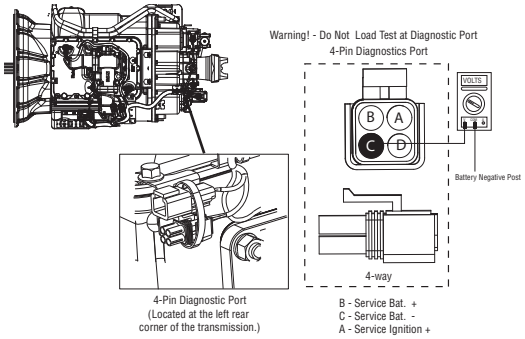


- If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required. Go to **Step B.**
- If voltage is outside of range, repair or replace batteries and charging system as required. Repeat this step.

B

Purpose: *Verify proper ground path at 4-way diagnostic port.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.



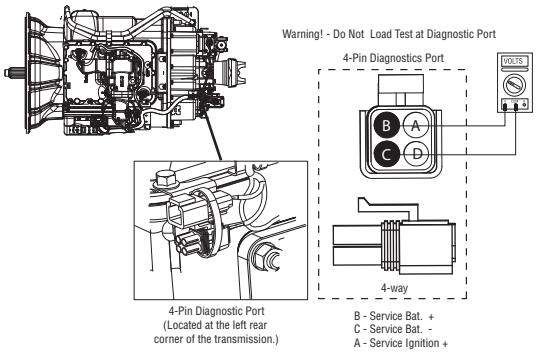
- If voltage between Pin C and battery negative post is 0.70 volts or less, go to **Step C.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

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C

Purpose: *Measure battery voltage at 4-way diagnostic port.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.

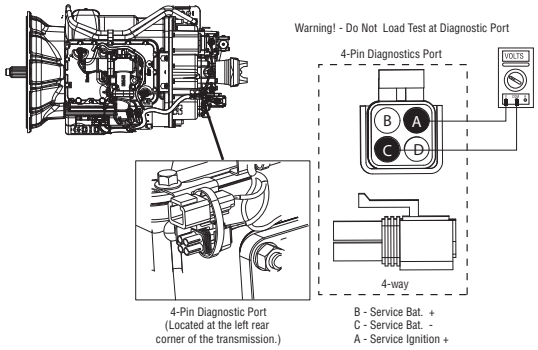


- If voltage is within 0.6 volts of battery voltage, go to **Step D.**
- If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

D

Purpose: *Measure ignition voltage at 4-way diagnostic port.*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step V.**
- If voltage is outside of range, repair ignition power supply to TECU. Fuse may be blown. Repeat test.

V

Purpose: *Verify repair.*

1. Drive vehicle and attempt to reset codes.
2. Retrieve codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If code 32 is Inactive, This code indicates a loss of ignition switched power to the TECU during operation. Verify the key was not turned off during operation. Inspect ignition circuit for intermittent open.

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Fault Code 33 - Low Battery Voltage Supply

J1587: MID 130 PID 168 FMI 4
J1939: SA 3 SPN 168 FMI 4

Overview

This fault code indicates that the vehicle battery power supply to the Transmission Electronic Control Unit (TECU) is below 7 volts.

When troubleshooting an Inactive code, See “Product Diagnostic (PD) Mode” on page 11.

Detection

Starting at key-on and throughout operation, the TECU constantly measures vehicle voltage. If voltage is below 7 volts for more than 1 second, Fault Code 33 will be set and the service light will flash.

Fallback

If this fault occurs while moving, it causes a 1-speed fallback. Once the vehicle is stopped, the starting gear and reverse can be engaged

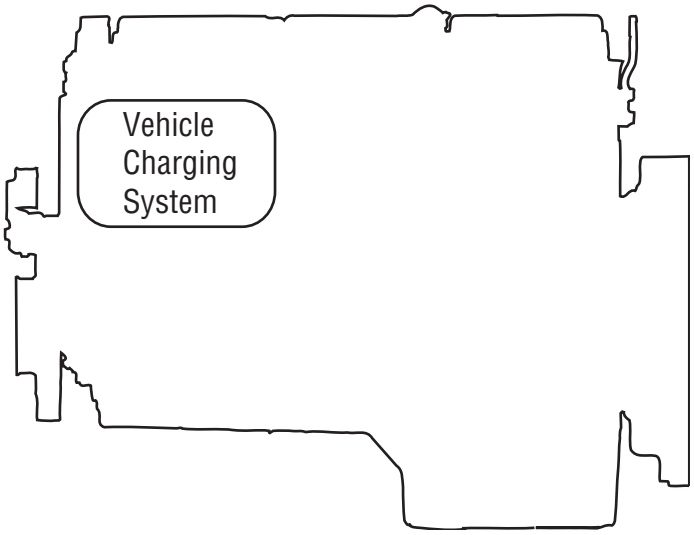
Possible Causes

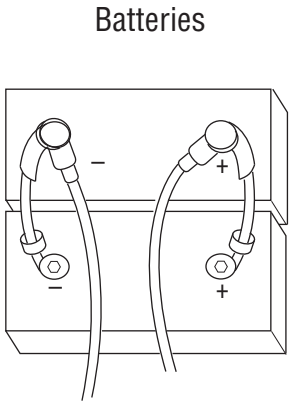
This fault code can be caused by any of the following:

- Corroded or loose power supply to TECU
- Low batteries
- Damaged Vehicle Harness
- TECU
- Charging system

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Component Identification





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Fault Code 33 - Low Battery Voltage Supply

A

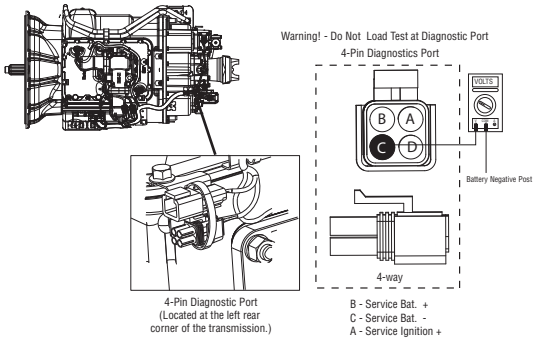
Purpose: *Measure battery voltage. Visually inspect batteries, inline fuse, power and ground supplies to TECU.*

1. Key off.
2. Inspect starter/battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.
   - If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required. Go to **Step B.**
   - If voltage is outside of range, repair or replace batteries, charging system as required. Repeat this step.

B

Purpose: *Verify proper ground path at 4-way diagnostic port.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.



- If voltage is 0.70 volts or less, go to **Step C.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

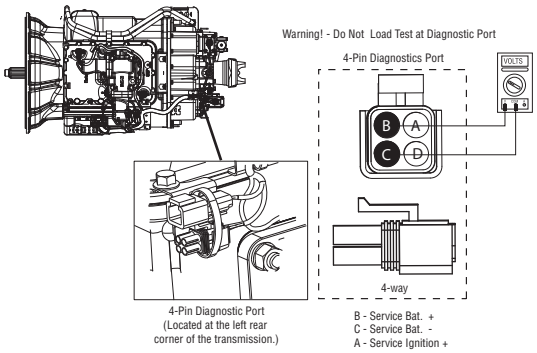
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C

Purpose: *Measure battery voltage at 4-way diagnostic port.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.

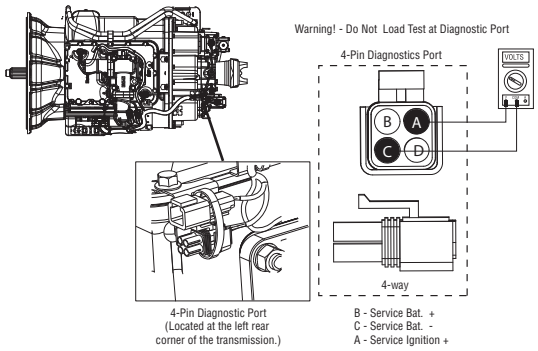


- If voltage is within 0.6 volts of battery voltage, go to **Step D.**
- If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

D

Purpose: *Measure ignition voltage at 4-way diagnostic port.*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step E.**
- If voltage is outside of range, repair ignition power supply to TECU. Fuse may be blown. Repeat test.

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E

Purpose: *Check for active and Inactive fault codes.*

1. Key on.
2. Retrieve codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 33 is Active, replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If Fault Code 33 is Inactive, clear codes and go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Key on.
3. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
4. Reconnect all connectors and the negative battery cable.
5. Drive vehicle and attempt to reset the code.
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 33 appears go to **Step A.** to find error in testing.
   - If code other than 33 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 34 - Weak Battery Voltage Supply

J1587: MID 130 PID 168 FMI 14
J1939: SA 3 SPN 168 FMI 14

Overview

This fault indicates the vehicle is supplying weak battery voltage to the transmission for 10 seconds.

When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

Starting at key-on and throughout operation, the Transmission Electronic Control Unit (TECU) constantly measures vehicle voltage. If voltage is below 9 volts for more than 10 seconds, Fault Code 34 will be set. The service light will not flash.

Fallback

If this fault occures while moving, it causes a 1-speed fallback. Once the vehicle is stopped, the starting gear and reverse can be engaged

Possible Causes

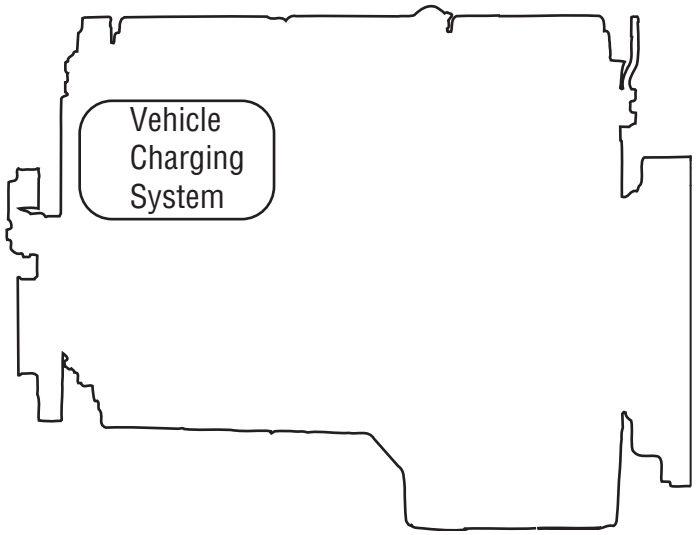
This fault code can be caused by any of the following:

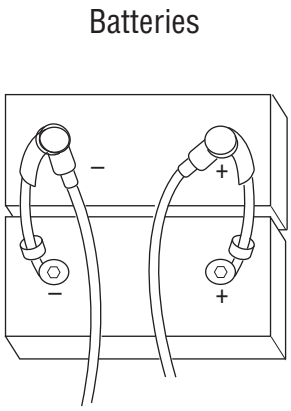
- Corroded or loose power supply to TECU
- Low batteries
- Damaged Vehicle Harness
- TECU
- Charging system

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Component Identification





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Fault Code 34 - Weak Battery Voltage Supply

A

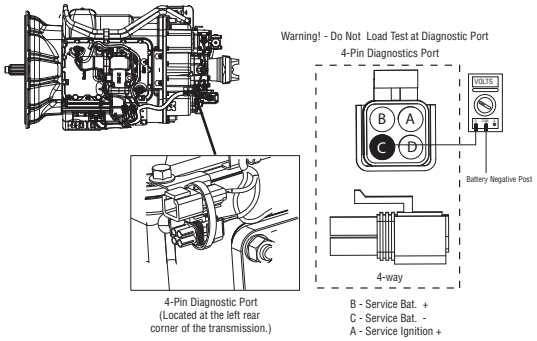
Purpose: *Measure battery voltage. Visually inspect batteries, inline fuse, power and ground supplies to TECU.*

1. Key off.
2. Inspect starter/battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.
   - If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required. Go to **Step B.**
   - If voltage is outside of range, repair or replace batteries, charging system as required. Repeat this step.

B

Purpose: *Verify proper ground path at 4-way diagnostic port.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.



- If voltage between is 0.70 volts or less, go to **Step C.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

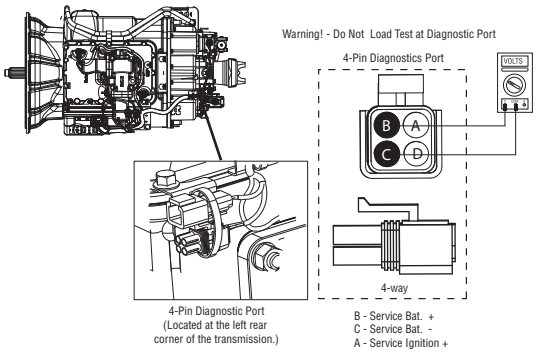
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C

Purpose: *Measure battery voltage at 4-way diagnostic port.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.

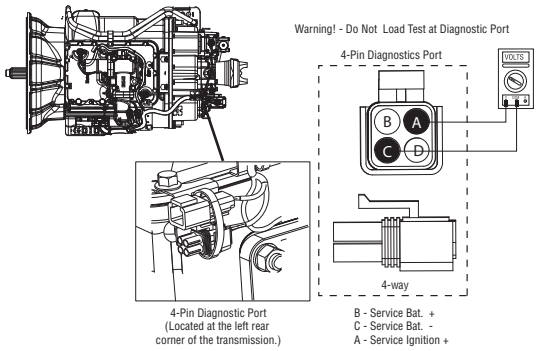


- If voltage is within 0.6 volts of battery voltage, go to **Step D.**
- If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

D

Purpose: *Measure ignition voltage at 4-way diagnostic port.*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step E.**
- If voltage is outside of range, repair ignition power supply to TECU. Fuse may be blown. Repeat test.

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E

Purpose: *Check for active and Inactive fault codes.*

1. Key on.
2. Retrieve codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 34 is Active, replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If Fault Code 34 is Inactive, clear codes. Go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Key on.
3. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
4. Reconnect all connectors and the negative battery cable.
5. Drive vehicle and attempt to reset the code
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 34 appears go to **Step A.** to find error in testing.
   - If code other than 34 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 35 - J1939 Communication Link

J1587: MID 130 SID 231 FMI 2
J1939: SA 3 SPN 639 FMI 2

Overview

This fault code indicates the Transmission Electronic Control Unit (TECU) failed to communicate with the engine over the J1939 data link.

If you have an Active Fault Code 35 with an UltraShift DM transmission and the engine will crank but not start, please check the OEM supplied MEIIR (Momentary Engine Ignition Interrupt Relay) circuit. Ensure that the engine has proper ignition voltage.

When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

Seventy-five seconds after key-on and throughout the operation, the TECU constantly monitors the communication with the engine ECM. If a communication fault occurs for more than 5 seconds, and no other devices are present, Fault Code 35 is set.

Fallback

If the fault occurs during power-up the transmission will go into AutoSelect mode. If the fault occurs while moving, it causes an in-place fallback. The transmission will remain in the gear that was engaged when the failure occurred. Once the vehicle stops, start and reverse gears can be selected and the transmission will operate in AutoSelect mode.

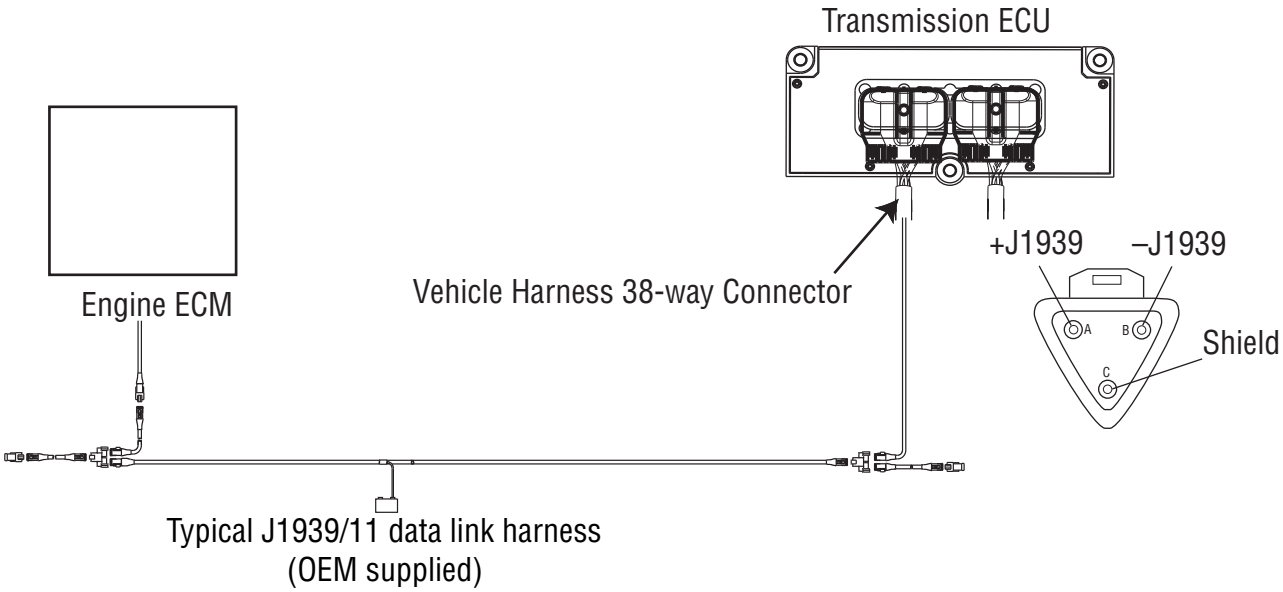
Possible Causes

This fault can be caused by any of the following:

- J1939 Data Link
- Engine ECM
- Vehicle Harness or Connections
- Engine Harness or Connections
- Excessive radio interference
- TECU

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Component Identification



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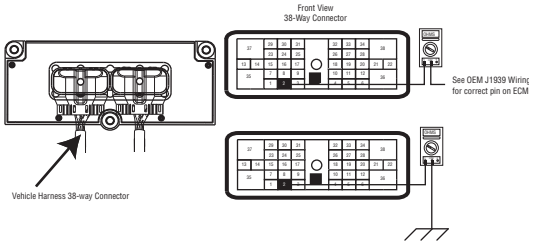
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Fault Code 35 - J1939 Communication Link

A

Purpose: *Verify continuity of J1939 Data Link low (-) circuit and test for short to ground.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect Vehicle Harness 38-way connector.
4. Disconnect engine ECM connector which contains the J1939 Data Link.
5. Measure resistance between:
   - Vehicle Harness 38-way connector Pin 2 and engine ECM pin number (see OEM wiring for (-) J1939).
   - Vehicle harness 38-way Pin 2 and ground.

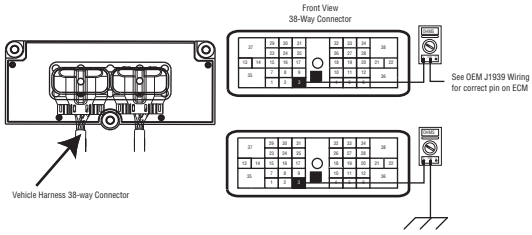


- If resistance between Pin 2 and engine ECM pin is 0 to 0.3 ohms and if resistance between Pin 2 and ground is OL, go to **Step B.**
- If resistance is outside of range, repair J1939 Data Link Harness between engine ECM and TECU. Go to **Step V.**

B

Purpose: *Verify continuity of J1939 Data Link (+) circuit and test for short to ground.*

1. Key off.
2. Measure resistance between:
   - Vehicle Harness 38-way connector Pin 3 and engine ECM pin number (see OEM J1939 wiring for (+) J1939)
   - Vehicle Harness 38-way Pin 3 and ground



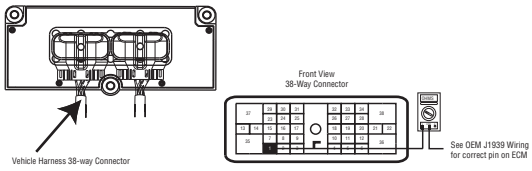
- If resistance between Pin 3 and engine ECM pin number is 0 to 0.3 ohms, and if resistance between Pin 3 and ground is OL,
  - If equipped with J1939 Lite, go to **Step D.**
  - If not equipped with J1939 Lite, go to **Step C.**
- If resistance is outside of range, repair J1939 Data Link Harness between engine ECM and TECU. Go to **Step V.**

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C

Purpose: *Verify continuity of J1939 Data Link Shield (+) wire (if equipped) and test for short to ground.*

1. Key off.
2. Measure resistance between Vehicle Harness 38-way connector Pin 1 and engine ECM pin number (see OEM J1939 wiring for J1939 shield).



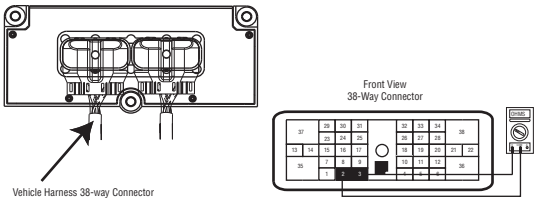
- If resistance between Pin 1 and engine ECM pin number is 0 to 0.3 ohms, go to **Step D.**
- If resistance is outside of range, Repair J1939 Data Link Harness between engine ECM and TECU. Go to **Step V.**

D

Purpose: *Confirm the presence of terminating resistors in the J1939 Data Link.*

1. Key off.
2. Measure resistance between Vehicle Harness 38-way connector Pin 2 and Pin 3.

   Note: En sure the volt/ohm meter is on the proper scale (around 200 ohm)



- If resistance between Pin 2 and Pin 3 is between 50 to 70 ohms, go to **Step V.**
- If resistance is more than 70 ohms, one or more of the terminating resistors on the J1939 Data Link Harness is either missing or out of range, repair OEM J1939 Data Link Harness. Go to **Step V.**
- If resistance is less than 50 ohms, repair the J1939 Data Link between the engine ECM and the TECU. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Key on.
3. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
4. Reconnect all connectors and the negative battery cable.
5. Drive vehicle and attempt to reset the code
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 35 appears go to **Step A.** to find error in testing.
   - If code other than 35 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 36 - J1939 Engine Message

J1587: MID 130 SID231 FMI 14
J1939: SA 3 SPN 639 FMI 14

Overview

This fault code indicates the Transmission Electronic Control Unit (TECU) has communicated with another ECU, but is unable to communicate with the engine ECU over the J1939 data link.

If you have an Active Fault Code 36 with an UltraShift DM transmission and engine will crank but not start, please check the OEM supplied MEIIR (Momentary Engine Ignition Interrupt Relay) circuit and see that the engine has proper ignition voltage.

When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

The fault is detected if J1939 communication from the engine is lost for 5 seconds and other devices are present on J1939.

Fallback

If the fault occurs during power-up, the transmission will go into AutoSelect mode. If the fault occurs while moving, it causes an in-place fallback and the transmission will remain in the gear that was engaged when the failure occurred. Once the vehicle stops, start and reverse gears can be selected and the transmission will operate in AutoSelect mode.

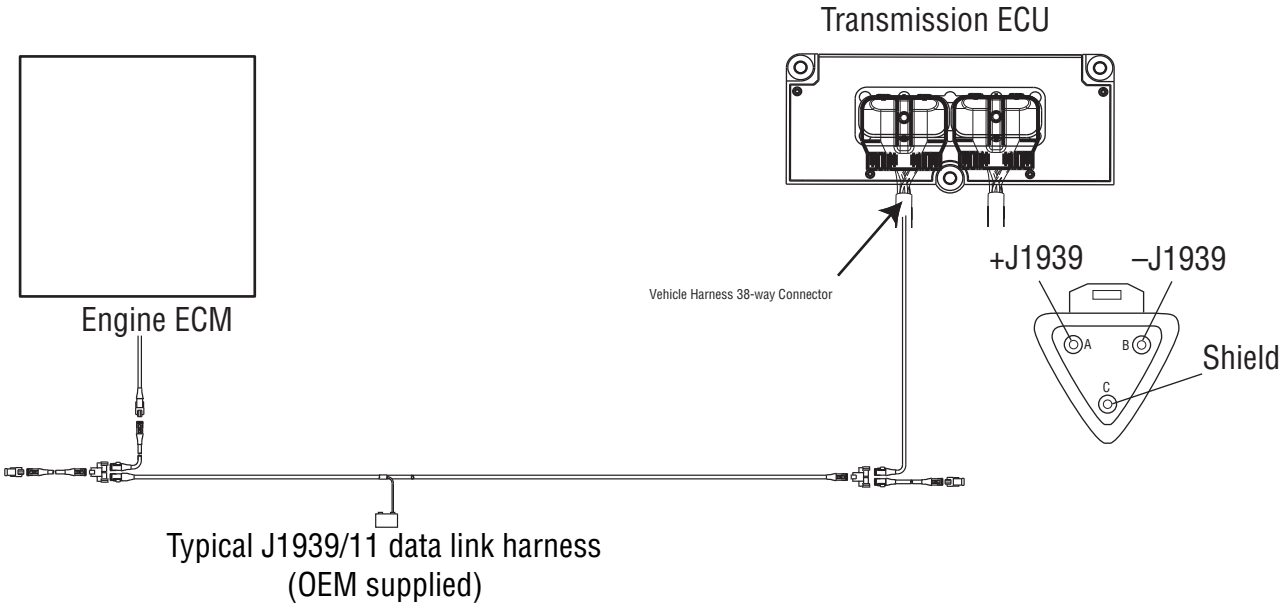
Possible Causes

This fault can be caused by any of the following:

- J1939 Data Link
- Engine ECM
- Vehicle Harness or Connections
- Engine Harness or Connections
- Excessive radio interference
- TECU

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Component Identification



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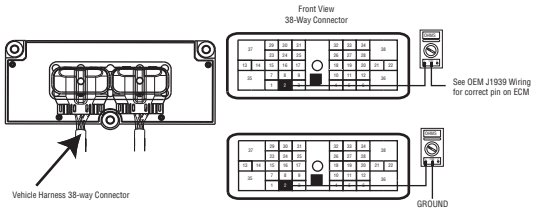
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Fault Code 36 - J1939 Engine Message

A

Purpose: *Verify continuity of J1939 Data Link Low (-) circuit and test for short to ground.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect Vehicle Harness 38-way connector.
4. Disconnect engine ECM connector which contains the J1939 Data Link.
5. Measure resistance between:
   - Vehicle Harness 38-way connector Pin 2 and engine ECM pin # (see OEM wiring for (-) J1939).
   - Vehicle Harness 38-way connector Pin 2 and ground.

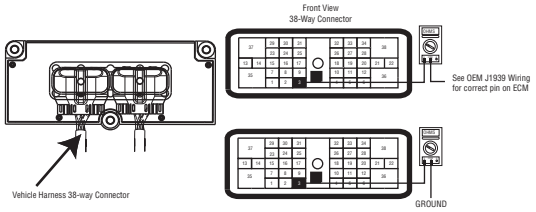


- If resistance between Pin 2 and engine ECM pin # (see OEM wiring for (-)J1939) is 0 to 0.3 ohms and if resistance between Pin 2 and ground is OL, go to **Step B.**
- If resistance is outside of range, repair J1939 Data Link Harness between engine ECM and TECU. Go to **Step V.**

B

Purpose: *Verify continuity of J1939 Data Link High (+) circuit and test for short to ground.*

1. Key off.
2. Measure resistance between:
   - Vehicle Harness 38-way connector Pin 3 and engine ECM pin # (see OEM wiring for (+)J1939)
   - Vehicle Harness 38-way connector Pin 3 and ground



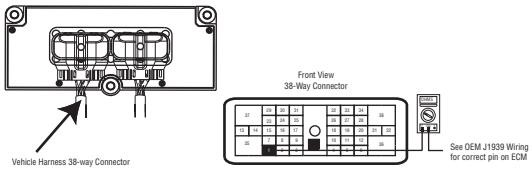
- If resistance between Pin 3 and engine ECM pin # (see OEM wiring for (+)J1939) is 0 to 0.3 ohms and if resistance between Pin 3 and ground is OL,
  - If equipped with J1939 Lite, go to **Step D.**
  - If not equipped with J1939 Lite, go to **Step C.**
- If resistance is outside of range, repair J1939 Data Link Harness between Engine ECM and TECU. Go to **Step V.**

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C

Purpose: *Verify continuity of J1939 Data Link Shield (+) wire (if equipped) and test for short to ground.*

1. Key off.
2. Measure resistance between Vehicle Harness 38-way connector Pin 1 and engine ECM pin # (see OEM wiring for J1939 shield).



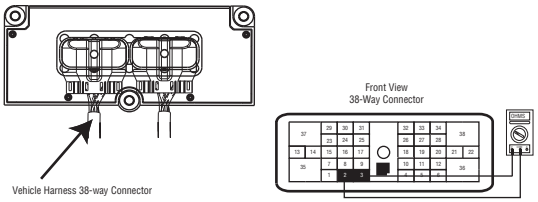
- If resistance between Pin 1 and engine ECM pin # (see OEM wiring for J1939 shield) is 0 to 0.3 ohms, go to **Step D.**
- If resistance is outside of range, repair J1939 Data Link Harness between engine ECM and TECU. Go to **Step V.**

D

Purpose: *Confirm the presence of terminating resistors in the J1939 Data Link.*

1. Key off.
2. Measure resistance between Vehicle Harness 38-way connector Pin 2 and Pin 3.

   Note: Make sure the volt/ohm meter is on the proper scale (around 200 ohm scale).



- If resistance between Pin 2 and Pin 3 is between 50 to 70 ohms, go to **Step V.**
- If resistance is more than 70 ohms, 1or more of the terminating resistors on the J1939 data link harness is either missing or out of range. Repair J1939 Data Link Harness. Go to **Step V.**
- If resistance is less than 50 ohms, repair the J1939 Data Link between the Engine ECM and the TECU. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and attempt to reset the code.
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 36 appears go to **Step A.** to find error in testing,
   - If fault code other than 36 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 37 - Power Supply

J1587: MID 130 SID 251 FMI 5
J1939: SA 3 SPN 627 FMI 5

Overview

This fault code indicates excessive resistance has been detected between the power supply source (battery or starter) and the Transmission Electronic Control Unit (TECU).

Detection

The resistance on the TECU power supply circuit is measured during each shift. If the resistance is greater than 0.4 ohms this fault will set.

Fallback

No fallback mode.

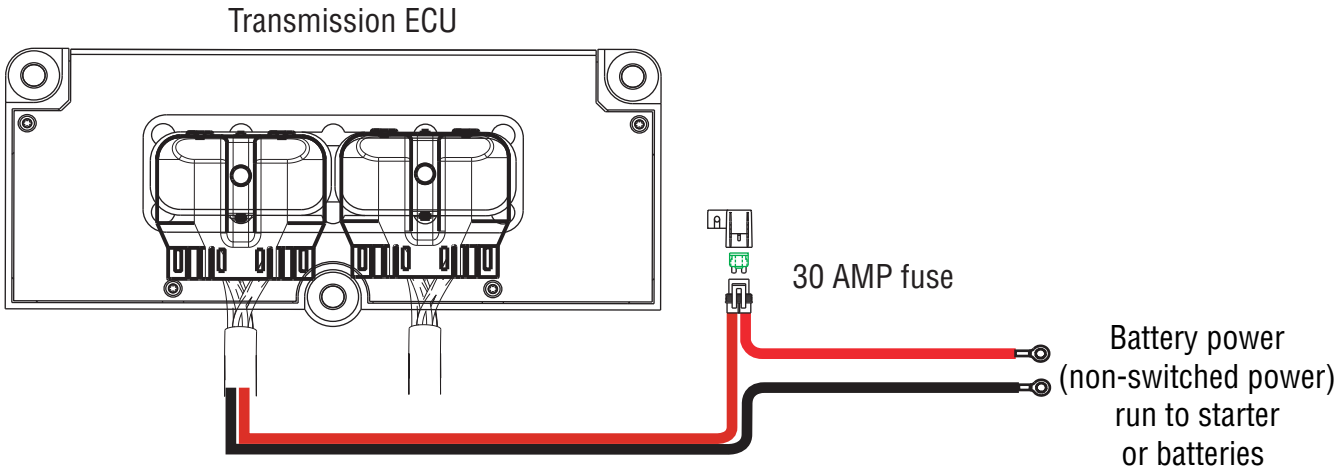
Possible Causes

This fault code can be caused by the following:

- Corrosion on power supply or ground supply connections or wires to the TECU
- Corrosion in fuse holder for TECU power supply.

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Component Identification



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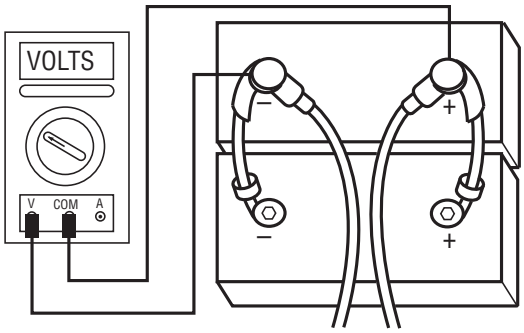
https://truckmanualshub.com/

Fault Code 37 - Power Supply

A

Purpose: *Measure battery voltage. Visually inspect batteries, inline fuse, power and ground supplies to the TECU.*

1. Key off.
2. Inspect starter/battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.

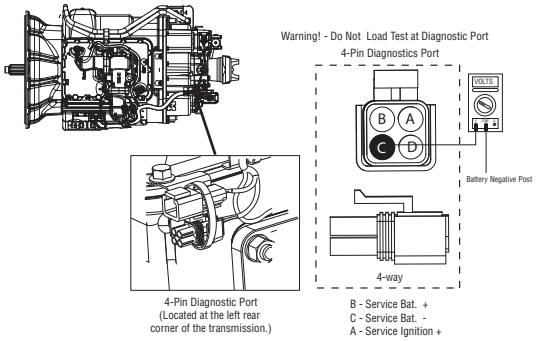


- If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required. Go to **Step B.**
- If voltage is outside of rangeRepair or replace batteries and charging system as required. Repeat this step.

B

Purpose: *Verify proper ground path at 4-way diagnostic port.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.



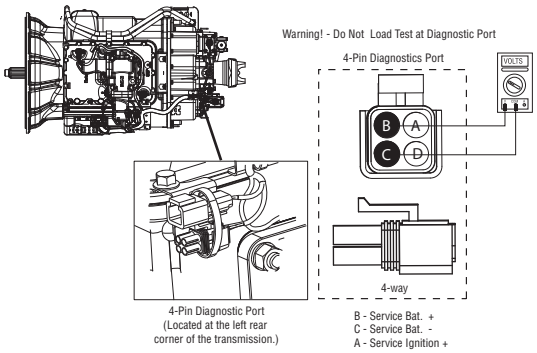
- If voltage is 0.70 volts or less, go to **Step C.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

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C

Purpose: *Measure battery voltage at 4-way diagnostic port.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.

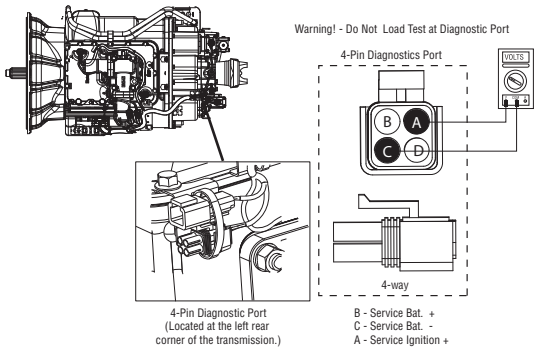


- If voltage is within 0.6 volts of battery voltage, go to **Step D.**
- If voltage is outside of rang, repair battery power supply to TECU. Fuse may be blown. Repeat test.

D

Purpose: *Measure ignition voltage at 4-way diagnostic port.*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step E.**
- If voltage is outside of range, repair ignition power supply to TECU. Fuse may be blown. Repeat test.

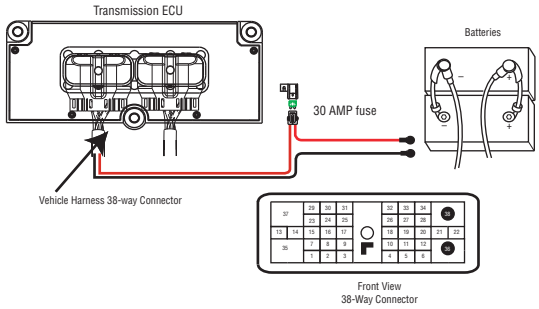
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E

Purpose: *Visually inspect batteries, inline fuse, power and ground supplies to the TECU.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Vehicle Harness 38-way.
4. Inspect main power 38-way connector terminals Pin 36 and Pin 38, in-line fuse holder, and power supply connections for integrity and corrosion.



- If no problem found, go to **Step V.**
- If problem is found, repair power/ground path for the main power supply. Go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Clean and reconnect all connectors.
3. Key on.
4. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and attempt to reset the code
6. Check for codes See “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 37 appears go to **Step A.** to find error in testing.
   - If fault code other than 37 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 41 - Range Failed to Engage

J1587: MID 130 PID 35, 36 FMI 7
J1939: SA 3 SPN 768, 769 FMI 7

Overview

This fault code indicates the transmission is unable to complete a shift across the range. The range is either stuck in high or low, or cannot complete engagement into high or low.

Detection

The transmission attempts the same range shift 5 consecutive times and determines the shift cannot be completed based on the speeds across the back box.

Fallback

This fault causes a current range fallback and the transmission stays in either low range or high range. When the vehicle comes to a stop, an attempt to shift into low range is made.

Possible Causes

This fault code can be caused by any of the following:

- Low air pressure
- Contaminated air supply
- Air leak
- Range Solenoid Valve
- Range Synchronizer
- Range Actuator / Cylinder / Piston / Yoke
- Range Cover

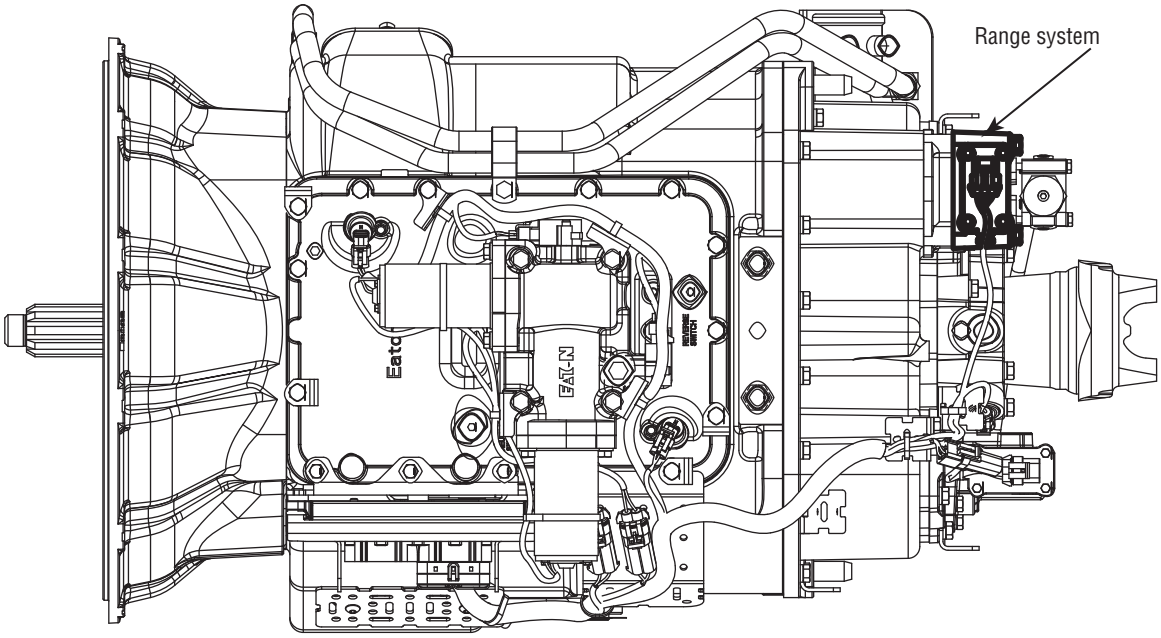
Additional Tools

- Two 0-100 PSI Air pressure gauges

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Component Identification



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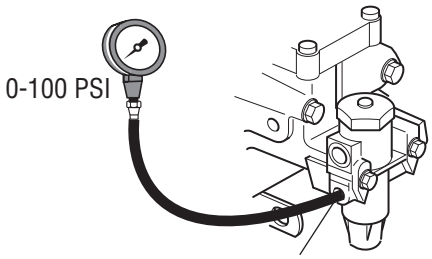
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Fault Code 41 - Range Failed to Engage

A

Purpose: *Measure vehicle air supply pressure.*

1. Key off.
2. Install a 0-100 PSI air pressure gauge in the regulated test port of the air filter/regulator.
3. Start engine and allow air pressure to build to governor cut-off.
4. Monitor the vehicle air pressure gauge on the dash.



- If air pressure cuts off at 90 to 120 PSI, go to **Step B.**
- If air pressure is outside of range, repair the air system as required. Repeat this step.

B

Purpose: *Measure vehicle maintains air supply pressure.*

1. Key off.
2. Monitor the vehicle air pressure gauge on the dash.
   - If vehicle maintains air pressure, go to **Step C.**
   - If vehicle loses air pressure, repair the air system as required. Repeat this step.

C

Purpose: *Verify air filter/regulator operation.*

1. Read air pressure gauge installed at the regulated port.
   - If air pressure is in range is 55 to 65 PSI (or 75 to 80 PSI for UltraShift PLUS LAS Models), go to **Step E.**
   - If air pressure is outside of range, go to **Step D.**

D

Purpose: *Confirm air flow to the filter regulator supply port.*

1. Remove air supply line to the air filter /regulator and check airflow.
   - If air flows from the supply line, repair Air Filter/Regulator. Go to **Step C.**
   - If air does not flow from the supply line, replace **Air Filter Regulator**. Go to **Step C.**

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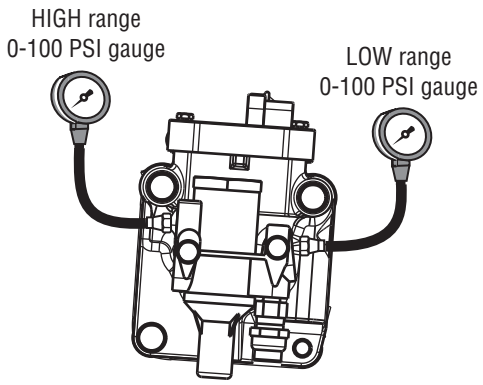
E

Purpose: *Measure low range air pressures.*

1. Key off.
2. Install two 0-100 PSI air pressure gauges into the range cover diagnostic ports.
3. Start vehicle. Allow air pressure to build to governor cut-off.
4. Turn off engine, but leave key in on position.
5. With Shift Control, select reverse, then select neutral.

   Note: Allow 5 minutes for checking the air pressure after shifting the transmission to neutral.

   Note: Monitor gear display after selecting reverse, then neutral and confirm gear position has changed in the display. A gear change is required to energize the range solenoid.



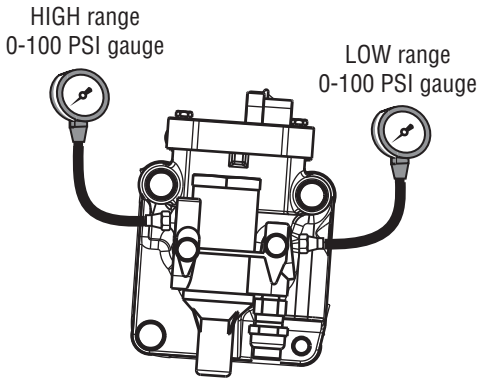
- If low range gauge is 55 to 65 PSI for Non-LAS Models (75 to 80 PSI for UltraShift PLUS LAS Models) and if high range gauge is 0 PSI, go to **Step F.**
- If air pressure gauges do not read as shown above, replace **Range Valve**. Go to **Step V.**

F

Purpose: *Measure high range air pressures.*

1. Key on.
2. With Shift Control, select the highest reverse gear available by pressing the up-shift button/arrow, then select neutral.

   Note: Monitor gear display after selecting the highest reverse gear available and confirm gear position has changed in the display. A gear change is required to energize the range solenoid.



- If high range gauge
  - 55 to 65 PSI for Non-LAS Models
  - 75 to 80 PSI for UltraShift PLUS LAS Models

  If low range gauge - 0 PSI for all others

  Repair mechanical range system as required. go to **Step V.**,
- If air pressure gauges do not read as shown above, replace **Range Valve**. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Remove all gauges.
3. Key on.
4. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and attempt to reset the code
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 41 appears go to **Step A.** to find error in testing.
   - If fault code other than 41 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 42 - Splitter Failed to Engage

J1587: MID 130 PID 37, 38 FMI 7
J1939: SA 3 SPN 770, 771 FMI 7

Overview

This fault code indicates the transmission is unable to complete a shift across the Splitter. The Splitter is either stuck in high or low, or cannot complete engagement into high or low.

Detection

The transmission attempts the same splitter shift 3 consecutive times and determines the shift cannot be completed based on the speeds across the back box.

Fallback

This fault causes a current splitter fallback and the transmission stays in either low split or high split.

Possible Causes

This fault code can be caused by any of the following:

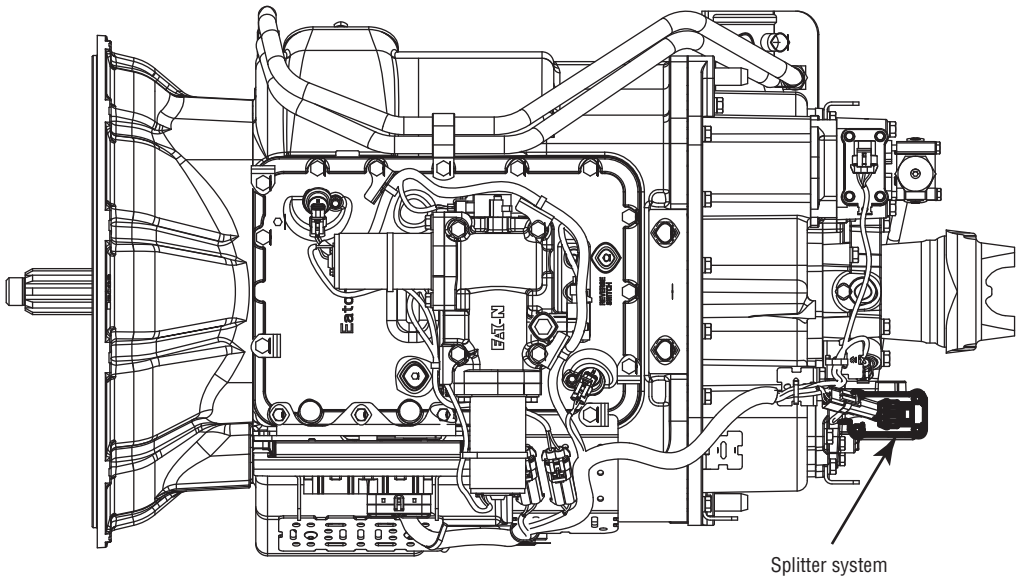
- Low air pressure
- Contaminated air supply
- Air leak
- Splitter Solenoid Valve
- Splitter Actuator / Cylinder / Piston / Yoke
- Splitter Clutch

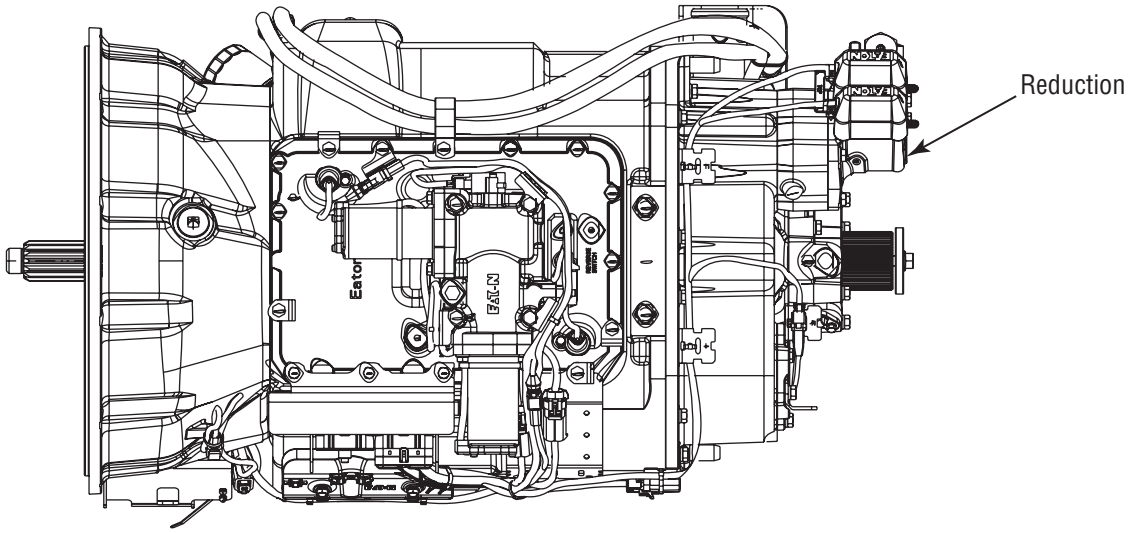
Additional Tools

- Two 0-100 PSI air pressure gauges

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Component Identification





Alternate View - Combination Cylinder Models

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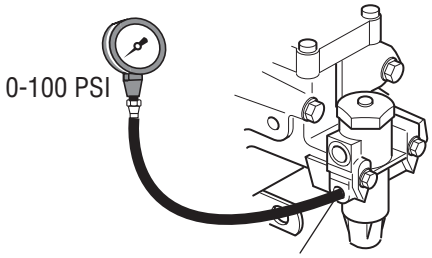
https://truckmanualshub.com/

Fault Code 42 - Splitter Failed to Engage

A

Purpose: *Measure vehicle air supply pressure.*

1. Key off.
2. Install a 0-100 PSI air pressure gauge in the regulated test port of the air filter/regulator.
3. Start engine and allow air pressure to build to governor cut-off.
4. Monitor the vehicle air pressure gauge on the dash.



- If air pressure cuts off at 90 to 120 PSI, go to **Step B.**
- If air pressure is outside of range, repair vehicle air system as required. Repeat this step.

B

Purpose: *Measure vehicle maintains air supply pressure.*

1. Key off.
2. Monitor the vehicle air pressure gauge on the dash.
   - If vehicle maintains air pressure, go to **Step C.**
   - If vehicle loses air pressure, repair vehicle air system as required. Repeat this step.

C

Purpose: *Verify air filter/regulator operation.*

1. Read air pressure gauge installed at the regulated port.
   - If air pressure is 55 to 65 PSI, go to **Step E.**
   - If air pressure is outside of range, go to **Step D.**

D

Purpose: *Confirm air flow to the filter regulator supply port.*

1. Remove air supply line to the air filter /regulator and check airflow.
   - If air flows from the supply line, replace the **Air Filter Regulator**. Go to **Step C.**
   - If air does not flow from the supply line, repair vehicle air supply to the regulator. Go to **Step C.**

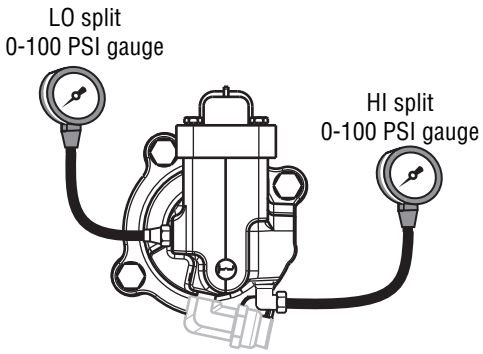
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E

Purpose: *Measure low splitter air pressures.*

1. Key off.
2. Start vehicle and allow air pressure to build to governor cut-off.
3. Turn off engine, but leave key in on position.
4. With Shift Control, select reverse (R1 in gear display for 13/18-speed), then select neutral.

   Note: Five minutes is allowed for checking the pressure after shifting the transmissions to neutral.



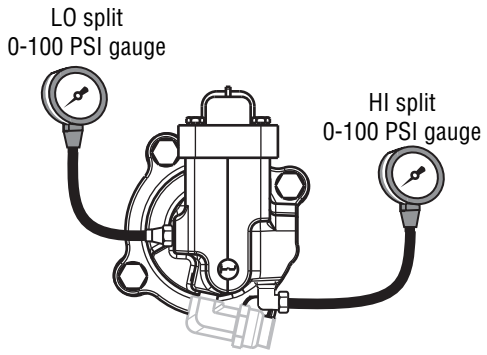
- If Low Splitter gauge is 55 to 65 PSI and high Splitter gauge is 0 PSI, go to **Step F.**
- If air pressure gauges do not read as shown above, replace the **Splitter Valve**. Go to **Step V.**

F

Purpose: *Measure high splitter air pressures.*

1. Key on.
2. With Shift Control, select reverse (R2 in the gear display 13/18-speed).

   Note: If R2 isn't displayed the up arrow button needs to be pressed.



- If High Splitter gauge is 55 to 65 PSI and Low Splitter gauge is 0 PSI, repair Mechanical Splitter system as required. Go to **Step V.**
- If air pressure gauges do not read as shown above, replace the **Splitter Valve**. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Remove all pressure gauges.
3. Key on.
4. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and attempt to reset the code
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 42 appears go to **Step A.** to find error in testing.
   - If fault code other than 42 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 43 - Range Solenoid Valve

J1587: MID 130 PID 35, 36 FMI 3, 4, 5
J1939: SA 3 SPN 768, 769 FMI 3, 4, 5

Overview

This fault code indicates an electrical failure of the solenoids that control the Range Solenoid Valve.

When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

Starting at key-on and throughout operation, the Transmission Electronic Control Unit (TECU) constantly measures this circuit. A failure mode of short to battery, short to ground or open circuit is detected.

Fallback

This fault causes a current range fallback and the transmission stays in either low range or high range. When the vehicle comes to a stop, an attempt to shift into low range is made.

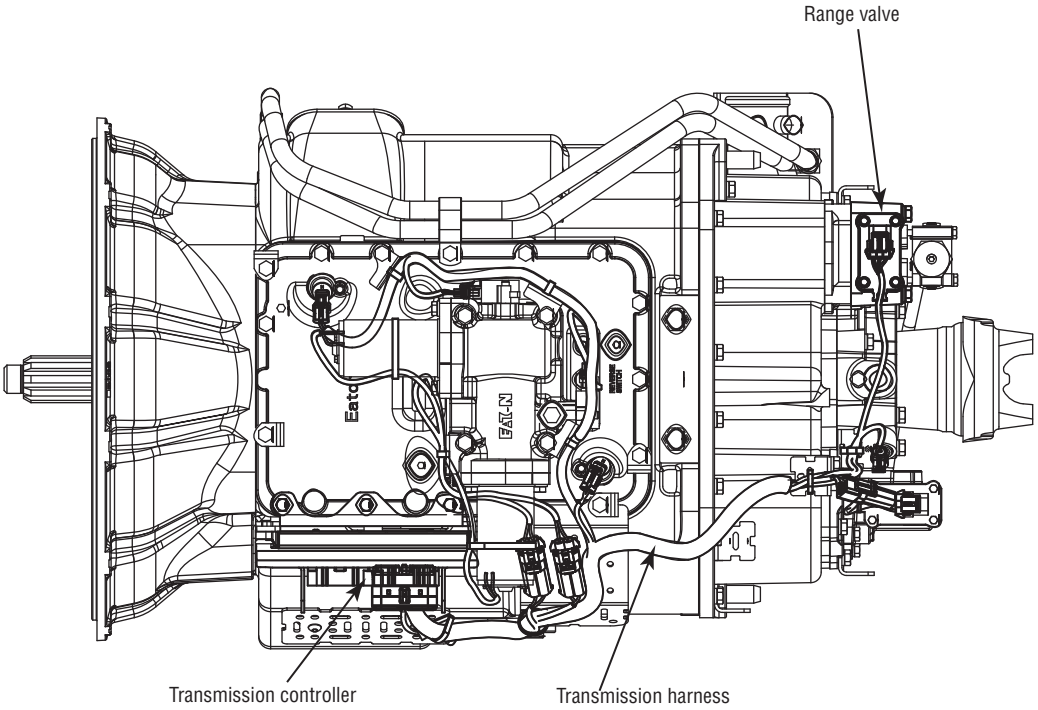
Possible Causes

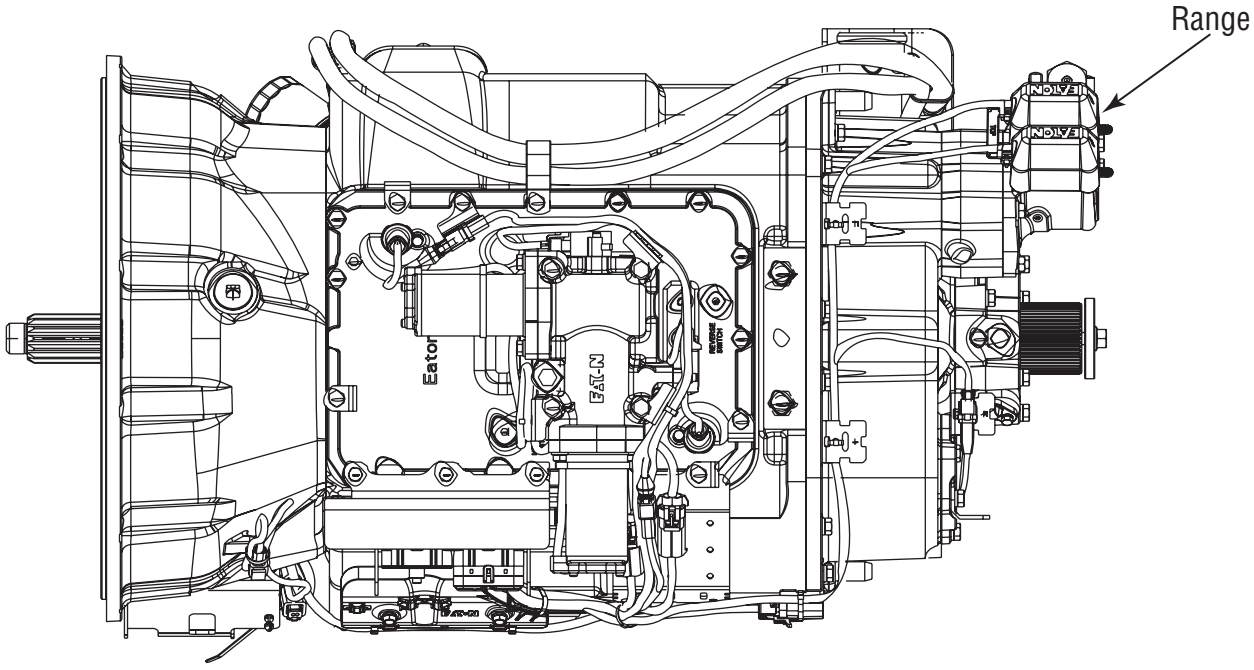
This fault code can be caused by any of the following:

- Range Solenoid Valve
- Transmission Harness
- TECU

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Component Identification





Alternate View - Combination Cylinder Models

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Fault Code 43 - Range Solenoid Valve

A

Purpose: *Measure resistance of high and low range solenoids through the Transmission Harness.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the TECU 38-way connector.
4. Measure resistance between Pin 28 and Pin 6 and between Pin 34 and Pin 6 on the Transmission Harness 38-way connector.

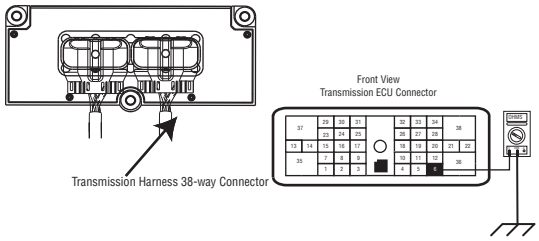
   Note: Observe polarity on Volt\Ohm Meter.

   - If resistance is 9 to 16 ohms, go to **Step B.**
   - If resistance is outside of range, go to **Step C.**

B

Purpose: *Test the Range Solenoid Valve common line for shorts to ground through the Transmission Harness.*

1. Measure resistance between the Transmission Harness 38-way connector Pin 6 and ground.



   - If resistance is OL, (if fault code is Active) replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If resistance is less than 10K ohm, go to **Step C.**

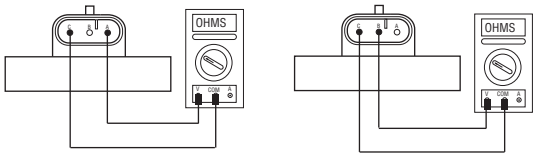
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C

Purpose: *Measure resistance of high and low range solenoids at the Range Solenoid Valve.*

1. Disconnect the Transmission Harness from Range Solenoid Valve.
2. Measure resistance between Pin A and Pin C and between Pin B and Pin C on the Range Solenoid Valve pins:

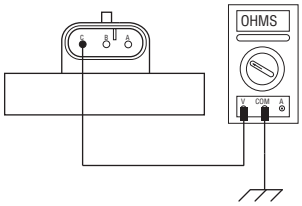


- If resistance is 9 to 16 ohms, go to **Step D.**
- If resistance is outside of range, replace the **Range Valve**. Go to **Step V.**

D

Purpose: *Test the Range Solenoid common line for shorts to ground at the Range Solenoid Valve.*

1. Measure resistance between Range Solenoid Valve Pin C and ground.



- If resistance is OL, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, replace the **Range Valve**. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and attempt to reset the code.
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 43 appears go to **Step A.** to find error in testing.
   - If code other than 43 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 44 - Inertia Brake Solenoid Coil

J1587: MID 130 SID 54 FMI 3, 4, 5
J1939: SA 3 SPN 787 FMI 3, 4, 5

Overview

This fault code indicates an electrical failure of the solenoid that controls the Inertia Brake.

When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

Starting at key-on and throughout operation, the Transmission Electronic Control Unit (TECU) constantly measures this circuit. A failure mode of a short to battery, short to ground or open circuit is detected.

Fallback

No Fallback Mode; however, if the Inertia Brake system failed, it may be difficult to engage a gear from a stop if the Inertia Brake was providing assistance (due to a dragging clutch). Also, hill shifting performance may be reduced.

Possible Causes

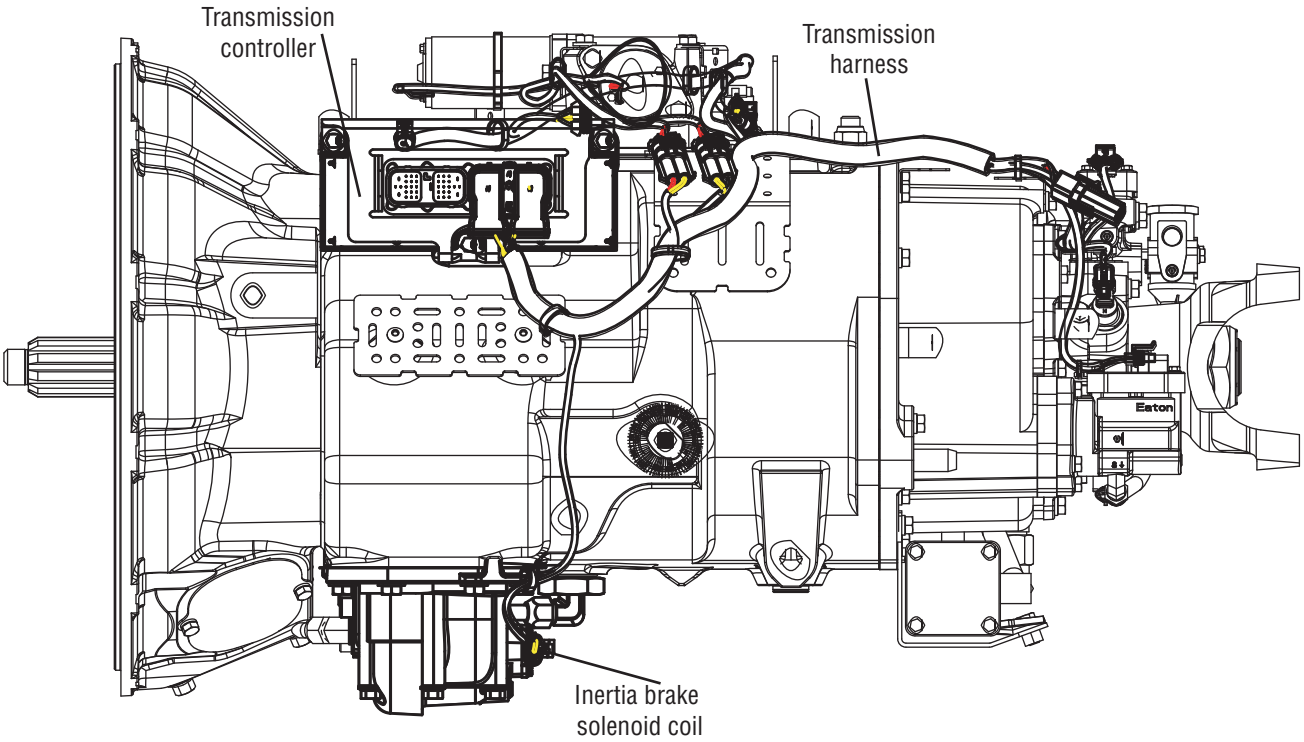
This fault code can be caused by any of the following:

- Inertia Brake Solenoid
- Transmission Harness
- TECU

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Component Identification



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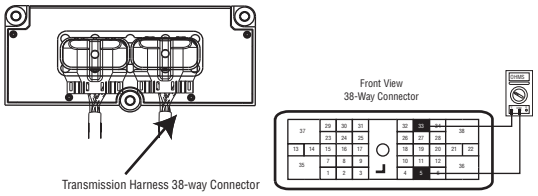
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Fault Code 44 - Inertia Brake Solenoid Coil

A

Purpose: *Measure resistance of the Inertia Brake Solenoid coil through the Transmission Harness.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Transmission Harness 38-way connector.
4. Measure resistance between the Transmission Harness 38-way connector Pin 33 and Pin 5.

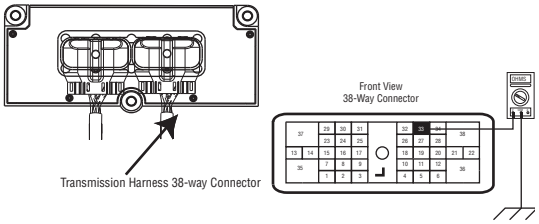


- If resistance is 2 to 6 ohms, go to **Step B.**
- If resistance is outside of range, go to **Step C.**

B

Purpose: *Test the high side solenoid coil for shorts to ground through the Transmission Harness.*

1. Measure resistance between the Transmission Harness 38-way connector Pin 33 and ground.



- If resistance is OL, (if fault code is Active) replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

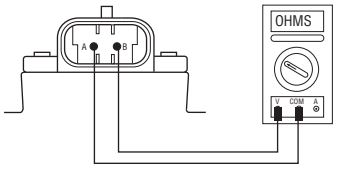
  Go to **Step V.**
- If resistance is less than 10K ohm, go to **Step C.**

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C

Purpose: *Measure resistance of the Inertia Brake Solenoid coil at the Inertia Brake.*

1. Disconnect the Transmission Harness from Inertia Brake coil.
2. Measure resistance between Inertia Brake coil Pin A and Pin B.



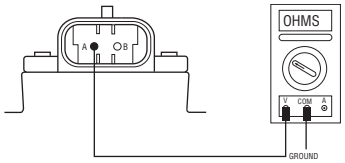
- If resistance is 2 to 6 ohms, go to **Step D.**
- If resistance is outside of range, replace the:
  - **Medium-Duty Inertia Brake**
  - **Heavy-Duty Inertia Brake**

  Go to **Step V.**

D

Purpose: *Test the solenoid coil for shorts to ground at the Inertia Brake.*

1. Measure resistance between Inertia Brake coil Pin A and ground.



- If resistance is OL, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, replace the:
  - **Medium-Duty Inertia Brake**
  - **Heavy-Duty Inertia Brake**

  Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the code.
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, Test complete.
   - If Fault Code 44 appears go to **Step A.** to find error in testing.
   - If code other than 44 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 45 - High Capacity (HCIB) Failure

J1587: MID 130 SID 54 FMI 7
J1939: SA 3 SPN 787 FMI 7

Overview

The fault code indicates that the High Capacity Inertia Brake (HCIB) is not performing as expected.

Detection

The HCIB fault sets if the Inertia Brake is unable to synchronize the transmission during an upshift.

Fallback

No Fallback Mode; however, if the Inertia Brake system has failed, it may be difficult to engage a gear from a neutral and shifting performance may be reduced.

Possible Causes

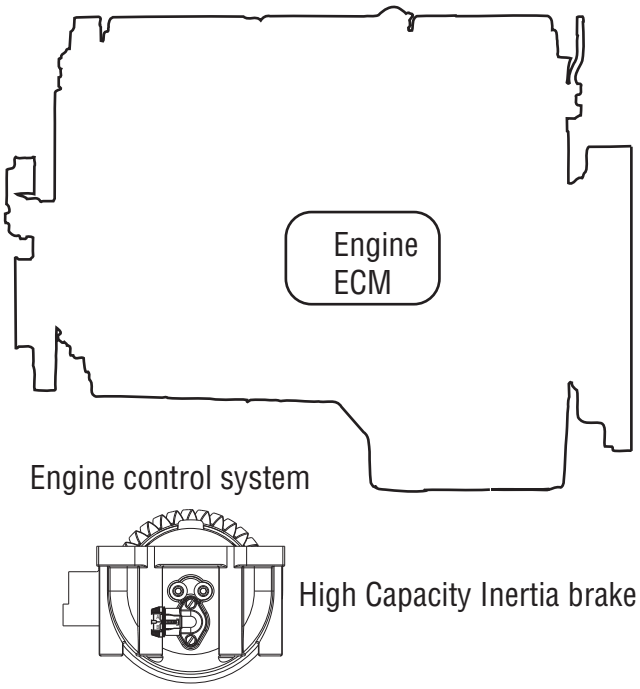
This fault code can be caused by any of the following:

- Failed HCIB

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Component Identification



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Fault Code 45 - High Capacity (HCIB) Failure

A

Purpose: *Check for active or Inactive fault codes.*

1. Key on.
2. Connect ServiceRanger.
3. Retrieve fault codes and FMIs with ServiceRanger using the 9-way diagnostic connector.
   - If Fault Code 27 or 44 are Active or Inactive, see the “Fault Code Isolation Procedure Index” on page 8
   - If Fault Code 45 is Active or Inactive, go to **Step B.**

B

Purpose: *Verify transmission model.*

1. Verify transmission model.
   - If the transmission is an UltraShift model (DM3, LST, LEP, or AW3), Replace the:
     - **Medium-Duty Inertia Brake**
     - **Heavy-Duty Inertia Brake**

     Go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Reconnect all connectors and verify that all components are properly installed.
3. Key on.
4. Clear codes, See “Fault Code Retrieval/Clearing” on page 5.
5. Drive vehicle and verify proper transmission operation. Attempt to reset the code.
6. Check for fault codes, See “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 45 appears go to **Step A.** to find error in testing.
   - If code other than 45 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 46 - Splitter Direct and Indirect Solenoid Valve

J1587: MID 130 SID 37, 38 FMI 3, 4, 5
J1939: SA 3 SPN 770, 771 FMI 3, 4, 5

Overview

This fault code indicates an electrical failure of the solenoids that control the Splitter Solenoid Valve.

When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

Starting at key-on and throughout operation, the Transmission Electronic Control Unit (TECU) constantly measures this circuit. Depending on the reading, a failure mode of short to battery, short to ground or open circuit is detected.

Fallback

This fault causes a current splitter fallback and the transmission stays in either low split or high split.

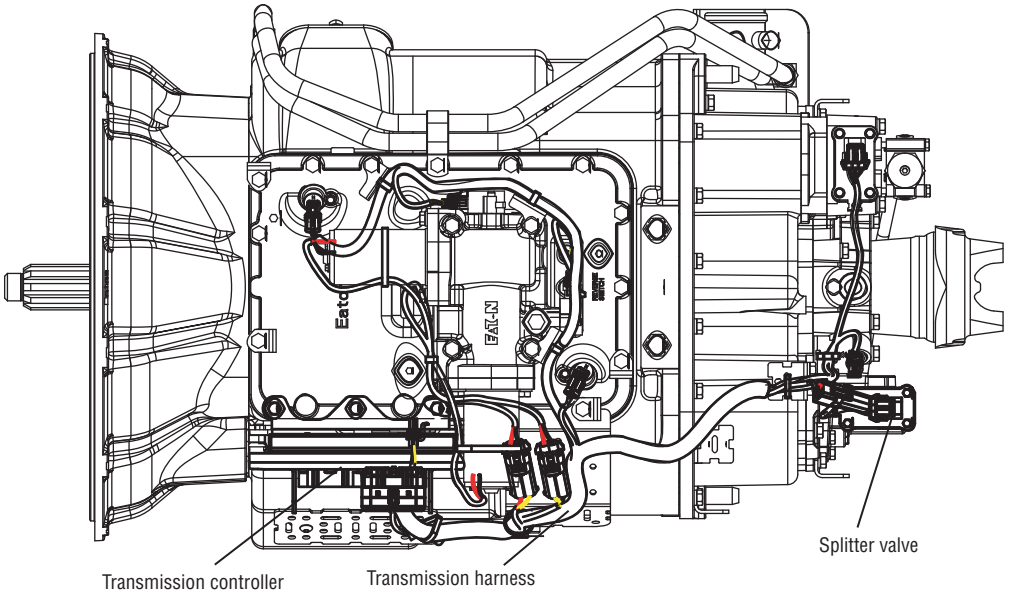
Possible Causes

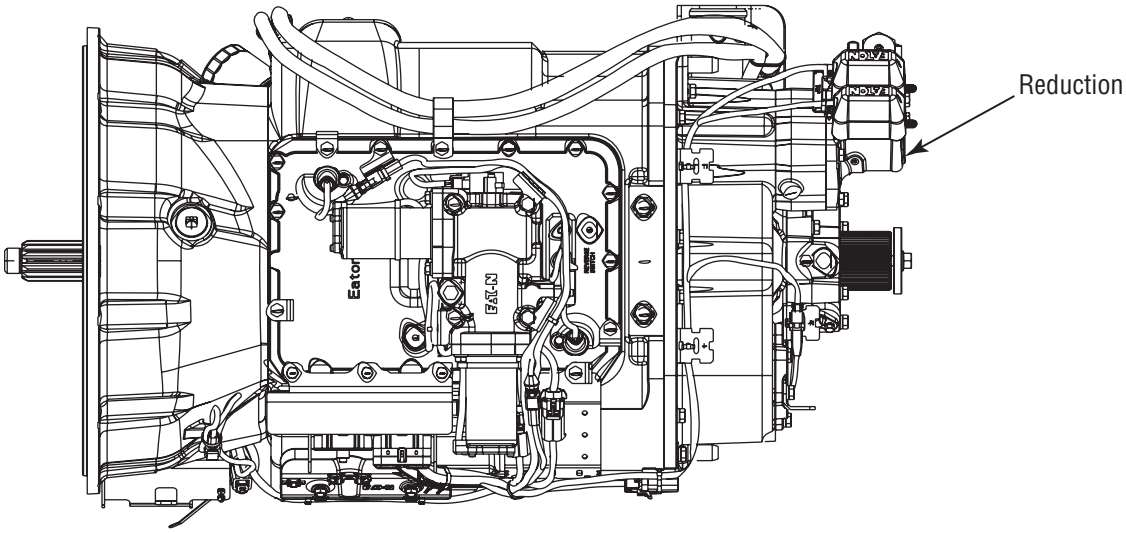
This fault code can be caused by any of the following:

- Splitter Solenoid Valve
- Transmission Harness
- TECU

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Component Identification





Alternate View - Combination Cylinder Models

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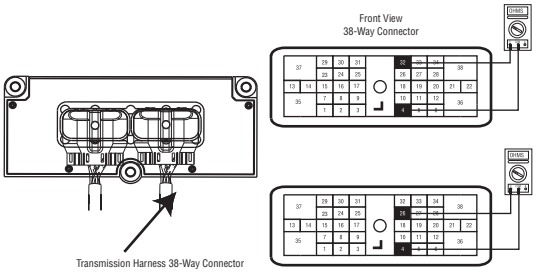
https://truckmanualshub.com/

Fault Code 46 - Splitter Direct Solenoid Valve

A

Purpose: *Measure resistance of the high and low splitter solenoids through the Transmission Harness*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Transmission Harness 38-way connector.
4. Measure resistance between the Transmission Harness 38-way connector pins:
   - 32 and 4
   - 26 and 4

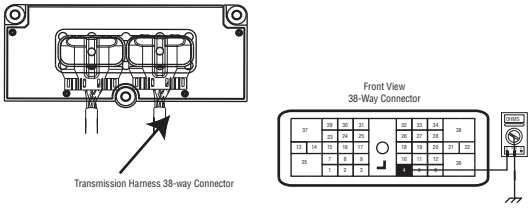


- If resistance is 9 to 16 ohms, go to **Step B.**
- If resistance is outside of range, go to **Step C.**.

B

Purpose: *Test the Splitter Solenoid Valve common line for shorts to ground through the Transmission Harness.*

1. Measure resistance between the Transmission Harness 38-way connector Pin 4 and ground.



- If resistance is OL, (if fault code is Active) replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

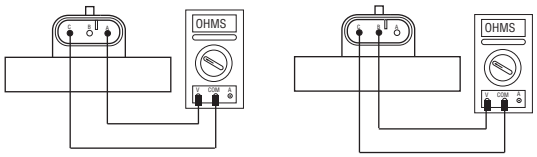
  Go to **Step V.**
- If resistance is less than 10K ohm, go to **Step C.**

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C

Purpose: *Measure resistance of the high and low splitter solenoids at the Splitter Solenoid Valve.*

1. Disconnect the Transmission Harness from Splitter Solenoid Valve.
2. Measure resistance between Splitter Solenoid Valve pins:
   - A and C
   - B and C

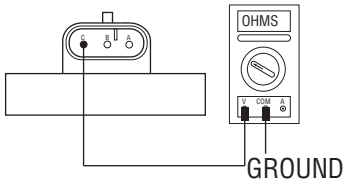


- If resistance is 9 to 16 ohms, go to **Step D.**
- If resistance is outside of range, replace the **Splitter Valve**. Go to **Step V.**

D

Purpose: *Test the Splitter Solenoid Valve common line for shorts to ground.*

1. Measure resistance between Splitter Solenoid Valve Pin C and ground.



- If resistance is OL, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, replace the **Splitter Valve** and go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the code.
6. Check for codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no codes, test complete.
   - If Fault Code 46 appears go to **Step A.** to find error in testing.
   - If code other than 46 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 51 - Rail Position Sensor

J1587: MID 130 SID 60 FMI 2, 3, 4, 10
J1939: SA 3 SPN 60 FMI 2, 3, 4, 10

Overview

This fault code indicates an electrical failure of the Rail Select Sensor or mechanical failure on the Electric Shifter.

The transmission controller supplies sensor power to the Electric Shifter position sensors and uses the reported sensor position to determine gear finger location. There are 4 fault conditions defined by the reported FMI via ServiceRanger software.

This fault will not be set if a System Battery Voltage Low fault (Fault Code 33) is active.

Detection

Starting at key-on and throughout operation, the transmission controller constantly monitors the position of the sensor. If a failure condition is detected, the fault code is set.

Conditions to Set Fault Code Active

- FMI 2 - The transmission controller detects the rail sensor voltage is outside the 10-90% range for 1 second or longer.
- FMI 3 - The transmission controller detects the rail sensor supply voltage is 5% above the expected supply voltage for 1 second or longer.
- FMI 4 - The transmission controller detects the rail sensor supply voltage is 5% below the expected supply voltage for 1 second or longer.
- FMI 10 - The transmission controller detects the rail sensor signal moving more than +/- 0.093" (2%) when the rail motor is turned off in gear.

Fallback

Fallback mode During Power-Up

- The transmission will power-up and may not be able to confirm neutral, no start gears can be selected.
- Unit may not crank. An equal sign will appear in the display.

Fallback Mode During Operation

- The transmission remains in its current gear. An F may appear in the gear display.
- The service light will blink.
- Until the fault is cleared, driver may have to shut off engine in gear.
- Will not upshift, downshift nor shift into neutral.

Conditions to Set Fault Code Inactive

- FMI 2 - The fault becomes Inactive when the transmission controller detects the rail sensor output voltage is within 10% - 90% for 1 second or longer.
- FMI 3, 4 - The fault becomes Inactive when the transmission controller detects the rail sensor supply is within +/- 5% of the expected voltage.
- FMI 10 - The rail position is within + / - 0.093" (2%) of when the shift state went idle.

Possible Causes

This fault code can be caused by any of the following:

FMI 2, 4, 10:

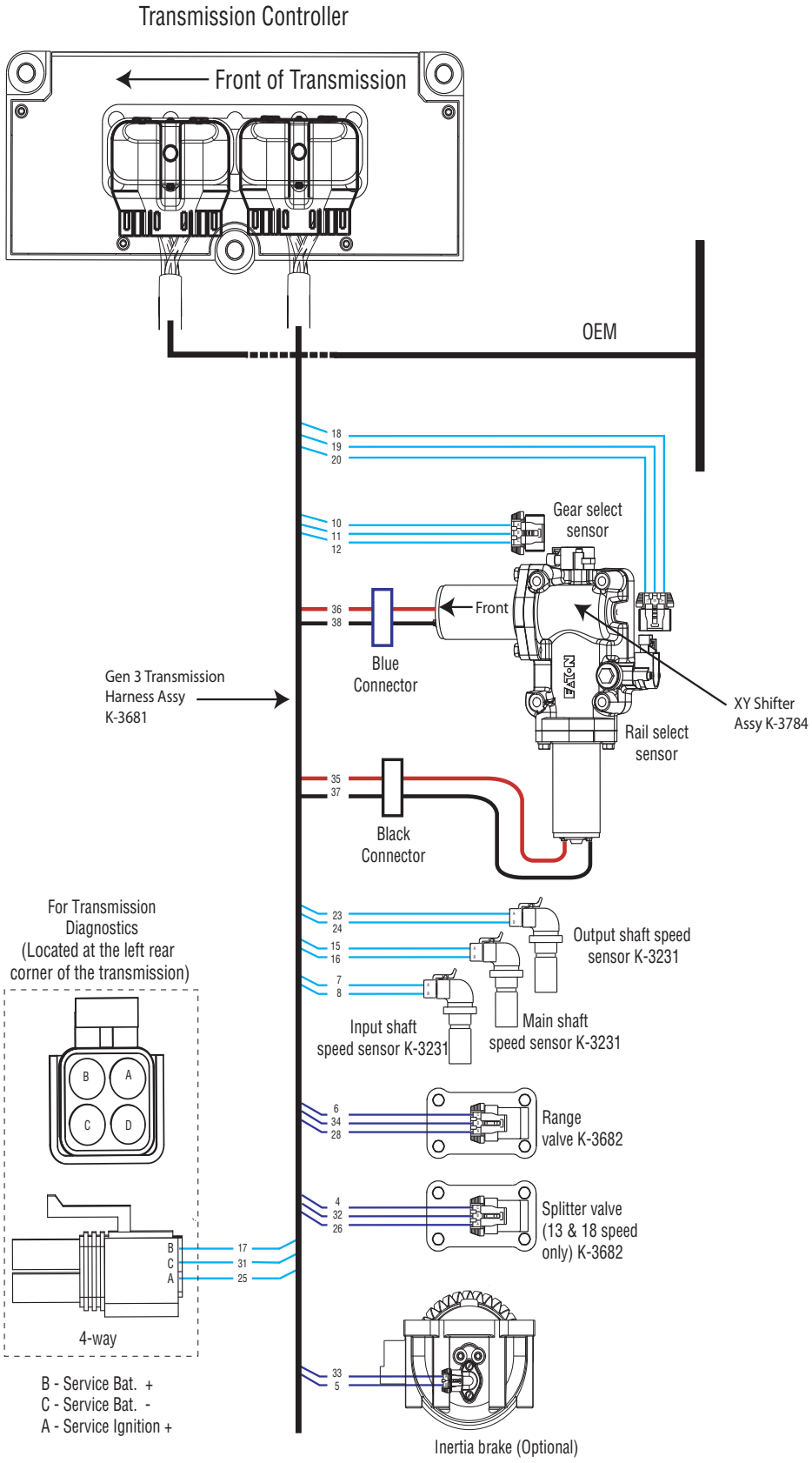
- Transmission Harness - Connections and wires between the transmission controller and the rail sensor may be loose or damaged, terminals and wires may be bent, burnt or wires may be grounded, open or shorted.
- Electric Shifter - The rail sensor may have been damaged or malfunctioned.

FMI 3:

- Transmission Controller - The transmission controller may have been damaged or malfunctioned.

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Component Identification



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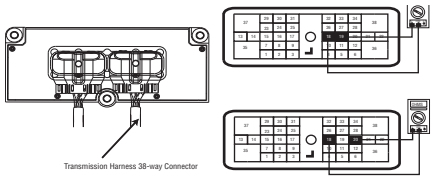
Fault Code 51 - Rail Position Sensor

A

Purpose: *Measure resistance of the Rail Position Sensors through the Transmission Harness.*

1. If the fault code is Inactive put unit in PDM mode and perform the wire wiggle test. Check the overall harness connections to sensor. If a tone is heard and/or a fault code appears in the gear display, the Fault Code Isolation Procedure Index.
2. Key off.
3. Disconnect negative battery cable.
4. Disconnect the Transmission Harness 38-way connector.
5. Measure resistance between Pin 18 and Pin 19 and between Pin 18 and Pin 20 on the Transmission Harness 38-way connector.

   Note: An Auto Ranging Digital Volt/Ohm Meter must be used.
6. Measure resistance of the Rail Position Sensors through the Transmission Harness.

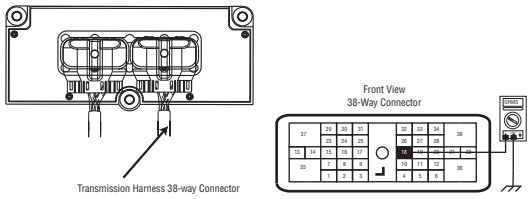


- If resistance between Pin 18 and Pin 19 is 100 to 200 ohms and between Pin 18 and Pin 20 resistance is 5K to 7K ohm, go to **Step B.**
- If any of the above conditions are not met, go to **Step C.**

B

Purpose: *Test the Rail Position Sensor Plus line for shorts to ground through the Transmission Harness.*

1. Measure resistance between Transmission Harness 38-way connector Pin 18 to ground.



- If resistance is OL, Reconnect 38-way connector, (if fault code is Active) replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**
- If FMI 2, 3, 4, or 10 is present with an Inactive code, replace the **Electric Shifter** and the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**
- If resistance is less than 10K ohm, go to **Step C.**

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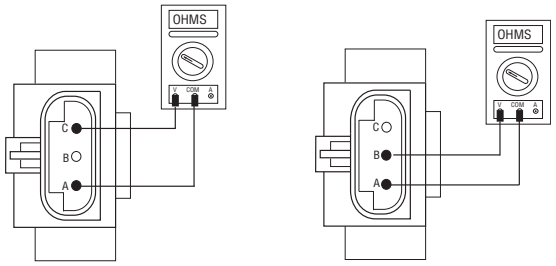
https://truckmanualshub.com/

C

Purpose: *Measure resistance of the Rail Position Sensor.*

1. Disconnect Transmission Harness from Rail Select Sensor.
2. Measure resistance between Pin A and Pin C and between Pin A and Pin B on the Rail Select Sensor.

   Note: An Auto Ranging Digital Volt/Ohm Meter must be used.

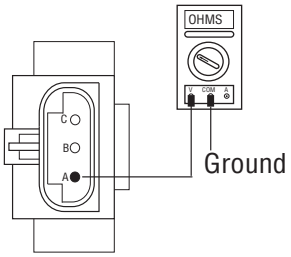


- If resistance between Pin A and Pin C is 5K to 7K and between Pin A and Pin B is 100 to 200 ohms, go to **Step D.**
- If any of the above conditions are not met, replace the **Electric Shifter**. Go to **Step V.**

D

Purpose: *Test the Rail Position Sensor Plus line for shorts to ground.*

1. Measure resistance between Rail Select Sensor Pin A and ground.



- If resistance is OL, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, replace the **Electric Shifter**. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Key on.
4. Clear codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the code.
6. Check for fault codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 51 appears go to **Step A.** to find error in testing.
   - If code other than 51 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 52 - Gear Position Sensor

J1587: MID 130 SID 59 FMI 2, 3, 4, 7
J1939: SA 3 SPN 59 FMI 2, 3, 4, 7

Overview

This fault code indicates an electrical failure of the Rail Select Sensor or mechanical failure on the Electric Shifter.

The transmission controller supplies sensor power to the Electric Shifter position sensors and uses the reported sensor position to determine gear finger location. There are 4 fault conditions defined by the reported FMI via ServiceRanger software.

This fault will not be set if a System Battery Voltage Low fault (Fault Code 33) is Active.

Detection

Starting at key-on and throughout operation, the transmission controller constantly monitors the position of the sensor. If a failure condition is detected, the fault code is set.

Conditions to Set Fault Code Active

Conditions to Set the Fault Code Active

- FMI 2 - The transmission controller detects the gear sensor voltage is outside the 10-90% range for 1 second or longer.
- FMI 3 - The transmission controller detects the gear sensor supply voltage is 5% above the expected supply voltage for 1 second or longer.
- FMI 4 - The transmission controller detects the gear sensor supply voltage is 5% below the expected supply voltage for 1 second or longer.

Fallback

Fallback mode During Power-Up

- The transmission will power-up and may not be able to confirm neutral, no start gears can be selected.
- Unit may not crank. An equal sign may appear in the display.

Fallback Mode During Operation

- The transmission remains in its current gear. An F may appear in the gear display.
- The service light will blink.
- Until the fault is cleared, driver may have to shut off engine in gear.
- Will not upshift, downshift nor shift to neutral.

Conditions to Set Fault Code Inactive

Conditions to Set the Fault Inactive

- FMI 2 - The fault becomes Inactive when the transmission controller detects the gear sensor output voltage is within 10% - 90% for 1 second or longer.
- FMI 3, 4 - The fault becomes Inactive when the transmission controller detects the gear sensor supply is within +/- 5% of the expected voltage.
- FMI 7 - Shift finger is beyond maximum engagement.

Possible Causes

This fault code can be caused by any of the following:

FMI 2, 4:

- Transmission Harness - Connections and wires between the transmission controller and the rail sensor may be loose or damaged, terminals and wires may be bent, burnt or wires may be grounded, open, or shorted.
- Electric Shifter - The rail sensor may have been damaged or malfunctioned.

FMI 3:

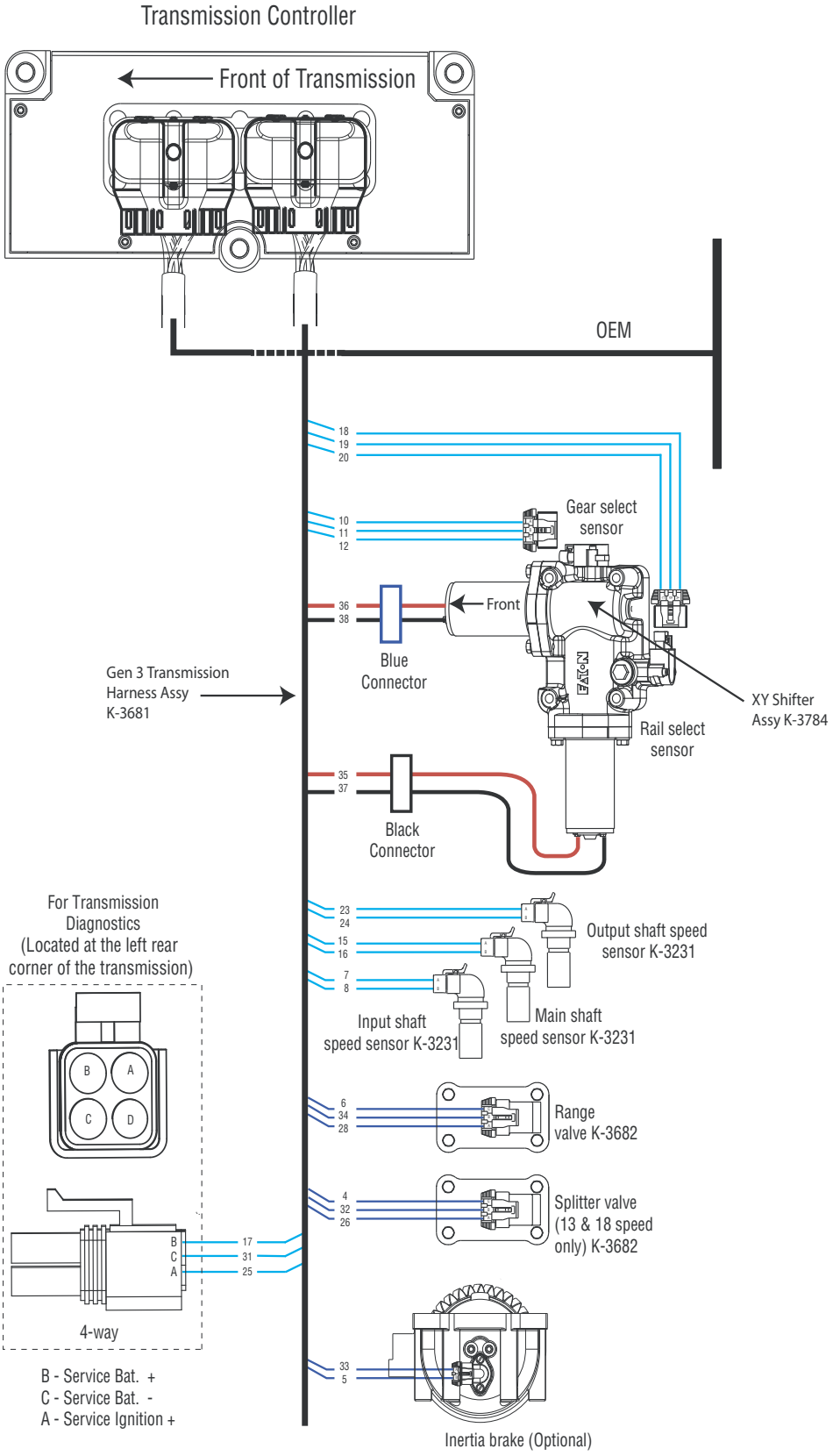
- Transmission Controller - The transmission controller may have been damaged or malfunctioned.

FMI 7:

- Electric Shifter - Possible broken shift finger.

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Component Identification



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Fault Code 52 - Gear Position Sensor

A

Purpose: *Measure resistance of the Gear Position Sensor through the Transmission Harness*

1. If the fault code is Inactive, see “Product Diagnostic (PD) Mode” on page 11. Perform the wire wiggle test. Check the overall harness connections to sensor. If a tone is heard and/or a fault code appears in the gear display, see “Fault Code Isolation Procedure Index” on page 8..
2. Key off.
3. Disconnect negative battery cable.
4. Disconnect the Transmission Harness 38-way connector.
5. Measure resistance between Transmission Harness 38-way connector pins:
   - 10 and 11
   - 10 and 12

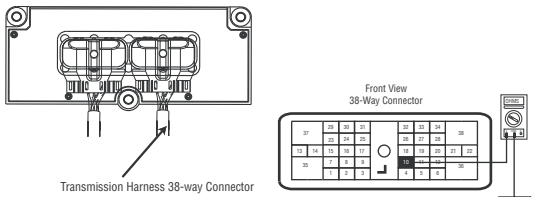
   Note: An Auto Ranging Digital Volt/Ohm Meter must be used.

   - If resistance between Pin 10 and Pin 11 is 100 to 200 ohms and between Pin 10 and Pin 12 is 5K to 7K ohm, go to **Step B.**
   - If any of the above conditions are not met, go to **Step C.**

B

Purpose: *Test the Gear Position Sensor Plus line for shorts to ground through the Transmission Harness.*

1. Measure resistance between Transmission Harness 38-way connector Pin 10 to ground.



   - If resistance is OL, reconnect 38-way connector, (if fault code is Active.) replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**
   - If FMI 2, 3, or 4 is present with an Inactive code, replace the **Electric Shifter** and the:
     - **Medium-Duty Transmission Harness**
     - **Heavy-Duty Transmission Harness**
   - If FMI 7 is present, remove **Electric Shifter** to inspect for a broken shift finger. If the shift finger is broken, replace the **Electric Shifter**.
   - If resistance is less than 10K ohm, go to **Step C.**

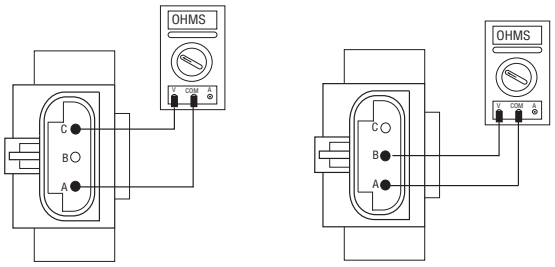
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C

Purpose: *Measure resistance of the Gear Position Sensor.*

1. Disconnect Transmission Harness from Gear Select Sensor.
2. Measure resistance between Gear Select Sensor pins:
   - A and C
   - A and B

   Note: An Auto Ranging Digital Volt/Ohm Meter must be used.

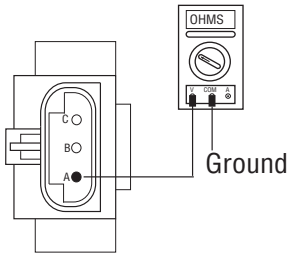


- If Pin A and Pin C resistance is 5K to 7K ohm and if Pin A and Pin B resistance is 100 to 200 ohms, go to **Step D.**
- If any of the above conditions are not met, replace **Electric Shifter**. Go to **Step V.**

D

Purpose: *Test the Gear Position Sensor Plus line for shorts to ground.*

1. Measure resistance between Gear Select Sensor Pin A and ground.



- If resistance is OL, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, replace **Electric Shifter**. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Key on.
4. Clear fault codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the fault code.
6. Check for fault codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 52 appears, go to **Step A.** to find error in testing.
   - If code other than 52 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 56 - Input Shaft Speed Sensor

J1587: MID 130 PID 161 FMI 2, 3, 4, 5, 10
J1939: SA 3 SPN 161 FMI 2, 3, 4, 5, 10

Overview

This fault code indicates an electrical problem in the Input Shaft Speed Sensor circuit. The signal from the sensor did not match the current operating conditions.

When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

A speed sensor is determined faulty when all the speed sensor readings are compared and one sensor is inconsistent, or the sensor is shorted to power or ground.

Fallback

This fault causes an in-place fallback. If the Input Shaft Speed Sensor fails before power-up, the transmission is unable to engage a gear.

Possible Causes

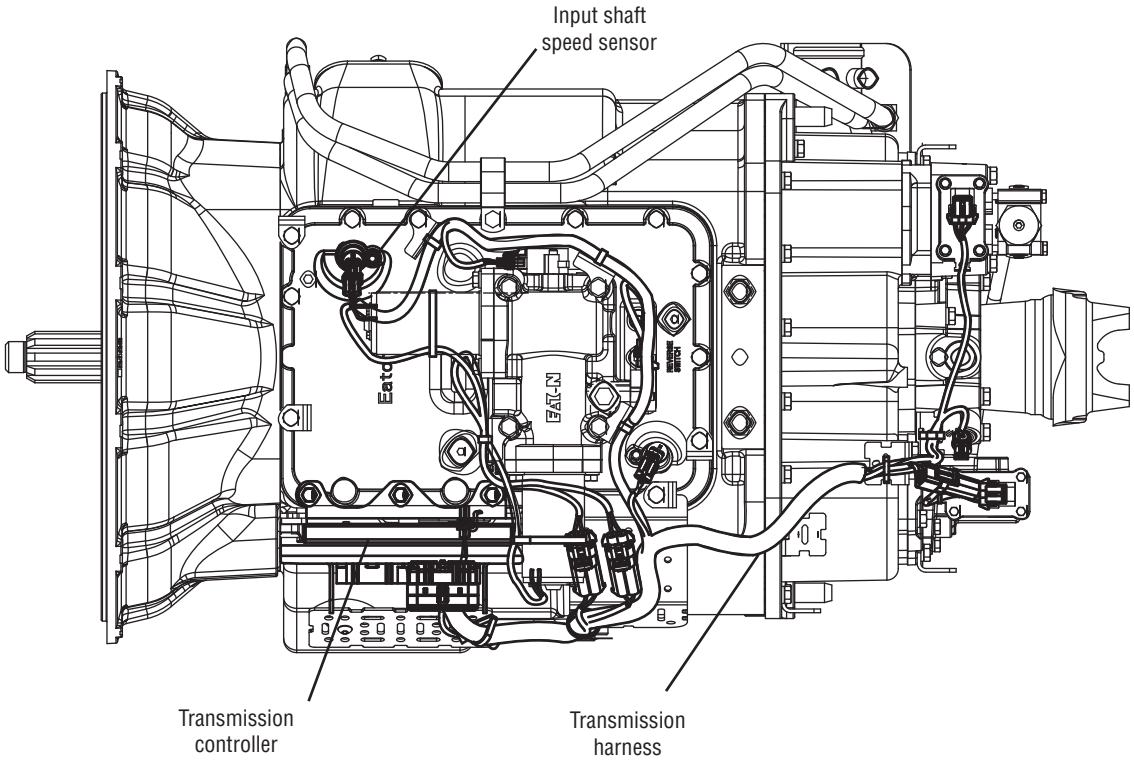
This fault code can be caused by any of the following:

- Transmission Harness
- Input Shaft Speed Sensor
- Various Transmission Components
- Transmission Electronic Control Unit (TECU)

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Component Identification



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Fault Code 56 - Input Shaft Speed Sensor

A

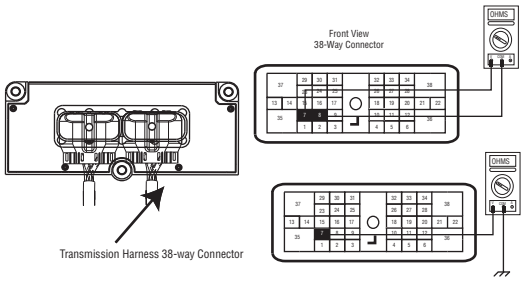
Purpose: *Monitor engine speed and Input Shaft speed in ServiceRanger.*

1. Drive vehicle and monitor engine RPM and Input Shaft RPM with ServiceRanger.
   - If engine RPM and Input Shaft RPM are the same, and code is not active during test drive, test complete.
   - If Input Shaft RPM is erratic or varies from engine RPM, go to **Step B.**

B

Purpose: *Measure Input Shaft Speed Sensor resistance and test for short through the Transmission Harness.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Transmission Harness 38-way connector.
4. Measure resistance between the Transmission Harness 38-way connector pins:
   - 7 and 8
   - 7 and ground



- If resistance between Pin 7 and Pin 8 is 2K to 4.5K ohm and Pin 7 to ground is OL, go to **Step C.**
- If resistance is outside of the range, go to **Step D.**

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C

Purpose: *Visually inspect Input Shaft Speed Sensor.*

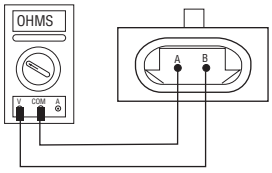
1. Inspect Input Shaft Speed Sensor for contamination or damage.
   - If no problem found, (if fault code is Active) replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If problem found or you were sent here from Step D or E, replace Input Shaft Speed Sensor and inspect the upper countershaft PTO gear for damage and go to **Step V.**

D

Purpose: *Measure Input Shaft Speed Sensor resistance at the Input Shaft Speed Sensor.*

1. Disconnect the Transmission Harness from Input Shaft Speed Sensor.
2. Measure resistance between Input Shaft Speed Sensor Pin A and Pin B.

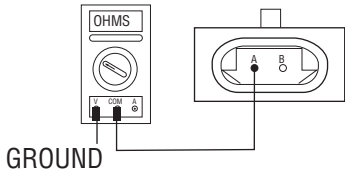


   - If resistance is 2K to 4.5K ohm, go to **Step E.**
   - If resistance is outside of range, go to **Step C.**

E

Purpose: *Test Input Shaft Speed Sensor for shorts to ground.*

1. Measure resistance between Input Shaft Speed Sensor Pin A and ground.



   - If resistance is OL, replace the:
     - **Medium-Duty Transmission Harness**
     - **Heavy-Duty Transmission Harness**

     Go to **Step V.**
   - If resistance is less than 10K ohm, go to **Step C.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Verify proper installation of speed sensor.
4. Key on.
5. Clear fault codes. See “Fault Code Retrieval/Clearing” on page 5.
6. Drive the vehicle and attempt to reset the fault code.
7. Check for fault codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no fault code, test complete.
   - If Fault Code 56 appears, go to **Step A.** to find error in testing,
   - If fault code other than 56 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 57 - Main Shaft Speed Sensor

J1587: MID 130 PID 160 FMI 2, 3, 4, 5
J1939: SA 3 SPN 160 FMI 2, 3, 4, 5

Overview

This fault code indicates an electrical problem in the Main Shaft Speed Sensor circuit. The signal from the sensor did not match the current operating conditions

When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

A speed sensor is determined faulty when all the speed sensor readings are compared and one sensor is inconsistent, or the sensor is shorted to power or ground.

Fallback

This fault causes an In-Place fallback mode.

Possible Causes

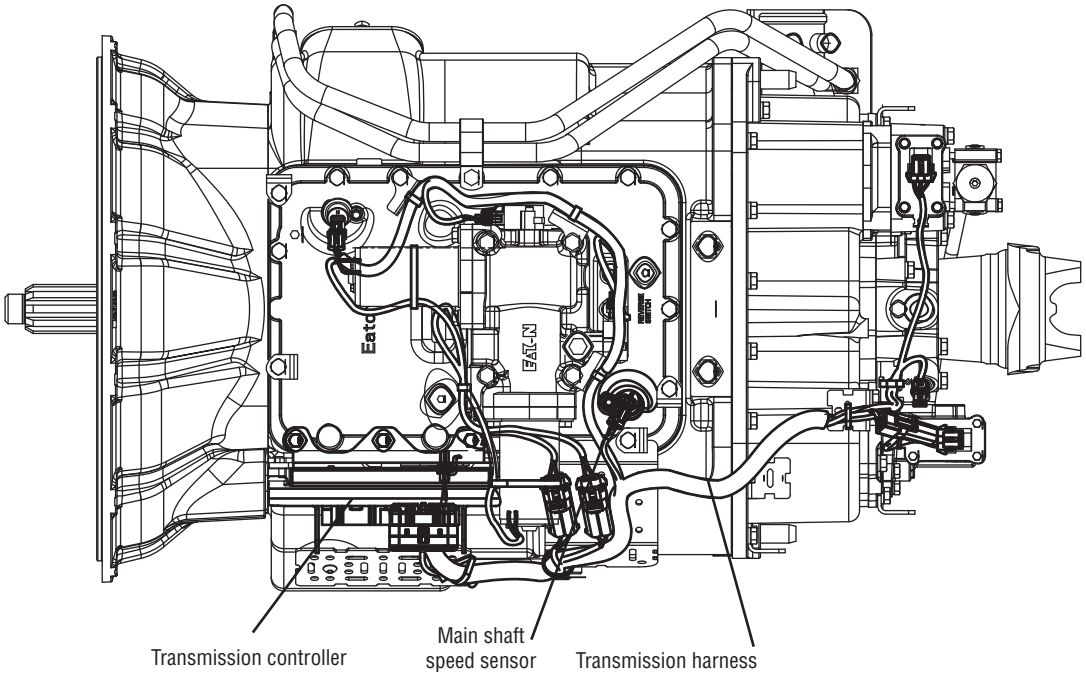
This fault code can be caused by any of the following:

- Transmission Harness
- Main Shaft Speed Sensor
- Various transmission components
- Transmission Electronic Control Unit (TECU)

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Component Identification



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Fault Code 57 - Main Shaft Speed Sensor

A

Purpose: *Measure Main Shaft Speed Sensor resistance, test for short to ground through the Transmission Harness*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Transmission Harness 38-way connector
4. Measure resistance between the Transmission Harness 38-way connector pins:
   - 15 and 16
   - 15 and ground
   - If resistance between Pin 15 and Pin 16 is 2k to 4.5K ohm and between Pin 15 to ground is OL, go to **Step B.**
   - If resistance is outside of the range, go to **Step C.**

B

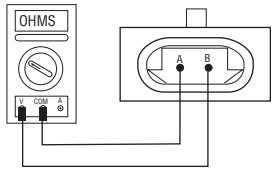
Purpose: *Visually inspect the Main Shaft Speed Sensor for contamination and damage.*

1. Inspect Main Shaft Speed Sensor for contamination or damage.
   - If no problem found, replace TECU (only if fault code is Active) and go to **Step V.**
   - If problem is found or you were sent here from Step C or D, replace Main Shaft Speed Sensor and inspect the upper reverse idler gear for damage and go to **Step V.**

C

Purpose: *Measure Main Shaft Speed Sensor resistance.*

1. Disconnect the Transmission Harness from the Main Shaft Speed Sensor.
2. Measure resistance between the Main Shaft Speed Sensor Pin A and Pin B.



   - If resistance is 2K to 4.5K ohm, go to **Step D.**
   - If resistance is outside of range, go to **Step B.**

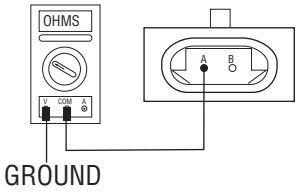
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D

Purpose: *Test Main Shaft Speed Sensor for shorts to ground.*

1. Measure resistance between Main Shaft Speed Sensor Pin A and ground.



- If resistance is OL, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, go to **Step B.**

V

Purpose: *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Verify proper installation of speed sensor.
4. Key on.
5. Clear codes. See “Fault Code Retrieval/Clearing” on page 5.
6. Drive the vehicle and attempt to reset the fault code.
7. Check for fault codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 57 appears, find error in testing go to **Step A.**
   - If fault code other than 57 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 58 - Output Shaft Speed Sensor

J1587: MID 130 PID 191 FMI 2, 3, 4, 5, 6, 8
J1939: SA 3 SPN 191 FMI 2, 3, 4, 5, 6, 8

Overview

This fault code indicates an electrical problem in the Output Shaft Speed Sensor circuit. The signal from the sensor did not match the current operating conditions

When troubleshooting an Inactive code See “Product Diagnostic (PD) Mode” on page 11.

Detection

A speed sensor is determined faulty when all the speed sensor readings are compared and one sensor is inconsistent, the sensor is shorted to power or ground, a grounded circuit is detected, or if an abnormal frequency is detected.

Fallback

This fault causes an In-Place fallback.

Possible Causes

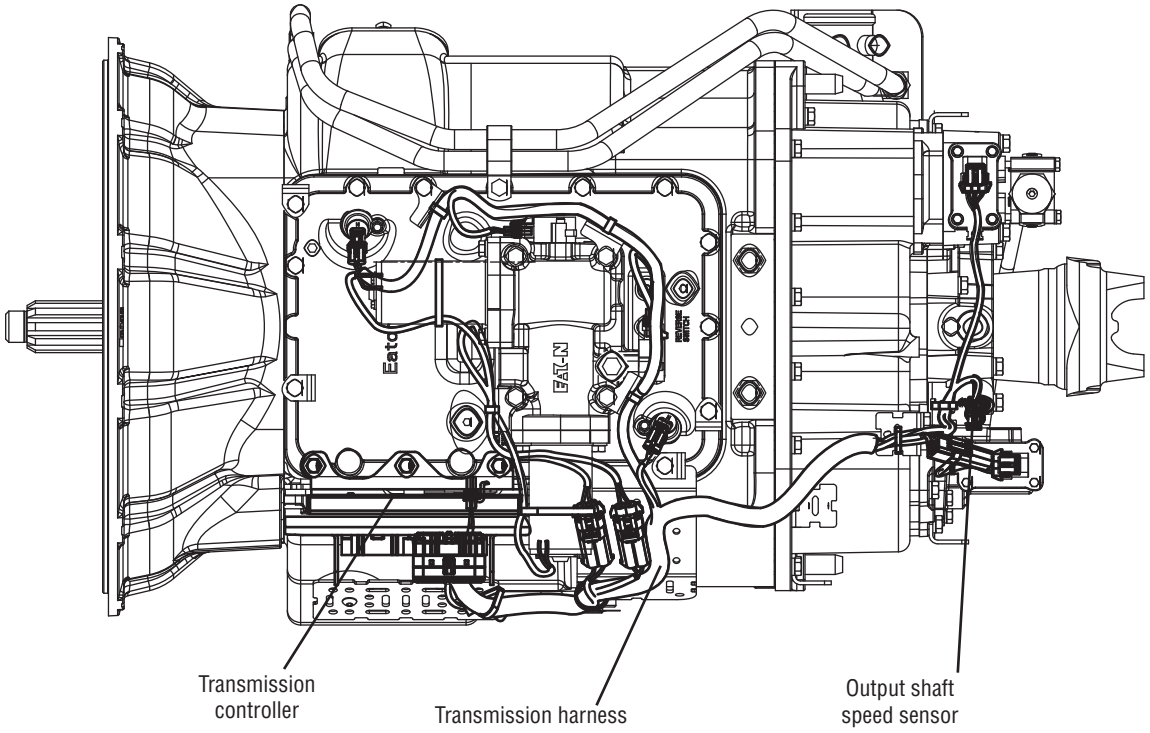
This fault code can be caused by any of the following:

- Transmission Harness
- Output Shaft Speed Sensor
- Various transmission components
- Transmission Electronic Control Unit (TECU)
- Failed or loose Tone Wheel

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Component Identification



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Fault Code 58 - Output Shaft Speed Sensor

A

Purpose: *Measure Output Shaft Speed Sensor resistance and test for short to ground through Transmission Harness.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Transmission Harness 38-way connector.
4. Measure resistance between the Transmission Harness 38-way connector pins:
   - 23 and 24
   - 23 and ground
     - If resistance between Pin 23 and Pin 24 is 2K to 4.5K ohm and between Pin 23 to ground is OL, go to **Step B.**
     - If resistance is outside of the range, go to **Step C.**

B

Purpose: *Visually inspect Output Shaft Speed sensor for contamination and damage.*

1. Inspect Output Shaft Speed Sensor for contamination or damage.
   - If no problem found, (if fault code is Active) replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     go to **Step V.**
   - If problem is found or you were sent here from Step C or D, replace the:
     - **Medium-Duty Output Shaft Speed Sensor**
     - **Heavy-Duty Output Shaft Speed Sensor**

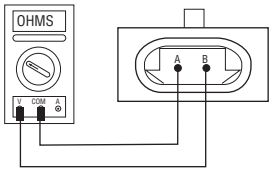
     Inspect the tone wheel for damage, looseness or corrosion. Go to **Step V.**

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C

Purpose: *Measure Output Shaft Speed Sensor resistance.*

1. Disconnect the Transmission Harness from the Output Shaft Speed Sensor.
2. Measure resistance between Output Shaft Speed Sensor Pin A and Pin B.

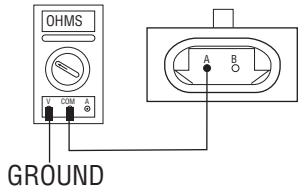


- If resistance is 2K to 4.5K ohm, go to **Step D.**
- If resistance is outside of range, go to **Step B.**

D

Purpose: *Test for shorts to ground of the Output Shaft Speed sensor.*

1. Measure resistance between Output Shaft Speed Sensor Pin A and ground.



- If resistance is OL, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, go to **Step B.**

V

Purpose: *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Verify proper installation of speed sensor.
4. Key on.
5. Clear fault codes.
6. Drive the vehicle and attempt to reset the fault code.
7. Check for fault codes.
   - If no fault codes, test complete.
   - If Fault Code 58 appears go to **Step A.** to find error in testing.
   - If fault code other than 58 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 61 - Rail Select Motor

J1587: MID 130 SID 39 FMI 1, 5, 6, 12
J1939: SA 3 SPN 772 FMI 1, 5, 6, 12

Overview

This fault indicates the Electric Shifter Rail Motor system is not working properly.

The Transmission Electronic Control Unit (TECU) checks the rail motor for open or shorted connections. There are four fault conditions defined by the reported FMI via ServiceRanger software.

Detection

Starting at key-on and throughout operation, the TECU constantly monitors the motor circuit. If a failure mode of short to battery, short to ground, open circuit, or low current is detected the fault is set.

Conditions to Set Fault Code Active

Conditions to Set the Fault Code Active

- FMI 1 - The TECU detects a high resistance in the motor circuit (5 ohms or greater) resulting in slow or no movement of the XY Shift finger. This fault will set when the Electric Shifter fails to select the proper rail.
- FMI 5, 6 - This fault is set when the condition is detected for at least 0.5 seconds and the TECU attempts to move the XY shift finger. FMI 5 is open or shorted to ground, FMI 6 is shorted to power.
- FMI 12 - The TECU detects a fault condition within the TECU XY control circuit, resulting in slow or no movement of the XY shift finger. This fault is set when the Electric Shifter fails to select the proper rail.

Fallback

Fallback Mode During Power-Up

- The transmission will power-up and may not be able to confirm neutral, no start gear can be selected.
- The engine will not crank and a dash will be shown in the gear display.

Fallback Mode During Operation

- The transmission remains in its current gear. An F may appear in the gear display.
- The service light will blink.
- Until the fault is cleared, driver may have to shut off engine in gear.

Conditions to Set Fault Code Inactive

Conditions to Set the Fault Code Inactive

- FMI 1, 12 - The fault becomes Inactive when the shift is completed.
- FMI 5, 6 - The fault becomes Inactive when the open or short circuit conditions are not detected for 0.5 seconds.

Possible Causes

This fault code can be caused by any of the following:

FMI 1, 5:

- The Electric Shifter rail motor may be damaged, failed or has developed a low resistance to ground.
- Connections and wires between the rail motor and the TECU may be loose or damaged, terminals and wires may be bent, or terminals may be burnt.
- TECU may have an internal short to ground or open circuit and has failed.

FMI 6:

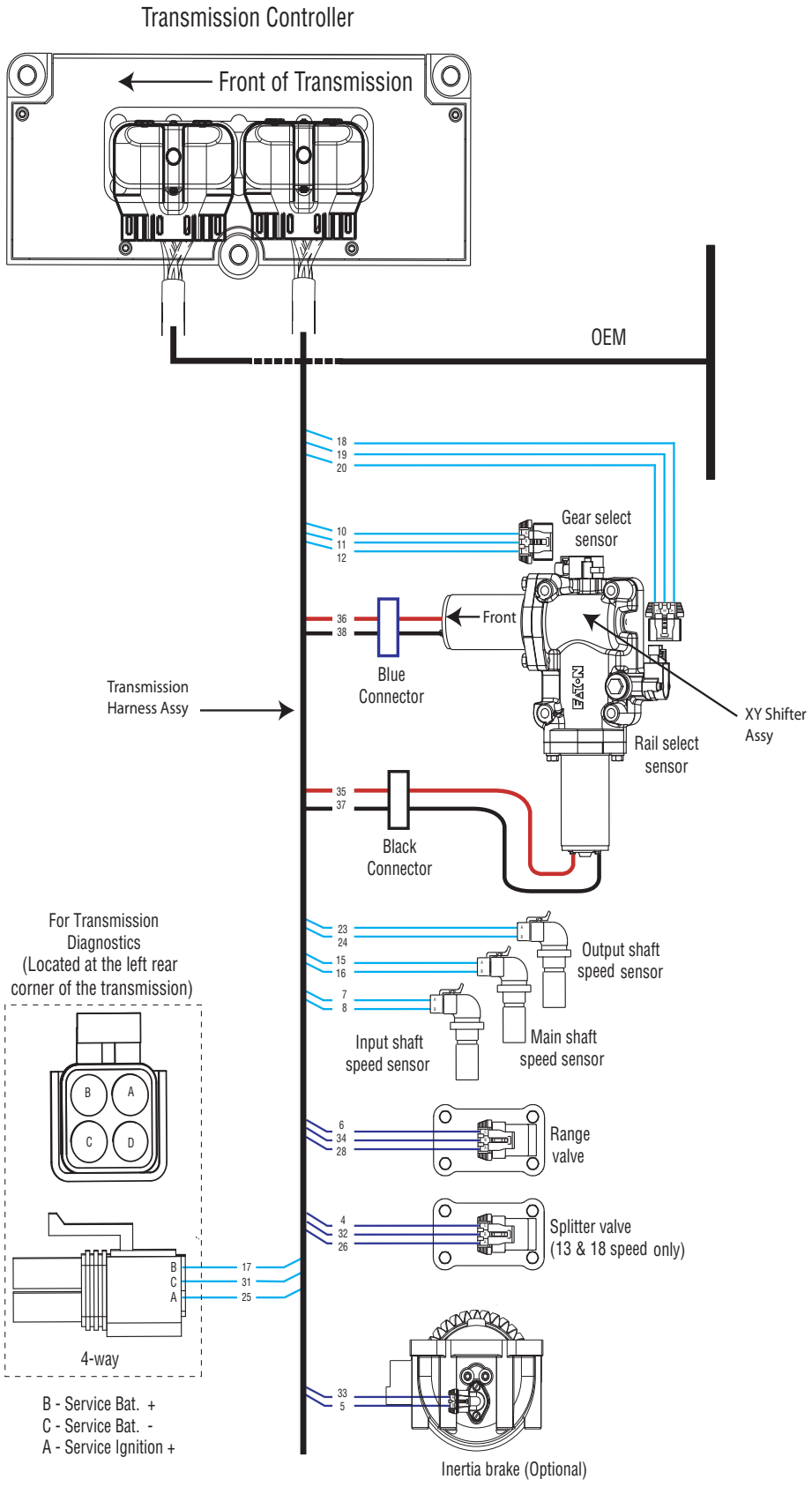
- The wires between the rail motor and the TECU may be grounded or shorted.
- TECU may have internal short to power and has failed.

FMI 12:

- Poor chassis power or ground.
- The wires between the rail motor and the TECU may be grounded or shorted.
- TECU internal failure.

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Component Identification



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Fault Code 61 - Rail Select Motor

A

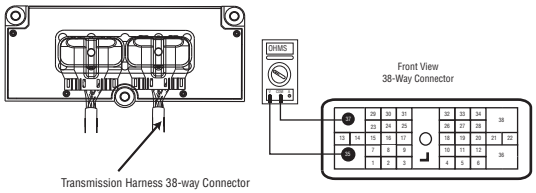
Purpose: *Check for active or Inactive fault codes (noting FMI) and perform electrical pretest.*

1. Use ServiceRanger to retrieve and record fault code 61 FMI information.
2. Perform the “Electrical Pretest” on page 12, inspect TECU power supply harness and fuse holder.
   - Issue found with TECU power supply harness or vehicle batteries, repair or replace items found during electrical pretest, go to **Step V.**
   - Electrical pretest passed, no issues found, go to **Step B.**

B

Purpose: *Measure the resistance of Electric Shifter Rail motor through the Transmission Harness.*

1. Key off.
2. Disconnect the negative battery cable.
3. Disconnect the Transmission Harness 38-way connector from the TECU.
4. Measure resistance between Pin 35 and Pin 37.



   - Measured resistance is 2 ohms or less, go to **Step C.**
   - Measured resistance is greater than 2 ohms, go to **Step D.**

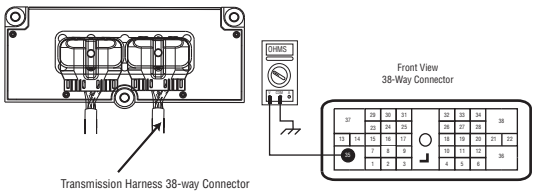
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C

Purpose: *Test the Electric Shifter Rail Motor for short to ground through the Transmission Harness.*

1. Measure the resistance between Pin 35 and ground.



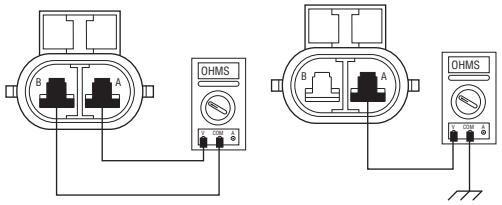
- Measured resistance is 1 M ohm or greater, go to **Step E.**
- Measured resistance is less than 1 M ohm, go to **Step D.**

D

Purpose: *Measure the resistance of Electric Shifter Rail motor at the Rail Motor and test for short to ground.*

1. Disconnect the black 2-way rail motor connector from the transmission harness.

2. Measure the resistance of the Rail Motor at the 2-way connector.
- Pin A to Pin B
- Pin A to Ground



- Measured resistance between Pin A and Pin B is 2 ohms or less, and Pin A to ground is 1 M ohm or greater, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

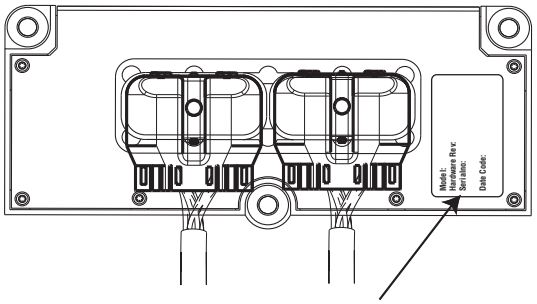
  Go to **Step V.**
- Measured resistance is out of range, replace the **Electric Shifter**. Go to **Step V.**

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E ***Purpose:*** *Use fault code FMI to make a repair decision.*

1. FMI information recorded from Step A.



- FMI 1 or 5 is Active, replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

  and the:

  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- FMI 1 or 5 is Inactive and the TECU serial number is between ETC2000000 and ETC2029918, replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

  and the:

  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- FMI 1 or 5 is Inactive and the TECU serial number is above ETC2029918, replace the **Electric Shifter** and the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- FMI 6 or 12 is Active or Inactive, replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

  Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear fault codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the fault code.
6. Check for fault codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 61 appears, find error in testing, go to **Step A.**

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Fault Code 63 - Gear Select Motor

J1587: MID 130 SID 40 FMI 1, 5, 6, 12
J1939: SA 3 SPN 773 FMI 1, 5, 6, 12

Overview

This fault indicates the Electric Shifter Gear Motor system is not working properly.

The Transmission Electronic Control Unit (TECU) checks the gear motor and controller for open or shorted connections. There are 4 fault conditions defined by the reported FMI via ServiceRanger software.

Detection

Starting at key-on and throughout operation, the TECU constantly monitors the motor circuit. If a failure mode of short to battery, short to ground, open circuit or low current is detected the fault is set.

Conditions to Set Fault Code Active

Conditions to Set the Fault Code Active

- FMI 1 - The TECU detects a high resistance in the motor circuit (5 ohms or greater) resulting in slow or no movement of the XY shift finger. This fault will set when the Electric Shifter fails to engage or disengage a gear.
- FMI 5, 6 - This fault is set when the condition is detected for at least 0.5 seconds and the TECU attempts to move the XY shift finger. FMI 5 is open or shorted to ground, FMI 6 is shorted to power.
- FMI 12 - The TECU detects a fault condition within the TECU XY control circuit, resulting in slow or no movement of the XY shift finger. This fault is set when the Electric Shifter fails to engage or disengage a gear.

Fallback

Fallback Mode During Power-Up

- The transmission will power-up and may not be able to confirm neutral, no start gear can be selected.
- The engine will not crank and a dash will be shown in the gear display.

Fallback Mode During Operation

- The transmission remains in its current gear. An F may appear in the gear display.
- The service light will blink.
- Until the fault is cleared, driver may have to shut off engine in gear.

Conditions to Set Fault Code Inactive

Conditions to Set the Fault Inactive

- FMI 1, 12 - The fault becomes Inactive when the shift is completed.
- FMI 5, 6 - The fault becomes Inactive when the open or short circuit conditions are not detected for 0.5 seconds.

Possible Causes

This fault code can be caused by any of the following:

FMI 1, 5:

- The Electric Shifter gear motor may be damaged, failed, or has developed a low resistance to ground.
- Connections and wires between the gear motor and the TECU may be loose or damaged, terminals and wires may be bent or terminals may be burnt.
- TECU may have an internal short to ground or open circuit and has failed.

FMI 6:

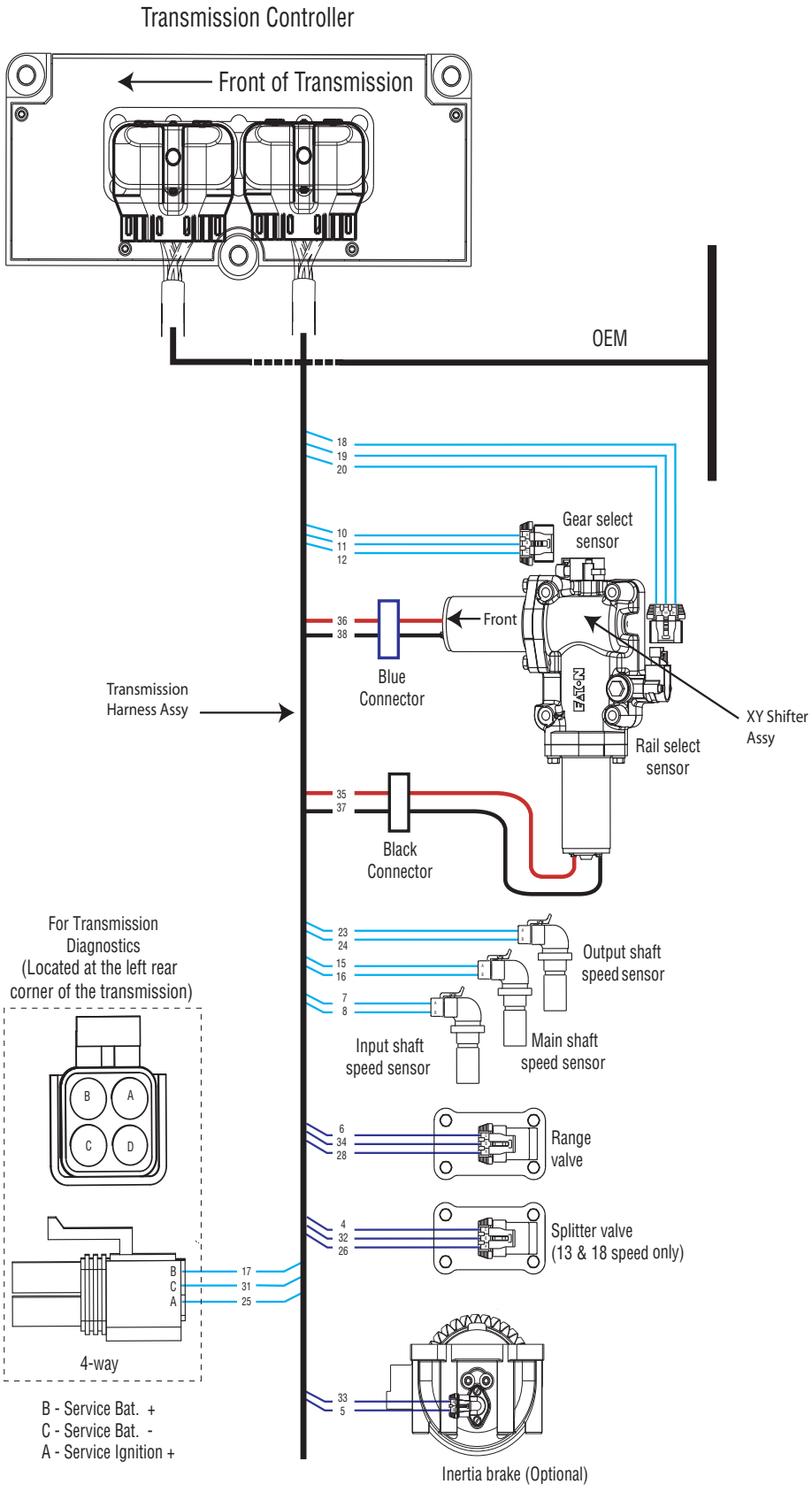
- The wires between the gear motor and TECU may be shorted to power.
- TECU may have internal short to power and has failed.

FMI 12:

- Poor chassis power or ground.
- The wires between the gear motor and TECU may be shorted to ground.
- TECU internal failure.

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Component Identification



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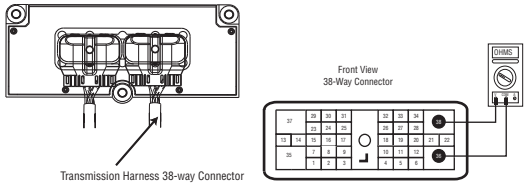
Fault Code 63 - Gear Select Motor

A ***Purpose:*** *Check for active or Inactive fault codes (noting FMI) and perform electrical pretest.*

1. Use ServiceRanger to retrieve and record Fault Code 63 FMI information.
2. Perform electrical pretest, see “Electrical Pretest” on page 12. Inspect TECU power supply harness and fuse holder.
   - If issue found with TECU power supply harness or vehicle batteries, repair or replace items found during electrical pretest. go to **Step V.**
   - Electrical pretest passed, no issues found, go to **Step B.**

B ***Purpose:*** *Measure the resistance of Electric Shifter Gear Motor through the Transmission Harness.*

1. Key off.
2. Disconnect the negative battery cable.
3. Disconnect the Transmission Harness 38-way connector from the TECU.
4. Measure resistance between Pin 36 and Pin 38.



   - Measured resistance is 2 ohms or less, go to **Step C.**
   - Measured resistance is greater than 2 ohms, go to **Step D.**

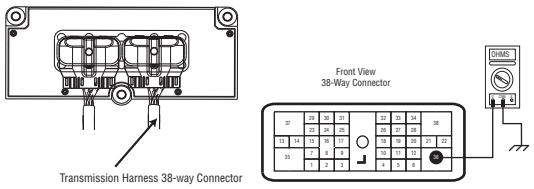
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C

Purpose: *Test the Electric Shifter for a short to ground through the Transmission Harness.*

1. Measure the resistance between Pin 36 and ground.



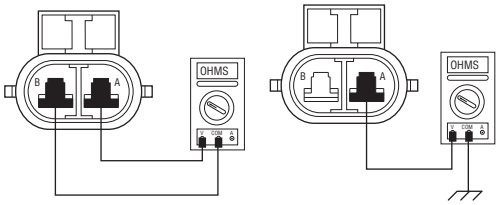
- If measured resistance is 1 M ohm or greater, go to **Step E.**
- If measured resistance is less than 1 M ohm, go to **Step D.**

D

Purpose: *Measure the resistance of the Electric Shifter Gear Motor, and test for short to ground.*

1. Disconnect the blue 2-way gear motor connector from the transmission harness.

2. Measure the resistance of the gear motor at the 2-way connector.
- Pin A to Pin B
- Pin A to Ground



- If measured resistance between Pin A and Pin B is 2 ohms or less, and between Pin A and ground is 1 M ohm or greater, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

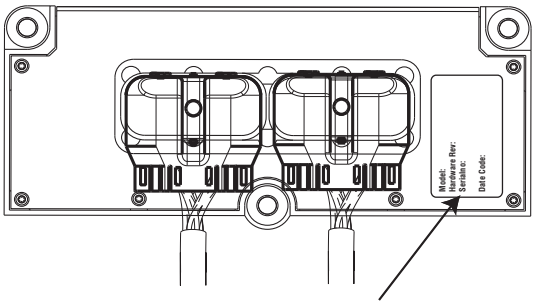
  Go to **Step V.**
- If measured resistance is out of range, replace the **Electric Shifter**. Go to **Step V.**

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E ***Purpose:*** *Use the fault code FMI to make a repair decision.*

1. FMI information recorded from Step A.



TECU Serial Number

- If FMI 1 or 5 is Active, replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

  and the:

  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**
- If FMI 1 or 5 is Inactive and the TECU serial number is between ETC2000000 and ETC2029918, replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

  and the:

  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If FMI 1 or 5 is Inactive and the TECU serial number is above ETC2029918, replace the **Electric Shifter** and the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If FMI 6 or 12 is active or Inactive, replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

  go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear fault codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the fault code.
6. Check for fault codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 63 appears go to **Step A.** to find error in testing.
   - If fault code other than 63 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 68 - Grade Sensor

J1587: MID 130 SID 227 FMI 14
J1939: SA 3 SPN 520274, 520321FMI 13, 14

Overview

The Grade Sensor is mounted inside the Transmission Electronic Control Unit (TECU) and is essential for Hill-Start Aid. The Grade Sensor also provides information to the TECU to assist in smooth vehicle launch and shifting.

Detection

A fault will be set if the grade sensor reports an illogical grade to the TECU.

Fallback

Hill-Start-Aid is enabled all the time.

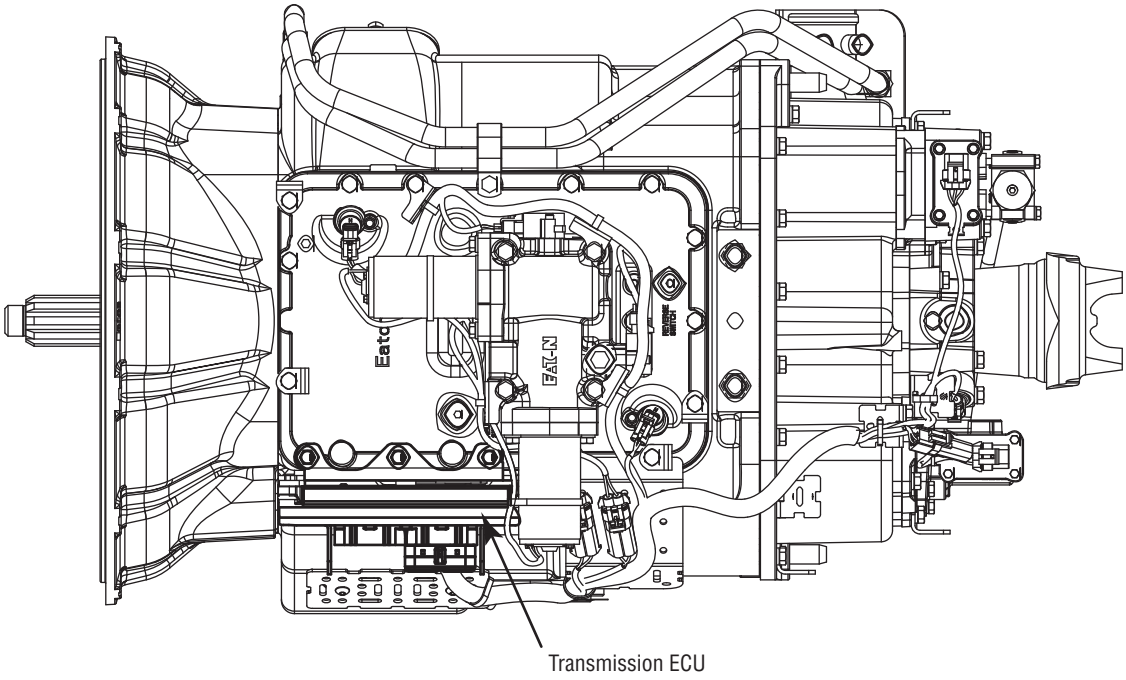
Possible Causes

This fault code can be caused by any of the following:

- Improperly mounted TECU
- Uncalibrated TECU
- TECU failure

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Component Identification



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Fault Code 68 - Grade Sensor

A ***Purpose:*** *Check for active and Inactive fault codes (noting FMI) and perform electrical pretest.*

1. Key on.
2. Retrieve active fault codes and FMIs with ServiceRanger using the 9-way diagnostic connector.
3. Perform electrical pretest, See “Electrical Pretest” on page 12.
   - If FMI 13 is Active after performing the electrical pretest, go to **Step B.**
   - If FMI 14 is Active after performing the electrical pretest, go to **Step C.**
   - If issue was repair during the electrical pretest, go to **Step V.**

B ***Purpose:*** *Perform TECU Grade Sensor calibration.*

Note: Before Grade Sensor Calibration, verify the vehicle is on level ground, the suspension is fully aired and the vehicle is at the appropriate ride height.

1. Key on.
2. Calibrate the TECU using ServiceRanger. (steps below)

   Note: The Grade Sensor can be calibrated via ServiceRanger or operator-triggered Special Function. Detailed instructions on both methods can be found in service manual TRSM0930.
3. Open the Advanced Product Functions menu and click on the transmission model.
4. Open the Grade Sensor Calibration and follow the instructions.
5. Click on Calibrate Grade Sensor.
6. Verify Fault Code 68 has gone Inactive.
   - If FMI 13 is not Active, Close ServiceRanger and turn off ignition switch to save calibration. go to **Step V.**
   - If FMI 13 is still Active, call Roadranger Tech Support at 1-800-826-4357 for assistance.

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C

Purpose: *Confirm proper TECU mounting.*

1. Key on.
2. Ensure that the TECU is properly mounted and secured.
   - If TECU found insecure or not properly mounted, properly secure the TECU. Go to **Step V.**
   - If TECU was found properly mounted and secure, (if fault code is Active) replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Key on.
4. Clear codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the code.
6. Check for fault codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, Test complete.
   - If Fault Code 68 appears go to **Step A.** to find error in testing.
   - If fault code other than 68 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 71 - Unable to Disengage Gear

J1587: MID 130 SID 60 FMI 7
J1939: SA 3 SPN 560 FMI 7

Overview

This fault indicates the system cannot disengage from the current gear. The system will continue attempting to disengage the current gear after the fault is set.

Vehicle must be moving and attempting to change gear position and no electrical faults are active.

Detection

The system is unable to select the neutral position after 3 consecutive attempts.

Conditions to Set Fault Code Active

Conditions to Set the Fault Code Active

- FMI 7 - The system is unable to select the neutral position after 3 consecutive attempts.

Fallback

Fallback mode During Power-Up

- None. This fault can not be set at power-up.

Fallback Mode During Operation

- When this fault is Active, the transmission will continue to attempt to select neutral.
- The system will alternate the engine speed up and down in an attempt to achieve disengagement.
- The gear display may blink the destination gear.
- The service light will not flash, nor will an F be displayed on the dash.
- The diagnostic code will not be transmitted on the J1587 bus until fault codes have been requested by a service tool.

Conditions to Set Fault Code Inactive

Conditions to Set the Fault Inactive

- FMI 7 - The fault becomes Inactive when neutral is achieved.

Possible Causes

This fault code can be caused by any of the following:

Shift Bar Housing

- Mechanical issue with the shift bar housing
- Damaged shift bar housing interlock parts

Electric Shifter

- New Electric Shifter installed and not recalibrated per the L-Letter (L-2003-30)
- Mechanical issue with the Electric Shifter
- Badly contaminated / gummed up / soiled Electric Shifter ball screw due to oil cooler leak
- Worn center shaft bushing (TAIB-0814.)

Base Transmission

- Main box mechanical failure
- Sliding clutch / shift yoke wear

Transmission Electronic Control Unit (TECU)

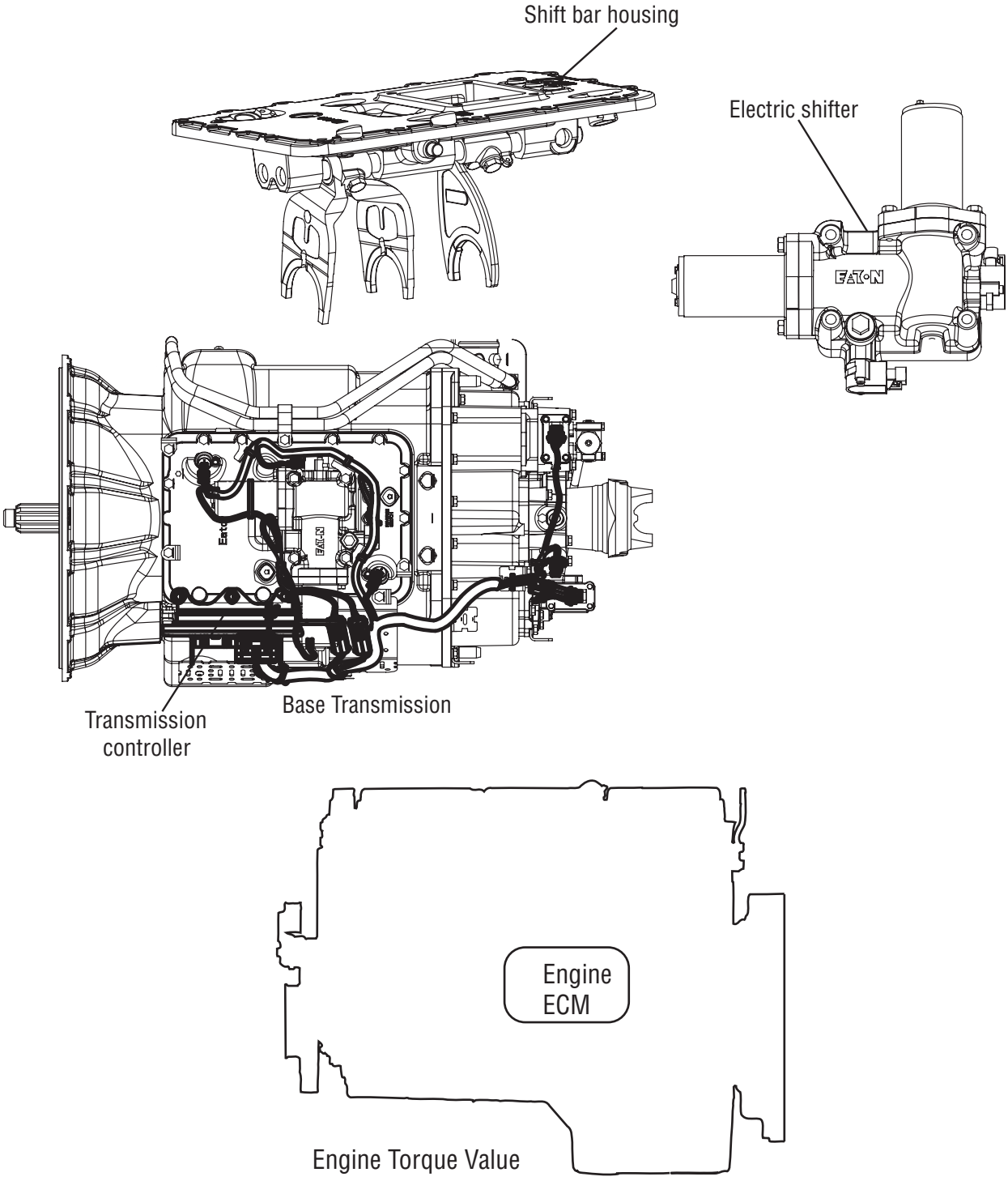
- New TECU installed and not recalibrated per the L-Letter (L-2005-04)

Engine

- Inaccurately reporting engine torque value

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Component Identification



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Fault Code 71 - Unable to Disengage Gear

A

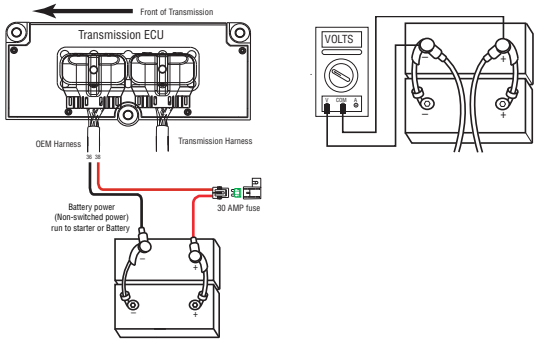
Purpose: *Determine if an Electric Shifter was installed without recalibrating the transmission.*

1. Key off.
2. Was a new Electric Shifter or TECU just installed without recalibrating the transmission?
   - Yes, perform transmission calibration. Turn key on, and allow the transmission to power up. Turn key off, wait 2 minutes and go to **Step V.**.
   - No, go to **Step B.**

B

Purpose: *Measure battery voltage. Visually inspect the batteries, inline fuse, power and ground supplies to the TECU.*

1. Key off.
2. Inspect starter, battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.



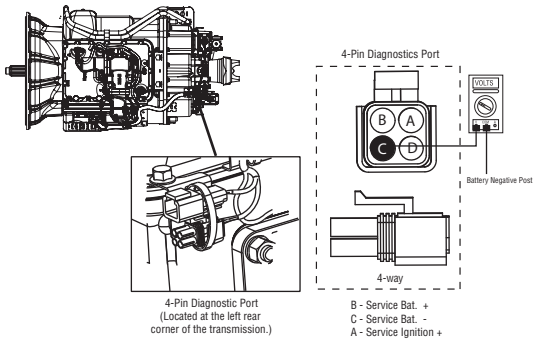
   - If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required and go to **Step C.**
   - If voltage is outside of range, repair or replace batteries and charge system as required. Repeat test.

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C

Purpose: *Verify proper ground path at 4-way diagnostic port.*

1. Locate the diagnostic port on the Transmission Harness - located at the left rear corner of the transmission.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.

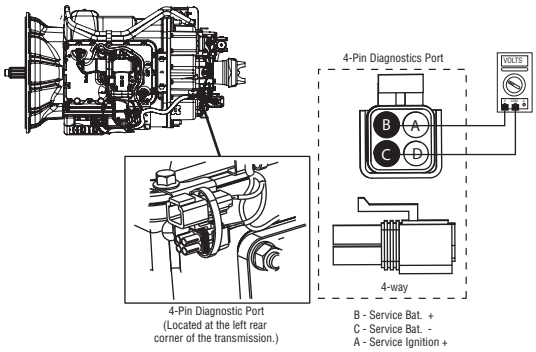


- If voltage between Pin C and battery negative post is 0.70 volts or less, go to **Step D.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

D

Purpose: *Measure batter voltage at 4-way diagnostic port.*

1. Key on.
2. Measure voltage between Pin B and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step E.**
- If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

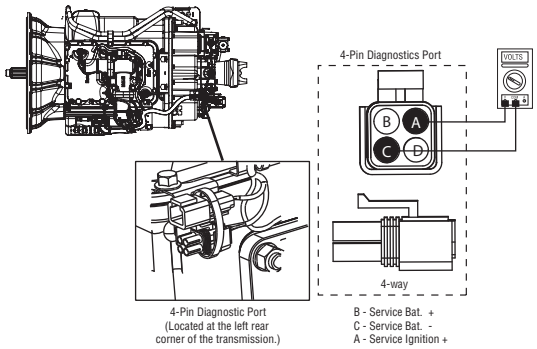
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E

Purpose: *Measure ignition voltage at 4-way diagnostic port.*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step F.**
- If voltage is outside of range, repair Ignition power supply to TECU. Fuse may be blown. Repeat test.

F

Purpose: *Visually inspect the Shift bar housing, Electric Shifter and base transmission for signs of mechanical damage.*

1. Key off.
2. Remove electric shifter from Shift Bar Housing.
3. Inspect the Shift Bar Housing
   - Visually inspect shift rails and blocks.
   - Verify shift bar housing operation by confirming shift rails can physically engage each gear individually.
   - Confirm the shift bar housing can not engage 2 gears at the same time.
4. Inspect Electric Shifter
   - Check for mechanical issues with the Electric Shifter.
   - Visually inspect for badly contaminated / gummed up / soiled Electric Shifter ball screw due to oil cooler leaks.
   - Check for a worn center shaft bushing (see TAIB-0814).
5. Inspect Base Transmission
   - Drain and inspect oil for debris.
   - Remove I-brake or PTO cover and inspect for main box mechanical failure.
   - Inspect sliding clutches and shift yokes for wear.

   - If no problem found, replace **Electric Shifter** and the:
     - **Medium-Duty Transmission Harness**
     - **Heavy-Duty Transmission Harness**

     Go to **Step V.**
   - If problem found, repair as required and go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear fault codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the fault code.
6. Check for fault codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 71 appears go to **Step A.** to find error in testing.
   - If fault code other than 71 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 72 - Failed to Select Rail

J1587: MID 130 SID 59 FMI 7
J1939: SA 3 SPN 772 FMI 7

Overview

This fault indicates the system is unable to position the XY shift finger on the desired shift rail. The system will continue attempting to select the desired rail position after the fault is set.

Vehicle must be moving and attempting to select a rail and no electrical faults are active.

Detection

The system is unable to select the desired rail position after 5 consecutive attempts.

Conditions to Set Fault Code Active

Conditions to Set the Fault Code Active

- FMI 7 - The system is unable to select the desired rail position after five consecutive attempts.

Fallback

Fallback mode During Power-Up

- Vehicle may not crank. A dash will appear in the gear display.

Fallback Mode During Operation

- When this fault is active, the transmission will continue to attempt to select the desired rail position.
- The system will alternate the engine speed up and down during a shift.
- The gear display may blink the destination gear.
- The service light will not flash, nor will an F be displayed on the dash.
- The diagnostic code will not be transmitted on the J1587 bus until fault codes have been requested by a service tool.

Conditions to Set Fault Code Inactive

Conditions to Set the Fault Inactive

- FMI 7 - The fault becomes Inactive when the desired rail position is achieved.

Possible Causes

This fault code can be caused by any of the following:

FMI 7:

- Mechanical issue with the shift bar housing
- Damaged shift bar housing interlock parts

Electric Shifter

- New Electric Shifter installed and not recalibrated per the L-Letter (L-2003-30)
- Mechanical issue with the Electric Shifter
- Badly contaminated / gummed up / soiled Electric Shifter ball screw due to oil cooler leak
- Worn center shaft bushing (TAIB-0814)

Base Transmission

- Main box mechanical failure
- Sliding clutch / shift yoke wear

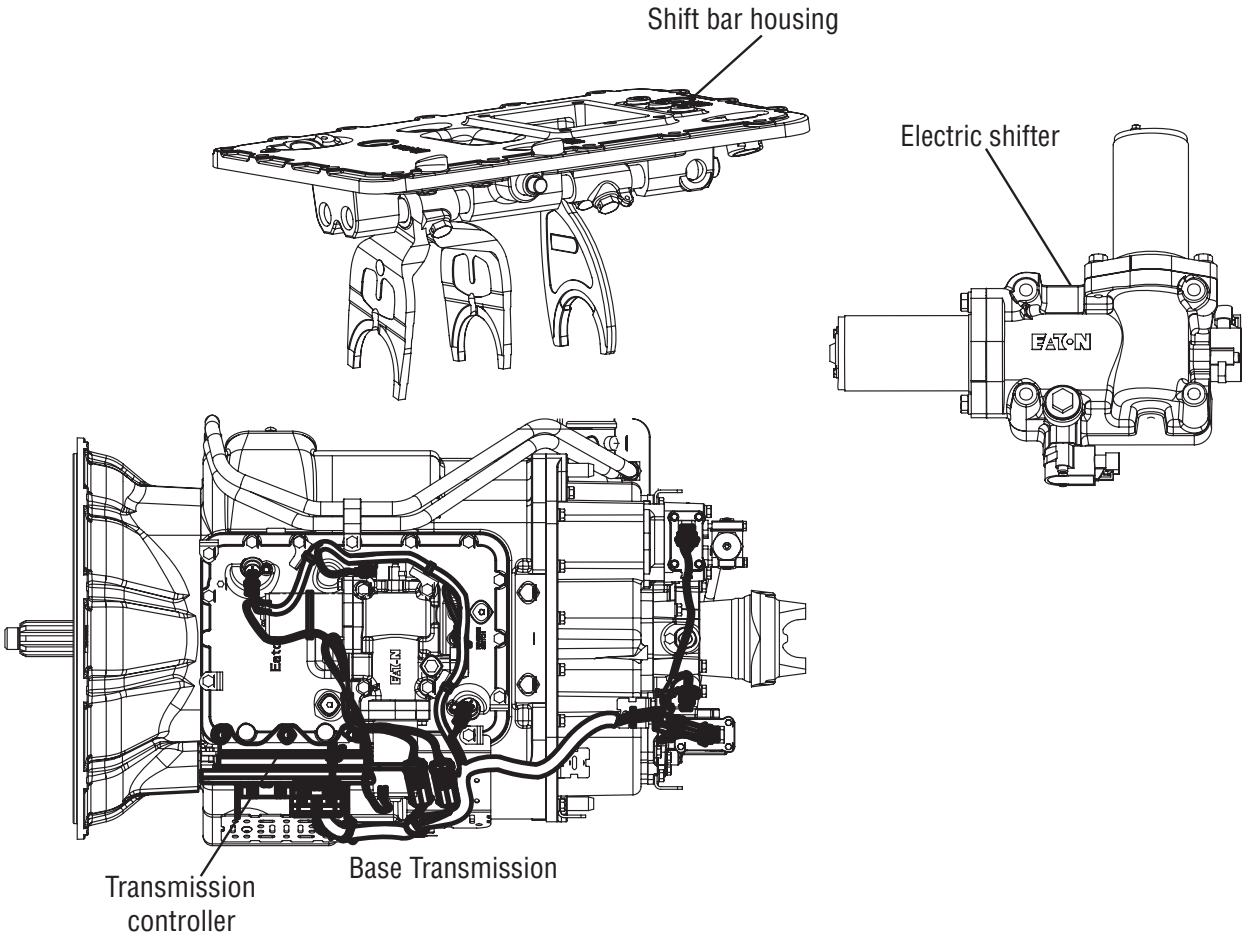
Transmission Electronic Control Unit (TECU)

- New TECU installed and not recalibrated per the L-Letter (L-2005-04)

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Component Identification



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Fault Code 72 - Failed to Select Rail

A

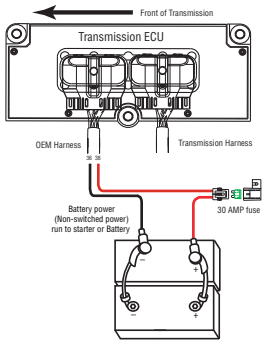
Purpose: *Determine if an Electric Shifter was installed without recalibrating the transmission.*

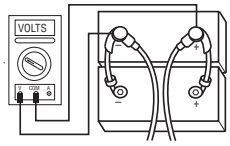
1. Key off.
2. Was a new Electric Shifter or TECU just installed without recalibrating the transmission?
   - Yes. Perform transmission calibration. Turn key on and allow the transmission to power up. Turn key off and wait 2 minutes. go to **Step V.**
   - No, go to **Step B.**

B

Purpose: *Measure battery voltage. Visually inspect the batteries, inline fuse, power and ground supplies to the TECU.*

1. Key off.
2. Inspect starter / battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.





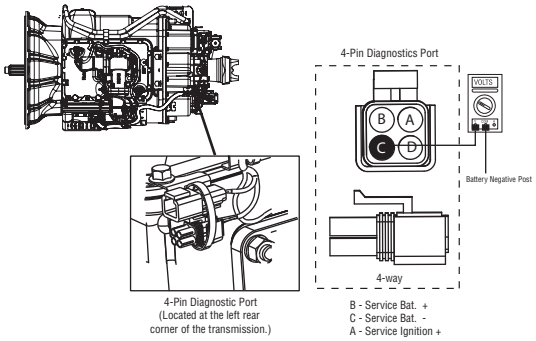
   - If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required and go to **Step C.**
   - If voltage is outside of range, repair or replace batteries and charge system as required. Repeat test.

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C

Purpose: *Verify proper ground path at 4-way diagnostic port.*

1. Locate the diagnostic port on the Transmission Harness - located at the left rear corner of the transmission.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.

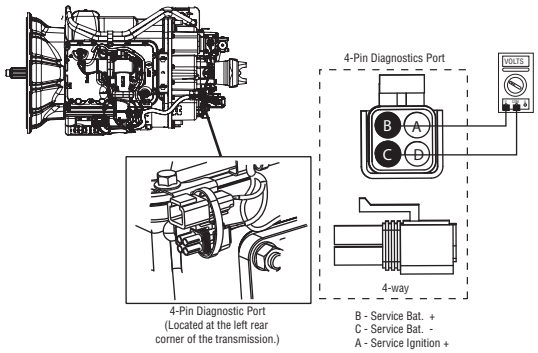


- If voltage is 0.70 volts or less, go to **Step D.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

D

Purpose: *Measure batter voltage at 4-way diagnostic port.*

1. Key on.
2. Measure voltage between Pin B and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step E.**
- If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

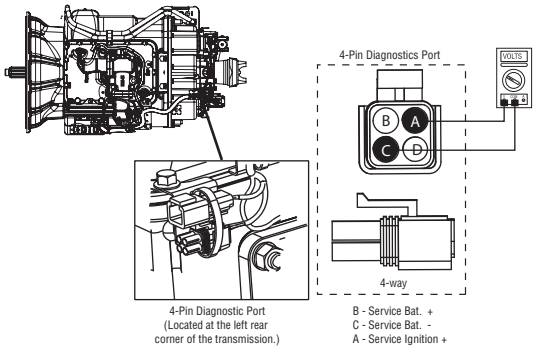
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E

Purpose: *Measure ignition voltage at 4-way diagnostic port.*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step F.**
- If voltage is outside of range, Repair Ignition power supply to TECU. Fuse may be blown. Repeat test.

F

Purpose: *Visually inspect the Shift Bar housing, Electric Shifter and base transmission for signs of mechanical damage.*

1. Key off.
2. Remove electric shifter from Shift Bar housing.
3. Inspect the Shift Bar housing
   - Visually inspect shift rails and blocks.
   - Verify Shift Bar housing operation by confirming shift rails can physically engage each gear individually.
   - Confirm the Shift Bar housing can not engage two gears at the same time.
4. Inspect Electric Shifter
   - Check for mechanical issues with the Electric Shifter.
   - Visually inspect for badly contaminated / gummed up / soiled Electric Shifter ball screw due to oil cooler leaks.
   - Check for a worn center shaft bushing (see TAIB-0814).
5. Inspect Base Transmission
   - Drain and inspect oil for debris.
   - Remove I-brake or PTO cover and inspect for main box mechanical failure.
   - Inspect sliding clutches and shift yokes for wear.
     - If no problem found, replace **Electric Shifter** and the:
       - **Medium-Duty Transmission Harness**
       - **Heavy-Duty Transmission Harness**

       Go to **Step V.**
     - If problem found, repair as required. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear fault codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the fault code.
6. Check for fault codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 72 appears go to **Step A.** to find error in testing.
   - If fault code other than 72 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 73 - Failed to Engage Gear

J1587: MID 130 SID 58 FMI 7
J1939: SA 3 SPN 781 FMI 7

Overview

This fault indicates the system cannot engage the desired gear. The system will continue attempting to engaged the desired gear after the fault is set.

Vehicle must be moving and attempting to engage a gear and no electrical faults can be active.

Detection

The system unsuccessfully attempts to engage a gear 5 times with no battery voltage faults.

Conditions to Set Fault Code Active

Conditions to Set Fault Code Active

- FMI 7 - The system is unable to engage a gear 5 times with no battery voltage faults.

Fallback

Fallback mode During Power-Up

- None. This fault can not be set at power-up.

Fallback Mode During Operation

- When this fault is active, the transmission will continue to attempt to engage the gear.
- The system will alternate the engine speed up and down in an attempt to achieve engagement.
- The gear display may blink the destination gear.
- The service light will not flash, nor will an F be displayed on the dash.
- The diagnostic code will not be transmitted on the J1587 bus until fault codes have been requested by a service tool.

Conditions to Set Fault Code Inactive

Conditions to Set Fault Code Active

- FMI 7 - The fault becomes Inactive when neutral is achieved.

Possible Causes

This fault code can be caused by any of the following:

FMI 7:

- Mechanical issue with the shift bar housing
- Damaged shift bar housing interlock parts

Electric Shifter

- New Electric Shifter installed and not recalibrated per the L-Letter (L-2003-30)
- Mechanical issue with the Electric Shifter
- Badly contaminated / gummed up / soiled Electric Shifter ball screw due to oil cooler leak
- Worn center shaft bushing (TAIB-0814)

Base Transmission

- Main box mechanical failure
- Sliding clutch / shift yoke wear

Transmission Electronic Control Unit (TECU)

- New TECU installed and not recalibrated per the L-Letter (L-2005-04.)

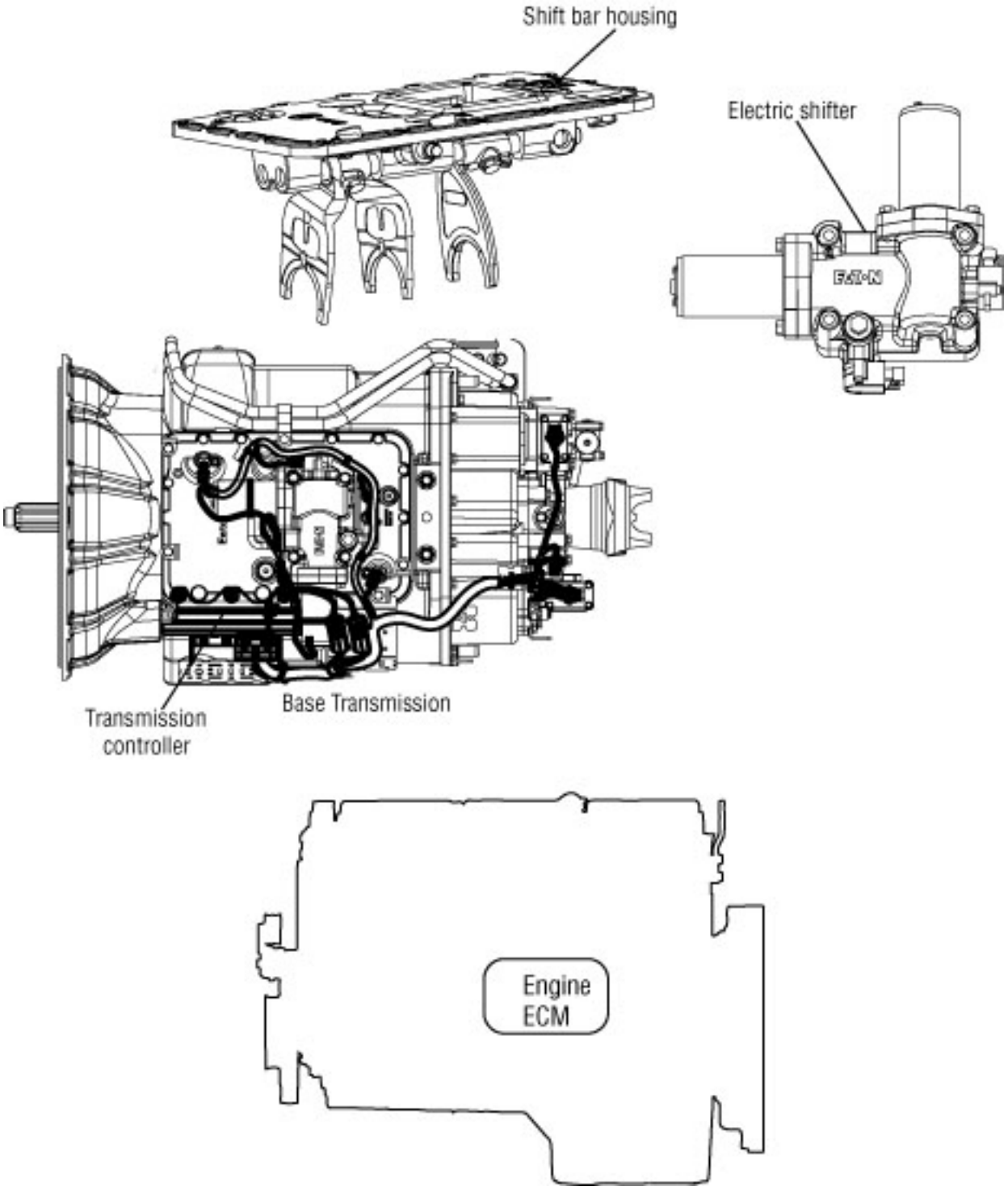
Engine

- Inaccurately or not responding to the transmission speed control command.

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Component Identification



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Fault Code 73 - Failed to Engage Gear

A

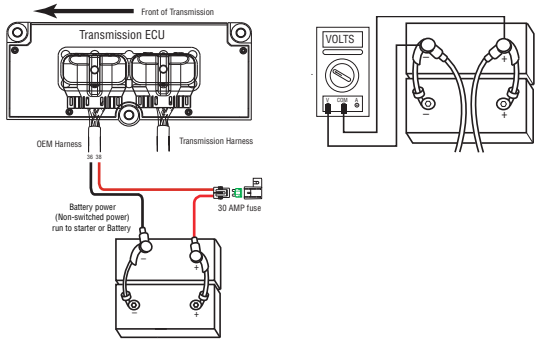
Purpose: *Determine if an Electric Shifter was installed without recalibrating the transmission.*

1. Key off.
2. Was a new Electric Shifter or TECU just installed without recalibrating the transmission?
   - Yes, Perform transmission calibration. Turn key on and allow the transmission to power up. Turn key off and wait 2 minutes. go to **Step V.**.
   - No, go to **Step B.**

B

Purpose: *Measure battery voltage. Visually inspect the batteries, inline fuse, power and ground supplies to the TECU.*

1. Key off.
2. Inspect starter / battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.



   - If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required. Go to **Step C.**
   - If voltage is outside of range, repair or replace batteries and charge system as required. Repeat test.

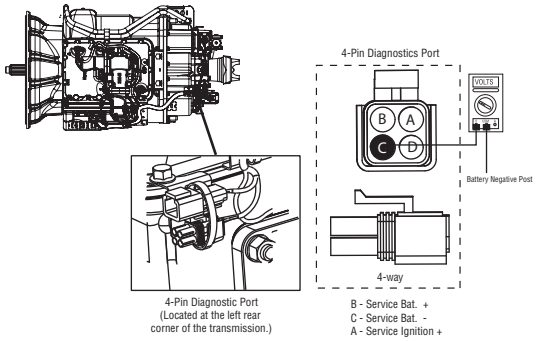
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C

Purpose: *Verify proper ground path at 4-way diagnostic port*

1. Locate the diagnostic port on the Transmission Harness - located at the left rear corner of the transmission.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.

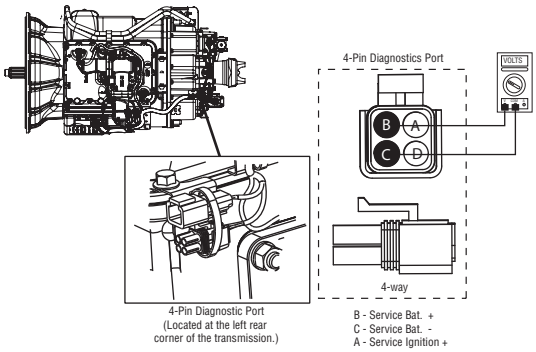


- If voltage is 0.70 volts or less, go to **Step D.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

D

Purpose: *Measure battery voltage at 4-way diagnostic port.*

1. Key on.
2. Measure voltage between Pin B and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step E.**
- If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

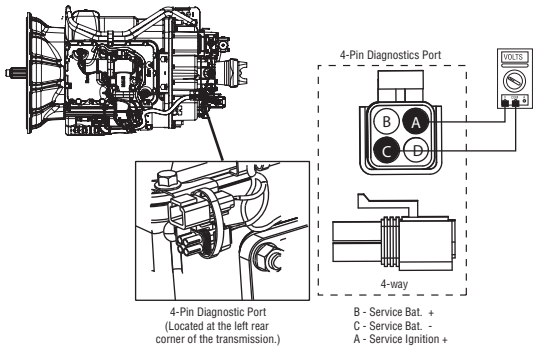
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E

Purpose: *Measure ignition voltage at 4-way diagnostic port*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step F.**
- If voltage is outside of range, repair ignition power supply to TECU. Fuse may be blown Repeat test.

F

Purpose: *Visually inspect the Shift Bar housing, Electric Shifter and base transmission for signs of mechanical damage.*

1. Key off.
2. Remove electric shifter from Shift Bar housing.
3. Inspect the Shift Bar housing
   - Visually inspect shift rails and blocks.
   - Verify Shift Bar housing operation by confirming shift rails can physically engage each gear individually.
   - Confirm the Shift Bar housing can not engage 2 gears at the same time.
4. Inspect Electric Shifter
   - Check for mechanical issues with the Electric Shifter.
   - Visually inspect for badly contaminated / gummed up / soiled Electric Shifter ball screw due to oil cooler leaks.
   - Check for a worn center shaft bushing (see TAIB-0814).
5. Inspect base transmission
   - Drain and inspect oil for debris.
   - Remove I-brake or PTO cover and inspect for main box mechanical failure.
   - Inspect sliding clutches and shift yokes for wear.
     - If no problem found, replace **Electric Shifter** and the:
       - **Medium-Duty Transmission Harness**
       - **Heavy-Duty Transmission Harness**

       Go to **Step V.**
     - If problem found, repair as required. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors and the negative battery cable.
3. Key on.
4. Clear fault codes, see “Fault Code Retrieval/Clearing” on page 5.
5. Drive the vehicle and attempt to reset the fault code.
6. Check for fault codes, see “Fault Code Retrieval/Clearing” on page 5.
   - If no fault codes, test complete.
   - If Fault Code 73 appears go to **Step A.** to find error in testing.
   - If fault code other than 73 appears, See “Fault Code Isolation Procedure Index” on page 8.

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Fault Code 74 - Engine Speed Response Fault

J1587: MID 130 PID 93/190 FMI 7
J1939: SA 3 SPN 518/898 FMI 7

Overview
This fault code indicates the transmission is unable to use system controls to synchronize during a shift.

Detection
If there is engine communication on the J1939 Link and the engine does not respond to transmission speed and torque commands, the code will set.

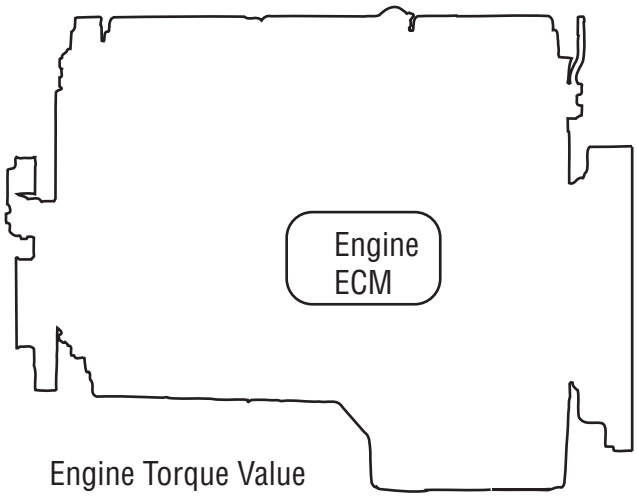
Fallback
If the failure occurs while moving, it could cause a 1-speed fallback. Once the vehicle is stopped, starting gear and reverse gear can be engaged.

Possible Causes
This fault code can be caused by any of the following:

- Engine control system

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Component Identification



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Fault Code 74 - Engine Speed Response Fault

A

Purpose: *Check for active or Inactive fault codes. Contact vehicle OEM for further direction.*

1. Key on.
2. Retrieve fault codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 74 is Active, contact the OEM because the engine is failing to respond to the transmissions command during a shift.
   - If fault code is not Active, test complete.

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Fault Code 75 - Power Down In Gear

J1587: MID 130 SID 60 FMI 14
J1939: SA 3 SPN 560 FMI 14

Overview

This fault is detected when the vehicle is powered-down in any gear position other than neutral.

Note: This code will only be set Inactive

Detection

The Transmission Electronic Control Unit (TECU) monitors shift device position and electric shifter position during vehicle shut down. If a non-neutral shift device position and in gear position are detected during vehicle shut down, this code will be set.

Fallback

No Fallback mode. This is a non driving, power-down fault. It may cause a dash to appear in the gear display during power-up if the transmission is torque locked after shutting down in gear.

Possible Causes

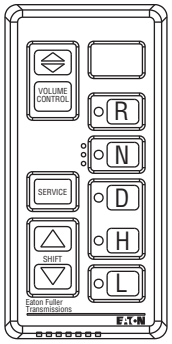
This fault code can be caused by any of the following:

- Improper shut down procedure

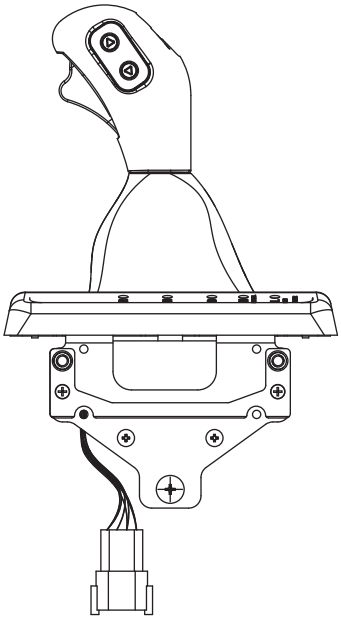
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Component Identification



Pushbutton Shift Control



Eaton Shift Lever

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Fault Code 75 - Power Down In Gear

A

Purpose: *Check for active or Inactive fault codes.*

1. Key on.
2. Retrieve Codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 75 is Inactive, no action necessary. This code indicates the driver powered down the system prior to selecting neutral.
   - Explain to driver, shift selector must be in neutral before powering down to prevent a stuck-in-gear situation and/or a power-up no crank situation.

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Fault Code 81 - Gear Engagement Detected

J1587: MID 130 SID 47 FMI 7
J1939: SA 3 SPN 780 FMI 7

Overview

The transmission controller has detected that the shift finger position indicates neutral and a comparison of input and main shaft speeds indicate the transmission is in gear. The comparison of shaft speeds is only performed when the vehicle is moving and a shift is in process.

Detection

- The fault is detected after the Transmission Electronic Control Unit (TECU) powers up and a non-neutral condition is detected during a shift.
- FMI 7 - The transmission controller detected an inaccurate finger position.

Conditions to Set Fault Code Active

Conditions to Recreate Fault

- Only set during a shift.

Fallback

This fault causes an in-place fallback. The transmission will remain in current gear.

Conditions to Set Fault Code Inactive

Conditions to Clear Fault

- The fault becomes Inactive after power down.

Possible Causes

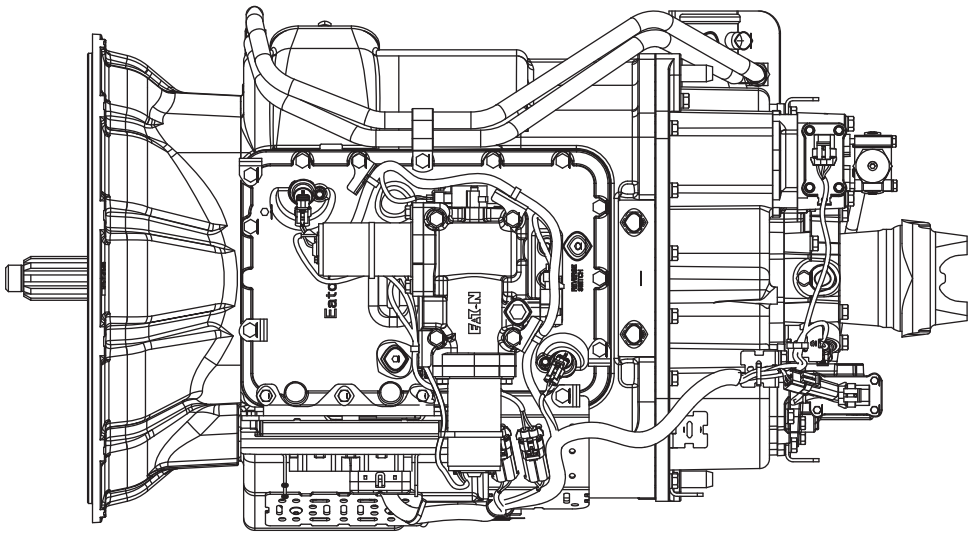
This fault code can be caused by any of the following:

- Worn internal transmission components.

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Component Identification

Transmission



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Fault Code 81 - Gear Engagement Detected

A

Purpose: *Check for active or Inactive fault codes. Contact Eaton support for further direction.*

1. Key on.
2. Retrieve codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 81 is active or Inactive, Customer - Call Eaton at 1-800-826-HELP (4357).
     CSC - Call Technician Service.

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Fault Code 83 - Shift Lever Missing

J1587: MID 130 SID 18, 19 FMI 14
J1939: SA 3 SPN 751, 752 FMI 7, 12

Overview

This fault code indicates the Eaton Cobra Lever or the OEM Shift Lever is not sensing any lever positions.

Detection

Starting at key on and throughout operation, the Transmission Electronic Control Unit (TECU) constantly measures the feedback from the Shift Lever circuit. If the Shift Lever reports no lever positions are sensed, the fault code is set.

Fallback

This fault causes a downshift only and shifts to neutral when the vehicle stops.

Possible Causes

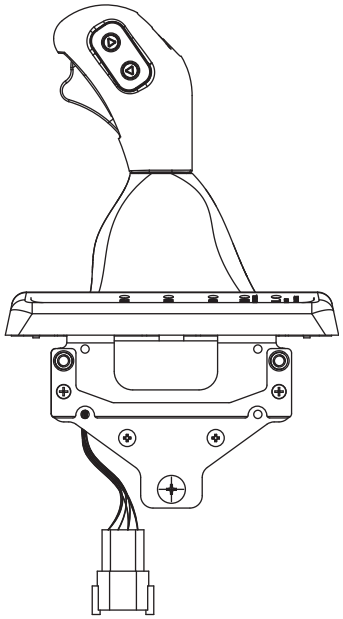
This fault code can be caused by any of the following:

- Eaton Cobra Lever or OEM Shift Lever

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Component Identification



Eaton Shift Lever

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Fault Code 83 - Shift Lever Missing

A

Purpose: *Check for active or Inactive fault codes.*

1. Key on.
2. Retrieve codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 83 is Active, replace Eaton **Cobra Lever** or OEM Shift Lever.
   - If Fault Code 83 is Inactive, test complete.

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Fault Code 84 - Shift Control Device Not Configured

J1587: MID 130 SID 18, 19 FMI 13
J1939: SA 3 SPN 751, 752 FMI 13

Overview

This fault indicates a new Transmission Electronic Control Unit (TECU) has not detected a Shift Control device.

Detection

The fault is detected the first time the system is powered up. The TECU looks for a shift control device if none are detected the system will set this code.

Note: The fault will only be set active.

Fallback

No crank at power-up.

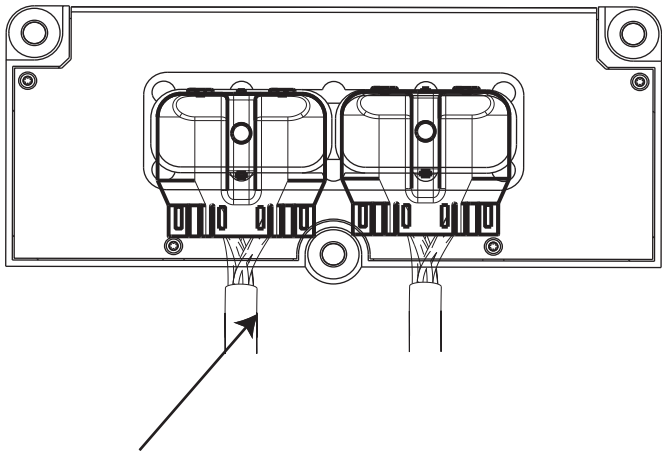
Possible Causes

This fault code can be caused by any of the following:

- Damaged OEM Wiring Harness between TECU and Shift Control device after new TECU is installed.
- Disconnected Shift Control device after new TECU is installed.

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Component Identification



Vehicle Harness 38-way Connector

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Fault Code 84 - Shift Control Device Not Configured

A

Purpose: *Confirm Shift Control device is properly installed. Check for active or Inactive fault codes.*

1. Verify Shift Control device is connected to the OEM wiring.
2. Key on.
3. Retrieve fault codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 84 is Active, repair OEM wiring between TECU and Shift Control device.

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Fault Code 85 - Shift Control Device Incompatible

J1587: MID 130 SID 18 FMI 12
J1939: SA 3 SPN 751 FMI 12

Overview

This fault indicates the Transmission Electronic Control Unit (TECU) has detected a non compatible Shift Control device.

Detection

The TECU looks for a Shift Control device at system power-up. If a non compatible shift control device is detected the system will set this code.

Fallback

This fault causes an in-place fallback

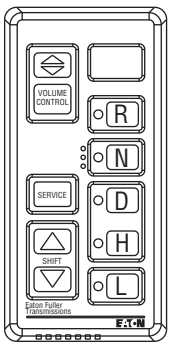
Possible Causes

This fault code can be caused by any of the following:

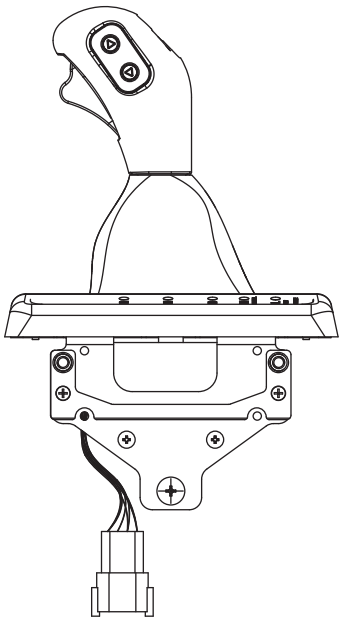
- Non compatible Shift Control device

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Component Identification



Pushbutton Shift Control



Eaton Shift Lever

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Fault Code 85 - Shift Control Device Incompatible

A ***Purpose:*** *Confirm Shift Control device part number. Ensure proper device installed.*

1. Verify Shift Control device is connected to the OEM wiring.
2. Key on.
3. Retrieve fault codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 85 is Active, verify correct Shift Control device is installed on vehicle.

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Fault Code 99 - Direction Mismatch

J1587: MID 130 SID 58 FMI 14
J1939: SA 3 SPN 781 FMI 14

Overview

The transmission controller is monitoring the Gear Position sensor and has determined the Electric Shifter is moving in the opposite intended direction.

Detection

- The fault can be detected any time after the Transmission Electronic Control Unit (TECU) powers up and a non-neutral mode is selected.
- FMI 14 - The transmission controller detected an incorrect Electric Shifter position.

Conditions to Set Fault Code Active

Conditions to Recreate Fault

- None

Fallback

This fault causes an in-place fallback. The transmission will remain in current gear.

Conditions to Set Fault Code Inactive

Conditions to Clear Fault

- The fault becomes Inactive after power down.

Possible Causes

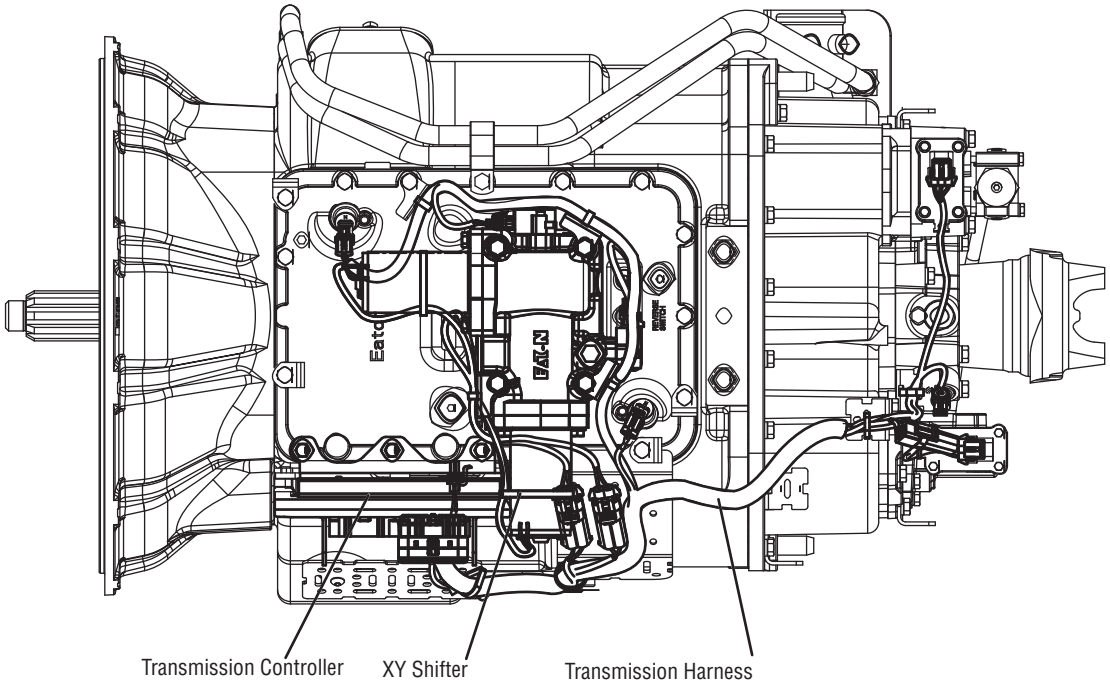
This fault code can be caused by the following:

- Internal transmission controller fault.
- Transmission wire harness shorted.
- Electric Shifter failure.

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Component Identification



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Fault Code 99 - Direction Mismatch

A

Purpose: *Check for active or Inactive fault codes. Contact Eaton technical support for further direction.*

1. Key on.
2. Retrieve fault codes. See “Fault Code Retrieval/Clearing” on page 5.
   - If Fault Code 99 is Active or Inactive, Customer - Call Eaton at 1-800-826-HELP (4357). CSC - Call Technician Service.

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Up/Down Button Test

Overview
This symptom-driven test is performed if unable to shift the transmission with the Up/Down buttons, and there are no Active or Inactive codes.

Detection
The shift control has no fault detection capability for this failure. The failure is observed by the driver when operating the vehicle.

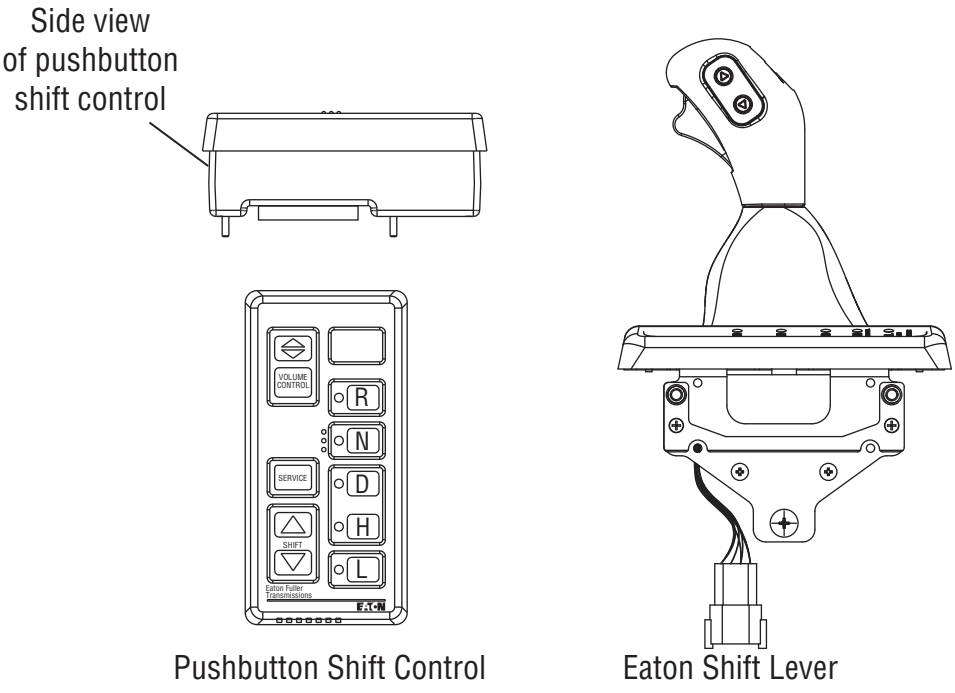
Fallback
There is no fallback for this symptom.

Possible Causes
This symptom can be caused by any of the following:

- Push button shift control
- Shift Lever

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Component Identification



Pushbutton Shift Control

Eaton Shift Lever

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Up/Down Button Test

A

Purpose: *Drive vehicle and attempt to complete manual button shifts in Manual Mode.*

1. Start engine.
2. Place Shift Device in manual.
3. Drive the vehicle using the buttons to initiate upshifts and downshifts, when conditions permit.
   - If the up and down buttons are working properly, the transmission will make upshifts and downshifts, test complete.
   - If the transmission does not make upshifts or downshifts, replace **Shift Control**. Repeat test.

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Start Enable Relay Contact Test

Overview
This symptom-driven test is performed if the engine does not crank with the Shift Lever in neutral, and there are no Active or Inactive codes.

Detection
The Transmission Electronic Control Unit (TECU) has no fault detection capability for this failure. The failure is observed by the driver when operating the vehicle. To observe this failure, attempt to start the vehicle.

Fallback
This symptom has no affect on vehicle operation; however, if the failure occurred before the engine was started, it is possible the engine will not start.

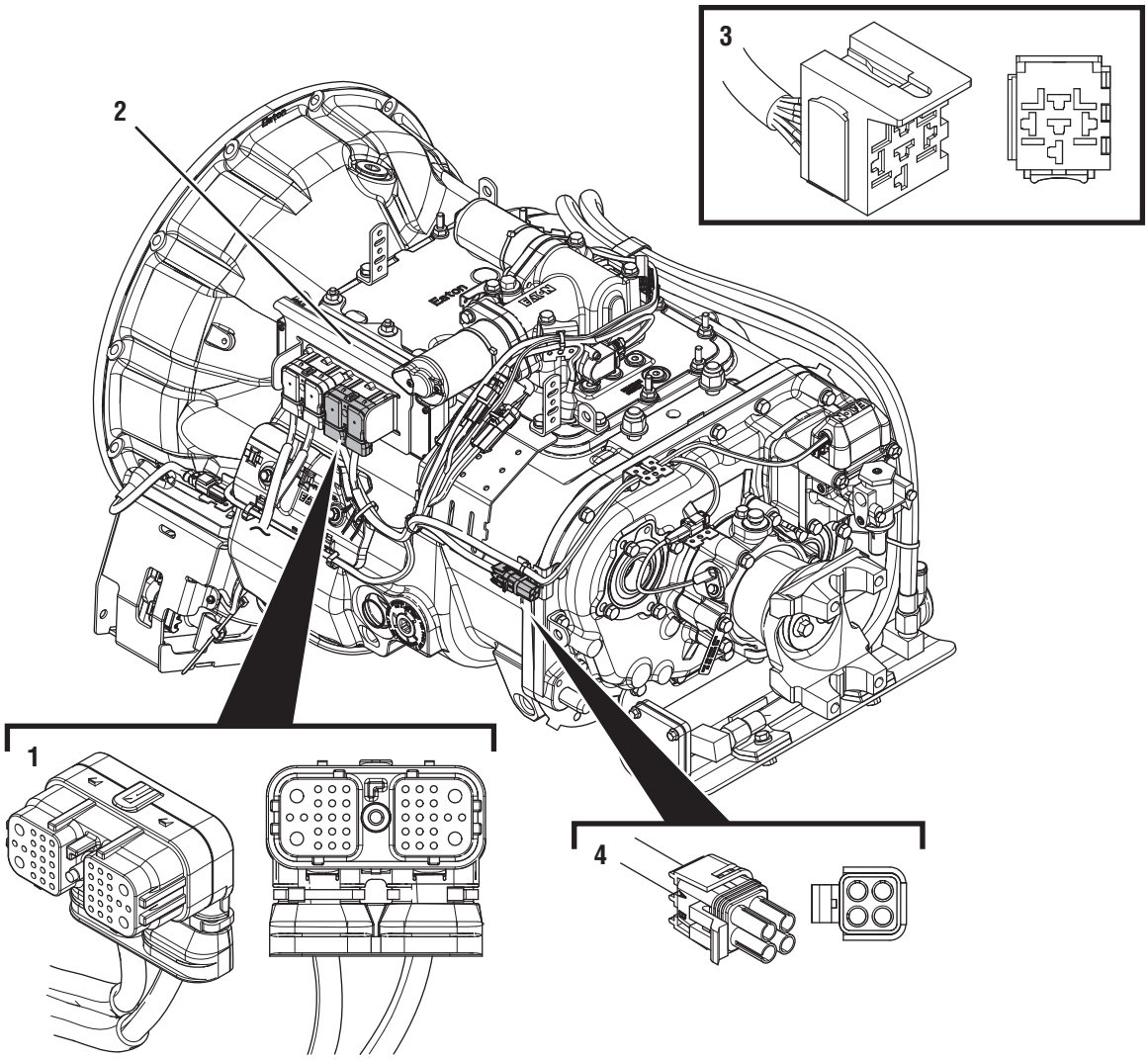
Possible Causes
This symptom can be caused by any of the following:

- Start Enable Relay
- Starter Solenoid wiring
- Vehicle Harness

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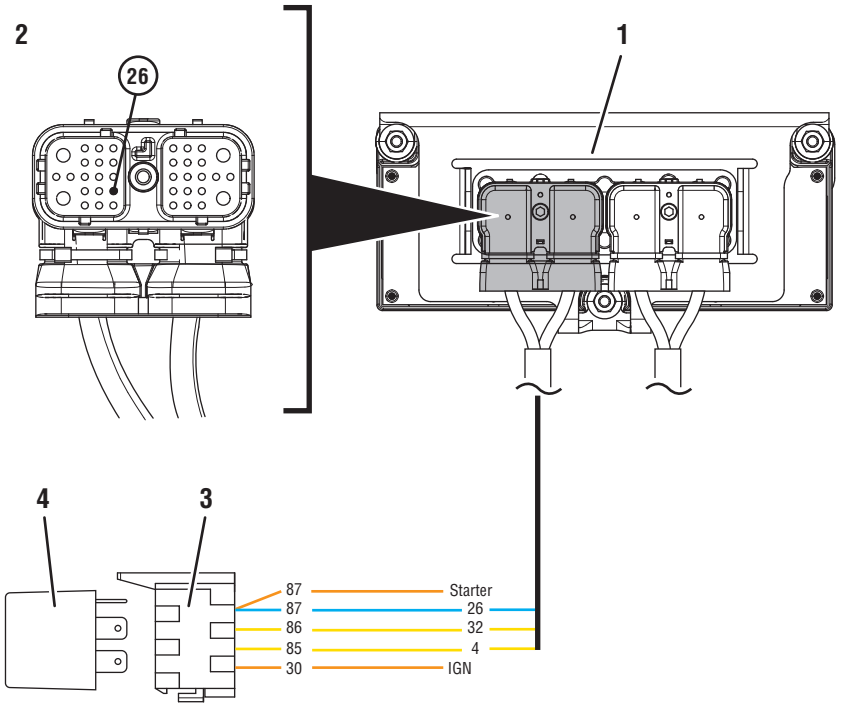
Component Identification



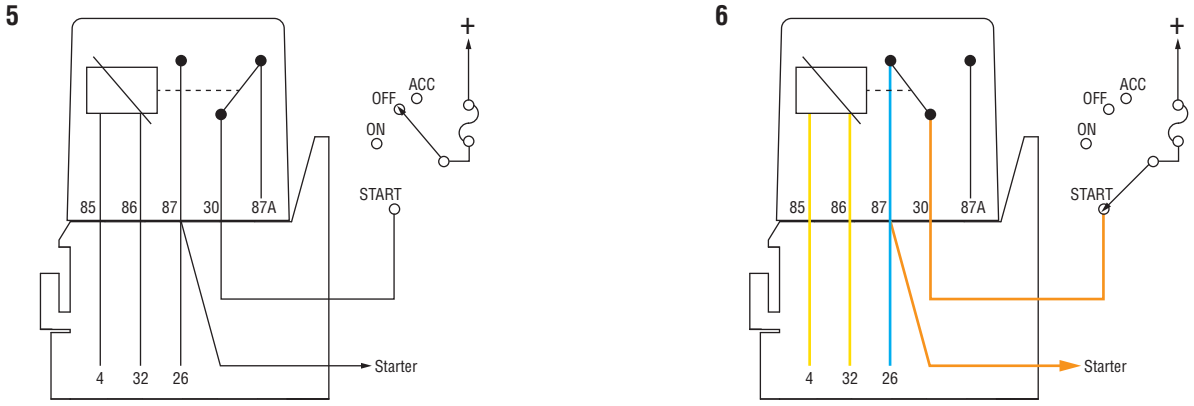
1. 38-Way Transmission Harness Connector
2. Transmission Electronic Control Unit (TECU)
3. 5-Way Start Enable Relay Socket
4. 4-Way Diagnostic Connector

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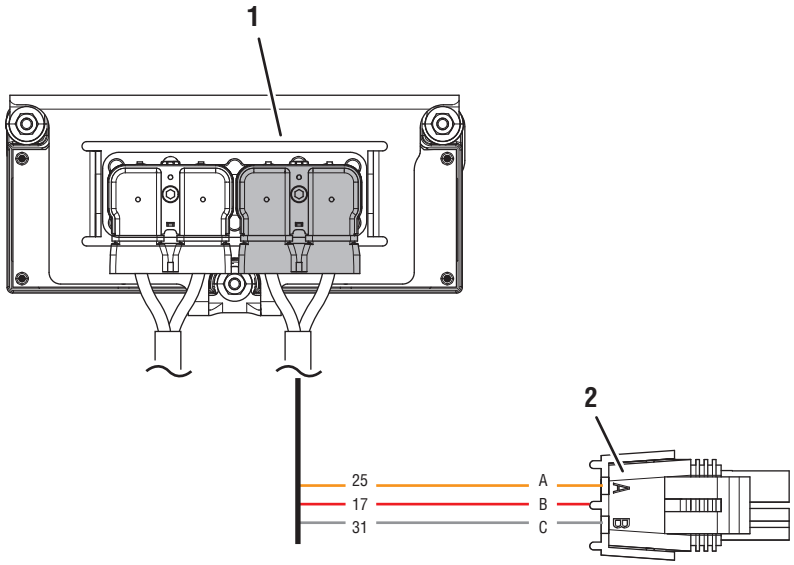
1. Transmission Electronic Control Unit (TECU)
2. 38-Way Vehicle Harness Connector
3. 5-Way Start Enable Relay Socket
4. 5-Way Start Enable Relay



Start Enable Relay Circuit States (Normally Open)
5. Open Relay - Key Off (Non-energized State)
6. Closed Relay - Key On and Transmission Confirmed in Neutral (Energized State)



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1. Transmission Electronic Control Unit (TECU)
2. 4-Way Diagnostic Connector

Battery Voltage
Ignition Voltage
Switched Battery from TECU
Switched 5V from TECU
Ground
Switched Ground
Communication
Relay/Solenoid Driver
Signal

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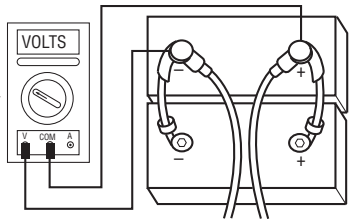
https://truckmanualshub.com/

Start Enable Relay Contact Test

A

Purpose: *Measure battery voltage. Visually inspect the batteries, inline fuse and power and ground supplies at the batteries.*

1. Key off.
2. Inspect starter/battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.

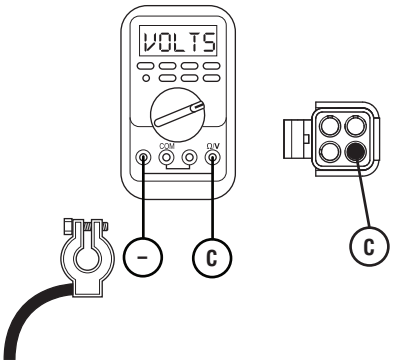


- If voltage is 11–13 volts on a 12-volt system or 22 to 26 on a 24 volt system, proceed with battery load test. Repair or replace batteries as required and go to **Step B.**
- If voltage is outside of range, repair or replace batteries and charging system as required. Repeat test.

B

Purpose: *Verify proper ground path between the batteries and the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.



- If voltage is 0.70 volts or less, go to **Step C.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

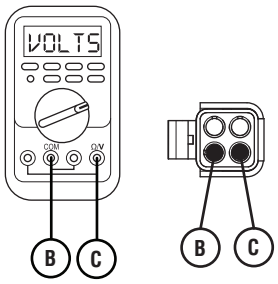
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C

Purpose: *Measure proper battery voltage at the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.

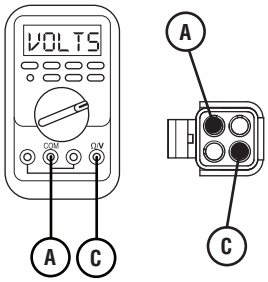


- If voltage is within 0.6 volts of battery voltage, go to **Step D.**
- If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

D

Purpose: *Measure proper ignition voltage at the transmission harness 4-way diagnostic connector.*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step E.**
- If voltage is outside of range, repair ignition power supply to TECU. Fuse may be blown. Repeat test.

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E

Purpose: *Visually inspect Start Enable Relay wiring and confirm that it is wired per requirements. Confirm if the engine will crank.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect Vehicle Harness 38-way connector.
4. Reconnect negative battery cable.
5. Key on.
6. Engage starter.

Note: The Start Enable Relay must be wired according to Eaton GEN III requirements (shown on previous page) for this test to work properly. If wired differently, consult OEM for correct wiring schematic.

- If engine cranks, go to **Step F.**
- If engine does not crank, go to **Step G.**

F

Purpose: *Remove the Start Enable Relay and confirm if the engine will crank.*

1. Key off.
2. Remove the Start Enable Relay.
3. Key on.
4. Engage starter.
   - If vehicle cranks, repair short to power on Vehicle Harness. go to **Step V.**
   - If vehicle does not crank, replace Start Enable Relay. go to **Step V.**

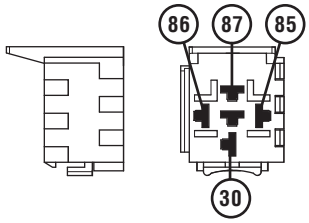
G

Purpose: *"Jump" the Start Enable Relay and confirm if the engine will crank.*

1. Key on.
2. Disconnect negative battery cable.
3. Reconnect Vehicle Harness 38-way connector.
4. Reconnect negative battery cable.
5. Place a jumper wire across connector contact 30 and contact 87.

Warning: Make sure the parking brake is set before jumping the Start Enable Relay.

6. Key on. Verify neutral on Gear Display.
7. Engage starter.



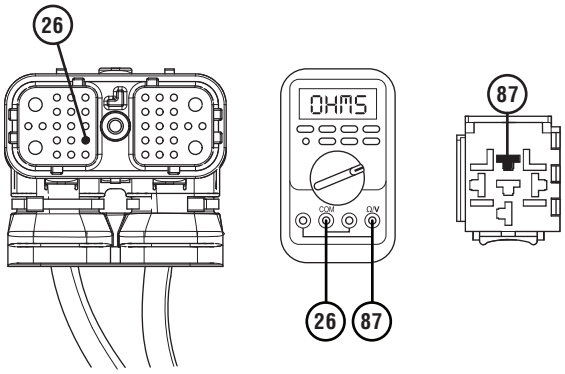
- If engine cranks, replace the Start Enable Relay. go to **Step H.**
- If engine does not crank, refer to OEM for repair of Vehicle Harness or starter.

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H

Purpose: *Verify continuity of the Start Enable Latch wire.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect Vehicle Harness 38-way connector.
4. Disconnect the Start Enable Relay.
5. Measure resistance between Pin 87 of the Start Enable Relay connector and Pin 26 of the Vehicle Harness 38-Way connector.



- If resistance is 0 to 0.3 ohms, go to **Step V.**
- If resistance is greater than 10K ohm, repair wiring and go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Key on.
4. Start the engine to determine whether the Start Enable Relay contact complaint has been repaired.
   - If engine starts, test complete.
   - If engine does not start go to **Step A.** to error in testing.

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J1587 Data Link Test

Overview
This symptom-driven test is performed if the ServiceRanger, a PC-based Service Tool, does not work.

Detection
The service technician observes the failure when operating ServiceRanger. To observe this failure, simply connect ServiceRanger to the transmission via the J1587 Diagnostic Connector located in the cab.

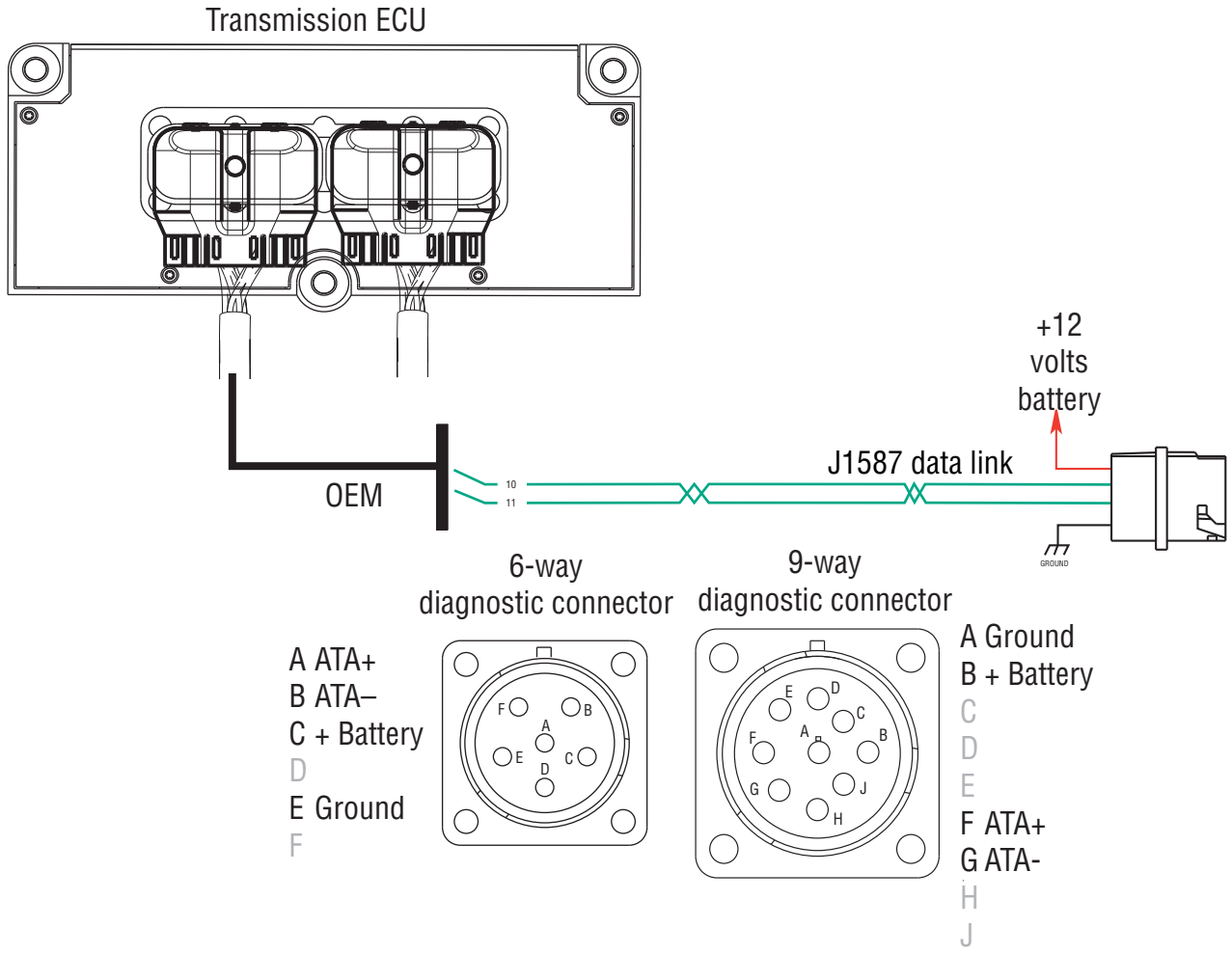
Fallback
There is no fallback mode for the J1587 Data Link.

Possible Causes
This symptom can be caused by any of the following:

- J1587 Data Link Harness
- ServiceRanger
- Transmission Electronic Control Unit (TECU)

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Component Identification



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J1587 Data Link Test

A ***Purpose:*** *Measure battery voltage supply to the vehicle diagnostic connector.*

1. Key off.
2. Measure voltage either between 6-Way Diagnostic Connector Pin C and Pin E or 9-Way Diagnostic Connector Pin B and Pin A.
   - If voltage is within 0.6 volts of battery voltage, go to **Step B.**
   - If voltage is outside of range, repair battery or ground wire to vehicle Diagnostic connector. Go to **Step V.**

Pins	Measurement
C to E	
B to A	

B ***Purpose:*** *Verify continuity of the J1587 Plus wire from the TECU to the vehicle diagnostic connector.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect Vehicle Harness 38-Way Connector.
4. Measure resistance from Vehicle Harness 38-Way Connector Pin 10 and either 6-Way Diagnostic Connector Pin A or 9-Way Diagnostic Connector Pin F.
   - If resistance is 0–0.3 ohms, go to **Step C.**
   - If resistance is outside of range, repair Vehicle Harness. Repeat this step.

Pins	Measurement
10 to A	
10 to F	

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C

Purpose: *Test the J1587 Plus wire for a short to ground through the vehicle diagnostic connector.*

1. Measure resistance between either 6-Way Diagnostic Connector Pin A or 9-Way Diagnostic Connector Pin F and ground.
   - If resistance is OL, go to **Step D.**
   - If resistance is less than 10K ohm, repair Vehicle Harness. Go to **Step V.**

Pins	Measurement
A to Ground	
F to Ground	

D

Purpose: *Verify continuity of the J1587 negative (–) wire from the TECU to the vehicle diagnostic connector.*

1. Measure resistance between Vehicle Harness 38-Way Connector Pin 11 and either 6-Way Diagnostic Connector Pin B or 9-Way Diagnostic Connector Pin G.
   - If resistance is 0–0.3 ohms, go to **Step E.**
   - If resistance is outside of range, repair Vehicle Harness and go to **Step V.**

Pins	Measurement
11 to B	
11 to G	

E

Purpose: *Test the J1587 negative (–) wire for a short to ground through the vehicle diagnostic connector.*

1. Measure resistance between either 6-Way Diagnostic Connector Pin B or 9-Way Diagnostic Connector Pin G and ground.
   - If resistance is OL, go to **Step V.**
   - If resistance is less than 10K ohm, repair Vehicle Harness. Go to **Step V.**

Pins	Measurement
B to Ground	
G to Ground	

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V

Purpose: *Verify repair.*

1. Key on.
2. Connect to ServiceRanger.
   - If ServiceRanger functions correctly, test complete.
   - If ServiceRanger does not function correctly go to **Step A.** find error in testing.

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Front Box Control Test

Overview
This symptom-driven test is performed if a dash is displayed on the gear display, and there are no active or Inactive codes.

Detection
Turn the key on and watch the Gear Display. If the Gear Display shows "-" constantly, the Transmission Electronic Control Unit (TECU) was not able to confirm front box control.

Any time the service light is flashing, go to Diagnostics Procedure.

Fallback
This fault causes an in-place fallback while moving, and it causes a failure during system initialization. A dash will appear on the Gear Display.

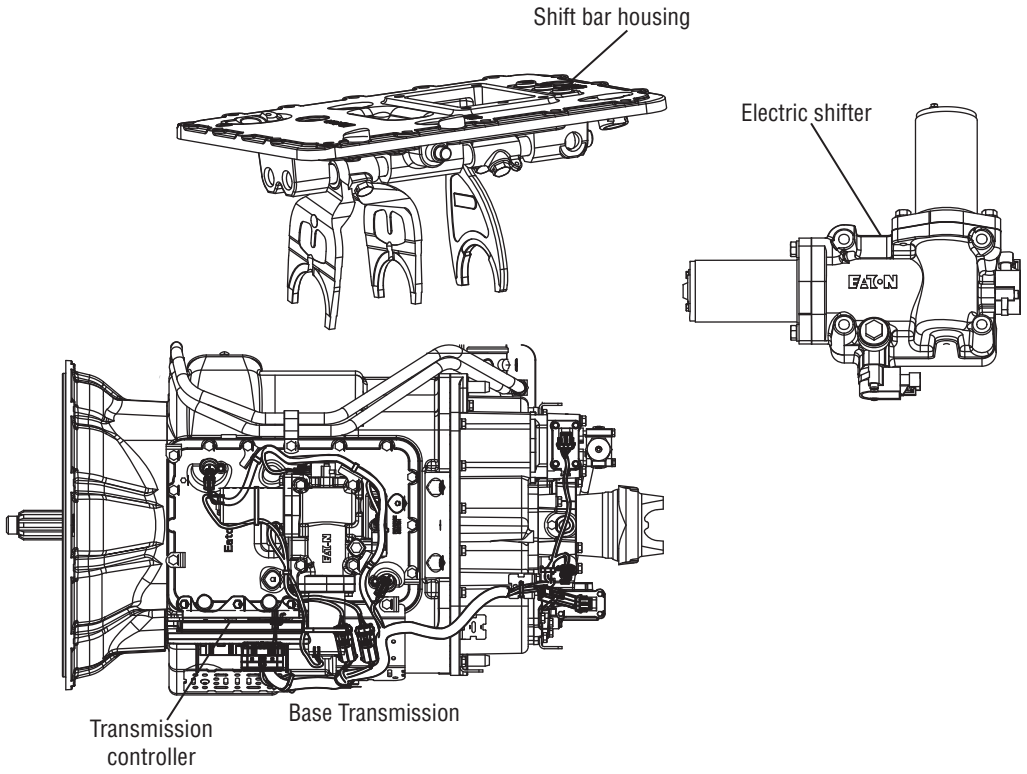
Possible Causes
This symptom can be caused by any of the following:

- Low power to gear select motor
- Electric shifter
- Gear Select Sensor
- Yoke / clutch / main shaft
- Shift Bar housing
- Dragging clutch
- Torque locked in gear

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Component Identification



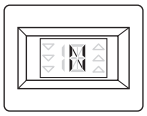
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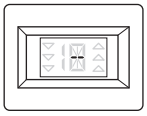
Front Box Control Test

A ***Purpose:*** *Visually observe the gear display after power-up.*

1. Key on.
2. Depress clutch pedal (if equipped) half way to the floor.
3. Place Shift Device in neutral.
4. Observe Gear Display.
   - If Gear Display shows N, go to **Step B.**

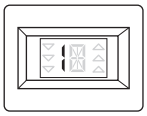


   - If service light is flashing, see “Diagnostic Procedures” on page 3.
   - If Gear Display shows: “-” or a flashing gear with no arrows, go to **Step C.**



B ***Purpose:*** *Visually observe the gear display when placing the transmission into Drive.*

1. Key on.
2. Place Shift Device in neutral.
3. Depress clutch pedal (if equipped) half way to the floor. If it is a two pedal design apply the service brake.
4. Select Drive
5. Observe Gear Display.



   - If Gear Display shows a solid gear, test complete.
   - If service light is flashing, See “Diagnostic Procedures” on page 3.
   - If Gear Display shows a flashing gear with no arrows, go to **Step C.**

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C ***Purpose:*** *Measure battery voltage. Visually inspect the batteries, inline fuse and power and ground supplies at the batteries.*

1. Key off.
2. Inspect starter/battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.
   - If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required and go to **Step D.**
   - If voltage is outside of range, repair or replace batteries and charging system as required. Repeat test.

D ***Purpose:*** *Verify proper ground path between the batteries and the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.
   - If voltage is 0.70 volts or less, go to **Step E.**
   - If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

E ***Purpose:*** *Measure proper battery voltage at the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.
   - If voltage is within 0.6 volts of battery voltage, go to **Step F.**
   - If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

F ***Purpose:*** *Measure proper ignition voltage at the transmission harness 4-way diagnostic connector.*

1. Key on.
2. Measure voltage between Pin A and Pin C.
   - If voltage is within 0.6 volts of battery voltage, go to **Step G.**
   - If voltage is outside of range, repair Ignition power supply to TECU. Fuse may be blown. Repeat test.

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G ***Purpose:*** *Remove Electric Shifter from the Shift Bar Housing and inspect the mechanical transmission.*

1. Key off.
2. Remove Electric Shifter from Shift Bar housing.
3. Inspect the Shift Bar housing:
   - Shift Blocks
   - Shift Rails
   - Inspect Electric Shifter for evidence of lube contamination.

   Note: See if the Shift Bar housing can engage two gears at the same time to verify interlock operation.

   - If no problem found, replace **Electric Shifter** go to **Step V.**
   - If problem found, repair as required go to **Step V.**

V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Place Shift Control into neutral.
4. Key on.
   - If Gear Display displays a solid N, test complete.
   - If Gear Display does not display a solid N, find error in testing, return to go to **Step A.**

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AutoShift Will Not Engage a Gear from Neutral Test

Overview

This symptom-driven test is performed if the transmission does not engage a gear, and there are no active or Inactive codes.

Detection

If the Transmission Electronic Control Unit (TECU) is unable to provide a fault code, the driver may observe this failure as the transmission not initiating or completing a shift. The driver may observe this failure as the transmission neutralizes.

Fallback

There is no fallback mode for this symptom.

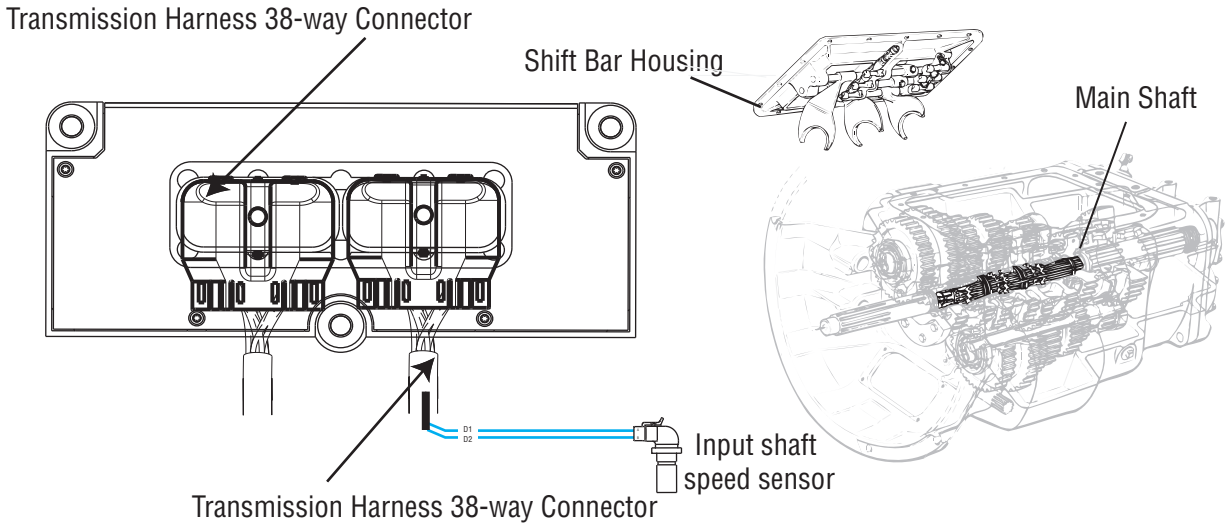
Possible Causes

This symptom can be caused by any of the following:

- Input Shaft Speed Sensor
- Transmission
- Clutch Brake/Clutch
- Transmission Harness
- TECU

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Component Identification



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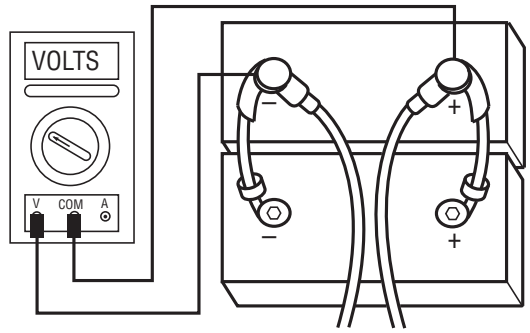
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AutoShift Will Not Engage a Gear from Neutral Test

A

Purpose: *Measure battery voltage. Visually inspect the batteries, inline fuse and power and ground supplies at the batteries.*

1. Key off.
2. Inspect starter/battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.

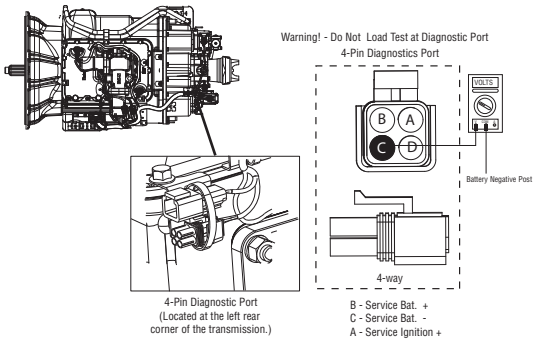


- If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required. Go to **Step B.**
- If voltage is outside of range, repair or replace batteries and charging system as required. Repeat test.

B

Purpose: *Verify proper ground path between the batteries and the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.



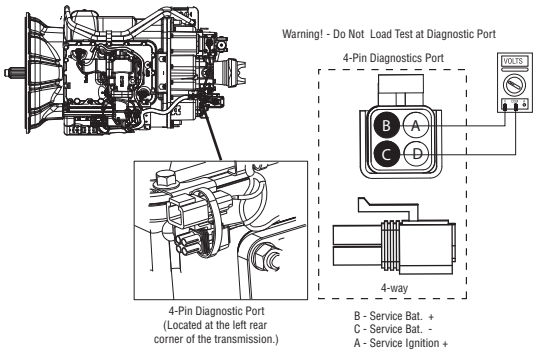
- If voltage is 0.70 volts or less, go to **Step C.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

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C

Purpose: *Measure proper battery voltage at the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.

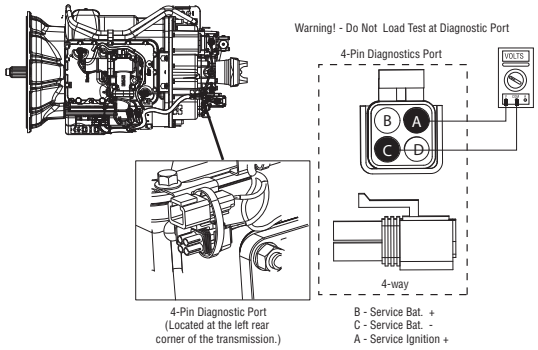


- If voltage is within 0.6 volts of battery voltage, go to **Step D.**
- If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

D

Purpose: *Measure proper ignition voltage at the transmission harness 4-way diagnostic connector.*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step E.**
- If voltage is outside of range, Repair ignition power supply to TECU. Fuse may be blown. Repeat test.

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E

Purpose: *Visually observe the gear display when placing the transmission into Drive.*

1. Key on.
2. Depress clutch pedal.
3. Start engine.
4. Release clutch pedal to verify input shaft speed.
5. Depress clutch pedal.
6. Place Shift Lever in D.
7. Observe Gear Display.
   - If Gear Display shows a solid N and the warning tone sounds, go to **Step F.**
   - If Gear Display shows a flashing gear with arrows, go to **Step M.**
   - If Gear Display shows a flashing gear with no arrows, See “Front Box Control Test” on page 282.
   - If Gear Display shows a solid gear but the vehicle will not move, contact your local Eaton Representative or call 1-800-826-HELP (4357).

F

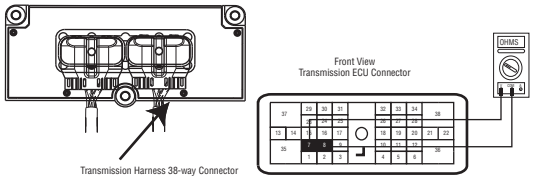
Purpose: *Monitor Input Shaft Speed in ServiceRanger.*

1. Key off.
2. Connect ServiceRanger, a PC-based Service Tool.
3. Start engine. Release clutch pedal.
4. View Input Shaft speed.
   - If Input Shaft speed exists, contact your local Eaton Representative or call 1-800-826-HELP (4357).
   - If input shaft speed does not exist, go to **Step G.**

G

Purpose: *Measure the resistance of the Input Shaft Speed Sensor through the Transmission Harness.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Transmission Harness 38-way connector.
4. Measure the resistance between the Transmission Harness 38-way connector Pin 7 and Pin 8.



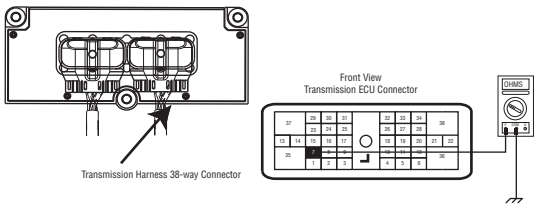
   - If resistance is 2K to 4.5K ohm, go to **Step H.**
   - If resistance is outside of range, go to **Step J.**

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H

Purpose: *Test the Input Shaft Speed Sensor circuit for a short to ground through the Transmission Harness.*

1. Measure resistance between the Transmission Harness 38-way connector Pin 7 and ground.



- If resistance is OL,go to **Step I.**
- If resistance is less than 10K ohm, go to **Step J.**

I

Purpose: *Visually remove and inspect the Input Shaft Speed Sensor for contamination or damage.*

1. Inspect Input Shaft Speed Sensor for contamination or damage.

- If no problem found, go to **Step L.**
- If problem found or you were sent here from Step J or K, replace the:
  - **Medium-Duty Input Shaft Speed Sensor**
  - **Heavy-Duty Input Shaft Speed Sensor**

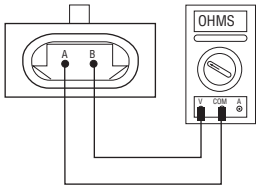
  Inspect the upper countershaft PTO gear for damage. Go to **Step V.**

J

Purpose: *Measure the resistance of the Input Shaft Speed Sensor at the Input Shaft Speed Sensor.*

1. Disconnect the Transmission Harness from the Input Shaft Speed Sensor.

2. Measure resistance between Input Shaft Speed Sensor Pin A and Pin B.



- If resistance is 2K to 4.5K ohm, go to **Step K.**
- If resistance is outside of range, go to **Step I.**

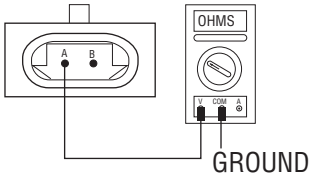
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K

Purpose: *Test the Input Shaft Speed Sensor circuit for a short to ground at the Input Shaft Speed Sensor.*

1. Measure resistance between Input Shaft Speed Sensor Pin A and ground.



- If resistance is OL, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, go to **Step I.**

L

Purpose: *Verify mechanical movement of the upper countershaft within the transmission.*

1. Key off.

2. Verify the Upper Countershaft is turning.

3. Turn the Input Shaft and verify the Upper Countershaft is rotating.

- If Upper Countershaft is turning, replace the:
  - **Medium-Duty Transmission Electronic Control Unit (TECU)**
  - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

  Go to **Step V.**
- If Upper Countershaft is not turning, contact your Eaton Representative or call Eaton at 1-800-826-HELP (4357).

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M ***Purpose:*** *Monitor Input Shaft Speed in ServiceRanger.*

1. Connect PC-based service tool.
2. Start engine.
3. Depress clutch pedal.
4. View input shaft speed.
   - If input shaft speed does not drop below 150 RPM, clutch is out of adjustment and/or Input Shaft Brake (Clutch Brake) is malfunctioning. Adjust clutch per manufacturer's specifications. go to **Step V.**
   - If input shaft speed drops below 150, test complete and go to **Step V.**

V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Key on.
4. Drive the vehicle to determine whether the complaint has been repaired.
   - If the transmission engages a gear, test complete.
   - If the transmission does not engage a gear go to **Step A.** to find error in testing.

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UltraShift DM3 Will Not Engage a Gear from Neutral Test

Overview

This symptom-driven test is performed if the transmission does not engage a gear, and there are no active or Inactive codes.

Detection

If the Transmission Electronic Control Unit (TECU) is unable to provide a fault code, the driver may observe this failure as the transmission not initiating or completing a shift. The driver may observe this failure as the transmission neutralizes.

Fallback

There is no fallback mode for this symptom.

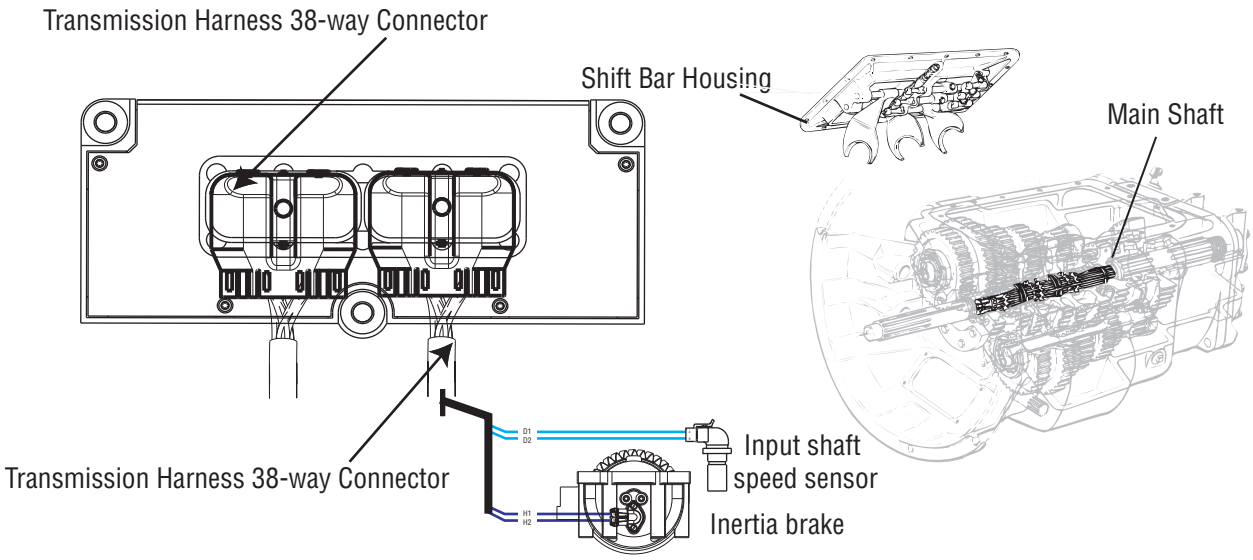
Possible Causes

This symptom can be caused by any of the following:

- Input Shaft Speed Sensor
- Transmission
- Inertia Brake
- Clutch/Clutch Brake
- OEM Service Brake Switch Operation
- TECU
- Transmission Harness

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Component Identification



Warning: Do not load test at diagnostic port.

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UltraShift DM3 Will Not Engage a Gear from Neutral Test

A

Purpose: *Measure battery voltage. Visually inspect the batteries, inline fuse and power and ground supplies at the batteries.*

1. Key off.
2. Inspect starter/battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.
   - If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required. Go to **Step B.**
   - If voltage is outside of range, repair or replace batteries and charging system as required. Repeat test.

B

Purpose: *Verify proper ground path between the batteries and the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.
   - If voltage is 0.70 volts or less, go to **Step C.**
   - If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

C

Purpose: *Measure proper battery voltage at the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.
   - If voltage is within 0.6 volts of battery voltage, go to **Step D.**
   - If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

D

Purpose: *Measure proper ignition voltage at the transmission harness 4-way diagnostic connector.*

1. Key on.
2. Measure voltage between Pin A and Pin C.
   - If voltage is within 0.6 volts of battery voltage, go to **Step E.**
   - If voltage is outside of range, repair ignition power supply to TECU. Fuse may be blown. Repeat test.

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E

Purpose: *Visually observe the gear display when placing the transmission into Drive.*

1. Key on.
2. Start engine.
3. Apply service brake while selecting D.
4. Observe Gear Display.

   Note: Using a ServiceRanger a PC-based Service Tool, verify OEM service brake operation.

   - If Gear Display shows a solid N and the warning tone sounds, go to **Step F.**
   - If Gear Display shows a flashing gear with arrows, go to **Step M.**
   - If Gear Display shows a flashing gear with no arrows, See “Front Box Control Test” on page 282.
   - If Gear Display shows a solid gear but the vehicle will not move, contact your Eaton Representative or call Eaton at 1-800-826-HELP (4357).

F

Purpose: *Monitor Input Shaft Speed in ServiceRanger.*

1. Key off.
2. Connect PC-based Service Tool.
3. Start engine. Increase RPM and hold above 1000 RPM.
4. View Input Shaft speed.
   - If Input Shaft speed exists, contact your Eaton Representative or call Eaton at 1-800-826-HELP (4357).
   - If Input Shaft speed does not exist, go to **Step G.**

G

Purpose: *Measure the resistance of the Input Shaft Speed Sensor through the Transmission Harness.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Transmission Harness 38-way connector.
4. Measure the resistance between the Transmission Harness 38-way connector Pin 7 and Pin 8.
   - If resistance is 2K to 4.5K ohm, go to **Step H.**
   - If resistance is outside of range, go to **Step J.**

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H ***Purpose:*** *Test the Input Shaft Speed Sensor circuit for a short to ground through the Transmission Harness.*

1. Measure resistance between the Transmission Harness 38-way connector Pin 7 and ground.
   - If resistance is OL, go to **Step I.**
   - If resistance is less than 10K ohm, go to **Step J.**

I ***Purpose:*** *Visually remove and inspect the Input Shaft Speed Sensor for contamination or damage.*

1. Inspect Input Shaft Speed Sensor for contamination or damage.
   - If no problem found, go to **Step L.**
   - If problem found, replace the:
     - **Medium-Duty Input Shaft Speed Sensor**
     - **Heavy-Duty Input Shaft Speed Sensor**

     and inspect the upper countershaft PTO gear for damage. Go to **Step V.**

J ***Purpose:*** *Measure the resistance of the Input Shaft Speed Sensor at the Input Shaft Speed Sensor.*

1. Disconnect the Transmission Harness from the Input Shaft Speed Sensor.
2. Measure resistance between Input Shaft Speed Sensor Pin A and Pin B.
   - If resistance is 2K to 4.5K ohm, go to **Step K.**
   - If resistance is outside of range, replace the:
     - **Medium-Duty Input Shaft Speed Sensor**
     - **Heavy-Duty Input Shaft Speed Sensor**

     Go to **Step V.**

K ***Purpose:*** *Test the Input Shaft Speed Sensor circuit for a short to ground at the Input Shaft Speed Sensor.*

1. Measure resistance between Input Shaft Speed Sensor Pin A and ground.
   - If resistance is OL, replace the:
     - **Medium-Duty Transmission Harness**
     - **Heavy-Duty Transmission Harness**

     Go to **Step V.**
   - If resistance is less than 10K ohm, replace the:
     - **Medium-Duty Input Shaft Speed Sensor**
     - **Heavy-Duty Input Shaft Speed Sensor**

     Go to **Step V.**

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L

Purpose: *Verify mechanical movement of the upper countershaft within the transmission.*

1. Key off.
2. Turn the Input Shaft and verify the upper countershaft is rotating.
   - If upper countershaft is turning, replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If upper countershaft is not turning, contact your Eaton Representative or call Eaton at 1-800-826- HELP (4357) for a repair strategy.

M

Purpose: *Monitor Input Shaft Speed in ServiceRanger.*

1. Connect PC-based service tool.
2. Start engine
3. View input shaft speed.
   - If input shaft speed stays above 150 RPM, clutch is dragging, go to **Step N.**
   - If input shaft speed drops below 150 RPM, test complete and go to **Step V.**

N

Purpose: *Perform Inertia Brake Test using ServiceRanger.*

1. Key on.
2. Make sure the PTO is off.
3. Connect ServiceRanger a PC-based Service Tool and select Advanced Product Functions.
4. Start engine.
5. Select Inertia Brake Test.
6. Run test and follow instructions.
   - Test passes, replace clutch and go to **Step V.**
   - Test fails, replace the:
     - **Medium-Duty Inertia Brake**
     - **Heavy-Duty Inertia Brake**

     Go to **Step V.**
   - Test aborts, correct displayed test failure condition and retest.

V

Purpose: *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Key on.
4. Drive the vehicle to determine whether the complaint has been repaired.
   - If the transmission engages a gear, test complete.
   - If the transmission does not engage a gear go to **Step A.** to find error in testing.

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UltraShift AW3 Clutch Engagement Test

Overview

This symptom-driven test is performed if a clutch engagement complaint exists, and there are no active or Inactive codes.

Detection

There is no detection other than a driver complaint.

Fallback

There is no fallback mode for clutch engagement complaint; however, it may effect vehicle performance.

Possible Causes

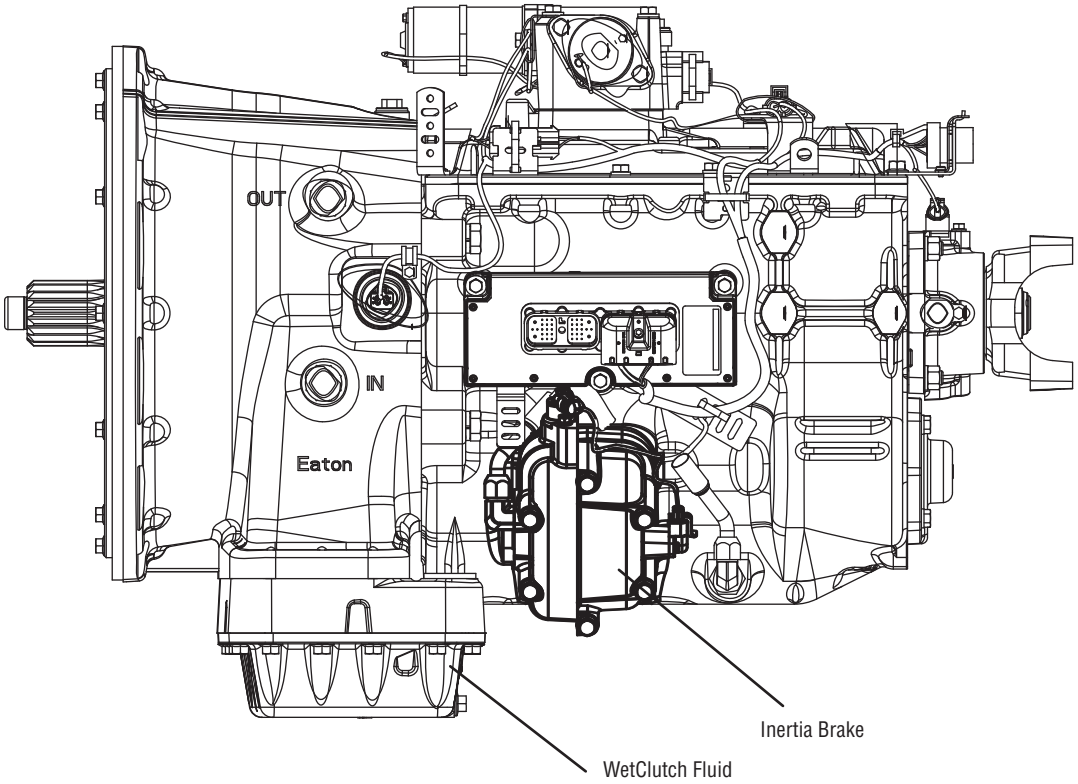
This symptom can be caused by any of the following:

- Low fluid level
- Inertia Brake
- Clutch calibration
- Transmission

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Component Identification



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UltraShift AW3 Clutch Engagement Test

A

Purpose: *Inspect the transmission fluid level.*

1. Place transmission in neutral.
2. Allow engine to idle at 600 to 700 RPM for a minimum of 2 minutes. Ensure transmission fluid temperature is 60 to 120 degrees F (16 to 49 degrees C)
3. Check transmission fluid level.
   - If fluid level is at COLD-FULL mark, go to **Step B.**
   - If fluid level is below the COLD-ADD mark, correct fluid level, check for leaks. Drive Vehicle, if clutch engagement complaint exists, repeat this step.

B

Purpose: *Visually inspect the torsional coupler.*

1. Remove the flywheel inspection cover and inspect the rubber coupler for damage or shear.
   - If no damage is observed, go to **Step C.**
   - If damage is observed, replace the Torsional Coupler. go to **Step V.**

C

Purpose: *Bring engine up to operating temperature and test the clutch engagement operation.*

1. Key on.
2. Engine running, allow engine to reach operating temperature.
3. Key off.
4. Start vehicle.
5. Allow vehicle to idle in neutral for a minimum of 2 minutes.
6. Drive vehicle.
   - If clutch engagement complaint does not change, go to **Step D.**
   - If clutch engagement complaint is corrected, test complete.

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D ***Purpose:*** *Disconnect the Inertia Brake from the Transmission Harness and test the clutch engagement operation.*

1. Key off.
2. Disconnect Transmission Harness from the Inertia Brake.
3. Key on.
4. Drive vehicle (Flashing Service Light will exist).
   - If clutch engagement complaint does not change, Contact your Eaton Representative or call Eaton at 1-800-826-HELP (4357).
   - If clutch engagement complaint is corrected, replace the:
     - **Medium-Duty Inertia Brake**
     - **Heavy-Duty Inertia Brake**

     Go to **Step V.**

V ***Purpose:*** *Verify repair.*

1. Key Off.
2. Reconnect Transmission Harness to Inertia Brake.
3. Key on.
4. Drive the vehicle to determine whether the complaint has been repaired.
   - If shift complaint has not been repaired, contact your Eaton Representative or call Eaton at 1-800-826-HELP (4357).
   - If the shift complaint has been repaired, test complete.

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AutoShift AS3 Shift Complaint Test

Overview
This symptom-driven test is performed if a shift complaint exists, and there are no active or Inactive codes.

Detection
There is no detection other than a driver complaint.

Fallback
There is no fallback mode for a shift complaint; however, it may affect vehicle performance.

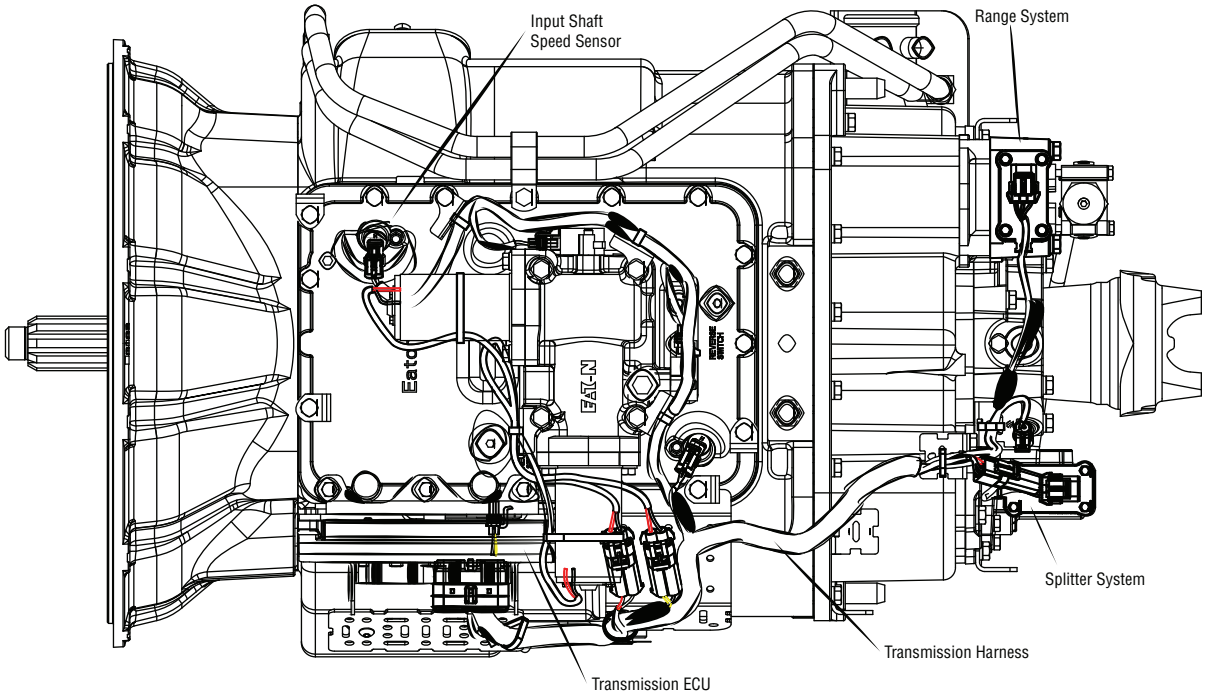
Possible Causes
This fault code can be caused by any of the following:

- Electric Shifter
- Range system
- Splitter system
- Input Shaft Speed Sensor
- Transmission Harness
- Shift Bar housing
- Transmission Electronic Control Unit (TECU)

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Component Identification



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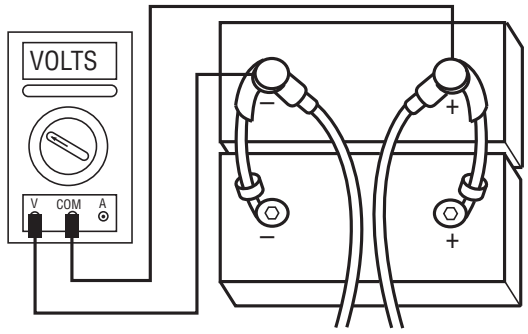
https://truckmanualshub.com/

AutoShift AS3 Shift Complaint Test

A

Purpose: *Measure battery voltage. Visually inspect the batteries, inline fuse and power and ground supplies at the batteries.*

1. Key off.
2. Inspect starter/battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.

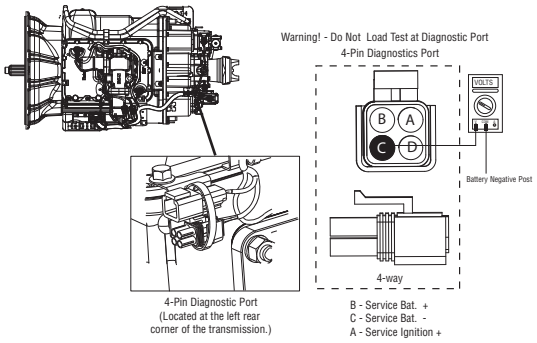


- If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required. Go to **Step B.**
- If voltage is outside of range, repair or replace batteries and charging system as required. Repeat this step.

B

Purpose: *Verify proper ground path between the batteries and the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.



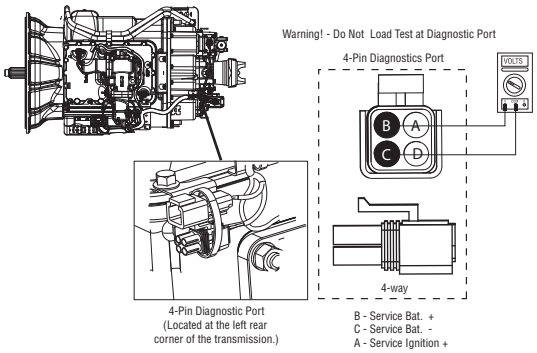
- If voltage is 0.70 volts or less, go to **Step C.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

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C

Purpose: *Measure proper battery voltage at the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.

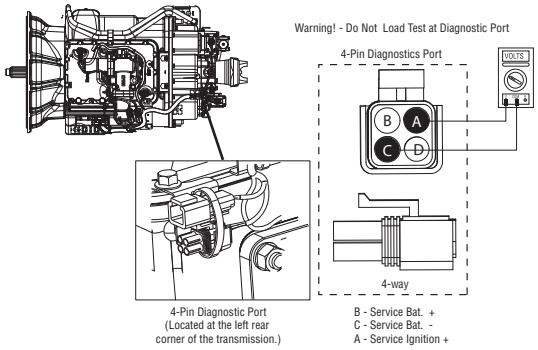


- If voltage is within 0.6 volts of battery voltage, go to **Step D.**
- If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

D

Purpose: *Measure proper ignition voltage at the transmission harness 4-way diagnostic connector.*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step E.**
- If voltage is outside of range, repair ignition power supply to TECU. Fuse may be blown. Repeat test.

E

Purpose: *Monitor Input Shaft Speed in ServiceRanger.*

1. Connect PC-based service tool and monitor Input Shaft speed with Clutch Pedal released.
   - If input shaft speed matches engine RPM, go to **Step K.**
   - If Input shaft speed reads 0, go to **Step F.**

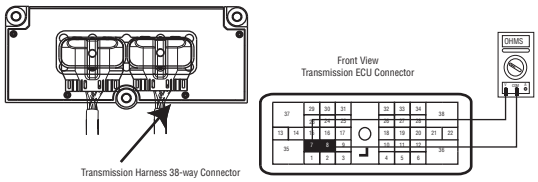
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F

Purpose: *Measure the resistance of the Input Shaft Speed Sensor through the Transmission Harness.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Transmission Harness 38-way connector.
4. Measure the resistance between the Transmission Harness 38-way connector Pin 7 and Pin 8.

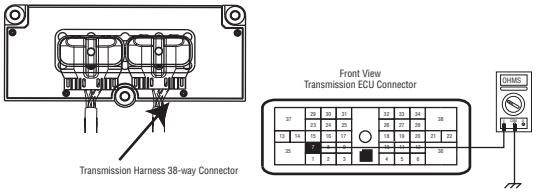


- If resistance is 2K to 4.5K ohm, go to **Step G.**
- If resistance is outside of range, go to **Step I.**

G

Purpose: *Test the Input Shaft Speed Sensor circuit for a short to ground through the Transmission Harness.*

1. Measure resistance between the Transmission Harness 38-way connector Pin 7 and ground.



- If resistance is OL, go to **Step H.**
- If resistance is less than 10K ohm, go to **Step I.**

H

Purpose: *Visually remove and inspect the Input Shaft Speed Sensor for contamination or damage.*

1. Inspect Input Shaft Speed Sensor for contamination or damage.
   - If no problem found, replace the:
     - **Medium-Duty Transmission Electronic Control Unit (TECU)**
     - **Heavy-Duty Transmission Electronic Control Unit (TECU)**

     Go to **Step V.**
   - If problem found or you were sent here from Step H or I, replace the:
     - **Medium-Duty Input Shaft Speed Sensor**
     - **Heavy-Duty Input Shaft Speed Sensor**

     Inspect the upper countershaft PTO gear for damage. Go to **Step V.**

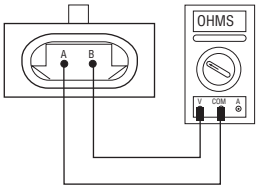
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I

Purpose: *Measure the resistance of the Input Shaft Speed Sensor at the Input Shaft Speed Sensor.*

1. Disconnect the Transmission Harness from the Input Shaft Speed Sensor.
2. Measure resistance between Input Shaft Speed Sensor Pin A and Pin B.

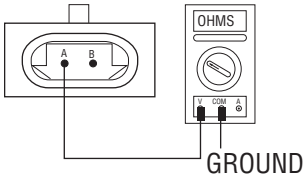


- If resistance is 2K to 4.5K ohm, go to **Step J.**
- If resistance is outside of range, go to **Step H.**

J

Purpose: *Test the Input Shaft Speed Sensor circuit for a short to ground at the Input Shaft Speed Sensor.*

1. Measure resistance between Input Shaft Speed Sensor Pin A and ground.



- If resistance is OL, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, go to **Step H.**

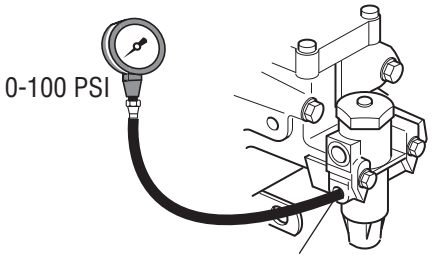
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K

Purpose: *Measure vehicle air supply pressure.*

1. Key off.
2. Install a 0-100 PSI air pressure gauge in the regulated test port of the air filter/regulator.
3. Start engine and allow air pressure to build to governor cut-off.
4. Monitor the vehicle air pressure gauge on the dash.



Regulated test port

- If air pressure cuts off between 90 to 120 PSI, go to **Step L.**
- If air pressure is outside of range, repair vehicle air system as required. Repeat test.

L

Purpose: *Confirm vehicle maintains air supply pressure.*

1. Key off.
2. Monitor the vehicle air pressure gauge on the dash.
   - If vehicle maintains air pressure, go to **Step M.**
   - If vehicle loses air pressure, repair vehicle air system as required. Repeat test.

M

Purpose: *Verify air filter/regulator operation.*

1. Read air pressure gauge installed at the regulated port.
   - If air pressure is between 55 to 65 PSI, go to **Step O.**
   - If air pressure is outside of range, go to **Step N.**

N

Purpose: *Confirm air flow to the filter regulator supply port.*

1. Remove air supply line to the air filter/regulator and check airflow.
   - If air flows from the supply line, repair **Air Filter Regulator**. Go to **Step K.**
   - If air does not flow from the supply line, repair vehicle air supply to the regulator. Go to **Step K.**

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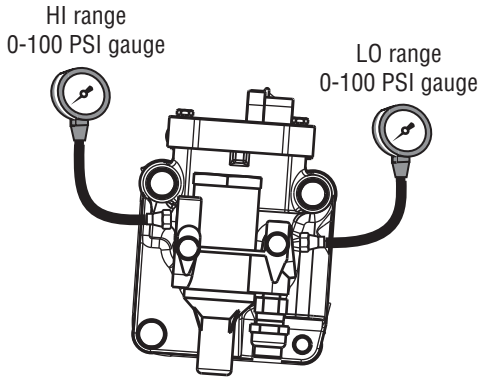
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O

Purpose: *Measure low range air pressures.*

1. Key off.
2. Install both 0-100 PSI air pressure gauges into the range cover diagnostic ports.
3. Start vehicle and allow air pressure to build to governor cut-off.
4. Turn off engine, but leave key on.
5. With Shift Control, select reverse, then select neutral.

   Note: Five minutes is allowed for checking the air pressure after shifting the transmission to neutral.

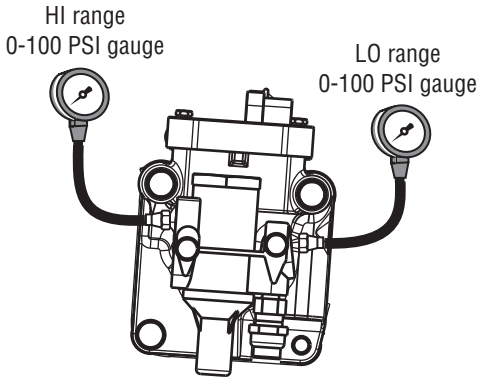


- If low range gauge is between 55 to 65 PSI and If high range gauge is 0 PSI, go to **Step P.**
- If both air pressure gauges do not read as listed above, replace **Range Valve**. Go to **Step P.**

P

Purpose: *Measure high range air pressures.*

1. Key on.
2. With the Shift Control, select the highest reverse gear available by pressing the upshift button/arrow, then select neutral.



- If high range gauge is between 55 to 65 PSI and if low range gauge is 0 PSI, go to **Step Q.**
- If both air pressure gauges do not read as listed above, replace **Range Valve**. Go to **Step V.**

Q

Purpose: *Identify if the transmission is equipped with a splitter system.*

1. Is the transmission equipped with a splitter system? (i.e. 18-Speed)
   - If the transmission is equipped with a splitter system, go to **Step R.**
   - If the transmission is not equipped with a splitter system, go to **Step V.**

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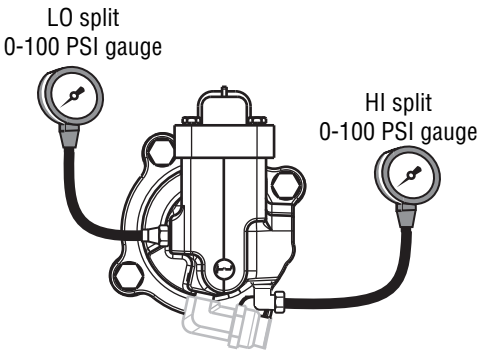
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R

Purpose: *Measure high splitter air pressures.*

1. Key off.
2. Start vehicle and allow air pressure to build to governor cut-off.
3. Turn off engine, but leave key on.
4. With Shift Control, select reverse (R1 in gear display for 13/18-speed), then select neutral

   Note: Five minutes is allowed for checking the pressure after moving the Shift Lever to neutral.



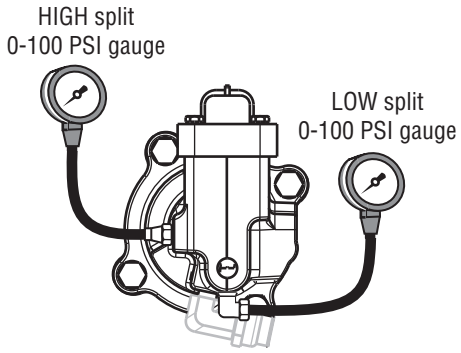
- If high splitter gauge is between 55 to 65 PSI and if low splitter gauge is 0 PSI, go to **Step S.**
- If air pressure gauges do not read as shown above, replace **Splitter Valve**. Go to **Step V.**

S

Purpose: *Measure low splitter air pressures.*

1. Key on.
2. With Shift Control, select reverse (R2 in the gear display 13/18-speed).

   Note: If R2 isn't displayed the up arrow button needs to be pressed.



- If low splitter gauge is between 55 to 65 PSI and if high splitter gauge is 0 PSI, go to **Step V.**
- If air pressure gauges do not read as shown above, replace **Splitter Valve**. Go to **Step V.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Remove all pressure gauges.
3. Reconnect all connectors.
4. Key on.
5. Drive the vehicle to determine whether the complaint has been repaired.
   - If the transmission shifts normal, test complete.
   - If the transmission still has a shifting complaint, find error in testing. Go to **Step A.**

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UltraShift DM3 Shift Complaint Test

Overview
This symptom-driven test is performed if a shift complaint exists, and there are no Active or Inactive codes.

Detection
There is no detection other than a driver complaint.

Fallback
There is no fallback mode for shift complaint; however, it may effect vehicle performance.

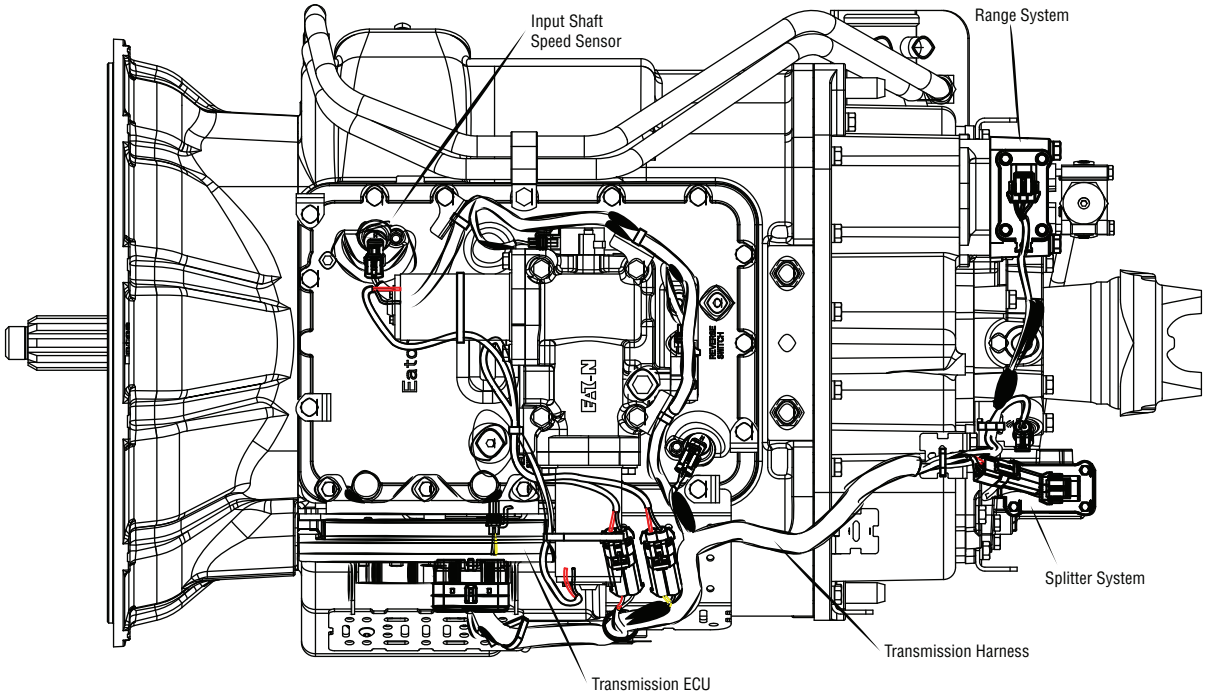
Possible Causes
This symptom can be caused by any of the following:

- Inertia Brake
- Input Shaft Speed Sensor
- Transmission Electric Control Unit (TECU)
- Transmission Harness
- Range System
- Splitter System

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Component Identification



Warning: Do not load test at the Diagnostic Port.

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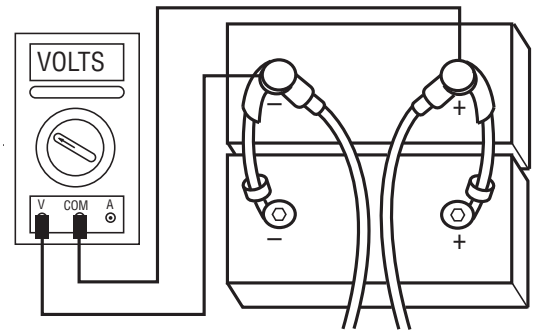
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UltraShift DM3 Shift Complaint Test

A

Purpose: *Measure battery voltage. Visually inspect the batteries, inline fuse and power and ground supplies at the batteries.*

1. Key off.
2. Inspect starter/battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.

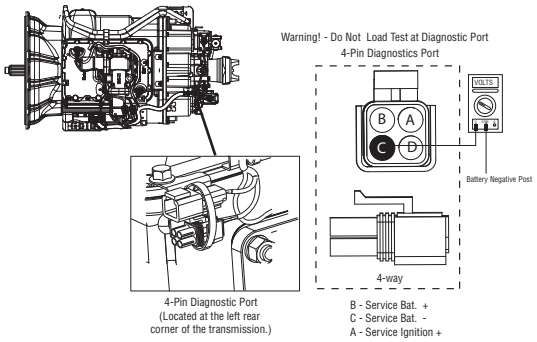


- If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required and go to **Step B.**
- If voltage is outside of range, repair or replace batteries and charging system as required. Repeat test.

B

Purpose: *Verify proper ground path between the batteries and the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.



- If voltage is 0.70 volts or less, go to **Step C.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

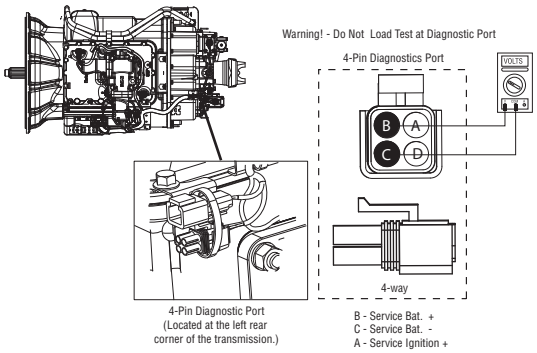
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C

Purpose: *Measure proper battery voltage at the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.

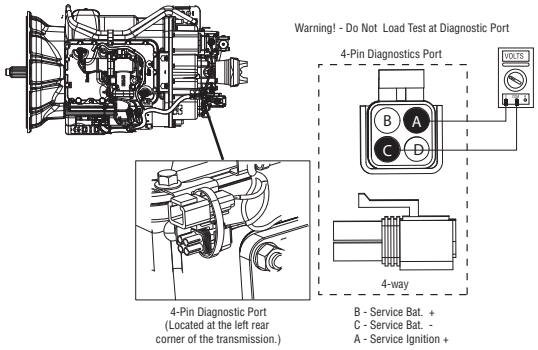


- If voltage is within 0.6 volts of battery voltage, go to **Step D.**
- If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

D

Purpose: *Measure proper ignition voltage at the transmission harness 4-way diagnostic connector.*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step E.**
- If voltage is outside of range, repair ignition power supply to TECU. Fuse may be blown. Repeat test.

E

Purpose: *Monitor Engine Speed and Input Shaft Speed in ServiceRanger.*

1. Compare engine RPM to Input Shaft RPM with ServiceRanger.

   Note: Engine RPM must remain above 1000 RPM during the following test.

   - If Input Shaft speed matches engine RPM, go to **Step K.**
   - If Input shaft speed reads 0, go to **Step F.**

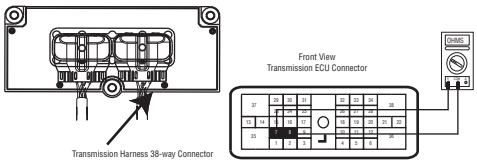
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F

Purpose: *Measure the resistance of the Input Shaft Speed Sensor through the Transmission Harness.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Transmission Harness 38-way connector.
4. Measure the resistance between the Transmission Harness 38-way connector Pin 7 and Pin 8.



- If resistance is 2K to 4.5K ohm, go to **Step G.**
- If resistance is outside of range, go to **Step I.**

G

Purpose: *Test the Input Shaft Speed Sensor circuit for a short to ground through the Transmission Harness.*

1. Measure resistance between the Transmission Harness 38-way connector Pin 7 and ground.
   - If resistance is OL, go to **Step H.**
   - If resistance is less than 10K ohm, go to **Step I.**

H

Purpose: *Visually remove and inspect the Input Shaft Speed Sensor for contamination or damage.*

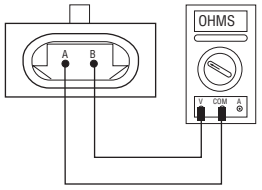
1. Inspect Input Shaft Speed Sensor for contamination or damage.
   - If no problem found, replace TECU and go to **Step V.**
   - If problem found or you were sent here from Step I or Step J, replace the:
     - **Medium-Duty Input Shaft Speed Sensor**
     - **Heavy-Duty Input Shaft Speed Sensor**

     Inspect the upper countershaft PTO gear for damage. Go to **Step V.**

I

Purpose: *Measure the resistance of the Input Shaft Speed Sensor at the Input Shaft Speed Sensor.*

1. Disconnect the Transmission Harness from the Input Shaft Speed Sensor.
2. Measure resistance between Input Shaft Speed Sensor Pin A and Pin B.



- If resistance is 2K to 4.5K ohm, go to **Step J.**
- If resistance is outside of range, go to **Step H.**

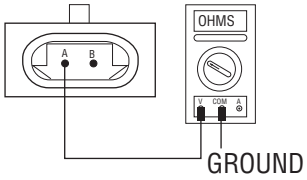
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J

Purpose: *Test the Input Shaft Speed Sensor circuit for a short to ground at the Input Shaft Speed Sensor.*

1. Measure resistance between Input Shaft Speed Sensor Pin A and ground.



- If resistance is OL, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, go to **Step H.**

K

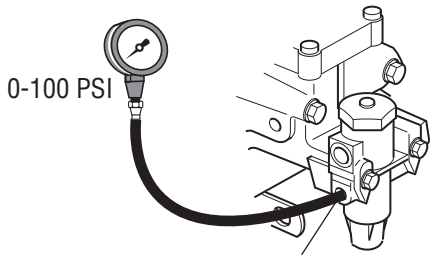
Purpose: *Measure vehicle air supply pressure.*

1. Key off.

2. Install a 0-100 PSI air pressure gauge in the regulated test port of the air filter/regulator.

3. Start engine and allow air pressure to build to governor cut-off.

4. Monitor the vehicle air pressure gauge on the dash.



- If air pressure cuts off at 90 to 120 PSI, go to **Step L.**
- If air pressure is outside of range, repair vehicle air system as required. Repeat test.

L

Purpose: *Confirm vehicle maintains air supply pressure.*

1. Key off.

2. Monitor the vehicle air pressure gauge on the dash.

- If vehicle maintains air pressure, go to **Step M.**
- If vehicle loses air pressure, repair vehicle air system as required. Repeat test.

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M

Purpose: *Verify air filter/regulator operation.*

1. Read air pressure gauge installed at the regulated port.
   - If air pressure is 55 to 65 PSI, go to **Step O.**
   - If air pressure is outside of range, go to **Step N.**

N

Purpose: *Confirm air flow to the filter regulator supply port.*

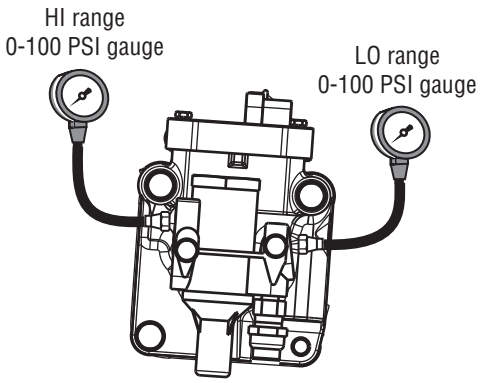
1. Remove air supply line to the air filter/regulator and check airflow.
   - If air flows from the supply line, repair the **Air Filter Regulator**.
   - If air does not flow from the supply line, repair vehicle air supply to the regulator and go to **Step J.**

O

Purpose: *Measure low range air pressures.*

1. Key off.
2. Install both 0-100 PSI air pressure gauges into the range cover diagnostic ports.
3. Start vehicle. Allow air pressure to build to governor cut-off.
4. Turn off engine, but leave key on.
5. With Shift Control, select reverse, then select neutral.

   Note: Five minutes is allowed for checking the air pressure after shifting the transmission to neutral.



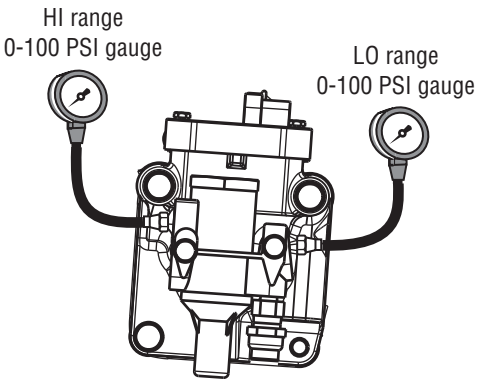
   - If low range gauge reads 55 to 65 PSI and high range gauge reads 0 PSI, go to **Step C.**
   - If neither gauge reads as listed above, replace the **Range Valve**. Go to **Step V.**

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P

Purpose: *Measure high range air pressures.*

1. Key on.
2. With the Shift Control, select the highest reverse gear available by pressing the upshift button/arrow, then select neutral.



- If high range gauge reads 55 to 65 PSI and low range gauge is 0 PSI, go to **Step Q.**
- If neither gauge reads as listed above, replace the **Range Valve**. Go to **Step V.**

Q

Purpose: *Identify if the transmission is equipped with a splitter system.*

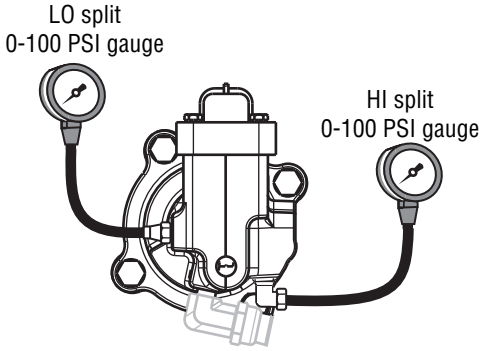
1. Is the transmission equipped with a splitter system? (i.e. 13-Speed)
   - If the transmission is equipped with a splitter system, go to **Step R.**
   - If the transmission is not equipped with a splitter system, go to **Step V.**

R

Purpose: *Measure high splitter air pressures.*

1. Key off.
2. Start vehicle and allow air pressure to build to governor cut-off.
3. Turn off engine, but leave key on.
4. With Shift Control, select reverse (R1 in gear display for 13/18-speed), then select neutral.

   Note: Five minutes is allowed for checking the pressure after moving the Shift Lever to neutral.



- If high splitter gauge reads 55 to 65 PSI and low splitter gauge is 0 PSI, go to **Step S.**
- If air pressure gauges do not read as shown above, replace **Splitter Valve**. Go to **Step V.**

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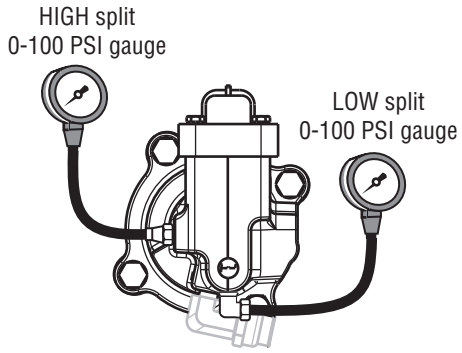
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S

Purpose: *Measure low splitter air pressures.*

1. Key on.
2. With Shift Control, select reverse (R2 in the gear display 13/18-speed).

   Note: If R2 isn't displayed the up arrow button needs to be pressed.



- If low splitter gauge reads 55 to 65 PSI and if high splitter gauge is 0 PSI, go to **Step V.**
- If neither gauge reads as shown above, replace the **Splitter Valve**. Go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Remove all pressure gauges.
3. Reconnect all connectors.
4. Key on.
5. Drive the vehicle to determine whether the complaint has been repaired.
   - If the transmission shifts normal, test complete.
   - If the transmission still has a shifting complaint go to **Step A.** to find error in testing.

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UltraShift AW3 Shift Complaint Test

Overview
This symptom-driven test is performed if a shift complaint exists, and there are no Active or Inactive codes.

Detection
There is no detection other than a driver complaint.

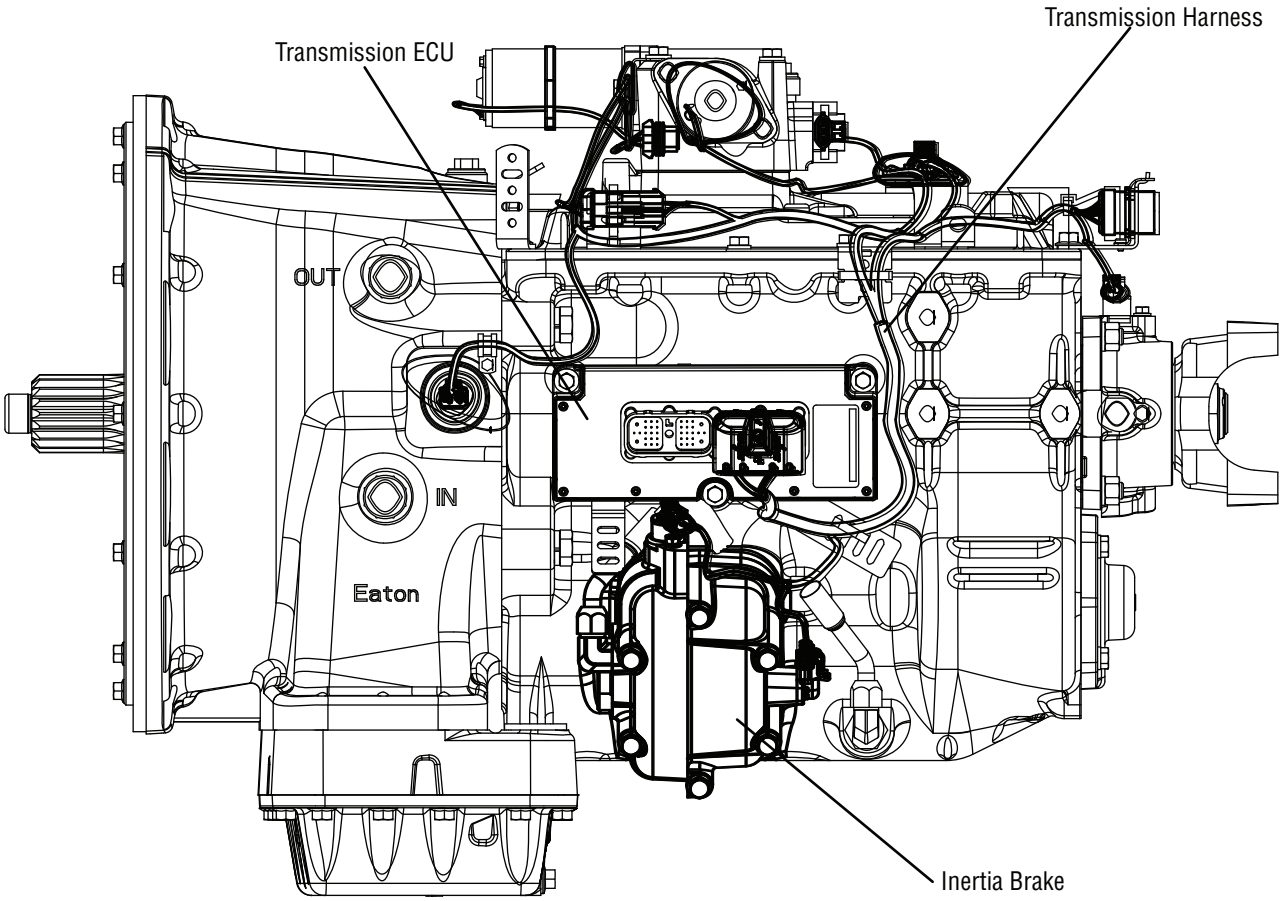
Fallback
There is no fallback mode for shift complaint; however, it may effect vehicle performance.

Possible Causes
This symptom can be caused by any of the following:

- Low Fluid Level
- Inertia Brake
- Input Shaft Speed Sensor
- Transmission Electronic Control Unit (TECU)
- Transmission Harness

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Component Identification



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UltraShift AW3 Shift Complaint Test

A

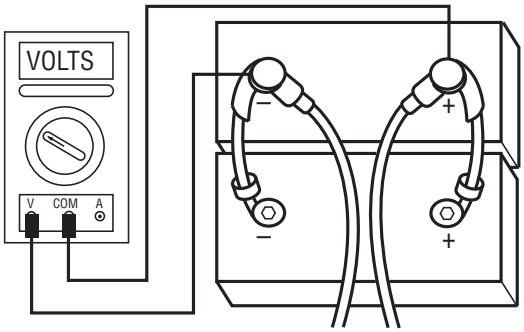
Purpose: *Inspect the transmission fluid level.*

1. Place transmission in neutral.
2. Allow engine to idle at 600 to 700 RPM for a minimum of 2 minutes. Ensure transmission fluid temperature is 60 to 120 degrees F (16 to 49 degrees C)
3. Check transmission fluid level.
   - If fluid level is at cold-full mark, go to **Step B.**
   - If fluid level is below the cold-add mark, correct fluid level, check for leaks and go to **Step V.**

B

Purpose: *Measure battery voltage. Visually inspect the batteries, inline fuse and power and ground supplies at the batteries.*

1. Key off.
2. Inspect starter/battery and in-line fuse holder connections for integrity.
3. Measure voltage across batteries.



   - If voltage is 11 to 13 volts on a 12-volt system or 22 to 26 on a 24-volt system, proceed with battery load test. Repair or replace batteries as required and go to **Step C.**
   - If voltage is outside of range, repair or replace batteries and charging system as required. Repeat test.

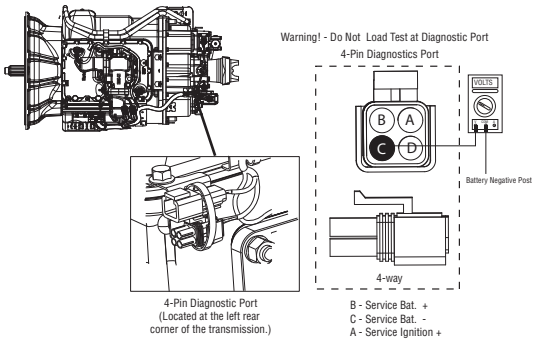
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C

Purpose: *Verify proper ground path between the batteries and the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin C and the battery negative post.

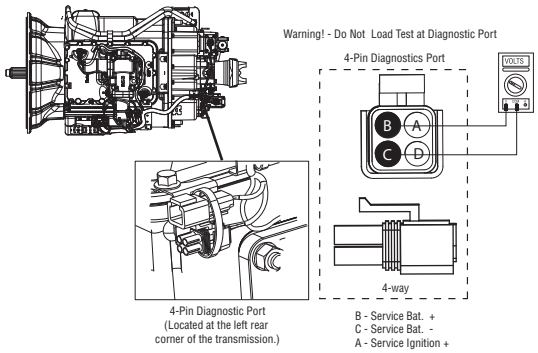


- If voltage between Pin C and battery negative post is 0.70 volts or less, go to **Step D.**
- If voltage is outside of range, repair battery ground supply to TECU. Repeat test.

D

Purpose: *Measure proper battery voltage at the transmission harness 4-way diagnostic connector.*

1. Locate diagnostic port on Transmission Harness.
2. Key on.
3. Measure voltage between Pin B and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step E.**
- If voltage is outside of range, repair battery power supply to TECU. Fuse may be blown. Repeat test.

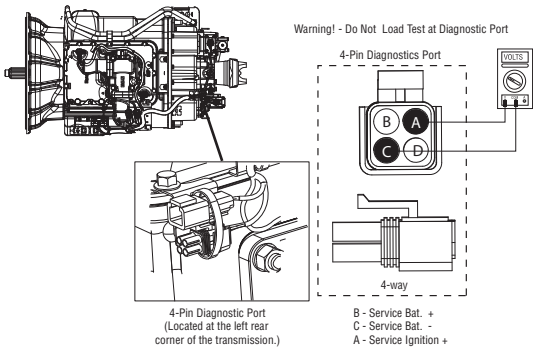
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E

Purpose: *Measure proper ignition voltage at the transmission harness 4-way diagnostic connector.*

1. Key on.
2. Measure voltage between Pin A and Pin C.



- If voltage is within 0.6 volts of battery voltage, go to **Step F.**
- If voltage is outside of range, repair ignition power supply to TECU. Fuse may be blown. Repeat test.

F

Purpose: *Perform "Inertia Brake Test" using ServiceRanger.*

1. Key on.
2. Connect ServiceRanger, select Advanced Product Function.
3. Start engine, PTO must be disengaged.
4. Select Inertia Brake test.
5. Run test and follow instructions.
   - Test passes, go to **Step G.**
   - Test fails, replace the:
     - **Medium-Duty Input Shaft Speed Sensor**
     - **Heavy-Duty Input Shaft Speed Sensor**

     Go to **Step V.**
   - Test aborts, correct displayed test failure condition and retest.

G

Purpose: *Monitor Engine Speed and Input Shaft Speed in ServiceRanger.*

1. Drive vehicle and monitor engine RPM and input shaft RPM with ServiceRanger
   - If engine RPM and input shaft rpm match during the test drive, test complete.
   - If input shaft RPM is erratic or reads zero, go to **Step H.**

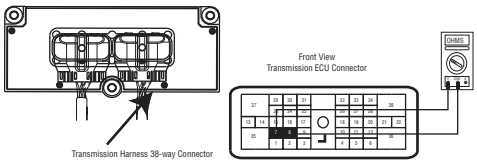
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H

Purpose: *Measure the resistance of the Input Shaft Speed Sensor through the Transmission Harness.*

1. Key off.
2. Disconnect negative battery cable.
3. Disconnect the Transmission Harness 38-way connector.
4. Measure the resistance between the Transmission Harness 38-way connector Pin 7 and Pin 8.

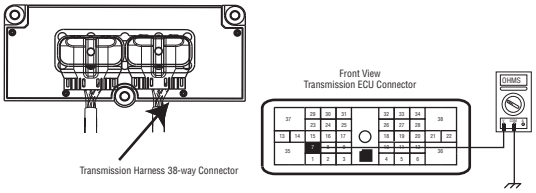


- If resistance is 2K to 4.5K ohm, go to **Step I.**
- If resistance is outside of range, go to **Step J.**

I

Purpose: *Test the Input Shaft Speed Sensor circuit for a short to ground through the Transmission Harness.*

1. Measure resistance between the Transmission Harness 38-way connector Pin 7 and ground.



- If resistance is OL, go to **Step J.**
- If resistance is less than 10K ohm, go to **Step K.**

J

Purpose: *Visually remove and inspect the Input Shaft Speed Sensor for contamination or damage.*

1. Inspect Input Shaft Speed Sensor for contamination or damage.
   - If no problem found, replace TECU go to **Step V.**
   - If problem found or you were sent here from Step J or K, replace the:
     - **Medium-Duty Input Shaft Speed Sensor**
     - **Heavy-Duty Input Shaft Speed Sensor**

     Inspect the upper countershaft PTO gear for damage. Go to **Step V.**

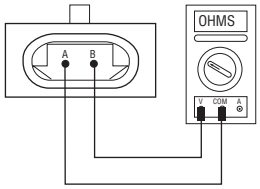
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K

Purpose: *Measure the resistance of the Input Shaft Speed Sensor at the Input Shaft Speed Sensor.*

1. Disconnect the Transmission Harness from the Input Shaft Speed Sensor.
2. Measure resistance between Input Shaft Speed Sensor Pin A and Pin B.

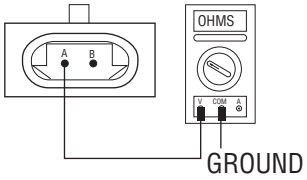


- If resistance is 2K to 4.5K ohm, go to **Step L.**
- If resistance is outside of range, go to **Step J.**

L

Purpose: *Test the Input Shaft Speed Sensor circuit for a short to ground at the Input Shaft Speed Sensor.*

1. Measure resistance between Input Shaft Speed Sensor Pin A and ground.



- If resistance is OL, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

  Go to **Step V.**
- If resistance is less than 10K ohm, go to **Step J.**

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V ***Purpose:*** *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Key on.
4. Drive the vehicle to determine whether the complaint has been repaired.
   - If the transmission shifts normal, test complete.
   - If the transmission still has a shifting complaint go to **Step A.** to find error in testing.

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Shift Lever Back Light Test

Overview
This symptom-driven test is performed if the Shift Lever or Shift Control back lighting is not functioning.

Detection
There is no detection other than a driver complaint.

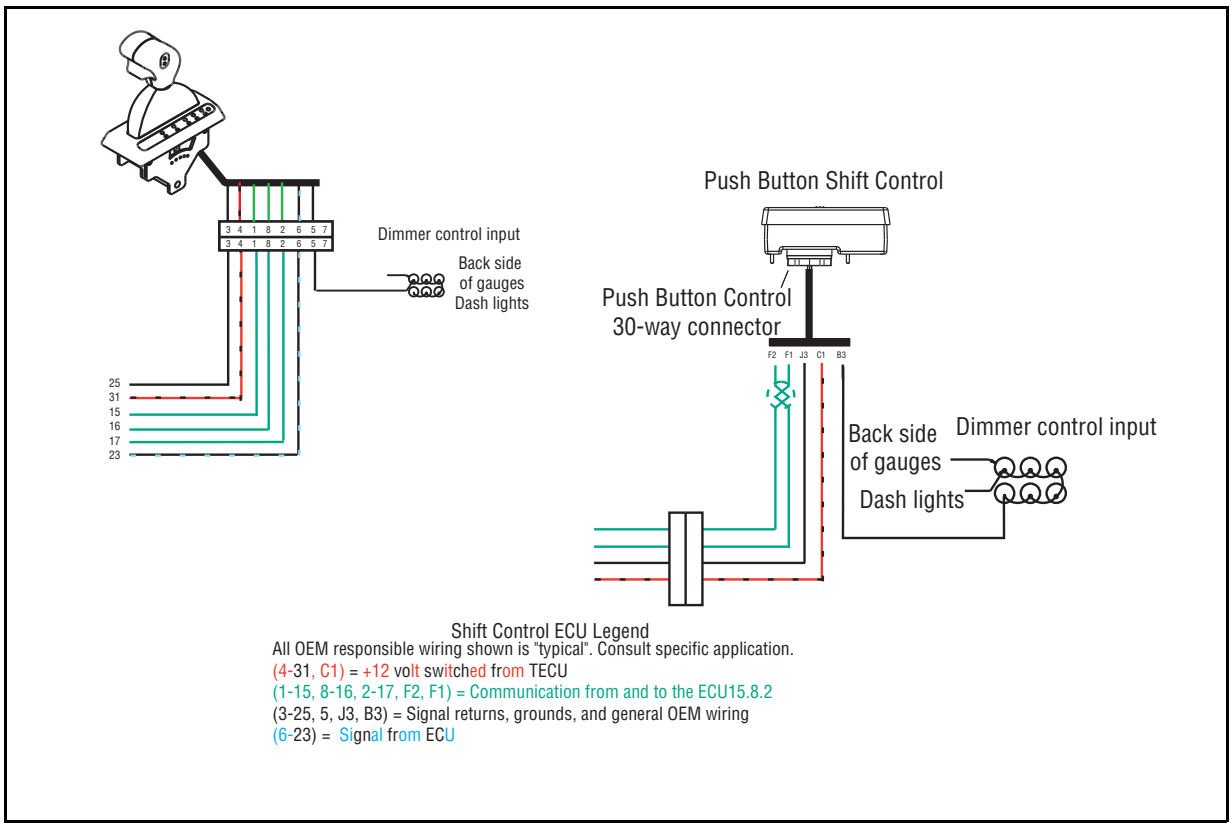
Fallback
There is no fallback mode for this symptom.

Possible Causes
This symptom can be caused by any of the following:

- OEM Wiring
- Shift Control
- Shift Lever

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Component Identification



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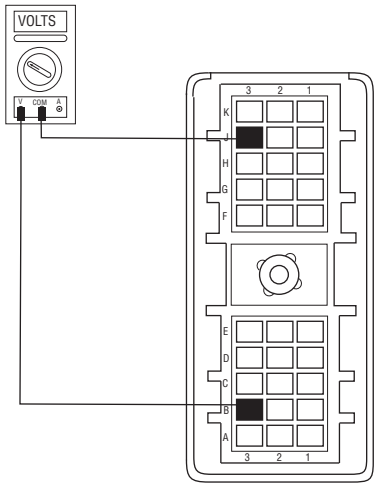
Shift Lever Back Light Test

A ***Purpose:*** *Visually identify the Driver Interface Device.*

1. Verify Shift Lever.
   - If vehicle is equipped with an OEM Shift Lever, refer to OEM for repair strategy.
   - If vehicle is equipped with a Push Button Shift Control, go to **Step B.**
   - If vehicle is equipped with Cobra Lever, go to **Step C.**

B ***Purpose:*** *Measure the dimmer switch voltage supply to the Shift Control.*

1. Key off.
2. Disconnect Shift Control 30-way connector.
3. Key on.
4. Turn dimmer switch to max.
5. Measure voltage between Pin B3 and Pin J3.



- If voltage is within 0.6 volts of battery voltage, replace **Shift Control**. Go to **Step V.**
- If voltage is outside of range, repair OEM wire between Pin B3 and the dash lights and go to **Step V.**

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C

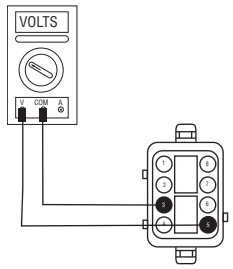
Purpose: *Inspect Cobra Lever lights with dimmer switched turned to the max position.*

1. Key on.
2. Turn vehicle lights on.
3. Turn dimmer switch to max.
   - Cobra Lever lights on, but do not dim when vehicle lights are on, go to **Step D.**
   - Cobra Lever lights do not come on, go to **Step E.**

D

Purpose: *Measure the dimmer switch voltage supply to the Cobra Lever.*

1. Key off.
2. Disconnect Cobra Lever 8-way connector.
3. Key on.
4. Turn dimmer switch to max.
5. Measure voltage between Pin 5 and Pin 3 on the 8-way Vehicle Harness.



   - If voltage is within 2 volts of battery voltage, replace **Cobra Lever** and go to **Step V.**
   - If voltage is outside of range, repair OEM wire between Pin 5 and dash lights and go to **Step V.**

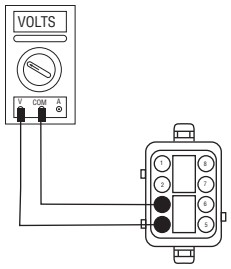
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E

Purpose: *Measure the ignition voltage supply to the Cobra Lever.*

1. Key off.
2. Disconnect Cobra Lever 8-way connector.
3. Key on.
4. Measure voltage between Pin 3 and Pin 4 on the 8-way Vehicle Harness connector.

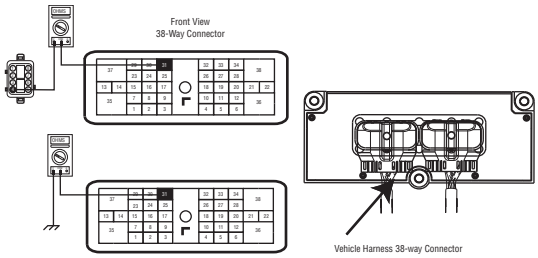


- If voltage is within 0.6 volts of battery voltage, replace **Cobra Lever**. Go to **Step V.**
- If voltage is out of range, go to **Step F.**

F

Purpose: *Verify continuity of the power supply from the TECU to the Cobra Lever and test for a short to ground.*

1. Key off.
2. Disconnect Negative battery cable.
3. Disconnect Vehicle Harness 38-way connector.
4. Measure resistance between:
   - Vehicle Harness 38-way connector Pin 31 and Vehicle Harness 8-way connector Pin 4.
   - Vehicle Harness 38-way connector Pin 31 and ground.



- If resistance between Pin 31 and Pin 4 is 0 to 0.3 ohms and the resistance between Pin 31 and ground is OL, go to **Step G.**
- If any of the above conditions are not met, replace the:
  - **Medium-Duty Transmission Harness**
  - **Heavy-Duty Transmission Harness**

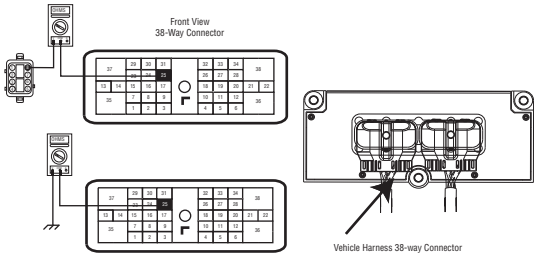
  Go to **Step V.**

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G

Purpose: *Verify continuity of the ground supply from the TECU to the Cobra Lever and test for a short to ground.*

1. Key off.
2. Measure resistance between Vehicle Harness 38-way connector Pin 25 and Vehicle Harness 8-way connector Pin 3 Vehicle Harness 38-way connector Pin 25 and ground.



- If resistance between Pin 25 and Pin 3 is 0 to 0.3 ohms and the resistance between Pin 25 and ground is OL, see “Electrical Pretest” on page 12. If test passes, replace the
  - **Medium-Duty Input Shaft Speed Sensor**
  - **Heavy-Duty Input Shaft Speed Sensor**

  go to **Step V.**

V

Purpose: *Verify repair.*

1. Key off.
2. Reconnect all connectors.
3. Key on.
4. Turn on the dash lights fully.
   - If back light works correctly, test complete.
   - If back lights do not work correctly, go to **Step A.** to find error in testing.

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Connector Pin Descriptions

Transmission Controller 38-Way (Vehicle Interface Connector)

38-Way	Description	Wire
1	J1939 Shield (CAN)	18 TXL
2	J1939 Low (CAN)	18 TXL
3	J1939 High (CAN)	18 TXL
4	Start Enable Relay Minus	18 TXL
5	Not Used	Plug
6	Not Used	Plug
7	Not Used	Plug
8	Not Used	Plug
9	Not Used	Plug
10	J1587 Plus	18 TXL
11	J1587 Minus	18 TXL
12	ISO9141-K Communications	18 TXL
13	Not Used	Plug
14	Not Used	Plug
15	Shift Control Input (Mode Auto)	18 TXL
16	Shift Control Input (Mode Manual/Neutral Signal)	18 TXL
17	Shift Control Input (Mode Common/Neutral Return)	18 TXL
18	PTO	18 TXL
19	Auto Neutral AW3	18 TXL

38-Way	Description	Wire
20	MEIIR Contact	18 TXL
21	MEIIR Minus	18 TXL
22	MEIIR Plus	18 TXL
23	Service Light Output	18 TXL
24	Not Used	18 TXL
25	Shift Control Power Minus	18 TXL
26	Start Enable Latch	18 TXL
27	HIL Low (Proprietary CAN)	18 TXL
28	HIL High (Proprietary CAN)	18 TXL
29	Not Used	Plug
30	Not Used	Plug
31	Shift Control Power Plus	18 TXL
32	Start Enable Relay Plus	18 TXL
33	Not Used	Plug
34	Not Used	Plug
35	Ignition	12 GXL or 14SXL
36	Battery Minus	12 GXL
37	Not Used	Plug
38	Battery Plus	12 GXL

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Push Button Shift Control 30-Way Connector

30-Way	Description	Wire
C1	Shift Control Power Plus	16 TXL
B3	V Dash	16 TXL
F1	HIL(+) HI	16 TXL
F2	HIL(-) LO	16 TXL
J3	Shift Control Power Minus	16 TXL

Cobra Lever 8-Way Connector

8-Way	Description	Wire
1	Shift Control Input (Mode Auto)	16 TXL
2	Shift Control Input (Mode Common)	16 TXL
3	Shift Control Power Minus	16 TXL
4	Shift Control Lever Power Plus	16 TXL
5	Dash Lights	16 TXL
6	Service Light Output	16 TXL
7	No Connection	16 TXL
8	Shift Control Input (Mode Manual)	16 TXL

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Transmission Controller 38-Way (Eaton Supplied Assembly)

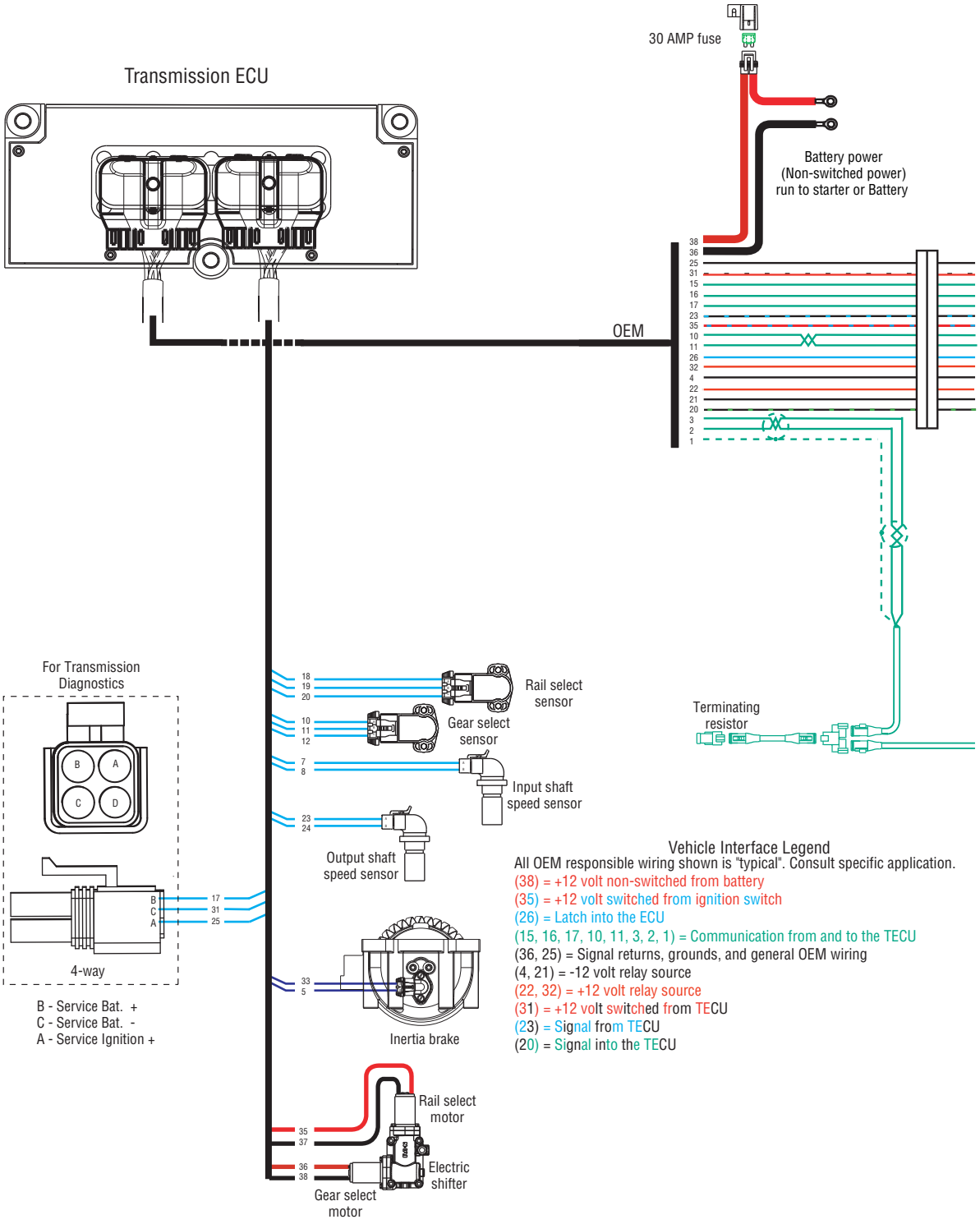
38-Way	Description	Wire
1	Not Used	Plug
2	Clutch Lube Solenoid Plus	18 TXL
3	Clutch Lube Solenoid Minus	18 TXL
4	Splitter Solenoid Common Minus	18 TXL
5	Inertia Brake Solenoid Minus	18 TXL
6	Range Solenoid Common Minus	18 TXL
7	Input Shaft Speed Sensor High	18 TXL
8	Input Shaft Speed Sensor Low	18 TXL
9	Not Used	Plug
10	Gear Position Sensor Plus	18 TXL
11	Gear Position Sensor Signal	18 TXL
12	Gear Position Sensor Minus	18 TXL
13	Clutch Solenoid Plus	18 TXL
14	Clutch Solenoid Minus	18 TXL
15	Main Shaft Speed Sensor High	18 TXL
16	Main Shaft Speed Sensor Low	18 TXL
17	Service Battery Plus	18 TXL
18	Rail Position Sensor Plus	18 TXL
19	Rail Position Sensor Signal	18 TXL

38-Way	Description	Wire
20	Rail Position Sensor Minus	18 TXL
21	Not Used	Plug
22	Not Used	Plug
23	Output Shaft Speed Sensor High	18 TXL
24	Output Shaft Speed Sensor Low	18 TXL
25	Service Ignition	18 TXL
26	Splitter Indirect Solenoid Plus	18 TXL
27	Not Used	Plug
28	Range High Solenoid Plus	18 TXL
29	Not Used	18 TXL
30	Not Used	18 TXL
31	Service Battery Minus	18 TXL
32	Splitter Direct Solenoid Plus	18 TXL
33	Inertia Brake Solenoid Plus	18 TXL
34	Range Low Solenoid Plus	18 TXL
35	Rail Motor Plus	14SXL
36	Gear Motor Plus	14SXL
37	Rail Motor Minus	14SXL
38	Gear Motor Minus	14SXL

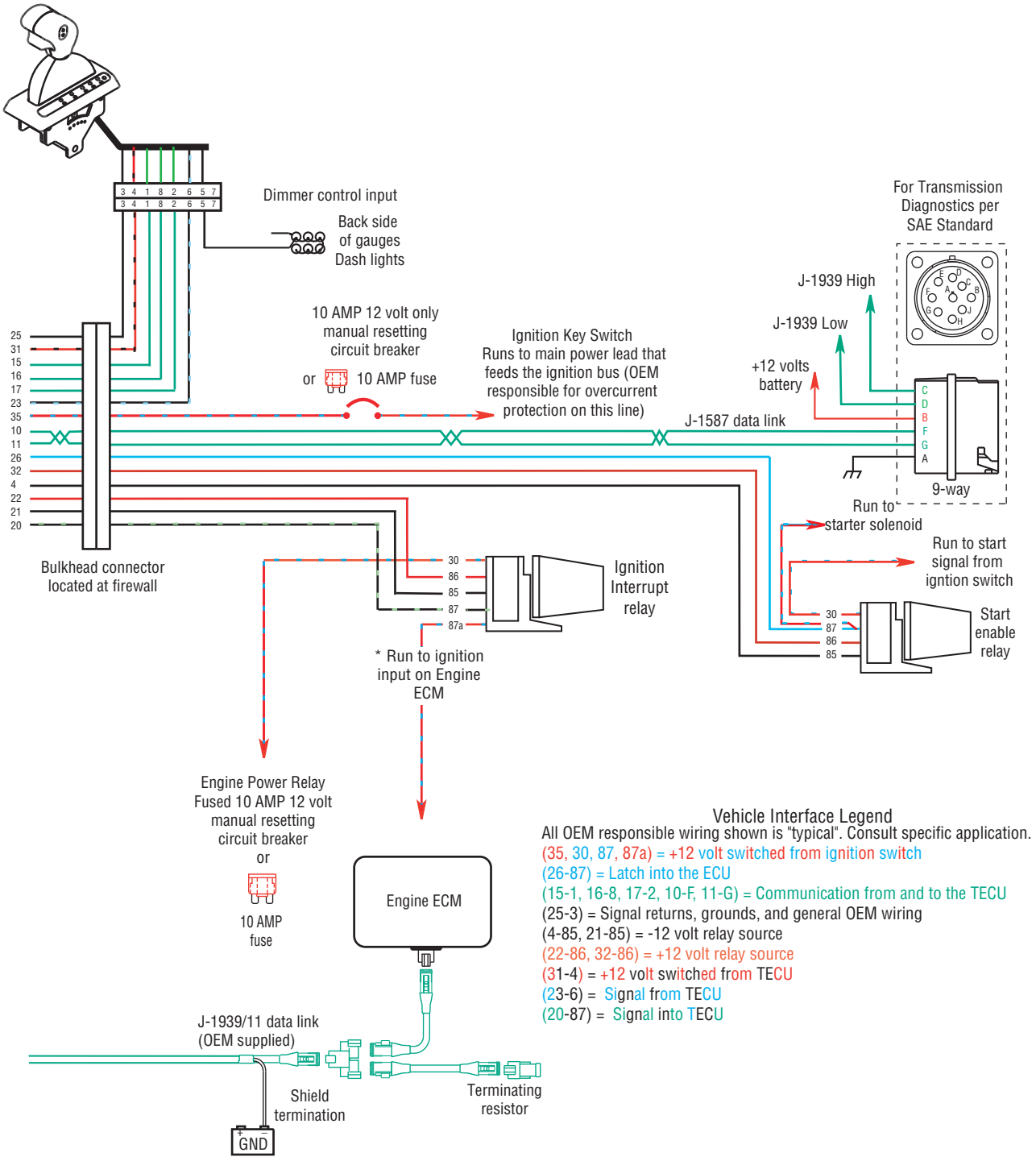
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Wiring Diagrams

UltraShift DM3 6-Speed Wiring Diagram with Analog Shifter



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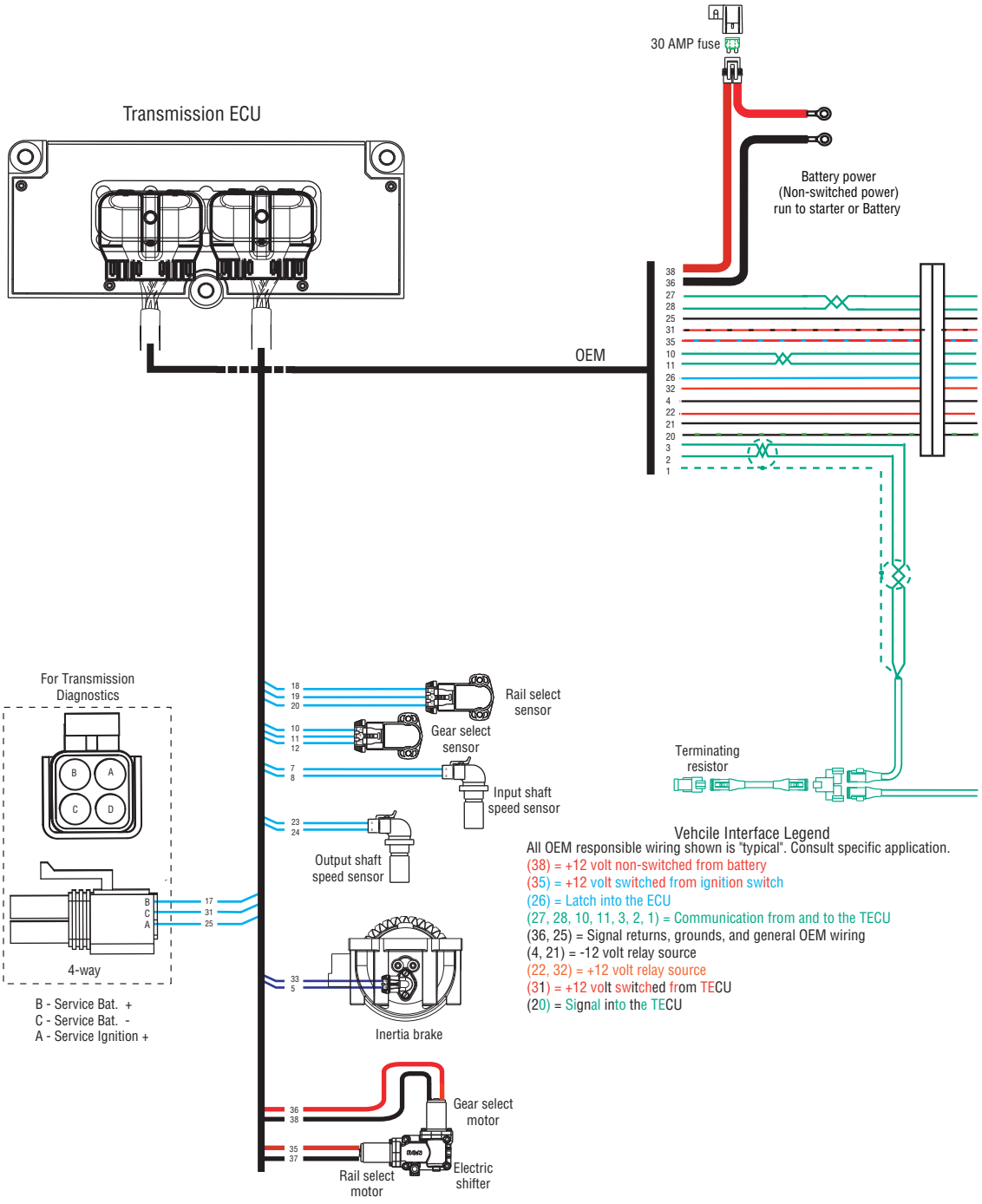


Vehicle Interface Legend

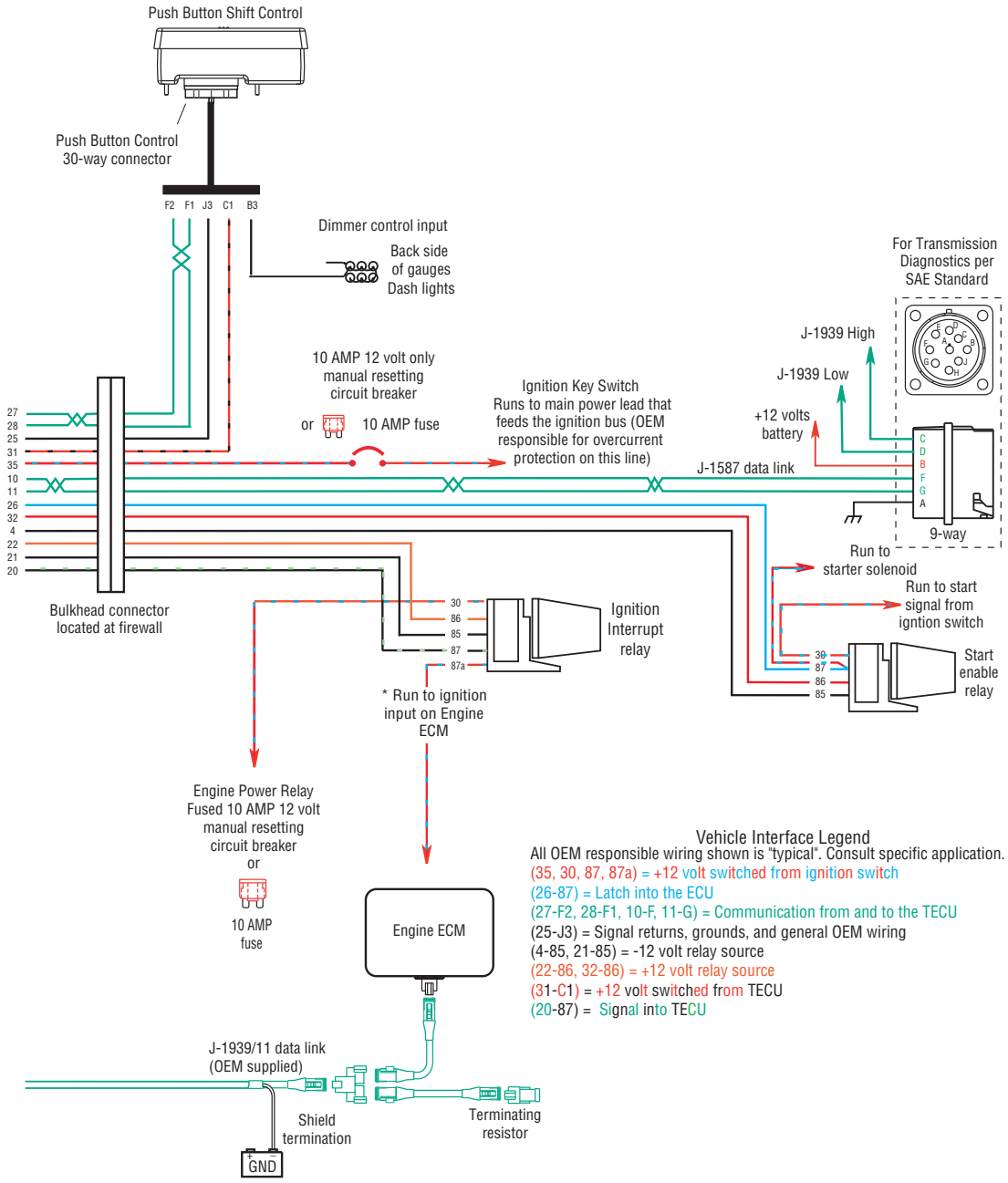
All OEM responsible wiring shown is "typical". Consult specific application.
(35, 30, 87, 87a) = +12 volt switched from ignition switch
(26-87) = Latch into the ECU
(15-1, 16-8, 17-2, 10-F, 11-G) = Communication from and to the TECU
(25-3) = Signal returns, grounds, and general OEM wiring
(4-85, 21-85) = -12 volt relay source
(22-86, 32-86) = +12 volt relay source
(31-4) = +12 volt switched from TECU
(23-6) = Signal from TECU
(20-87) = Signal into TECU

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UltraShift DM3 6-Speed Wiring Diagram with Push Button Shifter



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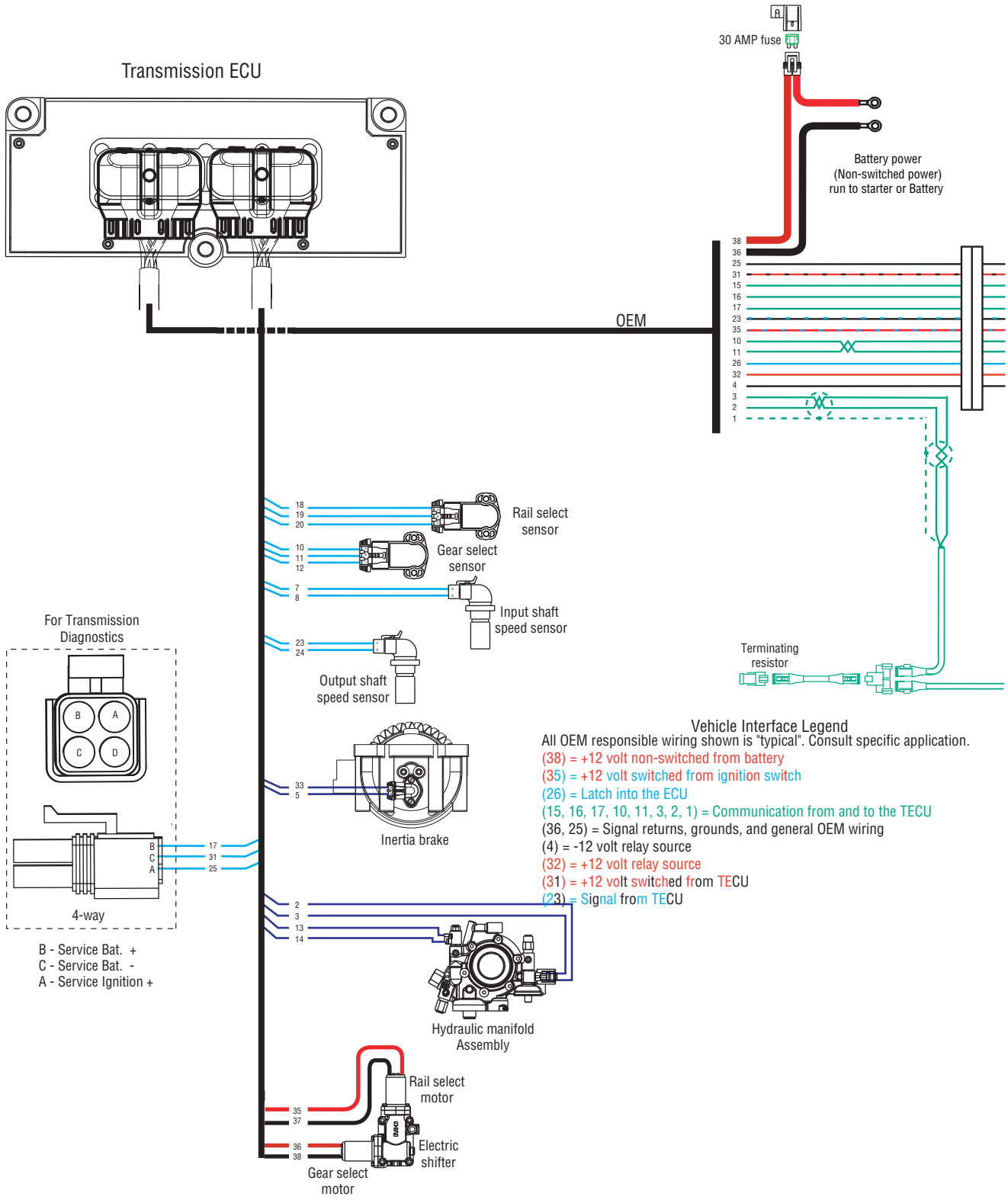


Vehicle Interface Legend

All OEM responsible wiring shown is "typical". Consult specific application.
(35, 30, 87, 87a) = +12 volt switched from ignition switch
(26-87) = Latch into the ECU
(27-F2, 28-F1, 10-F, 11-G) = Communication from and to the TECU
(25-J3) = Signal returns, grounds, and general OEM wiring
(4-85, 21-85) = -12 volt relay source
(22-86, 32-86) = +12 volt relay source
(31-C1) = +12 volt switched from TECU
(20-87) = Signal into TECU

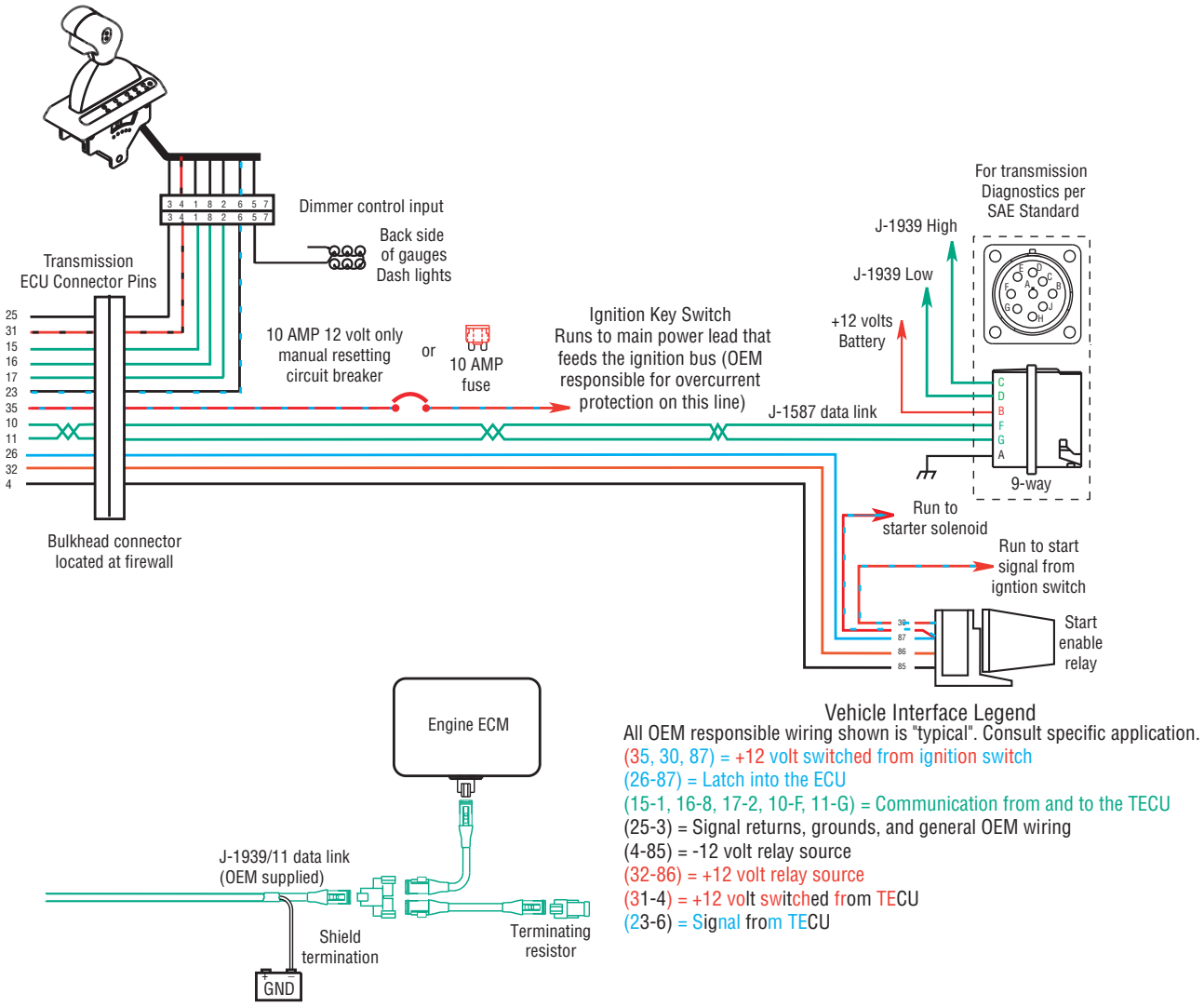
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UltraShift AW3 6-Speed Wiring Diagram with Analog Shifter



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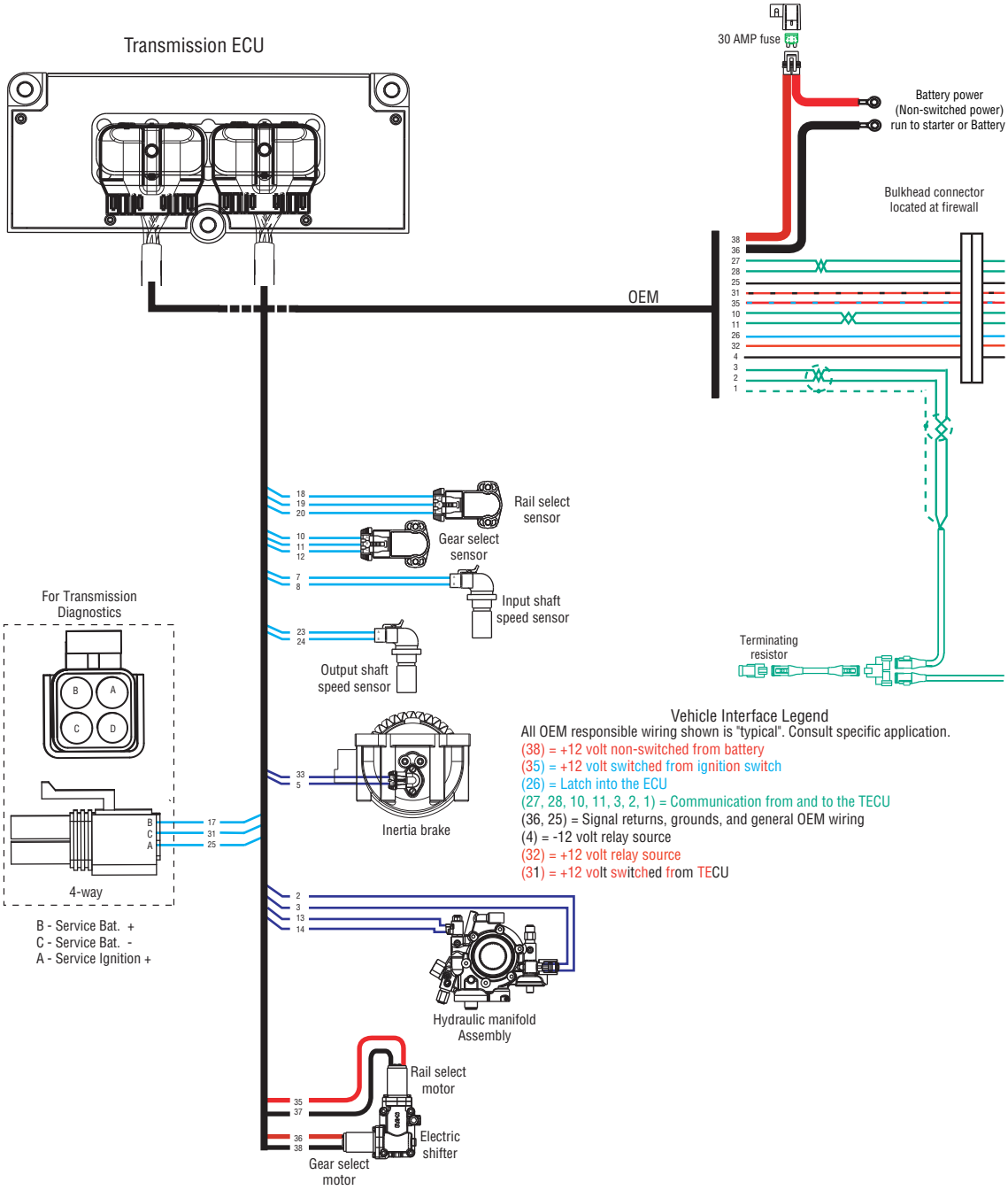


Vehicle Interface Legend

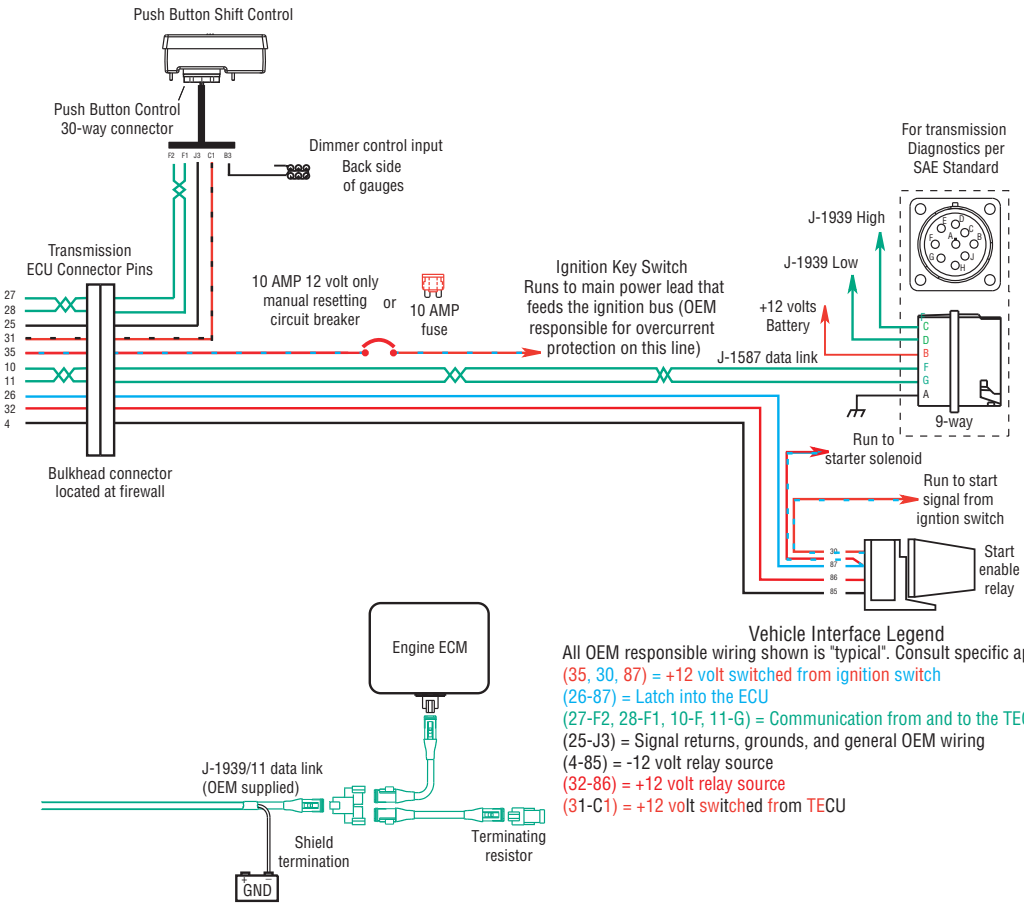
All OEM responsible wiring shown is "typical". Consult specific application.
(35, 30, 87) = +12 volt switched from ignition switch
(26-87) = Latch into the ECU
(15-1, 16-8, 17-2, 10-F, 11-G) = Communication from and to the TECU
(25-3) = Signal returns, grounds, and general OEM wiring
(4-85) = -12 volt relay source
(32-86) = +12 volt relay source
(31-4) = +12 volt switched from TECU
(23-6) = Signal from TECU

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UltraShift AW3 6-Speed Wiring Diagram with Push Button Shifter



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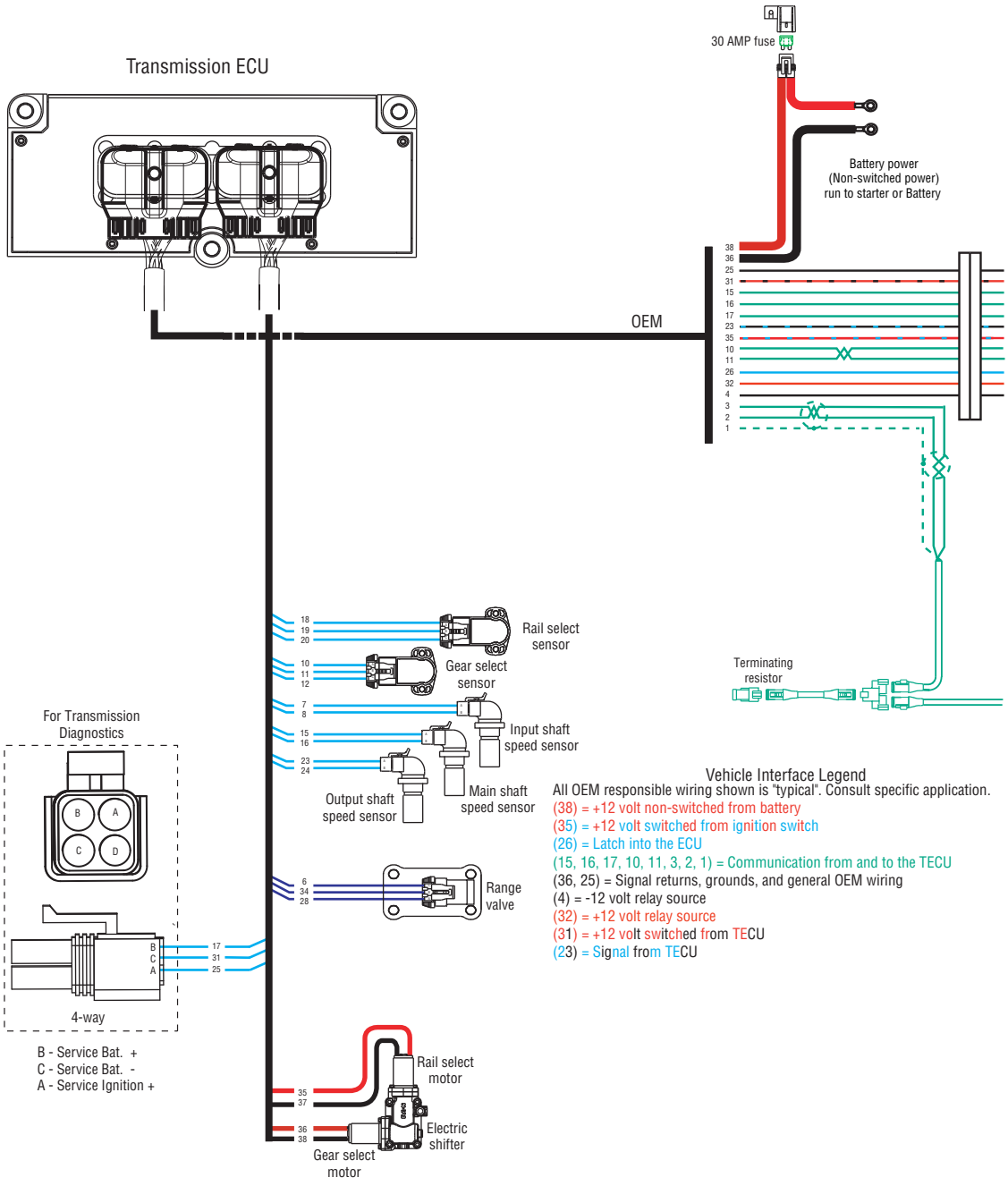


Vehicle Interface Legend

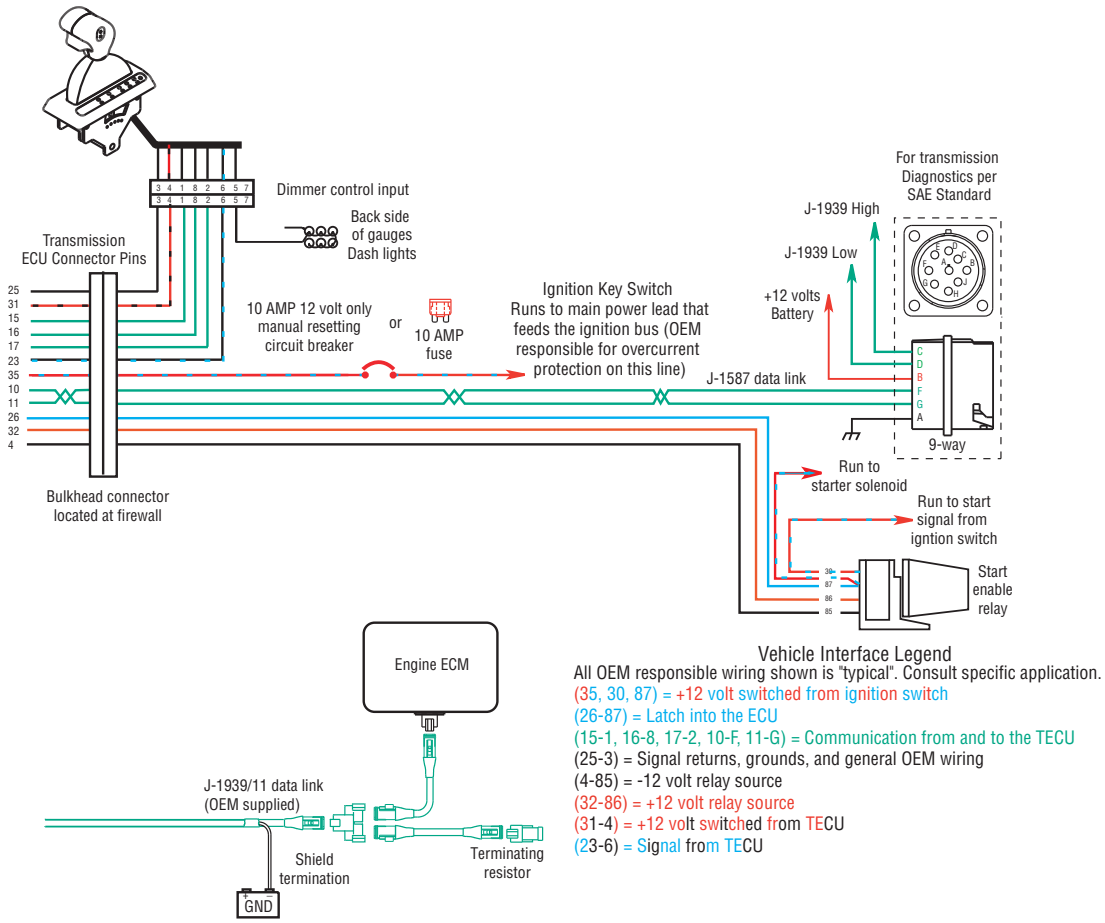
All OEM responsible wiring shown is "typical". Consult specific application.
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(25-J3) = Signal returns, grounds, and general OEM wiring
(4-85) = -12 volt relay source
(32-86) = +12 volt relay source
(31-C1) = +12 volt switched from TECU

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AutoShift 10-Speed Wiring Diagram with Analog Shifter



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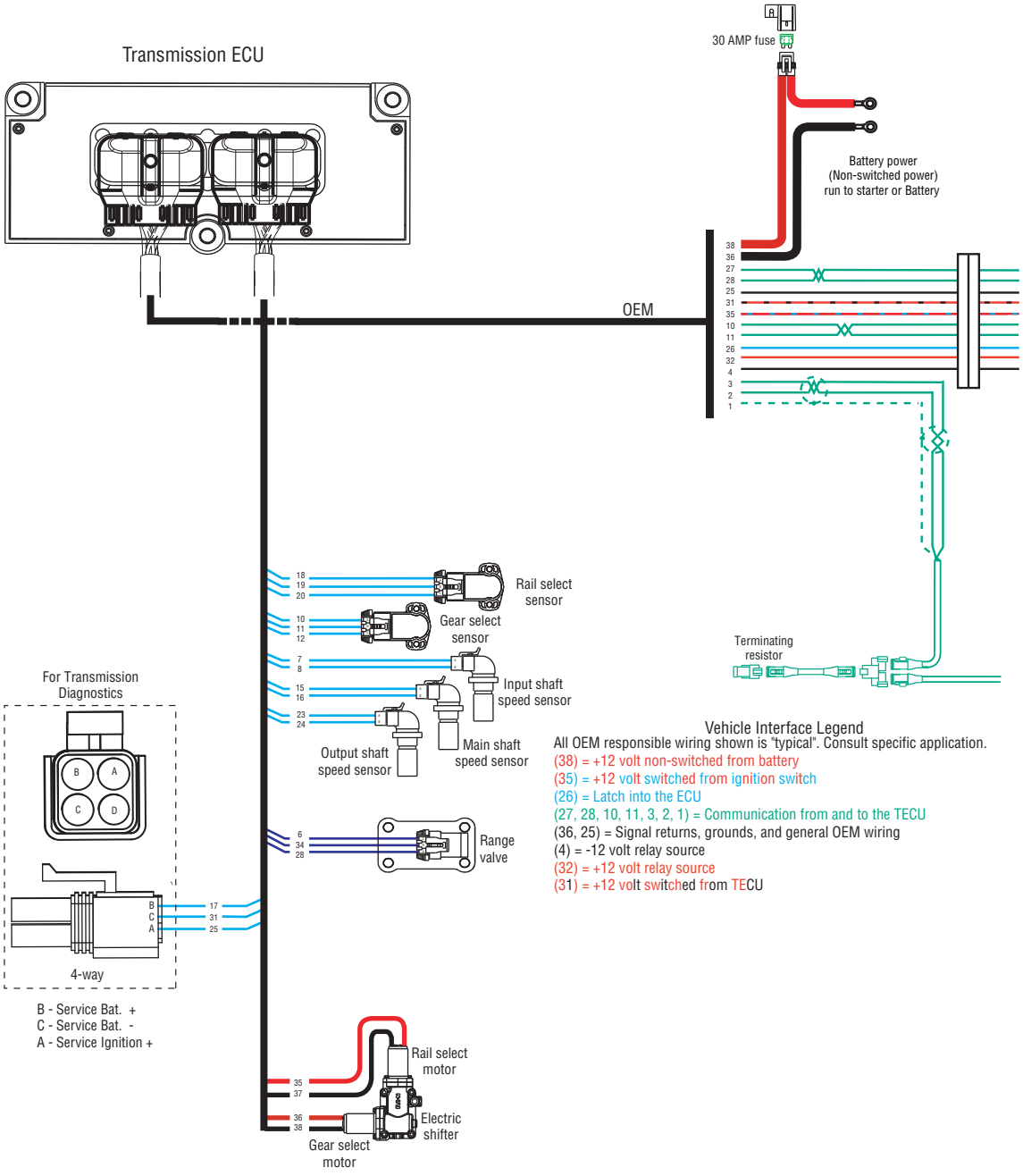


Vehicle Interface Legend

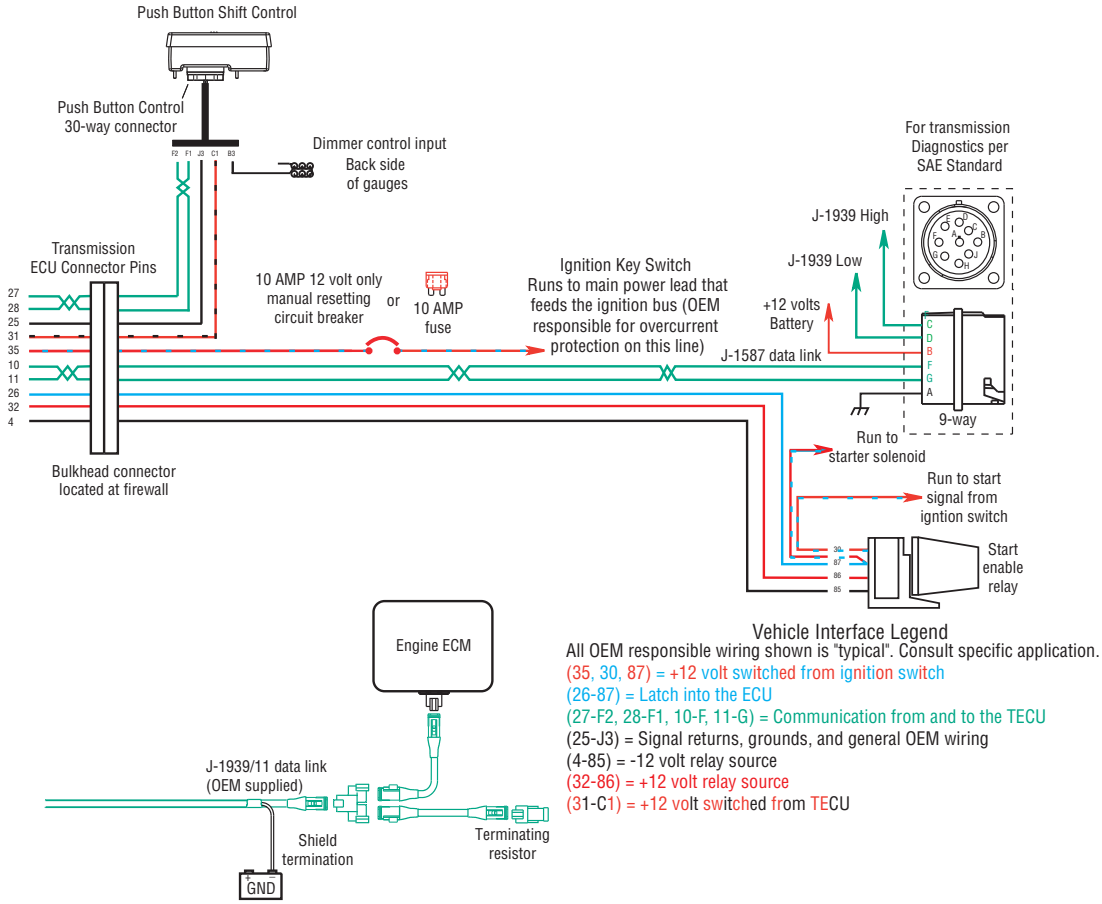
All OEM responsible wiring shown is "typical". Consult specific application.
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(26-87) = Latch into the ECU
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(4-85) = -12 volt relay source
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(31-4) = +12 volt switched from TECU
(23-6) = Signal from TECU

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AutoShift 10-Speed Wiring Diagram with Push Button Shifter



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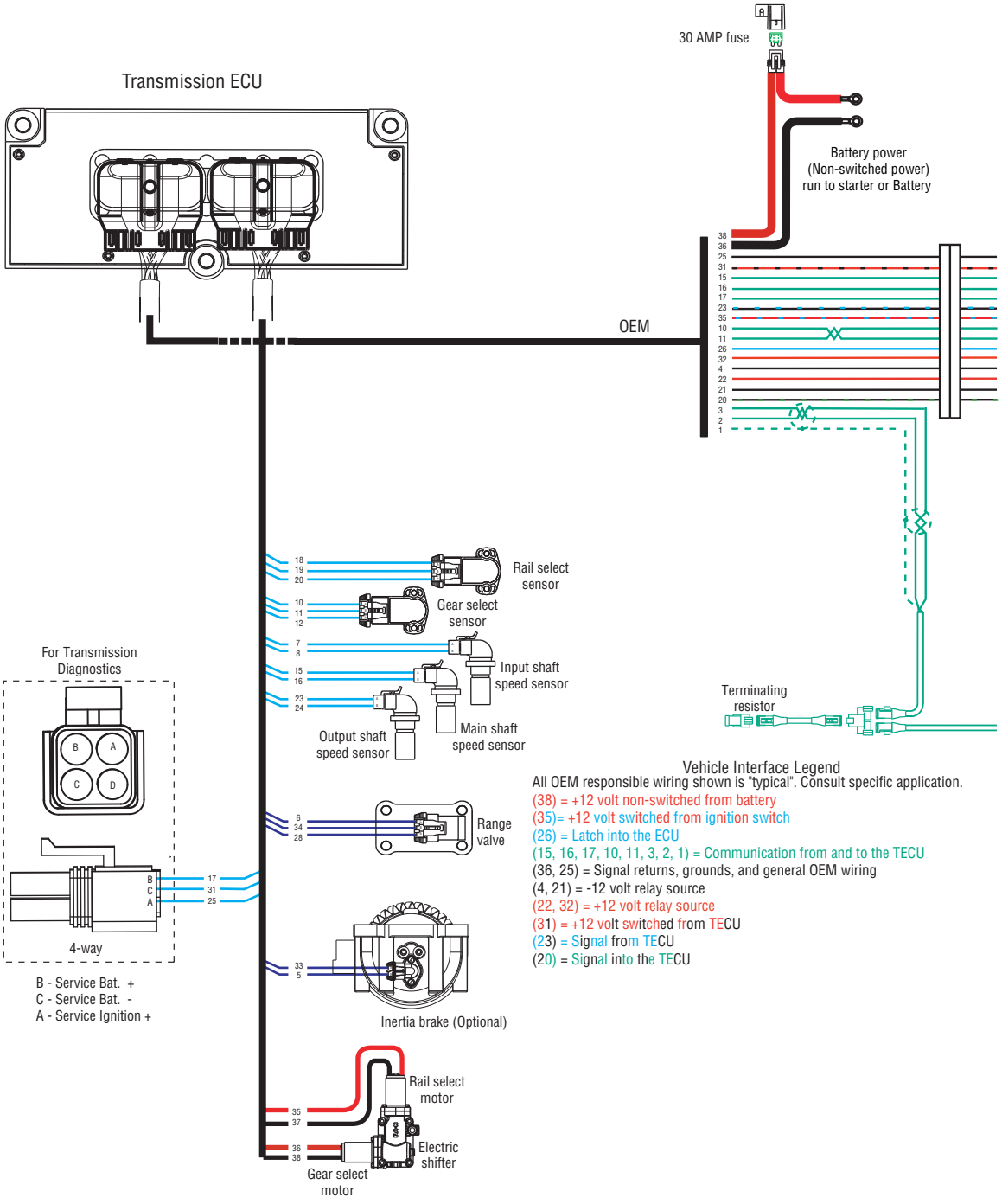


Vehicle Interface Legend

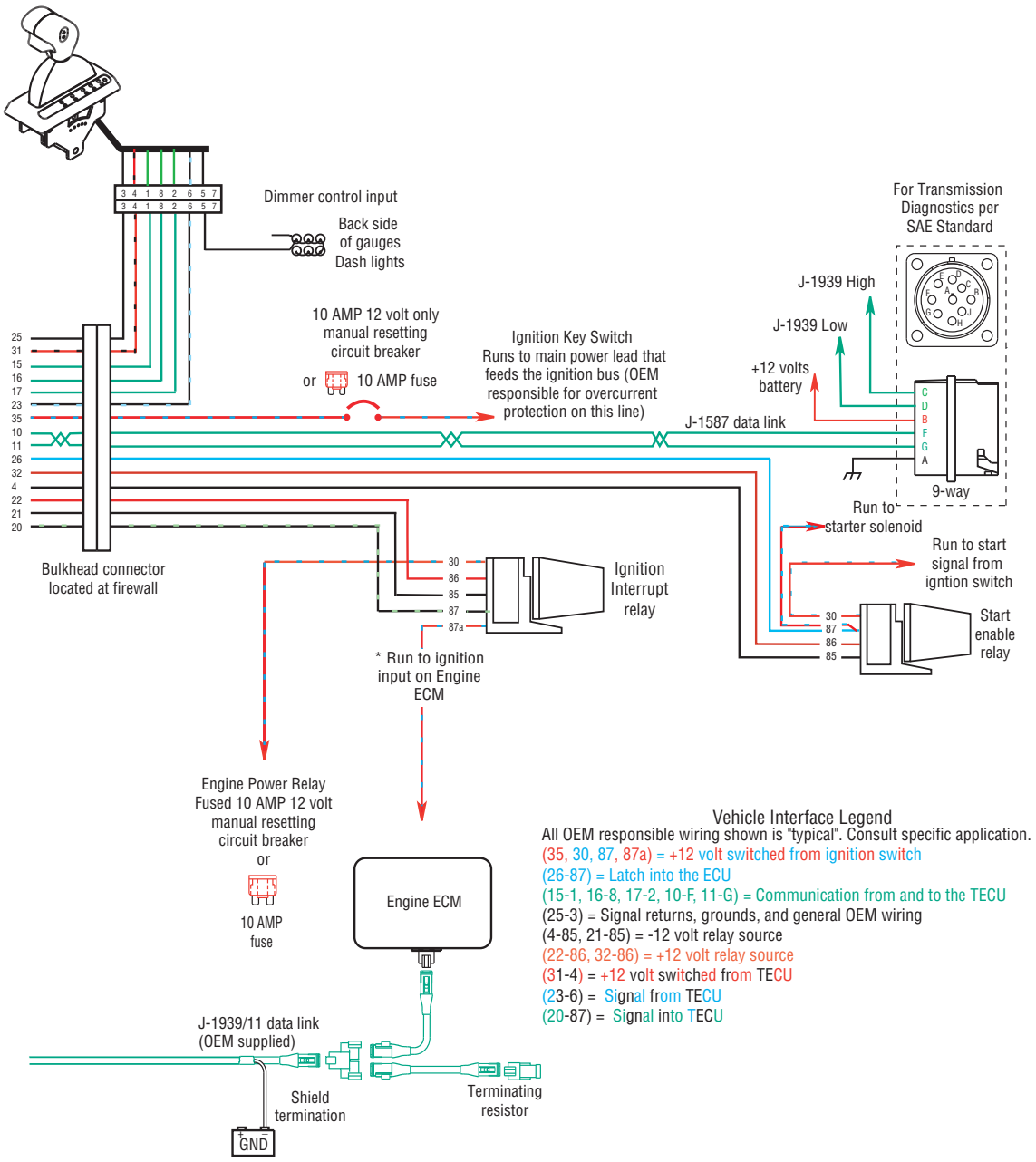
All OEM responsible wiring shown is "typical". Consult specific application.
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(4-85) = -12 volt relay source
(32-86) = +12 volt relay source
(31-C1) = +12 volt switched from TECU

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UltraShift 10-Speed Wiring Diagram with Analog Shifter

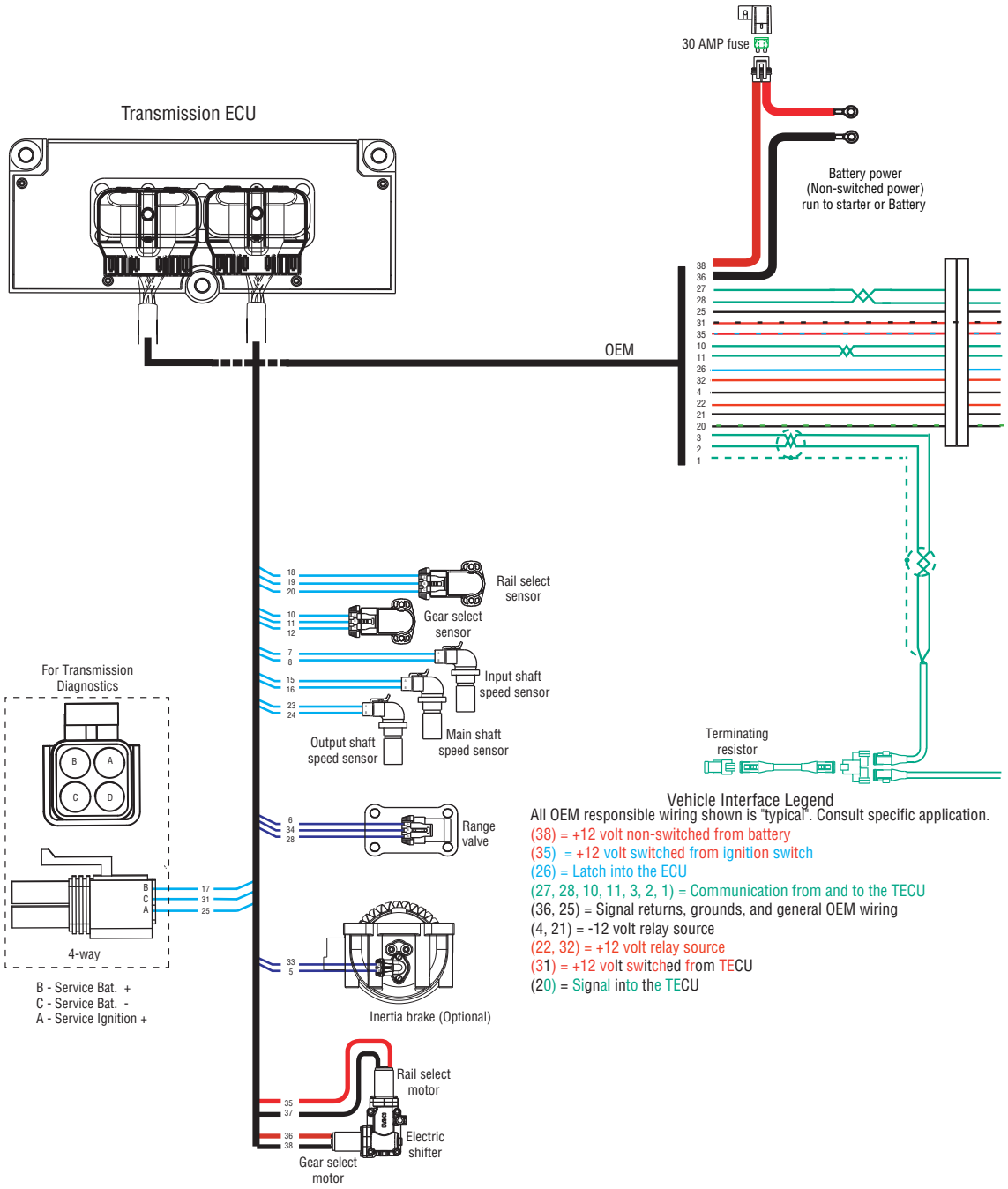


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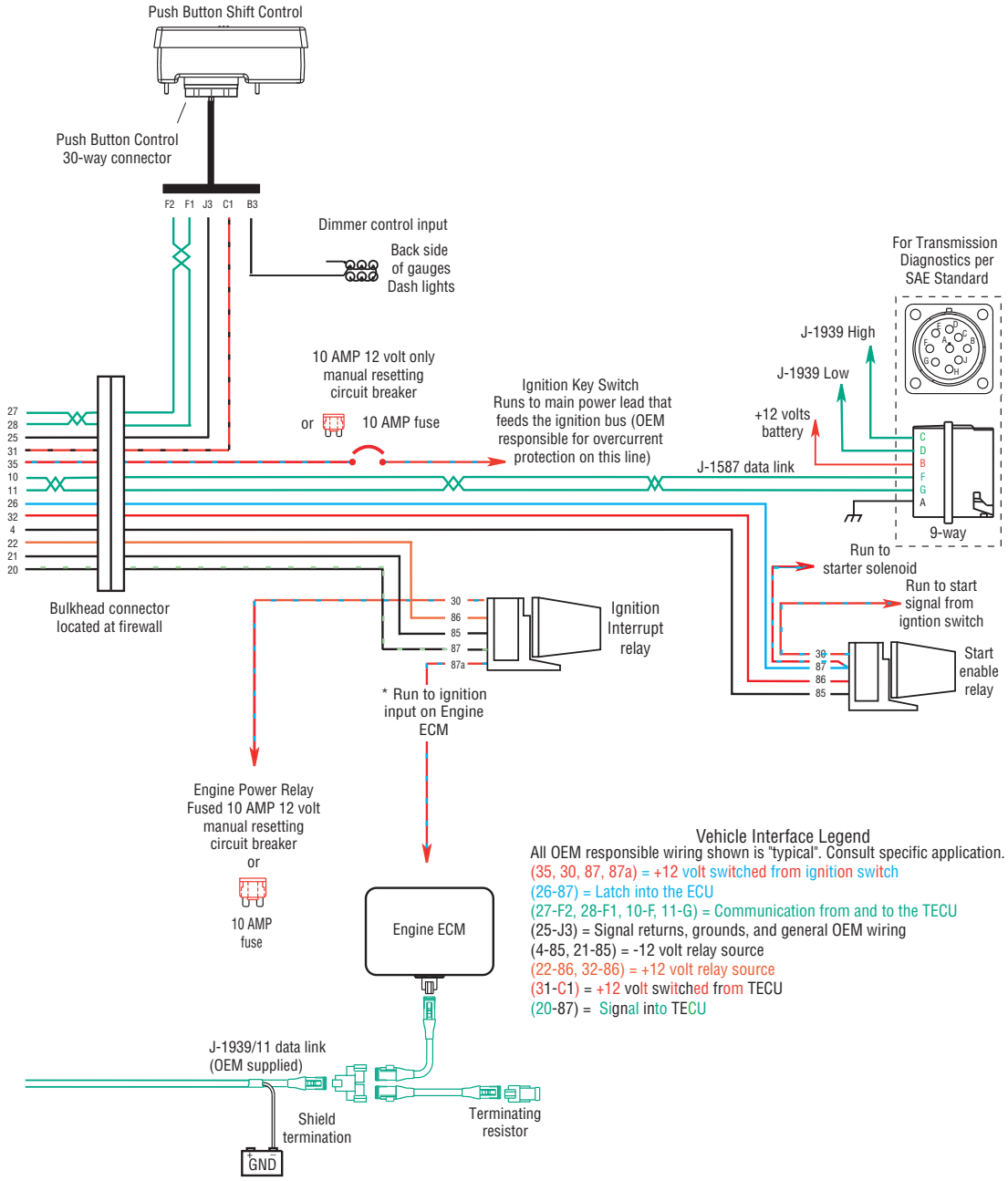


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UltraShift 10-Speed Wiring Diagram with Push Button Shifter

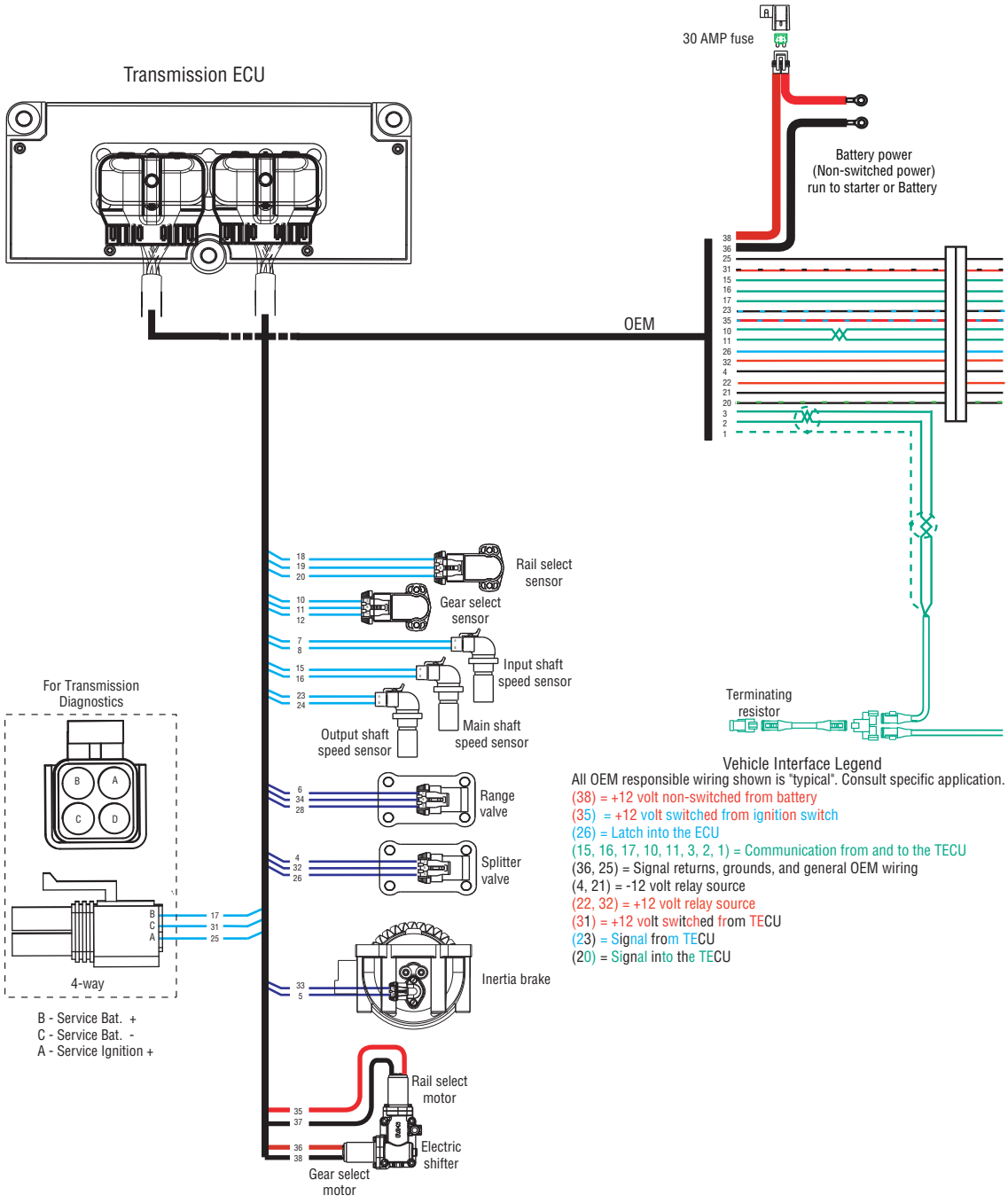


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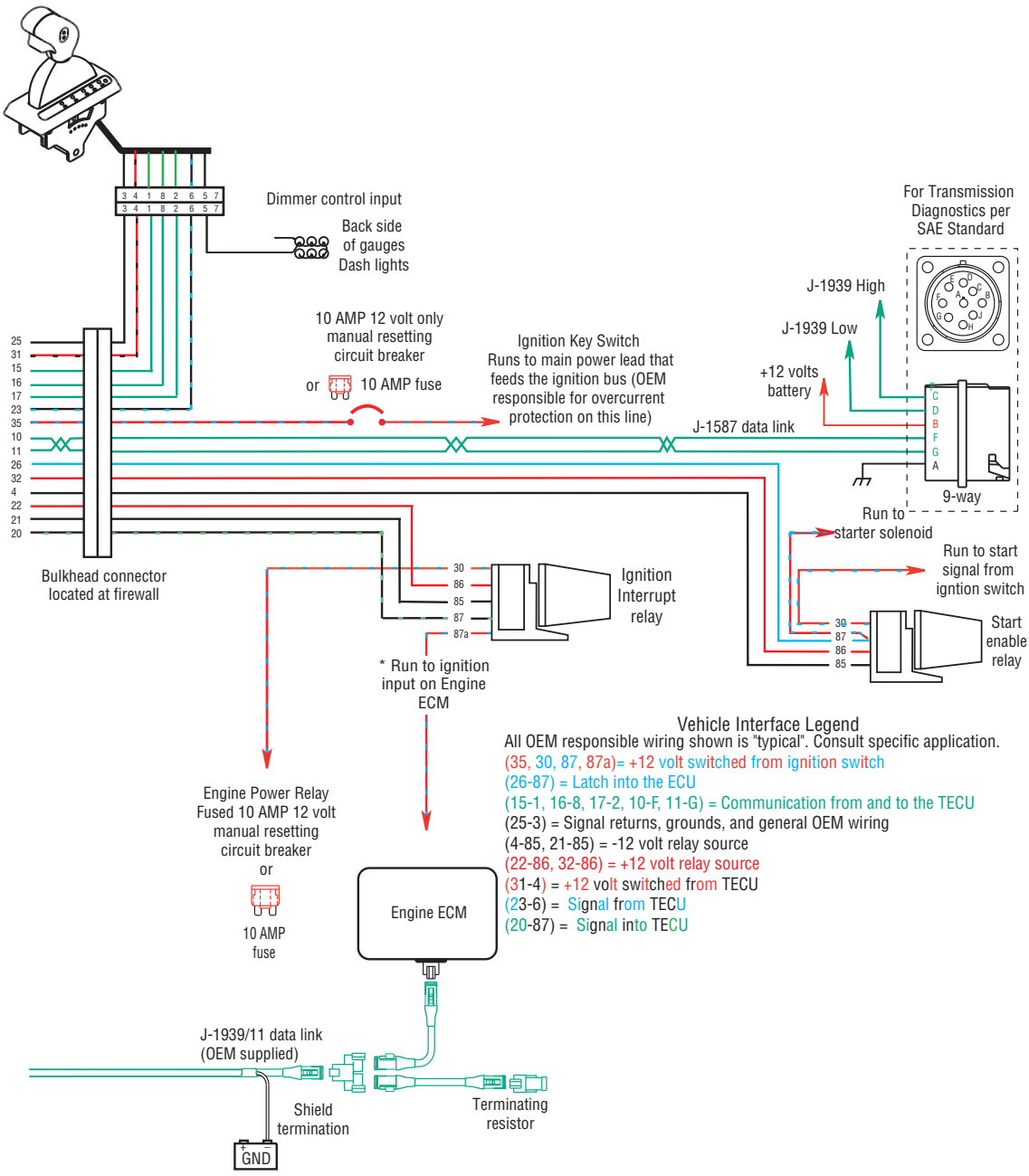


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UltraShift 13-Speed Wiring Diagram with Analog Shifter

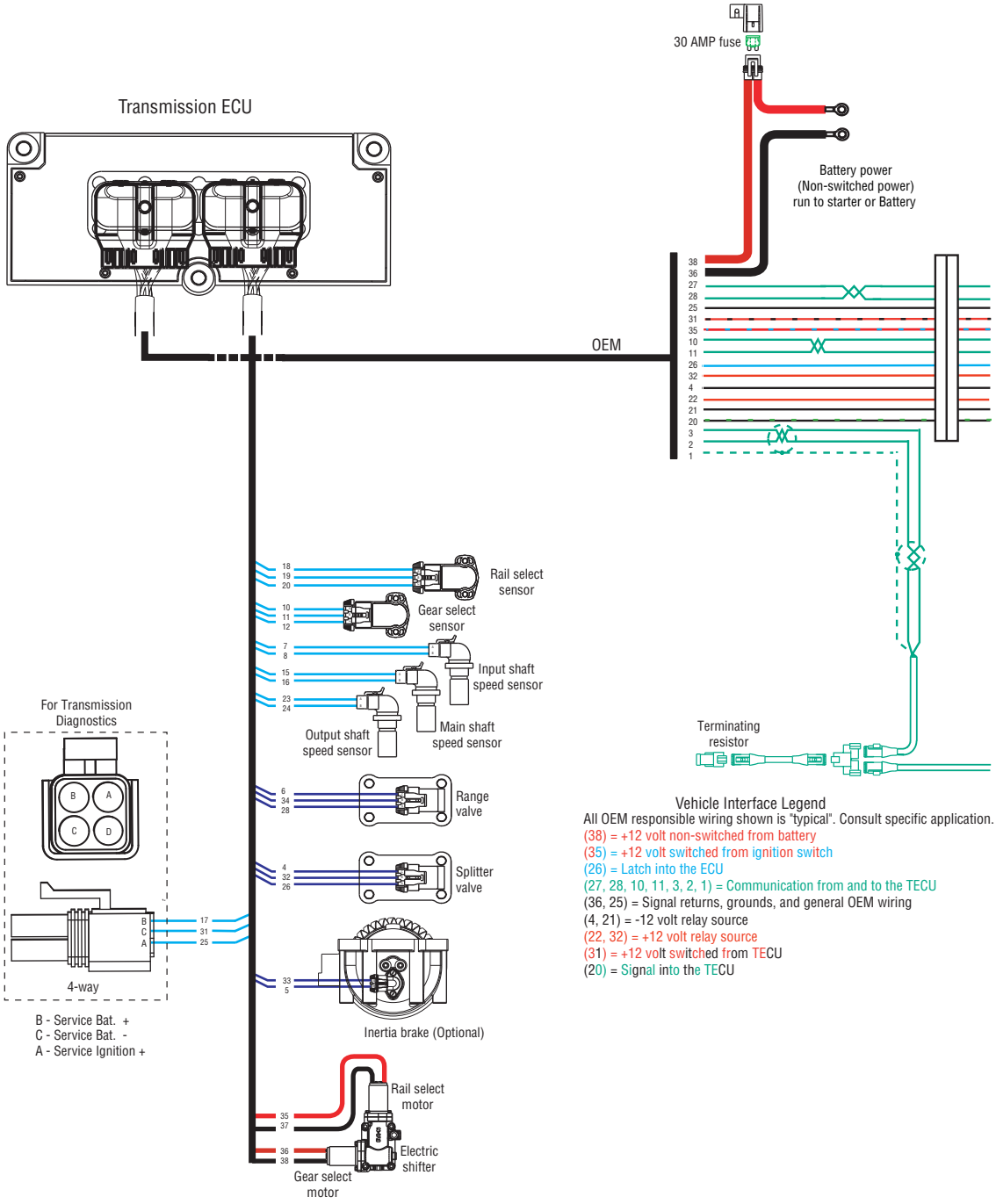


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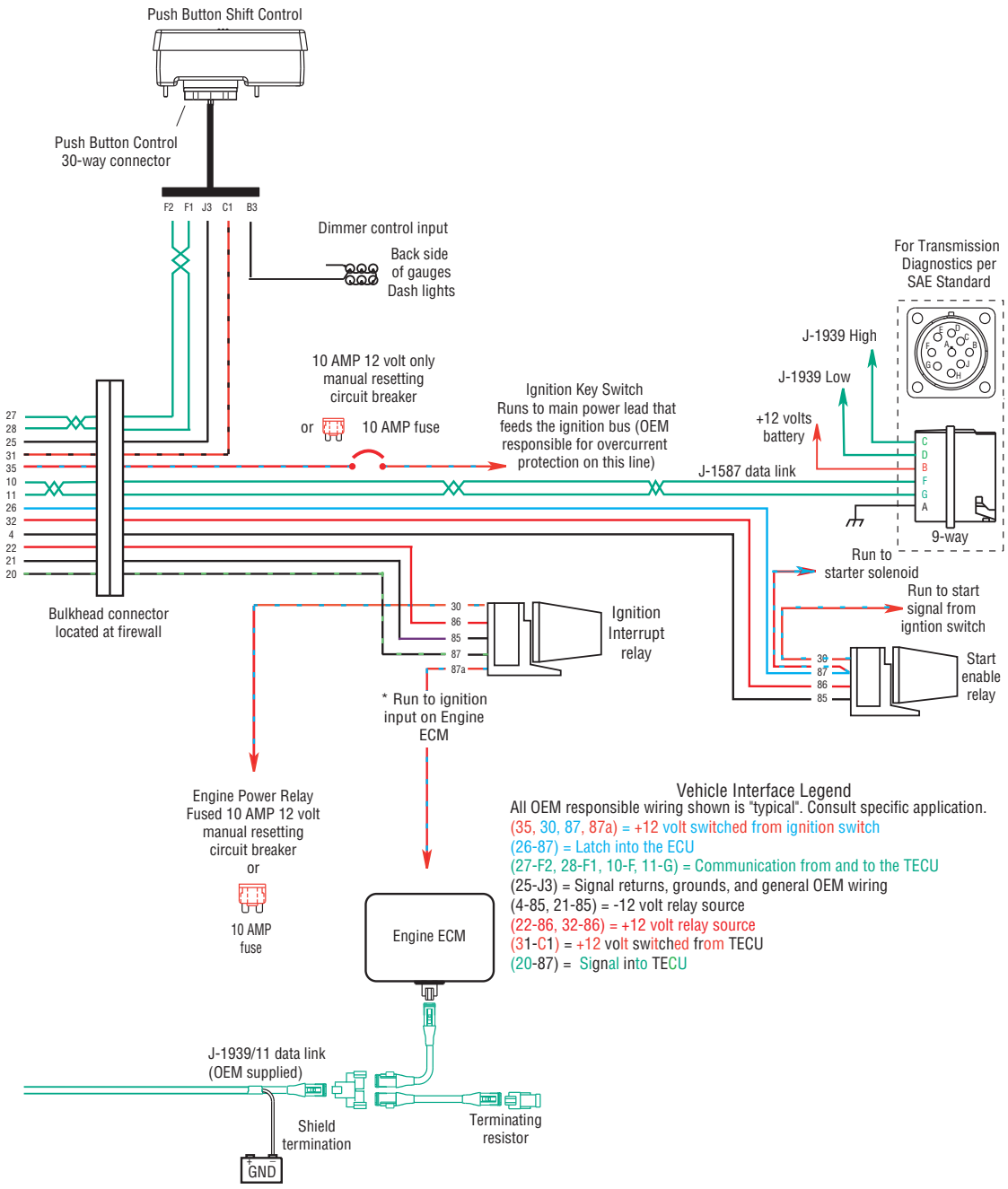
UltraShift 13-Speed Wiring Diagram with Push Button Shifter



Vehicle Interface Legend

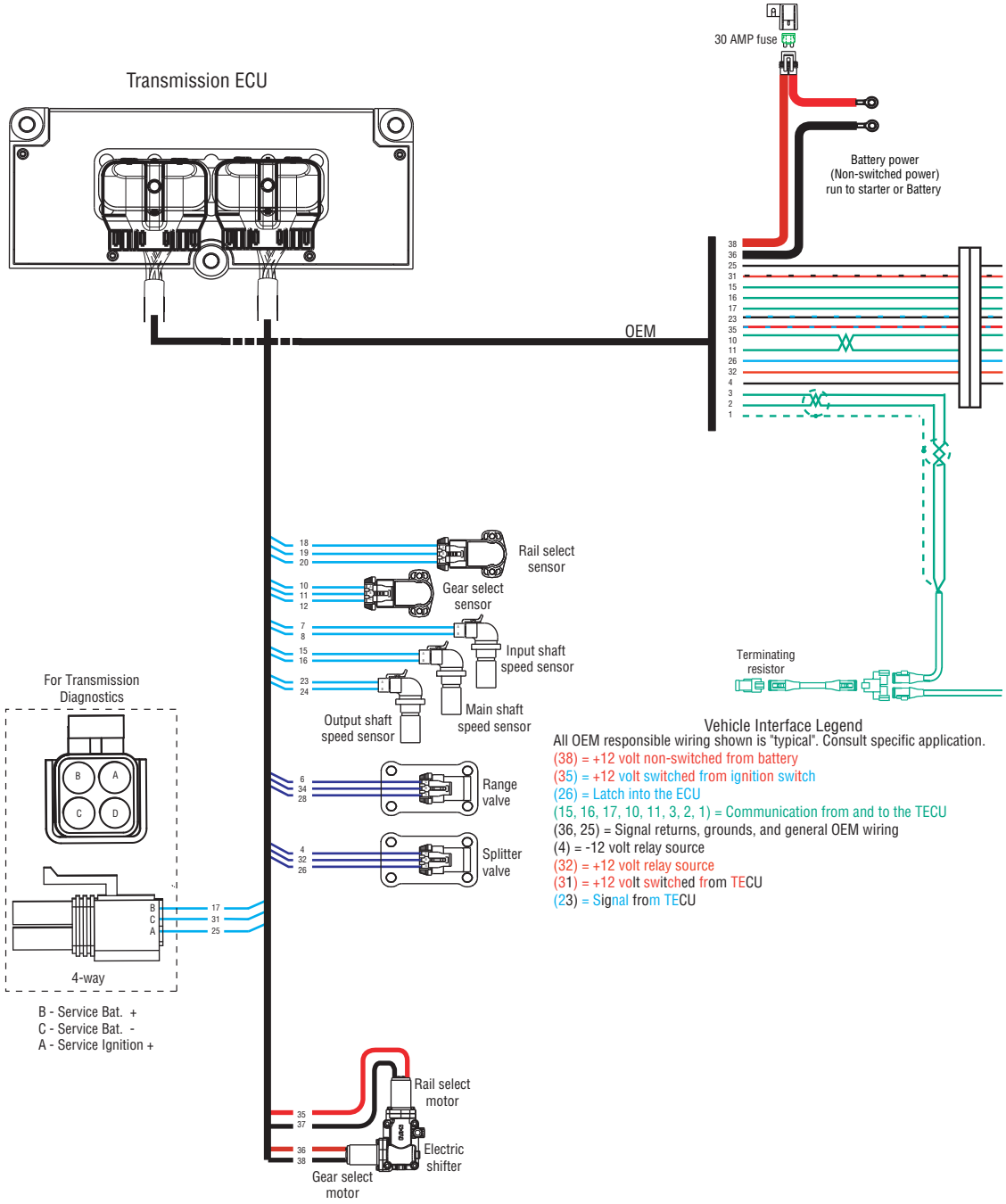
All OEM responsible wiring shown is "typical". Consult specific application.
(38) = +12 volt non-switched from battery
(35) = +12 volt switched from ignition switch
(26) = Latch into the ECU
(27, 28, 10, 11, 3, 2, 1) = Communication from and to the TECU
(36, 25) = Signal returns, grounds, and general OEM wiring
(4, 21) = -12 volt relay source
(22, 32) = +12 volt relay source
(31) = +12 volt switched from TECU
(20) = Signal into the TECU

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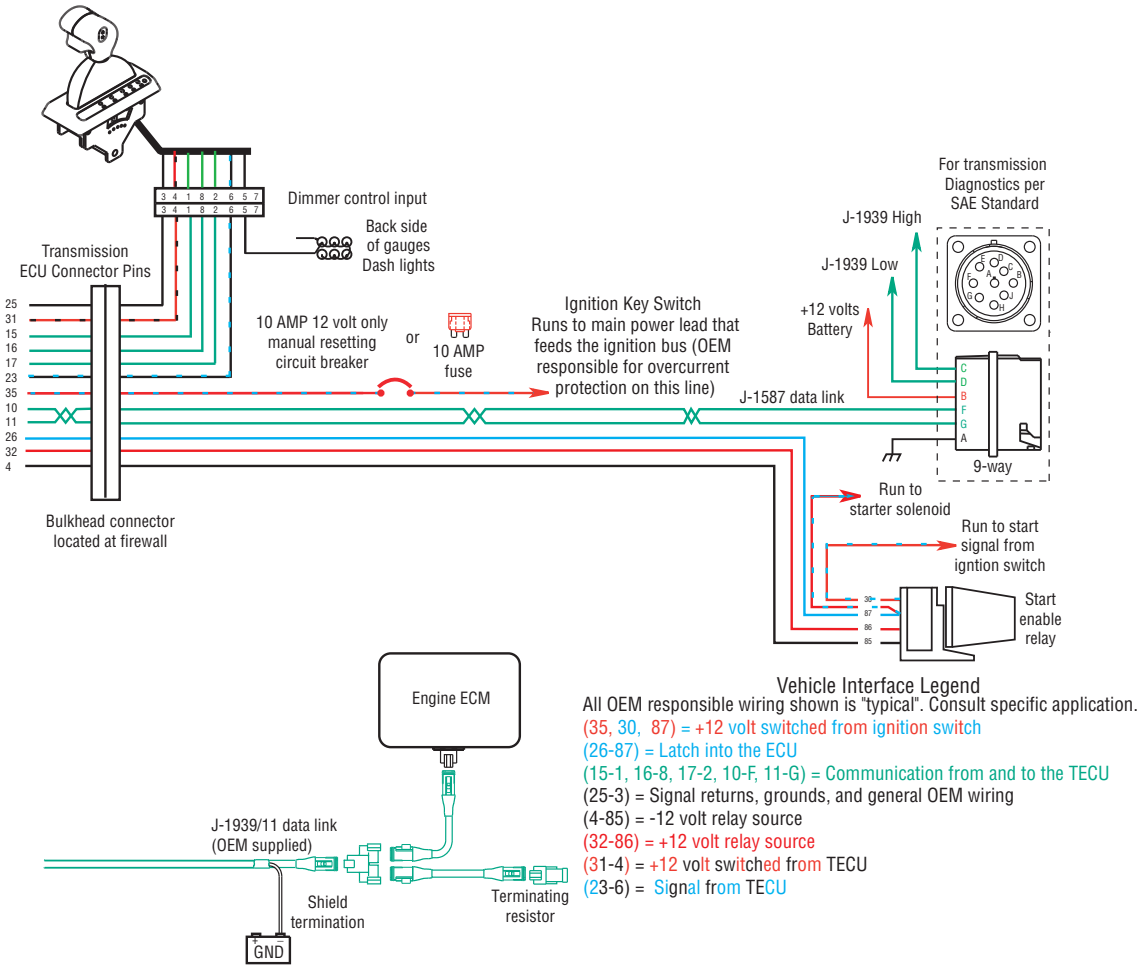
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AutoShift 18-Speed Wiring Diagram with Analog Shifter



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Vehicle Interface Legend

All OEM responsible wiring shown is "typical". Consult specific application.

(35, 30, 87) = +12 volt switched from ignition switch

(26-87) = Latch into the ECU

(15-1, 16-8, 17-2, 10-F, 11-G) = Communication from and to the TECU

(25-3) = Signal returns, grounds, and general OEM wiring

(4-85) = -12 volt relay source

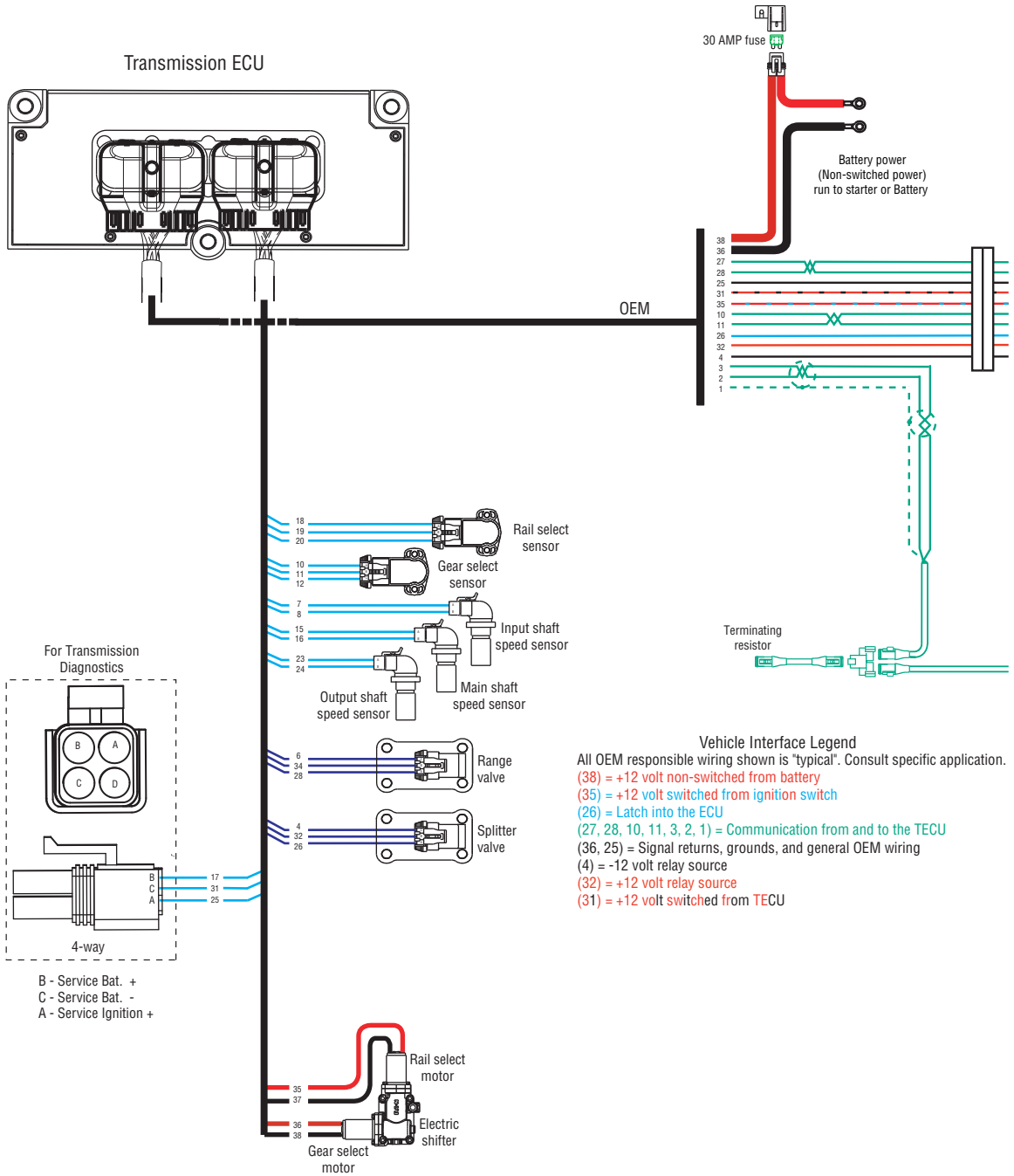
(32-86) = +12 volt relay source

(31-4) = +12 volt switched from TECU

(23-6) = Signal from TECU

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AutoShift 18-Speed Wiring Diagram with Push Button Shifter

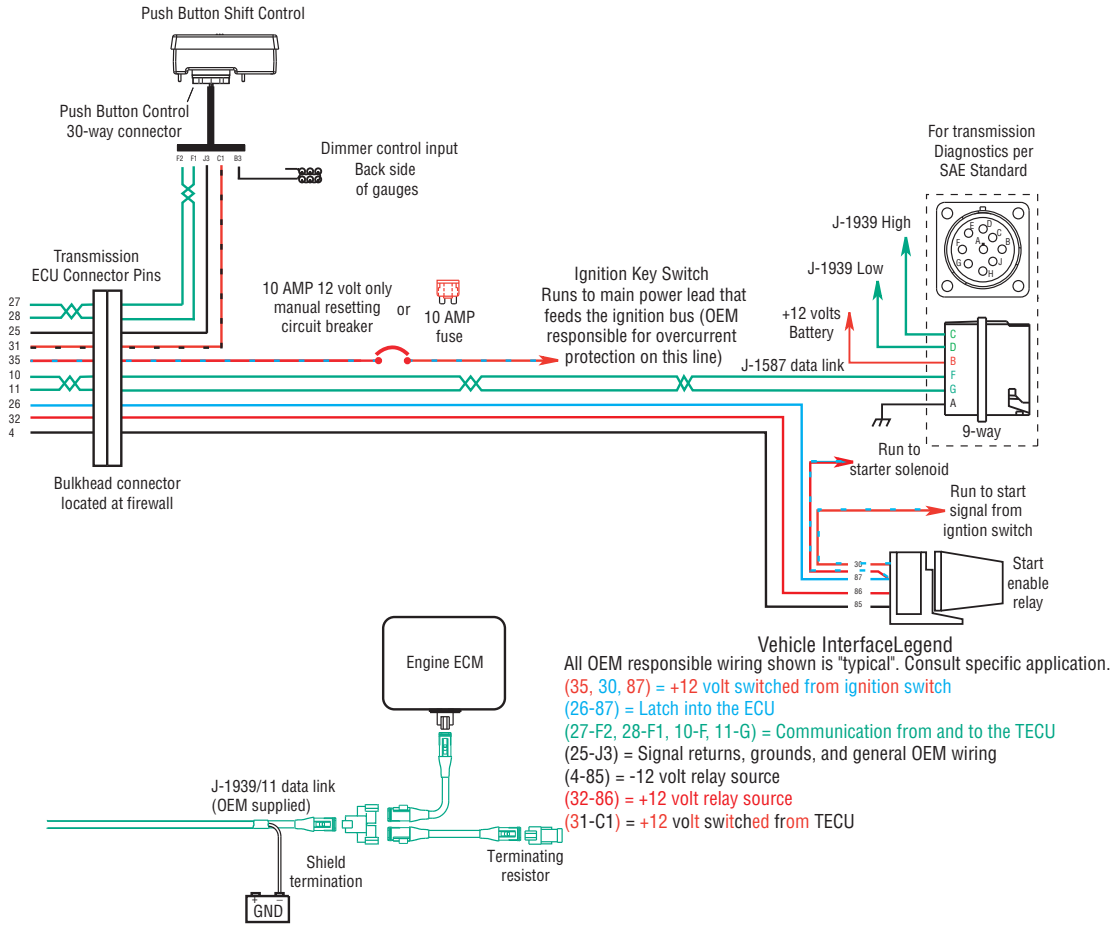


Vehicle Interface Legend

All OEM responsible wiring shown is "typical". Consult specific application.
(38) = +12 volt non-switched from battery
(35) = +12 volt switched from ignition switch
(26) = Latch into the ECU
(27, 28, 10, 11, 3, 2, 1) = Communication from and to the TECU
(36, 25) = Signal returns, grounds, and general OEM wiring
(4) = -12 volt relay source
(32) = +12 volt relay source
(31) = +12 volt switched from TECU

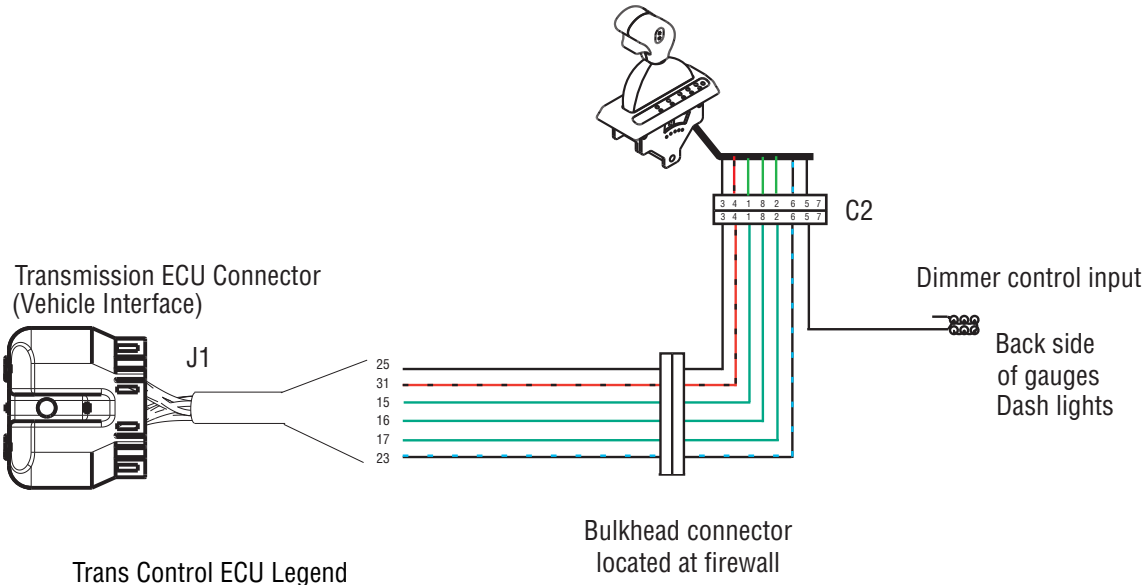
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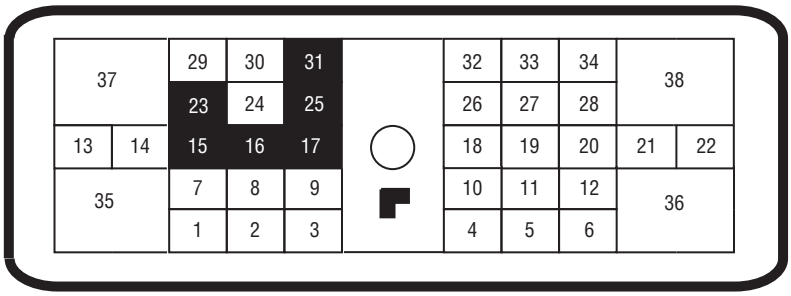
Eaton Cobra Lever Wiring Diagram



Trans Control ECU Legend

All OEM responsible wiring shown is "typical". Consult specific application.
(31-4) = +12 volt switched from TECU
(15-1, 16-8, 17-2) = Communication from and to the TECU
(25-3, 5) = Signal returns, grounds, and general OEM wiring
(23-6) = Signal from TECU

Front View
Transmission ECU Connector

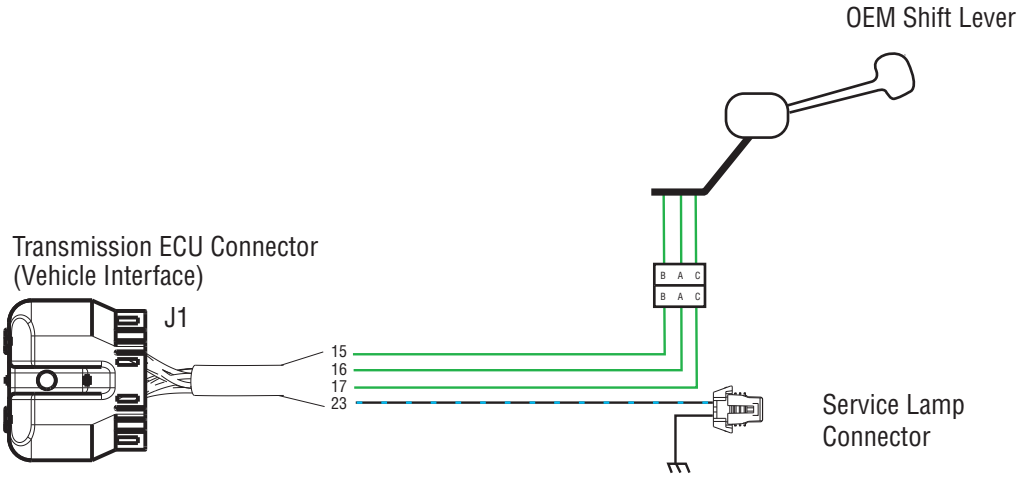


FROM	TO	Description
J1-15	C2-1	Shift Control Input (Mode Auto)
J1-17	C2-2	Shift Control Input (Mode Common)
J1-25	C2-3	Shift Control Power Minus
J1-31	C2-4	Shift Control Power Plus
	C2-5	Dash Lights
J1-23	C2-6	Service Light Output
J1-16	C2-8	Shift Control Input (Mode Manual)
	C2-7	No Connection

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OEM Shift Lever Wiring Diagram



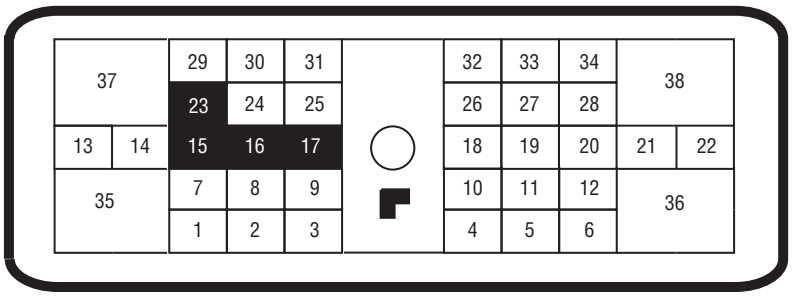
Vehicle Interface Legend

All OEM responsible wiring shown is "typical". Consult specific application.

(15-B, 16-A, 17-C) = Communication to and from the TECU

(23) = Signal from TECU

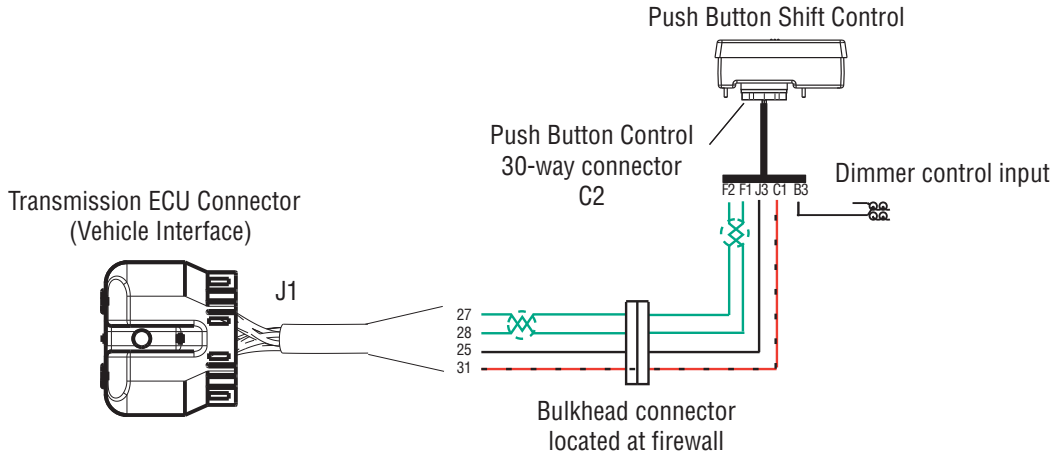
Front View
Transmission ECU Connector

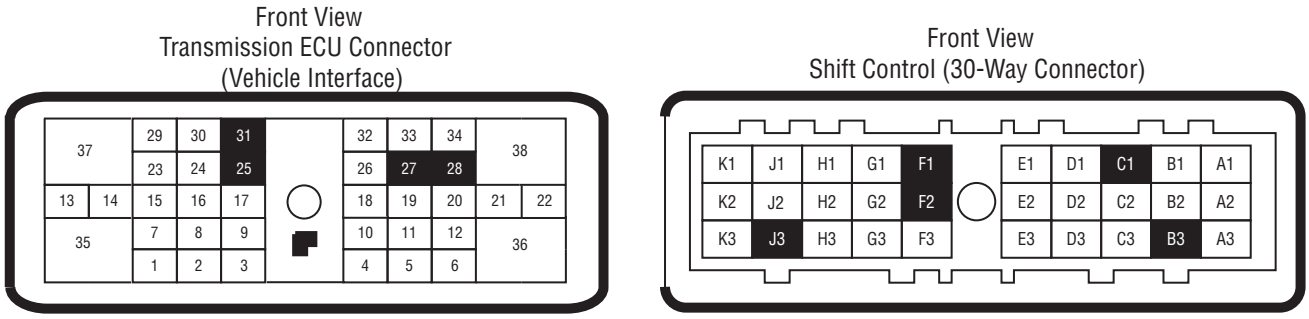


FROM	TO	Description
J1-15	F2-B	Shift Control Input (Mode Auto)
J1-16	F2-A	Shift Control Input (Mode Manual)
J1-17	F2-C	Shift Control Input (Mode Common)
J1-23	F3-A	Service Lamp Output
F3-B		Ground

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Eaton Push Button Wiring Diagram





Vehicle Interface Legend

All OEM responsible wiring shown is "typical". Consult specific application.
(31-C1) = +12 volt switched from TECU
(27-F2, 28-F1) = Communication from and to the TECU
(25-J3) = Signal returns, grounds, and general OEM wiring

FROM	TO	Description
J1-27	C2-F2	HIL(-) LO
J1-28	C2-F1	HIL(+) HI
J1-25	C2-J3	Shift Control Power Minus
J1-31	C2-C1	Shift Control Power Plus
C2-B3		Dimmer Control Input

FROM	TO	Description
J1-D1	C2-1	RNDHL
J1-D3	C2-2	COMMON
---------	C2-3	GROUND
J1-J2	C2-4	SPLICE into TRANS BATT 1

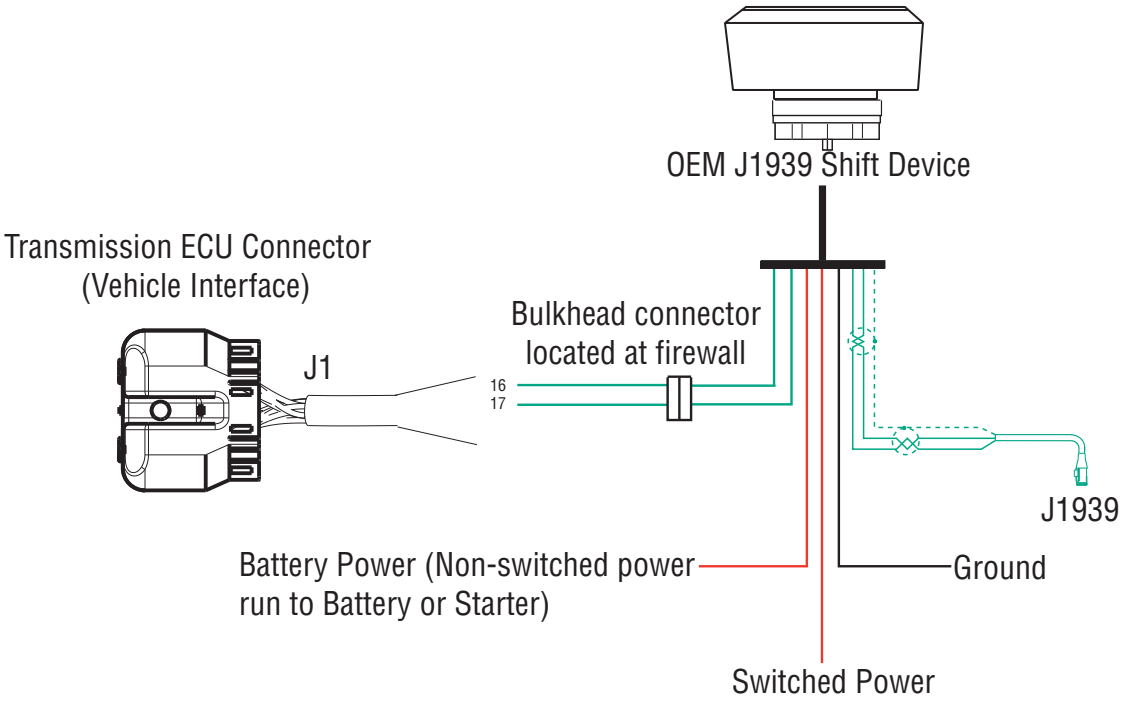
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FROM	TO	Description
J1-B3	C2-5	DIMMER CONTROL
J1-H2	C2-6	SERVICE LAMP
J1-D2	C2-8	MANUAL MODE

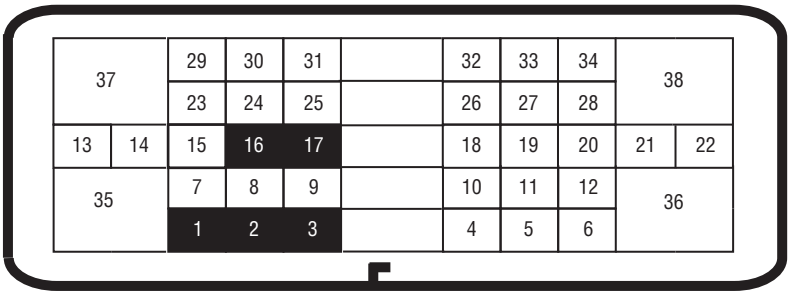
FROM	TO	Description
J1-27	C2-F2	EPL- LO
J1-28	C2-F1	EPL+ HI
J1-25	C2-J3	Ground 1
J1-31	C2-C1	Ignition
C2-B3		Dimmer Control Input

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OEM J1939 Shift Input Device Wiring Diagram



Front View
Transmission ECU Connector
(Vehicle Interface)



FROM	TO	Description
J1-16	Connector C2	Shift Control Input (Neutral Request Signal)
J1-17	Connector C2	Shift Control Input (Neutral Request Return)
OEM	Connector C2	Shift Control Power Minus (Ground)
OEM	Connector C2	Shift Control Power Plus (Ignition)
OEM	Connector C2	Shift Control Power Plus (Battery)
Connector C2	OEM	J1939 High
OEM	Connector C2	J1939 Low
OEM	Connector C2	J1939 Shield

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Proper Clutch Operation

When performing the test for proper clutch operation, the vehicle should be in the same condition as when the problem occurred. For instance, if the problem only occurs when the vehicle is hot, drive the vehicle to warm it up before conducting the test.

When the operator depresses the clutch pedal and shifts from neutral to drive or reverse, the Transmission Electronic Control Unit (TECU) waits for the transmission input shaft speed to decrease to less than 150 RPM before shifting the transmission into gear. If the clutch is not disengaging completely or the clutch brake is not functioning properly, the input shift will not slow down and the transmission will not shift into gear.

Check For Proper Clutch Operation

Note: Refer to publication CLSM0200.

With PC-Base Service Tool

1. Connect ServiceRanger a PC-based Service Tool.
2. Make sure the transmission is in neutral
3. Start engine.
4. Set ServiceRanger a PC-based Service Tool to monitor input shaft speed.
5. With Clutch pedal up (clutch engaged), compare input shaft speed and engine speed (RPM). They should be the same.

Note: If engine speed and input shaft speeds are not the same, then perform input shaft speed sensor test and confirm proper clutch adjustment.

6. Check clutch for slippage, and repair or replace as needed.
7. Depress clutch pedal to active clutch brake. Within 2 seconds, input shaft speed should be less than 25 RPM (0 RPM is desired). If input shaft does not stop turning, the clutch is not disengaging completely or the clutch brake is not functioning properly.
8. Check for proper clutch adjustment, adjust as necessary.
9. Inspect clutch brake for excessive friction material wear or internal damage. Replace as necessary.

Note: The clutch brake may have to be removed to inspect properly.

10. If clutch adjustment is correct and clutch brake appears satisfactory, the problem may be a defective clutch. The clutch may require repair or replacement. Refer to the clutch manufacturer's service information to verify a dragging clutch.

Without ServiceRanger a PC-based Service Tool

1. Place transmission in neutral.
2. Start engine.
3. Let up on the clutch pedal (clutch engaged).
4. Depress clutch pedal fully to activate clutch brake and hold for 2 seconds.
5. Place transmission in starting gear.
6. If starting gear display shows a solid gear (engaged), the procedure is complete. If the gear display shows a flashing gear (not yet engaged) continue on to number 7.
7. If flashing gear is displayed, slowly release the clutch pedal.
8. If flashing gear does not become solid or gear does not engage, check clutch brake for proper function and check clutch adjustment.
9. If gear does not engage and clutch is adjusted properly, troubleshoot for a dragging clutch according to clutch manufacturer.

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Confirm Proper Clutch Adjustment and Clutch Brake Contact

Confirm Release Bearing Travel Gap

Use a 1/2” gauge to verify the release bearing travel gap. This gap (distance between the rear of the release bearing and the clutch brake) must be between 1/2” and 9/16”.

If this dimension is incorrect, adjust the clutch per the clutch manufacturer’s instructions.

Confirm the Free-Play gap*

*For mechanical clutch release systems with free-play.

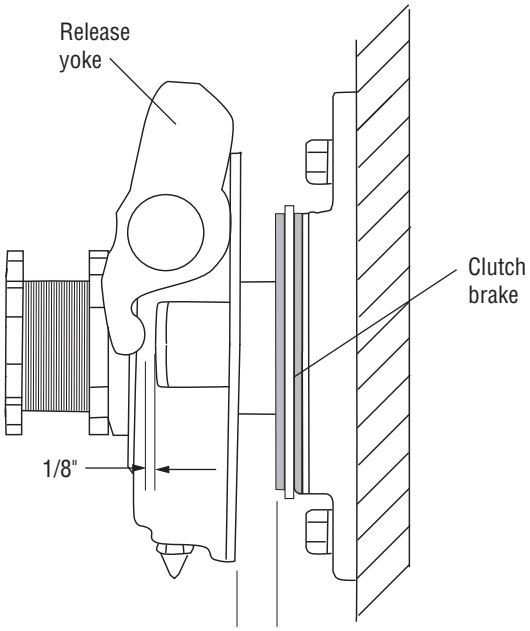
Use a 1/8” gauge to verify proper free-play gap on Easy Pedal.

If this dimension is incorrect, adjust the clutch per the clutch manufacturer’s instructions.

Confirm Proper Clutch Brake Contact

Insert a 0.010” feeler gauge between the release bearing and the clutch brake have an assistant fully depress the clutch pedal. The 0.010” feeler gauge should be squeezed between the rear of the release bearing and the clutch brake. Have the assistant slowly let up the clutch pedal. The 0.010” feeler gauge should slide out when the clutch pedal is 1/2” to 1” above the cab floor or lower pedal stop.

If the 0.010” feeler gauge is not adequately squeezed to prevent removal, or can be removed with the pedal less than 1/2” or greater than 1”, check and adjust the clutch pedal height and travel per the chassis manufacturer’s instructions. In addition, check the external clutch linkage for excessive wear or obstruction preventing complete travel.



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Clutch Grease Interval Service Procedure

Clutch Greasing Guidelines

It is highly important to follow proper clutch lube intervals as specified in Lubrication Manual, TCMT0021. Failure to do so may result in clutch failure and unnecessary repairs.

For more detailed cross-shaft greasing information refer to the “Release Yoke and Cross-shaft(s) Installation” section of this manual. Refer to Clutch Service Manual, CLSM0200, for release bearing greasing information.

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Adapter Test Kit J43318

Note: Use extreme caution when inserting adapters into the connectors to avoid spreading or distorting of the terminals.

Gray Adapters

Gray adapter are to only be used for the following connectors:

- Shift Control 30-way connector
- Speed Sensors
- Position Sensors
- Range Solenoid Valve
- Splitter Solenoid Valve

Green and Brown Adapters

Green and brown adapters are to only be used for the following connectors:

- Vehicle interface 38-way connector
- Transmission Electronic Control Unit (TECU) 38-way connector

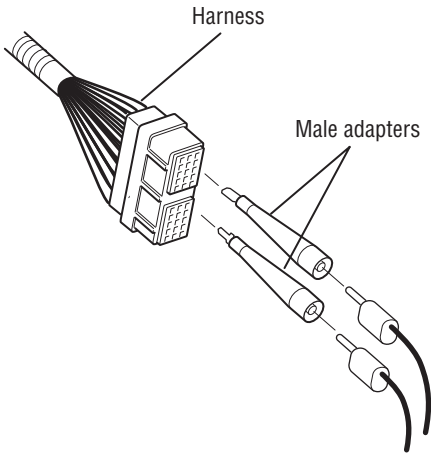
Purple Adapters

Purple adapter are to only be used for the following connectors:

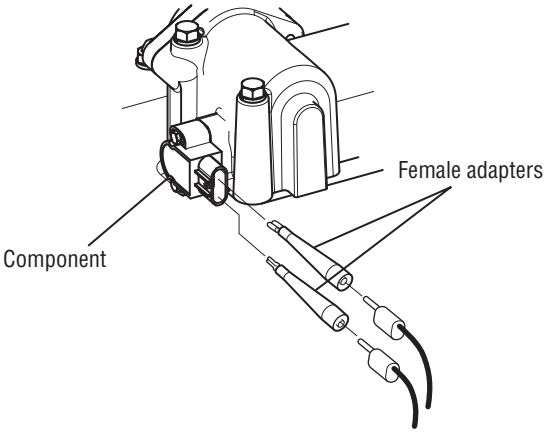
- Motors
- Main Power
- Inertia Brake

Adapter Pins

Use the male adapter to test the harness pins.



Use the female adapter to test the component pins.



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In Mexico, call 001-800-826-4357.

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