Troubleshooting Guide

Fuller Automated Transmissions TRTS0050 EN-US

November 2015

RTAO-11710B-AC	RTAO-15710B-AC
RTAO-11710C-AC	RTAO-15710C-AC
RTAO-12710B-AC	RTAO-16710B-AC
RTAO-12710C-AC	RTAO-16710B-AS
RTAO-13710B-AC	RTAO-16710C-AC
RTAO-13710C-AC	RTAO-16710C-AS
RTAO-14710B-AC	RTLO-14918B-AS
RTAO-14710B-AS	RTLO-16918B-AS
RTAO-14710C-AC	RTLO-18918B-AS
RTAO-14710C-AS	RTLO-20918B-AS

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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.

⚠ WARNING

Before starting a vehicle:

1. Sit in the driver's seat
2. Place shift lever in neutral
3. Set the parking brake

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

4. Place shift lever in neutral
5. Set the parking brake
6. Block the wheels

When parking the vehicle or leaving the cab:

7. Place shift lever in neutral
8. 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:

9. Place shift lever in neutral
10. Lift the drive wheels off of the ground or disconnect the driveling

Do not operate vehicle if alternator lamp is lit or if gauges indicate low voltage.

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Section 1: General Information

Section 2: Fault Isolation Procedures

Section 3: Symptom Isolation Procedures

Appendix

Suggested Tools

Air Gauges

- 2 (0-100) PSI Air Gauges

Volt/Ohm Meter

- SPX / Kent-Moore 1 (800) 328-6657
- P/N 5505027

PC-based Service Tool “ServiceRanger”

- Contact your OEM

Data Link Tester

- Eaton Service Parts 1 (800) 826-HELP (826-4357)
- P/N MF-KIT-04

Download Harness Kit

- Eaton Service Parts 1 (800) 826-HELP (826-4357)
- K-3481

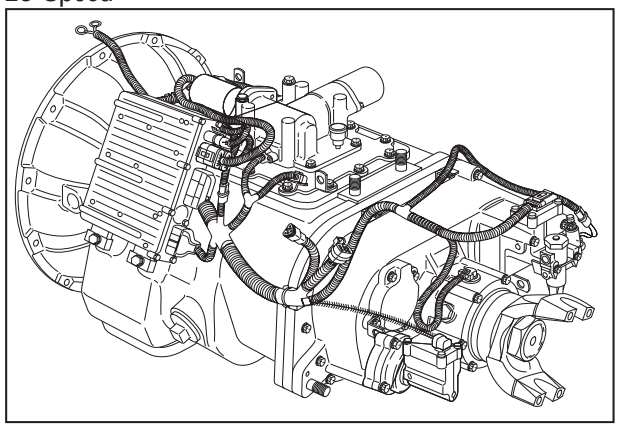
Test Adapter Kit

- SPX / Kent-Moore 1 (800) 328-6657
- Eaton Test Adapter Kit P/N J-43318
- Serial Link Adapter Kit P/N J-38351-B

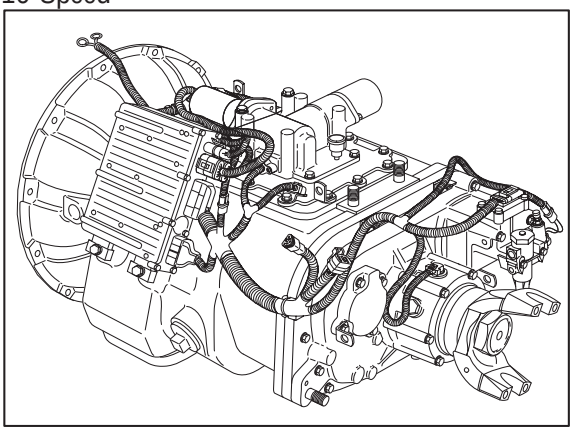
For more information call 1-800-826-HELP (826-4357)

Transmission Models Included

18-Speed

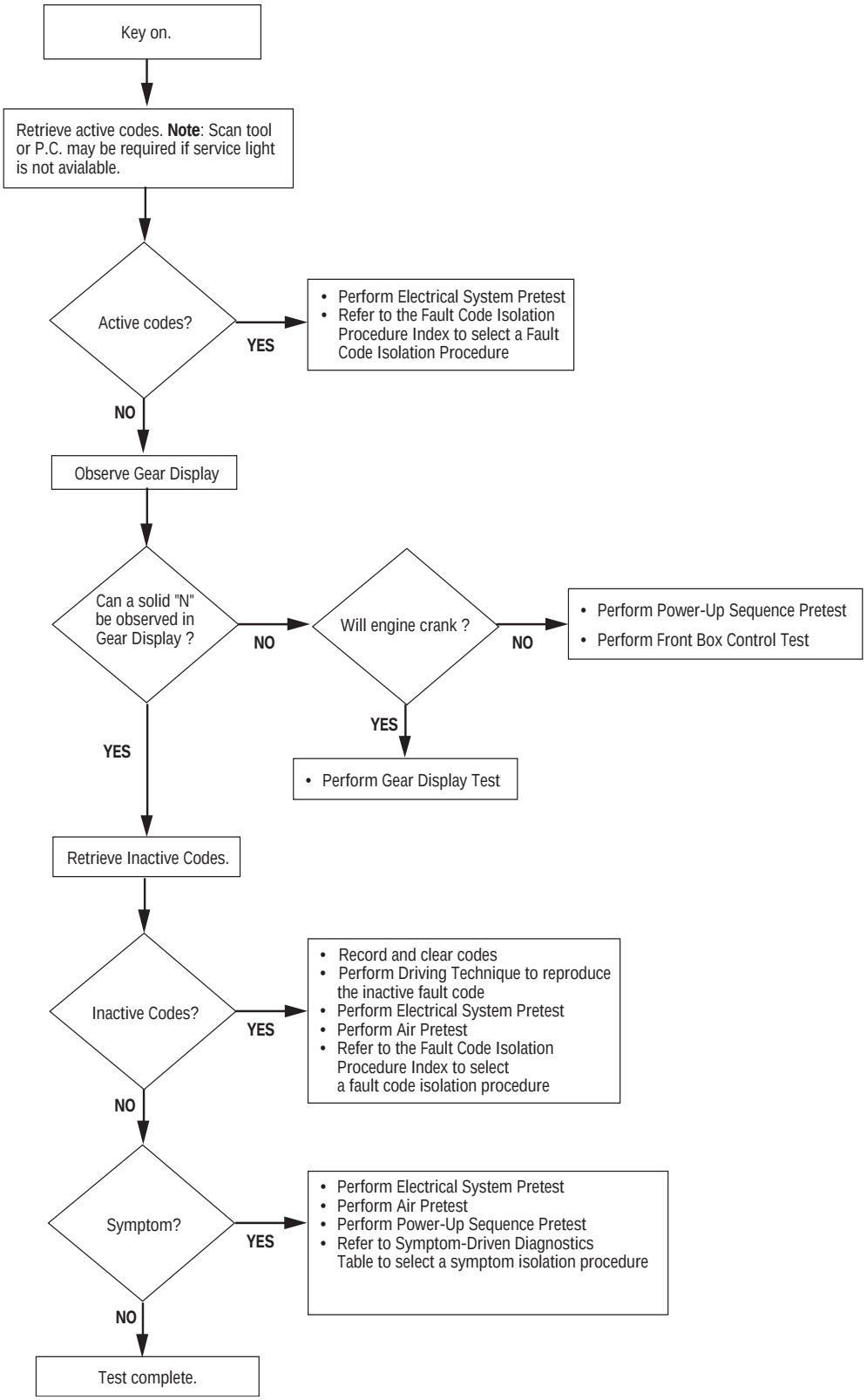


10-Speed



Diagnostic Procedure

Follow the flow cart below for all AutoSelect/AutoShift failures. Perform tests and procedures as directed by the flowchart.



Fault Code Retrieval/Clearing

Retrieving Fault Codes

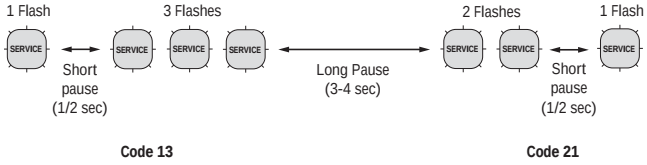
Retrieve fault codes by enabling the system's self-diagnostic mode.

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

1. Place the shift lever in neutral.
2. Set the parking brake.
3. Turn the ignition key on but do not start the engine. If the engine already running, you may still retrieve codes, however, do not engage the starter if the engine stalls.
4. To Retrieve Active Codes: Start with the key in the on position. Turn the key off and on two times within five seconds ending with the key in the on position. After five seconds, the service lamp begins flashing two-digit fault codes. If no faults are active, the service light will not flash.

5. To Retrieve Inactive Codes: Start with the key in the on position. Turn the key off and on four times within five seconds ending with the key in the on position. After five seconds, the service lamp begins flashing two-digit fault codes. If there are no inactive faults, the service light will not flash.

6. Observe the sequence of flashes on the indicator lamp and record the codes. A one to two second pause separates each stored code, and the sequence automatically repeats after all codes have been flashed.

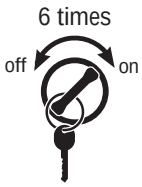


Clearing Fault Codes

The following procedure clears all inactive fault codes from the ECU'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 the shift lever in neutral.
2. Set the parking brake.
3. Turn the ignition key on but do not start the engine.
4. Start with the key in the on position. Turn the key off and on six times within five seconds ending with the key in the on position.



Note: If the codes have been successfully cleared, the service lamp will come on and stay on for five seconds.

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

Driving Techniques

Fault Codes	PID	SID	FMI	Description	Type of Code	Driving Technique
11		254	2,12	System Controller	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
12		233	12	Transmission Controller	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
13		236	4,5	Power Connect Relay Coil	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
14		18	12	Shift Lever	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat, vibration and selecting different shift lever positions.
15		57	2	Shift Lever Data Link	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
16		248	2	Eaton Proprietary Link (EPL)	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
17		237	4	Start Enable Relay Coil	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	PID	SID	FMI	Description	Type of Code	Driving Technique
31	62		3,4	Engine Brake Relay Coil	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
33	168		4	Battery Voltage Supply	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
35		231	2,7	Engine Control Failure	System	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat, vibration and varying levels of throttle demand.
41		56	7	Range Failed to Engage	System	Operate the vehicle and perform several range upshifts and downshifts. The failure is detected after 5 consecutive attempts to complete the same type of range shift. Several shifts (ten or more) may be necessary before the ECU confirms the failure.
42		61	7	Splitter Failed to Engage	System	Operate the vehicle and perform several range upshifts and downshifts. The failure is detected after 5 consecutive attempts to complete the same type of range shift. Several shifts (ten or more) may be necessary before the ECU confirms the failure.
43		35 or 36	3,4,5	Range Solenoid Valve	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
44	54		3,4,5	Interia Brake Solenoid Coil	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
46		37 or 38	4,5	Splitter Solenoid Valve	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	PID	SID	FMI	Description	Type of Code	Driving Technique
51	60		2	Rail Select Sensor	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
52	59		2	Gear Select Sensor	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
53		34	2	Reverse Ball Switch	Component	Select a reverse gear (repeatedly).
56	161		2	Input Shaft Speed Sensor	Component	Select a forward gear and drive at a steady speed no slower than 10 m.p.h. It may be necessary to operate the vehicle for a prolonged period of time if the cause of failure is related to heat and vibration.
57	160		2	Main Shaft Speed Sensor	Component	Select a forward gear and drive at a steady speed no slower than 10 m.p.h. It may be necessary to operate the vehicle for a prolonged period of time if the cause of failure is related to heat and vibration.
58	191		2	Output Shaft Speed Sensor	Component	Select a forward gear and drive at a steady speed no slower than 10 m.p.h. It may be necessary to operate the vehicle for a prolonged period of time if the cause of failure is related to heat and vibration.
61		39	5,6	Rail Select Motor	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
63		40	5,6	Gear Select Motor	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Codes	PID	SID	FMI	Description	Type of Code	Driving Technique
65		251	4	Low Motor Voltage	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.
71		60	7	Stuck Engaged	System	Engage LO gear and allow the vehicle to slowly move forward. While the vehicle is in motion, move the shift lever to Reverse LO and slowly bring the vehicle to a stop. The vehicle will shift into Reverse LO. Several shifts (ten or more) may be necessary before the ECU confirms the failure.
72		59	7	Failed to Select Rail	System	Complete several shifts while the vehicle is in motion, including selections from neutral. Allow the transmission to complete several automatic shifts.
73		58	7	Failed to Engage Gear	System	Complete several shifts while the vehicle is in motion, including selections from neutral. Allow the transmission to complete several automatic shifts.
74		54	7	Failed to Syn Initial Engagement	System	With vehicle stopped, select a drive gear and fully depress the clutch pedal. Return transmission to neutral. Repeat several times.
83		18	14	Shift Lever Missing	Component	Key on. If the fault is present, the system should automatically detect the problem and set the code. If the fault is not present at key on, operate the vehicle and attempt to duplicate the driving conditions that triggered the fault code. Possible triggers include heat and vibration.

Fault Code Isolation Procedure Index

Symptom Driven Diagnostics Index

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Electrical System Pretest

Overview

The test 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.

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 effect other systems.

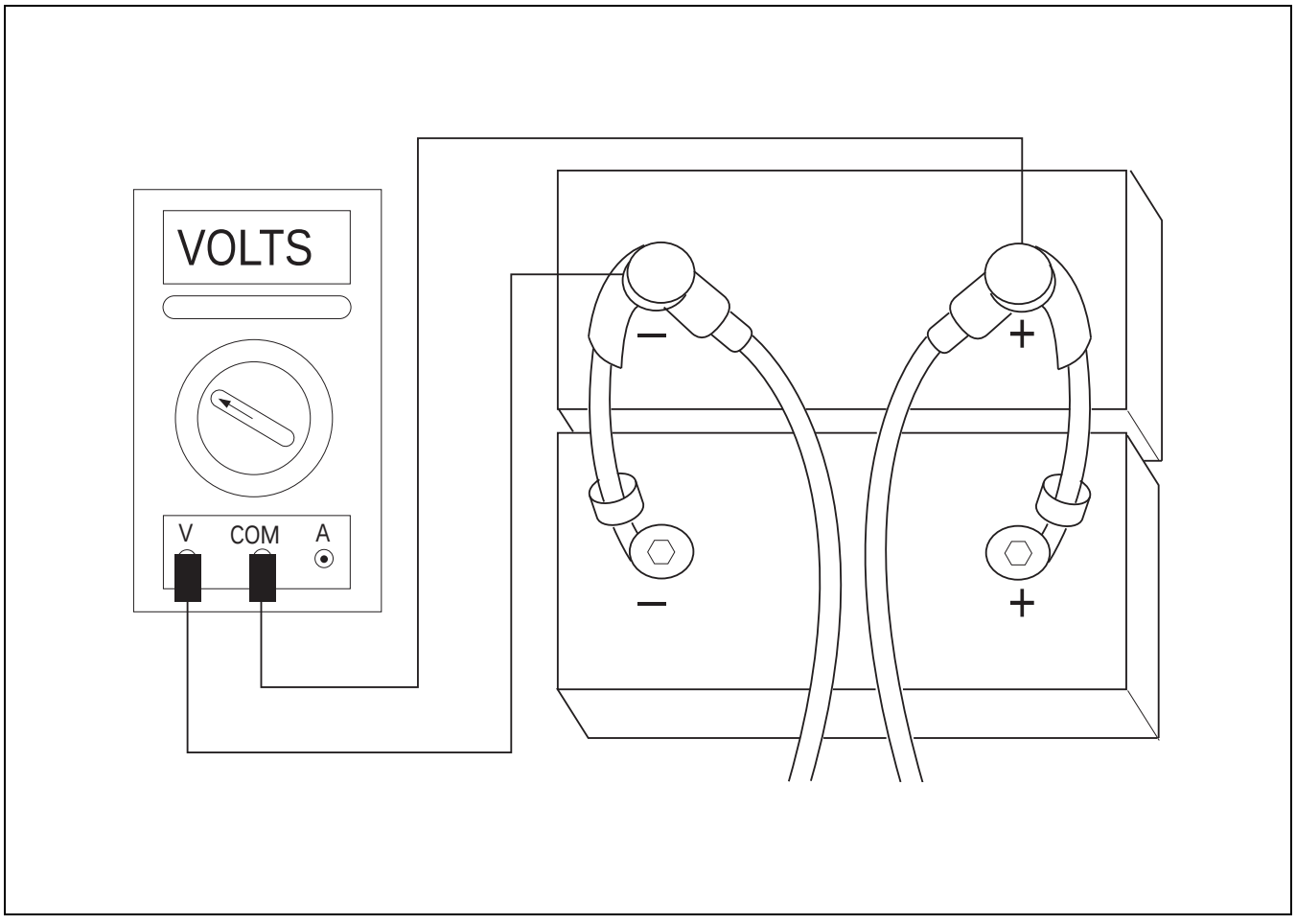
Required Tools

- Basic Hand Tools
- Eaton Test Adapter Kit
- Digital Volt/Ohm Meter
- Troubleshooting Guide
- Battery Load Tester

Possible Causes

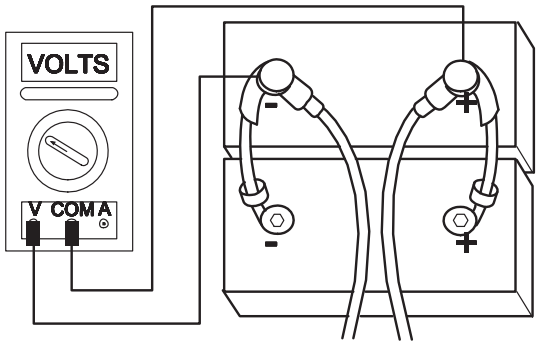
This pretest can be used for any of the following:

- Low Batteries
- Starter/Battery connections



Electrical System Pretest

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Inspect starter/battery connections for integrity.		
	3. Measure voltage across battery. →	If voltage is 11 to 13 volts on a 12 volt system or	
		22 to 26 on a 24 volt system →	Go to **Step V.**
		If voltage is outside of range →	Repair or replace battery/s and charging system as required. Repeat this step.



Step V	Procedure	Condition	Action
	1. Key off.		
	2. Load Test the Battery/s. →	If the battery/s maintain the specified load →	Test Complete.
		If the battery/s fail the load test →	Replace the damaged battery/s and repeat this step.

Power-Up Sequence Pretest

Overview

A failure during the self-check indicates a failure of the Shift Control.

Detection

The power-up self-check is performed automatically each time the key is turned on. Turn the key on and watch the service lamp. If power-up stops with the service lamp constantly on, or it never comes on, self-check has failed.

Fallback

If self-check fails, the product cannot perform any operations.

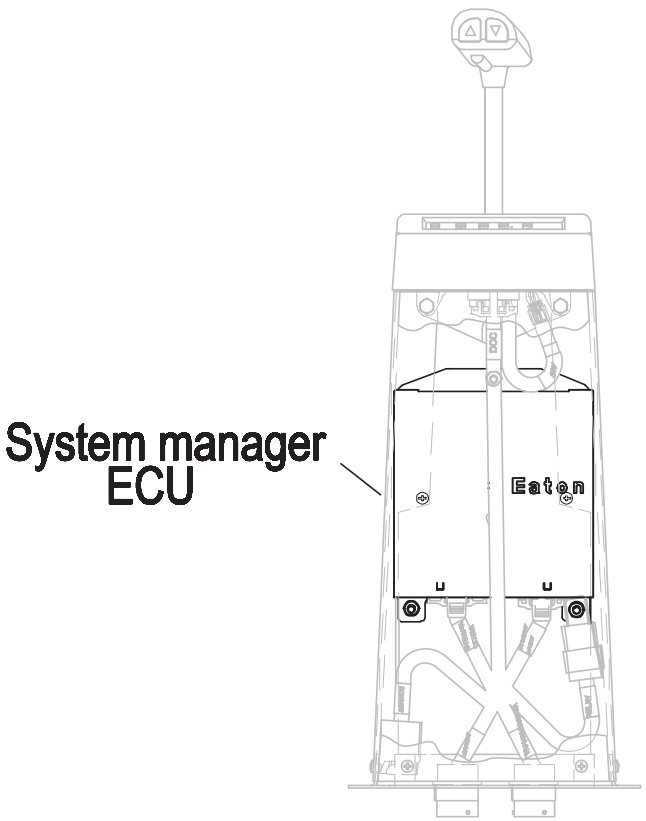
Required Tools

- Basic Hand Tools
- Eaton Test Adapter Kit
- Digital Volt/Ohm Meter
- Troubleshooting Guide

Possible Causes

This test can be used for the following:

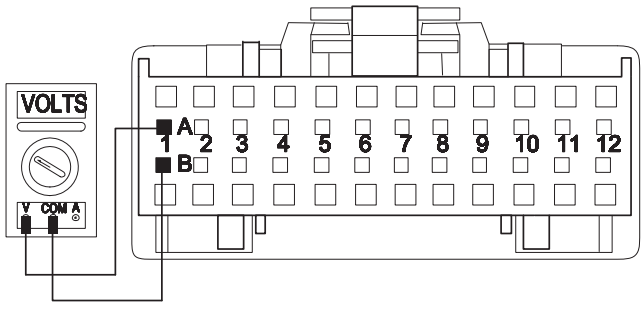
- Shift Control
- Vehicle Harness



Power-Up Sequence Pretest

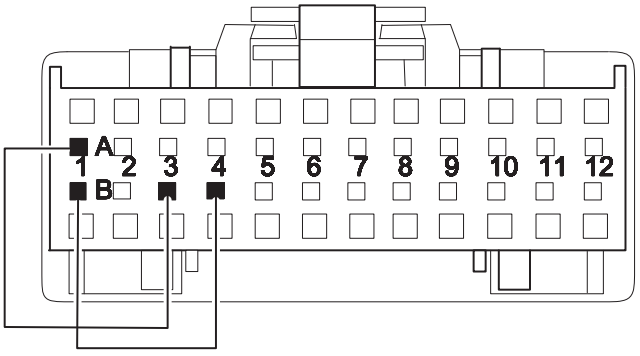
Step A	Procedure	Condition	Action
	1. Key on.		
	2. Observe service lamp. →	If service lamp lights for one second and goes off →	Test complete.
		If service lamp never comes on →	Go to **Step B.**
		If service lamp is on steady →	Replace Eaton supplied shift tower containing **system manager** and **shift lever.** If vehicle has the System Manager ECU mounted in a separate location from the Shift Lever, go to **Step C.**

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect shift lever 24-way connector.		
	3. Key on.		
	4. Measure voltage between shift lever 24-way connector pins A1 and B1. →	If voltage is within 1 volt of battery voltage →	**Replace shift lever.** Go to **Step A.**
		If voltage is outside of range →	**Repair or replace tower harness.** Go to **Step A.**



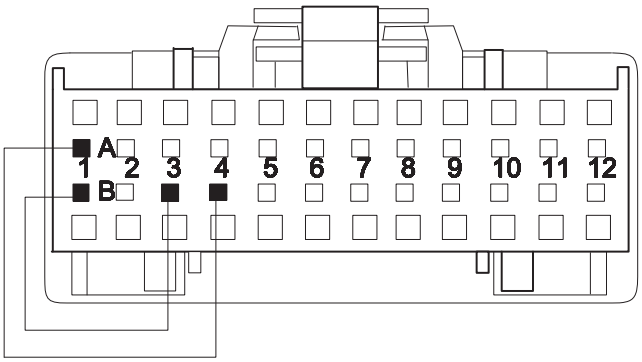
Power-Up Sequence Pretest , continued

Step C	Procedure	Condition	Action
	1. Key on. 2. Connect hand-held diagnostic tool to transmission diagnostic port. 3. Select monitor data and view "TRANS_RNG_SEL". 4. Disconnect shift lever 24-way 5. Place a jumper between shift lever 24-way connector pins: • A1 and B3 • B1 and B4	If TRANS_RNG_SEL reads "HI"	Go to **Step D.**
		If hand-held diagnostic tool does not read TRANS_RNG_SEL "HI"	Go to **Step E.**



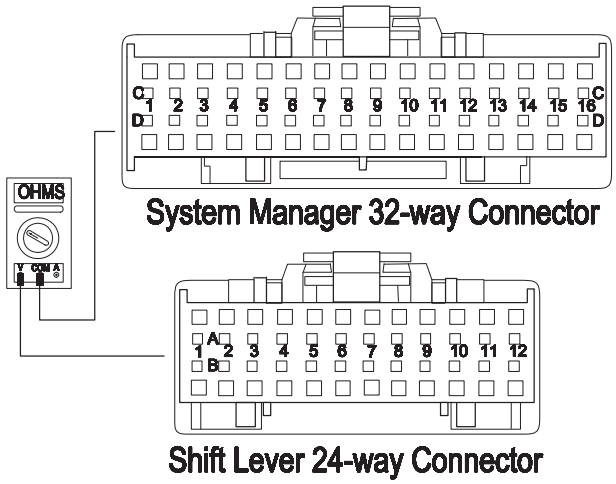
Power-Up Sequence Pretest , continued

Step D	Procedure	Condition	Action
	1. Key on. 2. Remove jumpers.		
	3. Place a jumper between shift lever 24-way connector pins: • B1 and B3 • A1 and B4	If TRANS_RNG_SEL reads "LO"	**Replace shift lever.** Go to **Step A.**
		If hand-held diagnostic tool does not read TRANS_RNG_SEL "LO"	Go to **Step E.**



Power-Up Sequence Pretest , continued

Step V	Procedure	Condition	Action
	1. Disconnect system manager 32-way connector.		
	2. Measure resistance between system manager 32-way connector pins and shift lever 24-way connector pins: • 32-way D8 and 24-way B8 • 32-way C8 and 24-way B7 • 32-way D9 and 24-way B6 • 32-way C9 and 24-way B5 • 32-way C13 and 24-way B4 • 32-way D13 and 24-way B3	If resistance for each measurement is 0 to .3 ohms	**Replace system manager ECU.** Go to **Step A.**
		If any measurement is outside of range	**Repair or replace tower harness as required.** Go to **Step A.**



Power-Up Sequence Pretest , continued

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Air 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 that the basic air input is OK before testing individual system functions.

Detection

There is no detection process specifically for the basic air 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 mode for air pretest, however, it may effect other systems.

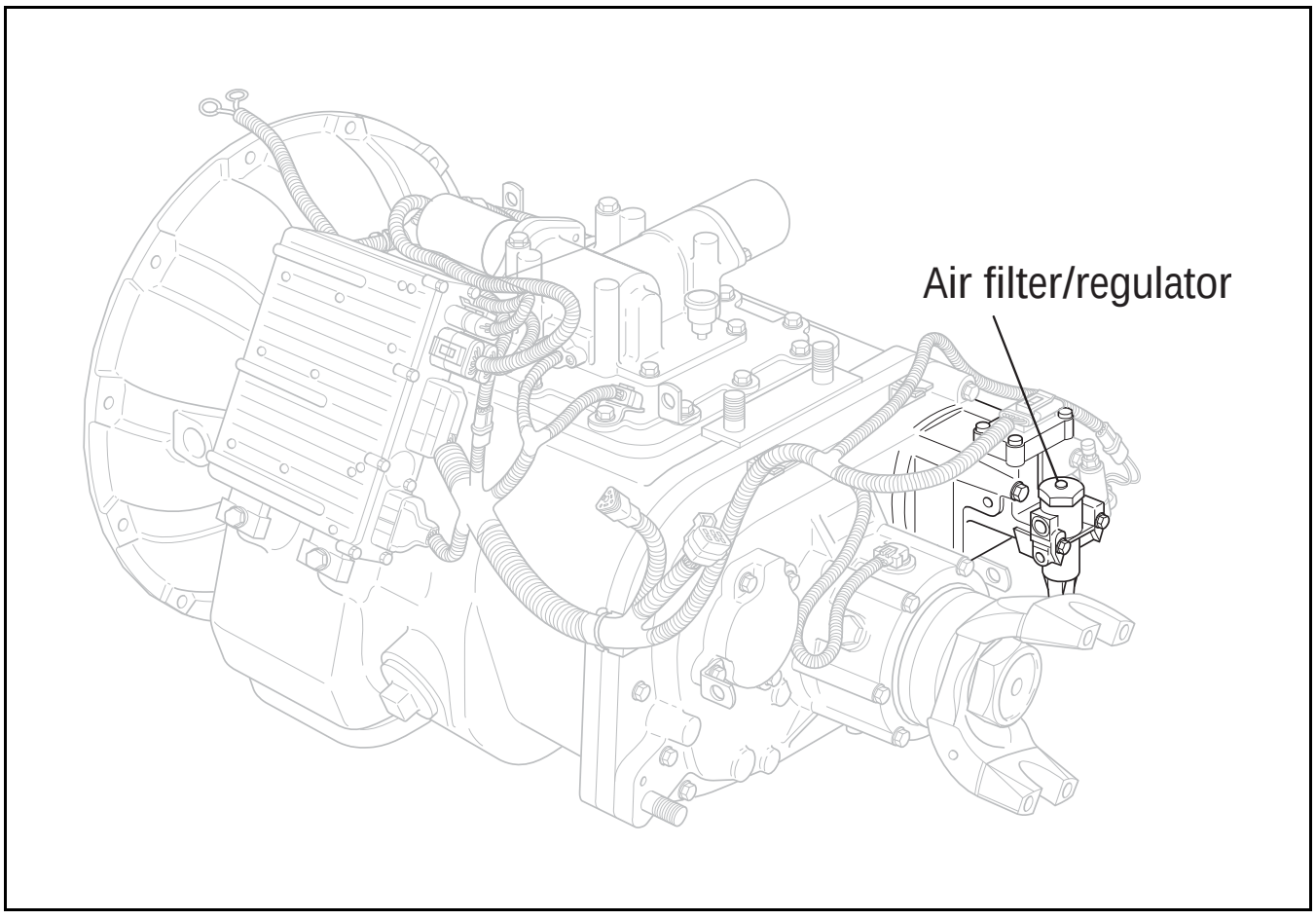
Required Tools

- Basic Hand Tools
- 0-100 PSI Air Pressure Gauge
- Troubleshooting Guide

Possible Causes

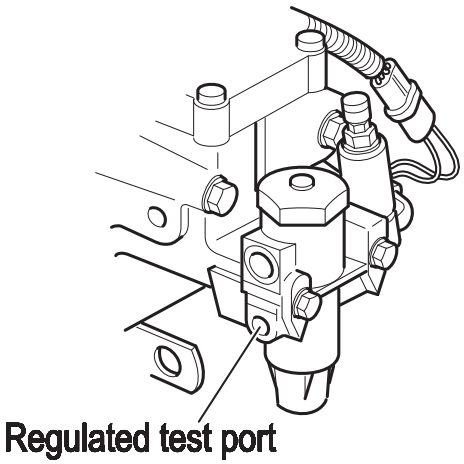
This pretest can be used for any of the following:

- Low Air Pressure
- Contaminated Air
- Air Filter / Regulator



Air Pretest

Step A	Procedure	Condition	Action
	1. Key off. 2. Install a 0 to 100 PSI air gauge in the requlated test port of the air filter/regulator. 3. Start engine and allow air pressure to build to governor cut-off.	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.



Step B	Procedure	Condition	Action
	1. Key off. 2. Monitor air pressure.	If vehicle maintains air pressure	Go to **Step C.**
		If vehicle loses air pressure	Repair vehicle air system as required. Repeat this step.

Air Pretest, continued

Step C	Procedure	Condition	Action
	1. Read air pressure gauge installed at the requlated port. →	If air pressure is 55 to 65 PSI →	Test Complete.
		If air pressure is outside of range →	Repair vehicle air system as required. Repeat this **Step V.**

Step V	Procedure	Condition	Action
	1. Remove air supply line to the air filter/ regulator and check air flow. →	If air flows from the supply line →	**Replace 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.**

Air Pretest, continued

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Component Code: 11 (SID 254, FMI 2,12) System Manager

Overview

This fault code indicates an internal failure of the System Manager ECU.

Detection

The System Manager checks the program memory every time the key is turned on. If the System Manager ECU is able to detect a failure within its own memory, it sets this fault code.

Fallback

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

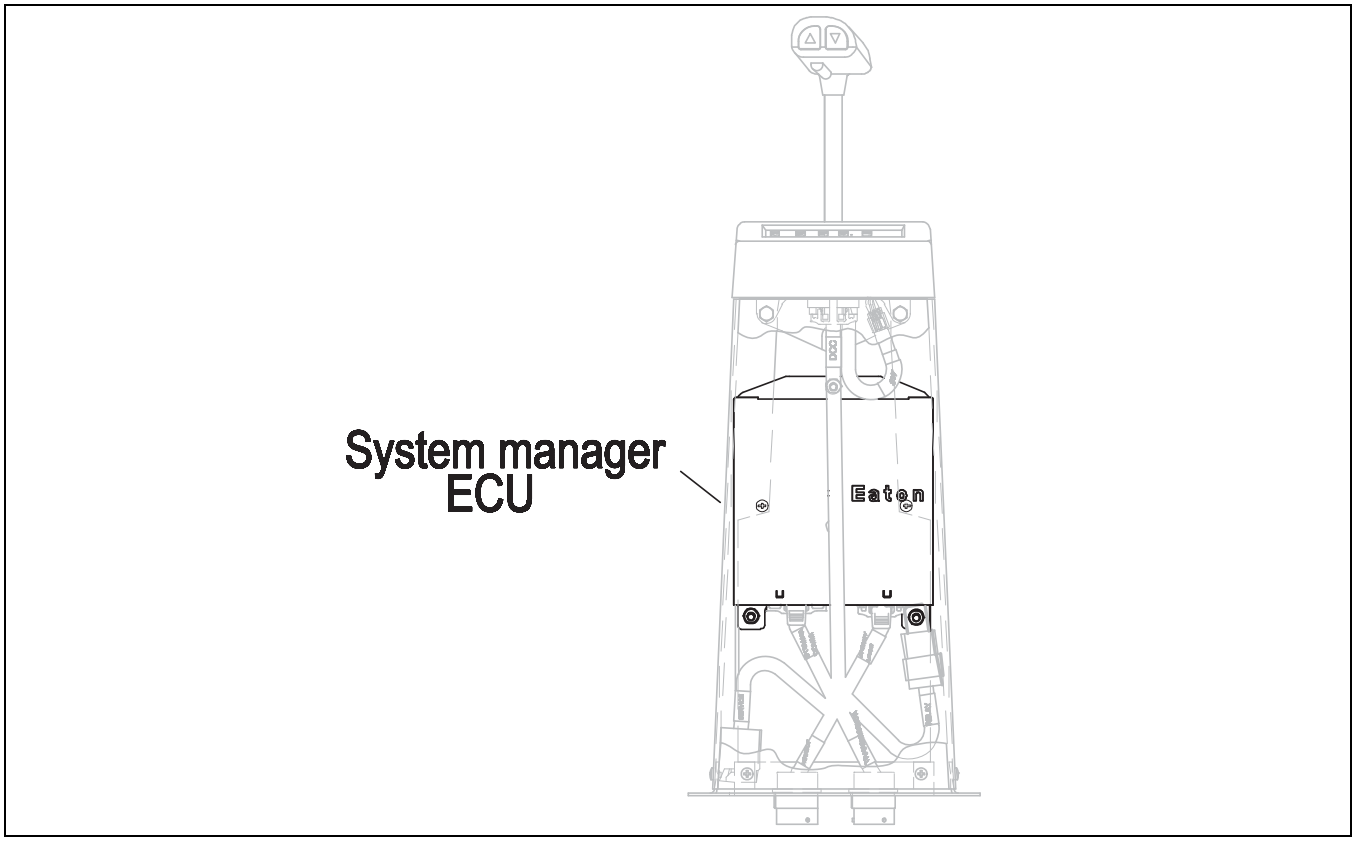
Required Tools

- Basic Hand Tools
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Improper configuration software
- Fault System Manager ECU



Code 11 (SID 254, FMI 2,12), System Controller Test

Step A	Procedure	Condition	Action
	1. Key on.		
	2. Retrieve code (see page 1-4) →	If code 11 is active →	**Replace System Manager.**
		If code 11 is inactive →	Test complete.

Component Code: 12 (SID 233, FMI 12) Transmission ECU

Overview

The code indicates an internal failure of the Transmission ECU.

Detection

The Transmission ECU checks the program memory every time the key is turned on. If the transmission is able to detect a failure within its own memory, it sets this fault code.

Fallback

This fault causes an In Place fallback while moving and a failure during system initialization.

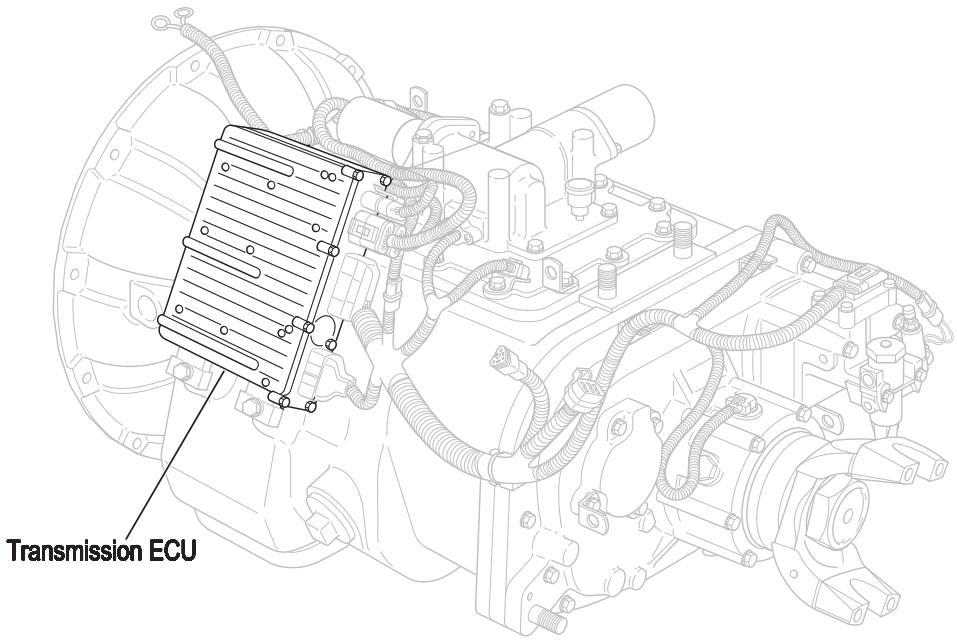
Required Tools

- Basic Hand Tools
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Improper configuration software
- Faulty Transmission ECU



Code 12 (SID 233, FMI 12),Transmission ECU Test

Step A	Procedure	Condition	Action
	1. Key on.		
	2. Retrieve codes (see page 1-4) →	If code 12 is active →	**Replace Transmission ECU.**
		If code 12 is inactive →	Test complete.

Component Code: 13 (SID 236, FMI 4,5) Power Connect Relay Coil

Overview

This code indicates an electrical failure of the relay used to distribute power throughout the transmission system.

Detection

The System Manager checks the integrity of the Power Connect Relay Coil. If it detects a short to ground or open it sets a fault.

Fallback

This fault causes and In Place fallback while moving and a failure during system initialization.

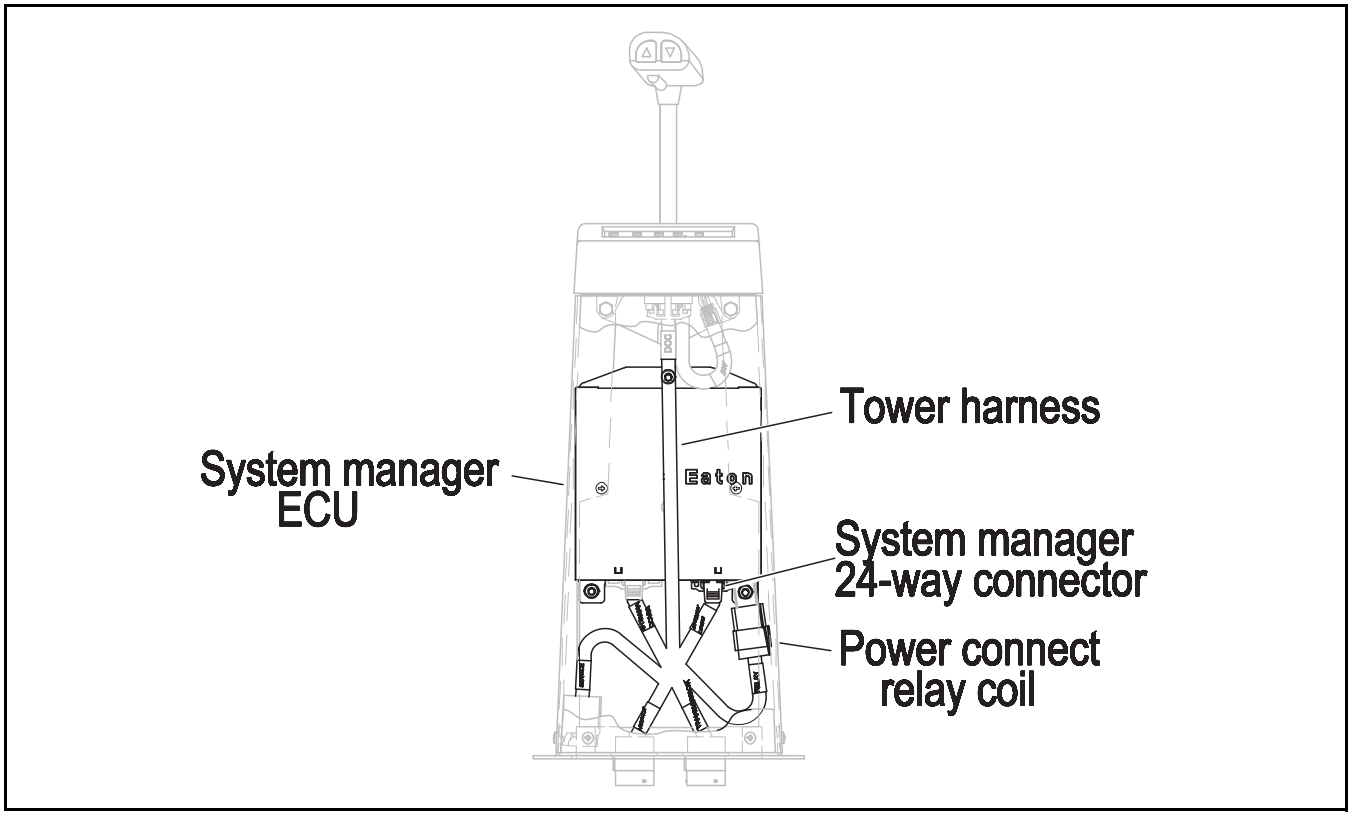
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

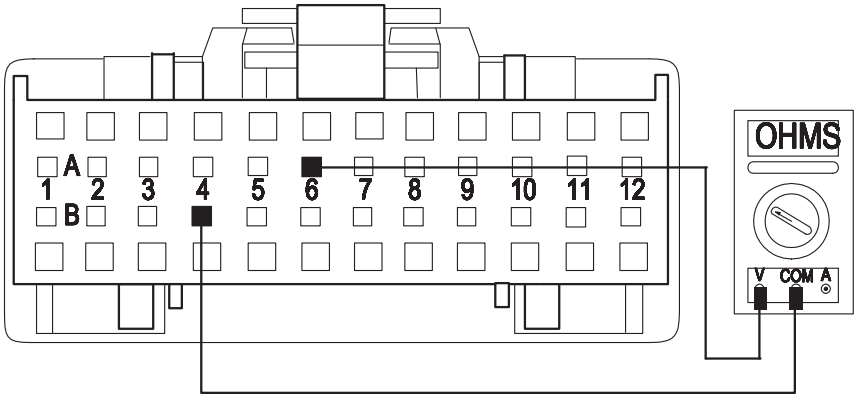
This fault can be caused by any of the following:

- System manager ECU
- Tower harness
- Power connect relay



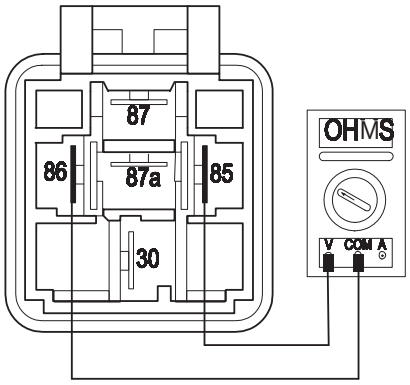
Code 13 (SID 236, FMI 4,5), Power Connect Relay Coil Test

Step A	Procedure	Condition	Action
	1. Key off. 2. Disconnect system manager 24-way connector.		
	3. Measure resistance between system manager 24-way connector pins A6 and B4. →	If resistance is 40 to 90 ohms →	**Replace system manager ECU (Only if Fault Code is Active).** Go to **Step V.**
		If resistance is outside of range →	Go to **Step B.**



Code 13 (SID 236, FMI 4,5), Power Connect Relay Coil Test, continued

Step B	Procedure	Condition	Action
	1. Remove power connect relay connector from tower harness.		
	2. Measure resistance between power connect relay pins 85 and 86.	If resistance is 40 to 90 ohms	**Repair or replace tower harness.** Go to **Step V.**
		If resistance is outside of range	**Replace power connect relay.** Go to **Step V.**



Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes (see page 1-4)	If no codes	Test complete.
		If code 13 appears	Return to **Step A** to find error in testing.
		If code other than 13 appears	Go to Fault Code Isolation Procedure Index (see page 1-10).

Code 13 (SID 236, FMI 4,5), Power Connect Relay Coil Test, continued

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Component Code: 14 (SID 18, FMI 12) Shift Lever

Overview

This code indicates an internal failure of the shift lever.

Detection

Starting at key-on and throughout operation, the System Manager constantly measures the feedback from the Shift Lever circuit. If the feedback is out of range, the fault is set. This type of failure represents a short to battery, short to ground, or open circuit.

Fallback

This fault causes a downshift only fallback.

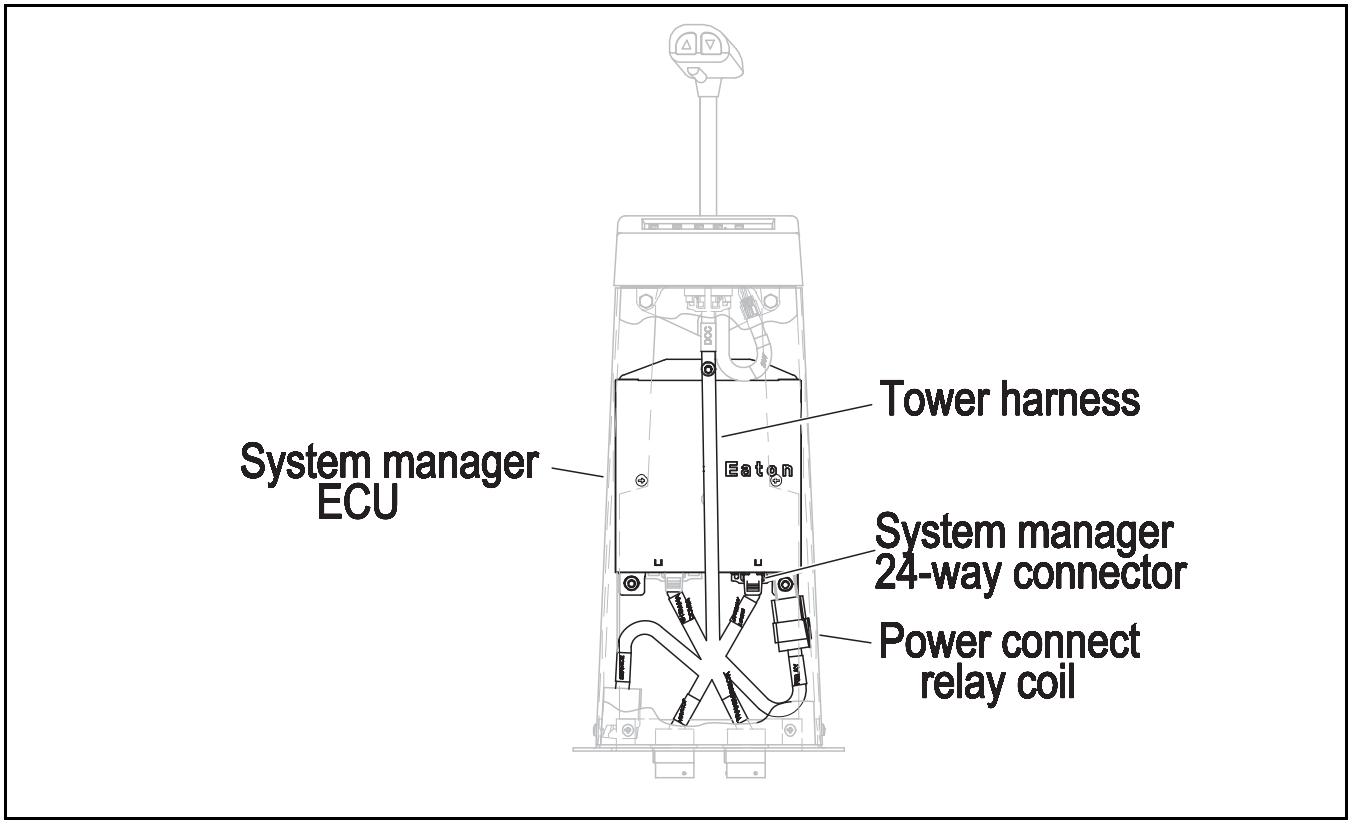
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

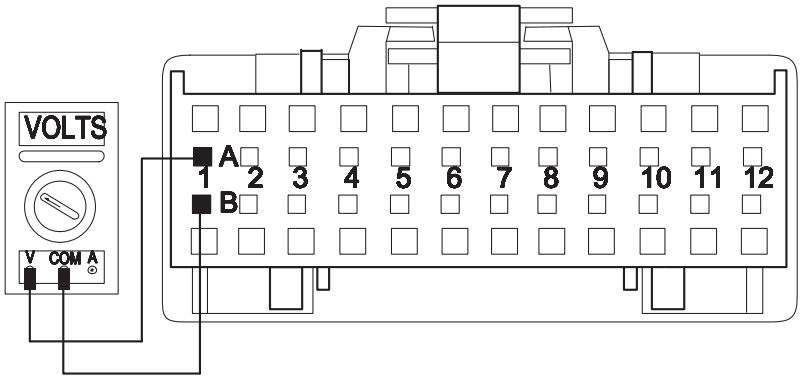
This fault can be caused by any of the following:

- Malfunctioning shift lever
- System Manager
- OEM harness



Code 14 (SID 18, FMI 12), Shift Lever Test

Step A	Procedure	Condition	Action
	1. Key off. 2. Disconnect shift lever 24-way connector. 3. Key on.		
	4. Measure voltage across shift lever 24-way connector pins A1 and B1.	If voltage is within 1 volt of battery voltage	**Replace shift lever (Only if Fault Code is Active).** Go to **Step V.**
		If voltage is outside of range	Repair ignition supply to shift lever. Go to **Step V.**



Code 14 (SID 18, FMI 12), Shift Lever Test, continued

Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes (see page 1-4)	If no codes	Test complete.
		If code 14 appears	Return to **Step A** to find error in testing.
		If code other than 14 appears	Go to Fault Code Isolation Procedure Index (see page 1-10).

Code 14 (SID 18, FMI 12), Shift Lever Test, continued

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Component Code: 15 (SID 57, FMI 2) Shift Lever Data Link

Overview

This code indicates that the system manager ECU and the shift lever are unable to communicate.

Detection

The System Manager constantly monitors communication with the Shift Lever and sets a fault if communication drops out.

Fallback

There is no Fallback Mode for this fault.

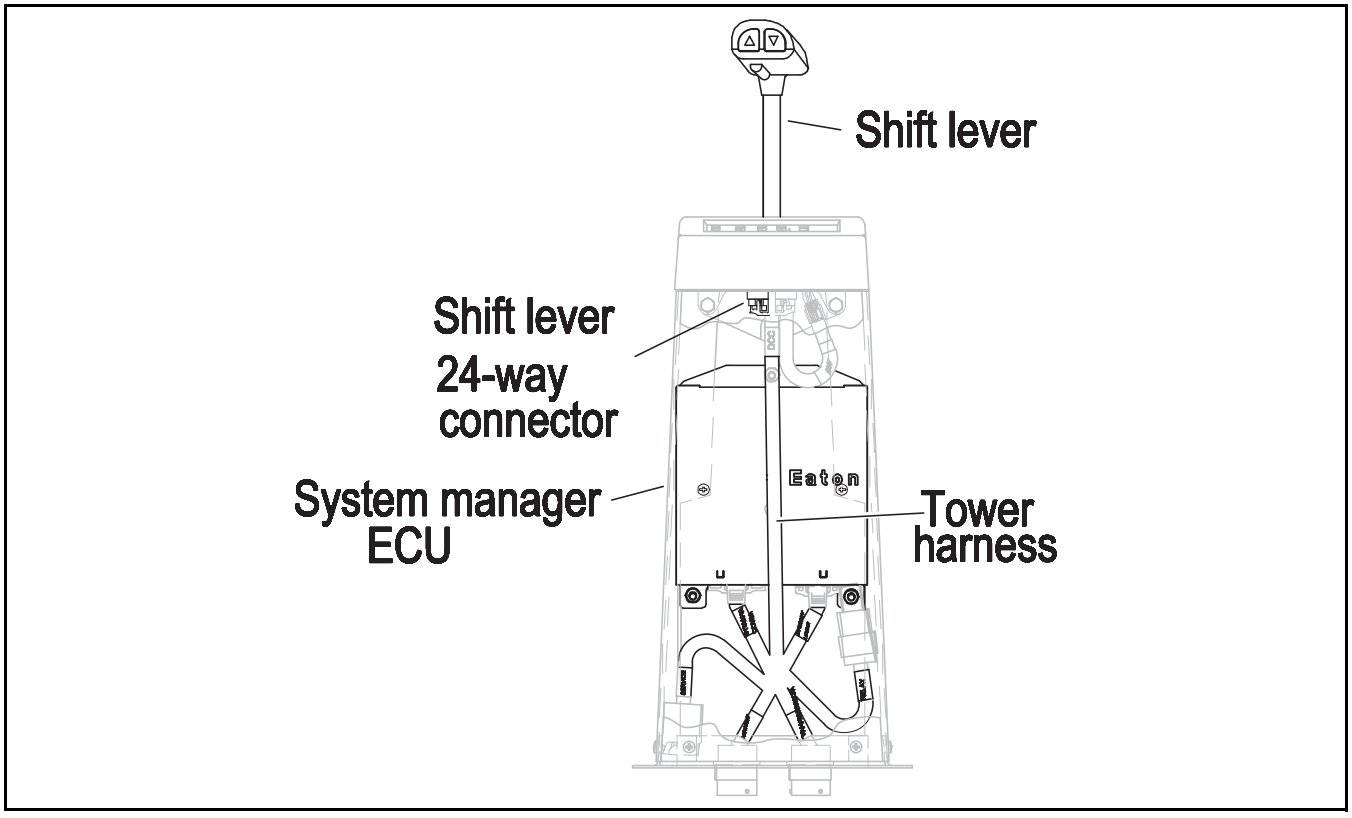
Required Tools

- Basic Hand Tools
- Hand-Held Diagnostic Tool
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

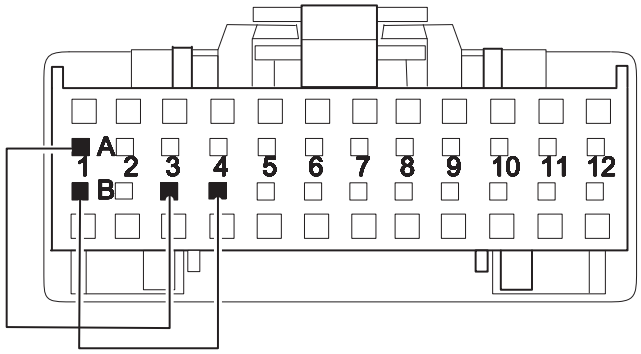
- Damaged shift lever data link
- Malfunctioning shift lever
- Malfunctioning system manager ECU



Code 15 (SID 57, FMI 2), Shift Lever Data Link Test

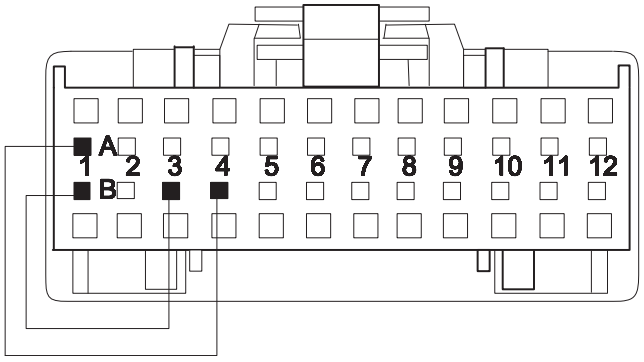
Step A	Procedure	Condition	Action
	1. Key on.		
	2. Retrieve Fault Codes (see page 1-4)	If code 15 is active	Replace Eaton supplied shift tower containing **system manager** and **shift lever.** If vehicle has the system manager ECU mounted in a separate location from the shift lever, go to **Step B.**
		If code 15 is inactive	Test complete.

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Connect hand-held diagnostic tool to transmission diagnostic port.		
	3. Select monitor data view "TRANS_RNG_SEL".		
	Disconnect shift lever 24-way connector.		
	Place a jumper between shift lever 24-way connector pins: • A1 and B3 • B1 and B4	If TRANS_RNG_SEL reads "HI"	Go to **Step C.**
		If hand-held diagnostic tool does not read TRANS_RNG_SEL "HI"	Go to **Step D.**



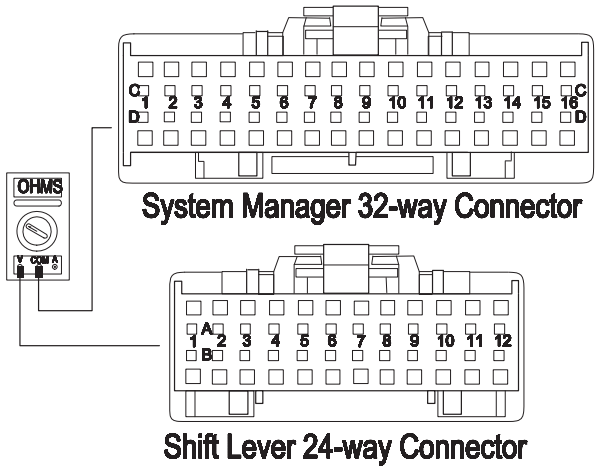
Code 15 (SID 57, FMI 2), Shift Lever Data Link Test, continued

Step C	Procedure	Condition	Action
	1. Remove jumpers.		
	2. Place a jumper between shift lever 24-way connector pins: • B1 and B3 • A1 and B4	If TRANS_RNG_SEL reads "LO"	**Replace shift lever.** Go to **Step V.**
		If hand-held diagnostic tool does not read TRANS_RNG_SEL "LO"	Go to **Step D.**



Code 15 (SID 57, FMI 2), Shift Lever Data Link Test, continued

Step D	Procedure	Condition	Action
	1. Disconnect system manager 32-way connector.		
	2. Measure resistance between system manager 32-way connector pins and shift lever 24-way connector pins: • 32-way D8 and 24-way B8 • 32-way C8 and 24-way B7 • 32-way D9 and 24-way B6 • 32-way C9 and 24-way B5 • 32-way C13 and 24-way B4 • 32-way D13 and 24-way B3	If resistance for each measurement is 0 to .3 ohms	**Replace system manger ECU.** Go to **Step V.**
		If any measurement is outside of range	**Repair or replace tower harness as required.** Go to **Step V**.



Code 15 (SID 57, FMI 2), Shift Lever Data Link Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes. (see page 1-4) 5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes(see page 1-4) →	If no codes →	Test complete.
		If code 15 appears →	Return to **Step A** to find error in testing.
		If code other than 15 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 15 (SID 57, FMI 2), Shift Lever Data Link Test, continued

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Component Code: 16 (SID 248, FMI 2) Eaton Proprietary Link (EPL)

Overview

This code indicates that the system manager ECU and the transmission ECU are unable to communicate.

Detection

Starting at key-on and throughout operation, the System Manager constantly monitors the communication with the Transmission ECU. If a communication fault occurs for more than five seconds, fault code 16 is set.

Fallback

This fault causes an In Place fallback while moving and a failure during system initialization.

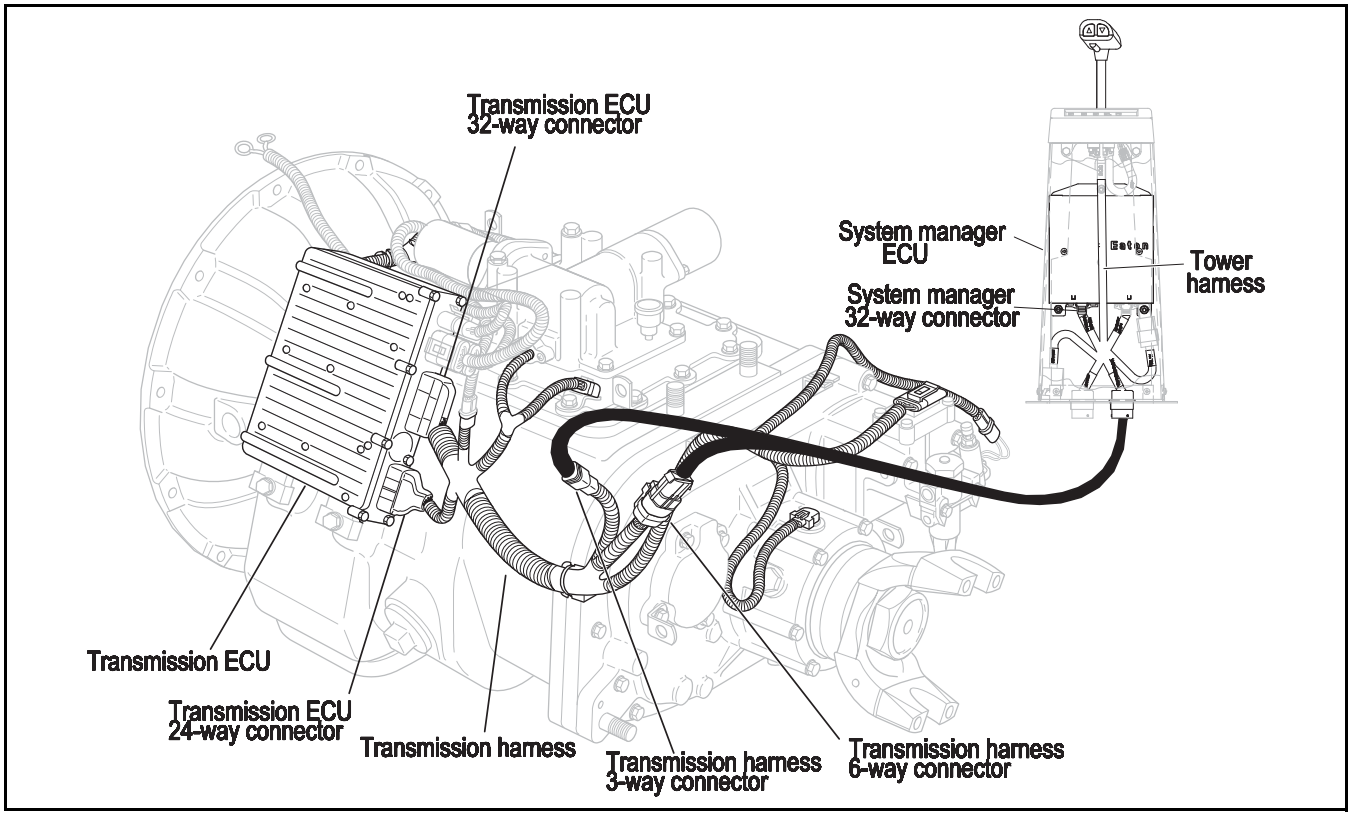
Required Tools

- Basic Hand Tools
- Hand-Held Diagnostic Tool
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide
- Data Link Tester

Possible Causes

This fault can be caused by any of the following:

- Damaged transmission interface harness
- Damaged transmission harness
- Damaged tower or OEM harness
- Malfunctioning transmission ECU
- Malfunctioning system manager ECU
- Powers and Grounds
- Damaged PIM

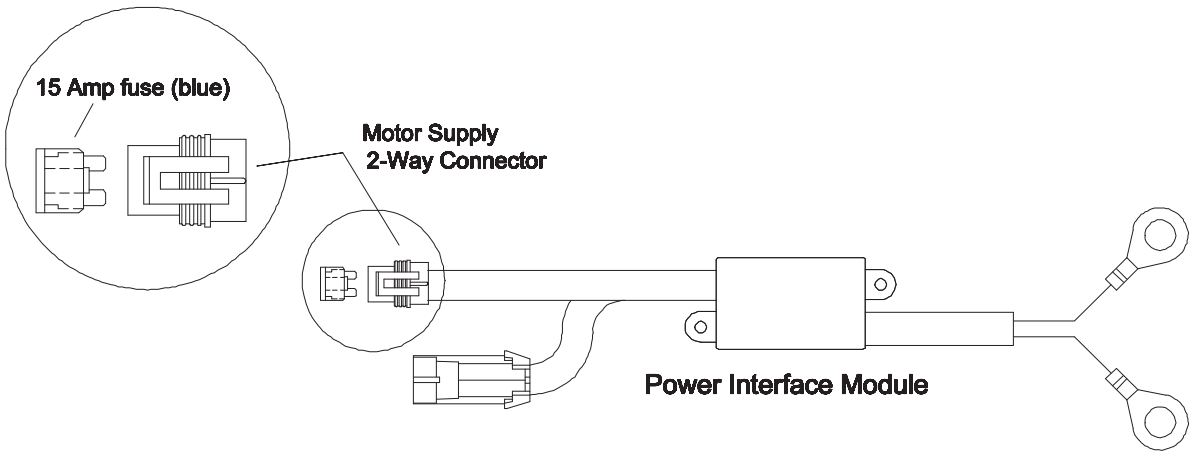


Code 16 (SID 248, FMI 2), Eaton Proprietary Link (EPL) Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Inspect starter/battery,inline fuse holder and PIM connections for integrity.	If okay	Go to **Step B.**
		If corroded or loose	Repair wiring or battery connections. Go to **Step V.**

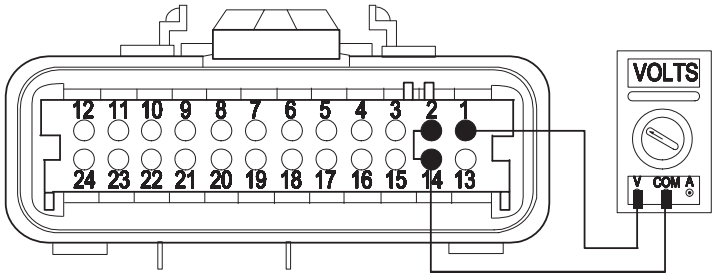
Code 16 (SID 248, FMI 2), Eaton Proprietary Link (EPL) Test, continued

Step B	Procedure	Condition	Action
	1. Key off. 2. Insert 15-amp fuse into Motor Supply 2-way connector.	If fuse blows immediately	⚠ CAUTION **Disconnect negative battery cable before reconnecting motor supply 2-way connector**. Go to **Step C.**
		If fuse does not blow immediately	⚠ CAUTION **Disconnect the battery cable before reconnecting the motor supply 2-way connector. Failure to disconnect the battery negative cable can cause the failure of the power interface module. Replace power interface module. Go to Step V.**



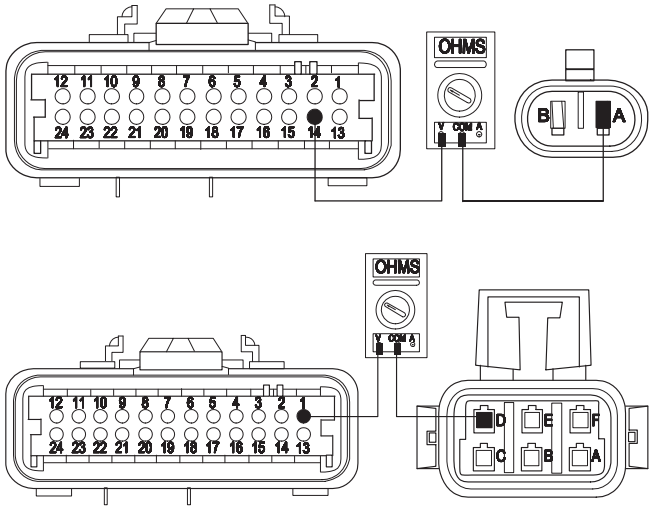
Code 16 (SID 248, FMI 2), Eaton Proprietary Link (EPL) Test, continued

Step C	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect transmission ECU 24-way connector.		
	3. Place a jumper between transmission ECU 24-way connector pins 2 and 14. The procedure is providing ground to the system manager ecu during the test.		
	4. Key on.		
	5. Measure voltage across transmission ECU 24-way connector pins 1 and 14. This procedure is checking for correct voltage from the power connect relay to the transmission controller.	If voltage is within 1 volt of battery voltage →	Go to **Step E.**
		If voltage is outside of range →	Go to **Step D.**



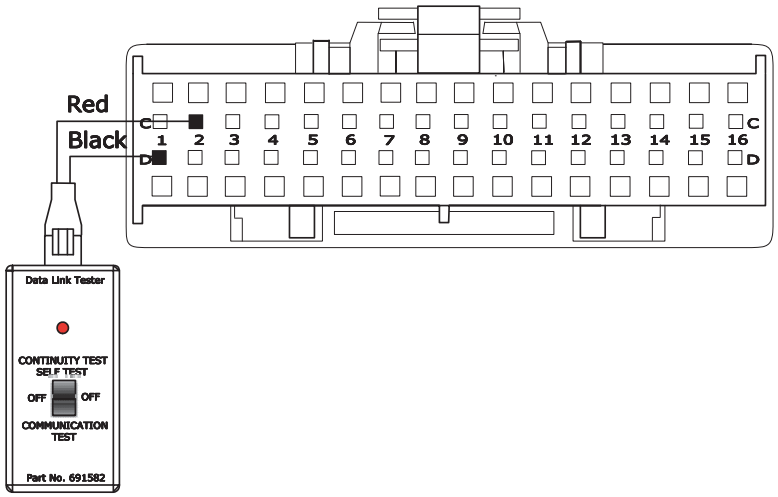
Code 16 (SID 248, FMI 2), Eaton Proprietary Link (EPL) Test, continued

Step D	Procedure	Condition	Action
	1. Remove jumper. 2. Disconnect transmission harness from transmission interface harness. 3. Disconnect power interface module from transmission harness. 4. Measure resistance between transmission ECU 24-way connector pin 14 and power interface module connector pin A on transmission harness. This procedure is checking the resistance of the ground wire supplied by the pim to the transmission ecu.		
	5. Measure resistance between transmission harness 6-way connector pin D and transmission ECU 24-way connector pin 1. This procedure is checking resistance of the power connect relay feed from the 6-way connector to the transmission ecu.	If both measurements are 0 to .3 ohms	**Repair or replace vehicle interface harness or tower harness.** Go to **Step V.**
		If either measurement is outside of range	**Repair or replace transmission harness.** Go to **Step V.**



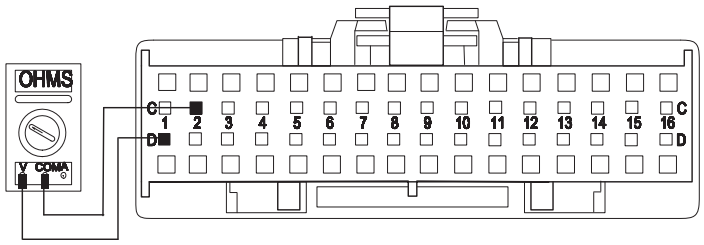
Code 16 (SID 248, FMI 2), Eaton Proprietary Link (EPL) Test, continued

Step E	Procedure	Condition	Action
	1. Reconnect transmission ECU 24-way connector. 2. Key off. Allow transmission to power down. 3. Disconnect system manager 32-way connector. 4. Connect data link tester to system manager 32-way connector pins C2 and D1. 5. Key on. 6. Start EPL Communication Test.	If LED is solid or flashing	**Replace system manager ECU (Only if Fault Code is Active).** Go to **Step V.**
		If LED is off	Go to **Step F.**



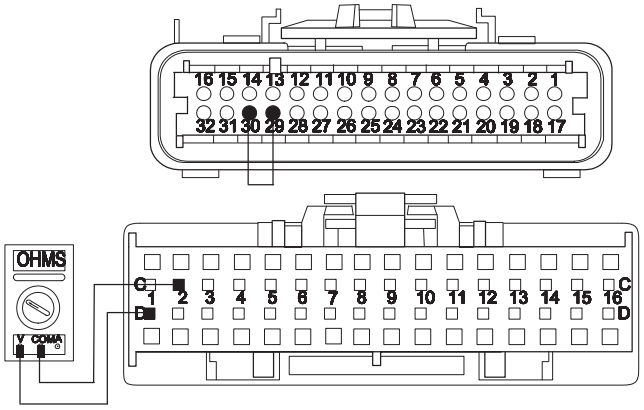
Code 16 (SID 248, FMI 2), Eaton Proprietary Link (EPL) Test, continued

Step F	Procedure	Condition	Action
	1. Key off. Allow transmission to power down. 2. Disconnect transmission ECU 32-way connector. 3. Remove EPL tester from system manager 32-way connector.		
	Measure resistance between system manager 32-way connector pins C2 and D1 and from each pin to ground. →	If resistance for each measurement is more than 10K ohms or open circuit (OL) →	Go to **Step G.**
		If resistance of any measurement is less than 10K ohms →	Go to **Step H.**



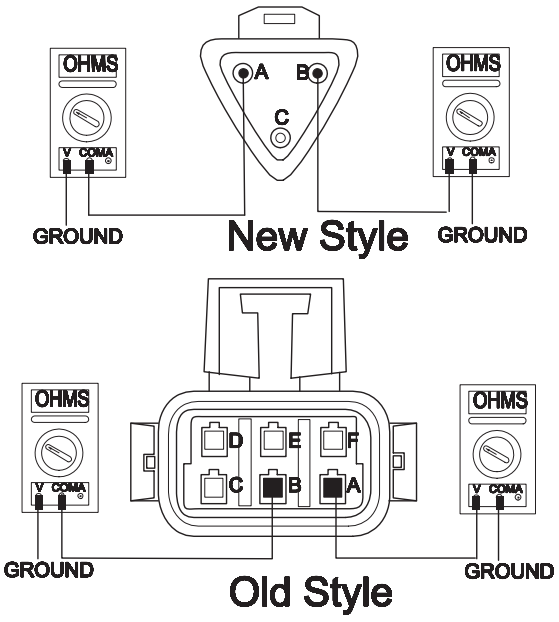
Code 16 (SID 248, FMI 2), Eaton Proprietary Link (EPL) Test, continued

Step G	Procedure	Condition	Action
	1. Place a jumper across transmission ECU 32-way connector pins 29 and 30.		
	2. Measure resistance between system manager 32-way connector pins C2 and D1.	If resistance is 0 to .3 ohms	**Replace transmission ECU.** Go to **Step V.**
		If resistance is outside of range	Go to **Step H.**



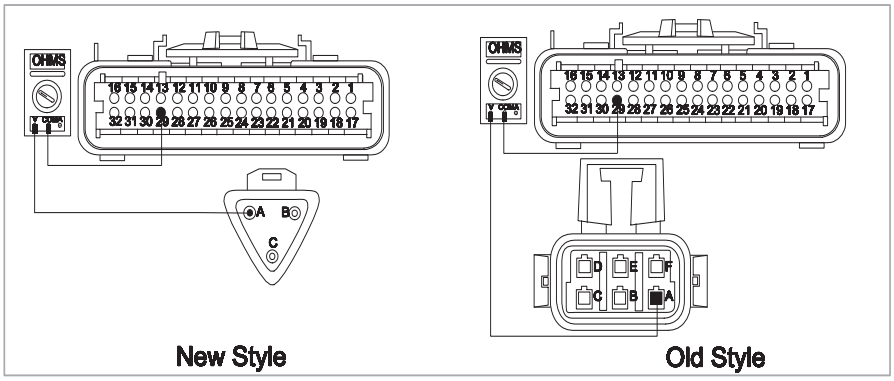
Code 16 (SID 248, FMI 2), Eaton Proprietary Link (EPL) Test, continued

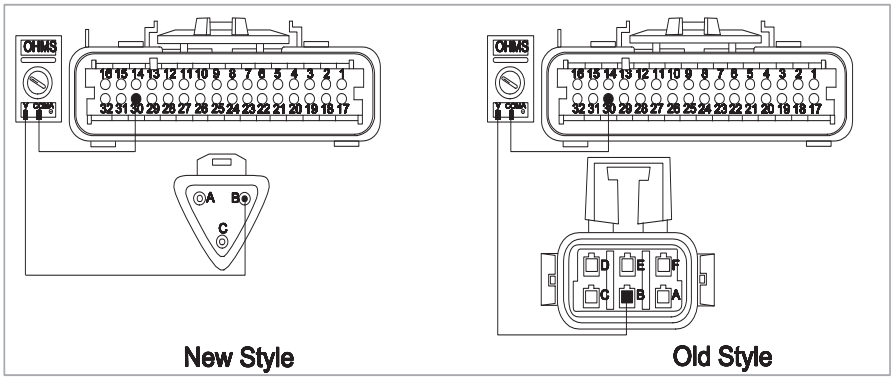
Step H	Procedure	Condition	Action
	1. Reconnect system manager 32-way connector. 2. Disconnect transmission harness 3-way connector from transmission interface harness. 3. Remove any jumper wires currently in place.		
	4. Measure resistance between transmission harness 3-way connector pins A and B and from each pin to ground. **Note:** Depending on which connector you have, refer to either the old style or the new style connector illustration.	If resistance for each measurement is more than 10K ohms or open circuit (OL) →	Go to **Step H.**
		If resistance of any measurement is less than 10K ohms →	**Repair or replace transmission harness.** Go to **Step V.**



Code 16 (SID 248, FMI 2), Eaton Proprietary Link (EPL) Test, continued

Step I	Procedure	Condition	Action
	1. Measure resistance between transmission ECU 32-way connector pin 29 and transmission harness 3-way connector pin A. **Note:** Depending on which connector you have, refer to either the old style or the new style connector illustration.		
	2. Measure resistance between transmission ECU 32-way connector pin 30 and transmission harness 3-way connector pin B. →	If both measurements are 0 to .3 ohms →	Repair OEM wiring from system manager ECU to transmission. Go to **Step V.**
		If either measurement is outside of range →	**Repair or replace transmission harness.** Go to **Step V.**





Code 16 (SID 248, FMI 2), Eaton Proprietary Link (EPL) Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes (see page 1-4) 5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes(see page 1-4) →	If no codes →	Test complete.
		If code 16 appears →	Return to **Step A.** to find error in testing.
		If code other than 16 appears →	Go to Fault Code Isolation Procedures Index.(see page 1-10)

Code 16 (SID 248, FMI 2), Eaton Proprietary Link (EPL) Test, continued

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Component Code: 17 (SID 237, FMI 4) Start Enable Relay Coil

Overview

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

Detection

Starting at key-on and throughout operation, the System Manager 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.

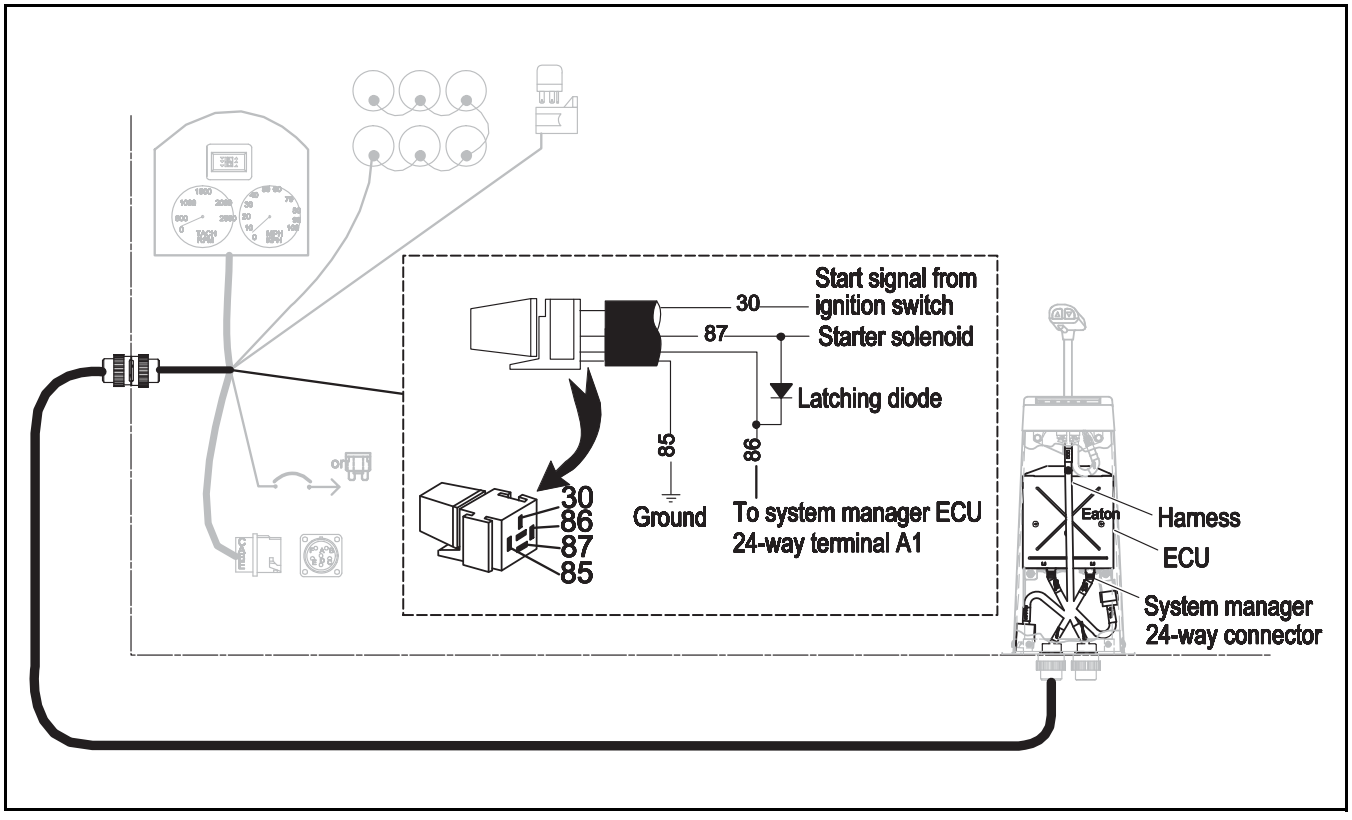
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

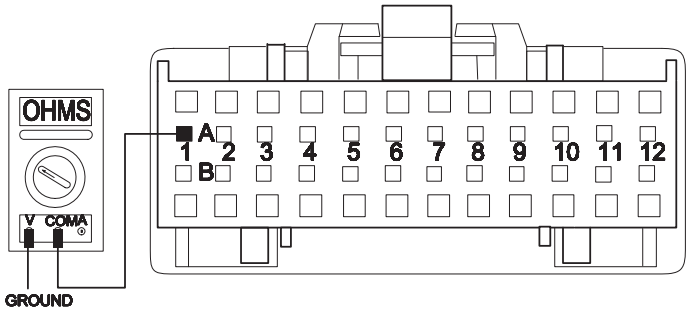
This fault can be caused by any of the following:

- Relay coil open or shorted
- Damaged tower or OEM harness
- Malfunctioning system manager ECU



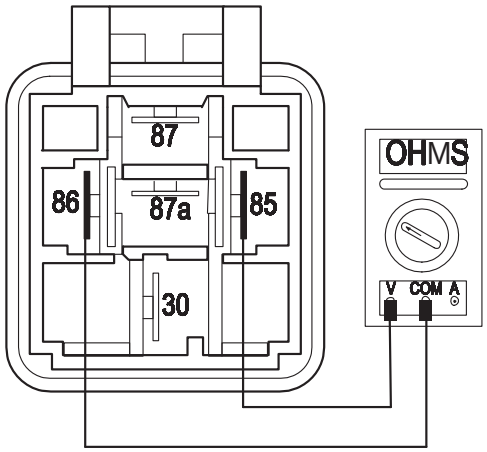
Code 17 (SID 237, FMI 4), Start Enable Relay Coil Test

Step A	Procedure	Condition	Action
	1. Key off. 2. Disconnect system manager. 3. Measure resistance between system manager 24-way connector pin A1 and ground.	If resistance is 40 to 120 ohms	**Replace system manager ECU (Only if Fault Code is Active).** Go to **Step V.**
		If resistance is outside of range	Go to **Step B.**



Code 17 (SID 237, FMI 4), Start Enable Relay Coil Test, continued

Step B	Procedure	Condition	Action
	1. Remove start enable relay from OEM dash harness.		
	2. Measure resistance between start enable relay pins 85 and 86. →	If resistance is 40 to 120 ohms →	Repair OEM wiring from system manager ECU to start enable relay. Go to **Step V.**
		If resistance is outside of range →	Replace start enable relay. Go to **Step V.**



Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes (see page 1-4). →	If no codes →	Test complete
		If code 17 appears →	Return to **Step A** to find error in testing.
		If code other than 17 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 17 (SID 237, FMI 4), Start Enable Relay Coil Test, continued

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Component Code: 31 (PID 62, FMI 3,4) Engine Brake Relay Coil

Overview

This code indicates an electrical failure of the relay used to inhibit the engine brake during shifts.

Detection

Starting at key-on and throughout operation, the System Manager constantly measures this circuit. A failure mode of a short to battery, short to ground, or open circuit is detected.

Fallback

There is no fallback mode with this fault.

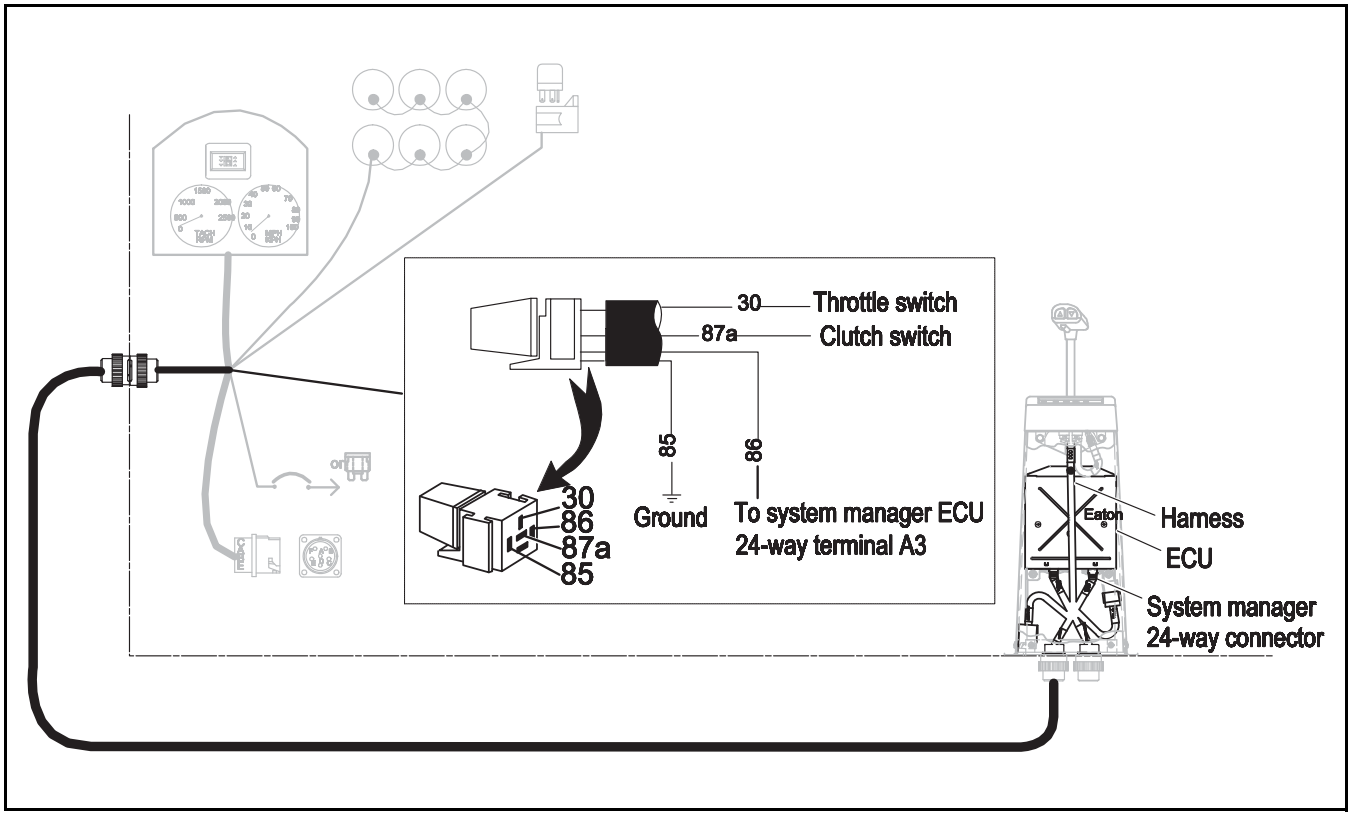
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

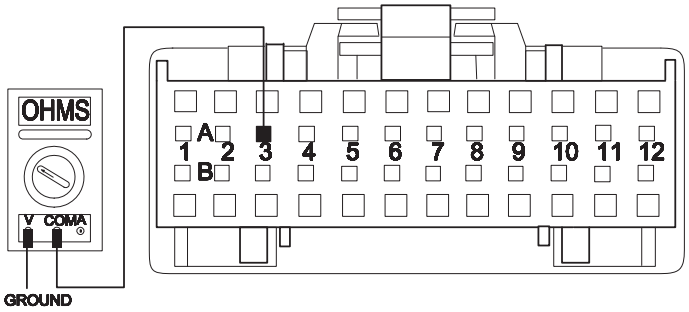
This fault can be caused by any of the following:

- Relay coil open or shorted
- Damaged tower or OEM harness
- Malfunctioning system manager ECU



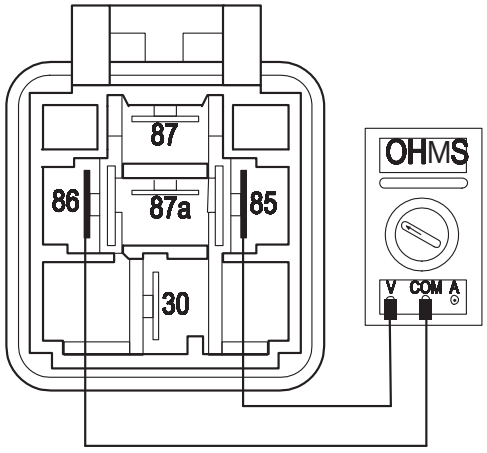
Code 31 (PID 62, FMI 3,4), Engine Brake Relay Coil Test

Step A	Procedure	Condition	Action
	1. Key off. 2. Disconnect system manager 24-way connector.		
	3. Measure resistance between system manager 24-way connector pin A3 and ground.	If resistance is 40 to 90 ohms	**Replace system manager ECU (Only if Fault Code is Active).** Go to **Step V.**
		If resistance is outside of range	Go to **Step B.**



Code 31 (PID 62, FMI 3,4), Engine Brake Relay Coil Test, continued

Step B	Procedure	Condition	Action
	1. Remove engine brake inhibit relay from OEM dash harness.		
	2. Measure resistance between engine brake inhibit relay pins 85 and 86. →	If resistance is 40 to 90 ohms →	Repair OEM wiring from system manager ECU to engine brake inhibit relay. Go to **Step V.**
		If resistance is outside of range →	Replace engine brake inhibit relay. Go to **Step V.**



Code 31 (PID 62, FMI 3,4), Engine Brake Relay Coil Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes(see page 1-4) 5. Use Driving Technique(see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes(see page 1-4) →	If no codes →	Test complete.
		If code 31 appears →	Return to **Step A** to find error in testing.
		If code other than 31 appears →	Go to Fault Code Isolation Procedure Index.(see page 1-10)

Component Code: 33 (PID 168, FMI 4) Battery Voltage Supply

Overview

This code indicates the system manager has detected that the battery power supply is low.

Detection

The fault is detected immediately after power-up. This fault causes the service lamp to flash, but cannot be retrieved via key clicks (because turning the ignition key off at this point results in an immediate shutdown).

Fallback

This fault causes an In Place fallback.

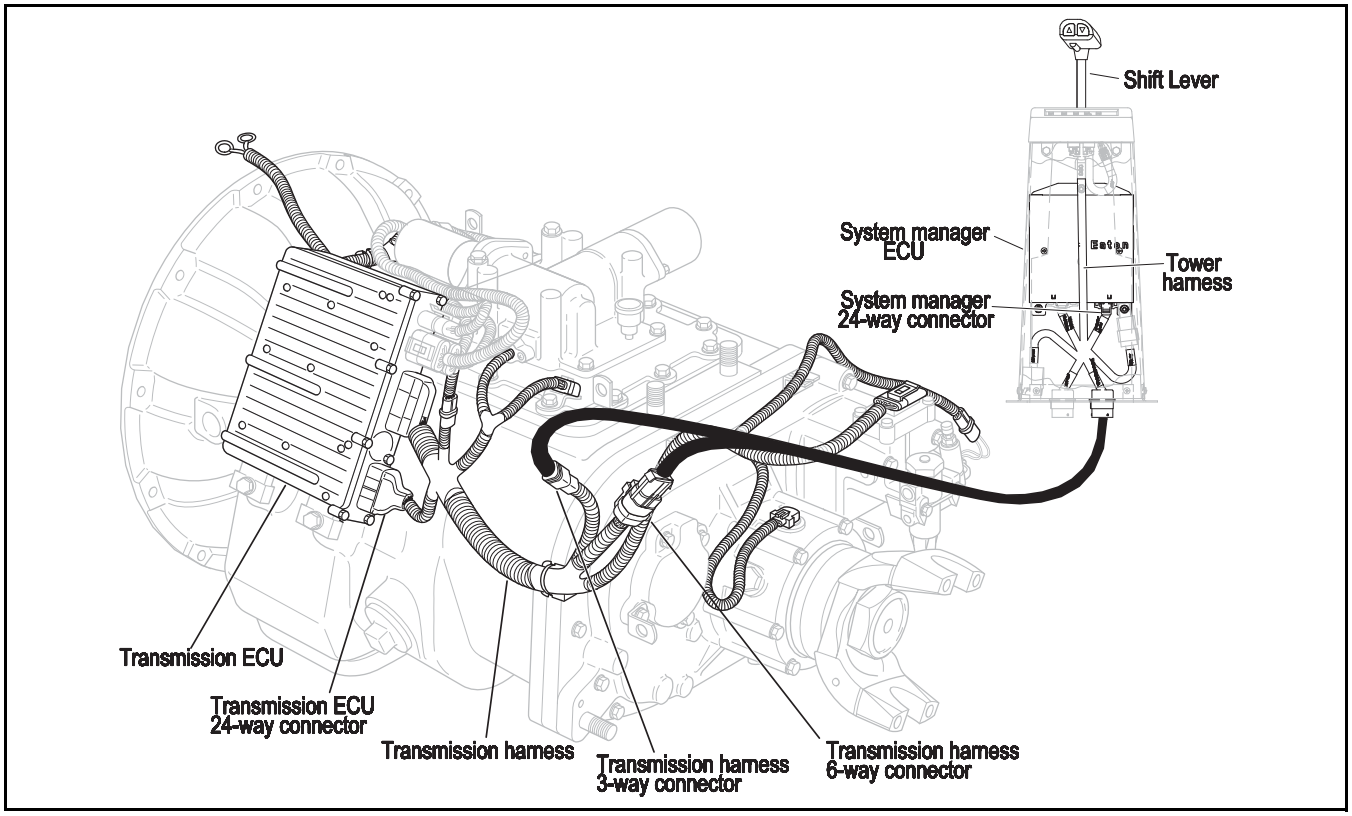
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide
-

Possible Causes

This fault can be caused by any of the following:

- Battery bus fuse/circuit breaker is open
- Low batteries
- Damaged tower or OEM harness
- Damaged transmission harness
- Malfunctioning power connect relay
- Malfunctioning system manager ECU

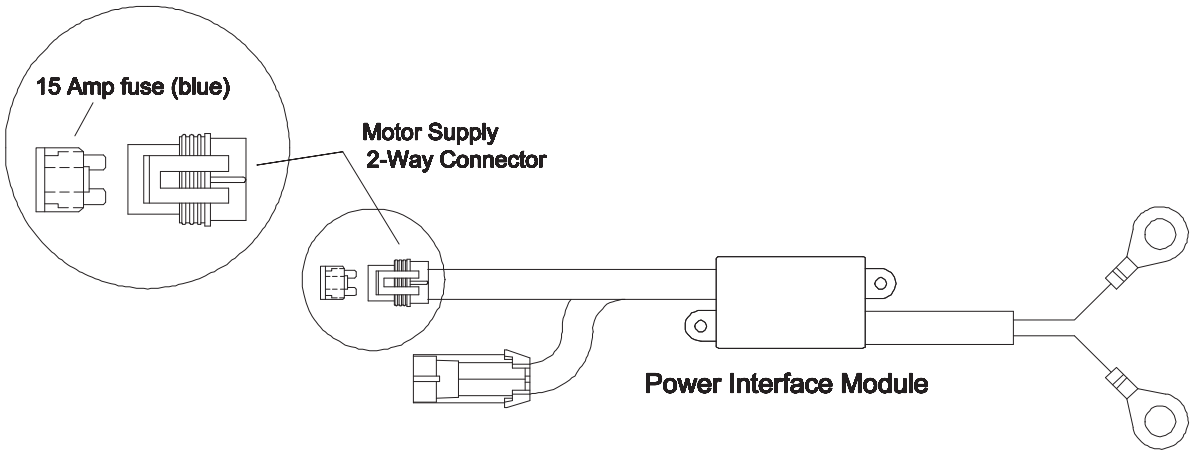


Code 33 (PID 168, FMI 4), Battery Voltage Supply Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Inspect starter/battery, inline fuse holder and PIM connections for integrity.	If okay	Go to **Step B.**
		If corroded or loose	Repair wiring or battery connections. Go to **Step V.**

Code 33 (PID 168, FMI 4), Battery Voltage Supply Test, continued

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Insert 15-amp fuse into Motor Supply 2-way connector. →	If fuse blows immediately →	⚠ CAUTION **Disconnect the negative battery cable before reconnecting the motor supply 2-way connector. Failure to disconnect the battery negative cable can cause the failure of the power interface module.** Go to **Step C.**
		If fuse does not blow immediately →	⚠ CAUTION **Disconnect the negative battery cable before reconnecting the motor supply 2-way connector. Failure to disconnect the battery negative cable can cause the failure of the power interface module. Replace power interface module. Go to Step V.**



Code 33 (PID 168, FMI 4), Battery Voltage Supply Test, continued

Step C	Procedure	Condition	Action
	1. Key on.		
	2. Retrieve Fault Codes (see page 1-4) →	If code 33 is active →	Perform Electrical System Test (see page 3-1).
		If code 33 is inactive →	Test complete.

System Code: 35
(SID 231, FMI 2,7)
Engine Control Failure

Overview

This code indicates the AutoShift failed to receive information from the engine or the engine failed to properly respond to throttle control during a shift as commanded by the engine J-1939 data link.

Detection

75 seconds after key-on and throughout the operation, the System Manager constantly monitors the communication with the engine ECM. If a communication fault occurs for more than five seconds, fault code 35 is set.

Fallback

If the fault occurs while moving, it causes a 1-speed fallback. Once vehicle has stopped, the starting gear and reverse can be engaged. If the failure occurs at system initialization, it causes an AutoSelect fallback mode.

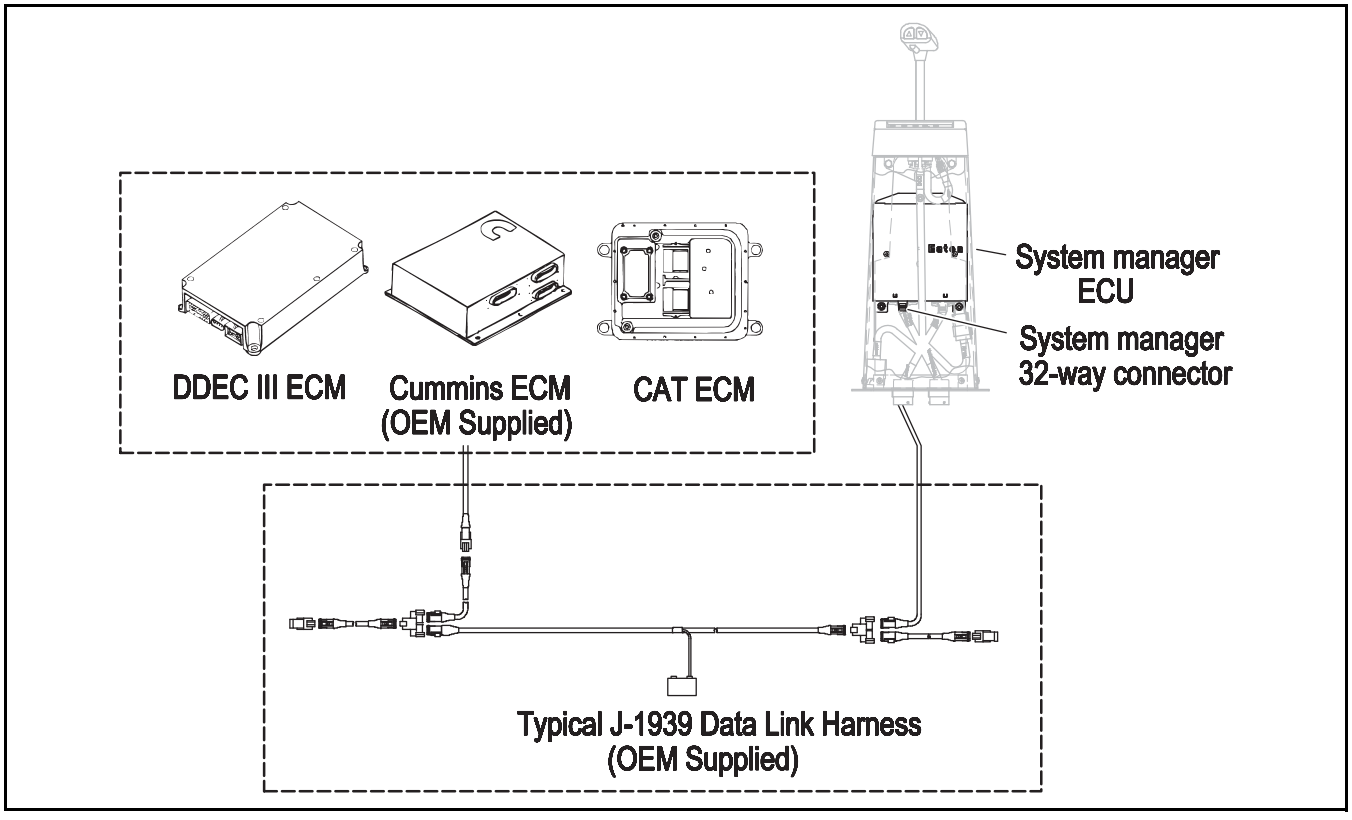
Required Tools

- Basic Hand Tools
- Hand-Held Diagnostic Tool
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide
- Data Link Tester

Possible Causes

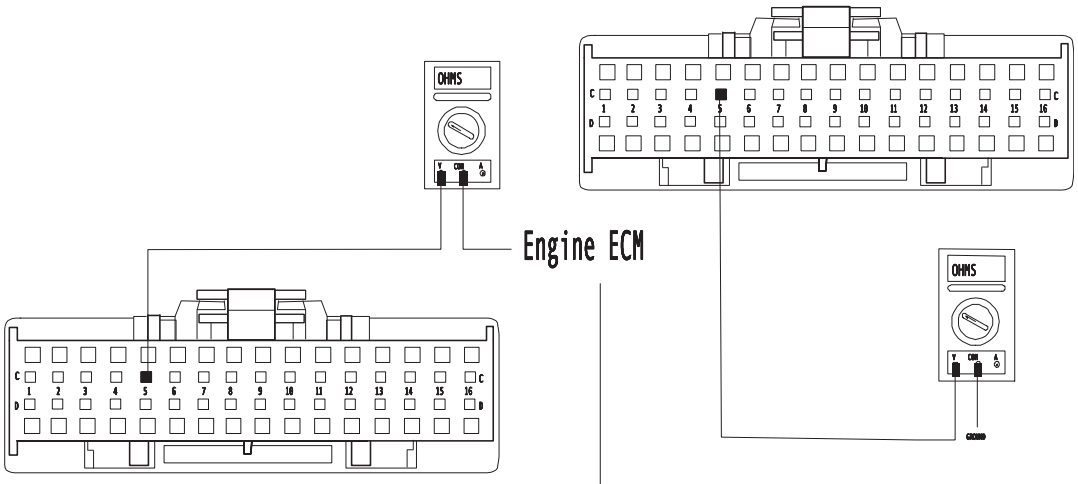
This fault can be caused by any of the following:

- Faulty J-1939 data link
- Faulty vehicle interface harness or connections
- Faulty engine harness or connections
- Excessive radio interference
- Faulty engine ECM
- Faulty engine fuel pump
- Faulty system manager ECU



Code 35 (SID 231, FMI 2,7), Engine Control Failure Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect system manager 32-way connector.		
	3. Disconnect engine ECM's connector which contains the J-1939 data link.		
	4. Measure resistance between: • System manager 32-way connector pin C5 and engine ECM pin # (see chart) • System manager 32-way pin C5 and ground	→ • If resistance between pin C5 and engine ECM pin # (see chart) is 0 to .3 ohms and • If resistance between pin C5 and ground is more than 10K ohms or open circuit (OL)	→ Go to **Step B.**
		If resistance is outside of range	→ Repair J-1939 data link harness between engine ECM and system manager. Go to **Step V.**

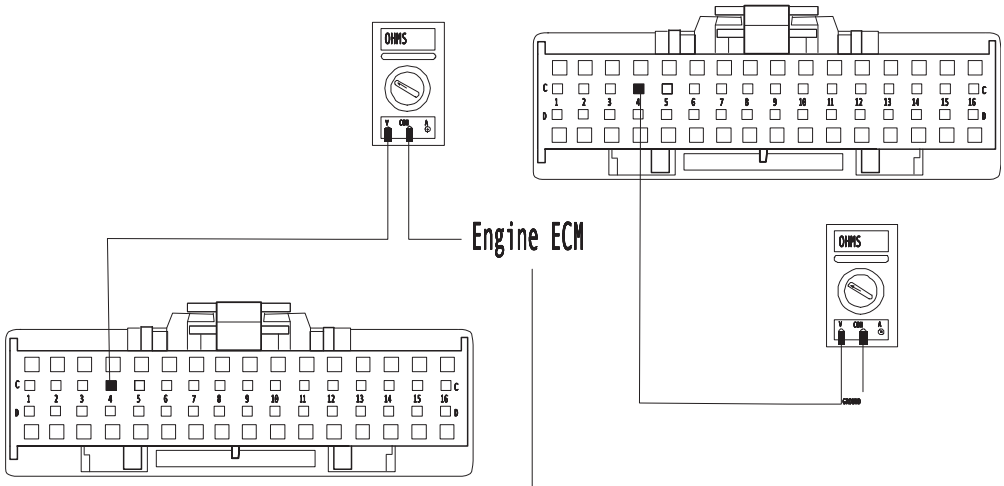


J-1939 ECM Pin Out Chart

CATERPILLAR		DETROIT	CUMMINS		MACK
ADEMII	ADEMIII	DEDC III & IV	ISM	CELECT Plus	V-Mac III
40-way P1 connector	70-way P1 connector	6-way communication connector	50-way C1 connector	3-way J-1939 connector	Engine controller EJ2 connector
33	50	F	46	A	8

Code 35 (SID 231, FMI 2,7), Engine Control Failure Test, continued

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Measure resistance between: • System manager 32-way connector pin C4 and engine ECM pin # (see chart) • System manager 32-way pin C4 and ground	→ • If resistance between pin C4 and engine ECM pin # (see chart) is 0 to .3 ohms and • If resistance between pin C4 and ground is more than 10K ohms or open circuit (OL)	→ • If equipped with J-1939-Lite, go to **Step D.** • If not equipped with J-1939-Lite, go to **Step C.**
		If resistance is outside of range →	Repair J-1939 data link harness between engine ECM and system manager. Go to **Step V.**

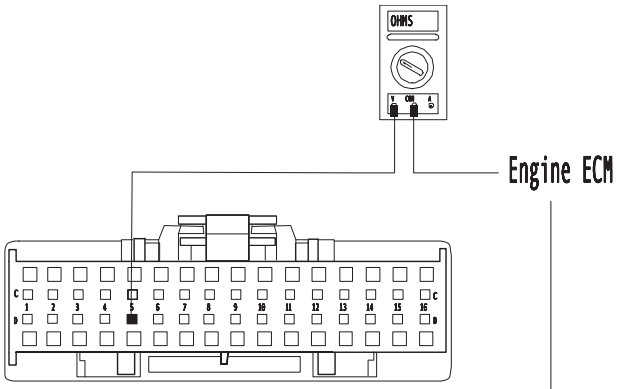


J-1939 ECM Pin Out Chart

CATERPILLAR		DETROIT	CUMMINS		MACK
ADEMII	ADEMIII	DEDC III & IV	ISM	CELECT Plus	V-Mac III
40-way P1 connector	70-way P1 connector	6-way communication connector	50-way C1 connector	3-way J-1939 connector	Engine controller EJ2 connector
39	34	E	37	B	39

Code 35 (SID 231, FMI 2,7), Engine Control Failure Test, continued

Step C	Procedure	Condition	Action
	1. Key off.		
	2. Measure resistance between system manager 32-way connector pin D5 and engine ECM pin # (see chart). →	If resistance between pin D5 and engine ECM pin # (see chart) is 0 to .3 ohms →	Go to **Step D.** (If working on a Mack engine, go to **Step E**).
		If resistance is outside of range →	Repair J-1939 data link harness between engine ECM and system manager. Go to **Step V.**

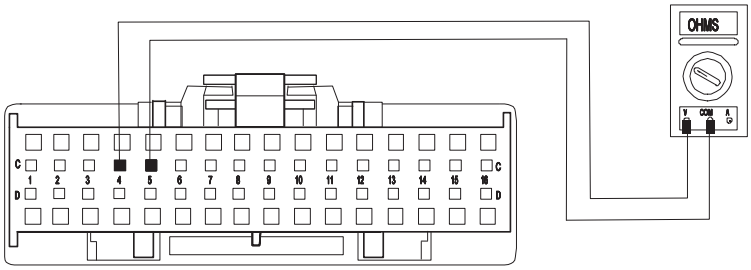


J-1939 ECM Pin Out Chart

CATERPILLAR		DETROIT	CUMMINS		MACK
ADEMII	ADEMIII	DEDC III & IV	ISM	CELECT Plus	V-Mac III
40-way P1 connector	70-way P1 connector	6-way communication connector	50-way C1 connector	3-way J-1939 connector	Engine controller EJ2 connector
26	42	D	36	C	20

Code 35 (SID 231, FMI 2,7), Engine Control Failure Test, continued

Step D	Procedure	Condition	Action
	1. Key off.		
	2. Measure resistance between system manager 32-way connector pins C5 and C4. **Note:** Make sure the volt/ohm meter is on the proper scale (around 200 ohm scale). →	If resistance between pin C5 and C4 is between 50 to 70 ohms →	Go to **Step E.**
		If resistance is above 70 ohms →	One or both of the terminating resistors on J-1939 data link harness are either missing or out of range. Repair J-1939 data link harness. Go to **Step V.**
		If resistance is less than 50 ohms →	Repair the J-1939 data link in between the engine ECM and the system manager. Go to **Step V.**



Code 35 (SID 231, FMI 2,7), Engine Control Failure Test, continued

Step E	Procedure	Condition	Action

1. Key off.

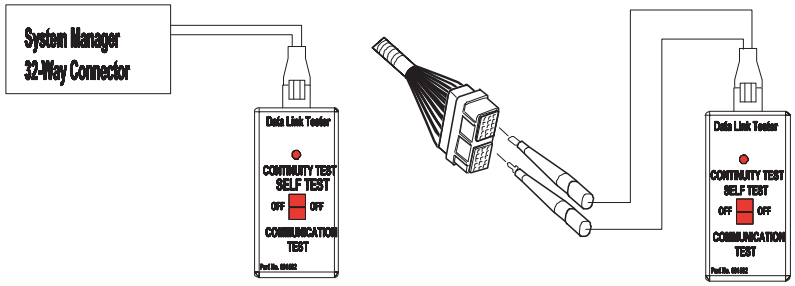
Note: Data link test is designed to test a signal from an individual ECU. The ECU must be isolated from the rest of the Data link.

2. Reconnect engine ECM connector and system manager 32-way connector.
3. Disconnect the 3-way stub connector, which connects the transmission into the J-1939 data link.
4. Connect the data link tester to the 3-way stub connector, which connects the transmission into the J-1939 data link.
   • Red lead from data link tester connects to the +J-1939
   •Black lead from data link tester connects to the -J-1939

   Note: If vehicle does not use 3-way stub connectors, then do no reconnect the engine ECM connector and connect the data link tester across the +/- J-1939 terminals (see chart).

J-1939 ECM Pin Out Chart

	EATON	CATERPILLAR		DETROIT	CUMMINS		MACK
	Autoshift	ADEMII	ADEMII	DEDC III & IV	ISM	CELECT Plus	V-Mac III
	30-way shift control connector	40-way P1 connector	70-way P1 connector	6-way communication connector	50-way C-1 connector	3-way J-1939 connector	Engine ECU EJ2 connector
+J-1939	G1	33	60	F	46	A	8
-J-1939	G2	39	34	E	37	B	39
Shield	G3	26	42	D	36	C	28



5. Place the data link tester in communication mode.
6. Key on. → If LED is solid or flashing → Problem exists with the engine ECM. Repair according to manufacturer's recommendations. Go to **Step V.**

   If LED if off → **Replace system manager.** Go to **Step V.**

Code 35 (SID 231, FMI 2,7), Engine Control Failure Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Key on. 3. Clear Fault Codes (see page 1-4) 4. Use Driving Technique to attempt to reset the code (see page 1-6)		
	5. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 35 appears →	Return to **Step A** to find error in testing.
		If code other than 35 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 35 (SID 231, FMI 2,7), Engine Control Failure Test, continued

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System Code: 41
(SID 56, FMI 7)
Range Failed to Engage

Overview

This code indicates the transmission is unable to complete a shift across the range. The range is either stuck in HI or LO, or cannot complete engagement in HI or LO.

Detection

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

Fallback

This fault causes a 5-speed fallback and the transmission stays in either LO range or HI range. When the vehicle comes to a stop, an attempt to shift into LO range is made.

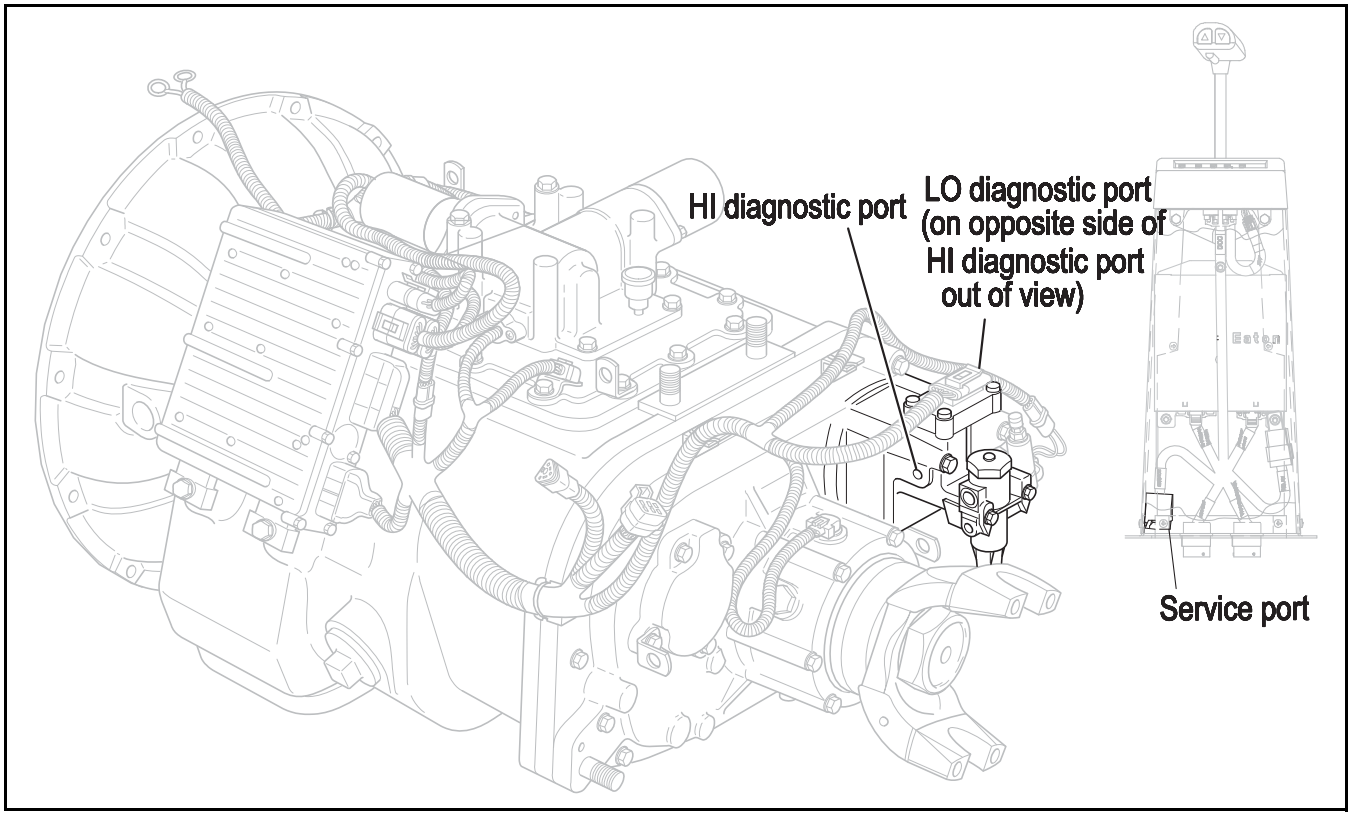
Required Tools

- Basic Hand Tools
- (2) 0-100 PSI Air Pressure Gauges
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Low air pressure
- Contaminated air supply
- Air leak
- Range solenoid stuck
- Failed range synchronizer
- Failed range actuator/cylinder/piston/yoke

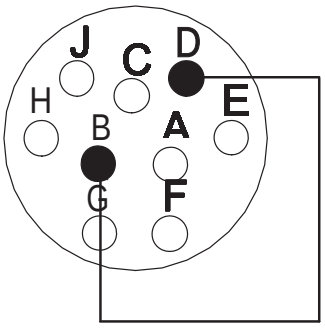


Code 41 (SID 56, FMI 7), Range Failed to Engage Test

Step A	Procedure	Condition	Action
	1. Key off. 2. Install both 0 to 100 PSI air gauges into the range valve diagnostic ports. 3. Start vehicle and allow air pressure to reach governor cut-off. 4. Release clutch to register input speed in transmission. 5. Turn off engine, but leave key in "ON" position.		
	6. With the shift control, select reverse and back to neutral. →	If LO range gauge = 55 to 65 PSI and If HI range gauge = 0 PSI	Go to **Step B.**
		Note: 5 minutes is allowed for checking the pressure after moving the shift lever to neutral. →	
		If both air gauges do not read in range →	**Repair or replace range valve and range cylinder as required.** Retest.

Code 41 (SID 56, FMI 7), Range Failed to Engage Test, continued

Step B	Procedure	Condition	Action
	1. Move shift lever to reverse, press upshift button, and move lever back to neutral. **Note:** If shift lever DOES NOT have upshift buttons, move shift lever to reverse and place a jumper between service port connector pins B and D. Remove jumper and place shift lever in neutral. →	If HI range gauge = 55 to 65 PSI and If LO range gauge = 0 PSI **Note:** 5 minutes is allowed for checking the pressure after moving the shift lever to neutral. →	Repair or replace mechanical range system as required. Go to **Step V.**
		If both air gauges do not read in range →	**Repair or replace range valve and range cylinder as required.** Go to **Step V.**



Code 41 (SID 56, FMI 7), Range Failed to Engage Test, continued

Step V	Procedure	Condition	Action
	1. Disconnect gauges. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes (see page 1-4) 5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 41 appears →	Return to **Step A** to find error in testing.
		If code other than 41 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

System Code: 42
(SID 61, FMI 7)
Splitter Failed to Engage

Overview

This code indicates the transmission is unable to complete a shift across the splitter. The splitter is either stuck in HI or LO, or cannot complete engagement in HI or LO.

Detection

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

Fallback

This fault causes a 9-speed fallback and the transmission stays in either LO split or HI split.

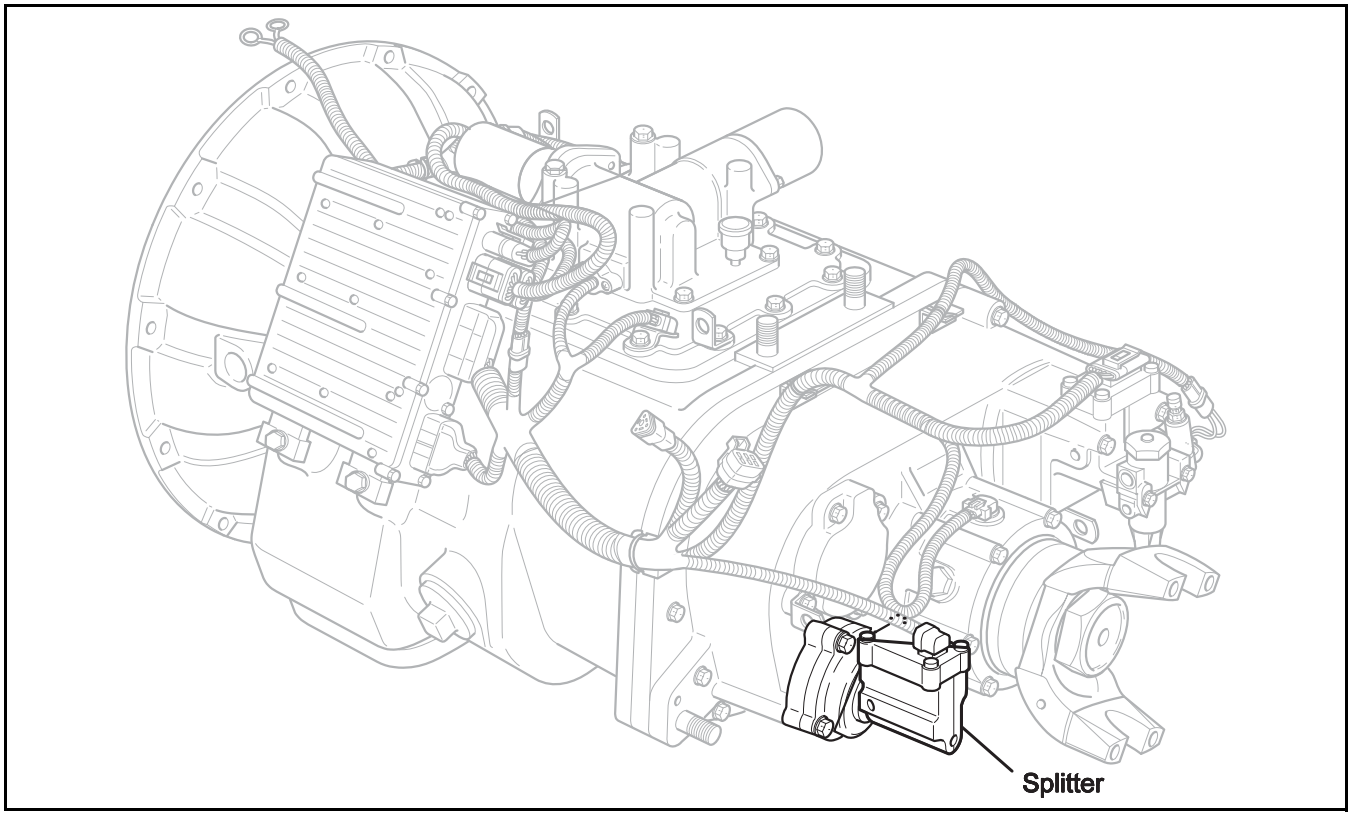
Required Tools

- Basic Hand Tools
- (2) 0-100 PSI Air Pressure Gauges
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Low air pressure
- Contaminated air supply
- Air leak
- Splitter solenoid stuck
- Failed splitter actuator/cylinder/piston/yoke



Code 42 (SID 6,1, FMI 7), Splitter Failed to Engage Test

Step A	Procedure	Condition	Action
	1. Key off. 2. Install both 0 to 100 PSI air gauges into the splitter valve diagnostic ports. 3. Start vehicle and allow air pressure to reach governor cut-off. 4. Release clutch to register input speed in transmission. 5. Turn off engine, but leave key in "ON" position.		
	6. With the shift control, select reverse and back to neutral. →	If HI split gauge = 55 to 65 PSI and If LO split gauge = 0 PSI	Go to **Step B.**
		Note: 5 minutes is allowed for checking the pressure after moving the shift lever to neutral. →	
		If both gauges do not read in range →	**Repair or replace splitter valve and splitter cylinder cover as required.** Repeat this step.

Step B	Procedure	Condition	Action
	1. Key on.		
	2. With shift control select reverse, press upshift button and select neutral. →	If LO split gauge = 55 to 65 and If HI split gauge = 0 PSI →	Repair or replace mechanical splitter system as required. Go to **Step V.**
		If both gauges do not read in range →	**Repair or replace splitter valve and splitter cylinder as required.** Go to **Step V.**

Code 42 (SID 6,1, FMI 7), Splitter Failed to Engage Test, continued

Step V	Procedure	Condition	Action
	1. Disconnect gauges. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes (see page 1-4) 5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 42 appears →	Return to **Step A** to find error in testing.
		If code other than 42 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 42 (SID 6,1, FMI 7), Splitter Failed to Engage Test, continued

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Component Code: 43 (SID 35,36, FMI 3,4,5) Range Solenoid Valve

Overview

This code indicates an electrical failure of the solenoids that control the pneumatic range valve.

Detection

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

Fallback

This fault causes a 5-speed fallback and the transmission stays in either LO range or HI range. When the vehicle comes to a stop, an attempt to shift into LO range is made.

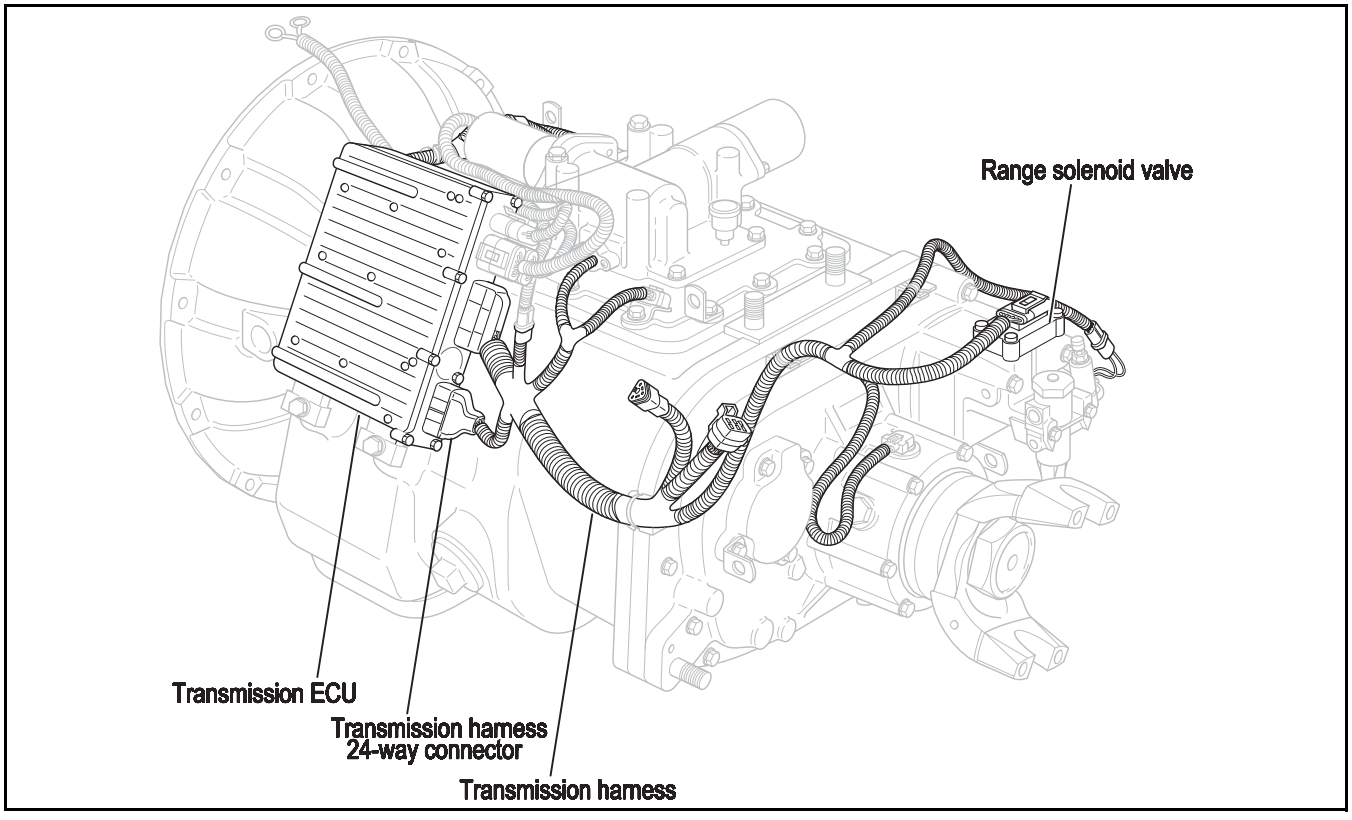
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

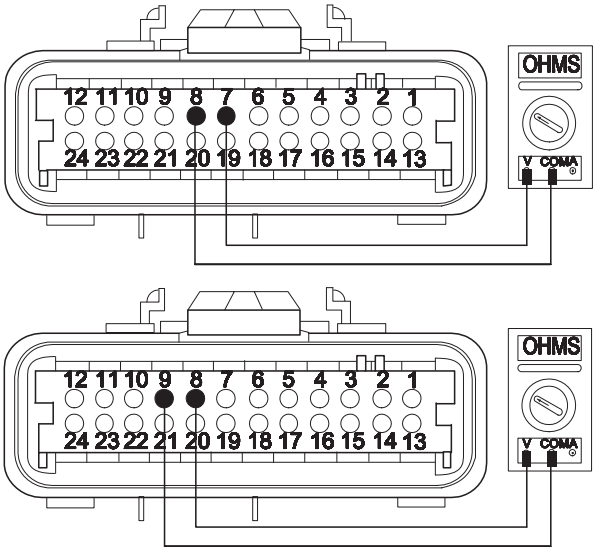
This fault can be caused by any of the following:

- Range solenoid coil open or shorted
- Damaged transmission harness
- Malfunctioning transmission ECU



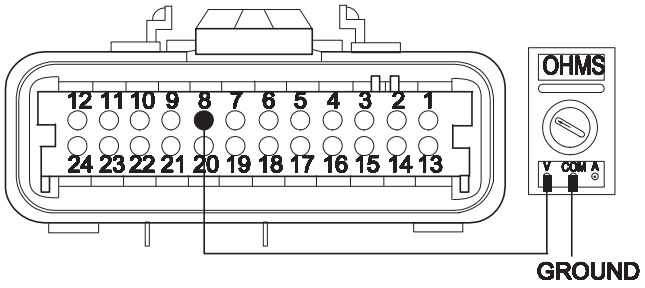
Code 43 (SID 35,36, FMI 3,4,5), Range Solenoid Valve Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect transmission ECU 24-way connector.		
	3. Measure resistance between transmission ECU 24-way connector pins: • 7 and 8 • 8 and 9	If resistance is 9 to 16 ohms	Go to **Step B.**
		If resistance is outside of range	Go to **Step C.**



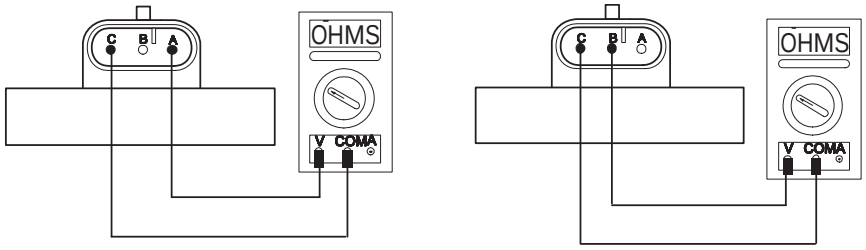
Code 43 (SID 35,36, FMI 3,4,5), Range Solenoid Valve Test, continued

Step B	Procedure	Condition	Action
	1. Measure resistance between transmission ECU 24-way connector pin 8 and ground. →	If resistance is more than 10K ohms or open circuit (OL →	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step V.**
		If resistance is less than 10K ohms →	Go to **Step C.**



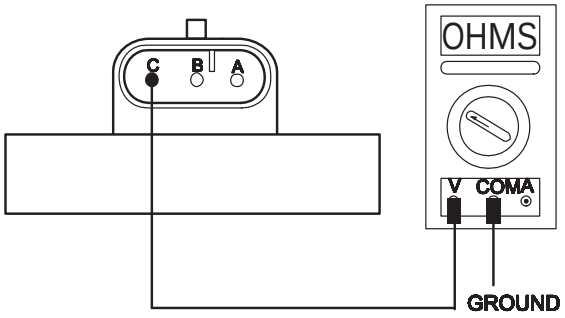
Code 43 (SID 35,36, FMI 3,4,5), Range Solenoid Valve Test, continued

Step C	Procedure	Condition	Action
	1. Disconnect transmission harness from range valve.		
	2. Measure resistance between range 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 range valve.** Go to **Step V.**



Code 43 (SID 35,36, FMI 3,4,5), Range Solenoid Valve Test, continued

Step D	Procedure	Condition	Action
	1. Measure resistance between range valve pin C and ground. →	If resistance is more than 10K ohms or open circuit (OL) →	**Repair or replace transmission harness.** Go to **Step V.**
		If resistance is less than 10K ohms →	**Replace range valve.** Go to **Step V.**



Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 43 appears →	Return to **Step A** to find error in testing.
		If code other than 43 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 43 (SID 35,36, FMI 3,4,5), Range Solenoid Valve Test, continued

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Component Code: 44 (PID 54, FMI 3,4,5) Interia Brake Solenoid Coil

Overview

This code indicates an electrical problem in the interia brake.

Detection

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

Fallback

There is no fallback associated with this failure. However, it may be difficult to perform an initial engagement due to a poorly adjusted clutch. Also, hill shifting performance may be reduced.

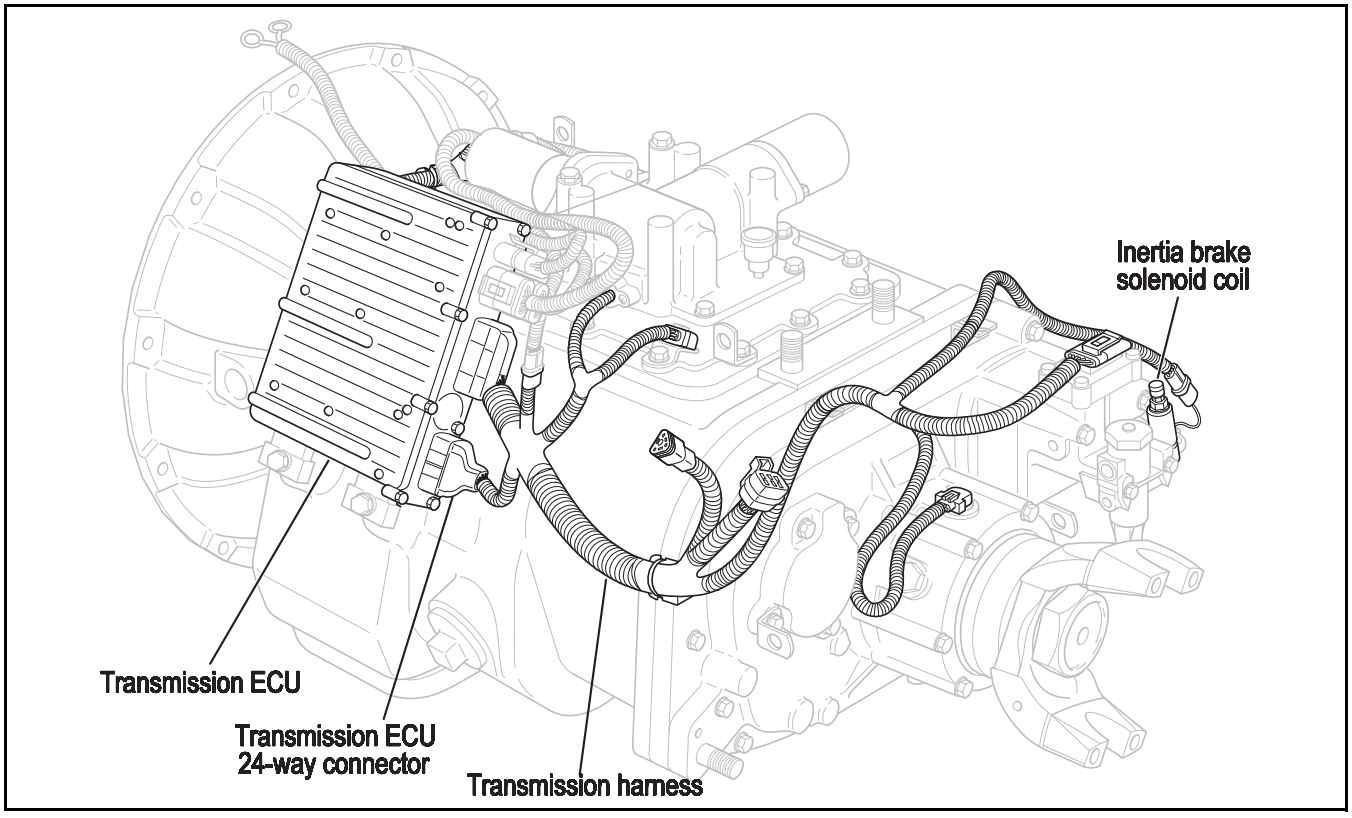
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

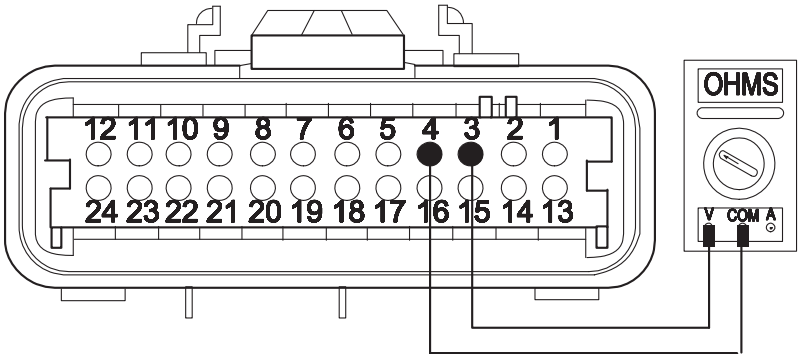
This fault can be caused by any of the following:

- Relay coil open or shorted
- Damaged transmission harness
- Malfunctioning transmission ECU



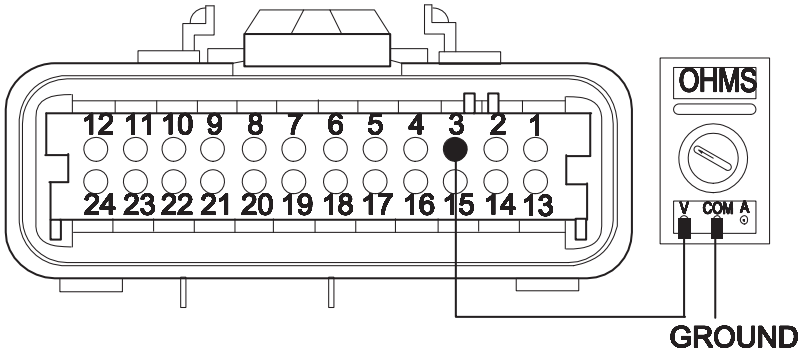
Code 44 (PID 54, FMI 3,4,5), Interia Brake Solenoid Coil Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect 24-way transmission ECU connector.		
	3. Measure resistance between 24-way transmission ECU connector pins 3 and 4. →	If resistance is 13 to 18 ohms →	Go to **Step B.**
		If resistance is outside of range →	Go to **Step C.**



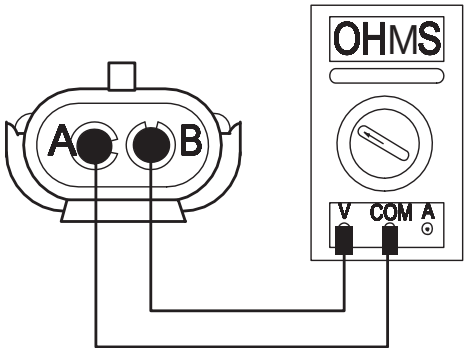
Code 44 (PID 54, FMI 3,4,5), Interia Brake Solenoid Coil Test, continued

Step B	Procedure	Condition	Action
	1. Measure resistance between 24-way transmission ECU connector pin 3 and ground. →	If resistance is more than 10K ohms or open circuit (OL) →	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step V.**
		If resistance is less than 10K ohms →	Go to **Step C.**



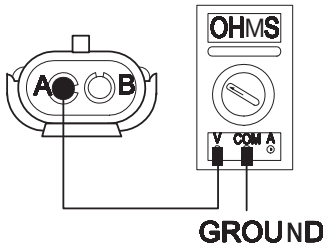
Code 44 (PID 54, FMI 3,4,5), Interia Brake Solenoid Coil Test, continued

Step C	Procedure	Condition	Action
	1. Disconnect transmission harness from interia brake solenoid coil.		
	2. Measure resistance between inertia brake solenoid coil pins A and B. →	If resistance is 13 to 18 ohms →	Go to **Step D.**
		If resistance is outside of range →	**Replace inertia brake solenoid.** Go to **Step V.**



Code 44 (PID 54, FMI 3,4,5), Interia Brake Solenoid Coil Test, continued

Step D	Procedure	Condition	Action
	1. Measure resistance between interia brake solenoid coil pin A and ground. →	If resistance is more than 10K ohms or open circuit (OL) →	**Repair or replace transmission harness.** Go to **Step V.**
		If resistance is less than 10K ohms →	**Replace inertia brake solenoid.** Go to **Step V.**



Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 44 appears →	Return to **Step A** to find error in testing.
		If code other than 44 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 44 (PID 54, FMI 3,4,5), Interia Brake Solenoid Coil Test, continued

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Component Code: 46 (SID 37,38, FMI 4,5) Splitter Solenoid Valve

Overview

This code indicates an electrical failure of the solenoids that control the splitter.

Detection

Starting at key-on and throughout operation, the Transmission Controller 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 9-speed fallback and the transmission stays in either LO split or HI split.

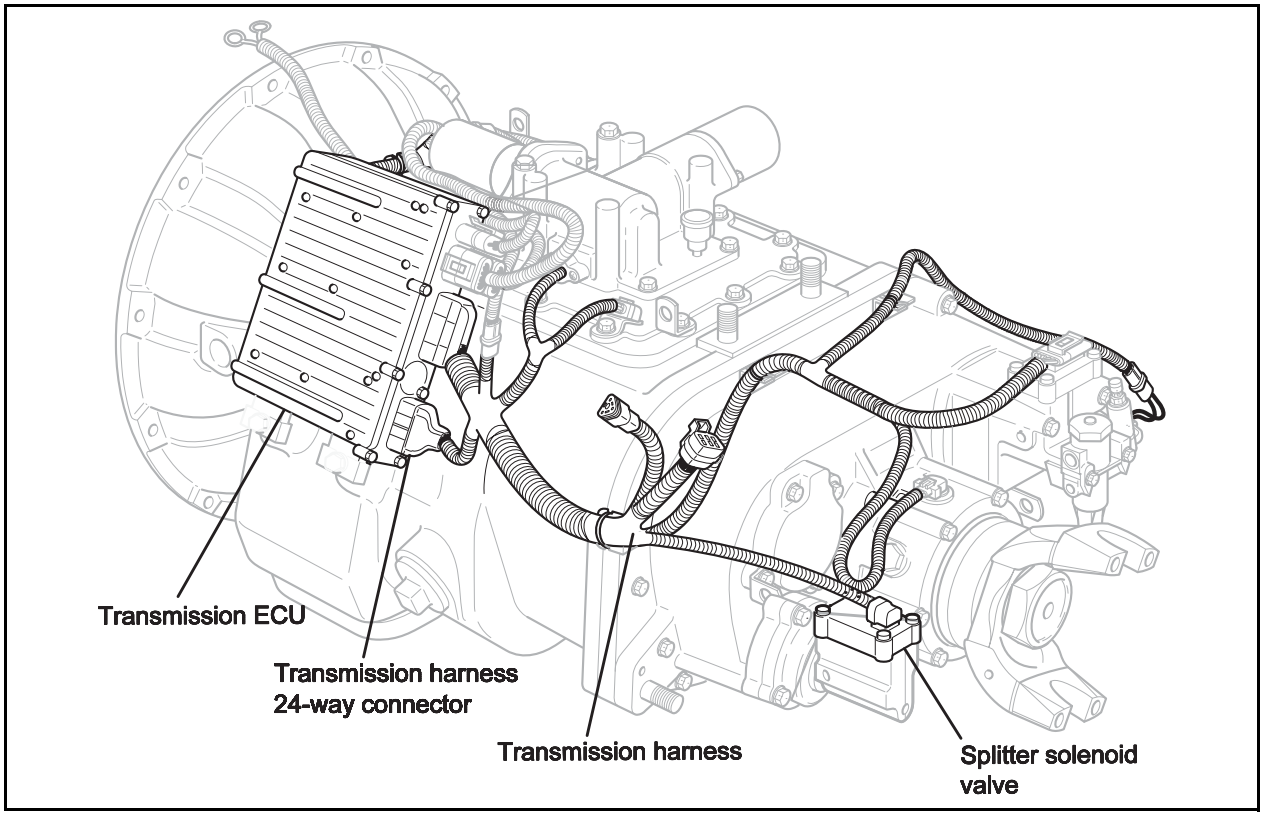
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

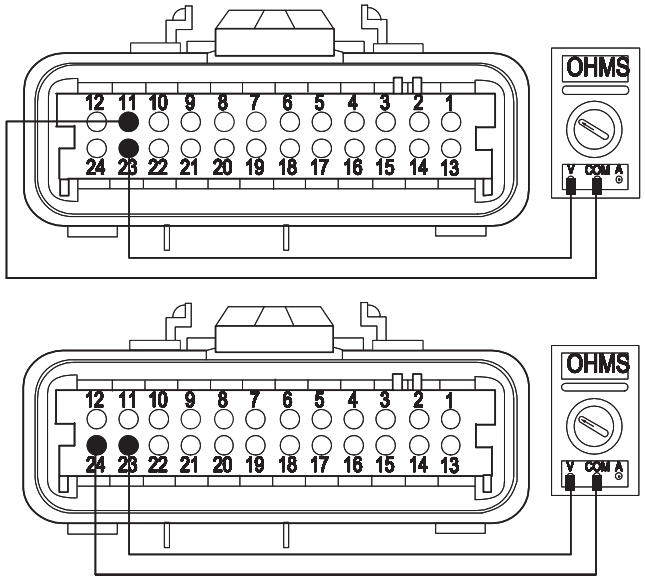
This fault can be caused by any of the following:

- Solenoid coil open or shorted
- Damaged transmission harness
- Malfunctioning transmission ECU



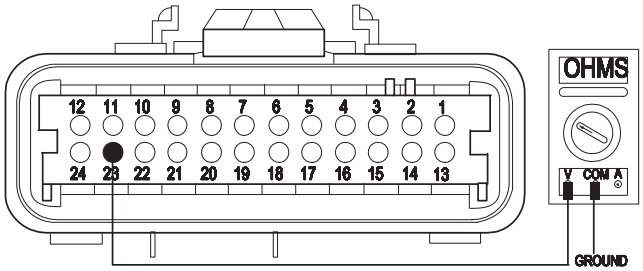
Code 46 (SID 37,38, FMI 4,5), Splitter Solenoid Valve Test

Step A	Procedure	Condition	Action
	1. Key off. 2. Disconnect transmission ECU 24-way connector.		
	3. Measure resistance between transmission ECU 24-way connector pins: • 11 and 23 • 24 and 23	If resistance is 9 to 16 ohms	Go to **Step B.**
		If resistance is outside of range	Go to **Step C.**



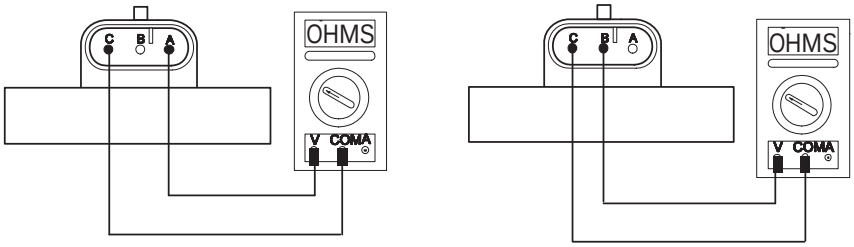
Code 46 (SID 37,38, FMI 4,5), Splitter Solenoid Valve Test, continued

Step B	Procedure	Condition	Action
	1. Measure resistance between transmission ECU 24-way connector pin 23 and ground. →	If resistance is more than 10K ohms or open circuit (OL) →	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step V.**
		If resistance is less than 10K ohms →	Go to **Step C.**



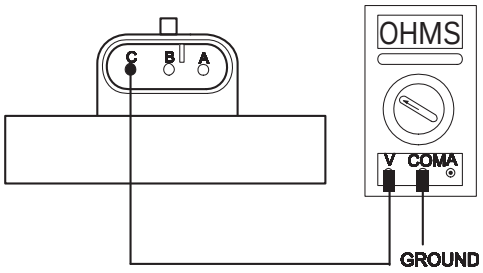
Code 46 (SID 37,38, FMI 4,5), Splitter Solenoid Valve Test, continued

Step C	Procedure	Condition	Action
	1. Disconnect transmission harness from splitter valve.		
	2. Measure resistance between splitter 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 splitter valve.** Go to **Step V.**



Code 46 (SID 37,38, FMI 4,5), Splitter Solenoid Valve Test, continued

Step D	Procedure	Condition	Action
	1. Measure resistance between range valve pin C and ground. →	If resistance is more than 10K ohms or open circuit (OL) →	**Repair or replace transmission harness.** Go to **Step V.**
		If resistance is less than 10K ohms →	**Replace range valve.** Go to **Step V.**



Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 46 appears →	Return to Step a to find error in testing.
		If code other than 46 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 46 (SID 37,38, FMI 4,5), Splitter Solenoid Valve Test, continued

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Component Code: 51 (PID 60, FMI 2) Rail Select Sensor

Overview

This code indicates an electrical failure of the rail select sensor on the electric shifter.

Detection

Starting at key-on and throughout operation, the Transmission Controller constantly monitors the feedback from the sensor. If the feedback is below 10% or above 90% of the sensor's full value, the fault code is set. This type of failure represents a short to ground or battery. The Transmission Controller also monitors the sensor feedback for a zero value, indicating an open circuit.

Fallback

This fault causes an In Place fallback.

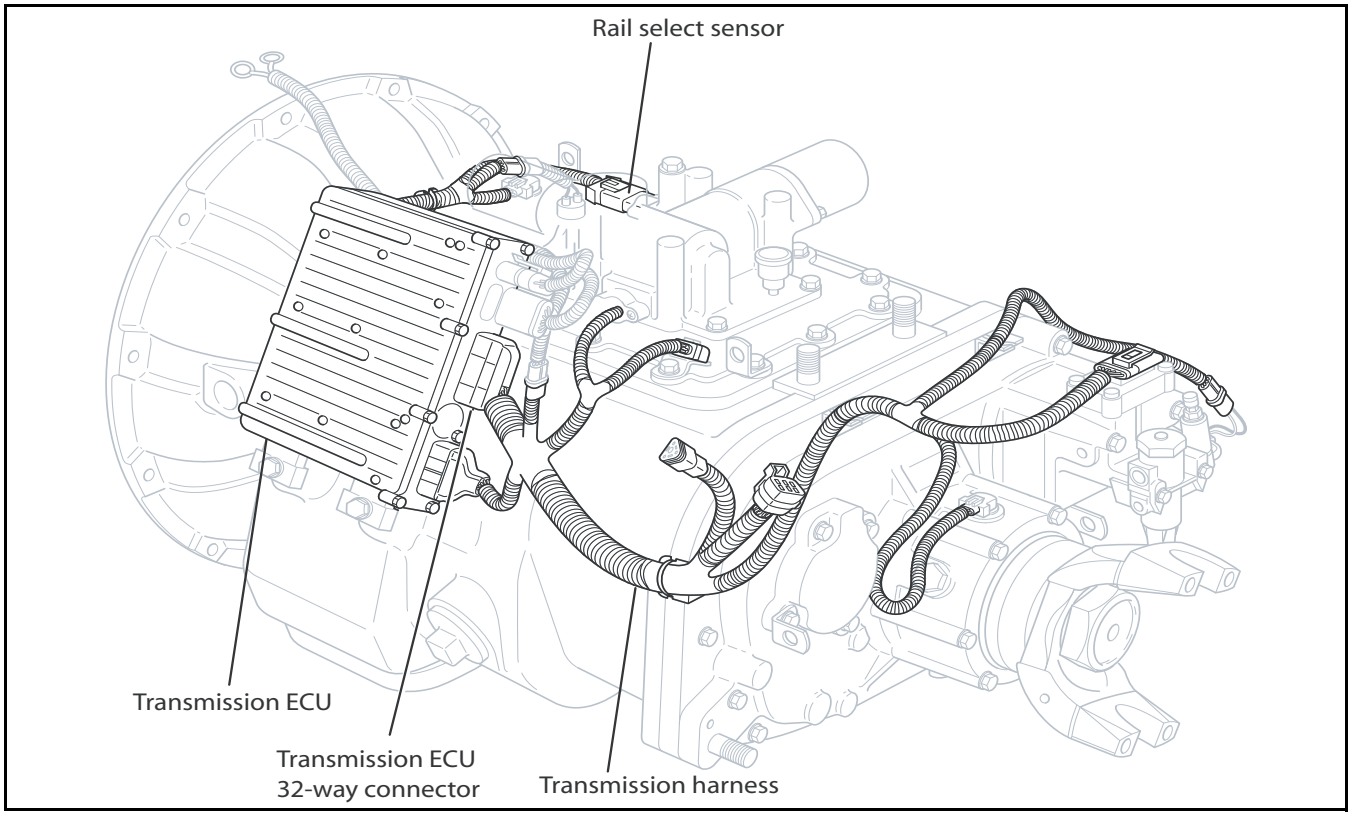
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

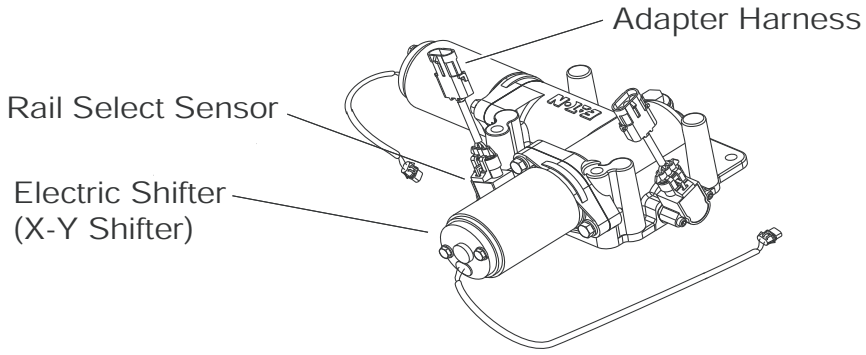
This fault can be caused by any of the following:

- Damaged transmission harness
- Mechanical connection failure in electric shifter
- Malfunctioning rail select sensor
- Malfunctioning transmission ECU



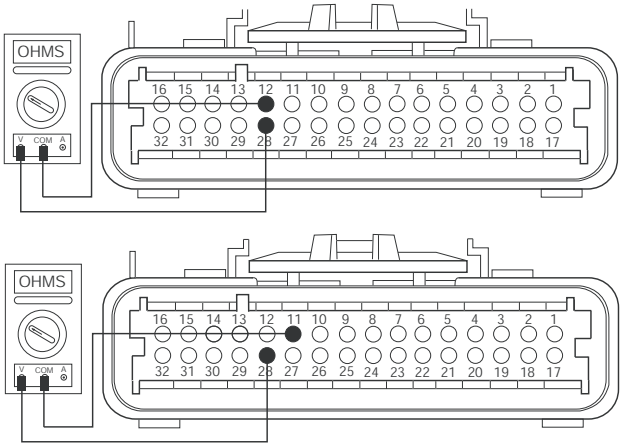
Code 51 (PID 60, FMI 2), Rail Select Sensor Test

Step A	Procedure	Condition	Action
1.	Is there an adapter harness between the rail select sensor and the transmission harness. →	If the adapter harness shown is between the rail select sensor and the transmission harness →	Go to **Step B.**
		If there is no adapter harness between the rail select sensor and the transmission harness →	Go to **Step F.**



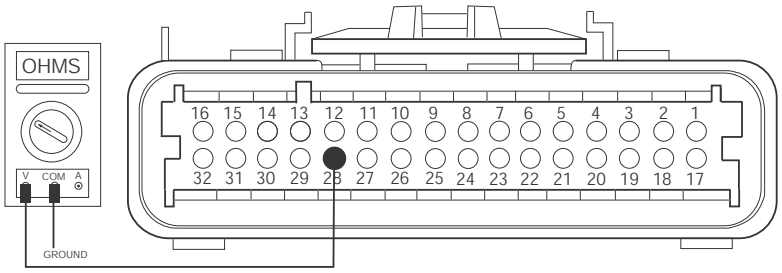
Code 51 (PID 60, FMI 2), Rail Select Sensor Test, continued

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect transmission ECU 32-way connector.		
	3. Measure resistance between transmission ECU 32-way connector pins: • 12 and 28 • 11 and 28	If pin 12 and 28 resistance is 5K to 7K ohms and If pin 11 and 28 resistance is 100 to 200 ohms →	Go to **Step C.**
	Note: An Auto Ranging Digital Volt/Ohm Meter must be used. →		
		If any of the above conditions are not met. →	Go to **Step D.**



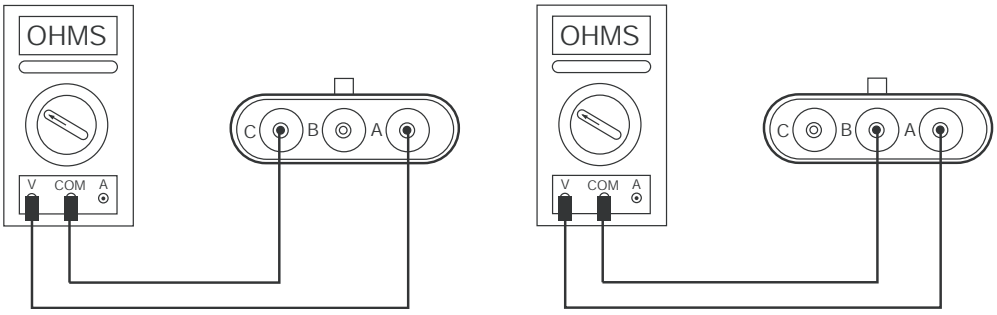
Code 51 (PID 60, FMI 2), Rail Select Sensor Test, continued

Step C	Procedure	Condition	Action
	1. Measure resistance between transmission ECU 32-way connector pin 28 to ground. →	If resistance is more than 10K ohms or open circuit (OL) →	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step V.**
		If resistance is less than 10K ohms →	Go to **Step D.**



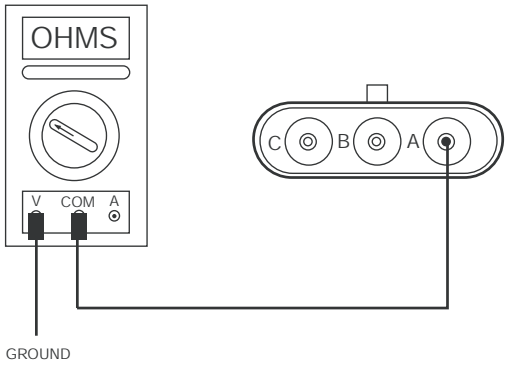
Code 51 (PID 60, FMI 2), Rail Select Sensor Test, continued

Step D	Procedure	Condition	Action
	1. Disconnect transmission harness from adapter harness.		
	2. Measure resistance between gear select sensor harness pins: • A and C • A and B	If pin A and C resistance is 5K to 7K ohms and If pin A and B resistance is 100 to 200 ohms	Go to **Step E.**
		If any of the above conditions are not met.	**Replace Electric Shifter.** Go to **Step V.**



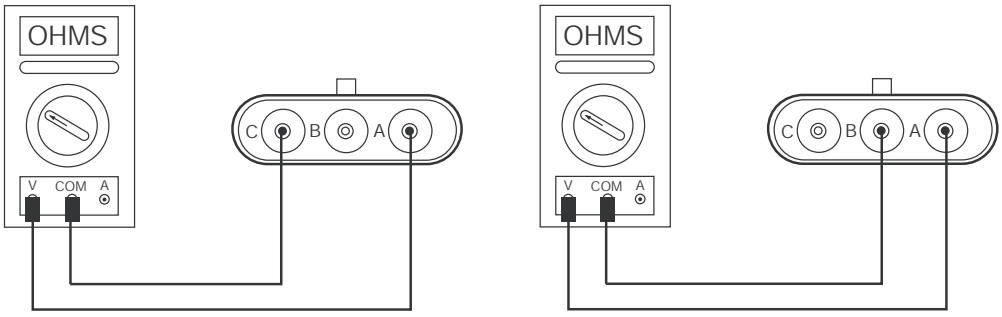
Code 51 (PID 60, FMI 2), Rail Select Sensor Test, continued

Step E	Procedure	Condition	Action
	1. Measure resistance between rail select harness pin A and ground. →	If resistance is more than 10K ohms or open circuit (OL) →	**Replace transmission harness.** Go to **Step V.**
		If resistance is less than 10K ohms →	**Replace Electric Shifter.** Go to **Step V.**



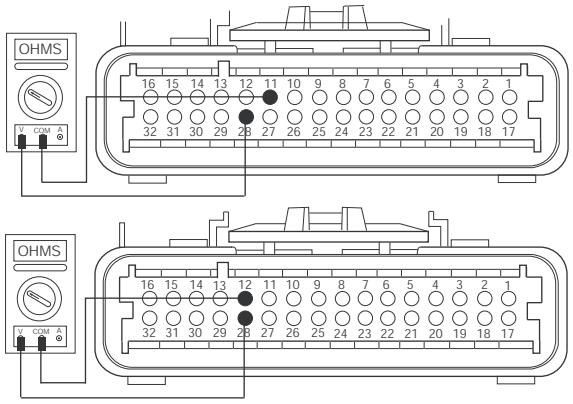
Code 51 (PID 60, FMI 2), Rail Select Sensor Test, continued

Step F	Procedure	Condition	Action
	1. Key off. Disconnect transmission harness from rail select sensor. 2. Remove rail select sensor from electric shifter.		
	3. Measure resistance between rail select sensor pins: • A and C • A and B **Note:** An Auto Ranging Digital Volt/Ohm Meter must be used. →	If pin A and C resistance is 750 to 1250 ohms and Pin A and B resistance changes smoothly through sensor rotation	Go to **Step G.**
		If any of the above conditions are not met	**Replace Electric Shifter.** Go to **Step V.**



Code 51 (PID 60, FMI 2), Rail Select Sensor Test, continued

Step G	Procedure	Condition	Action
	1. Reconnect transmission harness to rail select sensor. 2. Disconnect transmission ECU 32-way connector.		
	3. Measure resistance between transmission ECU 32-way connector pins: • 11 and 28 • 12 and 28 **Note:** An Auto Ranging Digital Volt/Ohm Meter must be used.	If pin 12 and 28 resistance is 750 to 1250 ohms and If pin 11 and 28 resistance changes smoothly through sensor rotation →	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step V.**
		If any of the above conditions are not met. →	**Replace transmission harness.** Go to **Step V.**



Code 51 (PID 60, FMI 2), Rail Select Sensor Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Reinstall rail select sensor to electric shifter (if removed). 3. Reconnect all connectors. 4. Key on. 5. Clear codes (see page 1-4) 6. Use Driving Technique (see page 1-6) to attempt to reset the code		
	7. Check for codes (see page 1-4) →	If no codes →	Test complete.
		If code 51 appears →	Return to **Step A** to find error in testing.
		If code other than 51 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 51 (PID 60, FMI 2), Rail Select Sensor Test, continued

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Component Code: 52 (PID 59, FMI 2) Gear Select Sensor

Overview

This code indicates an electrical failure of the rail select sensor on the electric shifter.

Detection

Starting at key-on and throughout operation, the Transmission Controller constantly monitors the feedback from the sensor. If the feedback is below 10% or above 90% of the sensor's full value, the fault code is set. This type of failure represents a short to ground or battery. The Transmission Controller also monitors the sensor feedback for a zero value, indicating an open circuit.

Fallback

This fault causes an In Place fallback.

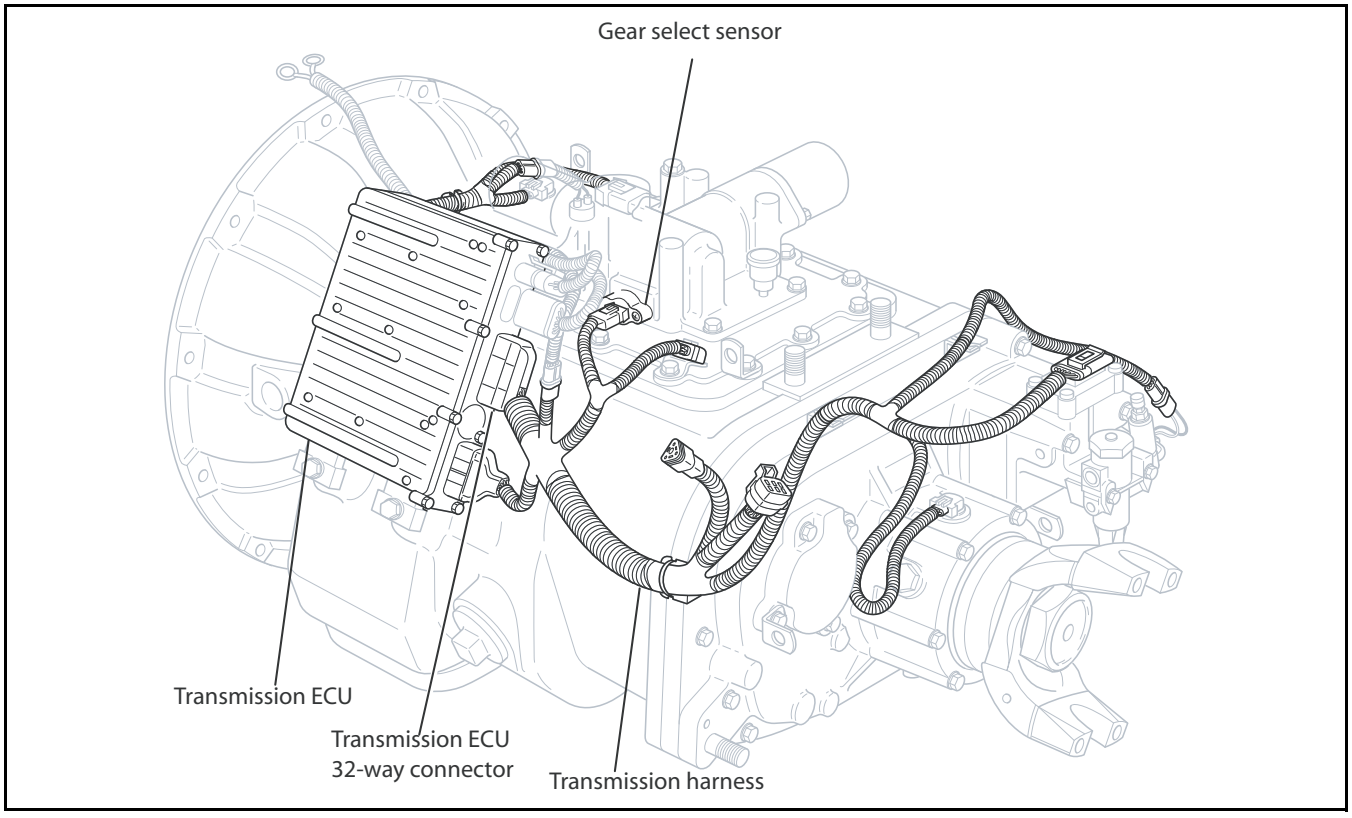
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

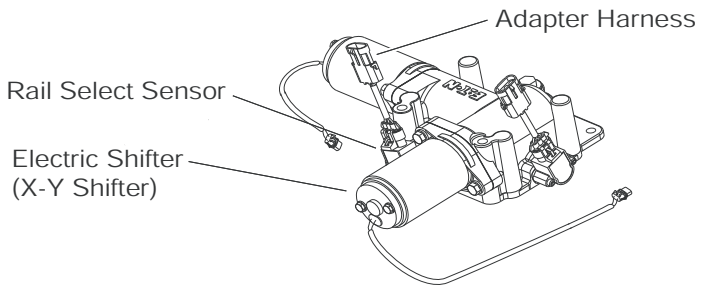
This fault can be caused by any of the following:

- Damaged Transmission harness
- Mechanical connection failure in electric shifter
- Malfunctioning gear select sensor
- Malfunctioning transmission ECU



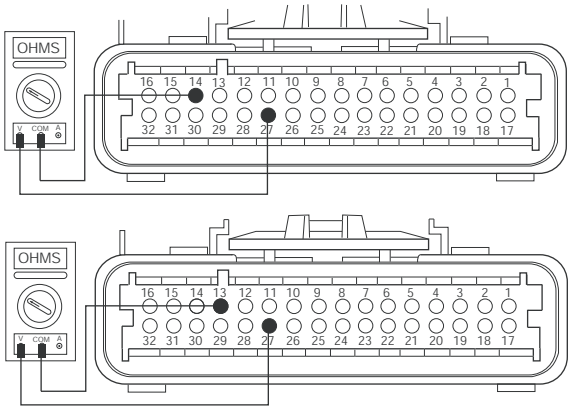
Code 52 (PID 59, FMI 2), Gear Select Sensor Test

Step A	Procedure	Condition	Action
	1. Is there an adapter harness between the rail select sensor and the transmission harness →	If the adapter harness shown is between the gear select sensor and the transmission harness →	Go to **Step B**.
		If there is no adapter harness between the gear select sensor and the transmission harness →	Go to **Step F.**



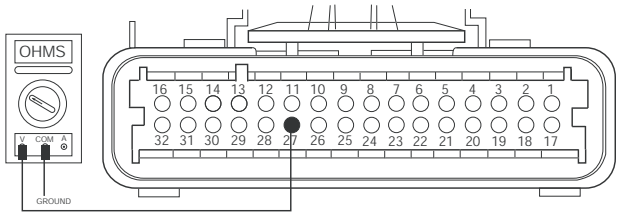
Code 52 (PID 59, FMI 2), Gear Select Sensor Test, continued

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect transmission ECU 32-way connector.		
	3. Measure resistance between transmission ECU 32-way connector pins: • 14 and 27 • 13 and 27	If pin 14 and 27 resistance is 5K to 7K ohms and If pin 13 and 27 resistance is 100 to 200 ohms →	Go to **Step C.**
	Note: An Auto Ranging Digital Volt/Ohm Meter must be used. →		
		If any of the above conditions are not met →	Go to **Step D.**



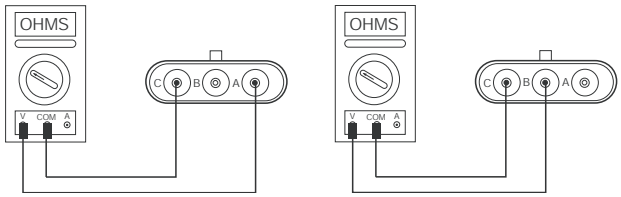
Code 52 (PID 59, FMI 2), Gear Select Sensor Test, continued

Step C	Procedure	Condition	Action
	1. Measure resistance between transmission ECU 32-way connector pin 27 to ground. →	If resistance is more than 10K ohms or open circuit (OL) →	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step V.**
		If resistance is less than 10K ohms →	Go to **Step D.**



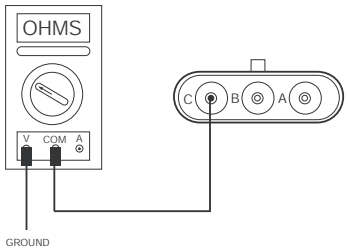
Code 52 (PID 59, FMI 2), Gear Select Sensor Test, continued

Step D	Procedure	Condition	Action
	1. Disconnect transmission harness from adapter harness.		
	2. Measure resistance between gear select sensor harness pins: • A and C • B and C	If pin A and C resistance is 5K to 7K ohms and If pin B and C resistance is 100 to 200 ohms	Go to **Step E.**
		If any of the above conditions are not met	**Replace Electric Shifter.** Go to **Step V.**



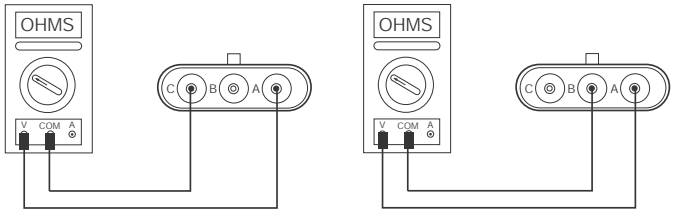
Code 52 (PID 59, FMI 2), Gear Select Sensor Test, continued

Step E	Procedure	Condition	Action
	1. Measure resistance between rail select sensor harness pin C and ground. →	If resistance is more than 10K ohms or open circuit (OL) →	**Replace transmission harness.** Go to **Step V.**
		If resistance is less than 10K ohms →	**Replace Electric Shifter.** Go to **Step V.**



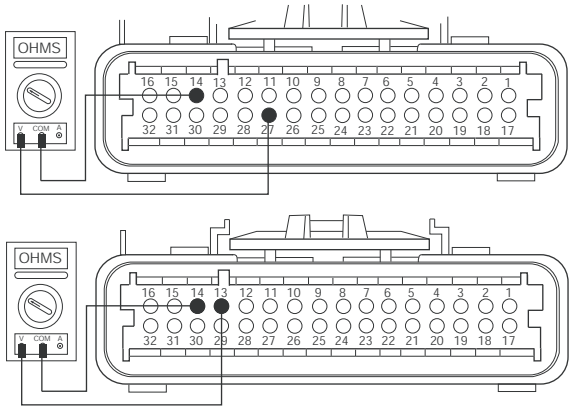
Code 52 (PID 59, FMI 2), Gear Select Sensor Test, continued

Step F	Procedure	Condition	Action
	1. Key off. 2. Disconnect transmission harness from gear select sensor. 3. Remove gear select sensor from electric shifter.		
	4. 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 C resistance is 750 to 1250 ohms and Pin A and B resistance changes smoothly through sensor rotation →	Go to **Step G.**
		If any of the above conditions are not met →	**Replace Electric Shifter.** Go to **Step V.**



Code 52 (PID 59, FMI 2), Gear Select Sensor Test, continued

Step G	Procedure	Condition	Action
	1. Reconnect transmission harness to gear select sensor. 2. Disconnect transmission ECU 32-way connector.		
	3. Measure resistance between transmission ECU 32-way connector pins: • 14 and 27 • 13 and 14	If pin 14 and 27 resistance is 750 to 1250 ohms and Pin 13 and 14 resistance changes smoothly through sensor rotation	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step V.**
		If any of the above conditions are not met	**Replace transmission harness.** Go to **Step V.**



Code 52 (PID 59, FMI 2), Gear Select Sensor Test, continued

Step V	Procedure	Condition	Action
	1. Key off. Reinstall gear select sensor to electric shifter (if removed). 2. Reconnect all connectors. 3. Key on. 4. Clear codes (see page 1-4) 5. Use Driving Technique (see page 1-6) to attempt to reset the code		
	6. Check for codes (see page 1-4) →	If no codes →	Test complete.
		If code 52 appears →	Return to **Step A** to find error in testing.
		If code other than 52 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 52 (PID 59, FMI 2), Gear Select Sensor Test, continued

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Component Code: 53 (SID 34, FMI 2) Reverse Ball Switch

Overview

This code indicates a mechanical or electrical failure of the ball switch that reports engagement in the reverse gear position.

Detection

The Transmission ECU monitors the Reverse Switch for incorrect input based on the gear selection.

Fallback

There is no fallback mode. Driver will be unable to select reverse or forward gears based on Reverse Switch failure.

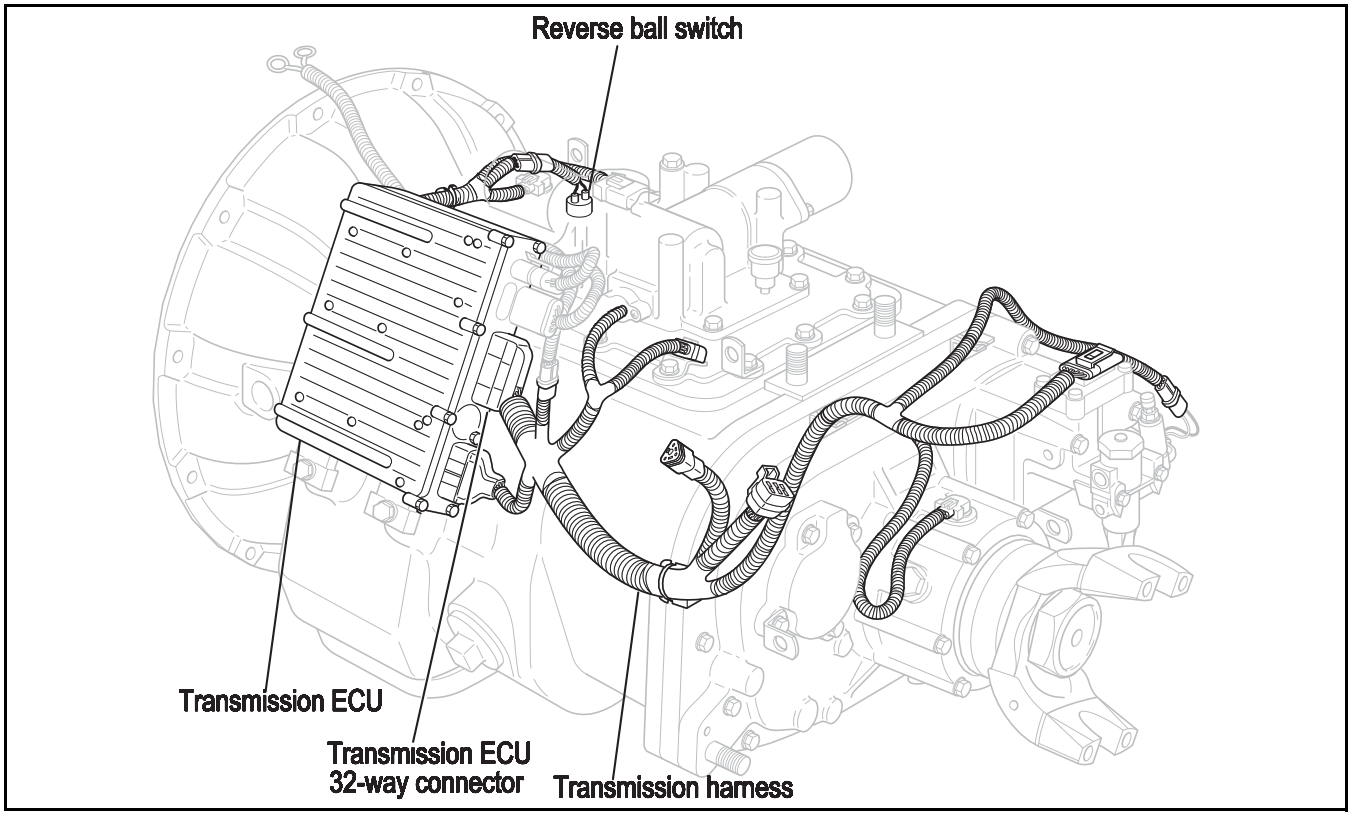
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

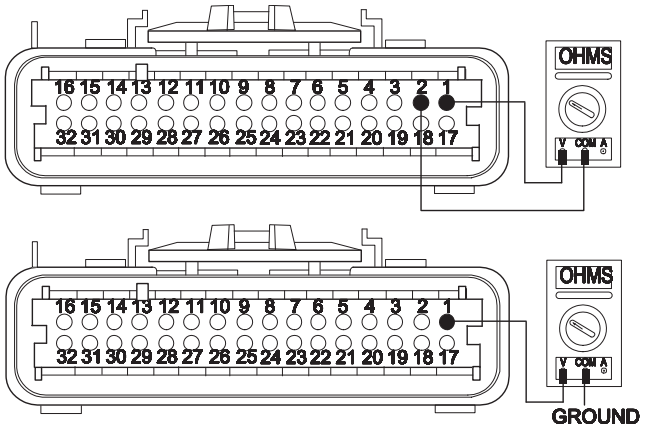
This fault can be caused by any of the following:

- Failed reverse ball switch
- Damaged transmission harness
- Gear select sensor in electric shifter
- Mechanical failure in electric shifter
- Worn yoke
- Failed shift block
- Malfunctioning transmission ECU



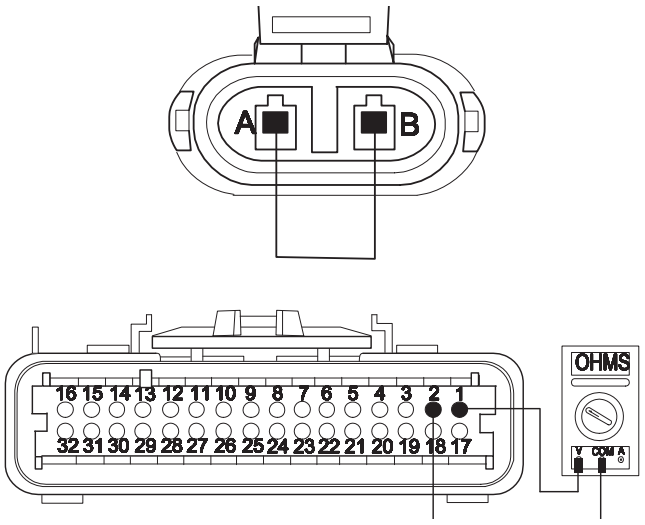
Code 53 (SID 34, FMI 2), Reverse Ball Switch Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect transmission ECU 32-way connector.		
	3. Measure resistance between transmission ECU connector pins 1 and 2.		
	4. Measure resistance between transmission ECU connector pins 1 and ground. →	If resistance for each measurement is more than 10K ohms or open circuit (OL) →	Go to **Step B.**
		If resistance of any measurement is less than 10K ohms →	Go to **Step C.**



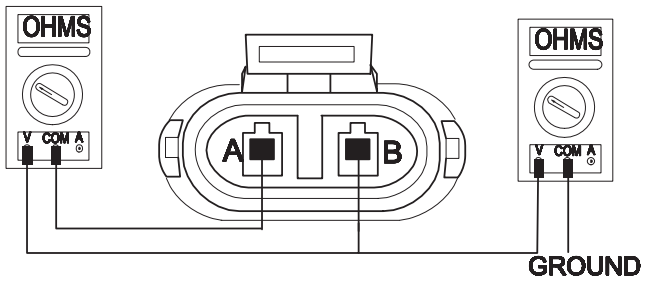
Code 53 (SID 34, FMI 2), Reverse Ball Switch Test, continued

Step B	Procedure	Condition	Action
	1. Locate reverse switch on shift bar housing and disconnect transmission harness from reverse switch. 2. Place jumper wire across reverse switch harness connector. 3. Measure resistance between transmission ECU 32-way connector pins 1 and 2. →	If resistance is 0 to .3 ohms →	**Replace reverse switch (Only if Fault Code is Active).** Go to **Step D.**
		If resistance is outside of range →	**Replace transmission harness.** Go to **Step V.**



Code 53 (SID 34, FMI 2), Reverse Ball Switch Test, continued

Step C	Procedure	Condition	Action
	1. Locate reverse switch on shift bar housing and disconnect transmission harness from reverse switch.		
	2. Measure resistance between reverse switch connector pins. →	If resistance is more than 10K ohms or open circuit (OL) →	**Repair or replace transmission harness.** Go to **Step V.**
		If resistance is less than 10K ohms →	**Replace reverse switch.** Go to **Step D.**



Step D	Procedure	Condition	Action
	1. Reverse switch has been replaced. Retest transmission function using Driving Technique (see page 1-6) →	If function is OK →	Test complete.
		If function is not correct →	Replace shift bar housing. Go to **Step E.**

Code 53 (SID 34, FMI 2), Reverse Ball Switch Test, continued

Step E	Procedure	Condition	Action
	1. Reverse switch and shift bar housing have been replaced. Retest transmission function using Driving Technique (see page 21). →	If function is OK →	Test complete.
		If function is not correct →	**Replace transmission ECU.** Go to **Step V.**

Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 53 appears →	Return to **Step A** to find error in testing.
		If code other than 53 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 53 (SID 34, FMI 2), Reverse Ball Switch Test, continued

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Component Code: 56 (PID 161, FMI 2) Input Shaft Speed Sensor

Overview

This code indicates an electrical problem in the input shaft speed sensor circuit. The signal from the sensor did not match the current operating conditions.

Detection

A speed sensor is determined faulty when all the speed sensor readings are compared and one sensor is inconsistent.

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 and the fault code cannot be reproduced.

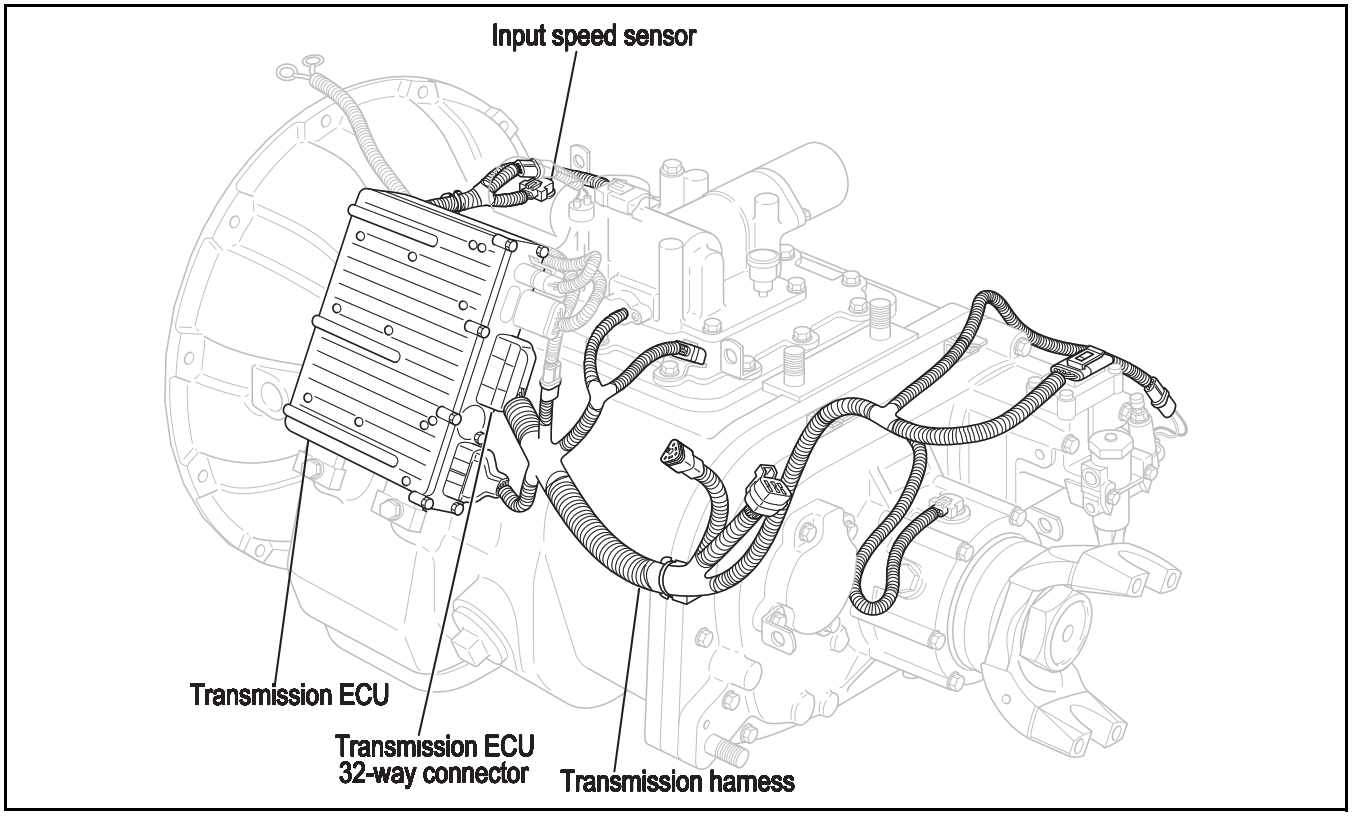
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

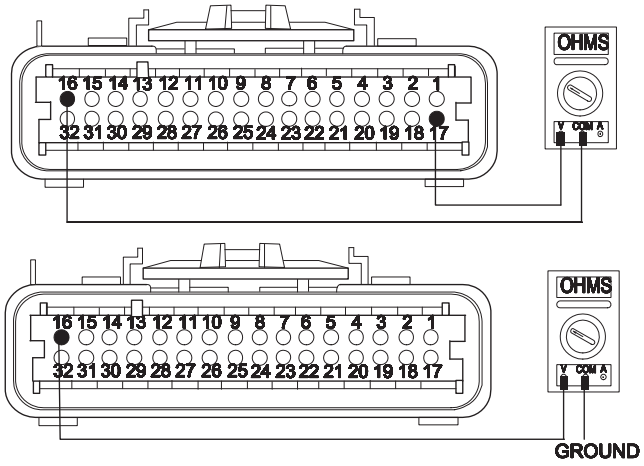
This fault can be caused by any of the following:

- Loose speed sensor
- Contaminated sensor end
- Damaged transmission harness
- Malfunctioning input shaft speed sensor
- Failed main drive gear
- Malfunctioning transmission ECU



Code 56 (PID 161, FMI 2), Input Shaft Speed Sensor Test

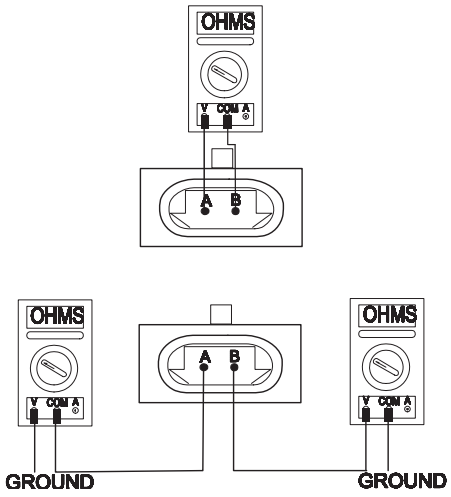
Step A	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect transmission controller 32-way connector.		
	3. Measure resistance across transmission ECU 32-way connector pins 16 and 17 and between pin 16 and ground. →	If pin 16 and 17 resistance is 2K to 4K ohms and Pin 16 and ground resistance is 10K ohms or open circuit (OL) →	Go to **Step B.**
		If any of the above conditions are not met →	Go to **Step C.**



Step B	Procedure	Condition	Action
	1. Inspect Input Shaft Speed Sensor for damage or contamination. →	If no problem found →	**Replace the transmission controller ECU (Only if Fault Code is Active).** Go to **Step V.**
		If problem is found or you were sent here from Step C →	**Repair Input Shaft Speed Sensor** and inspect upper countershaft PTO gear for damage. Go to **Step V.**

Code 56 (PID 161, FMI 2), Input Shaft Speed Sensor Test, continued

Step C	Procedure	Condition	Action
	1. Disconnect transmission harness from input speed sensor.		
	2. Measure resistance between input speed sensor pins and each pin and ground. →	If input shaft speed sensor pins resistance is 2K to 4K ohms and If input shaft speed sensor pins to ground are 10K ohms or open circuit (OL) →	**Repair or replace transmission harness.** Go to **Step V.**
		If any of the above conditions are not met →	Go to **Step B.**



Code 56 (PID 161, FMI 2), Input Shaft Speed Sensor Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes (see page 1-4) 5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 56 appears →	Return to **Step A** to find error in testing.
		If code other than 56 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Component Code: 57 (PID 160, FMI 2) Main Shaft Speed Sensor

Overview

This code indicates an electrical problem in the main shaft speed sensor circuit. The signal from the sensor did not match the current operating conditions.

Detection

A Speed Sensor is determined faulty when all the Speed Sensor readings are compared and one sensor is inconsistent.

Fallback

There is no fallback mode, because Main Shaft speed can be calculated from output shaft speed (may slow down shifting)

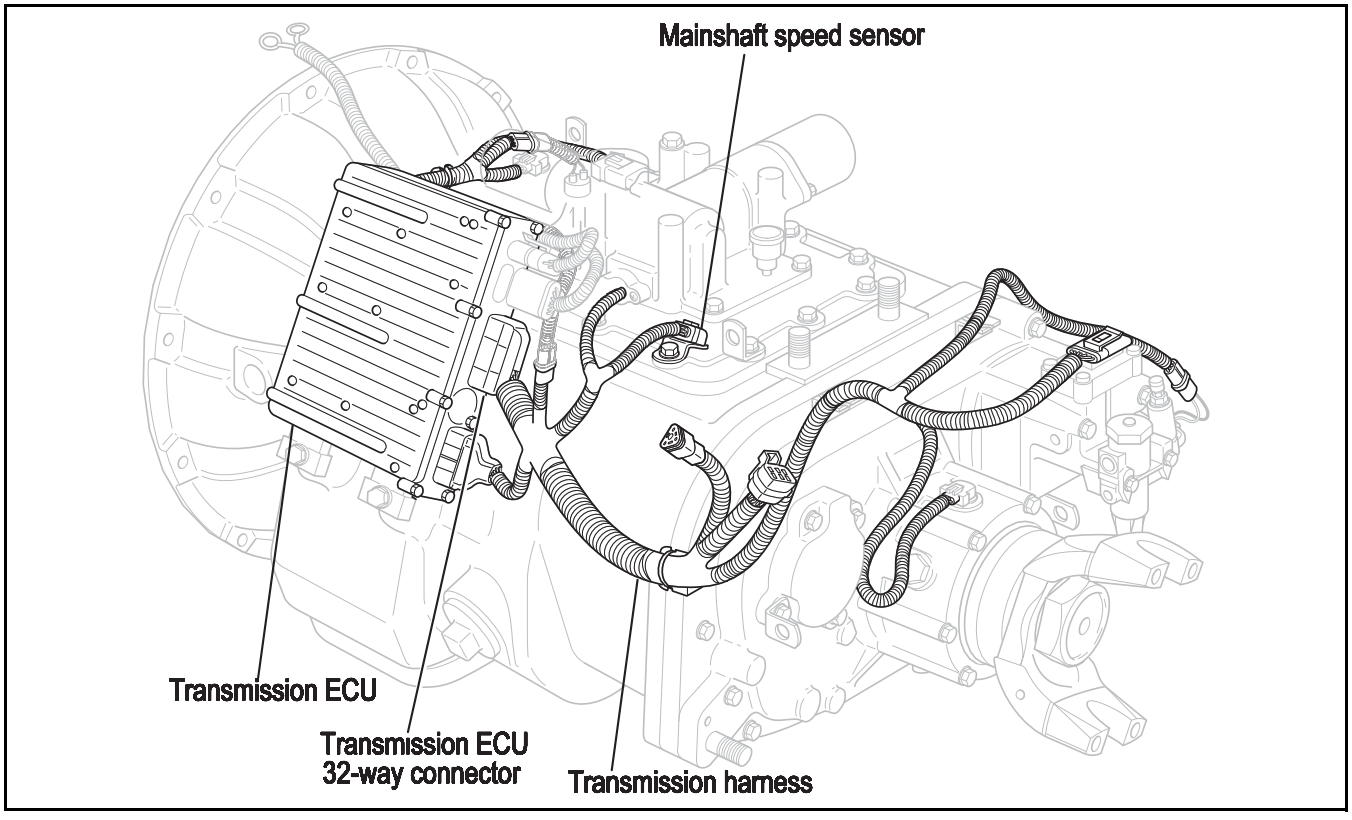
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

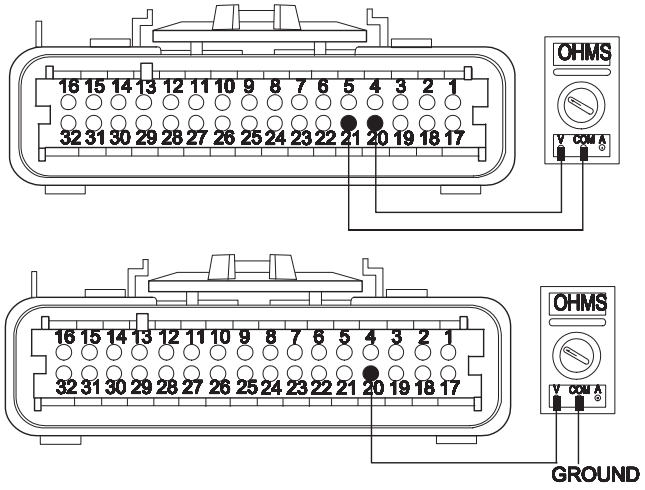
This fault can be caused by any of the following:

- Loose speed sensor
- Contaminated sensor end
- Damaged transmission harness
- Malfunctioning main shaft speed sensor
- Malfunctioning transmission ECU



Code 57 (PID 160, FMI 2), Main Shaft Speed Sensor Test

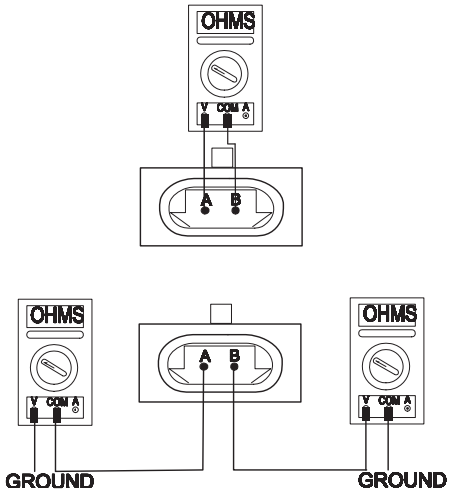
Step A	Procedure	Condition	Action
	1. Key off. 2. Disconnect transmission controller 32-way connector.		
	3. Measure resistance across transmission ECU 32-way connector pins 20 and 21 and between pin 20 and ground.	If pin 20 and 21 resistance is 2K to 4K ohms and Pin 20 and ground resistance is 10K ohms or open circuit (OL)	Go to **Step B.**
		If any of the above conditions are not met	Go to **Step C.**



Step B	Procedure	Condition	Action
	1. Inspect Mainshaft Speed Sensor for damage or contamination.	If no problem found	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step V.**
		If problem is found or you were sent here from Step C	**Replace Mainshaft Speed Sensor** and inspect upper reverse idler gear for damage. Go to **Step V.**

Code 57 (PID 160, FMI 2), Main Shaft Speed Sensor Test, continued

Step C	Procedure	Condition	Action
	1. Disconnect transmission harness from Main Speed Sensor.		
	2. Measure resistance between Main Speed Sensor pins and each pin and ground. →	If mainshaft speed sensor pins resistance is 2K to 4K ohms and If mainshaft speed sensor pins to ground are 10K ohms or open circuit (OL) →	**Repair or replace transmission harness.** Go to **Step V.**
		If any of the above conditions are not met →	Go to **Step B.**



Code 57 (PID 160, FMI 2), Main Shaft Speed Sensor Test, continued

Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique to attempt to reset the code (see page 1-6)	If no codes →	Test complete.
	6. Retrieve Fault Codes (see page 1-4) →	If code 57 appears →	Return to **Step A** to find error in testing.
		If code other than 57 appears →	Go to Fault Code Isolation Procedure Index (see page 1-10)

Component Code: 58 (PID 191, FMI 2) Output Shaft Speed Sensor

Overview

This code indicates an electrical problem in the output shaft speed sensor circuit. The signal from the sensor did not match the current operating conditions.

Detection

A Speed Sensor is determined faulty when all Speed Sensor readings are compared and one sensor is inconsistent.

Fallback

This fault causes a 5-speed fallback and the transmission stays in either LO range or HI range. When the vehicle comes to a stop, an attempt to shift into LO range is made. The fallback causes a 1-speed fallback on transmissions with no auxiliary section.

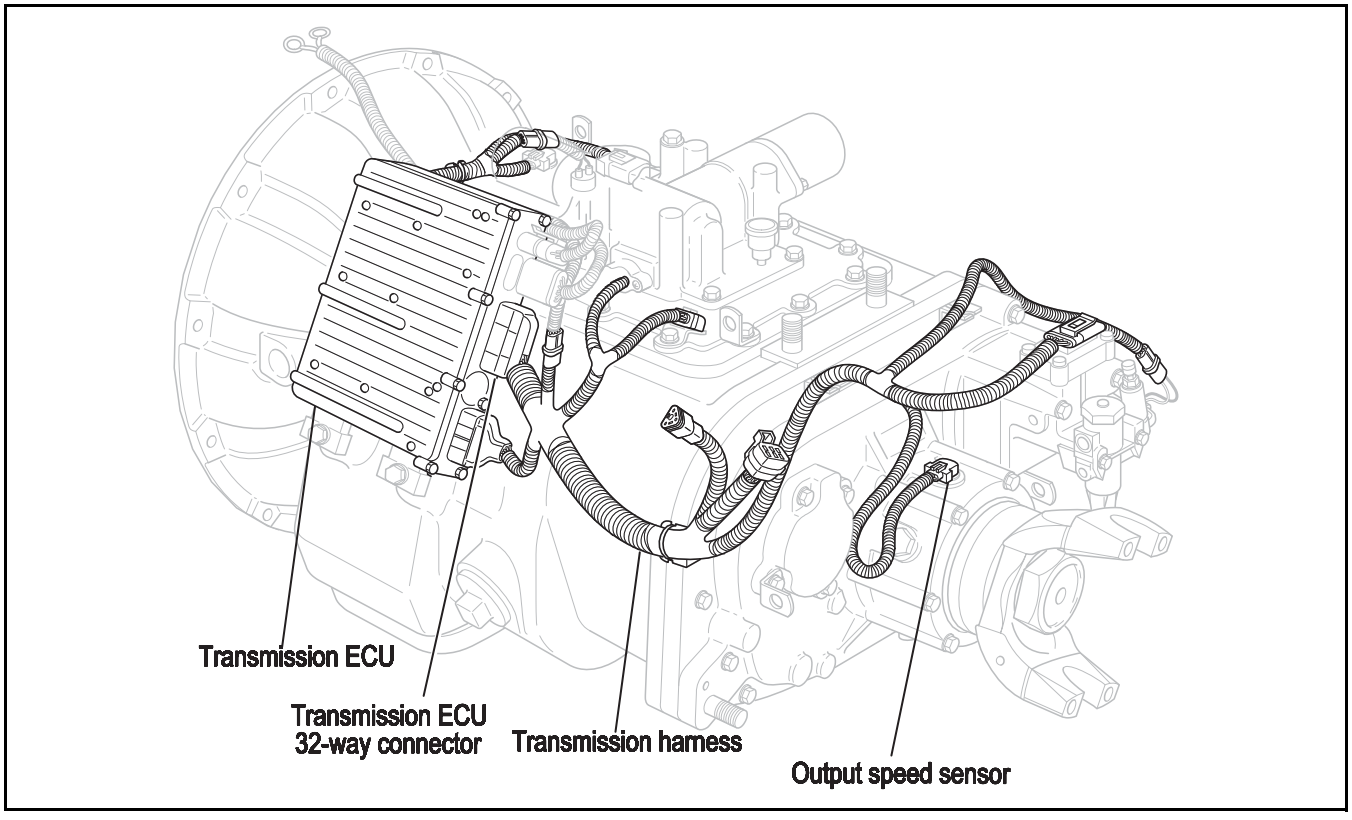
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

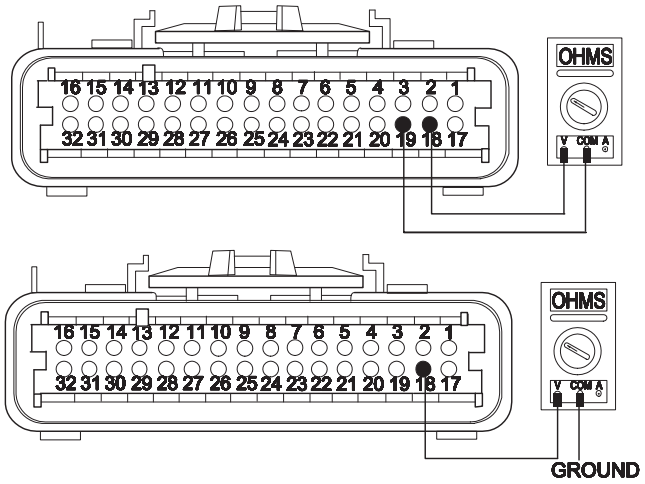
This fault can be caused by any of the following:

- Loose speed sensor
- Contaminated sensor end
- Damaged transmission harness
- Malfunctioning output shaft speed sensor
- Failed or loose tone wheel
- Malfunctioning transmission ECU



Code 58 (PID 191, FMI 2), Output Shaft Speed Sensor Test

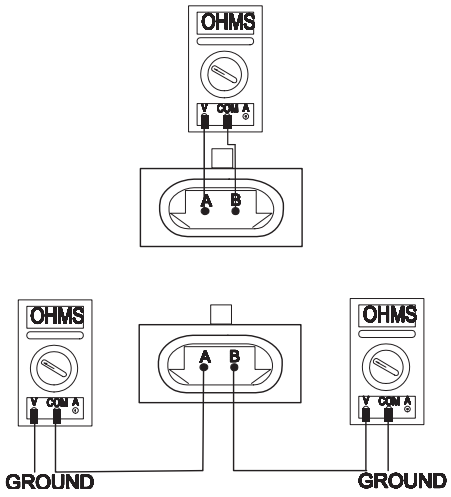
Step A	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect transmission controller 32-way connector.		
	3. Measure resistance across transmission ECU 32-way connector pins 18 and 19 and between pin 18 and ground. →	If pin 18 and 19 resistance is 2K to 4K ohms and Pin 18 and ground resistance is 10K ohms or open circuit (OL) →	Go to **Step B.**
		If any of the above conditions are not met →	Go to **Step C.**



Step B	Procedure	Condition	Action
	1. Inspect Output Speed Sensor for damage or contamination. →	If no problem found →	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step V.**
		If problem is found or you were sent here from Step C →	**Replace Output Shaft Speed Sensor** and inspect the tone wheel for damage, looseness, or contamination. Go to **Step V.**

Code 58 (PID 191, FMI 2), Output Shaft Speed Sensor Test, continued

Step C	Procedure	Condition	Action
	1. Disconnect transmission harness from Output Speed Sensor.		
	2. Measure resistance between Output Speed Sensor pins and each pin and ground. →	If output shaft speed sensor pins resistance is 2K to 4K ohms and If output shaft speed sensor pins to ground is 10K ohms or open circuit (OL) →	**Repair or replace transmission harness.** Go to **Step V.**
		If any of the above conditions are not met →	Go to **Step B.**



Code 58 (PID 191, FMI 2), Output Shaft Speed Sensor Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes (see page 1-4) 5. Use Driving Technique to attempt to reset the code. (see page 1-6)		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 58 appears →	Return to **Step A** to find error in testing.
		If code other than 58 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Component Code: 61 (SID 39, FMI 5,6) Rail Select Motor

Overview

This code indicates an electrical failure of the rail select motor that drives the electric shifter.

Detection

Starting at key-on and throughout operation, the Transmission Controller constantly measures the motor circuit. Failure mode of short to battery, short to ground, or open circuit is detected. The Transmission Controller also monitors the amount of current required to drive the motors. If the over current limit is exceeded, the fault code is also set.

Fallback

This fault causes an In Place fallback.

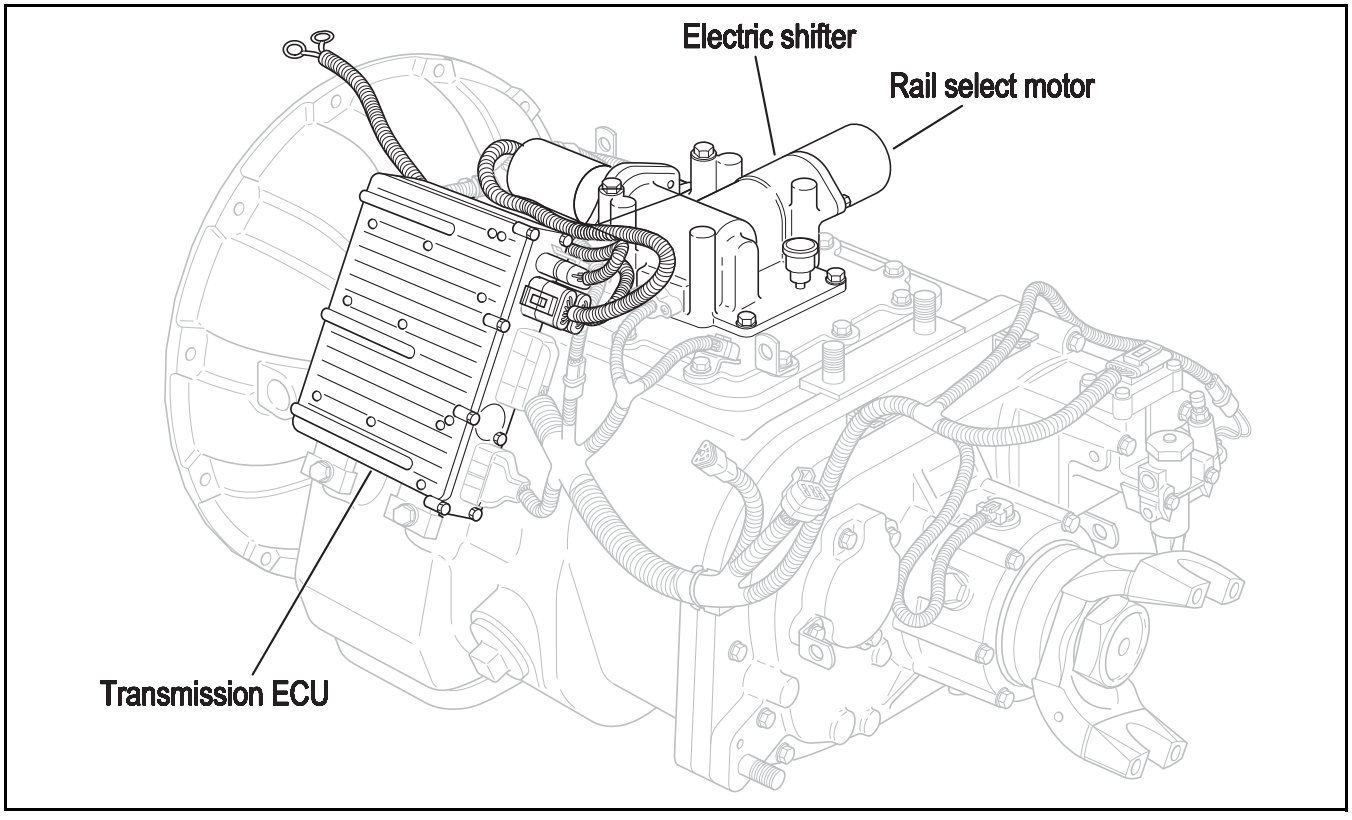
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Failed rail select motor
- Malfunctioning transmission ECU
- Power Interface Module

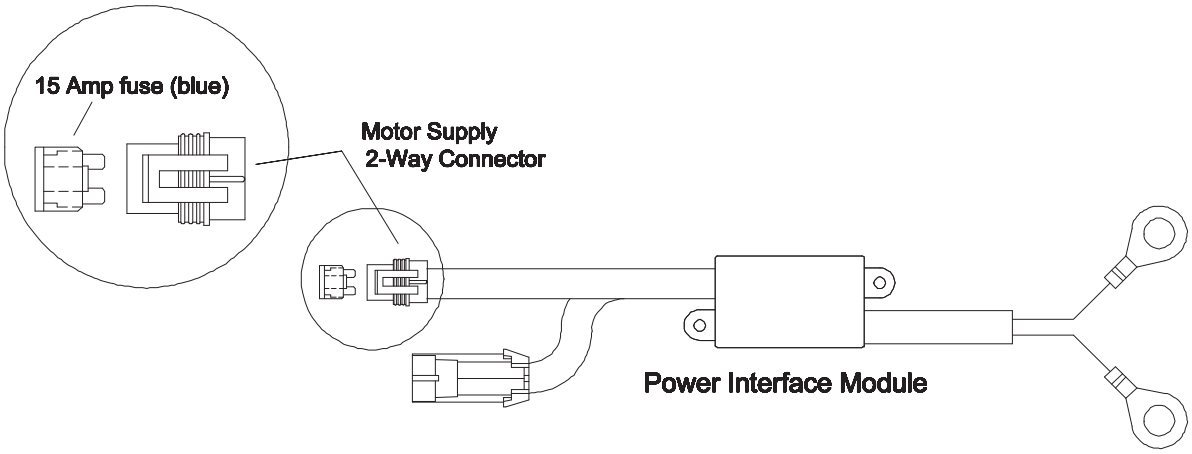


Code 61 (SID 39, FMI 5,6), Rail Select Motor Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Inspect starter/battery, inline fuse holder and PIM connections for integrity.	If okay →	Go to **Step B.**
		If corroded or loose →	Repair wiring or battery connections. Go to **Step V.**

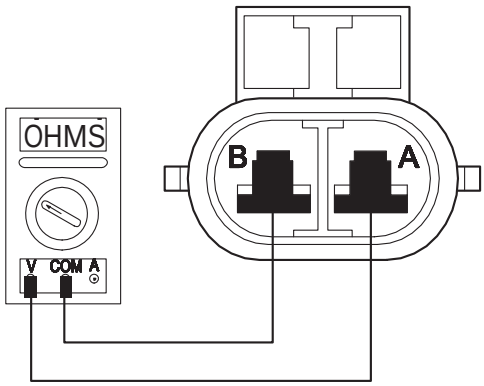
Code 61 (SID 39, FMI 5,6), Rail Select Motor Test, continued

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Insert 15-amp fuse into Motor Supply 2-way connector. →	If fuse blows immediately →	⚠ CAUTION **Disconnect negative battery cable before reconnecting motor supply 2-way connector** Go to **Step C.**
		If fuse does not blow immediately →	⚠ CAUTION **Disconnect the negative battery cable before reconnecting the motor supply 2-way connector. Failure to disconnect the battery negative cable can cause the failure of the power interface module. Replace power interface module.** Go to **Step V.**



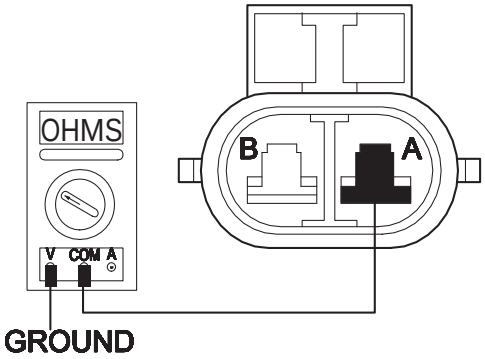
Code 61 (SID 39, FMI 5,6), Rail Select Motor Test, continued

Step C	Procedure	Condition	Action
	1. Disconnect rail select motor 2-way (black) connector from transmission ECU.		
	2. Measure the resistance across rail select 2-way connector pins. →	If resistance is .5 to 150 ohms →	Go to **Step D.**
		If resistance is outside of range →	**Replace electric shifter.** Go to **Step V.**



Code 61 (SID 39, FMI 5,6), Rail Select Motor Test, continued

Step D	Procedure	Condition	Action
	1. Measure resistance between rail select motor 2-way connector pin A and ground. →	If resistance is 10K ohms or open circuit (OL) →	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step E.**
		If resistance is outside of range →	**Replace electric shifter.** Go to **Step V.**



Step E	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect negative (-) battery cable.		
	3. Reconnect Motor Supply 2-way connector to transmission ECU.		
	4. Reconnect negative (-) battery cable.		
	5. Drive vehicle to determine whether fault code has been repaired. →	If fault code was repaired →	Go to **Step V.**
		If fault code 61 appears →	Go to **Step F.**

Code 61 (SID 39, FMI 5,6), Rail Select Motor Test, continued

Step F	Procedure	Condition	Action
	1. Key off.		
	2. Verify all connectors are seated correctly at the transmission ECU. →	If all connectors are seated correctly →	**Replace transmission ECU.** Go to **Step V.**
		If connectors are not seated correctly →	Seat all connectors. Go to **Step V.**

Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique to attempt to reset the code (see page 1-6)		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 61 appears →	Return to **Step A** to find error in testing.
		If code other than 61 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Component Code: 63 (SID 40, FMI 5,6) Gear Select Motor

Overview

This code indicates an electrical failure of the gear select motor that drives the electric shifter.

Detection

Starting at key-on and throughout operation, the Transmission Controller constantly measures the motor circuit. Failure mode of short to battery, short to ground, or open circuit is detected. The Transmission Controller also monitors the amount of current required to drive the motors. If the over current limit is exceeded, the fault code is also set.

Fallback

This fault causes an In Place fallback.

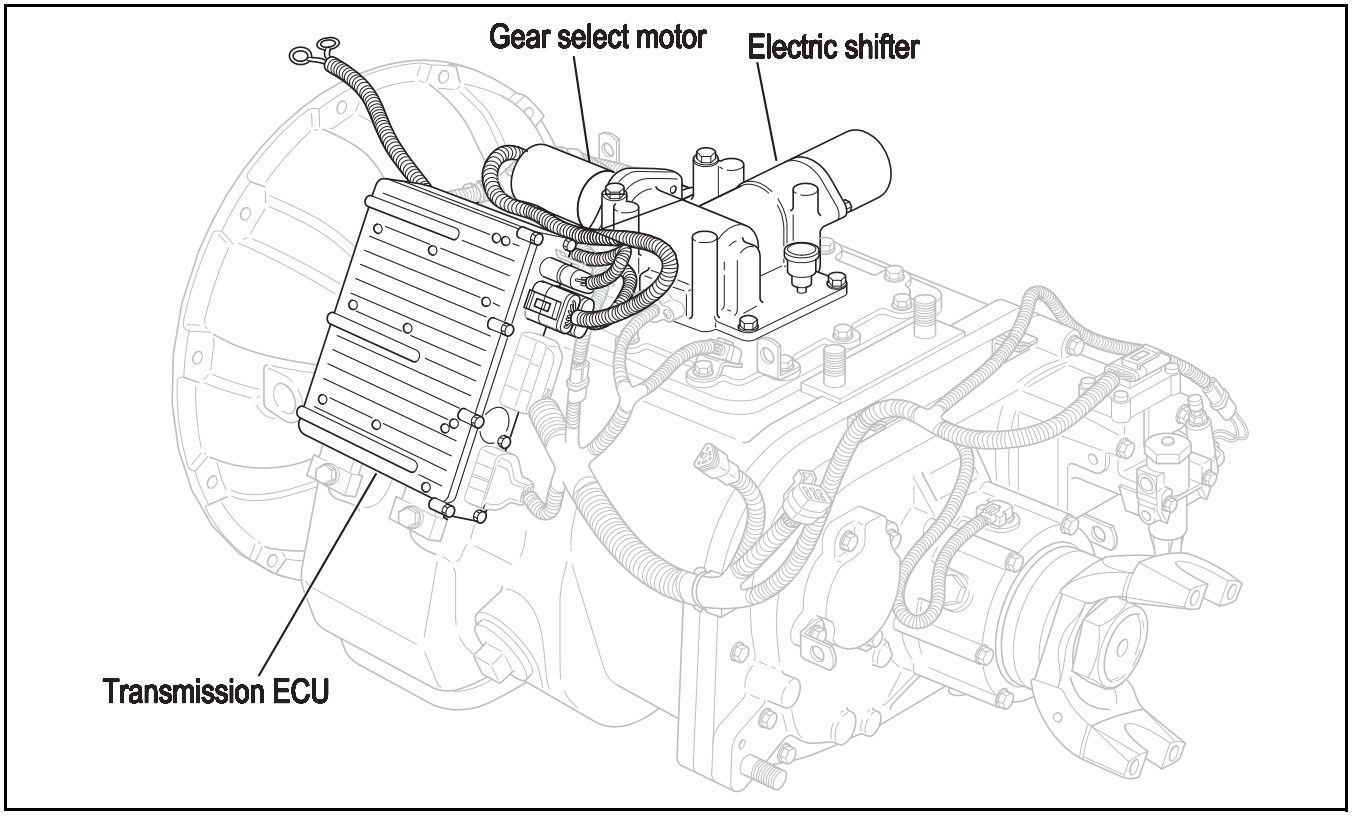
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Failed gear select motor
- Malfunctioning transmission ECU

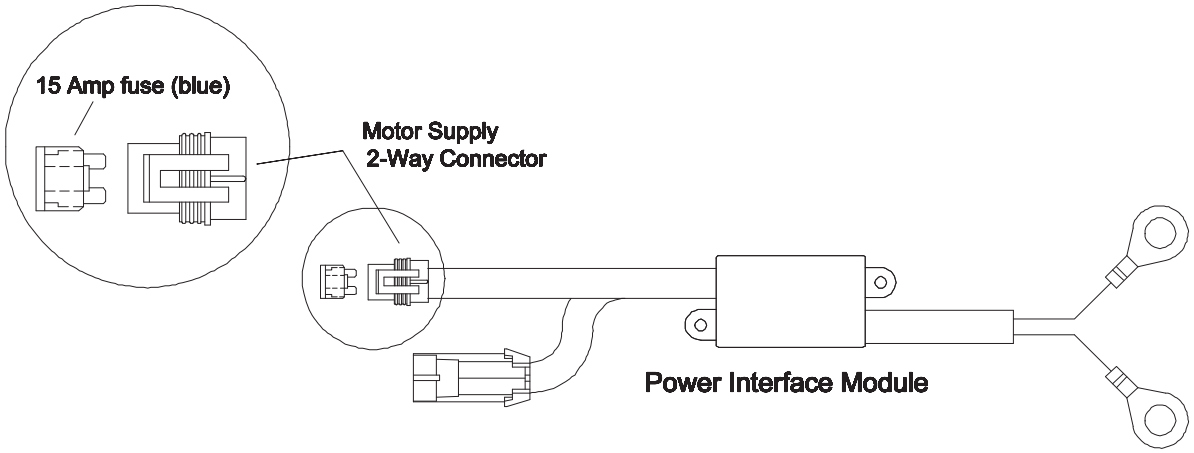


Code 63 (SID 40, FMI 5,6), Gear Select Motor Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Inspect starter/battery ,inline fuse holder and PIM connections for integrity.	If okay	Go to **Step B.**
		If corroded or loose	Repair wiring or battery connections. Go to **Step V.**

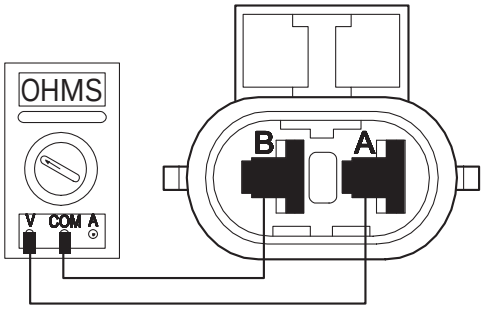
Code 63 (SID 40, FMI 5,6), Gear Select MotorTest, continued

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Insert 15-amp fuse into Motor Supply 2-way connector. →	If fuse blows immediately →	⚠ CAUTION **Disconnect negative battery cable before reconnecting motor supply 2-way connector.** Go to **Step C.**
		If fuse does not blow immediately →	⚠ CAUTION **Disconnect the negative battery cable before reconnecting the motor supply 2-way connector. Failure to disconnect the battery negative cable can cause the failure of the power interface module. Replace power interface module.** Go to Step **V.**



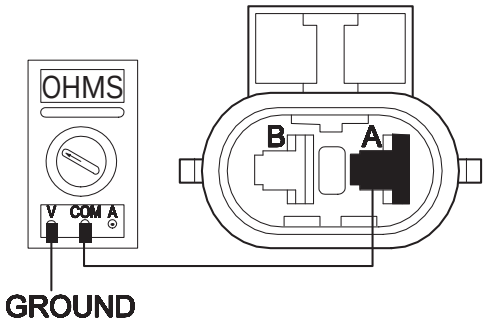
Code 63 (SID 40, FMI 5,6), Gear Select MotorTest, continued

Step C	Procedure	Condition	Action
	1. Disconnect gear select motor 2-way (blue) connector from transmission ECU.		
	2. Measure the resistance across gear select 2-way connector →	If resistance is .5 to 150 ohms →	Go to **Step D.**
		If resistance is outside of range →	**Replace electric shifter.** Go to **Step V.**



Code 63 (SID 40, FMI 5,6), Gear Select MotorTest, continued

Step D	Procedure	Condition	Action
	1. Measure resistance between gear select motor 2-way connector pin A and ground. →	If resistance is 10K ohms or open circuit [OL] →	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step E**
		If resistance is outside of range →	**Replace electric shifter.** Go to **Step V.**



Step E	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect negative (-) battery		
	3. Reconnect Motor Supply 2-way connector to transmission ECU.		
	4. Reconnect negative (-) battery cable.		
	5. Drive the vehicle to determine whether fault code has been repaired. →	If fault code 63 was repaired →	Go to **Step V.**
		If fault code 63 appears →	Go to **Step F.**

Code 63 (SID 40, FMI 5,6), Gear Select MotorTest, continued

Step F	Procedure	Condition	Action
	1. Key off.		
	2. Verify all connectors are seated correctly at the transmission ECU. →	If all connectors are seated correctly →	**Replace transmission ECU.** Go to **Step V.**
		If connectors are not seated correctly →	Seat all connectors. Go to **Step V.**

Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique to attempt to reset the code (see page 1-6)		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 63 appears →	Return to **Step A** to find error in testing.
		If code other than 63 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Component Code: 65 (SID 251, FMI 4) Low Motor Voltage

Overview

This code indicates the Transmission ECU has detected low battery power supply to the electric shifter motors.

Detection

Starting at key on and throughout operation, the Transmission ECU constantly measures the motor voltage. If the reading is low, the fault code is set.

Fallback

This causes an In Place fallback.

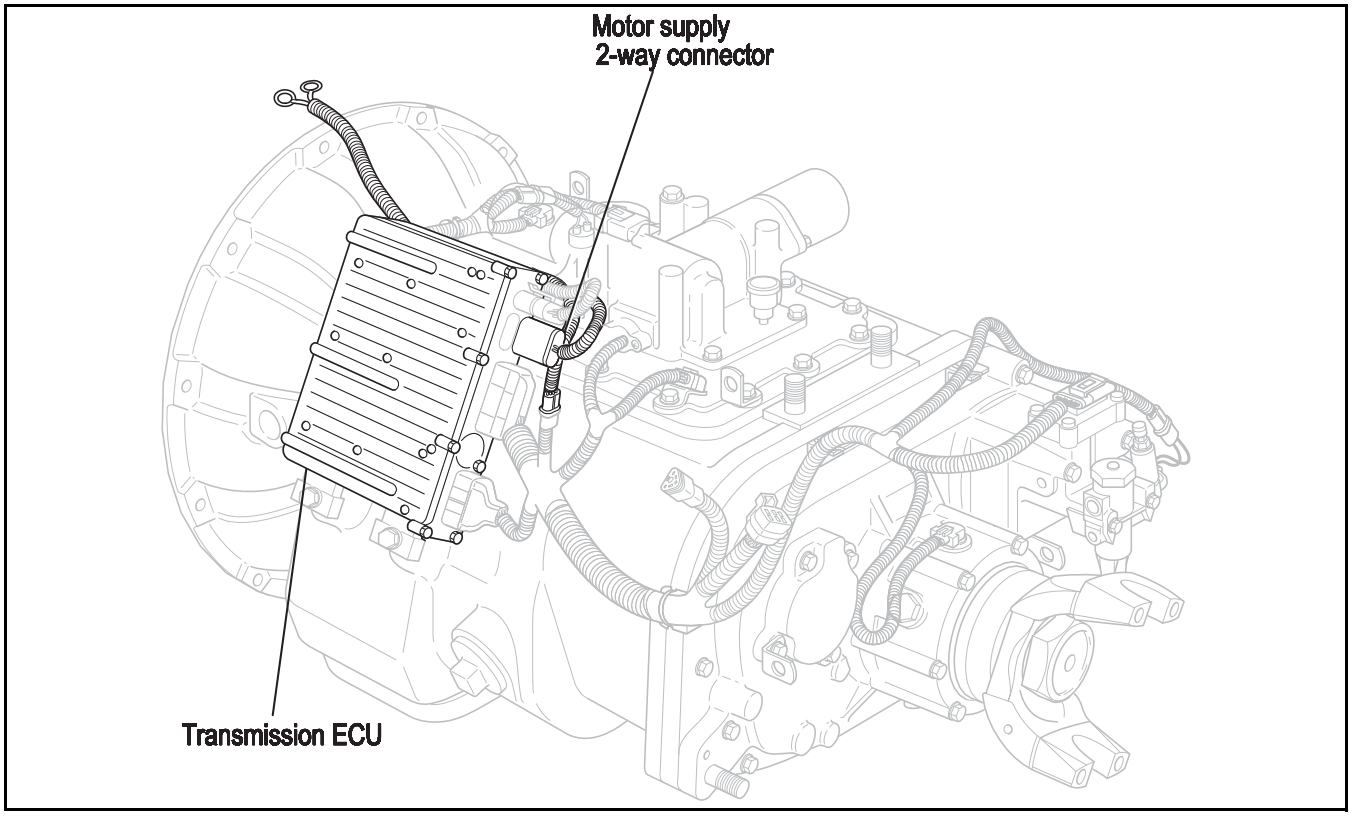
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Battery bus fuse/circuit breaker is open
- Low batteries
- Corroded or loose contacts
- Failed power interface module
- Malfunctioning transmission ECU

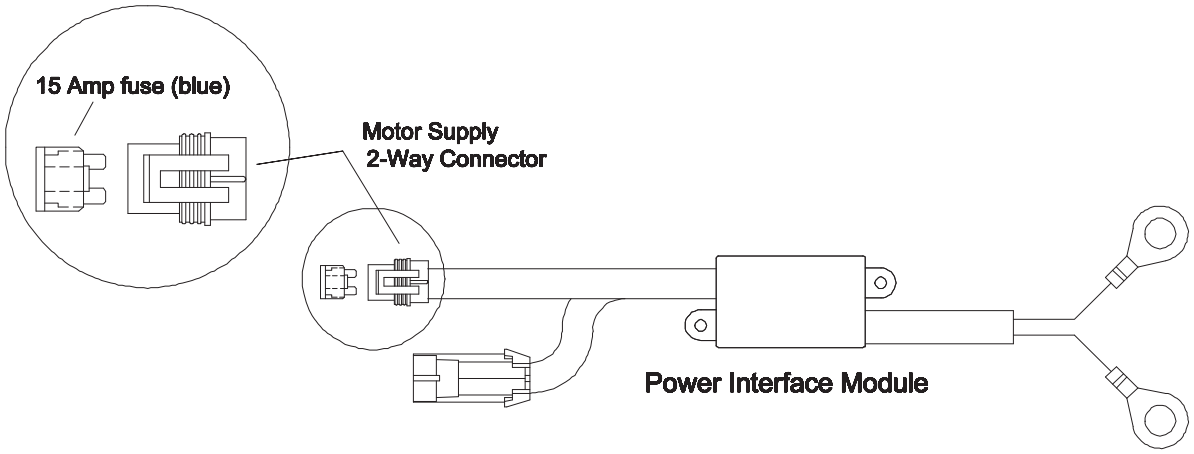


Code 65 (SID 251, FMI 4), Low Motor Voltage Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Inspect starter/battery ,inline fuse holder and PIM connections for integrity.	If okay →	Go to **Step B.**
		If corroded or loose →	Repair wiring or battery connections. Go to **Step V.**

Code 65 (SID 251, FMI 4), Low Motor Voltage Test, continued

Step B	Procedure	Condition	Action
	1. Key off. 2. Insert 15-amp fuse into Motor Supply 2-way connector.	If fuse blows immediately	⚠ CAUTION **Disconnect negative battery cable before reconnecting motor supply 2-way connector** Go to **Step C.**
		If fuse does not blow immediately	⚠ CAUTION **Disconnect the negative battery cable before reconnecting the motor supply 2-way connector. Failure to disconnect the battery negative cable can cause the failure of the power interface module. Replace power interface module.** Go to Step **V.**



Code 65 (SID 251, FMI 4), Low Motor Voltage Test, continued

Step C	Procedure	Condition	Action
	1. Key off. 2. Disconnect negative (-) battery cable. 3. Reconnect Motor Supply 2-way connector to transmission ECU. 4. Reconnect negative (-) battery cable. 5. Drive the vehicle to determine whether shift complaint has been repaired.	If fault code 65 was repaired	Go to **Step V.**
		If fault code 65 appears	Go to **Step D.**

Step D	Procedure	Condition	Action
	1. Key off. 2. Verify all connectors are seated correctly at the transmission ECU.	If all connectors are seated	**Replace transmission ECU (Only if Fault Code is Active).** Go to **Step V.**
		If connectors are not seated correctly	Seat all connectors. Go to **Step V.**

Step V	Procedure	Condition	Action
	1. Key off. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes (see page 1-4) 5. Use Driving Technique to attempt to reset the code (see page 1-6) 6. Retrieve Fault Codes(see page 1-4)	If no codes	Test complete.
		If code 65 appears	Return to **Step A** to find error in testing.
		If code other than 65 appears	Go to Fault Code Isolation Procedure Index. (see page 1-10)

System Code: 71 (SID 60, FMI 7) Stuck Engaged

Overview

This code indicates the transmission was unable to move the front box to neutral, during a shift request.

Detection

The transmission detects this by attempting the same shifter actions five times and not sensing the desired position.

Fallback

This causes an In Place Fallback.

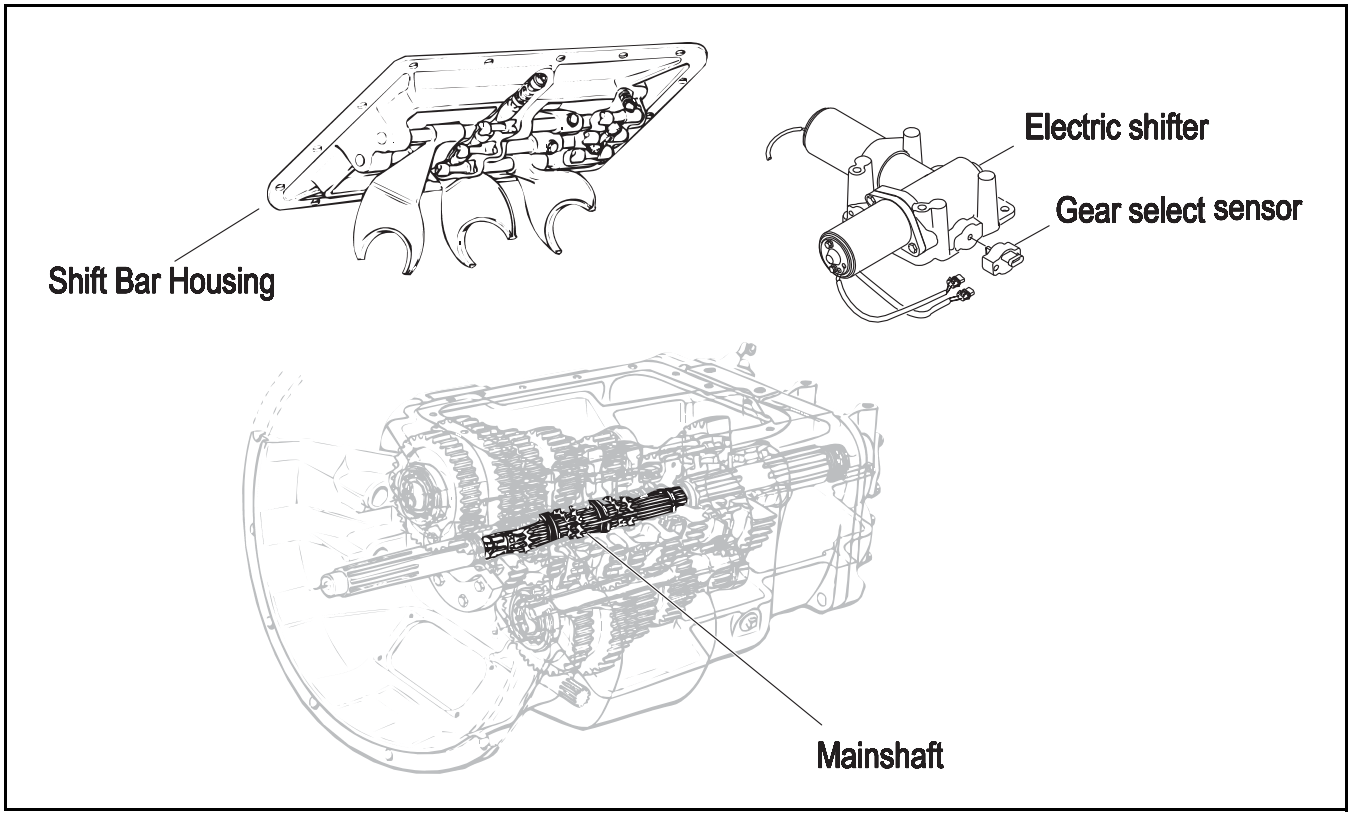
Required Tools

- Basic Hand Tools
- AutoSelect/AutoShift Troubleshooting Guide

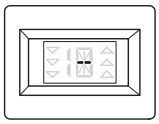
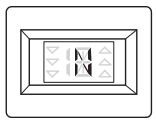
Possible Causes

This fault can be caused by any of the following:

- Low power to gear select motor
- Failed gear select sensor
- Malfunctioning electric shifter
- Malfunctioning yoke/clutch/mainshaft
- Failed shift block
- Failed or misaligned shift block
- Electric shifter calibration
- Dragging clutch
- Torque locked in gear



Code 71 (SID 60, FMI 7), Stuck Engaged Test

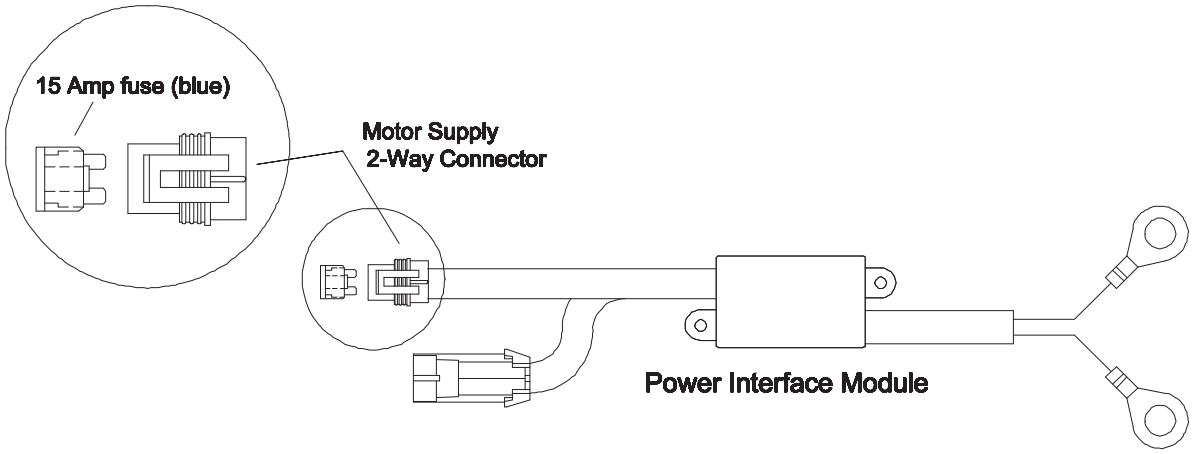
Step A	Procedure	Condition	Action
	1. Place shift lever in neutral. 2. Depress the clutch pedal. 3. Key on. 4. Observe service lamp.	If wait light is on constantly or Gear display shows: 	Go to **Step B.**
		If no lights or tones turn on	Perform Electrical Pretest (see page 2-2)
		If "N" is highlighted on shift lever and Gear display shows 	Test complete.

Code 71 (SID 60, FMI 7), Stuck Engaged Test, continued

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Inspect starter/battery ,inline fuse holder and PIM connections for integrity.	If okay →	Go to **Step C.**
		If corroded or loose →	Repair wiring or battery connections. Go to **Step V.**

Code 71 (SID 60, FMI 7), Stuck Engaged Test, continued

Step C	Procedure	Condition	Action
	1. Key off.		
	2. Insert 15-amp fuse into Motor Supply 2-way connector. →	If fuse blows immediately →	⚠ CAUTION **Disconnect negative battery cable before reconnecting motor supply 2-way connector.** Go to **Step D.**
		If fuse does not blow immediately →	⚠ CAUTION **Disconnect the negative battery cable before reconnecting the motor supply 2-way connector. Failure to disconnect the battery negative cable can cause the failure of the power interface module. Replace power interface module.** Go to Step **V.**



Code 71 (SID 60, FMI 7), Stuck Engaged Test, continued

Step D	Procedure	Condition	Action
	1. Remove electric shifter from shift bar housing.		
	2. Inspect electric shifter and shift bar housing. • Shift blocks • Roll pins • Finger movement • Mechanical linkages	If no problem found →	**Replace electric shifter.** Go to **Step V.**
		If problem found →	Repair as required. Go to **Step V.**

Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique to attempt to reset the code (see page 1-6)		
	6. Retrieve Fault Codes (see page 1-4)	If no codes →	Test complete.
		If code 71 appears code →	Return to **Step A** to find error in testing.
		If code other than 71 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 71 (SID 60, FMI 7), Stuck Engaged Test, continued

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System Code: 72
(SID 59, FMI 7)
Failed to Select Rail

Overview

This code indicates the transmission is unable to select the required rail during a shift.

Detection

The transmission detects this by attempting the same shifter actions five times and not sensing the desired position.

Fallback

This causes an In Place fallback.

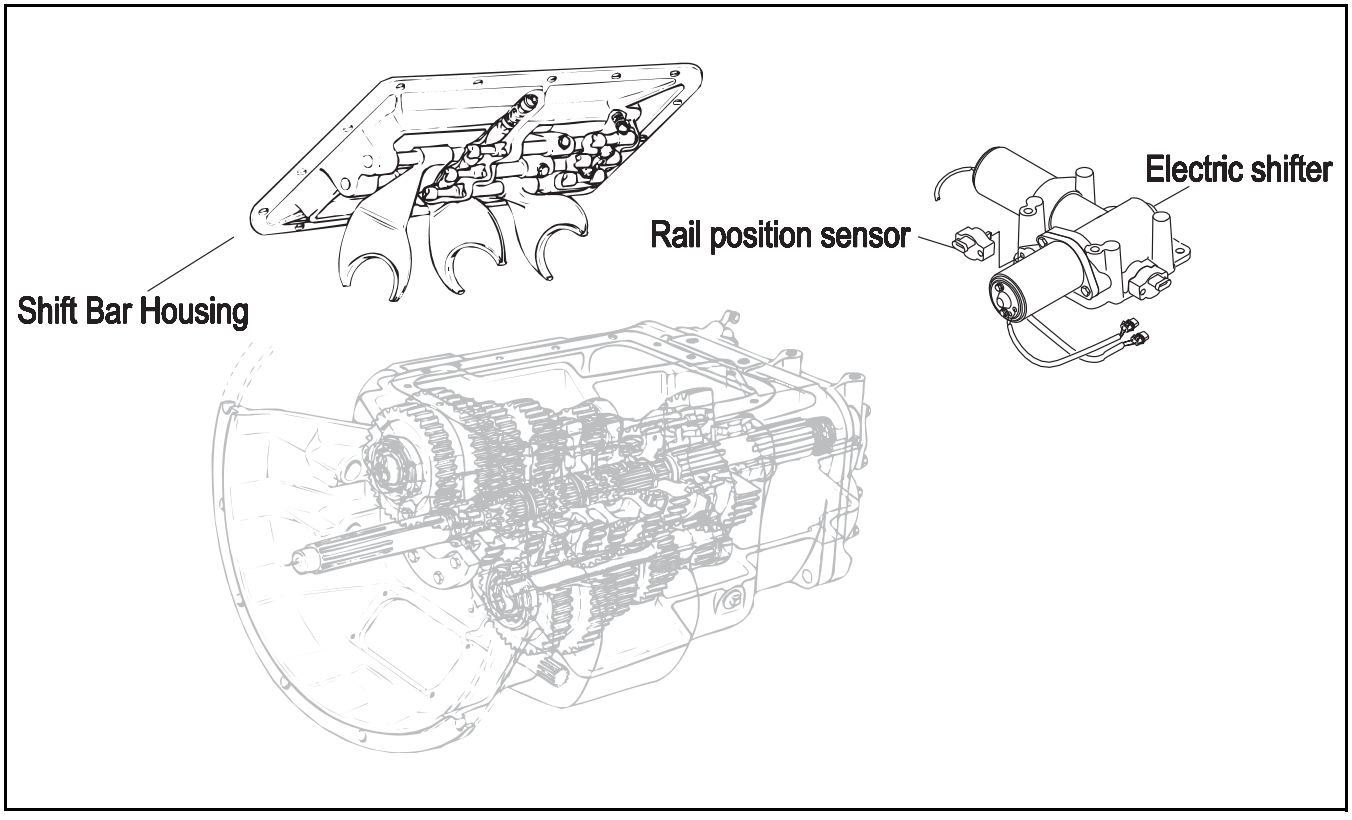
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Low power to rail motor
- Failed rail select motor
- Failed rail select sensor
- Failed or misaligned shift block
- Malfunctioning transmission ECU

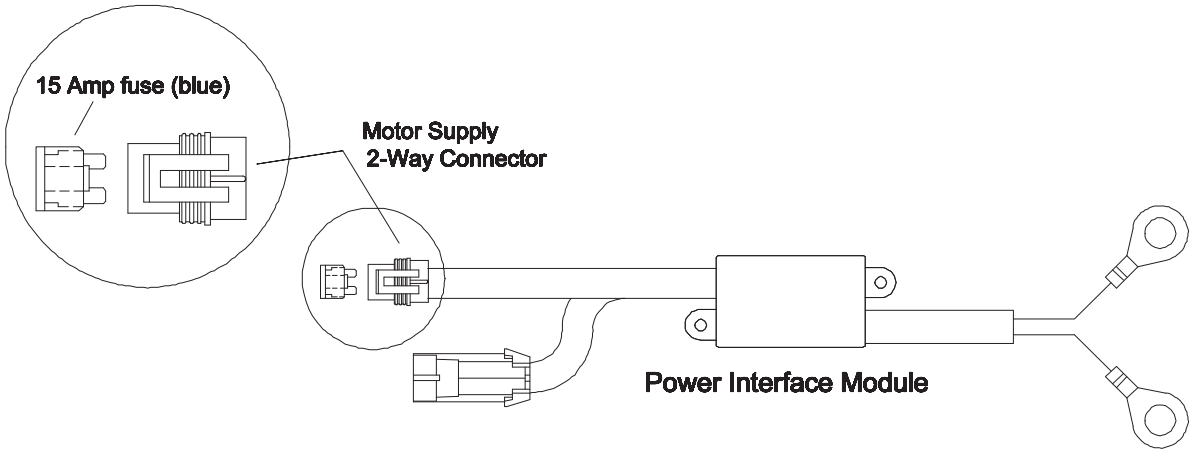


Code 72 (SID 59, FMI 7), Failed to Select Rail Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Inspect starter/battery ,inline fuse holder and PIM connections for integrity.	If okay →	Go to **Step B.**
		If corroded or loose →	Repair wiring or battery connections. Go to **Step V.**

Code 72 (SID 59, FMI 7), Failed to Select Rail Test, continued

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Insert 15-amp fuse into Motor Supply 2-way connector. →	If fuse blows immediately →	⚠ CAUTION **Disconnect negative battery cable before reconnecting motor supply 2-way connector.** Go to **Step C.**
		If fuse does not blow immediately →	⚠ CAUTION **Disconnect the negative battery cable before reconnecting the motor supply 2-way connector. Failure to disconnect the battery negative cable can cause the failure of the power interface module. Replace power interface module.** Go to Step **V.**



Code 72 (SID 59, FMI 7), Failed to Select Rail Test, continued

Step C	Procedure	Condition	Action
	1. Remove electric shifter from shift bar housing.		
	2. Inspect electric shifter and shift bar housing. • Shift blocks • Roll pins • Finger movement • Mechanical linkages	If no problem found	**Replace electric shifter.** Go to **Step V.**
		If problem found	Repair as required. Go to **Step V.**

Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique to attempt to reset the code (see page 1-6)		
	6. Retrieve Fault Codes (see page 1-4)	If no codes	Test complete.
		If code 72 appears	Return to **Step A** to find error in testing.
		If code other than 72 appears	Go to Fault Code Isolation Procedure Index. (see page 1-10)

System Code: 73
(SID 58, FMI 7)
Failed to Engage Gear

Overview

This code indicates the transmission is unable to engage the desired gear in the front box during a shift.

Detection

The transmission detects this by attempting the same shifter actions five times and not sensing the desired position.

Fallback

This causes an In Place fallback.

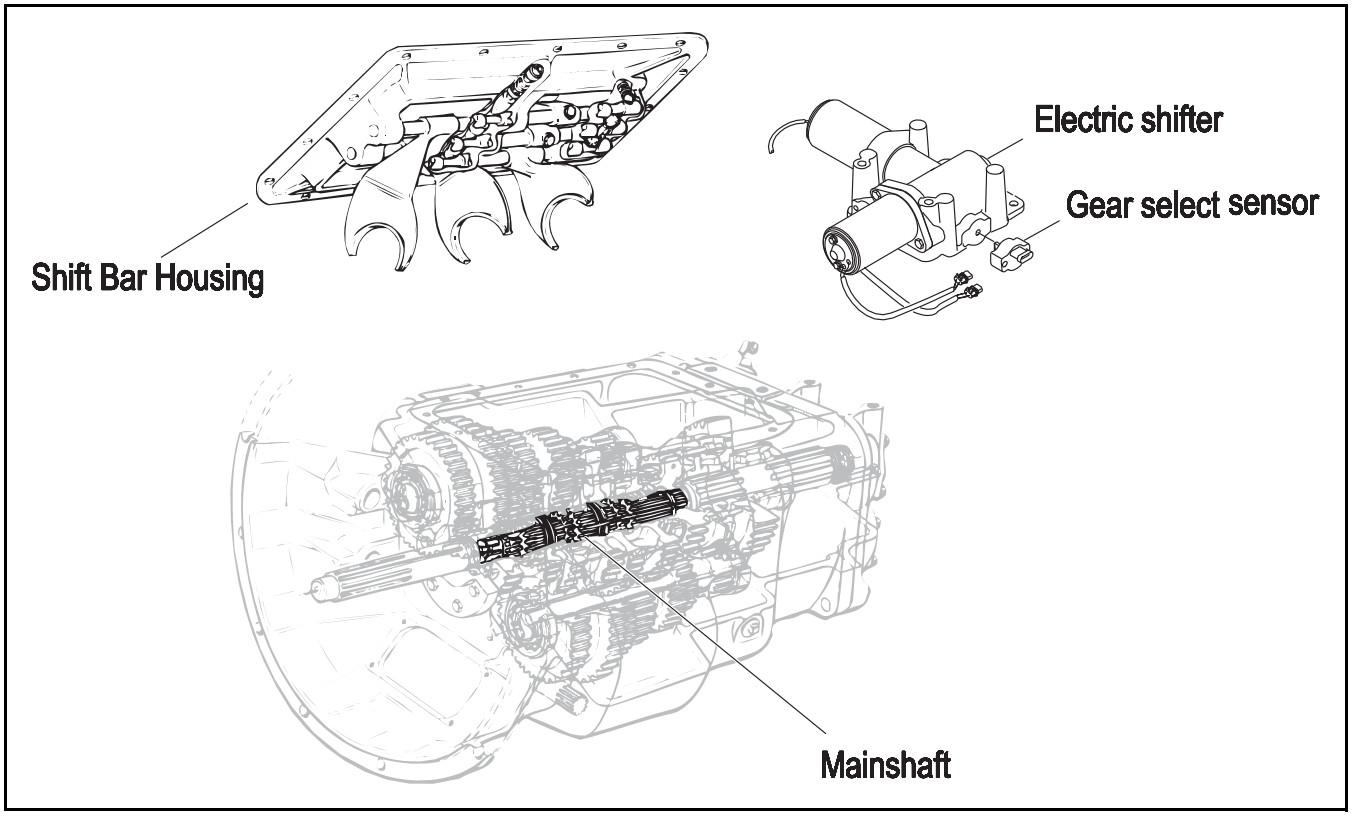
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Malfunctioning electric shifter
- Malfunctioning yoke/clutch/mainshaft
- Failed shift block
- Failed or misaligned shift block
- Electric shifter calibration
- Failed gear select sensor

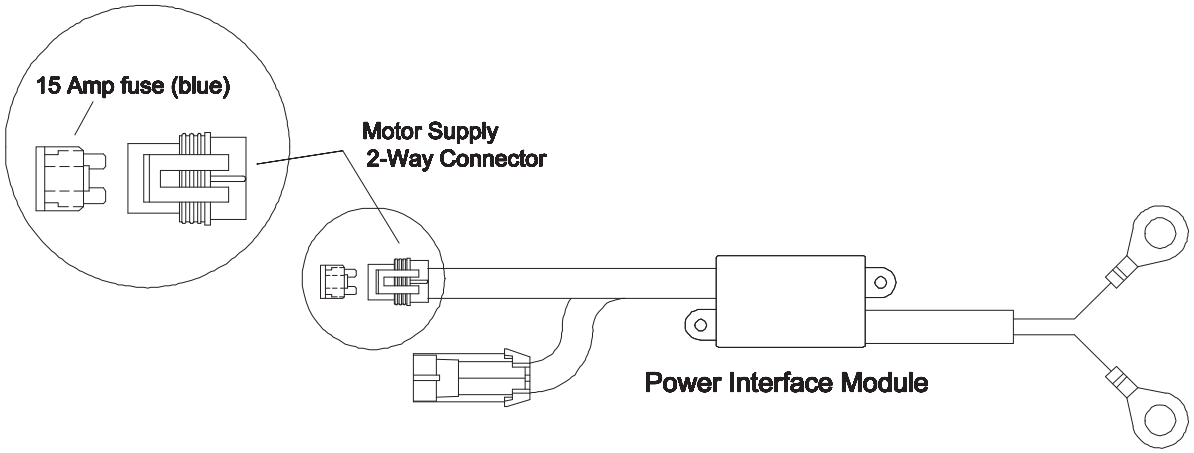


Code 73 (SID 58, FMI 7), Failed to Engage Gear Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Inspect starter/battery ,inline fuse holder and PIM connections for integrity.	If okay →	Go to **Step B.**
		If corroded or loose →	Repair wiring or battery connections. Go to **Step V.**

Code 73 (SID 58, FMI 7), Failed to Engage Gear Test, continued

Step B	Procedure	Condition	Action
	1. Key off. 2. Insert 15-amp fuse into Motor Supply 2-way connector.	If fuse blows immediately →	⚠ CAUTION **Disconnect negative battery cable before reconnecting motor supply 2-way connector.** Go to **Step C.**
		If fuse does not blow immediately →	⚠ CAUTION **Disconnect the negative battery cable before reconnecting the motor supply 2-way connector. Failure to disconnect the battery negative cable can cause the failure of the power interface module. Replace power interface module.** Go to **Step V.**



Code 73 (SID 58, FMI 7), Failed to Engage Gear Test, continued

Step C	Procedure	Condition	Action
	1. Remove electric shifter from shift bar housing.		
	2. Inspect electric shifter and shift bar housing. • Shift blocks • Roll pins • Finger movement • Mechanical linkages	If no problem found	**Replace electric shifter.** Go to **Step V.**
		If problem found	Repair as required. Go to **Step V.**

Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Clear Fault Codes (see page 1-4)		
	5. Use Driving Technique to attempt to reset the code (see page 1-6)		
	6. Retrieve Fault Codes (see page 1-4)	If no codes	Test complete.
		If code 73 appears	Return to **Step A** to find error in testing.
		If code other than 73 appears	Go to Fault Code Isolation Procedure Index. (see page 1-10)

System Code: 74
(SID 54, FMI 7)
Failed to Sync Initial Engagement

Overview

This code indicates the system was unable to bring input shaft to a stop using the interia brake.

Detection

The System Manager monitors engine rpm before initial gear engagement. If the inertia brake is commanded on and the engine rpm does not drop below the acceptable limit this code will be set.

Fallback

There is no fallback mode for this fault.

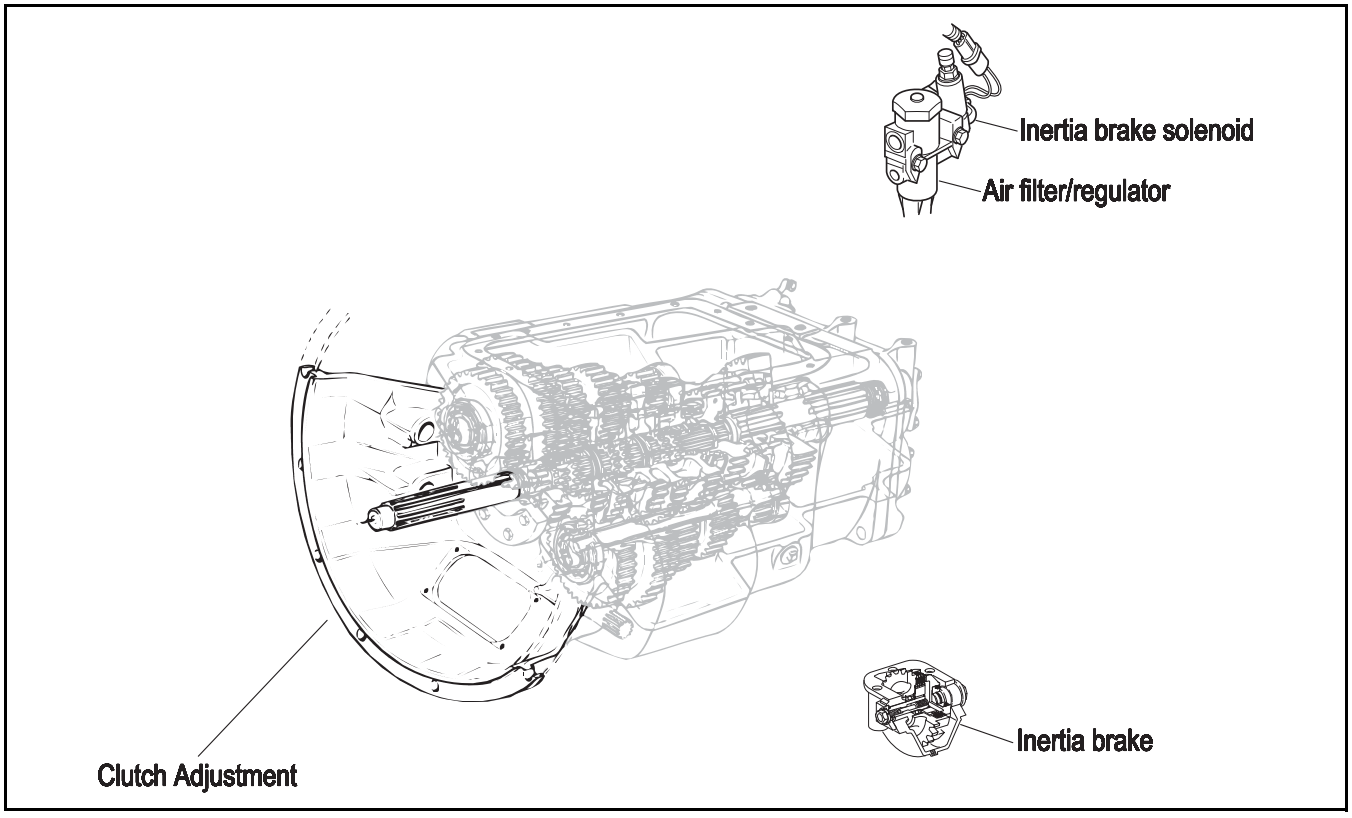
Required Tools

- Basic Hand Tools
- Hand-Held Diagnostic Tool
- 0-100 PSI Air Pressure Gauges
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Low air pressure
- Contaminated air supply
- Clutch out of adjustment
- Damaged input shaft brake
- Malfunctioning inertia brake
- Damaged internal transmission gearing



Code 74 (SID 54, FMI 7), Failed to Sync Initial Engagement Test

Step A	Procedure	Condition	Action
	1. Key on. 2. Connect hand-held diagnostic tool and monitor input shaft speed. 3. Fully depress the clutch pedal all the way to engage the input shaft brake. →	If the input shaft speed rapidly drops to 0 RPM →	Go to **Step B.**
		If the input shaft does not rapidly drop to 0 RPM →	The clutch is out of adjustment or the input shaft brake needs to be replaced. Repair or replace as required. Repeat this step.

Step B	Procedure	Condition	Action
	1. Key off. 2. Tee a 0 to 100 PSI air gauge in the supply between the inertia brake solenoid and the air filter/ regulator. 3. Key on. 4. Observe the gauge. →	If pressure is 58 to 63 PSI →	Go to **Step C.**
		If pressure is outside of range →	**Replace the air filter/regulator.** Go to **Step V.**

Code 74 (SID 54, FMI 7), Failed to Sync Initial Engagement Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Locate the air line from the inertia brake solenoid to the inertia brake. 3. Tee a 0 to 100 PSI air pressure gauge in the inertia brake line. 4. Key on. Allow air system to reach governor cut-off. 5. Place the transmission in "D". 6. Monitor the input shaft speed with the hand-held diagnostic tool. 7. Slowly depress the clutch pedal and keep the input shaft between 250 to 350 RPM for more than 10 seconds. (The transmission will not engage starting gear until input shaft speed drops below 150 RPM).		
	8. Observe the gauge. →	If pressure is 58 to 63 PSI →	**Replace the inertia brake.** Go to **Step V.**
		If pressure is outside of range →	**Replace the inertia brake solenoid.** Go to **Step V.**

Code 74 (SID 54, FMI 7), Failed to Sync Initial Engagement Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Remove air gauges. 3. Connect connectors. 4. Key on. 5. Clear Fault Codes (see page 1-4) 6. Use Driving Technique to attempt to reset the code (see page 1-6)		
	7. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 74 appears →	Return to **Step A** to find error in testing.
		If code other than 74 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Component Code: 83 (SID 18, FMI 14) Shift Lever Missing

Overview

This code indicates the Eaton or OEM Shift Lever is not sensing any lever positions.

Detection

Starting at key-on and throughout operation, the System Manager constantly measures the feedback from the Shift Lever circuit. If the Shift Lever reports no lever positions are sensed, the fault code is set. To allow the System Manager to detect this fault, it is necessary to turn the key on since it constantly monitors for this failure mode.?

Fallback

This fault causes a downshift only fallback and shifts to neutral when the vehicle stops.?

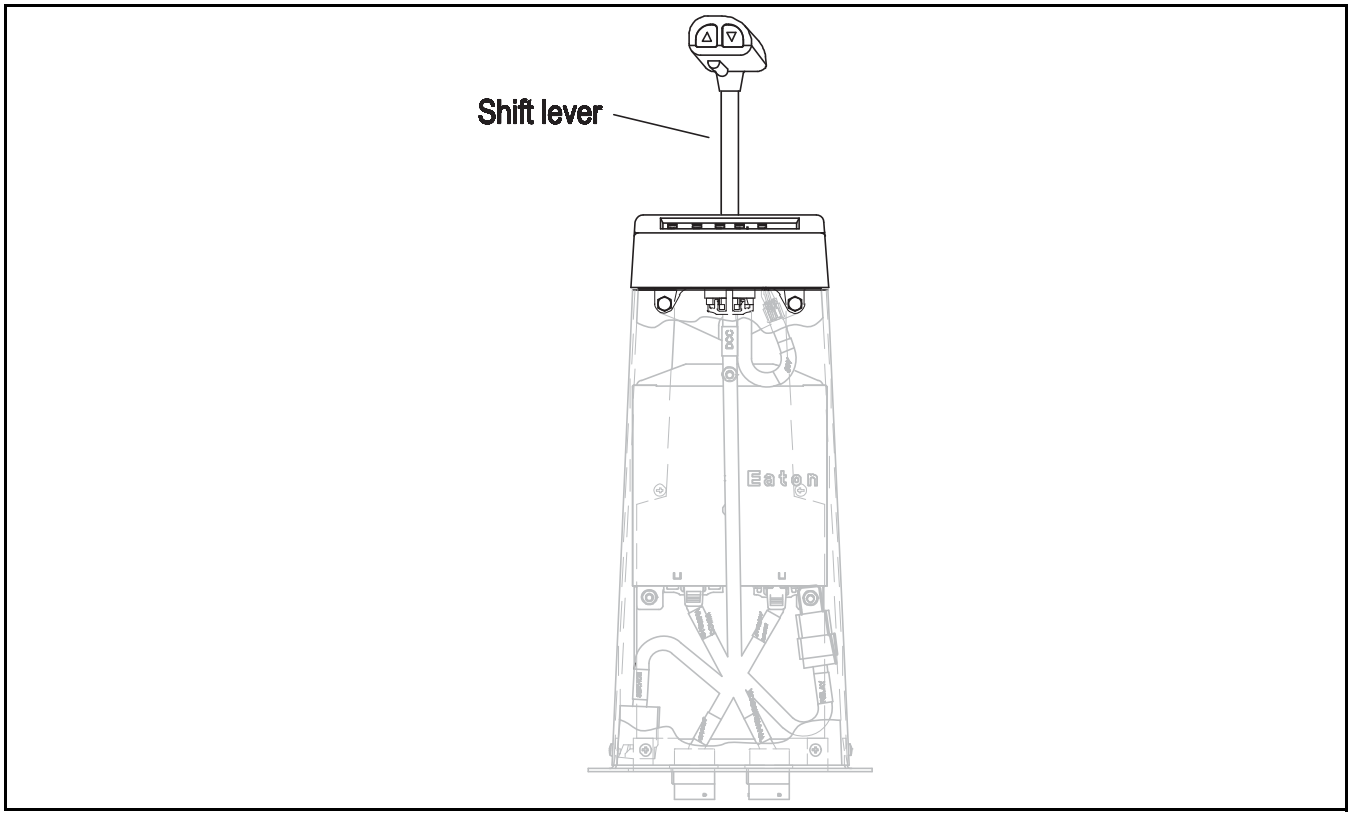
Required Tools

- Basic Hand Tools
- AutoSelect/AutoShift Troubleshooting Guide

Possible Causes

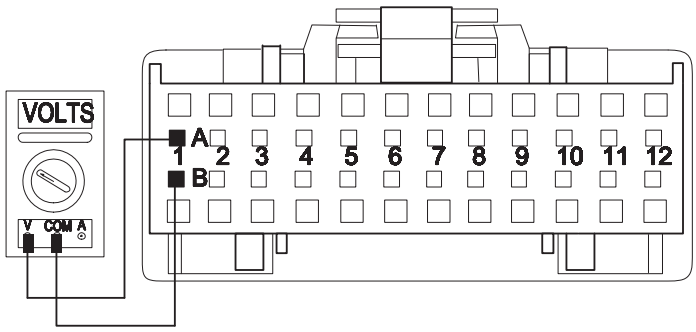
This fault can be caused by any of the following:

- Lever placed between positions



Code 83 (SID 18, FMI 14), Shift Lever Missing Test

Step A	Procedure	Condition	Action
	1. Key off. 2. Disconnect shift lever 24-way connector. 3. Key on. 4. Measure voltage across shift lever 24-way connector pins A1 and B1.	If voltage is within 1 volt of battery voltage	**Replace shift lever.** Go to **Step V.**
		If voltage is outside of range	Repair ignition supply to shift lever. Go to **Step V.**



Code 83(SID 18, FMI 14), Shift Lever Missing Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes (see page 1-4) 5. Use Driving Technique to attempt to reset the code(see page 1-6)		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 83 appears →	Return to **Step A** to find error in testing.
		If code other than 83 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Code 83(SID 18, FMI 14), Shift Lever Missing Test, continued

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Electrical System

Overview

The test does not relate to any specific fault code, but must be completed before performing Fault Code Isolation Table procedures. The pretest verifies the basic electrical inputs before testing individual circuits.

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 effect other systems.

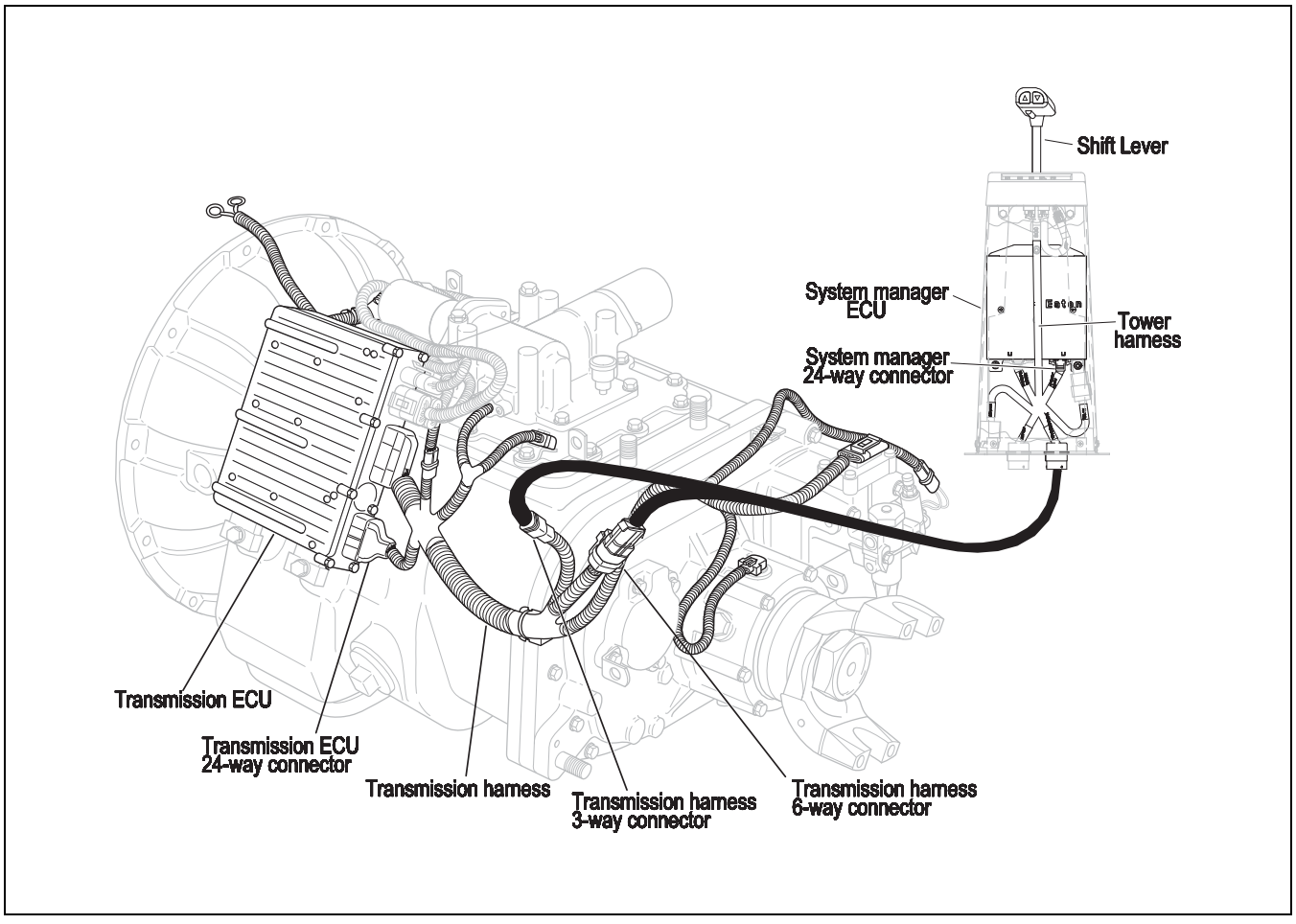
Required Tools

- Basic Hand Tools
- Eaton Test Adapter Kit
- Digital Volt/Ohm Meter
- Troubleshooting Guide

Possible Causes

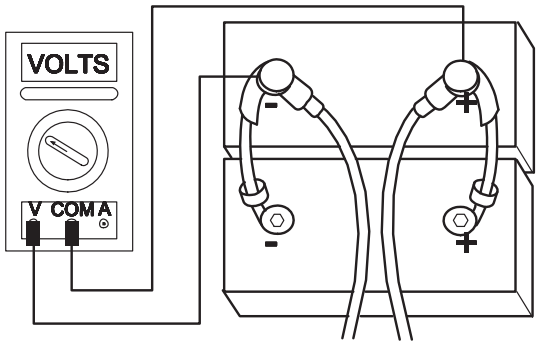
This pretest can be used for any of the following:

- Corroded Power Contacts
- Blown Fuse
- Wiring Harness
- Low Batteries



Electrical System Test

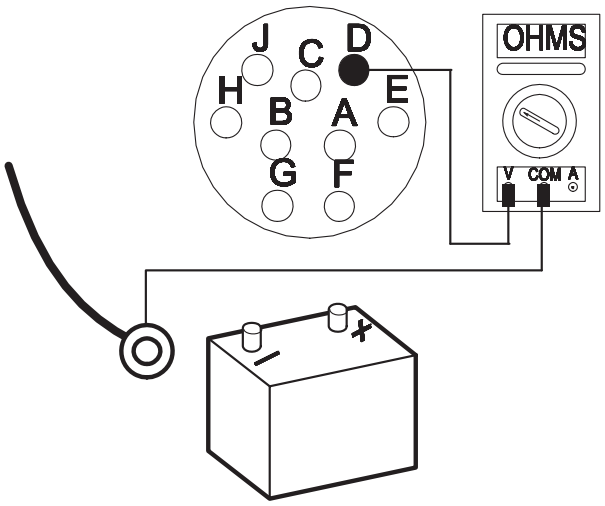
Step A	Procedure	Condition	Action
	1. Key off.		
	2. Inspect starter/battery connections for integrity.		
	3. Measure voltage across battery. →	If voltage is 11 to 13 volts on a 12 volt system or	
		22 to 26 on a 24 volt system →	Go to **Step B.**
		If voltage is outside of range →	Repair or replace batteries and charging system as required. Repeat this step.



Step B	Procedure	Condition	Action
	1. Key off.		
	2. Load Test the Baterys. →	If the batteries maintain the specified load →	Go to **Step C.**
		If the battery's fail the load test →	Replace the damaged battery/s and repeat this step.

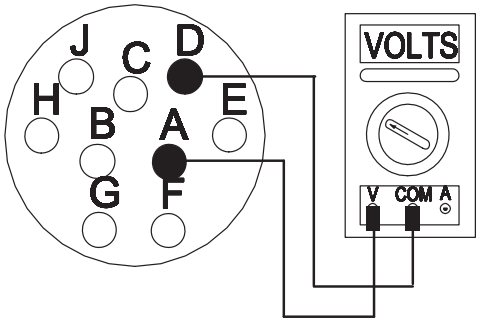
Electrical System Test, continued

Step C	Procedure	Condition	Action
	1. Locate service port (located in shift tower.) 2. Key off. 3. Disconnect negative (-) battery cable.		
	4. Measure resistance between service port pin D and negative battery cable. →	If resistance is 0 to .3 ohms →	Go to **Step D.**
		If resistance is outside of range →	Repair ground path for transmission. Repeat this step. **Note:** See wiring diagrams for typical ground path diagram.



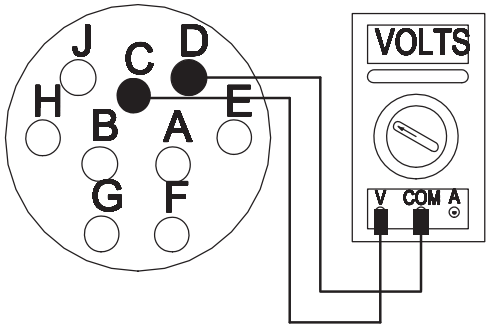
Electrical System Test, continued

Step D	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect negative (-) battery cable.		
	3. Measure voltage across service port pins A and D. →	If voltage is less than 1 volt →	Go to **Step E.**
		If voltage is outside of range →	Constant ignition power, repair ignition supply to transmission. Repeat this step.



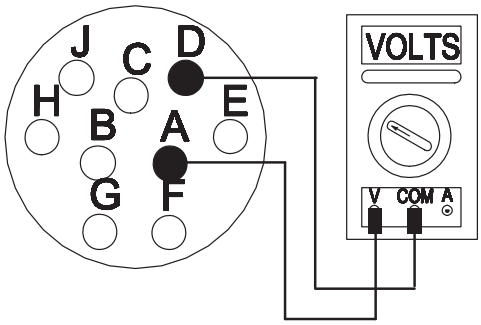
Electrical System Test, continued

Step E	Procedure	Condition	Action
	1. Key off.		
	2. Measure voltage across service port pins D and C. →	If voltage is less than 1 volt →	Go to **Step F.**
		If voltage is outside of range →	Go to **Step G.**



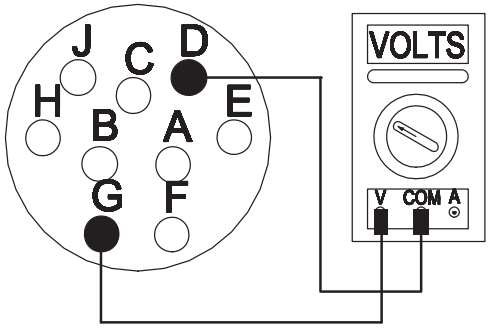
Electrical System Test, continued

Step F	Procedure	Condition	Action
	1. Key on.		
	2. Measure voltage across service port pins A and D. →	If voltage is within 1 volt of battery voltage →	Go to **Step G.**
		If there is no voltage →	No ignition power, repair ignition power supply to transmission. Repeat this step.



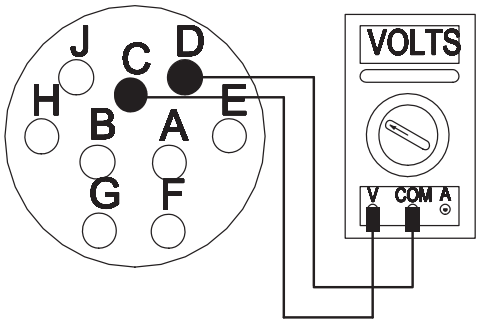
Electrical System Test, continued

Step G	Procedure		Condition		Action
	1. Key on.				
	2. Measure voltage across service port pins G and D.	→	If voltage is within 2 volts of battery voltage	→	Go to **Step H.**
			If voltage is outside of range	→	Go to **Step J.**



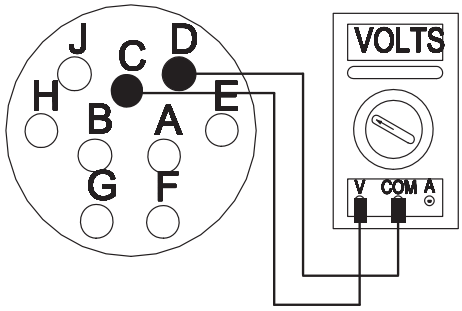
Electrical System Test, continued

Step H	Procedure	Condition	Action
	1. Key on.		
	2. Measure voltage across service port pins C and D. →	If voltage is within 1 volt of battery voltage →	Test complete. (Do not proceed further).
		If voltage is outside of range →	Go to **Step L.**



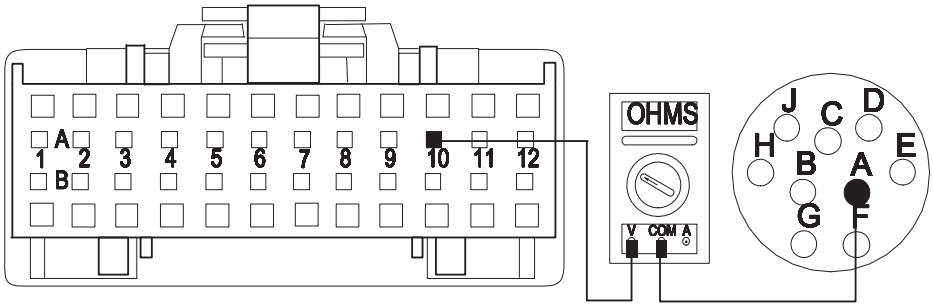
Electrical System Test, continued

Step I	Procedure	Condition	Action
	1. Key off.		
	2. Remove power connect relay.		
	3. Measure voltage across service port pins D and C. →	If voltage is within 1 volt of battery voltage →	Constant battery power, repair battery supply to transmission. Go to **Step E.**
		If voltage is outside of range →	**Replace power connect relay.** Go to **Step E.**



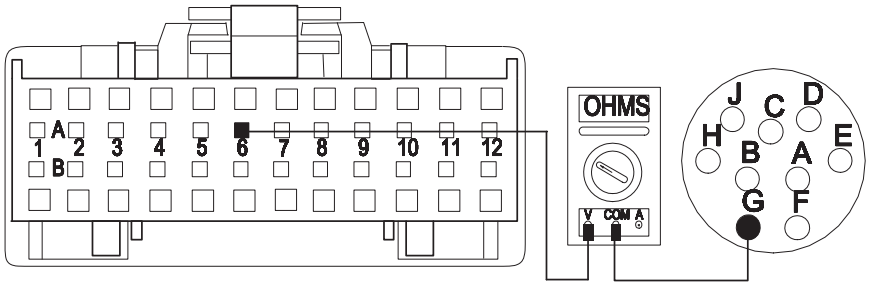
Electrical System Test, continued

Step J	Procedure	Condition	Action
	1. Disconnect system manager 24-way connector.		
	2. Measure resistance between system manager 24-way connector pin A10 and service port pin A. →	If resistance is 0 to .3 ohms →	Go to **Step K.**
		If resistance is outside of range →	**Repair or replace tower harness as required.** Repeat this step.



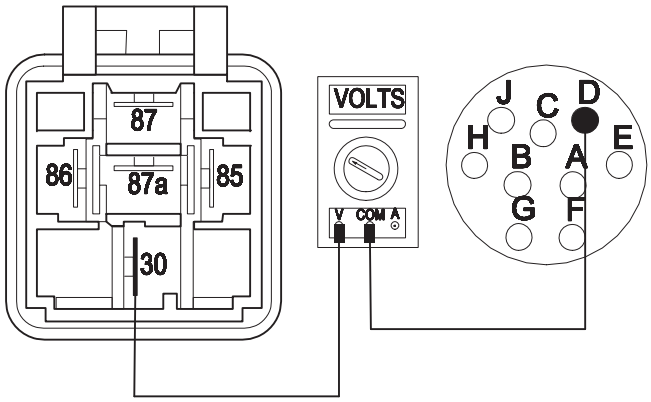
Electrical System Test, continued

Step K	Procedure	Condition	Action
	1. Measure resistance between system manager 24-way connector pin A6 and service port pin G. →	If resistance is 0 to .3 ohms →	**Replace system manager ECU.** Go to **Step E.**
		If resistance is outside of range →	**Repair or replace tower harness as required.** Go to **Step E.**



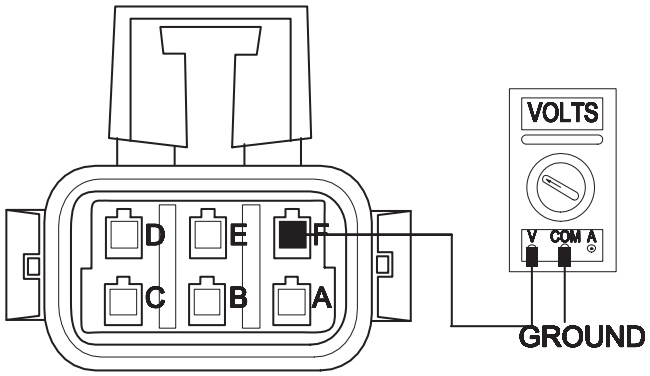
Electrical System Test, continued

Step L	Procedure	Condition	Action
	1. Disconnect power connect relay connector.		
	2. Measure voltage between power connect relay connector pin 30 and service port pin D. →	If voltage is within 1 volt of battery voltage →	**Replace power connect relay**. Repeat **Step H.**
		If voltage is outside of range →	Go to **Step M.**



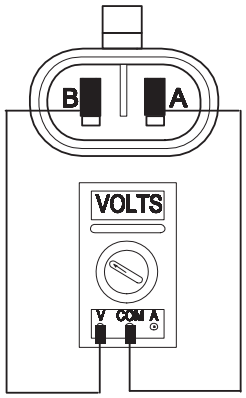
Electrical System Test, continued

Step M	Procedure	Condition	Action
	1. Reconnect power connect relay connector. 2. Disconnect transmission harness from transmission interface harness. 3. Measure voltage between transmission pin F and ground.	If voltage is within 1 volt of battery voltage	Repair vehicle interface harness as required. Go to **Step E.**
		If voltage is outside of range	Go to **Step N.**



Electrical System Test, continued

Step N	Procedure	Condition	Action
	1. Disconnect power module connector at transmission harness.		
	2. Measure voltage between power interface module connector pins. →	If voltage is within 1 volt of battery voltage →	**Repair or replace transmission harness as required.** Go to **Step E.**
		If voltage is outside of range →	Go to **Step O.**



Step O	Procedure	Condition	Action
	1. Check battery ground to power module. →	If battery and ground connections are okay →	**Replace power interface module.** Go to **Step V.**
		If battery and ground connections are not okay →	Repair connections and retest. Go to **Step A.**

Electrical System Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes (see page 1-4) 5. Attempt to reproduce symptom. 6. Check symptom. →	If no symptom →	Test complete.
		If symptom appears →	Return to **Step A** to find error in testing.
		If other code or symptom appears →	Go to Diagnostics Procedure (see page 1-3)

Electrical System Test, continued

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Front Box Control

Overview

This symptom-driven test is performed if the "-" is displayed on the Gear Display, and there are no active or inactive codes.

Detection

Turn key on and watch the Gear Display. If the Gear Display shows "-" constantly, the Transmission Controller was not able to confirm front box control.

Any time the service lamp is flashing, go to Diagnostic Procedure (page1-2).

Fallback

There is no fallback mode for this symptom.

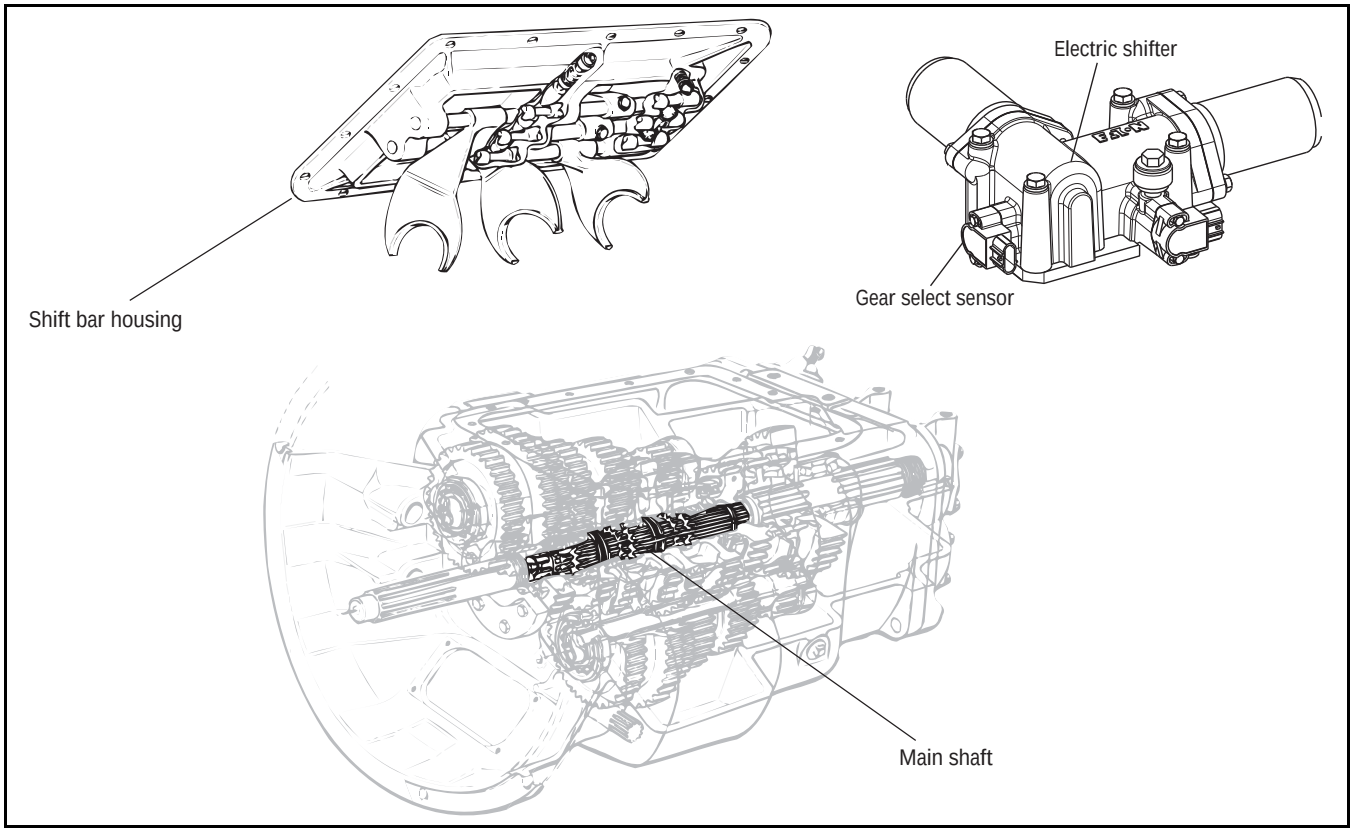
Required Tools

- Basic Hand Tools
- Eaton Test Adapter Kit
- Digital Volt/Ohm Meter
- Troubleshooting Guide

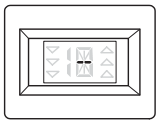
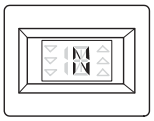
Possible Causes

This fault can be caused by any of the following:

- Electric Shifter
- Yoke/Clutch/Mainshaft
- Shift Block
- Gear Select Sensor

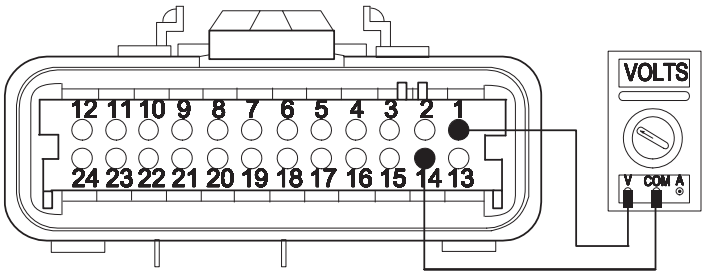


Front Box Control Test

Step A	Procedure	Condition	Action
	1. Place shift lever in neutral. 2. Depress the clutch pedal. 3. Key on. 4. Observe service lamp.	If service lamp and wait light are on constantly	Test EPL Link. Go to **Step B.**
		If wait light is on constantly or Gear display shows:	Test front box control. Go to **Step I.**
			
		If no lights or tones turn on	Perform Electrical Pretest (see page 2-1)
		If "N" is highlighted on shift lever and Gear display shows:	Test complete.
			

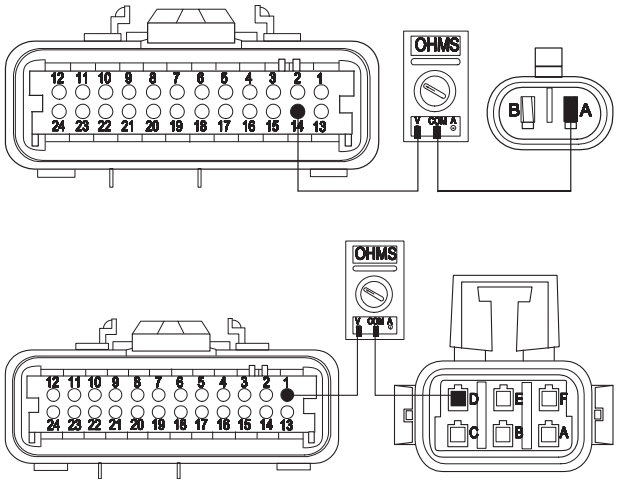
Front Box Control Test, continued

Step B	Procedure	Condition	Action
	1. Remove transmission ECU 24-way connector. 2. Key on. 3. Measure voltage across transmission ECU 24-way connector pins 1 and 14.	If voltage is within 1 volt of battery voltage	Go to **Step D.**
		If voltage is outside of range	Go to **Step C.**



Front Box Control Test, continued

Step C	Procedure	Condition	Action
	1. Disconnect transmission harness 6-way connector from transmission interface harness. 2. Disconnect power module from transmission harness. 3. Measure resistance between transmission ECU 24-way connector pin 14 and power module connector pin A on transmission harness.		
	4. Measure resistance between transmission harness 6-way connector pin D and transmission ECU 24-way connector pin 1.	If resistance is 0 to .3 ohms	Repair or replace vehicle interface harness or tower harness. Go to **Step A.**
		If resistance is outside of range	**Repair or replace transmission harnesses** as required. Go to **Step A.**

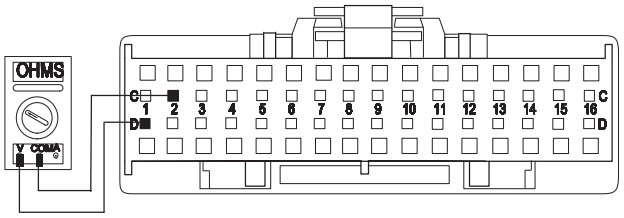


Front Box Control Test, continued

Step D	Procedure	Condition	Action
	1. Reconnect transmission ECU 24-way connector. 2. Key off. Allow transmission to power down. 3. Disconnect system manager 32-way connector. 4. Connect EPL tester to tower harness. 5. Key on. 6. Start EPL Communication Test →	If test passes →	**Replace system manager ECU.** Go to **Step A.**
		If test fails →	Go to **Step E.**

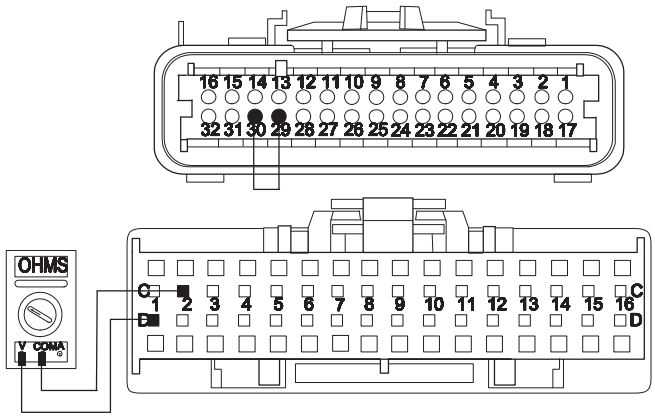
Front Box Control Test, continued

Step E	Procedure	Condition	Action
	1. Key off. Allow transmission to power down. 2. Disconnect transmission ECU 32-way connector. 3. Remove EPL tester from system manager 32-way connector.		
	4. Measure resistance between system manager 32-way connector pins C2 and D1 and from each pin to ground.	If resistance for each measurement is more than 10K ohms or open circuit [OL]	Go to **Step F.**
		If resistance of any measurement is less than 10K ohms	Go to **Step G.**



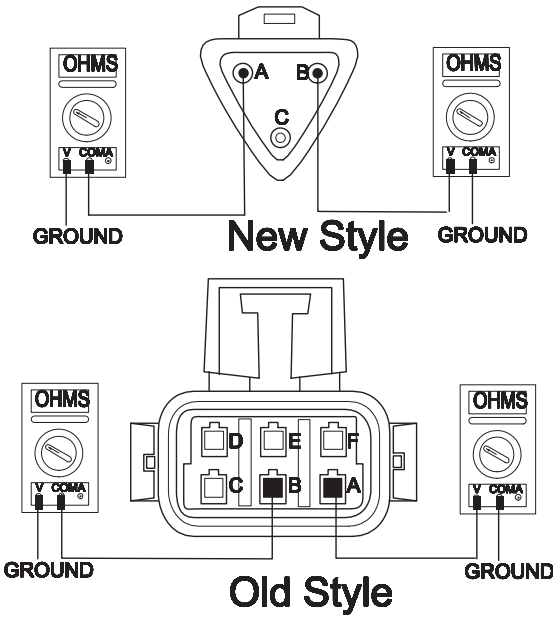
Front Box Control Test, continued

Step F	Procedure	Condition	Action
	1. Place a jumper across transmission ECU 32-way connector pins 29 and 30.		
	2. Measure resistance between system manager 32-way connector pins C2 and D1.	If resistance is 0 to .3 ohms	**Replace transmission ECU.** Repeat this step.
		If resistance is outside of range	Go to **Step G.**



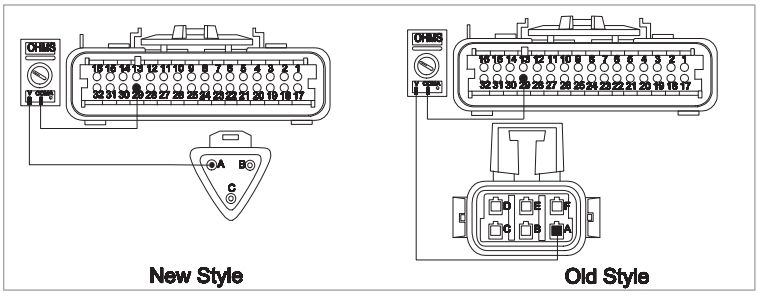
Front Box Control Test, continued

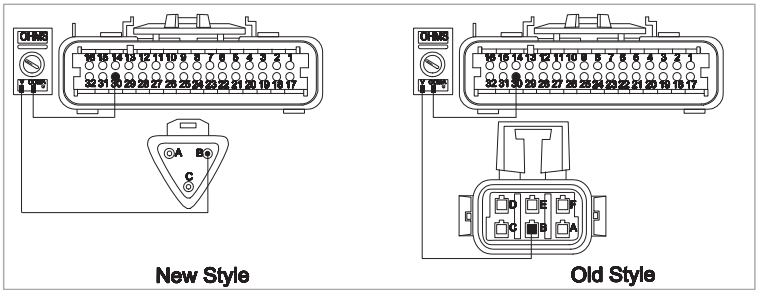
Step G	Procedure	Condition	Action
	1. Reconnect system manager 32-way connector. 2. Disconnect transmission harness 3-way connector from transmission interface harness. 3. Remove any jumper harness.		
	4. Measure resistance between transmission harness 3-way connector pins A and B and from each pin to ground. Note: Depending on which connector you have, refer to either the old style or the new style connector illustration.	If resistance for each measurement is more than 10K ohms or open circuit [OL] →	Go to **Step H.**
		If resistance of any measurement is less than 10K ohms →	**Repair or replace transmission harness.** Go to **Step A.**



Front Box Control Test, continued

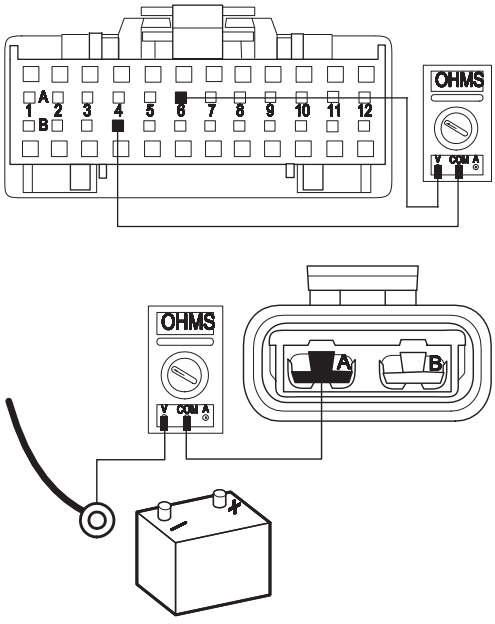
Step H	Procedure	Condition	Action
	1. Measure resistance between transmission ECU 32-way connector pin 29 and transmission harness 3-way connector pin A. **Note:** Depending on which connector you have, refer to either the old style or the new style connector illustration.		
	2. Measure resistance between transmission ECU 32-way connector pin 30 and transmission harness 3-way connector pin B. →	If both measurements are 0 to .3 ohms →	Repair OEM wiring from system manager to transmission harness. Go to **Step A.**
		If resistance of either measurement is outside of range →	**Repair or replace transmission harness.** Go to **Step A.**





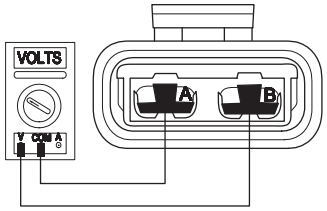
Front Box Control Test, continued

Step I	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect power module 2-way connector from transmission controller.		
	3. Disconnect negative (-) battery cable.		
	4. Measure resistance between power module 2-way connector pin A and negative battery cable. →	If resistance is 0 to .3 ohms →	Go to **Step J.**
		If resistance is outside of range →	Check battery and ground supply to power module and repeat this step. If problem continues, **replace power module.** Repeat this step.



Front Box Control Test, continued

Step J	Procedure	Condition	Action
	1. Measure voltage across power module 2-way connector pins. →	If voltage is within 1 volt of battery voltage →	Go to **Step V.**
		If voltage is outside of range →	Check battery and ground supply to power module and repeat this step. If problem continues, **replace power module.** Go to **Step A.**



Step V	Procedure	Condition	Action
	1. Remove electric shifter from shift bar housing.		
	2. Inspect electric shifter and shift bar housing: • Shift blocks • Roll pins • Finger movement • Mechanical linkages →	If no problem found →	**Replace electric shifter.** Go to **Step A.**
		If problem found →	Repair as required. Go to **Step A.**

Front Box Control Test, continued

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Gear Display Power Supply

Overview

This symptom-driven test is performed if the Gear Display is not working, and there are no active or inactive codes.

Detection

The System Manager has no fault detection capability for this failure. The failure is observed by the driver when operating the vehicle. To observe this failure, operate the vehicle and monitor the Gear Display.

Fallback

This symptom has no effect on vehicle operation, however, the Gear Display may not function.

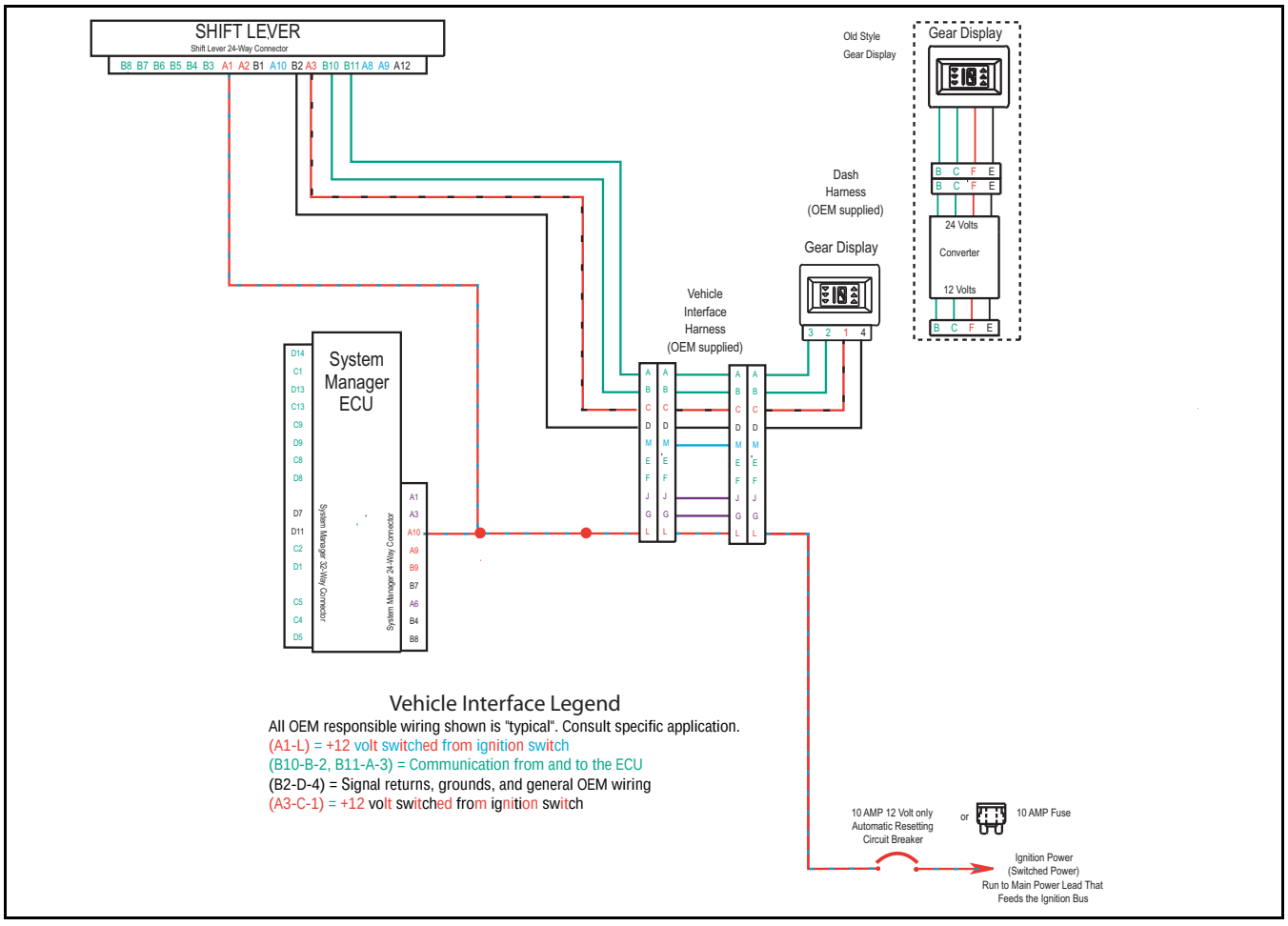
Required Tools

- Basic Hand Tools
- Eaton Test Adapter Kit
- Digital Volt/Ohm Meter
- Troubleshooting Guide
- Data Link Tester

Possible Causes

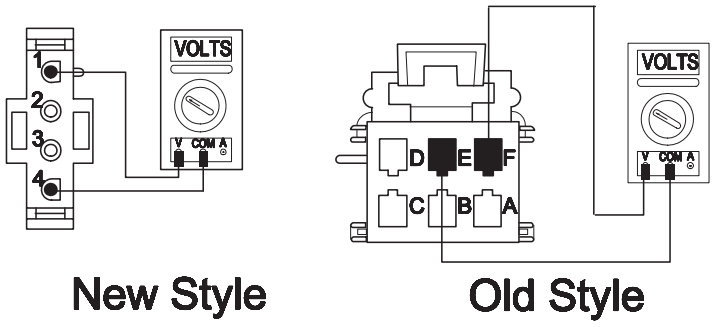
This fault can be caused by any of the following:

- Gear Display
- Vehicle Harness
- Ignition Power Supply
- Shift Control



Gear Display Power Supply Test

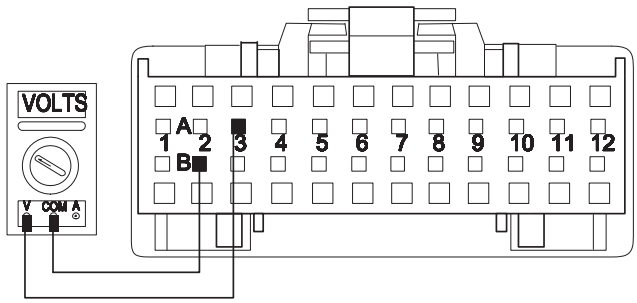
Step A	Procedure	Condition	Action
	1. Key off. Note: If the vehicle is equipped with a 12/25V converter at the gear display, the converter and gear display are viewed as one part. Replacement of the gear display includes the converter.		
	2. Remove the dash panel and unplug the gear display from the dash harness.		
	3. Key on.		
	4. Measure voltage across dash harness pins E or 4 and F or 1.	If voltage is within 1 volt of battery voltage →	Go to **Step D.**
	Note: Depending on which connector you have, refer to the old style or the new style connector illustration. →		
		If voltage is outside of range →	Go to **Step B.**



New Style Old Style

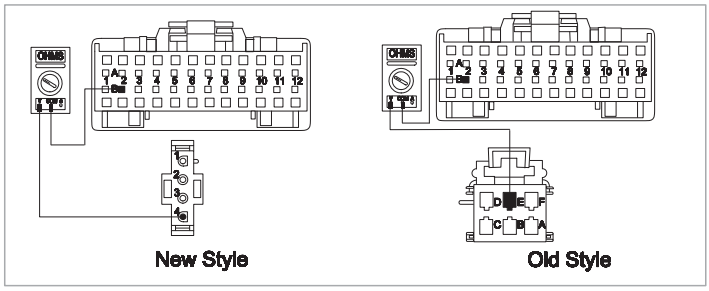
Gear Display Power Supply Test , continued

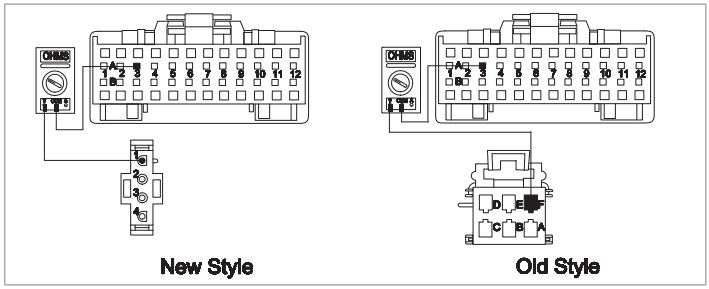
Step B	Procedure	Condition	Action
	1. Disconnect shift lever 24-way connector.		
	2. Measure voltage across shift lever 24-way connector pins A3 and B2. →	If voltage is within 1 volt of battery voltage →	Go to **Step C.**
		If voltage is outside of range →	Repair ignition and/or ground supply to shift lever. Go to **Step A.**



Gear Display Power Supply Test , continued

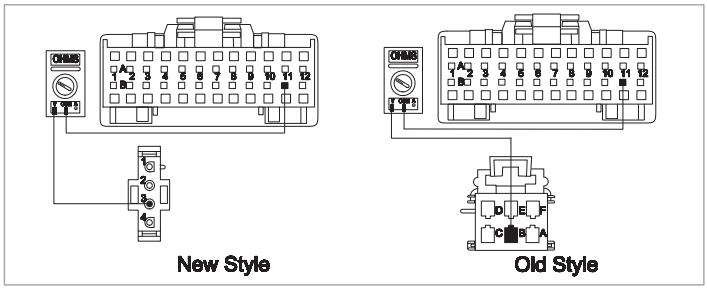
Step C	Procedure	Condition	Action
	1. Measure resistance between dash harness connector at gear display pin E or 4 and shift lever 24-way connector pin B2. **Note:** Depending on which connector you have, refer to the old style or the new style connector illustration.		
	2. Measure resistance between dash harness connector at gear display pin F or 1 and shift lever 24-way connector pin A3. →	If both measurements are 0 to .3 ohms →	**Replace shift lever.** Go to **Step V.**
		If either measurement is outside of range →	Repair harness between gear display and shift lever as required. Go to **Step V.**

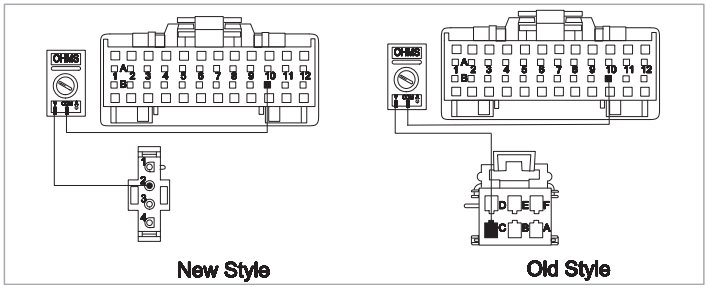




Gear Display Power Supply Test , continued

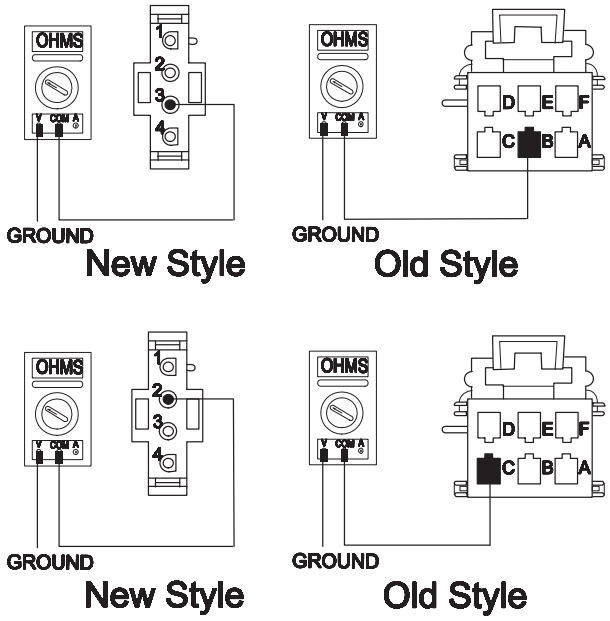
Step D	Procedure	Condition	Action
	1. Disconnect shift lever 24-way connector. 2. Measure resistance between dash harness connector at gear display pin B or 3 and shift lever 24-way connector pin B11. **Note:** Depending on which connector you have, refer to either the old style or the new style connector illustration.		
	3. Measure resistance between dash harness connector at gear display pin C or 2 and shift lever 24-way connector pin B10.	If both measurements are 0 to .3 ohms	Go to **Step E.**
		If resistance of either measurement is outside of range	Repair harness between gear display and shift lever as required. Repeat this step.





Gear Display Power Supply Test , continued

Step E	Procedure	Condition	Action
	1. Measure resistance between dash harness connector at gear display pin B or 3 and ground. **Note:** Depending on which connector you have, refer to either the old style or the new style connector illustration.		
	2. Measure resistance between dash harness connector at gear display pin C or 2 and ground. →	If both measurements are more than 10K ohms or open circuit [OL] →	**Replace gear display** and retest. If problem continues, **replace shift lever.** Go to **Step V.**
		If both measurements are less than 10K ohms →	Repair harness between gear display and shift lever as required. Go to **Step V.**



Gear Display Power Supply Test , continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Reconnect all connectors. 3. Key on. 4. Observe gear display	If after power up, gear display comes on	Test complete.
		If problem continues	Go to find error in testing.

Gear Display Power Supply Test , continued

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Start Enable Relay Contact

Overview

This symptom-driven test is performed if the engine does not start with the Shift Lever is in neutral, and there are no active or inactive codes.

Detection

The System Manager 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 effect on vehicle operation, however, if the failure occurred before the engine was started, it is possible the engine will not start.

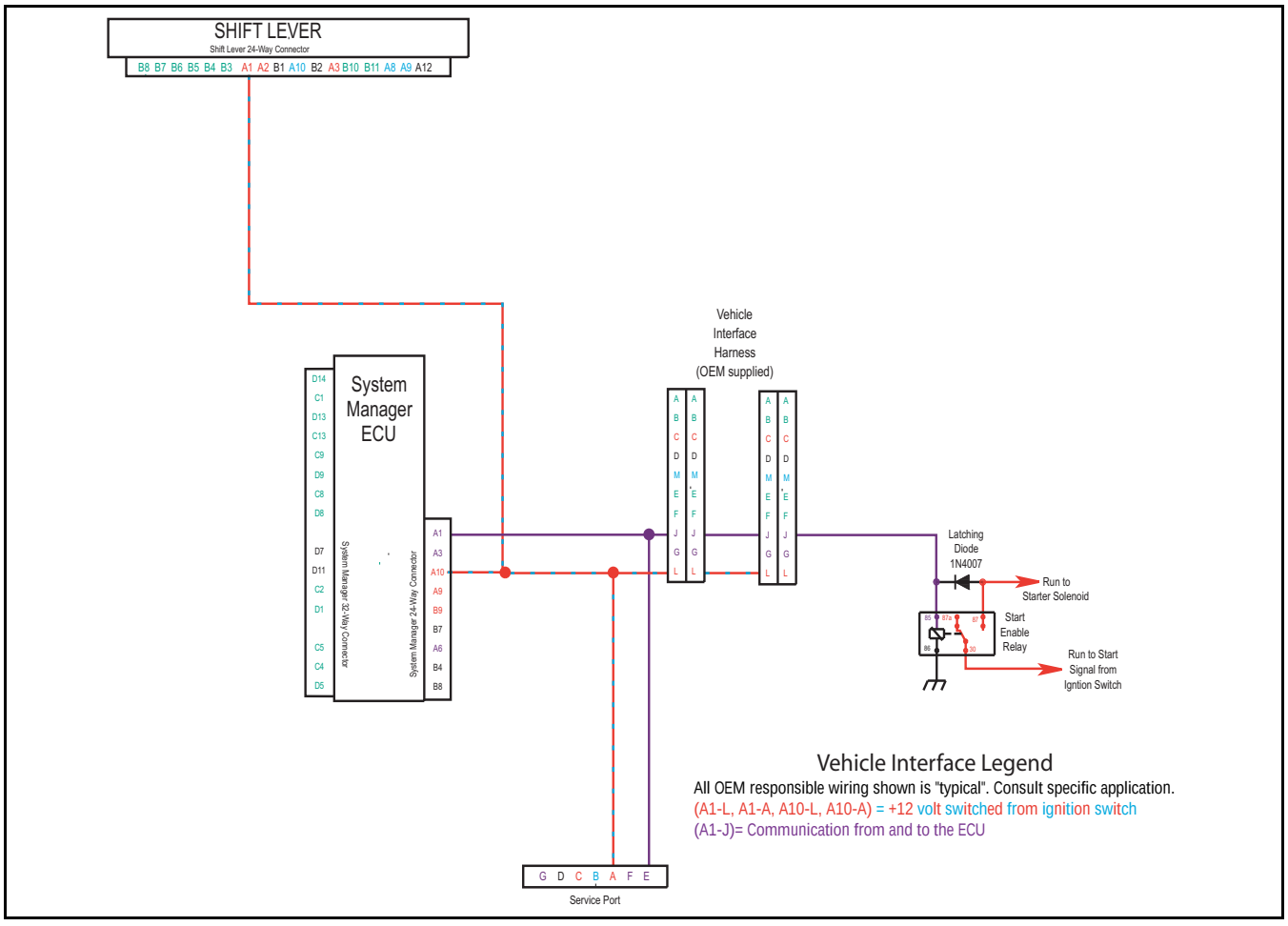
Required Tools

- Basic Hand Tools
- Eaton Test Adapter Kit
- Digital Volt/Ohm Meter
- Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

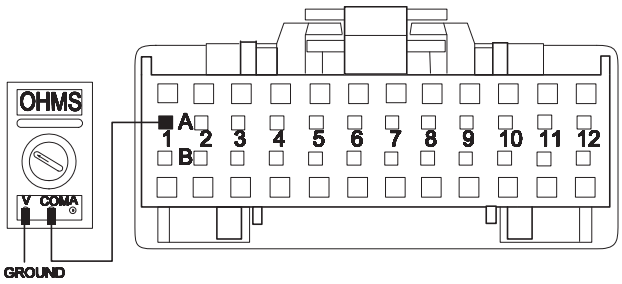
- Start Enable Relay
- Starter Solenoid Wiring



Start Enable Relay Contact Test

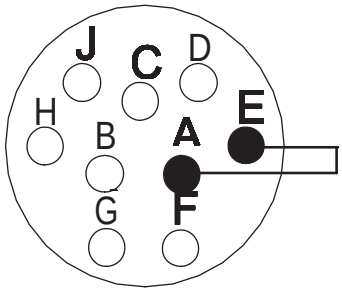
Step A	Procedure	Condition	Action
	1. Key off. 2. Disconnect system manager 24-way connector. 3. Key on. 4. Engage starter.	If engine cranks	Go to **Step B.**
		If engine does not crank	Go to **Step C.**

Step B	Procedure	Condition	Action
	1. Key off. 2. Measure voltage between system manager 24-way connector pin A1 and ground.	If voltage is less than 1 volt	Replace start enable relay. Go to **Step V.**
		If voltage is outside of range	Start enable supply is short battery. Repair as required. Go to **Step V.**



Start Enable Relay Contact Test, continued

Step C	Procedure	Condition	Action
	1. Place a jumper across service port pins A and E.		
	2. Engage starter. →	If engine cranks →	Go to **Step D.**
		If engine does not crank →	Go to **Step E.**

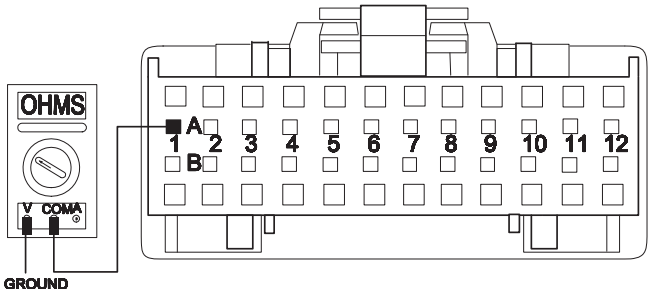


Step D	Procedure	Condition	Action
	1. While engaging starter, remove jumper wire. →	If engine continues to crank →	Test complete.
		If engine stops cranking when jumper is removed →	Replace start enable latching diode. Repeat this step.

Step E	Procedure	Condition	Action
	1. Replace start enable relay.		
	2. Engage starter. →	If engine cranks →	Test complete.
		If engine does not crank →	Go to **Step F.**

Start Enable Relay Contact Test, continued

Step F	Procedure	Condition	Action
	1. Measure resistance between system manager 24-way connector pin A1 and ground. →	If resistance is 40 to 90 ohms	Check vehicle starting system. If no problem found, **replace system manager.** Go to **Step V.**
		If resistance is outside of range	Repair harness between start enable relay and system manager. Go to **Step V.**



Step V	Procedure	Condition	Action
	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 the engine starts →	Test complete.
		If the engine does not start →	Return to **Step A** to find error in testing.
		If other code or symptom appears →	Go to Diagnostics Procedure (see page 1-3)

AutoShift/AutoSelect Will Not Engage a Gear

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 System Manager is unable to provide a fault code, the driver may observe this failure as the transmission not initiating or completing a shift.

Fallback

There is no fallback mode for this symptom.

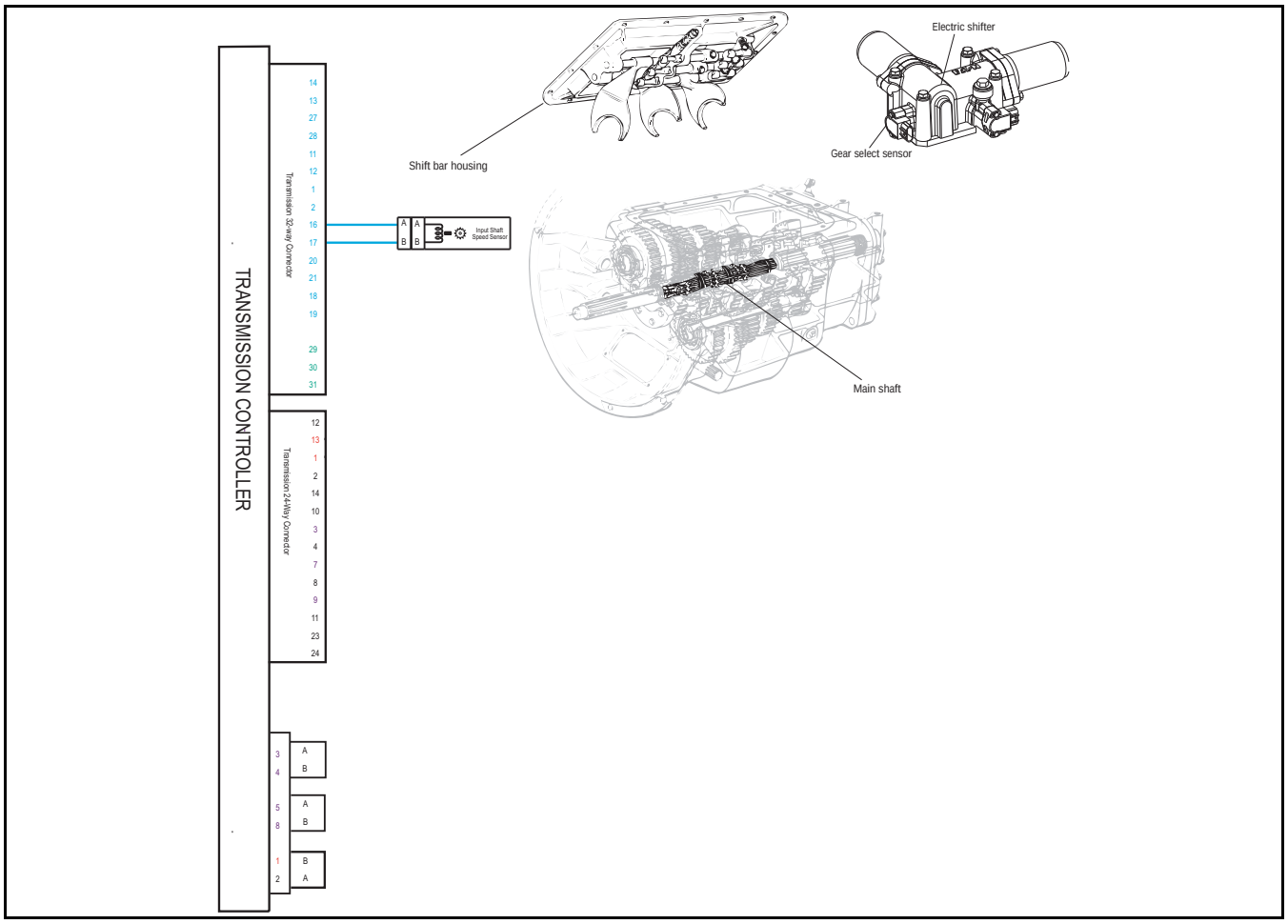
Required Tools

- Basic Hand Tools
- Eaton Test Adapter Kit
- Digital Volt/Ohm Meter
- Troubleshooting Guide
- PC-based Service Tool

Possible Causes

This fault can be caused by any of the following:

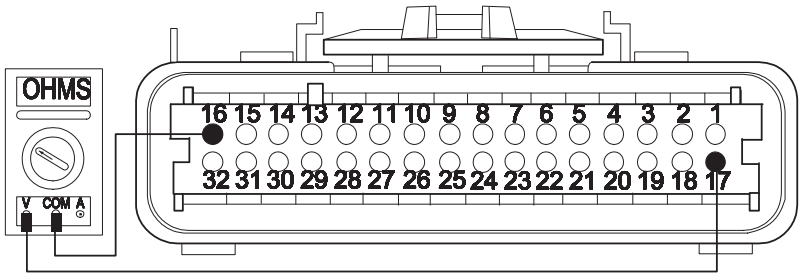
- Input Shaft Speed Sensor
- Electric Shifter
- Transmission
- Gear Select Sensor
- Interia Brake
- Clutch Brake



AutoShift/AutoSelect Will Not Engage a Gear Test

Step A	Procedure	Condition	Action
	1. Key off. 2. Connect hand-held diagnostic tool. 3. Start engine and view input shaft speed with clutch pedal released.	If input shaft speed exists	Go to **Step E.**
		If input shaft speed does not exist	Go to **Step B.**

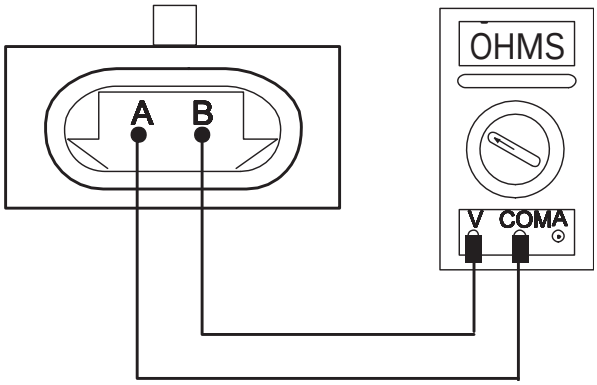
Step B	Procedure	Condition	Action
	1. Disconnect transmission ECU 32-way connector. 2. Measure resistance across transmission ECU 32-way connector pins 16 and 17.	If resistance is 2K to 4K ohms	Go to **Step C.**
		If resistance is outside of range	Go to **Step D.**



AutoShift/AutoSelect Will Not Engage a Gear , continued

Step C	Procedure	Condition	Action
	1. Inspect input shaft speed sensor for proper installation or contamination. →	If no problem found →	**Replace transmission ECU.** Go to **Step V.**
		If problem found →	Repair as required. Go to **Step V.**

Step D	Procedure	Condition	Action
	1. Disconnect transmission harness from input shaft speed sensor.		
	2. Measure resistance between input shaft speed sensor pins. →	If resistance is 2K to 4K ohms →	**Repair or replace transmission harness.** Go to **Step V.**
		If resistance is outside of range →	**Replace input shaft speed sensor.** Go to **Step V.**

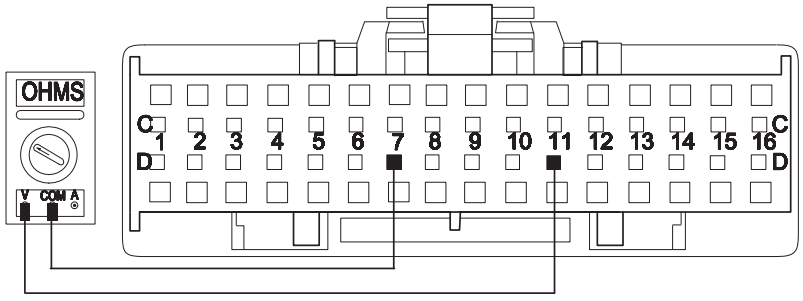


Step E	Procedure	Condition	Action
	1. Is vehicle equipped with a wheelchair lift. →	If yes →	Go to **Step F.**
		If no →	Test complete.

AutoShift/AutoSelect Will Not Engage a Gear , continued

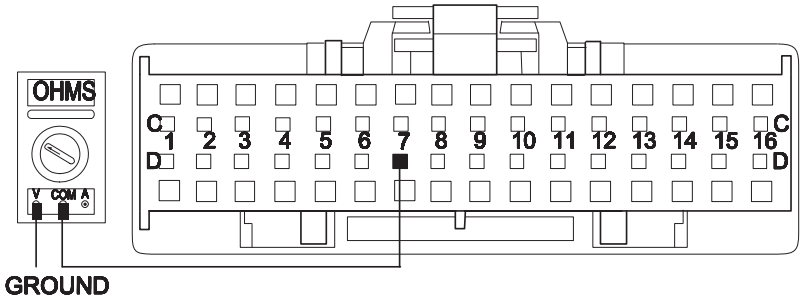
Step F	Procedure	Condition	Action
	1. Is wheelchair lift switch normally open or normally closed. →	If normally closed	Go to **Step F.**
		If normally open	Go to **Step J.**

Step G	Procedure	Condition	Action
	1. Make sure the lift is off and at rest position.		
	2. Disconnect system manager 32-way connector.		
	3. Measure resistance between system manager 32-way connector pins D7 and D11. →	If resistance is 0 to .3 ohms →	Go to **Step H.**
		If resistance is outside of range →	Pin D7 requires connection to pin D11. Repair harness. Repeat this step.



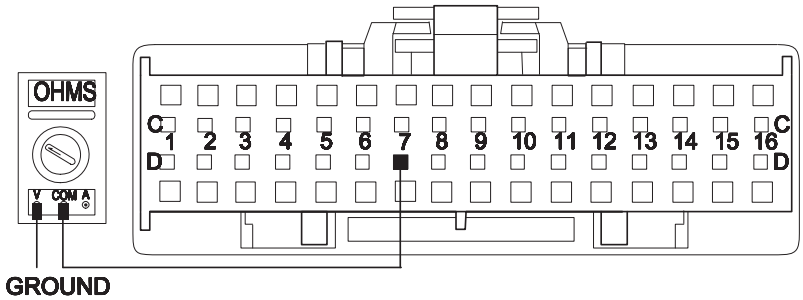
AutoShift/AutoSelect Will Not Engage a Gear , continued

Step H	Procedure	Condition	Action
	1. Measure resistance between system manager 32-way connector pin D7 and ground.	If resistance is 0 to .3 ohms	Go to **Step I.**
		If resistance is outside of range	Normally closed type systems require pin D7 be grounded for normal transmission operation. Repair harness or switch as required. Repeat this step.



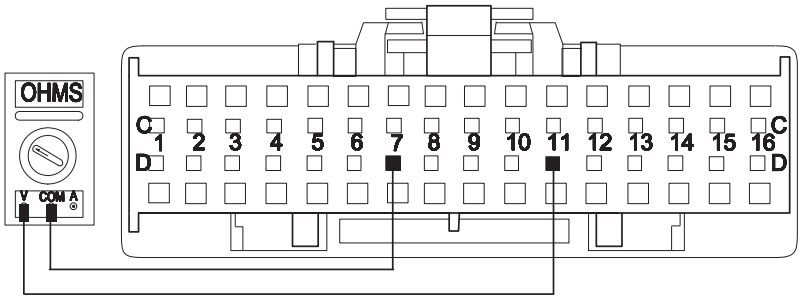
AutoShift/AutoSelect Will Not Engage a Gear , continued

Step I	Procedure	Condition	Action
	1. Activate wheelchair lift.		
	2. Measure resistance between system manager 32-way connector pin D7 and ground. →	If resistance is more than 10K ohms or open circuit [OL] →	**Replace system manager ECU.** Go to **Step V.**
		If resistance is less than 10K ohms →	Normally closed type systems require pin D7 open to ground to inhibit gear selection. Repair harness or switch as required. Go to **Step V.**



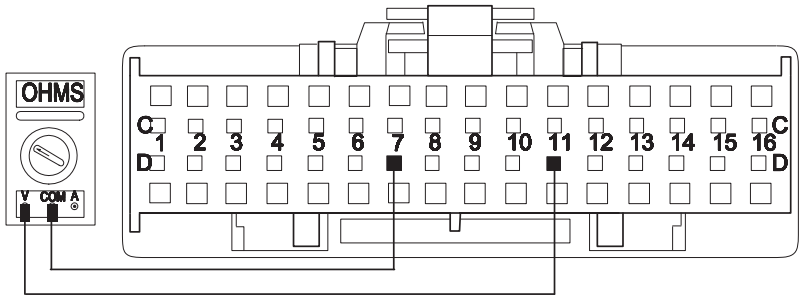
AutoShift/AutoSelect Will Not Engage a Gear , continued

Step J	Procedure	Condition	Action
	1. Make sure the lift is off and at rest position. 2. Disconnect system manager 32-way connector.		
	3. Measure resistance between system manager 32-way connector pins D7 and D11.	If resistance is more than 10K ohms or open circuit [OL]	Go to **Step K.**
		If resistance is less than 10K ohms	Normally open type systems require pins D7 and D11 be open for normal transmission operation. Repair harness or switch as required. Repeat this step.



AutoShift/AutoSelect Will Not Engage a Gear , continued

Step K	Procedure	Condition	Action
	1. Activate wheelchair lift		
	2. Measure resistance between system manager 32-way connector pins D7 and D11. →	If resistance is 0 to .3 ohms →	**Replace system manager ECU.**
		If resistance is outside of range →	**Replace input shaft speed sensor.** Go to **Step V.**



Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.		
	4. Drive the vehicle to determine whether the complaint has been repaired. →	If the complaint was repaired →	Test complete.
		If the complaint was not repaired →	Return to **Step A** to find error in testing.
		If other code or symptom appears →	Go to Diagnostics Procedure (see page 1-3)

J-1587 Data Link

Overview

This symptom-driven test is performed if the PC-based Service Tool does not work.

Detection

The service technician observes the failure when operating the PC-based Service Tool. To observe this failure, simply connect the PC-based Service Tool to the transmission via the J-1587 diagnostic connector located in the cab.

Fallback

There is no fallback mode for J-1587 Data Link. The PC-Base Service Tool will not work correctly.

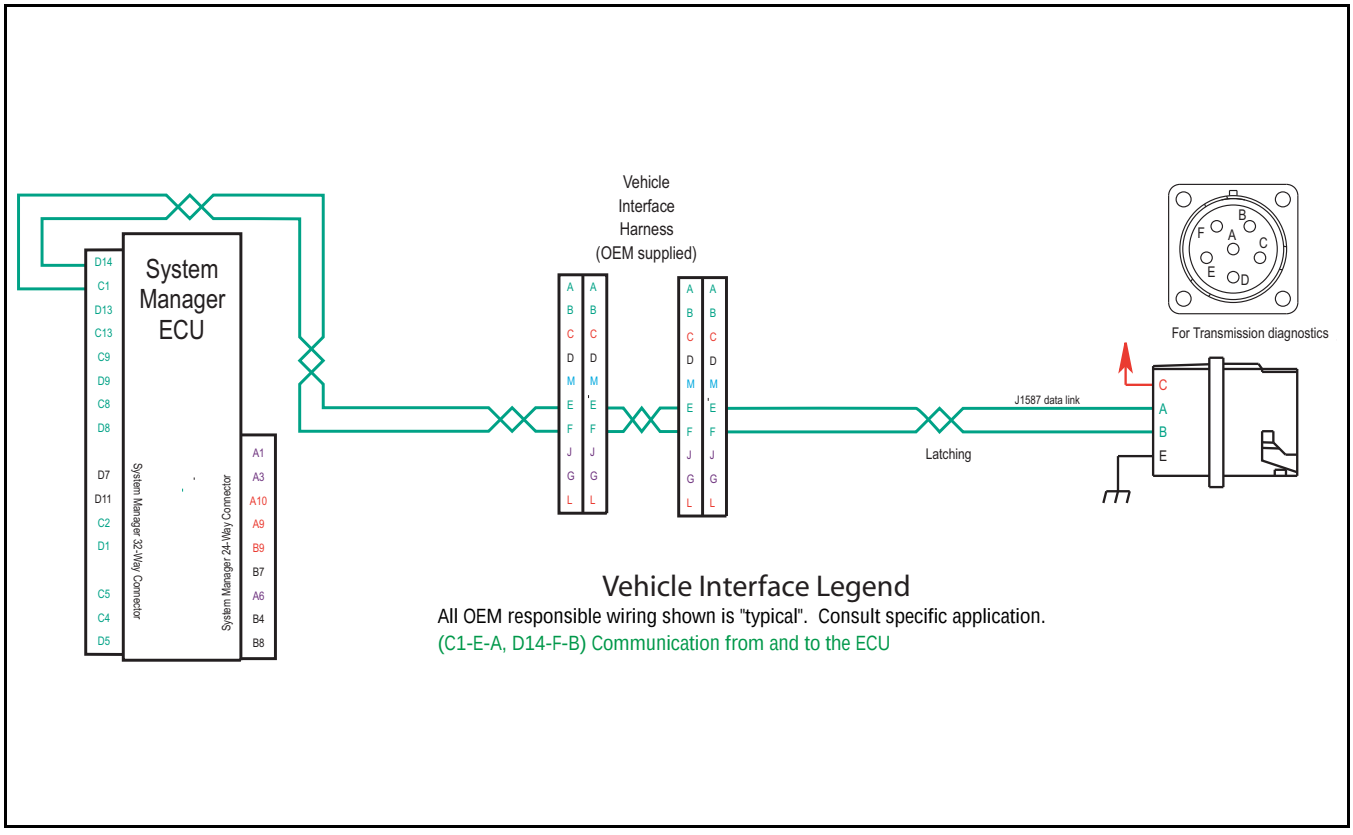
Required Tools

- Basic Hand Tools
- Eaton Test Adapter Kit
- Digital Volt/Ohm Meter
- Data Link Tester
- Troubleshooting Guide
- PC-based Service Tool

Possible Causes

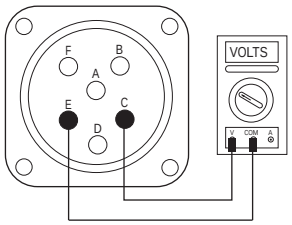
This symptom can be caused by any of the following:

- J-1587 Data Link Harness
- Shift Manager
- PC-based Service Tool



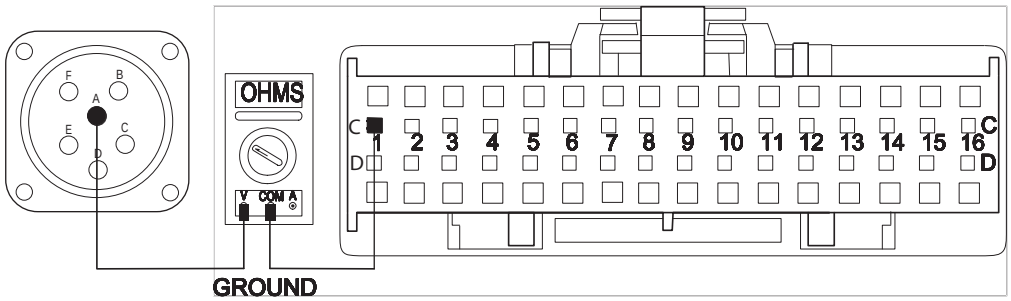
J-1587 Data Link Test

Step A	Procedure	Condition	Action
	1. Key on.		
	2. Measure voltage either between 6-way diagnostic connector.	If voltage is within .6 volts of battery voltage	Go to **Step B.**
		If voltage is outside of range	Repair battery or ground line to vehicle diagnostic connector. Go to **Step V.**



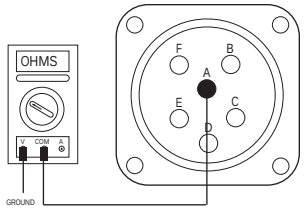
J-1587 Data Link Test, continued

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect System Manager 32-way connector.		
	3. Measure resistance from System Manager 32-way connector pin C1 and 6-way diagnostic pin A.	If resistance is 0 to .3 ohms	Go to **Step C.**
		If resistance is outside of range	Repair vehicle interface harness. Repeat this step.

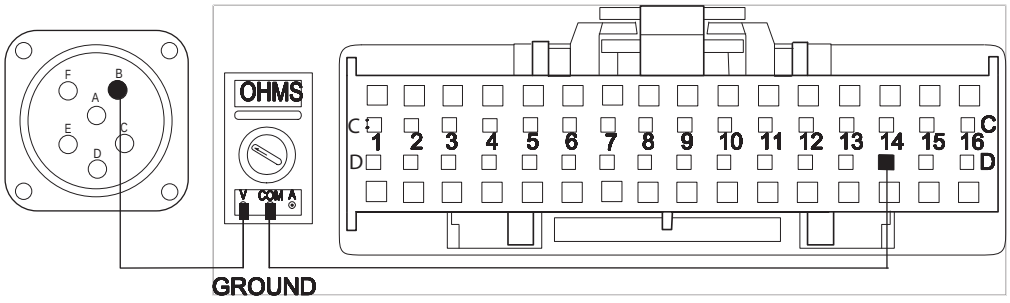


J-1587 Data Link Test, continued

Step C	Procedure	Condition	Action
	1. Measure resistance between 6-way diagnostic connector pin A and ground.	If resistance is more than 10K ohms or open circuit [OL]	Go to **Step D.**
		If resistance is less than 10K ohms	Repair vehicle interface harness. Go to **Step V.**

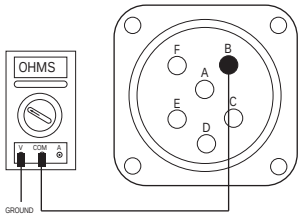


Step D	Procedure	Condition	Action
	1. Measure resistance between System Manager 32-way connector pin D14 and 6-way diagnostic connector pin B.	If resistance is 0 to .3 ohms	Go to **Step E.**
		If resistance is outside of range	Repair vehicle interface harness. Go to **Step V.**



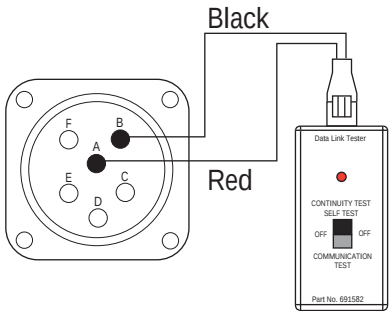
J-1587 Data Link Test, continued

Step E	Procedure	Condition	Action
	1. Measure resistance between 6-way diagnostic connector pin B and ground.	If resistance is more than 10K ohms or open circuit [OL]	Go to **Step F.**
		If resistance is less than 10K ohms	Repair vehicle interface harness. Go to **Step V.**



J-1587 Data Link Test, continued

Step F	Procedure	Condition	Action
	1. Key off. 2. Reconnect System Manager 32-way connector. 3. Disconnect all data links to the vehicle diagnostic connector, leaving only the transmission connected. 4. Connect the Data Link Tester across the 6-way diagnostic connector pins A and B. 5. Key on.		
	6. Place the Data Link Tester in the Communication Test mode.	If test passed →	Problem exists with service tool in one of the following areas: • Communication box • Cables • PC Repair as required. Go to **Step V.**
		If test failed →	**Replace System Manager.** Go to **Step V**.



J-1587 Data Link Test, continued

Step V	Procedure	Condition	Action
	1. Key on.		
	2. Connect PC-based Service Tool.	If PC-based Service Tool functions correctly →	Test complete.
		If PC-based Service Tool does not function correctly →	Return to **Step A** to find error in testing.

J-1587 Data Link Test, continued

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Range System

Overview

This symptom-driven test is completed if the transmission does not perform range shifts, and there are no active or inactive fault codes.

Detection

The failure is observed by the driver when operating the vehicle. To observe this failure, operate the vehicle and make several shifts up and down across the range.

Fallback

There is no fallback for this symptom.

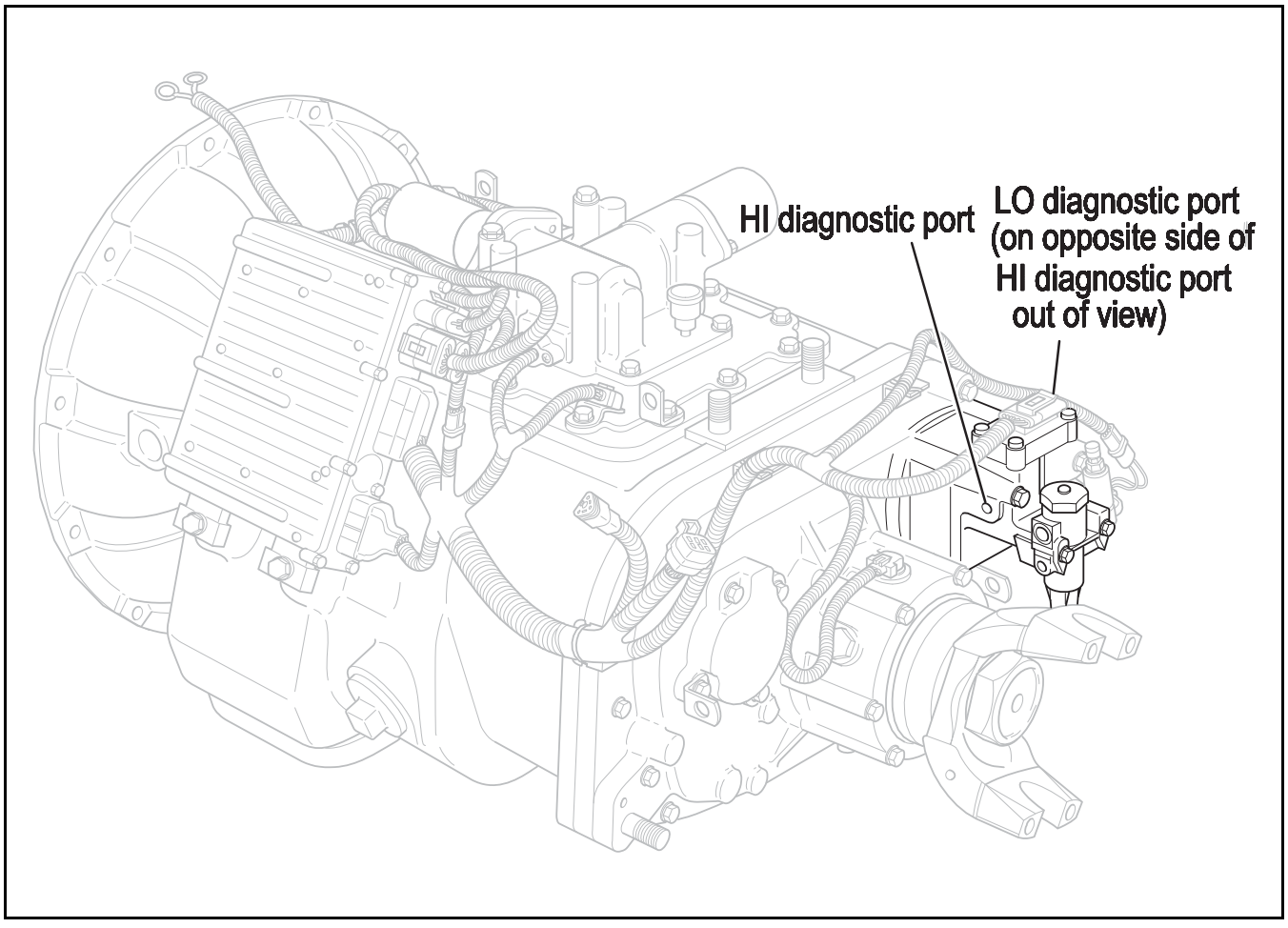
Required Tools

- Basic Hand Tools
- (2) 0-100 PSI Air Pressure Gauges
- Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Low Air Pressure
- Contaminated Air Supply
- Air Leak
- Range Valve
- Range Synchronizer
- Range Actuator/Cylinder/Piston/Yoke

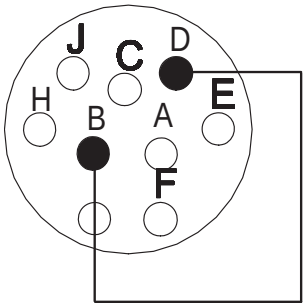


Range System Test

Step A	Procedure	Condition	Action
	1. Key off. 2. Install both 0 to 100 PSI air gauges into the range valve diagnostic ports. 3. Start vehicle and allow air pressure to reach governor cut-off. 4. Release clutch to register input speed in transmission. 5. Turn off engine, but leave key in "ON" position.		
	6. Move shift lever to reverse and back to neutral. →	If LO range gauge = 55 to 65 PSI and If HI range gauge = 0 PSI **Note:** 5 minutes is allowed for checking the pressure after moving the shift lever to neutral. →	Go to **Step B.**
		If both air gauges do not read as listed above. →	Repair or replace range valve and range cylinder cover as required. Retest.

Range System Test , continued

Step B	Procedure	Condition	Action
	1. Move shift lever to reverse, press upshift button, and move lever back to neutral. **Note:** If shift lever does not have upshift buttons, move shift lever to reverse and place a jumper between service port connector pins B and D. Remove jumper and place shift lever in neutral. →	If HI range gauge = 55 to 65 PSI and If LO range gauge = 0 PSI **Note:** 5 minutes is allowed for checking the pressure after moving the shift lever to neutral. →	Repair or replace mechanical range system as required. Go to **Step V.**
		If both air gauges do not read as listed above →	Repair or replace range valve and range cylinder cover as required. Go to **Step V.**



Range System Test , continued

Step V	Procedure	Condition	Action
	1. Disconnect gauges. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes. 5. Attempt to reproduce symptom. 6. Check symptom.	If no symptom	Test complete.
		If symptom appears	Return to **Step A** to find error in testing.
		If other code or symptom appears	Go to Diagnostics Procedure (see page 1-3)

Splitter System

Overview

This symptom-driven test is completed if the transmission does not perform Splitter Shifts, and there are no active or inactive fault codes.

Detection

The failure is observed by the driver when operating the vehicle. To observe this failure, operate the vehicle and make several shifts up and down across the Splitter.

Fallback

There is no fallback for this symptom.

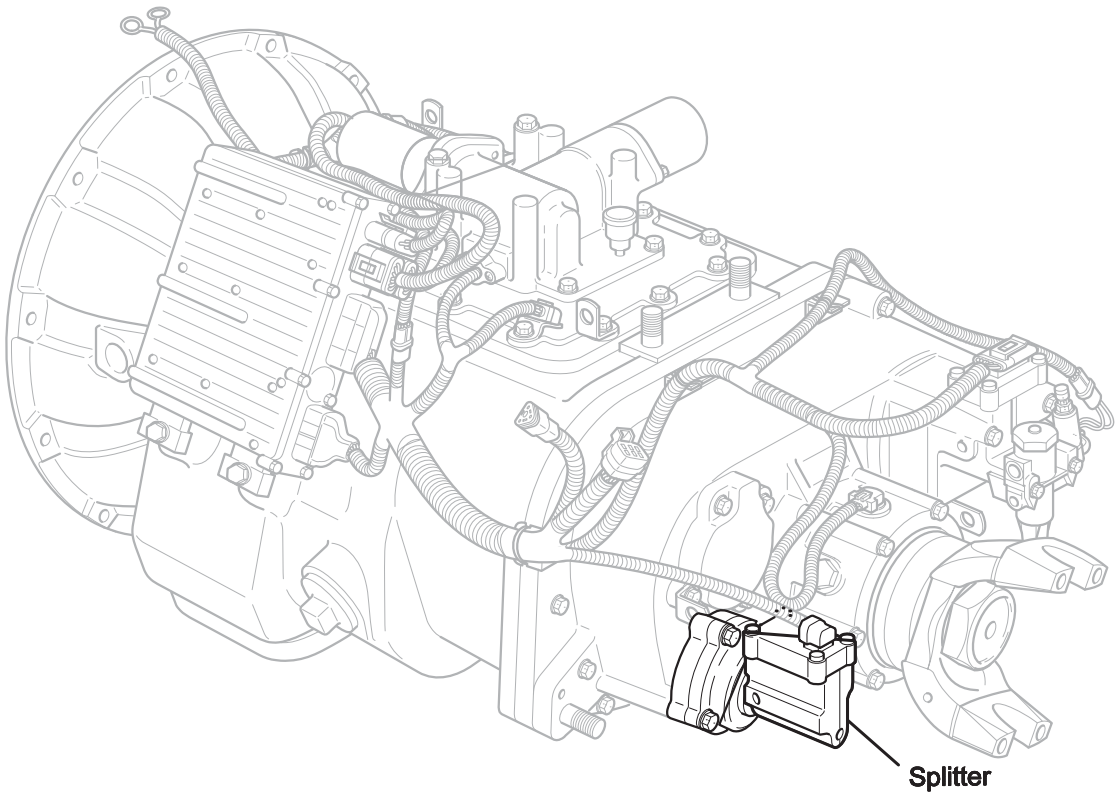
Required Tools

- Basic Hand Tools
- (2) 0-100 PSI Air Pressure Gauges
- Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Low Air Pressure
- Contaminated Air Supply
- Air Leak
- Splitter Valve
- Splitter Actuator/Cylinder/Piston/Yoke.



Splitter System Test

Step A	Procedure	Condition	Action
	1. Key off. 2. Install both 0 to 100 PSI air gauges into the splitter valve diagnostic ports. 3. Start vehicle and allow air pressure to reach governor cut-off. 4. Release clutch to register input speed in transmission. 5. Turn off engine, but leave key in "ON" position.		
	6. With the shift control, select reverse and back to neutral. →	If HI split gauge = 55 to 65 PSI and If LO split gauge = 0 PSI	Go to **Step B.**
		Note: 5 minutes is allowed for checking the pressure after moving the shift lever to neutral. →	
		If both air gauges do not read as listed above →	Repair or replace splitter valve and splitter cylinder cover as required. Repeat this step.

Step B	Procedure	Condition	Action
	1. Key on.		
	2. With shift control select reverse, press upshift button and select neutral. →	If LO split gauge = 55 to 65 PSI and If HI split gauge = 0 PSI →	Repair or replace mechanical splitter system as required. Go to **Step V.**
		If both gauges do not read as listed above →	Repair or replace splitter valve and splitter cylinder cover as required. Go to **Step V.**

Splitter System Test, continued

Step V	Procedure	Condition	Action
	1. Disconnect gauges. 2. Reconnect all connectors. 3. Key on. 4. Attempt to reproduce symptom. 5. Check symptom. →	If no symptom →	Test complete.
		If symptom appears →	Return to **Step A** to find error in testing.
		If other code or symptom appears →	Go to Diagnostics Procedure (see page 1-3)

Splitter System Test, continued

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Up/Down Button

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 System Manager 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.

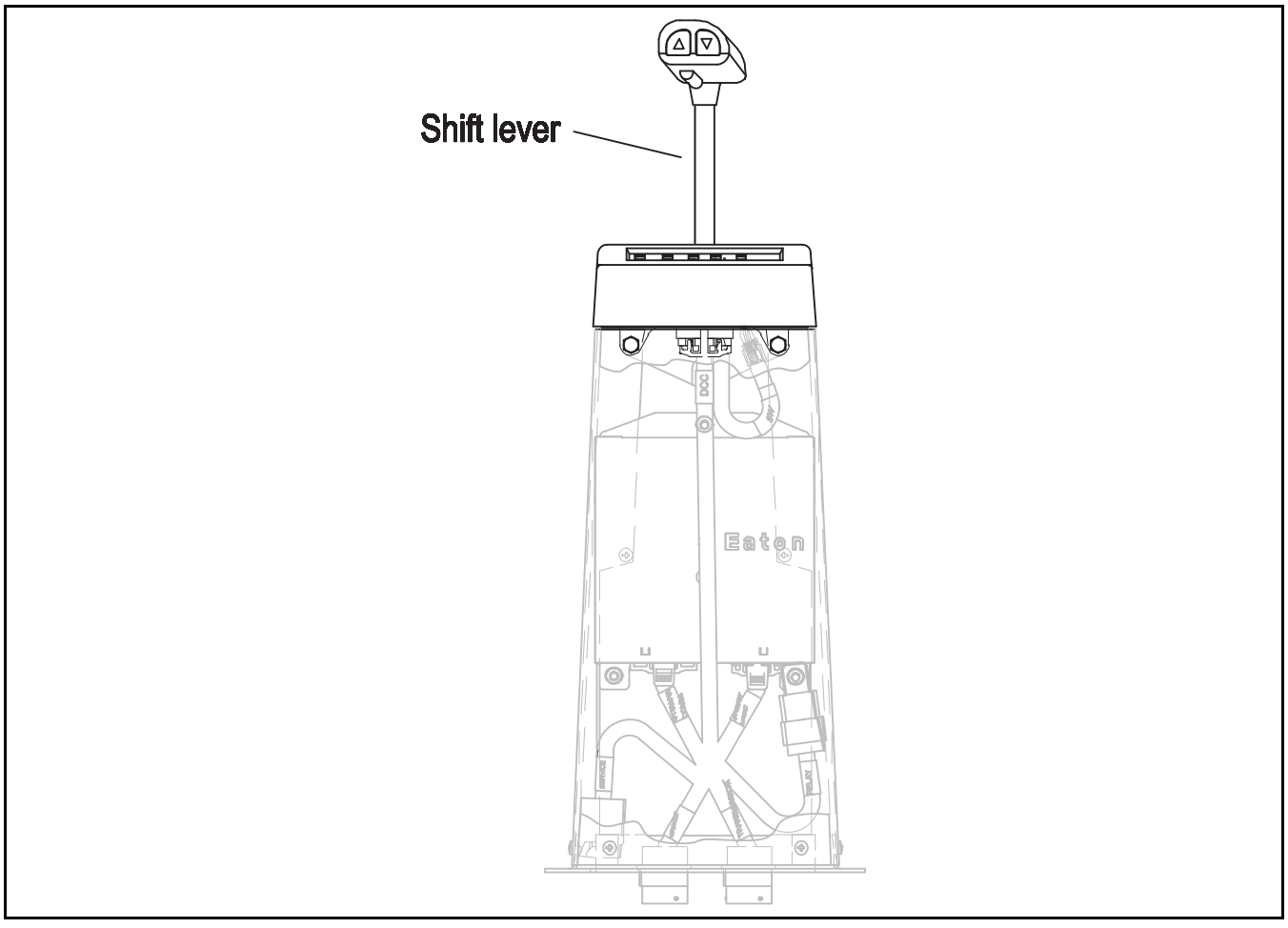
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Shift Lever



Up/Down Button Test

Step A	Procedure	Condition	Action
	1. Start engine. 2. Place Shift Lever in “Hold”. 3. Drive the vehicle and use the buttons to initiate upshifts and downshifts.	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 and/or downshifts.	**Replace Shift Lever.** Repeat this step.

AutoShift/AutoSelect Shift Complaint

Overview

This symptom-driven test is preformed 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.

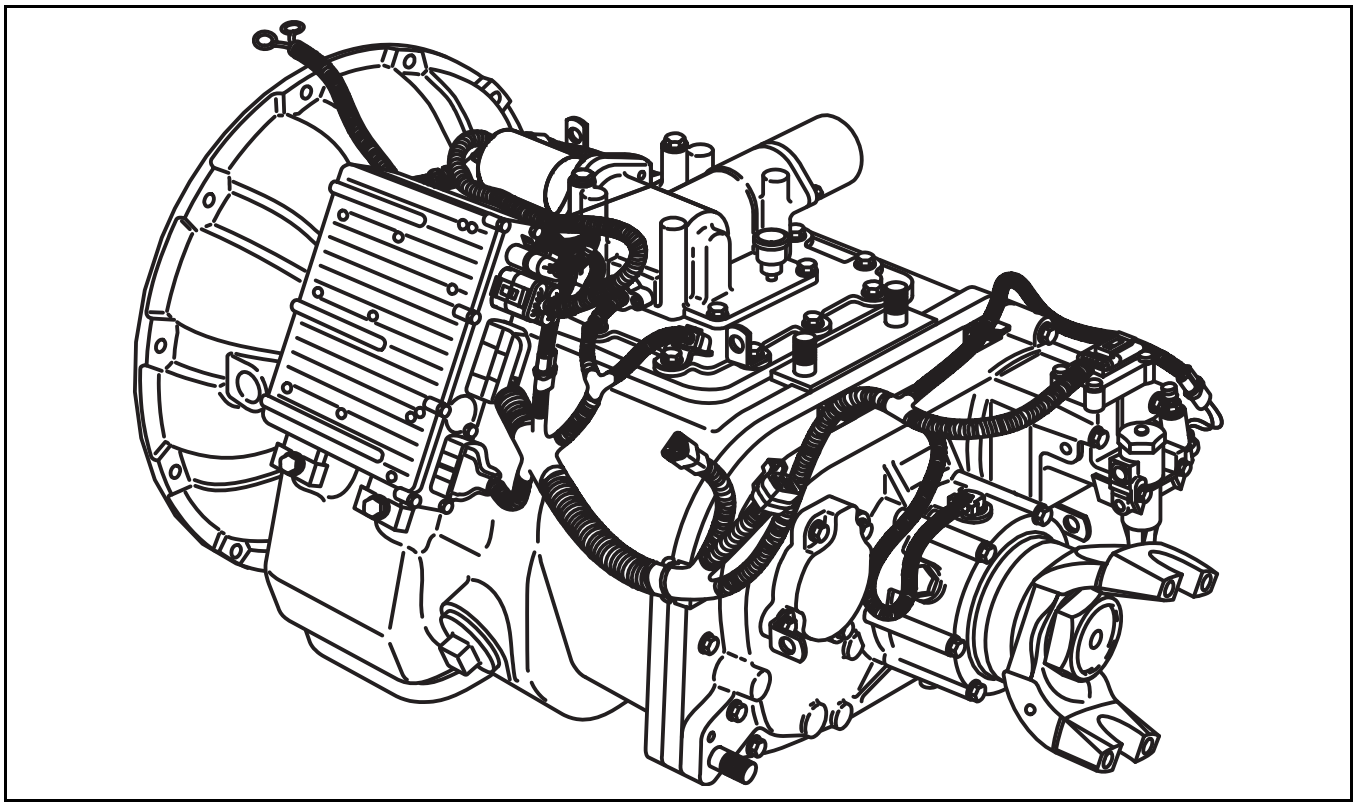
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoShift/AutoSelect Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

- Input Shaft Speed Sensor
- Electric Shifter
- Transmission
- Interia Brake
- Clutch Brake

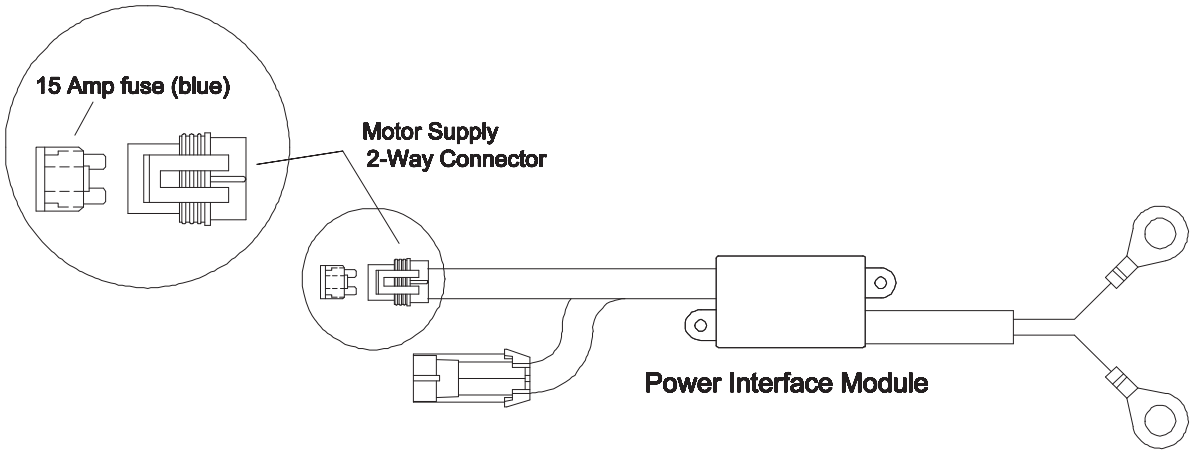


AutoShift/AutoSelect Shift Complaint Test

Step A	Procedure	Condition	Action
	1. Key off.		
	2. Inspect starter/battery ,inline fuse holder and PIM connections for integrity.	If okay →	Go to **Step B.**
		If corroded or loose →	Repair wiring or battery connections. Go to **Step V.**

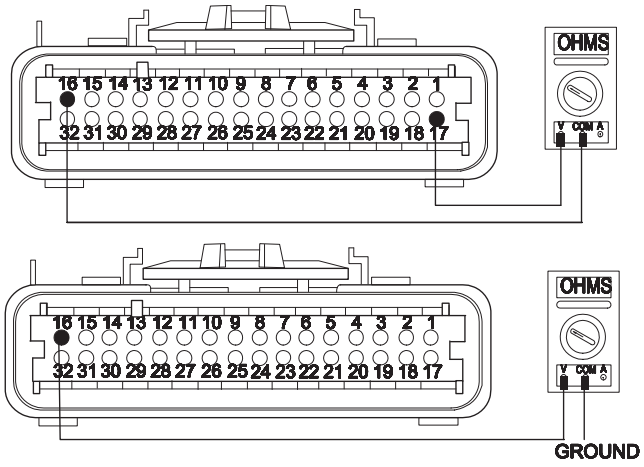
AutoShift/AutoSelect Shift Complaint Test, continued

Step B	Procedure	Condition	Action
	1. Key off.		
	2. Insert 15-amp fuse into Motor Supply 2-way connector. →	If fuse blows immediately →	⚠ CAUTION **Disconnect negative battery cable before reconnecting motor supply 2-way connector.** Go to **Step C.**
		If fuse does not blow immediately →	⚠ CAUTION **Disconnect the negative battery cable before reconnecting the motor supply 2-way connector. Failure to disconnect the battery negative cable can cause the failure of the power interface module. Replace power interface module.** Go to **Step V.**



AutoShift/AutoSelect Shift Complaint Test, continued

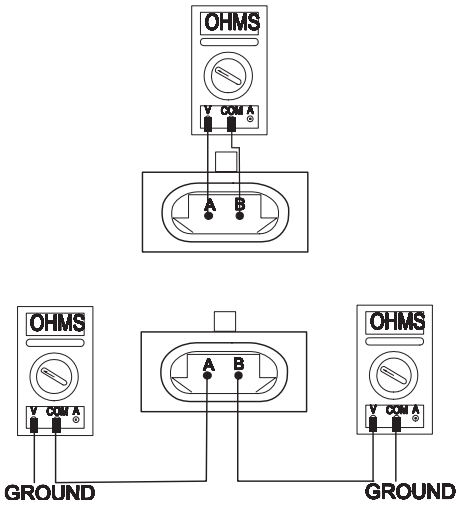
Step C	Procedure	Condition	Action
	1. Key off.		
	2. Disconnect transmission controller 32-way connector.		
	3. Measure resistance across transmission ECU 32-way connector pins 16 and 17 and between pin 16 and ground. →	If pin 16 and 17 resistance is 2K to 4K ohms and Pin 16 and ground resistance is 10K ohms or open circuit (OL) →	Go to **Step D.**
		If any of the above conditions are not met →	Go to **Step E.**



Step D	Procedure	Condition	Action
	1. Inspect Input Shaft Speed Sensor for damage or contamination. →	If no problem found →	**Replace the transmission controller ECU).** Go to **Step V.**
		If problem is found or you were sent here from Step E →	**Repair Input Shaft Speed Sensor** and inspect upper countershaft PTO gear for damage. Go to **Step V.**

AutoShift/AutoSelect Shift Complaint Test, continued

Step E	Procedure	Condition	Action
	1. Disconnect transmission harness from input speed sensor.		
	2. Measure resistance between input speed sensor pins and each pin and ground. →	If input shaft speed sensor pins resistance is 2K to 4K ohms and If input shaft speed sensor pins to ground are 10K ohms or open circuit (OL) →	**Repair or replace transmission harness.** Go to **Step V.**
		If any of the above conditions are not met →	Go to **Step D.**



AutoShift/AutoSelect Shift Complaint Test, continued

Step V	Procedure	Condition	Action
	1. Key off. 2. Reconnect all connectors. 3. Key on. 4. Clear Fault Codes (see page 1-4) 5. Use Driving Technique (see page 1-6) to attempt to reset the code.		
	6. Retrieve Fault Codes (see page 1-4) →	If no codes →	Test complete.
		If code 56 appears →	Return to **Step A** to find error in testing.
		If code other than 56 appears →	Go to Fault Code Isolation Procedure Index. (see page 1-10)

Transmission Air Leak

Overview

This symptom-driven test is performed if the transmission has an air leak and there are no Active or Inactive fault codes.

Detection

There is no detection process specifically for a transmission Air Leak. 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 mode for a transmission air leak, however, it may effect other vehicle systems.

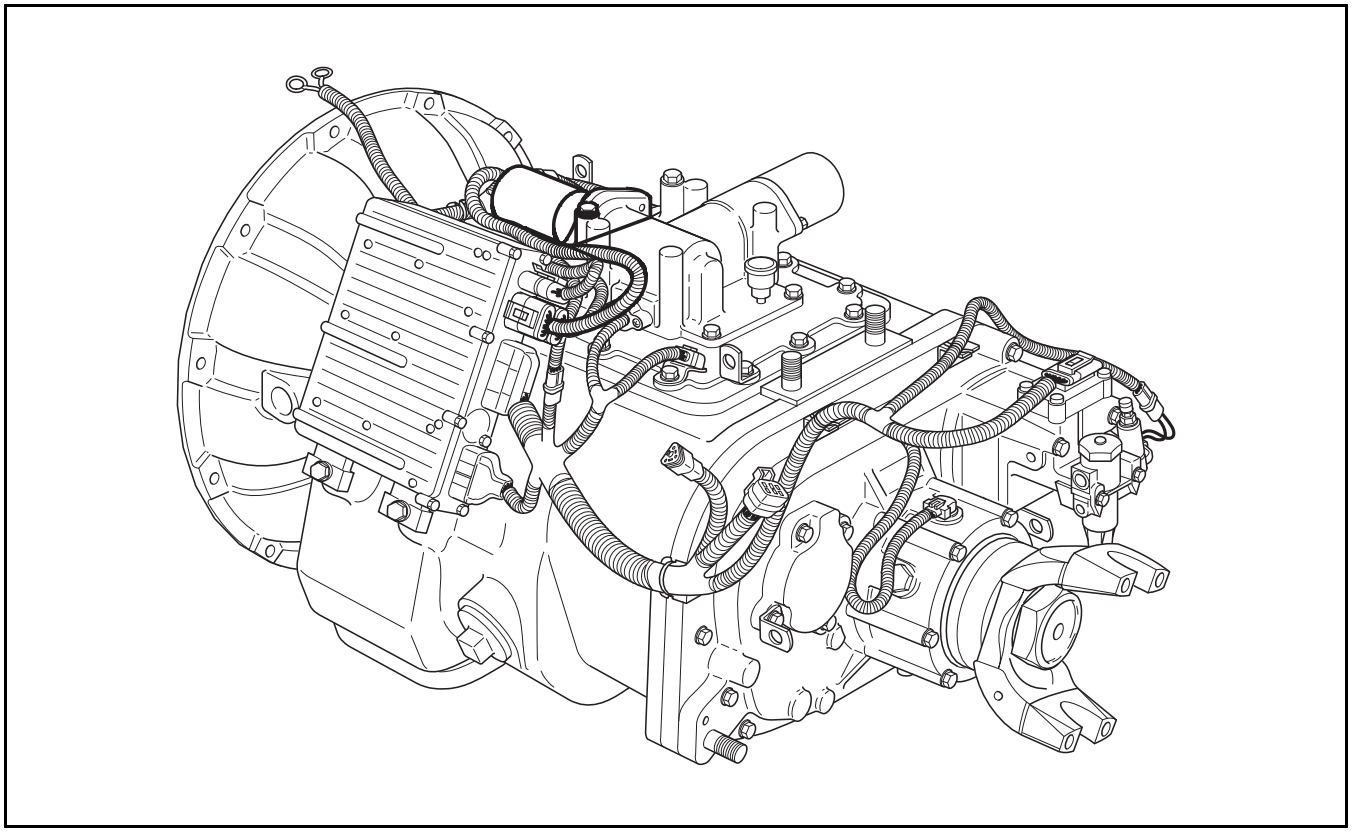
Required Tools

- Basic Hand Tools
- Troubleshooting Guide

Possible Causes

This symptom can be caused by any of the following:

- Contaminated Air
- Range Valve
- Splitter Valve
- Air Filter/Regulator
- Range Piston / O-ring
- Splitter Piston / O-ring



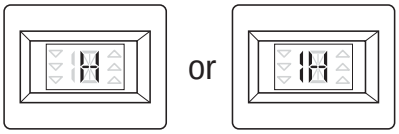
Transmission Air Leak Test

Step A	Procedure	Condition	Action
	1. Start engine.		
	2. Allow air pressure to build to governor cut-off.		
	3. Leave transmission in neutral.		
	4. Key off.		
	5. Listen for constant air leaks.	If there are no constant air leaks	Go to **Step B.**
		If air leaks from fittings or air lines at: • Air filter/regulator • Splitter Cylinder supply line (18-speed only)	Repair fittings or lines as required. Repeat this step.
		If air leaks at the Range Valve exhaust port	**Replace Range Valve.** Go to **Step V.**
		If air leaks at Splitter Valve exhaust port (18-speed only)	**Replace Splitter Valve.** Go to **Step V.**

Step B	Procedure	Condition	Action
	1. Start engine.		
	2. Release clutch to register Input Shaft speed in the transmission.		
	3. Turn off engine, but leave key in "ON" position.		
	4. With the Shift Lever, select reverse, then select neutral.	If there are no constant air leaks	Go to **Step C.**
		If air leaks at the Range Valve exhaust port	Go to **Step D.**
		If air leaks at the Splitter Valve exhaust port (18-speed only)	Go to **Step F.**
		If air leaks at the transmission breather	Go to **Step G.**

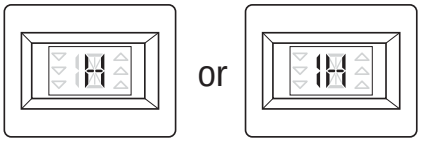
Transmission Air Leak Test, continued

Step C	Procedure	Condition	Action
	1. Key on.		
	2. With Shift Lever, select reverse, press the upshift button, then select neutral.	If there are no constant air leaks →	Go to **Step E.**
	Note: If Gear Display does not read "H" (10-speed) or "IH" (18-speed), go to the Up/Down Button Test.		
		If air leaks at the Range Exhaust Port →	**Replace Range Valve.** Go to **Step V.**



10-Speed 18-Speed

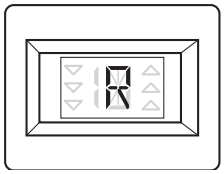
Step D	Procedure	Condition	Action
	1. Key on.		
	2. With Shift Lever, select reverse, press the upshift button, then select neutral.	If there are no constant air leaks →	**Replace Range Valve.** Go to **Step V.**
	Note: If Gear Display does not read "H" (10-speed) or "IH" (18-speed), go to the Up/Down Button Test.	If air leaks at the Range Exhaust Port →	Replace Range Piston and O-rings. Go to **Step V.**



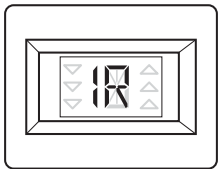
10-Speed 18-Speed

Transmission Air Leak Test, continued

Step E	Procedure	Condition	Action
	1. Key on.		
	2. With Shift Lever, select reverse, press the downshift button, then select neutral.		
	3. Listen for constant air leaks. →	If there are no constant air leaks →	Test complete.
		If air leaks at the Splitter exhaust port →	Repair Splitter Piston and O-rings. Go to **Step V.**
	Note: If Gear Display does not read "R" (10-speed), go to Up/Down Button Test.		

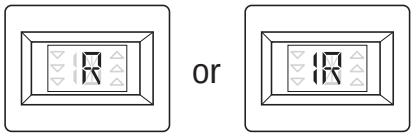


Step F	Procedure	Condition	Action
	1. Key on.		
	2. With Shift Lever, select reverse, press the downshift button, and then select neutral.		
	3. Listen for constant air leaks. →	If there are no constant air leaks →	**Replace Splitter Valve** (18-speed only). Go to **Step V.**
	Note: If Gear Display does not read "IR" (18-speed), go to Up/Down Button Test.	If air leaks at the Splitter Valve exhaust port →	Repair Splitter Piston and O-rings (18-speed only). Go to **Step V.**



Transmission Air Leak Test, continued

Step G	Procedure	Condition	Action
	1. Key on. 2. With Shift Lever, select reverse, press the downshift button, and then select neutral.		
	3. Listen for constant air leak.	If the leak continues →	Repair the Range Yoke Bar O-rings as required (18-speed only). Go to **Step V.**
	Note: If Gear Display does not read "H" (10-speed) or "IH" (18-speed), go to the Up/Down Button Test.	If the air leak stops →	Replace the Splitter Yoke Bar O-ring as required (18-speed only. Go to **Step V.**



10-Speed 18-Speed

Step V	Procedure	Condition	Action
	1. Start engine 2. Release clutch to register Input Shaft speed in the transmission. 3. Turn off engine, but leave key in the "ON" position. 4. Listen for constant air leaks under the following conditions: • With Shift Lever, select reverse, then select neutral • With Shift Lever, select reverse, then select neutral	If there are no constant leaks →	Test complete.
		If there are constant air leaks →	Return to **Step A** to find error in testing.

Transmission Air Leak Test, continued

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Neutral Lock Input

Overview

The Neutral Switch is used on some applications which require the Auto Neutral function.

Detection

The System Manager monitors the Neutral Switch circuit for a short to ground or open and sets a fault if detected.

Fallback

There is no fallback mode for this symptom.

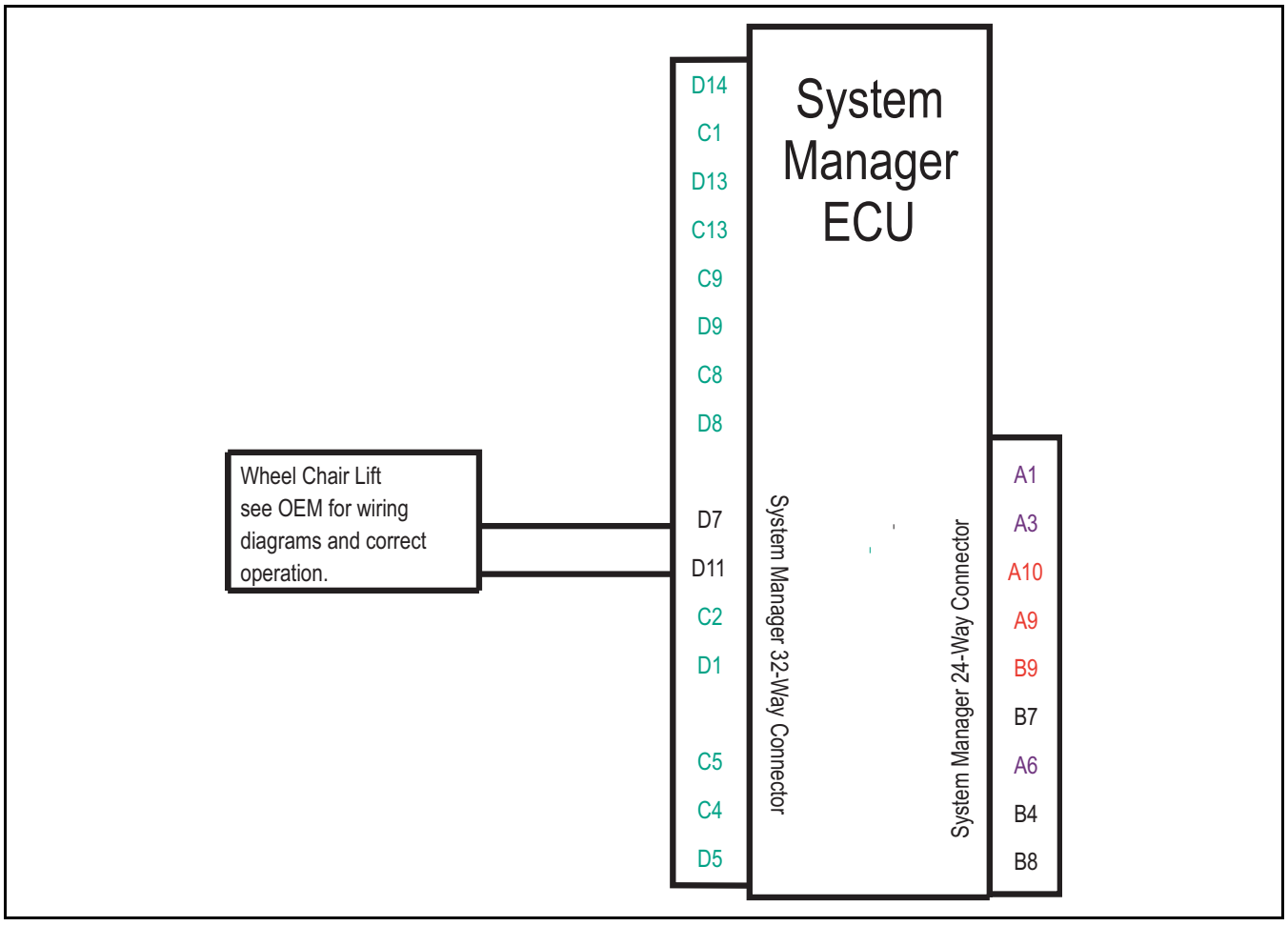
Required Tools

- Basic Hand Tools
- Digital Volt/Ohm Meter
- AutoShift/AutoSelect Troubleshooting Guide

Possible Causes

This fault can be caused by any of the following:

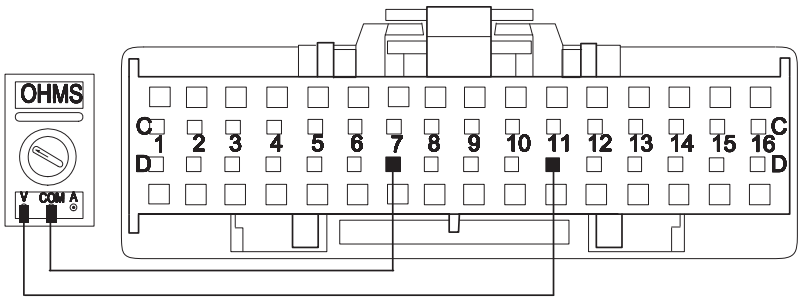
- Neutral Switch
- Wiring
- System Manager



Neutral Lock Input Test

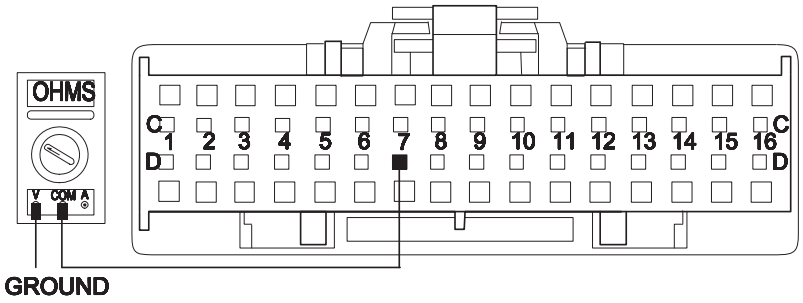
Step A	Procedure	Condition	Action
	1. Is wheelchair lift switch normally open or normally closed? →	If normally closed →	Go to **Step B.**
		If normally open →	Go to **Step E.**

Step B	Procedure	Condition	Action
	1. Make sure the lift is off and at rest position.		
	2. Disconnect system manager 32-way connector.		
	3. Measure resistance between system manager 32-way connector pins D7 and D11. →	If resistance is 0 to .3 ohms →	Go to **Step C.**
		If resistance is outside of range →	Pin D7 requires connection to pin D11. Repair harness. Repeat this step.



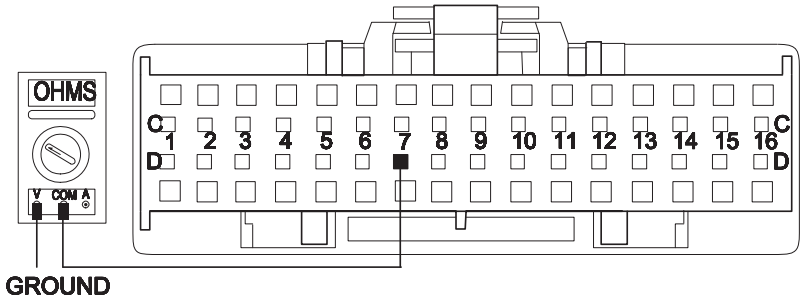
Neutral Lock Input Test, continued

Step C	Procedure	Condition	Action
	1. Measure resistance between system manager 32-way connector pin D7 and ground. →	If resistance is 0 to .3 ohms →	Go to **Step D.**
		If resistance is outside of range →	Normally closed type systems require pin D7 be grounded for normal transmission operation. Repair harness or switch as required. Repeat this step.



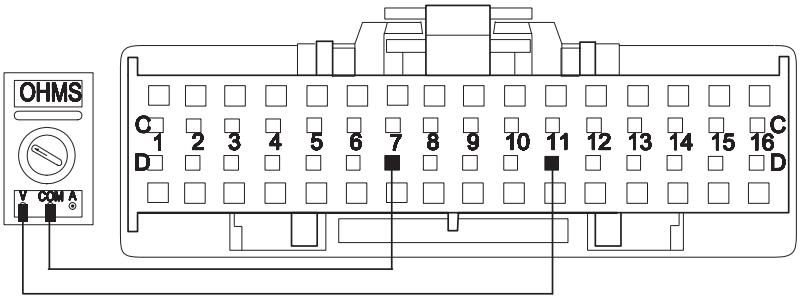
Neutral Lock Input Test, continued

Step D	Procedure	Condition	Action
	1. Activate wheelchair lift.		
	2. Measure resistance between system manager 32-way connector pin D7 and ground. →	If resistance is more than 10K ohms or open circuit [OL] →	**Replace system manager ECU.** Go to **Step V.**
		If resistance is less than 10K ohms →	Normally closed type systems require pin D7 open to ground to inhibit gear selection. Repair harness or switch as required. Go to **Step V.**



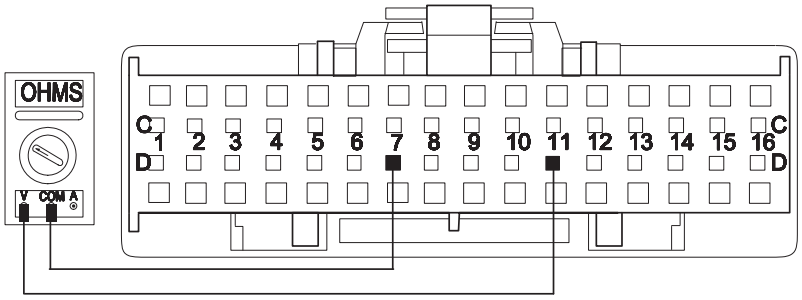
Neutral Lock Input Test, continued

Step E	Procedure	Condition	Action
	1. Make sure the lift is off and at rest position. 2. Disconnect system manager 32-way connector.		
	3. Measure resistance between system manager 32-way connector pins D7 and D11.	If resistance is more than 10K ohms or open circuit [OL]	Go to **Step F.**
		If resistance is less than 10K ohms	Normally open type systems require pins D7 and D11 be open for normal transmission operation. Repair harness or switch as required. Repeat this step.



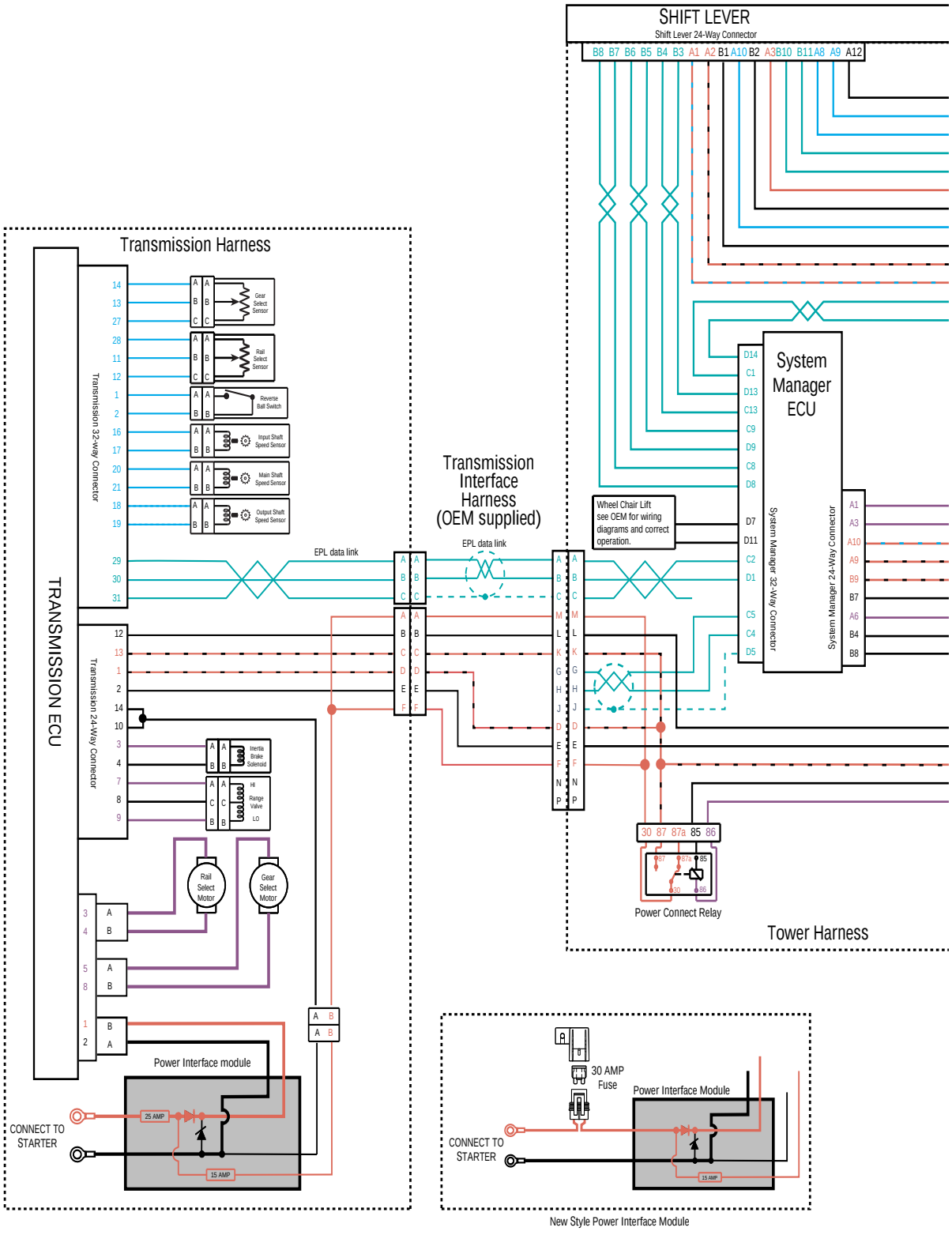
Neutral Lock Input Test, continued

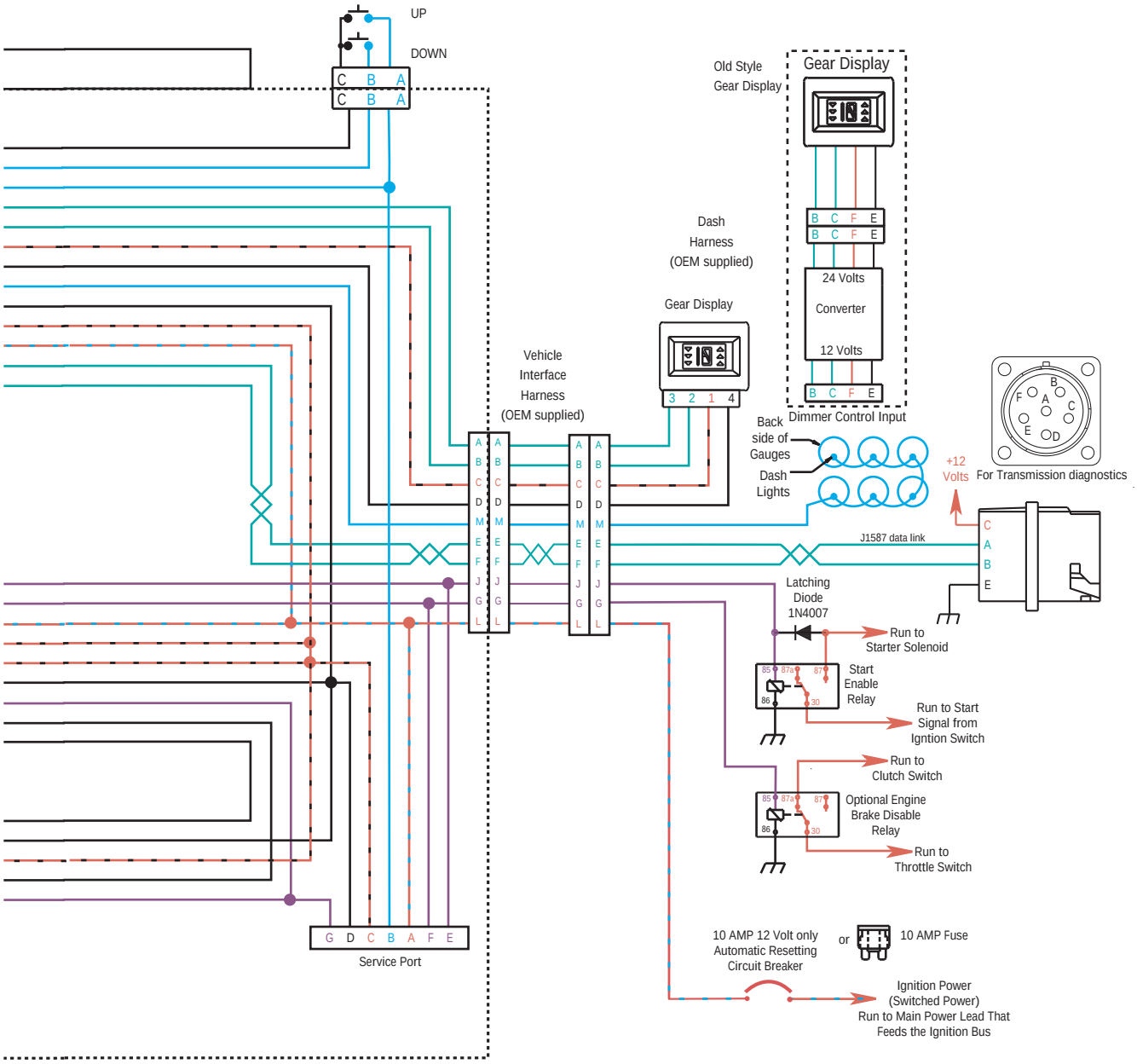
Step F	Procedure	Condition	Action
	1. Activate wheelchair lift.		
	2. Measure resistance between system manager 32-way connector pins D7 and D11. →	If resistance is 0 to .3 ohms →	**Replace system manager ECU.** Go to **Step V.**
		If resistance is outside of range →	Normally open type systems require pins D7 and D11 be connected to inhibit gear selection. Repair harness or switch as required. Go to **Step V.**



Step V	Procedure	Condition	Action
	1. Key off.		
	2. Reconnect all connectors.		
	3. Key on.	If the complaint was repaired →	Test complete.
	4. Drive the vehicle to determine whether the complaint has been repaired. →	If the complaint was not repaired →	Return to **Step A** to find error in testing.
		If other code or symptom appears →	Go to Diagnostics Procedure (see page 1-3)

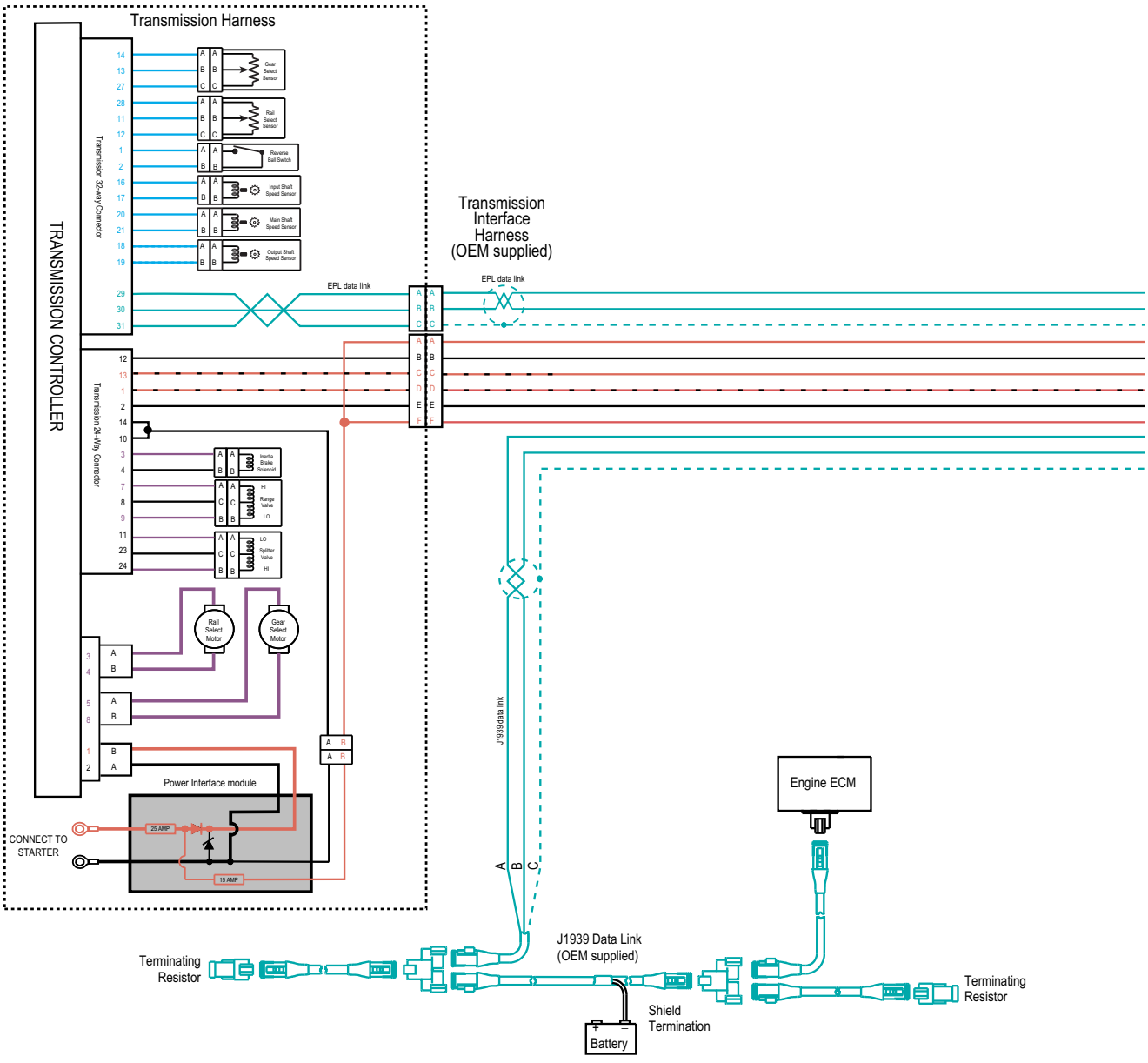
Current Style Wiring Harness AutoSelect

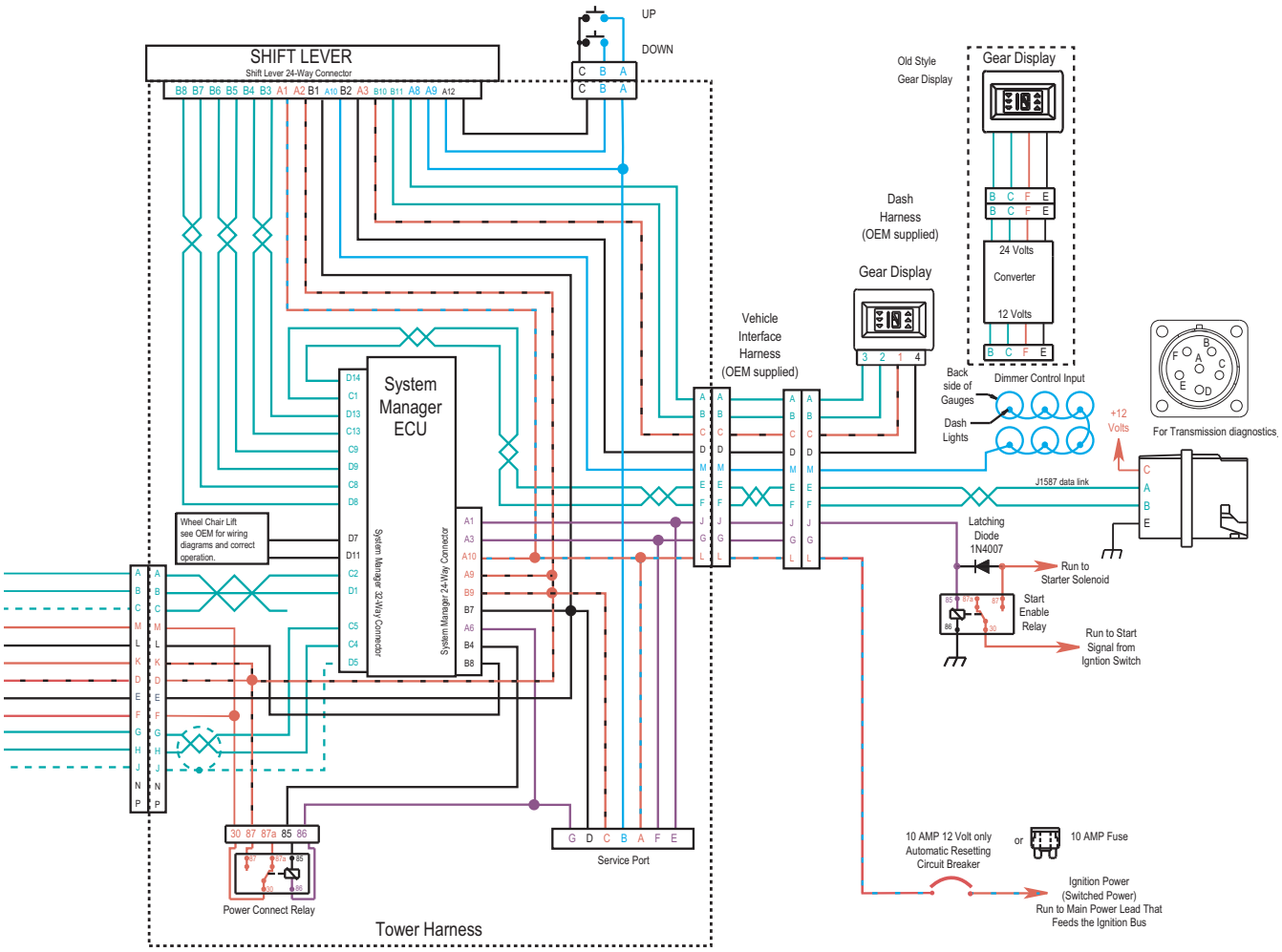




All OEM responsible wiring shown is "typical". Consult specific application.
+12 volt non-switched from battery
+12 volt switched from Power Connect Relay
+12 volt switched from Ignition Switch
Signals into the ECU
Communication from and to the ECU
Signal returns, Grounds, and general OEM wiring
+12 volt solenoid source

Current Style Wiring Harness AutoShift





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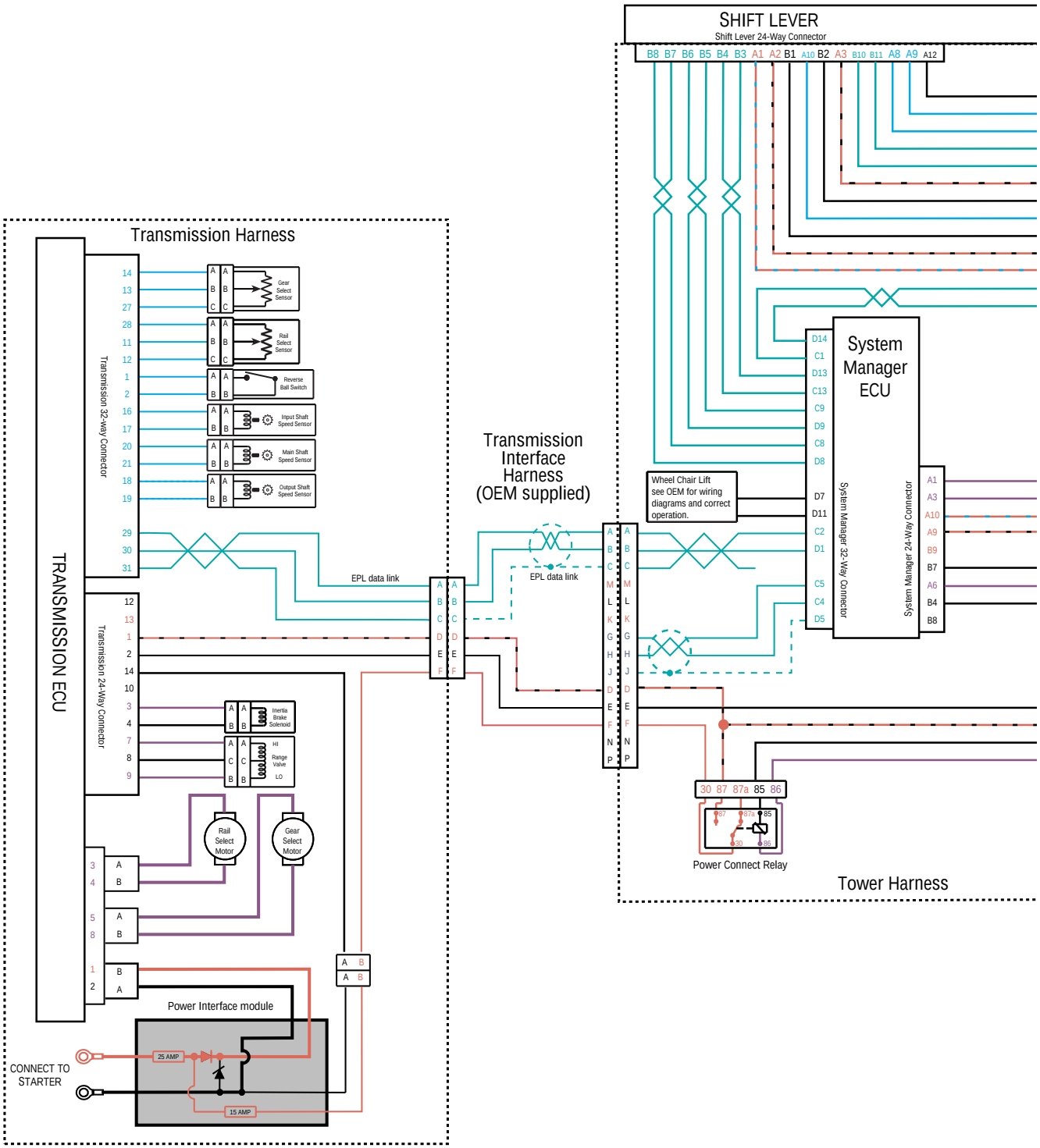
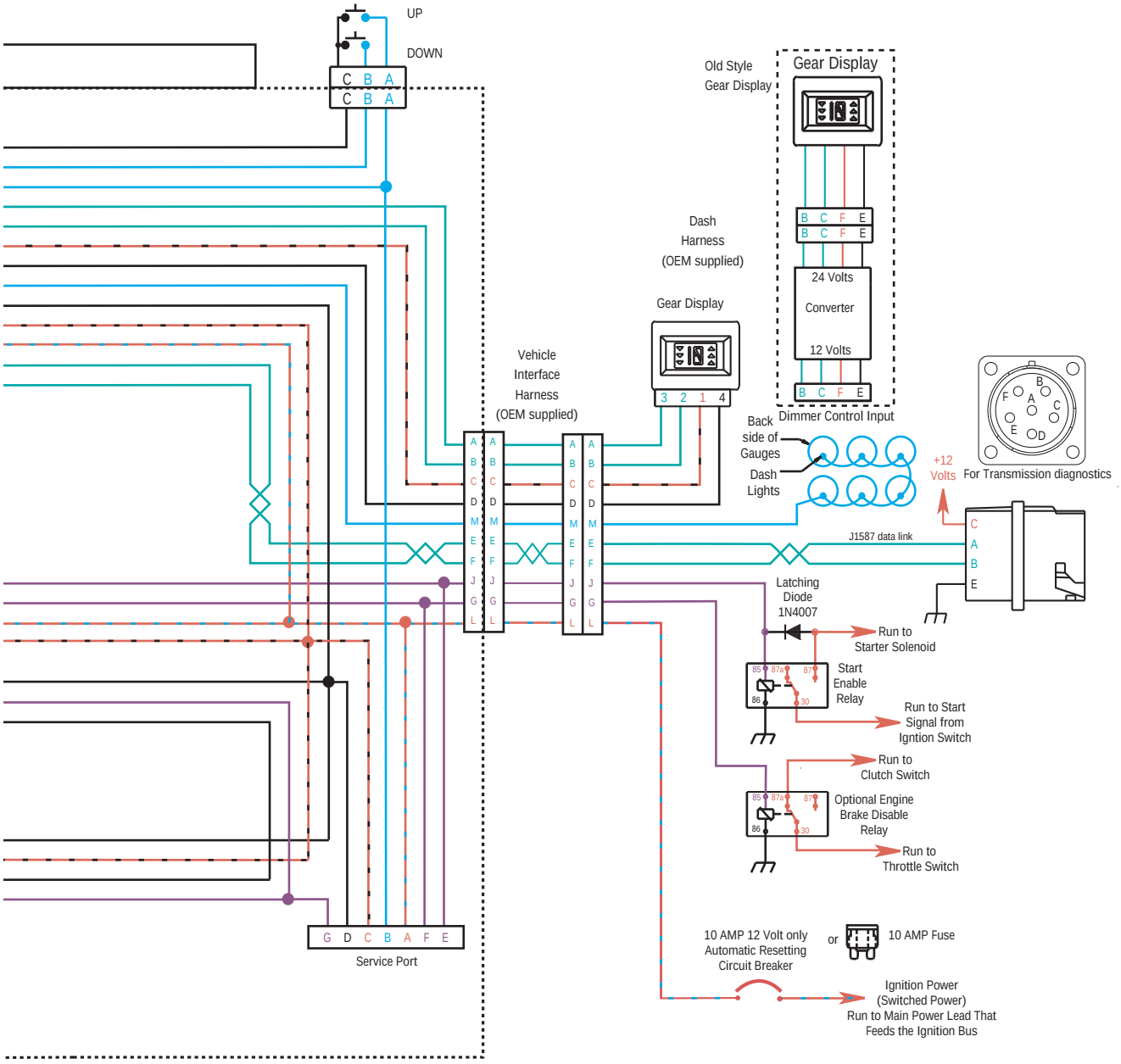
+12 volt switched from Ignition Switch
Signals into the ECU
Communication from and to the ECU
Signal returns, Grounds, and general OEM wiring
+12 volt solenoid source

Old Style Wiring Harness AutoSelect





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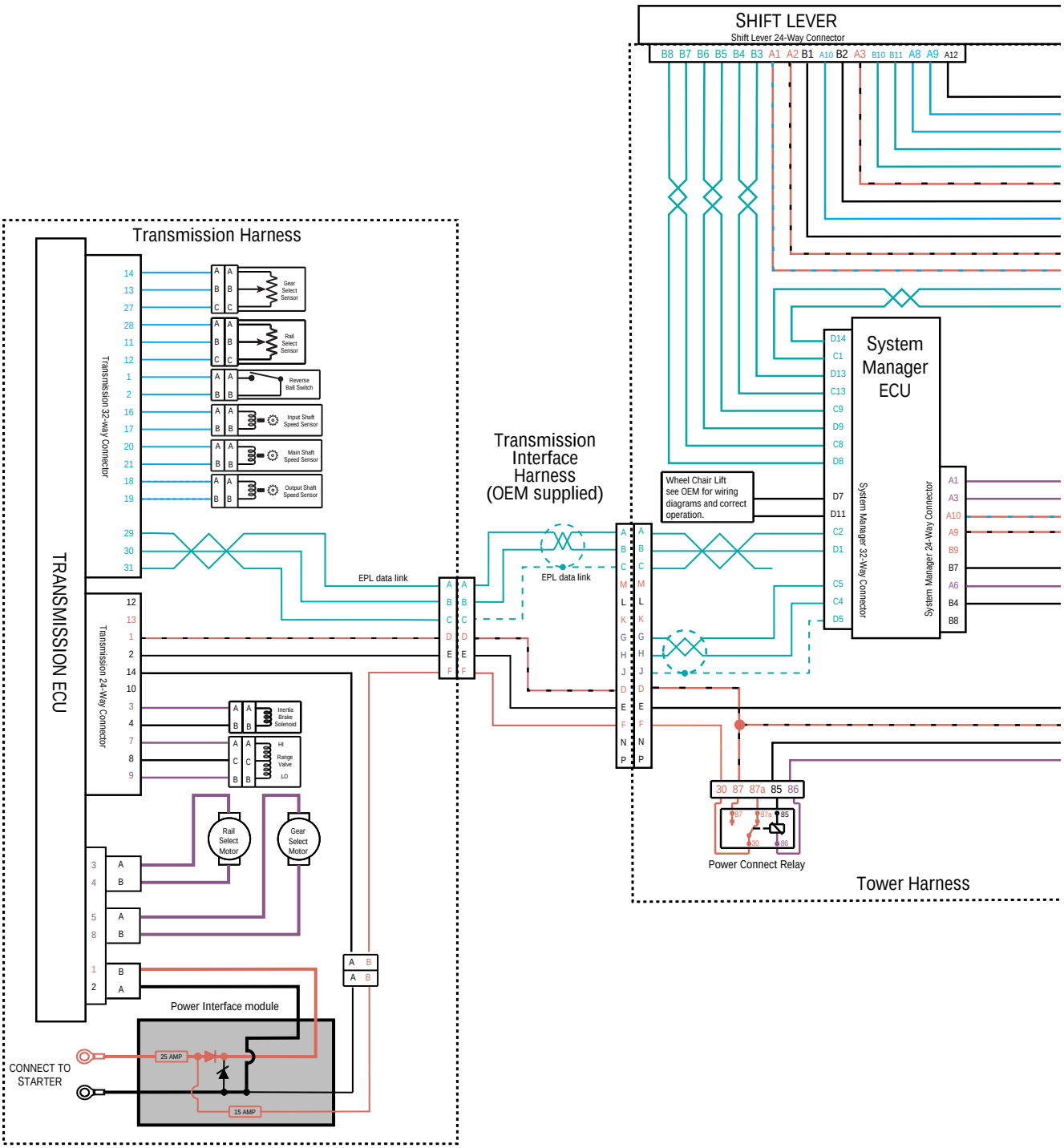
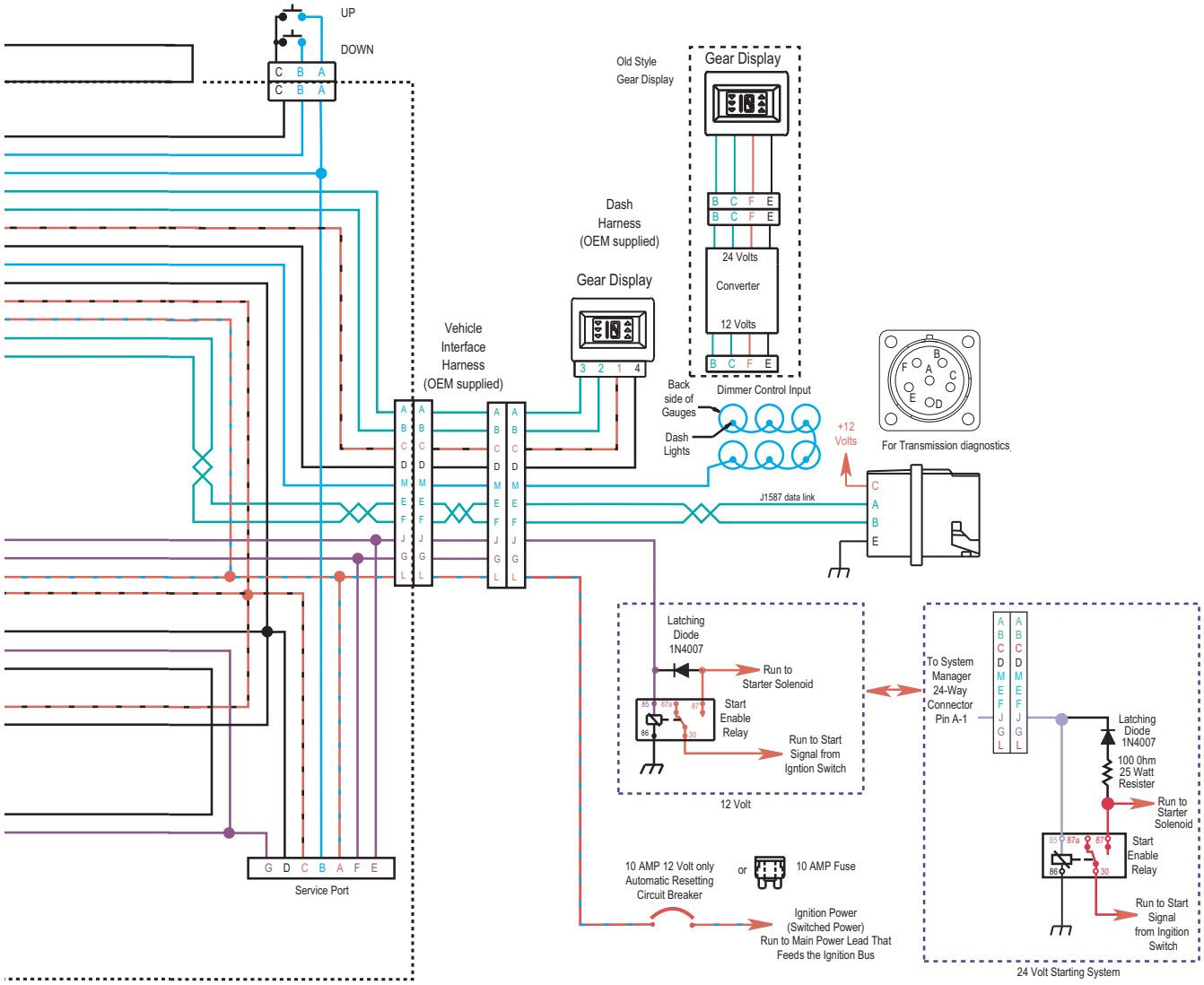
+12 volt solenoid source

Old Style Wiring Harness AutoShift





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Communication from and to the ECU
Signal returns, Grounds, and general OEM wiring
+12 volt solenoid source

Check for Proper Clutch Operation

When performing the test for proper clutch operation, the vehicle should be in 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 ECU 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 shaft will not slow down and the transmission will not shift into gear.

With Hand-held

1. Connect hand-held tool.
2. Make sure the transmission is in neutral.
3. Start engine.
4. Set hand-held to monitor input shaft speed.
5. With clutch pedal up (clutch engaged) compare input speed and engine speed (rpm). They should be the same.
6. If not:
    - Perform Input Shaft Speed Sensor test.
    - Confirm proper clutch adjustment, adjust as needed.
    - Check clutch for slippage, repair or replace as necessary.
7. Depress clutch pedal to activate clutch brake. Within 2 seconds, input shaft speed should be less than 25 rpm (0 rpm is desired).
8. If input shaft does not stop turning, this indicates that the clutch is not disengaging completely or the clutch brake is not functioning properly.
    - Check for proper clutch adjustment, adjust as necessary.
    - 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.

- 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 Hand-held

1. Make sure the transmission is 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. Gear display shows flashing gear not yet engaged or solid gear for engaged. If flashing gear is displayed, slowly release clutch pedal.
7. If flashing gear does not become solid or gear does not engage, check clutch brake for proper function and check clutch adjustment.
8. If gear does not engage and clutch is adjusted properly, troubleshoot for dragging clutch according to clutch manufacturer.

Confirm Proper Clutch Adjustment

Confirm release bearing travel gap

1. 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".
2. If this dimension is incorrect, adjust the clutch per the clutch manufacture's instructions.

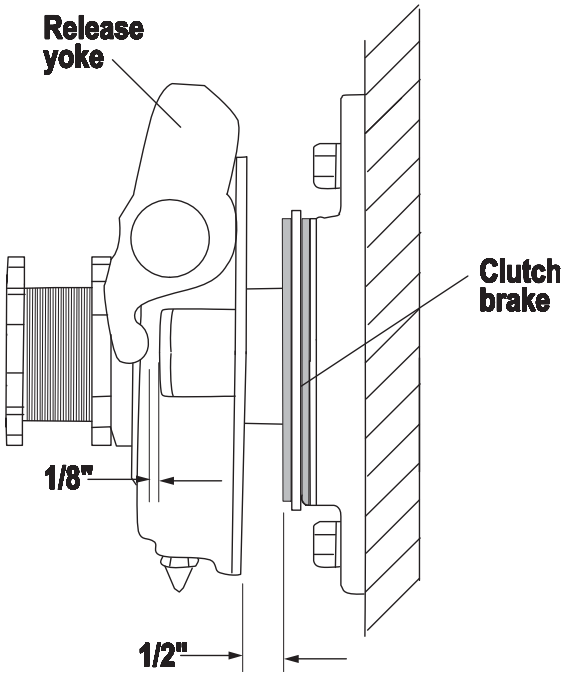
Confirm the free-play gap

1. Use a 1/8" gauge to verify proper free-play gap. This gap should be 1/8".
2. If this dimension is incorrect, adjust the clutch per the clutch manufacturer's instructions.

Clutch Brake Contact

Insert a .010" feeler gauge between the release bearing and the clutch brake. Have an assistant fully depress the clutch pedal. The .010" feeler gauge should be squeezed between the release bearing rear and the clutch brake. Have the assistant slowly let up on the clutch pedal. The .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 .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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