

SECTION 307-05: Automatic Transaxle/Transmission External Controls
DIAGNOSIS AND TESTING

2014 F-150 Workshop Manual
Procedure revision date: 10/25/2013

External Controls — Column Shift

Special Tool(s)

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Inspection and Verification

1. Verify the customer concern by operating the transmission external control.
2. Visually inspect for obvious signs of mechanical and electrical damage; refer to the following chart:

Visual Inspection Chart

Mechanical	Electrical
• Damaged Brake Shift Interlock Actuator (BSIA) • Damaged Tow/Haul switch • Damaged SelectShift™ switch	• Failed fuse(s): ■ Body Control Module (BCM) 18 (10A) ■ <u>BCM</u> 42 (5A) • PCM • Loose or damaged connections • Damaged wiring harness • Corroded or damaged terminals

3. If the fault is not visually evident, determine the symptom. GO to [Symptom Chart - External Controls, Column Shift](#) or GO to [Symptom Chart - NVH Column Shift](#).

DTC Chart

DTC Chart

DTC	Component	Description	Condition	Symptom	Action
B1319:11	Brake Shift Interlock	Shift Interlock (BSI) Output Circuit: Circuit	<u>BSIA</u> system malfunction	<u>BSIA</u> inoperative.	GO to Pinpoint

	Actuator (BSIA), <u>BCM</u>	short to ground			Test A.
B1319:15	Brake Shift Interlock Actuator (BSIA), <u>BCM</u>	Shift Interlock (BSI) Output Circuit: Circuit short to voltage or open	BSIA system malfunction	BSIA inoperative.	GO to Pinpoint Test A.
P0815	Upshift Switch Circuit	Upshift switch concerns, open or shorted circuit	The PCM signal input voltage status is out of range	Upshift switch inoperative.	GO to Pinpoint Test D.
P0816	Downshift Switch Circuit	Downshift switch concerns, open or shorted circuit	The PCM signal input voltage status is out of range	Downshift switch inoperative.	GO to Pinpoint Test D.
P1780	Tow/Haul Switch	Transmission Control Switch (TCS) (Overdrive (O/D) cancel) circuit out of self-test range	The PCM did not receive a Tow/Haul switch input during the Key ON Engine Running (KOER) self-test	Tow/Haul is inoperative or does not operate correctly.	GO to Pinpoint Test C.

Symptom Chart — External Controls, Column Shift

Symptom Chart — External Controls, Column Shift

Condition	Possible Sources	Action
The Brake Shift Interlock Actuator (BSIA) system does not release/lock correctly	- Circuitry - Fuse(s): - Body Control Module (BCM) 18 (10A) <u>BSIA</u> - Selector lever cable	GO to Pinpoint Test A. - VERIFY selector lever cable adjustment. REFER to Selector Lever Cable Adjustment — Column Shift in this section.
Transmission Range (TR) indicator (PRNDL) does not correspond to the selected gear	- Selector lever cable bracket - Instrument Panel Cluster (IPC) malfunction - Selector lever cable loose in the selector lever cable bracket - Selector lever cable	- TIGHTEN bolts holding the selector lever cable bracket. REFER to Selector Lever Cable Adjustment — Column Shift in this section. - REFER to Section 413-01. - VERIFY cable is fully seated in the selector lever cable bracket. REFER to Selector Lever Cable — Column Shift in this section. - VERIFY selector lever cable

	Clip securing the selector lever cable to the steering column bracket	adjustment. REFER to Selector Lever Cable Adjustment — Column Shift in this section. INSTALL clip correctly. REFER to Selector Lever Cable — Column Shift in this section.
TR indicator (PRNDL) does not illuminate	- IPC malfunction - TR sensor	- REFER to Section 413-00. - CHECK for TR sensor DTCs. REFER to Section 307-01.
The Tow/Haul switch does not operate correctly	- Tow/Haul switch - Tow/Haul switch not cycled during self-test - Circuitry	GO to Pinpoint Test C
The Tow/Haul indicator lamp is not operating correctly	- IPC - PCM - Circuitry	REFER to Section 413-01.
The SelectShift™ switch is not operating correctly	- SelectShift™ switch - PCM - Circuitry	GO to Pinpoint Test D.
Water enters inside the vehicle	- Cable assembly grommet - Torn selector lever cable assembly grommet	- SECURE grommet to floor panel. REFER to Selector Lever Cable — Column Shift in this section. - INSTALL a new selector lever cable. REFER to Selector Lever Cable — Column Shift in this section.
Excessive shift effort	- Selector lever cable - Cable bracket	- INSTALL a new selector lever cable. REFER to Selector Lever Cable — Column Shift in this section. - ADJUST cable. REFER to Selector Lever Cable Adjustment — Column Shift in this section. TIGHTEN cable bracket screws. REFER to Specifications in this section.
Selector lever will not shift from PARK	- Selector lever cable - Column bracket clip - Broken selector lever cable	- VERIFY selector lever cable adjustment. REFER to Selector Lever Cable Adjustment — Column Shift in this section. - INSTALL a new bracket clip. REFER to Selector Lever Cable — Column Shift in this section. - INSTALL a new selector lever cable. REFER to Selector

	• Brake Shift Interlock Actuator (BSIA) system failure	• Lever Cable — Column Shift in this section. • GO to Pinpoint Test A.
• Vehicle will not crank/start in park but will crank/start in neutral	• Selector lever cable • TR sensor	• VERIFY selector lever cable adjustment. REFER to Selector Lever Cable Adjustment — Column Shift in this section. • CHECK for TR sensor DTCs. REFER to Section 307-01.

Symptom Chart — NVH Column Shift

Symptom Chart — NVH Column Shift

NOTE: NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to [Section 100-04](#). Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, refer back to [Section 100-04](#) for the next likely system and continue diagnosis.

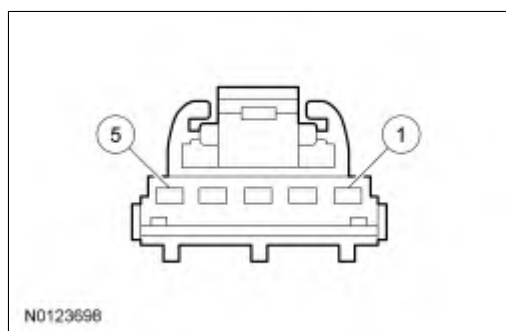
Condition	Possible Sources	Action
• Vibration — a high frequency (20-80 Hz) that is felt through the seat or selector lever. Changes with engine speed	• Selector lever cable incorrectly routed, grounded out or loose	• CHECK the selector lever cable. REPAIR as necessary. REFER to Selector Lever Cable — Column Shift in this section.
• Rattle, buzz or other noise	• Selector lever loose • Selector lever • Cable assembly grommet	• TIGHTEN the selector lever bolts. REFER to Selector Lever — Column Shift in this section. • INSTALL a new selector lever. REFER to Selector Lever — Column Shift in this section. • SECURE the grommet to the floor panel. REFER to Selector Lever Cable — Column Shift in this section.

Pinpoint Tests

Refer to Wiring Diagrams Cell [30](#), Transmission Controls for schematic and connector information.

Refer to Wiring Diagrams Cell [37](#), Shift Interlock for schematic and connector information.

Tow/Haul Connector — C2399

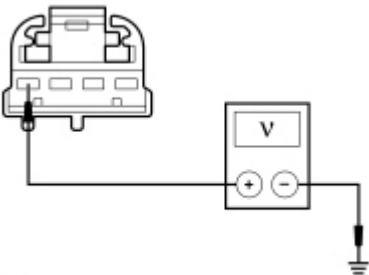
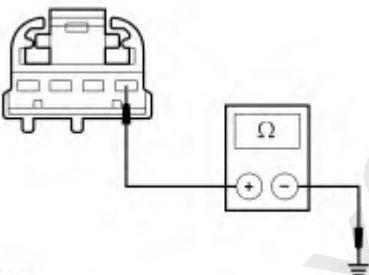
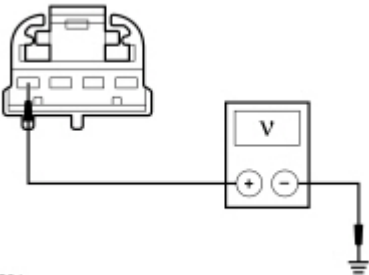


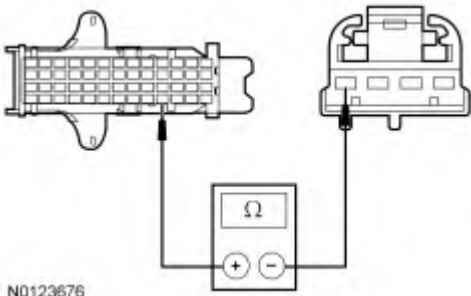
Pin Number	Circuit Function
1	Tow/Haul Power
2	Tow/Haul Signal
3	SelectShift™ Upshift
4	SelectShift™ Ground
5	SelectShift™ Downshift

PINPOINT TEST A: THE BSIA SYSTEM DOES NOT RELEASE/LOCK CORRECTLY

NOTE: Inspect the selector lever cable before proceeding with this pinpoint test.

Test Step	Result / Action to Take
A1 CHECK THE STOPLAMPS - Apply the brake pedal and observe the stoplamps. Do the stoplamps illuminate?	Yes VERIFY the <u>BCM</u> fuse 18 (10A) is OK, If OK GO to A2. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. No REFER to Section 417-01.
A2 CHECK THE <u>BSIA</u> OUTPUT CIRCUIT - Disconnect: Brake Shift Interlock Actuator (BSIA) C2008 . - Ignition ON. - Measure the voltage between the <u>BSIA</u> C2008-4, circuit CET53 (BU/OG), harness side and ground.	Yes GO to A3 . No If the voltage was greater than 10 volts with the brake pedal applied or not applied, GO to A4 . Otherwise, GO to A5 .

 N0130501 • Depress the brake pedal. • With the brake pedal depressed, measure the voltage between the <u>BSIA</u> C2008-4, circuit CET53 (BU/OG), harness side and ground. • Is the voltage greater than 10 volts with the brake pedal applied and 0 volts with the brake pedal not applied?	
A3 CHECK THE <u>BSIA</u> GROUND CIRCUIT FOR AN OPEN • Ignition OFF. • Measure the resistance between the <u>BSIA</u> C2008-1, circuit GD133 (BK), harness side and ground.  N0112231 • Is the resistance less than 5 ohms?	Yes REPLACE the <u>BSIA</u>. REFER to Brake Shift Interlock Actuator — Column Shift in this section. CLEAR the DTC. TEST the system for normal operation. No REPAIR circuit GD133 (BK) for an open. CLEAR the DTC. TEST the system for normal operation.
A4 CHECK THE <u>BSIA</u> OUTPUT CIRCUIT FOR A SHORT TO POWER • Ignition OFF. • Disconnect: <u>BCM</u> C2280B. • Inspect C2008 and C2280B for damaged, pushed-out terminals or loose wires. • Ignition ON. • Measure the voltage between the <u>BSIA</u> C2008-4, circuit CET53 (BU/OG), harness side and ground.  N0130501 • Is any voltage present?	Yes REPAIR circuit CET53 (BU/OG) for a short to power. CLEAR the DTC. TEST the system for normal operation. No GO to A5.

A5 CHECK THE <u>BSIA</u> POWER CIRCUIT FOR AN OPEN - Measure the resistance between the <u>BSIA</u> C2008-4, circuit CET53 (BU/OG) and <u>BCM</u> C2280B-49, CET53 (BU/OG) harness side.  N0123676 - Is the resistance less than 5 ohms?	Yes GO to A6. No REPAIR circuit CET53 (BU/OG) for an open. CLEAR the DTC. TEST the system for normal operation.
A6 CHECK FOR CORRECT BCM OPERATION - Disconnect all <u>BCM</u> connectors. - Check for: - corrosion - damaged pins - pushed-out pins - Connect all the <u>BCM</u> connectors and make sure they seat correctly. - Operate the system and verify the concern is still present. - Is the concern still present?	Yes REPLACE the <u>BCM</u>. REFER to Section 418-00. CLEAR the DTC. TEST the system for normal operation. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

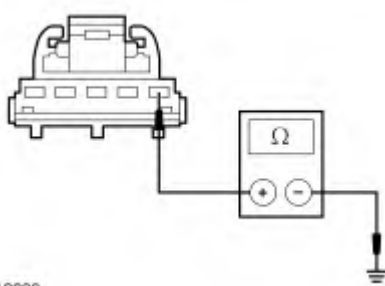
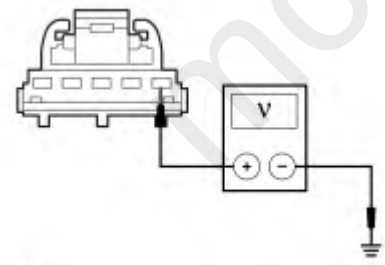
PINPOINT TEST C: THE TOW/HAUL SWITCH DOES NOT OPERATE CORRECTLY

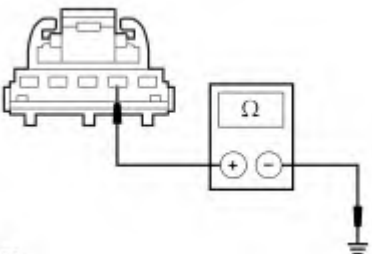
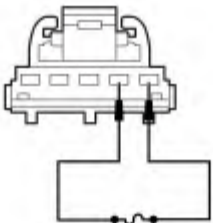
NOTE: Vehicles equipped with a 3.7L engine use PCM C175T.

NOTE: Vehicles equipped with a 5.0L or 6.2L engine use PCM C1381T.

NOTE: Vehicles equipped with a 3.5L engine use PCM C1551B.

Test Step	Result / Action to Take
C1 CHECK DTCs - Ignition ON. - Connect the scan tool. - Start the engine and RUN the Key ON Engine Running (KOER) self-test. - Is DTC P1780 set?	Yes GO to C2. No No trouble found with the Tow/Haul system. REFER to Section 413-01 if the Tow/Haul lamp does not illuminate.
C2 CHECK THE <u>BCM</u> FUSE 42 (5A) - Ignition OFF. - Remove Body Control Module (BCM) fuse 42 (5A). - Check fuse: <u>BCM</u> 42 (5A).	Yes GO to C4. No

Is the resistance less than 5 ohms?	GO to C3 .
C3 CHECK THE TOW/HAUL POWER CIRCUIT FOR A SHORT TO GROUND - Disconnect: Tow/Haul C2399. - Disconnect: <u>BCM</u> C2280B. - Inspect C2399 and C2280B for damaged, pushed-out terminals or loose wires. - Measure the resistance between the Tow/Haul C2399-1, circuit CBP42 (GN), harness side and ground.  N0112233 - Is the resistance greater than 10,000 ohms?	Yes GO to C4. No REPAIR circuit CBP42 (GN) for a short to ground. CLEAR the DTC. RERUN the <u>KOER</u> self-test and test the system for normal operation.
C4 CHECK THE TOW/HAUL POWER CIRCUIT FOR VOLTAGE - Disconnect: Tow/Haul C2399. - Inspect C2399 for damaged, pushed-out terminals or loose wires. - Ignition ON. - Measure the voltage between the Tow/Haul switch C2399-1, circuit CBP42 (GN), harness side and ground.  N0123677 - Is the voltage greater than 10 volts?	Yes GO to C5. No REPAIR circuit CBP42 (GN) for an open. CLEAR the DTC. RERUN the <u>KOER</u> self-test and test the system for normal operation.
C5 CHECK THE TOW/HAUL INPUT CIRCUIT FOR A SHORT TO GROUND - Disconnect: PCM C175T. - Disconnect: PCM C1381T. - Disconnect: PCM C1551B. - Inspect the connector for damaged, pushed-out terminals, corrosion or loose wires. - Measure the resistance between Tow/Haul switch C2399-2, circuit CET34 (BN/GN) and ground.	Yes GO to C6. No REPAIR circuit CET34 (BN/GN) for a short to ground. REPLACE the <u>BCM</u> 42 (5A). CLEAR the DTC. RERUN the <u>KOER</u> self-test and test the system for normal operation.

 N0123678 Is the resistance greater than 10,000 ohms?	
C6 CHECK THE TOW/HAUL INPUT CIRCUIT FOR AN OPEN - Connect the scan tool. - Enter the following diagnostic mode on the scan tool: TCS_DEPRES. - Connect a fused jumper from Tow/Haul switch, C2399-1 to C2399-2, harness side.  N0123679 - Does the TCS_DEPRES PID display YES?	Yes REPLACE the selector lever. REFER to Selector Lever — Column Shift in this section. CLEAR the DTC. RERUN the <u>KOER</u> self-test and test the system for normal operation. No INSPECT and REPAIR circuit CET34 (BN/GN) for an open. If an open circuit is not found, REPLACE the PCM. PERFORM the Solenoid Body Strategy Data Download procedure. REFER to Section 307-01. RERUN the <u>KOER</u> self-test and test the system for normal operation.

PINPOINT TEST D: THE SELECTSHIFT™ SWITCH IS NOT OPERATING CORRECTLY

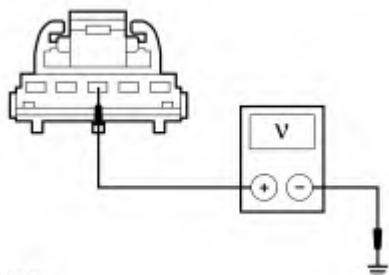
NOTE: Vehicles equipped with a 3.7L engine use PCM C175B.

NOTE: Vehicles equipped with a 5.0L or 6.2L engine use PCM C1381B.

NOTE: Vehicles equipped with a 3.5L engine use PCM C1551B.

Test Step	Result / Action to Take
D1 CHECK DTCs - Ignition ON. - Connect the scan tool. - Start the engine and RUN the Key ON Engine Running (KOER) self-test. - Is DTC P0815 set?	Yes GO to D2. No GO to D5.
D2 CHECK THE UPSHIFT CIRCUIT FOR VOLTAGE - Ignition OFF. - Disconnect: Tow/Haul C2399. - Inspect C2399 for damaged, pushed-out terminals, corrosion or loose wires.	Yes GO to D4. No

- Ignition ON.
- Measure the voltage between the Tow/Haul switch C2399-3, circuit CET43 (GY), harness side and ground.



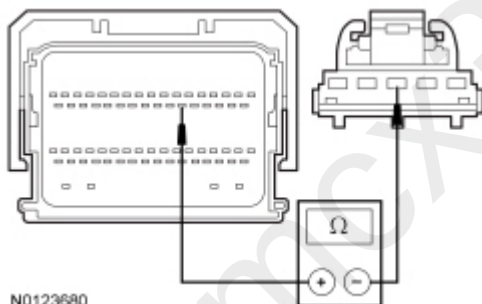
N0113447

- Is the voltage greater than 10 volts?

GO to [D3](#).

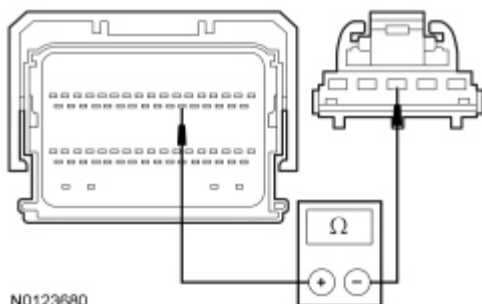
D3 CHECK THE UPSHIFT CIRCUIT FOR AN OPEN

- Ignition OFF.
- Disconnect: PCM C175B.
- Disconnect: PCM C1381B.
- Disconnect: PCM C1551B.
- Inspect the connector for damaged, pushed-out terminals, corrosion or loose wires.
- For 3.7L engine vehicles, measure the resistance between the Tow/Haul switch C2399-3, circuit CET43 (GY) and PCM C175B-23, harness side.



N0123680

- For 5.0L or 6.2L engine vehicles, measure the resistance between the Tow/Haul switch C2399-3, circuit CET43 (GY) and PCM C1381B-23, harness side.

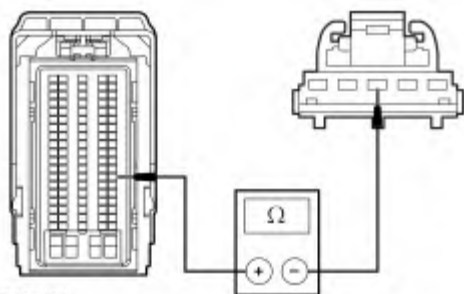


N0123680

- For 3.5L engine vehicles, measure the resistance between the Tow/Haul switch C2399-3, circuit CET43 (GY) and PCM C1551B-89, harness side.

Yes
GO to [D4](#).

No
REPAIR circuit CET43 (GY) for an open.
CLEAR the DTCs. RERUN the **KOER** self-test and test the system for normal operation.

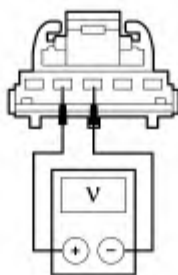


N0123681

- Is the resistance less than 5 ohms?

D4 CHECK THE SIGNAL RETURN CIRCUIT FOR AN OPEN

- Connect: PCM C175B.
- Connect: PCM C1381B.
- Connect: PCM C1551B.
- Ignition ON.
- Measure the voltage between Tow/Haul switch C2399-3 and C2399-4 harness side.



N0113450

- Is the voltage greater than 10 volts?

Yes

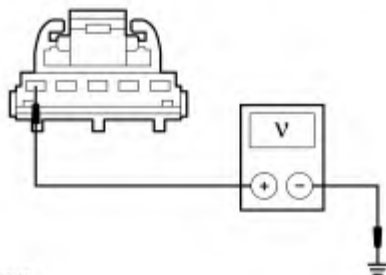
INSTALL a new selector lever, REFER to [Selector Lever — Column Shift](#) in this section. CLEAR the DTCs. RERUN the KOER self-test and test the system for normal operation.

No

INSPECT and REPAIR the signal return circuit RE407 (YE/VT) for an open. If an open circuit is not found, REPLACE the PCM. PROGRAM the PCM with the latest calibration level. PERFORM the solenoid strategy download procedure, REFER to solenoid body strategy in [Section 307-01](#). RERUN the KOER self-test and test the system for normal operation.

D5 CHECK THE DOWNSHIFT CIRCUIT FOR VOLTAGE

- Ignition OFF.
- Disconnect: Tow/Haul C2399.
- Inspect C2399 for damaged, pushed-out terminals, corrosion or loose wires.
- Ignition ON.
- Measure the voltage between the Tow/Haul switch C2399-5, circuit CET42 (GN/VT), harness side and ground.



N0113451

- Is the voltage greater than 10 volts?

Yes

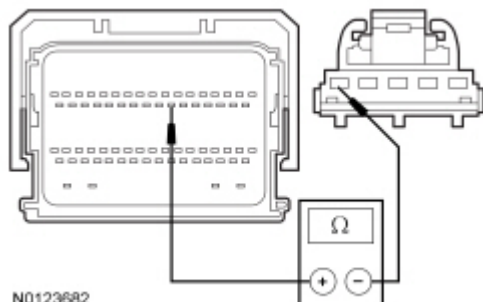
GO to [D7](#).

No

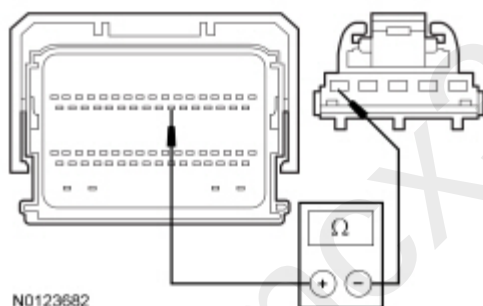
GO to [D6](#).

D6 CHECK THE DOWNSHIFT CIRCUIT FOR AN OPEN

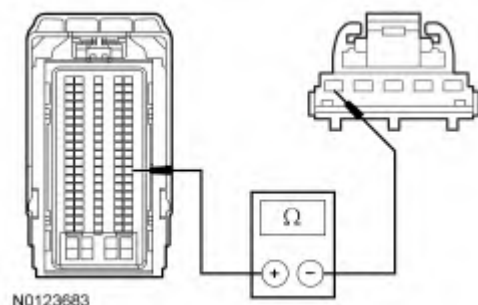
- Ignition OFF.
- Disconnect: PCM C175B.
- Disconnect: PCM C1381B.
- Disconnect: PCM C1551B.
- Inspect the connector for damaged, pushed-out terminals, corrosion or loose wires.
- For 3.7L engine vehicles, measure the resistance between the Tow/Haul switch C2399-5, circuit CET42 (GN/VT) and PCM C175B-24, harness side.



- For 5.0L or 6.2L engine vehicles, measure the resistance between the Tow/Haul switch C2399-5, circuit CET42 (GN/VT) and PCM C1381B-24, harness side.



- For 3.5L engine vehicles, measure the resistance between the Tow/Haul switch C2399-5, circuit CET42 (GN/VT) and PCM C1551B-88, harness side.



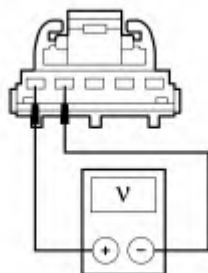
- Is the resistance less than 5 ohms?

YesGO to [D7](#).**No**

REPAIR circuit CET42 (GN/VT) for an open. CLEAR the DTCs. RERUN the KOER self-test and test the system for normal operation.

D7 CHECK THE SIGNAL RETURN CIRCUIT FOR AN OPEN

- Connect: PCM C175B.
- Connect: PCM C1381B.
- Connect: PCM C1551B.
- Ignition ON.
- Measure the voltage between tow/haul switch C2399-5 and C2399-4 harness side.



N0113454

- Is the voltage greater than 10 volts?

Yes

INSTALL a new selector lever, REFER to [Selector Lever — Column Shift](#) in this section. CLEAR the DTCs. RERUN the KOER self-test and test the system for normal operation.

No

INSPECT and REPAIR the signal return circuit RE407 (YE/VT) for an open. If an open circuit is not found, REPLACE the PCM. PROGRAM the PCM with the latest calibration level. PERFORM the solenoid strategy download procedure, REFER to solenoid body strategy in [Section 307-01](#). RERUN the KOER self-test and test the system for normal operation.