

2008 Ford Mustang

2008 ACCESSORIES & BODY, CAB Exterior Lighting - Mustang

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Exterior Lighting - Mustang

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	Nm	lb-ft	lb-in
Headlamp assembly nuts	8	-	71
Rear lamp assembly nuts	6	-	53
Reversing lamp switch (T5OD transmission)	37	27	-
Reversing lamp switch (TR3650 or TR6060 transmission)	27	20	-

DESCRIPTION AND OPERATION

EXTERIOR LIGHTING

NOTE: The smart junction box (SJB) is also known as the generic electronic module (GEM).

Headlamps

The headlamps are controlled by the SJB. The headlamp and multifunction switches are constantly monitored by the SJB. The SJB processes information (such as low beam, high beam or flash-to-pass requests) from the switch inputs, and then outputs voltage to the headlamps accordingly. In the event the SJB detects a fault with any of the headlamp switch inputs, all the exterior lamps are illuminated. There is also a headlamp battery saver feature. This feature turns off the headlamps 10 minutes after the ignition switch is turned OFF.

Headlamp Functionality - Halogen

When the low beams are requested (based on inputs to the SJB), the low beams are illuminated.

When the high beams are requested, the high beams are illuminated and the low beams turn off.

When the flash-to-pass feature is requested, the high beams are illuminated as long as the multifunction switch is held in the FLASH-TO-PASS position.

Headlamp Functionality - High Intensity Discharge (HID)

Vehicles equipped with HID headlamps utilize relays to control the voltage to the HID ballasts. The ballasts are located on the side of each headlamp assembly.

When the low beams are requested (based on inputs to the SJB), the HID relays are energized and the low beams are illuminated.

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When the high beams are requested, the HID relays stay energized and a shutter within each headlamp is activated. This changes the headlamp beam pattern to illuminate a greater distance.

The flash-to-pass feature is unique for HID equipped vehicles. If the low beams are off when the flash-to-pass is requested, the HID relays and the shutters within the headlamps are activated for less than 0.5 second. If the low beams are on when the flash-to-pass is requested, the shutters within the headlamps are activated as long as the multifunction switch is held in the FLASH-TO-PASS position.

Stoplamp

The stoplamp outputs are controlled by the SJB. The stoplamp switch is monitored by the SJB. When the SJB detects the brake pedal is applied, the SJB processes this information and outputs voltage to the stoplamp.

Turn Signal and Hazard Lamps

All turn signal outputs are controlled by the SJB. The multifunction switch and the hazard switch are monitored by the SJB. When the multifunction switch is in the left or right turn position, or the hazard switch is engaged, the SJB processes this information and outputs on/off voltage to the appropriate turn signal and hazard lamps. All turn signal lamps provide a lamp outage indication.

Parking, Rear or License Plate Lamps

The parking, rear, license plate and side marker lamps are controlled by the SJB. The headlamp switch is monitored by the SJB. When the headlamp switch is in the HEADLAMPS ON or PARKING LAMPS ON position, the SJB processes this information and outputs voltage to the parking, rear, licence plate and side marker lamps.

The battery saver feature does not turn the parking lamps off when the headlamp switch is in the PARKING LAMPS ON position.

Fog Lamps

The fog lamps are controlled by the SJB. The SJB monitors inputs from the headlamp switch and the multifunction switch. The SJB can only turn the fog lamps on when the ignition switch is in the RUN position, the parking lamps are on and the high beams are off. When the fog lamp switch is engaged, the SJB then activates the fog lamp relay, providing power to the fog lamps.

Reversing Lamps

The reversing lamps are controlled by the SJB. The PCM sends a message through the communication network indicating the transmission is in REVERSE (R). The SJB processes this information and outputs voltage to the reversing lamps.

Daytime Running Lamps (DRL)

NOTE: **The DRL is not a programmable parameter for this vehicle.**

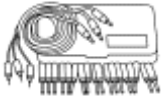
If the SJB is configured for DRL, this feature illuminates the low beam headlamps at a reduced intensity when the following conditions exist:

- The ignition switch is in the RUN position.
- The headlamp switch is in the OFF position.
- The parking brake is not engaged.

DIAGNOSTIC TESTS

HEADLAMPS

Special Tools

Illustration	Tool Name	Tool Number
 ST1137-A	73III Automotive Meter	105-R0057 or equivalent
 ST1138-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool	
 ST2834-A	Flex Probe Kit	105-R025C or equivalent

Principles of Operation

NOTE: **The smart junction box (SJB) is also known as the generic electronic module (GEM).**

The SJB monitors the headlamp switch position by sending voltage reference signals on multiple circuits to the headlamp switch. At any given time, one of the signal circuits is routed to ground. If the SJB does not detect any of the inputs to the headlamp switch is active (routed to ground) for 5 seconds, the SJB turns on the exterior lights and keeps them on for 10 minutes after the ignition switch is turned off (or 10 minutes from the time the SJB does not detect any headlamp switch input if the ignition switch was already off). If the SJB detects multiple circuits short to ground, the SJB implements a planned strategy depending on the inputs received. If either of these situations occur, the SJB should **NOT** be ruled immediately as being at fault. This is normal behavior of the SJB design as it has detected a fault with the inputs from the headlamp switch.

The SJB also monitors the multifunction switch for a flash-to-pass or high beam request. There are 2 voltage reference circuits which monitor this. When the multifunction switch is in the FLASH-TO-PASS or HIGH BEAM position, the voltage signal for that input is routed to ground.

NOTE: **The flash-to-pass feature does not require any input from the headlamp switch.**

When the SJB receives an input requesting the headlamps on, the SJB supplies voltage to the low beams. If the low beams are on and the SJB receives a request for high beams (or a flash-to-pass request), the SJB energizes an internal relay which routes voltage to the headlamps.

Headlamp Functionality - Halogen

When the low beams are requested (based on inputs to the SJB), the SJB provides voltage to the low beams.

When the high beams are requested, the SJB energizes an internal relay which routes voltage to the high beams and terminates voltage to the low beams.

When the flash-to-pass feature is requested, the SJB energizes an internal high beam relay which routes voltage to the high beams as long as the multifunction switch is held in the FLASH-TO-PASS position.

Headlamp Functionality - High Intensity Discharge (HID)

Relays are utilized to control the voltage to the HID ballasts. The ballasts are located on the side of each headlamp assembly.

When the low beams are requested (based on inputs to the SJB), the HID relays are energized and voltage is routed to the HID ballasts to illuminate the HID bulbs.

When the high beams are requested, the HID relays stay energized and the SJB energizes an internal high beam relay which routes voltage to the headlamps to actuate a shutter located within each headlamp. This changes the headlamp beam pattern to illuminate a greater distance.

The flash-to-pass feature is unique for HID equipped vehicles. If the low beams are off when the flash-to-pass is requested, the SJB provides voltage to the HID relays and energizes the internal high beam relay for the shutters within the headlamps for less than 0.5 second. If the SJB is already providing voltage to the HID relays (low beams) when the flash-to-pass is requested, the SJB energizes the internal high beam relay as long as the multifunction switch is held in the FLASH-TO-PASS position.

Inspection and Verification

- 1. Verify the customer concern.
- 2. Visually inspect for obvious signs of mechanical or electrical damage.

VISUAL INSPECTION CHART

Mechanical	Electrical
	• Bussed electrical center

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• Headlamp switch	(BEC) fuse(s): ○ 50 (15A) (high beams) ○ 67 (30A) • Wiring, terminals or connectors • Bulb(s) • Smart junction box (SJB)
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3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

NOTE: **Make sure the headlamp switch is in the OFF position.**

NOTE: **Make sure the multifunction switch is in the LOW BEAM position.**

NOTE: **Make sure to use the latest scan tool software release.**

4. If the cause is not visually evident, connect the scan tool to the data link connector (DLC).

NOTE: **The vehicle communication module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM.**

5. If the scan tool does not communicate with the VCM:

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM.
- Refer to **MODULE COMMUNICATIONS NETWORK** article, No Power To The Scan Tool, to diagnose no communication with the scan tool.

6. If the scan tool does not communicate with the vehicle:

- Verify the ignition key is in the ON position.
- Verify the scan tool operation with a known good vehicle.
- Refer to **MODULE COMMUNICATIONS NETWORK** article to diagnose no response from the PCM.

7. Carry out the network test:

- If the scan tool responds with no communication for one or more modules, refer to **MODULE COMMUNICATIONS NETWORK** article.
- If the network test passes, retrieve and record the continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the SJB.

9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to **MULTIFUNCTION ELECTRONIC MODULES** article.

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10. If no DTCs related to the concern are retrieved, go to **Symptom Chart**.

DTC Charts

SMART JUNCTION BOX (SJB) DTC CHART

DTC	Description	Action
B1470	Lamp Headlamp Input Circuit Failure	Go to <u>Pinpoint Test F</u> .
B2501	LF Lamp Low Beam Circuit Failure	If the low beam is inoperative, go to <u>Pinpoint Test C</u> . If the low beam is always on, go to <u>Pinpoint Test F</u> .
B2503	RF Lamp Low Beam Circuit Failure	If the low beam is inoperative, go to <u>Pinpoint Test C</u> . If the low beam is always on, go to <u>Pinpoint Test F</u> .
B2586	Headlamp Mode Select Circuit Failure	If the high beams are inoperative, go to <u>Pinpoint Test B</u> . If the high beams are always on, go to <u>Pinpoint Test F</u> .
B2598	Headlamp Relay Circuit Failure	If the high beams are inoperative, go to <u>Pinpoint Test B</u> . If the high beams are always on, go to <u>Pinpoint Test F</u> .
All other DTCs	-	REFER to <u>MULTIFUNCTION ELECTRONIC MODULES</u> article.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
No communication with the smart junction box (SJB)	- Fuse - Wiring, terminals or connectors - SJB	REFER to <u>MODULE COMMUNICATIONS NETWORK</u> article.
Both low beams are inoperative	- Fuse - Wiring, terminals or connectors - Bussed electrical center (BEC) - SJB	Go to <u>Pinpoint Test A</u>.
Both high beams are inoperative	- Fuse - Wiring, terminals or connectors - SJB configuration - High beam relay - Multifunction switch - BEC - SJB	Go to <u>Pinpoint Test B</u>.

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One low beam headlamp is inoperative - halogen headlamps	- Wiring, terminals or connectors - BEC - SJB	Go to <u>Pinpoint Test C.</u>
One low beam headlamp is inoperative - high intensity discharge (HID) headlamps	- Wiring, terminals or connectors - HID relay - BEC - Ballast - HID bulb - Headlamp assembly - SJB	Go to <u>Pinpoint Test D.</u>
One high beam headlamp is inoperative	- Wiring, terminals or connectors - Headlamp assembly - BEC	Go to <u>Pinpoint Test E.</u>
The headlamps are on continuously	- Wiring, terminals or connectors - High beam relay - HID relay - Headlamp switch - Multifunction switch - BEC - SJB	Go to <u>Pinpoint Test F.</u>
The flash-to-pass feature is inoperative	- Wiring, terminals or connectors - Multifunction switch - SJB	Go to <u>Pinpoint Test G.</u>

Pinpoint Tests

Pinpoint Test A: Both Low Beams Are Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Headlamps for schematic and connector information.

Normal Operation

The smart junction box (SJB) is supplied voltage for the low beams through circuit 1052 (TN/BK) from the bussed electrical center (BEC). When a request for the low beams is detected, the SJB provides voltage to the

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low beams or high intensity discharge (HID) relays (if equipped). The headlamps share a common ground through circuit 1205 (BK).

This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- BEC
- SJB

PINPOINT TEST A: BOTH LOW BEAMS ARE INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

A1 CHECK CIRCUIT 1052 (TN/BK) FOR A VOLTAGE

- Key in OFF position.
- Disconnect: SJB C2280h

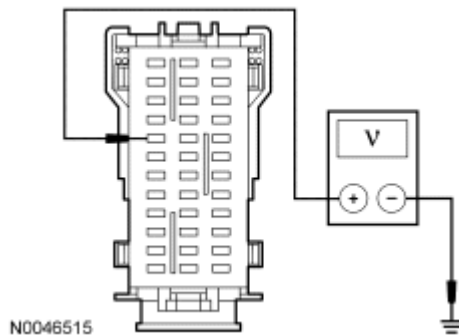


Fig. 1: Measuring Voltage Between SJB C2280H-32 And Ground
Courtesy of FORD MOTOR CO.

- Measure the voltage between the SJB C2280h-32, circuit 1052 (TN/BK), harness side and ground.
- **Is the voltage greater than 10 volts?**
YES : Go to A3.
NO : VERIFY the BEC fuse 67 (30A) is OK. If OK, go to A2.

A2 CHECK CIRCUIT 1052 (TN/BK) FOR AN OPEN

- Disconnect: BEC C1035a

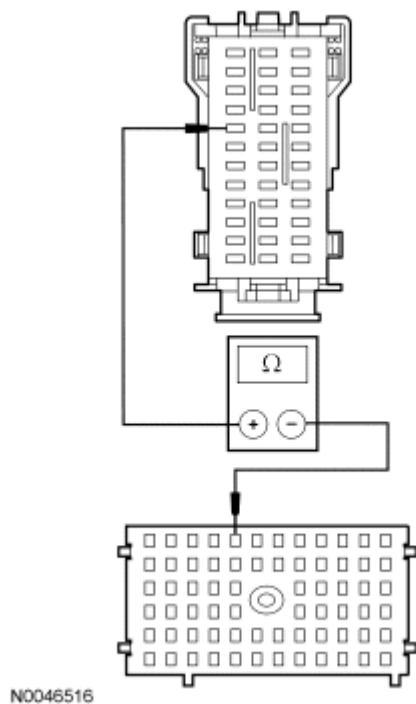


Fig. 2: Measuring Resistance Between SJB C2280H-32 And BEC C1035A-A5
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280h-32, circuit 1052 (TN/BK), harness side and the BEC C1035a-A5, circuit 1052 (TN/BK), harness side.
- **Is the resistance less than 5 ohms?**
YES : INSTALL a new BEC. TEST the system for normal operation.
NO : REPAIR the circuit. TEST the system for normal operation.

A3 CHECK CIRCUIT 1205 (BK) FOR AN OPEN

- Disconnect: BEC C1035c

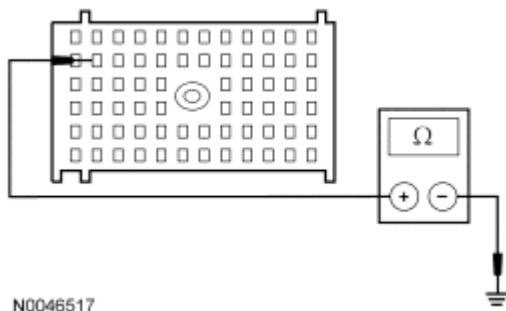


Fig. 3: Measuring Resistance Between BEC C1035C-E11 And Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the BEC C1035c-E11, circuit 1205 (BK), harness side and ground.

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- **Is the resistance less than 5 ohms?**

YES : Go to A4.

NO : REPAIR the circuit. TEST the system for normal operation.

A4 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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 B: Both High Beams Are Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Headlamps for schematic and connector information.

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Fuse and Relay Information for schematic and connector information.

Normal Operation

When the headlamp switch is placed in the HEADLAMPS ON position, the smart junction box (SJB) monitors the multifunction switch by sending a voltage reference signal through circuit 1394 (WH/RD). When the multifunction switch is placed in the HIGH BEAM position, the signal is routed to an internal ground within the SJB through circuit 1396 (VT/WH). The SJB then supplies ground for the high beam relay coil through circuit 1708 (LG/BK). The high beam relay is supplied voltage at all times from the bussed electrical center (BEC). When the high beam relay is energized, voltage is routed to the high beams.

If the SJB is not configured for the correct headlamp type, the high beams may be inoperative.

- DTC B2586 (Headlamp Mode Select Circuit Failure) - is an on-demand DTC that sets when the SJB detects a short to ground from the multifunction switch input (headlamp mode select) circuit.
- DTC B2598 (Headlamp Relay Circuit Failure) - is a continuous and on-demand DTC that sets when the SJB detects an open or short to voltage from the high beam relay coil ground controlled circuit.

This pinpoint test is intended to diagnose the following:

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- Fuse
- Wiring, terminals or connectors
- SJB configuration
- High beam relay
- Multifunction switch
- BEC
- SJB

PINPOINT TEST B: BOTH HIGH BEAMS ARE INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

B1 CHECK THE LOW BEAMS

- Key in OFF position.
- Place the headlamp switch in the HEADLAMPS ON position.
- **Do the low beams illuminate?**

YES : Go to B2.

NO : Go to **Pinpoint Test A.**

B2 USE THE RECORDED DTCs FROM THE SJB SELF-TEST

- Place the headlamp switch in the OFF position.
- Retrieve the recorded results from the SJB self-test.
- **Was DTC B2598 or B2586 present?**

YES : For DTC B2598, go to B3.

For DTC B2586, go to B9.

NO : Go to B11.

B3 CHECK THE HIGH BEAM RELAY (DTC B2598)

- Disconnect: High Beam Relay
- Substitute a known good relay and recheck the operation on the high beams.
- **Do the high beams operate correctly?**

YES : REMOVE the known good relay. INSTALL a new high beam relay. CLEAR the DTCs. REPEAT the self-test.

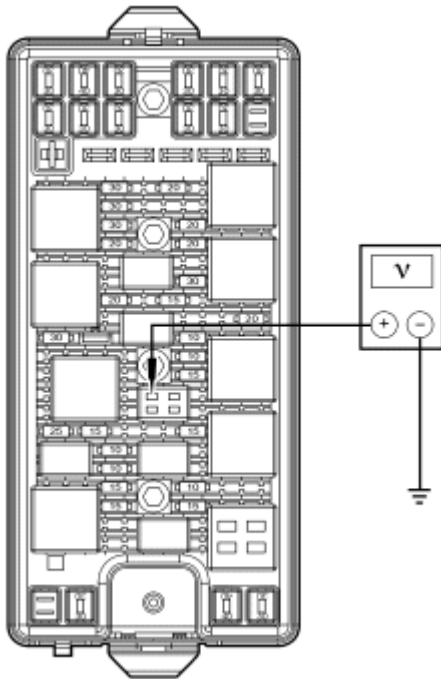
NO : REMOVE the known good relay. Go to B4.

B4 CHECK THE HIGH BEAM RELAY CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

- Disconnect: SJB C2280c
- Key in ON position.

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Fig. 4: Checking Circuit 1708 (LG/BK) For Short To Voltage
Courtesy of FORD MOTOR CO.

- Measure the voltage between the high beam relay pin 86, circuit 1708 (LG/BK), BEC face side and ground.
- **Is any voltage present?**
YES : Go to B5.
NO : Go to B6.

B5 CHECK CIRCUIT 1708 (LG/BK) FOR A SHORT TO VOLTAGE

- Key in OFF position.
- Disconnect: BEC C1035a
- Key in ON position.

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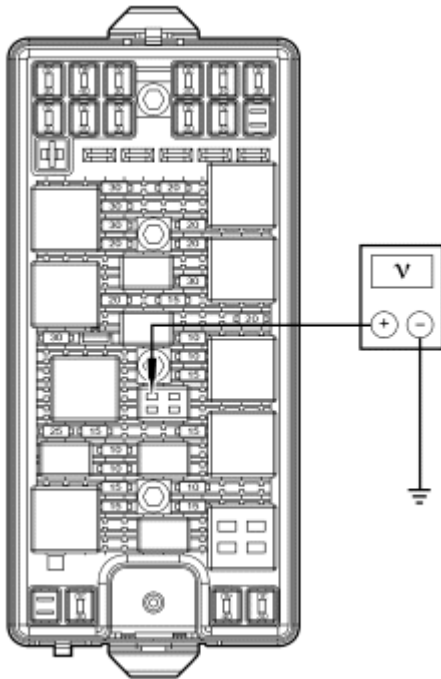


Fig. 5: Checking Circuit 1708 (LG/BK) For Short To Voltage
Courtesy of FORD MOTOR CO.

- Measure the voltage between the high beam relay pin 86, circuit 1708 (LG/BK), BEC face side and ground.
- **Is any voltage present?**
YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.
NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

B6 CHECK THE VOLTAGE FEED TO THE HIGH BEAM RELAY COIL

- Key in OFF position.

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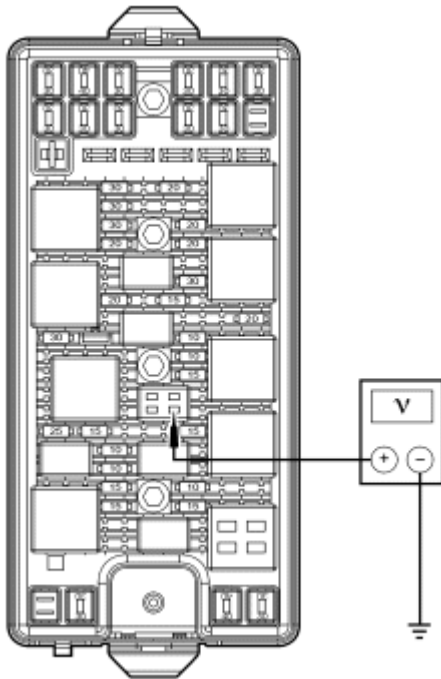


Fig. 6: Checking Voltage Feed To High Beam Relay Coil
Courtesy of FORD MOTOR CO.

- Measure the voltage between the high beam relay pin 85, BEC face side and ground.
- **Is the voltage greater than 10 volts?**

YES : Go to B7.

NO : VERIFY the BEC fuse 50 (15A) is OK. If OK, INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

B7 CHECK THE HIGH BEAM RELAY CONTROL CIRCUIT FOR AN OPEN

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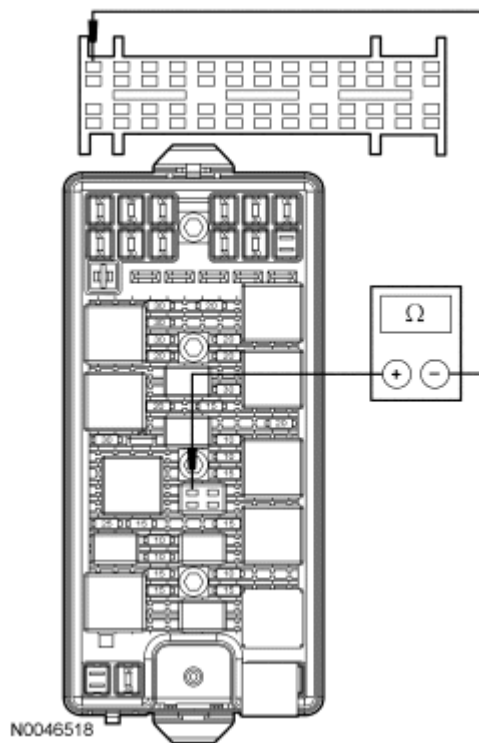


Fig. 7: Checking High Beam Relay Control Circuit For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the high beam relay pin 86, circuit 1708 (LG/BK), BEC face side and the SJB C2280c-1, circuit 1708 (LG/BK), harness side.
- **Is the resistance less than 5 ohms?**
YES : Go to B15.
NO : Go to B8.

B8 CHECK CIRCUIT 1708 (LG/BK) FOR AN OPEN

- Disconnect: BEC C1035a

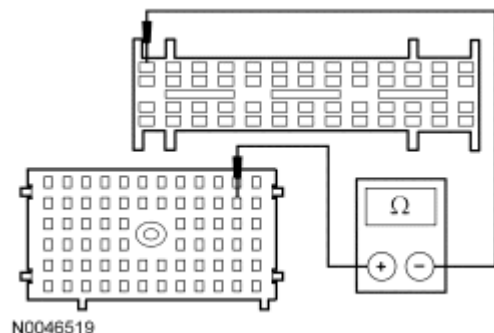


Fig. 8: Measuring Resistance Between BEC C1035A-B11 And SJB C2280C-1
Courtesy of FORD MOTOR CO.

- Measure the resistance between the BEC C1035a-B11, circuit 1708 (LG/BK), harness side and the

SJB C2280c-1, circuit 1708 (LG/BK), harness side.

- **Is the resistance less than 5 ohms?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

B9 CHECK THE MULTIFUNCTION SWITCH

- Disconnect: Multifunction Switch C202
- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: SJB Self-Test
- Repeat the SJB on-demand self-test.
- **Is DTC B2586 retrieved again?**

YES : Go to B10.

NO : INSTALL a new multifunction switch. REFER to **STEERING COLUMN SWITCHES** article. TEST the system for normal operation.

B10 CHECK CIRCUITS 1394 (WH/RD) FOR A SHORT TO GROUND

- Key in OFF position.
- Place the headlamp switch in the OFF position.
- Disconnect: SJB C2280b

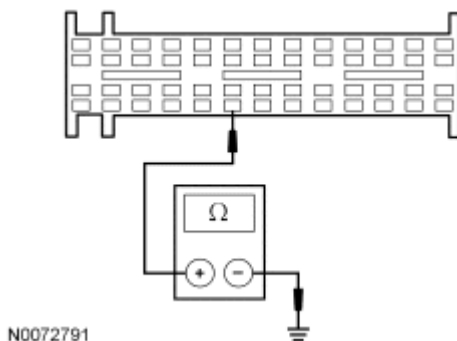


Fig. 9: Checking Circuits 1394 (WH/RD) For A Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280b-45, circuit 1394 (WH/RD), harness side and ground.
 - **Is the resistance greater than 10,000 ohms?**
- YES** : Go to B15.
- NO** : REPAIR the circuit. TEST the system for normal operation.

B11 CHECK THE HIGH BEAM SWITCH INPUT

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: SJB DataLogger
- Monitor the SJB multifunction switch status PID (HBEAMSW) while placing the multifunction switch in the HIGH BEAM position.

- **Does the PID indicate HIGH BEAM position is active?**

YES : Go to B12.

NO : Go to B13.

B12 CHECK THE HIGH BEAM RELAY (NO DTCs)

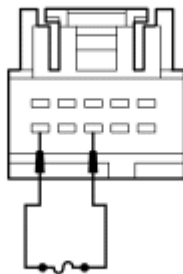
- Key in OFF position.
- Place the headlamp switch in the OFF position.
- Disconnect: High Beam Relay
- Substitute a known good relay and recheck the operation on the high beams.
- **Do the high beams operate correctly?**

YES : REMOVE the known good relay. INSTALL a new high beam relay. TEST the system for normal operation.

NO : REMOVE the known good relay. INSTALL a new BEC. TEST the system for normal operation.

B13 CHECK THE MULTIFUNCTION SWITCH

- Key in OFF position.
- Disconnect: Multifunction Switch C202
- Key in ON position.



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Fig. 10: Connecting Fused (5A) Jumper Wire Between Multifunction Switch C202-8, Circuit 1394 (WH/RD)

Courtesy of FORD MOTOR CO.

- Connect a fused (5A) jumper wire between the multifunction switch C202-8, circuit 1394 (WH/RD), harness side and the multifunction switch C202-10, circuit 1396 (VT/WH), harness side.
- Enter the following diagnostic mode on the diagnostic tool: SJB DataLogger
- Monitor the SJB multifunction switch status PID (HBEAMSW).
- **Does the PID indicate HIGH BEAM position is active?**

YES : REMOVE the jumper wire. INSTALL a new multifunction switch. REFER to **STEERING COLUMN SWITCHES** article. TEST the system for normal operation.

NO : REMOVE the jumper wire. Go to B14.

B14 CHECK CIRCUITS 1394 (WH/RD) AND 1396 (VT/WH) FOR AN OPEN

- Key in OFF position.
- Disconnect: SJB C2280b

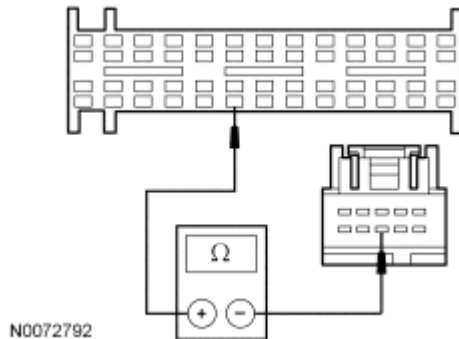


Fig. 11: Measuring Resistance Between SJB C2280B-45, Circuit 1394 (WH/RD), Harness Side & Multifunction Switch C202-8
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280b-45, circuit 1394 (WH/RD), harness side and the multifunction switch C202-8, circuit 1394 (WH/RD), harness side.

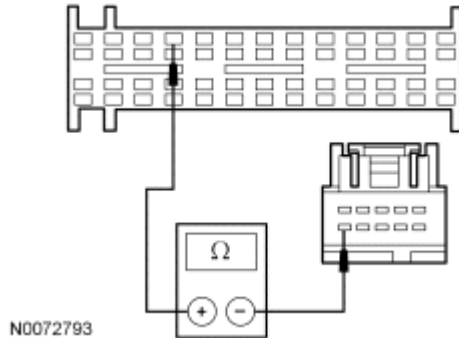


Fig. 12: Measuring Resistance Between SJB C2280B-4, Circuit 1396 (VT/WH), Harness Side & Multifunction Switch C202-10
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280b-4, circuit 1396 (VT/WH) and the multifunction switch C202-10, circuit 1396 (VT/WH).
- **Are the resistances less than 5 ohms?**
YES : Go to B15.
NO : REPAIR the circuit in question. TEST the system for normal operation.

B15 CHECK THE SJB CONFIGURATION

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: SJB DataLogger

NOTE: Vehicles equipped with halogen headlamps should display Non HID.
Vehicles with HID headlamps should display HID Active Mode.

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- Monitor the SJB headlamp configuration PID (HID Status).
- **Is the configuration correct for the vehicle build?**

YES : Go to B16.

NO : CONFIGURE the module using as-built data. TEST the system for normal operation.

B16 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test C: One Low Beam Headlamp Is Inoperative - Halogen Headlamps

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Headlamps for schematic and connector information.

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Fuse and Relay Information for schematic and connector information.

Normal Operation

When the smart junction box (SJB) receives a request for the low beams, the SJB provides voltage to circuits 1338 (WH) and 1336 (LG/WH), through the bussed electrical center (BEC), to the LH and RH low beams, respectively. Ground for the low beams is provided through circuit 1205 (BK), which is routed through the BEC.

- DTC B2501 (LF Lamp Low Beam Circuit Failure) - is a continuous and on-demand DTC that sets when the SJB detects an open or short to ground from the LH headlamp voltage supply circuit.
- DTC B2503 (RF Lamp Low Beam Circuit Failure) - is a continuous and on-demand DTC that sets when the SJB detects an open or short to ground from the RH headlamp voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- BEC
- SJB

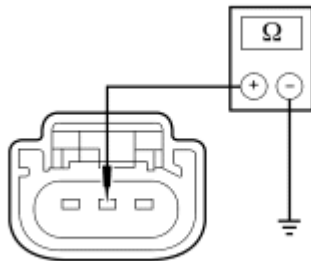
PINPOINT TEST C: ONE LOW BEAM HEADLAMP IS INOPERATIVE - HALOGEN HEADLAMPS

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

NOTE: Make sure the bulb is good before continuing diagnostics.

C1 CHECK THE HEADLAMP GROUND CIRCUIT

- Key in OFF position.
- Disconnect: Inoperative Headlamp



N0010865

Fig. 13: Measuring Resistance Between LH Headlamp C1021-2, Circuit 1205 (BK), Harness Side & Ground

Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH headlamp C1021-2, circuit 1205 (BK), harness side and ground; or between the RH headlamp C1041-2, circuit 1205 (BK), harness side and ground.

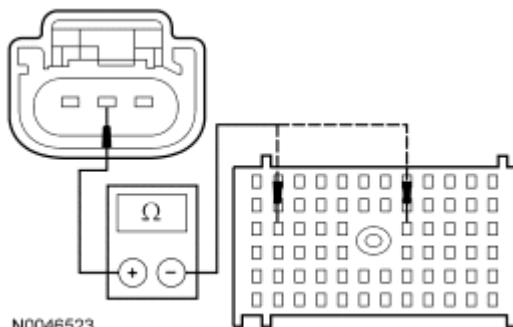
- **Is the resistance less than 5 ohms?**

YES : Go to C4.

NO : Go to C2.

C2 CHECK CIRCUIT 1205 (BK) FOR AN OPEN (HEADLAMP TO BEC)

- Disconnect: BEC C1035c



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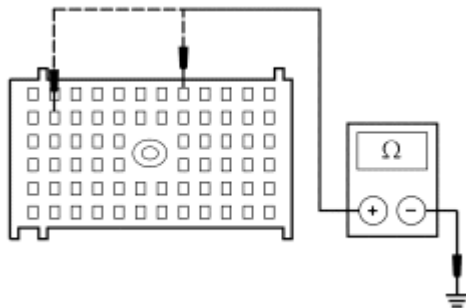
Fig. 14: Checking Circuit 1205 (BK) For Open (Headlamp To BEC)

Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH headlamp C1021-2, circuit 1205 (BK), harness side and the BEC C1035c-D5, circuit 1205 (BK), harness side; or between the RH headlamp C1041-2, circuit 1205 (BK), harness side and the BEC C1035c-D11, circuit 1205 (BK), harness side.
- **Is the resistance less than 5 ohms?**

YES : Go to C3.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

C3 CHECK CIRCUIT 1205 (BK) FOR AN OPEN (BEC TO GROUND)

N0046524

Fig. 15: Checking Circuit 1205 (BK) For Open (BEC To Ground)**Courtesy of FORD MOTOR CO.**

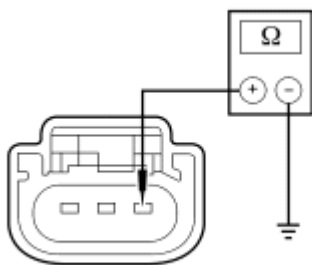
- Measure the resistance between the BEC C1035c-F5 (LH headlamp), circuit 1205 (BK), harness side and ground; or between the BEC C1035c-E11 (RH headlamp), circuit 1205 (BK), harness side and ground.
- **Is the resistance less than 5 ohms?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

C4 CHECK CIRCUIT 1336 (LG/WH) OR CIRCUIT 1338 (WH) FOR A SHORT TO GROUND

- Disconnect: SJB C2280d



N0010866

Fig. 16: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For Short To Ground**Courtesy of FORD MOTOR CO.**

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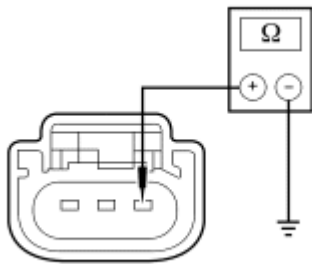
- Measure the resistance between the LH headlamp C1021-1, circuit 1338 (WH), harness side and ground; or between the RH headlamp C1041-1, circuit 1336 (LG/WH), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**

YES : Go to C7.

NO : Go to C5.

C5 CHECK CIRCUIT 1336 (LG/WH) OR CIRCUIT 1338 (WH) FOR A SHORT TO GROUND (SJB TO BEC)

- Disconnect: BEC C1035a



N0010866

Fig. 17: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For Short To Ground
Courtesy of FORD MOTOR CO.

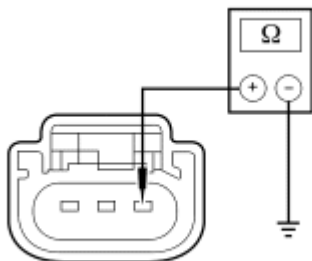
- Measure the resistance between the LH headlamp C1021-1, circuit 1338 (WH), harness side and ground; or between the RH headlamp C1041-1, circuit 1336 (LG/WH), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**

YES : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

NO : Go to C6.

C6 CHECK CIRCUIT 1336 (LG/WH) OR CIRCUIT 1338 (WH) FOR A SHORT TO GROUND (BEC TO HEADLAMP)

- Disconnect: BEC C1035c



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Fig. 18: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH headlamp C1021-1, circuit 1338 (WH), harness side and ground; or between the RH headlamp C1041-1, circuit 1336 (LG/WH), harness side and ground.

- **Is the resistance greater than 10,000 ohms?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

C7 CHECK CIRCUIT 1336 (LG/WH) OR CIRCUIT 1338 (WH) FOR AN OPEN (BEC TO HEADLAMP)

- Disconnect: BEC C1035c

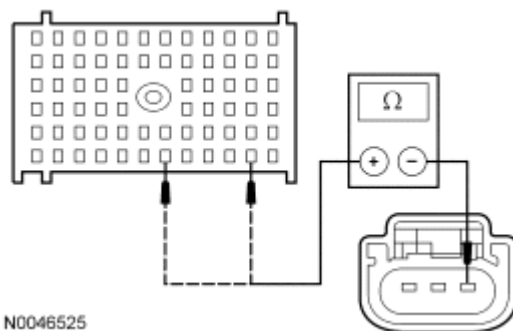


Fig. 19: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For Open (BEC To Headlamp)

Courtesy of FORD MOTOR CO.

- Measure the resistance between the BEC C1035c-A6, circuit 1338 (WH), harness side and the LH headlamp C1021-1, circuit 1338 (WH), harness side; or between the BEC C1035c-A2, circuit 1336 (LG/WH), harness side and the RH headlamp C1041-1, circuit 1336 (LG/WH), harness side.

- **Is the resistance less than 5 ohms?**

YES : Go to C8.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

C8 CHECK FOR VOLTAGE TO THE BEC

- Disconnect: BEC C1035a
- Connect: SJB C2280d
- Place the headlamp switch in the HEADLAMPS ON position.

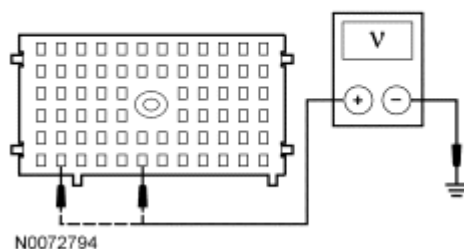


Fig. 20: Check For Voltage To BEC
Courtesy of FORD MOTOR CO.

- Measure the voltage between the BEC C1035a-F6 (LH headlamp), circuit 1338 (WH), harness side and ground; or between the BEC C1035a-F2 (RH headlamp), circuit 1336 (LG/WH), harness side and ground.
- **Is the voltage greater than 10 volts?**
YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.
NO : Go to C9.

C9 CHECK CIRCUIT 1336 (LG/WH) OR CIRCUIT 1338 (WH) FOR AN OPEN (SJB TO BEC)

- Place the headlamp switch in the OFF position.
- Disconnect: SJB C2280d

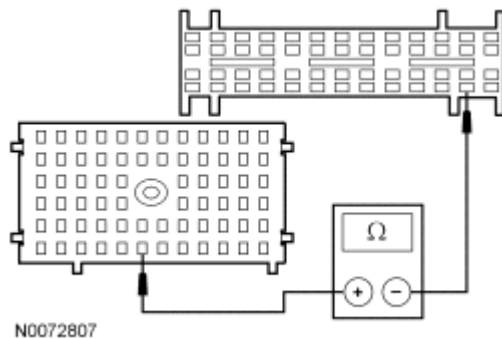


Fig. 21: Measuring Resistance Between BEC C1035A-F6 (LH Headlamp), Circuit 1338 (WH), Harness Side & SJB C2280D-51
Courtesy of FORD MOTOR CO.

- Measure the resistance between the BEC C1035a-F6 (LH headlamp), circuit 1338 (WH), harness side and the SJB C2280d-51, circuit 1338 (WH), harness side.

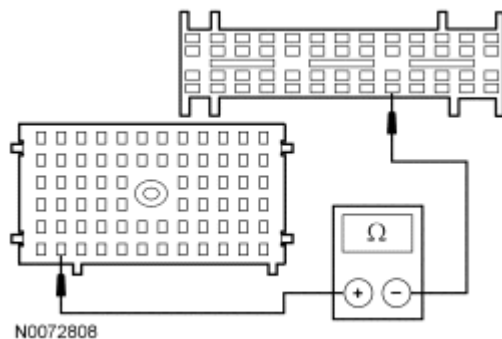


Fig. 22: Measuring Resistance Between BEC C1035A-F2 (RH Headlamp), Circuit 1336 (LG/WH), Harness Side & SJB C2280D-48
Courtesy of FORD MOTOR CO.

- Measure the resistance between the BEC C1035a-F2 (RH headlamp), circuit 1336 (LG/WH), harness side and the SJB C2280d-48, circuit 1336 (LG/WH), harness side.

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- **Is the resistance less than 5 ohms?**

YES : Go to C10.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

C10 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test D: One Low Beam Headlamp Is Inoperative - High Intensity Discharge (HID) Headlamps

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Headlamps for schematic and connector information.

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Fuse and Relay Information for schematic and connector information.

Normal Operation

When the smart junction box (SJB) receives a request for the low beams, the SJB provides voltage to circuits 1338 (WH) and 1336 (LG/WH), through the bussed electrical center (BEC), to the LH and RH high intensity discharge (HID) relays, respectively. Ground for the HID relays is provided through circuit 1205 (BK), which is routed through the BEC.

Voltage is supplied to the LH and RH HID relay switches through circuits 1055 (WH/LG) and 1056 (DB/LG), respectively.

When the HID relays are energized, voltage is routed to the LH and RH headlamps through circuits 2008 (PK/WH) (PK/BK for 5.4L) and 2009 (PK/WH), respectively.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- HID relay
- BEC

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- Ballast
- HID bulb
- Headlamp assembly
- SJB

PINPOINT TEST D: ONE LOW BEAM HEADLAMP IS INOPERATIVE - HIGH INTENSITY DISCHARGE (HID) HEADLAMPS

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

D1 CHECK THE HID RELAY

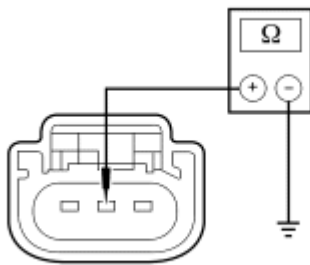
- Key in OFF position.
- Disconnect: Suspect HID Relay
- Substitute a known good relay and recheck the low beam operation.
- **Does the headlamp in question illuminate?**

YES : REMOVE the known good relay. INSTALL a new HID relay in question. TEST the system for normal operation.

NO : REMOVE the known good relay. Go to D2.

D2 CHECK THE HEADLAMP GROUND CIRCUIT

- Disconnect: Inoperative Headlamp



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Fig. 23: Measuring Resistance Between LH Headlamp C1021-2, Circuit 1205 (BK), Harness Side & Ground

Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH headlamp C1284-2, circuit 1205 (BK), harness side and ground; or between the RH headlamp C1285-2, circuit 1205 (BK), harness side and ground.
- **Is the resistance less than 5 ohms?**

YES : Go to D5.

NO : Go to D3.

D3 CHECK CIRCUIT 1205 (BK) FOR AN OPEN (HEADLAMP TO BEC)

- Disconnect: BEC C1035c

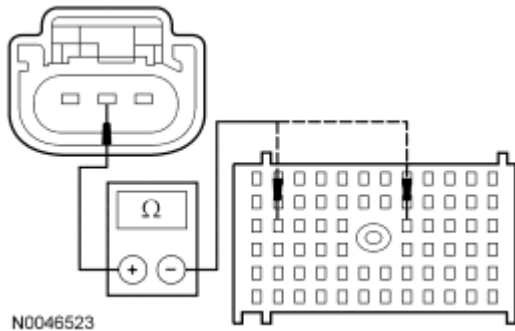


Fig. 24: Checking Circuit 1205 (BK) For Open (Headlamp To BEC)
Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH headlamp C1284-2, circuit 1205 (BK), harness side and the BEC C1035c-D5, circuit 1205 (BK), harness side; or between the RH headlamp C1285-2, circuit 1205 (BK), harness side and the BEC C1035c-D11, circuit 1205 (BK), harness side.

- **Is the resistance less than 5 ohms?**

YES : Go to D4.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

D4 CHECK CIRCUIT 1205 (BK) FOR AN OPEN (BEC TO GROUND)

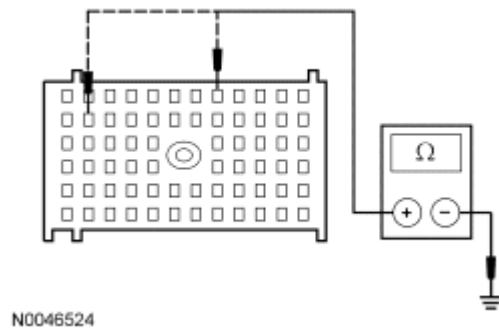


Fig. 25: Checking Circuit 1205 (BK) For Open (BEC To Ground)
Courtesy of FORD MOTOR CO.

- Measure the resistance between the BEC C1035c-F5 (LH headlamp), circuit 1205 (BK), harness side and ground; or between the BEC C1035c-E11 (RH headlamp), circuit 1205 (BK), harness side and ground.

- **Is the resistance less than 5 ohms?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

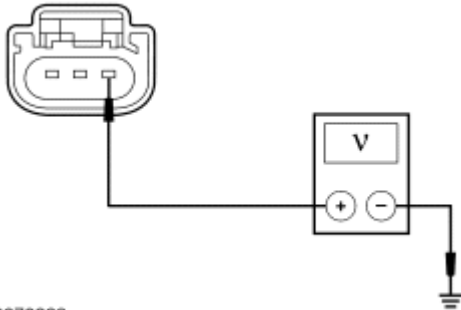
D5 CHECK FOR VOLTAGE TO THE HEADLAMP

- Connect: Suspect HID Relay

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- Place the headlamp switch in the HEADLAMPS ON position.



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Fig. 26: Checking Voltage To Inoperative Headlamp Bulb
Courtesy of FORD MOTOR CO.

- Measure the voltage the LH headlamp C1284-1, circuit 2008 (PK/WH) (PK/BK for 5.4L), harness side and ground; or between the RH headlamp C1285-1, circuit 2009 (PK/WH), harness side and ground.
- **Is the voltage greater than 10 volts?**
YES : Go to D17.
NO : Go to D6.

D6 CHECK THE HID RELAY GROUND CIRCUIT

- Place the headlamp switch in the OFF position.
- Disconnect: Suspect HID Relay

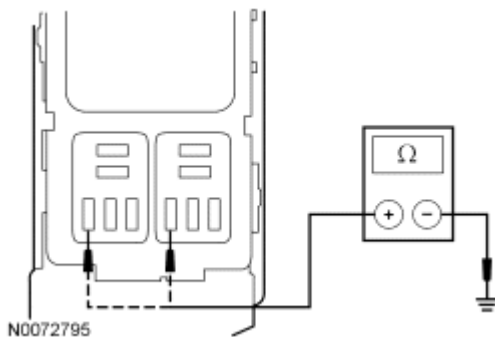


Fig. 27: Checking HID Relay Ground Circuit - 4.0L Or 4.6L
Courtesy of FORD MOTOR CO.

- For 4.0L or 4.6L vehicles, measure the resistance between the LH HID relay pin 1, circuit 1205 (BK), harness side and ground; or between the RH HID relay pin 1, circuit 1205 (BK), harness side and ground.

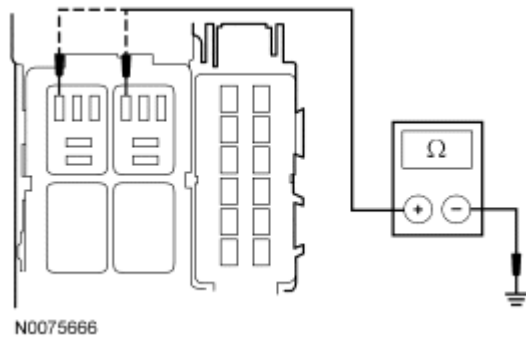


Fig. 28: Checking HID Relay Ground Circuit - 5.4L
Courtesy of FORD MOTOR CO.

- For 5.4L vehicles, measure the resistance between the LH HID relay pin 2, circuit 1205 (BK), harness side and ground; or between the RH HID relay pin 2, circuit 1205 (BK), harness side and ground.
- **Is the resistance less than 5 ohms?**
YES : Go to D8.
NO : Go to D7.

D7 CHECK CIRCUIT 1205 (BK) FOR AN OPEN (HID RELAY TO BEC)

- Disconnect: BEC C1035c
- Measure the resistance between the suspect HID relay pin, harness side and the BEC, harness side as follows:

HID Relay Pin	BEC Connector-Pin	Circuit
4.0L or 4.6L		
LH HID relay pin 1	C1035c-F3	1205 (BK)
RH HID relay pin 1	C1035c-F10	1205 (BK)
5.4L		
LH HID relay pin 2	C1035c-F3	1205 (BK)
RH HID relay pin 2	C1035c-F10	1205 (BK)

- **Is the resistance less than 5 ohms?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

D8 CHECK CIRCUIT 1336 (LG/WH) OR CIRCUIT 1338 (WH) FOR VOLTAGE

- Place the headlamp switch in the HEADLAMPS ON position.

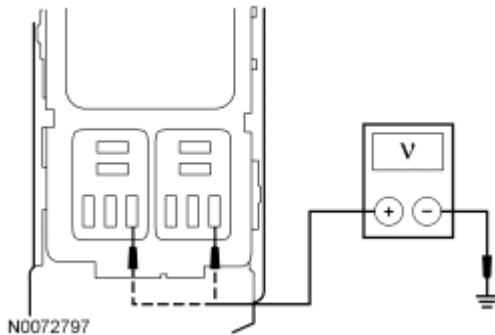


Fig. 29: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For Voltage - 4.0L Or 4.6L
Courtesy of FORD MOTOR CO.

- For 4.0L or 4.6L vehicles, measure the voltage between the LH HID relay pin 2, circuit 1338 (WH), harness side and ground; or between the RH HID relay pin 2, circuit 1336 (LG/WH), harness side and ground.

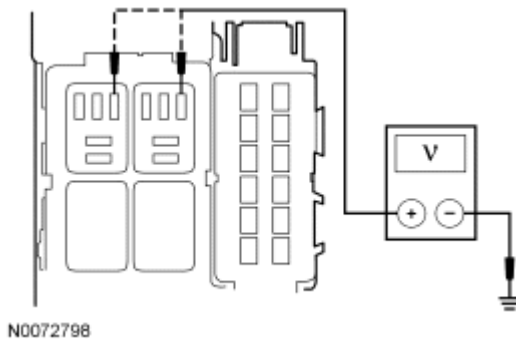


Fig. 30: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For Voltage - 5.4L
Courtesy of FORD MOTOR CO.

- For 5.4L vehicles, measure the voltage between the LH HID relay pin 1, circuit 1338 (WH), harness side and ground; or between the RH HID relay pin 1, circuit 1336 (LG/WH), harness side and ground.
- **Is the voltage greater than 10 volts?**
YES : Go to D15.
NO : Go to D9.

D9 CHECK CIRCUIT 1336 (LG/WH) OR CIRCUIT 1338 (WH) FOR A SHORT TO GROUND

- Place the headlamp switch in the OFF position.

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- Disconnect: SJB C2280d

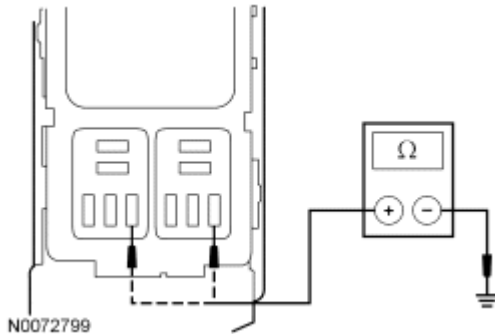


Fig. 31: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For A Short To Ground - 4.0L Or 4.6L

Courtesy of FORD MOTOR CO.

- For 4.0L or 4.6L vehicles, measure the resistance between the LH HID relay pin 2, circuit 1338 (WH), harness side and ground; or between the RH HID relay pin 2, circuit 1336 (LG/WH), harness side and ground.

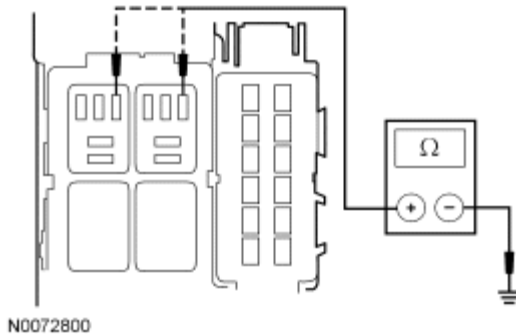


Fig. 32: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For A Short To Ground - 5.4L

Courtesy of FORD MOTOR CO.

- For 5.4L vehicles, measure the resistance between the LH HID relay pin 1, circuit 1338 (WH), harness side and ground; or between the RH HID relay pin 1, circuit 1336 (LG/WH), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**
YES : Go to D12.
NO : Go to D10.

D10 CHECK CIRCUIT 1336 (LG/WH) OR CIRCUIT 1338 (WH) FOR A SHORT TO GROUND (SJB TO BEC)

- Disconnect: BEC C1035a

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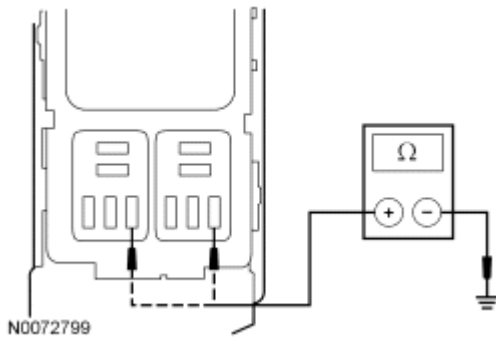


Fig. 33: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For A Short To Ground (SJB To BEC) - 4.0L Or 4.6L
Courtesy of FORD MOTOR CO.

- For 4.0L or 4.6L vehicles, measure the resistance between the LH HID relay pin 2, circuit 1338 (WH), harness side and ground; or between the RH HID relay pin 2, circuit 1336 (LG/WH), harness side and ground.

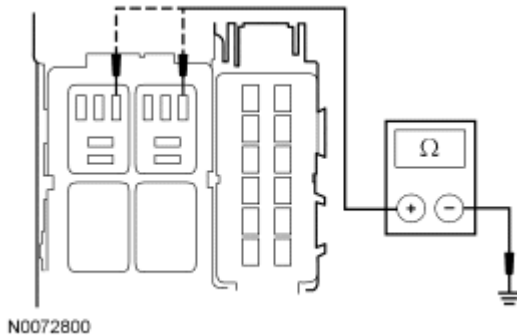


Fig. 34: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For A Short To Ground (SJB To BEC) - 5.4L
Courtesy of FORD MOTOR CO.

- For 5.4L vehicles, measure the resistance between the LH HID relay pin 1, circuit 1338 (WH), harness side and ground; or between the RH HID relay pin 1, circuit 1336 (LG/WH), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**
YES : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.
NO : Go to D11.

D11 CHECK CIRCUIT 1336 (LG/WH) OR CIRCUIT 1338 (WH) FOR A SHORT TO GROUND (BEC TO HEADLAMP)

- Disconnect: BEC C1035c

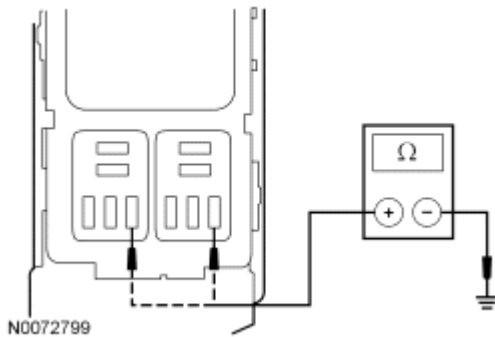


Fig. 35: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For A Short To Ground (BEC To Headlamp) - 4.0L Or 4.6L
 Courtesy of FORD MOTOR CO.

- For 4.0L or 4.6L vehicles, measure the resistance between the LH HID relay pin 2, circuit 1338 (WH), harness side and ground; or between the RH HID relay pin 2, circuit 1336 (LG/WH), harness side and ground.

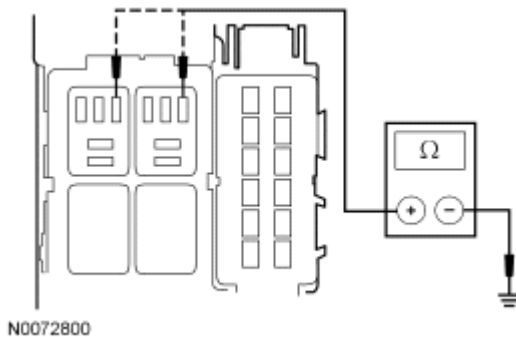


Fig. 36: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For A Short To Ground (BEC To Headlamp) - 5.4L
 Courtesy of FORD MOTOR CO.

- For 5.4L vehicles, measure the resistance between the LH HID relay pin 1, circuit 1338 (WH), harness side and ground; or between the RH HID relay pin 1, circuit 1336 (LG/WH), harness side and ground.
- Is the resistance greater than 10,000 ohms?**
YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.
NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

D12 CHECK CIRCUIT 1336 (LG/WH) OR CIRCUIT 1338 (WH) FOR AN OPEN (BEC TO HID RELAY)

- Disconnect: BEC C1035c
- Measure the resistance between the suspect HID relay pin, harness side and the BEC, harness side as follows:

HID	BEC	

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Relay Pin	Connector-Pin	Circuit
4.0L or 4.6L		
LH HID relay pin 2	C1035c-A6	1338 (WH)
RH HID relay pin 2	C1035c-A2	1336 (LG/WH)
5.4L		
LH HID relay pin 1	C1035c-A6	1338 (WH)
RH HID relay pin 1	C1035c-A2	1336 (LG/WH)

- Is the resistance less than 5 ohms?

YES : Go to D13.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

D13 CHECK FOR VOLTAGE TO THE BEC

- Disconnect: BEC C1035a
- Place the headlamp switch in the HEADLAMPS ON position.

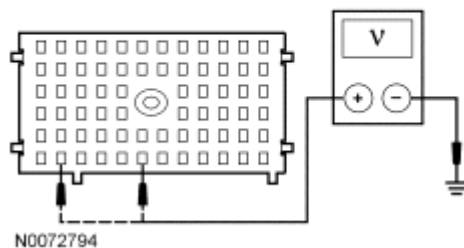


Fig. 37: Checking For Voltage To BEC
Courtesy of FORD MOTOR CO.

- Measure the voltage between the BEC C1035a-F6 (LH headlamp), circuit 1338 (WH), harness side and ground; or between the BEC C1035a-F2 (RH headlamp), circuit 1336 (LG/WH), harness side and ground.

- **Is the voltage greater than 10 volts?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : Go to D14.

D14 CHECK CIRCUIT 1336 (LG/WH) OR CIRCUIT 1338 (WH) FOR AN OPEN (SJB TO BEC)

- Place the headlamp switch in the OFF position.
- Disconnect: SJB C2280d

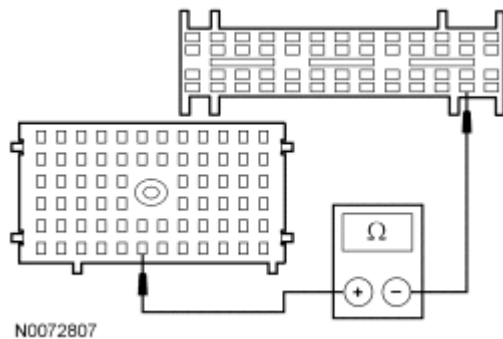


Fig. 38: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For An Open (SJB To BEC)
- Inoperative LH Headlamp
 Courtesy of FORD MOTOR CO.

- For an inoperative LH headlamp, measure the resistance between the BEC C1035a-F6, circuit 1338 (WH), harness side and the SJB C2280d-51, circuit 1338 (WH), harness side.

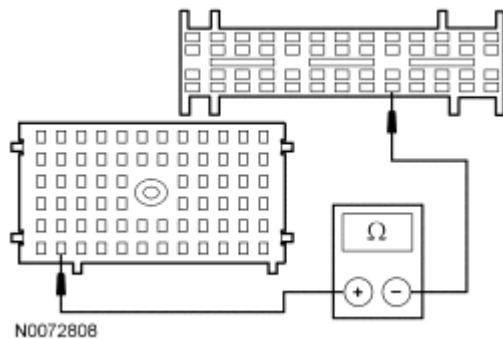


Fig. 39: Checking Circuit 1336 (LG/WH) Or Circuit 1338 (WH) For An Open (SJB To BEC)
- Inoperative RH Headlamp
 Courtesy of FORD MOTOR CO.

- For an inoperative RH headlamp, measure the resistance between the BEC C1035a-F2, circuit 1336 (LG/WH), harness side and the SJB C2280d-48, circuit 1336 (LG/WH), harness side.
- **Is the resistance less than 5 ohms?**
YES : Go to D19.
NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

D15 CHECK CIRCUIT 1055 (WH/LG) OR CIRCUIT 1056 (DB/LG) FOR VOLTAGE

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- Place the headlamp switch in the OFF position.

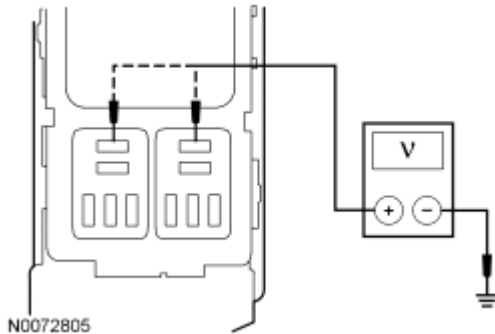


Fig. 40: Checking Circuit 1055 (WH/LG) Or Circuit 1056 (DB/LG) For Voltage - 4.0L Or 4.6L

Courtesy of FORD MOTOR CO.

- For 4.0L or 4.6L vehicles, measure the voltage between the LH HID relay pin 3, circuit 1055 (WH/LG), harness side and ground; or between the RH HID relay pin 3, circuit 1056 (DB/LG), harness side and ground.

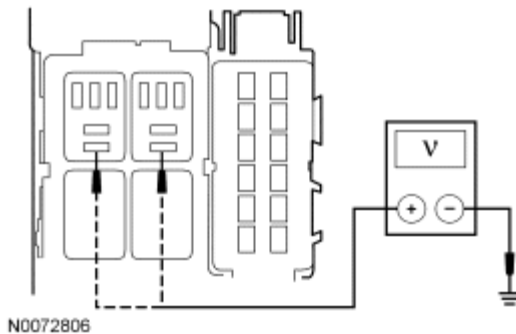


Fig. 41: Checking Circuit 1055 (WH/LG) Or Circuit 1056 (DB/LG) For Voltage - 5.4L

Courtesy of FORD MOTOR CO.

- For 5.4L vehicles, measure the voltage between the LH HID relay pin 3, circuit 1055 (WH/LG), harness side and ground; or between the RH HID relay pin 3, circuit 1056 (DB/LG), harness side and ground.
- Is the voltage greater than 10 volts?**
 - YES :** REPAIR circuit 2008 (PK/WH) (PK/BK for 5.4L) (LH headlamp) or circuit 2009 (PK/WH) (RH headlamp) for an open.
 - NO :** Go to D16.

D16 CHECK CIRCUIT 1055 (WH/LG) OR CIRCUIT 1056 (DB/LG) FOR AN OPEN

- Disconnect: BEC C1035c
- Measure the resistance between the suspect HID relay pin, harness side and the BEC, harness side as follows:

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HID Relay Pin	BEC Connector-Pin	Circuit
4.0L or 4.6L		
LH HID relay pin 3	C1035c-B8	1055 (WH/LG)
RH HID relay pin 3	C1035c-A9	1056 (DB/LG)
5.4L		
LH HID relay pin 3	C1035c-B8	1055 (WH/LG)
RH HID relay pin 3	C1035c-A9	1056 (DB/LG)

- **Is the resistance less than 5 ohms?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

D17 CHECK THE HEADLAMP HARNESS

- Place the headlamp switch in the OFF position.
- Inspect the headlamp harness for an open between the ballast and the vehicle harness connector.

- **Is the headlamp harness OK?**

YES : Go to D18.

NO : REPAIR or INSTALL a new headlamp assembly. REFER to **Headlamp Assembly**. TEST the system for normal operation.

D18 CHECK THE BALLAST

- Substitute a known good ballast.
- Connect: Inoperative Headlamp
- Place the headlamp switch in the HEADLAMPS ON position.
- **Does the inoperative headlamp now illuminate?**

YES : INSTALL a new ballast. REFER to **Headlamp Assembly**. TEST the system for normal operation.

NO : INSTALL a new HID bulb. REFER to **Headlamp Bulb**. TEST the system for normal operation.

D19 CHECK FOR CORRECT SJB OPERATION

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- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test E: One High Beam Headlamp Is Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Headlamps for schematic and connector information.

Normal Operation

When the high beam relay is energized, voltage is provided from the bussed electrical center (BEC) through circuits 1337 (VT/YE) and 1335 (YE/WH) to the LH and RH headlamps, respectively.

Vehicles equipped with high intensity discharge (HID) headlamps utilize a shutter within the headlamp assembly to increase the beam pattern.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Headlamp assembly
- BEC

PINPOINT TEST E: ONE HIGH BEAM HEADLAMP IS INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

NOTE: For halogen headlamps, make sure the bulb is good before continuing diagnostics.

E1 CHECK THE LOW BEAMS

- Key in OFF position.

NOTE: Make sure the multifunction switch is in the **LOW BEAM** position.

- Place the headlamp switch in the HEADLAMPS ON position.
- **Does the low beam illuminate in the headlamp in question?**
YES : For HID headlamps, go to E2.

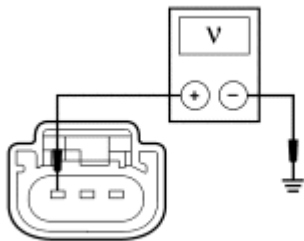
For halogen headlamps, go to E3.

NO : For halogen headlamps, go to **Pinpoint Test C.**

For HID headlamps, go to **Pinpoint Test D.**

E2 CHECK CIRCUIT 1335 (YE/WH) OR CIRCUIT 1337 (VT/YE) FOR VOLTAGE

- Disconnect: Inoperative Headlamp
- Place the headlamp switch in the HEADLAMPS ON position.
- Place sure the multifunction switch is in the HIGH BEAM position.



N0072803

Fig. 42: Checking Circuit 1335 (YE/WH) Or Circuit 1337 (VT/YE) For Voltage
Courtesy of FORD MOTOR CO.

- Measure the voltage between the LH headlamp C1021-3 or C1284-3, circuit 1337 (VT/YE), harness side and ground; or between the RH headlamp C1041-3 or C1285-3, circuit 1335 (YE/WH), harness side and ground.
- **Is the voltage greater than 10 volts?**
YES : REPAIR or INSTALL a new headlamp assembly. REFER to **Headlamp Assembly.** TEST the system for normal operation.
NO : Go to E3.

E3 CHECK CIRCUIT 1335 (YE/WH) OR CIRCUIT 1337 (VT/YE) FOR AN OPEN

- Place the headlamp switch in the OFF position.
- Disconnect: Inoperative Headlamp
- Disconnect: BEC C1035c

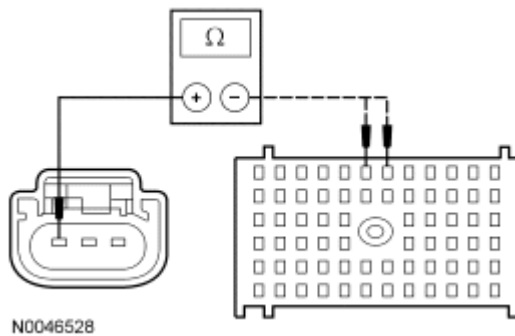


Fig. 43: Checking Circuit 1335 (YE/WH) Or Circuit 1337 (VT/YE) For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH headlamp C1021-3 or C1284-3, circuit 1337 (VT/YE), harness side and the BEC C1035c-F6, circuit 1337 (VT/YE), harness side; or between the RH headlamp C1041-3 or C1285-3, circuit 1335 (YE/WH), harness side and the BEC C1035c-F7, circuit 1335 (YE/WH), harness side.
- **Is the resistance less than 5 ohms?**
YES : INSTALL a new BEC. TEST the system for normal operation.
NO : REPAIR the circuit in question. TEST the system for normal operation.

Pinpoint Test F: The Headlamps Are On Continuously

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Headlamps for schematic and connector information.

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Fuse and Relay Information for schematic and connector information.

Normal Operation

The smart junction box (SJB) sends voltage reference signals to the headlamp switch through circuits 1400 (TN/WH), 1401 (BK/LG), and 1402 (RD/WH). At any given time, the headlamp switch routes one of the input circuits to ground through circuit 1205 (BK).

When the SJB detects the headlamp switch in the HEADLAMPS ON position (or a fault with the headlamp switch inputs) and the multifunction switch in the LOW BEAM position, the SJB sends voltage through circuits 1338 (WH) and 1336 (LG/WH) to the LH and RH low beams, or the LH and RH high intensity discharge (HID) relays (if equipped), respectively.

When the HID relays are energized, voltage is routed to the LH and RH headlamps through circuits 2008 (PK/BK) and 2009 (PK/WH), respectively.

The SJB also sends a voltage reference signal to the multifunction switch through circuits 1394 (WH/RD) and 1395 (RD/PK). When the multifunction switch is placed in the FLASH-TO-PASS or HIGH BEAM position, the signal is routed back to the SJB (ground internal to the SJB). When the SJB detects a request for flash-to-pass or high beams, the SJB provides ground to the high beam relay through circuit 1708 (LG/BK). When the

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high beam relay is energized, voltage is routed through circuits 1337 (VT/YE) and 1335 (YE/WH) to the LH and RH headlamps, respectively.

DTC Description	Fault Trigger Conditions
B1470 - Lamp Headlamp Input Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects an unexpected or conflicting value from the headlamp switch input circuits, such as an open or short to ground.
B2501 - LF Lamp Low Beam Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the LH headlamp voltage supply circuit.
B2503 - RF Lamp Low Beam Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the RH headlamp voltage supply circuit.
B2586 - Headlamp Mode Select Circuit Failure	An on-demand DTC that sets when the SJB detects a short to ground from either of the multifunction switch input circuits.
B2598 - Headlamp Relay Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects a short to ground from the high beam relay coil ground controlled circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- High beam relay
- HID relay
- Headlamp switch
- Multifunction switch
- BEC
- SJB

PINPOINT TEST F: THE HEADLAMPS ARE ON CONTINUOUSLY

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

F1 DETERMINE IF THE HIGH BEAMS ARE ALWAYS ON

- Key in ON position.
- While observing the headlamps, engage the flash-to-pass feature.
- **Does the headlamp brightness increase?**

YES : Go to F2.

NO : Go to F13.

F2 USE THE RECORDED DTCs FROM THE SJB SELF-TEST (LOW BEAMS ALWAYS ON)

- Using the recorded results from the SJB self-test:

- **Was DTC B1470 recorded?**

YES : Go to F3.

NO : Go to F8.

F3 CHECK THE SJB HEADLAMP SWITCH PIDs

- Enter the following diagnostic mode on the diagnostic tool: SJB DataLogger

NOTE: **Make sure the headlamp switch is correctly lined up (in a detent position) when checking each PID.**

- Monitor the SJB headlamp switch (HD_LMP_SW, P_LMP_SW, LAMP_SW) PIDs while moving the headlamp switch through all positions.

- **Do the headlamp switch positions agree with the PIDs?**

YES : The system is operating correctly. The concern may have been caused by the headlamp switch between detent positions.

NO : Go to F4.

F4 CHECK CIRCUIT 1205 (BK) FOR AN OPEN

- Key in OFF position.
- Disconnect: Headlamp Switch C205

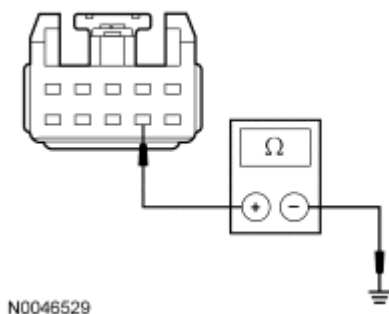


Fig. 44: Measuring Resistance Between Headlamp Switch C205-7 And Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the headlamp switch C205-7, circuit 1205 (BK), harness side and ground.

- **Is the resistance less than 5 ohms?**

YES : Go to F5.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

F5 CHECK THE HEADLAMP SWITCH

- Carry out the headlamp switch component test. Refer to COMPONENT TESTING.

- **Is the headlamp switch OK?**

YES : Go to F6.

NO : INSTALL a new headlamp switch. REFER to **Headlamp Switch**. CLEAR the DTCs. REPEAT the self-test.

F6 CHECK THE HEADLAMP SWITCH INPUT CIRCUITS FOR A SHORT TO GROUND

- Disconnect: SJB C2280b

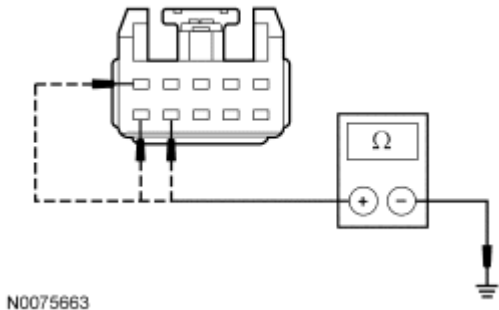


Fig. 45: Checking Headlamp Switch Input Circuits For A Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the headlamp switch, harness side and ground as follows:

Headlamp Switch Connector-Pin	Circuit
C205-9	1400 (TN/WH)
C205-5	1401 (BK/LG)
C205-10	1402 (RD/WH)

- **Are the resistances greater than 10,000 ohms?**

YES : Go to F7.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

F7 CHECK THE HEADLAMP SWITCH INPUT CIRCUITS FOR AN OPEN

- Measure the resistance between the headlamp switch, harness side and the SJB, harness side as follows:

Headlamp Switch Connector-Pin	SJB Connector-Pin	Circuit
		1400

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C205-9	C2280b-27	(TN/WH)
C205-5	C2280b-31	1401 (BK/LG)
C205-10	C2280b-46	1402 (RD/WH)

- **Are the resistances less than 5 ohms?**

YES : Go to F21.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

F8 CHECK THE SJB

- Key in OFF position.
- Disconnect: SJB C2280d
- Key in ON position.
- **Does either headlamp continue to illuminate?**

YES : Go to F9.

NO : Go to F21.

F9 CHECK CIRCUITS 1336 (LG/WH) AND 1338 (WH) FOR A SHORT TO VOLTAGE (SJB TO BEC)

- Key in OFF position.
- Disconnect: BEC C1035a
- Key in ON position.
- **Does either headlamp continue to illuminate?**

YES : Go to F10.

NO : REPAIR circuit 1338 (WH) (LH headlamp) or circuit 1336 (LG/WH) (RH headlamp).
CLEAR the DTCs. REPEAT the self-test.

F10 CHECK CIRCUITS 1336 (LG/WH) AND 1338 (WH) FOR A SHORT TO VOLTAGE (BEC TO HEADLAMP) (HALOGEN HEADLAMPS)

- Key in OFF position.
- Disconnect: BEC C1035c
- Key in ON position.
- **Does either headlamp continue to illuminate?**

YES : For halogen headlamps, REPAIR circuit 1338 (WH) (LH headlamp) or circuit 1336 (LG/WH) (RH headlamp). CLEAR the DTCs. REPEAT the self-test.

For HID headlamps, go to F11.

NO : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

F11 CHECK CIRCUITS 2008 (PK/BK) AND 2009 (PK/WH) FOR A SHORT TO VOLTAGE

- Key in OFF position.
- Disconnect: Suspect HID Relay

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- Key in ON position.
- **Does the headlamp in question continue to illuminate?**
YES : REPAIR circuit 2008 (PK/BK) (LH headlamp) or circuit 2009 (PK/WH) (RH headlamp).
TEST the system for normal operation.
- **NO** : Go to F12.

F12 CHECK CIRCUITS 1336 (LG/WH) AND 1338 (WH) FOR A SHORT TO VOLTAGE (BEC TO HEADLAMP) (HID HEADLAMPS)

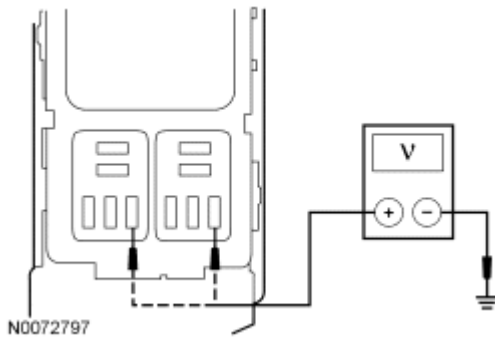


Fig. 46: Checking Circuits 1336 (LG/WH) & 1338 (WH) For A Short To Voltage (BEC To Headlamp) (HID Headlamps) - 4.0L Or 4.6L
Courtesy of FORD MOTOR CO.

- For 4.0L or 4.6L vehicles, measure the voltage between the LH HID relay pin 2, circuit 1338 (WH), harness side and ground; or between the RH HID relay pin 2, circuit 1336 (LG/WH), harness side and ground.

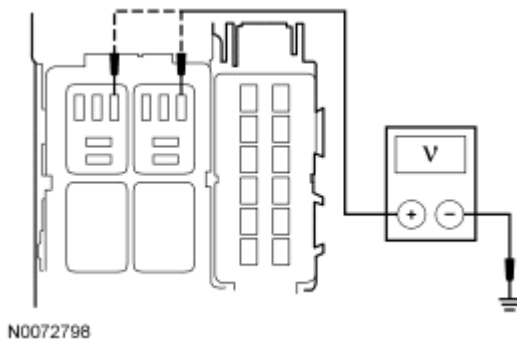


Fig. 47: Checking Circuits 1336 (LG/WH) & 1338 (WH) For A Short To Voltage (BEC To Headlamp) (HID Headlamps) - 5.4L
Courtesy of FORD MOTOR CO.

- For 5.4L vehicles, measure the voltage between the LH HID relay pin 1, circuit 1338 (WH), harness side and ground; or between the RH HID relay pin 1, circuit 1336 (LG/WH), harness side and ground.
- **Is any voltage present?**
YES : REPAIR circuit 1338 (WH) (LH headlamp) or circuit 1336 (LG/WH) (RH headlamp).

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CLEAR the DTCs. REPEAT the self-test.

NO : INSTALL a new HID relay. TEST the system for normal operation.

F13 USE THE RECORDED DTCs FROM THE SJB SELF-TEST (HIGH BEAMS ALWAYS ON)

- Retrieve the recorded results from the SJB self-test.
- **Was DTC B2586 or B2598 recorded?**

YES : For DTC B2586, go to F14.

For DTC B2598, go to F17.

NO : Go to F19.

F14 CHECK THE MULTIFUNCTION SWITCH

- Key in OFF position.
- Disconnect: Multifunction Switch C202
- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: SJB Self-Test
- Clear the SJB DTCs. Repeat the SJB on-demand self-test.
- **Is DTC B2586 still present?**

YES : Go to F15.

NO : INSTALL a new multifunction switch. REFER to **STEERING COLUMN SWITCHES** article. CLEAR the DTCs. REPEAT the self-test.

F15 CHECK CIRCUITS 1394 (WH/RD) AND 1395 (RD/PK) FOR A SHORT TO GROUND

- Key in OFF position.
- Disconnect: SJB C2280b

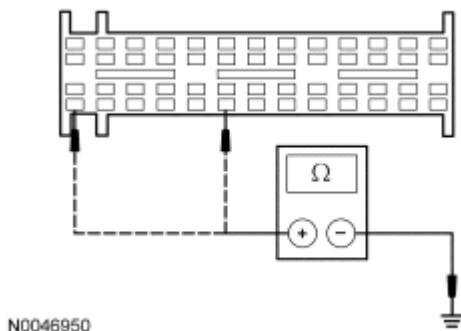


Fig. 48: Measuring Resistance Between SJB C2280B-45, SJB C2280B-40 & Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280b-45, circuit 1394 (WH/RD), harness side and ground; and between the SJB C2280b-40, circuit 1395 (RD/PK), harness side and ground.
- **Are the resistances greater than 10,000 ohms?**

YES : Go to F16.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

F16 CHECK CIRCUITS 1394 (WH/RD) AND 1395 (RD/PK) FOR A SHORT TO CIRCUIT 1396 (VT/WH)

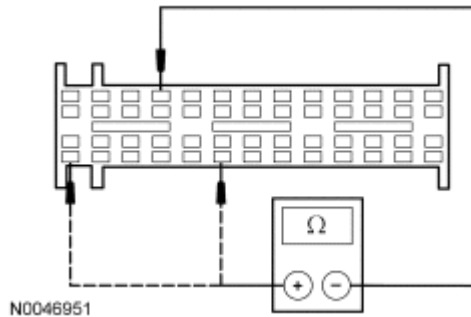


Fig. 49: Measuring Resistance Between SJB C2280B-45, SJB C2280B-4, SJB C2280B-40 & SJB C2280B-4
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280b-45, circuit 1394 (WH/RD), harness side and the SJB C2280b-4, circuit 1396 (VT/WH), harness side; and between the SJB C2280b-40, circuit 1395 (RD/PK), harness side and the SJB C2280b-4, circuit 1396 (VT/WH), harness side.
- **Are the resistances greater than 10,000 ohms?**

YES : Go to F21.

NO : REPAIR the circuits in question. CLEAR the DTCs. REPEAT the self-test.

F17 CHECK THE SJB HIGH BEAM CONTROL

- Disconnect: SJB C2280c
- Key in ON position.
- **Do the headlamps continue to illuminate?**

YES : Go to F18.

NO : Go to F21.

F18 CHECK CIRCUIT 1708 (LG/BK) FOR A SHORT TO GROUND

- Key in OFF position.
- Disconnect: BEC C1035a
- Key in ON position.
- **Do the headlamps continue to illuminate?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

F19 CHECK THE HIGH BEAM RELAY

- Disconnect: High Beam Relay
- Key in ON position.
- **Do the headlamps continue to illuminate?**

YES : Go to F20.

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NO : INSTALL a new high beam relay. TEST the system for normal operation.

F20 CHECK CIRCUITS 1335 (YE/WH) AND 1337 (VT/YE) FOR A SHORT TO VOLTAGE

- Key in OFF position.
- Disconnect: BEC C1035c
- Key in ON position.
- **Does either headlamp continue to illuminate?**
 - YES** : REPAIR circuit 1337 (VT/YE) (LH headlamp) or circuit 1335 (YE/WH) (RH headlamp). TEST the system for normal operation.
 - NO** : INSTALL a new BEC. TEST the system for normal operation.

F21 CHECK FOR CORRECT SJB OPERATION

- Key in OFF position.
- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**
 - YES** : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test G: The Flash-to-Pass Feature is Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Headlamps for schematic and connector information.

Normal Operation

The smart junction box (SJB) sends a voltage reference signal to the multifunction switch through circuit 1395 (RD/PK). When the flash-to-pass feature is activated, the multifunction switch routes the signal back to the SJB. The SJB then provides voltage to the high beams.

Vehicles equipped with high intensity discharge (HID) headlamps utilize a shutter within the headlamp assembly to increase the beam pattern. When the flash-to-pass feature is activated, the SJB activates the low beams and the shutters momentarily (less than 0.5 second).

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors

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- Multifunction switch
- SJB

PINPOINT TEST G: THE FLASH-TO-PASS FEATURE IS INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

G1 CHECK THE HIGH BEAM OPERATION

- Key in OFF position.
- Place the headlamp switch in the HEADLAMPS ON position.
- Place the multifunction switch in the HIGH BEAM position.

- **Do the high beams illuminate?**

YES : Go to G2.

NO : Go to Pinpoint Test B.

G2 CHECK THE INPUT FROM THE MULTIFUNCTION SWITCH

- Place the headlamp switch in the OFF position.
- Disconnect: SJB C2280b
- Place the multifunction switch in the FLASH-TO-PASS position.

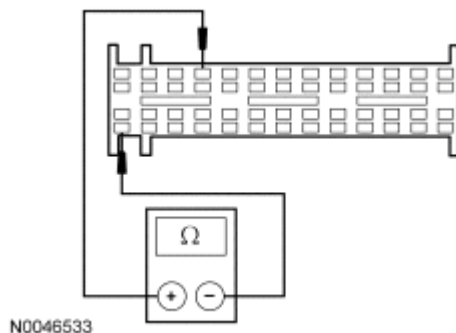


Fig. 50: Measuring Resistance Between SJB C2280B-40, SJB C2280B-4, Circuit 1395 (RD/PK) Circuit 1396 (VT/WH)
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280b-40, circuit 1395 (RD/PK), harness side and the SJB C2280b-4, circuit 1396 (VT/WH), harness side.

- **Is the resistance less than 5 ohms?**

YES : Go to G4.

NO : Go to G3.

G3 CHECK CIRCUIT 1395 (RD/PK) FOR AN OPEN

- Disconnect: Multifunction Switch C202

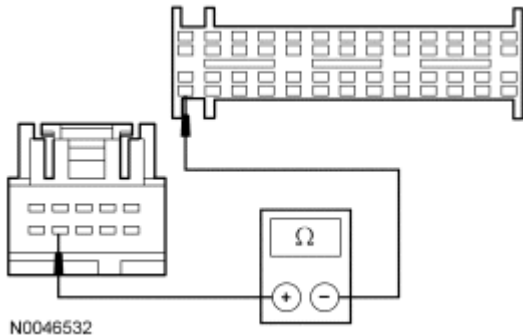


Fig. 51: Measuring Resistance Between Multifunction Switch C202-9 And SJB C2280B-40
 Courtesy of FORD MOTOR CO.

- Measure the resistance between the multifunction switch C202-9, circuit 1395 (RD/PK), harness side and the SJB C2280b-40, circuit 1395 (RD/PK), harness side.
- **Is the resistance less than 5 ohms?**
YES : INSTALL a new multifunction switch. REFER to **STEERING COLUMN SWITCHES** article. TEST the system for normal operation.
NO : REPAIR the circuit. TEST the system for normal operation.

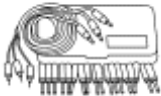
G4 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**
YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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.

STOPLAMP

Special Tools

Illustration	Tool Name	Tool Number
 ST1137-A	73III Automotive Meter	105-R0057 or equivalent

 ST1138-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool	
 ST2834-A	Flex Probe Kit	105-R025C or equivalent

Principles of Operation

NOTE: **The smart junction box (SJB) is also known as the generic electronic module (GEM).**

The SJB monitors the input from the stoplamp switch. When the brake pedal is applied, voltage is routed to the SJB. The SJB then supplies voltage to the rear lamps and the high mounted stoplamp.

The turn and hazard lamp functions override the rear stoplamp function.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

VISUAL INSPECTION CHART

Mechanical	Electrical
Stoplamp switch	- Bussed electrical center (BEC) fuse: 59 (30A) (RH stoplamp) 63 (30A) (LH stoplamp) 67 (30A) (high mounted stoplamp) - smart junction box (SJB) fuse 15 (10A) (stoplamp switch) - Wiring, terminals or connectors - Bulb(s)

- | | |
|--|---|
| | <ul style="list-style-type: none"> • SJB |
|--|---|

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

NOTE: **Make sure the headlamp switch is in the OFF position.**

NOTE: **Make sure the multifunction switch is in the LOW BEAM position.**

NOTE: **Make sure to use the latest scan tool software release.**

4. If the cause is not visually evident, connect the scan tool to the data link connector (DLC).

NOTE: **The vehicle communication module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM.**

5. If the scan tool does not communicate with the VCM:
- Check the VCM connection to the vehicle.
 - Check the scan tool connection to the VCM.
 - Refer to **MODULE COMMUNICATIONS NETWORK** article, No Power To The Scan Tool, to diagnose no communication with the scan tool.
6. If the scan tool does not communicate with the vehicle:
- Verify the ignition key is in the ON position.
 - Verify the scan tool operation with a known good vehicle.
 - Refer to **MODULE COMMUNICATIONS NETWORK** article to diagnose no response from the PCM.
7. Carry out the network test:
- If the scan tool responds with no communication for one or more modules, refer to **MODULE COMMUNICATIONS NETWORK** article.
 - If the network test passes, retrieve and record the continuous memory DTCs.
8. Clear the continuous DTCs and carry out the self-test diagnostics for the SJB.
9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to **MULTIFUNCTION ELECTRONIC MODULES** article.
10. If no DTCs related to the concern are retrieved, go to **Symptom Chart**.

DTC Charts

SMART JUNCTION BOX (SJB) DTC CHART

DTC	Description	Action
B1485	Brake Pedal Input Short to Battery	Go to <u>Pinpoint Test I.</u>
B2044	Left Rear Stop Lamp Circuit Short to	Go to <u>Pinpoint Test H.</u>

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	Ground	
B2046	Right Rear Stop Lamp Circuit Short to Ground	Go to <u>Pinpoint Test H.</u>
B2048	Left Rear Turn Lamp Circuit Short to Ground	Go to <u>Pinpoint Test H.</u>
B2049	Left Rear Turn Lamp Circuit Open	If the lamp is inoperative, go to <u>Pinpoint Test H.</u> If the lamp is always on, go to <u>Pinpoint Test I.</u>
B2050	Right Rear Turn Lamp Circuit Short to Ground	Go to <u>Pinpoint Test H.</u>
B2051	Right Rear Turn Lamp Circuit Open	If the lamp is inoperative, go to <u>Pinpoint Test H.</u> If the lamp is always on, go to <u>Pinpoint Test I.</u>
B2519	High Mount Stop Lamp Circuit Failure	If the lamp is inoperative, go to <u>Pinpoint Test H.</u> If the lamp is always on, go to <u>Pinpoint Test I.</u>
B2527	Left Rear Stop Lamp Circuit Failure	Go to <u>Pinpoint Test H.</u>
B2528	Left Rear Stop Lamp Circuit Short to Battery	If the lamp is inoperative, go to <u>Pinpoint Test H.</u> If the lamp is always on, go to <u>Pinpoint Test I.</u>
B2529	Left Rear Turn Lamp Circuit Failure	If the lamp is inoperative, go to <u>Pinpoint Test H.</u> If the lamp is always on, go to <u>Pinpoint Test I.</u>
B2533	Right Rear Stop Lamp Circuit Failure	Go to <u>Pinpoint Test H.</u>
B2534	Right Rear Stop Lamp Circuit Short to Battery	If the lamp is inoperative, go to <u>Pinpoint Test H.</u> If the lamp is always on, go to <u>Pinpoint Test I.</u>
All other DTCs	-	REFER to <u>MULTIFUNCTION ELECTRONIC MODULES</u> article.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
No communication with the smart junction box (SJB)	- Fuse - Wiring, terminals or connectors - SJB	REFER to <u>MODULE COMMUNICATIONS NETWORK</u> article.
One or more stoplamp are inoperative	- Fuse - Wiring, terminals or connectors - Stoplamp switch - Bussed electrical center (BEC) - SJB	Go to <u>Pinpoint Test H.</u>
	Wiring, terminals or connectors	

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- | | | |
|--|---|--|
| <ul style="list-style-type: none">• The stoplamp are on continuously | <ul style="list-style-type: none">• Stoplamp switch• SJB• PCM | <ul style="list-style-type: none">• Go to <u>Pinpoint Test I.</u> |
|--|---|--|

Pinpoint Tests

Pinpoint Test H: One Or More Stoplamp Are Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Turn Signal/Stop/Hazard Lamps for schematic and connector information.

Normal Operation

Voltage is supplied from the bussed electrical center (BEC) to the smart junction box (SJB) through circuits 1523 (DG), 905 (GY/LB), and 1052 (TN/BK) to power the LH stoplamp, RH stoplamp, and the high mounted stoplamp.

The stoplamp switch is provided voltage through circuit 10 (LG/RD). When the brake pedal is applied, the stoplamp switch routes voltage to the SJB through circuit 511 (LG). The SJB then provides voltage to the stoplamp through circuits 1783 (RD/WH), 1374 (TN/LB), 1728 (LB/OG), and 1363 (WH/RD). Ground for the stoplamp is provided through circuit 1205 (BK).

DTC Description	Fault Trigger Conditions
B2044 - Left Rear Stop Lamp Circuit Short to Ground	A continuous and on-demand DTC that sets when the SJB detects a short to ground from the LH rear lamp 1 voltage supply circuit.
B2046 - Right Rear Stop Lamp Circuit Short to Ground	A continuous and on-demand DTC that sets when the SJB detects a short to ground from the RH rear lamp 1 voltage supply circuit.
B2048 - Left Rear Turn Lamp Circuit Short to Ground	A continuous and on-demand DTC that sets when the SJB detects a short to ground from the LH rear lamp 1 voltage supply circuit.
B2049 - Left Rear Turn Lamp Circuit Open	A continuous and on-demand DTC that sets when the SJB detects an open from the LH rear lamp 1 voltage supply circuit.
B2050 - Right Rear Turn Lamp Circuit Short to Ground	A continuous and on-demand DTC that sets when the SJB detects a short to ground from the RH rear lamp 1 voltage supply circuit.
B2051 - Right Rear Turn Lamp Circuit Open	A continuous and on-demand DTC that sets when the SJB detects an open from the RH rear lamp 1 voltage supply circuit.
B2519 - High Mount Stop Lamp Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects an open or short to ground from the high mounted stoplamp voltage supply circuit.
	A continuous and on-demand DTC that sets when

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B2527 - Left Rear Stop Lamp Circuit Failure	the SJB detects a short to ground from the LH rear lamp 2 voltage supply circuit.
B2528 - Left Rear Stop Lamp Circuit Short to Battery	A continuous and on-demand DTC that sets when the SJB detects an open from the LH rear lamp 1 or lamp 2 voltage supply circuit.
B2529 - Left Rear Turn Lamp Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects an open or short to ground from the LH rear lamp 1 voltage supply circuit.
B2533 - Right Rear Stop Lamp Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects a short to ground from the RH rear lamp 2 voltage supply circuit.
B2534 - Right Rear Stop Lamp Circuit Short to Battery	A continuous and on-demand DTC that sets when the SJB detects an open from the RH rear lamp 1 or lamp 2 voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- Stoplamp switch
- BEC
- SJB

PINPOINT TEST H: ONE OR MORE STOPLAMP ARE INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

H1 DETERMINE IF ALL THE STOPLAMP ARE INOPERATIVE

- Key in OFF position.
- Apply the brake pedal and observe the rear lamps.
- **Are all the stoplamp inoperative?**

YES : Go to H2.

NO : Go to H8.

H2 CHECK CIRCUIT 1523 (DG) FOR VOLTAGE

- Disconnect: SJB C2280h

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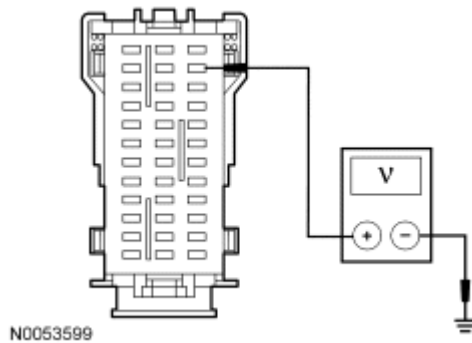


Fig. 52: Measuring Voltage Between SJB C2280H-11, Circuit 1523 (DG), Harness Side & Ground
Courtesy of FORD MOTOR CO.

- Measure the voltage between the SJB C2280h-11, circuit 1523 (DG), harness side and ground.
- **Is the voltage greater than 10 volts?**
YES : Go to H4.
NO : VERIFY the BEC fuse 63 (30A) is OK. If OK, go to H3.

H3 CHECK CIRCUIT 1523 (DG) FOR AN OPEN

- Disconnect: BEC C1035a

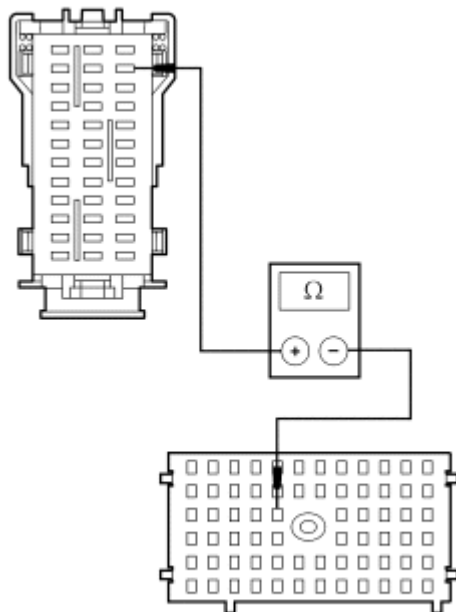


Fig. 53: Measuring Resistance Between SJB C2280H-11 & BEC C1035A-C5, Circuit 1523 (DG)
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280h-11, circuit 1523 (DG), harness side and BEC C1035a-C5, circuit 1523 (DG), harness side.
- **Is the resistance less than 5 ohms?**
YES : INSTALL a new BEC. TEST the system for normal operation.
NO : REPAIR the circuit. TEST the system for normal operation.

H4 CHECK CIRCUIT 10 (LG/RD) FOR VOLTAGE

- Connect: SJB C2280h
- Disconnect: Stoplamp Switch C2314

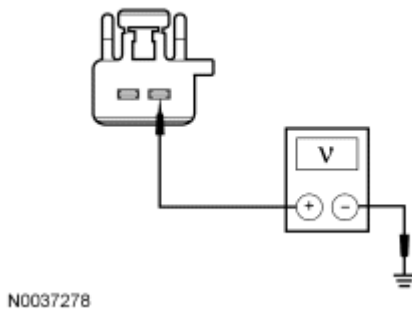


Fig. 54: Checking Circuit 10 (LG/RD) For Voltage
Courtesy of FORD MOTOR CO.

- Measure the voltage between the stoplamp switch C2314-1, circuit 10 (LG/RD), harness side and ground.
- **Is the voltage greater than 10 volts?**
YES : Go to H6.
NO : VERIFY the SJB fuse 15 (10A) is OK. If OK, go to H5.

H5 CHECK CIRCUIT 10 (LG/RD) FOR AN OPEN

- Disconnect: SJB C2280h

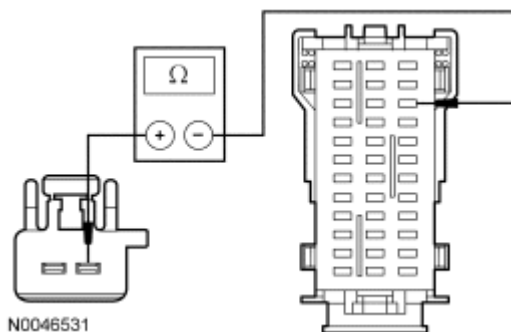


Fig. 55: Checking Circuit 10 (LG/RD) For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the stoplamp switch C2314-1, circuit 10 (LG/RD), harness side and

the SJB C2280h-10, circuit 10 (LG/RD), harness side.

- **Is the resistance less than 5 ohms?**

YES : Go to H13.

NO : REPAIR the circuit. TEST the system for normal operation.

H6 BYPASS THE STOPLAMP SWITCH

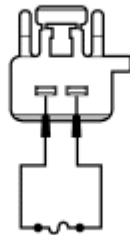


Fig. 56: Connecting Fused Jumper Wire Between Stoplamp Switch C2314-1, Circuit 10 (LG/RD)

Courtesy of FORD MOTOR CO.

- Connect a fused (5A) jumper wire between the stoplamp switch C2314-1, circuit 10 (LG/RD), harness side and the stoplamp switch C2314-2, circuit 511 (LG), harness side.

- **Do the stoplamp illuminate?**

YES : REMOVE the jumper wire. INSTALL a new stoplamp switch. REFER to **Stoplamp Switch**. TEST the system for normal operation.

NO : REMOVE the jumper wire. Go to H7.

H7 CHECK CIRCUIT 511 (LG) FOR AN OPEN

- Disconnect: SJB C2280h

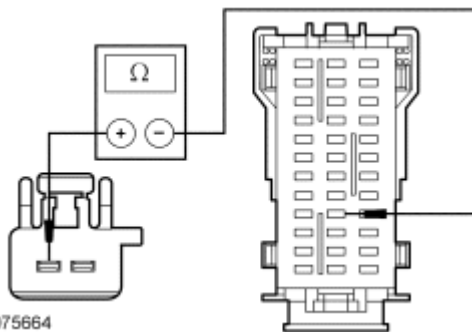


Fig. 57: Checking Circuit 511 (LG) For An Open

Courtesy of FORD MOTOR CO.

- Measure the resistance between the stoplamp switch C2314-2, circuit 511 (LG), harness side and the SJB C2280h-16, circuit 511 (LG), harness side.

- **Is the resistance less than 5 ohms?**

YES : Go to H13.

NO : REPAIR the circuit. TEST the system for normal operation.

H8 CHECK THE VOLTAGE TO THE SJB

- Key in OFF position.
- Disconnect: SJB C2280h

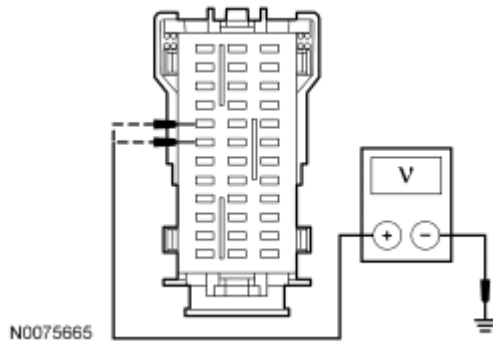


Fig. 58: Checking Voltage To SJB
Courtesy of FORD MOTOR CO.

- Measure the voltage between the SJB, harness side and ground as follows:

SJB Connector- Pin	Circuit
C2280h-31	905 (GY/LB)
C2280h-32	1052 (TN/BK)

- Are the voltages greater than 10 volts?

YES : Go to H10.

NO : VERIFY the BEC fuses 59 (30A) and 67 (30A) are OK. If OK, go to H9.

H9 CHECK THE VOLTAGE SUPPLY CIRCUITS TO THE SJB FOR AN OPEN

- Disconnect: BEC C1035a
- Measure the resistance between the SJB, harness side and the BEC, harness side as follows:

SJB Connector- Pin	BEC Connector- Pin	Circuit
C2280h-31	C1035a-F8	905 (GY/LB)
C2280h-32	C1035a-A5	1052 (TN/BK)

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- **Are the resistances less than 5 ohms?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

H10 CHECK CIRCUIT 1205 (BK) FOR AN OPEN

- Disconnect: Inoperative Stoplamp
- Measure the resistance between the inoperative stoplamp, harness side and ground as follows:

Inoperative Stoplamp	Connector-Pin	Circuit
High mounted stoplamp	C475-1	1205 (BK)
LH rear lamp 1	C4112-1	1205 (BK)
LH rear lamp 2	C4113-1	1205 (BK)
RH rear lamp 1	C4114-1	1205 (BK)
RH rear lamp 2	C4115-1	1205 (BK)

- **Is the resistance less than 5 ohms?**

YES : Go to H11.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

H11 CHECK THE STOPLAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO GROUND

- Disconnect: SJB C2280d
- Measure the resistance between the inoperative stoplamp, harness side and ground as follows:

Inoperative Stoplamp	Connector-Pin	Circuit
High mounted stoplamp	C475-2	1374 (TN/LB)
LH rear lamp 1	C4112-3	1783 (RD/WH)
LH rear lamp 2	C4113-3	1783 (RD/WH)
RH rear lamp 1	C4114-3	1783 (RD/WH)
RH rear lamp 2	C4115-3	1783 (RD/WH)

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- **Is the resistance greater than 10,000 ohms?**

YES : Go to H12.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

H12 CHECK THE STOPLAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN

- Measure the resistance between the inoperative stoplamp, harness side and the SJB, harness side as follows:

Inoperative Stoplamp Connector- Pin/ Circuit	SJB Connector- Pin/ Circuit
High mounted stoplamp C475-2 1374 (TN/LB)	C2280d-39 1374 (TN/LB)
LH rear lamp 1 C4112-3 1783 (RD/WH)	C2280d-14 1363 (WH/RD)
LH rear lamp 2 C4113-3 1783 (RD/WH)	C2280d-18 1728 (LB/OG)
RH rear lamp 1 C4114-3 1783 (RD/WH)	C2280d-47 1783 (RD/WH)
RH rear lamp 2 C4115-3 1783 (RD/WH)	C2280d-40 1783 (RD/WH)

- **Is the resistance less than 5 ohms?**

YES : Go to H13.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

H13 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.

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- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test I: The Stoplamp Are On Continuously

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Turn Signal/Stop/Hazard Lamps for schematic and connector information.

Normal Operation

When the brake pedal is applied, the stoplamp switch routes voltage to the smart junction box (SJB) through circuit 511 (LG). Voltage is also routed to the PCM through circuit 599 (PK/LG). The SJB then provides voltage to the stoplamp through circuits 1783 (RD/WH), 1374 (TN/LB), 1728 (LB/OG), and 1363 (WH/RD). Ground for the stoplamp is provided through circuit 1205 (BK).

DTC Description	Fault Trigger Conditions
B1485 - Brake Pedal Input Short to Battery	An on-demand DTC that sets when the SJB detects a short to voltage from the stoplamp switch input.
B2049 - Left Rear Turn Lamp Circuit Open	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the LH rear lamp 1 voltage supply circuit.
B2051 - Right Rear Turn Lamp Circuit Open	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the RH rear lamp 1 voltage supply circuit.
B2519 - High Mount Stop Lamp Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the high mounted stoplamp voltage supply circuit.
B2528 - Left Rear Stop Lamp Circuit Short to Battery	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the LH rear lamp 1 or lamp 2 voltage supply circuit.
B2529 - Left Rear Turn Lamp Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the LH rear lamp 1 voltage supply circuit.
B2534 - Right Rear Stop Lamp Circuit Short to	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the RH rear

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Battery

lamp 1 or lamp 2 voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Stoplamp switch
- SJB
- PCM

PINPOINT TEST I: THE STOPLAMP ARE ON CONTINUOUSLY

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

I1 USE THE RECORDED DTCs FROM THE SJB SELF-TEST

- Key in OFF position.
- Retrieve the recorded results from the SJB self-test.
- **Was DTC B1485 present?**
YES : Go to I2.
NO : Go to I5.

I2 CHECK THE STOPLAMP SWITCH

- Disconnect: Stoplamp Switch C2314
- **Do the stoplamp continue to illuminate?**
YES : Go to I3.
NO : INSTALL a new stoplamp switch. REFER to Stoplamp Switch. CLEAR the DTCs. REPEAT the self-test.

I3 CHECK THE PCM

- Disconnect: PCM C175b
- **Do the stoplamp continue to illuminate?**
YES : Go to I4.
NO : Go to I6.

I4 CHECK CIRCUITS 511 (LG) AND 599 (PK/LG) FOR A SHORT TO VOLTAGE

- Disconnect: SJB C2280h

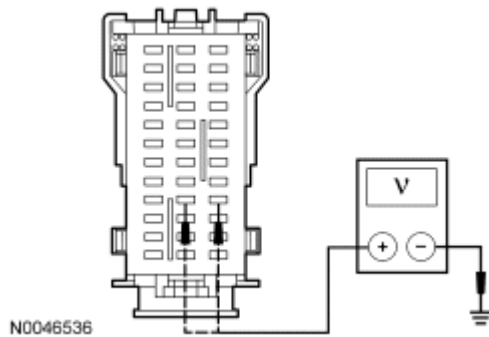


Fig. 59: Checking Circuits 511 (LG) And 599 (PK/LG) For Short To Voltage
Courtesy of FORD MOTOR CO.

- Measure the voltage between the SJB C2280h-16, circuit 511 (LG), harness side and ground; and between the SJB C2280h-4, circuit 599 (PK/LG), harness side and ground.
- **Is any voltage present?**
YES : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.
NO : Go to I7.

I5 CHECK CIRCUITS 1363 (WH/RD), 1728 (LB/OG), 1783 (RD/WH) AND 1374 (TN/LB) FOR A SHORT TO VOLTAGE

- Disconnect: SJB C2280d
- **Do any stoplamp continue to illuminate?**
YES : For the high mounted stoplamp, REPAIR circuit 1374 (TN/LB). CLEAR the DTCs. REPEAT the self-test.

For the LH rear stoplamp 1, REPAIR circuit 1363 (WH/RD). CLEAR the DTCs. REPEAT the self-test.

For the LH rear stoplamp 2, REPAIR circuit 1728 (LB/OG). CLEAR the DTCs. REPEAT the self-test.

For either RH rear stoplamp 1 or 2, REPAIR circuit 1783 (RD/WH). CLEAR the DTCs. REPEAT the self-test.

NO : Go to I7.

I6 CHECK FOR CORRECT PCM OPERATION

- Disconnect all the PCM connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the PCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.

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- **Is the concern still present?**

YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS** article.
CLEAR the DTCs. REPEAT the self-test.

NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

I7 CHECK FOR CORRECT SJB OPERATION

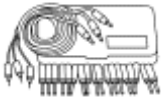
- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

TURN SIGNAL AND HAZARD LAMPS

Special Tools

Illustration	Tool Name	Tool Number
 ST1137-A	73III Automotive Meter	105-R0057 or equivalent
 ST1138-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool	
 ST2834-A	Flex Probe Kit	105-R025C or equivalent

Principles of Operation

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NOTE: The smart junction box (SJB) is also known as the generic electronic module (GEM).

The SJB monitors the multifunction switch position by sending voltage reference signals to the multifunction switch. When the multifunction switch is in the LH or RH TURN positions, the input signal is routed to an internal ground within the SJB. When the hazard flasher lamp switch is pressed, the input signal is routed to ground.

NOTE: The hazard switch is a momentary contact switch.

When the SJB receives a request for a turn signal or the hazard lamps, the SJB supplies on/off voltage to the appropriate turn lamps.

The rear stoplamp are combined with the turn lamps. The turn and hazard lamp functions override the rear stoplamp function.

The timed on/off cycle is determined by the SJB and is set to flash approximately 80 times per minute if both the front and rear turn lamps operate correctly. If an individual turn signal lamp is inoperative, the SJB flashes the remaining turn lamp approximately 160 times per minute.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

VISUAL INSPECTION CHART

Mechanical	Electrical
• Multifunction switch • Hazard flasher switch	• Wiring, terminals or connectors • Bulb(s) • Smart junction box (SJB)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

NOTE: Make sure the headlamp switch is in the OFF position.

NOTE: Make sure the multifunction switch is in the LOW BEAM position.

NOTE: Make sure to use the latest scan tool software release.

4. If the cause is not visually evident, connect the scan tool to the data link connector (DLC).

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NOTE: The vehicle communication module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM.

5. If the scan tool does not communicate with the VCM:
 - Check the VCM connection to the vehicle.
 - Check the scan tool connection to the VCM.
 - Refer to **MODULE COMMUNICATIONS NETWORK** article, No Power To The Scan Tool, to diagnose no communication with the scan tool.
6. If the scan tool does not communicate with the vehicle:
 - Verify the ignition key is in the ON position.
 - Verify the scan tool operation with a known good vehicle.
 - Refer to **MODULE COMMUNICATIONS NETWORK** article to diagnose no response from the PCM.
7. Carry out the network test:
 - If the scan tool responds with no communication for one or more modules, refer to **MODULE COMMUNICATIONS NETWORK** article.
 - If the network test passes, retrieve and record the continuous memory DTCs.
8. Clear the continuous DTCs and carry out the self-test diagnostics for the SJB.
9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to **MULTIFUNCTION ELECTRONIC MODULES** article.
10. If no DTCs related to the concern are retrieved, go to **Symptom Chart**.

DTC Charts

SMART JUNCTION BOX (SJB) DTC CHART

DTC	Description	Action
B1499	Lamp Turn Signal Left Circuit Failure	Go to <u>Pinpoint Test L.</u>
B1502	Lamp Turn Signal Left Circuit Short to Ground	Go to <u>Pinpoint Test L.</u>
B1503	Lamp Turn Signal Right Circuit Failure	Go to <u>Pinpoint Test L.</u>
B1506	Lamp Turn Signal Right Circuit Short to Ground	Go to <u>Pinpoint Test L.</u>
B2048	Left Rear Turn Lamp Circuit Short to Ground	REFER to <u>Stoplamp</u> to continue diagnosis.
B2049	Left Rear Turn Lamp Circuit Open	REFER to <u>Stoplamp</u> to continue diagnosis.
B2050	Right Rear Turn Lamp Circuit Short to Ground	REFER to <u>Stoplamp</u> to continue diagnosis.
B2051	Right Rear Turn Lamp Circuit Open	REFER to <u>Stoplamp</u> to continue diagnosis.
B2071	Hazard Switch Signal Short to Ground	Go to <u>Pinpoint Test M.</u>
B2281	Right Turn Switch Short to Ground	Go to <u>Pinpoint Test K.</u>

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B2282	Left Turn Switch Short to Ground	Go to <u>Pinpoint Test K.</u>
B2529	Left Rear Turn Lamp Circuit Failure	REFER to <u>Stoplamp</u> to continue diagnosis.
All other DTCs	-	REFER to <u>MULTIFUNCTION ELECTRONIC MODULES</u> article.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
No communication with the smart junction box (SJB)	- Fuse - Wiring, terminals or connectors - SJB	REFER to <u>MODULE COMMUNICATIONS NETWORK</u> article.
The turn signal lamps are inoperative	- Wiring, terminals or connectors - Multifunction switch - SJB	Go to <u>Pinpoint Test J.</u>
The turn signal lamps are always on	- Wiring, terminals or connectors - Multifunction switch - SJB	Go to <u>Pinpoint Test K.</u>
One turn signal lamp is inoperative/always on	- Wiring, terminals or connectors - Bulb holder - Bussed electrical center (BEC) - SJB	Go to <u>Pinpoint Test L.</u>
The hazard lamps are inoperative/always on	- Wiring, terminals or connectors - Hazard flasher switch - SJB	Go to <u>Pinpoint Test M.</u>

Pinpoint Tests

Pinpoint Test J: The Turn Signal Lamps Are Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Turn Signal/Stop/Hazard Lamps for schematic and connector information.

Normal Operation

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The smart junction box (SJB) sends a voltage reference signal to the multifunction switch through circuit 1393 (LB/RD) (LH turn signal) and circuit 1392 (LG/OG) (RH turn signal). When the multifunction switch is placed in the LH or RH TURN position, the signal is routed through circuit 1396 (VT/WH) to an internal ground within the SJB.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Multifunction switch
- SJB

PINPOINT TEST J: THE TURN SIGNAL LAMPS ARE INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

J1 CHECK THE HIGH BEAM OPERATION

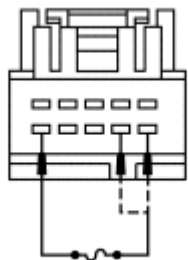
- Key in OFF position.
- Place the headlamp switch in the HEADLAMPS ON position.
- Place the multifunction switch in the HIGH BEAM position.
- **Do the high beams operate correctly?**

YES : Go to J2.

NO : REFER to Headlamps.

J2 CHECK THE MULTIFUNCTION SWITCH

- Place the headlamp switch in the OFF position.
- Disconnect: Multifunction Switch C202
- Key in ON position.



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Fig. 60: Connecting Fused (5A) Jumper Wire Between Multifunction Switch C202-6 (LH Turn Signal), Circuit 1393 (LB/RD)
Courtesy of FORD MOTOR CO.

- Connect a fused (5A) jumper wire between the multifunction switch C202-6 (LH turn signal),

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circuit 1393 (LB/RD) and the multifunction switch C202-10, circuit 1396 (VT/WH), harness side; or between the multifunction switch C202-7 (RH turn signal), circuit 1392 (LG/OG) and the multifunction switch C202-10, circuit 1396 (VT/WH), harness side.

- **Does the LH or RH turn signal operate?**

YES : REMOVE the jumper wire. INSTALL a new multifunction switch. REFER to **STEERING COLUMN SWITCHES** article. TEST the system for normal operation.

NO : REMOVE the jumper wire. Go to J3.

J3 CHECK CIRCUIT 1393 (LB/RD) OR CIRCUIT 1392 (LG/OG) FOR AN OPEN

- Key in OFF position.
- Disconnect: SJB C2280b

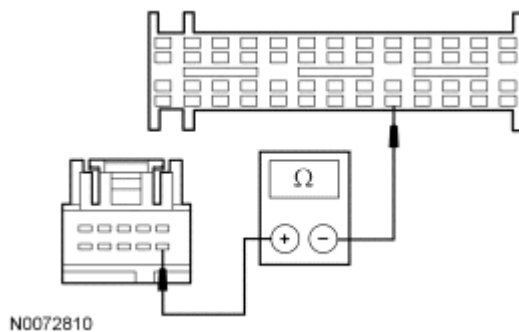


Fig. 61: Checking Circuit 1393 (LB/RD) Or Circuit 1392 (LG/OG) For An Open - Inoperative LH Turn Signal

Courtesy of FORD MOTOR CO.

- For an inoperative LH turn signal, measure the resistance between the multifunction switch C202-6, circuit 1393 (LB/RD) and the SJB C2280b-48, circuit 1393 (LB/RD), harness side.

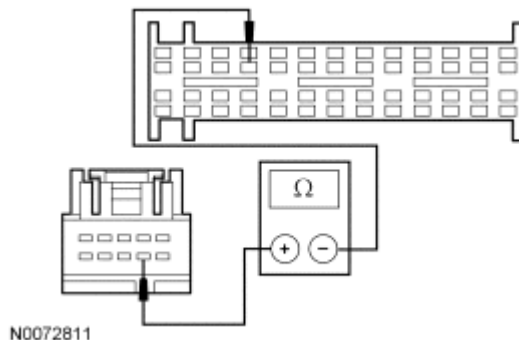


Fig. 62: Checking Circuit 1393 (LB/RD) Or Circuit 1392 (LG/OG) For An Open - Inoperative RH Turn Signal

Courtesy of FORD MOTOR CO.

- For an inoperative RH turn signal, measure the resistance between the multifunction switch C202-7, circuit 1392 (LG/OG) and the SJB C2280b-17, circuit 1392 (LG/OG), harness side.
- **Is the resistance less than 5 ohms?**

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YES : Go to J4.

NO : REPAIR the circuit in question. TEST the system for normal operation.

J4 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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 K: The Turn Signal Lamps Are Always On

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Turn Signal/Stop/Hazard Lamps for schematic and connector information.

Normal Operation

The smart junction box (SJB) sends a voltage reference signal to the multifunction switch through circuit 1393 (LB/RD) (LH turn signal) and circuit 1392 (LG/OG) (RH turn signal). When the multifunction switch is placed in the LH or RH TURN position, the signal is routed through circuit 1396 (VT/WH) to an internal ground within the SJB.

- DTC B2281 (Right Turn Switch Short to Ground) - is an on-demand DTC that sets when the SJB detects a short to ground from the RH turn signal input circuit.
- DTC B2282 (Left Turn Switch Short to Ground) - is an on-demand DTC that sets when the SJB detects a short to ground from the LH turn signal input circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Multifunction switch
- SJB

PINPOINT TEST K: THE TURN SIGNAL LAMPS ARE ALWAYS ON

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

K1 CHECK THE MULTIFUNCTION SWITCH

- Key in OFF position.
- Disconnect: Multifunction Switch C202
- Key in ON position.
- **Do the turn signal lamps continue to flash on and off?**

YES : Go to K2.

NO : INSTALL a new multifunction switch. REFER to STEERING COLUMN SWITCHES article. CLEAR the DTCs. REPEAT the self-test.

K2 CHECK CIRCUIT 1393 (LB/RD) OR CIRCUIT 1392 (LG/OG) FOR A SHORT TO GROUND

- Key in OFF position.
- Disconnect: SJB C2280b

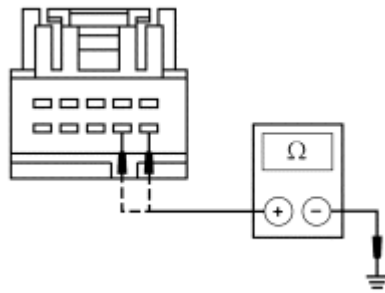


Fig. 63: Checking Circuit 1393 (LB/RD) Or Circuit 1392 (LG/OG) For A Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the multifunction switch C202-6 (LH turn signal), circuit 1393 (LB/RD), harness side and ground; and between the multifunction switch C202-7 (RH turn signal), circuit 1392 (LG/OG), harness side and ground.

- **Is the resistance greater than 10,000 ohms?**

YES : Go to K3.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

K3 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to MULTIFUNCTION ELECTRONIC MODULES

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article. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test L: One Turn Signal Lamp Is Inoperative/Always On

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Turn Signal/Stop/Hazard Lamps for schematic and connector information.

Normal Operation

When the smart junction box (SJB) detects a request for the LH or RH turn signal, the SJB provides voltage, through the bussed electrical center (BEC), to the front turn lamps through circuit 1342 (GY/BK) (LH front turn lamp) or circuit 1341 (DB/OG) (RH front turn lamp). The turn lamps are grounded through circuit 1205 (BK) through the BEC.

The rear lamps are combination stop/turn lamps. The function of the rear turn lamps uses the stoplamp circuitry.

DTC Description	Fault Trigger Conditions
B1499 - Lamp Turn Signal Left Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects an open or short to voltage from the LH front turn signal voltage supply circuit.
B1502 - Lamp Turn Signal Left Circuit Short to Ground	A continuous and on-demand DTC that sets when the SJB detects a short to ground from the LH front turn signal voltage supply circuit.
B1503 - Lamp Turn Signal Right Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects an open or short to voltage from the RH front turn signal voltage supply circuit.
B1506 - Lamp Turn Signal Right Circuit Short to Ground	A continuous and on-demand DTC that sets when the SJB detects a short to ground from the RH front turn signal voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Bulb holder
- BEC
- SJB

PINPOINT TEST L: ONE TURN SIGNAL LAMP IS INOPERATIVE/ALWAYS ON

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

L1 CHECK THE STOPLAMP

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- Key in ON position.
- Apply and release the brake pedal, while observing the stoplamp.
- **Do the stoplamp operate correctly?**

YES : Go to L2.

NO : REFER to Stoplamp.

L2 DETERMINE IF A LAMP IS ALWAYS ON

NOTE: **Make sure the multifunction switch is in the NEUTRAL position.**

- Observe the front turn lamps.
- **Is either turn lamp illuminated?**

YES : Go to L3.

NO : Go to L6.

L3 CHECK THE TURN LAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO VOLTAGE

- Key in OFF position.
- Disconnect: SJB 2280d
- Key in ON position.
- **Does either turn lamp continue to illuminate?**

YES : Go to L4.

NO : Go to L16.

L4 CHECK CIRCUIT 1341 (DB/OG) (RH TURN SIGNAL) OR CIRCUIT 1342 (GY/BK) (LH TURN SIGNAL) FOR A SHORT TO VOLTAGE (SJB TO BEC)

- Key in OFF position.
- Disconnect: BEC C1035a
- Key in ON position.
- **Does either turn lamp continue to illuminate?**

YES : Go to L5.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

L5 CHECK CIRCUIT 1341 (DB/OG) (RH TURN SIGNAL) OR CIRCUIT 1342 (GY/BK) (LH TURN SIGNAL) FOR A SHORT TO VOLTAGE (BEC TO TURN LAMP)

- Key in OFF position.
- Disconnect: BEC C1035c
- Disconnect: Always On Lamp
- Key in ON position.

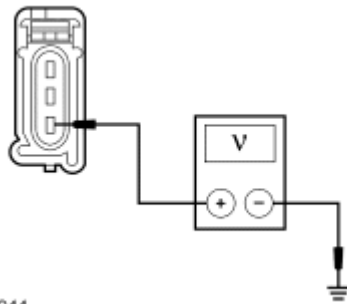


Fig. 64: Checking Circuit 1341 (DB/OG) Or Circuit 1342 (GY/BK) For Short To Voltage (BEC To Turn Lamp)
Courtesy of FORD MOTOR CO.

- Measure the voltage between the LH front turn lamp C1023-3, circuit 1342 (GY/BK), harness side and ground; or between the RH front turn lamp C1043-3, circuit 1341 (DB/OG), harness side and ground.
- **Is any voltage present?**
YES : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.
NO : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

L6 CHECK THE TURN LAMP GROUND CIRCUIT FOR AN OPEN

- Key in OFF position.
- Disconnect: Inoperative Turn Lamp

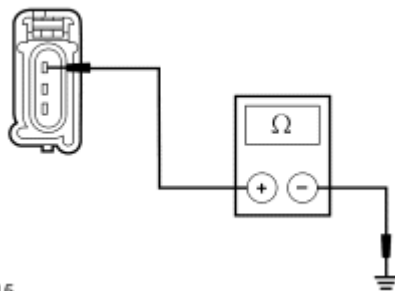


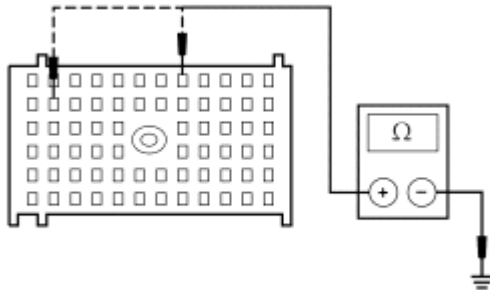
Fig. 65: Checking Turn Lamp Ground Circuit For An Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH turn lamp C1023-1, circuit 1205 (BK), harness side and ground; or between the RH turn lamp C1043-1, circuit 1205 (BK), harness side and ground.
- **Is the resistance less than 5 ohms?**
YES : Go to L9.
NO : Go to L7.

L7 CHECK CIRCUIT 1205 (BK) FOR AN OPEN (BEC TO GROUND)

- Key in OFF position.

- Disconnect: BEC C1035c



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Fig. 66: Checking Circuit 1205 (BK) For Open (BEC To Ground)
Courtesy of FORD MOTOR CO.

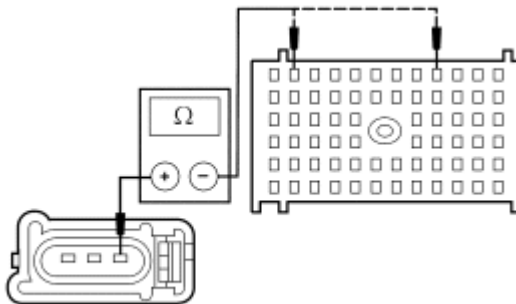
- Measure the resistance between the BEC C1035c-F5 (LH turn lamp), circuit 1205 (BK), harness side and ground; or between the BEC C1035c-E11 (RH turn lamp), circuit 1205 (BK), harness side and ground.

- **Is the resistance less than 5 ohms?**

YES : Go to L8.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

L8 CHECK CIRCUIT 1205 (BK) FOR AN OPEN (TURN LAMP TO BEC)



N0046901

Fig. 67: Checking Circuit 1205 (BK) For Open (Turn Lamp To BEC)
Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH front turn lamp C1023-1, circuit 1205 (BK), harness side and the BEC C1035c-F4, circuit 1205 (BK), harness side; or between the RH front turn lamp C1043-1, circuit 1205 (BK), harness side and the BEC C1035c-F11, circuit 1205 (BK), harness side.

- **Is the resistance less than 5 ohms?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

L9 CHECK FOR VOLTAGE TO THE INOPERATIVE TURN LAMP

- Turn the hazard flasher lamp function on.

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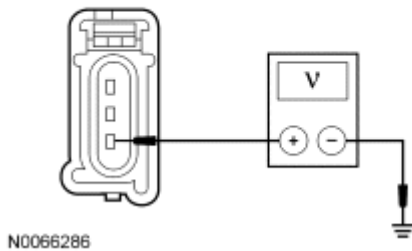


Fig. 68: Checking For Voltage To Inoperative Turn Lamp
Courtesy of FORD MOTOR CO.

- Measure the voltage between the LH front turn lamp C1023-3, circuit 1342 (GY/BK), harness side and ground; or between the RH front turn lamp C1043-3, circuit 1341 (DB/OG), harness side and ground.
- **Does the voltage alternate between 0 and greater than 10 volts?**
YES : INSTALL a new bulb holder. CLEAR the DTCs. REPEAT the self-test.
NO : Go to L10.

L10 CHECK THE TURN LAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO GROUND

- Turn the hazard flasher lamp function off.
- Disconnect: SJB C2280d

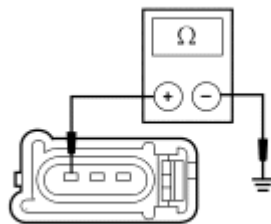


Fig. 69: Checking Circuit 1341 (DB/OG) Or Circuit 1342 (GY/BK) For Short To Ground (BEC To Turn Lamp)
Courtesy of FORD MOTOR CO.

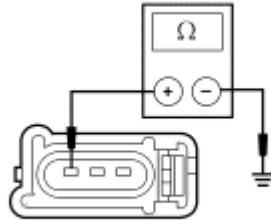
- Measure the resistance between the LH turn lamp C1023-3, circuit 1342 (GY/BK), harness side and ground; or between the RH turn lamp C1043-3, circuit 1341 (DB/OG), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**
YES : Go to L13.
NO : Go to L11.

L11 CHECK CIRCUIT 1341 (DB/OG) (RH TURN SIGNAL) OR CIRCUIT 1342 (GY/BK) (LH TURN SIGNAL) FOR A SHORT TO GROUND (SJB TO BEC)

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- Disconnect: BEC C1035a



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Fig. 70: Checking Circuit 1341 (DB/OG) Or Circuit 1342 (GY/BK) For Short To Ground (BEC To Turn Lamp)

Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH turn lamp C1023-3, circuit 1342 (GY/BK), harness side and ground; or between the RH turn lamp C1043-3, circuit 1341 (DB/OG), harness side and ground.

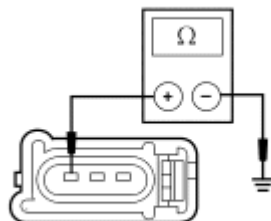
- **Is the resistance greater than 10,000 ohms?**

YES : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

NO : Go to L12.

L12 CHECK CIRCUIT 1341 (DB/OG) (RH TURN SIGNAL) OR CIRCUIT 1342 (GY/BK) (LH TURN SIGNAL) FOR A SHORT TO GROUND (BEC TO TURN LAMP)

- Disconnect: BEC C1035c



N0046902

Fig. 71: Checking Circuit 1341 (DB/OG) Or Circuit 1342 (GY/BK) For Short To Ground (BEC To Turn Lamp)

Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH turn lamp C1023-3, circuit 1342 (GY/BK), harness side and ground; or between the RH turn lamp C1043-3, circuit 1341 (DB/OG), harness side and ground.

- **Is the resistance greater than 10,000 ohms?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

L13 CHECK FOR VOLTAGE TO THE BEC

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- Connect: SJB C2280d
- Disconnect: BEC C1035a
- Turn the hazard flasher lamp function on.

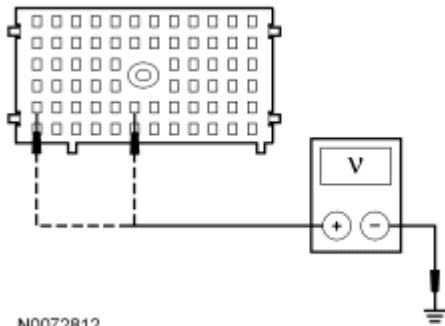


Fig. 72: Checking For Voltage To BEC
Courtesy of FORD MOTOR CO.

- Measure the voltage between the BEC C1035a-E1 (LH turn lamp), circuit 1342 (GY/BK), harness side and ground; or between the BEC C1035a-E6 (RH turn lamp), circuit 1341 (DB/OG), harness side and ground.
- **Does the voltage alternate from 0 to greater than 10 volts?**
YES : Go to L15.
NO : Go to L14.

L14 CHECK CIRCUIT 1341 (DB/OG) (RH TURN SIGNAL) OR CIRCUIT 1342 (GY/BK) (LH TURN SIGNAL) FOR AN OPEN (SJB TO BEC)

- Turn the hazard flasher lamp function off.
- Disconnect: SJB C2280d

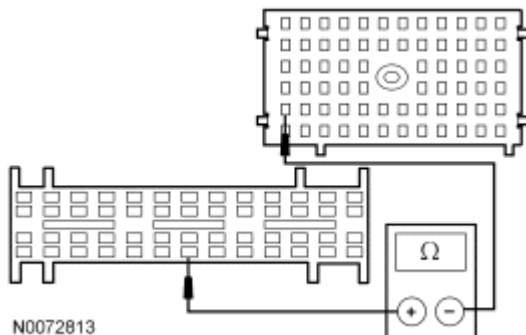


Fig. 73: Checking Circuit 1341 (DB/OG) (RH Turn Signal) Or 1342 (GY/BK) (LH Turn Signal) For An Open (SJB To BEC) - Inoperative LH Turn Lamp
Courtesy of FORD MOTOR CO.

- For an inoperative LH turn lamp, measure the resistance between the SJB C2280d-46 (LH turn lamp), circuit 1342 (GY/BK), harness side and the BEC C1035a-E1, circuit 1342 (GY/BK), harness side.

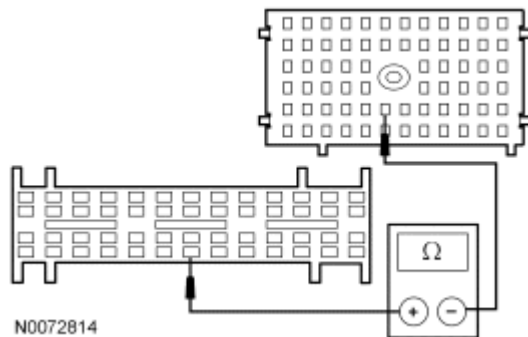


Fig. 74: Checking Circuit 1341 (DB/OG) (RH Turn Signal) Or 1342 (GY/BK) (LH Turn Signal) For An Open (SJB To BEC) - Inoperative RH Turn Lamp
 Courtesy of FORD MOTOR CO.

- For an inoperative RH turn lamp, measure the resistance between the SJB C2280d-41 (RH turn lamp), circuit 1341 (DB/OG), harness side and the BEC C1035a-E6, circuit 1341 (DB/OG), harness side.
- **Is the resistance less than 5 ohms?**
YES : Go to L16.
NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

L15 CHECK CIRCUIT 1341 (DB/OG) (RH TURN SIGNAL) OR CIRCUIT 1342 (GY/BK) (LH TURN SIGNAL) FOR AN OPEN (BEC TO TURN LAMP)

- Turn the hazard flasher lamp function off.
- Disconnect: BEC C1035c

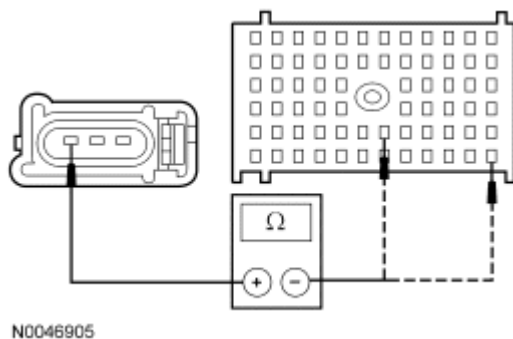


Fig. 75: Checking Circuit 1341 (DB/OG) Or Circuit 1342 (GY/BK) For Open (BEC To Turn Lamp)
 Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH turn lamp C1023-3, circuit 1342 (GY/BK), harness side and the BEC C1035c-A1, circuit 1342 (GY/BK), harness side; or between the RH turn lamp C1043-3, circuit 1341 (DB/OG), harness side and the BEC C1035c-B6, circuit 1341 (DB/OG), harness side.
- **Is the resistance less than 5 ohms?**
YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.
NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

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L16 CHECK FOR CORRECT SJB OPERATION

- Key in OFF position.
- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test M: The Hazard Lamps Are Inoperative/Always On

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Turn Signal/Stop/Hazard Lamps for schematic and connector information.

Normal Operation

The smart junction box (SJB) sends a voltage reference signal to the hazard flasher switch through circuit 1689 (RD/WH). When the hazard flasher switch is pressed, the signal is routed to ground through circuit 1205 (BK).

- DTC B2071 (Hazard Switch Signal Short to Ground) - is an on-demand DTC that sets when the SJB detects a short to ground from the hazard flasher lamp switch input circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Hazard flasher switch
- SJB

PINPOINT TEST M: THE HAZARD LAMPS ARE INOPERATIVE/ALWAYS ON

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

M1 USE THE RECORDED DTCs FROM THE SJB SELF-TEST

- Key in OFF position.
- Retrieve the recorded results from the SJB self-test.

- **Was DTC B2071 present?**

YES : Go to M2.

NO : Go to M4.

M2 CHECK THE HAZARD FLASHER LAMP SWITCH (DTC B2071)

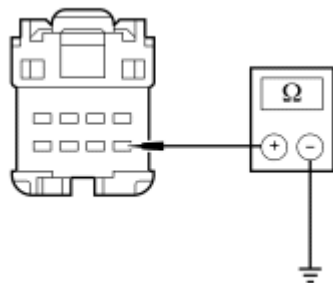
- Disconnect: Hazard Flasher Switch C2039
- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: SJB Self-Test
- Repeat the SJB on-demand self-test.
- **Is DTC B2071 present?**

YES : Go to M3.

NO : INSTALL a new hazard flasher switch. TEST the system for normal operation.

M3 CHECK CIRCUIT 1689 (RD/WH) FOR SHORT TO GROUND

- Key in OFF position.
- Disconnect: SJB C2280b



N0010906

Fig. 76: Measuring Resistance Between Hazard Switch C2039-5 And Ground
Courtesy of FORD MOTOR CO.

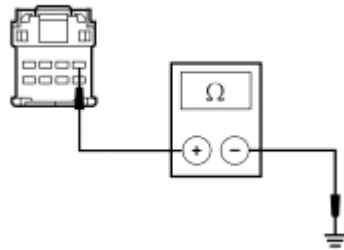
- Measure the resistance between the hazard flasher switch C2039-5, circuit 1689 (RD/WH), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**

YES : Go to M7.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

M4 CHECK CIRCUIT 1205 (BK) FOR AN OPEN

- Disconnect: Hazard Flasher Switch C2039



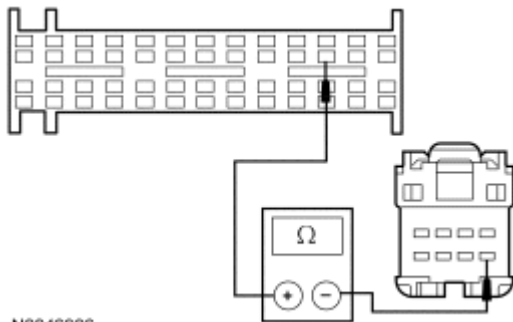
N0038814

Fig. 77: Checking Circuit 1205 (BK) For An Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the hazard flasher switch C2039-1, circuit 1205 (BK), harness side and ground.
- **Is the resistance less than 5 ohms?**
YES : Go to M5.
NO : REPAIR the circuit. TEST the system for normal operation.

M5 CHECK CIRCUIT 1689 (RD/WH) FOR AN OPEN

- Disconnect: SJB C2280b



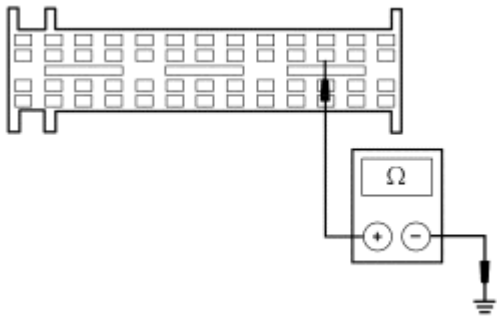
N0046906

Fig. 78: Measuring Resistance Between SJB C2280B-24 And Hazard Switch C2039-5
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280b-24, circuit 1689 (RD/WH), harness side and the hazard flasher switch C2039-5, circuit 1689 (RD/WH), harness side.
- **Is the resistance less than 5 ohms?**
YES : Go to M6.
NO : REPAIR the circuit. TEST the system for normal operation.

M6 CHECK THE HAZARD FLASHER SWITCH

- Connect: Hazard Flasher Switch C2039



N0046907

Fig. 79: Measuring Resistance Between SJB C2280B-24 And Ground
Courtesy of FORD MOTOR CO.

- While pressing and releasing the hazard flasher switch, measure the resistance between the SJB C2280b-24, circuit 1689 (RD/WH), harness side and ground.
- **Is the resistance less than 5 ohms with the hazard flasher switch pressed and greater than 10,000 ohms with the hazard flasher switch released?**

YES : Go to M7.

NO : INSTALL a new hazard flasher switch. TEST the system for normal operation.

M7 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

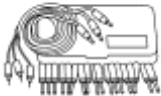
YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. TEST the system for normal operation.

NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

PARKING, REAR AND LICENSE PLATE LAMPS

Special Tools

Illustration	Tool Name	Tool Number
 ST1137-A	73III Automotive Meter	105-R0057 or equivalent

 ST1138-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool	
 ST2834-A	Flex Probe Kit	105-R025C or equivalent

Principles of Operation

NOTE: **The smart junction box (SJB) is also known as the generic electronic module (GEM).**

When the SJB receives an input from the headlamp switch indicating a request for the parking lamps, the SJB supplies voltage to the parking lamps.

The battery saver feature does not turn the parking lamps off when the headlamp switch is in the PARKING LAMPS ON position.

The SJB monitors the headlamp switch position by sending voltage reference signals on multiple circuits to the headlamp switch. At any given time, one of the signal circuits is routed to ground. If the SJB does not detect any of the inputs to the headlamp switch is active (routed to ground) for 5 seconds, the SJB turns on the exterior lights and keeps them on for 10 minutes after the ignition switch is turned off (or 10 minutes from the time the SJB does not detect any headlamp switch input if the ignition switch was already off). If the SJB detects multiple circuits short to ground, the SJB implements a planned strategy depending on the multiple inputs received. If either of these situations occur, the SJB should **NOT** be ruled immediately as being at fault. This is normal behavior of the SJB design as it has detected a fault with the inputs from the headlamp switch.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

VISUAL INSPECTION CHART

Mechanical	Electrical
Headlamp switch	- Wiring, terminals or connectors - Bulb(s) - Smart junction box (SJB)

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3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

NOTE: Make sure the headlamp switch is in the OFF position.

NOTE: Make sure the multifunction switch is in the LOW BEAM position.

NOTE: Make sure to use the latest scan tool software release.

4. If the cause is not visually evident, connect the scan tool to the data link connector (DLC).

NOTE: The vehicle communication module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM.

5. If the scan tool does not communicate with the VCM:

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM.
- Refer to **MODULE COMMUNICATIONS NETWORK** article, No Power To The Scan Tool, to diagnose no communication with the scan tool.

6. If the scan tool does not communicate with the vehicle:

- Verify the ignition key is in the ON position.
- Verify the scan tool operation with a known good vehicle.
- Refer to **MODULE COMMUNICATIONS NETWORK** article to diagnose no response from the PCM.

7. Carry out the network test:

- If the scan tool responds with no communication for one or more modules, refer to **MODULE COMMUNICATIONS NETWORK** article.
- If the network test passes, retrieve and record the continuous memory DTCs.

8. Clear the continuous DTCs and carry out the self-test diagnostics for the SJB.

9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to **MULTIFUNCTION ELECTRONIC MODULES** article.

10. If no DTCs related to the concern are retrieved, go to **Symptom Chart**.

DTC Charts

SMART JUNCTION BOX (SJB) DTC CHART

DTC	Description	Action
B1470	Lamp Headlamp Input Circuit Failure	Go to <u>Pinpoint Test O</u> .
B2035	LF Side Repeater Lamp Output CKT Failure	If the lamps are inoperative, go to <u>Pinpoint Test N</u> . If the lamps are always on, go to <u>Pinpoint Test O</u> .

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B2491	RF Park Lamp Output Circuit Short to Battery	If the lamp is inoperative, go to <u>Pinpoint Test N.</u> If the lamp is always on, go to <u>Pinpoint Test O.</u>
B2493	LF Park Lamp Output Circuit Short to Battery	If the lamp is inoperative, go to <u>Pinpoint Test N.</u> If the lamp is always on, go to <u>Pinpoint Test O.</u>
B2523	License Lamp Circuit Failure	If the lamps are inoperative, go to <u>Pinpoint Test N.</u> If the lamps are always on, go to <u>Pinpoint Test O.</u>
All other DTCs	-	REFER to <u>MULTIFUNCTION ELECTRONIC MODULES</u> article.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
No communication with the smart junction box (SJB)	- Fuse - Wiring, terminals or connectors - SJB	REFER to <u>MODULE COMMUNICATIONS NETWORK</u> article.
One or more parking, rear, or license plate lamp is inoperative	- Wiring, terminals or connectors - Bulb holder - Bussed electrical center (BEC) - SJB	Go to <u>Pinpoint Test N.</u>
The parking, rear, or license plate lamps are on continuously	- Wiring, terminals or connectors - Headlamp switch - BEC - SJB	Go to <u>Pinpoint Test O.</u>

Pinpoint Tests

Pinpoint Test N: One Or More Parking, Rear Or License Plate Lamp Is Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Parking Rear and License Lamps for schematic and connector information.

Normal Operation

The smart junction box (SJB) sends a voltage reference signal to the headlamp switch through circuit 1401 (BK/LG). When the headlamp switch is placed in the PARKING LAMPS ON position, the SJB provides voltage to the parking, rear, license plate and side marker lamps. The lamps are grounded through circuit 1205 (BK).

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DTC Description	Fault Trigger Conditions
B2035 - LF Side Repeater Lamp Output CKT Failure	A continuous and on-demand DTC that sets when the SJB detects an open or short to ground from all the side marker lamps voltage supply circuit.
B2491 - RF Park Lamp Output Circuit Short to Battery	A continuous and on-demand DTC that sets when the SJB detects an open from the RH front parking lamp voltage supply circuit.
B2493 - LF Park Lamp Output Circuit Short to Battery	A continuous and on-demand DTC that sets when the SJB detects an open from the LH front parking lamp voltage supply circuit.
B2523 - License Lamp Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects an open or short to ground from the license plate lamp and both rear parking lamp voltage supply circuits.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Bulb holder
- BEC
- SJB

PINPOINT TEST N: ONE OR MORE PARKING, REAR OR LICENSE PLATE LAMP IS INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

N1 CHECK THE STOPLAMP OPERATION

- Key in OFF position.
- Apply and release the brake pedal while observing the stoplamp.
- **Do the stoplamp operate correctly?**

YES : Go to N2.

NO : REFER to Stoplamp.

N2 CHECK THE TURN SIGNAL OPERATION

- Key in ON position.
- Place the multifunction switch in the LH and then RH TURN position.
- **Do the turn lamps operate correctly?**

YES : Go to N3.

NO : REFER to Turn Signal and Hazard Lamps.

N3 CHECK CIRCUIT 1205 (BK) FOR AN OPEN

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NOTE: Make sure the bulb is good before continuing diagnostics.

- Key in OFF position.
- Disconnect: Inoperative Parking Lamp
- Measure the resistance between the inoperative parking lamp, harness side and ground as follows:

Inoperative Parking Lamp Connector- Pin	Circuit
LH front C1023-1	1205 (BK)
RH front C1043-1	1205 (BK)
LH front side marker C151-2	1205 (BK)
RH front side marker C161-2	1205 (BK)
LH rear side marker C481-2	1205 (BK)
RH rear side marker C482-2	1205 (BK)
LH rear 1 C4112-1	1205 (BK)
LH rear 2 C4113-1	1205 (BK)
LH rear parking C412-1	1205 (BK)
RH rear 1 C4114-1	1205 (BK)
RH rear 2 C4115-1	1205 (BK)
RH rear parking C415-1	1205 (BK)
License plate C4046-2	1205 (BK)

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- **Is the resistance less than 5 ohms?**

YES : For a side marker or front lamp, go to N5.

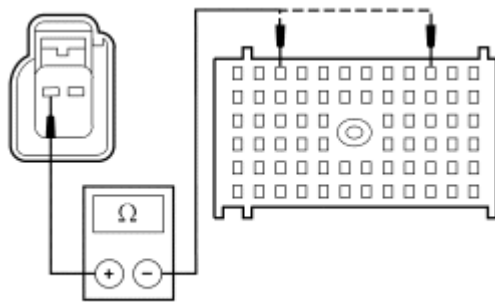
For a rear or license plate lamp, go to N6.

NO : For a front side marker lamp, go to N4.

For all others, REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

N4 CHECK CIRCUIT 1205 (BK) FOR AN OPEN (SIDE LAMP TO BEC)

- Disconnect: BEC C1035c



N0046914

Fig. 80: Checking Circuit 1205 (BK) For Open (Side LAMP To BEC)

Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH front side marker C151-2, circuit 1205 (BK), harness side and the BEC C1035c-F3, circuit 1205 (BK), harness side; or between the RH front side marker C161-2, circuit 1205 (BK), harness side and the BEC C1035c-F10, circuit 1205 (BK), harness side.

- **Is the resistance less than 5 ohms?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

N5 CHECK FOR VOLTAGE TO THE BULB HOLDER

- Place the headlamp switch in the PARKING LAMPS ON position.
- Measure the voltage between the inoperative parking lamp, harness side and ground as follows:

Inoperative Parking Lamp Connector-Pin	Circuit
LH front C1023-2	1340 (DG)
RH front C1043-2	1339 (BK/PK)

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LH front side marker C151-1	667 (WH/RD)
RH front side marker C161-1	14 (BN)
LH rear side marker C481-1	1361 (RD/PK)
RH rear side marker C482-1	1361 (RD/PK)

- **Is the voltage greater than 10 volts?**

YES : INSTALL a new bulb holder. CLEAR the DTCs. REPEAT the self-test.

NO : Go to N6.

N6 CHECK THE PARKING LAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO GROUND

NOTE: If testing at a rear side marker lamp, both rear side marker lamps must be disconnected for correct test results.

NOTE: If testing at the rear lamp 1 or rear lamp 2, both lamps must be disconnected for correct test results.

- Place the headlamp switch in the OFF position.
- Disconnect: SJB C2280d
- Measure the resistance between the inoperative parking lamp, harness side and ground as follows:

Inoperative Parking Lamp Connector-Pin	Circuit
LH front C1023-2	1340 (DG)
RH front C1043-2	1339 (BK/PK)
LH front side marker C151-1	667 (WH/RD)
RH front side marker	14 (BN)

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C161-1	
LH rear side marker C481-1	1361 (RD/PK)
RH rear side marker C482-1	1361 (RD/PK)
LH rear 1 C4112-2	1366 (TN/RD)
LH rear 2 C4113-2	1366 (TN/RD)
LH rear parking C412-2	1729 (DB/LG)
RH rear 1 C4114-2	1366 (TN/RD)
RH rear 2 C4115-2	1366 (TN/RD)
RH rear parking C415-2	1729 (DB/LG)
License plate C4046-1	1370 (DG/LG)

- **Is the resistance greater than 10,000 ohms?**

YES : Go to N9.

NO : For a front lamp or front side marker, go to N7.

For all others, REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

N7 CHECK THE PARKING LAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO GROUND (BEC TO SJB)

- Disconnect: BEC C1035a
- Measure the resistance between the inoperative parking lamp, harness side and ground as follows:

Inoperative Parking Lamp Connector-Pin	Circuit
LH front C1023-2	1340 (DG)
RH front	1339

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C1043-2	(BK/PK)
LH front side marker C151-1	667 (WH/RD)
RH front side marker C161-1	14 (BN)

- **Is the resistance greater than 10,000 ohms?**

YES : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

NO : Go to N8.

N8 CHECK THE PARKING LAMP VOLTAGE SUPPLY CIRCUIT FOR A SHORT TO GROUND (BEC TO FRONT LAMP)

- Disconnect: BEC C1035c
- Measure the resistance between the inoperative parking lamp, harness side and ground as follows:

Inoperative Parking Lamp Connector-Pin	Circuit
LH front C1023-2	1340 (DG)
RH front C1043-2	1339 (BK/PK)
LH front side marker C151-1	667 (WH/RD)
RH front side marker C161-1	14 (BN)

- **Is the resistance greater than 10,000 ohms?**

YES : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

NO : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

N9 CHECK THE PARKING LAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN (SJB TO LAMP)

- Measure the resistance between the inoperative parking lamp, harness side and the SJB harness side as follows:

Inoperative Parking Lamp	SJB Connector-
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Connector- Pin/ Circuit	Pin/ Circuit
LH front C1023-2 1340 (DG)	C2280d-29 1340 (DG)
RH front C1043-2 1339 (BK/PK)	C2280d-31 1339 (BK/PK)
LH front side marker C151-1 667 (WH/RD)	C2280d-16 667 (WH/RD)
RH front side marker C161-1 14 (BN)	C2280d-17 14 (BN)
LH rear side marker C481-1 1361 (RD/PK)	C2280d-15 1361 (RD/PK)
RH rear side marker C482-1 1361 (RD/PK)	C2280d-15 1361 (RD/PK)
LH rear 1 C4112-2 1366 (TN/RD)	C2280d-30 1364 (DB/YE)
LH rear 2 C4113-2 1366 (TN/RD)	C2280d-30 1364 (DB/YE)
LH rear parking C412-2 1729 (DB/LG)	C2280d-24 1784 (TN/RD)
RH rear 1 C4114-2 1366 (TN/RD)	C2280d-32 1366 (TN/RD)

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RH rear 2 C4115-2 1366 (TN/RD)	C2280d-32 1366 (TN/RD)
RH rear parking C415-2 1729 (DB/LG)	C2280d-38 1729 (DB/YE)
License plate C4046-1 1370 (DG/LG)	C2280d-37 1370 (DG/LG)

- **Is the resistance less than 5 ohms?**

YES : Go to N12.

NO : For a front lamp or front side marker, go to N10.

For all others, REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

N10 CHECK THE PARKING LAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN (SJB TO BEC)

- Disconnect: BEC C1035a
- Measure the resistance between the BEC, harness side and the SJB, harness side as follows:

Inoperative Parking Lamp	BEC Connector- Pin	SJB Connector- Pin	Circuit
LH front	C1035a-D3	C2280d-29	1340 (DG)
RH front	C1035a-D1	C2280d-31	1339 (BK/PK)
LH front side marker	C1035a-A6	C2280d-16	667 (WH/RD)
RH front side marker	C1035a- D10	C2280d-17	14 (BN)

- **Is the resistance less than 5 ohms?**

YES : Go to N11.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

N11 CHECK THE PARKING LAMP VOLTAGE SUPPLY CIRCUIT FOR AN OPEN (BEC TO LAMP)

- Disconnect: BEC C1035c

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- Measure the resistance between the inoperative parking lamp, harness side and the BEC, harness side as follows:

Inoperative Parking Lamp Connector-Pin	BEC Connector-Pin	Circuit
LH front C1023-2	C1035c-A3	1340 (DG)
RH front C1043-2	C1035c-C1	1339 (BK/PK)
LH front side marker C151-1	C1035c-D1	667 (WH/RD)
RH front side marker C161-1	C1035c-B10	14 (BN)

- **Is the resistance less than 5 ohms?**

YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

N12 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test O: The Parking, Rear Or License Plate Lamps Are On Continuously

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Parking Rear and License Lamps for schematic and connector information.

Normal Operation

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The smart junction box (SJB) sends a voltage reference signal to the headlamp switch through circuit 1401 (BK/LG). When the headlamp switch is placed in the PARKING LAMPS ON position, the SJB provides voltage to the parking, license plate and side marker lamps.

DTC Description	Fault Trigger Conditions
B1470 - Lamp Headlamp Input Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects a short to ground from the headlamp switch input circuit (parking lamps).
B2035 - LF Side Repeater Lamp Output CKT Failure	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the side marker lamps voltage supply circuit.
B2491 - RF Park Lamp Output Circuit Short to Battery	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the RH front parking lamp voltage supply circuit.
B2493 - LF Park Lamp Output Circuit Short to Battery	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the LH front parking lamp voltage supply circuit.
B2523 - License Lamp Circuit Failure	A continuous and on-demand DTC that sets when the SJB detects a short to voltage from the license plate lamp and both tail lamp voltage supply circuits.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Headlamp switch
- BEC
- SJB

PINPOINT TEST O: THE PARKING, REAR OR LICENSE PLATE LAMPS ARE ON CONTINUOUSLY

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

O1 USE THE RECORDED DTCs FROM THE SJB SELF-TEST

- Key in OFF position.
- Retrieve the recorded results from the SJB self-test.
- **Was DTC B1470 present?**
YES : Go to O2.
NO : Go to O4.

O2 CHECK THE HEADLAMP SWITCH

- Disconnect: Headlamp Switch C205
- Carry out the headlamp switch component test. Refer to COMPONENT TESTING.

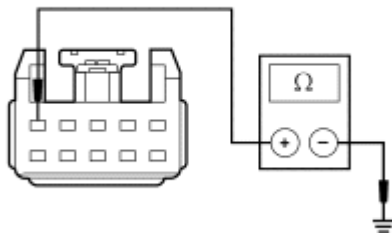
- **Is the headlamp switch OK?**

YES : Go to O3.

NO : INSTALL a new headlamp switch. REFER to **Headlamp Switch**. CLEAR the DTCs. REPEAT the self-test.

O3 CHECK CIRCUIT 1401 (BK/LG) FOR A SHORT TO GROUND

- Disconnect: SJB C2280b



N0046915

Fig. 81: Measuring Resistance Between Headlamp Switch C205-5 And Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the headlamp switch C205-5, circuit 1401 (BK/LG), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**

YES : Go to O7.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

O4 CHECK THE PARKING LAMP VOLTAGE SUPPLY CIRCUITS FOR A SHORT TO VOLTAGE

- Disconnect: SJB C2280d
- Key in ON position.
- **Does any parking lamp continue to illuminate?**

YES : If a front side marker or front lamp continues to illuminate, go to O5.

For all other lamps, REPAIR the voltage supply circuit in question. CLEAR the DTCs. REPEAT the self-test.

NO : Go to O7.

O5 CHECK THE PARKING LAMP VOLTAGE SUPPLY CIRCUITS FOR A SHORT TO VOLTAGE (SJB to BEC)

- Key in OFF position.
- Disconnect: BEC C1035a
- Key in ON position.
- **Does any parking lamp continue to illuminate?**

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YES : Go to O6.

NO : REPAIR the voltage supply circuit in question between the SJB and the BEC. CLEAR the DTCs. REPEAT the self-test.

O6 CHECK THE PARKING LAMP VOLTAGE SUPPLY CIRCUITS FOR A SHORT TO VOLTAGE (BEC to LAMP)

- Key in OFF position.
- Disconnect: BEC C1035c
- Disconnect: Suspect Parking Lamp
- Key in ON position.
- Measure the voltage between suspect parking lamp, harness side and ground as follows:

Suspect Lamp	Connector-Pin	Circuit
LH front	C1023-2	1340 (DG)
RH front	C1043-2	1339 (BK/PK)
LH side marker	C151-1	667 (WH/RD)
RH side marker	C161-1	14 (BN)

- **Is any voltage present?**

YES : REPAIR the voltage supply circuit in question. CLEAR the DTCs. REPEAT the self-test.

NO : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

O7 CHECK FOR CORRECT SJB OPERATION

- Key in OFF position.
- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. TEST the system for normal operation.

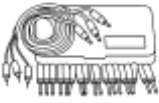
NO : The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

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FOG LAMPS

Special Tools

Illustration	Tool Name	Tool Number
 ST1137-A	73III Automotive Meter	105-R0057 or equivalent
 ST1138-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool	
 ST2834-A	Flex Probe Kit	105-R025C or equivalent

Principles of Operation

NOTE: The smart junction box (SJB) is also known as the generic electronic module (GEM).

The SJB monitors the fog lamp switch input by sending a voltage reference signal to the headlamp switch. When the fog lamp switch is engaged, the voltage reference signal is routed to ground.

The fog lamps can be turned on when the following conditions are met:

- The ignition switch is in the RUN or START position.
- The low beam headlamps or the parking lamps are on.
- The high beams are off.

When the SJB receives an input from the headlamp switch indicating a request for the fog lamps, the SJB provides ground for the fog lamp relay coil. When the fog lamp relay is energized, voltage is routed to the fog lamps and the fog lamps on indicator located within the headlamp switch.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

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VISUAL INSPECTION CHART

Mechanical	Electrical
• Headlamp switch	• Bussed electrical center (BEC) fuse 58 (15A) (fog lamp relay) • Wiring, terminals or connectors • Fog lamp relay • Bulb(s) • BEC • Smart junction box (SJB)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

NOTE: Make sure the headlamp switch is in the OFF position.

NOTE: Make sure the multifunction switch is in the LOW BEAM position.

NOTE: Make sure to use the latest scan tool software release.

4. If the cause is not visually evident, connect the scan tool to the data link connector (DLC).

NOTE: The vehicle communication module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM.

5. If the scan tool does not communicate with the VCM:

- Check the VCM connection to the vehicle.
- Check the scan tool connection to the VCM.
- Refer to **MODULE COMMUNICATIONS NETWORK** article, No Power To The Scan Tool, to diagnose no communication with the scan tool.

6. If the scan tool does not communicate with the vehicle:

- Verify the ignition key is in the ON position.
- Verify the scan tool operation with a known good vehicle.
- Refer to **MODULE COMMUNICATIONS NETWORK** article to diagnose no response from the PCM.

7. Carry out the network test:

- If the scan tool responds with no communication for one or more modules, refer to **MODULE COMMUNICATIONS NETWORK** article.
- If the network test passes, retrieve and record the continuous memory DTCs.

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8. Clear the continuous DTCs and carry out the self-test diagnostics for the SJB.
9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to **MULTIFUNCTION ELECTRONIC MODULES** article.
10. If no DTCs related to the concern are retrieved, go to **Symptom Chart**.

DTC Charts

SMART JUNCTION BOX (SJB) DTC CHART

DTC	Description	Action
B2030	Front Fog Lamp Relay CKT Failure	If the fog lamps are inoperative, go to <u>Pinpoint Test P</u> . If the fog lamps are always on, go to <u>Pinpoint Test R</u> .
B2254	Front Fog Lamp Switch Failure	Go to <u>Pinpoint Test R</u> .
All other DTCs	-	REFER to <u>MULTIFUNCTION ELECTRONIC MODULES</u> article.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
No communication with the smart junction box (SJB)	- Fuse - Wiring, terminals or connectors - SJB	REFER to <u>MODULE COMMUNICATIONS NETWORK</u> article.
The fog lamps are inoperative	- Fuse - Wiring, terminals or connectors - Fog lamp relay - Headlamp switch - Bussed electrical center (BEC) - SJB	Go to <u>Pinpoint Test P</u>.
An individual fog lamp is inoperative	- Wiring, terminals or connectors - BEC	Go to <u>Pinpoint Test Q</u>.
The fog lamps are on continuously	- Wiring, terminals or connectors - Fog lamp relay - Headlamp switch - BEC - SJB	Go to <u>Pinpoint Test R</u>.

• The fog lamp on indicator is inoperative	• Wiring, terminals or connectors • Headlamp switch • BEC	• Go to <u>Pinpoint Test S.</u>
--	---	--

Pinpoint Tests

Pinpoint Test P: The Fog Lamps Are Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Fog Lamps for schematic and connector information.

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Fuse and Relay Information for schematic and connector information.

Normal Operation

The smart junction box (SJB) sends a voltage reference signal to the headlamp switch through circuit 1669 (OG/LG). When the fog lamp switch is engaged, the voltage signal is routed to ground. The fog lamp relay is provided voltage through the bussed electrical center (BEC). When the ignition switch is in the ON position, the parking lamps are on and the SJB detects a request for the fog lamps, the SJB provides a ground for the fog lamp relay coil through circuit 1347 (DB/WH). When the relay is energized, voltage is routed through circuits 1721 (LB/BK) and 1776 (TN/OG) to the LH and RH fog lamps, respectively. The fog lamps share the ground circuit with the headlamps.

- DTC B2030 (Front Fog Lamp Relay CKT Failure) - is a continuous and on-demand DTC that sets when the SJB detects an open or short to voltage from the fog lamp relay coil ground controlled circuit.

This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- Fog lamp relay
- Headlamp switch
- BEC
- SJB

PINPOINT TEST P: THE FOG LAMPS ARE INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

P1 USE THE RECORDED DTCs FROM THE SJB SELF-TEST

- Key in OFF position.

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- Retrieve the recorded results from the SJB self-test.

- **Is DTC B2030 present?**

YES : Go to P2.

NO : Go to P8.

P2 CHECK THE FOG LAMP RELAY (DTC B2030)

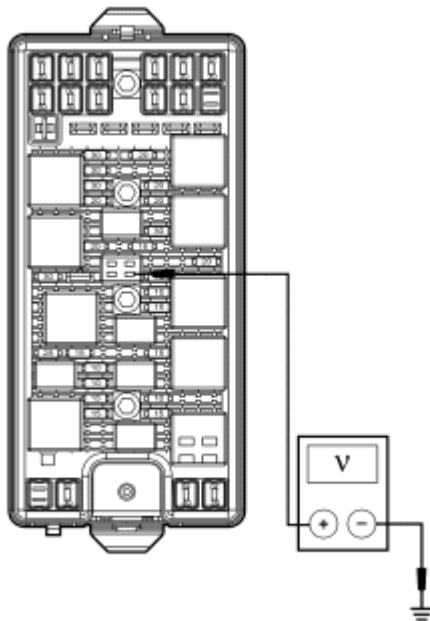
- Disconnect: Fog Lamp Relay
- Substitute a known good relay and recheck the system.

- **Do the fog lamps operate correctly?**

YES : REMOVE the known good relay. INSTALL a new fog lamp relay. CLEAR the DTCs. REPEAT the self-test.

NO : REMOVE the known good relay. Go to P3.

P3 CHECK VOLTAGE TO THE RELAY COIL



N0053606

Fig. 82: Measuring Voltage Between Fog Lamp Relay Pin 85, Circuit 1347 (DB/WH), Harness Side & Ground

Courtesy of FORD MOTOR CO.

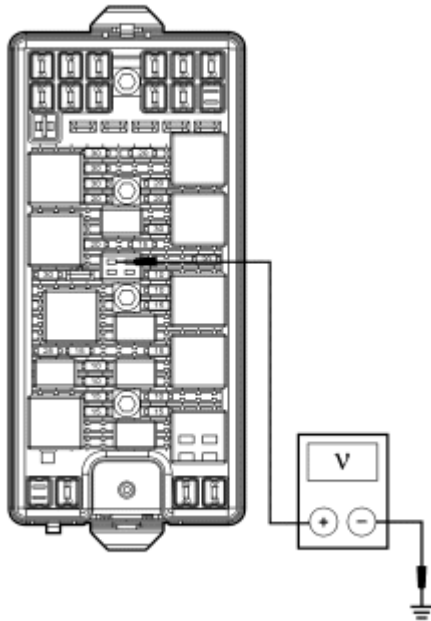
- Measure the voltage between the fog lamp relay pin 86, BEC face side and ground.
- **Is the voltage greater than 10 volts?**

YES : Go to P4.

NO : VERIFY the BEC fuse 58 (15A) is OK. If OK, INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.

P4 CHECK THE FOG LAMP RELAY COIL GROUND CONTROL CIRCUIT FOR SHORT TO VOLTAGE

- Disconnect: SJB C2280c
- Key in ON position.



N0053605

Fig. 83: Measuring Voltage Between Fog Lamp Relay Pin 86, Harness Side & Ground
Courtesy of FORD MOTOR CO.

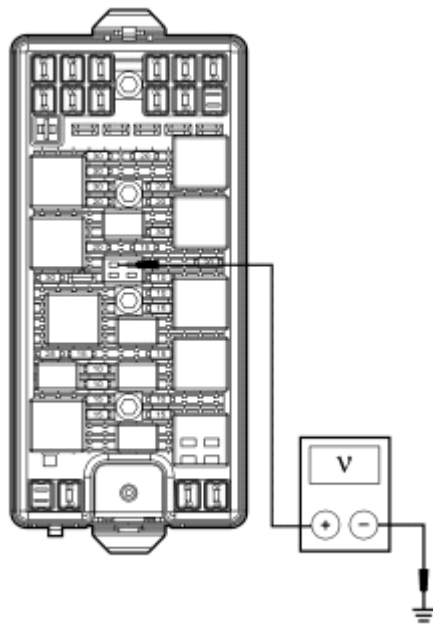
- Measure the voltage between the fog lamp relay pin 85, circuit 1347 (DB/WH), BEC face side and ground.
- **Is any voltage present?**
YES : Go to P5.
NO : Go to P6.

P5 CHECK CIRCUIT 1347 (DB/WH) FOR SHORT TO VOLTAGE

- Key in OFF position.
- Disconnect: BEC C1035a
- Key in ON position.

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N0053605

Fig. 84: Measuring Voltage Between Fog Lamp Relay Pin 86, Harness Side & Ground
Courtesy of FORD MOTOR CO.

- Measure the voltage between the fog lamp relay pin 85, circuit 1347 (DB/WH), BEC face side and ground.
- **Is any voltage present?**
YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.
NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

P6 CHECK THE FOG LAMP RELAY COIL GROUND CONTROL CIRCUIT FOR AN OPEN

- Key in OFF position.

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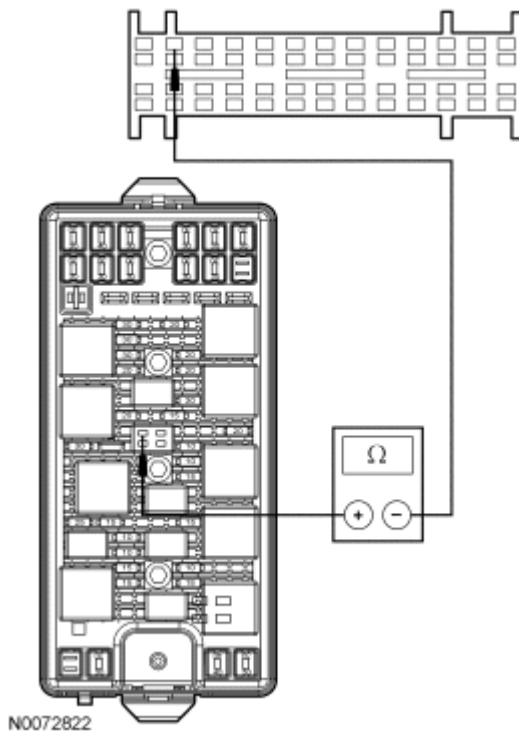


Fig. 85: Measuring Resistance Between Fog Lamp Relay Pin 85, Circuit 1347 (DB/WH), BEC Face Side & SJB C2280C-2
Courtesy of FORD MOTOR CO.

- Measure the resistance between the fog lamp relay pin 85, circuit 1347 (DB/WH), BEC face side and the SJB C2280c-2, circuit 1347 (DB/WH), harness side.
- **Is the resistance less than 5 ohms?**
YES : Go to P12.
NO : Go to P7.

P7 CHECK CIRCUIT 1347 (DB/WH) FOR AN OPEN

- Disconnect: BEC C1035a

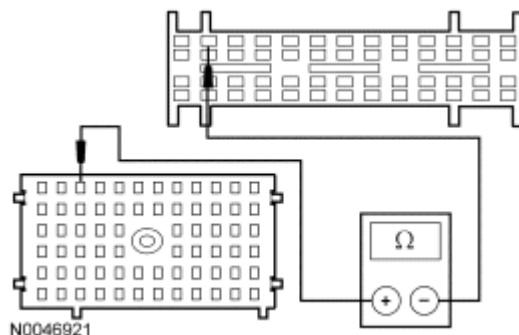


Fig. 86: Measuring Resistance Between BEC C1035A-A3 And SJB C2280C-2
Courtesy of FORD MOTOR CO.

- Measure the resistance between the BEC C1035a-A3, circuit 1347 (DB/WH), harness side and the SJB C2280c-2, circuit 1347 (DB/WH), harness side.
- **Is the resistance less than 5 ohms?**
YES : INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.
NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

P8 CHECK THE FOG LAMP SWITCH INPUT

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: SJB DataLogger
- Monitor the SJB headlamp switch PID (FOG_SW) while placing the headlamp switch in the PARKING LAMPS ON position and engaging the fog lamp switch.
- **Does the PID indicate the fog lamp switch is active?**
YES : Go to P11.
NO : Go to P9.

P9 CHECK THE HEADLAMP SWITCH

- Key in OFF position.
- Place the headlamp switch in the OFF position.
- Disconnect: Headlamp Switch C205
- Carry out the headlamp switch component test. Refer to COMPONENT TESTING.
- **Is the headlamp switch OK?**
YES : Go to P10.
NO : INSTALL a new headlamp switch. REFER to Headlamp Switch. TEST the system for normal operation.

P10 CHECK CIRCUIT 1669 (OG/LG) FOR AN OPEN

- Disconnect: SJB C2280b

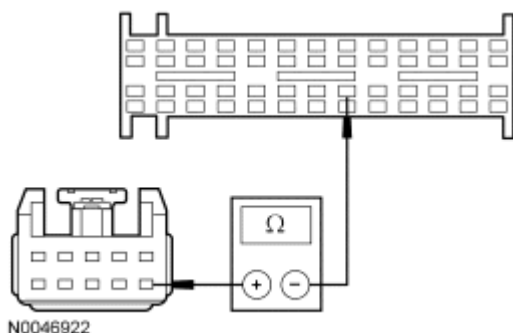


Fig. 87: Measuring Resistance Between Headlamp Switch C205-6 And SJB C2280B-34
 Courtesy of FORD MOTOR CO.

- Measure the resistance between the headlamp switch C205-6, circuit 1669 (OG/LG), harness side and the SJB C2280b-34, circuit 1669 (OG/LG), harness side.
- **Is the resistance less than 5 ohms?**

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YES : Go to P12.

NO : REPAIR the circuit. TEST the system for normal operation.

P11 CHECK THE FOG LAMP RELAY (NO DTCs)

- Key in OFF position.
- Place the headlamp switch in the OFF position.
- Substitute a known good relay and recheck the system.
- **Do the fog lamps operate correctly?**

YES : REMOVE the known good relay. INSTALL a new fog lamp relay. TEST the system for normal operation.

NO : REMOVE the known good relay. INSTALL a new BEC. TEST the system for normal operation.

P12 CHECK FOR CORRECT SJB OPERATION

- Key in OFF position.
- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test Q: An Individual Fog Lamp Is Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Fog Lamps for schematic and connector information.

Normal Operation

When the fog lamp relay is energized, voltage is routed through circuits 1721 (LB/BK) and 1776 (TN/OG) to the LH and RH fog lamps, respectively. The fog lamps are provided ground through circuit 1205 (BK).

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- BEC

PINPOINT TEST Q: AN INDIVIDUAL FOG LAMP IS INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

NOTE: Make sure the fog lamp bulb is good before continuing diagnostics.

Q1 CHECK CIRCUIT 1205 (BK) FOR AN OPEN

- Key in OFF position.
- Disconnect: Inoperative Fog Lamp
- Disconnect: BEC C1035c

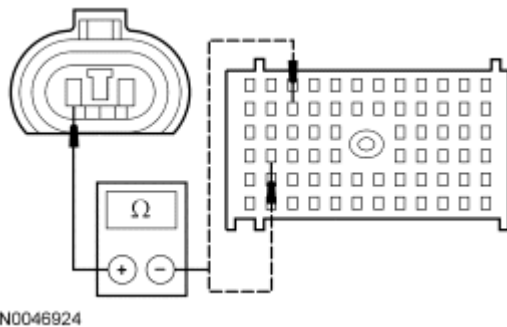


Fig. 88: Checking Circuit 1205 (BK) For Open - 4.0L Or 4.6L
Courtesy of FORD MOTOR CO.

- For 4.0L or 4.6L, measure the resistance between the LH fog lamp C152-2, circuit 1205 (BK), harness side and the BEC C1035c-E10, circuit 1205 (BK), harness side; or between the RH fog lamp C162-2, circuit 1205 (BK), harness side and the BEC C1035c-C11, circuit 1205 (BK), harness side.

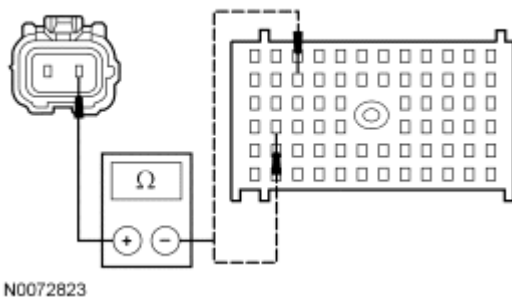


Fig. 89: Checking Circuit 1205 (BK) For Open - 5.4L
Courtesy of FORD MOTOR CO.

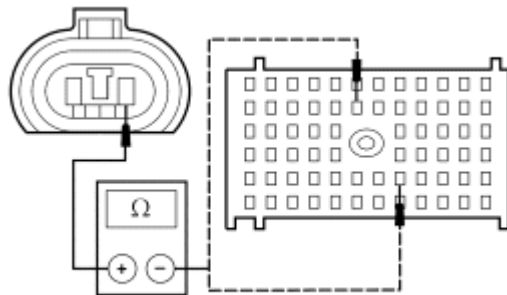
- For 5.4L, measure the resistance between the LH fog lamp C1322-B, circuit 1205 (BK), harness side and the BEC C1035c-E10, circuit 1205 (BK), harness side; or between the RH fog lamp C1323-B, circuit 1205 (BK), harness side and the BEC C1035c-C11, circuit 1205 (BK), harness side.

- **Is the resistance less than 5 ohms?**

YES : Go to Q2.

NO : REPAIR the circuit. TEST the system for normal operation.

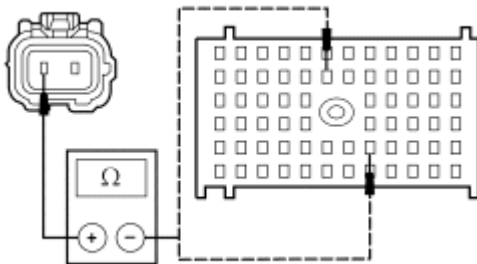
Q2 CHECK CIRCUIT 1776 (TN/OG) OR CIRCUIT 1721 (LB/BK) FOR AN OPEN



N0046925

Fig. 90: Checking Circuit 1776 (TN/OG) Or Circuit 1721 (LB/BK) For Open - 4.0L Or 4.6L
Courtesy of FORD MOTOR CO.

- For 4.0L or 4.6L, measure the resistance between the LH fog lamp C152-1, circuit 1721 (LB/BK), harness side and the BEC C1035c-B5, circuit 1721 (LB/BK), harness side; or between the RH fog lamp C162-1, circuit 1776 (TN/OG), harness side and the BEC C1035c-E7, circuit 1776 (TN/OG), harness side.



N0072824

Fig. 91: Checking Circuit 1776 (TN/OG) Or Circuit 1721 (LB/BK) For Open - 5.4L
Courtesy of FORD MOTOR CO.

- For 5.4L, measure the resistance between the LH fog lamp C1322-A, circuit 1721 (LB/BK), harness side and the BEC C1035c-B5, circuit 1721 (LB/BK), harness side; or between the RH fog lamp C1323-A, circuit 1776 (TN/OG), harness side and the BEC C1035c-E7, circuit 1776 (TN/OG), harness side.
- **Is the resistance less than 5 ohms?**
- YES :** INSTALL a new BEC. TEST the system for normal operation.
- NO :** REPAIR the circuit in question. TEST the system for normal operation.

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Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Fog Lamps for schematic and connector information.

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Fuse and Relay Information for schematic and connector information.

Normal Operation

The smart junction box (SJB) sends a voltage reference signal to the headlamp switch through circuit 1669 (OG/LG). When the fog lamp switch is engaged, the voltage signal is routed to ground. The fog lamp relay is provided voltage through the bussed electrical center (BEC). When the ignition switch is in the ON position, the parking lamps are on, and the SJB detects a request for the fog lamps, the SJB provides a ground for the fog lamp relay coil through circuit 1347 (DB/WH). When the relay is energized, voltage is routed through circuits 1721 (LB/BK) and 1776 (TN/OG) to the LH and RH fog lamps, respectively.

- DTC B2030 (Front Fog Lamp Relay CKT Failure) - is a continuous and on-demand DTC that sets when the SJB detects a short to ground from the fog lamp relay coil ground controlled circuit.
- DTC B2254 (Front Fog Lamp Switch Failure) - is an on-demand DTC that sets when the SJB detects a short to ground from the fog lamp switch input circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Fog lamp relay
- Headlamp switch
- BEC
- SJB

PINPOINT TEST R: THE FOG LAMPS ARE ON CONTINUOUSLY

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

R1 RETRIEVE THE RECORDED DTCs FROM THE SJB SELF-TEST

- Key in OFF position.
- Retrieve the recorded results from the SJB self-test.
- **Was DTC B2030 or B2254 present?**

YES : For DTC B2254, go to R2.

For DTC B2030, go to R4.

NO : Go to R6.

R2 CHECK THE HEADLAMP SWITCH

- Key in OFF position.

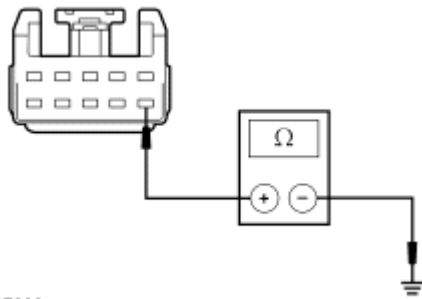
- Disconnect: Headlamp Switch C205
- Carry out the headlamp switch component test. Refer to COMPONENT TESTING.
- **Is the headlamp switch OK?**

YES : Go to R3.

NO : INSTALL a new headlamp switch. CLEAR the DTCs. REPEAT the self-test.

R3 CHECK CIRCUIT 1669 (OG/LG) FOR A SHORT TO GROUND

- Disconnect: SJB C2280b



N0037299

Fig. 92: Checking Circuit 1669 (OG/LG) For A Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the headlamp switch C205-6, circuit 1669 (OG/LG), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**

YES : Go to R9.

NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

R4 CHECK THE SJB

- Disconnect: SJB C2280c
- Key in ON position.
- **Do the fog lamps continue to illuminate?**

YES : Go to R5.

NO : Go to R9.

R5 CHECK CIRCUIT 1347 (DB/WH) FOR A SHORT TO GROUND

- Key in OFF position.
 - Disconnect: BEC C1035a
 - Key in ON position.
 - **Do the fog lamps continue to illuminate?**
- YES :** INSTALL a new BEC. CLEAR the DTCs. REPEAT the self-test.
- NO :** REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

R6 CHECK THE FOG LAMP RELAY

- Disconnect: Fog Lamp Relay

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- Key in ON position.
- **Do the fog lamps continue to illuminate?**

YES : Go to R7.

NO : INSTALL a new fog lamp relay. TEST the system for normal operation.

R7 CHECK CIRCUIT 2024 (VT/OG) FOR A SHORT TO VOLTAGE

- Key in OFF position.
- Disconnect: BEC C1035a
- Key in ON position.
- **Do the fog lamps continue to illuminate?**

YES : Go to R8.

NO : REPAIR the circuit. TEST the system for normal operation.

R8 CHECK CIRCUITS 1721 (LB/BK) (LH FOG LAMP) AND 1776 (TN/OG) (RH FOG LAMP) FOR A SHORT TO VOLTAGE

- Key in OFF position.
- Disconnect: BEC C1035c
- Key in ON position.

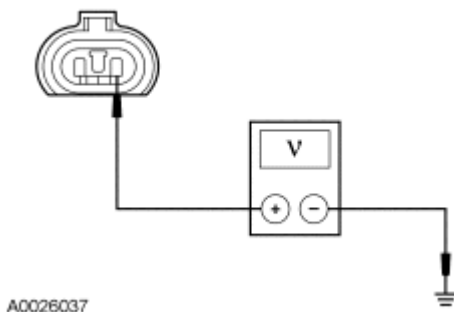
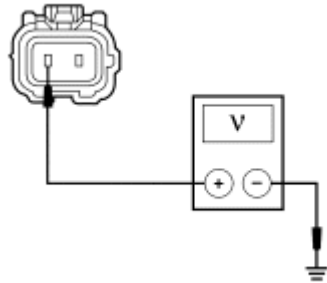


Fig. 93: Checking Circuits 1721 (LB/BK) (LH Fog Lamp) & 1776 (TN/OG) (RH Fog Lamp) For A Short To Voltage - 4.0L Or 4.6L
Courtesy of FORD MOTOR CO.

- For 4.0L or 4.6L, measure the voltage between the LH fog lamp C152-1, circuit 1721 (LB/BK), harness side and ground; or between the RH fog lamp C162-1, circuit 1776 (TN/OG), harness side and ground.



N0072825

Fig. 94: Checking Circuits 1721 (LB/BK) (LH Fog Lamp) & 1776 (TN/OG) (RH Fog Lamp) For A Short To Voltage - 5.4L
Courtesy of FORD MOTOR CO.

- For 5.4L, measure the voltage between the LH fog lamp C1322-A, circuit 1721 (LB/BK), harness side and ground; or between the RH fog lamp C1323-A, circuit 1776 (TN/OG), harness side and ground.
- **Is any voltage present?**
YES : REPAIR the circuit in question. TEST the system for normal operation.
NO : INSTALL a new BEC. TEST the system for normal operation.

R9 CHECK FOR CORRECT SJB OPERATION

- Key in OFF position.
- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**
YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test S: The Fog Lamp On Indicator Is Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Fog Lamps for schematic and connector information.

Normal Operation

When the fog lamp relay is energized, the bussed electrical center (BEC) routes voltage through circuit 2024 (VT/OG) to the headlamp switch.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Headlamp switch
- BEC

PINPOINT TEST S: THE FOG LAMPS ON INDICATOR IS INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

S1 CHECK CIRCUIT 2024 (VT/OG) FOR VOLTAGE

- Key in OFF position.
- Disconnect: Headlamp Switch C205
- Enter the following diagnostic mode on the diagnostic tool: SJB DataLogger
- Select the SJB fog lamp relay (FOG_RLY) active command. Command the fog lamps on.

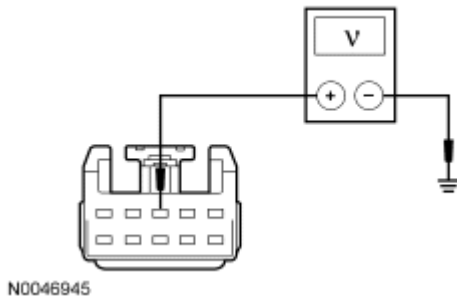


Fig. 95: Measuring Voltage Between Headlamp Switch C205-3 And Ground
Courtesy of FORD MOTOR CO.

- Measure the voltage between the headlamp switch C205-3, circuit 2024 (VT/OG), harness side and ground.
- **Is the voltage greater than 10 volts?**
YES : INSTALL a new headlamp switch. REFER to **Headlamp Switch**. TEST the system for normal operation.
NO : Go to S2.

S2 CHECK CIRCUIT 2024 (VT/OG) FOR AN OPEN

- Disconnect: BEC C1035a

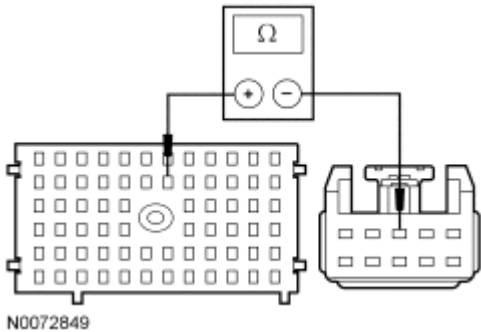
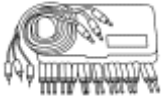


Fig. 96: Checking Circuit 2024 (VT/OG) For An Open
 Courtesy of FORD MOTOR CO.

- Measure the resistance between the BEC C1035a-B7, circuit 2024 (VT/OG), harness side and the headlamp switch C205-3, circuit 2024 (VT/OG), harness side.
- **Is the resistance less than 5 ohms?**
YES : INSTALL a new BEC. TEST the system for normal operation.
NO : REPAIR the circuit. TEST the system for normal operation.

REVERSING LAMPS

Special Tools

Illustration	Tool Name	Tool Number
 ST1137-A	73III Automotive Meter	105-R0057 or equivalent
 ST1138-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool	
 ST2834-A	Flex Probe Kit	105-R025C or equivalent

Principles of Operation

NOTE: The smart junction box (SJB) is also known as the generic electronic module (GEM).

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The digital transmission range (TR) sensor (automatic transmission) or the reversing lamp switch (manual transmission) is hardwired to the PCM, which monitors the transmission gear status. When the PCM detects the transmission is in REVERSE (R), the PCM sends a message over the network indicating the transmission is in REVERSE (R). When the SJB receives this message, the SJB provides voltage to the reversing lamps.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

VISUAL INSPECTION CHART

Mechanical	Electrical
• Reversing lamp switch (manual transmission) • Digital transmission range (TR) sensor (automatic transmission)	• Bussed electrical center (BEC) fuse 62 (20A) • Wiring, terminals or connectors • Bulb(s) • Smart junction box (SJB)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

NOTE: Make sure the headlamp switch is in the OFF position.

NOTE: Make sure the multifunction switch is in the LOW BEAM position.

NOTE: Make sure to use the latest scan tool software release.

4. If the cause is not visually evident, connect the scan tool to the data link connector (DLC).

NOTE: The vehicle communication module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM.

5. If the scan tool does not communicate with the VCM:
 - Check the VCM connection to the vehicle.
 - Check the scan tool connection to the VCM.
 - Refer to **MODULE COMMUNICATIONS NETWORK** article, No Power To The Scan Tool, to diagnose no communication with the scan tool.
6. If the scan tool does not communicate with the vehicle:
 - Verify the ignition key is in the ON position.
 - Verify the scan tool operation with a known good vehicle.

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- Refer to **MODULE COMMUNICATIONS NETWORK** article to diagnose no response from the PCM.
7. Carry out the network test:
 - If the scan tool responds with no communication for one or more modules, refer to **MODULE COMMUNICATIONS NETWORK** article.
 - If the network test passes, retrieve and record the continuous memory DTCs.
 8. Clear the continuous DTCs and carry out the self-test diagnostics for the SJB.
 9. If the DTCs retrieved are related to the concern, go to DTC Charts. For all other DTCs, refer to **MULTIFUNCTION ELECTRONIC MODULES** article.
 10. If no DTCs related to the concern are retrieved, go to **Symptom Chart**.

DTC Charts

SMART JUNCTION BOX (SJB) DTC CHART

DTC	Description	Action
B2525	Left Rear Backup Lamp Circuit Failure	If the reversing lamp is inoperative, go to <u>Pinpoint Test U</u> . If the reversing lamp is always on, go to <u>Pinpoint Test V</u> .
B2532	Right Rear Backup Lamp Circuit Short to Battery	If the reversing lamp is inoperative, go to <u>Pinpoint Test U</u> . If the reversing lamp is always on, go to <u>Pinpoint Test V</u> .
All other DTCs	-	REFER to <u>MULTIFUNCTION ELECTRONIC MODULES</u> article.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
• No communication with the smart junction box (SJB)	• Fuse • Wiring, terminals or connectors • SJB	• REFER to <u>MODULE COMMUNICATIONS NETWORK</u> article.
• Both reversing lamps are inoperative	• Fuse • Wiring, terminals or connectors • Reversing lamp switch (manual transmission) • Digital transmission range (TR) sensor	• Go to <u>Pinpoint Test T</u>.

	input (automatic transmission) concern • Bussed electrical center (BEC) • SJB • PCM	
• An individual reversing lamp is inoperative	• Wiring, terminals or connectors • SJB	• Go to <u>Pinpoint Test U.</u>
• The reversing lamps are on continuously	• Wiring, terminals or connectors • Reversing lamp switch (manual transmission) • Digital transmission range (TR) sensor input (automatic transmission) concern • SJB • PCM	• Go to <u>Pinpoint Test V.</u>

Pinpoint Tests

Pinpoint Test T: Both Reversing Lamps Are Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Reversing Lamps for schematic and connector information.

Normal Operation - Manual Transmission

The powertrain control module (PCM) sends a voltage reference signal to the reversing lamp switch through circuit 1789 (VT/WH). When the transmission is placed in REVERSE (R), the reversing lamp switch closes and routes the signal back to the PCM through circuit 359 (GY/RD). The PCM then sends a message to the smart junction box (SJB), through the instrument cluster (IC) gateway function, over the communication network. The SJB then provides voltage to the reversing lamps. The SJB is provided voltage from the bussed electrical center (BEC) through circuit 1679 (WH/YE) to power the reversing lamps.

Normal Operation - Automatic Transmission

When the PCM detects the transmission is in REVERSE (R), a message is sent to the SJB, through the instrument cluster (IC) gateway function, over the communication network. The SJB then provides voltage to the reversing lamps. The SJB is provided voltage from the BEC through circuit 1679 (WH/YE) to power the reversing lamps.

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The PCM sets DTCs if any faults with the digital transmission range (TR) sensor inputs are detected.

This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- Reversing lamp switch (manual transmission)
- Digital transmission range (TR) sensor input (automatic transmission) concern
- BEC
- SJB
- PCM

PINPOINT TEST T: BOTH REVERSING LAMPS ARE INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

T1 CHECK THE SJB OUTPUT

- Key in ON position.
- Enter the following diagnostic mode on the diagnostic tool: SJB DataLogger
- Select the SJB reversing lamps (BACKUP_1, BACKUP_2) active command. Command the reversing lamps on.
- **Do the reversing lamps illuminate?**

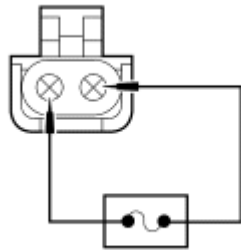
YES : For vehicles with an automatic transmission, REFER to **AUTOMATIC TRANSAXLE/TRANSMISSION - 5R55S** article to continue diagnosis of the digital transmission range (TR) sensor.

For vehicles with a manual transmission, go to T2.

NO : Go to T4.

T2 CHECK THE REVERSING LAMP SWITCH

- Key in OFF position.
- Disconnect: Reversing Lamp Switch C169



N0011231

Fig. 97: Connecting Fused (5A) Jumper Wire Between Reversing Lamp Switch C169-A And Reversing Lamp Switch C169-B
Courtesy of FORD MOTOR CO.

- Connect a fused (5A) jumper wire between the reversing lamp switch C169-A, circuit 1789 (VT/WH), harness side and the reversing lamp switch C169-B, circuit 359 (GY/RD), harness side.

- Key in ON position.

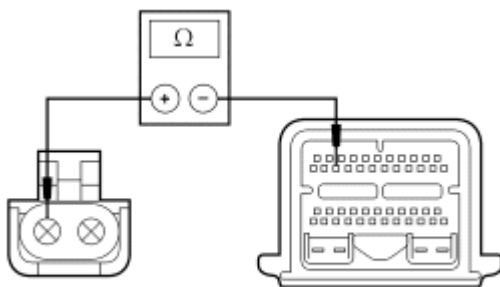
- **Do the reversing lamps illuminate?**

YES : REMOVE the jumper wire. INSTALL a new reversing lamp switch. REFER to **Reversing Lamp Switch**. TEST the system for normal operation.

NO : REMOVE the jumper wire. Go to T3.

T3 CHECK CIRCUITS 1789 (VT/WH) AND 359 (GY/RD) FOR AN OPEN

- Key in OFF position.
- Disconnect: PCM C175t



N0072826

Fig. 98: Measuring Resistance Between Reversing Lamp Switch C169-A, Circuit 1789 (VT/WH), Harness Side & PCM C175T-21
Courtesy of FORD MOTOR CO.

- Measure the resistance between the reversing lamp switch C169-A, circuit 1789 (VT/WH), harness side and the PCM C175t-21, circuit 1789 (VT/WH), harness side.

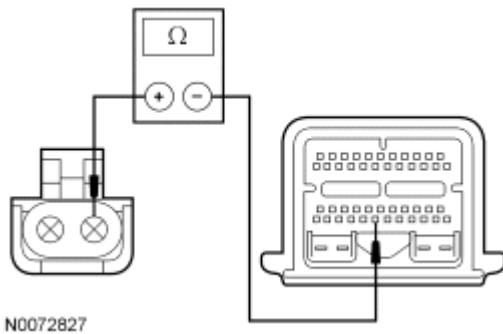


Fig. 99: Measuring Resistance Between Reversing Lamp Switch C169-B, Circuit 359 (GY/RD), Harness Side & PCM C175T-41
Courtesy of FORD MOTOR CO.

- Measure the resistance between the reversing lamp switch C169-B, circuit 359 (GY/RD), harness side and the PCM C175t-41, circuit 359 (GY/RD), harness side.

- **Are the resistances less than 5 ohms?**

YES : Go to T7.

NO : REPAIR the circuit in question. TEST the system for normal operation.

T4 CHECK CIRCUIT 1679 (WH/YE) FOR VOLTAGE

- Key in OFF position.
- Disconnect: SJB C2280h

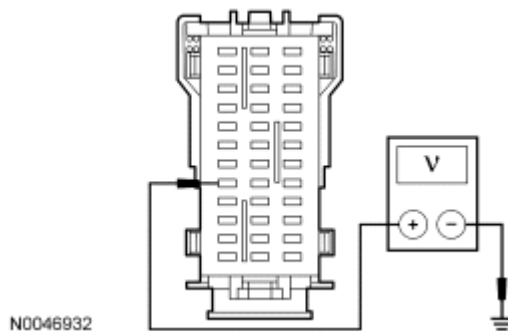


Fig. 100: Measuring Voltage Between SJB C2280H-29 And Ground
Courtesy of FORD MOTOR CO.

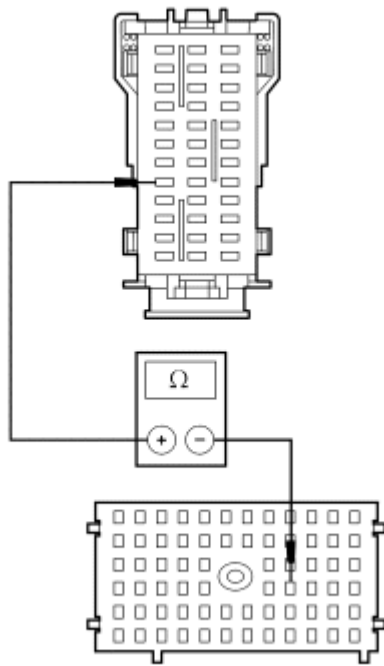
- Measure the voltage between the SJB C2280h-29, circuit 1679 (WH/YE), harness side and ground.
- **Is the voltage greater than 10 volts?**

YES : Go to T6.

NO : VERIFY the BEC fuse 62 (20A) is OK. If OK, go to T5.

T5 CHECK CIRCUIT 1679 (WH/YE) FOR AN OPEN

- Key in OFF position.
- Disconnect: BEC C1035a



N0046933

Fig. 101: Measuring Resistance Between SJB C2280H-29 And BEC C1035A-D9
Courtesy of FORD MOTOR CO.

- Measure the resistance between the SJB C2280h-29, circuit 1679 (WH/YE), harness side and the BEC C1035a-D9, circuit 1679 (WH/YE), harness side.
- **Is the resistance less than 5 ohms?**
YES : INSTALL a new BEC. TEST the system for normal operation.
NO : REPAIR the circuit. TEST the system for normal operation.

T6 CHECK FOR CORRECT SJB OPERATION

- Key in OFF position.
- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**
YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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.

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T7 CHECK FOR CORRECT PCM OPERATION

- Disconnect all the PCM connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the PCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS** article. 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 U: An Individual Reversing Lamp Is Inoperative

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Reversing Lamps for schematic and connector information.

Normal Operation

When the transmission is placed in REVERSE (R), the PCM sends a message to the smart junction box (SJB), through the instrument cluster (IC) gateway function, over the communication network. The SJB then provides voltage through circuits 1362 (DG/OG) and 1367 (WH/YE) to the LH and RH reversing lamps, respectively. Ground for the lamps is provided through circuit 1205 (BK).

- DTC B2525 (Left Rear Backup Lamp Circuit Failure) - is a continuous and on-demand DTC that sets when the SJB detects an open or short to ground from the LH reversing lamp voltage supply circuit.
- DTC B2532 (Right Rear Backup Lamp Circuit Short to Battery) - is a continuous and on-demand DTC that sets when the SJB detects an open or short to ground from the RH reversing lamp voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- SJB

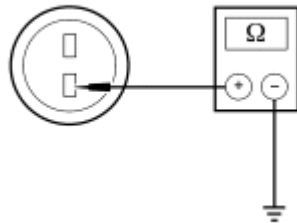
PINPOINT TEST U: AN INDIVIDUAL REVERSING LAMP IS INOPERATIVE

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

NOTE: Make sure the bulb is good before continuing diagnostics.

U1 CHECK CIRCUIT 1205 (BK) FOR AN OPEN

- Key in OFF position.
- Disconnect: Inoperative Reversing Lamp



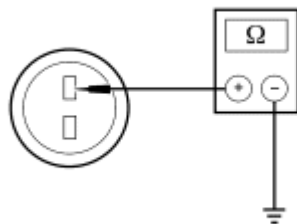
N0011227

Fig. 102: Checking Circuit 1205 (BK) For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH reversing lamp C451-1, circuit 1205 (BK), harness side and ground; or between the RH reversing lamp C461-1, circuit 1205 (BK), harness side and ground.
- **Is the resistance less than 5 ohms?**
YES : Go to U2.
NO : REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

U2 CHECK CIRCUIT 1362 (DG/OG) OR CIRCUIT 1367 (WH/YE) FOR A SHORT TO GROUND

- Disconnect: SJB C2280d



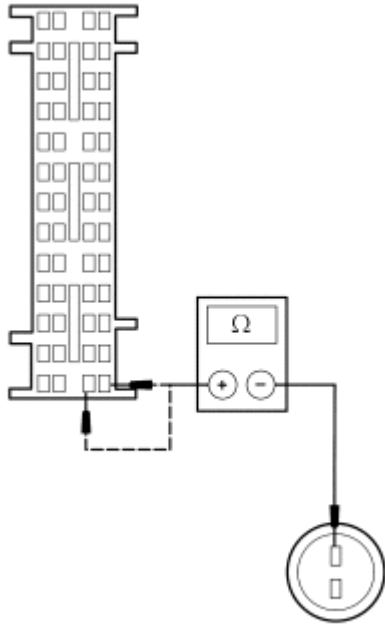
N0011229

Fig. 103: Checking Circuit 1362 (DG/OG) Or Circuit 1367 (WH/YE) For Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH reversing lamp C451-2, circuit 1367 (WH/YE), harness side and ground; or between the RH reversing lamp C461-2, circuit 1367 (WH/YE), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**
YES : Go to U3.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

U3 CHECK CIRCUIT 1362 (DG/OG) OR CIRCUIT 1367 (WH/YE) FOR AN OPEN



N0046934

Fig. 104: Checking Circuit 1362 (DG/OG) Or Circuit 1367 (WH/YE) For Open
Courtesy of FORD MOTOR CO.

- Measure the resistance between the LH reversing lamp C451-2, circuit 1367 (WH/YE), harness side and the SJB C2280d-26, circuit 1362 (DG/OG), harness side; or between the RH reversing lamp C461-2, circuit 1367 (WH/YE), harness side and the SJB C2280d-13, circuit 1367 (WH/YE), harness side.

- **Is the resistance less than 5 ohms?**

YES : Go to U4.

NO : REPAIR the circuit in question. CLEAR the DTCs. REPEAT the self-test.

U4 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**

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YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test V: The Reversing Lamps Are On Continuously

Refer to appropriate SYSTEM WIRING DIAGRAM ARTICLE, Reversing Lamps for schematic and connector information.

Normal Operation - Manual Transmission

The PCM sends a voltage reference signal to the reversing lamp switch through circuit 1789 (VT/WH). When the transmission is placed in REVERSE (R), the reversing lamp switch closes and routes the signal back to the PCM through circuit 359 (GY/RD). The PCM then sends a message to the smart junction box (SJB), through the instrument cluster (IC) gateway function, over the communication network. The SJB then provides voltage through circuits 1362 (DG/OG) and 1367 (WH/YE) to the LH and RH reversing lamps, respectively.

Normal Operation - Automatic Transmission

When the PCM detects the transmission is in REVERSE (R), a message to the smart junction box (SJB), through the instrument cluster (IC) gateway function, over the communication network. The SJB then provides voltage through circuits 1362 (DG/OG) and 1367 (WH/YE) to the LH and RH reversing lamps, respectively.

The PCM sets DTCs if any faults with the digital transmission range (TR) sensor inputs are detected.

- DTC B2525 (Left Rear Backup Lamp Circuit Failure) - is a continuous and on-demand DTC that sets when the SJB detects a short to voltage on the LH reversing lamp voltage supply circuit.
- DTC B2532 (Right Rear Backup Lamp Circuit Short to Battery) - is a continuous and on-demand DTC that sets when the SJB detects a short to voltage on the RH reversing lamp voltage supply circuit.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Reversing lamp switch (manual transmission)
- Digital transmission range (TR) sensor input (automatic transmission) concern
- SJB
- PCM

PINPOINT TEST V: THE REVERSING LAMPS ARE ON CONTINUOUSLY

CAUTION: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.

V1 RETRIEVE THE RECORDED DTCs FROM THE SJB SELF-TEST

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- Key in OFF position.
- Retrieve the recorded results from the SJB self-test.
- **Was DTC B2525 or B2532 present?**

YES : Go to V2.

NO : Go to V3.

V2 CHECK CIRCUITS 1362 (DG/OG) AND 1367 (WH/YE) FOR A SHORT TO VOLTAGE

- Disconnect: SJB C2280d
- Key in ON position.
- **Does either reversing lamp continue to illuminate?**
YES : REPAIR circuit 1362 (DG/OG) (LH reversing lamp) or circuit 1367 (WH/YE) (RH reversing lamp) as necessary. CLEAR the DTCs. REPEAT the self-test.
NO : Go to V6.

V3 CHECK THE PCM

- Disconnect: PCM C175t
- Key in ON position.
- **Do the reversing lamps continue to illuminate?**
YES : Go to V6.
NO : If equipped with a manual transmission, go to V4.

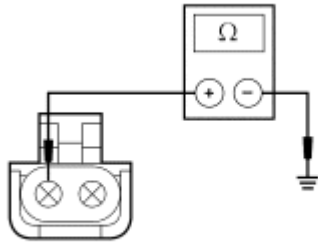
If equipped with an automatic transmission, REFER to **AUTOMATIC TRANSAXLE/TRANSMISSION - 5R55S** article to continue diagnosis of the digital transmission range (TR) sensor.

V4 CHECK THE REVERSING LAMP SWITCH

- Key in OFF position.
- Connect: PCM C175t
- Disconnect: Reversing Lamp Switch C169
- Key in ON position.
- **Do the reversing lamps continue to illuminate?**
YES : Go to V5.
NO : INSTALL a new reversing lamp switch. REFER to **Reversing Lamp Switch**. TEST the system for normal operation.

V5 CHECK CIRCUIT 1789 (VT/WH) FOR A SHORT TO GROUND

- Key in OFF position.
- Disconnect: PCM C175t



N0072828

Fig. 105: Checking Circuit 1789 (VT/WH) For A Short To Ground
Courtesy of FORD MOTOR CO.

- Measure the resistance between the reversing lamp switch C169-A, circuit 1789 (VT/WH), harness side and ground.
- **Is the resistance greater than 10,000 ohms?**
YES : Go to V7.
NO : REPAIR the circuit. TEST the system for normal operation.

V6 CHECK FOR CORRECT SJB OPERATION

- Key in OFF position.
- Disconnect all the SJB connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.
- **Is the concern still present?**
YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. 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. CLEAR the DTCs. REPEAT the self-test.

V7 CHECK FOR CORRECT PCM OPERATION

- Key in OFF position.
- Disconnect all the PCM connectors.
- Check for:
 - corrosion
 - damaged pins
 - pushed-out pins
- Connect all the PCM connectors and make sure they seat correctly.
- Operate the system and verify the concern is still present.

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- **Is the concern still present?**

YES : INSTALL a new PCM. REFER to **ELECTRONIC ENGINE CONTROLS** article. 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.

DAYTIME RUNNING LAMPS (DRL)

Principles of Operation

NOTE: The smart junction box (SJB) is also known as the generic electronic module (GEM).

NOTE: The DRL is not a programmable parameter for this vehicle.

The Smart Junction Box (SJB) controls the DRL by using various inputs to determine whether or not the DRL should be illuminated. These inputs include:

- Ignition switch position
- Parking brake switch input
- Headlamps on or off
- Transaxle gear selection

When the DRL is active, the SJB provides a pulse-width modulated (PWM) voltage to the low beam headlamps. This illuminates the headlamps at a reduced intensity.

Inspection and Verification

1. Verify the customer concern.
2. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

NOTE: Make sure the headlamp switch is in the OFF position.

NOTE: Make sure the multifunction switch is in the LOW BEAM position.

NOTE: Make sure to use the latest scan tool software release.

3. If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

NOTE: The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM.

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4. If the scan tool does not communicate with the VCM:
 - Check the VCM connection to the vehicle.
 - Check the scan tool connection to the VCM.
 - Refer to **MODULE COMMUNICATIONS NETWORK** article, No Power To The Scan Tool, to diagnose no communication with the scan tool.
5. If the scan tool does not communicate with the vehicle:
 - Verify the ignition key is in the ON position.
 - Verify the scan tool operation with a known good vehicle.
 - Refer to **MODULE COMMUNICATIONS NETWORK** article to diagnose no response from the PCM.
6. Carry out the network test.
 - If the scan tool responds with no communication for one or more modules, refer to **MODULE COMMUNICATIONS NETWORK** article.
 - If the network test passes, retrieve and record the continuous memory DTCs.
7. If any DTCs are retrieved, refer to the Diagnostic Trouble Code (DTC) Chart in **MULTIFUNCTION ELECTRONIC MODULES** article.
8. If no DTCs are retrieved, go to **Symptom Chart**.

Symptom Chart

Symptom Chart

Condition	Possible Sources	Action
• The daytime running lamps (DRL) are inoperative	• Parking brake switch input concern • Headlamp operation • Ignition switch input concern • Smart Junction Box (SJB)	• Go to <u>Pinpoint Test W</u>.
• The DRL are on with the parking brake set	• Parking brake switch input • SJB	• With the ignition switch on, apply the parking brake and observe the brake warning indicator. • If the brake warning indicator is inoperative, REFER to <u>INSTRUMENT CLUSTER (IC), MESSAGE CENTER, AND WARNING CHIMES</u> article to diagnose the brake warning indicator. • If the brake warning indicator

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illuminates, INSTALL a new SJB.
REFER to **MULTIFUNCTION
ELECTRONIC MODULES** article.
TEST the system for normal operation.

Pinpoint Tests

Pinpoint Test W: The Daytime Running Lamps (DRL) Are Inoperative

Normal Operation

When the ignition switch is in the RUN position, the parking brake is not applied and the headlamps are not requested on from the headlamp switch, the Smart Junction Box (SJB) provides a pulse-width modulated (PWM) voltage to the low beam headlamps. This illuminates the headlamps at a reduced intensity.

This pinpoint test is intended to diagnose the following:

- Parking brake switch input concern
- Headlamp operation
- Ignition switch input concern
- SJB

PINPOINT TEST W: THE DAYTIME RUNNING LAMPS (DRL) ARE INOPERATIVE

W1 VERIFY THE DRL OPERATION

- Key in ON position.
- Verify the parking brake is fully released.
- **Are the DRL illuminated?**

YES : The system is operating correctly. INFORM the customer of the conditions required for the DRL to operate correctly.

NO : Go to W2.

W2 CHECK THE BRAKE WARNING INDICATOR (DRL INOPERATIVE)

- Observe the brake warning indicator.
- **Is the brake warning indicator illuminated?**

YES : REFER to **INSTRUMENT CLUSTER (IC), MESSAGE CENTER, AND WARNING CHIMES** article to diagnose the brake warning indicator.

NO : Go to W3.

W3 CHECK THE OPERATION OF THE HEADLAMPS

- Place the headlamp switch in the HEADLAMPS ON position and observe the headlamps.
- **Do the headlamps operate correctly?**

YES : Go to W4.

NO : REFER to **Headlamps**.

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W4 CHECK THE IGNITION SWITCH INPUT

- Place the headlamp switch in the OFF position.
- Enter the following diagnostic mode on the diagnostic tool: SJB DataLogger
- Monitor the SJB ignition switch PID (IGN_SW) while cycling the ignition switch through all its positions.
- **Does the PID agree with the ignition switch positions?**

YES : INSTALL a new SJB. REFER to **MULTIFUNCTION ELECTRONIC MODULES** article. TEST the system for normal operation.

NO : REFER to **STEERING COLUMN SWITCHES** article to diagnose the input from the ignition switch.

GENERAL PROCEDURES

HEADLAMP ADJUSTMENT

Special Tools

Illustration	Tool Name	Tool Number
 ST3041-A	Vision 100 Headlamp Aimer	196-00005 or equivalent

Headlamp Aiming

1. The headlamp aiming procedure depends on what type of beam pattern the headlamp is equipped with. Vehicles may come equipped with VOL or VOR headlamps. To identify the headlamp beam pattern, look on the headlamp lens. Molded in small letters on the headlamp lens is one of the following:
 - VOL and SAE
 - VOR and SAE
2. Once the headlamp beam pattern is identified, aim the headlamps using one of the following methods as applicable.
 - Photometric aimers can aim VOL- and VOR- headlamps. This is the preferred method of headlamp aiming.
 - Visual or screen method aiming can be used to aim VOL- and VOR- headlamps.
 - Mechanical aimers cannot be used with VOR- or VOL-type headlamps. Aerodynamic lamps that can be aimed mechanically have 3 nibs molded into the lens of the lamp.

Photometric Aiming

1. For the photometric aiming procedure, refer to the appropriate photometric headlamp aimer instruction article.

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Screen Method Aiming

All headlamp types

- NOTE:** Horizontal aim is not necessary for VOL or VOR headlamps.
- NOTE:** Consult your state vehicle inspection manual for recommended tolerance ranges for visual aiming.
- NOTE:** The sight shield may need to be positioned or removed for access to the adjusters.

1. Before starting headlamp adjustment:

- check the tire inflation.
- check that no other load is in the vehicle other than a half tank of fuel.
- check that the headlamps are clean.
- check for correct headlamp operation.
- check that the vehicle is on level ground.
- if the vehicle is equipped with air suspension, make sure that the switch is on.

NOTE: The vertical wall or screen must be a minimum of 2.4-m (8-ft) wide.

2. Park the vehicle on a level surface approximately 7.6-m (25-ft) from the vertical wall or screen directly in front of it.

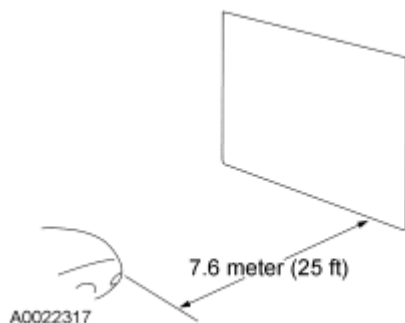


Fig. 106: Identifying Distance Between Vehicle And Vertical Wall Or Screen
Courtesy of FORD MOTOR CO.

NOTE: The center of the lamp is marked either on the lens (circle, crosshair or other mark) or on the bulb shield internal to the lamp (crosshair or other mark).

3. Mark a horizontal reference line on the vertical wall or screen.

1. Measure the center of the headlamp height to ground and record the measurement.

2. Make a 2.4-meter (8-ft) horizontal mark (using masking tape) on the vertical wall or screen at the same distance from the ground as previously recorded.

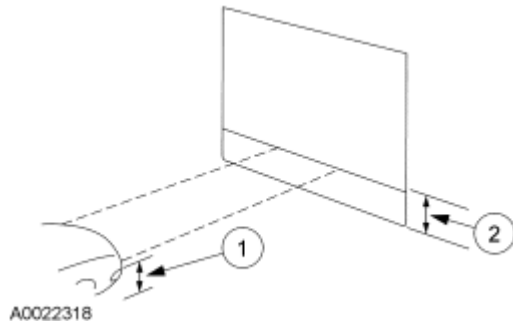


Fig. 107: Aiming Headlights
Courtesy of FORD MOTOR CO.

NOTE: This procedure should be done in a dark environment to effectively see the headlamp beam pattern.

4. Turn on the low beam headlamps to illuminate the wall or screen and open the hood.
5. On the wall or screen, locate the high intensity area of the beam pattern.

VOR-type headlamps

NOTE: The appearance of the VOR beam pattern may vary between vehicles.

6. Identify at the top edge of this high intensity area a distinct horizontal cutoff in the beam pattern. If the top edge of this cutoff is not even with the horizontal reference line, the headlamp beam needs to be adjusted using the headlamp adjusting screw.

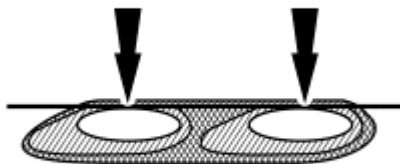


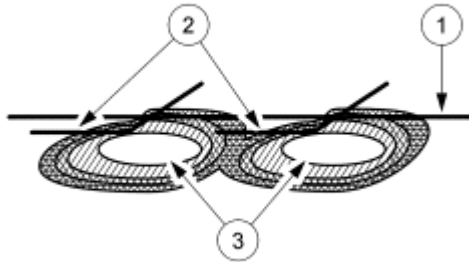
Fig. 108: Identifying High Intensity Area (VOR Type Headlamps)
Courtesy of FORD MOTOR CO.

VOL-type headlamps

7. For VOL-type headlamps, there is a distinct cutoff in the left portion of the beam pattern. The edge of this

cutoff should be positioned 50.2 mm (2 in) below the horizontal reference line. Adjust the headlamp as necessary using the headlamp adjusting screw.

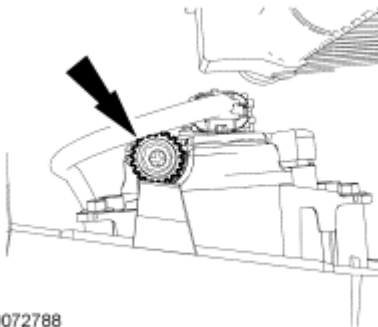
1. Horizontal reference line.
2. Top edge of the beam pattern.
3. High intensity zone.



A0042249

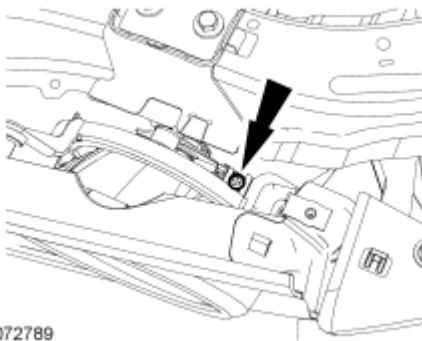
Fig. 109: Identifying VOL-Type Headlamps Beam Pattern
Courtesy of FORD MOTOR CO.

FRONT FOG LAMP ADJUSTMENT



N0072788

Fig. 110: Fog Lamp Adjustment Screw Location - 4.0L
Courtesy of FORD MOTOR CO.



N0072789

Fig. 111: Fog Lamp Adjustment Screw Location - 4.6L
Courtesy of FORD MOTOR CO.

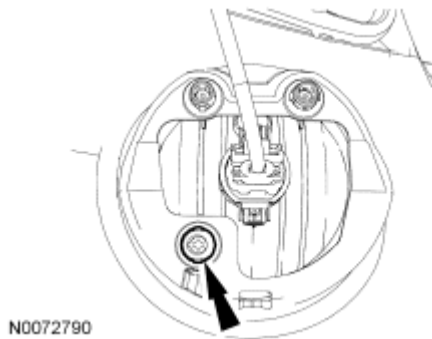


Fig. 112: Fog Lamp Adjustment Screw Location - 5.4L
Courtesy of FORD MOTOR CO.

NOTE: Horizontal aim is not required for this vehicle and is not adjustable. Consult your state vehicle inspection center for recommended tolerance ranges for visual aiming.

1. Before starting the fog lamp assembly adjustment:
 - Check the tire inflation.
 - Make sure there are no other loads in the vehicle other than a half tank of fuel.
 - Make sure the vehicle is on level ground.
 - Make sure the fog lamps and headlamps are clean.
 - Make sure the headlamps are operating and are correctly aimed.

NOTE: The vertical wall screen must be a minimum of 2.4 meters (8 ft) wide.

2. Park the vehicle on a level surface approximately 7.6 meters (25 ft) from the vertical wall or screen directly in front of it.

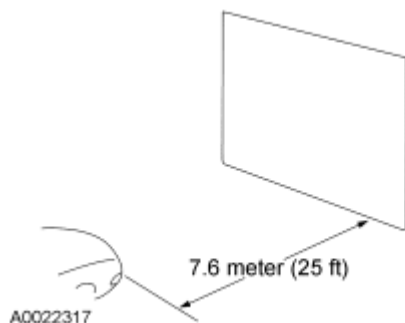
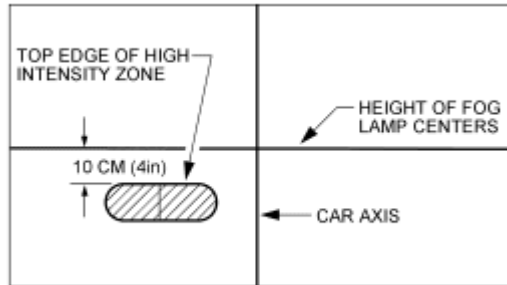


Fig. 113: Identifying Distance Between Vehicle And Vertical Wall Or Screen
Courtesy of FORD MOTOR CO.

3. The correct visual aim for the fog lamps is with the top edge of the high-intensity zone 10 cm (4 in) below the horizontal center of the fog lamps.



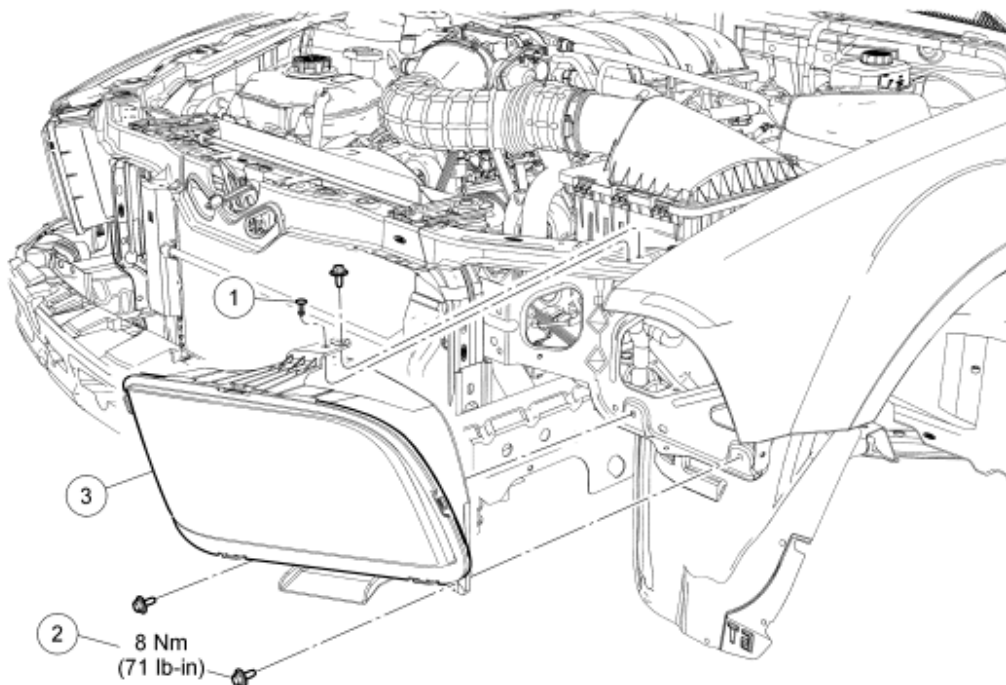
A0026963

Fig. 114: Identifying Correct Visual Aim For Fog Lamps
Courtesy of FORD MOTOR CO.

4. If necessary, rotate the adjusting screw until the fog lamp beam is within specification.

REMOVAL AND INSTALLATION

HEADLAMP ASSEMBLY



N0044469

Fig. 115: Exploded View Of Headlamp Assembly With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	58403D24	Push pin
2	W712277	Headlamp assembly bolts (3 required)

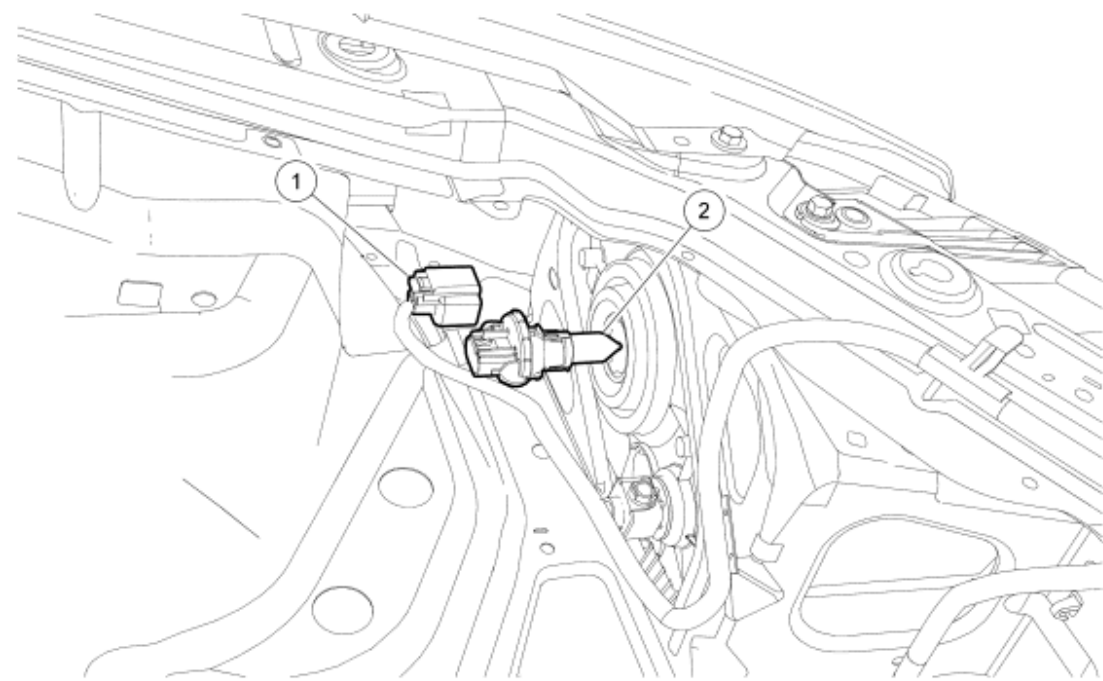
REMOVAL AND INSTALLATION

1. Remove the front bumper cover. For additional information, refer to **BUMPERS** article.
2. Remove the push pin.
3. Remove the 3 bolts and the headlamp assembly.
 - Disconnect the electrical connector.
 - To install, tighten the bolts to 8 Nm (71 lb-in).
4. To install, reverse the removal procedure.

HEADLAMP BULB

NOTE: **The air cleaner assembly is shown removed for clarity.**

NOTE: **Halogen bulb shown, high intensity discharge (HID) bulb is similar.**



N0053635

Fig. 116: Exploded View Of Headlamp Bulb & Headlamp Bulb Electrical Connector
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Headlamp bulb electrical connector (part of 14290)

REMOVAL AND INSTALLATION

WARNING: The bulb contains gas under pressure. The bulb may shatter if the glass envelope is scratched or if the bulb is dropped. Handle the bulb only by its base. Avoid touching the glass envelope. Failure to follow these instructions may result in personal injury.

NOTE: The headlamp bulb should not be removed from the headlamp until just before a new bulb is installed. Removing the bulb for an extended period of time may affect headlamp bulb performance. Contaminants may enter the headlamp where they can settle on the lens and reflector. Never turn on the headlamps with the bulb removed from the headlamp.

NOTE: Make sure the headlamp switch and the ignition switch are in the OFF position.

Halogen bulb

1. For the LH bulb on vehicles equipped with the Bullitt™ package, remove the air cleaner. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
2. Disconnect the headlamp bulb electrical connector.
3. Rotate the headlamp bulb approximately 1/8 turn counterclockwise and remove the bulb from the headlamp assembly.

HID bulb

4. For the LH bulb, remove the air cleaner. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
5. Disconnect the electrical connector from the headlamp assembly.
6. Remove the HID bulb access cover.
7. Release the retainer and remove the headlamp bulb.
 - Disconnect the electrical connector.

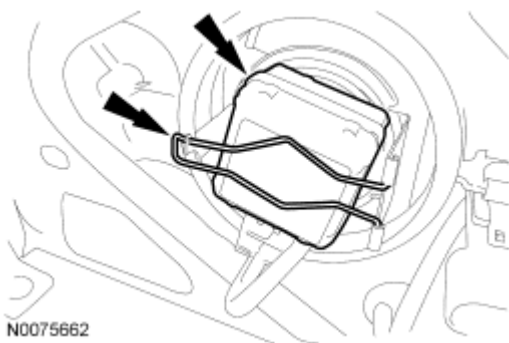


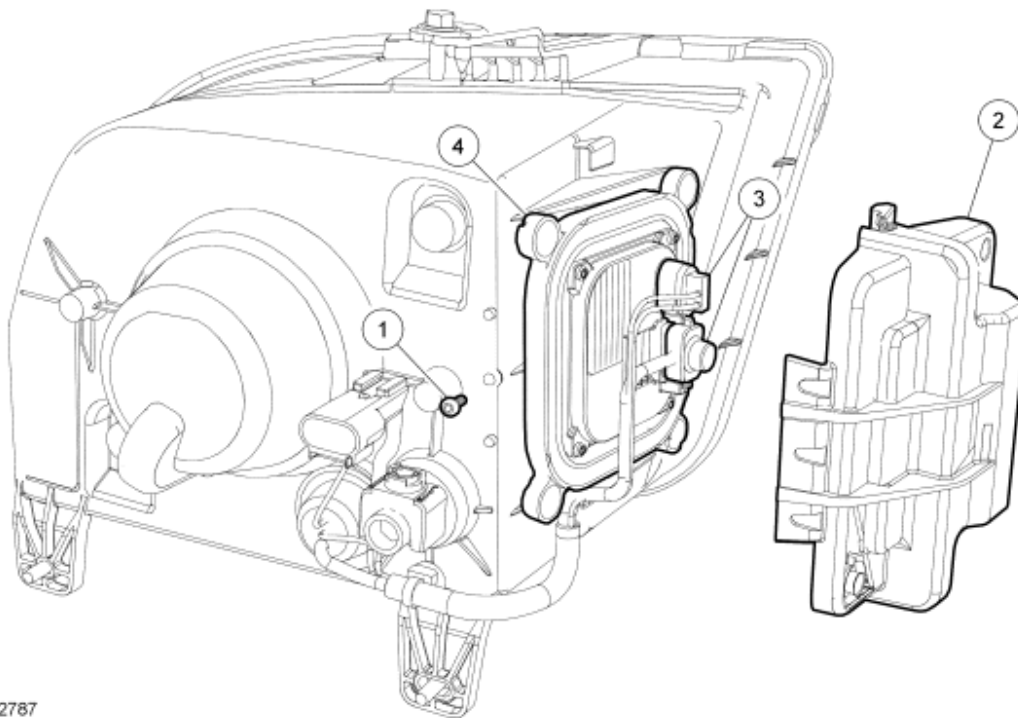
Fig. 117: Releasing Retainer & Remove Headlamp Bulb
Courtesy of FORD MOTOR CO.

All bulb types

8. To install, reverse the removal procedure.
 - For vehicles equipped with HID headlamps, make sure the bulb cover is fully seated.

BALLAST

NOTE: GT shown, others similar.



N0072787

Fig. 118: Exploded View Of Ballast
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Ballast cover screw
2	13008	Ballast cover
3	-	Ballast electrical connector (part of 13005/13006)
4	13C170	Ballast

REMOVAL AND INSTALLATION

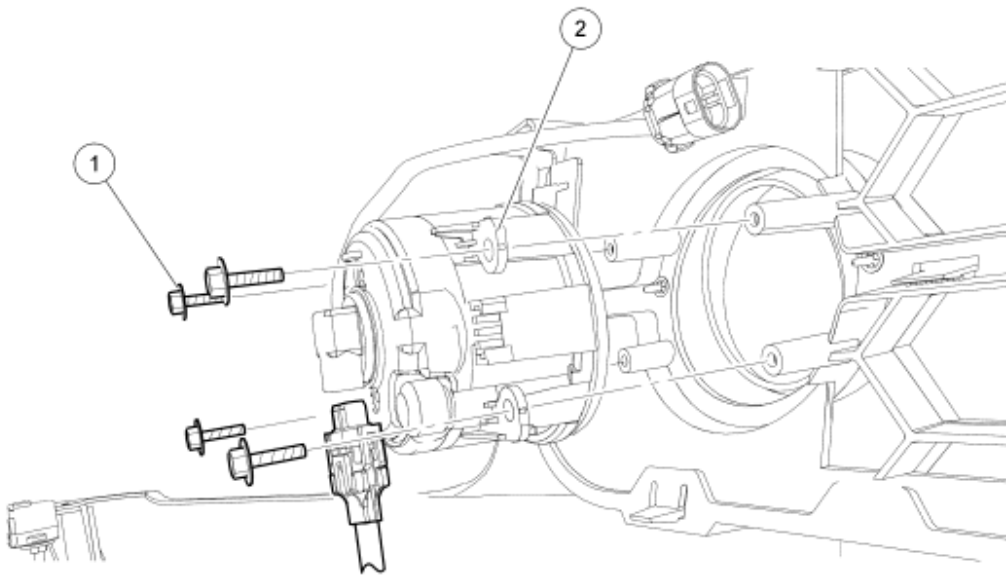
1. Remove the headlamp assembly. For additional information, refer to **Headlamp Assembly**.

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2. Remove the screw (2 screws for Shelby GT500) and ballast cover.
3. Disconnect the electrical connectors and remove the ballast.
4. To install, reverse the removal procedure.

FOG LAMP



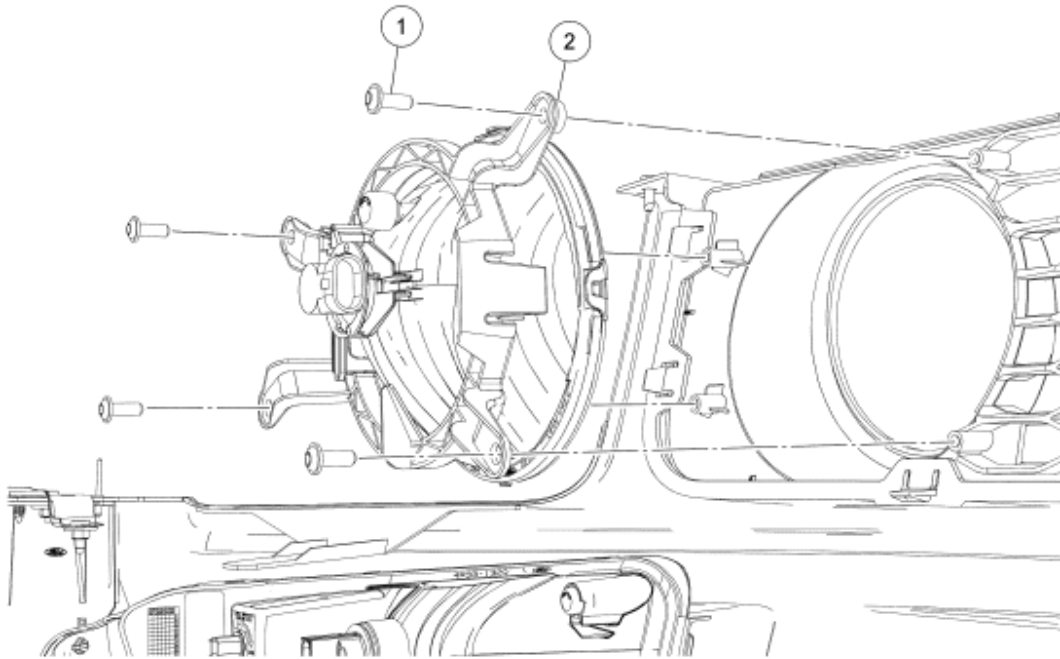
N0044457

Fig. 119: Exploded View Of Fog Lamp - 4.0L Vehicles
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W707607S	Fog lamp mounting screws (4 required)
2	15200	Fog lamp

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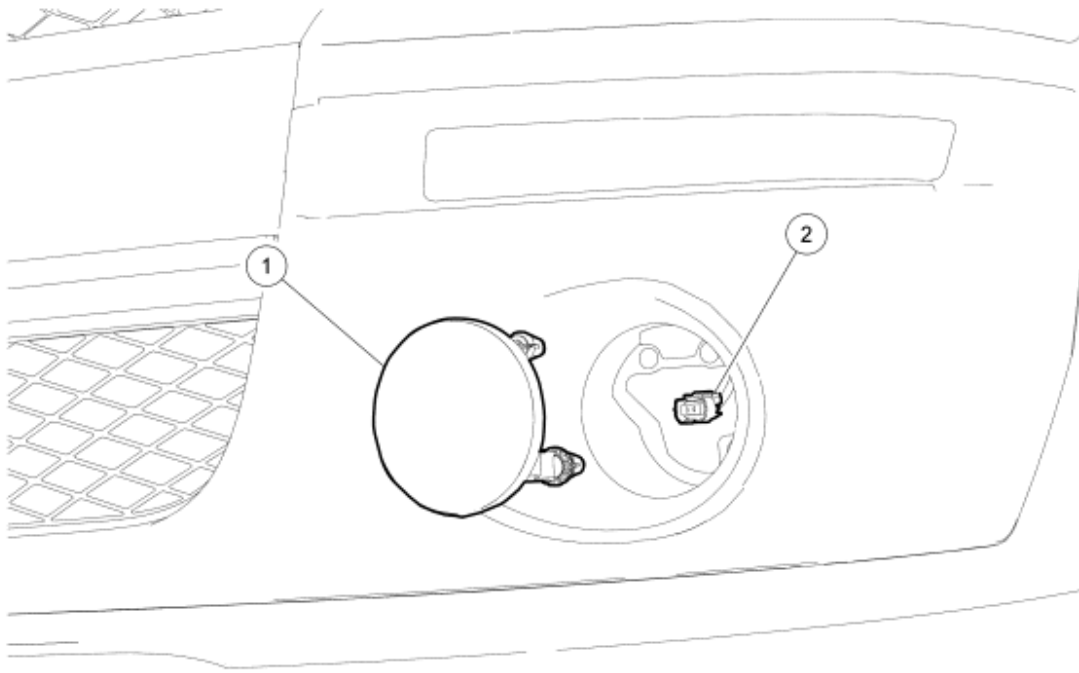
N0014033

Fig. 120: Exploded View Of Fog Lamp - 4.6L Vehicles
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W505974S	Fog lamp mounting screws (4 required)
2	15K201/15201	Fog lamp (RH/LH)

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N0053636

Fig. 121: Exploded View Of Fog Lamp - 5.4L Vehicles
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	15K201	Fog lamp
2	-	Fog lamp electrical connector (part of 14290)

REMOVAL AND INSTALLATION

4.0L and 4.6L vehicles

1. Remove the front bumper cover. For additional information, refer to **BUMPERS** article.
2. Remove the 4 screws and the fog lamp.

5.4L vehicles

3. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **IDENTIFICATION CODES** article.
4. Release the tabs and remove the fog lamp.
 - Disconnect the electrical connector.

All vehicles

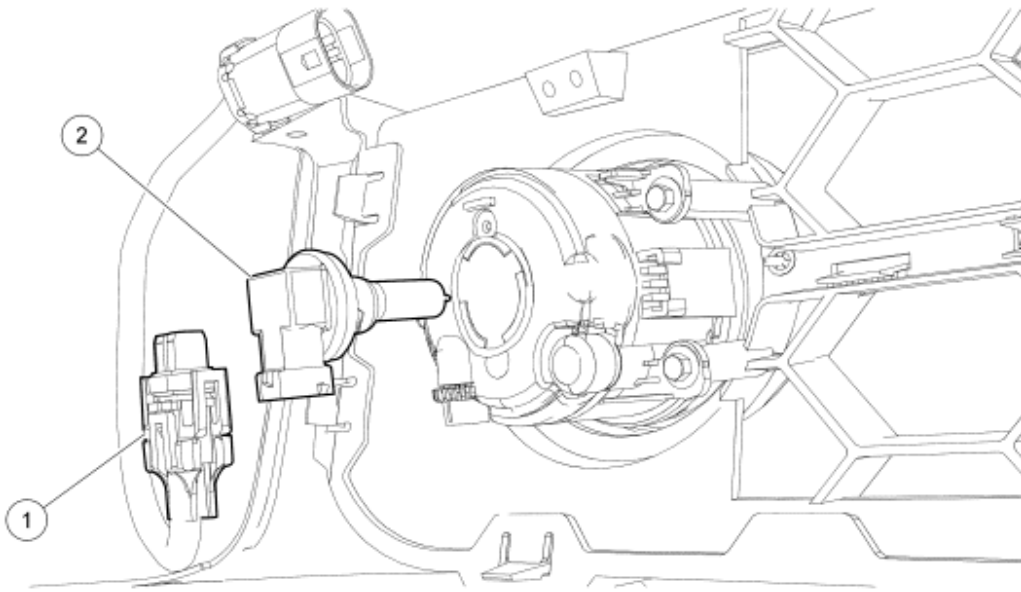
5. To install, reverse the removal procedure.

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FOG LAMP BULB

NOTE: 4.0L fog lamp shown, 4.6L fog lamp similar.



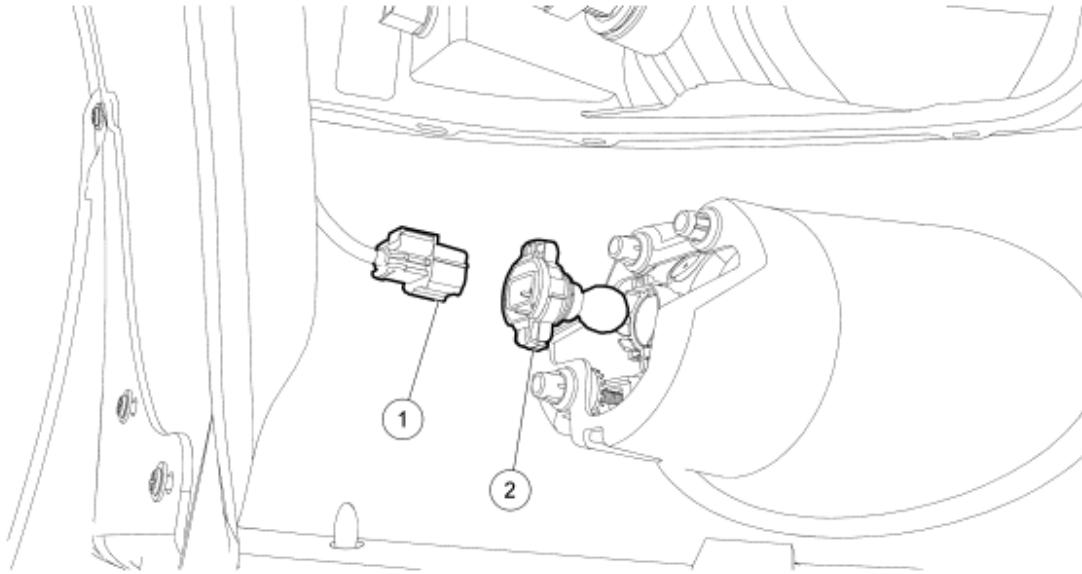
N0053637

Fig. 122: Exploded View Of Fog Lamp Bulb - 4.0L & 4.6L Vehicles
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Fog lamp bulb electrical connector (part of 15A211)
2	13N021	Fog lamp bulb

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N0053638

Fig. 123: Exploded View Of Fog Lamp Bulb - 5.4L Vehicles
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Fog lamp bulb electrical connector (part of 14290)
2	13N021	Fog lamp bulb

REMOVAL AND INSTALLATION

WARNING: The bulb contains gas under pressure. The bulb may shatter if the glass envelope is scratched or if the bulb is dropped. Handle the bulb only by its base. Avoid touching the glass envelope. Failure to follow these instructions may result in personal injury.

NOTE: The fog lamp bulb should not be removed from the fog lamp until just before a new bulb is installed. Removing the bulb for an extended period of time may affect fog lamp bulb performance. Contaminants may enter the fog lamp where they can settle on the lens and reflector. Never turn on the fog lamps with the bulb removed.

NOTE: Make sure the headlamp switch and the ignition switch are in the OFF position.

4.0L and 4.6L vehicles

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1. Remove the front bumper cover. For additional information, refer to **BUMPERS** article.
2. Disconnect the electrical connector and remove the fog lamp bulb.

5.4L vehicles

3. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **IDENTIFICATION CODES** article.
4. Release (squeeze) the tabs and remove the fog lamp bulb.
 - Disconnect the electrical connector.

All vehicles

5. To install, reverse the removal procedure.

SIDE LAMP/FRONT TURN SIGNAL LAMP BULB

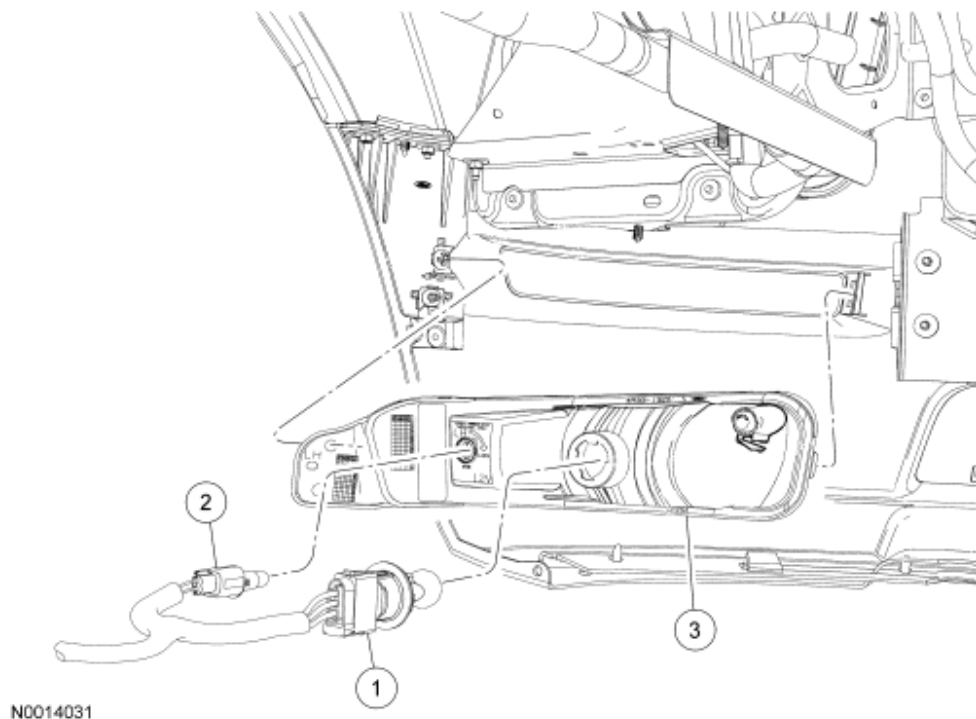


Fig. 124: Exploded View Of Side Lamp/Front Turn Signal Lamp Bulb
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	13411	Bulb socket
2	13411	Bulb socket
3	13200/13201	Front side marker lamp assembly (RH/LH)

REMOVAL AND INSTALLATION

1. Remove the front fender splash shield. For additional information, refer to **FRONT END BODY PANELS** article.
2. Release the 2 locking tabs and remove the front side marker lamp assembly.
 - Disconnect the electrical connectors.

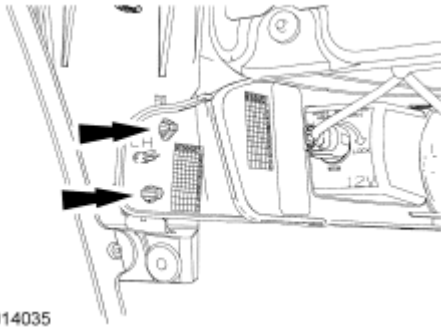


Fig. 125: Locating Locking Tabs
Courtesy of FORD MOTOR CO.

3. To install, reverse the removal procedure.

REVERSING LAMP SWITCH

NOTE: T5OD transmission shown, TR3650 transmission similar.

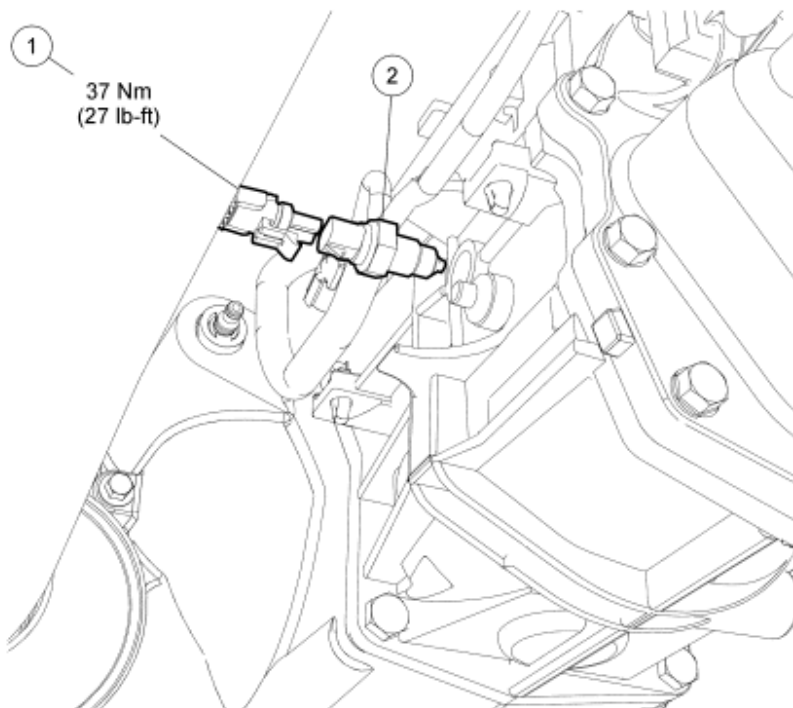


Fig. 126: Exploded View Of Reversing Lamp Switch With Torque Specification
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Reversing lamp switch electrical connector (part of 12B637)
2	15520	Reversing lamp switch

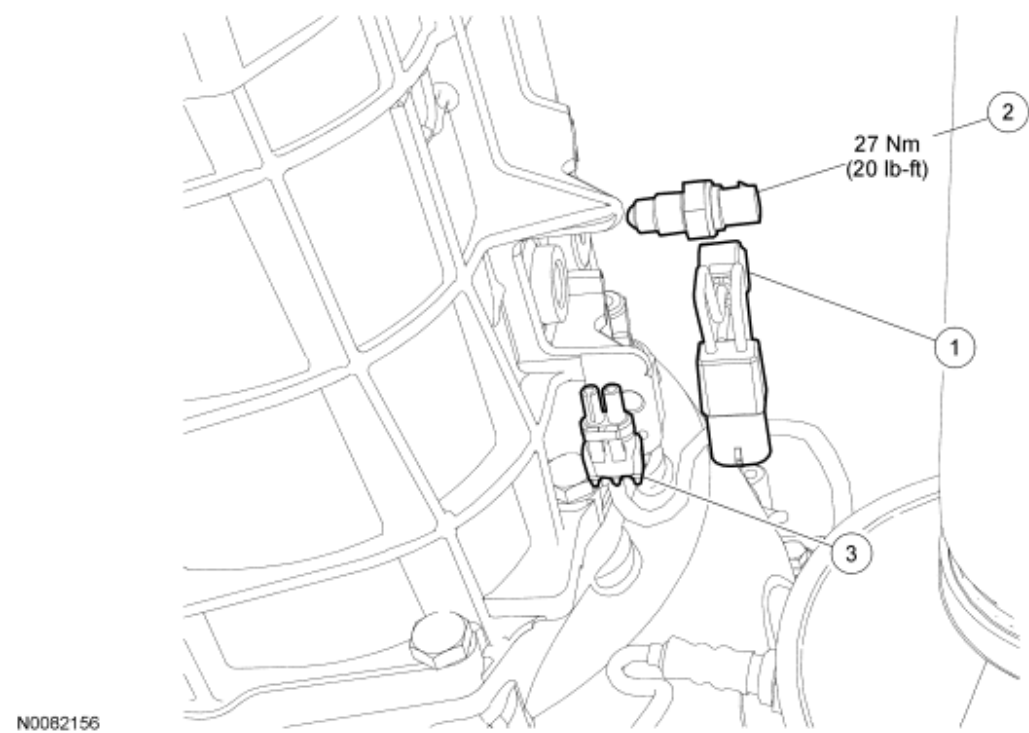


Fig. 127: Exploded View Of TR6060 Transmission
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Reversing lamp switch jumper harness
2	15520	Reversing lamp switch
3	-	Reversing lamp switch electrical connector (part of 12B637)

REMOVAL AND INSTALLATION

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Disconnect the electrical connector and remove the reversing lamp switch.
 - To install, tighten to 37 Nm (27 lb-ft) (T5OD transmission).
 - To install, tighten to 27 Nm (20 lb-ft) (TR3650 or TR6060 transmission).

3. To install, reverse the removal procedure.

STOPLAMP SWITCH

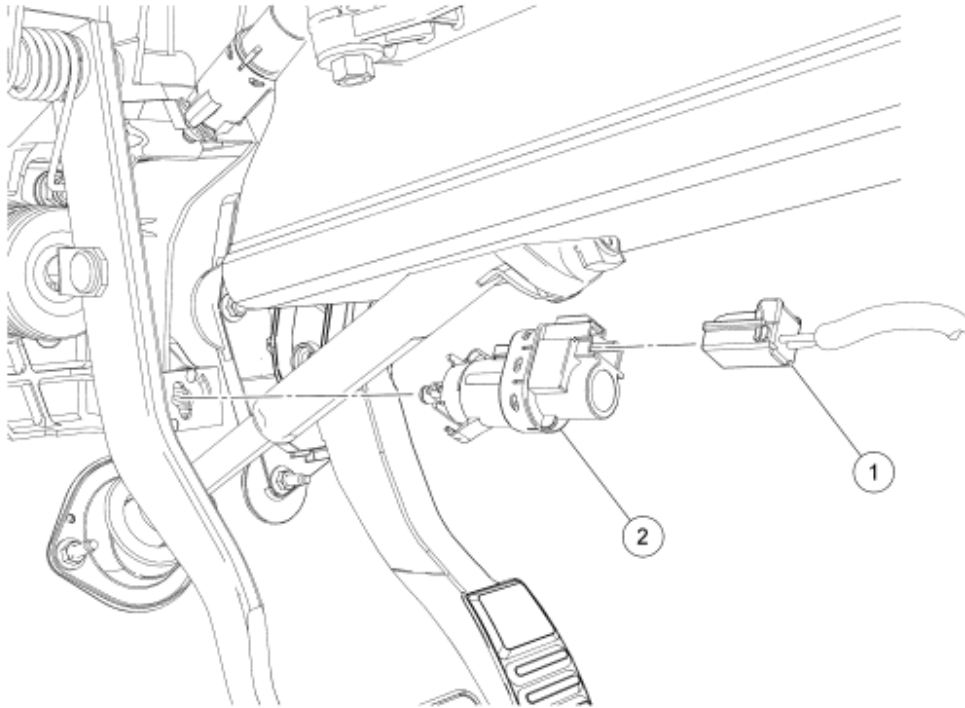


Fig. 128: Exploded View Of Stoplamp Switch
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Stoplamp switch electrical connector (part of 14A005)
2	13480	Stoplamp switch

REMOVAL AND INSTALLATION

CAUTION: Do not press, pull or otherwise move the brake pedal while removing or installing the stoplamp switch. The switch must be installed with the booster push rod attached to the brake pedal and with the brake pedal in the at-rest position. Installing the switch with the brake pedal in any other position results in incorrect adjustment and damage to the switch.

CAUTION: The switch plunger must be compressed for the switch to rotate in the bracket. Attempting to remove the switch with the plunger extended (during brake pedal apply) results in damage to the switch.

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NOTE: Rotate the stoplamp switch clockwise approximately 1/8 turn to remove.

1. Remove the stoplamp switch.
 - Disconnect the electrical connector.
2. To install, reverse the removal procedure.

HEADLAMP SWITCH

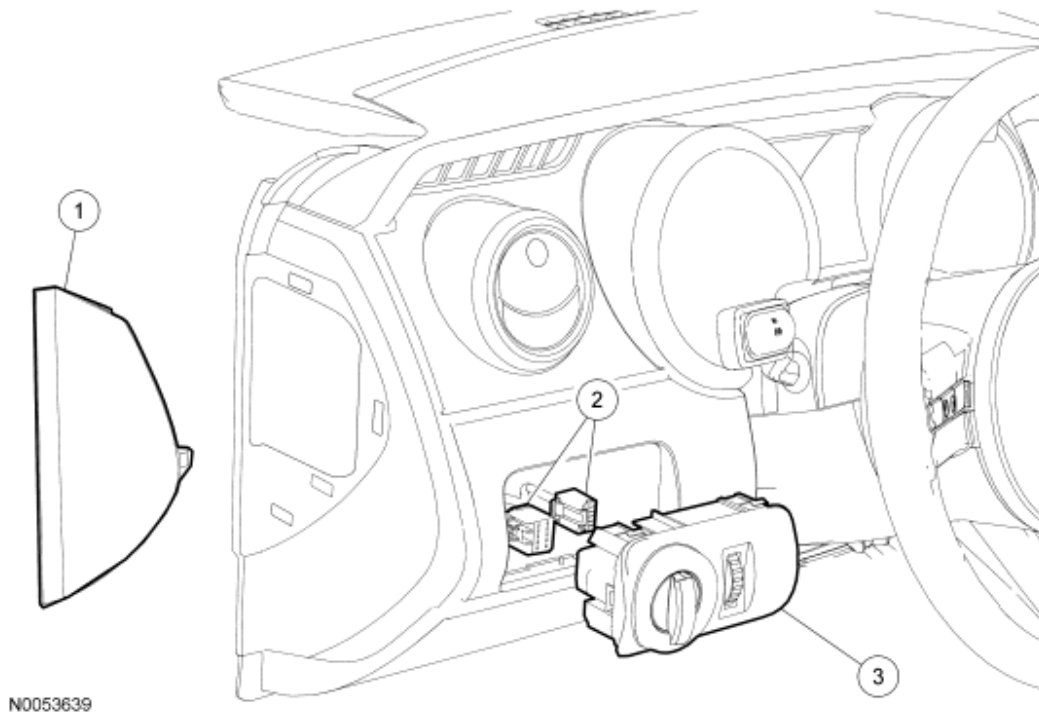


Fig. 129: Exploded View Of Headlamp Switch
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6304481	Instrument panel side finish panel
2	11654	Headlamp switch
3	-	Headlamp switch electrical connectors (part of 14401)

REMOVAL AND INSTALLATION

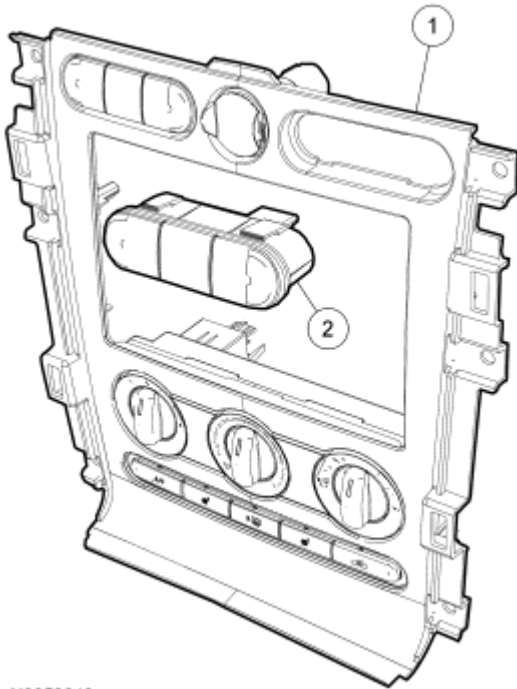
1. Remove the instrument panel side finish panel.

NOTE: The headlamp switch is removed by pushing from behind.

2. Remove the headlamp switch.

- Disconnect the electrical connectors.
3. To install, reverse the removal procedure.

HAZARD FLASHER LAMP SWITCH



N0053640

Fig. 130: Exploded View Of Hazard Flasher Lamp Switch
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6304302	Instrument panel center finish panel
2	13D734	Hazard flasher lamp switch

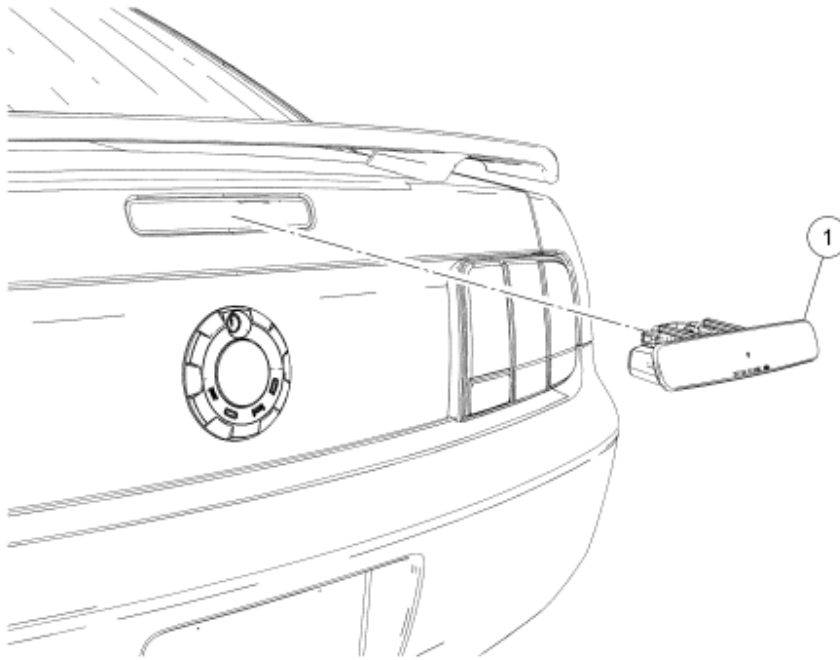
REMOVAL AND INSTALLATION

1. Remove the instrument panel center finish panel. For additional information, refer to **INSTRUMENT PANEL AND CONSOLE** article.
2. Release the tabs and remove the hazard flasher lamp switch.
3. To install, reverse the removal procedure.

HIGH MOUNTED STOPLAMP

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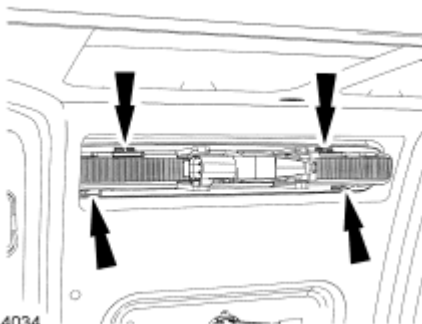
N0014030

Fig. 131: Exploded View Of High Mounted Stoplamp
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	13A613	High mounted stoplamp assembly

REMOVAL AND INSTALLATION

1. Remove the decklid latch trim cover.
2. Release the locking tabs and remove the high mounted stoplamp assembly.
 - Disconnect the electrical connector.



N0014034

Fig. 132: Locating High Mounted Stoplamp Assembly
Courtesy of FORD MOTOR CO.

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3. To install, reverse the removal procedure.

SIDE MARKER LAMP - REAR

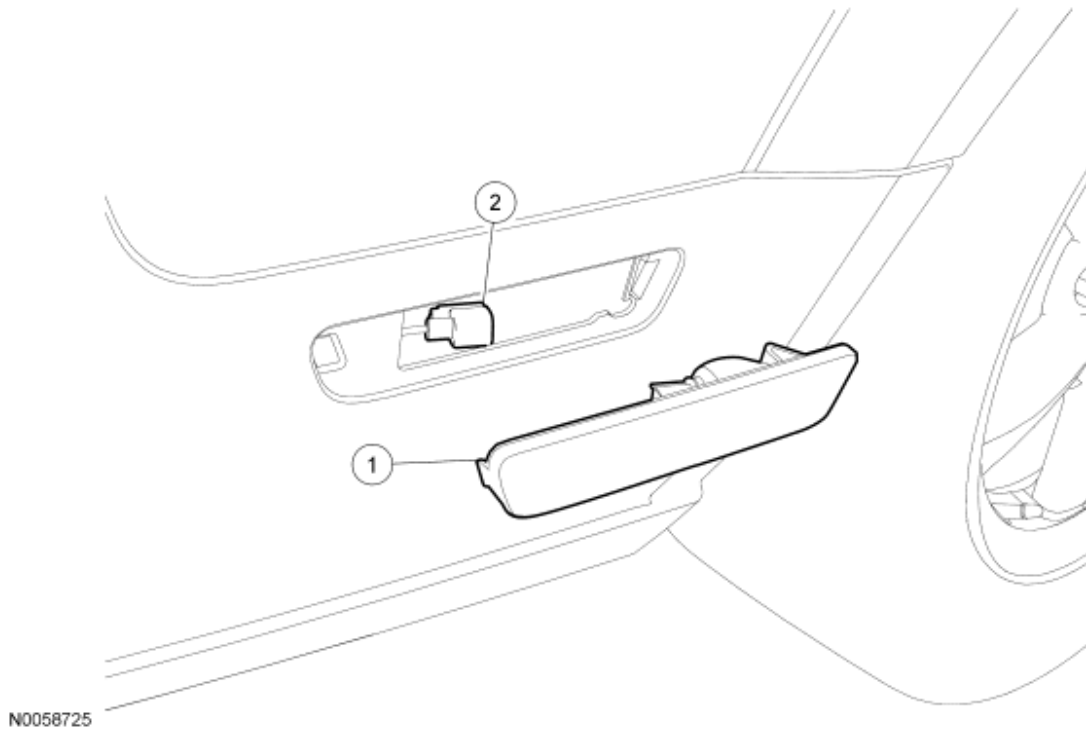


Fig. 133: Exploded View Of Rear Side Marker Lamp
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	15A201	Rear side marker lamp
2	-	Rear side marker lamp electrical connector (part of 13A444)

REMOVAL AND INSTALLATION

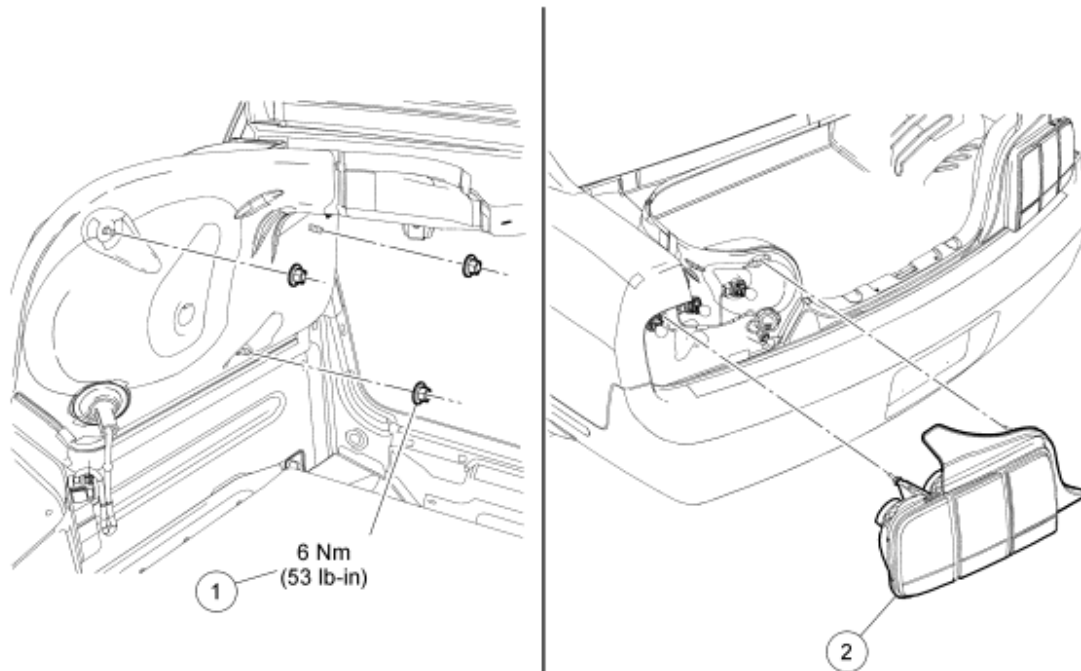
NOTE: Using a suitable thin-bladed tool, separate the rear of the side marker lamp from the bumper cover first.

1. Remove the rear side marker lamp.
 - Disconnect the electrical connector.
2. To install, reverse the removal procedure.

REAR LAMP ASSEMBLY

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N0040857

Fig. 134: Exploded View Of Rear Lamp Assembly With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	N621926-S424	Rear lamp mounting nuts (3 required)
2	13B404/13B405	Rear lamp assembly (RH/LH)

REMOVAL AND INSTALLATION

NOTE: If the vehicle is equipped with a factory installed subwoofer, the subwoofer must be removed before removing the right side rear lamp.

1. Remove the rear luggage compartment trim panel.
2. Remove the push pin retainer and position the trim panel aside.
3. Remove the LH side luggage compartment trim panel.
4. Remove the 3 rear lamp mounting nuts.
 - To install, tighten to 6 Nm (53 lb-in).
5. Remove the rear lamp assembly.
 - Remove the bulbs from the rear lamp assembly.
6. To install, reverse the removal procedure.