Headlamps

Special Tool(s)

	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
	Flex Probe Kit 105-R025D or equivalent

Principles of Operation

NOTE: *The Smart Junction Box (SJB) is also known as the Generic Electronic Module (GEM) .*

Exterior Lighting

The SJB monitors the headlamp switch position by sending voltage signals on multiple circuits to the headlamp switch. There is one circuit for each headlamp switch position. At any given time, one of the signal circuits is switched to ground.

If the SJB does not detect any of the inputs to the headlamp switch are active (switched to ground) for 5 seconds, the SJB turns the parking lamps and headlamps on and keeps them on until the battery saver feature times out.

Additionally, if the SJB detects multiple headlamp switch input circuits short to ground, the SJB turns the parking lamps and headlamps on and keeps them on until the battery saver feature times out.

Refer to Exterior Lighting in the Description and Operation portion of this section for information regarding the Battery Saver feature.

If either situation occurs, the SJB **cannot** 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 monitors the multifunction switch for a flash-to-pass or high beam request. There are 2 voltage reference circuits monitoring this. When the multifunction switch is in the FLASH-TO-PASS or HIGH BEAM position, the voltage signal 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

The High Intensity Discharge (HID) headlamps utilize a second (hot at all times) voltage feed to the HID ballasts.

When the low beams are requested (based on inputs to the SJB), the HID ballasts energize and provide high voltage to the HID bulbs.

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

If the low beams are off when the flash-to-pass is requested, the HID ballasts and the shutters within the headlamps are activated for approximately 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.

Field-Effect Transistor (FET) Protection

Field-Effect Transistor (FET) is a type of transistor that when used with module software can be used to monitor and control current flow on module outputs. The FET protection strategy is used to prevent module damage in the event of excessive current flow.

The SJB utilizes a FET protective circuit strategy for many of its outputs (for example, a headlamp output circuit). Output loads (current level) are monitored for excessive current (typically short circuits) and are shut down (turns off the voltage or ground provided by the module) when a fault event is detected. A continuous DTC is stored at the fault event and a cumulative counter is started.

When the demand for the output is no longer present, the module resets the FET circuit protection to allow the circuit to function. The next time the driver requests a circuit to activate that has been shut down by a previous short (FET protection) and the circuit remains shorted, the FET protection shuts off the circuit again and the cumulative counter advances.

When the excessive circuit load occurs often enough, the module shuts down the output until a repair procedure is carried out. Each FET protected circuit has 3 predefined levels of short circuit tolerance based on the harmful effect of each circuit fault on the FET and the ability of the FET to withstand it. A module lifetime level of fault events is established based upon the durability of the FET . If the total tolerance level is determined to be 600 fault events, the 3 predefined levels would be 200, 400 and 600 fault events.

When each tolerance level is reached, the continuous DTC that was stored on the first failure cannot be cleared by a command to clear the continuous DTCs. The module does not allow this code to be cleared or the circuit restored to normal operation until a successful self-test proves that the fault has been repaired. After the self-test has successfully completed (no on-demand DTCs present), DTC B106E and the associated continuous DTC (the DTC related to the shorted circuit) automatically clear and the circuit function returns.

When the first or second level is reached, the continuous DTC (associated with the short circuit) sets along with DTC B106E. These DTCs can be cleared using the module on-demand self-test, then the Clear DTC operation on the scan tool (if the on-demand test shows the fault corrected). The module never resets the fault event counter to zero and continues to advance the fault event counter as short circuit fault events occur.

If the number of short circuit fault events reach the third level, then DTCs B106F and B1342 set along with the associated continuous DTC. This DTC cannot be cleared and the module must be replaced.

The SJB FET protected output circuits for the headlamp system are the LH low beam and the RH low beam output circuits.

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
• Multifunction switch
• Headlamp assembly
	• Battery Junction Box (BJB) fuse(s):
	  ▪ 26 (20A) (LH ballast)
	  ▪ 27 (20A) (RH ballast)
	• Smart Junction Box (SJB) fuse(s):
	  ▪ 7 (10A) (LH low beam)
	  ▪ 8 (10A) (RH low beam)
	  ▪ 23 (15A) (high beams)
	• Bulb(s)
	• Wiring, terminals or connectors
	• 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.
4. **NOTE:** *Make sure to use the latest scan tool software release.*

   If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC) .
5. **NOTE:** *The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM .*

   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 Section 418-00, No Power To The Scan Tool, to diagnose no power to 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 Section 418-00 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 Section 418-00.
- 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, refer to Diagnostic Trouble Code (DTC) Chart in this section. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in Section 419-10.
10. If no DTCs related to the concern are retrieved, GO to Symptom Chart.

Symptom Chart

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. Refer to Diagnostic Methods in Section 100-00 for information about these practices.

Symptom Chart

Condition	Possible Causes	Action
• Both low beams are inoperative	• Bulbs • Smart Junction Box (SJB)	• VERIFY the bulbs are OK. If OK, GO to Pinpoint Test B.
• The low beams turn on after a 5-second delay when the headlamp switch is placed in the HEADLAMPS ON position	• Wiring, terminals or connectors • Headlamp switch • SJB	• GO to Pinpoint Test D.
• Both high beams are inoperative	• Fuse • Wiring, terminals or connectors • Multifunction switch • SJB	• VERIFY the bulbs are OK. If OK, GO to Pinpoint Test A.
• One low beam headlamp is inoperative	• Fuse • Wiring, terminals or connectors • Ballast • High Intensity Discharge (HID) bulb • Headlamp assembly • SJB	• VERIFY the bulb is OK. If OK, GO to Pinpoint Test B.
• One high beam headlamp is inoperative	• Wiring, terminals or connectors • Headlamp assembly	• VERIFY the bulb is OK. If OK, GO to Pinpoint Test C.
• The low beam(s) are always on	• Wiring, terminals or connectors • Headlamp switch • Ballast • SJB	• GO to Pinpoint Test D.
• The high beam(s) are always on	• Wiring, terminals or connectors • Multifunction switch • SJB	• GO to Pinpoint Test E.
• The flash-to-pass feature is inoperative	• Wiring, terminals or connectors • Multifunction switch • SJB	• GO to Pinpoint Test F.

Pinpoint Tests

Pinpoint Test A: Both High Beams Are Inoperative

Refer to Wiring Diagrams Cell 85 , Headlamps/Autolamps 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 high beam request circuit from the multifunction switch. When the multifunction switch is placed in the HIGH BEAM position, the signal is routed to ground. The SJB then energizes the high beam relay (integrated into the SJB) which supplies voltage to the headlamps.

This pinpoint test is intended to diagnose the following:

- Fuse
- Wiring, terminals or connectors
- Multifunction switch
- SJB

PINPOINT TEST A : BOTH HIGH BEAMS ARE INOPERATIVE

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

A1 CHECK THE HIGH BEAM INDICATOR

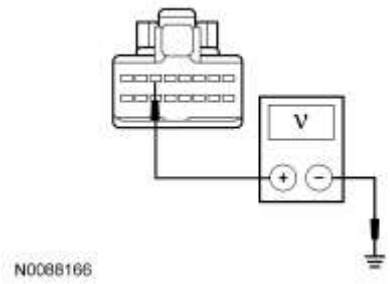
- Ignition ON.
- Place the headlamp switch in the HEADLAMPS ON position.
- Place the multifunction switch in the HIGH BEAM position.

Does the high beam indicator illuminate?

Yes	VERIFY the SJB fuse 23 (15A) is OK. If OK, GO to A5. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short.
No	GO to A2.

A2 CHECK FOR VOLTAGE TO THE MULTIFUNCTION SWITCH

- Place the headlamp switch in the OFF position.
- Ignition OFF.
- Disconnect: Multifunction Switch C202 .
- Ignition ON.
- Measure the voltage between the multifunction switch C202 Pin 6, circuit CLF17 (WH/OG), harness side and ground.

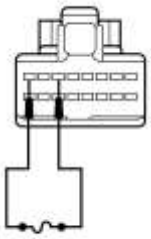


Is the voltage greater than 11 volts?

Yes	GO to A3.
No	GO to A4.

A3 BYPASS THE MULTIFUNCTION SWITCH

- Ignition OFF.
- Connect a fused jumper wire between the multifunction switch C202 Pin 6, circuit CLF17 (WH/OG), harness side and the multifunction switch C202 Pin 8, circuit GD116 (BK/VT), harness side.



N0057365

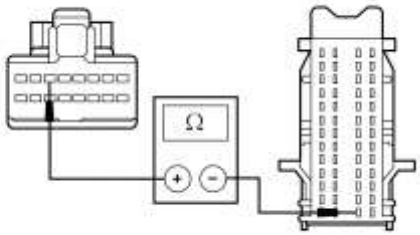
- Place the headlamp switch in the HEADLAMPS ON position.

Do the high beams illuminate?

Yes	REMOVE the jumper wire. INSTALL a new multifunction switch. REFER to Section 211-05. TEST the system for normal operation.
No	REMOVE the jumper wire. REPAIR circuit GD116 (BK/VT) for an open.

A4 CHECK THE HIGH BEAM REQUEST INPUT CIRCUIT FOR AN OPEN

- Ignition OFF.
- Disconnect: SJB C2280B .
- Measure the resistance between the multifunction switch C202 Pin 6, circuit CLF17 (WH/OG), harness side and the SJB C2280B Pin 27, circuit CLF17 (WH/OG), harness side.



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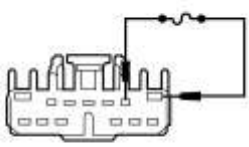
Is the resistance less than 3 ohms?

Yes	GO to A6.
No	REPAIR circuit CLF17 (WH/OG) for an open. TEST the system for normal operation.

A5 CHECK THE SJB HIGH BEAM OUTPUT CIRCUIT FOR AN OPEN

NOTE: *An assistant may be required to listen for the high beam shutters activating for this step.*

- Ignition OFF.
- Disconnect: SJB C2280E .
- Connect a fused jumper wire between the SJB C2280E Pin 1, circuit CE612 (GY/VT), harness side and the SJB C2280E Pin 2, circuit CLF08 (YE/VT), harness side.



N0057367

- Ignition ON.

Do the high beam shutters activate?

Yes	REMOVE the jumper wire. GO to A6.
No	REMOVE the jumper wire. REPAIR circuit CLF08 (YE/VT) for an open. TEST the system for normal operation.

A6 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 Section 419-10. 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: One Low Beam Headlamp Is Inoperative

Diagnostic Overview

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. Refer to Diagnostic Methods in Section 100-00 for information about these practices.

Refer to Wiring Diagrams Cell 85 , Headlamps/Autolamps for schematic and connector information.

Normal Operation and Fault Conditions

When the Smart Junction Box (SJB) detects the headlamp switch in the HEADLAMPS ON position and the multifunction switch in the LOW BEAM position, the SJB provides voltage to the LH and RH low beam headlamps.

The headlamps utilize a second (hot at all times) voltage feed to the ballasts from the Battery Junction Box (BJB) .

When the ballasts receive the headlamp on voltage from the SJB , the ballasts provide high voltage to the HID bulbs.

DTC Description	Fault Trigger Conditions
• B106E — Solid State Driver Disabled Due to Short Circuit	A continuous DTC that sets when the SJB has temporarily shut down the output driver. **The module has temporarily disabled a low beam output because an excessive current draw exists (such as a short to ground). The SJB cannot enable the low beam output until the cause of the short is corrected, the DTCs have been cleared and a successful self-test is run.**
• B106F — Module Disabled Due to External Fault	A continuous DTC that sets when the SJB has permanently shut down the output driver. **The module has permanently disabled a low beam output because an excessive current draw fault (such as a short to ground) has exceeded the limits that the SJB can withstand. The cause of the excessive current draw MUST be corrected before a new SJB is installed.**
• B2A2E — Right Front Lamp Low Beam	An on-demand DTC that sets when the SJB detects an open from the RH low beam output circuit.

DTC Description	Fault Trigger Conditions
Circuit Open	
• B2A2F — Right Front Lamp Low Beam Circuit Short to Ground	A continuous and on-demand DTC that sets when the SJB detects a short to ground from the RH low beam output circuit.
• B2A30 — Left Front Lamp Low Beam Circuit Open	An on-demand DTC that sets when the SJB detects an open from the LH low beam output circuit.
• B2A31 — Left Front Lamp Low Beam Circuit Short to Ground	A continuous and on-demand DTC that sets when the SJB detects a short to ground from the LH low beam output circuit.

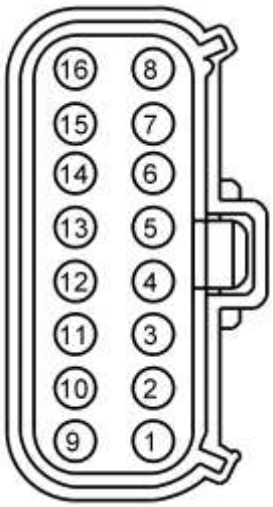
PINPOINT TEST B : ONE LOW BEAM HEADLAMP IS INOPERATIVE

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

B1 CHECK FOR VOLTAGE TO THE HEADLAMP

- Ignition OFF.
- Disconnect: Inoperative Headlamp .
- Place the headlamp switch in the HEADLAMPS ON position.
- Measure the **voltage** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
LH Headlamp			
C1509 Pin 1	CLF04 (BN/BU)	—	Ground
RH Headlamp			
C1510 Pin 1	CLF05 (BU/GN)	—	Ground



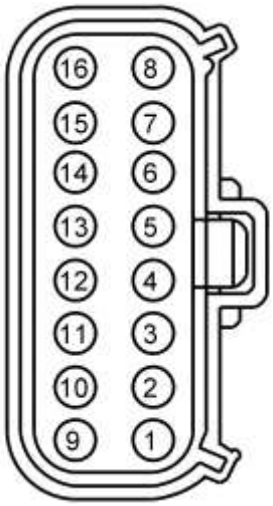
Is the voltage greater than 11 volts?

Yes	GO to B2.
No	VERIFY the SJB fuse 7 (10A) (LH low beam) or fuse 8 (10A) (RH low beam) is OK. GO to B6.

B2 CHECK BALLAST SUPPLY VOLTAGE TO THE HEADLAMP

- Measure the **voltage** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
LH Headlamp			
C1509 Pin 10	SBB26 (YE/RD)	—	Ground
RH Headlamp			
C1510 Pin 10	SBB27 (BU/RD)	—	Ground



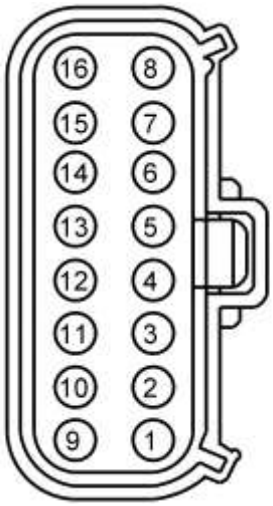
Is the voltage greater than 11 volts?

Yes	GO to B3.
No	VERIFY the BJB fuse 26 (20A) (LH headlamp) or fuse 27 (20A) (RH headlamp) is OK. If OK, REPAIR the circuit in question for an open. TEST the system for normal operation. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. GO to B9.

B3 CHECK FOR VOLTAGE TO THE HEADLAMP USING THE CONNECTOR GROUND

- Measure the **voltage** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
LH Headlamp			
C1509 Pin 1	CLF04 (BN/BU)	C1509 Pin 8	GD129 (BK/YE)
C1509 Pin 1	CLF04 (BN/BU)	C1509 Pin 14	GD123 (BK/GY)
RH Headlamp			
C1510 Pin 1	CLF05 (BU/GN)	C1510 Pin 8	GD123 (BK/GY)
C1510 Pin 1	CLF05 (BU/GN)	C1510 Pin 14	GD129 (BK/YE)



Is the voltage greater than 11 volts?

Yes	GO to B4.
No	REPAIR circuit GD129 (BK/YE) or circuit GD123 (BK/GY) for an open. TEST the system for normal operation.

B4 CHECK THE HEADLAMP BULB HARNESS FOR AN OPEN OR SHORT

- Inspect the headlamp bulb harness for an open or short.

Is the headlamp bulb harness OK?

Yes	GO to B5.
No	INSTALL a new headlamp bulb harness. TEST the system for normal operation.

B5 CHECK THE BALLAST

- Substitute a known good ballast and recheck the headlamp operation.

Does the headlamp operate correctly?

Yes	INSTALL a new ballast. REFER to Ballast in this section. TEST the system for normal operation.
No	INSTALL a new HID bulb. REFER to Headlamp Bulb in this section. TEST the system for normal operation.

B6 USE THE RECORDED DTCS FROM THE SJB SELF-TEST

- Place the headlamp switch in the OFF position.
- Check the recorded results from the SJB self-test.

Is DTC B2A2E or DTC B2A30 present?

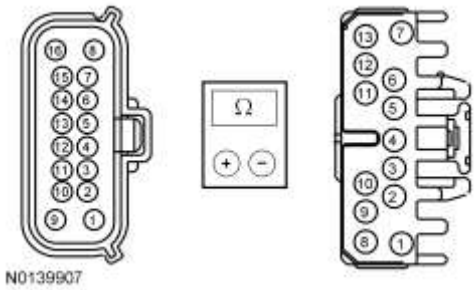
Yes	GO to B7.
No	GO to B8.

B7 CHECK THE SJB LOW BEAM OUTPUT CIRCUIT FOR AN OPEN

- Disconnect: SJB C2280E .

- Measure the **resistance** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
LH Headlamp			
C1509 Pin 1	CLF04 (BN/BU)	C2280E Pin 13	CLF04 (BN/BU)
RH Headlamp			
C1510 Pin 1	CLF05 (BU/GN)	C2280E Pin 4	CLF05 (BU/GN)



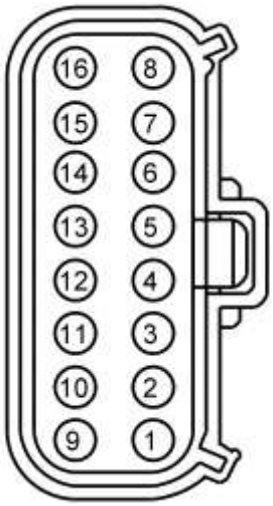
Is the resistance less than 3 ohms?

Yes	GO to B11.
No	REPAIR circuit CLF04 (BN/BU) (LH headlamp) or circuit CLF05 (BU/GN) (RH headlamp) for an open. CLEAR the DTCs. REPEAT the self-test.

B8 ISOLATE THE HEADLAMP AS THE CAUSE OF THE SHORT

- Ignition ON.
- Enter the following diagnostic mode on the scan tool: SJB Self-Test .
- Clear the DTCs **and** repeat the on-demand self-test **(required to enable the low beam output driver if DTC B106E is present)**.
- Place the headlamp switch in the HEADLAMPS ON position.
- Measure the **voltage** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
LH Headlamp			
C1509 Pin 1	CLF04 (BN/BU)	—	Ground
RH Headlamp			
C1510 Pin 1	CLF05 (BU/GN)	—	Ground



Is the voltage greater than 11 volts?

Yes	GO to B9.
No	GO to B10.

B9 CHECK THE HEADLAMP BULB HARNESS FOR A SHORT TO GROUND

- Inspect the headlamp bulb harness for a short to ground.

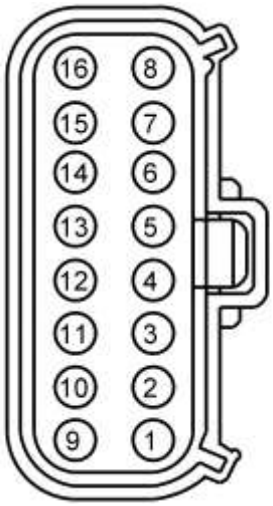
Is the headlamp bulb harness OK?

Yes	INSTALL a new ballast. REFER to Ballast in this section. TEST the system for normal operation.
No	INSTALL a new headlamp bulb harness. TEST the system for normal operation.

B10 CHECK THE SJB LOW BEAM OUTPUT CIRCUIT FOR A SHORT TO GROUND

- Place the headlamp switch in the OFF position.
- Ignition OFF.
- Disconnect: SJB C2280E .
- Measure the **resistance** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
LH Headlamp			
C1509 Pin 1	CLF04 (BN/BU)	—	Ground
RH Headlamp			
C1510 Pin 1	CLF05 (BU/GN)	—	Ground



Is the resistance greater than 10,000 ohms?

Yes	GO to B11.
No	REPAIR circuit CLF04 (BN/BU) (LH headlamp) or circuit CLF05 (BU/GN) (RH headlamp) for a short to ground. After the repair: If no DTCs are present, TEST the system for normal operation. If DTC B106E is present, CLEAR the DTCs **and** REPEAT the self-test **(required to enable the low beam output driver if DTC B106E is present)**. TEST the system for normal operation. If DTC B106F is present, INSTALL a new SJB . REFER to Section 419-10. TEST the system for normal operation.

B11 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 Section 419-10. 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 High Beam Headlamp Is Inoperative

Refer to Wiring Diagrams Cell 85 , Headlamps/Autolamps for schematic and connector information.

Diagnostic Overview

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. Refer to Diagnostic Methods in Section 100-00 for information about these practices.

Normal Operation and Fault Conditions

When the Smart Junction Box (SJB) detects the headlamp switch in the HEADLAMPS ON position and the multifunction switch in the HIGH BEAM position, the SJB energizes the high beam relay (integrated into the SJB). When the relay is energized, the relay routes voltage to the headlamps.

The High Intensity Discharge (HID) headlamps utilize a shutter within each headlamp. When the shutter is activated, the headlamp beam pattern changes to illuminate a greater distance.

PINPOINT TEST C : ONE HIGH BEAM HEADLAMP IS INOPERATIVE

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

C1 CHECK THE LOW BEAM OPERATION

- Check the operation of the low beams.

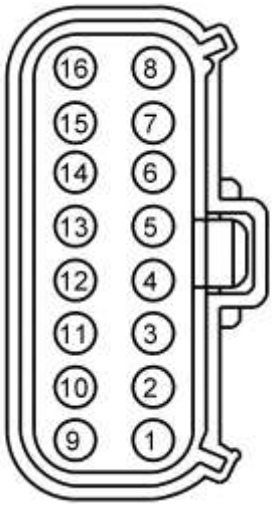
Do the low beams operate correctly?

Yes	GO to C2.
No	GO to Pinpoint Test B.

C2 CHECK FOR VOLTAGE TO THE HEADLAMP

- Place the headlamp switch in the OFF position.
- Ignition OFF.
- Disconnect: Inoperative Headlamp .
- Place the headlamp switch in the HEADLAMPS ON position.
- Place the multifunction switch in the HIGH BEAM position.
- Measure the **voltage** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
LH Headlamp			
C1509 Pin 12	CLF08 (YE/VT)	—	Ground
RH Headlamp			
C1510 Pin 12	CLF08 (YE/VT)	—	Ground



Is the voltage greater than 11 volts?

Yes	INSTALL a new headlamp assembly. REFER to Headlamp Assembly in this section. TEST the system for normal operation.
No	REPAIR circuit CLF08 (YE/VT) for an open. TEST the system for normal operation.

Pinpoint Test D: The Low Beam(s) Are Always On

Diagnostic Overview

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. Refer to Diagnostic Methods in Section 100-00 for information about these practices.

Refer to Wiring Diagrams Cell 85 , Headlamps/Autolamps for schematic and connector information.

Normal Operation and Fault Conditions

The Smart Junction Box (SJB) sends voltage signals to the headlamp switch (OFF, PARKING LAMPS and HEADLAMPS). At any given time, the headlamp switch routes one of the input circuits to ground.

When the SJB detects the headlamp switch in the HEADLAMPS ON position (or a fault with one of the headlamp switch input circuits for more than 5 seconds) and the multifunction switch in the LOW BEAM position, the SJB provides voltage to the low beam headlamps.

The headlamps utilize a second (hot at all times) voltage feed to the HID ballasts.

When the ballasts receive the headlamp on voltage from the SJB , the ballasts provide high voltage to the HID bulbs.

DTC Description	Fault Trigger Conditions
• B1472 — Lamp Headlamp Input Circuit Short to Ground	An on-demand DTC that can set when the SJB detects the headlamps on input circuit is short to ground.
• B2498 — Headlamp Switch Multiple Signals Input Active	An on-demand DTC that can set when the SJB detects multiple headlamp switch inputs active at the same time.
• B2A22 — Headlamp OFF Circuit Open	An on-demand DTC that sets when the SJB detects the headlamp switch off input circuit open.
• B2A2E — Right Front Lamp Low Beam Circuit Open	An on-demand DTC that sets when the SJB detects the RH low beam output circuit shorted to voltage.
• B2A30 — Left Front Lamp Low Beam Circuit Open	An on-demand DTC that sets when the SJB detects the LH low beam output circuit shorted to voltage.

PINPOINT TEST D : THE LOW BEAM(S) ARE ALWAYS ON

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

D1 CHECK FOR AUTOLAMP DTCS

- Review the DTCs retrieved from the SJB self-test.

Is DTC B1696, B1791, B1793 or B2008 present?

Yes	GO to Pinpoint Test H.
No	GO to D2.

D2 CHECK THE SJB HEADLAMP SWITCH PIDS

NOTE: *Make sure the headlamp switch is lined up in the correct position when monitoring the PIDs.*

NOTE: *Only one PID should indicate ON at each headlamp switch position.*

- Enter the following diagnostic mode on the scan tool: SJB Data Logger .
- While moving the headlamp switch through all positions, monitor the SJB headlamp switch input PIDs (HDLMP_OFF_CKT, HDLMP_PRK_CKT, HDLMP_ON_CKT, HDLMP_AUT_CKT).

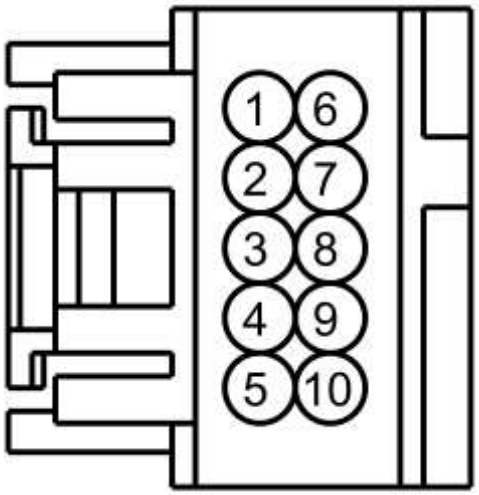
Do all of the headlamp switch positions agree with the PIDs (with only one PID indicating ON in each position)?

Yes	GO to D7.
No	If the PID HDLMP_AUT_CKT disagrees, GO to Pinpoint Test H. Otherwise, GO to D3.

D3 CHECK FOR VOLTAGE TO THE HEADLAMP SWITCH

- Ignition OFF.
- Disconnect: Headlamp Switch C205 .
- Ignition ON.
- Measure the **voltage** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
C205 Pin 6	CLF23 (WH/VT)	—	Ground
C205 Pin 2	CLS34 (GY)	—	Ground
C205 Pin 7	CLF18 (BU/WH)	—	Ground



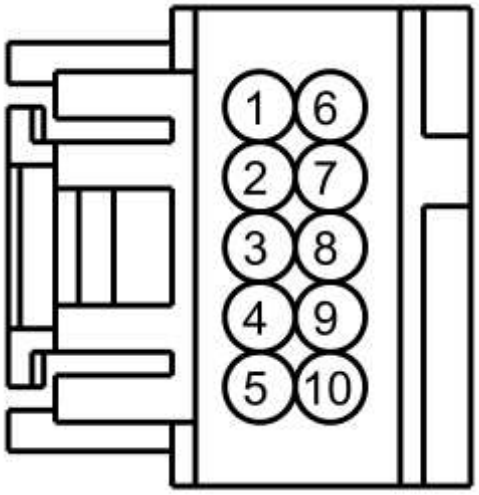
Are the voltages greater than 11 volts?

Yes	GO to D4.
No	GO to D5.

D4 CHECK FOR VOLTAGE BETWEEN THE OFF CIRCUIT AND GROUND

- Measure the **voltage** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
C205 Pin 6	CLF23 (WH/VT)	C205 Pin 3	GD116 (BK/VT)



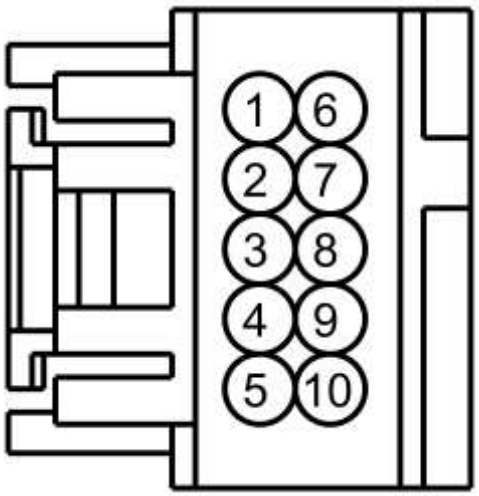
Is the voltage greater than 11 volts?

Yes	INSTALL a new headlamp switch. REFER to Headlamp Switch in this section. CLEAR the DTCs. REPEAT the self-test.
No	REPAIR circuit GD116 (BK/VT) for an open. CLEAR the DTCs. REPEAT the self-test.

D5 CHECK THE HEADLAMP SWITCH INPUT CIRCUITS FOR A SHORT TO GROUND

- Disconnect: SJB C2280B .
- Measure the **resistance** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
C205 Pin 6	CLF23 (WH/VT)	—	Ground
C205 Pin 2	CLS34 (GY)	—	Ground
C205 Pin 7	CLF18 (BU/WH)	—	Ground



Are the resistances greater than 10,000 ohms?

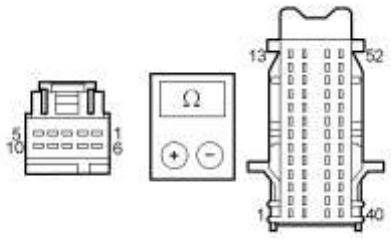
Yes	GO to D6.

No	REPAIR the circuit in question for a short to ground. CLEAR the DTCs. REPEAT the self-test.

D6 CHECK THE HEADLAMP SWITCH INPUT CIRCUITS FOR AN OPEN

- Measure the **resistance** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
C205 Pin 6	CLF23 (WH/VT)	C2280B Pin 47	CLF23 (WH/VT)
C205 Pin 2	CLS34 (GY)	C2280B Pin 31	CLS34 (GY)
C205 Pin 7	CLF18 (BU/WH)	C2280B Pin 30	CLF18 (BU/WH)



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Are the resistances less than 3 ohms?

Yes	GO to D7.
No	REPAIR the circuit in question for an open. CLEAR the DTCs. REPEAT the self-test.

D7 CHECK THE SJB OUTPUT

- Ignition OFF.
- Disconnect: SJB C2280E .
- Ignition ON.

Does the LH or RH headlamp continue to illuminate?

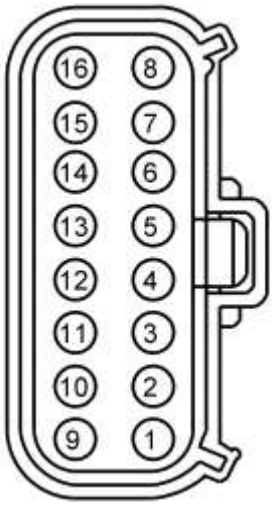
Yes	GO to D8.
No	GO to D9.

D8 CHECK THE SJB LOW BEAM OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Disconnect: Illuminated Headlamp .
- Ignition ON.
- Measure the **voltage** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
LH Headlamp			
C1509 Pin 1	CLF04 (BN/BU)	—	Ground

RH Headlamp			
C1510 Pin 1	CLF05 (BU/GN)	—	Ground



Is any voltage present?

Yes	REPAIR circuit CLF04 (BN/BU) (LH headlamp) or circuit CLF05 (BU/GN) (RH headlamp) for a short to voltage. CLEAR the DTCs. REPEAT the self-test.
No	INSTALL a new ballast. REFER to Ballast in this section. TEST the system for normal operation.

D9 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 Section 419-10. 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: The High Beam(s) Are Always On

Diagnostic Overview

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. Refer to Diagnostic Methods in Section 100-00 for information about these practices.

Refer to Wiring Diagrams Cell 85 , Headlamps/Autolamps for schematic and connector information.

Normal Operation and Fault Conditions

The Smart Junction Box (SJB) sends a voltage signal to the multifunction switch. When the multifunction switch is placed in the FLASH-TO-PASS or HIGH BEAM position, the voltage signal is routed to ground. When the SJB detects a request for flash-to-pass or high

beams (when the low beams are on), the SJB energizes the high beam relay (integrated into the SJB), which routes voltage to the headlamps.

NOTE: *If the high beam circuit is supplied voltage when the headlamps are not on, the headlamps do not illuminate. The circuit only supplies voltage to activate the high beam shutters within the headlamp assemblies. The low beams must be on for light to illuminate from the headlamps.*

- DTC B1510 (Flash To Pass Switch Circuit Short to Ground) — an on-demand DTC that sets when the SJB detects the flash-to-pass request input circuit is short to ground.
- DTC B2A23 (High Beam Input Circuit Short to Ground) — an on-demand DTC that sets when the SJB detects a short to ground on the high beam request input circuit.

PINPOINT TEST E : THE HIGH BEAM(S) ARE ALWAYS ON

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

E1 CHECK FOR DTC B1510 OR DTC B2A23

- Ignition OFF.
- Review the DTCs retrieved from the SJB self-test.

Was DTC B1510 or DTC B2A23 retrieved?

Yes	GO to E2.
No	GO to E4.

E2 CHECK THE MULTIFUNCTION SWITCH

- Disconnect: Multifunction Switch C202 .
- Ignition ON.

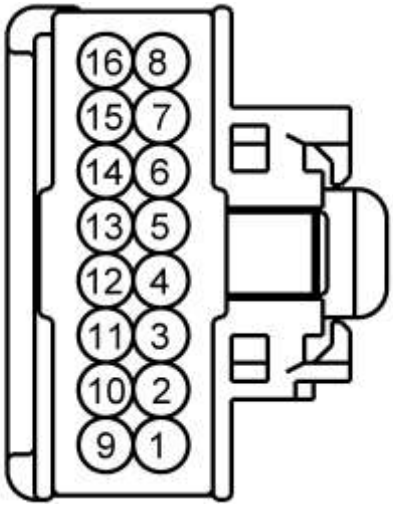
Do the high beams continue to illuminate?

Yes	GO to E3.
No	INSTALL a new multifunction switch. REFER to Section 211-05. CLEAR the DTCs. REPEAT the self-test.

E3 CHECK THE HIGH BEAM AND FLASH-TO-PASS REQUEST INPUT CIRCUITS FOR A SHORT TO GROUND

- Ignition OFF.
- Disconnect: SJB C2280B .
- Measure the **resistance** between:

Positive Lead		Negative Lead	
C202 Pin 4	CLF27 (GN/BN)	—	Ground
C202 Pin 6	CLF17 (WH/OG)	—	Ground



Are the resistances greater than 10,000 ohms?

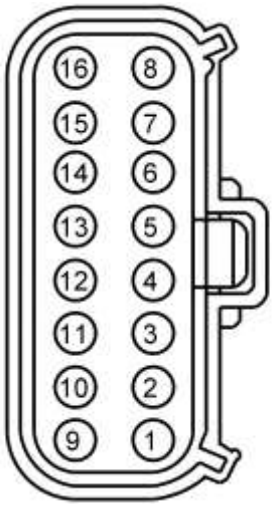
Yes	GO to E5.
No	REPAIR the circuit in question for a short to ground. CLEAR the DTCs. REPEAT the self-test.

E4 CHECK THE SJB HIGH BEAM OUTPUT CIRCUIT FOR A SHORT TO VOLTAGE

NOTE: *If only an individual high beam is always on, install a new headlamp assembly. Refer to Headlamp Assembly in this section.*

- Ignition OFF.
- Disconnect: LH or RH Headlamp .
- Disconnect: SJB C2280E .
- Ignition ON.
- Measure the **voltage** between:

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
LH Headlamp			
C1509 Pin 12	CLF08 (YE/VT)	—	Ground
RH Headlamp			
C1510 Pin 12	CLF08 (YE/VT)	—	Ground



Is any voltage present?

Yes	REPAIR circuit CLF08 (YE/VT) for a short to voltage. CLEAR the DTCs. REPEAT the self-test.
No	GO to E5.

E5 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 Section 419-10. 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 F: The Flash-To-Pass Feature Is Inoperative

Refer to Wiring Diagrams Cell 85 , Headlamps/Autolamps for schematic and connector information.

Normal Operation

The Smart Junction Box (SJB) sends a voltage signal to the multifunction switch. When the multifunction switch is placed in the FLASH-TO-PASS position, the voltage signal is routed to ground. When the SJB detects a request for flash-to-pass, the SJB provides voltage to the high beam headlamps.

If the low beams are off when flash-to-pass is requested, the HID ballasts and the shutters within the headlamps are activated for approximately 0.5 seconds. If the low beams are on when 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.

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Multifunction switch
- SJB

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

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

F1 VERIFY THE HIGH BEAM HEADLAMP OPERATION

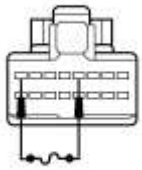
- Ignition ON.
- Place the headlamp switch in the HEADLAMPS ON position.
- Place the multifunction switch in the HIGH BEAM position while observing the headlamps.

Do the high beam headlamps illuminate?

Yes	GO to F2.
No	GO to Pinpoint Test A.

F2 CHECK THE MULTIFUNCTION SWITCH

- Ignition OFF.
- Disconnect: Multifunction Switch C202 .
- Place the headlamp switch in the HEADLAMPS ON position.
- Connect a fused jumper wire between the multifunction switch C202 Pin 4, circuit CLF27 (GN/BN), harness side and the multifunction switch C202 Pin 8, circuit GD116 (BK/VT), harness side.



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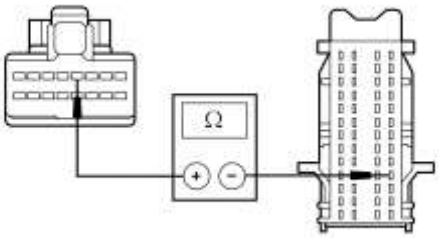
Do the high beams illuminate?

Yes	REMOVE the jumper wire. INSTALL a new multifunction switch. REFER to Section 211-05. TEST the system for normal operation.
No	REMOVE the jumper wire. GO to F3.

F3 CHECK THE FLASH-TO-PASS REQUEST INPUT CIRCUIT FOR AN OPEN

- Place the headlamp switch in the HEADLAMPS OFF position.
- Disconnect: SJB C2280B .
- Measure the resistance between the multifunction switch C202 Pin 4, circuit CLF27 (GN/BN), harness side and the SJB C2280B Pin 43, circuit CLF27 (GN/BN), harness side.



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Is the resistance less than 3 ohms?

Yes	GO to F4.
No	REPAIR circuit CLF27 (GN/BN) for an open. TEST the system for normal operation.

F4 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 Section 419-10. 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.