Charging System - 2.3L EcoBoost (201kW/273PS)

Inspection and Verification

1. Verify the customer concern by operating the charging system.

2. Before diagnosing or repairing the charging system inspect the following items:

- Check the battery for loose, damaged or corroded connections.
- Check the generator for loose, damaged or corroded connections.
- Check engine and battery grounds for loose, damaged or corroded connections.
- Check high current BJB for loose or corroded connections.
- Verify fuses or fusible links.
- Inspect wiring, terminals and connectors.

3. Inspect the FEAD system. REFER to 303-05.

4. Check the battery condition and state of charge.
REFER to: Battery (414-01 Battery, Mounting and Cables, Diagnosis and Testing).

5. Check for abnormal ignition-off current drain(s).
REFER to: Battery Drain Check (414-01 Battery, Mounting and Cables, General Procedures).

6. If an obvious cause for an observed or reported concern is found, repair as necessary (if possible) before proceeding.

7. Using the diagnostic scan tool, retrieve all Diagnostic Trouble Codes (DTCs). Refer to the appropriate DTC Chart in this section.

DTC Charts

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. For information about these practices, REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

BCM DTC Chart

NOTE: *Diagnose all PCM DTCs first.*

DTC	Description	Action
B11DB:02	Battery Monitoring Module "A": General Signal Failure	GO to Pinpoint Test E
B11DB:08	Battery Monitoring Module "A": Bus Signal / Message Failure	GO to Pinpoint Test E
B11DB:09	Battery Monitoring Module "A": Component Failure	GO to Pinpoint Test E
B11DB:11	Battery Monitoring Module "A": Circuit Short To Ground	GO to Pinpoint Test E
B11DB:49	Battery Monitoring Module "A": Internal Electronic Failure	CLEAR the diagnostic trouble codes (DTCs). REPEAT the BCM self-test. If DTC B11DB:49 is retrieved, INSTALL new battery monitoring sensor. REFER to: Battery Monitoring Sensor (414-01 Battery, Mounting and Cables, Removal and Installation).
B11DB:55	Battery Monitoring Module "A": Not Configured	CHECK the vehicle service history for recent service actions related to this module. This DTC sets due to incomplete or incorrect PMI procedures. INSTALL As-Built data from Professional Technician Society (PTS) following diagnostic scan tool instructions under Module Programming>As-Built.
B11DB:9A	Battery Monitoring Module "A": Component or System Operating Conditions	GO to Pinpoint Test E
B1489:11	Battery Monitoring System (BMS) Sensor Power Circuit Short To Ground	GO to Pinpoint Test E
All Other DTCs	—	REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing).

PCM DTC Chart

DTC	Description	Action

P0562	System Voltage Low	GO to Pinpoint Test B
P0563	System Voltage High	GO to Pinpoint Test A
P065B	Generator Control Circuit Range/Performance	GO to Pinpoint Test B
P065C	Generator Mechanical Performance	GO to Pinpoint Test C
P0A3B	Generator Over Temperature	CARRY OUT self-test of the PCMand DIAGNOSE any grille shutter or cooling fan Diagnostic Trouble Codes (DTCs). If no grille shutter or cooling fan Diagnostic Trouble Codes (DTCs) are present, INSTALL a new generator. REFER to: Generator - 2.3L EcoBoost (201kW/273PS) (414-02 Generator and Regulator, Removal and Installation).
P1397	System Voltage Out Of Self-Test Range	If combined with P0562, GO to Pinpoint Test B. If combined with P0563, GO to Pinpoint Test A
U012D	Lost Communication With Generator Control Module	GO to Pinpoint Test F
U042E	Invalid Data Received From Generator Control Module	GO to Pinpoint Test F
All Other DTCs	—	REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), Diagnosis and Testing).

Symptom Chart(s)

Symptom Chart: Charging System

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. For information about these practices, REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

Symptom Chart

Condition	Possible Sources	Actions
System voltage high	Refer to the Pinpoint Test	GO to Pinpoint Test A
System voltage low or battery is discharged	Refer to the Pinpoint Test	GO to Pinpoint Test B
The generator is noisy	Refer to the Pinpoint Test	GO to Pinpoint Test C
Radio interference	Refer to the Pinpoint Test	GO to Pinpoint Test D
Charging system warning indicator is never or always on	• IPC • Generator • PCM • Wiring, terminals or connectors	RETRIEVE Diagnostic Trouble Codes (DTCs) from all modules. If any Diagnostic Trouble Codes (DTCs) are found, Refer to DTC Chart in this section. If no Diagnostic Trouble Codes (DTCs) are found, REFER to: Instrumentation, Message Center and Warning Chimes (413-01 Instrumentation, Message Center and Warning Chimes, Diagnosis and Testing).

Pinpoint Tests

System Voltage High

Refer to Wiring Diagrams Cell 12 for schematic and connector information.

NOTE: *Diagnostic Trouble Code (DTC) P0563 can be set if the vehicle has been recently jump started or the battery has been recently charged. The battery may become discharged due to excessive load(s) on the charging system from aftermarket accessories or if vehicle accessories have been operating for an extended period of time without the engine running.*

Normal Operation and Fault Conditions

With the engine running, the charging system supplies voltage to the battery and the vehicle electrical system through the high current BJB and battery B+ cable. The voltage that is supplied to the vehicle electrical system is used for the operation of the various vehicle systems and modules. Many modules monitor this voltage and if it rises above or below their calibrated setpoints, a DTC sets.

Diagnostic Trouble Code (DTC) Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P0563	System Voltage High	This DTC sets in the PCM when the PCM detects voltage from the charging system greater than 15.9 volts with vehicle speed above 8 km/h (5 mph).

Possible Sources

- Battery
- Generator
- Engine, generator or battery ground
- PCM
- Wiring, terminals or connectors

Visual Inspection and Diagnostic Pre-checks

- Inspect grounds G107 and G110 for loose, damaged or corroded connections.
- Inspect the high current BJB for loose, damaged or corroded connections.

PINPOINT TEST A : SYSTEM VOLTAGE HIGH

NOTE: *Make sure battery voltage is greater than 12.2 volts prior to and during this pinpoint test.*

NOTE: *Do not have a battery charger attached during vehicle testing.*

A1 PERFORM INSPECTION AND VERIFICATION

- Perform Inspection and Verification procedure in this section.

Was an obvious cause for an observed or reported concern found?

Yes	CORRECT the cause as necessary.
No	GO to A2

A2 MONITOR THE GENERATOR VOLTAGE DESIRED (GENVDSD) PID (PARAMETER IDENTIFICATION)

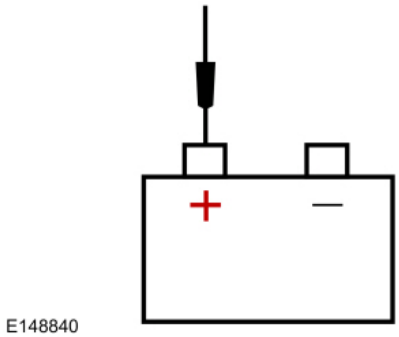
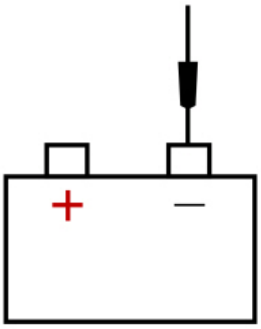
- Start the engine.
- Using a diagnostic scan tool, view the PCM Parameter Identifications (PIDs).
- Monitor the PCM GENVDSD PID.

Does the PID indicate 15.9 volts or less?

Yes	GO to A3
No	GO to A9

A3 COMPARE THE GENERATOR VOLTAGE DESIRED (GENVDSD) PID (PARAMETER IDENTIFICATION) WITH BATTERY VOLTAGE

- With the engine still running at idle, measure and record:

Positive Lead	Measurement / Action	Negative Lead
 E148840		 E148841

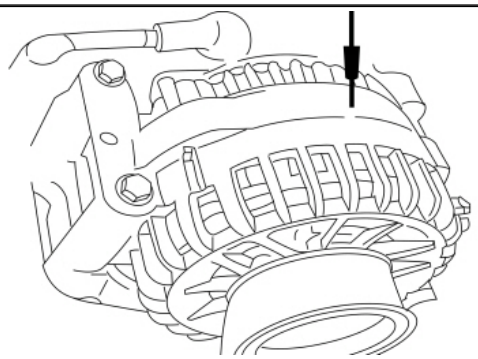
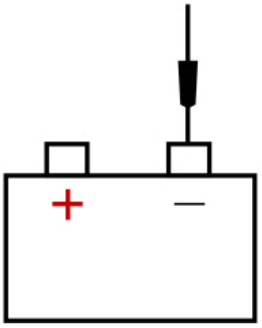
- Using a diagnostic scan tool, view the PCM PID GENVDSD.

Is the recorded battery voltage within ±0.5 volt of the PID?

Yes	The system is operating correctly at this time. The concern may have been caused by an intermittently loose or corroded connector. ADDRESS the root cause of any connector or pin issues.
No	GO to A4

A4 CHECK THE VOLTAGE DROP IN THE VEHICLE GROUNDS

- With the engine still running at idle, headlamps on and heater blower on high, measure the voltage drop between generator case and the battery negative terminal
- Measure and record:

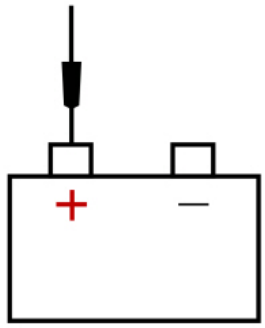
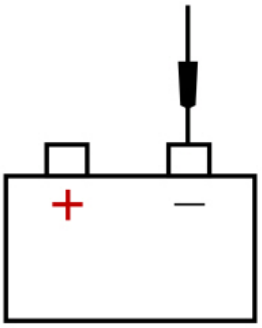
Positive Lead	Measurement / Action	Negative Lead
 Generator case		 E148841

Is the voltage drop less than 0.5 volt?

Yes	GO to A5
No	INSPECT and REPAIR the engine ground, generator ground or the battery ground for corrosion.

A5 MONITOR THE GENERATOR VOLTAGE DESIRED (GENVDSD) PID (PARAMETER IDENTIFICATION) WHILE COMMANDED

- Using a diagnostic scan tool, view the PCM GENVDSD PID.
- Using a diagnostic scan tool active command, set the PCM PID GENVDSD to 14 volts.
- With the engine still running at idle, measure battery and record:

Positive Lead	Measurement / Action	Negative Lead
 E148840		 E148841

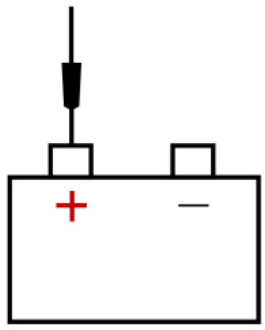
Is the recorded battery voltage within ±0.5 volt of the PID?

Yes	GO to A6
No	INSTALL a new generator. REFER to: Generator - 2.3L EcoBoost (201kW/273PS) (414-02 Generator and Regulator, Removal and Installation).

A6 CHECK THE GENERATOR OUTPUT

- Increase the engine rpm until the generator starts to generate output.
- With the engine running, measure and record:

Positive Lead	Measurement / Action	Negative Lead

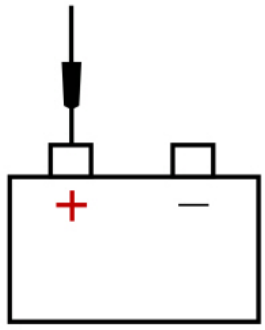
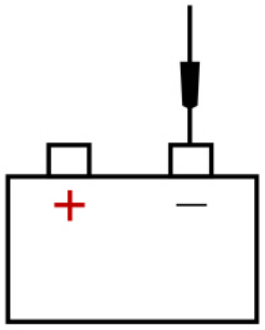
 E148840		Ground

Is the voltage above 15.2 volts?

Yes	INSTALL a new generator. REFER to: Generator - 2.3L EcoBoost (201kW/273PS) (414-02 Generator and Regulator, Removal and Installation).
No	GO to A7

A7 COMPARE THE SUPPLY VOLTAGE (VPWR) PID (PARAMETER IDENTIFICATION) TO BATTERY VOLTAGE

- With the engine running at idle, measure and record:

Positive Lead	Measurement / Action	Negative Lead
 E148840		 E148841

- Using a diagnostic scan tool, view PCM Parameter Identifications (PIDs).
- Monitor the PCM PID VPWR.

Does the PID accurately display battery voltage within ±0.5 volt of the recorded battery voltage?

Yes	INSTALL a new generator. REFER to: Generator - 2.3L EcoBoost (201kW/273PS) (414-02 Generator and Regulator, Removal and Installation).
No	GO to A8

A8 CHECK PCM (POWERTRAIN CONTROL MODULE) SUPPLY VOLTAGE CIRCUITS

- Turn the headlamps and heater blower off.
- Ignition OFF.
- Disconnect BJB PCM power relay.
- Disconnect PCM C175B.
- Ignition ON.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-100		Ground
C175B-101		Ground
C175B-102		Ground

Are the voltages within 0.5 volt of the recorded battery voltage?

Yes	GO to A9
No	REPAIR the affected circuit(s).

A9 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all PCM connectors.
- Repair:
  - corrosion (install new connector or terminals – clean module pins)
  - damaged or bent pins – install new terminals/pins
  - pushed-out pins – install new pins as necessary
- Reconnect the PCM connectors. Make sure they seat and latch correctly.
- Operate the system and determine if the concern is still present.

Is the concern still present?

Yes	CHECK OASIS for any applicable Technical Service Bulletins (TSBs). If a TSB exists for this concern, DISCONTINUE this test and FOLLOW the TSB instructions. If no Technical Service Bulletins (TSBs) address this concern, INSTALL a new PCM. REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), Diagnosis and Testing). CLEAR all Diagnostic Trouble Codes (DTCs) in all modules.
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.

System Voltage Low or Battery is Discharged

Refer to Wiring Diagrams Cell 12 for schematic and connector information.

Normal Operation and Fault Conditions

With the engine running, the charging system supplies voltage to the battery and the vehicle electrical system through the high current BJB and battery B+ cable. The PCM monitors this B+ voltage through PCM VPWR circuits. If the charging system voltage drops 1.5 volts or more below the generator voltage desired (GENVDSD), the DTC sets and the charging system MIL illuminates after 30 seconds.

Diagnostic Trouble Code (DTC) Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P0562	System Voltage Low	If voltage drops 1.5 volts or more below the generator voltage desired (calculated by the PCM), this DTC sets after 30 seconds.
P065B	Generator Control Circuit Range/Performance	This DTC sets when the generator reports an internal regulator failure.
P065C	Generator Mechanical Performance	This DTC sets when the generator reports an internal mechanical failure.

Possible Sources

- Battery
- Fuses or fusible links
- Generator
- PCM
- Wiring, terminals or connectors

Visual Inspection and Diagnostic Pre-checks

- Inspect the FEAD system. REFER to 303-05.
- Inspect for abnormal ignition-off current drain(s).
- Inspect the battery.
- Inspect the high current BJB for loose, damaged or corroded connections.
- Verify BJB fuse F1 (225A).

PINPOINT TEST B : SYSTEM VOLTAGE LOW OR BATTERY IS DISCHARGED

NOTE: *Make sure battery voltage is greater than 12.2 volts prior to and during this pinpoint test.*
NOTE: *Do not have a battery charger attached during vehicle testing.*

B1 PERFORM INSPECTION AND VERIFICATION

- Perform Inspection and Verification procedure in this section.

Was an obvious cause for an observed or reported concern found?

Yes	CORRECT the cause as necessary.
No	GO to B2

B2 RETRIEVE DIAGNOSTIC TROUBLE CODES (DTCS)

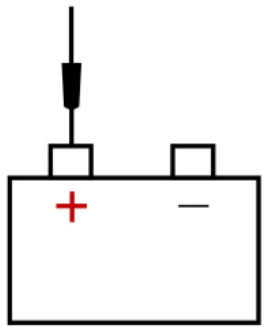
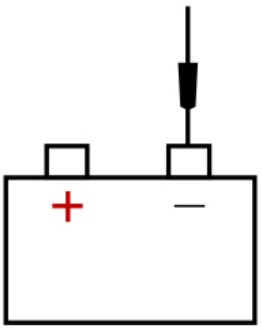
- Using a diagnostic scan tool, perform the PCM self-test.

Is DTC P065B, P065C, U012D or U042E present?

Yes	If P065B and P065C are present, GO to Pinpoint Test C If P065B is present without P065C, INSTALL a new generator. REFER to: Generator - 2.3L EcoBoost (201kW/273PS) (414-02 Generator and Regulator, Removal and Installation). If U012D or U042E is present, GO to Pinpoint Test F
No	GO to B3

B3 CHECK THE GENERATOR CONNECTIONS

- Ignition OFF.
- Disconnect all of the generator connectors and inspect for:
  - corrosion (install new connector or terminals – clean module pins)
  - damaged or bent pins – install new terminals/pins
  - pushed-out pins – install new pins as necessary
- Reconnect the generator connectors. Make sure they seat and latch correctly.
- Measure and record:

Positive Lead	Measurement / Action	Negative Lead
 E148840		 E148841

- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C102B-1		Ground

Is the voltage within 0.5 volt of the recorded battery voltage?

Yes	GO to B4
No	TIGHTEN or INSTALL a new generator B+ nut as needed. REFER to: Generator - 2.3L EcoBoost (201kW/273PS) (414-02 Generator and Regulator, Removal and Installation). VERIFY high current BJB MEGA 1 fuse (225A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.

B4 CHECK THE VOLTAGE DROP IN THE GENERATOR B+ CIRCUIT

- Start the engine.
- With the engine running at idle, headlamps on and blower on high, measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C102B-1		

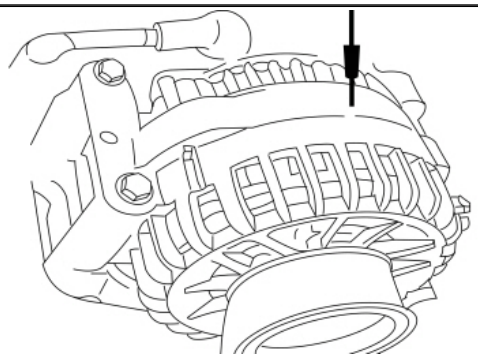
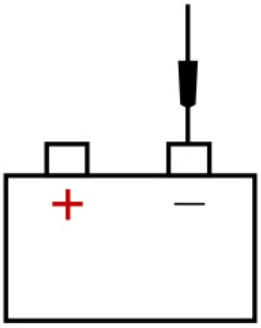
- Perform a wiggle test of the generator wiring and connections while measuring voltage drop.

Is the voltage drop less than 0.5 volt?

Yes	GO to B5
No	INSPECT and REPAIR any corrosion in the generator B+ circuit or positive battery cable connections.

B5 CHECK THE VOLTAGE DROP IN THE VEHICLE GROUNDS

- With the engine still running at idle, headlamps on and heater blower on high, measure:

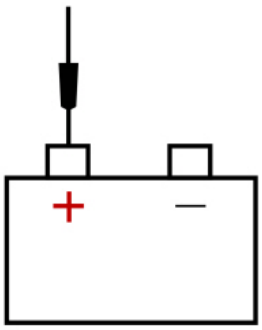
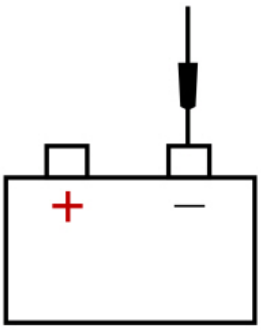
Positive Lead	Measurement / Action	Negative Lead
 Generator case		 E148841

Is the voltage drop less than 0.5 volt?

Yes	GO to B6
No	INSPECT and REPAIR the engine ground, generator ground or the battery ground for corrosion.

B6 MONITOR THE GENERATOR VOLTAGE DESIRED (GENVDSD) PID (PARAMETER IDENTIFICATION) WHILE COMMANDED

- Using a diagnostic scan tool, view the PCM GENVDSD PID.
- Using a diagnostic scan tool active command, set the PCM PID GENVDSD to 14 volts.
- With the engine still running at idle, measure battery and record:

Positive Lead	Measurement / Action	Negative Lead
 E148840		 E148841

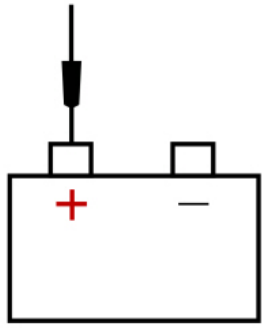
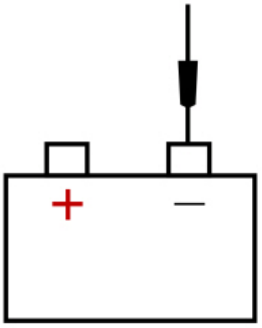
Is the recorded battery voltage within ±0.5 volt of the PID?

Yes	GO to B7

No	INSTALL a new generator. REFER to: Generator - 2.3L EcoBoost (201kW/273PS) (414-02 Generator and Regulator, Removal and Installation).

B7 COMPARE THE SUPPLY VOLTAGE (VPWR) PID (PARAMETER IDENTIFICATION) TO BATTERY VOLTAGE

- With the engine still running at idle, headlamps on and blower on high, measure and record:

Positive Lead	Measurement / Action	Negative Lead
 E148840		 E148841

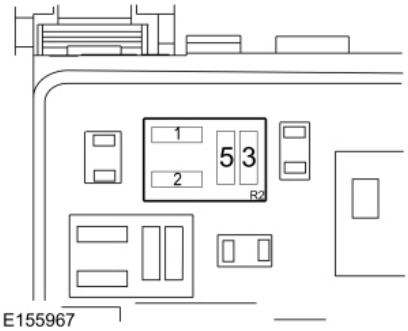
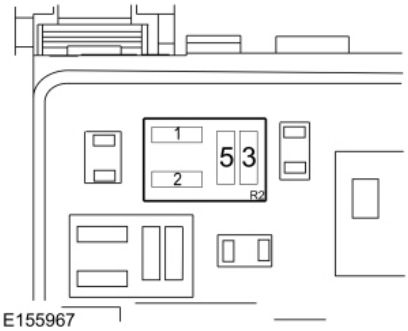
- Using a diagnostic scan tool, view the PCM PID VPWR.

Does the PID accurately display battery voltage within ±0.5 volt of the recorded battery voltage?

Yes	GO to B8
No	REPAIR high resistance or loose connections in the affected PCM power circuit(s).

B8 CHECK PCM (POWERTRAIN CONTROL MODULE) VOLTAGE SUPPLY CIRCUITS

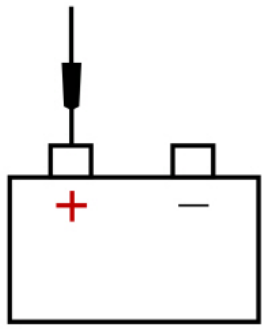
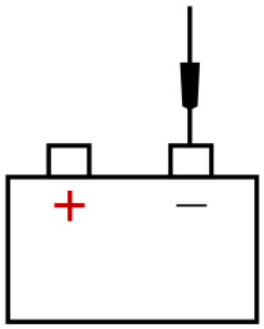
- Ignition OFF.
- Disconnect BJB PCM power relay.
- Disconnect PCM C175B.
- Connect a fused jumper wire:

Positive Lead	Measurement / Action	Negative Lead
 E155967 BJB PCM Relay pin 3		 E155967 BJB PCM Relay pin 5

- **NOTE:** *The following step will load test the circuit. A headlamp bulb would be an effective load. To avoid connector terminal damage, use the Flex Probe Kit for connector connections.*

  Connect the load to a suitable ground connection.
- Measure and record:

Positive Lead	Measurement / Action	Negative Lead

 E148840		 E148841

- Ignition ON.
- Measure and record:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-100		Ground
C175B-101		Ground
C175B-102		Ground

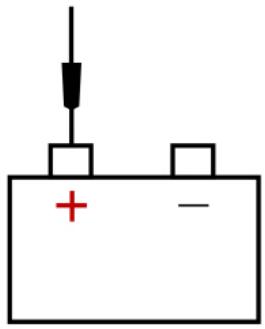
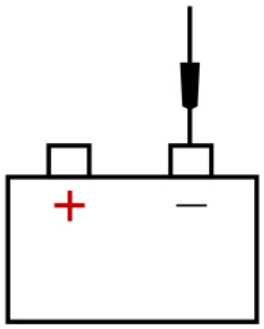
Are the voltages within 0.5 volt of the recorded battery voltage?

Yes	REMOVE the fused jumper wire. GO to B9
No	REPAIR the affected circuit(s).

B9 CHECK PCM (POWERTRAIN CONTROL MODULE) GROUND FOR HIGH RESISTANCE

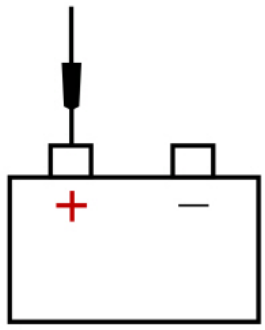
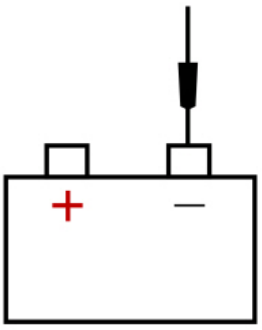
- **NOTE:** *Measure battery voltage at the battery.*

  With the engine still running at idle, turn off all accessory loads, measure and record:

Positive Lead	Measurement / Action	Negative Lead
 E148840		 E148841

- Using a diagnostic scan tool, view PCM PID VPWR and record.
- With the engine still running at idle, turn headlamps ON and blower on HIGH.
- Measure and record:

Positive Lead	Measurement / Action	Negative Lead

 E148840		 E148841

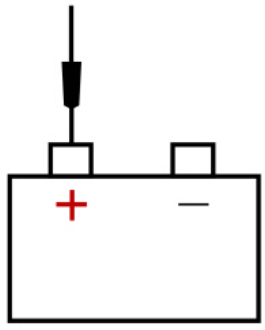
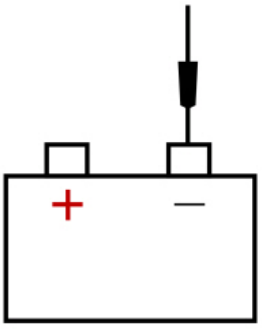
- Using a diagnostic scan tool, view PCM PID VPWR and record.

Does the PID read within ±0.5 volt of battery voltage with accessory loads on and off?

Yes	GO to B10
No	REPAIR the affected PCM ground circuit(s).

B10 MONITOR THE SUPPLY VOLTAGE (VPWR) PID (PARAMETER IDENTIFICATION)

- **NOTE:** *Measure battery voltage at the battery.*
  With the engine still running at idle, turn off all accessory loads.
- Measure and record:

Positive Lead	Measurement / Action	Negative Lead
 E148840		 E148841

- Using a diagnostic scan tool, view PCM PID VPWR and record.
- Momentarily accelerate the engine to Wide Open Throttle (WOT) and release. Repeat this step 4-5 times while continuing to monitor the PID .

Does the PID stay within 0.5 volt of the recorded battery voltage when the engine Revolutions Per Minute (RPM) are increased?

Yes	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. INSPECT and REPAIR any connector or pin issues found. If no connector or pin issues are found, PERFORM the battery drain test. REFER to: Battery Drain Check (414-01 Battery, Mounting and Cables, General Procedures).
No	GO to B11

B11 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all PCM connectors.
- Repair:
  - corrosion (install new connector or terminals – clean module pins)
  - damaged or bent pins – install new terminals/pins
  - pushed-out pins – install new pins as necessary
- Reconnect the PCM connectors. Make sure they seat and latch correctly.
- Operate the system and determine if the concern is still present.

Is the concern still present?

Yes	CHECK OASIS for any applicable Technical Service Bulletins (TSBs). If a TSB exists for this concern, DISCONTINUE this test and FOLLOW the TSB instructions. If no Technical Service Bulletins (TSBs) address this concern, INSTALL a new PCM. REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), Diagnosis and Testing). CLEAR all Diagnostic Trouble Codes (DTCs) in all modules.
No	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. ADDRESS the root cause of any connector or pin issues.

Generator Noise or Mechanical Performance

Normal Operation and Fault Conditions

The generator is belt-driven by the engine FEAD system. There are several sources of generator noise which include bearing noise, electrical fault noise, generator or belt pulley misalignment. A generator with certain types of diode or stator failures can also produce an audible noise.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P065C	Generator Mechanical Performance	This DTC sets when the generator reports an internal mechanical failure.

Possible Sources

- FEAD belt
- Loose bolts/brackets
- Generator/pulleys

Visual Inspection and Diagnostic Pre-checks

- Inspect the FEAD belt.
- Inspect for loose bolts/brackets.
- Inspect the generator/pulley.

PINPOINT TEST C : GENERATOR NOISE OR MECHANICAL PERFORMANCE

C1 CHECK FOR ACCESSORY DRIVE BELT NOISE AND LOOSE MOUNTING BRACKETS

- Ignition OFF.
- Check the FEAD belt and tensioner for damage and correct installation.
  REFER to: Accessory Drive (303-05 Accessory Drive - 2.3L EcoBoost (201kW/273PS), Diagnosis and Testing).

Is the accessory drive OK?

Yes	GO to C2
No	REPAIR as necessary.

C2 CHECK THE GENERATOR MOUNTING

- Check the generator mounting for loose bolts or misalignment.

Is the generator mounted correctly?

Yes	GO to C3
No	REPAIR as necessary.

C3 CHECK THE GENERATOR FOR NOISE

- Start the engine.
- With the engine running, use a stethoscope or equivalent listening device to probe the generator and the accessory drive area for unusual mechanical noise.

Is the generator the noise source?

Yes	INSTALL a new generator. REFER to: Generator - 2.3L EcoBoost (201kW/273PS) (414-02 Generator and Regulator, Removal and Installation).
No	Diagnose the source of the engine noise. REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing).

Radio Interference

Refer to Wiring Diagrams Cell 12 for schematic and connector information.

Normal Operation and Fault Conditions

The generator radio suppression equipment reduces interference transmitted through the speakers by the vehicle electrical system.

NOTE: *If the Original Equipment Manufacturer (OEM) Audio Control Module (ACM) has been replaced with an aftermarket unit, the vehicle may not pass this test. Return the vehicle to Original Equipment Manufacturer (OEM) condition before following this pinpoint test.*

NOTE: *If the engine is operated at greater than 2,000 Revolutions Per Minute (RPM) momentarily, the generator self-excites. Make sure when the generator is disconnected the engine rpm stays below 2,000 Revolutions Per Minute (RPM). If it rises above 2,000 Revolutions Per Minute (RPM), turn the ignition to the OFF position and start the test over again.*

NOTE: *Inspect for any aftermarket accessories that have been added to the vehicle. Check the wiring for these accessories and be sure they have not been attached to the generator circuits and are positioned away from the generator wiring.*

Possible Sources

- Generator
- In-vehicle entertainment system
- Wiring, terminals or connectors

Visual Inspection and Diagnostic Pre-checks

- Inspect the generator.
- Inspect the in-vehicle entertainment system.

PINPOINT TEST D : RADIO INTERFERENCE

D1 VERIFY THE GENERATOR IS THE SOURCE OF THE AUDIO SYSTEM INTERFERENCE

- Start the engine.
- Allow the engine to idle.
- Tune the audio system to a station where interference is present.
- Ignition OFF.
- Disconnect Generator C102B.
- Start the engine.
- Allow the engine to idle.

Is the interference present with the generator disconnected?

Yes	DIAGNOSE the audio system. Refer to the appropriate section in Group 415 for the procedure.
No	INSTALL a new generator. REFER to: Generator - 2.3L EcoBoost (201kW/273PS) (414-02 Generator and Regulator, Removal and Installation).

Battery Monitoring Sensor Faults

Refer to Wiring Diagrams Cell 12 for schematic and connector information.

Normal Operation and Fault Conditions

The BCM monitors the battery state of charge using the battery monitoring sensor attached to the negative battery cable. Battery voltage is hardwired to the battery monitoring sensor and data is transferred from the battery monitoring sensor to the BCM via a LIN circuit.

Diagnostic Trouble Code (DTC) Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
B11DB:02	Battery Monitoring Module "A": General Signal Failure	This DTC sets if the BCM receives corrupted data from the battery monitoring sensor over the LIN.
B11DB:08	Battery Monitoring Module "A": Bus Signal / Message Failure	This DTC sets if the BCM receives corrupted data from the battery monitoring sensor over the LIN.
B11DB:09	Battery Monitoring Module "A": Component Failure	This DTC sets if the BCM detects a fault on the battery monitoring sensor LIN.
B11DB:11	Battery Monitoring Module "A": Circuit Short To Ground	This DTC sets if the BCM detects low voltage on the battery monitoring sensor

		LIN.
B11DB:9A	Battery Monitoring Module "A": Component or System Operating Conditions	This DTC sets if the BCM receives corrupted data from the battery monitoring sensor over the LIN.
B1489:11	Battery Monitoring System (BMS) Sensor Power Circuit Short To Ground	This DTC sets if the BCM receives no data from the battery monitoring sensor over the LIN.

Possible Sources

- Battery monitoring sensor
- BCM
- Wiring, terminals or connectors

Visual Inspection and Diagnostic Pre-checks

- Inspect the battery monitoring sensor.
- Inspect the battery monitoring sensor connector.
- Inspect the BJB fuse 1 (225A).

PINPOINT TEST E : BATTERY MONITORING SENSOR FAULTS

NOTE: *Make sure battery voltage is greater than 12.2 volts prior to and during this pinpoint test.*

NOTE: *Do not have a battery charger attached during vehicle testing.*

E1 CHECK ELECTRICAL CONNECTOR CONDITION

- Disconnect Battery Monitoring Sensor C1647.
- Check the Battery Monitoring Sensor electrical connections for security, damage and corrosion.
- Check the battery cable connections.
- Connect Battery Monitoring Sensor C1647.

Are all connectors clean and connected properly?

Yes	GO to E2
No	REPAIR any corrosion in the battery cable connections. REPAIR any damaged, bent or pushed-out pins.

E2 RETRIEVE BCM (BODY CONTROL MODULE) DIAGNOSTIC TROUBLE CODES (DTCS)

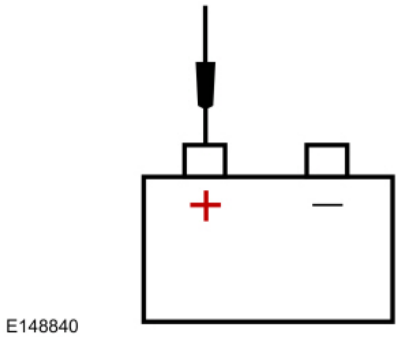
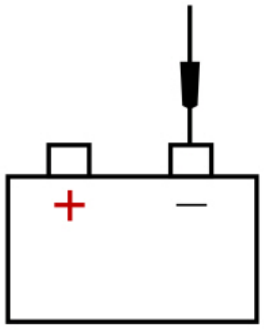
- Ignition ON.
- Using a diagnostic scan tool, clear all Diagnostic Trouble Codes (DTCs) in all modules.
- Using a diagnostic scan tool, perform the BCM self-test.

Did the DTC return?

Yes	GO to E3
No	For any PCM or BCM Diagnostic Trouble Codes (DTCs) refer to DTC charts in this section. The concern may have been caused by a loose or corroded connector. ADDRESS the root cause of any connector or pin issues.

E3 CHECK THE BATTERY MONITORING SENSOR SUPPLY VOLTAGE

- Ignition OFF.
- Disconnect Battery Monitoring Sensor C1647.
- Measure and record:

Positive Lead	Measurement / Action	Negative Lead
 E148840		 E148841

- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C1647-2		Ground

Is the voltage within 0.5 volt of the recorded battery voltage?

Yes	GO to E4
No	VERIFY BJB fuse 1 (225A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.

E4 CHECK THE BATTERY MONITORING SENSOR LIN (LOCAL INTERCONNECT NETWORK) CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition ON.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C1647-1		Ground

Is the voltage greater than 10 volts?

Yes	REPAIR the circuit.
No	GO to E5

E5 CHECK THE BATTERY MONITORING SENSOR LIN (LOCAL INTERCONNECT NETWORK) CIRCUIT FOR A SHORT TO GROUND

- Ignition OFF.
- Disconnect BCM C2280C.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C1647-1	Ω	Ground

Is the resistance greater than 10,000 ohms?

Yes	GO to E6
No	REPAIR the circuit.

E6 CHECK THE BATTERY MONITORING SENSOR LIN (LOCAL INTERCONNECT NETWORK) CIRCUIT FOR AN OPEN

- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C1647-1	Ω	C2280C-4

Is the resistance less than 3 ohms?

Yes	INSTALL a new battery monitoring sensor. REFER to: Battery Monitoring Sensor (414-01 Battery, Mounting and Cables, Removal and Installation). CLEAR all Diagnostic Trouble Codes and PERFORM self-test again. If BCM DTC U1007:00 returns, GO to E7
No	REPAIR the circuit.

E7 CHECK FOR CORRECT BCM (BODY CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all BCM connectors.

- Repair:
  - corrosion (install new connector or terminals – clean module pins)
  - damaged or bent pins – install new terminals/pins
  - pushed-out pins – install new pins as necessary
- Reconnect the BCM connectors. Make sure they seat and latch correctly.
- Operate the system and determine if the concern is still present.

Is the concern still present?

Yes	CHECK OASIS for any applicable Technical Service Bulletins (TSBs). If a TSB exists for this concern, DISCONTINUE this test and FOLLOW the TSB instructions. If no Technical Service Bulletins (TSBs) address this concern, INSTALL a new BCM. REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Removal and Installation).
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.

DTC U012D, U042E

Refer to Wiring Diagrams Cell 12 for schematic and connector information.

Normal Operation and Fault Conditions

The charging system supplies voltage to the battery and the vehicle electrical system through the battery B+ cable. The PCM monitors the generator output through a LIN communication circuit. The PCM uses this LIN circuit to communicate the desired voltage setpoint to the generator internal voltage regulator. The generator also uses this to communicate the generator load and error conditions to the PCM.

Diagnostic Trouble Code (DTC) Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
U012D	Lost Communication With Generator Control Module	Sets if the PCM does not detect communication through the LIN circuit. This can be a result of an open or short in the LIN circuit. This DTC also sets if the generator B+ circuit is open.
U042E	Invalid Data Received From Generator Control Module	Sets when the PCM receives invalid data from the generator.

Possible Sources

- Active grille shutters
- Battery monitoring sensor
- Generator
- PCM
- Wiring, terminals or connectors

Visual Inspection and Diagnostic Pre-checks

- Inspect high current BJB for loose, damaged or corroded connections.
- Inspect the BJB fuse 1 (225A).
- Inspect the FEAD belt.

PINPOINT TEST F : DTC U012D, U042E

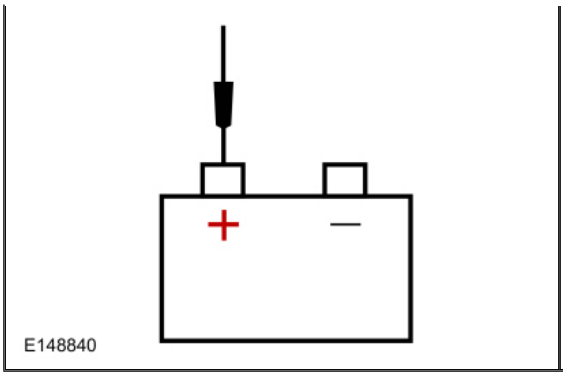
NOTE: *Make sure battery voltage is greater than 12.2 volts prior to and during this pinpoint test.*

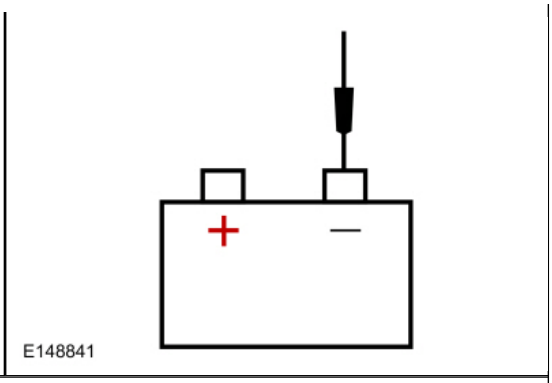
NOTE: *Do not have a battery charger attached during vehicle testing.*

F1 COMPARE THE GENERATOR B+ CIRCUIT TO BATTERY VOLTAGE

- Measure and record:

Positive Lead	Measurement / Action	Negative Lead
		





- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C102B-1	V	Ground

Is the voltage within 0.5 volt of the recorded battery voltage?

Yes	GO to F2
No	TIGHTEN or INSTALL a new generator B+ nut as needed. REFER to: Generator - 2.3L EcoBoost (201kW/273PS) (414-02 Generator and Regulator, Removal and Installation). VERIFY high current BJB fuse MEGA 1 (225A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.

F2 CHECK THE GENERATOR LIN (LOCAL INTERCONNECT NETWORK) CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Disconnect Generator C102A.
- Disconnect PCM C175B.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C102A-1	V	Ground

Is any voltage present?

Yes	REPAIR the circuit.
No	GO to F3

F3 CHECK THE GENERATOR LIN (LOCAL INTERCONNECT NETWORK) CIRCUIT FOR A SHORT TO GROUND

- Ignition OFF.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C102A-1	Ω	Ground

Is the resistance greater than 10,000 ohms?

Yes	GO to F4
No	REPAIR the circuit.

F4 CHECK THE GENERATOR LIN (LOCAL INTERCONNECT NETWORK) CIRCUIT FOR AN OPEN

- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C102A-1	Ω	C175B-47

Is the resistance less than 3 ohms?

Yes	INSTALL a new generator. REFER to: Generator - 2.3L EcoBoost (201kW/273PS) (414-02 Generator and Regulator, Removal and Installation). REPEAT the PCM self-test. If DTC U012D is retrieved again, GO to F5
No	REPAIR the affected circuit.

F5 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all PCM connectors.
- Repair:
  - corrosion (install new connector or terminals – clean module pins)
  - damaged or bent pins – install new terminals/pins
  - pushed-out pins – install new pins as necessary
- Reconnect the PCM connectors. Make sure they seat and latch correctly.
- Operate the system and determine if the concern is still present.

Is the concern still present?

Yes	CHECK OASIS for any applicable Technical Service Bulletins (TSBs). If a TSB exists for this concern, DISCONTINUE this test and FOLLOW the TSB instructions. If no Technical Service Bulletins (TSBs) address this concern, INSTALL a new PCM. REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), Diagnosis and Testing). CLEAR all Diagnostic Trouble Codes (DTCs) in all modules.
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.