Starting System

Inspection and Verification

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

1. Verify the customer concern.
2. Check the battery for loose, damaged or corroded connections.
3. Check the starter for loose, damaged or corroded connections.
4. Check the battery condition and state of charge.
   REFER to: Battery Charging (414-01 Battery, Mounting and Cables, General Procedures).
5. Using the crankshaft, rotate the engine. Verify the crankshaft and each of the components driven by the accessory drive belt rotate and are not seized or damaged.
6. If any aftermarket accessories have been added to the vehicle, make sure they are properly wired.
7. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding.

DTC Charts

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

BCM DTC Chart

DTC	Description	Action
C113A:11	PCM Wake-up Signal: Circuit Short to Ground	Without push-button start, REFER to: Passive Anti-Theft System (PATS) (419-01B Passive Anti-Theft System (PATS), Diagnosis and Testing). With push-button start, GO to Pinpoint Test D
C113A:15	PCM Wake-up Signal: Circuit Short to Battery or Open	Without push-button start, REFER to: Passive Anti-Theft System (PATS) (419-01B Passive Anti-Theft System (PATS), Diagnosis and Testing). With push-button start, GO to Pinpoint Test D
All Other DTCs	-	REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing).

PCM DTC Chart

DTC	Description	Action
P06E4	Control Module Wake-up Circuit Performance	RETRIEVE and RECORD all CMDTCs. If BCM DTC C113A:11 or C113A:15 is found, REFER to the BCM DTC Chart in this section. Clear all Diagnostic Trouble Codes (DTCs). RERUN the PCM self-test. If the DTC returns, CHECK OASIS for any applicable Technical Service Bulletins (TSBs). If no Technical Service Bulletins (TSBs) address this concern, INSTALL a new PCM REFER to: Powertrain Control Module (PCM) (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), Removal and Installation).
P06E9	Engine Starter Performance	If the engine cranks, Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual. If the engine does not crank, for vehicles without push button start, GO to Pinpoint Test A For vehicles with push button start, GO to Pinpoint Test B
P162F	Starter Motor Disabled - Engine Crank Time Too Long	This DTC sets in the PCM when the engine has been cranked for more than a total of 60 seconds without allowing sufficient time for the starter to cool. Diagnose all other DTCs and symptoms. Check the charging system voltage and correct as necessary. Clear the DTC.
P2535	Ignition Switch Run/Start Position Circuit High	For vehicles without Push button start, GO to Pinpoint Test E For vehicles with Push button start, 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).

RTM DTC Chart

DTC	Description	Action
All DTCs	-	REFER to: Tire Pressure Monitoring System (TPMS) (204-04B Tire Pressure Monitoring System (TPMS), Diagnosis and Testing).

Symptom Chart(s)

Symptom Chart: Starting System

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

Symptom Chart

Condition	Possible Sources	Actions
The engine does not crank — without Push-button Start	Refer to the Pinpoint Test.	GO to Pinpoint Test A
The engine does not crank — with Push-button Start	Refer to the Pinpoint Test.	GO to Pinpoint Test B
The engine cranks slowly	Refer to the Pinpoint Test.	PERFORM the starter system component test. REFER to Starter Motor - Positive Circuit Test in this section.
The engine cranks but will not start	• Fuses • PCM • Fuel pump • Fuel pump relay • Run/start relay • Starter • Wiring	Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.
Unusual starter noise	Refer to the Pinpoint Test.	GO to Pinpoint Test C
The starter spins but the engine does not crank	Starter motor	INSPECT the starter motor mounting and engagement. REPAIR as necessary.
	Damaged flexplate	INSPECT the flexplate for damaged, missing or worn teeth. REPAIR as necessary.
The starter does not disengage from the flexplate	• Starter relay • Wiring, terminals or connectors	REMOVE the starter relay. If the engine stops cranking, INSTALL a new relay. If the engine continues to crank, REPAIR circuit CDC35 (BU/WH) for a short to voltage.
The remote start is inoperative	• Remote start feature not enabled • Passive Key • Hood switch input • PCM • Wiring, terminals or connectors	REFER to: Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Diagnosis and Testing).
The remote start has poor range performance	• Passive Key or battery • After market systems • High power devices • TV/radio transmission towers • RTM	Diagnose The RKE Transmitter Has Poor Range Performance, REFER to: Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Diagnosis and Testing).

Pinpoint Test(s)

Engine Does Not Crank - without Push-button Start

Refer to Wiring Diagrams Cell 20 for schematic and connector information.

Normal Operation and Fault Conditions

REFER to: Starting System - System Operation and Component Description (303-06 Starting System - 2.3L EcoBoost (201kW/273PS), Description and Operation).

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P06E9	Engine Starter Performance	No engine rotation detected during crank event.

Possible Sources

- Battery
- Battery cables
- Starter motor
- BJB starter relay

Visual Inspection and Diagnostic Pre-checks

- Inspect the Run/start relay.
- Inspect the high current BJB connections.
- Verify the BJB fuse 84 (30A).
- Verify the BCM fuse 18 (5A).
- Inspect the Integrated Keyhead Transmitter (IKT).

PINPOINT TEST A : ENGINE DOES NOT CRANK - WITHOUT PUSH-BUTTON START

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 VERIFY THE BCM (BODY CONTROL MODULE) AND PCM (POWERTRAIN CONTROL MODULE) PASS THE NETWORK TEST

- Ignition ON.
- Using a diagnostic scan tool, perform the Network Test.

Did the BCM and PCM pass the Network Test?

Yes	GO to A3
No	REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).

A3 RETRIEVE DIAGNOSTIC TROUBLE CODES (DTCS)

- Using a diagnostic scan tool, perform BCM and PCM self-tests.

Are any Diagnostic Trouble Codes (DTCs) present?

Yes	For all BCM Diagnostic Trouble Codes (DTCs), refer to the BCM DTC Chart in this section. For PCM DTC P06E9, GO to A4 For all other PCM Diagnostic Trouble Codes (DTCs), REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), Diagnosis and Testing).
No	GO to A4

A4 CHECK BCM (BODY CONTROL MODULE) IGN_SW_STATE PID (PARAMETER IDENTIFICATION)

- Using a diagnostic scan tool, view the BCM Parameter Identifications (PIDs).
- Monitor the BCM PID IGN_SW_STATE while turning the ignition switch from OFF to START.

Does the PID change from Off to Start when the ignition switch is turned from OFF to START?

Yes	GO to A5
No	DIAGNOSE No power in Start. REFER to: Steering Wheel and Column Electrical Components (211-05 Steering Wheel and Column Electrical Components, Diagnosis and Testing).

A5 CHECK THE PCM (POWERTRAIN CONTROL MODULE) IN GEAR-TRANSMISSION IS APPLYING A LOAD TO ENGINE (IN_GEAR) PID (PARAMETER IDENTIFICATION)

- Using a diagnostic scan tool, view the PCM Parameter Identifications (PIDs).
- Monitor the PCM PID IN_GEAR, while placing the gear selector in PARK and then NEUTRAL.

Does the PID read No in both positions?

Yes	GO to A6
No	REFER to: Diagnostic Trouble Code (DTC) Charts and Pinpoint Tests - 2.3L EcoBoost (201kW/273PS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

A6 CHECK THE PCM (POWERTRAIN CONTROL MODULE) ENGINE CRANKING (ENG_CRANK) PID (PARAMETER IDENTIFICATION)

- Make sure the transmission is in PARK or NEUTRAL.
- Using a diagnostic scan tool, view the PCM Parameter Identifications (PIDs).
- Monitor the PCM PID ENG_CRANK while turning the ignition switch to the START position.

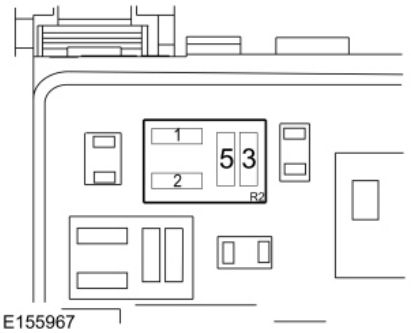
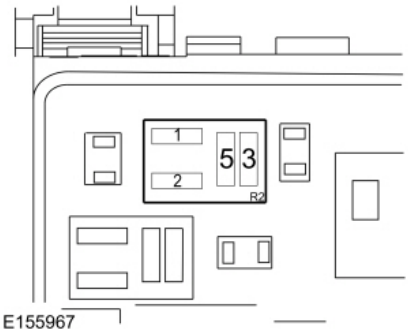
Does the PID change from Inactive to Active?

Yes	GO to A7
No	GO to A17

A7 CHECK THE STARTER RELAY CONTROL OPERATION

NOTICE: The following step uses a test light to simulate normal circuit loads. To avoid connector terminal damage, use the Flex Probe Kit for the test light probe connection to the vehicle. Do not use the test light probe directly on any connector.

- Remove the BJB starter relay.
- Measure:

Positive Lead	Measurement / Action	Negative Lead
 BJB starter relay pin 2		 BJB starter relay pin 1

- Make sure the transmission is in PARK or NEUTRAL.
- While holding the key in the START position, observe the test light.

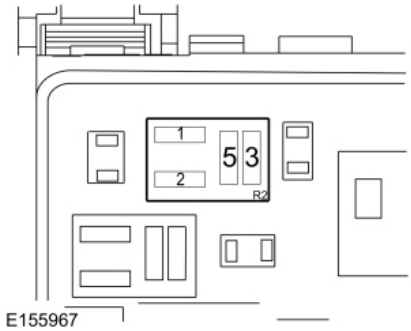
Does the test light illuminate when the key is in the START position?

Yes	GO to A8
No	GO to A15

A8 CHECK THE VOLTAGE TO THE STARTER RELAY

- Measure:

Positive Lead	Measurement / Action	Negative Lead
		Ground

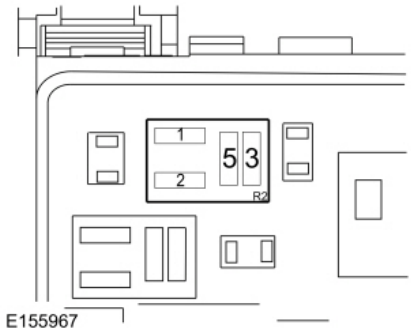
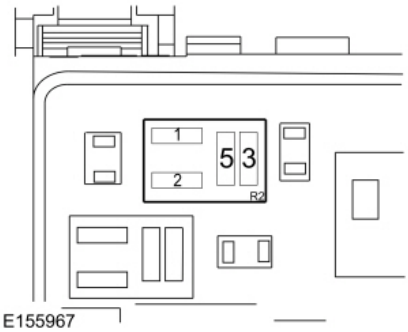
 BJB starter relay pin 3		

Is the voltage greater than 11 volts?

Yes	GO to A9
No	VERIFY the BJB fuse 84 (30A) is OK. If OK, REPAIR the circuit for an open. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.

A9 CHECK THE STARTER MOTOR OPERATION AT THE STARTER RELAY

- Ignition OFF.
- With the transmission in PARK or NEUTRAL, momentarily connect a fused jumper wire:

Positive Lead	Measurement / Action	Negative Lead
 BJB starter relay pin 3		 BJB starter relay pin 5

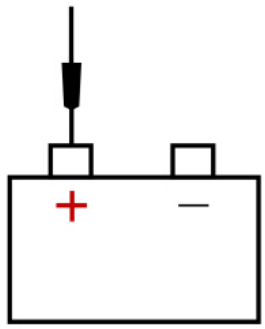
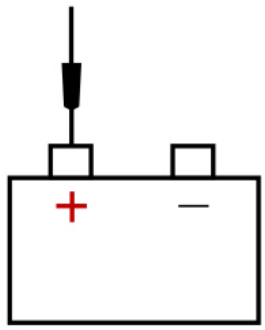
Did the starter engage and the engine crank?

Yes	INSTALL a new starter relay.
No	GO to A10

A10 CHECK THE BATTERY GROUND CABLES

- Measure:

Positive Lead	Measurement / Action	Negative Lead
		Ground G107

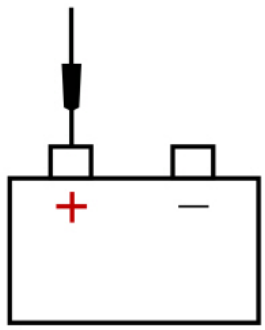
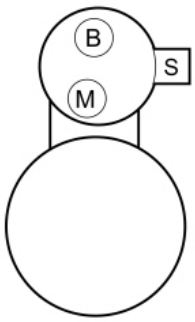
 E148840		
 E148840		Ground G110

Are the voltages greater than 11 volts?

Yes	GO to A11
No	CLEAN or INSTALL new negative battery cables as necessary. REFER to: Battery Cables - 2.3L EcoBoost (201kW/273PS) (414-01 Battery, Mounting and Cables, Removal and Installation).

A11 CHECK THE STARTER MOTOR GROUND

- Measure:

Positive Lead	Measurement / Action	Negative Lead
 E148840		 E148837 Starter motor case

Is the voltage greater than 11 volts?

Yes	GO to A12
No	CLEAN the starter motor mounting flange and MAKE SURE the starter motor is correctly mounted. REFER to: Starter Motor (303-06 Starting System - 2.3L EcoBoost (201kW/273PS), Removal and Installation).

A12 CHECK THE VOLTAGE TO THE STARTER MOTOR

- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C197A-1 ("B" terminal)	V	Ground

Is the voltage greater than 11 volts?

Yes	GO to A13
No	INSTALL a new positive battery cable. REFER to: Battery Cables - 2.3L EcoBoost (201kW/273PS) (414-01 Battery, Mounting and Cables, Removal and Installation).

A13 CHECK THE STARTER MOTOR FOR CORRECT OPERATION

- Perform Starter Motor - Positive Circuit Test in this section.

Was an obvious cause found?

Yes	Correct the cause as necessary.
No	GO to A14

A14 CHECK FOR START INPUT AT THE STARTER

- Connect BJB starter relay.
- Disconnect Starter solenoid C197B.
- While holding the key in the START position, measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C197B-1 ("S" terminal)	V	Ground

Is the voltage greater than 11 volts?

Yes	CLEAN the starter solenoid "S" terminal and starter solenoid connector. CHECK the wiring and the starter motor for a loose or intermittent connection.
No	REPAIR the circuit for an open.

A15 CHECK THE PCM (POWERTRAIN CONTROL MODULE) STARTER RELAY CONTROL CIRCUITS FOR A SHORT TO GROUND

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

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-71	Ω	Ground
C175B-69	Ω	Ground

Are the resistances greater than 10,000 ohms?

Yes	GO to A16
No	REPAIR the affected circuit.

A16 CHECK THE PCM (POWERTRAIN CONTROL MODULE) STARTER RELAY CONTROL CIRCUITS FOR AN OPEN

- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-71	Ω	BJB starter relay pin 2
C175B-69	Ω	BJB starter relay pin 1

Are the resistances less than 3 ohms?

Yes	GO to A17
No	REPAIR the affected circuit.

A17 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all PCM connectors.
- Repair:
  - corrosion (install new connectors 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: Powertrain Control Module (PCM) (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), 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.

Engine Does Not Crank - with Push-Button Start

Refer to Wiring Diagrams Cell 20 for schematic and connector information.

Normal Operation and Fault Conditions

REFER to: Starting System - System Operation and Component Description (303-06 Starting System - 2.3L EcoBoost (201kW/273PS), Description and Operation).

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P06E9	Engine Starter Performance	No engine rotation detected during crank event

Possible Sources

- Battery
- Battery cables
- IPC
- Starter motor
- BJB starter relay

Visual Inspection and Diagnostic Pre-checks

- Inspect the Run/start relay.
- Inspect the high current BJB connections.
- Verify the BJB fuse 84 (30A).
- Verify the BCM fuse 18 (5A).
- Inspect the Integrated Keyhead Transmitter (IKT).

PINPOINT TEST B : ENGINE DOES NOT CRANK - WITH PUSH-BUTTON START

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 CHECK FOR NO KEY DETECTED MESSAGE IN THE MESSAGE CENTER

- **NOTE:** *There are certain areas inside the vehicle where the IA key may not be detected and the message center displays NO KEY DETECTED. If the IA key is in the far outside edges of the interior (like in a door map pocket or above a sun visor) it might not be detected. Move the IA key to a different location and try to start the vehicle again.*

  Check the message displayed in the message center while pressing the ignition switch - push button start.

Is NO KEY DETECTED displayed?

Yes	Diagnose the NO KEY DETECTED concern. REFER to: Passive Anti-Theft System (PATS) (419-01B Passive Anti-Theft System (PATS), Diagnosis and Testing).
No	GO to B3

B3 VERIFY THE BCM (BODY CONTROL MODULE) AND PCM (POWERTRAIN CONTROL MODULE) PASS THE NETWORK TEST

- Ignition ON.
- Using a diagnostic scan tool, perform the Network Test.

Did the BCM and PCM pass the Network Test?

Yes	GO to B4
No	REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).

B4 RETRIEVE DIAGNOSTIC TROUBLE CODES (DTCS)

- Using a diagnostic scan tool, perform BCM and PCM self-tests.

Are any Diagnostic Trouble Codes (DTCs) present?

Yes	For all BCM Diagnostic Trouble Codes (DTCs), refer to the BCM DTC Chart in this section. For PCM DTC P06E9 GO to B5 For all other PCM Diagnostic Trouble Codes (DTCs), REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), Diagnosis and Testing).
No	GO to B5

B5 CHECK THE OPERATION OF THE STOPLAMPS

- While observing the stoplamps, apply the brake pedal.

Do the stoplamps illuminate?

Yes	GO to B6
No	Diagnose All the Stoplamps are inoperative. REFER to: Stoplamps (417-01 Exterior Lighting, Diagnosis and Testing).

B6 CHECK THE BRAKE PEDAL POSITION (BOO1) PID (PARAMETER IDENTIFICATION)

- Using a diagnostic scan tool, view PCM Parameter Identifications (PIDs)
- Monitor the PCM B001 PID while applying the brake pedal.

Does the PID read On?

Yes	GO to B8
No	GO to B7

B7 CHECK THE BPP (BRAKE PEDAL POSITION) SWITCH CIRCUIT FOR VOLTAGE AT THE PCM (POWERTRAIN CONTROL MODULE)

- Ignition OFF.
- Disconnect PCM C175B.
- While applying the brake pedal, measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-10		Ground

Is the voltage greater than 11 volts?

Yes	GO to B21
No	REPAIR the circuit.

B8 CHECK BCM (BODY CONTROL MODULE) IGN_SW_STATE PID (PARAMETER IDENTIFICATION)

- Using a diagnostic scan tool, view the BCM Parameter Identifications (PIDs).
- Make sure the transmission is in PARK or NEUTRAL.
- Monitor the BCM PID IGN_SW_STATE while pressing the ignition switch - push button start and the brake pedal.

Does the PID change from Off to Start when the ignition switch - push button start and the brake pedal are pressed?

Yes	GO to B9
No	DIAGNOSE No power in Start. REFER to: Steering Wheel and Column Electrical Components (211-05 Steering Wheel and Column Electrical Components, Diagnosis and Testing).

B9 CHECK THE PCM (POWERTRAIN CONTROL MODULE) IN GEAR-TRANSMISSION IS APPLYING A LOAD TO ENGINE (IN_GEAR) PID (PARAMETER IDENTIFICATION)

- Using a diagnostic scan tool, view the PCM Parameter Identifications (PIDs).
- Monitor the PCM PID IN_GEAR, while placing the gear selector in PARK and then NEUTRAL.

Does the PID read No in both positions?

Yes	GO to B10
No	REFER to: Diagnostic Trouble Code (DTC) Charts and Pinpoint Tests - 2.3L EcoBoost (201kW/273PS) (307-01 Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).

B10 CHECK THE PCM (POWERTRAIN CONTROL MODULE) ENGINE CRANKING (ENG_CRANK) PID (PARAMETER IDENTIFICATION)

- Make sure the transmission is in PARK or NEUTRAL.
- Using a diagnostic scan tool, view the PCM Parameter Identifications (PIDs).
- Monitor the PCM PID ENG_CRANK while pressing the ignition switch - push button start and the brake pedal.

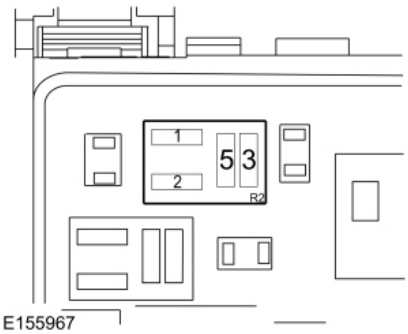
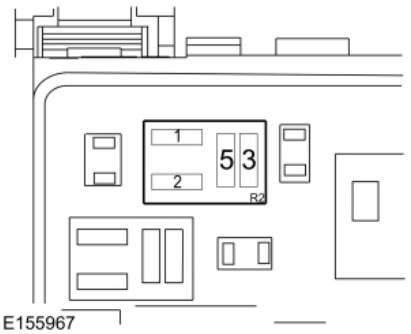
Does the PID change from Inactive to Active?

Yes	GO to B11
No	GO to B21

B11 CHECK THE STARTER RELAY CONTROL OPERATION

NOTICE: The following step uses a test light to simulate normal circuit loads. To avoid connector terminal damage, use the Flex Probe Kit for the test light probe connection to the vehicle. Do not use the test light probe directly on any connector.

- Remove the BJB starter relay.
- Measure:

Positive Lead	Measurement / Action	Negative Lead
 BJB starter relay pin 2		 BJB starter relay pin 1

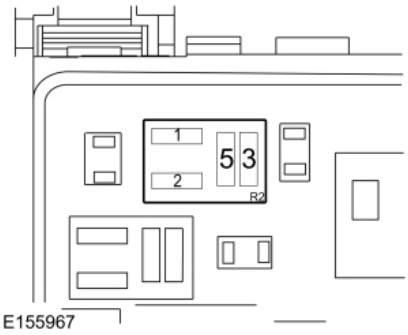
- Make sure the transmission is in PARK or NEUTRAL.
- While pressing the ignition switch - push button start and the brake pedal, observe the test light.

Does the test light illuminate when the ignition switch - push button start is pressed?

Yes	GO to B12
No	GO to B19

B12 CHECK THE VOLTAGE TO THE STARTER RELAY

- Measure:

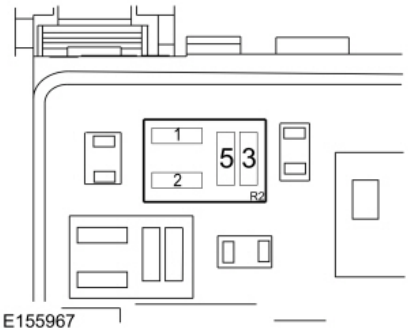
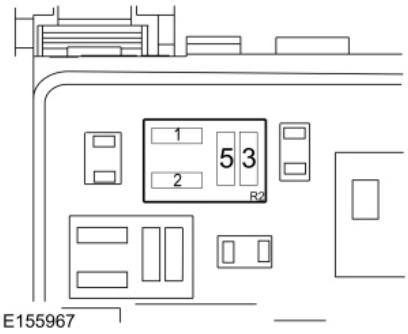
Positive Lead	Measurement / Action	Negative Lead
 BJB starter relay pin 3		Ground

Is the voltage greater than 11 volts?

Yes	GO to B13
No	VERIFY BJB fuse 84 (30A) is OK. If OK, REPAIR the circuit for an open. If not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short.

B13 CHECK THE STARTER MOTOR OPERATION AT THE STARTER RELAY

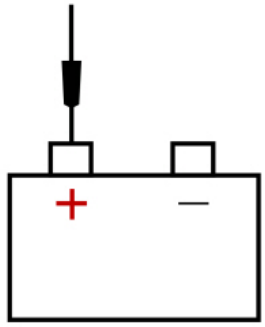
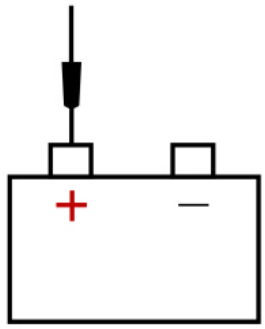
- Ignition OFF.
- With the transmission in PARK or NEUTRAL, momentarily connect a fused jumper wire:

Positive Lead	Measurement / Action	Negative Lead
 BJB starter relay pin 3		 BJB starter relay pin 5

Did the starter engage and the engine crank?

Yes	INSTALL a new starter relay.
No	GO to B14

- Measure:

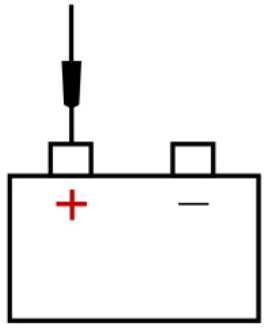
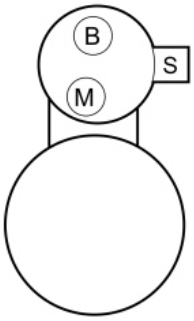
Positive Lead	Measurement / Action	Negative Lead
 E148840		Ground G107
 E148840		Ground G110

Are the voltages greater than 11 volts?

Yes	GO to B15
No	CLEAN or INSTALL new negative battery cables as necessary. REFER to: Battery Cables - 2.3L EcoBoost (201kW/273PS) (414-01 Battery, Mounting and Cables, Removal and Installation).

B15 CHECK THE STARTER MOTOR GROUND

- Measure:

Positive Lead	Measurement / Action	Negative Lead
 E148840		 E148837 Starter motor case

Is the voltage greater than 11 volts?

Yes	GO to B16

No	CLEAN the starter motor mounting flange and MAKE SURE the starter motor is correctly mounted. REFER to: Starter Motor (303-06 Starting System - 2.3L EcoBoost (201kW/273PS), Removal and Installation).

B16 CHECK THE VOLTAGE TO THE STARTER MOTOR

- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C197A-1 ("B" terminal)		Ground

Is the voltage greater than 11 volts?

Yes	GO to B17
No	INSTALL a new positive battery cable. REFER to: Battery Cables - 2.3L EcoBoost (201kW/273PS) (414-01 Battery, Mounting and Cables, Removal and Installation).

B17 CHECK THE STARTER MOTOR FOR CORRECT OPERATION

- Perform Starter Motor - Positive Circuit Test in this section.

Was an obvious cause found?

Yes	Correct the cause as necessary.
No	GO to B18

B18 CHECK FOR START INPUT AT THE STARTER

- Connect BJB starter relay.
- Disconnect Starter solenoid C197B.
- While holding the key in the START position, measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C197B-1 ("S" terminal)		Ground

Is the voltage greater than 11 volts?

Yes	CLEAN the starter solenoid "S" terminal and starter solenoid connector. CHECK the wiring and the starter motor for a loose or intermittent connection.
No	REPAIR the circuit for an open.

B19 CHECK THE PCM (POWERTRAIN CONTROL MODULE) STARTER RELAY CONTROL CIRCUITS FOR A SHORT TO GROUND

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

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-71	Ω	Ground
C175B-69	Ω	Ground

Are the resistances greater than 10,000 ohms?

Yes	GO to B20
No	REPAIR the affected circuit.

B20 CHECK THE PCM (POWERTRAIN CONTROL MODULE) STARTER RELAY CIRCUITS FOR AN OPEN

- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-71	Ω	BJB starter relay pin 2
C175B-69	Ω	BJB starter relay pin 1

Are the resistances less than 3 ohms?

Yes	GO to B21
No	REPAIR the affected circuit.

B21 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all PCM connectors.
- Repair:
  - corrosion (install new connectors 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: Powertrain Control Module (PCM) (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), 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.

Unusual Starter Noise

Normal Operation and Fault Conditions

Correct starter operation relies on correct mounting of the starter to the engine, alignment of the starter ring gear to the flexplate and correct functioning of the starter assembly (internal gears, bearings).

Possible Sources

- Engine
- Starter motor
- Starter motor mounting

Visual Inspection and Diagnostic Pre-checks

- Inspect the starter motor.
- Inspect the starter motor mounting.

PINPOINT TEST C : UNUSUAL STARTER NOISE

C1 CHECK THE STARTER MOUNTING

- Inspect the starter mounting bolts for looseness.

Is the starter motor mounted correctly?

Yes	GO to C2
No	INSTALL the starter motor correctly. REFER to: Starter Motor (303-06 Starting System - 2.3L EcoBoost (201kW/273PS), Removal and Installation).

C2 CHECK FOR STARTER NOISE

- Ignition OFF.
- Connect a remote starter switch between the starter solenoid C197A-1 ("B" terminal) and C197B-1 ("S" terminal).
- Engage the starter and verify the noise is due to starter operation.

Is the noise due to the starter engagement?

Yes	REFER to: Starter Motor Drive Gear and Flywheel Ring Gear Inspection (303-06 Starting System - 2.3L EcoBoost (201kW/273PS), General Procedures).
No	REFER to: Engine (303-00 Engine System - General Information, Diagnosis and Testing). to continue diagnosis.

C113A:11, C113A:15

Refer to Wiring Diagrams Cell 23 for schematic and connector information.

Normal Operation and Fault Conditions

The wake-up control circuit wakes up the PCM prior to the engine cranking. The PCM needs to wake up prior to a crank request so it has time to go through its initialization. The wake-up control circuit is controlled by the BCM. The BCM activates the wake-up control circuit when the driver door is opened, the BCM detects a passive key, or when the engine start/stop button is pressed.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
C113A:11	PCM Wake-up Signal: Circuit Short to Ground	Set by the BCM when a short to ground is detected on the wake-up control circuit.
C113A:15	PCM Wake-up Signal: Circuit Short to Battery or Open	Set by the BCM when a short to voltage or an open is detected on the wake-up control circuit.

Possible Sources

- BCM
- PCM
- Wiring, terminals or connectors

PINPOINT TEST D : C113A:11, C113A:15

D1 CHECK FOR BCM (BODY CONTROL MODULE) DIAGNOSTIC TROUBLE CODES (DTCS)

- Ignition ON.
- Using a diagnostic scan tool, perform the BCM self-test.

Is DTC C113A:11 present?

Yes	GO to D2
No	If DTC C113A:15 is present, GO to D4 For all other BCM Diagnostic Trouble Codes (DTCs), REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing).

D2 CHECK THE PCM (POWERTRAIN CONTROL MODULE) FOR A SHORT TO GROUND

- Ignition OFF.
- Disconnect PCM C175B.
- Ignition ON.
- Using a diagnostic scan tool, clear the BCM Diagnostic Trouble Codes (DTCs).
- Using a diagnostic scan tool, perform the BCM self-test.

Is BCM DTC C113A:11 present?

Yes	GO to D3
No	GO to D7

D3 CHECK THE PCM (POWERTRAIN CONTROL MODULE) WAKE-UP SIGNAL CIRCUIT FOR A SHORT TO GROUND

- Ignition OFF.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-52	Ω	Ground

Is the resistance greater than 10,000 ohms?

Yes	GO to D7
No	REPAIR the circuit.

D4 CHECK THE PCM (POWERTRAIN CONTROL MODULE) WAKE-UP SIGNAL CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Disconnect PCM C175B if necessary.
- Disconnect BCM C2280C.
- Ignition ON.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-52		Ground

Is any voltage present?

Yes	REPAIR the circuit.
No	GO to D5

D5 CHECK THE PCM (POWERTRAIN CONTROL MODULE) WAKE-UP SIGNAL CIRCUIT FOR AN OPEN

- Ignition OFF.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-52	Ω	C2280C-18

Is the resistance less than 3 ohms?

Yes	GO to D6
No	REPAIR the circuit.

D6 CHECK FOR CORRECT BCM (BODY CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all BCM connectors.
- Repair:
  - corrosion (install new connectors 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.

D7 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all PCM connectors.
- Repair:
  - corrosion (install new connectors 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: Powertrain Control Module (PCM) (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), 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.

P2535 (without Push Button Start)

Refer to Wiring Diagrams Cell 20 for schematic and connector information.

Normal Operation and Fault Conditions

When the ignition is turned to the START position the PCM receives a voltage signal on the crank detect circuit. The PCM then supplies voltage and ground to the starter relay coil when the required inputs have been received.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P2535	Ignition Switch Run/Start Position Circuit High	This DTC sets when the PCM detects voltage on the crank detect circuit while the engine is running.

Possible Sources

- BCM
- Ignition switch
- PCM
- Wiring, terminals or connectors

PINPOINT TEST E : DTC P2535 (WITHOUT PUSH BUTTON START)

E1 RETRIEVE DIAGNOSTIC TROUBLE CODES (DTCS)

- Ignition ON.
- Using a diagnostic scan tool, perform PCM self-tests.

Is DTC P2535 recorded?

Yes	GO to E2
No	For all PCM Diagnostic Trouble Codes (DTCs), refer to the PCM DTC Chart in this section.

E2 CHECK THE CRANK DETECT CIRCUIT FOR A SHORT TO VOLTAGE WITH PCM (POWERTRAIN CONTROL MODULE) DISCONNECTED

- Ignition OFF.
- Disconnect PCM C175B.
- Ignition ON.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-45		Ground

Is any voltage present?

Yes	GO to E3
No	GO to E5

E3 CHECK THE CRANK DETECT CIRCUIT FOR A SHORT TO VOLTAGE WITH IGNITION SWITCH DISCONNECTED

- Ignition OFF.
- Disconnect Ignition switch C250.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-45		Ground

Is any voltage present?

Yes	GO to E4
No	INSTALL a new ignition switch. REFER to: Ignition Switch (211-05 Steering Wheel and Column Electrical Components, Removal and Instal,ation).

E4 CHECK THE CRANK DETECT CIRCUIT FOR A SHORT TO VOLTAGE WITH BCM (BODY CONTROL MODULE) DISCONNECTED

- Ignition OFF.
- Disconnect BCM C2280H.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-45		Ground

Is any voltage present?

Yes	REPAIR the circuit.
No	GO to E6

E5 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Disconnect and inspect all PCM connectors.
- Repair:
  - corrosion (install new connectors or terminals - clean module pins)
  - damaged or bent pins - install new terminals/pins
  - pushed-out pins - install new pins as necessary
- Reconnect all 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: Powertrain Control Module (PCM) (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), 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.

E6 CHECK FOR CORRECT BCM (BODY CONTROL MODULE) OPERATION

- Disconnect and inspect all BCM connectors.
- Repair:
  - corrosion (install new connectors or terminals - clean module pins)
  - damaged or bent pins - install new terminals/pins
  - pushed-out pins - install new pins as necessary
- Reconnect all 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.

P2535 (with Push Button Start)

Refer to Wiring Diagrams Cell 25 for schematic and connector information.

Normal Operation and Fault Conditions

When the engine start/stop switch has been pressed, the PCM receives a voltage signal on the crank detect circuit. The PCM then supplies voltage and ground to the starter relay coil when the required inputs have been received.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P2535	Ignition Switch Run/Start Position Circuit High	This DTC sets when the PCM detects voltage on the crank detect circuit while the engine is running.

Possible Sources

- BCM
- Ignition switch - Push Button Start
- PCM
- Wiring, terminals or connectors

PINPOINT TEST F : DTC P2535 (WITH PUSH BUTTON START)

F1 RETRIEVE DIAGNOSTIC TROUBLE CODES (DTCS)

- Ignition ON.
- Using a diagnostic scan tool, perform PCM self-tests.

Is DTC P2535 recorded?

Yes	GO to F2
No	For all PCM Diagnostic Trouble Codes (DTCs), refer to the PCM DTC Chart in this section.

F2 CHECK THE CRANK DETECT CIRCUIT FOR A SHORT TO VOLTAGE WITH PCM (POWERTRAIN CONTROL MODULE) DISCONNECTED

- Ignition OFF.
- Disconnect PCM C175B.
- Ignition ON.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-45		Ground

Is any voltage present?

Yes	GO to F3
No	GO to F5

F3 CHECK THE CRANK DETECT CIRCUIT FOR A SHORT TO VOLTAGE WITH IGNITION SWITCH - PUSH BUTTON START DISCONNECTED

- Ignition OFF.
- Disconnect Ignition switch - Push Button Start C2195.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-45		Ground

Is any voltage present?

Yes	GO to F4
No	INSTALL a new ignition switch - push button start. REFER to: Ignition Switch - Vehicles With: Keyless Entry and Push Button Start (211-05 Steering Wheel and Column Electrical Components, Removal and Installation).

F4 CHECK THE CRANK DETECT CIRCUIT FOR A SHORT TO VOLTAGE WITH BCM (BODY CONTROL MODULE) DISCONNECTED

- Ignition OFF.
- Disconnect BCM C2280H.
- Measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
C175B-45		Ground

Is any voltage present?

Yes	REPAIR the circuit.
No	GO to F6

F5 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Disconnect and inspect all PCM connectors.
- Repair:
  - corrosion (install new connectors or terminals - clean module pins)
  - damaged or bent pins - install new terminals/pins
  - pushed-out pins - install new pins as necessary
- Reconnect all 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: Powertrain Control Module (PCM) (303-14 Electronic Engine Controls - 2.3L EcoBoost (201kW/273PS), 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.

F6 CHECK FOR CORRECT BCM (BODY CONTROL MODULE) OPERATION

- Disconnect and inspect all BCM connectors.
- Repair:
  - corrosion (install new connectors or terminals - clean module pins)
  - damaged or bent pins - install new terminals/pins
  - pushed-out pins - install new pins as necessary
- Reconnect all 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.

Component Test(s)

Starter Motor - Positive Circuit Test

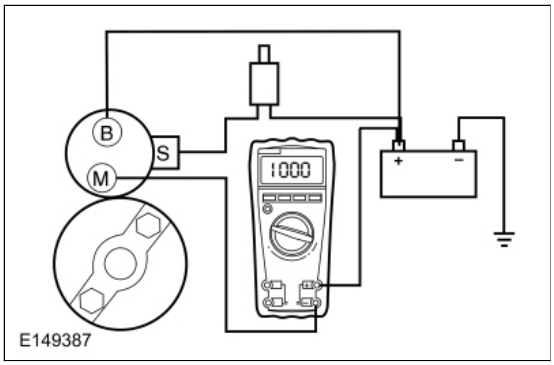
NOTE: *Always make the multimeter connection at the component terminal rather than at the wiring end of the connector. Making a connection at the wiring end of the connector could result in false readings because the meter will not pick up a high resistance between the wiring connector and component.*

1. Make sure the battery is fully charged.
   REFER to: Battery Charging (414-01 Battery, Mounting and Cables, General Procedures).

2. Perform a battery drain test.
   REFER to: Battery Drain Check (414-01 Battery, Mounting and Cables, General Procedures).

3. Connect a remote starter switch between starter solenoid “S” terminal and the battery positive terminal.

4. Connect the multimeter positive lead to the battery positive post. Connect the negative lead to the starter solenoid "M" terminal.

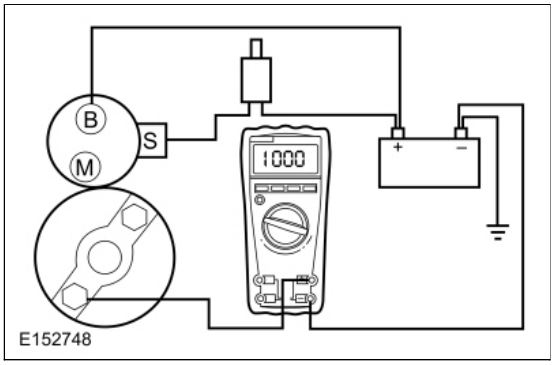


5. Place gear selector lever in Park or Neutral.
6. Engage the remote starter switch. Read and record the voltage. The voltage reading should be 0.5 volt or less.
7. If the voltage reading is 0.5 volt or less, perform Starter Motor - Ground Circuit Test in this section.
8. A voltage reading greater than 0.5 volt is an indication of excessive resistance in the connections, the positive battery cable or in the starter solenoid. Remove the cables from the solenoid "B", "S" and "M" terminals. Clean the cables and connections and reinstall the cables to the correct terminals. Repeat Steps 3 through 6.
9. If the voltage reading is still greater than 0.5 volt when checked at the "M" terminal, move the multimeter negative lead to the starter solenoid “B” terminal.
10. With the gear selector lever in Park or Neutral, engage the remote starter switch. Read and record the voltage.
11. If the voltage reading at the "B" terminal is lower than 0.5 volt, the concern is in the connections at the starter solenoid or in the solenoid contacts. Install a new starter motor.
REFER to: Starter Motor (303-06 Starting System - 2.3L EcoBoost (201kW/273PS), Removal and Installation).
12. If the voltage reading taken at the solenoid "B" terminal is greater than 0.5 volt after cleaning the cables and connections at the solenoid, the concern is in the positive battery cable connection or in the positive battery cable itself. Clean the positive battery cable connection. If this does not resolve the concern, install a new positive battery cable.
REFER to: Battery Cables - 2.3L EcoBoost (201kW/273PS) (414-01 Battery, Mounting and Cables, Removal and Installation).

Starter Motor - Ground Circuit Test

A slow cranking condition can be caused by resistance in the ground or return portion of the cranking circuit. This procedure checks the voltage drop in the ground circuit.

1. Connect a remote starter switch between starter solenoid "S" terminal and the battery positive terminal.
2. Connect the multimeter positive lead to the starter motor housing (the connection must be clean and free of rust or grease). Connect the negative lead to the negative battery terminal.
3. Place gear selector lever in Park or Neutral.
4. Engage the remote starter switch and crank the engine. Read and record the voltage reading. The reading should be 0.5 volt or less.



5. If the voltage reading is greater than 0.5 volt, clean the negative cable connections at the battery, the body ground connections and the starter ground connection. Retest.
6. If the voltage reading is greater than 0.5 volt, install a new negative battery cable.
REFER to: Battery Cables - 2.3L EcoBoost (201kW/273PS) (414-01 Battery, Mounting and Cables, Removal and Installation).
7. If the voltage reading is less than 0.5 volt and the engine still cranks slowly, install a new starter motor.
REFER to: Starter Motor (303-06 Starting System - 2.3L EcoBoost (201kW/273PS), Removal and Installation).