

- Ignition OFF.
- Disconnect and inspect all TCCM connectors.
- Check for the following:
 - 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
- Connect all TCCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. ADDRESS the root cause of the connector or pin issues.

PINPOINT TEST D : DTC P185D:00

Refer to Wiring Diagrams Cell [34](#) for schematic and connector information.

Normal Operation and Fault Conditions

When the ELD is fully locked, the indicator illuminates steadily. When the ELD MSS is engaged to lock the rear differential, a PWM signal is sent to the ELD field coil by the TCCM through the differential lock control circuit. This PWM signal is initially 98% duty cycle to lock the differential and then tapers off to a lower duty cycle once the differential is locked. If the differential does not lock, the TCCM module continues to send the signal for a set amount of time. Once the ELD is locked, the indicator illuminates steadily.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Condition
TCCM P185D:00	Differential Lock-Up Control Circuit Performance: No Sub Type Information	This DTC sets if the locker is not able to engage after a calibratable number of retries or a delta rear wheel condition persists while commanding the ELD ON. Fault clear if locker successfully engages. CLEAR the DTCs if the locker engages successfully

Possible Sources

- Wiring, terminals or connectors
- ELD field coil

NOTE: Make sure the battery is fully charged before carrying out this pinpoint test.

NOTE:

Clean and inspect the internal connector from coil to external ELD connector for damage.

D1 CHECK THE ABS MODULE WHEEL SPEED SENSOR PIDS

Brake Vacuum Pump

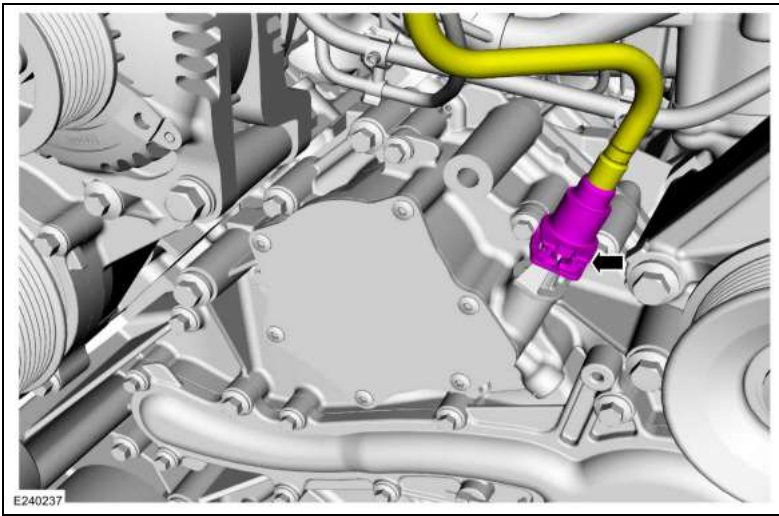
Materials

Name	Specification
Motorcraft® Metal Surface Prep - ZC-31-A	-

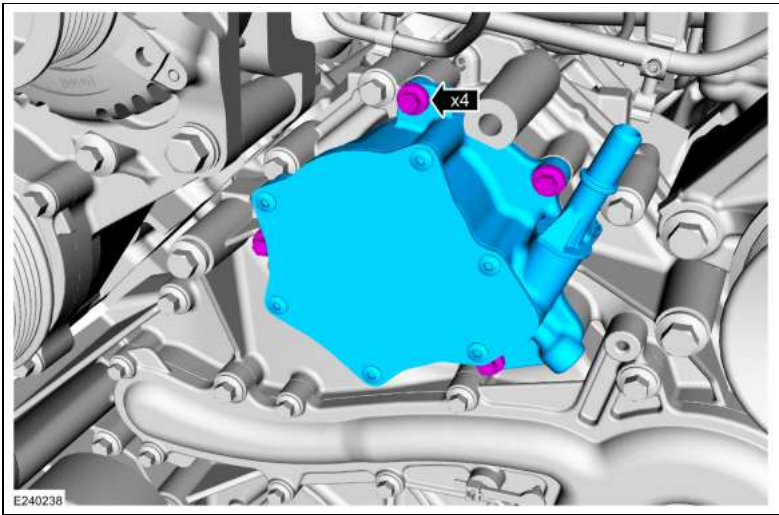
Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Remove the cooling fan drive assembly.
Refer to: Cooling Fan Drive Assembly (303-05B Accessory Drive - 6.7L Power Stroke Diesel, Removal and Installation).
2. Disconnect the vacuum hose.



3. Remove the bolts and the brake vacuum pump.
Torque: 89 lb.in (10 Nm)



4. Inspect the gasket and install a new gasket as necessary.

SCCM DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
B11D9:16	Vehicle Battery: Circuit Below Threshold	Sets in continuous memory if the SCCM detects battery voltage below 8 volts on the battery voltage supply circuit.

Possible Causes

- Battery
- Wiring, terminals or connectors
- Fuse
- Charging system
- SCCM

Visual Inspection and Diagnostic Pre-checks

- Make sure the vehicle battery terminals and cables are free of any corrosion and other contaminants.
- Make sure the vehicle battery terminals are tightened to their correct torque specifications.

PINPOINT TEST I : B11D9:16

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

I1 CHECK FOR SCCM (STEERING COLUMN CONTROL MODULE) DIAGNOSTIC TROUBLE CODES (DTCs)

- Ignition ON.
- Using a diagnostic scan tool, clear the SCCM Diagnostic Trouble Codes (DTCs).
- Using a diagnostic scan tool, carry out the SCCM self-test.

Is DTC B11D9:16 still present?

Yes	GO to I2
No	The system is operating normally at this time. The DTC may have been set previously during battery charging or while jump starting the vehicle.

I2 CHECK FOR CHARGING SYSTEM DIAGNOSTIC TROUBLE CODES (DTCs) IN THE PCM (POWERTRAIN CONTROL MODULE)

- Using a diagnostic scan tool, carry out the PCM KOEO and KOER self-tests.

Are any charging system Diagnostic Trouble Codes (DTCs) present in the PCM?

Yes	DIAGNOSE the charging system Diagnostic Trouble Codes (DTCs). Refer to the appropriate section in Group 414 for the procedure.
No	GO to I3

I3 CHECK THE BATTERY CONDITION AND STATE OF CHARGE

Use the UV Long-Wave W/12-foot Cord & Alligator Clips (164-R3748) or Leak Tracker UV-LED Leak Detection Flashlight (164-TP8695) to carry out the following procedure for oil leak diagnosis.

1. Add 237 ml (8 Fl Oz) of Dye-Lite® Oil-Based Fluid Dye (164-TP33200008) to a minimum of 0.47L (1/2 qt) and a maximum of 0.95L (1 qt) engine oil. Thoroughly premix the oil based fluid dye or it will not have enough time to reach the crankcase, oil galleries and seal surfaces during this particular 15 minute test. The additive must be added through the oil fill. Check the level on the oil level indicator to determine what amount of oil to premix. If it is in the middle of the crosshatch area or below the full mark, use 0.95L (1 qt). If it is at the full mark, use 0.47L (1/2 qt).
2. **NOTE:** *For best results allow the customer to drive the vehicle for a day.*

Run the engine for 15 minutes. Stop the engine and inspect all seal and gasket areas for leaks using the UV Leak Detector Kit. A fluoresces white area will identify the leak. For extremely small leaks, several hours may be required for the leak to appear.
3. At the end of test, make sure the oil level is within the upper and lower oil indicator marks. Remove oil as necessary if it registers above the full mark.

Leakage Points - Underhood

NOTE: *Check for oil in the valley of the engine that may have accumulated on the engine front cover or ran through the valley drain hole on the right front of the engine.*

Examine the following areas for oil leakage:

- Valve cover gaskets
- Cylinder head gaskets
- Engine front cover
- Oil level indicator tube
- Crankcase vent oil separator
- Turbocharger pedestal
- Turbocharger oil supply tube

Leakage Points - Under Engine, With Vehicle on Hoist

NOTE: *Verify that the oil leak is not from the upper engine area.*

Examine the following areas for oil leakage:

- Oil pan gaskets
- Oil pan sealer
- Engine front cover gasket
- Crankshaft front seal
- Crankshaft rear seal
- Oil filter adapter
- Oil cooler
- Engine oil and pressure sensor

Leakage Points - With Transmission and Flywheel/Flexplate Removed

Examine the following areas for oil leakage:

- Crankshaft rear oil seal
- Flexplate mounting bolt holes (with flexplate installed)
- Pipe plugs at the end of oil passages
- Core plugs

Compression Test

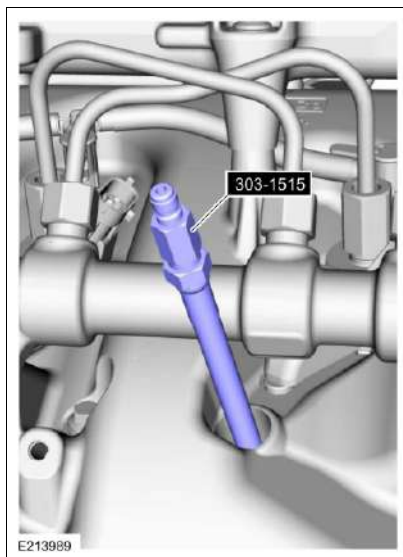
1. Make sure the oil in the crankcase is of the correct viscosity and at the correct level.
2. Operate the engine until it is at normal operating temperature. Turn the ignition switch to the OFF position.
3. **NOTE:** *Failure to remove all glow plugs may result in inconsistent test results.*

Remove the glow plugs.

REFER to: Glow Plugs (303-07C Glow Plug System - 6.7L Power Stroke Diesel, Removal and Installation).

NOTE: *The battery charger must be left connected during the compression test and disconnected when the test is complete.*

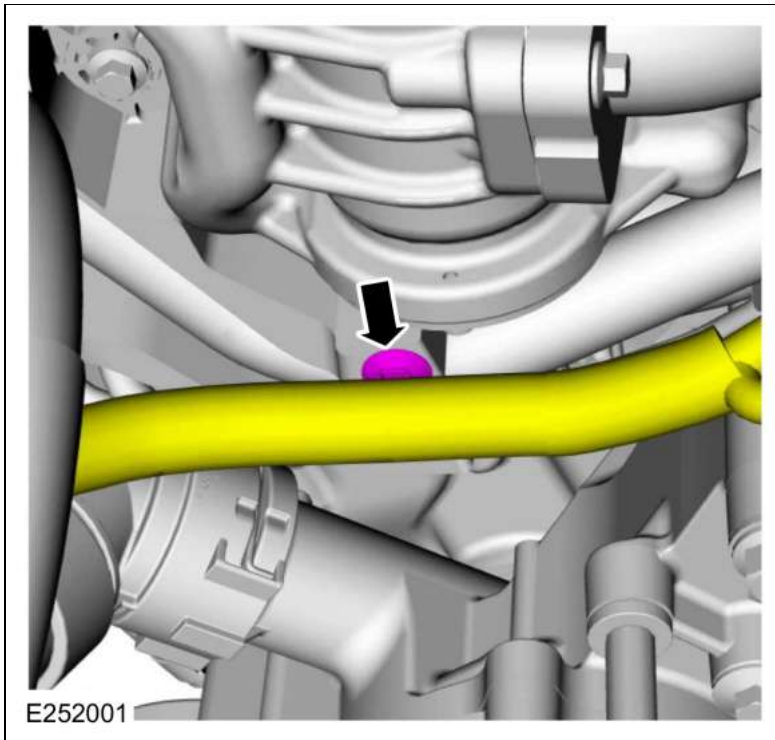
4. Connect a battery charger to the battery.



5. Install the Compression Test Adapter (303-1515) and a commercially available diesel compression tester.

NOTE: *Note the approximate number of compression strokes necessary to obtain the highest reading.*

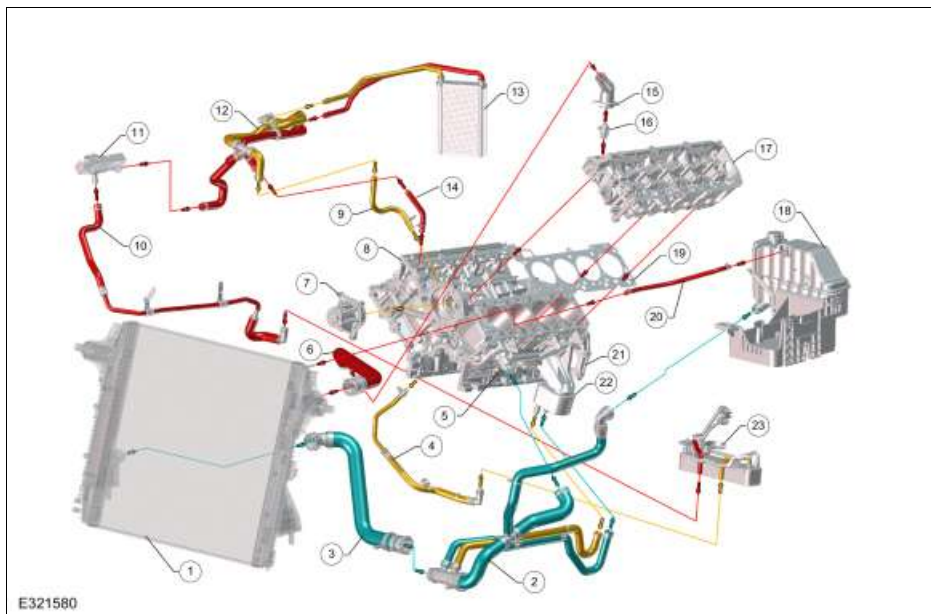
6. Install an auxiliary starter switch in the starting circuit. With the ignition switch in the OFF position, crank the engine a consistent number of strokes (minimum of 2 compression strokes to 12 compression strokes). Record the readings.
7. Repeat the test on each cylinder, cranking the engine the same number of compression strokes, record the readings. Compare the readings of the 8 cylinders.
 - There must be a minimum cylinder pressure of 2068.4 kpa (300 psi) and have no more than a 20% difference from the average on any given cylinder.
8. Investigate and repair any cylinder(s) that are outside the 20% range.



179. Install the accessory drive belt tensioner and the bolt.
Torque: 35 lb.ft (48 Nm)

Engine Cooling - Component Location

NOTE: Coolant temperature will vary with ambient temperature and load. Temperatures shown are for ambient temperature of 38Â°C (100Â°F). Red arrows indicate a temperature over 90Â°C (194Â°F), Orange arrows indicate a temperature of approximately 90Â°C (194Â°F), Blue arrows indicate a temperature below 90Â°C (194Â°F).



Item	Description
1	Radiator
2	Degas bottle hose assembly
3	Lower radiator hose
4	Transmission oil cooler inlet hose
5	Oil filter adapter
6	Upper radiator hose
7	Coolant pump
8	Cylinder head RH
9	Heater outlet hose
10	Transmission oil cooler outlet hose
11	Transmission fluid heater coolant control valve
12	Heater hose assembly
13	Heater core
14	Heater inlet hose
15	Coolant outlet connector
16	Thermostat
17	Cylinder head LH
18	Degas bottle and battery tray assembly
19	Cylinder head gasket LH
20	Radiator overflow hose
21	Cylinder block
22	Engine oil cooler
23	Transmission oil cooler

Engine Cooling System Draining, Vacuum Filling and Bleeding

Special Tool(s) / General Equipment

 ST1720-A	ROB75240 Coolant/Battery Refractometer (Fahrenheit)
	Fluid Container
	Cooling System Vacuum Tester and Refiller

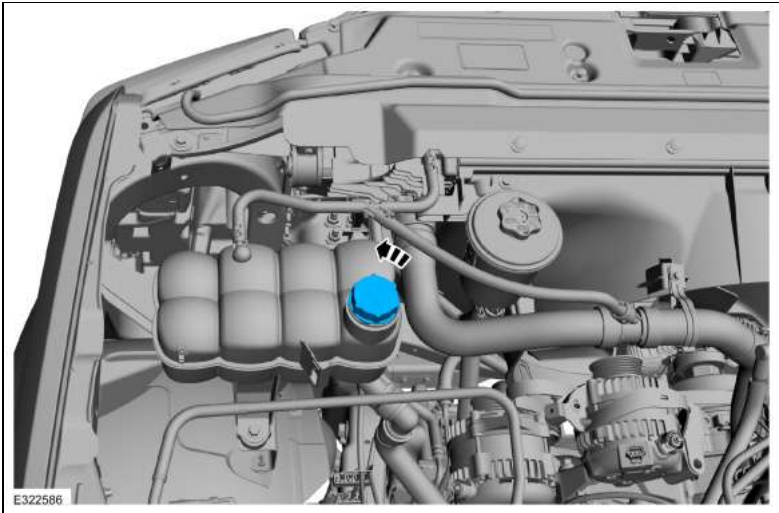
Draining

- NOTICE:** The coolant must be recovered in a suitable, clean container for reuse. If the coolant is contaminated, it must be recycled or disposed of correctly. Using contaminated coolant may result in damage to the engine or cooling system components.
- NOTICE:** Use the correct coolant. Do not mix coolant types. Mixing coolant types may degrade the coolant corrosion protection and may damage the engine or cooling system. For the correct coolant specified for this vehicle, refer to Specifications.
- NOTICE:** Always fill the cooling system with the manufacturer's specified coolant. Chemically flush the cooling system if a non-specified coolant has been used. Refer to Cooling System Flushing. Failure to follow these instructions may damage the engine or cooling system.
- NOTE:** During normal vehicle operation, coolant can change color. As long as the engine coolant is clear and uncontaminated, this color change does not indicate the engine coolant has degraded nor does it require the engine coolant to be drained, the system to be flushed, or the engine coolant to be replaced.
- NOTE:** Less than 80% of coolant capacity can be recovered with the engine in the vehicle. Dirty, rusty or contaminated coolant requires replacement.

1. 
- 

⚠️**WARNING:** When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

Remove the pressure relief cap.



2. With the vehicle in NEUTRAL, position it on a hoist.
Refer to: Jacking and Lifting - Overview (100-02 Jacking and Lifting, Description and Operation).

3. 

NOTE: Be prepared to collect escaping fluid.

Connect a hose to drain the coolant. Open the radiator drain valve and drain the engine coolant in a suitable, clean container.
Use the General Equipment: Fluid Container

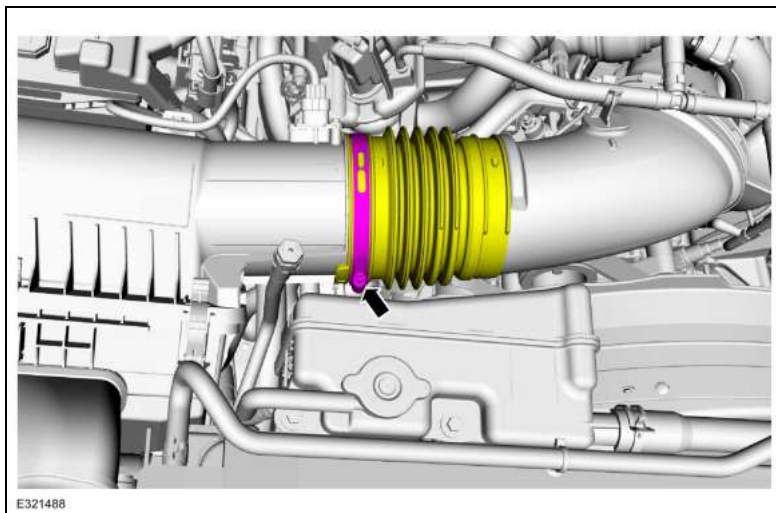
Air Cleaner

Removal

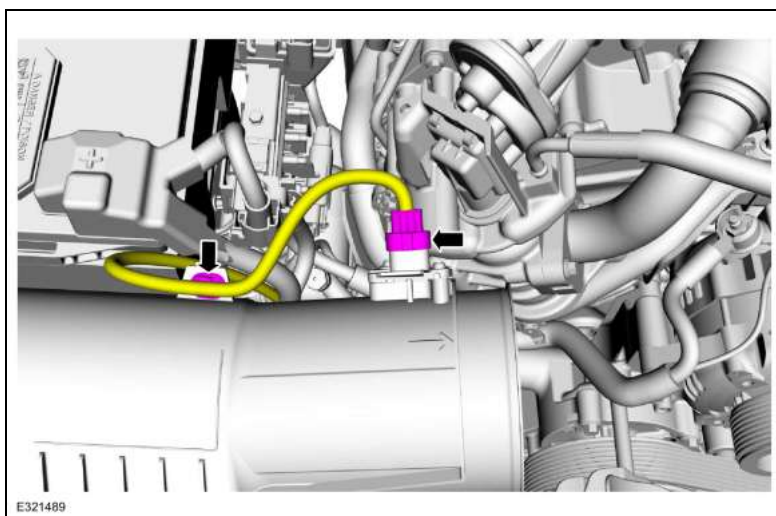
NOTICE: The turbocharger compressor vanes can be damaged by even the smallest particles. When removing any turbocharger or engine air intake system component, ensure that no debris enters the system. Failure to do so may result in damage to the turbocharger.

NOTE: Removal steps in this procedure may contain installation details.

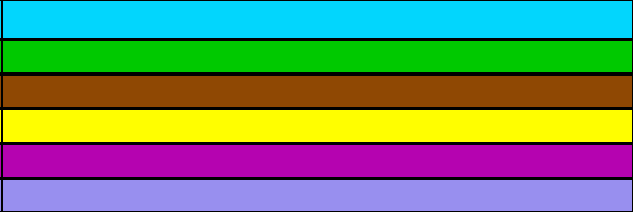
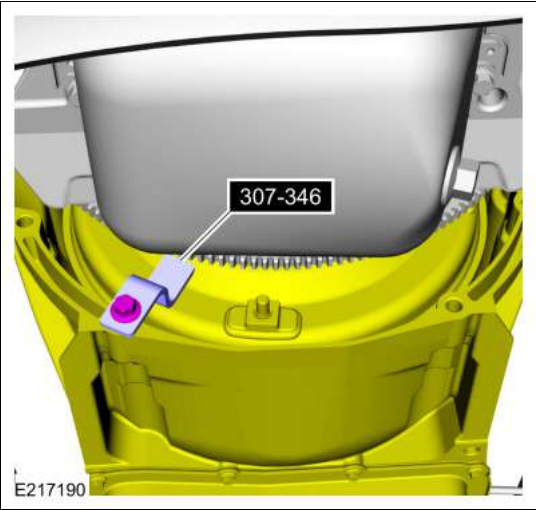
1. Loosen the clamp and disconnect the air cleaner outlet pipe.
Torque: 35 lb.in (4 Nm)



2. Disconnect the MAF sensor electrical connector and detach the wiring harness retainer.



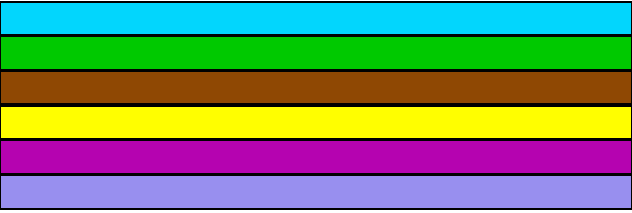
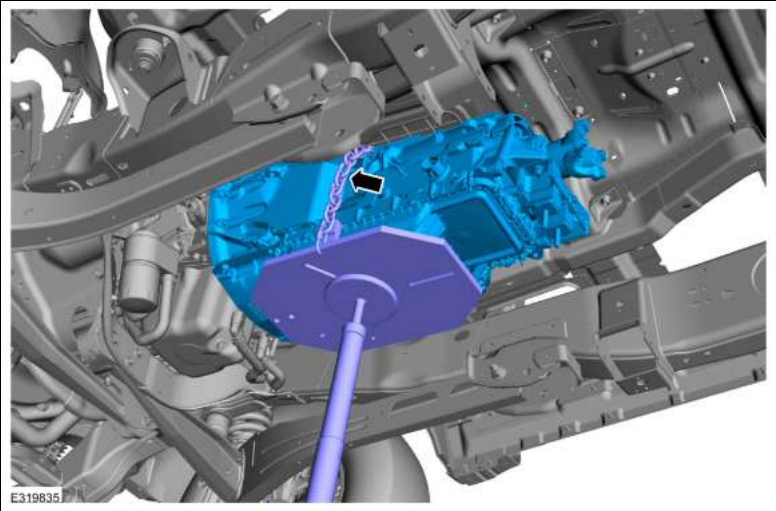
3. Remove the pushpin and the upper air cleaner inlet pipe.



Rear Wheel Drive (RWD) vehicles

31. **NOTICE:** Secure the transmission to the transmission jack with a safety strap.

Using the high-lift transmission jack, remove the transmission.
Use the General Equipment: Transmission Jack



32. If the transmission is to be overhauled or if installing a new or re-manufactured transmission, remove and discard the bolts (N605804) and remove the transmission support insulator bracket.

NOTE: Access to the connectors in the following step is difficult. Before carrying out this step, visually inspect the harness for obvious damage. If no damage is evident, proceed with the test.

- Disconnect In-vehicle temperature and humidity sensor [C2247](#) .
- Disconnect Drivers side temperature door actuator [C2091](#) .
- Disconnect Passenger side temperature door actuator [C2092](#) .
- Disconnect Air distribution door actuator [C236](#) .
- Measure:

AIR INLET DOOR ACTUATOR

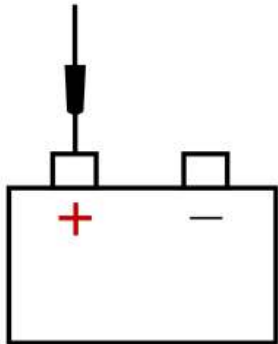
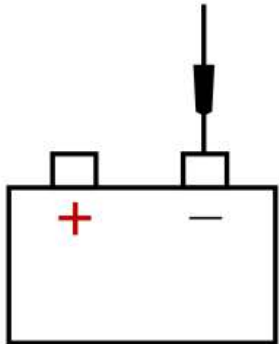
Positive Lead	Measurement / Action	Negative Lead
C289-1	Ω	C289-2
C289-1	Ω	C289-3
C289-1	Ω	C289-5
C289-1	Ω	C289-6
C289-2	Ω	C289-3
C289-2	Ω	C289-5
C289-2	Ω	C289-6
C289-3	Ω	C289-5
C289-3	Ω	C289-6
C289-5	Ω	C289-6

Are the resistances greater than 10,000 ohms?

Yes	INSTALL a new air inlet door actuator. REFER to: Air Inlet Door Actuator (412-00 Climate Control System - General Information, Removal and Installation). CLEAR all Diagnostic Trouble Codes (DTCs). CARRY OUT the FCIM self-test. TEST the system for normal operation. If the concern is still present, GO to D5
No	REPAIR the circuit.

D5 CHECK FOR CORRECT FRONT CONTROLS INTERFACE MODULE OPERATION

- Ignition OFF.
- Disconnect Generator [C102A](#).
- Disconnect Generator [C102B](#).
- Inspect for:
 - corrosion (install new connector or terminals â€ clean module pins)
 - damaged or bent pins â€ install new terminals/pins
 - pushed-out pins â€ 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:

GENERATOR	
-----------	---

Positive Lead	Measurement / Action	Negative Lead
C102B-1		Ground

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

Yes	GO to E3
No	TIGHTEN or INSTALL a new generator B+ nut as needed. REFER to: Generator - 6.7L Power Stroke Diesel (414-02 Generator and Regulator, Removal and Installation). VERIFY high current BJB fuse F2 (275A) MEGA 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.

E3 CHECK THE VOLTAGE DROP IN THE GENERATOR B+ CIRCUIT

- Ignition OFF.
- Disconnect and inspect the SODR connector and related in-line 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 SODR connector and related in-line connectors. Make sure the connectors 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 TSB instructions. If no Technical Service Bulletins (TSBs) address this concern, INSTALL a new SODR. REFER to: Side Obstacle Detection Control Module (419-04 Side and Rear Vision, Removal and Installation).
No	The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. ADDRESS the root cause of any connector or pin issues.

☐ PINPOINT TEST B : THE CTA (CROSS TRAFFIC ALERT) SYSTEM IS INOPERATIVE OR DOES NOT FUNCTION CORRECTLY

Refer to Wiring Diagrams Cell [146](#) for schematic and connector information.

Normal Operation and Fault Conditions

REFER to: Blind Spot Information System - System Operation and Component Description (419-04 Side and Rear Vision, Description and Operation).

Possible Sources

- Communication network concern
- Obstruction or damage to the rear lamp assemblies or surrounding body panels
- Configuration concern
- SODL
- SODR
- IPC concern
- PCM concern
- GWM concern
- PAM concern (internal to the BCM)
- TRM concern
- DDM concern
- PDM concern

Visual Inspection and Pre-checks

- Verify a trailer is not electrically connected to the vehicle.
- Check for damage to the rear lamp assemblies and surrounding body panels.

B1 VERIFY THE LH (LEFT-HAND) AND RH (RIGHT-HAND) EXTERIOR MIRROR BLIS (BLIND SPOT INFORMATION SYSTEM) & CTA (CROSS TRAFFIC ALERT) LED (LIGHT EMITTING DIODE) OPERATION

- Measure:

KEYLESS ENTRY KEYPAD

Positive Lead	Measurement / Action	Negative Lead
C500-1	Ω	C500-3
C500-1	Ω	C500-5
C500-3	Ω	C500-5

Are the resistances greater than 10,000 ohms?

Yes	GO to O11
No	REPAIR the circuits in question.

O11 CHECK FOR CORRECT BCM (BODY CONTROL MODULE) OPERATION

- Disconnect and inspect all the 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 and make sure they seat and latch correctly.
- Operate the system and determine if the concern is still present.

Is the concern still present?

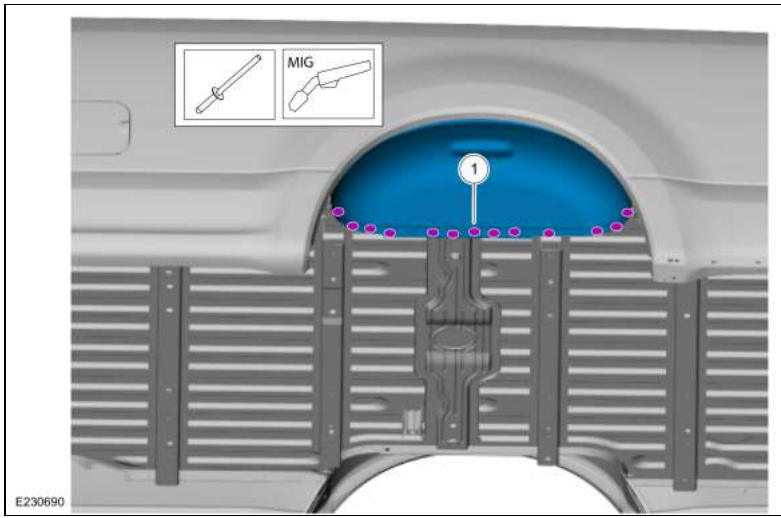
Yes	CHECK OASIS for any applicable service articles: TSB, GSB, SSM, or FSA. If a service article exists for this concern, DISCONTINUE this test and FOLLOW the service article instructions. If no service articles address this concern, INSTALL a new BCM. REFER to: Body Control Module (BCM) (419-10 Multifunction 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.

The Keyless Entry Keypad Illumination Is Inoperative

Refer to Wiring Diagrams Cell [117](#) for schematic and connector information.

Normal Operations and Fault Conditions

REFER to: Handles, Locks, Latches and Entry Systems - System Operation and Component Description (501-14 Handles, Locks, Latches and Entry Systems, Description and Operation).

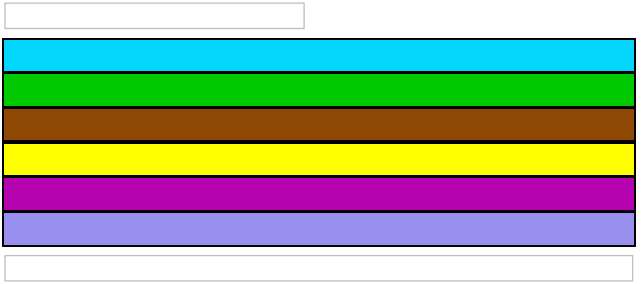
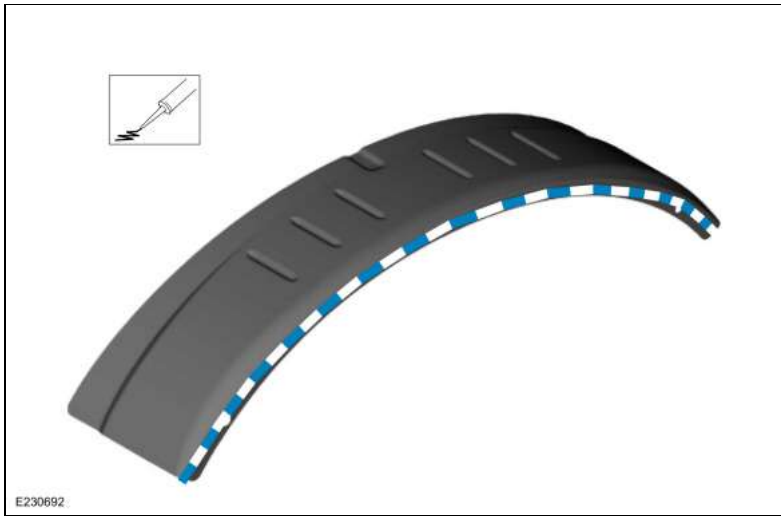


Outer Wheelhouse

3. 80-120 grit sand paper.
Sand to remove e-coat and clean.

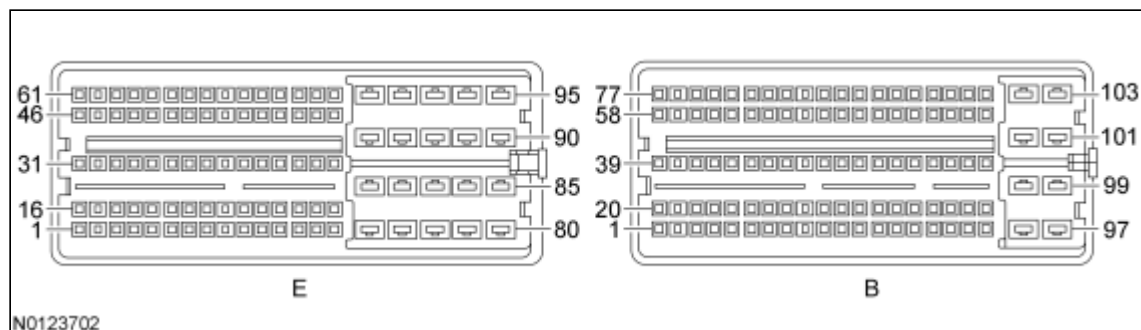


4. Apply adhesive to the outer wheelhouse to body side mating surface.
Material: Metal Bonding Adhesive / TA-1, TA-1-B, 3M[®] 08115, LORD Fusor[®] 108B



5. **NOTE:** Do not lift the wheelhouse to reposition, to minimize the possibility of breaking the adhesive bond slide the component to its proper location.

Install the outer wheelhouse, properly position and securely clamp.
Use the General Equipment: Locking Pliers

3.5L Expedition/Navigator**198 Pin PCM****Typical Diagnostic Reference Values**

Inputs	Component/PID Only	Measured/PID Values				Units Measured/PID
		KOEO	Hot Idle	48 KM/H (30 MPH)	89 KM/H (55 MPH)	
AAT	AAT Sensor	15 (59)	15 (59)	15 (59)	15 (59)	DEG C (DEG F)
AAT_V	AAT Sensor	3.08	3.08	3.08	3.08	VOLTS
AC_REQ	PID	NO	NO	NO	NO	YES/NO
APP	APP Sensor	0	0	0	0	%
APP1	APP Sensor	0.79	0.79	0.79	0.79	VOLTS
APP1 (APP_D)	APP Sensor	16	16	16	16	%
APP2	APP Sensor	0.40	0.40	0.40	0.40	VOLTS
APP2 (APP_E)	APP Sensor	8	8	8	8	%
APP_MAXDIFF	PID	0	0	0	0	DEG
BARO	PID	100 (14.50)	100 (14.50)	100 (14.50)	100 (14.50)	kPa (PSI)/
BARO_V	PID	3.92	3.92	3.92	3.92	VOLTS
BOO1	BPP Switch	FALSE	FALSE	FALSE	FALSE	TRUE/FALSE
BOO2	BPP Switch	FALSE	FALSE	FALSE	FALSE	TRUE/FALSE
BRKOV RD_POSS	PID	8	8	8	8	NUMERIC VALUE
BRKOV R_ACTION	PID	1	1	1	1	NUMERIC VALUE
CAC_T	CACT Sensor	32 (89.6)	32 (89.6)	32 (89.6)	32 (89.6)	DEG C (DEG F)