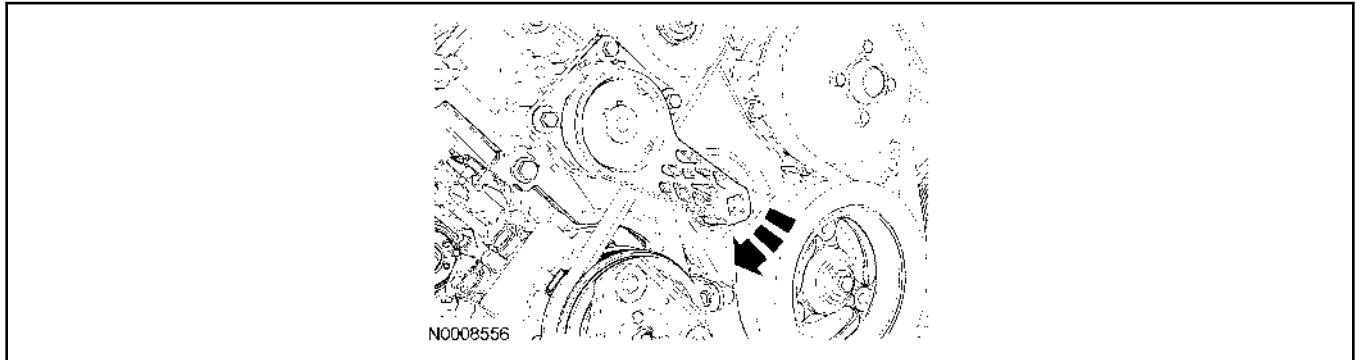


Accessory Drive Belt — Gasoline Engines

Removal and Installation

1. Rotate the drive belt tensioner clockwise and remove the accessory drive belt.



2. **NOTE:**
Refer to Accessory Drive for correct drive belt routing.

To install, reverse the removal procedure.

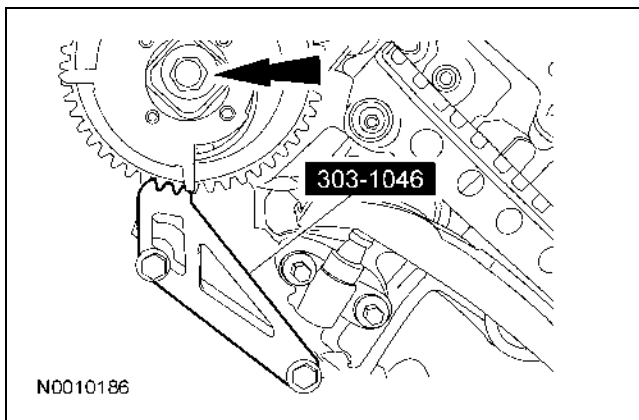
IN-VEHICLE REPAIR (Continued)

20.  **CAUTION:** Damage to the variable camshaft timing (VCT) phaser sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

 **CAUTION:** Only use hand tools to remove the VCT phaser sprocket assembly or damage may occur to the camshaft or VCT phaser sprocket.

Using the special tool, remove the bolt and the RH VCT phaser sprocket assembly.

- Discard the VCT phaser sprocket bolt.

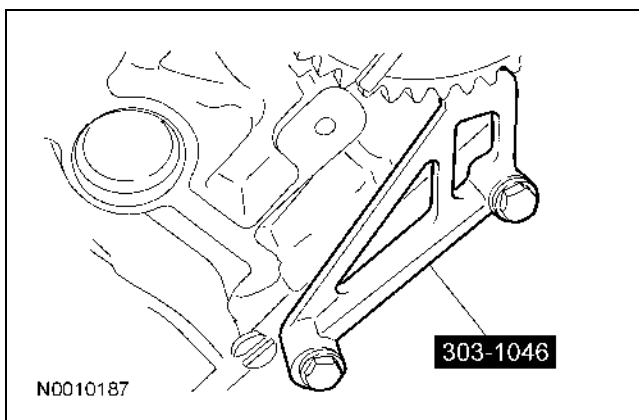


21.  **CAUTION:** Damage to the VCT phaser sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

 **CAUTION:** Only use hand tools to remove the VCT phaser sprocket assembly or damage may occur to the camshaft or VCT phaser sprocket.

Using the special tool, remove the bolt and the LH VCT phaser sprocket assembly.

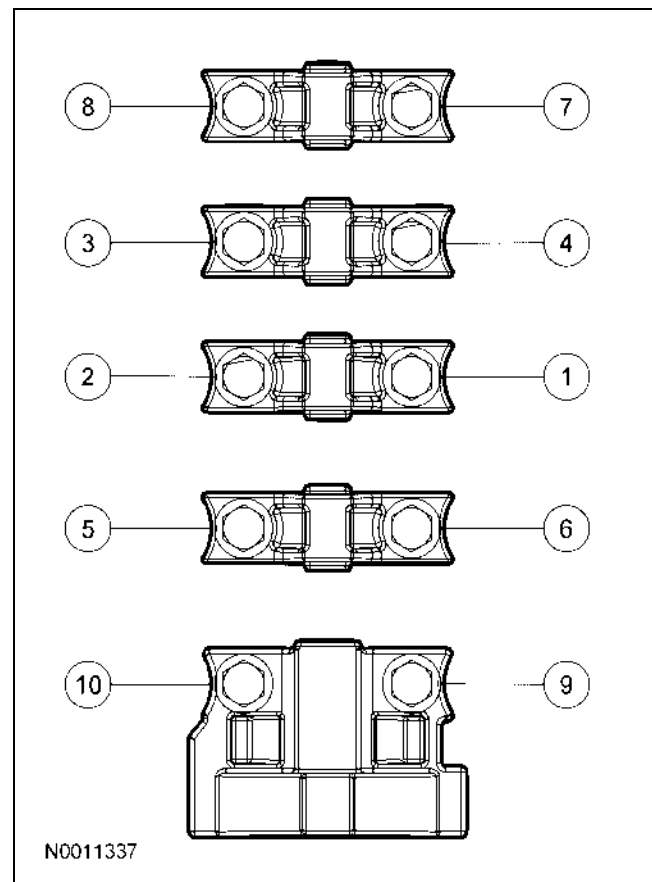
- Discard the VCT phaser sprocket bolt.



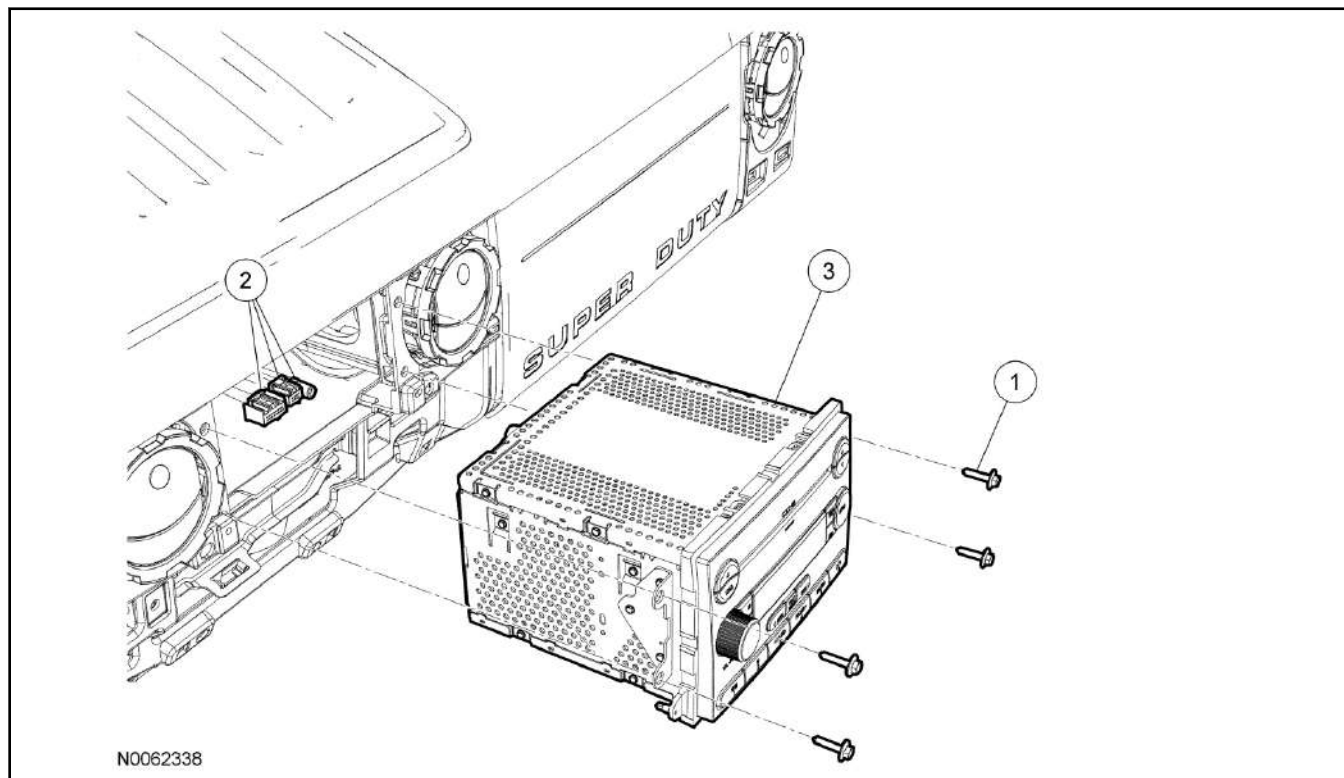
22.  **CAUTION:** Remove the front thrust camshaft bearing cap straight upward from the bearing towers or the bearing cap may be damaged from sideloading.

NOTE: The camshaft bearing caps must be installed in their original locations. Record camshaft bearing cap locations.

Remove the bolts in the sequence shown and remove the RH cylinder head front camshaft bearing cap and then the remaining bearing caps.



Audio Control Module (ACM)



Item	Part Number	Description
1	W707628	Audio control module (ACM) screws (4 required)
2	—	ACM electrical connectors (part of 14401)
3	18806	ACM

Removal and Installation

NOTE:

When installing a new navigation audio control module (ACM), remove the navigation map DVD from the ACM (if possible) before sending it to an authorized audio system repair facility.

1. **NOTE:**
Programmable module installation (PMI) is only necessary if a new ACM is being installed.

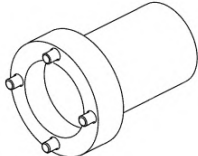
NOTE:

Vehicles equipped with the base AM/FM radio do not require PMI.

Upload the ACM configuration information to the scan tool. For additional information, carry out the PMI procedure in Section 418-01.

2. Remove the instrument panel center finish panel. For additional information, refer to Section 501-12.
3. Remove the 4 screws and the ACM.
 - Disconnect the electrical connectors.
4. To install, reverse the removal procedure.
 - Download the configuration information to the ACM. For additional information, refer to Section 418-01.

IN-VEHICLE REPAIR**Park System****Special Tool(s)**

 ST2720-A	Socket, Output Shaft Locknut 307-458
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Removal**All vehicles**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to Section 100-02.

Four-Wheel Drive (4WD) vehicles

2. **NOTE:**
The transmission insulator studs may come out of the insulator while removing the nuts. Install new insulator studs if the studs come out of the insulator.

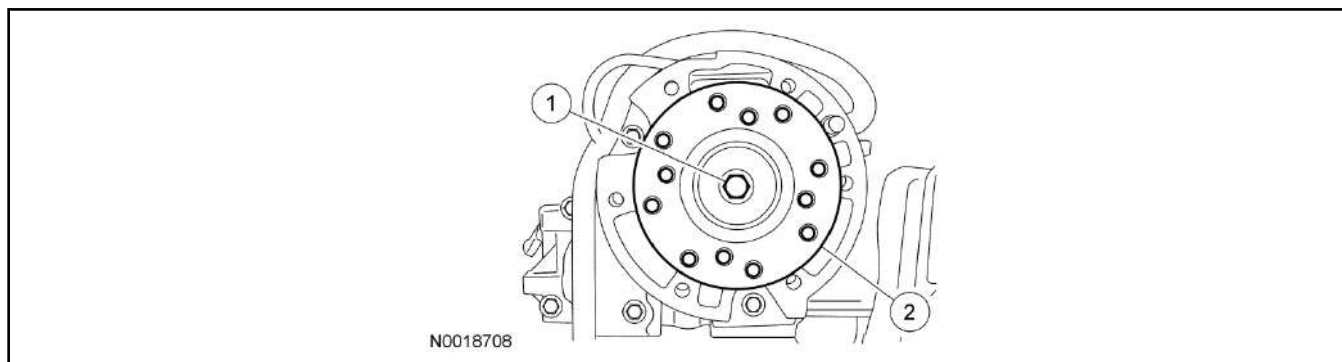
Remove the transfer case. For additional information, refer to Section 308-07B.

Rear Wheel Drive (RWD) vehicles

3. Remove the rear driveshaft. For additional information, refer to Section 205-01.

Transmissions with a fixed flange

4. Remove the output shaft flange.
 - 1 Remove and discard the output shaft flange bolt.
 - 2 Remove the output shaft flange.

**All vehicles**

5. Using a suitable transmission jack, support the transmission.
6. Remove the bolts, and raise the transmission upward, from the insulator.

DIAGNOSIS AND TESTING (Continued)

This pinpoint test is intended to diagnose the following:

- Wiring, terminals or connectors
- Memory SET switch
- Seat track
- DSM

PINPOINT TEST K: THE MEMORY SEAT DOES NOT OPERATE CORRECTLY — DOES NOT OPERATE USING THE MEMORY SET SWITCH, LATE PRODUCTION

NOTICE:

This vehicle uses 2 different driver seat modules (DSMs) and will be referred to as early production and late production. The circuit locations at the connectors are different and the DSMs are not interchangeable. Before diagnosing or servicing, make sure the correct DSM has been identified. Failure to follow this instruction can cause component failure. Refer to Wiring Diagrams Cell 123, Memory Seats for schematic and connector information.

NOTE:

Verify good battery condition before diagnosing the memory seat system. Poor battery condition may interfere with memory seat operation, even if vehicle starting is possible.

Test Step		Result / Action to Take
K1	CHECK DSM GEAR SELECTED (TRANSGEAR) PID STATES	
	NOTE: The DSM monitors ignition switch and transmission gear selector position status messages communicated across the CAN. This information is required for correct memory seat operation. Ignition switch and transmission gear selector status should be verified by using a scan tool to monitor the available PID data before proceeding with memory seat diagnosis. • Connect the scan tool. • Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger/ DSM PID: TRANSGEAR. • Operate the transmission gear selector in all positions while monitoring the following DSM PID TRANSGEAR states: — D6_PRK — REV — NTRL — DRIVE5 — DRIVE3 — DRIVE2 — DRIVE1 • Do the PID states agree with the selected positions?	Yes GO to K2. No To diagnose a transmission gear selector (PRNDL) status concern, REFER to Section 307-01.
K2	CHECK DSM IGNITION SWITCH STATUS (IGN_SW) PID STATES	
	• Enter the following diagnostic mode on the scan tool: DataLogger/ DSM PID: IGN_SW. • Cycle the ignition switch in all positions while monitoring the following DSM IGN_SW PID states: — Off — Accessory — Run — Start • Do the PID states agree with the selected positions?	Yes GO to K3. No To diagnose an ignition switch status concern, REFER to Section 211-05.
K3	RETRIEVE DSM DTCs	
	• Using the switches, attempt to operate the memory seat, memory exterior mirrors and memory adjustable pedals in all directions through the full range of travel. • Place the memory seat, memory exterior mirrors and memory adjustable pedals in central travel positions. • Enter the following diagnostic mode on the scan tool: Self Test/ DSM/ Retrieve DTCs. • Are any DSM DTCs retrieved?	Yes If DTCs B1952, B1956, and B1964 are all retrieved, GO to K10. If DTCs B1953, B1957 and B1965 are all retrieved, GO to K10. If DTC B1530, GO to K5. If DTC B1534, GO to K5. If DTC B1538, GO to K5. If DTC B1663, GO to K11. If DTC B1664, GO to K14. If DTC B1665, GO to K17.

GENERAL PROCEDURES**Remote Keyless Entry (RKE) Transmitter Programming****NOTE:**

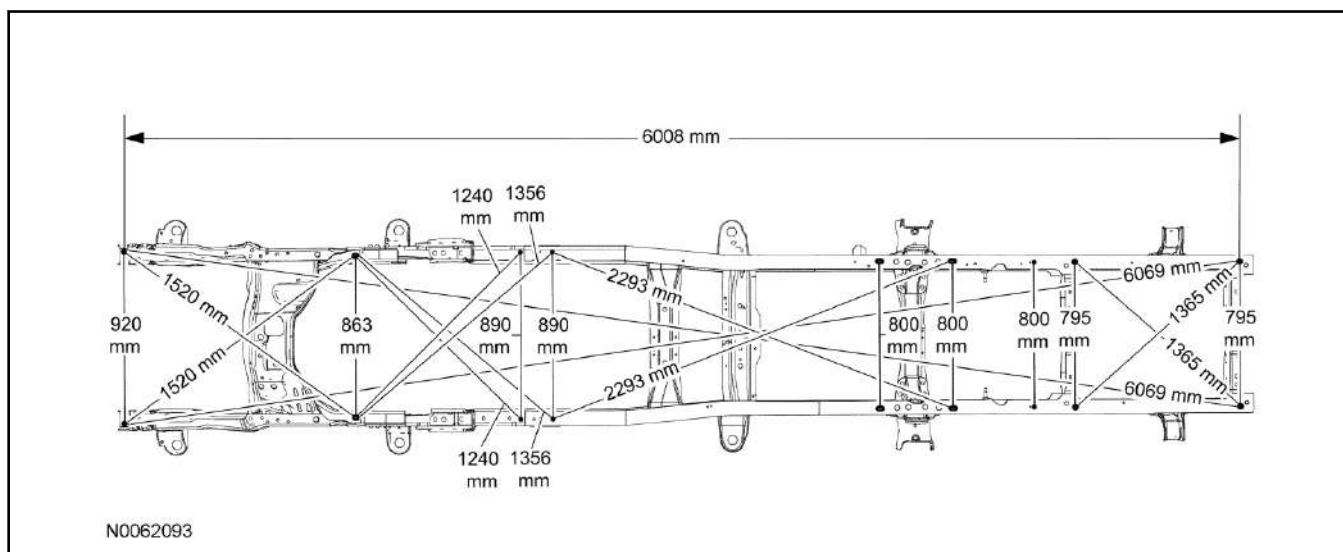
All Remote Keyless Entry (RKE) transmitters must be programmed at the same time.

NOTE:

Programming the RKE transmitters can be accomplished using a scan tool or by carrying out the following steps.

1. The vehicle must be electronically unlocked before entering the program mode using the RKE transmitter, keyless entry keypad (if equipped) or door lock control switch while the driver door is open.
2. Turn the key from the OFF to the ON position 8 times within 10 seconds, with the eighth turn ending in the ON position. If the module successfully enters program mode, the module locks and unlocks all the doors.
3. Within 20 seconds, press any button on an RKE transmitter and the doors lock and then unlock to confirm that the RKE transmitter is programmed. Repeat this step for each RKE transmitter.
4. If the door locks do not respond for any RKE transmitter, wait several seconds and press the button again. If the door locks still fail to respond, refer to Inspection and Verification in this section. (Make sure that no more than the maximum number of RKE transmitters [4] are attempted to be programmed. If 4 transmitters are programmed and an attempt is made to program an additional transmitter, the vehicle horn will sound indicating that the maximum number of transmitters has already been programmed.)
5. Exiting the programming mode is accomplished if one of the following occurs:
 - The key transitions to the OFF position.
 - Twenty seconds have passed since entering programming mode or since the last RKE transmitter was programmed.
 - The maximum number of RKE transmitters has been programmed.

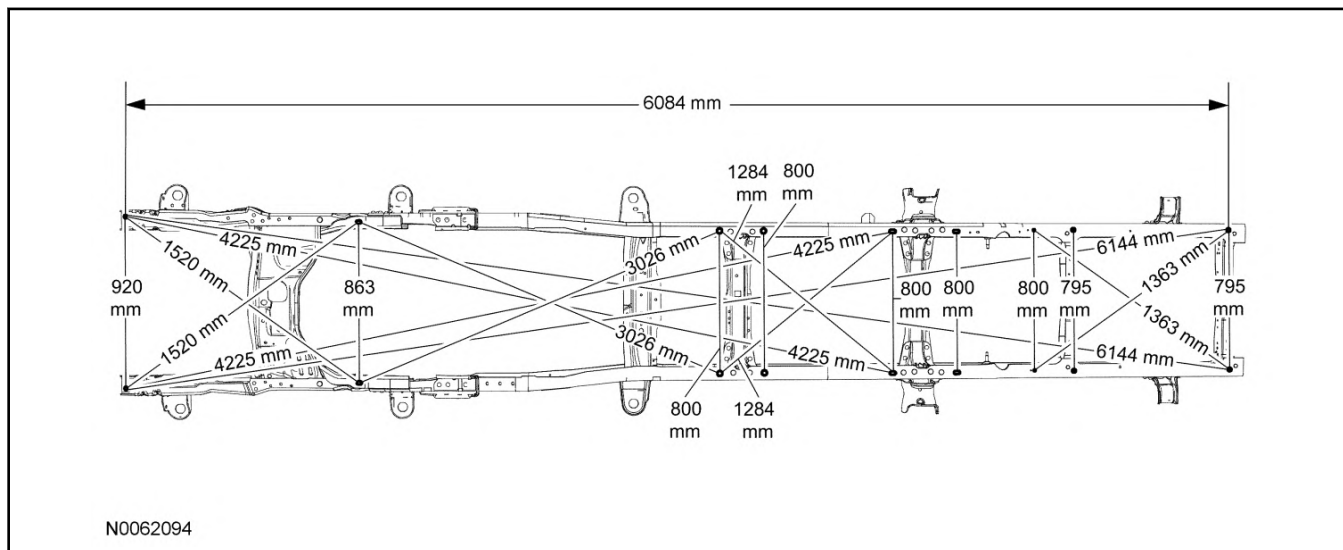
DESCRIPTION AND OPERATION (Continued)



Frame Dimensions — 4,191 mm (165 in) Wheelbase, F-350-550 Chassis Cab, Narrow Frame

NOTE:

Measurements are obtained on center, unless otherwise indicated.



Frame Dimensions — 4,470 mm (176 in) Wheelbase, F-350-550 Chassis Cab, Narrow Frame

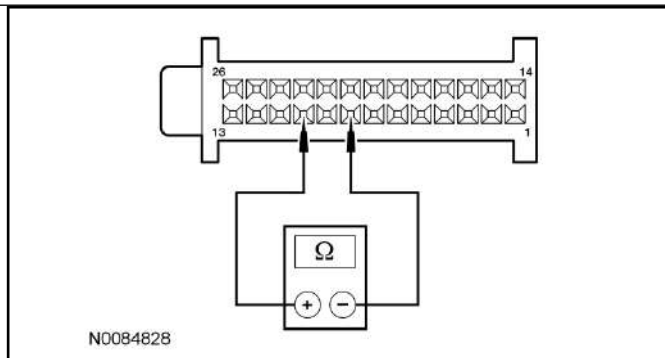
NOTE:

Measurements are obtained on center, unless otherwise indicated.

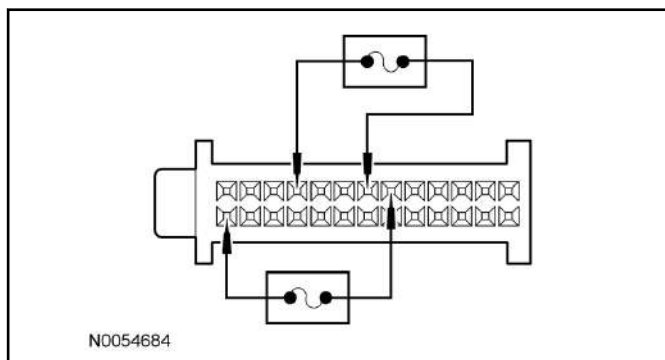
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST F: INCORRECT/ERRATIC DIRECTION OF AIRFLOW FROM OUTLETS (Continued)

F6 CHECK THE DOOR ACTUATOR CLOCKWISE OPERATION (Continued)

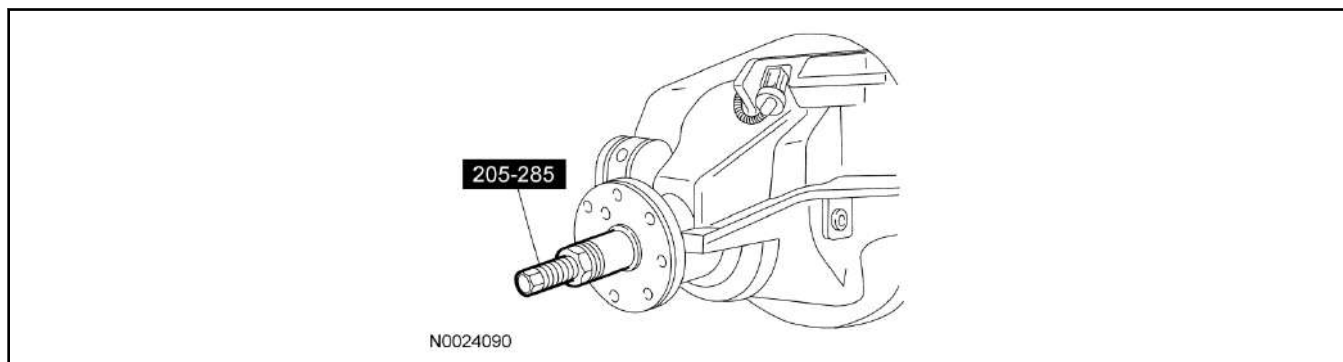


- Connect a fused jumper wire between:
 - HVAC module — EMTC C2357a-13, circuit SBP15 (WH/RD), harness side and HVAC module — EMTC C2357a-19, circuit CH202 (BU/GN), harness side. Connect a second fused jumper wire between HVAC module — EMTC C2357a-23, circuit GD133 (BK), harness side and HVAC module — EMTC C2357a-20, circuit CH203 (GN/BN), harness side.
 - HVAC module — EATC C228a-13, circuit SBP15 (WH/RD), harness side and HVAC module — EATC C228a-19, circuit CH229 (WH/BU), harness side. Connect a second fused jumper wire between HVAC module — EATC C228a-23, circuit GD133 (BK), harness side and HVAC module — EATC C228a-20, circuit CH228 (YE/GY), harness side.

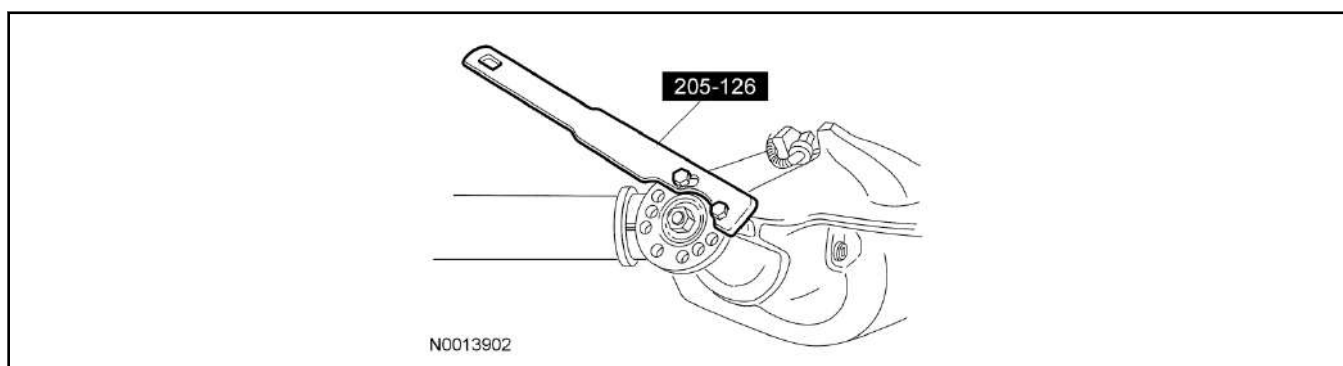


- Remove the fused jumpers.
- Connect a fused jumper wire between:
 - **For EMTC systems**, HVAC module — EMTC C2357a-23, circuit GD133 (BK), harness side and HVAC module — EMTC C2357a-19, circuit CH202 (BU/GN), harness side. Connect a second fused jumper wire between HVAC module — EMTC C2357a-13, circuit SBP15 (WH/RD), harness side and HVAC module — EMTC C2357a-20, circuit CH203 (GN/BN), harness side.
 - **For EATC systems**, HVAC module — EATC C228a-23, circuit GD133 (BK), harness side and HVAC module — EATC C228a-19, circuit CH229 (WH/BU), harness side. Connect a second fused jumper wire between HVAC module — EATC C228a-13, circuit SBP15 (WH/RD), harness side and HVAC module — EATC C228a-20, circuit CH228 (YE/GY), harness side.

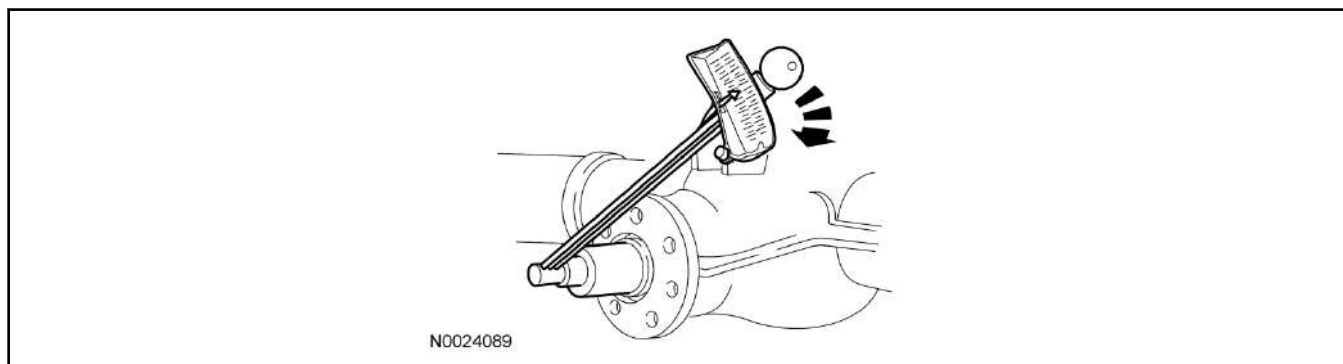
IN-VEHICLE REPAIR (Continued)



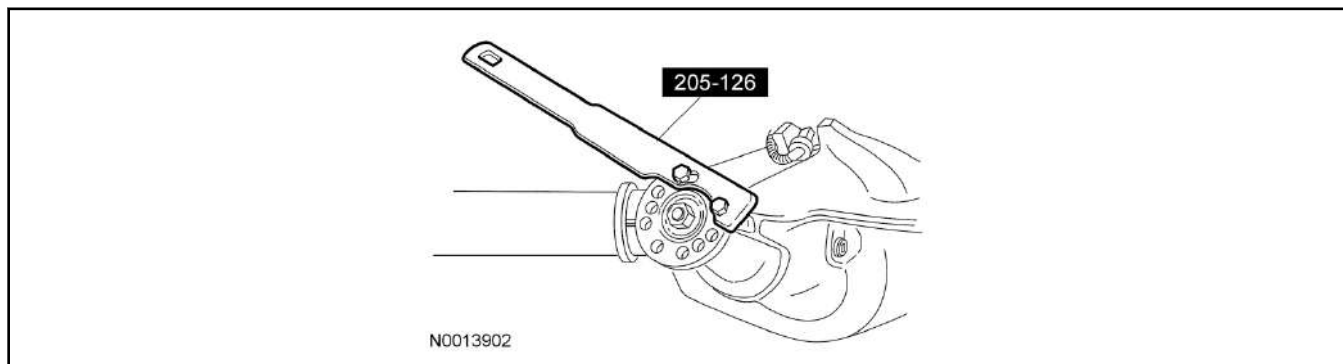
18. Use the Drive Pinion Flange Holding Fixture to prevent the pinion flange from turning while installing the old washer and the pinion shaft locknut.
- Tighten to 637 Nm (470 lb-ft).



19. Using a Nm (lb-in) torque wrench, rotate the pinion. The rotational torque must read 2.3-4.5 Nm (20-40 lb-in).
- To increase the drive pinion bearing preload, remove drive pinion bearing preload shims. To decrease the drive pinion bearing preload, add drive pinion bearing shims.



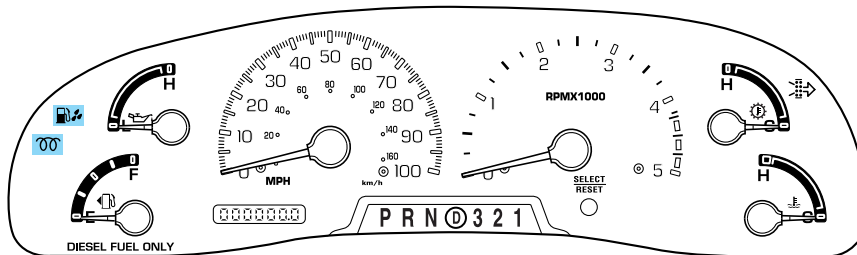
20. While using the Drive Pinion Flange Holding Fixture to prevent the pinion flange from turning, remove and discard the old washer and pinion shaft locknut.



DIAGNOSIS AND TESTING (Continued)**(Continued)**

DTC	Description	Source	Action
U2050	No Application Present	ACM	REFER to Section 415-00.
U2050	No Application Present	CDIM	REFER to Section 211-05.
U2050	No Application Present	DSM	REFER to Section 418-01.
U2050	No Application Present	HVAC Module	REFER to Section 412-00.
U2050	No Application Present	IC	REFER to Section 418-01.
U2050	No Application Present	RCM	REFER to Section 501-20B.
U2050	No Application Present	SDARS Module	REFER to Section 418-01.
U2050	No Application Present	SJB	REFER to Smart Junction Box (SJB) in this section.
U2051	1 or More Calibration Files Missing/Corrupt	ABS Module	REFER to Section 418-01.
U2051	1 or More Calibration Files Missing/Corrupt	ACM	REFER to Section 415-00.
U2472	Unexpected Ignition State	IC	REFER to Section 413-01.
U2472	Unexpected Ignition State	SJB	DIAGNOSE other DTCs first. DTC U2472 will set if ignition is not in ON or is unknown during self-test. If still present, REFER to Section 211-05.
U2473	Unexpected Vehicle Speed (VSS)	ACM	DTC U2473 will set if vehicle speed exceeds 5 km/h (3 mph) during the self-test. REFER to Section 415-00.
U2473	Unexpected Vehicle Speed (VSS)	SJB	DTC U2473 will set if vehicle speed exceeds 5 km/h (3 mph) during the self-test. REFER to Section 418-01.
U2510	CAN - Invalid Data for Vehicle Security	IC	REFER to Section 419-01.
U2511	CAN - Data Mis-Match (Receive Data Does Not Match Expected)	IC	REFER to Section 419-01.

Warning lights



WAIT TO START

With the key in the ON position, the



WAIT TO START light will illuminate if glow plug heat is necessary as a starting aid. Wait until the light goes off before starting. The light should always illuminate briefly, when the ignition key is in the ON position. If the light does not illuminate, there may be a problem. Refer to the *Starting* chapter in this guide. After the engine starts, the light should remain off.

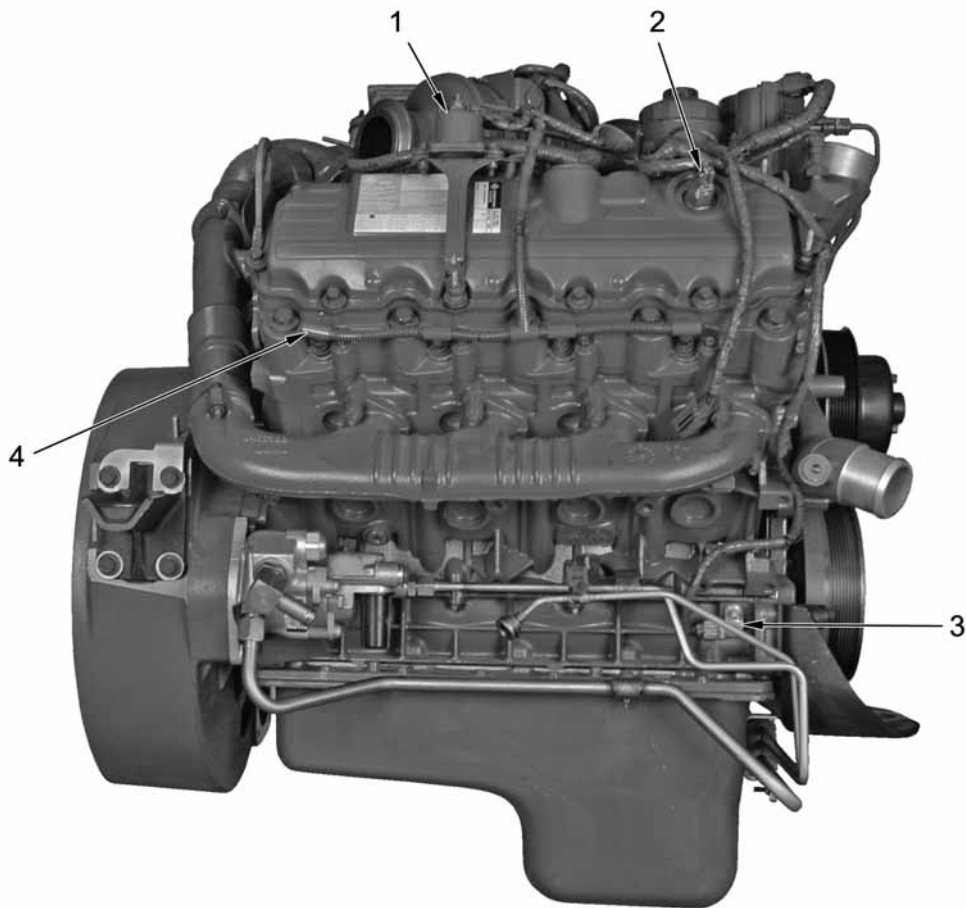
WATER IN FUEL

During refueling, it is possible for



water-contaminated diesel fuel to be pumped into your tank. Your vehicle fuel system is equipped with an HFCM to remove water from the fuel. The WATER IN FUEL light will illuminate when the ignition is turned to START (as part of the light function check) and when the HFCM has a significant quantity of water in it.

If the light illuminates when the engine is running, stop the vehicle as soon as safely possible, shut off the engine, then drain the HFCM. Refer to the *General maintenance information* chapter for drain procedure. Allowing water to stay in the system could result in extensive damage to, or failure of, the fuel injection system.

Electronic Components – Right

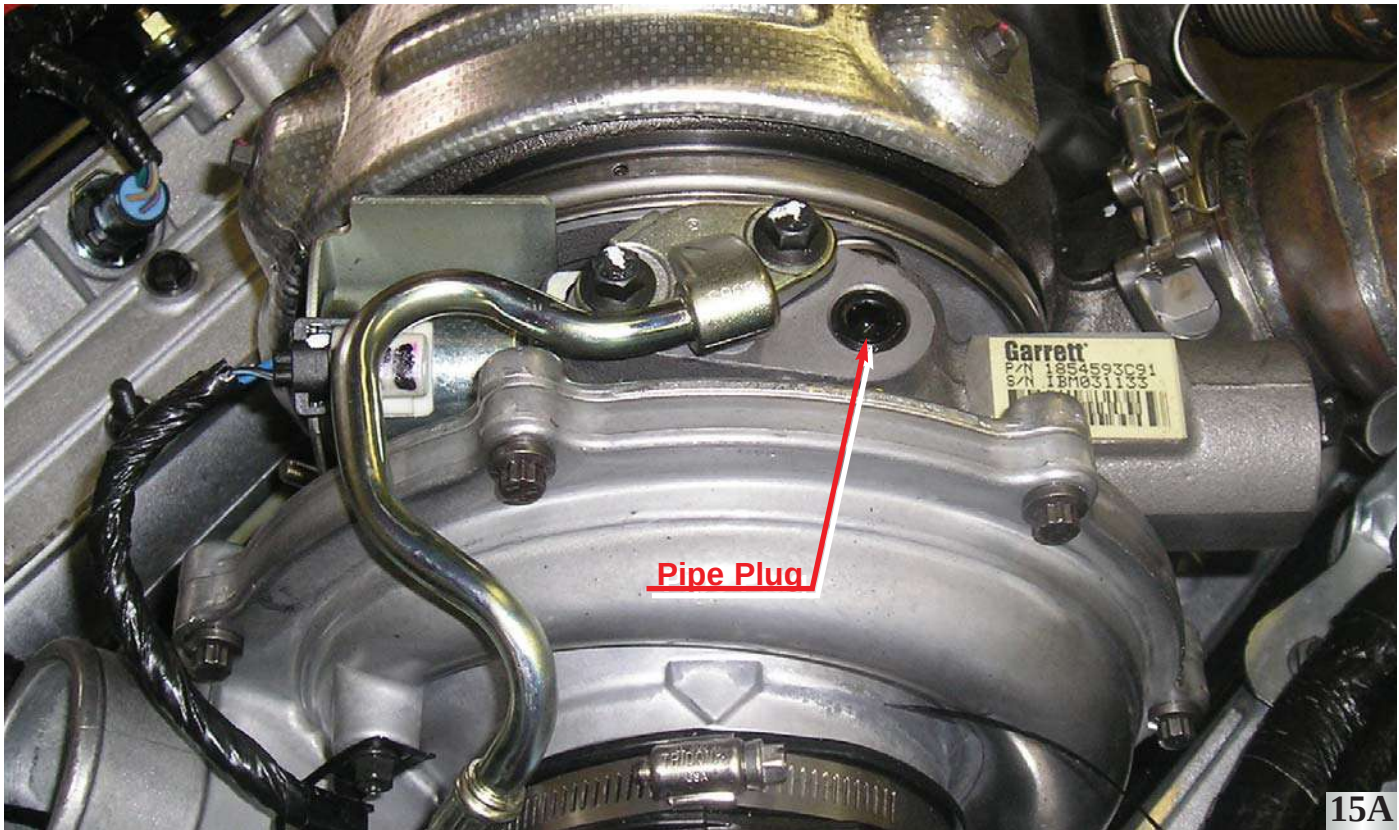
D31487

Figure 424 Electronic components – Right

- | | |
|---|-------------------------------------|
| 1. Glow plug relay | 3. Crankshaft Position (CKP) sensor |
| 2. Injector Control Pressure (ICP) sensor | 4. Glow plug harness |

Test 4

- Remove the pipe plug from the top of the VGT actuator housing, located near the oil supply tube.
- Apply an index mark on the VGT control valve cam follower (tip of the actuator).
- With the engine running, use the WDS active command feature, increase the VGT% pid.
- While increasing the VGTDC# PID from 20% to 85% watch the VGT control valve cam lobe for movement at each step.
- If movement is not observed replace turbocharger assembly.



15A

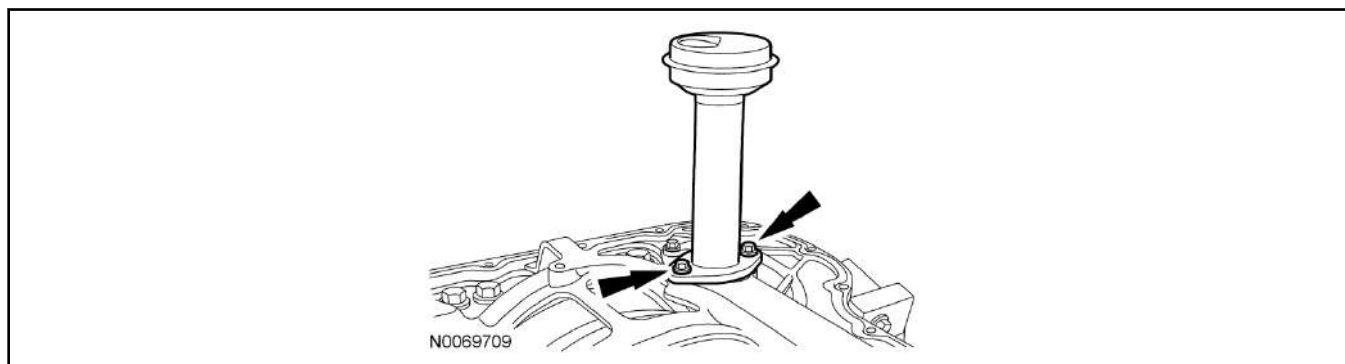
TURBOCHARGER NOISE

One common cause for turbo replacement is noise. A large percentage of the turbochargers replaced for noise are not bad. Compared to the turbocharger on the 7.3L Power Stroke, the VGT is louder, under some conditions, due to increased boost and compressor speed. This is normal and should not be a cause for replacement.

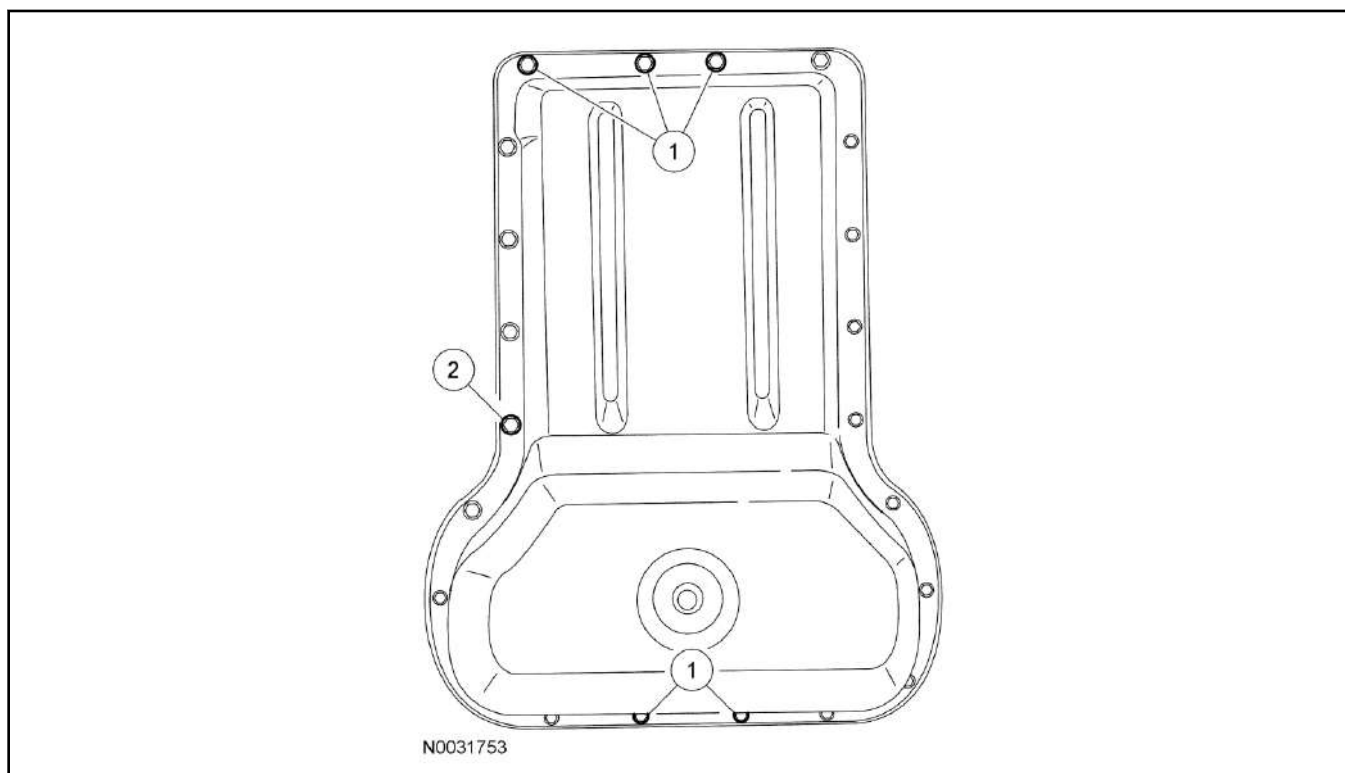
Exhaust Leaks

Turbochargers have been replaced for noise concerns when the concern is exhaust mis-alignment at the connections and bad or missing gaskets. There are four (4) locations near the turbocharger that need to be inspected prior to replacing a turbocharger for a noise complaint. One of these is located in the exhaust up pipe on the passenger side, there is a flange that requires a metal gasket in the pipe just above the EGR cooler connection. There is also a metal gasket at the EGR cooler that is held in place with a V-band clamp. If the gasket is missing, damaged or the clamp misaligned, it could be misdiagnosed as a turbocharger failure. Two other leak points are at the turbine inlet and outlet; misaligned clamps and pipes can cause a noise concern. If the turbocharger itself is responsible for excessive noise, expect to find wheel to housing rub and bearing failure.

(Continued)



33. Install the oil pan and the 22 bolts.
- 1 Install the 5 longer oil pan bolts.
 - 2 Install the 17 remaining oil pan bolts.
- Tighten to 13 Nm (115 lb-in).



34. **NOTICE:**
To prevent engine damage, keep the valve tappets in the order in which they were removed. Install all valve tappets back in their original positions.

Apply clean engine oil to the valve tappets and install them into the valve tappet guides. Install the valve tappet guides and the 4 bolts.

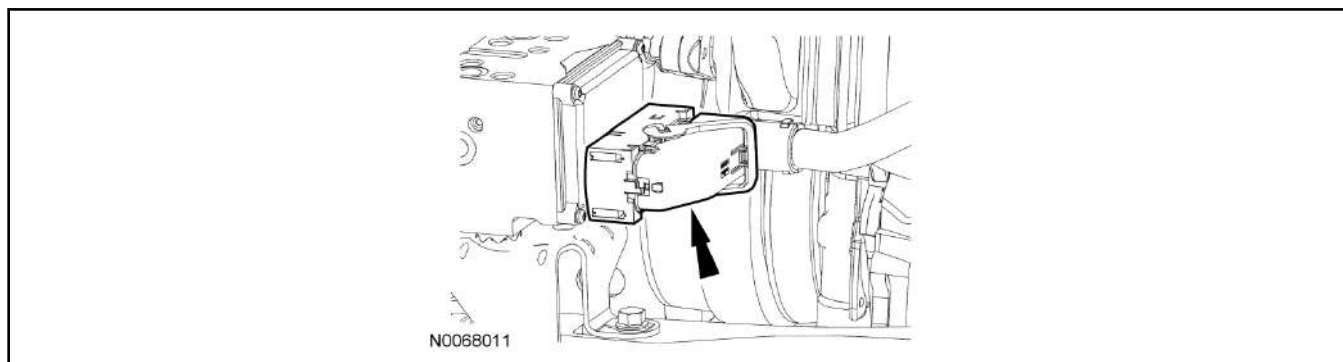
- Tighten to 13 Nm (115 lb-in).

IN-VEHICLE REPAIR (Continued)

Item	Part Number	Description
1	9448	Exhaust manifold gasket
2	9430	Exhaust manifold
3	9F465	Horizontal EGR cooler bracket
4	W302550	Horizontal EGR cooler bracket bolt (4 required)
5	W302675	Exhaust manifold bolt (4 required)
6	8287	Clamp (2 required)
7	W302549	Pin (2 required)

Removal

1. Remove the LH turbocharger inlet pipe. For additional information, refer to Section 309-00.
2. Remove the degas bottle. For additional information, refer to Section 303-03.
3. Remove the LH front tire and wheel. Carry out the Wheel and Tire — Single Rear Wheel (SRW) or the Wheel and Tire — Dual Rear Wheels (DRW) procedure. For additional information, refer to Section 204-04.
4. Remove the LH fender splash shield. For additional information, refer to Section 501-02.
5. Remove the oil level indicator. Remove the nut for the oil level indicator tube.
6. Remove the bolt and position the oil level indicator tube aside.
 - Remove and discard the O-ring seal.
7. Disconnect the anti-lock module electrical connector and position aside.



8. Loosen the clamp for the EGR cooler coolant supply hose.
9. **NOTICE:**
The coolant hose clamps used on this engine are constant tension worm gear clamps. Standard worm gear clamps cannot be used. Failure to use the correct coolant hose clamps may result in hose joint failure.

NOTE:
Position a drain pan prior to removing the EGR cooler coolant supply tube.

Remove the bolts and the EGR cooler coolant supply tube.
 - Discard the clamp on the hose and the O-ring seal on the tube.
10. **NOTICE:**
The coolant hose clamps used on this engine are constant tension worm gear clamps. Standard worm gear clamps cannot be used. Failure to use the correct coolant hose clamps may result in hose joint failure.

Loosen the clamp and disconnect the EGR cooler outlet coolant hose.
 - Discard the clamp.
11. Remove the 2 nuts for the horizontal EGR cooler outlet.
12. Remove the 2 studs for the horizontal EGR cooler outlet.
 - Remove and discard the gasket.
13. Remove the bolt and disconnect the steering shaft.
 - Discard the bolt.