

Anti-Lock Control - Traction Control and Stability Assist**Special Tool(s)**

 ST3093-A	Fluke 77-IV Digital Multimeter FLU77-4 or equivalent
 ST1136-A	Flex Probe Kit 105-R025D or equivalent
 ST3030-A	Rotunda Active Wheel Speed Sensor Tester 105-R0110
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Principles of Operation**ABS with Traction Control, Electronic Stability Control (ESC) and Roll Stability Control (RSC®)**

The ABS module with traction control and Roll Stability Control (RSC®) manages anti-lock braking to maintain vehicle control during deceleration and performs additional functions specific to traction control and RSC®.

ABS Operation

When the ignition switch is in the RUN position, the ABS module does a preliminary electrical check and, at approximately 20 km/h (12 mph), the hydraulic pump motor is turned on for approximately one-half second. During this time a buzzing or humming noise may be heard and a vibration maybe felt in the brake pedal. This is a normal condition. Any malfunction of the ABS disables the stability assist and the ABS warning indicator illuminates. However, the power-assist braking system functions normally.

The ABS module monitors and compares the rotational speed of each wheel. Wheel speeds are measured by the wheel speed sensor, which electrically senses each tooth of the sensor ring as it passes through the magnetic field of the sensor. When the ABS module detects an impending wheel lock, the ABS module commands the hydraulic pump motor on and commands the Hydraulic Control Unit (HCU) to open and close the appropriate solenoid valves to modulate the brake pressure to the individual brake caliper(s). Once the affected wheel(s) return to the desired speed, the ABS module commands the HCU to return the solenoid valves to their normal position and normal base brake operation is restored.

The ABS module must be confred when a new ABS module is installed.

Fuel System - 6.0L Diesel

The 6.0L diesel fuel system consists of the following components:

- Fuel tubes
- Fuel filter (located in the fuel conditioning module)
- Secondary fuel filter (located on the engine)
- Fuel level sensor (located in the fuel tank)
- Fuel tank filler pipe assembly
- Fuel tank
- Fuel conditioning module (located on the LH frame rail)
- Inertia Fuel Shutoff (IFS) switch (located behind the RH cowl side trim panel)

The fuel system for the direct injection turbo diesel:

- is controlled by the PCM.
- utilizes an electric, frame-mounted Fuel Pump (FP).
- incorporates a fuel filter and water separator assembly.

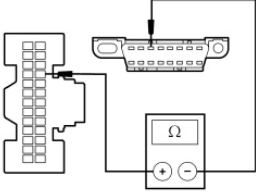
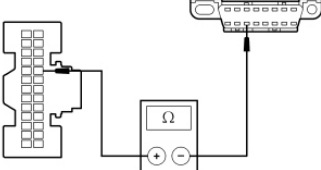
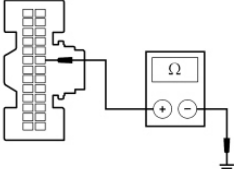
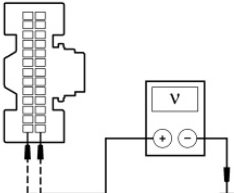
The electric FP :

- draws fuel from the tank.
- circulates fuel under pressure through the fuel filter, the water separator and the pressure regulator to the cylinder head fuel galleries and then to the fuel injectors.
- Ex returned to the fuel tank through the fuel return hose.

Fuel Filter/Water Separator

The diesel engine is equipped with a fuel filter and water separator assembly. Drain the water from the fuel filter at the recommended maintenance intervals. Refer to the Owner's Literature for maintenance intervals. If there is water in the fuel, an indicator on the instrument panel will alert the operator. When the indicator glows continuously while the engine is running, drain the water from the fuel filter and water separator bowl as soon as possible to prevent damage to the fuel injection system.

For exploded view information of the fuel system, refer to Fuel Tank and Filler Pipe - Exploded View or Fuel Line - 6.0L Diesel in [Section 310-00](#) .

 N0089997 • Measure the resistance between the IC C220-9, circuit VDB07 (VT/OG), harness side and the DLC C251-11, circuit VDB07 (VT/OG), harness side.	
 N0089998 • Are the resistances less than 5 ohms?	
C5 CHECK THE IC GROUND CIRCUIT FOR AN OPEN • Measure the resistance between the IC C220-8, circuit GD114 (BK/BU), harness side and ground.  N0089999 • Are the resistances less than 5 ohms?	Yes CONNECT the negative battery cable. GO to <u>C6</u> . No REPAIR the circuit. CONNECT the negative battery cable. CLEAR the DTCs. REPEAT the network test with the scan tool.
C6 CHECK THE IC VOLTAGE SUPPLY CIRCUITS FOR AN OPEN • Disconnect: IC C220. • Measure the voltage between the IC C220-13, circuit SBP26 (YE/RD), harness side and ground; and between the IC C220-26, circuit CBP29 (VT/WH), harness side and ground.  N0090000 • Are the voltages greater than 10 volts?	Yes GO to <u>C7</u> . No VERIFY the Smart Junction Box (SJB) fuses 26 (10A) and 29 (5A) are OK. If OK, REPAIR the circuit in question. If not OK, REFER to the Wiring Diagrams Manual to identify the possible causes of the circuit short. TEST the system for normal operation.

SECTION 303-01B: Engine - 5.4L (2V)
REMOVAL

2011 E-Series Workshop Manual
Procedure revision date: 07/29/2010

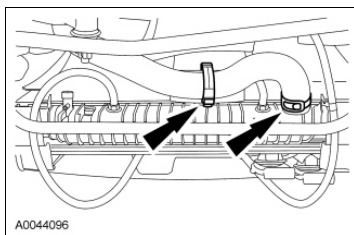
Engine

Special Tool(s)

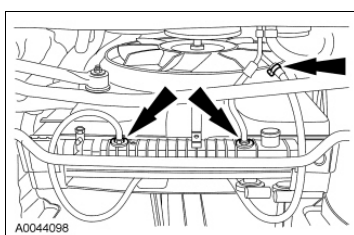
 ST1499-A	Holding Wrench, Fan Pulley 303-239 (T84T-6312-C)
 ST1377-A	Lifting Bracket, Engine 303-F047 (014-00073)
 ST1628-A	Wrench, Fan Clutch Nut 303-240 (T84T-6312-D)

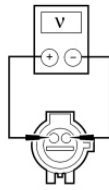
Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to [Section 100-02](#).
2. If equipped, recover the A/C system. For additional information, refer to [Section 412-00](#).
3. Remove the intake manifold. For additional information, refer to [Intake Manifold](#) in this section.
4. Remove the accessory drive belt.
5. Remove the starter. For additional information, refer to [Section 303-06](#).
6. Remove the front bumper. For additional information, refer to [Section 501-19](#).
7. Disconnect the lower radiator hose from the radiator.
 - Disconnect the hose hanger.
 - Disconnect the hose.



8. Disconnect the transmission cooler hoses and drain the fluid into a suitable container.





A0057374

- Is the voltage greater than 10 volts?

F12 CHECK THE WHEEL SPEED SENSOR CIRCUITS FOR AN OPEN

NOTE: Both circuits must be checked for each DTC.

- Ignition OFF.
- Disconnect: ABS Module C135.
- Measure the resistance between the ABS module connector, harness side and the suspect wheel speed sensor connector, harness side as indicated in the following chart:

Wheel Speed Sensor	Circuit	ABS Module
C160-2	RCA19 (VT)	C135-4
C160-1	VCA05 (GY/VT)	C135-3
C150-2	RCA17 (YE)	C135-28
C150-1	VCA03 (VT/WH)	C135-27

- Are the resistances less than 5 ohms?

F13 CHECK FOR CORRECT ABS MODULE OPERATION

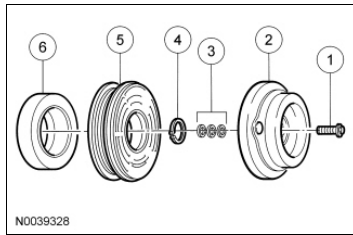
- Check ABS module C135 for:
 - ◆ corrosion.
 - ◆ pushed-out pins.
 - ◆ spread terminals.
- Connect: ABS C135.
- Make sure the ABS connector seats correctly.

Yes
GOo F13 .

No
REPAIR the affected circuit(s). TEST DRIVE the vehicle above 32 km/h (20 mph) and CARRY OUT at least one ABS stop.

Yes
INSTALL a new ABS module. REFER to Anti-Lock Brake System (ABS) Module in this section. TEST DRIVE the vehicle above 32 km/h (20 mph) and CARRY OUT at least one ABS stop.

No
The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

A/C Compressor Clutch Assembly

Item	Part Number	Description
1	W711877	A/C clutch bolt
2	19D786	A/C clutch disc and hub
3	19D648	A/C clutch disc and hub spacers
4	N805338	A/C compressor pulley snap ring
5	19D784	A/C compressor pulley
6	19D798	A/C clutch field coil

The magnetic A/C clutch has the following characteristics:

- The A/C clutch drives the compressor shaft.
- When battery positive voltage (B+) is applied to the A/C clutch field coil, the clutch plate and hub assembly is drawn toward the A/C clutch pulley.
- The magnetic force locks the clutch plate and hub assembly and the A/C clutch pulley together as one unit, causing the compressor shaft to rotate.
- When B+ is removed from the A/C clutch field coil, springs in the clutch plate and hub assembly move the clutch plate away from the A/C clutch pulley.

A/C Pressure Relief Valve

NOTE: If the A/C compressor is operating within limits and the A/C pressure relief valve is venting, or if the A/C pressure relief valve is leaking around the threads, replace the A/C pressure relief valve and O-ring. If the A/C pressure relief valve still vents after it is replaced, diagnose the refrigerant system for a restriction.

An A/C pressure relief valve is incorporated in the A/C compressor to prevent damage to the A/C compressor and other system components by relieving unusually high system discharge pressure buildups. For specifications regarding operating pressure(s), refer to Section 412-00.

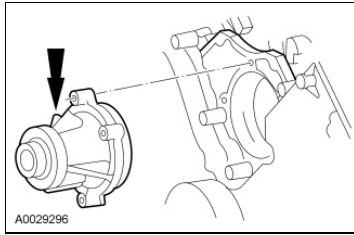
The A/C pressure relief valve is a separate component and can be replaced separately from the A/C compressor. It is necessary to recover the refrigerant before removing the A/C pressure relief valve.

Condenser Core

The condenser core has the following characteristics:

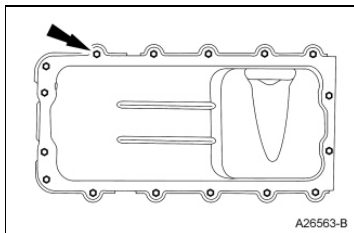
- it is an aluminum fin and tube design heat exchanger located in front of the vehicle radiator.
- it cools compressed refrigerant gas by allowing air to pass over fins and tubes to extract heat and by condensing gas to liquid refrigerant as it is cooled.

Evaporator Core

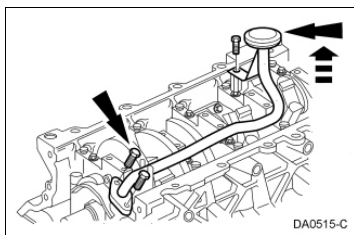


55. Before removing the pistons, inspect the top of the cylinder bores. If necessary, remove the ridge or carbon deposits from each cylinder using an abrasive pad or equivalent, following the manufacturer's instructions.

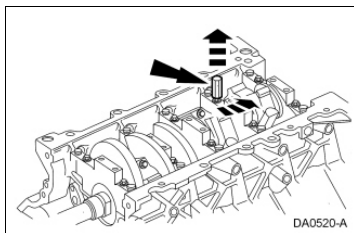
56. Remove the 14 bolts, the oil pan and the oil pan gasket.
 • Clean and inspect the sealing surfaces.



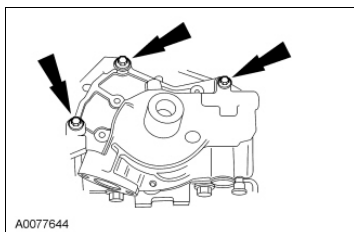
57. Remove the 3 bolts and the oil pump screen and pickup tube.



58. Remove the oil pump screen and pickup tube spacer.



59. Remove the 3 bolts and the oil pump.



60. **NOTICE:** Make sure connecting rods and rod caps are numbered to keep them in the correct orientation. Failure to follow these instructions may result in engine damage.

Remove the 16 bolts and the 8 connecting rod caps.

Engine Ignition

Electronic Ignition (EI) System

The Electronic Ignition (EI) system consists of:

- ten ignition coils.
- ten spark plugs.
- Crankshaft Position (CKP) sensor.

The EI system is a coil-on-plug ignition system which uses one ignition coil for each cylinder attached to the spark plug. The PCM receives a signal from the CKP sensor and sends low voltage signals to each of the ignition coils. The ignition coils turn low voltage signals into high voltage pulses which are passed through the spark plugs to ignite the compressed fuel and air mixture.

Crankshaft Position (CKP) Sensor

The CKP sensor:

- is a variable reluctance sensor.
- is triggered by a 40-minus-1 tooth trigger wheel mounted on the crankshaft.
- provides base timing and crankshaft speed (rpm) to the PCM.

For removal and installation, refer to Section 303-14 .

Ignition Coils

The 10 separate ignition coils:

- change low voltage signals from the PCM to high voltage pulses.
- produce the high voltage pulses to the spark plugs.
- are connected directly to each spark plug.

For removal and installation, refer to Ignition Coil-On-Plug in this section.

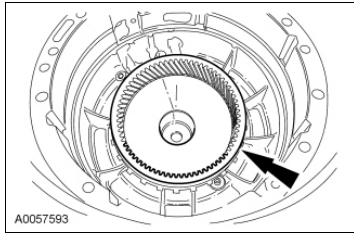
Spark Plugs

The 10 spark plugs:

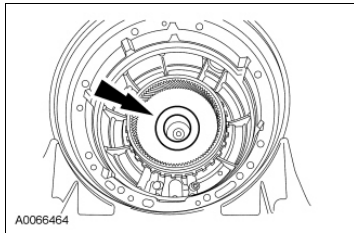
- change a high voltage pulse into a spark, which ignites the fuel and air mixture.

For removal and installation, refer to Spark Plugs in this section.

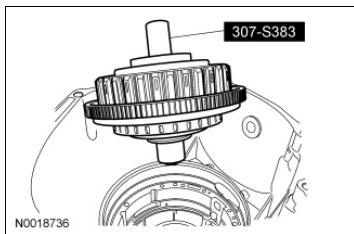
39. Install the center shaft and ring gear.



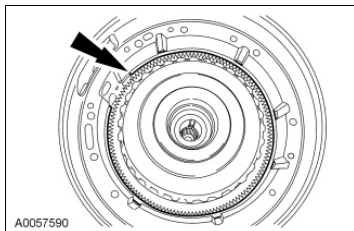
40. Install the No. 4 thrust bearing onto the center shaft.



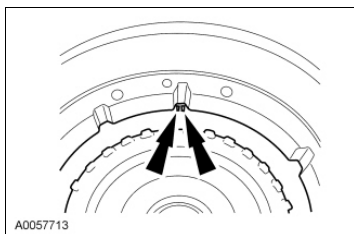
41. Using the Clutch Loading Fixture, install the coast clutch assembly and overdrive carrier.



42. Install the overdrive clutch assembly snap ring with the gap in the 6 o'clock position.



43. Install the overdrive pressure plate with the notches facing up.

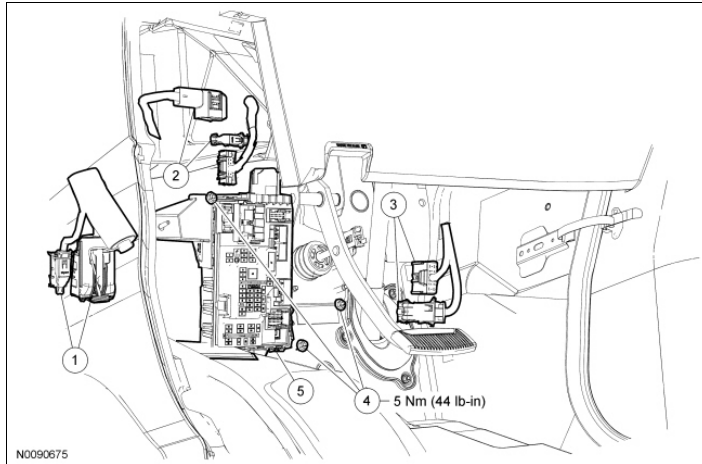


44. Install the overdrive clutch.

- Start with a friction plate, alternating with a steel plate.

Smart Junction Box (SJB)

NOTE: Steering column opening cover removed for clarity.



Item	Part Number	Description
1	-	Smart Junction Box (SJB) electrical connectors (2 required) (part of 14405)
2	-	SJB electrical connectors (3 required) (part of 12A581)
3	-	SJB electrical connectors (2 required) (part of 14401)
4	W707137-S437	SJB nuts (3 required)
5	15K602	SJB

Removal

NOTE: Prior to the replacement of the module, it is necessary to upload the module configuration information to a scan tool. This information must be downloaded into the new Smart Junction Box (SJB) after installation. For additional information, refer to [Section 418-01](#) . In the event that As-Built data entry is required (SJB does not communicate), all Remote Keyless Entry (RKE) devices must be programmed to the new SJB . A minimum of 2 devices are necessary to complete the configuration and turn off the flashing interior lights.

NOTE: The Tire Pressure Monitoring System (TPMS) functionality is integrated into the SJB .

NOTE: A new SJB is delivered in a "manufacturing mode" with 8 pre-set DTCs. A successful configuration of the SJB , then a successful TPMS sensor training, then a successful self-test including the clearing of all DTCs is required in order to clear the 8 manufacturing mode DTCs. The 8 manufacturing mode DTCs are:

- B106D (Tire Pressure Monitor System [TPMS] Initiators Not Configured) This DTC is present when the SJB is not configured, even on applications that are not equipped with initiators.
- B2477 (Module Configuration Failure)
- B2868 (Left Front Tire Pressure Sensor Fault)
- B2869 (Right Front Tire Pressure Sensor Fault)
- B2870 (Right Rear Tire Pressure Sensor Fault)
- B2871 (Left Rear Tire Pressure Sensor Fault)
- B2A21 (One or More Configuration Files Missing Or Corrupt)

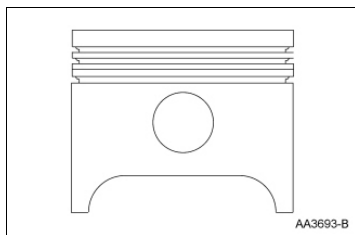
Piston Ring-to-Groove Clearance

Special Tool(s)

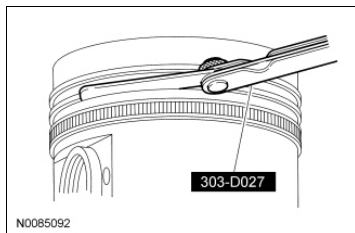
 ST1271-A	Feeler Gauge Set 303-D027 (D81L-4201-A) or equivalent
---	--

NOTE: Refer to the appropriate Section 303-01 for the specification.

1. Inspect the piston for ring land damage or accelerated wear.

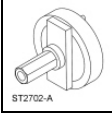


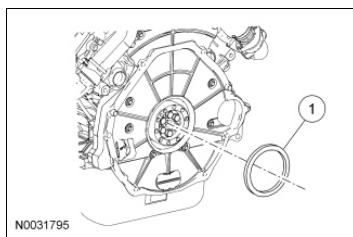
2. Using the Feeler Gauge Set, measure the piston ring-to-groove clearance.



Crankshaft Rear Seal

Special Tool(s)

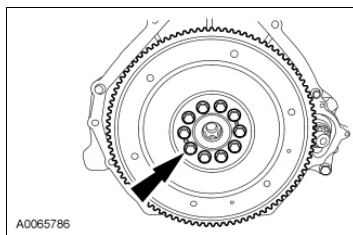
 ST2702-A	Installer, Crankshaft Rear Seal and Wear Ring 303-770
 ST1185-A	Slide Hammer 100-001



Item	Part Number	Description
1	6701	Crankshaft rear seal

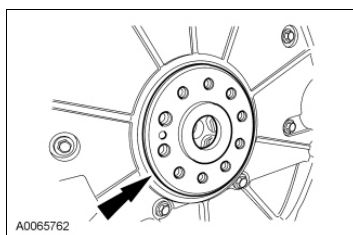
Removal

1. Remove the transmission. For additional information, refer to [Section 307-01B](#).
2. Remove the 10 bolts and flexplate.
 - Discard the bolts.

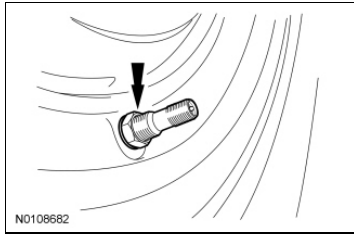


3. **NOTICE:** Use extreme care when removing the flywheel front adapter to prevent damage to the alignment dowel pin.

Remove the flywheel front adapter.

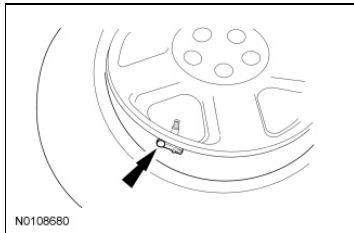


4. **NOTICE:** To prevent engine damage, do not remove the rear primary crankshaft flange bolts

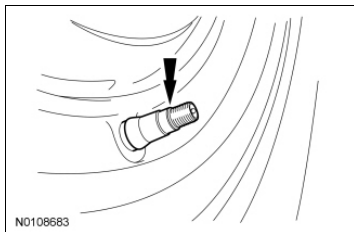


Valve Stem Mounted Sensors

Valve stem mounted sensors are attached to the wheel's valve stem with a screw.



The valve stems that are used on wheels that are equipped with valve stem mounted sensors have a rubber seal and an extra brass shoulder, larger in diameter and with no threads, that can only be seen when the cap is removed.



Instrument Cluster (IC) and Message Center

The IC illuminates the TPMS indicator when it receives a message from the SJB to do so and displays the appropriate message(s) in the message center (if equipped).

The IC and message center are diagnosed and serviced in their own respective workshop manual sections.

Shift Point Road Test

NOTE: Always drive the vehicle in a safe manner according to the driving conditions and obey all traffic laws.

NOTE: Shift speed ranges are approximate for all applications.

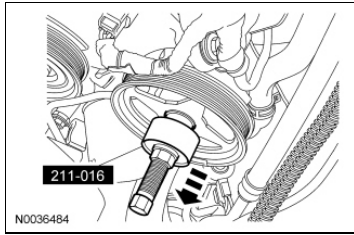
The shift point road test verifies that the shift control system is operating correctly.

1. Bring engine and transmission up to normal operating temperature.
2. Operate the vehicle with the selector lever in the (D) position.
3. Apply minimum throttle and observe speeds at which an upshift occurs and the torque converter engages, refer to the Shift Speeds Chart in this section.
4. With the transmission in Overdrive (O/D) (4th gear), press the Transmission Control Switch (TCS). The transmission should downshift to 3rd gear. Release the accelerator pedal; engine braking should occur.
5. Press the accelerator pedal to floor, Wide Open Throttle (WOT). The transmission should shift from 3rd to 2nd gear or 3rd to 1st, depending on vehicle speed. The Torque Converter Clutch (TCC) should disengage and then reapply.
6. With the selector lever in the (D) position and vehicle speed above 80 km/h (50 mph) and less than half throttle, move the selector lever from the (D) position to the manual 2 position and release the accelerator pedal. The transmission should immediately downshift into 2nd gear. With the vehicle remaining in 2nd gear, move the selector lever into the manual 1 position, and release the accelerator pedal. The transmission should downshift into 1st gear at vehicle speeds approximately below 45-56 km/h (28-35 mph).
7. If the transmission fails to upshift/downshift or TCC does not apply and release, refer to Diagnosis By Symptom in this section.

Shift Speed Chart

NOTE: Shift speed ranges are approximate for all applications. For specific applications (engine, axle ratio and application), refer to the Automatic Transmission Specification booklet. Always drive the vehicle in a safe manner according to the driving conditions and obey all traffic laws.

Throttle Position	Shift	MPH	Km/H
Closed Throttle	4-3	11-25	18-40
	3-2	11-25	18-40
	2-1	4-10	6-16
Light Throttle	1-2	9-17	14-27
Throttle Position (TP) Voltage	2-3	15-35	24-56



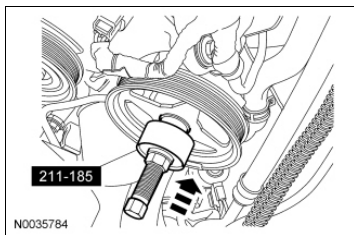
Installation

All vehicles

1. **NOTICE:** Do not install a power steering pump pulley that has been removed and installed twice or pulley failure and/or pump damage may occur. Inspect the pulley for paint marks in the web area near the hub. If there are 2 paint marks, discard the pulley and install a new one. If there is one paint mark or no paint marks, use a paint pencil to mark the web area of the pulley near the hub.

NOTE: Make sure that the power steering pump pulley is installed flush with the power steering pump shaft.

Using the Power Steering Pump Pulley Installer, install the pulley to the power steering pump.



2. If equipped, install the deflector shield.
3. **NOTICE:** Inspect the power steering belt for correct alignment. If the belt is not correctly aligned, damage to the belt may occur.

Rotate the tensioner clockwise and install the accessory drive belt to the power steering pump pulley.

Vehicles with 6.0L engine

4. Install the engine cooling fan. For additional information, refer to [Section 303-03](#).