About this Manual

Introduction

WARNING: Before beginning any service procedure in this manual, refer to health and safety warnings in section 100-00 General Information. Failure to follow this instruction may result in serious personal injury.

For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).

This manual describes and directs repair procedures specified by Ford Motor Company for the vehicle. Critical health and safety precautions are included. Anyone who deviates from these instructions risks compromising personal safety or vehicle integrity.

SECTION CONTENT

This manual is divided into groups, each containing sections numbered based on the component part number. Section contents may include:

- Specifications
  - Fluid capacities, component specifications and torque values not covered in other procedures
- Description and Operation
  - Overview of the system, component locations, and system operation
- Diagnosis and Testing
  - Symptom charts, DTC charts and diagnostic tests
  - See the Diagnosis and Testing Information in this document
- General Procedures
  - Service adjustments, electronic programming and other special procedures
- Removal and Installation
  - Component removal and installation instructions
- Removal
  - Component removal instructions
- Installation
  - Component installation instructions
- Disassembly and Assembly
  - Component disassembly and assembly instructions
- Disassembly and Assembly of Subassemblies
  - Assembly disassembly and assembly instructions

IMPORTANT INFORMATION

Section number 100-00 General Information contains the following important information (including this document):

- Critical Health and Safety Precautions - service safety precautions applicable to the entire manual.
  For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).
- A Symbols Glossary - definitions of the action directed by each symbol.
  For additional information, refer to: Symbols Glossary (100-00 General Information, Description and Operation).
- Diagnostic Methods - support information for diagnostics.
  For additional information, refer to: Diagnostic Methods (100-00 General Information, Description and Operation).

Warnings, Notices and Notes

WARNINGS

Warnings provide information to avoid personal injury and to make sure service actions on critical safety systems are performed correctly. Warnings that apply to an entire system or workshop manual section are located in section 100-00 Description and Operation, Health and Safety Precautions.
For additional information, refer to: Health and Safety Precautions (100-00 General Information, Description and Operation).

NOTICES (in some publications, CAUTIONS)

Notices provide information to avoid damage to the vehicle or a component.

NOTES

Rear Drive Axle and Differential

Preliminary Inspection

1. Visually inspect the housing, seals, and pinion flange for obvious signs of mechanical damage.
2. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
3. If the cause is not visually evident, verify the symptom and REFER to Symptom Chart: NVH.

Symptom Chart(s)

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: NVH

Symptom Chart

Condition	Possible Sources	Actions
Axle howling or whine	• Axle lubricant low	• CHECK the lubricant level. FILL the axle to specification. REFER to: Differential Fluid Level Check (205-02 Rear Drive Axle/Differential, General Procedures).
	• Axle housing damage	• INSPECT and INSTALL a new axle assembly as necessary. REFER to: Axle Assembly (205-02 Rear Drive Axle/Differential, Removal and Installation). • INSPECT and INSTALL new rear differential subframe bushings as necessary. REFER to: Differential Rear Bushing (205-02 Rear Drive Axle/Differential, Removal and Installation).
	• Damaged, worn or incorrect ring and pinion gear contact	• INSPECT and INSTALL a new axle assembly as necessary. REFER to: Axle Assembly (205-02 Rear Drive Axle/Differential, Removal and Installation).
Driveline clunk - loud clunk when shifting from REVERSE to DRIVE	• Incorrect axle lubricant level	• CHECK the lubricant level. FILL the axle to specification. REFER to: Differential Fluid Level Check (205-02 Rear Drive Axle/Differential, General Procedures).
	• Excessive backlash in the axle	• CHECK for excessive axle backlash. INSPECT and INSTALL a new axle assembly as necessary. REFER to: Axle Assembly (205-02 Rear Drive Axle/Differential, Removal and Installation).

Specifications

Lubricants, Fluids, Sealers and Adhesives

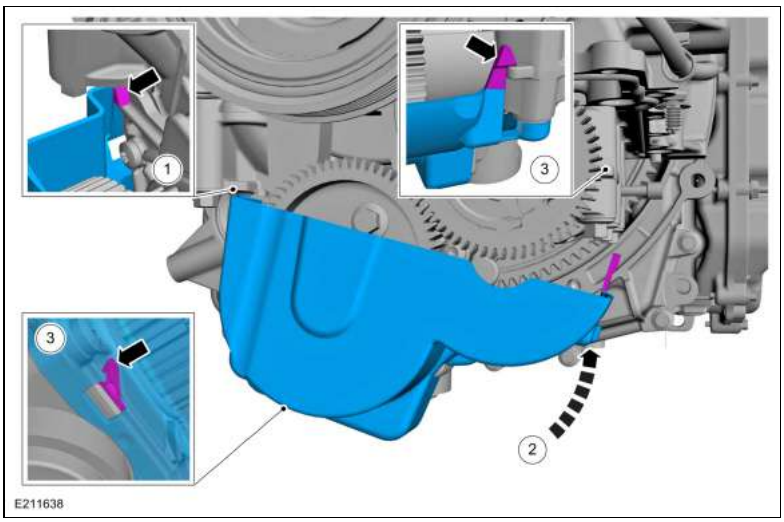
Item	Specifications
MotorcraftÂ® DOT 4 LV High Performance Motor Vehicle Brake Fluid / PM-20	WSS-M6C65-A2

Torque Specifications

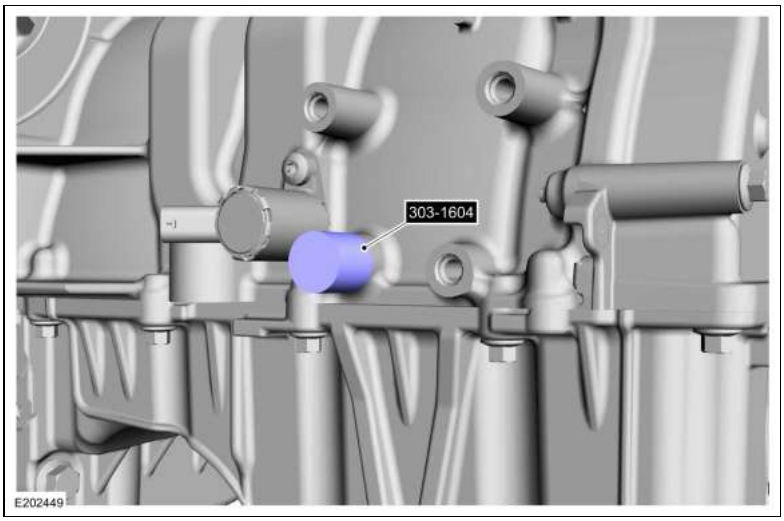
Item	Nm	lb-ft	lb-in
Front caliper bleeder screw	8	-	71
Rear caliper bleeder screw	12	-	106
Rear wheel cylinder bleeder screw	8	-	71
Master cylinder brake tube fittings	25	18	-

General Specifications

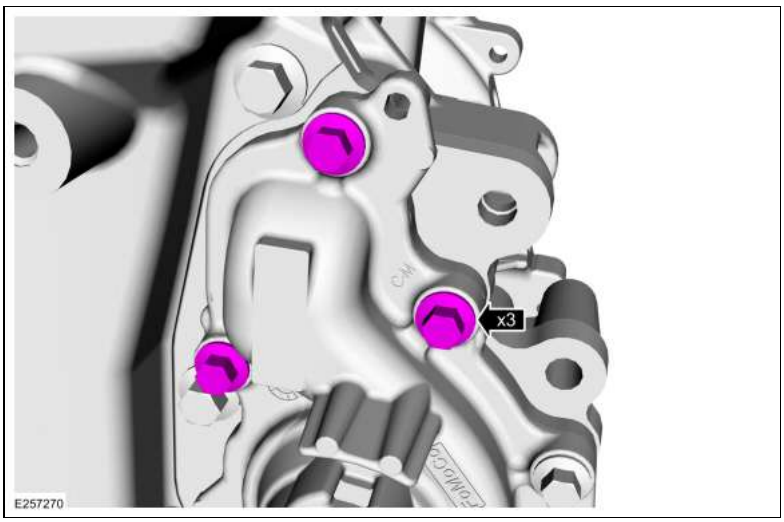
Item	Specification
Front brake disc minimum thickness	0.906 in (23 mm)
Rear brake disc minimum thickness	0.354 in (9 mm)
Brake drum maximum diameter	9.055 in (230 mm)
Brake pad minimum thickness	0.118 in (3 mm)
Brake shoe minimum thickness	0.039 in (1 mm)
Brake pad maximum taper wear (in any direction)	0.118 in (3 mm)
Maximum brake disc thickness variation	0.001 in (.018 mm)
Maximum brake disc runout (installed)	0.002 in (.05 mm)



12. Remove Special Service Tool: 303-1604 Timing Peg, Crankshaft TDC.



13.
Torque: 177 lb.in (20 Nm)



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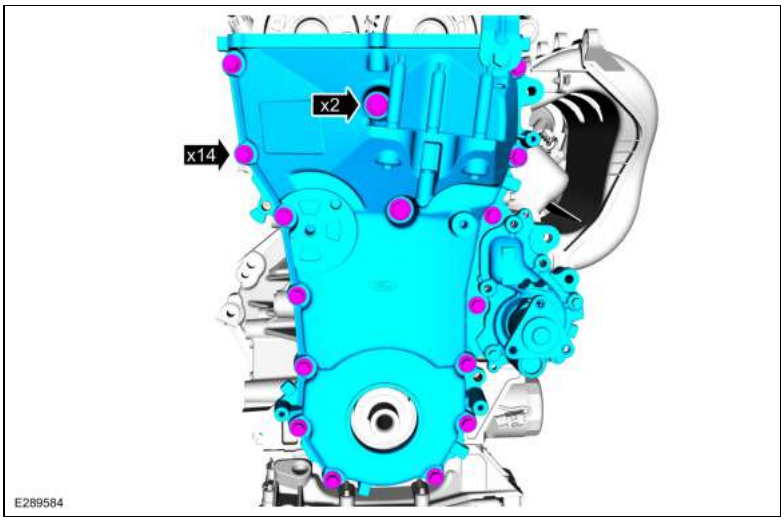

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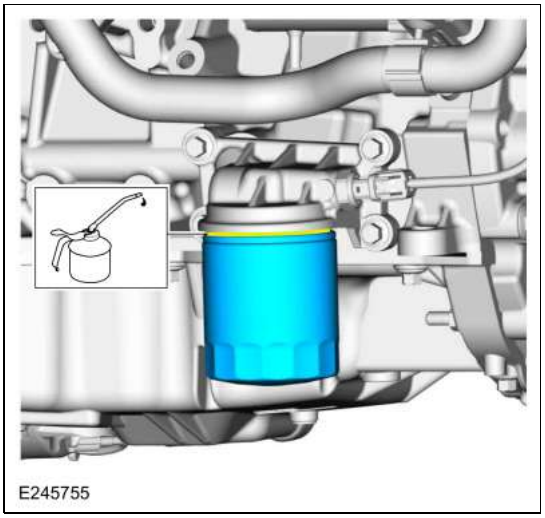
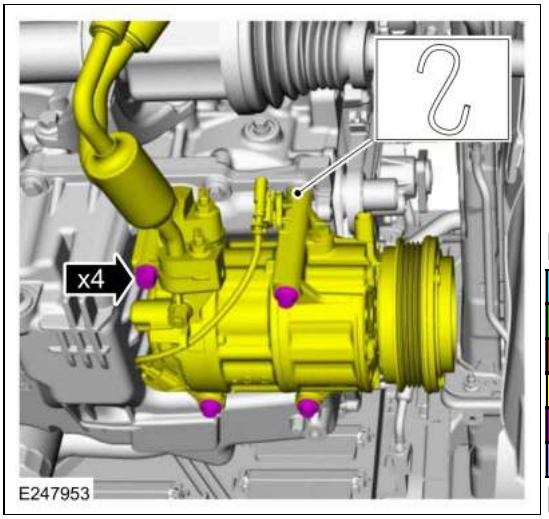
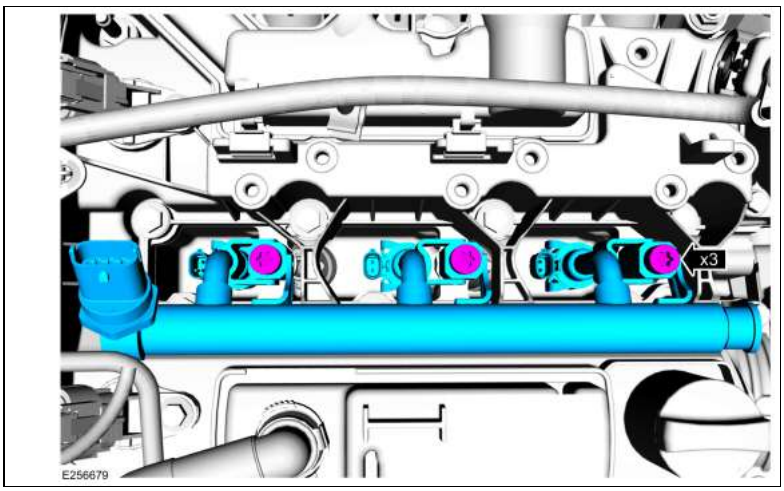


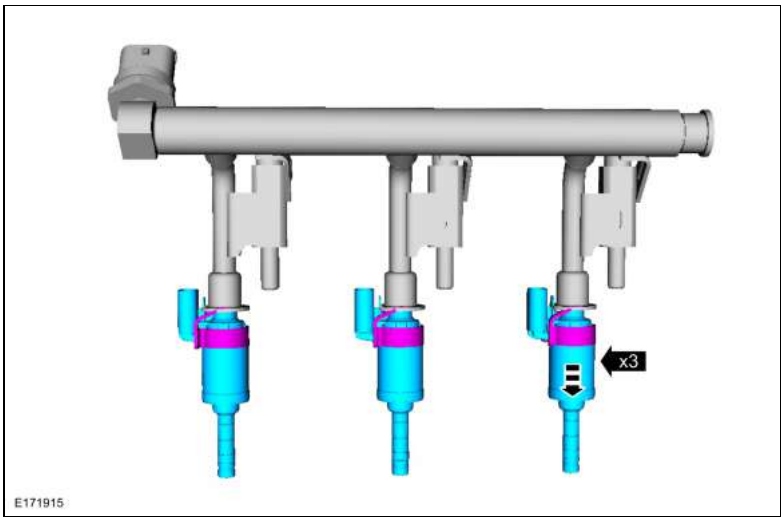
14. Remove the support and position the A/C compressor and install the bolts.
Torque: 18 lb.ft (25 Nm)



15. Connect the A/C compressor electrical connectors.



7. Remove the fuel injectors from the fuel rail.



8. Remove and discard the fuel injector clips.

Diagnosis By Symptom

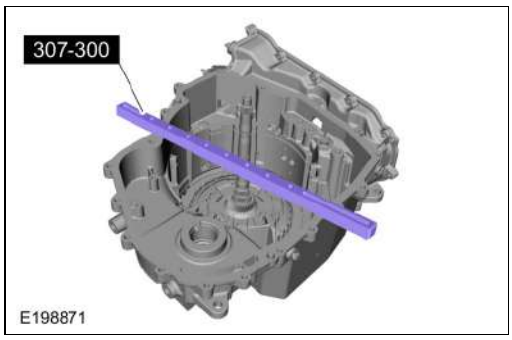
Symptom Chart(s)

Symptom Chart: Automatic Transmission

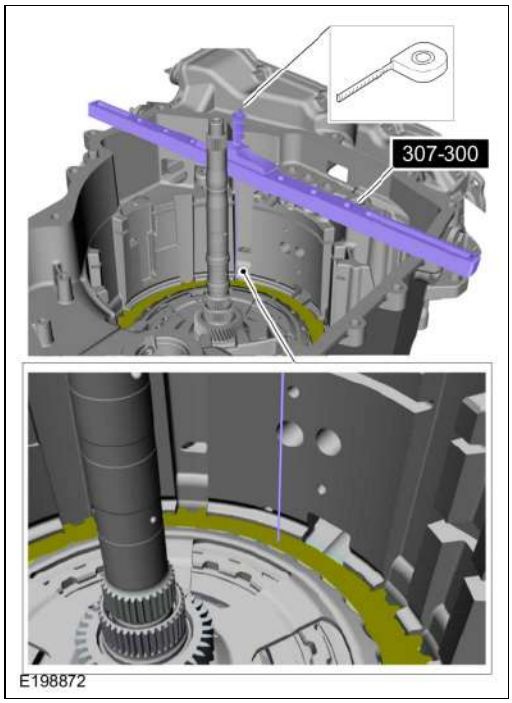
Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.
REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

In most circumstances the PCM sets a DTC to help guide with diagnostics. Refer to the DTC Chart before using the Symptom Chart.

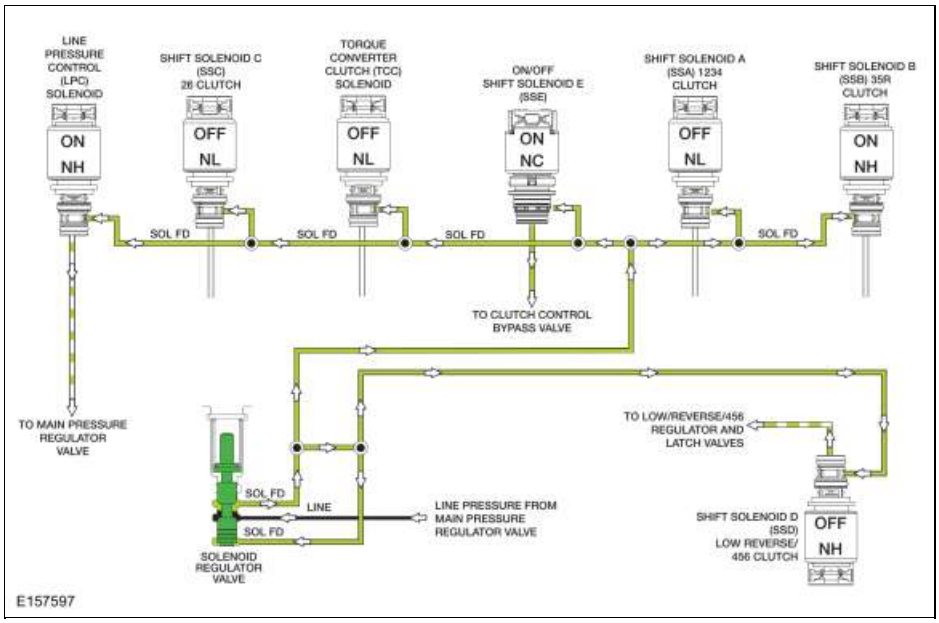
Symptom	Possible Sources	Action
• Engagement Concerns	• No Forward	• Forward clutch damaged or worn. REFER to: Forward Clutch Assembly (307-01A Automatic Transmission - 6-Speed Automatic Transmission â€“ 6F15, Diagnosis and Testing).
	• No Reverse	• Direct clutch damaged or worn. REFER to: Direct Clutch Assembly (307-01A Automatic Transmission - 6-Speed Automatic Transmission â€“ 6F15, Diagnosis and Testing).
	• Harsh Reverse	• Direct clutch damaged or worn. REFER to: Direct Clutch Assembly (307-01A Automatic Transmission - 6-Speed Automatic Transmission â€“ 6F15, Diagnosis and Testing). • Damaged center support. REFER to: Low/Reverse Clutch Assembly (307-01A Automatic Transmission - 6-Speed Automatic Transmission â€“ 6F15, Diagnosis and Testing).
	• Harsh Forward	• Forward clutch damaged or worn. REFER to: Forward Clutch Assembly (307-01A Automatic Transmission - 6-Speed Automatic Transmission â€“ 6F15, Diagnosis and Testing). • Damaged center support. REFER to: Forward Clutch Assembly (307-01A Automatic Transmission - 6-Speed Automatic Transmission â€“ 6F15, Diagnosis and Testing).
	• Delayed/Soft Reverse	• Direct clutch damaged or worn. REFER to: Direct Clutch Assembly (307-01A Automatic Transmission - 6-Speed Automatic Transmission â€“ 6F15, Diagnosis and Testing).
	• Delayed Soft/Forward	• Forward clutch damaged or worn. REFER to: Forward Clutch Assembly (307-01A Automatic Transmission - 6-Speed Automatic Transmission â€“ 6F15, Diagnosis and Testing).
	• No Forward and No Reverse	• Check the transmission fluid level. REFER to: Transmission Fluid Level Check (307-01A Automatic Transmission - 6-Speed Automatic Transmission â€“ 6F15, General Procedures). • Inspect the filter and pump assembly. REFER to: Pump Assembly (307-01A Automatic Transmission - 6-Speed Automatic Transmission â€“ 6F15, Description and Operation).



255. Using a 7-8" (375-400mm) depth gauge, measure and record as measurement A, the distance from the special tool to the top of the intermediate (2, 6) clutch pack at 3 different points and average the 3 distances.
Use Special Service Tool: 307-300 Gauge Bar, Shim Selection.



256. Using a depth gauge, measure and record as measurement B, the distance from the top of the special tool to the transmission case step above the intermediate (2, 6) clutch.
Use Special Service Tool: 307-300 Gauge Bar, Shim Selection.

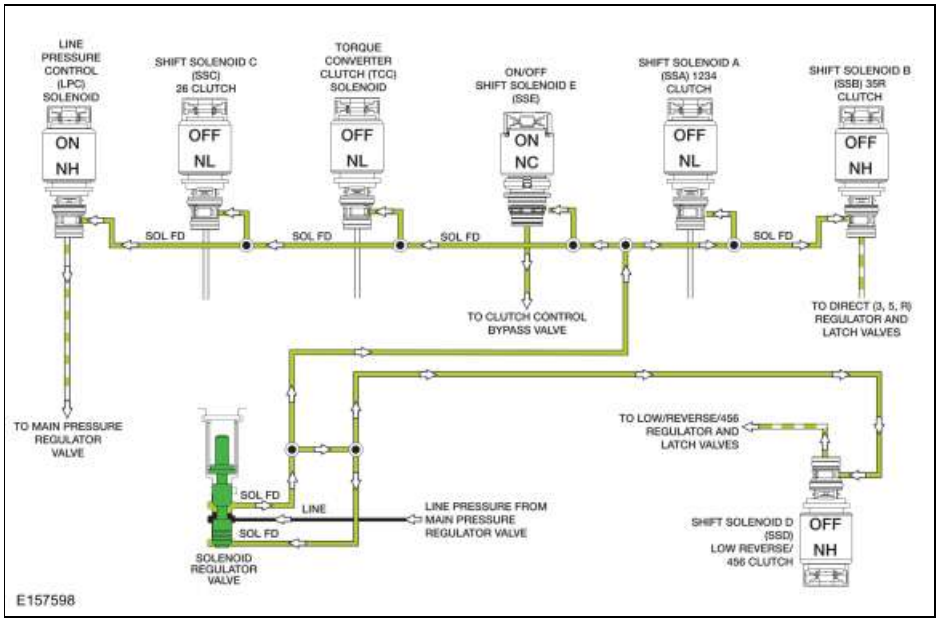


Line pressure from the main pressure regulator valve is directed to the individual shift, TCC and LPC solenoids by the solenoid regulator valve through the SOL FD circuit. The solenoids, controlled by the PCM, direct the fluid to the valves that they control.

The LPC solenoid applies varying pressure to the main pressure regulator valve to control line pressure.

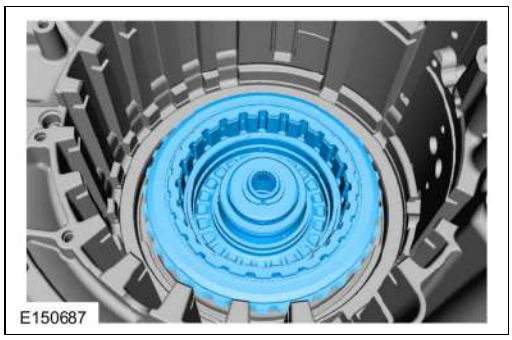
In the PARK and NEUTRAL positions, SSD applies varying pressure to the low reverse/456 regulator and latch valves through the VBS CBR1/456 hydraulic circuit to position the valves to apply the low/reverse clutch. ON/OFF SSE directs pressure to the clutch control bypass valve to position the valve to direct regulated line pressure from the low reverse/456 regulator valve to the low/reverse clutch.

REVERSE Position Solenoid Hydraulic Circuits

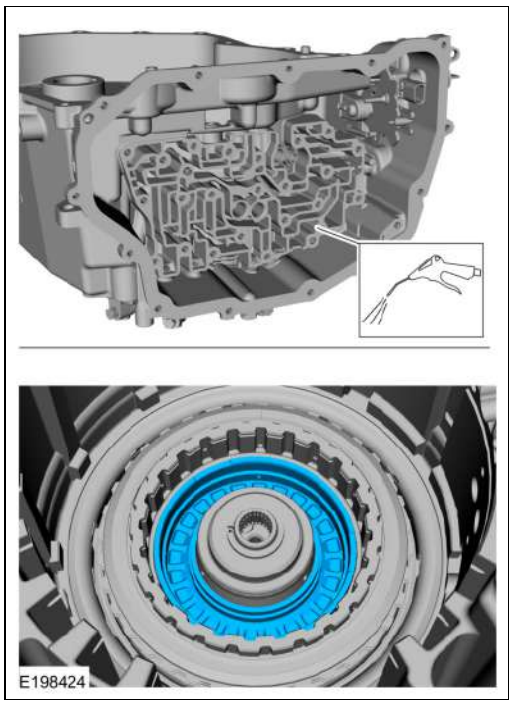


In the REVERSE position, SSD applies varying pressure to the low reverse/456 regulator and latch valves through the VBS CBR1/456 hydraulic circuit to position the valves to apply the low/reverse clutch. ON/OFF SSE directs pressure to the clutch control bypass valve to position the valve to direct regulated line pressure from the low reverse/456 regulator valve to the low/reverse clutch. The clutch control bypass valve also directs line pressure from the REVERSE circuit to the 35R regulator valve through the C35R FD and DRIVE 2/C35R FD circuits. SSB directs varying pressure to the 35R regulator and latch valves through the VBS C35R hydraulic circuit to apply the direct (3, 5, R) clutch.

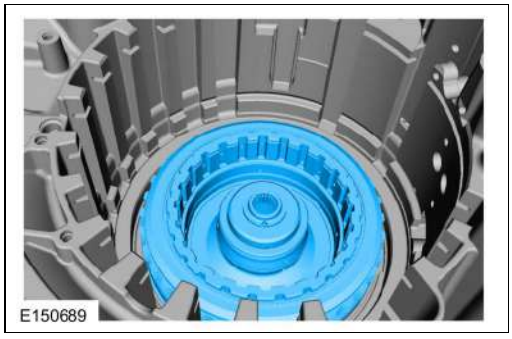
Manual Low Position and 1st Gear Below 8 km/h (5 mph) Solenoid Hydraulic Circuits



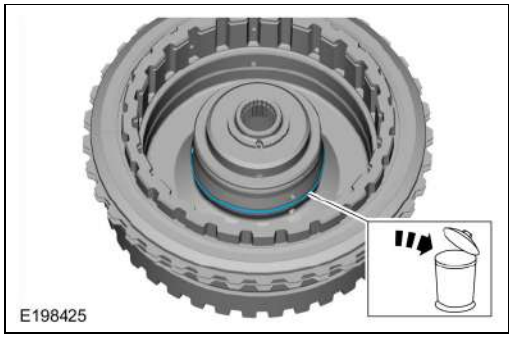
188. Apply compressed air to the overdrive (4, 5, 6) clutch piston port and remove the overdrive (4, 5, 6) clutch piston.



189. Remove the overdrive/direct clutch assembly from the transmission case.



190. Remove and discard the overdrive (4, 5, 6) clutch piston seal from the overdrive/direct clutch assembly.



191. Remove and discard the seals (7A548, 7J008) from the overdrive (4, 5, 6) clutch piston.

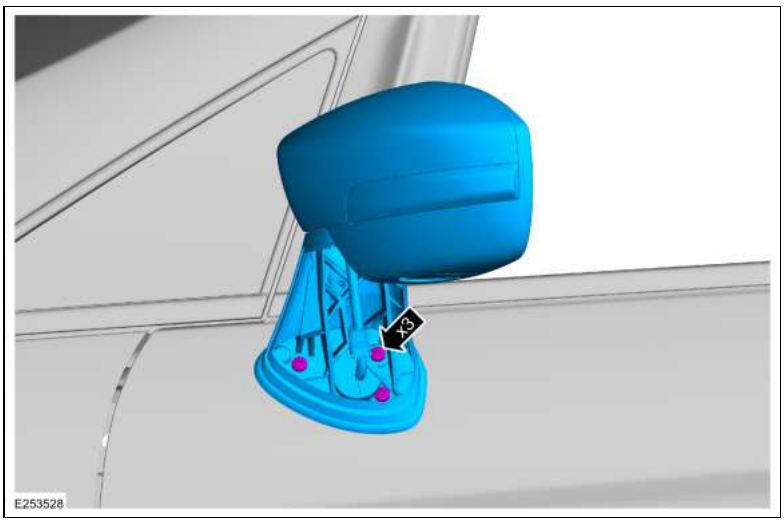
Condition	Possible Sources	Actions
Reduced outlet airflow	• Plugged or wet cabin air filter • Frozen evaporator	GO to Pinpoint Test H
The air inlet door is inoperative or does not operate correctly	Refer to Pinpoint Test	GO to Pinpoint Test D
Incorrect/erratic direction of airflow from outlets	Refer to Pinpoint Test	GO to Pinpoint Test E
Insufficient, erratic or no heat	Refer to Diagnostic Routine	GO to Pinpoint Test F
The Air Conditioning (A/C) is inoperative	Refer to Pinpoint Test	GO to Pinpoint Test G
Insufficient A/C (air conditioning) cooling	• Improper refrigerant level • Temperature door actuator	• CARRY OUT the refrigerant system tests. Refer to the appropriate Refrigerant System Tests procedure in Group 412. • If OK, DIAGNOSE for a temperature door actuator not operating correctly. GO to Pinpoint Test I
The Air Conditioning (A/C) is always on â€" Air Conditioning (A/C) mode always commanded ON	Refer to Pinpoint Test	GO to Pinpoint Test H
Temperature control is inoperative or does not operate correctly	Refer to Pinpoint Test	GO to Pinpoint Test I
The blower motor is inoperative	Refer to Pinpoint Test	GO to Pinpoint Test J
The blower motor does not operate correctly	Refer to Pinpoint Test	GO to Pinpoint Test K
The electric booster heater is inoperative or does not operate correctly	Refer to the Pinpoint Test	GO to Pinpoint Test V
Insufficient Heat In Auto Start-Stop Mode Only	Refer to Pinpoint Test	GO to Pinpoint Test P
Air Conditioning (A/C) pressure relief valve discharging	• A/C pressure relief valve • High system pressure	• Using a manifold gauge set, CHECK the A/C system pressure. • If the pressure is below the A/C pressure relief valve open pressure, 3,447-4,137 kPa (500-600 psi), INSTALL a new A/C Compressor. Refer to the appropriate A/C Compressor - Removal and Installation procedure in Group 412. • If the A/C system pressure is above the A/C pressure relief valve open pressure 3,447-4,137 kPa (500-600 psi), REPAIR the A/C system for a restriction.

Symptom Chart: Noise, Vibration, and Harshness (NVH)

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

Condition	Possible Sources	Actions

DTC	Description	Action **New:** *hover over Pinpoint Test links to show title*
U0415:82	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module: Alive/Sequence Counter Incorrect/Not Updated	This DTC sets when the IPC fails to receive updated ABS data from the ABS module. RETRIEVE and REPAIR all non-network Diagnostic Trouble Codes (DTCs) in the ABS module and other modules on the network. REFER to: Anti-Lock Brake System (ABS) (206-09 Anti-Lock Brake System (ABS) and Stability Control, Diagnosis and Testing). or REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control, Diagnosis and Testing). If no Diagnostic Trouble Codes (DTCs) are present in the ABS module, DIAGNOSE the observable symptom.
U0422:00	Invalid Data Received From Body Control Module: No Sub Type Information	This DTC sets when the IPC receives invalid TPMS data from the BCM. RETRIEVE and REPAIR all non-network Diagnostic Trouble Codes (DTCs) in the BCM and other modules on the network. REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing). If no Diagnostic Trouble Codes (DTCs) are present in the BCM, DIAGNOSE the observable symptom.
U0422:82	Invalid Data Received From Body Control Module: Alive/Sequence Counter Incorrect/Not Updated	This DTC sets when the IPC fails to receive updated TPMS data from the BCM. RETRIEVE and REPAIR all non-network Diagnostic Trouble Codes (DTCs) in the BCM and other modules on the network. REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing). If no Diagnostic Trouble Codes (DTCs) are present in the BCM, DIAGNOSE the observable symptom.
U0424:00	Invalid Data Received From HVAC Control Module: No Sub Type Information	This DTC sets when the IPC fails to receive data for the outside air temperature display from the HVAC module. RETRIEVE and REPAIR all non-network Diagnostic Trouble Codes (DTCs) in the HVAC module, PCM and other modules on the network. For HVAC module Diagnostic Trouble Codes (DTCs), or REFER to: Climate Control System - Vehicles With: Electronic Automatic Temperature Control (EATC) (412-00 Climate Control System - General Information, Diagnosis and Testing). For PCM Diagnostic Trouble Codes (DTCs), refer to the appropriate 303-14 section.
U0424:81	Invalid Data Received From HVAC Control Module: Invalid Serial Data Received	This DTC sets when the IPC receives invalid data for the outside air temperature display from the HVAC module. RETRIEVE and REPAIR all non-network Diagnostic Trouble Codes (DTCs) in the HVAC module, PCM and other modules on the network. For HVAC module Diagnostic Trouble Codes (DTCs), or REFER to: Climate Control System - Vehicles With: Electronic Automatic Temperature Control (EATC) (412-00 Climate Control System - General Information, Diagnosis and Testing). For PCM Diagnostic Trouble Codes (DTCs), refer to the appropriate 303-14 section. If no Diagnostic Trouble Codes (DTCs) are present in the HVAC module or PCM, DIAGNOSE the observable symptom.
U0424:82	Invalid Data Received From HVAC Control Module: Alive/Sequence Counter Incorrect/Not Updated	This DTC sets when the IPC receives invalid update data for the outside air temperature display from the HVAC module. RETRIEVE and REPAIR all non-network Diagnostic Trouble Codes (DTCs) in the HVAC module, PCM and other modules on the network. For HVAC module Diagnostic Trouble Codes (DTCs), or REFER to: Climate Control System - Vehicles With: Electronic Automatic Temperature Control (EATC) (412-00 Climate Control System - General Information, Diagnosis and Testing). For PCM Diagnostic Trouble Codes (DTCs), refer to the appropriate 303-14 section. If no Diagnostic Trouble Codes (DTCs) are present in the HVAC module or PCM, DIAGNOSE the observable symptom.
U0431:82	Invalid Data Received From Body Control Module "A": Alive/Sequence Counter Incorrect/Not Updated	This DTC sets when the IPC fails to receive updated load shed and electronic latch data from the BCM. RETRIEVE and REPAIR all non-network Diagnostic Trouble Codes (DTCs) in the BCM and other modules on the network. REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing). If no Diagnostic Trouble Codes (DTCs) are present in the BCM, DIAGNOSE the observable symptom.
U0452:81	Invalid Data Received From Restraints Control Module: Invalid Serial Data Received	This DTC sets when the IPC receives invalid network data from the RCM due to incorrect Belt-MinderÂ® configuration in the IPC. RETRIEVE and REPAIR all non-network Diagnostic Trouble Codes (DTCs) in the RCM and other modules on the network. REFER to: Airbag Supplemental Restraint System (SRS) - Vehicles Without: Rear Seat Side Airbag (501-20B Supplemental Restraint System, Diagnosis and Testing). If no Diagnostic Trouble Codes (DTCs) are present in the RCM, DIAGNOSE the observable symptom.
U0533:56	Invalid Data Received From Side Obstacle Detection Control Module-Left Invalid / Incompatible Configuration	This DTC sets when the IPC receives invalid data from the SODL. CHECK the vehicle service history for recent service actions related to this module. This DTC sets due to incomplete or incorrect PMI procedures. If there have been recent service actions with this module, REPEAT the PMI procedure as directed by the scan tool. If there have been no recent service actions, INSTALL a new module to correct the failure to retain configuration data.



Mirror Glass

6. **WARNING: Place a shop towel between the hands and the exterior mirror glass for protection in case of glass breakage during mirror service. Failure to follow this instruction may result in serious personal injury.**

   NOTICE: Apply hand pressure directly over the center of the mirror. Failure to follow this instruction may result in glass breakage.

   Position the exterior mirror glass fully outward down.

7. Using the flat head screwdriver release the tabs starting at upper inboard side of mirror and continuing around the mirror until all the tabs are released.
   Use the General Equipment: Flat Headed Screw Driver

Windshield Washer Reservoir

Special Tool(s) / General Equipment

Fluid Suction Gun

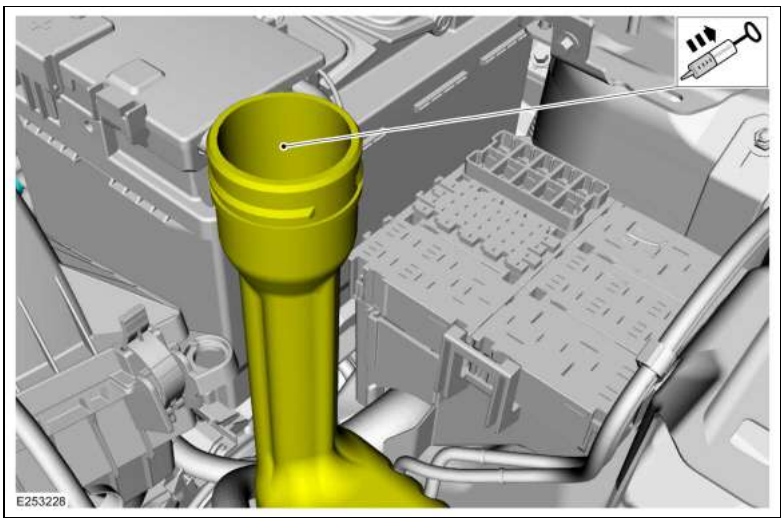
Materials

Name	Specification
MotorcraftÂ® Premium Windshield Wash Concentrate with Bitterant ZC-32-B2	WSS-M14P19-A

Removal

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

1. Using a suction gun, remove the windshield washer fluid from the reservoir.
   Use the General Equipment: Fluid Suction Gun



2. Remove the LH headlamp assembly.
3. If equipped.
   1. Detach the wiring harness retainers.
   2. Remove the pin type retainer.
   3. Remove the bolt and the engine air intake resonator.
      Torque: 27 lb.in (3 Nm)

QT: Powertrain Control Module (PCM) Quick Test

QT1 CARRY OUT THE PCM QUICK TEST

Note: *Verify the battery state of charge (SOC) is greater than 70% before diagnosing any auto stop start concerns. Refer to the Workshop Manual Section 414–00, Charging System, for additional information.*

Note: *For vehicles indicating not ready for inspection maintenance (I/M) testing, refer to the Owner Literature, Readiness For Inspection/Maintenance (I/M) Testing to complete the system readiness. If an I/M testing system readiness concern is still present, GO to Pinpoint Test QC.*

Note: *If the vehicle was brought in with an emission compliance concern, GO to Pinpoint Test EM.*

Note: *For applications that use a stand alone transmission control module (TCM), the PCM does not output TCM related diagnostic trouble codes (DTCs). Refer to the Workshop Manual Section 307-01, Automatic Transmission, to diagnosis all TCM DTCs.*

Note: *If unable to access the PCM DTCs, or a scan tool communication concern exists, GO to Pinpoint Test QA in Section 5. For additional information on retrieving malfunction indicator lamp (MIL) and non-MIL DTCs, refer to Section 2, Quick Test Description for the Continuous Memory Self-Test.*

- Complete the preliminary checks looking for obvious concerns that may relate to the symptom. Check for the following items:
  - fuses
  - electrical circuits and connectors
  - vacuum lines (leaks, routing)
  - air intake system (leaks, restrictions)
  - fuel quality (octane, contamination, winter/summer blend)
  - cooling system (engine operating at correct temperature)
  - oil quality (contamination and correct maintenance)
- Access any related Online Automotive Service Information System (OASIS) or Technical Service Bulletin (TSB) information (if available).
- Carry out the PCM self-test to access any DTCs. Record any key ON engine OFF (KOEO), key ON engine running (KOER) (if the engine runs) and continuous memory (MIL and non-MIL) DTCs.

Are any DTCs present?

Yes	GO to Section 4, Diagnostic Trouble Code (DTC) Charts and Descriptions for direction to repair DTCs after noting the following: DIAGNOSE the DTCs in the following order (begin diagnosis with the first DTC output in that mode and diagnose any circuit related DTCs first). For multiple circuit DTCs that are set as a result of a concern with more than one component, REFER to the Wiring Diagrams Manual Electronic Engine Controls Cell and identify the common cause such as SIGRTN, VREF, or VPWR. CONTINUE DTC diagnosis by referring to the appropriately identified pinpoint test. 1. Any KOEO self-test DTCs. 2. Any KOER self-test DTCs. 3. Any continuous memory self-test DTCs. Retrieve any available freeze frame data and disregard any identical/related continuous DTCs already repaired.
No	GO to No Diagnostic Trouble Codes (DTCs) Present Symptom Chart Index for direction to the correct symptom chart in No Diagnostic Trouble Codes (DTCs) Present Symptom Charts. If the symptom is not listed, REFER to the applicable Workshop Manual Section to continue diagnosis.