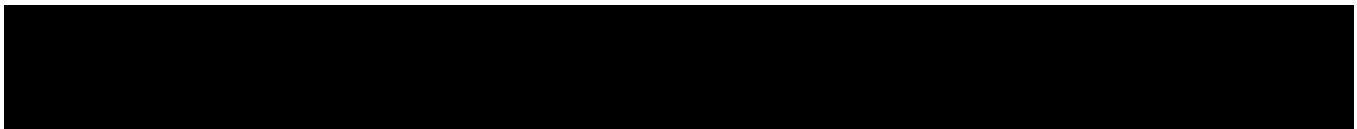
SECTION 100-00 General Information

VEHICLE APPLICATION:2007.50 Transit

CONTENTS PAGE

DESCRIPTION AND OPERATION



DESCRIPTION AND OPERATION

The flame is bright, and eye protection should be used, but the ultra-violet emission is much less than that from arc welding, and lighter filters may be used.

The process itself produces few toxic fumes, but such fumes and gases may be produced from coatings on the work, particularly during cutting away of damaged body parts, and inhalation of the fumes should be avoided.

In brazing, toxic fumes may be produced from the metals in the brazing rod, and a severe hazard may arise if brazing rods containing cadmium are used. In this event particular care must be taken to avoid inhalation of fumes and expert advice may be required.

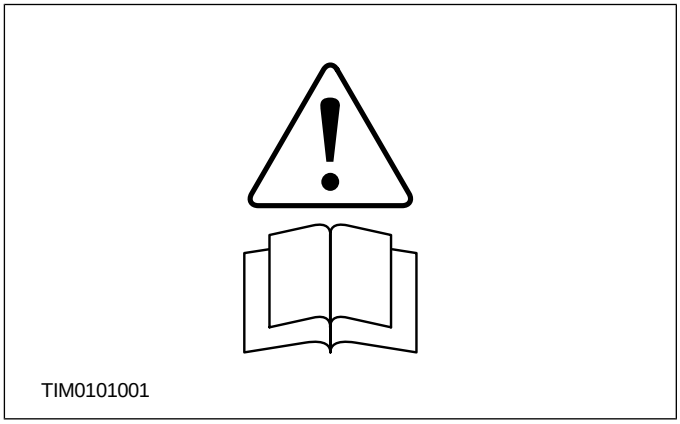
SPECIAL PRECAUTIONS MUST BE TAKEN BEFORE ANY WELDING OR CUTTING TAKES PLACE ON VESSELS, WHICH HAVE CONTAINED COMBUSTIBLE MATERIALS, FOR EXAMPLE BOILING OR STEAMING OUT OF FUEL TANKS.

Warning Symbols on Vehicles

Decals showing warning symbols will be found on various vehicle components.

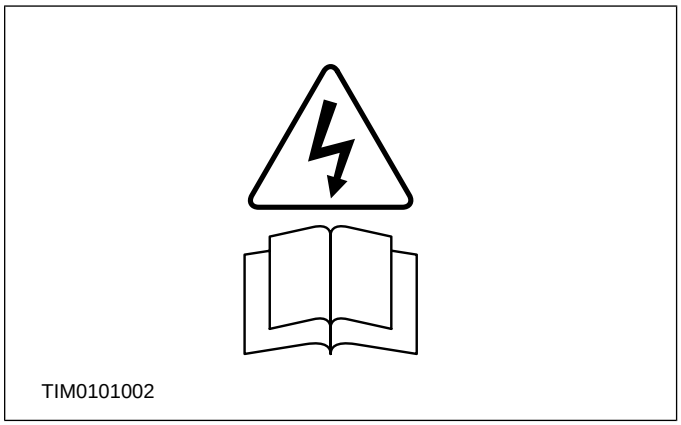
These decals must not be removed. The warnings are for the attention of owners/operators and persons carrying out service or repair operations on the vehicle.

The most commonly found decals are reproduced below together with an explanation of the warnings.



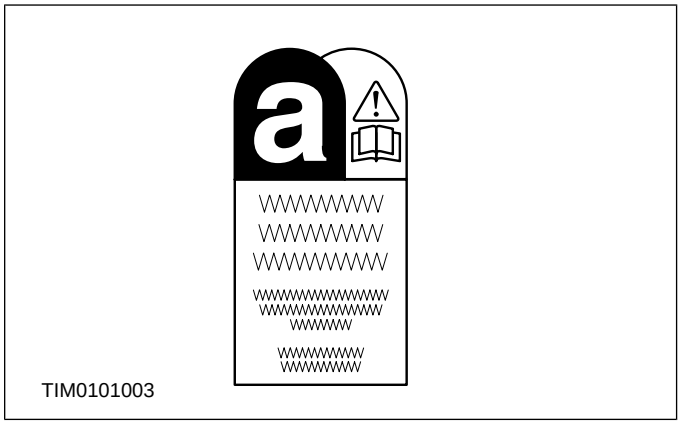
TIM0101001

1. Components or assemblies displaying the caution triangle and open book symbol advise consultation of the relevant section of the owner literature before touching or attempting adjustments of any kind.



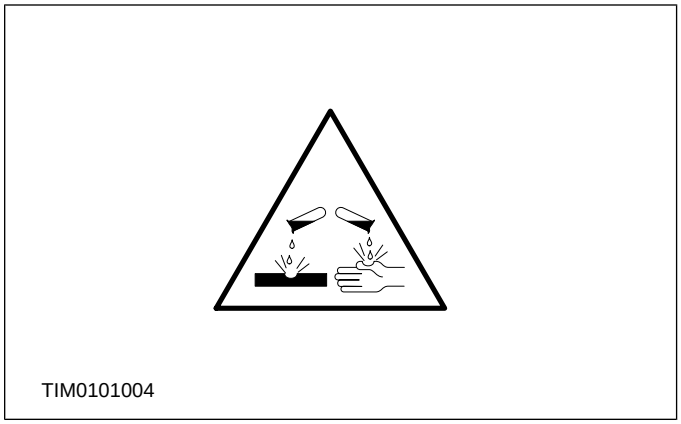
TIM0101002

2. Components or assemblies displaying the warning triangle with the `electrified' arrow and open book symbol give warning of inherent high voltages. Never touch these with the engine running or the ignition switched on. See Electric Shock in this subsection.



TIM0101003

3. Vehicles and replacement components which contain asbestos are identified by this symbol. See Asbestos in this subsection.



TIM0101004

4. Components or assemblies displaying this symbol give warning that the component contains a corrosive substance. See Acids and Alkalis in this subsection.

DESCRIPTION AND OPERATION

Item 10: Rear Axle/Axle Ratio

Code	Ratio
A	T51 /5.44 rear wheel drive
B	T51 /5.88 rear wheel drive
C	T53 /3.73 rear wheel drive
D	T53 4.27 rear wheel drive
E	T53/4.78 rear wheel drive
F	T53/5.11 rear wheel drive
G	T53/5.44 rear wheel drive
H	T53 /5.88 rear wheel drive
T	4.23 front wheel drive
U	4.54 front wheel drive
W	T51 /3.73 rear wheel drive
X	T51 /4.27 rear wheel drive
Y	T51 /4.78 rear wheel drive
Z	T51 /5.11 rear wheel drive

Item 11

Used by SVO only.

Item 12: Transmission/Transaxle Identification

Code	Transmission
M6	6-speed manual transmission (MT82) (5.44)
V2	5-speed manual transmission (VXT75) (3.80)
W2	5-speed manual transmission (MT75) (4.20)

Item 13: Door Combination

Code	Roof			Front Doors Hinged	Side Loading Doors		
	Low	Mid	High		LH sliding	RH sliding	RH sliding LH sliding
A	x			x			
B	x			x			
C		x		x			

DIAGNOSIS AND TESTING

PINPOINT TEST C : IDLE BOOM/SHAKE/VIBRATION/SHUDDER

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CHECK THE CABLE/HOSES	
	1 Check the engine compartment for any component that may have a touch condition between the engine and body or chassis. For example: control cable, air conditioning (A/C) hoses, acceleration cable. • Are the components OK? → **Yes** GO to C2. → **No** REPAIR or INSTALL new components as necessary. ROAD TEST as necessary.
C2: CHECK THE ENGINE COOLING RADIATOR	
	1 Check the engine cooling radiator mountings and bushings for security and condition. Check the radiator installation for any component that may have a touch condition. • Is the installation and bushings OK? → **Yes** GO to C3. → **No** REPAIR or INSTALL new components as necessary. ROAD TEST as necessary.
C3: CHECK THE EXHAUST SYSTEM	
	1 Carry out the exhaust system neutralizing procedure. REFER to:Exhaust System Neutralizing (100-04, General Procedures). • Is the exhaust system OK? → **Yes** GO to C4. → **No** REPAIR as necessary. ROAD TEST as necessary.

DIAGNOSIS AND TESTING

Front Suspension

REFER to Section 204-00 [Suspension System - General Information].

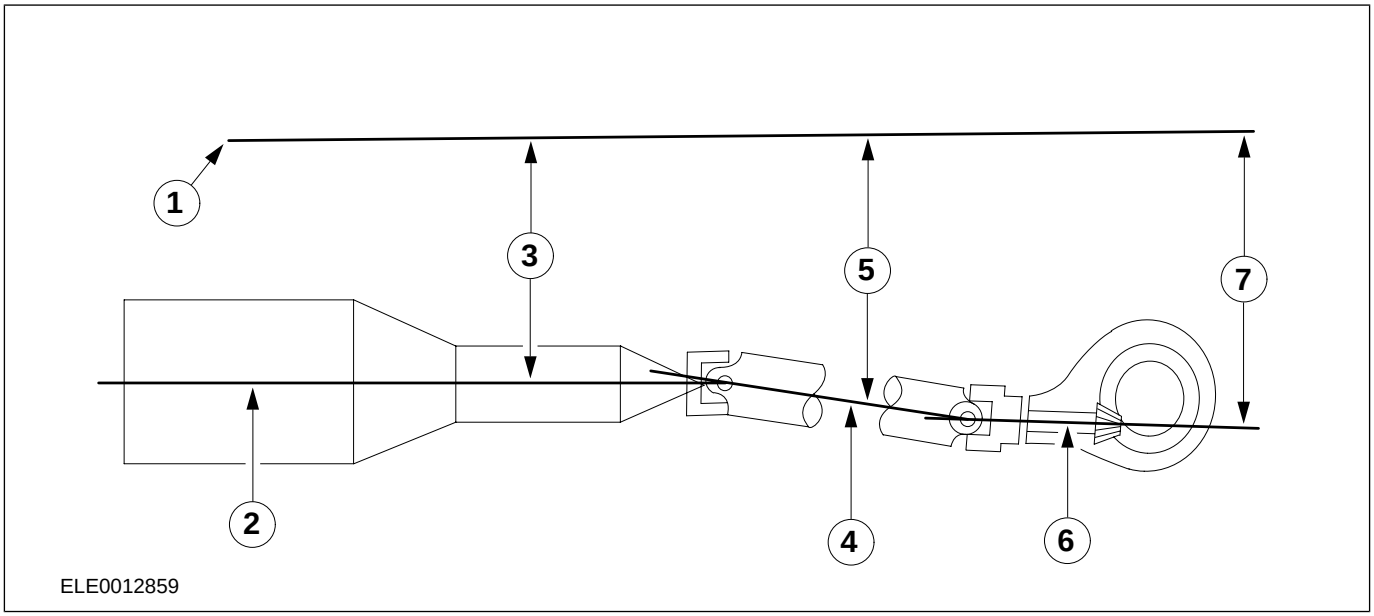
SECTION 204-02 Rear Suspension

VEHICLE APPLICATION:2007.50 Transit

CONTENTS PAGE

DIAGNOSIS AND TESTING

Driveline Angle



Item	Description
1	Bottom of the frame
2	Engine crankshaft centerline
3	Engine angle
4	Driveshaft and coupling shaft centerline
5	Driveshaft and coupling angle
6	Rear axle drive pinion centerline
7	Axle drive pinion angle

An incorrect driveline (drive pinion) angle can often be detected by the driving condition in which the vibration occurs.

– A vibration during coasting from 72 to 56 km/h 45 to 35 mph) is often caused by a high axle drive pinion angle.
– A vibration during acceleration, from 56 to 72 km/h (35 to 45 mph) may indicate a low drive pinion angle.

When these conditions exist, check the driveline angles.

REFER to:Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).

If the tires and driveline angle are not the cause, carry out the NVH tests to determine whether the concern is caused by a condition in the axle.

REFER to:Noise, Vibration and Harshness (NVH) (100-04 Noise, Vibration and Harshness, Diagnosis and Testing).

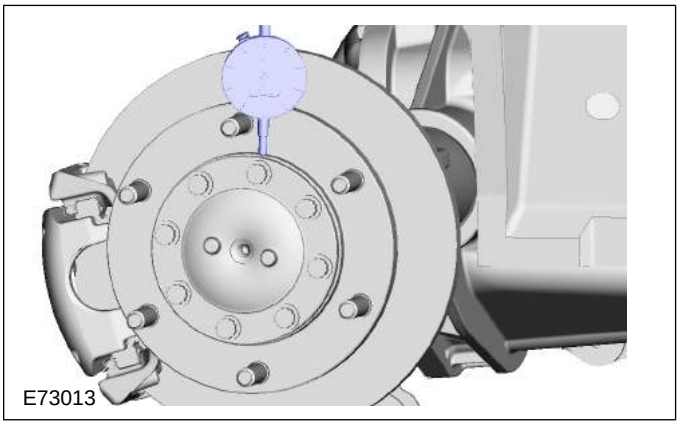
Universal Joint Wear

Place the vehicle on a wheel free lift and rotate the driveshaft by hand. Check for rough operation or seized universal joints.

Pilot Runout

1. **NOTE:Clean the wheel hub flange with abrasive paper before positioning the dial indicator gauge with magnetic base.**

   Position the dial indicator with magnetic base as close to the wheel hub or axle flange face as possible. Zero the indicator dial.

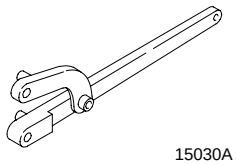
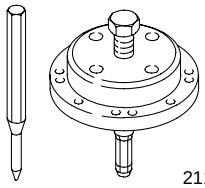
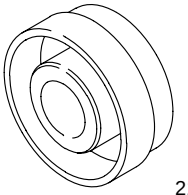
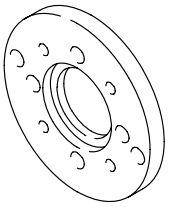


2. Rotate the wheel hub or axle flange one full turn and note the maximum and minimum measurements. The difference between the maximum and minimum measurements will be the total runout. Pilot runout must not exceed 0.15 mm.

IN-VEHICLE REPAIR

Drive Pinion Flange and Drive Pinion Seal

Special Tool(s)

 15030A	Flange Holding Wrench, Universal 205-072 (15-030A)
 21151	Remover, Crankshaft Rear Seal 303-336 (21-151)
 21159	Installer/Aligner, Front Cover Seal 303-373 (21-159)
 16055	Remover, Mainshaft Double Lip Seal 308-151 (16-055)

General Equipment

Two leg puller

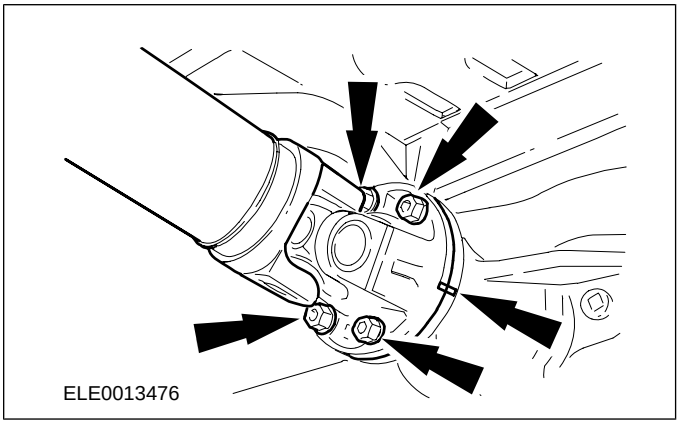
Materials

Name	Specification
SAE 75W-140 High performance rear axle oil	WSL-M2C192-A

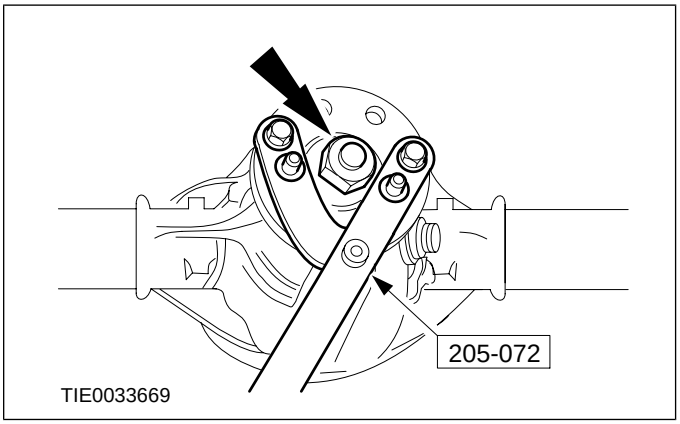
Removal

1. **Raise and support the vehicle. For additional information, refer to Section 100-02 [Jacking and Lifting].**
2. **NOTE:Mark the position of the driveshaft flange in relation to the drive pinion flange.**

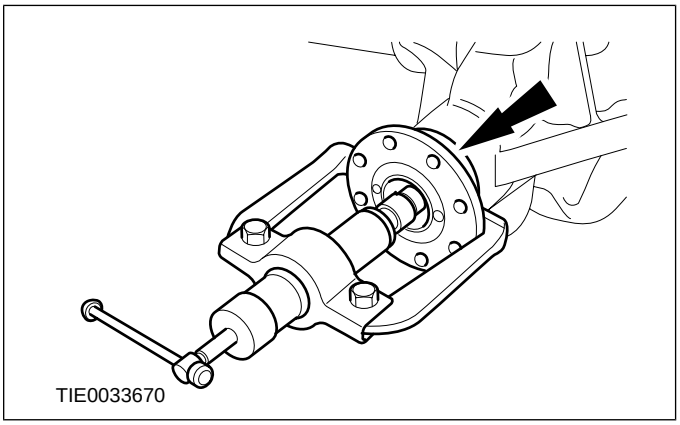
Detach the driveshaft from the drive pinion flange and position it to one side.



3. **Using the special tool, remove the drive pinion flange locknut and washer.**
   - Discard the washer.



4. **Using a suitable two leg puller, remove the drive pinion flange.**

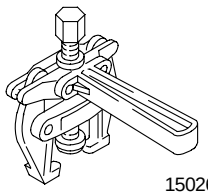
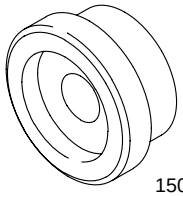
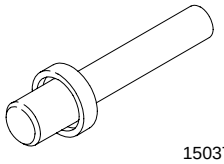


5. **Using the special tools, make pilot holes in the drive pinion seal.**

DISASSEMBLY AND ASSEMBLY

Differential Case and Ring Gear

Special Tool(s)

 15026A	Remover, Differential Bearing 205-071 (15-026A)
 1502651	Adaptor for 205-071 (Thrust Pad) 205-071-02 (15-026-51)
 15037	Installer, Differential Bearing 205-082 (15-037)

General Equipment

Soft faced hammer

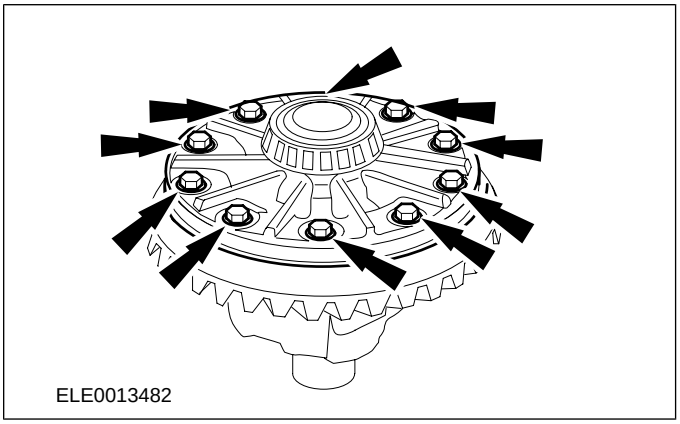
Materials

Name	Specification
SAE 75W-140 High performance rear axle oil	WSL-M2C192-A

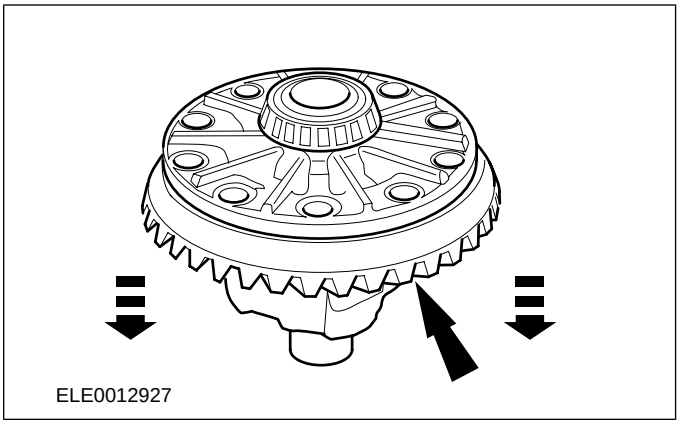
Disassembly

1. **CAUTION:The limited-slip differential must not be dismantled. It is serviced as an assembly.**

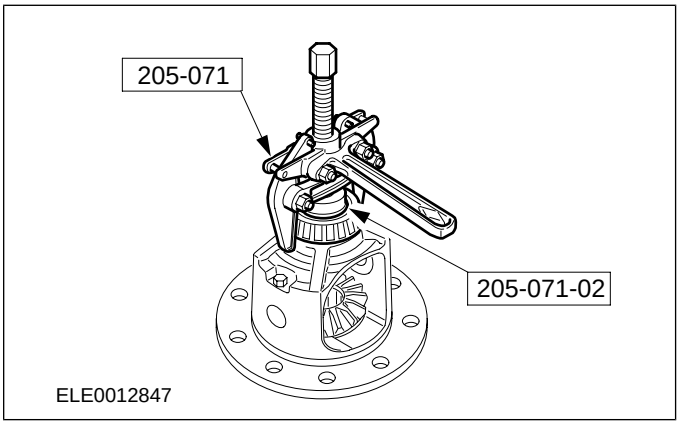
Remove and discard the ring gear retaining bolts.



2. **Using a soft faced hammer, remove the ring gear.**



3. **Using the special tools, remove the differential bearing cones.**



DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C3: CHECK FOR FRONT BRAKE VIBRATION	
	1 Road test the vehicle between 40-80 km/h (25-50 mph) with light and medium application on the brake pedal. • Is a vibration present? → **Yes** CHECK the brake discs and brake pads for excessive wear. REFER to: Specifications (206-03 Front Disc Brake, Specifications), Specifications (206-04 Rear Disc Brake, Specifications), Specifications (206-02 Drum Brake, Specifications). INSTALL new brake discs or brake pads as necessary. REFER to: Brake Pads (206-03 Front Disc Brake, Removal and Installation), Brake Pads (206-04 Rear Disc Brake, Removal and Installation), Brake Shoes (206-02 Drum Brake, Removal and Installation). TEST the system for normal operation. → **No** Vehicle is OK. VERIFY the customer concern.

PINPOINT TEST D : THE PEDAL GOES DOWN FAST

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CHECK THE BRAKE PEDAL EFFORT	
	1 Road test the vehicle and depress the brake pedal. • Is the brake pedal effort OK? → **Yes** Vehicle is OK. VERIFY the customer concern. → **No** GO to D2.

REMOVAL AND INSTALLATION

Brake Caliper (12 243 0)

General Equipment

Brake hose clamp

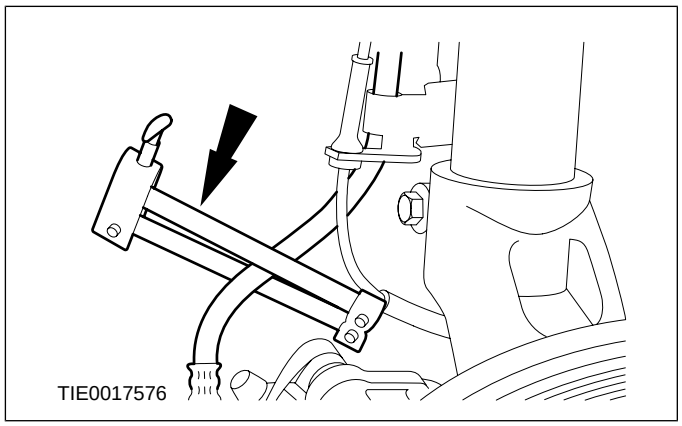
Removal

CAUTION:If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

1. **Remove the brake pads.**

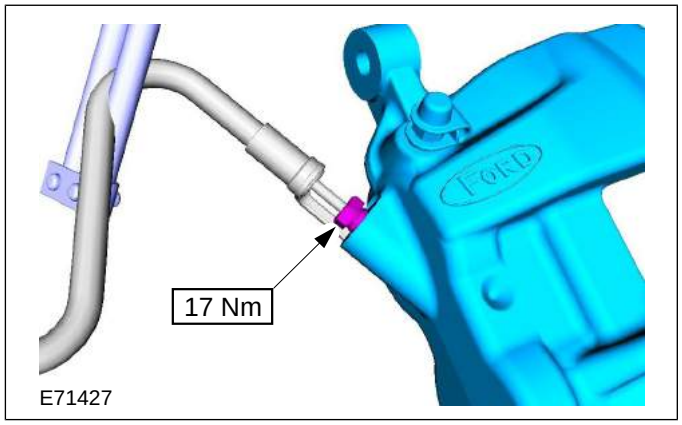
   For additional information, refer to:Brake Pads (206-03 Front Disc Brake, Removal and Installation).

2. **Using a suitable brake hose clamp, clamp the brake hose.**

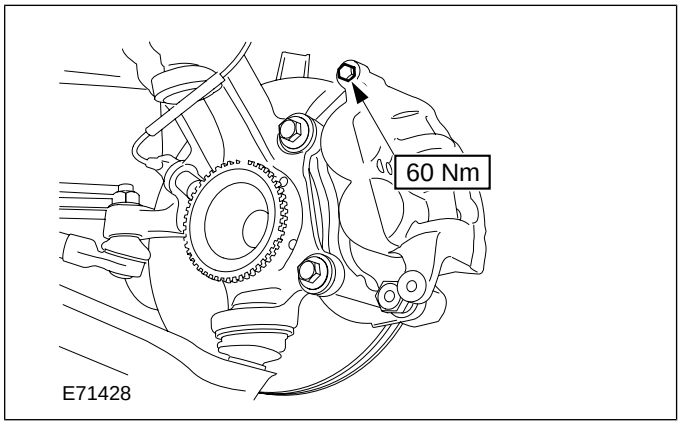


3. **CAUTION:Cap the brake hose to prevent fluid loss or dirt ingress.**

   Disconnect the brake hose from the brake caliper.



4. **Remove the brake caliper.**



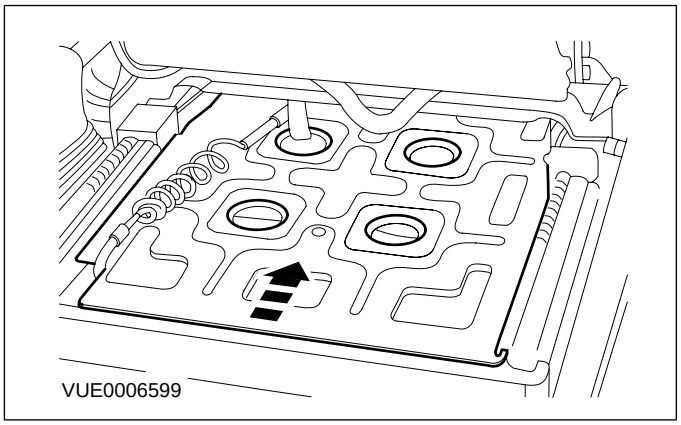
Installation

1. **To install, reverse the removal procedure.**
2. **Bleed the brake system.**

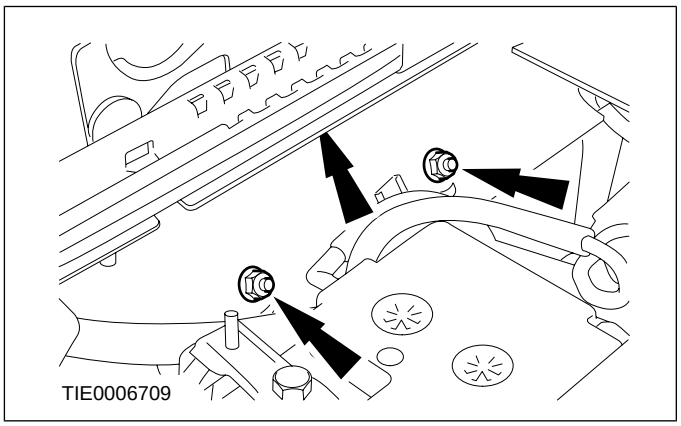
   For additional information, refer to:Brake System Bleeding (206-00, General Procedures).

REMOVAL AND INSTALLATION

10. Slide the battery cover forwards.

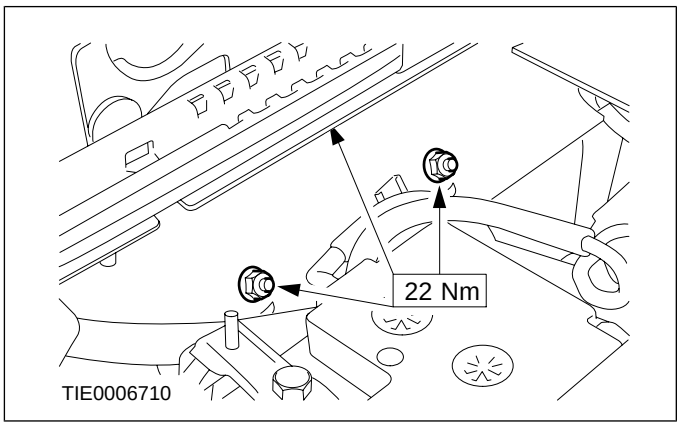


11. Remove the parking brake control.



Installation

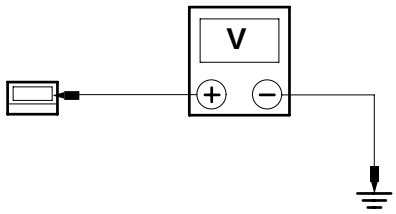
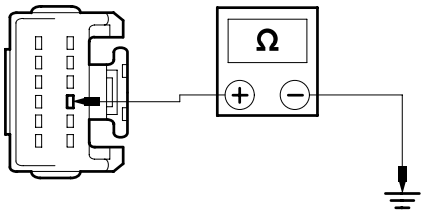
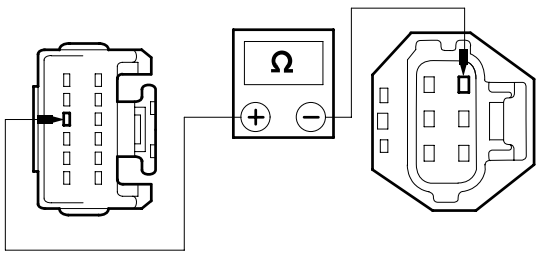
1. To install, reverse the removal procedure.



2. Adjust the parking brake. For additional information, refer to: (206-05 Parking Brake and Actuation)

Parking Brake Cable Adjustment - Vehicles With: Rear Drum Brakes (General Procedures),
Parking Brake Cable Adjustment - Vehicles With: Rear Disc Brakes (General Procedures).

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VUE0036605	3 Measure the voltage between the park brake switch C4066 pin 1, circuit 31S-GE44 (BK-RD), component side and ground. • Is the voltage greater than 10 volts? → **Yes** GO to C6. → **No** INSTALL a new park brake switch. TEST the system for normal operation.
C6: CHECK CIRCUIT 31S-GE44C (BK/RD) FOR SHORT TO GROUND	
	1 DisconnectParking Brake Module C7051a.
 VUE0036614	2 Measure the resistance between the parking brake module C7051a pin 3, circuit 31S-GE44C (BK/RD), harness side and ground. • Is the resistance greater than 10,000 ohms? → **Yes** GO to C7. → **No** REPAIR the short to ground. TEST the system for normal operation.
C7: CHECK CIRCUIT 7-XL4 (YE/RD) FOR OPEN	
	1 DisconnectParking Brake Actuator C7058.
 VUE0036610	2 Measure the resistance between the parking brake actuator C7058 pin 3, circuit 7-XL4 (YE/RD), harness side and the parking brake module C7051a pin 10, circuit 7-XL4 (YE/RD), harness side. • Is the resistance less than 5 ohms? → **Yes** GO to C8. → **No** REPAIR the circuit. TEST the system for normal operation.

SPECIFICATIONS

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Super DOT 4 brake fluid	ESD-M6C57-A
High temperature grease	ESE-M12A4-A

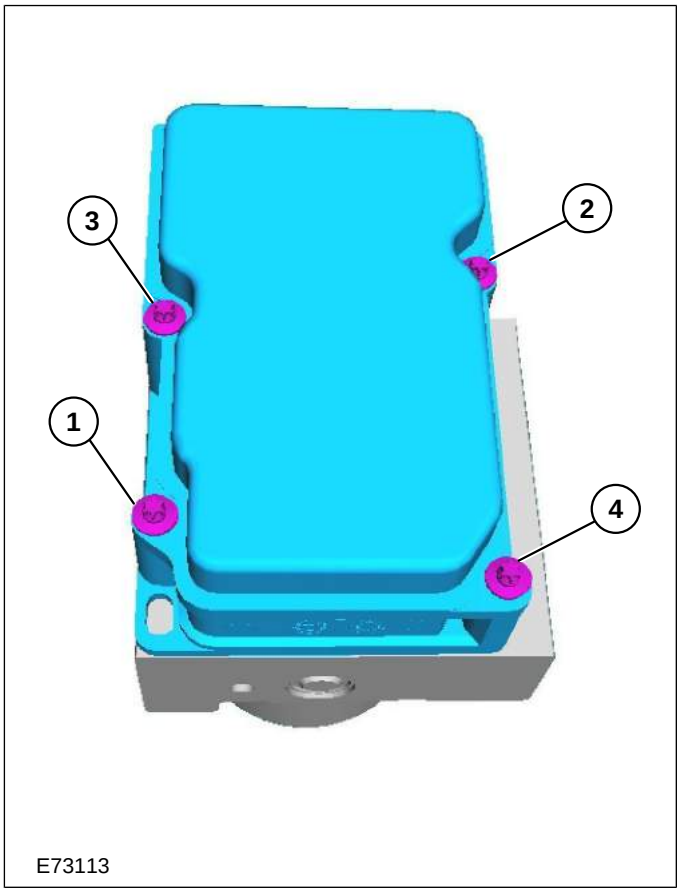
Torque Specifications

Description	Nm	lb-ft	lb-in
Brake master cylinder retaining nuts	20	15	-
Brake master cylinder union	15	11	-
Brake pedal bracket retaining nuts	20	15	-
Clutch pedal pivot shaft retaining bolt	20	15	-
Brake pedal pivot shaft retaining bolt	20	15	-

REMOVAL AND INSTALLATION

Take extra care not to damage the seal.

1. Using the outer edges of the ABS module, lower the module onto the HCU pump body. DO NOT APPLY PRESSURE ONTO THE MODULE COVER.
2. If the module cover is damaged or deformed, install a new module.
   Torque:
   - Stage1: 1.5 Nm
   - Stage2: 2.0 Nm
   - Stage3: 3.0 Nm



E73113

2. Install the HCU.

Refer to: Hydraulic Control Unit (HCU) (206-09 Anti-Lock Control, Removal and Installation).

3. Carry out the ABS Function Test.

General Equipment: Worldwide Diagnostic System (WDS)

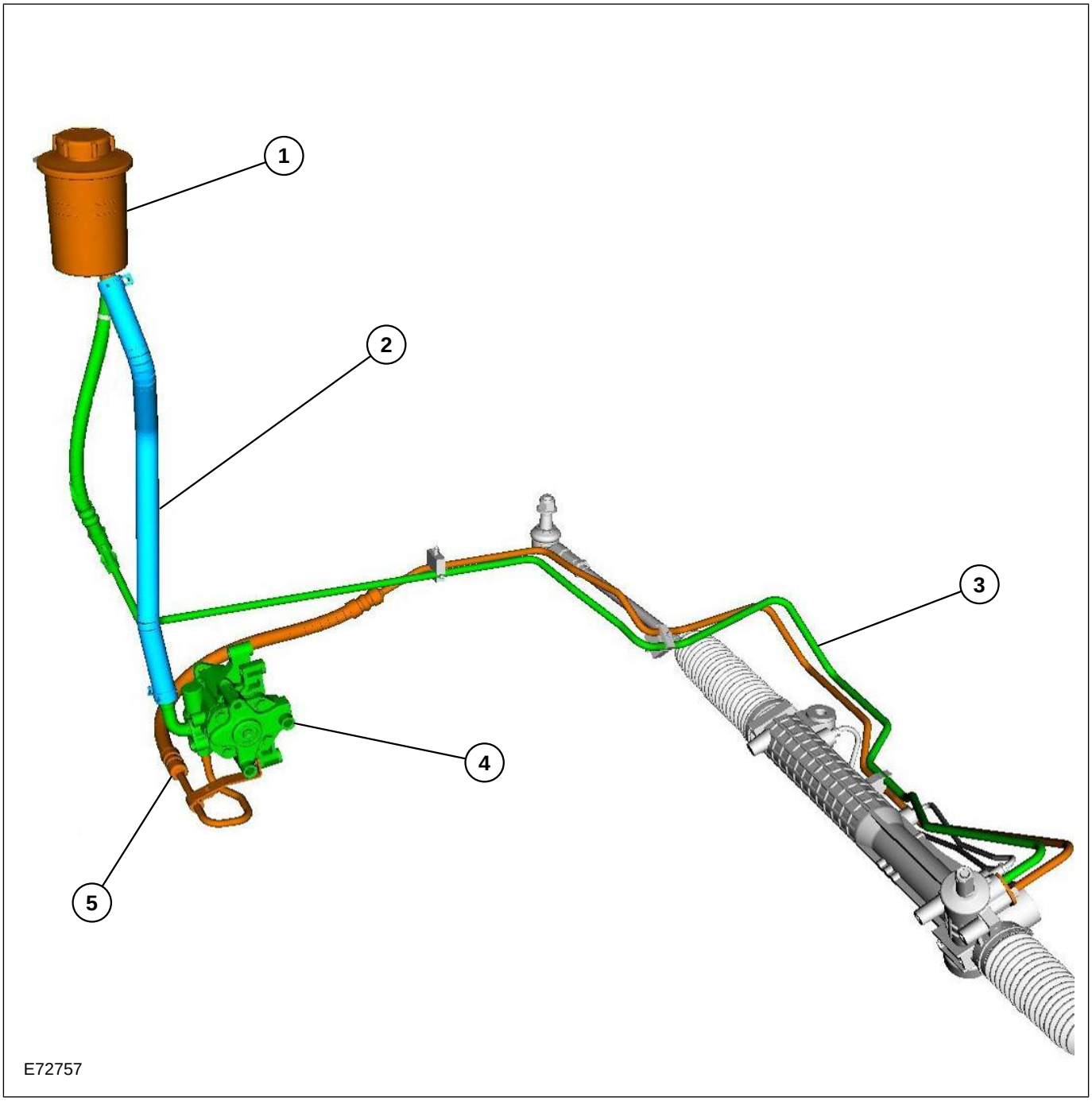
4. Carry out a road test.

Refer to: Road/Roller Testing (100-00 General Information, Description and Operation).

DESCRIPTION AND OPERATION

Power Steering

2.2L Duratorq-TDCi (Puma) Diesel



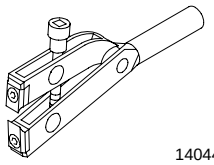
Item	Part Number	Description
1		Power steering fluid reservoir
2		Power steering fluid supply line
3		Power steering fluid return line

Item	Part Number	Description
4		Power steering pump
5		Power steering fluid pressure line

REMOVAL AND INSTALLATION

Tie Rod (13 263 0)

Special Tool(s)

 14044	Clamping Tool, Boot Retaining Clamp 204-169 (14-044)

General Equipment

Pipe wrench

Materials	
Name	**Specification**
Thread-locking compound	WSK-M2G349-A8

Removal

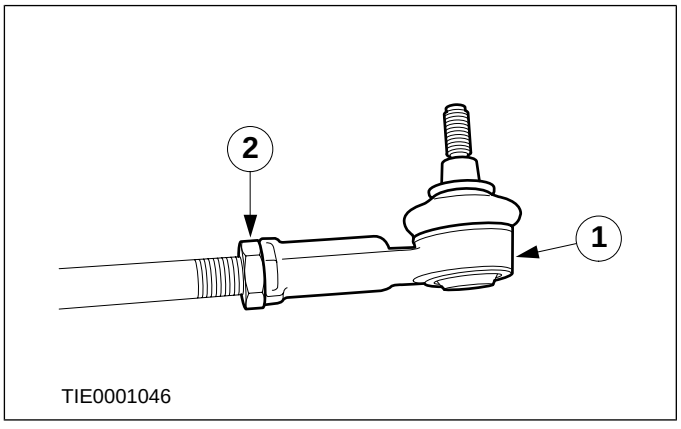
1. **Remove the steering gear.**

   For additional information, refer to:Steering Gear (211-02 Power Steering, Removal and Installation).

2. **NOTE:Make a note of the number of turns used to remove the tie-rod end.**

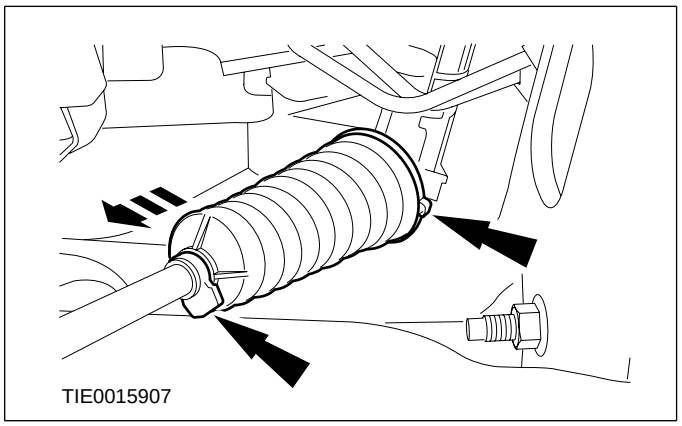
   Remove the tie-rod end and the tie-rod end locknut.

   1. Remove the tie-rod end.
   2. Remove the tie-rod end locknut.

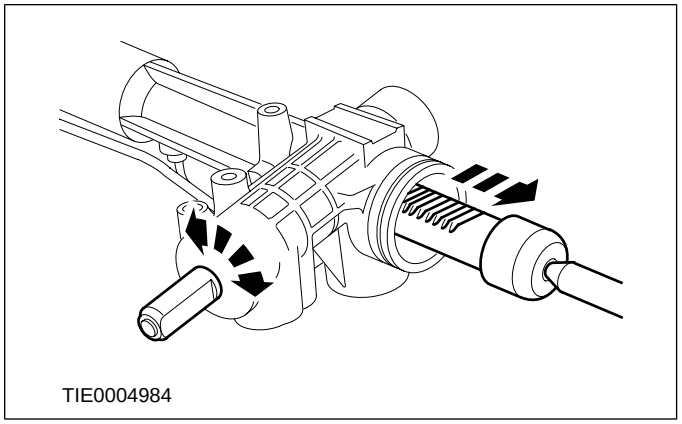


3. **Remove the steering gear boot.**

   - Discard the steering gear boot and retaining clamps.



4. **Rotate the steering gear pinion to expose the steering rack.**



5. **CAUTIONS:**

   Do not clamp the steering rack on exposed hydraulic sealing surfaces.

   Clamp the steering rack in vise jaws. Do not clamp the steering gear body.

   Make sure vise jaw protectors are used.

DIAGNOSIS AND TESTING

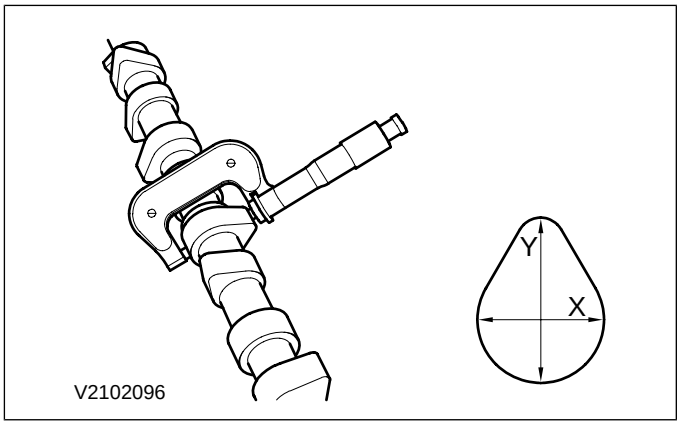
Symptom	Possible Sources	Action
	• Exhaust gas recirculation (EGR) cooler (if equipped).	• Install a new EGR cooler.
	• Oil cooler.	• Install a new oil cooler.
	• Damaged gaskets or warped mating faces.	• Check the cylinder head gasket for damage. Check the cylinder head and cylinder block for distortion. REFER to Cylinder Head Distortion / Cylinder Block Distortion in this section.
	• Cracks or fractures in engine components surrounded by coolant, such as cylinder liners and cylinder head combustion chamber.	• Determine the damaged engine component and install a new component.
• Engine will not crank	• Battery or cables.	• Check the battery, bracket and cables. REFER to Section 414-00 [Charging System - General Information].
	• Starter motor or cables.	• Check the starting system. REFER to Section 303-06 [Starting System].
• Engine cranks but will not start	• Fuel tank is empty.	• Check the fluid level.
	• Water in fuel.	• Drain the water from the fuel system. REFER to Section 310-00 [Fuel System - General Information].
	• Fuel filter blocked (only vehicles with diesel engine).	• Install a new fuel filter. REFER to Section 310-01 [Fuel Tank and Lines].
	• Air in fuel lines (only vehicles with diesel engine).	• Bleed the fuel system. Check the fuel system for leaks. REFER to Section 310-00 [Fuel System - General Information].
	• Engine intake air system.	• Check the intake air system. REFER to Section 303-12 [Intake Air Distribution and Filtering].

GENERAL PROCEDURES

Camshaft Lobe Lift

1. Determine the cam lift.

- Using a micrometer measure the cam in two directions.
- The difference between the two measurements is the cam lift.



SPECIFICATIONS

Oil Pressure Specifications

Description	bar
Minimum oil pressure at idle speed	1.25
Minimum oil pressure at 2000 rpm	2.0

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Ford Formula E SAE 5W-30 engine oil	WSS-M2C913-B
Sealer — oil pan, camshaft carrier and engine front cover	WSE-M4G323-A4

IN-VEHICLE REPAIR

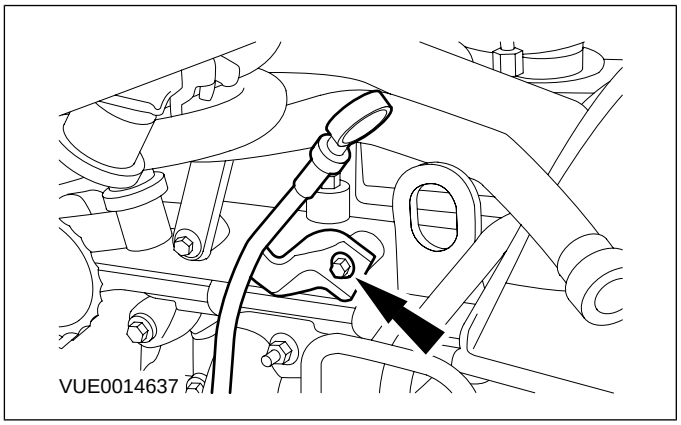
Exhaust Manifold (21 187 0)

Removal

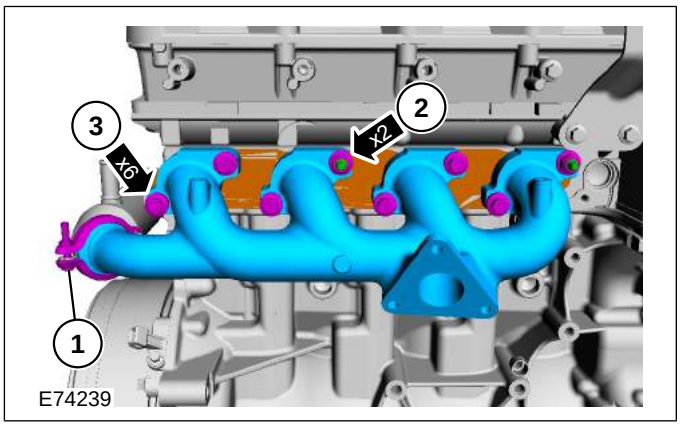
1. **Remove the turbocharger. For additional information, refer to:(303-04 Fuel Charging and Controls - Turbocharger)**

   Turbocharger - 2.4L Duratorq-TDCi (Puma) Diesel (100 PS/115 PS) (Removal and Installation),
   Turbocharger - 2.4L Duratorq-TDCi (Puma) Diesel (140 PS) (Removal and Installation).

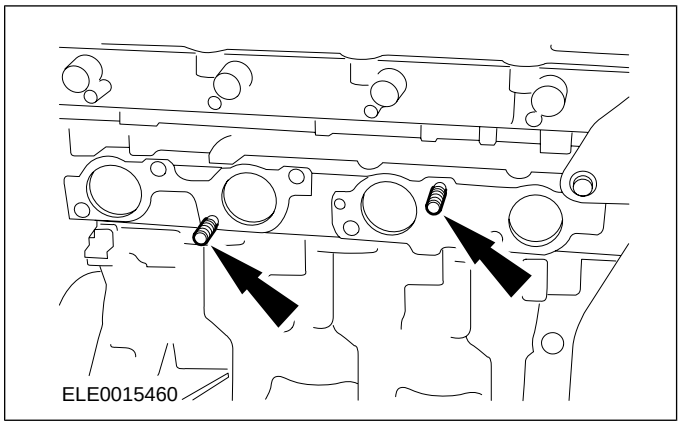
2. **Remove the oil level indicator and tube.**
   - Discard the O-ring seal.



3. **Remove the exhaust manifold.**



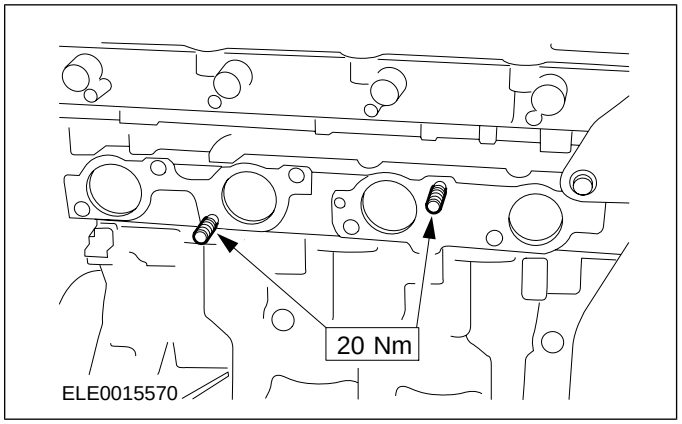
4. **Remove the exhaust manifold studs.**
   - Discard the studs.



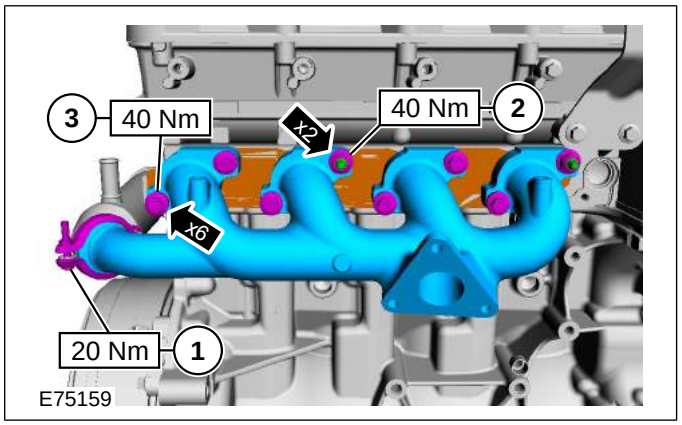
Installation

1. **NOTE:Install new exhaust manifold studs, bolts, nuts, gaskets and O-ring seals.**

   Install the exhaust manifold studs.

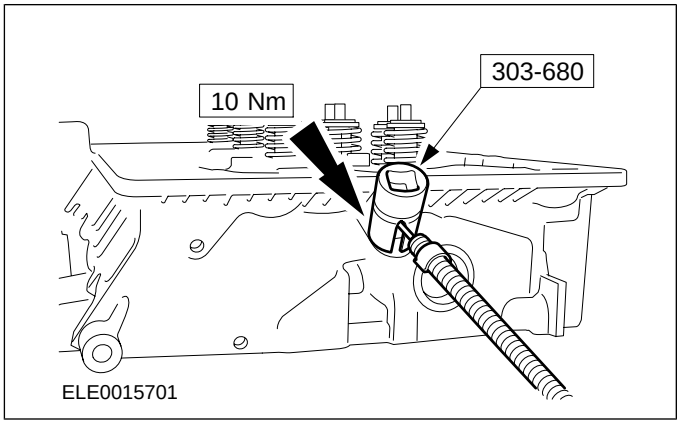


2. **Install the exhaust manifold.**



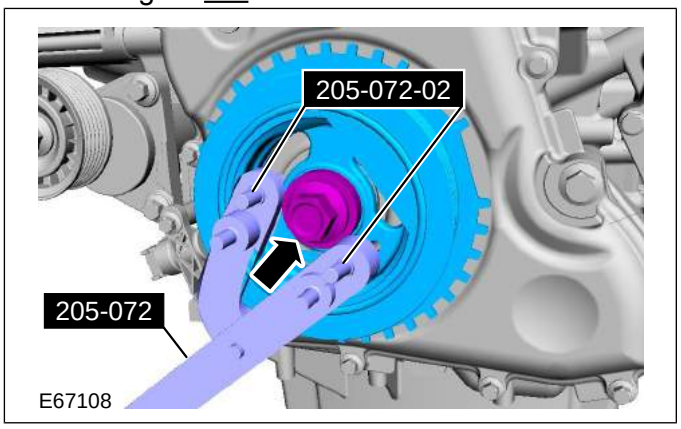
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

2. **CAUTION:Install a new cylinder head temperature (CHT) sensor.**

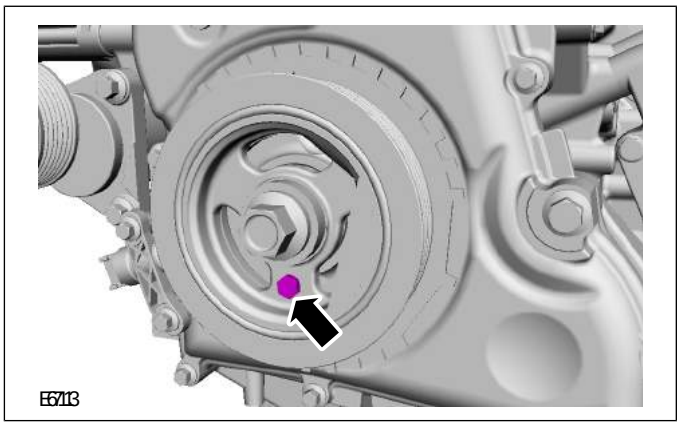


REMOVAL AND INSTALLATION

9. Special Tool(s): 205-072, 205-072-02
Torque:
- Stage1: 100 Nm
- Stage2: 90°

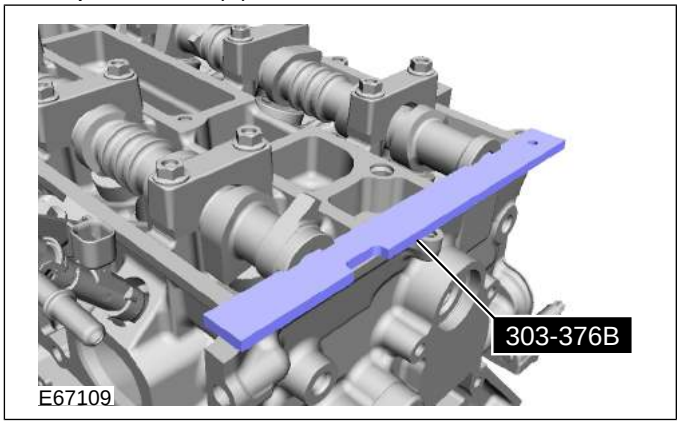


10.



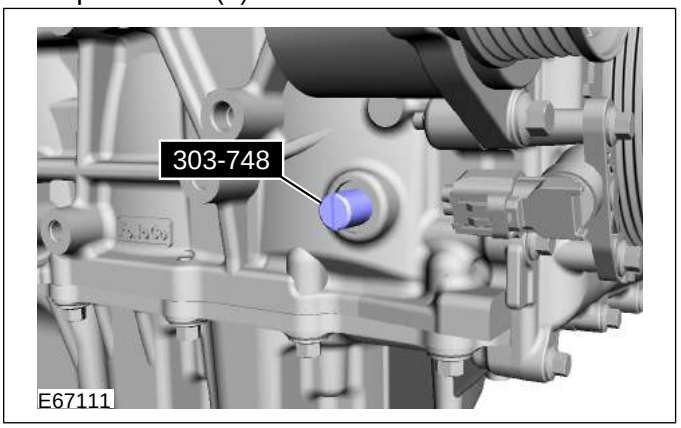
11. Remove the special tool.

Special Tool(s): 303-376B



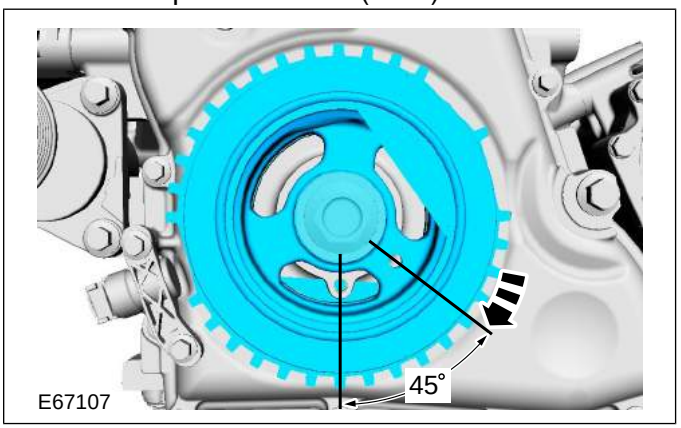
12. Remove the special tool.

Special Tool(s): 303-748



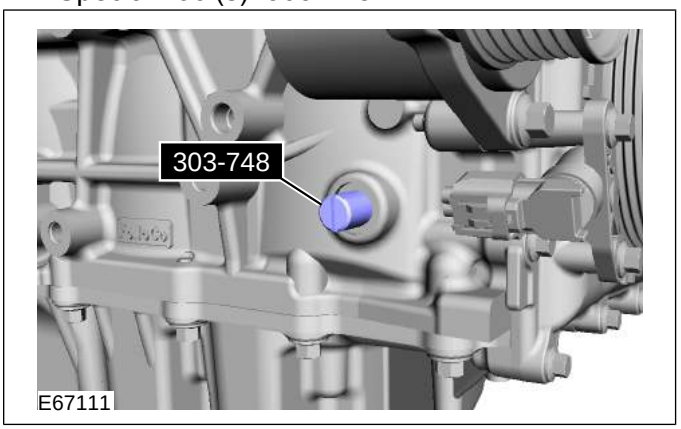
13. ⚠ **CAUTION:Only rotate the crankshaft clockwise.**

Rotate the crankshaft one and three quarters until piston No. 1 is approximately 45 degrees before top dead center (TDC).



14. Install the special tool.

Special Tool(s): 303-748

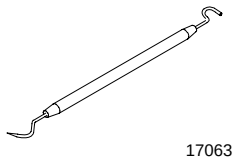


15. ⚠ **CAUTION:Only rotate the crankshaft clockwise.**

REMOVAL AND INSTALLATION

Timing Chain

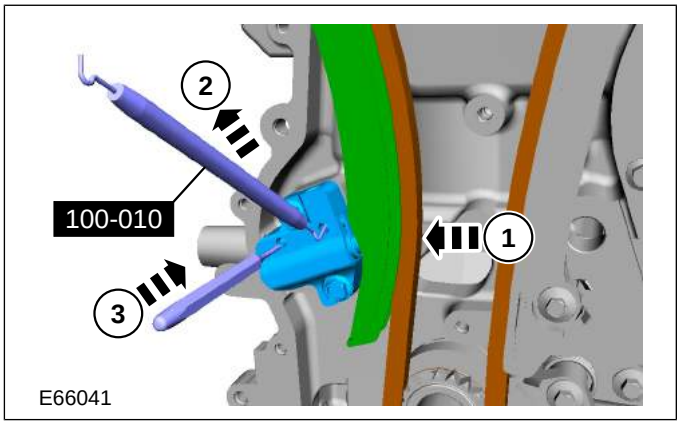
Special Tool(s)

 17063	Remover, O-Ring Seal 100-010

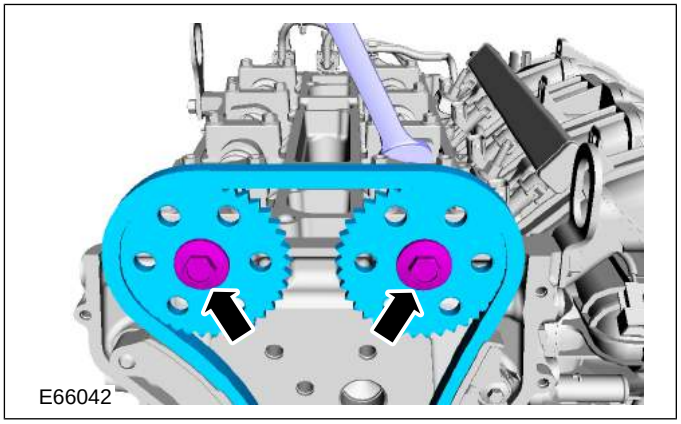
Special Tool(s)

Removal

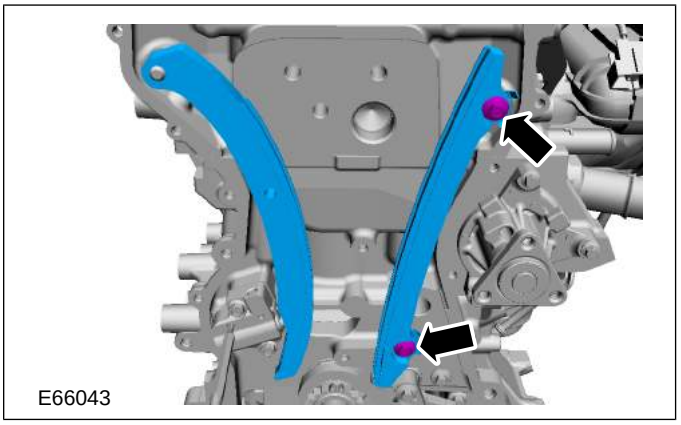
1. Remove the following items:
   1. Refer to:Engine Front Cover (303-01 Engine - 2.3L Duratec-HE (MI4), Removal and Installation).
2. 2. Special Tool(s): 100-010
   3. 2 mm punch



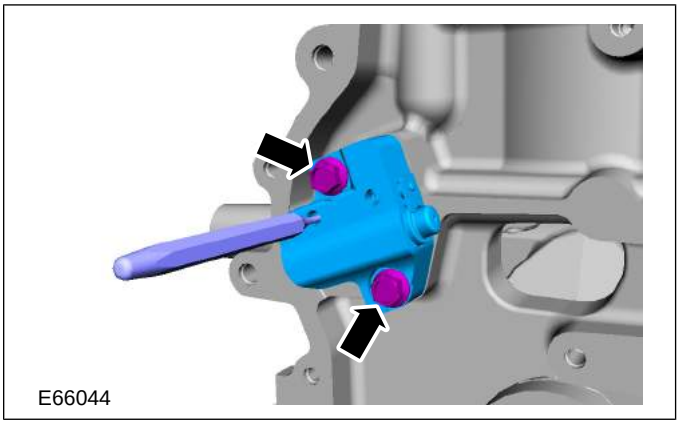
3. **NOTE:**Counterhold the camshafts at the hexagon using an open-ended spanner to prevent the camshafts from turning.



4.

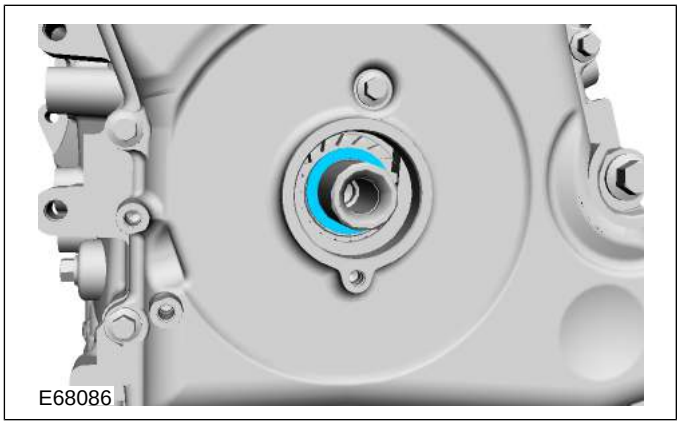


5.

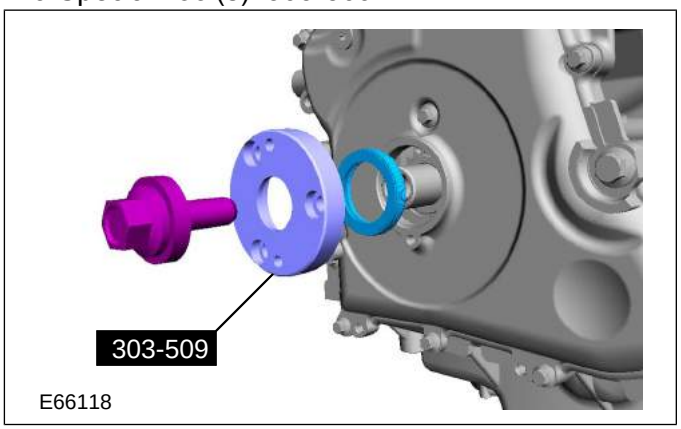


ASSEMBLY

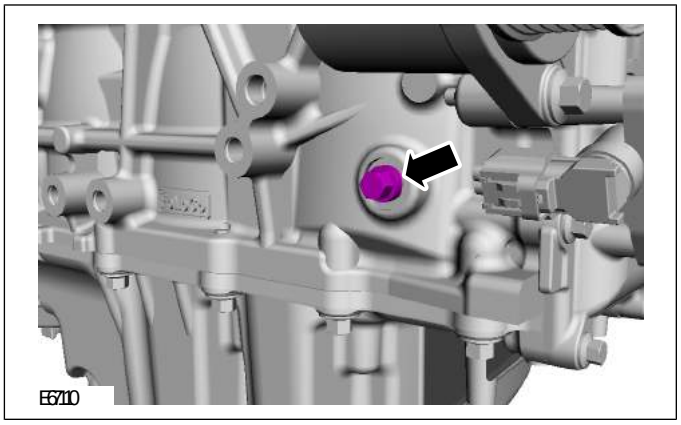
28. **CAUTION:Make sure that a new friction washer is installed.**



29. Special Tool(s): 303-509

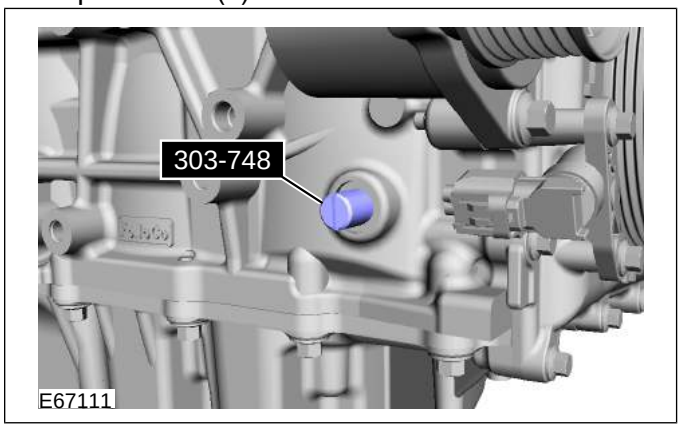


30.



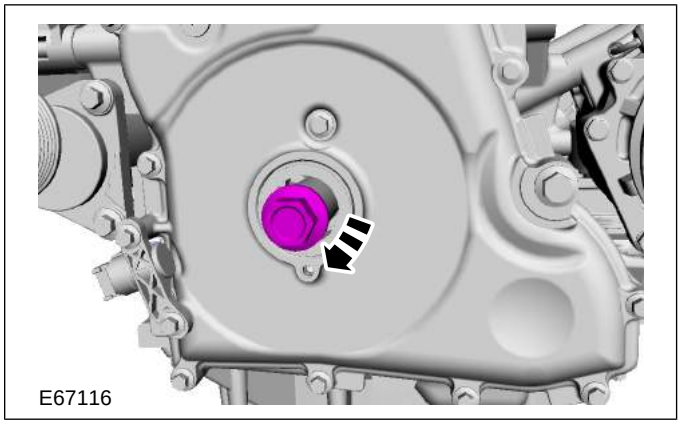
31. Install the special tool.

Special Tool(s): 303-748

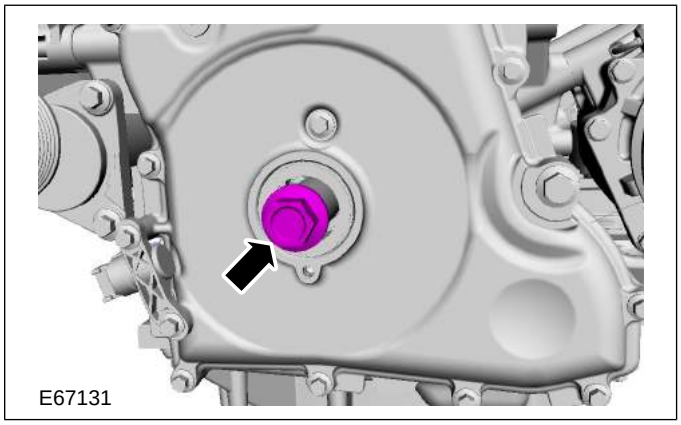


32. **CAUTION:Only rotate the crankshaft clockwise.**

Rotate the crankshaft until it contacts the special tool.



33. • Discard the crankshaft pulley retaining bolt.



DIAGNOSIS AND TESTING

CAUTION:If the ECT sensor output reaches the 120ºC default line under normal cooling system pressure, internal damage may be caused to the engine and a diagnostic trouble code (DTC) will be set in the PCM. The test should be stopped and the cause located and corrected. If the cooling system does not pressurize, the coolant will boil at 100ºC which may also damage the engine. CARRY OUT the Coolant Expansion Tank Cap Pressure Test Component Test in this section.

If the WDS only allows the ECT sensor to be displayed in volts, refer to the following table for corresponding Celsius values:

Volts	ºCelsius
1.33	60
1.02	70
0.78	80
0.60	90
0.46	100
0.35	110
0.27	120

The CHT sensor output is useful to examine the cylinder head temperature rise during the warm-up cycle and later during the normal light throttle cruise test. This sensor output may vary between vehicles with manual transmission and vehicles with automatic transmission and should be used for reference only.

The LOAD display is used for reference as it is necessary to maintain a stable load line during the test. It is necessary to carry out the test under normal light throttle cruise driving conditions and average loads, typically 40% to 70% of the load value.

The VSS output is used for reference but can help to identify misfires and sensors which fail during the warm-up cycle.

The RPM display indicates the engine speed and can be compared with the DSRPM.

The DSRPM is the desired or calculated idle speed which the PCM commands the engine to reach. If the thermostat opens too early (before the correct opening temperature has been reached), the engine will not reach this value.

When using the WDS in data logger mode, the signals recorded should remain within the DEFAULT values set by the WDS.

3. **WARNING:Make sure that the WDS is placed in the vehicle so that it does not interfere with the safe operation of the vehicle. Do not place the WDS in the deployment path of any air bag. Failure to follow these instructions may result in personal injury.**

NOTE: The road test is best carried out with the aid of another technician in the vehicle to enable the vehicle to be driven safely while the sensor outputs are monitored within datalogger. If there is only one technician available, the WDS can be set up (using the record/capture mode camera icon) before leaving the workshop to record a 16 km (10 mile) test.

NOTE: The results from the test are more conclusive if the engine is cold when the test is started.

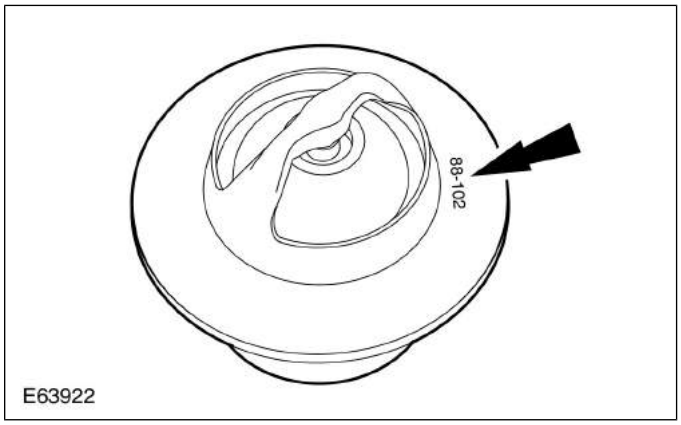
Carry out a road test.

REFER to: Road/Roller Testing (100-00 General Information, Description and Operation).

4. Drive the vehicle at a constant throttle opening and set speed until the ECT value settles into a shallow rise and fall signal, close to a straight line. This indicates that the thermostat is functioning correctly.

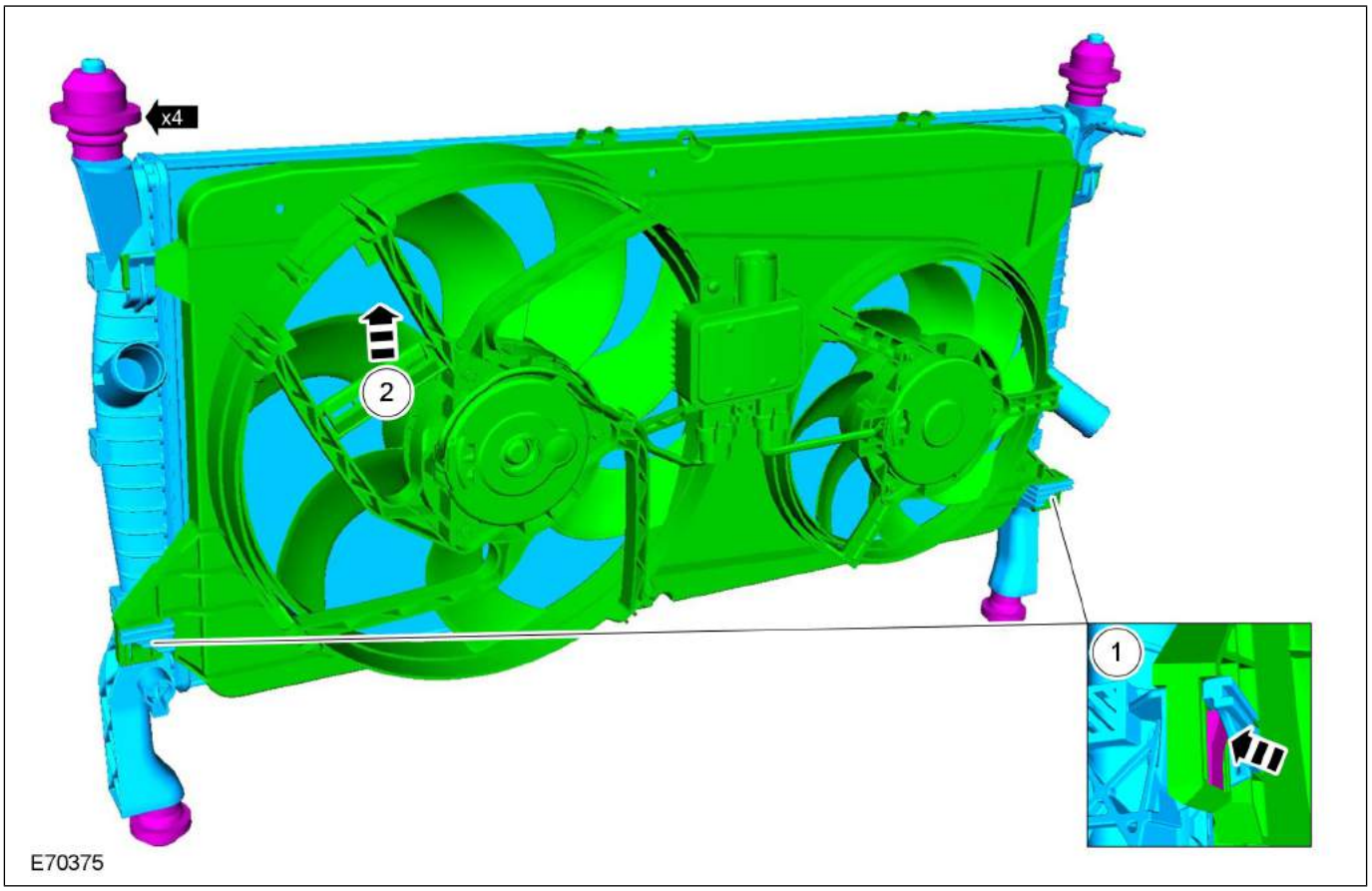
NOTE: Some thermostats indicate the temperature(s) in Celsius and Fahrenheit.

The graphic below shows the location and an example of the opening temperature (88ºC) and fully open temperature (102ºC) of a thermostat.



The graphic below shows an alternative method used to show the opening temperature (88ºC) and fully open temperature (112ºC) of a thermostat.

REMOVAL AND INSTALLATION

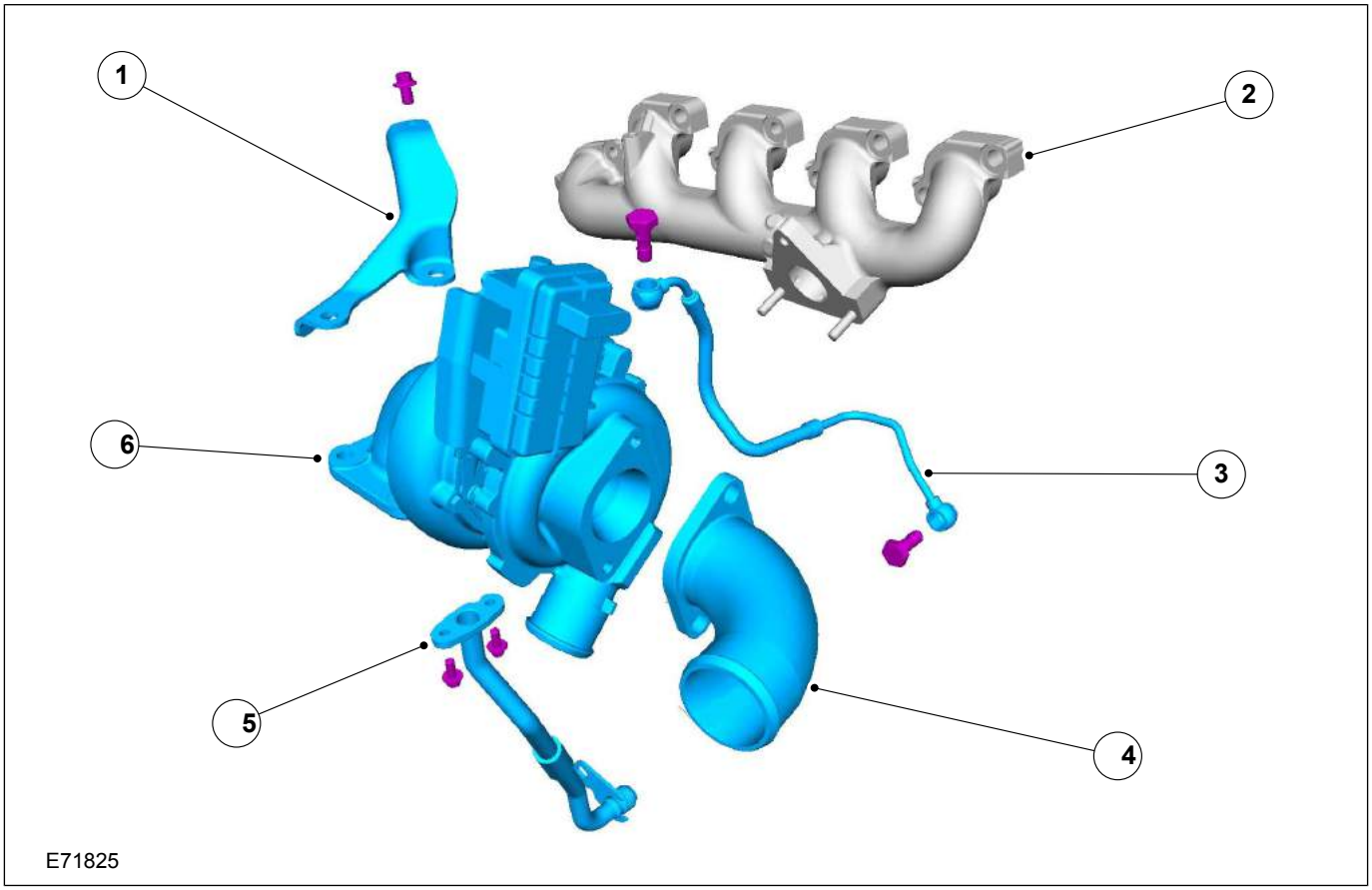


Installation

1. To install, reverse the removal procedure.

DESCRIPTION AND OPERATION

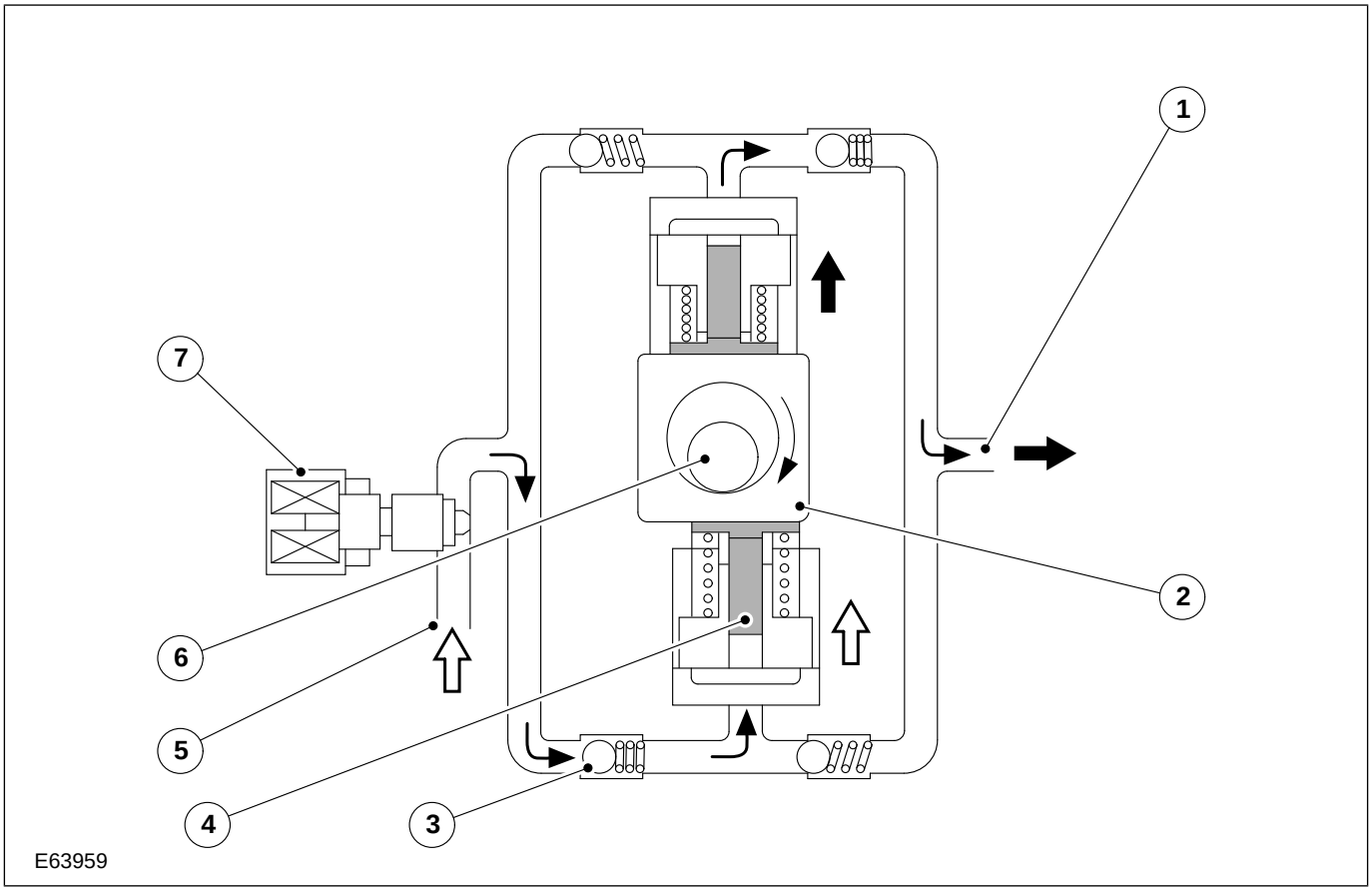
Vehicles with 2.4L Duratorq-TDCi (Puma) (140 PS) diesel engine



Item	Description
1	Turbocharger to exhaust manifold bracket
2	Exhaust manifold
3	Oil supply tube
4	Charge air cooler to turbocharger intake pipe
5	Oil drain tube
6	Turbocharger

DIAGNOSIS AND TESTING

First stage of high-pressure fuel development



Item	Description
1	Fuel outlet port
2	High-pressure fuel pump cam ring
3	Fuel intake valve

Item	Description
4	High-pressure fuel pump chamber
5	Fuel intake port
6	Eccentric cam
7	Fuel metering valve

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Catalytic converter blocked.	• REMOVE and visually INSPECT the catalytic converter for damage. INSTALL a new catalytic converter as necessary. REFER to: Catalytic Converter - 2.4L Duratorq-TDCi (Puma) Diesel (309-00 Exhaust System, Removal and Installation).
	• Wiring harness/connector.	• REFER to the WDS.
	• PCM.	• REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls, Diagnosis and Testing).
• Black smoke at cruising speeds and glow plug indicator is flashing	• DTC detected.	• REFER to the WDS.

REMOVAL AND INSTALLATION

Fuel Rail

General Equipment

Worldwide Diagnostic System (WDS)

Removal

WARNINGS:

Make sure that the engine is switched off.

Make sure that the fuel pressure has dropped to zero and that the fuel temperature is at ambient temperature.

Wait at least 1 minute after the engine has stopped before commencing any repair to the fuel injection system.

CAUTION:Always carry out the cleaning process before carrying out any repairs to the fuel injection system components.

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

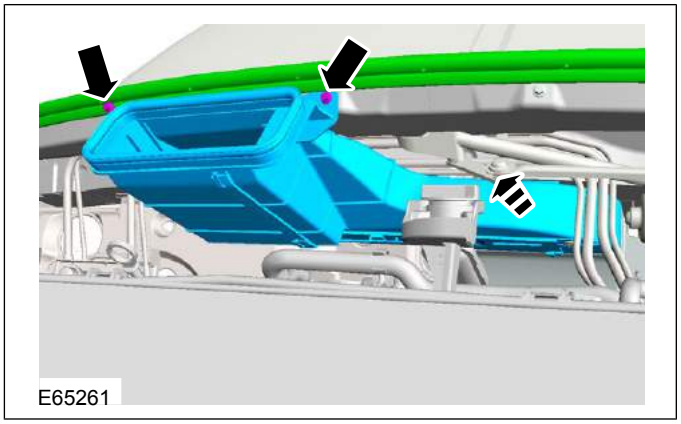
1. Within the datalogger function of WDS, check that the fuel pressure has dropped to zero and that the fuel temperature has either reached ambient temperature or is below 30ºC whichever is the greater.

   General Equipment: Worldwide Diagnostic System (WDS)

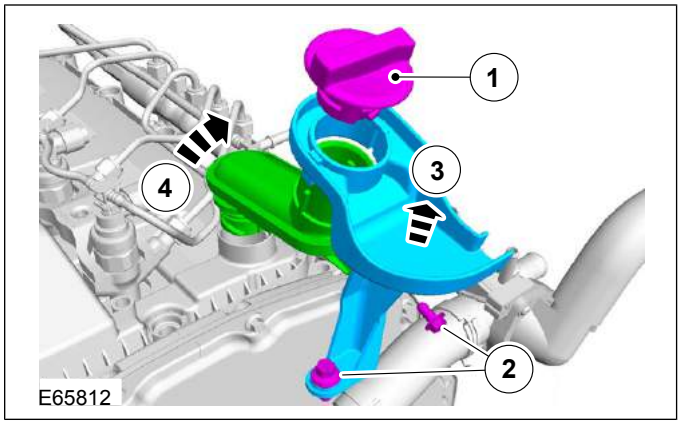
2. Disconnect the battery ground cable.

   Refer to:Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

3.



4.



5. Remove the intake manifold.

   Refer to:Intake Manifold (303-01 Engine - 2.4L Duratorq-TDCi (Puma) Diesel, In-vehicle Repair).

6. **CAUTIONS:**

   Make sure that the fuel line remains in contact at both ends until both unions nuts have been unscrewed and the area around the joints thoroughly cleaned.

   Make sure that all openings are sealed. Use new blanking caps.

   Vacuum foreign material from the high-pressure fuel supply line, the fuel injector and the fuel rail.

   Refer to:Fuel Injection Component Cleaning (303-04 Fuel Charging and Controls - 2.4L Duratorq-TDCi (Puma) Diesel, General Procedures).

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
	• Accessory drive belt idler pulley bearing failure.	• REMOVE the accessory drive belt. REFER to:Accessory Drive Belt - 2.2L Duratorq-TDCi (Puma) Diesel, Vehicles With: Air Conditioning (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 2.4L Duratorq-TDCi (Puma) Diesel (303-05 Accessory Drive, Removal and Installation) / Accessory Drive Belt - 2.3L Duratec-HE (MI4) (303-05 Accessory Drive, Removal and Installation). INSPECT the idler pulley(s) for smooth rotation. INSTALL a new idler pulley(s) as necessary. TEST the system for normal operation.
NOTE: Chirp is defined as a twittering noise, often intermittent • Accessory drive belt chirp	• Pulley misalignment (usually evident at idle).	• CHECK that the accessory drive belt is running centrally on the flat pulleys. TEST the system for normal operation. • CHECK the pulleys for excessive end float and bent flanges. • With the engine running at idle, use a stethoscope to identify the source of the noise. INSTALL new components as necessary. TEST the system for normal operation.
	• Generator decoupler seized.	• CHECK the generator decoupler for correct operation or damage. REFER to the Generator Decoupler Component Test in this procedure.

DIAGNOSIS AND TESTING

Engine Ignition

General Equipment

Worldwide Diagnostic System (WDS)

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
• Wiring harness • Electrical connector(s) • Spark plug(s) • Spark plug wire(s) • Ignition coil-on-plug • Powertrain control module (PCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
• Engine misfire	• Spark plug(s). • Spark plug wire(s).	• Using the WDS CARRY OUT a KV test.
	• Ignition coil-on-plug. • PCM. • PCM calibration.	• REFER to the WDS.
• Engine stumbling	• Spark plug(s). • Spark plug wire(s).	• Using the WDS CARRY OUT a KV test.
	• Ignition coil-on-plug. • PCM. • PCM calibration.	• REFER to the WDS.
• Engine lacks power	• Spark plug(s). • Spark plug wire(s).	• Using the WDS CARRY OUT a KV test.
	• Ignition coil-on-plug.	• REFER to the WDS.

REMOVAL AND INSTALLATION

Evaporative Emission Canister

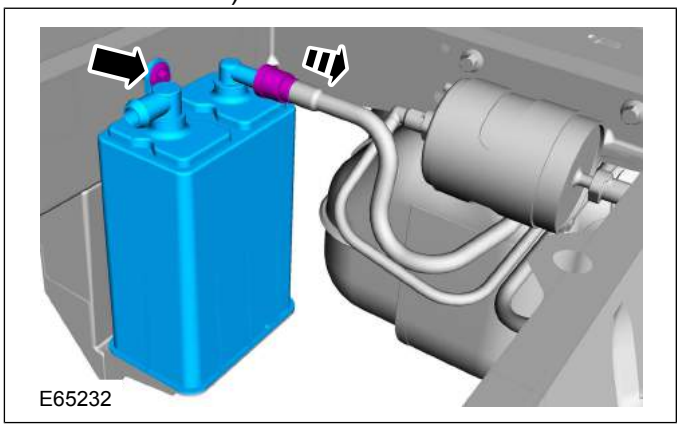
Removal

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

1. Raise and support the vehicle.

   Refer to:Lifting (100-02 Jacking and Lifting, Description and Operation).

2. Refer to:Quick Release Coupling (310-00 Fuel System - General Information, General Procedures).



Installation

1. To install, reverse the removal procedure.

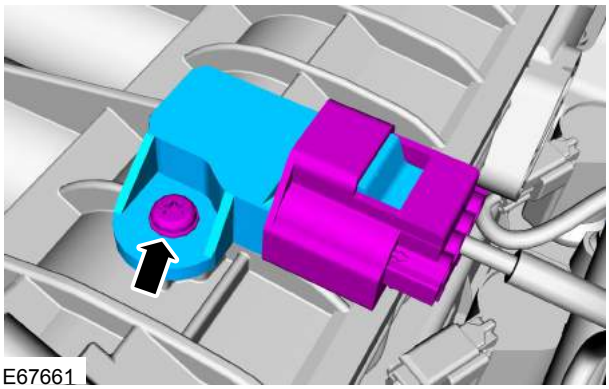
REMOVAL AND INSTALLATION

Manifold Absolute Pressure (MAP) Sensor

Removal

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

1. Torque: 3 Nm



Installation

1. Lubricate the O-ring seal with clean engine oil.
2. To install, reverse the removal procedure.

SPECIFICATIONS

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Grease - pilot bearing	WSD-M1C238-A
Grease - input shaft guide sleeve	ESD-M1C220-A

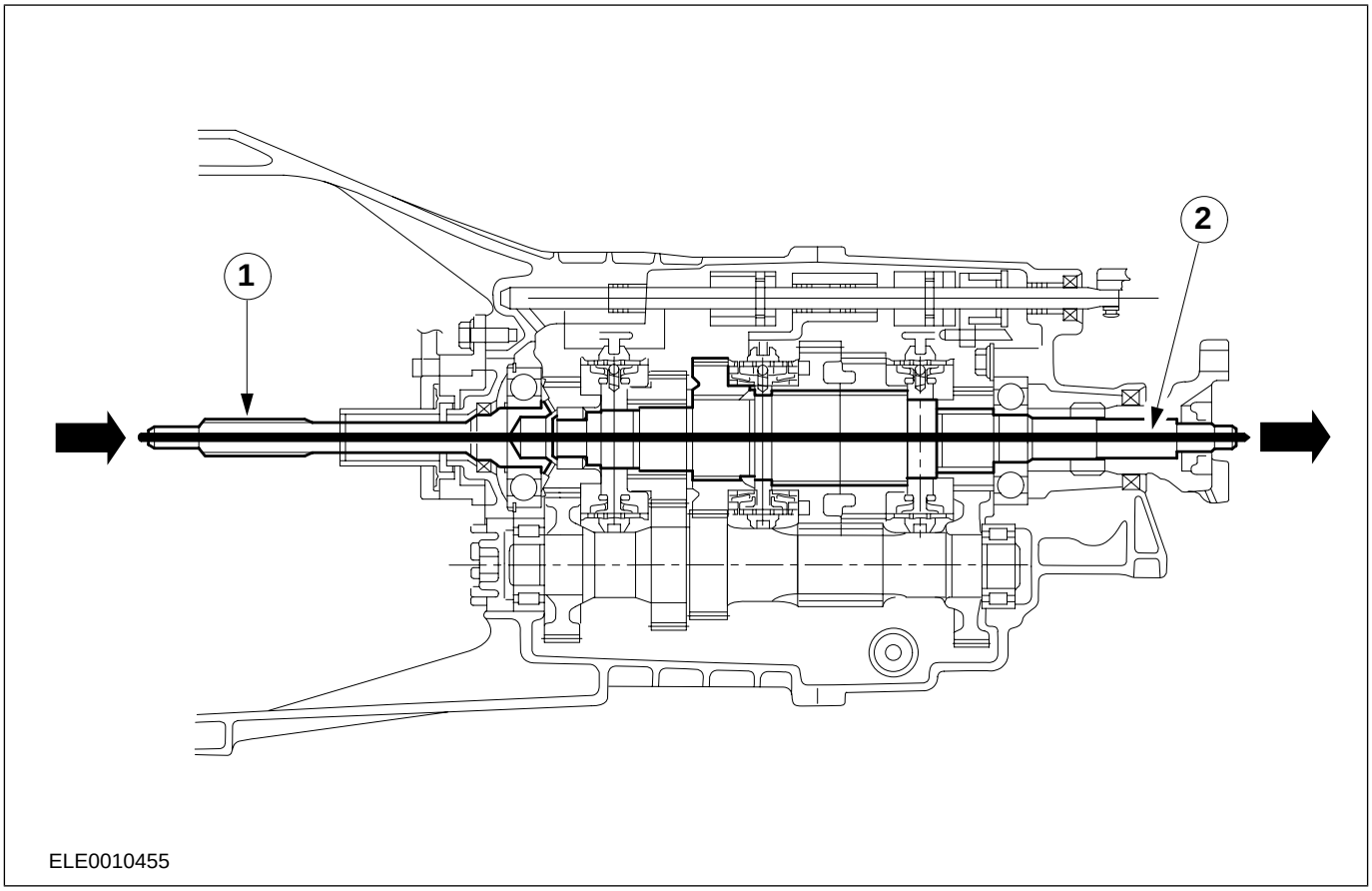
Torque Specifications

Description	Nm	lb-ft	lb-in
Clutch pressure plate retaining bolts	29	21	–
Flywheel retaining bolts	a	–	–

a) Refer to the procedure in this section.

DESCRIPTION AND OPERATION

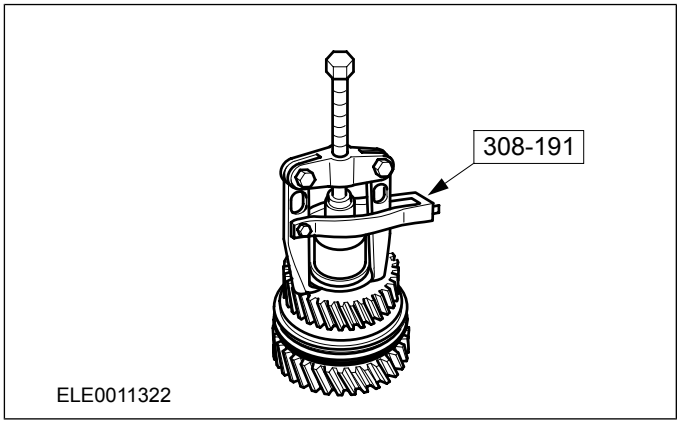
Fourth gear



Item	Part Number	Description
1		Input shaft
2		Output shaft

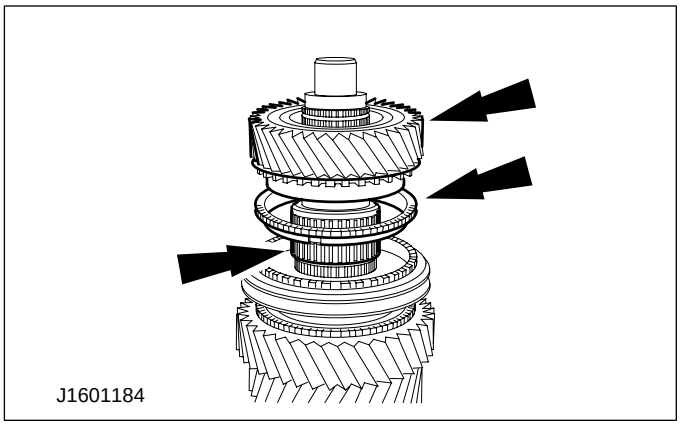
DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

- Locate the special tool in the recesses off the bearing ring.



5. **NOTE:Mark the position of the second gear wheel in relation to the synchronizer ring to aid installation.**

   Remove the second gear wheel, the needle roller bearing and synchronizer ring.

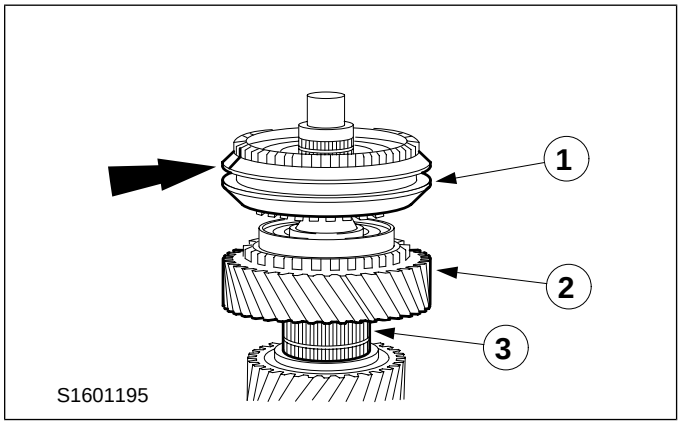


6. **NOTE:Mark the position of the shift ring in relation to the first gear wheel to aid installation.. Components are paired.**

NOTE: Remove the circlip.

Remove the first/second gear synchronizer and the first gear wheel.

1. First/second gear synchronizer.
2. First gear wheel.
3. Needle roller bearing.



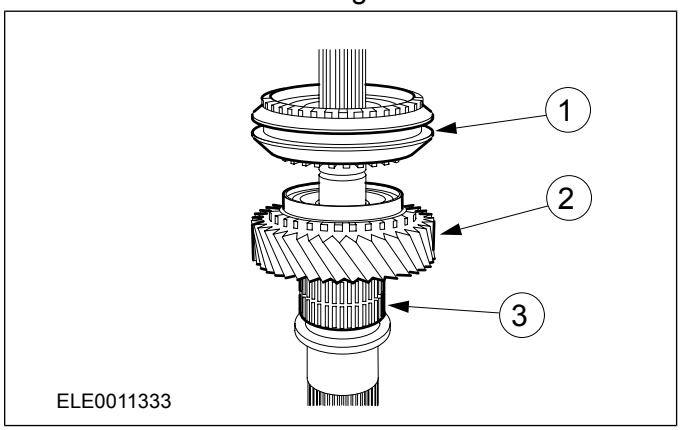
7. **NOTE:Mark the position of the shift ring in relation to the reverse gear wheel to aid installation. Components are paired.**

NOTE: Clamp the output shaft the other way round in the vise.

NOTE: Remove the circlip.

Remove the fifth/reverse gear synchronizer, the reverse gear wheel and needle roller bearing.

1. Fifth/reverse gear synchronizer.
2. Reverse gear wheel.
3. Needle roller bearing.

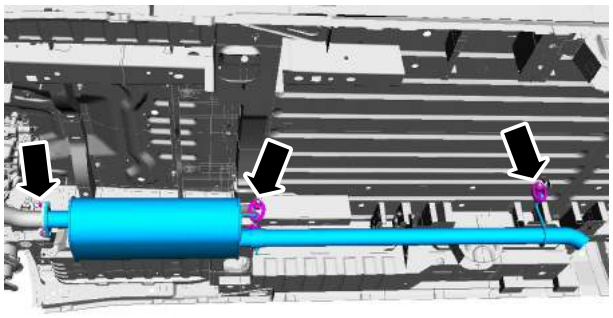


Assembly

1. **Carefully clean and check all sliding parts and lubricate the synchronizer rings with Manual transmission fluid before assembly.**
2. **Install the needle roller bearing, reverse gear wheel and synchronizer unit.**
   1. Install the reverse gear wheel.
   2. Install the synchronizer.

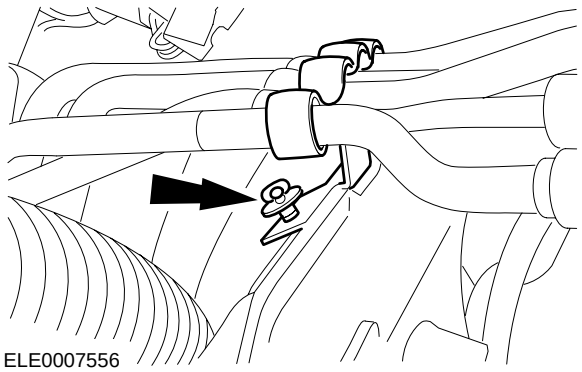
INSTALLATION

21. **Install the exhaust muffler.**


E73592

Vehicles with auxiliary heating

22. **Attach the power steering lines to the front axle crossmember.**

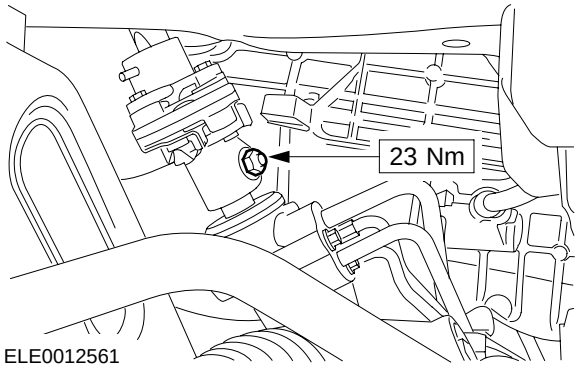

ELE0007556

All vehicles

23. **WARNING:Install a new steering column flexible coupling nut. Failure to follow this instruction may result in personal injury.**

NOTE: Make sure the road wheels are in the straight ahead position.

Connect the steering column flexible coupling to the steering gear pinion.

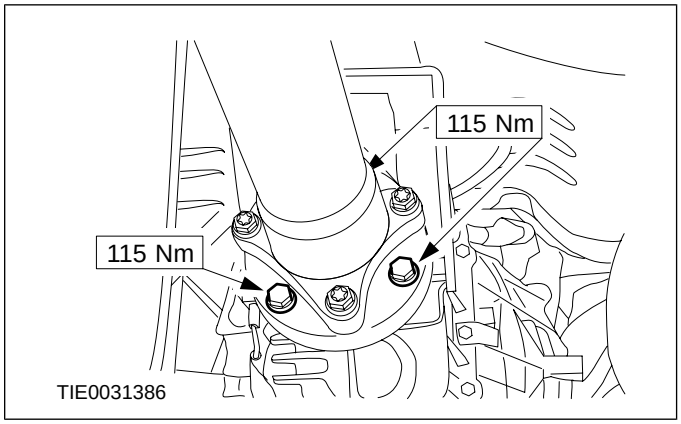


ELE0012561

24. **NOTE:Align the mark on the driveshaft flange with the mark on the transmission output shaft flange.**

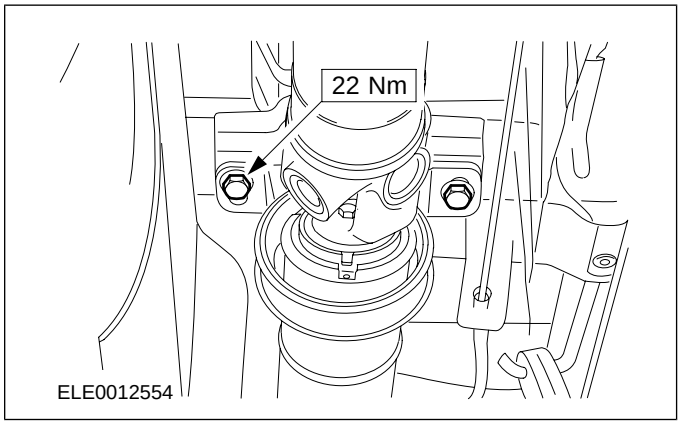
NOTE: Install new driveshaft to transmission output shaft flange retaining bolts.

Attach the driveshaft to the transmission output shaft flange.



TIE0031386

25. **Tighten the driveshaft front center bearing retaining bolts.**



ELE0012554

26. **Lower the vehicle.**
27. **Connect the battery ground cable.**

For additional information, refer to:Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).

28. **Adjust the gearshft cables.**

For additional information, refer to:Gearshift Cables (308-06 Manual Transmission/Transaxle External Controls - Vehicles With: MT-75, Removal and Installation).

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	3 Using a suitable connector, connect the fuel injection pump return line to the fuel filter to fuel tank return line.
	4 Start the engine and observe the clear plastic pipe for visible signs of air. • Did the air decrease in the clear plastic pipe? → **Yes** Air ingress is at the fuel filter or housing. REPAIR or INSTALL a new fuel filter or housing as necessary. Test the system for normal operation. → **No** INSTALL a new fuel level sensor. REFER to Section 310-01 [Fuel Tank and Lines].

Component Tests

Fuel Filter Element - Vehicles with 75 PS, 90 PS or 100 PS Engine

Carry out the following test to determine if a new fuel filter element should be installed.

1. With the engine switched OFF, check the position of the yellow plunger in the fuel filter minder gauge.
2. If the yellow plunger is in the clear or red zones, press the yellow button on the top of the fuel filter minder gauge and hold for 3 seconds to reset it.
3. Start the engine. Slowly raise the engine speed to 4000 rpm and hold for 7 seconds.
4. Check the position of the yellow plunger in the fuel filter minder gauge.
5. If the yellow plunger is in the green zone, a new fuel filter element does not have to be installed.
6. If the yellow plunger is in the clear zone and the vehicle is in for a service, a new fuel filter element should be installed.
7. If the yellow plunger is in the red zone, a new fuel filter element must be installed.

Fuel Filter Element - Vehicles with 120 PS Engine

Carry out the following test to determine if a new fuel filter element should be installed.

1. With the engine running at idle speed, check the position of the yellow plunger in the fuel filter minder gauge.
2. If the yellow plunger is in the clear or red zones, press the yellow button on the top of the fuel filter minder gauge and hold for 3 seconds to reset it.
3. Slowly raise the engine speed to 4000 rpm and hold for 7 seconds.
4. Check the position of the yellow plunger in the fuel filter minder gauge.
5. If the yellow plunger is in the green zone, a new fuel filter element does not have to be installed.
6. If the yellow plunger is in the clear zone and the vehicle is in for a service, a new fuel filter element should be installed.
7. If the yellow plunger is in the red zone, a new fuel filter element must be installed.

Fuel Filter Minder Gauge - Vehicles with Diesel Engine

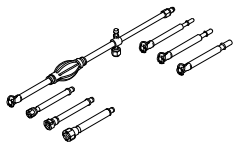
WARNINGS:

Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable mixtures are always present and may ignite. Failure to follow these instructions may result in personal injury.

REMOVAL AND INSTALLATION

Fuel Filter Element — 2.2L Duratorq-TDCi (Puma) Diesel/2.4L Duratorq-TDCi (Puma) Diesel

Special Tool(s)

 E50230	Hand Pressure Pump with Adapter Kit 310-110A

Special Tool(s)

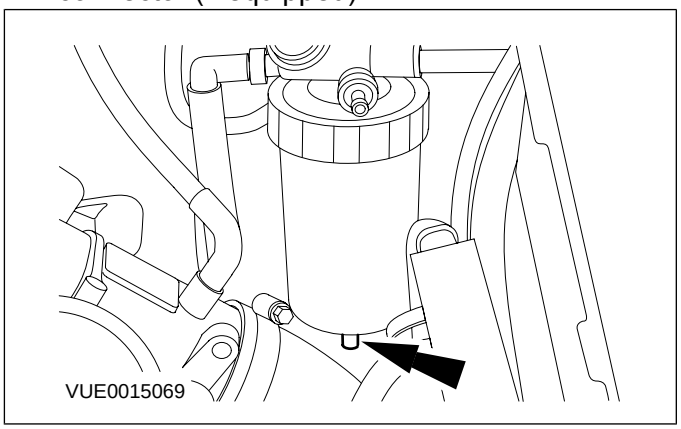
Removal

All vehicles

1. **WARNING:**

   Refer to: Diesel Fuel System Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Disconnect the water-in-fuel sensor electrical connector (if equipped).



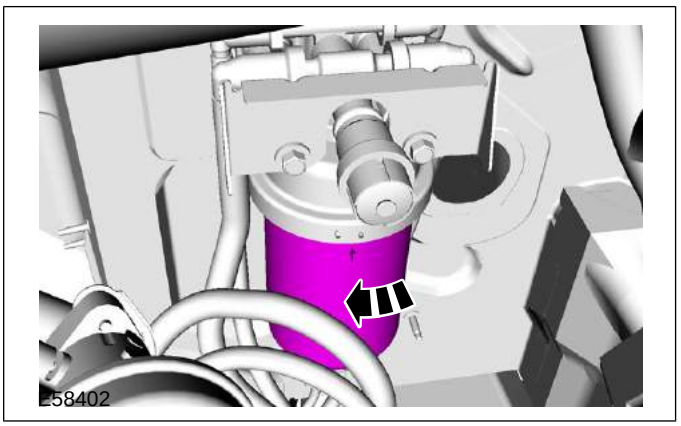
Left-hand drive vehicles

3. **CAUTION:Use lint free cloth.**

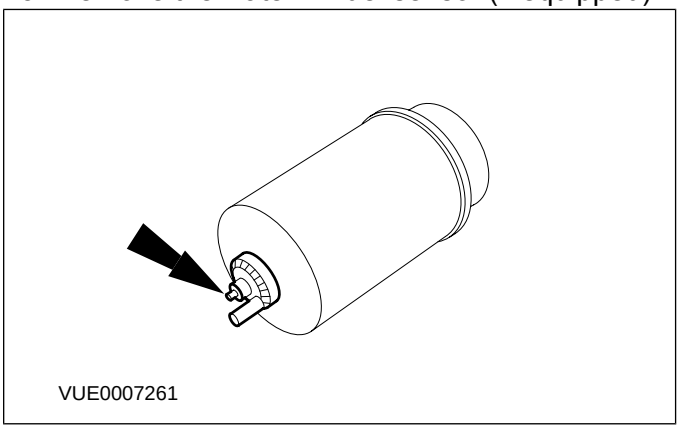
   Protect the generator with lint-free cloth to prevent contamination.

All vehicles

4.

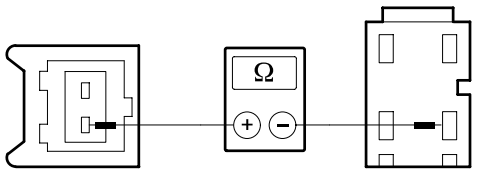
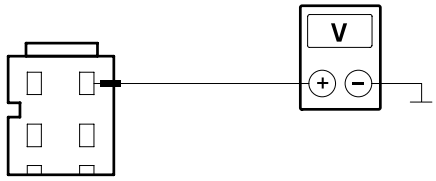


5. Remove the water-in-fuel sensor (if equipped).



6. Discard the fuel filter.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A8: CHECK THE CIRCUIT BETWEEN THE BLOWER MOTOR AND THE BLOWER SWITCH FOR OPEN CIRCUIT - LEVEL 3 INOPERATIVE	
	1 Ignition switch in position 0.
	2 Disconnect Connector CH123 from the blower motor.
	3 Disconnect Connector CH101B from the blower switch.
 VFE0033621	4 Measure the resistance between the blower motor, connector CH123, pin 2, circuit VH301B (YE/BU), wiring harness side and the blower switch, connector CH101B, pin 2, circuit VH301A (YE/BU), wiring harness side. • Is a resistance of less than 2 Ohms registered? → **Yes** RENEW the blower switch. CHECK the operation of the system. → **No** LOCATE and REPAIR the break in circuit VH301A (YE/BU) between soldered connection S2H301 and the blower switch using the Wiring Diagrams. CHECK the operation of the system.
A9: MEASURE THE VOLTAGE AT THE BLOWER RESISTOR ASSEMBLY	
	1 Ignition switch in position 0.
	2 Disconnect Connector CH403 from the blower resistor assembly.
	3 Ignition switch in position II.
 VFE0023419	4 Measure the resistance between the blower resistor assembly, connector CH403, pin 1, circuit VH301C (YE/BU), wiring harness side and ground. • Does the meter display battery voltage? → **Yes** INSTALL a new heater blower series resistor. CHECK the operation of the system. → **No** LOCATE and REPAIR the break in circuit VH301C (YE/BU) between soldered connection S2H301 and the blower resistor assembly using the Wiring Diagrams. CHECK the operation of the system.
A10: CHECK THE GROUND CONNECTION OF BLOWER RESISTOR ASSEMBLY - LEVEL 1	
	1 Ignition switch in position 0.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 Measure the resistance at the refrigerant low pressure switch, connector CH421, between pin 1 and pin 4, component side. • Is a resistance of less than 2 Ohms registered? → **Yes** LOCATE and RECTIFY the break in circuit CH421A (GY) between the refrigerant low pressure switch and the refrigerant high pressure switch with the aid of the Wiring Diagrams. CHECK the operation of the system. → **No** RENEW the refrigerant low pressure switch. CHECK the operation of the system.
C20: CHECK THE CIRCUIT BETWEEN THE REFRIGERANT LOW PRESSURE SWITCH AND THE A/C CONTROL ASSEMBLY FOR OPEN CIRCUIT	
	1 Ignition switch in position 0.
	2 Disconnect Connector CH101C from the A/C control assembly.
	3 Measure the resistance between the A/C control assembly, connector CH101C, pin 4, circuit CH422F (VT), wiring harness side and the refrigerant low pressure switch, connector CH421, pin 1, circuit CH422A (VT), wiring harness side. • Is a resistance of less than 2 Ohms registered? → **Yes** RENEW the A/C control assembly. CHECK the operation of the system. → **No** LOCATE and RECTIFY the open circuit between the air conditioning control assembly and the refrigerant low pressure switch with the aid of the Wiring Diagrams. CHECK the operation of the system.
C21: CHECK THE FUNCTION OF THE DEFROST SWITCH	
	1 Set the air distribution to defrost. • Does the A/C clutch work, and is the A/C indicator lamp on? → **Yes** GO to C24. → **No** GO to C22.

GENERAL PROCEDURES

Refrigerant Oil Adding

CAUTION:Collect the refrigerant oil in a clean measuring cylinder.

1. **NOTE:**This step only needs to be carried out when removing the A/C compressor.

   NOTE: Rotate the compressor shaft at least 6 to 8 turns when draining the refrigerant oil.

   Drain the refrigerant oil from the defective A/C compressor and dispose of it.

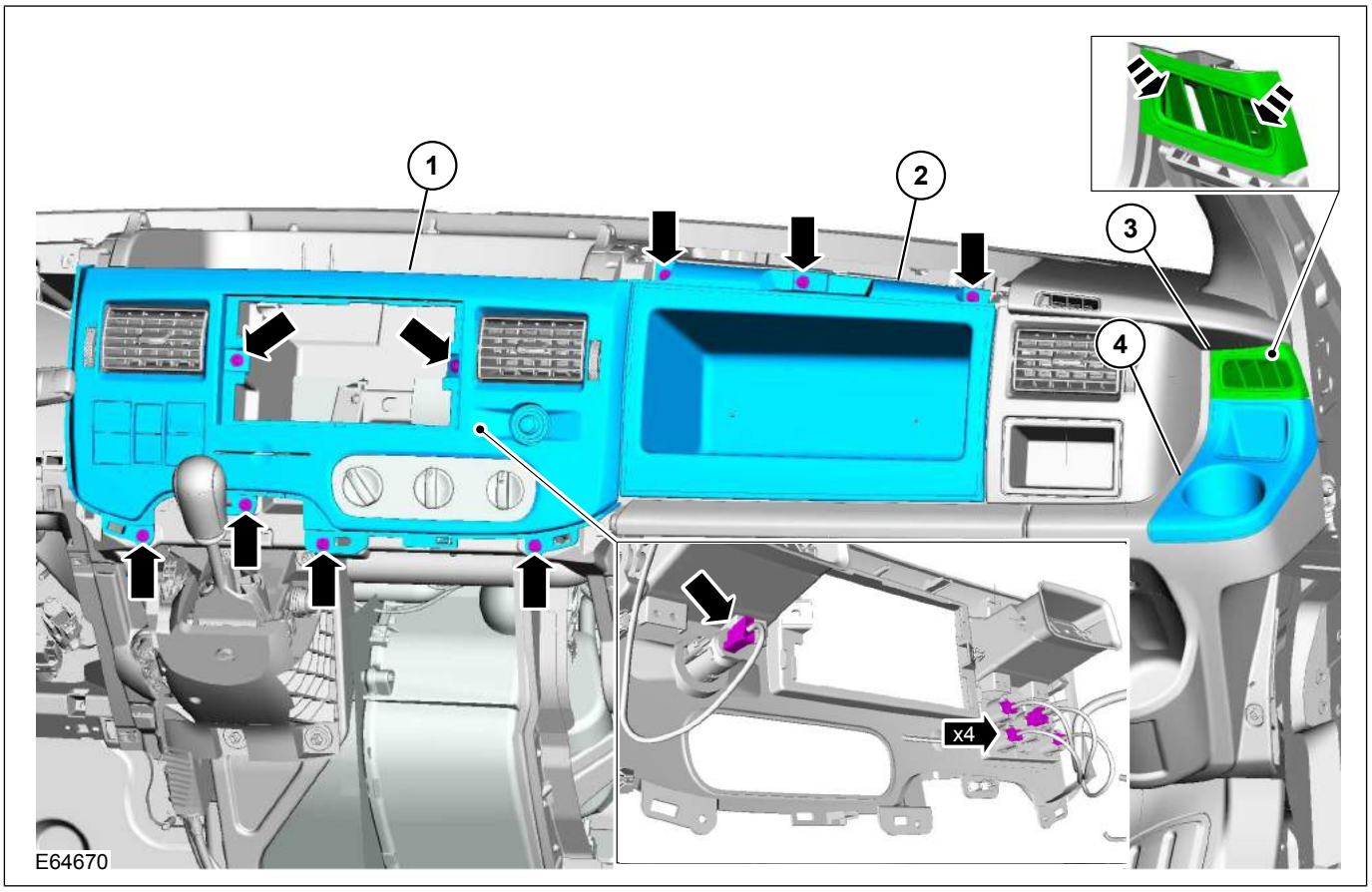
2. **CAUTIONS:**

   The refrigerant oil top-up quantity must not exceed the refrigerant oil fill quantity.

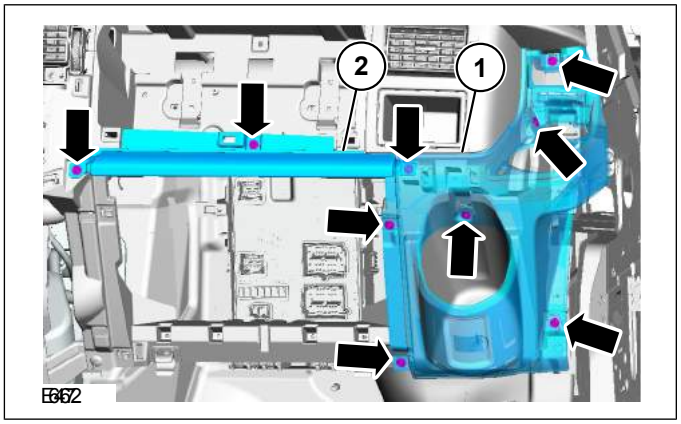
   If other A/C components are being renewed in addition to the A/C compressor, there is no need to top up with additional refrigerant oil, apart from filling the compressor.

   Top up with the calculated quantity of new refrigerant oil. See: Specifications (412-00 Heating, Ventilation, Air-Conditioning - General information, Specifications).

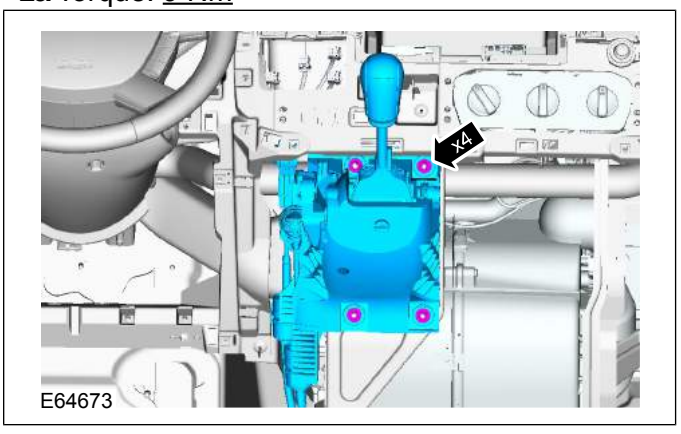
REMOVAL AND INSTALLATION



25.



26. Torque: 9 Nm



REMOVAL AND INSTALLATION

Low-Pressure Cutoff Switch

Materials	
Name	**Specification**
Refrigerant Oil	WSH-M1C231-B

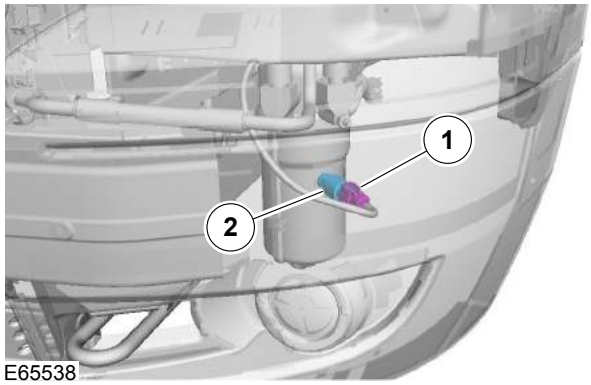
Removal

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

1. Refer to:Air Conditioning (A/C) System Health and Safety Precautions (100-00 General Information, Description and Operation).
2. Remove the left-hand side headlamp.

   Refer to:Headlamp Assembly (417-01 Exterior Lighting, Removal and Installation).
3. **CAUTION:Make sure that the low-pressure cutoff switch valve closes completely after removal of the low-pressure cutoff switch.**

   Torque: 8 Nm



Installation

1. To install, reverse the assembly procedure.
2. Coat the low pressure switch O-rings with clean refrigerant oil before installation.

   Material: Refrigerant Oil

DISASSEMBLY AND ASSEMBLY

Auxiliary Climate Control Housing

Disassembly

1. Disassemble the additional air conditioning system housing.

   Refer to: (412-02B, Disassembly and Assembly).

Assembly

2. To install, reverse the removal procedure.

DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• The stability assist deactivation switch illumination is inoperative	• Fuse(s). • Circuit(s). • Stability assist deactivation switch	• GO to Pinpoint Test I.

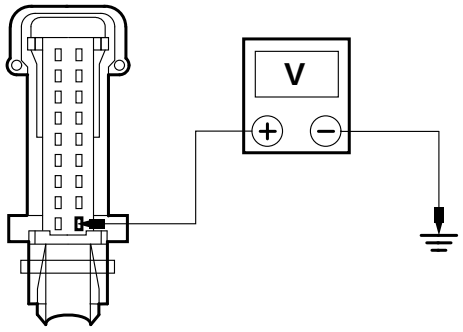
Pinpoint Tests

NOTE: Use a digital multimeter for all electrical measurements.

PINPOINT TEST A : THE CONTROL ILLUMINATION IS INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK EXTERIOR LAMPS	
	1 Turn the headlamp switch to the ON position. • Are the exterior lamps on? → **Yes** INSTALL a new headlamp switch. TEST the system for normal operation. → **No** REFER to:Headlamps (417-01 Exterior Lighting, Diagnosis and Testing).

PINPOINT TEST B : THE INSTRUMENT CLUSTER ILLUMINATION IS INOPERATIVE

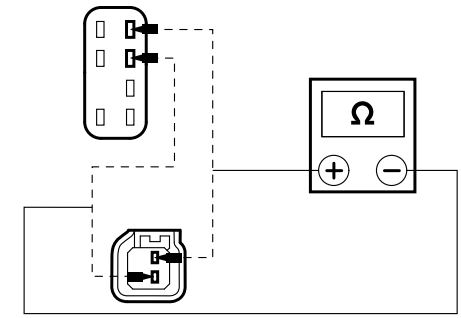
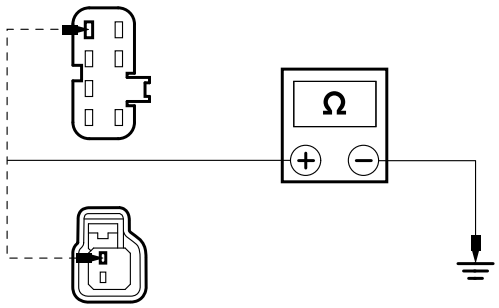
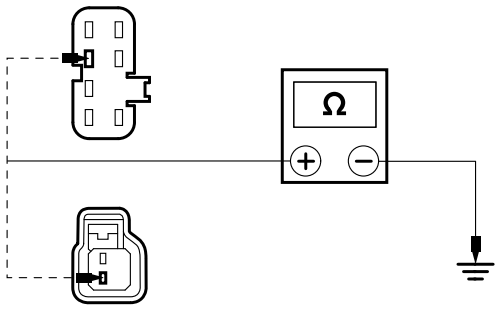
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK THE INSTRUMENT CLUSTER ILLUMINATION FOR POWER	
	1 Disconnect Instrument Cluster CMC01.
	2 Turn the headlamp switch to the ON position.
 E69753	3 Measure the voltage between the instrument cluster CMC01 pin 10, circuit CLN17 (BU/RD), harness side and ground while operating the dimmer switch from the minimum to the maximum positions. • Does the voltage vary between 1 volt and 10 volts approximately? → **Yes** GO to B3. → **No** GO to B2.

DIAGNOSIS AND TESTING

Symptom Chart

Symptom	Possible Sources	Action
• The charging system warning indicator is on with the engine running (The charging system voltage does not increase)	• Accessory drive belt.	• CHECK the accessory drive belt condition, REFER to:Accessory Drive (303-05 Accessory Drive, Diagnosis and Testing).
	• Circuit. • Generator. • Voltage regulator.	• CARRY OUT the generator tests, REFER to the Generator On-Vehicle Tests in Component Tests in this section.
• The charging system warning indicator is off with the ignition switch in the RUN position and the engine off	• Bulb.	• INSTALL a new bulb.
	• Ignition switch.	• CHECK the ignition switch.
	• Circuit. • Generator.	• CARRY OUT the generator tests, REFER to the Generator On-Vehicle Tests in Component Tests in this section.
• Radio interference	• Circuit. • Generator.	• REFER to the WDS
• The generator is noisy	• Accessory drive belt.	• REFER to:Accessory Drive (303-05 Accessory Drive, Diagnosis and Testing).
	• Loose generator mounting bolts.	• TIGHTEN the generator mounting bolts.

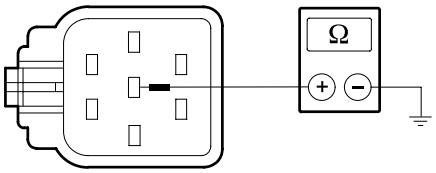
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E72091	2 Measure the resistance between the affected speaker pin 1 and pin 2, component side. • Is the resistance approximately 4.0 ohms? → **Yes** GO to C2. → **No** INSTALL a new speaker. TEST the system for normal operation.
C2: CHECK SPEAKER INPUT FOR SHORT TO GROUND	
	1 Disconnect Audio Unit CME03A.
 E72096	2 Measure the resistance between the affected speaker connector pin 1, harness side and ground. • Is the resistance greater than 10,000 ohms (open circuit)? → **Yes** GO to C3. → **No** REPAIR speaker input circuit. TEST the system for normal operation.
C3: CHECK SPEAKER RETURN FOR SHORT TO GROUND	
 E72093	1 Measure the resistance between the affected speaker connector pin 2, harness side and ground. • Is the resistance greater than 10,000 ohms (open circuit)? → **Yes** INSTALL a new speaker. TEST the system for normal operation. If the concern persists, INSTALL a new audio unit. REFER to:Audio Unit (415-01 Information and Entertainment System, Removal and Installation). → **No** REPAIR speaker return circuit. TEST the system for normal operation.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B13: CHECK CONTROL CIRCUITS BETWEEN HEADLIGHT SWITCH AND CENTRAL JUNCTION BOX (CJB) FOR OPEN CIRCUIT (BOX VAN, BUS, COMBI)	
	1 Ignition switch in position 0.
	2 Disconnect Central junction box (CJB) from connector C2BP02F.
	3 Measure the resistance between the headlight switch connector CLF23, pin 6, circuit CLF18B (BU/WH), wiring harness side and the central junction box (CJB), connector C2BP02F, pin 38, circuit CLF18A (BU/WH), wiring harness side.
	4 Measure the resistance between the headlight switch connector CLF23, pin 4, circuit CLF19A (VT/GN), wiring harness side and the central junction box (CJB), connector C2BP02F, pin 34, circuit CLF19A (VT/GN), wiring harness side.
	5 Measure the resistance between the headlight switch connector CLF23, pin 16, circuit ZA104A (OG/GN), wiring harness side and the central junction box (CJB), connector C2BP02F, pin 39, circuit ZA104A (OG/GN), wiring harness side.
	6 Measure the resistance between the light switch, connector CLF23, pin 13, circuit ZA105A (OG/GY), wiring harness side and central junction box (CJB), connector C2BP02F, pin 37, circuit ZA105A (OG/GY), wiring harness side. • Is a resistance of less than 2 Ohms measured in all of the cases? → **Yes** INSTALL a new CJB. CHECK the operation of the system. → **No** LOCATE and REPAIR the break in the affected circuit using the Wiring Diagrams. CHECK the operation of the system.
B14: CHECK CONTROL CIRCUITS BETWEEN HEADLIGHT SWITCH AND CENTRAL JUNCTION BOX (CJB) FOR OPEN CIRCUIT (PLATFORM TRUCK)	
	1 Ignition switch in position 0.
	2 Disconnect Central junction box (CJB) from connector CBP02F.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0003175	2 Measure the resistance between the right-hand headlamp: – Box van / Bus / Combi: Connector C1LF09, pin 4, circuit A_GD131V (BK/GY), wiring harness side and ground. – Platform truck with side parking lamp/turn signal lamp: Connector CLF09, pin 4, circuit A_GD131T (BK/GY), wiring harness side and ground. – Platform truck without side parking lamp/turn signal lamp: Connector CLF09, pin 4, circuit A_GD131H (BK/GY), wiring harness side and ground. • Is a resistance of less than 2 Ohms registered? → **Yes** RENEW headlamp. CHECK the operation of the system. → **No** LOCATE and RECTIFY the break in the circuit between the headlamp and soldered connection S1D131B using the wiring diagrams. CHECK the operation of the system.

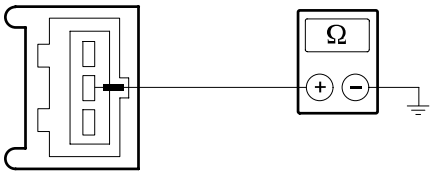
PINPOINT TEST G : DIPPED OR MAIN BEAM ON PERMANENTLY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: DETERMINE VEHICLE EQUIPMENT LEVEL	
	1 DETERMINE vehicle equipment level. • Is the vehicle equipped with automatic headlamp system? → **Yes** GO to G2. → **No** GO to G3.
G2: DETERMINE THE FAULT CONDITION	
NOTE: Shine light at the rain sensor, enough to prevent the automatic headlamp system being activated.	
	1 Ignition switch in position II.
	2 SWITCH ON the automatic headlamp system.

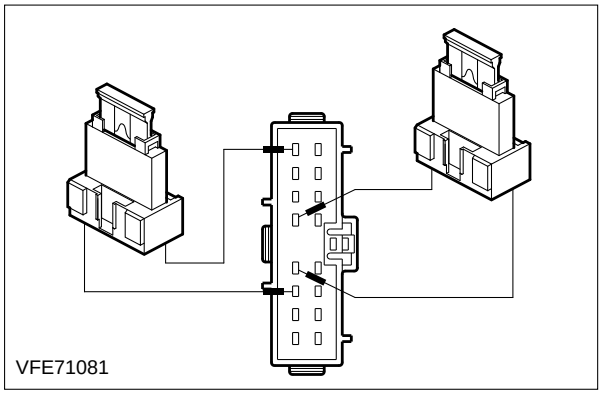
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0022920	2 Measure the resistance between high mounted stoplamp: – Vehicles without tailgate, without trailer socket: Connector CLS17, pin 2, circuit A_GD149AE (BK/GY), wiring harness side and ground. – All other vehicles: connector CLS17L, pin 2, circuit A_GD151BE (BK/GN), wiring harness side, and ground. • Is a resistance of less than 2 Ohms registered? → **Yes** RENEW additional high-mounted stop lamp. CHECK the operation of the system. → **No** - Vehicles without tailgate, without trailer socket: LOCATE and RECTIFY the break in the circuit between the additional high-mounted stop lamp and soldered connection S4D149B using the Wiring Diagrams. CHECK the operation of the system. - All other vehicles: LOCATE and RECTIFY the break in the circuit between the additional high-mounted stop lamp and soldered connection S4D149A using the Wiring Diagrams. CHECK the operation of the system.
B8: CHECK COMMON VOLTAGE SUPPLY OF REAR LEFT-HAND LAMP CLUSTER AND ADDITIONAL HIGH-MOUNTED STOP LAMP FOR OPEN CIRCUIT	
	1 Ignition switch in position 0.
	2 Disconnect Left-hand rear lamp assembly from connector CLS22.
	3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0010896	2 Measure resistance between right-hand side parking lamp/turn signal lamp: – Box van / Bus / Combi: Connector C1LS14B, pin 2, circuit A_GD131X (BK/GY), wiring harness side and ground. – Platform truck: Connector CLS21, pin 2, circuit A_GD131S (BK/GY), wiring harness side and ground. • Is a resistance of less than 2 Ohms registered? → **Yes** CHECK and if necessary RENEW the side parking lamp/turn signal lamp. CHECK the operation of the system. → **No** LOCATE and REPAIR break in circuit(s) between side parking lamp/turn signal lamp and soldered connection S1D131B using the Wiring Diagrams. CHECK the operation of the system.
C25: CHECK THE SHARED GROUND SUPPLY OF THE FRONT RIGHT TURN SIGNAL LAMPS FOR OPEN CIRCUIT (BOX VAN, BUS, COMBI)	
	1 Ignition switch in position 0.
	2 Disconnect Right parking lamp (side)/turn signal lamp from connector C1LS14B.
	3 Ignition switch in position II.
	4 SWITCH ON the right-hand turn signal.
 VFE0016139	5 Measure the voltage between the right-hand parking lamp/turn signal lamp (side), connector C1LS14B, pin 1, circuit CLS25E (YE/VT), wiring harness side and ground. • Is fluctuating battery voltage measured? → **Yes** LOCATE and RECTIFY break in circuits between soldered connection S1D131B and ground connection G31 with the aid of the Wiring Diagrams. CHECK the operation of the system. → **No** GO to C26.
C26: CHECK THE SHARED VOLTAGE SUPPLY TO THE FRONT RIGHT TURN SIGNAL LAMPS FOR OPEN CIRCUIT (BOX VAN, BUS, COMBI)	
	1 Ignition switch in position 0.
	2 Connect Right parking lamp (side)/turn signal lamp from connector C1LS14B.

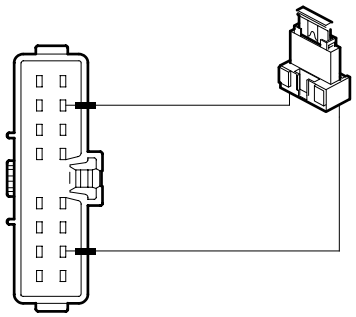
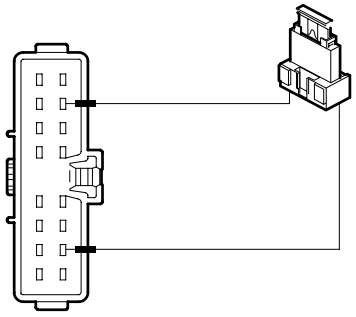
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A8: CHECK THE LIGHT SWITCH	
	1 Using two fused jumper wires (5 A) at the light switch, connector CLF23: – connect between pin 11, circuit SBP71A (RD/WH) and pin 16, circuit ZA104A (OG/GN), wiring harness side. – connect between pin 12, circuit SBP71B (RD/WH) and pin 13, circuit ZA105A (OG/GY), wiring harness side.
	2 CHECK the side lights. • Are the side lights (parking lights) on? → **Yes** INSTALL a new light switch. CHECK the operation of the system. → **No** GO to A9.
A9: CHECK CIRCUIT ZA104A (OG/GN) BETWEEN THE LIGHT SWITCH AND THE CENTRAL JUNCTION BOX (CJB) FOR BREAKS	
	1 Disconnect Central junction box (CJB) from connector CBP02F.
	2 Measure the resistance between the light switch, connector CLF23, pin 16, circuit ZA104A (OG/GN), wiring harness side and central junction box (CJB), connector CBP02F, pin 39, circuit ZA104A (OG/GN), wiring harness side. • Is a resistance of less than 2 Ohm registered? → **Yes** INSTALL a new central junction box (CJB). CHECK the operation of the system. → **No** LOCATE and RECTIFY the break in the circuit between the light switch and the central junction box (CJB) with the aid of the Wiring Diagrams. CHECK the operation of the system.
A10: CHECK THE VOLTAGE SUPPLY TO THE LIGHT SWITCH FOR OPEN CIRCUIT	
	1 Ignition switch in position 0.
	2 Disconnect Light switch from connector CLF23.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 CHECK Fuse F79 (7.5 A) (CJB). • Is the fuse OK? → **Yes** GO to B23. → **No** INSTALL a new fuse F79 (7.5 A) (CJB) and CHECK the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground with the aid of the Wiring Diagrams. CHECK the operation of the system.
B23: CHECK THE VOLTAGE SUPPLY TO FUSE F79 (7.5 A) (CJB) FOR OPEN CIRCUIT	
	1 Connect Fuse F79 (7.5 A) (CJB).
	2 Measure the voltage between fuse F79 (7.5 A) (CJB) and ground. • Is battery voltage measured? → **Yes** GO to B24. → **No** LOCATE and RECTIFY the break in the voltage supply of fuse F79 (7.5 A) (CJB) with the aid of the Wiring Diagrams. If necessary INSTALL a new central junction box (CJB). CHECK the operation of the system.
B24: CHECK THE CENTRAL JUNCTION BOX (CJB)	
	1 Ignition switch in position 0.
	2 Disconnect Central junction box (CJB) from connector CBP02B.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E0024110	3 Connect a fused jumper wire (10 A) at the light switch, connector CLF23, between pin 2, circuit CLS48A (BU), wiring harness side and pin 7: – Box van / Bus / Combi: circuit SBP67G (RD/BU), wiring harness side. – Platform truck: circuit SBP67B (RD/BU), wiring harness side.
	4 Ignition switch in position II.
	5 Measure the voltage between fuse F81 (10 A) (CJB) and ground. • Does the meter display battery voltage? → **Yes** RENEW the light switch. CHECK the operation of the system. → **No** GO to A25.
A24: RULE OUT THE LIGHT SWITCH AS A POSSIBLE CAUSE OF THE FAULT	
	1 Ignition switch in position 0.
	2 Disconnect Light switch from connector CLF23.
 E0024110	3 Connect a fused jumper wire (10 A) to the light switch, connector CLF23, between pin 7: – Box van / Bus / Combi: circuit SBP69A (GY/RD), wiring harness side and pin 2, circuit CLS48A (BU), wiring harness side. – Platform truck: circuit SBP69A (RD/GY), wiring harness side and pin 2, circuit CLS48 (BU), wiring harness side.
	4 Ignition switch in position II.

DIAGNOSIS AND TESTING

PINPOINT TEST W : REVERSING LAMPS DO NOT OPERATE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK FUSE F33 (10 A) (EJB)	
	1 Ignition switch in position 0.
	2 Disconnect fuse F33 (10 A) (EJB).
	3 CHECK fuse F33 (10 A) (EJB). • Is the fuse OK? → **Yes** GO to A2. → **No** RENEW fuse F33 (10 A) (EJB) and CHECK the operation of the system. If the fuse blows again, LOCATE and RECTIFY the short to ground using the Wiring Diagrams. CHECK the operation of the system.
A2: CHECK THE VOLTAGE SUPPLY TO FUSE F33 (10A) (EJB) FOR OPEN CIRCUIT	
	1 Connect fuse F33 (10 A) (EJB).
	2 Ignition switch in position II.
	3 Measure the voltage between fuse F33 (10A) (EJB) and ground. • Does meter display battery voltage? → **Yes** GO to A3. → **No** RENEW THE EJB. CHECK the operation of the system.
A3: CHECK THE POWER SUPPLY OF THE REVERSING LAMP SWITCH FOR OPEN CIRCUIT	
	1 Ignition switch in position 0.
	2 Disconnect Reversing lamp switch from CET47.
	3 Ignition switch in position II.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	4 CHECK the reversing lamps at the vehicle. • Are the backup lamps on the vehicle continuously lit? → **Yes** REFER to:Reversing Lamps (417-01 Exterior Lighting, Diagnosis and Testing). → **No** Continue troubleshooting on the trailer. CHECK system operates correctly
C8: DETERMINE THE FAULT CONDITION	
	1 Ignition switch in position 0.
	2 Disconnect Trailer from connector CAT23.
	3 Ignition switch in position II.
	4 CHECK left-hand turn signal lamp on vehicle. • Does the left-hand turn signal lamp on the vehicle flash continuously? → **Yes** REFER to:Turn Signal and Hazard Lamps (417-01 Exterior Lighting, Diagnosis and Testing). → **No** GO to C9.
C9: NARROW DOWN THE LOCATION OF THE SHORT TO BATTERY VOLTAGE ON THE VEHICLE (LEFT-HAND TURN SIGNAL LAMP)	
	1 Ignition switch in position 0.
	2 Connect Trailer socket tester to connector CAT23.
	3 Ignition switch in position II.
	4 CHECK trailer socket tester. • Is voltage supply measured at the trailer socket, pin 1 (left-hand turn signal lamp)? → **Yes** GO to C10. → **No** Continue troubleshooting on the trailer.
C10: RULE OUT THE TRAILER CONTROL UNIT AS CAUSE FOR SHORT CIRCUIT TO BATTERY VOLTAGE ON THE VEHICLE (LEFT-HAND TURN SIGNAL LAMP)	
	1 Ignition switch in position 0.
	2 Disconnect Inline fuse F83 (15 A).

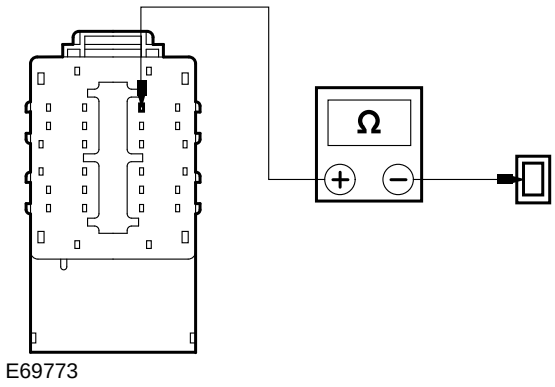
SECTION 417-02 Interior Lighting

VEHICLE APPLICATION:2007.50 Transit

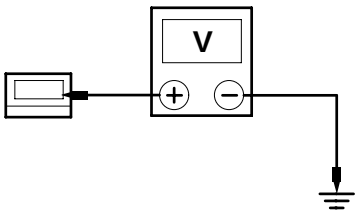
CONTENTS PAGE

DIAGNOSIS AND TESTING

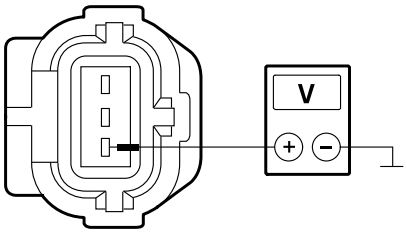
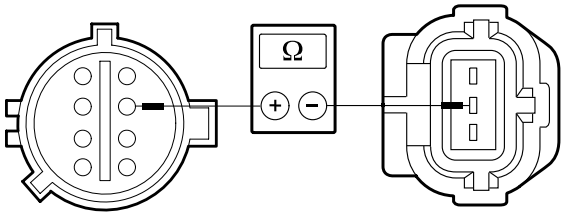
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 Disconnect CJB CBP02B.
 E69773	3 Measure the resistance between the rear door footwell lamp CLN28M pin 1, circuit CLN43 (WH/BU), harness side and the CJB CBP02B pin 27, circuit CLN43 (WH/BU), harness side. • Is the resistance less than 1 ohm? → **Yes** INSTALL a new rear door footwell lamp. TEST the system for normal operation. If the concern persists, INSTALL a new CJB. TEST the system for normal operation. → **No** REPAIR circuit CLN43 . TEST the system for normal operation.

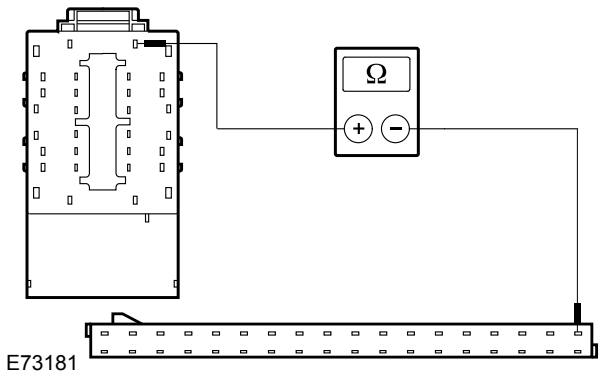
PINPOINT TEST I : THE CARGO LAMP IS INOPERATIVE (TOURNEO)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I1: CHECK THE CARGO LAMP FOR POWER	
	1 Disconnect Cargo Lamp CLN28K.
 VUE0003764	2 Measure the voltage between the cargo lamp CLN28K pin 1, circuit SBP72 (VT/RD), harness side and ground. • Is the voltage greater than 10 volts? → **Yes** GO to I2. → **No** REPAIR circuit SBP72 (VT/RD). TEST the system for normal operation.
I2: CHECK THE CARGO LAMP FOR GROUND	
	1 Disconnect Cargo Lamp CLN28J.

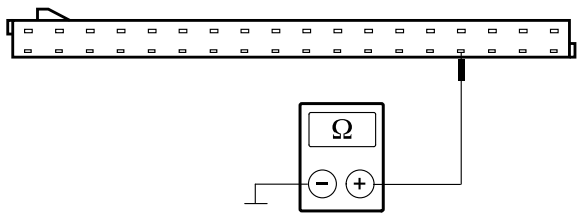
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 Measure the voltage between the inertia fuel safety shut-off switch, connector CE227, pin 3, circuit SBB24B (RD/VT), wiring harness side and ground. • Does the meter display battery voltage? → **Yes** GO to B16. → **No** LOCATE and REPAIR the break in the circuit between the inertia fuel safety shut-off switch and the EJB with the aid of the Wiring Diagrams. CHECK the operation of the system.
B16: CHECK FOR OPEN CIRCUIT BETWEEN THE PROGRAMMABLE FUEL-FIRED BOOSTER HEATER AND THE INERTIA FUEL SAFETY SHUT-OFF SWITCH	
 E69574	1 Measure the resistance between the programmable fuel-fired booster heater, connector CHF01, pin 2, circuit CE226D (YE/VT), wiring harness side and the inertia fuel safety shut-off switch, connector CE227, pin 2, circuit CE226A (YE/VT), wiring harness side. • Is a resistance of less than 2 Ohm registered? → **Yes** CHECK and if necessary RENEW the inertia fuel safety shut-off switch. CHECK the operation of the system. → **No** LOCATE and REPAIR the open circuit between the programmable fuel-fired booster heater and the inertia fuel safety shut-off switch using the Wiring Diagrams. CHECK the operation of the system.

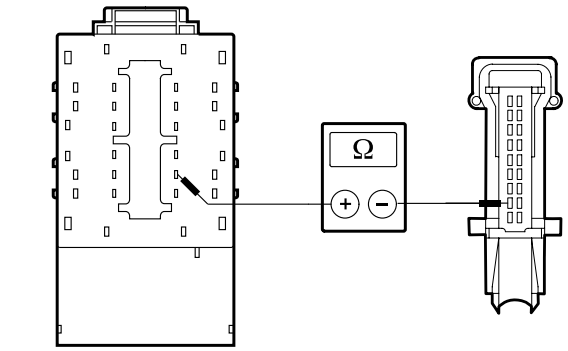
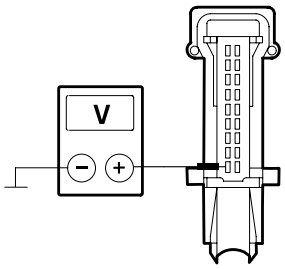
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 E73181	2 Measure the resistance between the CJB, connector CBP02E, pin 31, circuit SBP73A (RD), wiring harness side and the control module for mobile electronic auxiliary equipment, connector CMM01A, pin 18, circuit SBP73E (RD), wiring harness side. • Is a resistance of less than 2 Ohm registered? → **Yes** CHECK the CJB and RENEW as necessary. CHECK the operation of the system. → **No** LOCATE and REPAIR the open circuit between soldered connection S2BP73 and the CJB with the aid of the Wiring Diagrams. CHECK the operation of the system.

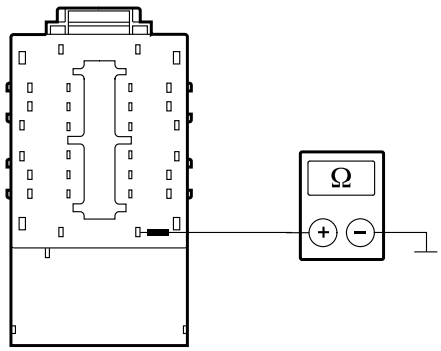
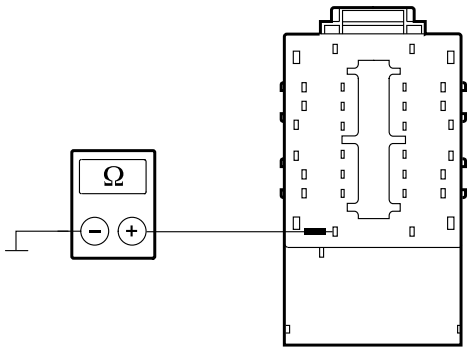
H6: CHECK THE GROUND CONNECTION OF THE CONTROL MODULE FOR MOBILE ELECTRONIC AUXILIARY EQUIPMENT

 E69592	1 Measure the resistance between the control module for mobile electronic auxiliary equipment, connector CMM01A, pin 33, circuit GD114G (BK/BU), wiring harness side and ground.

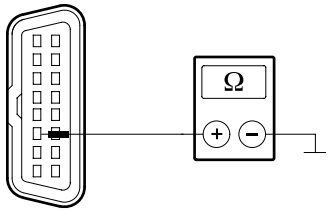
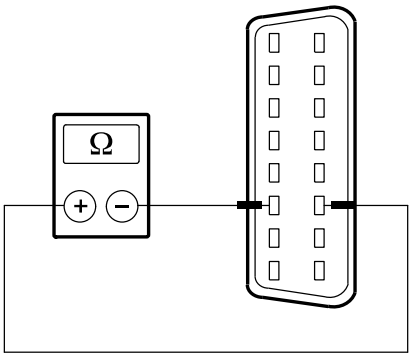
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	2 Disconnect Connector CBP02E from the CJB.
 E69607	3 Measure the resistance between the CJB, connector CBP02E, pin 11, circuit SBP82A (YE/RD), wiring harness side and the instrument cluster, connector CMC01, pin 2, circuit SBP82C (YE/RD), wiring harness side. • Is a resistance of less than 2 Ohm registered? → **Yes** CHECK the CJB and RENEW as necessary. CHECK the operation of the system. → **No** LOCATE and REPAIR the break in the circuit between the instrument cluster and the CJB using the Wiring Diagrams. CHECK the operation of the system.
K21: CHECK THE VOLTAGE AT THE INSTRUMENT CLUSTER	
	1 Ignition switch in position II.
	2 Measure the voltage between the instrument cluster, connector CMC01, pin 1, circuit SBP66C (YE/RD), wiring harness side and ground. • Does the meter display battery voltage? → **Yes** GO to K23. → **No** GO to K22.
K22: CHECK FOR OPEN CIRCUIT BETWEEN THE CJB AND THE INSTRUMENT CLUSTER	
	1 Ignition switch in position 0.
	2 Disconnect Connector CBP02E from the CJB.

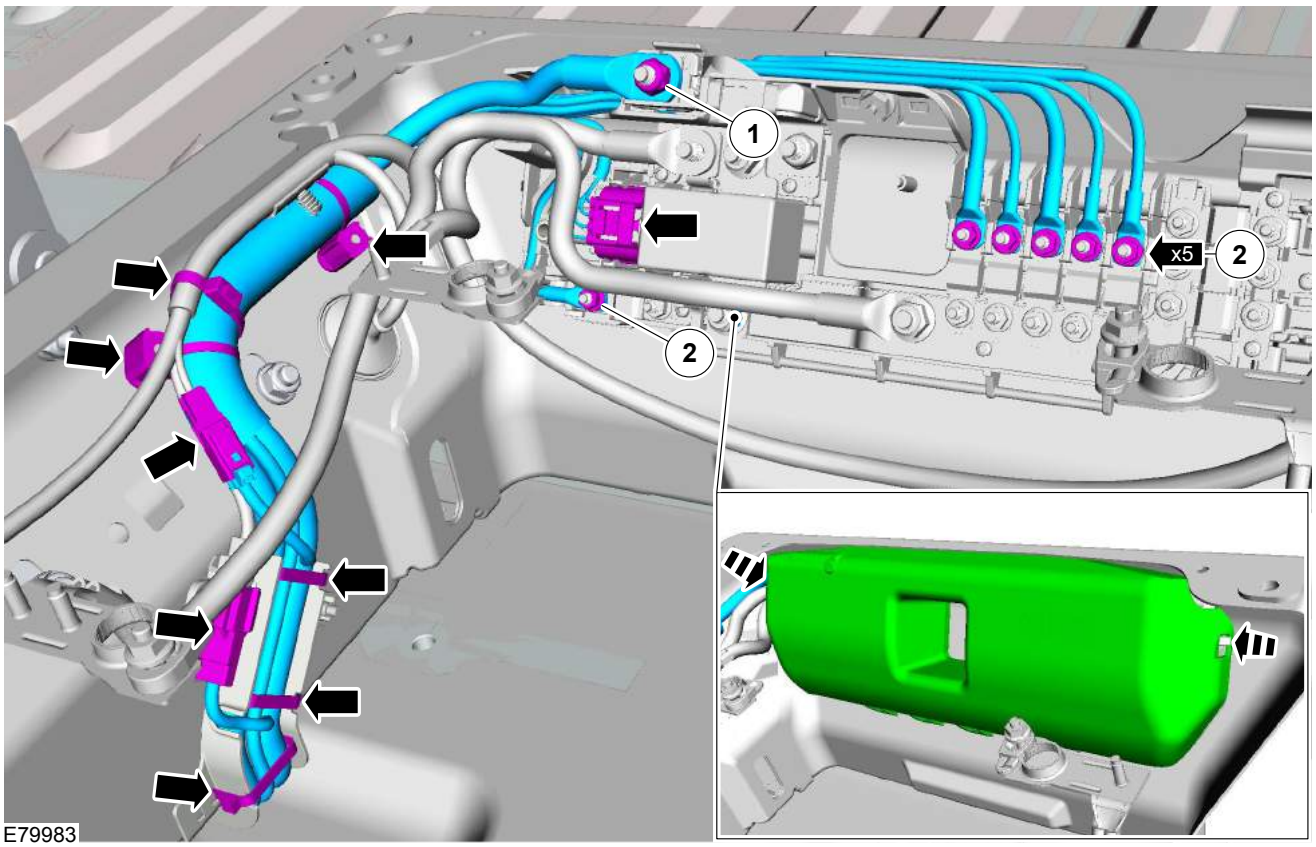
DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	4 Measure the resistance between the GEM, connector C2BP02B, pin 3, circuit GD113B (BK/YE), wiring harness side and ground. • Is a resistance of less than 2 Ohm measured in all of the cases? → **Yes** GO to M13. → **No** - If a resistance of more than 2 Ohm is measured in one of the measurements: LOCATE and RECTIFY the break in the corresponding circuit between the GEM and soldered connection S2D113B with the aid of the Wiring Diagrams. CHECK the operation of the system. - If a resistance of more than 2 Ohm is measured in all of the measurements: LOCATE and REPAIR the break in circuit GDD113A (BK/YE) between soldered connection S2D113B and ground connection GP13 with the aid of the Wiring Diagrams. CHECK the operation of the system.
M13: TEST THE GEM GROUND CONNECTION	
	1 Measure the resistance between the GEM, connector C2BP02B, pin 2, circuit GD113C (BK/YE), wiring harness side and ground. • Is a resistance of less than 2 Ohm registered? → **Yes** GO to M14. → **No** LOCATE and REPAIR the break in the circuit between the GEM and ground point GP13 with the aid of the Wiring Diagrams. CHECK the operation of the system.
M14: CHECK FOR OPEN CIRCUIT BETWEEN THE GEM AND THE DLC	
⚠ **CAUTION:The following measurement may only be performed using the WDS digital multimeter. Failure to observe this instruction can lead to damage.**	
	1 Disconnect Connector CBP02F from the GEM.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
P12: CHECK THE HS CAN BUS FOR A SHORT TO GROUND	
 VFE0028959	1 Measure the resistance between the DLC, connector CDB04, pin 14, circuit VDB05B (WH), wiring harness side and ground. • Is a resistance of more than 10,000 Ohm measured? → **Yes** CHECK the PCM and RENEW if necessary. CHECK the operation of the system. → **No** LOCATE and REPAIR the short to ground in the circuit between the PCM and the DLC with the aid of the Wiring Diagrams. CHECK the operation of the system.
P13: CHECK THE GEM	
	1 Disconnect Connector CBP02F from the GEM.
 E45951	2 Measure the resistance between the DLC, connector CDB04, between pin 6, circuit VDB04B (WH/BU), wiring harness side and pin 14, circuit VDB05B (WH), wiring harness side. • Is a resistance of between 115 and 125 Ohm measured? → **Yes** GO to P14. → **No** - All except vehicles with diesel engines: GO to P16. - Vehicles with diesel engines: GO to P18.
P14: CHECK FOR OPEN CIRCUIT BETWEEN THE GEM AND THE DLC	
	1 Measure the resistance between the GEM, connector C2BP02F, pin 11, circuit VDB05A (WH), wiring harness side and the DLC, connector CDB04, pin 14, circuit VDB05A (WH), wiring harness side. • Is a resistance of less than 2 Ohm registered? → **Yes** GO to P15. → **No** LOCATE and RECTIFY the break in circuit VDB05A (WH) between the GEM and the DLC with the aid of the Wiring Diagrams. CHECK the operation of the system.

REMOVAL AND INSTALLATION



61. 2. Torque: 22 Nm
3. Torque: 55 Nm

SECTION 419-10 Multifunction Electronic Modules

VEHICLE APPLICATION:2007.50 Transit

CONTENTS PAGE

DESCRIPTION AND OPERATION

DIAGNOSIS AND TESTING

REMOVAL AND INSTALLATION

REMOVAL AND INSTALLATION

Generic Electronic Module (GEM)

Removal

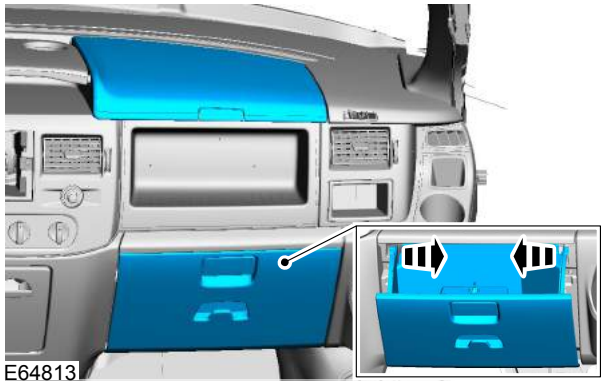
CAUTIONS:

Never swap the GEM between two vehicles.

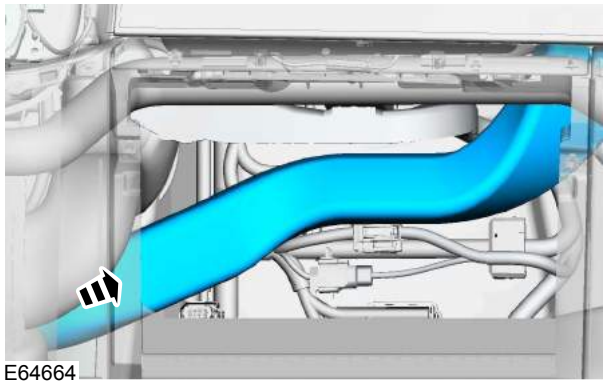
Compare the number of relays and fuses in the defective CJB and the new CJB. Transfer from the defective CJB any relays and fuses which are not in the new CJB. In doing so, pay attention that fuses with the correct Ampere rating are used, by referring to the wiring diagrams. Remove any surplus relays and fuses from the new CJB.

NOTE: The GEM is integrated in the central junction box (CJB) and cannot be replaced as a separate unit.

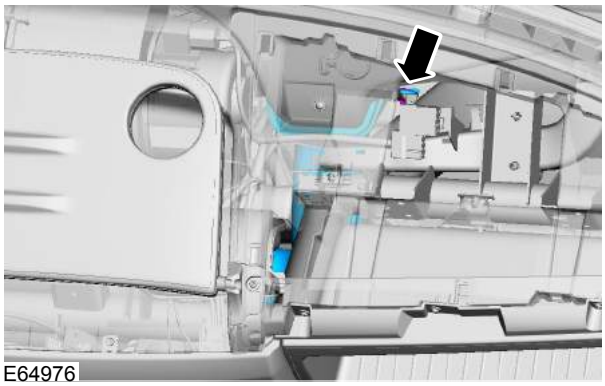
1.



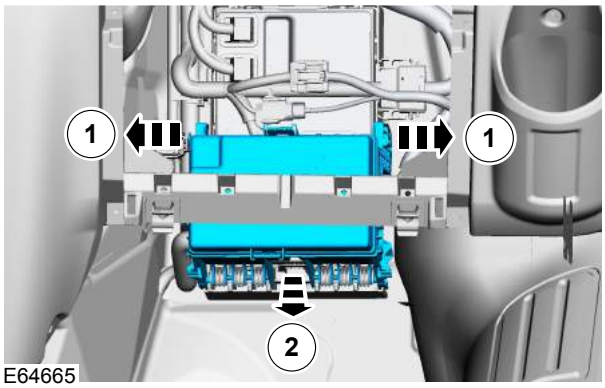
2.



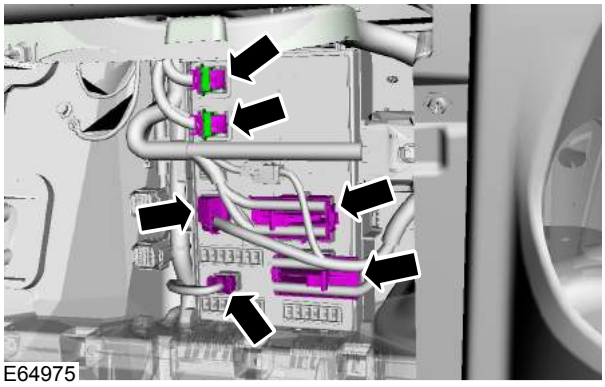
3.



4.



5.

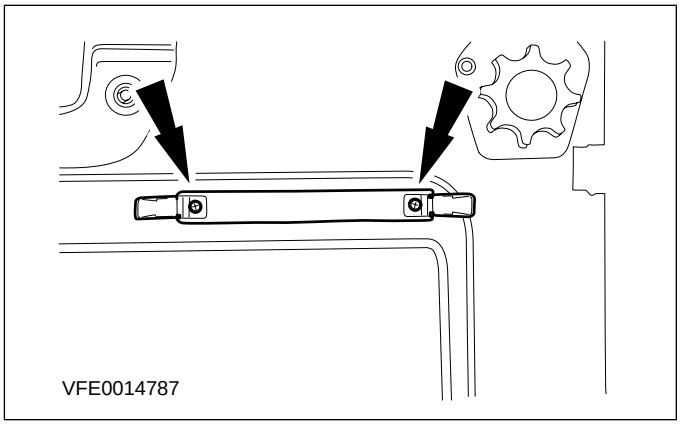


REMOVAL AND INSTALLATION

Rear Door Trim Panel — Van/Kombi/Bus (43 706 0)

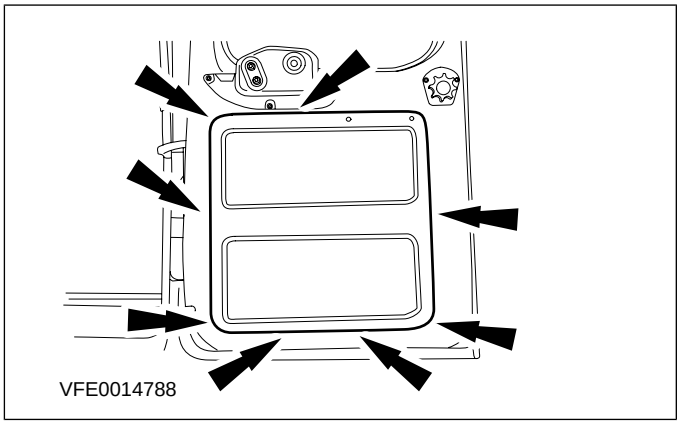
Removal

1. **Remove the rear door interior pull handle (if equipped).**
   - Lever open the covers to expose the bolts.



2. **NOTE:High-level trim panel shown, low-level trim panel similar.**

   Remove the rear door trim panel.



Installation

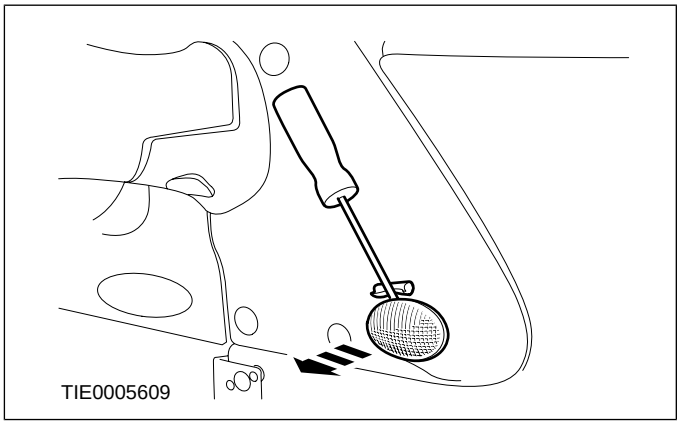
1. **To install, reverse the removal procedure.**

REMOVAL AND INSTALLATION

Exterior Mirror (43 364 0)

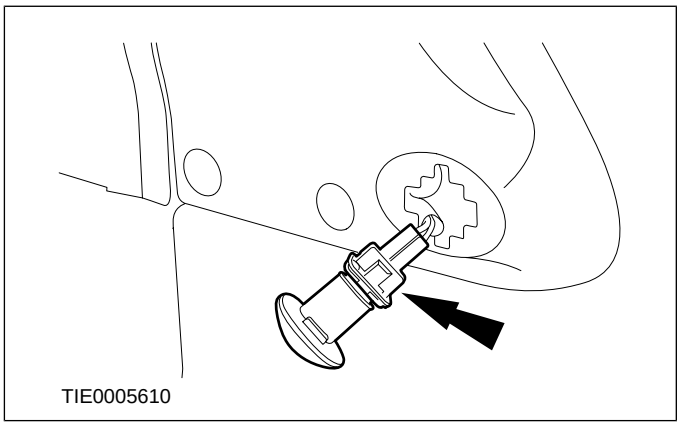
Removal

1. Using a suitable screwdriver, detach the turn signal from the trim panel.



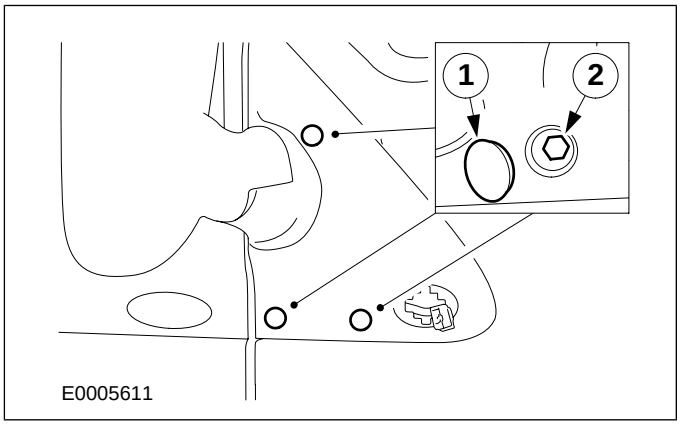
2. Remove the turn signal.

- Disconnect the electrical connector.



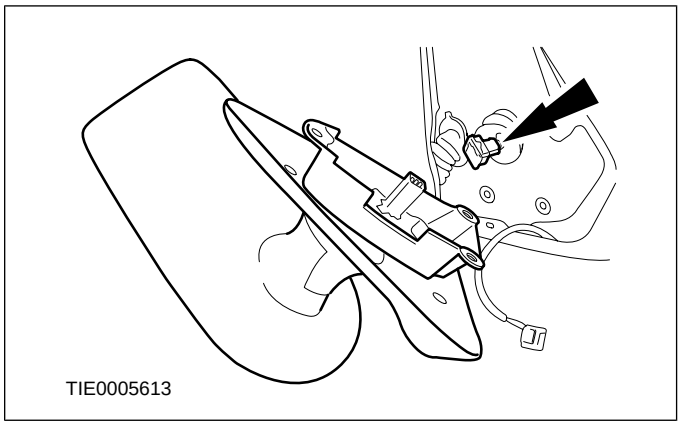
3. Detach the mirror.

1. Remove the screw covers.
2. Remove the screws.



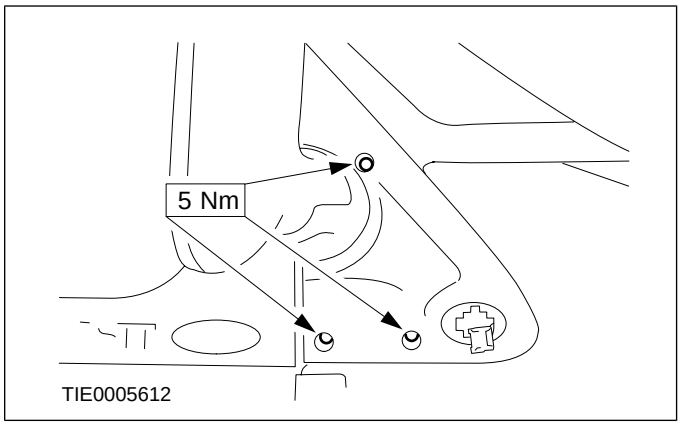
4. Remove the mirror.

- Disconnect the mirror electrical connector.



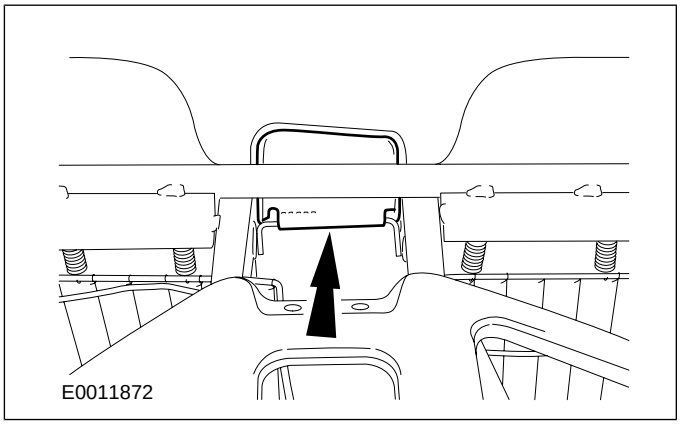
Installation

1. To install, reverse the removal procedure.



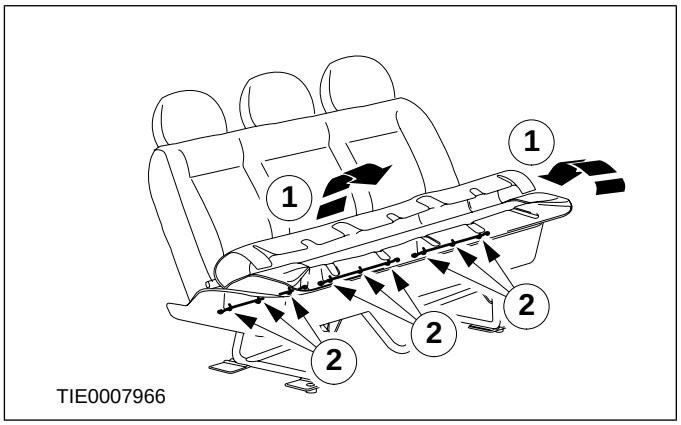
DISASSEMBLY AND ASSEMBLY

- Detach the retaining strip.



8. Remove the cushion cover.

1. Roll the cushion cover towards the center to access the pleating hog rings.
2. Cut the hog rings.

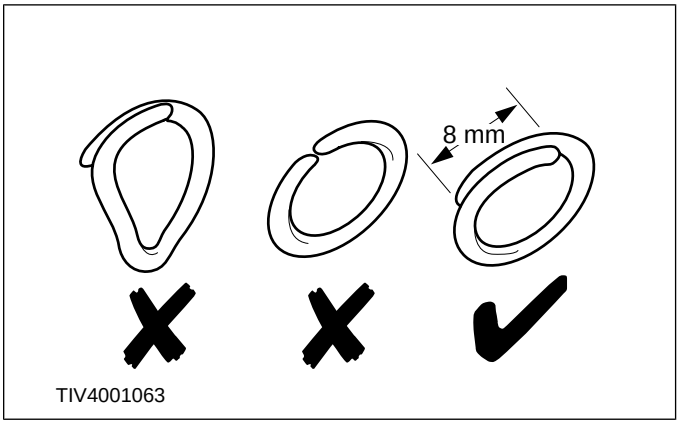


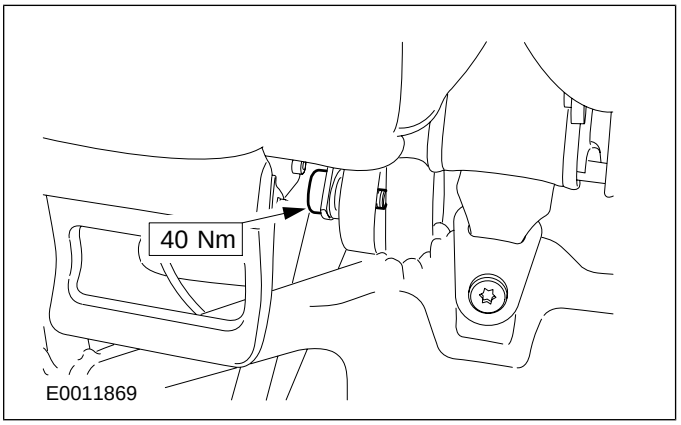
9. Remove the seat cushion.

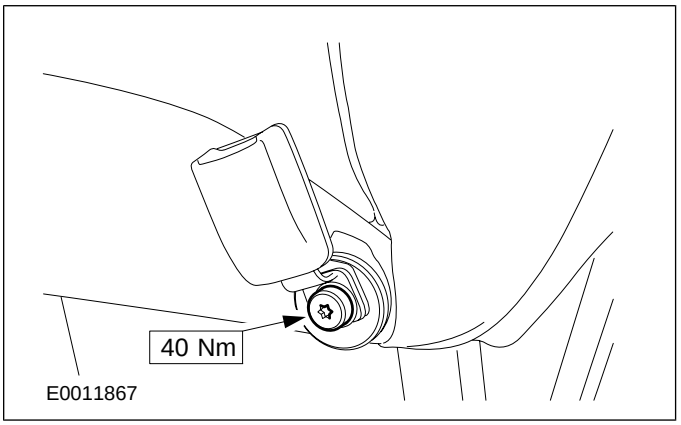
Assembly

1. NOTE:Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

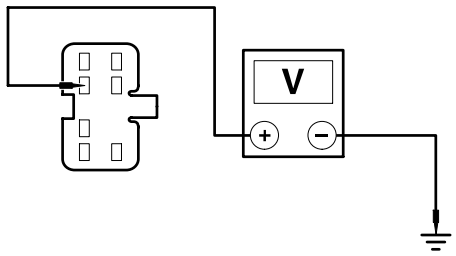
To assemble, reverse the disassembly procedure.



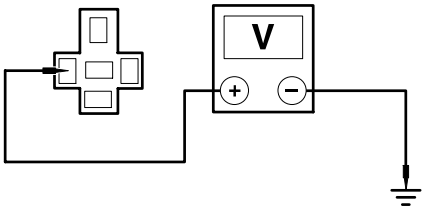
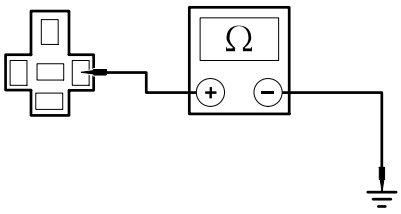




DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B2: CHECK FOR VOLTAGE TO THE DRIVER SIDE POWER WINDOW SWITCH	
	1 Ignition switch in position II.
 TIE0013078	2 Measure the voltage between the: Left-hand drive vehicles with one-touch down • Driver power window switch CPW10B pin 2, circuit CB156G (BU/GN), harness side and ground. Right-hand drive vehicles with one-touch down • Driver power window switch CPW10B pin 2, circuit CB156F (BU/GN), harness side and ground. Left-hand drive vehicles without one-touch down • Driver power window switch CPW10B pin 2, circuit CB156F (BU/GN), harness side and ground. Right-hand drive vehicles without one-touch down • Driver power window switch CPW10B pin 2, circuit CB156G (BU/GN), harness side and ground. • Is the voltage greater than 10 volts? → **Yes** GO to B3. → **No** Left-hand drive vehicles with one-touch down - REPAIR circuit CB156G (BU/GN). TEST the system for normal operation. Right-hand drive vehicles with one-touch down - REPAIR circuit CB156F (BU/GN). TEST the system for normal operation. Left-hand drive vehicles without one-touch down - REPAIR circuit CB156F (BU/GN). TEST the system for normal operation. Right-hand drive vehicles without one-touch down - REPAIR circuit CB156G (BU/GN). TEST the system for normal operation.
B3: CHECK FOR CONTINUITY BETWEEN THE DRIVER POWER WINDOW SWITCH AND THE DRIVER SIDE FRONT DOOR WINDOW REGULATOR MOTOR DOWN CIRCUIT	
	1 Ignition switch in position 0.
	2 Disconnect Driver Side Front Door Window Regulator Motor CPW10B.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 TIE0035307	2 Measure the voltage between the: Vehicles with rear doors • Left-hand heated rear window grid wire CRD02C pin 1, circuit L_CB159E (BN/WH), harness side and ground. • Right-hand heated rear window grid wire CRD02A pin 1, circuit R_CB159E (BN/WH), harness side and ground. Vehicles with liftgate • Liftgate heated rear window grid wire CRD02e pin 1, circuit L_CB159G (BN/WH), harness side and ground. • Is the voltage greater than 10 volts? → **Yes** Vehicles with rear doors - REPAIR circuit L_CB159E (BN/WH) or circuit R_CB159E (BN/WH). TEST the system for normal operation. Vehicles with liftgate - REPAIR circuit L_CB159G (BN/WH). TEST the system for normal operation. → **No** GO to F3.
F3: CHECK FOR CONTINUITY BETWEEN THE HEATED WINDSHIELD GLASS RELAY AND GROUND	
	1 Ignition switch in position 0.
	2 Disconnect Heated Windshield Glass Relays R22 and R26.
 TIE0035306	3 Measure the resistance between the: • Left-hand side heated windshield glass relay R26 pin 2, harness side and ground. • Right-hand side heated windshield glass relay R22 pin 2, harness side and ground. • Is the resistance less than 5 ohms? → **Yes** REPAIR circuit CRD01C (VT/OG) or the heated windshield glass relay auxiliary junction box circuit. TEST the system for normal operation. → **No** GO to F4.
F4: CHECK THE HEATED WINDSHIELD GLASS RELAY CIRCUIT FOR A SHORT TO POWER	
	1 Ignition switch in position II.

REMOVAL AND INSTALLATION

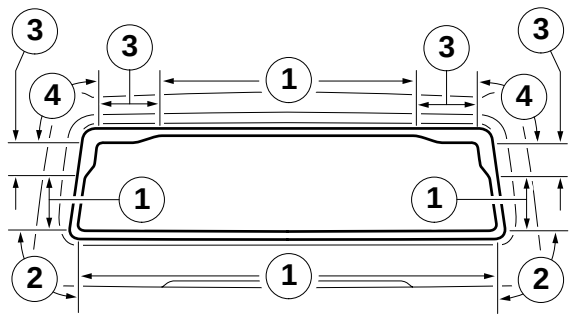
CAUTION:Make sure the cutting blades are changed where the cutting depth changes to avoid damage to the body and trim panels.

NOTE: Some resistance may be encountered when cutting through the glass locating pegs in the upper corners of the glass.

Using a suitable direct glazing cutter for bonded glass, cut the PU adhesive and, with the aid of another technician, use glazing suction cups to remove the rear window glass.

- Cut the PU adhesive from inside the vehicle to the given maximum depths.

1. 30 mm.
2. 40 mm.
3. 50 mm.
4. 65 mm.



TIE0012782

Installation

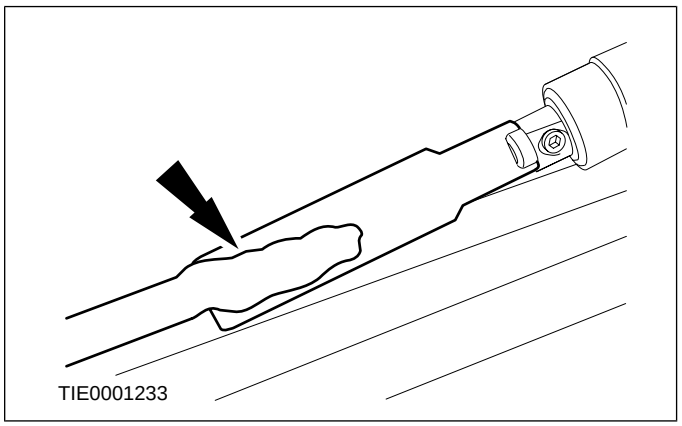
1. **Carefully remove the remaining part of the locating pegs from the rear window glass flange.**
2. **CAUTIONS:**

   During the curing period of the PU adhesive, the door windows must be left open to avoid a build up of pressure when the doors are opened and closed.

   Do not touch the adhesive surface as re-bonding will be impaired.

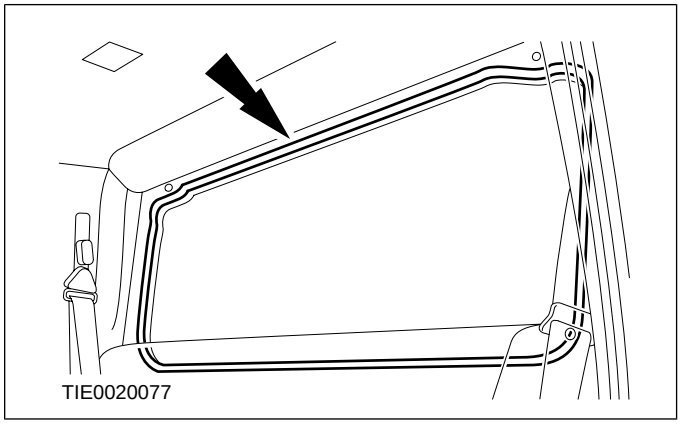
NOTE: Make sure the spacers located at the lower corners of the rear window glass flange are secure.

Carefully trim the remaining PU adhesive from the rear window glass flange to leave approximately 1 mm of trimmed PU adhesive adhered to the flange.


TIE0001233

3. **Check the rear window glass flange for damaged sheet metal, rust or foreign material which may have caused, or may cause, glass breakage.**
4. **CAUTION:To make sure that the PU adhesive cures, it is essential that all bonding surfaces are free of moisture.**

   Using a hot air gun, apply warm air (25°C) to the rear window glass flange and glass bond line to remove all traces of moisture.
5. **Prepare the glass, rear window glass flange and trimmed PU adhesive in accordance with the instructions supplied with the adhesive kit.**
6. **Install the rear window glass weatherstrip.**

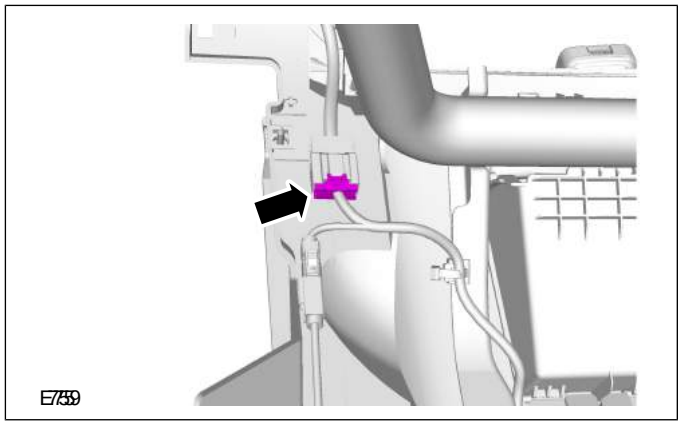

TIE0020077

7. **NOTE:Discard the first 100 mm of PU adhesive as this may have a reduced working time.**

NOTE: To avoid water leaks, any breakage in the continuous bead must be overlapped by 20 mm.

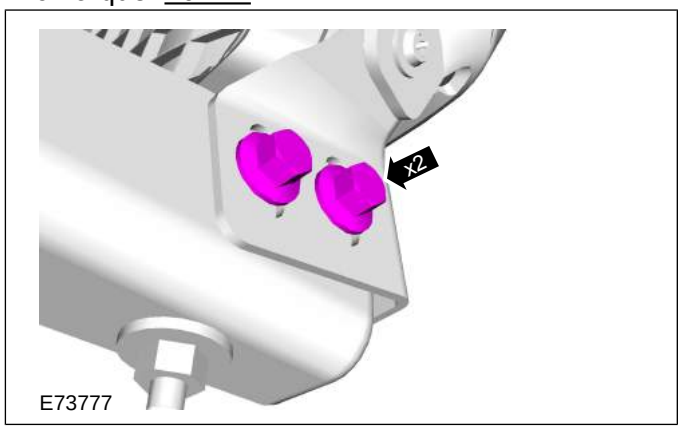
REMOVAL AND INSTALLATION

25.

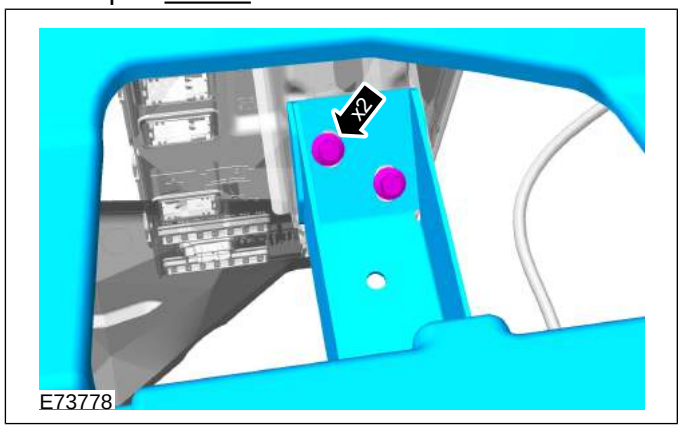


All vehicles

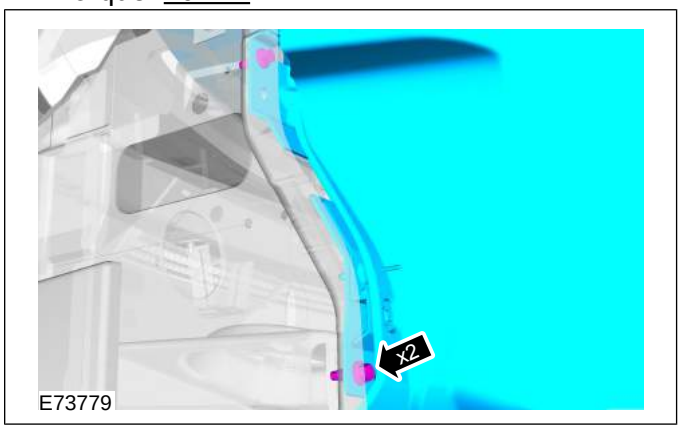
26. Torque: 10 Nm



27. On both sides.
Torque: 10 Nm



28. On both sides.
Torque: 20 Nm



Installation

1. To install, reverse the removal procedure.

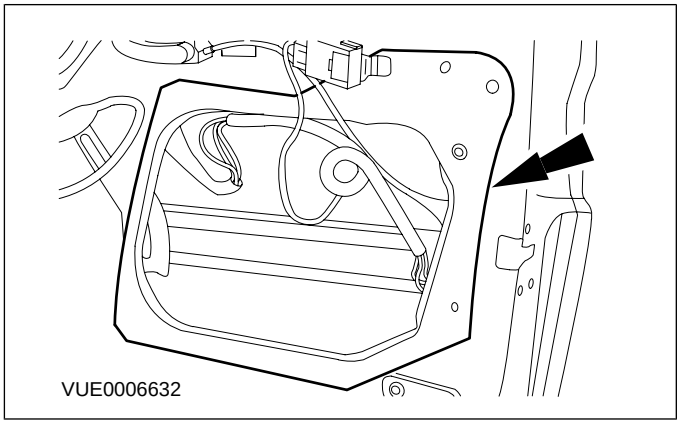
REMOVAL AND INSTALLATION

Exterior Front Door Handle

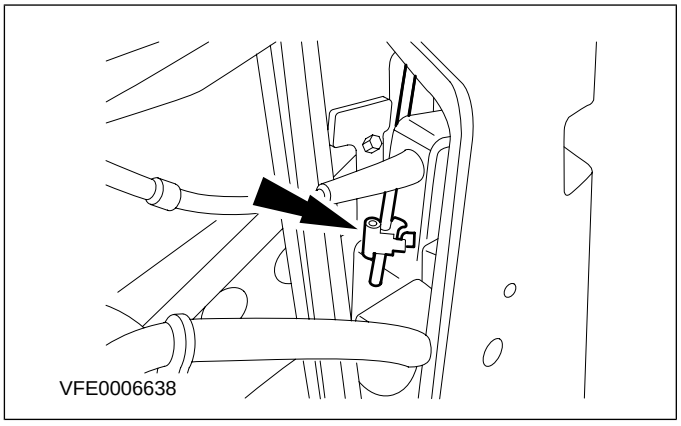
Removal

1. **Remove the front door trim panel. For additional information, refer to Section 501-05 [Interior Trim and Ornamentation].**
2. **NOTE:Do not touch the adhesive surface as re-bonding will be impaired.**

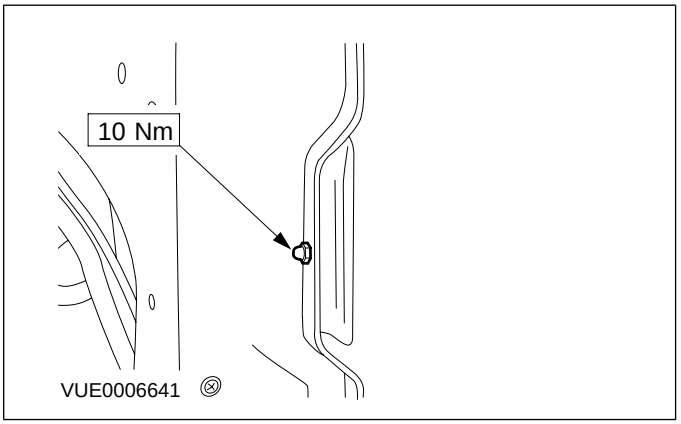
   Detach the watershield from the front door panel.



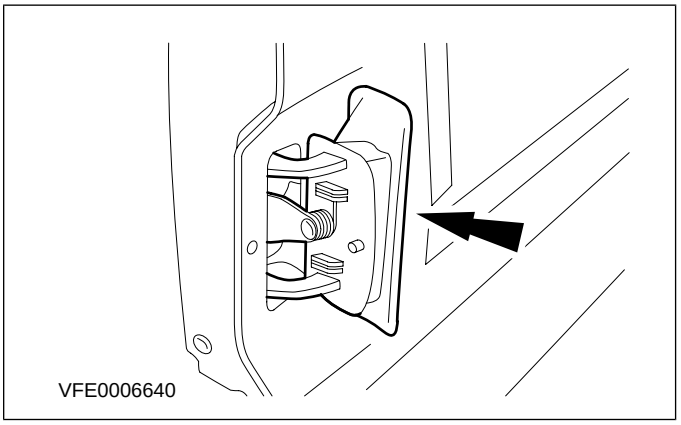
3. **Disconnect the exterior front door handle actuating rod.**
   - Open the clip and pull out the actuating rod.



4. **Remove the exterior front door handle retaining nut.**



5. **Remove the exterior front door handle.**



Installation

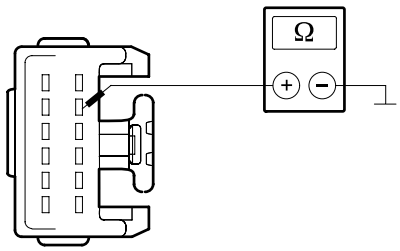
1. **To install, reverse the removal procedure.**

SPECIFICATIONS

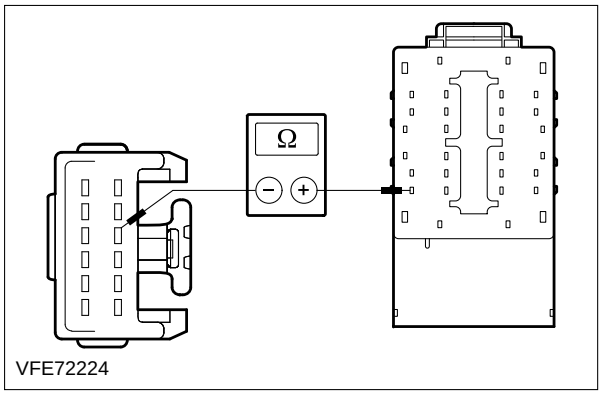
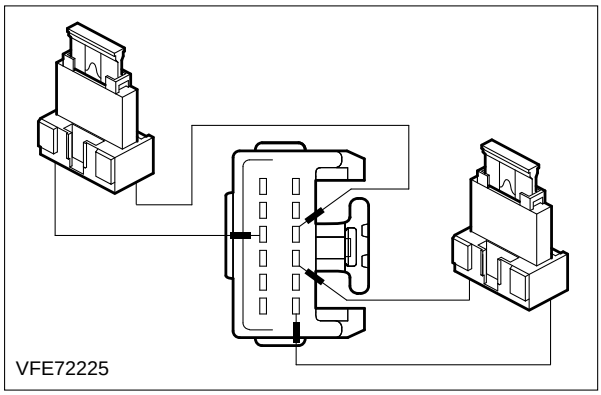
Wiper Blade and Pivot Arm Adjustment

Angle between the windshield and the wiper arm	3 degrees

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 VFE0038551	3 Measure resistance between wash/wipe system switch, connector CRW08, pin 5, circuit CRW20A (GY/YE), wiring harness side and ground. • Is a resistance of more than 10,000 ohms measured? → **Yes** INSTALL a new CJB. CHECK system operates correctly → **No** LOCATE and RECTIFY the short to ground in the circuit between the wash/wipe system switch and central junction box (CJB) using the Wiring Diagrams. CHECK system operates correctly
C4: CHECK THE CJB	
	1 Ignition switch in position 0.
	2 Disconnect Central junction box (CJB) from connector CBP02D.
	3 Ignition switch in position II. • Does the rear window wiper motor run continuously (not in intermittent mode)? → **Yes** GO to C5. → **No** INSTALL a new CJB. CHECK system operates correctly
C5: CHECK CIRCUIT CRW02A (GY/BU) BETWEEN THE CENTRAL JUNCTION BOX (CJB) AND THE REAR WINDOW WIPER RELAY FOR SHORT TO GROUND	
	1 Ignition switch in position 0.
	2 Disconnect Rear window wiper relay from socket R24.
	3 Ignition switch in position II. • Does/do the rear window wiper motor(s) run continuously (not in intermittent mode)? → **Yes** GO to C6. → **No** LOCATE and RECTIFY the short to ground in circuit CRW02A (GY/BU) between the central junction box (CJB) and the rear window wiper relay using the Wiring Diagrams. CHECK system operates correctly

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I7: CHECK CIRCUIT CRW12A (GY/OG) BETWEEN WASH/WIPE SWITCH AND CENTRAL JUNCTION BOX (CJB) FOR BREAKS	
	1 Measure the resistance between the wash/wipe system switch, connector CRW08, pin 4, circuit CRW12A (GY/OG), wiring harness side and the central junction box (CJB), connector CBP02E, pin 5, circuit CRW12A (GY/OG), wiring harness side. • Is a resistance of less than 2 ohms registered? → **Yes** GO to I8. → **No** LOCATE and RECTIFY the break in the circuit between the wash/wipe system switch and central junction box (CJB) using the Wiring Diagrams. CHECK system operates correctly
I8: CHECK THE WASH/WIPE SWITCH	
	1 Connect Central junction box (CJB) to connector CBP02E.
	2 Two fused jumper wires (10 A) at the wash/wipe system switch: – Van, bus, combi: Connect connector CRW08, pin 3, B_GD115C (BK/GY) and pin 1, circuit CRW07A (GY/BN), wiring harness side. – Van, bus, combi: Connect connector CRW08, pin 10, SBP67A (BU/RD) and pin 4, circuit CRW12A (GY/OG), wiring harness side. – Drop side body: Connect connector CRW08, pin 3, B_GD115C (BK/RD) and pin 1, circuit CRW07A (GY/BN), wiring harness side. – Drop side body: Connect connector CRW08, pin 10, SBP67A (RD/BU) and pin 4, circuit CRW12A (GY/OG), wiring harness side.
	3 Ignition switch in position II. • Is the front wash/wipe function operative? → **Yes** RENEW the wash/wipe switch. CHECK system operates correctly → **No** INSTALL a new CJB. CHECK system operates correctly

SPECIFICATIONS

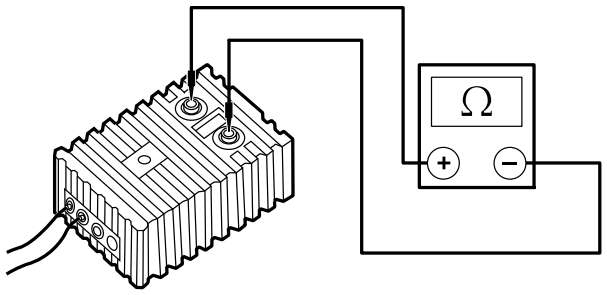
Torque Specifications

Description	Nm	lb-ft	lb-in
Safety belt retractor retaining bolts	40	30	-
Driver safety belt buckle retaining bolts	40	30	-
Front single passenger single seat safety belt buckle retaining bolts	40	30	-
Front double passenger seat inner safety belt buckle retaining bolt	55	41	-
Front double passenger seat outer safety belt buckle retaining bolt	40	30	-
Safety belt lower anchor retaining bolts	40	30	-
Safety belt upper anchor retaining bolts	40	30	-
Safety belt shoulder height adjuster retaining bolts	40	30	-
Seat outer trim panel retaining screws	3	-	27
Seat front trim panel retaining screws	3	-	27

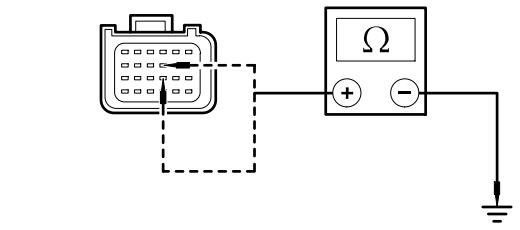
DIAGNOSIS AND TESTING

Symptom	Possible Sources	Action
• DTC B1231: Longitudinal acceleration threshold exceeded	• Crash data memory full.	**NOTE:** The crash data memory can be cleared a maximum of five times. • Clear down the crash data memory using WDS. REPEAT the self-test, CLEAR the DTCs.
• DTC B1317: Battery voltage high	• Charging system.	• CHECK the charging system. REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing). REPEAT the self-test, CLEAR the DTCs.
• DTC B1318: Battery voltage low	• Battery. • Charging system. • Circuit(s).	• GO to Pinpoint Test B.
• DTC B1342: RCM is defective	• RCM.	• INSTALL a new RCM. REFER to: Restraints Control Module (RCM) (501-20 Supplemental Restraint System, Removal and Installation). REPEAT the self-test, CLEAR the DTCs.
• DTC B1868: Air bag warning indicator open circuit or short to ground	• Instrument cluster.	• CHECK the instrument cluster. REFER to: Instrument Cluster (413-01 Instrument Cluster, Diagnosis and Testing).
• DTC B1877: Driver side safety belt pretensioner open circuit	• Driver side safety belt pretensioner. • Circuit(s).	• GO to Pinpoint Test C.
• DTC B1878: Passenger side safety belt pretensioner open circuit	• Passenger side safety belt pretensioner. • Circuit(s).	• GO to Pinpoint Test D.
• DTC B1879: Driver side safety belt pretensioner short to ground	• Driver side safety belt pretensioner. • Circuit(s).	• GO to Pinpoint Test E.
• DTC B1881: Passenger side safety belt pretensioner open circuit	• Passenger side safety belt pretensioner. • Circuit(s).	• GO to Pinpoint Test F.
• DTC B1882: Passenger side safety belt pretensioner short to battery	• Passenger side safety belt pretensioner. • Circuit(s).	• GO to Pinpoint Test G.
• DTC B1883: Passenger side safety belt pretensioner short to ground	• Passenger side safety belt pretensioner. • Circuit(s).	• GO to Pinpoint Test H.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
N2: CHECK THE PASSENGER AIR BAG MODULE SQUIB RESISTANCE	
WARNING:Do not proceed with this test unless using WDS. Failure to follow this instruction may result in personal injury.	
	1 Connect the Test and Deployment Lead to the driver air bag module.
	2 Select DMM specific on WDS.
	3 Connect the Test and Deployment Lead to WDS.
 TIE39388	4 Measure the resistance of the passenger air bag module squib. • Is the resistance between 2 and 3 ohms? → **Yes** REPEAT the self-test, CLEAR the DTCs. REACTIVATE the system. → **No** INSTALL a new passenger air bag module. REFER to:Passenger Air Bag Module (501-20 Supplemental Restraint System, Removal and Installation). REPEAT the self-test, CLEAR the DTCs. REACTIVATE the system.
N3: CHECK THE PASSENGER AIR BAG WIRING HARNESS FOR OPEN CIRCUIT OR HIGH RESISTANCE	
	1 Ignition switch in position 0.
	2 Disconnect RCM CR114A.
	3 Disconnect Passenger Air Bag Module Simulator.

DIAGNOSIS AND TESTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
 TIE0030224	2 Measure the resistance between the: • RCM CR114B pin 9, circuit RR132A (BU/WH), harness side and ground. • RCM CR114B pin 15, circuit VR218A (YE/OG), harness side and ground. • Are the resistances greater than 10,000 ohms? → **Yes** REPEAT the self-test, CLEAR the DTCs. REACTIVATE the system. → **No** REPAIR circuit RR132A (BU/WH) or circuit VR218A (YE/OG). REPEAT the self-test, CLEAR the DTCs. REACTIVATE the system.

PINPOINT TEST AE : RCM DISCONNECTED OR INOPERATIVE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
WARNING:Wait at least one minute after disconnecting the battery ground cable before disconnecting any SRS electrical connector. Failure to follow this instruction may result in personal injury.	
NOTE: Use a digital multimeter for all electrical measurements.	
AE1: CHECK THE RCM ELECTRICAL CONNECTORS	
	1 Deactivate the SRS.
	2 Check the RCM electrical connectors. • Are the RCM electrical connectors fully engaged? → **Yes** GO to AE2. → **No** CONNECT the RCM electrical connectors. REPEAT the self-test, CLEAR the DTCs. REACTIVATE the system.
AE2: CHECK THE IGNITION SUPPLY CIRCUIT FOR AN OPEN CIRCUIT	
	1 Disconnect RCM CR114A.
	2 Ignition switch in position II.

DESCRIPTION AND OPERATION

Environmental Regulations

Orderly and responsible waste management is not only very important for the protection of health and the environment, but it also has great importance where saving natural resources is concerned.

In body repair shops, since the introduction of the EU directives on the avoidance of vehicle waste and the promotion of return, re-use and recycling of vehicles and their components (2000/53/EU), more rigorous attention than before is also paid to avoidance and recycling of waste materials.

NOTE: The organization of disposal in the operation must comply with the country specific waste regulations:

In this respect, body repair shops must take into account and comply with the following requirements:

- Separate waste according to its recycling and disposal methods.
- Produce evidence for the correct transport and disposal of waste.

NOTE: The organization of disposal in the plant must comply with the requirements of the Waste Avoidance and Management Act.

The avoidance and recycling of waste must always take priority. However, despite all measures which may be taken, waste cannot be completely avoided.

NOTE: Useable waste which is not allowed in household rubbish, must be disposed of as special waste

All remaining waste must be treated as commercial waste and disposed of according to the local requirements.

DESCRIPTION AND OPERATION

In addition, Ford must have given its approval for a sectional replacement solution in the damaged area.

Depending on the damaged areas, further facts are to be taken into account when deciding for or against sectional repair:

- Severance cuts should be as short as possible.
- The effort for follow-on work on the connections must not be too great.
- It must be possible to reproduce the optical path of visible edges on door openings.
- Inner reinforcement panels must not restrict the straightening repair.
- Inner reinforcement profiles in the pillar areas must allow for separation.
- The Ford regulations on sectional repairs on supporting frame sections must be taken into account.
- The large surface welding seams at the connections must be restored.

DESCRIPTION AND OPERATION

- When PUR cracks or similar damage occurs, pores of foam can be seen.
- GRP can be recognized by the glass fiber structure on the inside.

CAUTION:Danger of poisoning! When burned, most plastics release vapors harmful to health. Ventilate the room well and use respiratory protection. Where possible work using an extraction system.

A burning test allows the plastic to be determined more exactly. This involves burning a small piece of the plastic material and observing the behavior of the flame, the smoke characteristics and the dripping behavior.

Characteristics of plastics:

Plastic	Flame behavior	Smoke characteristic	Dripping behavior
ABS	No way to distinguish from other copolymers	Blackish	-
PA	Bluish, transparent flame with yellow edge	No smoke	Drips with blistering
PC, PC/PBT, PBT/PC	Yellow, very sooty flame with black-brown fire areas	Yellow-white plumes of smoke	-
PP, EPDM	Calm flame, similar to a candle	No smoke	Melts
PUR	Agitated flame	Intense sooty plumes	Hardly drips
GRP	Yellow-red, intense sooty flame	Whitish plumes of smoke	-

Another method to determine the plastic group is the sanding test. In this a place is chosen which will not be visible later, and the finger belt sander is used to sand the plastic.

The plastic group can be determined using the pattern of the dust:

- Thermosets produce a white dust.
- Thermoplastics smear and do not produce dust.

Mechanical Check

The plastic group can be determined by a sound test:

- Degree of hardness - the higher-pitched the sound, the harder the plastic.
- Elasticity - the more muffled the sound, the higher the elasticity of the plastic.

Safety instructions

In addition to the general safety instructions, the relevant regulations and accident prevention legislation must be observed.

NOTE: Without exception, before starting work you must read the safety and warning instructions in the chapter "Safety Instructions". In addition, pay attention to the warning instructions of the particular equipment manufacturer.

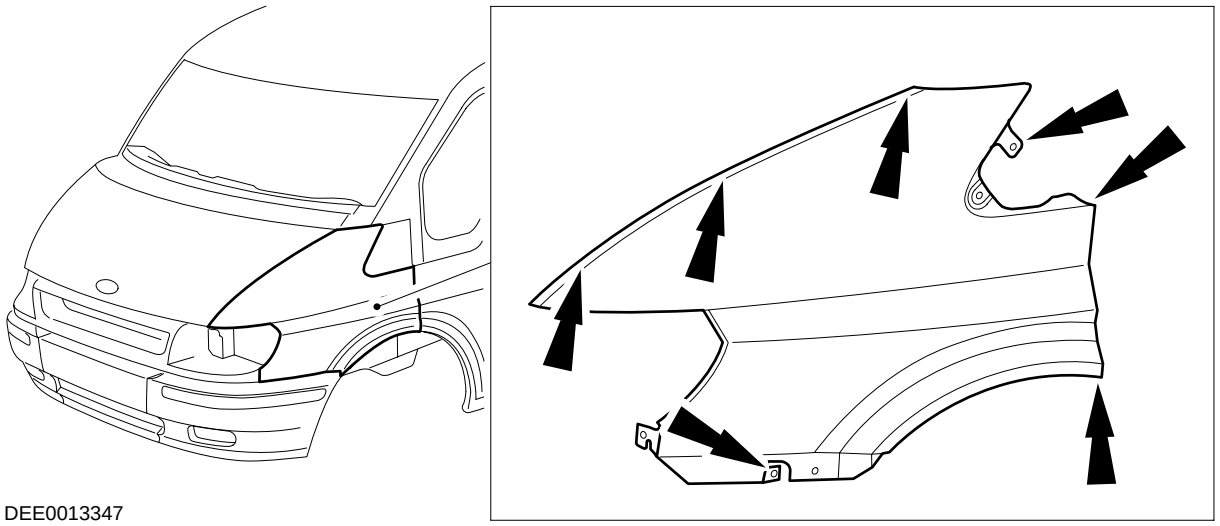
Information sheets, safety notices and guidelines for the processing of adhesives containing isocyanate, polyester resin, adhesives, solvent and thinners provide more details on their use.

The following instructions must always be followed:

- Polyester resin, adhesive, solvents and thinners are inflammable and must not be used near naked fire or flames.
- Sawing and grinding operations must only be carried out in rooms equipped with extraction systems.
- If no rooms with extraction systems are available, only use tools with extraction equipment.
- Protective equipment such as gloves, protective goggles, aprons and breathing masks are essential.

DESCRIPTION AND OPERATION

Fender attachment points



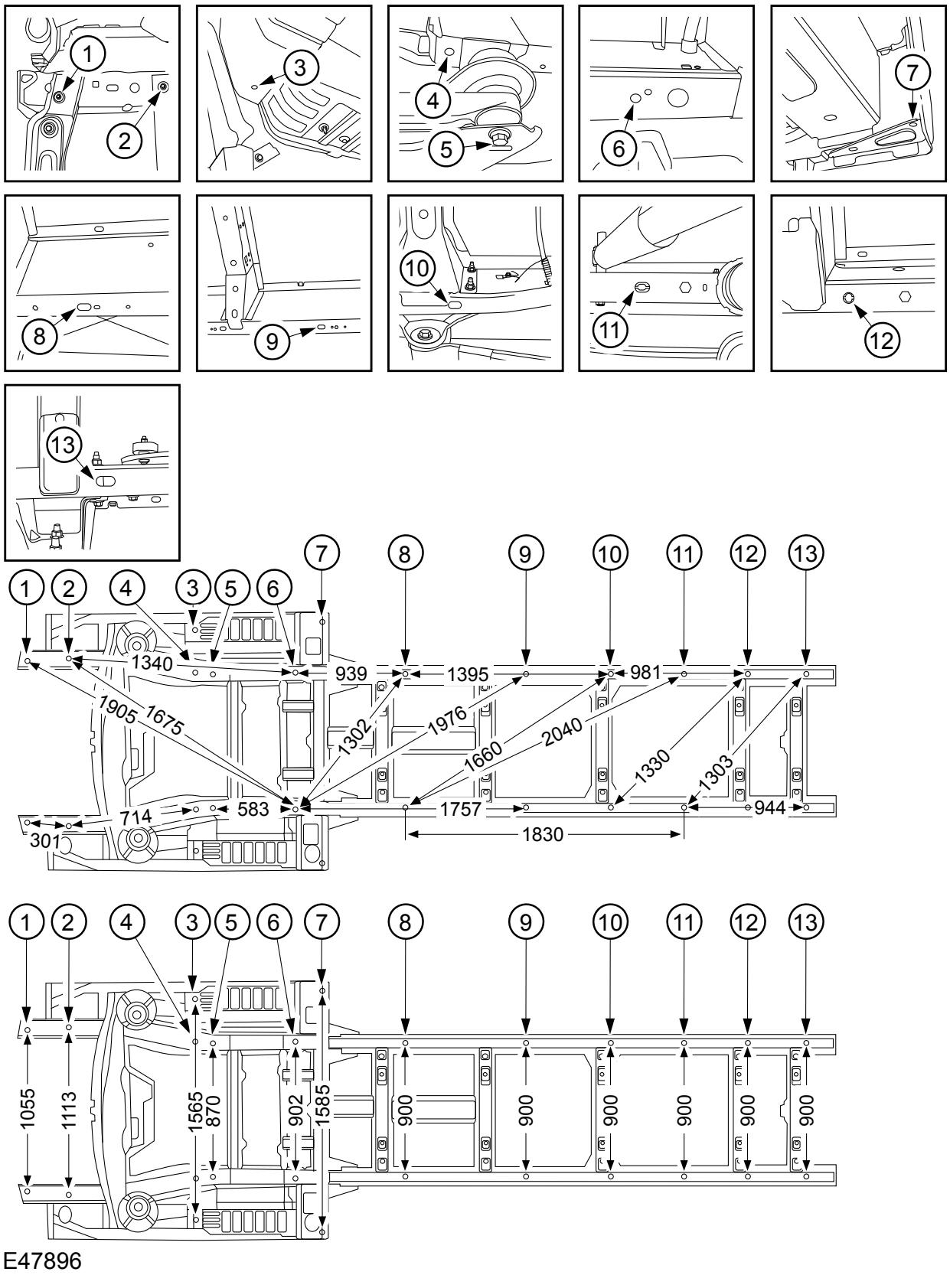
DEE0013347

Wiring harness and hose routing

During work on the bodywork, such as cutting, grinding or welding, the installation location of the wiring harness and hoses must be taken into account due to the risk of damage.

NOTE: The graphic DEE0013350 represents the most important areas in which the wiring harness and hose routing are present in the bodywork.

GENERAL PROCEDURES



10. Body frame dimensions for double chassis cab with long wheel base and rear-wheel drive

- A tolerance of ± 3 mm applies to all dimensions given. All detailed illustrations correspond to the left-hand side of the vehicle.

REMOVAL AND INSTALLATION

Sliding Door Step Outer Panel

Materials	
Name	Specification
Sill outer panel	

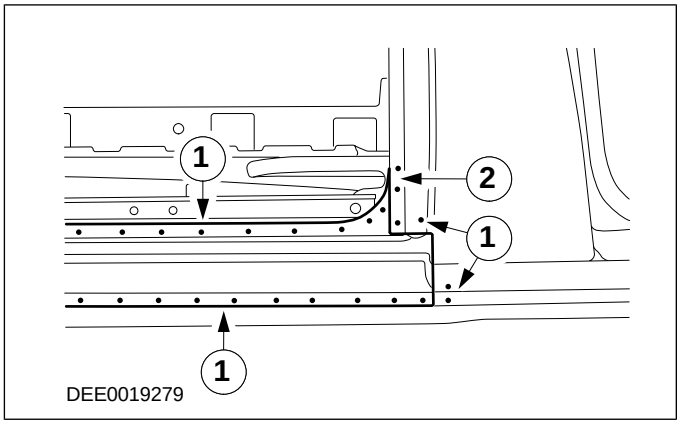
Removal

1. General Instructions

- Necessary removal work: door sealing rubber

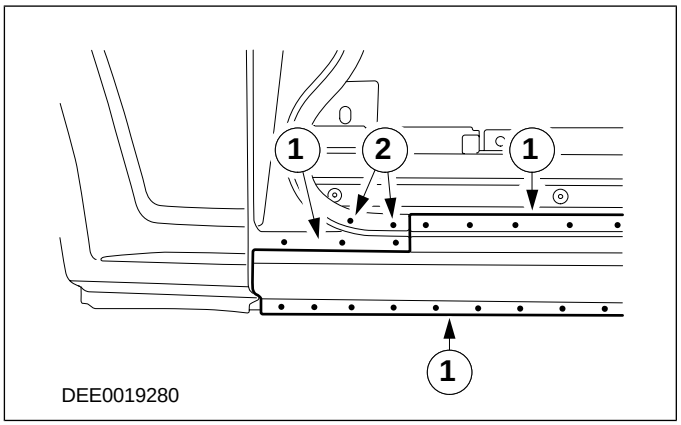
2. Sill outer panel

1. Mill out the spot welds.
2. Mill out the spot welds (2 panel thicknesses).



3. Sill outer panel

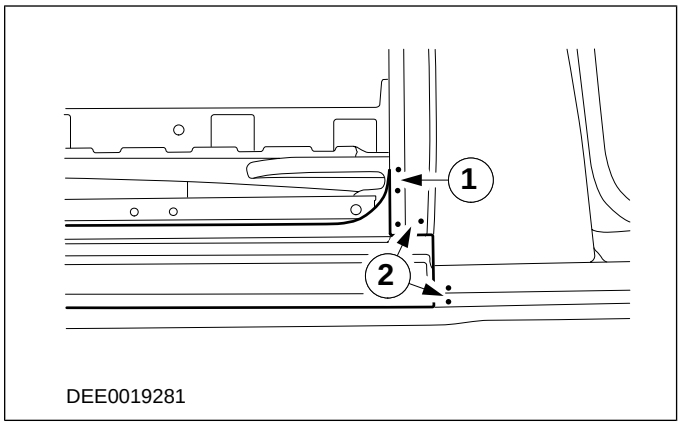
1. Mill out the spot welds.
2. Mill out the spot welds (2 panel thicknesses).



Installation

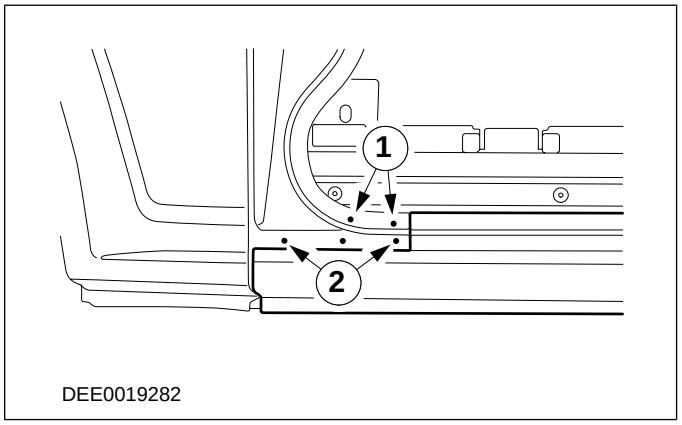
1. Sill outer panel

1. Puddle weld (two panel thicknesses).
2. Puddle weld.



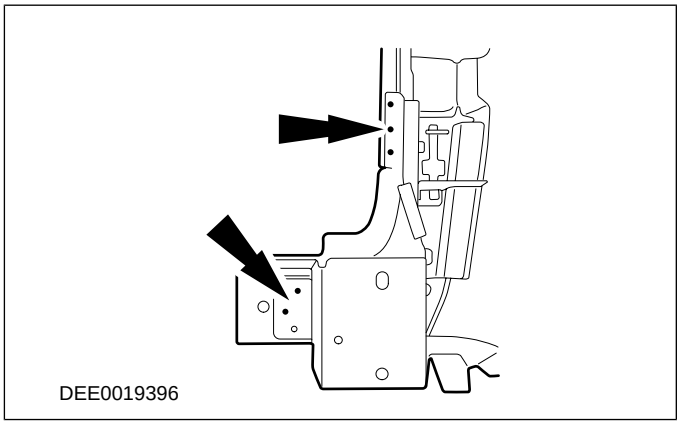
2. Sill outer panel

1. Puddle weld (two panel thicknesses).
2. Puddle weld.



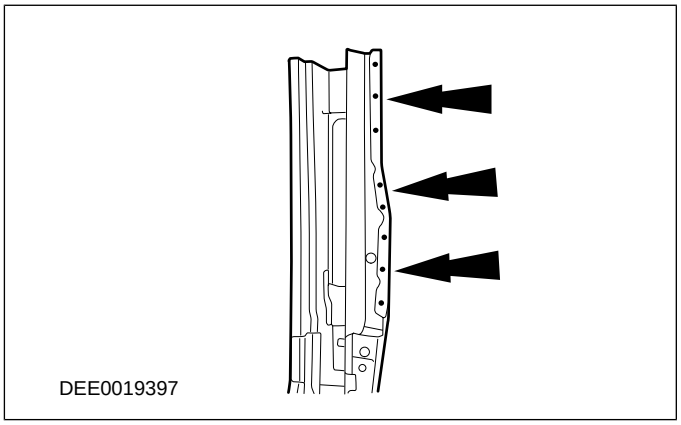
REMOVAL AND INSTALLATION

- Add the missing spot welds.



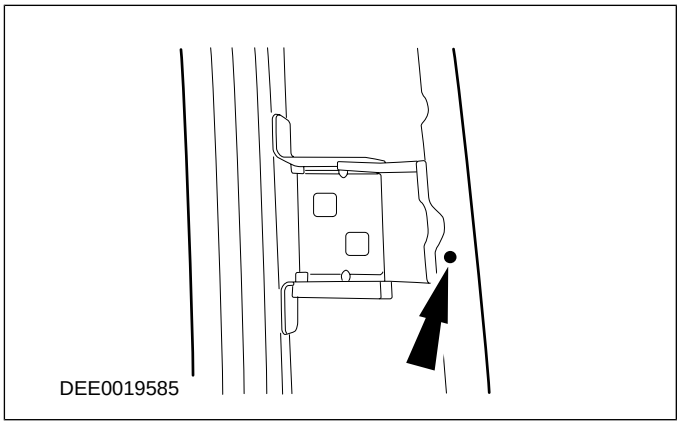
4. Prepare the new part

- Add the missing spot welds.



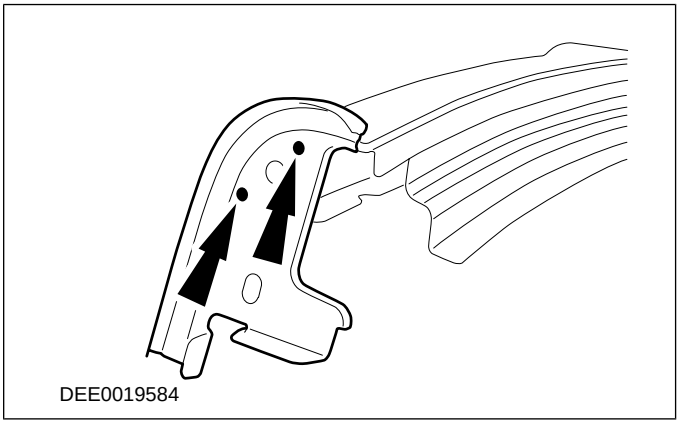
5. Prepare the new part

- Add the missing spot weld.



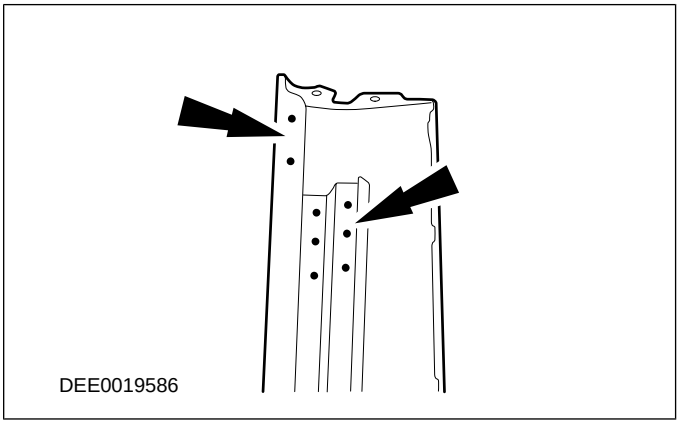
6. Prepare the new part

- Drill through the drip rail closing panel (two panel thicknesses).



7. Prepare the new part

- Make holes for puddle welding.



8. Align the box corner and secure it.

9. Neighbouring side panel

DESCRIPTION AND OPERATION

Environmental Regulations

Waste disposal in the repair paint shop

More than ever before, since the introduction of EU directives, rigorous attention is paid to the avoidance of waste materials and to recycling in repair paint shops. In this respect, repair paint shops must take into account and comply with the following requirements:

- Separate waste according to its recycling and disposal methods.
- Produce evidence for the correct transport and disposal of waste.

NOTE: The organization of disposal in the plant must comply with the requirements of the Waste Avoidance and Management Act: The avoidance and recycling of waste must always take priority.

However, despite all measures which may be taken, waste cannot be completely avoided.

NOTE: Waste which is not allowed in household rubbish, and which can no longer be utilized, must be disposed of as special waste.

Paint residues containing solvent, application residues, sanding dust, waste containing peroxides, solvents, soiled cleaning cloths and paint slurry all count as special waste. Each of these must be collected in a separate, sealed and suitably labeled metal container and properly disposed of using a specialist company.

Careful separation allows some waste to be usefully re-used.

- Empty metal containers can be sent for scrap instead of being disposed of as waste.
- Contaminated cleaning thinners can be separated by distillation.
- Packing material and masking paper can be added to the recycled paper collection.

Residues which cannot be used must be correctly disposed of.

All remaining waste must be treated as commercial waste and disposed of according to the local regulations.

The new VOC (Volatile Organic Compounds) solvent regulation

Keeping the air clean protects the environment and the population from the heath-damaging effects of air pollutants.

In certain atmospheric conditions, volatile organic compounds contribute to summer smog.

NOTE: For comprehensive information, please refer to the European VOC Directive, 1999/13/EU. Furthermore, the effective national regulations must be complied with.

The European VOC (Volatile Organic Compounds) Directive has controlled the limits for such compounds since August 2001. It applies to production coating companies and those which undertake repair painting of private and commercial vehicles.

Not least because of the VOC legislation, modern, low solvent and solvent-free lacquers and paints are finding greatly increased distribution across industry and the trade. Up to the year 2007, emissions from painting work will drop by at least 40%.

At the same time, the paint manufacturers guarantee for example that they will produce a ready-to-spray product consisting of base paint + hardener + thinners, with a permitted VOC level.

A company in business today can conform with the stipulated requirements by introducing water-based paints and using the other necessary products from the relevant paint manufacturers.

For more detailed information, please refer to the EU VOC Directive.

DESCRIPTION AND OPERATION

Application	2-component polyester glass fiber stopper
Use	Equalization of unevenness; blending in of vehicle extensions; repair of GRP components
Hardener quantity	approx. 3 - 5%
Working time	approx. 4 - 6 minutes
Drying	20°C approx. 12 minutes
	Short wavelength infrared approx. 4 minutes
	Medium wavelength infrared approx. 5 - 10 minutes
Sanding tool	Eccentric, sanding disk by hand
Grade	P80 - P150

2-component polyester fine stopper should always be applied after 2-component polyester glass fiber stopper.

Application	2-component polyester spray stopper
Use	Equalization of unevenness
Hardener quantity	approx. 3 - 5%
Working time	approx. 25 - 30 minutes
Layer thickness	200 µm or 4 - 8 spray passes
Drying	20°C approx. 3 hours
	Short wavelength infrared approx. 10 minutes
	Medium wavelength infrared approx. 15 - 20 minutes
Sanding tool	Eccentric, sanding disk by hand
Grade	P80 - P150; fine sand - P280

Application	2-component plastic stopper for flexible thermoplastic
Use	Equalization of scratches or unevenness
Hardener quantity	approx. 3 - 5%
Working time	approx. 25 - 30 minutes
Drying	20°C approx. 15 - 30 minutes
	60°C approx. 15 min
	(Short wavelength infrared approx. 8 minutes)*
	(Medium wavelength infrared approx. 8-10 minutes)*
Sanding tool	Eccentric, sanding disk by hand
Grade	P80 - P150; fine sand - P280

***Infrared drying may adversely affect adhesion, therefore check the manufacturer's instructions.**

Plastic stopper has a very great tendency to shrink back, so that the edge of the stopper repair becomes visible.

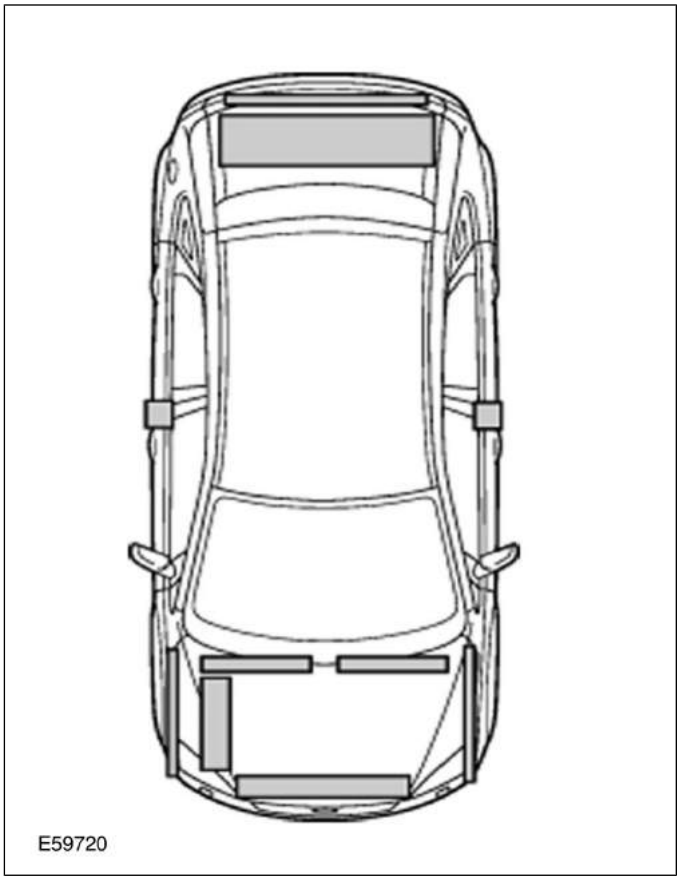
Plastic stoppers are flexible and universally applicable on all types of plastic (except for pure PE and PP, these are plastics which cannot be painted). The manufacturer's instructions must be very exactly followed in order that no adhesion problems occur. A special plastic etch primer is specified for some materials.

Primers

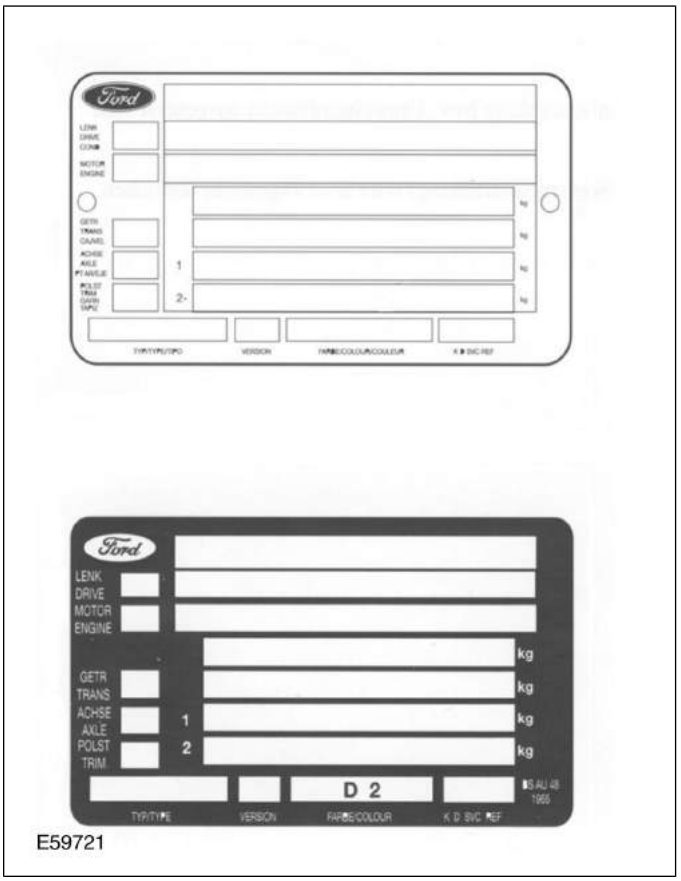
Application	1-component primer
Use	Isolation of bare sanded areas.
Spray gun	HVLP 1.3 mm
Spray pressure	2.0 bar
Drying	20°C approx. 15 - 20 minutes
	60°C approx. 10 min

DESCRIPTION AND OPERATION

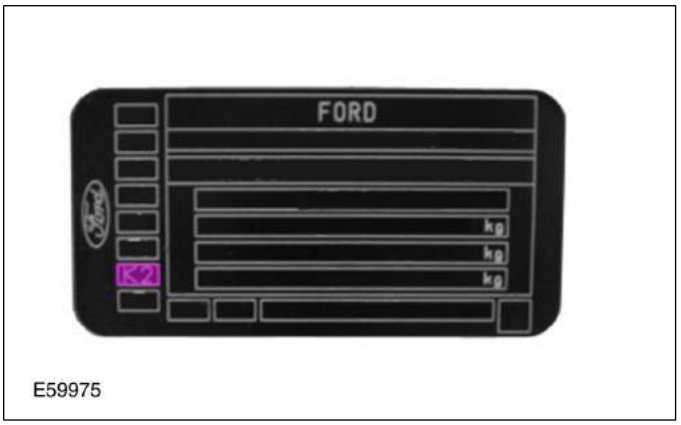
- Luggage compartment interior
- Inner rear panel - luggage compartment



The type plate gives the color code in the last row.



On the newer type plates, the color code is given in the left-hand column, at the penultimate position.



Color shade catalog or color shade system of the repair paint manufacturer.

The repair paint manufacturers offer a variety of possible systems for the determining the production color shade of motor vehicles. There are electronic systems, color card systems and manuals for the determination of color shades.

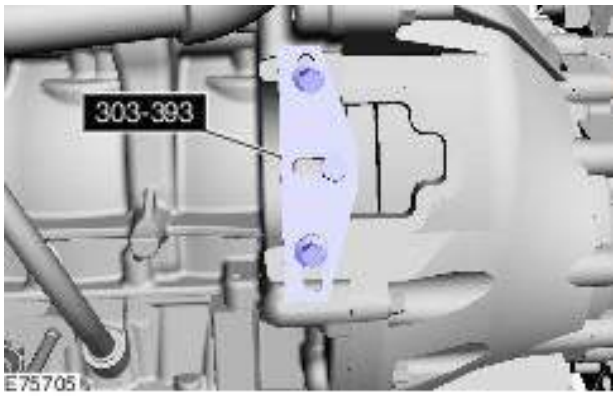
4. Install the accessory drive belt. For additional information, refer to: (303-05) Accessory Drive Belt - 2.2L Duratorq-TDCi (Puma) Diesel, Vehicles With: Air Conditioning (Removal and Installation), Accessory Drive Belt - 2.2L Duratorq-TDCi (Puma) Diesel, Vehicles Without: Air Conditioning (Removal and Installation).

Transit 2006.5 (04.2006-)

Engine - 2.2L Duratorq-TDCi (Puma) Diesel - Engine Front Cover

In-vehicle Repair

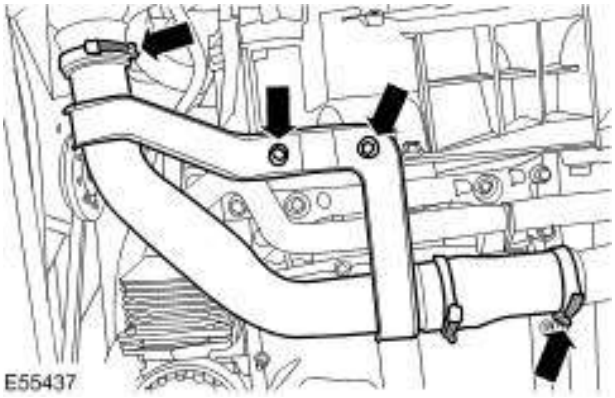
Removal



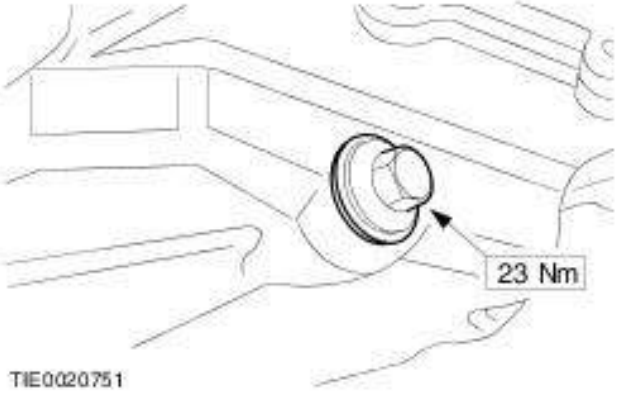
1. Remove the generator. For additional information, refer to: Generator - 2.2L Duratorq-TDCi (Puma) Diesel (414-02 Generator and Regulator, Removal and Installation).
2. Remove the starter motor. For additional information, refer to: Starter Motor - 2.2L Duratorq-TDCi (Puma) Diesel (303-06 Starting System, Removal and Installation).
3. Install the special tool.

Removal

1. Raise and support the vehicle.
   For additional information, refer to: Lifting (100-02 Jacking and Lifting, Description and Operation).



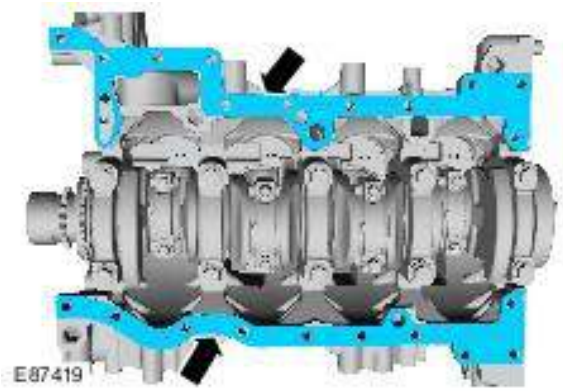
2. Remove the charge air cooler outlet pipe.
3. Drain the engine.



4. **NOTE:**Inspect the oil pan drain plug seal for damage. Install a new drain plug and seal if required.
   Install the drain plug.
5. Remove the oil pan retaining bolts.

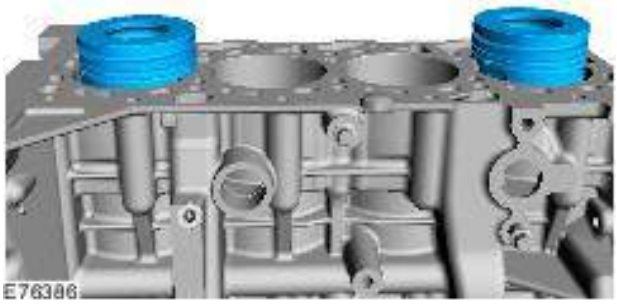
6. **CAUTION:**Do not distort the oil pan.
   Using a suitable spatula, remove the oil pan.
   - Slide the spatula around the profile of the oil pan.

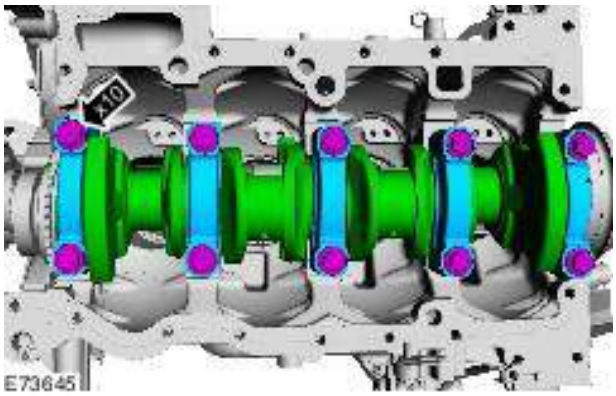
Installation



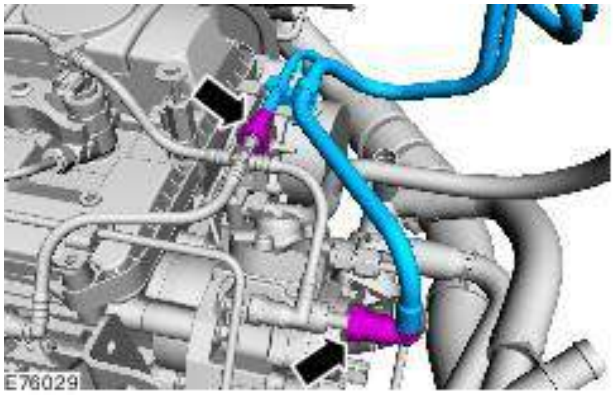
48. **NOTE:**Note the position of each component before removal.

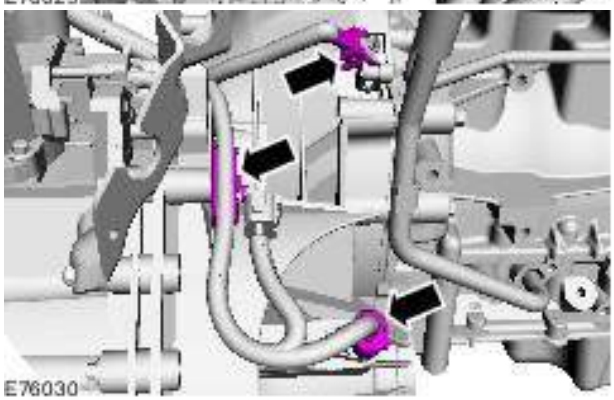
49. **NOTE:**Note the position of each component before removal.



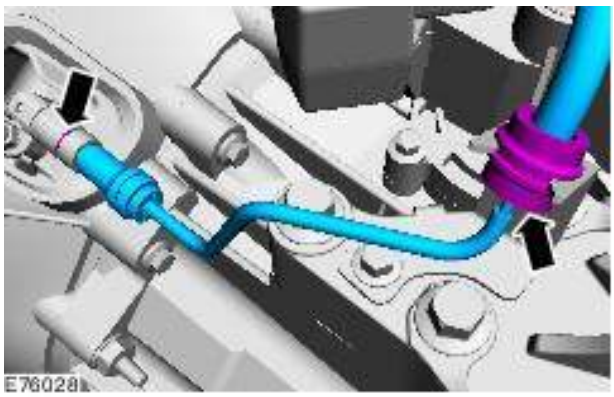


51. **NOTE:**Note the position of each component before removal.

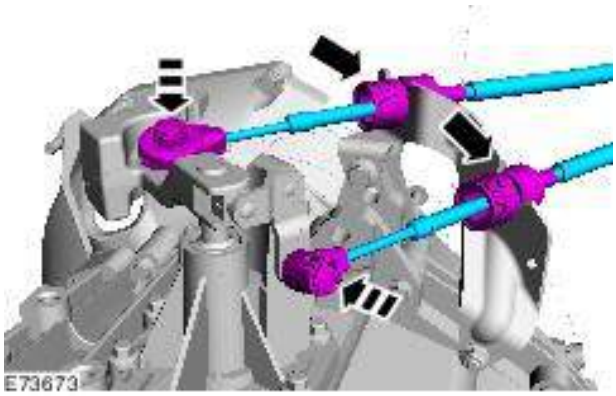




19.



21. **CAUTION:**If the fluid is spilled on the paintwork, the affected area must be immediately washed down with cold water.



22.

		Visually INSPECT the dual mass flywheel for damage. INSTALL new parts as necessary.
Engine stumbling and glow plug indicator is flashing	* DTC detected.	* REFER to the Ford approved diagnostic tool.
Engine stumbling	* Low fuel level.	* CHECK the fuel tank level is greater than four liters. If the fuel tank level is less than four liters, FILL with fuel.
	* Incorrect or contaminated fuel.	* CHECK for signs of contamination such as strange odours from the fuel tank. * CHECK for signs of water or petrol in the diesel. * If contaminated fuel is found, DRAIN the complete fuel system. FLUSH the fuel system through with clean diesel. INSTALL a new fuel filter element. REFER to: Fuel Filter Element - Diesel (310-01 Fuel Tank and Lines, Removal and Installation). INSTALL a new fuel pump, fuel injectors, fuel rail, and high-pressure fuel supply lines. REFER to: Fuel Pump (303-04C Fuel Charging and Controls - 2.4L Duratorq-TDCi (Puma) Diesel, Removal and Installation) / Fuel Injectors (303-04C Fuel Charging and Controls - 2.4L Duratorq-TDCi (Puma) Diesel, Removal and Installation) / Fuel Rail (303-04C Fuel Charging and Controls - 2.4L Duratorq-TDCi (Puma) Diesel, Removal and Installation).
	* Accelerator pedal position (APP) sensor.	* REFER to the Ford approved diagnostic tool.
	* Fuel injector(s).	* REFER to the Ford approved diagnostic tool.
	* Fuel pump.	* GO to Pinpoint Test A.
	* FRP sensor.	* REFER to the Ford approved diagnostic tool.
	* CKP sensor.	* REFER to the Ford approved diagnostic tool.
	* CMP sensor.	* REFER to the Ford approved diagnostic tool.
	* Dual mass flywheel.	*

Removal and Installation

General Equipment

Long nose pliers
Worldwide Diagnostic System (WDS)

Removal

WARNING: Refer to: Diesel Fuel System Health and Safety Precautions (100-00 General Information, Description and Operation).

WARNING: Make sure that the engine is switched off.

WARNING: Make sure that the fuel pressure has dropped to zero and that the fuel temperature is at ambient temperature.

WARNING: Wait for a minimum of 1 minute after the engine has stopped before commencing any repair to the fuel injection system.

CAUTION: Fuel injectors must not be dismantled or the nozzles cleaned, not even with ultrasonic equipment. Install new fuel injectors if necessary.

CAUTION: Fuel injectors sharing a common fuel injector clamp must be removed in pairs.

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

1. Within the datalogger function of WDS, check that the fuel pressure has dropped to zero and that the fuel temperature has either reached ambient temperature or is below 30ºC whichever is the greater.
   General Equipment: Worldwide Diagnostic System (WDS)
2. Disconnect the battery ground cable.
   Refer to: Battery Disconnect (414-01 Battery, Mounting and Cables, General Procedures).
3. Remove the air cleaner.
   Refer to: Air Cleaner - 2.2L Duratorq-TDCi (Puma) Diesel (303-12 Intake Air Distribution and Filtering, Removal and Installation).