

Driveline System - General Information - Driveline System

Diagnosis and Testing

Principle of Operation

For a detailed description of driveline operation, refer to the relevant Description and Operation section in the workshop manual. REFER to:

[Driveshaft](#) (205-01 Driveshaft, Description and Operation),
[Driveshaft](#) (205-01 Driveshaft, Description and Operation),
[Driveshaft](#) (205-01 Driveshaft, Description and Operation),
 Rear Drive Axle and Differential (205-02, Description and Operation),
 Rear Drive Axle and Differential (205-02, Description and Operation),
 Rear Drive Axle and Differential (205-02, Description and Operation),
[Rear Drive Halfshafts](#) (205-05 Rear Drive Halfshafts, Description and Operation),
[Rear Drive Halfshafts](#) (205-05 Rear Drive Halfshafts, Description and Operation),
[Rear Drive Halfshafts](#) (205-05 Rear Drive Halfshafts, Description and Operation).

Inspection and Verification



CAUTION: Only serviceable items can be renewed or adjusted. Failure to follow this instruction may result in the warranty of the component being rejected.

Certain driveline trouble symptoms are also common to the engine, transmission, wheel bearings, tires, and other parts of the vehicle. For this reason, make sure that the cause of the trouble is in the driveline before adjusting, repairing, or installing any new components. For additional information, refer to Workshop Manual section 100-04 Noise, Vibration and Harshness.

1. Verify the customer concern by carrying out a road test of the vehicle.
2. Visually inspect for obvious signs of mechanical damage and system integrity.
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 concern is not visually evident, verify the symptom and refer to the Symptom Chart.

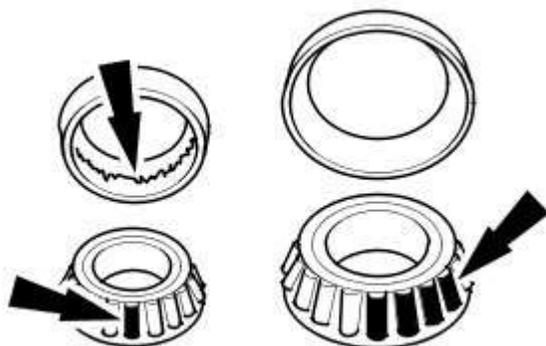
Identify the Condition

Gear Howl and Whine

Howling or whining of the ring gear and pinion is due to an incorrect gear pattern, gear damage or incorrect bearing preload.

Bearing Whine

Bearing whine is a high-pitched sound similar to a whistle. It is usually caused by worn/damaged pinion bearings, which are operating at driveshaft speed. Bearing noise occurs at all driving speeds. This distinguishes it from gear whine which is speed dependent.



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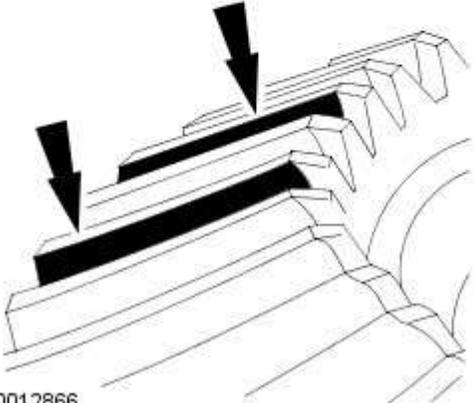
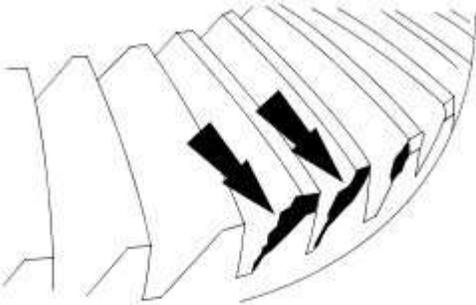
As noted, pinion bearings make a high-pitched, whistling noise, usually at all speeds. If however there is only one pinion bearing that is worn/damaged, the noise may vary in different driving phases.

A wheel bearing noise can be mistaken for a pinion bearing noise.

Chuckle

Chuckle that occurs on the coast driving phase is usually caused by excessive clearance between the differential gear hub and the differential case bore.

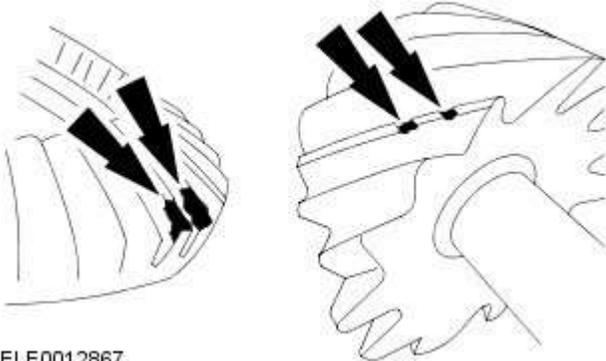
Damage to a gear tooth on the coast side can cause a noise identical to a chuckle. A very small tooth nick or ridge on the edge of a tooth can cause the noise.



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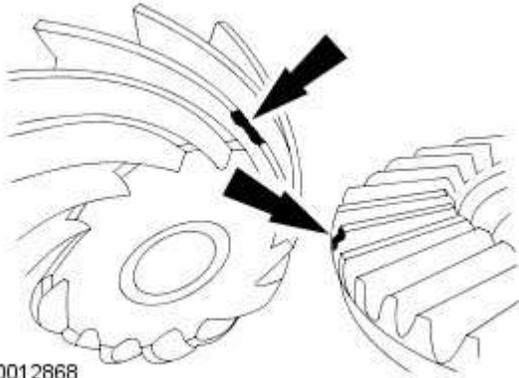
Knock

Knock, which can occur on all driving phases, has several causes including damaged teeth or gearset.



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A gear tooth damaged on the drive side is a common cause of the knock.



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Clunk

Clunk is a metallic noise heard when the automatic transmission is engaged in REVERSE or DRIVE. The noise may also occur when the throttle is applied or released. Clunk is caused by transmission calibration, backlash in the driveline or loose suspension components and is felt or heard in the vicinity of the rear drive axle.

Bearing Rumble

Bearing rumble sounds like marbles being tumbled. This condition is usually caused by a worn/damaged wheel bearing. The lower pitch is because the wheel bearing turns at only about one-third of the driveshaft speed. Wheel bearing noise also may be high-pitched, similar to gear noise, but will be evident in all four driving modes.

Symptom Chart

Symptom	Possible Cause	Action
Noise is at constant tone over a narrow vehicle speed range. Usually heard on light drive and coast conditions	<ul style="list-style-type: none"> Rear drive axle 	<ul style="list-style-type: none"> For additional information, GO to Pinpoint Test A.
Noise is the same on drive or coast	<ul style="list-style-type: none"> Road Worn or damaged driveshaft joint Driveshaft center bearing Wheel bearing 	<ul style="list-style-type: none"> No action required for road noise Install new components as required
Noise is produced with the vehicle standing and driving	<ul style="list-style-type: none"> Engine Transmission 	<ul style="list-style-type: none"> For additional information, REFER to: Engine - 3.0L/4.2L (303-00 Engine System - General Information, Diagnosis and Testing), Engine - 2.7L Diesel (303-00 Engine System - General Information, Diagnosis and Testing), Diagnostic Strategy (307-01A Automatic Transmission/Transaxle - V6 3.0L Petrol, Diagnosis and Testing).
Loud clunk in the driveline when shifting from reverse to forward	<ul style="list-style-type: none"> Transmission calibration Transmission Mount Transmission Suspension components Backlash in the driveline Engine idle speed set too high Engine mount 	<ul style="list-style-type: none"> Using the Manufacturer approved diagnostic system, re-configure the Transmission Control Module (TCM) with the latest available calibration Inspect and install new transmission mounts as required For additional transmission information, REFER to: Diagnostic Strategy (307-01A Automatic Transmission/Transaxle - V6 3.0L Petrol, Diagnosis and Testing). Inspect and install new suspension components as required Inspect and install new driveline components as required Check and adjust the idle speed as required Inspect and install new engine mounts as required
Clicking, popping, or grinding noises	<ul style="list-style-type: none"> Inadequate or contaminated lubrication in the rear drive halfshaft constant velocity (CV) joint Another component contacting the 	<ul style="list-style-type: none"> Inspect, clean and lubricate with new grease as required Inspect and repair as required Inspect and install new components as required

Symptom	Possible Cause	Action
	rear drive halfshaft <ul style="list-style-type: none"> Wheel bearings, brakes or suspension components 	
Vibration at highway speeds	<ul style="list-style-type: none"> Out-of-balance wheel(s) or tire(s) Driveline out of balance/misalignment Driveshaft center bearing touching body mounting point 	<ul style="list-style-type: none"> Balance and install new wheel(s) and tire(s) as required REFER to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation). For additional information, REFER to: Driveline Angle Inspection (205-00 Driveline System - General Information, General Procedures). Refer to the Manufacturer approved diagnostic system for driveshaft balancing application Check for correct spacer washer thickness. Inspect and install new washers as required
Shudder, Vibration During Acceleration	<ul style="list-style-type: none"> Powertrain/driveline misalignment High constant velocity (CV) joint operating angles caused by incorrect ride height 	<ul style="list-style-type: none"> Check for misalignment. Install new components as required. For driveshaft alignment, REFER to: Driveline Angle Inspection (205-00 Driveline System - General Information, General Procedures). Check the ride height and verify the correct spring rate. Install new components as required
Lubricant Leak	<ul style="list-style-type: none"> Rear drive axle breather Damaged seal Rear drive axle filler plug Rear drive axle rear cover joint 	<ul style="list-style-type: none"> Check oil level and correct as required Install new components as required

Pinpoint Tests

PINPOINT TEST A : EXCESSIVE DRIVELINE NOISE	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK NOISE FROM VEHICLE ON ROAD TEST	
	1 Road test vehicle to determine load and speed conditions when noise occurs.
	2 Assess the noise with different gears selected.
	Does the noise occur in different gears at the same vehicle speed?
Yes	Install a new rear drive axle/differential assembly. REFER to: Axle Assembly - V6 3.0L Petrol (205-02 Rear Drive Axle/Differential, Removal and Installation). Re-test the system for normal operation.
No	Suspect the engine or transmission. For additional information, REFER to: Engine - 3.0L/4.2L (303-00 Engine System - General Information, Diagnosis and Testing), Engine - 2.7L Diesel (303-00 Engine System - General Information, Diagnosis and Testing), Diagnostic Strategy (307-01A Automatic Transmission/Transaxle - V6 3.0L Petrol, Diagnosis and Testing).

Driveline System - General Information - Driveline Angle Inspection

General Procedures

Special Tool(s)

	<p>Alignment Tool 205-535</p>
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All vehicles

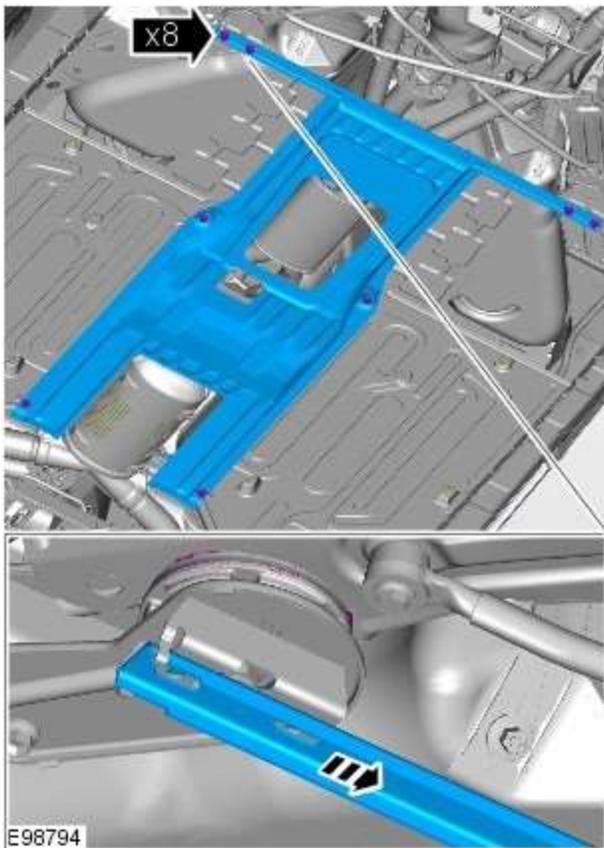
1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

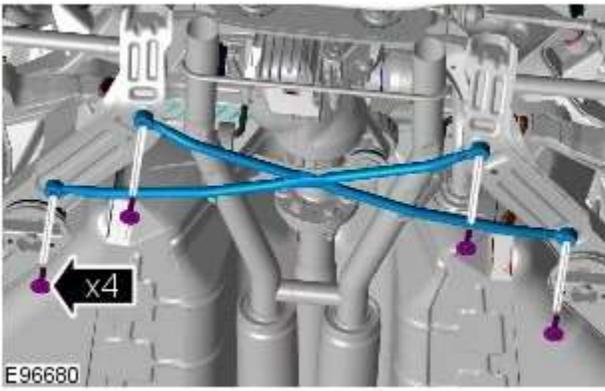
Raise and support the vehicle.

All vehicles

2. Remove the air deflector.
For additional information, refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

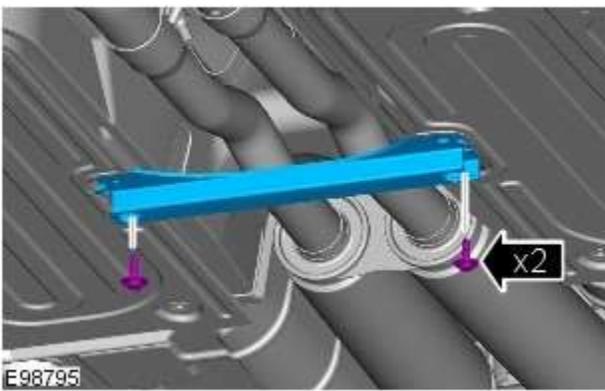
3. Remove the engine rear undershield.



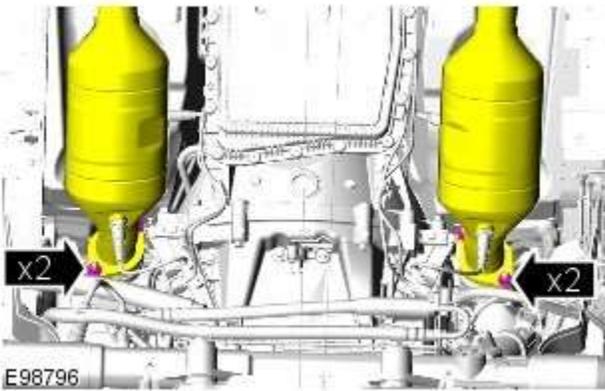


4. Remove the rear subframe crossbrace.

All except vehicles with diesel engine

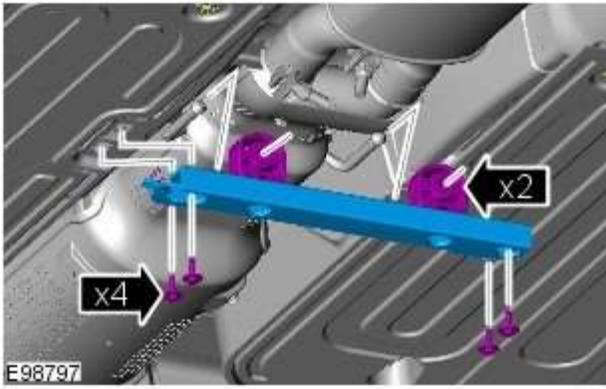


5. Remove the support bracket.

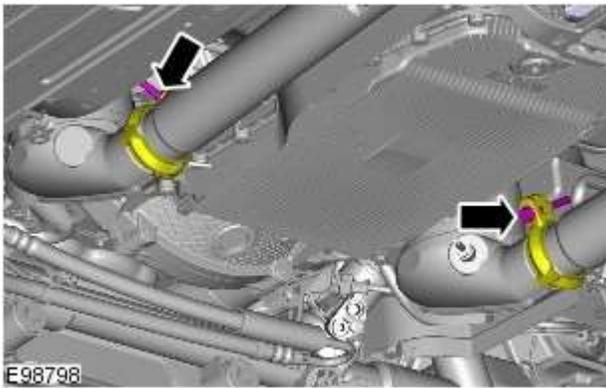


6. Loosen the retaining nuts.

Vehicles with diesel engine

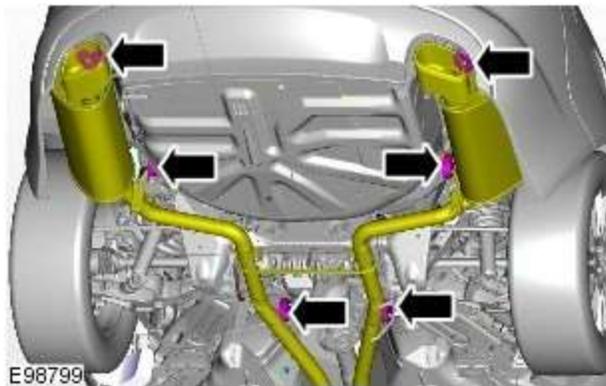


7. Remove the support bracket.
 - Remove the bolts.
 - Detach the intermediate muffler exhaust hanger insulators.



8. Loosen the catalytic converter to diesel particulate filter (DPF) retaining clamps.

All vehicles

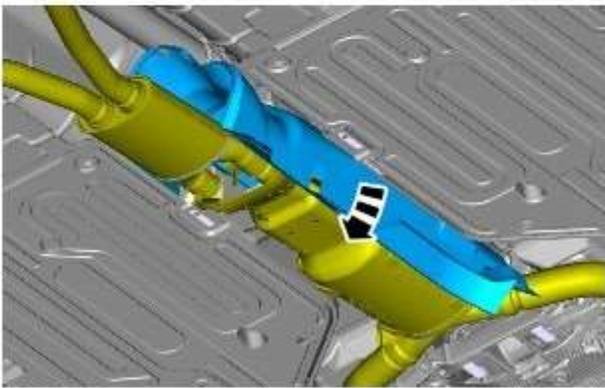
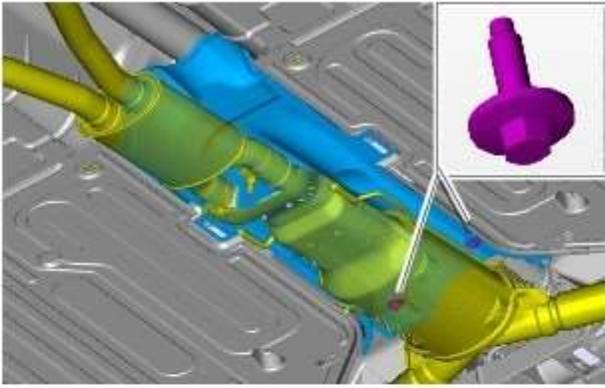


9.  **CAUTION:** Make sure that the exhaust system is supported with a suitable transmission stand.

Lower the exhaust assembly sufficiently to gain access to the driveshaft heat shield.

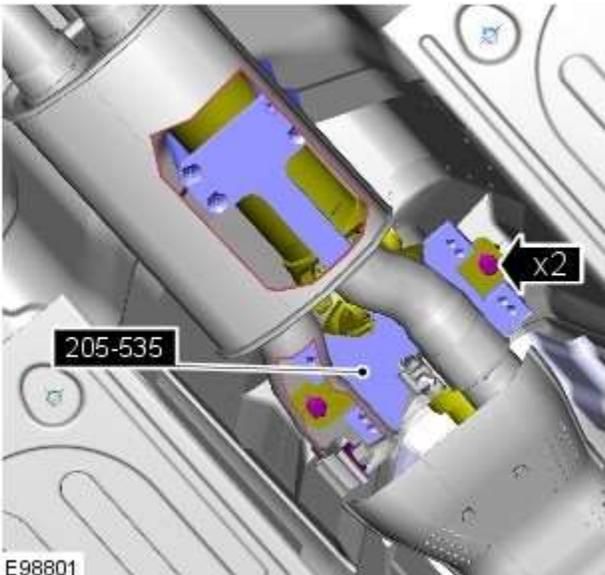
- Release the 6 exhaust hangers.

10. Remove the driveshaft heat shield.



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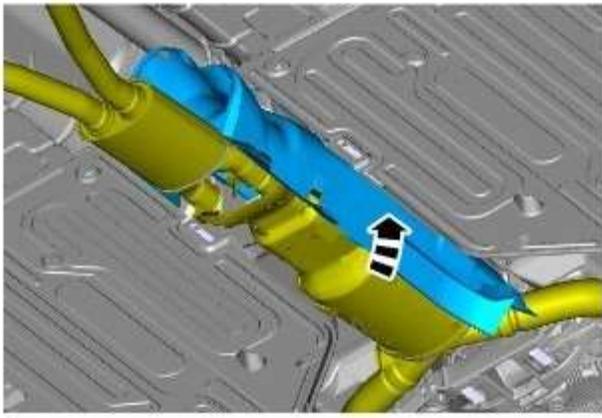
All vehicles



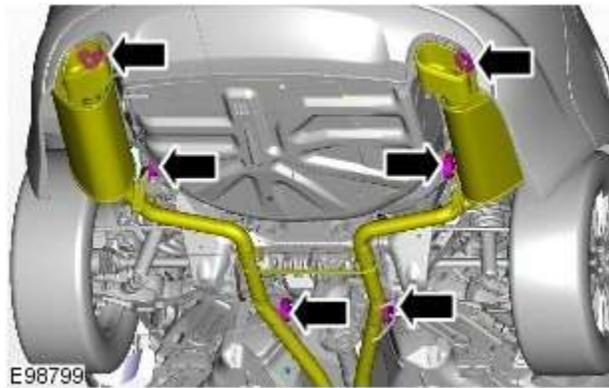
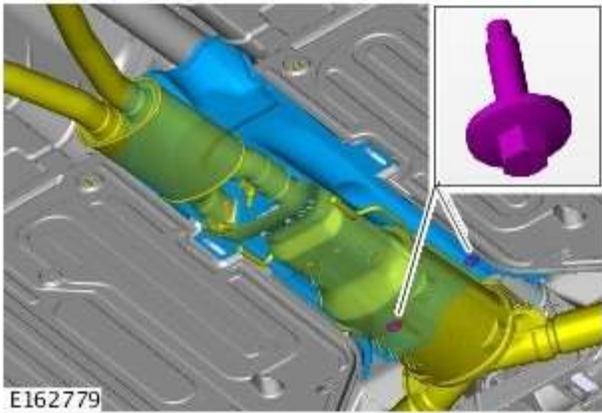
11.  CAUTION: Make sure that the special tool is correctly located.

Using the special tool, align the driveshaft center bearing.

- Tighten to 40 Nm.

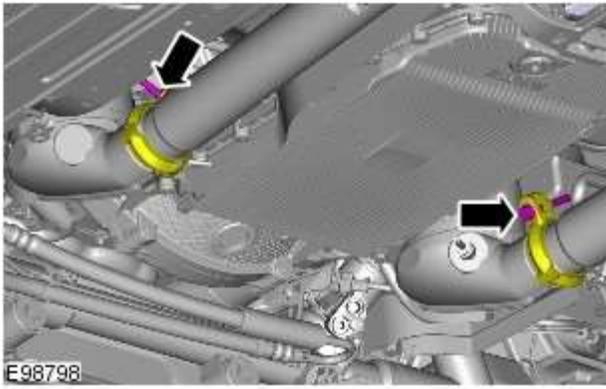


12. Install the driveshaft heat shield.
 - Tighten to 10 Nm.

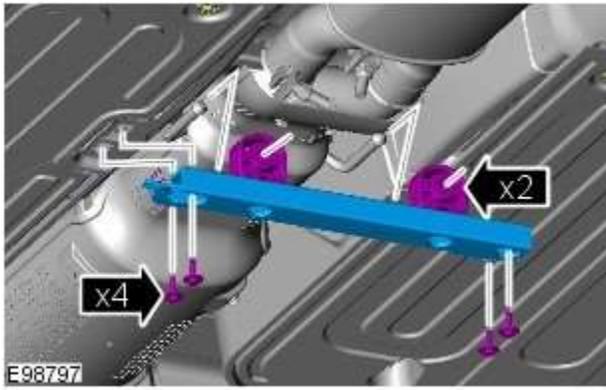


13.  CAUTION: Make sure that the exhaust system is supported with a suitable transmission stand.
Attach the exhaust hangers.

Vehicles with diesel engine

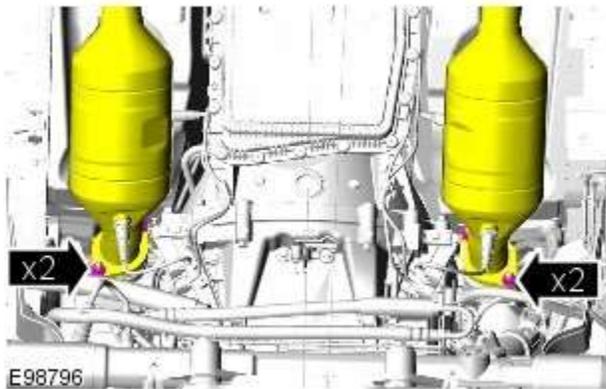


14. Tighten the catalytic converter to DPF retaining clamps.
 - Tighten to 11 Nm.

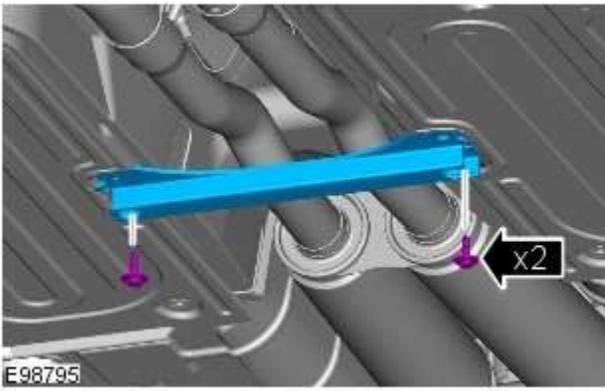


15. Install the support bracket.
 - Attach the intermediate muffler exhaust hanger insulators.
 - Tighten to 10 Nm.

All except vehicles with diesel engine

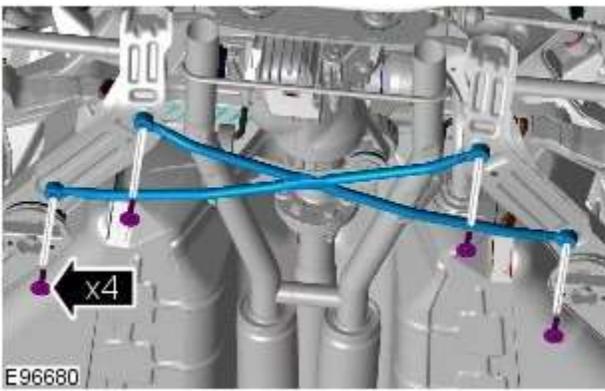


16. Tighten the retaining nuts.
 - Tighten to 45 Nm.

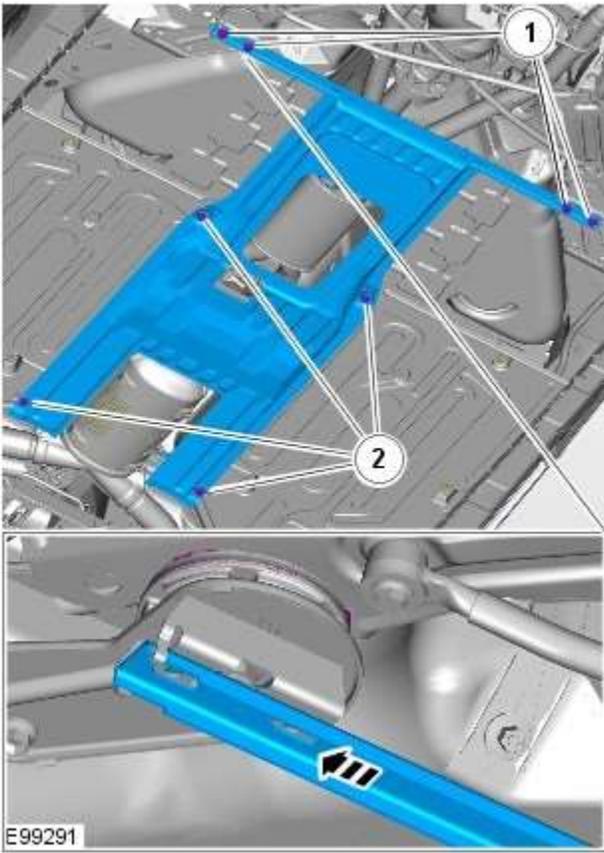


17. Install the support bracket.
 - Tighten to 10 Nm.

All vehicles



18. Install the rear subframe cross brace.
 - Tighten to 62 Nm.



19. Install the engine rear undershield.
 1. Tighten to 30 Nm.
 2. Tighten to 10 Nm.

20. Install the air deflector.
For additional information, refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

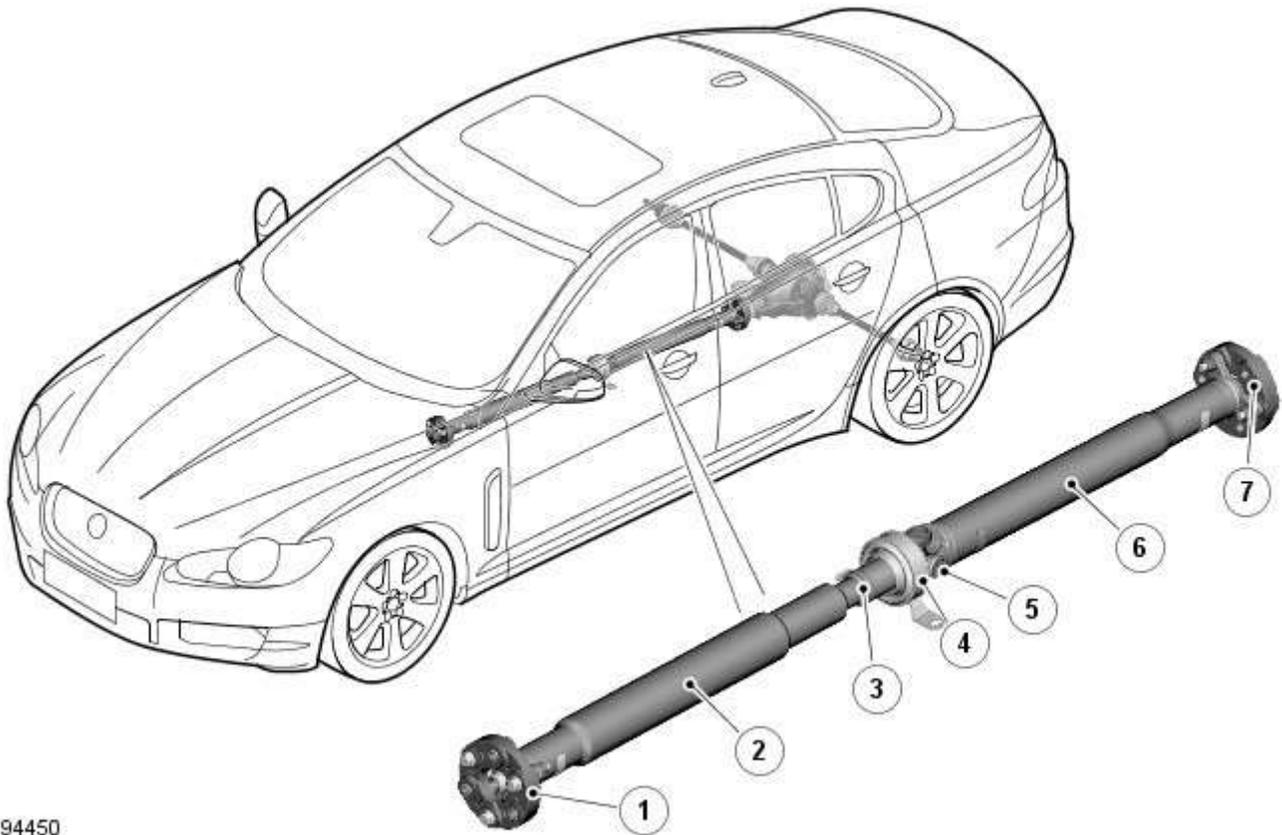
Driveshaft -

Torque Specifications

Description	Nm	lb-ft	lb-in
Centre bearing retaining bolts	48	36	-
Transmission flexible joint retaining bolts	127	94	-
Rear drive axle CV joint retaining bolts	73	54	-
Driveshaft heat shield retaining bolts	7	-	62

Driveshaft - Driveshaft - Component Location

Description and Operation



E94450

Item	Description
1	Transmission flexible joint
2	Collapsible front driveshaft tube
3	Splined slip joint
4	Center bearing
5	Universal joint
6	Rear driveshaft tube
7	Differential flexible joint

Driveshaft - Driveshaft - Overview

Description and Operation

Driveshaft Overview

The two-piece driveshaft, manufactured from lightweight tubular steel, transmits drive from the engine, via the transmission, to the differential. The driveshaft aligns with the centerline of the **vehicle's** body and is supported by a center bearing.

Driveshaft - Driveshaft - System Operation and Component Description

Description and Operation

System Operation

Driveshaft

The two-piece driveshaft, manufactured from lightweight tubular steel, transmits drive from the engine, via the transmission, to the differential. The driveshaft aligns with the centerline of the **vehicle's** body and is supported by a center bearing.

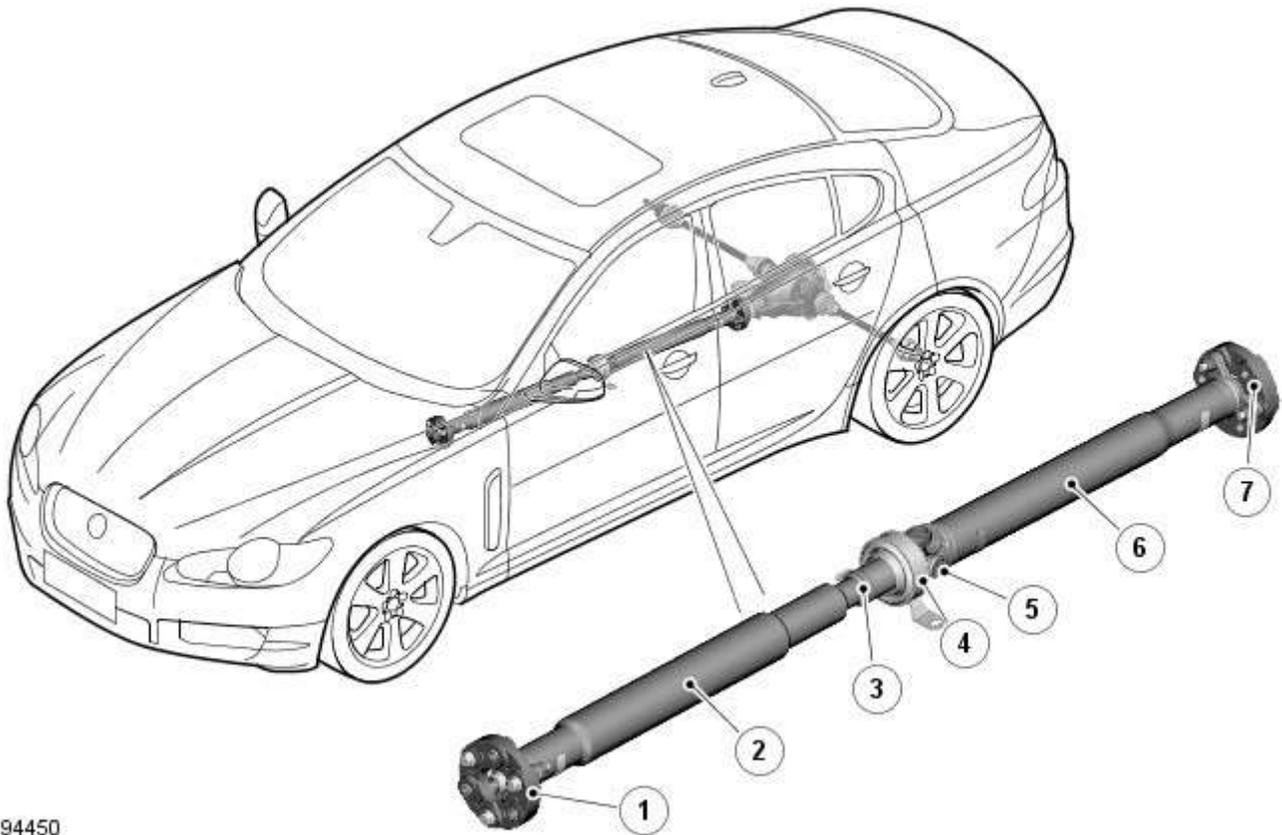
The driveshaft's front tube is of swaged construction, which is a crash energy management feature, designed to collapse progressively and predictably in the event of a severe frontal impact. A low-friction splined slip-joint at the center of the driveshaft provide the driveshaft's plunge capability.

Flexible couplings connecting the driveshaft to both the transmission and the differential counteract the angular movement of the driveshaft caused by the driveline's acceleration and braking forces.

The center universal joint is positioned at a specified angle using shims between the center bearing and the vehicle's body. The driveline angles have been carefully configured to balance minimum power losses with excellent vibration and wear characteristics. The universal joint is lubricated during manufacture and sealed for life.

Driveshaft - Universal Joints - Component Location

Description and Operation



E94450

Item	Description
1	Transmission flexible joint
2	Collapsible front driveshaft tube
3	Splined slip joint
4	Center bearing
5	Universal joint
6	Rear driveshaft tube
7	Differential flexible joint

Driveshaft - Universal Joints - Overview

Description and Operation

Refer to: [Driveshaft](#) (205-01 Driveshaft, Description and Operation).

Driveshaft - Universal Joints - System Operation and Component Description

Description and Operation

System Operation

Refer to: [Driveshaft](#) (205-01 Driveshaft, Description and Operation).

Driveshaft - Driveshaft

Diagnosis and Testing

For additional information.

REFER to: [Driveline System](#) (205-00 Driveline System - General Information, Diagnosis and Testing).

Driveshaft - Driveshaft Runout and Balancing

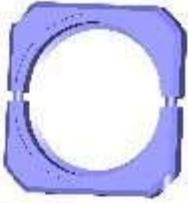
General Procedures

1. For additional information, refer to the Jaguar Approved Diagnostic System.

Driveshaft - Driveshaft V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Special Tool(s)

 E117586	205-932 Remover, Driveshaft
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Removal



NOTE: Select NEUTRAL before disconnecting the battery, to allow the driveshaft to be turned.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

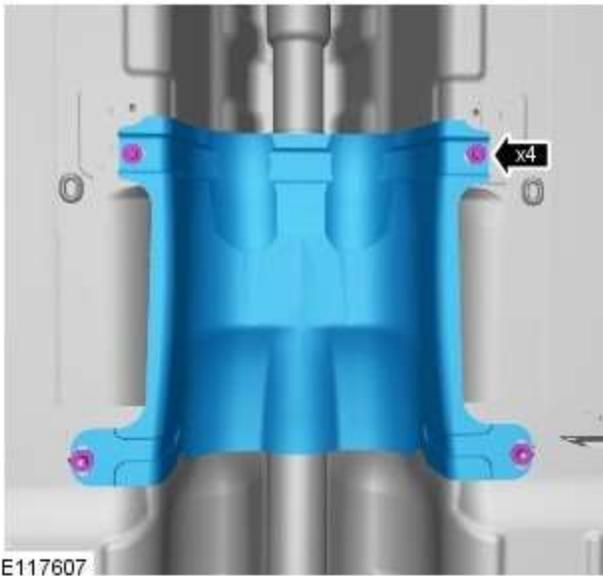


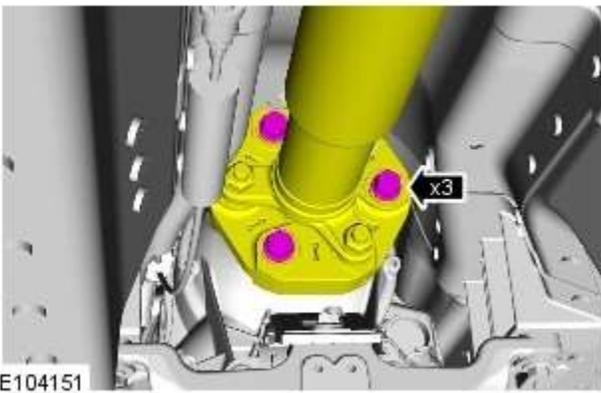
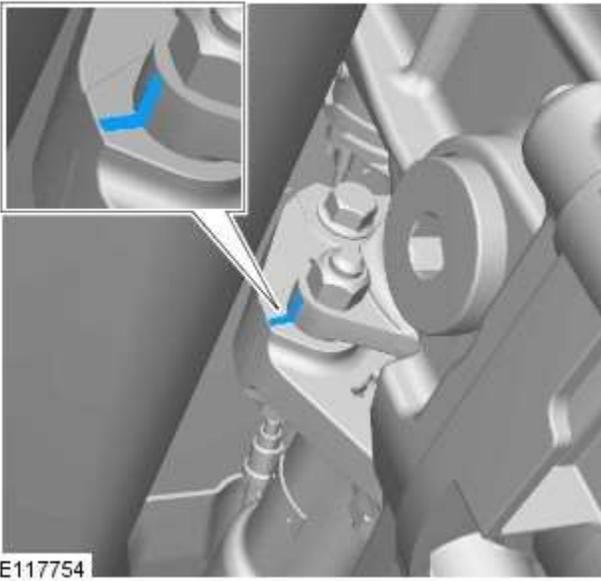
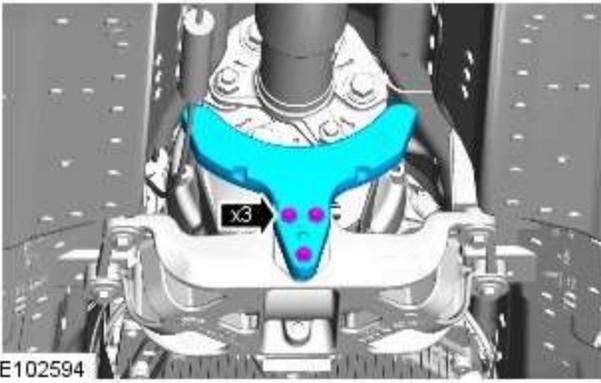
2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Exhaust System](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

4.

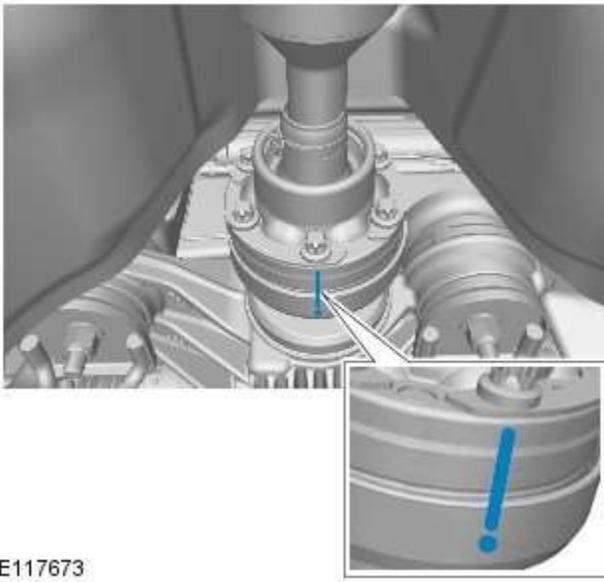




5.

6.  NOTE: Mark the position of the driveshaft on the transmission flange.

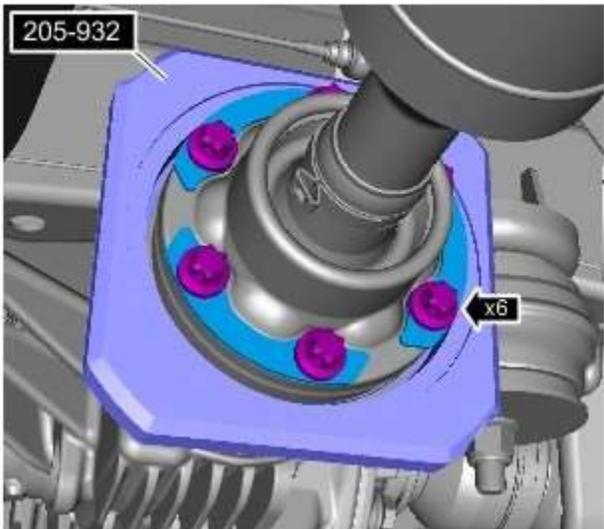
7.  CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.



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8.  CAUTION: Do not use the 5mm hole on the differential case flange for the alignment mark.

 NOTE: Using the 3mm hole on the differential case flange, paint an alignment mark (as indicated) to aid correct installation of the driveshaft to the differential case.

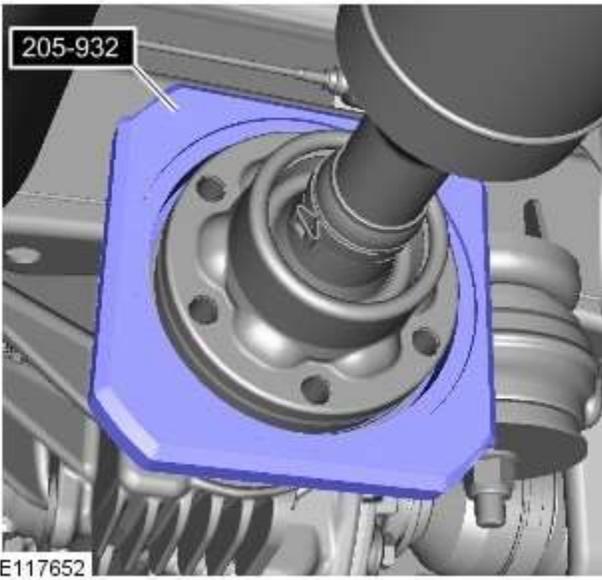


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9.  CAUTION: To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

 NOTE: Make sure that the special tool is correctly installed to the recess on the driveshaft.

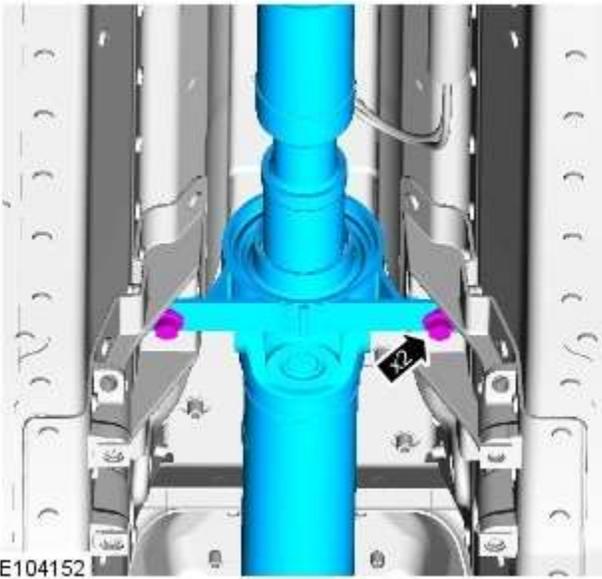
Special Tool(s): [205-932](#)



10.  CAUTION: To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

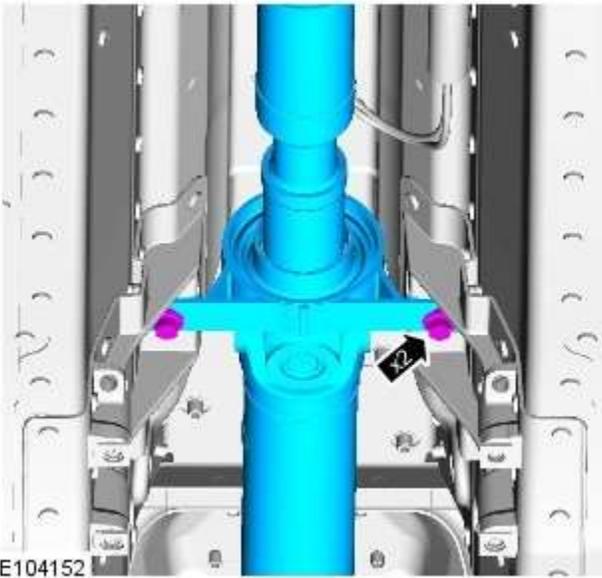
 NOTE: Using a suitable hammer and drift, make sure that you only hit the corner edges of the special tool to remove the driveshaft.

Special Tool(s): [205-932](#)

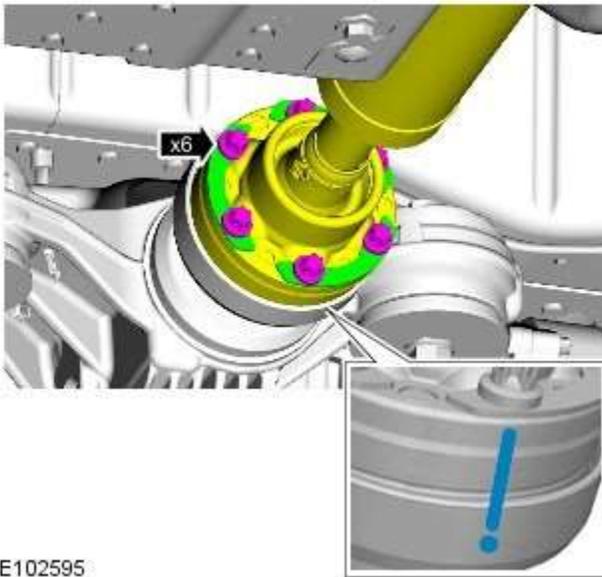


- 11.

Installation

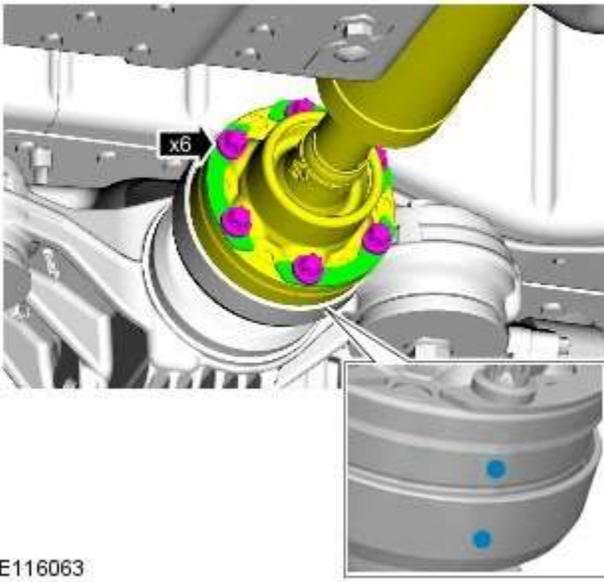


1.  CAUTION: Only tighten the bolts finger-tight at this stage.



2.  NOTE: Make sure that the alignment mark on the driveshaft is correctly aligned to the alignment mark on the differential case.

Torque: 75 Nm



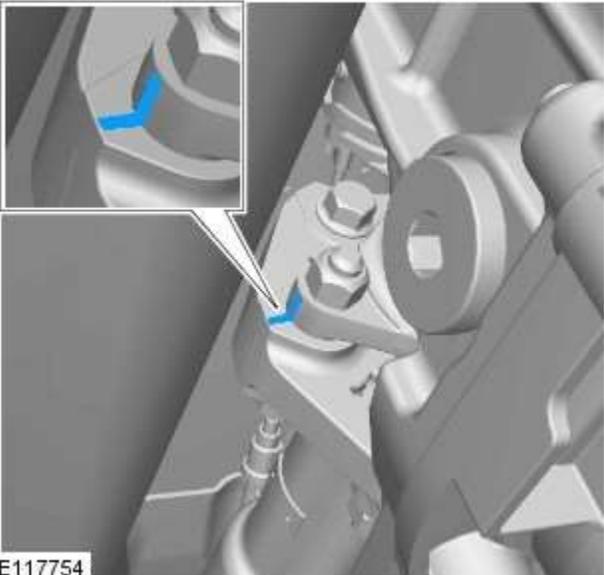
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3. NOTES:

 This step only applies if a new driveshaft is being installed.

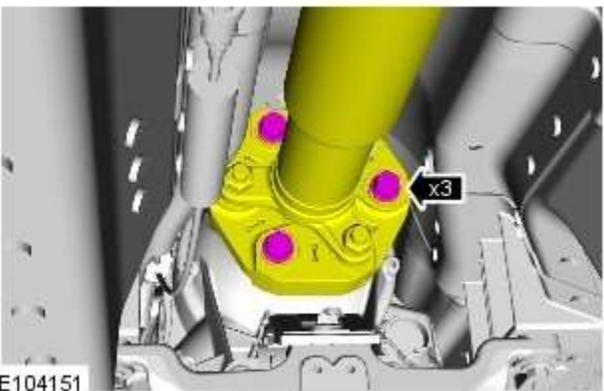
 Using the 3mm hole on the differential case flange and paint alignment mark on the driveshaft (as indicated). Make sure that the alignment marks are correctly aligned.

Torque: 75 Nm



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4.  NOTE: Make sure that you re-align the driveshaft to the transmission flange using the alignment mark.

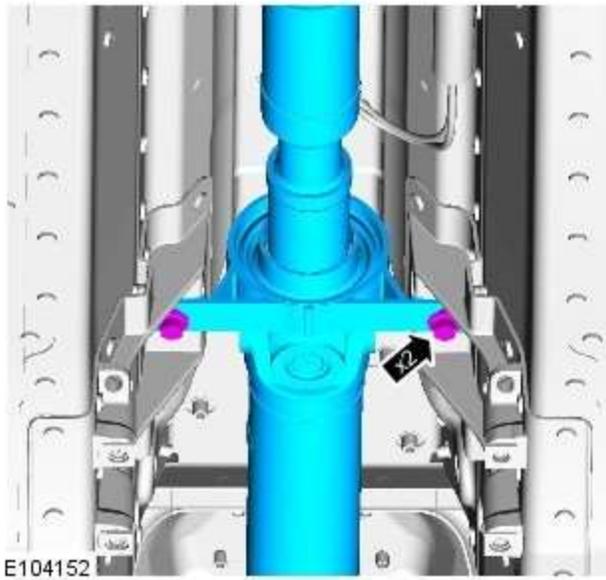


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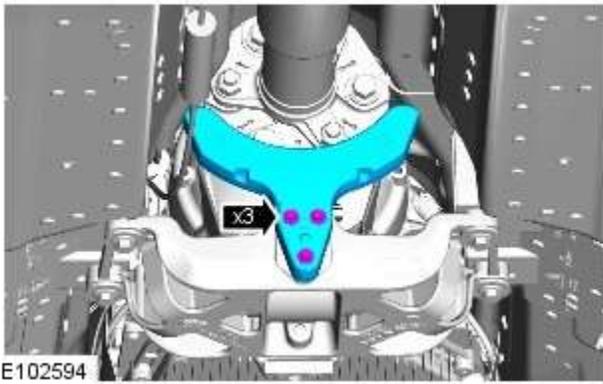
5.  CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.

Torque: 127 Nm

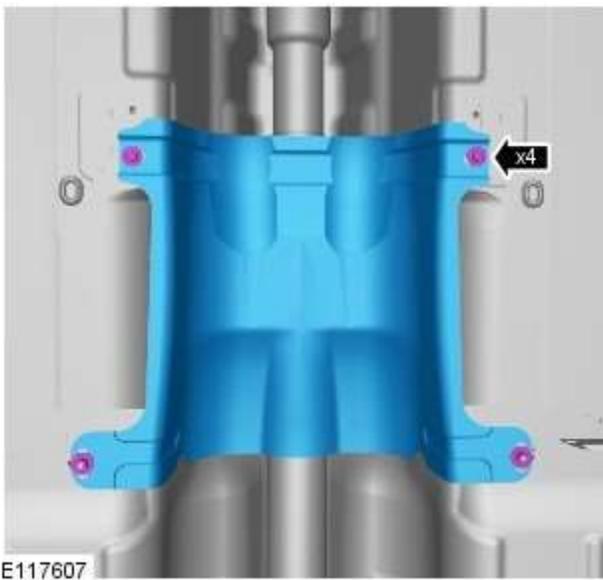
6. *Torque:* 40 Nm



7. *Torque:* 5 Nm



8. *Torque:* 7 Nm



9. Refer to: [Exhaust System](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

10. Lower the vehicle.

11. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Rear Drive Axle/Differential -

General Specifications

Item	Specification
Differential fluid - vehicles without supercharger	Castrol SAF XO (75W 90)
Differential fluid - vehicles with supercharger	Castrol BOT 720 (75W 90)

Initial Specifications

Item	Specification
Differential fluid capacity - vehicles without supercharger	0.9 Liters
Differential fluid capacity - vehicles with supercharger	1.3 Liters

Service Specifications

Item	Specification
Differential fluid capacity - vehicles without supercharger	0.85 Liters
Differential fluid capacity - vehicles with supercharger	1.25 Liters

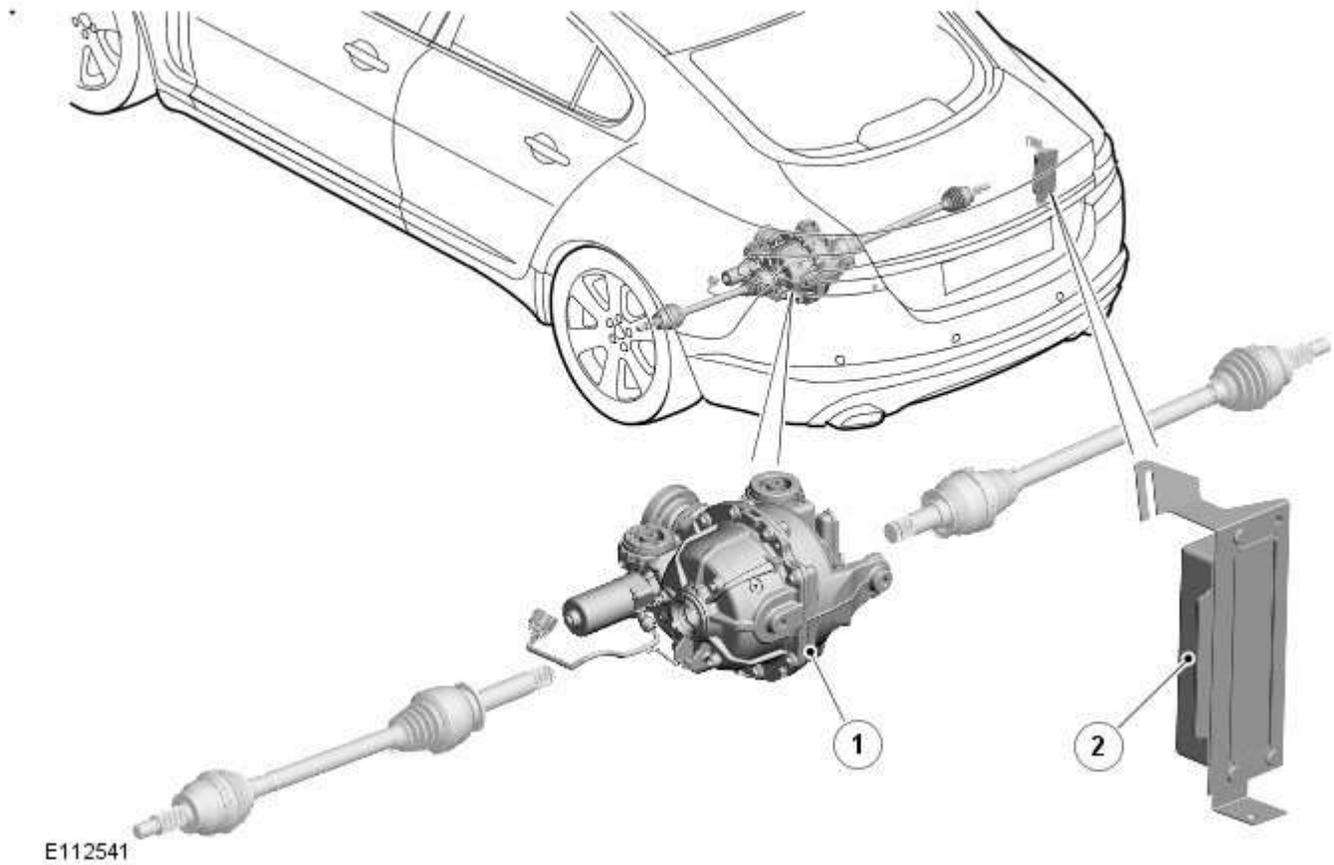
Torque Specifications

Description	Nm	lb-ft	lb-in
Differential case front retaining bolt	90	66	-
Differential case rear retaining bolts	192	142	-
Differential filler plug	27	20	-
Differential drain plug	27	20	-
Halfshaft constant velocity joint nut	300	221	-
Driveshaft retaining bolts	73	54	-

Rear Drive Axle/Differential - Rear Drive Axle and Differential - Component Location

Description and Operation

ELECTRONIC DIFFERENTIAL - 5.0L SUPERCHARGER VEHICLES FROM 2010MY



Item	Description
1	Electronic differential
2	Differential Locking Module (DLM)

Rear Drive Axle/Differential - Rear Drive Axle and Differential - Overview

Description and Operation

OVERVIEW

The differential has two functions:

- to convert the 'angle of drive' through 90° and distribute drive, via the rear drive halfshafts, to the rear wheels.
- to compensate for differences in the rotational speeds of the vehicle's rear wheels during cornering.

Two types of differential are installed:

- an open differential on 5.0L V8 normally aspirated, 4.2L V8 naturally aspirated, 3.0L V6 petrol and 3.0L V6 diesel vehicles
- an electronic differential on 5.0L V8 [SC \(supercharger\)](#) vehicles.

Both types of differential are attached to the rear subframe at four mounting points. Each mounting point incorporates a rubber bush to reduce [NVH \(noise, vibration and harshness\)](#). The bushes in the forward mounting points are installed in the differential. The bushes in the rear mounting points are installed in the rear subframe.

The open differentials are almost identical in their design and differ only in the final drive ratio and a heavier input flange which is fitted to 3.0L V6 diesel vehicles. The final drive ratios for the open and the electronic differentials are as follows:

- 5.0L V8, 4.2L V8 naturally aspirated, 5.0L V8 [SC](#) and 3.0L V6 petrol engines - 3.31:1
- 3.0L V6 diesel engines - 2.73:1.

Rear Drive Axle/Differential - Rear Drive Axle and Differential - System Operation and Component Description

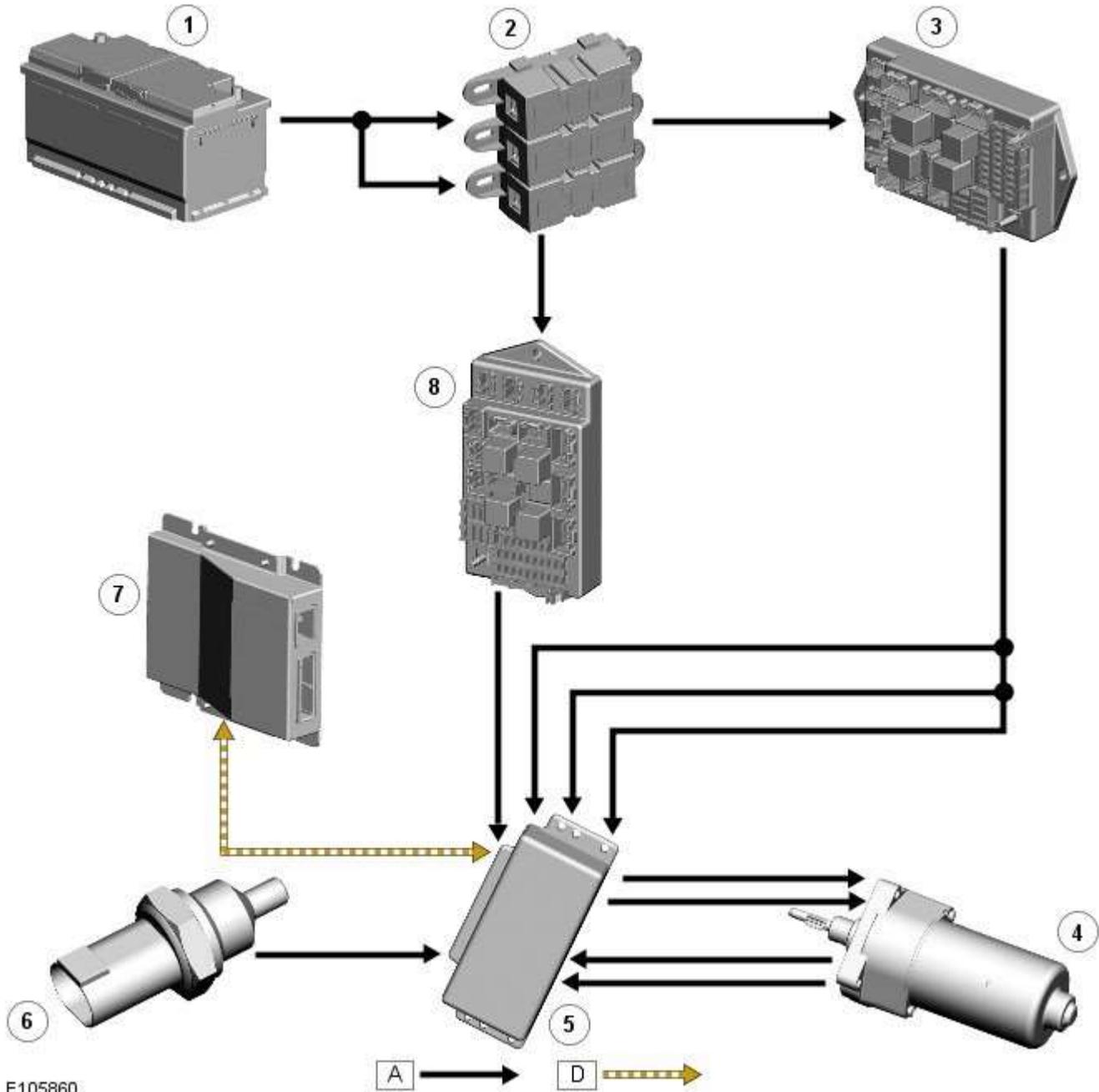
Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus

Control Diagram - 5.0L Supercharger Vehicles Only



E105860

Item	Description
1	Battery
2	Megafuse (175 A)
3	AJB (auxiliary junction box)
4	Motor

5	Differential Locking Module (DLM)
6	Oil temperature sensor
7	High speed CAN from suspension control module
8	CJB (central junction box)

System Operation

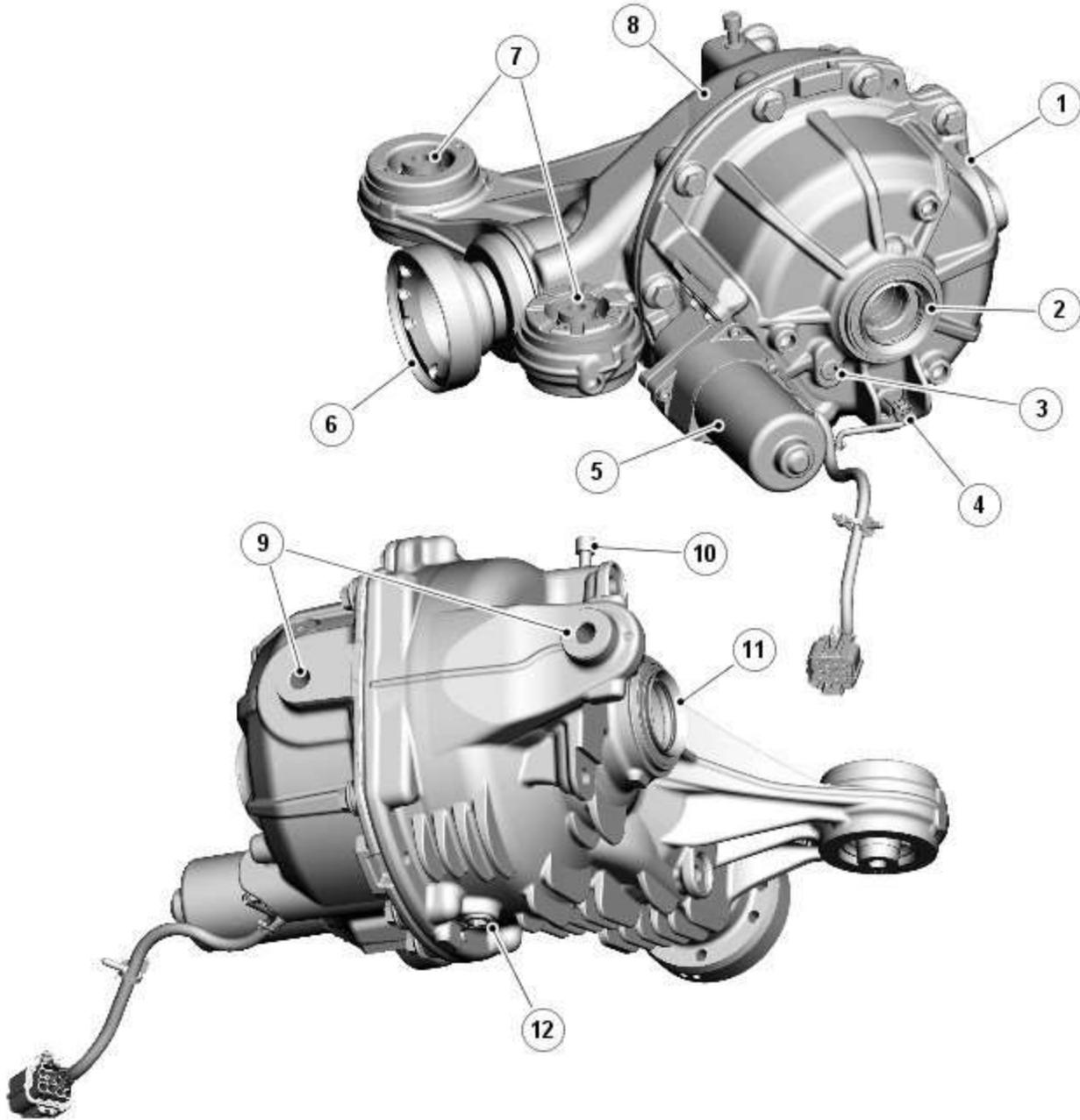
ELECTRONIC DIFFERENTIAL - 5.0L SUPERCHARGER VEHICLES FROM 2010MY

The multi-plate clutch prevents excessive differential slip and therefore maximizes the traction performance of the vehicle. This is fundamentally different from 'braked' traction control systems, which can only counteract differential slip when it occurs.

A certain amount of differential slip is required to allow the vehicle to turn corners and to remain stable under control of the [ABS \(anti-lock brake system\)](#). The system is completely automatic and does not require any special driver input.

The multi-plate clutch actively controls the torque flow through the differential and optimizes the torque distribution in the driveline. The clutch biases the torque from the differential to the wheel with the higher grip and prevents the wheel with the lower grip from spinning.

ELECTRONIC DIFFERENTIAL - 5.0L SUPERCHARGER - VEHICLES FROM 2010MY



E105858

Item	Description
1	Cover
2	LH rear drive halfshaft oil seal
3	Filler/Level plug
4	Temperature sensor
5	Motor
6	Input flange
7	Front mounting points with insulator assemblies
8	Carrier
9	Rear mounting points
10	Breather
11	RH rear drive halfshaft oil seal
12	Magnetic drain plug

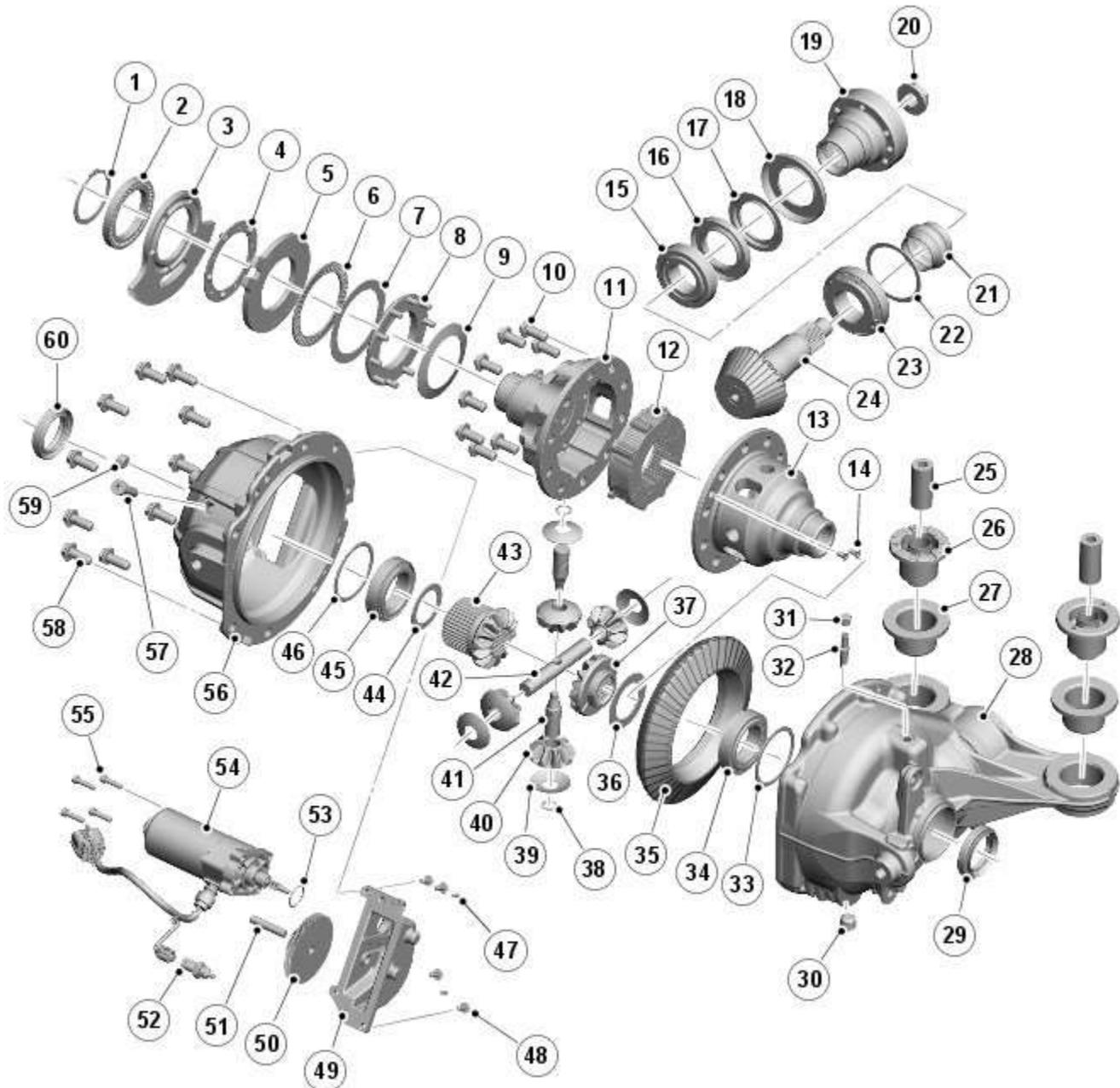
The electronic differential has the same functionality as the open differential, but it also incorporates a locking and torque biasing function to give improved traction performance and vehicle dynamic stability. Operation of the electronic differential is controlled by the Differential Locking Module (DLM).

The basic construction of the electronic differential is similar to the open differential. However, the electronic differential also has the following:

- Two additional planet gears in the differential carrier, to cater for the higher torque through the differential during locking events.
- A multi-plate clutch and actuator assembly installed on the LH sun gear
- A motor and reduction gearbox, attached to the cover.
- A temperature sensor installed in the cover.

The DLM (differential locking module) operates the motor of the electronic differential under the control of the ADM (adaptive damping module).

Exploded View of Electronic Differential



E105859

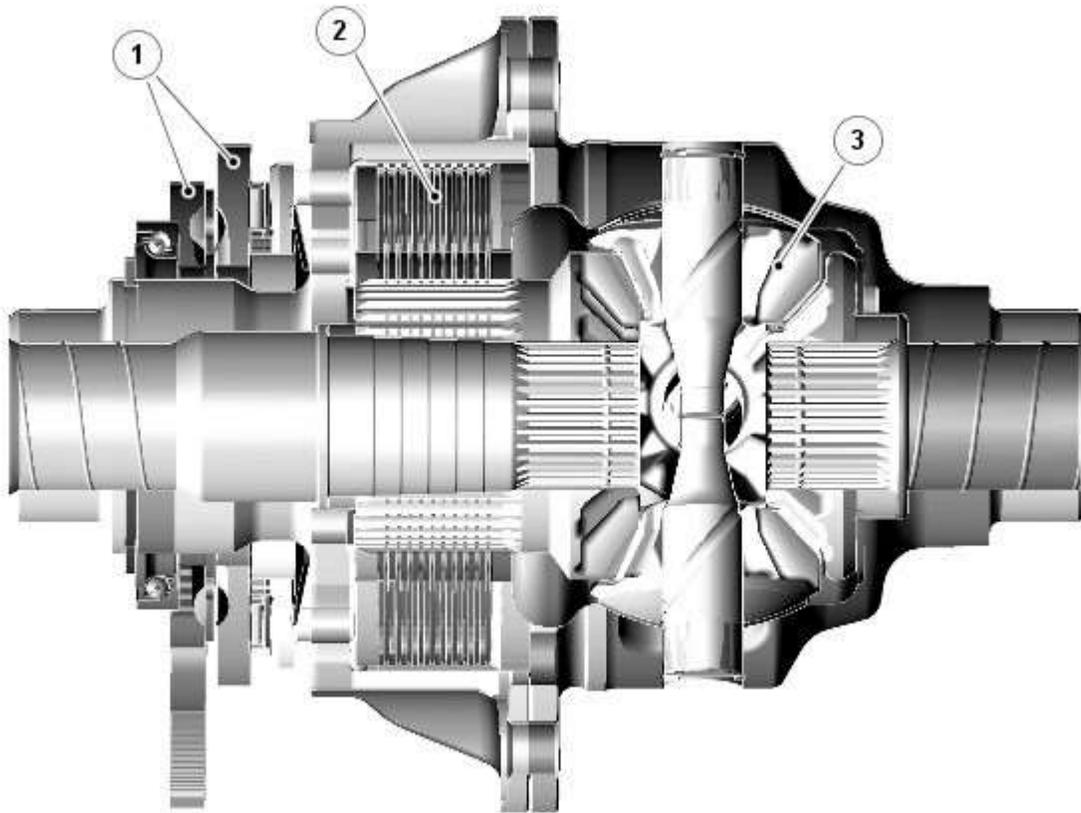
Item	Description
1	Circlip
2	Bearing assembly
3	Input actuator
4	Actuator balls
5	Output actuator

6	Thrust race
7	Shim
8	Thrust plate
9	Dished washer
10	Bolt (10 off)
11	Clutch basket
12	Multi-plate clutch and pressure disc
13	Differential case
14	Screw (2 off)
15	Bearing assembly
16	Oil seal
17	Oil slinger inner
18	Oil slinger outer
19	Input flange
20	Pinion nut
21	Collapsible spacer
22	Shim
23	Bearing assembly
24	Pinion shaft
25	Mounting insulator inner (2 off)
26	Mounting insulator rubber (2 off)
27	Mounting insulator outer (2 off)
28	Carrier
29	Oil seal
30	Drain plug
31	Vent
32	Breather cap
33	Shim
34	Bearing assembly
35	Drive gear
36	Shim
37	RH sun gear
38	Circlip
39	Thrust washer (4 off)
40	Planet gear (4 off)
41	Pin (2 off)
42	Shaft
43	LH sun gear
44	Shim
45	Bearing assembly
46	Shim
47	Dowel (2 off)
48	Bolt (4 off)
49	Reduction gear casing
50	Reduction gear
51	Shaft
52	Temperature sensor
53	O-ring seal
54	Motor
55	Screw (4 off)
56	Cover
57	Output actuator locking pin
58	Bolt (9 off)

59	Filler/Level plug
60	Oil seal

The multi-plate clutch is contained in a clutch basket attached to the differential carrier with the crown wheel securing bolts. Alternate plates of the clutch pack are keyed to the clutch basket and the [LH](#) sun gear. A pressure disc is installed on the outer end of the clutch pack and keyed to the clutch basket. A thrust race on the end of the clutch basket incorporates lugs which extend through the clutch basket onto the pressure disc.

The actuator assembly is mounted on bearings on the outboard end of the clutch basket, against the thrust race. The actuator assembly consists of input and output actuators separated by five ball bearings. A locking pin in the cover engages with a slot in the output actuator to prevent it turning, but allow it to move axially. The input actuator engages with the reduction gearbox and is free to rotate relative to the cover. Ball bearings locate in curved grooves in the mating faces of the input and output actuators. The bottom surface of each groove incorporates a ramp. Rotation of the input actuator forces the ball bearings up the ramps in the grooves and induces an axial movement in the output actuator. The thrust race and pressure disc transfer the axial movement from the output actuator to the clutch pack.



E 112539

Item	Description
1	Actuator
2	Multi-plate clutch
3	Differential

The motor is a 12 V dc motor that adjusts the frictional loading of the multi-plate clutch, via the reduction gearbox and the actuator assembly, under the control of the DLM. Adjusting the frictional loading of the multi-plate clutch adjusts the locking torque between the crown wheel drive gear and the sun wheel.

Four bolts attach the motor to the reduction gearbox, which is located in position on the cover with two dowels, and secured with four bolts. An O-ring seals the joint between the motor and the reduction gearbox.

The motor is driven by a 12 V dc feed direct from the DLM. The motor also incorporates the following connections with the DLM:

- A motor temperature sensor, to prevent excessive use from damaging the motor.
- Two Hall effect motor position sensors, to enable closed loop control of the motor.

The temperature sensor provides a differential oil temperature signal to the DLM, to prevent excessive use from damaging the multi-plate clutch.

Differential Locking Module (DLM)

The DLM controls operation of the electronic differential. The DLM is attached to a bracket located on the [LH](#) side of the luggage compartment, immediately forward of the fender tail lamp, behind the trim.

The DLM receives three battery feeds from the [AJB](#) and an ignition feed from the [CJB](#). A connection with the high speed [CAN](#) bus allows the DLM to communicate with other systems on the vehicle.

A certain amount of differential slip is required to allow the vehicle to turn corners and to remain stable under control of the [ABS](#). The ADM monitors the driver's demands through primary vehicle controls and automatically sets the slip torque in the differential. The system is completely automatic and does not require any special driver input.

The differential strategy in the ADM includes:

- A pre-loading function, increasing locking torque with increased driving torque.
- A slip controller to decrease locking torque for optimum comfort, e.g. parking.

The ADM memorizes the position of the motor when the ignition is switched off.

[CAN](#) bus messages used by the ADM include wheel speed, steering angle, automatic transmission speed, temperature information, car configuration, axle ratios and mode inputs.

The ADM also sends messages via the [CAN](#) bus to tell other control modules on the network the status of the electronic differential. The clutch torque and default mode status are some of the main signals sent out by the ADM.

If the DLM or ADM are replaced, a Jaguar approved diagnostic system must be connected to the vehicle and the differential self-calibration procedure must be performed. This procedure must also be performed if the motor or electronic differential is replaced.

If a fault occurs with the electronic differential, the ADM, the DLM, or one of the required input signals, the ADM records an error code and displays a warning in the message center.

The following messages can be displayed:

Message	Description	Chime
E-DIFF NOT AVAILABLE	Differential temperature has reached the overheat threshold. System deactivated until temperature returns within limits.	Single
E-DIFF FAULT	Fault has occurred with electronic differential. System deactivated until fault rectified.	Single

Rear Drive Axle/Differential - Rear Drive Axle and Differential

Diagnosis and Testing

Principle of Operation

For a detailed description of the Rear Drive Axle and Differential, refer to the relevant Description and Operation section in the workshop manual. REFER to: [Rear Drive Axle and Differential](#) (205-02 Rear Drive Axle/Differential, Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Mechanical	Electrical
<ul style="list-style-type: none"> • Fixings that secure Rear Differential Control Module (Heat path for Module Heatsink) 	<ul style="list-style-type: none"> • Fuses/Relays • Damaged, Loose or Corroded Connector(s) • Damage to Wiring Loom/Incorrect Location, Stretched or Taught

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, check the system for any logged Diagnostic Trouble Codes (DTCs) and refer to the DTC index.

DTC Index

For a list of diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Rear Differential Control Module \(RDCM\)](#) (100-00 General Information, Description and Operation).

Rear Drive Axle/Differential - Differential Draining and Filling

General Procedures

Check



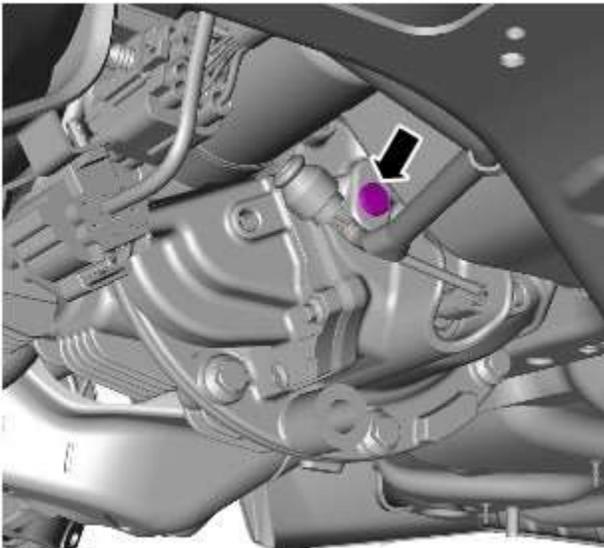
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Specifications - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-02 Rear Drive Axle/Differential, Specifications).



2. **WARNING:** Make sure to support the vehicle with axle stands.

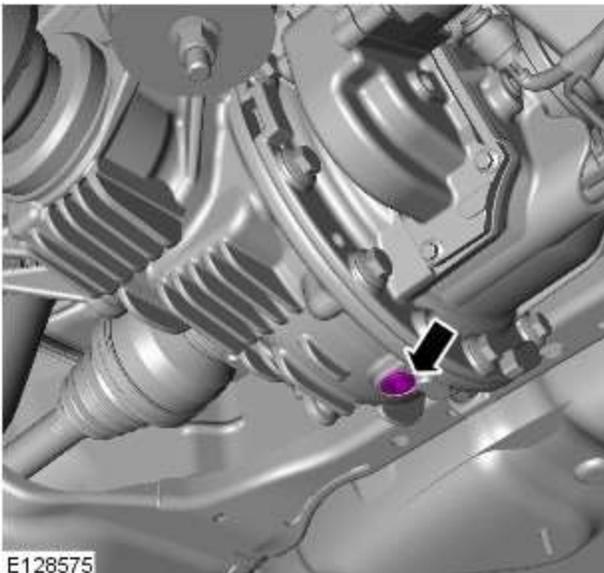
Raise and support the vehicle.



E128569

3.

- Clean the area around the lubricant filler plug.
- Position container to collect fluid loss.

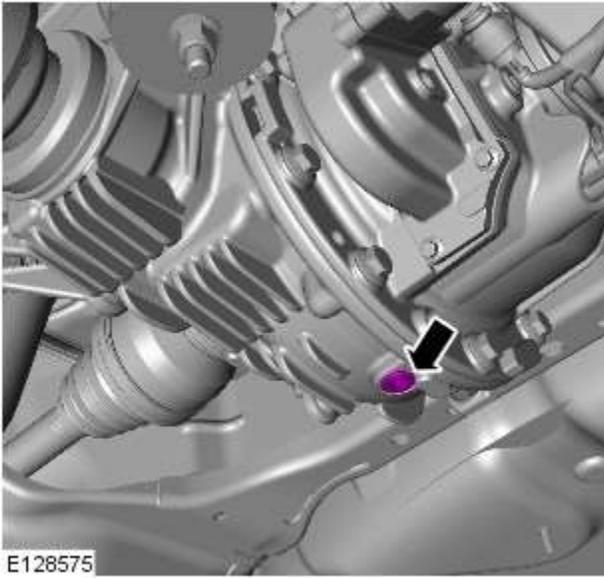


E128575

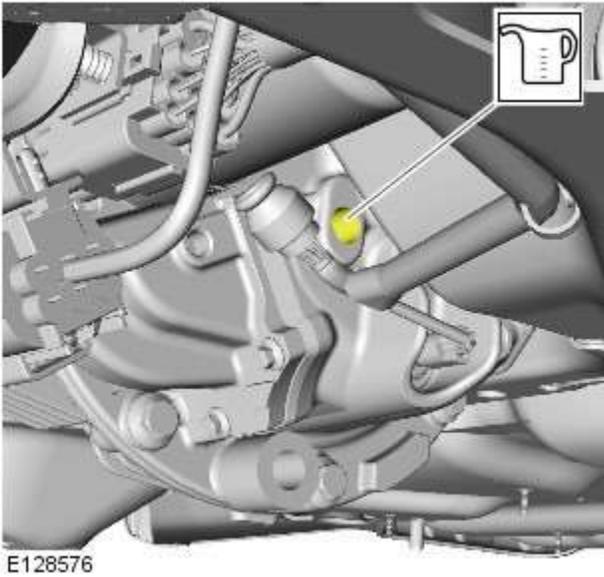
4.

- Clean the area around the drain plug.
- Remove the fluid drain plug.
- Drain the differential lubricant.

Adjustment



1.
 - Clean the drain plug.
 - **Torque:** 27 Nm

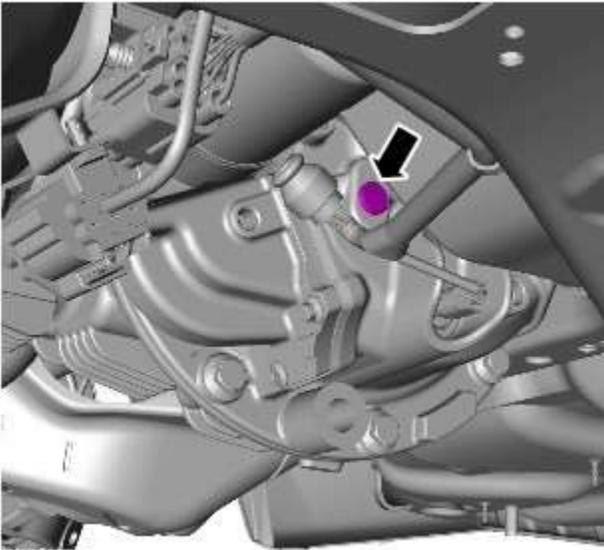


2. CAUTIONS:

 Do not fill the differential with lubricant up to the filler plug. The filler plug is only used to fill the differential with lubricant, and not to act as a level indicator.

 Make sure the correct specification and quantity of oil is used.

- Fill the differential with the correct amount of lubricant.



E128569

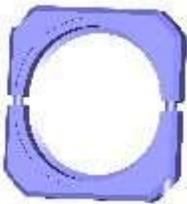
3.

- Clean the filler plug.
- **Torque:** 27 Nm

Rear Drive Axle/Differential - Differential Case TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Special Tool(s)

 <p>E117586</p>	<p>205-932 Remover, Driveshaft</p>
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Removal

All vehicles

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

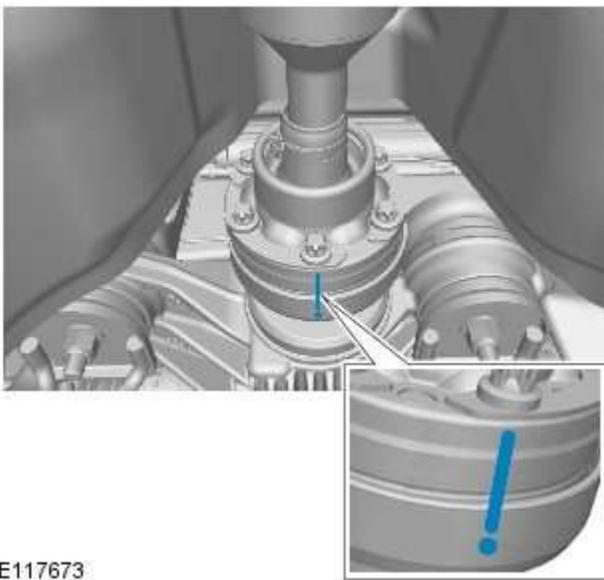
2. Refer to: [Rear Halfshaft - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-05 Rear Drive Halfshafts, Removal and Installation).
3. Refer to: [Exhaust System](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

4. CAUTIONS:

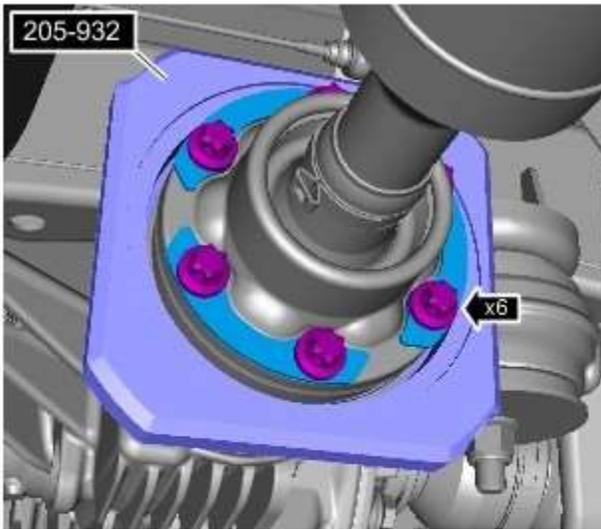
 Do not use the 5mm hole on the differential case flange for the alignment mark.

 Make sure that the driveshaft is supported with suitable retaining straps.

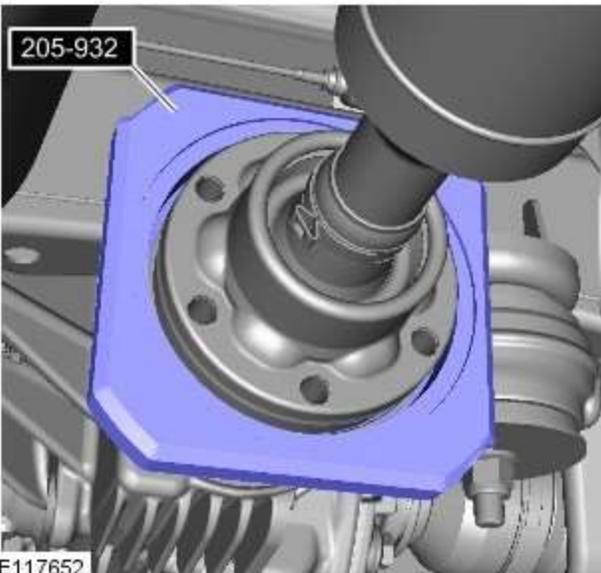
 **NOTE:** Using the 3mm hole on the differential case flange, paint an alignment mark (as indicated) to aid correct installation of the driveshaft to the differential case.



E117673



E117651



E117652

5. NOTES:



On vehicles with diesel engine, note the illustrated orientation of the special tool.



Make sure that the special tool is correctly installed to the recess on the driveshaft.

Special Tool(s): [205-932](#)

6.  CAUTION: Care must be taken not to damage the surrounding components when using the special tool.

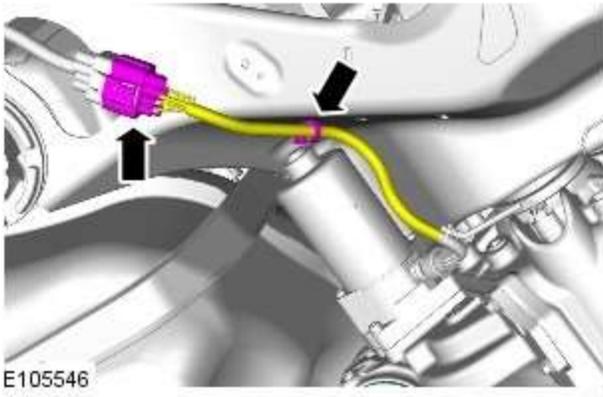


NOTE: Using a suitable hammer and drift, make sure that you only hit the corner edges of the special tool to remove the driveshaft.

Special Tool(s): [205-932](#)

Vehicles with supercharger

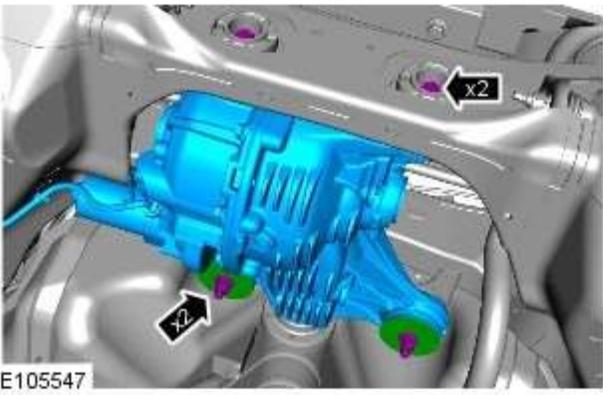
7.



All vehicles

8. Support the rear differential casing.

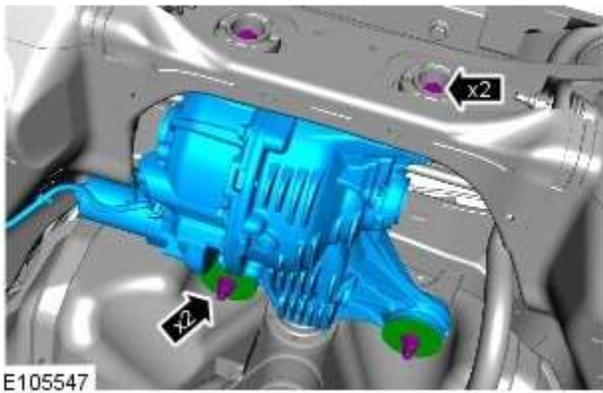
9.



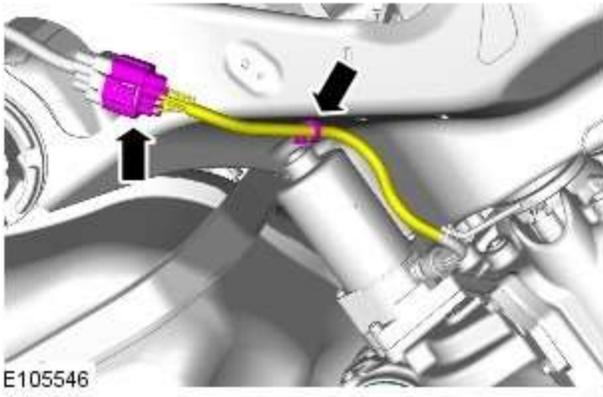
Installation

All vehicles

1. *Torque:*
M14 190 Nm
M12 90 Nm

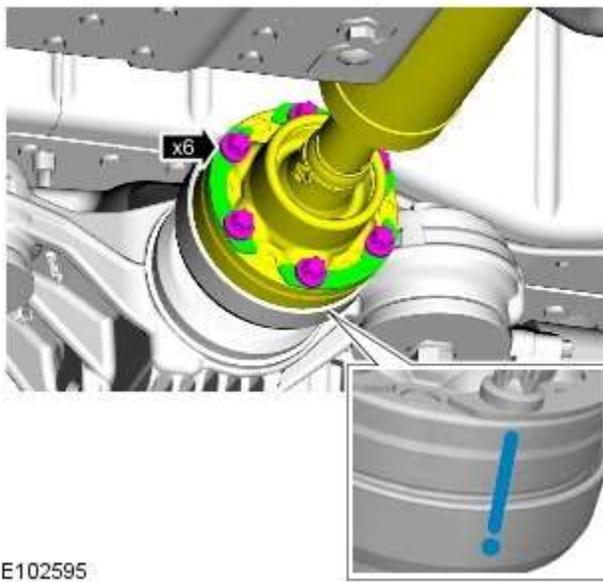


Vehicles with supercharger



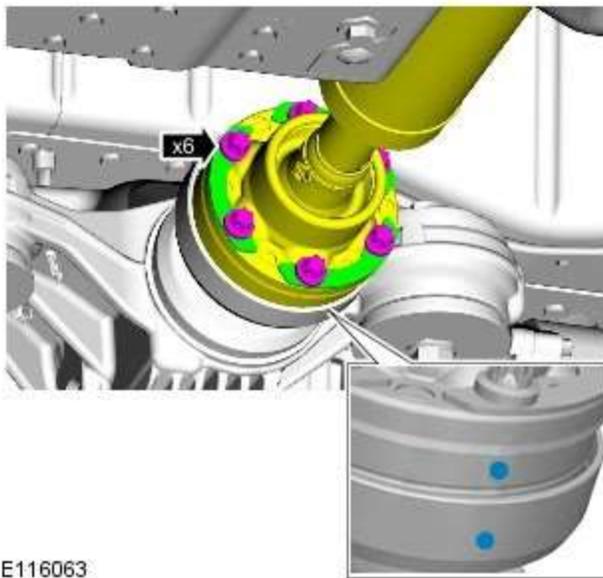
2.

All vehicles



3. NOTE: Make sure that the alignment mark on the driveshaft is correctly aligned to the alignment mark on the differential case.

Torque: 75 Nm



4. NOTES:

 This step only applies if a new driveshaft is being installed.

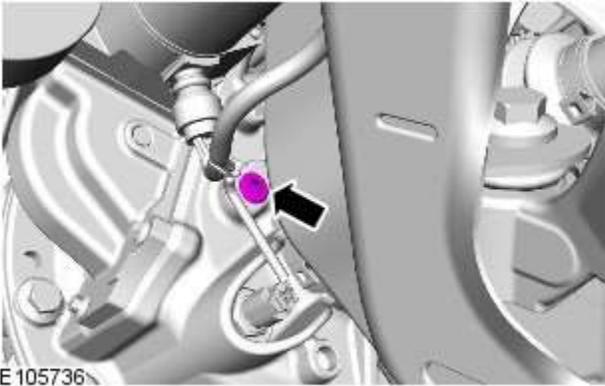
 Using the 3mm hole on the differential case flange and paint alignment mark on the driveshaft (as indicated). Make sure that the alignment marks are correctly aligned.

Torque: 75 Nm

5. Refer to: [Exhaust System](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
6. Refer to: [Rear Halfshaft - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-05 Rear Drive Halfshafts, Removal and Installation).

7. Check and top-up the differential case.

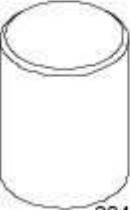
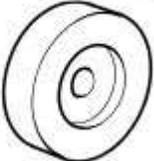
Torque: 30 Nm



Rear Drive Axle/Differential - Differential Front Bushing TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Special Tool(s)

 <p>204-274</p>	<p>204-274 Bush install and removal tool</p>
 <p>204-275</p>	<p>204-275 Bush install and removal tool</p>
 <p>204-335</p>	<p>204-335 Bush install and removal tool</p>
 <p>204-601 E 112037</p>	<p>204-601 Bush install tool</p>
 <p>E52717</p>	<p>303-1121 Installer, Crankshaft Seal</p>

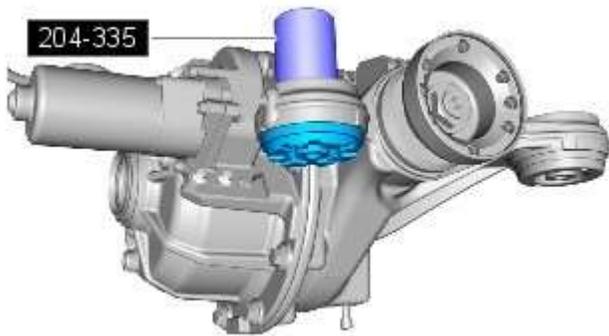
Removal

1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Refer to: [Differential Case - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-02 Rear Drive Axle/Differential, Removal and Installation).

3. *Special Tool(s)*: [204-335](#)



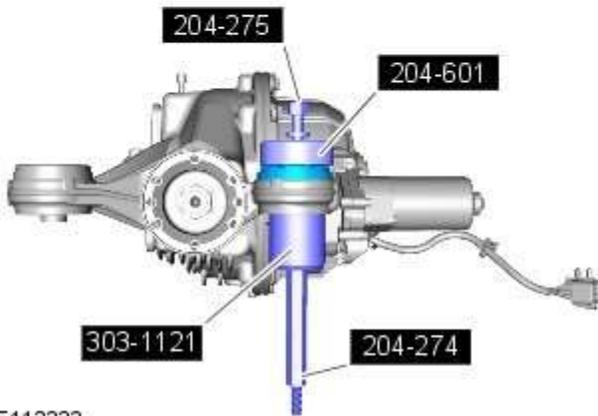
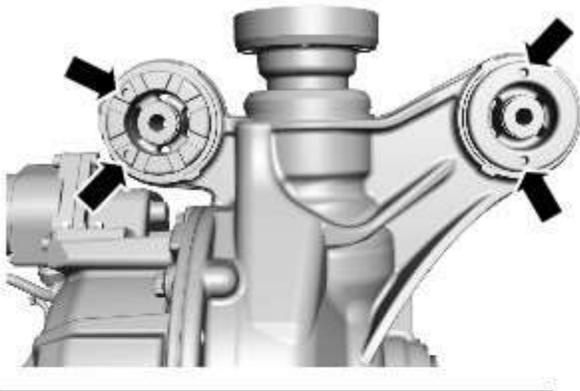
E112221

Installation



1. *NOTE*: Make sure the new bushes are installed in the correct orientation.

Special Tool(s): [204-275](#), [204-601](#), [303-1121](#), [204-274](#)



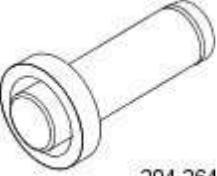
E112222

2. Refer to: [Differential Case - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-02 Rear Drive Axle/Differential, Removal and Installation).

Rear Drive Axle/Differential - Drive Pinion Seal

Removal and Installation

Special Tool(s)

 <p>204-264</p>	<p>204-264 Pinion Seal Replacer</p>
 <p>E117040</p>	<p>204-265 Remover/Installer, Drive Pinion Seal</p>
 <p>E117041</p>	<p>204-266 Adapter for 204-265</p>
 <p>E117042</p>	<p>204-267 Adapter for 204-265</p>
 <p>204-269</p>	<p>204-269 Flange remover forcing screw</p>
 <p>205-053</p> <p>E54574</p>	<p>205-053 Retainer, Drive Flange</p>



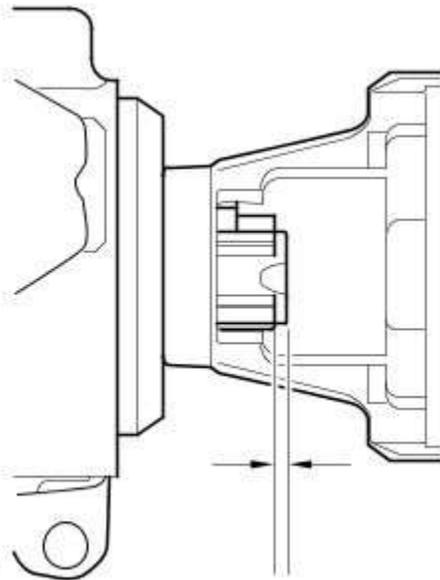
Removal



1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Refer to: Driveshaft - TD4 2.2L Diesel (205-01, Removal and Installation).
Refer to: [Driveshaft - V6 3.0L Petrol](#) (205-01 Driveshaft, Removal and Installation).
Refer to: [Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-01 Driveshaft, Removal and Installation).
Refer to: [Driveshaft - TDV6 3.0L Diesel](#) (205-01 Driveshaft, Removal and Installation).

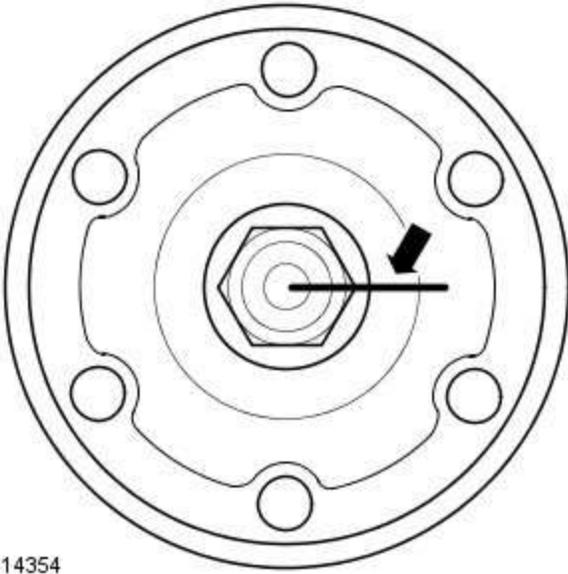


3.  **NOTE:** Measure for installation.

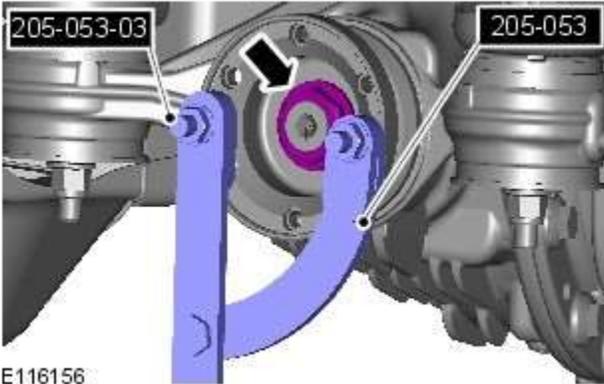
Measure the depth of the pinion nut on the pinion shaft.



- NOTE: Accurately scribe a line to mark the drive pinion shaft to the drive pinion nut and pinion flange.

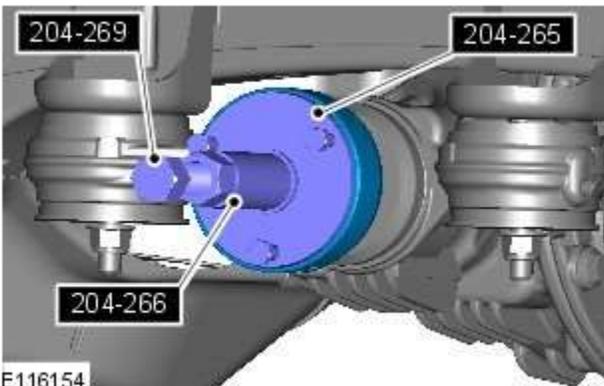


E114354



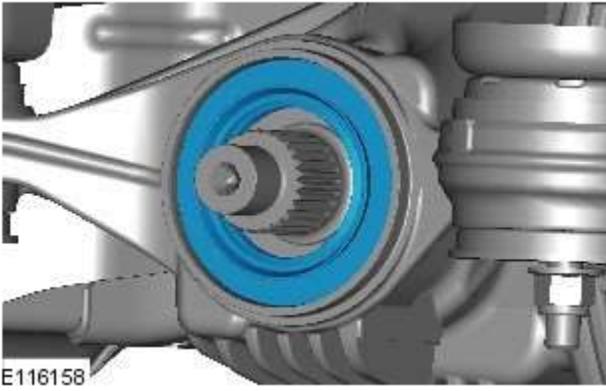
E116156

- Special Tool(s): [205-053](#), [205-053-03](#)



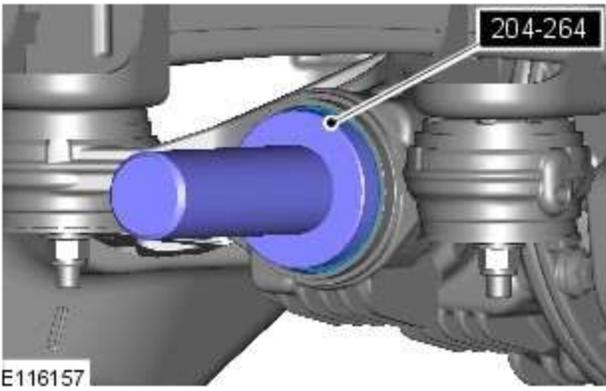
E116154

- Special Tool(s): [204-266](#), [204-265](#), [204-269](#)

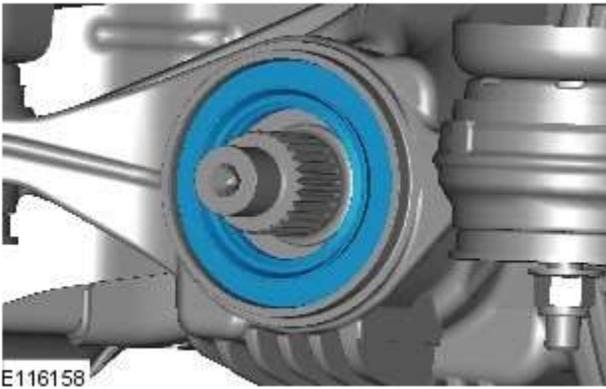


7.  NOTE: Be prepared to collect escaping fluid.

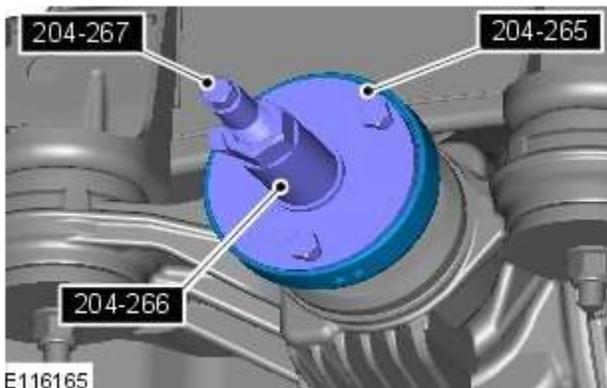
Installation



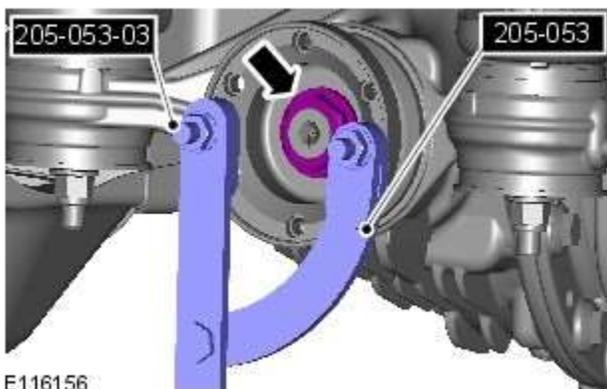
1. *Special Tool(s)*: [204-264](#)



- 2.



3. *Special Tool(s):* [204-267](#), [204-266](#), [204-265](#)



4. CAUTIONS:

 Make sure the drive pinion flange has no end float and is free to rotate.

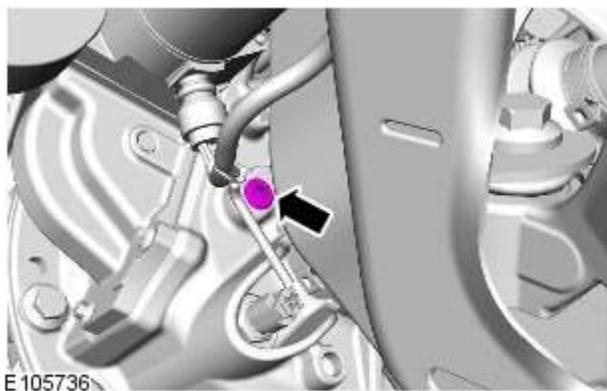
 Make sure that the drive pinion flange scribed mark is aligned and is never tightend short of the scribed mark on the drive pinion shaft and is no more than a maximum of 5 degrees past the scribed mark on the drive pinion shaft.

NOTES:

 Using the special tool, counter hold the drive pinion flange.

 Measure the depth of the pinion nut on the pinion shaft to previous noted depth.

Special Tool(s): [205-053](#), [205-053-03](#)



5. Check and top-up the differential case.

Torque: 34 Nm

6. Refer to: Driveshaft - TD4 2.2L Diesel (205-01, Removal and Installation).
 Refer to: [Driveshaft - V6 3.0L Petrol](#) (205-01 Driveshaft, Removal and Installation).
 Refer to: [Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-01 Driveshaft, Removal and Installation).
 Refer to: [Driveshaft - TDV6 3.0L Diesel](#) (205-01 Driveshaft, Removal and Installation).

Rear Drive Axle/Differential - Differential Locking Motor

Removal and Installation

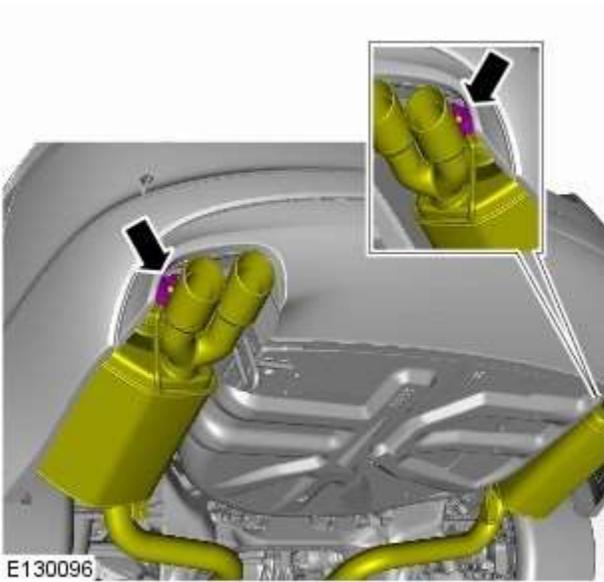
Removal



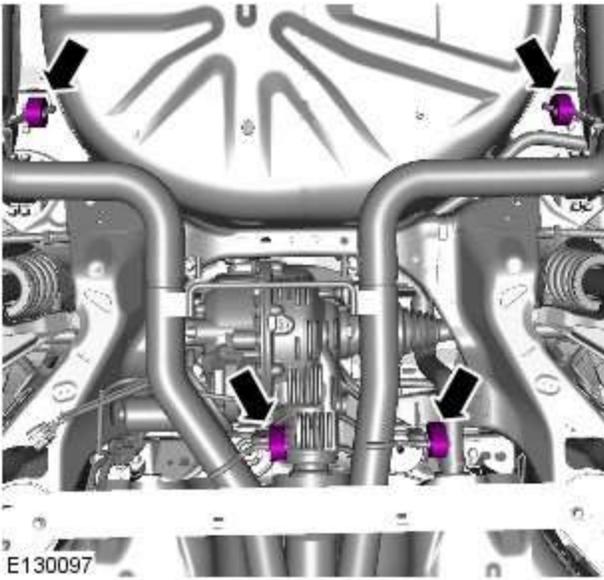
NOTE: Removal steps in this procedure may contain installation details.

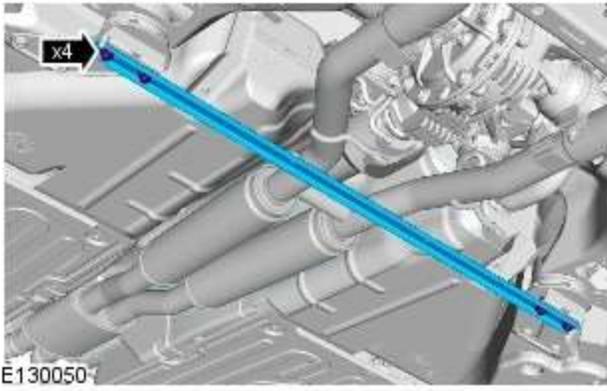
1. Refer to: [Differential Draining and Filling](#) (205-02 Rear Drive Axle/Differential, General Procedures).

2.

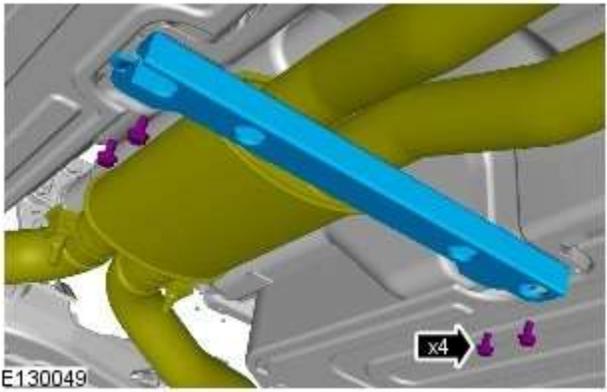


3.

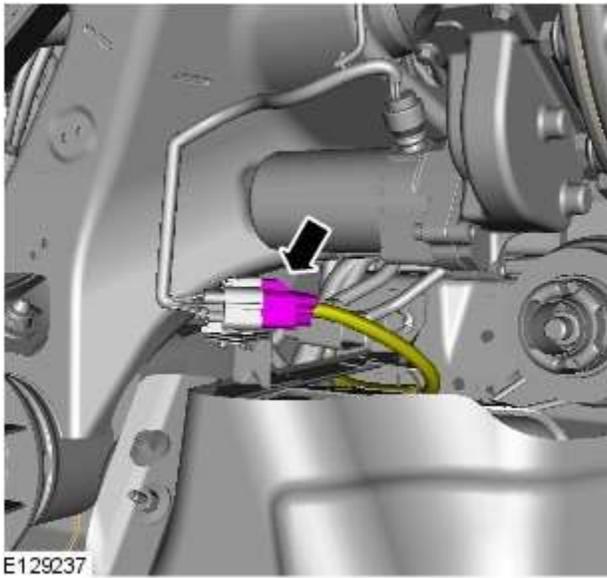




4.

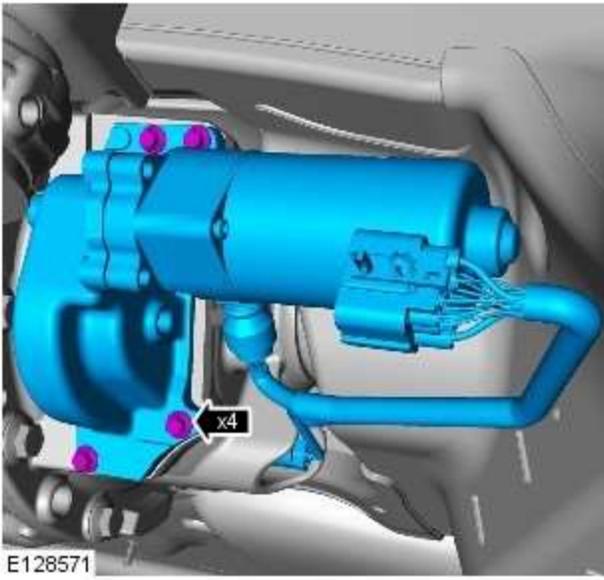


5.  CAUTION: Make sure that the exhaust system is supported with a suitable transmission stand.

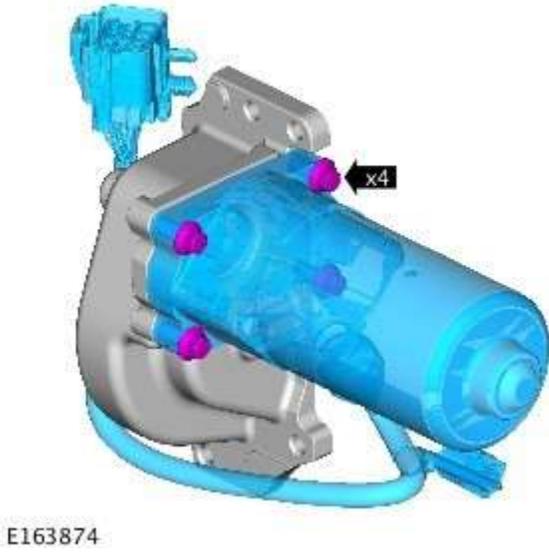


6.

7.

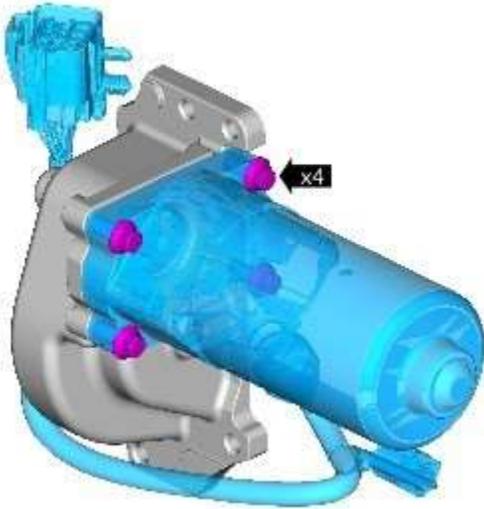


8.

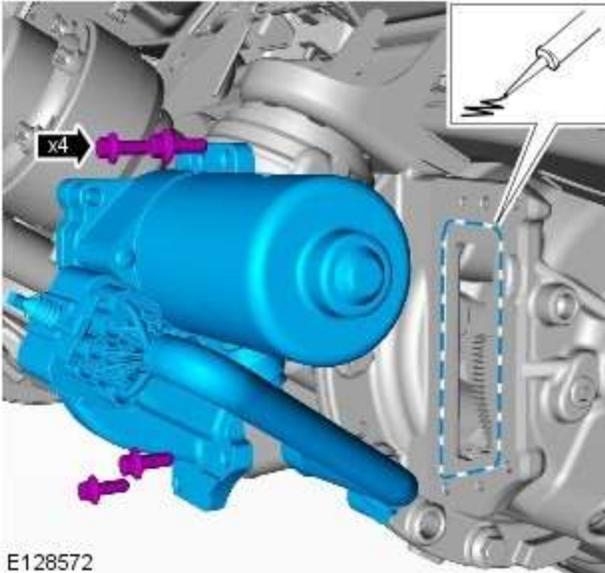


Installation

1. *Torque:* 11 Nm



E163874



E128572

2. CAUTIONS:



Make sure that the mating faces are clean and free of foreign material.

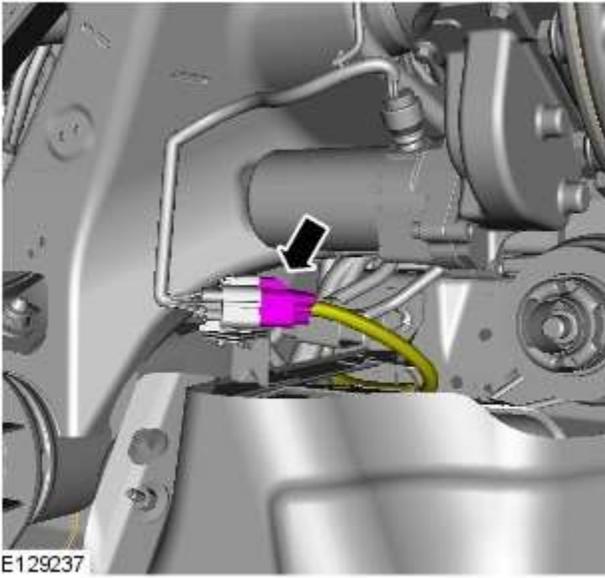


Apply a continuous bead of silicone gasket sealant (Loctite 5999) as shown on the illustration. The application of the sealant must be 4mm diameter. Install the component immediately after applying the sealant without smearing the sealant.



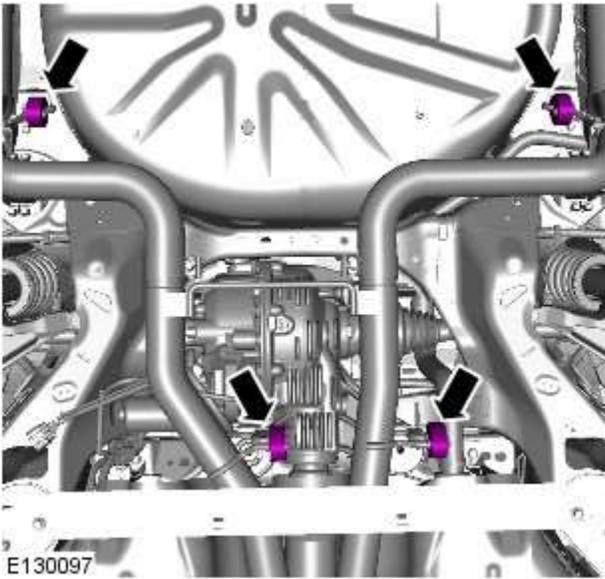
NOTE: New units must be configured using the Programmable Module Installation Routine in the diagnostic tool.

- *Torque:* 11 Nm
- Apply a suitable amount of approved sealant to one of the mating faces.



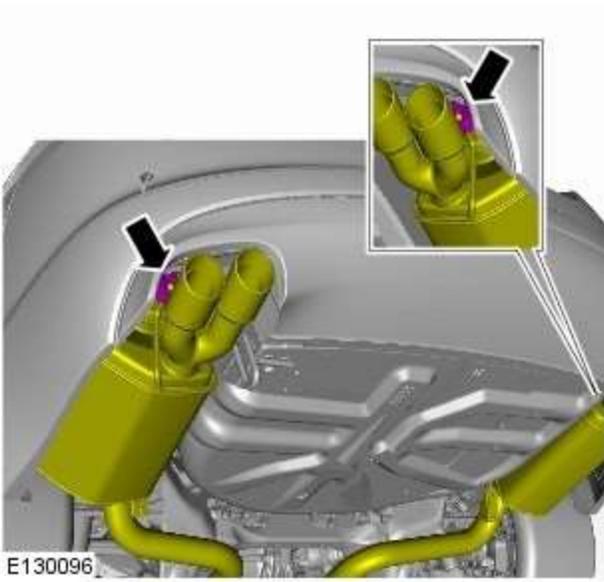
3.

4. Refer to: [Differential Draining and Filling](#) (205-02 Rear Drive Axle/Differential, General Procedures).

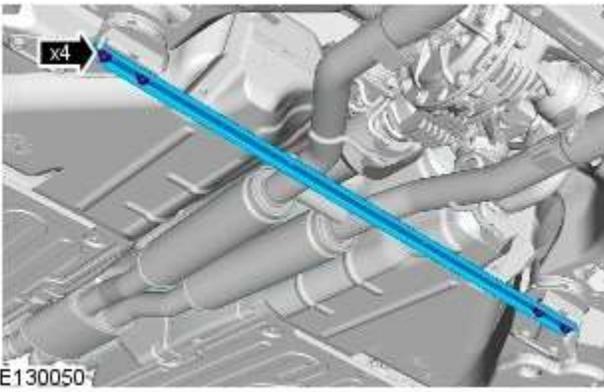


5.

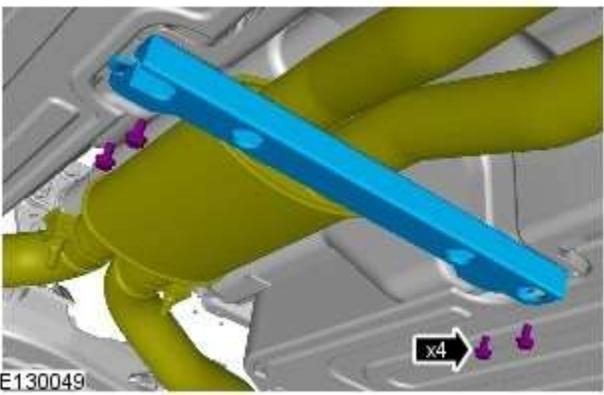
6.



7. *Torque: 62 Nm*



8. *Torque: 25 Nm*



Rear Drive Halfshafts -

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Constant velocity (CV) grease	Optimal LN 584 LO

Fill Capacities

Description	Grams
Grease for inner CV joint - all vehicles	140
Grease for outer CV joint - all vehicles	125

Torque Specifications



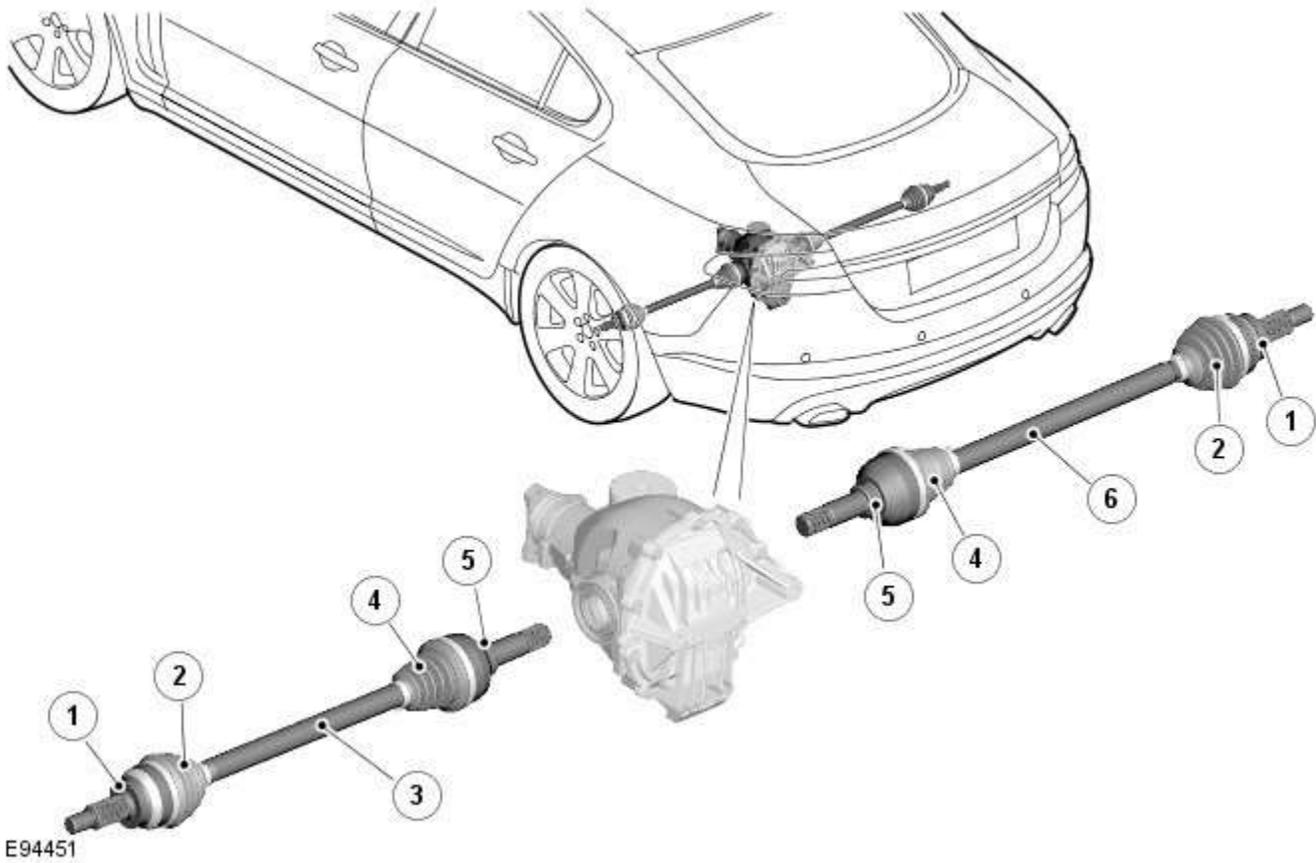
NOTE: Make sure that a new nut is installed.

Item	Nm	lb-ft	lb-in
Halfshaft outer constant velocity joint retaining nut	300	221	-

Rear Drive Halfshafts - Rear Drive Halfshafts - Component Location

Description and Operation

Component Location



Item	Description
1	Outer constant velocity joint
2	Outer constant velocity joint gaiter
3	Left hand halfshaft
4	Inner constant velocity joint gaiter
5	Inner constant velocity joint
6	Right hand halfshaft

Rear Drive Halfshafts - Rear Drive Halfshafts - Overview

Description and Operation

Overview

The CV (constant velocity) joint at each end of the halfshafts meets the angle change requirements due to suspension deflection. The plunge capability of the CV joint accommodates the length change.

Rear Drive Halfshafts - Rear Drive Halfshafts - System Operation and Component Description

Description and Operation

System Operation

Component Description

Rear Drive Halfshafts

The solid-steel halfshafts are of unequal length, with each halfshaft comprising inner and outer CV (constant velocity) joints. The CV joints are the 'ball and socket' type packed with grease and protected by gaiters.

The outer CV joint is an interference fit into the wheel hub and secured by a locking nut. The inner CV joint is a slide fit and is retained in the differential with a spring clip.

Rear Drive Halfshafts - Rear Drive Halfshafts

Diagnosis and Testing

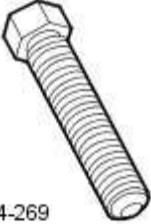
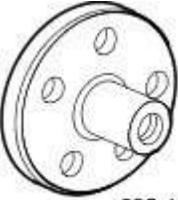
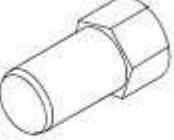
For additional information.

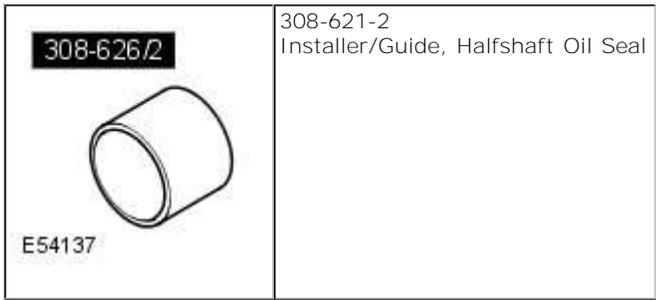
REFER to: [Driveline System](#) (205-00 Driveline System - General Information, Diagnosis and Testing).

Rear Drive Halfshafts - Rear Halfshaft TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Special Tool(s)

 <p>100-012</p> <p>E54135</p>	<p>100-012 Slide Hammer</p>
 <p>204-269</p>	<p>204-269 Flange remover forcing screw</p>
 <p>205-491</p>	<p>205-491 Hub puller</p>
 <p>20549101</p>	<p>205-491-1 Adapter nuts</p>
 <p>308-005</p> <p>E54134</p>	<p>308-005 Remover, Axle oil seal</p>
 <p>308-626/1</p> <p>E54136</p>	<p>308-621-1 Installer, Halfshaft Oil Seal</p>



Removal

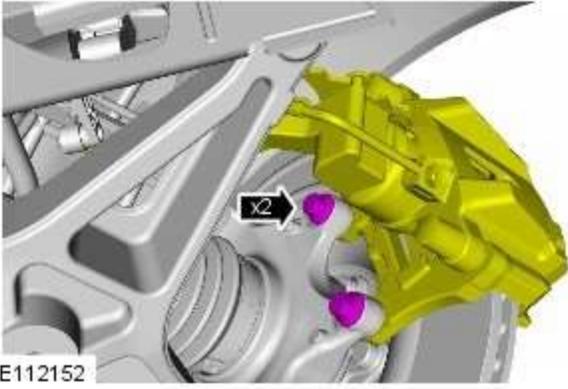


1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
Raise and support the vehicle.
2. Remove the LH rear wheel and tire.

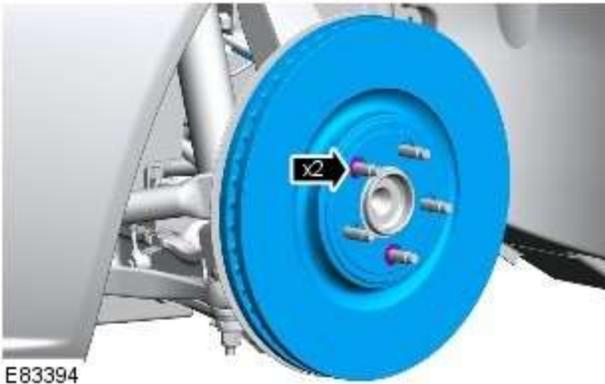
Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).



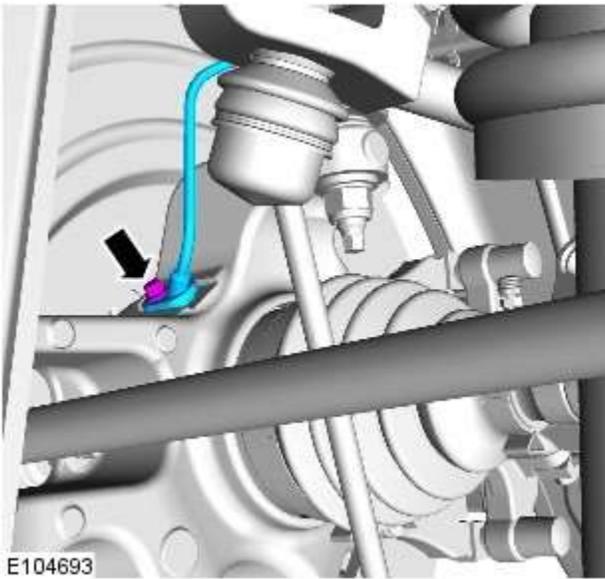
3. With assistance, remove the halfshaft retaining nut, and retain it for the install procedure.



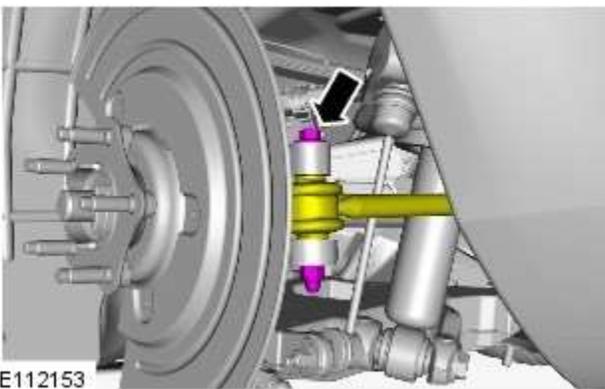
4. Release the brake caliper.



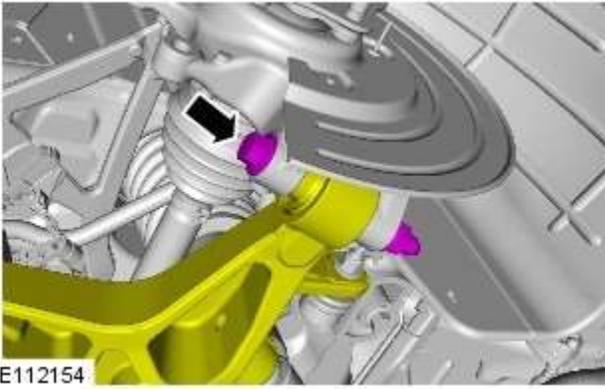
5. Remove the rear brake disc.



6. Remove the wheel speed sensor.



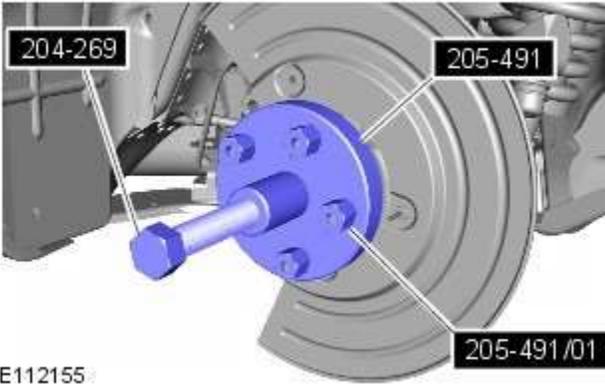
7. Disconnect the toe link.



E112154

8.

Release the lower arm.



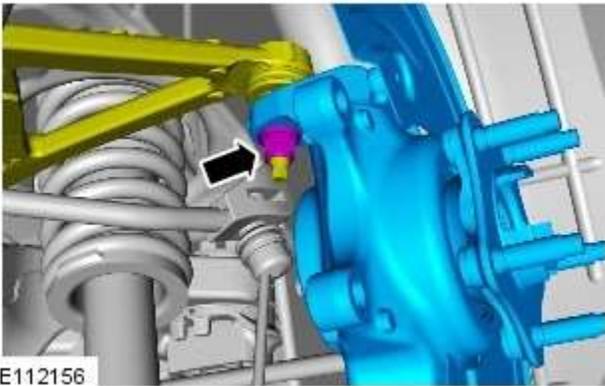
E112155

9.

 **CAUTION:** Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

Using the special tools, release the halfshaft from the drive flange.

Special Tool(s): [204-269](#), [205-491-1](#), [205-491](#)



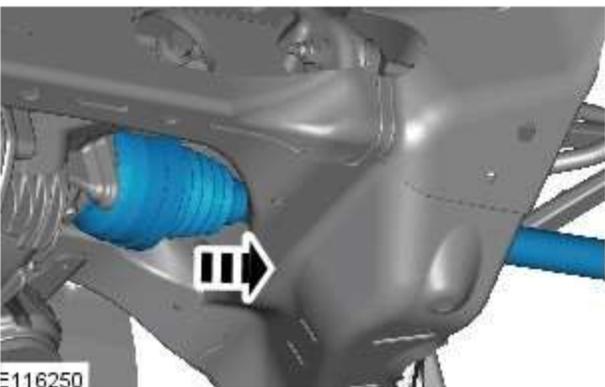
E112156

10.

 **NOTE:** Use an additional wrench to prevent the component from rotating.

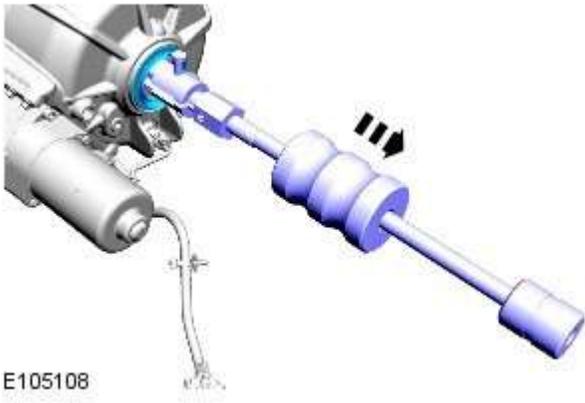
Remove the wheel knuckle.

Release the halfshaft from the differential.



E116250

11.



12. Remove and discard the halfshaft oil seal.

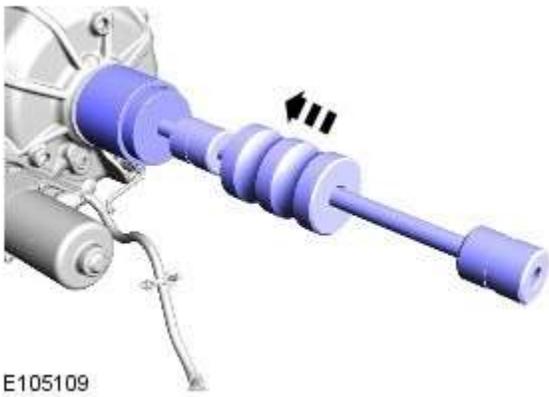
Special Tool(s): [100-012](#), [308-005](#)

13. Remove and discard the circlip.



Installation

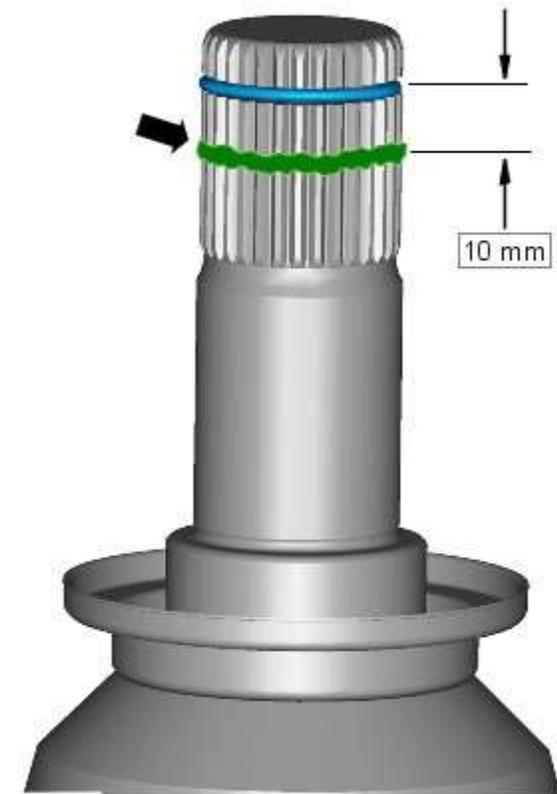
1. Clean the components mating faces.



E105109

- Using the special tool, install a new halfshaft oil seal.

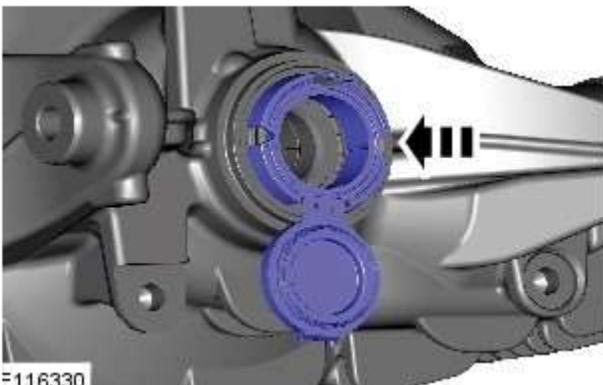
Special Tool(s): [100-012](#), [308-621-1](#), [308-621-2](#)



E116329

-  CAUTION: Use Loctite WSK-M2G349-A4 or equivalent, meeting the Jaguar specification.

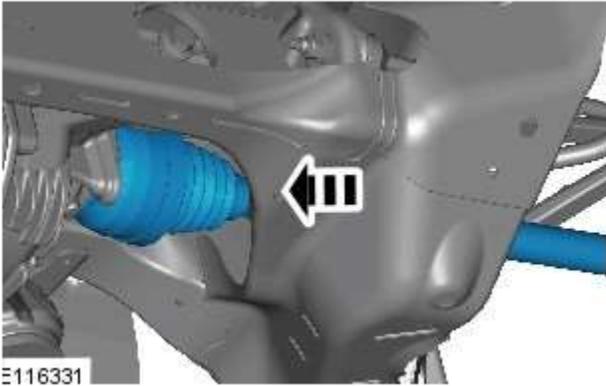
Install a new circlip.



E116330

-  CAUTION: The halfshaft oil seal protector must be left in place, until the halfshaft is fully installed.

Install the halfshaft oil seal protector.

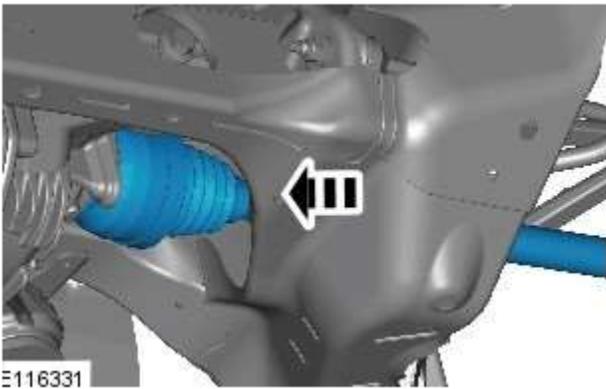


5. CAUTIONS:

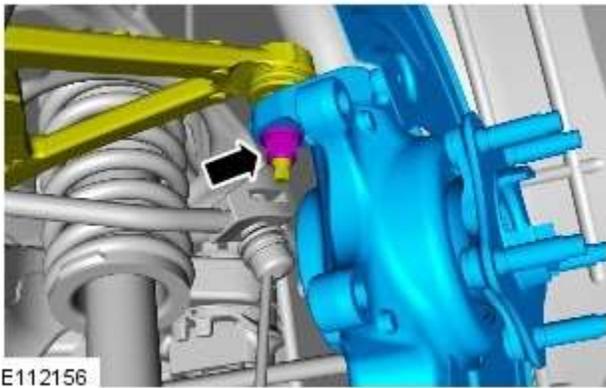
 Do not install the rear halfshaft fully at this stage.

 Only install the rear halfshaft until the halfshaft splines have past the halfshaft oil seal.

6. Remove and discard the halfshaft oil seal protector.



7. CAUTION: Make sure that the rear halfshaft circlip is installed correctly by pulling the halfshaft gently to make sure it is engaged.



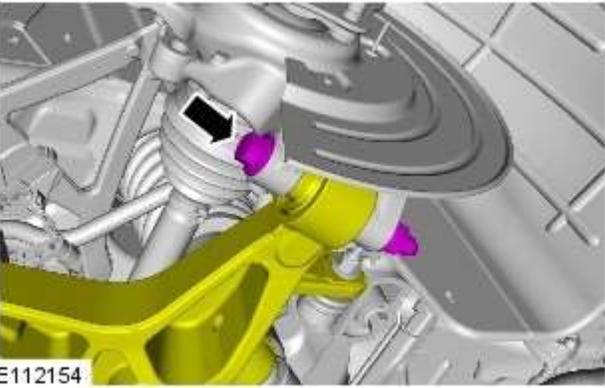
8.  CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

Torque: 90 Nm



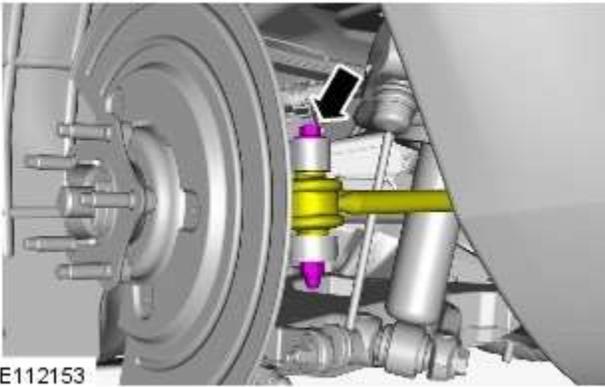
9.  CAUTION: Install the halfshaft nut finger tight.

 NOTE: Do not fully tighten the locking nut at this stage.



10.  CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

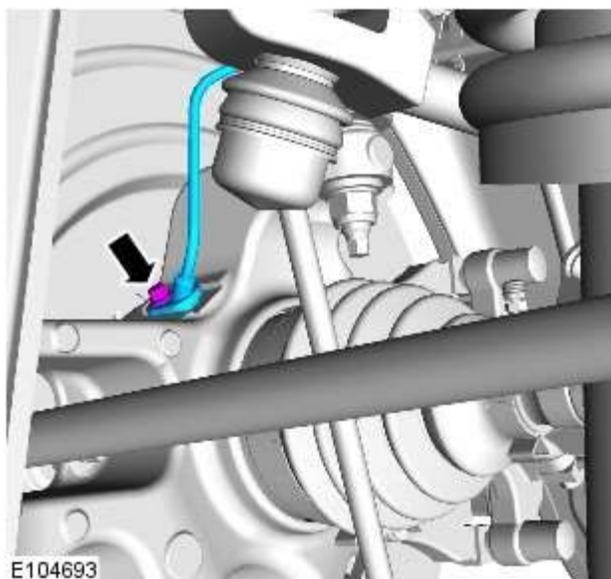
Torque: 150 Nm



11.  CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

Torque: 55 Nm

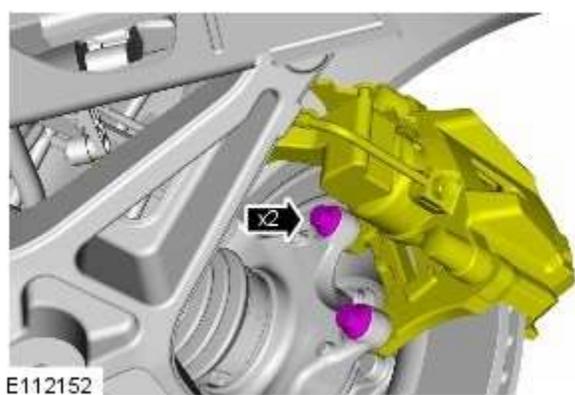
12. *Torque:* 6 Nm



13. Install the brake disc.



14. *Torque:* 103 Nm

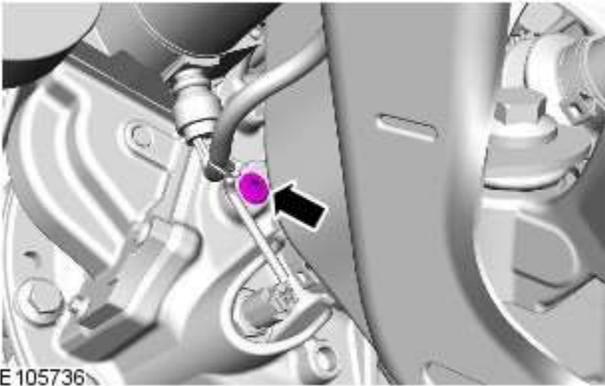




E112151

15.  CAUTION: Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

Torque: 300 Nm



E 105736

16. Check and top-up the differential case.

17. Install the LH rear wheel and tire.

Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

Rear Drive Halfshafts - Inner Constant Velocity (CV) Joint Boot

Removal and Installation

Removal

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the rear halfshaft.
For additional information, refer to: [Rear Halfshaft - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-05 Rear Drive Halfshafts, Removal and Installation).

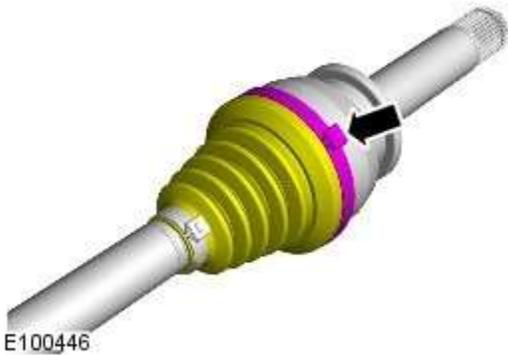


3. **CAUTION:** Use suitable protective covers to protect the halfshaft.

Using a suitable clamp, secure the rear halfshaft.

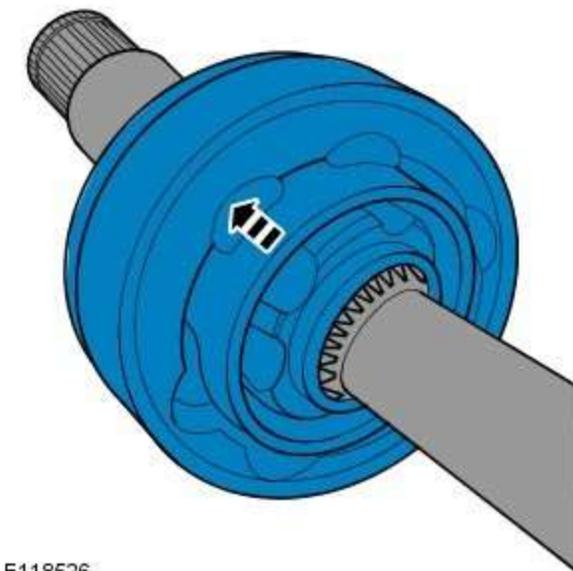
4.  **CAUTION:** Make sure the inner constant velocity (CV) joint is not separated from the halfshaft.

Remove and discard the inner CV joint boot retaining clip.

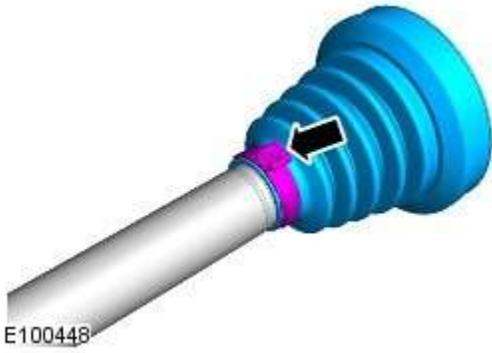


5.  **CAUTION:** Make sure the CV joint ball bearings do not drop out of the CV joint.

Using a suitable tool, remove the inner CV joint.



6. Remove the inner CV joint boot.
 - Remove and discard the retaining clip.

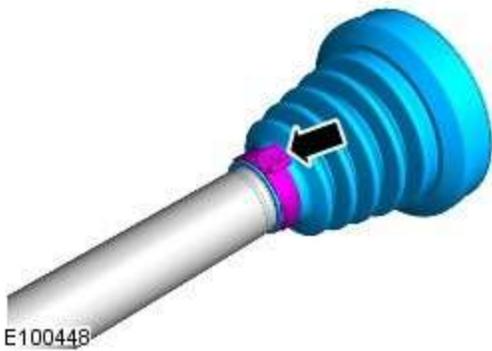


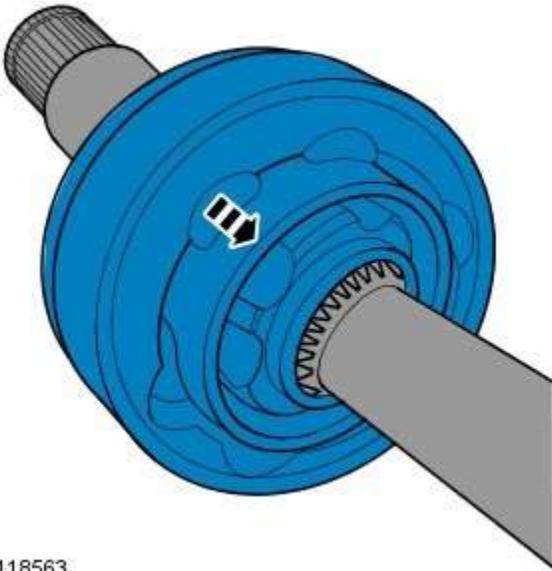
Installation

1.  NOTE: Make sure that the protective sleeve is correctly installed, prior to installing the CV joint boot.



2.  NOTE: Install a new retaining clip.





E118563

3. CAUTIONS:

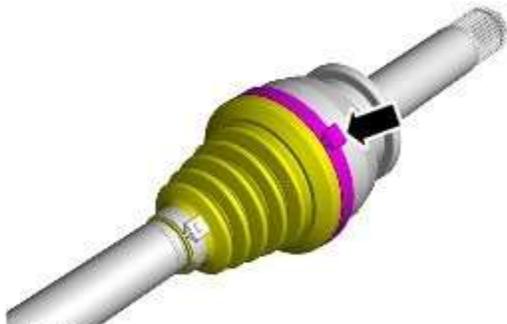
 Only use lubricants meeting the Jaguar specification.

 Make sure the CV joint ball bearings do not drop out of the CV joint.

 NOTE: Clean the constant velocity (CV) joint, removing as much of the old grease as possible.

Install the inner CV joint.

- Fill the CV joint with 40 grams of grease.
- Fill the CV joint boot with 100 grams of grease.



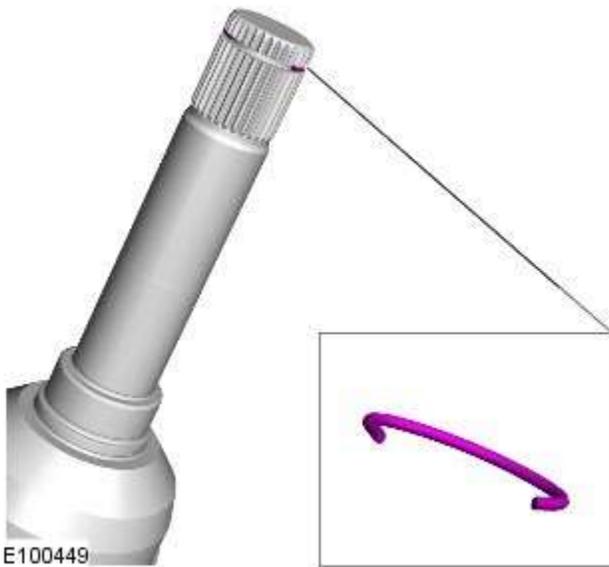
E100446

4. CAUTIONS:

 Make sure the CV joint is not separated from the halfshaft.

 Make sure enough air is present in the CV boot.

Install a new retaining clip.



E100449

5. Install a new retaining clip.

6. Remove the rear halfshaft from the clamp.

7. Install the rear halfshaft.
For additional information, refer to: [Rear Halfshaft - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-05 Rear Drive Halfshafts, Removal and Installation).

Rear Drive Halfshafts - Outer Constant Velocity (CV) Joint Boot

Removal and Installation

Removal

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2.

3. For additional information, refer to: [Inner Constant Velocity \(CV\) Joint Boot](#) (205-05 Rear Drive Halfshafts, Removal and Installation).

4.



E118528

5.



E118524

6.  **CAUTION:** Make sure the CV joint ball bearings do not drop out of

the CV joint.

 NOTE: Clean the constant velocity (CV) joint, removing as much of the old grease as possible.

Installation

-  CAUTION: Only use lubricants meeting the Jaguar specification.

 NOTE: Make sure that the protective sleeve is correctly installed, prior to installing the CV joint boot.

- Fill the CV joint with 50 grams of grease.
- Fill the CV joint boot with 85 grams of grease.



E118459

-  CAUTION: Make sure enough air is present in the CV boot.

 NOTE: Install new retaining clips.



E118528