Published: Jan 5, 2009

Specifications

General Specifications

Item	Specification
Clear Vision	
Clear vision (negative value is counterclockwise)	0° ± 3°
Ride Height	
Front	371 mm ± 15 mm
Rear	370 mm ± 15 mm
Ball Joint Radial Play	
Lower ball joint — maximum	0.8 mm

Wheel Alignment - Front

2001.50 MY onwards VIN - C00344 to Current				
Item		**LH**	**RH**	**Split LH-RH**
Castor	Decimal degrees	2.25° ± 0.75°	2.25° ± 0.75°	0° ± 0.75°
	Degrees/minutes	2° 15' ± 45'	2° 15' ± 45'	0° ± 45'
Camber	Decimal degrees	-0.54° ± 0.75°	-0.54° ± 0.75°	0° ± 0.75°
	Degrees/minutes	-0° 32' ± 45'	-0° 32' ± 45'	0° ± 45'
Total toe	Decimal degrees	-0.1° ± 0.20°		
	Degrees/minutes	-0° 6' ± 12'		

Wheel Alignment - Rear

2001.50 MY onwards VIN - C00344 to Current			
Item		**LH**	**RH**
Camber	Decimal degrees	-0.70° ± 0.75°	-0.70° ± 0.75°
	Degrees/minutes	-0° 42' ± 45'	-0° 42' ± 45'
Toe	Decimal degrees	0.125° ± 0.14°	0.125° ± 0.14°
	Degrees/minutes	0° 8' ± 8'	0° 8' ± 8'
Total toe	Decimal degrees	0.25° ± 0.20°	
	Degrees/minutes	0° 15' ± 12'	
Rear thrust angle	Decimal degrees	0° ± 0.14°	
	Degrees/minutes	0° ± 8'	

- All the above figures are measured at "kerb" height -all fluids at full and a full fuel tank.
- Tires must be inflated to normal pressure
- Rear thrust angle = (LH toe - RH toe) ÷ 2
- Ride height is measured from the centre of the wheel to the apex of the wheel arch, through the wheel centre line.

General Specifications

Item	Specification
Crabbing — maximum (centerline of front tires compared to centerline of rear tires)	0°
Ride Height	
Front	376mm
Rear	379mm
Ball Joint Radial Play	
Lower ball joint — maximum	0.8 mm (1/32 in.)
Vehicle Lean (Side-to-Side Height Differences)	
Front wheel opening difference — maximum	12 mm (0.5 in.)
Rear wheel opening difference — maximum	0.25 mm (0.01 in.)
Vehicle Attitude (Front-to-Rear Height Difference)	
Maximum vehicle attitude = average front - average rear	14.5 mm (0.6 in.)

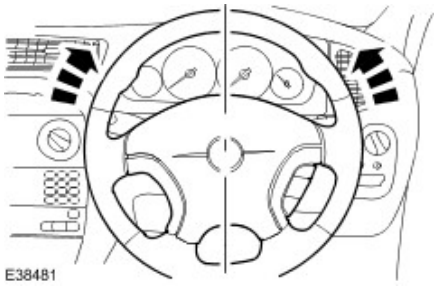
Published: Jul 3, 2002

Front Toe Adjustment (57.65.01)

NOTE:

The checking and subsequent adjustment of the front toe setting should be carried out on a flat surface and in accordance with the manufactures instructions for the wheel alignment equipment used.

1. Start the engine and centralize the steering wheel.



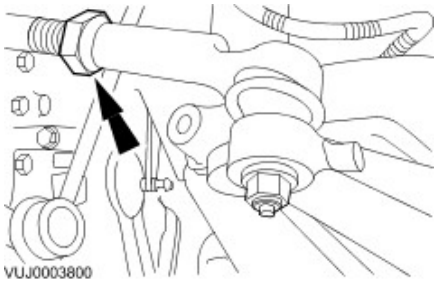
2. Turn the engine off, and hold the steering wheel in the 'straight ahead' position by attaching a rigid link from the steering wheel to the brake pedal.

3. Using suitable four wheel alignment equipment, check the toe setting.

4. **NOTE:**

Right-hand shown, left-hand similar.

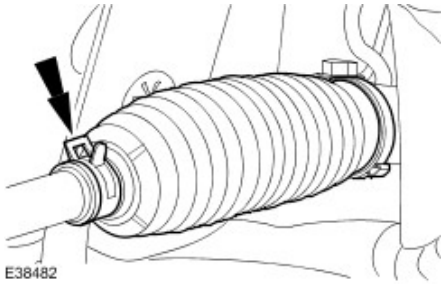
Loosen the tie rod end locknuts.



5. **NOTE:**

Right-hand shown, left-hand similar.

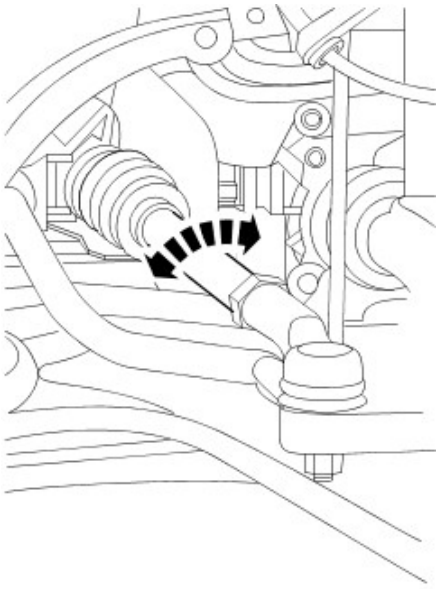
Reposition the steering gear boot outer clamps.



6. **NOTE:**

Right-hand shown, left-hand similar.

Rotate the tie-rods an equal amount in either a clockwise or a counterclockwise direction to adjust the toe setting.

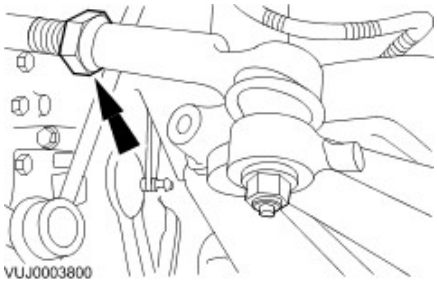


E38483

7. **NOTE:**
   Right-hand shown, left-hand similar.

Tighten the tie-rod end locknuts.

- Tighten to 40 Nm.



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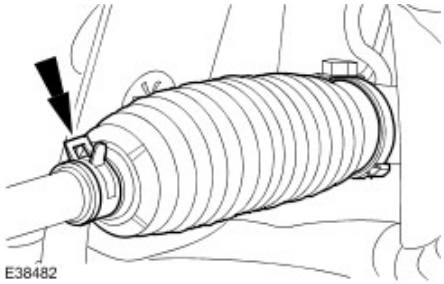
8. **NOTE:**
   Right-hand shown, left-hand similar.

Reposition the steering gear boot outer clamps.



E38482

9. Check the toe setting.

Published: Jun 24, 2003

Rear Toe Adjustment (57.65.08)

NOTE:

The checking and subsequent adjustment of the rear toe setting should be carried out on a flat surface and in accordance with the manufactures instructions for the wheel alignment equipment used.

1. **NOTE:**

   Final tightening of the rear suspension components should be carried out when the vehicle weight is on the road wheels.

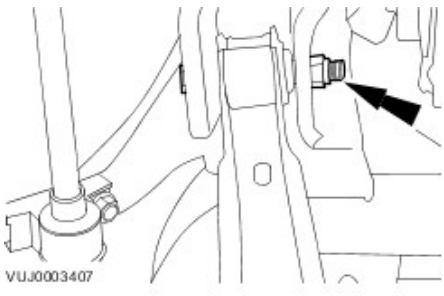
Using suitable four wheel alignment equipment, check the toe setting.

2. Raise and support the vehicle. <<100-02>>

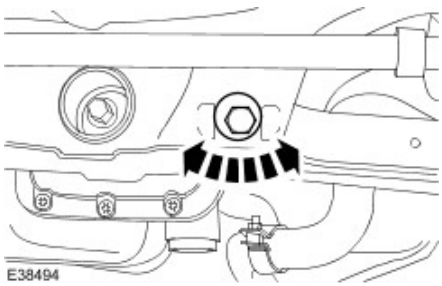
3. **NOTE:**

   Left-hand shown, right-hand similar.

Loosen the rear lower arm cam bolt nuts.



4. Rotate the the cam bolts equal amounts, in either a clockwise or a counterclockwise direction, to adjust the toe setting.



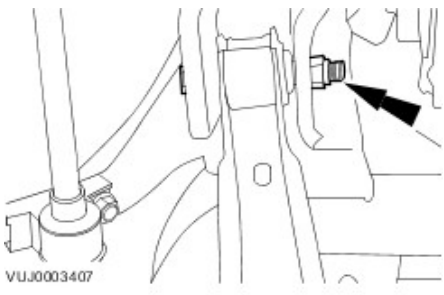
5.

CAUTION: The final tightening of the suspension components should be carried out with the vehicle on its wheels. Failure to follow this instruction may result in damage to the vehicle.

NOTE:

Left-hand shown, right-hand similar.

Tighten the rear lower arm cam bolt nuts.



6. Lower the vehicle.

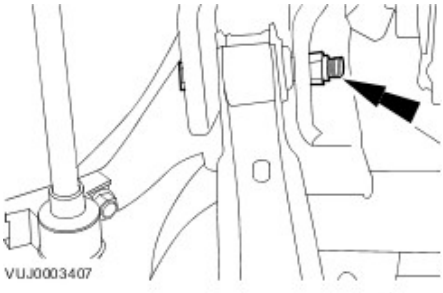
- Bounce the vehicle to make sure that the suspension is in its normal resting position.

7. **NOTE:**

   Left-hand shown, right-hand similar.

Tighten the rear lower arm cam bolt nuts.

- Tighten to 115 Nm.



Published: Jan 29, 2002

Wheel Bearing Inspection

1. Raise and support the vehicle. For additional information, refer to <<100-02>> .

2. **NOTE:**
   Make sure the wheel rotates freely and the brake pads are retracted sufficiently to allow movement of the wheel and tire.

Firmly hold the tire at the top and bottom and move the wheel inward and outward while lifting the weight of the wheel and tire off the wheel bearing.

3. If the wheel and tire is loose on the wheel hub assembly or does not rotate freely, install a new front or rear wheel bearing as necessary. For additional information, refer to <<204-01>> or <<204-02>> .

Published: Oct 24, 2001

Wheel Alignment Angles

Toe is adjustable on the front and rear suspension system. The front toe is adjusted by use of the front tie-rod. The rear toe is adjusted by the use of cam bolts in the lower control arm to the rear crossmember.

Toe

Positive Toe (Toe-In)

VUJ0002674

Negative Toe (Toe-Out)

VUJ0002673

The vehicle toe setting:

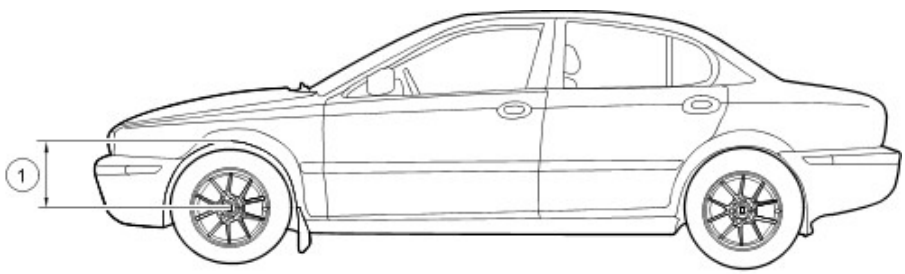
- Affects tire wear and directional stability.

Ride Height

NOTE:

All ride height measurements are carried out with vehicle empty and 9 litres of fuel in the tank (showroom condition).

Front Ride Height Measurement



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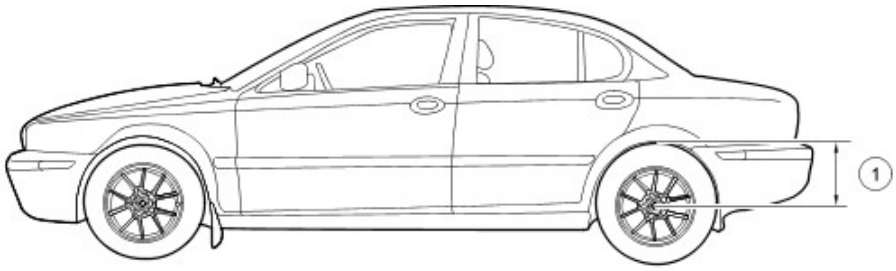
Item	Description
1	Front ride height measurement

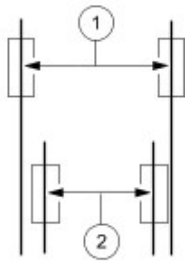
Rear Ride Height Measurement



VUJ0002676

Item	Description
1	Rear ride height measurement

Wheel Track



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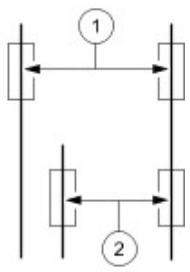
Item	Description
1	Front track
2	Rear track

Crabbing



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Item	Description
1	Front track
2	Rear track crabbing

Crabbing is the condition in which the independent rear suspension (IRS) system is not square to the chassis. Heavily crowned roads can give the illusion of crabbing.

Wander

Wander is the tendency of the vehicle to require frequent, random left and right steering wheel corrections to maintain a straight path down a level road.

Shimmy

Shimmy, as observed by the driver, is large, consistent, rotational oscillations of the steering wheel resulting from large, side-to-side (lateral) tire/wheel movements.

Shimmy is usually experienced near 40 miles/hour (64 km/h), and can start or be amplified when the tire contacts pot holes or irregularities in the road surface.

Nibble

Sometimes confused with shimmy, nibble is a condition resulting from tire interaction with various road surfaces and observed by the driver as small rotational oscillations of the steering wheel.

Poor Returnability of the Steering

Poor returnability of the steering is used to descr be the poor return of the steering wheel to center after a turn or the steering correction is completed.

Drift/Pull

Pull is a tugging sensation, felt by the hands on the steering wheel, that must be overcome to keep the vehicle going straight.

Drift describes what a vehicle with this condition does with hands off the steering wheel.

- A vehicle-related drift/pull, on a flat road, will cause a consistent deviation from the straight-ahead path and require constant steering input in the opposite direction to counteract the effect.
- Drift/pull may be induced by conditions external to the vehicle (i.e., wind, road crown).

Vague On-Center Feel

Vague on-center feel is characterized by little or no build up of turning effort felt in the steering wheel as the wheel is rocked slowly left and right within very small turns around center or straight-ahead (under 20 degrees of steering wheel turn). Efforts may be said to be "flat on center."

- In the diagnosis of a road ability problem, it is important to understand the difference between wander and vague on-center feel.

Published: Mar 29, 2001

Suspension System

Inspection and Verification

1 . Verify the customer's concern by carrying out a road test on a smooth road. If any vibrations are apparent, refer to <<100-04>>.

2 . Visually inspect for obvious signs of mechanical damage.

Visual Inspection Chart

Mechanical
• Damaged tires • Wheel bearing(s) • Loose or damaged front or rear suspension components • Loose, damaged or missing suspension retainer(s) • Incorrect spring usage • Damaged or sagging spring(s) • Damaged or leaking shock absorber(s) • Damaged or leaking strut(s) • Worn or damaged suspension bushing(s) • Loose, worn or damaged steering system components • Damaged axle components

1 . If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the next step.

2 . If the fault is not visually evident, verify the symptom and refer to the following Symptom Chart.

Symptom Chart

Crabbing

Possible Source(s):

- Incorrect rear thrust angle.

  Action(s) to take:

  - CHECK the rear subframe alignment. For additional information, refer to<<502-00>>.

Possible Source(s):

- Front or rear suspension components.

  Action(s) to take:

  - INSPECT the front and rear suspension systems. REPAIR or INSTALL new suspension components as necessary. For additional information, refer to<<204-01>> or<<204-02>>.

Possible Source(s):

- Drive axle damaged.

  Action(s) to take:

  - INSTALL a new drive axle. For additional information, refer to<<205-02>>.

Drift/Pull

Possible Source(s):

- Unequal tire pressure.

  Action(s) to take:

  - CHECK and ADJUST the tire pressures. INSPECT the tire for excessive wear. For additional information, refer to <<204-04>>.

Possible Source(s):

- Incorrect wheel alignment.

  Action(s) to take:

  - CHECK and ADJUST the wheel alignment. For additional information, refer to
    in this section.

Possible Source(s):

- Tires.

  Action(s) to take:

- CHECK and ADJUST the tire pressures. INSPECT the tire for excessive wear. For additional information, refer to <<204-04>>.

Possible Source(s):

- Unevenly loaded or overloaded vehicle.

  Action(s) to take:

  - NOTIFY the customer of incorrect vehicle loading.

Possible Source(s):

- Damaged steering components.

  Action(s) to take:

  - CHECK the steering system. For additional information, refer to <<211-00>>.

Possible Source(s):

- Brake drag.

  Action(s) to take:

  - CHECK the brakes. For additional information, refer to<<206-00>>.

Front Bottoming or Riding Low

Possible Source(s):

- Spring(s).

  Action(s) to take:

  - CHECK the ride height. INSTALL new springs as necessary. For additional information, refer to <<204-01>>.

Incorrect Tire Wear

Possible Source(s):

- Incorrect tire pressure (rapid center rib or inner and outer edge wear).

  Action(s) to take:

  - CHECK and ADJUST the tire pressure. INSPECT the tire for excessive wear. For additional information, refer to <<204-04>>.

Possible Source(s):

- Excessive front or rear toe (rapid inner or outer edge wear).

  Action(s) to take:

  - CHECK and ADJUST the wheel alignment. For additional information, refer to
    or
    in this section.

Possible Source(s):

- Tires out of balance (tires cupped or dished).

  Action(s) to take:

  - BALANCE the tires.

Rough Ride

Possible Source(s):

- Spring(s).

  Action(s) to take:

  - CHECK and INSTALL new springs as necessary. For additional information, refer to <<204-01>> or<<204-02>>.

Possible Source(s):

- Shock absorber(s).

  Action(s) to take:

  - CHECK and INSTALL new shock absorbers as necessary. For additional information, refer to <<204-01>> or<<204-02>>.

Shimmy or Wheel Tramp

Possible Source(s):

- Loose wheel nut(s).

  Action(s) to take:

  - CHECK and TIGHTEN the wheel nuts to specification. For additional information, refer to <<204-04>>.

Possible Source(s):

- Loose front suspension retainers.

  Action(s) to take:

- CHECK and TIGHTEN the suspension retainers to specification. For additional information, refer to <<204-01>>.

Possible Source(s):

- Front wheel bearing(s).

  Action(s) to take:

  - CHECK the wheel bearings. For additional information, refer to in this section.

Possible Source(s):

- Wheels/tires.

  Action(s) to take:

  - CHECK the wheels/tires. BALANCE or INSTALL new wheels/tires as necessary. For additional information, refer to <<204-04>>.

Possible Source(s):

- Shock absorber(s).

  Action(s) to take:

  - CHECK and INSTALL new shock absorbers as necessary. For additional information, refer to <<204-01>> or<<204-02>>.

Possible Source(s):

- Spring(s).

  Action(s) to take:

  - CHECK and INSTALL new springs as necessary. For additional information, refer to <<204-01>> or<<204-02>>.

Possible Source(s):

- Loose, worn or damaged ball joint(s).

  Action(s) to take:

  - CHECK the Ball Joint(s). For additional information, refer to Ball Joint inspection in this section.

Possible Source(s):

- Loose, worn or damaged steering components.

  Action(s) to take:

  - CHECK and INSTALL new components as necessary. For additional information, refer to <<211-00>>.

Possible Source(s):

- Front wheel alignment.

  Action(s) to take:

  - CHECK and ADJUST the front wheel alignment. For additional information, refer to in this section.

Poor Returnability of the steering.

Possible Source(s):

- Ball joints.

  Action(s) to take:

  - CHECK the Ball Joint(s). For additional information, refer to Ball Joint inspection in this section.

Possible Source(s):

- Steering components.

  Action(s) to take:

  - CHECK and INSTALL new components as necessary. For additional information, refer to <<211-00>>.

Steering wheel off-center

Possible Source(s):

- Unequal front or rear toe settings.

  Action(s) to take:

  - CHECK and ADJUST the wheel alignment. For additional information, refer to or in this section.

Possible Source(s):

- Steering components.

  Action(s) to take:

  - CHECK and INSTALL new components as necessary. For additional information, refer to <<211-00>>.

Sway or roll

Possible Source(s):

- Overloaded, unevenly or incorrectly loaded vehicle.

  Action(s) to take:

  - NOTIFY the customer of incorrect vehicle loading.

Possible Source(s):

- Loose wheel nut(s).

  Action(s) to take:

  - CHECK and TIGHTEN the wheel nut(s) to specification. For additional information, refer to <<204-04>>.

Possible Source(s):

- Spring(s).

  Action(s) to take:

  - CHECK and INSTALL new springs as necessary. For additional information, refer to <<204-01>> or<<204-02>>.

Possible Source(s):

- Shock absorber(s).

  Action(s) to take:

  - CHECK and INSTALL new shock absorbers as necessary. For additional information, refer to <<204-01>> or<<204-02>>.

Possible Source(s):

- Loose front stabilizer bar or rear stabilizer bar.

  Action(s) to take:

  - CHECK and TIGHTEN the stabilizer bar to specification. For additional information, refer to <<204-01>> or<<204-02>>.

Possible Source(s):

- Worn lower suspension arm stabilizer bar bushing.

  Action(s) to take:

  - INSTALL new lower suspension arm stabilizer bar bushing as necessary. For additional information, refer to <<204-01>> or<<204-02>>.

Vehicle Leans to One Side

Possible Source(s):

- Unevenly loaded or overloaded vehicle.

  Action(s) to take:

  - NOTIFY the customer of incorrect vehicle loading.

Possible Source(s):

- Front or rear suspension components.

  Action(s) to take:

  - INSPECT the front and rear suspension systems. REPAIR or INSTALL new suspension components as necessary. For additional information, refer to<<204-01>> or<<204-02>>.

Possible Source(s):

- Shock absorber(s).

  Action(s) to take:

  - CHECK and INSTALL new shock absorbers as necessary. For additional information, refer to <<204-01>> or<<204-02>>.

Possible Source(s):

- Spring(s).

  Action(s) to take:

  - CHECK and INSTALL new springs as necessary. For additional information, refer to <<204-01>> or<<204-02>>.

Possible Source(s):

- Incorrect ride height. Lateral tilt out of specification.

  Action(s) to take:

  - CHECK the ride height. INSTALL new springs as necessary. For additional information, refer to <<204-01>> or<<204-02>>.

Vibration/Noise

Possible Source(s):

- Tires/wheels.
- Wheel bearings.

- Wheel hubs.
- Brake components.
- Suspension components.
- Steering components.

  Action(s) to take:
  - CHECK and INSTALL new components as necessary. For additional information, refer to <<100-04>>.

Wander

Possible Source(s):

- Unevenly loaded or overloaded vehicle.

  Action(s) to take:
  - NOTIFY the customer of incorrect vehicle loading.

Possible Source(s):

- Ball joint(s).

  Action(s) to take:
  - CHECK the Ball Joint(s). For additional information, refer to Ball Joint inspection in this section.

Possible Source(s):

- Front wheel bearing(s).

  Action(s) to take:
  - CHECK the wheel bearings. For additional information, refer to in this section.

Possible Source(s):

- Loose, worn or damaged suspension components.

  Action(s) to take:
  - CHECK and INSTALL new suspension components as necessary. For additional information, refer to <<204-01>> or<<204-02>>.

Possible Source(s):

- Loose suspension retainers.

  Action(s) to take:
  - CHECK and TIGHTEN the suspension retainers to specification. For additional information, refer to <<204-01>> or<<204-02>>.

Possible Source(s):

- Steering components.

  Action(s) to take:
  - CHECK and INSTALL new steering components. For additional information, refer to<<211-00>>.

Possible Source(s):

- Wheel alignment (excessive total front toe-out).

  Action(s) to take:
  - CHECK and ADJUST the front wheel alignment. For additional information, refer to in this section.

Component Tests

Ball Joint Inspection

1 . Raise and support the vehicle. For additional information, refer to<<100-02>>.

2 . Prior to carrying out any inspection of the ball joints, inspect the wheel bearings. For additional information, refer to
.

3 . Position a safety stand beneath the jacking point to test the lower arm.

4 . While an assistant pulls and pushes the top and bottom of the tire, observe the relative movement between the ball joint and the suspension lower arm. Any movement at or exceeding the specification indicates a worn or damaged ball joint.Install a new lower arm as necessary. For additional information, refer to<<204-01>> or<<204-02>>.

5 . Remove the safety stand.

6 . Lower the vehicle.

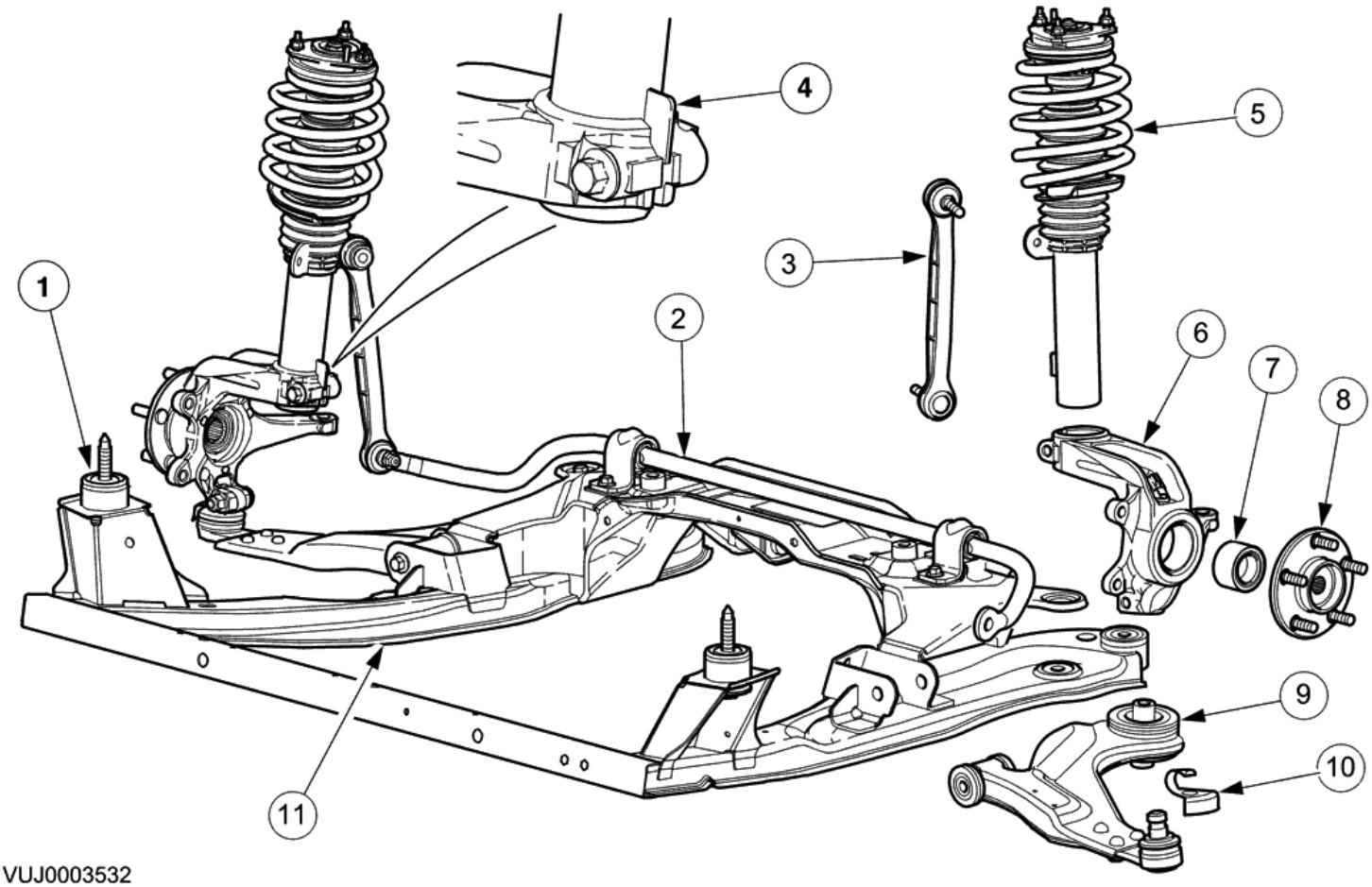
Published: Feb 23, 2004

Specifications

Torque Specifications

Description	Nm	lb-ft	lb-in
Lower arm front retaining bolt	A	A	A
Lower arm rear retaining nut and bolt	A	A	A
Lower arm ball joint retaining nut and bolt	83	61	-
Stabilizer bar to link bar retaining nuts	48	35	-
Stabilizer bar to subframe retaining bolts	48	35	-
Strut top mount retaining nuts	25	18	-
Subframe front mount retaining bolts	142	105	-
Subframe rear mount retaining bolts	142	105	-
Subframe reinforcement plate retaining bolts (M8)	35	26	-
Subframe reinforcement plate retaining bolts (M10)	70	52	-
Engine roll restrictor to engine retaining bolt	80	59	-
Wheel knuckle pinch bolt	85	63	-
Wheel hub retaining nut	270	200	-
Steering column lower retaining bolt	25	18	-
A = refer to the procedure for the correct torque sequence			

Front Suspension



VUJ0003532

Item	Description
1	Front subframe mounting bush
2	Stabilizer bar
3	Stabilizer link bar
4	Suspension strut anti slip fin
5	Suspension strut spring
6	Wheel knuckle
7	Wheel hub bearing
8	Wheel hub
9	Lower arm
10	Ball joint heat shield
11	Subframe

The front suspension consists of two strut and spring assemblies and a subframe, attached to which are the lower arms and the stabilizer bar.

The lower arm is of a pressed steel, fabricated construction which is attached to the subframe by bolts through horizontal and vertical bushings. The lower arm also carries a ball joint that attaches the lower arm to the wheel knuckle. Each wheel knuckle mounts the halfshaft in a double groove ball bearing which is secured on both sides by a snap ring.

The wheel knuckle also mounts to the strut and tie-rod end.

The stabilizer bar consists of a transverse bar with two ball jointed link bars.

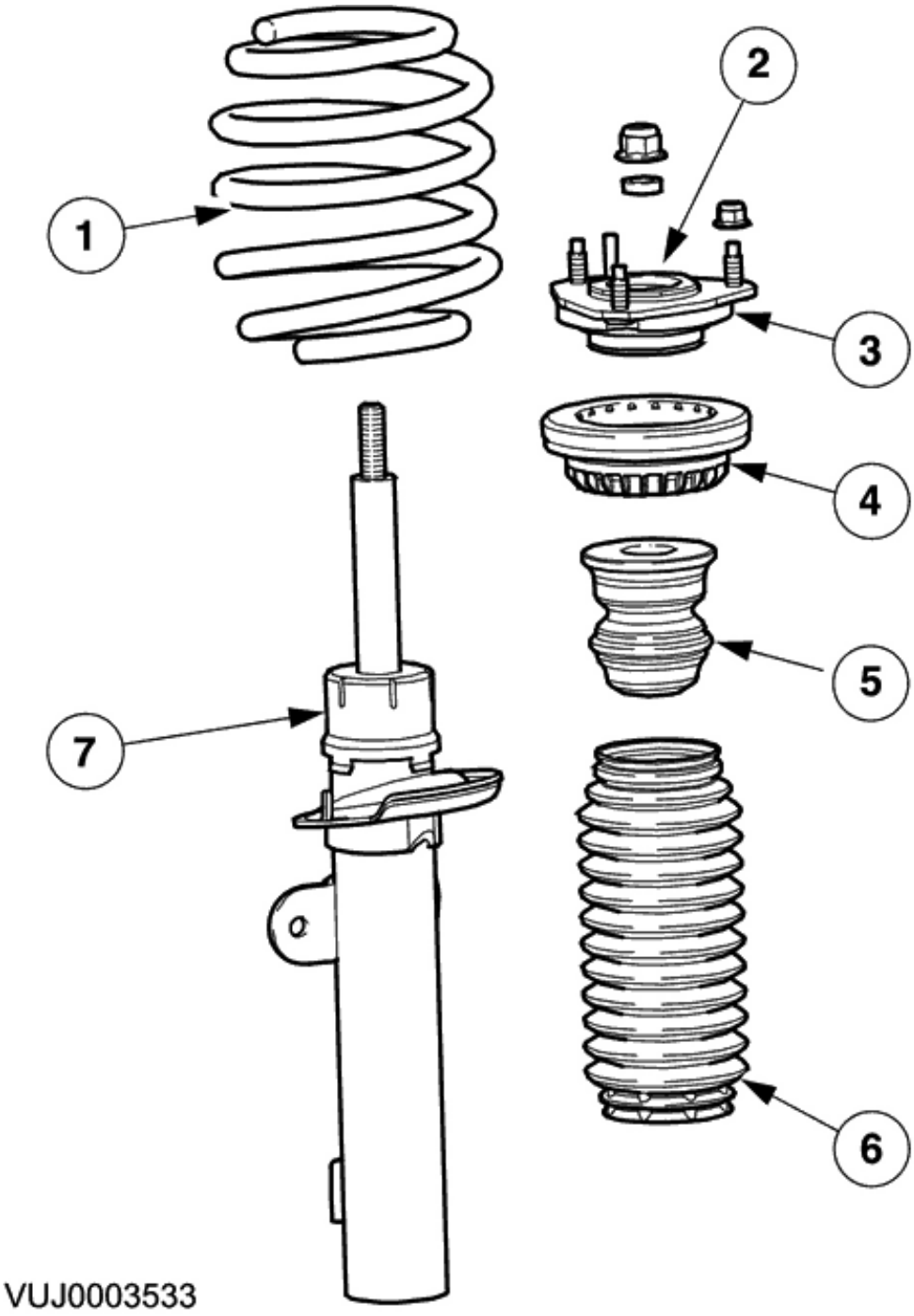
The strut and spring assembly is supported from its upper mounting by a rubber insulator fitted to the strut top mount. A coil spring is located between two seats on the strut. A plastic shield is fitted around the piston to prevent dirt and water ingress. A rubber bump stop is also fitted to protect the strut at its fully compressed condition.

As the road wheel rises, the movement is transmitted to the wheel knuckle, then through the ball joints to the lower arms and the strut and spring assembly. The spring absorbs the shock and the damper damps any unwanted spring frequencies, which could lead to an unstable vehicle.

A stabilizer bar is mounted via clamps and bushes to the front subframe and is connected via link bars to each of the strut and spring assemblies.

When cornering, weight is naturally transferred to the outer wheel and there is a natural tendency for the inner wheel to lift. The stabilizer bar helps to minimize this by transferring some of the apparent rise of outer wheel to the inner wheel through the link bars to the strut and spring assemblies. This helps to provide a smoother ride.

Strut and Spring Assembly



Item	Description
1	Spring assembly
2	Thrust bearing
3	Strut and spring top mount
4	Spring isolator
5	Bump stop
6	Damper piston gaiter
7	Damper assembly

Published: Mar 2, 2001

Front Suspension

For additional information, refer to <<204-00>>

Published: Jan 12, 2005

Lower Arm (60.35.02)

Special Service Tools

204-192

Separator, Ball Joint
204-192 (JD-219)

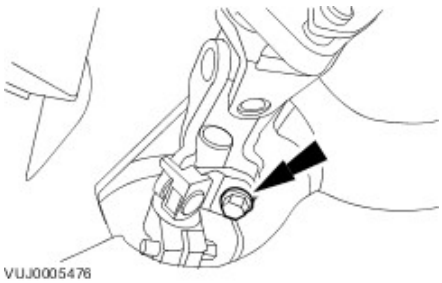
Powertrain Assembly Jack
HTJ1200-2

Removal

All vehicles

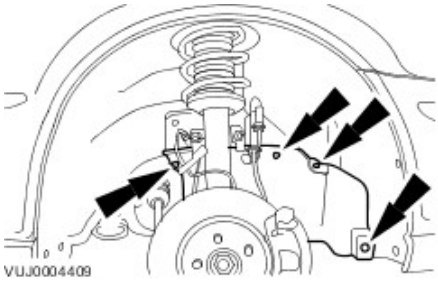
1 . Position the front wheels in a straight ahead position and centralize the steering wheel.
- Lock in position and remove the ignition key.

2 . Detach the steering column.
- Remove and discard the steering column lower retaining bolt.

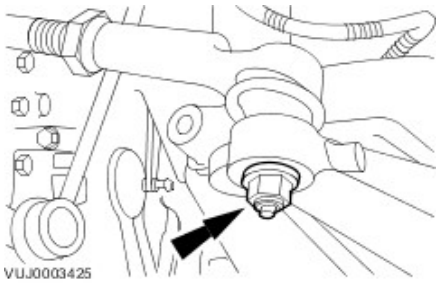


3 . Remove the front wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

4 . Remove the wheel arch liner access cover.



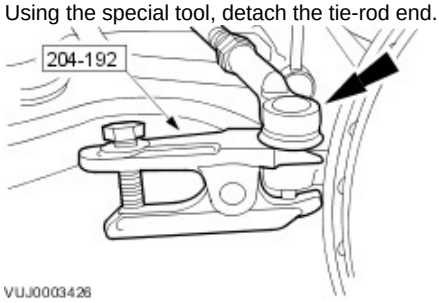
5 . Remove both the tie-rod end retaining nuts.



6 . **NOTE:**

When the tie-rod end is separated from the wheel hub assembly, the ball joint seal should be protected to prevent damage.

Using the special tool, detach the tie-rod end.

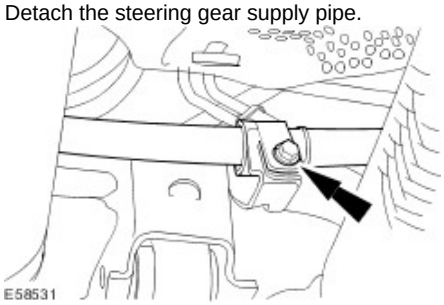


Vehicles with high intensity discharge headlamps

7 . Detach the link rod from the headlamp leveling sensor.

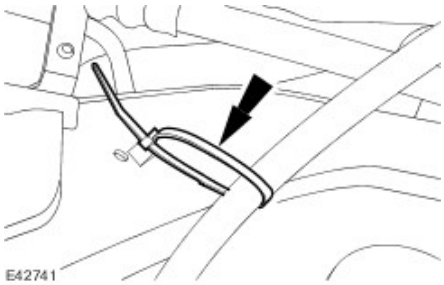
All vehicles

8 . Detach the steering gear supply pipe.



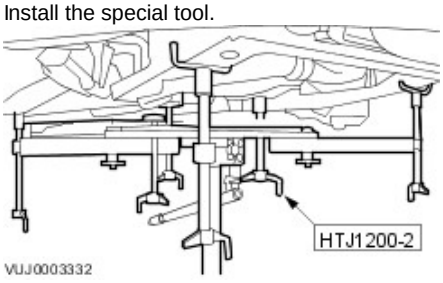
Vehicles with automatic transmission

9 . Detach the selector lever cable.



All vehicles

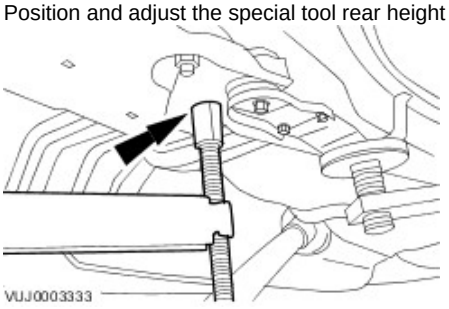
10 . Install the special tool.



11 . **NOTE:**

Left-hand shown, right-hand similar.

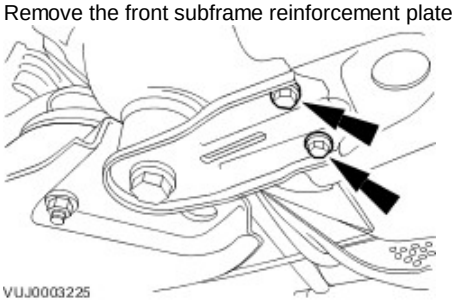
Position and adjust the special tool rear height adjuster.



12 . **NOTE:**

Left-hand shown, right-hand similar.

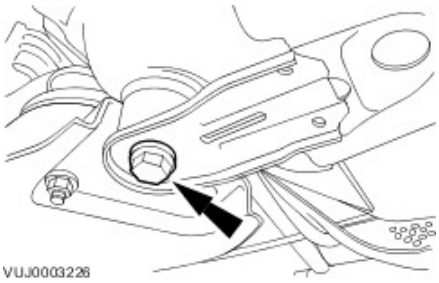
Remove the front subframe reinforcement plate retaining bolts.



13 . **NOTE:**

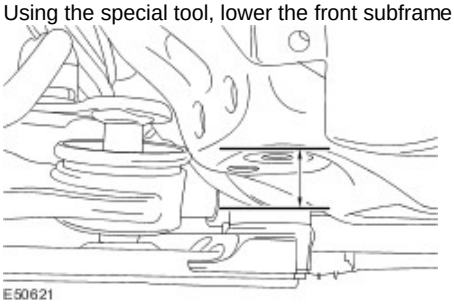
Left-hand shown, right-hand similar.

Remove the front subframe rear mount retaining bolts.



14 . **WARNING: Rotate the special tool height adjustment valve slowly. Failure to follow this instruction may result in personal injury.**

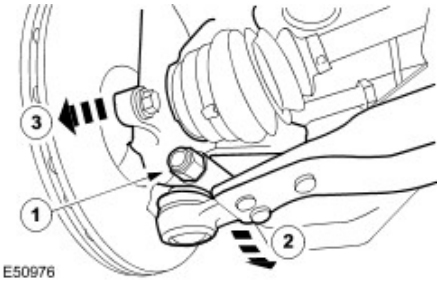
Using the special tool, lower the front subframe to a maximum of 50 mm (1.97 inches).



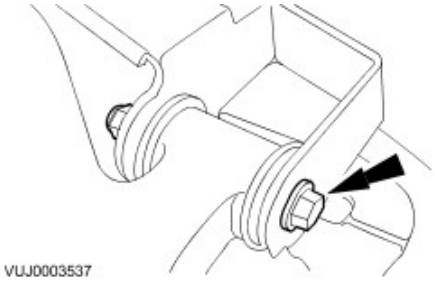
15 . **CAUTION: To prevent damage to the lower arm bushing, make sure the subframe is lowered before detaching the lower arm ball joint. Failure to follow this instruction may result in damage to the vehicle.**

Detach the lower arm from the wheel knuckle.

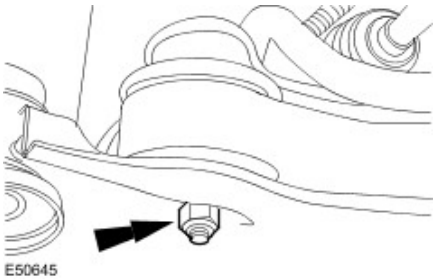
1) Remove the lower arm ball joint retaining nut and bolt.
2) Reposition the lower arm.
3) Reposition the wheel knuckle.



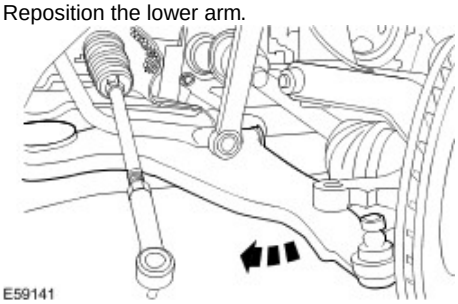
16 . Remove and discard the lower arm front retaining bolt.



17 . Remove and discard the lower arm retaining nut.

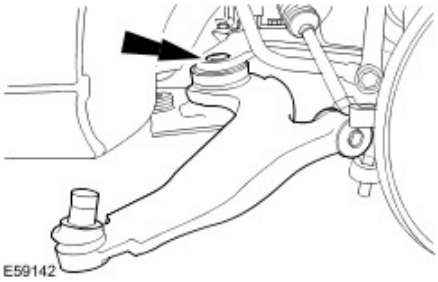


18 . Reposition the lower arm.



19 . Remove the lower arm.

- Remove and discard the lower arm rear retaining bolt.

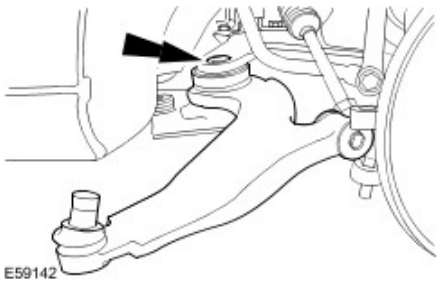


Installation

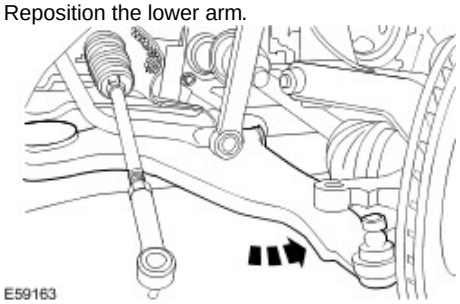
All vehicles

1 . Install the lower arm.

- Install a new lower arm rear retaining bolt.



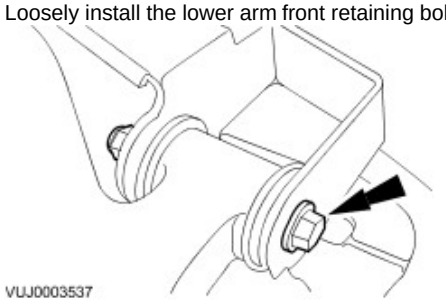
2 . Reposition the lower arm.



3 . **NOTE:**

Install a new retaining bolt.

Loosely install the lower arm front retaining bolt.



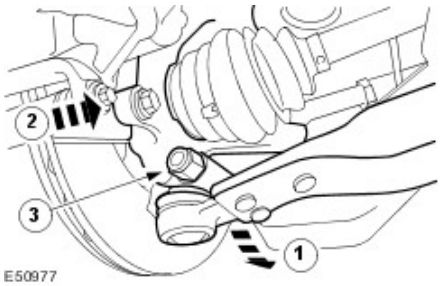
4 . **NOTE:**

Install a new retaining nut.

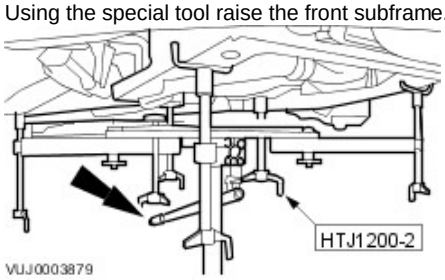
Attach the wheel knuckle.

1) Reposition the lower arm.
2) Attach the wheel knuckle.
3) Install the lower arm ball joint retaining nut and bolt.

Tighten to 83 Nm.



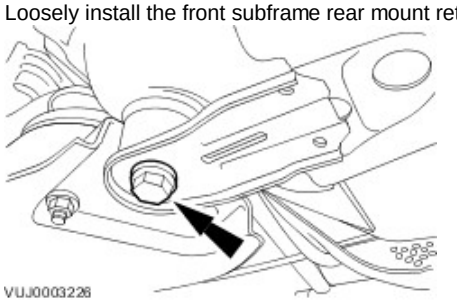
5 . Using the special tool raise the front subframe.



6 . **NOTE:**

Left-hand shown, right-hand similar.

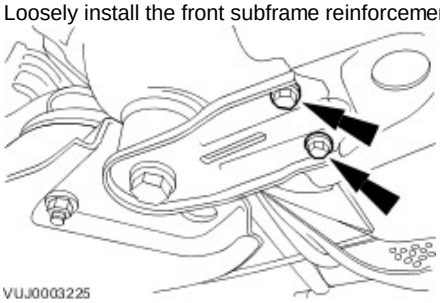
Loosely install the front subframe rear mount retaining bolts.



7 . **NOTE:**

Left-hand shown, right-hand similar.

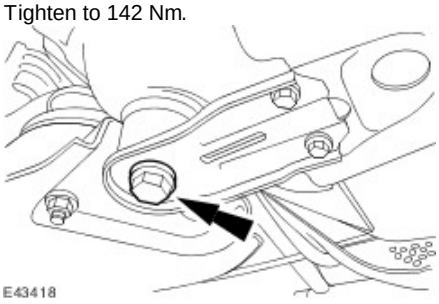
Loosely install the front subframe reinforcement plate retaining bolts.



8 . **NOTE:**

Left-hand shown, right-hand similar.

Tighten to 142 Nm.

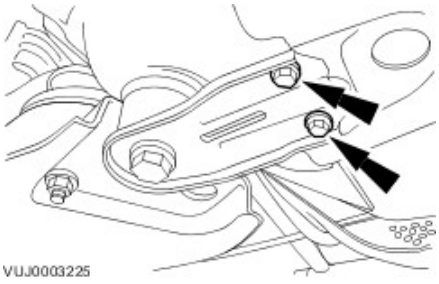


9 . **NOTE:**

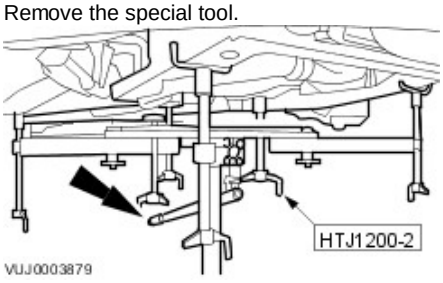
Left-hand shown, right-hand similar.

Tighten the front subframe reinforcement bolts.

- M8 to 35 Nm.
- M10 to 70 Nm.

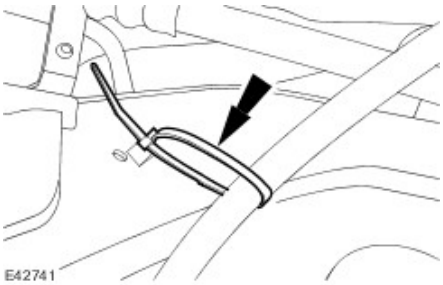


10 . Remove the special tool.



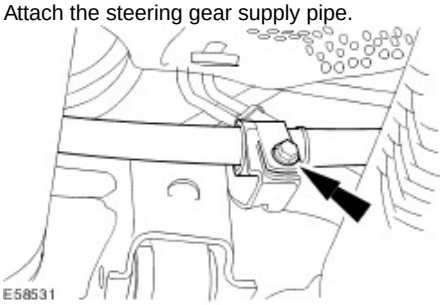
Vehicles with automatic transmission

11 . Attach the selector lever cable.



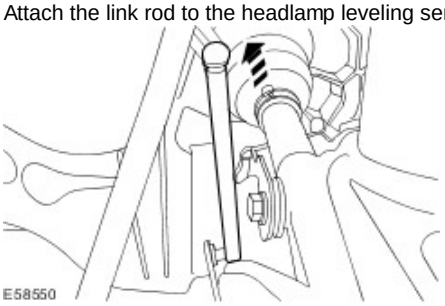
All vehicles

12 . Attach the steering gear supply pipe.



Vehicles with high intensity discharge headlamps

13 . Attach the link rod to the headlamp leveling sensor.



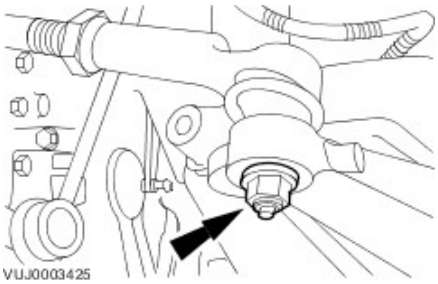
All vehicles

14 . **NOTE:**

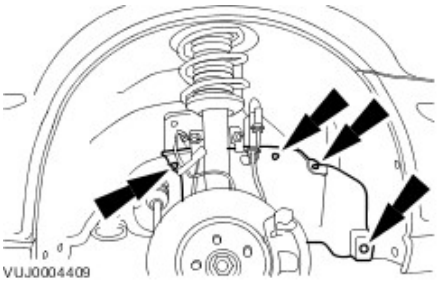
Right-hand shown, left-hand similar.

Attach both the tie-rod ends.

Tighten to 35 Nm.



15 . Install the right-hand wheel arch liner access cover.



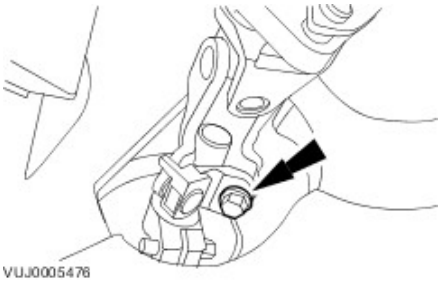
16 . Install the front wheels and tires.
For additional information, refer to Wheel and Tire (74.20.05)

17 . Lower the vehicle.

18 . **NOTE:**
Install a new retaining bolt.

Attach the steering column.

- Install a new steering column lower retaining bolt.
- Tighten to 25 Nm.

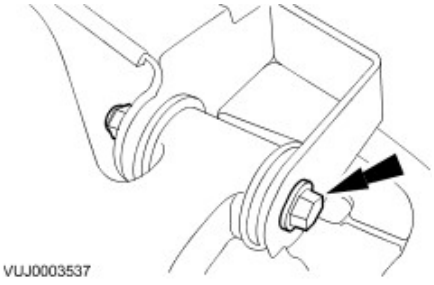


19 . **CAUTION: The final tightening of the lower arm front retaining bolt, must be carried out with the vehicle on its wheels. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:
Right-hand shown, left-hand similar.

Fully tighten the lower arm front retaining bolt.

- Stage 1: Tighten to 90 Nm.
- Stage 2: Tighten 60 degrees.

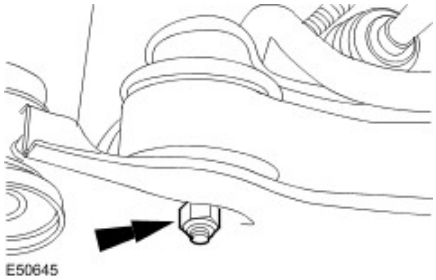


20 . **CAUTION: The final tightening of the lower arm rear retaining nut and bolt, must be carried out with the vehicle on its wheels. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:
Right-hand shown, left-hand similar.

Fully tighten the lower arm rear retaining nut and bolt.

- Stage 1: Tighten to 90 Nm.
- Stage 2: Tighten 60 degrees.



21 . Using the Jaguar approved diagnostic system, configure the steering angle sensor.

Published: Feb 9, 2005

Shock Absorber and Spring Assembly (60.30.02)

Special Service Tools

Separator, Ball Joint
204-192 (JD-219)

Powertrain Assembly Jack
HTJ1200-2

Wheel hub puller
205-491

Adapter nuts
205-491-01

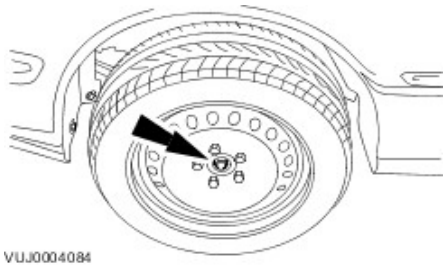
Forcing screw
204-269

Knuckle splitter
204-159

Removal

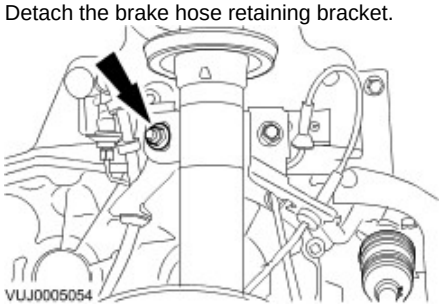
All vehicles

1 . Loosen the wheel hub nut.

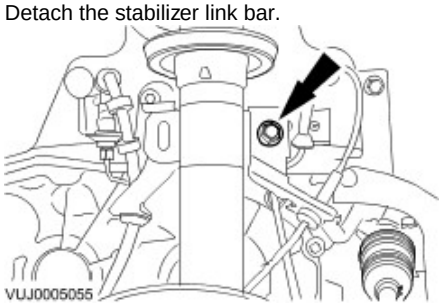


2 . Remove the wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

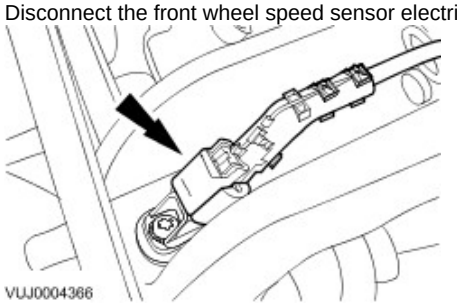
3 . Detach the brake hose retaining bracket.



4 . Detach the stabilizer link bar.

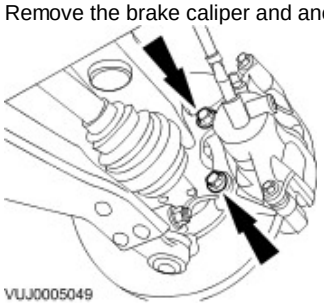


5 . Disconnect the front wheel speed sensor electrical connector.

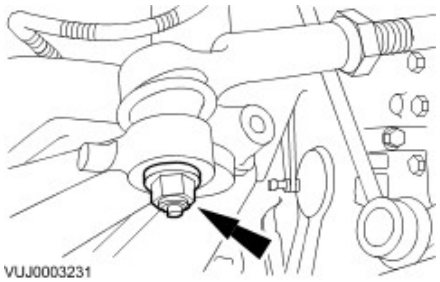


6 . **CAUTION: Secure the brake caliper and anchor plate assembly to one side.**

Remove the brake caliper and anchor plate assembly.



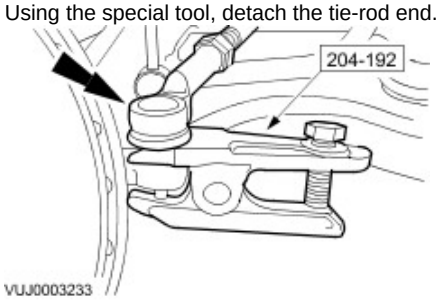
7 . Remove the tie-rod end retaining nut.



8 . **NOTE:**

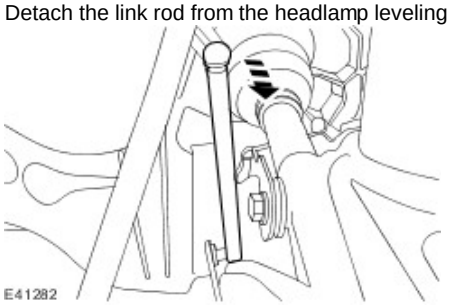
When the tie-rod end is separated from the wheel hub assembly, the ball joint seal should be protected to prevent damage.

Using the special tool, detach the tie-rod end.



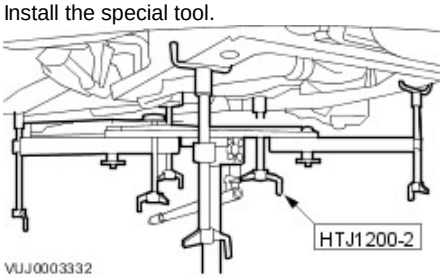
Vehicles with high intensity discharge headlamps

9 . Detach the link rod from the headlamp leveling sensor.



All vehicles

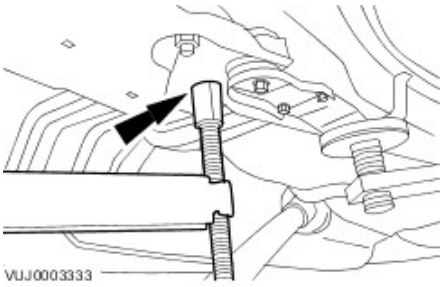
10 . Install the special tool.



11 . **NOTE:**

Left-hand shown, right-hand similar.

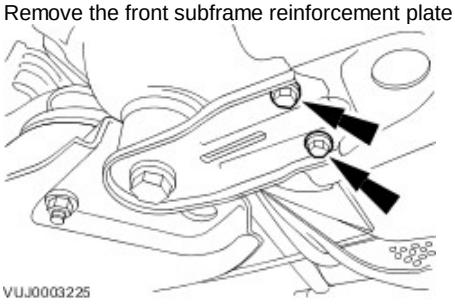
Position and adjust the special tool rear height adjuster.



12 . **NOTE:**

Left-hand shown, right-hand similar.

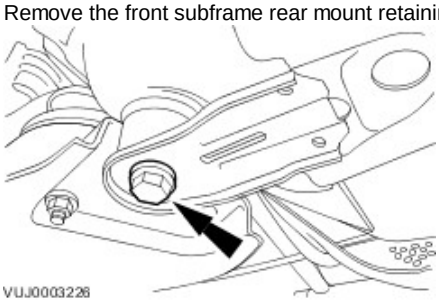
Remove the front subframe reinforcement plate retaining bolts.



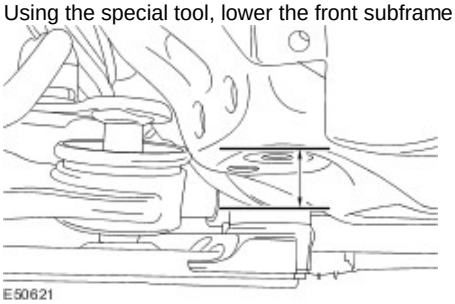
13 . **NOTE:**

Left-hand shown, right-hand similar.

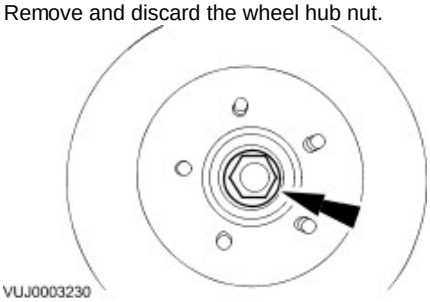
Remove the front subframe rear mount retaining bolts.



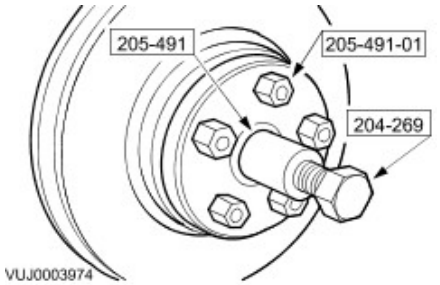
14 . Using the special tool, lower the front subframe to a maximum of 30 mm (1.18 inches).



15 . Remove and discard the wheel hub nut.



16 . Using special tools, detach the halfshaft.

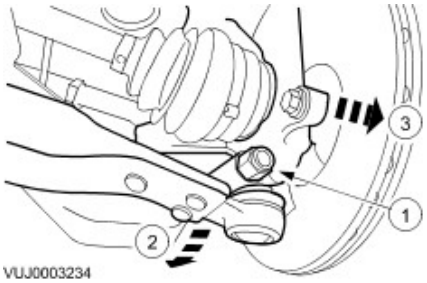


17 .

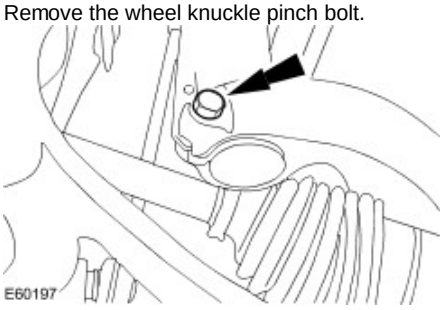
CAUTION: To prevent damage to the lower arm bushing, make sure the subframe is lowered before detaching the lower arm ball joint.

Detach the wheel knuckle.

1) Remove the lower arm ball joint retaining nut and bolt.
2) Reposition the lower arm.
3) Detach the wheel knuckle from the halfshaft.
   - Remove and discard the lower arm ball joint shield.

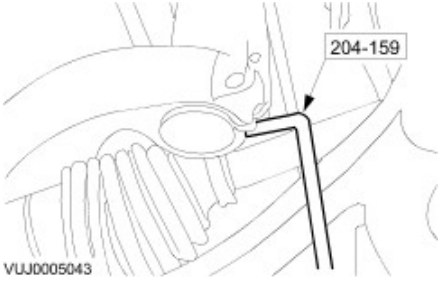


18 . Remove the wheel knuckle pinch bolt.



19 . Using the special tool, remove the wheel knuckle.

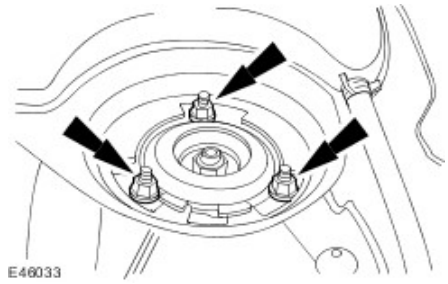
- Using the special tool, spread the wheel knuckle.
- Remove the wheel knuckle.



20 . **NOTE:**

Note the orientation of the retaining stud marked with a paint spot.

Remove the strut and spring assembly.



Installation

All vehicles

1 . **NOTE:**

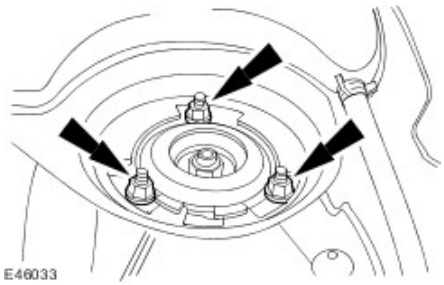
Make sure orientation arrow on the strut top rubber mount faces from front to rear of the vehicle.

NOTE:

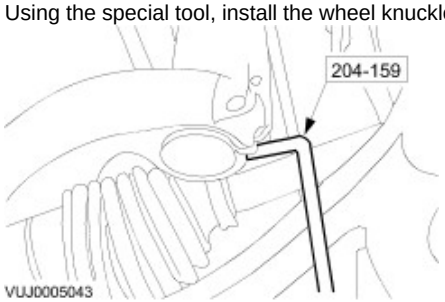
Make sure the retaining stud marked with a paint spot is correctly orientated.

Install the strut and spring assembly.

Tighten to 25 Nm.

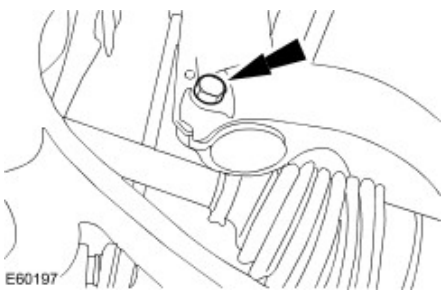


2 . Using the special tool, install the wheel knuckle.



3 . Install the wheel knuckle pinch bolt.

Tighten to 85 Nm.



4 . **NOTE:**

Install a new retaining nut.

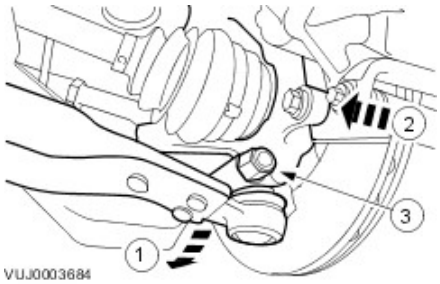
NOTE:

Install a new lower arm ball joint shield.

Attach the wheel knuckle.

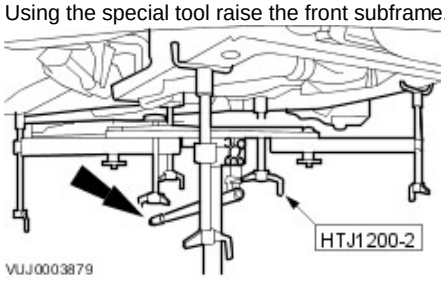
1) Reposition the lower arm.
2) Attach the wheel knuckle to the halfshaft.
3) Install the lower arm ball joint retaining nut and bolt.

- Tighten to 83 Nm.



5 . Loosely install the new wheel hub nut.

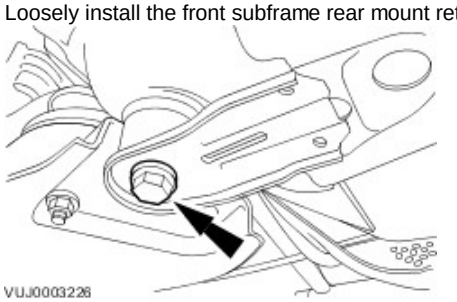
6 . Using the special tool raise the front subframe.



7 . **NOTE:**

Left-hand shown, right-hand similar.

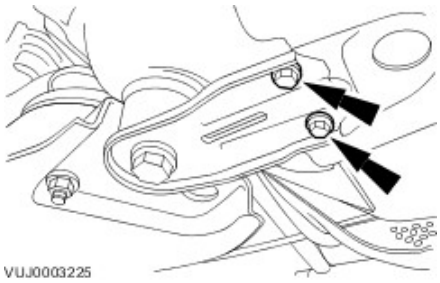
Loosely install the front subframe rear mount retaining bolts.



8 . **NOTE:**

Left-hand shown, right-hand similar.

Loosely install the front subframe reinforcement plate retaining bolts.

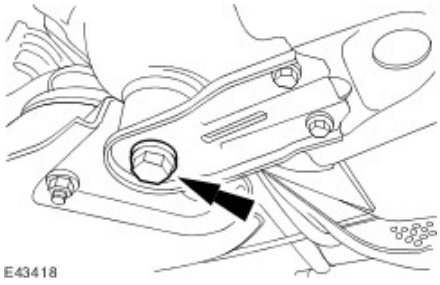


9 . **NOTE:**

Left-hand shown, right-hand similar.

Tighten the front subframe rear mount retaining bolts.

- Tighten to 142 Nm.

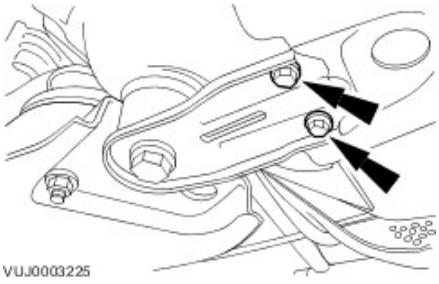


10 . **NOTE:**

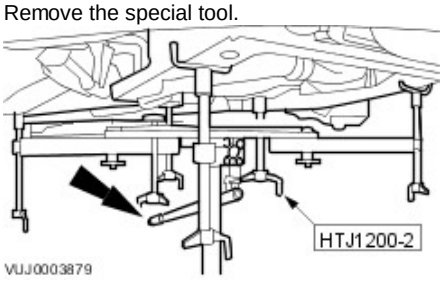
Left-hand shown, right-hand similar.

Tighten the front subframe reinforcement bolts.

- M8 to 35 Nm.
- M10 to 70 Nm.

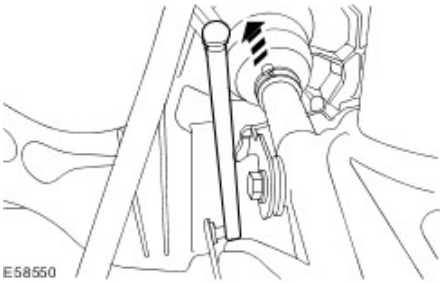


11 . Remove the special tool.



Vehicles with high intensity discharge headlamps

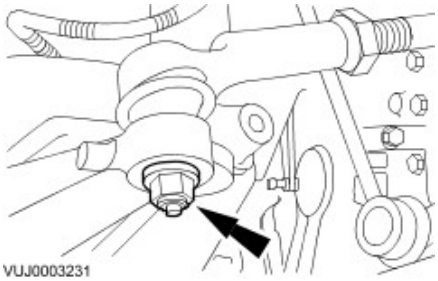
12 . Attach the link rod to the headlamp leveling sensor.



All vehicles

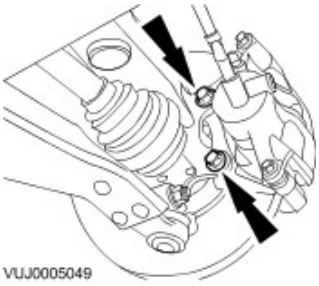
13 . Attach the tie-rod end.

Tighten to 35 Nm.

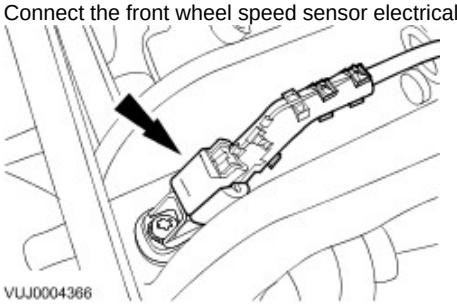


14 . Attach the brake caliper and anchor plate assembly.

Tighten to 133 Nm.



15 . Connect the front wheel speed sensor electrical connector.

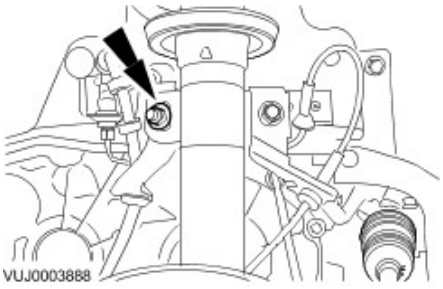


16 . Attach the stabilizer link bar.

Tighten to 48 Nm.

17 . Attach the brake hose retaining bracket.

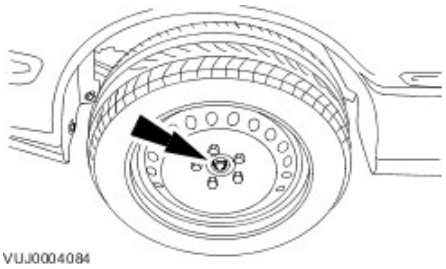
Tighten to 48 Nm.



18 . Install the wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

19 . Tighten the wheel hub nut.

Tighten to 330 Nm.

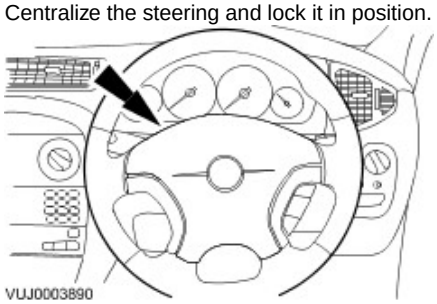


Stabilizer Bar

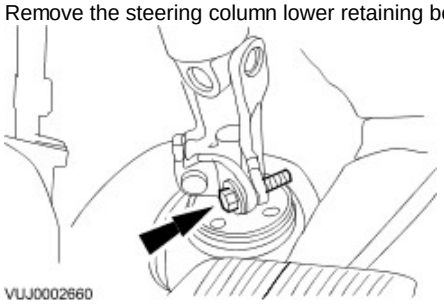
. **:**

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

Centralize the steering and lock it in position.

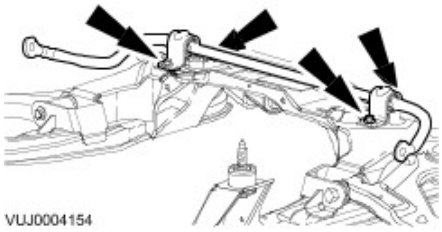


. Remove the steering column lower retaining bolt.



. Remove the front subframe. For additional information, refer to<<502-00>>.

. Remove the stabilizer bar.

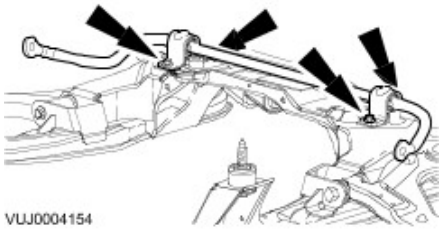


. **:**

Install new stablizer bar bushes when replacing the stablizer bar.

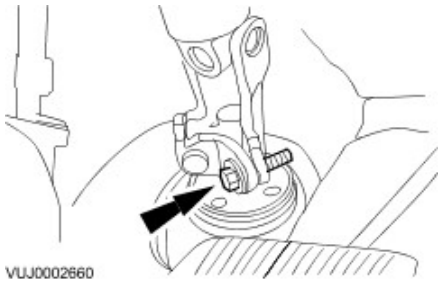
To install, reverse the removal procedure.

. Tighten to 48 Nm.



. Carry out front subframe alignment. For additional information, refer to<<502-00>>.

. Tighten to 26 Nm.



VUJ0002660

Published: Jan 24, 2006

Front Stabilizer Bar Bushing (60.10.04)

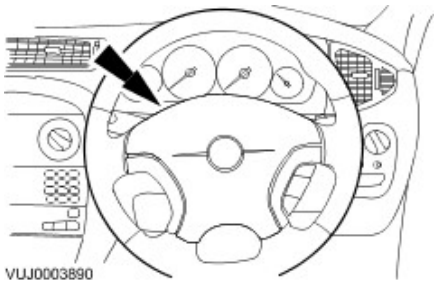
Special Service Tools

Powertrain assembly jack
HTJ1200-02

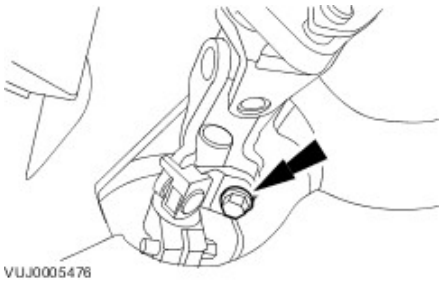
Removal

All vehicles

1 . Center the steering wheel.
- Lock in position and remove the ignition key.



2 . Detach the steering column.
- Remove and discard the extension shaft lower retaining bolt.



3 . Remove the front wheels and tires.
For additional information, refer to Wheel and Tire (74.20.05)

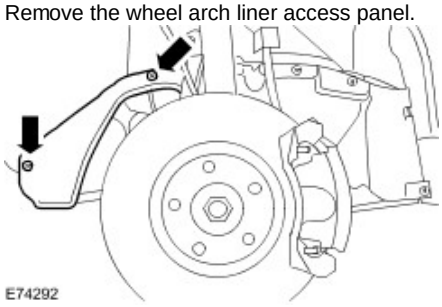
Vehicles with high intensity discharge headlamps

4 . Detach the link rod from the headlamp leveling sensor.

Vehicles with diesel engine

5 . **NOTE:**
Right-hand shown, left-hand similar.

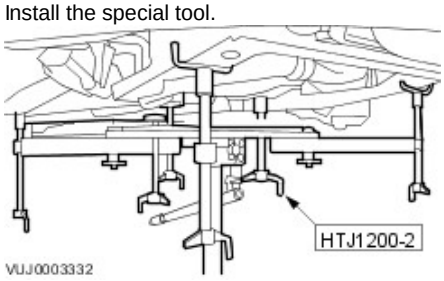
Remove the wheel arch liner access panel.



6 . Remove the air deflector.
For additional information, refer to Air Deflector - 2.0L Diesel/2.2L Diesel (76.11.41)

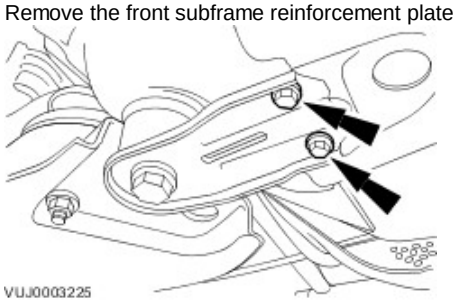
All vehicles

7 . Install the special tool.



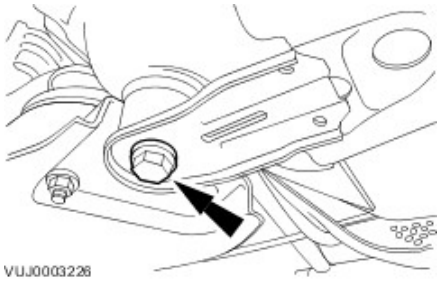
8 . **NOTE:**
Left-hand shown, right-hand similar.

Remove the front subframe reinforcement plate retaining bolts.



9 . **NOTE:**
Left-hand shown, right-hand similar.

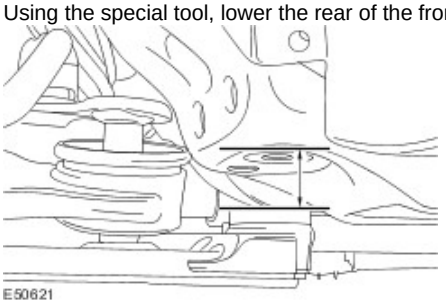
Remove the front subframe rear mount retaining bolts.



10 .

WARNING: Rotate the special tool height adjustment valve slowly. Failure to follow this instruction may result in personal injury.

Using the special tool, lower the rear of the front subframe to a maximum of 50 mm (1.97 inches).

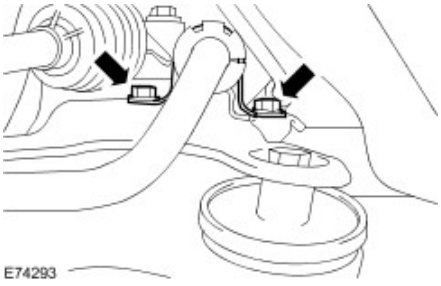


11 . **NOTE:**

Left-hand shown, right-hand similar.

Remove the stabilizer bar bush retaining bracket.

- Remove the retaining bolts.



12 . **NOTE:**

Left-hand shown, right-hand similar.

Remove the stabilizer bar bush.

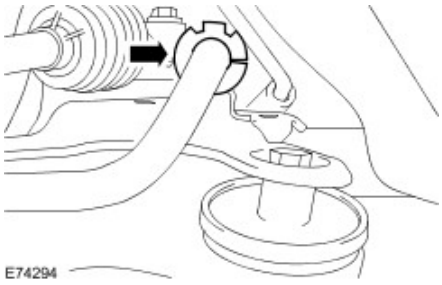
Installation

All vehicles

1 . **NOTE:**

Left-hand shown, right-hand similar.

Install the stabilizer bar bush.

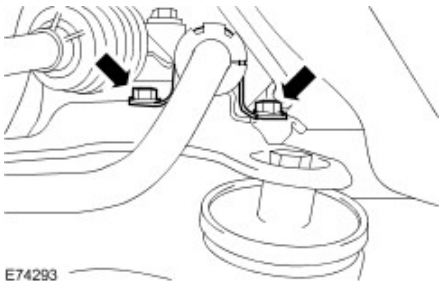


2 . **NOTE:**

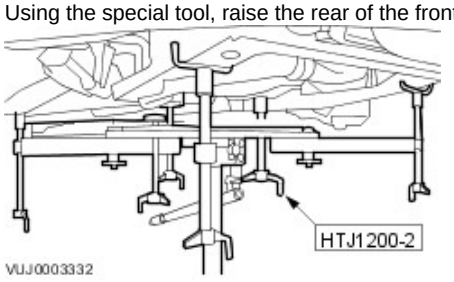
Left-hand shown, right-hand similar.

Install the stabilizer bar bush retaining bracket.

Tighten the retaining bolts to 48 Nm.



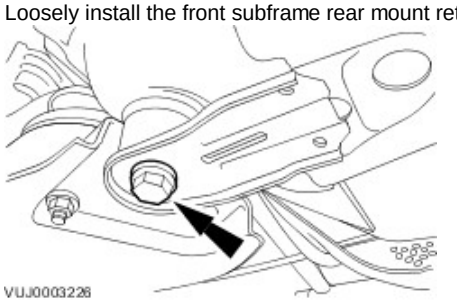
3 . Using the special tool, raise the rear of the front subframe.



4 . **NOTE:**

Left-hand shown, right-hand similar.

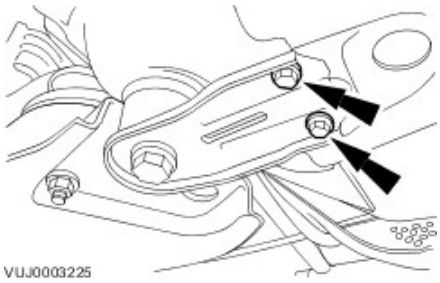
Loosely install the front subframe rear mount retaining bolts.



5 . **NOTE:**

Left-hand shown, right-hand similar.

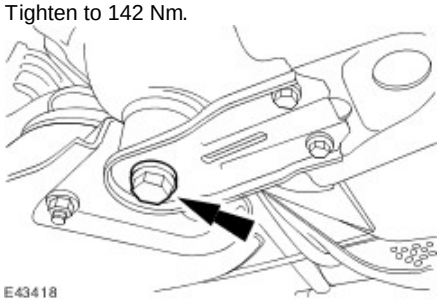
Loosely install the front subframe reinforcement plate retaining bolts.



6 . **NOTE:**

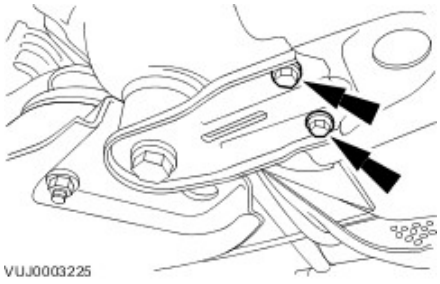
Left-hand shown, right-hand similar.

Tighten to 142 Nm.

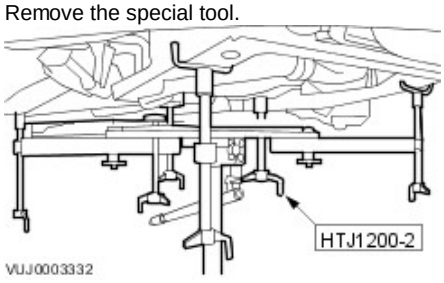


7 . Tighten the front subframe reinforcement bolts.

- M8 to 35 Nm.
- M10 to 70 Nm.



8 . Remove the special tool.



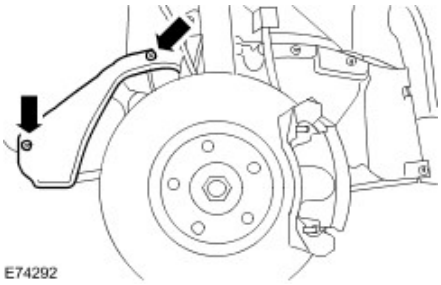
Vehicles with diesel engine

9 . Install the air deflector.
For additional information, refer to Air Deflector - 2.0L Diesel/2.2L Diesel (76.11.41)

10 . **NOTE:**

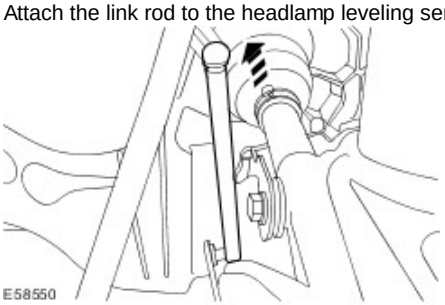
Right-hand shown, left-hand similar.

Install the wheel arch liner access panel.



Vehicles with high intensity discharge headlamps

11 . Attach the link rod to the headlamp leveling sensor.



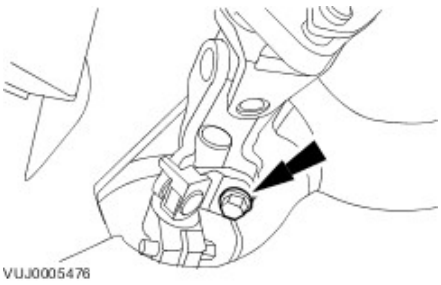
All vehicles

12 . Install the front wheels and tires.
For additional information, refer to Wheel and Tire (74.20.05)

13 . **NOTE:**
Install a new retaining bolt.

Attach the steering column.

- Install a new steering column lower retaining bolt.
- Tighten to 25 Nm.



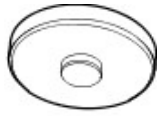
Published: Mar 29, 2001

Front Wheel Bearing and Wheel Hub (60.25.03)

Special Service Tools

Front hub carrier support
204-310

Hub flange remover
204-116-03



Bearing remover
204-262

Hub carrier support
204-309

Bearing support
204-313

Bearing guide
204-312

Bearing installer
204-311

Bearing receiver
501-063

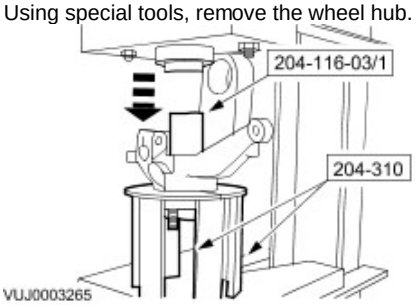
Removal

1 . Remove wheel knuckle. For additional information refer to,
For additional information, refer to .

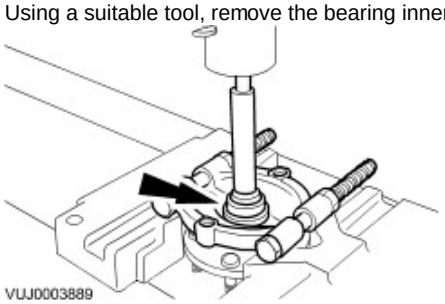
2 **NOTE:**

· When removing the wheel hub from the wheel knuckle the bearing will be destroyed and the bearing inner ring will remain on the wheel hub.

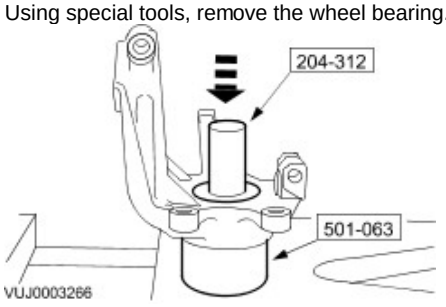
Using special tools, remove the wheel hub.



3 . Using a suitable tool, remove the bearing inner ring.



4 . Using special tools, remove the wheel bearing.

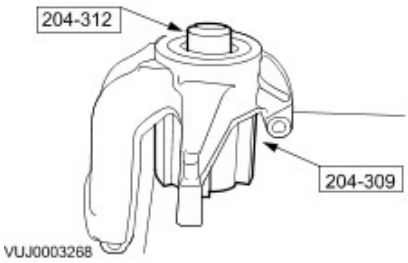


Installation

1 . **NOTE:**

Insert special tool 204-312 in to 204-309.

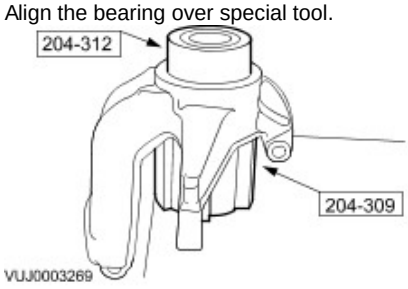
Support the wheel knuckle on special tools.



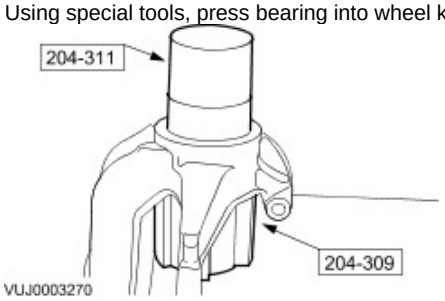
2 .

CAUTION: Make sure wheel bearing is correctly orientated with the colored side facing inboard.

Align the bearing over special tool.



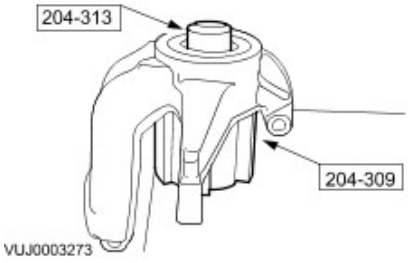
3 . Using special tools, press bearing into wheel knuckle.



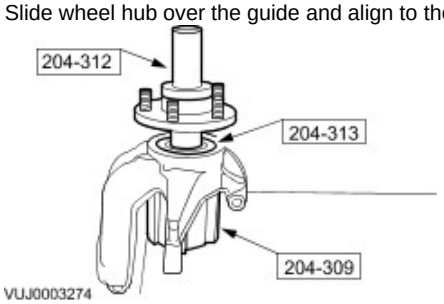
4 . **NOTE:**

Change special tool 204-312 to 204-313.

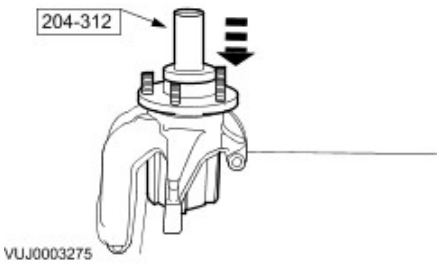
Align the bearing and wheel knuckle over special tool.



5 . Slide wheel hub over the guide and align to the bearing.



6 . Using special tools install the wheel hub.



7 . Install the wheel knuckle. For additional information, refer to
For additional information, refer to .

Published: Dec 3, 2003

Wheel Knuckle (60.25.23)

Special Service Tools

Ball joint splitter
204-192

Wheel hub puller
205-491

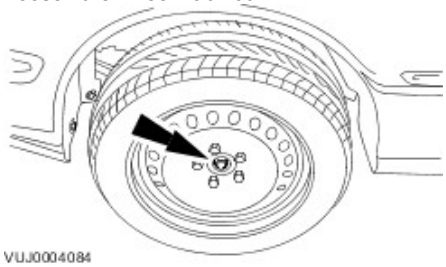
Adapter nuts
205-491-01

Forcing screw
204-269

Knuckle splitter
204-159

Removal

1 . Loosen the wheel hub nut.

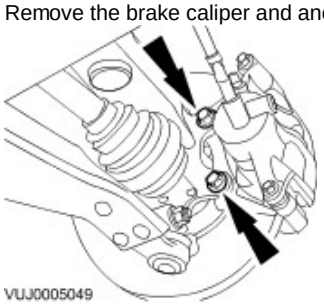


2 . Remove the wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

3 .

CAUTION: Secure the brake caliper anchor plate assembly to one side.

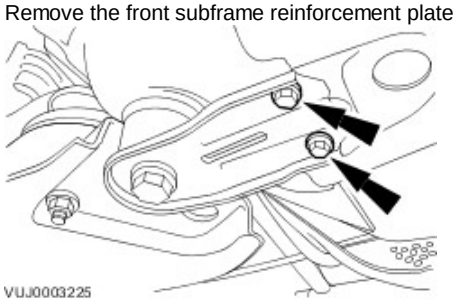
Remove the brake caliper and anchor plate assembly.



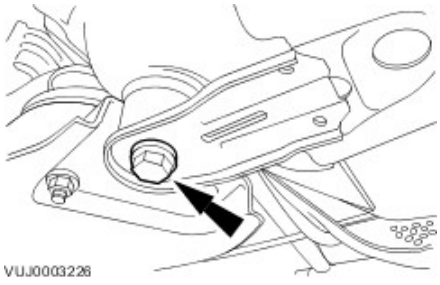
4 .

CAUTION: Only one side of the subframe needs to be lowered to detach the lower arm ball joint.

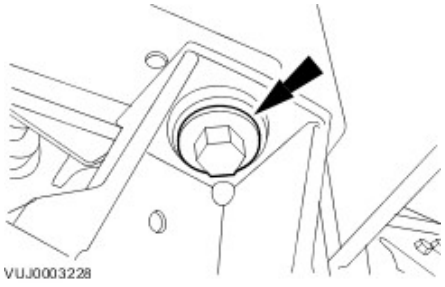
Remove the front subframe reinforcement plate retaining bolts.



5 . Loosen the front subframe rear mount retaining bolt.



6 . Loosen the front subframe front mount retaining bolt.

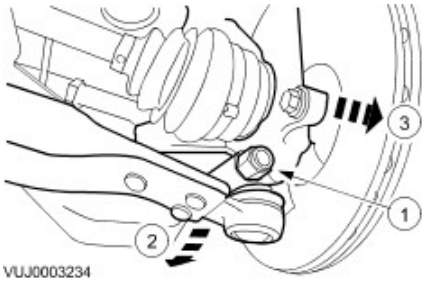


7 .

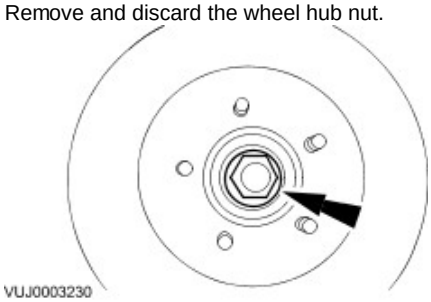
CAUTION: To prevent damage to the lower arm bushing, make sure the subframe is lowered before detaching the lower arm ball joint.

Detach the wheel knuckle.

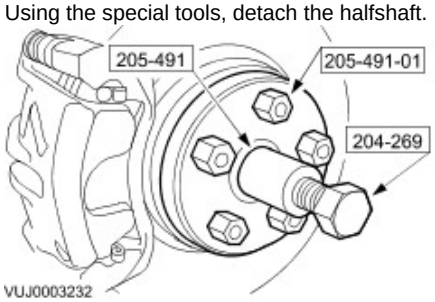
1) Remove the lower arm ball joint retaining nut and bolt.
2) Reposition the lower arm.
3) Detach the wheel knuckle.



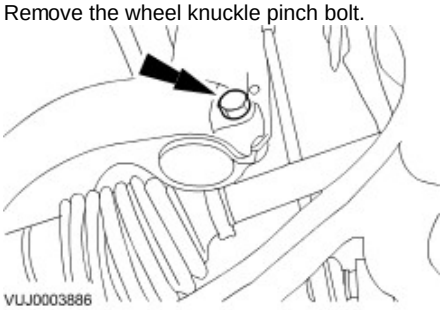
8 . Remove and discard the wheel hub nut.



9 . Using the special tools, detach the halfshaft.

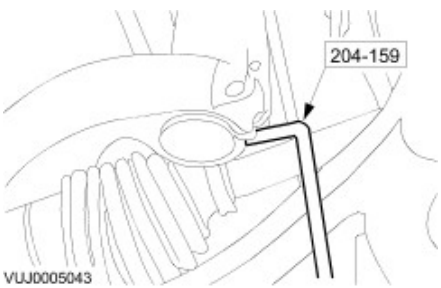


10 . Remove the wheel knuckle pinch bolt.



11 . Remove the wheel knuckle.

1) Using the special tool, spread the wheel knuckle.
2) Remove the wheel knuckle.

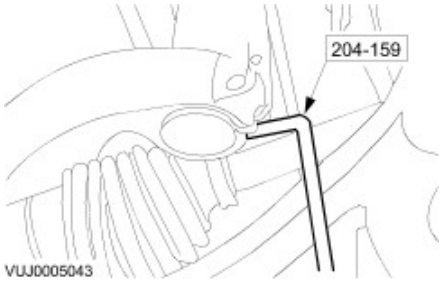


Installation

1 . Attach the wheel knuckle to the strut and spring assembly.

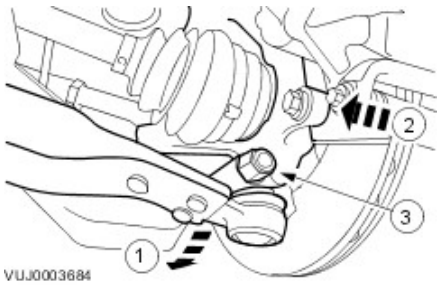
1) Using the special tool, spread the wheel knuckle.
2) Attach the wheel knuckle.

Tighten to 85 Nm.



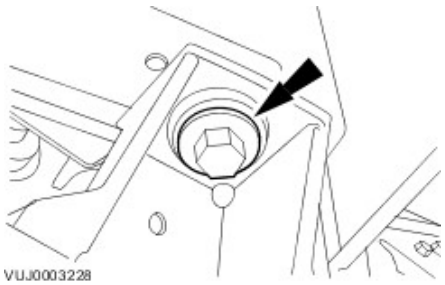
2 . Attach the wheel knuckle.

1) Reposition the lower arm.
2) Attach the wheel knuckle.
3) Attach the lower arm ball joint retaining nut and bolt.
4) Tighten to 83 Nm.

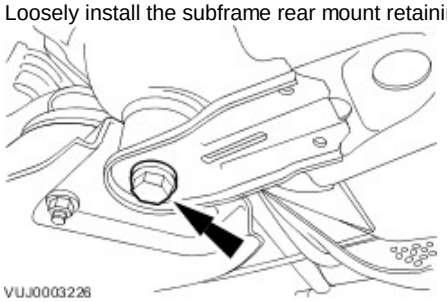


3 . Tighten the front subframe front mount retaining bolt.

Tighten to 142 Nm.

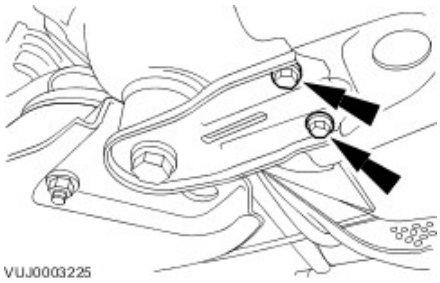


4 . Loosely install the subframe rear mount retaining bolt.

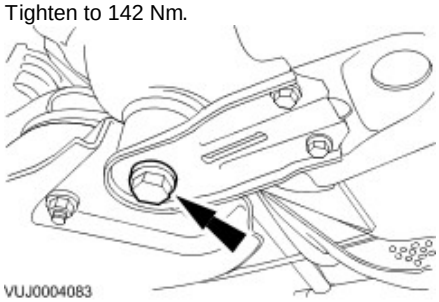


5 . Tighten the front subframe reinforcement plate retaining bolts.

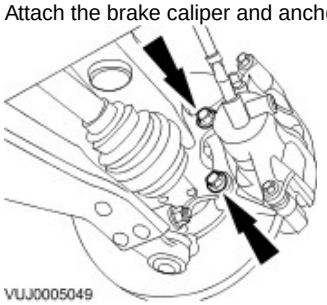
Tighten to 35 Nm.



6 . Tighten to 142 Nm.



7 . Attach the brake caliper and anchor plate assembly.



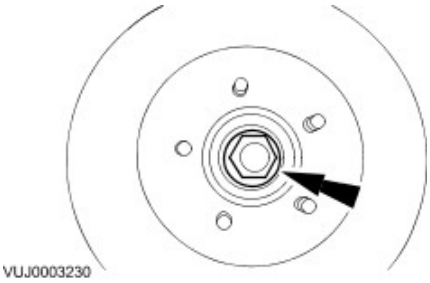
8 . Attach the stabilizer bar connecting link.

Tighten to 48 Nm.

9 . Attach the brake hose retaining bracket.

Tighten to 48 Nm.

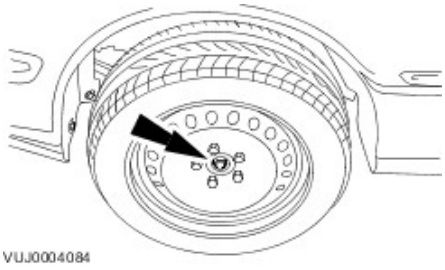
10 . Install the new wheel hub nut.



11 . Install the wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

12 . Tighten the wheel hub nut.

- Tighten to 270 Nm.



13 . Carry out front subframe alignment procedure.
For additional information, refer to Underbody Misalignment Check (57.65.20)

Published: Aug 10, 2005

Shock Absorber and Spring Assembly (60.30.21)

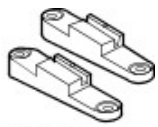
Special Service Tools

204-112

Spring coil compressor
204-112

E66191

Spring adapters
204-167-01



20411203

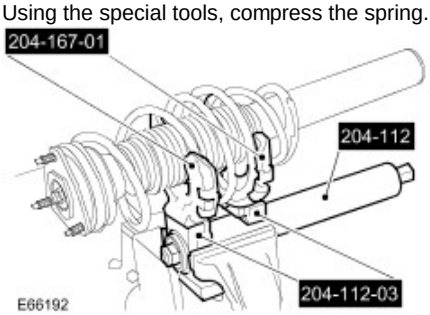
Spring adapters
204-112-03

Disassembly

1 . Remove the shock absorber and spring assembly.
For additional information, refer to Shock Absorber and Spring Assembly (60.30.02)

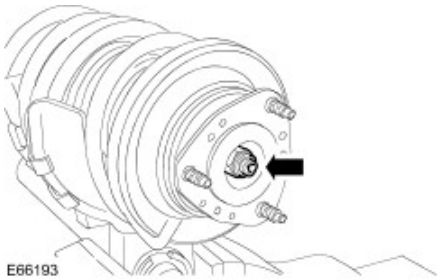
2 . **WARNING: AS THE SPRING IS UNDER EXTREME TENSION CARE MUST BE TAKEN AT ALL TIMES. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.**

Using the special tools, compress the spring.



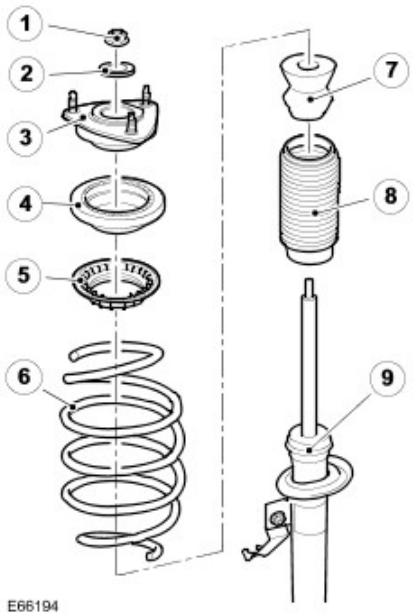
E66192

3 . Loosen the thrust bearing retaining nut.



4 . Disassemble the shock absorber and spring assembly.

1. Remove the thrust bearing nut.
2. Remove the spacer.
3. Remove the top mount.
4. Remove the thrust bearing.
5. Remove the spring seat.
6. Remove the spring.
7. Remove the bump stop.
8. Remove the gaiter.
9. Remove the shock absorber.



Assembly

CAUTION: Make sure the spring locates correctly against the spring seats

1 . To assemble, reverse the disassembly procedure.

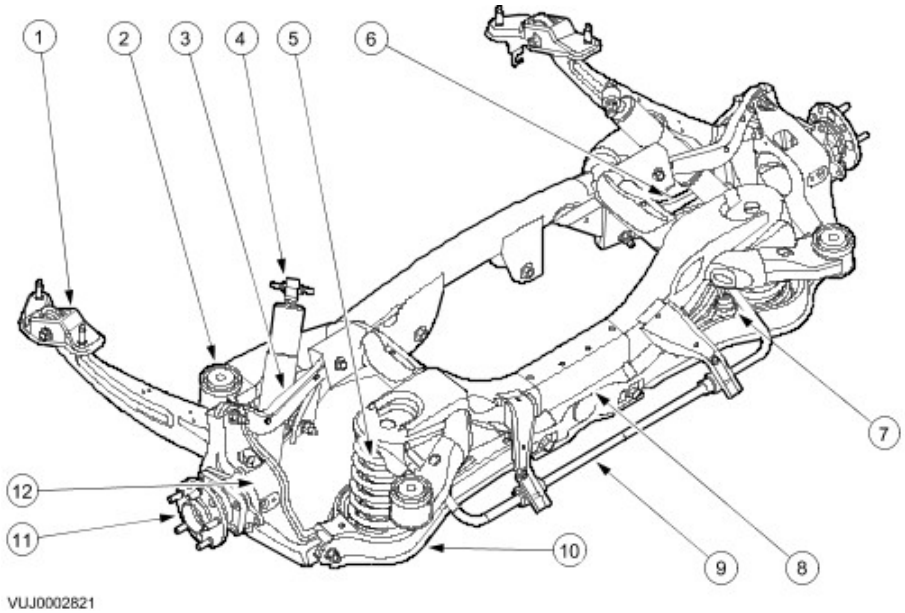
- Tighten to 47 Nm.

Torque Specifications

Description	Nm	Lb-Ft	Lb-In
Front lower arm to wheel knuckle retaining bolt	115	85	-
Front lower arm to subframe retaining bolt	115	85	-
Rear lower arm to wheel knuckle retaining bolt	115	85	-
Rear lower arm to subframe retaining bolt	115	85	-
Upper arm to wheel knuckle retaining bolt	115	85	-
Upper arm to subframe retaining bolt	115	85	-
Wheel knuckle to mounting bracket retaining nut	130	96	-
Wheel knuckle mounting bracket to body retaining bolts	126	93	-
Wheel hub to wheel knuckle retaining bolts	63	46	-
Rear halfshaft to wheel hub retaining nut	270	200	-
Damper to wheel knuckle retaining bolt	130	96	-
Damper to body retaining bolts	25	18	-
Stabilizer bar to subframe retaining bolts	25	18	-
Stabilizer bar link arm to rear lower arm retaining nut	35	26	-

Published: Mar 29, 2001

Rear Suspension



VUJ0002821

Item	Part Number	Description
1	—	Wheel knuckle mounting bracket
2	—	Subframe mount bushing
3	—	Upper arm
4	—	Shock absorber
5	—	Spring
6	—	Front lower arm
7	—	Stabilizer bar link
8	—	Subframe
9	—	Stabilizer bar
10	—	Rear lower arm
11	—	Wheel hub
12	—	Wheel knuckle

The independent rear suspension features an upper arm and front and rear lower arms which attach to the wheel knuckle. The rear lower arm carries the spring and is used to adjust the rear wheel alignment.

Components

The wheel knuckle:

- carries the wheel hub.
- carries the brake caliper assembly.
- carries the Anti-lock brake (ABS) sensor.

The wheel hub:

- carries the brake disc.
- is not a servicable item.

The stabilizer bar link:

- is of a steel construction with a link at each end.
- transmits vertical movements of the rear suspension to the stabilizer bar.

The stabilizer bar:

- is mounted on the subframe.

- is connected to the left-hand and right-hand rear lower arms by the stabilizer bar links.
- is fitted to all models with or without sports suspension.

The upper arm:

- is a one piece steel forging and incorporates rubber bushes with steel inserts at both ends.
- is the upper support for the wheel knuckle.

The front lower arm:

- is of a tubular steel design and incorporates a rubber bush with a steel insert at one end.
- is the front lower support for the wheel knuckle.

The rear lower arm:

- is of a steel design and has cam bolts at the subframe mounting points to adjust wheel alignment.
- is the rear lower support for the wheel knuckle.
- carries the road spring.
- is used to adjust the rear wheel alignment

Bushings:

- are a moulded construction with aluminium inserts.
- are incorporated within the subframe to isolate noise and vibrations.

Published: Mar 2, 2001

Rear Suspension

For additional information, refer to<<204-00>>.

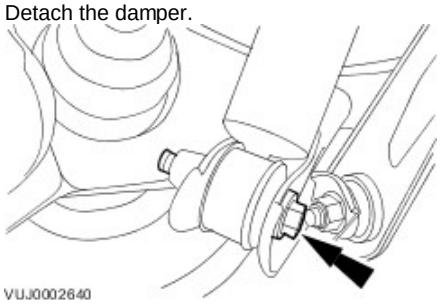
Published: Dec 2, 2003

Damper

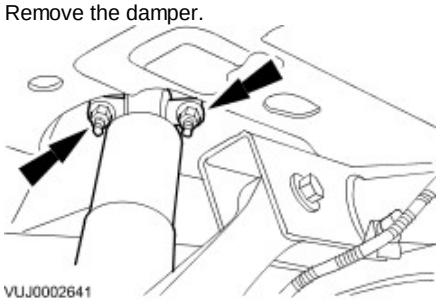
Removal

1 . Raise and support the vehicle.
For additional information, refer to Lifting

2 . Detach the damper.



3 . Remove the damper.

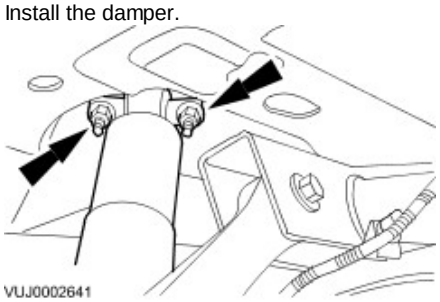


Installation

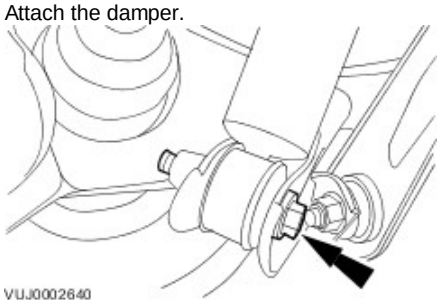
NOTE:

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

1 . Install the damper.



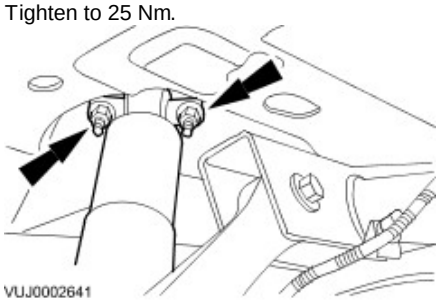
2 . Attach the damper.



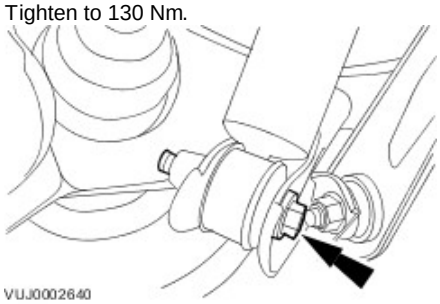
NOTE:

Carry out final tightening of the rear suspension components.

3 . Tighten to 25 Nm.



4 . Tighten to 130 Nm.



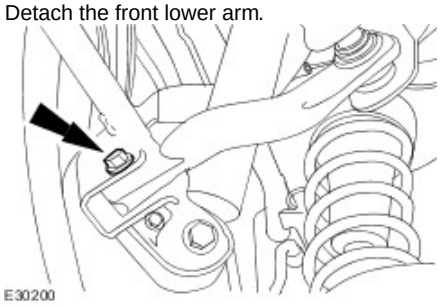
Published: Feb 26, 2008

Front Lower Arm - 4-Door (64.35.51)

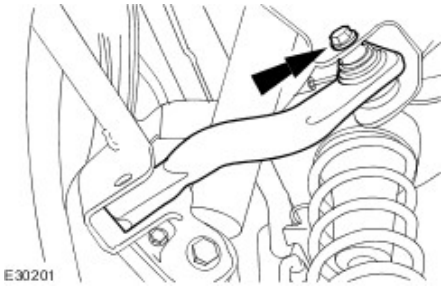
Removal

1 . Raise and support the vehicle.
For additional information, refer to Lifting

2 . Detach the front lower arm.



3 . Remove the front lower arm.

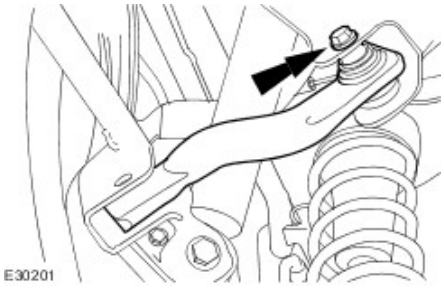


Installation

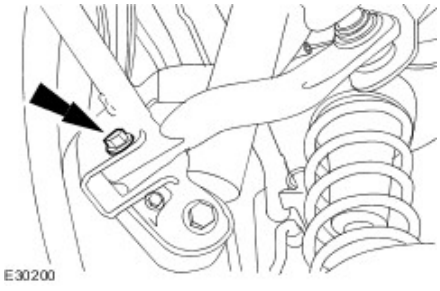
NOTE:

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

1 . Install the front lower arm.

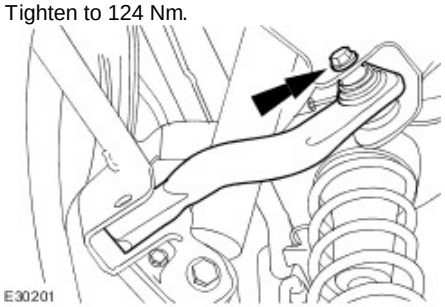


2 . Attach the front lower arm.

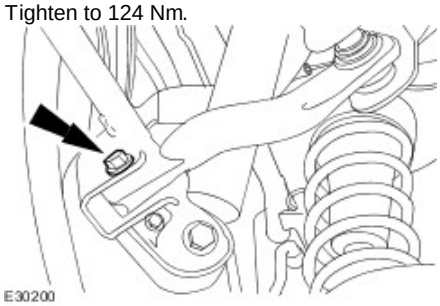


3 . Lower the vehicle.

4 . Tighten to 124 Nm.



5 . Tighten to 124 Nm.



Published: Jun 15, 2005

Front Lower Arm - Wagon (64.35.51)

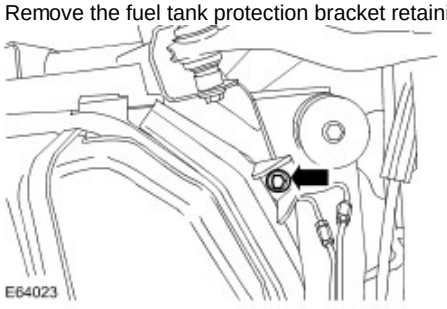
Removal

All vehicles

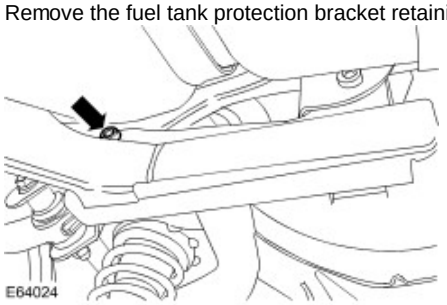
1 . Raise and support the vehicle.
For additional information, refer to Lifting

Vehicles with 2.0L engine

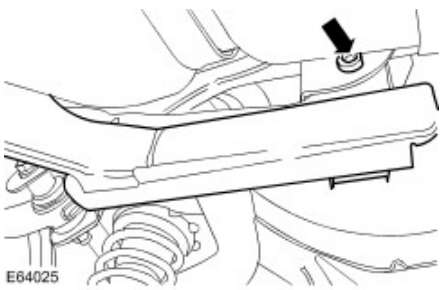
2 . Remove the fuel tank protection bracket retaining bolt.



3 . Remove the fuel tank protection bracket retaining bolt.

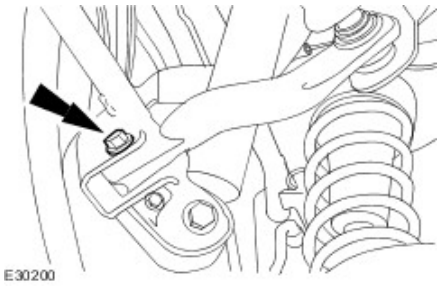


4 . Reposition the fuel tank protection bracket.
- Loosen the fuel tank protection bracket retaining bolt.

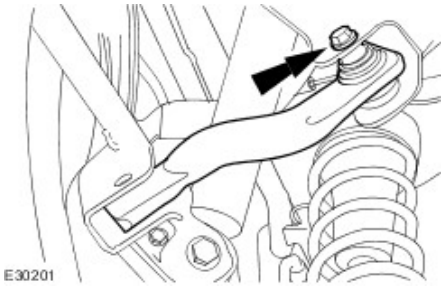


All vehicles

5 . Detach the front lower arm.



6 . Remove the front lower arm.



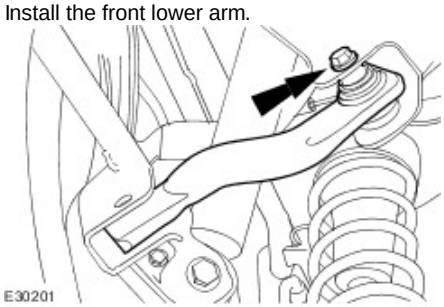
Installation

All vehicles

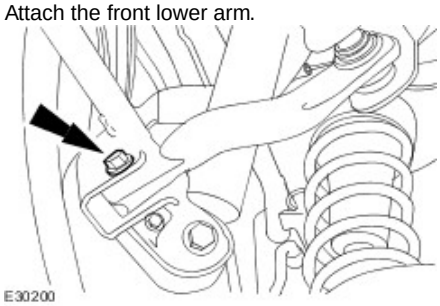
NOTE:

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

1 . Install the front lower arm.

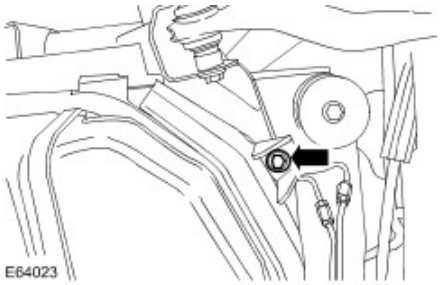


2 . Attach the front lower arm.

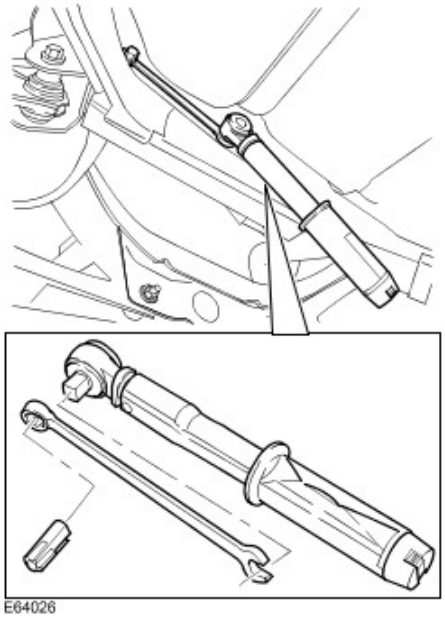


Vehicles with 2.0L engine

3 . Loosely install the fuel tank protection bracket retaining bolt.

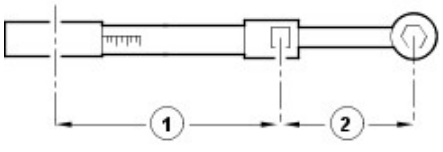


4. Using a suitable torx adaptor, 10 mm combination spanner and 3/8 drive torque wrench, install the fuel tank protection bracket retaining bolt.



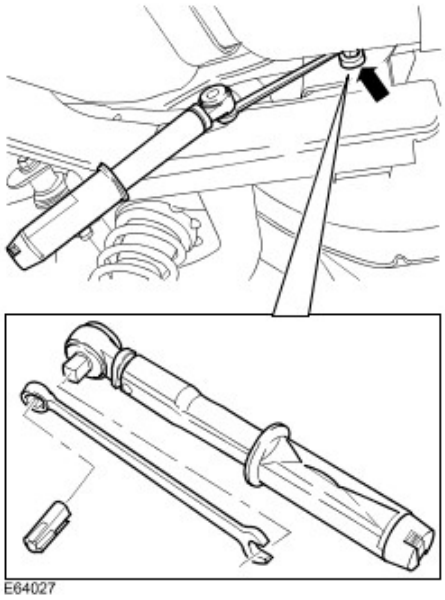
5. Using the torx adaptor, 10 mm combination spanner and 3/8 drive torque wrench, tighten the fuel tank protection bracket retaining bolt.

- To make sure the fuel tank protection bracket retaining bolt is torqued to the correct specification, the following calculation steps must be followed.
  - Step 1. Multiply 25 Nm by the effective length of the torque wrench (1).
  - Step 2. Add the effective length of the special tool (2) to the effective length of the torque wrench (1).
  - Step 3. Divide the total of step 1 by the total of step 2.
  - Step 4. Set the torque wrench to the figure arrived at in step 3.
- Tighten the fuel tank protection bracket retaining bolt to the torque given by the calculation.



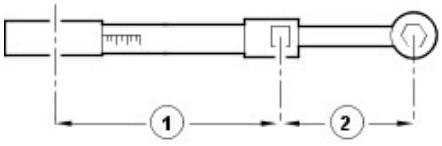
E37107

6. Using a suitable torx adaptor, 10 mm combination spanner and 3/8 drive torque wrench, install the fuel tank protection bracket retaining bolt.



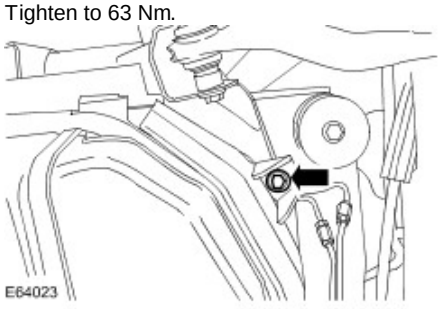
7 . Using the torx adaptor, 10 mm combination spanner and 3/8 drive torque wrench, tighten the fuel tank protection bracket retaining bolt.

- To make sure the fuel tank protection bracket retaining bolt is torqued to the correct specification, the following calculation steps must be followed.
  - Step 1. Multiply 90 Nm by the effective length of the torque wrench (1).
  - Step 2. Add the effective length of the special tool (2) to the effective length of the torque wrench (1).
  - Step 3. Divide the total of step 1 by the total of step 2.
  - Step 4. Set the torque wrench to the figure arrived at in step 3.
- Tighten the fuel tank protection bracket retaining bolt to the torque given by the calculation.



E37107

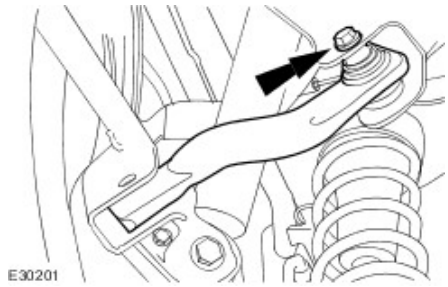
8 . Tighten to 63 Nm.



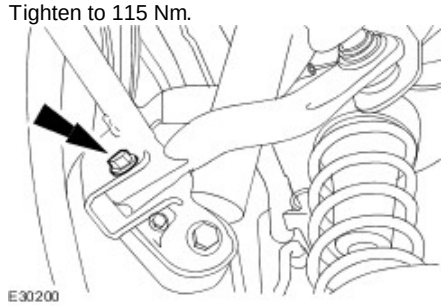
All vehicles

9 . Lower the vehicle.

10 . Tighten to 115 Nm.



11 . Tighten to 115 Nm.



Published: Feb 26, 2008

Rear Lower Arm (64.35.52)

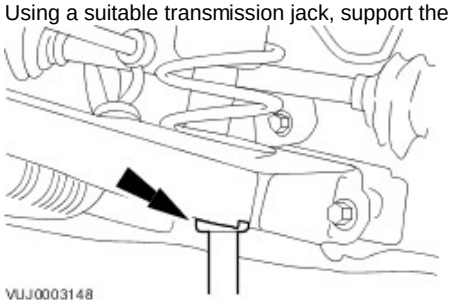
Removal

1 . Remove the rear wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

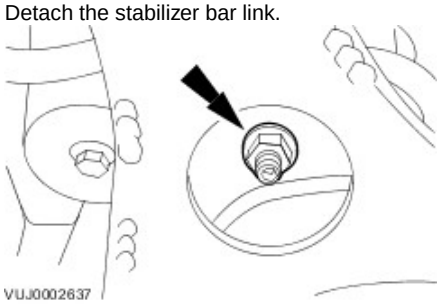
2 . Using suitable tie straps, secure the spring to the subframe.

3 . **CAUTION: Make sure that excessive strain is not placed on the rear lower arm.**

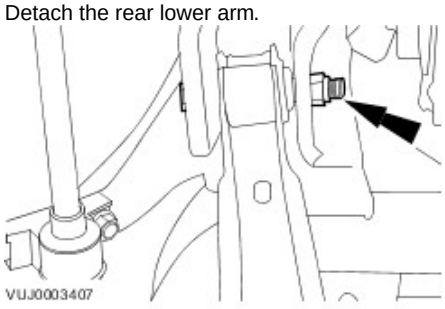
Using a suitable transmission jack, support the rear lower arm.



4 . Detach the stabilizer bar link.

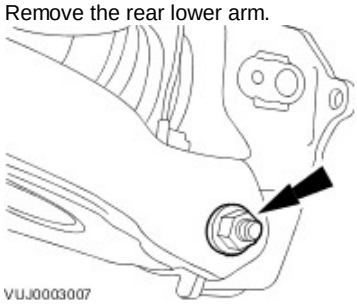


5 . Detach the rear lower arm.



6 . **CAUTION: Carefully lower the transmission jack.**

Remove the rear lower arm.

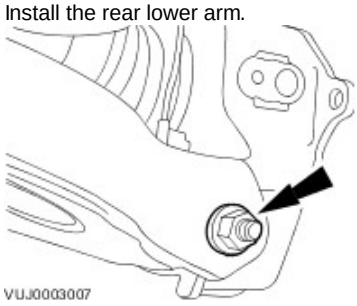


Installation

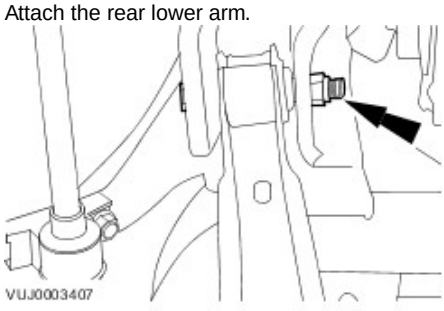
NOTE:

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

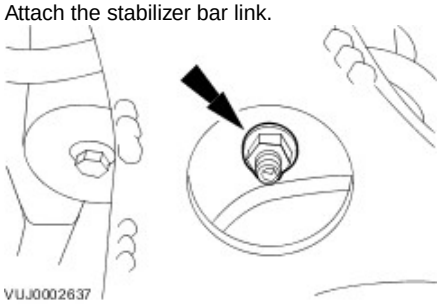
1 . Install the rear lower arm.



2 . Attach the rear lower arm.

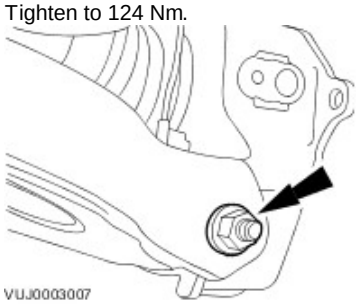


3 . Attach the stabilizer bar link.

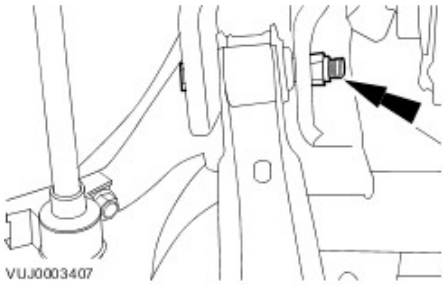


4 . Install the rear wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

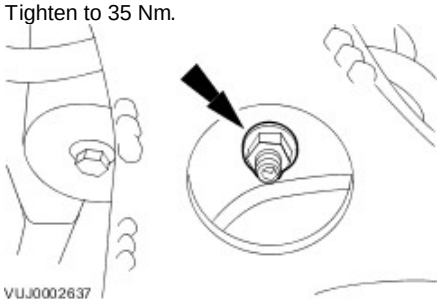
5 . Tighten to 124 Nm.



6 . Tighten to 124 Nm.



7 . Tighten to 35 Nm.



8 . Check the wheel alignment and adjust as necessary.
For additional information, refer to Wheel Alignment Angles

Published: Feb 26, 2008

Spring (64.20.01)

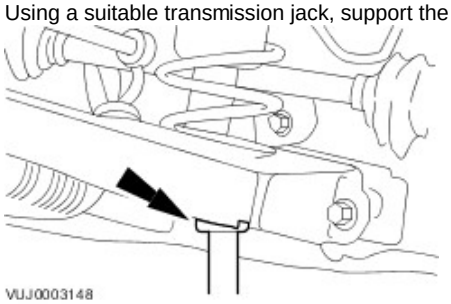
Removal

1 . Remove the rear wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

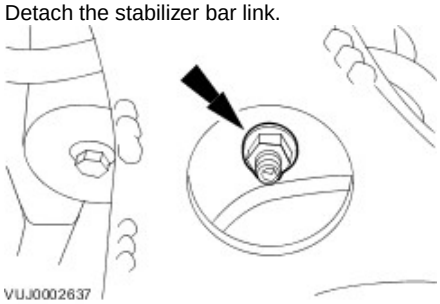
2 . Using suitable tie straps, secure the spring to the subframe.

3 . **CAUTION: Make sure that excessive strain is not placed on the rear lower arm.**

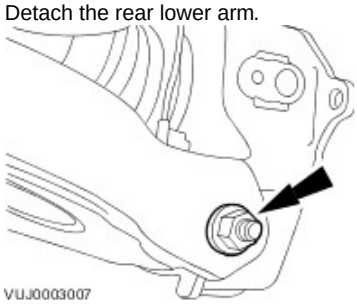
Using a suitable transmission jack, support the rear lower arm.



4 . Detach the stabilizer bar link.

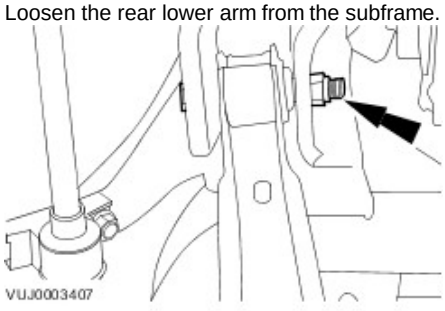


5 . Detach the rear lower arm.



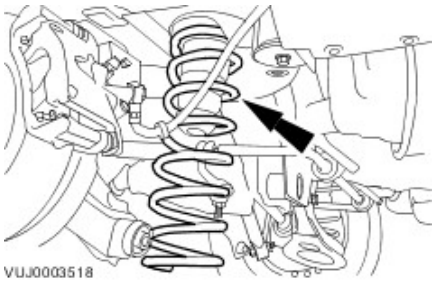
6 . **CAUTION: Carefully lower the transmission jack.**

Loosen the rear lower arm from the subframe.



7 . Remove the spring.

Remove the isolator.



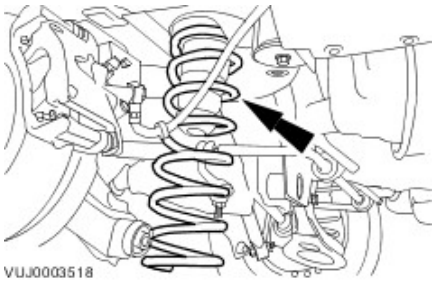
Installation

NOTE:

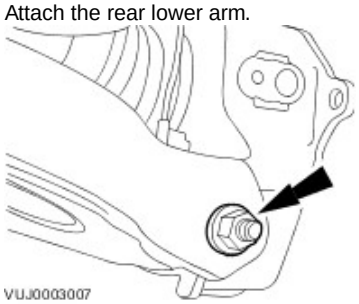
The final tightening of the rear suspension components must be carried out with the vehicle on its wheels.

1 . Install the spring.

Install the isolator.



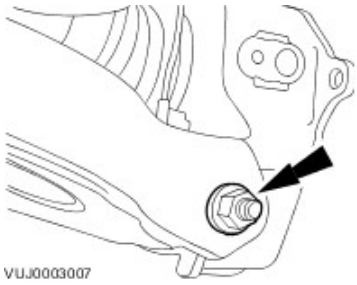
2 . Attach the rear lower arm.



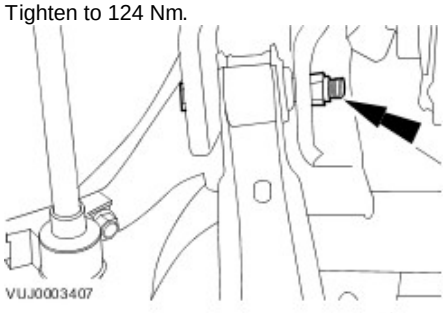
3 . Attach the anti roll bar link.

4 . Install the wheel rear wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

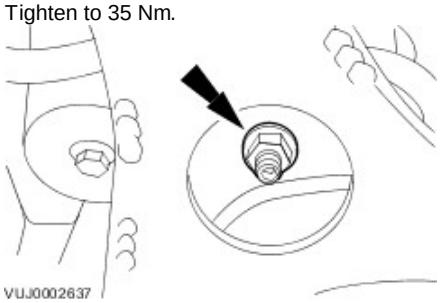
5 . Tighten to 124 Nm.



6 . Tighten to 124 Nm.



7 . Tighten to 35 Nm.



8 . Check the wheel alignment and adjust as necessary.
For additional information, refer to Wheel Alignment Angles

Published: Nov 15, 2001

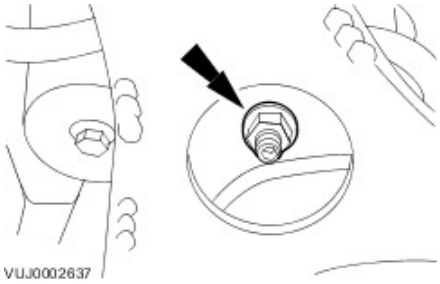
Rear Stabilizer Bar (64.35.08)

Removal

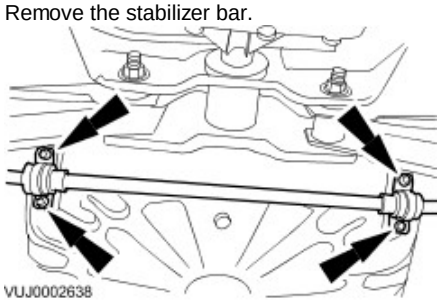
1 . Raise and support the vehicle. For additional information, refer to <<100-02>>.

2 . Detach the stabilizer bar links.

- Right-hand shown, left-hand similar.



3 . Remove the stabilizer bar.



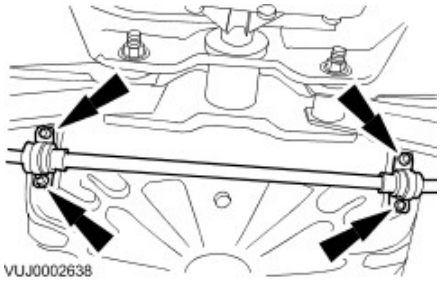
Installation

NOTE:

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

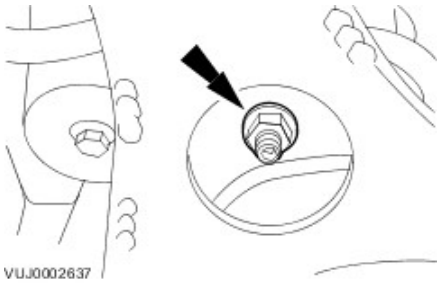
1 . To install, reverse the removal procedure.

- Tighten to 25 Nm.



2 . Tighten to 35 Nm.

- Right-hand shown, left-hand similar.


VUJ0002637

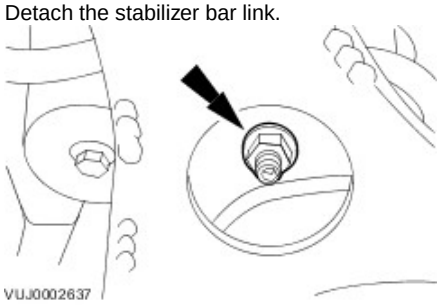
Published: Nov 15, 2001

Rear Stabilizer Bar Link (64.35.24)

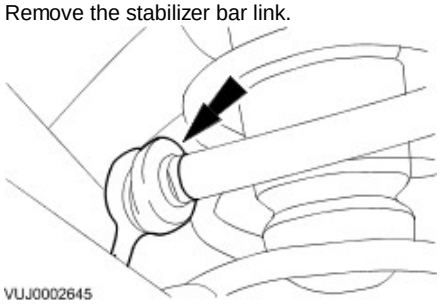
Removal

1 . Raise and support the vehicle. For additional information, refer to <<100-02>>.

2 . Detach the stabilizer bar link.



3 . Remove the stabilizer bar link.



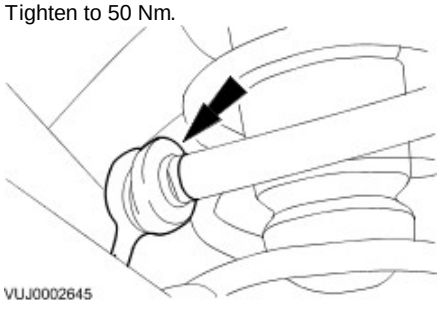
Installation

NOTE:

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

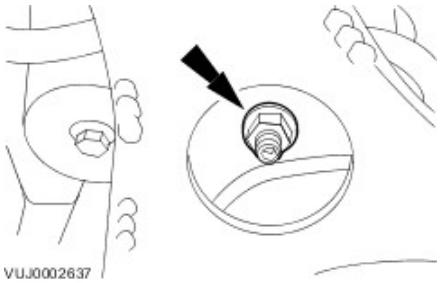
1 . **CAUTION: Make sure rubber boot does not twist while tightening.**

Tighten to 50 Nm.



2 . To install, reverse the removal procedure.

Tighten to 35 Nm.


VUJ0002637

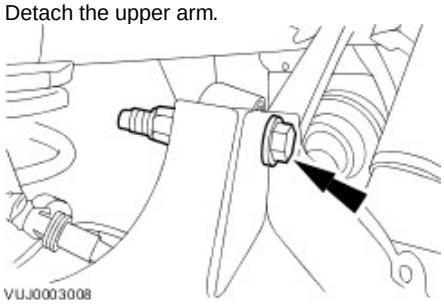
Published: Feb 26, 2008

Upper Arm (64.25.31)

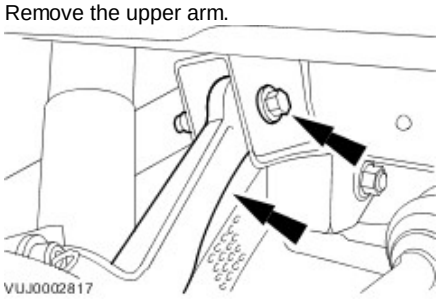
Removal

1 . Remove the rear wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

2 . Detach the upper arm.



3 . Remove the upper arm.

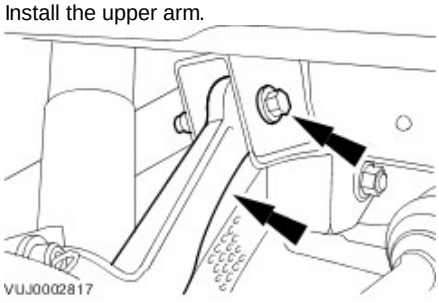


Installation

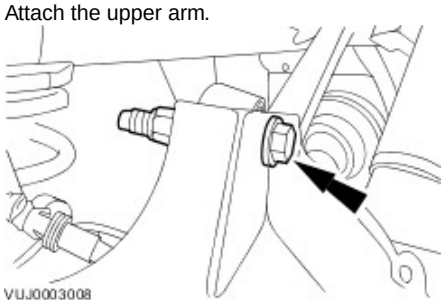
NOTE:

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

1 . Install the upper arm.

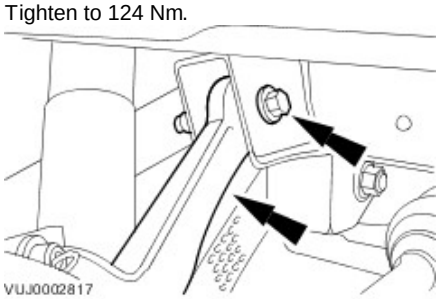


2 . Attach the upper arm.

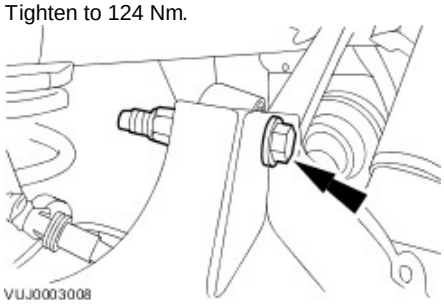


3 . Install the wheel and tire assembly.
For additional information, refer to Wheel and Tire (74.20.05)

4 . Tighten to 124 Nm.



5 . Tighten to 124 Nm.



6 . Check the wheel alignment and adjust as necessary.
For additional information, refer to Wheel Alignment Angles

Published: Dec 1, 2003

Wheel Hub (64.15.14)

Special Service Tools

Puller, Wheel hub remover
205-491

Forcing Screw, Wheel hub remover
204-269

Adaptor Nuts, Wheel hub remover
205-491-01

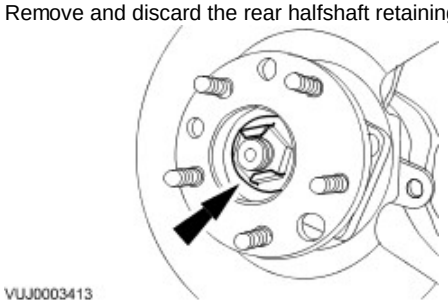
Removal

All vehicles

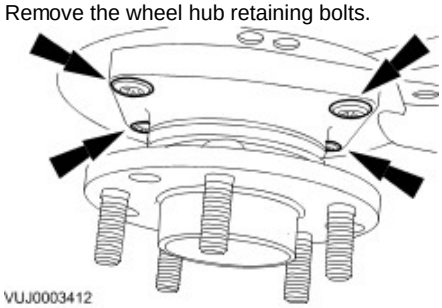
1 . Remove the rear brake disc.
For additional information, refer to Brake Disc (70.10.11)

Vehicles with 2.5L or 3.0L engine

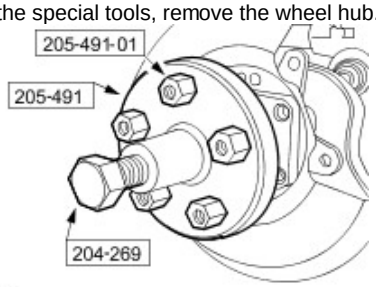
2 . Remove and discard the rear halfshaft retaining nut.



3 . Remove the wheel hub retaining bolts.



4 . Using the special tools, remove the wheel hub.



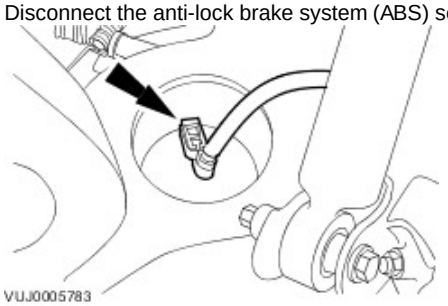
VUJ0003411

Vehicles with 2.0L engine

5 .

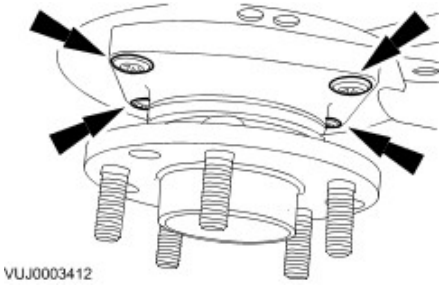
CAUTION: Failure to follow this procedure may result in damage to the anti-lock brake system (ABS) components.

Disconnect the anti-lock brake system (ABS) sensor electrical connector.


VUJ0005783

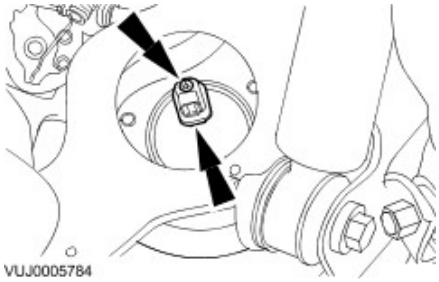
6 . Remove the wheel hub.

- Remove the retaining bolts.


VUJ0003412

7 . Remove the (ABS) sensor.

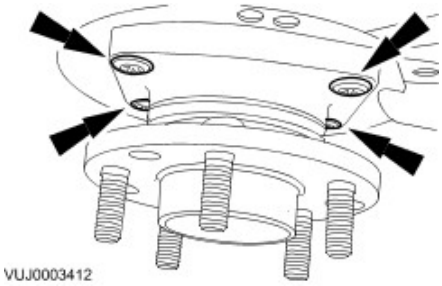
- Remove the retaining bolt.


VUJ0005784

Installation

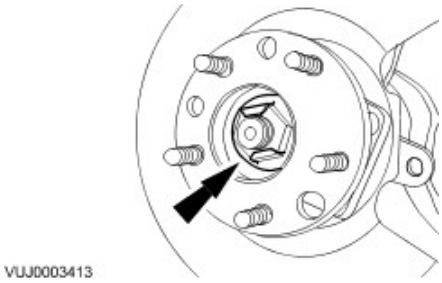
All vehicles

1 . Install the wheel hub.
   - Tighten to 63 Nm.



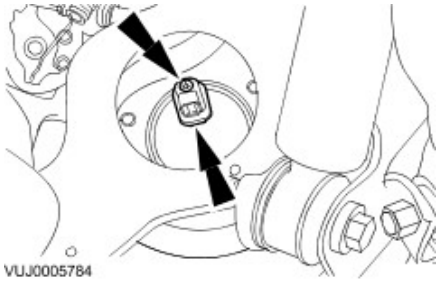
Vehicles with 2.5L or 3.0L engine

2 . Install a new rear halfshaft retaining nut.
   - Tighten to 270 Nm.

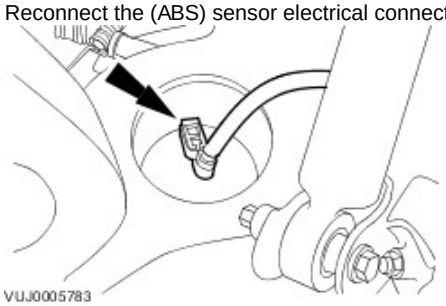


Vehicles with 2.0L engine

3 . Install the (ABS) sensor.
   - Tighten to 7 Nm.



4 . Reconnect the (ABS) sensor electrical connector.



All vehicles

5 . Install the rear brake disc.
   For additional information, refer to Brake Disc (70.10.11)

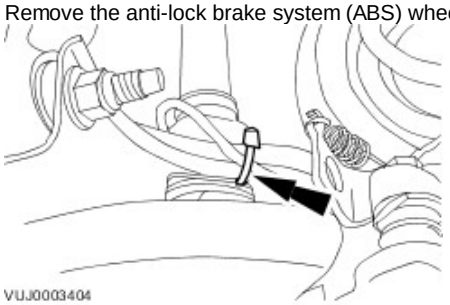
Published: Feb 26, 2008

Wheel Knuckle (64.15.22)

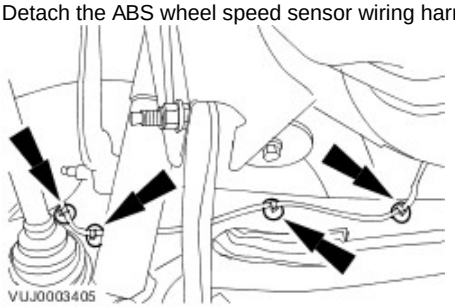
Removal

1 . Remove the wheel hub.
For additional information, refer to

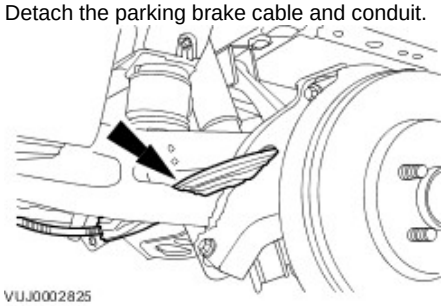
2 . Remove the anti-lock brake system (ABS) wheel speed sensor wiring harness retaining strap.


VUJ0003404

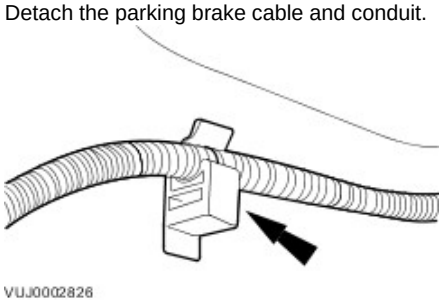
3 . Detach the ABS wheel speed sensor wiring harness.


VUJ0003405

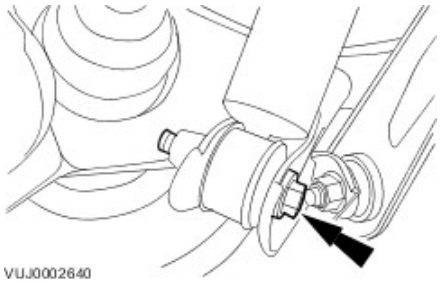
4 . Detach the parking brake cable and conduit.


VUJ0002825

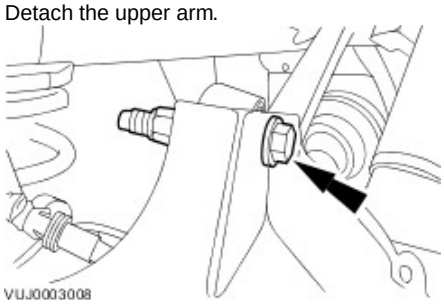
5 . Detach the parking brake cable and conduit.


VUJ0002826

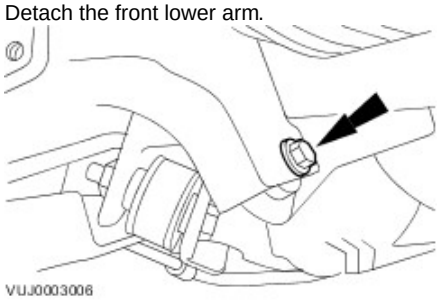
6 . Detach the damper.



7 . Detach the upper arm.



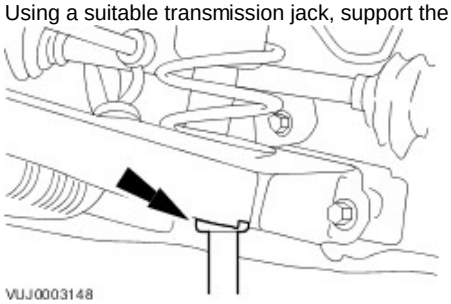
8 . Detach the front lower arm.



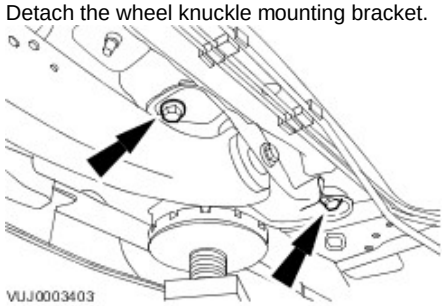
9 .

CAUTION: Make sure that excessive strain is not placed on the lower arm.

Using a suitable transmission jack, support the rear lower arm.

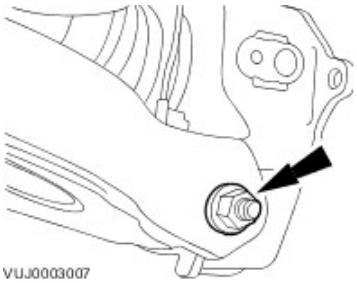


10 . Detach the wheel knuckle mounting bracket.



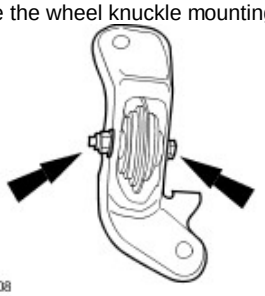
11 . Remove the wheel knuckle.

- Detach the rear lower arm.



12 . **CAUTION: Make sure correct position of the mounting bracket is noted before removal.**

Remove the wheel knuckle mounting bracket.



Installation

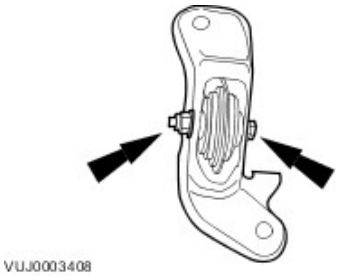
NOTE:

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

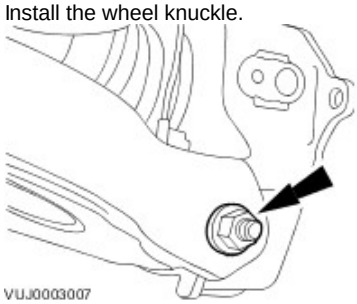
1 . **CAUTION: Make sure the mounting bracket is installed in the correct position.**

Install the wheel knuckle mounting bracket.

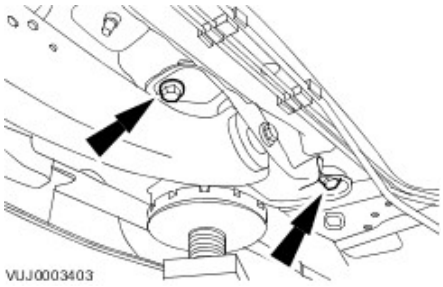
Tighten to 130 Nm.



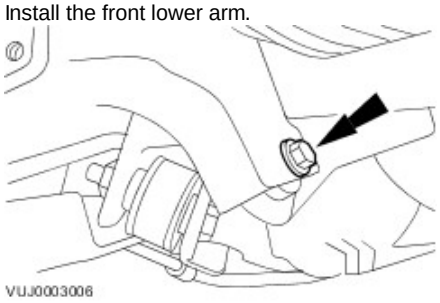
2 . Install the wheel knuckle.



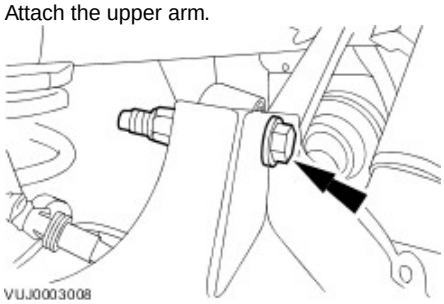
3 . Attach the wheel knuckle mounting bracket.



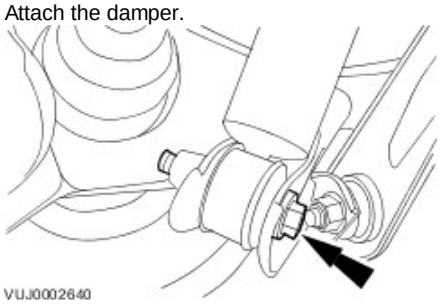
4 . Install the front lower arm.



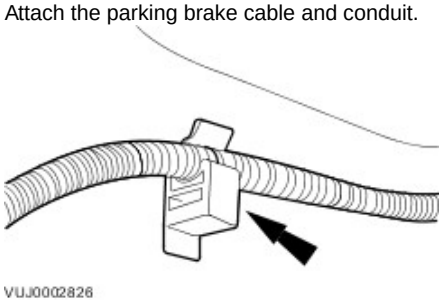
5 . Attach the upper arm.



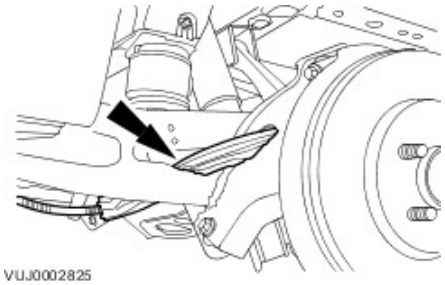
6 . Attach the damper.



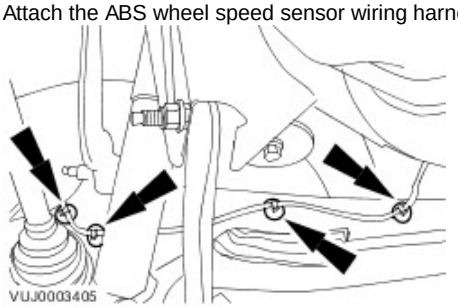
7 . Attach the parking brake cable and conduit.



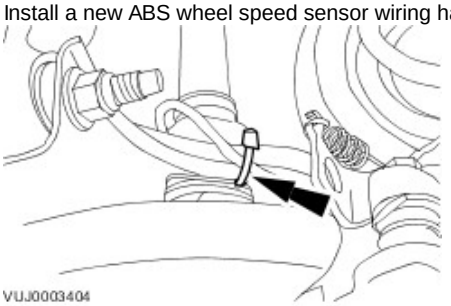
8 . Attach the parking brake cable and conduit.



9 . Attach the ABS wheel speed sensor wiring harness.

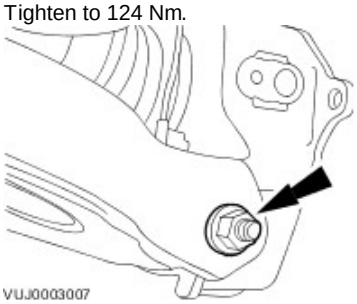


10 . Install a new ABS wheel speed sensor wiring harness retaining strap.

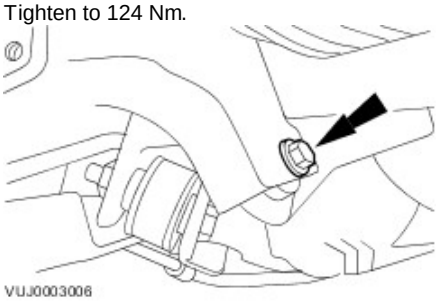


11 . Install the wheel hub.
For additional information, refer to

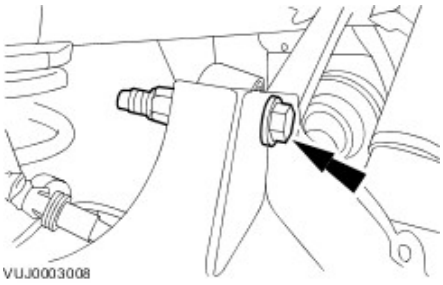
12 . Tighten to 124 Nm.



13 . Tighten to 124 Nm.



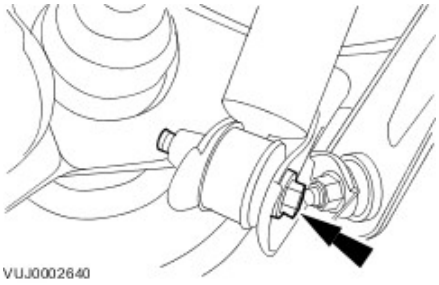
14 . Tighten to 124 Nm.



15 Tighten to 115 Nm.

.

Note: If you are re-using this fixing on a vehicle built prior to VIN J29472, then tighten to 130 Nm. If you are replacing a fixing on any vehicle, then you must replace both nut and bolt and tighten to 115 Nm.



16 . Check the wheel alignment and adjust as necessary.
For additional information, refer to Wheel Alignment Angles

Published: Mar 7, 2008

Wheel Knuckle Front Bushing (64.15.28)

Special Service Tools

Support Cup, Rear wheel knuckle front bush
204-300

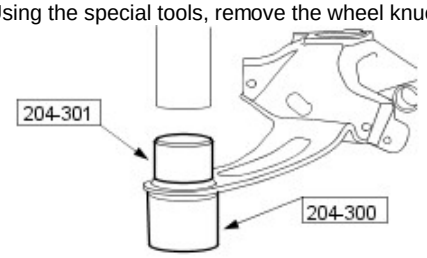
Remover, Rear wheel knuckle front bush
204-301

Installer, Rear wheel knuckle front bush
204-302

Removal

1 . Remove the wheel knuckle. For additional information, refer to
For additional information, refer to Wheel Knuckle (64.15.22) .

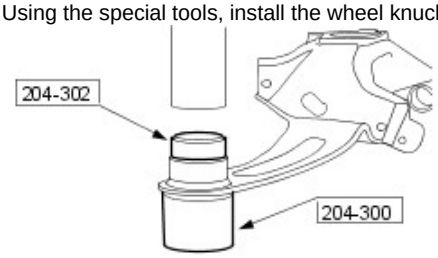
2 . Using the special tools, remove the wheel knuckle front bushing.



VUJ0003520

Installation

1 . Using the special tools, install the wheel knuckle front bushing.



VUJ0003519

2 . Install the wheel knuckle. For additional information, refer to
For additional information, refer to Wheel Knuckle (64.15.22) .

Published: Feb 26, 2008

Wheel Knuckle Rear Bushing (64.15.30)

Special Service Tools

Forcing Screw, Rear Wheel Knuckle Rear Bush
204-246

Support Cup, Rear Wheel Knuckle Rear Bush
204-296

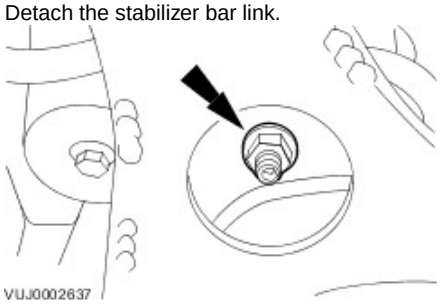
Remover, Rear Wheel Knuckle Rear Bush
204-298

Installer, Rear Wheel Knuckle Rear Bush
204-297

Removal

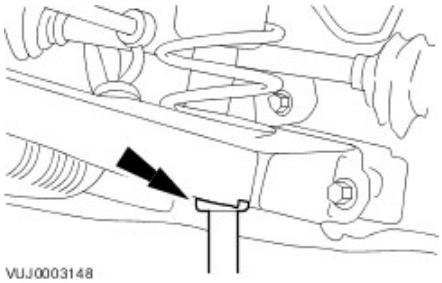
1 . Remove the rear wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

2 . Detach the stabilizer bar link.

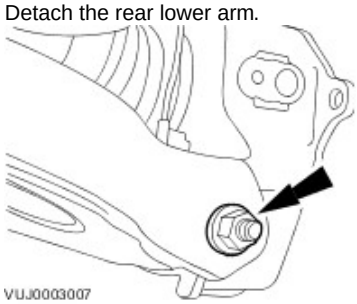


3 . **CAUTION: Make sure that excessive strain is not placed on the lower arm.**

Using a suitable transmission stand, support the rear lower arm.

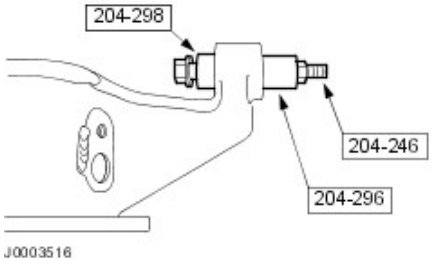


4 . Detach the rear lower arm.



5 . **CAUTION: Carefully lower the transmission jack.**

Using the special tools, remove the wheel knuckle rear bushing.



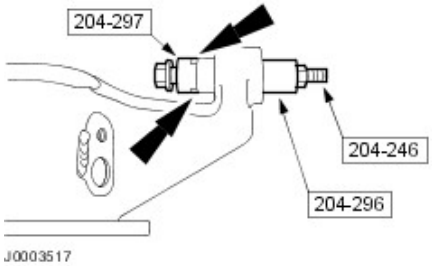
Installation

NOTE:

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

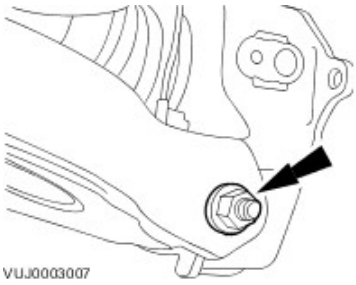
1 . Using the special tools, install the wheel knuckle rear bushing.

- Align the bushing horizontally.

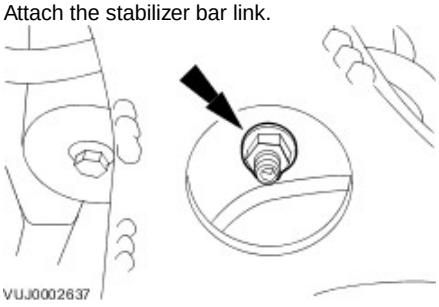


2 . **CAUTION: Carefully raise the transmission jack.**

Attach the rear lower arm.

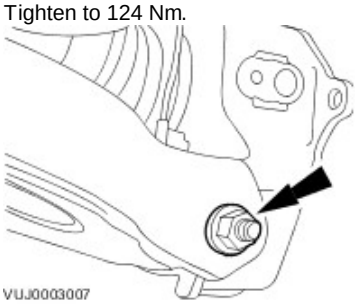


3 . Attach the stabilizer bar link.

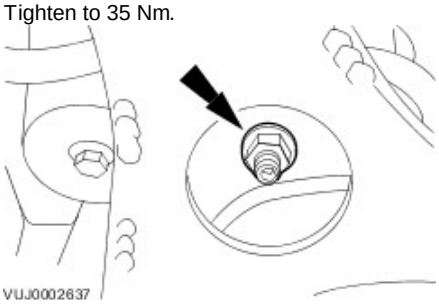


4 . Install the rear wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

5 . Tighten to 124 Nm.



6 . Tighten to 35 Nm.



7 . Check the wheel alignment and adjust as necessary.
For additional information, refer to Wheel Alignment Angles

Published: May 25, 2006

Specifications

Tire Pressures

Wheel Size	Tire Size	Tire Manufacturer	Rim	Engine	Comfort		Normal	
					Front	Rear	Front	Rear
16"	205/55 R16 91 V	Pirelli P6000	6.5Jx16	2.0L	2.07 bar (30 lbf/in²)	2.07 bar (30 lbf/in²)	2.41 bar (35 lbf/in²)	2.21 bar (32 lbf/in²)
				2.5L and 3.0L	2.21 bar (32 lbf/in²)	2.21 bar (32 lbf/in²)	2.62 bar (38 lbf/in²)	2.41 bar (35 lbf/in²)
				2.0L and 2.2L Diesel	2.21 bar (32 lbf/in²)	2.07 bar (30 lbf/in²)	2.41 bar (35 lbf/in²)	2.21 bar (32 lbf/in²)
	205/55 R16 91 H	Continental CH95	6.5Jx16	2.5L and 3.0L	2.21 bar (32 lbf/in²)	2.21 bar (32 lbf/in²)	2.62 bar (38 lbf/in²)	2.41 bar (35 lbf/in²)
17"	225/45 R17 91 Y	Pirelli P Zero	7Jx17	2.5L and 3.0L	2.07 bar (30 lbf/in²)	2.07 bar (30 lbf/in²)	2.62 bar (38 lbf/in²)	2.41 bar (35 lbf/in²)
				2.0L and 2.2L Diesel	2.21 bar (32 lbf/in²)	2.07 bar (30 lbf/in²)	2.48 bar (36 lbf/in²)	2.34 bar (34 lbf/in²)
	225/45 R17 91 H	Continental CH95	7Jx17	2.5L and 3.0L	2.07 bar (30 lbf/in²)	2.07 bar (30 lbf/in²)	2.62 bar (38 lbf/in²)	2.41 bar (35 lbf/in²)
	225/45 R17 94 W	Continental SportContact	7Jx17	2.5L and 3.0L	2.34 bar (34 lbf/in²)	2.34 bar (34 lbf/in²)	2.62 bar (38 lbf/in²)	2.41 bar (35 lbf/in²)
				2.0L and 2.2L Diesel	2.34 bar (34 lbf/in²)	2.34 bar (34 lbf/in²)	2.62 bar (38 bf/in²)	2.41 bar (35 lbf/in²)
	205/50 R17 93 Y	Pirelli P Zero Rosso	7Jx17	2.0L	2.34 bar (34 lbf/in²)	2.34 bar (34 lbf/in²)	2.48 bar (36 lbf/in²)	2.34 bar (34 lbf/in²)
18"	225/40 R18 92 Y	Pirelli P Zero Nero	7.5x18	2.0L	2.34 bar (34 lbf/in²)	2.21 bar (32 lbf/in²)	2.62 bar (38 lbf/in²)	2.41 bar (35 lbf/in²)
				2.5L and 3.0L	2.48 bar (36 lbf/in²)	2.34 bar (34 lbf/in²)	2.76 bar (40 lbf/in²)	2.41 bar (35 lbf/in²)
				2.0L and 2.2L Diesel	2.34 bar (34 lbf/in²)	2.21 bar (32 lbf/in²)	2.62 bar (38 lbf/in²)	2.41 bar (35 lbf/in²)
16" (temporary use spare wheel)	T125/85 R16 99 M	Pirelli	4Jx16	All Variants	4.14 bar (60 ibf/in²)			

Torque Specifications

Description	Nm	lb-ft	lb-in
Wheel nuts - Vehicles with steel wheels	80	59	-
Wheel nuts - Vehicles with aluminium wheels	103	76	-

Tire Specification

Tire Manufacturer	Tire Size
Pirelli P6000 Powergy	205/55R16 91V
Continental CH95	205/55R16 91 H
Continental SportContact	225/45R17 94W
Pirelli P-Zero	225/45R17 91 Y
Continental CH95	225/45 R17 91 H
Pirelli P-Zero Rosso	205/50R17 93 Y
Pirelli P-Zero Nero	225/40R18 92 Y
Pirelli (Spare Tire)	T125/85R16 99 M

Winter Tire Specification

Tire Manufacturer	Tire Size
Pirelli Snowsport	205/55R16 91 H
Continental Winter Contact TS790	205/55R16 91 H

Pirelli Snowsport	205/50R17 93 H
Pirelli Snowsport	225/45R17 91 H
Pirelli Snowsport	225/40R18 92 H
Continental Winter Contact TS790	225/40R18 92 H

Wheel Specification

Wheel Type	Wheel Size
16 Inch - Steel	16x6.5J
16 Inch - Alloy	16x6.5J
17 Inch - Alloy	17x7J
18 Inch - Alloy	18x7.5J
Spare wheel - steel	4Jx16

Published: Nov 1, 2001

Specifications

General Specifications

Item	Specification
Tire Pressures	0-100 mph (0-160 km/h)
Front 205/55 R16	2.2 bar (32 lbf/in2)
Rear 205/55 R16	2.2 bar (32 lbf/in2)
Front 205/50 R17	2.3 bar (34 lbf/in2)
Rear 205/50 R17	2.2 bar (32 lbf/in2)
Front 225/45 R17	2.1 bar (30 lbf/in2)
Rear 225/45 R17	2.1 bar (30 lbf/in2)
Spare Tire	4.2 bar (60 lbf/in2)

Torque Specifications

Description	Nm	lb-ft	lb-in
Wheel nuts - Vehicles with steel wheels	80	59	-
Wheel nuts - Vehicles with aluminium wheels	103	76	-

Tire Specification

Tire Manufacturer	Tire Size
Pirelli P6000 Powergy	205/55R16 91V
Pirelli Snowsport	205/55R16 91 H
Pirelli Snowsport	205/55R16 91 V
Continental Winter Contact TS790	205/55R16 91 V
Pirelli P-Zero	225/45R17 91 Y
Pirelli Snowsport	225/45R17 91 H
Pirelli Snowsport	225/45R17 91 V
Pirelli (Spare Tire)	145/80R16 98 M

Wheel Specification

Wheel Type	Wheel Size
Steel	6.5x16
Five spoke - alloy	6.5x16
Ten spoke - alloy	6.5x16
Double five spoke - alloy	7x17
Spare wheel - steel	4Jx16

Published: Nov 1, 2001

Safety Precautions

 **WARNING: Do not mix different types of tires on the same vehicle such as radial, bias or bias belted tires except in emergencies (temporary spare usage). Failure to follow this instruction may result in personal injury.**

 **WARNING: Never run the engine with one wheel off the ground, for example when changing a wheel. The wheel resting on the ground may cause the vehicle to move. Failure to follow this instruction may result in personal injury.**

 **WARNING: Aftermarket aerosol tire sealants are extremely flammable. Always question the customer to make sure that these products have not been used. Failure to follow this instruction may result in personal injury.**

 **WARNING: Always wear safety goggles or a face shield when performing any work with wheel and tire assemblies. Failure to follow this instruction may result in personal injury.**

 **WARNING: Retighten the wheel nuts at (500 miles) 800 Km after any wheel change or anytime the wheel nuts are loosened. Failure to follow this instruction may result in personal injury.**

 **WARNING: Failure to retighten the wheel nuts at the specified mileage may cause the wheels to become detached while the vehicle is in motion. Failure to follow this instruction may result in personal injury.**

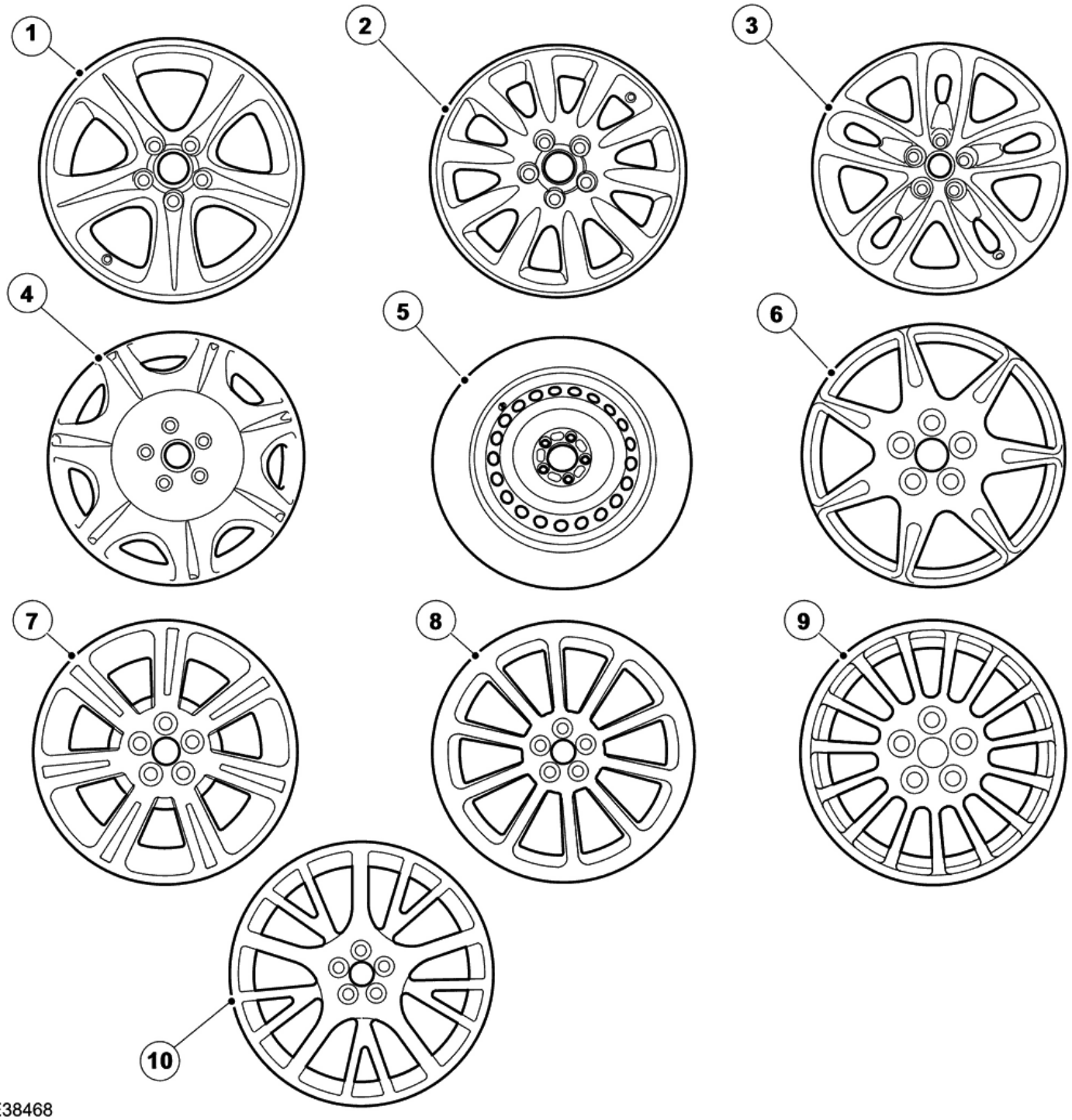
 **WARNING: Each individual axle, wheel and tire has its own maximum weight or tire inflation rating. Do not overload or over-inflate beyond the capacity of the lowest rated components of the system. Failure to follow these instructions may result in personal injury.**

 **WARNING: When changing a wheel, make sure that the vehicle cannot move. Always apply the parking brake and select the transmission park position. Failure to follow these instructions may result in personal injury.**

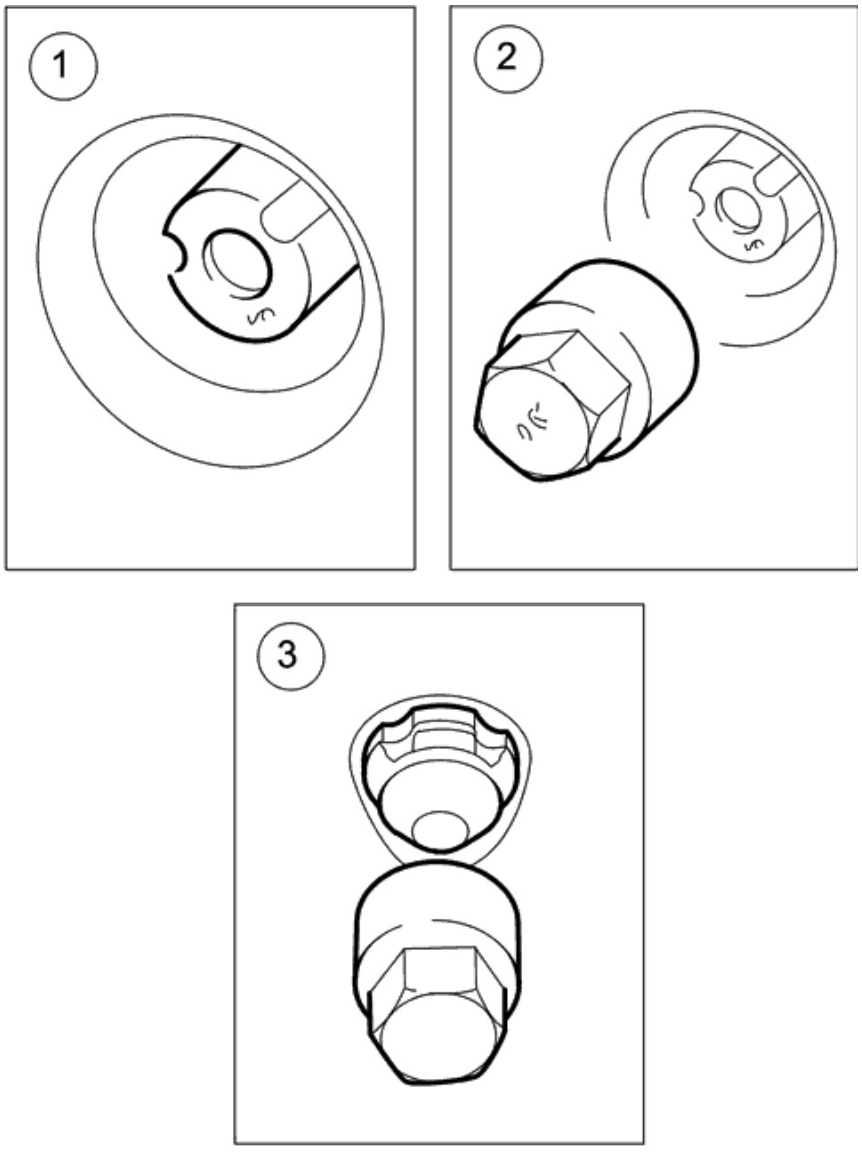
 **WARNING: Reduce air pressure as much as possible by pushing the valve core plunger in before removing the valve core. Failure to follow this instruction may result in personal injury.**

 **CAUTION: Do not clean aluminium wheels with steel wool, abrasive type cleaners or detergents. Failure to follow these instructions may result in damage to the vehicle.**

Wheels and Tires



Item	Description
1	Five spoke alloy
2	Ten spoke alloy
3	Double five spoke alloy
4	Wheel trim (from 2002 MY)
5	Steel wheel
6	Seven spoke alloy (from 2002 MY)
7	Seven spoke flute (from 2003 MY)
8	Melbourne (from 2003 MY)
9	Indianapolis (from 2003 MY)
10	Five spoke alloy (from 2003 MY, Japan only)



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Published: Apr 23, 2007

Wheels and Tires

E45065

Item	Part Number	Description
1	—	Locking wheel nut and wrench socket

Locking Wheel Nuts

Locking wheel nuts are fitted to all UK and Mexico vehicles with alloy wheels, and are available as an accessory in certain other markets.

One locking wheel nut is fitted to each road wheel and may only be removed by using the correctly coded socket.

Locking wheel nuts are available in one length only. The correct socket, and cover removal tool if required, is supplied with the vehicle tool kit. Sets of sockets are available to Jaguar dealers.

Recommended Tires

The radial ply tires recommended by Jaguar meet the high speed performance of the vehicle. Only tires of identical specification may be fitted as replacements. Under no circumstances must cross-ply tires be fitted.

Tire Inflation Pressures

All recommended tires, including winter tires, must be inflated to the pressures shown in the Specifications sub-section. Inflation pressures must only be checked when the tires are cold.

If it is necessary to use non-recommended tires, they must be inflated to 0.14 bar (2 lbf/in^2) above the pressure for the recommended tires, Jaguar specified tires are marked with a letter 'J' on the side wall.

Tire Replacement and Wheel-Interchanging

When the replacement of a tire is necessary, it is preferable to fit a complete set. If two replacement tires are fitted (to one axle), they must be of the same manufacturer and type as those on the other axle.

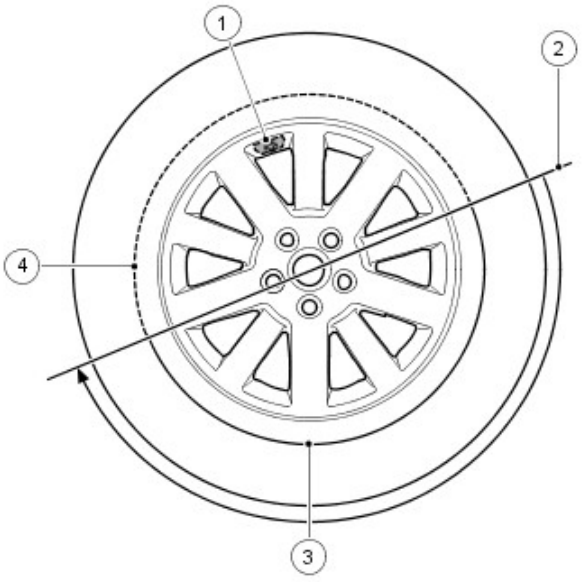
No attempt must be made to interchange wheels from the front to the rear or vice-versa, as wear produces a characteristic pattern on each tire depending upon its position on the vehicle. If this position is changed after wear has occurred, the performance of the tire will be adversely affected.

New tires must be balanced before fitting to the vehicle.

Vehicles fitted with Tire Pressure Monitoring System

On vehicles fitted with TPMS, care must be taken when removing and refitting tires to ensure that the tire pressure sensor is not damaged.

Vehicles fitted with TPMS can be visually identified by an external metal locknut and valve of the tire pressure sensor on the road wheels. Vehicles without TPMS will have rubber tire valve.



Item	Part Number	Description
1		Tire valve and pressure sensor
2		Tire fitting/removal tool initial start position
3		High tire and bead tension area
4		Low tire and bead tension area

When removing the tire, the bead breaker must not be used within 90º of the tire valve in each direction on each side of the tire.

When using the tire removal machine, the fitting arm start position must be positioned as shown in the tire changing illustration for each side of the tire. The wheel can then be rotated through 180 degrees in a counter-clockwise direction. This will relieve tension from the tire bead allowing the remaining 180 degrees of the tire to be manually pulled from the rim.

When refitting the tire, position the fitting arm as shown. Rotate the tire and take care that the bead on the low tension side of the tire does not damage the sensor.

Winter (Snow) Tires

Winter tires must only be fitted in complete four-wheel sets of the same type and size. The maximum speed with winter tires fitted (without snow chains) is 210 km/h (131 mile/h) for 'H' rated, and 240 km/h (150 mile/h) for 'V' rated.

When using snow chains, note that:

- Snow chains must only be fitted to the driven wheels.
- Only Jaguar approved snow chains should be used.
- Snow chains must not be used on roads which are clear of snow.
- The maximum speed with snow chains fitted is 48 km/h (30 mile/h).
- Traction control (where fitted) must be switched OFF when using snow chains.

Rotational Indicators

Some recommended winter tires may have an arrow moulded in the sidewall to indicate the correct direction of rotation. It is essential that these tires are fitted so that the arrow is pointing in the direction of rotation.

Some of the recommended tires for normal and winter use have an asymmetric tread pattern. These tires have inside and outside markers which should be fitted appropriately to the wheel.

Temporary-Use Spare Wheel

In certain markets, the spare wheel supplied with the vehicle is of the temporary-use type; it is narrower than the normal road wheel and takes up less room in the wheel luggage compartment.

When using this type of spare wheel note that:

- Maximum speed must not exceed 80 km/h (50 mile/h).
- The normal road wheel must be replaced as soon as possible.
- Only one temporary-use wheel may be fitted to the vehicle at any time.

- Traction control (where fitted) must be switched OFF.

Tread Wear Indicator

Tread wear indicators are molded into the bottom of the tread grooves across the width of the tire. The tire must be renewed when tread wear indicators become visible, at the surface of the tread, in two or more adjacent tread grooves.

Note that tire tread depth and condition must comply with prevailing local legislation.

Tire Pressure Monitoring System

The TPMS is a driver assistance system which assists the driver to maintain the tire pressures at the optimum level. The TPMS is a standard fitment on NAS vehicles and an optional fitment in other markets. The TPMS system has the following benefits:

- Improve fuel consumption
- Maintain ride and handling characteristics
- Reduce the risk of rapid tire deflation - which may be caused by under inflated tires
- Comply with legislation requirements in relevant markets.

 **CAUTION: The TPMS is not intended as a replacement for regular tire pressure and tire condition checks and should be considered as additional to good tire maintenance practices.**

The TPMS measures the pressure in each of the tires on the vehicle and issues warnings to the driver if any of the pressures deviate from defined tolerances.

NOTE:

During a 'blow-out' a very rapid reduction in pressure is experienced. The system is not intended to warn the driver of a 'blow-out', since it is not possible to give the driver sufficient warning that such an event is occurring, due to its short duration. The design of the TPMS is to assist the driver in keeping the tires at the correct pressure, which will tend to reduce the likelihood of a tire 'blow-out' occurring.

The controlling software for the TPMS is located within a TPMS module. The software detects the following:

- the tire pressure is below the recommended low pressure value - under inflated tire
- the position of the tire on the vehicle
- malfunction warning.

The system comprises a TPMS module, a RF antenna, 4 initiators and 4 tire pressure sensors (the space saver spare wheel is not fitted with a sensor).

The TPMS module is located under the Right-Hand (RH) side of the rear seat. The RF antenna is located behind the rear bumper. The front initiators are positioned at the front of the wheel arches. The rear initiators are positioned at the rear of the rear wheel arches.

The 4 initiators are hardwired to the TPMS module. The initiators transmit 125 KHz Low Frequency (LF) signals to the tire pressure sensors which respond by modifying the mode status within the RF transmission. The 315 MHz RF signals are detected by the RF antenna which is connected directly to the TPMS module. The received RF signals from the tire pressure sensors are passed to the TPMS module and contain identification, pressure, temperature and acceleration information for each wheel and tire.

The TPMS module communicates with the instrument cluster via the high speed Controller Area Network (CAN) bus to provide the driver with appropriate warnings. The TPMS module also indicates status or failure of the TPMS or components.

Tire Location and Identification

The TPMS can identify the position of the wheels on the vehicle and assign a received tire pressure sensor identification to a specific position on the vehicle, for example FL (front left), FR (front right), RL (rear left) and RR (rear right). This feature is required because of the different pressure targets and threshold between the front and rear tires.

The wheel location is performed automatically by the TPMS module using an 'auto-location' function. This function is fully automatic and requires no input from the driver. The TPMS module automatically re-learns the position of the wheels on the vehicle if the tire pressure sensors are replaced or the wheel positions on the vehicle are changed.

The TPMS software can automatically detect, under all operating conditions, the following:

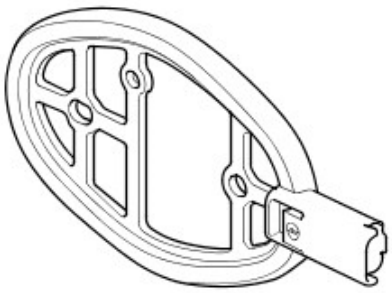
- one or more new tire pressure sensors have been fitted
- one or more tire pressure sensors have stopped transmitting
- reject identifications from tire pressure sensors which do not belong to the vehicle
- two 'running' wheels on the vehicle have changed positions.

If a new tire pressure sensor is fitted on any 'running' wheel, the module can learn the new sensor identification automatically when the vehicle is driven for more than 15 minutes at a speed of more than 20 km/h (12.5 mph).

The tire learn and location process is ready to commence when the vehicle has been stationary or traveling at less than 12 mph (20 km/h) for 15 minutes. This is known as 'parking mode'. The learn/locate process requires the vehicle to be driven at speeds of more than 20 km/h (12.5 mph) for 15 minutes. If the vehicle speed reduces to below 20 km/h (12.5 mph), the learn process timer is suspended until the vehicle speed increases to more than 20 km/h (12.5 mph), after which time the timer is resumed. If the vehicle speed remains below 20 km/h (12.5 mph) for more than 15 minutes, the timer is set to zero and process starts again.

If the tire pressure sensors fitted to the running wheels vehicle are changed, the module can learn the new sensor identifications automatically. The learn function requires no manual intervention by the driver.

Initiator

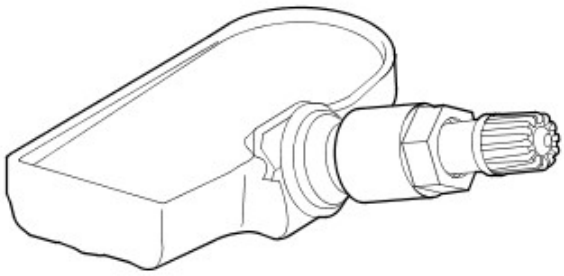


E45552

The initiator is a passive LF transmitter. It transmits signals which are received by the tire pressure sensors prompting them to modify their mode status.

The TPMS module energizes each initiator in turn using LF drivers. The corresponding tire pressure sensor detects the LF signal and responds by modifying the mode status within the RF transmission.

Tire Pressure Sensor



E45553

The TPMS uses active tire pressure sensors which are located on each wheel, inside the tire cavity. The sensor incorporates the tire valve and is secured in the wheel by a nut on the outside of the wheel. The sensor contains a Printed Circuit Board (PCB) which houses a Positive Temperature Coefficient (PTC) sensor, a Piezo pressure sensor, a radio receiver and transmitter and a lithium battery.

The tire pressure sensors use the PTC sensor and the Piezo sensor to periodically measure the pressure and temperature of the air inside the tire. The data is transmitted by RF data signals at 315 MHz.

The RF transmission from the sensor contains a unique identification code in its transmission data. This allows the TPMS to identify the wheel on the vehicle. If the sensor is replaced on a 'running' wheel, the new sensor identification will be learnt when the vehicle is driven at speed of more than 20 km/h (12.5 mph) for 15 minutes.

The tire pressure sensor can also detect when the wheel is rotating. In order to preserve battery power, the sensor uses different transmission rates when the wheel is stationary or moving.

The care points detailed in 'Tire Changing' earlier in this section must be followed to avoid damage to the sensor. If a new sensor is fitted, a new nut, seal and washer must also be fitted and the sensor nut tightened to the correct torque as given in the Removal and Installation section of this manual.

Instrument Cluster

The warning indications to the driver are common on all vehicles fitted with TPMS. The driver is alerted to system warnings by a low tire pressure warning indicator in the instrument cluster and an applicable text message in the message center.

The TPMS module passes system status information to the instrument cluster on the high speed CAN bus. The instrument cluster then converts this data into illumination of the warning indicator and display of an appropriate message.

When the ignition is switched on, the warning indicator is illuminated for 3 seconds for a bulb check.

NOTE:

If the vehicle is not fitted with the TPMS, the warning indicator will not illuminate.

The instrument cluster checks, within the 3 second bulb check period, for a CAN bus message from the TPMS. During this time the TPMS performs internal tests and CAN bus initialization. The warning indicator will be extinguished if the TPMS module does not issue a fault message or tire pressure warning message.

If a TPMS fault warning message is detected by the instrument cluster at ignition on, the warning indicator will flash for 72 seconds after the 3 second bulb check period and then remain permanently illuminated.

If a tire pressure warning message is detected by the instrument cluster at ignition on, the warning indicator will extinguish briefly after the 3 second bulb check period, before re-illuminating to indicate a tire pressure warning.

Principles of Operation

Each time the vehicle is driven the TPMS module activates each initiator in turn to transmit a LF 125 KHz signal to each tire pressure sensor. The LF signal is received by the tire pressure sensor which responds by transmitting a 315 MHz signal which is received by the RF antenna. The signal contains coded data which corresponds to sensor identification, air pressure, air temperature and acceleration data and is passed to the TPMS module.

When the vehicle has been parked for more than 15 minutes and then driven at a speed of more than 12.5 mph (20 km/h), the initiators fire in turn for 18 seconds in the following order:

- Front left
- 18 second pause (for the TPMS module to detect a response from the tire pressure sensor)
- Front right
- 18 second pause
- Rear right
- 18 second pause
- Rear left
- 18 second pause.

Each tire pressure sensor responds in turn which allows the TPMS module to establish the sensor positions at the start of the drive cycle. This process is repeated up to 3 times but less if the sensor positions are already known. The process is known as 'Auto Location' and takes 2 to 5 minutes to complete.

During this period the tire pressure sensors transmit at regular intervals, once every 15 seconds. For the remainder of the drive cycle the tire pressure sensors transmit once every 60 seconds or more often if a change of tire pressure is sensed until the vehicle stops and the TPMS returns to the parking mode.

Once the wheel positions have been established, the initiators stop transmitting the LF signal and do not transmit again until the vehicle has been parked for more than 15 minutes.

The TPMS enters 'Parking Mode' after the vehicle speed has been less than 20 km/h (12.5 mph) for 15 minutes. In parking mode the tire pressure sensors transmit a coded RF signal once every 13 hours. If the tire pressure decreases by more than 0.06 bar (1 lbf/in^2), the sensor will transmit more often if pressure in the tire is being lost.

Published: Mar 29, 2001

Wheels and Tires

General notes

Factory installed tires and wheels are designed to operate satisfactory when inflated to the recommended inflation pressures; refer to the Specifications sub-section. The recommended pressures apply to vehicle loads up to and including full-rated load capacity.

Correct tire pressures and driving technique have an important influence on tire life. Heavy cornering, excessively rapid acceleration and unnecessary sharp braking increase tire wear.

Replacement tires should follow the recommended:

- Size.
- Speed rating.
- Load range.
- Radial construction type.

The use of any other size or type may seriously affect:

- Safety.
- Ride.
- Handling.
- Speedometer and odometer calibration.
- Vehicle ground clearance.
- Tire clearance between body and chassis.
- Wheel bearing life.
- Brake cooling.

Wheels need to be renewed when:

- Impact damaged.
- Heavily corroded.
- Porous.
- Wheel stud holes or seats become damaged.
- They have excessive radial or lateral runout.

Safety notes

 **WARNING: Do not mix different types of tires on the same vehicle. Handling may be seriously affected resulting in loss of control. Failure to follow these instructions may result in personal injury.**

 **WARNING: When using winter tires, observe the direction of the sidewall moulded indicators; correct tire rotational direction is critical. Failure to follow these instructions may result in personal injury.**

 **WARNING: A tire and wheel must always be correctly matched. Wider or narrower tires than recommended could cause danger through sudden deflation. Failure to follow these instructions may result in personal injury.**

 **WARNING: When using the temporary spare wheel, maximum speed must not exceed 50 mile/h (80 km/h). Drive with caution and replace with the specified wheel / tire assembly as soon as possible. Failure to follow these instructions may result in personal injury.**

 **WARNING: Traction control (if available) must not be engaged with a temporary spare wheel fitted. Failure to follow these instructions may result in personal injury.**

 **WARNING: When changing a wheel, make sure that the vehicle cannot move. Always apply the parking brake and select the transmission park position. Failure to follow these instructions may result in personal injury.**

 **WARNING: Never run the engine with one wheel off the ground, for example, when changing the wheel. The wheel**

resting on the ground may cause the vehicle to move. Failure to follow these instructions may result in personal injury.

 **WARNING: Tighten the wheel nuts to specification. Too tight may cause damage, too loose may allow the wheel to become detached. Failure to follow these instructions may result in personal injury.**

 **WARNING: Use only wheels and wheel nuts supplied by Jaguar. Aftermarket wheels or wheel nuts may not fit or function correctly and could cause injury or damage. Failure to follow these instructions may result in personal injury.**

Inspection and Verification

1 . Verify the customer's concern by driving the vehicle.

2 . Visually inspect for obvious signs of damage:

Visual Inspection Chart

Mechanical
Incorrect tire pressure
Wheel imbalance
Tires worn beyond tread wear indicators
Cuts
Abrasions
Bulges (blister)
Ply separation
Embedded objects
Impact damage
Incorrect speed rating
Incorrect load rating
Incorrect rotational direction

1 . If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

2 . If the concern is not visually evident, verify the symptom and refer to Symptom Chart.

Tire Wear Inspection

To maximize tire performance, inspect the tires for signs of incorrect inflation and uneven wear which may indicate a need for balancing, rotation or front suspension alignment. Tires should also be checked frequently for cuts, stone bruises, abrasions, blisters, and for objects that may have become embedded in the tread. More frequent inspections are recommended when rapid or extreme temperature changes occur or when road surfaces are rough or occasionally littered with debris.

Tire Wear Diagnosis

New tires should be installed if the wear indicators are exposed or if there is severe shoulder wear. Shoulder wear is usually caused by either excessive camber or excessive toe on radial tires.

Sometimes incorrect rear toe settings or damaged struts will cause severe cupping' or scalloped' tire wear on non-drive wheels.

Incorrect rear toe alignment will also cause other unusual wear patterns.

Road Test

A tire v bration diagnostic procedure always begins with a road test. The road test and customer interview (if available) will provide much of the information needed to find the source of a v bration.

During the road test, drive the vehicle on a road that is smooth and free of undulations. If vibration is apparent, note and record the following:

- The speed at which the vibration occurs.
- What type of v bration occurs in each speed range. mechanical or audible.
- How the vibration is affected by changes in the following: engine torque. vehicle speed. engine speed.
- Type of v bration-sensitivity: torque sensitive, vehicle speed sensitive or engine speed sensitive.

The following explanations help isolate the source of the vibration.

Torque Sensitive

This means that the condition may be improved or made worse by accelerating, decelerating, coasting, maintaining a steady vehicle speed or applying engine torque.

Vehicle Speed Sensitive

This means that the vibration always occurs at the same vehicle speed and is not affected by engine torque, engine speed or the transmission gear selected.

Engine Speed Sensitive

This means that the vibration occurs at varying vehicle speeds when a different transmission gear is selected. It may sometimes be isolated by increasing or decreasing engine speed with the transmission in NEUTRAL or by stall testing with the transmission in gear. If the condition is engine speed sensitive, the cause is probably not related to the tires.

If the road test indicates that there is tire whine, but no shake or vibration, the noise originates with the contact between the tire and the road surface.

A thumping noise usually means that the tire has a flat or soft spot making a noise as they slap the roadway. Tire whine may be distinguished from axle noise. Tire whine remains the same over a range of speeds.

Tires show excess wear on edge of treads

Possible Source(s):

- Tires under-inflated

  Action(s) to take:

  - Correct pressure to specification.

Possible Source(s):

- Vehicle overloaded

  Action(s) to take:

  - Correct as required.

Tires show excess wear on edge of treads (having the correct tire pressures).

Possible Source(s):

- Incorrect toe setting

  Action(s) to take:

  - Set to specification. For additional information refer to<<204-00>>

Tires show excess wear in center of tread.

Possible Source(s):

- Tires over-inflated

  Action(s) to take:

  - Correct pressure to specification.

Other excessive tire wear problems

Possible Source(s):

- Incorrect tire pressure

  Action(s) to take:

  - Correct pressure to specification.

Possible Source(s):

- Incorrect tire / wheel usage

  Action(s) to take:

  - Install correct tire and wheel combination.

Possible Source(s):

- Loose or leaking dampers

  Action(s) to take:

- Tighten or install a new as necessary. For additional information refer to<<204-01>> or <<204-02>>.

Possible Source(s):

- Geometry out of alignment

  Action(s) to take:

  - Check and adjust.

Possible Source(s):

- Loose, worn or damaged suspension components

  Action(s) to take:

  - Inspect, repair or install a new as necessary.

Possible Source(s):

- Wheel and tire assembly out of balance

  Action(s) to take:

  - Balance wheel and tire assembly.

Possible Source(s):

- Excessive lateral or radial runout of wheel or tire

  Action(s) to take:

  - Check, repair or install a new as necessary. Refer to the procedure in this section.

Wheel mounting is difficult

Possible Source(s):

- Incorrect application or mismatched parts, including wheel studs and wheel nuts. Corroded, worn or damaged parts

  Action(s) to take:

  - Clean or install a new part.

Wobble or shimmy affecting wheel runout

Possible Source(s):

- Damaged wheel (eventually damaging wheel bearings and causing uneven tire wear)

  Action(s) to take:

  - Inspect wheel rims for damage and runout. Install a new wheel rim as necessary.

Excessive vibration, rough steering or severe tire wear

Possible Source(s):

- Loose or incorrect attaching parts

  Action(s) to take:

  - Tighten or install new parts.

Vehicle vibrations

Possible Source(s):

- Tires / wheels mismatched

  Action(s) to take:

  - Install correct tire / wheel combination.

Possible Source(s):

- Inflation pressure too high or low

  Action(s) to take:

  - Correct pressure to specification.

Possible Source(s):

- Uneven tire wear

  Action(s) to take:

  - Refer to Diagnosis and Testing in this section.

Possible Source(s):

- Out-of-balance wheel, tire, wheel hub or disc assembly

  Action(s) to take:

  - Determine the out-of-balance component and balance or install a new part.

Possible Source(s):

- Damaged or distorted wheel from road impact hazard or incorrect handling

  Action(s) to take:
  - Install a new wheel.

Possible Source(s):
- Excessive radial runout

  Action(s) to take:
  - Install a new wheel or tire. Check for incorrect wheel and tire specifications.

Possible Source(s):
- Excessive lateral runout

  Action(s) to take:
  - Install a new wheel or tire.

Possible Source(s):
- Incorrectly seated tire

  Action(s) to take:
  - Remount the tire.

Possible Source(s):
- Loose wheel mountings - damaged wheel studs, wheel nuts, worn or broken wheel hub face or foreign material on mounting faces

  Action(s) to take:
  - Tighten or install new parts. Clean mounting surfaces.

Possible Source(s):
- Defective wheel bearings

  Action(s) to take:
  - Install a new bearing set. For additional information refer to<<204-01>>or <<204-02>>

Possible Source(s):
- Brake disc imbalance

  Action(s) to take:
  - For additional information refer to Section<<206-00>>

Possible Source(s):
- Water in tires

  Action(s) to take:
  - Remove water.

Possible Source(s):
- Loose engine or transmission mounts

  Action(s) to take:
  - Tighten or install a new mount.

Possible Source(s):
- Incorrect front end alignment

  Action(s) to take:
  - Align front end. For additional information refer to<<204-01>>

Possible Source(s):
- Loose or worn driveline or suspension parts

  Action(s) to take:
  - Repair or install new parts.

Possible Source(s):
- Excessive driveshaft runout or imbalance

  Action(s) to take:
  - Install a new driveshaft, for additional information refer to<<205-01>>

Possible Source(s):
- Worn or damaged flexible drive joint

  Action(s) to take:
  - Install a new drive shaft. For additional information refer to<<205-01>>

Damaged wheel hub stud threads

Possible Source(s):

- Sliding wheel across the wheel studs during installation. Loose wheel nuts

  Action(s) to take:

  - Install new wheel studs.

Broken wheel studs

Possible Source(s):

- Loose or overtightened wheel nuts

  Action(s) to take:

  - Install new wheel studs.

Corrosion / contamination streaks from the wheel hub wheel stud holes

Possible Source(s):

- Loose wheel nuts

  Action(s) to take:

  - Check complete assembly. Install new parts. Follow correct torque procedure.

Wheel difficult to remove from wheel hub

Possible Source(s):

- Corrosion

  Action(s) to take:

  - Apply a small amount of grease to the wheel hub face and spigot location.

Damaged wheel nuts

Possible Source(s):

- Loose wheel assembly

  Action(s) to take:

  - Install new wheel nuts. Follow correct torque procedure.

Possible Source(s):

- Over-tightened wheel nuts

  Action(s) to take:

  - Install new wheel nuts. Follow correct torque procedure.

Frozen wheel nuts

Possible Source(s):

- Corrosion or galling

  Action(s) to take:

  - If corrosion is light, wire brush away corrosion. If corrosion is excessive install new wheel studs and wheel nuts.

Published: Jun 4, 2007

Tire Low Pressure Sensor - VIN Range: J28493->V99999

Removal

NOTE:

It is strongly recommended that a new tire low pressure sensor O-ring seal, washer, nut, valve core and cap are installed each time a tire is removed and installed. The O-ring seal, washer, nut, valve core and cap must be replaced if the tire low pressure sensor is removed. Removal of the tire low pressure sensor retaining nut must be regarded as tire low pressure sensor removal. The tire low pressure sensor valve cap must always be in place except when inflating, releasing pressure or checking pressure.

1 . Remove the wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

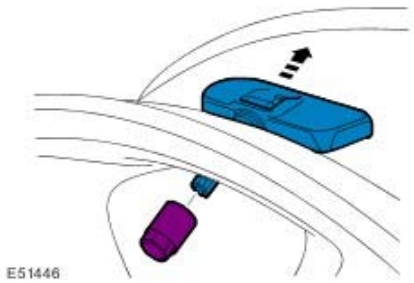
2 . **CAUTION: Make sure the tire bead is broken from the wheel rim 180 degrees from the tire low pressure sensor. Failure to follow this instruction may result in damage to the tire low pressure sensor.**

Remove the tire.

3 . **CAUTION: Make sure you do not push on the tire low pressure sensor valve. Failure to follow this instruction may result in damage to the valve.**

Remove the tire low pressure sensor.

- Remove and discard the tire low pressure sensor retaining nut, valve core, valve cap, O-ring seal and washer.



Installation

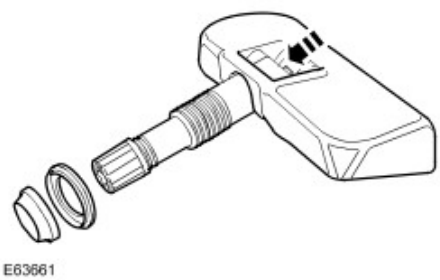
1 . **CAUTION: The base of the valve stem must be held whilst pushing on the new seal and washer. Failure to follow this instruction may result in damage to the tire low pressure sensor.**

NOTE:

Make sure that the washer and O-ring seal are installed correctly. The flat face of washer must be seated against the sensor housing. The taper of O-ring seal points towards the wheel.

Install a new washer and O-ring seal.

- Install a new valve core and valve cap.



2
.
CAUTION: Make sure solvents or cleaning agents of any type are not used to clean the tire low pressure sensor. Failure to follow this instruction may result in damage to the tire low pressure sensor.

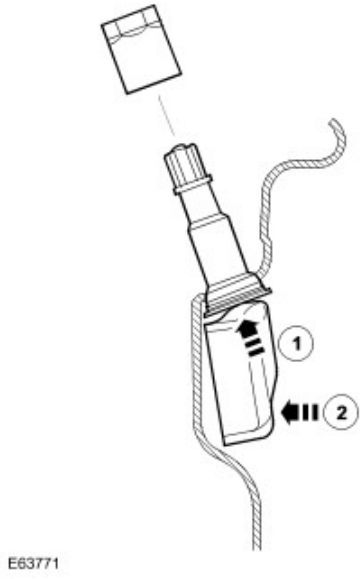
NOTE:

If the tire low pressure sensor is replaced on a road wheel, the new tire low pressure sensor identification code will be learnt when the vehicle is first driven. If a new tire low pressure sensor is fitted to the spare wheel the identification code for that tire low pressure sensor must be programmed into the tire pressure monitoring system module. The identification code is printed on the casing of each tire low pressure sensor and is prefixed with ID.

Install the tire low pressure sensor.

1) Support the base of the valve stem when installing the tire low pressure sensor.
2) Hold the tire low pressure sensor against the wheel rim when tightening the retaining nut.

- Install a new tire low pressure sensor retaining nut.
- Tighten the nut to 8 Nm.



3 .
CAUTION: Make sure no damage occurs to the tire low pressure sensor.

Install the tire and balance the wheel.

4 . Install the wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

Published: Jun 4, 2007

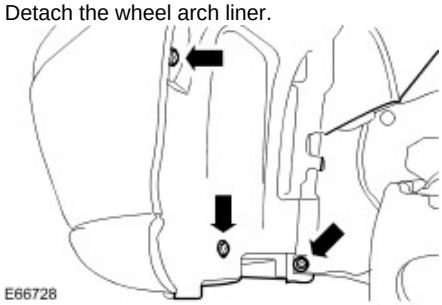
Tire Pressure Monitoring System (TPMS) Front Antenna - VIN Range: J28493->V99999

Removal

1 . Raise and support the vehicle.
For additional information, refer to Jacking

2 . **NOTE:**
Left-hand shown, right-hand similar.

Detach the wheel arch liner.

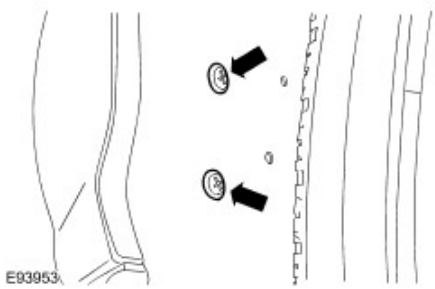


3 . **NOTE:**
Left-hand shown, right-hand similar.

Disconnect the tire pressure monitoring system front antenna electrical connector.

4 . **NOTE:**
Left-hand shown, right-hand similar.

Remove the tire pressure monitoring system front antenna.



Installation

1 . To install, reverse the removal procedure.

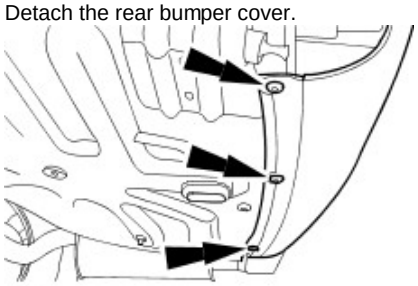
Published: Jun 4, 2007

Tire Pressure Monitoring System (TPMS) Main Antenna - VIN Range: J28493->V99999

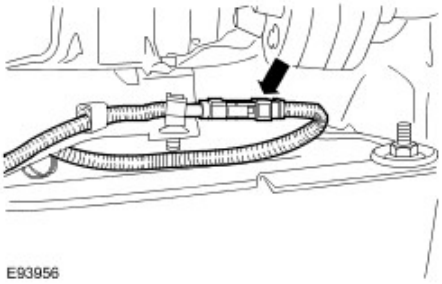
Removal

1 . Raise and support the vehicle.
For additional information, refer to Jacking

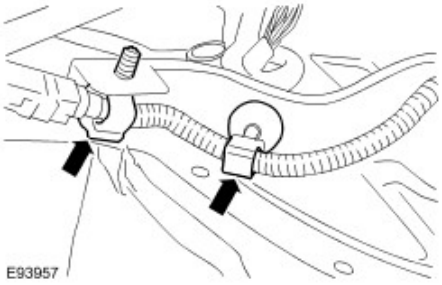
2 . Detach the rear bumper cover.



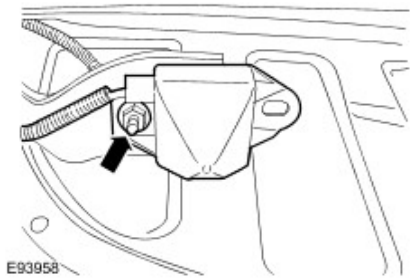
3 . Disconnect the tire pressure monitoring system main antenna electrical connector.



4 . Release the tire pressure monitoring system main antenna electrical harness.

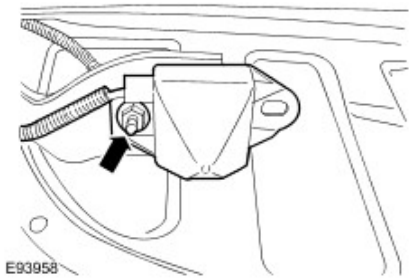


5 . Remove the tire pressure monitoring system main antenna.



Installation

1 . To install, reverse the removal procedure.
- Tighten to 5 Nm.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Published: Jun 4, 2007

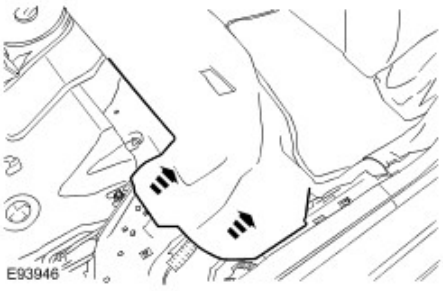
Tire Pressure Monitoring System (TPMS) Module - VIN Range: J28493->V99999

Removal

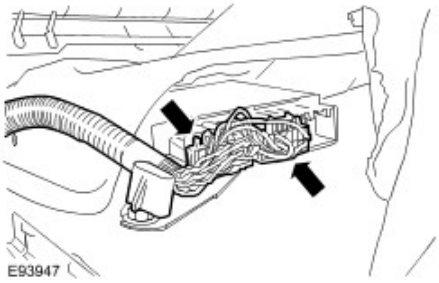
1 . Remove the rear seat cushion.
For additional information, refer to Rear Seat Cushion (76.70.37)

2 . Remove the rear scuff plate trim panel.
For additional information, refer to Rear Scuff Plate Trim Panel (76.13.82)

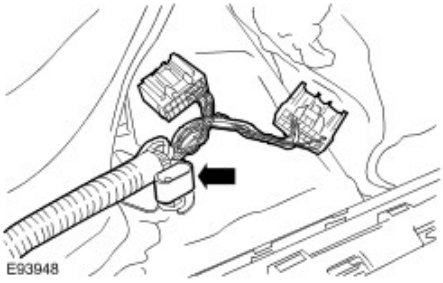
3 . Reposition the floor covering.



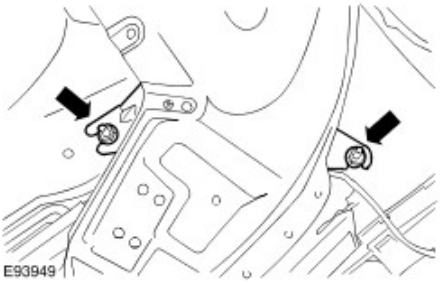
4 . Disconnect the tire pressure monitoring system module electrical connectors.



5 . Reposition the tyre pressure monitoring system module harness.

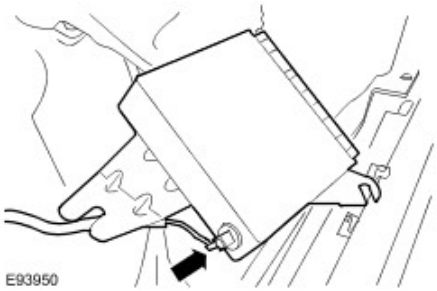


6 . Reposition the tire pressure monitoring system module.
- Remove the retaining nuts.



7 . Remove the tire pressure monitoring system module.

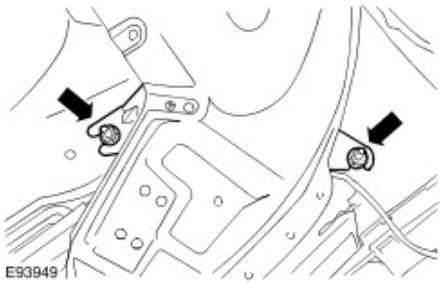
- Disconnect the external antenna connector.



Installation

1 . To install, reverse the removal procedure.

- Tighten to 5 Nm.



Published: Jun 4, 2007

Tire Pressure Monitoring System (TPMS) Rear Antenna - VIN Range: J28493->V99999

Removal

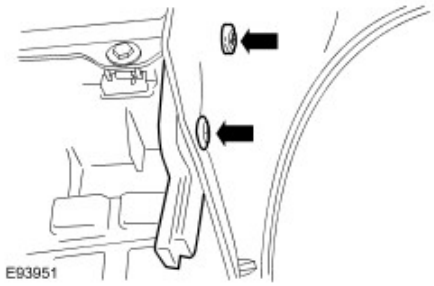
1 . Raise and support the vehicle.
For additional information, refer to Jacking

2 . **NOTE:**
Left-hand shown, right-hand similar.

Disconnect the tire pressure monitoring system rear antenna electrical connector.

3 . **NOTE:**
Left-hand shown, right-hand similar.

Remove the tire pressure monitoring system rear antenna.



Installation

1 . To install, reverse the removal procedure.

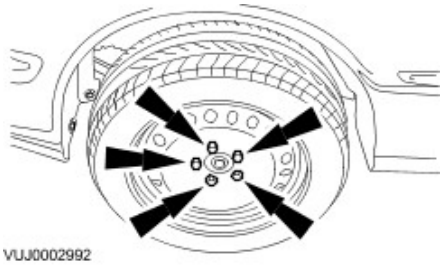
Published: Mar 29, 2001

Wheel and Tire (74.20.05)

Removal

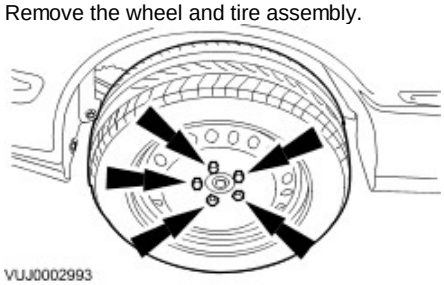
1. **CAUTION: Do not use heat to loosen a seized wheel nut, excessive heat may cause damage to the wheel and the wheel bearings.**

   Loosen the wheel nuts.



2. Raise and support the vehicle. For additional information refer to <<100-02>>.

3. Remove the wheel and tire assembly.



Installation

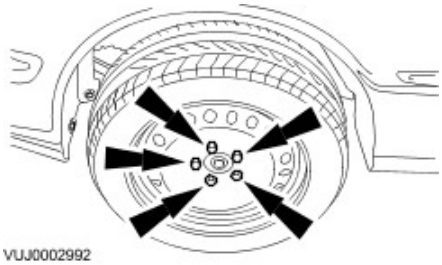
Vehicles with steel wheels

1. **WARNING: Make sure that there is no contamination of the wheel, hub or brake disc contact surfaces. Installation without metal to metal contact at the mounting surfaces may cause the wheel nuts to loosen and allow the wheel to detach while the vehicle is in motion. Failure to follow these instructions may result in personal injury.**

   WARNING: Apply a small amount of grease to the hub and wheel mating surfaces before installation. Make sure that the grease does not come into contact with the wheel studs or vehicle braking system components. Failure to follow these instructions may result in personal injury.

   To install, reverse the removal procedure.

   Tighten to 80 Nm.



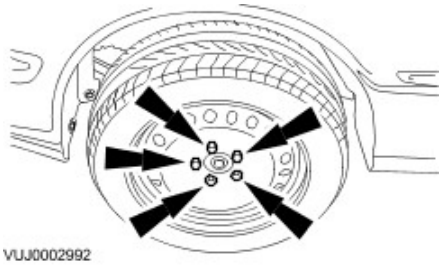
Vehicles with aluminium wheels

2. **WARNING: Make sure that there is no contamination of the wheel, hub or brake disc contact surfaces. Installation without metal to metal contact at the mounting surfaces may cause the wheel nuts to loosen and allow the wheel to detach while the vehicle is in motion. Failure to follow these instructions may result in personal injury.**

WARNING: Apply a small amount of grease to the hub and wheel mating surfaces before installation. Make sure that the grease does not come into contact with the wheel studs or vehicle braking system components. Failure to follow these instructions may result in personal injury.

To install, reverse the removal procedure.

Tighten to 103 Nm.



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Published: Aug 10, 2005

Driveline System

The driveline transfers engine torque to the drive wheels. On vehicles with 2.0L or diesel engines the power is transmitted through the transaxle to the front drive halfshafts. On vehicles with 2.5L and 3.0L engines the power is transmitted through the transaxle to the transfer case. The transfer case then splits the torque 40% to the front drive halfshafts and 60% to the driveshaft which is connected to the rear drive differential and the rear drive halfshafts.

For additional information, refer to Wheels and Tires (204-04 Wheels and Tires)

For additional information, refer to Front Drive Halfshafts (205-04 Front Drive Halfshafts)

For additional information, refer to Driveshaft (205-01 Driveshaft)

For additional information, refer to Transfer Case (308-07 Transfer Case)

For additional information, refer to Rear Drive Halfshafts (205-05 Rear Drive Halfshafts)

For additional information, refer to Rear Drive Axle and Differential (205-02 Rear Drive Axle/Differential)

For additional information, refer to Manual Transaxle (308-03 Manual Transmission/Transaxle)

For additional information, refer to Transmission Description (307-01 Automatic Transmission/Transaxle)

The engine is installed at a specific angle. This is determined by the engine mounts. If the engine angle is out of specification, the engine mounts must be inspected for damage and new ones installed if necessary.

Driveline Vibration

Driveline v bration exhibits a higher frequency and lower amplitude than high-speed shake. Driveline vibration is directly related to the speed of the vehicle and is usually noticed at various speed ranges. Driveline vibration can be felt as a tremor in the floorpan or is heard as a rumble, hum or boom. Driveline v bration can exist in all drive modes, but may exhibit different symptoms depending upon whether the vehicle is accelerating, decelerating, cruising or coasting. Check the driveline angles if the v bration is particularly noticeable during acceleration or deceleration, especially at lower speeds.

In order to diagnose v brations in the driveshaft, refer to the Jaguar Approved Diagnostic System.

Driveline Angle

On vehicles with 2.0L or diesel engines the driveline angularity is the angular relationship between the transaxle and the halfshafts. On vehicles with 2.5L and 3.0L engines the driveline angularity is the angular relationship between the transfer case drive pinion, the driveshaft and the rear differential drive pinion. On all engines variations the factors determining driveline angularity include ride height and engine mounts.

If the wheels and 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 driveline. For additional information, refer to Noise, Vibration and Harshness (NVH) (100-04 Noise, Vibration and Harshness)

Published: Mar 29, 2001

Driveline System

Inspection and Verification

Certain driveline conditions are also common to the engine, transaxle, transfer case, wheel bearings, wheels and tires and other parts of the vehicle. For this reason, make sure the cause of the trouble is in the driveline before adjusting, repairing or installing any new components. For additional information, refer to <<100-04>>.

1 . Verify the customer concern by carrying out a road test of the vehicle.

2 . Visually inspect for obvious signs of mechanical damage.

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.

Transfer Case, Front Transaxle and Axle Noise

Gear Howl and Whine

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

Bearing Whine

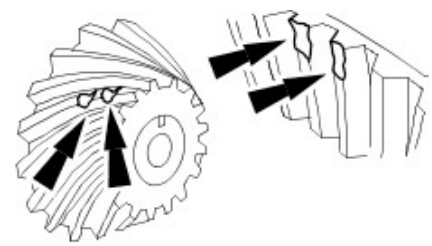
Bearing whine is a high-pitched sound similar to a whistle. It is usually caused by worn/damaged pinion bearings. Bearing noise occurs at all driving speeds. This distinguishes it from gear whine which is speed dependent.

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.

Knock

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



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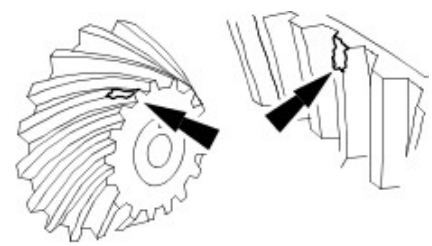
A gear tooth damaged on the drive side is a common cause of the knock.



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Clunk

Clunk is a metallic noise heard when the automatic transaxle is engaged in REVERSE or DRIVE. The noise may also occur when the throttle is applied or released. Clunk is caused by backlash in the driveline or loose suspension components.

Bearing Rumble

Bearing rumble 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 may also be high-pitched, similar to gear noise, but will be evident in all four driving modes.

Symptom Chart

Noise is at constant tone over a narrow vehicle speed range. Usually heard on light driving and coasting conditions

Possible Source(s):

- Rear drive differential.
- Transfercase.
- Transaxle.

Action(s) to take:

- For additional information, refer to Pinpoint Test A

Noise is the same on driving or coasting.

Possible Source(s):

- Road.
- Wheel bearing.

Action(s) to take:

- Normal conditions.
- CHECK and INSTALL a new wheel bearing as necessary. For additional information, refer to <<204-02>>.

Possible Source(s):

- Worn or damaged driveshaft joint.

Action(s) to take:

- INSTALL new components as necessary.

Possible Source(s):

- Driveshaft center bearing.

Action(s) to take:

- INSTALL new components as necessary.

Noise is produced with the vehicle standing and driving

Possible Source(s):

- Engine

Action(s) to take:

- For additional information, refer to <<303-00>>.

Possible Source(s):

- Transmission

Action(s) to take:

- For additional information, refer to <<307-01>>. For additional information, refer to <<308-03>>.

Noise is more pronounced while turning

Possible Source(s):

- Front or rear differential side gears and pinion gears.

Action(s) to take:

- For additional information, refer to <<205-02>> and <<308-07>>.

Loud clunk in the driveline when Shifting from Reverse to Drive.

Possible Source(s):

- Engine idle speed set too high.
- Engine mount.

Action(s) to take:

- CHECK and adjust as necessary.
- INSPECT and INSTALL new engine mounts as necessary.

Possible Source(s):

- Transaxle Mount.

Action(s) to take:

- INSPECT and INSTALL new transaxle mounts as necessary.

Possible Source(s):

- Transaxle.

Action(s) to take:

- For additional information, refer to <<307-01>> and<<308-03>>.

Possible Source(s):

- Suspension.

Action(s) to take:

- INSPECT and INSTALL new suspension components as necessary.

Possible Source(s):

- Backlash in the driveline.

Action(s) to take:

- INSTALL new components as necessary.

Clicking, popping or grinding noises

Possible Source(s):

- Inadequate or contaminated lubrication in the constant velocity (CV) joints.
- Another component contacting the axle shaft.
- Wheel bearings, brakes or suspension components.

Action(s) to take:

- INSPECT, CLEAN and LUBRICATE with new grease as necessary.
- INSPECT and REPAIR as necessary.
- INSPECT and INSTALL new components as necessary.

Vibration at high speeds.

Possible Source(s):

- Out-of-balance wheels and tires.

Action(s) to take:

- INSTALL new wheels and tires as necessary. For additional information, refer to<<204-04>>.

Possible Source(s):

- Driveline out of balance/misalignment.

Action(s) to take:

- For additional information, refer to the approved Jaguar diagnostic system.

Shudder or vibration during acceleration.

Possible Source(s):

- Powertrain/driveline misalignment.

Action(s) to take:

- CHECK for misalignment. INSTALL new components as necessary.

Possible Source(s):

- High CV joint operating angles caused by incorrect ride height.

Action(s) to take:

- CHECK the ride height and VERIFY the correct spring rate. INSTALL new components as necessary.

Lubricant leak.

Possible Source(s):

- Transaxle, transfer case or rear drive differential vent.

Action(s) to take:

- INSTALL new components as necessary.

Possible Source(s):

- Transaxle halfshaft seal, transfer case halfshaft seal, transaxle to transfer case O/ring seal, transfer case drive pinion seal, rear drive differential pinion seal or rear drive halfshaft seal.

Action(s) to take:

- INSTALL new components as necessary.

Possible Source(s):

- Filler plug.

  Action(s) to take:

  - INSTALL new components as necessary.

Possible Source(s):

- Axle rear cover joint.

  Action(s) to take:

  - INSTALL new components as necessary.

PINPOINT TEST A : EXCESSIVE DRIVELINE NOISE

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 at the same vehicle speed?**

-> Yes
INSTALL a new final drive. TEST the system for normal operation

-> No
REFER to <<204-04>>, <<205-01>>,<<205-04>>, <<205-05>>, <<303-00>>, <<307-01>>, <<308-03>> and<<308-07>>.

Published: Nov 7, 2001

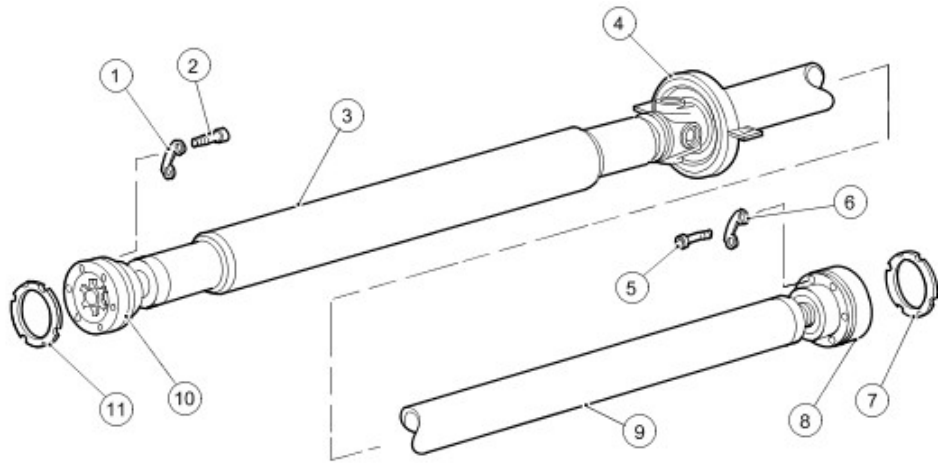
Specifications

Torque Specifications

Description	Nm	lb-ft	lb-in
Driveshaft center bearing retaining bolts	25	18	-
Driveshaft front universal joint retaining bolts	44	32	-
Driveshaft rear universal joint retaining bolts	44	32	-

Published: Dec 3, 2003

Driveshaft



VUJ0002769

Item	Part Number	Description
1	—	Link washer
2	—	Driveshaft universal joint retaining bolt
3	—	Driveshaft front collapsible tube
4	—	Driveshaft center bearing
5	—	Driveshaft universal joint retaining bolt
6	—	Link washer
7	—	Paper gasket
8	—	Driveshaft rear universal joint
9	—	Driveshaft rear tube
10	—	Driveshaft front universal joint
11	—	Paper gasket

WARNING: Under no circumstances must a 2004.25 MY or earlier driveshaft assembly be fitted to a later vehicle. Failure to follow this instruction may result in personal injury.

CAUTION: To preserve 'drive line' refinement, individual parts, other than fixings, MUST NOT be renewed. In the event of any balance or driveshaft component related concern, the complete assembly must be renewed. Under no circumstances may the universal joint be removed from the driveshaft (or its fixings be loosened). Do not drop or subject the driveshaft to damage.

NOTE:

2004.25 MY driveshaft assemblies may be fitted to earlier model year vehicles. For modification details refer to For additional information, refer to Driveshaft (205-01 Driveshaft)
in this section.

NOTE:

All driveshaft assemblies are balanced. If undercoating the vehicle, protect the driveshaft, universal joints and the drive half shafts to prevent over-spray of the undercoating material.

The driveshaft consists of the following:

- A two piece welded steel tube.
- A center bearing.
- Two universal joints.

Universal Joint

The universal joints are:

- A lubed-for-life design and require no lubrication in service.

DRIVELINE

Driveshaft

The principal change to the AWD driveshaft is a new sliding spline, which provides a crash collapsible feature. The second notable change is to the center bearing. This driveshaft is a backward compatible fitment to earlier vehicles.

Front Tube Sliding Spline

The forward section of the front tube has a sliding formed steel spline, which locates within an aluminum splined sleeve muff (box coupling) on the front tube rear section. This replaces the current "swaged" tube design.

Sealed CV Joints

The previous driveshaft had open CV joints. The new driveshaft has sealed joints at both ends (steel can shaped fabrication). The steel can has two roles:

- To compress the sealing gasket between the CV joint and the steel can.
- To retain grease in the CV joint.

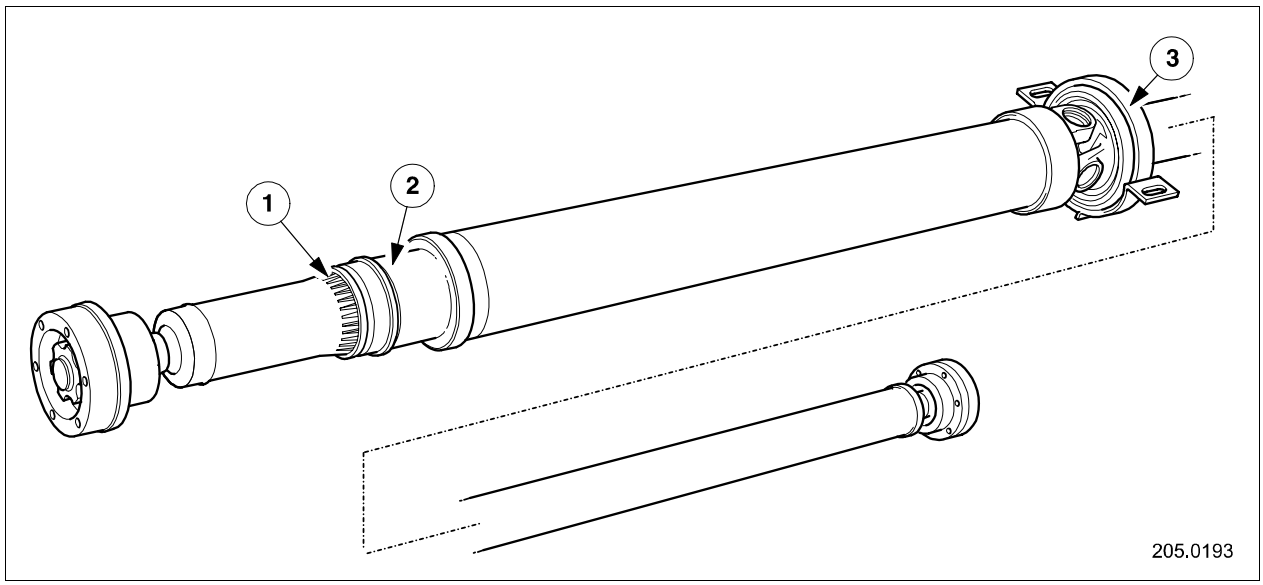


Fig. 40 Driveshaft

1. Sliding spline
2. Aluminum splined sleeve muff
3. Center bearing

Published: Mar 2, 2001

Driveshaft

For additional information, refer to<<205-00>>.

Published: Mar 29, 2001

Driveshaft Runout and Balancing

1. For additional information, refer to the approved Jaguar diagnostic system.

Published: Aug 22, 2005

Driveshaft (47.15.01)

Removal

NOTE:

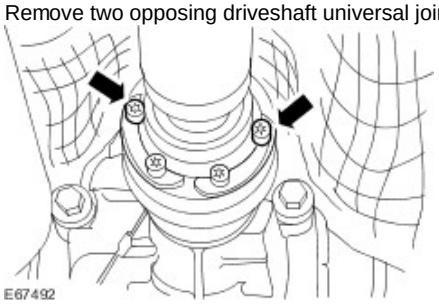
Removal of the driveshaft rear universal joint shown, removal of the driveshaft front universal joint similar.

1 . Raise and support the vehicle.
For additional information, refer to Lifting

2 . **NOTE:**

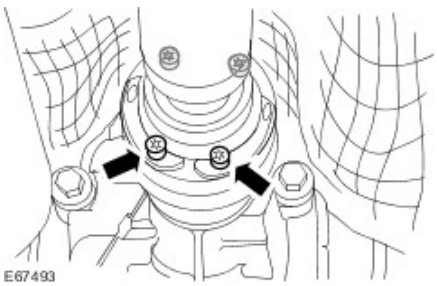
Mark the position of the driveshaft in relation to the drive pinion flange.

Remove two opposing driveshaft universal joint retaining bolts.



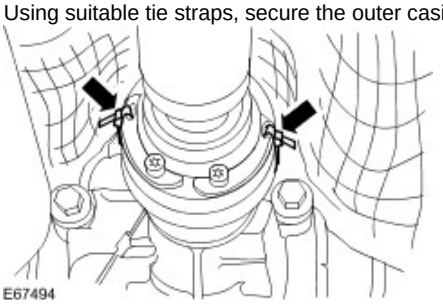
3 . Loosen the remaining driveshaft universal joint retaining bolts.

Using a suitable tool, detach the driveshaft from drive pinion flange.



4 . **CAUTION: Make sure the outer casing of the driveshaft universal joint is secured to the driveshaft universal joint through the securing holes. Failure to follow this instruction may invalidate the warranty of the driveshaft.**

Using suitable tie straps, secure the outer casing of the driveshaft universal joint.



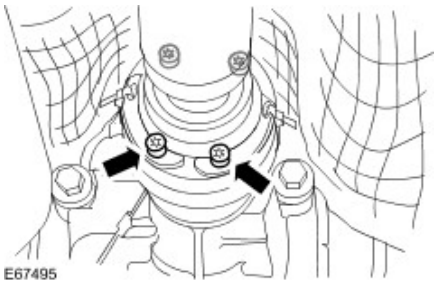
5 . **CAUTION: Make sure the front and rear driveshaft sections are supported.**

NOTE:

If installed, remove and discard the gasket.

Detach the driveshaft universal joint.

- Remove and discard the driveshaft retaining bolts and link washers.

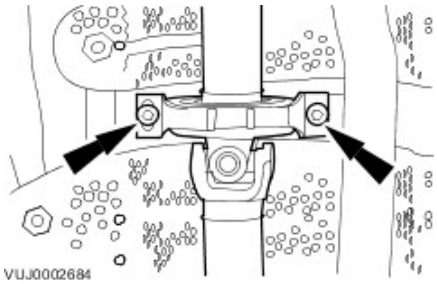


6 . Repeat the above procedure for the driveshaft front universal joint.

7 . **CAUTION: Make sure the front and rear driveshaft sections are supported.**

Remove the driveshaft.

- Remove driveshaft center bearing retaining bolts.

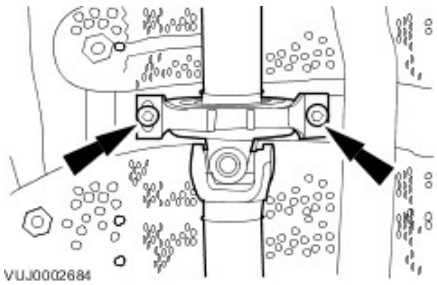


Installation

1 . **CAUTION: Make sure the front and rear driveshaft sections are supported.**

Install the driveshaft.

- Loosely install the driveshaft center bearing retaining bolts.



2 . **CAUTION: INSTALLING A NEW DRIVESHAFT. If a new driveshaft is to be installed, no gasket is required between the driveshaft and the drive pinion flange. Failure to follow this instruction may result in damage to the vehicle.**

CAUTION: INSTALLING THE ORIGINAL DRIVESHAFT. If a gasket was removed from between the driveshaft and the drive pinion flange on the driveshaft removal procedure, make sure to install a new gasket. If no gasket was removed from between the driveshaft and the drive pinion flange on the driveshaft removal procedure, a new gasket is not required. Failure to follow this instruction may result in damage to the vehicle.

NOTE:

If a new driveshaft is to be installed align the ‘H’ on the rear drive axle flange with the paint mark on the driveshaft.

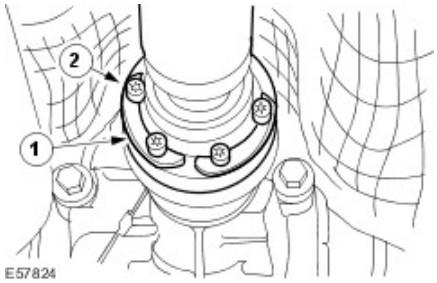
NOTE:

Remove and discard the tie straps.

Attach the driveshaft rear universal joint.

1) Install new driveshaft retaining bolt link washers.
2) Install new driveshaft retaining bolts.

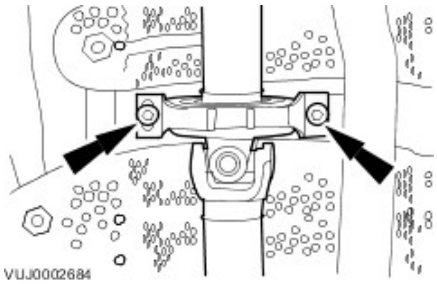
Tighten to 44 Nm.



3 . Repeat the above procedure for the driveshaft front universal joint.

4 . Fully tighten the driveshaft center bearing retaining bolts.

Tighten to 25 Nm.



5 . Carry out a driveshaft alignment check using specifications found in underbody misalignment checks.
For additional information, refer to Underbody Misalignment Check (57.65.20)

Published: May 22, 2008

Specifications

General Specifications

Item	Specification
Oil type	M2C192A synthetic
Oil capacity	1.2 liters

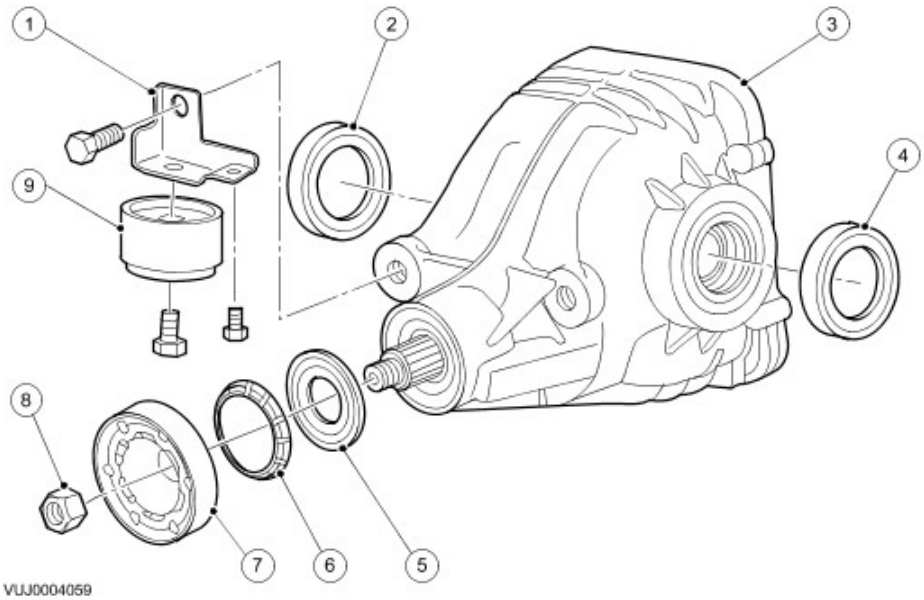
Torque Specifications

Description	Nm	lb-ft	lb-in
Driveshaft front universal joint retaining bolts	40	30	-
Driveshaft rear universal joint retaining bolts	40	30	-
Axle front retaining bolts	90	66	-
Axle rear retaining bolt stage one	A	-	-
Driveshaft center bearing retaining bolts	25	18	-
Vibration damper retaining bolt	40*	30	-
Drive pinion flange preload lower than specification on used bearings	1.7	-	15
Drive pinion flange preload higher than specification on used bearings	1.7	-	15

A = refer to the procedure for the correct torque sequence. *Tighten existing fittings on vehicles prior to VIN J24258 to 48 Nm.

Published: Mar 29, 2001

Rear Drive Axle and Differential



Item	Part Number	Description
1	—	Vibration damper bracket
2	—	Axle shaft oil seal
3	—	Axle housing
4	—	Axle shaft oil seal
5	—	Drive pinion seal
6	—	Drive pinion collapsible spacer
7	—	Drive pinion flange
8	—	Drive pinion flange retaining nut
9	—	Vibration damper

The rear axle drive pinion receives power from the engine through the transaxle and driveshaft. The drive pinion gear rotates the differential drive gear which is bolted to the axle housing outer flange. Inside the axle housing, two differential pinion gears are mounted on a differential shaft which is pinned to the axle housing. These differential pinion gears are engaged with the differential side gears to which the axle shafts are splined. As the differential gear turns, it rotates the axle shafts and rear wheels.

When it is necessary for one wheel and axle shaft to rotate faster than the other, the faster turning differential side gear causes the differential pinion gears to roll on the slower turning differential side gear. This allows differential action between the two axle shafts.

The v bration damper is designed to damp driveshaft boom. It is bolted to the rear differential vibration damper bracket which in turn is bolted to the rear axle.

Published: Mar 29, 2001

Rear Drive Axle and Differential

For additional information, refer to <<205-00>>.

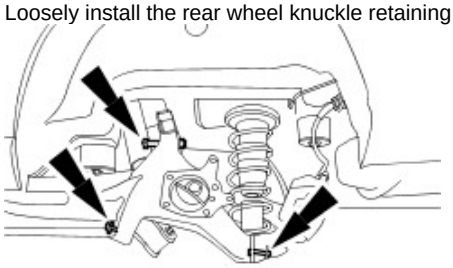
Published: Feb 26, 2008

Axle Assembly (51.25.13)

Removal

1 . Remove the left-hand rear halfshaft.
For additional information, refer to Rear Halfshaft (47.10.13)

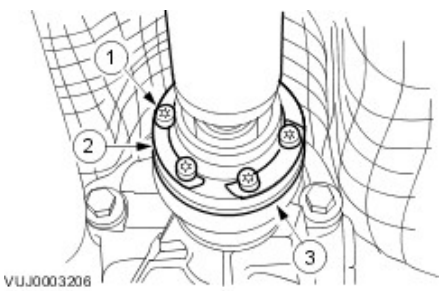
2 . Loosely install the rear wheel knuckle retaining bolts.


VUJ0004053

3 . **CAUTION: Support the driveshaft front and rear sections. Failure to follow this instruction may result in damage to the vehicle.**

Detach the driveshaft front universal joint.

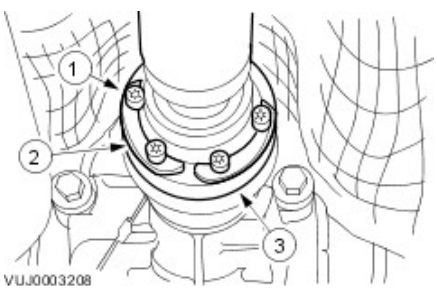
1) Remove and discard the driveshaft front universal joint retaining bolts.
2) Remove and discard the driveshaft retaining bolts link washers.
3) Detach the driveshaft front universal joint.
   - Remove and discard the gasket.



VUJ0003206

4 . Detach the driveshaft rear universal joint.

1) Remove and discard the driveshaft rear universal joint retaining bolts.
2) Remove and discard the driveshaft retaining bolts link washers.
3) Detach the driveshaft rear universal joint.
   - Remove and discard the gasket.

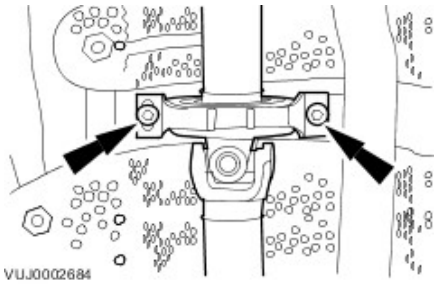


VUJ0003208

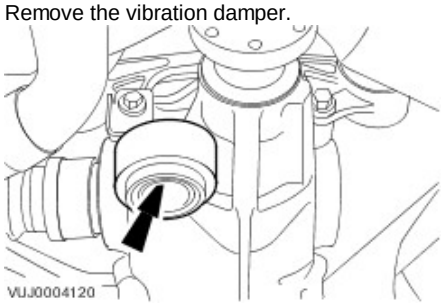
5 . **CAUTION: Support the driveshaft front and rear sections.**

Remove the driveshaft.

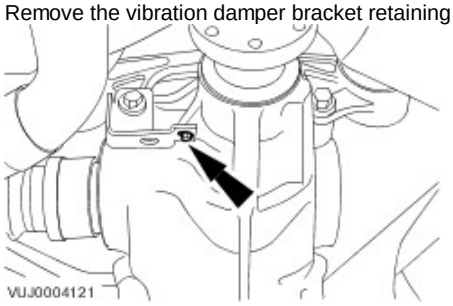
- Discard the retaining bolts.



6 . Remove the vibration damper.



7 . Remove the vibration damper bracket retaining bolt.

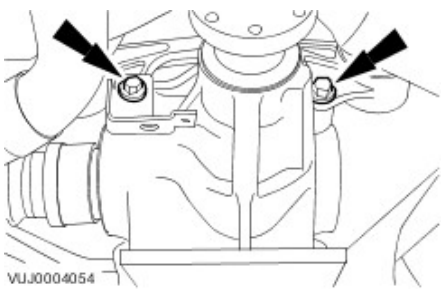


8 . **NOTE:**

Support the axle assembly.

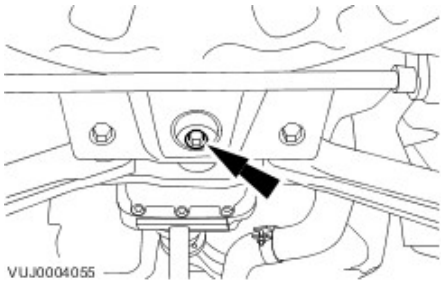
Remove the axle assembly front retaining bolts.

- Remove the v bration damper bracket.



9 . Remove and discard the axle assembly rear retaining bolt and lower the axle assembly.

- Remove and Discard the axle assembly washer.

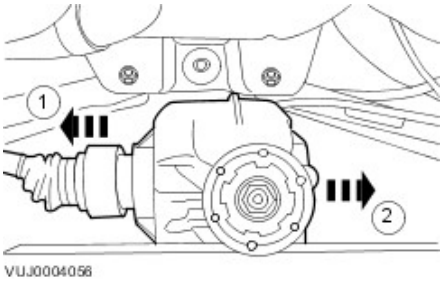


10 . **NOTE:**

The halfshaft is retained in the differential by a spring clip.

Remove the axle assembly.

1) Using a suitable pry tool detach the rear halfshaft.
2) Remove the axle assembly.



Installation

1 . **NOTE:**

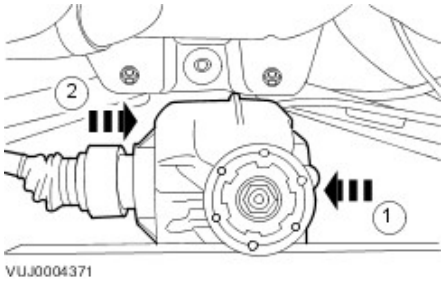
Support the axle assembly.

NOTE:

When installing the halfshaft make sure the spring clip is fully engaged in the differential.

Install the axle assembly.

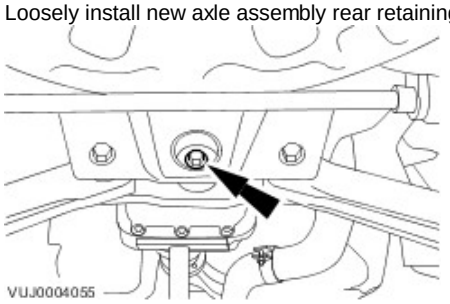
1) Install the axle assembly.
2) Install the halfshaft into the axle assembly.



2 . **NOTE:**

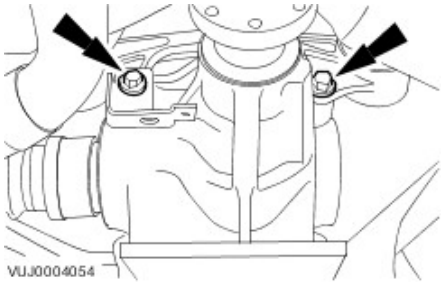
Install a new axle assembly washer.

Loosely install new axle assembly rear retaining bolt.

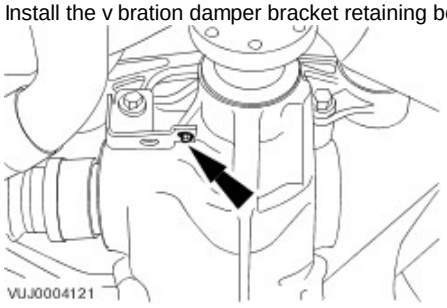


3 . Loosely install the axle assembly front retaining bolts.

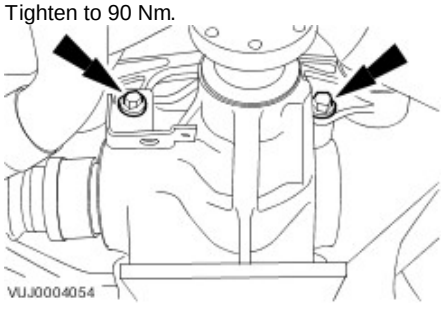
Install the v bration damper bracket.



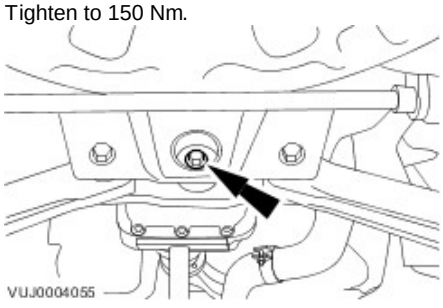
4 . Install the v bration damper bracket retaining bolt.



5 . Tighten to 90 Nm.

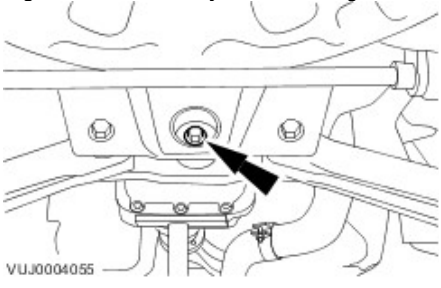


6 . Tighten to 150 Nm.

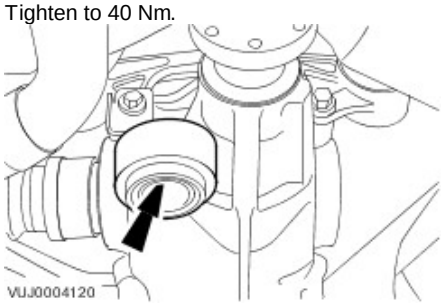


7 . **CAUTION: Slowly tighten the axle retaining bolt to final torque. Failure to follow this instruction may result in damage to the vehicle.**

Tighten to 150 Nm. If you are refitting an old fixing (before VIN J24258), tighten to 135 Nm.



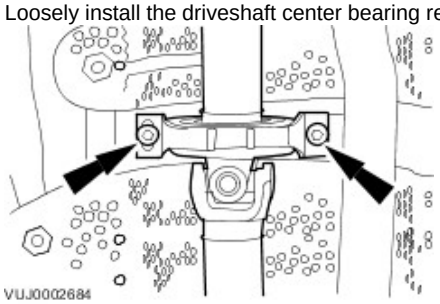
8 . Tighten to 40 Nm.



9 .

CAUTION: Support the driveshaft front and rear sections.

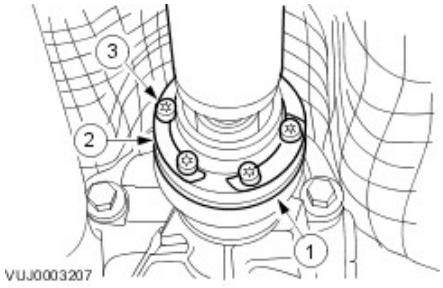
Loosely install the driveshaft center bearing retaining bolts.



10 . Attach the driveshaft front universal joint.

1) Install a new gasket.
2) Install new driveshaft retaining bolts link washers.
3) Install new driveshaft retaining bolts.

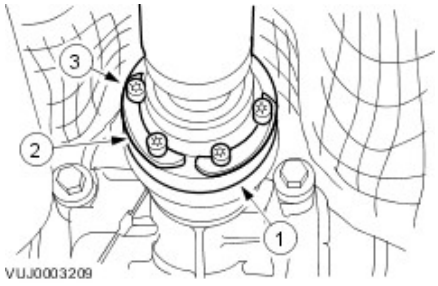
Tighten to 40 Nm.



11 . Attach the driveshaft rear universal joint.

1) Install a new gasket.
2) Install new driveshaft retaining bolt link washers.
3) Install new driveshaft retaining bolts.

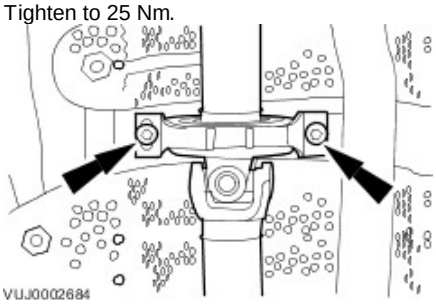
Tighten to 40 Nm.



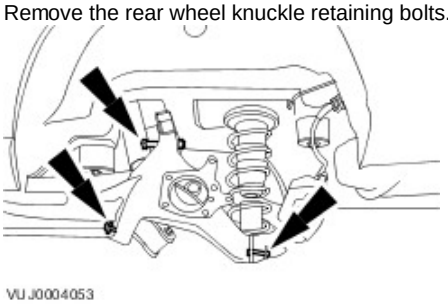
12 . Carry out the under body misalignment check.

For additional information, refer to Underbody Misalignment Check (57.65.20)

13 . Tighten to 25 Nm.



14 . Remove the rear wheel knuckle retaining bolts.

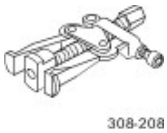


15 . Install the left-hand rear halfshaft.
For additional information, refer to Rear Halfshaft (47.10.13)

Published: Mar 29, 2001

Axle Shaft Seal (51.20.04)

Special Service Tools



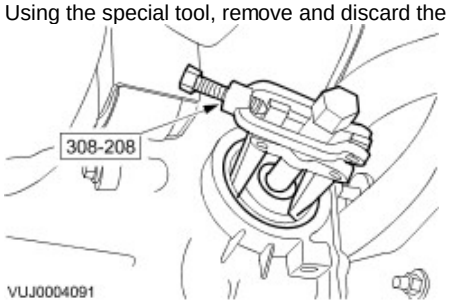
Remover, Axle Shaft Oil Seal
308-208

Installer, Oil Seal
204-264

Removal

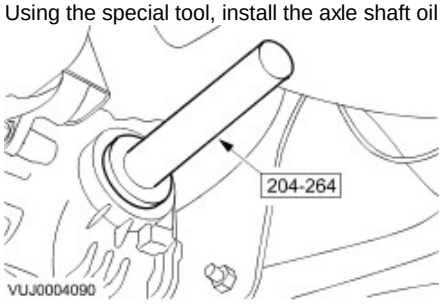
1 . Remove the rear halfshaft. For additional information, refer to <<205-05>>.

2 . Using the special tool, remove and discard the axle shaft oil seal.



Installation

1 . Using the special tool, install the axle shaft oil seal.

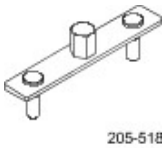


2 . Install the halfshaft. For additional information, refer to<<205-05>>.

Published: Nov 5, 2004

Drive Pinion Flange

Special Service Tools

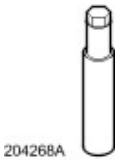


Torque To Turn Rotary Tool
205-518

Wrench, Flange
205-053

Remover, Flange Plate
204-295

Remover, Flange Boss
204-266



Remover, Flange Shaft
204-268A

Installer, Oil Seal
204-264

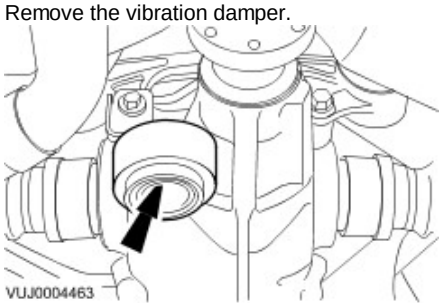
Removal

1. **CAUTION: The following step must be carried out to make sure the correct drive pinion flange retaining nut torque is achieved.**

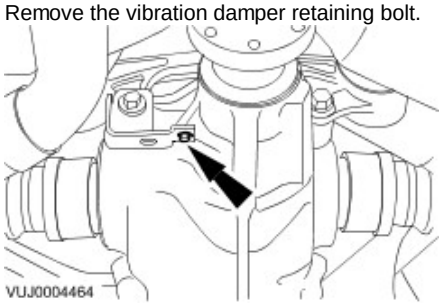
   Remove the rear brake pads.
   For additional information, refer to Brake Pads (70.40.03)

2 . Remove the driveshaft.
For additional information, refer to Driveshaft (47.15.01)

3 . Remove the vibration damper.

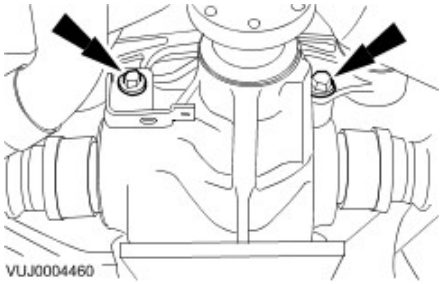


4 . Remove the vibration damper retaining bolt.



5 . **NOTE:**
Support the axle assembly.

Remove the axle front retaining bolts.
Remove the v bration damper bracket.

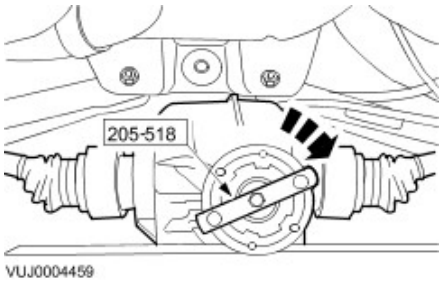


6 . Remove the axle assembly rear retaining bolt.

7 . **CAUTION: Make sure CV joints do not exceed 18 degrees from the center line.**

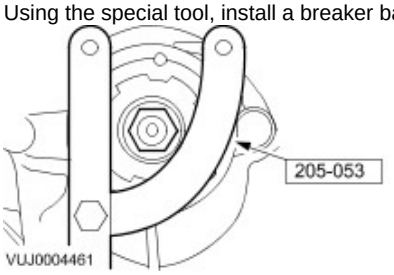
Lower the differential.

8 . Install the special tool to the drive pinion flange.



9. Install a Nm (pound/inch) torque wrench on the special tool and record the torque necessary to maintain rotation of the drive pinion gear through several revolutions.

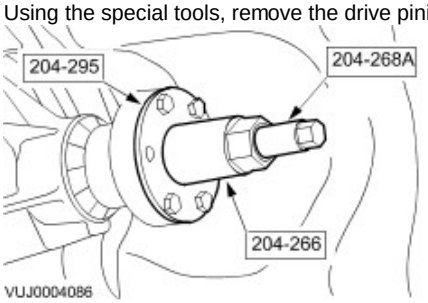
10. Using the special tool, install a breaker bar and remove and discard the drive pinion flange retaining nut.



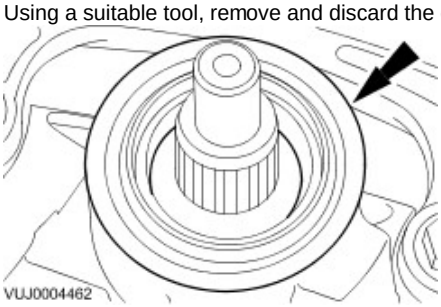
11. **NOTE:**

Mark the pinion flange in relation to the drive pinion stem to ensure correct alignment during installation.

Using the special tools, remove the drive pinion flange.



12. Using a suitable tool, remove and discard the drive pinion seal.



Installation

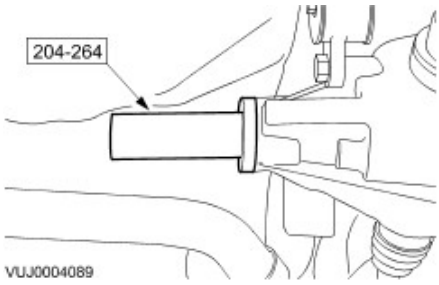
1. **CAUTION: Installation without the correct tool can result in early seal failure.**

CAUTION: If the drive pinion seal becomes misaligned during installation , remove it and install a new one.

NOTE:

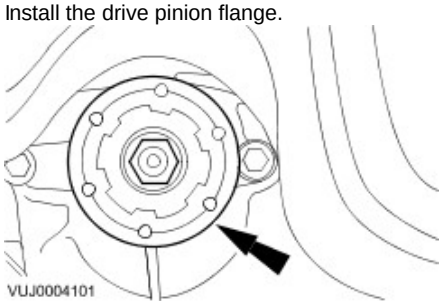
Lubricate the lips of the new drive pinion oil seal. Use a long life grease or equivalent.

Using the special tool, install the drive pinion seal.



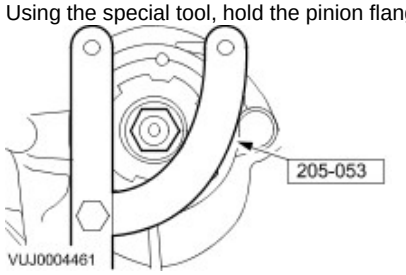
2. **CAUTION: Inspect the pinion flange seal journal for rust or nicks/scratches prior to installing the pinion flange. Polish the seal journal with a fine crocus cloth, if required.**

Install the drive pinion flange.



3. **CAUTION: Do not under any circumstance, loosen the pinion nut to reduce preload, if preload is exceeded install a new collapsible spacer and pinion nut.**

Using the special tool, hold the pinion flange while tightening the drive pinion retaining nut.



4. **CAUTION: If the preload recorded prior to disassembly is lower than the specification (1.7 Nm / 15 lb-in) for used bearings, tighten the companion flange nut until the pinion preload reaches the specification (1.7 Nm / 15 lb-in). If the preload recorded prior to disassembly is higher than the specification for used bearings, tighten the companion flange nut to the original reading as recorded.**

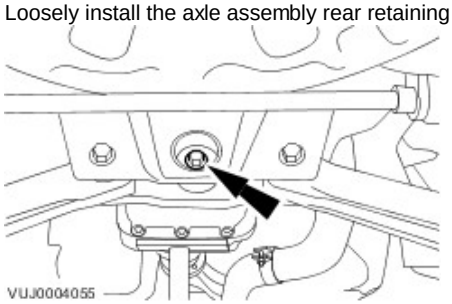
NOTE:

Rotate the pinion to allow the pinion bearing to seat correctly. Take frequent pinion bearing torque preload measurements by rotating the pinion with a (Nm / lb-in) torque wrench.

Using the special tool, carry out a pinion bearing preload check.

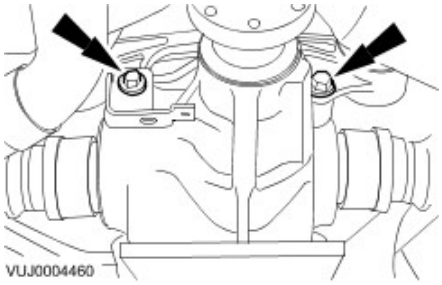
5 . Install the axle assembly.

6 . Loosely install the axle assembly rear retaining bolt.

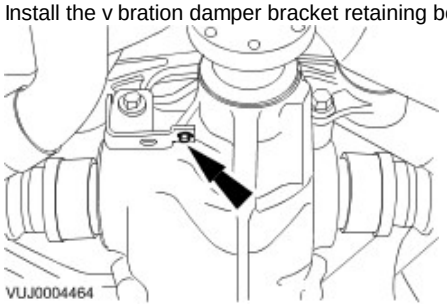


7 . Loosely install the axle assembly front retaining bolts.

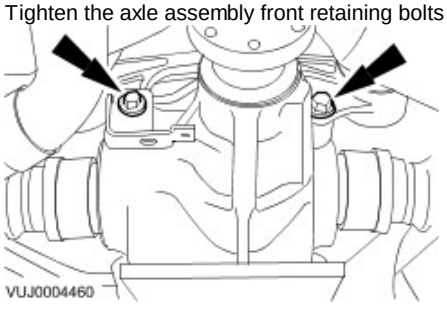
- Install the v bration damper bracket.



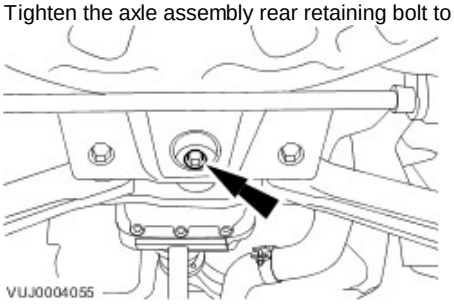
8 . Install the v bration damper bracket retaining bolt.



9 . Tighten the axle assembly front retaining bolts to 90 Nm.

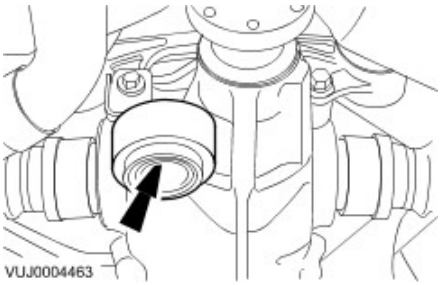


10 . Tighten the axle assembly rear retaining bolt to 110 Nm and then slowly tighten to 135 Nm.



11 . Install the vibration damper.

- Tighten to 48 Nm.



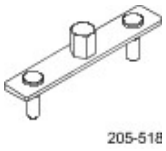
12 . Install the driveshaft.
For additional information, refer to Driveshaft (47.15.01)

13 . Install the rear brake pads.
For additional information, refer to Brake Pads (70.40.03)

Published: Nov 5, 2004

Drive Pinion Seal (51.20.01)

Special Service Tools

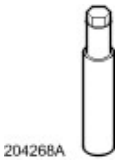


Torque To Turn Rotary Tool
205-518

Wrench, Flange
205-053

Remover, Flange Plate
204-295

Remover, Flange Boss
204-266



Remover, Flange Shaft
204-268A

Installer, Oil Seal
204-264

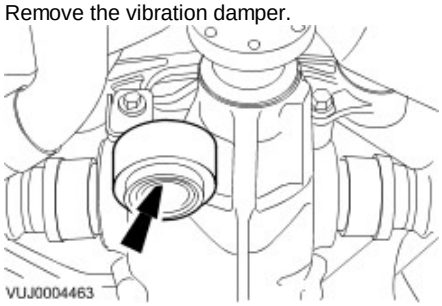
Removal

1. **CAUTION: The following step must be carried out to make sure the correct drive pinion flange retaining nut torque is achieved.**

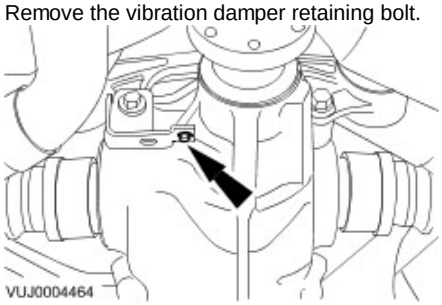
   Remove the rear brake pads.
   For additional information, refer to Brake Pads (70.40.03)

2 . Remove the driveshaft.
For additional information, refer to

3 . Remove the vibration damper.

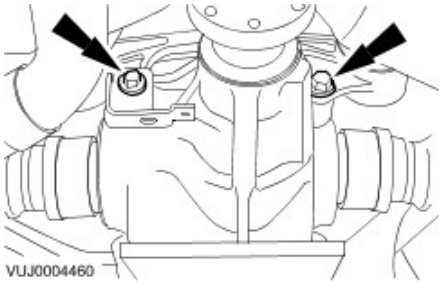


4 . Remove the vibration damper retaining bolt.



5 . **NOTE:**
Support the axle assembly.

Remove the axle front retaining bolts.
Remove the v bration damper bracket.

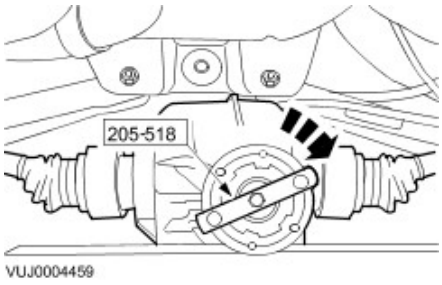


6 . Remove the axle assembly rear retaining bolt.

7 . **CAUTION: Make sure CV joints do not exceed 18 degrees from the center line.**

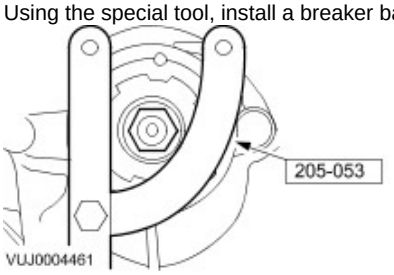
Lower the differential.

8 . Install the special tool to the drive pinion flange.



9. Install a Nm (pound/inch) torque wrench on the special tool and record the torque necessary to maintain rotation of the drive pinion gear through several revolutions.

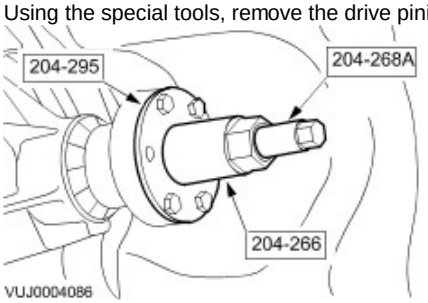
10. Using the special tool, install a breaker bar and remove and discard the drive pinion flange retaining nut.



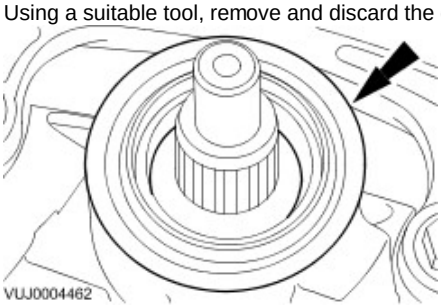
11. **NOTE:**

Mark the pinion flange in relation to the drive pinion stem to ensure correct alignment during installation.

Using the special tools, remove the drive pinion flange.



12. Using a suitable tool, remove and discard the drive pinion seal.



Installation

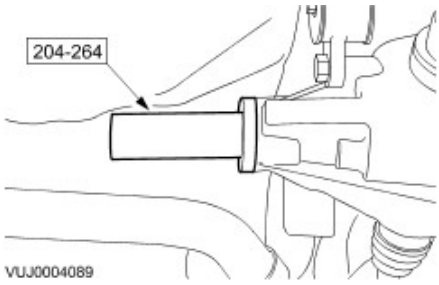
1. **CAUTION: Installation without the correct tool can result in early seal failure.**

CAUTION: If the drive pinion seal becomes misaligned during installation , remove it and install a new one.

NOTE:

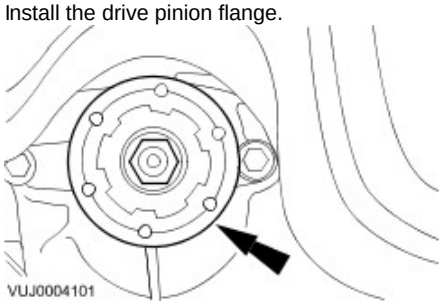
Lubricate the lips of the new drive pinion oil seal. Use a long life grease or equivalent.

Using the special tool, install the drive pinion seal.



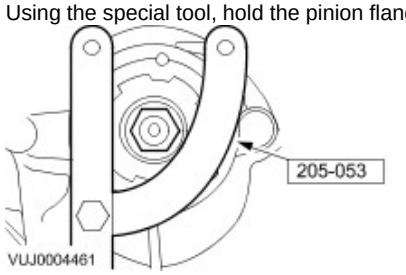
2. **CAUTION: Inspect the pinion flange seal journal for rust or nicks/scratches prior to installing the pinion flange. Polish the seal journal with a fine crocus cloth, if required.**

Install the drive pinion flange.



3. **CAUTION: Do not under any circumstance, loosen the pinion nut to reduce preload, if preload is exceeded install a new collapsible spacer and pinion nut.**

Using the special tool, hold the pinion flange while tightening the drive pinion retaining nut.



4. **CAUTION: If the preload recorded prior to disassembly is lower than the specification (1.7 Nm / 15 lb-in) for used bearings, tighten the companion flange nut until the pinion preload reaches the specification (1.7 Nm / 15 lb-in). If the preload recorded prior to disassembly is higher than the specification for used bearings, tighten the companion flange nut to the original reading as recorded.**

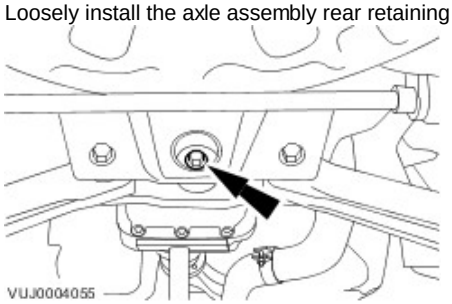
NOTE:

Rotate the pinion to allow the pinion bearing to seat correctly. Take frequent pinion bearing torque preload measurements by rotating the pinion with a (Nm / lb-in) torque wrench.

Using the special tool, carry out a pinion bearing preload check.

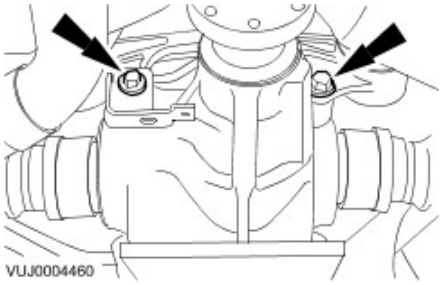
5 . Install the axle assembly.

6 . Loosely install the axle assembly rear retaining bolt.

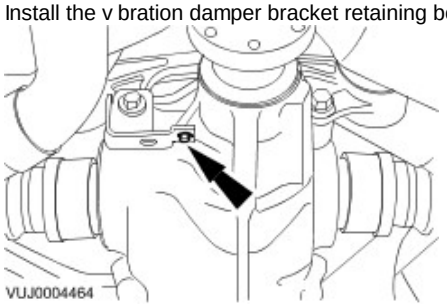


7 . Loosely install the axle assembly front retaining bolts.

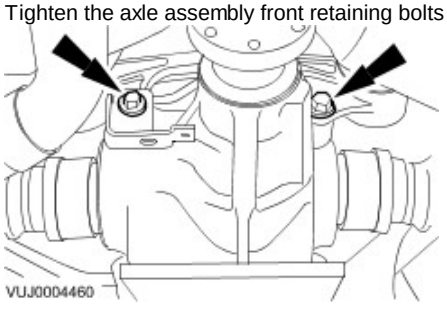
- Install the v bration damper bracket.



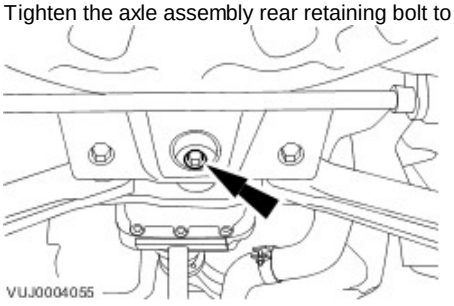
8 . Install the v bration damper bracket retaining bolt.



9 . Tighten the axle assembly front retaining bolts to 90 Nm.

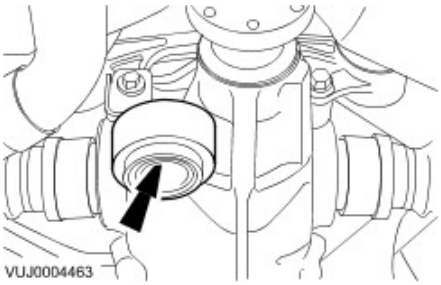


10 . Tighten the axle assembly rear retaining bolt to 110 Nm and then slowly tighten to 135 Nm.



11 . Install the vibration damper.

- Tighten to 48 Nm.



12 . Install the driveshaft.
For additional information, refer to

13 . Install the rear brake pads.
For additional information, refer to Brake Pads (70.40.03)

Published: Aug 10, 2005

Specifications

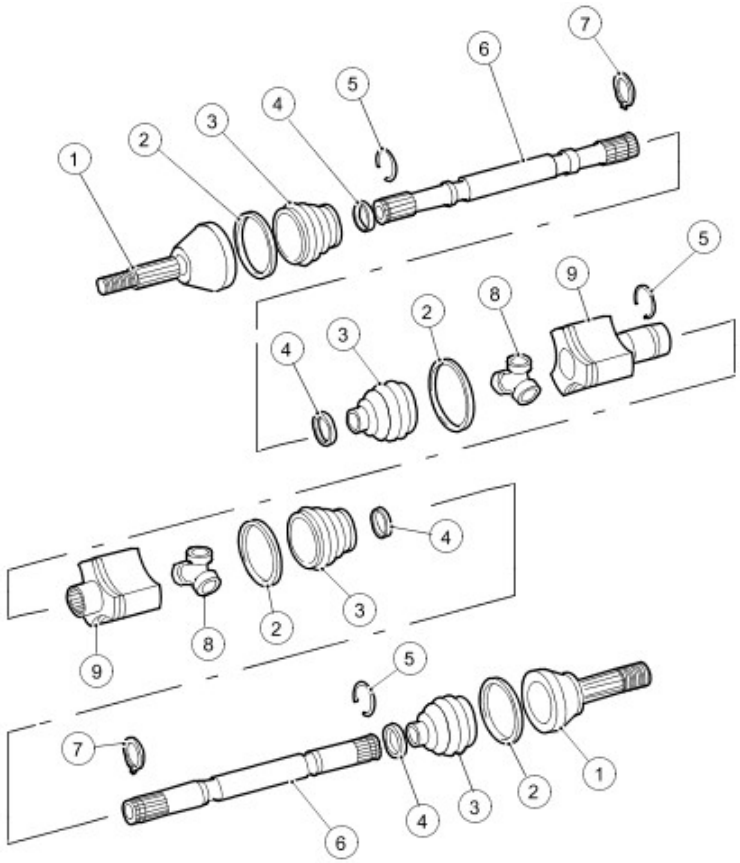
Torque Specifications

Description	Nm	lb-ft	lb-in
Wheel hub nut	270	200	-
Tie rod end retaining nut	35	26	-
Lower arm ball joint retaining nut	83	61	-
Front subframe reinforcement plate retaining bolt	35	26	-
Front subframe rear mount retaining bolt	142	105	-
Front subframe front mount retaining bolt	142	105	-
Transfer case Y bracket retaining bolt	25	18	-
Intermediate shaft bearing carrier retaining bolts	25	18	-
Front right-hand halfshaft retaining nuts - Vehicles with 2.0L or diesel engine	25	18	-

Published: Aug 10, 2005

Front Drive Halfshafts

Front Drive Halfshafts



VUJ0005086

Item	Part Number	Description
1	—	Outer constant velocity (CV) joint
2	—	CV joint boot retaining clip
3	—	CV joint boot
4	—	CV joint boot retaining clip
5	—	Snap ring
6	—	Barshaft
7	—	Circlip
8	—	Tripod star
9	—	Tripod star housing

The front drive halfshafts are of equal lengths with the inner constant velocity (CV) joint being of the plunger type.

The inner and outer CV joints are linked by a solid barshaft. The inner CV joints are retained in the differential with the aid of a spring clip.

On vehicles with 2.0L or diesel engines there is an addition of an intermediate shaft which connects the right-hand side of the differential with the right-hand halfshaft. The right-hand halfshaft is retained in the intermediate shaft with the aid of a spring circlip. The intermediate shaft is supported by an additional bearing which is fitted to the outer end of the intermediate shaft and is attached to the right-hand catalytic converter retaining bracket.

Handling Front Drive Halfshafts

The following points should be observed when handling front drive halfshafts:

- Do not pull on the CV joints.
- Do not allow the CV joints to exceed 18 degrees of articulation.
- Check polished surfaces and splines for damage.

- Do not allow the CV joint boots to come into contact with sharp edges, hot vehicle components or the exhaust system.
- Do not drop the front drive halfshafts, this may cause damage to the interior of the boots which may not be visible.
- Do not support the front drive halfshaft by holding the CV joint alone.

Underbody Protection and Corrosion Prevention

The CV joint boots should be covered during application of underbody protection or corrosion prevention. Foreign matter on the CV boots may cause premature ageing of the material. Foreign material on the front drive halfshafts may cause imbalance.

Published: Dec 2, 2003

Front Halfshaft LH (47.10.15)

Special Service Tools

Ball joint splitter
204-192

Wheel hub puller
205-491

Adapter nuts
205-491-01

Forcing screw
204-269

Slide hammer
100-012

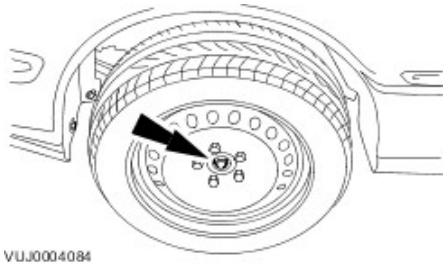
100-012-02
Slide hammer shaft

Halfshaft remover fork
204-226

Removal

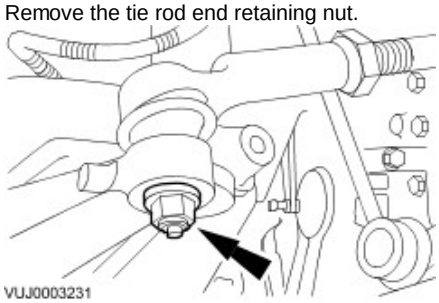
All vehicles

1 . Loosen the wheel hub nut.

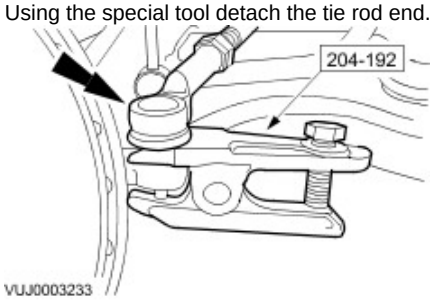


2 . Remove the front road wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

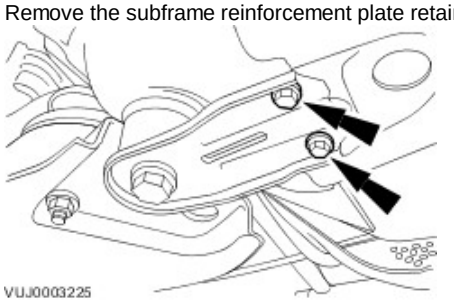
3 . Remove the tie rod end retaining nut.



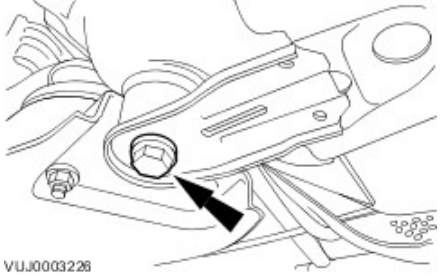
4 . Using the special tool detach the tie rod end.



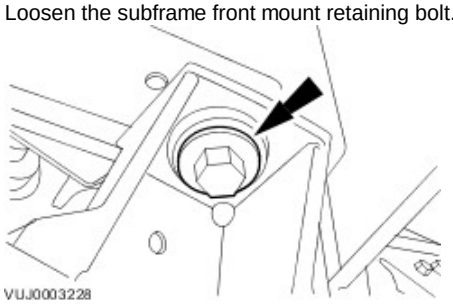
5 . Remove the subframe reinforcement plate retaining bolts.



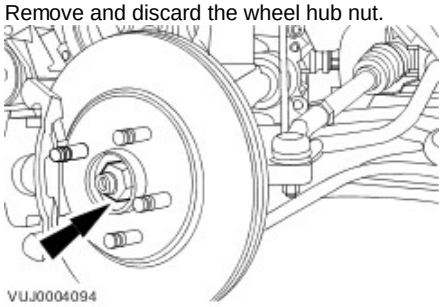
6 . Loosen the subframe rear mount retaining bolt.



7 . Loosen the subframe front mount retaining bolt.

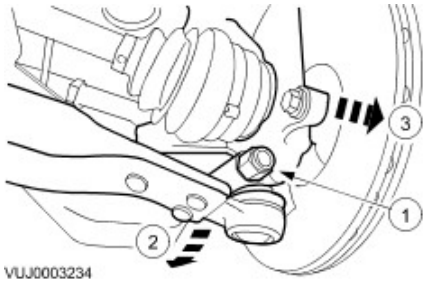


8 . Remove and discard the wheel hub nut.

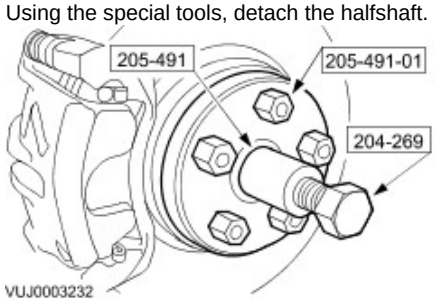


9 . Detach the wheel knuckle.

1) Remove the lower arm ball joint retaining bolt.
2) Reposition the lower arm.
3) Detach the wheel knuckle.



10 . Using the special tools, detach the halfshaft.



Vehicle with automatic transmission

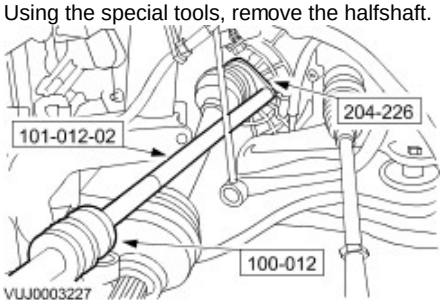
11 . Drain the automatic transmission fluid.
For additional information, refer to Transmission Fluid Drain and Refill (44.24.02)

Vehicles with manual transmission

12 . Drain the manual transmission fluid.
For additional information, refer to Transaxle Draining and Filling - Vehicles With: 5-Speed Manual Transmission (44.24.02)

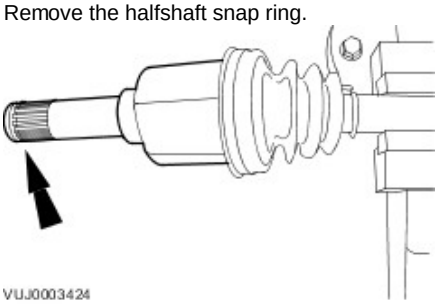
All vehicles

13 . Using the special tools, remove the halfshaft.



14 . **CAUTION: Use suitable protective covers to protect the barshaft.**

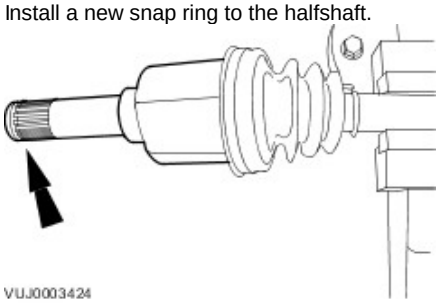
Remove the halfshaft snap ring.



Installation

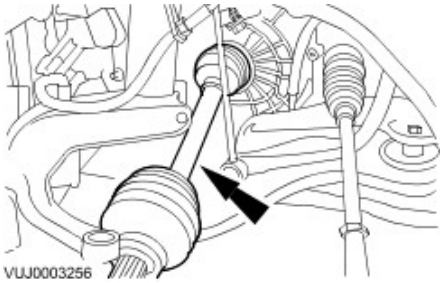
All vehicles

1 . Install a new snap ring to the halfshaft.



2 . **CAUTION: Make sure the CV joint splines are located fully. Do not use excessive force when engaging the CV joint into the transmission.**

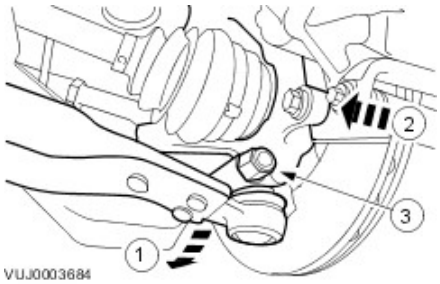
Install the halfshaft.



3 . Attach the wheel knuckle.

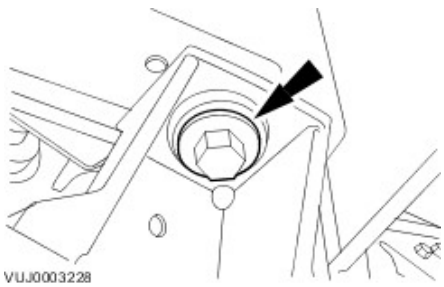
1) Reposition the lower arm.
2) Attach the wheel knuckle.
3) Install the lower arm ball joint retaining bolt.

Tighten to 83 Nm.

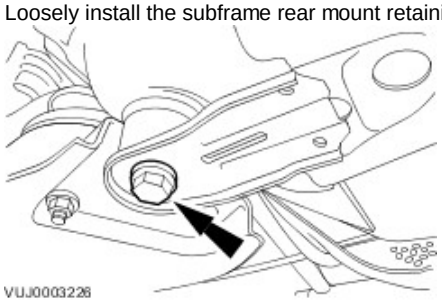


4 . Tighten the front subframe front mount retaining bolt.

Tighten to 142 Nm.

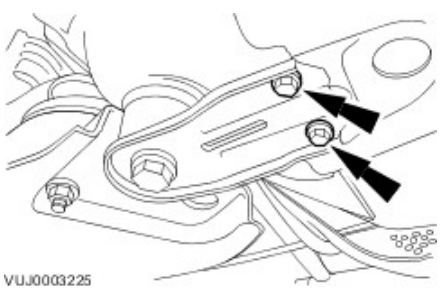


5 . Loosely install the subframe rear mount retaining bolt.

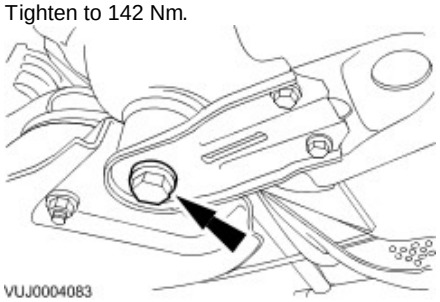


6 . Install the subframe reinforcement plate retaining bolts.

Tighten to 35 Nm.

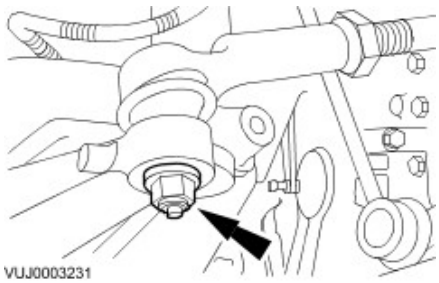


7 . Tighten to 142 Nm.

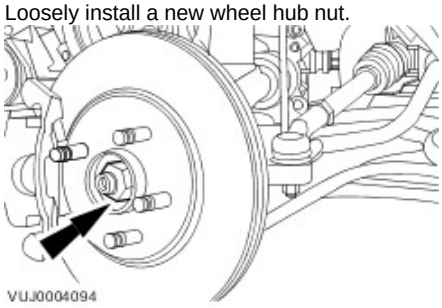


8 . Install the tie rod end.

Tighten to 35 Nm.



9 . Loosely install a new wheel hub nut.



10 . Install the front road wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

Vehicle with automatic transmission

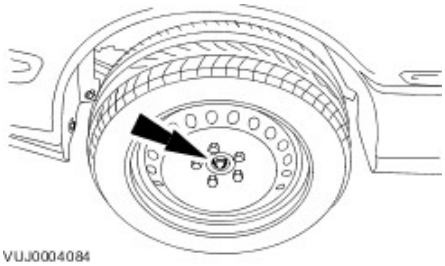
11 . Refill the automatic transmission system.
For additional information, refer to Transmission Fluid Drain and Refill (44.24.02)

Vehicles with manual transmission

12 . Refill the manual transmission system.
For additional information, refer to Transaxle Draining and Filling - Vehicles With: 5-Speed Manual Transmission (44.24.02)

13 . Tighten the wheel hub nut.

Tighten to 270 Nm.



14 . Check the subframe alignment.
For additional information, refer to Underbody Misalignment Check (57.65.20)

Published: Jul 3, 2003

Front Halfshaft RH - 2.0L/2.5L/3.0L (47.10.16)

Special Service Tools

204-192

Ball joint splitter
204-192

205-491

Wheel hub puller
205-491

20549101

Adapter nuts
205-491-01

204-269

Forcing screw
204-269

307-442

RH halfshaft splitter
307-442

307-443

RH halfshaft splitter handle
307-443

100-012-02

Slide hammer shaft
100-012-02

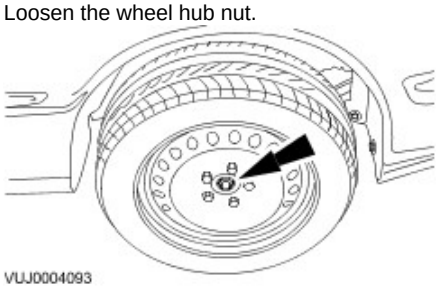
Slide hammer
100-012

Halfshaft remover fork
204-226

Removal

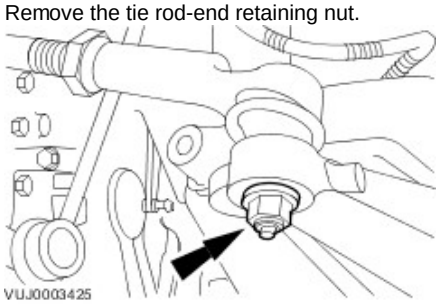
All vehicles

1 . Loosen the wheel hub nut.

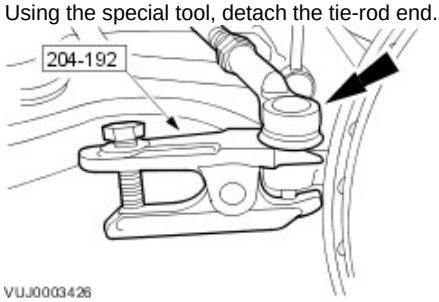


2 . Remove the front road wheel and tire.
For additional information, refer to
For additional information, refer to Wheel and Tire (74.20.05)

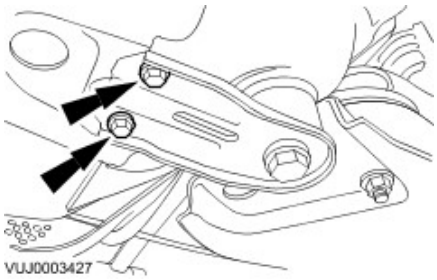
3 . Remove the tie rod-end retaining nut.



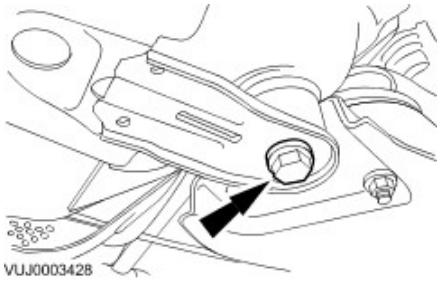
4 . Using the special tool, detach the tie-rod end.



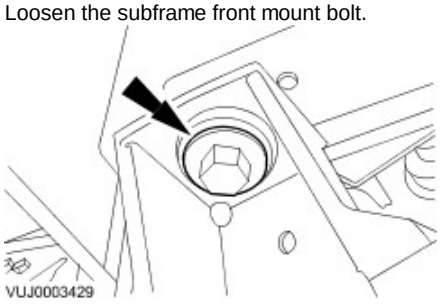
5 . Remove the subframe reinforcement plate retaining bolts.



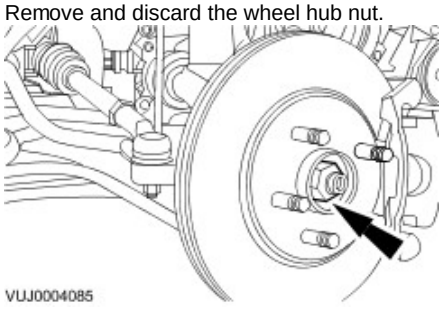
6 . Loosen the subframe rear mount bolt.



7 . Loosen the subframe front mount bolt.

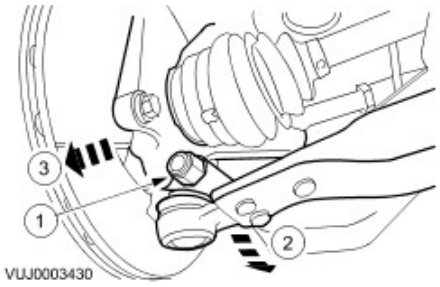


8 . Remove and discard the wheel hub nut.

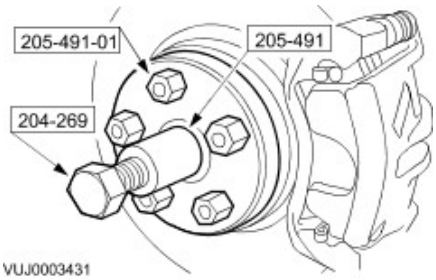


9 . Detach the wheel knuckle.

1) Remove the lower arm ball joint retaining bolt.
2) Reposition the lower arm.
3) Detach the wheel knuckle.



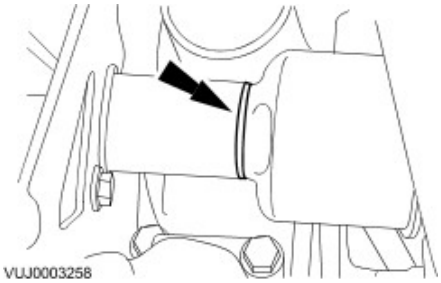
10 . Using the special tools, detach the halfshaft.



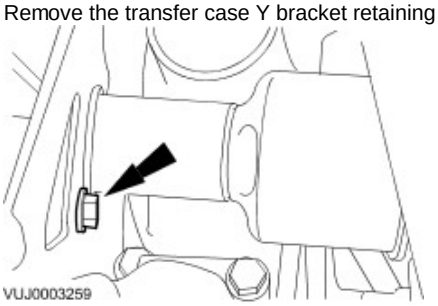
Vehicles with 2.5L or 3.0L engine

11 . Remove the exhaust muffler inlet pipe.
For additional information, refer to
For additional information, refer to Muffler Inlet Pipe - 2.0L/2.5L/3.0L (30.10.06)

12 . Remove the halfshaft seal.



13 . Remove the transfer case Y bracket retaining bolt.

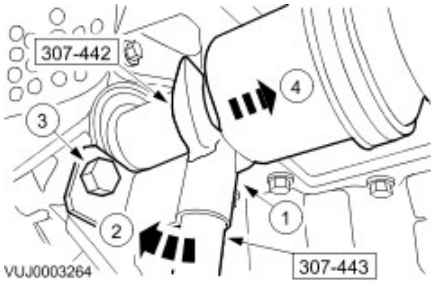


14 .

CAUTION: To prevent damage to the transfer box internal seal, make sure that the link shaft is not retracted further than 200 mm from the transfer box casing.

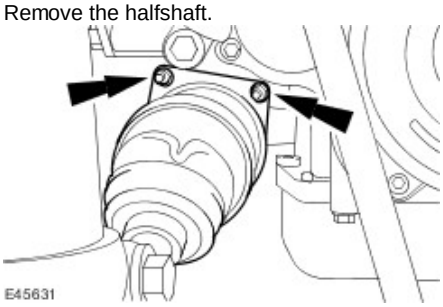
Using the special tools, remove the halfshaft.

1) Attach special tools to the halfshaft.
2) Lever the special tools to displace the halfshaft.
3) Install the transfer case Y bracket retaining bolt.
4) Remove the halfshaft.



Vehicles with 2.0L engine

15 . Remove the halfshaft.

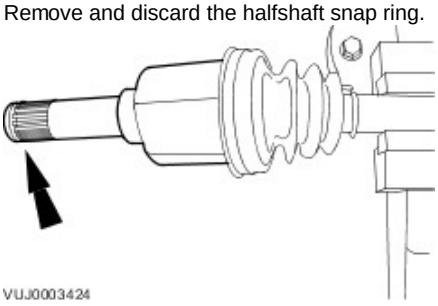


All vehicles

16 .

CAUTION: Use suitable protective covers to protect the barshaft.

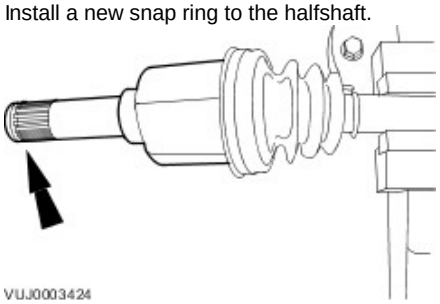
Remove and discard the halfshaft snap ring.



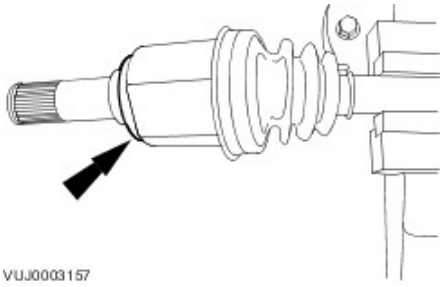
Installation

All vehicles

1 . Install a new snap ring to the halfshaft.



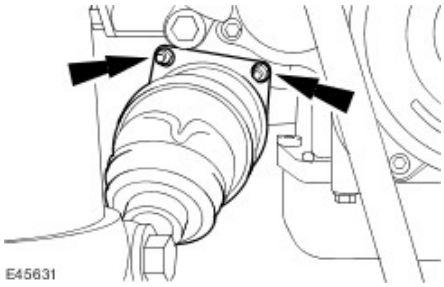
2 . Install a new halfshaft seal.



Vehicles with 2.0L engine

3 . Install the halfshaft.

Tighten to 25 Nm.

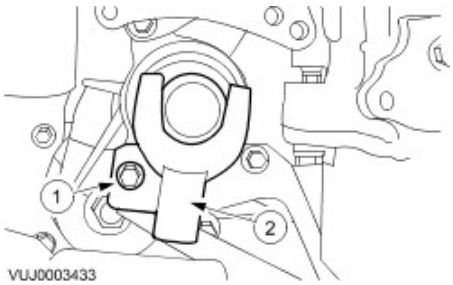


Vehicles with 2.5L or 3.0L engine

4 . Remove the special tool.

1) Remove the transfer case Y bracket retaining bolt.

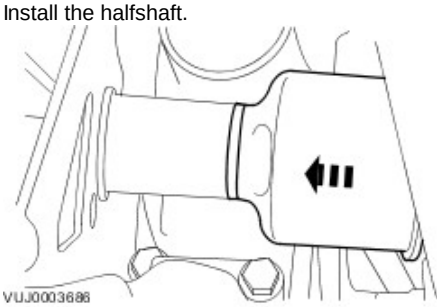
2) Remove the special tool.



5 .

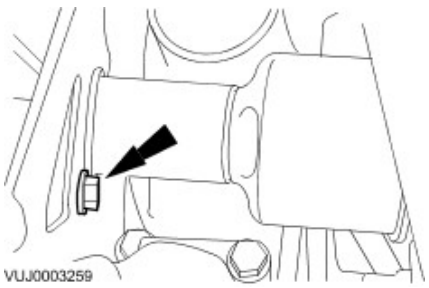
CAUTION: Make sure the CV joint splines are located fully. Do not use excessive force when engaging the CV joint into the link shaft.

Install the halfshaft.



6 . Install the transfer case Y bracket retaining bolt.

Tighten to 25 Nm.



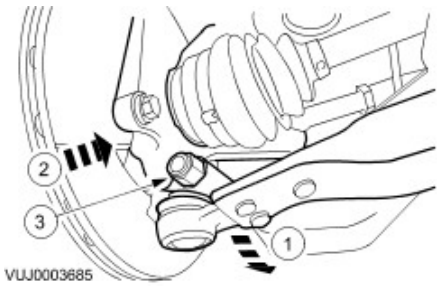
7 . Install the exhaust muffler inlet pipe.
For additional information, refer to
For additional information, refer to Muffler Inlet Pipe - 2.0L/2.5L/3.0L (30.10.06)

All vehicles

8 . Attach the wheel knuckle.

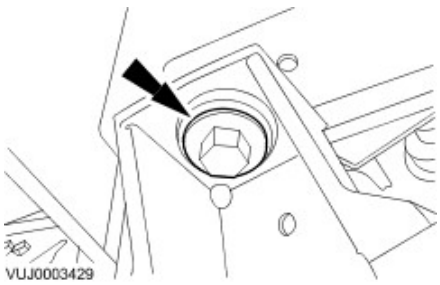
1) Reposition the lower arm.
2) Attach the wheel knuckle.
3) Install the lower arm ball joint retaining bolt.

Tighten to 83 Nm.



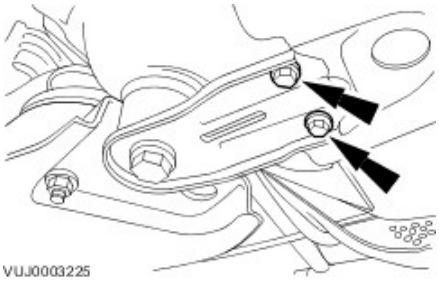
9 . Tighten the subframe front mount retaining bolt.

Tighten to 142 Nm.

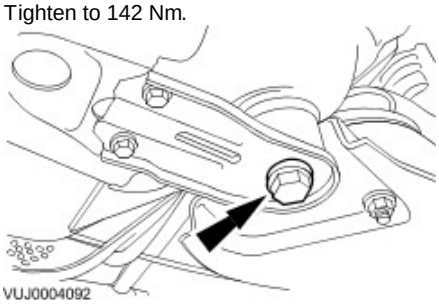


10 . Install the subframe reinforcement plate retaining bolts.

Tighten to 35 Nm.

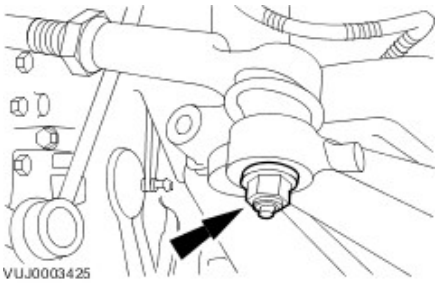


11 . Tighten to 142 Nm.

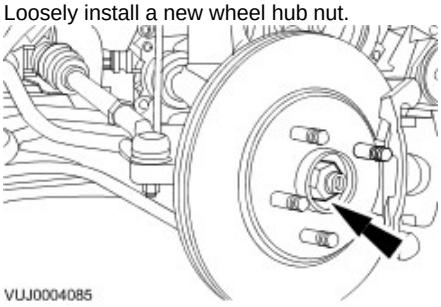


12 . Install the tie-rod end.

Tighten to 35 Nm.



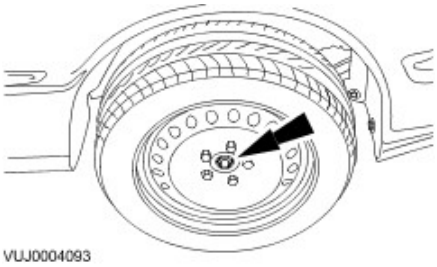
13 . Loosely install a new wheel hub nut.



14 . Install the front road wheel and tire.
For additional information, refer to
For additional information, refer to Wheel and Tire (74.20.05)

15 . Tighten the wheel hub nut.

Tighten to 270 Nm.



16 . Check the subframe alignment.
For additional information, refer to
For additional information, refer to Underbody Misalignment Check (57.65.20)

Published: Aug 10, 2005

Front Halfshaft RH - 2.0L Diesel/2.2L Diesel (47.10.16)

Special Service Tools

204-192

Ball joint splitter
204-192

205-491

Wheel hub puller
205-491

20549101

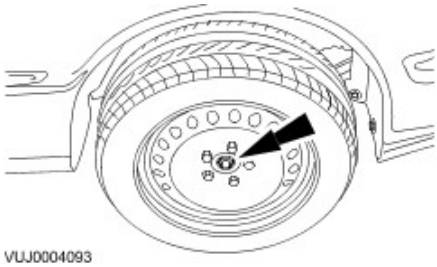
Adapter nuts
205-491-01

204-269

Forcing screw
204-269

Removal

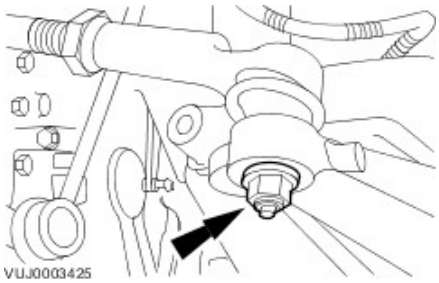
1 . Loosen the wheel hub nut.



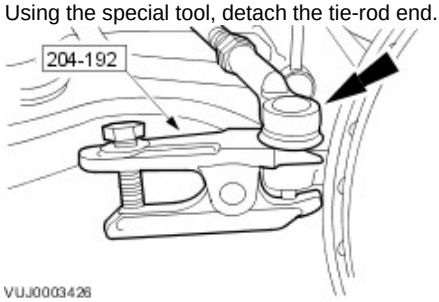
VUJ0004093

2 . Remove the front road wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

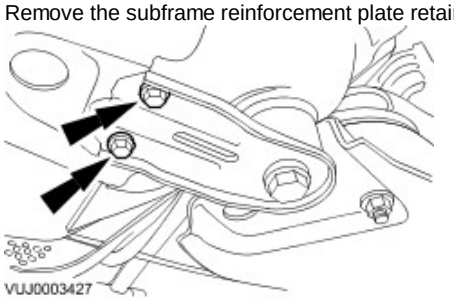
3 . Remove the tie rod-end retaining nut.



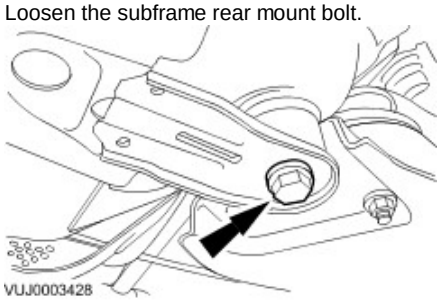
4 . Using the special tool, detach the tie-rod end.



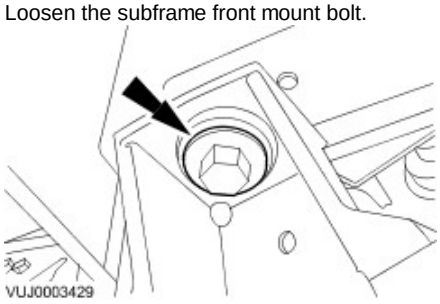
5 . Remove the subframe reinforcement plate retaining bolts.



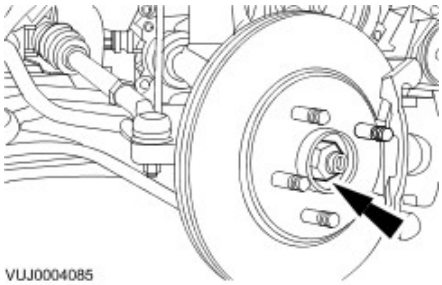
6 . Loosen the subframe rear mount bolt.



7 . Loosen the subframe front mount bolt.

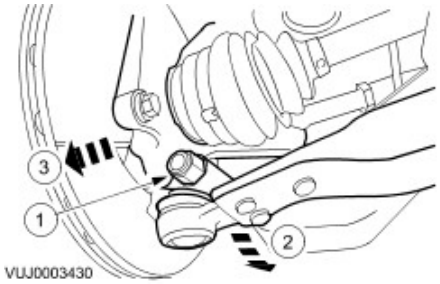


8 . Remove and discard the wheel hub nut.

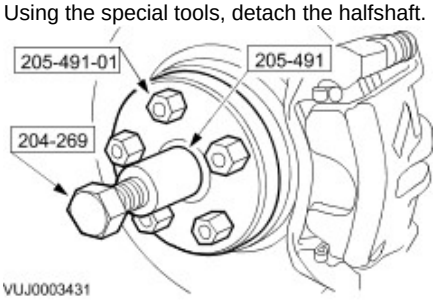


9 . Detach the wheel knuckle.

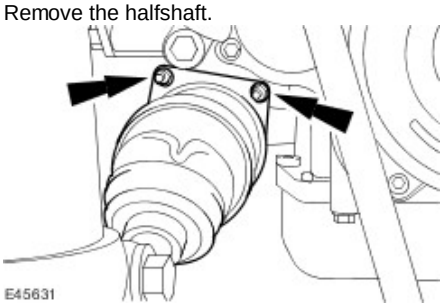
1) Remove the lower arm ball joint retaining bolt.
2) Reposition the lower arm.
3) Detach the wheel knuckle.



10 . Using the special tools, detach the halfshaft.

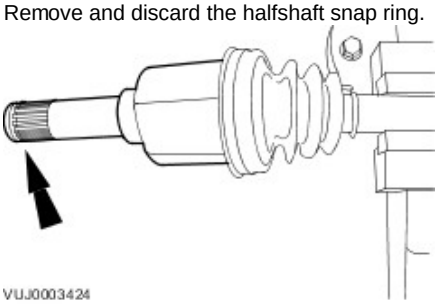


11 . Remove the halfshaft.



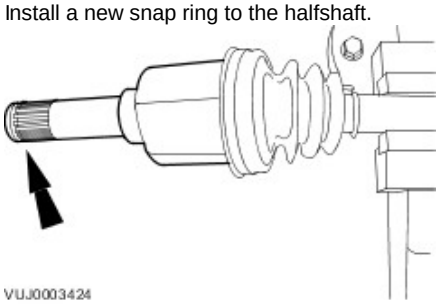
12 . **CAUTION: Use suitable protective covers to protect the barshaft.**

Remove and discard the halfshaft snap ring.



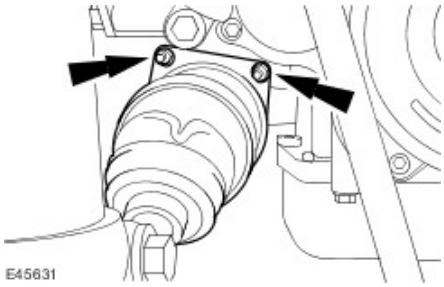
Installation

1 . Install a new snap ring to the halfshaft.



2 . Install the halfshaft.

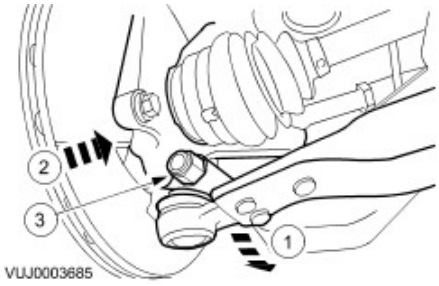
- Tighten to 25 Nm.



3 . Attach the wheel knuckle.

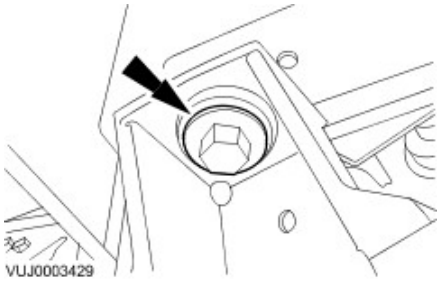
1) Reposition the lower arm.
2) Attach the wheel knuckle.
3) Install the lower arm ball joint retaining bolt.

- Tighten to 83 Nm.



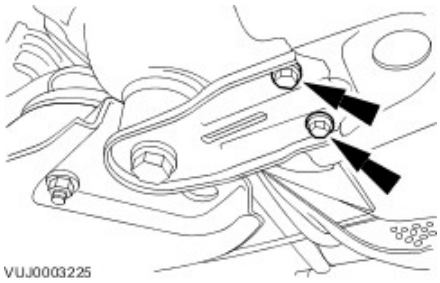
4 . Tighten the subframe front mount retaining bolt.

- Tighten to 142 Nm.

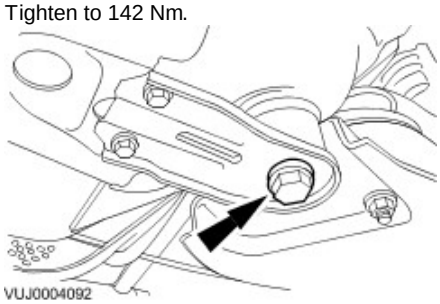


5 . Install the subframe reinforcement plate retaining bolts.

- Tighten to 35 Nm.

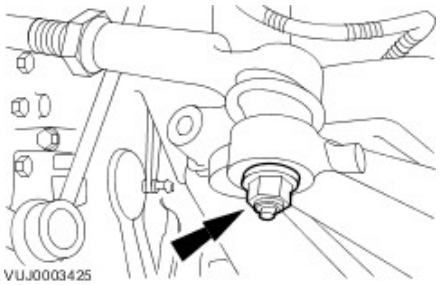


6 . Tighten to 142 Nm.

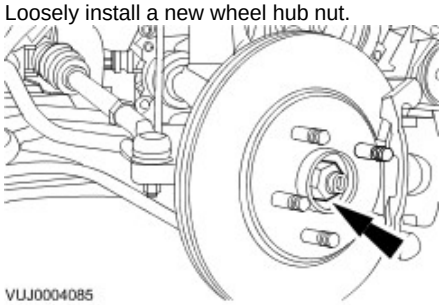


7 . Install the tie-rod end.

Tighten to 35 Nm.



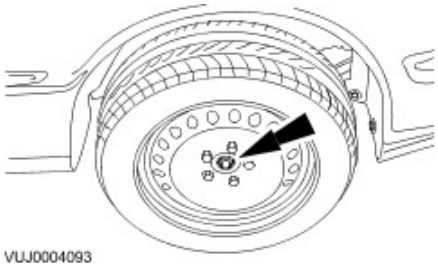
8 . Loosely install a new wheel hub nut.



9 . Install the front road wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

10 . Tighten the wheel hub nut.

Tighten to 270 Nm.



11 . Check the subframe alignment.
For additional information, refer to Underbody Misalignment Check (57.65.20)

Published: Feb 21, 2002

Inner Constant Velocity (CV) Joint Boot (47.10.18)

Removal

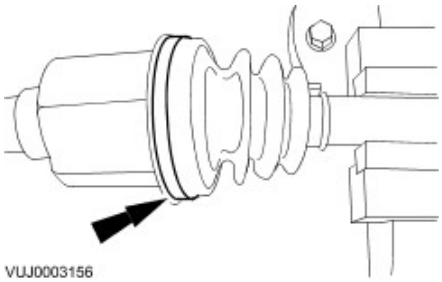
1 . Remove the front halfshaft. For additional information, refer to
For additional information, refer to . For additional information, refer to
For additional information, refer to .

2 . **CAUTION: Use suitable protective covers to protect the barshaft.**

Using a suitable clamp, secure the front halfshaft.

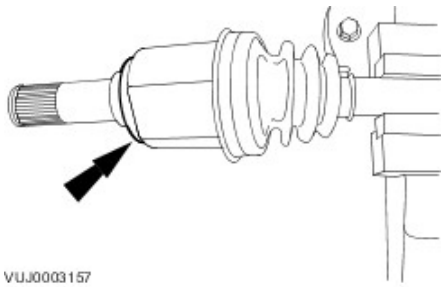
3 . Remove the inner constant velocity (CV) joint boot outer retaining clip.

- Remove and discard the retaining clip.

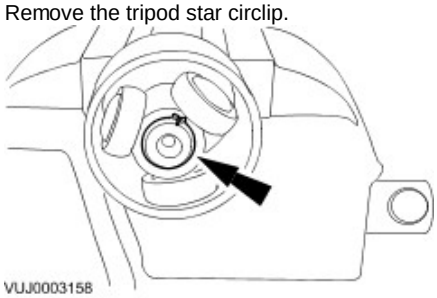


4 . Remove the tripod star housing.

- Remove and discard the grease.

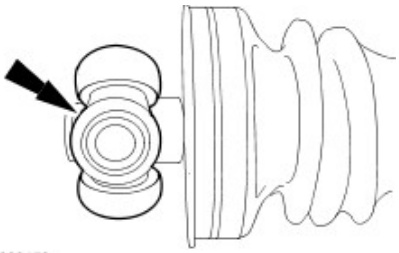


5 . Remove the tripod star circlip.



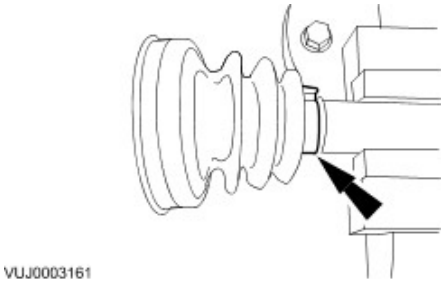
6 . **CAUTION: Do not damage the roller bearings.**

Using a suitable brass drift, remove the tripod star.

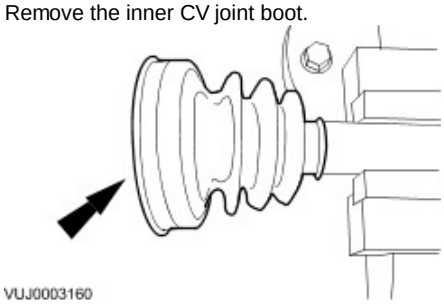


7 . Remove the inner CV joint boot retaining clip.

Remove and discard the retaining clip.

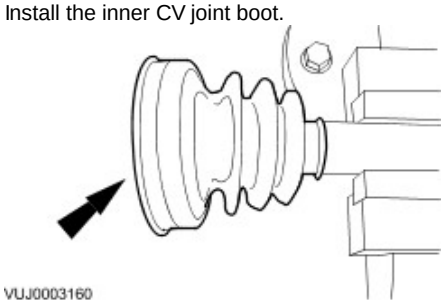


8 . Remove the inner CV joint boot.



Installation

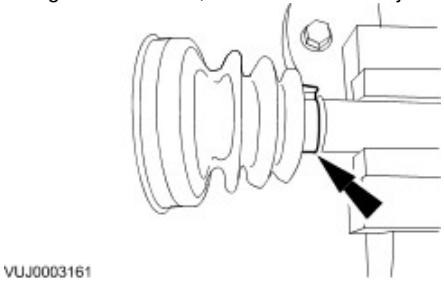
1 . Install the inner CV joint boot.



2 . **NOTE:**

Install a new retaining clip.

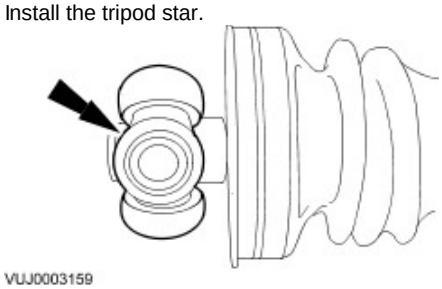
Using a suitable tool, install the inner CV joint boot retaining clip.



3 .

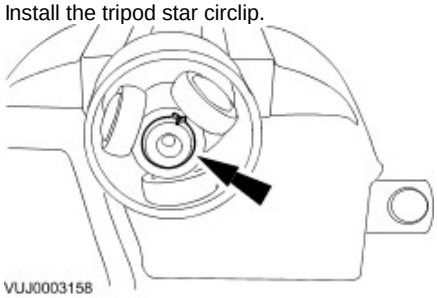
CAUTION: Do not damage the roller bearings.

Install the tripod star.



VUJ0003159

4 . Install the tripod star circlip.

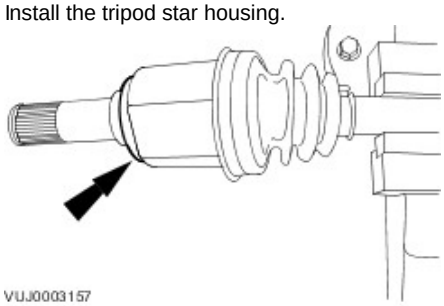


VUJ0003158

5 . **NOTE:**

Install new grease.

Install the tripod star housing.



VUJ0003157

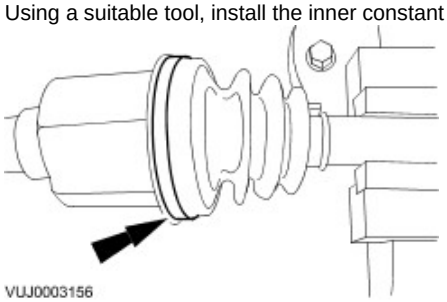
6 . **NOTE:**

Make sure enough air is present in the CV boot.

NOTE:

Install a new retaining clip.

Using a suitable tool, install the inner constant velocity (CV) joint boot outer retaining clip.



VUJ0003156

7 . Remove the front halfshaft from the clamp.

8 . Install the front halfshaft. For additional information, refer to
For additional information, refer to . For additional information, refer to
For additional information, refer to .

Published: Nov 22, 2001

Intermediate Shaft

Removal

All vehicles

1 . Remove the right-hand halfshaft.
For additional information, refer to

Vehicles with automatic transmission

2 . Drain the automatic transmission fluid. <<307-01>>

Vehicles with manual transmission

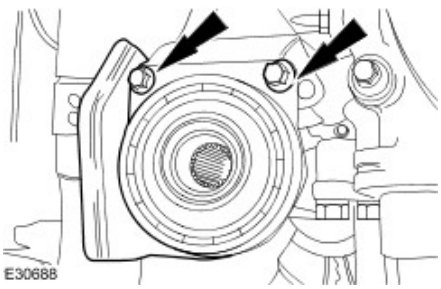
3 . Drain the manual transmission fluid. <<308-03>>

All vehicles

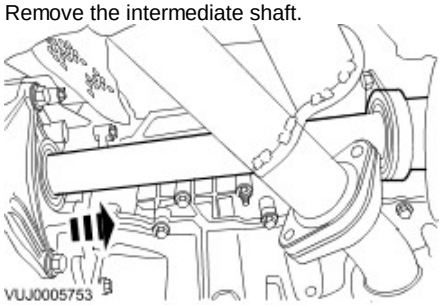
4 . **CAUTION: Before removing the bearing carrier retaining bolts, identify their correct position. Failure to follow this procedure will result in damage to the vehicle.**

Remove the intermediate shaft bearing carrier retaining bolts.

- Remove the branch pipe heat shield.



5 . Remove the intermediate shaft.

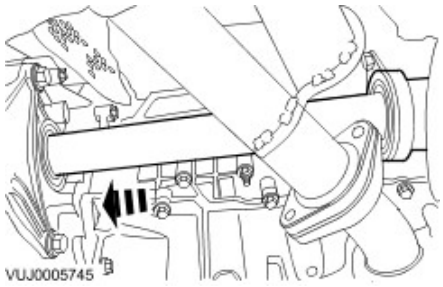


Installation

All vehicles

1 . **CAUTION: Make sure the intermediate shaft splines are located fully. Do not use excessive force when engaging the intermediate shaft into the transmission.**

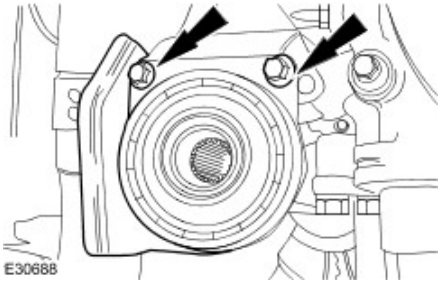
Install the intermediate shaft.



2 . **CAUTION: Before installing the bearing carrier retaining bolts make sure that the bearing carrier is located in the same position that it was removed from, failure to follow this procedure will result in damage to the vehicle.**

Install the branch pipe heat shield.

Tighten to 25 Nm.



Vehicles with automatic transmission

3 . Refill the automatic transmission system. <<307-01>>

Vehicles with manual transmission

4 . Refill the manual transmission. <<308-03>>

All vehicles

5 . Install the right-hand halfshaft.
For additional information, refer to

Published: Oct 30, 2003

Specifications

Lubricants, Fluids, Sealers and Adhesives

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

Fill Capacities

Description	Grams
Grease for inner CV joint boot	90
Grease for inner CV joint	90
Grease for outer CV joint boot	90
Grease for outer CV joint	90

Torque Specifications

Description	Nm	Lb-Ft	Lb-In
Upper arm to wheel knuckle retaining bolt	120	89	-
Rear lower arm to wheel knuckle retaining nut	120	89	-
Front lower arm to wheel knuckle retaining bolt	120	89	-

Published: Nov 15, 2001

Outer Constant Velocity (CV) Joint Boot (47.10.19)

Removal

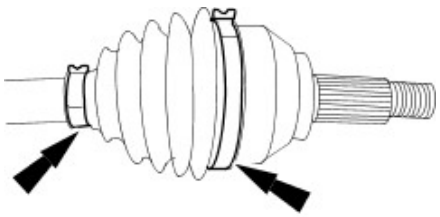
1 . Remove the front halfshaft. For additional information, refer to
For additional information, refer to . For additional information, refer to
For additional information, refer to .

2 . **CAUTION: Use suitable protective covers to protect the barshaft.**

Using a suitable clamp, secure the front halfshaft

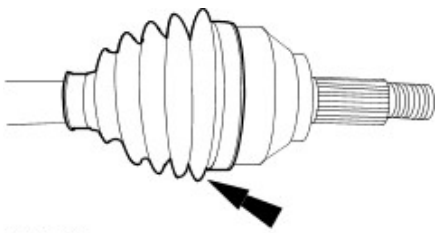
3 . Remove the outer constant velocity (CV) joint retaining clips.

- Remove and discard the retaining clips.


VUJ0003163

4 . Detach the outer CV joint boot.

- Remove and discard the grease.


VUJ0003164

5 . **CAUTION: Do not damage the bearing retainer.**

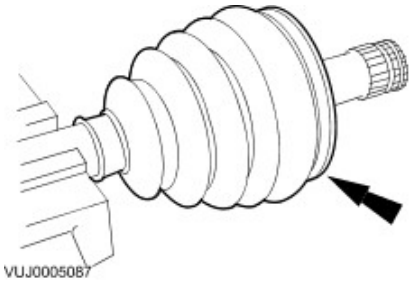
NOTE:

The outer CV joint is retained to the shaft by a spring clip.

Using a suitable brass drift, remove the outer CV joint.

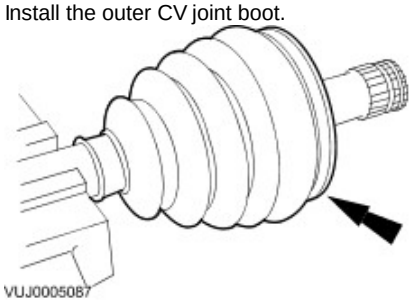

VUJ0004050

6 . Remove the outer CV joint boot.



Installation

1 . Install the outer CV joint boot.

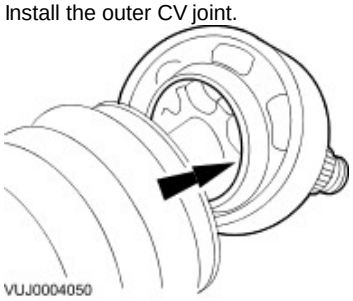


2 . **CAUTION: Do not damage the bearing retainer.**

NOTE:

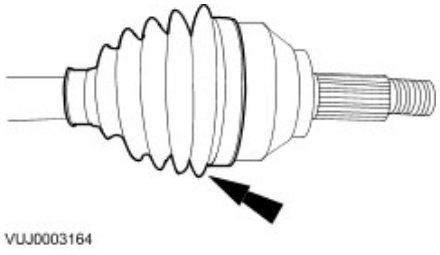
The outer CV joint is retained to the shaft by a spring clip.

Install the outer CV joint.



3 . Attach the outer CV joint boot.

Install new grease.



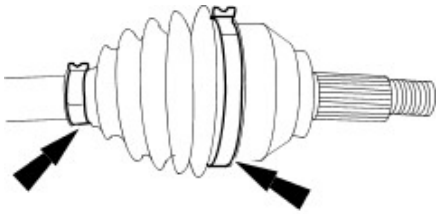
4 . **NOTE:**

Make sure enough air is present in the CV boot.

NOTE:

Install new retaining clips.

Using a suitable tool, install the CV joint retaining clips.



VUJ0003163

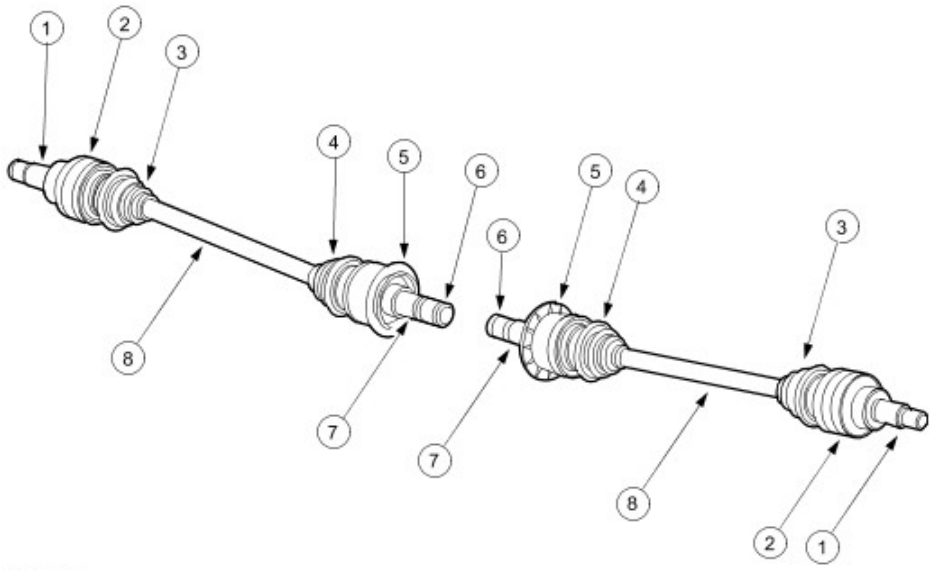
5 . Remove the front halfshaft from the clamp.

6 . Install the front halfshaft. For additional information, refer to
For additional information, refer to . For additional information, refer to
For additional information, refer to .

Published: Mar 29, 2001

Rear Drive Halfshafts

Rear Drive Halfshafts



VUJ0003011

Item	Part Number	Description
1	—	Outer constant velocity (CV) joint
2	—	Anti-lock brake system (ABS) ring
3	—	Outer CV joint boot
4	—	Inner CV joint boot
5	—	Seal protector
6	—	Spring clip
7	—	Inner CV joint
8	—	Barshaft

The rear drive halfshafts are of unequal lengths and both the inner CV joint and outer CV joints are of the plunger type.

The outer CV joints are fitted with an ABS ring which is continuously monitored by the wheel speed sensor.

The inner and outer CV joints are linked by a solid barshaft. The inner CV joints are retained in the differential with the aid of a spring clip.

The inner CV joints are fitted with plastic seal protectors to protect the halfshaft oil seals located in the differential from debris.

Due to the unique construction of the rear drive halfshafts they are not a serviceable item. If a problem occurs the halfshaft must be replaced as a complete unit.

Handling Rear Drive Halfshafts

The following points should be observed when handling rear drive halfshafts:

- Do not pull on the CV joints
- Do not allow the CV joints to exceed 18 degrees of travel
- Check polished surfaces and splines for damage
- Do not allow the CV joint boots to come into contact with sharp edges, hot vehicle components or the exhaust system
- Do not drop the rear drive halfshafts, this may cause damage to the splined sections of the CV joints, the threaded sections of the CV joints or the interior of the boots which may not be visible
- Do not support the rear drive halfshaft by holding the CV joint alone

Underbody Protection and Corrosion Prevention

The CV joint boots should be covered during application of underbody protection or corrosion prevention. Foreign matter on the CV boots may cause premature ageing of the material. Foreign material on the rear drive halfshafts may cause imbalance.

Published: Mar 29, 2001

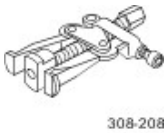
Rear Drive Halfshafts

For additional information, refer to <<205-00>>.

Published: Oct 30, 2003

Rear Halfshaft (47.10.13)

Special Service Tools



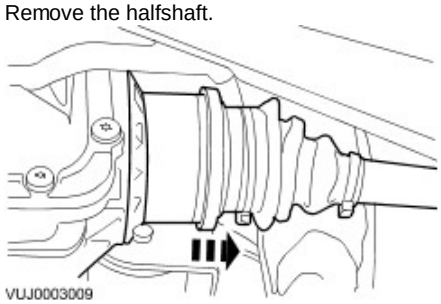
Remover, Axle Shaft Oil Seal
308-208

Installer, Oil Seal
204-264

Removal

1 . Remove the wheel knuckle.
For additional information, refer to Wheel Knuckle (64.15.22)

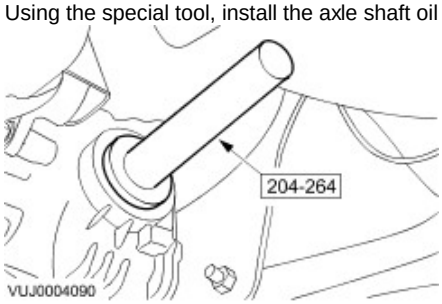
2 . Remove the halfshaft.



3 . Using the special tool, remove and discard the axle shaft oil seal.

Installation

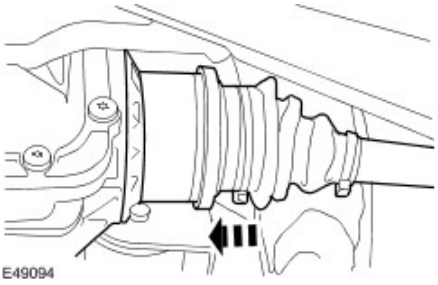
1 . Using the special tool, install the axle shaft oil seal.



2 . **NOTE:**

When installing the halfshaft make sure the spring clip is fully engaged in the differential.

Install the halfshaft.



3 . Install the wheel knuckle.
For additional information, refer to Wheel Knuckle (64.15.22)

Published: Oct 30, 2003

Outer Constant Velocity (CV) Joint Boot (47.10.32)

Removal

NOTE:

Outer Constant Velocity (CV) Joint Boot shown, inner Constant Velocity (CV) Joint Boot similar.

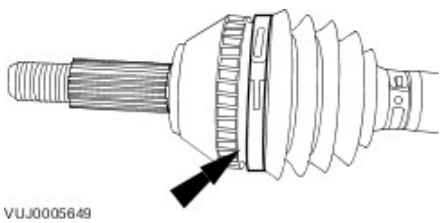
1 . Remove the halfshaft.
For additional information, refer to Rear Halfshaft (47.10.13)

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

Using a suitable clamp, secure the halfshaft.

3 . Remove the outer constant velocity (CV) joint boot retaining clip.

- Discard the retaining clip.

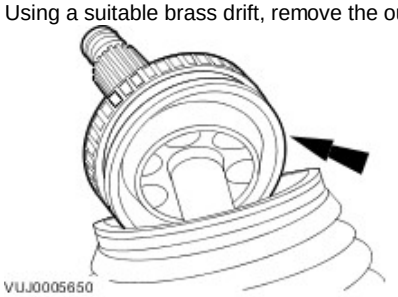


4 . **CAUTION: Do not damage the bearing retainer.**

NOTE:

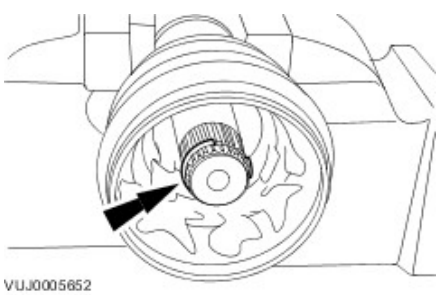
The outer CV joint is retained to the shaft by a spring clip.

Using a suitable brass drift, remove the outer CV joint.



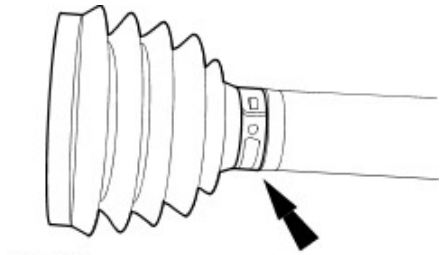
5 . Remove the retaining clip.

- Discard the retaining clip.



6 . Remove the outer CV joint boot.

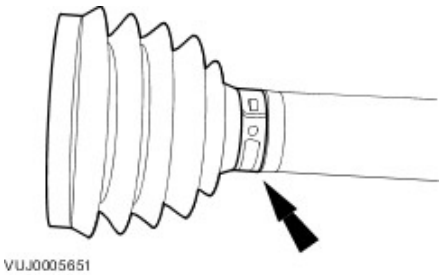
- Discard the retaining clip.



Installation

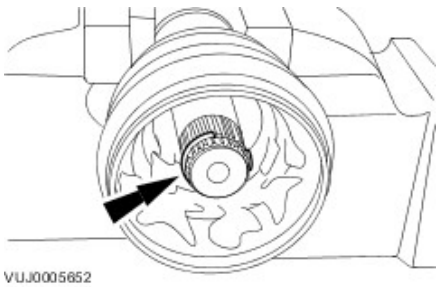
1 . Install the outer CV joint boot.

- Install a new retaining clip.
- Using a suitable tool, install the retaining clip.



2 . Install the new retaining clip.

- Install a new retaining clip.
- Using a suitable tool, install the retaining clip.



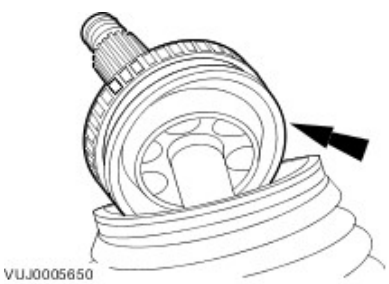
3 . **CAUTION: Make sure the CV joint ball bearings do not drop out of the CV joint.**

NOTE:

Use a CV grease meeting Jaguar specification.

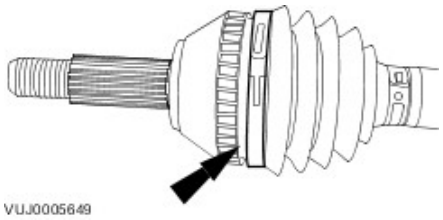
Install the outer CV joint.

- Fill the outer CV joint and outer CV gaitor with grease.



4 . Install the new retaining clip.

- Using a suitable tool, install the retaining clip.



5 . Remove the halfshaft from the clamp.

6 . Install the halfshaft.
For additional information, refer to Rear Halfshaft (47.10.13)

Published: Apr 24, 2006

Specifications

Lubricants, Fluids, Sealers and Adhesives

 **CAUTION: Do not use brake fluid ITT Super Dot 4 on 2006my vehicles onwards. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:

Brake fluid ITT Super Dot 4 has now been superseded by Shell ESL Super Dot 4 which is the Jaguar recommended brake fluid. Shell ESL Super Dot 4 can be used on all model years.

Item	Specification
Brake fluid	ITT Super Dot 4
Brake fluid	Shell ESL Super Dot 4
Caliper slide pin grease	Klueber GLK1

Brake Lining and Disc Specifications

Item	Specification
Brake pad nominal thickness - front	10.4 mm (0.40 in)
Brake pad minimum thickness - front	2 mm (0.08 in)
Brake pad nominal thickness - rear	11.80 mm (0.43 in)
Brake pad minimum thickness - rear	2 mm (0.08 in)
Brake disc diameter - front	300 mm (12 in)
Brake disc diameter - rear	280 mm (11.032 in)
New disc nominal thickness - front	24 mm (0.95 in)
New disc nominal thickness - rear	12 mm (0.47 in)
Worn disc discard thickness - front	22.2 mm (0.87 in)
Worn disc discard thickness - rear	10.2 mm (0.40 in)
Maximum disc runout (installed) - front	0.076 mm (0.003 in)
Maximum hub face runout (installed) - front	0.05 mm (0.002 in)
Maximum disc runout (installed) - rear	0.076 mm (0.003 in)
Maximum hub face runout (installed) - rear	0.05 mm (0.002 in)
Maximum thickness variation - new disc - front	0.009 mm (0.0004 in) in 360°
Maximum thickness variation - new disc - rear	0.009 mm (0.0004 in) in 360°
Caliper piston diameter -single piston - front	57 mm (2.24 in)
Caliper piston diameter - rear	38 mm (1.49 in)

Published: Dec 2, 2003

Brake Disc Runout Check

Check

1. Raise and support the vehicle.
Lifting

2. Remove the wheel and tire assembly.
Wheel and Tire (74.20.05)

3. Remove the front brake calipers. Or remove the rear brake calipers.
Brake Caliper (70.55.02)
Brake Caliper (70.55.03)

4. Install all wheel nuts and tighten equally to 20 Nm.
   - Make sure that the disc is fully seated against the hub face.

5. Install a dial test indicator gauge and holding fixture to a suitable mounting point.

6. **NOTE:**
   If the runout is outside specification, check the hub face runout.

Using the dial test indicator with a suitable adaptor, measure the inner and outer faces of the disc.

1. Position the gauge so that it contacts the disc 10 mm from the outer edge.
2. Slowly rotate the hub/disc assembly. Note the reading range.

7. If a front hub runout check is required, remove the front brake disc. If a rear hub runout check is required, remove the rear brake disc. For additional information, refer to
Brake Disc (70.10.10)
Brake Disc (70.10.11)

8. **NOTE:**
   The hub surface should be free from dirt and corrosion. Do not use abrasive cloths to clean hub faces.

Using the dial test indicator, measure the hub face runout.

1. Position the gauge so that it contacts the mounting tube between the stud and the chamfer.
2. Slowly rotate the hub and note the runout. For additional information, refer to the specification chart.
   - If the front hub runout exceeds the specifications, install a new hub, brake disc and recheck. If the rear hub runout exceeds the specifications, install a new hub, brake disc and recheck.
   Front Wheel Bearing and Wheel Hub (60.25.03)
   Wheel Hub (64.15.14)

9. If the front hub face is within specification, install a new disc. If the rear hub face is within specification, install a new disc.
Brake Disc (70.10.10)
Brake Disc (70.10.11)

10. Install the wheel and tire assembly.
Wheel and Tire (74.20.05)

VUJ0002696

Published: Mar 29, 2001

Brake System Bleeding (70.25.03)

WARNING: Brake Fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid contacts the eyes, flush the eyes for 15 minutes with cold running water. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately. Failure to follow these instructions can result in personal injury.

CAUTION: Make sure that the vehicle is standing on a level surface or supported on a wheel free lift.

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

NOTE:

The system consists of separate circuits for each front and diagonally opposite rear wheel.Each front to rear circuit and each wheel circuit can be bled individually of each other.

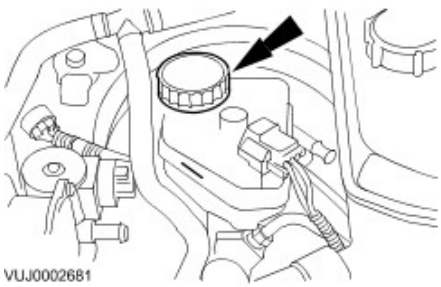
NOTE:

The service ABS hydraulic control unit is supplied pre-filled with brake fluid. Therefore, a conventional bleed procedure should be adequate to remove all the air from the brake system.

1.

CAUTION: Make sure that the filler cap does not become contaminated.

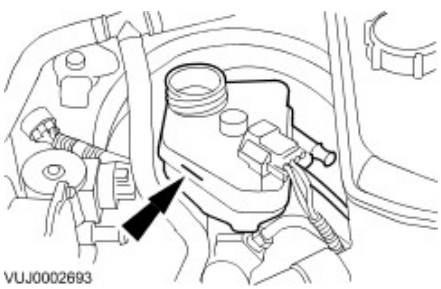
Remove the master cylinder reservoir filler cap.



2. **NOTE:**

Always use fluid from a sealed container and dispose of used fluid safely.

Fill up the master cylinder reservoir to the MAX mark as necessary.



3. Install a bleed tube to the rear right-hand brake caliper bleed nipple.

4. Bleed the circuit.

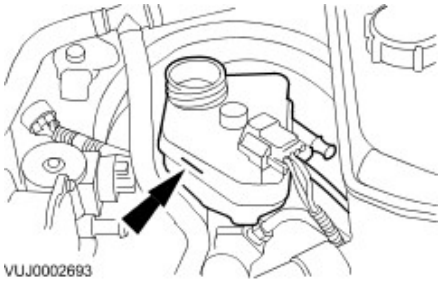
- Make sure the bleed tube is firmly attached to the bleed nipple.
- Submerge the end of the bleed tube in a bleed jar containing a small quantity of approved brake fluid.
- Position the bleed jar base at least 300 mm above the bleed nipple to maintain fluid pressure and prevent air leaking past the bleed

nipple threads.

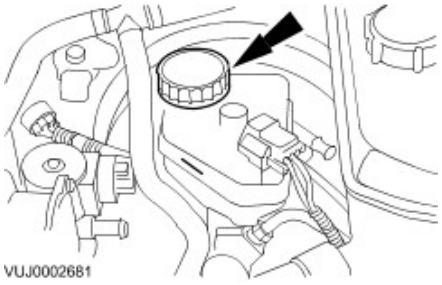
- Open the bleed nipple half a turn.
- Slowly apply the brake pedal to its maximum travel (this forces brake fluid into the bleed jar).
- Close the bleed nipple.
- Return the brake pedal to the rest position.
- Wait 2 seconds to allow the brake fluid to replenish the system.
- Fill up the master cylinder reservoir to the MAX mark as necessary.
- Continue to bleed the circuit until air-free brake fluid is pumped into the jar.
- Fully tighten the bleed nipple.

5. Repeat the procedure for the rear left, front right and front left-hand brake circuits.

6. Fill up the master cylinder reservoir to the MAX mark.



7. Install the master cylinder reservoir cap.



Published: Jul 10, 2003

Brake System

 **WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid contacts the eyes, flush the eyes for 15 minutes with cold running water. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately. Failure to follow these instructions may result in personal injury.**

The braking system is a diagonally split, dual circuit design featuring front and rear disc brakes.

The hydraulic system provides separate circuits for each pair of diagonally opposed wheels (left front, right rear and right front, left rear). The front calipers, mounted on the front knuckle, are single pistoned floating caliper design which make sure that equal effort is applied through both brake pads. The rear calipers are a single pistoned floating caliper design. The pads in all cases are asbestos free.

The parking brake control is located between the front seats and operates the rear brakes through a cable system. The cable has a manual adjust mechanism incorperated into the parking brake control.

The master cylinder is of a tandem design and is linked to a brake booster to reduce the brake pedal effort. On 2.0L variants a vacuum pump is fitted to ensure assistance in certain circumstances. The tandem design will make sure that in the event of one brake circuit failure the other will remain fully operational. The booster operating rod is connected directly to the brake pedal.

Published: May 1, 2007

Brake System

Principles of Operations

The brake system operates by transferring effort applied to the brake pedal, by the driver, to the brakes at each wheel.

The braking effort is distributed to each wheel, using a hydraulic system. The system is assisted using a vacuum brake booster that reduces pedal effort for a given hydraulic pressure. The parking brake operates on the rear wheels and is applied using a hand operated control.

Inspection and Verification

NOTE:

Prior to carrying out any diagnosis, make sure that the brake system warning indicator is functional.

Visually examine the front and rear tire and wheel assemblies for damage such as uneven wear patterns, tread worn out or sidewall damage.Verify the tires are the same size, type and, where possible, same manufacture.Replace the damaged wheel or excessively worn tire. For additional information, refer to
Wheel and Tire (74.20.05) .

Wheels and tires must be cleared of any foreign matter and tire pressures adjusted to the correct specification.

If the tires exhibit uneven wear or feathering, the cause must be corrected. Check the steering and suspension components for damage or wear, if necessary check and adjust the front wheel alignment. For additional information, refer to
Front Toe Adjustment (57.65.01) .

Road Test

Visual Inspection Chart

Mechanical	Electrical
Brake master cylinder	Parking brake switch
Brake caliper piston(s)	Damaged or corroded wiring harness
Brake discs	Brake master cylinder fluid level switch
Wheel bearings	Vacuum pump controller
Brake pads	Pedal box switches
Power brake booster	
Brake pedal linkage	
Booster vacuum hose	
Tires	
Debris	
Modulator	
Vacuum pump	

Carry out a road test to compare actual vehicle braking performance with the performance standards expected by the driver. The ability of the test driver to make valid comparisons and detect performance deficiencies will depend on experience.

The driver should have a thorough knowledge of brake system operation and accepted general performance guidelines to make good comparisons and detect performance concerns.

An experienced brake technician will always establish a route that will be used for all brake diagnosis road tests. The roads selected will be reasonably smooth and level. Gravel or bumpy roads are not suitable because the surface does not allow the tires to grip the road equally. Crowned roads should be avoided because of the large amount of weight shifted to the low set of wheels on this type of road. Once the route is established and consistently used, the road surface variable can be eliminated from the test results.

Before a road test, obtain a complete description of the customer concerns or suspected condition. From the description, the technician's experience will allow the technician to match poss ble causes with symptoms. Certain components will be tagged as possible suspects while others will be eliminated by the evidence. More importantly, the customer description can reveal unsafe conditions which should be checked or corrected before the road test. The description will also help form the basic approach to the road test by narrowing the concern to specific components, vehicle speed or conditions.

Begin the road test with a general brake performance check. Keeping the description of the concern in mind, test the brakes at different vehicle speeds using both light and heavy pedal pressure. To determine if the concern is in the front or rear braking system, use the brake pedal and then use the parking brake control. If the condition (pull, vibration, pulsation) occurs only with the parking brake, the concern is in the rear brake system.

If the concern becomes evident during this check, verify it fits the description given before the road test. If the concern is not evident, attempt to duplicate the condition using the information from the description.

If a concern exists, use the Symptom Chart in order to isolate it to a specific sub-system and condition description. From this description, a list of possible sources can be used to further narrow the cause to a specific component or condition.

Brakes noisy

Possible Source(s):

- Brake pads.
- Brake discs.

Action(s) to take:

- GO to Pinpoint Test A.

Vibration when brakes are applied

Possible Source(s):

- Wheels require balancing.
- Wheel hub nuts.
- Caliper mounting bolts.
- Brake pads.
- Foreign material/scratches/corrosion on brake disc contact surfaces.
- Excessive brake disc thickness variation.
- Excessive brake disc runout.
- Wheel bearing wear or failure.
- Suspension bush wear or failure.
- Steering bush wear or failure.

Action(s) to take:

- Go to Pinpoint Test B.

The brakes pull or drift

Possible Source(s):

- Tire pressures/wear.
- Calipers.
- Brake pads.
- Brake discs.
- Wheel alignment adjustment.
- Wheel bearing.
- Suspension bushes and ball joints.

Action(s) to take:

- GO to Pinpoint Test C.

The pedal feels spongy

Possible Source(s):

- Air in brake system.
- Leak in hydraulic system.
- Brake booster/master cylinder.
- Brake pads.

Action(s) to take:

- GO to Pinpoint Test D.

The pedal goes down fast

Possible Source(s):

- Air in brake system.
- Leak in hydraulic system.
- Brake booster/master cylinder.
- Brake pads.

Action(s) to take:

- GO to Pinpoint Test E.

The pedal goes down slowly

Possible Source(s):

- Air in brake system.
- Brake booster/master cylinder.

Action(s) to take:

- Go to Pinpoint Test F.

Excessive brake pedal effort

Possible Source(s):

- Brake pads.
- Brake booster.
- Vacuum pump.

Action(s) to take:

- GO to Pinpoint Test G.

Brake lockup during light brake pedal force

Possible Source(s):

- Brake pads.
- Calipers.

Action(s) to take:

- GO to Pinpoint Test H.

Brakes drag

Possible Source(s):

- Parking brake control applied/malfunction.
- Seized parking brake cables.
- Seized caliper slide pins.
- Seized caliper.
- Brake booster.
- Pedal gear.

Action(s) to take:

- GO to Pinpoint Test I.

Excessive/Erratic brake pedal travel

Possible Source(s):

- Hydraulic system.
- Brake pads.
- Brake discs.
- Hub and bearing assembly.

Action(s) to take:

- GO to Pinpoint Test J.

The red brake warning indicator is always on

Possible Source(s):

- Fluid level.

Action(s) to take:

- FILL the system to specification. CHECK for leaks.

Possible Source(s):

- Brake fluid level sensor.

Action(s) to take:

- INSTALL a new brake master cylinder fluid reservoir. For additional information, refer to Brake Master Cylinder (70.30.08) .

Possible Source(s):

- Parking brake control.

Action(s) to take:

- RELEASE and ADJUST the parking brake. For additional information, refer to Parking Brake Cable Adjustment - Vehicles With: Manually Adjusted Parking Brake, VIN Range: D55322->E24053 (70.35.10) .

Possible Source(s):

- Electrical circuit.

Action(s) to take:

- For additional information, refer to the approved Jaguar diagnostic system for analysis/rectification of the concern.

Slow or incomplete brake pedal return

Possible Source(s):

- Brake pedal binding.
- Brake booster/master cylinder.

Action(s) to take:

- GO to Pinpoint Test K.

PINPOINT TEST G92276p1 : BRAKES NOISY

G92276t1 : INSPECT BRAKE PADS

1. Inspect the condition of the front and rear brake pads. Check for damage to any anti-squeal shims.

- **Are the brake pads OK?**

-> Yes
GO to Pinpoint Test G92276t2.

-> No
CLEAN the front brake pads or INSTALL new front brake pads if necessary. For additional information, refer to Brake Pads (70.40.02) . CLEAN the rear brake pads or INSTALL new rear brake pads if necessary. For additional information, refer to Brake Pads (70.40.03) .Test vehicle for presence of brake squeal.

G92276t2 : INSPECT BRAKE DISCS

1. Inspect the brake discs for excessive corrosion, wear or disc thickness variation.

- **Does excessive corrosion, wear or disc thickness variation exist?**

-> Yes
INSTALL new front brake discs and brake pads. For additional information, refer to Brake Disc (70.10.10) . INSTALL new rear brake discs and brake pads. For additional information, refer to Brake Disc (70.10.11) . TEST the system for normal operation.

-> No
Vehicle is OK.

PINPOINT TEST G92276p2 : VIBRATION WHEN BRAKES ARE APPLIED

G92276t3 : ROAD TEST VEHICLE

1. Road test the vehicle between 40-80 km/h (25-50 mph) without applying brakes.

- **Is the vibration present?**

-> Yes
TEST for noise vibration and harshness. For additional information, refer to Noise, Vibration and Harshness (NVH) . REPEAT road test if necessary.

-> No
GO to Pinpoint Test G92276t4.

G92276t4 : CHECK FOR 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 caliper mounting bolts and wheel hub nuts and TIGHTEN as necessary. CHECK the balance of all road wheels and REPAIR as necessary. CHECK the brake discs for excessive wear, runout, thickness variation or cracks. For additional information refer to Front Disc Brake INSTALL new brake discs and brake pads as necessary. GO to Pinpoint Test G92276t5.

-> No
Vehicle is OK.

G92276t5 : IS VIBRATION STILL PRESENT UNDER BRAKE APPLICATION?

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 for wear or failure of steering bushes. For additional information, refer to Power Steering . CHECK for wear or failure of steering ball joints. For additional information, refer to Steering Linkage . CHECK for wear or failure of front wheel bearings, suspension bushes and ball joints. For additional information, refer to Front Suspension . CHECK for wear or failure of rear wheel bearings, suspension bushes and ball joints. For additional information, refer to Rear Suspension .

-> No
Vehicle is OK.

PINPOINT TEST G92276p3 : THE BRAKES PULL OR DRIFT

G92276t6 : ROAD TEST VEHICLE

1. Road test the vehicle and apply the brake pedal.

- **Does the vehicle pull or drift?**

-> Yes
GO to Pinpoint Test G92276t7.

-> No
Vehicle is OK.

G92276t7 : INSPECT TIRE PRESSURE

1. Check for excessive tire wear or incorrect pressures.

- **Are the tires at the correct pressure and in good condition?**

-> Yes
GO to Pinpoint Test G92276t8.

-> No
ADJUST the tire pressures or INSTALL new tires if excessively worn. TEST the system for normal operation.

G92276t8 : CHECK CALIPERS

1. Check the front caliper pistons for binding, leaking or sticking. For additional information, refer to Front Disc Brake . Check the rear caliper pistons for binding, leaking or sticking. For additional information, refer to Rear Disc Brake .

- **Do the disc brake caliper pistons and pins bind, leak or stick?**

-> Yes
INSTALL new calipers as necessary. TEST the system for normal operation.

-> No
GO to Pinpoint Test G92276t9.

G92276t9 : INSPECT BRAKE DISCS

1. Check the brake discs for excessive damage, thickness variation or runout. For additional information, refer to Front Disc Brake .

- **Does excessive damage or runout exist?**

-> Yes
INSTALL new brake discs and brake pads as necessary.TEST the system for normal operation.

-> No
GO to Pinpoint Test G92276t10.

G92276t10 : INSPECT THE FRONT HUB AND WHEEL BEARING ASSEMBLY

1. Check the front hub and wheel bearing assembly. For additional information, refer to
Wheel Bearing Inspection .

- **Are the wheel bearings OK?**

-> Yes
GO to Pinpoint Test G92276t11.

-> No
INSTALL new wheel bearings. For additional information, refer to
Front Wheel Bearing and Wheel Hub (60.25.03) .TEST the system for normal operation.

G92276t11 : CHECK SUSPENSION BUSHES AND BALL JOINTS.

1. Check all suspension bushes and ball joints.

- **Are the suspension bushes and ball joints OK?**

-> Yes
GO to Pinpoint Test G92276t12.

-> No
INSTALL new front suspension bushes and ball joints as required. For additional information, refer to
Front Stabilizer Bar Bushing (60.10.04) . INSTALL new rear suspension bushes and ball joints as required. For additional information, refer to
Rear Lower Arm (64.35.52) .

G92276t12 : CHECK VEHICLE ALIGNMENT

1. Check the vehicle alignment. For additional information, refer to
Underbody Misalignment Check (57.65.20) .

- **Is the alignment within specification?**

-> Yes
Vehicle is OK.

-> No
Adjust the alignment as necessary. For additional information, refer to
Underbody Misalignment Check (57.65.20) .

PINPOINT TEST G92276p4 : THE PEDAL FEELS SPONGY

G92276t13 : CHECK FOR SPONGY PEDAL (IGNITION OFF)

1. Check for a firm brake pedal.

- **Is the brake pedal effort and brake pedal travel normal?**

-> Yes
Vehicle is OK.

-> No
GO to Pinpoint Test G92276t14.

G92276t14 : CHECK BRAKE PEDAL RESERVE (IGNITION OFF)

1. Pump the brake pedal 10 times and hold on the final application.

- **Does the brake pedal feel firm on final application?**

-> Yes
GO to Pinpoint Test G92276t15.

-> No
BLEED the brake system. For additional information, refer to
Brake System Bleeding (70.25.03) .TEST the system for normal operation.

G92276t15 : CHECK BRAKE PEDAL RESERVE (ENGINE ON)

1. Engine is idle. 2. Apply the brake pedal lightly three or four times. 3. Wait 15 seconds for the vacuum to recover. 4. Push down on the brake pedal until it stops moving downward or an increased resistance to the brake pedal travel occurs. 5. Hold the brake pedal in the applied position while increasing the engine speed to 2000 revs/min. 6. Release the accelerator pedal.

- **Does the brake pedal move downward as the engine speed returns to idle?**

-> Yes
GO to Pinpoint Test G92276t16.

-> No
CHECK the vacuum to brake booster. For additional information, refer to
Brake Booster - RHD (70.50.17) .

G92276t16 : CHECK BRAKE FLUID LEVEL

1. Check the brake master cylinder reservoir fluid level.

- **Is the fluid level OK?**

-> Yes
BLEED the brake system. For additional information, refer to
Brake System Bleeding (70.25.03) .TEST the system for normal operation.

-> No
CHECK the brake master cylinder reservoir sealing points. For additional information, refer to Brake Master Cylinder Component Test in this section. ADD fluid and BLEED the brake system. For additional information, refer to
Brake System Bleeding (70.25.03) .TEST the system for normal operation. REPEAT road test if necessary.

PINPOINT TEST G92276p5 : THE PEDAL GOES DOWN FAST

G92276t17 : ROAD TEST VEHICLE

1. Road test and apply the brake pedal.

- **Is the brake pedal effort and brake pedal travel normal?**

-> Yes
Vehicle is OK.

-> No
GO to Pinpoint Test G92276t18.

G92276t18 : CHECK BRAKE FLUID LEVEL

1. Check the brake master cylinder reservoir fluid level.

- **Is the fluid level within specification?**

-> Yes
GO to Pinpoint Test G92276t19.

-> No
CHECK the brake master cylinder reservoir sealing points. For additional information, refer to Brake Master Cylinder Component Test in this section. ADD fluid and BLEED the brake system. For additional information, refer to
Brake System Bleeding (70.25.03) .TEST the system for normal operation. REPEAT road test if necessary.

G92276t19 : CHECK BRAKE PEDAL TRAVEL-PRESSURIZE SYSTEM (IGNITION OFF)

1. Pump the brake pedal rapidly (five times).

- **Does the brake pedal travel build up and then hold?**

-> Yes

BLEED the brake system. Refer to
Brake System Bleeding (70.25.03) . TEST the system for normal operation. REPEAT road test. For additional information, refer to
Hydraulic Brake Actuation .

-> No
GO to Pinpoint Test G92276t20.

G92276t20 : CHECK FOR BRAKE SYSTEM LEAKS

1. Check for external brake system leaks. For additional information, refer to Master Cylinder in this section.

- **Are leaks found?**

-> Yes
REPAIR as necessary, ADD fluid and BLEED brake system. For additional information, refer to
Brake System Bleeding (70.25.03) .TEST the system for normal operation. REPEAT road test.

-> No
System is OK.

PINPOINT TEST G92276p6 : THE PEDAL GOES DOWN SLOWLY

G92276t21 : ROAD TEST VEHICLE - CHECK BRAKE PEDAL OPERATION

1. Check if the condition occurs during actual stopping application by applying the brake pedal while the vehicle is moving.

- **Does the condition occur when the vehicle is moving?**

-> Yes
GO to Pinpoint Test G92276t22.

-> No
GO to Pinpoint Test G92276t23.

G92276t22 : CHECK FOR BRAKE SYSTEM LEAKS

1. Check for external brake system leaks. For additional information, refer to Master Cylinder in this section.

- **Are there any external brake system leaks?**

-> Yes
REPAIR as necessary. ADD fluid and BLEED the brake system. For additional information, refer to
Brake System Bleeding (70.25.03) .TEST the system for normal operation.

-> No
GO to Pinpoint Test G92276t23.

G92276t23 : CARRY OUT A BRAKE MASTER CYLINDER BYPASS TEST

1. Test for brake master cylinder bypass condition. Refer to Brake Master Cylinder Component Test in this section.

- **Are any concerns found?**

-> Yes
INSTALL a new brake master cylinder, ADD fluid and BLEED the brake system. For additional information, refer to
Brake System Bleeding (70.25.03) .TEST the system for normal operation.

-> No
System is OK.

PINPOINT TEST G92276p7 : EXCESSIVE BRAKE PEDAL EFFORT

G92276t24 : CHECK BRAKE PADS

1. Check the brake pads for wear, contamination, correct installation, damage and type.

- **Are any concerns found?**

-> Yes

INSTALL the front brake pads correctly or INSTALL new front brake pads if necessary. For additional information, refer to Brake Pads (70.40.02) .INSTALL the rear brake pads correctly or INSTALL new rear brake pads if necessary. For additional information, refer to Brake Pads (70.40.03) .REPEAT road test.

-> No
GO to Pinpoint Test G92276t25.

G92276t25 : CHECK VACUUM

1. Disconnect the vacuum booster hose from the booster. 2. Connect a vacuum/pressure tester to the vacuum hose. 3. Run the engine at normal operating temperature. 4. Record the vacuum reading.

- **Is the reading 40.5kPa (12 in-Hg) or greater?**

-> Yes
GO to Pinpoint Test G92276t26.

-> No
LOCATE and REPAIR the source of low vacuum. TEST the system for normal operation.

G92276t26 : INSPECT SYSTEM

1. Switch the engine off. 2. Reconnect the vacuum hose. 3. Inspect the brake booster, rubber grommet and all vacuum plumbing for cracks, holes, damaged connections or missing clamps. 4. Pump the brake pedal several times to release the vacuum. Push down on the brake pedal and hold.

- **Does the brake pedal move down when the engine is started?**

-> Yes
Vacuum system is OK.

-> No
GO to Pinpoint Test G92276t27.

G92276t27 : CHECK POWER BRAKE BOOSTER VALVE

1. Check the brake booster and vacuum pump valves. For additional information, refer to Brake Booster in this section.

- **Is the power brake booster and vacuum pump valve OK?**

-> Yes
CHECK the brake booster. For additional information, refer to Brake Booster in this section. INSTALL a new brake booster if necessary. TEST the system for normal operation.

-> No
INSTALL a new brake booster valve and vacuum pump valve. TEST the system for normal operation.

PINPOINT TEST G92276p8 : BRAKE LOCKUP DURING LIGHT BRAKE PEDAL FORCE

G92276t28 : TEST BRAKE LOCKUP

1. Road test the vehicle and apply the brake pedal lightly.

- **Do the brakes lockup?**

-> Yes
GO to Pinpoint Test G92276t29.

-> No
Vehicle is OK.

G92276t29 : INSPECT BRAKE PADS

1. Inspect brake pads for contamination, correct installation, damage and type.

- **Are any concerns found?**

-> Yes
CHECK the front brake pads. For additional information, refer to
Front Disc Brake .CHECK the rear brake pads. For additional information, refer to
Rear Disc Brake .INSTALL new brake pads as necessary.REPEAT road test.

-> No
GO to Pinpoint Test G92276t30.

G92276t30 : INSPECT BRAKE CALIPERS

1. Inspect brake calipers for binding, leaking or sticking.

- **Are any concerns found?**

-> Yes
CHECK the front brake calipers. For additional information, refer to
Front Disc Brake .CHECK the rear brake calipers. For additional information, refer to
Rear Disc Brake .INSTALL the brake calipers correctly or INSTALL new brake calipers as necessary. TEST the system for normal operation. REPEAT road test if necessary.

-> No
Vehicle is OK.

PINPOINT TEST G92276p9 : BRAKES DRAG

G92276t31 : ROAD TEST VEHICLE

1. Road test the vehicle and apply the brakes.

- **Are the brakes functioning correctly?**

-> Yes
Vehicle is OK.

-> No
GO to Pinpoint Test G92276t32.

G92276t32 : CHECK CALIPERS

1. Check the front caliper pistons for binding, leaking or sticking. For additional information, refer to
Front Disc Brake . Check the rear caliper pistons for binding, leaking or sticking. For additional information, refer to
Rear Disc Brake .

- **Do the disc brake caliper pistons and pins bind, leak or stick?**

-> Yes
INSPECT the brake calipers and parking brake cables. INSTALL new components as necessary. Road test vehicle.

-> No
GO to Pinpoint Test G92276t33.

G92276t33 : CHECK BRAKE BOOSTER

1. Check the brake booster connecting rod alignment and travel. For additional information, refer to
Power Brake System .

- **Is the connecting rod OK?**

-> Yes
Vehicle is OK.

-> No
INSTALL a new brake booster. For additional information, refer to
Brake Booster - RHD (70.50.17) . TEST the system for normal operation.

PINPOINT TEST G92276p10 : EXCESSIVE/ERRATIC BRAKE PEDAL TRAVEL

G92276t34 : TEST ON ROUGH ROAD

1. Road test the vehicle on rough road conditions. 2. Apply the brakes slowly.

- **Is the brake pedal effort and brake pedal travel normal?**

-> Yes
Vehicle is OK.

-> No
GO to Pinpoint Test G92276t35.

G92276t35 : CHECK BRAKE FLUID LEVEL

1. Check the brake master cylinder reservoir fluid level.

- **Is the fluid level OK?**

-> Yes
GO to Pinpoint Test G92276t36.

-> No
CHECK brake master cylinder reservoir sealing points. For additional information, refer to Brake Master Cylinder in this section. ADD brake fluid and BLEED the brake system. For additional information, refer to
Brake System Bleeding (70.25.03) .TEST the system for normal operation. REPEAT road test if necessary.

G92276t36 : CHECK BRAKE PEDAL RESERVE

1. Engine is idle. 2. Apply the brake pedal lightly three or four times. 3. Wait 15 seconds for the vacuum to replenish. 4. Push down on the brake pedal until it stops moving downward or an increased resistance to the brake pedal travel occurs. 5. Hold the brake pedal in the applied position while increasing the engine speed to 2000 revs/min. 6. Release the accelerator pedal.

- **Does the brake pedal move downward as the engine speed returns to idle?**

-> Yes
GO to Pinpoint Test G92276t37.

-> No
CHECK the vacuum to the brake booster. For additional information, refer to
Power Brake System .

G92276t37 : CHECK THE FRONT HUB AND BEARING ASSEMBLY

1. Check the front hub and bearing assembly. For additional information, refer to
Front Suspension .

- **Are the front wheel bearings loose?**

-> Yes
INSTALL a new front wheel bearing if damaged. For additional information, refer to
Front Wheel Bearing and Wheel Hub (60.25.03) . TEST the system for normal operation.

-> No
CHECK the front brake discs for thickness variances. For additional information, refer to
Brake Disc Runout Check .

PINPOINT TEST G92276p11 : SLOW OR INCOMPLETE BRAKE PEDAL RETURN

G92276t38 : CHECK FOR BRAKE PEDAL RETURN

1. Run the engine at fast idle while making several brake applications. 2. Pull the brake pedal rearward with approximately 44 N force. 3. Release the brake pedal and measure the distance to the toe board. 4. Make a hard brake application. 5. Release the brake pedal and measure the brake pedal to toe board distance. The brake pedal should return to its original position.

- **Does the brake pedal return to its original position?**

-> Yes
Vehicle is OK.

-> No
GO to Pinpoint Test G92276t39.

G92276t39 : CHECK FOR BRAKE PEDAL BINDING

1. Check the brake pedal to make sure it is operating OK.

- **Is the brake pedal operating OK?**

-> Yes
INSTALL a new brake booster. For additional information, refer to
Brake Booster - RHD (70.50.17) .TEST the system for normal operation.

-> No
REPAIR or INSTALL new brake pedal. TEST the system for normal operation.

Component Tests

Brake Booster

1 . Check all hoses and connections. All unused vacuum connectors should be capped. Hoses and their connections should be correctly secured and in good condition with no holes and no collapsed areas. Inspect the valve on the brake booster for damage.

2 . Check the hydraulic brake system for leaks or low fluid.

3 . With the transmission in PARK (automatic transmissions) or in NEUTRAL (manual transmissions), stop the engine and apply the parking brake. Pump the brake pedal several times to exhaust all vacuum in the system.

4 . With the engine switched off and all vacuum in the system exhausted, apply the brake pedal and hold it down. Start the engine. If the vacuum system is operating, the brake pedal will tend to move downward under constant foot pressure. If no motion is felt, the vacuum booster system is not functioning.

5 . Remove the vacuum hose from the brake booster. Manifold vacuum should be available at the brake booster end of the hose with the engine at idle speed and the transmission in PARK or NEUTRAL. Make sure that all unused vacuum outlets are correctly capped, hose connectors are correctly secured and vacuum hoses are in good condition. When it is established that manifold vacuum is available to the brake booster, connect the vacuum hose to the brake booster and repeat Step 3. If no downward movement of the brake pedal is felt, install a new brake booster.

6 . Operate the engine for a minimum of 10 seconds at a fast idle. Stop the engine and allow the vehicle to stand for 10 minutes. Then, apply the brake pedal with approximately 89 N of force. The pedal feel (brake application) should be the same as that noted with the engine running. If the brake pedal feels hard (no power assist), install a new valve and then repeat the test. If the brake pedal still feels hard, install a new brake booster. If the brake pedal movement feels spongy, bleed the brake system. For additional information, refer to
Brake System Bleeding (70.25.03) in this section.

Brake Master Cylinder

Usually, the first and strongest indicator of anything wrong in the brake system is a feeling through the brake pedal. In diagnosing the condition of the brake master cylinder, check pedal feel as evidence of a brake concern. Check for brake warning lamp illumination and the brake fluid level in the brake master cylinder reservoir.

Normal Conditions

The following conditions are considered normal and are not indications that the brake master cylinder is in need of repair.

- New brake systems are designed to produce a pedal effort that is not as hard as in the past. Complaints of light pedal efforts should be compared to the pedal efforts of another vehicle of the same model and year.
- The fluid level will fall with brake pad wear.

Abnormal Conditions

NOTE:
Prior to carrying out any diagnosis, make sure the brake system warning indicator is functional.

Changes in the brake pedal feel or brake pedal travel are indicators that something could be wrong in the brake system. The diagnostic procedure and techniques use brake pedal feel, warning indicator illumination and low brake fluid level as indicators to diagnosing brake system concerns. The following conditions are considered abnormal and indicate that the brake master cylinder is in need of repair:

- Brake pedal goes down fast. This could be caused by an external or internal leak.
- Brake pedal goes down slowly. This could be caused by an internal or external leak.
- Brake pedal is low or feels spongy. This condition may be caused by no fluid in the brake master cylinder, reservoir cap vent holes clogged or air in the hydraulic system.

- Brake pedal effort is excessive. This may be caused by a bind or obstruction in the pedal/linkage, a faulty non return valve, booster or insufficient booster vacuum.
- Rear brakes lock up during light pedal force. This may be caused by damaged brake pads, an incorrectly adjusted parking brake, a partially applied parking brake, a damaged ABS sensor or bearing failure.
- Brake pedal effort erratic. This condition could be caused by the brake booster or incorrectly installed brake pads.
- Brake warning indicator is on. This may be caused by low fluid level or float assembly damaged.

Non Pressure Leaks

Any reduced fluid volume in the brake master cylinder reservoir condition may be caused by two types of pressure external leaks.

Type 1: An external leak may occur at the master cylinder reservoir cap because of incorrect positioning of gasket and cap. Reposition cap and gasket.

Type 2: An external leak may occur at the reservoir mounting seals. Repair such a leak by installing new seals and make sure that the reservoir retaining pin is correctly installed.

Type 3: An external leak may occur in the manual transmission clutch operating system. For additional information, refer to
Manual Transmission and Clutch

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Specifications

Lubricants, Fluids, Sealers and Adhesives

 **CAUTION: Do not use brake fluid ITT Super Dot 4 on 2006my vehicles onwards. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:

Brake fluid ITT Super Dot 4 has now been superseded by Shell ESL Super Dot 4 which is the Jaguar recommended brake fluid. Shell ESL Super Dot 4 can be used on all model years.

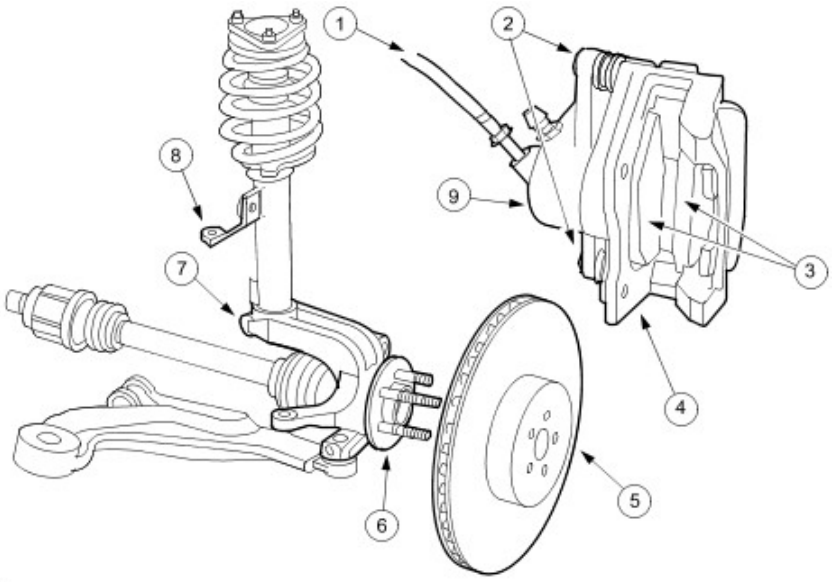
Item	Specification
Brake fluid	ITT Super Dot 4
Brake fluid	Shell ESL Super Dot 4
Brake caliper slide pin grease	Klueber GLK1

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake pipe union	15	11	-
Brake caliper anchor plate retaining bolts	133	98	-
Brake caliper retaining bolts	30	22	-
Brake hose retaining bracket	40	30	-
Brake hose to brake caliper	10	7	-

Published: Oct 25, 2001

Front Disc Brake



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Item	Part Number	Description
1	—	Brake hose
2	—	Brake caliper retaining bolts
3	—	Brake pads
4	—	Brake caliper anchor plate
5	—	Brake disc
6	—	Wheel hub
7	—	Wheel knuckle
8	—	Brake hose retaining bracket
9	—	Brake caliper

WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid contacts the eyes, flush the eyes for 15 minutes with cold running water. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately. Failure to follow these instructions can result in personal injury.

NOTE:

Brake system materials inherently generate heat in order to dissipate energy. As a result, occasional squeal is poss ble, which may be compounded by severe environmental conditions, such as cold, heat, rain, snow, salt and mud.

The front disc brake system consists of the following components:

- Brake pads.
- Single piston, floating brake calipers.
- Brake discs.
- Brake caliper anchor plates.
- Brake hoses.

The brake caliper has two retaining bolts that attach it to the brake caliper anchor plate. The brake caliper anchor plate is attached to the wheel knuckle with two retaining bolts. The hydraulic system provides separate circuits for each pair of diagonally opposed wheels (i.e. left front, right rear and right front, left rear).

The brake disc is manufactured from cast iron and is of the vented type. It is retained on the wheel hub studs by the wheel and wheel nuts.

The brake calipers are mounted on the wheel knuckles. These are of single, sliding piston type which ensures that equal effort is applied through both brake pads.

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Front Disc Brake

For additional information, refer to<<206-00>>.

Published: Mar 29, 2001

Brake Caliper (70.55.02)

Special Service Tools

Brake pedal hold-down tool
JDS 9013

Removal

1 . Remove the wheel and tire. For additional information, refer to<<204-04>>.

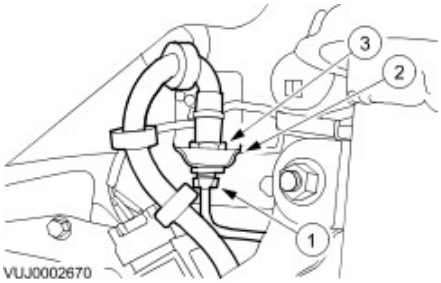
2 . **CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.**

NOTE:

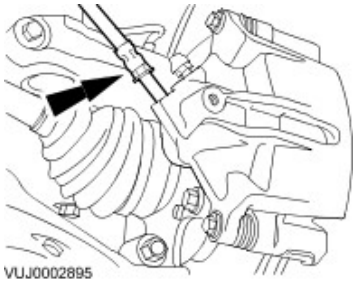
To prevent the loss of brake fluid, apply the brake pedal hold down tool and adjust to hold the brake pedal down 40mm. Install a bleeder bottle to the bleed nipple and loosen.

Detach the brake hose.

1) Detach the brake pipe.
2) Remove the retaining clip.
3) Detach the brake hose.



3 . Detach the brake hose.

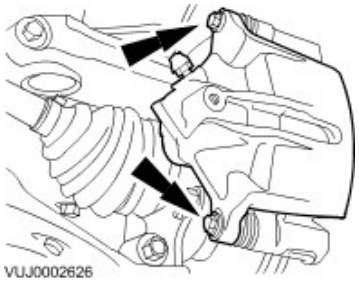


4 . **NOTE:**

Tighten the bleed nipple and remove the bleeder tube and bottle.

Remove the brake caliper.

- Remove and discard the brake caliper retaining bolts.



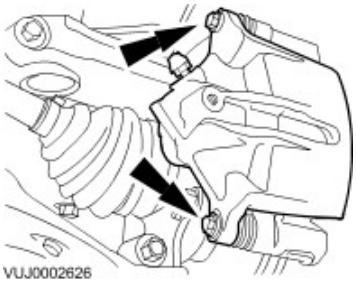
Installation

1. **CAUTION: If the pistons are pushed back into the housing, brake fluid will be forced out of the inlet port of the brake caliper.**

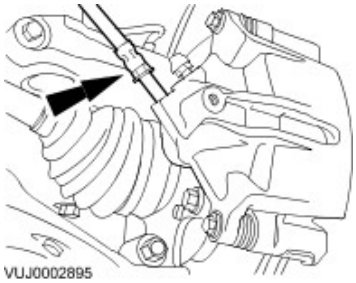
CAUTION: Make sure that the brake disc faces are clean before installation.

NOTE:
Install new brake caliper retaining bolts.

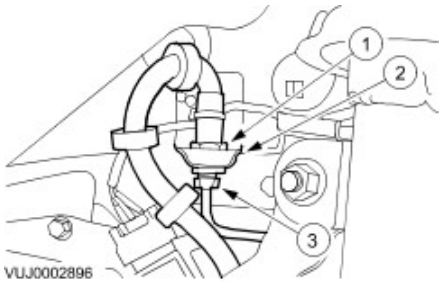
Install the brake caliper.
Tighten to 30 Nm.



2 . Attach the brake hose to the brake caliper.
Tighten to 10 Nm.



3 . Attach the brake hose.
1) Attach the brake hose.
2) Install the retaining clip.
3) Attach the brake pipe.



4 . Remove the brake pedal hold down tool.

5 . Bleed the brake system. For additional information, refer to<<206-00>>.

6 . Install the wheel and tire. For additional information, refer to <<204-04>>.

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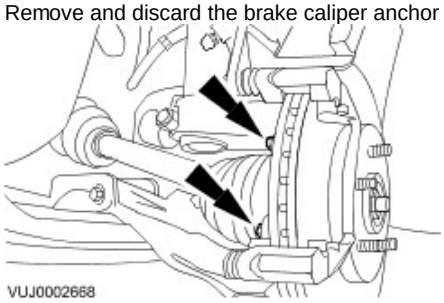
Brake Disc (70.10.10)

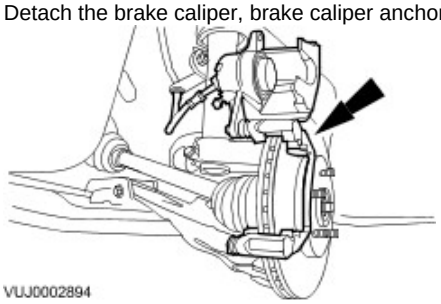
Removal

1 . Remove the brake pads, refer to the procedure in this section :
For additional information, refer to .

2 . Remove and discard the brake caliper anchor plate retaining bolts.



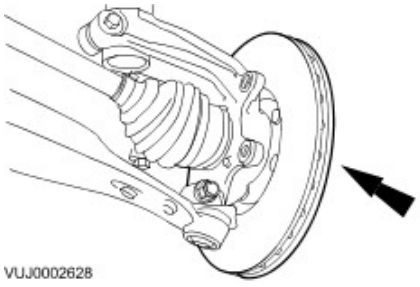
3 . Detach the brake caliper, brake caliper anchor plate assembly and secure to one side.



4 **NOTE:**

· If the brake disc is being refitted, the tip of a wheel hub stud must be marked with a corresponding part of the brake disc for correct re-alignment.

Remove the brake disc.



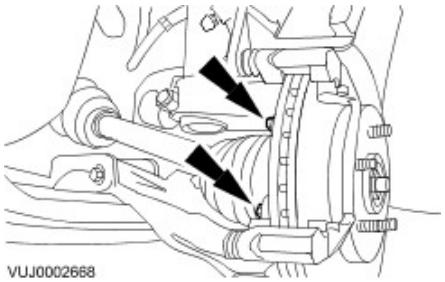
Installation

1 . **NOTE:**

Install new brake caliper anchor plate retaining bolts.

To install, reverse the removal procedure.

Tighten to 133 Nm.



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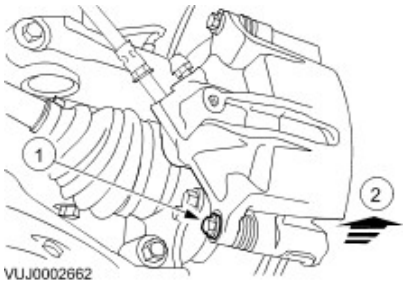
Brake Pads (70.40.02)

Removal

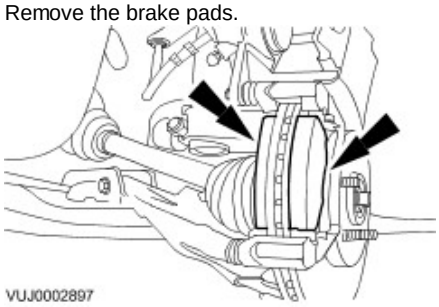
1 . Remove the wheel and tire. For additional information, refer to<<204-04>>.

2 . Pivot the brake caliper upwards.

1) Remove and discard the brake caliper lower retaining bolt.
2) Pivot the brake caliper upwards.



3 . Remove the brake pads.



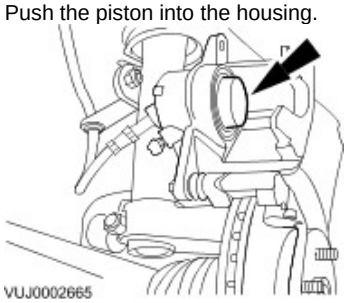
Installation

1 .

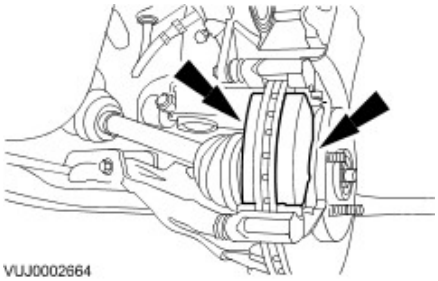
CAUTION: If the piston is pushed back into the housing, brake fluid will be forced into the fluid reservoir.

CAUTION: Make sure that the brake disc faces are clean before installation.

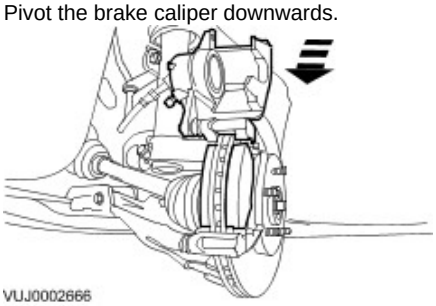
Push the piston into the housing.



2 . Install the brake pads.

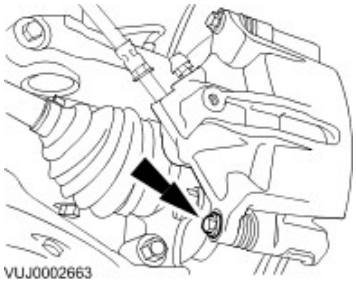


3 . Pivot the brake caliper downwards.



4 . Install a new brake caliper lower retaining bolt.

Tighten to 30 Nm.



5 . Install the wheel. For additional information, refer to<<204-04>>.

Published: Apr 24, 2006

Specifications

Lubricants, Fluids, sealers and Adhesives

 **CAUTION: Do not use brake fluid ITT Super Dot 4 on 2006my vehicles onwards. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:

Brake fluid ITT Super Dot 4 has now been superseded by Shell ESL Super Dot 4 which is the Jaguar recommended brake fluid. Shell ESL Super Dot 4 can be used on all model years.

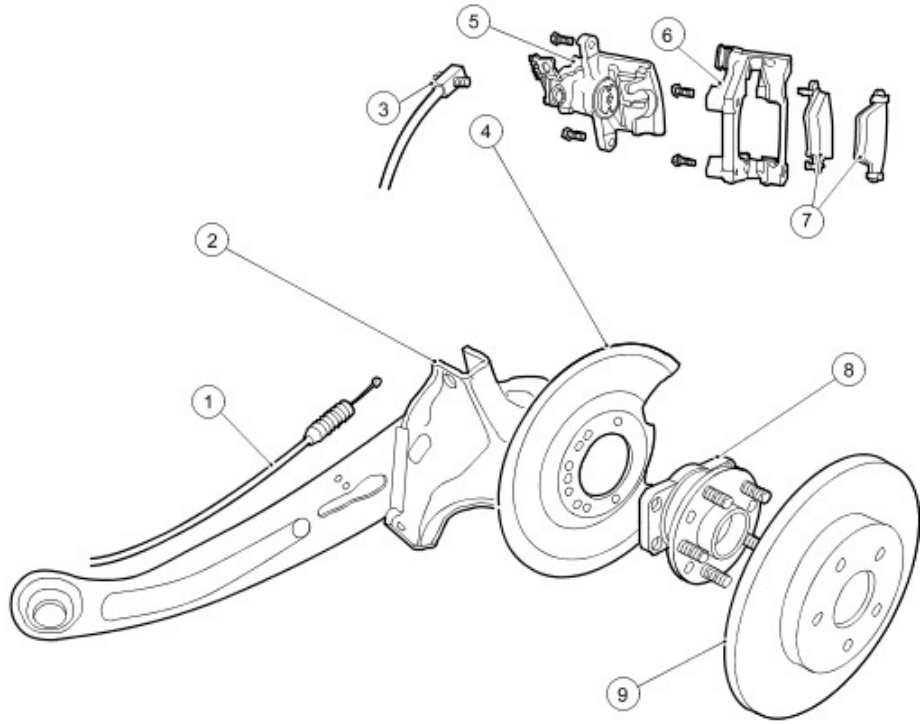
Item	Specification
Brake fluid	ITT Super Dot 4
Brake fluid	Shell ESL Super Dot 4
Caliper slide pin grease	Dow Corning G807

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake hose union	38	28	-
Brake caliper anchor plate retaining bolt	70	52	-
Brake caliper retaining bolt	32	24	-

Published: Nov 4, 2003

Rear Disc Brake



VUJ0003152

Item	Part Number	Description
1	—	Parking brake cable
2	—	Hub carrier
3	—	Brake hose
4	—	Brake disc shield
5	—	Brake caliper
6	—	Brake caliper anchor plate
7	—	Brake pads
8	—	Wheel hub
9	—	Brake disc

WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid contacts the eyes, flush the eyes for 15 minutes with cold running water. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately. Failure to follow these instructions may result in personal injury.

NOTE:

Brake system materials inherently generate heat in order to dissipate energy. As a result, occasional squeal is poss ble, which may be compounded by severe environmental conditions, such as cold, heat, rain, snow, salt and mud.

The rear disc brake system consists of the following components:

- Brake pads.
- Single piston, floating disc calipers.
- Brake discs.
- Brake caliper anchor plates.
- Brake hoses.
- Parking brake cables.

The caliper has two retaining bolts that attach the caliper to the anchor plate. The anchor plate is attached to the hub carrier with two bolts. The hydraulic system provides separate circuits for each pair of diagonally opposed wheels (i.e.left front, right rear and right front, left rear).

The brake disc is manufactured from cast iron and is of the solid type. It is retained on the hub by the wheel and the wheel studs.

The rear brake calipers are mounted on the hub carrier. These are of single, sliding piston type which ensures that equal effort is applied through both brake pads.

The rear brake caliper incorporates the parking brake which is self adjusting according to brake pad wear.

Published: Mar 2, 2001

Rear Disc Brake

For additional information, refer to<<206-00>>.

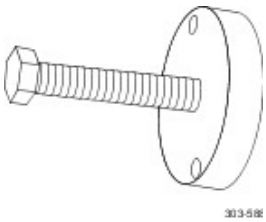
Published: Nov 4, 2003

Brake Caliper (70.55.03)

Special Service Tools

Brake pedal hold-down tool
JDS 9013

Brake caliper piston retractor tool
206-080



Crankshaft pulley/damper remover
303-588

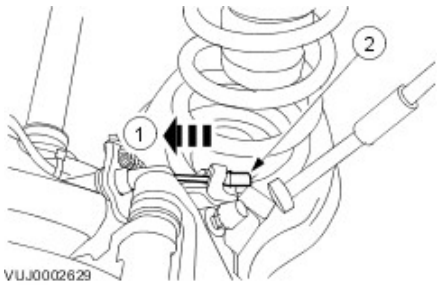
Removal

1 . Remove the wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

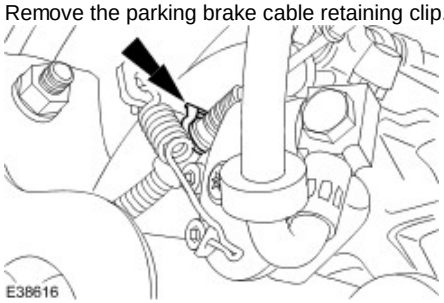
2 . Detach the parking brake cable.

1) Release the tension.

2) Detach the parking brake cable.



3 . Remove the parking brake cable retaining clip.



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

NOTE:

To prevent the loss of brake fluid, apply the brake pedal hold down tool and adjust to hold the brake pedal down 40mm. Install a bleeder bottle to the bleed nipple and loosen.

NOTE:

Remove and discard the brake hose sealing washers.

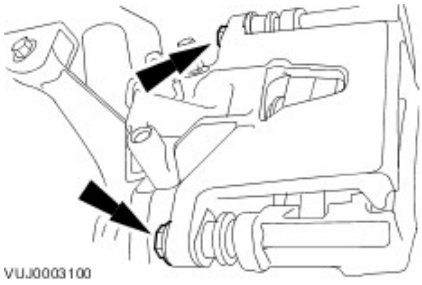
Detach the brake hose.

5. **NOTE:**

Tighten the bleed nipple and remove the bleeder tube and bottle.

Remove the brake caliper.

- Remove and discard the brake caliper retaining bolts.



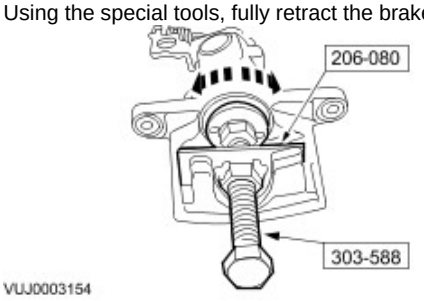
Installation

1. **CAUTION: If the piston is pushed back into the housing, brake fluid will be forced out of the inlet port of the brake caliper.**

NOTE:

The left-hand brake caliper piston retracts counter clockwise and the right-hand retracts clockwise.

Using the special tools, fully retract the brake caliper piston.



2
.
CAUTION: Make sure the piston location mark is in the correct position so that the locator pin on the brake pad backing plate locates correctly into the piston.

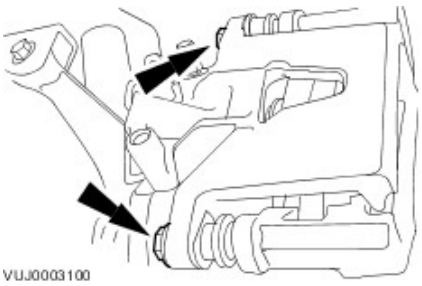
CAUTION: Make sure that the brake disc faces are clean before installation.

NOTE:

Install new brake caliper retaining bolts.

Install the brake caliper.

Tighten to 32 Nm.



3 . **NOTE:**

Install new brake hose sealing washers.

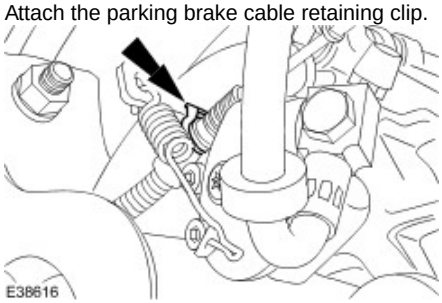
Attach the brake hose.

Tighten to 38 Nm.

4 . Remove the brake pedal hold down tool.

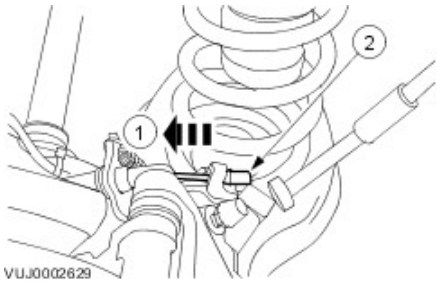
5 . Bleed the brake system.
For additional information, refer to Brake System Bleeding (70.25.03)

6 . Attach the parking brake cable retaining clip.



7 . Attach the parking brake cable.

1) Release the tension.
2) Attach the parking brake cable.



8 . Install the wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

Published: Dec 2, 2003

Brake Disc (70.10.11)

Removal

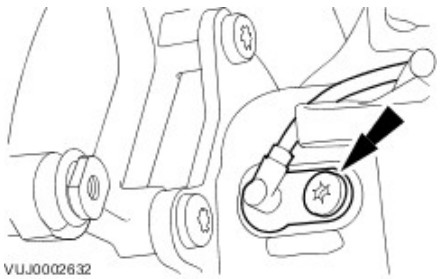
All vehicles

1 . Remove the brake pads.
For additional information, refer to Brake Pads (70.40.03)

Vehicles with 2.5L or 3.0L engine

2 . Detach the Anti-lock brake system (ABS) wheel speed sensor.

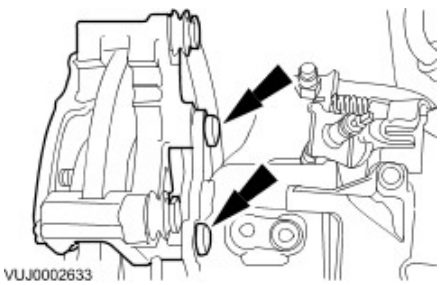
- Remove the ABS wheel speed sensor retaining bolt.



All vehicles

3 . Remove the brake caliper anchor plate.

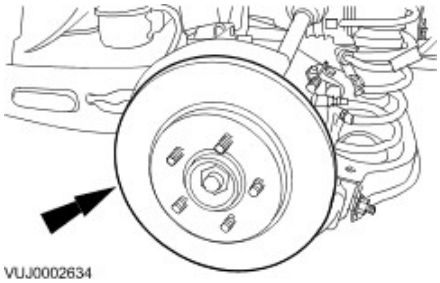
- Remove and discard the brake caliper anchor plate retaining bolts.



4 **NOTE:**

- If the brake disc is being refitted, the tip of a wheel hub stud must be marked with a corresponding part of the brake disc for correct re-alignment.

Remove the brake disc.



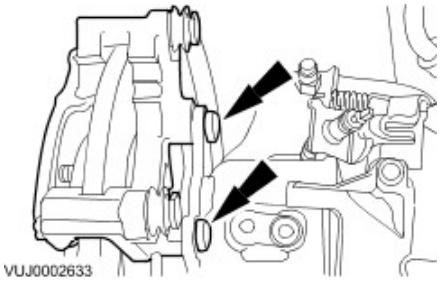
Installation

1 . **NOTE:**

Install new brake caliper anchor plate retaining bolts.

To install, reverse the removal procedure.

- Tighten to 70 Nm.



Published: Mar 29, 2001

Brake Disc Shield (70.10.19)

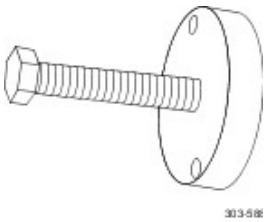
1 . Remove the rear wheel hub. For additional information, refer to <<204-02>>.

Published: Nov 4, 2003

Brake Pads (70.40.03)

Special Service Tools

Brake caliper piston retractor tool
206-080



Crankshaft pulley/damper remover
303-588

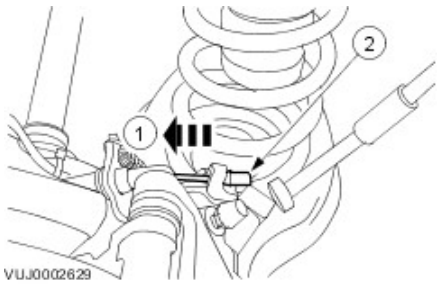
Removal

1 . Remove the wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

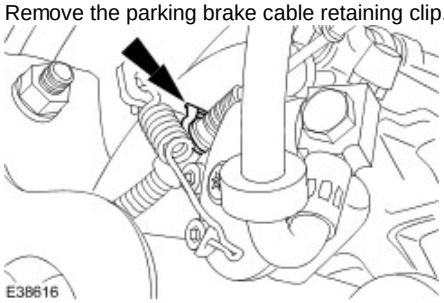
2 . Detach the parking brake cable.

1) Release the tension.

2) Detach the parking brake cable.

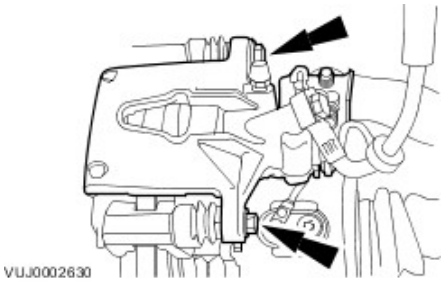


3 . Remove the parking brake cable retaining clip.

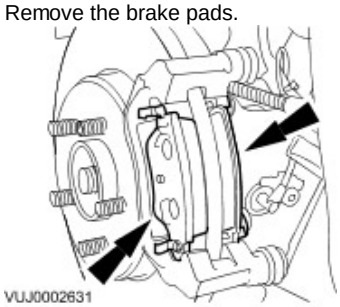


4 . Detach the brake caliper and secure to one side.

Remove and discard the brake caliper retaining bolts.



5 . Remove the brake pads.



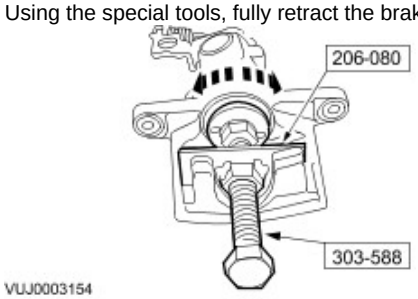
Installation

1 . **CAUTION: If the piston is pushed back into the housing, brake fluid will be forced back into the fluid reservoir.**

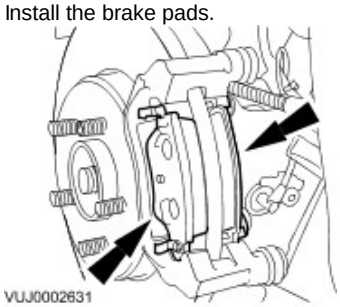
NOTE:

The left-hand brake caliper piston retracts counter clockwise and the right-hand retracts clockwise.

Using the special tools, fully retract the brake caliper piston.



2 . Install the brake pads.



3 . **CAUTION: Make sure that the brake disc faces are clean before installation.**

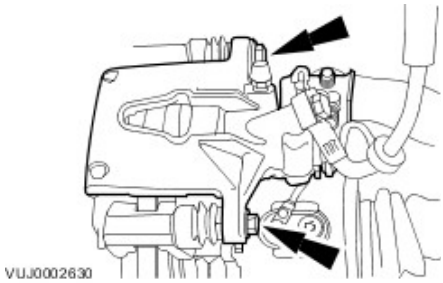
CAUTION: Make sure the piston location mark is in the correct position so that the locator pin on the brake pad backing plate locates correctly into the piston.

NOTE:

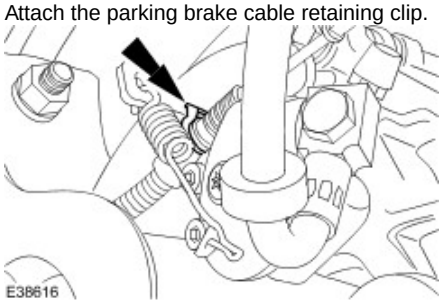
Install new brake caliper retaining bolts.

Attach the brake caliper.

Tighten to 32 Nm.



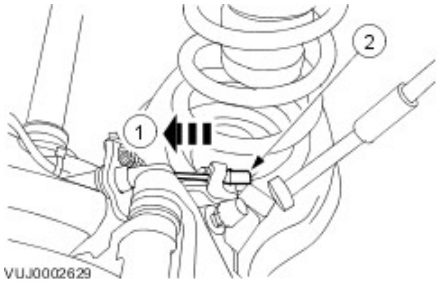
4 . Attach the parking brake cable retaining clip.



5 . Attach the parking brake cable.

1) Release the tension.

2) Attach the parking brake cable.



6 . Install the wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

Published: Mar 29, 2001

Specifications

Torque Specifications

Description	Nm	lb-ft	lb-in
Parking brake control retaining nuts	20	15	-

Published: Aug 10, 2005

Parking Brake Cable Adjustment - Vehicles With: Manually Adjusted Parking Brake, VIN Range: D55322->E24053 (70.35.10)

Special Service Tools

Parking brake cable adjuster socket.
206-087

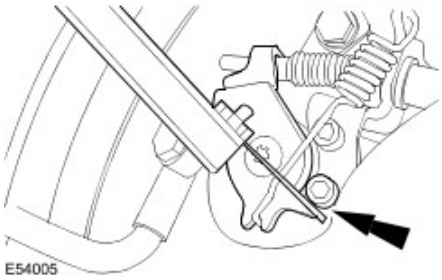
1. Release the parking brake.

2. Raise and support the vehicle.
Lifting

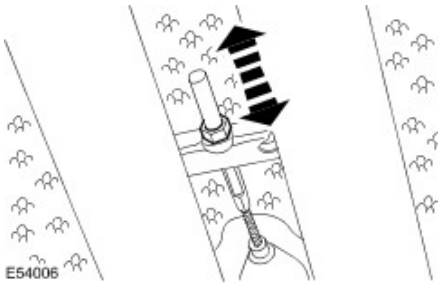
3. **NOTE:**
   Make sure the handbrake is in OFF position.

NOTE:
The caliper gap must be between 0.1mm and 1.5mm on one side of the vehicle. The other side of the vehicle must be between 0mm (no gap) and 1.5mm. If the vehicle is within specification, no further action is required. If the vehicle is not within specification, carry out steps 4 to 8.

Using suitable feeler gauges, measure the gap between the parking brake caliper lever and the parking brake caliper lever stop on both sides of the vehicle.

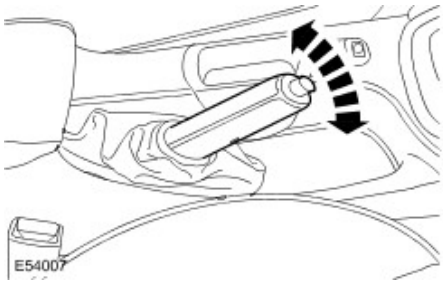


4. Using special tool 206-087 adjust the parking brake cable to obtain the required measurement.



5. Lower the vehicle.

6. Operate the parking brake lever to maximum travel five times to allow the parking brake cables to stretch.



7. Raise the vehicle.

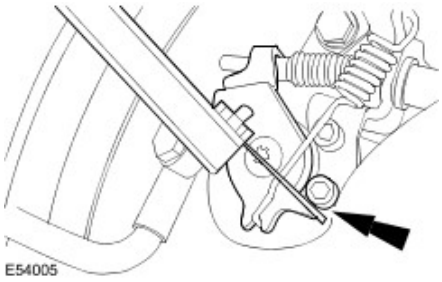
8. **NOTE:**

   Make sure the handbrake is in OFF position.

NOTE:

The caliper gap must be between 0.1mm and 1.5mm on one side of the vehicle. The other side of the vehicle must be between 0mm (no gap) and 1.5mm. If the vehicle is within specification, no further action is required. If the vehicle is not within specification, carry out steps 4 to 8.

Using suitable feeler gauges, measure the gap between the parking brake caliper lever and the parking brake caliper lever stop on both sides of the vehicle.



Published: Aug 10, 2005

Parking Brake Cable Adjustment - Vehicles With: Manually Adjusted Parking Brake, VIN Range: E24054->V99999 (70.35.10)

Special Service Tools

Parking brake cable adjuster socket.
206-087

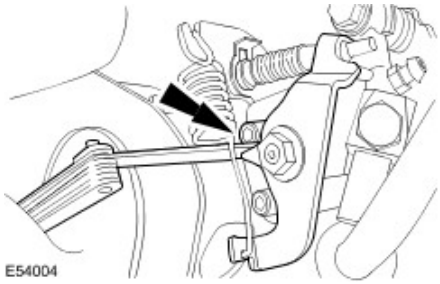
1. Release the parking brake.

2. Raise and support the vehicle.
Lifting

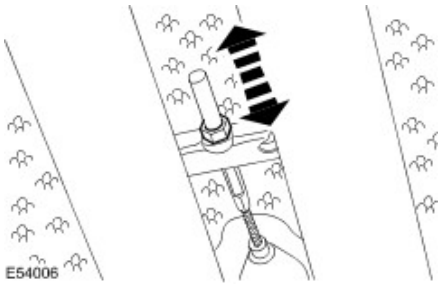
3. **NOTE:**
   Make sure the handbrake is in OFF position.

NOTE:
The caliper gap must be between 0.1mm and 1.5mm on one side of the vehicle. The other side of the vehicle must be between 0mm (no gap) and 1.5mm. If the vehicle is within specification, no further action is required. If the vehicle is not within specification, carry out steps 4 to 8.

Using suitable feeler gauges, measure the gap between the parking brake caliper lever and the parking brake caliper lever stop on both sides of the vehicle.

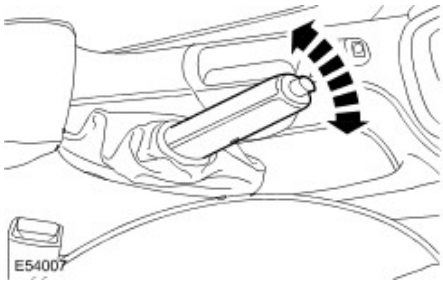


4. Using special tool 206-087 adjust the parking brake cable to obtain the required measurement.



5. Lower the vehicle.

6. Operate the parking brake lever to maximum travel five times to allow the parking brake cables to stretch.



7. Raise the vehicle.

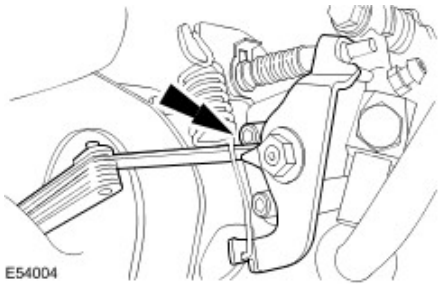
8. **NOTE:**

   Make sure the handbrake is in OFF position.

NOTE:

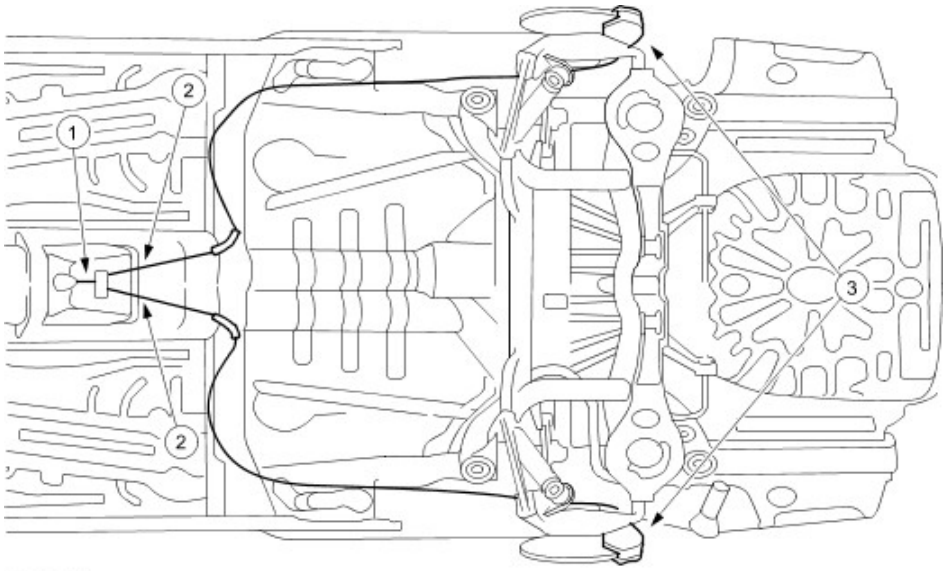
The caliper gap must be between 0.1mm and 1.5mm on one side of the vehicle. The other side of the vehicle must be between 0mm (no gap) and 1.5mm. If the vehicle is within specification, no further action is required. If the vehicle is not within specification, carry out steps 4 to 8.

Using suitable feeler gauges, measure the gap between the parking brake caliper lever and the parking brake caliper lever stop on both sides of the vehicle.



Published: Mar 29, 2001

Parking Brake



VUJ0002888

Item	Part Number	Description
1	—	Front cable
2	—	Rear cable
3	—	Brake calipers

The parking brake control system is cable-operated and controlled by an independent hand-operated parking brake control lever. The parking brake control lever activates the rear brake calipers through a cable and rear caliper lever with a ball in ramp mechanism. The rear caliper self adjusts to compensate for pad wear through hydraulic operation.

To adjust the cable, operate the parking brake control lever several times.

Published: May 1, 2007

Parking Brake

Inspection and Verification

1 . Verify the customer concern by operating the system to duplicate the condition.

2 . Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
Mechanical	**Electrical**
Parking brake control	Parking brake control warning circuit. For additional information, refer to Instrument Cluster .
Cable and conduit	
Equalizer	

1 . If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

2 . If the concern is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

The parking brake will not engage

Possible Source(s):

- Parking brake control.
- Cable and conduit.

Action(s) to take:

- Go to Pinpoint Test A.

The parking brake will not release

Possible Source(s):

- Cable and conduit.
- Parking brake control.

Action(s) to take:

- Go to Pinpoint Test B.

Pinpoint tests

PINPOINT TEST G92292p1 : THE PARKING BRAKE WILL NOT ENGAGE

G92292t1 : CHECK FOR INCORRECTLY ADJUSTED REAR PARKING BRAKE CABLE

1. Operate the parking brake control several times to adjust the cable.

- **Does the parking brake now engage correctly?**

-> Yes
Vehicle OK.

-> No
GO to Pinpoint Test G92292t2.

G92292t2 : CHECK FOR WORN BRAKE PADS

1. Inspect the brake pads for excessive wear. For additional information, refer to Brake System .

- **Are brake pads OK?**

-> Yes

GO to Pinpoint Test G92292t3.

-> No
INSTALL new brake pads. Test the system for normal operation.

G92292t3 : CHECK FOR DAMAGED PARKING BRAKE CABLES

1. Inspect the parking brake cables and conduit for damage, rust or fraying.

- **Are the parking brake cables and conduits OK?**

-> Yes
CHECK for other causes such as loose parking brake control or conventional brake system components.

-> No
REPAIR or INSTALL new cables and conduit as necessary. TEST the system for normal operation.

PINPOINT TEST G92292p2 : THE PARKING BRAKE WILL NOT RELEASE

G92292t4 : CHECK PARKING BRAKE CONTROL

1. Raise and support the vehicle with the parking brake fully applied. For additional information, refer to Lifting .

Release the parking brake by pulling upwards on the control lever and pushing the release button.

- **Did the parking button release?**

-> Yes
CHECK for other causes such as conventional brake system components, REPAIR or INSTALL new components as necessary.

-> No
GO to Pinpoint Test G92292t5.

G92292t5 : CHECK PARKING BRAKE CABLES

1. Loosen the parking brake cable tension.

Rotate the wheels by hand.

- **Did the rear wheels rotate OK?**

-> Yes
INSTALL a new parking brake control; Refer to the procedures in this section. TEST the system for normal operation.

-> No
GO to Pinpoint Test G92292t6.

G92292t6 : CHECK FRONT PARKING BRAKE CABLE

1. Disconnect the parking brake front cable from the rear brake cable and conduit at the equalizer.

Rotate the wheels by hand.

- **Did the rear wheels rotate OK?**

-> Yes
INSTALL a new front parking brake cable. For additional information, refer to the procedure in this section: Parking Brake Cable - Vehicles With: Manually Adjusted Parking Brake (70.35.29) . TEST the system for normal operation.

-> No
GO to Pinpoint Test G92292t7.

G92292t7 : CHECK REAR PARKING BRAKE CABLES

1. Disconnect the parking brake rear cable from the rear brake calipers, one at a time.

Rotate the wheel affected by the disconnected parking brake.

- **Did the rear wheel rotate OK?**

-> Yes
INSTALL a new rear parking brake cable. For additional information, refer to the procedure in this section:
Parking Brake Cable - Vehicles With: Manually Adjusted Parking Brake (70.35.29) . TEST the system for normal operation.

-> No
For additional information, refer to
Brake System .

Published: Aug 12, 2002

Parking Brake Cable - Vehicles With: Manually Adjusted Parking Brake (70.35.29)

Special Service Tools

Parking brake cable adjuster socket.
206-087

Removal

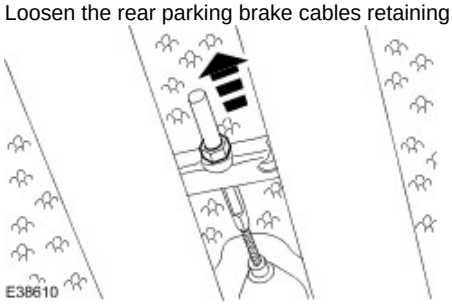
1 . Release the parking brake.

2 . Raise and support the vehicle. <<100-02>>

3 . **NOTE:**
2.5L or 3.0L shown, 2.0L similar.

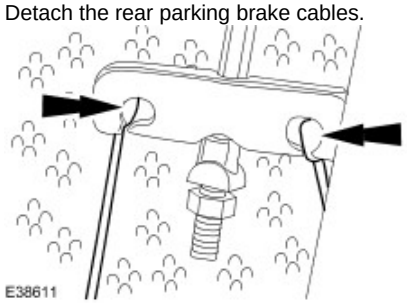
NOTE:
Using special tool 206-087 loosen the rear parking brake cable.

Loosen the rear parking brake cables retaining nut.

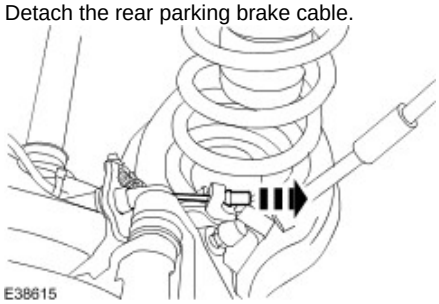


4 . **NOTE:**
2.5L or 3.0L shown, 2.0L similar.

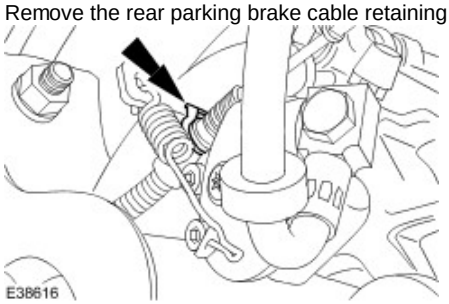
Detach the rear parking brake cables.



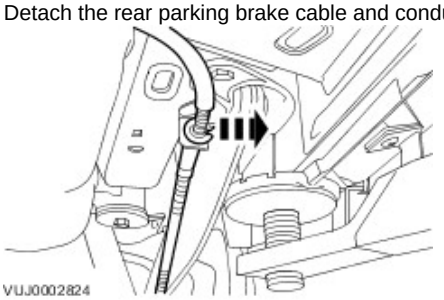
5 . Detach the rear parking brake cable.



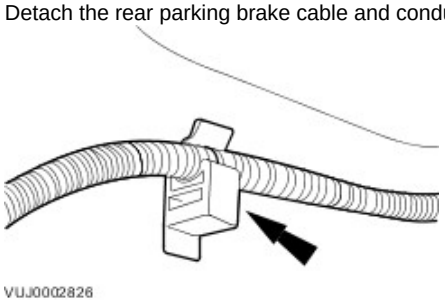
6 . Remove the rear parking brake cable retaining clip.



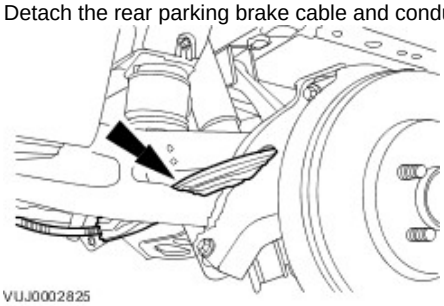
7 . Detach the rear parking brake cable and conduit.



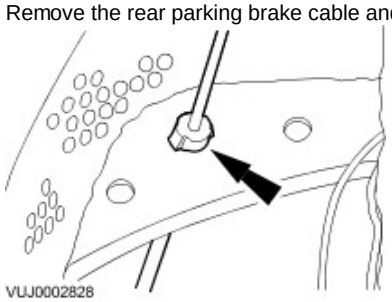
8 . Detach the rear parking brake cable and conduit.



9 . Detach the rear parking brake cable and conduit.



10 . Remove the rear parking brake cable and conduit.



Installation

1 . To install, reverse the removal procedure.

2 Carry out the parking brake cable adjustment.

. For additional information, refer to Parking Brake Cable Adjustment - Vehicles With: Manually Adjusted Parking Brake, VIN Range: D55322->E24053 (70.35.10)

Published: Mar 29, 2001

Parking Brake Cable - Vehicles With: Self-Adjusting Parking Brake (70.35.29)

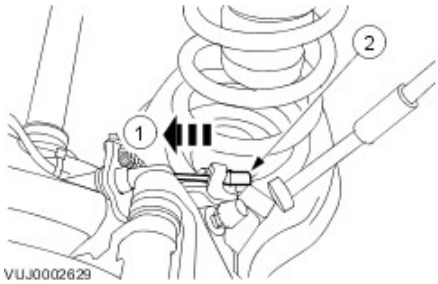
Removal

1 . Remove the rear road wheel and tire. For additional information, refer to<<204-04>>.

2 . Detach the rear parking brake cable.

1) Release the tension.

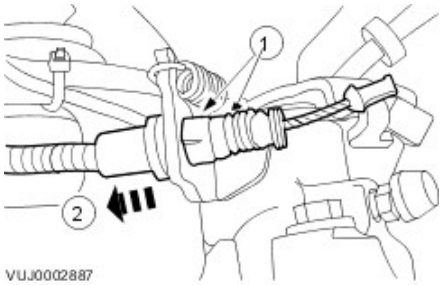
2) Detach the rear parking brake cable.



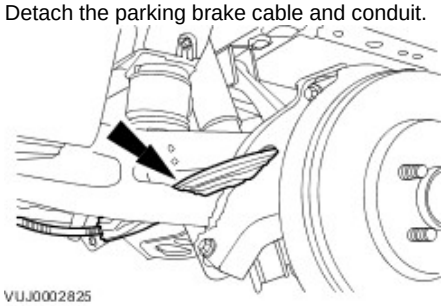
3 . Detach the parking brake cable and conduit.

1) Release the parking brake conduit retaining tangs.

2) Detach the parking brake cable and conduit.

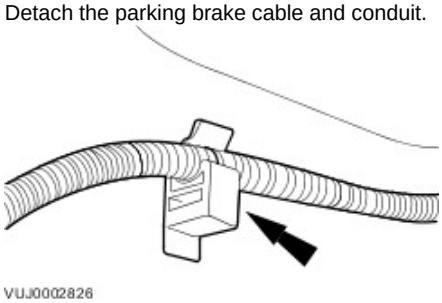


4 . Detach the parking brake cable and conduit.

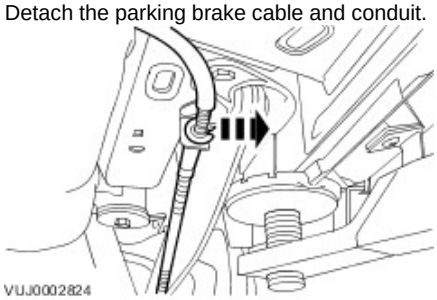


5 . Remove the body undertray. For additional information, refer to <<501-08>>.

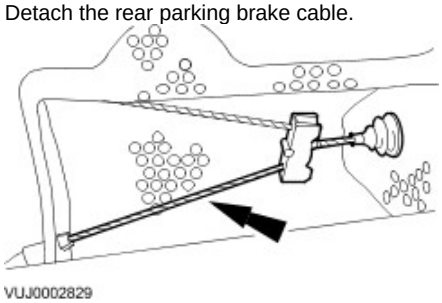
6 . Detach the parking brake cable and conduit.



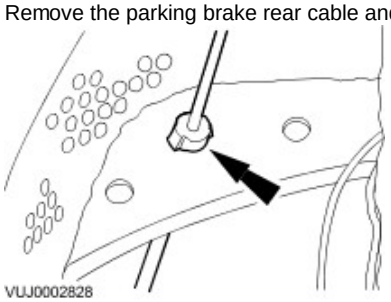
7 . Detach the parking brake cable and conduit.



8 . Detach the rear parking brake cable.



9 . Remove the parking brake rear cable and conduit.



Installation

1 . To install, reverse the removal procedure.

Published: Aug 12, 2002

Parking Brake Control - Vehicles With: Manually Adjusted Parking Brake (70.35.08)

Special Service Tools

Parking brake cable adjuster socket.
206-087

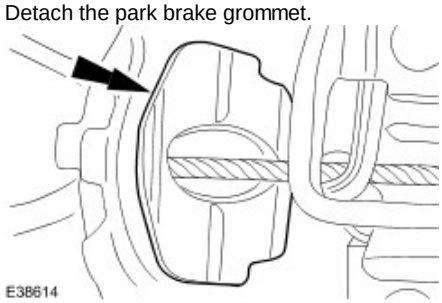
Removal

All vehicles

1 . Remove the center console. For additional information, refer to <<501-12>>.

2 . Disconnect the parking brake warning indicator switch electrical connector.

3 . Detach the park brake grommet.



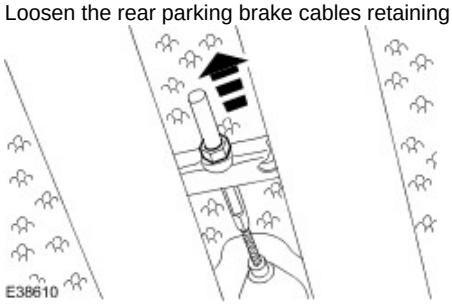
4 . Release the parking brake.

5 . Raise and support the vehicle. <<100-02>>

6 . **NOTE:**
2.5L or 3.0L shown, 2.0L similar.

NOTE:
Using special tool 206-087 loosen the rear parking brake cables.

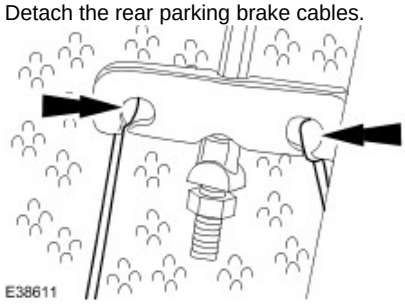
Loosen the rear parking brake cables retaining nut.



7 . **NOTE:**

2.5L or 3.0L shown, 2.0L similar.

Detach the rear parking brake cables.

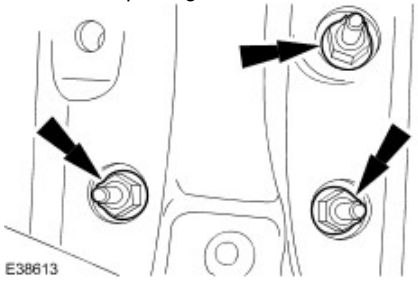


Vehicles with 2.5L or 3.0L engine

8 . Remove the driveshaft. For additional information refer to <<205-01>>.

All vehicles

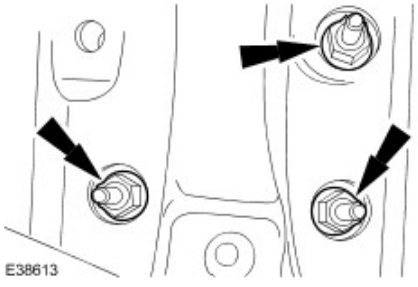
9 . Remove the parking brake.



Installation

1 . To install, reverse the removal procedure.

Tighten to 25 Nm.



2 . Carry out the parking brake cable adjustment.

For additional information, refer to Parking Brake Cable Adjustment - Vehicles With: Manually Adjusted Parking Brake, VIN Range: D55322->E24053 (70.35.10)

Published: Nov 21, 2001

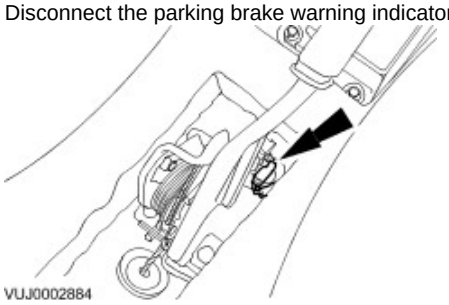
Parking Brake Control - Vehicles With: Self-Adjusting Parking Brake (70.35.08)

Removal

All vehicles

1 . Remove the center console. For additional information, refer to <<501-12>>.

2 . Disconnect the parking brake warning indicator switch electrical connector.


VUJ0002884

3 . Release the parking brake.

4 . Remove the rear road wheels and tires. For additional information, refer to <<204-04>>.

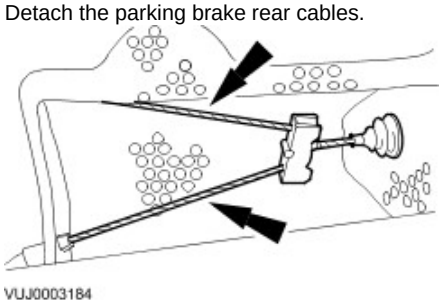
Vehicles with 2.5L or 3.0L engine

5 . Remove the driveshaft. For additional information refer to <<205-01>>.

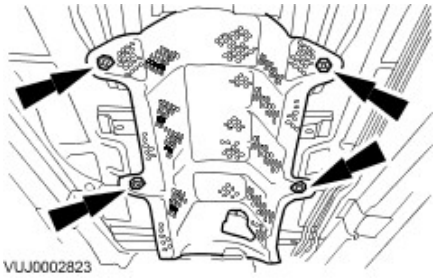
All vehicles

6 . Remove the exhaust front muffler. For additional information, refer to <<309-00>>.

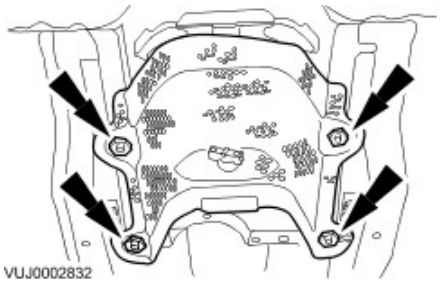
7 . Detach the parking brake rear cables.


VUJ0003184

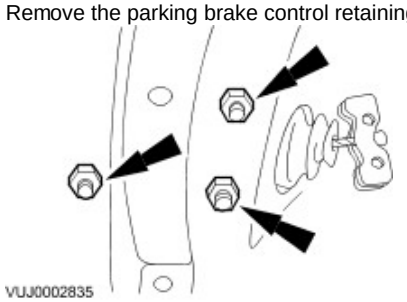
8 . Remove the exhaust front heat shield.


VUJ0002823

9 . Remove the exhaust rear heat shield.



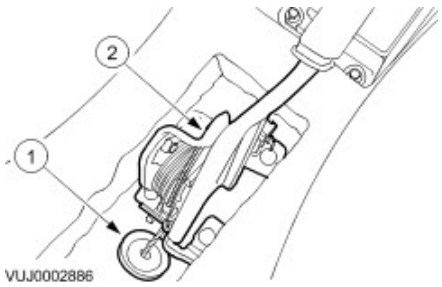
10 . Remove the parking brake control retaining nuts.



11 . Lower the vehicle.

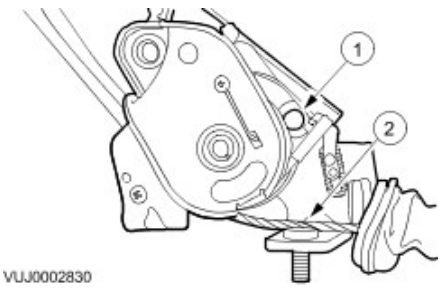
12 . Detach the parking brake control.

1) Detach the parking brake cable grommet.
2) Detach the parking brake control.



13 . Remove the parking brake control.

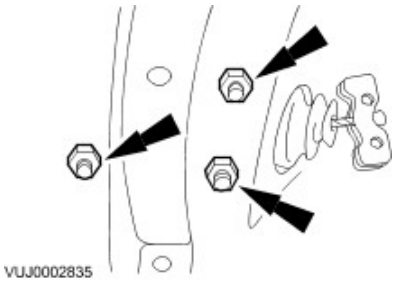
1) Align the flat on the nipple to clear the spring.
2) Remove the parking brake control.



Installation

1 . To install, reverse the removal proceedure.

Tighten to 20 Nm.



VUJ0002835

Published: Apr 24, 2006

Specifications

Lubricants, Fluids, Sealers and Adhesives

 **CAUTION: Do not use brake fluid ITT Super Dot 4 on 2006my vehicles onwards. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:

Brake fluid ITT Super Dot 4 has now been superseded by Shell ESL Super Dot 4 which is the Jaguar recommended brake fluid. Shell ESL Super Dot 4 can be used on all model years.

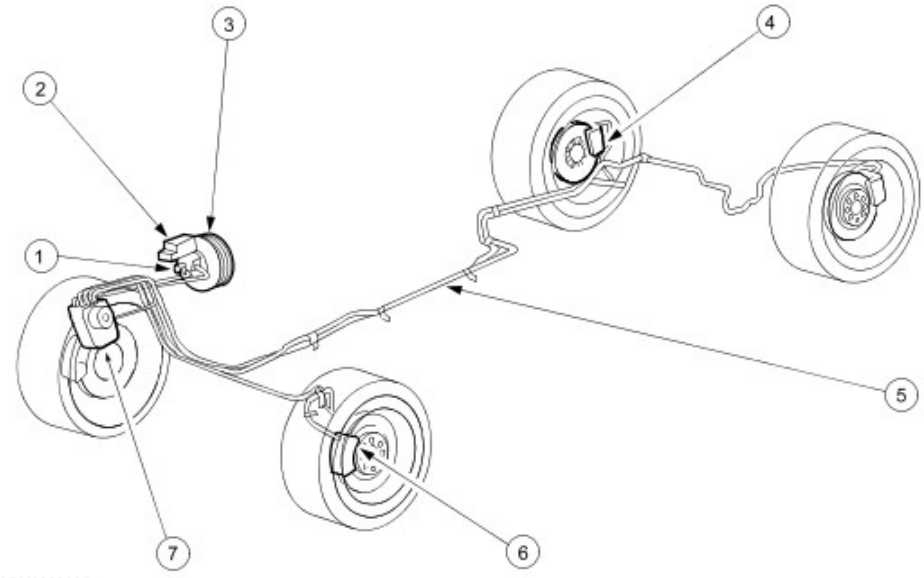
Item	Specification
Brake fluid	ITT Super Dot 4
Brake fluid	Shell ESL Super Dot 4

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake master cylinder retaining nuts.	20	15	-
Brake tube to brake master cylinder unions.	15	11	-

Published: Mar 29, 2001

Hydraulic Brake Actuation



VUJ0003005

Item	Part Number	Description
1	—	Brake master cylinder
2	—	Brake fluid reservoir
3	—	Brake booster
4	—	Rear brake caliper
5	—	Brake tubes
6	—	Front brake caliper
7	—	Hydraulic control unit

WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid contacts the eyes, flush the eyes for 15 minutes with cold running water. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately. Failure to follow these instructions may result in personal injury.

The hydraulic brake system is of a pedal operated, diagonally split dual line brake system that consists of the following components:

- a brake booster
- a master cylinder and reservoir
- front brake calipers
- rear brake calipers
- brake tubes and hoses
- Anti-lock brake system (ABS)
- Traction control system (TCS)/Interactive vehicle dynamics (IVD)

Brake Master Cylinder

The brake master cylinder is a dual piston type. The master cylinder operates as follows:

- when the brake pedal is applied, pressure is applied by mechanical linkage to the primary and secondary systems
- brake master cylinder pistons apply hydraulic pressure to the two circuits

The master cylinder consists of the following components:

- primary and secondary pistons
- brake fluid reservoir with integral fluid level warning indicator

Published: Mar 2, 2001

Hydraulic Brake Actuation

For additional information, refer to <<206-00>>.

Published: Oct 31, 2001

Brake Fluid Reservoir (70.30.16)

Removal

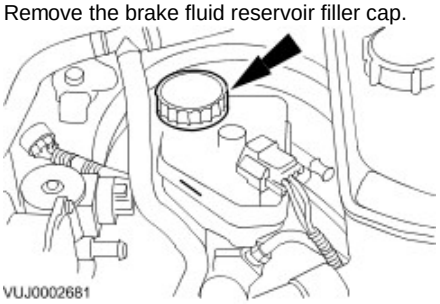
All vehicles

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

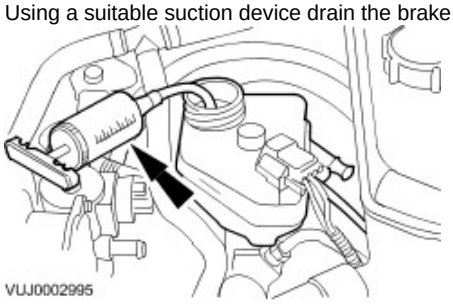
   NOTE:

   Make sure the filler cap does not become contaminated.

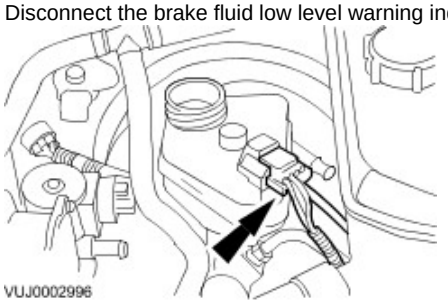
   Remove the brake fluid reservoir filler cap.



2. Using a suitable suction device drain the brake fluid reservoir.

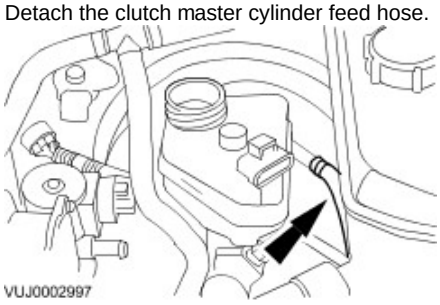


3. Disconnect the brake fluid low level warning indicator electrical connector.



Vehicles with manual transmission

4. Detach the clutch master cylinder feed hose.



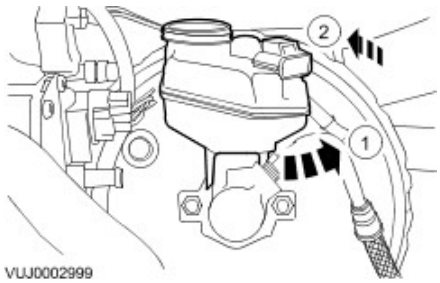
All vehicles

5 . **NOTE:**

Remove and discard the O-ring seals from the brake master cylinder.

Remove the brake fluid reservoir.

1) Release one leg of the reservoir from the retaining pin.
2) Remove the brake fluid reservoir.



Installation

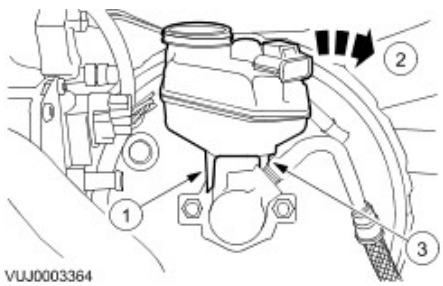
All vehicles

1 . **NOTE:**

Install new O-ring seals to the brake master cylinder.

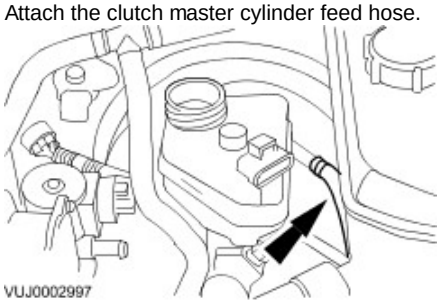
Install the brake fluid reservoir.

1) Locate the left hand brake fluid reservoir leg to the retaining pin.
2) Fully seat the brake fluid reservoir to the master cylinder.
3) Fully seat the right hand brake fluid reservoir leg to the retaining pin.



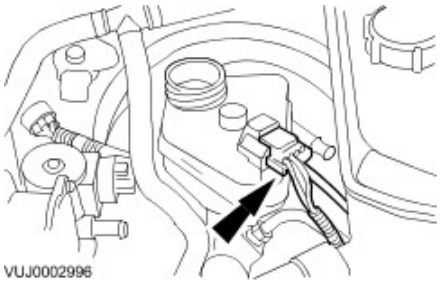
Vehicles with manual transmission

2 . Attach the clutch master cylinder feed hose.

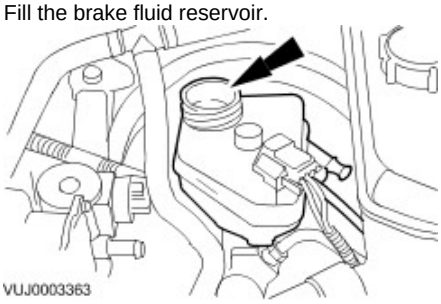


All vehicles

3 . Connect the brake fluid low level warning indicator electrical connector.

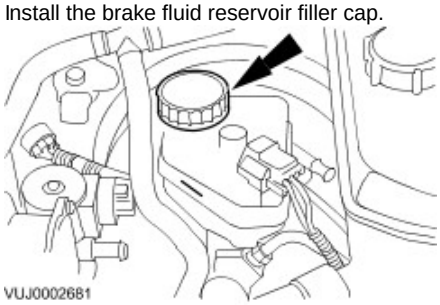


4 . Fill the brake fluid reservoir.



5 . Bleed the brake system. For additional information, refer to <<206-00>>.

6 . Install the brake fluid reservoir filler cap.



Published: Oct 31, 2001

Brake Master Cylinder (70.30.08)

Removal

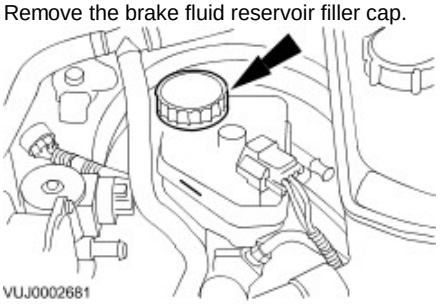
All vehicles

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

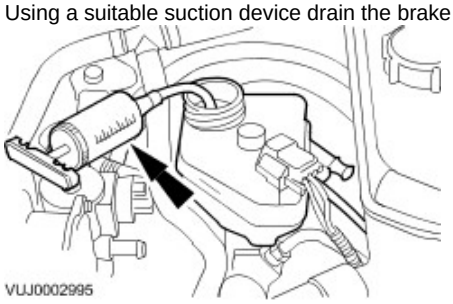
   NOTE:

   Make sure the filler cap does not become contaminated.

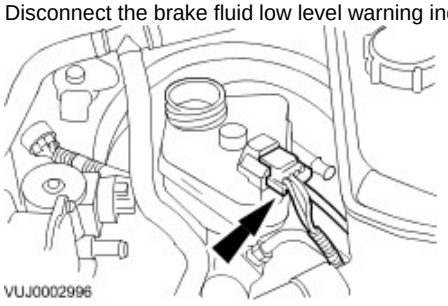
   Remove the brake fluid reservoir filler cap.



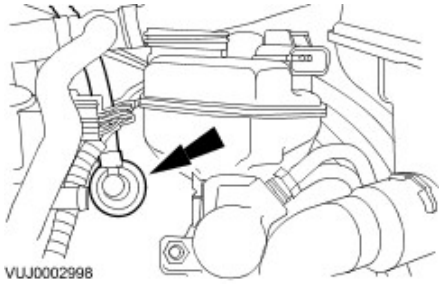
2. Using a suitable suction device drain the brake fluid reservoir.



3. Disconnect the brake fluid low level warning indicator electrical connector.

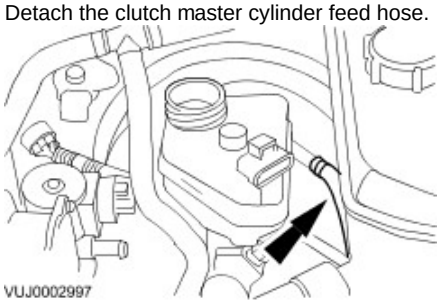


4. Detach the brake booster vacuum hose.



Vehicles with manual transmission

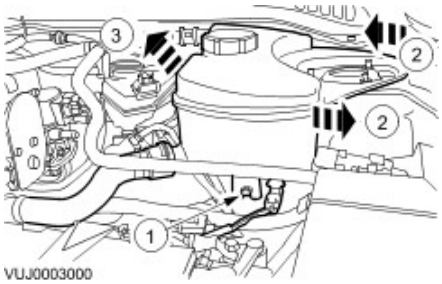
5 . Detach the clutch master cylinder feed hose.



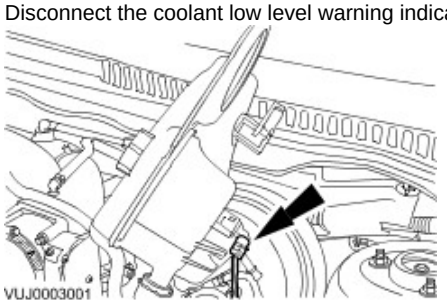
All vehicles

6 . Reposition the coolant expansion tank.

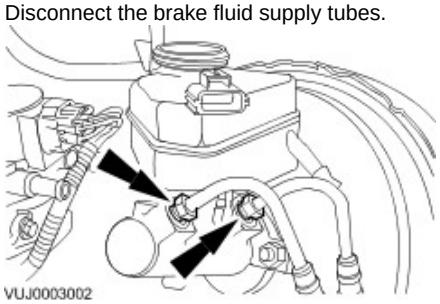
1) Remove the coolant expansion tank retaining bolt.
2) Turn the coolant expansion tank counter clockwise.
3) Reposition the coolant expansion tank.



7 . Disconnect the coolant low level warning indicator electrical connector.



8 . Disconnect the brake fluid supply tubes.

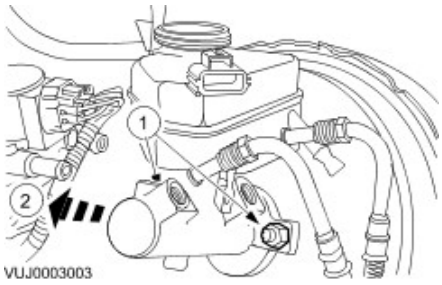


9 . **NOTE:**

Remove and discard the O-ring seal at the rear of the brake master cylinder.

Remove the brake master cylinder and reservoir.

1) Remove the brake master cylinder retaining nuts.
2) Remove the brake master cylinder and reservoir.

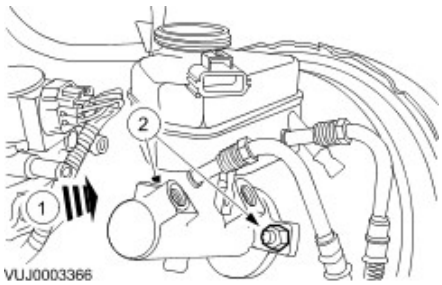


Installation

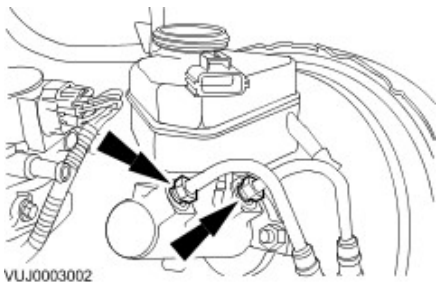
All vehicles

1 . **NOTE:**
Install a new O-ring seal to the rear of the brake master cylinder.

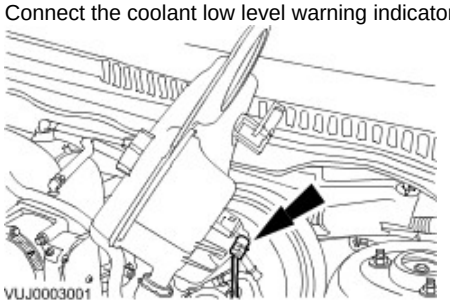
Install the brake master cylinder and reservoir.
1) Install the brake master cylinder and reservoir.
2) Install the brake master cylinder retaining nuts.
Tighten to 20 Nm.



2 . Connect the brake fluid supply tubes.
Tighten to 15 Nm.

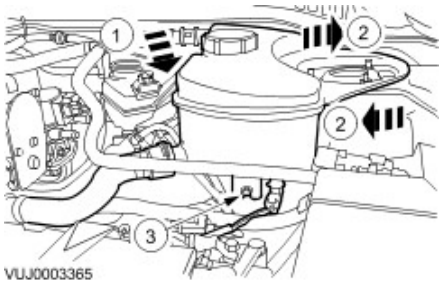


3 . Connect the coolant low level warning indicator electrical connector.



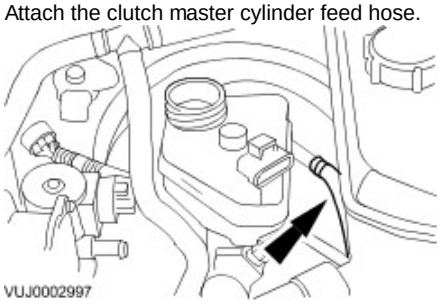
4 . Attach the coolant expansion tank.
1) Reposition the coolant expansion tank.
2) Turn the coolant expansion tank clockwise.

3) Install the coolant expansion tank retaining bolt.



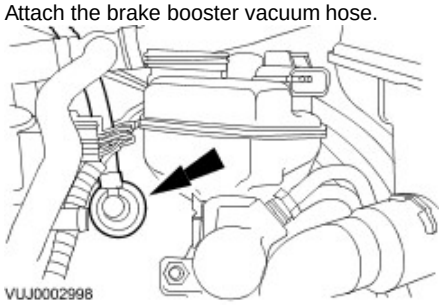
Vehicles with manual transmission

5 . Attach the clutch master cylinder feed hose.

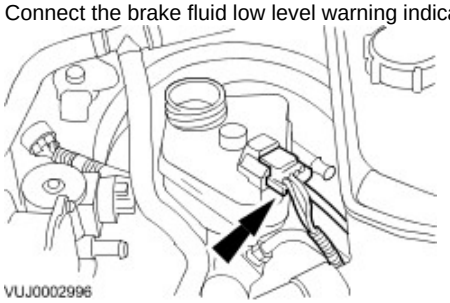


All vehicles

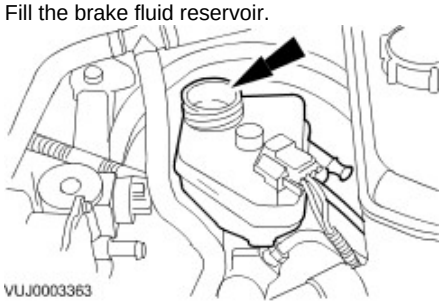
6 . Attach the brake booster vacuum hose.



7 . Connect the brake fluid low level warning indicator electrical connector.

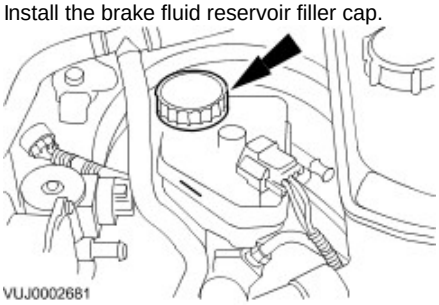


8 . Fill the brake fluid reservoir.



9 . Bleed the brake system. For additional information, refer to <<206-00>>.

10 . Install the brake fluid reservoir filler cap.



Published: Feb 7, 2005

Brake Pedal and Bracket (70.35.03)

Removal

Vehicles with manual transmission

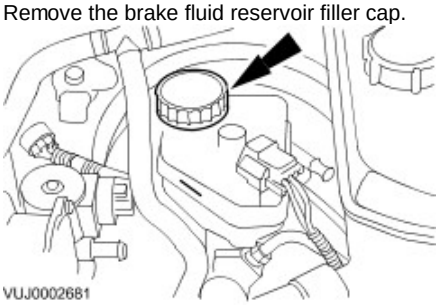
1. **WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid contacts the eyes, flush the eyes for 15 minutes with cold water. Get medical attention immediately if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately. Failure to follow these instructions may result in personal injury.**

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

NOTE:

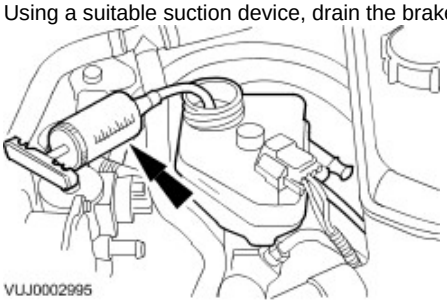
Make sure the filler cap does not become contaminated.

Remove the brake fluid reservoir filler cap.



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

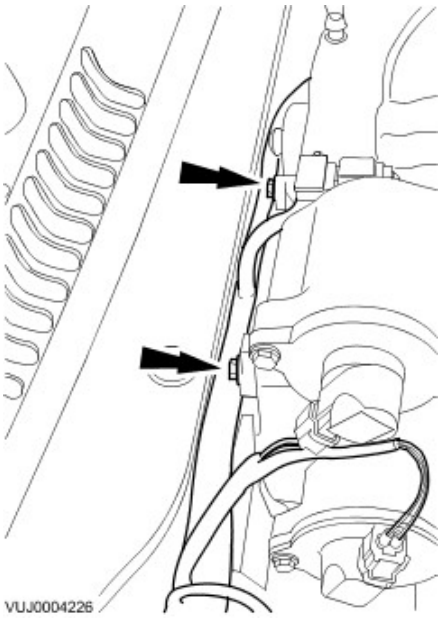
Using a suitable suction device, drain the brake fluid reservoir.



3 . **NOTE:**

Vehicles with 2.5L or 3.0L engine only.

Detach the engine wiring harness.



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

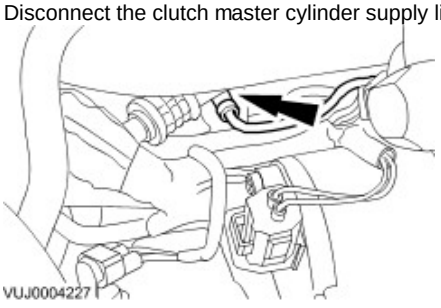
NOTE:

Install suitable blanking plugs.

NOTE:

Right-hand drive shown, left-hand drive similar.

Disconnect the clutch master cylinder supply line.



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

NOTE:

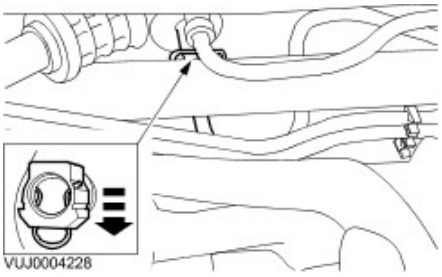
Install suitable blanking plugs.

NOTE:

Right-hand drive shown, left-hand drive similar.

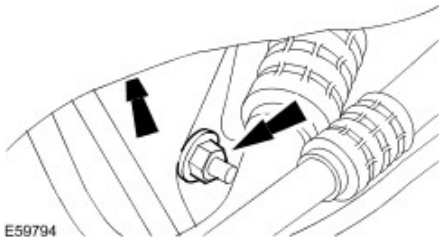
Disconnect the clutch slave cylinder supply line from the clutch master cylinder.

- Release the retaining clip to disconnect the line.



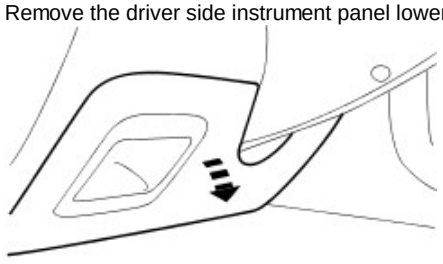
Right-hand drive vehicles

6 . Remove the brake pedal and bracket retaining nuts.



Vehicles without driver lower air bag

7 . Remove the driver side instrument panel lower trim panel.

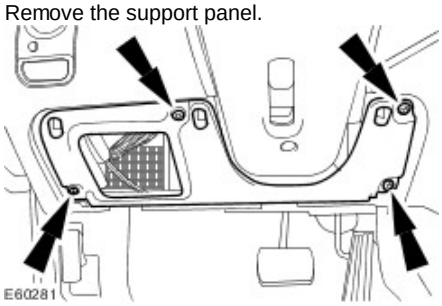


Vehicles with driver lower air bag

8 . Remove the driver lower air bag.
For additional information, refer to Driver Lower Air Bag Module (76.73.75)

All vehicles

9 . Remove the support panel.



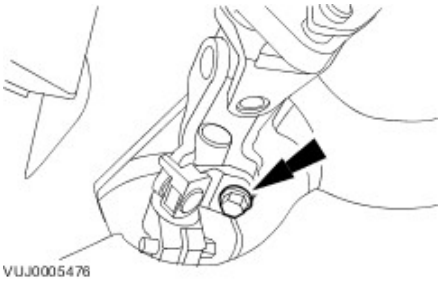
Left-hand drive vehicles

10 . Position the front wheels in a straight ahead position and centralize the steering wheel.

- Lock in position and remove the ignition key.

11 . Detach the steering column.

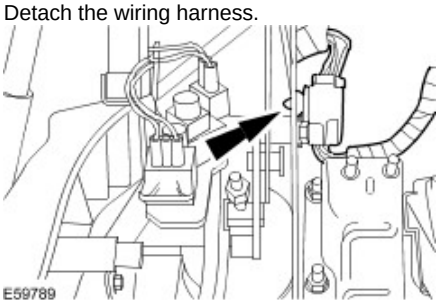
- Remove and discard the steering column lower retaining bolt.



All vehicles

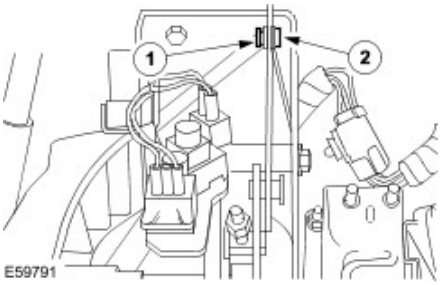
12 . Remove the accelerator pedal.
For additional information, refer to Accelerator Pedal (19.20.01)

13 . Detach the wiring harness.

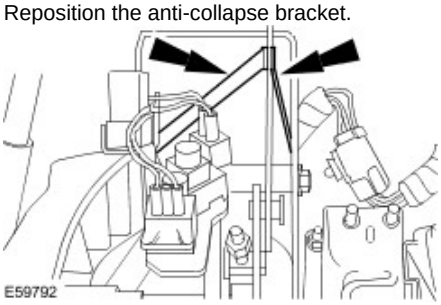


14 . Remove the anti-collapse bracket clevis pin.

1) Remove the anti-collapse bracket clevis pin retaining clip.
2) Remove the anti-collapse bracket clevis pin.

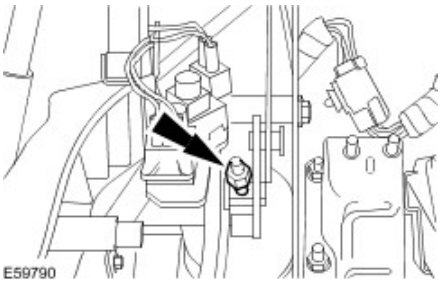


15 . Reposition the anti-collapse bracket.

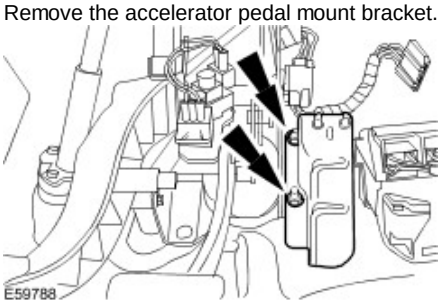


Right-hand drive vehicles

16 . Remove the brake booster push rod retaining nut.



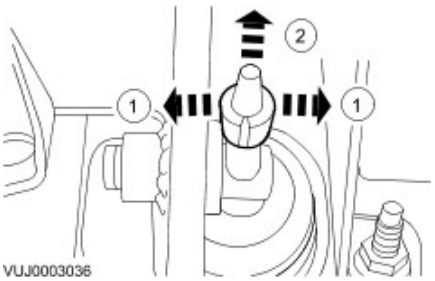
17 . Remove the accelerator pedal mount bracket.



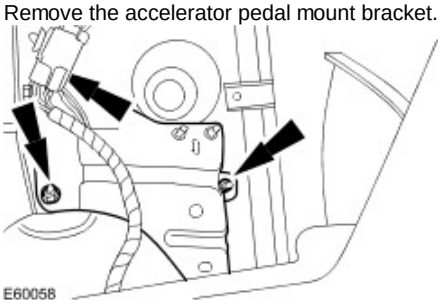
Left-hand drive vehicles

18 . Remove the brake booster push rod retaining clip.

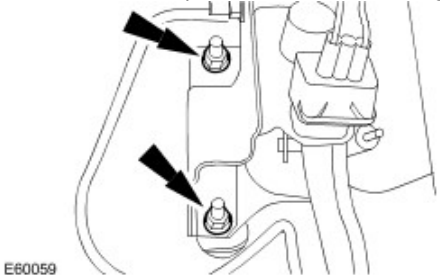
1) Release the brake booster push rod retaining clip.
2) Remove the brake booster push rod retaining clip.



19 . Remove the accelerator pedal mount bracket.

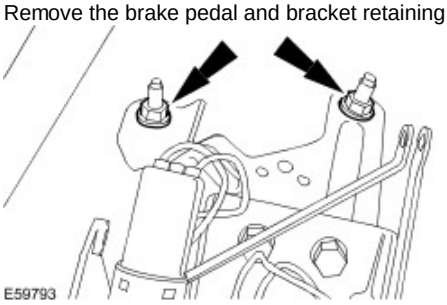


20 . Remove the brake pedal and bracket retaining nuts.



All vehicles

21 . Remove the brake pedal and bracket retaining nuts.

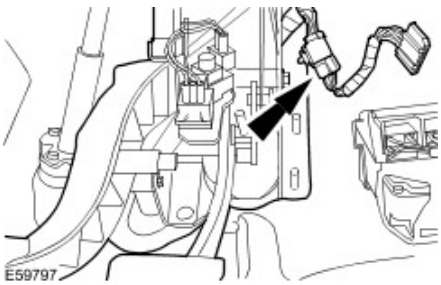


22 . **NOTE:**

Right-hand drive shown, left-hand drive similar.

Remove the brake pedal and bracket.

Disconnect the electrical connector.



Installation

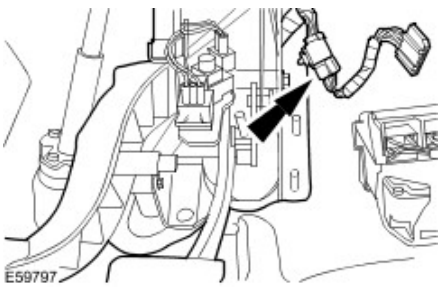
All vehicles

1 . **NOTE:**

Right-hand drive shown, left-hand drive similar.

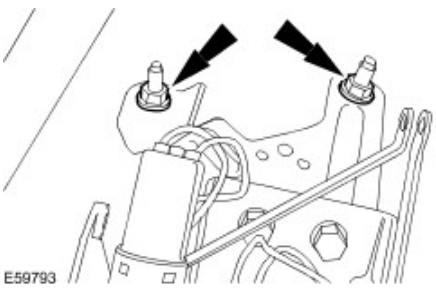
Install the brake pedal and bracket.

Connect the electrical connector.



2 . Install the brake pedal and bracket retaining nuts.

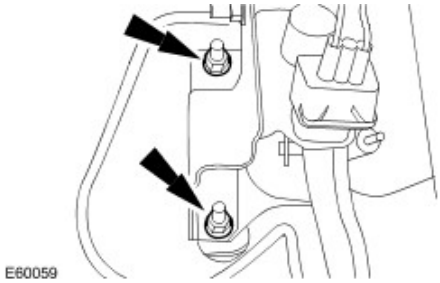
Tighten to 25 Nm.



Left-hand drive vehicles

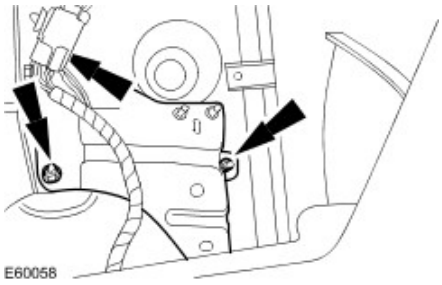
3 . Install the brake pedal and bracket retaining nuts.

Tighten to 25 Nm.

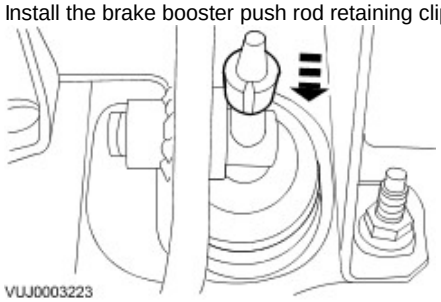


4 . Install the accelerator pedal mount bracket.

Tighten to 25 Nm.



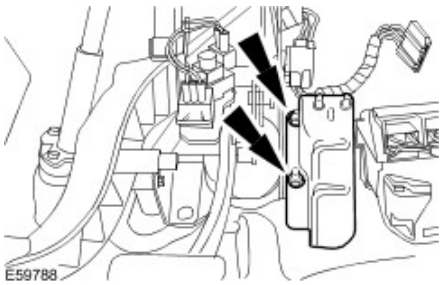
5 . Install the brake booster push rod retaining clip.



Right-hand drive vehicles

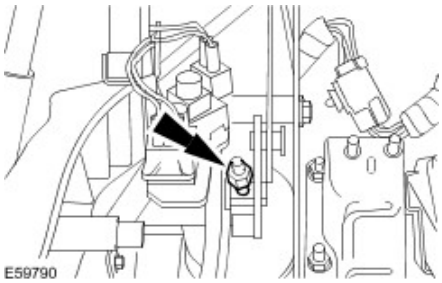
6 . Install the accelerator pedal mount bracket.

Tighten to 25 Nm.



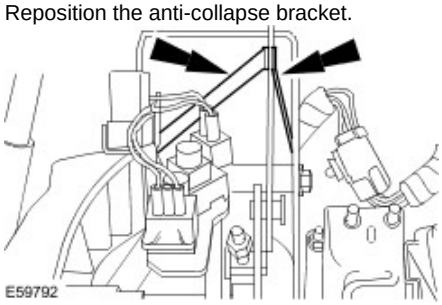
7 . Install the brake booster push rod retaining nut.

Tighten to 3 Nm.



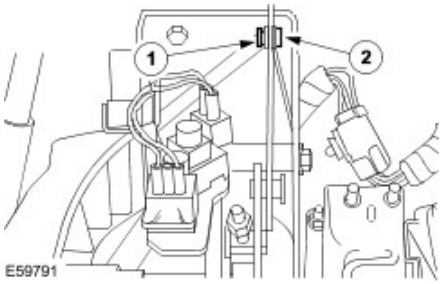
All vehicles

8 . Reposition the anti-collapse bracket.

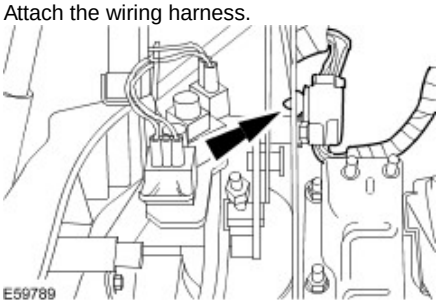


9 . Install the anti-collapse bracket clevis pin retaining clip.

1) Install the anti-collapse bracket clevis pin.
2) Install the anti-collapse bracket clevis pin retaining clip.



10 . Attach the wiring harness.

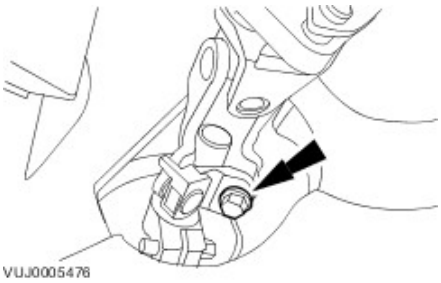


11 . Install the accelerator pedal.
For additional information, refer to Accelerator Pedal (19.20.01)

Left-hand drive vehicles

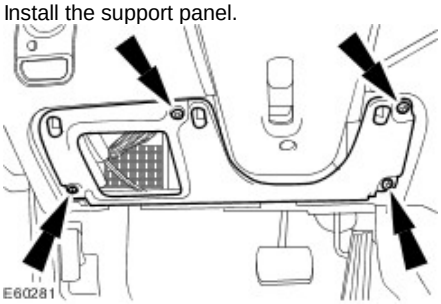
12 . Attach the steering column.

- Install a new steering column lower retaining bolt.
- Tighten to 25 Nm.



All vehicles

13 . Install the support panel.

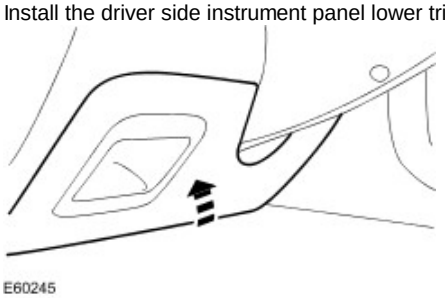


Vehicles with driver lower air bag

14 . Install the driver lower air bag.
For additional information, refer to Driver Lower Air Bag Module (76.73.75)

Vehicles without driver lower air bag

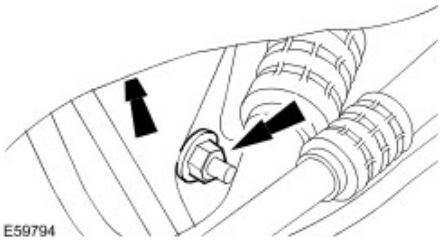
15 . Install the driver side instrument panel lower trim panel.



Right-hand drive vehicles

16 . Install the brake pedal and bracket retaining nuts.

Tighten to 25 Nm.



Vehicles with manual transmission

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

NOTE:

Remove the blanking plugs.

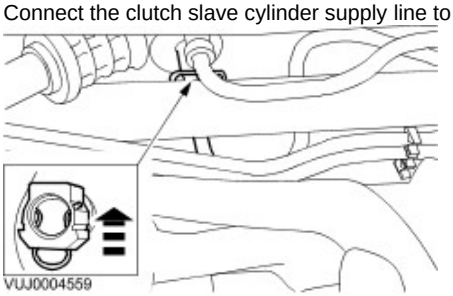
NOTE:

Reposition the retaining clip.

NOTE:

Right-hand drive shown, left-hand drive similar.

Connect the clutch slave cylinder supply line to the clutch master cylinder.



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

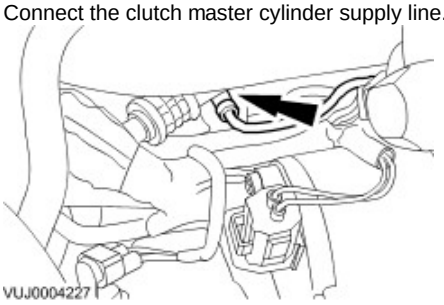
NOTE:

Remove the blanking plugs.

NOTE:

Right-hand drive shown, left-hand drive similar.

Connect the clutch master cylinder supply line.

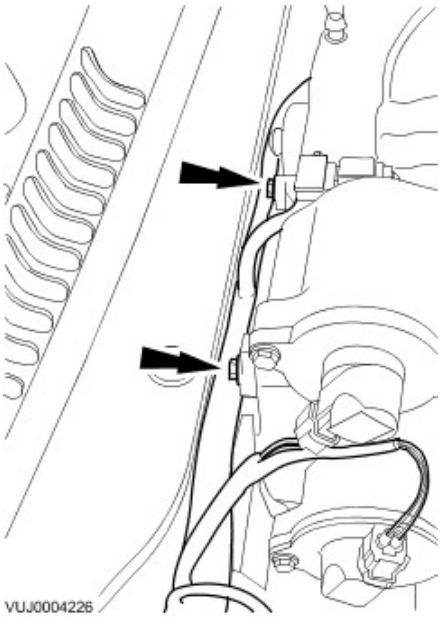


19 . **NOTE:**

Vehicles with 2.5L or 3.0L engine only.

Attach the engine wiring harness.

Tighten to 10 Nm.



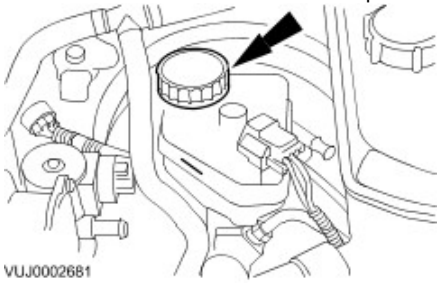
20 . Bleed the hydraulic clutch system.
For additional information, refer to Clutch System Bleeding - Vehicles With: 5-Speed Manual Transmission (33.15.01)

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

NOTE:

Make sure the filler cap does not become contaminated.

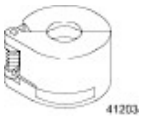
Install the brake fluid reservoir filler cap.



Published: May 30, 2006

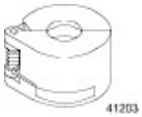
Brake Pedal Cross-Shaft

Special Service Tools



Disconnect tool, fuel line.
310-076

Disconnect tool, fuel line.
310-D005



Disconnect tool, fuel line.
412-038

5 Point Security Torx Bit.
418-535

Removal

All vehicles

1 . Disconnect the battery ground cable.
For additional information, refer to Battery Disconnect and Connect

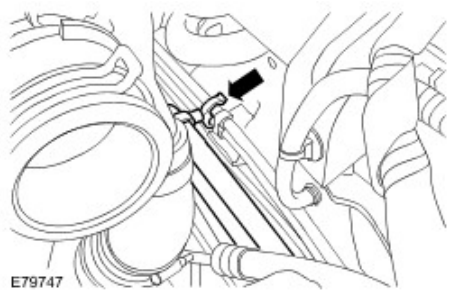
2 . Recover the air conditioning (A/C) refrigerant.
For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging (82.30.30)

Vehicles with diesel particulate filter

3 . Remove the air cleaner outlet pipe.
For additional information, refer to Air Cleaner Outlet Pipe (19.10.31)

4 . **NOTE:**
Note the orientation of the retaining clip.

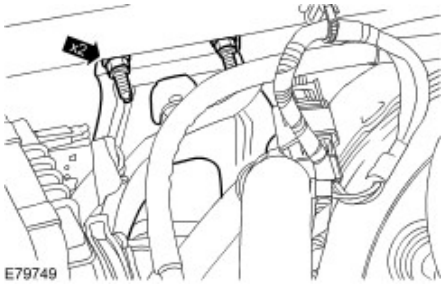
Detach the diesel particulate filter (DPF) high-pressure and low-pressure hoses.



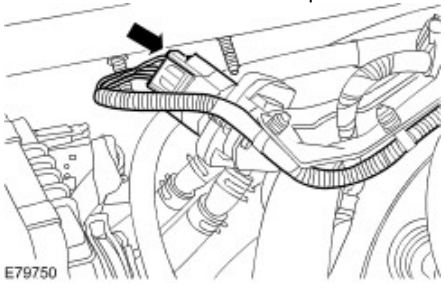
5 . Detach the wiring harness.

6 . Detach the DPF differential pressure sensor retaining bracket.

- Remove the retaining nuts.



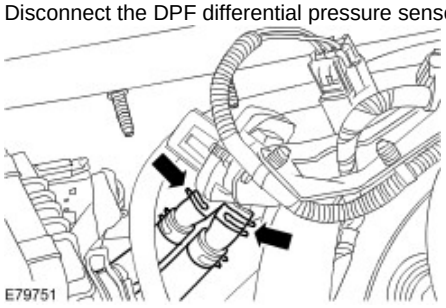
7 . Disconnect the DPF differential pressure sensor electrical connector.



8 **NOTE:**

· Note the orientation of the DPF differential pressure high-pressure and low-pressure hoses and make sure they are installed in the same position.

Disconnect the DPF differential pressure sensor high-pressure and low-pressure hoses.

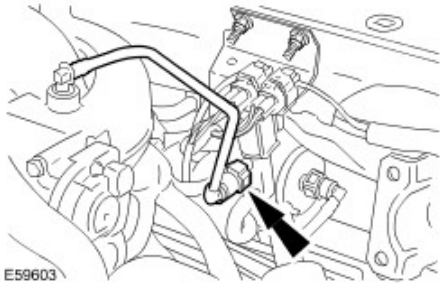


All vehicles

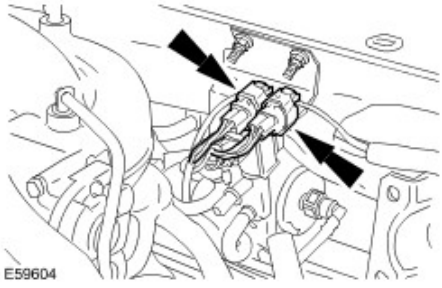
9 . Remove the brake booster.
For additional information, refer to Brake Booster - RHD (70.50.17)

All except vehicles with diesel engine

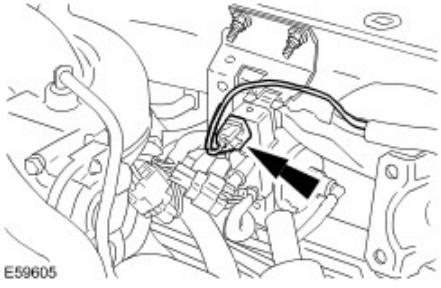
10 . Disconnect the upper fuel vapor hose from the evaporative emission canister purge valve.



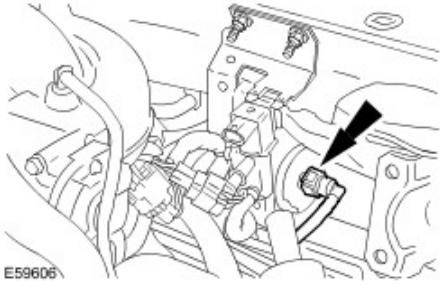
11 . Detach the oxygen sensor electrical connectors.



12 . Disconnect the evaporator solenoid electrical connector.

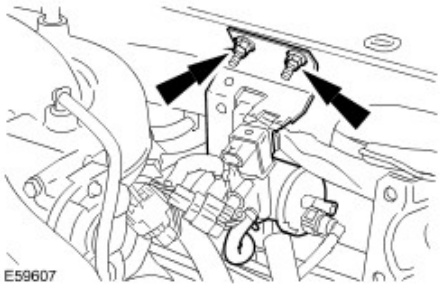


13 . Disconnect the lower fuel vapor hose from the evaporative emission canister purge valve.



14 . Detach the wiring harness from the retaining bracket.

15 . Remove the evaporative emission canister purge valve retaining bracket.

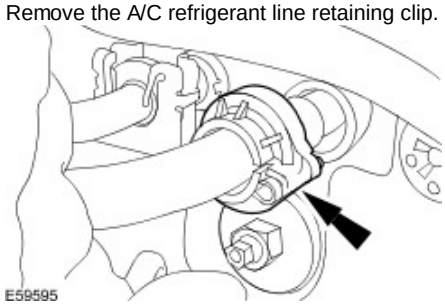


Vehicles with 2.0L engine

16 . Remove the intake manifold.
For additional information, refer to Intake Manifold (30.15.01)

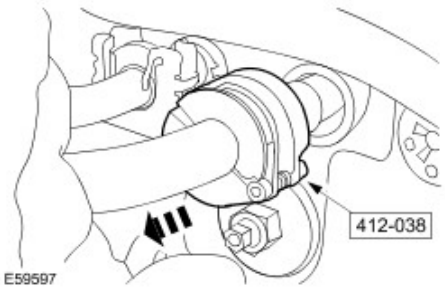
All vehicles

17 . Remove the A/C refrigerant line retaining clip.

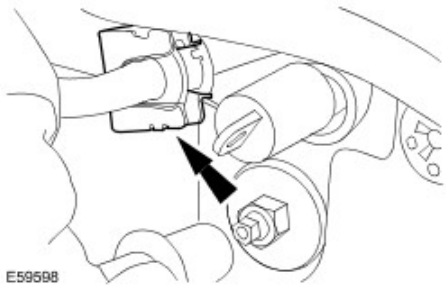


18 . **NOTE:**
Install blanking plugs to the exposed ports.

Using the special tool, disconnect the A/C refrigerant line.
- Remove and discard the O-ring seals.



19 . Remove the A/C refrigerant line retaining clip.

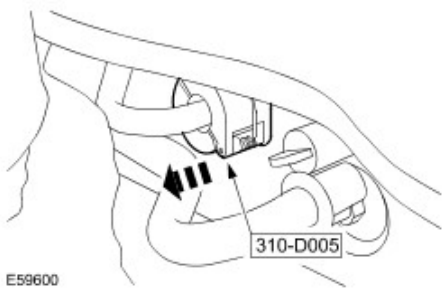


20 . **NOTE:**

Install blanking plugs to the exposed ports.

Using the special tool, disconnect the A/C refrigerant line.

- Remove and discard the O-ring seals.

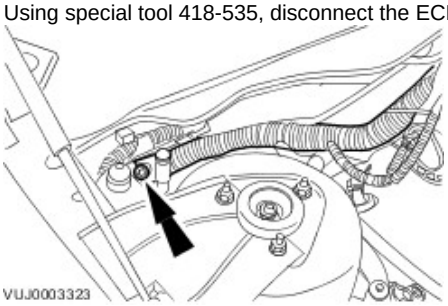


All except vehicles with diesel engine

21 . **NOTE:**

The bolt remains captive in the engine control module (ECM) electrical connector.

Using special tool 418-535, disconnect the ECM electrical connector.

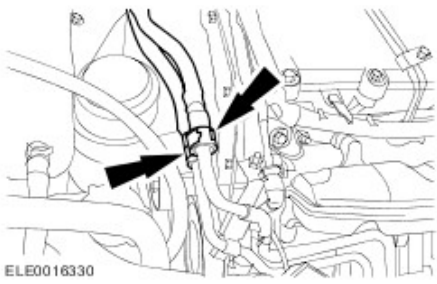


Vehicles with diesel engine

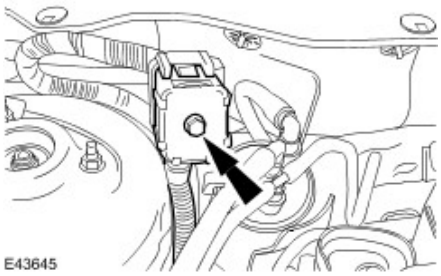
22 . **NOTE:**

Install blanking plugs to the fuel pump fuel supply and return line male and female connectors.

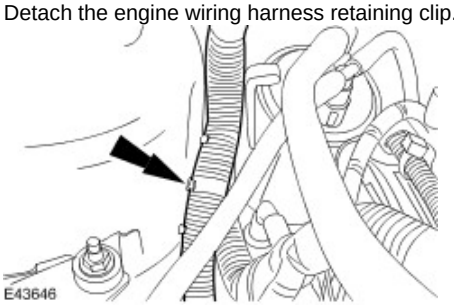
Disconnect the fuel pump fuel supply and return lines.
For additional information, refer to Quick Release Coupling - Push Connect



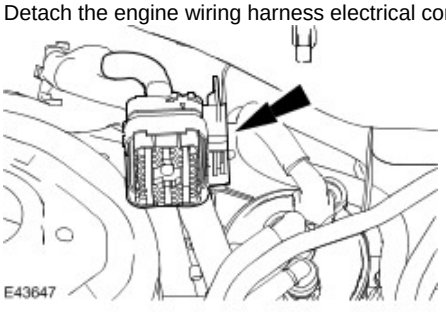
23 . Disconnect the engine wiring harness electrical connector.



24 . Detach the engine wiring harness retaining clip.



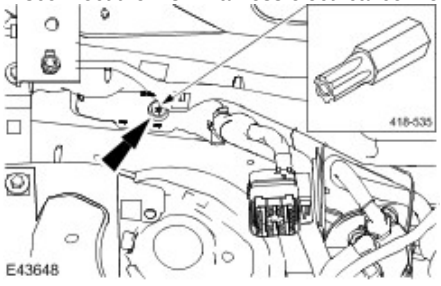
25 . Detach the engine wiring harness electrical connector.



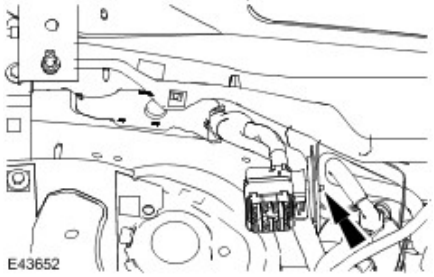
26 . **NOTE:**

The bolt remains captive in the ECM electrical connector.

Disconnect the ECM harness electrical connector.

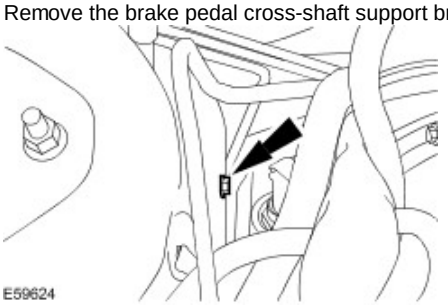


27 . Detach the engine wiring harness retaining clip.

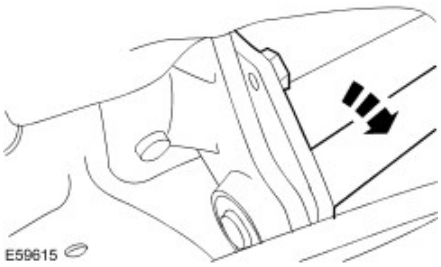


All vehicles

28 . Remove the brake pedal cross-shaft support bracket retaining bolt.

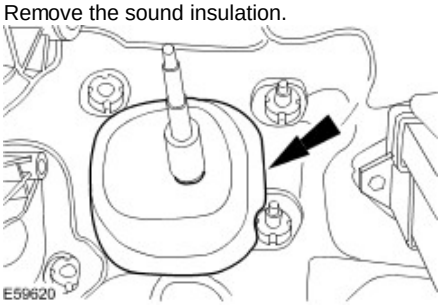


29 . Rotate the brake pedal cross-shaft clockwise.

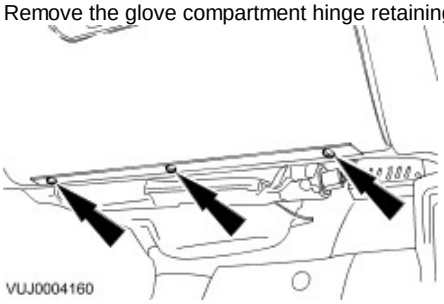


30 . Remove the brake pedal and bracket.
For additional information, refer to Brake Pedal and Bracket (70.35.03)

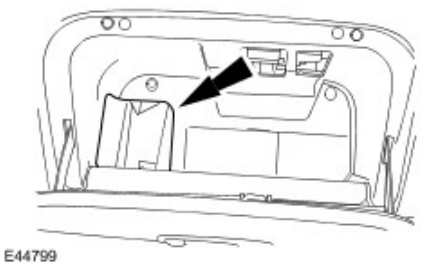
31 . Remove the sound insulation.



32 . Remove the glove compartment hinge retaining screws.

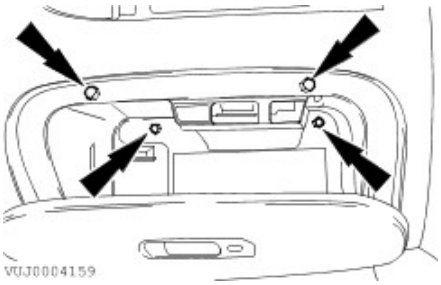


33 . Remove the glove compartment finisher trim.

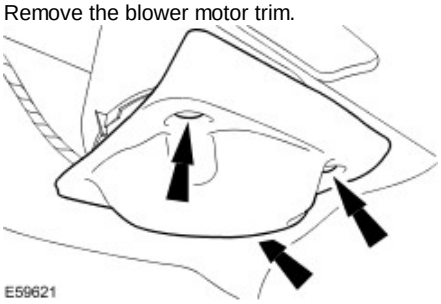


34 . Remove the glove compartment.

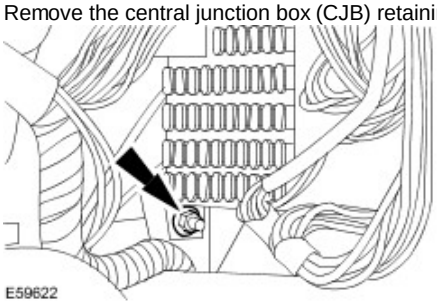
- Remove the glove compartment retaining screws.



35 . Remove the blower motor trim.



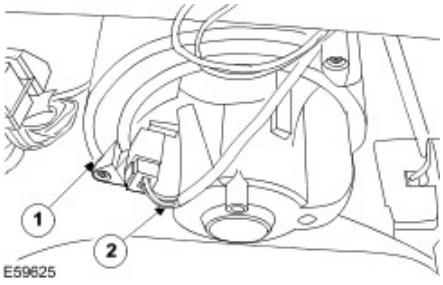
36 . Remove the central junction box (CJB) retaining nut.



37 . Detach the CJB.

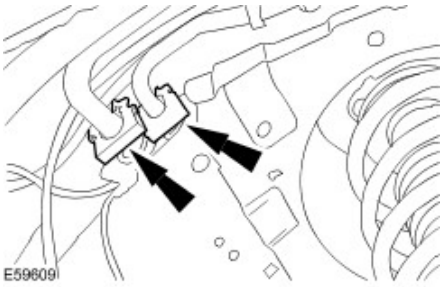
38 . Reposition the brake pedal cross-shaft securing bracket.

1) Undo but do not remove the brake pedal cross-shaft securing bracket retaining nut.
2) Reposition the brake pedal cross-shaft securing bracket.



39 . Remove the right-hand fender splash shield.
For additional information, refer to Fender Splash Shield (76.10.90)

40 . Remove the refrigerant lines retaining clips.

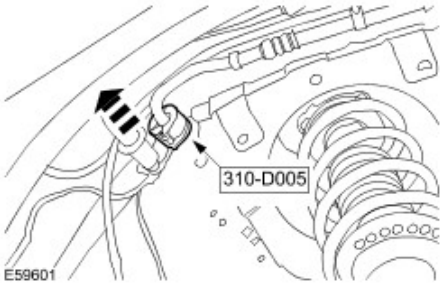


41 . **NOTE:**

Install blanking plugs to the exposed ports.

Using the special tool, disconnect the A/C refrigerant line.

- Remove and discard the O-ring seals.

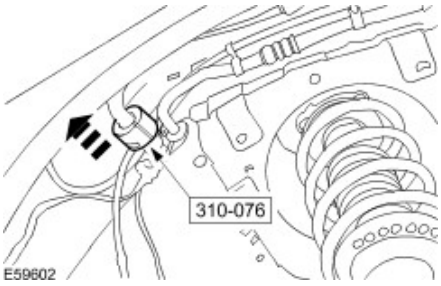


42 . **NOTE:**

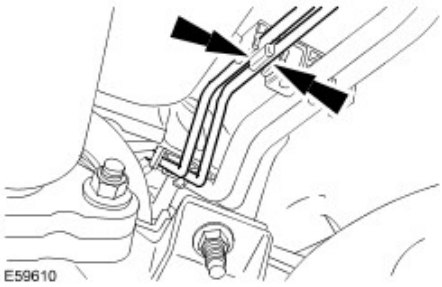
Install blanking plugs to the exposed ports.

Using the special tool, disconnect the A/C refrigerant line.

- Remove and discard the O-ring seals.



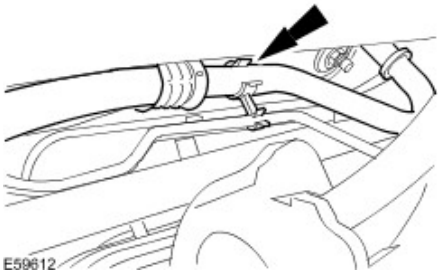
43 . Detach the brake lines.



44 . Remove the A/C refrigerant line.

- Remove the retaining clip.

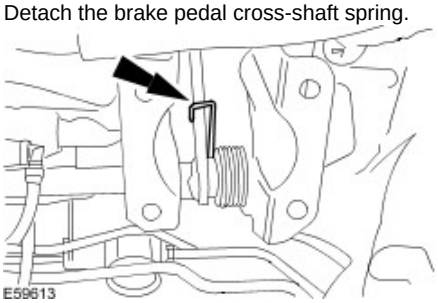
45 . Remove the A/C refrigerant line.



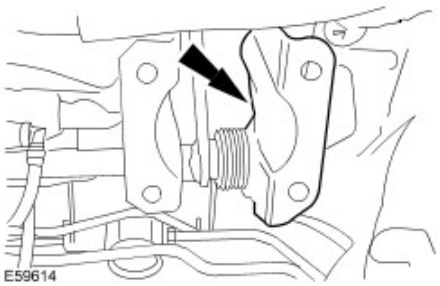
46 . **NOTE:**

Note the position of the brake pedal cross-shaft spring.

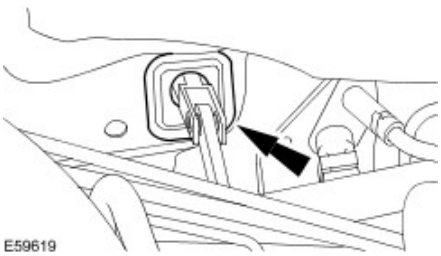
Detach the brake pedal cross-shaft spring.



47 . Detach the brake pedal cross-shaft left-hand mounting bracket.



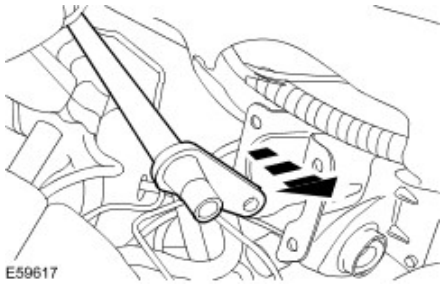
48 . Detach the brake pedal cross-shaft grommet.



49 . **NOTE:**

Remove the brake pedal cross-shaft spring bush.

Remove the brake pedal cross-shaft.



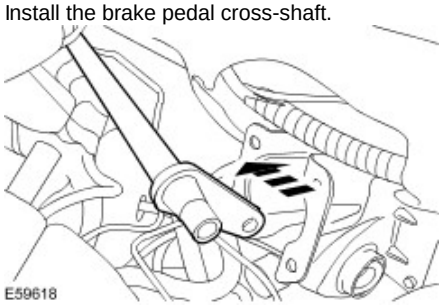
Installation

All vehicles

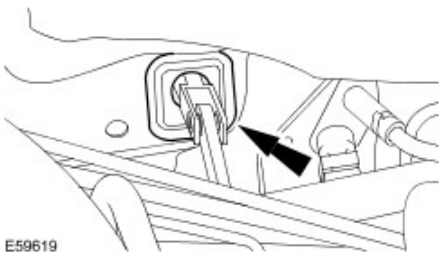
1 . **NOTE:**

Make sure that the brake pedal cross-shaft bush is correctly positioned.

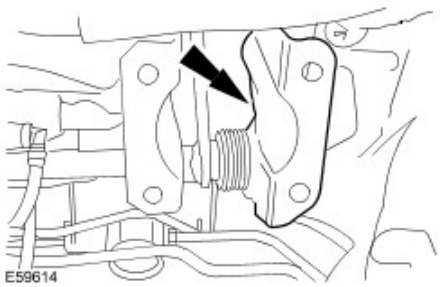
Install the brake pedal cross-shaft.



2 . Attach the brake pedal cross-shaft grommet.



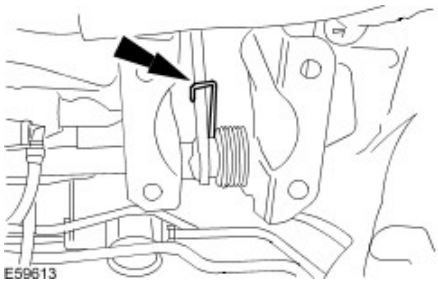
3 . Attach the brake pedal cross-shaft left-hand mounting bracket.



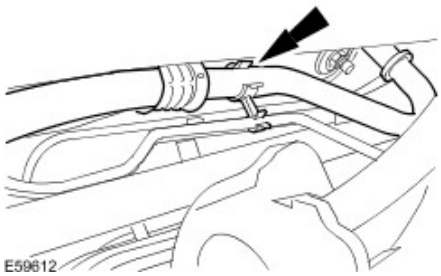
4 . **NOTE:**

Make sure the brake pedal cross-shaft spring is located in its original position.

Attach the brake pedal cross-shaft spring.



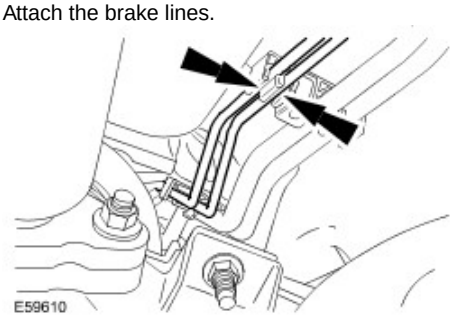
5 . Install the A/C refrigerant line.



6 . Install the A/C refrigerent line.

- Install the retaining clip.

7 . Attach the brake lines.

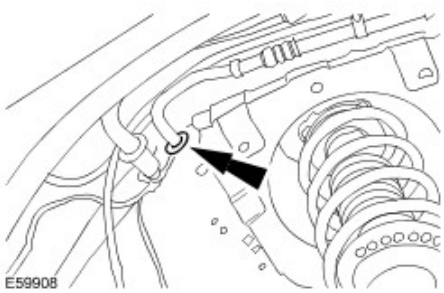


8 . **NOTE:**

Remove the blanking plugs.

Connect the A/C refrigerant line.

- Install new O-ring seals.

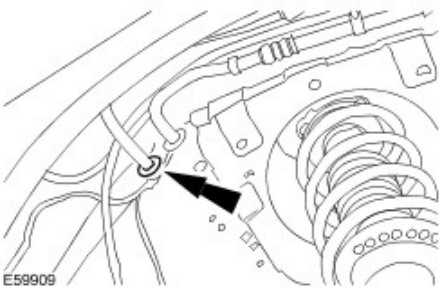


9 . **NOTE:**

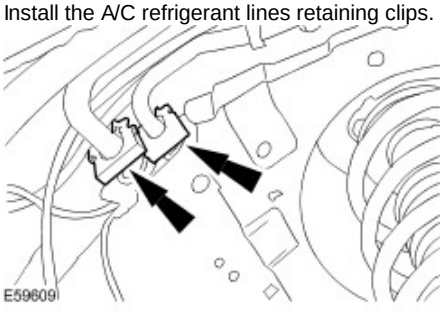
Remove the blanking plugs.

Connect the A/C refrigerant line.

- Install new O-ring seals.



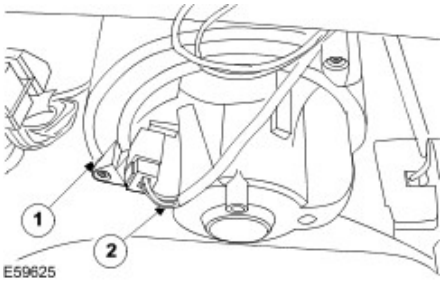
10 . Install the A/C refrigerant lines retaining clips.



11 . Install the right-hand fender splash shield.
For additional information, refer to Fender Splash Shield (76.10.90)

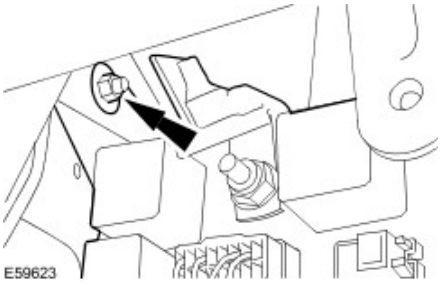
12 . Reposition the brake pedal cross-shaft securing bracket.

1) Tighten the brake pedal cross-shaft securing bracket retaining nut.
2) Reposition the brake pedal cross-shaft securing bracket.



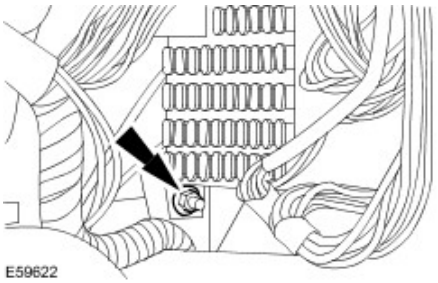
13 . Attach the CJB.

- Tighten to 6 Nm.

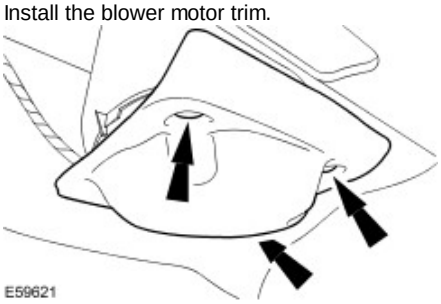


14 . Install the CJB retaining nut.

- Tighten to 6 Nm.

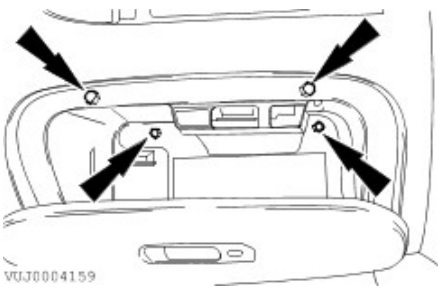


15 . Install the blower motor trim.

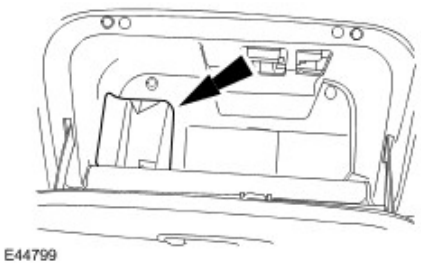


16 . Install the glove compartment.

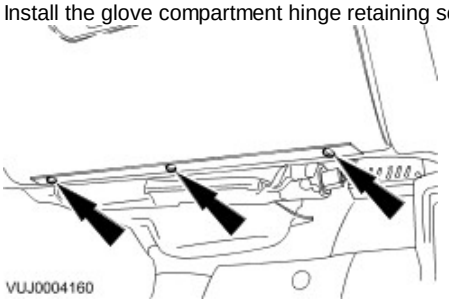
- Install the passenger compartment retaining screws.



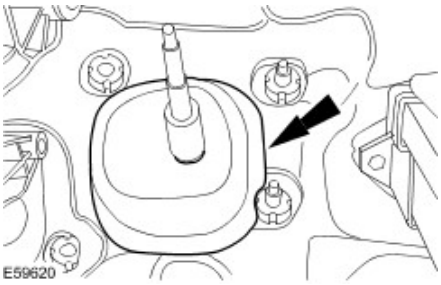
17 . Install the glove compartment finisher trim.



18 . Install the glove compartment hinge retaining screws.

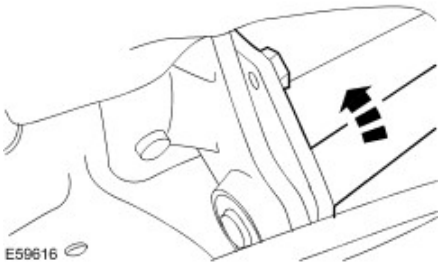


19 . Install the sound insultation.



20 . Install the pedal box.
For additional information, refer to Brake Pedal and Bracket (70.35.03)

21 . Rotate the brake pedal cross-shaft counter-clockwise.



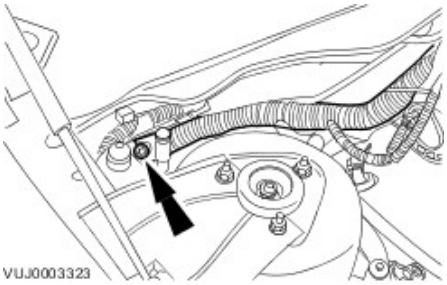
22 . Install the brake pedal cross-shaft support bracket retaining bolt.

- Tighten to 25 Nm.

All except vehicles with diesel engine

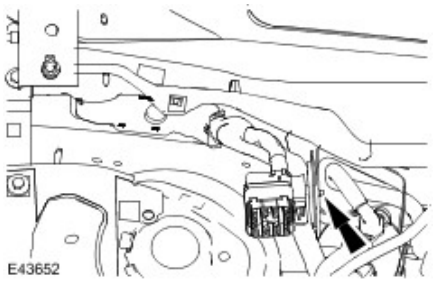
23 . Connect the ECM electrical connector.

- Using special tool 418-535, tighten to 5 Nm.



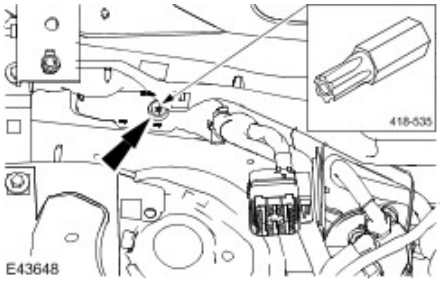
Vehicles with diesel engine

24 . Attach the engine wiring harness retaining clip.

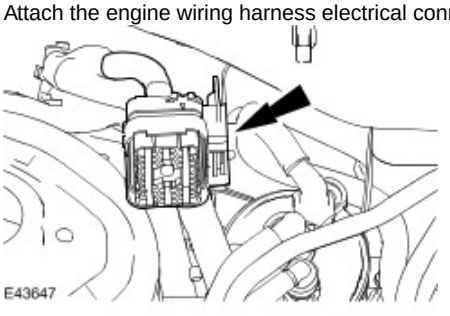


25 . Connect the ECM electrical connector.

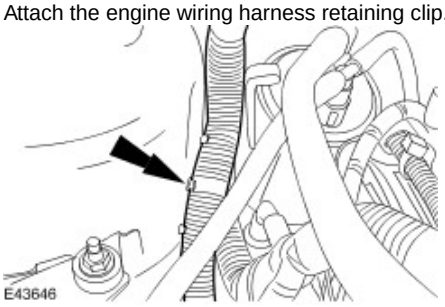
Tighten to 5 Nm.



26 . Attach the engine wiring harness electrical connector.

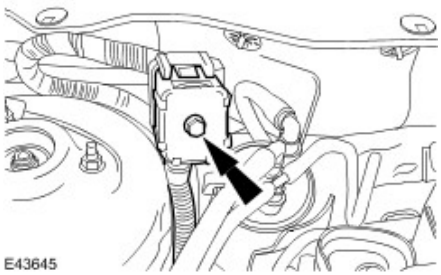


27 . Attach the engine wiring harness retaining clip.



28 . Connect the engine wiring harness electrical connector.

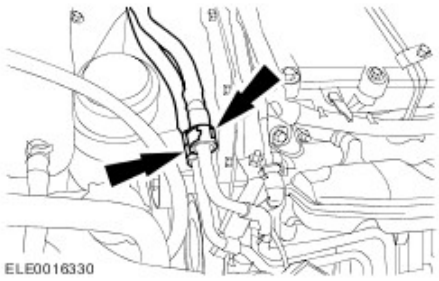
Tighten to 10 Nm.



29 . **NOTE:**

Remove the blanking plugs from the fuel pump fuel supply and return line male and female connectors.

Connect the fuel pump fuel supply and return lines.
For additional information, refer to Quick Release Coupling - Push Connect



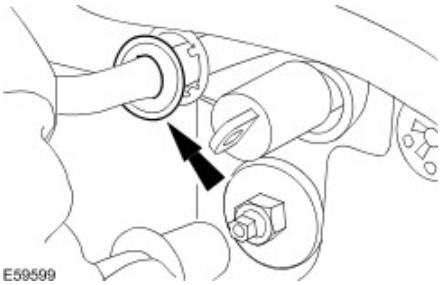
All vehicles

30 . **NOTE:**

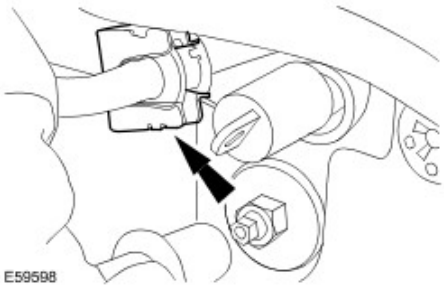
Remove the blanking plugs.

Connect the A/C refrigerant line.

Install new O-ring seals.



31 . Install the A/C refrigerant line retaining clip.

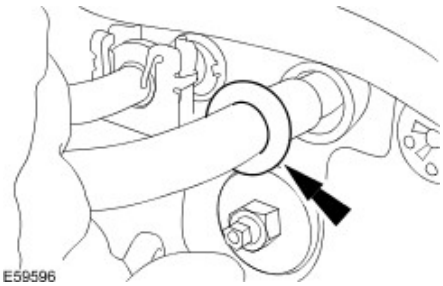


32 . **NOTE:**

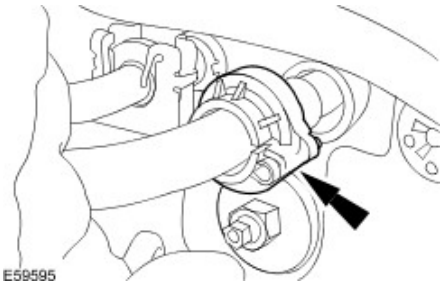
Remove the blanking plugs.

Connect the A/C refrigerant line.

Install new O-ring seals.



33 . Install the refrigerant line retaining clip.



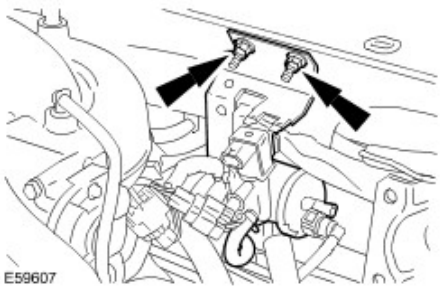
Vehicles with 2.0L engine

34 . Install the intake manifold.
For additional information, refer to Intake Manifold (30.15.01)

All except vehicles with diesel engine

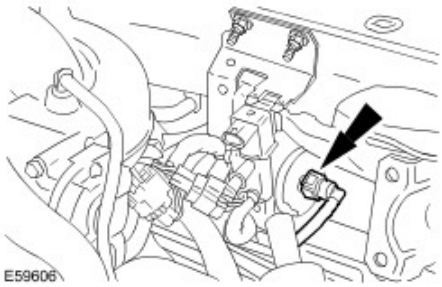
35 . Install the evaporative emission canister purge valve retaining bracket.

- Install the retaining nuts.
- Tighten to 5 Nm.

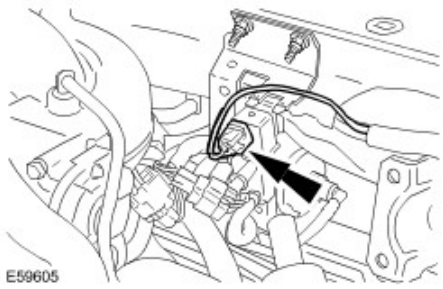


36 . Attach the wiring harness to the retaining bracket.

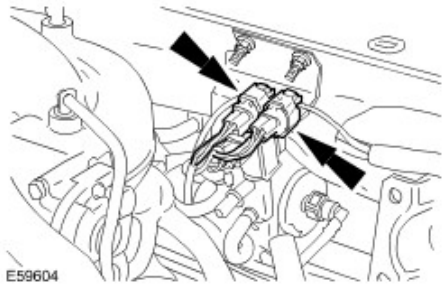
37 . Connect the lower fuel vapor hose to the evaporative emission canister purge valve.



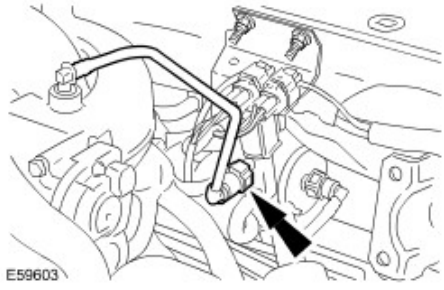
38 . Connect the evaporator solenoid electrical connector.



39 . Attach the oxygen sensor electrical connectors.



40 . Connect the upper fuel vapor hose to the evaporative emission canister purge valve.



All vehicles

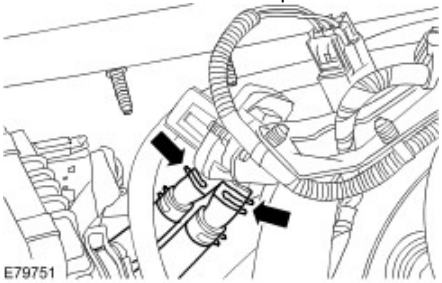
41 . Install the brake booster.
For additional information, refer to Brake Booster - RHD (70.50.17)

Vehicles with diesel particulate filter

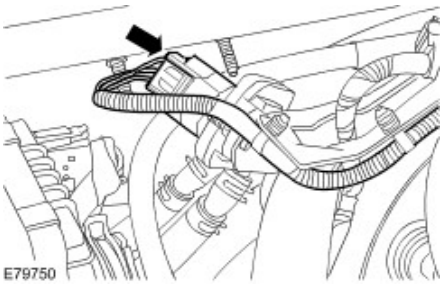
42 **NOTE:**

- Note the orientation of the DPF differential pressure high-pressure and low-pressure hoses and make sure they are installed in the same position.

Connect the DPF differential pressure sensor high-pressure and low-pressure hoses.

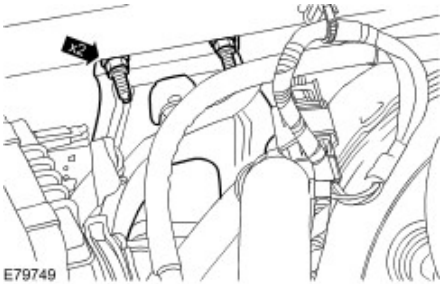


43 . Connect the DPF differential pressure sensor electrical connector.



44 . Attach the DPF differential pressure sensor retaining bracket.

- Install the retaining nuts.
- Tighten to 5 Nm.

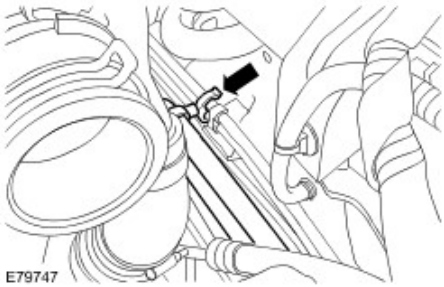


45 . Attach the wiring harness.

46 .

CAUTION: Install the retaining clip to the original position. Failure to follow this instruction may result in damage to the vehicle.

Attach the the DPF high-pressure and low-pressure hoses.



47 . Install the air cleaner outlet pipe.
For additional information, refer to Air Cleaner Outlet Pipe (19.10.31)

All vehicles

48 . Recharge the A/C refrigerant.
For additional information, refer to Air Conditioning (A/C) System Recovery, Evacuation and Charging (82.30.30)

49 . Connect the battery ground cable.
For additional information, refer to Battery Connect (86.15.15)

Description	Nm	lb-ft	lb-in
Brake booster retaining nuts	25	18	-
Brake master cylinder retaining nuts	25	18	-
Coolant expansion tank retaining bolt	3	-	27
Speed control module retaining bolt - Vehicles with 2.0L engine	4	-	35
Vacuum pump retaining nuts - Vehicles with 2.0L engine	10	-	89
Vacuum pump retaining bolts - Vehicles with diesel engine	23	17	-

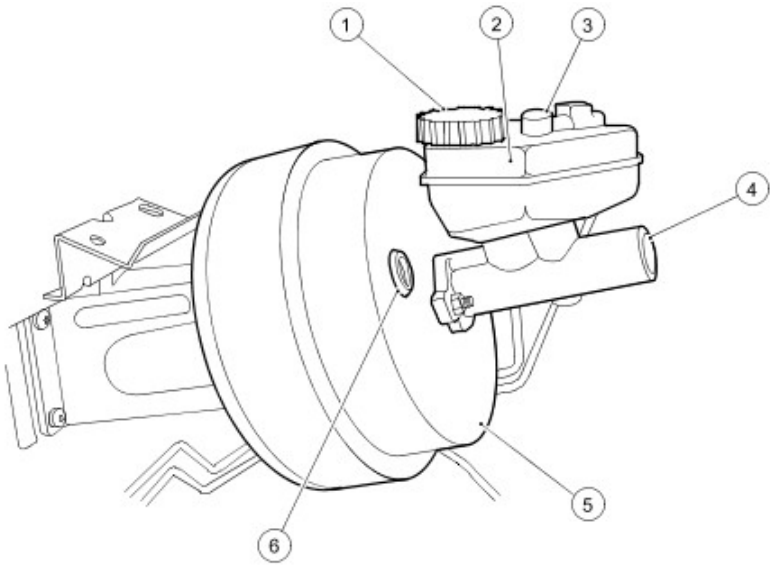
Torque Specifications

Description	Nm	Lb-Ft	Lb-In
Brake booster retaining nuts	20	15	-
Vacuum pump retaining nuts	25	18	-

Published: Mar 29, 2001

Brake Booster

WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with eyes. Wash hands after handling. If brake fluid contacts the eyes, flush the eyes for 15 minutes with cold running water. Get medical attention if irritation persists. If taken internally, drink water and induce vomiting. Get medical attention immediately. Failure to follow these instructions may result in personal injury.



VUJ0003042

Item	Part Number	Description
1	—	Brake fluid reservoir filler cap
2	—	Brake fluid reservoir
3	—	Brake fluid low level warning indicator
4	—	Brake master cylinder
5	—	Brake booster
6	—	Brake booster vacuum hose grommet

The diaphragm type power brake booster:

- is self contained.
- is mounted on the engine side of the bulkhead.
- uses engine intake manifold vacuum, vacuum pump and atmospheric pressure for its assistance.
- is connected to a manifold vacuum hose with a built in non return valve.

Published: Mar 2, 2001

Power Brake System

For additional information, refer to <<206-00>>.

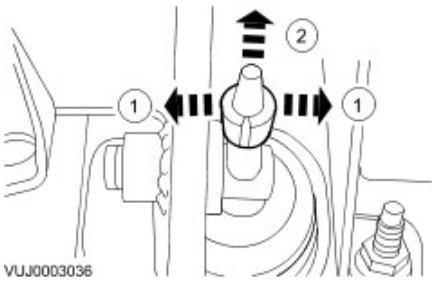
Published: Apr 16, 2004

Brake Booster - LHD (70.50.17)

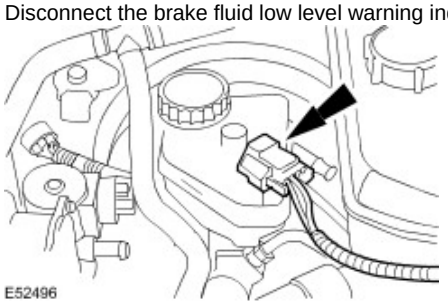
Removal

All vehicles

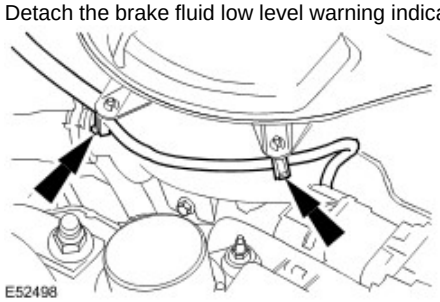
1 . Remove the brake booster push rod retaining clip.
   1) Release the brake booster push rod retaining clip.
   2) Remove the brake booster push rod retaining clip.



2 . Disconnect the brake fluid low level warning indicator electrical connector.

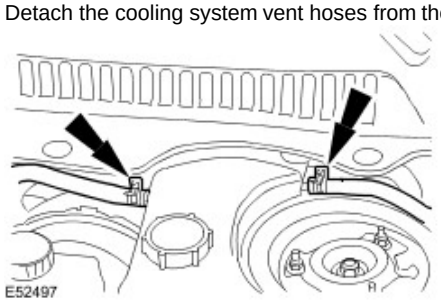


3 . Detach the brake fluid low level warning indicator wiring harness from the coolant expansion tank.



4 . **NOTE:**
   Install blanking plugs to the cooling system vent hoses and the coolant expansion tank.

   Detach the cooling system vent hoses from the coolant expansion tank.

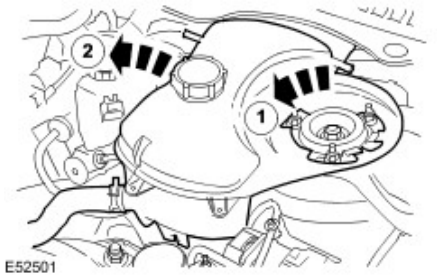


5 . Remove the coolant expansion tank retaining bolt.

6 . Reposition the coolant expansion tank.

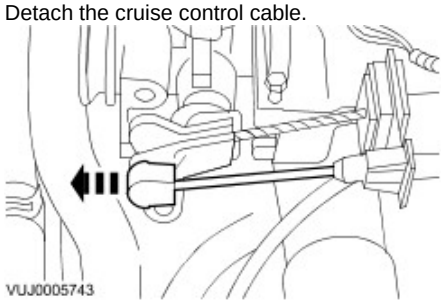
1) Detach the coolant expansion tank.

2) Reposition the coolant expansion tank.



Vehicles with 2.0L engine

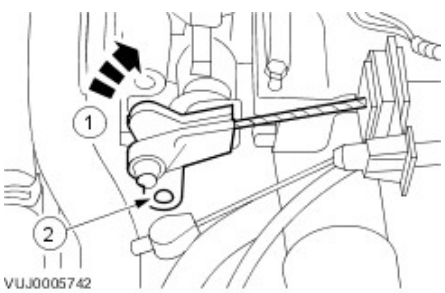
7 . Detach the cruise control cable.



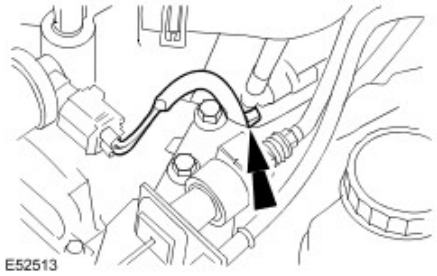
8 . Detach the throttle cable.

1) Reposition the throttle lever to the fully open position.

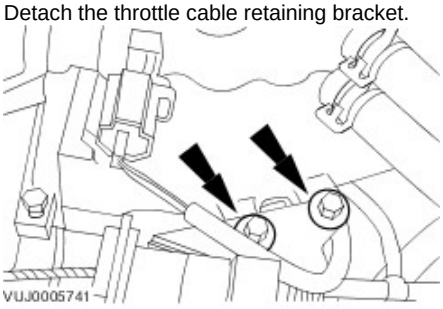
2) Detach the throttle cable.



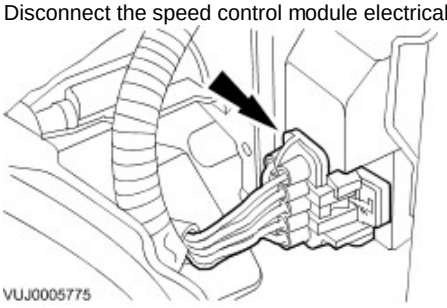
9 . Detach the idle air control (IAC) valve wiring harness.



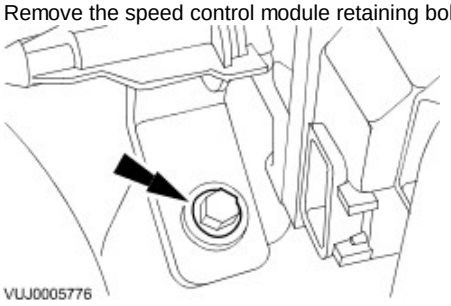
10 . Detach the throttle cable retaining bracket.



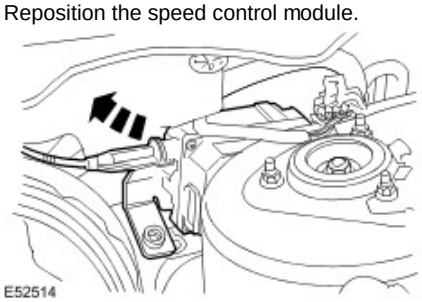
11 . Disconnect the speed control module electrical connector.



12 . Remove the speed control module retaining bolt.



13 . Reposition the speed control module.



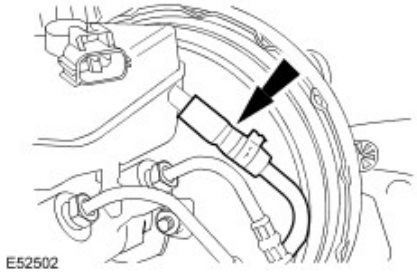
Vehicles with manual transmission

14 . **CAUTION: If brake fluid is split on the paintwork, the affected area must be immediately washed down with cold water. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:

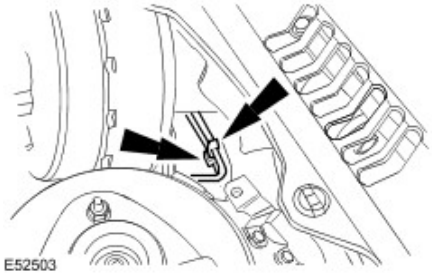
Install blanking plugs to the clutch master cylinder feed hose and the brake fluid reservoir.

Detach the clutch master cylinder feed hose.



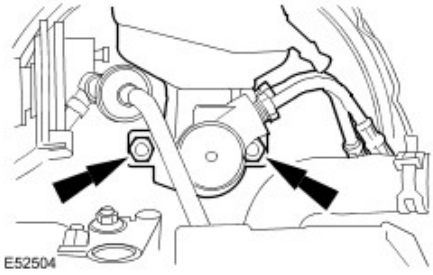
All vehicles

15 . Detach the brake fluid supply tubes from the retaining clip.

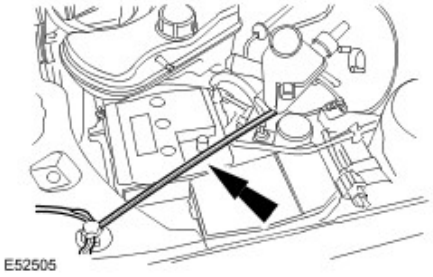


16 . Detach the brake master cylinder assembly from the brake booster.

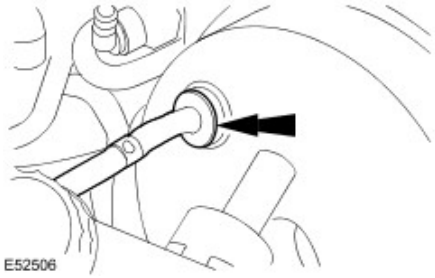
- Remove and discard the O-ring seal at the rear of the brake master cylinder.



17 . Using a suitable cord, reposition the brake master cylinder assembly.

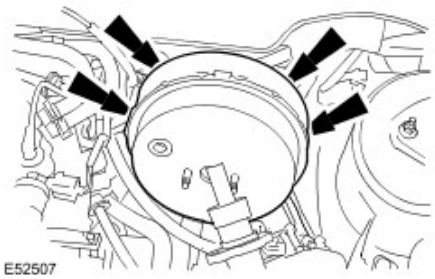


18 . Detach the brake booster vacuum hose.

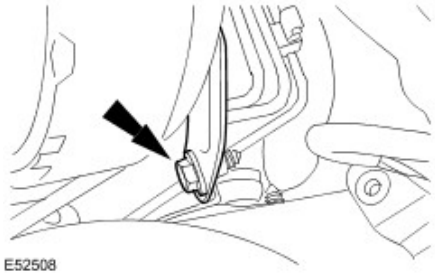


19 . Detach the brake booster.

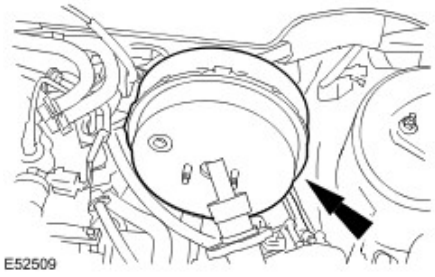
- Remove the brake booster retaining nuts.



20 . Remove the brake booster support bracket.



21 . Remove the brake booster.



Installation

All vehicles

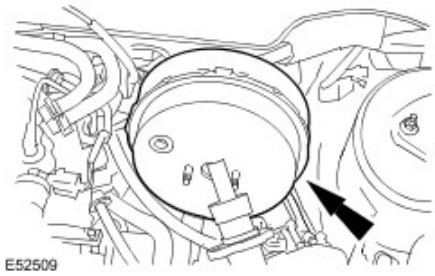
1 . **NOTE:**

Make sure the brake booster push rod is correctly aligned to the brake pedal.

NOTE:

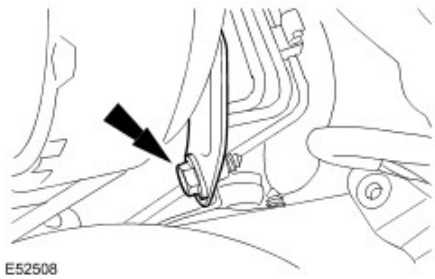
Do not install the brake booster retaining nuts at this stage.

Install the brake booster.



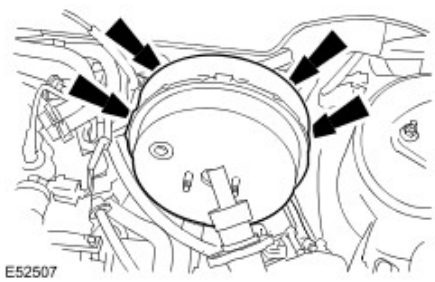
2 . Install the brake booster support bracket.

- Loosely install the brake booster support bracket retaining bolt.

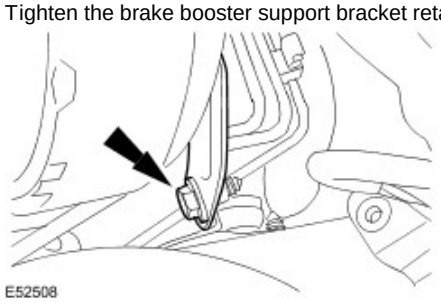


3 . Attach the brake booster.

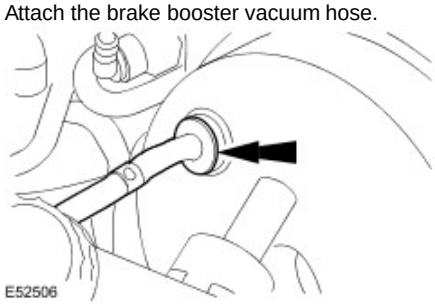
- Tighten to 25 Nm.



4 . Tighten the brake booster support bracket retaining bolt.



5 . Attach the brake booster vacuum hose.



6 . **NOTE:**

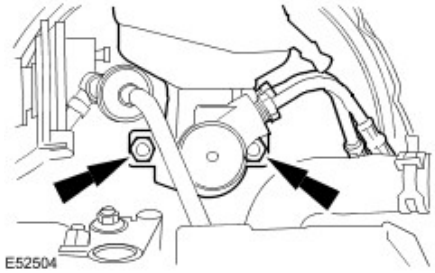
Install a new brake master cylinder to brake booster O-ring seal.

NOTE:

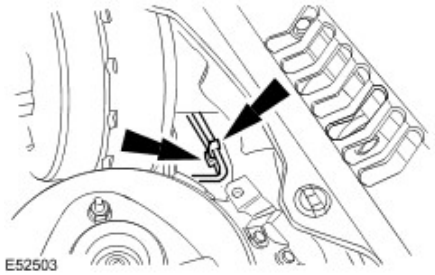
Make sure the brake booster push rod is correctly aligned to the brake master cylinder assembly.

Attach the brake master cylinder assembly to the brake booster.

Tighten to 25 Nm.



7 . Attach the brake fluid supply tubes to the retaining clip.



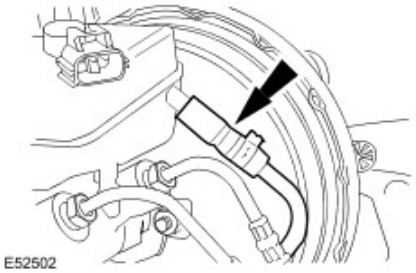
Vehicles with manual transmission

8 . **CAUTION: If brake fluid is split on the paintwork, the affected area must be immediately washed down with cold water. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:

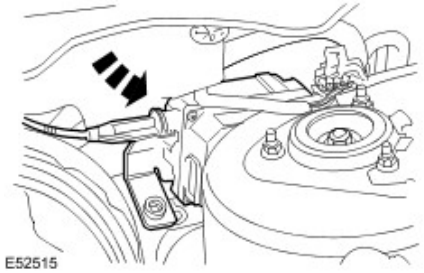
Remove the blanking plugs from the clutch master cylinder feed hose and the brake fluid reservoir.

Attach the clutch master cylinder feed hose.



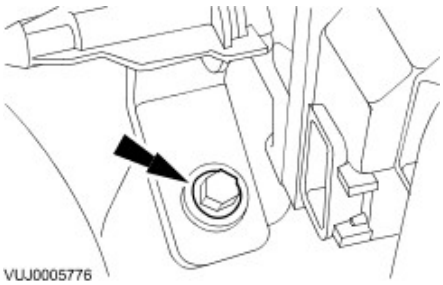
Vehicles with 2.0L engine

9 . Reposition the speed control module.

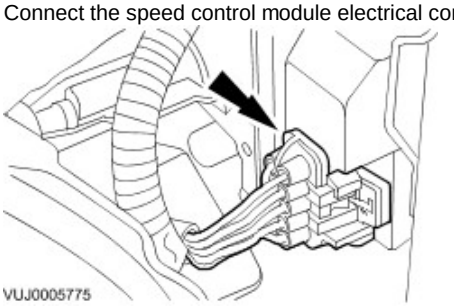


10 . Install the speed control module retaining bolt.

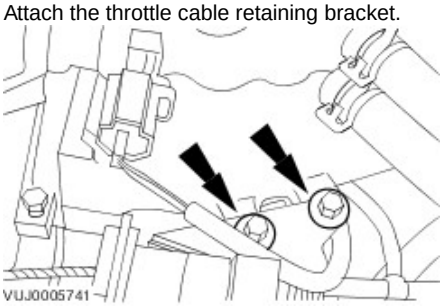
Tighten to 4 Nm.



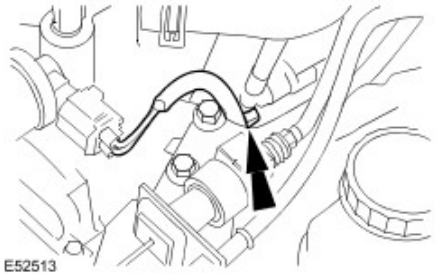
11 . Connect the speed control module electrical connector.



12 . Attach the throttle cable retaining bracket.

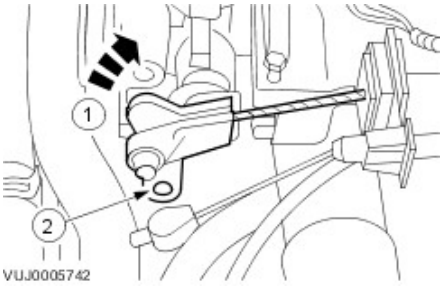


13 . Attach the IAC valve wiring harness.

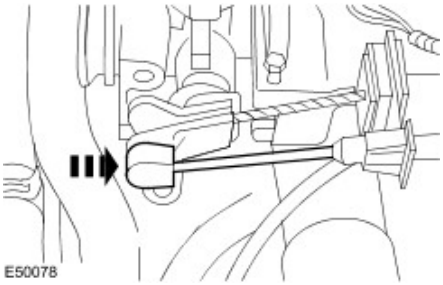


14 . Attach the throttle cable.

1) Reposition the throttle lever to the fully open position.
2) Attach the throttle cable.



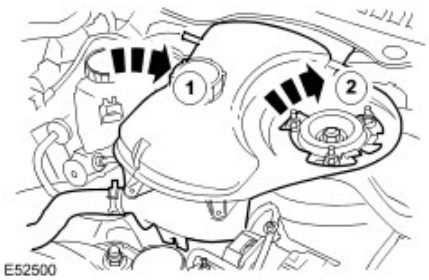
15 . Attach the cruise control cable.



All vehicles

16 . Attach the coolant expansion tank.

1) Reposition the coolant expansion tank.
2) Attach the coolant expansion tank.



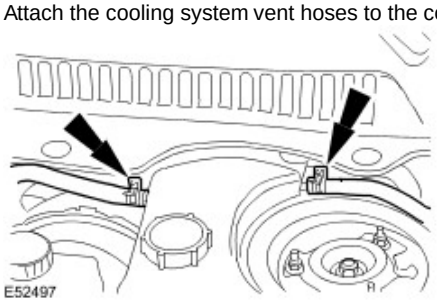
17 . Install the coolant expansion tank retaining bolt.

Tighten to 3 Nm.

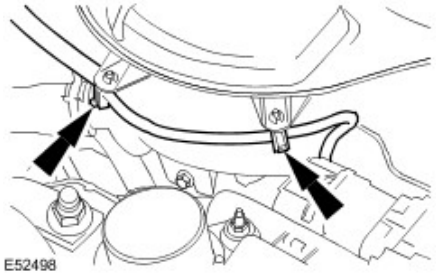
18 . **NOTE:**

Remove the blanking plugs from the cooling system vent hoses and the coolant expansion tank.

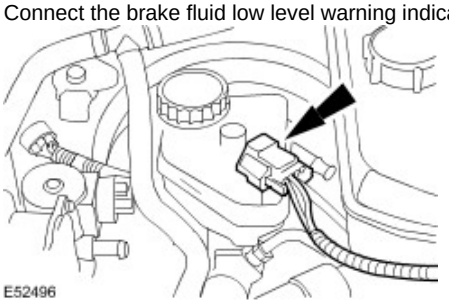
Attach the cooling system vent hoses to the coolant expansion tank.



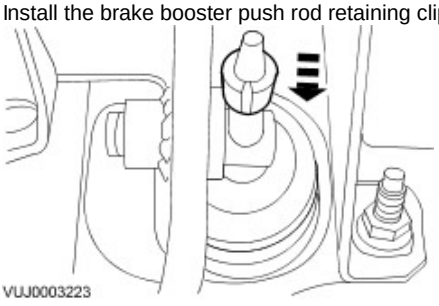
19 . Attach the brake fluid low level warning indicator wiring harness to the coolant expansion tank.



20 . Connect the brake fluid low level warning indicator electrical connector.



21 . Install the brake booster push rod retaining clip.



22 . Check and top up the cooling system as required.

Vehicles with manual transmission

23 . Bleed the clutch system.
For additional information, refer to Clutch System Bleeding - Vehicles With: 5-Speed Manual Transmission (33.15.01)

Published: Apr 16, 2004

Brake Booster - RHD (70.50.17)

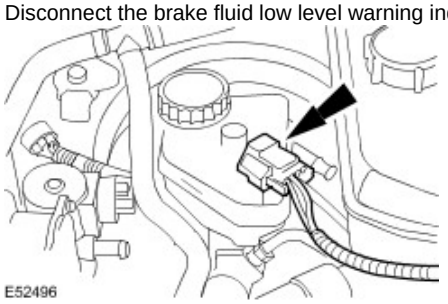
Special Service Tools

Brake pedal hold down tool
JDS 9013

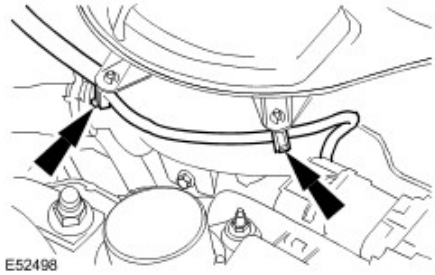
Removal

All vehicles

1 . Disconnect the brake fluid low level warning indicator electrical connector.



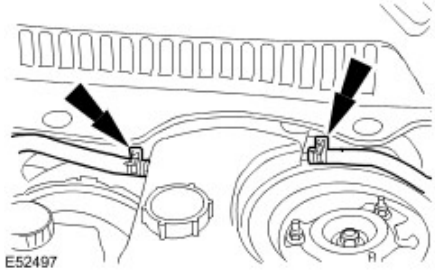
2 . Detach the brake fluid low level warning indicator wiring harness from the coolant expansion tank.



3 . **NOTE:**

Install blanking plugs to the cooling system vent hoses and the coolant expansion tank.

Detach the cooling system vent hoses from the coolant expansion tank.

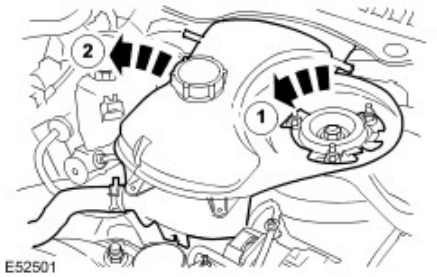


4 . Remove the coolant expansion tank retaining bolt.

5 . Reposition the coolant expansion tank.

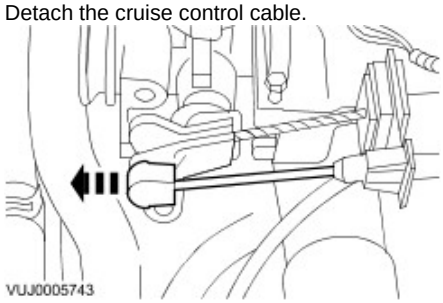
1) Detach the coolant expansion tank.

2) Reposition the coolant expansion tank.



Vehicles with 2.0L engine

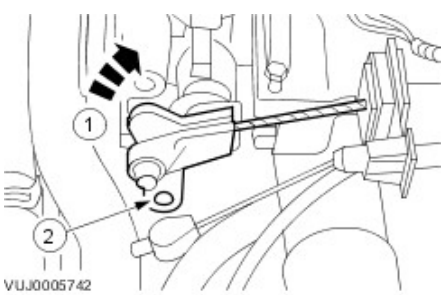
6 . Detach the cruise control cable.



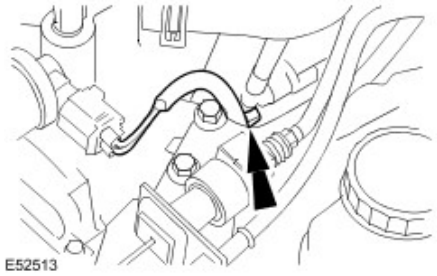
7 . Detach the throttle cable.

1) Reposition the throttle lever to the fully open position.

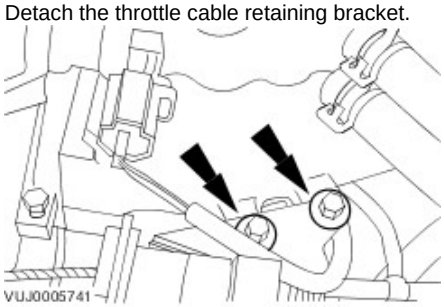
2) Detach the throttle cable.



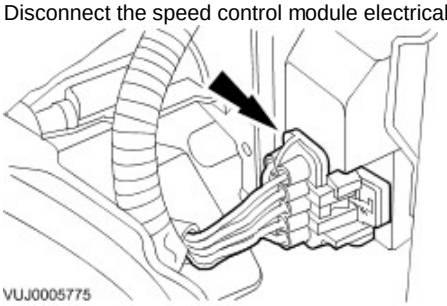
8 . Detach the idle air control (IAC) valve wiring harness.



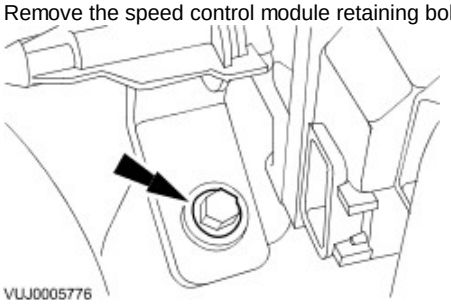
9 . Detach the throttle cable retaining bracket.



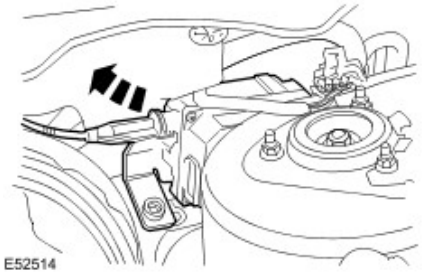
10 . Disconnect the speed control module electrical connector.



11 . Remove the speed control module retaining bolt.



12 . Reposition the speed control module.



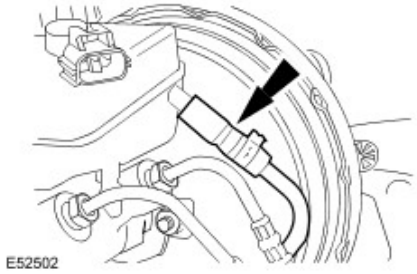
Vehicles with manual transmission

13 . **CAUTION: If brake fluid is split on the paintwork, the affected area must be immediately washed down with cold water. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:

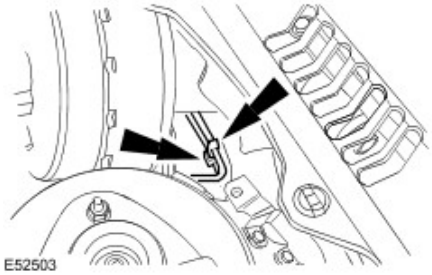
Install blanking plugs to the clutch master cylinder feed hose and the brake fluid reservoir.

Detach the clutch master cylinder feed hose.



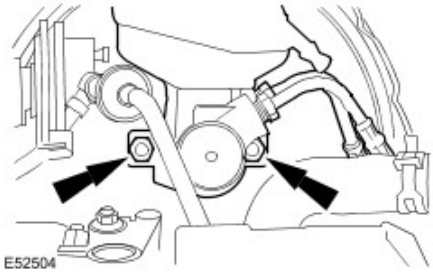
All vehicles

14 . Detach the brake fluid supply tubes from the retaining clip.

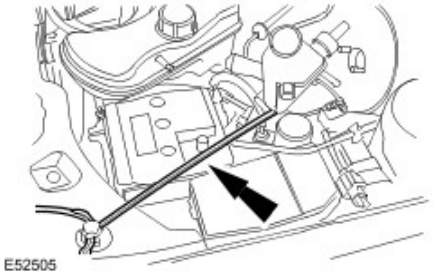


15 . Detach the brake master cylinder assembly from the brake booster.

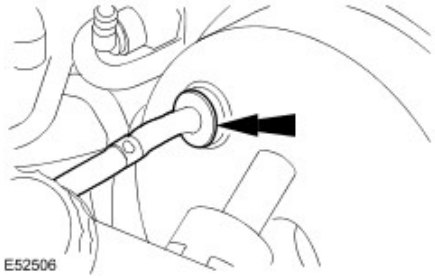
- Remove and discard the O-ring seal at the rear of the brake master cylinder.



16 . Using a suitable cord, reposition the brake master cylinder assembly.

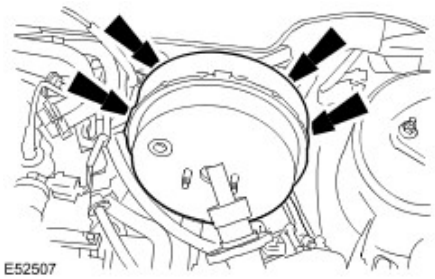


17 . Detach the brake booster vacuum hose.

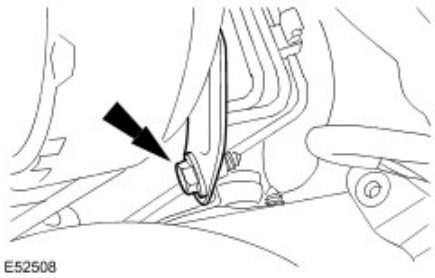


18 . Detach the brake booster.

- Remove the brake booster retaining nuts.

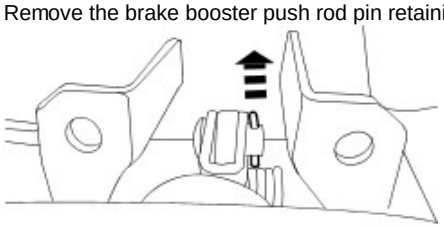


19 . Remove the brake booster support bracket.

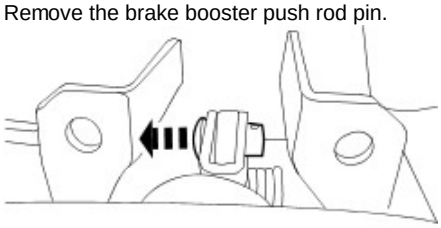


20 . Using the brake pedal hold down tool, apply the brake pedal until the brake booster push rod pin can be removed.

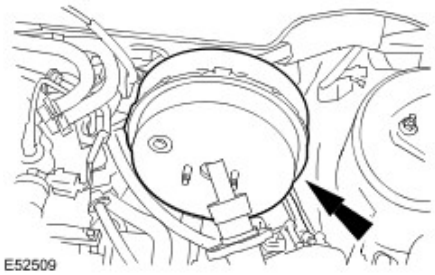
21 . Remove the brake booster push rod pin retaining clip.



22 . Remove the brake booster push rod pin.



23 . Remove the brake booster.



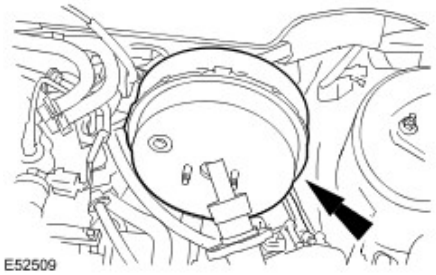
Installation

All vehicles

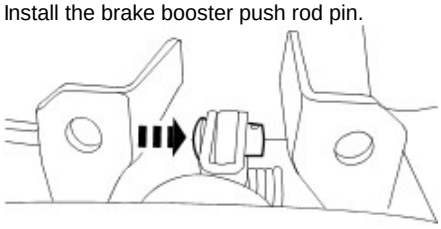
1 . **NOTE:**

Do not install the brake booster retaining nuts at this stage.

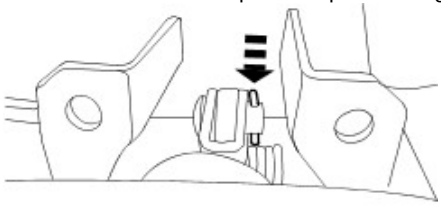
Install the brake booster.



2 . Install the brake booster push rod pin.



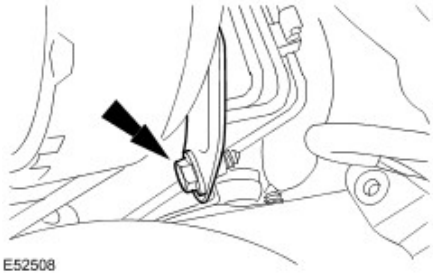
3 . Install the brake booster push rod pin retaining clip.



4 . Remove the brake pedal hold down tool.

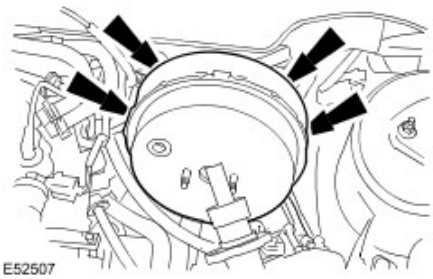
5 . Install the brake booster support bracket.

- Loosely install the brake booster support bracket retaining bolt.

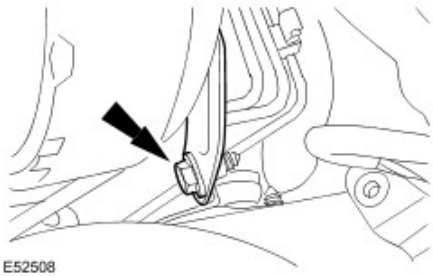


6 . Attach the brake booster.

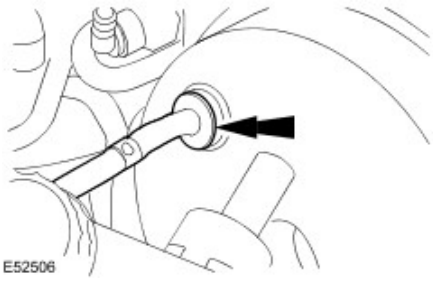
- Tighten to 25 Nm.



7 . Tighten the brake booster support bracket retaining bolt.



8 . Attach the brake booster vacuum hose.



9 . **NOTE:**

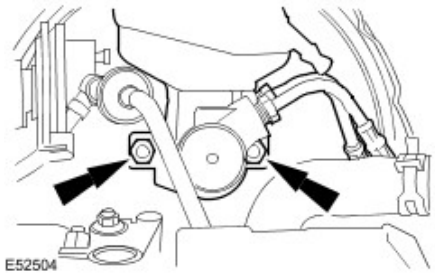
Install a new brake master cylinder to brake booster O-ring seal.

NOTE:

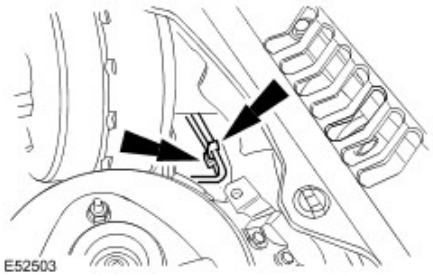
Make sure the brake booster push rod is correctly aligned to the brake master cylinder assembly.

Attach the brake master cylinder assembly to the brake booster.

- Tighten to 25 Nm.



10 . Attach the brake fluid supply tubes to the retaining clip.



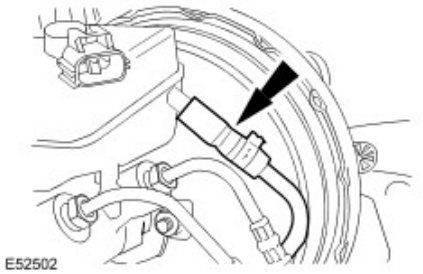
Vehicles with manual transmission

11 . **CAUTION: If brake fluid is split on the paintwork, the affected area must be immediately washed down with cold water. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:

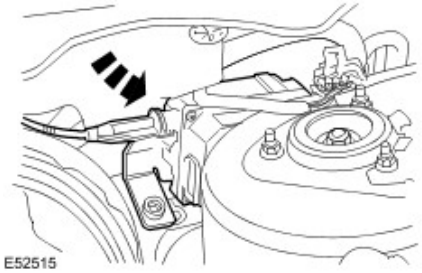
Remove the blanking plugs from the clutch master cylinder feed hose and the brake fluid reservoir.

Attach the clutch master cylinder feed hose.



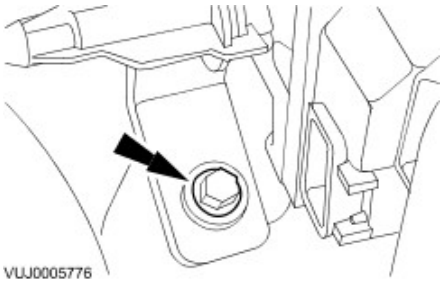
Vehicles with 2.0L engine

12 . Reposition the speed control module.

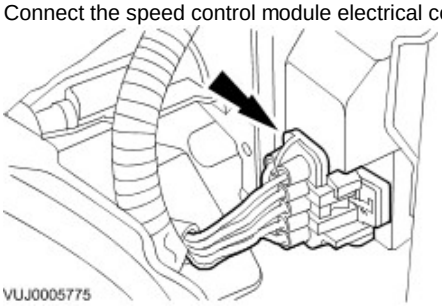


13 . Install the speed control module retaining bolt.

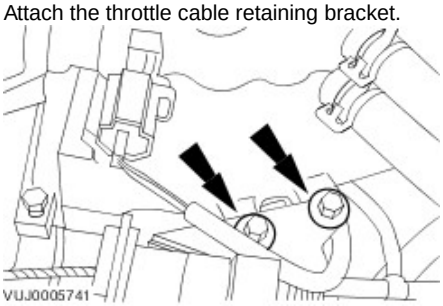
- Tighten to 4 Nm.



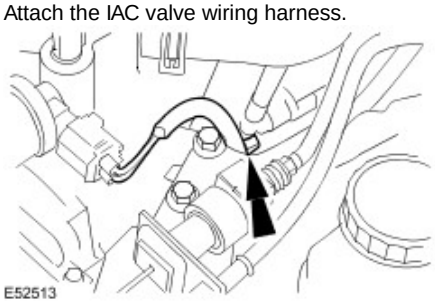
14 . Connect the speed control module electrical connector.



15 . Attach the throttle cable retaining bracket.

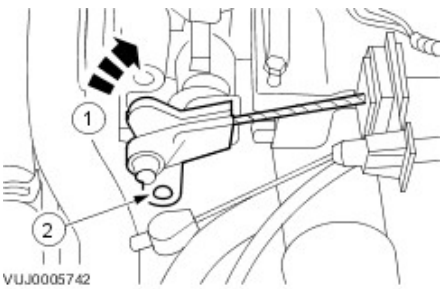


16 . Attach the IAC valve wiring harness.

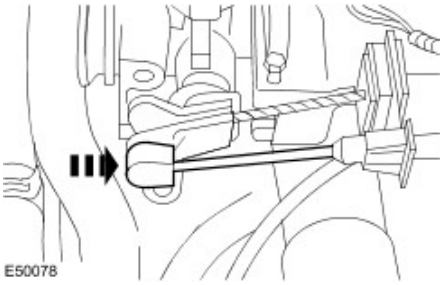


17 . Attach the throttle cable.

1) Reposition the throttle lever to the fully open position.
2) Attach the throttle cable.



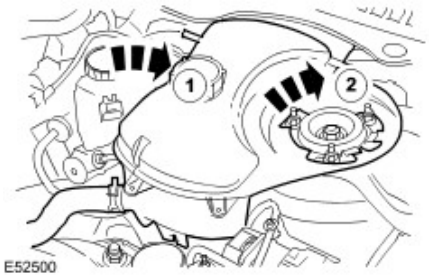
18 . Attach the cruise control cable.



All vehicles

19 . Attach the coolant expansion tank.

1) Reposition the coolant expansion tank.
2) Attach the coolant expansion tank.



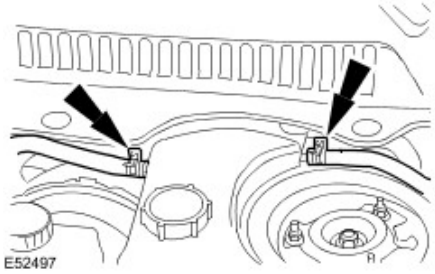
20 . Install the coolant expansion tank retaining bolt.

Tighten to 3 Nm.

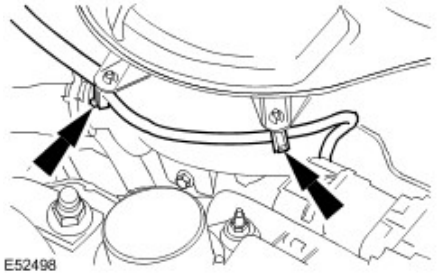
21 . **NOTE:**

Remove the blanking plugs from the cooling system vent hoses and the coolant expansion tank.

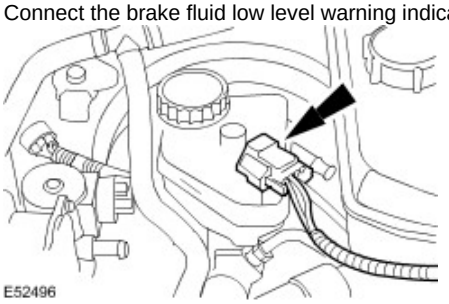
Attach the cooling system vent hoses to the coolant expansion tank.



22 . Attach the brake fluid low level warning indicator wiring harness to the coolant expansion tank.



23 . Connect the brake fluid low level warning indicator electrical connector.



24 . Check and top up the cooling system as required.

Vehicles with manual transmission

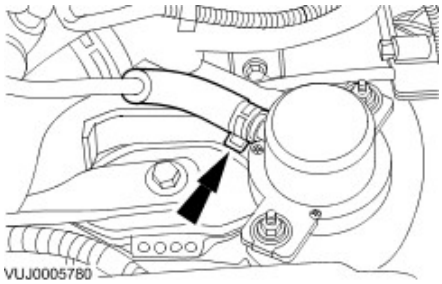
25 . Bleed the clutch system.
For additional information, refer to Clutch System Bleeding - Vehicles With: 5-Speed Manual Transmission (33.15.01)

Published: Nov 30, 2001

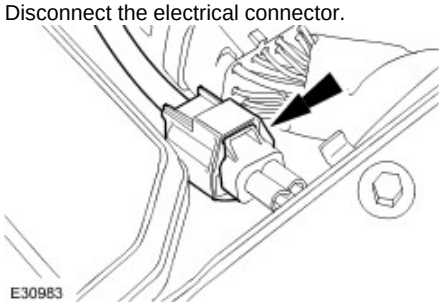
Brake Vacuum Pump - 2.0L

Removal

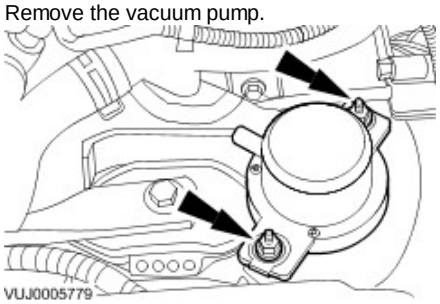
1 . Disconnect the vacuum hose.
   - Release the retaining clip.



2 . Disconnect the electrical connector.

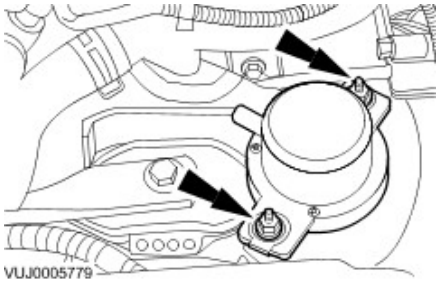


3 . Remove the vacuum pump.



Installation

1 . To install, reverse the removal procedure.
   - Tighten to 25 Nm.



Published: Dec 3, 2003

Brake Vacuum Pump - 2.0L Diesel/2.2L Diesel

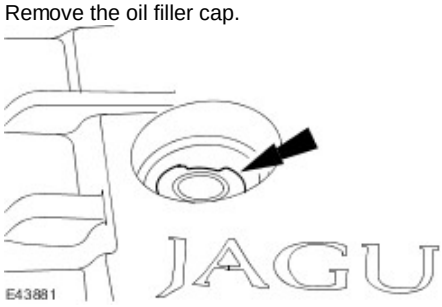
Special Service Tools

Remover/Install, Cooling Hose Clamp
303-397

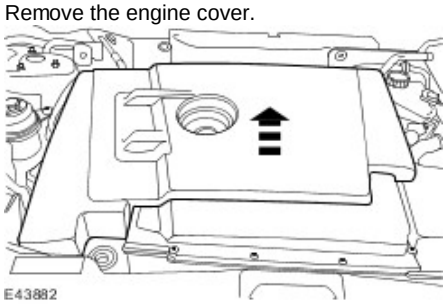
Removal

1 . Remove the oil level indicator.

2 . Remove the oil filler cap.



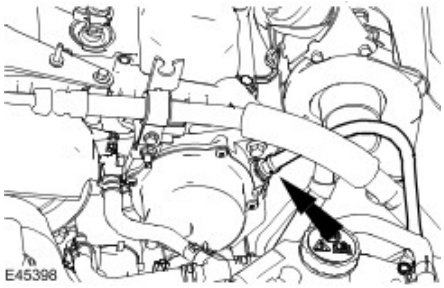
3 . Remove the engine cover.



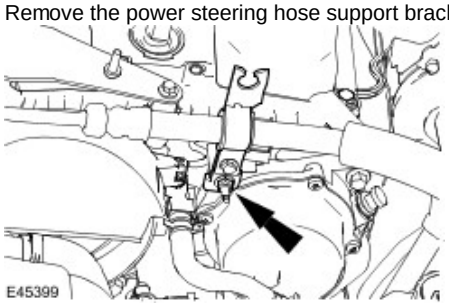
4 . Drain the cooling system.
For additional information, refer to Cooling System Draining, Filling and Bleeding

5 . Remove the air cleaner outlet pipe.
For additional information, refer to Air Cleaner Outlet Pipe (19.10.31)

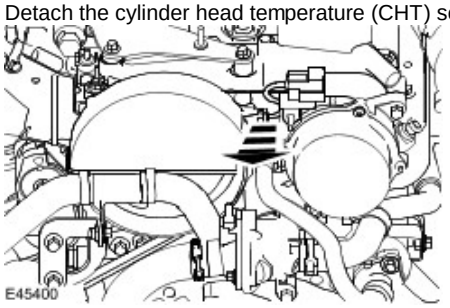
6 . Disconnect the brake vacuum hose from the brake vacuum pump.



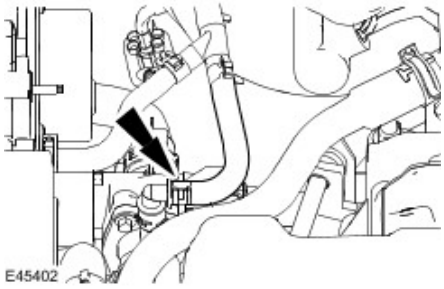
7 . Remove the power steering hose support bracket.



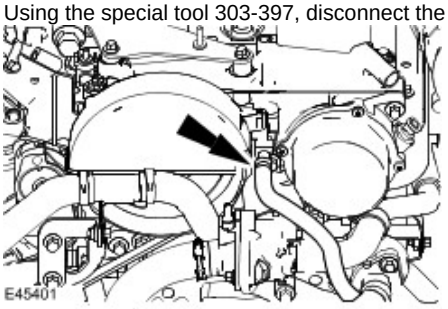
8 . Detach the cylinder head temperature (CHT) sensor electrical connector away from the brake vacuum pump.



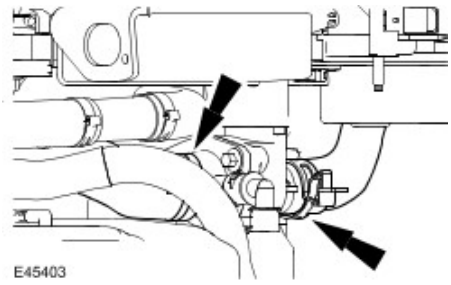
9 . Using the special tool 303-397, disconnect the coolant hose.



10 . Using the special tool 303-397, disconnect the coolant expansion tank hose from the brake vacuum pump.

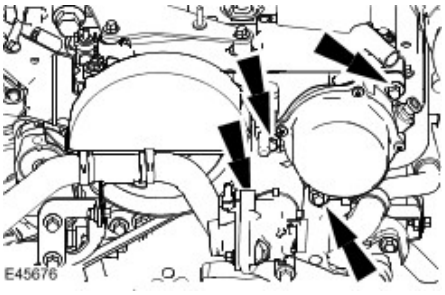


11 . Using the special tool 303-397, disconnect the coolant hoses.



12 . Remove the brake vacuum pump.

- Remove and discard the gasket.



Installation

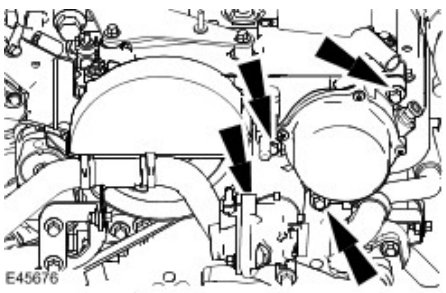
1 . **CAUTION: Make sure the drive coupling is aligned with the camshaft coupling.**

NOTE:

Install a new brake vacuum pump gasket.

To install, reverse the removal procedure.

- Tighten to 23 Nm.



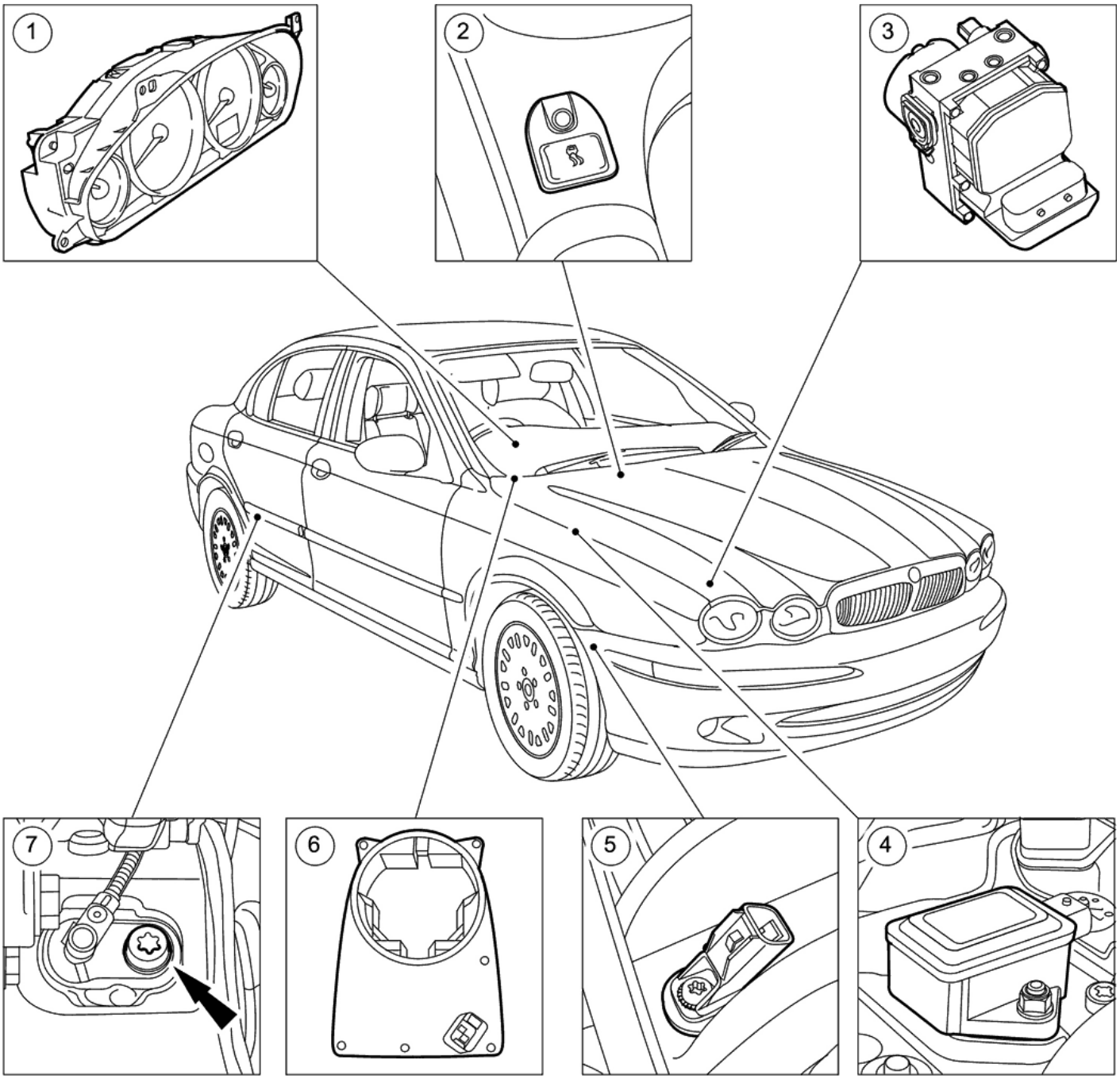
General Specifications

Item	Specification
Brake fluid	ITT Super Dot 4

Torque Specifications

Description	Nm	Lb-Ft	Lb-In
Brake line connections to brake pressure control valve block	17	13	-
Steering wheel sensor securing screws	1	-	9
Yaw rate sensor securing nut	6	-	53
Front wheel speed sensor securing screw	5	-	44
Rear wheel speed sensor securing screw (2.5L and 3.0L)	22	16	-
Rear wheel speed sensor securing screw (2.0L only)	7	-	62

Anti-Lock Control - Stability Assist



VUJ0004357

Item	Description
1	Instrument cluster
2	Dynamic stability control 'ON/OFF' switch
3	ABS/Traction control hydraulic unit
4	Yaw rate sensor
5	Front wheel speed sensor
6	Steering wheel angle sensor
7	Rear wheel speed sensor

The anti-lock brake system (ABS) modulates brake pressure on each wheel independently to maintain vehicle stability during braking. The ABS continually monitors the rotational velocity of each wheel anytime the ignition switch is in the RUN position and determines if a tire is loosing traction when the brakes are applied. Only then does the ABS intervene to modulate the brake pressure to the necessary wheel. The modulation continues until the wheel rotates freely. The brake pressure is then restored and the modulate/restore cycle is repeated whenever loss of traction is detected. This cycle occurs at a rate of several times per second.

The ABS module is capable of detecting the following system conditions

- Hydraulic valve failure
- Wheel speed sensor failure
- ABS power relay short circuit
- Interconnect failures to the ABS sensors, power and ground to the ABS module
- Over/under voltage conditions

The ABS provides self-diagnostics and displays failure messages, via the ABS indicator, in the instrument cluster. Failure of the ABS module, for whatever reason, will not compromise the normal operation of the brake system.

Dynamic stability control (DSC) maximises vehicle stability under all conditions. The DSC system compares actual vehicle course to that intended by the driver. If the intended course differs from the actual course due to over steer or under steer conditions, the DSC system will brake individual wheels and reduce engine torque to bring the vehicle back to the driver's intended direction. By using a combined yaw rate sensor and lateral accelerometer, the vehicles rotational motion around its vertical axis and centrifugal forces generated while cornering are calculated to determine the vehicle's actual behavior. Using additional sensors for detecting steering wheel position and road wheel speed enables the system to recognize the driver's intentions.

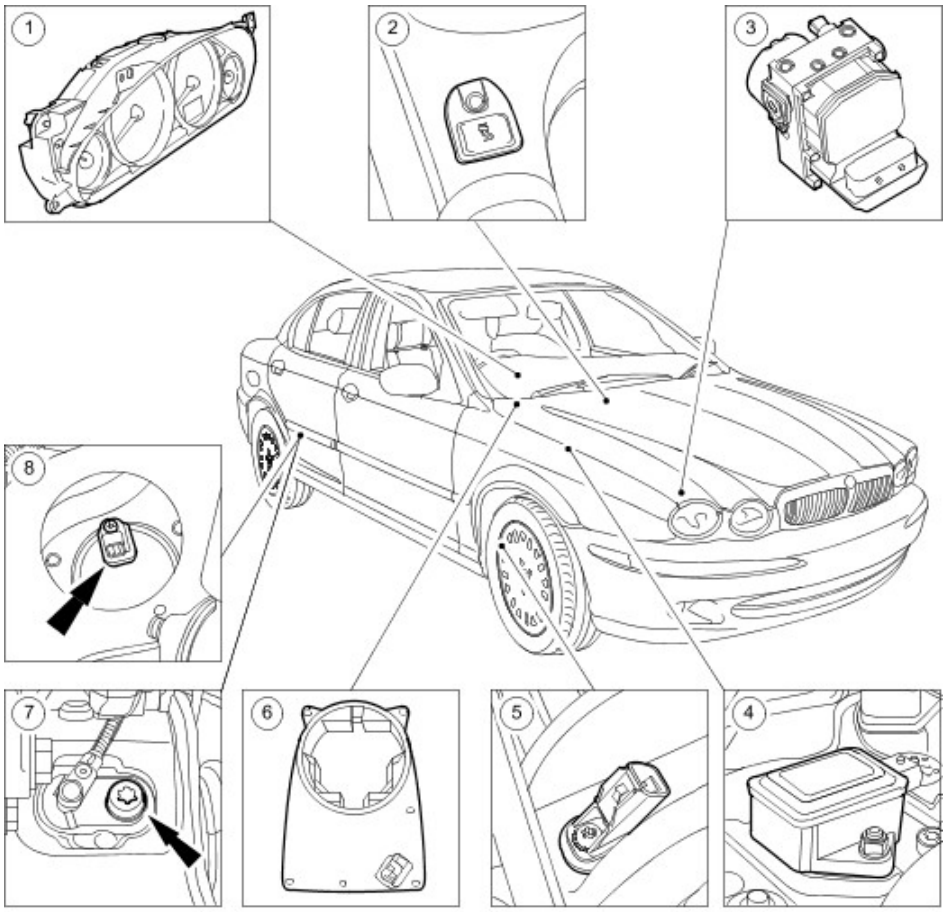
Traction control is an additional function added to the DSC system. The vehicles driven wheels are continually monitored for wheel spin relative to the calculated reference speed and to each other. If wheel spin is detected, the traction control function intervenes independently of the driver, applying brake pressure to the slipping wheel and reducing the engine drive torque supply. Meanwhile, brake pressure is modulated by the traction control until traction is re-established. Traction control brake actuation is diminished above 25 mph. Above this speed traction control relies primarily on engine torque reduction.

Dynamic stability control is enabled/disabled via the DSC 'ON/OFF' switch. When the switch is in the 'OFF' position, the amber DSC warning lamp solidly illuminates within the instrument cluster message center. The DSC is automatically activated when the ignition is switched on. The DSC provides self-diagnostics also via the instrument cluster message center.

The traction control brake intervention is automatically disabled whenever the brakes exceed a temperature limit. The traction brake intervention will remain disabled until the brakes have cooled, irrespective of ignition switch position or ignition switch cycling.

Published: Aug 10, 2005

Anti-Lock Control - Stability Assist



E30961

Item	Part Number	Description
1	—	Instrument cluster
2	-	Dynamic stability control 'ON/OFF' switch
3	-	ABS/Traction control hydraulic unit
4	-	Yaw rate sensor
5	-	Front wheel speed sensor
6	-	Steering wheel angle sensor
7	-	Rear wheel speed sensor - Vehicles with 2.5L and 3.0L engines
8		Rear wheel speed sensor - Vehicles with 2.0L or diesel engines

The anti-lock brake system (ABS) modulates brake pressure on each wheel independently to maintain vehicle stability during braking. The ABS continually monitors the rotational velocity of each wheel anytime the ignition switch is in the RUN position and determines if a tire is loosing traction when the brakes are applied. Only then does the ABS intervene to modulate the brake pressure to the necessary wheel. The modulation continues until the wheel rotates freely. The brake pressure is then restored and the modulate/restore cycle is repeated whenever loss of traction is detected. This cycle occurs at a rate of several times per second.

The ABS module is capable of detecting the following system conditions:

- Hydraulic valve failure
- Wheel speed sensor failure
- ABS power relay short circuit
- Interconnect failures to the ABS sensors, power and ground to the ABS module
- Over/under voltage conditions

The ABS provides self-diagnostics and displays failure messages, via the ABS indicator, in the instrument cluster. Failure of the ABS module, for whatever reason, will not compromise the normal operation of the brake system.

Dynamic stability control (DSC) maximizes vehicle stability under all conditions. The DSC system compares actual vehicle course to that intended by the driver. If the intended course differs from the actual course due to over steer or under steer conditions, the DSC system will brake individual wheels and reduce engine torque to bring the vehicle back to the driver's intended direction. By using a combined yaw rate sensor and lateral accelerometer, the vehicles rotational motion around its vertical axis and centrifugal forces generated while cornering are

calculated to determine the vehicle's actual behavior. Using additional sensors for detecting steering wheel position and road wheel speed enables the system to recognize the driver's intentions.

The DSC system also incorporates emergency brake assist (EBA), which measures the rate at which the brake pressure increases during a braking manoeuvre. If the system detects an emergency braking situation, EBA automatically initiates the full braking effect. This can reduce the stopping distances in critical situations, therefore allowing an inexperienced driver to stop in the same distance as an experienced driver.

On vehicles with 2.0L or diesel engines the traction control system (TCS) is incorporated into the anti-lock brake system (ABS). On vehicles with 2.5L and 3.0L engines the traction control is an additional function added to the DSC system. The vehicles driven wheels are continually monitored for wheel spin relative to the calculated reference speed and to each other. If wheel spin is detected, the traction control function intervenes independently of the driver, applying brake pressure to the slipping wheel and reducing the engine drive torque supply. Meanwhile, brake pressure is modulated by the traction control until traction is re-established. Traction control brake actuation is diminished above 40 kph (25 mph). Above this speed traction control relies primarily on engine torque reduction.

Dynamic stability control is enabled/disabled via the DSC 'ON/OFF' switch. When the switch is in the 'OFF' position, the amber DSC warning lamp solidly illuminates within the instrument cluster message center. The DSC is automatically activated when the ignition is switched on. The DSC provides self-diagnostics also via the instrument cluster message center.

The traction control brake intervention is automatically disabled whenever the brakes exceed a temperature limit. The traction brake intervention will remain disabled until the brakes have cooled, irrespective of ignition switch position or ignition switch cycling.

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Anti-Lock Control - Stability Assist - VIN Range: C00344->J12991

Principle of operation

The anti-lock brake system (ABS) modulates brake pressure on each wheel independently to maintain vehicle stability during braking. The ABS continually monitors the rotational velocity of each wheel anytime the ignition switch is in the **ON** position and determines if a tire is skidding when the brakes are applied. Only then does the ABS intervene to modulate the brake pressure to the skidding wheel. The modulation continues until the wheel rotates freely. The brake pressure is then restored and the modulate/restore cycle is repeated whenever skidding is detected. This cycle occurs at a rate of several times per second.

The ABS module is capable of detecting the following system conditions:

- hydraulic valve failure
- wheel speed sensor failure
- ABS power relay short circuit
- interconnect failures to the ABS sensors, power and ground to the ABS module
- over/under voltage conditions

The ABS provides failure messages, via the ABS indicator, in the instrument cluster. Failure of the ABS module, for whatever reason, will not compromise the normal operation of the brake system.

Dynamic Stability Control (DSC) equipped vehicles

DSC maximizes vehicle stability under all conditions. The DSC system compares actual vehicle course to that intended by the driver. If the intended course differs from the actual course due to over steer or under steer conditions, the DSC system will brake individual wheels and reduce engine torque to bring the vehicle back to the driver's intended direction. By using a combined yaw rate sensor and lateral accelerometer, the vehicles rotational motion around its vertical axis and centrifugal forces generated while cornering are calculated to determine the vehicle's actual behavior. Using additional sensors for detecting steering wheel position and road wheel speed enables the system to recognize the driver's intentions.

DSC/TCS is enabled/disabled via the DSC/TCS **ON/OFF** switch. When the switch is in the **OFF** position, the amber DSC/TCS warning lamp solidly illuminates within the instrument cluster message center. The DSC/TCS is automatically activated when the ignition is switched on. The DSC/TCS also provides failure messages via the instrument cluster message center.

On 2.0L vehicles the traction control system (TCS) is incorporated into the anti-lock brake system (ABS). Where DSC is fitted, traction control is a function within the DSC system. The vehicle's driven wheels are continually monitored for wheel spin relative to the calculated reference speed and to each other. If wheel spin is detected, the traction control function intervenes independently of the driver, applying brake pressure to the slipping wheel and reducing the engine drive torque supply. Meanwhile, brake pressure is modulated by the traction control until traction is re-established. Traction control brake actuation is diminished above 40 km/h (25 mph). Above this speed traction control relies primarily on engine torque reduction.

The traction control brake intervention is automatically disabled whenever the brakes exceed a temperature limit. The traction brake intervention will remain disabled until the brakes have cooled, irrespective of ignition switch position or ignition switch cycling.

Inspection and Verification

1 . Verify the customer concern.

2 . Confirm if the ABS warning light was illuminated, or still is.

NOTE:

An intermittent fault may allow the warning light to go off. This does not necessarily mean the fault is not present. Some warnings will appear to clear when the ignition is cycled. This is often because the warning has flagged as a result of one of the vehicle's on-board diagnostic routines having run to detect the fault. If the same routine is not run when the ignition is switched **ON**, the warning will not reflag until the routine does run.

3 . In order to confirm the customer concern, it may be necessary to follow a drive cycle which will enable the system to perform it's diagnostic routine (see below).

Diagnostic Drive Cycles

NOTE:

See the DTC index for details of codes and possible sources/actions.

DTC	Cycle to detect fault	Cycle to clear fault	System response to fault detection

C1095	Turn the ignition switch to the **OFF** position. Restart and drive the vehicle to activate ABS	Drive vehicle at more than 40 km/h (25 mph) for more than 2 minutes	ABS shut-down, ABS light **ON**, DSC/TCS shut-down, DSC/TCS light **ON**
C1137	Turn the ignition switch to the **OFF** position, then **ON** for more than 8 minutes	Turn the ignition switch to the **ON** position	ABS shut-down, ABS light **ON**, DSC/TCS shut-down, DSC/TCS light **ON**
C1145/C1155 /C1165/C1175	Turn the ignition switch to the **OFF** position. Restart and drive the vehicle at more than 20 km/h (12.5 mph) for more than 2 minutes	Drive vehicle at more than 20 km/h (12.5 mph)	ABS shut-down, ABS light **ON**, DSC/TCS shut-down, DSC/TCS light **ON**
C1233/C1234 /C1235/C1236	Turn the ignition switch to the **OFF** position. Restart and drive the vehicle at more than 40 km/h (25 mph) for more than 2 minutes	Drive vehicle at more than 20 km/h (12.5 mph)	ABS shut-down, ABS light **ON**, DSC/TCS shut-down, DSC/TCS light **ON**
C1267	Turn the ignition switch to the **OFF** position. Restart and drive the vehicle at more than 40 km/h (25 mph)	Turn the ignition switch to the **ON** position	ABS shut-down, ABS light **ON**, DSC/TCS shut-down, DSC/TCS light **ON**
B1342	Turn the ignition switch to the **OFF** position. Restart and drive the vehicle at more than 20 km/h (12.5 mph)	Turn the ignition switch to the **ON** position	ABS shut-down, ABS light **ON**, DSC/TCS shut-down, DSC/TCS light **ON**
B1676	Turn the ignition switch to the **OFF** position, then turn the ignition switch to the **ON** position	Turn the ignition switch to the **ON** position	System functions between 9 and 19 volts

Visual Inspection

1 . Visually inspect for obvious signs of mechanical or electrical damage.

Mechanical	Electrical
• Check the tire sizes, condition, and inflation • Brake fluid level or leakage • Wheel speed sensor fitment • Wheel speed sensor air gap • Wheel speed sensor toothed wheels (missing teeth/contamination)	• Warning light operation • Fuses (see table) • ABS/Traction control control unit • Wheel speed sensors • Wheel speed sensor link leads • Connectors/pins • Harnesses • Grounds

Fuse Identification Table

Location	Fuse Number	Rating	Circuit
Battery junction box	05	30 Amp	Vacuum module battery supply (2 ltr only)
Central junction box	67	5 Amp	Vacuum module ignition supply (2 ltr only)
Battery junction box	03	60 Amp	ABS/DSC/TCS module battery supply
Central junction box	96	7.5 Amp	ABS/DSC/TCS module ignition supply
Central junction box	90	7.5 Amp	Brake light switch circuit

1 . If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

2 . If the cause is not visually evident and the Jaguar approved diagnostic system is not available, use a fault code reader to retrieve the fault codes before proceeding to the Diagnostic Trouble Code (DTC) Index Chart.

DTC Index

DTC	Description	Possible Source	Action
C1095	Pump motor circuit fault	• Pump motor circuit; open circuit, short circuit, high resistance • Pump motor failure • Pump motor power supply circuit; open circuit, short circuit to GROUND • Pump motor GROUND circuit; open circuit	The pump motor is internal to the control module. For pump circuit tests, GO to Pinpoint Test G92304p9. Please check part is not on any form of prior authorisation before replacement.
C1137	Control module circuit failure	• Control module failure	Please check part is not on any form of prior authorisation before replacement.

C1145	Right-hand front wheel speed sensor (WSS) circuit failure	• Wheel speed sensor circuit(s); open circuit, short circuit	For right-hand front WSS circuit tests, GO to Pinpoint Test G92304p1.
C1155	Left-hand front wheel speed sensor (WSS) circuit failure	• Wheel speed sensor circuit(s); open circuit, short circuit	For left-hand front WSS circuit tests, GO to Pinpoint Test G92304p2.
C1165	Right-hand rear wheel speed sensor (WSS) circuit failure	• Wheel speed sensor circuit(s); open circuit, short circuit	For right-hand rear WSS circuit tests, GO to Pinpoint Test G92304p3.
C1175	Left-hand rear wheel speed sensor (WSS) circuit failure	• Wheel speed sensor circuit(s); open circuit, short circuit	For left-hand rear WSS circuit tests, GO to Pinpoint Test G92304p4.
C1222	Wheel speed signal conflict	• Vehicle operating with punctured tire(s) • Mismatched wheel/tire sizes • Wheel speed sensor reluctor tooth damage - one or more wheels	Check wheel/tire sizes and conditions, check for sensor/reluctor damage. Check for associated DTCs. Clear the DTC, check the system for normal operation.
C1233	Left-hand front wheel speed sensor (WSS) signal fault	• Wheel speed sensor failure • Harness damage/kinks • Incorrect air gap • Contamination of the sensor wheel	Check the air gap at the left-hand front WSS, check the harness for damage/kinks. For left-hand front WSS circuit tests, GO to Pinpoint Test G92304p2.
C1234	Right-hand front wheel speed sensor (WSS) signal failure	• Wheel speed sensor failure • Harness damage/kinks • Incorrect air gap • Contamination of the sensor wheel	Check the air gap at the right-hand front WSS, check the harness for damage/kinks. For right-hand front WSS circuit tests, GO to Pinpoint Test G92304p1.
C1235	Right-hand rear wheel speed sensor (WSS) signal failure	• Wheel speed sensor failure • Harness damage/kinks • Incorrect air gap • Wheel speed sensor reluctor damage (AWD) • Contamination of the sensor wheel	Check the air gap at the right-hand rear WSS, check for reluctor damage (AWD). Check the harness for damage/kinks. For right-hand rear WSS circuit tests, GO to Pinpoint Test G92304p3.
C1236	Left-hand rear wheel speed sensor (WSS) signal failure	• Wheel speed sensor failure • Harness damage/kinks • Incorrect air gap • Wheel speed sensor reluctor damage (AWD) • Contamination of the sensor wheel	Check the air gap at the left-hand rear WSS, check for reluctor damage (AWD). Check the harness for damage/kinks. For left-hand rear WSS circuit tests, GO to Pinpoint Test G92304p4.
C1266	Modulator solenoids power supply circuit fault	• Power supply failure to valve relay • ABS modulator failure • DSC modulator failure	Check the fuses and power circuit. For additional information, refer to the wiring diagrams. Please check part is not on any form of prior authorisation before replacement.
C1267	Modulator valve fault	• Modulator valve failure	Please check part is not on any form of prior authorisation before replacement.
C1278	Steering angle sensor CAN message not plaus ble	• Steering angle sensor not calibrated • Steering angle sensor power supply circuit; open circuit, high resistance • Steering angle sensor failure	For steering angle sensor power supply circuit tests, GO to Pinpoint Test G92304p5.
C1279	Yaw rate sensor circuit fault	• Yaw rate sensor circuit; open circuit, short circuit, high resistance	For yaw rate sensor power supply circuit tests, GO to Pinpoint Test G92304p6. For yaw rate sensor CAN circuit tests, Communications Network - VIN Range: E96603->J28492

		• Yaw rate sensor CAN circuit; open circuit • Yaw rate sensor failure	
C1280	Yaw rate sensor CAN message not plausible	• Yaw rate sensor failure	Use the Jaguar approved diagnostic system to measure the yaw rate offset. For CAN circuit tests, Communications Network - VIN Range: E96603->J28492
C1282	Lateral acceleration CAN message not plaus ble	• Yaw rate sensor installation • Yaw rate sensor failure	Check the power supply to the sensor. For additional information, refer to the wiring diagrams. Use the Jaguar approved diagnostic system to measure the lateral accelerator signal. For CAN circuit tests, Communications Network - VIN Range: E96603->J28492
C1288	Brake pressure sensor circuit fault	• Brake pressure sensor circuit; open circuit, short circuit, high resistance • Brake pressure sensor failure	For brake pressure sensor circuit tests, GO to Pinpoint Test G92304p7.
C1440	Brake pressure signal fault	• Brake pressure sensor failure • Control module failure	Use the Jaguar approved diagnostic system to measure the brake pressure signals.
C1956	Steering angle sensor fault	• Steering angle sensor CAN circuit; open circuit • Steering angle sensor failure	For CAN circuit tests, Communications Network - VIN Range: E96603->J28492
C1975	DSC signal conflict	• Steering angle sensor incorrectly installed • Steering angle sensor not calibrated - recalibrate using the Jaguar approved diagnostic system • Steering angle sensor failure	Check the installation of the steering angle sensor. Recalibrate as necessary. INSTALL a new sensor if necessary.
B1676	Battery voltage out of range: 9 - 16 volts	• Charging system high/low voltage • Control module failure	For charging system tests, Charging System - 2.0L/2.5L/3.0L Charging System - 2.0L Diesel/2.2L Diesel Please check part is not on any form of prior authorisation before replacement.
None	Brake light switch circuit fault	• Brake light switch power supply circuit fault • Brake light switch to ABS/DSC module circuit fault • Brake light switch fault	For brake light switch circuit tests, GO to Pinpoint Test G92304p8.

Pinpoint Tests

PINPOINT TEST G92304p1 : DTC C1145, C1234; RIGHT-HAND FRONT WHEEL SPEED SENSOR (WSS) CIRCUIT FAILURE

G92304t1 : CHECK THE RIGHT-HAND FRONT WSS SENSOR CIRCUIT FOR HIGH RESISTANCE

1. Make sure the ignition switch is in the **OFF** position. 2. Disconnect the ABS/DSC module electrical connector, JB45/JB185. 3. Disconnect the wheel speed sensor electrical connector, RF01. 4. Measure the resistance between RF01, pin 02 (W) and JB45/JB185, pin 16 (WR).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t2.

G92304t2 : CHECK THE RIGHT-HAND FRONT WSS SENSOR CIRCUIT FOR SHORT CIRCUIT TO BATTERY

1. Measure the voltage between RF01, pin 02 (W) and GROUND.

- **Is the voltage greater than 3 volts?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t3.

G92304t3 : CHECK THE RIGHT-HAND FRONT WSS SENSOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

1. Measure the resistance between RF01, pin 02 (W) and GROUND.

- **Is the resistance less than 10,000 ohms?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t5.

G92304t5 : CHECK THE RIGHT-HAND FRONT WSS POWER CIRCUIT FOR HIGH RESISTANCE

1. Disconnect the wheel speed sensor. 2. Measure the resistance between RF01, pin 01 (R) and JB45/JB185, pin 15 (NR).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t6.

G92304t6 : CHECK THE RIGHT-HAND FRONT WSS POWER CIRCUIT FOR SHORT CIRCUIT TO BATTERY

1. Measure the voltage between RF01, pin 01 (R) and GROUND.

- **Is the voltage greater than 3 volts?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t7.

G92304t7 : CHECK THE RIGHT-HAND FRONT WSS POWER CIRCUIT FOR SHORT CIRCUIT TO GROUND

1. Measure the resistance between RF01, pin 01 (R) and GROUND.

- **Is the resistance less than 10,000 ohms?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
INSTALL a new WSS,
Front Wheel Speed Sensor (70.60.03) CLEAR the DTC, test the system for normal operation. If the DTC is repeated, please check part is not on any form of prior authorisation before replacement.

PINPOINT TEST G92304p2 : DTC C1155, C1233; LEFT-HAND FRONT WHEEL SPEED SENSOR (WSS) CIRCUIT FAILURE

G92304t19 : CHECK THE LEFT-HAND FRONT WSS SENSOR CIRCUIT FOR HIGH RESISTANCE

1. Make sure the ignition switch is in the **OFF** position. 2. Disconnect the ABS/DSC module electrical connector, JB45/JB185. 3. Disconnect the wheel speed sensor electrical connector, LF01. 4. Measure the resistance between LF01, pin 02 (W) and JB45/JB185, pin 12 (W).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t20.

G92304t20 : CHECK THE LEFT-HAND FRONT WSS SENSOR CIRCUIT FOR SHORT CIRCUIT TO BATTERY

1. Measure the voltage between LF01, pin 02 (W) and GROUND.

- **Is the voltage greater than 3 volts?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t21.

G92304t21 : CHECK THE LEFT-HAND FRONT WSS SENSOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

1. Measure the resistance between LF01, pin 02 (W) and GROUND.

- **Is the resistance less than 10,000 ohms?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t22.

G92304t22 : CHECK THE LEFT-HAND FRONT WSS POWER CIRCUIT FOR HIGH RESISTANCE

1. Disconnect the wheel speed sensor. 2. Measure the resistance between LF01, pin 01 (N) and JB45/JB185, pin 28 (N).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t23.

G92304t23 : CHECK THE LEFT-HAND FRONT WSS POWER CIRCUIT FOR SHORT CIRCUIT TO BATTERY

1. Measure the voltage between LF01, pin 01 (N) and GROUND.

- **Is the voltage greater than 3 volts?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t24.

G92304t24 : CHECK THE LEFT-HAND FRONT WSS POWER CIRCUIT FOR SHORT CIRCUIT TO GROUND

1. Measure the resistance between LF01, pin 01 (N) and GROUND.

- **Is the resistance less than 10,000 ohms?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
INSTALL a new WSS,
Front Wheel Speed Sensor (70.60.03) CLEAR the DTC, test the system for normal operation. If the DTC is repeated, please check part is not on any form of prior authorisation before replacement.

PINPOINT TEST G92304p3 : DTC C1165, C1235; RIGHT-HAND REAR WHEEL SPEED SENSOR (WSS) CIRCUIT FAILURE

G92304t26 : CHECK THE RIGHT-HAND REAR WSS SENSOR CIRCUIT FOR HIGH RESISTANCE

1. Make sure the ignition switch is in the **OFF** position. 2. Disconnect the ABS/DSC module electrical connector, JB45/JB185. 3. Disconnect the wheel speed sensor electrical connector, CA60. 4. Measure the resistance between CA60, pin 02 (WG) and JB45/JB185, pin 31 (WG).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t27.

G92304t27 : CHECK THE RIGHT-HAND REAR WSS SENSOR CIRCUIT FOR SHORT CIRCUIT TO BATTERY

1. Measure the voltage between CA60, pin 02 (WG) and GROUND.

- **Is the voltage greater than 3 volts?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t28.

G92304t28 : CHECK THE RIGHT-HAND REAR WSS SENSOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

1. Measure the resistance between CA60, pin 02 (WG) and GROUND.

- **Is the resistance less than 10,000 ohms?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t29.

G92304t29 : CHECK THE RIGHT-HAND REAR WSS POWER CIRCUIT FOR HIGH RESISTANCE

1. Disconnect the wheel speed sensor. 2. Measure the resistance between CA60, pin 01 (NG) and JB45/JB185, pin 30 (NG).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t30.

G92304t30 : CHECK THE RIGHT-HAND REAR WSS POWER CIRCUIT FOR SHORT CIRCUIT TO BATTERY

1. Measure the voltage between CA60, pin 01 (NG) and GROUND.

- **Is the voltage greater than 3 volts?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t31.

G92304t31 : CHECK THE RIGHT-HAND REAR WSS POWER CIRCUIT FOR SHORT CIRCUIT TO GROUND

1. Measure the resistance between CA60, pin 01 (NG) and GROUND.

- **Is the resistance less than 10,000 ohms?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
INSTALL a new WSS,
Rear Wheel Speed Sensor (70.60.04) CLEAR the DTC, test the system for normal operation. If the DTC is repeated, please check part is not on any form of prior authorisation before replacement.

PINPOINT TEST G92304p4 : DTC C1175, C1236; LEFT-HAND REAR WHEEL SPEED SENSOR (WSS) CIRCUIT FAILURE

G92304t33 : CHECK THE LEFT-HAND REAR WSS SENSOR CIRCUIT FOR HIGH RESISTANCE

1. Make sure the ignition switch is in the **OFF** position. 2. Disconnect the ABS/DSC module electrical connector, JB45/JB185. 3. Disconnect the wheel speed sensor electrical connector, CA55. 4. Measure the resistance between CA55, pin 02 (WU) and JB45/JB185, pin 14 (WU).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t34.

G92304t34 : CHECK THE LEFT-HAND REAR WSS SENSOR CIRCUIT FOR SHORT CIRCUIT TO BATTERY

1. Measure the voltage between CA55, pin 02 (WU) and GROUND.

- **Is the voltage greater than 3 volts?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t35.

G92304t35 : CHECK THE LEFT-HAND REAR WSS SENSOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

1. Measure the resistance between CA55, pin 02 (WU) and GROUND.

- **Is the resistance less than 10,000 ohms?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No

GO to Pinpoint Test G92304t36.

G92304t36 : CHECK THE LEFT-HAND REAR WSS POWER CIRCUIT FOR HIGH RESISTANCE

1. Disconnect the wheel speed sensor. 2. Measure the resistance between CA55, pin 01 (GB) and JB45/JB185, pin 13 (GB).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t37.

G92304t37 : CHECK THE LEFT-HAND REAR WSS POWER CIRCUIT FOR SHORT CIRCUIT TO BATTERY

1. Measure the voltage between CA55, pin 01 (GB) and GROUND.

- **Is the voltage greater than 3 volts?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t38.

G92304t38 : CHECK THE LEFT-HAND REAR WSS POWER CIRCUIT FOR SHORT CIRCUIT TO GROUND

1. Measure the resistance between CA55, pin 01 (GB) and GROUND.

- **Is the resistance less than 10,000 ohms?**

-> Yes
REPAIR the short circuit. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
INSTALL a new WSS,
Rear Wheel Speed Sensor (70.60.04) CLEAR the DTC, test the system for normal operation. If the DTC is repeated, please check part is not on any form of prior authorisation before replacement.

PINPOINT TEST G92304p5 : C1278; STEERING ANGLE SENSOR PLAUSIBILITY ERROR

G92304t8 : CHECK THE POWER SUPPLY TO THE STEERING ANGLE SENSOR

1. Turn the ignition switch to the **OFF** position. 2. Disconnect the steering angle sensor electrical connector, IP19. 3. Turn the ignition switch to the **ON** position. 4. Measure the voltage between IP19, pin 02 (GW) and GROUND.

- **Is the voltage less than 5 volts?**

-> Yes
GO to Pinpoint Test G92304t13.

-> No
GO to Pinpoint Test G92304t9.

G92304t13 : CHECK THE STEERING ANGLE SENSOR POWER SUPPLY CIRCUIT FOR HIGH RESISTANCE

1. Turn the ignition switch to the **OFF** position. 2. Disconnect the DSC module electrical connector, JB185. 3. Measure the resistance between IP19, pin 02 (GW) and JB185, pin 39 (GW).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. This circuit includes harness splice, IPS6. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
REPAIR the circuit between the steering angle sensor and battery. This circuit includes the primary distribution box (fuse 96), the ignition switch and the DSC control module. For additional information, refer to the wiring diagrams. Please check part is not on any form of prior authorisation before replacement.

G92304t9 : CHECK THE GROUND TO THE STEERING ANGLE SENSOR

1. Turn the ignition switch to the **OFF** position. 2. Measure the resistance between IP19, pin 01 (B) and GROUND.

- **Is the resistance greater than 5 ohms?**

-> Yes
GO to Pinpoint Test G92304t14.

-> No
For CAN circuit tests,
Communications Network - VIN Range: E96603->J28492

G92304t14 : CHECK THE STEERING ANGLE SENSOR GROUND CIRCUIT FOR HIGH RESISTANCE

1. Disconnect the DSC control module electrical connector, JB185. 2. Measure the resistance between IP19, pin 01 (B) and JB185, pin 21 (B).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. This circuit includes harness splice, IPS7. For additional information, refer to the wiring diagrams, test the system for normal operation.

-> No
For CAN circuit tests,
Communications Network - VIN Range: E96603->J28492

PINPOINT TEST G92304p6 : C1279; YAW RATE SENSOR CIRCUIT FAULT

G92304t10 : CHECK THE POWER SUPPLY TO THE YAW RATE SENSOR

1. Turn the ignition switch to the **OFF** position. 2. Disconnect the yaw rate sensor electrical connector, IP20. 3. Turn the ignition switch to the **ON** position. 4. Measure the voltage between IP20, pin 04 (GW) and GROUND.

- **Is the voltage less than 5 volts?**

-> Yes
GO to Pinpoint Test G92304t15.

-> No
GO to Pinpoint Test G92304t11.

G92304t15 : CHECK THE YAW RATE SENSOR POWER SUPPLY CIRCUIT FOR HIGH RESISTANCE

1. Turn the ignition switch to the **OFF** position. 2. Disconnect the DSC control module electrical connector, JB185. 3. Measure the resistance between IP20, pin 04 (GW) and JB185, pin 39 (GW).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. This circuit includes harness splice, IPS6. For additional information, refer to the wiring diagrams. CLEAR the DTC, test the system for normal operation.

-> No
REPAIR the circuit between the yaw rate sensor and battery. This circuit includes the primary distribution box (fuse 96), the ignition switch and the DSC control module. For additional information, refer to the wiring diagrams. Please check part is not on any form of prior authorisation before replacement.

G92304t11 : CHECK THE GROUND TO THE YAW RATE SENSOR

1. Measure the resistance between IP20, pin 01 (B) and GROUND.

- **Is the resistance greater than 5 ohms?**

-> Yes
GO to Pinpoint Test G92304t16.

-> No
For CAN circuit tests,
Communications Network - VIN Range: E96603->J28492

G92304t16 : CHECK THE YAW RATE SENSOR GROUND CIRCUIT FOR HIGH RESISTANCE

1. Disconnect the DSC control module electrical connector, JB185. 2. Measure the resistance between IP20, pin 01 (B) and JB185, pin 21 (B).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. This circuit includes harness splice, IPS7. For additional information, refer to the wiring diagrams, test the system for normal operation.

-> No
For CAN circuit tests,
Communications Network - VIN Range: E96603->J28492 Please check part is not on any form of prior authorisation before replacement.

PINPOINT TEST G92304p7 : C1288; BRAKE PRESSURE SENSOR CIRCUIT FAULT

G92304t12 : CHECK THE POWER SUPPLY TO THE BRAKE PRESSURE SENSOR

1. Turn the ignition switch to the **OFF** position. 2. Disconnect the brake pressure sensor electrical connector, JB89. 3. Turn the ignition switch to the **ON** position. 4. Measure the voltage between JB89, pin 03 (GB) and GROUND.

- **Is the voltage less than 4.5 volts?**

-> Yes
GO to Pinpoint Test G92304t17.

-> No
GO to Pinpoint Test G92304t39.

G92304t17 : CHECK THE BRAKE PRESSURE SENSOR POWER SUPPLY CIRCUIT FOR HIGH RESISTANCE

1. Turn the ignition switch to the **OFF** position. 2. Disconnect the DSC module electrical connector, JB185. 3. Measure the resistance between JB89, pin 03 (GB) and JB185, pin 42 (GB).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams, test the system for normal operation.

-> No
REPAIR the circuit between the brake pressure sensor and battery. This circuit includes the primary distribution box (fuse 96), the ignition switch and the DSC control module. For additional information, refer to the wiring diagrams.

G92304t39 : CHECK THE GROUND TO THE BRAKE PRESSURE SENSOR

1. Turn the ignition switch to the **OFF** position. 2. Measure the resistance between JB89, pin 01 (B) and GROUND.

- **Is the resistance greater than 5 ohms?**

-> Yes
GO to Pinpoint Test G92304t40.

-> No
GO to Pinpoint Test G92304t41.

G92304t40 : CHECK THE BRAKE PRESSURE SENSOR GROUND CIRCUIT FOR HIGH RESISTANCE

1. Disconnect the DSC module electrical connector, JB185. 2. Measure the resistance between JB89, pin 01 (B) and JB185, pin 25 (B).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams, test the system for normal operation.

-> No
Please check part is not on any form of prior authorisation before replacement.

G92304t41 : CHECK THE BRAKE PRESSURE SENSOR SENSOR CIRCUIT FOR HIGH RESISTANCE

1. Disconnect the DSC module electrical connector, JB185. 2. Measure the resistance between JB89, pin 02 (WG) and JB185, pin 26 (WG).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams, test the system for normal operation.

-> No
Check the brake light switch circuit. Please check part is not on any form of prior authorisation before replacement.

PINPOINT TEST G92304p8 : CHECK THE BRAKE LIGHT SWITCH CIRCUIT

G92304t42 : CHECK THE POWER SUPPLY TO THE BRAKE LIGHT SWITCH

1. Disconnect the brake light switch electrical connector, PA03. 2. Turn the ignition switch to the **ON** position. 3. Measure the voltage between PA03, pin 03 (NR) and GROUND.

- **Is the voltage less than 10 volts?**

-> Yes
REPAIR the circuit between the brake light switch and battery. This circuit includes the central junction box (fuse 90), and the ignition switch. For additional information, refer to the wiring diagrams, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t43.

G92304t43 : CHECK THE CIRCUIT BETWEEN THE BRAKE LIGHT SWITCH AND THE ABS/DSC MODULE FOR HIGH RESISTANCE

1. Turn the ignition switch to the **OFF** position. 2. Disconnect the ABS/DSC module electrical connector, JB45/JB185. 3. Measure the resistance between PA03, pin 03 (NR) and JB45/JB185, pin 32 (GO).

- **Is the resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. This circuit includes the central junction box. For additional information, refer to the wiring diagrams, test the system for normal operation.

-> No
GO to Pinpoint Test G92304t44.

G92304t44 : CHECK THE CIRCUIT BETWEEN THE BRAKE LIGHT SWITCH AND THE ABS/DSC MODULE FOR SHORT CIRCUIT TO BATTERY

1. Measure the voltage between PA03, pin 03 (NR) and GROUND.

- **Is the voltage greater than 3 volts?**

-> Yes
REPAIR the short circuit. This circuit includes the central junction box. For additional information, refer to the wiring diagrams, test the system for normal operation.

-> No

GO to Pinpoint Test G92304t45.

G92304t45 : CHECK THE FUNCTION OF THE BRAKE LIGHT SWITCH

1. Connect an ohmmeter across pins 01 and 03 of the brake light switch. 2. Operate the brake pedal. 3. Measure the resistance across the switch as the pedal is operated up and down.

- **Does the resistance switch between open and closed circuit as the pedal is operated?**

-> Yes
Please check part is not on any form of prior authorisation before replacement.

-> No
INSTALL a new brake light switch. TEST the system for normal operation.

PINPOINT TEST G92304p9 : PUMP MOTOR AND SOLENOIDS POWER OR GROUND CIRCUIT FAULT

G92304t4 : CHECK THE POWER SUPPLY TO THE PUMP MOTOR AND SOLENOIDS

1. Make sure the ignition switch is in the **OFF** position. 2. Disconnect the ABS/DSC control module electrical connector, JB45/JB185. 3. Measure the voltage between JB45/JB185, pin 02 (R) and GROUND. 4. Measure the voltage between JB45/JB185, pin 06 (R) and GROUND.

- **Is either voltage less than 10 volts?**

-> Yes
REPAIR the circuit between the ABS/DSC module and battery. This circuit includes the battery junction box (fuse 03) and harness splice, JBS27. For additional information, refer to the wiring diagrams.

-> No
GO to Pinpoint Test G92304t18.

G92304t18 : CHECK THE GROUND TO THE ABS/DSC MODULE

1. Measure the resistance between JB45/JB185, pin 01 (B) and GROUND. 2. Measure the resistance between JB45/JB185, pin 05 (B) and GROUND.

- **Is either resistance greater than 5 ohms?**

-> Yes
REPAIR the high resistance circuit. For additional information, refer to the wiring diagrams.

-> No
RECHECK the DTCs. Please check part is not on any form of prior authorisation before replacement.

Published: Feb 26, 2008

Anti-Lock Control - Stability Assist - VIN Range: J12992->V99999

Principles of Operation

For a detailed description of the Anti-Lock Control - Stability Assist systems, refer to the relevant Description and Operation sections in the workshop manual.
Anti-Lock Control - Stability Assist

Inspection and Verification

NOTE:

An intermittent fault may allow the warning light to go off. This does not necessarily mean the fault is not present. Some warnings will appear to clear when the ignition is cycled. This is often because the warning has flagged as a result of one of the vehicle's on-board diagnostic routines having run to detect the fault. If the same routine is not run when the ignition is switched ON, the warning will not reflag until the routine does run.

1 . Verify the customer concern.

2 . Visually inspect for obvious signs of mechanical or electrical damage.

Mechanical	Electrical
• Check the tire sizes, condition, and inflation • Brake fluid level or leakage • Wheel speed sensor fitment • Wheel speed sensor air gap • Wheel speed sensor toothed wheels (missing teeth/contamination) • Wheel bearings	• Warning light operation • Fuses • Anti-lock Brake System (ABS) • Traction Control System (TCS) • Dynamic Stability Control (DSC) • Hydraulic Control Unit (HCU) • Steering wheel rotation sensor • Wheel Speed Sensors (WSS) • Wheel speed sensor link leads • Connectors/terminals • Harnesses • Grounds

3 . If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step

DTC index

CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTE:

If the control module/HCU is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/HCU.

NOTE:

Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).

NOTE:

When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

NOTE:

Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

NOTE:

Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

NOTE:

If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always

check for loose connections and corroded terminals.

DTC	Description	Possible cause	Action
C006308	Yaw Rate Sensor	• Bus signal / message failures which cannot be assigned to a specific signal or message • Yaw rate sensor signal is in a valid range but is implausible • Yaw rate sensor not correctly mounted • Yaw rate sensor not correctly connected • Ignition supply to yaw rate sensor open circuit, short to power, short to ground • Ground line to yaw rate sensor open circuit, short to power, short to ground • Yaw rate sensor internal failure	Check yaw rate sensor for correct mounting. Check yaw rate sensor connector for corrosion and correct installation. Refer to the electrical guides and check yaw rate supply, ground circuits for short to ground, power and open circuit. Install yaw rate sensor as required. Road test vehicle to ensure DSC lamp is extinguished.
C007298	Brake Temperature Too High	• Component or system over temperature. The HCU has detected that the temperature is too high for the correct operation of component or system • Overheating of at least one hydraulic braking circuit	Check brake system for binding, dragging brakes.
C110964	Vehicle Dynamics Control Switch	• Signal plaus bility failure. The HCU has detected a plausibility failure • Traction switch has been operated to frequently, greater than 15 times within 30 seconds • Traction switch has been operated for too long • Traction switch is stuck closed • Traction off circuit short to ground • Damage or corrosion to traction off circuit wiring or connectors	Verify with customer that switch has not been depressed for greater than 10 seconds or repeatedly pressed. Using the manufacturer approved diagnostic system check datalogger signal 2B05 electronic traction control / dynamic stability control input/output, for sticking switch. Refer to the electrical guides and check traction off circuit for short to ground. Check for damage or corrosion to traction off circuit wiring and connectors. Install traction switch as required.
C1A0000	Control Module	• Internal failure control module	Clear DTCs using the manufacturer approved diagnostic system, confirm fault is still present. Suspect the HCU, check and install a new unit as required, refer to the new module/component installation note at the top of the DTC Index. After replacement the new HCU must be configured, by carrying out the following procedure. Ignition ON for 30 seconds, brake warning lamps will remain illuminated. Ignition OFF. Ignition ON, brake warning lamps will extinguish after 3 seconds.
C1A0001	Electronic Control Unit	• General Electrical Failure • Implausible HCU valve actuation	Clear DTCs using the manufacturer approved diagnostic system, confirm fault is still present. Suspect the HCU, check and install a new unit as required, refer to the new module/component installation note at the top of the DTC Index. After replacement the new HCU must be configured, by carrying out the following procedure. Ignition ON for 30 seconds, brake warning lamps will

		• Internal failure	remain illuminated. Ignition OFF. Ignition ON, brake warning lamps will extinguish after 3 seconds.
C1A0016	System Voltage Low	• Circuit voltage below threshold. The HCU has measured a voltage below a specified range but not necessarily a short to ground • HCU supply voltage less than 9.3 volts, pump running or less than 9.6 volts, pump not running • Low or discharged battery • Ground circuit to module high resistance, poor connection, corroded terminals • Motor ground circuit to module high resistance, poor connection, corroded terminals • Ignition circuit to module intermittent open circuit, poor connection, corroded terminals • Pump supply circuit to module intermittent open circuit, poor connection, corroded terminals • Solenoid supply circuit to module intermittent open circuit, poor connection, corroded terminals	Check vehicle battery is at correct voltage and is not low or discharged. Check vehicle charging system is correctly charging the battery. Refer to the electrical guides and check ground circuit to module for high resistance, poor connection, corroded terminals. Motor ground circuit to module for high resistance, poor connection, corroded terminals. Ignition circuit to module intermittent for open circuit, poor connection, corroded terminals. Pump supply circuit to module for intermittent open circuit, poor connection, corroded terminals. Solenoid supply circuit to module for intermittent open circuit, poor connection, corroded terminals.
C1A0017	System Voltage High	• Circuit voltage above threshold. The HCU has measured a voltage above a specified range but not necessarily a short to battery • Module supply voltage greater than 16.8 volts • Over voltage of the battery charging system • Over voltage measured between module ignition and ground • Over voltage measured between module pump supply and motor ground • Over voltage measured between module solenoid supply and motor ground	Using the manufacturer approved diagnostic system check other control modules for similar DTCs. Check vehicle battery is at correct voltage and is not above or overcharged condition. Check vehicle charging system is correctly charging the battery.
C1A001C	System Voltage Unstable	• Circuit voltage out of range. The HCU has measured a voltage	Check vehicle battery is at correct voltage and is not low or discharged. Check vehicle charging system is correctly charging the battery. Refer to the electrical guides and check ground circuit to module for high resistance, poor connection, corroded terminals. Motor ground circuit to module for high

		outside the expected range but not identified as too high or too low • Module supply voltage equal too or less than 8.2 volts for more than 20ms • Low or discharged battery • Battery charging system failure • Ground circuit to module high resistance, poor connection, corroded terminals • Motor ground circuit to module high resistance, poor connection, corroded terminals • Ignition circuit to module intermittent open circuit, poor connection, corroded terminals • Pump supply circuit to module intermittent open circuit, poor connection, corroded terminals • Solenoid supply circuit to module intermittent open circuit, poor connection, corroded terminals	resistance, poor connection, corroded terminals. Ignition circuit to module intermittent for open circuit, poor connection, corroded terminals. Pump supply circuit to module for intermittent open circuit, poor connection, corroded terminals. Solenoid supply circuit to module for intermittent open circuit, poor connection, corroded terminals.
C1A004A	Variant Selection	• Incorrect component installed. Mismatch between the hardware connected to the HCU/ module and the hardware expected by the HCU • Transferred variant value not released • Transferred variant value outside permissible range • EEPROM values with valid HCU data implausible • Transferred variant values from engine control module are invalid for this vehicle	Clear DTCs using the manufacturer approved diagnostic system. Cycle ignition and wait for brake warning lamps to extinguish, allow up to 30 seconds. If the DTC is still present carry out the following procedure again using the manufacturer approved diagnostic system vehicle configuration main menu, special applications, vehicle identification block read. Contact dealer technical support.
C1A0067	Control Module	• Signal incorrect after event. The HCU has not seen the correct change of a parameter or group of parameters in response to a particular event • Incorrect tire pressure • Incorrect size wheel or tire • Poor WSS signal at higher frequency. At approximately 50 kph (31 mph) WSS may not compare and	Using the manufacturer approved diagnostic system compare the signals for all the WSS simultaneously. Check for similar values and operation between each WSS. Check for other WSS DTCs, rectify as required. Clear DTCs road test and re-check. Contact dealer technical support.

		show a variance	
C1A7614	Valve Relay Circuit	• Circuit short to ground or open • Solenoid supply circuit open • Solenoid supply circuit short to ground • Internal failure in HCU, solenoid valve supply relay	Refer to the electrical guides and check solenoid supply circuit for short to ground and open circuit. Suspect the HCU, check and install a new unit as required, refer to the new module/component installation note at the top of the DTC Index. After replacement the new HCU must be configured, by carrying out the following procedure. Ignition ON for 30 seconds, brake warning lamps will remain illuminated. Ignition OFF. Ignition ON, brake warning lamps will extinguish after 3 seconds.
C1A7804	Generic Valve Fault	• System internal failures • Internal failure in HCU	Suspect the HCU, check and install a new unit as required, refer to the new module/component installation note at the top of the DTC Index. After replacement the new HCU must be configured, by carrying out the following procedure. Ignition ON for 30 seconds, brake warning lamps will remain illuminated. Ignition OFF. Ignition ON, brake warning lamps will extinguish after 3 seconds.
C1A9114	Front Left Wheel Speed Sensor Circuit	• Circuit short to ground or open. The DTC is logged when the ignition is on, the vehicle is stationary and the fault is present for greater than 240 ms • WSS signal front left circuit short to ground • WSS signal front left circuit short to power • WSS signal front left open circuit • WSS supply front left circuit short to ground • WSS supply front left circuit short to power • WSS supply front left open circuit • WSS internal failure	Check connectors of harness to WSS, intermediate harness connectors and harness connectors to module for corrosion and correct terminal tension. Refer to the electrical guides and check WSS signal front left circuit for short to ground, power and open circuit. Refer to the electrical guides and check WSS supply front left circuit for short to ground, power and open circuit. Check WSS circuit for damage to insulation. Install WSS harness as required. Install WSS as required.
C1A9129	Front Left Wheel Speed Sensor Circuit	• Signal invalid. A failure where the value of the signal is not plausible given the operating conditions • Excessive free play in wheel bearings • Incorrect size wheel or tire • Excessive air gap between WSS and sensor target ring • Incorrect number of teeth on WSS target ring • Corrosion of WSS in sensor mounting • Electrical interference on the WSS signal circuit • Damage to WSS circuit wiring • WSS's crossed over, monitoring incorrect wheels • Internal failure in HCU	Using the manufacturer approved diagnostic system compare the datalogger signals for all the WSS simultaneously. Check for similar values and operation between each WSS. Check wheel rims and tires are to the correct size. Check WSS target ring air gap is to specification. Check that the WSS target ring is correctly installed, check wheel bearing is correctly installed. Check correct wheel bearing is installed. Check that WSS is not corroded in its mounting bracket. Using the manufacturer approved diagnostic system check that each wheel corresponds correctly to its signal. Suspect the HCU, check and install a new HCU as required, refer to the new module/component installation note at the top of the DTC Index. After replacement the new HCU must be configured, by carrying out the following procedure. Ignition ON for 30 seconds, brake warning lamps will remain illuminated. Ignition OFF. Ignition ON, brake warning lamps will extinguish after 3 seconds.
C1A9214	Rear Left Wheel Speed Sensor Circuit	• Circuit short to ground or open. The DTC is logged when	Check connectors of harness to WSS, intermediate harness connectors and harness connectors to module for corrosion and correct terminal tension. Refer to the electrical guides and check WSS signal rear left circuit for short to ground, power and open circuit. Refer to the electrical guides and check

		the ignition is on, the vehicle is stationary and the fault is present for greater than 240 ms • WSS signal rear left circuit short to ground • WSS signal rear left circuit short to power • WSS signal rear left open circuit • WSS supply rear left circuit short to ground • WSS supply rear left circuit short to power • WSS supply rear left open circuit • WSS internal failure	WSS supply rear left circuit for short to ground, power and open circuit. Check WSS circuit for damage to insulation. Install WSS harness as required. Install WSS as required.
C1A9229	Rear Left Wheel Speed Sensor Circuit	• Signal invalid. A failure where the value of the signal is not plausible given the operating conditions • Incorrect size wheel or tire • Excessive air gap between WSS and sensor target ring • Distortion or displacement of WSS target ring • Incorrect number of teeth on WSS target ring • Corrosion of WSS in sensor mounting • WSS target ring dirty or damaged teeth • WSS's crossed over, monitoring incorrect wheels • Internal failure in HCU	Using the manufacturer approved diagnostic system compare the datalogger signals for all the WSS simultaneously. Check for similar values and operation between each WSS. Check wheel rims and tires are to the correct size. Check WSS target ring air gap is to specification. Check that the WSS target ring is correctly installed, secure and is not misaligned or has drifted off centre. Check correct number of teeth are on the WSS target ring. Check that WSS is not corroded in its mounting bracket. Check WSS target ring is not dirty or damaged. Using the manufacturer approved diagnostic system check that each wheel corresponds correctly to its signal. Suspect the HCU, check and install a new HCU as required, refer to the new module/component installation note at the top of the DTC Index. After replacement the new HCU must be configured, by carrying out the following procedure. Ignition ON for 30 seconds, brake warning lamps will remain illuminated. Ignition OFF. Ignition ON, brake warning lamps will extinguish after 3 seconds.
C1A9314	Rear Right Wheel Speed Sensor Circuit	• Circuit short to ground or open. The DTC is logged when the ignition is on, the vehicle is stationary and the fault is present for greater than 240 ms • WSS signal rear right circuit short to ground • WSS signal rear right circuit short to power • WSS signal rear right open circuit • WSS supply rear right circuit short to ground • WSS supply rear right circuit short to power • WSS supply rear right open circuit • WSS internal failure	Check connectors of harness to WSS, intermediate harness connectors and harness connectors to module for corrosion and correct terminal tension. Refer to the electrical guides and check WSS signal rear right circuit for short to ground, power and open circuit. Refer to the electrical guides and check WSS supply rear right circuit for short to ground, power and open circuit. Check WSS circuit for damage to insulation. Install WSS harness as required. Install WSS as required.
C1A9329	Rear Right Wheel Speed Sensor Circuit	• Signal invalid. A failure where the value of the signal is not plausible given	Using the manufacturer approved diagnostic system compare the datalogger signals for all the WSS simultaneously. Check for similar values and operation between each WSS. Check wheel rims and tires are to the correct size. Check WSS target ring air gap is to specification. Check that the WSS target

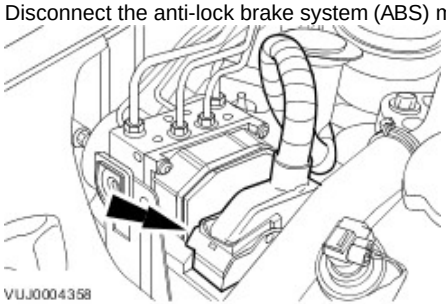
		the operating conditions • Incorrect size wheel or tire • Excessive air gap between WSS and sensor target ring • Distortion or displacement of WSS target ring • Incorrect number of teeth on WSS target ring • Corrosion of WSS in sensor mounting • WSS target ring dirty or damaged teeth • WSS's crossed over, monitoring incorrect wheels • Internal failure in HCU	ring is correctly installed, secure and is not misaligned or has drifted off centre. Check correct number of teeth are on the WSS target ring. Check that WSS is not corroded in its mounting bracket. Check WSS target ring is not dirty or damaged. Using the manufacturer approved diagnostic system check that each wheel corresponds correctly to its signal. Suspect the HCU, check and install a new HCU as required, refer to the new module/component installation note at the top of the DTC Index. After replacement the new HCU must be configured, by carrying out the following procedure. Ignition ON for 30 seconds, brake warning lamps will remain illuminated. Ignition OFF. Ignition ON, brake warning lamps will extinguish after 3 seconds.
C1A9414	Front Right Wheel Speed Sensor Circuit	• Circuit short to ground or open. The DTC is logged when the ignition is on, the vehicle is stationary and the fault is present for greater than 240 ms • WSS signal front right circuit short to ground • WSS signal front right circuit short to power • WSS signal front right open circuit • WSS supply front right circuit short to ground • WSS supply front right circuit short to power • WSS supply front right open circuit • WSS internal failure	Check connectors of harness to WSS, intermediate harness connectors and harness connectors to module for corrosion and correct terminal tension. Refer to the electrical guides and check WSS signal front right circuit for short to ground, power and open circuit. Refer to the electrical guides and check WSS supply front right circuit for short to ground, power and open circuit. Check WSS circuit for damage to insulation. Install WSS harness as required. Install WSS as required.
C1A9429	Front Right Wheel Speed Sensor Circuit	• Signal invalid. A failure where the value of the signal is not plausible given the operating conditions • Excessive free play in wheel bearings • Incorrect size wheel or tire • Excessive air gap between WSS and sensor target ring • Incorrect number of teeth on WSS target ring • Corrosion of WSS in sensor mounting • Electrical interference on the WSS signal circuit • Damage to WSS circuit wiring • WSS's crossed over, monitoring incorrect wheels • Internal failure in HCU	Using the manufacturer approved diagnostic system compare the datalogger signals for all the WSS simultaneously. Check for similar values and operation between each WSS. Check wheel rims and tires are to the correct size. Check WSS target ring air gap is to specification. Check that the WSS target ring is correctly installed, check wheel bearing is correctly installed. Check correct wheel bearing is installed. Check that WSS is not corroded in its mounting bracket. Using the manufacturer approved diagnostic system check that each wheel corresponds correctly to its signal. Suspect the HCU, check and install a new HCU as required, refer to the new module/component installation note at the top of the DTC Index. After replacement the new HCU must be configured, by carrying out the following procedure. Ignition ON for 30 seconds, brake warning lamps will remain illuminated. Ignition OFF. Ignition ON, brake warning lamps will extinguish after 3 seconds.

Published: Mar 10, 2009

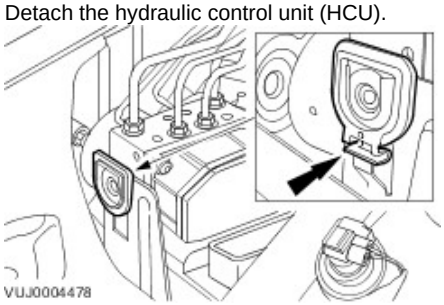
Anti-Lock Brake System (ABS) Module - VIN Range: C00001->J12991 (70.60.02)

Removal

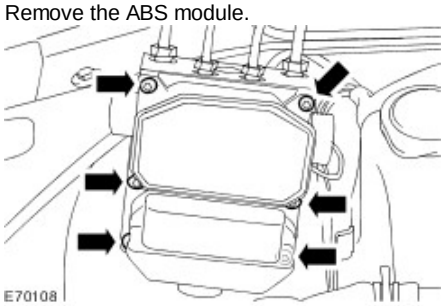
1 . Disconnect the anti-lock brake system (ABS) module electrical connector.



2 . Detach the hydraulic control unit (HCU).



3 . Remove the ABS module.



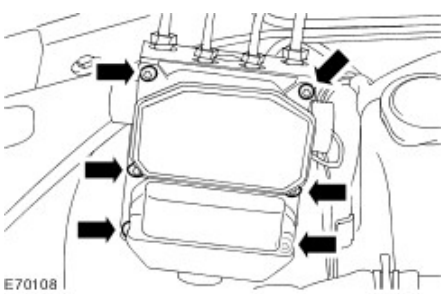
Installation

1 . **NOTE:**

Install new retaining bolts.

To install, reverse the removal procedure.

Tighten to 3 Nm.



2 . Reprogram the ABS module, using the Jaguar approved diagnostic system.

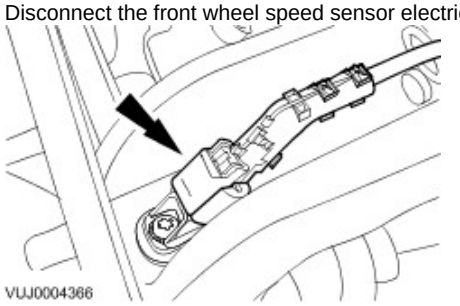
Published: Mar 29, 2001

Front Wheel Speed Sensor (70.60.03)

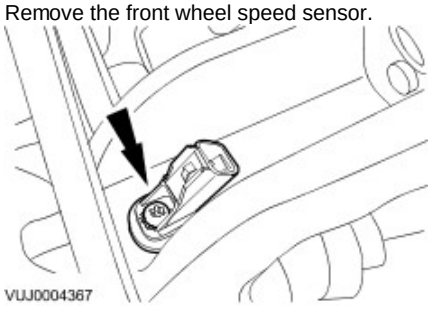
Removal

1 . Remove the wheel and tire assembly. For additional information, refer to<<204-04>>.

2 . Disconnect the front wheel speed sensor electrical connector.

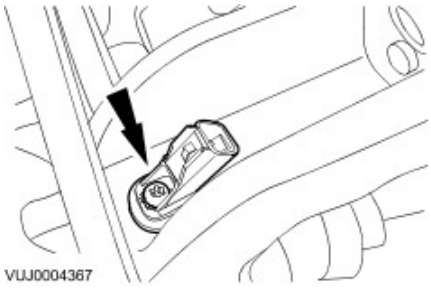


3 . Remove the front wheel speed sensor.



Installation

1 . To install, reverse the removal procedure.
   1) Tighten to 5 Nm



Published: Jul 10, 2003

Hydraulic Control Unit (HCU) - VIN Range: C00001->J12991 (70.60.18)

Removal

All vehicles

1 . Disconnect the battery ground cable.
For additional information, refer to
For additional information, refer to Battery Disconnect and Connect

2 . Raise and support the vehicle.
For additional information, refer to
For additional information, refer to Lifting

3 . Connect a bleed pipe bottle to the caliper bleed nipple and loosen the bleed nipple.

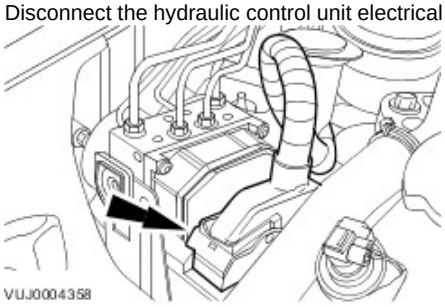
4 . Install pedal hold-down tool.

- Install the tool between the pedal and the seat frame.
- Turn the tool hand-wheel to depress and hold the pedal 60 mm (2.4 in) from the 'OFF' position
- This will prevent loss of fluid from the reservoir through disconnected brake pipes.

5 . Remove the bleed pipe and bottle.

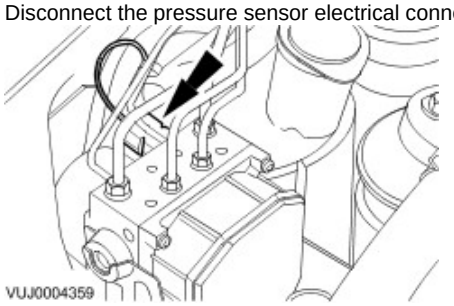
- Tighten the caliper bleed nipple.
- Disconnect and remove the bleed pipe and bottle.
- Install the bleed nipple dust cap.

6 . Disconnect the hydraulic control unit electrical connector.



Vehicles with stability assist

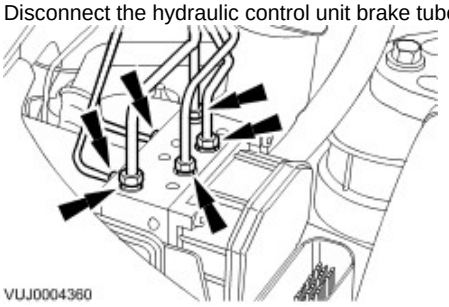
7 . Disconnect the pressure sensor electrical connector.



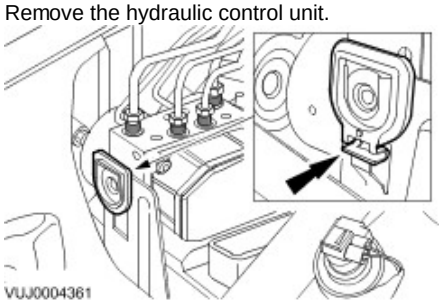
All vehicles

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

Disconnect the hydraulic control unit brake tubes.



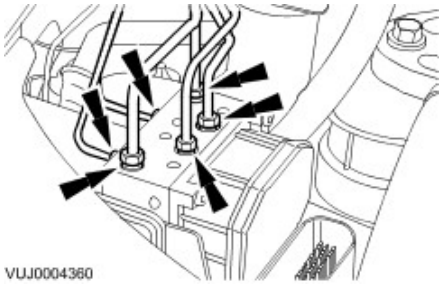
9 . Remove the hydraulic control unit.



Installation

1 . To install, reverse the removal procedure.

Tighten to 17 Nm.



2 . Bleed the brake system.
For additional information, refer to
For additional information, refer to Brake System Bleeding (70.25.03)

Published: Dec 8, 2006

Hydraulic Control Unit (HCU) - VIN Range: J12992->V99999 (70.60.18)

Special Service Tools

Brake pedal hold-down tool
JDS 9013

Removal

1 . Disconnect the battery ground cable.
For additional information, refer to Battery Disconnect and Connect

2 . Raise and support the vehicle.
For additional information, refer to Lifting

3 . Connect a bleed pipe bottle to the caliper bleed nipple and loosen the bleed nipple.

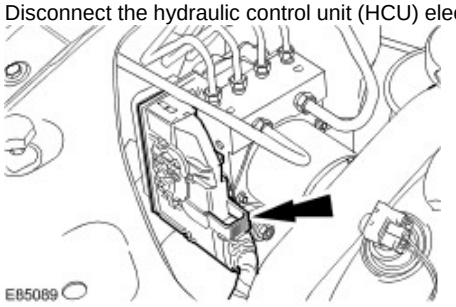
4 . Install pedal hold-down tool.

- Install the tool between the pedal and the seat frame.
- Turn the tool hand-wheel to depress and hold the pedal 60 mm (2.4 in) from the 'OFF' position.
- This will prevent loss of fluid from the reservoir through disconnected brake pipes.

5 . Remove the bleed pipe and bottle.

- Tighten the caliper bleed nipple.
- Disconnect and remove the bleed pipe and bottle.
- Install the bleed nipple dust cap.

6 . Disconnect the hydraulic control unit (HCU) electrical connector.



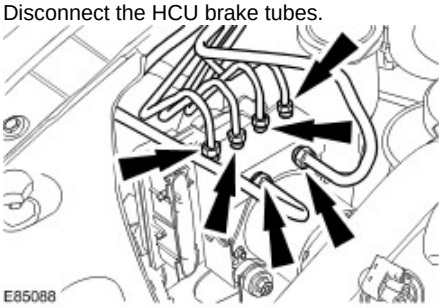
7 .

WARNING: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling, as prolonged contact may cause irritation and dermatitis. If brake fluid contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention. If taken internally do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

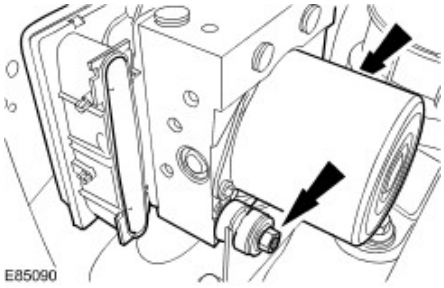
CAUTION: If brake fluid is spilt on the paintwork, the effected area must be immediately washed down with cold water.

CAUTION: Cap the exposed brake tubes and ports to prevent loss of fluid and dirt ingress. Failure to follow this instruction may result in damage to the vehicle.

Disconnect the HCU brake tubes.

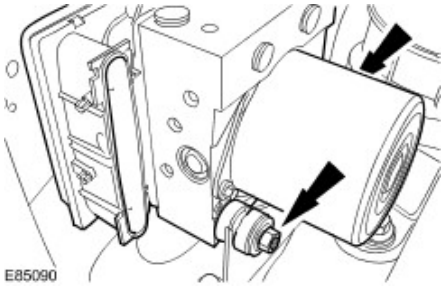


8 . Remove the HCU.



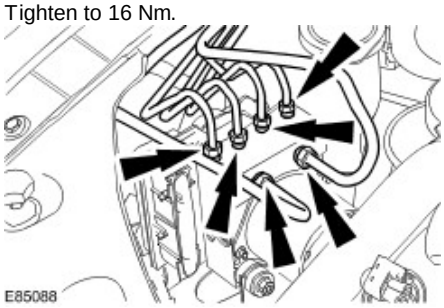
Installation

1 . To install, reverse the removal procedure.
Tighten to 8 Nm.



2 .
CAUTION: Make sure the brake tubes are installed to the correct ports. Failure to follow this instruction may result in damage to the vehicle.

Tighten to 16 Nm.



3 . Bleed the anti-lock brake system (ABS).
For additional information, refer to Brake System Bleeding (70.25.03)

Published: Aug 10, 2005

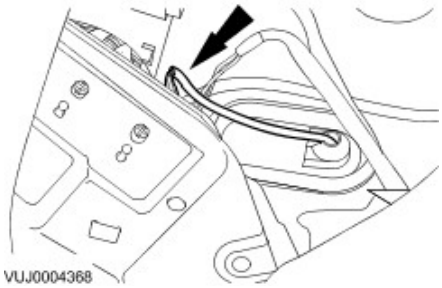
Rear Wheel Speed Sensor (70.60.04)

Removal

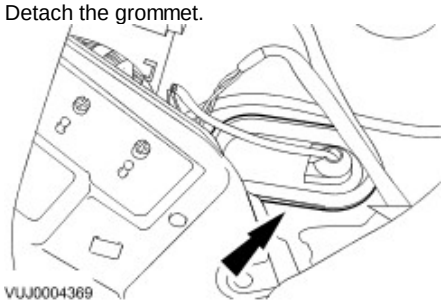
Vehicles with 2.5L or 3.0L engine

1 . Remove the rear seat cushion.
For additional information, refer to Rear Seat Cushion (76.70.47)

2 . Disconnect the rear ABS wheel speed sensor electrical connector.

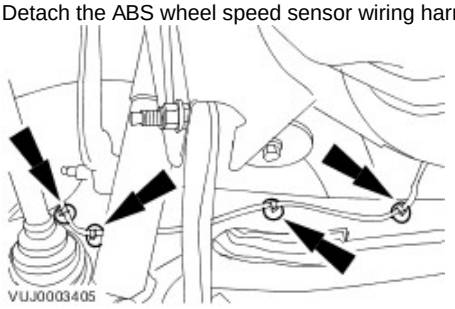


3 . Detach the grommet.

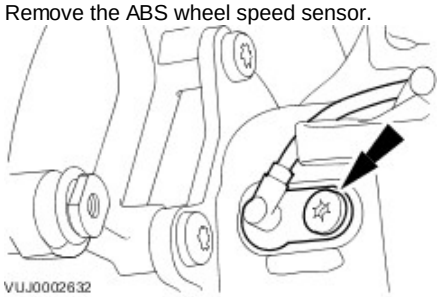


4 . Raise and support the vehicle.
For additional information, refer to Lifting

5 . Detach the ABS wheel speed sensor wiring harness.

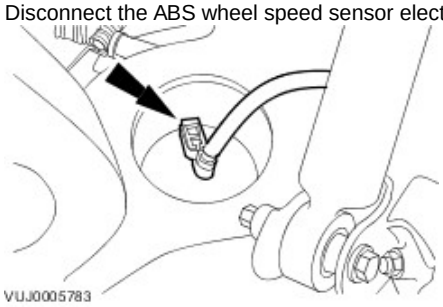


6 . Remove the ABS wheel speed sensor.

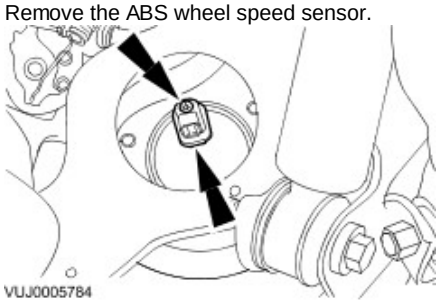


Vehicles with 2.0L or diesel engine

7 . Disconnect the ABS wheel speed sensor electrical connector.



8 . Remove the ABS wheel speed sensor.

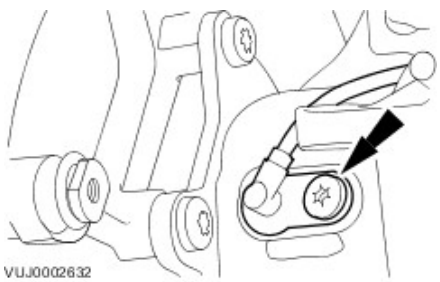


Installation

Vehicles with 2.5L or 3.0L engine

1 . To install, reverse the removal procedure.

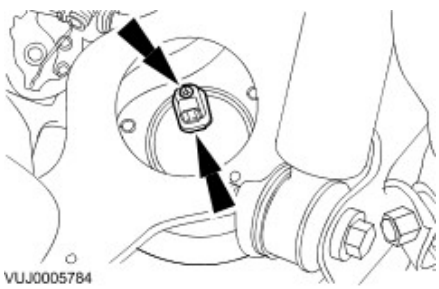
1) Tighten to 22 Nm.



Vehicles with 2.0L or diesel engine

2 . To install reverse the removal procudure.

1) Tighten to 7 Nm.



Published: Mar 12, 2009

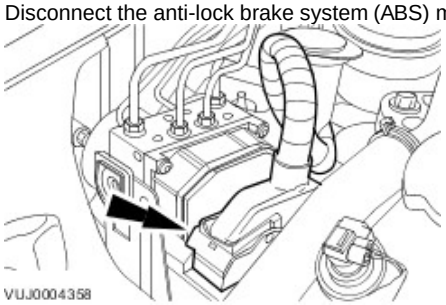
Stability Assist Module

Removal

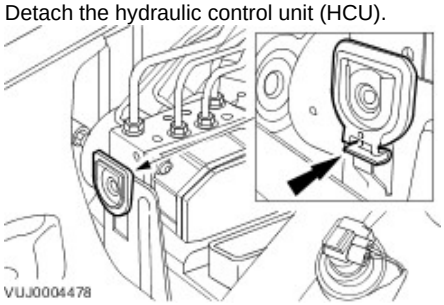
1 . **NOTE:**

Stability assist module is an integral component of the ABS module and cannot be separated.

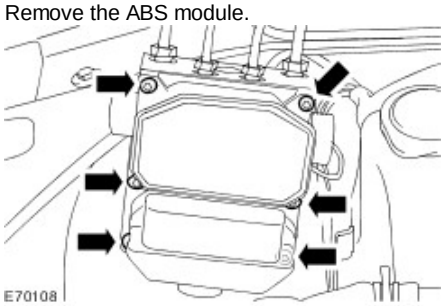
Disconnect the anti-lock brake system (ABS) module electrical connector.



2 . Detach the hydraulic control unit (HCU).



3 . Remove the ABS module.



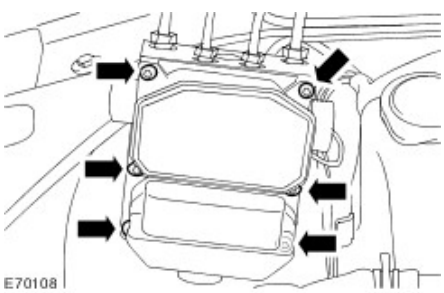
Installation

1 . **NOTE:**

Install new retaining bolts.

To install, reverse the removal procedure.

Tighten to 3 Nm.



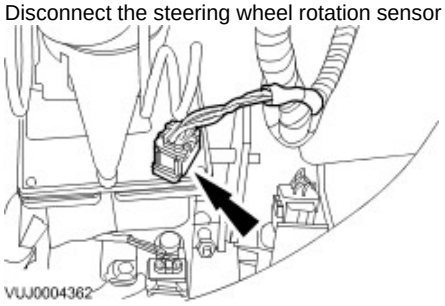
2 . Reprogram the ABS module, using the Jaguar approved diagnostic system.

Published: Dec 2, 2003

Steering Wheel Rotation Sensor (86.56.58)

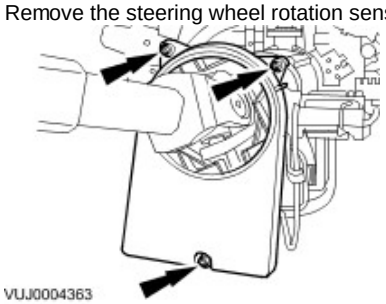
Removal

1 . Disconnect the steering wheel rotation sensor electrical connector.



2 . Remove the upper steering column.
For additional information, refer to

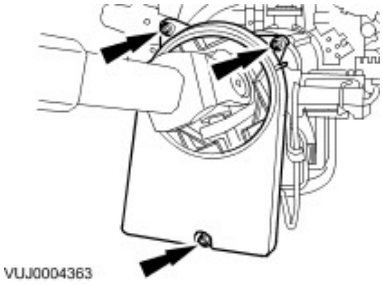
3 . Remove the steering wheel rotation sensor.



Installation

1 . To install, reverse the removal procedure.

Tighten to 1 Nm.



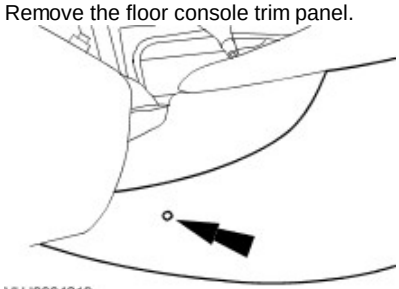
2 . Calibrate the steering wheel angle sensor using the Jaguar approved diagnostic system.

Published: Jul 10, 2003

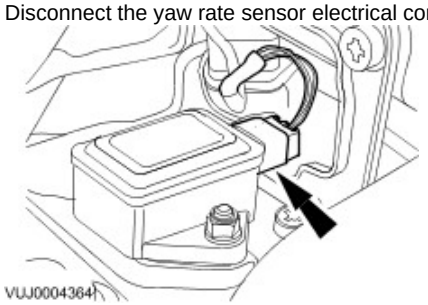
Yaw Rate Sensor - 2.0L/2.5L/3.0L/2.0L Diesel (86.56.57)

Removal

1 . Remove the floor console trim panel.

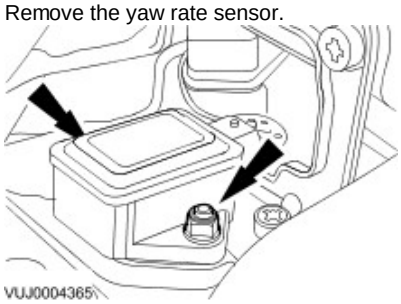


2 . Disconnect the yaw rate sensor electrical connector.



3 . **WARNING: Note the correct orientation of the yaw rate sensor.**

Remove the yaw rate sensor.

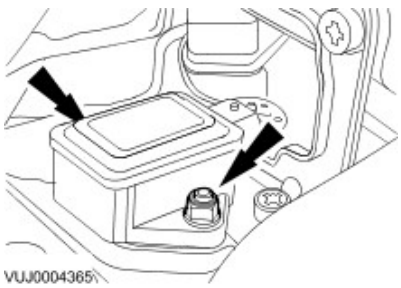


Installation

1 . **WARNING: Make sure the yaw rate sensor is correctly installed.**

To install, reverse the removal procedure.

Tighten to 6 Nm.



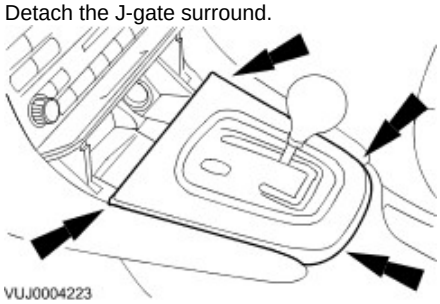
Published: Aug 12, 2005

Yaw Rate Sensor - 2.2L Diesel (86.56.57)

Removal

Vehicles with automatic transmission

1 . Detach the J-gate surround.

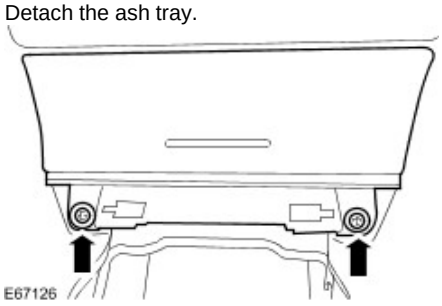


Vehicles with manual transmission

2 . Detach the gear selector surround.

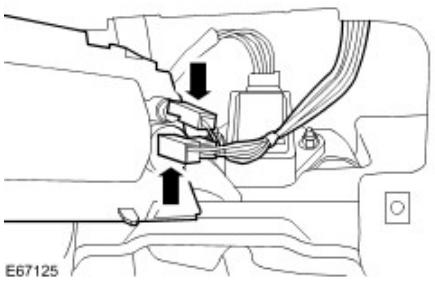
All vehicles

3 . Detach the ash tray.



4 . Remove the ash tray.

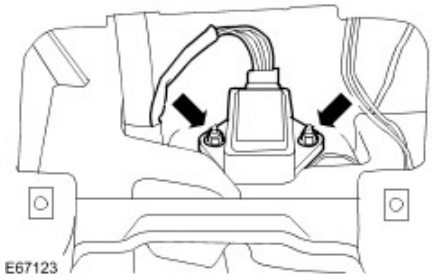
- Disconnect the electrical connectors.



5. **CAUTION: Make sure the yaw rate sensor is not subjected to any form of impact and is not dropped or damaged. Failure to follow this instruction may result in failure of the sensor.**

Detach the yaw rate sensor.

- Remove the retaining nuts.



6 . Remove the yaw rate sensor.

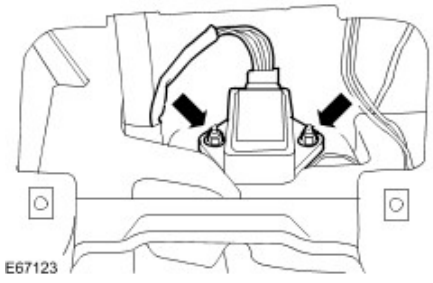
- Disconnect the electrical connector.

Installation

1. **CAUTION: Make sure the yaw rate sensor is not subjected to any form of impact and is not dropped or damaged. Failure to follow this instruction may result in failure of the sensor.**

To install, reverse the removal procedure.

- Tighten to 6 Nm.



Published: Jan 24, 2002

Specifications

Steering Linkage Specifications

Steering Linkage Free Play	Measurement (mm)	Measurement (in)
Free play (measured at the steering wheel rim)	0-6	0-0.24

Power Steering Pump Specifications

Item	Specification
Power steering pump relief pressure	106-114 bar

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Power steering fluid	Dextron 3

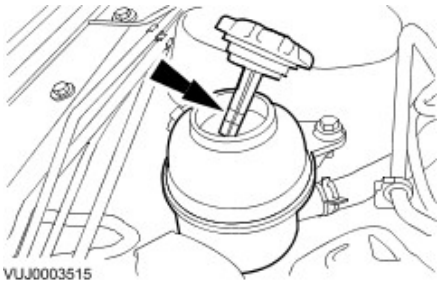
Published: Mar 29, 2001

Power Steering System Filling

1. **NOTE:**

   When filling the reservoir, make sure that the fluid is clean and not agitated prior to use. The fluid should be poured slowly into the reservoir to minimize the poss bility of aeration.

Fill the reservoir.



2. **NOTE:**

   Do not start the engine.

Turn the steering from lock to lock.

3. Check the fluid level. Fill the reservoir if necessary.

4. Start the engine and allow to idle. Top up the reservoir as air is vented.

5. With the engine idling turn the steering from lock to lock topping up the reservoir if necessary.

6. When no further change of fluid level occurs run engine for a further 20 minutes to vent any remaining air.

7. With the engine idling, turn the steering wheel from lock to lock. If excessive noise is apparent or shudder is evident through the steering wheel, repeat the filling procedure.

Published: Apr 20, 2010

Power Steering System Flushing (57.15.08)

NOTE:

If heavy steering or contamination within the power steering system is found, it is necessary to carry out the system flush procedure as detailed below. If any components have been replaced in the power steering system the procedure below must be carried out in full.

NOTE:

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

1. Remove the power steering fluid reservoir cap.

2. Using a suitable syringe, remove the power steering fluid from the power steering fluid reservoir.

3.

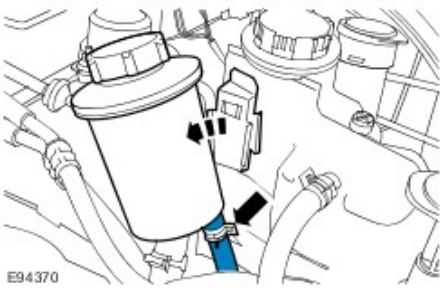
CAUTION: Be prepared to collect escaping fluids.

NOTE:

Note the orientation of the clip.

Detach the power steering fluid reservoir.

- Detach but do not remove the power steering fluid reservoir.
- Release the power steering fluid return hose from the power steering fluid reservoir.
- If a quick release coupling is fitted to the power steering return hose, release the power steering fluid return hose from the coupling by removing the clip.



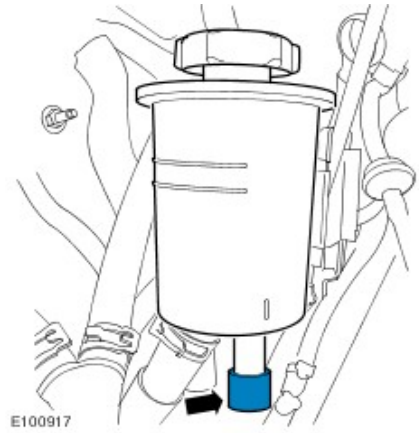
4.

CAUTION: Be prepared to collect escaping fluids.

NOTE:

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

Using a suitable blanking cap, cap the power steering reservoir return pipe.



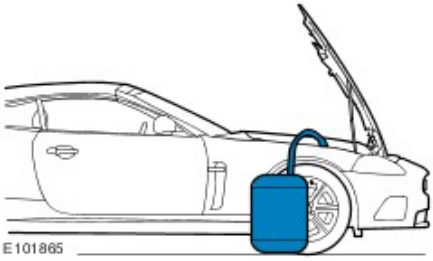
5.

CAUTION: Be prepared to collect escaping fluids.

NOTE:

Make sure the extended pipe is not kinked or twisted and is correctly secured with hose clips.

Attach a suitable pipe to the power steering return hose to allow the fluid to drain.



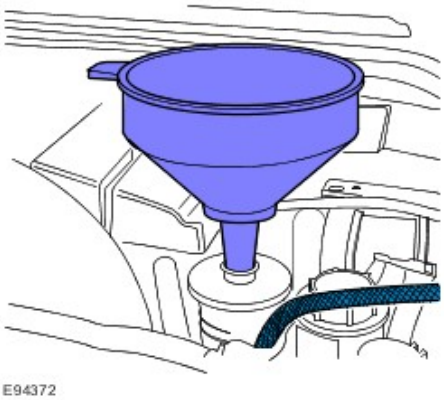
6. **NOTE:**

The suitable funnel should have the a capacity of 4 litres and O-ring seal

NOTE:

The suitable funnel must be tightly sealed to the power steering fluid reservoir to avoid fluid leakage.

Install a suitable funnel onto the power steering fluid reservoir.



7.

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 with the wheels just clear of the ground.

8.

CAUTION: Steps 8 and 9 must be carried out within 2 - 3 seconds of each other. Failure to follow this instruction may result in damage to the power steering system.

CAUTION: Be prepared to collect escaping fluids.

Using the suitable funnel, top up the power steering system with the specified fluid. Make sure the fluid level is maintained at two thirds full in the funnel.

9.

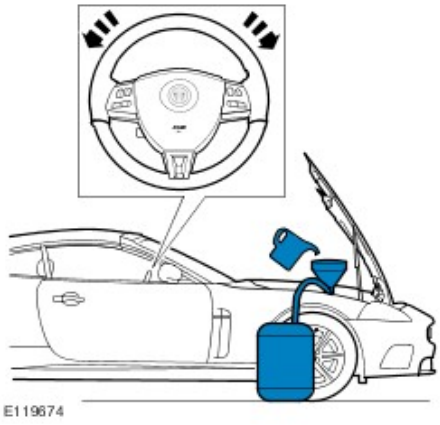
CAUTION: Be prepared to collect escaping fluids.

CAUTION: Do not allow the power steering fluid level in the power steering fluid reservoir to fall below the minimum power steering fluid level. Failure to follow this instruction may result in damage to the power steering system.

CAUTION: Make sure the engine is switched off as soon as the full 4 litres of power steering fluid has entered the power steering fluid reservoir.

Flush the power steering system.

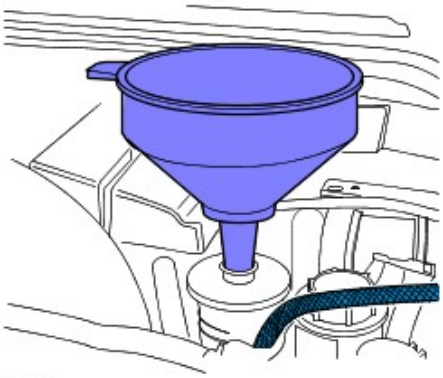
- Start the engine
- With assistance turn the steering slowly lock to lock 3 times at approximately 1 revolution every 5 seconds.
- Continue to flush the power steering system until 4 litres of power steering fluid has been added to the power steering reservoir. This should take approximately 30 seconds.



10.

CAUTION: Be prepared to collect escaping fluids.

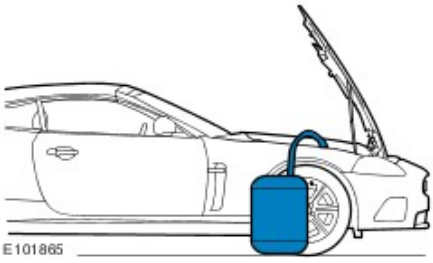
Remove the suitable funnel.


E94372

11.

CAUTION: Be prepared to collect escaping fluids.

Remove the suitable pipe to the power steering return hose.


E101865

12.

CAUTION: Be prepared to collect escaping fluids.

NOTE:

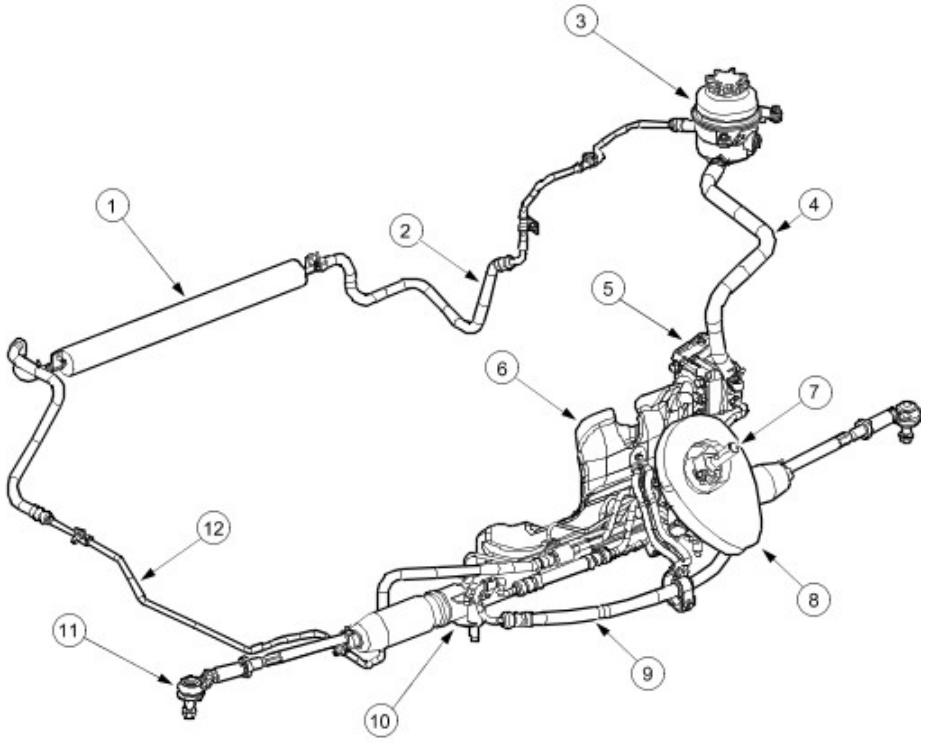
Note the orientation of the clip.

If a quick release coupling is fitted to the power steering return hose, connect the power steering fluid return hose to the coupling by installing the clip.

13. Install a new power steering fluid reservoir.

Published: Feb 21, 2006

Steering System



VUJ0003736

Item	Part Number	Description
1	—	Fluid cooler
2	—	Low pressure pipe - fluid cooler to reservoir
3	—	Fluid reservoir
4	—	Power steering pump
5	—	Heat shield
6	—	Extension shaft
7	—	Dash panel seal
8	—	High pressure pipe
9	—	Steering gear
10	—	Tie-rod end
11	—	Low pressure pipe - steering gear to fluid cooler

Vehicles with 2.0L or diesel engines

The power steering system is a rack and pinion design, with an engine-driven pump providing the steering assistance.

Vehicles with 2.5L or 3.0L engines

The power steering system is a rack and pinion design, with an engine-driven pump providing the steering assistance. The system features variable steering assistance with vehicle speed and a variable ratio steering rack.

Absolute cleanliness must be observed when replenishing the fluid or dismantling any part of the system. New fluid from a sealed container must be used.

NOTE:

If the steering gear, pump or cooler are being replaced for leakage or noise related issues and there is no evidence of fluid contamination, there is no need to replace the reservoir.

In some cases where the fluid clearly contains particulate matter, and the system continues to function, flush the system with fresh fluid and

replace the reservoir, as there is the possibility that the reservoir internal filter may be damaged or faulty.

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Steering System

Inspection and Verification

1 . Verify the customer concern by driving the vehicle.

2 . Visually inspect for obvious signs of mechanical or electrical damage.

Mechanical Checks
• Incorrect tire pressure, loose wheel nuts, incorrect wheel alignment • Loose tie-rods • Loose damper and spring assemblies or ball joint • Loose steering column shaft universal joints • Loose pinch bolts on steering column shaft • Loose steering gear assembly • Check for external damage to the steering gear. Damaged tie-rods  **CAUTION: If a steering gear assembly is returned under warranty with leaking seals, but there is also damage to the steering gear boot/boots the steering gear warranty will be invalid. This is due to the steering gear seals being damaged due to foreign materials entering the steering gear boot and damaging the steering gear seals thereafter.** Damaged steering gear boot • Damaged accessory drive belt • Binding or misaligned steering column, pump or steering gear • Incorrect fluid level • Hose leaks or line restrictions • Hose fouling bodywork

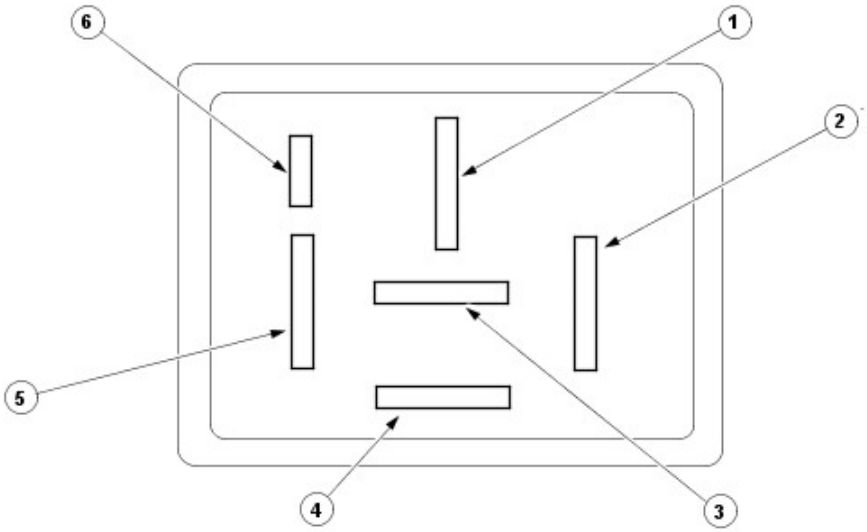
Electrical Checks/Tests
• Make sure all connectors are in place (steering gear Servotronic solenoid and steering control module (SCM) - if applicable) • Make sure all the fuses are in place and not blown • DISCONNECT the steering gear transducer and the steering should become heavy • TEST electrical values: Power Supply to the SCM = 12 Volts Steering gear transducer resistance 7.0 to 7.5 Ohms is normal Steering gear transducer voltage = 6 Volts Steering gear transducer current = 840 mA at 0 mph reducing to 0 mA at maximum speed • RECONNECT all electrical items disturbed during testing

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 . Check the power steering fluid condition. For additional information, REFER to Power Steering Fluid Condition Check in this section.

5 . If the concern is not visually evident, verify the symptom and REFER to Steering Fault Diagnosis by Symptom Charts in this section.

Steering Relay Harness Connector



E39815

Item	Description
1	Steering transducer ground
2	Ignition feed
3	Steering transducer feed
4	Ground
5	Speed sensor signal
6	Serial interface

Steering Linkage Inspection and Backlash (Freeplay) Check

CAUTION: Steering gear boots must be handled carefully to avoid damage. Use new clamps when installing steering gear boots.

Inspect the boots for cuts, deterioration, twisting or distortion. Check the steering gear boots to make sure they are tight. Install new boots or clamps as necessary.

NOTE:

The following steps must be carried out with assistance.

1 . With the wheels in the straight ahead position, gently turn the steering wheel to the left and the right to check for free play.

2 . Free play should be between 0 and 6 mm (0 and 0.24 in) at the steering wheel rim. If the free play exceeds this limit, either the ball joints are worn, the lower steering column joints are worn or the backlash of the steering gear is excessive.

CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will result in the steering gear warranty to become invalid.

3 . The backlash of the steering gear cannot be adjusted, install a new steering gear. For additional information, <<211-02>>

4 . Grasp the steering wheel firmly and move it up and down and to the left and right without turning the wheel to check for column bearing wear, steering wheel or steering column. For additional information, <<211-04>>

Power Steering Fluid Condition Check

1 . Run the engine for 2 minutes.

2 . Check the power steering fluid system level.

3 . Observe the color and the odor. The color under normal circumstances should be dark reddish, not brown or black.

4 . Allow the fluid to drip onto a facial tissue and examine the stain.

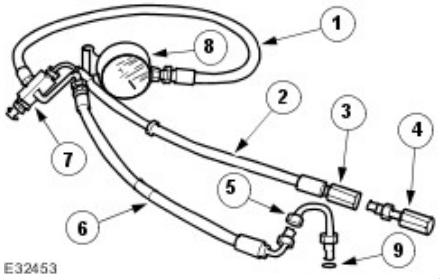
5 . If evidence of solid material is found, the power steering fluid system should be drained for further inspection.

6 . If fluid contamination or steering component failure is confirmed by the sediment in the power steering fluid system, REFER to Steering

Fault Diagnosis by Symptom Charts in this section.

Power Steering Pressure Test

Test Equipment



E32453

Item	Special Tool Number	Description
1	211-011	Pressure Gauge Hose
2	211-011-08	Pump Return Hose
3	211-011-07	Pump Return Hose Connector
4	211-011-03/2	Test Equipment to High Pressure Hose Adaptor
5	211-011-03/1	Pump High Pressure Outlet to Hose Adaptor
6	211-011-02	Pump Adaptor to Control Valve Hose
7	211-011-01	Control Valve
8	211-011	Pressure Gauge
9	-	'O' Ring Seal

The measurement of the maximum system pressure, (which is governed by the pressure relief valve) is achieved by inserting the Service Tool (pressure gauge and adaptors) into the fluid circuit of the power steering system. Run the engine at idle speed, turn the steering from lock to lock and read the maximum pressure recorded on the gauge.

Installing Test Equipment

To install the pressure test equipment:

- Place a suitable drain tray below the power steering pump.
- Install a hose clamp on the reservoir to pump hose prior to disconnecting any hoses, to avoid unnecessary loss of fluid.
- Disconnect the hose from the power steering pump high pressure outlet.
- Install the pump outlet to hose adaptor (5). Do not omit the 'O' ring seal (9).
- Connect the power steering pump adaptor to control valve hose (6) of the test equipment.
- Install the adaptor (4) in the high pressure hose previously removed from the power steering pump outlet.
- Connect the connector (3) of the test equipment hose (2) to the adaptor (4).
- Remove the hose clamp from the reservoir hose.
- Start the engine.

With the control valve (7) OPEN and the engine idling, the following system pressures may be checked:

- During turning.
- When the steering is held on full lock.
- With the steering at rest.

CAUTION: To avoid excessive heating of the power steering pump, do not close the valve for longer than 5 seconds maximum.

CAUTION: Do not drive the vehicle with the test equipment installed.

With the control valve (7) CLOSED the power steering pump maximum output pressure can be checked.

Removing Test Equipment

To remove the test equipment:

- Install a hose clamp on the reservoir to power steering pump hose.
- Removing the test equipment is a reversal of the installation instructions.
- Install a new 'O' ring seal (9) to the power steering pump high pressure outlet to hose connection.
- Install the original hose to the power steering pump.
- Remove the clamp from the reservoir to the power steering pump hose.
- Top-up the reservoir fluid.
- Bleed the power steering system. For additional information,

Steering Fault Diagnosis by Symptom Charts

Leakage

Condition	Possible Sources	Action
• Fluid leakage	Confirm the position of the fluid leak.	• CLEAN the area of the leak. • Inspect the area and confirm the exact position of leak. • Make sure the fluid is not from another system on the vehicle.
	• Overfilled system.	• CORRECT the fluid level as necessary.
	• Component leak.	**NOTE:** Record the position of the leak and some indication of the rate of the leak on the Warranty Return Record Sheet. • LOCATE the suspect component or CHECK hose connections and repair as necessary.
	• Damaged fluid cap.	• INSTALL a new fluid cap.
	• Loose or damaged hose fittings.	• TIGHTEN or INSTALL a new hose as necessary.
	• Leakage at power steering pump.	• INSTALL a new power steering pump as necessary. For additional information, <<211-02>>
• Fluid leakage	• Leakage at steering hose to steering gear connection.	• CHECK steering hose to steering gear connection for leakage. CHECK and TIGHTEN the steering hose to steering gear connection retaining bolts/bolts as necessary.
	• Power steering fluid leakage at O-ring seals.	• CHECK the power steering system for signs of steering fluid loss from O-ring seals. • INSTALL new O-ring seals as necessary. • BLEED the power steering system. For additional information, <<211-00>>
	• Power steering fluid leakage from transfer pipes.	• CHECK the power steering system for signs of steering fluid loss from the transfer pipes. • CHECK and TIGHTEN the transfer pipes if required, INSTALL new transfer pipes as necessary. • BLEED the power steering system. For additional information, <<211-00>>
	• Power steering fluid leakage from the steering gear.	• CHECK the power steering gear for signs of fluid loss. • INSTALL a new steering gear as necessary. For additional information, <<211-02>>
	• Power steering fluid leakage from steering gear boot.	• CHECK the power steering gear for signs of fluid loss. • INSTALL a new steering gear as necessary. For additional information, <<211-02>>

Functional

Condition	Possible Sources	Action

• Free play at steering wheel	• Excess play in the steering linkage.	• CHECK the steering linkage for excess play. For additional information, REFER to the Steering Linkage Inspection and Backlash (Freeplay) Check in this section.
	• Steering wheel loose.	• CHECK and TIGHTEN the steering wheel retaining bolt/bolts as necessary. For additional information, <<211-04>>
	• Lower steering column pinch bolt loose.	• CHECK and TIGHTEN the lower steering column pinch bolts as necessary. For additional information, <<211-04>>
	• Excessive wear in lower steering column.	• CHECK for lower steering column for wear in the universal joints. If wear is present, INSTALL a new lower steering column as necessary.
	• Wear in suspension joints.	**CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will result in the steering gear warranty to become invalid.** • CHECK for excess wear in the front suspension joints. For additional information, <<204-00>>
• Vehicle wanders from side to side on the road, when the vehicle is driven straight ahead and the steering wheel is held in a firm position	• Incorrect tire pressure or tire size.	• CHECK and ADJUST the tire pressure. For additional information, <<204-04>> • INSTALL a new tire as necessary. For additional information, <<204-04>>
	• Vehicle is unevenly or excessively loaded.	• ADJUST the load evenly.
	• Loose/worn tie-rods.	• INSTALL a new tie-rod end. For additional information, <<211-03>>
	• Steering gear bolts loose or damaged.	• TIGHTEN or INSTALL new bolts.
	• Loose or worn suspension ball joint(s).	• INSTALL a new suspension ball joint assembly. For additional information, <<204-01>>
	• Steering column universal joint pinch bolt loose.	• TIGHTEN the steering column universal joint pinch bolt. For additional information, <<211-04>>
	• Incorrect toe adjustment.	• ADJUST as necessary. For additional information, <<204-00>>
	• Loose or worn rear suspension.	• TIGHTEN loose, or INSTALL new rear suspension components. For additional information, <<204-02>>
• Vehicle tends to pull to one side when driven on a level surface	• Incorrect tire pressure. • Incorrect tire size or different tire/tread type. • Uneven tire wear	• CHECK and ADJUST the tire pressure. For additional information, <<204-04>> • INSTALL a new tire as necessary. For additional information, <<204-04>>
	• Vehicle is unevenly loaded or overloaded.	• Adjust the load.

	• Incorrect toe adjustment.	• ADJUST as necessary. For additional information, <<204-00>>
	• Damaged front suspension components.	• INSTALL new front suspension components as necessary. For additional information, <<204-01>>
	• Damaged rear suspension components.	• INSTALL new rear suspension components as necessary. For additional information, <<204-02>>
	• Steering gear valve effort out of balance.	• SHIFT the transmission into NEUTRAL while driving at no more than 30 miles/hour (50 km/h) and turn the ignition to position I (engine OFF-coasting). If the vehicle does not pull with the engine off, INSTALL a new steering gear. For additional information, <<211-02>> • If the vehicle does drift with the engine off, CROSS SWITCH front wheel assemblies. • If the vehicle pulls to the opposite side, SWITCH wheels that were on the rear to the same side on the front. • If the vehicle pull direction is not changed, CHECK the front suspension components and toe adjustments. For additional information, <<204-01>>
	• Check the front and rear brakes for correct operation.	• ADJUST as necessary. For additional information, <<206-00>>
	• Check for bent rear suspension components and for damaged coil springs in the front suspension.	• INSTALL new rear suspension components as necessary. For additional information, <<204-02>> • INSTALL new front suspension components as necessary. For additional information, <<204-01>>
	• Check the rear suspension for loose or worn suspension components.	• TIGHTEN or INSTALL new components as necessary. For additional information, <<204-02>>
	• Incorrect underbody alignment.	• CHECK underbody alignment. For additional information, <<502-00>>
• Poor returnability of the steering	• Lower steering column interference.	• CHECK the steering column is free from interference from the engine harness, sound proofing or the floor covering.
	• Incorrect tire pressure.	• CHECK and ADJUST the tire pressure. For additional information, <<204-04>>
	• Incorrect tire size or type.	• INSTALL a new tire as necessary. For additional information, <<204-04>>
	• Steering column upper shroud fouling on the steering wheel.	• CHECK steering column upper shroud for fouling. ADJUST as necessary.
	• Steering column universal joints binding.	• INSTALL a new steering column. For additional information, <<211-04>>
	• Steering column shaft floor seal binding.	• CHECK the steering column shaft floor seal for correct fitment and REFIT as necessary.
	• Steering column shaft floor seal may be torn.	• INSTALL a new steering column shaft floor seal as necessary.

	• Binding or damaged tie-rods.	• CHECK tie-rod end for excessive wear or tightness in ball joint. INSTALL a new tie-rod end. For additional information, <<211-03>>
	• Damaged or worn front suspension components.	• INSTALL new front suspension components as necessary. For additional information, <<204-01>>
	• Incorrect toe adjustment.	• ADJUST as necessary. For additional information, <<204-00>>
• Excessive steering efforts required during low speed manoeuvring and/or during parking manoeuvres	• Low power steering fluid.	• CHECK steering system for signs of steering fluid loss. • BLEED the power steering system. For additional information, <<211-00>>
	• Damaged accessory drive belt tensioner.	• INSTALL a new accessory drive belt tensioner.
	• Hose or cooler line restriction.	• CHECK hose or cooler lines for correct routing. • INSTALL a new hose as necessary.
	• Fluid aeration.	• BLEED the system. For additional information,
	• Steering transducer not closed - no feed voltage.	• CHECK the steering transducer circuit. For additional information, REFER to the wiring diagrams. • Carry out the electrical checks and tests. For additional information, REFER to the Electrical Checks and Tests in this section.
	• Steering transducer not closed - cable fault.	• CHECK the steering transducer circuit. For additional information, REFER to the wiring diagrams. • Carry out the electrical checks and tests. For additional information, REFER to the Electrical Checks and Tests in this section.
	• Steering control module (SCM) defective.	• CHECK the SCM and INSTALL a new SCM as necessary.
	• Power steering fluid delivery pressure or flow too low.	• CHECK the power steering pressure. For additional information, REFER to the Power Steering Pressure Test in this section. • INSTALL a new power steering pump as necessary. For additional information, <<211-02>>
	• Internal steering gear leakage.	• CHECK the power steering pressure. For additional information, REFER to the Power Steering Pressure Test in this section. • INSTALL a new steering gear as necessary. For additional information, <<211-02>>
• Steering operation is very heavy when driving, but when stationary manoeuvring is good	• Steering transducer open early.	• CHECK steering transducer and INSTALL a new steering transducer as necessary. • Carry out the electrical checks and tests. For additional information, REFER to the Electrical Checks and Tests in this section.
	• Steering transducer open early, steering control module (SCM) fault.	• CHECK SCM and INSTALL a new SCM as necessary.

	• Steering transducer open early, speedo signal error.	• CHECK speedo circuit. For additional information, REFER to the wiring diagrams.
• Steering operation is very light when driving, but when stationary manoeuvring is good	• Steering transducer not open, (no power steering fluid flow).	• CHECK the power steering fluid condition. For additional information, REFER to the Power Steering Fluid condition check in this section.
	• Steering transducer not open, steering control module (SCM) fault.	• CHECK the SCM and INSTALL a new SCM as necessary. • Carry out the electrical checks and tests. For additional information, REFER to the Electrical Checks and Tests in this section.
	• Steering transducer not open, speedo signal error.	• CHECK the speedo circuit. For additional information, REFER to the wiring diagrams.
	• CHECK the power steering fluid low pressure pipe for restricted flow.	• INSTALL a new power steering fluid low pressure pipe.
• Steering heavy operation during rapid manoeuvring	• Air in power steering system.	• CHECK for an air leak into the power steering system and repair as necessary. • BLEED the power steering system. For additional information,
	• Fluid loss at the power steering pump shaft seal.	• CHECK the power steering pump for signs of steering fluid loss. • INSTALL a new power steering pump as necessary. For additional information, <<211-02>>
	• Power steering fluid delivery pressure or flow too low.	• CHECK the power steering pump for signs of steering fluid loss. • CHECK the power steering pressure. For additional information, REFER to the Power Steering Pressure Test in this section. • INSTALL a new power steering pump as necessary. For additional information, <<211-02>>
• Steering heavy operation in one direction	• Lower steering column interference.	• CHECK the steering column is free from interference from the engine harness, sound proofing or the floor covering.
	• Incorrect steering geometry.	• CHECK the front wheel alignment. For additional information, <<204-00>>
	• Faulty rotary valve/seal.	• CHECK the power steering pressure. For additional information, REFER to the Power Steering Pressure Test in this section. • INSTALL a new steering gear as necessary. For additional information, <<211-02>>
	• Tire fouling on the wheel arch liner.	• CHECK for clearance between the tire and the wheel arch liner. • Remove and refit the wheel arch liner or INSTALL a new wheel arch liner as necessary.
• Steering heavy operation in both directions	• Low power steering fluid.	• CHECK steering system for signs of steering fluid loss. • BLEED the power steering system. For additional information, <<211-00>>

	• Air in power steering system.	• CHECK the power steering pump for signs of steering fluid loss. • INSTALL a new power steering pump as necessary. For additional information, <<211-02>>
	• Fluid loss at the power steering pump shaft seal.	• CHECK the power steering pump for signs of steering fluid loss. • INSTALL a new power steering pump as necessary. For additional information, <<211-02>>
	• Power steering fluid delivery pressure or flow too low.	• CHECK the power steering pump for signs of steering fluid loss. • CHECK the power steering pressure. For additional information, REFER to the Power Steering Pressure Test in this section. • INSTALL a new power steering pump as necessary. For additional information, <<211-02>>
• Steering operation varies from heavy to light when driving at constant speed	• Lower steering column interference.	• CHECK the steering column is free from interference from the engine harness, sound proofing or the floor covering.
	• Incorrect speedometer signal.	• CHECK the speedo circuit. For additional information, refer to the wiring diagrams.
	• Steering transducer cable/connection faulty or grounded.	• CHECK the steering transducer circuit. For additional information, refer to the wiring diagrams. • Carry out the electrical checks and tests. For additional information, REFER to the Electrical Checks and Tests in this section.
• Steering wheel varies from light to heavy two times per revolution	• Lower steering column interference.	• CHECK the steering column is free from interference from the engine harness, sound proofing or the floor covering.
	• Steering column universal joints binding.	• INSTALL a new steering column. For additional information, <<211-04>>
	• Seized or damaged steering components.	• CHECK for wear or failure of suspension bushes and ball joints. For additional information, <<204-00>>

Noise

Condition	Possible Sources	Action
• Accessory drive belt squeal	• Incorrect accessory drive belt tension or accessory drive belt glazed.	• CHECK accessory drive belt condition and INSTALL a new accessory drive belt as necessary. For additional information, <<303-05>>
• Chirp noise in the steering pump	• Loose or worn accessory drive belt.	• CHECK accessory drive belt condition and INSTALL a new accessory drive belt as necessary. For additional information, <<303-05>>
• Power steering pump noisy	• Low power steering fluid.	• CHECK steering system for signs of steering fluid loss. • BLEED the power steering system. For additional information, <<211-00>>
	• Power steering pump worn or otherwise defective.	• CHECK for leaks. REPAIR as necessary. • CHECK the power steering pressure. For additional information, REFER to the Power Steering Pressure Test in this section.

		• INSTALL a new power steering pump as necessary. For additional information, <<211-02>>
• Whine type noise	• Aerated fluid.	• BLEED the power steering system. For additional information,
	• Power steering pump.	• CHECK for leaks. REPAIR as necessary. • INSTALL a new power steering pump as necessary. For additional information, <<211-02>>
• Noise during steering gear movement	• Low power steering fluid.	• CHECK steering system for signs of steering fluid loss. • BLEED the power steering system. For additional information, <<211-00>>
	• Water contamination to the power steering fluid.	• DRAIN the power steering system. • BLEED the power steering system. For additional information, <<211-00>>
	• Cavitation due to restricted power steering feed hose.	• CHECK and reposition power steering feed hoses and INSTALL new hoses as necessary.
• Continuous noise	• Low power steering fluid.	• CHECK steering system for signs of steering fluid loss. • BLEED the power steering system. For additional information, <<211-00>>
	• Power steering pump drive loose.	• CHECK power steering coupling and power steering pump. • INSTALL a new power steering coupling or power steering pump as necessary. For additional information, <<211-02>>
	• Incorrect accessory drive belt tension or accessory drive belt glazed.	• CHECK accessory drive belt condition and INSTALL a new accessory drive belt as necessary. For additional information, <<303-05>>
	• Power steering pump drive pulley loose.	• CHECK and TIGHTEN the power steering pump drive pulley retaining bolts as necessary. For additional information, <<303-03>>
	• Power steering pump retaining bolts loose.	• CHECK the power steering pump retaining bolts and TIGHTEN as necessary.
	• Power steering hose/pipe in contact with the vehicles body.	• CHECK and reposition power steering hoses/pipes, INSTALL new hoses/pipes as necessary.
	• Power steering hose restricted/twisted.	• CHECK and reposition power steering hose, replace hose as necessary.

Vibration

Condition	Possible Sources	Action
• Feedback (knocking noises in the steering gear) - condition where roughness is felt in the steering wheel by the driver when the vehicle is driven over rough surfaces	• Loose/worn tie-rods.	• INSTALL a new tie-rod end. For additional information, <<211-03>>
	• Steering gear retaining bolts loose or damaged.	**CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will result in the steering gear warranty to become invalid.**

		• CHECK and TIGHTEN the steering gear retaining bolts. • INSTALL new retaining bolts as necessary. For additional information, <<211-02>>
	• Loose suspension bushing, bolts or ball joints.	• TIGHTEN or INSTALL new components as necessary. For additional information, <<204-01>>
	• Steering column retaining bolts loose.	 **CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will result in the steering gear warranty to become invalid.** • CHECK and TIGHTEN the steering column retaining bolts/nuts and pinch bolts if required. For additional information, <<211-04>>
	• Excessive wear in steering column assembly.	• CHECK for steering column for wear in the universal joints and bearings. If wear is present, INSTALL a new steering column as necessary. For additional information, <<211-04>>
• N bble (Shimmy) Oscillation of the steering wheel (not vertical which is SHAKE). This is driven by road wheel imbalance.	• Road wheel imbalance.	• CHECK for road wheel imbalance. • CHECK for relevant SERVICE BULLETINS/SERVICE ACTIONS for the vehicle on Jaguar Communications Online (JCOL) or in hard copy form.
	• Steering wheel replacement.	• CHECK for relevant SERVICE BULLETINS/SERVICE ACTIONS for the vehicle on Jaguar Communications Online (JCOL) or in hard copy form.
	• Rack replacement.	• CHECK for relevant SERVICE BULLETINS/SERVICE ACTIONS for the vehicle on Jaguar Communications Online (JCOL) or in hard copy form.

Description of General Steering System Noises

Boom

Rhythmic sound l ke a drum roll or distant thunder. May cause pressure on the ear drum.

Buzz

Low-pitched sound, like a bee. Usually associated with vibrations.

Chatter

Rapidly repeating metallic sound.

Chuckle

Rapid noise that sounds like a stick against the spokes of a spinning bicycle wheel.

Chirp

High pitched rapidly repeating sound, l ke chirping birds.

Click

Light sound, like a ball point pen being clicked.

Click/Thump

Heavy metal-to-metal sound, l ke a hammer striking steel.

Grind

Abrasive sound, l ke a grinding wheel or sandpaper rubbing against wood.

Groan/Moan

Continuous, low-pitched humming sound.

Groan/Howl

Low, guttural sound, like an angry dog.

Hiss

Continuous sound like air escaping from a tire valve.

Hum

Continuous sound of varying frequencies, like a wire humming in the wind.

Knock

Heavy, loud repeating sound like a knock on a door.

Ping

Similar to knock, except at higher frequency.

Rattle

A sound suggesting looseness, such as marbles rolling around in a can.

Roar

Deep, long, prolonged sound like an animal, or winds and ocean waves.

Rumble

Low, heavy continuous sound l ke that made by wagons or thunder.

Scrape

Grating noise like one hard plastic rubbing part rubbing against another.

Squeak

High-pitched sound l ke rubbing a clean window.

Squeal

Continuous, high-pitched sound like running finger nails across a chalkboard.

Tap

Light, hammering sound like tapping pencil on edge of table. May be rhythmic or intermittent.

Weep

Continuous mid-range sound (lower frequency than squeal, higher frequency than groan).

Whir/Whine

High-pitched buzzing sound, like an electric motor or drill.

Whistle

Sharp, shrill sound, like wind passing a small opening.

Description of Specific Steering System Noise Types

Belt Squeal

Belt squeal is a high frequency air-borne noise generated by slippage of the ribbed Vee belt on the power steering pump pulley. Squeal increases with system loading and at the end of lock.

Clonk

Clonk is a structure-borne noise heard as a loose-sounding rattle or vibration coming from the steering column. Clonk can be identified by driving and turning over cobblestones, rough roads, or high frequency bumps such as 25-50 mm tall tar strips. Clonk requires a tie-rod load impact.

Column Knock

Column knock is a loose-sounding rattle or v bration generated by the steering column shaft contacting other portions of the column assembly. The noise is both audible and tactile. Column knock is generated by driving over cobblestones or rough pavement. It is not necessary to turn the steering wheel to create this noise.

Column Rattle

Column rattle is a metallic sounding noise created when applying a highly impulsive force to the steering wheel. Column rattle is often used to combine the more general group of column noises including clonk and column knock. Column rattle noises can be caused by clonk, knock, loose column components, bonus parts etc. A series of parked, straight-line driving, and cornering test should be carried out to isolate the source/sources.

Grinding/Scrape

Grinding is a low frequency noise in the column when the steering wheel is turned. Is generally caused by interference between moving components such as the steering wheel to steering column shroud.

Grunt (Squawk)

Grunt is a "honking" sound elicited when coming off one of the steering stops. Grunt is generally excited during parking manoeuvres with a low to medium speed steering input.

Hiss (Swish)

Hiss or Valve Hiss is a high-frequency sound coming from the steering gear when the system is loaded. It is a rushing or "swish" noise that doesn't change frequency with RPM. Hiss is the general noise generated by the flow of hydraulic fluid through restrictions in the steering system. Restrictions include the rotary steering valve, power steering tubes, connectors, tuning orifices, etc. Hiss can be air-borne and structure-borne, but the structure-borne path through the steering intermediate shaft is usually dominant.

Moan (Groan)

Moan is the general structure-borne noise of the steering system. Moan is primarily transmitted to the driver via the body structure through the pump mount, engine mounts, power steering lines and power steering brackets. On some vehicles, moan is a load humming noise, often present when the wheel is turned and the system is loaded. It may change frequency with engine RPM and if the system is loaded or

unloaded.

Rack Knock (Rack Slap)

 **CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will result in the steering gear warranty to become invalid.**

Rack Knock is a rattle sound and steering wheel vibration caused by separation of the steering gear and pinion while driving over bumps. It is a structure-borne noise transmitted through the intermediate shaft and column. Rack knock can also be heard as a "thump" or impact noise that occurs with the vehicle stationary when the steering wheel is released from a loaded position and allowed to return to rest. Noise occurs with the engine on or off.

Rattles

Rattles are noises caused by knocking or hitting with components in the steering system. Steering rattles can occur in the engine compartment, the suspension, or the passenger compartment . Rattles can be caused by loose parts, movable and flexible parts, and improper clearances.

Squeaks/Scrapes

Squeaks/Scrapes are noises due to friction or component rubbing anywhere in the steering system. Squeaks/Scrapes have appeared in steering linkages and joints, in column components and in column and steering wheel trim parts.

Weep

Weep is an air-borne noise, occasionally generated when turning the steering across lock at a constant rate. When present on a vehicle the noise, once initiated can often be maintained across a large proportion of the available steering movement.

Whistle

Whistle is similar to hiss but is louder and of a higher frequency. It is also more of a pure tone noise than hiss. Whistle is air-borne and is generated by a high flow rate of hydraulic fluid through a small restriction.

Zip

Zip noise is the air-borne noise generated by power steering pump cavitation when power steering fluid does not flow freely through the suction hose from the reservoir to the pump. Zip primarily occurs during cold weather at start-up.

Steering System Vibrations and Harshness

Buzz

Buzz is a tactile rotary v bration felt in the steering wheel for slow steering inputs. Buzz can also be called a grinding feel and it is closely related to grunt and is caused by high system gain with low damping. Buzz is generally excited during parking manoeuvres with low to medium speed steering input.

Buzz (Electrical)

A different steering buzz can be caused by pulse width modulated (PWM) electric actuators used in variable assist steering systems. This buzz is felt by turning the ignition key to run without starting the engine and holding onto the steering wheel. In extreme cases, the buzz can be felt with the engine running also.

Column/Steering Wheel Shake

Column shake is a low frequency vertical vibration excited by primary engine vibrations.

Nibble (Shimmy)

Steering nibble is a rotary oscillation or vibration of the steering wheel, which can be excited at a specific vehicle speed. Nibble is driven by wheel and tire imbalance exciting a suspension recession mode, which then translates into steering gear travel and finally steering wheel nibble.

Shudder (Judder)

Shudder is a low frequency oscillation of the entire steering system (tire, wheels, steering gear and linkage, etc.) when the vehicle is steered during static-park or at low speeds. Shudder is very dependent on road surface.

Torque Ripple

Torque ripple is a concern with Electric Power Steering (EPS) systems. Torque ripple is most evident at static-park steering the wheel very slowly from lock to lock. Torque ripple is primarily caused by motor commutation.

Torque/Velocity Variation (Phasing/Effort Cycling)

Steering wheel torque variation occurring twice in one revolution is normally as a result of problems with the lower steering column (intermediate shaft), but foul conditions generally result in either constant stiffness or single point stiffness. Depending upon the orientation of the joints, the steering can feel asymmetric (torque falling off in one direction and rising in the other) or else it can simply have pronounced peaks and troughs as the steering moves from lock to lock.

Wheel Fight (Kick Back)

Wheel fight is excess feedback of sudden road forces through the steering system and back to the driver. It is evaluated at all vehicle speeds over cobblestones, rough roads, and potholes. The tires, wheels, and suspension generate forces into the steering systems. Steering friction, hydraulic damping, hydraulic compliance, mechanical compliance, steering ratio, and assist gain all affect how much is transmitted to the driver.

Steering Linkage

 **CAUTION: Steering gear boots must be handled carefully to avoid damage. Use new clamps when installing steering gear boots.**

Inspect the boots for cuts, deterioration, twisting or distortion. Check the steering gear boots to make sure they are tight. Install new boots or clamps as necessary.

NOTE:

The following steps must be carried out with assistance.

1 . With the wheels in the straight ahead position, gently turn the steering wheel to the left and the right to check for free play.

2 . Free play should be between 0 and 6 mm (0 and 0.24 in) at the steering wheel rim. If the free play exceeds this limit, either the ball joints are worn, the lower steering column joints are worn or the backlash of the steering gear is excessive.

3 .

 **CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will result in the steering gear warranty to become invalid.**

The backlash of the steering gear cannot be adjusted, install a new steering gear. For additional information, <<211-02>>

4 . Grasp the steering wheel firmly and move it up and down and to the left and right without turning the wheel to check for column bearing wear, steering wheel or steering column. For additional information, <<211-04>>

General Specifications

Item	Specification
Power assisted steering fluid	Dexron 2E

Torque Specifications

Description	Nm	Lb-Ft	Lb-In
Tie rod end retaining nut	35	26	-
Power steering pump retaining bolts	25	18	-
Extension shaft lower retaining bolt	27	20	-
Power steering gear actuator retaining bolts	3	-	27
Power steering gear retaining bolts	133	98	-
Latch plate to pinion housing retaining bolt	10	7	-

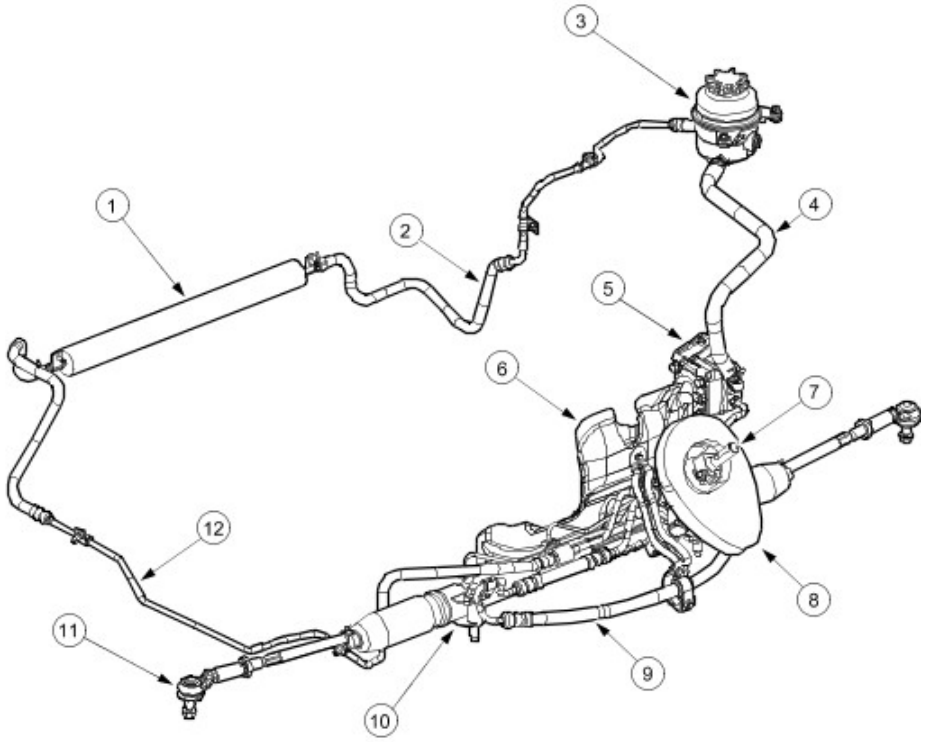
Published: Mar 29, 2001

Start Up Procedure After Power Steering Pump/Gear Overhaul

1. For additional information, refer to<<211-00>>.

Published: Feb 21, 2006

Power Steering



VUJ0003736

Item	Part Number	Description
1	—	Fluid cooler
2	—	Low pressure pipe - fluid cooler to reservoir
3	—	Fluid reservoir
4	—	Power steering pump suction hose
5	—	Power steering pump
6	—	Heat shield
7	—	Extension shaft
8	—	Dash panel seal
9	—	High pressure pipe
10	—	Steering gear
11	—	Tie-rod end
12		Low pressure pipe - steering gear to fluid cooler

Vehicles with 2.0L or diesel engines

The power steering system uses a rack and pinion type, variable ratio steering gear. The power steering pump is belt driven on all model variants and the power steering oil cooler is of a wire bound tube type and is mounted in front of the radiator.

Vehicles with 2.5L or 3.0L engines

The power steering system uses a rack and pinion type, variable ratio steering gear with servotronic steering assistance. The power steering pump is belt driven on all model variants and the power steering oil cooler is of a wire bound tube type and is mounted in front of the radiator.

A variable steering rack ratio reduces the amount of turns from lock to lock to improve parking maneuvers without loosing any steering feel at higher speeds.

The steering assistance decreases smoothly at a calibrated rate to increase the steering efforts required as vehicle speed increases. The steering efforts are controlled by the servotronic valve (actuator) position, which in turn is controlled electronically by the servotronic ECU

housed in the instrument cluster.

Absolute cleanliness must be observed when replenishing the fluid or dismantling any part of the system. New fluid from a sealed container must be used.

NOTE:

If the steering gear, pump or cooler are being replaced for leakage or noise related issues and there is no evidence of fluid contamination, there is no need to replace the reservoir.

In some cases where the fluid clearly contains particulate matter, and the system continues to function, flush the system with fresh fluid and replace the reservoir, as there is the possibility that the reservoir internal filter may be damaged or faulty.

Published: Mar 29, 2001

Power Steering

For additional information, refer to<<211-00>>.

Published: Mar 29, 2001

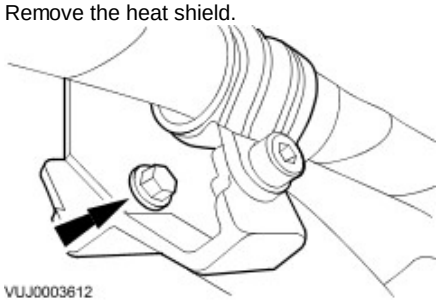
Power Steering Control Valve Actuator - 2.5L/3.0L (57.10.32)

Removal

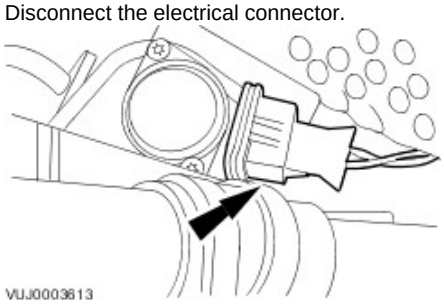
1 . Raise and support the vehicle. For additional information, refer to <<100-02>>.

2 . Remove the exhaust front muffler. For additional information, refer to <<309-00>>.

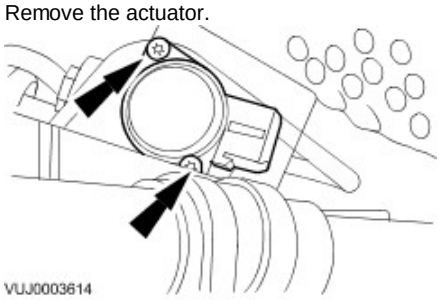
3 . Remove the heat shield.



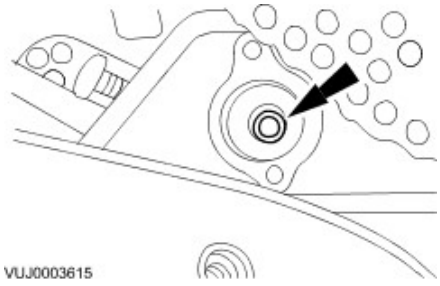
4 . Disconnect the electrical connector.



5 . Remove the actuator.



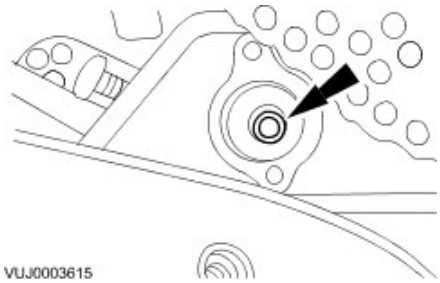
6 . Remove and discard the filter.



Installation

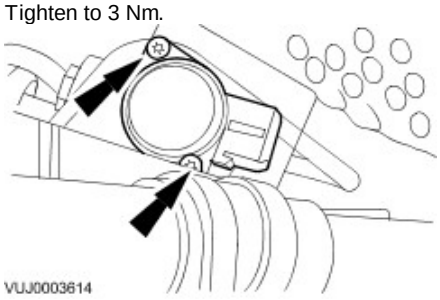
1 . To install, reverse the removal procedure.

1) Install a new filter



2 . **CAUTION: Make sure bolts are tightened evenly.**

Tighten to 3 Nm.



Published: Feb 21, 2006

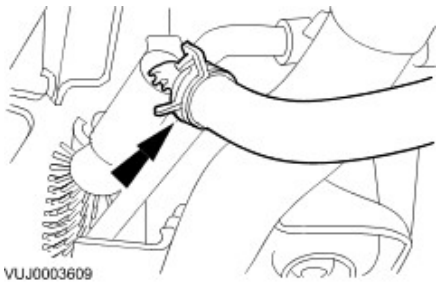
Power Steering Fluid Cooler - 2.0L Diesel (57.15.11)

Removal

1 . Remove the radiator splash shield. For additional information, refer to
For additional information, refer to Radiator Splash Shield (76.22.90) .

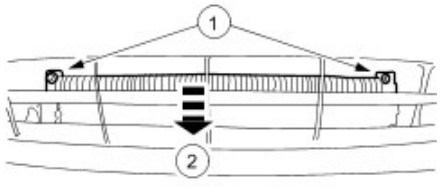
2 . Disconnect the power assisted steering oil cooler inlet and outlet hoses.

- Left-hand side shown, right-hand side similar.
- Drain the fluid into a suitable container.



3 . Remove the power assisted steering oil cooler.

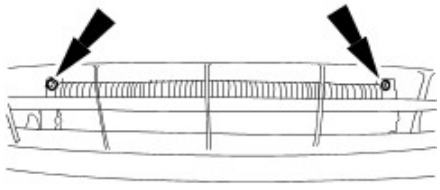
1) Remove the mounting bolts.
2) Remove the power assisted steering oil cooler.



Installation

1 . To install, reverse the removal procedure.

- Tighten to 7 Nm.



2 **NOTE:**

· If the cooler is being replaced for leakage or noise related issues and there is no evidence of fluid contamination, there is no need to replace the reservoir.

In some cases where the fluid clearly contains particulate matter, and the system continues to function, flush the system with fresh fluid and replace the reservoir, as there is the possibility that the reservoir internal filter may be damaged or faulty.

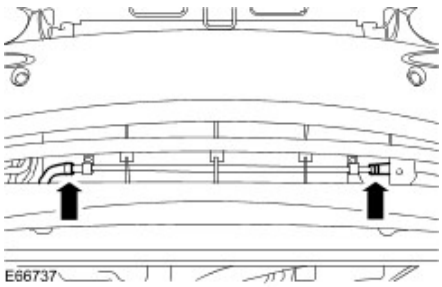
Published: Feb 21, 2006

Power Steering Fluid Cooler - 2.2L Diesel (57.15.11)

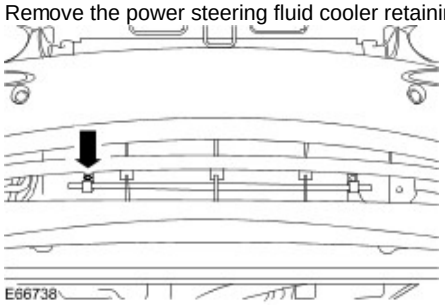
Removal

1 . Remove the radiator splash shield.
For additional information, refer to Radiator Splash Shield (76.22.90)

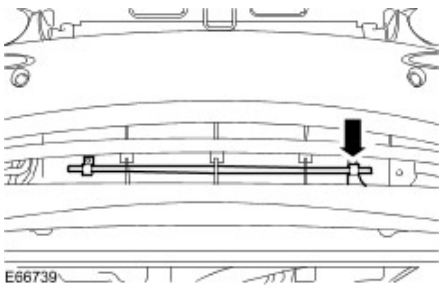
2 . Disconnect the power steering fluid cooler hoses.
- Drain the fluid into a suitable container.



3 . Remove the power steering fluid cooler retaining bolt.

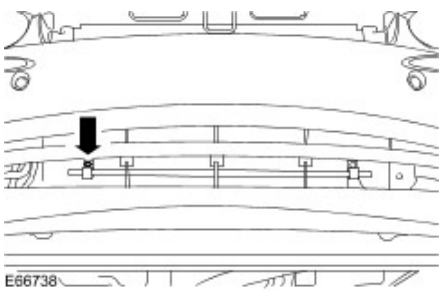


4 . Remove the power steering fluid cooler.
- Detach the power steering fluid cooler from the retaining clip.



Installation

1 . To install, reverse the removal procedure.
- Tighten to 7 Nm.



2 **NOTE:**

- If the cooler is being replaced for leakage or noise related issues and there is no evidence of fluid contamination, there is no need to replace the reservoir.

In some cases where the fluid clearly contains particulate matter, and the system continues to function, flush the system with fresh fluid and replace the reservoir, as there is the possibility that the reservoir internal filter may be damaged or faulty.

Published: Mar 29, 2001

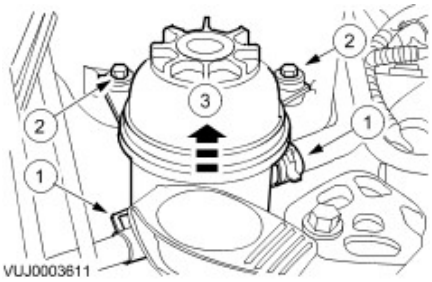
Power Steering Fluid Reservoir (57.15.08)

Removal

1. **CAUTION: If power steering fluid is spilt on the paintwork, the effected area must be immediately washed down with cold water.**

   Remove the power steering fluid reservoir.

   1) Disconnect the power steering supply and return hoses.
      - Drain the fluid into a suitable container.
   2) Remove the power steering reservoir bolts.
   3) Remove the power steering reservoir.



Installation

1. **CAUTION: Use only Jaguar specification Dexron 2E power assisted steering oil.**

   To install, reverse the removal procedure.

2. Bleed the power steering system. For additional information, refer to <<211-00>>.

Published: Feb 21, 2006

Power Steering Pump - 2.0L/2.5L/3.0L (57.20.14)

Removal

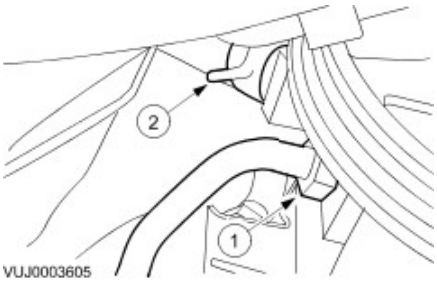
1 . Remove the accessory drive belt.
For additional information, refer to Accessory Drive Belt - 2.0L/2.5L/3.0L (12.10.40)

2 .

CAUTION: Whenever the power steering pump unions are disconnected the steering gear valve body ports and hoses should be plugged to prevent dirt ingress.

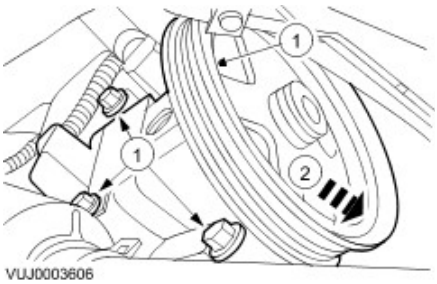
Disconnect the power steering feed and high pressure hoses.

1) Disconnect the power steering high pressure hose.
   - Drain the fluid into a suitable container.
2) Disconnect the power steering feed hose.



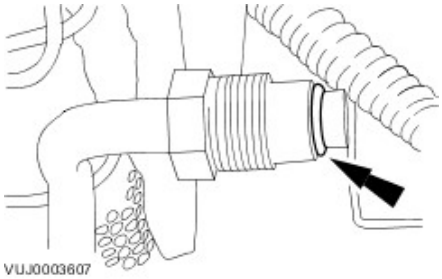
3 . Remove the power steering pump.

1) Remove the power steering pump retaining bolts, power steering pump heat shield and high pressure pipe securing bracket.
2) Remove the power steering pump.



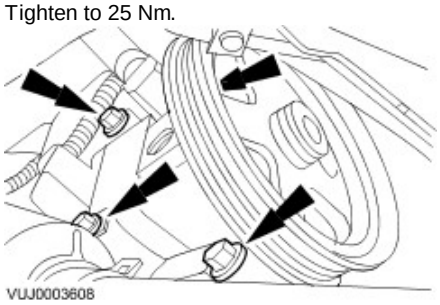
Installation

1 . To install, reverse the removal procedure.
   - Install a new O-ring seal.

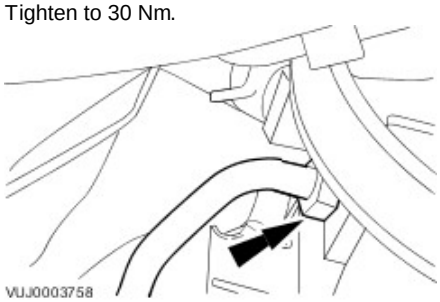


2 . **CAUTION: Make sure the heat shield is fitted correctly and is free from damage.**

Tighten to 25 Nm.



3 . Tighten to 30 Nm.



4 **NOTE:**

· If the steering gear, pump or cooler are being replaced for leakage or noise related issues and there is no evidence of fluid contamination, there is no need to replace the reservoir.

In some cases where the fluid clearly contains particulate matter, and the system continues to function, flush the system with fresh fluid and replace the reservoir, as there is the possibility that the reservoir internal filter may be damaged or faulty.

Published: Apr 20, 2010

Power Steering Pump - 2.0L Diesel/2.2L Diesel (57.20.14)

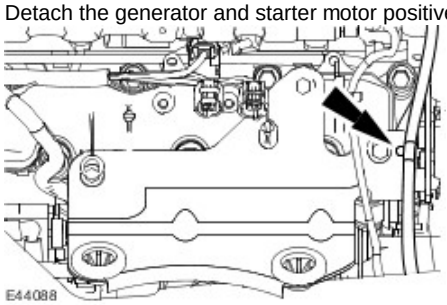
Removal

1 . Disconnect the battery ground cable.
For additional information, refer to Battery Disconnect and Connect

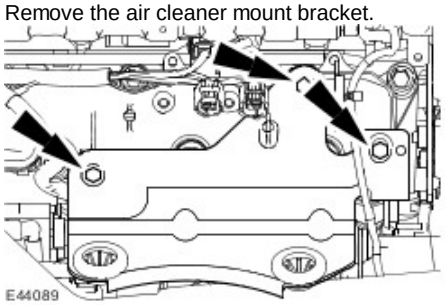
2 . Remove the air deflector.
For additional information, refer to Air Deflector - 2.0L Diesel/2.2L Diesel (76.11.41)

3 . Remove the air cleaner.
For additional information, refer to Air Cleaner (19.10.05)

4 . Detach the generator and starter motor positive cable from the air cleaner mount bracket.



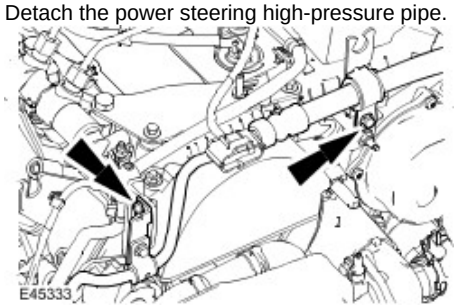
5 . Remove the air cleaner mount bracket.



6 . Detach the power steering pump belt.

- Rotate the power steering pump belt tensioner clockwise.

7 . Detach the power steering high-pressure pipe.



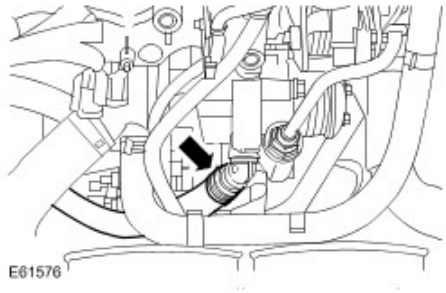
8 . **CAUTION: Whenever the power steering pump feed hose is disconnected the power steering pump port and hose should be plugged to prevent dirt ingress. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:

Shown with the exhaust gas recirculation (EGR) cooler to EGR valve tube removed for clarity.

Disconnect the power steering feed hose.

- Drain the fluid into a suitable container.



9 . **CAUTION: Whenever the power steering high-pressure pipe union is disconnected the power steering pump port and pipe should be plugged to prevent dirt ingress. Failure to follow this instruction may result in damage to the vehicle.**

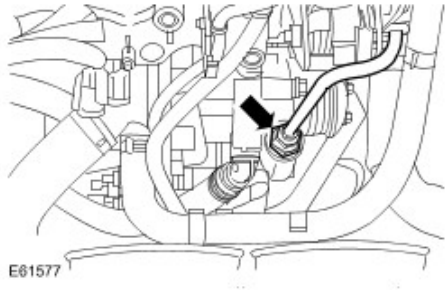
CAUTION: Do not disconnect the quick release connector on the high-pressure pipe as it will not disconnect. Failure to follow this instruction may result in damage to the vehicle.

NOTE:

Shown with the EGR cooler to EGR valve tube removed for clarity.

Remove the power steering high-pressure pipe union from the power steering pump boss

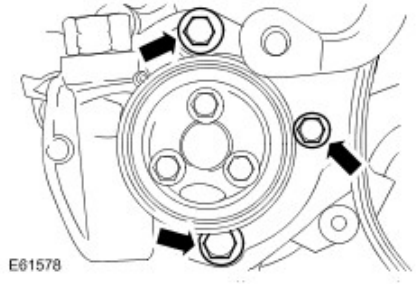
- Remove and discard the O-ring seal.



10 . **NOTE:**

Shown with the EGR cooler to EGR valve tube removed for clarity.

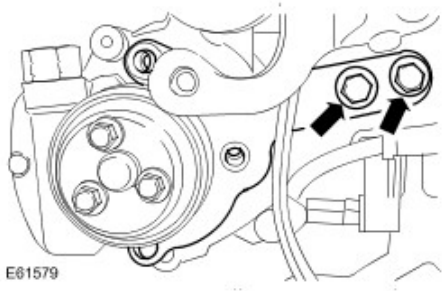
Remove the power steering pump retaining bolts.



11 . **NOTE:**

Shown with the EGR cooler to EGR valve tube removed for clarity.

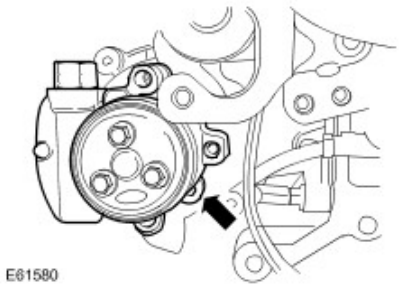
Remove the power steering pump securing bracket.



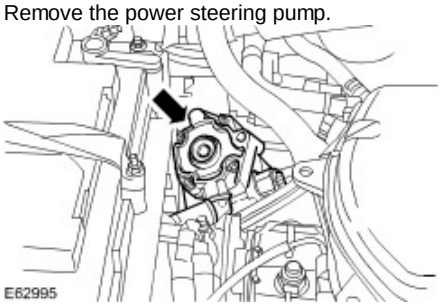
12 . **NOTE:**

Shown with the EGR cooler to EGR valve tube removed for clarity.

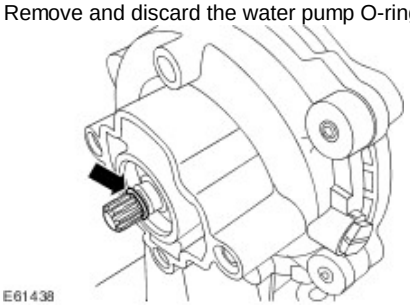
Detach the power steering pump from the coolant pump.



13 . Remove the power steering pump.

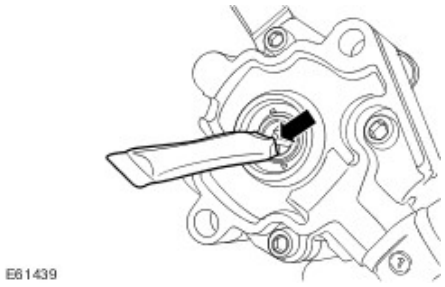


14 . Remove and discard the water pump O-ring seal.



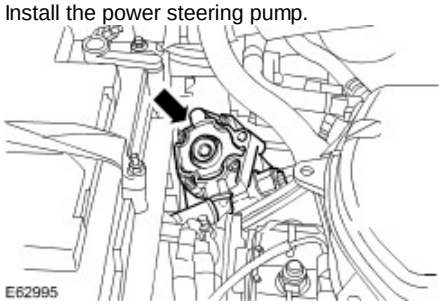
Installation

1 . Coat the power steering pump drive splines with .



2 . Install a new water pump O-ring seal.

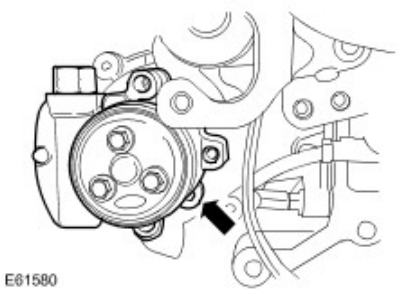
3 . Install the power steering pump.



4 . **NOTE:**

Shown with the EGR cooler to EGR valve tube removed for clarity.

Attach the power steering pump to the coolant pump.

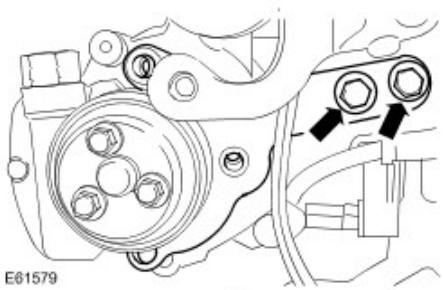


5 . **NOTE:**

Shown with the EGR cooler to EGR valve tube removed for clarity.

Install the power steering pump securing bracket.

Tighten to 25 Nm.

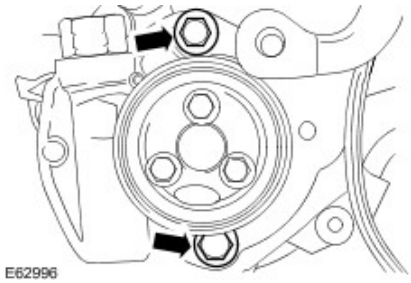


6 . **NOTE:**

Shown with the EGR cooler to EGR valve tube removed for clarity.

Install the power steering pump retaining bolts.

- Tighten to 25 Nm.

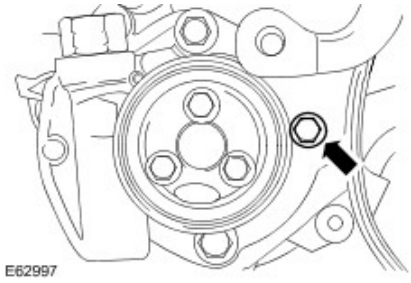


7 . **NOTE:**

Shown with the EGR cooler to EGR valve tube removed for clarity.

Install the power steering pump retaining bolt.

- Tighten to 10 Nm.



8 . **NOTE:**

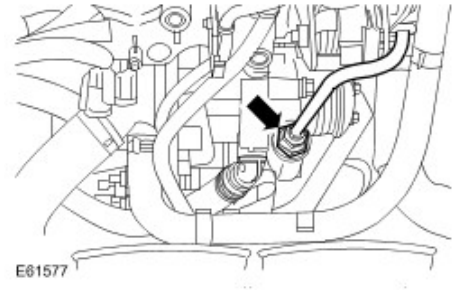
Remove the plugs from the power steering pump port and the pipe.

NOTE:

Shown with the EGR cooler to EGR valve tube removed for clarity.

Connect the power steering high-pressure pipe union.

- Install a new O-ring seal.
- Tighten to 30 Nm.



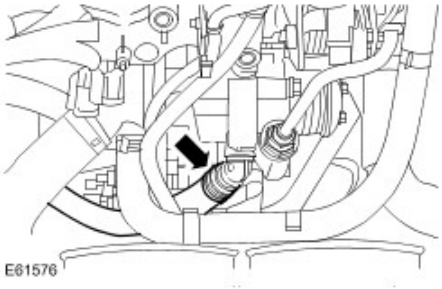
9 . **NOTE:**

Remove the plugs from the power steering pump port and the feed hose.

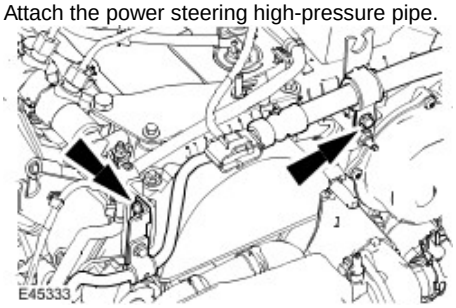
NOTE:

Shown with the EGR cooler to EGR valve tube removed for clarity.

Connect the power steering feed hose.



10 . Attach the power steering high-pressure pipe.

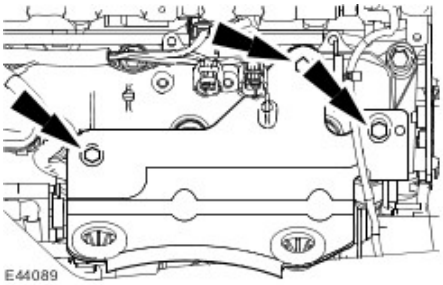


11 . Attach the power steering pump belt.

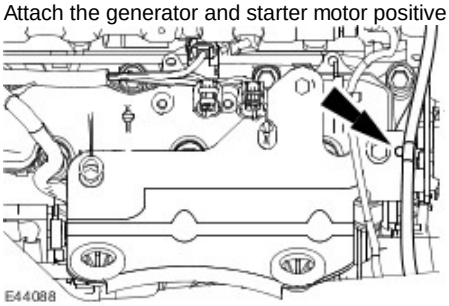
- Rotate the power steering pump belt tensioner clockwise.

12 . Install the air cleaner mount bracket.

- Tighten to 25 Nm.



13 . Attach the generator and starter motor positive cable to the air cleaner mounting bracket.



14 . Install the air cleaner.
For additional information, refer to Air Cleaner (19.10.05)

15 . Install the air deflector.
For additional information, refer to Air Deflector - 2.0L Diesel/2.2L Diesel (76.11.41)

16 . Connect the battery ground cable.
For additional information, refer to Battery Connect (86.15.15)

17 **NOTE:**

- If the pump is being replaced for leakage or noise related issues and there is no evidence of fluid contamination, there is no need to replace the reservoir.

In some cases where the fluid clearly contains particulate matter, and the system continues to function, flush the system with fresh fluid and replace the reservoir, as there is the possibility that the reservoir internal filter may be damaged or faulty.

Published: Feb 13, 2008

Steering Gear - 2.0L/2.5L/3.0L (57.10.01)

Special Service Tools

Powertrain Assembly Jack
HTJ1200-2

Removal

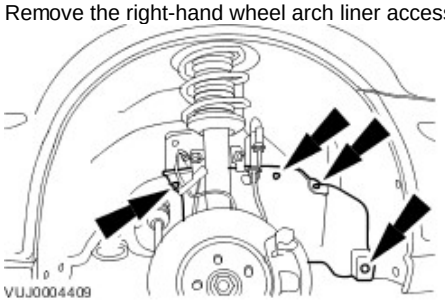
All vehicles

1 . Center the steering wheel.
- Lock in position and remove the ignition key.

2 . Remove the steering column coupling.
For additional information, refer to Steering Column Coupling

Right-hand drive vehicles

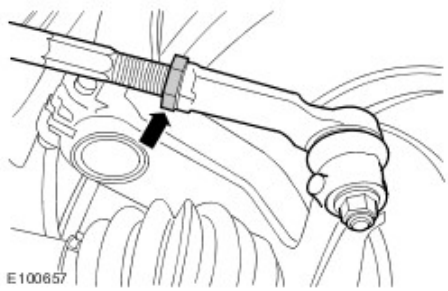
3 . Remove the right-hand wheel arch liner access cover.



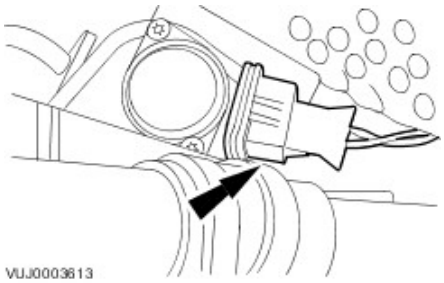
All vehicles

4 . **NOTE:**
Right-hand shown, left-hand similar.

Release both tie-rod end ball joints.
1) Loosen the locknuts.
2) Release both track rods from the tie rod ends, note number of turns for installation.



5 . Disconnect the power steering control valve actuator electrical connector (if equipped).

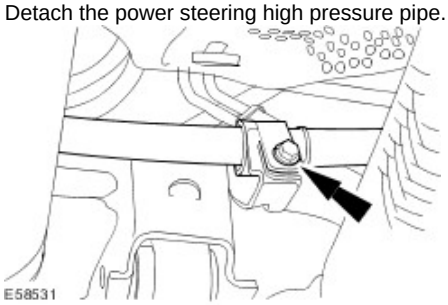


Vehicles with high intensity discharge headlamps

6 . Detach the link rod from the headlamp leveling sensor.

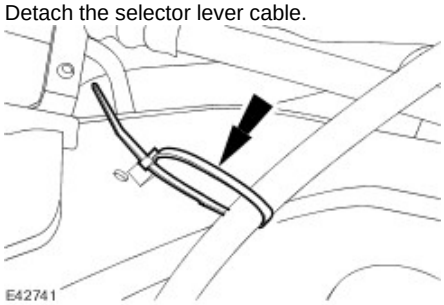
All vehicles

7 . Detach the power steering high pressure pipe.



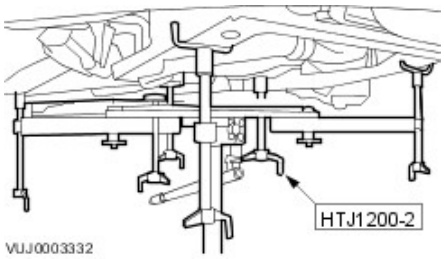
Vehicles with automatic transmission

8 . Detach the selector lever cable.



All vehicles

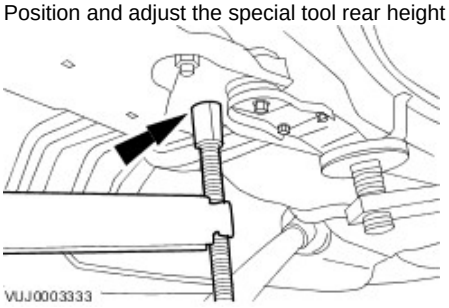
9 . Install the special tool.



10 . **NOTE:**

Left-hand shown, right-hand similar.

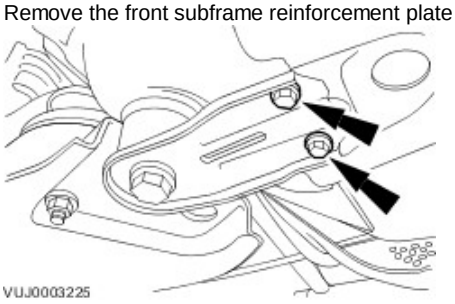
Position and adjust the special tool rear height adjuster.



11 . **NOTE:**

Left-hand shown, right-hand similar.

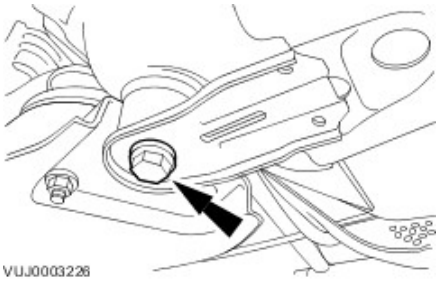
Remove the front subframe reinforcement plate retaining bolts.



12 . **NOTE:**

Left-hand shown, right-hand similar.

Remove the front subframe rear mount retaining bolts.



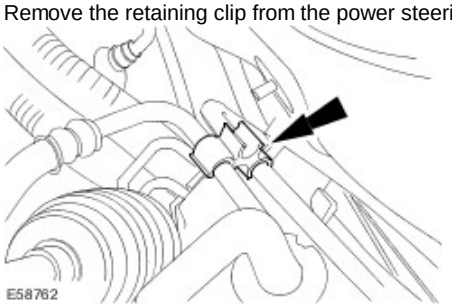
13 .

WARNING: Rotate the special tool height adjustment valve slowly. Failure to follow this instruction may result in personal injury.

Using the special tool, lower the front subframe to a maximum of 50 mm (1.97 inches).

Left-hand drive vehicles

14 . Remove the retaining clip from the power steering high and low pressure pipes.



All vehicles

15 .

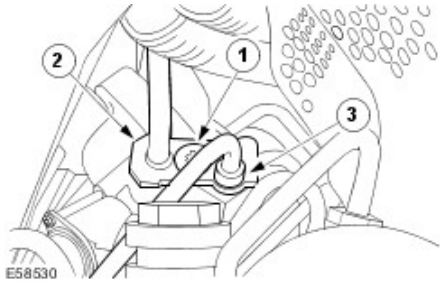
CAUTION: Whenever the power steering pipes are disconnected, the steering gear valve body ports and power steering pipes should be plugged to prevent dirt ingress. Failure to follow this instruction may result in damage to the vehicle.

NOTE:

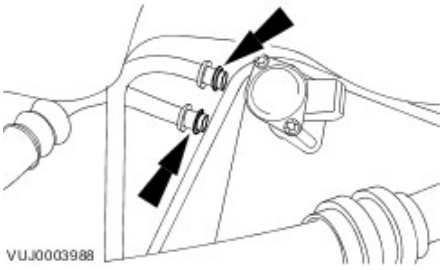
Left-hand drive vehicles shown, right-hand drive vehicles similar.

Disconnect the power steering high and low pressure pipes from the steering gear.

1) Remove the latch plate retaining bolt.
2) Disconnect the power steering high pressure pipe.
3) Disconnect the power steering low pressure pipe.

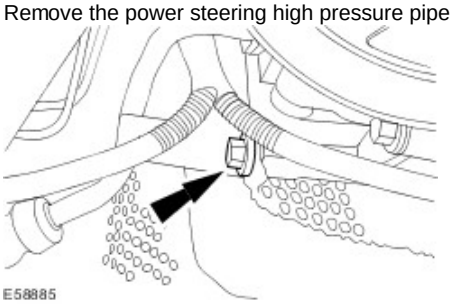


16 . Remove and discard the O-ring seals.



Right-hand drive vehicles

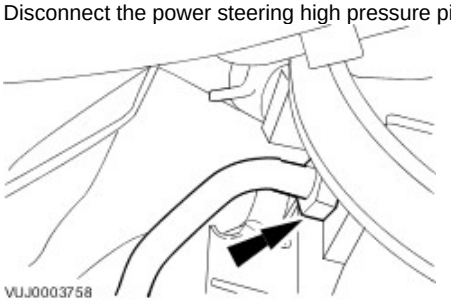
17 . Remove the power steering high pressure pipe bracket retaining bolt.



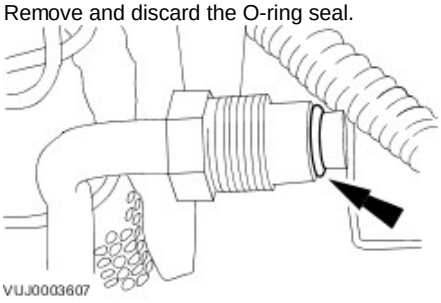
18 .

CAUTION: Whenever the power steering high pressure pipe is disconnected, the power steering pump port and pipe should be plugged to prevent dirt ingress. Failure to follow this instruction may result in damage to the vehicle.

Disconnect the power steering high pressure pipe from the power steering pump.



19 . Remove and discard the O-ring seal.

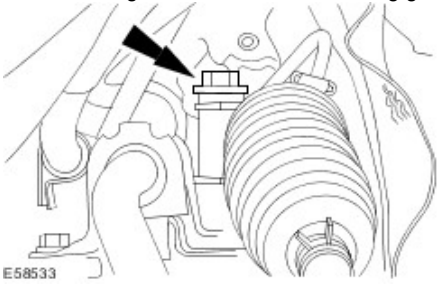


All vehicles

20 . **NOTE:**

Left-hand drive vehicles shown, right-hand drive vehicles similar.

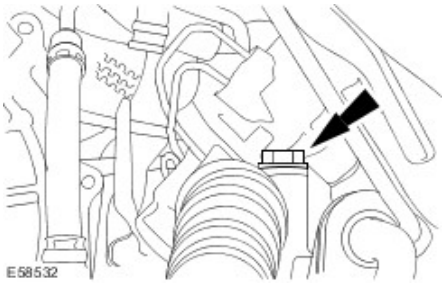
Detach the right-hand side of the steering gear.



21 . **NOTE:**

Left-hand drive vehicles shown, right-hand drive vehicles similar.

Detach the left-hand side of the steering gear.



22 . **NOTE:**

Left-hand drive vehicles shown, right-hand drive vehicles similar.

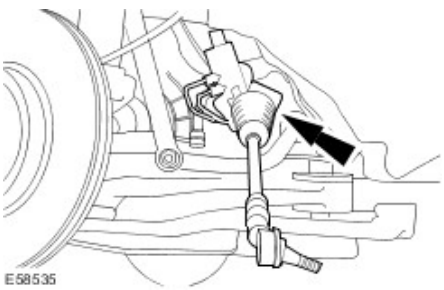
Remove the steering gear bu khead seal.

23 . **NOTE:**

Left-hand drive vehicles shown, right-hand drive vehicles similar.

Remove the steering gear.

- Rotate the steering gear.
- Remove the steering gear through the driver side wheel arch aperture .



Installation

All vehicles

1 . **NOTE:**

Left-hand drive vehicles shown, right-hand drive vehicles similar.

Install the steering gear.

2 . **CAUTION: Make sure the steering gear bulkhead seal is correctly aligned. Failure to follow this instruction may result in damage to the vehicle.**

NOTE:

Left-hand drive vehicles shown, right-hand drive vehicles similar.

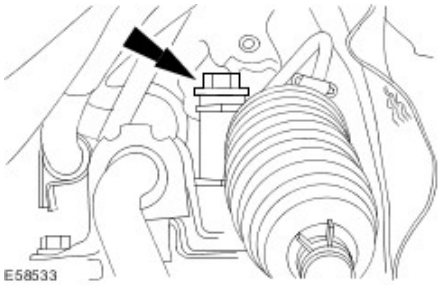
Install the steering gear bulkhead seal.

3 . **NOTE:**

Left-hand drive vehicles shown, right-hand drive vehicles similar.

Attach the right-hand side of the steering gear.

- Loosely install the steering gear retaining bolt.

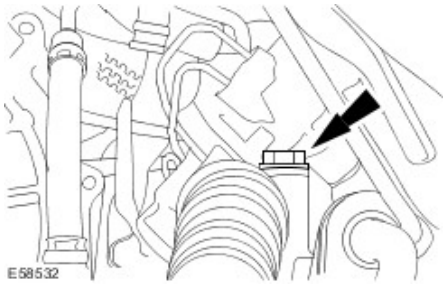


4 . **NOTE:**

Left-hand drive vehicles shown, right-hand drive vehicles similar.

Attach the left-hand side of the steering gear.

- Loosely install the steering gear retaining bolt.

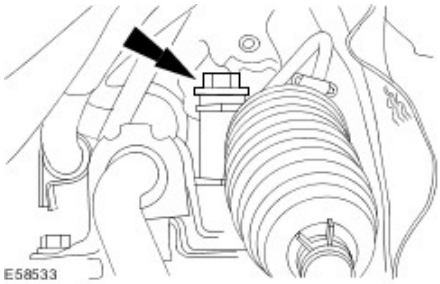


5 . **NOTE:**

Left-hand drive vehicles shown, right-hand drive vehicles similar.

Tighten the right-hand side steering gear retaining bolt.

- Tighten to 115 Nm.

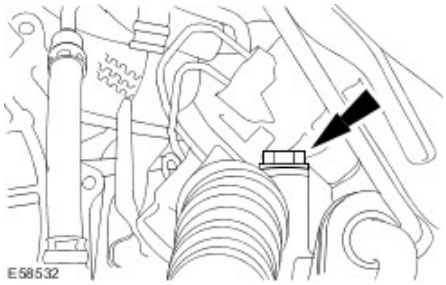


6 . **NOTE:**

Left-hand drive vehicles shown, right-hand drive vehicles similar.

Tighten the left-hand side steering gear retaining bolt.

- Tighten to 115 Nm.

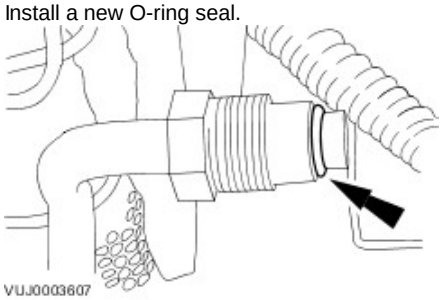


Right-hand drive vehicles

7 . **NOTE:**

Remove the blanking plug.

Install a new O-ring seal.



8 . **NOTE:**

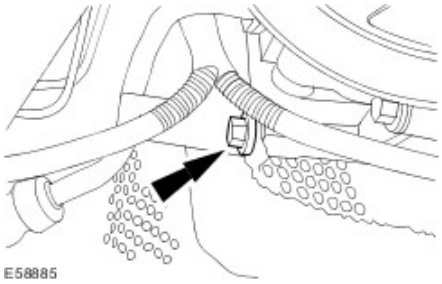
Remove the blanking plug.

Connect the power steering high pressure pipe to the power steering pump.

- Tighten to 30 Nm

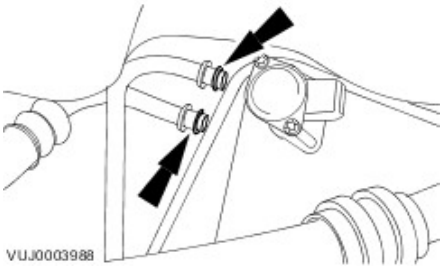
9 . Install the power steering high pressure pipe bracket retaining bolt.

- Tighten to 25 Nm



All vehicles

10 . Install new O-ring seals.



11 . **NOTE:**

Left-hand drive vehicles shown, right-hand drive vehicles similar.

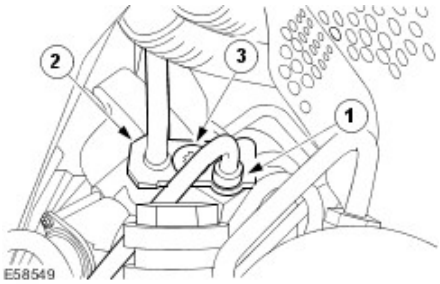
NOTE:

Remove the blanking plugs.

Connect the power steering high and low pressure pipes to the steering gear.

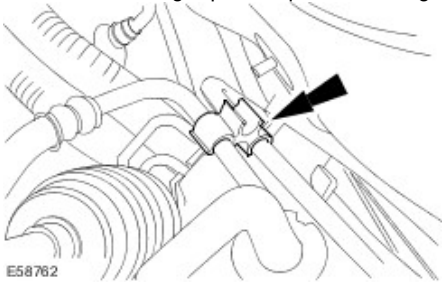
1) Connect the power steering low pressure pipe.
2) Connect the power steering high pressure pipe.
3) Install the latch plate retaining bolt

Tighten to 10 Nm.



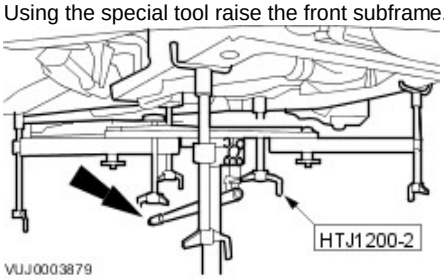
Left-hand drive vehicles

12 . Install the retaining clip to the power steering high and low pressure pipes.



All vehicles

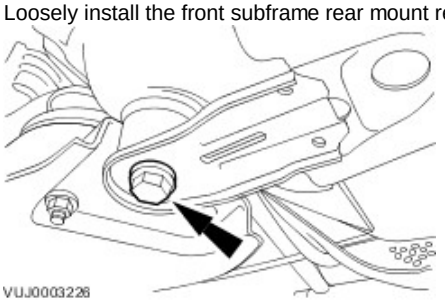
13 . Using the special tool raise the front subframe.



14 . **NOTE:**

Left-hand shown, right-hand similar.

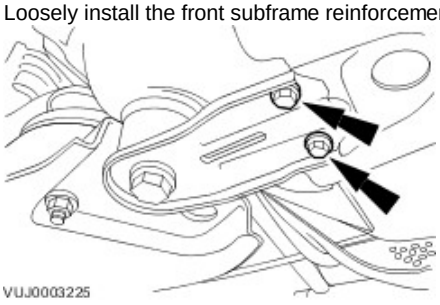
Loosely install the front subframe rear mount retaining bolts.



15 . **NOTE:**

Left-hand shown, right-hand similar.

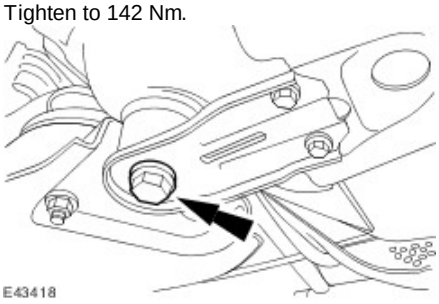
Loosely install the front subframe reinforcement plate retaining bolts.



16 . **NOTE:**

Left-hand shown, right-hand similar.

Tighten to 142 Nm.

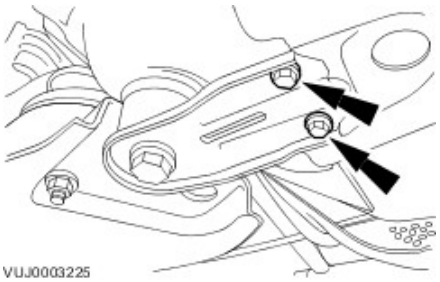


17 . **NOTE:**

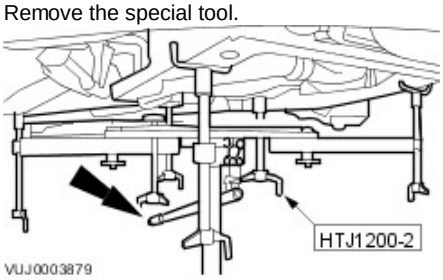
Left-hand shown, right-hand similar.

Tighten the front subframe reinforcement bolts.

- M8 to 35 Nm.
- M10 to 70 Nm.

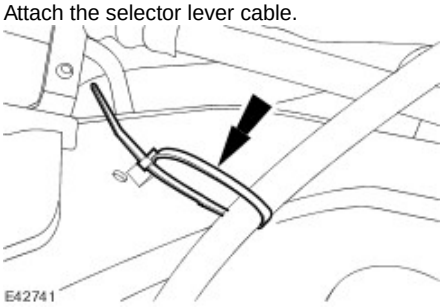


18 . Remove the special tool.



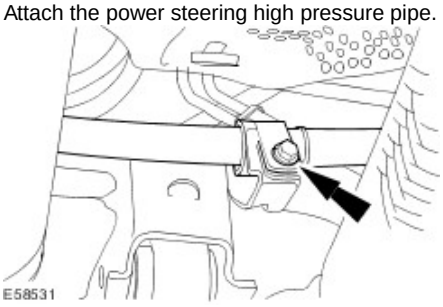
Vehicles with automatic transmission

19 . Attach the selector lever cable.



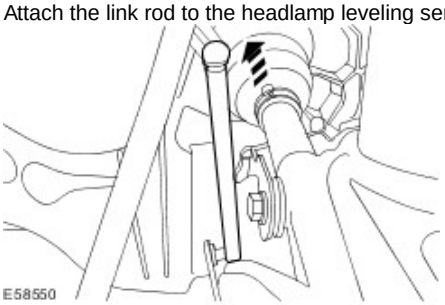
All vehicles

20 . Attach the power steering high pressure pipe.



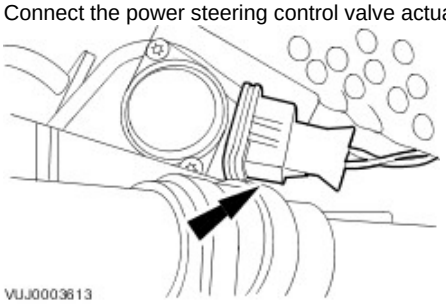
Vehicles with high intensity discharge headlamps

21 . Attach the link rod to the headlamp leveling sensor.



All vehicles

22 . Connect the power steering control valve actuator electrical connector (if equipped).

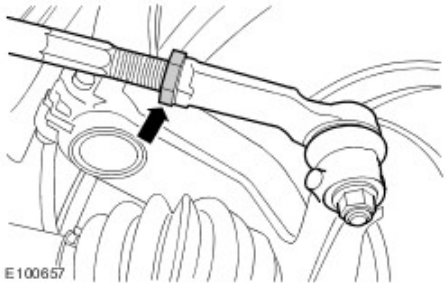


23 . **NOTE:**

Right-hand shown, left-hand similar.

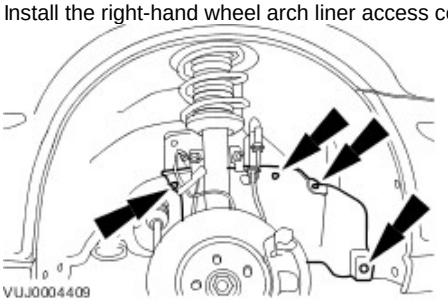
Connect tie-rod end ball joints.

1) Attach both tie rod ends to previously noted positions.
2) Tighten tie rod locking nut.



Right-hand drive vehicles

24 . Install the right-hand wheel arch liner access cover.



All vehicles

25 . Carry out steering system bleed procedure.
For additional information, refer to Power Steering System Filling

26 . **CAUTION: Make sure the steering column coupling is installed with the vehicle on its wheels. Failure to follow this instruction may result in damage to the vehicle.**

Install the steering column coupling.
For additional information, refer to Steering Column Coupling

27 . **NOTE:**

If the steering gear is being replaced for leakage or noise related issues and there is no evidence of fluid contamination, there is no need to replace the reservoir.

In some cases where the fluid clearly contains particulate matter, and the system continues to function, flush the system with fresh fluid and replace the reservoir, as there is the possibility that the reservoir internal filter may be damaged or faulty.

28 . Using the Jaguar approved diagnostic system, configure the steering angle sensor.

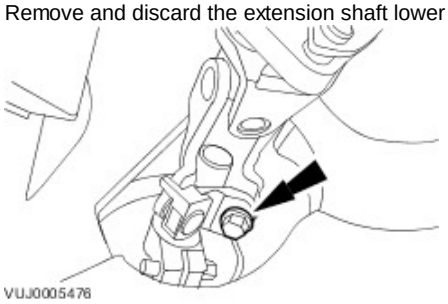
Published: Feb 15, 2008

Steering Gear - 2.0L Diesel/2.2L Diesel (57.10.01)

Removal

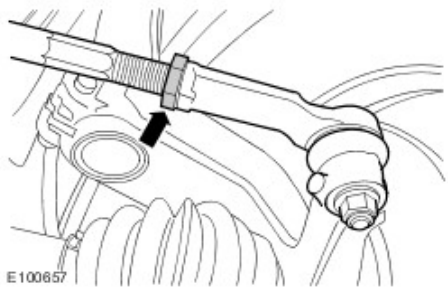
1 . Center the steering wheel.
- Lock in position and remove the ignition key.

2 . Remove and discard the extension shaft lower retaining bolt.



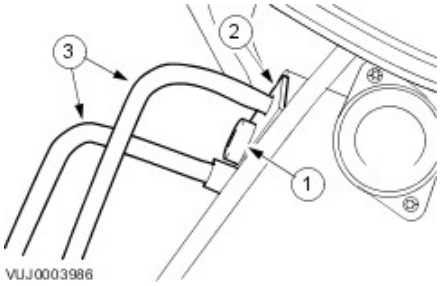
3 . **NOTE:**
Right-hand shown, left-hand similar.

Release both tie-rod end ball joints.
1) loosen the locknut.
2) Release both track rods from tie rod ends, note the number of turns for installation.

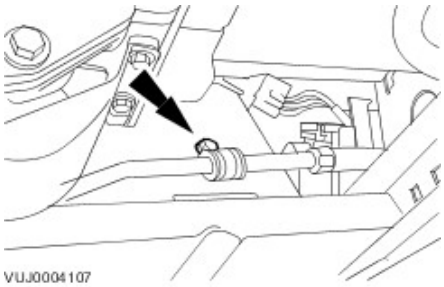


4 . Remove the air deflector.
For additional information, refer to Air Deflector - 2.0L Diesel/2.2L Diesel (76.11.41)

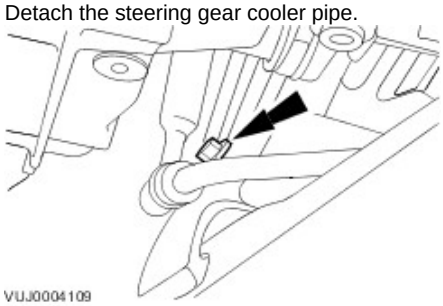
5 . Disconnect the steering gear fluid lines.
1) Remove the latch plate bolt.
2) Rotate latch plate counter clockwise.
3) Disconnect the steering gear fluid lines.



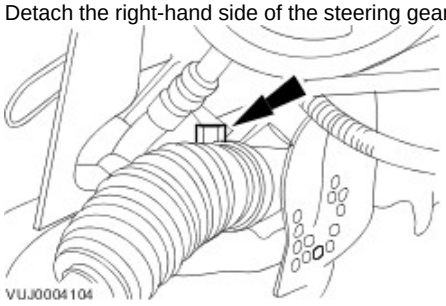
6 . Detach the steering gear cooler pipe.



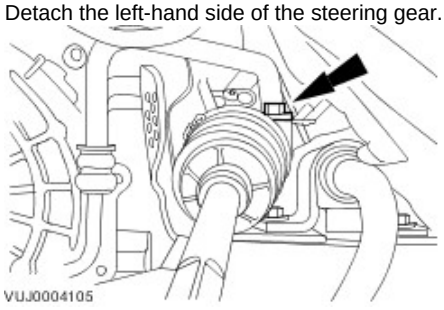
7 . Detach the steering gear cooler pipe.



8 . Detach the right-hand side of the steering gear.

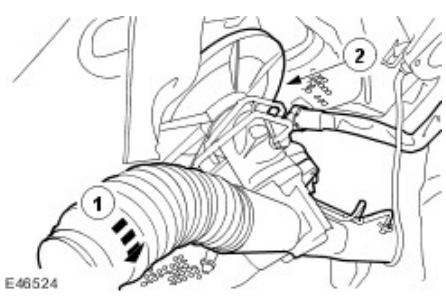


9 . Detach the left-hand side of the steering gear.

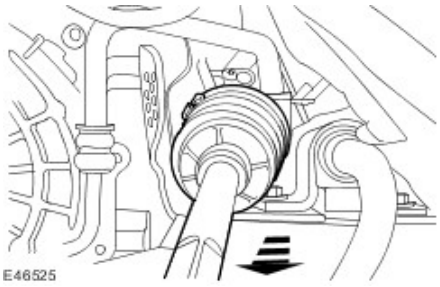


10 . Remove the bulk head panel seal.

1) Reposition the steering gear.
2) Remove the bulk head panel seal.

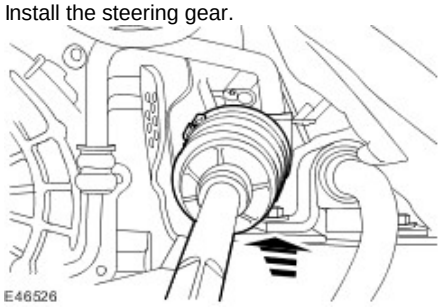


11 . Remove the steering gear.



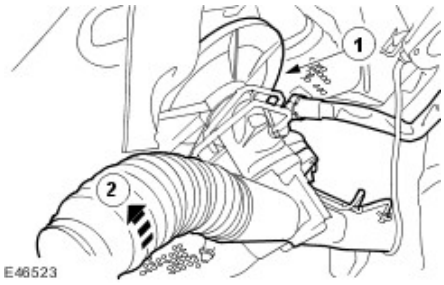
Installation

1 . Install the steering gear.



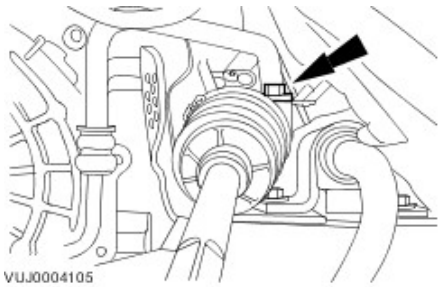
2 . Reposition the steering gear.

1) Install the bu k head panel seal.
2) Reposition the steering gear.



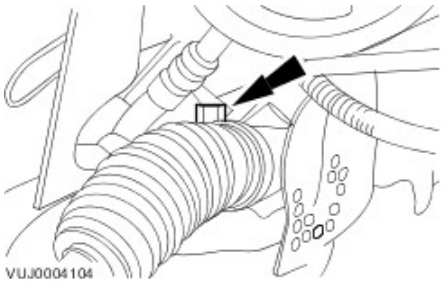
3 . Attach the left-hand side of the steering gear.

Tighten to 133 Nm.

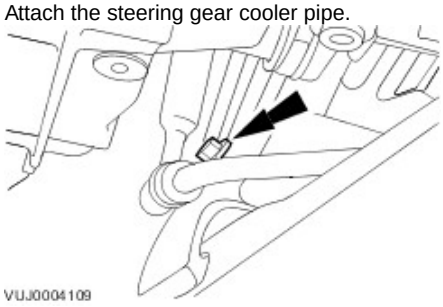


4 . Attach the right-hand side of the steering gear.

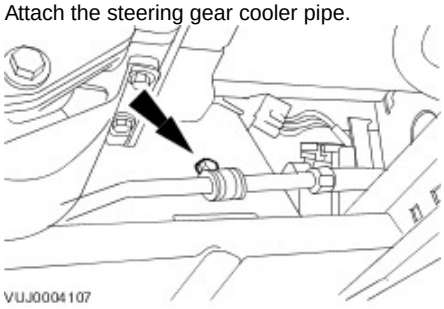
Tighten to 133 Nm.



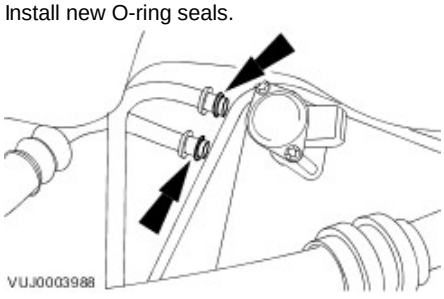
5 . Attach the steering gear cooler pipe.



6 . Attach the steering gear cooler pipe.

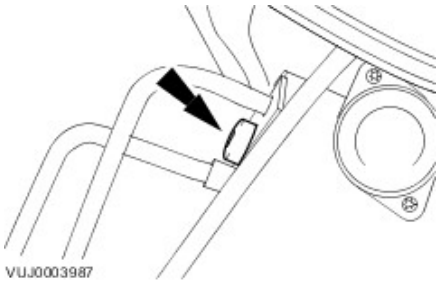


7 . Install new O-ring seals.



8 . Attach the steering gear fluid lines.

Tighten to 10 Nm.



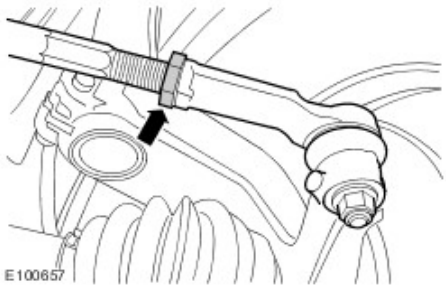
9 . Install the air deflector.
For additional information, refer to Air Deflector - 2.0L Diesel/2.2L Diesel (76.11.41)

10 . **NOTE:**

Right-hand shown, Left hand similar.

Connect tie-rod end ball joints.

1) Attach both tie rods to previously noted positions.
2) Tighten the tie rod locking nut.

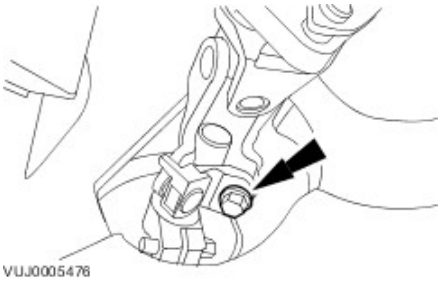


11 . **NOTE:**

Install a new bolt.

Attach the lower steering column.

Tighten to 25 Nm.



12 . Carry out steering system bleed procedure.
For additional information, refer to Power Steering System Filling

13 **NOTE:**

· If the steering gear is being replaced for leakage or noise related issues and there is no evidence of fluid contamination, there is no need to replace the reservoir.

In some cases where the fluid clearly contains particulate matter, and the system continues to function, flush the system with fresh fluid and replace the reservoir, as there is the possibility that the reservoir internal filter may be damaged or faulty.

14 . If a new steering gear has been installed carry out the front toe adjustment procedure.
For additional information, refer to Front Toe Adjustment (57.65.01)

Published: Mar 29, 2001

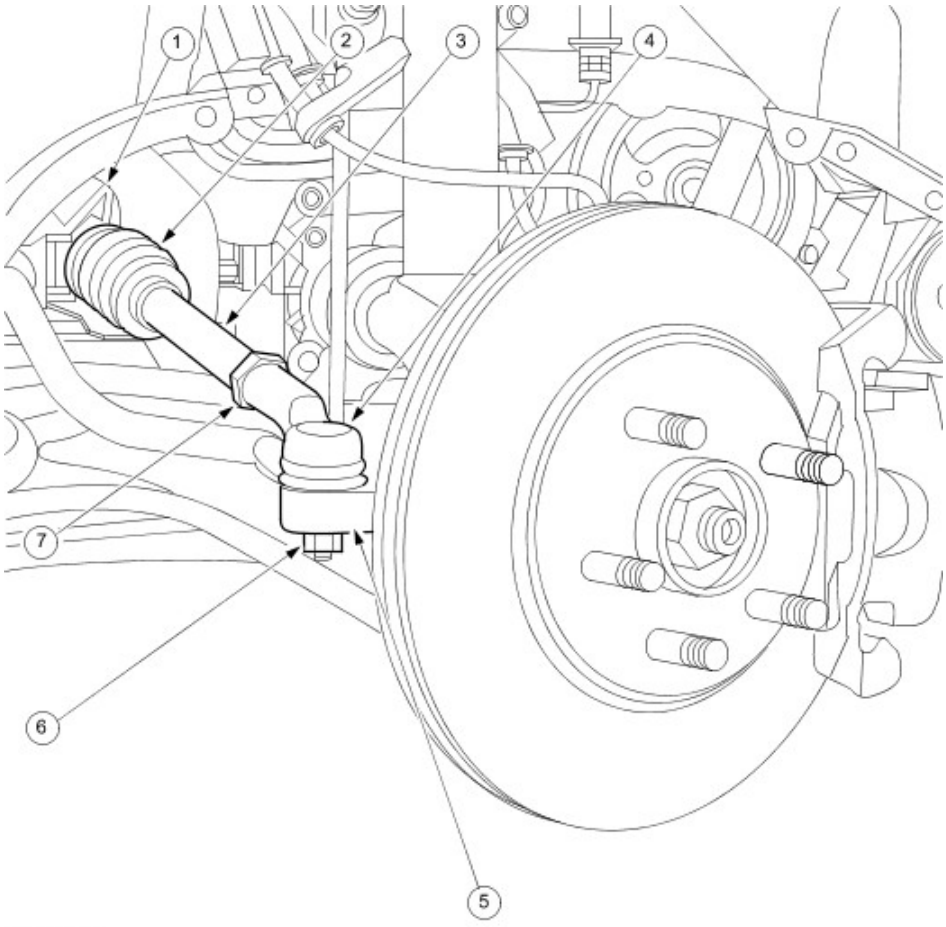
Specifications

Torque Specifications

Description	Nm	lb-ft	lb-in
Tie-rod end retaining nut	35	26	-
Tie-rod end lock nut	40	30	-
Wheel nuts - Vehicles with steel wheels	80	59	-
Wheel nuts - Vehicles with aluminium wheels	103	76	-

Published: Mar 29, 2001

Steering Linkage



VUJ0003799

Item	Part Number	Description
1	—	Steering gear
2	—	Tie-rod end boot
3	—	Tie-rod
4	—	Tie-rod end
5	—	Wheel hub assembly
6	—	Tie-rod end retaining nut
7	—	Tie-rod end lock nut

The left and right-hand tie-rod assemblies:

- Transmit steering forces from the steering gear to the wheel hubs.
- Provide front road wheel toe setting by adjustment of the threaded outer tie-rod ends.

NOTE:

Steering geometry adjustments must only be carried out with the vehicle on turn plates to allow the wheels to move during adjustment.

The left and right-hand steering rack boots:

- Are installed between the steering rack and the tie-rod ends.
- Are of the concertina type.
- Retain lubricant and prevent the ingress of foreign matter.

Published: Mar 29, 2001

Steering Linkage

For additional information, refer to<<211-00>>.

Published: Oct 23, 2001

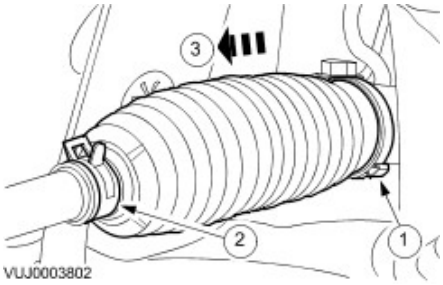
Steering Gear Boot (57.10.29)

Removal

1 . Remove the tie-rod end. For additional information, refer to procedure in this section:
For additional information, refer to

2 . Remove the steering gear boot.

1) Remove and discard the steering gear boot retaining clamp.
2) Detach the steering gear boot retaining clamp.
3) Remove the steering gear boot.



Installation

1 .

CAUTION: Make sure the steering gear is clean before installing the boot.

To install, reverse the removal procedure.

- Install the steering gear boot using a new retaining clamp.

Published: Mar 29, 2001

Tie Rod End (57.55.02)

Special Service Tools

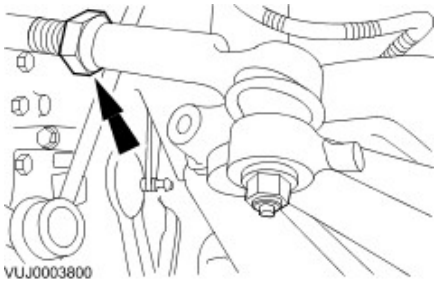
204-192

Seperator, Ball Joint
204-192 (JD-219)

Removal

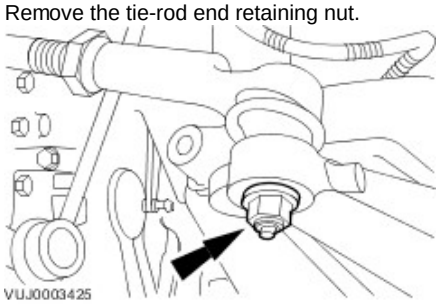
1 . Remove the wheel and tire. For additional information refer to <<204-04>>.

2 . Loosen the tie-rod end lock nut.



VUJ0003800

3 . Remove the tie-rod end retaining nut.

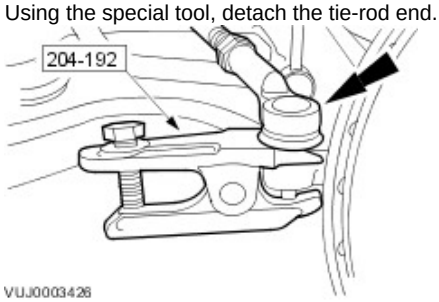


VUJ0003425

4 . **NOTE:**

When the tie-rod end is seperated from the wheel hub assembly, the ball joint seal should be protected to prevent damage.

Using the special tool, detach the tie-rod end.

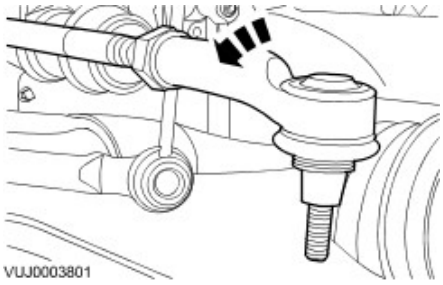


VUJ0003426

5 . **NOTE:**

Make a note of the number of turns required to remove the tie-rod end.

Remove the tie-rod end.



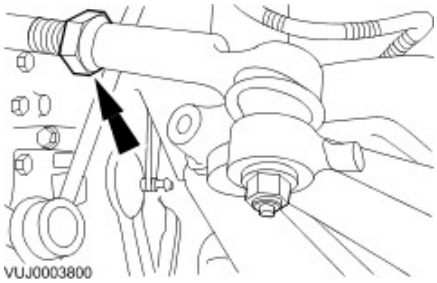
Installation

1 . **NOTE:**

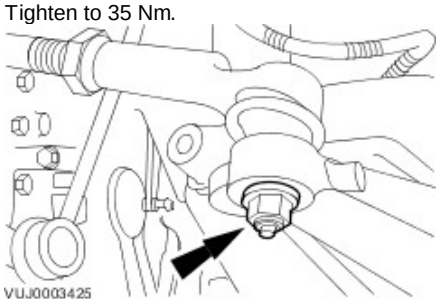
Make sure the tie-rod end is installed on the tie-rod by the same amount of turns used to remove it.

To install, reverse the removal procedure.

Tighten to 40 Nm.



2 . Tighten to 35 Nm.



3 . Check the toe adjustment. For additional information, refer to <<204-00>>.

Published: Nov 20, 2001

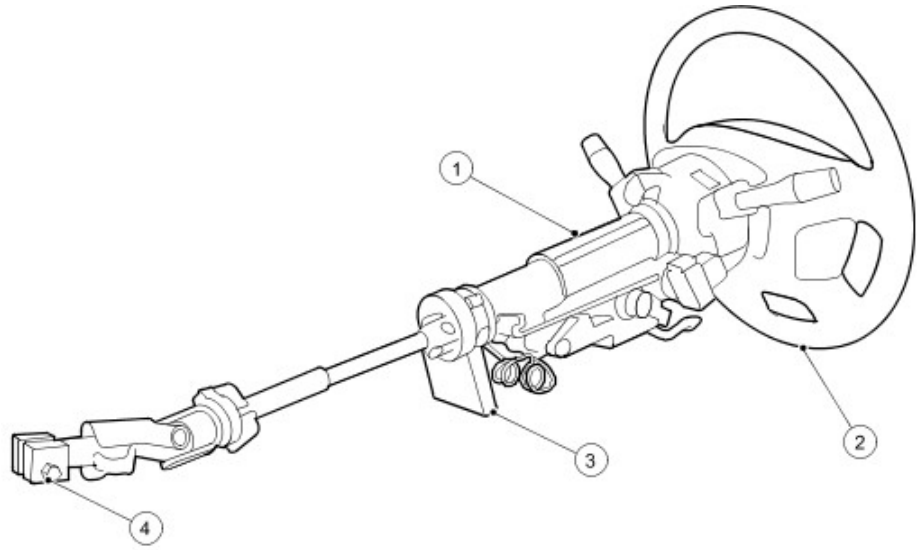
Specifications

Torque Specifications

Description	Nm	lb-ft	lb-in
Steering wheel retaining bolt	47	35	-
Steering column lower retaining bolt	25	18	-
Steering column retaining bolts	24	18	-
Steering column flexible coupling retaining bolt.	25	18	–

Published: Nov 20, 2001

Steering Column



VUJ0005478

Item	Part Number	Description
1	—	Steering column
2	—	Steering wheel
3	—	Steering wheel angle sensor
4	—	Steering column flexible coupling

The steering column lock is secured to the upper casting of the steering column and consists of a locking pin. The steering column is locked and unlocked by inserting and removing the ignition key respectively.

The steering column has tilt and telescope functions. These allow the driver to manually set the steering column position by using the tilt/telescope lever, regardless of the ignition switch position. The steering column is capable of being tilted up or tilted down and telescoped in or out, and is unlocked and locked into position using a single lever located on the underside of the steering column.

The lower part of the steering column consists of two shafts. The lower flexible coupling shaft is attached to both the steering gear and the upper shaft.

No routine maintenance of the steering wheel is required. Any setting of steering wheel for misalignment must be achieved by adjusting the tie rods.

Published: Mar 2, 2001

Steering Column

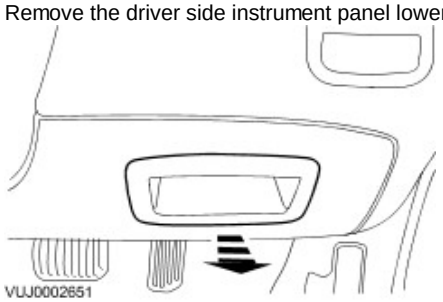
For additional information, refer to <<211-00>>.

Published: Jul 21, 2003

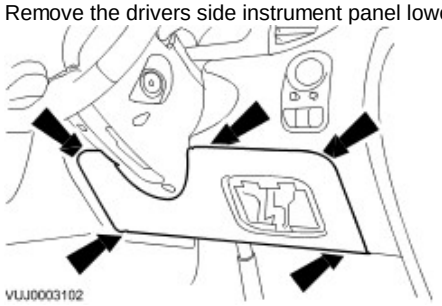
Ignition Switch Lock Cylinder (57.40.29)

Removal

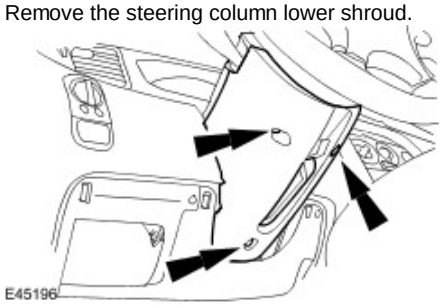
1 . Remove the driver side instrument panel lower trim panel pocket.



2 . Remove the drivers side instrument panel lower trim panel.

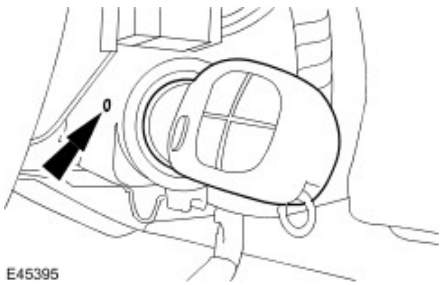


3 . Remove the steering column lower shroud.



4 . Remove the ignition switch lock cylinder.

- Turn the ignition key to position 1.
- Press the locking pin.
- Remove the ignition switch lock cylinder.



Installation

1 . To install, reverse the removal procedure.

Published: Nov 11, 2003

Steering Column (57.40.01)

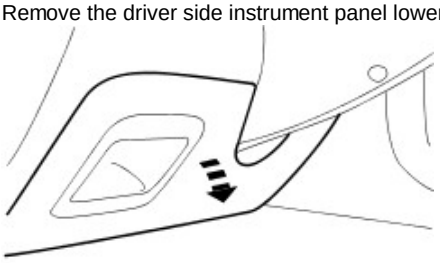
Removal

All vehicles

1 . Remove the clockspring.
For additional information, refer to Clockspring (86.65.92)

Vehicles without Driver Lower Airbag Module

2 . Remove the driver side instrument panel lower trim panel.


VUJ0004808

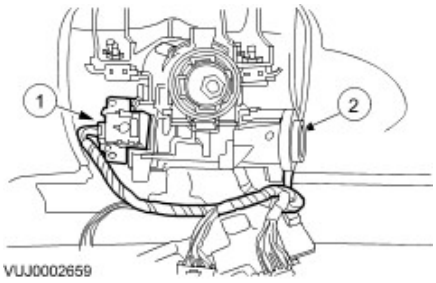
Vehicles with Driver Lower Airbag Module

3 . Remove the driver lower airbag module.
For additional information, refer to Driver Lower Air Bag Module (76.73.75)

All vehicles

4 . Disconnect the ignition switch electrical connector.

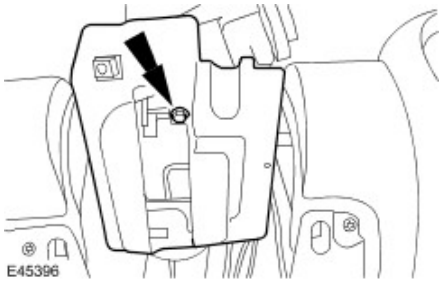
1) Disconnect the passive anti-theft system transceiver electrical connector.
2) Disconnect the ignition switch electrical connector.



VUJ0002659

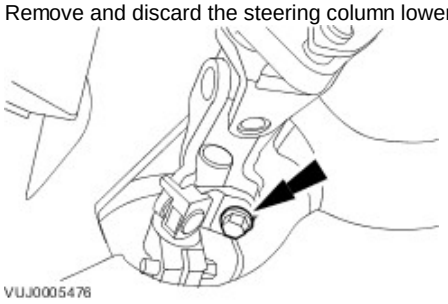
5 . Reposition the steering column wiring harness bracket.

- Remove the steering column wiring harness bracket retaining screw.


E45396

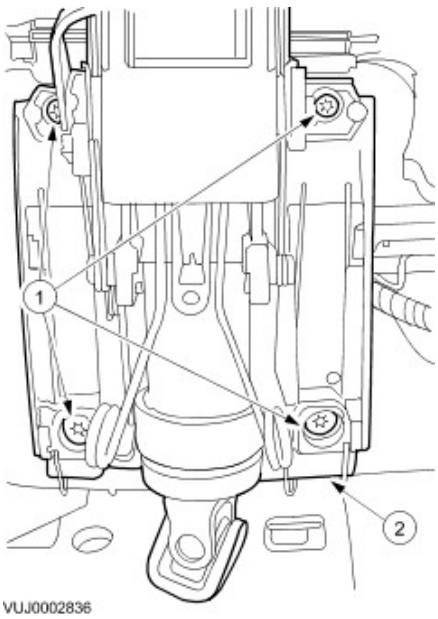
6 . Disconnect the steering wheel rotation sensor electrical connector.

7 . Remove and discard the steering column lower retaining bolt.



8 . Remove the steering column.

1) Remove the steering column retaining bolts.
2) Remove the steering column.

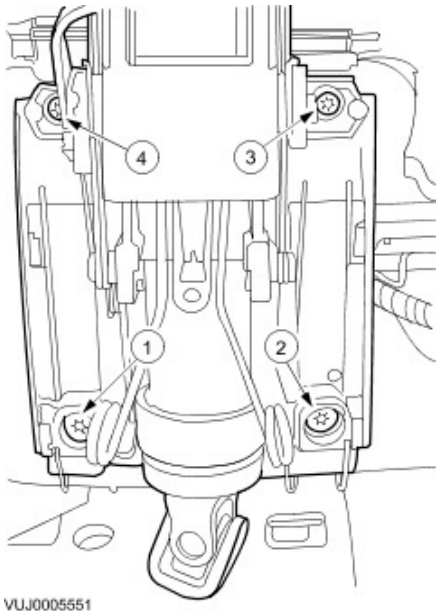


Installation

1 . To install, reverse the removal procedure.

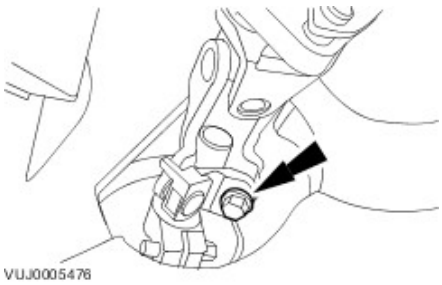
2 . Tighten in the sequence shown.

Tighten to 24 Nm.



3 . Install a new bolt.

Tighten to 25 Nm.

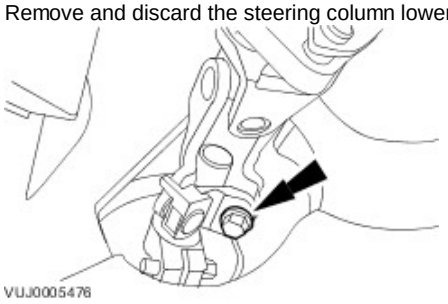


Published: Jul 21, 2003

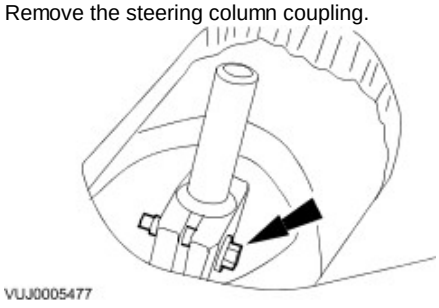
Steering Column Coupling

Removal

1 . Remove and discard the steering column lower retaining bolt.



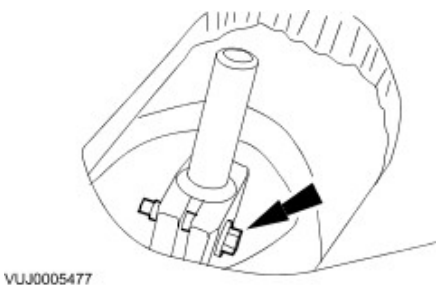
2 . Remove the steering column coupling.



Installation

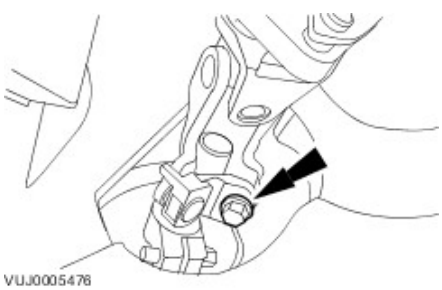
1 . To install, reverse the removal procedure.

Tighten to 25 Nm.



2 . Install a new bolt.

Tighten to 25 Nm.

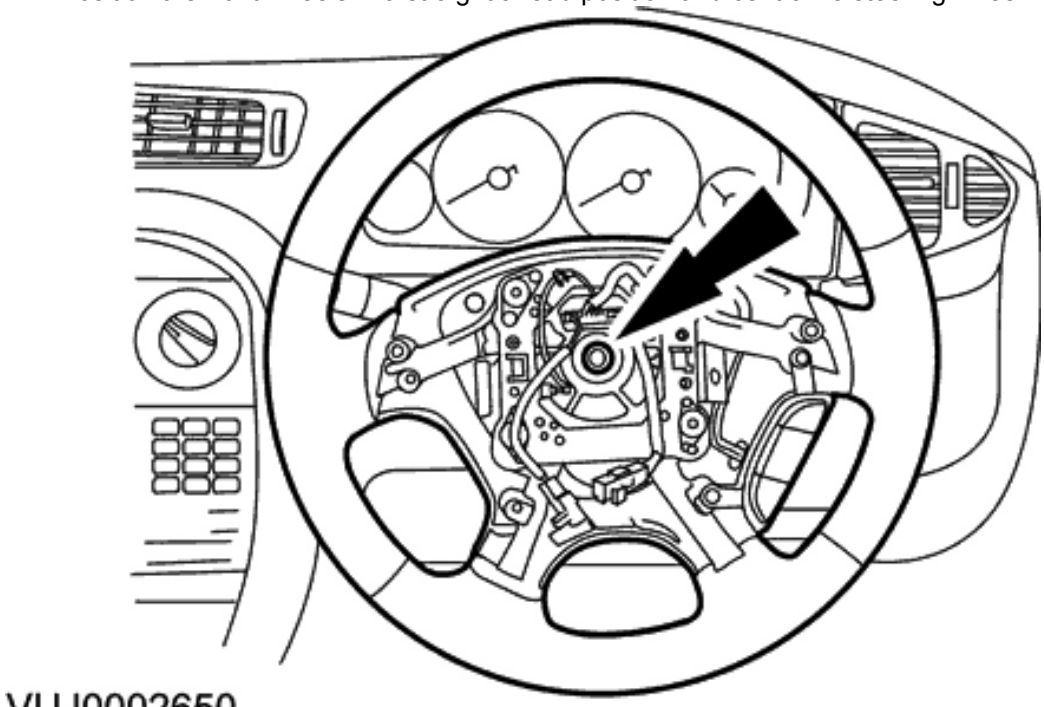


Steering Wheel 57.60.01

Removal

1. Remove the driver airbag module. For additional information, refer to**<<501-20A>><<501-20B>>** .

2. Position the front wheels in a straight ahead position and centralize steering wheel.



VUJ0002650

3. Remove the steering wheel.

4. Using a suitable insulation/masking tape, secure the cassette module to prevent movement from the centralized position.

Installation

1. To install, reverse the removal procedure.
   - Tighten to 47 Nm.

Published: Nov 26, 2003

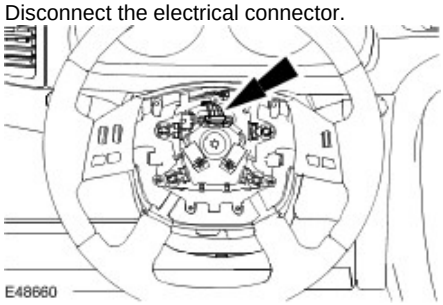
Steering Wheel (57.60.01)

Removal

1 . Position the front wheels in a straight ahead position and centralize steering wheel.

2 . Remove the driver airbag module.
For additional information, refer to Driver Air Bag Module (76.73.39)

3 . Disconnect the electrical connector.



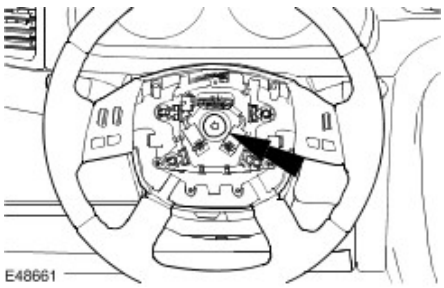
4 . Remove the steering wheel.

5 . Using suitable insulation/masking tape, secure the clockspring to prevent movement from the centralized position.

Installation

1 . To install, reverse the removal procedure.

Tighten to 47 Nm.



Published: Jul 11, 2003

Steering Column Switches

Steering Column Multifunction Switch RH

The steering column multifunction switch RH controls the following functions when the ignition switch is in position II:

Flick Wipe

Flick wipe operation:

- Is obtained by pulling the switch stalk towards the driver.
- Features continuous wipe action at slow speed while the switch stalk position is held.

Intermittent Wipe

In the intermittent wipe position:

- The wiper operates intermittently, with a variable time delay between wipes.
- The time delay may be varied by rotating the column switch collar. This switch has six positions and varies the delay between 1 and 22 seconds. The collar is turned counter-clockwise to increase the delay.

Slow Speed Wiper

In the slow speed position:

- The wiper operates continuously at slow speed.

High Speed Wiper

In the high speed position:

- The wiper operates continuously at high speed.

Windscreen Wash/Wipe

The wash/wipe function:

- Is operated by the button at the end of the switch sta k.
- If the switch stalk is in the off or intermittent position the washers will operate for the duration the button is being pressed. The wipers will operate at the slow speed while the button is being pressed and provides an additional three sweeps of the wipers after the button is released.
- If the switch stalk is in the flick, slow or high speed position the washers will operate for the duration the button is being pressed. The wipers will operate at the slow or high speed respectively while the button is being pressed.
- Is disabled if the 'Washer Fluid Low' message is displayed but manual operation is still available.

Headlamp Power Wash (if equipped)

The headlamp power wash function:

- Operates only when the headlamps are on and the windscreen wash/wipe button is pressed.
- Provides one short burst to the headlamps for approximately 0.5 of a second.

After the initial application, the headlamp power wash operates on every fifth operation of the wash/wipe button.

Rain Sensing/Auto Wipe (if equipped)

The rain sensing/auto wipe function:

- Operates if the wash/wipe switch is set to the intermittent position and the variable delay is adjusted to the minimum position. If any other position is selected the rain sensing function is disabled and the system reverts to the intermittent function with position two being the shortest delay.
- When rain sensing/auto wipe is selected the area of the windscreen covered by the rain sensor is monitored for moisture. If moisture is detected the wipers are activated. The speed of the wipers is dependent on the amount of moisture detected on the windscreen. When the windscreen is dry the wipers are parked until moisture is detected again.

Steering Column Multifunction Switch LH

The steering column multifunction switch LH controls the following functions when the ignition switch is in position II:

Direction Indicators

The direction indicators:

- Operate when the ignition switch is in position II.
- Are operated by moving the switch stalk up or down until it latches in position to indicate a right or left turn respectively.
- May be operated while the switch sta k is held against spring pressure before reaching the latched position.
- Cancel automatically upon completion of a turn. The multifunction switch LH stalk then returns to the center position.

An audible ticking and a flashing green warning lamp on the instrument cluster indicates that the direction indicators are operating. If an indicator bulb fails, the warning lamp and ticking operate at twice the normal rate.

Main Beam

The main beam switch has two pull positions. Operating the switch to the first position and then releasing it will cause the main beam to flashed. The main beam can be flashed with the ignition on or off and will remain activated as long as the switch is held.

Operating the switch to the second position will operate main beam continuously if the headlamps are on.

STEERING WHEEL & SWITCHES

A new type of steering wheel will be introduced later this year on the X TYPE.

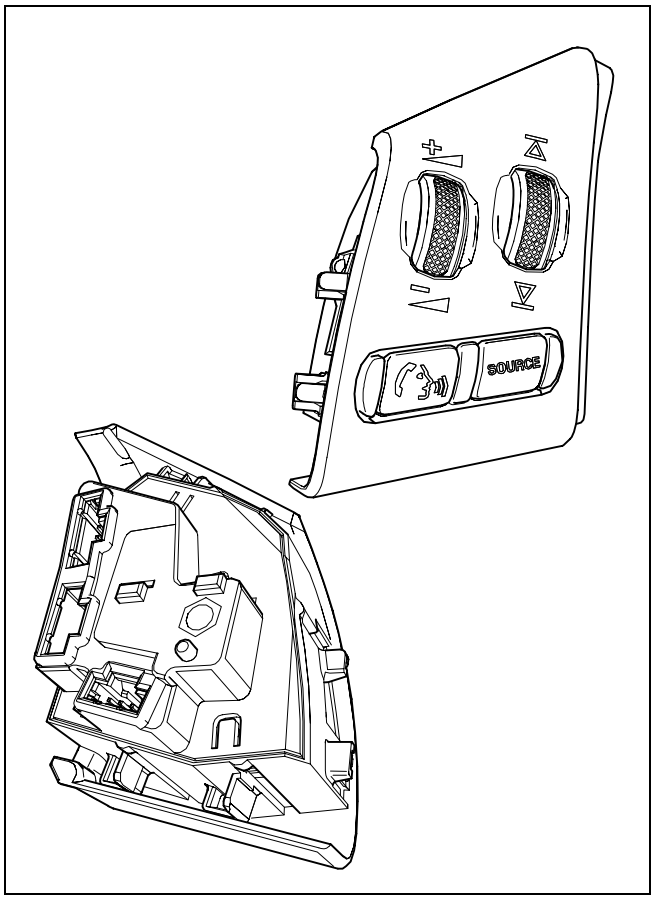
It has a Hybrid armature made up from magnesium hub and upper spokes and steel rim and lower spokes, which has a hexagonal hole that attaches to the steering column.

The steering wheel is fixed using an M10x20 torx drive bolt.

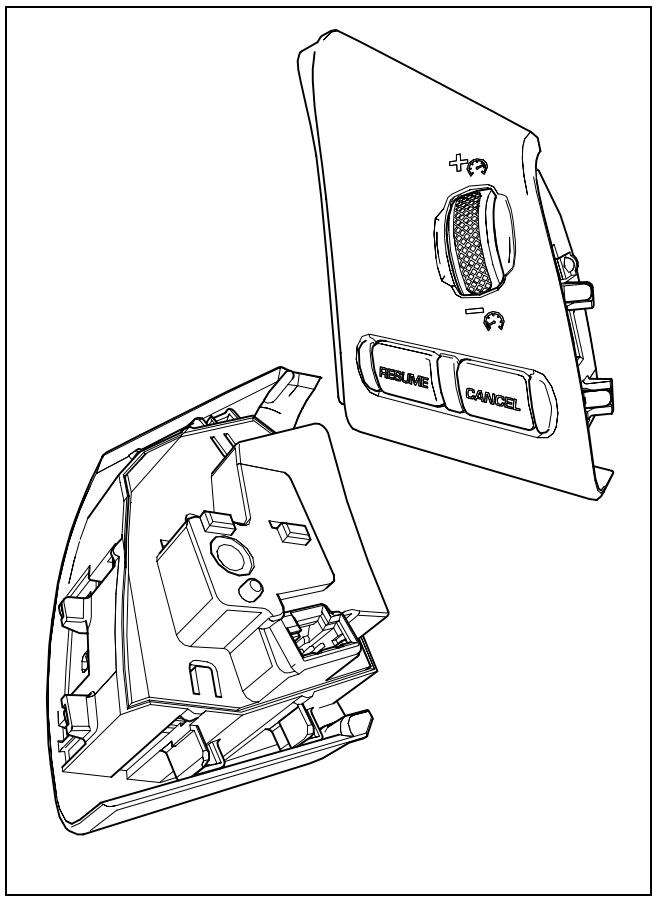
2004MY X-TYPE dash featuring new style steering wheel

The X TYPE sees the first introduction of the new cross carline switches. They are mounted on to the upper two spokes on the wheel assembly.

The ICE switch pack consists of two buttons for mode selection and mute/phone and two rotary thumb wheels (which have a 30 degree angle of rotation) used for the volume and seek functions.



Entertainment switchpack



Speed control switchpack

The cruise control switch pack consists of two buttons for resume and cancel features (on/off has been dropped) and a rotary thumb wheel used for speed increase and decrease.

To service the switch gear, the driver's airbag and steering wheel must be removed. Once this is done, the steering wheel back cover can be removed by unscrewing the four retaining screws. Once this has been removed, the switches can be displaced by removing the single mounting screw from the rear of the wheel.

The switch gear harness includes the horn harness which once the switch fixing is removed can be disconnected from the horn assembly.

Published: Nov 1, 2001

Steering Column Switches

Inspection and Verification

1 . Verify the customer concern.

2 . Visually inspect for obvious signs of electrical damage.

Visual Inspection Chart

Electrical
• Wiring harness for damage or corrosion • Electrical connector(s) • Switch(s) • Relay(s) • Module

1 . If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

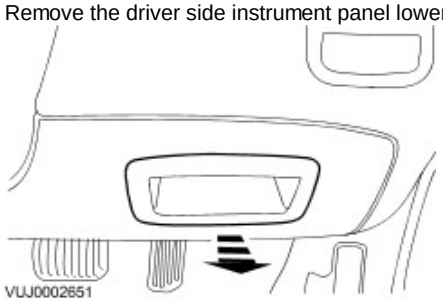
2 . If the cause is not visually evident, verify the symptom and refer to the Jaguar Approved Diagnostic System.

Published: Jul 8, 2003

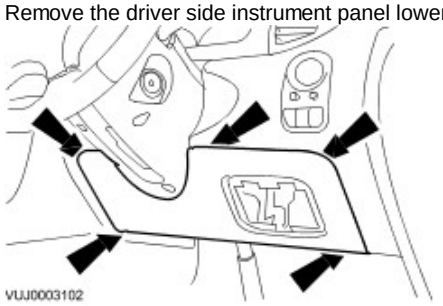
Steering Column Multifunction Switch LH (86.65.78)

Removal

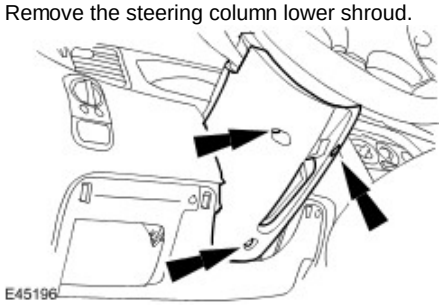
1 . Remove the driver side instrument panel lower trim panel pocket.



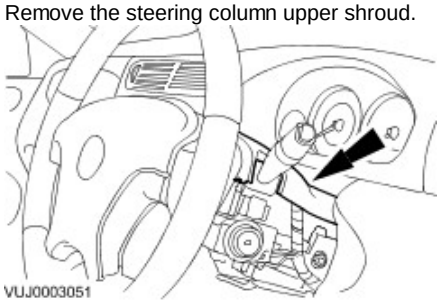
2 . Remove the driver side instrument panel lower trim panel.



3 . Remove the steering column lower shroud.

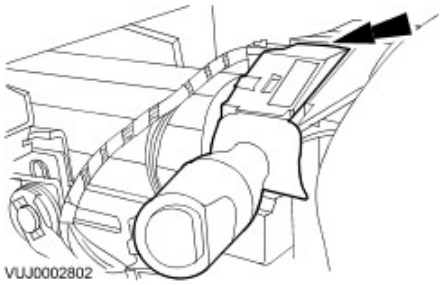


4 . Remove the steering column upper shroud.

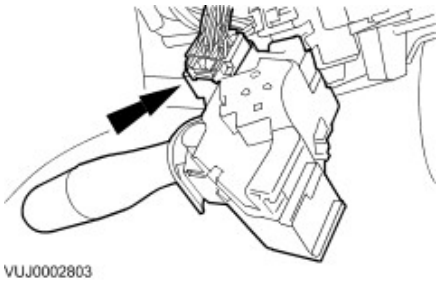


5 . Detach the steering column multifunction switch left-hand.

- Release the retaining tang.



6 . Remove the steering column multifunction switch left-hand.
- Disconnect the electrical connector.



Installation

1 . To install, reverse the removal procedure.

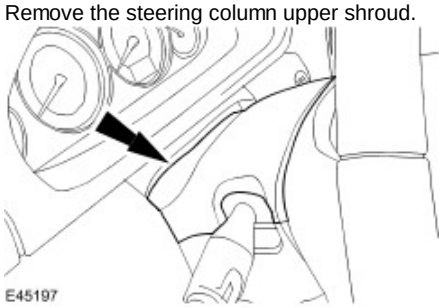
Published: Jul 8, 2003

Steering Column Multifunction Switch RH (86.65.41)

Removal

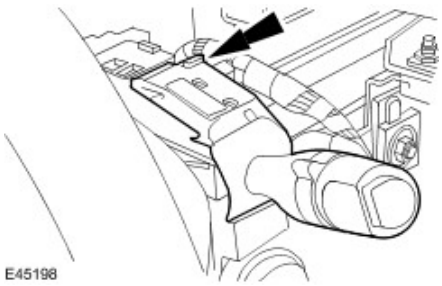
1 . Lower the steering column.

2 . Remove the steering column upper shroud.



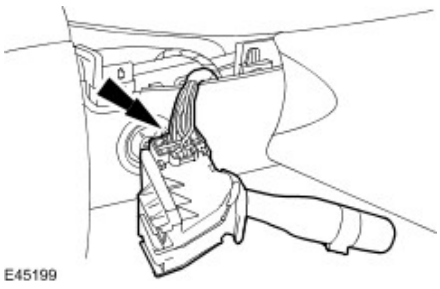
3 . Detach the steering column multifunction switch right-hand.

- Release the retaining tang.



4 . Remove the steering column multifunction switch right-hand.

- Disconnect the electrical connector.



Installation

1 . To install, reverse the removal procedure.