

2. CHASSIS

204 : Suspension

204-00 : Suspension system – General information

Specifications

Specifications

Wheel Alignment Specification - Front

All Right-Hand Drive and Japan without dynamics pack				
Item		LH	RH	Split LH-RH
Castor	Decimal degrees	$7.05^{\circ} \pm 0.75^{\circ}$	$6.51^{\circ} \pm 0.75^{\circ}$	$0.55^{\circ} \pm 0.75^{\circ}$
	Degrees/minutes	$7^{\circ} 3' \pm 45'$	$6^{\circ} 31' \pm 45'$	$0^{\circ} 33' \pm 45'$
Camber	Decimal degrees	$-0.7^{\circ} \pm 0.75^{\circ}$	$-0.3^{\circ} \pm 0.75^{\circ}$	$-0.4^{\circ} \pm 0.75^{\circ}$
	Degrees/minutes	$-0^{\circ} 42' \pm 45'$	$-0^{\circ} 18' \pm 45'$	$-0^{\circ} 24' \pm 45'$
Total toe	Decimal degrees	$0.17^{\circ} \pm 0.20^{\circ}$		
	Degrees/minutes	$0^{\circ} 10' \pm 12'$		

All Right-Hand Drive and Japan with dynamics pack				
Item		LH	RH	Split LH-RH
Castor	Decimal degrees	$7.28^{\circ} \pm 0.75^{\circ}$	$6.74^{\circ} \pm 0.75^{\circ}$	$0.55^{\circ} \pm 0.75^{\circ}$
	Degrees/minutes	$7^{\circ} 17' \pm 45'$	$6^{\circ} 44' \pm 45'$	$0^{\circ} 33' \pm 45'$
Camber	Decimal degrees	$-1.0^{\circ} \pm 0.75^{\circ}$	$-0.6^{\circ} \pm 0.75^{\circ}$	$-0.4^{\circ} \pm 0.75^{\circ}$
	Degrees/minutes	$-0^{\circ} 60' \pm 45'$	$-0^{\circ} 36' \pm 45'$	$-0^{\circ} 24' \pm 45'$
Total toe	Decimal degrees	$0.14^{\circ} \pm 0.20^{\circ}$		
	Degrees/minutes	$0^{\circ} 8' \pm 12'$		

USA, Canada, Mexico and Dominican Republic without dynamics pack				
Item		LH	RH	Split LH-RH

Castor	Decimal degrees	6.78° ± 0.75°	6.78° ± 0.75°	0° ± 0.75°
	Degrees/minutes	6° 47' ± 45'	6° 47' ± 45'	0° 0' ± 45'
Camber	Decimal degrees	-0.25° ± 0.75°	-0.75° ± 0.75°	0.5° ± 0.75°
	Degrees/minutes	-0° 15' ± 45'	-0° 45' ± 45'	0° 30' ± 45'
Total toe	Decimal degrees	0.17° ± 0.20°		
	Degrees/minutes	0° 10' ± 12'		

USA, Canada, Mexico and Dominican Republic with dynamics pack				
Item		LH	RH	Split LH-RH
Castor	Decimal degrees	7.01° ± 0.75°	7.01° ± 0.75°	0° ± 0.75°
	Degrees/minutes	7° 1' ± 45'	7° 1' ± 45'	0° 0' ± 45'
Camber	Decimal degrees	-0.55° ± 0.75°	-1.05° ± 0.75°	0.5° ± 0.75°
	Degrees/minutes	-0° 33' ± 45'	-0° 63' ± 45'	0° 30' ± 45'
Total toe	Decimal degrees	0.14° ± 0.20°		
	Degrees/minutes	0° 8' ± 12'		

Rest of the World without dynamics pack				
Item		LH	RH	Split LH-RH
Castor	Decimal degrees	6.78° ± 0.75°	6.78° ± 0.75°	0° ± 0.75°
	Degrees/minutes	6° 47' ± 45'	6° 47' ± 45'	0° 0' ± 45'
Camber	Decimal degrees	-0.4° ± 0.75°	-0.6° ± 0.75°	0.2° ± 0.75°
	Degrees/minutes	-0° 24' ± 45'	-0° 36' ± 45'	0° 12' ± 45'
Total toe	Decimal degrees	0.17° ± 0.20°		
	Degrees/minutes	0° 10' ± 12'		

Rest of the World with dynamics pack				
Item		LH	RH	Split LH-RH
Castor	Decimal degrees	7.01° ± 0.75°	7.01° ± 0.75°	0° ± 0.75°
	Degrees/minutes	7° 1' ± 45'	7° 1' ± 45'	0° 0' ± 45'
Camber	Decimal degrees	-0.7° ± 0.75°	-0.9° ± 0.75°	0.2° ± 0.75°
	Degrees/minutes	-0° 42' ± 45'	-0° 54' ± 45'	0° 12' ± 45'
Total toe	Decimal degrees	0.14° ± 0.20°		
	Degrees/minutes	0° 8' ± 12'		

Wheel Alignment Specification - Rear

Naturally Aspirated (NA)			
Item		LH	RH
Camber	Decimal degrees	-0.53° ± 0.75°	-0.53° ± 0.75°
	Degrees/minutes	-0° 32' ± 45'	-0° 32' ± 45'
Toe	Decimal degrees	0.125° ± 0.14°	0.125° ± 0.14°
	Degrees/minutes	0° 7.5' ± 8'	0° 7.5' ± 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° 0' ± 8'	

Supercharged (SC) without dynamics pack			
Item		LH	RH
Camber	Decimal degrees	-0.63° ± 0.75°	-0.63° ± 0.75°
	Degrees/minutes	-0° 38' ± 45'	-0° 38' ± 45'
Toe	Decimal degrees	0.125° ± 0.14°	0.125° ± 0.14°
	Degrees/minutes	0° 7.5' ± 8'	0° 7.5' ± 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° 0' ± 8'	

Supercharged (SC) with dynamics pack			
Item		LH	RH
Camber	Decimal degrees	-0.99° ± 0.75°	-0.99° ± 0.75°
	Degrees/minutes	-0° 59' ± 45'	-0° 59' ± 45'
Toe	Decimal degrees	0.125° ± 0.14°	0.125° ± 0.14°
	Degrees/minutes	0° 7.5' ± 8'	0° 7.5' ± 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° 0' ± 8'	

Vehicle ride height

	Front	Rear
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Naturally aspirated (NA)	396 mm ± 15 mm	396 mm ± 15 mm
Supercharged (SC) without dynamics pack	394 mm ± 15 mm	393 mm ± 15 mm
Supercharged (SC) with dynamics pack	384 mm ± 15 mm	379 mm ± 15 mm

- 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.

Front Toe Adjustment (57.65.01)



CAUTION: Make sure the vehicle is on a flat level surface.



CAUTION: Make sure the tire pressures are within specification.



CAUTION: Make sure that only the manufacturers' recommended four wheel alignment equipment is used.



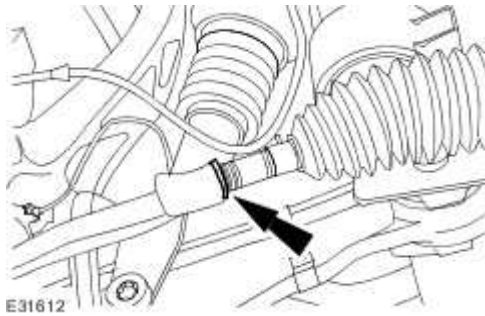
CAUTION: Make sure the steering is in the straight ahead position.

1. For wheel alignment information, refer to the suspension specification section.
2. Check the tie rod ends, suspension joints, wheel bearings and wheels and tires for damage, wear and free play.
 - Adjust or repair any worn, damaged or incorrectly adjusted components.
3. Check and adjust tire pressures.

4. Position the vehicle on a calibrated, level, vehicle lift.
5. Release the vehicle parking brake.
6. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.
7. **NOTE:**

LH illustration shown, RH is similar.

To adjust, loosen the tie rod end lock nuts.



8.



CAUTION: Do not allow the gaiter to twist.

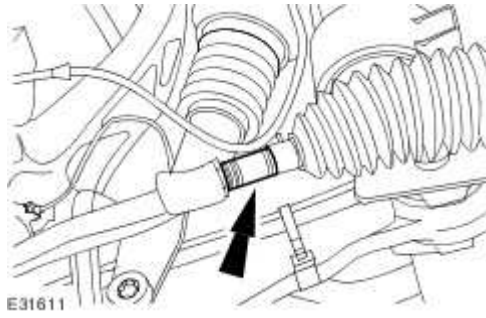
NOTE:

Both tie rods must be rotated by an equal amount.

NOTE:

LH illustration shown, RH is similar.

Adjust the front toe.



9. Tighten the tie rod end lock nuts to 55 Nm (40 lb.ft).
10. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.

Rear Toe Adjustment (57.65.08)



CAUTION: Make sure the vehicle is on a flat level surface.



CAUTION: Make sure the tire pressures are within specification.



CAUTION: Make sure that only the manufacturers' recommended four wheel alignment equipment is used.



CAUTION: Make sure the steering is in the straight ahead position.

1. For wheel alignment information, refer to the suspension specification section.
2. Check the tie rod ends, suspension joints, wheel bearings and wheels and tires for damage, wear and free play.
 - Adjust or repair any worn, damaged or incorrectly adjusted components.
3. Check and adjust tire pressures.
4. Position the vehicle on a calibrated, level, vehicle lift.

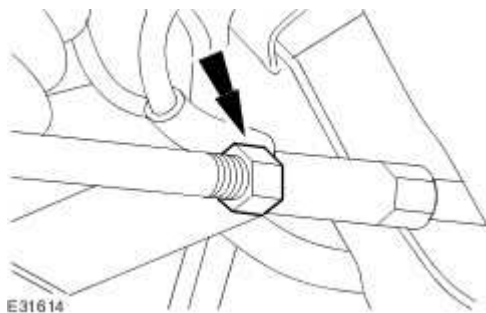
5. Release the vehicle parking brake.

6. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.

7. **NOTE:**

LH illustration shown, RH is similar.

To adjust, loosen the toe link locknuts.



8.



CAUTION: Do not allow the gaiter to twist.

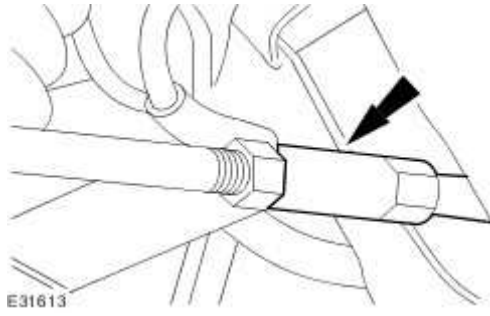
NOTE:

Both tie rods must be rotated by an equal amount.

NOTE:

LH illustration shown, RH is similar.

Adjust the rear toe.



9. Tighten the toe link locknuts to 55 Nm (40 lb.ft).
10. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.

Four-Wheel Alignment



CAUTION: Make sure the vehicle is on a flat level surface.



CAUTION: Make sure the tire pressures are within specification.



CAUTION: Make sure that only the manufacturers' recommended four wheel alignment equipment is used.



CAUTION: Make sure the steering is in the straight ahead position.

1. For wheel alignment information, refer to the suspension specification section.
2. Check the tie rod ends, suspension joints, wheel bearings and wheels and tires for damage, wear and free play.
 - Adjust or repair any worn, damaged or incorrectly adjusted components.
3. Check and adjust tire pressures.
4. Position the vehicle on a calibrated, level, vehicle lift.

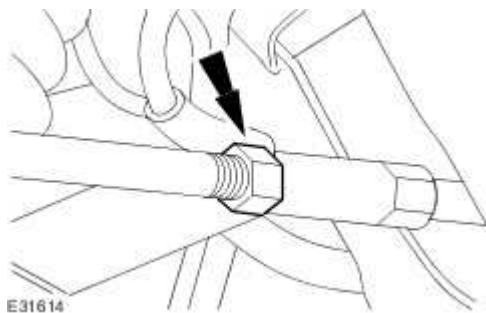
5. Release the vehicle parking brake.

6. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.

7. **NOTE:**

LH illustration shown, RH is similar.

To adjust, loosen the toe link locknuts.



8.



CAUTION: Do not allow the gaiter to twist.

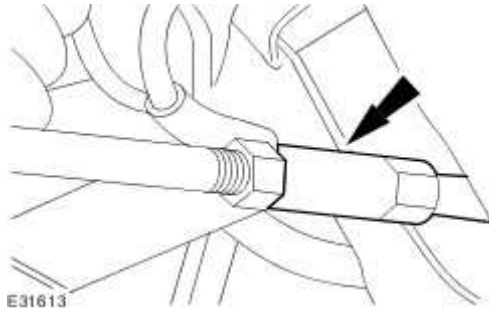
NOTE:

Both tie rods must be rotated by an equal amount.

NOTE:

LH illustration shown, RH is similar.

Adjust the rear toe.

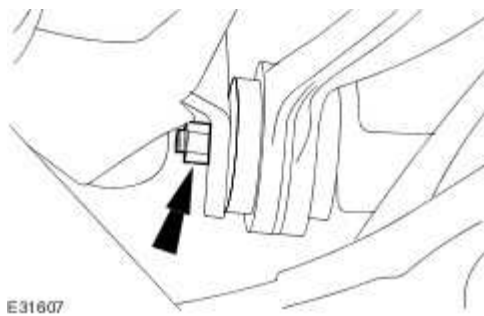


9. Tighten the toe link locknuts to 55 Nm (40 lb.ft).

10. **NOTE:**

LH illustration shown, RH is similar.

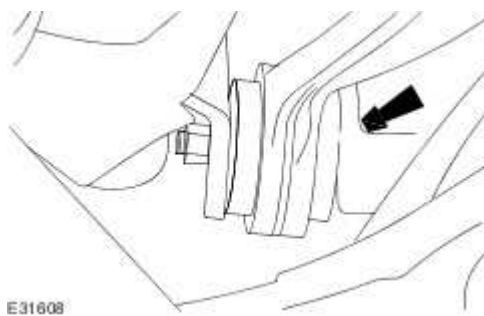
To adjust the caster, loosen the front lower arm lock nuts.



11. **NOTE:**

LH illustration shown, RH is similar.

Rotate the caster adjustment cam bolt.



12.

⚠ CAUTION: Make sure the caster adjustment bolt does not rotate while the lock nut is being tightened.

Tighten the caster adjustment cam bolt nut.

- Tighten the nut and bolt to 175 Nm (129 lb.ft).

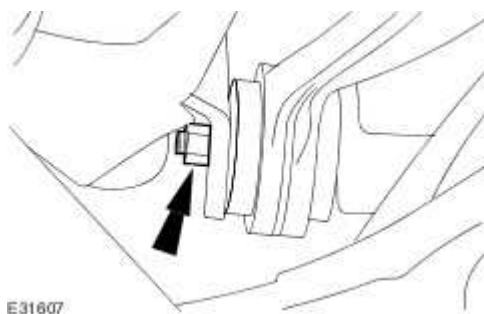
13.

⚠ CAUTION: Adjustments made to the camber setting will affect the front toe setting. Therefore , the camber and toe may need to be adjusted at the same time.

NOTE:

LH illustration shown, RH is similar.

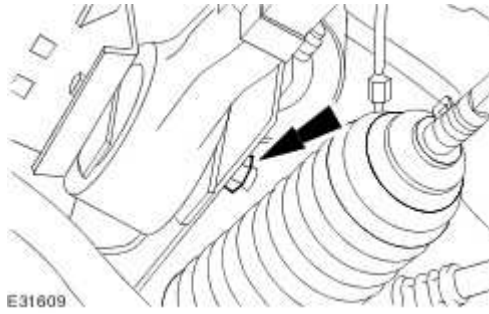
To adjust the camber, loosen the rear lower arm lock nuts.



14. **NOTE:**

LH illustration shown, RH is similar.

Rotate the camber adjustment cam bolt.



15.

⚠ CAUTION: Make sure the camber adjustment bolt does not rotate while the lock nut is being tightened.

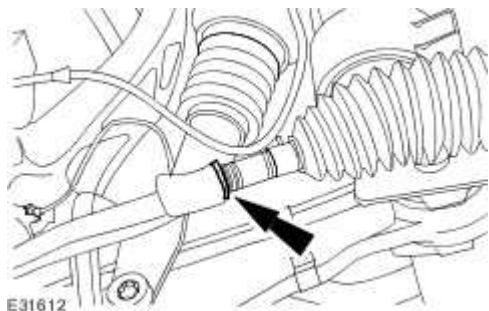
Tighten the camber adjustment cam bolt nut.

- Tighten the nut and bolt to 175 Nm (129 lb.ft).

16. **NOTE:**

LH illustration shown, RH is similar.

To adjust, loosen the tie rod end lock nuts.



17.

⚠ CAUTION: Do not allow the gaiter to twist.

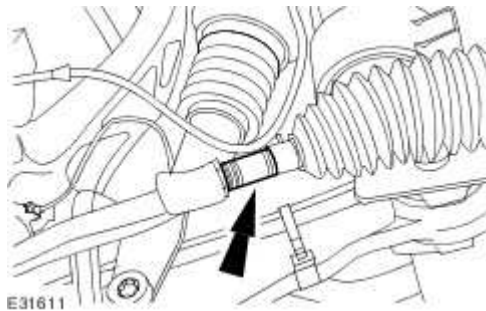
NOTE:

Both tie rods must be rotated by an equal amount.

NOTE:

LH illustration shown, RH is similar.

Adjust the front toe.



18. Tighten the tie rod end lock nuts to 55 Nm (40 lb.ft).

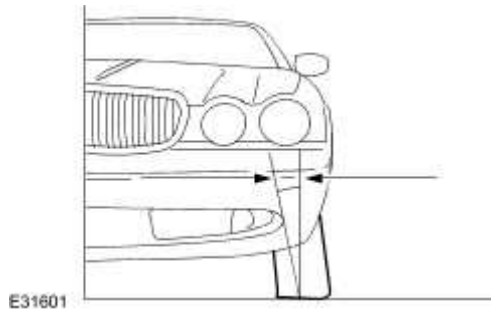
19. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.

Wheel Alignment Angles

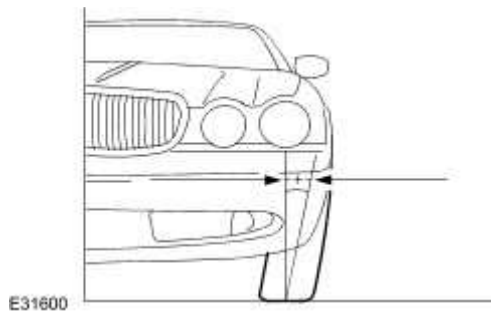
Camber, caster and toe are adjustable on the front suspension system. Only the toe is adjustable on the rear suspension system. Camber and caster are adjusted by means of eccentric cams on the lower arm mounting bolts. The front toe is adjusted by use of the front tie-rod. The rear toe is adjusted by the use of toe link assemblies connecting the knuckles to the rear sub-frame.

Camber

Negative Camber

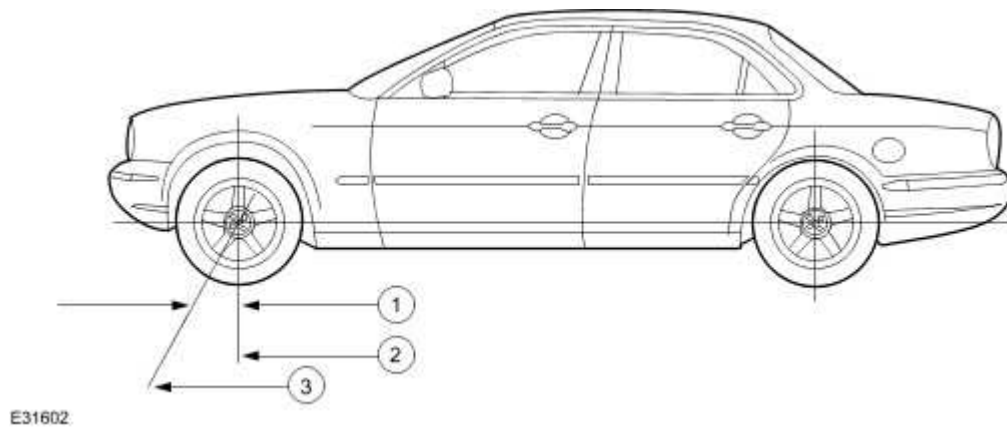


Positive Camber



Camber is the vertical tilt of the wheel when viewed from the front. Camber can be positive or negative and has a direct effect on tire wear.

Caster



Item	Description
1	Positive caster
2	True vertical
3	Steering axis

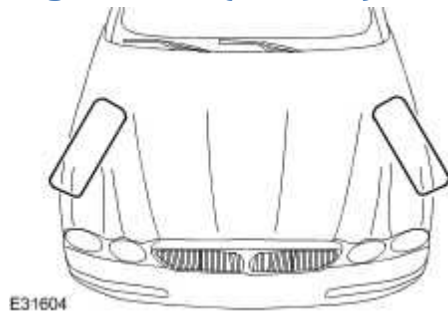
Caster is the deviation from vertical of an imaginary line drawn through the ball joints when viewed from the side. The caster specifications in this section will give the vehicle the best directional stability characteristics when loaded and driven. The caster setting is not related to tire wear.

Toe

Positive Toe (Toe-In)



Negative Toe (Toe-Out)



The vehicle toe setting:

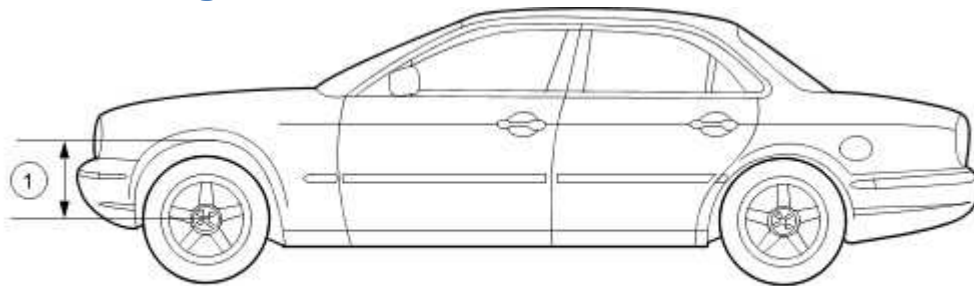
- affects tire wear and directional stability.

Ride Height

NOTE:

All ride height measurements are carried out with vehicle empty and 9 liters of fuel in the tank (showroom condition). The vehicle must be driven above 40 km/h (25 miles/hour) for a minimum of five minutes to make sure that the reservoir is full.

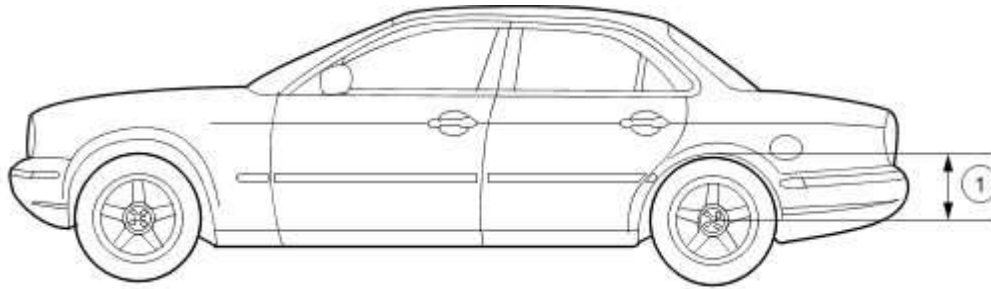
Front Ride Height Measurement



E31605

Item	Description
1	Ride height

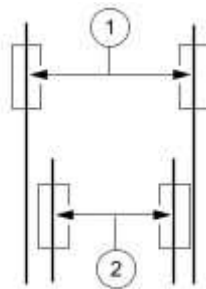
Rear Ride Height Measurement



E31606

Item	Description
1	Ride height

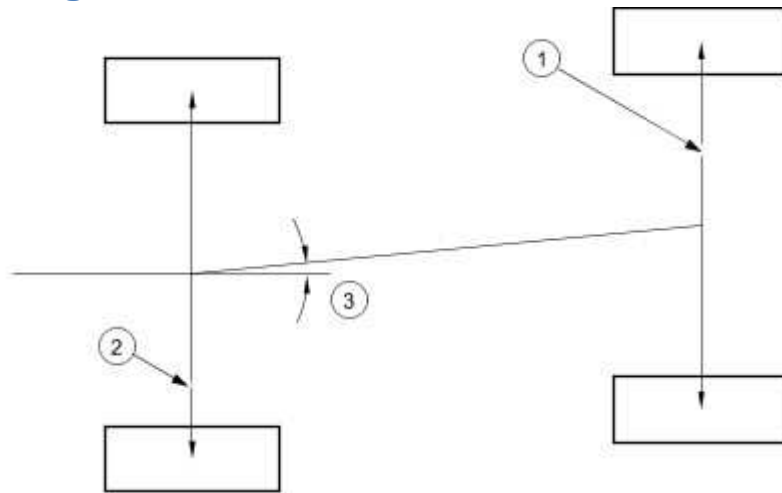
Wheel Track



A0001102

Item	Description
1	Front track
2	Rear track

Crabbing



E31475

Item	Description
1	Front track
2	Rear track
3	Crabbing angle

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 rotational oscillations of the steering wheel which may come and go over time, generally resulting from wheel and tire imbalances.

Shimmy can be experienced at any speed but generally between 80 to 145 km/h (50 to 90 miles/hour) and is most often experienced on smooth roads at steady speeds.

Nibble

Sometimes confused with shimmy, nibble is a condition resulting from tire interaction with various road surfaces or brake disc irregularity 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 describe 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 buildup 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 roadability problem, it is important to understand the difference between wander and vague on-center feel.

Suspension System

Principle of Operation

For a detailed description of the suspension system, refer to the relevant Description and Operation section of the workshop manual.

Wheel Alignment Angles

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

Noise, Vibration and Harshness (NVH)

2 . Visually inspect for obvious signs of damage and system integrity.

Visual Inspection Chart

Mechanical
• Damaged tires • Wheel bearing(s) • Loose or damaged front or rear suspension components • Loose, damaged or missing suspension fastener(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 toe adjustment.
Specifications
Rear Toe Adjustment (57.65.08)

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.
Front Suspension
Rear Suspension

Possible Source(s):

- Drive axle damaged.

Action(s) to take:

- INSTALL a new rear drive axle/differential.
Axle Assembly - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8, Vehicles Without: Differential Drain Plug (51.25.13)

Drift/Pull

Possible Source(s):

- Unequal tire pressure.

Action(s) to take:

- CHECK and ADJUST the tire pressures. INSPECT the tire for excessive wear.
Specifications

Possible Source(s):

- Incorrect wheel alignment.

Action(s) to take:

- CHECK and ADJUST the wheel alignment.
Specifications

Possible Source(s):

- Tires.

Action(s) to take:

- CHECK and ADJUST the tire pressures. INSPECT the tire for excessive wear.
Specifications

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.
Steering System

Possible Source(s):

- Brake drag.

Action(s) to take:

- CHECK the brakes.
Brake System

Front Bottoming or Riding Low

Possible Source(s):

- Coil springs.

Action(s) to take:

- CHECK the ride height. INSTALL new springs as necessary.

Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8
(60.30.04)

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.
Specifications

Possible Source(s):

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

Action(s) to take:

- CHECK and ADJUST the wheel alignment.
Front Toe Adjustment (57.65.01)

Possible Source(s):

- Excessive negative or positive camber (rapid inner or outer edge wear).

Action(s) to take:

- CHECK and ADJUST the wheel alignment.
Four-Wheel Alignment

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 spring(s) as necessary.
Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8
(60.30.04)
Rear Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8
(64.30.02)

Shimmy or Wheel Tramp

Possible Source(s):

- Loose wheel nut(s).

Action(s) to take:

- CHECK and TIGHTEN the wheel nuts to specification.
Specifications

Possible Source(s):

- Loose front suspension fasteners.

Action(s) to take:

- CHECK and TIGHTEN the suspension fasteners to specification.
Specifications

Possible Source(s):

- Front wheel bearing(s).

Action(s) to take:

- CHECK the wheel bearings.
Front Wheel Bearing and Wheel Hub (60.25.03)

Possible Source(s):

- Worn or damaged suspension component bushing.

Action(s) to take:

- CHECK and INSTALL new components as necessary.
Rear Lower Arm Bushing (60.35.56)
Shock Absorber Bushing (60.30.16)
Stabilizer Bar Link Bushing (60.10.03)

Possible Source(s):

- Wheel/tires.

Action(s) to take:

- CHECK the wheels/tires. BALANCE or INSTALL new wheel/tires as necessary.
Wheel and Tire (74.20.05)

Possible Source(s):

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

Action(s) to take:

- CHECK the Ball Joint(s).
Front Suspension

Possible Source(s):

- Loose, worn or damaged steering components.

Action(s) to take:

- CHECK and INSTALL new components as necessary.

Possible Source(s):

- Front wheel alignment.

Action(s) to take:

- CHECK and ADJUST the wheel alignment.
Front Toe Adjustment (57.65.01)

Possible Source(s):

- Shock absorber(s).

Action(s) to take:

- CHECK and INSTALL new shock absorber(s) as necessary.
Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.30.04)
Rear Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.30.02)

Possible Source(s):

- Spring(s).

Action(s) to take:

- CHECK and INSTALL new springs as necessary.
Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.30.04)
Rear Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.30.02)

Poor self center action of the steering

Possible Source(s):

- Ball joints.

Action(s) to take:

- CHECK the Ball Joints.
Suspension System

Possible Source(s):

- Steering components.

Action(s) to take:

- CHECK and INSTALL new components as necessary.

Steering wheel off-center

Possible Source(s):

- Unequal front or rear toe settings.

Action(s) to take:

- CHECK and ADJUST the wheel alignment.
Front Toe Adjustment (57.65.01)
Rear Toe Adjustment (57.65.08)

Possible Source(s):

- Steering components.

Action(s) to take:

- CHECK and INSTALL new components as necessary.

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.
Specifications

Possible Source(s):

- Coil spring(s).

Action(s) to take:

- CHECK and INSTALL new coil springs as necessary.
Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8
(60.30.04)

Possible Source(s):

- Loose front stabilizer bar or rear stabilizer bar.

Action(s) to take:

- CHECK and TIGHTEN the stabilizer bar to specification.
Specifications
Specifications

Possible Source(s):

- Worn lower suspension arm stabilizer bar insulators.

Action(s) to take:

- INSTALL new lower suspension arm stabilizer bar as necessary.
Front Stabilizer Bar Link - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8
(60.10.02)

Rear Stabilizer Bar Link (64.35.24)

Possible Source(s):

- Shock absorber(s).

Action(s) to take:

- CHECK and INSTALL new shock absorber(s) as necessary.
Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.30.04)
Rear Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.30.02)

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.

Possible Source(s):

- Shock absorber(s).

Action(s) to take:

- CHECK and INSTALL new shock absorber(s) as necessary.
Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.30.04)
Rear Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.30.02)

Possible Source(s):

- Coil spring(s).

Action(s) to take:

- CHECK and INSTALL new spring(s) as necessary.
Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.30.04)
Rear Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.30.02)

Possible Source(s):

- Incorrect ride height. Lateral tilt out of specification.

Action(s) to take:

- CHECK the ride height. INSTALL new spring(s) as necessary.
Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.30.04)
Rear Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.30.02)

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.
Noise, Vibration and Harshness (NVH)

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).
Suspension System

Possible Source(s):

- Front wheel bearing(s).

Action(s) to take:

- CHECK the wheel bearings.

Possible Source(s):

- Loose, worn or damaged suspension components.

Action(s) to take:

- CHECK and INSTALL new suspension components as necessary.

Possible Source(s):

- Loose suspension fasteners.

Action(s) to take:

- CHECK and TIGHTEN the suspension fasteners to specification.
Specifications
Specifications

Possible Source(s):

- Steering components.

Action(s) to take:

- CHECK and INSTALL new steering components.

Possible Source(s):

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

Action(s) to take:

- CHECK and ADJUST the wheel alignment.
Specifications
Front Toe Adjustment (57.65.01)

Component Tests

Ball Joint Inspection

NOTE:

The front suspension is shown in the following procedures. The inspection of the rear suspension upper ball joint is similar.

1 . Raise and support the vehicle.

Lifting

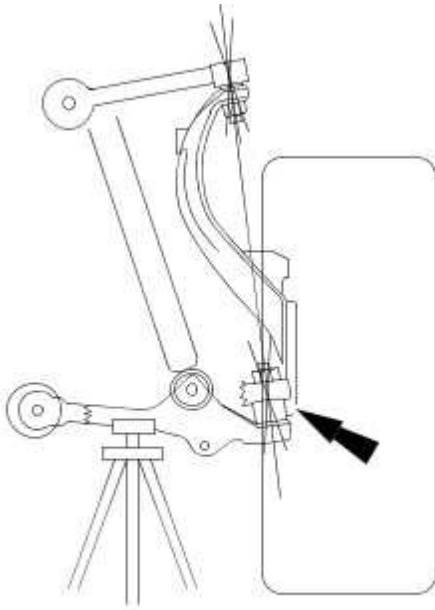
2 . Prior to carrying out any inspection of the ball joints, inspect the front wheel bearings.

3 .



CAUTION: The safety stand beneath the suspension lower arm must only support the weight of the suspension and not the full weight of the vehicle. Failure to follow this instruction may result in damage to the components.

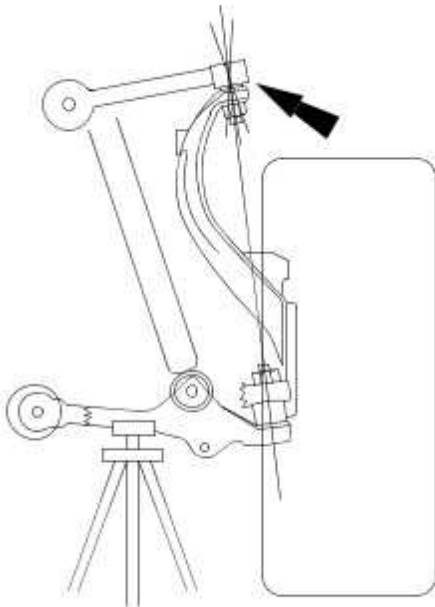
Position a safety stand beneath the front suspension lower arm or rear suspension lower arm to be tested.



VUJ0005101

4 . While an assistant pulls and pushes the top and bottom of the tire, observe the relative movement between the ball joint and the front suspension lower arm. Any movement at or exceeding the specification indicates a worn or damaged ball joint. Install a new wheel knuckle as necessary.

Wheel Knuckle (60.25.23)



VUJ0005100

5 . While an assistant pulls and pushes the top and bottom of the tire, observe the relative movement between the ball joint and the

front suspension upper arm or rear suspension upper arm. Any movement at or exceeding the specification indicates a worn or damaged ball joint. Install a new upper arm as necessary.

**Upper Arm LH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8
(60.35.41)**

**Upper Arm RH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8
(60.35.42)**

Upper Arm (64.25.31)

6 . Remove the safety stand.

7 . Lower the vehicle.

204-01 : Front suspension

Specifications

Specifications

Torque Specifications



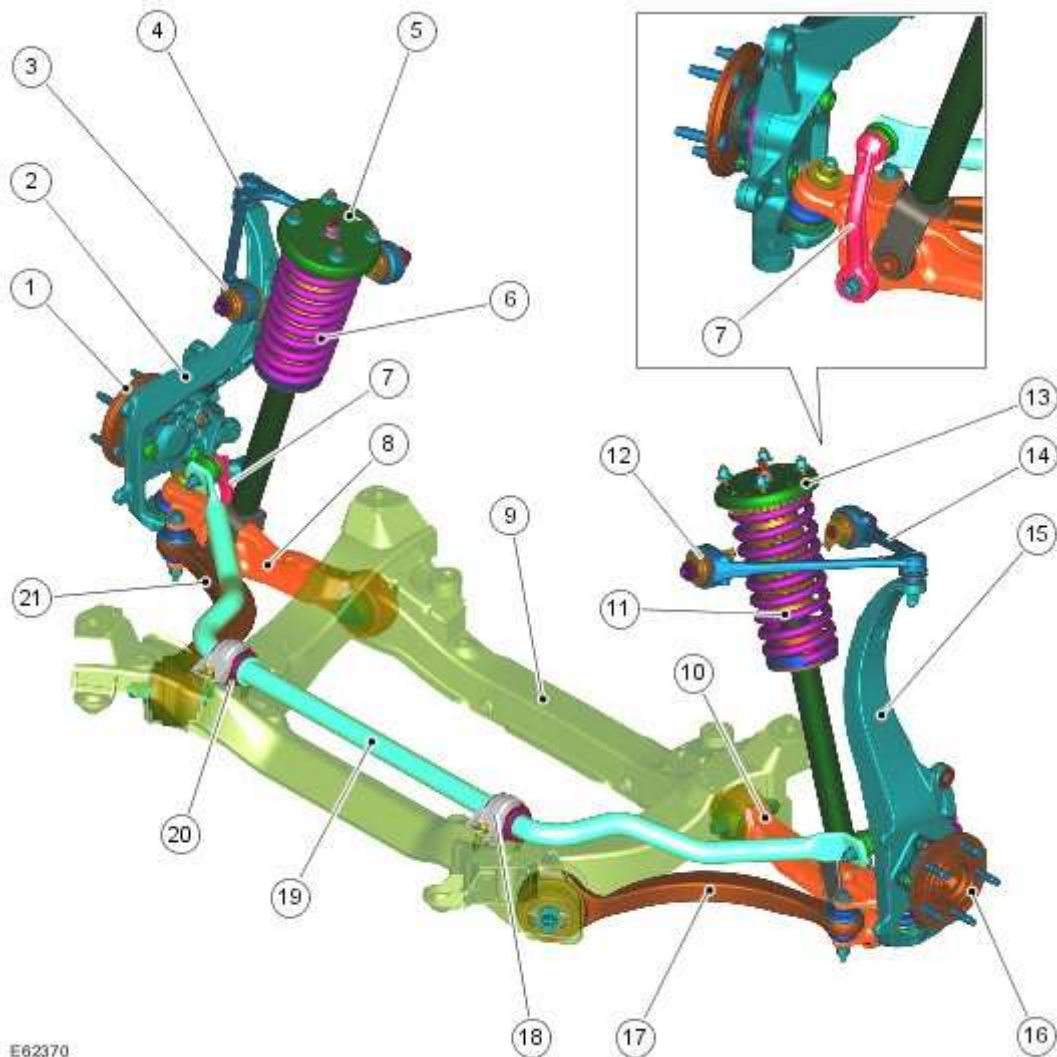
CAUTION: Nuts and bolts must be tightened with the weight of the vehicle on the suspension.

Description	Nm	lb-ft
Front lower arm to rear lower arm - nut *:		
Stage 1	60	44
Stage 2	135 degrees in clockwise direction	135 degrees - clockwise direction
Front lower arm to subframe - nut *	175	129
Rear lower arm to subframe - nut *	175	129
Rear lower arm to wheel knuckle ball joint - nut *	92	68
Shock absorber to spring - nut:		
Active shock absorber	50	37
Passive shock absorber	27	20
Shock absorber and spring assembly to lower arm - bolt	175	129
Shock absorber and spring assembly to top mount - nuts	27	20
Stabilizer bar clamp to subframe - bolt	55	40
Stabilizer bar link to lower arm - nut *	70	52
Stabilizer bar link to stabilizer bar - nut *	43	32
Upper arm ball-joint - nut *	90	66
Upper arm to subframe brackets - nut *	60	44
Wheel bearing and hub assembly to wheel knuckle - bolts *	90	66

* New nut/bolt must be installed.

Front Suspension

COMPONENT LOCATION



Item	Part Number	Description
1		Right Hand (RH) wheel hub and bearing assembly
2		RH wheel knuckle
3		Upper control arm bush (2 off)
4		RH upper control arm

5		RH top mount plate
6		RH damper and spring assembly
7		Stabilizer link
8		RH lower lateral control arm
9		Front subframe
10		Left Hand (LH) lower lateral control arm
11		LH damper and spring assembly
12		Upper control arm bush (2 off)
13		LH top mount plate
14		LH upper control arm
15		LH wheel knuckle
16		LH wheel hub and bearing assembly
17		LH lower control arm
18		Mounting bracket (2 off)
19		Stabilizer bar
20		Stabilizer bar bush (2 off)
21		RH lower control arm

INTRODUCTION

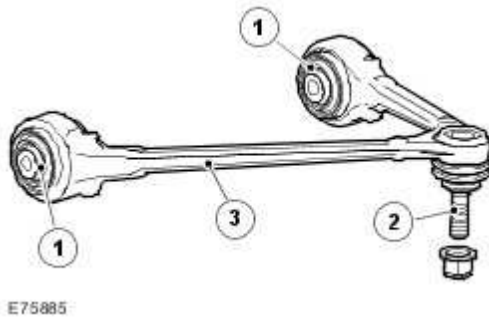
The front suspension is a fully independent design. The front suspension components are attached to the front subframe and the vehicle body. The subframe is attached to the vehicle body with four long bolts which pass through bushes located in the subframe.

The front suspension on each side comprises:

- Upper control arm
- Lower lateral control arm
- Lower control arm
- Wheel knuckle and hub assembly

- Stabilizer bar
- Spring and damper module.

UPPER CONTROL ARM

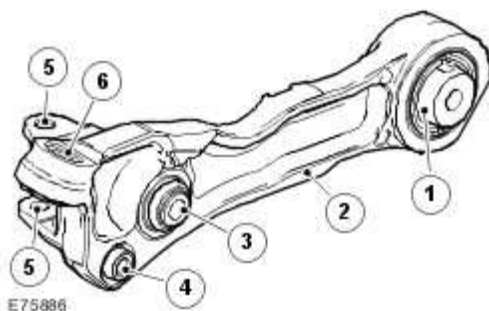


Item	Part Number	Description
1		Bush (2 off)
2		Ball joint and locknut
3		Upper control arm

The forged aluminum upper control arm is a wishbone design with three mounting points. The two inner mounting points are fitted with bushes. The outer mounting is fitted with a ball joint which locates in a hole in the wheel knuckle and is secured with a locknut.

The inclination of the upper control arm axis provides an anti-dive and anti-squat action during vehicle braking and acceleration and also improves castor trail which in turn improves steering 'feel'.

LOWER LATERAL CONTROL ARM



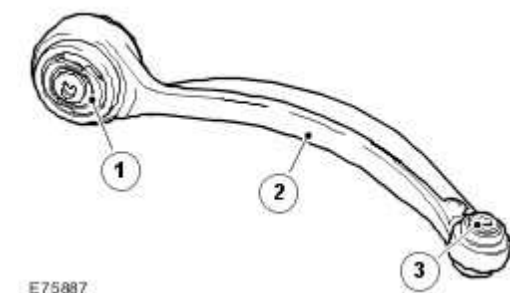
Item	Part Number	Description
1		Bush - subframe attachment
2		Lower lateral control arm

3		Damper module attachment
4		Insert - stabilizer link attachment
5		Lower control arm attachment
6		Wheel knuckle attachment

The forged aluminum lower lateral control arm is fitted with a bush in its inner end which locates between brackets on the subframe. The arm is secured with an eccentric bolt, an eccentric washer and a locknut which allow for the adjustment of the suspension camber geometry.

The outer end of the control arm has a tapered hole which locates on a ball joint fitted to the wheel knuckle. Two cast brackets on the forward face of the control arm allow for the attachment of the lower control arm. A threaded insert is fitted behind the two cast brackets and provides for the attachment of the stabilizer link with a bolt. A bush is fitted to a cross-holes in the control arm which provides the locations for the forked attachment of the damper module.

LOWER CONTROL ARM



Item	Part Number	Description
1		Hydrabush
2		Lower control arm
3		Spherical bearing

The cast lower control arm is fitted with a hydrabush in its inner end which locates between brackets on the subframe. The arm is secured with an eccentric bolt, an eccentric washer and a locknut which allow for adjustment of the castor and camber geometry.

The outer end of the control arm is fitted with a spherical bearing and locates between the cast brackets on the lower lateral control arm. The lower lateral control arm and lower control arm together form a wishbone design.

WHEEL KNUCKLE



Item	Part Number	Description
1		Upper control arm attachment
2		Ball joint locknut
3		
4		Bolt - Hub attachment (2 off)
5		Torx bolt - Hub attachment (2 off)
6		Steering tie rod ball joint attachment
7		Disc shield attachment
8		Ball joint - lower lateral arm attachment
9		Wheel hub and bearing assembly
10		Wheel knuckle

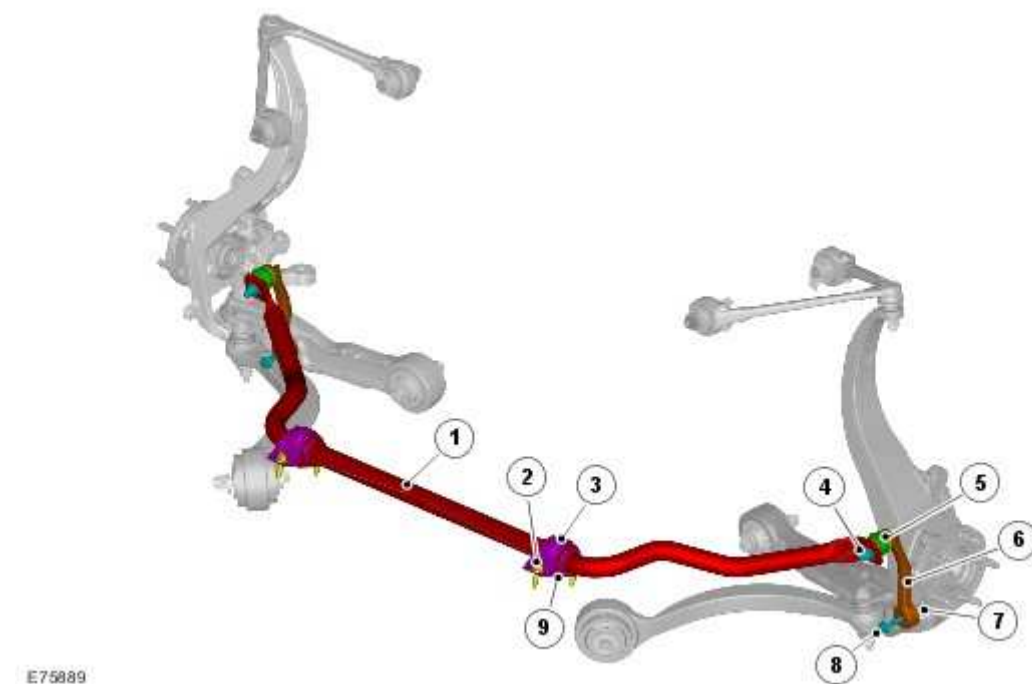
The cast aluminum wheel knuckle is a swan neck design which provides the attachment for the upper control arm and lower lateral control arm. The lower lateral control arm locates on a non serviceable ball joint integral with the wheel knuckle. The lower boss on the knuckle provides for the attachment

of the steering gear tie-rod ball joint.

The wheel knuckle also provides the mounting locations for the wheel hub and bearing assembly, the wheel speed sensor and also the brake caliper and disc shield. which is retained with 3 rivets.

The wheel hub assembly includes the wheel bearing and ABS sensor pulse ring. The hub assembly is a non-serviceable component and requires replacement as a complete assembly. The wheel hub is secured to the knuckle with 2 bolts and 2 Torx bolts.

STABILIZER BAR



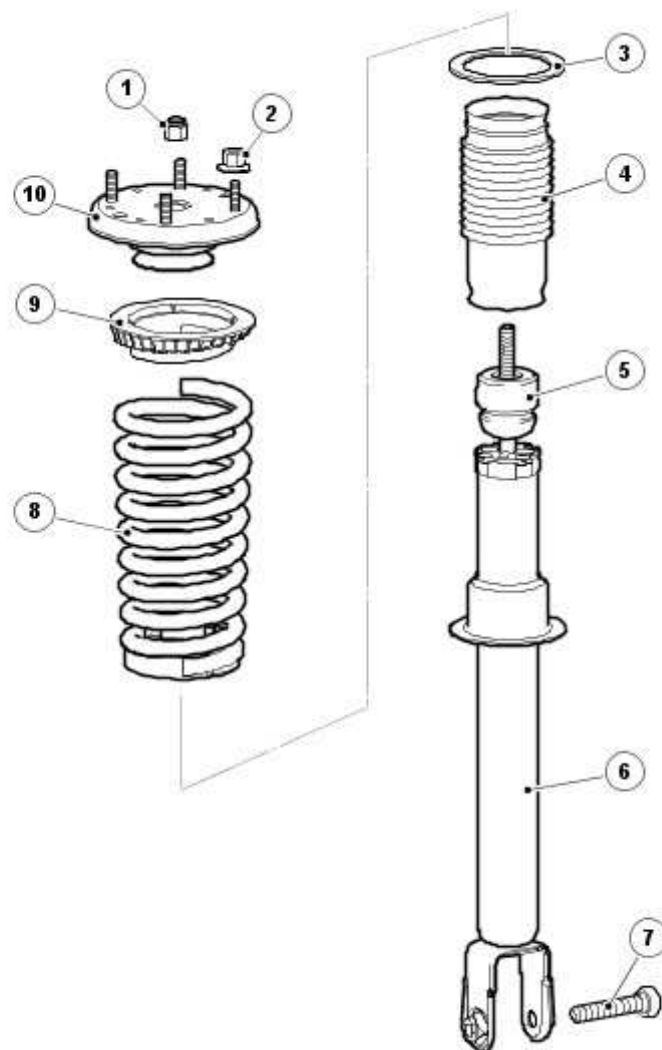
Item	Part Number	Description
1		Stabilizer bar
2		Bolt (4 off)
3		Bracket (2 off)
4		Locknut (2 off)
5		Ball joint (2 off)
6		Stabilizer link (2 off)
7		Locknut (2 off)

8		Bolt (2 off)
9		Bush (2 off)

The stabilizer bar is attached to the front of the subframe with bushes and mounting brackets. The pressed steel brackets locate over the bushes and are attached to the cross member with bolts screwed into threaded locations in the subframe. The stabilizer bar has crimped, 'anti-shuffle' collars pressed in position on the inside edges of the bushes. The collars prevent sideways movement of the stabilizer bar.

The stabilizer bar is manufactured from 32 mm diameter, manganese steel bar. Each end of the stabilizer bar curves rearwards to attach to a ball joint on a stabilizer link. Each stabilizer link is secured to a bush in the lower lateral arm with a bolt and locknut. The links allow the stabilizer bar to move with the wheel travel providing maximum effectiveness.

SPRING AND DAMPER MODULE



Item	Part Number	Description
1		Damper self locking nut
2		Top mount self locking nut (4 off)
3		Spring packer
4		Gaitor
5		Spring aid
6		Damper
7		Bolt
8		Spring
9		Upper spring seat
10		Top mount

The spring and damper assemblies are located between the lower lateral arm and the front suspension housing in the inner wing. Two coil spring damper variants are available; a conventional oil damped strut and a Computer Active Technology Suspension (CATS) adaptive damper. For additional information, refer to Vehicle Dynamic Suspension (204-05)

Different combinations of springs and dampers are available depending on the vehicle model. The damper and spring assemblies are similar in their construction with the CATS adaptive damper having a solenoid operated valve installed in the damper body.

The dampers are a monotube design with a spring seat welded onto the damper tube. The lower end of the damper has a forked mounting with a cross hole and captive nut. The fork locates over

the lower lateral control arm and is secured with a bolt.

The damper functions by restricting the flow of hydraulic fluid through internal galleries in the damper piston, providing damping of undulations in the road surface. The CATS damper has a solenoid operated valve which further restricts the flow of hydraulic fluid, providing a stiffer damping characteristic for the damper and improving vehicle handling. The solenoid is computer controlled and can switch between soft and hard damping settings depending on driving style and vehicle speed. For additional information, refer to Vehicle Dynamic Suspension (204-05)

The damper piston is connected to a damper rod which is sealed at its exit point from the damper body. The threaded outer end of the damper rod locates through a hole in the top mount. A self locking nut secures the top mount to the damper rod. The damper rod on CATS dampers have an electrical connector on the outer end of the damper rod.

The damper rod is fitted with a spring aid which prevents the top mount making contact with the top of the damper body during full suspension compression and also assists with the suspension tune.

The spring rate of the coil springs can differ between models and are color coded for identification. The coil spring locates on a spring packer and a lower spring seat which is integral with the damper body. The spring locates in an upper spring seat which is located on the underside of the top mount.

The top mount has four studs which locate through mating holes in the vehicle inner wing and are secured with self locking nuts.

Front Suspension

For additional information, refer to [<<204-00>>](#)

Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.30.04)

Special Service Tools



Suspension spring compressor

204-476-01

Removal

1



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

Raise and support the vehicle.

2 . Remove the LH front wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

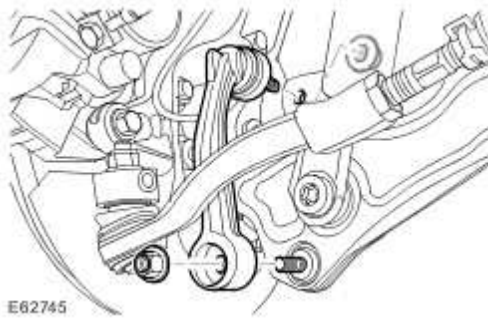
3 . **NOTE:**

Use an additional wrench to prevent the ball joint rotating.

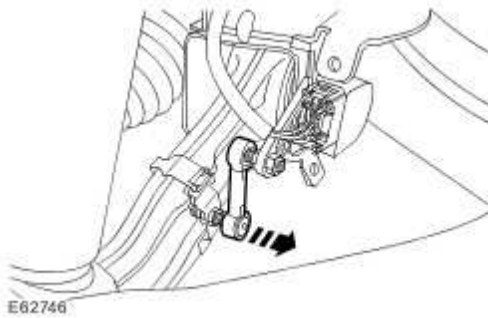
Disconnect the LH stabilizer bar link.



Remove and discard the 2 nuts.



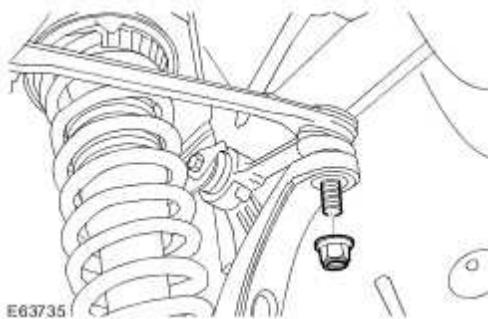
4 . Disconnect the height sensor link.



5  **CAUTION:** Use an Allen key to prevent the ball joint rotating whilst removing the nut.

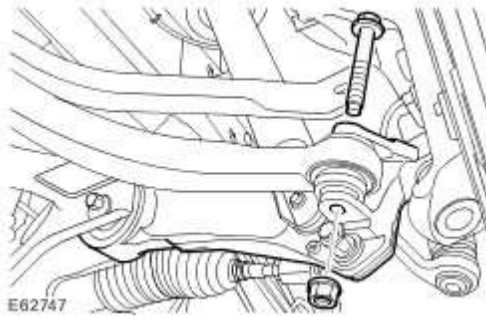
Release the upper suspension arm ball joint.

▶ Remove and discard the nut.



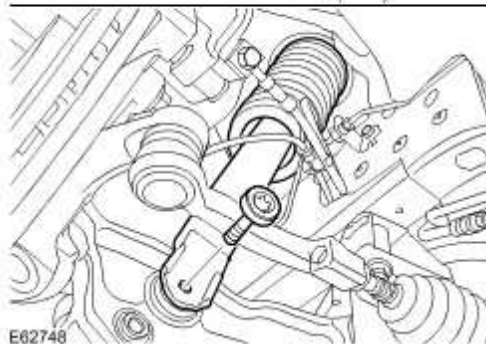
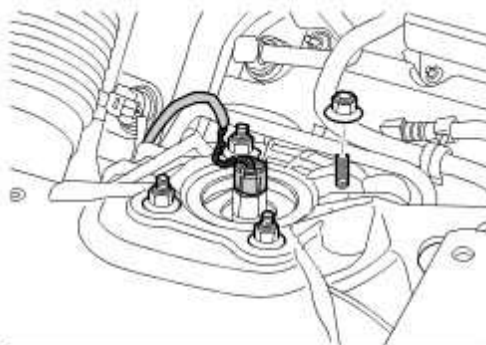
6 . Release the LH lower suspension arm.

- ▶ Remove the bolt and discard the nut.



7 . Remove the shock absorber and spring assembly.

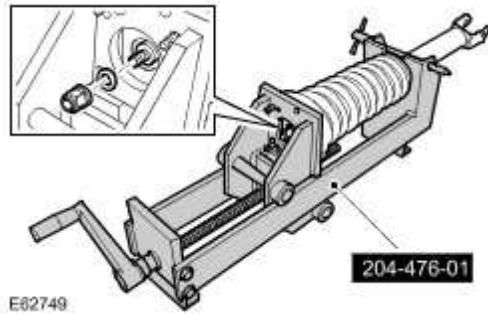
- ▶ Active shock absorber: Disconnect the electrical connector.
- ▶ Remove the Torx bolt.
- ▶ Remove the 4 nuts.



8 . Using the special tool, compress the suspension spring to remove the shock absorber.

► Compress the spring.

► Remove the nut.

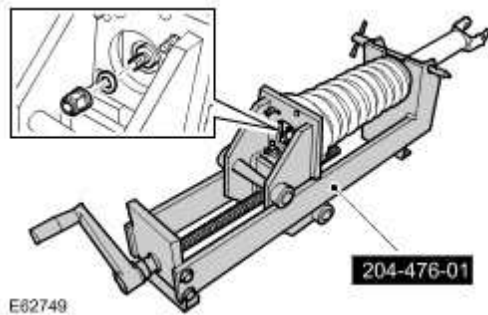


Installation

1 . Using the special tool, compress the spring to install the shock absorber.

► Passive shock absorber: Tighten the nut to 27 Nm (20 lb.ft).

► Active shock absorber: Tighten the nut to 50Nm (37 lb.ft).



2 . Install the shock absorber and spring assembly.

► Tighten the nuts to 27 Nm (20 lb.ft).

► Tighten the Torx bolt to 175 Nm (129 lb.ft).

► Active shock absorber: Connect the electrical connector.

3 . Install the lower suspension arm.

 Install the bolt and tighten the new nut to 60 Nm (44 lb.ft) + 135 degrees.

4



. **CAUTION:** Use an Allen key to prevent the ball joint rotating whilst installing the nut.

Connect the upper suspension arm ball joint.

 Tighten the nut to 90 Nm (66 lb.ft).

5 . Connect the height sensor link.

6 . **NOTE:**

Use an additional wrench to prevent the component from rotating.

Install the stabilizer bar link.

 Tighten the nuts to 43 Nm (30 lb.ft).

7 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

Front Lower Arm (60.35.53)

Removal



CAUTION: Nuts and bolts must be tightened with the weight of the vehicle on the suspension.

1



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

Raise and support the vehicle.

2 . Remove the LH front wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

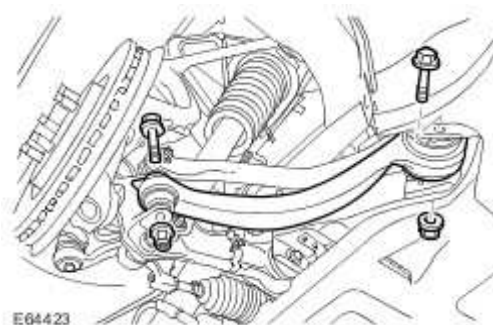
3 . **NOTE:**

Note the fitted position.

Release the forward lower control arm.



Remove the 2 bolts and discard the nuts.



Installation

- 1 . Install the forward lower control arm.

 Install the bolt and tighten the new nut to 60 Nm (44 lb.ft) + 135 degrees.

 Tighten the 14mm bolt to 175 Nm (129 lb.ft).

- 2 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

- 3 Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment,
and adjust if required.

Rear Lower Arm (60.35.54)

Removal



CAUTION: Nuts and bolts must be tightened with the weight of the vehicle on the suspension.

1



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

Raise and support the vehicle.

2 . Remove the LH front wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

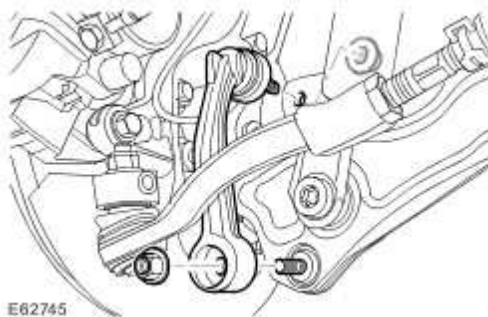
3 . **NOTE:**

Use an additional wrench to prevent the ball joint rotating.

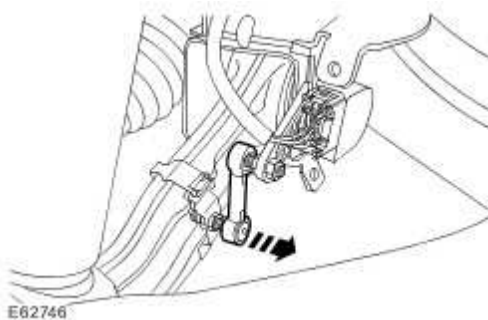
Disconnect the LH stabilizer bar link.



Remove and discard the 2 nuts.

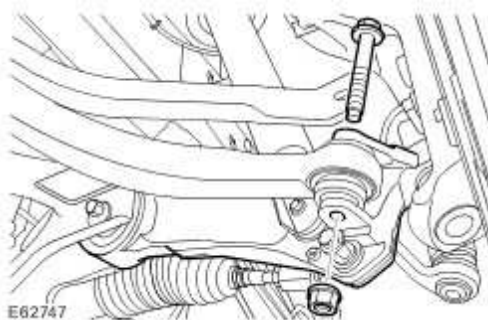


4 . Disconnect the height sensor link.



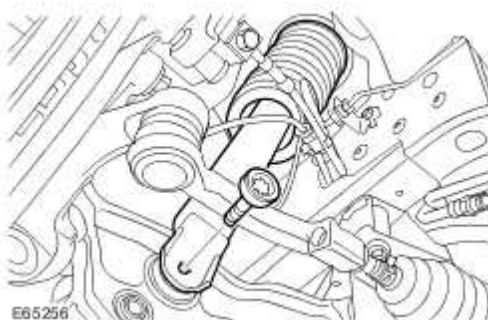
5 . Release the forward lower control arm.

▶ Remove the bolt and discard the nut.



6 . Release the shock absorber from the lower arm.

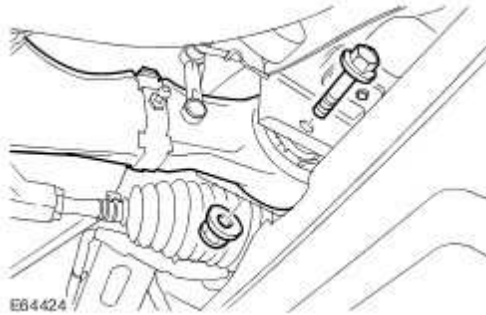
▶ Remove the Torx bolt.



7 . **NOTE:**

Note the fitted position.

Remove the lower arm nut and bolt; discard the nut.



8



CAUTION: Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

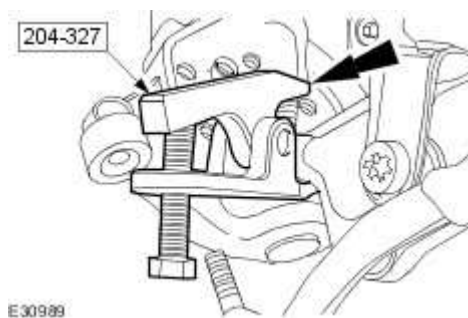
Remove the LH lower arm.



Remove and discard the nut.



Using the special tool, release the ball joint from the lower suspension arm.



Installation

1 . **NOTE:**

Align to the position noted on removal.

Install the lower suspension arm.

▶ Tighten the nut and bolt to 175 Nm.

2 . Install the forward lower control arm.

▶ Install the bolt and tighten the new nut to 60 Nm + 135 degrees.

3 . **NOTE:**

Use an additional wrench to prevent the ball joint rotating.

Install the lower arm ball joint

▶ Clean the component mating faces.

▶ Tighten the nut to 92 Nm.

4 . **NOTE:**

Use an additional wrench to prevent the component from rotating.

Install the stabilizer bar link.

▶ Tighten the nuts to 43 Nm.

5 . Connect the height sensor link.

6 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

7 Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment,
and adjust if required.

Rear Lower Arm Bushing (60.35.56)

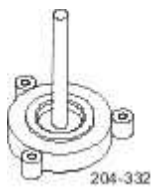
Special Service Tools



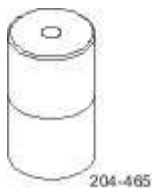
Rear lower arm bushing remover and installer
204-464



Rear lower arm bushing remover
204-333



Rear lower arm bushing installer
204-332



Rear lower arm bushing installer
204-465



Rear lower arm bushing installer
204-334

Removal

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

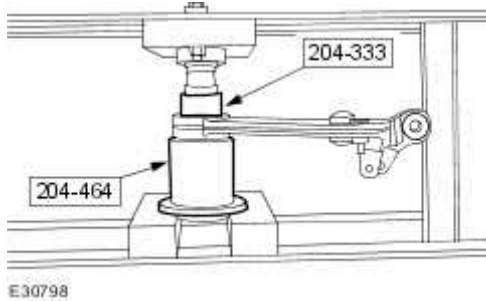
Raise and support the vehicle.

- 2 . Remove the LH lower arm.
For additional information, refer to Rear Lower Arm (60.35.54)

- 3 . **NOTE:**

Note the fitted position.

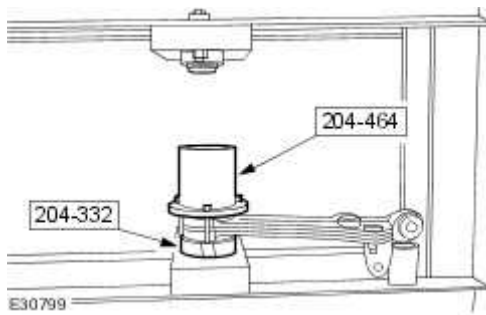
Using the special tools, remove and discard the lower arm rear bushings.



Installation

- 1 . Install the special tools to the rear lower arm.

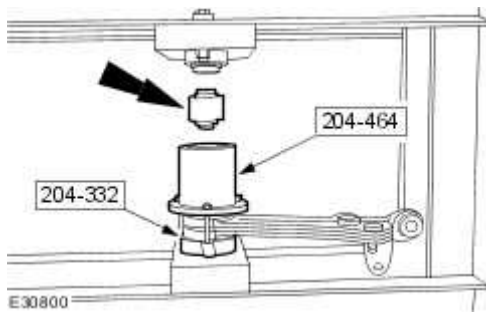
 Tighten the bolts.



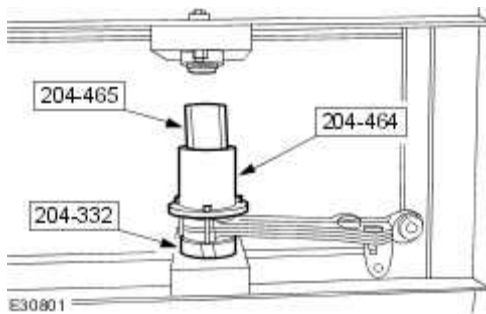
2 . NOTE:

Align to the position noted on removal.

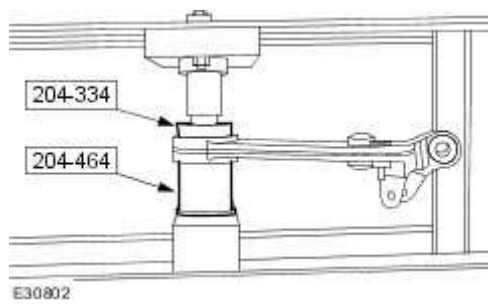
Position the bushing in the special tool.



3 . Using the special tools, partially install the lower arm bushing.



4 . Change the special tools, then complete installation of the bushing.



5 . Install the lower suspension arm.

For additional information, refer to Rear Lower Arm (60.35.54)

Shock Absorber Bushing (60.30.16)

Special Service Tools



Replacer support-bush
204-337



Replacer-bush
204-338



Remover-bush
204-336



Remover support-bush
204-335

Removal

1



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

Raise and support the vehicle.

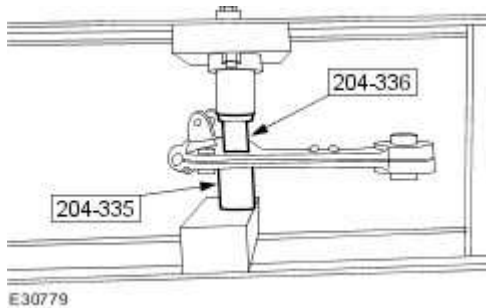
- 2 . Remove the front lower suspension arm.

For additional information, refer to Rear Lower Arm (60.35.54)

- 3 . **NOTE:**

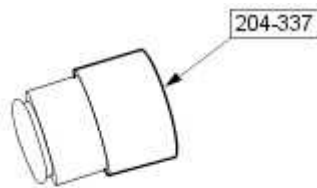
Take note of the fitted position of the bush.

Using the special tools, remove the shock absorber bushing.



Installation

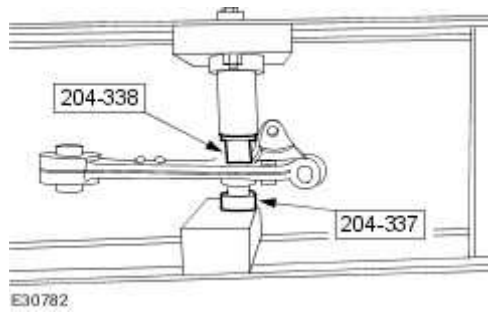
- 1 . Install the bushing into the special tool.



- 2 . **NOTE:**

Align to the position noted on removal.

Using the special tools, install the shock absorber bushing.



- 3 . Install the lower suspension arm.
For additional information, refer to Rear Lower Arm (60.35.54)

Front Stabilizer Bar - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.10.01)

Special Service Tools



303-021

Engine support bracket
303-021



303-749

Engine lifting brackets
303-749



HTJ12002

Power train assembly jack
HTJ1200-2



502-010

E65082

Subframe alignment bolts
502-010

Removal

- 1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to

2



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

Raise and support the vehicle.

3 . Remove the radiator air deflector.

For additional information, refer to Radiator Splash Shield (76.22.90)

4 . Remove the engine undershield.

For additional information, refer to Air Deflector (76.11.41)

5 . Remove the lower suspension arms.

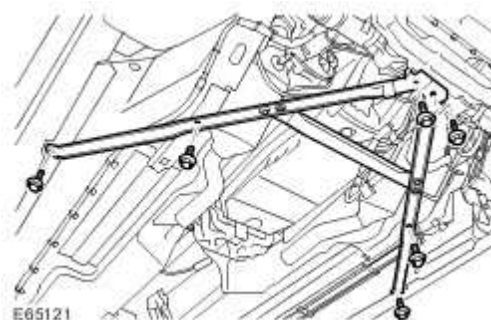
For additional information, refer to Rear Lower Arm (60.35.54)

6 . Remove the throttle body.

For additional information, refer to Throttle Body (19.70.04)

7 . With assistance, remove the A-frame.

▶ Remove the 6 bolts.



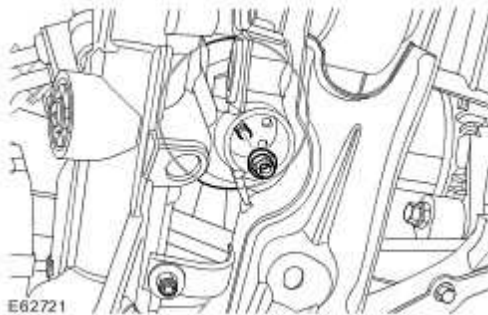
8 . NOTE:

RH illustration shown, LH is similar

Release the engine mounts.

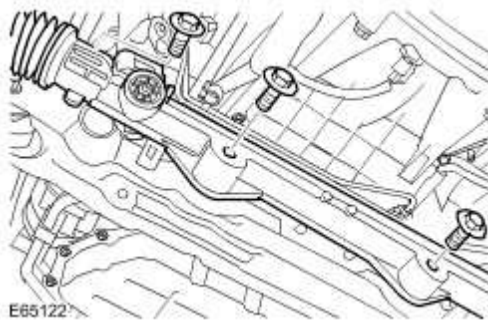
▶ Remove and discard the 2 nuts.

▶ Raise the engine.



9 . Support and release the power steering rack.

▶ Remove the 3 bolts.



10 . Secure the radiator assembly.

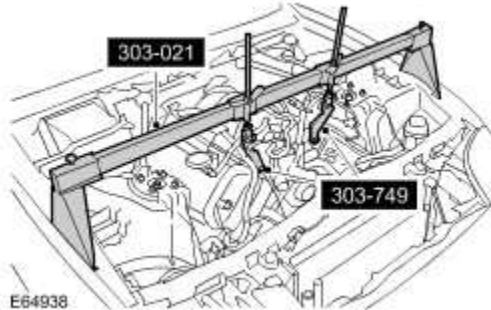
▶ Secure with cable ties.

11 .



CAUTION: Protect the paintwork during this operation.

Using the special tools, support the engine.



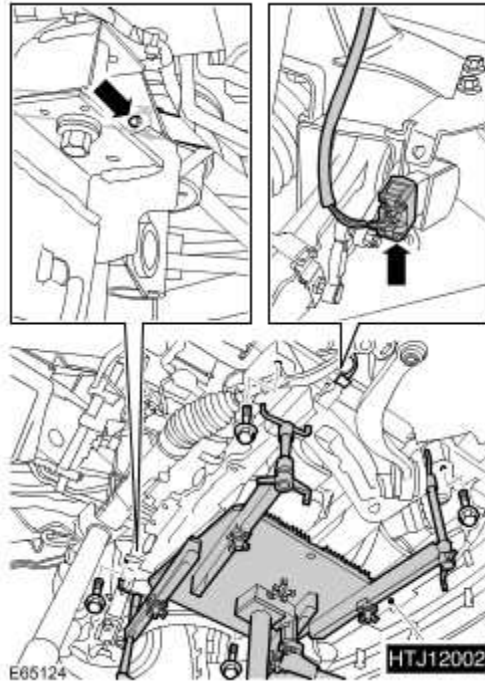
12 . Using the special tool, support the subframe.

13 . **NOTE:**

Note the fitted position.

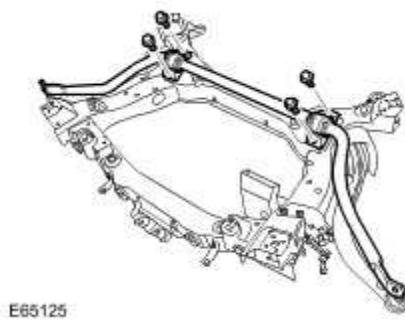
With assistance, remove the front subframe assembly.

- ▶ Remove the 4 bolts.
- ▶ Release the PAS pipe to subframe clip.
- ▶ Disconnect the electrical connector.



14 . Remove the stabilizer bar.

- ▶ Remove the 4 bolts.
- ▶ Remove the stabilizer bar bushing.



Installation

1 . Install the stabilizer bar.

- ▶ Install the stabilizer bar bushings.

- ▶ Tighten the bolts to 45 Nm (33 lb.ft).

- 2 .  **CAUTION: To align the sub-frame, install the special bolts in place of the front fixings. Tighten the rear fixings to set the position, remove the special bolts.**

With assistance, install the front subframe.

- ▶ Position the radiator mountings.
- ▶ Using the special the special tools, align the subframe.
- ▶ Connect and secure the electrical connector.

- 3 . Tighten the subframe bolts.

- ▶ Tighten the front bolts (M15) to 80 Nm plus 360deg.
- ▶ Tighten the rear bolts (M12) to 80 Nm plus 270deg.

- 4 . With assistance, install the A-frame.

- ▶ Tighten the bolts to 55 Nm (40 lb.ft).

- 5 . Lower the engine onto its mounts.

- ▶ Tighten the new nuts to 63 Nm (46 lb.ft).
- ▶ Remove the special tools.

- 6 . Install the engine undershield.

For additional information, refer to Air Deflector (76.11.41)

- 7 . Install the radiator deflector.

For additional information, refer to Radiator Splash Shield (76.22.90)

8 . Remove and discard the 2 cable ties.

9 . Install the lower suspension arms.

For additional information, refer to Rear Lower Arm (60.35.54)

10 . Install the throttle body.

For additional information, refer to Throttle Body (19.70.04)

11 . Connect the battery ground cable and install the cover.

For additional information, refer to

12 Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment,
. and adjust if required.

Front Stabilizer Bar Link - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.10.02)

Removal

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

Raise and support the vehicle.

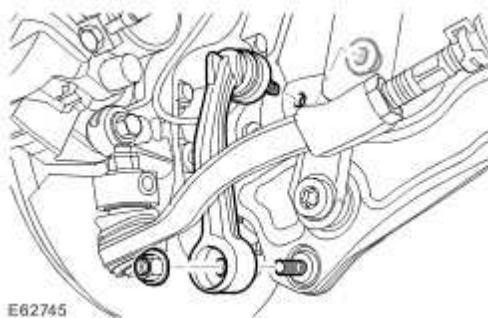
- 2 . Remove the front wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

- 3 . **NOTE:**

Use an additional wrench to prevent the ball joint rotating.

Remove the LH stabilizer bar link.

-  Remove and discard the 2 nuts.



Installation

- 1 . **NOTE:**

Use an additional wrench to prevent the ball joint rotating.

Install the stabilizer bar link.

 Tighten the nuts to 48 Nm (35 lb.ft).

2 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

Stabilizer Bar Link Bushing (60.10.03)

Special Service Tools



Bush installer
204-340



Bush remove
204-342



Support
204-341



Support
204-339

Removal

1



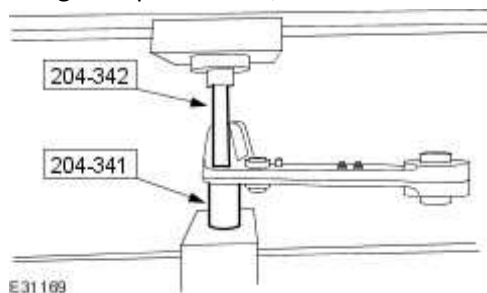
· **WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.**

Raise and support the vehicle.

- 2 . Remove the LH lower arm.

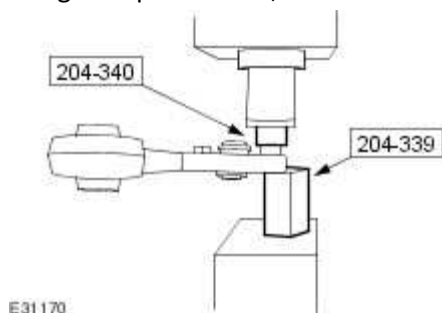
For additional information, refer to Rear Lower Arm (60.35.54)

- 3 . Using the special tools, remove and discard the stabilizer bar link bushing.



Installation

- 1 . Using the special tools, install the stabilizer bar link bushing.



- 2 . Install the lower suspension arm.

For additional information, refer to Rear Lower Arm (60.35.54)

Upper Arm LH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.35.41)

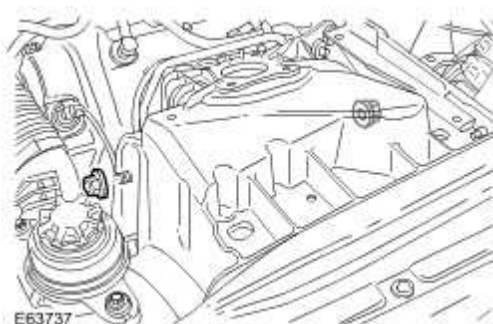
Removal

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

Raise and support the vehicle.

- 2 Remove the shock absorber and spring assembly.
 - For additional information, refer to Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.30.04)
- 3 . Remove the engine control module (ECM).
For additional information, refer to Engine Control Module (ECM) (18.30.01)
- 4 . Remove the LH upper suspension arm.

- ▶ Remove and discard the 2 nuts.



Installation

- 1  **CAUTION: The final tightening of the upper arm must be carried out with the**

vehicle on it's wheels.

Install the upper arm.

 Install the bolts and new nuts.

2 Install the shock absorber and spring assembly.

- . For additional information, refer to Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.30.04)

3  **CAUTION: The final tightening of the upper arm must be carried out with the vehicle on it's wheels.**

Tighten the upper suspension arm nuts to 60 Nm (44 lb.ft).

4 . Install the ECM.

For additional information, refer to Engine Control Module (ECM) (18.30.01)

Upper Arm RH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.35.42)

Removal

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

Raise and support the vehicle.

- 2 Remove the shock absorber and spring assembly.
 - For additional information, refer to Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.30.04)
- 3 . Remove the coolant expansion tank.
 - For additional information, refer to Coolant Expansion Tank (26.15.01)
- 4 . Remove the LH upper suspension arm.

- ▶ Remove and discard the 2 nuts.



Installation

- 1  **CAUTION:** The final tightening of the upper arm must be carried out with the

vehicle on it's wheels.

Install the upper arm.

 Install the bolts and new nuts.

2 Install the shock absorber and spring assembly.

. For additional information, refer to Front Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.30.04)

3 . Tighten the upper suspension arm nuts to 60 Nm (44 lb.ft).

4 . Install the coolant expansion tank.

For additional information, refer to Coolant Expansion Tank (26.15.01)

Front Wheel Bearing and Wheel Hub (60.25.03)

Removal

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

Raise and support the vehicle.

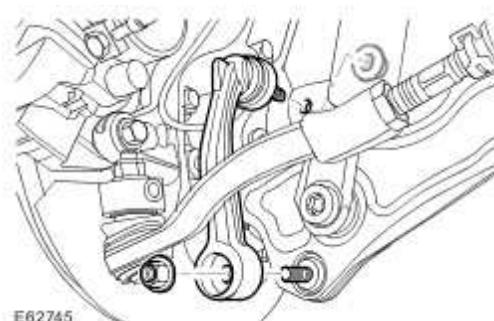
- 2 Remove the front brake disc.
 - For additional information, refer to Brake Disc - Vehicles With: Standard Brakes (70.10.10)
 - For additional information, refer to Brake Disc - Vehicles With: High Performance Brakes (70.10.10)
 - For additional information, refer to
 - For additional information, refer to

3 . NOTE:

Use an additional wrench to prevent the ball joint rotating.

Remove the LH stabilizer bar link.

- ▶ Remove and discard the 2 nuts.



- 4 . Remove the wheel speed sensor.

▶ Release the clip.

▶ Tie aside.

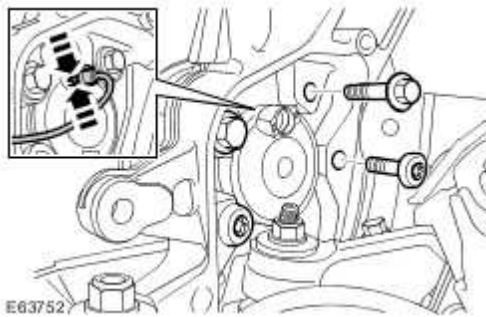
5 . NOTE:

Note the fitted position.

LH front: Carefully remove the hub assembly.

▶ Remove and discard the 2 Torx bolts.

▶ Remove and discard the 2 bolts.



Installation

1 . NOTE:

Align to the position noted on removal.

NOTE:

Make sure all component mating faces are clean.

LH front: Carefully install the hub assembly.

▶ Clean the component mating faces.

▶ Tighten the bolts to 90 Nm (66 lb.ft).

2 . Install the wheel speed sensor.

 Secure the clip.

3 . **NOTE:**

Use an additional wrench to prevent the ball joint rotating.

Install the stabilizer bar link.

 Tighten the nuts to 48 Nm (35 lb.ft).

4 Install the front brake disc.

. For additional information, refer to Brake Disc - Vehicles With: Standard Brakes (70.10.10)

For additional information, refer to Brake Disc - Vehicles With: High Performance Brakes (70.10.10)

For additional information, refer to

For additional information, refer to

Wheel Knuckle (60.25.23)

Special Service Tools

Ball joint splitter
204-327

Removal

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

Raise and support the vehicle.

- 2 . Remove the hub assembly.
For additional information, refer to Front Wheel Bearing and Wheel Hub (60.25.03)

- 3 . Remove the brake disc shield.

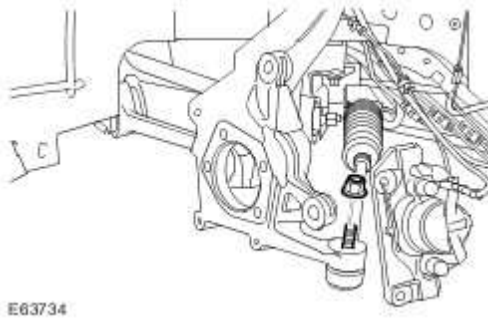
 Remove the 3 rivets.

- 4 . **NOTE:**

Use an additional wrench to prevent the component from rotating.

Disconnect the steering gear tie rod end ball joint.

 Remove and discard the tie rod end retaining nut.

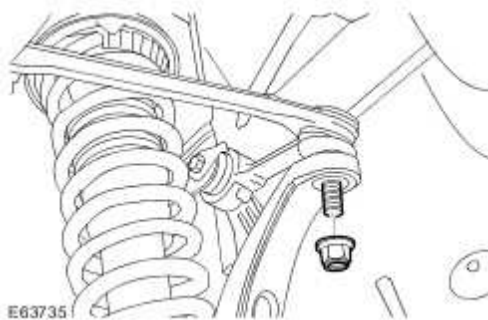


5 . NOTE:

Use an additional wrench to prevent the ball joint rotating.

Disconnect the upper arm from the wheel knuckle.

▶ Remove and discard the nut.



- 6
-  **CAUTION:** Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

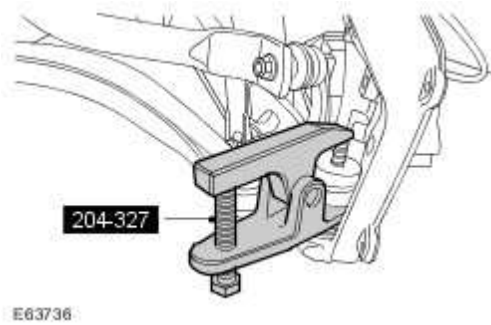
NOTE:

Use an additional wrench to prevent the ball joint rotating.

Remove the wheel knuckle.

▶ Remove and discard the nut.

- ▶ Using the special tool, release the ball joint from the lower suspension arm.



Installation

1 . NOTE:

Use an additional wrench to prevent the ball joint rotating.

Install the wheel knuckle.

- ▶ Clean the component mating faces.
- ▶ Tighten the nut to 92 Nm.

2 . Install the brake disc shield.

- ▶ Install the rivets.
- ▶ Repeat the above procedure for the other side.

3 . NOTE:

Use an additional wrench to prevent the ball joint rotating.

Connect the upper arm and wheel knuckle.

- ▶ Tighten the nut to 90 Nm.

4 . NOTE:

Use an additional wrench to prevent the component from rotating.

Connect the tie-rod end ball joint.

 Tighten the nut to 55 Nm.

5 . Install the hub assembly.

For additional information, refer to Front Wheel Bearing and Wheel Hub (60.25.03)

204-02 : Rear suspension

Specifications

Specifications

Torque Specifications



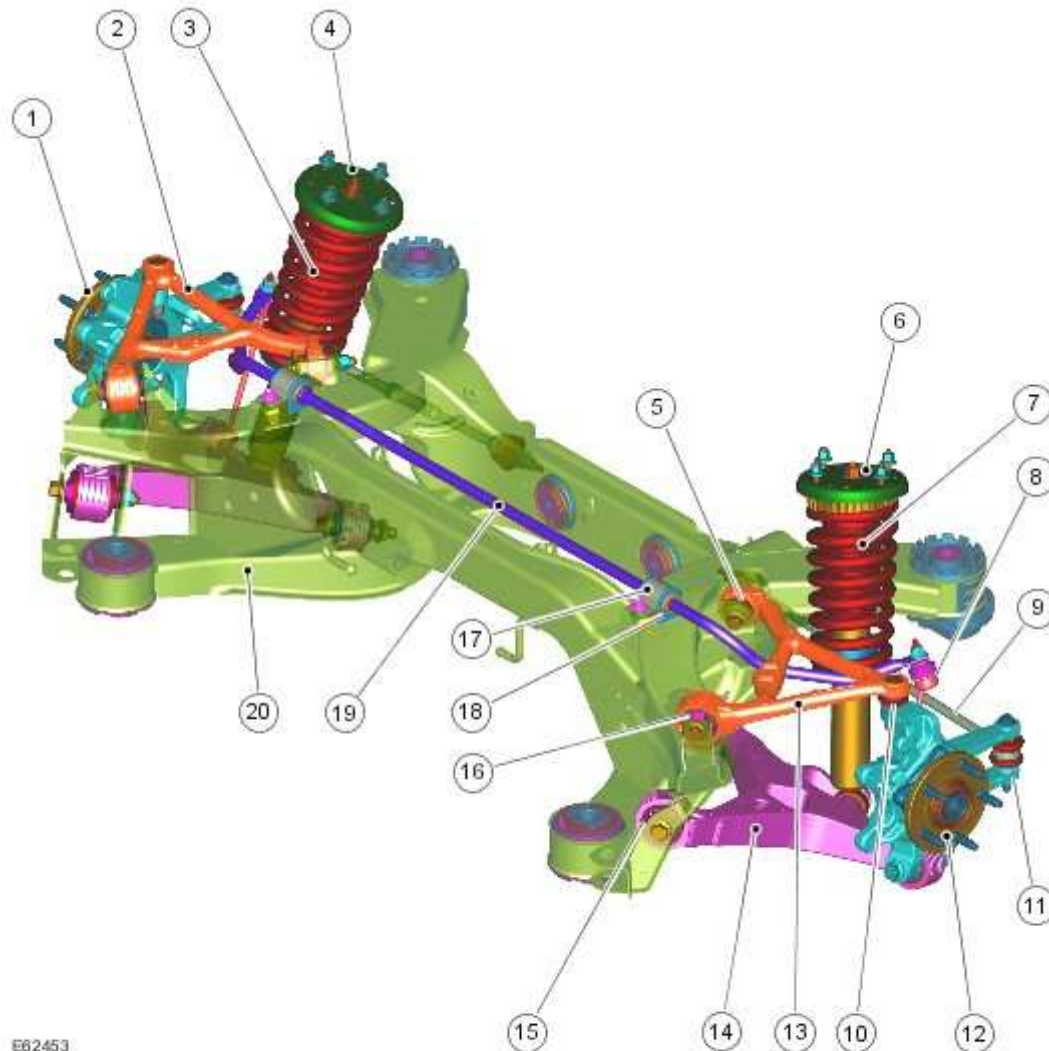
CAUTION: Nuts and bolts must be tightened with the weight of the vehicle on the suspension.

Description	Nm	lb-ft
Halfshaft/hub - nut *	300	221
Lower arm to subframe - nut *	164	121
Lower arm to wheel knuckle - nut *	150	110
Shock absorber to spring - nut:		
Active shock absorber	50	37
Passive shock absorber	27	20
Shock absorber and spring assembly to top mount - nuts	27	20
Shock absorber and spring assembly to lower arm - bolt	133	98
Stabilizer bar clamp to subframe - nut *	55	40
Stabilizer bar link to lower arm - nut *	48	35
Stabilizer bar link to stabilizer bar - nut *	48	35
Toe link to subframe - ball joint nut *	90	66
Toe link to wheel knuckle - nut *	55	40
Upper arm to subframe - nut *	97	71
Upper arm to wheel knuckle - ball-joint nut *	90	66
Wheel bearing to wheel knuckle - bolts	70	52

* New nut/bolt must be installed.

Rear Suspension

COMPONENT LOCATION



E62453

Item	Part Number	Description
1		Right Hand (RH) wheel hub and bearing assembly
2		RH upper control arm
3		RH spring and damper assembly

4		RH top plate
5		Bush - upper control arm
6		Left Hand (LH) top plate
7		LH spring and damper assembly
8		Stabilizer link
9		Toe-link (2 off)
10		Ball joint
11		LH wheel knuckle
12		LH wheel hub and bearing assembly
13		LH upper control arm
14		LH lower control arm
15		Bush - lower control arm
16		Bush - upper control arm
17		Mounting bracket (2 off)
18		Bush (2 off)
19		Stabilizer bar
20		Rear crossbeam

INTRODUCTION

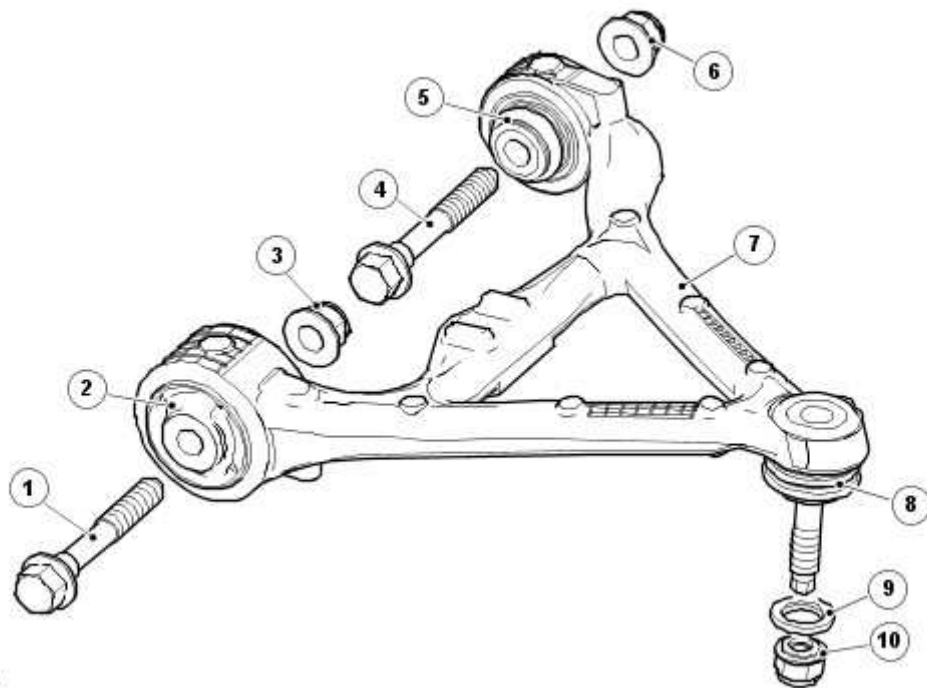
The rear suspension is a double wishbone design which is attached to a rear crossbeam. The crossbeam is attached to the vehicle body with 4 long bolts which pass through bushes located in the crossbeam.

The rear suspension on each side comprises:

- Upper control arm
- Lower control arm
- Toe-link
- Wheel knuckle and hub assembly

- Stabilizer bar
- Spring and damper module.

UPPER CONTROL ARM

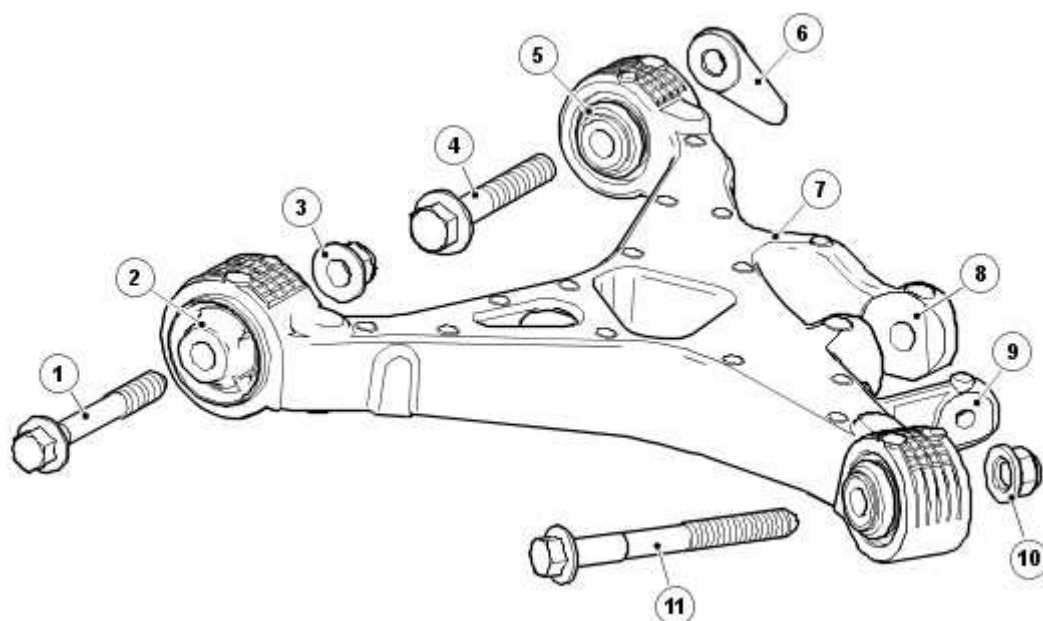


Item	Part Number	Description
1		Bolt
2		Bush
3		Locknut
4		Bolt
5		Bush
6		Locknut
7		Upper control arm
8		Ball joint
9		Washer
10		Locknut

The cast aluminum upper control arm is a wishbone design with 3 mounting points. Two bushed

mountings locate in brackets on the crossbeam. The outer end has a ball joint which mates with the wheel knuckle.

LOWER CONTROL ARM



E76075

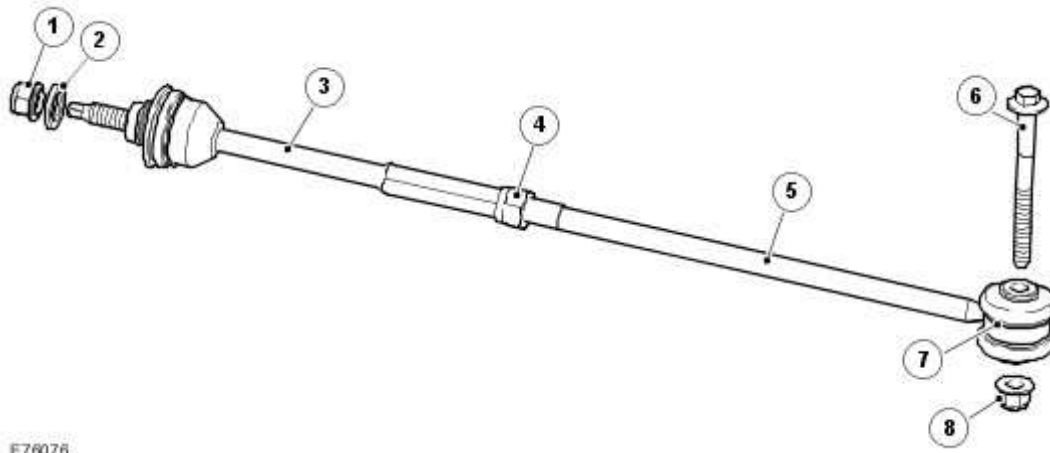
Item	Part Number	Description
1		Bolt
2		Bush
3		Locknut
4		Bolt
5		Bush
6		Caged nut
7		Lower control arm
8		Rear damper attachment
9		Stabilizer link attachment
10		Locknut

11		Bolt
----	--	------

The cast aluminum lower control arm is a wishbone design with 3 bushed mounting points. Two bushes locate between brackets on the crossbeam and the outer bush locates in the wheel knuckle.

The rear of the control arm has mounting points for the damper and the stabilizer link.

TOE-LINK



E76076

Item	Part Number	Description
1		Locknut
2		Washer
3		Inner rod and ball joint
4		Locknut
5		Outer rod
6		Bolt
7		Outer ball joint
8		Locknut

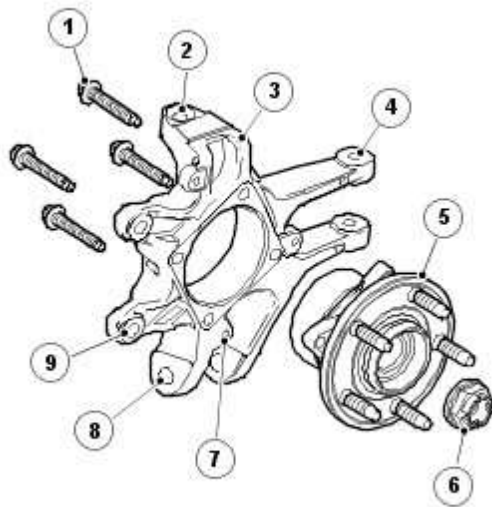
The toe-link is located between the wheel knuckle and brackets on the rear crossbeam.

The toe-link comprises an inner rod with integral ball joint. The inner ball joint has a threaded spigot which locates in a bracket on the crossbeam and is secured with a washer and locknut. The rod has an internal thread which accepts the outer rod.

The outer rod has a ball joint at its outer end which is located between 2 brackets on the wheel knuckle, and is secured with a bolt and locknut.

The length of the toe-link can be adjusted by rotating the inner and outer rods. This allows for adjustment of the toe angle for the rear wheel. Once set the inner and outer rods can be locked in position by tightening a locknut against the inner rod.

WHEEL KNUCKLE



E76077

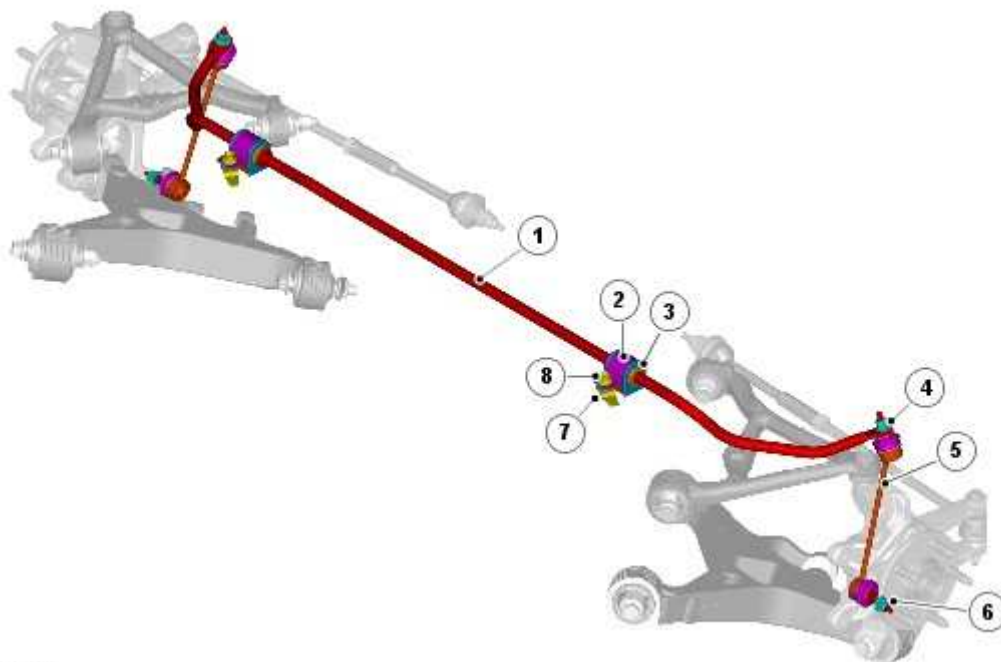
Item	Part Number	Description
1		Hub attachment bolt (4 off)
2		Upper control arm attachment
3		Wheel knuckle
4		Toe-link attachment
5		Wheel hub and bearing assembly
6		Half shaft nut
7		Brake dust shield attachment
8		Lower control arm attachment

9		Brake caliper attachment
---	--	--------------------------

The wheel knuckle is an aluminum casting which provides for the attachment of the upper and lower control arms and the toe-link. The wheel knuckle also provides the mounting locations for the wheel hub and bearing assembly, the wheel speed sensor and the brake caliper and brake dust shield which is secured with 3 rivets.

The wheel hub assembly includes the wheel bearing. The hub assembly is a non-serviceable component and requires replacement as a complete assembly. The wheel hub is secured to the knuckle with 4 bolts.

STABILIZER BAR



E76078

Item	Part Number	Description
1		Stabilizer bar
2		Bracket (2 off)
3		Bush (2 off)
4		Locknut (2 off)
5		Stabilizer link (2 off)
6		Locknut (2 off)

7		Caged nut (2 off)
8		Bolt (2 off)

The stabilizer bar is attached to the top of the crossbeam with 2 bushes and mounting brackets. The brackets are secured to the crossbeam with bolts and caged nuts. The stabilizer bar has crimped, 'anti-shuffle' collars pressed in position on the inside edges of the bushes. The collars prevent sideways movement of the stabilizer bar.

The stabilizer bar is manufactured from manganese steel bar and is available in 2 diameters, dependant on the vehicle model. Each type of stabilizer bar has a different torsional rate and is also color coded for identification.

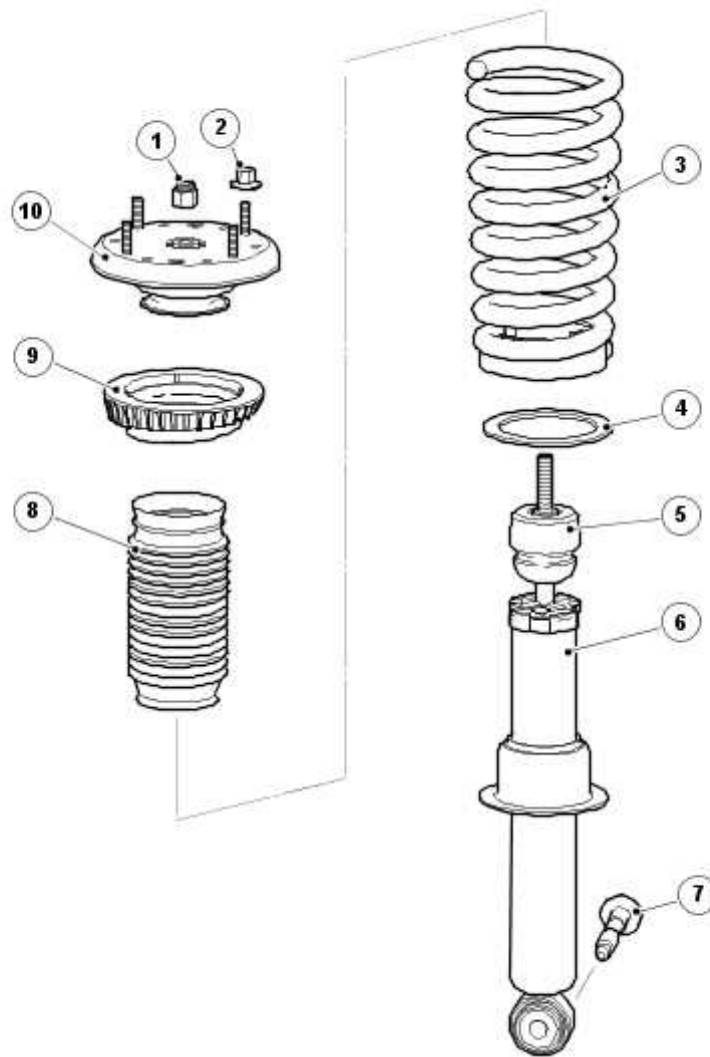
Stabilizer Bar Diameters

Engine Type	Model	Diameter mm (in)
4.2L naturally aspirated	Coupe	17 mm (0.669 in)
4.2L naturally aspirated	Convertible	16 mm (0.629 in)
4.2L supercharged	All models	17 mm (0.669 in)

Each end of the stabilizer bar curves rearward to attach to a ball joint on each stabilizer link. Each link is attached via a second ball joint to a cast bracket on the lower control arm which is secured with a locknut. The links allow the stabilizer bar to move with the wheel travel providing maximum effectiveness.

The stabilizer bar is attached to the forward face of the chassis front subframe. The stabilizer bar is attached to the subframe with 2 rubber bushes. Pressed steel brackets locate over the bushes and are attached to the cross member with bolts screwed into threaded locations in the subframe.

SPRING AND DAMPER MODULE



E76079

Item	Part Number	Description
1		Damper rod self locking nut
2		Top mount self locking nut
3		Spring
4		Spring packer
5		Spring aid
6		Damper
7		Bolt

8		Gaitor
9		Upper spring seat
10		Top mount

The spring and damper modules are attached to cast brackets on the lower control arms and to the rear floor side member assemblies via the 4 studs in the top plate. Similar to the front suspension, two variants are available; passive and active. The active spring and damper assemblies employ the CATS active suspension system.

Different combinations of springs and dampers are available depending on the vehicle model. The damper and spring assemblies are similar in their construction with the CATS adaptive damper having a solenoid operated valve installed in the damper body.

The dampers are a monotube design with a spring seat welded onto the damper tube. The lower end of the damper has a bushed mounting which locates in the lower control arm and is secured with a bolt.

The damper functions by restricting the flow of hydraulic fluid through internal galleries in the damper piston, providing damping of undulations in the road surface. The CATS damper has a solenoid operated valve which further restricts the flow of hydraulic fluid, providing a stiffer damping characteristic for the damper and improving vehicle handling. The solenoid is computer controlled and can switch between soft and hard damping settings depending on driving style and vehicle speed. For additional information, refer to Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension)

The damper piston is connected to a damper rod which is sealed at its exit point from the damper body. The threaded outer end of the damper rod locates through a hole in the top mount. A self locking nut secures the top mount to the damper rod. The damper rod on CATS dampers have an electrical connector on the outer end of the damper rod.

The damper rod is fitted with a spring aid which prevents the top mount making contact with the top of the damper body during full suspension compression and also assists with the suspension tune.

The spring rate of the coil springs can differ between models and are color coded for identification. The coil spring locates on a spring packer and a lower spring seat which is integral with the damper body. The spring locates in an upper spring seat which is located on the underside of the top mount.

The top mount has 4 studs which locate through mating holes in the vehicle rear floor side member and are secured with self locking nuts.

Rear Suspension

For additional information, refer to [<<204-00>>](#).

Lower Arm - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.35.43)

Removal



CAUTION: Nuts and bolts must be tightened with the weight of the vehicle on the suspension.

1



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

Raise and support the vehicle.

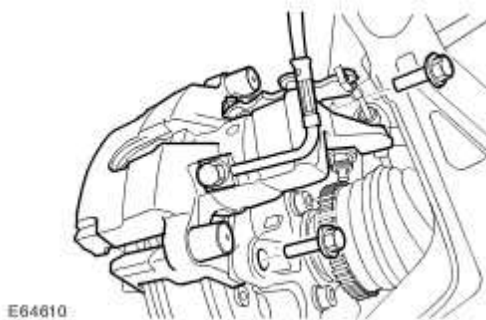
2 . Remove the LH rear wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

3 . Release the brake caliper.

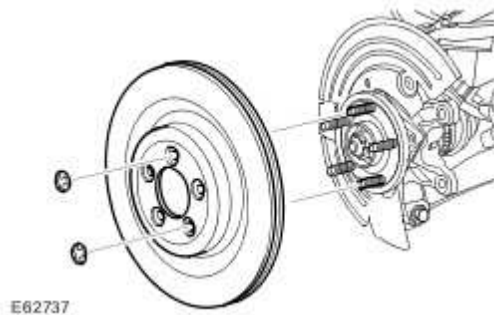
▶ Remove and discard the 2 bolts.

▶ Tie the brake caliper aside.



4 . Remove the rear brake disc.

▶ Remove the 2 clips.

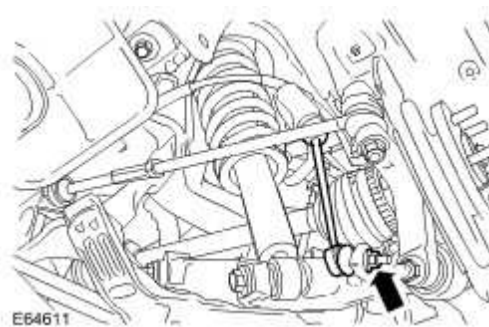


5 . **NOTE:**

Use an additional wrench to prevent the component from rotating.

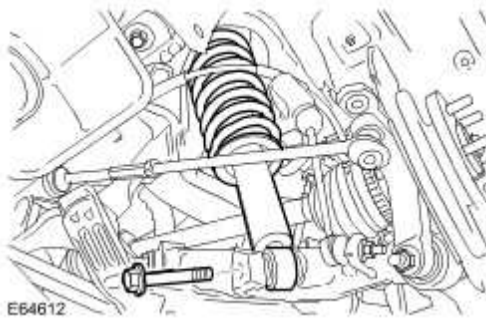
Disconnect the stabilizer bar link.

▶ Remove and discard the nut.



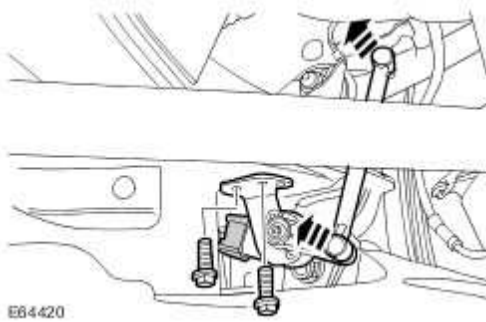
6 . Release the rear shock absorber from the lower suspension arm.

▶ Remove the bolt.



7 . Remove the suspension height sensor.

- ▶ Release the height sensor link.
- ▶ Release and disconnect the electrical connector.
- ▶ Remove the 2 bolts.



8 . Release the lower suspension arm from the hub assembly.

- ▶ Remove the bolt and discard the nut.
- ▶ Position a transmission jack to support the hub assembly.

9 . Remove the lower arm.

- ▶ Remove the 2 bolts and discard the nuts.



Installation

1 . Install the rear suspension arm.

▶ Tighten the nuts and bolts to 97 Nm (72 lb.ft).

2 . Attach the hub assembly to the lower arm.

▶ Tighten the nut and bolt to 150 Nm (110 lb.ft).

3 . Install the shock absorber.

▶ Tighten the bolt to 133 Nm (98 lb.ft).

4 . **NOTE:**

Use an additional wrench to prevent the component from rotating.

Install the stabilizer bar link.

▶ Tighten the nuts to 48 Nm (35 lb.ft).

5 . Install the height sensor.

▶ Tighten the bolts to 10 Nm (7 lb.ft).

 Secure the height sensor link.

 Connect and secure the electrical connector.

6 . Install the brake disc.

 Secure the clips.

7 . Install the brake caliper.

 Tighten the bolts to 103 Nm (76 lb.ft).

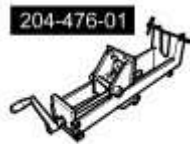
8 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

9 . Carry out the final suspension tightening with the vehicle on its wheels.

Rear Shock Absorber - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.30.02)

Special Service Tools



E64117

Suspension spring compressor

204-476-01

Removal

- 1 . Remove the LH loadspace trim panel.

For additional information, refer to Loadspace Trim Panel - 2-Door (76.13.73.60)

For additional information, refer to Loadspace Trim Panel - Convertible (76.13.73.60)

2



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

Raise and support the vehicle.

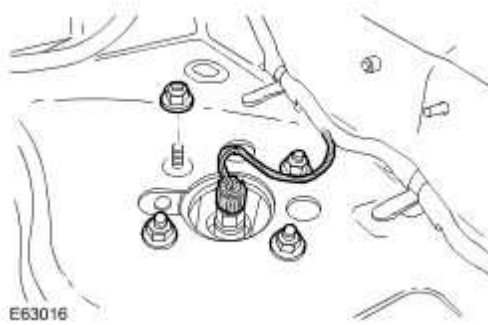
- 3 . Remove the LH rear wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

- 4 . Release the shock absorber and spring assembly.

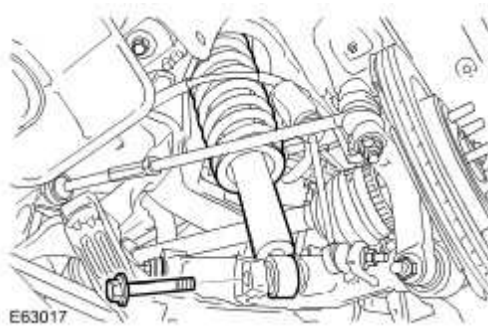
▶ Active shock absorber: Disconnect the electrical connector.

▶ Remove the 4 nuts.



5 . Remove the shock absorber and spring assembly.

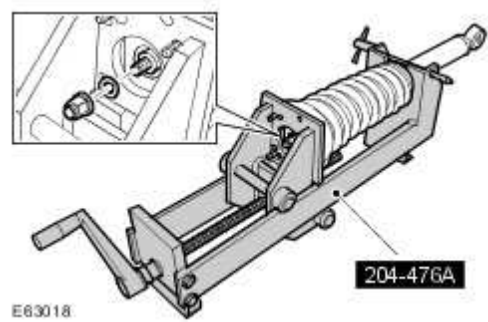
▶ Remove the bolt.



6 . Using the special tool, compress the suspension spring to remove the shock absorber.

▶ Compress the spring.

▶ Remove the nut.

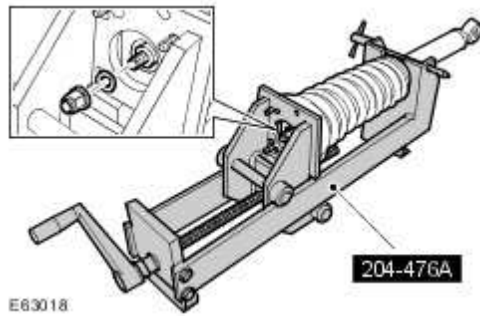


Installation

1 . Using the special tool, compress the spring to install the shock absorber.

▶ Passive shock absorber: Tighten the nut to 27 Nm (20 lb.ft).

▶ Active shock absorber: Tighten the nut to 50 Nm (37 lb.ft).



2 . Install the shock absorber and spring assembly.

▶ Tighten the nuts to 27 Nm (20 lb.ft).

▶ Tighten the bolt to 133 Nm (98 lb.ft).

▶ Active shock absorber: Connect the electrical connector.

3 . Install the LH rear wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

4 . Install the loadspace trim panel.

For additional information, refer to Loadspace Trim Panel - 2-Door (76.13.73.60)

For additional information, refer to Loadspace Trim Panel - Convertible (76.13.73.60)

5 Using only four-wheel alignment equipment approved by Jaguar, check and adjust the wheel alignment.

Rear Stabilizer Bar (64.35.08)

Removal

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

Raise and support the vehicle.

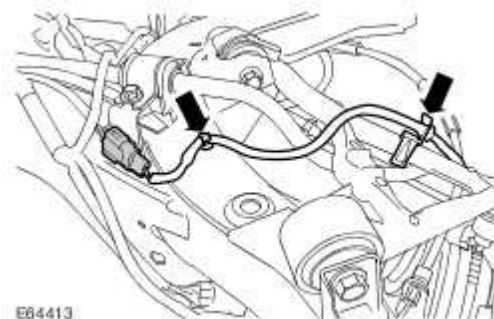
- 2 . Remove the rear sub-frame assembly.
For additional information, refer to Rear Subframe (64.25.01)

- 3 . **NOTE:**

LH illustration shown, RH is similar.

Disconnect the LH rear ABS sensor.

- ▶ Disconnect the electrical connector.
- ▶ Release the 2 clips.
- ▶ Carefully tie the harness aside.
- ▶ Repeat the above procedure for the other side.

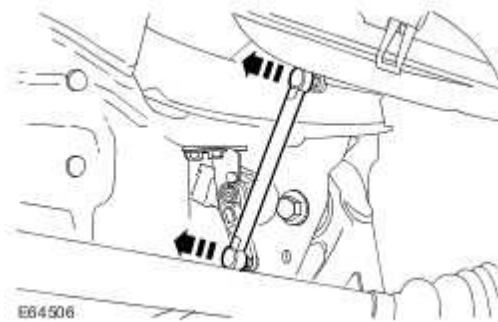


- 4 . Disconnect the electronic parking brake actuator electrical connector.

- ▶ Release the electrical connector.



- 5 . Remove the headlamp levelling sensor link.



- 6 . **NOTE:**

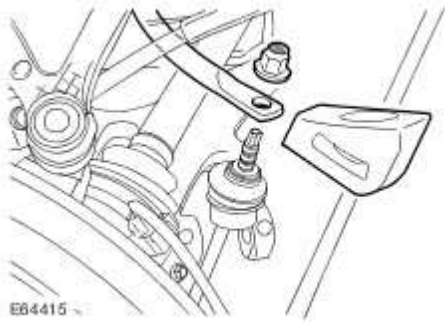
Use an additional wrench to prevent the component from rotating.

NOTE:

LH illustration shown, RH is similar.

Release both stabilizer bar links.

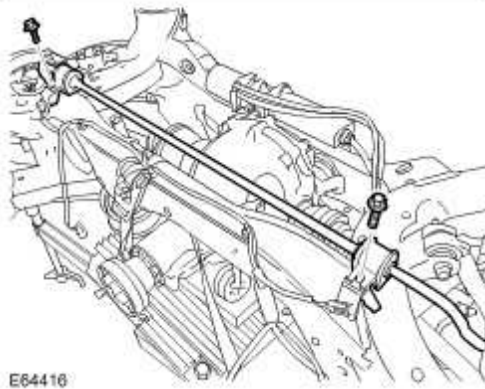
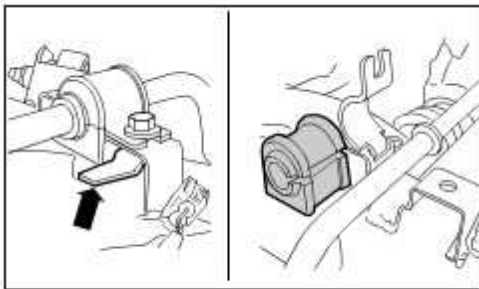
- ▶ Remove the bump stops.
- ▶ Remove and discard the 2 nuts.



7 . Remove the stabilizer bar bushings.

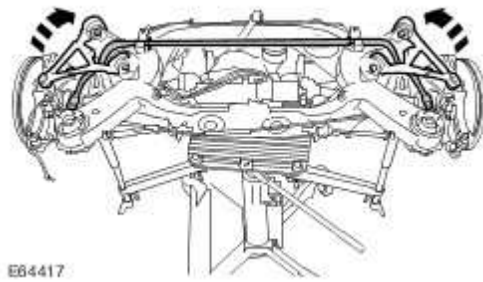
▶ Remove the 2 bolts and discard the cage nuts.

▶ Release the bushings.



8 . With assistance, remove the rear stabilizer bar.

▶ Raise the suspension arms, to release the bar.



Installation

1 . With assistance, install the rear stabilizer bar.

2 . Install the stabilizer bar bushings.

▶ Tighten the bolts and new nuts to 55 Nm (40 lb.ft).

3 . **NOTE:**

Use an additional wrench to prevent the component from rotating.

Install the stabilizer bar links.

▶ Install the bump stops.

▶ Tighten the nuts to 48 Nm (35 lb.ft).

4 . Connect the electronic parking brake actuator electrical connector.

▶ Secure the electrical connector

5 . Install the height sensor link.

6 . Connect the LH rear ABS sensor.

- ▶ Connect the electrical connector.
- ▶ Carefully secure the clips.
- ▶ Repeat the above procedure for the other side.

7 . Install the rear sub-frame.

For additional information, refer to Rear Subframe (64.25.01)

Rear Stabilizer Bar Link (64.35.24)

Removal

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

Raise and support the vehicle.

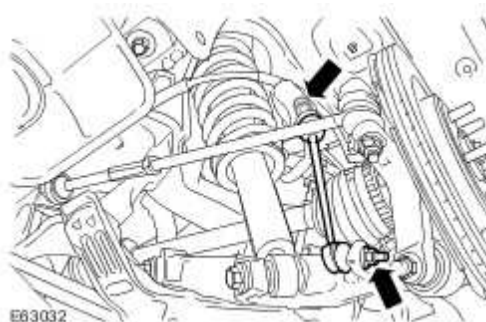
- 2 . Remove the LH rear wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

- 3 . **NOTE:**

Use an additional wrench to prevent the ball joint rotating.

Remove the LH stabilizer bar link.

-  Remove and discard the 2 nuts.



Installation

- 1 . **NOTE:**

Use an additional wrench to prevent the ball joint rotating.

Install the stabilizer bar link.

 Tighten the nuts to 48 Nm (35 lb.ft).

2 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

Rear Wheel Bearing - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.15.14)

Special Service Tools



Hub puller
205-491



Flange remover forcing screw
204-269



Adaptor nuts
205-491-01

Removal

1



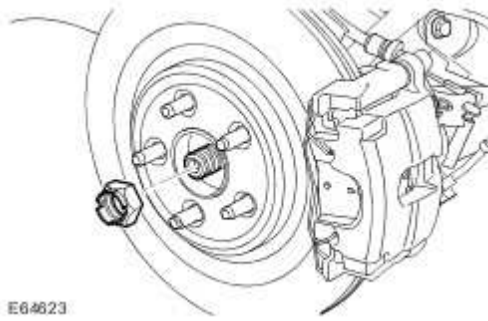
- **WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.**

Raise and support the vehicle.

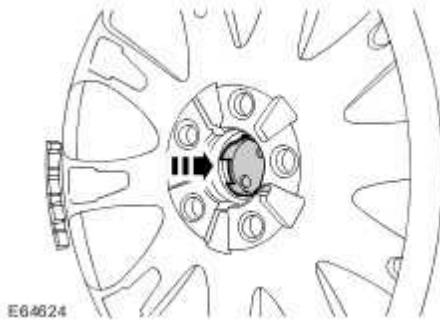
2 . Remove the LH rear wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

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



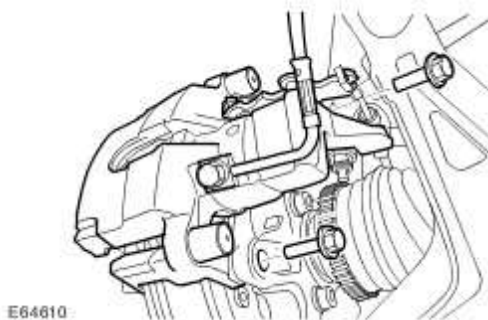
4 . Remove the wheel trim.



5 . Release the brake caliper.

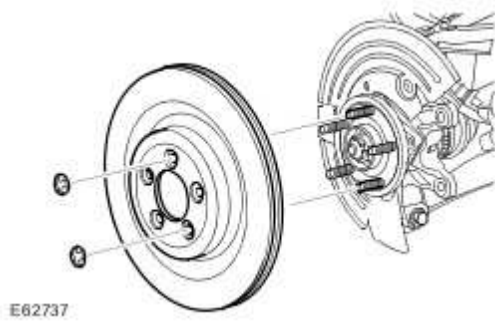
▶ Remove and discard the 2 bolts.

▶ Tie the brake caliper aside.



6 . Remove the rear brake disc.

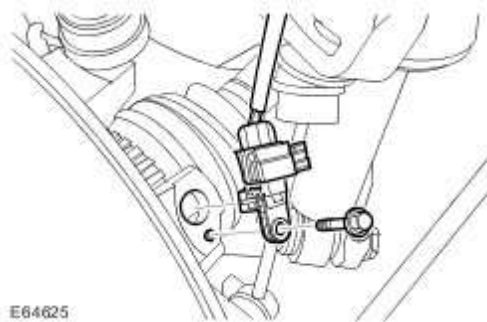
▶ Remove the 2 clips.



7 . Remove the wheel speed sensor.

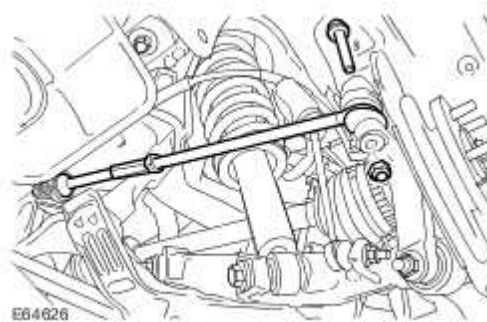
▶ Remove the bolt.

▶ Tie aside.



8 . Disconnect the toe link.

▶ Remove the bolt and discard the nut.

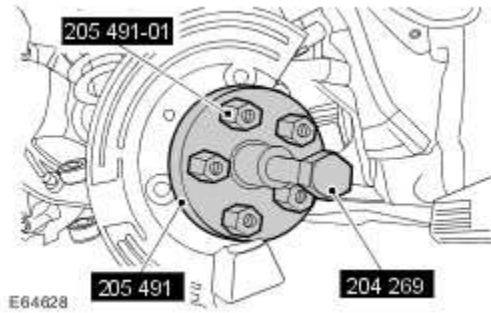


9 . Release the lower arm.

▶ Remove the bolt and discard the nut.



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

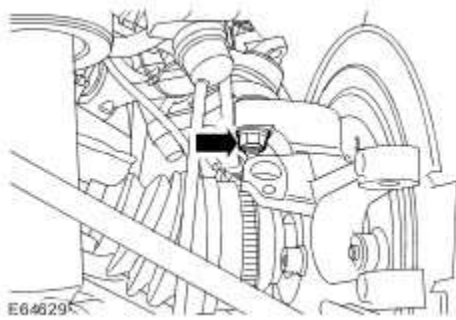


11 . **NOTE:**

Use an additional wrench to prevent the component from rotating.

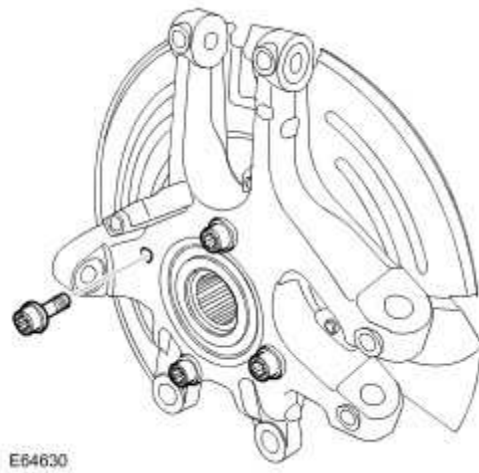
Remove the wheel knuckle.

▶ Release the upper suspension arm ball joint.



12 . Remove the wheel bearing assembly.

▶ Remove the 4 Allen bolts.



Installation

1 . Install the wheel bearing.

▶ Tighten the bolts to 70 Nm (52 lb.ft).

2 . Install the knuckle assembly.

▶ Tighten the nut to 90 Nm (66 lb.ft).

3 . **NOTE:**

Do not fully tighten the locking nut at this stage.

Install the halfshaft.

▶ Tighten the old nut.

4



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

Install the lower arm nut and bolt.

▶ Tighten the nut and bolt to 150 Nm (110 lb.ft).

5



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

Connect the toe link.

▶ Tighten the nut and bolt to 55 Nm (40 lb.ft).

6 . Install the wheel speed sensor.

▶ Install the bolt and tighten to 10 Nm (7 lb.ft).

7 . Install the brake disc.

▶ Secure the clips.

8 . Install the brake caliper.

▶ Tighten the bolts to 103 Nm (76 lb.ft).

9 . Install the wheel and tire assembly.

For additional information, refer to Wheel and Tire (74.20.05)

10 . Remove the old halfshaft nut and install the new one, tighten to 300 Nm (222 lb.ft)

 Install the wheel trim.

11 . Install the wheel trim.

Tie Bar

Removal

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

Raise and support the vehicle.

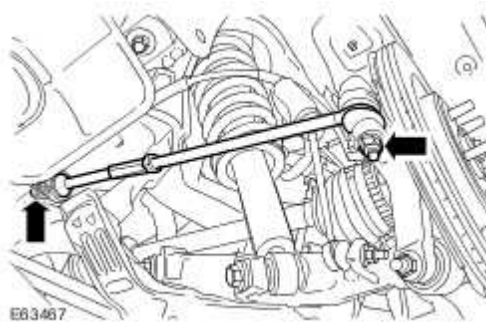
- 2 . Remove the LH rear wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)

- 3 . **NOTE:**

Use an additional wrench to prevent the ball joint rotating.

Remove the tie rod.

- ▶ Remove and discard the 2 tie-rod end retaining nuts.



Installation

- 1 . **NOTE:**

Use an additional wrench to prevent the ball joint rotating.

Install the tie rod.

 Tighten the new inner nut to 90 Nm (59 lb.ft).

 Tighten the new outer nut to 55 Nm (41 lb.ft).

2 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

3 Using only four-wheel alignment equipment approved by Jaguar, check and adjust the wheel
alignment.

Upper Arm (64.25.31)

Special Service Tools



Brake pedal hold down tool JDS 9013

Removal

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

Raise and support the vehicle.

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

- 3  **CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.**

NOTE:

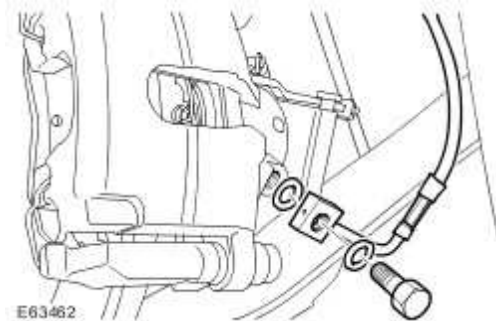
Some fluid spillage is inevitable during this operation.

NOTE:

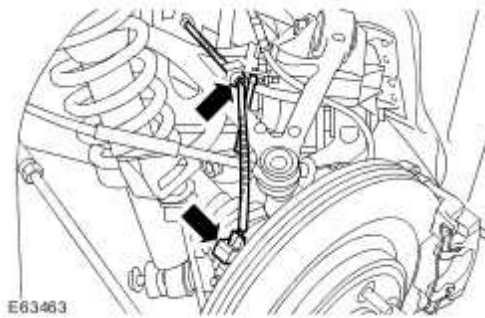
Note the fitted position.

Disconnect the brake hose from the brake caliper.

- Using the special tool, press and hold the brake pedal.
- Remove and discard the two sealing washers.

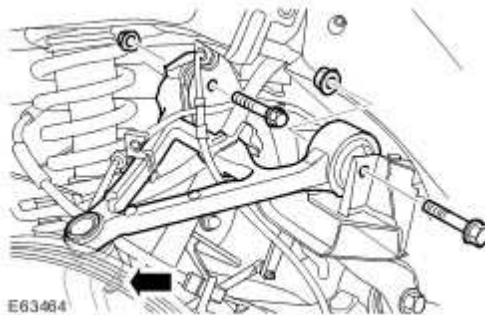


4 . Release the rear wheel speed sensor lead.



5 . Remove the LH upper arm.

- LH rear: Remove the upper arm 2 nuts and bolts.
- Remove and discard the nut.



Installation

- 1  **CAUTION:** The final tightening of the upper arm must be carried out with the vehicle on it's wheels.

Install the upper arm.

- ▶ Tighten the nuts and bolts to 97 Nm (72 lb.ft).
- ▶ Tighten the nut to 90 Nm (66 lb.ft).

2 . NOTE:

Align to the position noted on removal.

Connect the brake hose to the brake caliper.

- ▶ Install 2 new sealing washers.
- ▶ Tighten the union to 35 Nm (26 lb.ft).

3 . Install the rear wheel speed sensor lead.

4 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

5 . Bleed the brake system.

For additional information, refer to Brake System Bleeding (70.25.03)

Wheel Knuckle - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.15.22)

Removal

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

Raise and support the vehicle.

- 2 Remove the wheel knuckle.
 - . For additional information, refer to Rear Wheel Bearing - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.15.14)
- 3 . Remove the brake disc shield.

 Remove the 3 rivets.



Installation

- 1 . Install the brake disc shield.

 Install the rivets.

 Repeat the above procedure for the other side.

2 Install the wheel knuckle.

- . For additional information, refer to Rear Wheel Bearing - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.15.14)

204-04 : Wheels and Tires

Specifications

Specifications

Wheel and Tire Specification

NOTE:

Spare wheel assembly not fitted with runflat tires.

NOTE:

As tire fitment can vary in individual markets, consult the vehicle handbook or tire label for further information.

Wheel Size	Tire Type	Tire Size
8.5" x 18"	Continental Sport Contact 2	245/45R 18 96Y
9.5"v x 18"	Continental Sport Contact 2	275/40R 18 99Y
8.5" x 19"	Dunlop Sport 01	245/40R 19 94Y
8.5" x 19" (runflat)	Dunlop Sport 01 DSST	245/40R 19 94Y
9.5" x 19"	Dunlop Sport 01	275/35R 19 96Y
9.5" x 19" (runflat)	Dunlop Sport 01 DSST	275/35R 19 96Y
8.5" x 20"	Dunlop Sport Maxx Directional	255/35R 20 97Y
9.5" x 20"	Dunlop Sport Maxx Directional	285/30R 20 99Y
4" x 18"	Pirelli (spare)	T135/80R 18 104M

Tire Pressures

Description	Tire Pressure		
	Front	Rear	Space Saver Spare
All Derivatives	2.1 bar (30 lb/in ²)	2.3 bar (33 lb/in ²)	4.2 bar (60 lb/in ²)

Torque Specifications

Description	Nm	lb-ft
Wheel nuts	125	92
Tire low pressure sensor	6.5	5

Wheels and Tires

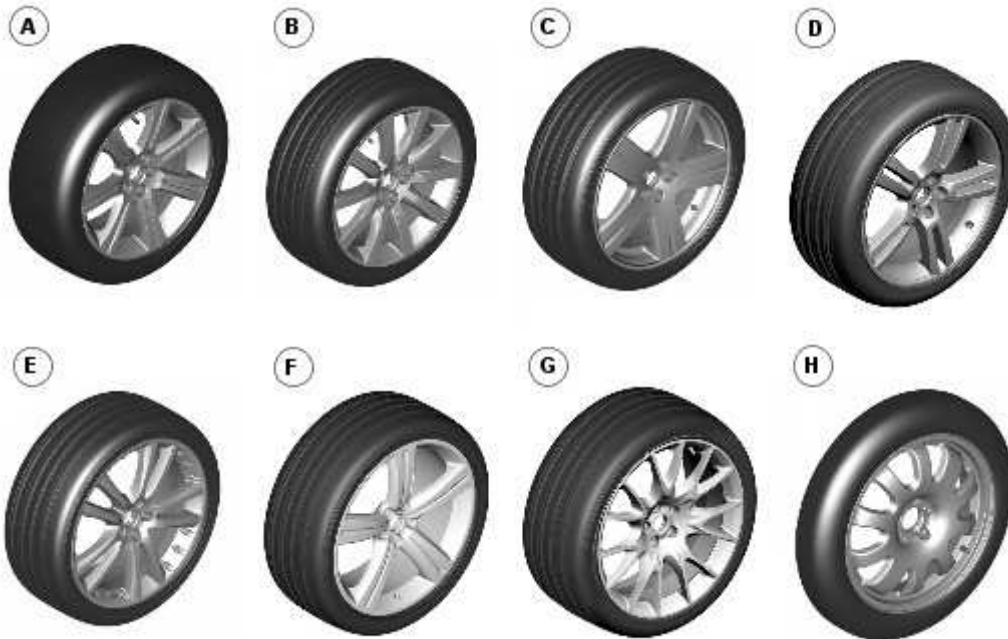
INTRODUCTION

A number of alloy wheels are available ranging from 18 in. to 20 in. diameter. The rim widths are 8.5 or 9.0 in. for front wheels and 9.5 or 10.5 in. for rear wheels. An alloy space saver wheel is a standard fitment, except for vehicles fitted with run-flat tires.

A Tire Pressure Monitoring System (TPMS) is also available as a standard or optional fitment dependant on market. The TPMS is a driver warning system if a tire pressure is outside predetermined thresholds.

A 'run-flat' tire option is available with the 19 in. wheel option. Vehicles fitted with these tires have the TPMS fitted as standard and are not supplied with a spare wheel, vehicle jack or wheel brace.

WHEELS



E101651

Item	Part Number	Description
A		Venus (8.5J X 18 Front/9.5J X 18 Rear)
B		Carelia (8.5J X 19 Front/9.5J X 19 Rear)
C		Sabre - Run-flat tires (8.5J X 19 Front/9.5J X 19 Rear)

D		Jupiter (8.5J X 19 Front/9.5J X 19 Rear)
E		Senta (8.5J X 20 Front/9.5J X 20 Rear)
F		Cremona (8.5J X 20 Front/9.5J X 20 Rear)
G		Vortex (9.0J X 20 Front/10.5J X 20 Rear)
H		Space saver wheel (4J X 18)

TIRES

Tires are available in a number of sizes and tread patterns dependent on vehicle specification. Tire sizes are as follows:

- T135/80R18 (space saver wheel)
- 245/45ZR18 Front / 275/40ZR18 Rear
- 245/40ZR19 Front / 275/35ZR19 Rear
- 255/35ZR20 Front / 285/30ZR20 Rear
- 255/35ZR20 Front / 295/30ZR20 Rear.

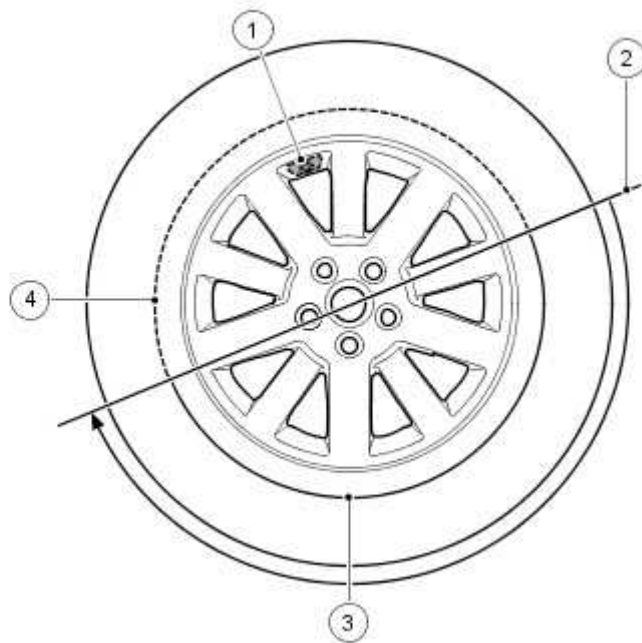


WARNING: Tires should be inflated to the recommended pressures (shown on a label on the 'B' pillar) only when the tires are cold (ambient temperature). If the tires have been subjected to use or exposed to direct sunlight, move the vehicle into a shaded position and allow the tires to cool before checking/adjusting the pressures.

Tire Changing

On vehicles fitted the 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.



E45549

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 90 degrees 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.

Run-Flat Tires

Run-flat tires can be handled, fitted and removed using the same principles as used for normal low profile and high-performance tires, with two exceptions:

- They are always fitted with tire pressure sensors
- They have thicker bead cores and more rigid sidewalls which require special care when being mounted on the rims.

It is recommended that the tire fitting machine is fitted with plastic rollers for the upper and lower bead. This will ensure that the bead is removed gently, protecting the rims and the tire pressure sensors.

Adequate amounts of special fitting lubricant must be used to ensure that the sidewalls move with the minimum exertion and locate on the rim flange correctly.

Run-flat tires can be identified by the marking 'RSC' on the tire sidewall.

NOTE:

Vehicles fitted with run-flat tires are not supplied with a spare wheel, vehicle jack or wheel brace.

TREAD Act - NAS Only

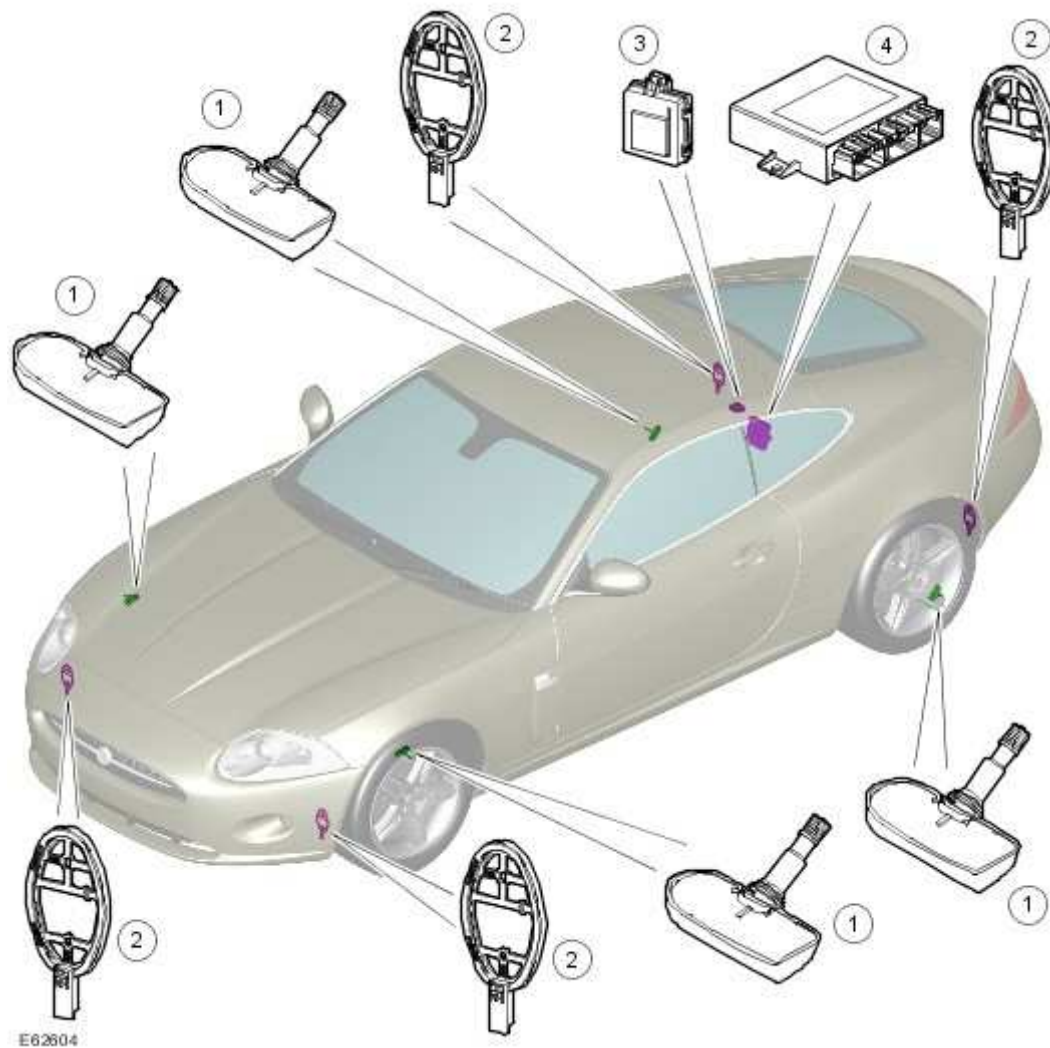
Vehicles supplied to the North American markets must comply with the legislation of the Transport Recall Enhancement, Accountability and Documentation (TREAD) act. Part of the requirement of the TREAD act is for the vehicle to display a label which defines the recommended tire inflation pressure, load limits and maximum load of passengers and luggage weight the vehicle can safely carry. This label will be specific to each individual vehicle and will be installed on the production line. The label is positioned on the driver's side 'B' pillar on NAS vehicles and the inside rear face of the LH door on Canadian specification vehicles.

This label must not be removed from the vehicle. The label information will only define the specification of the vehicle as it came off the production line. It will not include dealer or owner fitted accessory wheels and tires of differing size from the original fitment.

If the label is damaged or removed for body repair, it must be replaced with a new label specific to that vehicle. A new label is requested from Jaguar parts and will be printed specifically for the supplied VIN of the vehicle.

TIRE PRESSURE MONITORING SYSTEM (TPMS)

COMPONENT LOCATION



Item	Part Number	Description
1		Tire pressure sensor (4 off)
2		Initiator (4 off)
3		Tire Pressure Monitoring System (TPMS) receiver
4		TPMS module

OVERVIEW

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 North American Specification (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 (the space saver spare wheel is not monitored) 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 assist 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.

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

The TPMS module is located behind the Left Hand (LH) rear passenger seat, behind the Auxiliary Junction Box (AJB) and the TPMS RF receiver is located on the AJB mounting bracket. The front initiators are positioned at the front of the wheel arches, behind the fender splash shields. The rear initiators are positioned at the rear of the rear wheel arches, behind the fender splash shields.

The 4 initiators are hard wired 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 or 433 MHz RF signals are detected by the RF receiver 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 medium speed 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
- TPMS module can 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).

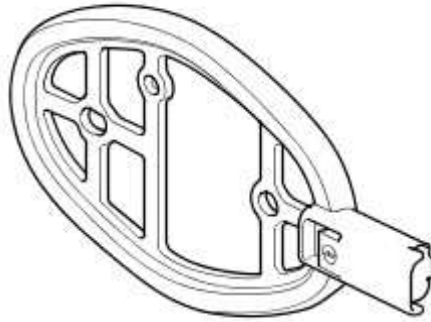
The tire learn and location process is ready to commence when the vehicle has been stationary or travelling at less than 12 mph (20 km/h) for 15 minutes. This is known as 'parking mode'. The learn/locate process requires the vehicle to be driven at speeds of more than 12 mph (20 km/h) for 15 minutes.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

Spare Tire Identification

Tire pressure sensors are not fitted to the space saver spare wheel and therefore the spare wheel is not monitored.

Initiators



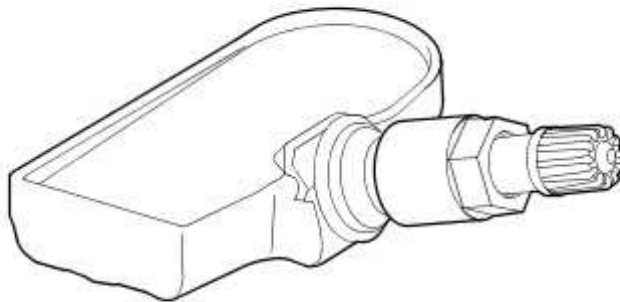
E45552

Four initiators are fitted to the vehicle. The front initiators are located near the front of the front wheel arches, behind the fender splash shields. The rear initiators are located at the rear of the rear wheel arches, behind the fender splash shields. Each initiator has a connector which connects to the vehicle body harness.

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

The TPMS module energises 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 Co-efficient (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

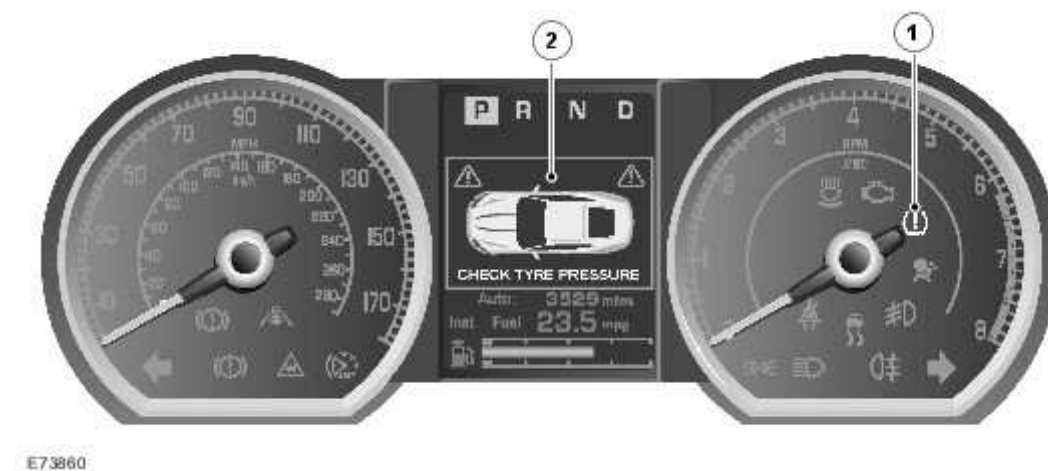
pressure and temperature of the air inside the tire. The data is transmitted by RF data signals at either 315 MHz or 433 MHz dependant on market requirements.

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 Service Repair Manual.

Instrument Cluster Indications



Item	Part Number	Description
1		Low tire pressure warning indicator
2		Message centre

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 centre.

The TPMS module passes system status information to the instrument cluster on the medium 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 initialisation. 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 illuminate on vehicles up to 2007.25MY and will flash on vehicles from 2007.25MY 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.

The following table shows the warning indicator functionality for given events:

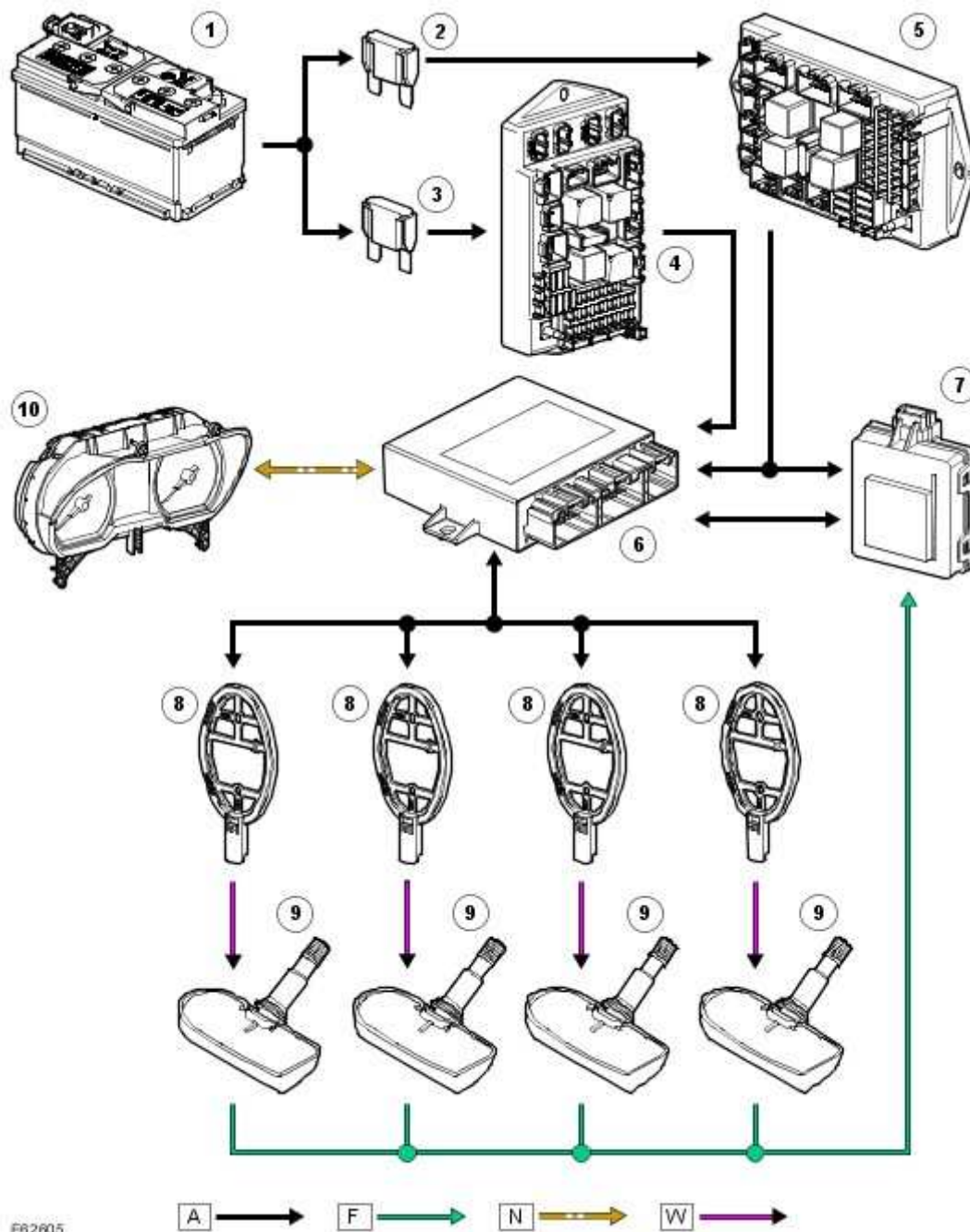
Event	Instrument Cluster Indications
Low pressure warning limit reached in one wheel	Warning indicator illuminated. 'CHECK TYRE PRESSURE' message displayed and applicable tire highlighted on display.
Low pressure warning limit reached in one or more wheels in low speed mode (only if programmed or learning)	Warning indicator illuminated. 'CHECK ALL TYRE PRESSURES' message displayed.
TPMS fault	On vehicles up to 2007.25MY - Warning indicator permanently illuminated. On vehicles from 2007.25MY - Warning indicator flashes for 72 seconds and is then permanently illuminated. 'TYRE PRESSURE SYSTEM FAULT' message displayed.
No transmission from a specific tire pressure sensor or Specific tyre pressure sensor fault	Warning indicator illuminated. 'TYRE NOT MONITORED' message displayed and Amber LED flashes for 72 seconds. Amber LED illuminated at next and subsequent ignition on cycle.
No transmission from more than one tyre pressure sensor or More than one tyre pressure sensor fault	Warning indicator illuminated. 'TYRE PRESSURE SYSTEM FAULT' message displayed and Amber LED flashes for 72 seconds. Amber LED illuminated at next and subsequent ignition on cycle.
CAN signals missing	On vehicles up to 2007.25MY - Warning indicator permanently illuminated. On vehicles from 2007.25MY - Warning indicator

	flashes for 72 seconds and is then permanently illuminated. 'TYRE PRESSURE SYSTEM FAULT' message displayed.
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CONTROL DIAGRAM

NOTE:

A = Hardwired; **F** = RF Transmission; **N** = Medium speed CAN bus; **W** = LF Transmission



Item	Part Number	Description
1		Battery
2		Megafuse (175A)
3		Megafuse (175A)
4		Central Junction Box (CJB)
5		Auxiliary junction box
6		TPMS module
7		TPMS receiver
8		Initiators
9		Tire pressure sensors
10		Instrument cluster

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 or 433 MHz (depending on market) signal which is received by the RF receiver. 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 6 seconds on all 433 MHz vehicles or for 18 seconds on 315 MHz vehicles in the following order:

- Front left
- 6 second pause (for the TPMS module to detect a response from the tire pressure sensor)
- Front right
- 6 second pause
- Rear right
- 6 second pause
- Rear left
- 6 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 three times but less if the sensor positions are already known. The process is known as 'Auto Location' and takes 2 to 4 minutes

to complete.

During this period the tire pressure sensors transmit at regular intervals, once every 5 seconds (once every 15 seconds on 315 MHz vehicles). 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 warning appears in the instrument cluster message centre when the inflation pressure has fallen to 25% of the nominal pressure. The displayed message will also include the position(s) of the affected wheel(s) displayed on a vehicle graphic.

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/in²), the sensor will transmit more often if pressure in the tire is being lost.

Wheels and Tires - VIN Range: B10572- >B32752

Principle of Operation

For a detailed description of the wheels and tires, refer to the relevant Description and Operation section in the workshop manual.

Wheels and Tires

Inspection and Verification



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

1 . Verify the customer complaint. As much information as possible should be gathered from the driver to assist in diagnosing the cause(s). Confirm which of the following two warning types (A or B) exist for the Tire Pressure Monitoring System when the ignition status is switched from 'OFF' to 'ON'

(A) Check Tire Pressure Warnings. A low tire pressure warning will **continuously** illuminate the low tire pressure warning lamp. This warning may be accompanied by a text message such as CHECK  TIRE PRESSURE (refer to owner literature). The manufacturer approved diagnostic system does NOT need to be used. Diagnostic Trouble Codes (DTCs) are not generated with this type of warning. To extinguish this warning it is essential that, with the

ignition 'ON', all vehicle tires (including the spare) are to be set to the correct pressure as stated in the vehicle handbook or as indicated on the placard label in the passenger/driver door aperture. **It is not necessary to drive the vehicle to clear 'check tire pressure' warnings - just changing the tire pressure causes the tire low pressure sensor to transmit new data.**

NOTE:

The tire pressures should be set by:

- Using a calibrated tire pressure gauge
- With 'cold' tires (vehicle parked in the ambient temperature for at least one hour, not in a garage with an artificial ambient temperature)

NOTE:

If the tire pressure warning does not clear within two minutes, it is likely that the gauge is not correctly calibrated or the tires are 'warm'. Carry out the following steps until the warning has cleared:

- Increase the tire pressures by 3psi
- Wait a further two minutes
- When the tires are at ambient temperature and a **calibrated** gauge is available, reset the tire pressures to the correct pressure.

NOTE:

Tire pressure adjustments are part of routine owner maintenance. Tire pressure adjustments that are required due to a lack of owner maintenance are not to be claimed under vehicle warranty.

(B) System Fault Warnings. When a system fault is detected, the low tire pressure warning lamp will flash for approximately 75 seconds prior to being continuously illuminated. Visually inspect for obvious signs of damage and system integrity. Check for the presence of tire low pressure sensors on all four wheels (note: a tire low pressure sensor has a metal valve stem rather than a rubber one).

2 . Check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

NOTE:

If the tester fails to communicate with the Tire Pressure Monitoring System module, the following actions are recommended:

- Remove the Tire Pressure Monitoring System power supply fuse, inspect and re-install (if intact). Test to see if communications have been re-established.
- Remove the Tire Pressure Monitoring System ignition fuse (if applicable), inspect and re-install (if intact). Test to see if communications have

been re-established.

- With ignition status set to 'ON', refer to the electrical circuit diagrams and check Tire Pressure Monitoring System module for power, ignition and ground supplies .
- Carry out CAN network integrity test using the manufacturer approved diagnostic system.

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 or a component 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/component.

NOTE:

Generic scan tools may not read the codes listed, or may read only five digit codes. If this is the case, 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 extra information read by the

manufacturer-approved diagnostic system).

NOTE:

When performing 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:

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
C1A5 6-31	Left Front Tire Pressure Sensor and Transmitter Assembly-no signal	• Missing, incompatible or defective tire low pressure sensor or	GO to Pinpoint Test G561999p6.

		radio frequency receiver	
C1A5 6-68	Left Front Tire Pressure Sensor and Transmitter Assembly-event information	Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event	No action required.
C1A5 6-91	Left Front Tire Pressure Sensor and Transmitter Assembly-parametric	Tire low pressure sensor has reported out of range information for pressure, temperature or acceleration	Replace defective tire low pressure sensor. Refer to the relevant section of the workshop manual.
C1A5 6-93	Left Front Tire Pressure	No tire low pressure	GO to Pinpoint Test

	Sensor and Transmitter Assembly-no operation	sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction	G561999p7.
C1A5 7-11	Left Front Initiator-circuit short to ground	Left front initiator circuit is short to ground	GO to Pinpoint Test G561999p2. Refer to Pinpoint test B1
C1A5 7-12	Left Front Initiator-circuit short to battery	Left front initiator circuit is short to power	GO to Pinpoint Test G561999p2. Go to Pinpoint test B2
C1A5 7-13	Left Front Initiator-circuit open	Left front initiator circuit open	GO to Pinpoint Test G561999p2. Go to Pinpoint test B9
C1A5 8-31	Right Front Tire Pressure	Missing, incompatible or	GO to Pinpoint Test

	Sensor and Transmitter Assembly-no signal	defective tire low pressure sensor or radio frequency receiver	G561999p6.
C1A5 8-68	Right Front Tire Pressure Sensor and Transmitter Assembly-event information	Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event	No action required.
C1A5 8-91	Right Front Tire Pressure Sensor and Transmitter Assembly-parametric	Tire low pressure sensor has reported out of range information for pressure, temperature or	Replace defective tire low pressure sensor. refer to the relevant section of the workshop manual.

		acceleration	
C1A5 8-93	Right Front Tire Pressure Sensor and Transmitter Assembly-no operation	No tire low pressure sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction	GO to Pinpoint Test G561999p7.
C1A5 9-11	Right Front Initiator-circuit short to ground	Right front initiator circuit is short to ground	GO to Pinpoint Test G561999p3. Go to Pinpoint test C1
C1A5 9-12	Right Front Initiator-circuit short to battery	Right front initiator circuit is short to power	GO to Pinpoint Test G561999p3. Go to Pinpoint test C2
C1A5 9-13	Right Front Initiator-circuit open	Right front initiator circuit open	GO to Pinpoint Test G561999p3. Go to Pinpoint

			test C9
C1A6 0-31	Left Rear Tire Pressure Sensor and Transmitter Assembly-no signal	Missing, incompatible or defective tire low pressure sensor or radio frequency receiver	GO to Pinpoint Test G561999p6.
C1A6 0-68	Left Rear Tire Pressure Sensor and Transmitter Assembly-event information	Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event	No action required.
C1A6 0-91	Left Rear Tire Pressure Sensor and Transmitter Assembly-	Tire low pressure sensor has reported out of range	Replace defective tire low pressure sensor, refer to the relevant

	parametric	information for pressure, temperature or acceleration	section of the workshop manual.
C1A6 0-93	Left Rear Tire Pressure Sensor and Transmitter Assembly-no operation	No tire low pressure sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction	GO to Pinpoint Test G561999p7.
C1A6 1-11	Left Rear Initiator-circuit short to ground	Left rear initiator circuit short to ground	GO to Pinpoint Test G561999p4. Go to Pinpoint test D1
C1A6 1-12	Left Rear Initiator-circuit short to battery	Left rear initiator circuit short to power	GO to Pinpoint Test G561999p4. Go to Pinpoint test D2

C1A6 1-13	Left Rear Initiator-circuit open	Left rear initiator circuit open	GO to Pinpoint Test G561999p4. Go to Pinpoint test D9
C1A6 2-31	Right Rear Tire Pressure Sensor and Transmitter Assembly-no signal	Missing, incompatibl e or defective tire low pressure sensor or radio frequency receiver	GO to Pinpoint Test G561999p6.
C1A6 2-68	Right Rear Tire Pressure Sensor and Transmitter Assembly- event information	Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event	No action required.
C1A6	Right Rear	Tire low	Replace

2-91	Tire Pressure Sensor and Transmitter Assembly-parametric	pressure sensor has reported out of range information for pressure, temperature or acceleration	defective tire low pressure sensor, refer to the relevant section of the workshop manual.
C1A6 2-93	Right Rear Tire Pressure Sensor and Transmitter Assembly-no operation	No tire low pressure sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction	GO to Pinpoint Test G561999p7.
C1A6 3-11	Right Rear Initiator-circuit short to ground	Right rear initiator circuit short to ground	GO to Pinpoint Test G561999p5. Go to Pinpoint test E1
C1A6 3-12	Right Rear Initiator-circuit	Right rear initiator circuit short	GO to Pinpoint Test

	short to battery	to power	G561999p5. Go to Pinpoint test E2
C1A6 3-13	Right Rear Initiator-circuit open	Right rear initiator circuit open	GO to Pinpoint Test G561999p5. Go to Pinpoint test E9
C1A6 4-68	Spare Wheel Tire Pressure Sensor and Transmitter Assembly-event information	Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event	No action required.
C1A6 4-91	Spare Wheel Tire Pressure Sensor and Transmitter Assembly-parametric	Tire low pressure sensor has reported out of range information for pressure,	Replace defective tire low pressure sensor, refer to the relevant section of the

		temperature or acceleration	workshop manual.
C1A64-93	Spare Wheel Tire Pressure Sensor and Transmitter Assembly-no operation	Missing, incompatible or defective tire low pressure sensor or radio frequency receiver	GO to Pinpoint Test G561999p8.
C1D19-11	External Receiver Data Line-circuit short to ground	Tire pressure monitoring system radio frequency receiver or data line circuit is short to ground	GO to Pinpoint Test G561999p1.
C1D19-12	External Receiver Data Line-circuit short to battery	Tire pressure monitoring system radio frequency	GO to Pinpoint Test G561999p9.

		receiver or data line circuit is short to power	
C1D1 9-87	External Receiver Data Line-missing message	• Radio Frequency reception blocked • Tire pressure monitoring system radio frequency receiver faulty • Tire pressure monitoring system radio frequency receiver or data line circuits open circuit • Missing, incompatible or defective tire low	GO to Pinpoint Test G561999p10.

		pressure sensors	
U0010-88	Medium Speed CAN Communication Bus-bus off	• CAN bus fault	Carry out CAN network integrity tests. Refer to the electrical wiring diagrams and check CAN network for short, open circuit.
U0140-00	Lost communication with body control module-no sub type information	• CAN bus fault • Central Junction Box fault	Refer to the electrical wiring diagrams and check Central Junction Box power and ground supplies for short, open circuit. Carry out CAN network integrity tests.
U0142-00	Lost Communication With Body Control Module "B" -	• CAN bus fault • Auxiliary Junction Box fault	Refer to the electrical wiring diagrams and check Auxiliary Junction Box

	no sub type information		power and ground supplies for short, open circuit. Carry out CAN network integrity tests.
U0155-00	Lost Communications With Instrument Panel Cluster (IPC) Control Module-no sub type information	• CAN bus fault • Instrument cluster fault	Refer to the electrical wiring diagrams and check instrument cluster power and ground supplies for short, open circuit. Carry out CAN network integrity tests.
U0164-00	Lost Communication With HVAC Control Module-no sub type information	• CAN bus fault • Climate control module fault	Refer to the electrical wiring diagrams and check climate control module power and ground supplies for short, open circuit. Carry out

			CAN network integrity tests.
U0300-00	Internal Control Module Software Incompatibility -no sub type information	• Incompatible tire pressure monitoring system module for vehicle CAN network	Check correct tire pressure monitoring system module is installed to vehicle specification, otherwise suspect the Auxiliary Junction Box.
U0415-00	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module-no subtype information	• Invalid data received from the Anti-Lock Braking System Control Module • CAN bus fault • Anti-Lock Braking System fault	Check Anti-Lock Braking System control module and Instrument Cluster for related DTCs and refer to the relevant DTC Index. Carry out CAN network integrity tests.
U0424-00	Invalid Data Received	• HVAC control	Check climate control module

	From HVAC Control Module-no sub type information	module fault	for related DTCs and refer to relevant DTC Index.
U1A1 4-49	CAN Initialisation Failure-internal electronic failure	Tire pressure monitoring system module fault	Install a new tire pressure monitoring module. Refer to the new module/component installation note at the top of the DTC Index.
U3000 -55	Control Module-not configured	Tire pressure monitoring system configuration data is invalid	Check and amend the car configuration file.
U3000 -87	Control Module-missing message	Tire pressure monitoring system configuration data not	Check the Auxiliary Junction Box for related DTCs and refer to the relevant DTC

		received	Index. Carry out CAN network integrity test.
U3002-81	Vehicle Identification Number - invalid serial data received	Tire pressure monitoring system module and vehicle VIN mis-match	NOTE: This DTC indicates that the tire pressure monitoring system module is not the original part installed to the vehicle at the factory/dealer and could have been substituted. Refer to the note above the DTC index about replacing components which may remain under

			manufacturer warranty. Re-install the original or a new tire pressure monitoring system control module.
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Component Tests

Wheels and Tires

For wheel and tire specification information (pressures, torques, etc).
Specifications

When replacing wheels or tires, local legislation regarding health and safety must be complied with.

If the vehicle has a Tire Pressure Monitoring System installed, only Jaguar approved wheels and tires should be used. If the wheel and tire size is changed (for example from R18 to R20) the Tire Pressure Monitoring System module should be updated with the correct pressure information appropriate to the new wheel and tire set. Update the Tire Pressure Monitoring System module using the Jaguar approved diagnostic system.

As a general guideline, only replace tires in pairs or as a set, and only with tires of equivalent size and specification.

Confirm the symptoms of the customer complaint.

As much information as possible should be gathered from the driver to assist in diagnosing the cause(s).

1 . Before a road test, carry out a basic inspection to make sure the vehicle is safe and legal to drive.

Basic inspection

- Correct tire inflation.
Specifications

- Legal tire tread depth
- Cuts/Bulges in tire sidewall(s)
- Tire ply separation
- Embedded objects
- Wheel rim damage
- Correct tire installation (specification, direction of rotation, etc)
- Any obvious distortion of the tire (flat/high spots)
- Worn/Damaged steering or suspension components

Road test

If the results of the basic inspection are acceptable, carry out a road test to confirm the symptoms.

To reproduce the symptoms, test the vehicle on similar roads to those on which the fault occurs and at similar speeds (provided it is legal to do so).

If the vibration or noise can be reproduced, note the speed at which it occurs and see if it is possible to drive through the symptom, meaning, is it possible to alter the fault by driving faster or slower than the speed at which it occurs?

If it **is** possible, it is likely that the fault is caused by an imbalance in the wheel or tire.

If the vibration or noise gets worse as the vehicle speed increases, it is likely that the fault is caused by distortion in the wheel or tire, or worn or damaged components.

Distortion checks

Check for distortion by raising the vehicle so that the wheels are free and placing an axle stand or similar fixed object next to each wheel in turn.

If the stand is placed at the tread of the tire, the tire can be checked for ovality by turning the wheel by hand and checking for high or low spots where the gap between the tread and the stand increases or reduces.

If the stand is placed next to the wheel rim or tire sidewall, the wheel and tire can be checked for run-out in a similar way.

Pinpoint Tests

PINPOINT TEST G561999p1 : C1D1911 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO GROUND

G561999t1 : C1D1911 Verify External Receiver Data Line Circuit Short To Ground

1. Ignition off. 2. Disconnect the Tire Pressure Monitoring System Receiver electrical connector, CA131. 3. Measure the resistance between

CA131, harness side	Battery
Pin 1	Negative terminal

- **Is the resistance less than 5 Ohms?**

-> **Yes**

GO to A2. GO to Pinpoint Test G561999t2.

-> **No**

GO to A3. GO to Pinpoint Test G561999t3.

G561999t2 : C1D1911 Check The External Receiver Data Line Circuit For Short Circuit To Ground

1. Disconnect the Tire Pressure Monitoring System Control Module electrical connector, CA109. 2. Measure the resistance between

CA131, harness side	Battery
Pin 1	Negative terminal

- **Is the resistance less than 5 Ohms?**

-> **Yes**

REPAIR the short circuit in wiring harness.

-> **No**

GO to A4. GO to Pinpoint Test G561999t4.

G561999t3 : C1D1911 Check The Tire Pressure Monitoring System External Receiver For Short Circuit To Ground

1. Reconnect the Tire Pressure Monitoring System Receiver electrical connector, CA131. 2. Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.

- **Is the DTC C1D1911 set?**

-> **Yes**

Replace Tire Pressure Monitoring Receiver.

-> **No**

Investigate possible cause of intermittent failure.

G561999t4 : C1D1911 Check The Tire Pressure Monitoring System Control Module For Short Circuit To Ground

1. Reconnect the Tire Pressure Monitoring System Control Module electrical connector, CA109. 2. Reconnect the Tire Pressure Monitoring System Receiver electrical connector, CA131. 3. Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.

- **Is the DTC C1D1911 set?**

-> **Yes**

Replace Tire Pressure Monitoring System Control Module.

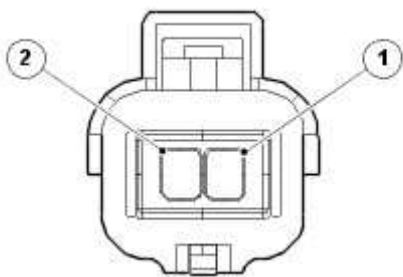
-> **No**

Investigate possible cause of intermittent failure.

PINPOINT TEST G561999p2 : LEFT FRONT LOW FREQUENCY INITIATOR CIRCUIT

G561999t5 : Check the initiator circuit for short circuit to ground

1. Ignition off. 2. Disconnect the left hand front low-frequency initiator electrical connector, FB013. 3.



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4. Measure the resistance between:

FB013, harness side	Battery
Pin 2	Negative terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

GO to Pinpoint Test G561999t9.

-> **No**

GO to Pinpoint Test G561999t6.

G561999t6 : Check the initiator circuit for short circuit to power

1. Measure the resistance between:

FB013, harness side	Battery
Pin 2	Positive terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

GO to Pinpoint Test G561999t10.

-> **No**

GO to Pinpoint Test G561999t7.

G561999t7 : Check the initiator circuit for short circuit to ground

1. Measure the resistance between:

FB013, harness side	Battery
Pin 1	Negative terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

GO to Pinpoint Test G561999t11.

-> **No**

GO to Pinpoint Test G561999t8.

G561999t8 : Check the initiator circuit for short circuit to power

1. Measure the resistance between:

FB013, harness side	Battery
Pin 1	Positive terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

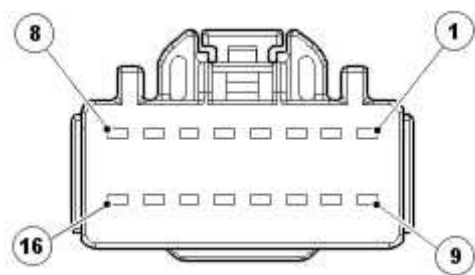
GO to Pinpoint Test G561999t12.

-> **No**

GO to Pinpoint Test G561999t13.

G561999t9 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



E63855

3. Measure the resistance between:

FB013, harness side	Battery
----------------------------	----------------

Pin 2	Negative terminal
-------	-------------------

- Is the resistance less than 10,000 ohms?

-> Yes

REPAIR the short circuit. This circuit contains intermediate connectors, FB001 and FL070. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> No

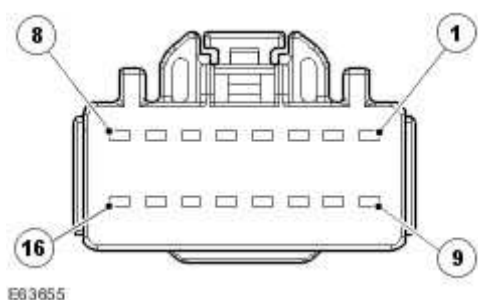
INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t10 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



3. Measure the resistance between:

FB013, harness side	Battery
Pin 2	Positive terminal

- Is the resistance less than 10,000 ohms?

-> Yes

REPAIR the short circuit. This circuit contains intermediate connectors, FB001 and FL070. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

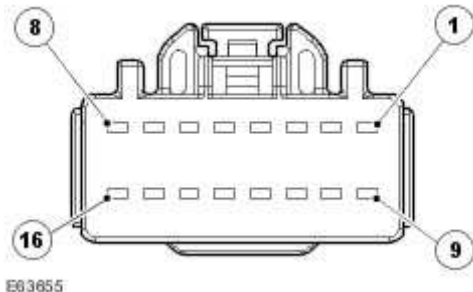
-> No

INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible
Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t11 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



3. Measure the resistance between:

FB013, harness side	Battery
Pin 1	Negative terminal

- **Is the resistance less than 10,000 ohms?**

-> **Yes**

REPAIR the short circuit. This circuit contains intermediate connectors, FB001 and FL070. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

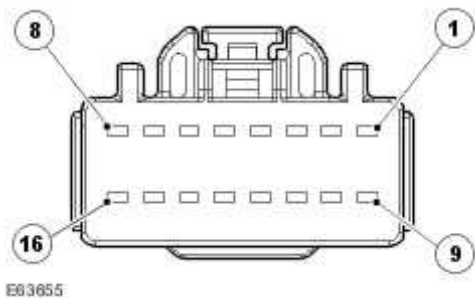
INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t12 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



3. Measure the resistance between:

FB013, harness side	Battery
Pin 1	Positive terminal

- Is the resistance less than 10,000 ohms?

-> Yes

REPAIR the short circuit. This circuit contains intermediate connectors, FB001 and FL070. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> No

INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t13 : Check the initiator circuit for high resistance

1. Measure the resistance between:

CA072, harness side	FB013, harness side
Pin 14	Pin 2

- Is the resistance greater than 5 ohms?

-> Yes

REPAIR the high resistance circuit. This circuit contains intermediate connectors, FB001 and FL070.

For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

GO to Pinpoint Test G561999t14.

G561999t14 : Check the initiator circuit for high resistance

1. Measure the resistance between:

CA072, harness side	FB013, harness side
Pin 13	Pin 1

- **Is the resistance greater than 5 ohms?**

-> **Yes**

REPAIR the high resistance circuit. This circuit contains intermediate connectors, FB001 and FL070. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

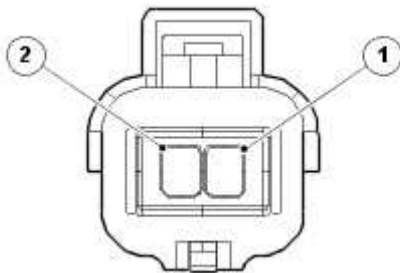
INSTALL a new left hand front low-frequency initiator.

Tire Pressure Monitoring System (TPMS) Front Antenna

PINPOINT TEST G561999p3 : RIGHT FRONT LOW FREQUENCY INITIATOR CIRCUIT

G561999t15 : Check the initiator circuit for short circuit to ground

1. Ignition off. 2. Disconnect the right hand front low-frequency initiator electrical connector, FB012. 3.



E63657

Measure the resistance between:

FB012, harness side	Battery
Pin 2	Negative terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

GO to Pinpoint Test G561999t19.

-> **No**

GO to Pinpoint Test G561999t16.

G561999t16 : Check the initiator circuit for short circuit to power

1. Measure the resistance between:

FB012, harness side	Battery
Pin 2	Positive terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

GO to Pinpoint Test G561999t20.

-> **No**

GO to Pinpoint Test G561999t17.

G561999t17 : Check the initiator circuit for short circuit to ground

1. Measure the resistance between:

FB012, harness side	Battery
Pin 1	Negative terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

GO to Pinpoint Test G561999t21.

-> **No**

GO to Pinpoint Test G561999t18.

G561999t18 : Check the initiator circuit for short circuit to power

1. Measure the resistance between:

FB012, harness side	Battery
Pin 1	Positive terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

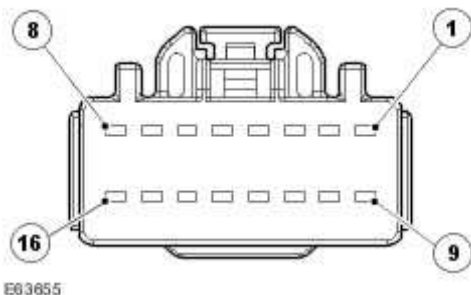
GO to Pinpoint Test G561999t22.

-> **No**

GO to Pinpoint Test G561999t23.

G561999t19 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



Measure the resistance between:

FB012, harness side	Battery
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Pin 2	Negative terminal
-------	-------------------

- Is the resistance less than 10,000 ohms?

-> Yes

REPAIR the short circuit. This circuit contains intermediate connectors, FB001 and FL070. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> No

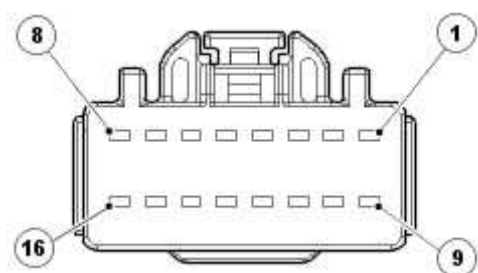
INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t20 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



E03655

Measure the resistance between:

FB012, harness side	Battery
Pin 2	Positive terminal

- Is the resistance less than 10,000 ohms?

-> Yes

REPAIR the short circuit. This circuit contains intermediate connectors, FB001 and FL070. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

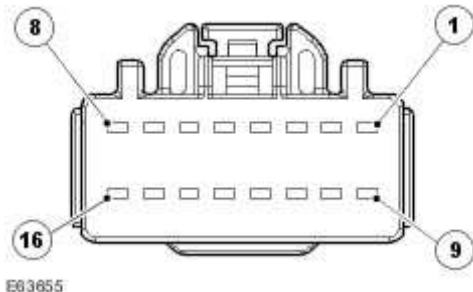
-> No

INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible
Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t21 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, FB072. 2.



Measure the resistance between:

FB012, harness side	Battery
Pin 1	Negative terminal

- **Is the resistance less than 10,000 ohms?**

-> **Yes**

REPAIR the short circuit. This circuit contains intermediate connectors, FB001 and FL070. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

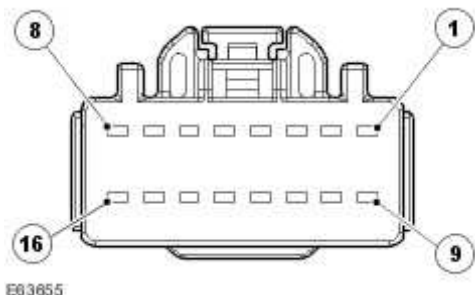
INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t22 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



Measure the resistance between:

FB012, harness side	Battery
Pin 1	Positive terminal

- Is the resistance less than 10,000 ohms?

-> Yes

REPAIR the short circuit. This circuit contains intermediate connectors, FB001 and FL070. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> No

INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t23 : Check the initiator circuit for high resistance

1. Measure the resistance between:

CA072, harness side	FB012, harness side
Pin 16	Pin 2

- Is the resistance greater than 5 ohms?

-> Yes

REPAIR the high resistance circuit. This circuit contains intermediate connectors, FB001 and FL070.

For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

GO to Pinpoint Test G561999t24.

G561999t24 : Check the initiator circuit for high resistance

1. Measure the resistance between:

CA072, harness side	FB012, harness side
Pin 15	Pin 1

- **Is the resistance greater than 5 ohms?**

-> **Yes**

REPAIR the high resistance circuit. This circuit contains intermediate connectors, FB001 and FL070. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

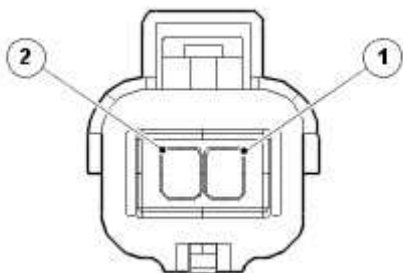
-> **No**

INSTALL a new right hand front low-frequency initiator.
Tire Pressure Monitoring System (TPMS) Front Antenna

PINPOINT TEST G561999p4 : LEFT REAR LOW FREQUENCY INITIATOR CIRCUIT

G561999t25 : Check the initiator circuit for short circuit to ground

1. Ignition off. 2. Disconnect the left hand rear low-frequency initiator electrical connector, RB010. 3.



E03657

Measure the resistance between:

RB010, harness side	Battery
Pin 2	Negative terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

GO to Pinpoint Test G561999t29.

-> **No**

GO to Pinpoint Test G561999t26.

G561999t26 : Check the initiator circuit for short circuit to power

1. Measure the resistance between:

RB010, harness side	Battery
Pin 2	Positive terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

GO to Pinpoint Test G561999t30.

-> **No**

GO to Pinpoint Test G561999t27.

G561999t27 : Check the initiator circuit for short circuit to ground

1. Measure the resistance between:

RB010, harness side	Battery
Pin 1	Negative terminal

- Is the resistance less than 10,000 ohms?

-> Yes

GO to Pinpoint Test G561999t31.

-> No

GO to Pinpoint Test G561999t28.

G561999t28 : Check the initiator circuit for short circuit to power

1. Measure the resistance between:

RB010, harness side	Battery
Pin 1	Positive terminal

- Is the resistance less than 10,000 ohms?

-> Yes

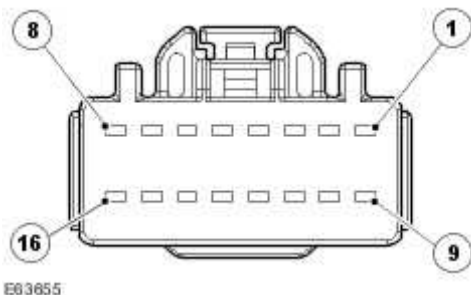
GO to Pinpoint Test G561999t32.

-> No

GO to Pinpoint Test G561999t33.

G561999t29 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



Measure the resistance between:

RB010, harness side	Battery
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Pin 2	Negative terminal
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- Is the resistance less than 10,000 ohms?

-> Yes

REPAIR the short circuit. This circuit contains intermediate connector, RB001. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> No

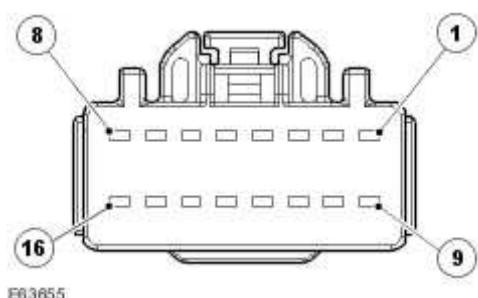
INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t30 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



E03655

Measure the resistance between:

RB010, harness side	Battery
Pin 2	Positive terminal

- Is the resistance less than 10,000 ohms?

-> Yes

REPAIR the short circuit. This circuit contains intermediate connector, RB001. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

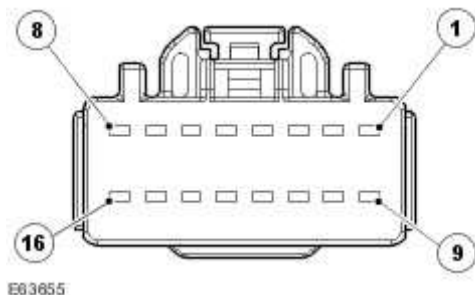
-> No

INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible
Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t31 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



Measure the resistance between:

RB010, harness side	Battery
Pin 1	Negative terminal

- **Is the resistance less than 10,000 ohms?**

-> **Yes**

REPAIR the short circuit. This circuit contains intermediate connector, RB001. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

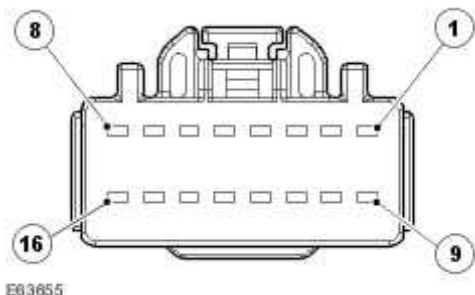
INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t32 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



Measure the resistance between:

RB010, harness side	Battery
Pin 1	Positive terminal

- **Is the resistance less than 10,000 ohms?**

-> **Yes**

REPAIR the short circuit. This circuit contains intermediate connector, RB001. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t33 : Check the initiator return circuit for high resistance

1. Measure the resistance between:

CA072, harness side	RB010, harness side
Pin 6	Pin 2

- **Is the resistance greater than 5 ohms?**

-> **Yes**

REPAIR the high resistance circuit. This circuit contains intermediate connector, RB001. For additional

information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

GO to Pinpoint Test G561999t35.

G561999t34 : Check the initiator circuit for high resistance

1. Measure the resistance between:

CA072, harness side	RB010, harness side
Pin 5	Pin 1

- **Is the resistance greater than 5 ohms?**

-> **Yes**

REPAIR the high resistance circuit. This circuit contains intermediate connector, RB001. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

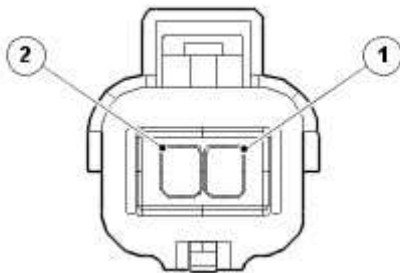
INSTALL a new rear left hand low-frequency initiator.

Tire Pressure Monitoring System (TPMS) Rear Antenna

PINPOINT TEST G561999p5 : RIGHT REAR LOW FREQUENCY INITIATOR CIRCUIT

G561999t35 : Check the initiator circuit for short circuit to ground

1. Ignition off. 2. Disconnect the right hand rear low-frequency initiator electrical connector, RB009. 3.



E63657

Measure the resistance between:

RB009, harness side	Battery
Pin 2	Negative terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

GO to Pinpoint Test G561999t39.

-> **No**

GO to Pinpoint Test G561999t36.

G561999t36 : Check the initiator circuit for short circuit to power

1. Measure the resistance between:

RB009, harness side	Battery
Pin 2	Positive terminal

- Is the resistance less than 10,000 ohms?

-> **Yes**

GO to Pinpoint Test G561999t40.

-> **No**

GO to Pinpoint Test G561999t37.

G561999t37 : Check the initiator circuit for short circuit to ground

1. Measure the resistance between:

RB009, harness side	Battery
Pin 1	Negative terminal

- Is the resistance less than 10,000 ohms?

-> Yes

GO to Pinpoint Test G561999t41.

-> No

GO to Pinpoint Test G561999t38.

G561999t38 : Check the initiator circuit for short circuit to power

1. Measure the resistance between:

RB009, harness side	Battery
Pin 1	Positive terminal

- Is the resistance less than 10,000 ohms?

-> Yes

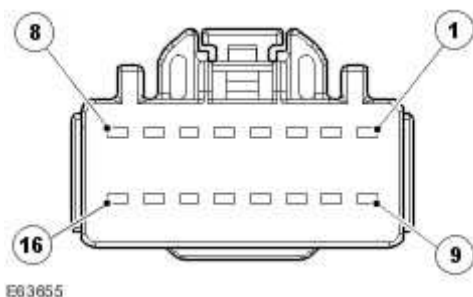
GO to Pinpoint Test G561999t42.

-> No

GO to Pinpoint Test G561999t43.

G561999t39 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



Measure the resistance between:

RB009, harness side	Battery
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Pin 2	Negative terminal
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- Is the resistance less than 10,000 ohms?

-> Yes

REPAIR the short circuit. This circuit contains intermediate connector, RB001. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> No

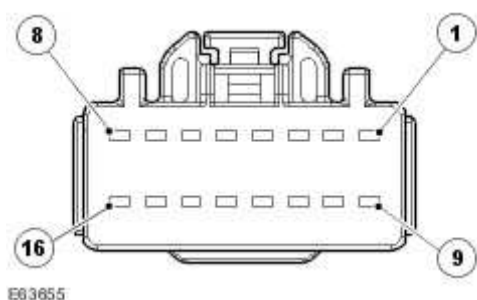
INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t40 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



E03655

Measure the resistance between:

RB009, harness side	Battery
Pin 2	Positive terminal

- Is the resistance less than 10,000 ohms?

-> Yes

REPAIR the short circuit. This circuit contains intermediate connector, RB001. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

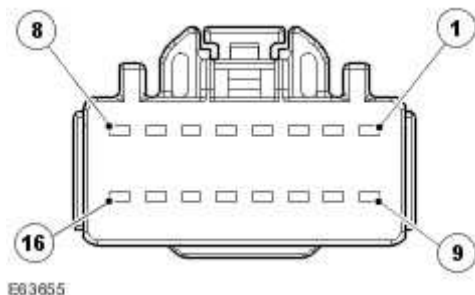
-> No

INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible
Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t41 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



Measure the resistance between:

RB009, harness side	Battery
Pin 1	Negative terminal

- Is the resistance less than 10,000 ohms?

-> Yes

REPAIR the short circuit. This circuit contains intermediate connector, RB001. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> No

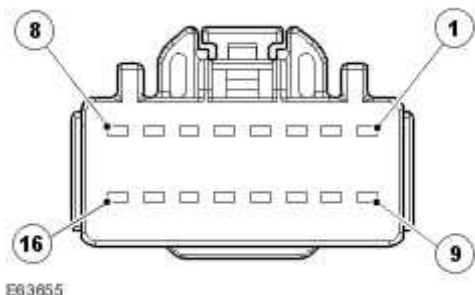
INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t42 : Check whether the short circuit is in the harness or the module

1. Disconnect the Tire Pressure Monitoring System module connector, CA072. 2.



E83855

Measure the resistance between:

RB009, harness side	Battery
Pin 1	Positive terminal

- **Is the resistance less than 10,000 ohms?**

-> **Yes**

REPAIR the short circuit. This circuit contains intermediate connector, RB001. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

INSTALL a new Tire Pressure Monitoring System module.

Tire Pressure Monitoring System (TPMS) Module - Convertible

Tire Pressure Monitoring System (TPMS) Module - 2-Door

G561999t43 : Check the initiator circuit for high resistance

1. Measure the resistance between:

CA072, harness side	RB009, harness side
Pin 8	Pin 2

- **Is the resistance greater than 5 ohms?**

-> **Yes**

REPAIR the high resistance circuit. This circuit contains intermediate connector, RB001. For additional

information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

GO to Pinpoint Test G561999t44.

G561999t44 : Check the initiator circuit for high resistance

1. Measure the resistance between:

CA072, harness side	RB009, harness side
Pin 7	Pin 1

- **Is the resistance greater than 5 ohms?**

-> **Yes**

REPAIR the high resistance circuit. This circuit contains intermediate connector, RB001. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

-> **No**

INSTALL a new rear right hand low-frequency initiator.

Tire Pressure Monitoring System (TPMS) Rear Antenna

PINPOINT TEST G561999p6 : MISSING, INCOMPATIBLE OR DEFECTIVE RUNNING TIRE LOW PRESSURE SENSOR OR RECEIVER

G561999t45 : Check for correct wheel and tire assembly and tire low pressure sensor

1. Establish that a full size running wheel and tire assembly has a tire low pressure sensor installed. As a visual confirmation, a tire low pressure sensor has a metal valve stem rather than a rubber one and cannot be installed to a mini/space saver spare wheel.

- **Is a full size wheel and tire assembly with tire low pressure sensor installed?**

-> **Yes**

GO to Pinpoint Test G561999t46.

-> **No**

Install the correct wheel and tire assembly or tire low pressure sensor, of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application.

G561999t46 : Check for additional DTCs

1. Remove the Tire Pressure Monitoring System power supply fuse and re-install it. Clear DTCs and leave the vehicle stationary for 15 minutes, then drive it at a speed greater than 15.5 mph (25 kph) continuously for at least 10 minutes. Note: If the vehicle speed drops below this value, the drive time to complete the test will need to be increased. The use of the manufacturer approved diagnostic system, and the datalogger signal 'Tire pressure monitor system status – learn mode status' will verify the completion of the test when the value returns to 'Inactive'. 2. Check for additional DTCs C1A5631, C1A5831, C1A6031, C1A6231, with identical time stamps.

- **Have all four DTCs logged with identical time stamps in the tire pressure monitoring system module?**

-> **Yes**

Replace the tire pressure monitoring system radio frequency receiver.

Tire Pressure Monitoring System (TPMS) Receiver

-> **No**

GO to Pinpoint Test G561999t47.

G561999t47 : Verify the position of the defective tire low pressure sensor

1. Check tire pressure monitoring system DTCs.

- **Are any C1AXX31 DTCs logged?**

-> **Yes**

Install the correct tire low pressure sensor, of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application, to the position identified by the logged DTC.

Tire Low Pressure Sensor

-> **No**

No further action is required. Note: The use of the manufacturer approved diagnostic system, and the datalogger signal 'Tire pressure monitor system status – learn completed successfully' will verify the successful completion of the test.

PINPOINT TEST G561999p7 : LOCALIZATION FAILURE

G561999t48 : Check for additional DTCs

1. Check for additional DTCs: C1A5711, C1A5712, C1A5713. C1A5911, C1A5912, C1A5913, C1A6111, C1A6112, C1A6113, C1A6311, C1A6312, C1A6313.

- Are any of the DTCs listed above also logged?

-> **Yes**

Refer to the DTC Index and remedial actions.

-> **No**

GO to Pinpoint Test G561999t49.

G561999t49 : Check for additional DTCs

1. Check for additional DTCs: C1A5631, C1A5831, C1A6031 or C1A6231

- Is a C1A5631, C1A5831, C1A6031 or C1A6231 DTC also logged?

-> **Yes**

Refer to the DTC Index and remedial actions.

-> **No**

GO to Pinpoint Test G561999t50.

G561999t50 : Check Initiator installation

1. Check for correct installation of Initiator.

Tire Pressure Monitoring System (TPMS) Front Antenna

Tire Pressure Monitoring System (TPMS) Rear Antenna

- Is the Initiator correctly installed?

-> **Yes**

GO to Pinpoint Test G561999t51.

-> **No**

Rectify as required.

Tire Pressure Monitoring System (TPMS) Front Antenna

Tire Pressure Monitoring System (TPMS) Rear Antenna

G561999t51 : Check for short circuit in Initiator harness

1. Locate and remove module blue connector L. 2. Measure the resistance across the relevant initiator circuits within the blue connector.

- **Is the resistance less than 1 Ohm?**

-> **Yes**

A value of less than 1 Ohm indicates a short circuit, rectify the short circuit as required.

-> **No**

Install the correct tire low pressure sensor, of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application, to the position identified by the logged DTC.

Tire Low Pressure Sensor

PINPOINT TEST G561999p8 : SPARE TIRE LOW PRESSURE SENSOR NO OPERATION

G561999t52 : Establish the type of spare wheel and tire assembly installed

1. Establish the type of spare wheel and tire assembly Installed.

- **Is the spare wheel a mini/space saver type?**

-> **Yes**

Tire low pressure sensors are not installed to mini/space-saver spare wheels. Tire low pressure sensors are installed to full size spare wheels only. The DTC is to be ignored and no repair action is required.

-> **No**

GO to Pinpoint Test G561999t53.

G561999t53 : Establish that the spare wheel has a tire low pressure sensor installed

1. Establish that the spare wheel has a tire low pressure sensor installed, considering the following additional information:

a) As a visual confirmation, the tire low pressure sensor has a metal valve stem rather than a rubber one.

- **Is a tire low pressure sensor installed?**

-> **Yes**

GO to Pinpoint Test G561999t54.

-> **No**

A new spare tire low pressure sensor should be installed. Note: Refer to the note above the DTC index about replacing components which may remain under manufacturer warranty. Refer to the relevant section of the workshop manual.

G561999t54 : Confirm operation of the spare wheel pressure sensor

1. Deflate the spare tire, in close proximity to the vehicle, until it is completely deflated. 2. Complete an ignition cycle to ignition on and verify that the instrument cluster reports a spare tire pressure warning for approximately 20 seconds. 3. Re-inflate the spare tire, in close proximity to the vehicle, to the recommended spare tire pressure. 4. Complete an ignition cycle to ignition on and verify that the instrument cluster no longer reports a spare tire pressure warning.

- **Does the instrument cluster continue to report a spare tire pressure warning?**

-> **Yes**

GO to Pinpoint Test G561999t55.

-> **No**

No repair action is required. It is possible that the customer may have placed items in the vehicle's luggage compartment that prevented correct RF reception.

G561999t55 : Verify that the spare Tire Low Pressure Sensor ID has been correctly programmed to the module

1. Remove tire low pressure sensor. Record the 8 character hexadecimal ID written on the casing. 2. Use the approved diagnostic system to read the spare tire sensor ID from the module. Refer to the relevant procedure in the workshop manual. 3. Compare the IDs from steps 1 & 2.

- **Do the IDs match?**

-> **Yes**

Replace the spare tire low pressure sensor. Refer to the relevant installation section in the workshop manual.

The identification for the sensor must be programmed into the tire pressure monitoring system module using the manufacturer approved diagnostic system. The identification code is provided on a label with the complete assembly and is also printed on the casing of each sensor.

-> **No**

Program the spare tire sensor ID, recorded in step 1, to the module using the approved diagnostic system. The identification code is provided on a label with the complete assembly and is also printed on the casing of each sensor.

Repeat test to ensure correct operation. GO to Pinpoint Test G561999t54.

PINPOINT TEST G561999p9 : C1D1912 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO POWER

G561999t56 : C1D1912 Verify External Receiver Data Line Circuit Short To Power

1. Ignition off. 2. Disconnect the Tire Pressure Monitoring System Receiver electrical connector, CA131. 3. Measure the resistance between

CA131, harness side	Battery
Pin 1	Positive terminal

- Is the resistance less than 5 Ohms?

-> **Yes**

GO to Pinpoint Test G561999t57.

-> **No**

GO to Pinpoint Test G561999t58.

G561999t57 : C1D1912 Check The External Receiver Data Line Circuit For Short Circuit To Power

1. Disconnect the Tire Pressure Monitoring System Control Module electrical connector, CA109. 2. Measure the resistance between

CA131, harness side	Battery
Pin 1	Positive terminal

- Is the resistance less than 5 Ohms?

-> Yes

REPAIR the short circuit in wiring harness.

-> No

GO to Pinpoint Test G561999t59.

G561999t58 : C1D1912 Check The Tire Pressure Monitoring System External Receiver For Short Circuit To Power

1. Reconnect the Tire Pressure Monitoring System Receiver electrical connector, CA131. 2. Using manufacturer approved diagnostic system run On Demand Self Test (0x0202).

- Is the DTC C1D1912 set?

-> Yes

Replace Tire Pressure Monitoring Receiver.

-> No

Investigate possible cause of intermittent failure.

G561999t59 : C1D1912 Check The Tire Pressure Monitoring System Control Module For Short Circuit To Power

1. Reconnect the Tire Pressure Monitoring System Control Module electrical connector, CA109. 2. Reconnect the Tire Pressure Monitoring System Receiver electrical connector, CA131. 3. Using manufacturer approved diagnostic system run On Demand Self Test (0x0202).

- Is the DTC C1D1912 set?

-> Yes

Replace Tire Pressure Monitoring System Control Module.

-> No

Investigate possible cause of intermittent failure.

PINPOINT TEST G561999p10 : C1D1987 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE MISSING MESSAGE

G561999t60 : C1D1987 Verify External Receiver Data Line Missing Message

1. Using manufacturer approved diagnostic system run On Demand Self Test (0x0202).

- **Is the DTC C1D1987 set?**

-> **Yes**

GO to Pinpoint Test G561999t61.

-> **No**

GO to Pinpoint Test G561999t64.

G561999t61 : C1D1987 Check External Receiver Data Line Circuit

1. Ignition off. 2. Disconnect the Tire Pressure Monitoring System Receiver electrical connector, CA131. 3. Disconnect the Tire Pressure Monitoring System Control Module electrical connector, CA109 4. Measure the resistance between

CA131, harness side	CA109, harness side
Pin 1	Pin4

- **Is the resistance less than 5 ohms?**

-> **Yes**

GO to Pinpoint Test G561999t62.

-> **No**

REPAIR the high resistance/open circuit in wiring harness.

G561999t62 : C1D1987 Check External Receiver

1. Reconnect the Tire Pressure Monitoring System Control Module electrical connector, CA109 2. Reconnect the Tire Pressure Monitoring System Receiver electrical connector, CA131. 3. Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.

- **Is the DTC C1D1987 set?**

-> **Yes**

Replace Tire Pressure Monitoring Receiver. GO to Pinpoint Test G561999t63.

-> **No**

Investigate possible cause of intermittent failure.

G561999t63 : C1D1987 Check Tire Pressure Monitoring System Control Module

1. Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.

- **Is the DTC C1D1987 set?**

-> **Yes**

Replace Tire Pressure Monitoring System Control Module.

-> **No**

Test is complete. No further action is required.

G561999t64 : C1D1987 Check Wheels Have Tire Sensors Installed

1. **NOTE:**

As a visual check, a tire low pressure sensor has a metal valve stem rather than a rubber one and cannot be installed to a mini/space saver spare wheel.

Check that all full size running wheel and tire assemblies have tire low pressure sensors installed.

- **Is a full size wheel and tire assembly with tire low pressure sensor installed to all running wheel positions?**

-> **Yes**

GO to Pinpoint Test G561999t65.

-> **No**

If agreed with the customer install correct tire low pressure sensors in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application, as required. Note: Confirm why the vehicle has non-TPMS wheel & tire assemblies fitted before installing tire low pressure sensors, which are not to be claimed under vehicle warranty.

G561999t65 : C1D1987 Check Tire Sensor Compatibility To Tire Pressure Monitoring System Receiver

1. Remove tire low pressure sensor from 1 wheel. 2. Verify the tire low pressure sensor part number from the information on the casing.

- **Is the tire low pressure sensor the correct part for the vehicle?**

-> **Yes**

Replace Tire Pressure Monitoring Receiver. Carry out the following to verify repair.

Remove the Tire Pressure Monitoring System power supply fuse and re-install it. Clear DTCs and leave the vehicle stationary for 15 minutes, then drive it at a speed greater than 15.5 mph (25 kph) continuously for at least 10 minutes.

Note: If the vehicle speed drops below this value, the drive time to complete the test will need to be increased. The use of the manufacturer approved diagnostic system, and the datalogger signal 'Tire pressure monitor system status – learn mode status' will verify the completion of the test when the value returns to 'Inactive'.

-> No

Install the correct tire low pressure sensor, of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application, to the position(s) identified. Note: Confirm why the vehicle has incorrect TPMS wheel & tire assemblies fitted before installing tire low pressure sensors, which are not to be claimed under vehicle warranty.

Wheels and Tires - VIN Range: B00379- >B10571

Principle of Operation

For a detailed description of the wheels and tires, refer to the relevant Description and Operation section in the workshop manual.

Wheels and Tires

Inspection and Verification

1 . Verify the customer complaint.

NOTE:

Record any messages displayed by the system.

2 . Visually inspect for obvious signs of damage and system integrity.

Mechanical	Electrical
• Tire pressures • Tire/Wheel damage. Refer to component tests in this section • Tire low pressure sensor installation/damage • Front antenna installation/damage • Rear antenna installation/damage	• Fuses • Front antenna installation/damage • Rear antenna installation/damage • Tire Pressure Monitoring System (TPMS) module • Connectors/harnesses

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

4 . If the cause is not visually evident use the Jaguar approved diagnostic system or a scan tool to retrieve the Diagnostic Trouble Codes (DTCs) before proceeding to the DTC Index.

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 or a component 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/component.

NOTE:

Generic scan tools may not read the codes listed, or may read only five digit codes. If this is the case, 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 extra information read by the manufacturer-approved diagnostic system).

NOTE:

When performing 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:

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
C1A5616	Left hand front tire low pressure sensor	Low battery detected	Replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A5631	Left hand front tire low pressure sensor	No signal detected	Check for stored DTC C1A5616 and follow the actions indicated. If this DTC is not stored replace the tire low pressure sensor. Tire Low Pressure

			Sensor
C1A5691	Left hand front tire low pressure sensor	Data out of range	Replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A5693	Left hand front tire low pressure sensor	No sensor can be found at this location	Check for stored DTCs C1A5711, C1A5712, C1A5713 or C1A5631 and follow the actions indicated.
C1A5711	Left hand front antenna	Left hand front antenna circuit - short to ground	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1A5712	Left hand front antenna	Left hand front antenna circuit - short to power	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1A5713	Left hand front antenna	Left hand front antenna circuit - high resistance	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1A5816	Right hand front tire low pressure sensor	Low battery detected	Replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A5831	Right hand front tire low pressure sensor	No signal detected	Check for stored DTC C1A5816 and follow the actions indicated. If this DTC is not stored replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A5891	Right hand front tire low pressure	Data out of range	Replace the tire low pressure sensor. Tire Low Pressure

	sensor		Sensor
C1A5893	Right hand front tire low pressure sensor	No sensor can be found at this location	Check for stored DTCs C1A5911, C1A5912, C1A5913 or C1A5831 and follow the actions indicated.
C1A5911	Right hand front antenna	Right hand front antenna circuit - short to ground	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1A5912	Right hand front antenna	Right hand front antenna circuit - short to power	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1A5913	Right hand front antenna	Right hand front antenna circuit - high resistance	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1A6016	Left hand rear tire low pressure sensor	Low battery detected	Replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A6031	Left hand rear tire low pressure sensor	No signal detected	Check for stored DTC C1A6016 and follow the actions indicated. If this DTC is not stored replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A6091	Left hand rear tire low pressure sensor	Data out of range	Replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A6093	Left hand rear tire low pressure	No sensor can be found at this location	Check for stored DTCs C1A6111, C1A6112, C1A6113 or C1A6031

	sensor		and follow the actions indicated.
C1A6111	Left hand rear antenna	Left hand rear antenna circuit - short to ground	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1A6112	Left hand rear antenna	Left hand rear antenna circuit - short to power	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1A6113	Left hand rear antenna	Left hand rear antenna circuit - high resistance	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1A6216	Right hand rear tire low pressure sensor	Low battery detected	Replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A6231	Right hand rear tire low pressure sensor	No signal detected	Check for stored DTC C1A6216 and follow the actions indicated. If this DTC is not stored replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A6291	Right hand rear tire low pressure sensor	Data out of range	Replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A6293	Right hand rear tire low pressure sensor	No sensor can be found at this location	Check for stored DTCs C1A6311, C1A6312, C1A6313 or C1A6231 and follow the actions indicated.
C1A6311	Right hand rear	Right hand rear antenna	Carry out any pinpoint tests associated with this

	antenna	circuit - short to ground	DTC using the manufacturer approved diagnostic system
C1A6312	Right hand rear antenna	Right hand rear antenna circuit - short to power	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1A6313	Right hand rear antenna	Right hand rear antenna circuit - high resistance	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1A6416	Spare tire low pressure sensor	Low battery detected	Replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A6491	Spare tire low pressure sensor	Data out of range	Replace the tire low pressure sensor. Tire Low Pressure Sensor
C1A6493	Spare tire low pressure sensor	No sensor can be found at this location	If the vehicle has a temporary spare wheel and tire installed take no action. Check for stored DTC C1A6416 and follow the actions indicated. If this DTC is not stored replace the tire low pressure sensor. Tire Low Pressure Sensor
C1D1800	Location failure	The control module cannot locate the sensor	Check for DTCs indicating a component fault
C1D1911	External receiver data line short to ground	External receiver data line circuit - short to ground	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

C1D1912	External receiver data line short to power	External receiver data line circuit - short to power	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D1987	External receiver message missing	External receiver data line circuit - high resistance	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U001088	Medium speed CAN	Bus OFF	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U015500	Lost communications with instrument cluster	Lost communications with instrument cluster	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U014000	Lost communication with CJB	Lost communication with CJB	For Network tests. Communications Network
U014200	Lost communication with RJB	Lost communication with RJB	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U016400	Lost communication with climate control module	Lost communication with climate control module	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U030000	Internal control module software incompatibility	Invalid configuration message is received	Re-configure the RJB using the manufacturer approved diagnostic system. Clear the DTC and retest. If the DTC is still logged suspect the TPMS module, refer to the new module

			installation note at the top of the DTC Index
U041600	Invalid data received from ABS control module	Vehicle speed signal fault	Check ABS module for DTCs and refer to DTC Index. Anti-Lock Control - Stability Assist
U042400	Invalid data received from climate control module	Invalid data received from climate control module	Check climate control module for DTCs and refer to DTC Index. Climate Control System
U1A1449	CAN error	Internal electronic failure	Install a new TPMS module, refer to the new module installation note at the top of the DTC Index
U300087	Control Module	Missing message	Re-configure the RJB using the manufacturer approved diagnostic system. Check TPMS module for DTCs and refer to the DTC Index. Check CAN network integrity using the manufacturer approved diagnostic system
U300281	Vehicle Identification Number (VIN)	Vehicle/component mismatch. Corrupt VIN data being transmitted, module previously installed to other vehicle	Install original module, check for DTCs and refer to relevant DTC Index

Component Tests

Wheels and Tires

For wheel and tire specification information (pressures, torques, etc).
Specifications

When replacing wheels or tires, local legislation regarding health and safety must be complied with.

If the vehicle has TPMS installed, only Jaguar approved wheels and tires should be used. If the wheel

and tire size is changed (for example from R18 to R20) the TPMS module should be updated with the correct pressure information appropriate to the new wheel and tire set. Update the TPMS module using the Jaguar approved diagnostic system.

As a general guideline, only replace tires in pairs or as a set, and only with tires of equivalent size and specification.

Confirm the symptoms of the customer complaint.

As much information as possible should be gathered from the driver to assist in diagnosing the cause(s).

1 . Before a road test, carry out a basic inspection to make sure the vehicle is safe and legal to drive.

Basic inspection

- Correct tire inflation.
Specifications
- Legal tire tread depth
- Cuts/Bulges in tire sidewall(s)
- Tire ply separation
- Embedded objects
- Wheel rim damage
- Correct tire installation (specification, direction of rotation, etc)
- Any obvious distortion of the tire (flat/high spots)
- Worn/Damaged steering or suspension components.
Front Suspension
Rear Suspension

Road test

If the results of the basic inspection are acceptable, carry out a road test to confirm the symptoms.

To reproduce the symptoms, test the vehicle on similar roads to those on which the fault occurs and at similar speeds (provided it is legal to do so).

If the vibration or noise can be reproduced, note the speed at which it occurs and see if it is possible to drive through the symptom, meaning, is it possible to alter the fault by driving faster or slower than the speed at which it occurs?

If it **is** possible, it is likely that the fault is caused by an imbalance in the wheel or tire.

If the vibration or noise gets worse as the vehicle speed increases, it is likely that the fault is caused by distortion in the wheel or tire, or worn or damaged components.

Distortion checks

Check for distortion by raising the vehicle so that the wheels are free and placing an axle stand or similar fixed object next to each wheel in turn.

If the stand is placed at the tread of the tire, the tire can be checked for ovality by turning the wheel by hand and checking for high or low spots where the gap between the tread and the stand increases or reduces.

If the stand is placed next to the wheel rim or tire sidewall, the wheel and tire can be checked for run-out in a similar way.

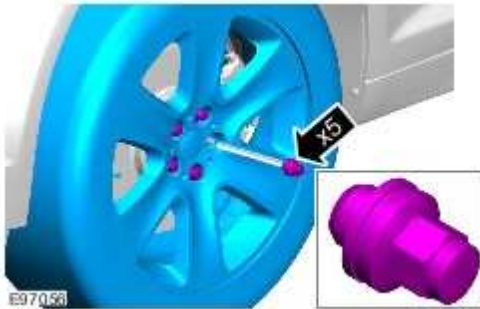
Wheel and Tire (74.20.05)

Removal

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

Raise and support the vehicle.

2. TORQUE: 125 Nm



Installation

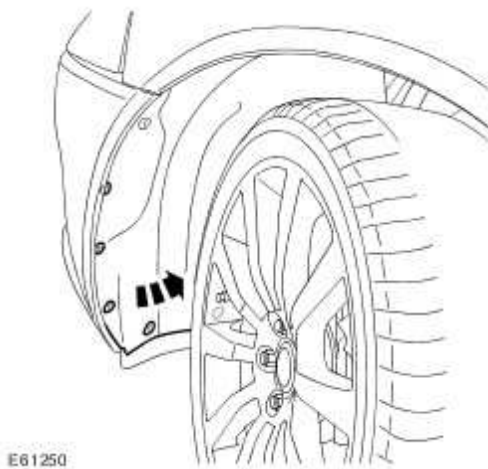
1.  **CAUTION:** Apply a small amount of grease to the bore and spigot areas of the wheel before installation. Make sure the grease does not come into contact with the vehicles braking components and the wheel stud threads. Failure to follow these instructions may result in personal injury.

To install, reverse the removal procedure.

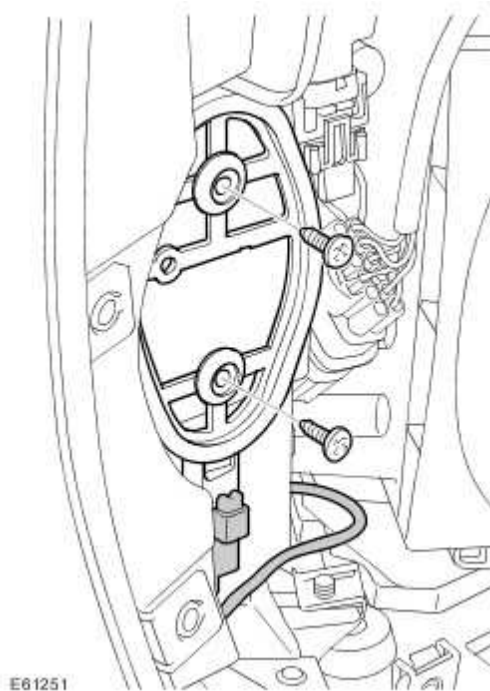
Tire Pressure Monitoring System (TPMS) Front Antenna

Removal

- 1 . Disconnect the battery ground cable.
For additional information, refer to
- 2 . Turn the steering on to full lock for access.
- 3 . Release the front of the fender splash shield.
 - ▶ Remove the 5 Torx bolts.
 - ▶ Tie the splash shield aside.



- 4 . Remove the tire pressure antenna.
 - ▶ Disconnect the electrical connector.
 - ▶ Remove the 2 clips.



Installation

1 . Install the tire pressure antenna.

▶ Install the clips.

▶ Connect the electrical connector.

2 . Install the fender splash shield.

▶ Tighten the Torx bolts.

3 . Connect the battery ground cable.
For additional information, refer to

Tire Pressure Monitoring System (TPMS) Rear Antenna

Removal

- 1 . Disconnect the battery ground cable.

For additional information, refer to

2



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

Raise and support the vehicle.

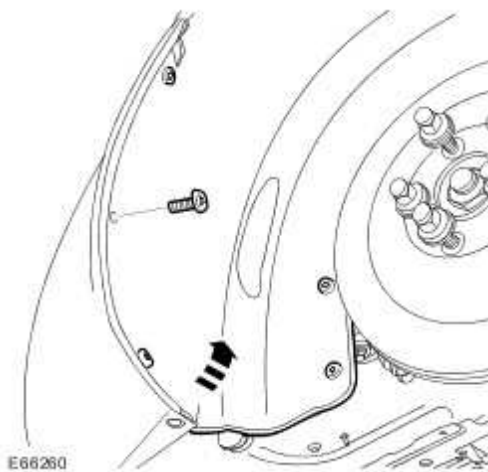
- 3 . Remove the LH rear wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

- 4 . Release the rear lower edge of the rear fender splash shield.

▶ Remove the 5 Torx bolts.

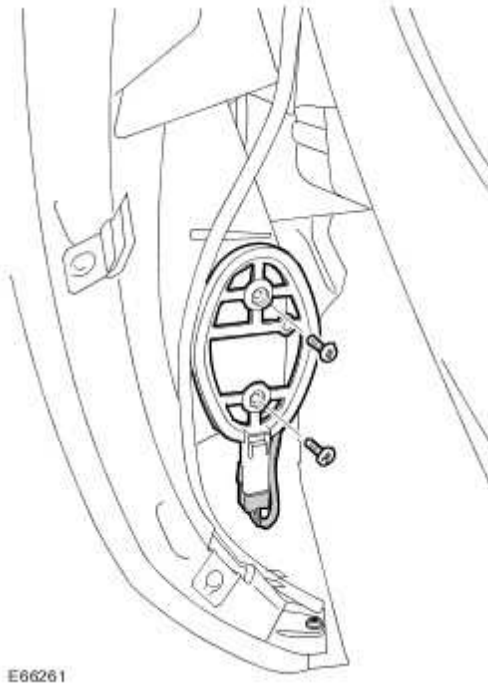
▶ Tie the splash shield aside.



5 . Remove the tire pressure antenna.

▶ Disconnect the electrical connector.

▶ Remove the 2 clips.



Installation

1 . Install the tire pressure antenna.

▶ Install the clips.

▶ Connect the electrical connector.

2 . Install the fender splash shield.

▶ Tighten the Torx bolts.

3 . Install the wheel and tire assembly.

For additional information, refer to Wheel and Tire (74.20.05)

- 4 . Connect the battery ground cable.
For additional information, refer to

Tire Pressure Monitoring System (TPMS) Module - Convertible

Removal

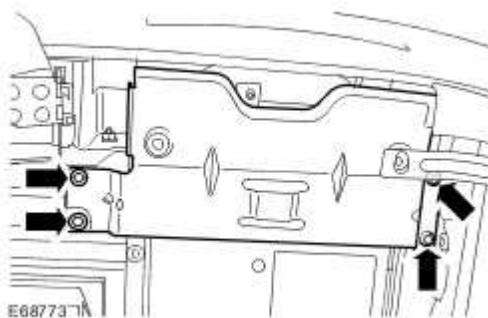
1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to

2 . Make the SRS system safe.

3 . Remove the LH roll over protection unit.

4 . Remove the rear seat RH backrest retaining bracket.

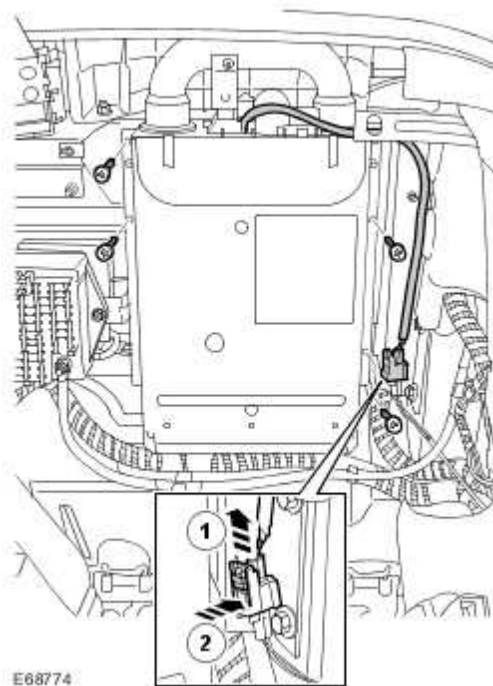
▶ Remove the 2 nuts and 2 bolts.



5 . Remove the RH roll over protection unit.

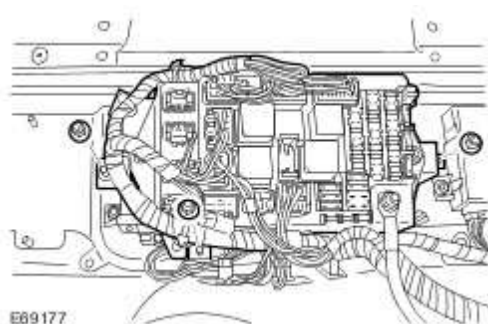
▶ Disconnect the electrical connector.

▶ Remove the 4 Torx bolts.



6 . Release the auxiliary junction box mounting bracket.

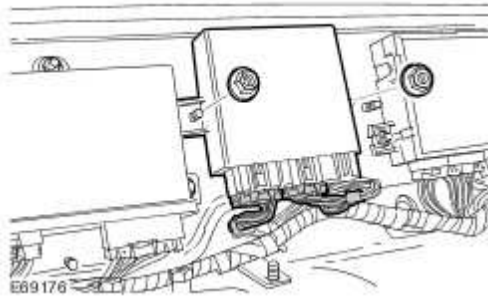
► Remove the 3 nuts.



7 . Remove the tire pressure monitoring module.

► Remove the 2 nuts.

► Disconnect the 2 electrical connectors.



Installation

1 . Install the tire pressure monitoring module.

▶ Tighten the nuts to 10 Nm (7 lb.ft).

▶ Connect the electrical connectors.

2 . Secure the auxiliary junction box mounting bracket.

▶ Tighten the nuts to 10 Nm (7 lb.ft).

3 . Install the rear seat RH backrest retaining bracket.

▶ Tighten the nuts and bolts to 10 Nm (7 lb.ft).

4 . Install the RH roll over protection unit.

▶ Tighten the Torx bolts to 25 Nm (18 lb.ft).

▶ Connect the electrical connector.

5 . Install the LH roll over protection unit.

6 . Connect the battery ground cable and install the cover.

For additional information, refer to

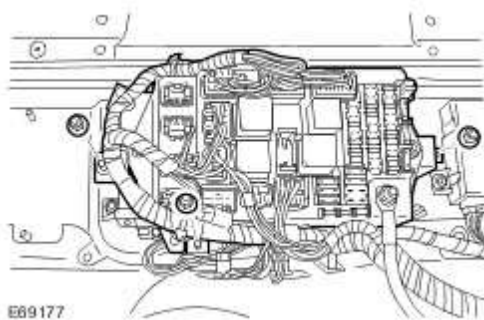
7 . Using WDS, configure a new module.

Tire Pressure Monitoring System (TPMS) Module - 2-Door

Removal

- 1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to
- 2 . Remove the rear seat backrest.
For additional information, refer to Rear Seat Backrest (76.70.38)
- 3 . Release the auxiliary junction box mounting bracket.

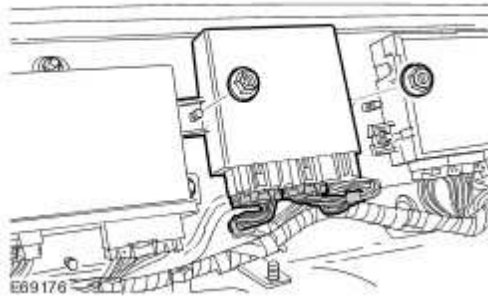
▶ Remove the 3 nuts.



- 4 . Remove the tire pressure monitoring module.

▶ Remove the 2 nuts.

▶ Disconnect the 2 electrical connectors.



Installation

1 . Install the tire pressure monitoring module.

▶ Tighten the nuts to 10 Nm (7 lb.ft).

▶ Connect the electrical connectors.

2 . Secure the auxiliary junction box mounting bracket.

▶ Tighten the nuts to 10 Nm (7 lb.ft).

3 . Install the rear seat backrest.

For additional information, refer to Rear Seat Backrest (76.70.38)

4 . Connect the battery ground cable and install the cover.

For additional information, refer to

5 . Using WDS, configure a new module.

Tire Low Pressure Sensor

Removal

NOTE:

It is strongly recommended that the valve seal and steel washer is replaced each time a tire is changed to avoid a seal failure. The seal and washer must be replaced if the sensor is removed. Removal of the sensor retaining nut must be regarded as sensor removal. The valve cap must always be in place except when inflating, releasing pressure or checking pressure.

1



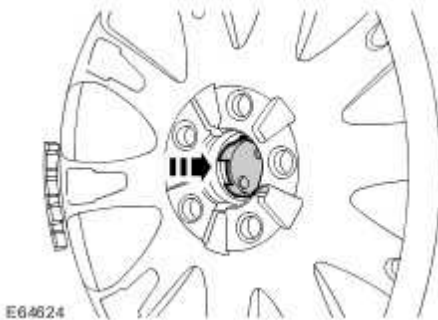
WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2 . Remove the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

3 . Remove the wheel trim.



4



CAUTION: To avoid damage to the tire low pressure sensor, release the tire bead from the rim, 180 degrees from the valve.

Remove the tire from the wheel.

5



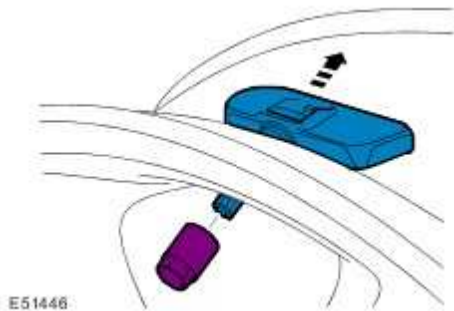
CAUTION: Do not push on the valve.



CAUTION: If the tire low pressure sensor is to be re-installed, a new washer, seal and nut must be installed.

Remove the tire low pressure sensor.

- ▶ Remove the nut.
- ▶ Release and withdraw the sensor along the valve axis.



6 If necessary, install a new seal and washer.

- ▶ Remove and discard the seal and washer.
- ▶ Install a new washer and seal, making sure the valve remains pressed fully onto its seat.



Installation

- 1  **CAUTION:** Do not use compressed air to clean the sensor. Do not clean the sensor with solvents or cleaning agents of any type, use a clean dry cloth.

Clean the component mating faces.

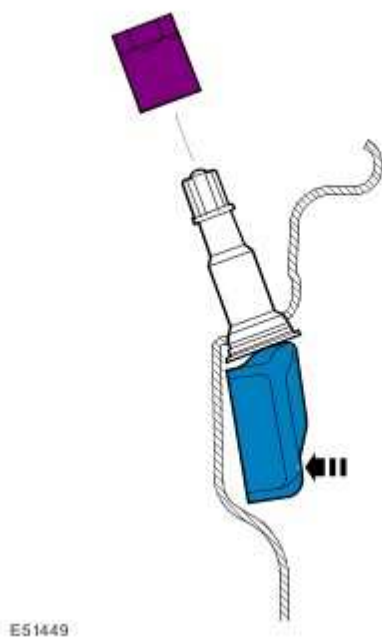
- 2  **CAUTION:** Do not apply any lubricant to the new valve.

NOTE:

If the sensor is replaced on a 'running' wheel, the new sensor identification will be learnt in the first 15 minutes of the vehicle is being driven. If a new sensor is fitted to the spare wheel the identification for that sensor must be programmed into the Tire Pressure Monitoring System (TPMS) module using WDS. The identification code is provided on a label with the complete assembly and is also printed on the sensor assembly.

Install the tire low pressure sensor.

-  Install and hand tighten the nut whilst keeping the sensor in place.
-  Tighten the nut to 6.5 Nm (4.8 lb.ft).



3 . Install the tire and balance the wheel.

4 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

5 . Install the wheel trim.

Tire Pressure Monitoring System (TPMS) Receiver

Removal

- 1 . Remove the floor console.

For additional information, refer to Floor Console (76.25.01)

- 2 . Remove the tire pressure monitoring receiver.

▶ Disconnect the electrical connector.

▶ Release from the mounting pad.



Installation

- 1 . Install the tire pressure monitoring receiver.

▶ Connect the electrical connector.

▶ Secure to the mounting pad.

- 2 . Install the floor console.

For additional information, refer to Floor Console (76.25.01)

204-05 : Vehicle dynamic suspension

Specifications

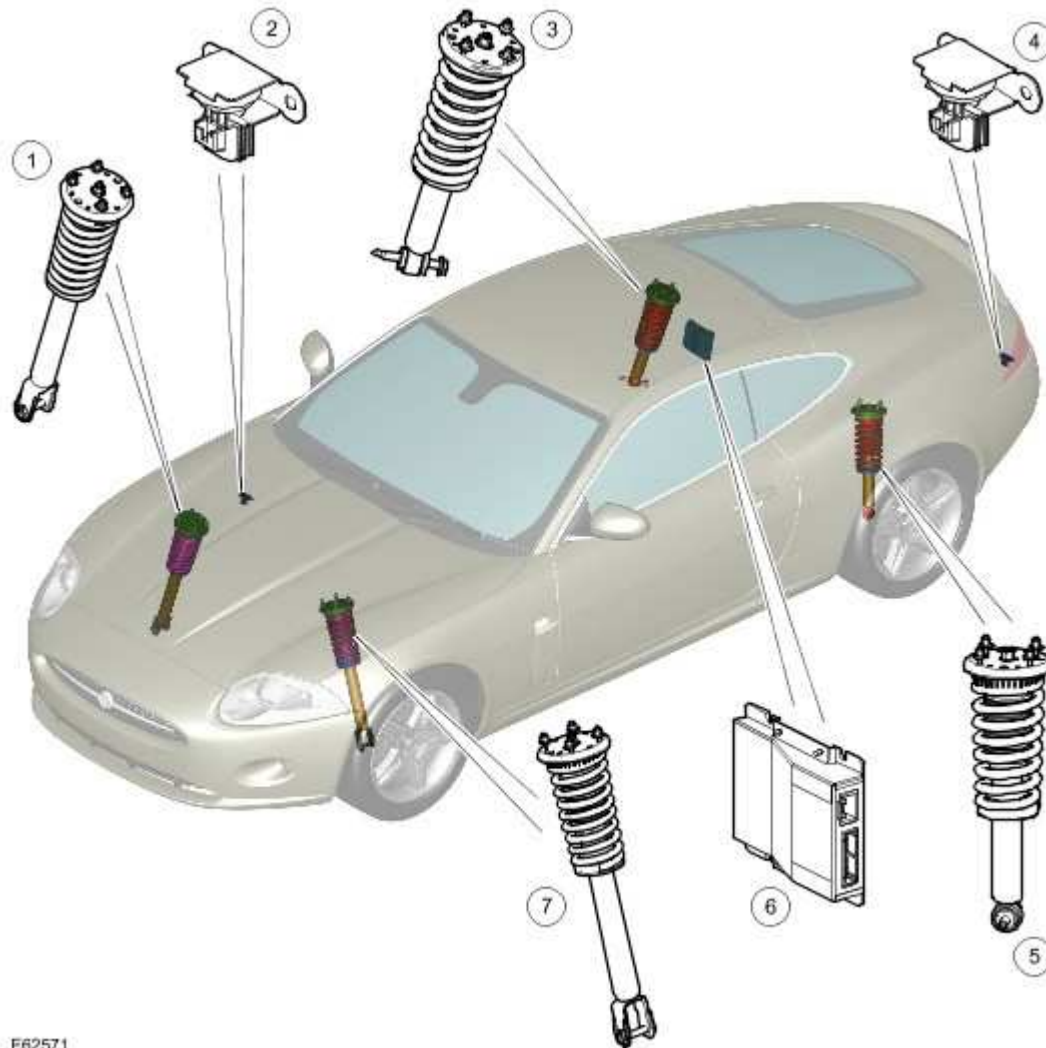
Specifications

Torque Specifications

Item	Nm	lb-ft	lb-in
Accelerometer - bolt	8	6	71
Adaptive damping control module - nut	4	3	35
Front shock absorber.	-	-	-
Rear shock absorber.	-	-	-

Vehicle Dynamic Suspension

COMPONENT LOCATION



E62571

Item	Part Number	Description
1		Right Hand (RH) front spring and damper assembly
2		Front vertical acceleration sensor
3		RH rear spring and damper assembly
4		Rear vertical acceleration sensor

5		Left Hand (LH) rear spring and damper assembly
6		Adaptive Damping Control Module (ADCM)
7		LH front spring and damper assembly

INTRODUCTION

An adaptive damping system, known as Computer Active Technology Suspension (CATS) is available on certain models. The CATS system is an electronically controlled suspension system which constantly adjusts the damping characteristics of the suspension dampers in reaction to the current driving conditions.

The system is controlled by an Adaptive Damping Control Module (ADCM) which is located behind the backrest of the RH rear passenger seat. The ADCM receives signals from two dedicated vertical acceleration sensors in addition to inputs from other electronic system components to determine vehicle body motion and driver inputs. These signals are used by the ADCM to control the damping characteristics of each damper from soft to firm to give the optimum vehicle ride.

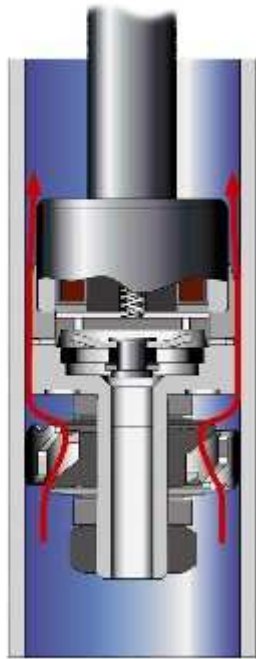
DAMPERS

The CATS dampers are monotube, nitrogen gas and oil filled units, manufactured by Bilstein. The dampers have a two-stage adjustment which allows the damping force to be electrically adjusted when the vehicle is being driven. The two stage dampers provide the optimum compromise between performance handling and ride comfort.

The CATS dampers can be easily identified by an electrical connector on the end of the piston rod, in the center of the top mount.

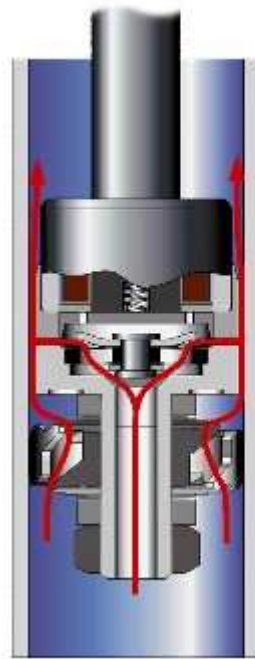
The two-stage adjustment is achieved by a solenoid controlled valve. When the solenoid valve is deenergized, the damper is on its firm setting and oil flow is restricted to flowing at a controlled rate through orifices in the damper piston. The restricted oil flow stiffens the damper action improving the handling when braking, accelerating and cornering.

A



E72756

B



Item	Part Number	Description
A		Firm setting
B		Soft setting

The solenoid is connected to a by-pass valve which allows additional oil flow through the damper. When the solenoid is energized, the valve is lifted from its seat, allowing oil to flow through a hollow piston rod in the center of the damper piston and out through additional orifices. The increased oil flow softens the damper action providing a more comfortable ride quality.

The solenoid is operated by a 400 Hz Pulse Width Modulation (PWM) signal from the ADCM. When energized, the ADCM applies a 1.3 Ampere (A) push current for 75 milliseconds to move the valve and then applies a 0.5 A hold current to operate the damper in the 'soft' setting. For additional information, refer to Vehicle Dynamic Suspension (204-05)

ACCELERATION SENSORS

Two acceleration sensors are used in the CATS system. The front sensor is located in the rear of the RH front wheel arch, behind the washer reservoir. The rear sensor is mounted in the luggage compartment, in the rear LH corner adjacent to the rear lamp assembly.

The sensors measure acceleration in the vertical plane and output a corresponding analogue signal to the ADCM.

Each sensor is connected to the ADCM via three wires which supply ground, 5 V supply and signal return. The sensor terminals are gold plated due to the low signal currents.

The acceleration sensors are of the capacitive type. The sensing element comprises two parallel plate capacitors. The capacitors alter the peak voltage which is generated by an internal oscillator when the sensor is subjected to acceleration. Detection circuits within the sensor measure the peak voltage and pass an analogue output signal to the ADCM. The sensors output a signal voltage of approximately $1 \text{ V/g} \pm 0.05 \text{ V/g}$. For additional information, refer to Vehicle Dynamic Suspension (204-05)

CATS SYSTEM FAULT MESSAGE

The ADCM has a CAN connection to the instrument cluster. If a fault is detected by the ADCM, a message is sent to the instrument cluster and a message 'CATS SYSTEM FAULT' is displayed.

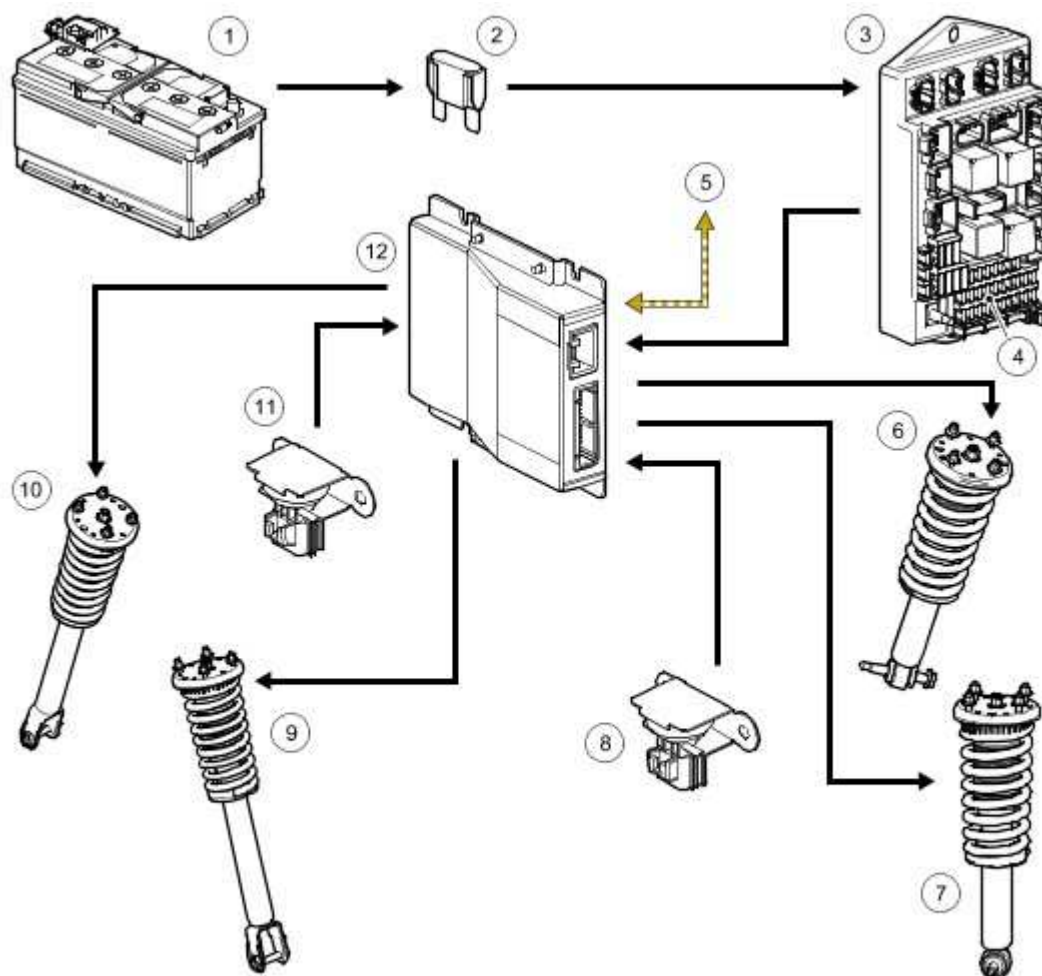
When this message is displayed a fault has been detected and an appropriate Diagnostic Trouble Code (DTC) will be logged in the ADCM. The faults can be interrogated using the Integrated Diagnostic System (IDS).

When a fault is detected, the ADCM stops outputs to the active dampers and the dampers operate continually on their default 'hard' setting until the fault is corrected.

CONTROL DIAGRAM

NOTE:

A = Hardwired; **D** = High speed CAN bus



E62572



Item	Part Number	Description
1		Battery
2		Megafuse (175 A)
3		Central Junction Box (CJB)
4		Fuse 14 (15 A) - ACM power supply
5		High Speed CAN connection to other vehicle systems
6		RH rear active damper
7		LH rear active damper

8		Rear vertical acceleration sensor
9		LH front active damper
10		RH front active damper
11		Front vertical acceleration sensor
12		ADCM

PRINCIPLES OF OPERATION

The ADCM uses a combination of information from other system modules and data from the acceleration sensors to measure the vehicle motion and driver inputs. Using this information, the ADCM applies algorithms to control the dampers for the current driving conditions.

The ADCM receives signals on the high speed Controller Area Network (CAN) bus from the following system components:

- Vehicle speed - Anti-lock Brake system (ABS) module
- Brake switch status - Engine Control Module (ECM)
- Brake pressure - ABS module
- Gear position - Transmission Control Module (TCM)
- Lateral acceleration - ABS module
- Throttle pedal position - ECM
- Power mode - CJB via instrument cluster gateway
- Steering wheel angle - Steering angle sensor via ABS module
- Steering wheel speed - Steering angle sensor via ABS module
- Engine speed - ECM
- Engine running status - ECM
- Car Configuration File (CCF) Data - Auxiliary junction box via instrument cluster gateway
- Master configuration identification - Auxiliary junction box via instrument cluster gateway
- Vehicle information parameters - Auxiliary junction box via instrument cluster gateway.

The ADCM also outputs information for use by other systems as follows:

- CATS Fault - instrument cluster
- Front left damper status - ECM
- Front right damper status - ECM
- Rear left damper status - ECM
- Rear right damper status - ECM.

The ADCM monitors the input signals and operates the damper solenoids. The input signals are compared against algorithms with the ADCM and preset speed thresholds.

The vehicle speed signal is the main input for the ADCM. The ADCM contains upper and lower speed thresholds at which the dampers are set to the firm setting. The gear position signal is also used to

determine longitudinal detection and, along with the speed signal, is compared against algorithms to select the appropriate damper setting.

The firm setting has a higher priority than the soft setting. This is because the firm setting provides better vehicle control in any driving condition. The dampers are set to firm when driving at high speed or if a system fault is detected.

When the vehicle is stationary with the engine running, the dampers are set to the soft setting.

The ADCM receives its power supply via a relay in the CJB. The relay remains energised for a period of time after the ignition is off. This allows the ADCM to record and store any fault codes relating to CATS system faults.

Vehicle Dynamic Suspension

Principle of Operation

For a detailed description of the adaptive damping system operation, refer to the relevant Description and Operation section of the workshop manual.

Vehicle Dynamic Suspension

Inspection and Verification

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

Visual Inspection Chart

Mechanical	Electrical
• Coil spring(s) • Shock absorber(s) • Accelerometer(s) installation	• Fuse(s) • Wiring harness/electrical connectors • Accelerometer(s) • Adaptive damping 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 failure is not visually evident, check the system for any logged Diagnostic Trouble Codes (DTCs) and refer to the DTC index.

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 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.

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 logged and, after carrying out the pinpoint tests, a fault is not identified, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
C110A12	Front vertical acceleration sensor	Front vertical acceleration sensor circuit - short to power	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front vertical acceleration sensor circuit for short to power
C110A14	Front vertical acceleration sensor	Front vertical acceleration sensor circuit - short to ground, open circuit	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front vertical acceleration

			sensor circuit for short to ground, open circuit
C110A29	Front vertical acceleration sensor	Signal not changing or out of range	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C110B12	Rear vertical acceleration sensor	Rear vertical acceleration sensor circuit - short to power	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check rear vertical acceleration sensor circuit for short to power
C110B14	Rear vertical acceleration sensor	Rear vertical acceleration sensor circuit - short to ground, open circuit	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check rear vertical acceleration sensor circuit for short to ground, open circuit
C110B29	Rear vertical acceleration sensor	Signal not changing or out of range	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C110C12	Left front damper solenoid	Left front damper solenoid circuit - short to power	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left front damper solenoid circuit for short to power
C110C14	Left front damper solenoid	- Left front damper solenoid circuit - short to ground, open circuit - Left front damper failure	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left front damper solenoid circuit for short to ground, open

			circuit. Check and install a new damper as required
C110C1D	Left front damper solenoid	- Left front damper solenoid circuit - short to ground/power, open circuit - Left front damper failure	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left front damper solenoid circuit for short to ground, power, open circuit. Check and install a new damper as required
C110D12	Right front damper solenoid	Right front damper solenoid circuit - short to power	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right front damper solenoid circuit for short to power
C110D14	Right front damper solenoid	- Right front damper solenoid circuit - short to ground, open circuit - Right front damper failure	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right front damper solenoid circuit for short to ground, open circuit. Check and install a new damper as required
C110D1D	Right front damper solenoid	- Right front damper solenoid circuit - short to ground/power, open circuit - Right front damper failure	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right front damper solenoid circuit for short to ground, power, open circuit. Check and install a new damper as required
C110E12	Left rear damper	Left rear damper solenoid	Carry out any pinpoint tests associated with this DTC using

	solenoid	circuit - short to power	the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left rear damper solenoid circuit for short to power
C110E14	Left rear damper solenoid	- Left rear damper solenoid circuit - short to ground, open circuit - Left rear damper failure	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left rear damper solenoid circuit for short to ground, open circuit. Check and install a new damper as required
C110E1D	Left rear damper solenoid	- Left rear damper solenoid circuit - short to ground/power, open circuit - Left rear damper failure	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left rear damper solenoid circuit for short to ground, power, open circuit. Check and install a new damper as required
C110F12	Right rear damper solenoid	Right rear damper solenoid circuit - short to power	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right rear damper solenoid circuit for short to power
C110F14	Right rear damper solenoid	- Right rear damper solenoid circuit - short to ground, open circuit - Right rear damper failure	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right rear damper solenoid circuit for short to ground, open circuit. Check and install a new damper as required

C110F1D	Right rear damper solenoid	- Right rear damper solenoid circuit -short to ground/power, open circuit - Right rear damper failure	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right rear damper solenoid circuit for short to ground, power, open circuit. Check and install a new damper as required
C1A391C	Sensor supply voltage	Circuit voltage out of range	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U000188	High speed CAN communication bus	Vehicle CAN Bus off condition	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out the CAN network integrity tests using the manufacturer approved diagnostic system
U010087	Lost communications with ECM	Missing message from ECM	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check ECM power and ground supplies for short, open circuit. Carry out the CAN network integrity tests using the manufacturer approved diagnostic system
U010187	Lost communication with TCM	Missing message from TCM	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check TCM power and ground supplies for short, open circuit. Carry out the CAN network integrity tests using the manufacturer approved

			diagnostic system
U012187	Lost communication with anti-lock control - stability assist module	Anti-lock control - stability assist system failure	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check ABS module power and ground supplies for short, open circuit. Carry out the CAN network integrity tests using the manufacturer approved diagnostic system
U042286	Lost communication with CJB	Signal invalid	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CJB power and ground supplies for short, open circuit. Carry out the CAN network integrity tests using the manufacturer approved diagnostic system
U015587	Lost communication with instrument cluster	Missing message from Instrument cluster	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check instrument cluster power and ground supplies for short, open circuit. Carry out the CAN network integrity tests using the manufacturer approved diagnostic system
U030000	Internal control module software incompatibility	CAN master configuration ID incorrect	Re-configure the RJB using the manufacturer approved diagnostic system, clear DTCs and re-test. If DTC still logged suspect Adaptive damping module, refer to new module installation note at top of DTC

			Index
U040186	Invalid data received from ECM/PCM	Signal invalid	Check for engine management DTCs. Electronic Engine Controls
U040286	Invalid data received from TCM	Signal invalid	Check for transmission DTCs. Diagnostic Strategy
U041586	Invalid data received from ABS control module	Signal invalid	Check for ABS DTCs.
U042386	Invalid data received from Instrument Cluster	Signal invalid	Check for instrument cluster DTCs. Instrument Cluster
U1A1400	CAN initialisation failure	CAN network harness short, disconnected	Check CAN network. Communications Network
U300001	Control module	General electrical failure	Check integrity of electrical connectors and pins to module. Check damper negative circuits for short to ground. Install a new adaptive damping module. Adaptive Damping Module - Convertible (86.56.35) Adaptive Damping Module - 2-Door (86.56.35)
U300049	Control module	Internal electronic failure	Suspect adaptive damping module, refer to new module installation note at top of DTC Index
U300055	Control module	Not configured	Configure adaptive damping module using manufacturer approved diagnostic system
U300281	Vehicle identification number	Vehicle/component mismatch. Corrupt VIN data being transmitted, module installed from donor vehicle	Install original module, check for adaptive damping related DTCs and refer to DTC Index
U30031C	Battery voltage	Circuit voltage out of range	Carry out any pinpoint tests

			associated with this DTC using the manufacturer approved diagnostic system
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Adaptive Damping Module - Convertible (86.56.35)

Removal



WARNING: To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.



WARNING: Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.



WARNING: To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.



WARNING: To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.



WARNING: To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.



WARNING: Never probe the electrical connectors of air bag modules or any other

supplemental restraint system component. Failure to follow this instruction may result in personal injury.



WARNING: Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

- 1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to Specifications

2



WARNING: Make sure that sufficient time has elapsed after disconnecting the battery ground cable(s), before commencing work on the supplemental restraint system (SRS). Failure to follow these instructions may result in personal injury.

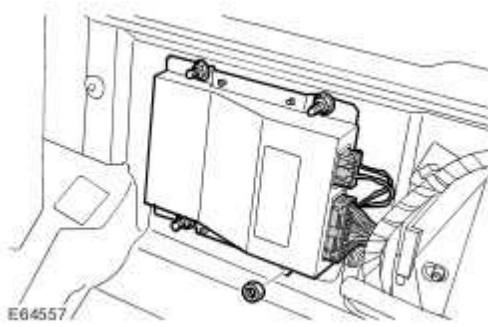
Make the air bag supplemental restraint system (SRS) safe.

- 3 . Remove the RH roll over protection unit.
For additional information, refer to Rollover Protection Unit

- 4 . Remove the active damping module.

▶ Remove the 4 nuts.

▶ Disconnect the 2 electrical connectors.



Installation

1 . Install the active damping module.

▶ Tighten the nuts to 10 Nm.

▶ Connect the electrical connectors.

2 . Install the RH roll over protection unit.

For additional information, refer to Rollover Protection Unit

3 . Connect the battery ground cable and install the cover.

For additional information, refer to Specifications

Adaptive Damping Module - 2-Door (86.56.35)

Removal

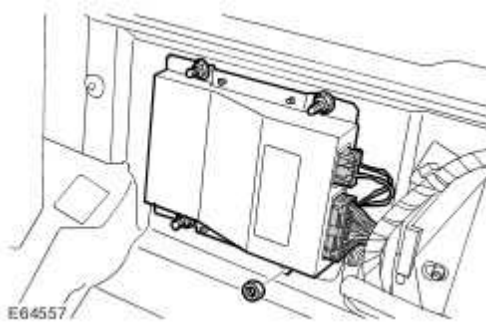
- 1 . Remove the rear seat backrest.

For additional information, refer to Rear Seat Backrest (76.70.38)

- 2 . Remove the active damping module.

▶ Remove the 4 nuts.

▶ Disconnect the 2 electrical connectors.



Installation

- 1 . Install the active damping module.

▶ Tighten the nuts to 10 Nm (7 lb.ft).

▶ Connect the electrical connectors.

- 2 . Install the rear seat backrest.

For additional information, refer to Rear Seat Backrest (76.70.38)

Front Suspension Vertical Accelerometer

Removal

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

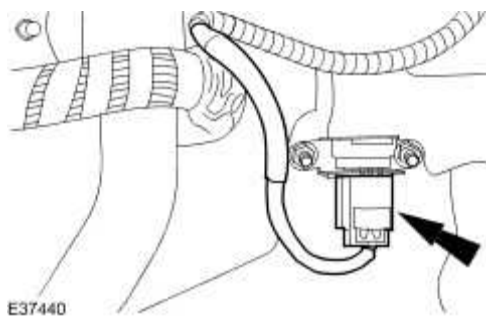
Raise and support the vehicle.

- 2 . Remove the windshield washer reservoir.
For additional information, refer to Windshield Washer Reservoir (84.10.01)

- 3  **CAUTION:** Make sure the accelerometer is not dropped as damage will be caused to the internal components.

Remove the accelerometer.

- Remove the 2 nuts.
- Disconnect the electrical connector.



Installation

- 1 . Install the accelerometer.
 - Tighten the nuts to 8 Nm (6 lb.ft).

 Connect the electrical connector.

2 . Install the windshield washer reservoir.

For additional information, refer to Windshield Washer Reservoir (84.10.01)

Rear Suspension Vertical Accelerometer

Removal

- 1 . Remove the LH loadspace trim panel.

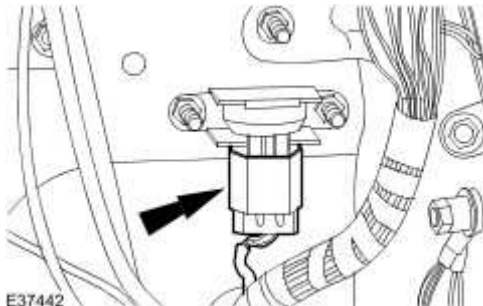
For additional information, refer to Loadspace Trim Panel - Convertible (76.13.73.60)

For additional information, refer to Loadspace Trim Panel - 2-Door (76.13.73.60)

- 2  **CAUTION: Make sure the accelerometer is not dropped as damage will be caused to the internal components.**

Remove the accelerometer.

- ▶ Remove the 2 nuts.
- ▶ Disconnect the electrical connector.



Installation

- 1 . Install the accelerometer.

- ▶ Tighten the nuts to 8 Nm (6 lb.ft).
- ▶ Connect the electrical connector.

- 2 . Install the LH loadspace trim panel.

For additional information, refer to Loadspace Trim Panel - Convertible (76.13.73.60)

For additional information, refer to Loadspace Trim Panel - 2-Door (76.13.73.60)

205 : Driveline

205-00 : Driveline system – General information

Diagnosis and testing

Driveline System

Principle of Operation

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

Driveshaft

Rear Drive Axle and Differential - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8

Rear Drive Halfshafts

Inspection and Verification



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

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

- 1 . Verify the customer concern by carrying out a road test of the vehicle.
- 2 . Visually inspect for obvious signs of mechanical damage and system integrity.
- 3 . If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
- 4 . If the concern is not visually evident, verify the symptom and refer to the Symptom Chart.

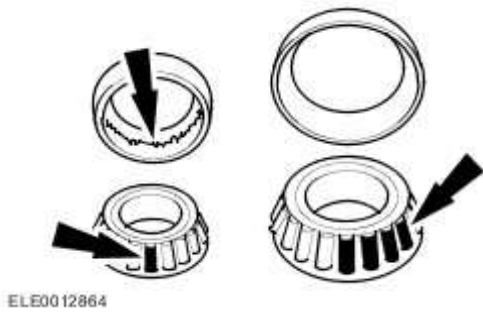
Identify the Condition

Gear Howl and Whine

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

Bearing Whine

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



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

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

Chuckle

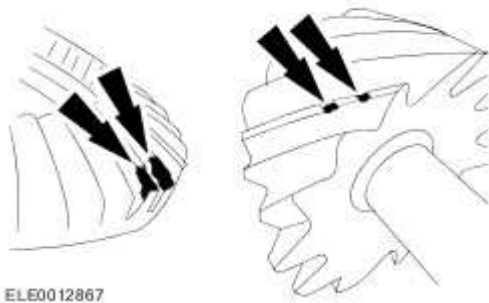
Chuckle that occurs on the coast driving phase is usually caused by excessive clearance between the differential gear hub and the differential case bore.

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

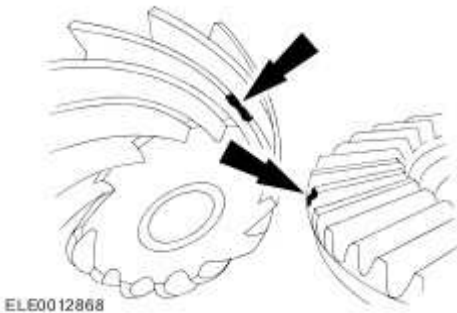


Knock

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



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



Clunk

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

Bearing Rumble

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

Symptom Chart

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

Possible Source(s):

- Rear drive axle.

Action(s) to take:

- For additional information, GO to Pinpoint Test G544822p1.

Noise is the same on drive or coast

Possible Source(s):

- Road.

Action(s) to take:

- Normal conditions.

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.

Possible Source(s):

- Wheel bearing.

Action(s) to take:

- CHECK and INSTALL a new wheel bearing as necessary.
Rear Wheel Bearing - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8
(64.15.14)

Noise is produced with the vehicle standing and driving

Possible Source(s):

- Engine.

Action(s) to take:

- For additional information,
Engine

Possible Source(s):

- Transmission.

Action(s) to take:

- For additional information,
Diagnostic Strategy

Loud clunk in the driveline when shifting from reverse to forward

Possible Source(s):

- Transmission calibration.

Action(s) to take:

- Using the Jaguar approved diagnostic system, re-configure the Transmission Control Module (TCM) with the latest available calibration.

Possible Source(s):

- Transmission Mount.

Action(s) to take:

- INSPECT and INSTALL new transmission mounts as necessary.

Possible Source(s):

- Transmission.

Action(s) to take:

- For additional information,
Diagnostic Strategy

Possible Source(s):

- Suspension components.

Action(s) to take:

- INSPECT and INSTALL new suspension components as necessary.

Possible Source(s):

- Backlash in the driveline.

Action(s) to take:

- INSPECT and INSTALL new driveline components as necessary.

Possible Source(s):

- Engine idle speed set too high.

Action(s) to take:

- Check and adjust the idle speed as necessary.

Possible Source(s):

- Engine mount.

Action(s) to take:

- INSPECT and INSTALL new engine mounts as necessary.

Clicking, popping, or grinding noises

Possible Source(s):

- Inadequate or contaminated lubrication in the rear drive halfshaft constant velocity (CV) joint.

Action(s) to take:

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

Possible Source(s):

- Another component contacting the rear drive halfshaft.

Action(s) to take:

- INSPECT and REPAIR as necessary.

Possible Source(s):

- Wheel bearings, brakes or suspension components.

Action(s) to take:

- INSPECT and INSTALL new components as necessary.

Vibration at highway speeds

Possible Source(s):

- Out-of-balance wheel(s) or tire(s).

Action(s) to take:

- BALANCE and INSTALL new wheel(s) and tire(s) as necessary.
Wheel and Tire (74.20.05)

Possible Source(s):

- Driveline out of balance/misalignment.

Action(s) to take:

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

Possible Source(s):

- Driveshaft center bearing touching body mounting point.

Action(s) to take:

- Check for correct spacer washer thickness. INSPECT and INSTALL new washers as necessary.

Shudder, Vibration During Acceleration

Possible Source(s):

- Powertrain/driveline misalignment.

Action(s) to take:

- CHECK for misalignment. INSTALL new components as necessary. For driveshaft

alignment, GO to Pinpoint Test G544822p1.

Possible Source(s):

- High constant velocity (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):

- Rear drive axle breather.

Action(s) to take:

- Check oil level and correct as necessary.

Possible Source(s):

- Damaged seal.

Action(s) to take:

- INSTALL new components as necessary.

Possible Source(s):

- Rear drive axle filler plug.

Action(s) to take:

- INSTALL new components as necessary.

Possible Source(s):

- Rear drive axle rear cover joint.

Action(s) to take:

- INSTALL new components as necessary.

Pinpoint Tests

PINPOINT TEST G544822p2 : EXCESSIVE DRIVELINE NOISE

G544822t1 : CHECK NOISE FROM VEHICLE ON ROAD TEST

1. Road test vehicle to determine load and speed conditions when noise occurs. 2. Assess the noise with different gears selected.

- Does the noise occur in different gears at the same vehicle speed?

-> Yes

INSTALL a new rear drive axle/differential assembly.

Axle Assembly - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8, Vehicles Without: Differential Drain Plug (51.25.13) RE-TEST the system for normal operation.

-> No

Engine

Diagnostic Strategy

PINPOINT TEST G544822p1 : DRIVESHAFT ALIGNMENT

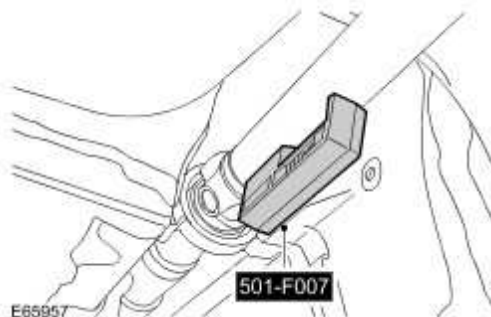
G544822t2 : CHECK DRIVESHAFT COMPOUND ANGLE

1. Remove exhaust system and center heat shield.

Exhaust System 2.

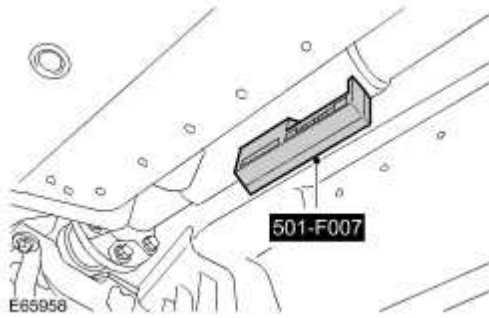


Place inclinometer (special tool number 501-F007) on flat surface and calibrate. 3.



Using the inclinometer check the angle of the driveshaft rearwards of the center bearing and note

the reading (reading one) 4.



Check the angle of the driveshaft forward of the center bearing and note the reading (reading two). Subtract reading two from reading one to obtain the compound angle of the driveshaft. The correct specification for the driveshaft compound angle is $1.1^\circ \pm 0.3^\circ$

- **Is driveshaft compound angle correct?**

-> **Yes**

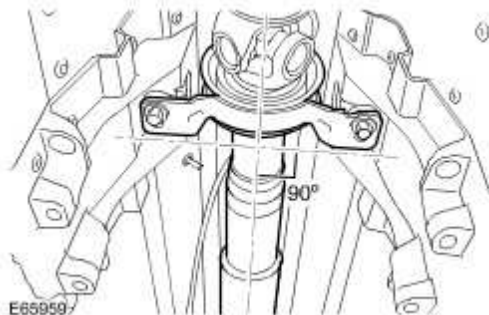
GO to Pinpoint Test G544822t3.

-> **No**

Adjust driveshaft center bearing height by adding or removing shims (refer to parts catalogue for selection of shims available) and re-check compound angle. GO to Pinpoint Test G544822t3.

G544822t3 : CHECK CENTER BEARING ALIGNMENT

1.



Check the center bearing is aligned at 90° to front section of driveshaft.

- **Is the center bearing aligned correctly?**

-> **Yes**

Driveshaft alignment is correct. Install center heat shield and exhaust system.
Exhaust System

-> **No**

Undo but do not remove center bearing bolts, align center bearing to front section of driveshaft, tighten bolts to correct torque.

Specifications Install center heat shield and exhaust system.
Exhaust System

205-01 : Driveshaft

Specifications

Specifications

Torque Specifications

Item	Nm	lb-ft	lb-in
Center bearing - bolt*	40	29	-
Driveshaft balance - nut*	12	9	-
Driveshaft flange to differential flange - nut/bolt*	88	65	-
Driveshaft flange to transmission flange - nut/bolt*	108	80	-

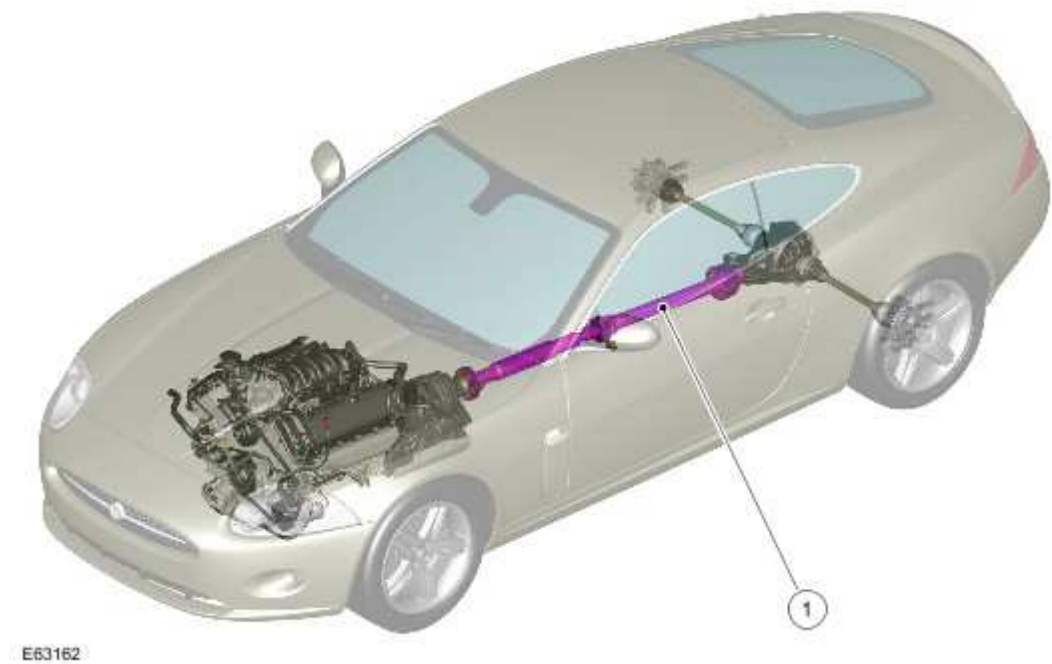
* New nut/bolt must be installed.

Driveshaft Runout and Balancing

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

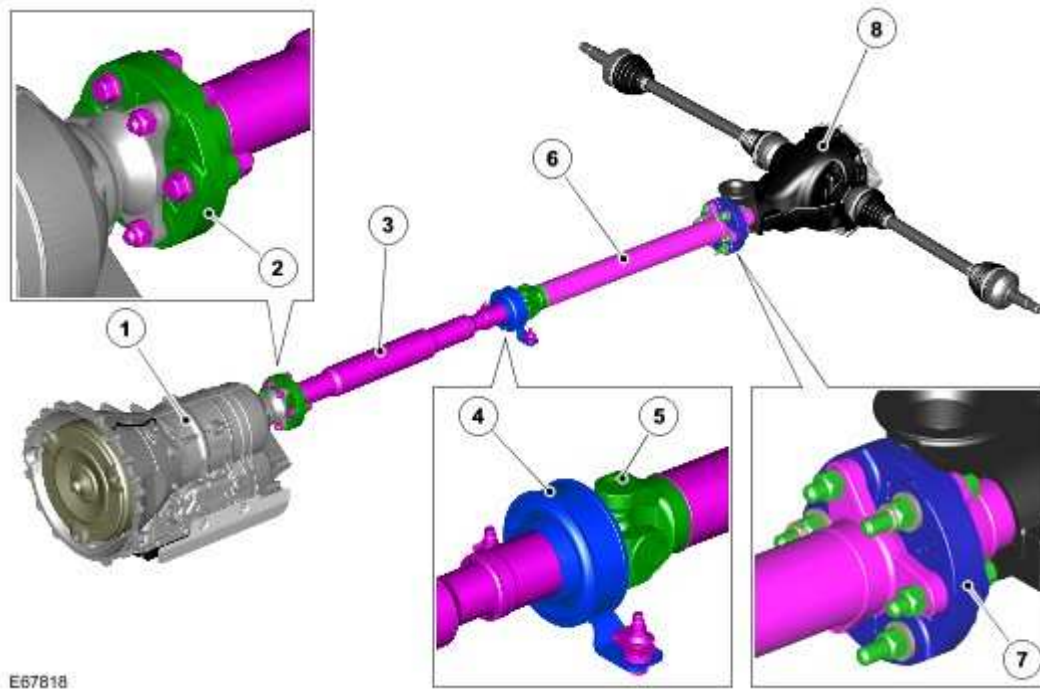
Driveshaft

COMPONENT LOCATION



Item	Part Number	Description
1		Driveshaft

INTRODUCTION



Item	Part Number	Description
1		Transmission
2		Transmission flexible joint
3		Collapsible front driveshaft tube
4		Center bearing
5		Universal joint
6		Rear driveshaft tube
7		Rear drive axle flexible joint
8		Rear drive axle/differential

The driveshaft consists of the following components:

- A two-piece welded steel tube with a splined center slip joint
- One universal joint
- A center bearing
- Two flexible joints.

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

The driveshaft's front tube is of a swaged construction, designed to collapse in a controlled manner in the event of the vehicle being involved in a front-end collision. Low friction splines at the center of the driveshaft provide the driveshaft's plunge capability.

A flexible coupling is used to connect the driveshaft assembly to the transmission and the differential, allowing for angular movement of the drive shafts due to acceleration and braking. The centre universal joint is lubricated during manufacture and sealed for life. This joint is positioned to a specified angle using shims between the center bearing and the body.

Driveshaft

For additional information, refer to [<<205-00>>](#).

Driveshaft - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (47.15.01)

Removal

NOTE:

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

- 1 . Remove the cover and disconnect the battery ground cable.

For additional information, refer to Specifications

2



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

Raise and support the vehicle.

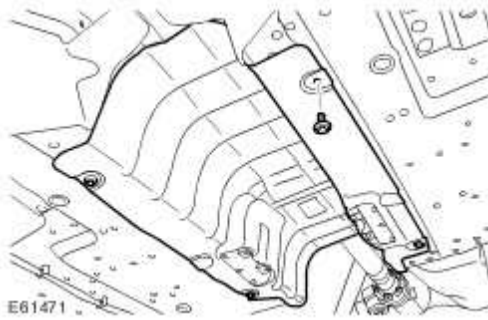
- 3 . Remove the exhaust system.

For additional information, refer to Exhaust System

- 4 . Remove the center heat shield.



Remove the 4 bolts.

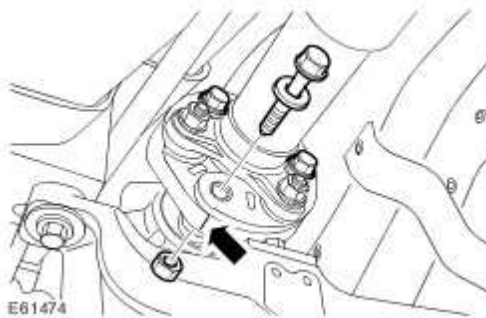


- 5
-  **CAUTION:** Mark the position of the driveshaft flange in relation to the drive pinion flange.

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

Release the driveshaft from the transmission drive flange.

 Remove the 3 nuts and bolts.



- 6
-  **CAUTION:** Mark the position of the driveshaft flange in relation to the drive pinion flange.

 **CAUTION:** To avoid damage to the joint or gaiter, do not allow the driveshaft to

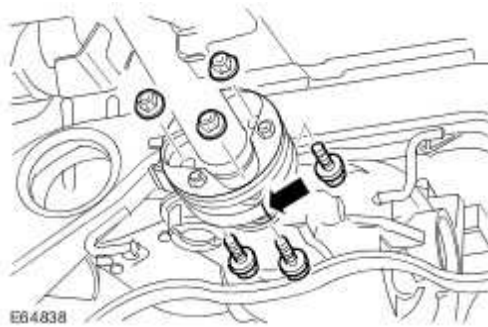
hang.



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

Release the driveshaft from the rear axle drive flange.

▶ Remove the 3 nuts and bolts.



7 . NOTE:

Spacers are fitted between the centre bearing and the body.

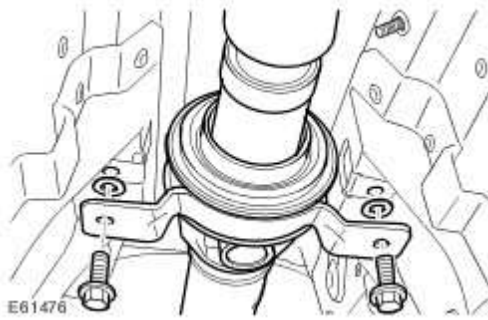
NOTE:

Note the fitted position.

With assistance, remove the driveshaft.

▶ Remove the 2 driveshaft center bearing mount bolts.

▶ Collect the spacers.



Installation

1 . NOTE:

Replace the spacers to the fitted position.

With assistance, install the driveshaft and secure the center bearing.

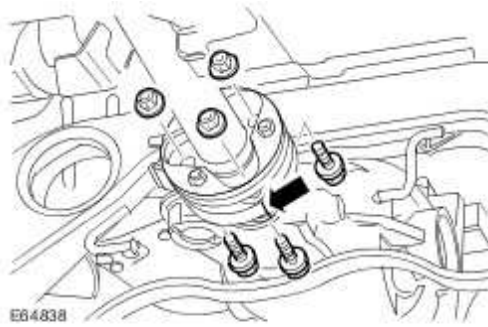
- ▶ Install the spacers.
- ▶ Align the center bearing mount.
- ▶ Install the bolts, but do not tighten fully at this stage.

2 . NOTE:

Align to the position noted on removal.

Attach the driveshaft to the rear axle drive flange.

- ▶ Tighten the nuts and bolts to 88 Nm (65 lb.ft).

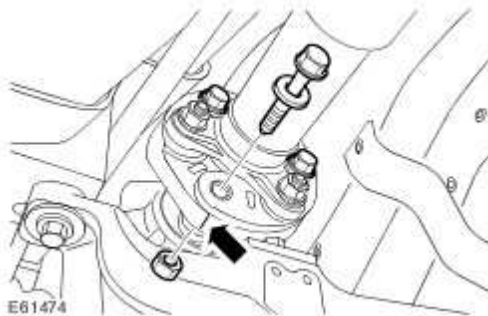


3 . NOTE:

Align to the position noted on removal.

Attach the driveshaft to the transmission flange.

▶ Tighten the nuts and bolts to 110 Nm (81 lb.ft).



4



CAUTION: Make sure the center bearing mount is not under tension and central within the slots.

Carefully tighten the centre bearing bolts to 40 Nm (30 lb.ft) keeping the bearing in a central position.

5 . Install the center heat shield.

 Install the bolts and tighten to 10 Nm (7 lb.ft).

6 . Install the exhaust system.

For additional information, refer to Exhaust System

7 . Connect the battery ground cable and install the cover.

For additional information, refer to Specifications

205-02 : Rear drive axle / Differential

Specifications

Specifications

General Specifications

Item	Specification
Differential Ratio	3.31 : 1

Lubricants, Fluids, Sealers and Adhesives

	Specifications
Differential fluid type	M2C 192A Synthetic

Capacities

	Liters
Differential fluid capacity	1.25 liters

Torque Specifications

Item	Nm	lb-ft	lb-in
Differential flange to driveshaft flange - nuts/bolts*	88	65	-
Differential flange to pinion shaft - nut*	A	-	-
Differential front mounting - bolt*	90	66	-
Differential rear mounting - bolt*	163	120	-

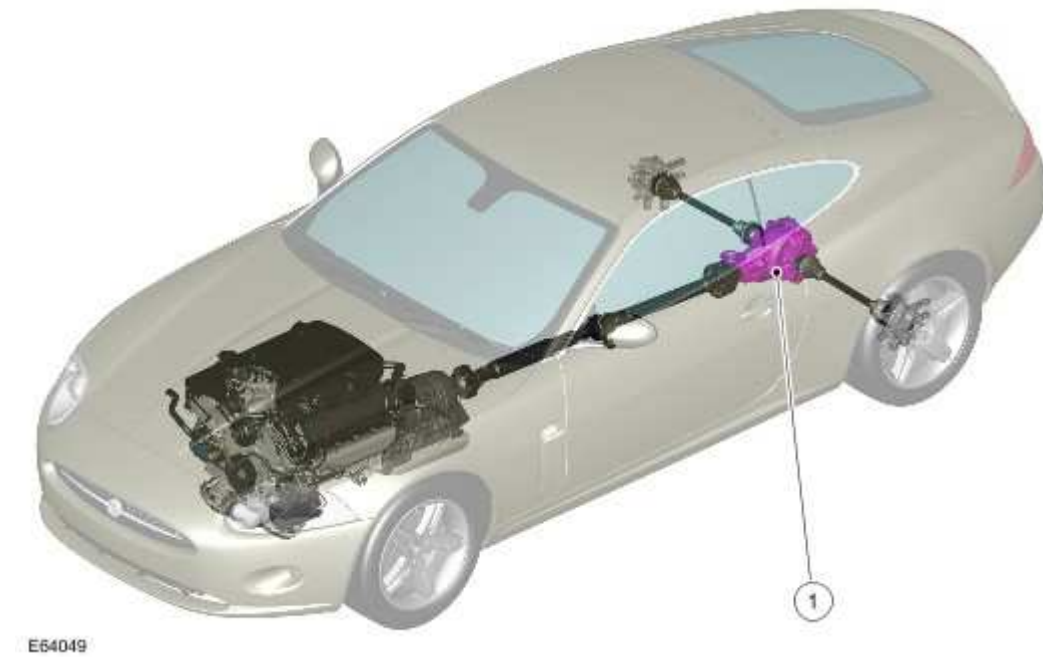
NOTE:

A = refer to the procedure for correct torque sequence.

* New nut/bolt must be installed.

Rear Drive Axle and Differential - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8

COMPONENT LOCATION



Item	Part Number	Description
1		Differential

INTRODUCTION

The differential is supported at three mounting points, one at the front of the unit, and two at the rear, through rubber bushes to the vehicle's rear subframe. This mounting arrangement plus the subframe to vehicle-body mounting arrangement provides the rear driveline with double isolation from the vehicle's body.

The unit is constructed of a lightweight cast-iron main casing and an aluminum rear cover. The rear cover incorporates fins to aid cooling.

The pinion shaft aligns with the centerline of the vehicle's body and is supported by two taper-roller bearings. The hypoid-gear set is also supported by taper roller bearings.

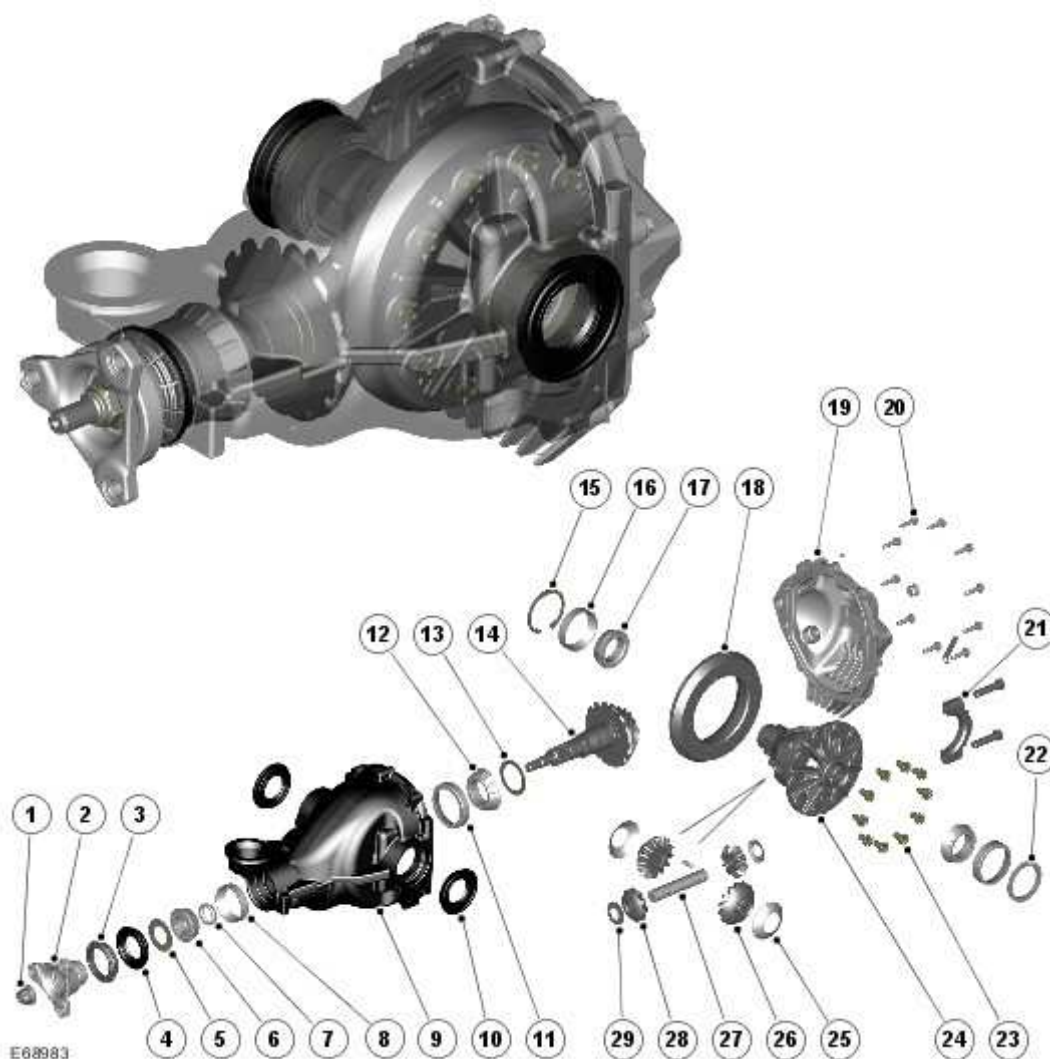
The unit has a final drive ratio of 3.31:1 and the lubricant is fill for life.



CAUTION: Running-in For Final Drive Unit During the first 1500 km (940 miles) and if at any time a new final drive unit is fitted:

- avoid full throttle applications
- do not exceed 190 km/h (120 mph)
- do not participate in motor racing events, test track days, sports driving schools or similar
- avoid towing during running-in period.

OPERATION



Item	Part Number	Description

1		Pinion nut
2		Pinion flange
3		Dust shield
4		Pinion oil seal
5		Pinion shaft oil slinger
6		Pinion bearing
7		Collapsible spacer
8		Pinion bearing cup
9		Differential housing
10		LH Output shaft oil seal
11		Differential pinion bearing cup
12		Pinion bearing
13		Drive pinion bearing adjustment shim
14		Pinion
15		Circlip
16		Differential bearing cup
17		Differential pilot bearing
18		Ring gear
19		Differential rear cover
20		Rear cover bolt (10 off)
21		Differential bearing cap
22		Differential bearing adjustment shim
23		Ring gear bolt (10 off)

24		Differential
25		Dished plate
26		Sunwheel
27		Shaft
28		Planet gear
29		Thrust washer

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

When it is necessary for one wheel and halfshaft 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 halfshafts.

Axle Assembly - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8, Vehicles Without: Differential Drain Plug (51.25.13)

Special Service Tools



Power train assembly jack HTJ
1200-2

Removal

- 1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to

2



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

Raise and support the vehicle.

- 3 . Remove both the rear halfshafts.
For additional information, refer to Rear Halfshaft (47.10.13)
- 4 . Remove the exhaust system.
For additional information, refer to Exhaust System

5



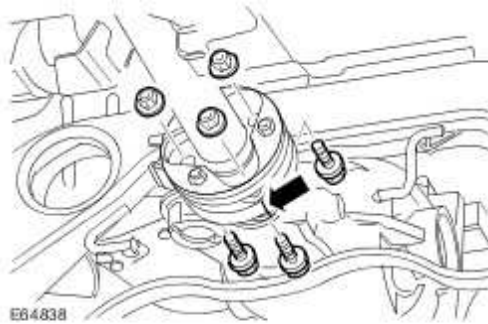
CAUTION: Mark the position of the driveshaft flange in relation to the drive pinion flange.



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

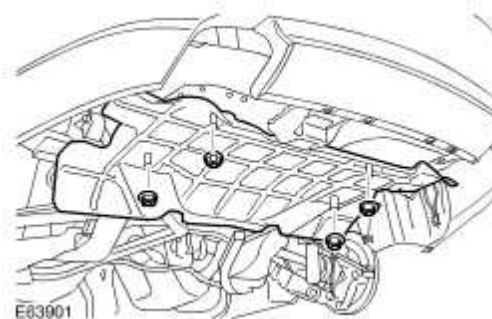
Release the driveshaft from the rear axle drive flange.

▶ Remove the 3 nuts and bolts.



6 . Remove the exhaust rear heat shield .

▶ Remove the 4 nuts.

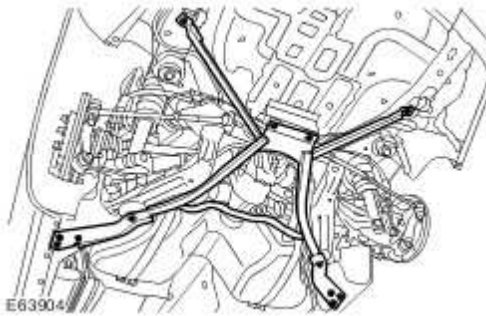


7 . With assistance: Remove the body K-frame.

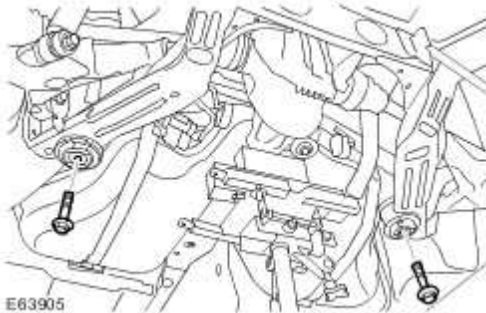
▶ Using a jack, support the differential.

▶ Remove the 8 bolts.

▶ Remove the 4 Torx bolts.



8 . Install the 2 sub-frame mounting bolts and remove the support jack.

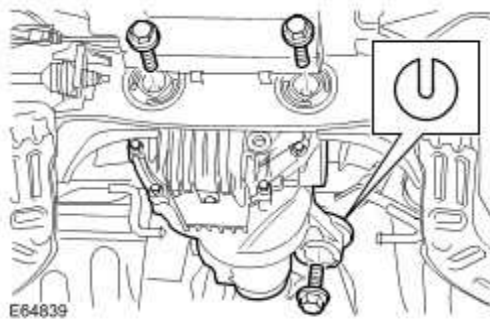


9 . Using a transmission jack, support the differential.

10 .  **CAUTION: Note the fitted position of the special washers.**

Remove the rear differential.

▶ Remove the 3 bolts.



Installation

1 . NOTE:

Align to the position noted on removal.

Install the rear differential.

- ▶ Tighten the 14mm bolts to 163Nm (120 lb.ft).
- ▶ Tighten the 12mm bolt to 90Nm (66 lb.ft).

2 . With assistance, install the K-frame.

- ▶ Remove the 2 bolts.
- ▶ Tighten the M10 bolts to 40 Nm (30 lb.ft).
- ▶ Tighten the M12 bolts to 133 Nm (98 lb.ft).
- ▶ Tighten the sub frame bolts to 60 Nm (44 lb.ft), then a further 240 degrees.

3 . Remove the transmission jack.

4 . Install the heat shield.

 Tighten the nuts to 10 Nm (7 lb.ft).

5 . NOTE:

Align to the position noted on removal.

Install the driveshaft.

 Tighten the nuts and bolts to 88Nm (65 lb.ft).

6 . Install the exhaust system.

For additional information, refer to Exhaust System

7 . Install both the halfshafts.

For additional information, refer to Rear Halfshaft (47.10.13)

8 . Check and top-up the differential case.

 Tighten the filler plug to 34 Nm (25 lb.ft).

9 . Connect the battery ground cable and install the cover.

For additional information, refer to

Axle Assembly - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8, Vehicles With: Differential Drain Plug (51.25.13)

No Data Available

Axle Housing Bushing - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (64.25.30)

Special Service Tools



204-275

Forcing screw

204-275



204-274

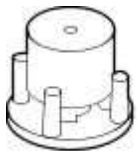
Forcing screw nut

204-274



JAG-061

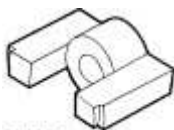
Bearing kit JAG-061



205-534

Receiving cup and mount plate

205-534



205-533

Remover front mount bush
205-533



Installer front mount bush
204-245



Installer front mount bush
204-243

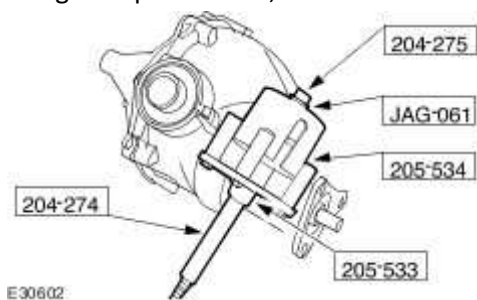
Removal

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

Raise and support the vehicle.

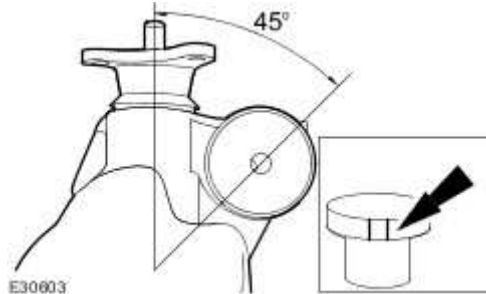
- 2 Remove the rear differential.
 - For additional information, refer to Axle Assembly - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8, Vehicles Without: Differential Drain Plug (51.25.13)

- 3 . Using the special tools, remove the differential bushing.

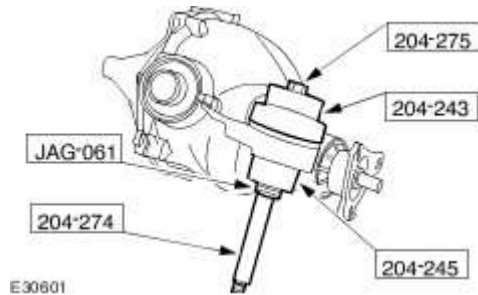


Installation

- 1 The raised mouldings on the bushing, should be set at 45 degrees to the center line of the pinion shaft.



- 2 Using the special tools, install the bushing.



- 3 Install the rear differential.
 - For additional information, refer to Axle Assembly - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8, Vehicles Without: Differential Drain Plug (51.25.13)

Drive Pinion Seal - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (51.20.01)

Special Service Tools



Flange holding tool
205-053



Pinion seal installer
204-264



Flange remover/replacer
204265



Flange remover/replacer boss
204-266



Flange remover/replacer shaft centre
204-267



Flange remover/replacer forcing screw
204-269

Removal

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

Raise and support the vehicle.

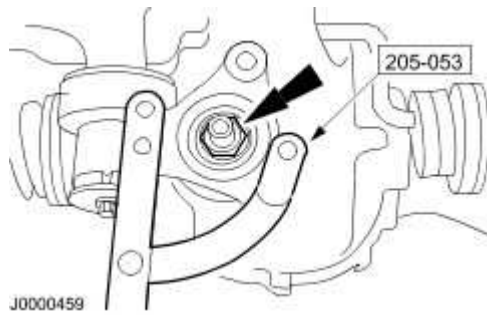
- 2 Remove the driveshaft.
 - For additional information, refer to Driveshaft - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (47.15.01)

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

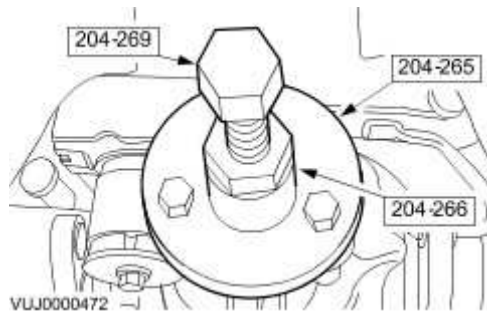
 **CAUTION: Only use a paint mark to match mark the drive pinion flange, loosen the nut 180 degrees then tighten back to mark and note the torque value.**

Remove the drive pinion flange retaining nut.

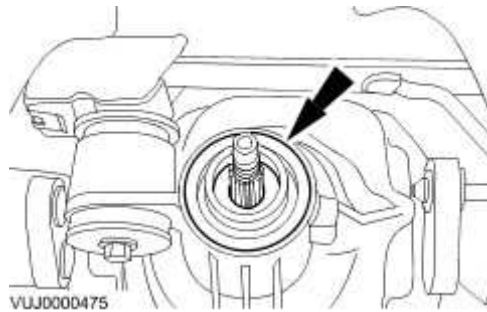
-  Mark the drive pinion flange to nut relationship.
-  Loosen the nut 180 degrees, then tighten back to the mark and note the torque value.



4 . Using the special tool, remove the drive pinion flange.

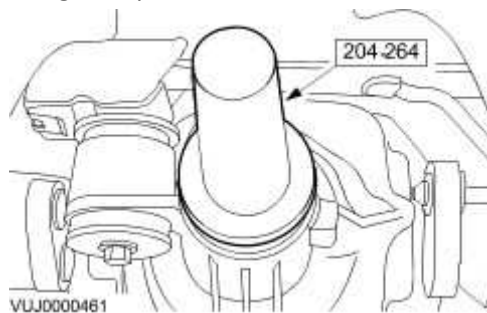


5 . Carefully remove and discard the oil seal.

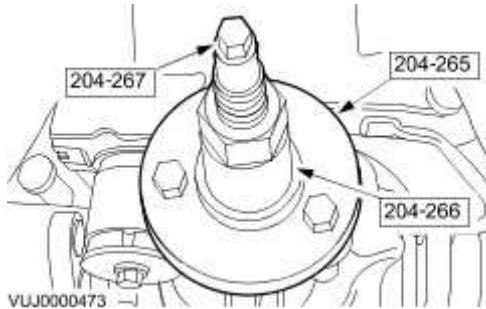


Installation

1 . Using the special tool, install a new oil seal.



2 . Using the special tools, install the drive flange.



3

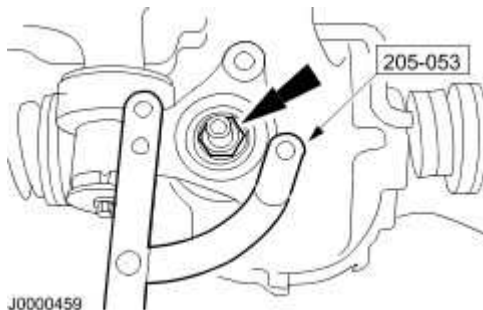


CAUTION: Tighten the drive pinion flange nut to the force noted on removal.



CAUTION: Tighten the drive pinion flange nut to a further 10%.

Install the drive pinion flange retaining nut, and tighten to the torque noted on removal, then a further 10%.



4 . Check and top-up the differential case.



Tighten the filler plug to 34 Nm (25 lb.ft).

5 Install the driveshaft.

- For additional information, refer to Driveshaft - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (47.15.01)

205-05 : Rear drive halfshafts

Specifications

Specifications

Lubricants, Fluids, Sealers and Adhesives

	Specifications
Constant velocity (CV) grease	Optimal LN 584 LO
Driveshaft locking compound	Loctite WSK-M2G349-A4

Capacities

	Liters
Grease for inner CV joint/boot	140g
Grease for outer CV joint/boot	120g

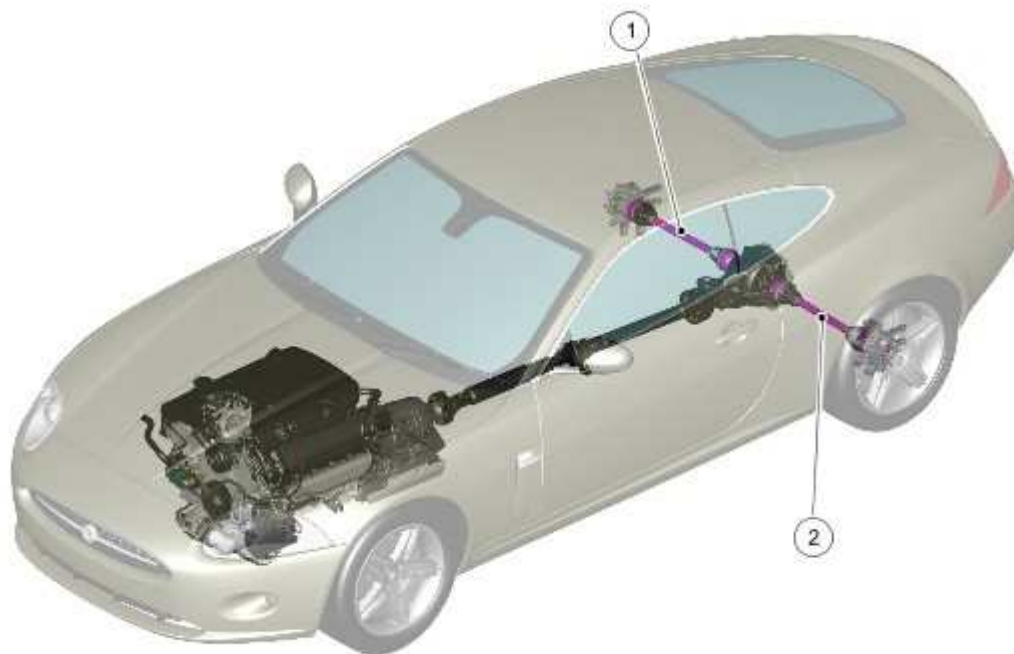
Torque Specifications

Item	Nm	lb-ft	lb-in
Halfshaft/hub - nut *	300	222	-

* New nut/bolt must be installed.

Rear Drive Halfshafts

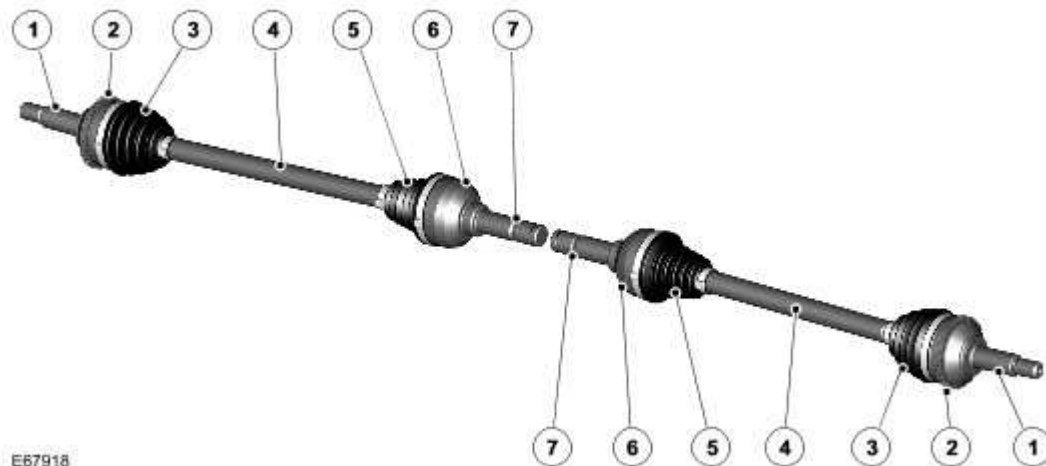
COMPONENT LOCATION



E63163

Item	Part Number	Description
1		RH rear drive halfshaft
2		LH rear drive halfshaft

INTRODUCTION



E67918

Item	Part Number	Description
1		Outer Constant Velocity (CV) joint
2		Anti-lock Braking System (ABS) ring
3		Outer CV joint gaiter
4		Rear drive halfshaft
5		Inner CV joint gaiter
6		Inner CV joint
7		Spring clip

The rear drive halfshafts are of unequal length and both inner and outer joints are of the CV type, with plunging inboard and fixed outboard capability allowing for suspension movement.

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 bar halfshaft with a spline interference-fit into the wheel hub. The inner CV joint is of a spline slide-fit arrangement and is retained in the rear drive axle with the aid of a spring clip.

Rear Drive Halfshafts

For additional information, refer to [<<205-00>>](#).

Rear Halfshaft (47.10.13)

Special Service Tools



Halfshaft seal protector
205-461



Hub puller
205-491



Adapter nuts
205-491-01



Flange remover forcing screw
204-269



Halfshaft oil seal installer
205-532

Removal



CAUTION: Angularly Adjusted Roller (AAR) joints, used at the inboard end of some halfshafts have no internal retaining mechanism and can separate.



CAUTION: Do not allow halfshafts to hang unsupported at one end or joint damage will occur.

1



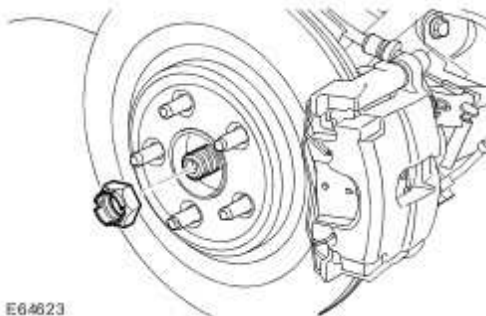
WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2 . Remove the LH rear wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

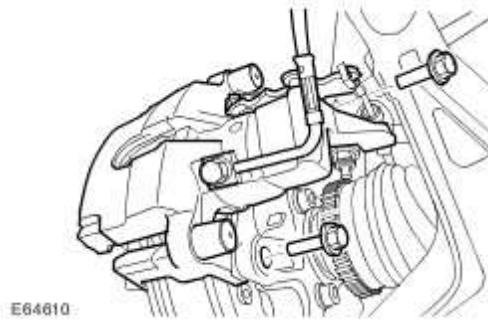
3 . With assistance, remove the halfshaft retaining nut, and retain it for the install procedure.



4 . Release the brake caliper.

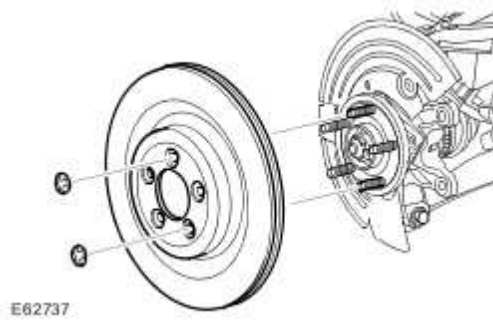
▶ Remove and discard the 2 bolts.

▶ Tie the brake caliper aside.

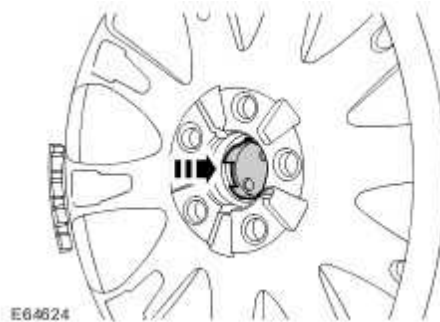


5 . Remove the rear brake disc.

▶ Remove the 2 clips.



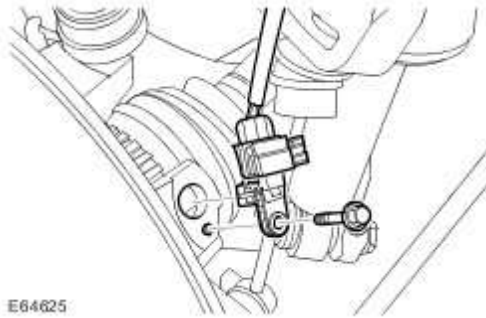
6 . Remove the wheel trim.



7 . Remove the wheel speed sensor.

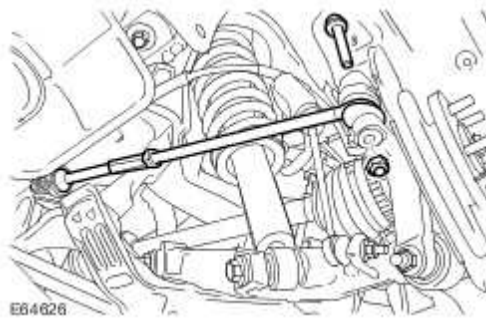
▶ Remove the bolt.

▶ Tie aside.



8 . Disconnect the toe link.

▶ Remove the bolt and discard the nut.

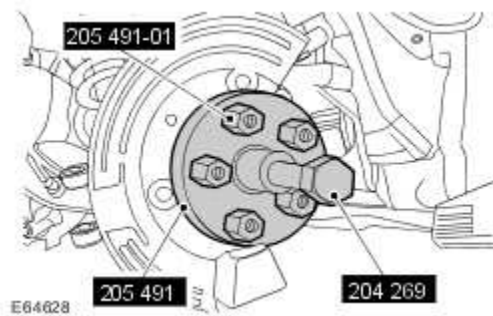


9 . Release the lower arm.

▶ Remove the bolt and discard the nut.



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



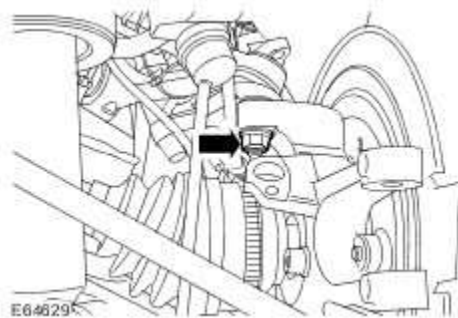
11 . **NOTE:**

Use an additional wrench to prevent the component from rotating.

Remove the wheel knuckle.

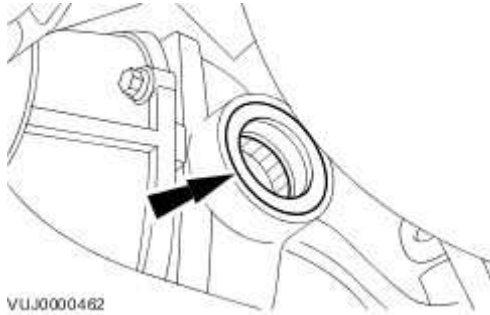
► Release the upper suspension arm ball joint.

► Remove and discard the nut.

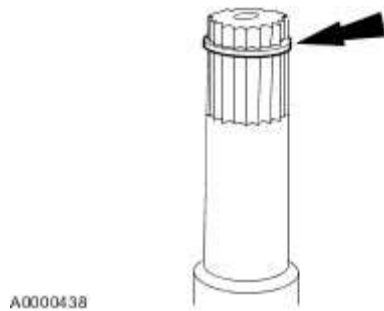


12 . Release the halfshaft from the differential.

13 . Remove and discard the halfshaft oil seal.



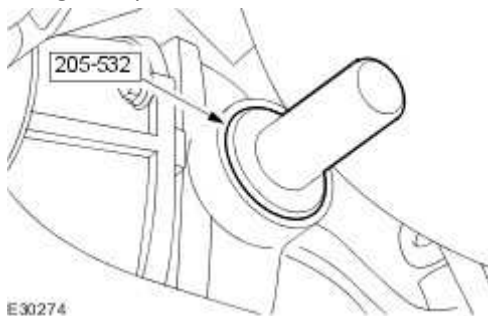
14 . Remove and discard the circlip.



Installation

1 . Clean the components mating faces.

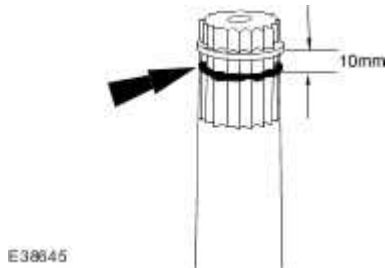
2 . Using the special tool, install a new halfshaft oil seal.



3 . Install a new circlip.

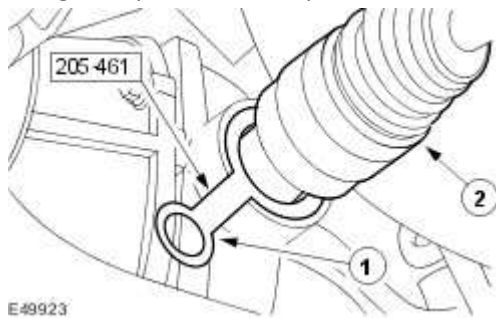
- 4  **CAUTION:** Use Loctite WSK-M2G349-A4 or equivalent, meeting the Jaguar specification.

Apply a 3 mm (0.125) diameter bead of sealant to the halfshaft splines.



- 5  **CAUTION:** Application of the sealant to assembly must take no longer than 5 minutes.

Using the special tool, to protect the seal install the halfshaft.



6 . Remove the special tool.

7 . **NOTE:**

Use an additional wrench to prevent the component from rotating.

Install the knuckle assembly.

▶ Tighten the nut to 90 Nm (66 lb.ft).

8 . **NOTE:**

Do not fully tighten the locking nut at this stage.

Install the halfshaft.

▶ Lightly tighten the old nut.

9



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

Install the lower arm nut and bolt.

▶ Tighten the nut and bolt to 150 Nm (110 lb.ft).

10



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

Connect the toe link.

▶ Tighten the nut and bolt to 55 Nm (40 lb.ft).

11 . Install the wheel speed sensor.

▶ Install the bolt and tighten to 10 Nm (7 lb.ft).

12 . Install the brake disc.

▶ Secure the clips.

13 . Install the brake caliper.

 Tighten the bolts to 103 Nm (76 lb.ft).

14 . Remove the old halfshaft nut and install the new one, tighten to 300 Nm (222 lb.ft)

 Install the wheel trim.

15 . Install the wheel trim.

16 .  **CAUTION: Only use lubricants meeting the Jaguar specification.**

Check and top-up the differential case.

 Tighten the filler plug to 34 Nm (25 lb.ft).

Inner Constant Velocity (CV) Joint Boot (47.10.33)

Removal



CAUTION: The inboard joint has angularly adjusted roller (AAR) joints. AAR joints have no internal retaining mechanism and can separate.

1



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

Raise and support the vehicle.

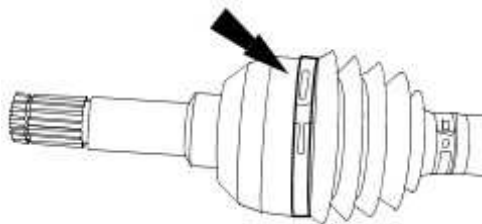
2 . Remove the halfshaft.

For additional information, refer to Rear Halfshaft (47.10.13)

3 . **NOTE:**

Position and secure component in a bench vice fitted with soft jaws.

Remove and discard the CV joint boot outer retaining clamp.

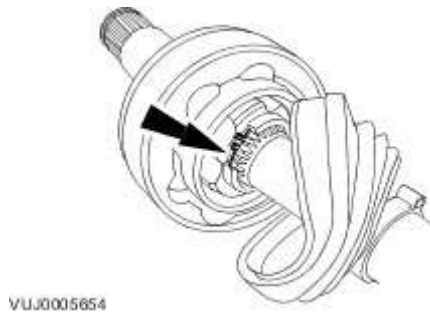


VUJ0005653

4 . Remove the outer CV joint.



Carefully release the clip.

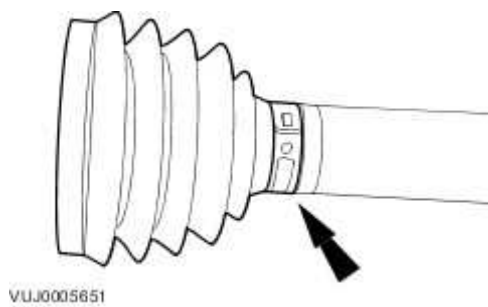


5 . NOTE:

Note the fitted position.

Remove the outer CV joint boot.

▶ Remove and discard the CV joint boot inner retaining clamp.



Installation

1 . Clean and inspect the components for deterioration.

2 . NOTE:

Align to the position noted on removal.

Install the CV joint boot.

▶ Secure the clip.

3 . **NOTE:**

Check that the circlip is fully engaged.

Install the outer CV joint.

4 .



CAUTION: Only use lubricants meeting the Jaguar specification.

Pack the CV joint with the grease supplied.

5



CAUTION: Ensure enough air is present in the CV boot before the retaining clip is secured.

Install the CV joint boot to the CV joint.



Secure the clip.

6 . Install the halfshaft.

For additional information, refer to Rear Halfshaft (47.10.13)

Outer Constant Velocity (CV) Joint Boot (47.10.32)

Removal



CAUTION: The inboard joint has angularly adjusted roller (AAR) joints. AAR joints have no internal retaining mechanism and can separate.

1



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

Raise and support the vehicle.

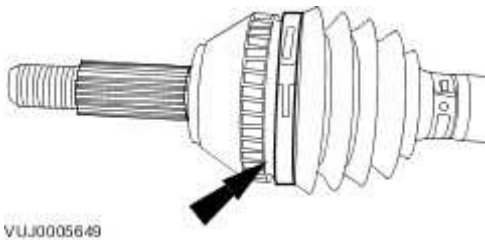
2 . Remove the halfshaft.

For additional information, refer to Rear Halfshaft (47.10.13)

3 . **NOTE:**

Position and secure component in a bench vice fitted with soft jaws.

Remove and discard the CV joint boot outer retaining clamp.



4

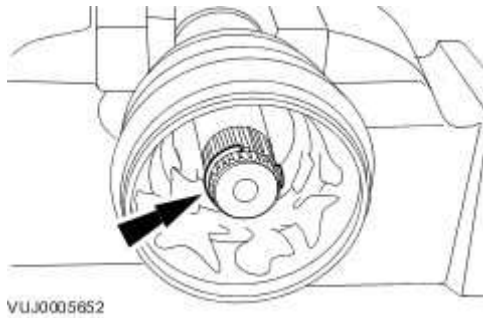


CAUTION: Use a soft face hammer or soft drift to release the C V joint from the retaining circlip.

Remove the outer CV joint.



5 . Remove and discard the circlip.

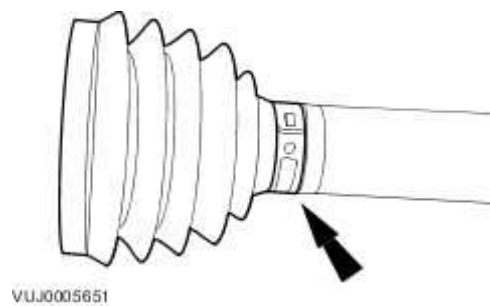


6 . **NOTE:**

Note the fitted position.

Remove the outer CV joint boot.

▶ Remove and discard the CV joint boot inner retaining clamp.



Installation

1 . Clean and inspect the components for deterioration.

2 . **NOTE:**

Align to the position noted on removal.

Install the CV joint boot.

 Secure the clip.

3 . Install the circlip.

4 . **NOTE:**

Check that the circlip is fully engaged.

Install the outer CV joint.

5 . **CAUTION: Only use lubricants meeting the Jaguar specification.**

Pack the CV joint with the grease supplied.

6 . **CAUTION: Ensure enough air is present in the CV boot before the retaining clip is secured.**

Install the CV joint boot to the CV joint.

 Secure the clip.

7 . Install the halfshaft.

For additional information, refer to Rear Halfshaft (47.10.13)

206 : Brake system

206-00 : Brake system – General information

Specifications

Specifications

Lubricants, Fluids, Sealers and Adhesives

	Specifications
Brake fluid	Shell ESL (Dot 4)

Brake Disc Runout Check

Check

1. Remove the wheel and tire.

[Wheel and Tire \(74.20.05\)](#)

2. Install all wheel nuts and tighten equally to 20 Nm (15 lb.ft).

- Make sure that the brake disc is fully seated against the hub face.

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

4. **NOTE:**

If the runout is outside specification, check the hub face runout.

Using the dial test indicator, measure the inner and outer faces of the brake disc.

[Specifications](#)

[Specifications](#)

1. Position the gauge so that it contacts the disc 10 mm (0.4 in) from the outer edge.
2. Slowly rotate the hub/disc assembly. Note the reading.

5. If a front hub runout check is required, remove the front brake disc.

[Brake Disc - Vehicles With: Standard Brakes \(70.10.10\)](#)

6. If a rear hub runout check is required, remove the rear brake disc.

[Brake Disc \(70.10.11\)](#)

7. **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 \(60.25.03\)](#)

[Rear Wheel Bearing - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 \(64.15.14\)](#)

8. If the front hub face is within specification, install a new brake disc. If the rear hub face is within specification, install a new disc.

[Brake Disc - Vehicles With: Standard Brakes \(70.10.10\)](#)

[Brake Disc \(70.10.11\)](#)

9. Install the wheel and tire.

[Wheel and Tire \(74.20.05\)](#)

Brake System Bleeding (70.25.03)



CAUTION: The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.



CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

NOTE:

1.



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

Raise and support the vehicle.

2. Check that the brake fluid lines are secure and that there are no signs of a brake fluid leak. If a brake fluid leak is detected, investigate and rectify the cause of the leak before bleeding the brakes.

3. Remove the brake master cylinder cover.

- Remove the 4 clips.



4.



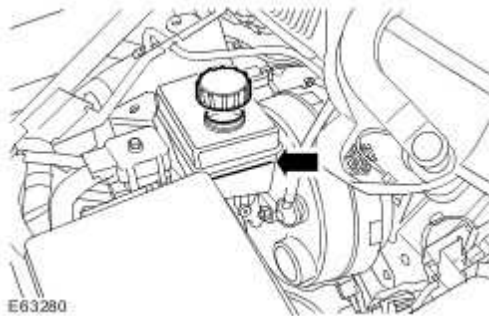
WARNING: Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.



CAUTION: Brake fluid will damage paint finished surfaces. If spilled,

immediately remove the fluid and clean the area with water.

Remove the brake fluid reservoir cap.

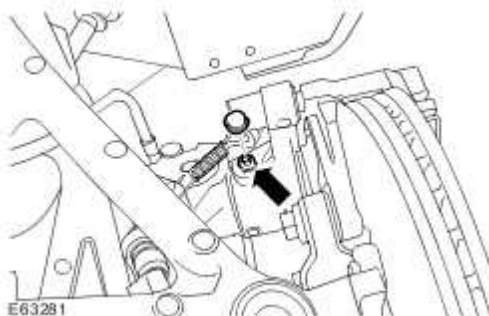


5. Fill the brake fluid reservoir to the MAX mark.

6. Install the bleed tube to the right hand rear brake caliper bleed screw and immerse the free end of the bleed tube in a bleed jar, containing a small quantity of approved brake fluid.

- Remove the bleed screw covers.

7. Loosen the bleed screw by one-half to three-quarters of a turn.



8.



CAUTION: The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

NOTE:

If the bleed tube used, does not have a one way valve the bleed screw will need to be closed before the brake pedal is returned to the rest position. Then opened again and the procedure repeated for each pedal application.

With assistance, depress the brake pedal steadily through its full stroke and allow it to return to the rest position. Repeat the procedure until brake fluid, clean and air-free flows into the bleed jar.

9.



CAUTION: Make sure the bleed screw cap is installed after bleeding. This will prevent corrosion to the bleed screw.

With the brake pedal fully depressed, tighten the bleed screw.

- Vehicles with standard brakes: Tighten the front caliper bleed screw to 8 Nm (6 lb.ft).
- Vehicles with high performance brakes: Tighten the front caliper bleed screw to 15 Nm (11 lb.ft).
- Tighten the rear bleed screw to 15 Nm (11 lb.ft).

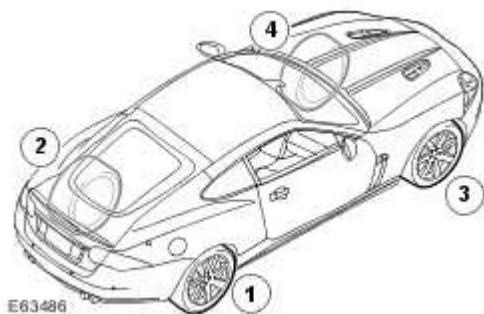
10. Fill the brake fluid reservoir to the MAX mark.

11.



WARNING: Braking efficiency may be seriously impaired if an incorrect bleed sequence is used.

Repeat the brake bleeding procedure for each brake caliper, following the above sequence.



12. Fill the brake fluid reservoir to the MAX mark.

13. Apply the brakes and check for leaks.

14. Install the brake fluid reservoir cap.

15. Install the brake master cylinder cover.

- Carefully secure the clips.

Brake System

Principle of Operation

For a detailed description of the brake system, refer to the relevant Description and Operation section in the workshop manual.

Front Disc Brake

Rear Disc Brake

Parking Brake

Hydraulic Brake Actuation

Brake Booster

Anti-Lock Control - Stability Assist - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8

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 wheel and tire 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 manufacturer. Replace the damaged wheel or excessively worn tire.

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 and, if necessary, check and adjust front wheel alignment.

Specifications

Front Toe Adjustment (57.65.01)

Visual Inspection Chart

Mechanical	Electrical
• Brake master cylinder • Brake caliper piston(s) • Brake discs • Wheel bearings • Brake pads • Power brake booster	• Parking brake actuator • Parking brake module • Parking brake switch • Damaged or corroded wiring harness • Brake master cylinder fluid level switch

- | | |
|--|--|
| <ul style="list-style-type: none">• Brake pedal linkage• Brake booster vacuum hose• Tires• Debris | |
|--|--|

Road Test

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 possible 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.

Symptom Chart

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.
- Brake 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 bushing wear or failure.
- Steering bushing wear or failure.

Action(s) to take:

- Go to Pinpoint Test B.

The brakes pull or drift

Possible Source(s):

- Tire pressures/wear.
- Brake calipers.
- Brake pads.
- Brake discs.
- Wheel alignment adjustment.
- Wheel bearing.
- Suspension bushings 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.

Action(s) to take:

- GO to Pinpoint Test G.

Brake lockup during light brake pedal force

Possible Source(s):

- Brake pads.
- Brake 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 brake 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.
Brake Fluid Reservoir (70.30.16)

Possible Source(s):

- Parking brake control.

Action(s) to take:

- For additional information,
Parking Brake

Possible Source(s):

- Electrical circuit.

Action(s) to take:

- For additional information,
Parking Brake

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 Tests

PINPOINT TEST G545069p1 : BRAKES NOISY

G545069t1 : 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 G545069t2.

-> **No**

CLEAN the front brake pads or INSTALL new front brake pads if necessary.

Brake Pads - Vehicles With: Standard Brakes (70.40.02) CLEAN the rear brake pads or INSTALL new rear brake pads if necessary.

Brake Pads (70.40.03) Test vehicle for presence of brake squeal.

G545069t2 : 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.

Brake Disc - Vehicles With: Standard Brakes (70.10.10)

Brake Pads - Vehicles With: Standard Brakes (70.40.02) . INSTALL new rear brake discs and brake pads.

Brake Disc (70.10.11)

Brake Pads (70.40.03) TEST the system for normal operation.

-> **No**

Vehicle is OK.

PINPOINT TEST G545069p2 : VIBRATION WHEN BRAKES ARE APPLIED

G545069t3 : 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.

Noise, Vibration and Harshness (NVH) REPEAT road test if necessary.

-> **No**

GO to Pinpoint Test G545069t4.

G545069t4 : 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 tyres and REPAIR as necessary. CHECK the brake discs for excessive wear, runout, thickness variation or cracks. INSTALL new brake discs and brake pads as necessary. GO to Pinpoint Test G545069t5.

-> **No**

Vehicle is OK.

G545069t5 : 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 gear bushings. CHECK for wear or failure of steering gear ball joints. CHECK for wear or failure of front wheel bearings, suspension bushings and ball joints. CHECK for wear or failure of rear wheel bearings, suspension bushings and ball joints. REFER to relevant section in workshop manual and INSTALL new parts as necessary.

-> **No**

Vehicle is OK.

PINPOINT TEST G545069p3 : THE BRAKES PULL OR DRIFT

G545069t6 : ROAD TEST VEHICLE

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

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

-> **Yes**

GO to Pinpoint Test G545069t7.

-> **No**

Vehicle is OK.

G545069t7 : INSPECT TIRE CONDITION/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 G545069t8.

-> **No**

ADJUST the tire pressures or INSTALL new tires if excessively worn. TEST the system for normal operation.

G545069t8 : CHECK CALIPERS

1. Check the disc brake caliper pistons and pins for binding, leaking or sticking.

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

-> **Yes**

RECTIFY sticking pins and INSTALL new brake calipers as necessary.

Brake Caliper - Vehicles With: Standard Brakes (70.55.02)

Brake Caliper (70.55.03) TEST the system for normal operation.

-> **No**

GO to Pinpoint Test G545069t9.

G545069t9 : INSPECT BRAKE DISCS

1. Check the brake discs for excessive damage, thickness variation or runout.

Brake Disc Runout Check

- **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 G545069t10.

G545069t10 : INSPECT THE FRONT HUB AND WHEEL BEARING ASSEMBLY

1. Check the front hub and wheel bearing assembly.

- **Are the wheel bearings OK?**

-> **Yes**

GO to Pinpoint Test G545069t11.

-> **No**

INSTALL new wheel bearings.

Front Wheel Bearing and Wheel Hub (60.25.03) TEST the system for normal operation.

G545069t11 : CHECK SUSPENSION BUSHINGS AND BALL JOINTS.

1. Check all suspension bushings and ball joints.

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

-> **Yes**

GO to Pinpoint Test G545069t12.

-> **No**

INSTALL new front suspension bushings and ball joints as necessary. INSTALL new rear suspension bushings and ball joints as necessary. REFER to the relevant section in the workshop manual.

G545069t12 : CHECK VEHICLE ALIGNMENT

1. Check the vehicle alignment.

Front Subframe (76.10.05)

- **Is the alignment within specification?**

-> **Yes**

Vehicle is OK.

-> **No**

Adjust the alignment as necessary.

Front Subframe (76.10.05)

PINPOINT TEST G545069p4 : THE PEDAL FEELS SPONGY

G545069t13 : CHECK FOR SPONGY PEDAL (ENGINE 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 G545069t14.

G545069t14 : CHECK BRAKE PEDAL RESERVE (ENGINE 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 G545069t15.

-> **No**

BLEED the brake system.

Brake System Bleeding (70.25.03)

G545069t15 : 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 G545069t16.

-> **No**

CHECK the vacuum to brake booster.

G545069t16 : CHECK BRAKE FLUID LEVEL

1. Check the brake master cylinder reservoir fluid level.

- **Is the fluid level OK?**

-> **Yes**

BLEED the brake system.

Brake System Bleeding (70.25.03) TEST the system for normal operation.

-> **No**

CHECK for leaking brake system and RECTIFY as necessary. ADD fluid and BLEED the brake system.

Brake System Bleeding (70.25.03) TEST the system for normal operation. REPEAT road test if necessary.

PINPOINT TEST G545069p5 : THE PEDAL GOES DOWN FAST

G545069t17 : ROAD TEST VEHICLE

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

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

-> **Yes**

Vehicle is OK.

-> **No**

GO to Pinpoint Test G545069t19.

G545069t19 : CHECK BRAKE PEDAL TRAVEL-PRESSURIZE SYSTEM

1. Pump the brake pedal rapidly (five times).

- **Does the brake pedal travel build up and then hold?**

-> **Yes**

BLEED the brake system.

Brake System Bleeding (70.25.03) TEST the system for normal operation.

-> **No**

GO to Pinpoint Test G545069t20.

G545069t20 : CHECK FOR BRAKE SYSTEM LEAKS

1. Check for external brake system leaks. For additional information, refer to brake master cylinder component test in this section.

- **Are leaks found?**

-> **Yes**

REPAIR as necessary, ADD fluid and BLEED brake system.

Brake System Bleeding (70.25.03) TEST the system for normal operation.

-> **No**

System is OK.

PINPOINT TEST G545069p6 : THE PEDAL GOES DOWN SLOWLY

G545069t21 : 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 G545069t22.

-> **No**

GO to Pinpoint Test G545069t23.

G545069t22 : CHECK FOR BRAKE SYSTEM LEAKS

1. Check for external brake system leaks. For additional information, refer to brake master cylinder component test in this section.

- **Are there any external brake system leaks?**

-> **Yes**

REPAIR as necessary. ADD fluid and BLEED the brake system.

Brake System Bleeding (70.25.03) TEST the system for normal operation.

-> **No**

GO to Pinpoint Test G545069t23.

G545069t23 : 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.

Brake System Bleeding (70.25.03) TEST the system for normal operation.

-> **No**

System is OK.

PINPOINT TEST G545069p7 : EXCESSIVE BRAKE PEDAL EFFORT

G545069t24 : 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.

Brake Pads - Vehicles With: Standard Brakes (70.40.02) INSTALL the rear brake pads correctly or INSTALL new rear brake pads if necessary.

Brake Pads (70.40.03) TEST the system for normal operation. REPEAT road test.

-> **No**

GO to Pinpoint Test G545069t25.

G545069t25 : CHECK VACUUM

1. Disconnect the vacuum hose from the brake 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 40.5 kPa (12 in-Hg) or greater?**

-> **Yes**

GO to Pinpoint Test G545069t26.

-> **No**

LOCATE and REPAIR the source of low vacuum. TEST the system for normal operation.

G545069t26 : 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 exhaust 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 G545069t27.

G545069t27 : CHECK POWER BRAKE BOOSTER VALVE

1. Check the brake booster valve. For additional information, refer to Brake Booster component test in this section.

- **Is the power brake booster valve OK?**

-> **Yes**

CHECK the brake booster. For additional information, refer to Brake Booster component test in this section. INSTALL a new brake booster if necessary.

Brake Booster - RHD RWD (70.50.17)

Brake Booster - LHD RWD (70.50.17) TEST the system for normal operation.

-> **No**

INSTALL a new brake booster valve. TEST the system for normal operation.

PINPOINT TEST G545069p8 : BRAKE LOCKUP DURING LIGHT BRAKE PEDAL FORCE

G545069t28 : TEST BRAKE LOCKUP

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

- **Do the brakes lockup?**

-> **Yes**

GO to Pinpoint Test G545069t29.

-> **No**

Vehicle is OK.

G545069t29 : INSPECT BRAKE PADS

1. Inspect brake pads for 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.

Brake Pads - Vehicles With: Standard Brakes (70.40.02) INSTALL the rear brake pads correctly or INSTALL new rear brake pads if necessary.

Brake Pads (70.40.03) TEST the system for correct operation.

-> **No**

GO to Pinpoint Test G545069t30.

G545069t30 : INSPECT BRAKE CALIPERS

1. Inspect brake calipers for binding, leaking or sticking.

- **Are any concerns found?**

-> **Yes**

INSTALL the brake calipers correctly or INSTALL new brake calipers as necessary.

Brake Caliper - Vehicles With: Standard Brakes (70.55.02)

Brake Caliper (70.55.03) TEST the system for normal operation.

-> **No**

Vehicle is OK.

PINPOINT TEST G545069p9 : BRAKES DRAG

G545069t31 : 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 G545069t32.

G545069t32 : CHECK BRAKE CALIPERS

1. Check the front caliper pistons and pins for binding, leaking or sticking.

Brake Caliper - Vehicles With: Standard Brakes (70.55.02) Check the rear caliper pistons and pins for binding, leaking or sticking.

Brake Caliper (70.55.03)

- **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. Test the system for normal operation. Road test vehicle if necessary.

-> **No**

GO to Pinpoint Test G545069t33.

G545069t33 : CHECK BRAKE BOOSTER

1. Check the brake booster connecting rod alignment and travel.

- **Is the connecting rod OK?**

-> **Yes**

Vehicle is OK.

-> **No**

INSTALL a new brake booster.

Brake Booster - RHD RWD (70.50.17)

Brake Booster - LHD RWD (70.50.17) TEST the system for normal operation.

PINPOINT TEST G545069p10 : EXCESSIVE/ERRATIC BRAKE PEDAL TRAVEL

G545069t34 : 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 G545069t35.

G545069t35 : CHECK BRAKE FLUID LEVEL

1. Check the brake master cylinder reservoir fluid level.

- **Is the fluid level OK?**

-> **Yes**

GO to Pinpoint Test G545069t36.

-> **No**

CHECK brake master cylinder reservoir sealing points. For additional information, refer to Brake master cylinder component test in this section. ADD brake fluid and BLEED the brake system.

Brake System Bleeding (70.25.03) TEST the system for normal operation. REPEAT road test if necessary.

G545069t36 : CHECK BRAKE PEDAL RESERVE

1. Run engine at idle speed. 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 G545069t37.

-> **No**

CHECK the vacuum to the brake booster.

G545069t37 : CHECK THE FRONT WHEEL BEARING ASSEMBLY

1. Check the front wheel bearing assembly.

- **Are the front wheel bearings loose?**

-> **Yes**

INSTALL a new front wheel bearing if damaged.

Front Wheel Bearing and Wheel Hub (60.25.03) TEST the system for normal operation.

-> **No**

CHECK the front brake discs for thickness variances.

PINPOINT TEST G545069p11 : SLOW OR INCOMPLETE BRAKE PEDAL RETURN

G545069t38 : CHECK FOR BRAKE PEDAL RETURN

1. Run the engine at idle while making several brake applications. 2. Pull the brake pedal rearward with approximately 44.5 N (10lb) 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 G545069t39.

G545069t39 : CHECK FOR BRAKE PEDAL BINDING

1. Disconnect the brake booster from the brake pedal. Check the brake pedal to ensure free operation.

- **Is the brake pedal operating freely?**

-> **Yes**

INSTALL a new brake booster.

Brake Booster - RHD RWD (70.50.17)

Brake Booster - LHD RWD (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 automatic transmission in PARK, stop the engine and apply the parking brake. Pump the brake pedal several times to exhaust all vacuum in the system. 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.

4 . 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 automatic transmission in PARK. 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.

5 . 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 (20lb) 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.

Brake System Bleeding (70.25.03)

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.

- Modern 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

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:

NOTE:

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

- 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, 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 may be caused by two types of none pressure external leaks.

Type 1: An external leak may occur at the brake master cylinder reservoir cap because of incorrect positioning of the gasket and cap. Reposition cap and gasket.

Type 2: An external leak may occur at the brake master cylinder reservoir mounting seals. Repair such a leak by installing new seals and make sure that the brake master cylinder reservoir retaining bolt is correctly installed.

206-03 : Front disc brake

Specifications

Specifications

Brake Disc

Item	Specification
Disc type	Ventilated
Disc diameter	326 mm (12.83 in)
Disc diameter (Supercharged models)	355 mm (13.98 in)
Disc diameter (vehicles fitted with Alcon braking system)	400 mm (15.75 in)
Disc thickness (new)	30 mm (1.18 in)
Disc thickness (Supercharged models new)	32 (1.26 in)
Disc thickness (vehicles fitted with Alcon braking system new)	36 mm (1.42 in)
Minimum disc thickness (service limit)	28 mm (1.10 in)
Minimum disc thickness (Supercharged models service limit)	30mm (1.18 in)
Minimum disc thickness (vehicles fitted with Alcon braking system service limit)	34 mm (1.34 in)
Disc thickness variation (new)	0.008 mm (0.0003 in)
Maximum disc run-out - installed	0.09 mm (0.0035 in)
Maximum hub face run-out - installed	0.0135 mm (0.00053 in)

Caliper and pads

Item	Specification
Caliper	Floating cast iron caliper with 60 mm single piston
Caliper (Supercharged models)	Floating cast iron/aluminium composite caliper with 60mm single piston
Caliper (vehicles fitted with Alcon braking system)	Opposed aluminium caliper with 6 pistons. Piston diameters 38.1 mm, 34.9 mm and 30.2 mm
Minimum pad thickness (service limit)	2 mm (0.078 in)
Minimum pad thickness (vehicles fitted with Alcon braking system service limit including	8.5 mm (0.335 in)

brake pad back plate)	
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Torque Specifications

Item	Nm	lb-ft
Brake caliper anchor plate - bolts*	115	85
Brake caliper - guide pins	28	21
Brake caliper - guide pins (Supercharged models)	58	43
Brake hose to caliper - union	35	26
Brake hose to caliper - union (Supercharged models)	38	28

* New nuts/bolts must be installed **Torque Specifications - vehicles fitted with Alcon braking system**

NOTE:

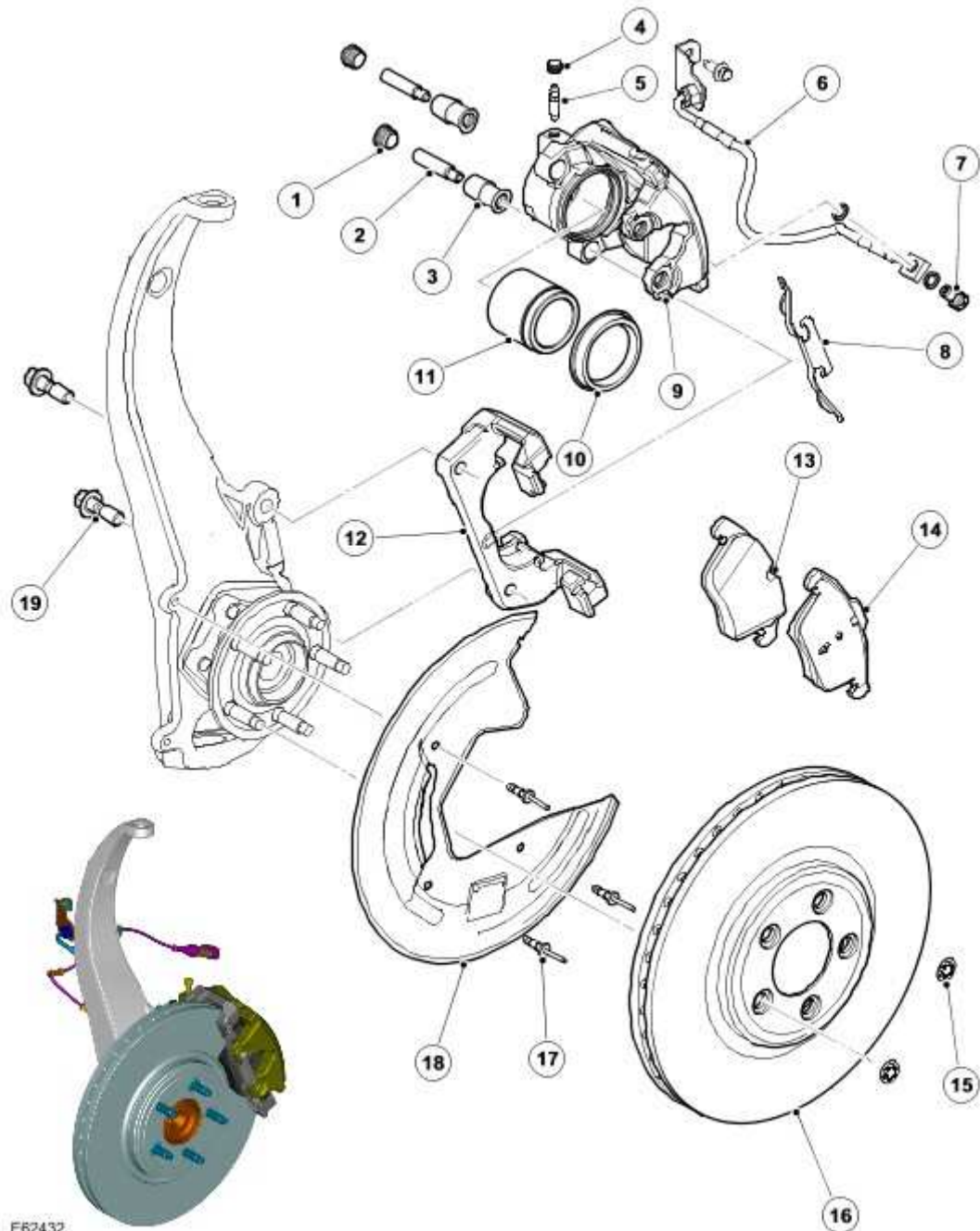
Alcon brake system can be identified by the existence of half-moon shaped marking in the friction surface of the brake disc.

Item	Nm	lb-ft
Brake caliper anchor plate to wheel knuckle - bolts*	108	80
Brake caliper to caliper anchor plate - bolts	115	85

* New nuts/bolts must be installed

Front Disc Brake

STANDARD BRAKES - COMPONENT LOCATION



Item	Part Number	Description
1		Guide pin dust cover (2 off)

2		Guide pin (2 off)
3		Guide pin bush (2 off)
4		Bleed screw dust cap
5		Bleed screw
6		Brake hose
7		Bolt - brake hose to caliper
8		Anti-rattle spring
9		Brake caliper housing
10		Piston dust cover
11		Piston
12		Caliper carrier
13		Inboard brake pad
14		Outboard brake pad
15		Retaining washers (2 off)
16		Brake disc
17		Rivets (3 off)
18		Brake dust shield
19		Caliper carrier bolts (2 off)

INTRODUCTION

The front standard type braking system used on the naturally aspirated vehicles features 326 x 20 mm (12.83 x 0.79 in) diameter ventilated brake discs and cast iron, single piston, sliding calipers.

The caliper is mounted within a fixed carrier that is secured to the front wheel knuckle with 2 bolts. When hydraulic pressure is supplied to the caliper, the piston extends to force the inner pad against the brake disc. The caliper reacts and slides along 2 guide pins to bring the outer pad into contact with the brake disc.

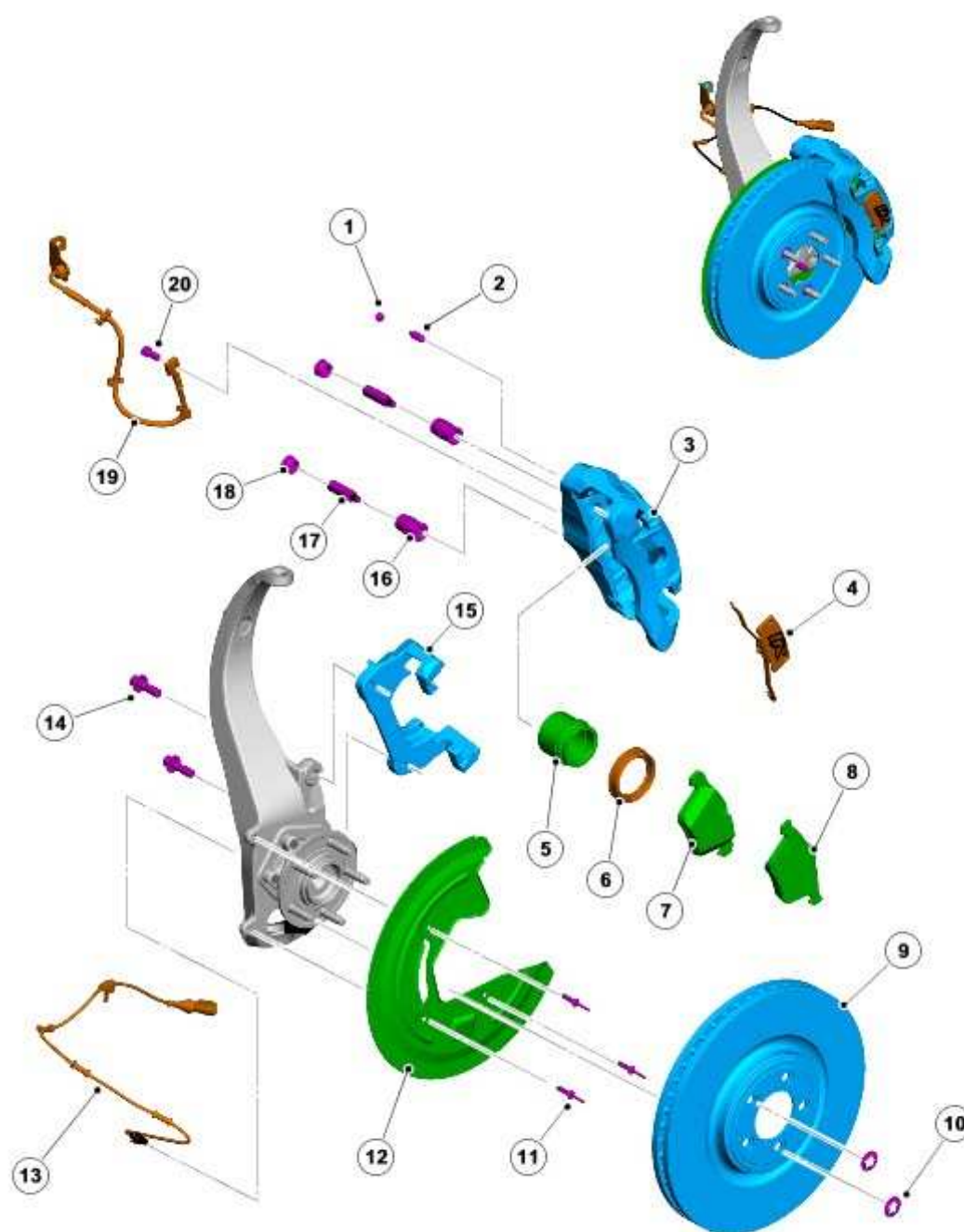
Each inboard brake pad is installed with a pressed steel anti-rattle spring.

NOTE:

There is no wear indicator installed to the front brake pads.

The brake disc is manufactured from cast iron and is of the vented type. The disc is retained on the wheel hub by 2 retaining washers and the wheel nuts.

PERFORMANCE BRAKES - COMPONENT LOCATION



E83350

Item	Part Number	Description
1		Bleed screw dust cap
2		Bleed screw
3		Brake caliper housing

4		Anti-rattle spring (with 'R' type badge)
5		Piston
6		Piston dust cover
7		Inboard brake pad
8		Outboard brake pad
9		Brake disc
10		Retaining washers (2 off)
11		Rivets (3 off)
12		Brake dust shield
13		Anti-lock Brake System (ABS) sensor cable
14		Caliper carrier bolts (2 off)
15		Caliper carrier
16		Guide pin bush (2 off)
17		Guide pin (2 off)
18		Guide pin dust cover (2 off)
19		Brake hose
20		Bolt - brake hose to caliper

INTRODUCTION

The front performance type braking system used on the supercharged vehicle features 355 x 32 mm (13.98 x 1.26 in) diameter ventilated brake discs, and composite aluminum and cast iron, single piston, sliding calipers.

In addition, the brake calipers on the supercharged vehicle are painted and a logo badge is formed on the anti-rattle spring.

The caliper is mounted within a fixed carrier that is secured to the front wheel knuckle with 2 bolts. When hydraulic pressure is supplied to the caliper, the piston extends to force the inner pad against

the brake disc. The caliper reacts and slides along 2 guide pins to bring the outer pad into contact with the brake disc.

Each inboard brake pad is installed with a pressed steel anti-rattle spring.

NOTE:

There is no wear indicator installed to the front brake pads.

The brake disc is manufactured from cast iron and is of the vented type. The disc is retained on the wheel hub by 2 retaining washers and the wheel nuts.

Front Disc Brake

For additional information, refer to [<<206-00>>](#).

Brake Caliper - Vehicles With: Standard Brakes (70.55.02)

Special Service Tools



Brake pedal hold down tool JDS 9013

Removal



CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

1



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

Raise and support the vehicle.

- 2 . Remove the LH front wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

3



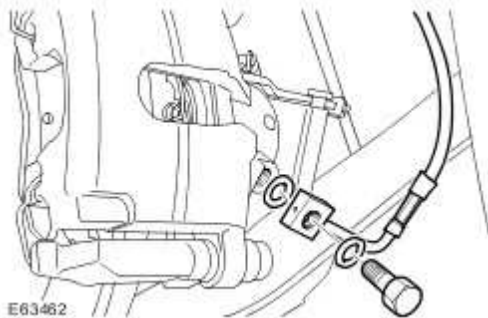
- **CAUTION:** Always plug any open connections to prevent contamination.

NOTE:

To prevent the loss of brake fluid, using the special tool apply the brake pedal and set to 40mm (1.6 in) below the rest position.

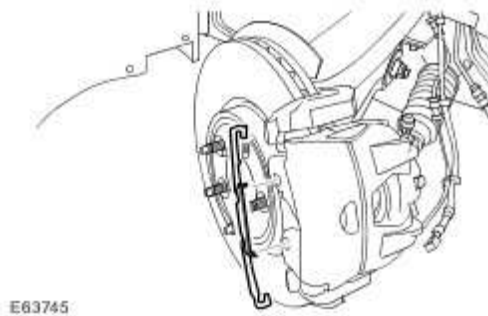
Disconnect the brake hose from the brake caliper.

- ▶ Using the special tool, press and hold the brake pedal.
- ▶ Remove and discard the two sealing washers.



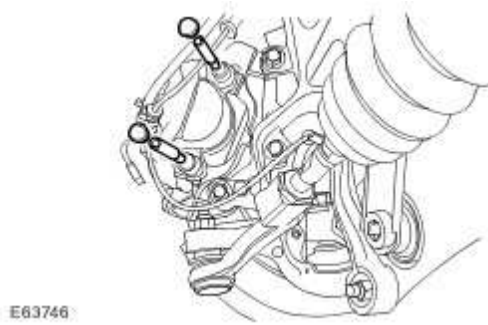
4 . Remove the LH anti-rattle spring.

- ▶ Release the 2 clips.



5 . Remove the LH brake caliper.

- ▶ Remove the 2 access plugs.
- ▶ Release the 2 brake caliper guide pins.

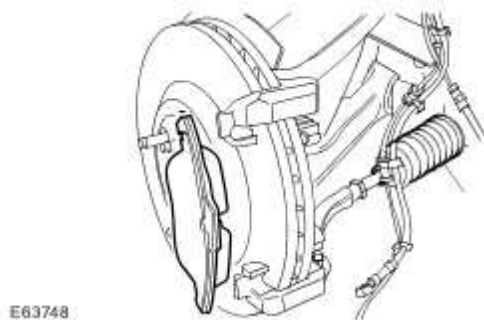


6 . Release the inboard brake pad from the caliper.

▶ Release the clip.



7 . Remove the outboard brake pad.

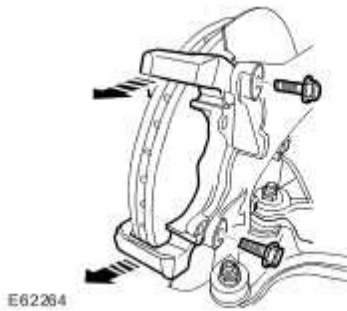


8 . **NOTE:**

Do not disassemble further if the component is removed for access only.

Remove the brake caliper anchor plate.

- ▶ Remove and discard the 2 bolts.



Installation

- 1 . Install the brake caliper anchor plate.

- ▶ Clean the component mating faces.
- ▶ Tighten the bolts to 115 Nm (85 lb.ft).

- 2 . Install the LH brake pads.

- ▶ Secure the inboard brake pad in the clip.
- ▶ Position the outboard brake pad.

- 3 . Install the LH brake caliper.

- ▶ Tighten the guide pins to 28 Nm (21 lb.ft).
- ▶ Install the access plugs.

- 4 . Install the LH anti-rattle spring.

- ▶ Carefully secure the clips.

5 . Connect the brake hose to the brake caliper.

 Install new sealing washers.

 Tighten the union to 35 Nm (26 lb.ft).

6 . Install the front wheels and tires.

For additional information, refer to Wheel and Tire (74.20.05)

7 . Bleed the brake system.

Brake Disc - Vehicles With: Standard Brakes (70.10.10)

Removal



CAUTION: Brake discs must be renewed in pairs.

1



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

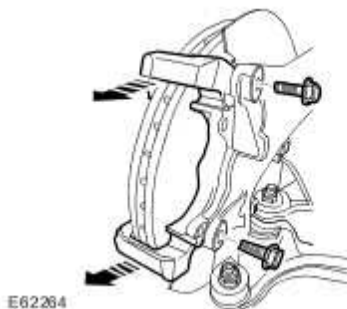
Raise and support the vehicle.

2 . Remove the front brake pads.

For additional information, refer to Brake Pads - Vehicles With: Standard Brakes (70.40.02)

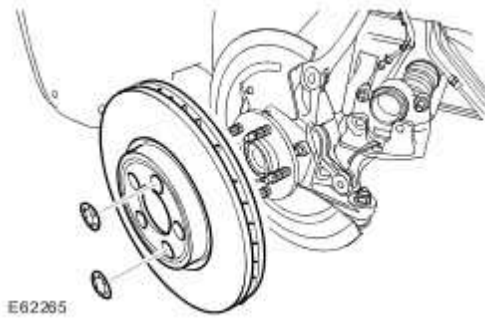
3 . Remove the brake caliper anchor plate.

▶ Remove and discard the 2 bolts.



4 . Remove the brake disc.

▶ Remove the 2 clips.



Installation

1



- **WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.**

Install the brake disc.

► Clean the component mating faces.

► Secure the clips.

2 . Install the brake caliper anchor plate.

► Clean the component mating faces.

► Tighten the bolts to 115 Nm (85 lb.ft).

3 . Install the brake pads.

For additional information, refer to Brake Pads - Vehicles With: Standard Brakes (70.40.02)

Brake Disc - Vehicles With: High Performance Brakes (70.10.10)

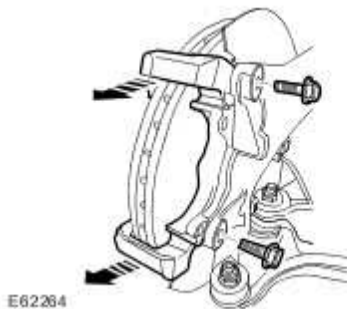
Removal

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

Raise and support the vehicle.

- 2 Remove the front brake pads.
 - For additional information, refer to Brake Pads - Vehicles With: High Performance Brakes (70.40.02)
- 3 . Remove the brake caliper anchor plate.

 Remove and discard the 2 bolts.



- 4 . Remove the brake disc.

 Remove the 2 clips.



Installation

1



- **WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.**

Install the brake disc.

▶ Clean the component mating faces.

▶ Secure the clips.

2 . Install the brake caliper anchor plate.

▶ Clean the component mating faces.

▶ Tighten the bolts to 115 Nm (85 lb.ft).

3 Install the brake pads.

- For additional information, refer to Brake Pads - Vehicles With: High Performance Brakes (70.40.02)

Brake Pads - Vehicles With: Standard Brakes (70.40.02)

Removal



WARNING: Brake pads must be renewed in axle sets only. Failure to follow this instruction may result in braking efficiency being impaired.



WARNING: Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.

1



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

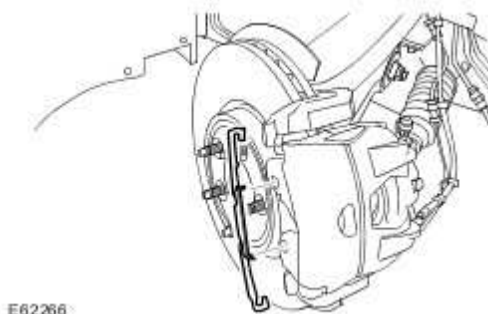
Raise and support the vehicle.

- 2 . Remove the front wheels and tires.

For additional information, refer to Wheel and Tire (74.20.05)

- 3 . Remove the LH anti-rattle spring.

► Release the 2 clips.



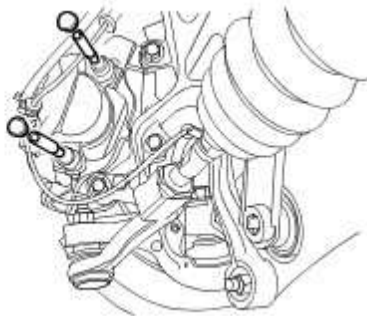
4 .



CAUTION: Do not allow the brake caliper to hang on the brake hose.

Remove the LH brake caliper.

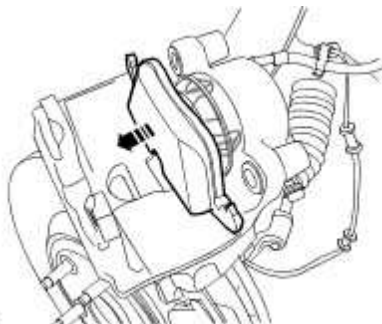
- ▶ Remove the 2 access plugs.
- ▶ Remove the 2 caliper guide pins.
- ▶ Tie the brake caliper aside.



E62267

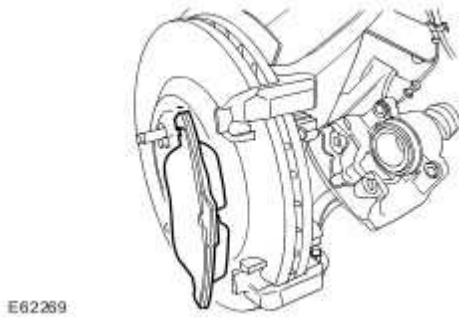
5 . Release the inboard brake pad from the caliper.

- ▶ Release the clip.



E62268

6 . Remove the outboard brake pad.



7 . Repeat the above procedure for the RH caliper.

Installation

- 1  **WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.**

Clean the caliper housings and anchor plates, using brake cleaning fluid.

- 2  **CAUTION: As the piston is pushed back into the caliper housing, the brake fluid level in the reservoir will rise. Do not allow the reservoir to overflow.**

 **CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.**

Press the LH pistons into the caliper housing.

- 3 . Install the LH brake pads.

 Secure the inboard brake pad in the clip.

 Position the outboard brake pad.

4 . Install the LH brake caliper.

▶ Tighten the guide pins to 28 Nm (21 lb.ft).

▶ Install the access plugs.

5 . Install the LH anti-rattle spring.

▶ Carefully secure the clips.

6 . Repeat the above procedure for the RH caliper.

7 . Install the front wheels and tires.

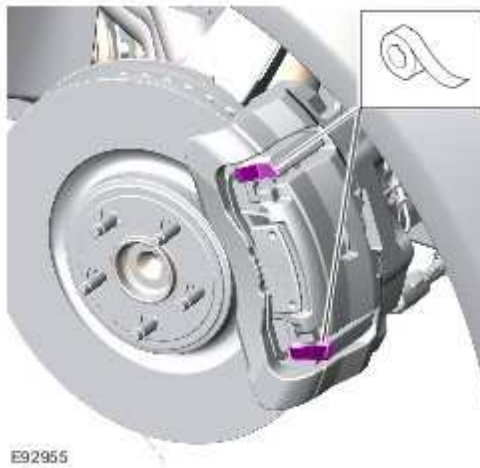
For additional information, refer to Wheel and Tire (74.20.05)

Brake Pads - Vehicles With: High Performance Brakes (70.40.02)

Removal

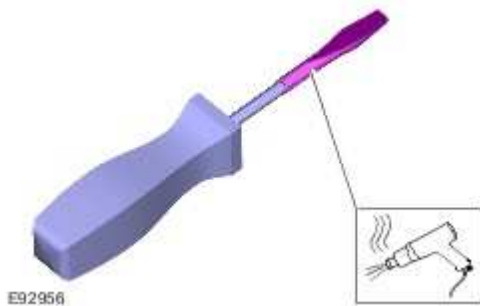
- 1 . Raise and support the vehicle.
- 2 . Remove the front road wheels and tires.
For additional information, refer to Wheel and Tire (74.20.05)

- 3 . Apply protective tape to the caliper.



- 4 .  **CAUTION: Removal of the clips is a delicate procedure, damage will occur if any force is used.**

Apply heatshrink or protective tape to the end of the screw-driver.



5

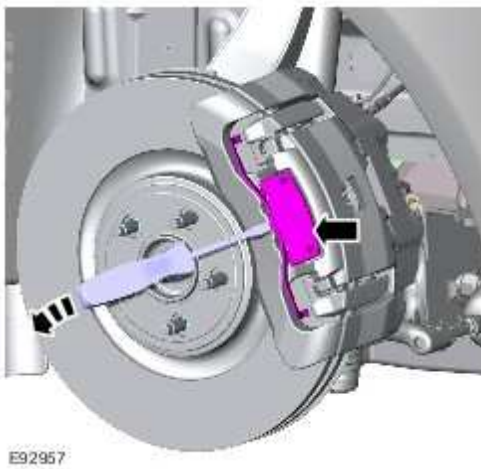


CAUTION: Removal of the clips is a delicate procedure, damage will occur if any force is used.

Remove the anti-rattle spring.



Lever the anti-rattle spring in the center of the spring until either side is released.



6.



CAUTION: Do not allow the brake caliper to hang on the brake hose.

Remove the brake caliper.



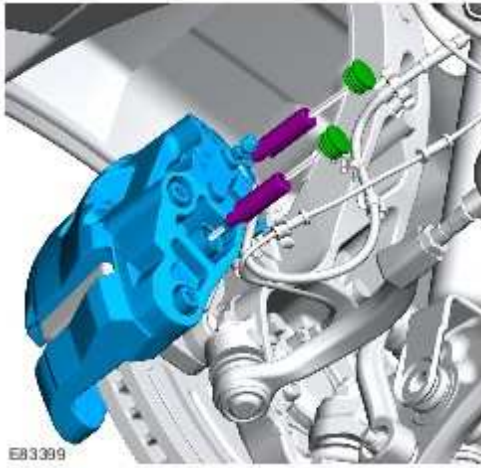
Remove the 2 access plugs.



Remove the 2 caliper guide pins.

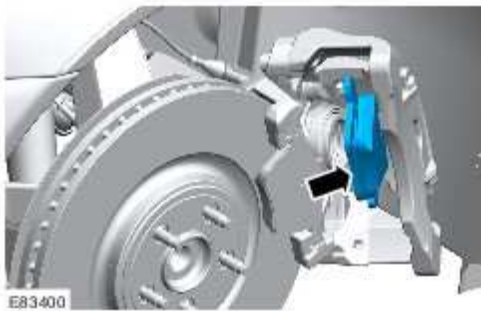


Tie the brake caliper aside.

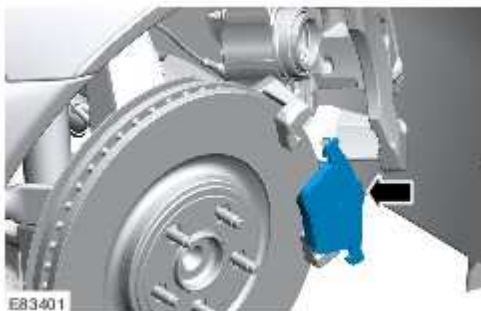


7 . Release the inboard brake pad from the caliper.

▶ Release the clip.



8 . Remove the outboard brake pad.



Installation

1



- **WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.**

Clean the brake caliper housings and anchor plates, using brake cleaning fluid.

2



- **CAUTION: As the piston is pushed back into the caliper housing, the brake fluid level in the reservoir will rise. Do not allow the reservoir to overflow.**



CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

Press the piston into the caliper housing.

3 . Install the brake pads.

- ▶ Secure the inboard brake pad in the clip.
- ▶ Position the outboard brake pad.

4 . Install the brake caliper.

- ▶ Tighten the guide pins to 58 Nm (43 lb.ft).
- ▶ Install the access plugs.

5 Install the anti-rattle spring.

- ▶ Secure the bottom arm of the anti-rattle spring under the bottom anchor bracket of the caliper.

- ▶ Compress the upper spring arm into the correct position, under the upper anchor bracket, whilst retaining the logo plate.
- ▶ Using the screw-driver, tap the central locating tag into the locked position.

6 . Repeat the above procedure on the opposite side.

7 . Install both wheels and tires.

For additional information, refer to Wheel and Tire (74.20.05)

206-04 : Rear disc brake

Specifications

Specifications

Brake Disc

Item	Specification
Disc type	Ventilated
Disc diameter	326 mm (12.8 in)
Disc diameter (vehicles fitted with Alcon braking system)	350 mm (13.78 in)
Disc thickness (new)	20 mm (0.78 in)
Disc thickness (vehicles fitted with Alcon braking system new)	28 mm (1.10 in)
Minimum disc thickness (service limit)	18 mm (0.70 in)
Minimum disc thickness (vehicles fitted with Alcon braking system service limit)	26 mm (1.02 in)
Disc thickness variation (new)	0.008 mm (0.0003 in)
Maximum disc run-out - installed	0.075 mm (0.0029 in)
Maximum hub face run-out - installed	0.0135 mm (0.00053 in)

Caliper and pads

Item	Specification
Caliper	Floating aluminium caliper with 45 mm single piston and integral park brake mechanism
Caliper (vehicles fitted with Alcon braking system)	Opposed aluminium caliper with four 31.8 mm diameter pistons.
Minimum pad thickness (service limit)	2 mm (0.078 in)
Minimum pad thickness (vehicles fitted with Alcon braking system service limit including brake pad back plate)	7.5 mm (0.30 in)

Torque Specifications

Item	Nm	lb-ft
------	----	-------

Brake caliper anchor plate - bolts*	103	76
Brake caliper - guide pins	28	21
Brake hose to caliper - union	35	26

* New nuts/bolts must be installed **Torque Specifications - vehicles fitted with Alcon braking system**

NOTE:

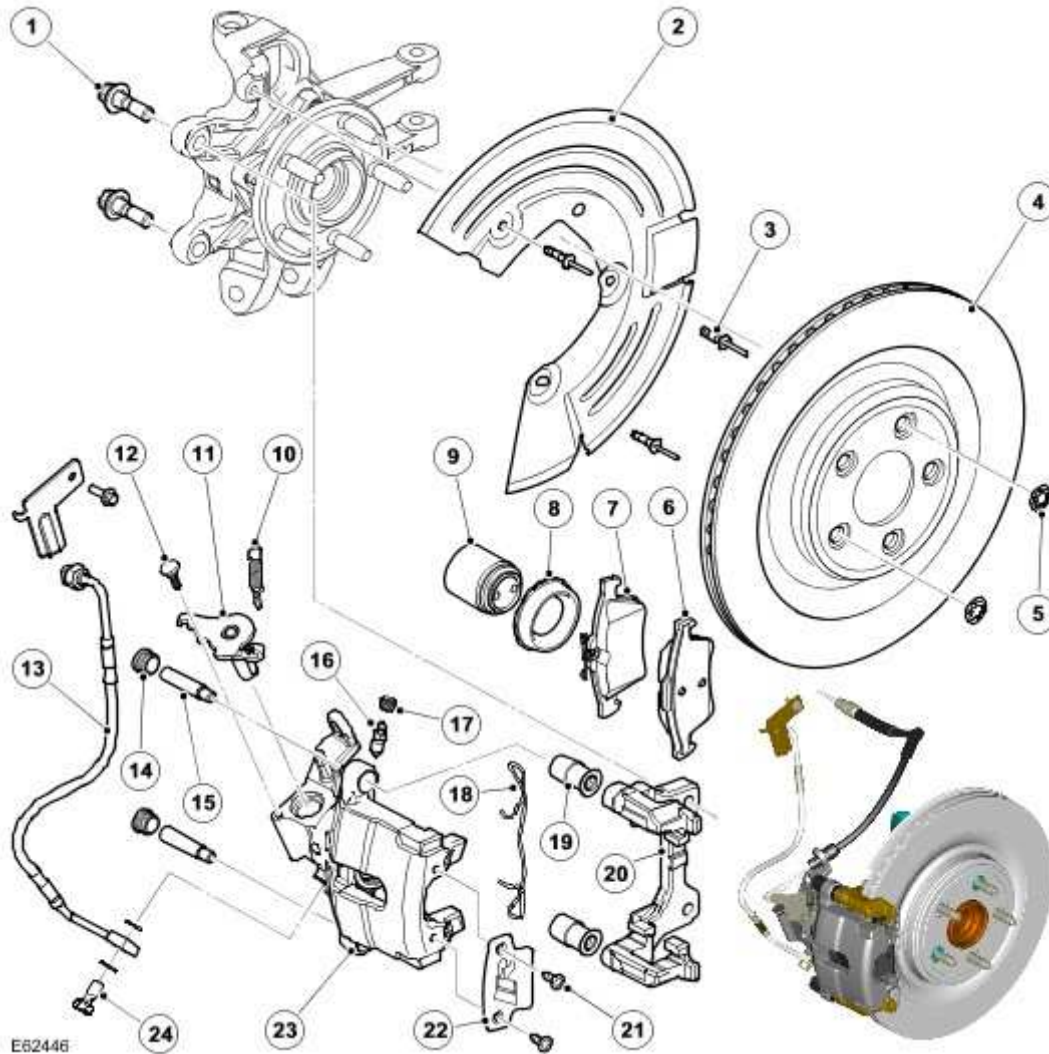
Alcon brake system can be identified by the existence of half-moon shaped marking in the friction surface of the brake disc.

Item	Nm	lb-ft
Hydraulic brake caliper anchor plate to wheel knuckle - bolts*	108	80
Hydraulic brake caliper to caliper anchor plate - bolts	115	85
Parking brake caliper to caliper anchor plate - bolts	63	46
Parking brake caliper anchor plate to rear wheel knuckle - front bolt	70	52
Parking brake caliper anchor plate to rear wheel knuckle - rear bolt	63	46

* New nuts/bolts must be installed

Rear Disc Brake

COMPONENT LOCATION



Item	Part Number	Description
1		Caliper carrier bolts (2 off)
2		Brake dust shield
3		Rivets (3 off)
4		Brake disc

5		Retaining washers (2 off)
6		Outboard brake pad
7		Inboard brake pad
8		Piston dust cover
9		Piston
10		Parking brake return spring
11		Parking brake lever
12		Parking brake lever stop
13		Brake hose
14		Guide pin dust cover (2 off)
15		Guide pins (2 off)
16		Bleed screw
17		Bleed screw dust cap
18		Anti-rattle spring
19		Guide pin bush (2 off)
20		Caliper carrier
21		Screw (2 off) - (supercharged model)
22		'R' type logo badge (supercharged model)
23		Brake caliper housing
24		Bolt - brake hose to caliper

INTRODUCTION

The rear braking system on both the naturally aspirated and supercharged vehicles features 326 x 20 mm (12.83 x 0.79 in) diameter ventilated brake discs with aluminum, single acting piston, sliding calipers.

The brake calipers on the supercharged vehicle are painted and also include a logo badge. The logo badge must be removed in order to renew the brake pads.

The caliper is mounted within a fixed carrier that is secured to the rear wheel knuckle with 2 bolts. When hydraulic pressure is supplied to the caliper, the piston extends to force the inner pad against the brake disc. The caliper reacts and slides along 2 guide pins to bring the outer pad into contact with the brake disc.

Each inboard brake pad is installed with a wire type anti-rattle spring.

NOTE:

There is no wear indicator installed to the rear brake pads.

The brake disc is manufactured from cast iron and is of the vented type. The disc is retained on the wheel hub by 2 retaining washers and the wheel nuts.

Also incorporated into each rear brake caliper carrier is the parking brake mechanism. For additional information, refer to Parking Brake (206-05 Parking Brake and Actuation)

Repairs



CAUTION: Do not use the 'Emergency Release' tool to allow work to be carried out on the rear brakes. Work can only be carried out on the rear brakes after the 'parking brake unjam' routine is run.

Before carrying out any work on the rear brakes, the Jaguar approved diagnostic system must be connected and the 'parking brake unjam' routine run.

When all work is carried out on the rear brakes, the parking brake system will require resetting. For additional information, refer to Parking Brake (206-05 Parking Brake and Actuation)

Rear Disc Brake

For additional information, refer to [<<206-00>>](#).

Brake Caliper (70.55.03)

Special Service Tools



Brake pedal hold down tool
JDS9013

Removal

All vehicles

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

Raise and support the vehicle.

- 2 . Remove the LH rear wheel and tire.
For additional information, refer to Wheel and Tire (74.20.05)
- 3 . Release the parking brake cable tension.
For additional information, refer to Parking Brake Cable Tension Release

- 4  **CAUTION: Always plug any open connections to prevent contamination.**

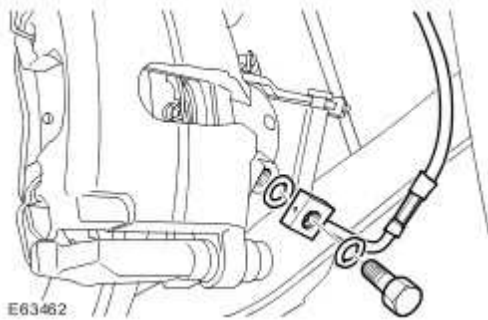
NOTE:

To prevent the loss of brake fluid, using the special tool apply the brake pedal and set to 40mm (1.6 in) below the rest position.

Disconnect the brake hose from the brake caliper.

▶ Using the special tool, press and hold the brake pedal.

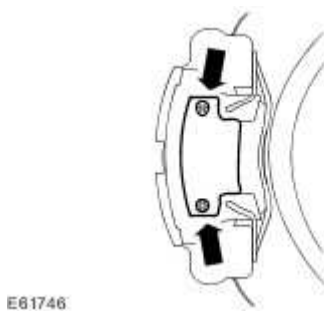
▶ Remove and discard the 2 sealing washers.



Vehicles with high performance brakes

5 . Remove the logo badge.

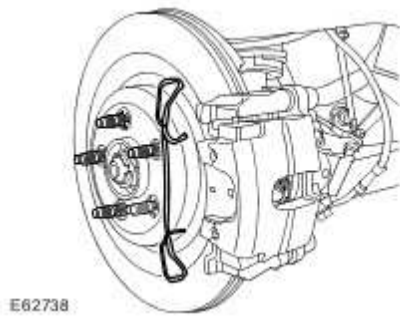
▶ Remove the 2 screws.



All vehicles

6 . Remove the LH anti-rattle spring.

- ▶ Release the 2 clips.



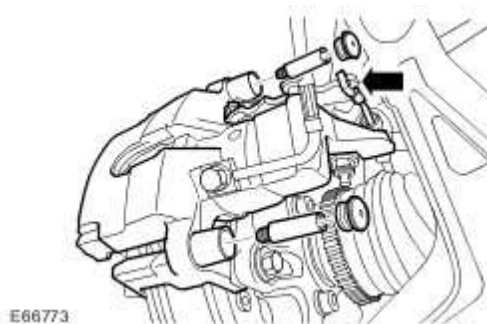
- 7 . Disconnect and release the parking brake cable from the caliper.

- ▶ Release the clip.

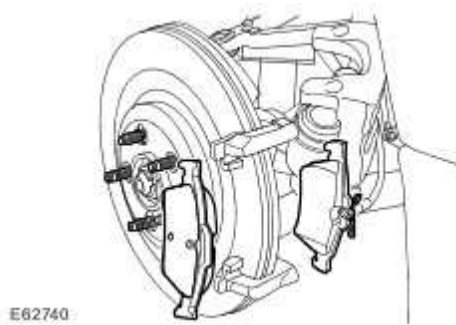
- 8 . Remove the LH brake caliper.

- ▶ Remove the 2 access plugs.

- ▶ Release the 2 brake caliper guide pins.



- 9 . Remove the brake pads.

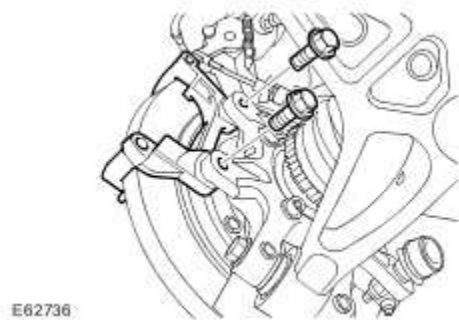


10 . NOTE:

Do not disassemble further if the component is removed for access only.

Remove the brake caliper anchor plate.

▶ Remove and discard the 2 bolts.



Installation

All vehicles

1 . Install the brake caliper anchor plate.

▶ Clean the component mating faces.

▶ Tighten the bolts to 103 Nm (76 lb.ft).

2 . Install the LH brake pads.

3 . Install the LH brake caliper.

 Tighten the guide pins to 28 Nm (21 lb.ft).

 Install the access plugs.

4 . Install the LH anti-rattle spring.

 Carefully secure the clips.

Vehicles with high performance brakes

5 . Install the logo badge.

 Tighten the screws to 5 Nm (3 lb.ft).

All vehicles

6 . Connect the brake hose to the brake caliper.

 Install new sealing washers.

 Tighten the union to 35 Nm (26 lb.ft).

7 . Connect the parking brake cable.

 Carefully secure the clips.

8 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

9 . Bleed the brake system.

For additional information, refer to Brake System Bleeding (70.25.03)

Brake Disc (70.10.11)

Removal



WARNING: Brake pads must be renewed in axle sets only. Failure to follow this instruction may result in braking efficiency being impaired.

1



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

Raise and support the vehicle.

- 2 . Remove the rear brake pads.

For additional information, refer to Brake Pads (70.40.03)

- 3 . Tie the brake caliper aside.

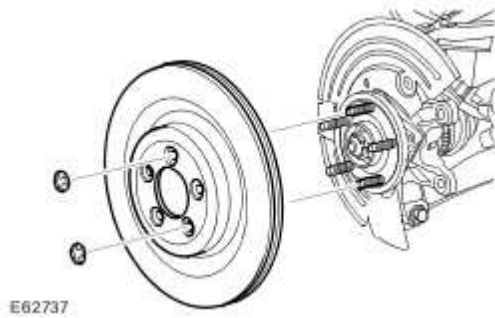
- 4 . Remove the brake caliper anchor plate.

▶ Remove and discard the 2 bolts.



- 5 . Remove the brake disc.

- ▶ Remove the 2 clips.



Installation

- 1  **WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.**

Install the brake disc.

- ▶ Clean the component mating faces.
- ▶ Secure the clips.

- 2 . Install the brake caliper anchor plate.

- ▶ Clean the component mating faces.
- ▶ Tighten the bolts to 103 Nm (76 lb.ft).

- 3 . Install the brake pads.

For additional information, refer to Brake Pads (70.40.03)

Brake Disc (70.10.11)

Removal



WARNING: Brake pads must be renewed in axle sets only. Failure to follow this instruction may result in braking efficiency being impaired.

1



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

Raise and support the vehicle.

- 2 . Remove the rear brake pads.

For additional information, refer to Brake Pads (70.40.03)

- 3 . Tie the brake caliper aside.

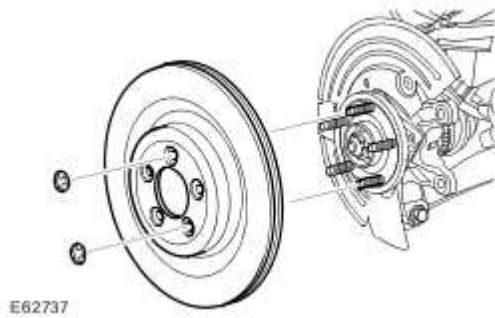
- 4 . Remove the brake caliper anchor plate.

▶ Remove and discard the 2 bolts.



- 5 . Remove the brake disc.

- ▶ Remove the 2 clips.



Installation

- 1  **WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.**

Install the brake disc.

- ▶ Clean the component mating faces.
- ▶ Secure the clips.

- 2 . Install the brake caliper anchor plate.

- ▶ Clean the component mating faces.
- ▶ Tighten the bolts to 103 Nm (76 lb.ft).

- 3 . Install the brake pads.

For additional information, refer to Brake Pads (70.40.03)

206-05 : Parking brake and Actuation

Specifications

Specifications

Torque Specifications

Item	Nm	lb-ft	lb-in
Parking brake actuator - bolts	20	15	-
Parking brake module - nuts	4	3	35
Parking brake switch- bolts	6	4	53

Parking Brake Cable Tension Release

Special Service Tools



Electric parking brake release tool 206-082. Only to be used for EMERGENCY brake release



Electric parking brake release tool link lead 206-082-01. Only to be used for EMERGENCY brake release



WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.



CAUTION: Ensure the vehicle transmission is in park position before the cable tension is released.



CAUTION: The warranty of the electric parking brake release tool will be invalidated if the casing has been removed.

NOTE:

The tools shown must only be used in the event of an emergency.

1.



WARNING: Always use Jaguar approved diagnostic equipment to release the cable tension, when carrying out repair operations on the electric park brake which require cable tension release.

Connect the Jaguar approved diagnostic equipment to release the electric parking brake cable tension.

- Follow the on-screen instructions.

2.



WARNING: The procedure below should only be used in emergency situations, to release the electric park brake. All calibration of the parking brake system will be lost, and the parking brake will need to be re-calibrated to function correctly.

Release the auxiliary junction box access cover.

- Release from the clip.

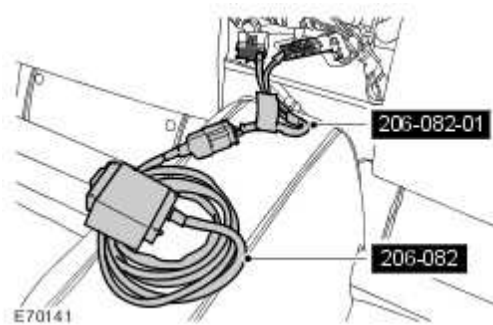


3. Disconnect the parking brake module.

- Disconnect the 2 electrical connectors in the sequence illustrated.

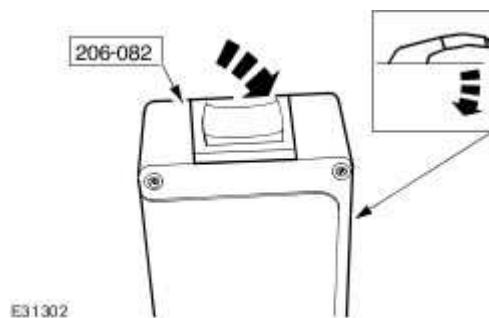


4. Connect the special tool.



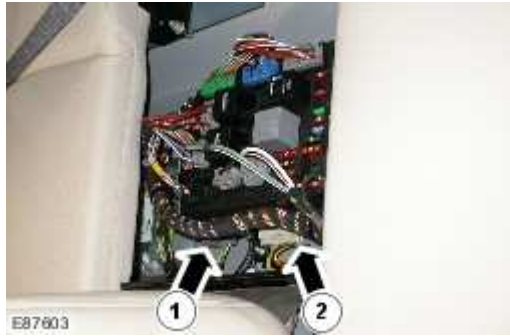
5. Release the parking brake cable tension.

- An audible 'click', signals complete parking brake cable tension release.



6. Remove the special tool.

- Reverse the removal sequence, connect and secure the electrical connectors.



7. Secure the auxiliary junction box access cover.

- Align the pegs and secure the clip.

8.



WARNING: Calibrate the electric park brake using Jaguar approved diagnostic equipment. If Jaguar approved diagnostic equipment is not available disconnect the battery for approximately 30 seconds , the vehicle will then prompt the driver to carry out the calibration procedure as per the vehicle hand book on re-connection.

Re-calibrate the electric park brake.

Parking Brake

Principle of Operation

For a detailed description of the Parking Brake operation, refer to the relevant Description and Operation section of the workshop manual.

Parking Brake

Parking Brake Calibration

The parking brake system must be calibrated whenever the battery has been disconnected or has been in a state of discharge, or repairs have been carried out to the rear service or parking brake system.

NOTE:

If new rear brake pads have been installed, pressure must be applied to the brake pedal a minimum of five times prior to calibration of the parking brake system.

To calibrate the parking brake system:

- 1 . Place gear selector lever in 'P' Park position.
- 2 . Release parking brake cable tension to service position.
Parking Brake Cable Tension Release
- 3 . Set the ignition status to 'ON'.
- 4 . Apply and hold the footbrake then pull up the parking brake switch.
- 5 . To release the parking brake, apply and hold the footbrake then release and press down the parking brake switch.

Inspection and Verification

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

Mechanical	Electrical
• Parking brake cable • Parking brake actuator • Brake caliper	• Fuse(s) • Wiring harness/electrical connectors • Check for bent/corroded pins

- | | |
|--|---|
| <ul style="list-style-type: none">• Brake pads• Stabilizer bar drop link caps | <ul style="list-style-type: none">• Parking brake switch• Parking brake module |
|--|---|

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

4 . If the cause is not visually evident check the system for any logged Diagnostic Trouble Codes (DTCs) and proceed to the DTC Index , alternatively, verify the customer concern and refer to the Symptom Chart.

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 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.

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 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
B131700	Parking Brake Module voltage high	Battery voltage is high (above 18 volts)	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B131800	Parking Brake module voltage low	Battery voltage is low (below 8 volts) (not logged on battery disconnect)	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B134200	Parking Brake module is defective	Internal module fault	Install new Parking Brake module, refer to the new module installation note at the top of the DTC Index
C109400	Primary parking brake apply switch circuit failure	- Connector fault - bent, loose or corroded pin(s) - Harness fault - high resistance, open circuit - Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C140800	Primary parking brake release switch circuit voltage out of range	- Connector fault - bent, loose or corroded pin(s) - Harness fault - low resistance to ground - Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C140900	Primary parking brake apply switch circuit voltage out of range	- Connector fault - bent, loose or corroded pin(s) - Harness fault - low resistance to ground - Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

C176900	Primary parking brake apply switch circuit short to ground	• Connector fault - bent, loose or corroded pin(s) • Harness fault - short to ground • Switch fault	Refer to the electrical circuit diagrams and test primary parking brake apply switch circuit for short to ground
C178200	Primary parking brake release switch circuit failure	• Connector fault - bent, loose or corroded pin(s) • Harness fault - high resistance, open circuit • Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C178300	Primary parking brake release switch circuit short to ground	• Connector fault - bent, loose or corroded pin(s) • Harness fault - short to ground • Switch fault	Refer to the electrical circuit diagrams and test primary parking brake release switch circuit for short to ground
C178400	Parking brake motor output circuit short to ground	• Connector fault - bent, loose or corroded pin(s) • Harness fault - short to ground • Actuator fault	Refer to the electrical circuit diagrams and test parking brake motor output circuit for short to ground
C178500	Parking brake motor output circuit open circuit	• Connector fault - bent, loose or corroded pin(s) • Harness fault - open circuit • Actuator fault	Refer to the electrical circuit diagrams and test parking brake motor output circuit for high resistance
C178600	Parking brake motor output circuit short to power	• Connector fault - bent, loose or corroded pin(s) • Harness fault - short to power • Actuator fault	Refer to electrical circuit diagrams and test parking brake motor output circuit for short to power
C179900	Hall effect circuit failure	• Connector fault - bent, loose or corroded pin(s) • Hall effect sensor power circuit fault • Hall effect sensor ground circuit fault • Hall effect sensor signal circuit fault • Mechanical fault with sensor/actuator	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C180100	Motor engage current reached	• Service brake not correctly adjusted following lining	Refer to parking brake calibration procedure. Check

	before full apply travel distance	- replacement - Parking brake not calibrated after lining replacement - Cables fouled, trapped or damaged - Cables incorrectly routed or fixed - Caliper malfunction - Actuator malfunction	for mechanical failure of parking brake system
C180200	Motor engage current not reached or travelled too far upon apply	- Service brake not correctly adjusted following lining replacement - Parking brake not calibrated after lining replacement - Cables broken - Cables incorrectly routed or fixed - Caliper malfunction - Actuator malfunction	Refer to parking brake calibration procedure. Check for mechanical failure of parking brake system
C180300	Motor disengage full travel distance not reached upon release	- Intermittent motor and circuit - open circuit - Actuator malfunction (excessive noise may be heard during release)	Check for additional motor circuit DTCs and refer to DTC Index. Check for mechanical failure of parking brake system
C198900	Parking brake apply and release switches are active at the same time	- Connector fault - bent, loose or corroded pin(s) - Harness fault - apply and release circuits - short to each other - Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D0062	Apply switch active then release switch active	- Connector fault - bent, loose or corroded pin(s) - Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D0064	Erroneous apply switch active	- Connector fault - bent, loose or corroded pin(s) - Harness fault - primary or secondary apply circuit - Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D0066	Parking brake apply/release switch signal has too many	High amount of apply/release applications in short space of time (switch	Cycle ignition to re-enable switch functionality

	transitions/events	locked out due to abuse)	
C1D0711	Secondary parking brake apply switch circuit short to ground	• Connector fault - bent, loose or corroded pin(s) • Harness fault - short to ground • Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D0715	Secondary parking brake apply switch circuit failure	• Connector fault - bent, loose or corroded pin(s) • Harness fault - high resistance, open circuit • Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D071C	Secondary parking brake apply switch circuit voltage out of range	• Connector fault - bent, loose or corroded pin(s) • Harness fault - low resistance to ground • Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D0811	Secondary parking brake release switch circuit short to ground	• Connector fault - bent, loose or corroded pin(s) • Harness fault - short to ground • Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D0815	Secondary parking brake release switch circuit failure	• Connector fault - bent, loose or corroded pin(s) • Harness fault - high resistance, open circuit • Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D081C	Secondary parking brake release switch circuit voltage out of range	• Connector fault - bent, loose or corroded pin(s) • Harness fault - low resistance to ground • Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D1000	Field effect transistor circuit over current/over temperature	• Internal module fault	Install a new parking brake module, refer to the new module installation note at the top of the DTC Index
C1D1162	Release switch active then apply switch active	• Connector fault - bent, loose or corroded pin(s) • Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

C1D1164	Erroneous release switch active	- Connector fault - bent, loose or corroded pin(s) - Harness fault - primary or secondary apply circuit - Switch fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D1564	Brake switch status	- ECM off Bus (ECM off Bus DTC may also be logged) - Harness fault - brake switch circuit open circuit to parking brake module	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D1614	High power battery feed circuit failure	- Fuse - Harness fault - high resistance, open circuit - Connector fault - bent, loose or corroded pin(s)	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
C1D2092	Vehicle deceleration, performance or incorrect operation	Implausible vehicle speed message sent from ABS	Cycle the ignition. Check ABS for DTCs and refer to DTC Index
U000187	High speed CAN communication bus	All CAN messages are detected missing at Ignition ON	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U000188	High speed CAN communication Bus - bus off	CAN Bus circuit fault	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U010000	Lost communication with ECM	ECM off Bus	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U010100	Lost communication with the TCM	TCM off Bus	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U010400	Lost communication with speed control front distance range	Speed control module off Bus	Carry out any pinpoint tests associated with this DTC using the manufacturer

	sensor		approved diagnostic system
U012100	Lost communication with anti-lock brake system	• ABS module off Bus	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U015500	Lost communication with instrument cluster	• Instrument cluster off Bus	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U030000	Internal control module software incompatibility	• Invalid configuration message is received	Re-configure the RJB using the manufacturer approved diagnostic system. Clear the DTC and retest. If the DTC is still logged suspect the Parking Brake module, refer to the new module installation note at the top of the DTC Index
U040100	Invalid data received from ECM	• Invalid message from the ECM	No fault with parking brake system if this DTC is logged. Check ECM for DTCs and refer to the DTC Index. Electronic Engine Controls
U040200	Invalid data received from TCM	• Invalid message from the TCM	No fault with parking brake system if this DTC is logged. Check TCM for DTCs and refer to the DTC Index. Diagnostic Strategy
U041500	Invalid data received from anti-lock control - stability assist module	• Invalid message from the anti-lock brake system	No fault with parking brake system if this DTC is logged. Check anti-lock control - stability assist module for DTCs and refer to the DTC Index.
U042200	Invalid data received from Central Junction	• Invalid message from the CJB	No fault with parking brake system if this DTC is logged. Check CJB for DTCs and refer

	Box (CJB)		to the DTC Index. Communications Network
U042300	Invalid data received from instrument cluster	Invalid message from the instrument cluster	No fault with parking brake system if this DTC is logged. Check the instrument cluster for DTCs and refer to DTC Index. Instrument Cluster
U043364	Invalid data received from speed control front distance range sensor	Incorrect apply request from the speed control when the conditions were not correct	No fault with parking brake system if this DTC is logged. Check the speed control module for DTCs and refer to DTC Index. Speed Control
U200168	Reduced system function	Invalid or missing message from ABS with ignition OFF and vehicle speed > 3Kph	No fault with parking brake system if this DTC is logged. Check the anti-lock control - stability assist module for DTCs and refer to the DTC Index.
U300281	Vehicle Identification Number (VIN)	Vehicle/component VIN mismatch between RJB and parking brake module, module installed from donor vehicle	Install original module, check for parking brake related DTCs and refer to DTC Index. If DTC remains suspect parking brake module, refer to new module installation note at top of DTC Index
U300362	Battery voltage	Mis-match of battery voltage, of 2 volts or lower, between parking brake module and RJB	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

Symptom Chart

Symptom	Possible Cause	Action
The parking brake will not engage or release	Cables fouled, trapped or damaged	Check the rear and primary cables for

(with no parking brake warning message)	• Cables incorrectly routed or installed • Rear lining wear • Service brake incorrectly adjusted following lining change • Caliper malfunction	correct installation and damage. Parking Brake Switch - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (70.35.46) Parking Brake Cable LH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 Parking Brake Cable RH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 • Inspect the rear brake linings for wear • Re-calibrate the parking brake, refer to the calibration procedure • Check the rear service brake for correct installation and operation
The parking brake will not engage or release (with parking brake warning message)	• Cables fouled, trapped or damaged • Cables incorrectly routed or installed • Rear lining wear • Actuator malfunction • Caliper malfunction	• Check the rear and primary cables for correct installation and damage. Parking Brake Release Actuator - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (70.35.45) Parking Brake Switch - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (70.35.46) Parking Brake Cable LH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 Parking Brake Cable RH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 • Inspect the rear brake linings for wear • Re-calibrate the parking brake, refer to the calibration procedure • Check the rear service brake for correct installation and operation
No communication with the parking brake	• Fuse • Module off Bus	• Check fuses • Ensure battery is fully

module	• CAN network error • Parking brake module fault	charged and in serviceable condition. Check battery voltage at parking brake module • Check CAN network using manufacturer approved diagnostic system
'Parkbrake Fault' displayed on message center with associated warning lamps	• Parking brake system fault	• Check the parking brake module for DTCs and refer to DTC Index
Brakes drag	• Parking brake not re-calibrated after battery has been disconnected or has been in a state of discharge, or repairs have been carried out to the rear service or parking brake system • Service brake system fault	• Re-calibrate parking brake, refer to the calibration procedure • Check the service brake for correct operation

Parking Brake Cable LH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8

Removal



WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.

1



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

Raise and support the vehicle.

- 2 . Remove the LH rear wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

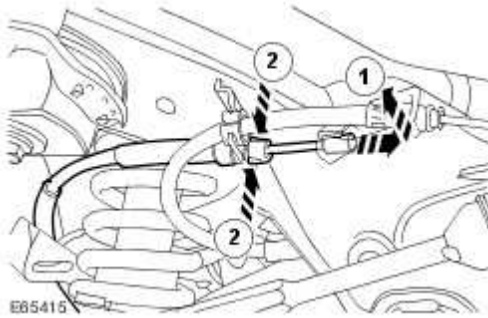
- 3 . Release the parking brake cable tension.

For additional information, refer to Parking Brake Cable Tension Release

- 4 . Disconnect the LH parking brake cable.



Release the clip.

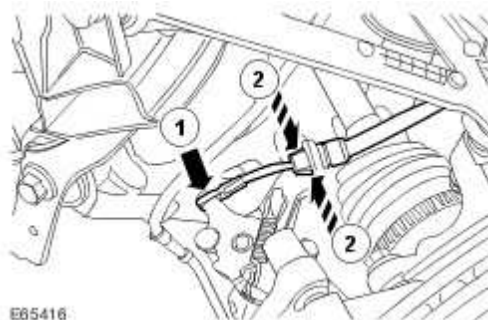


5 . NOTE:

Note the fitted position.

Disconnect and release the parking brake cable from the caliper.

- ▶ Release the 2 clips.
- ▶ Remove the LH parking brake cable.



Installation

1 . NOTE:

Align to the position noted on removal.

Install the parking brake cable.

- ▶ Carefully secure the clips.

2 . Connect the parking brake cable.

 Carefully secure the clips.

3 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

Parking Brake Cable RH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8

Removal



WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.

1



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

Raise and support the vehicle.

2 . Remove the RH rear wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

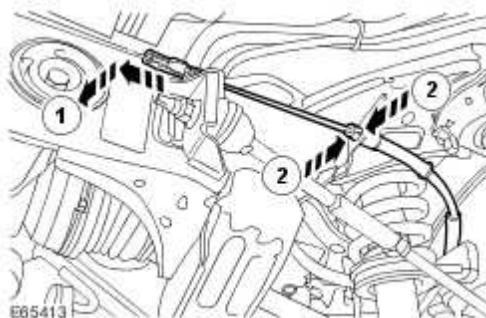
3 . Release the parking brake cable tension.

For additional information, refer to Parking Brake Cable Tension Release

4 . Disconnect the RH parking brake cable.



Release the 2 clips.



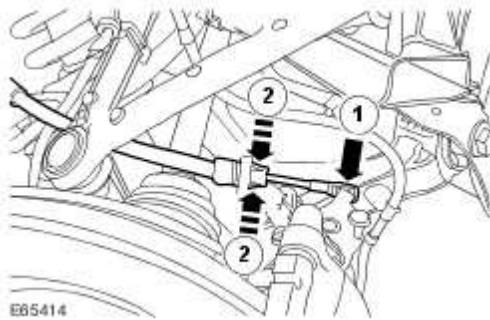
5 . NOTE:

Note the fitted position.

Disconnect and release the parking brake cable from the caliper.

▶ Release the 2 clips.

▶ Remove the LH parking brake cable.



Installation

1 . NOTE:

Align to the position noted on removal.

Install the parking brake cable.

▶ Carefully secure the clips.

2 . Connect the parking brake cable.

▶ Carefully secure the clips.

3 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

Parking Brake Module - Convertible (70.35.47)

Removal

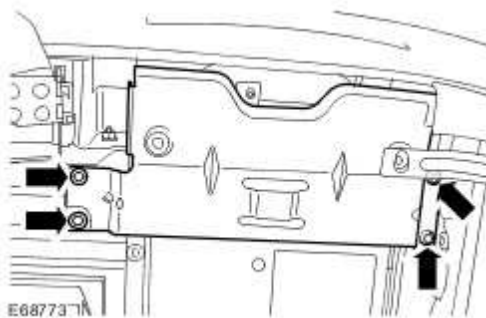
- 1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to

- 2 . Make the SRS system safe.
For additional information, refer to

- 3 . Remove the LH roll over protection unit.
For additional information, refer to Rollover Protection Unit

- 4 . Remove the rear seat RH backrest retaining bracket.

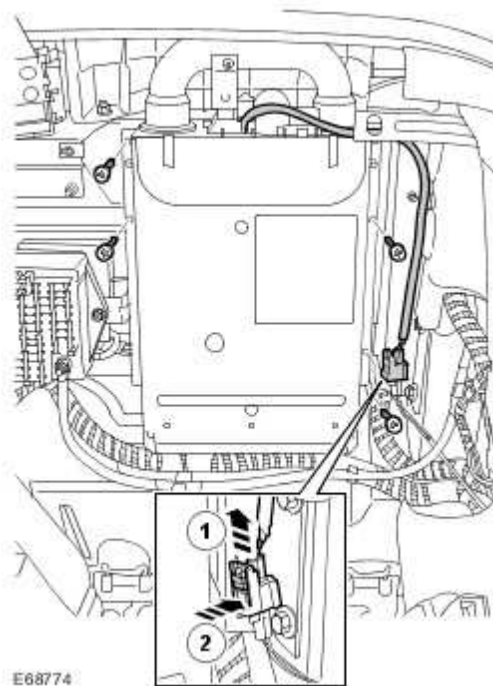
▶ Remove the 2 nuts and 2 bolts.



- 5 . Remove the RH roll over protection unit.

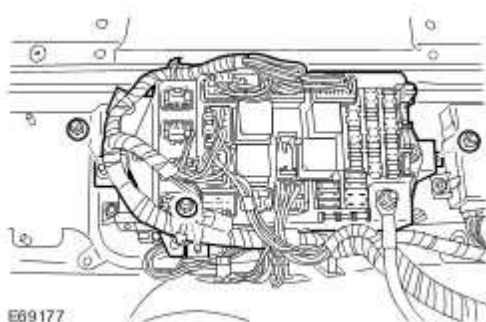
▶ Disconnect the electrical connector.

▶ Remove the 4 Torx bolts.



6 . Release the auxiliary junction box mounting bracket.

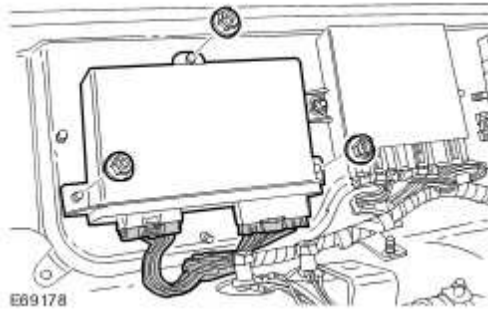
▶ Remove the 3 nuts.



7 . Remove the parking brake module.

▶ Remove the 3 nuts.

▶ Disconnect the 2 electrical connectors.



Installation

1 . Install the parking brake module.

▶ Tighten the nuts to 4 Nm (3 lb.ft).

▶ Connect the electrical connectors.

2 . Secure the auxiliary junction box mounting bracket.

▶ Tighten the nuts to 10 Nm (7 lb.ft).

3 . Install the rear seat RH backrest retaining bracket.

▶ Tighten the nuts and bolts to 10 Nm (7 lb.ft).

4 . Install the RH roll over protection unit.

▶ Tighten the Torx bolts to 25 Nm (18 lb.ft).

▶ Connect the electrical connector.

5 . Install the LH roll over protection unit.

For additional information, refer to Rollover Protection Unit

6 . Connect the battery ground cable and install the cover.

For additional information, refer to

7 . Connect WDS to the vehicle and configure a new module.

Parking Brake Module - 2-Door (70.35.47)

Removal

- 1 . Remove the cover and disconnect the battery ground cable.

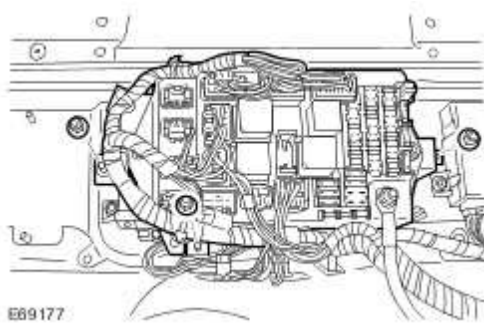
For additional information, refer to

- 2 . Remove the rear seat backrest.

For additional information, refer to Rear Seat Backrest (76.70.38)

- 3 . Release the auxiliary junction box mounting bracket.

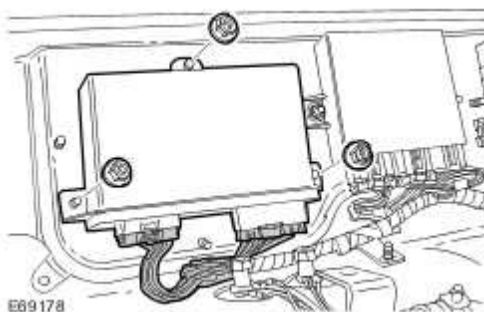
▶ Remove the 3 nuts.



- 4 . Remove the parking brake module.

▶ Remove the 3 nuts.

▶ Disconnect the 2 electrical connectors.



Installation

- 1 . Install the parking brake module.

- ▶ Tighten the nuts to 4 Nm (3 lb.ft).

- ▶ Connect the electrical connectors.

- 2 . Secure the auxiliary junction box mounting bracket.

- ▶ Tighten the nuts to 10 Nm (7 lb.ft).

- 3 . Install the rear seat backrest.

For additional information, refer to Rear Seat Backrest (76.70.38)

- 4 . Connect the battery ground cable and install the cover.

For additional information, refer to

Parking Brake Release Actuator - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (70.35.45)

Removal



WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.

1



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

Raise and support the vehicle.

2 . Remove the exhaust system.

For additional information, refer to Exhaust System

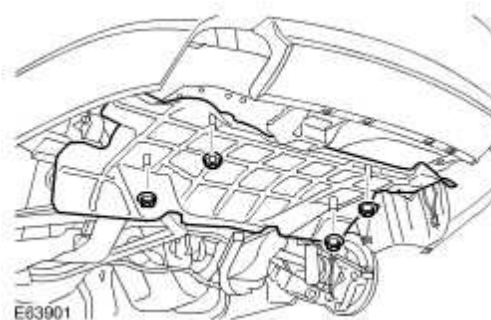
3 . Release the parking brake cable tension.

For additional information, refer to Parking Brake Cable Tension Release

4 . Remove the exhaust rear heat shield .



Remove the 4 nuts.

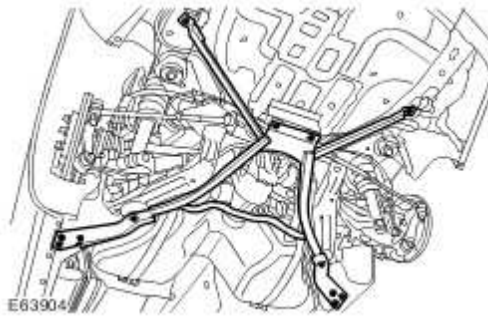


5 . With assistance: Remove the body K-frame.

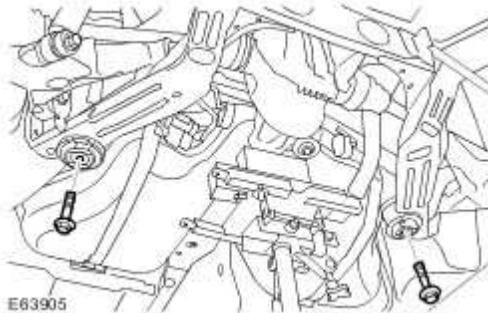
▶ Using a jack, support the differential.

▶ Remove the 8 bolts.

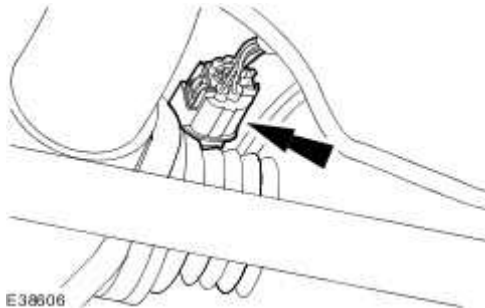
▶ Remove the 4 Torx bolts.



6 . Install the 2 subframe mounting bolts and remove the jack.



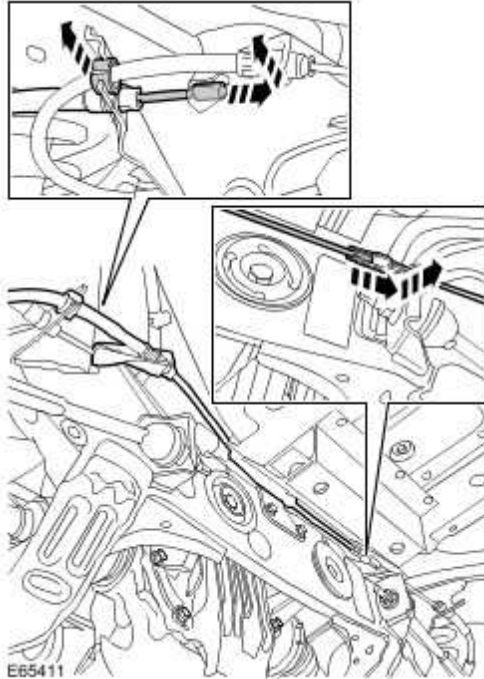
7 . Disconnect the electrical connector.



8 . Release the LH and RH cables.

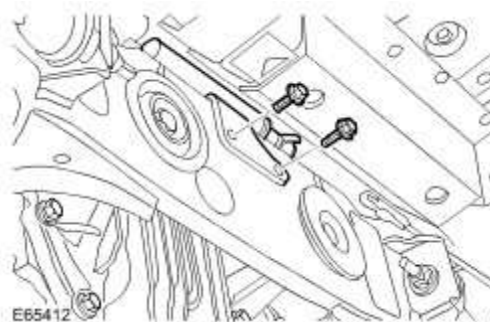
► Release the clip.

9 . Release the cable securing clip.



10 . Release the parking brake actuator.

► Remove the 2 bolts.

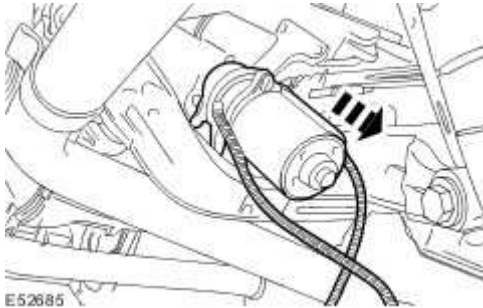


11 . **NOTE:**

Note the fitted position.

Remove the parking brake actuator and cable assembly.

▶ Remove the 2 bolts.



Installation

1 . NOTE:

Align to the position noted on removal.

Install the parking brake actuator and cable assembly.

▶ Tighten the bolts to 20 Nm (15 lb.ft).

2 . Connect the parking brake cable.

▶ Secure the clips.

3 . Connect and secure the electrical connector.

4 . Using a transmission jack, support the differential.

▶ Remove the 2 bolts.

5 . With assistance, install the K-frame.

 Tighten the M10 bolts to 40 Nm (30 lb.ft).

 Tighten the M12 bolts to 133 Nm (98 lb.ft).

 Tighten the sub frame bolts to 60 Nm (44 lb.ft), then a further 240 degrees.

6 . Remove the transmission jack.

7 . Install the heat shield.

 Tighten the nuts to 10 Nm (7 lb.ft).

8 . Install the exhaust system.

For additional information, refer to Exhaust System

9 . Calibrate the parking brake actuator.

For additional information, refer to Parking Brake Cable Tension Release

Parking Brake Switch - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (70.35.46)

Removal

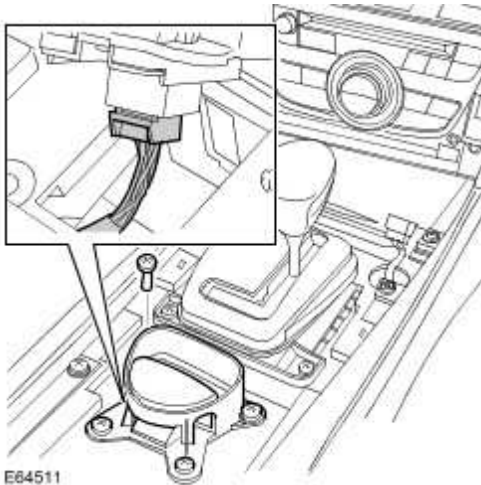
- 1 . Remove the floor console veneer trim panel.

For additional information, refer to Floor Console Finish Panel (76.47.26)

- 2 . Remove the parking brake switch.

▶ Remove the 4 Torx bolts.

▶ Disconnect the electrical connector.



Installation

- 1 . Install the parking brake switch.

▶ Connect the electrical connector.

▶ Install the Torx bolts and tighten to 6 Nm (4 lb.ft).

- 2 . Install the floor console veneer trim panel.

For additional information, refer to Floor Console Finish Panel (76.47.26)

206-06 : Hydraulic brake actuation

Specifications

Specifications

General

Item	Specification
Brake master cylinder diameter	26.9 mm

Lubricants, Fluids, Sealers and Adhesives

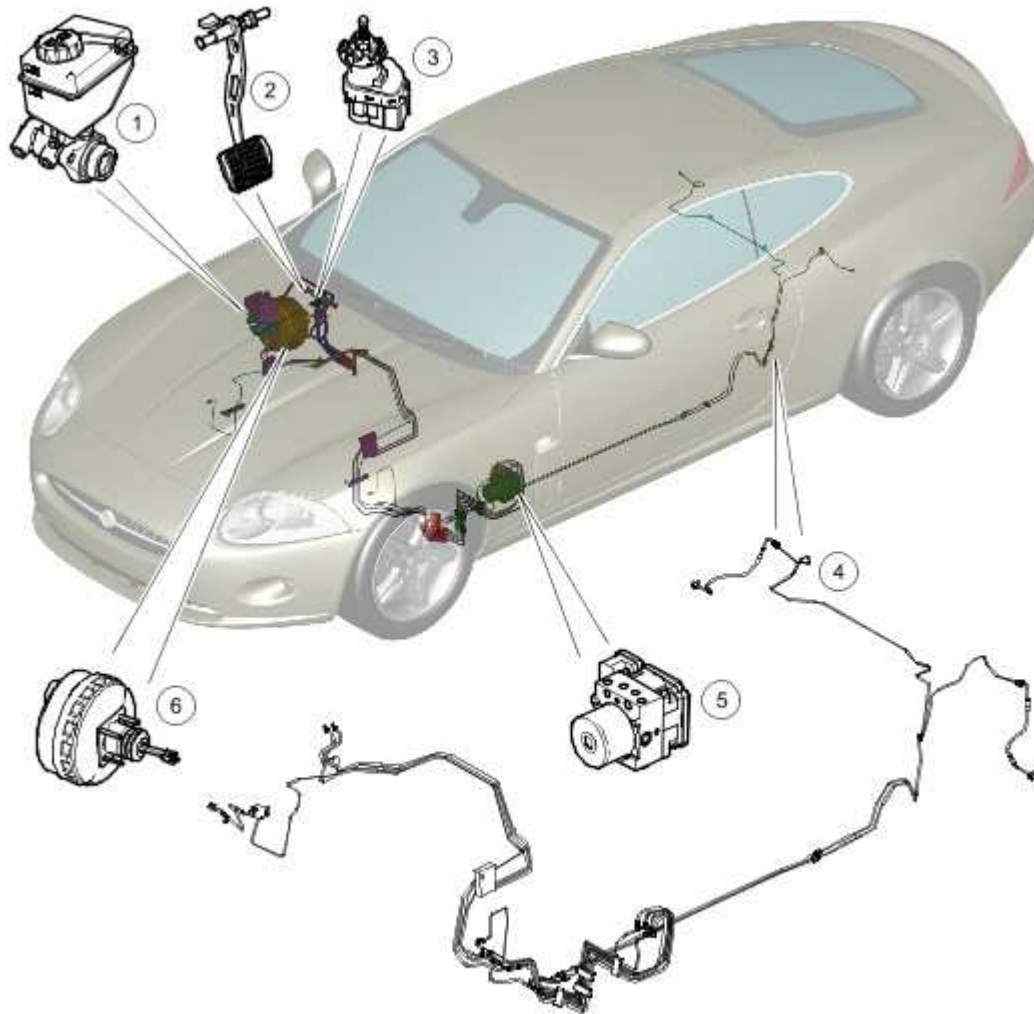
	Specifications
Brake fluid	Shell ESL (Dot 4)

Torque Specifications

Item	Nm	lb-ft	lb-in
Bleed nipple - front brake caliper	8	6	70
Bleed nipple - front brake caliper (Supercharged models)	14	10	-
Bleed nipple - rear brake caliper	14	10	-
Brake master cylinder to brake booster - nuts	25	18	-
Brake tube to components - union nut	17	13	-
Master cylinder reservoir to master cylinder	6	4	53
Master cylinder reservoir to master cylinder (Supercharged models)	4	3	35
Pedal bracket	25	18	-

Hydraulic Brake Actuation

COMPONENT LOCATION



E64682

Item	Part Number	Description
1		Brake master cylinder and fluid reservoir
2		Brake pedal
3		Stoplamp switch
4		Brake pipes

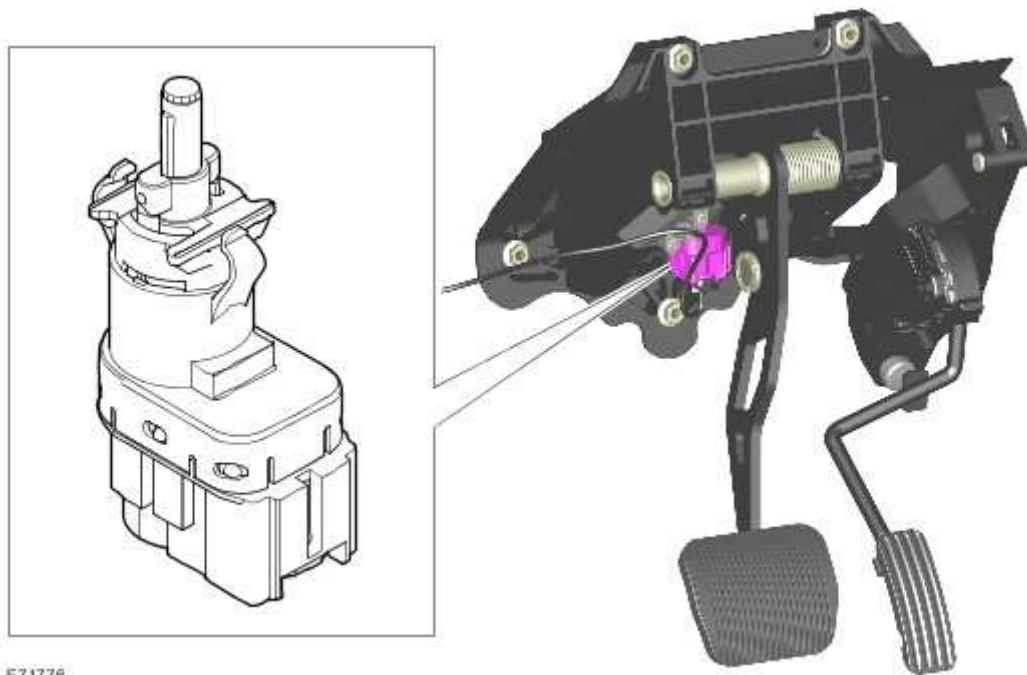
5		Anti-lock Brake System (ABS) module
6		Brake booster

INTRODUCTION

The hydraulic brake system is a diagonally split dual line system, and consists of the brake pedal, brake master cylinder and hydraulic pipes and hoses. The system also features a non-active brake booster. For additional information, refer to Brake Booster (206-07 Power Brake Actuation)

Brake pipes distribute pressure from the master cylinder to the 4 corners of the vehicle via the ABS module. Braided steel hoses are used to connect the brake pipes to the front and rear calipers.

BRAKE PEDAL



E71776

The brake pedal is mounted in a bracket attached to the rear side of the engine bulkhead. The bracket also contains the accelerator pedal. A clevis pin connects the brake pedal to the push rod of the brake booster.

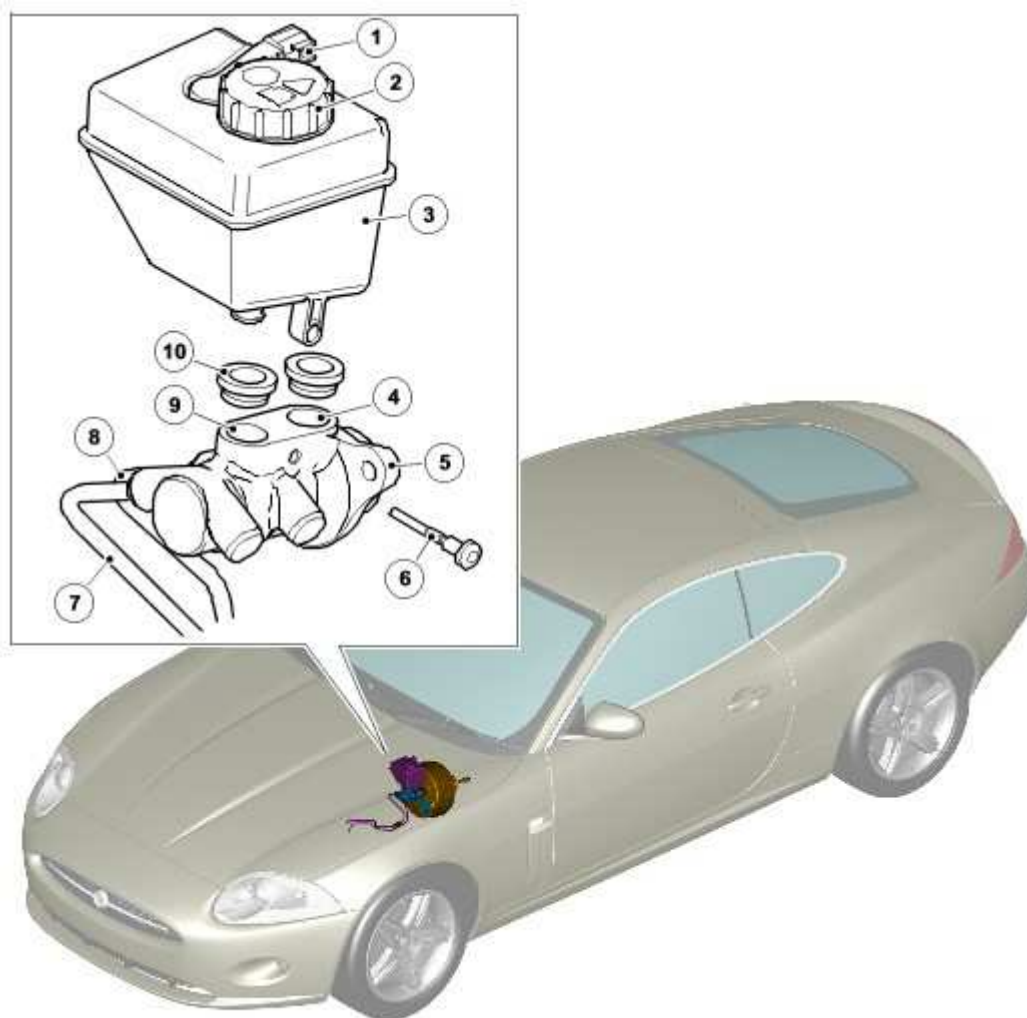
The stoplamp switch is mounted in the brake pedal bracket and is operated by the brake pedal. The stoplamp switch is also used by the speed control system and the ABS. For additional information, refer to Speed Control (310-03 Speed Control)

For additional information, refer to Anti-Lock Control - Stability Assist (206-09 Anti-Lock Control - Stability Assist)

BRAKE MASTER CYLINDER AND FLUID RESERVOIR

NOTE:

Left-Hand Drive (LHD) shown, Right-Hand Drive (RHD) similar



E73934

Item	Part Number	Description
1		Brake fluid level switch electrical connector
2		Brake fluid reservoir cap
3		Brake fluid reservoir
4		Primary circuit inlet port
5		Brake master cylinder

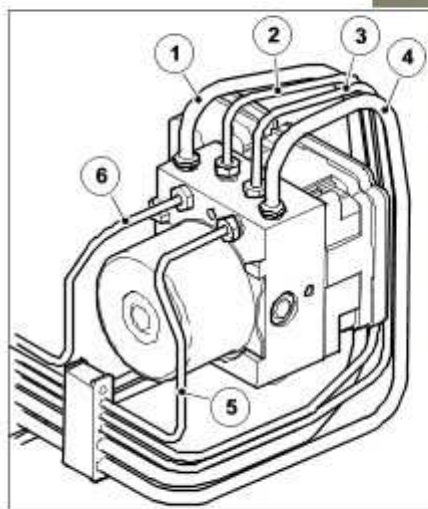
6		Torx bolt
7		Secondary circuit outlet port
8		Primary circuit outlet port
9		Secondary circuit inlet port
10		Reservoir to master cylinder seal (2 off)

The brake master cylinder is attached to the front of the brake booster, on the drivers side of the engine compartment. The brake master cylinder consists of a cylinder housing containing 2 pistons in tandem. The rear piston produces pressure for the primary braking circuit and the front piston produces pressure for the secondary circuit. A reservoir is mounted on top of the master cylinder to provide a supply of brake fluid for the primary and secondary circuits. The reservoir also provides a location for the brake fluid level switch.

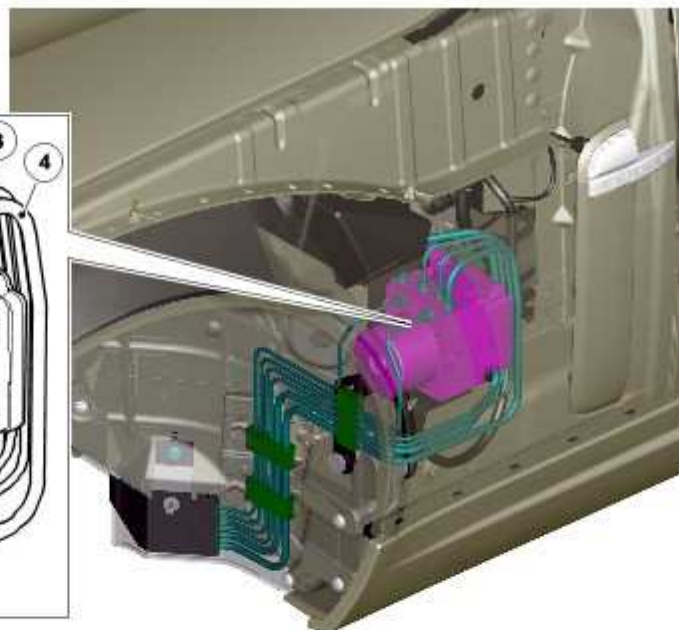
BRAKE FLUID LEVEL SWITCH

The brake fluid level switch is located in the fluid reservoir and is hardwired to the ABS module. When the level of fluid in the reservoir reaches a predetermined low level, the switch contacts close and provide a signal feed back to the ABS module. The ABS module then broadcasts a message on the high speed Controller Area Network (CAN) bus to the instrument cluster. On receipt of the message, the brake fluid red warning indicator will illuminate and 'BRAKE FLUID LOW' will be displayed in the message center.

ANTI-LOCK BRAKING SYSTEM MODULE



E73935



Item	Part Number	Description
1		Secondary circuit inlet port
2		Left Hand (LH) front brake
3		Right Hand (RH) front brake
4		Primary circuit inlet port
5		LH rear brake
6		RH rear brake

The ABS module is located in the LH front wheel arch and incorporates the Hydraulic Control Unit (HCU). The HCU is a 4 channel unit that modulates the supply of hydraulic pressure to the brakes under control of the ABS module.

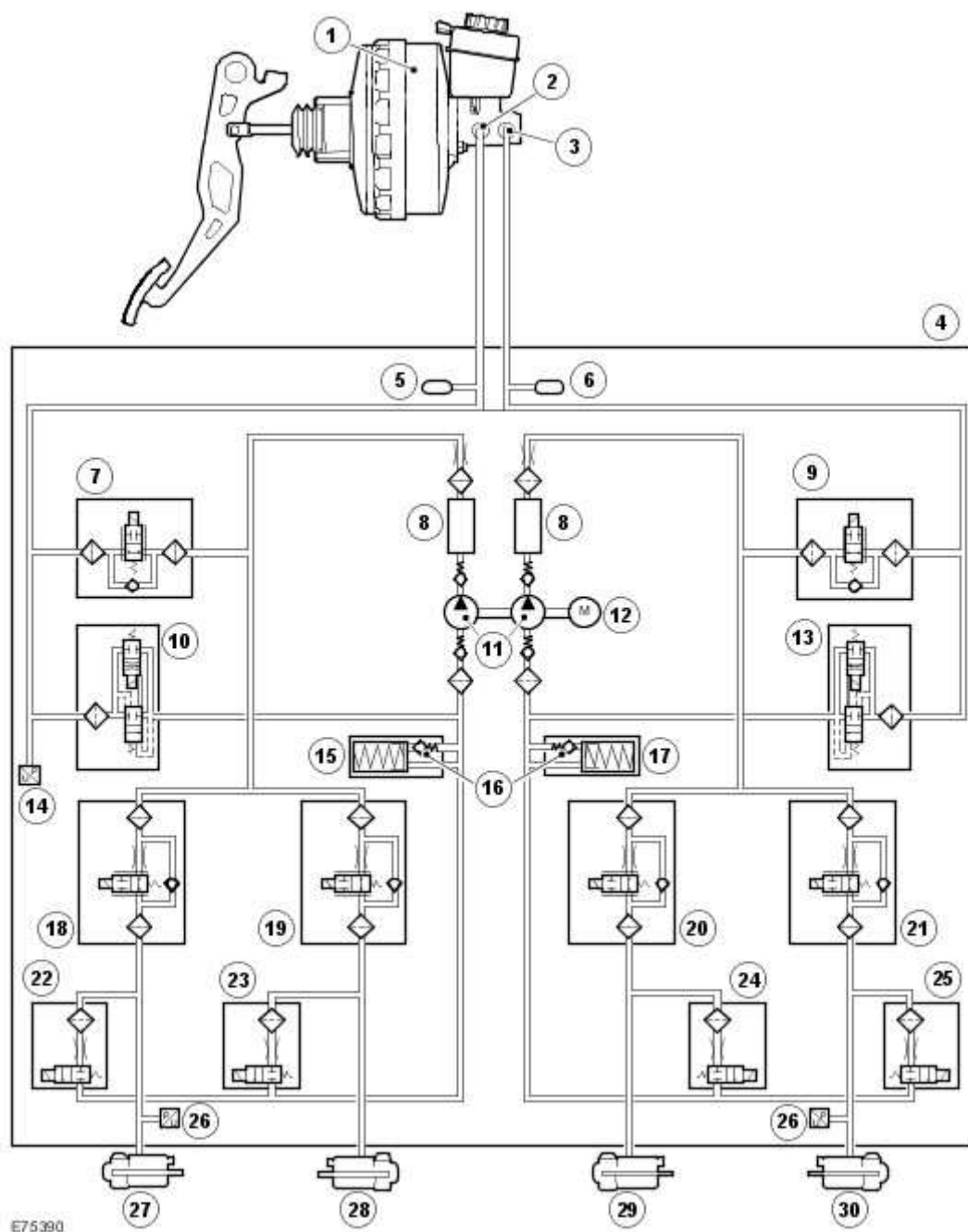
The primary and secondary outlets of the master cylinder are connected to the primary and secondary circuits within the HCU. The primary circuit in the HCU has separate outlet ports to the RH front and LH rear brakes. The secondary circuit in the HCU has separate outlet ports to the LH front and RH rear brakes.



CAUTION: The ABS module and the Hydraulic Control Unit (HCU) are a single unit and must not be separated.

CONTROL DIAGRAM

Hydraulic Control Unit



E75390

Item	Part Number	Description
1		Brake booster
2		Primary circuit
3		Secondary circuit

4		HCU
5		Pulsation damper
6		Pulsation damper
7		Separation valve
8		Damping chambers
9		Separation valve
10		Shuttle valve
11		Hydraulic pumps
12		Motor
13		Shuttle valve
14		Pressure sensor - all vehicles
15		Low pressure accumulator
16		Check valve
17		Low pressure accumulator
18		Inlet valve
19		Inlet valve
20		Inlet valve
21		Inlet valve
22		Outlet valve
23		Outlet valve
24		Outlet valve
25		Outlet valve
26		Pressure sensors - vehicles fitted with adaptive speed control only

27		Right front brake
28		Left rear brake
29		Right rear brake
30		Left front brake

PRINCIPLES OF OPERATION

When the brake pedal is pressed, the front push rod in the brake booster pushes the master cylinder primary piston along the bore of the housing. This produces pressure in the primary pressure chamber which, in conjunction with the primary spring, overcomes the secondary spring and simultaneously moves the secondary piston along the bore. The initial movement of the pistons away from the piston stops closes the primary and secondary center valves in the master cylinder. Further movement of the pistons then pressurises the fluid in the primary and secondary chambers and thus the brake circuits. The fluid in the chambers behind the pistons is unaffected by the movement of the pistons and can flow unrestricted through the inlet ports between the chambers and the reservoir.

Pressurised fluid enters the HCU, which is mounted on the front of the ABS module. The HCU modulates the supply of pressurised fluid to the brakes under control of the ABS module. For additional information, refer to Anti-Lock Control - Stability Assist (206-09 Anti-Lock Control - Stability Assist)

Hydraulic Brake Actuation

For additional information, refer to [<<206-00>>](#).

Brake Master Cylinder - LHD RWD (70.30.08)

Removal

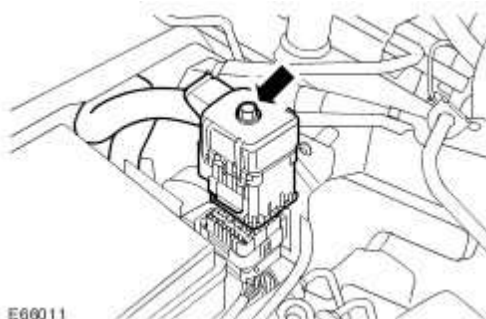


CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

- 1 . Remove the brake fluid reservoir.
For additional information, refer to Brake Fluid Reservoir (70.30.16)

- 2 . Release and disconnect the electrical connector.

 Fully loosen the bolt.



- 3 . **NOTE:**

Some fluid spillage is inevitable during this operation.

Disconnect the brake master cylinder lines.

4

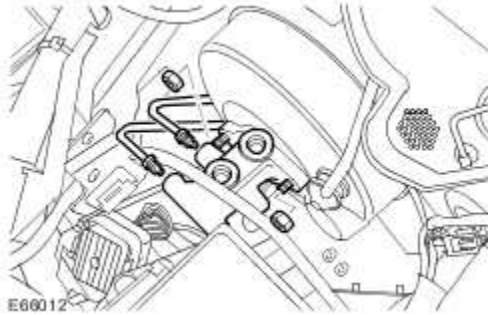


- . **CAUTION:** Before disconnecting or removing the components, ensure the area

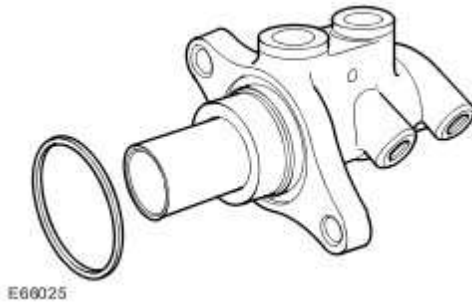
around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the brake master cylinder.

▶ Remove the 2 nuts.



5 . Remove and discard the O-ring seal.



Installation

1 . Install a new O-ring seal.

2 . Install the brake master cylinder.

▶ Tighten the nuts to 25 Nm (18 lb.ft).

3 . Connect the brake master cylinder lines.

 Tighten the brake line unions to 17 Nm (13 lb.ft).

4 . Connect and secure the electrical connector.

 Tighten the bolt.

5 . Install the brake fluid reservoir.

For additional information, refer to Brake Fluid Reservoir (70.30.16)

Brake Master Cylinder - RHD RWD (70.30.08)

Removal



CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

- 1 . Remove the coolant expansion tank.

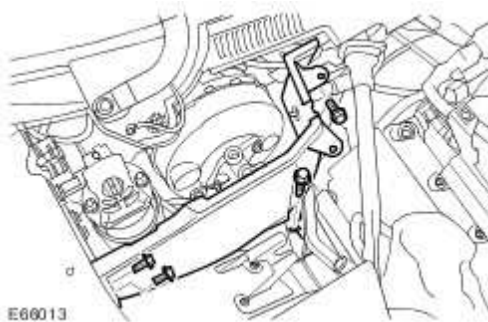
For additional information, refer to Coolant Expansion Tank (26.15.01)

- 2 . Remove the brake fluid reservoir.

For additional information, refer to Brake Fluid Reservoir (70.30.16)

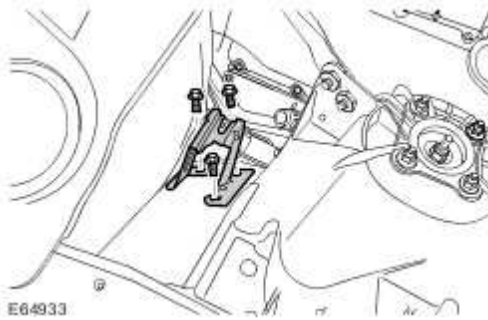
- 3 . Release the plenum box sidewall.

▶ Remove the 4 bolts.



- 4 . Remove the coolant expansion tank mounting bracket.

▶ Remove the 3 nuts.



5 . NOTE:

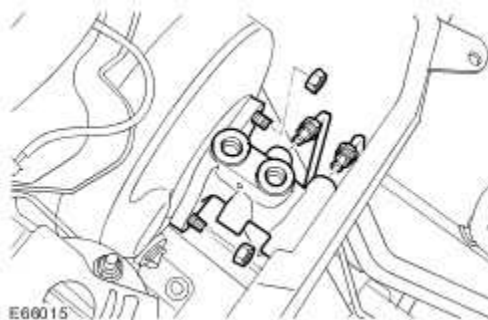
Some fluid spillage is inevitable during this operation.

Disconnect the brake master cylinder lines.

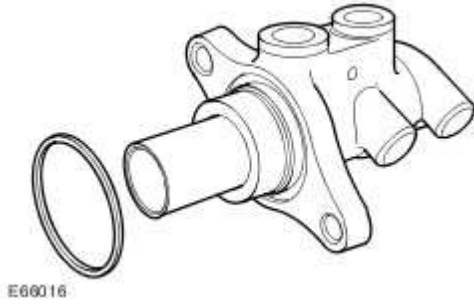
- 6  **CAUTION:** Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

Remove the brake master cylinder.

- ▶ Remove the 2 nuts.



- 7 . Remove and discard the O-ring seal.



Installation

1 . Install a new O-ring seal.

2 . Install the brake master cylinder.

▶ Tighten the nuts to 25 Nm (18 lb.ft).

3 . Connect the brake master cylinder lines.

▶ Tighten the brake line unions to 17 Nm (13 lb.ft).

4 . Install the plenum chamber panel.

▶ Tighten the bolts to 10 Nm (7 lb.ft).

5 . Install the coolant expansion tank mounting bracket.

▶ Tighten the nuts to 10 Nm (7 lb.ft).

6 . Remove the brake fluid reservoir.

For additional information, refer to Brake Fluid Reservoir (70.30.16)

7 . Install the coolant expansion tank.

For additional information, refer to Coolant Expansion Tank (26.15.01)

Brake Fluid Reservoir (70.30.16)

Removal



CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

1 . NOTE:

LH illustration shown, RH is similar.

Remove the air intake cover.

▶ Remove the 4 clips.



2 . Siphon the fluid from the brake master cylinder.

▶ Position an absorbent cloth to collect fluid spillage.

3 . Disconnect the low brake fluid warning indicator switch electrical connector.

4 .



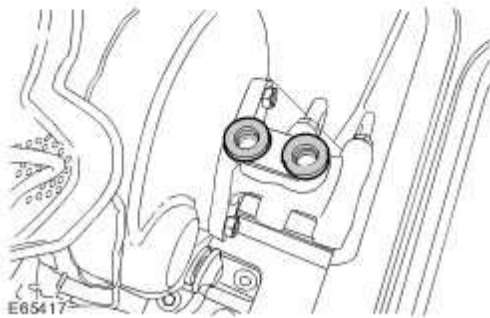
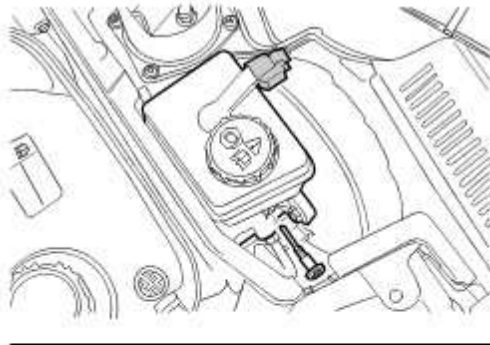
CAUTION: Always plug any open connections to prevent contamination.

NOTE:

Some fluid spillage is inevitable during this operation.

Remove the brake fluid reservoir.

- ▶ Remove the Torx bolt.
- ▶ Remove and discard 2 brake fluid reservoir seals.



Installation

- 1 . Clean the components.
- 2 . Install the brake fluid reservoir.
 - ▶ Install new brake fluid reservoir seals.
 - ▶ Tighten the Torx bolt to 6 Nm (4 lb.ft).
- 3 . Connect the low brake fluid warning indicator switch electrical connector.

4 . Bleed the brake system.

For additional information, refer to Brake System Bleeding (70.25.03)

5 . Install the air intake cover.

 Carefully secure the clips.

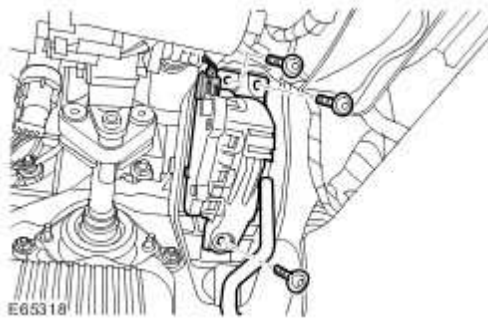
Brake Pedal and Bracket (70.35.03)

Removal

- 1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to
- 2 . Remove the instrument panel.
For additional information, refer to Instrument Panel (76.46.01)
- 3 . Remove the windshield wiper arms.
For additional information, refer to Wiper Pivot Arm (84.15.03)
- 4 . Remove the throttle pedal assembly.

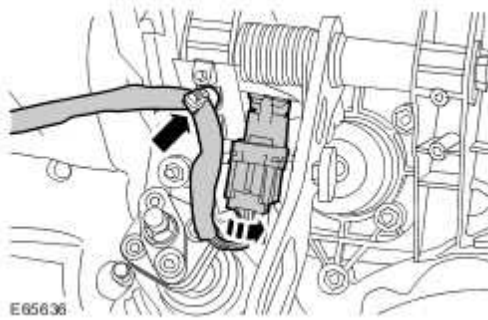
▶ Remove the 3 Torx screws.

▶ Disconnect the electrical connector.



- 5 . Release the brake switch.

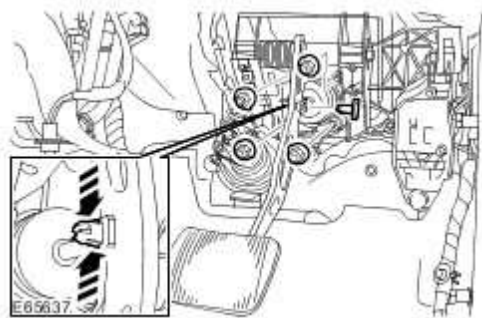
▶ Rotate clockwise approximately 30 degrees.



6 . Release the brake booster.

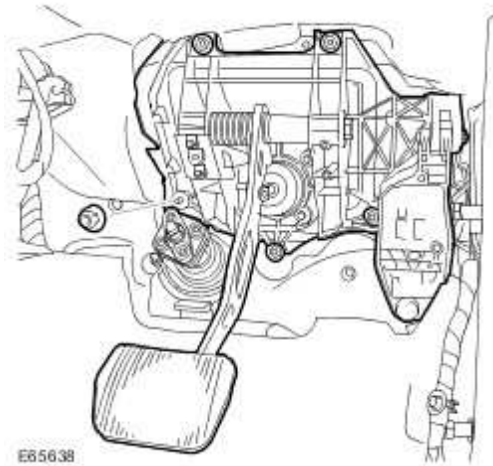
▶ Remove the brake pedal clevis pin.

▶ Remove the 4 nuts.



7 . Remove the nuts from the brake pedal bracket.

▶ Remove the 5 nuts.



8 . **NOTE:**

Working from the engine bay.

Remove the air intake cover.

▶ Remove the 4 clips.



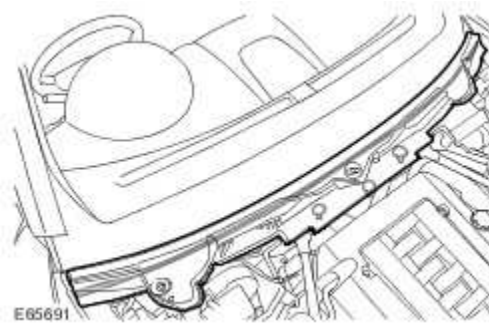
9 . Remove the brake master cylinder cover.

▶ Remove the 3 clips.



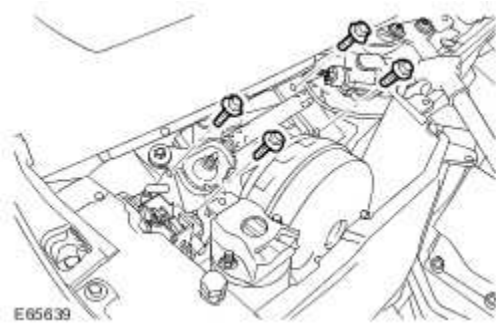
10 . Remove the plenum chamber panel.

- ▶ Release the retaining clip.
- ▶ Release the 3 clips.
- ▶ Disconnect the washer jet hose.



11 . Remove the brake pedal bracket.

- ▶ Remove sealant for access to the bulkhead screw heads.
- ▶ Remove the 4 screws.
- ▶ Release the electrical harness clip.



Installation

- 1 . Install the brake pedal bracket.
 - ▶ Align to the studs and lightly tighten the nuts.
 - ▶ Install and tighten the bulkhead screws.
 - ▶ Apply sealant to the bulkhead screw heads.
 - ▶ Secure the electrical harness with the clip.
- 2 . Tighten the brake pedal bracket nuts to 25 Nm (18 lb.ft).
- 3 . Install the plenum chamber panel.
 - ▶ Connect the washer jet hose.
 - ▶ Carefully secure the clips.
- 4 . Install the brake master cylinder cover.
 - ▶ Carefully secure the clips.
- 5 . Install the air intake cover.
 - ▶ Carefully secure the clips.

6 . Secure the brake booster.

 Tighten the nuts to 25 Nm (18 lb.ft).

 Install the brake pedal clevis pin.

7 . Install the brake switch.

8 . Install the throttle pedal assembly.

 Connect the electrical connector.

 Install the Torx screws.

9 . Install the windshield wiper arms.

For additional information, refer to Wiper Pivot Arm (84.15.03)

10 . Install the instrument panel.

For additional information, refer to Instrument Panel (76.46.01)

11 . Connect the battery ground cable and install the cover.

For additional information, refer to

206-07 : Power brake actuation

Specifications

Specifications

General

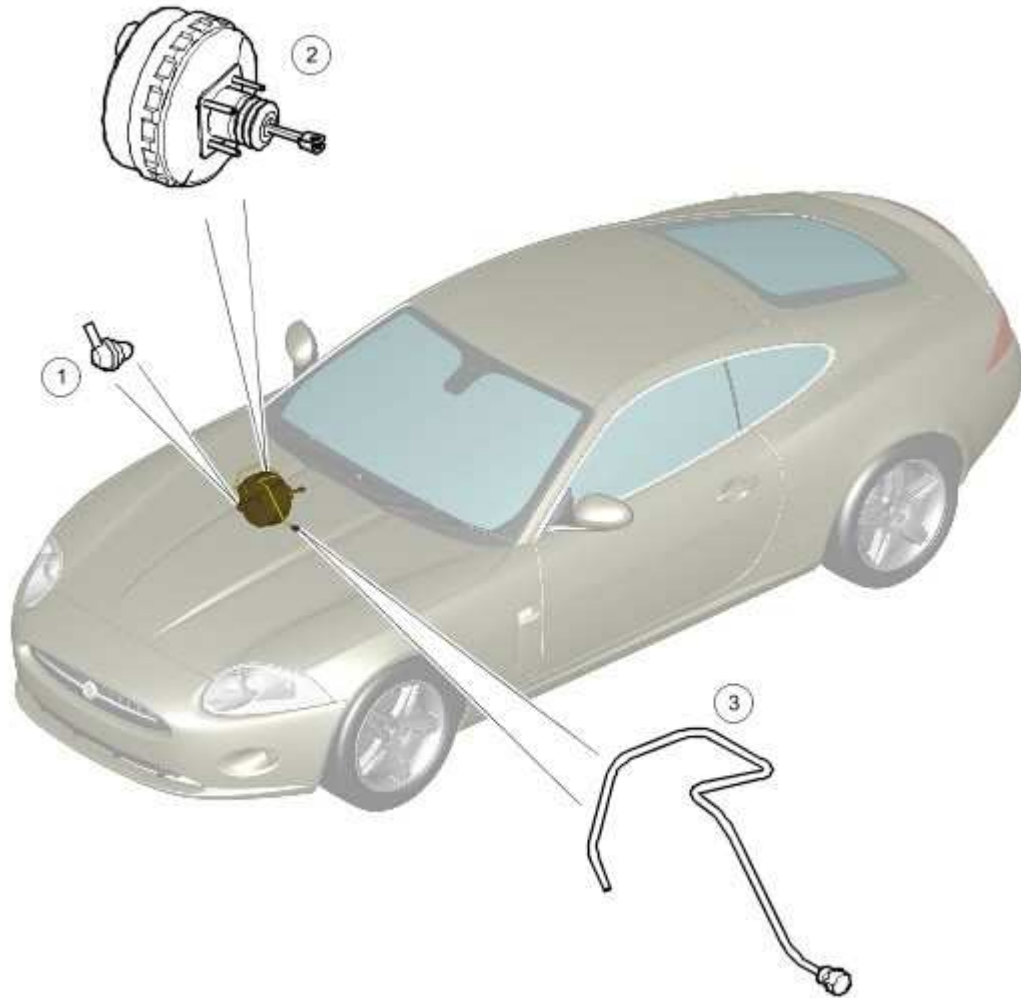
Item	Specification
Brake booster - boost ratio	5.8:1
Brake booster - boost ratio (Supercharged models)	6.2:1

Torque Specifications

Item	Nm	lb-ft	lb-in
Brake booster to bulk head/pedal bracket - nuts	25	18	-

Brake Booster

COMPONENT LOCATION



E64818

Item	Part Number	Description
1		Check valve
2		Brake booster
3		Vacuum pipe

INTRODUCTION

Power assistance for the braking system is provided by a vacuum operated non-active brake booster. The unit gives a boost ratio of 6.2:1 and is secured to the drivers side of the engine compartment bulkhead by 4 studs/nuts.

The input push rod within the brake booster is connected to the brake pedal. The output rod locates in the primary piston of the brake master cylinder. For additional information, refer to Hydraulic Brake Actuation (206-06 Hydraulic Brake Actuation)

VACUUM PIPE

A 2 piece plastic vacuum pipe connects the brake booster to the inlet manifold to provide the necessary vacuum inside the booster. The connection into the brake booster also contains a check valve to maintain the vacuum and prevent fuel vapour from entering the brake booster.

Power Brake System

For additional information, refer to [<<206-00>>](#).

Brake Booster - LHD RWD (70.50.17)

Removal

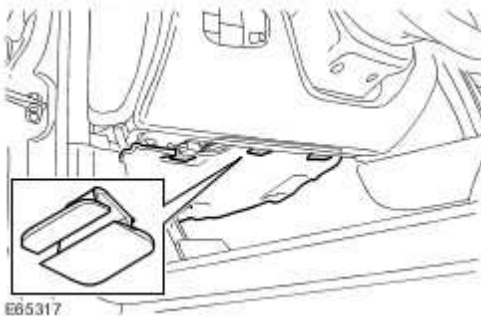
- 1 . Remove the brake master cylinder.

For additional information, refer to Brake Master Cylinder - LHD RWD (70.30.08)

- 2  **CAUTION: Removal of the clips is a delicate procedure, damage will occur if any force is used.**

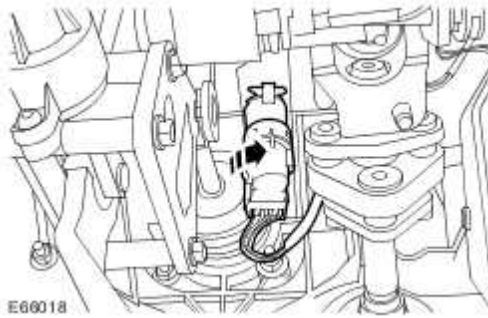
Remove the driver's side footwell trim panel.

- ▶ Carefully release the 3 clips.

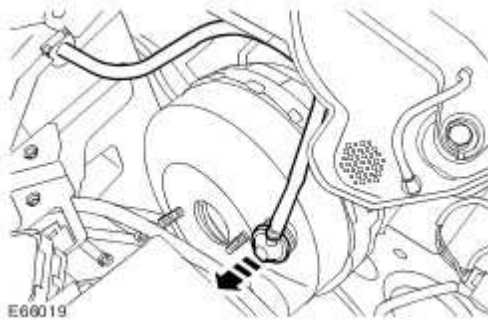


- 3 . Release the brake switch.

- ▶ Rotate clockwise approximately 30 degrees.



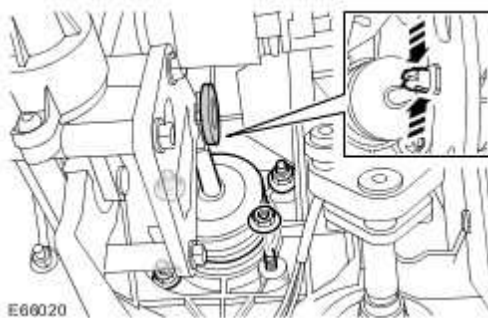
4 . Release the vacuum pipe.



5 . Remove the brake booster.

▶ Remove the brake pedal clevis pin.

▶ Remove the 4 nuts.



6 . Remove and discard the gasket.

Installation

1 . Install new gaskets.

2 . Install the brake booster.

 Tighten the nuts to 25 Nm (18 lb.ft).

 Install the brake pedal clevis pin.

3 . Connect the vacuum hose.

4 . Install the brake switch.

5 . Install the driver's side footwell trim panel.

 Carefully align and secure the clips.

6 . Install the brake master cylinder.

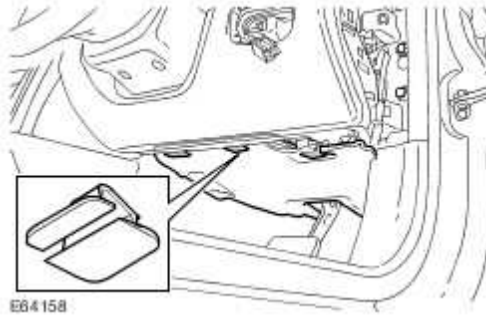
For additional information, refer to Brake Master Cylinder - LHD RWD (70.30.08)

Brake Booster - RHD RWD (70.50.17)

Removal

- 1 . Remove the brake master cylinder.

For additional information, refer to Brake Master Cylinder - RHD RWD (70.30.08)



- 2  **CAUTION:** Removal of the clips is a delicate procedure, damage will occur if any force is used.

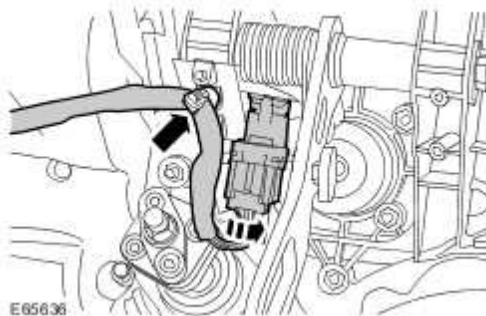
Remove the driver's side footwell trim panel.

▶ Carefully release the 3 clips.

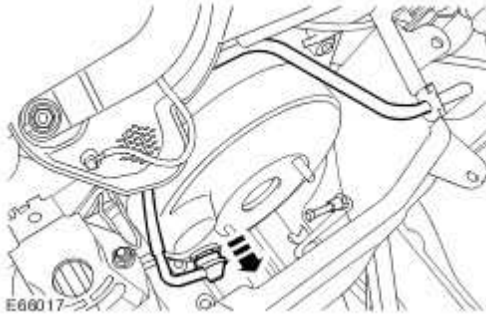
- 3 . Release the brake switch.

▶ Rotate clockwise approximately 30 degrees.

▶ Carefully release the clip.



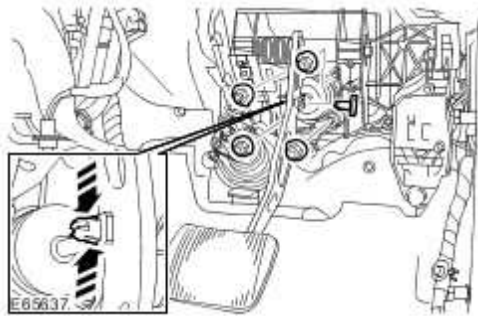
4 . Release the vacuum pipe.



5 . Remove the brake booster.

▶ Remove the brake pedal clevis pin.

▶ Remove the 4 nuts.



6 . Remove and discard the gasket.

Installation

1 . Install new gaskets.

2 . Install the brake booster.

▶ Tighten the nuts to 25 Nm (18 lb.ft).

▶ Install the brake pedal clevis pin.

3 . Connect the vacuum hose.

4 . Install the brake switch.

5 . Install the driver's side footwell trim panel.

 Carefully align and secure the clips.

6 . Install the brake master cylinder.

For additional information, refer to Brake Master Cylinder - RHD RWD (70.30.08)

206-09 : Anti-lock control – stability assist

Specifications

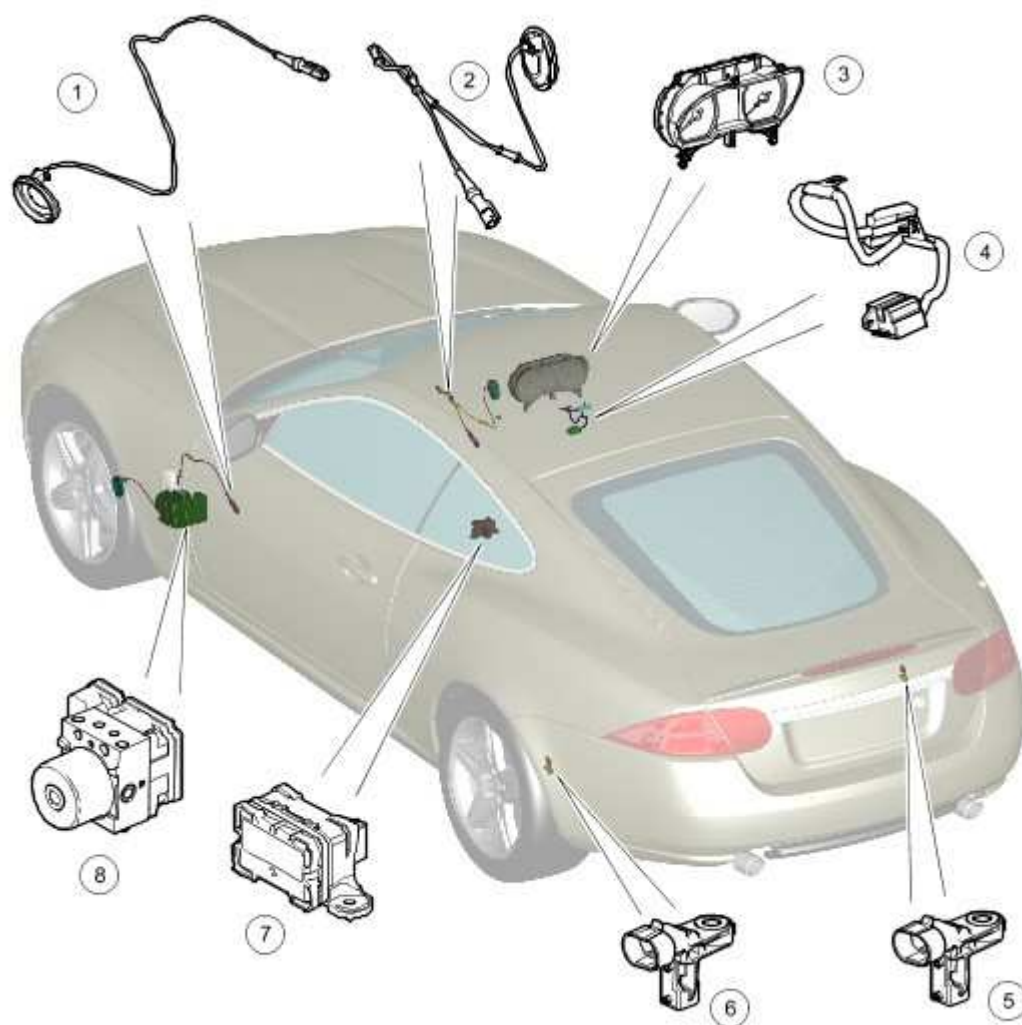
Specifications

Torque Specifications

Item	Nm	lb-ft	lb-in
Brake tubes to hydraulic control unit - union nut	17	13	-
Hydraulic control unit bracket to vehicle - bolt	9	7	79
Hydraulic control unit to bracket - bolt	9	7	79
Rear wheel speed sensor - bolt	9	7	79
Steering angle sensor - screw	4	3	35
Yaw rate sensor and accelerometer - nut	9	7	-

Anti-Lock Control - Stability Assist - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8

COMPONENT LOCATION



E64749

Item	Part Number	Description
1		Left Hand (LH) front wheel speed sensor
2		Right Hand (RH) front wheel speed sensor
3		Instrument cluster

4		Steering angle sensor
5		RH rear wheel speed sensor
6		LH rear wheel speed sensor
7		Yaw rate and lateral acceleration sensor
8		Anti-Lock Brake System (ABS) module

INTRODUCTION

The Dynamic Stability Control system utilizes information on wheel speed, steering angle and vehicle body attitude to enhance the stability of the vehicle. This is achieved by controlling engine torque and application of the brakes at individual wheels. Dynamic Stability Control incorporates the following systems:

- ABS
- Traction Control
- Panic Brake Assist
- Active Yaw Control
- Braking in Curve Stability

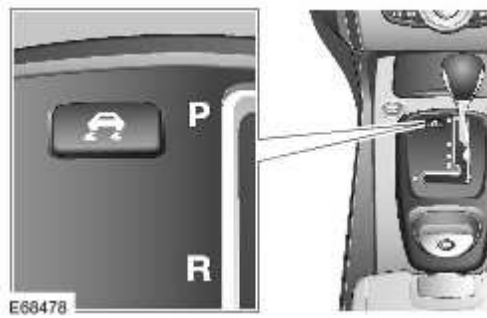
The Dynamic Stability Control system software also controls the braking functions of the Adaptive Speed Control system. For additional information, refer to Speed Control (310-03 Speed Control)

The Dynamic Stability Control software is contained within the ABS module and can apply or release braking force to each individual wheel, and increase or reduce engine torque to correct oversteer, understeer, wheel spin and wheel lock.



WARNING: Although the vehicle is fitted with Dynamic Stability Control, it remains the drivers responsibility to drive safely according to the prevailing conditions.

DYNAMIC STABILITY CONTROL SWITCH



The non-latching dynamic stability control switch is mounted in the floor console adjacent the L gate and forms part of the gear selector module assembly.

Dynamic Stability Control becomes active whenever the engine is running. A momentary press of the switch allows the driver to toggle between the standard Dynamic Stability Control settings and the optimized 'Trac DSC' settings. For more information on 'Trac DSC' refer to 'Principles of Operation'.

On early (06.5 model year) naturally aspirated vehicles, Dynamic Stability Control can be switched off by pressing and holding the switch for more than 3 seconds. On later (07.25 model year) naturally aspirated and supercharged vehicles the switch needs to be pressed and held for more than 10 seconds to switch Dynamic Stability Control off.

In each case the message 'DSC OFF' will be displayed in the instrument cluster message center to confirm Dynamic Stability Control has been switched off. The amber Dynamic Stability Control warning indicator in the instrument cluster will remain illuminated however. The system can be switched back on again by simply pressing and releasing the switch. The message 'DSC ON' will then appear in the instrument cluster message center to confirm the system is on.

NOTE:

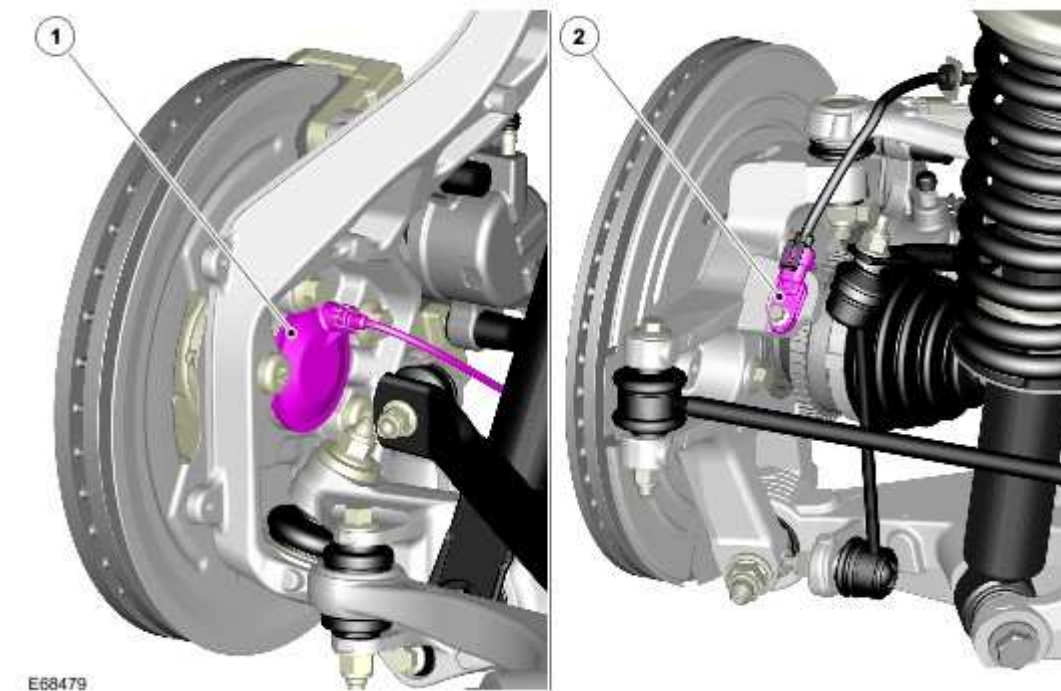
Switch requests may be delayed if the switch is pressed while a Dynamic Stability Control operation is taking place. The switch request will be displayed in the instrument cluster but the ABS module will not initiate any stability changes until it is safe to do so.

If a fault is detected with the Dynamic Stability Control switch, the ABS module defaults to the 'DSC ON' setting and any switch requests are ignored.



WARNING: It is recommended that when using snow chains, Trac DSC is switched on.

WHEEL SPEED SENSORS



Item	Part Number	Description
1		Front wheel speed sensor
2		Rear wheel speed sensor

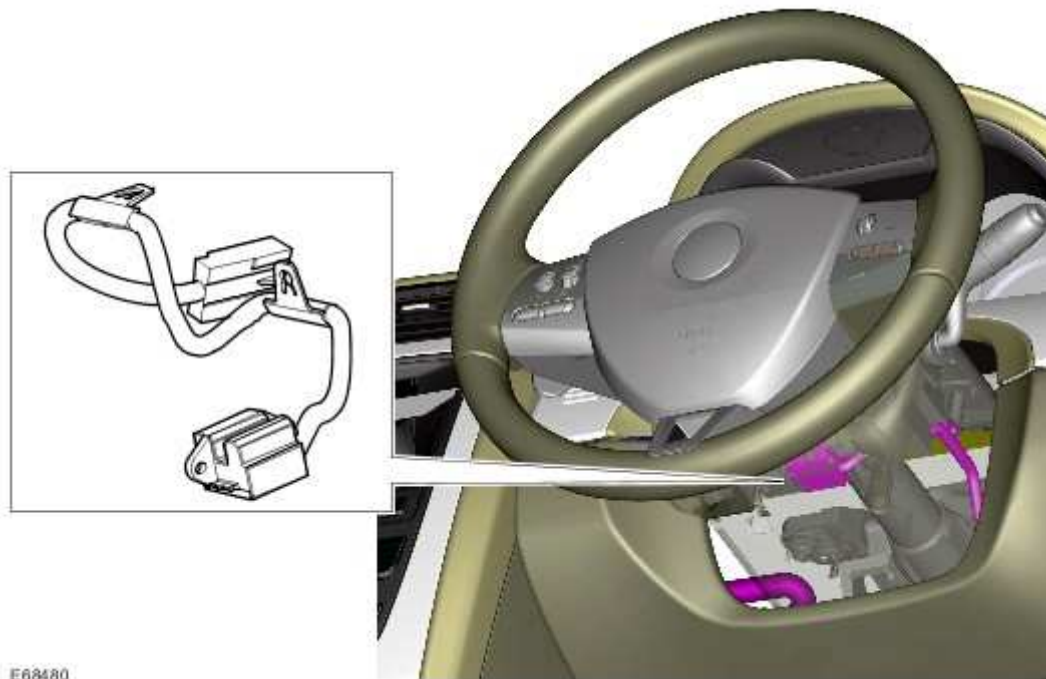
An active wheel speed sensor is installed in each wheel hub to provide the ABS module with a rotational speed signal from each road wheel. The head of each wheel speed sensor is positioned close to a 46 tooth sensor ring. The rear sensor rings are located on the outer diameter of the halfshaft constant velocity joints. The front sensor rings are located within the wheel hub and bearing assemblies. A fly lead connects each sensor to the vehicle wiring.

The wheel speed sensors each have a signal and a return connection with the ABS module. When the ignition is ON the ABS module supplies a signal feed to the wheel speed sensors and monitors the return signals. Any rotation of the road wheels induces current fluctuations in the return signals, which are converted into individual wheel speeds and overall vehicle speed by the ABS module.

The ABS module broadcasts the individual wheel speeds and the vehicle speed on the high speed Controller Area Network (CAN) bus for use by other systems.

If a wheel speed sensor fault is detected by the ABS module, 'ABS FAULT' will be displayed in the instrument cluster message center and an amber warning indicator lamp will illuminate. For additional information, refer to Information and Message Center (413-08 Information and Message Center)

STEERING ANGLE SENSOR



The steering angle sensor measures the steering wheel angle and the rate of change of the steering wheel angle. These measurements are received by the ABS module and broadcast on the high speed CAN bus for use by other systems.

The steering angle sensor is mounted on the steering column upper shroud mounting bracket, immediately behind the multifunction switches, and is secured by 2 screws. A fly lead connects the sensor to the passenger compartment wiring harness via a 4 pin multiplug.

The sensor is housed in a 'U' shaped plastic casing and contains 2 offset Light Emitting Diode's (LED's) facing 2 detectors.

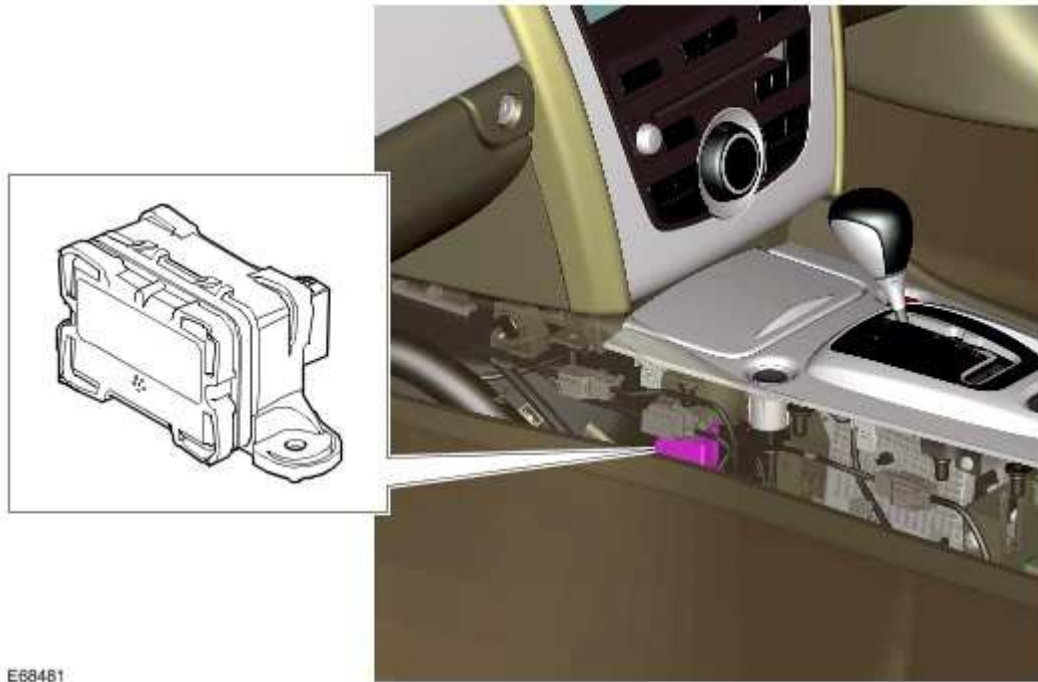
An encoder ring is mounted on the inner steering column shaft and intersects the LED's and detectors. The encoder ring contains 60 slots which break and restore the light beams between the LED's and the detectors as the steering wheel is rotated. The ABS module is able to determine the direction of rotation of the steering wheel by monitoring when the light beams change state. The LED's and detectors are mounted in such a way that only one beam will change state, either to broken or restored, at any one time.

The center (straight ahead) position of the steering wheel has to be learned by the ABS module every time the ignition is switched ON. The steering angle sensor is unable to determine the center position so inputs from the yaw rate and lateral acceleration sensor and wheel speed signals are also used by the ABS module to help it perform this process. If extreme weather conditions are present, for example ice causing extreme wheel spin or understeer/oversteer, the ABS module may not be able to determine the center position of the steering wheel. In this situation 'DSC NOT AVAILABLE' will be displayed in the instrument cluster message center and the amber warning indicator will illuminate. For additional information, refer to Information and Message Center (413-08 Information and

Message Center)

'DSC NOT AVAILABLE' will also be displayed if the ABS module detects a steering angle sensor fault. The amber warning indicator will also illuminate until the fault is rectified.

YAW RATE AND LATERAL ACCELERATION SENSOR

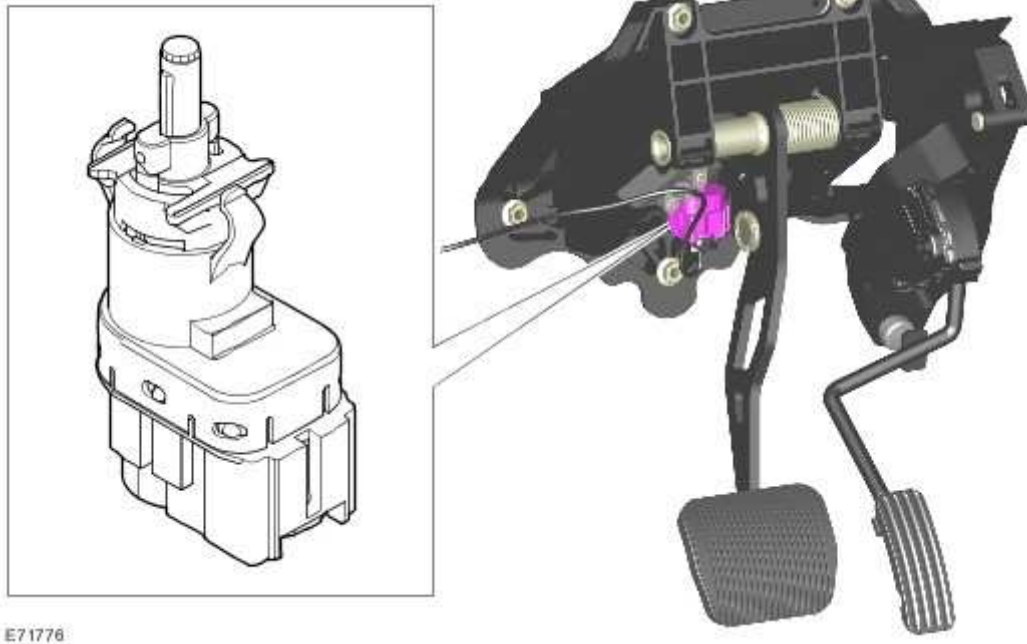


The yaw rate and lateral acceleration sensor is mounted on the transmission tunnel, forward of the gear selector module. The sensor is secured by 2 screws and connects to the vehicle wiring via a 4 pin multiplug.

When the ignition is ON, the sensor receives a power feed from the ABS module. The ABS module also provides a ground path for the sensor. The sensor measures the yaw rate and lateral acceleration of the vehicle, providing values to the ABS module via a dedicated, private high speed CAN bus connection. The ABS module broadcasts these values on the high speed CAN bus for use by other systems.

If a sensor fault is detected by the ABS module, 'DSC NOT AVAILABLE' will be displayed in the instrument cluster message center and the amber warning indicator will illuminate. For additional information, refer to Information and Message Center (413-08 Information and Message Center)

STOPLAMP SWITCH



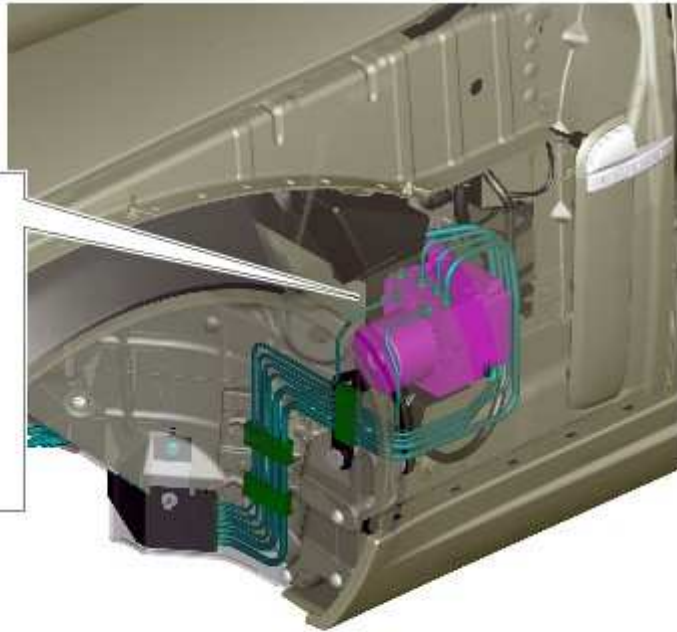
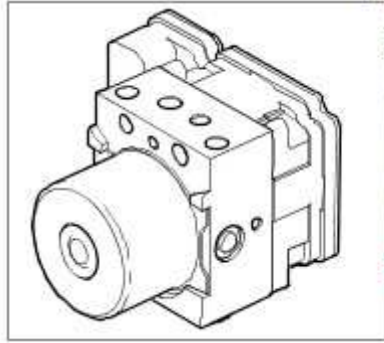
The stoplamp switch is mounted on the brake pedal bracket and is connected to the vehicle harness via a 4 pin multiplug.

When the brake pedal is pressed, the switch contacts close. This allows a hard wired signal feed to be sent to the Engine Control Module (ECM). A stoplamp switch status message is then sent from the ECM to the ABS module on the high speed CAN bus. The ABS module is then able to control braking force accordingly in conjunction with the Hydraulic Control Unit (HCU).

NOTE:

The stoplamp switch also forms part of the speed control system. For additional information, refer to Speed Control (310-03 Speed Control)

ABS MODULE



E68482

The ABS module is secured to a mounting bracket located in the LH front wheel arch. The module is mounted on the rear face of the Hydraulic Control Unit (HCU), which it uses to control all braking and stability functions by modulating hydraulic pressure to the individual wheel brakes.

Two different ABS modules are available; one for vehicles with standard Speed Control, one for vehicles fitted with Adaptive Speed Control. Both incorporate analogue valves which offer refined pressure control and reduced noise levels over previously used systems.

If an ABS modulator fault is detected, 'ABS FAULT' will be displayed in the instrument cluster message center and the amber warning indicator will illuminate. For additional information, refer to Information and Message Center (413-08 Information and Message Center)



CAUTION: The ABS module and the Hydraulic Control Unit (HCU) are a single unit and must not be separated.

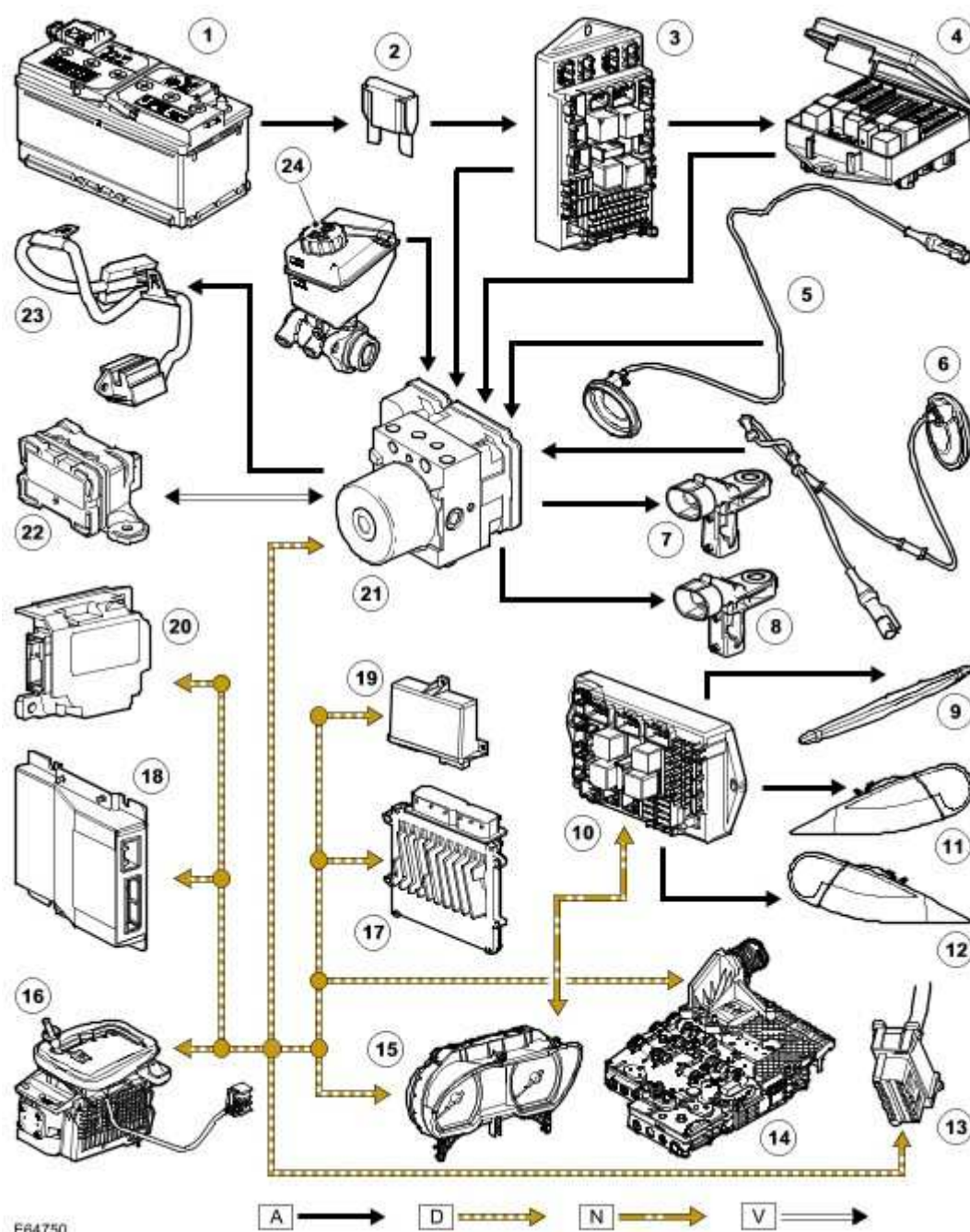
HYDRAULIC CONTROL UNIT (HCU)

The HCU is a 4 channel unit, secured to a mounting bracket located in the LH front wheel arch. The HCU modulates the supply of hydraulic pressure to the brakes under the control of the ABS module. For additional information, refer to Hydraulic Brake Actuation (206-06 Hydraulic Brake Actuation)

CONTROL DIAGRAM

NOTE:

A = Hardwired; D = High Speed CAN bus; N = Medium Speed CAN bus; V = Private CAN bus



E64750

Item	Part Number	Description
1		Battery
2		Megafuse (175A)

3		CJB
4		Power distribution box
5		RH front wheel speed sensor
6		LH front wheel speed sensor
7		RH rear wheel speed sensor
8		LH rear wheel speed sensor
9		High mounted stop lamp
10		Auxiliary junction box
11		LH stop lamp
12		RH stop lamp
13		Diagnostic socket
14		Transmission Control Module (TCM)
15		Instrument cluster
16		Gear selector module
17		ECM
18		Adaptive Damping Control Module (ADCM)
19		Park brake control module
20		Adaptive speed control module
21		ABS module
22		Yaw rate and lateral acceleration sensor
23		Steering angle sensor
24		Brake fluid level switch

PRINCIPLES OF OPERATION

Trac DSC

'Trac DSC' optimizes the Dynamic Stability Control settings to maximize traction in difficult conditions such as deep snow, gravel, sand or when snow chains are fitted. This makes greater traction possible, without losing the benefits of Dynamic Stability Control, however the stability of the vehicle may be less than normal.



WARNING: 'Trac DSC' must only be used when necessary for the prevailing conditions. The vehicle should then only be driven appropriately for those conditions. When conditions improve sufficiently, full stability of the vehicle must be regained by switching 'Trac DSC' off and returning the vehicle to the Dynamic Stability Control mode.

Pressing and releasing the Dynamic Stability Control switch will switch the vehicle between normal Dynamic Stability Control settings and 'Trac DSC' settings. To confirm which setting has been selected, either 'DSC ON' or 'Trac DSC' will be temporarily displayed in the instrument cluster message center.

When 'Trac DSC' is selected, the amber Dynamic Stability Control warning indicator located in the instrument cluster will illuminate. The warning indicator will remain illuminated until 'Trac DSC' becomes active. At this point the warning indicator will flash.

NOTE:

If speed control is engaged it will automatically disengage if Dynamic Stability Control or 'Trac DSC' becomes active. For additional information, refer to Speed Control (310-03 Speed Control)

ABS

ABS controls the speed of all road wheels to ensure optimum wheel slip when braking at the adhesion limit. This prevents the wheels from locking, which helps to retain effective steering control of the vehicle in a braking situation.

Traction Control

Traction control attempts to optimize forward traction by reducing engine torque or braking a spinning wheel until it regains grip.

Traction control is activated if an individual wheel speed is above that of the vehicle reference speed and the brake pedal is not pressed. The spinning wheel is braked, allowing the excess torque to be transmitted to the non-spinning wheel through the driveline. If necessary, the ABS module also sends a high speed CAN bus message to the Engine Control Module (ECM) to request a reduction in engine torque.

Panic Brake Assist

Panic Brake Assist (PBA) helps the driver bring the vehicle to a halt in an emergency braking situation by automatically maximizing the braking effort. There are 2 situations when the ABS module will invoke PBA:

- When the brake pedal is pressed very suddenly
- When the brake pedal is pressed hard enough to bring the front brakes into ABS operation.

When the brake pedal is pressed very suddenly, the ABS module increases hydraulic pressure to all of the brakes until they reach the threshold for ABS operation, thus applying the maximum braking effort for the available traction. The ABS module monitors for the sudden application of the brakes using inputs from the stoplamp switch and from a pressure sensor within the HCU. With the brake pedal pressed, if the rate of increase of hydraulic pressure exceeds the predetermined limit, the ABS module invokes emergency braking.

When the brake pedal is pressed hard enough to bring the front brakes into ABS operation, the ABS module increases the hydraulic pressure to the rear brakes up to the ABS threshold.

PBA operation continues until the driver releases the brake pedal enough for the hydraulic pressure in the HCU to drop below a threshold value stored in the ABS module.

Active Yaw Control

Active Yaw Control monitors the vehicle for oversteer or understeer by comparing signals from the yaw rate and lateral acceleration sensor with signals from the steering angle sensor. If the ABS module determines the vehicle is not responding correctly to steering inputs from the driver it will control the HCU to;

- apply brake pressure to the inner wheels to correct understeer
- apply brake pressure to the outer wheels to correct oversteer.

Braking in Curve Stability

Braking in Curve Stability influences the brake pressures below the Dynamic Stability Control and ABS thresholds to counteract the yawing movement produced when braking in a corner. Braking in Curve Stability produces a correction torque by limiting the brake pressure on one side of the vehicle.

System Malfunction

If an error is detected in the Dynamic Stability Control system, a message will be displayed in the instrument cluster message center and the amber warning indicator will illuminate. In this condition the vehicle is still safe to drive but the system may not react under slide or wheel spin conditions. For additional information, refer to Anti-Lock Control - Stability Assist (206-09 Anti-Lock Control - Stability Assist)

Anti-Lock Control - Stability Assist

No Data Available

Anti-Lock Brake System (ABS) Module (70.60.02)

Removal

NOTE:

The ABS Module is part of the hydraulic control unit (HCU) and cannot be serviced separately.

- 1 . Remove the HCU.

For additional information, refer to Hydraulic Control Unit (HCU) (70.60.18)

Installation

- 1 . Install the HCU.

For additional information, refer to Hydraulic Control Unit (HCU) (70.60.18)

Front Wheel Speed Sensor - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (70.60.03)

Removal

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

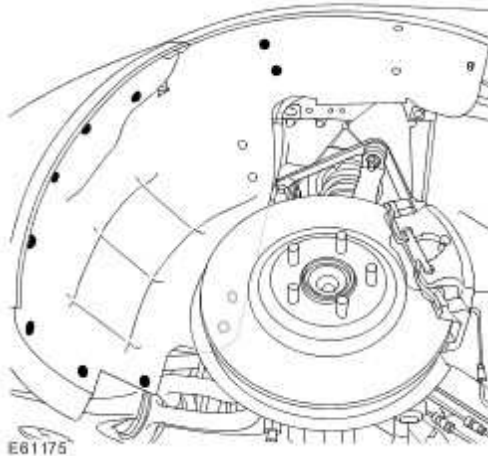
Raise and support the vehicle.

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

- 3 . Release the front of the fender splash shield.

 Remove the 11 Torx bolts.

 Tie the splash shield aside.

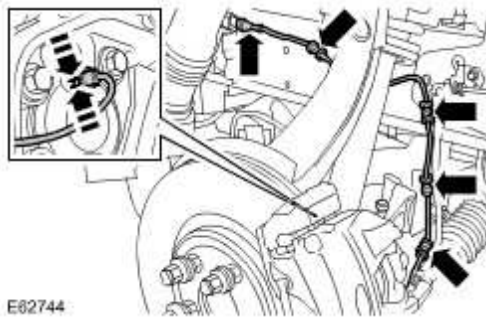


- 4 . Remove the wheel speed sensor.

 Remove the retaining clip.

▶ Carefully release the 4 clips.

▶ Disconnect the electrical connector.



Installation

1 . Install the wheel speed sensor.

▶ Install the retaining clip.

▶ Carefully secure the clips.

▶ Connect and secure the electrical connector.

2 . Install the fender splash shield.

▶ Tighten the Torx bolts.

3 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

Hydraulic Control Unit (HCU) (70.60.18)

Special Service Tools



Brake pedal hold down tool
JDS9013

Removal



CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

1



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

Raise and support the vehicle.

- 2 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to

- 3 . Remove the front LH fender splash shield.
For additional information, refer to Fender Splash Shield (76.10.90)

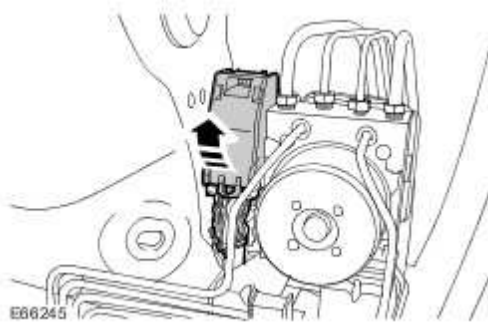
4 **NOTE:**

- To prevent the loss of brake fluid, using the special tool apply the brake pedal and set to 40mm (1.6 in) below the rest position.

Using the special tool, press and hold the brake pedal.

5 . Disconnect the hydraulic control unit (HCU) electrical connector.

▶ Carefully release the clip.

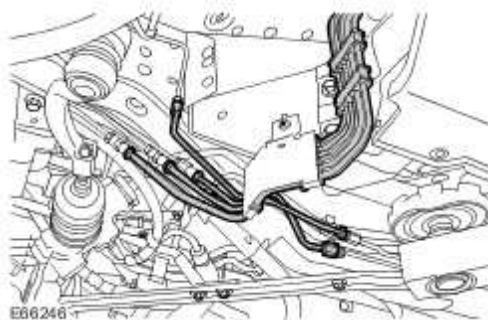


6 .  **CAUTION:** Always plug any open connections to prevent contamination.

NOTE:

Some fluid spillage is inevitable during this operation.

Disconnect the 6 brake pipe unions.

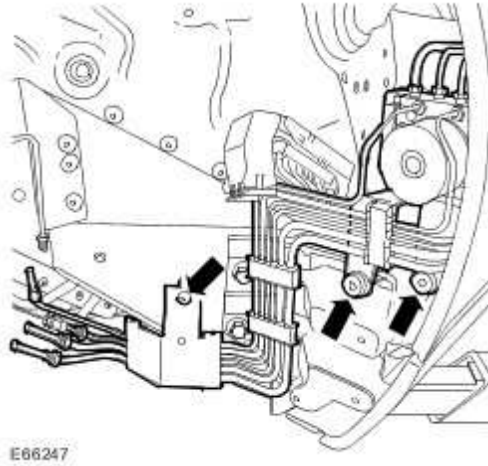


7 . **NOTE:**

Note the fitted position of the locating pegs.

Remove the HCU and pipe assembly.

▶ Remove the 3 Torx bolts.



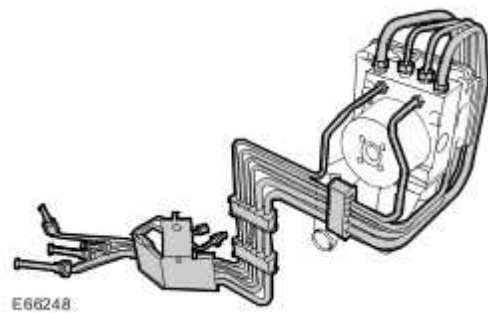
8 .



CAUTION: Always plug any open connections to prevent contamination.

Remove the HCU.

▶ Disconnect the 6 brake pipe unions.

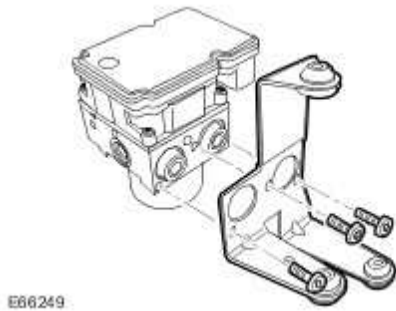


9 . **NOTE:**

Do not disassemble further if the component is removed for access only.

Remove the HCU bracket.

- ▶ Remove the 3 Torx bolts.



Installation

- 1 . Install the HCU bracket.

- ▶ Tighten the Torx bolt to 10 Nm (7 lb.ft).

- 2 . Connect the brake pipe unions.

- ▶ Tighten the brake line unions to 17 Nm (13 lb.ft).

- 3 . **NOTE:**

When installing the HCU , make sure the locating peg fits securely into the grommet.

Install the HCU and pipe assembly.

- ▶ Position the locating peg.
- ▶ Tighten the Torx bolts to 10 Nm (7 lb.ft).
- ▶ Tighten the brake line unions to 17 Nm (13 lb.ft).

- 4 . Connect and secure the electrical connector.

5 . Remove the special tool.

6 . Bleed the brake system.

For additional information, refer to Brake System Bleeding (70.25.03)

7 . Install the fender splash shield.

For additional information, refer to Fender Splash Shield (76.10.90)

8 . Connect the battery ground cable and install the cover.

For additional information, refer to

9 . Using WDS, configure a new HCU.

Rear Wheel Speed Sensor - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (70.60.04)

Removal

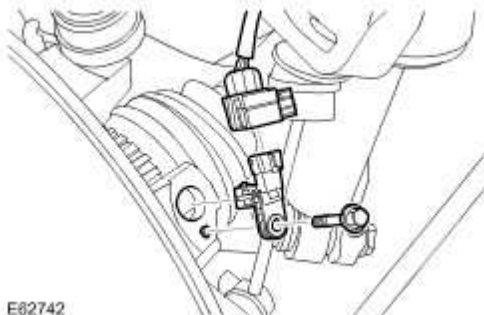
- 1  **WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.**

Raise and support the vehicle.

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

- 3 . Remove the wheel speed sensor.

- ▶ Remove the bolt.
- ▶ Disconnect the electrical connector.



Installation

- 1 . Install the wheel speed sensor.
 - ▶ Clean the component mating faces.
 - ▶ Connect and secure the electrical connector.

 Install the bolt and tighten to 10 Nm (7 lb.ft).

2 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

Yaw Rate Sensor and Accelerometer (86.56.64)

Removal

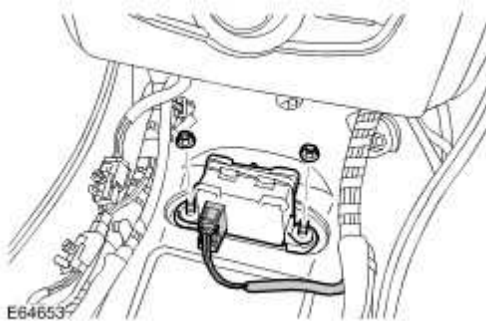
- 1 . Remove the floor console.

For additional information, refer to Floor Console (76.25.01)

- 2 . Remove the accelerometer.

▶ Remove the 2 nuts.

▶ Disconnect the electrical connector.



Installation

- 1 . Install the accelerometer.

▶ Tighten the nuts to 9 Nm (7 lb.ft).

▶ Connect the electrical connector.

- 2 . Install the floor console.

For additional information, refer to Floor Console (76.25.01)

211-00 : Steering system – General information
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Specifications

Specifications

	Specifications

Power Steering System Bleeding (57.15.02)

1. Clean power steering fluid reservoir around the filler cap and fluid indicator.
 - Check the power steering fluid, if aerated, wait until fluid is free from bubbles then top-up reservoir to UPPER level mark with recommended fluid.

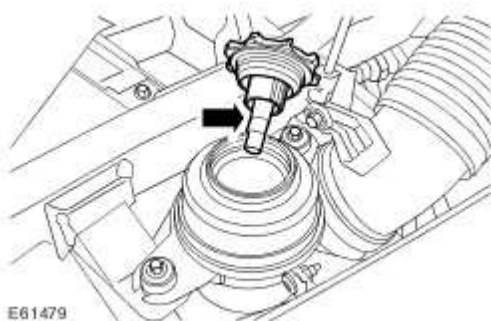
2.



CAUTION: Fluid must always be present in the reservoir during bleeding.

Remove the filler cap and fill to the MAX level mark.

- Install the reservoir filler cap.



3. Start the engine and allow to run for 10 seconds, stop the engine.
 - Check the power steering fluid, if aerated, wait until fluid is free from bubbles then top-up reservoir to UPPER level mark with recommended fluid.

4.



CAUTION: Do not hold steering on full lock for longer than 10 seconds.

Start the engine and turn steering fully lock to lock, stop the engine.

- Check and top-up power steering fluid level.

5. Start and run the engine for 2 minutes, turn the steering fully lock to lock.

- Check and top-up power steering fluid level.

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.



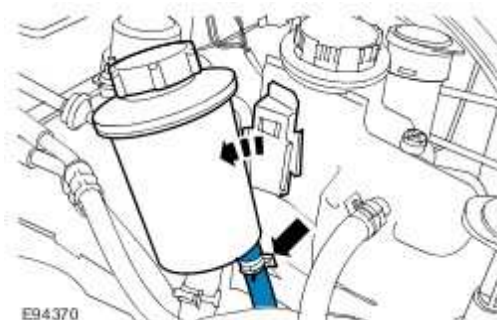
CAUTION: Be prepared to collect escaping fluids.

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.

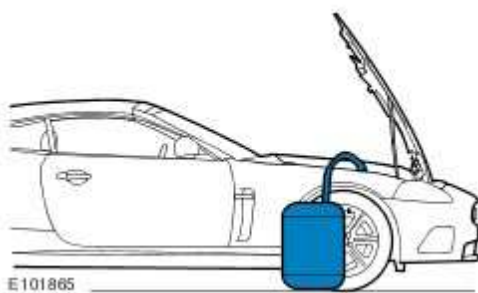


CAUTION: Be prepared to collect escaping fluids.

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.



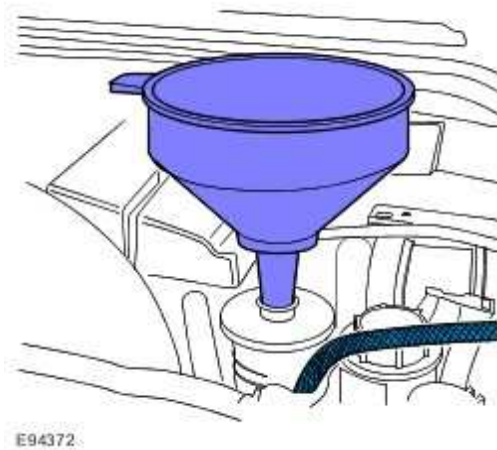
6. **NOTE:**

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.



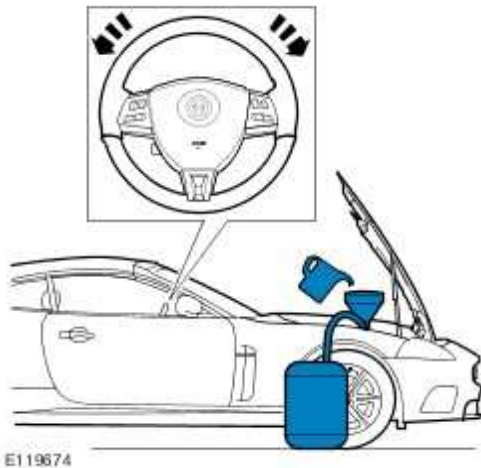
CAUTION: Do not allow the power steering fluid level in the power steering fluid reservoir to fall below the minimum power steering fluid level. Failure to follow this instruction may result in damage to the power steering system.



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.

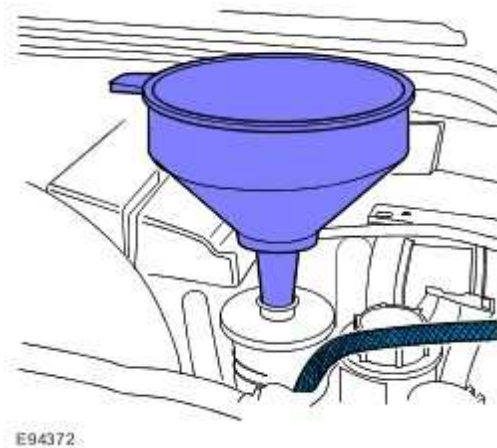


10.



CAUTION: Be prepared to collect escaping fluids.

Remove the suitable funnel.

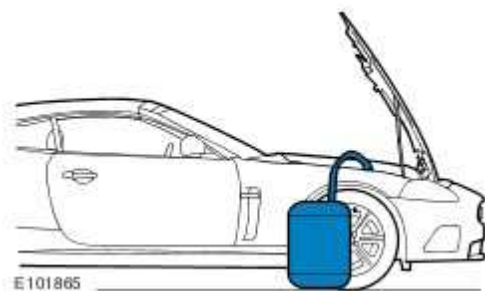


11.



CAUTION: Be prepared to collect escaping fluids.

Remove the suitable pipe to the power steering return hose.



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.

Steering System

Principle of Operation

For a detailed description of the steering system operation, refer to the relevant Description and Operation section of the workshop manual.

Power Steering

Steering Column

Inspection and Verification

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

Mechanical	Electrical
• Tire condition/pressure • Fluid level • Leaks • Security, condition and correct installation of suspension components • Security, condition and correct installation of steering system components	• Fuses • Harnesses for damage/corrosion • Electrical connector(s) • Damaged/corroded pins



CAUTION: If a steering gear assembly is returned under warranty with leaking output shaft 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 output shaft seals being damaged due to foreign materials entering the steering gear boot and damaging the steering gear output shaft seals thereafter.

- 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.

Symptom Charts



WARNING: It is not possible to CHECK the torque of a patchlock bolt, if the torque is suspected to be low, the bolt must be REMOVED/DISCARDED and a new bolt MUST be INSTALLED

and torqued to the correct value.

Fluid Leakage

NOTE:

Confirm the position of the fluid leak. CLEAN the area of the leak, inspect the area and confirm the exact position. Ensure the fluid is not from another system on the vehicle.

Symptom	Possible Causes	Action
Power steering fluid leakage	Overfilled system	CORRECT the fluid level as necessary
	Steering gear	Install new steering gear. Steering Gear (57.10.01)
	Damaged fluid cap/reservoir	INSTALL a new fluid cap/reservoir. Power Steering Fluid Reservoir - 4.2L NA V8 - AJV8 (57.15.08)
	- Loose or damaged hoses and fittings - O-ring or Dowty seals	- TIGHTEN the hose connection or latch plate fixing to the recommended torque. Specifications INSTALL new components as necessary - INSTALL new O-ring or Dowty seals as necessary
	Fluid cooler	INSTALL new fluid cooler. Power Steering Fluid Cooler - 4.2L NA V8 - AJV8 (57.15.11)
	Power steering pump	INSTALL a new power steering pump. Power Steering Pump - 4.2L NA V8 - AJV8 (57.20.14)

Functional

Symptom	Possible Causes	Action
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Steering wheel misalignment	Steering not correctly centred	CHECK the steering alignment. Specifications
Excessive free play at steering wheel (refer to the Steering Linkage Inspection and Backlash (Free play) Check in this section)	Steering wheel loose	CHECK and TIGHTEN the steering wheel retaining bolt as necessary. Steering Wheel (57.60.01)
	Excess play in the steering linkage	INSTALL new components as necessary
	Steering gear not correctly adjusted (causing excessive backlash)	 CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty INSTALL a new steering gear as necessary. Steering Gear (57.10.01)
	Lower steering column universal joint pinch bolts loose	CHECK and TIGHTEN the lower steering column pinch bolts as necessary. Specifications
	Excessive wear in steering column universal joints	INSTALL a new steering column or steering column lower shaft as necessary. Steering Column (57.40.01) Steering Column Lower Shaft (57.40.05)
	Steering gear mounting bolts loose or damaged	CHECK/TIGHTEN and INSTALL new steering gear mounting bolts as necessary.

		Specifications
	Wear in steering gear tie-rod end ball joints	INSTALL new tie-rod ends as necessary. Tie Rod End - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (57.55.02)
	NOTE: Inner ball joint wear is rare. The steering gear installed to all Jaguar vehicles has a spring loaded pinion to ensure the correct level of engagement between the rack and pinion. This play is optimized with the steering gear in the central position and should not be confused with inner ball joint wear. Check for vertical motion in the inner ball joint with the steering gear in the central position. Wear in steering gear inner ball joints	INSTALL new steering gear as necessary. Steering Gear (57.10.01)
	Wear in suspension ball joints/bushings	INSTALL new components as necessary
Veer under braking	Steering gear not correctly adjusted	 CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty INSTALL a new steering gear as necessary.

		Steering Gear (57.10.01)
	Contamination of brake pads and discs	RECTIFY the source of the contamination and INSTALL new brake pads and discs as necessary. Brake Disc - Vehicles With: Standard Brakes (70.10.10) Brake Disc - Vehicles With: High Performance Brakes (70.10.10) Brake Pads - Vehicles With: Standard Brakes (70.40.02) Brake Pads - Vehicles With: High Performance Brakes (70.40.02)
	- Seized front brake caliper slide pins or piston - Damaged brake discs	- RECTIFY sticking slide pins and INSTALL new calipers as necessary. Brake Caliper - Vehicles With: Standard Brakes (70.55.02) Brake Caliper - Vehicles With: High Performance Brakes (70.55.02) - INSTALL new brake discs as necessary. Brake Disc - Vehicles With: Standard Brakes (70.10.10) Brake Disc - Vehicles With: High Performance Brakes (70.10.10)
Vehicle pulls to one side when driving on a level surface	- Uneven tire wear - Incorrect tire pressure	- For further information on diagnosis of uneven tire wear. Suspension System - ADJUST tire pressures. Specifications

	Incorrect geometry adjustment	NOTE: Dealerships must keep a copy of the BEFORE and AFTER geometry figures with job card for future reference ADJUST as necessary. Specifications
	Vehicle is unevenly loaded or overloaded	Notify the customer of incorrect vehicle loading
	Steering gear is not correctly adjusted	 CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty INSTALL a new steering gear as necessary. Steering Gear (57.10.01)
	Loose, damaged or worn front suspension components	TIGHTEN and INSTALL new front suspension components as necessary. Specifications
	Loose, damaged or worn rear suspension components	TIGHTEN and INSTALL new rear suspension components as necessary. Specifications
	Incorrect brake operation	For further information on diagnosis of the brake system.

		Brake System
	Incorrect underbody alignment	SET underbody alignment referring to the Removal and Installation procedures for instruction. Front Subframe (76.10.05) Rear Subframe (64.25.01)
Vehicle wanders from side to side when 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. Specifications - INSTALL a new tire as necessary. Wheel and Tire (74.20.05)
	Vehicle is unevenly or excessively loaded	Notify the customer of incorrect vehicle loading
	Incorrect toe adjustment	ADJUST as necessary. Specifications Front Toe Adjustment (57.65.01)
	Loose or worn steering gear tie-rod end(s)	TIGHTEN and INSTALL a new tie-rod end as necessary. Specifications Tie Rod End - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (57.55.02)
	Loose or worn suspension ball joint(s)	TIGHTEN and INSTALL a new suspension ball joint assembly as necessary. Specifications Wheel Knuckle (60.25.23)
	Steering column universal joint pinch bolt loose	TIGHTEN the steering column universal joint pinch bolt to the correct torque.

		Specifications
	Loose or worn rear suspension components	TIGHTEN and INSTALL new rear suspension components as necessary. Specifications
Poor self center action of the steering	Incorrect tire pressure, size or type	CHECK/ADJUST the tire pressure and INSTALL correct tire as necessary. Specifications Wheel and Tire (74.20.05)
	Incorrect geometry adjustment	NOTE: Dealerships must keep a copy of the BEFORE and AFTER geometry figures with job card for future reference ADJUST as necessary. Specifications
	Steering column/steering column lower shaft interference	CHECK the steering column and steering column lower shaft are free from interference from the engine harness, sound proofing and floor covering
	Steering column shroud fouling on the steering wheel	Correctly INSTALL/ALIGN as necessary
	Steering column universal joints binding or stiff	INSTALL a new upper or lower steering column as necessary. Steering Column (57.40.01) Steering Column Lower

		Shaft (57.40.05)
	Steering column lower shaft floor seal incorrectly installed, binding or damaged	Correctly INSTALL and INSTALL new lower shaft as necessary. Steering Column Lower Shaft (57.40.05)
	Binding or damaged steering gear tie-rod(s)	INSTALL a new tie-rod end as necessary. Tie Rod End - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (57.55.02)
	Loose, damaged or worn front suspension components	TIGHTEN and INSTALL new front suspension components as necessary. Specifications
Excessive steering efforts required during low speed/rapid manoeuvring and/or during parking manoeuvres	Low power steering fluid	CHECK and RECTIFY any fluid leakage. Steering System Fill to correct level
	Damaged Front End Accessory Drive (FEAD) belt tensioner	INSTALL a new FEAD belt tensioner. Accessory Drive Belt Tensioner - 4.2L NA V8 - AJV8 (12.10.41)
	Power steering hose or fluid cooler restriction	CHECK hoses and cooler for restriction/damage and INSTALL new components as necessary. Power Steering Fluid Cooler - 4.2L NA V8 - AJV8 (57.15.11)
	Fluid aeration	BLEED the system. Power Steering System Bleeding (57.15.02)
	Steering transducer not closed - no feed voltage or	Refer to the electrical circuit diagrams and test steering

	cable fault	transducer circuit
	NOTE: REFER to the power steering pressure check in this section. - Power steering fluid delivery pressure or flow too low - Internal steering gear leakage	INSTALL a new power steering pump or steering gear as necessary. Power Steering Pump - 4.2L NA V8 - AJV8 (57.20.14) Steering Gear (57.10.01)
Steering operation is very heavy when VEHICLE IS IN MOTION AT LOW SPEED, but when stationary manoeuvring is NORMAL	Steering transducer open early	Refer to the electrical circuit diagrams and test steering transducer circuit
	Speedometer signal error	Check for vehicle speed related DTCs and refer to the relevant DTC Index
Steering operation is very light when VEHICLE IN MOTION AT HIGHER SPEED, but when stationary manoeuvring is NORMAL	Steering transducer not open, (no power steering fluid flow)	Refer to the electrical circuit diagrams and test steering transducer circuit
	Speedometer signal error	Check for vehicle speed related DTCs and refer to the relevant DTC Index
	Power steering fluid low pressure pipe/hose restricted flow	- CHECK for kinking or blockage of pipe/hose - Ensure CORRECT INSTALLATION and INSTALL a new power steering fluid low pressure pipe/hose as necessary
	Fluid reservoir filter blocked	INSTALL a new reservoir, refill with fluid and bleed the system.

		Power Steering Fluid Reservoir - 4.2L NA V8 - AJV8 (57.15.08) Power Steering System Bleeding (57.15.02)
Steering operation is heavy 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	NOTE: Dealerships must keep a copy of the BEFORE and AFTER geometry figures with job card for future reference. CHECK the front wheel alignment. Specifications
	Faulty rotary valve/seal	NOTE: Refer to the power steering pressure check in this section If the power steering system pressure is low but the power steering pump maximum output pressure is correct INSTALL a new steering gear. Steering Gear (57.10.01)
	Tire fouling on the wheel arch liner or suspension	CHECK for correct installation or damage to wheel arch liner and

	components	suspension components. Correctly INSTALL and INSTALL new components as necessary CHECK tire for correct size, type and pressure
	Damaged steering gear cylinder feed pipe	INSTALL new components as necessary
Steering operation is heavy in both directions	Low power steering fluid	- CHECK and RECTIFY any fluid leaks. Refer to the fluid leakage symptom charts in this section - Fill power steering system to correct level
	Faulty rotary valve/seal	NOTE: Refer to the power steering pressure check in this section If the power steering system pressure is low but the power steering pump maximum output pressure is correct, INSTALL a new steering gear. Steering Gear (57.10.01)
	NOTE: Refer to the power steering pressure check in this section - Power steering fluid delivery pressure or flow too low - Internal steering gear	INSTALL a new power steering pump or steering gear as necessary. Power Steering Pump - 4.2L NA V8 - AJV8 (57.20.14) Steering Gear (57.10.01)

	leakage	
	Fluid loss at the power steering pump shaft seal	INSTALL a new power steering pump as necessary. Power Steering Pump - 4.2L NA V8 - AJV8 (57.20.14)
	Steering column universal joints binding or stiff	INSTALL a new upper or lower steering column as necessary. Steering Column (57.40.01) Steering Column Lower Shaft (57.40.05)
	Seized front ball joints	INSTALL new components as necessary. Wheel Knuckle (60.25.23) Upper Arm LH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.35.41) Upper Arm RH - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (60.35.42)
	Seized or worn steering gear	INSTALL new steering gear as necessary. Steering Gear (57.10.01)
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 and floor covering
	Incorrect speedometer signal	Check for vehicle speed related DTCs and refer to the relevant DTC Index
	Steering transducer circuit fault	Refer to the electrical circuit diagrams and test steering

		transducer circuit
	Steering column universal joint binding or stiff	INSTALL a new upper or lower steering column as necessary. Steering Column (57.40.01) Steering Column Lower Shaft (57.40.05)
Uncharacteristic effort/speed relationship	Steering transducer circuit fault	Refer to the electrical circuit diagrams and test steering transducer circuit
	Incorrect tire pressure, size or type	CHECK/ADJUST the tire pressure and INSTALL correct tire as necessary. Specifications Wheel and Tire (74.20.05)
Excessive kick-back through steering wheel	NOTE: Inner ball joint wear is rare. The steering gear installed to all Jaguar vehicles have a spring loaded pinion to ensure the correct level of engagement between the rack and pinion. This play is optimized with the steering gear in the central position and should not be confused with inner ball joint wear. Check for vertical motion in the inner ball joint with the steering gear in the central position. Badly worn steering gear/linkage	INSTALL new steering gear and tie-rod ends as necessary. Steering Gear (57.10.01) Tie Rod End - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (57.55.02)
	Loose or worn front	TIGHTEN and INSTALL

	suspension components/bushings	new front suspension components as necessary. Specifications
- Column will not adjust - Column will not move to memory position	Electrical/electronic failure	- CHECK column adjust switch datalogger signal using the manufacturer approved diagnostic system - CHECK fuses/relays - Check instrument cluster for column movement/memory related DTCs and refer to DTC Index. Instrument Cluster If DTCs B1C3314, B1C3514 are stored, and the column inches when the switch is activated and there is no memory recall function, there will be an existing fault with the circuit, if the column function is OK the fault is intermittent If DTCs B1C3277, B1C3477 are stored, these should be ignored in this case - CHECK condition of wiring and connectors - CHECK column calibration. The BAR code information is located in the right hand luggage compartment floor area below the carpet - CHECK seat control memory module
	Motor locked/jammed	- CHECK to see if mechanism has reached hard end stops - Free mechanism - Replace motor with

		appropriate service kit
Column easy entry/exit does not function	Electrical/electronic failure	- Turn column adjust switch to AUTO position, check that 'Column Adjust AUTO' text is displayed in the instrument cluster message center - CHECK column adjust switch datalogger signal using the manufacturer approved diagnostic system - CHECK fuses/relays - Check instrument cluster for column movement/memory related DTCs and refer to DTC Index. Instrument Cluster If DTCs B1C3314, B1C3514 are stored, and the column inches when the switch is activated and there is no memory recall function, there will be an existing fault with the circuit, if the column function is OK the fault is intermittent If DTCs B1C3277, B1C3477 are stored, these should be ignored in this case - CHECK condition of wiring and connectors - CHECK column calibration. The BAR code information is located in the right hand luggage compartment floor area below the carpet - CHECK seat control memory module for DTCs and refer to DTC Index

When driver memory recall requested from driver switch pack - Column and exterior mirrors DO NOT move to memory position - Driver seat DOES move to memory position	Driver seat has passenger seat module installed	Install the correct module to the driver seat
When passenger memory recall requested from passenger switch pack - Column, exterior mirrors and passenger seat ALL move to memory position	Passenger seat has driver seat module installed	Install the correct module to the passenger seat
Electromechanical Steering column lock will not operate	Internal lock failure	- Refer to the electrical circuit diagrams and test steering column lock circuit - Install a new steering column lock as necessary

Noise

Symptom	Possible Causes	Action
Continuous noise	Low power steering fluid level	CHECK for leaks and RECTIFY as necessary. For further information refer to the symptom charts for leakage in this section. FILL power steering fluid reservoir to correct level
	NOTE: Look for small air bubbles visible in the fluid, air may also get trapped in the hydraulic system	BLEED the power steering system. Power Steering System Bleeding (57.15.02)

	Air in hydraulic system	
	Power steering pipe/hose in contact with the vehicle body	CHECK and REPOSITION, or INSTALL new IF damaged/deformed, power steering pipe/hose
	Power steering pipe/hose restricted or twisted	- CHECK and CLEAR restriction to pipe/hose - REPOSITION power steering pipe/hose. INSTALL new pipe/hose IF permanently damaged/deformed
	Power steering pump mounting bolts loose	TIGHTEN the power steering pump mounting bolts to the correct torque. Specifications
Noise gets worse when system is loaded	NOTE: Refer to the power steering pressure check in this section - Low power steering fluid level - Aerated fluid - Low power steering pump pressure	- CHECK and FILL power steering fluid reservoir to correct level - Bleed the power steering system. Power Steering System Bleeding (57.15.02) - CHECK power steering pump pressure. If the pump pressure is low, INSTALL a new power steering pump. Power Steering Pump - 4.2L NA V8 - AJV8 (57.20.14)
Front End Accessory Drive (FEAD) belt squeal	FEAD belt incorrectly tensioned or glazed	- CHECK FEAD belt tension - CHECK FEAD belt condition and INSTALL a new belt as necessary. Accessory Drive Belt - 4.2L NA V8 - AJV8 (12.10.40)
Chirp noise from the steering pump when a load is applied	Loose or worn FEAD belt	- CHECK FEAD belt tension - CHECK FEAD belt condition and INSTALL a new belt as necessary. Accessory Drive Belt - 4.2L NA

		V8 - AJV8 (12.10.40)
Scrape/grind noise from behind steering wheel while steering	Steering column shroud foul condition or clockspring	- Correctly INSTALL the steering column shroud to eliminate the foul condition - INSTALL a new clockspring as necessary. Clockspring
	Foreign objects	REMOVE foreign objects from between steering column shroud and steering wheel/steering column rotating components
Click	Clockspring or steering column multifunction switch LH	Correctly INSTALL and INSTALL new components as necessary. Clockspring Steering Column Multifunction Switch LH (86.65.78)
	Loose universal joint pinch bolt	INSTALL a new universal joint pinch bolt and TIGHTEN to correct specification. Specifications
Squeak	Steering column shroud joints	APPLY Krytox spray to steering column shroud joints
	Clockspring	INSTALL new clockspring as necessary. Clockspring
Knock	Loose fixings (universal joint pinch bolt and steering column fixings)	TIGHTEN fixings to correct specification. Specifications
Rattle	Foreign objects	REMOVE foreign objects from between steering column shroud and steering wheel/steering column rotating components
	Loose fixings	TIGHTEN steering column fixings to correct specification. Specifications

Noise while adjusting column	Electric motor/solenoid	NOTE: Before carrying out repairs/replacement, assess column adjustment noise levels against other vehicles of the same model Install new components as necessary
	Motor spindle/lead screw	Lubricate lead screw

Vibration

Symptom	Possible Causes	Action
Wheel Fight (Kick Back) - condition where roughness is felt in the steering wheel by the driver when the vehicle is driven over rough surfaces	Loose or worn steering components/bushings	 CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty. TIGHTEN and INSTALL new steering components/bushings as necessary
	Loose or worn suspension components/bushings	TIGHTEN and INSTALL new suspension components/bushings as necessary
Nibble (Shimmy) - condition where oscillation of the steering wheel occurs (not vertical which is Shake). This is driven	Road wheel and tire condition	- CHECK for wheel and tire damage. INSTALL new components as necessary. Wheel and Tire (74.20.05) - CHECK for tire uniformity. INSTALL new tire(s) as

by road wheel imbalance		necessary
	Road wheel imbalance	CHECK and ADJUST road wheel balance as necessary
Shake - condition where vertical vibration of the steering wheel/column occurs (not oscillation which is Nibble)	NOTE: Vibration smooths out after several miles of driving Road wheel imbalance due to tire flat-spotting	- ENSURE tires installed are to Jaguar specification. INSTALL new tires as necessary - CHECK and ADJUST tire pressures to correct specification

Component Tests

Steering Linkage Inspection and Backlash (Free play) 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 invalidate the steering gear warranty.

3 . The backlash of the steering gear cannot be adjusted, install a new steering gear if excessive backlash is diagnosed.

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.

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 . Using a suitable clean syringe extract a suitable amount of fluid from the reservoir.

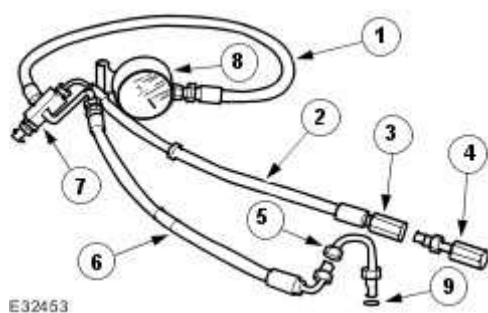
5 . Allow the fluid to drip onto a facial tissue and examine the stain.

6 . If evidence of solid material is found, the power steering fluid system should be drained for further inspection.

7 . 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



Item	Part 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 to check the system pressure.

With the control valve (7) OPEN and the engine idling, the following system pressures may be checked:

- During turning when static (dry parking pressure).
- When the steering is held on full lock (maximum system pressure or pressure relief).
- With the steering at rest (idle pressure or back pressure).



CAUTION: To avoid excessive heating of the power steering pump when CHECKING the pressure, do not close the valve for more than 5 seconds maximum.



CAUTION: When CHECKING the pump pressure 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.

Power Steering System Bleeding (57.15.02)

Description of Terms

General Steering System Noises

Boom

Rhythmic sound like 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, like chirping birds.

Click

Light sound, like a ball point pen being clicked.

Click/Thump

Heavy metal-to-metal sound, like a hammer striking steel.

Grind

Abrasive sound, like 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 like that made by wagons or thunder.

Scrape

Grating noise like one hard plastic part rubbing against another.

Squeak

High-pitched sound like 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.

Whirr/Whine

High-pitched buzzing sound, like an electric motor or drill.

Whistle

Sharp, shrill sound, like wind passing a small opening.

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 full 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 vibration 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 tests 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. It is generally caused by interference between moving components such as the steering wheel to steering column shroud.

Grunt (Squawk/Whoop)

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 loud 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.

Steering Gear Knock (Steering Gear Slap)



CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty.

Steering gear 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. Steering gear 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 of 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 components, movable and flexible components, 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.

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 vibration felt in the steering wheel when steering inputs are slow. 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/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.

211-02 : Power steering

Specifications

Specifications

Lubricants, Fluids, Sealers and Adhesives

	Specifications
Power steering fluid	Mobil ATF (meeting Dexron 3 specification)

Capacities

	Liters
Power steering fluid	1

Torque Specifications

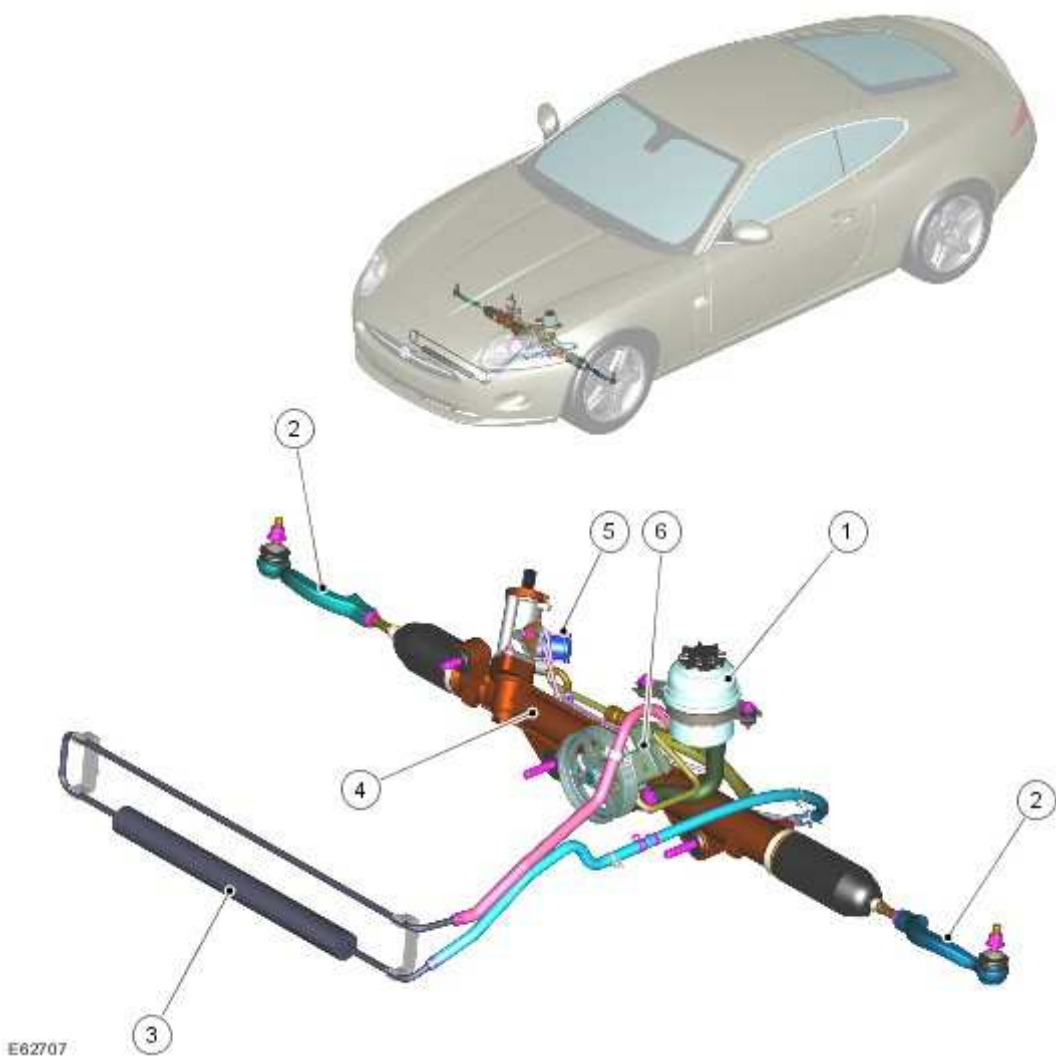
Item	Nm	lb-ft	lb-in
Power steering pump to bracket - bolt	25	18	-
Power steering pump bracket to engine - bolt	25	18	-
Steering gear to vehicle - bolt	100	74	-

Power Steering

COMPONENT LOCATION

NOTE:

Naturally aspirated shown, Supercharged similar



Item	Part Number	Description
1		Power steering fluid reservoir
2		Tie-rod

3		Power steering fluid cooler and hoses
4		Steering gear
5		Servotronic valve
6		Power steering pump

INTRODUCTION

The steering system comprises a ZF manufactured rack and pinion Servotronic 2 steering gear, a power steering pump, a fluid reservoir, a fluid cooler and fluid hoses. The steering gear is an end take-off rack and pinion power assisted unit with the addition of road speed proportional ZF Servotronic 2 assistance.

The steering rack is connected to the front wheel knuckles by adjustable tie-rods. The tie-rods allow for adjustment to centralize the steering wheel and also adjust the toe setting of the front wheel geometry.

The steering gear has a variable ratio rack. This provides conventional response when the steering is in the centre, straight ahead position, but provides more direct and faster steering as the turning angle increases. The variable ratio provides precise and rapid steering response at high speeds and provides optimized steering of the vehicle when manoeuvring into parking spaces, turning in tight areas and when cornering in extreme conditions.

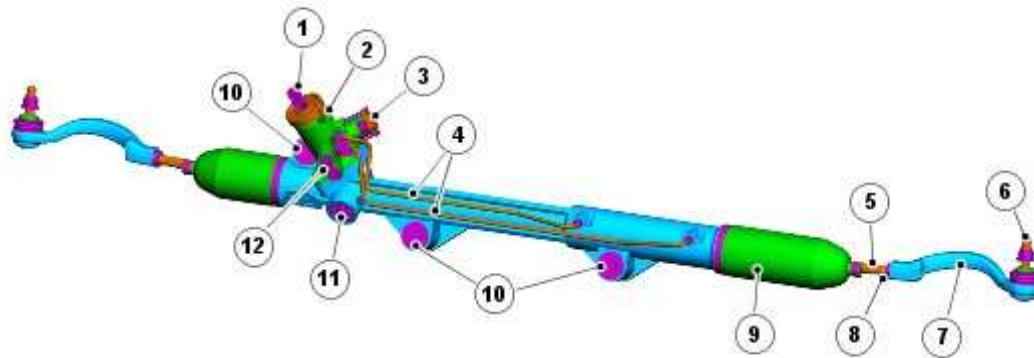
Fluid is supplied to the steering gear by a fixed displacement vane pump, belt driven from the crankshaft pulley. The pump is mounted on the LH (left-hand) side of the engine, above the A/C (air conditioning) compressor.

A fluid reservoir is positioned at the front LH (left-hand) side of the engine compartment, forward of the front suspension housing. A fluid cooler is located in front of the engine cooling radiator. On Supercharged models, a different design of fluid cooler to that fitted to naturally aspirated models is mounted in a higher position in front of the radiator.

Servotronic 2 adds electronic control and speed sensitive steering to the steering gear. The Servotronic 2 feature provides easy and comfortable steering operation when parking, improved 'road feel' at increased road speeds and adds an integrated, positive centre feel feature which optimises steering wheel torque during high speed driving.

The Servotronic 2 system is controlled by software which is incorporated into the instrument cluster. The software responds to road speed signals and controls the power assistance via a transducer valve located on the steering gear valve housing.

STEERING GEAR



E83973

Item	Part Number	Description
1		Input shaft
2		Valve unit
3		Servotronic valve
4		Pressure/Return pipes
5		Tie-rod
6		Locknut
7		Tie-rod end
8		Locknut
9		Steering gear boots
10		Mounting bolts and washers
11		Pinion housing
12		Pressure/Return connection from/to pump

The steering gear is located at the rear of the engine and attached to the front sub-frame. The gear is secured to the sub-frame with three bolts and washers which screw into threaded tubes which are integral with the sub-frame.

The steering gear comprises an aluminum, cast, valve housing which contains the hydraulic valve unit

and Servotronic valve. The mechanical steering rack and the hydraulic actuator are located in a steel cylinder which is attached to the cast valve housing.

The steering gear uses a rack with an integrated piston which is guided on plain bearings within the cylinder and the valve housing. The pinion, which is attached to the valve unit, runs in bearings and meshes with the rack teeth. The rack is pressed against the pinion by a spring loaded yoke which ensures that the teeth mesh with the minimum of play. The pinion is connected to the valve unit via a torsion bar. The rotary motion of the steering wheel is converted into linear movement of the rack by the rack and pinion mechanism and is initiated by the valve unit. This movement is transferred into movement of the road wheels by adjustable tie-rods.

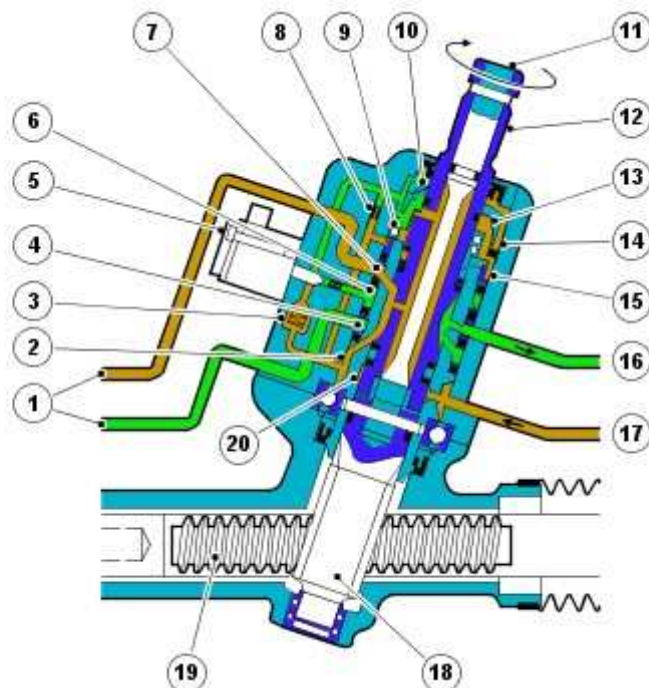
The teeth angles at the centre of the rack vary from those at the end sections. It is this variation in teeth angles which provides the variable ratio.

The piston of the hydraulic actuator is located on the rack bar. Each side of the piston is connected to fluid pressure or fluid return via external metal pipes which are connected to the valve unit.

Each end of the rack bar has a threaded hole which provides for the fitment of the tie-rod. The external ends of the gear are sealed with boots which prevent the ingress of dirt and moisture. The tie-rod has a long threaded area which allows for the fitment of the tie-rod end. The thread allows for the adjustment of the steering toe. When the correct toe setting is achieved, a locknut is tightened against the tie-rod end preventing inadvertent movement.

The gear has a central hole machined along most of its length. The hole allows the air in the boots to be balanced when the steering is turned. The boots are serviceable items and are retained on the gear housing and the tie-rod with clips.

Valve Unit



Item	Part Number	Description
1		Pressure/return to/from steering gear
2		Return fluid chamber
3		Cut-off valve
4		Radial groove
5		Servotronic transducer valve
6		Fluid feed radial groove
7		Radial groove
8		Orifice
9		Balls
10		Compression spring
11		Torsion bar
12		Valve rotor
13		Reaction piston
14		Reaction chamber
15		Centering piece
16		Pressure supply from pump
17		Return to reservoir
18		Pinion
19		Steering gear rack bar
20		Valve sleeve

The valve unit is an integral part of the steering gear. The principle function of the valve unit is to provide power assistance (i.e. when parking) to optimize the effort required to turn the steering wheel.

The pinion housing of the valve is an integral part of the main steering gear casting. The pinion housing has four machined ports which provide connections for pressure feed from the power steering pump, return fluid to the reservoir and pressure feeds to each side of the cylinder piston.

The valve unit comprises an outer sleeve, an input shaft, a torsion bar and a pinion shaft. The valve unit is co-axial with the pinion shaft which is connected to the steering column via the input shaft. The valve unit components are located in the steering gear pinion housing which is sealed with a cap.

The outer sleeve is located in the main bore of the pinion housing. Three annular grooves are machined on its outer diameter. PTFE rings are located between the grooves and seal against the bore of the pinion housing. Holes are drilled radially in each annular groove through the wall of the sleeve. The bore of the outer sleeve is machined to accept the input shaft. Six equally spaced slots are machined in the bore of the sleeve. The ends of the slots are closed and do not continue to the end of the outer sleeve. The radial holes in the outer sleeve are drilled into each slot.

The input shaft has two machined flats at its outer end which allow for the attachment of the steering column intermediate shaft yoke. The flats ensure that the intermediate shaft is fitted in the correct position. The inner end of the input shaft forms a dog-tooth which mates with a slot in the pinion shaft. The fit of the dog-tooth in the slot allows a small amount of relative rotation between the input shaft and the pinion shaft before the dog-tooth contacts the wall of the slot. This ensures that, if the power assistance fails, the steering can be operated manually without over stressing the torsion bar. The central portion of the input shaft has equally spaced longitudinal slots machined in its circumference. The slots are arranged alternately around the input shaft.

The torsion bar is fitted inside the input shaft and is an interference fit in the pinion shaft. The torsion bar is connected to the input shaft by a drive pin. The torsion bar is machined to a smaller diameter in its central section. The smaller diameter allows the torsion bar to twist in response to torque applied from the steering wheel in relation to the grip of the tyres on the road surface.

The pinion shaft has machined teeth on its central diameter which mate with teeth on the steering gear rack. A slot, machined in the upper end of the pinion shaft mates with the dog-tooth on the input shaft. The pinion shaft locates in the pinion housing and rotates on ball and roller bearings.

Servotronic Valve

The Servotronic transducer valve is located in a port in the side of the steering gear valve housing. The valve is sealed in the housing with an O-ring seal and is secured with two long screws into threaded holes in the housing. The Servotronic valve is a transducer controlled valve which responds to control signals supplied from Servotronic software in the instrument cluster.

The Servotronic valve determines the hydraulic reaction at the steering gear rotary valve and controls the input torque required to turn the steering wheel. The Servotronic system allows the steering to be turned with the optimum effort when the vehicle is stationary or manoeuvred at slow speed. The hydraulic reaction changes proportional to the vehicle speed, with the required steering effort increasing as the vehicle moves faster. At high speeds, the Servotronic system provides the

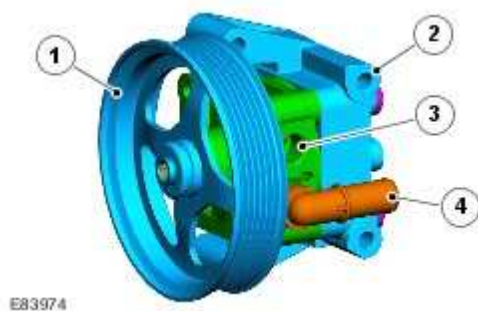
driver with a good feedback through the steering providing precise steering and improved stability.

The instrument cluster receives road speed signals from the ABS module and calculates the correct controlling signal for the Servotronic valve. The Servotronic software within the instrument cluster has a diagnostic capability which allows a Jaguar approved diagnostic system to check the tune of the steering and retrieve fault codes relating to the Servotronic valve. Two fault codes are stored relating to the valve for positive connection short to ground or battery and negative connection short to ground or battery.

The Servotronic software within the instrument cluster also contains a number of steering maps which are selected via the car configuration file depending on the vehicle model and tire fitment.

If a failure of the Servotronic valve or software occurs, the system will suspend Servotronic assistance and only a default level of assistance will be available. Fault codes relating to the fault are stored in the instrument cluster. No warning lamps are illuminated and the driver may be aware of the steering being 'heavier' than usual.

POWER STEERING PUMP



Item	Part Number	Description
1		Pulley
2		Pump body
3		High pressure outlet port (to steering gear)
4		Low pressure suction port (from reservoir)

The power steering pumps used on naturally aspirated and supercharged engine variants are basically the same pump with different flow control valve mechanisms. The pump is a positive displacement, vane type pump which supplies a constant fluid flow to the steering gear valve unit. The pump is driven by a Poly Vee belt from the crankshaft pulley. A self-adjusting tensioner is fitted to maintain the correct tension on the belt.

The pump has an internal pressure relief valve and a flow control valve. The pressure relief valve

limits the maximum pressure supplied to the steering gear to 110 bar (1595 lbf in²) $\pm$ 4 bar (58 lbf in²). The flow control valve limits the maximum flow to 7.5 l/min (1.64 gal/min) $\pm$ 0.75 l/min (0.16 gal/min) regardless of engine speed. The pump has a displacement of 10.5 cm³/rev (0.64 in³/rev).

A shaft runs longitudinally through the pump. One end of the shaft is fitted with a pressed-on drive pulley, the opposite end of the shaft is closed by a cover. The shaft runs in bearings located in the body and oil seals at each end of the shaft prevent leakage of hydraulic fluid. The pump contains ten vanes which rotate within a cam ring and are driven by the shaft. As the vanes rotate, the cam ring causes the space between the vanes to increase. This causes a depression between the vanes and fluid is drawn from the reservoir via the suction hose into the space between the vanes.

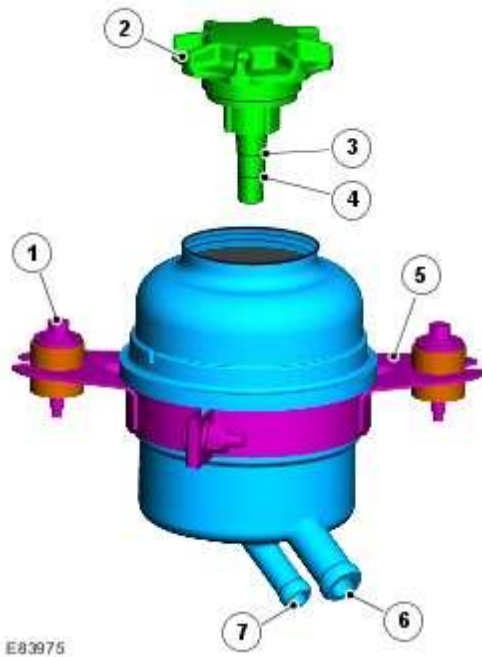
As the shaft rotates, the inlet port is closed to the vanes which have drawn in fluid, trapping the fluid between the vanes. The cam ring causes the space between the vanes to reduce and consequentially compresses and pressurises the hydraulic fluid trapped between them.

Further rotation of the shaft moves the vanes to the outlet port. As the vanes pass the port plate the pressurised fluid passes from the pump outlet port into the pressure hose to the steering gear.

The pressurised fluid is subject to control by the flow control and pressure relief valve. The flow control valve maintains a constant flow of fluid supplied to the steering gear irrespective of engine speed variations. The pressure relief valve limits the maximum pressure on the output side of the pump. A metering orifice is included in the discharge port of the pump. If the pressure in the orifice reaches a predetermined level, a spring loaded ball in the centre of the flow control valve is lifted from its seat and allows pressurised fluid to recirculate within the pump.

The pressure relief valve will operate if the discharge from the pump is restricted, i.e.; steering held on full lock. If the output from the pump is blocked, all output is recirculated through the pump. In this condition, as no fresh fluid is drawn into the pump from the reservoir, the fluid temperature inside the pump will increase rapidly. Consequentially, periods of operation of the steering gear on full lock should be kept to a minimum to prevent overheating of the pump and the fluid within it.

RESERVOIR



Item	Part Number	Description
1		Mounting bolt (2 off)
2		Cap
3		Maximum oil level
4		Minimum oil level
5		Bracket
6		Feed to pump
7		Return from cooler

The reservoir is located in the engine compartment, forward of the Left Hand (LH) suspension turret. A bracket attached to the reservoir is bolted via 2 rubber mounts, to 2 brackets on the front body crossmember.

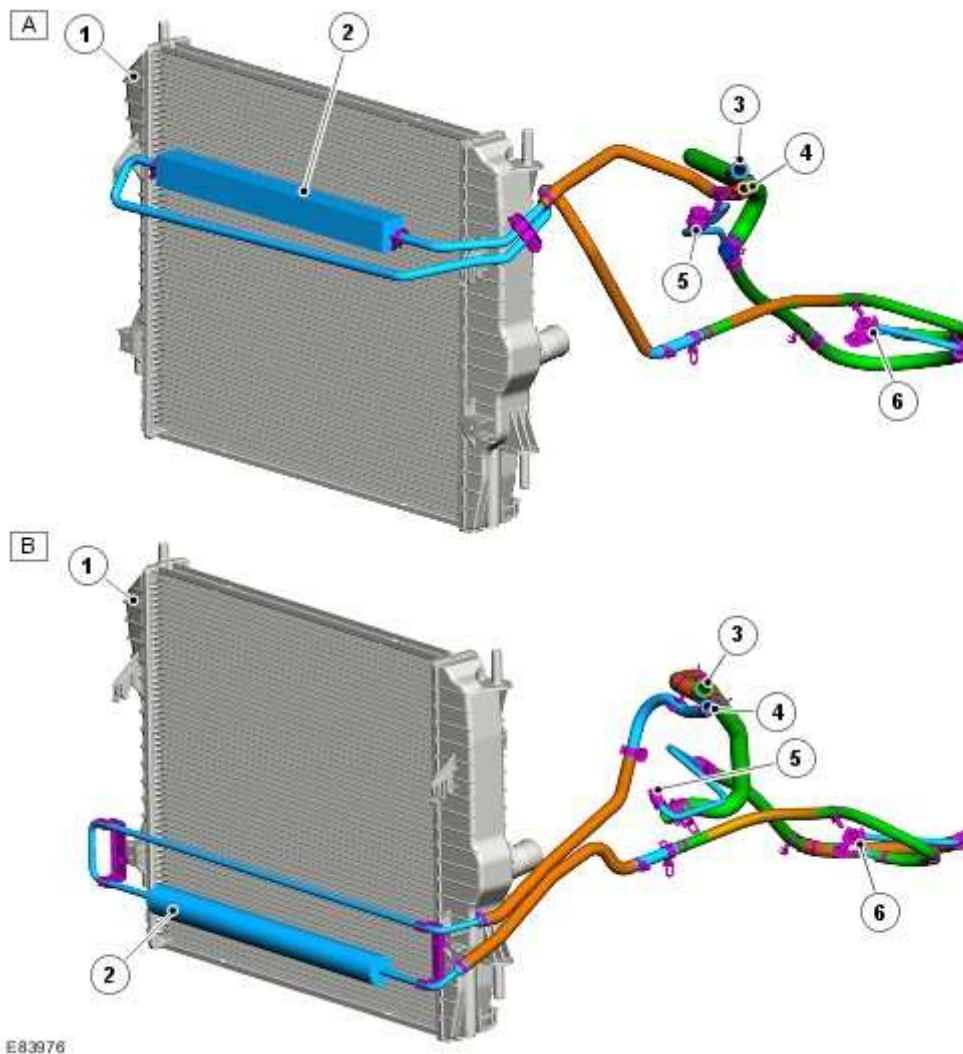
The reservoir is a plastic moulding with an integral 100 micron, non-serviceable filter. Two moulded ports at the base of the reservoir provide for attachment of the fluid supply hose to the power steering pump and fluid return hose from the fluid cooler.

The reservoir is fitted with a removable cap which is screwed into the reservoir body. The cap has a

dip stick with different diameters which denote the minimum and maximum fluid levels.

The reservoir has a fluid capacity to the maximum level of 400 cc (0.85 US pints).

HOSES AND FLUID COOLER



E83976

Item	Part Number	Description
A		Supercharged
B		Naturally aspirated
1		Engine cooling radiator
2		Power steering fluid cooler
3		Reservoir suction pipe

4		Reservoir return pipe
5		Power steering pump pressure pipe
6		Steering gear pressure/return pipes

The supercharged and naturally aspirated vehicles differ in the location of the fluid cooler and consequently the routing of the hoses. The remaining components of the power steering system are similar in both variants.

Hoses

A mixture of metal pipes and rubber hoses are used in the power steering on both models. The high pressure pipe from the pump and the return pipe to the cooler from the steering gear are attached to one mounting plate. The pipe connections are sealed with O ring seals and the plate is secured with a bolt screwed into the steering gear.

On both naturally aspirated models and supercharged models, the pump high pressure pipe is attached to the pump with a threaded, flared, pipe fitting which is sealed with an O ring seal.

Fluid Cooler

The fluid cooler is located in the return circuit from the steering gear to the reservoir. The cooler is an aluminum fin and tube design. Cool air entering the front of the vehicle passes over the cooler and flows through the fins. The fins act as heat exchangers, conducting heat from the fluid as it passes through the tube.

On naturally aspirated models the cooler is located near the bottom of the engine cooling radiator. On supercharged models, the cooler is located higher up, near the top of the radiator, to allow for the fitment of the charge air cooler required on the supercharged model.

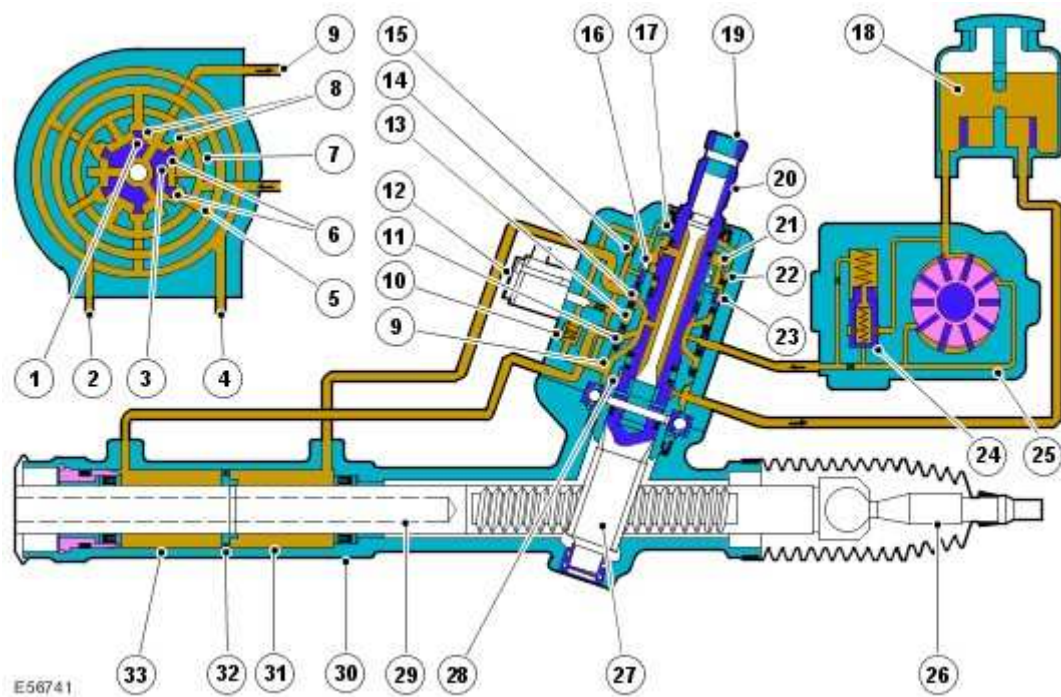
PRINCIPLES OF OPERATION

The following hydraulic circuits show power steering operation and fluid flow for the steering in a straight ahead, neutral position and when turning right. The circuit diagram for turning left is similar to that shown for turning right.

Power Steering in Neutral Position

NOTE:

Circuit shows steering rotary valve in neutral position with the vehicle not moving.



Item	Part Number	Description
1		Return fluid control groove
2		Radial groove
3		Feed fluid control groove
4		Radial groove
5		Axial groove
6		Feed fluid control edge
7		Feed fluid radial groove
8		Return fluid control edge
9		Return fluid chamber
10		Cut-off valve
11		Radial groove
12		Servotronic transducer valve

13		Feed fluid radial groove
14		Radial groove
15		Orifice
16		Balls
17		Compression spring
18		Torsion bar
19		Power steering fluid reservoir
20		Valve rotor
21		Reaction piston
22		Reaction chamber
23		Centering piece
24		Pressure relief/flow limiting valve
25		Power steering pump
26		Inner tie-rod
27		Pinion
28		Valve sleeve
29		Steering gear rack
30		Steering gear housing
31		Power assist cylinder - right
32		Piston
33		Power assist cylinder - left

When the engine is started, the power steering pump draws fluid from the reservoir down the low pressure suction line. The fluid passes through the pump and is delivered at pressure, via a hose, to the steering rack valve unit.

The pressurised fluid flows through a connecting bore in the valve and, via the feed fluid radial groove and the transverse bores in the valve sleeve, passes to the feed fluid control groove of the valve rotor.

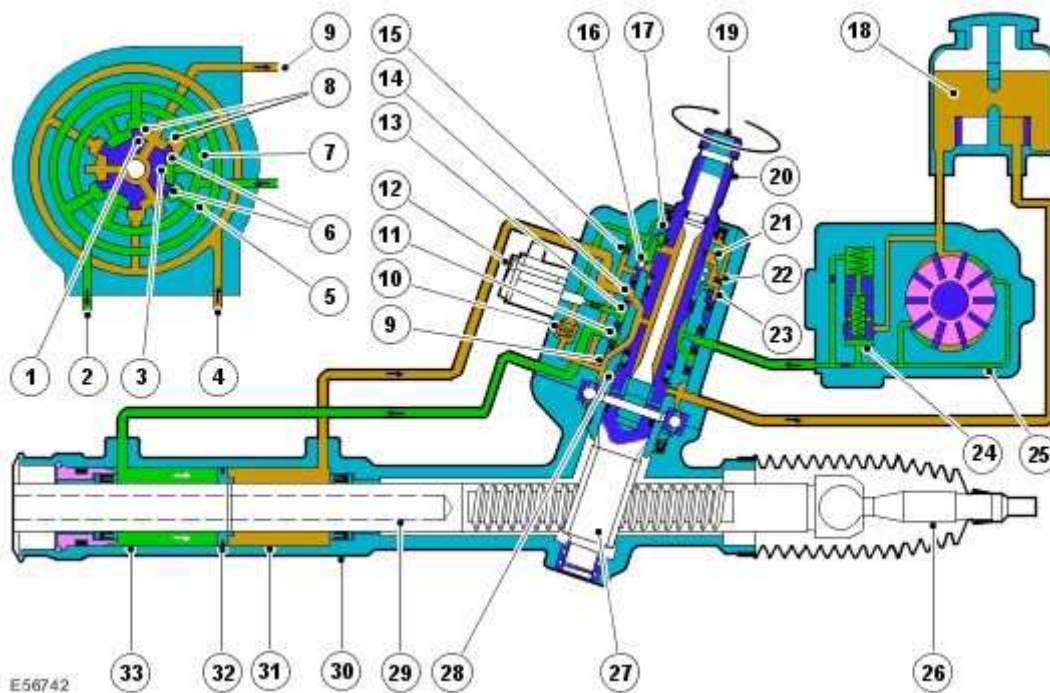
In the neutral (straight ahead) position, the fluid passes over the open feed fluid control edges to all valve sleeve axial grooves. The fluid then passes through return fluid control edges and the return fluid grooves of the valve rotor, back to the reservoir passes via the fluid cooler.

Simultaneously, the radial grooves of the valve and their associated pipes provide a connection the left and right power assist cylinders.

Power Steering in Right Turn Position

NOTE:

Circuit shows steering rotary valve in right turn position, at high vehicle speed and with rapid steering corrections. The Servotronic transducer valve is fully open and the maximum hydraulic reaction is limited by the cut-off valve.



Item	Part Number	Description
1		Return fluid control groove
2		Radial groove

3		Feed fluid control groove
4		Radial groove
5		Axial groove
6		Feed fluid control edge
7		Feed fluid radial groove
8		Return fluid control edge
9		Return fluid chamber
10		Cut-off valve
11		Radial groove
12		Servotronic transducer valve
13		Feed fluid radial groove
14		Radial groove
15		Orifice
16		Balls
17		Compression spring
18		Power steering fluid reservoir
19		Torsion bar
20		Valve rotor
21		Reaction piston
22		Reaction chamber
23		Centering piece
24		Pressure relief/flow limiting valve
25		Power steering pump

26		Inner track rod
27		Pinion
28		Valve sleeve
29		Steering gear
30		Steering gear housing
31		Power assist cylinder - right
32		Piston
33		Power assist cylinder - left

When the steering wheel is turned to the right, the steering rack and piston moves to the left in the piston bore. The valve rotor is rotated to the right (clockwise) and pressurised fluid is directed over the further opened feed fluid control edges and to the associated axial grooves, the radial groove and via an external pipe to the left power assist cylinder chamber. The pressure applied to the piston from the left power assist cylinder chamber provides the hydraulic assistance.

An adaptable pressure build-up is achieved by the partially or fully closed feed fluid control edges restricting or preventing a connection between the fluid pressure inlet and the other axial grooves connected to the radial groove.

Simultaneously, the fluid pressure outlet to the pressurised axial grooves are restricted or partially restricted by the closing return fluid control edges. The fluid displaced by the piston from the right power assist cylinder chamber, flows through an external pipe to the radial grooves. From there the fluid passes to the associated axial grooves and on to the return fluid control grooves, via the further opened return fluid control edges.

The return flow of fluid to the reservoir passes via interconnecting bores which lead to the return fluid chamber. When the steering wheel is turned to the left the operating sequence is as above but the pressure is applied to the opposite side of the piston.

Servotronic Operation

The Servotronic software contains a number of steering maps which are selected via the car configuration file depending on the vehicle mode and tire fitment.

If a failure of the Servotronic valve or software occurs, the system will suspend Servotronic assistance and only normal power steering wheel be available. Fault codes relating to the fault are stored, but no warning lamps are illuminated and the driver may be aware of the steering being 'heavier' than usual.

When the vehicle is manoeuvred into and out of a parking space (or other similar manoeuvre), the Servotronic software uses road speed data from the ABS module to determine the vehicle speed, which in this case will be slow or stationary. The Servotronic software analyses the signals and outputs an appropriate control current to the Servotronic transducer valve. The Servotronic valve closes and prevents fluid flowing from the feed fluid radial groove to the reaction chamber. An orifice also ensures that there is return pressure in the reaction chamber. This condition eliminates any 'reaction' ensuring that the steering is very light to operate, reducing the effort required to turn the steering wheel. .

As the vehicle is driven and the road speed increases, the Servotronic software analyses the road speed signals from the ABS module and reduces the amount of control current supplied to the Servotronic valve which increases the reaction pressure. This modifies the input torque applied through the steering wheel and provides the driver with an improved 'road feel' allowing precise steering and directional stability.

Power Steering

For additional information, refer to [<<211-00>>](#).

Power Steering Fluid Cooler - 4.2L NA V8 - AJV8 (57.15.11)

Removal

- 1 . Remove the cover and disconnect the battery ground cable.

For additional information, refer to

2



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

Raise and support the vehicle.

- 3 . Remove the front bumper cover.

For additional information, refer to Front Bumper Cover (76.22.78)

- 4 . **NOTE:**

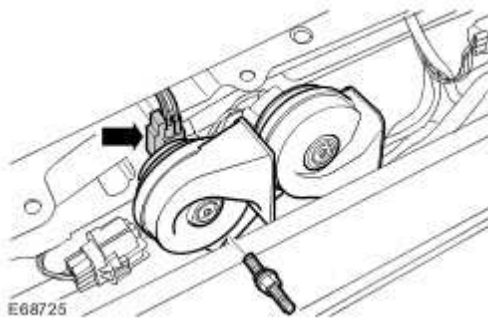
Note the fitted position.

Remove the horn assembly.

▶ Disconnect the electrical connector.

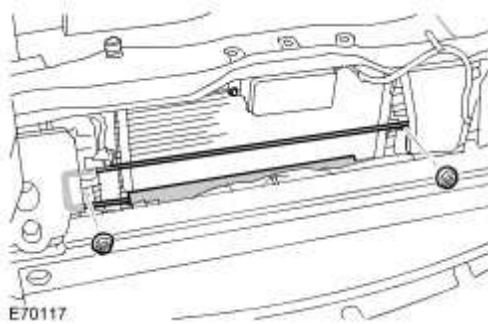
▶ Release the wiring harness clip.

▶ Remove the stud.



5 . Release the power steering fluid cooler.

▶ Remove the 2 nuts.

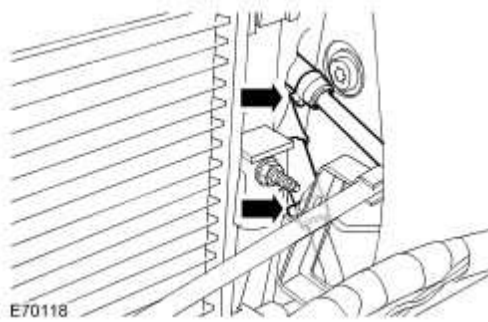


6  **CAUTION:** Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.

Remove the power steering fluid cooler.

▶ Remove and discard the hose clips.

▶ Position a container to collect the fluid spillage.



Installation

1 . Install the power steering fluid cooler.

- ▶ Clean the components.
- ▶ Connect the hoses and secure with the clips.
- ▶ Tighten the nuts to 10 Nm (7 lb.ft).

2 . Install the horn assembly.

- ▶ Tighten the stud to 25 Nm (18 lb.ft).
- ▶ Attach the wiring harness.
- ▶ Connect the electrical connector.

3 . Install the front bumper cover.

For additional information, refer to Front Bumper Cover (76.22.78)

4 . Connect the battery ground cable and install the cover.

For additional information, refer to

5 . Refill and bleed the power steering.

For additional information, refer to Power Steering System Bleeding (57.15.02)

Power Steering Fluid Cooler - 4.2L SC V8 - AJV8 (57.15.11)

Removal

- 1 . Remove the cover and disconnect the battery ground cable.

For additional information, refer to Specifications

2



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

Raise and support the vehicle.

- 3 . Remove the intake air resonator.

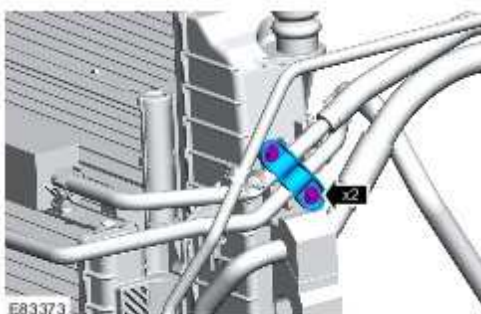
For additional information, refer to Intake Air Resonator

- 4 . Remove the front bumper cover.

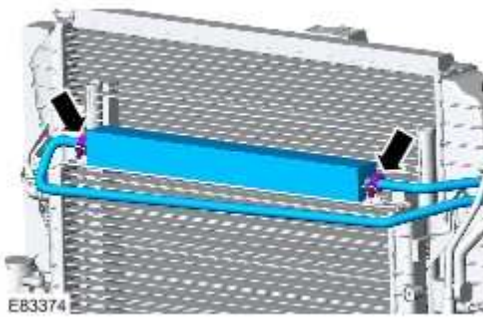
For additional information, refer to Front Bumper Cover (76.22.78)

- 5 . Release the power steering fluid cooler.

▶ Remove the 2 bolts.



6 . Release the 2 power steering fluid cooler clips.



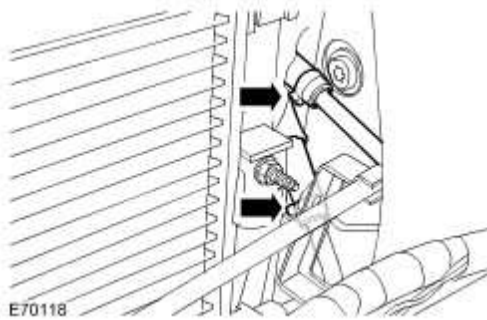
7



- CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.

Remove the power steering fluid cooler.

- ▶ Remove and discard the hose clips.
- ▶ Position a container to collect the fluid spillage.



Installation

1 . Install the power steering fluid cooler.

- ▶ Clean the components.
- ▶ Connect the hoses and secure with the clips.
- ▶ Tighten the bolts to 7 Nm (5 lb.ft).

 Secure with the clips.

2 . Install the front bumper cover.

For additional information, refer to Front Bumper Cover (76.22.78)

3 . Install the intake air resonator.

For additional information, refer to Intake Air Resonator

4 . Connect the battery ground cable and install the cover.

For additional information, refer to Specifications

5 . Refill and bleed the power steering.

For additional information, refer to Power Steering System Bleeding (57.15.02)

Power Steering Fluid Reservoir - 4.2L NA V8 - AJV8 (57.15.08)

Removal



CAUTION: If power steering fluid comes into contact with the paintwork, the affected area must be immediately washed down with cold water.

1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to

2 . Remove the engine cover.
For additional information, refer to Engine Cover (76.11.35)

3 . Remove the air intake duct.

▶ Remove the bolt.

▶ Release the 2 clips.



4 . Release the power steering fluid reservoir.

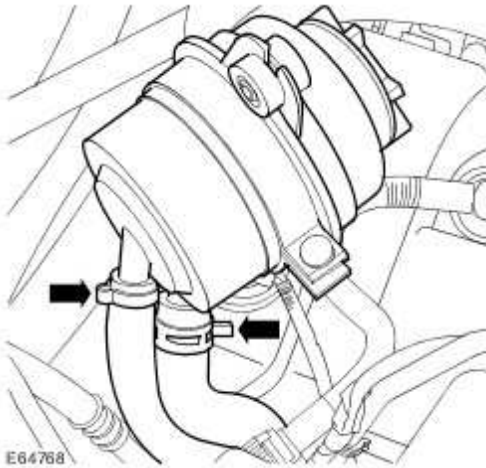
▶ Remove the 2 bolts.



- 5 .  **CAUTION:** Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.

Release the 2 power steering fluid reservoir lines.

- ▶ Position a container to collect the fluid.
- ▶ Release the feed line clip.
- ▶ Remove and discard the return line clip.



- 6 . Remove the power steering fluid reservoir.

Installation

- 1 . Attach the power steering fluid reservoir lines.

- ▶ Clean the components.

- ▶ Secure with the clips.

- 2 . Secure the power steering fluid reservoir.

- ▶ Tighten the bolts to 6 Nm (4 lb.ft).

- 3 . Install the air intake duct.

- ▶ Tighten the clips.

- ▶ Tighten the bolt to 10 Nm (7 lb.ft).

- 4 . Install the engine cover.

For additional information, refer to Engine Cover (76.11.35)

- 5 . Connect the battery ground cable and install the cover.

For additional information, refer to

- 6 . Check and top-up power steering fluid level.

For additional information, refer to Power Steering System Bleeding (57.15.02)

Power Steering Fluid Reservoir - 4.2L SC V8 - AJV8 (57.15.08)

Removal



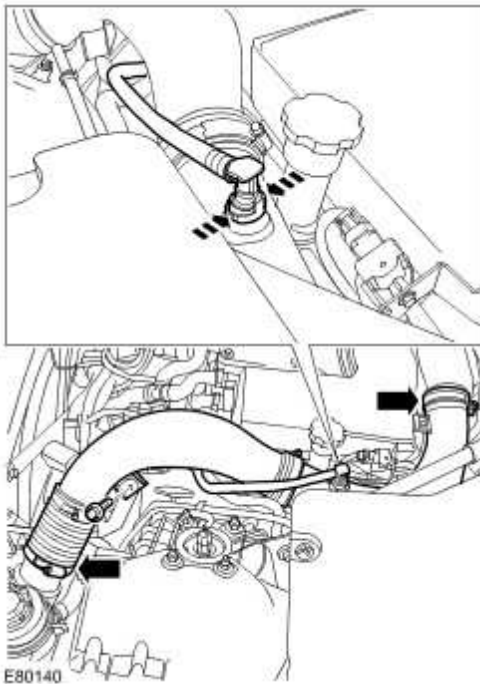
CAUTION: If power steering fluid comes into contact with the paintwork, the affected area must be immediately washed down with cold water.

- 1 . Remove the engine cover.

For additional information, refer to Engine Cover (76.11.35)

- 2 . Remove the LH intake air resonator.

- ▶ Remove the bolt.
- ▶ Release the 2 clips.
- ▶ Disconnect the engine breather line.



3 . Release the power steering fluid reservoir.

▶ Remove the 2 bolts.



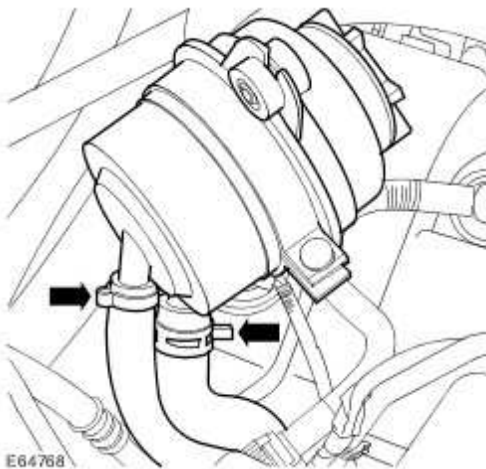
4 .  **CAUTION:** Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.

Release the 2 power steering fluid reservoir lines.

▶ Position a container to collect the fluid.

▶ Release the feed line clip.

▶ Remove and discard the return line clip.



- 5 . Remove the power steering fluid reservoir.

Installation

- 1 . Attach the power steering fluid reservoir lines.

- ▶ Clean the components.

- ▶ Secure with the clips.

- 2 . Secure the power steering fluid reservoir.

- ▶ Tighten the bolts to 6 Nm (4 lb.ft).

- 3 . Install the intake air resonator.

- ▶ Tighten the clips.

- ▶ Tighten the bolt to 10 Nm (7 lb.ft).

- ▶ Connect the engine breather line.

- 4 . Install the engine cover.

For additional information, refer to Engine Cover (76.11.35)

- 5 . Check and top-up power steering fluid level.

For additional information, refer to Power Steering System Bleeding (57.15.02)

Power Steering Pump - 4.2L NA V8 - AJV8 (57.20.14)

Removal

- 1 . Remove the cover and disconnect the battery ground cable.

For additional information, refer to

2



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

Raise and support the vehicle.

- 3 . Remove the LH front wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

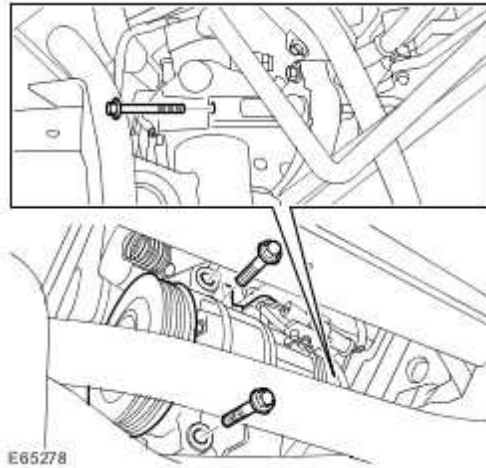
- 4 . Remove the accessory drive belt.

For additional information, refer to Accessory Drive Belt - 4.2L NA V8 - AJV8 (12.10.40)

- 5 . Release the air conditioning compressor.



Remove the 3 bolts.



- 6 .  **WARNING: Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.**

 **CAUTION: Always plug any open connections to prevent contamination.**

Disconnect the low pressure line from the power steering pump.

 Release the clip.

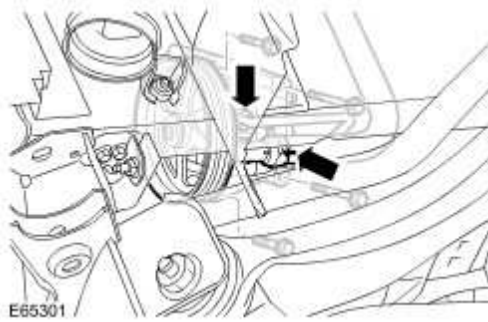
- 7 .  **CAUTION: Always plug any open connections to prevent contamination.**

Disconnect the high pressure line from the power steering pump.

 Remove and discard the O-ring seal.

- 8 . Remove the power steering pump.

 Remove the 4 bolts.



Installation

1 . Install the power steering pump.

▶ Tighten the bolts to 25 Nm (18 lb.ft).

2 . Connect the high pressure line.

▶ Clean the component mating faces.

▶ Install a new O-ring seal.

▶ Tighten the union to 25 Nm (18 lb.ft).

3 . Connect the low pressure line.

▶ Clean the component mating faces.

▶ Secure with the clip.

4 . Secure the A/C compressor.

▶ Tighten the bolts to 25 Nm (18 lb.ft).

5 . Install the accessory drive belt.

For additional information, refer to Accessory Drive Belt - 4.2L NA V8 - AJV8 (12.10.40)

6 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

7 . Connect the battery ground cable and install the cover.

For additional information, refer to

8 . Check and top-up power steering fluid level.

For additional information, refer to Power Steering System Bleeding (57.15.02)

Power Steering Pump - 4.2L SC V8 - AJV8 (57.20.14)

Removal

- 1 . Remove the cover and disconnect the battery ground cable.

For additional information, refer to Specifications

2



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

Raise and support the vehicle.

- 3 . Remove the LH front wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

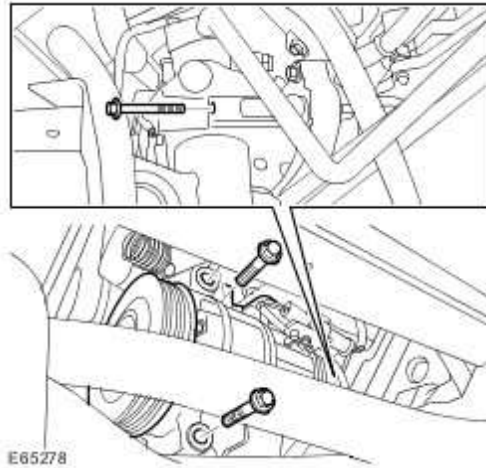
- 4 . Remove the accessory drive belt.

For additional information, refer to Accessory Drive Belt - 4.2L SC V8 - AJV8 (12.10.40)

- 5 . Release the air conditioning compressor.



Remove the 3 bolts.



- 6 .  **WARNING: Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.**

 **CAUTION: Always plug any open connections to prevent contamination.**

Disconnect the low pressure line from the power steering pump.

 Release the clip.

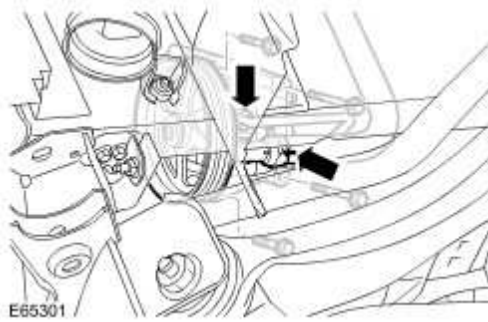
- 7 .  **CAUTION: Always plug any open connections to prevent contamination.**

Disconnect the high pressure line from the power steering pump.

 Remove and discard the O-ring seal.

- 8 . Remove the power steering pump.

 Remove the 4 bolts.



Installation

1 . Install the power steering pump.

▶ Tighten the bolts to 25 Nm (18 lb.ft).

2 . Connect the high pressure line.

▶ Clean the component mating faces.

▶ Install a new O-ring seal.

▶ Tighten the union to 25 Nm (18 lb.ft).

3 . Connect the low pressure line.

▶ Clean the component mating faces.

▶ Secure with the clip.

4 . Secure the A/C compressor.

▶ Tighten the bolts to 25 Nm (18 lb.ft).

5 . Install the accessory drive belt.

For additional information, refer to Accessory Drive Belt - 4.2L SC V8 - AJV8 (12.10.40)

6 . Install the wheel and tire.

For additional information, refer to Wheel and Tire (74.20.05)

7 . Connect the battery ground cable and install the cover.

For additional information, refer to Specifications

8 . Check and top-up power steering fluid level.

For additional information, refer to Power Steering System Bleeding (57.15.02)

Steering Gear (57.10.01)

Removal



CAUTION: Make sure that only the manufacturers' recommended four wheel alignment equipment is used.



CAUTION: Do not turn the steering wheel with the lower steering column disconnected as damage to the clock spring and steering wheel switches may occur.

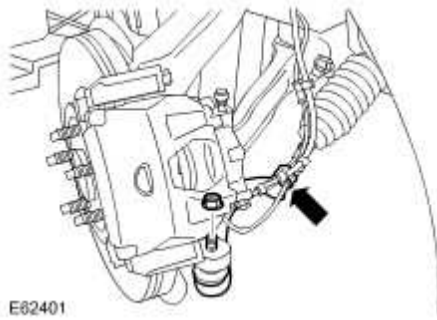
NOTE:

Make sure the steering is in the straight ahead position.

- 1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to
- 2 . Raise and support the vehicle.
- 3 . Remove the front wheels and tires.
For additional information, refer to Wheel and Tire (74.20.05)
- 4 . Remove the air deflector.
For additional information, refer to Air Deflector (76.11.41)
- 5 . Release both tie-rod end ball joints.



Remove and discard the 2 nuts.



6 . Disconnect the power steering control valve actuator electrical connector.



7 .  **CAUTION: Air tools MUST NOT be used on steering column bolts.**

Disconnect the lower steering column from the steering gear.

 Remove and discard the bolt.



8 . Release the power steering line support bracket.

9



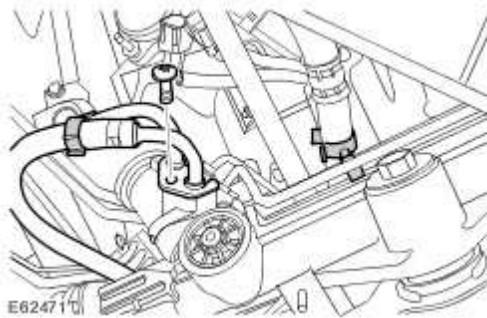
CAUTION: Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.

NOTE:

Some fluid spillage is inevitable during this operation.

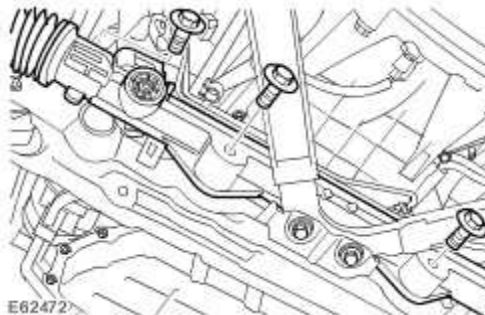
Disconnect the power steering feed and return fluid lines from the steering gear.

- ▶ Remove the bolt.
- ▶ Position a container to collect spillage.
- ▶ Remove and discard both O-ring seals.



10 . Remove the steering gear.

- ▶ Remove the 3 bolts.



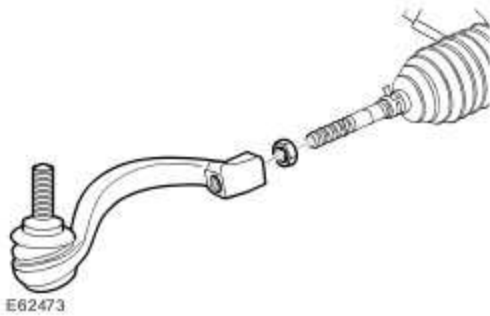
- 11 .  **CAUTION: Do not allow the gaiter to twist.**

NOTE:

Do not disassemble further if the component is removed for access only.

Remove both tie rod ends.

- ▶ Loosen the tie-rod end ball joint retaining nut.
- ▶ Repeat the above procedure for the other side.



Installation

- 1 . Install both tie rod ends.

- ▶ Tighten the tie rod end lock nut to 55 Nm (40 lb.ft).

- 2 . Install the steering gear.

- ▶ Tighten the bolts to 100 Nm (74 lb.ft).

- 3 . Connect the power steering feed and return fluid lines.

- ▶ Install the new O-ring seals.
- ▶ Tighten the bolt to 15Nm (11 lb.ft).

4 . Connect the power steering control valve actuator electrical connector.

5 . Secure the power steering line support mount.

6 . Connect the steering column lower shaft.

 Tighten the bolt to 35 Nm (26 lb.ft).

7 . Connect the tie-rod end ball joints.

8 . Install the front wheels and tires.

For additional information, refer to Wheel and Tire (74.20.05)

9 . Install the air deflector.

For additional information, refer to Air Deflector (76.11.41)

10 . Connect the battery ground cable and install the cover.

For additional information, refer to

11 . Fill and bleed the power steering system.

For additional information, refer to Power Steering System Bleeding (57.15.02)

12 Using only four-wheel alignment equipment approved by Jaguar, check and adjust the wheel alignment.

Steering Gear Bushing (57.10.30)

Special Service Tools



204-275

Bushing remover and installer bolt

204-275



204-274

Bushing remover and installer nut

204-274



JAG-061

Bearing kit

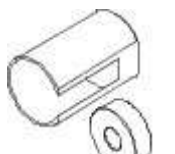
JAG-061



204-273

Steering gear lower bushing remover and installer

204-273



211-271

Steering gear upper bushing remover and installer 211-271

Removal

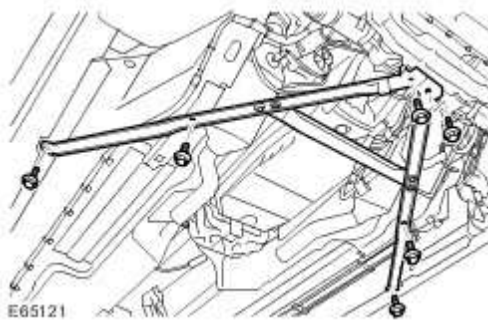
- 1  **WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.**

Raise and support the vehicle.

- 2 . Remove the air deflector.
For additional information, refer to Air Deflector (76.11.41)

- 3 . With assistance, remove the A-frame.

 Remove the 6 bolts.



- 4 . Disconnect the power steering control valve actuator electrical connector.
- 5 . Release the power steering line support bracket.



6.  **CAUTION: Air tools MUST NOT be used on steering column bolts.**

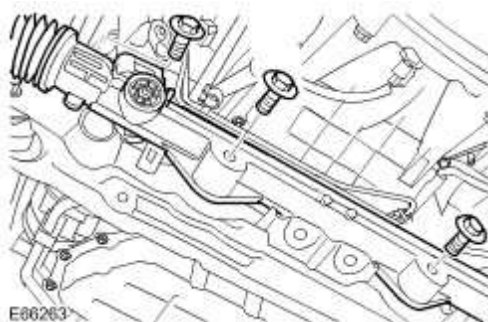
Disconnect the lower steering column from the steering gear.

-  Remove and discard the bolt.

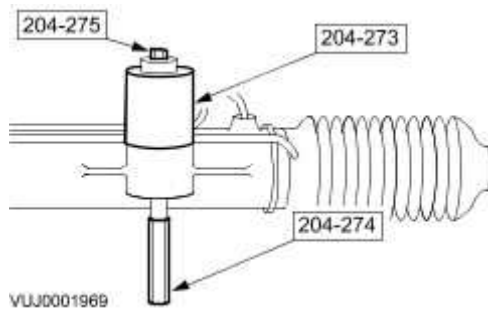


7. Release the steering gear.

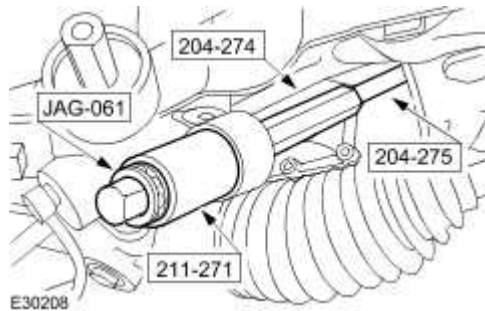
-  Remove the 3 bolts.



- 8 . Using the special tools, remove the steering gear lower bushing.

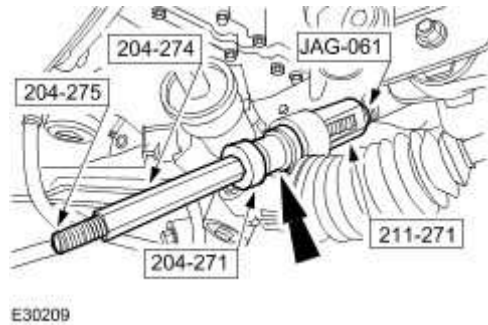


- 9 . Using the special tools, remove the steering gear upper bushing.

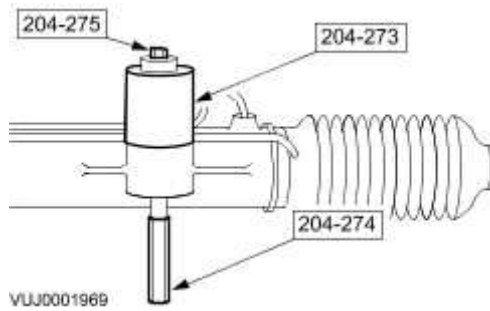


Installation

- 1 . Using the special tools, install the steering gear upper bushing.



- 2 . Using the special tools, install the steering gear lower bushing.



3 . Install the steering gear.

▶ Tighten the bolts to 100 Nm (74 lb.ft).

4 . Connect the power steering control valve actuator electrical connector.

5 . Secure the power steering line support bracket.

6 . Connect the steering column lower shaft.

▶ Tighten the bolt to 35 Nm (26 lb.ft).

7 . With assistance, install the A-frame.

▶ Tighten the bolts to 55 Nm (40 lb.ft).

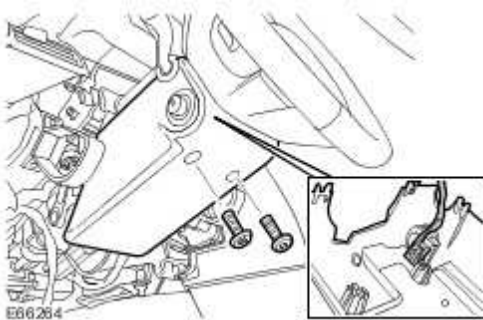
8 . Install the air deflector.

For additional information, refer to Air Deflector (76.11.41)

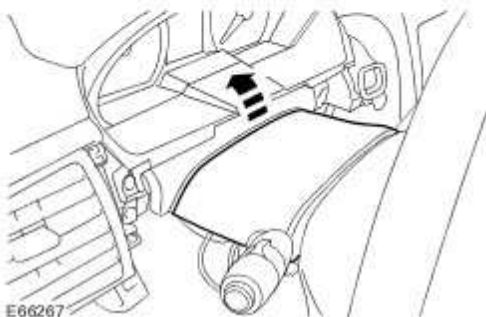
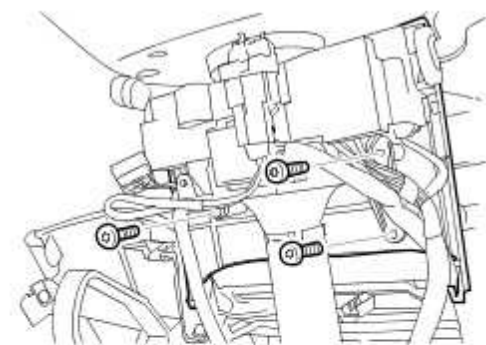
Steering Angle Sensor

Removal

- 1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to Specifications
- 2 . Make the SRS system safe.
For additional information, refer to Standard Workshop Practices
- 3 . Remove the steering wheel.
For additional information, refer to Steering Wheel (57.60.01)
- 4 . Remove the instrument panel, lower trim panel.
For additional information, refer to Instrument Panel Lower Trim Panel (76.46.11)
- 5 Remove the steering column lower cowl.
 - ▶ Remove the 2 screws.
 - ▶ If installed, disconnect the steering column and foot pedal control switch electrical connector.



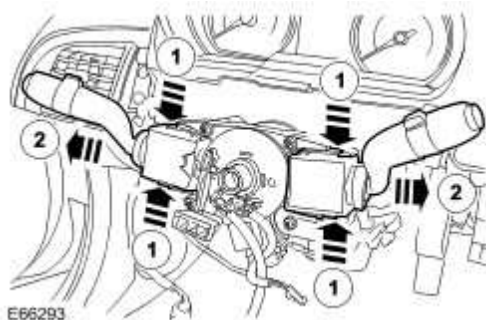
- 6 . Remove the steering column upper cowl.
 - ▶ Remove the 3 screws.



7 . Release the multifunction switch.

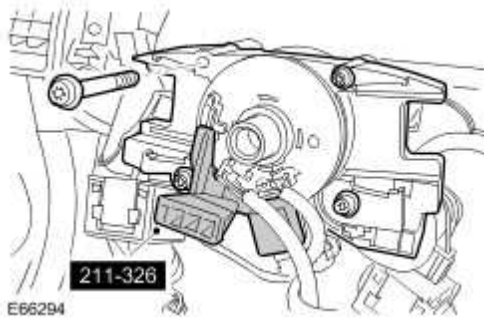
▶ Depress the 2 clips.

▶ Repeat the above procedure on the opposite hand.



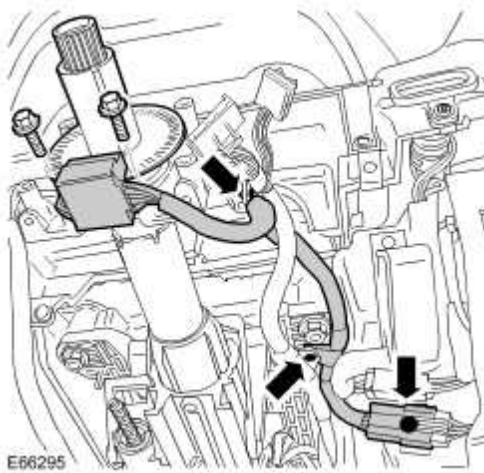
8 . Release the clockspring.

▶ Remove the 4 Torx bolts.



9 . Remove the steering angle sensor.

- ▶ Disconnect the electrical connector.
- ▶ Release the 3 wiring harness clips.
- ▶ Separate the harness.
- ▶ Remove the 2 bolts.
- ▶ Remove the reluctor ring.



Installation

1 . Install the steering angle sensor.

- ▶ Install the reluctor ring.

▶ Tighten the bolts to 3 Nm (2.2 lb.ft).

▶ Connect the electrical connector.

▶ Secure the clips.

2 . Install the clockspring.

▶ Tighten the Torx bolts to 6 Nm (4 lb.ft).

3 . Install the steering column upper cowl.

▶ Install the screws.

4 . Install the steering column lower cowl.

▶ If installed, connect the steering column and foot pedal switch electrical connector.

▶ Secure in the clips.

▶ Install the screws.

5 . Install the instrument panel, lower trim panel.

For additional information, refer to Instrument Panel Lower Trim Panel (76.46.11)

6 . Install the steering wheel.

For additional information, refer to Steering Wheel (57.60.01)

7 . Connect the battery ground cable and install the cover.

For additional information, refer to Specifications

211-03 : Steering linkage

Specifications

Specifications

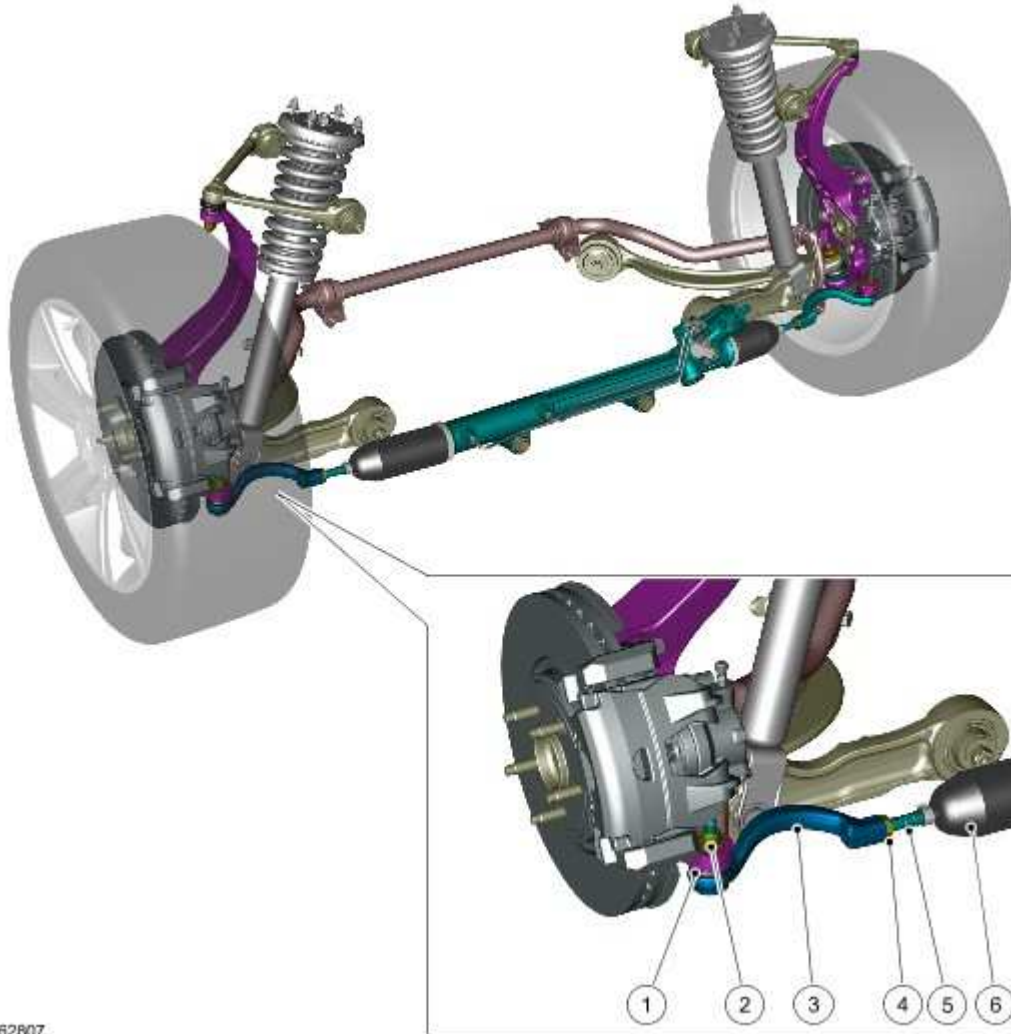
Torque Specifications

Item	Nm	lb-ft	lb-in
Tie rod end ball-joint to wheel knuckle - nut*	75	55	-
Tie rod end - locking nut*	55	40	-

* New nuts/bolts must be installed.

Steering Linkage

COMPONENT LOCATION



E62807

Item	Part Number	Description
1		Taper ball joint
2		Locknut
3		Tie rod arm - outer
4		Locknut

5		Tie rod arm - inner
6		Gaitor

INTRODUCTION

The steering linkage comprises the tie rod which provides the connection between the steering gear and the front wheel knuckle. Each end of the steering gear has a threaded hole which provides for the fitment of the tie rods. The external ends of the tie rods are sealed with gaitors to prevent the ingress of dirt and moisture into the steering gear.

Each tie rod comprises two parts; an inner and outer tie rod. The inner and outer tie rods are screwed into each other and locked with a locknut to prevent inadvertent movement. The threads on the tie rods allow the position of the outer tie rod to be adjusted in order to set the correct toe angle for each front wheel.

The outer tie rod incorporates a non-serviceable tapered ball joint which locates in a tapered hole in the front wheel knuckle and is secured with a self-locking nut. The ball joint has an internal hexagonal drive which enables the joint to be held stationary when the self-locking nut is tightened.

Steering Linkage

For additional information, refer to [<<211-00>>](#)

Steering Gear Boot (57.10.29)

Removal

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

Raise and support the vehicle.

- 2 Remove the tie-rod end.
 - For additional information, refer to Tie Rod End - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (57.55.02)
 - For additional information, refer to

3 . **NOTE:**

Note the fitted position.

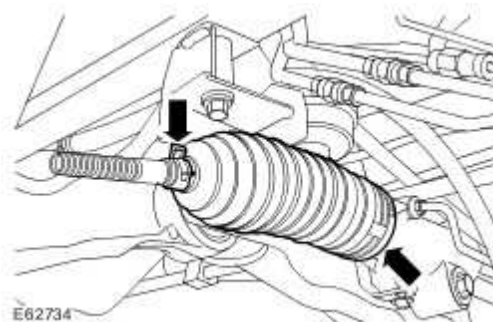
Remove the locknut.

4 . **NOTE:**

Clean the components general area prior to dismantling.

Remove the steering gear boot.

-  Release the 2 clips.



Installation

1 . Install the steering gear boot.

▶ Clean the component mating faces.

▶ Carefully secure the clips.

2 . **NOTE:**

Align to the position noted on removal.

Install the locknut.

3 Install the tie-rod end.

. For additional information, refer to Tie Rod End - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (57.55.02)

For additional information, refer to

4 Using only four-wheel alignment equipment approved by Jaguar, check and adjust the wheel alignment.

For additional information, refer to Front Toe Adjustment (57.65.01)

Tie Rod End - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8 (57.55.02)

Removal

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

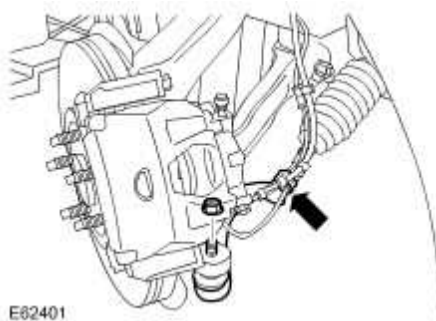
Raise and support the vehicle.

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

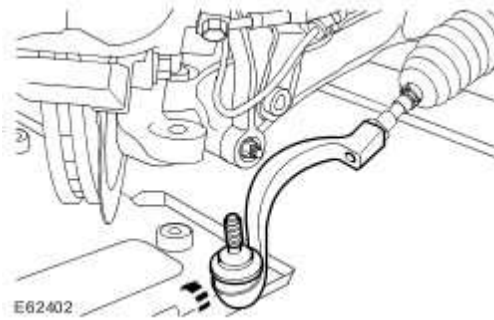
- 3 . Loosen the tie-rod end lock nut.

- 4  **CAUTION: To prevent damage to the tie rods, use an additional wrench when loosening or tightening the components.**

Remove and discard the tie rod end retaining nut.



- 5 . Remove the tie-rod end, note the number of turns for installation.



Installation

1 . Install the tie rod end, note the number of turns until adjacent to the locknut.

2



· **CAUTION: To prevent damage to the tie rods, use an additional wrench when loosening or tightening the components.**

Connect the tie-rod end ball joint.

- ▶ Clean the component mating faces.
- ▶ Install a new nut and tighten to 75 Nm (55 lb.ft).

3 . Tighten the tie-rod locking nut.

- ▶ Clean the component mating faces.
- ▶ Tighten the nut to 55 Nm (40 lb.ft).

4 . Install the front wheel.

For additional information, refer to Wheel and Tire (74.20.05)

5 Using only four-wheel alignment equipment approved by Jaguar, check and adjust the wheel
· alignment.

211-04 : Steering column

Specifications

Specifications

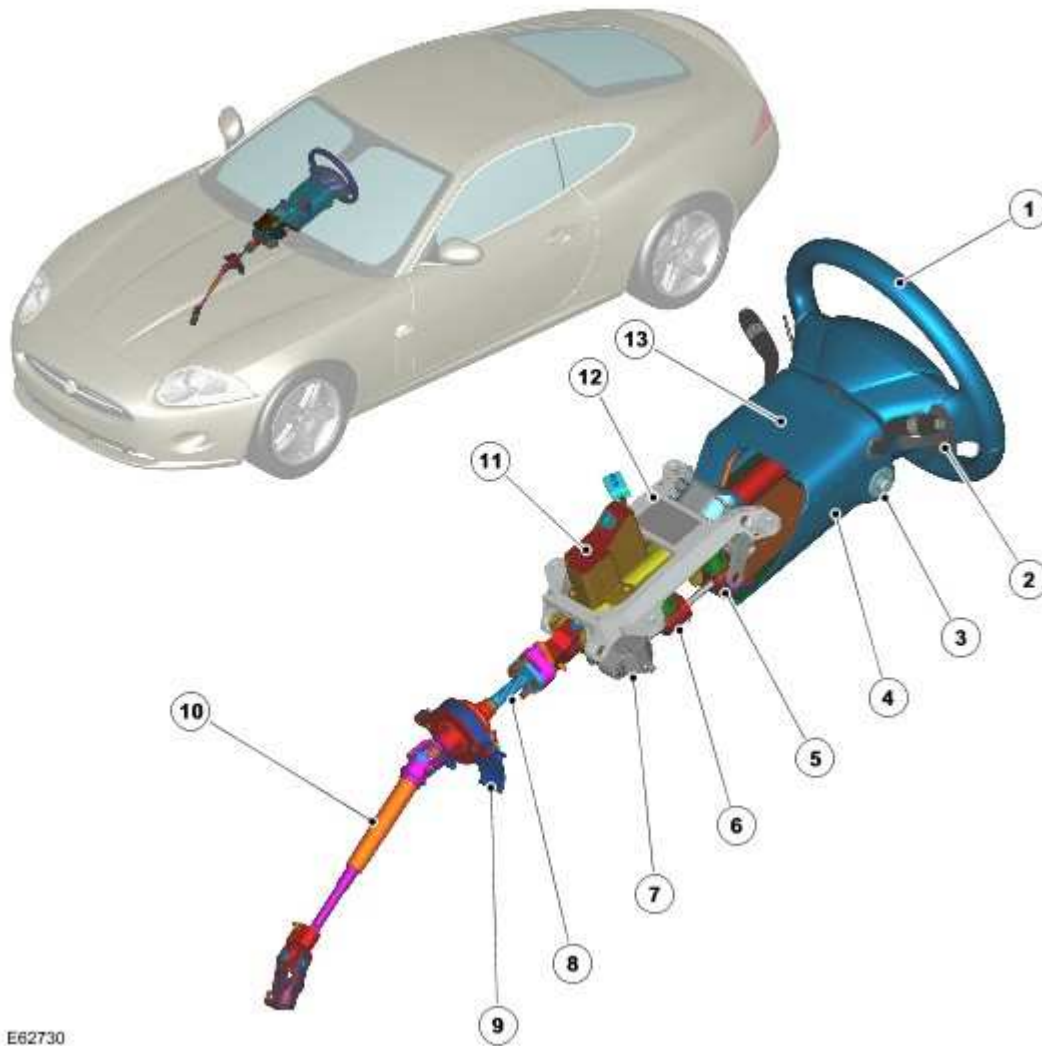
Torque Specifications

Item	Nm	lb-ft	lb-in
Clock spring to steering column - bolt	7	5	62
Lower steering column, bearing-carrier to body - bolt	9	7	80
Lower steering column, bearing to bearing carrier - bolt	9	7	80
Lower steering column to steering gear - universal-joint pinch bolt*	30	22	-
Steering column to vehicle body - nuts	24	18	-
Steering column to lower steering column - universal-joint pinch bolt*	30	22	-
Steering wheel to steering column - bolt	62	46	-

* New nuts/bolts must be installed.

Steering Column

COMPONENT LOCATION



E62730

Item	Part Number	Description
1		Steering wheel
2		Gear change paddle switch (if fitted)
3		Column adjust switch
4		Lower shroud

5		Rake adjustment housing
6		Reach adjustment housing
7		Column adjustment motor
8		Lower column - upper collapse shaft
9		Bulkhead bearing assembly
10		Lower column - lower collapse shaft
11		Electric steering column lock mechanism
12		Column mounting plate
13		Upper shroud

INTRODUCTION

The steering column comprises the upper column assembly, the lower column assembly and the steering wheel. The three components are positively connected together to pass driver rotary input from the steering wheel to a linear output of the steering gear.

The upper column assembly contains electrical adjustment for steering wheel reach and rake and also provides the location for the ignition switch, the electric steering column lock mechanism and the steering angle sensor.

The steering column is attached to the in-vehicle crossbeam. Crash load absorption is provided by a 'peeling tube' mechanism.

Column adjustment is provided by a single motor for both reach and rake adjustment. Operation of the column adjustment is controlled by a four way joystick type switch located in the column lower shroud. Column adjustment is an integral part of the driver position memory system and also incorporates an entry/exit mode to allow the driver additional room to enter and exit the vehicle.

An electric steering column lock mechanism is positioned on the column assembly. The lock is controlled by the CJB (central junction box) and is an integral function of the passive start system.

Two plastic shrouds are fitted to the upper column assembly. The lower shroud is fitted with an energy absorbing foam pad to minimize leg injury in the event of an accident.

The lower column assembly comprises two splined shafts connected by a universal joint in the center. The splines of the upper shaft locate in a flexible coupling which in turn is located in the yoke on the lower shaft of the upper column assembly. The splines allow the shaft to collapse in the event

of an accident. The flexible coupling controls axial and torsional movements and also assists with noise and vibration damping.

A bulkhead mounted bearing is located on the upper shaft and supports the lower column as it passes from the passenger compartment to the engine compartment.

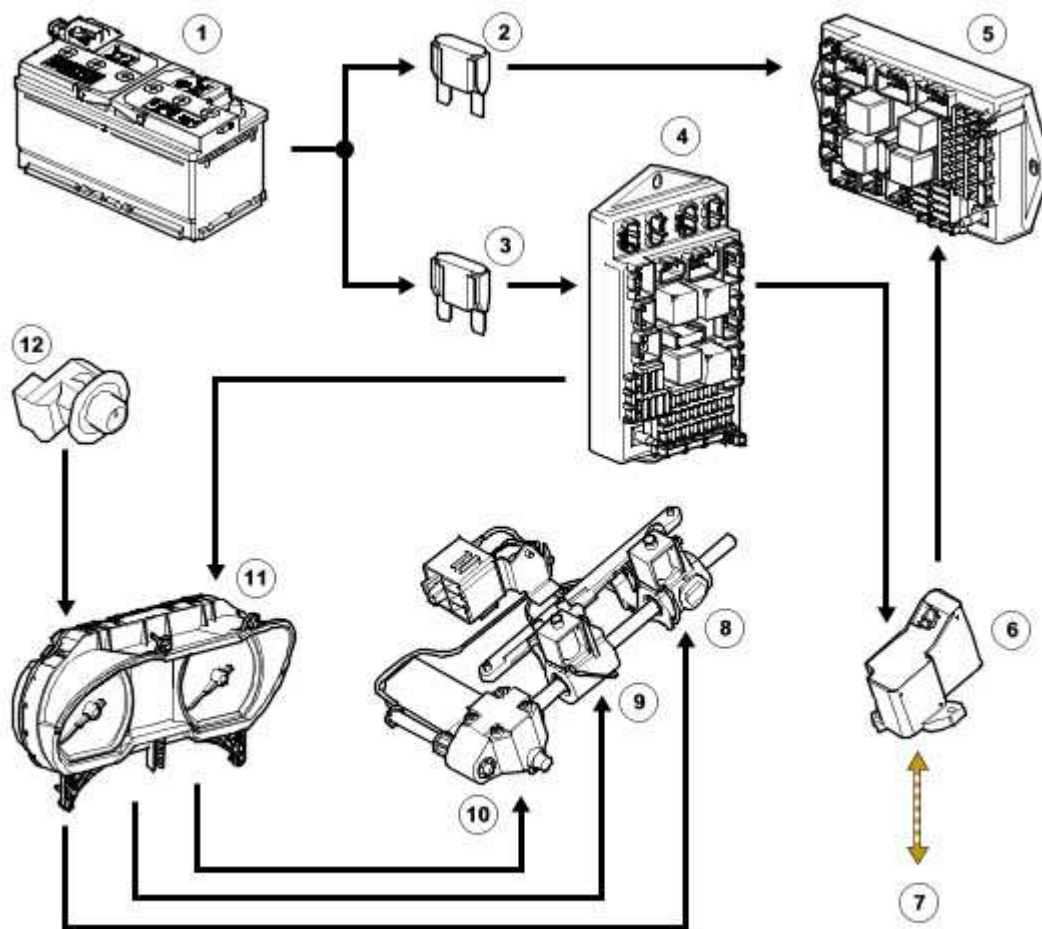
The splines on the lower shaft locate in a universal joint which in turn is connected to the steering gear input shaft. The lower column assembly incorporates a crash collapse mechanism in the form of a 'tube-in-tube' design.

The steering wheel locates on a splined shaft in the upper column assembly and is secured with a bolt. The steering wheel houses the driver's airbag and switches for the audio system, gear change (if fitted) and speed control. A clockspring is used to connect to the vehicle harness.

CONTROL DIAGRAM

NOTE:

A = Hardwired; **D** = High speed CAN bus



E62733



Item	Part Number	Description
1		Battery
2		Megafuse (175A)
3		Megafuse (175A)
4		Central Junction Box (CJB)
5		Auxiliary fusebox
6		Electric steering column lock mechanism
7		High Speed CAN connection to other vehicle systems

8		Rake adjustment solenoid and potentiometer
9		Reach adjustment solenoid and potentiometer
10		Steering column adjustment motor
11		Instrument cluster
12		Steering column adjustment switch

Steering Column

For additional information, refer to [<<211-00>>](#).

Steering Column (57.40.01)

Special Service Tools



E43628

Clockspring locking tool

211-326



E65858

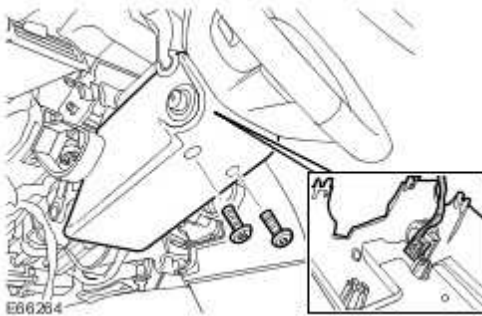
Driver air bag module remover

501-106

Removal

- 1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to Specifications
- 2 . Make the SRS system safe.
- 3 . Remove the instrument panel lower trim panel.
For additional information, refer to Instrument Panel Lower Trim Panel (76.46.11)
- 4 Remove the steering column lower cowl.
.
 Remove the 2 screws.

- ▶ If installed, disconnect the steering column and foot pedal control switch electrical connector.



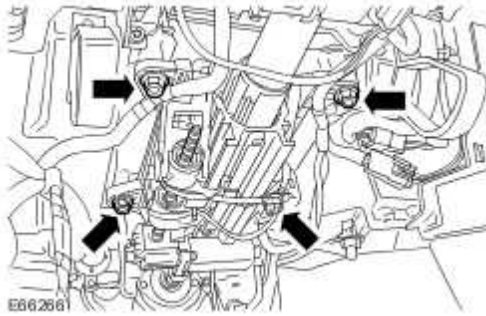
- 5
- ▶ **CAUTION:** Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

Check the road wheels are in the straight ahead position, then remove the steering column universal joint upper clamp bolt.



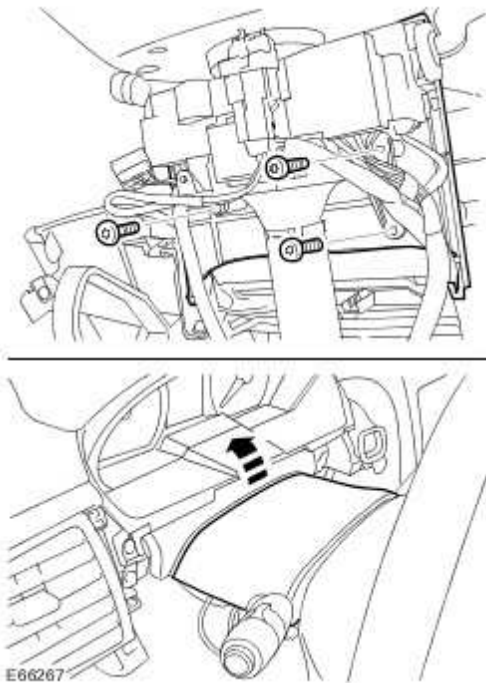
- 6 . Release the steering column.

- ▶ Loosen but do not remove the 4 nuts.



7 . Remove the steering column upper cowl.

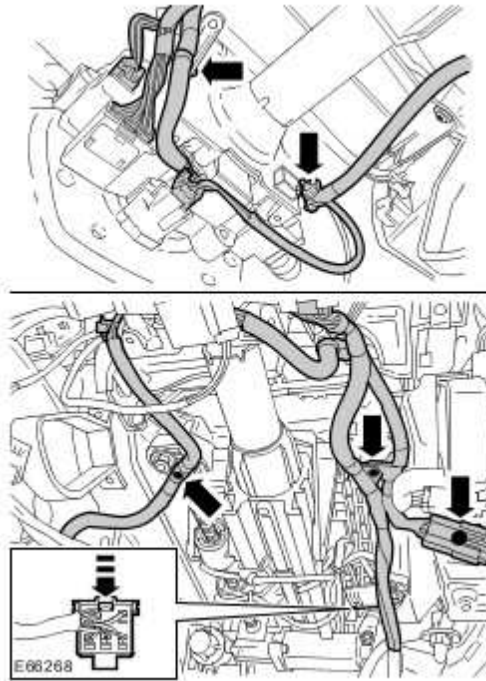
► Remove the 3 screws.



8 . Disconnect the upper steering column wiring harness connections.

► Disconnect the 6 electrical connectors.

► Release the 3 wiring harness clips.

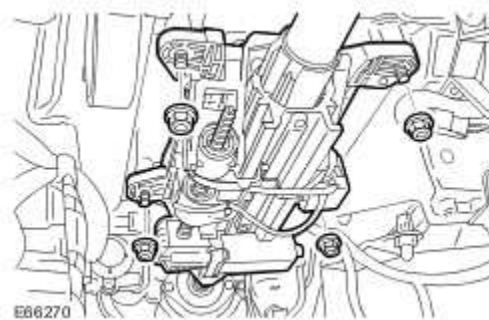


9 . Disconnect the steering angle sensor electrical connector.

► Release the 3 clips.

10 . Remove the steering column.

► Remove the 4 nuts.

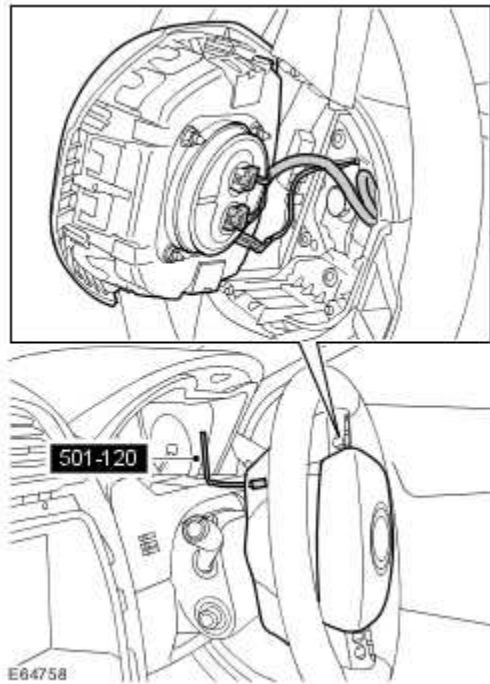


11 . **NOTE:**

Do not disassemble further if the component is removed for access only.

Using the special tool, remove the driver air bag module.

- ▶ Rotate the steering wheel for access to slots.
- ▶ Carefully release the 2 clips.
- ▶ Disconnect the 3 electrical connectors.



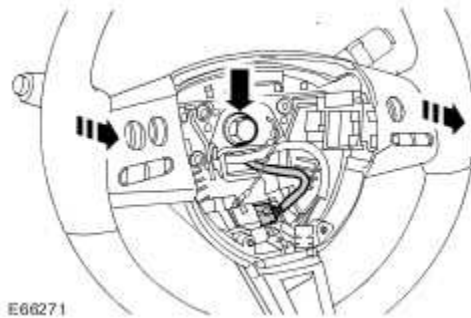
12 . NOTE:

Note the fitted position.

Remove the steering wheel.

- ▶ Disconnect the electrical connector.
- ▶ Loosen, but do not fully remove the bolt.
- ▶ Release the steering wheel from the spline.
- ▶ Remove the bolt.

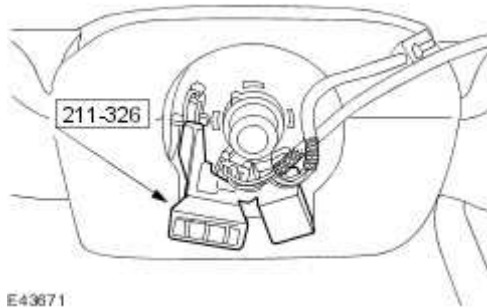
▶ Release the electrical harness.



- 13 .  **CAUTION:** Failing to install the clockspring special tool, may result in damage to vehicle.

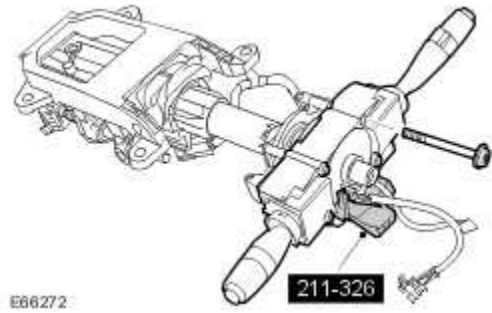
 **CAUTION:** Do not dismantle the clockspring, it has no serviceable parts and must be replaced as a complete assembly.

Install the special tool to the clockspring.



- 14 . Remove the clockspring.

▶ Remove the 4 Torx bolts.

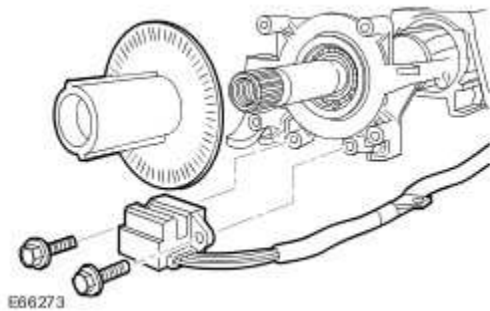


15 . NOTE:

Note the fitted position.

Remove the steering angle sensor.

- ▶ Remove the 2 bolts.
- ▶ Remove the reluctor ring.



Installation

1 . Install the steering angle sensor.

- ▶ Install the reluctor ring.
- ▶ Install the bolts and tighten to 3 Nm (2.2 lb.ft).

2 . Install the clockspring.

- ▶ Install the Torx bolts and tighten to 6 Nm (4 lb.ft).

3 . Remove the special tool.

4 . **NOTE:**

Note the fitted position.

Install the steering wheel.

- ▶ Check the clockspring is aligned.
- ▶ Position the electrical harness.
- ▶ Tighten the bolt to 40 Nm (30 lb.ft).
- ▶ Connect the electrical connector.

5 . Install the driver air bag module.

- ▶ Connect the electrical connectors.
- ▶ Carefully align and secure the clips.

6 . Install the steering column.

- ▶ Install the 4 nuts, do not tighten at this time.

7 . Connect the steering angle sensor electrical connector.

- ▶ Secure the 3 clips.

8 . Connect the steering harness electrical connectors

▶ Secure the 3 clips.

9 . Install the steering column upper cowl.

▶ Install the screws.

10 . Secure the steering column.

▶ Tighten the nuts to 30 Nm (22 lb.ft).

11 . Connect the steering column lower shaft to the steering column.

▶ Align the shafts.

▶ Tighten the nuts to 30 Nm (22 lb.ft).

12 Install the steering column lower cowl.

▶ If installed, connect the steering column and foot pedal switch electrical connector.

▶ Secure in the clips.

▶ Install the screws.

13 . Install the instrument panel lower trim panel.

For additional information, refer to Instrument Panel Lower Trim Panel (76.46.11)

14 . Connect the battery ground cable and install the cover.

For additional information, refer to Specifications

15



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.

16 . Loosen the upper bolt from the steering column lower universal joint.

 Allow the steering column lower universal joint to settle.

 Tighten the bolt to 30 Nm (22 lb.ft).

17 . Connect WDS and configure the steering angle sensor.

Steering Column Lower Shaft (57.40.05)

Removal

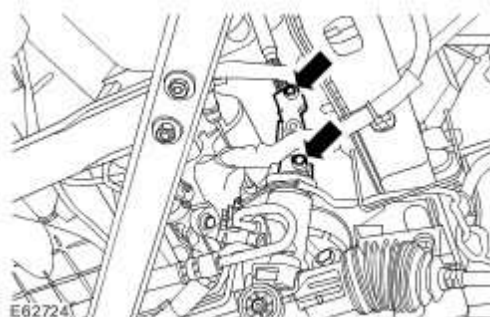
1 . Turn the steering wheel to the straight ahead position.

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

Raise and support the vehicle.

3 . Remove the steering column lower universal joint assembly for access.

 Remove and discard the 2 bolts.



4 . Remove the instrument panel lower trim panel.

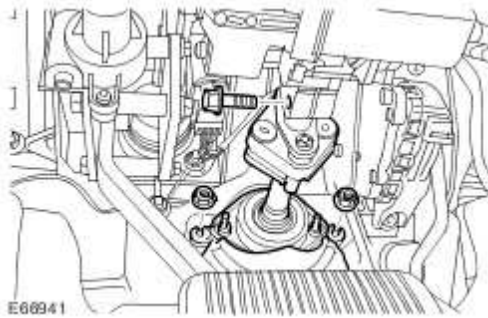
For additional information, refer to Instrument Panel Lower Trim Panel (76.46.11)

5 . Disconnect the steering column lower shaft from the steering column.

 Remove the bolt.

6 . Remove the steering column lower shaft.

- ▶ Remove the 2 nuts.
- ▶ Release the bearing carrier.
- ▶ Discard the gasket.

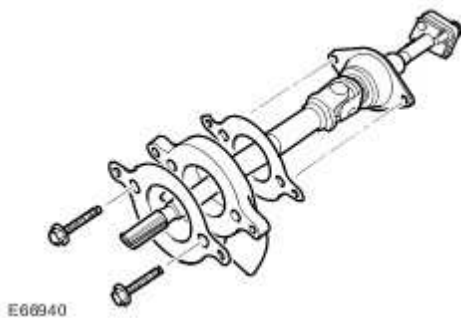


7 . NOTE:

Do not disassemble further if the component is removed for access only.

Remove the bearing carrier.

- ▶ Remove the 2 bolts.



Installation

- 1 . Install the bearing carrier.

- ▶ Install a new gasket.

 Tighten the bolts to 10 Nm (7 lb.ft).

2 . Install the steering column lower shaft.

 Install a new gasket.

 Tighten the nuts to 10 Nm (7 lb.ft).

3 . Connect the steering column lower shaft to the steering column.

 Align the shafts.

 Tighten the nuts to 30 Nm (22 lb.ft).

4 . Raise the vehicle.

5 . Install the steering column lower universal joint assembly.

 Align the shafts.

 Tighten the new bolts to 30 Nm (22 lb.ft).

6 . Install the instrument panel lower trim panel.

For additional information, refer to Instrument Panel Lower Trim Panel (76.46.11)

Steering Wheel (57.60.01)

Special Service Tools



E43628

Clockspring locking tool
211-326

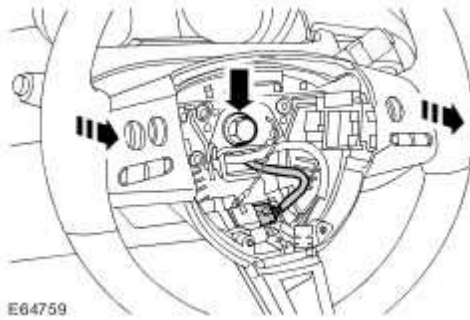
Removal

- 1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to Specifications
- 2 . Make the SRS system safe.
- 3 . Remove the driver air bag module.
For additional information, refer to Driver Air Bag Module (76.73.39)
- 4 . **NOTE:**

Note the fitted position.

Remove the steering wheel.

- ▶ Disconnect the electrical connector.
- ▶ Loosen, but do not fully remove the bolt.
- ▶ Release the steering wheel from the spline.
- ▶ Remove the bolt.
- ▶ Release the electrical harness.

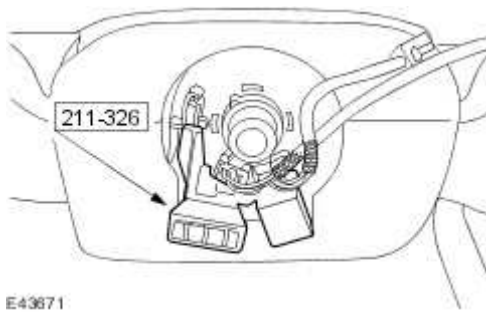


- 5 .  **CAUTION:** Failing to install the clockspring special tool, may result in damage to vehicle.

 **CAUTION:** Do not dismantle the clockspring, it has no serviceable parts and must be replaced as a complete assembly.

 **CAUTION:** Do not allow the clockspring to unwind.

Install the special tool to the clockspring.

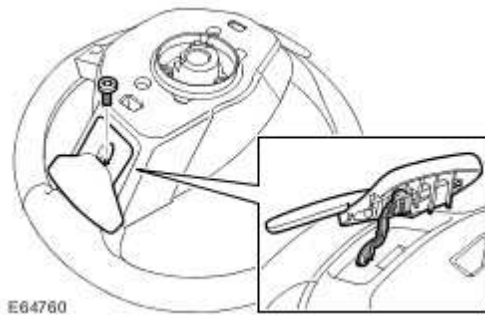


6 . **NOTE:**

Do not disassemble further if the component is removed for access only.

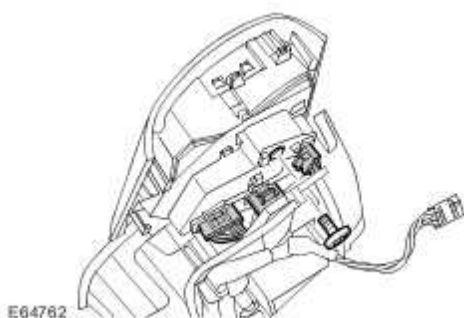
Remove the upshift and downshift paddle switches.

- ▶ Remove the Torx bolt.
- ▶ Release the assembly.
- ▶ Disconnect the electrical connector.
- ▶ Repeat the procedure and remove the opposite hand.



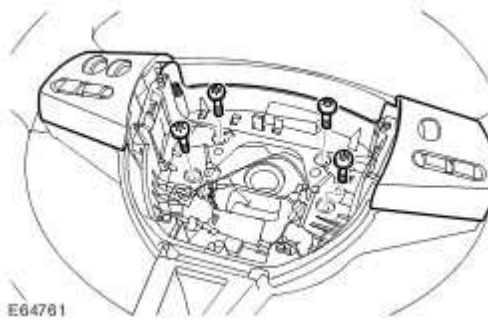
7 . Remove the steering wheel switch assembly.

- ▶ Remove the Torx bolt.
- ▶ Disconnect the electrical connectors.
- ▶ Repeat the procedure and remove the opposite hand.



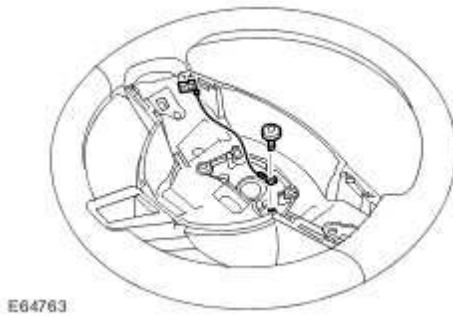
8 . Remove the air bag housing.

- ▶ Remove the 4 Torx bolts.
- ▶ Release the electrical harness.



9 . Remove the air bag ground cable.

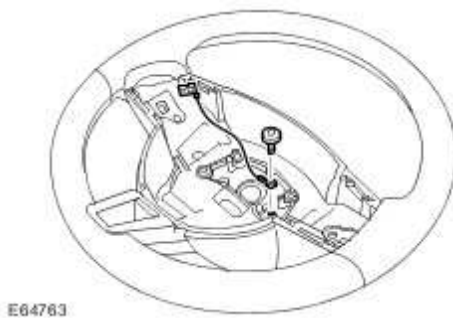
▶ Remove the Torx screw.



Installation

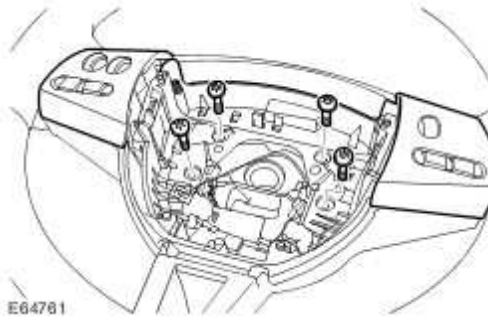
1 . Install the air bag ground cable.

▶ Install the Torx screw.



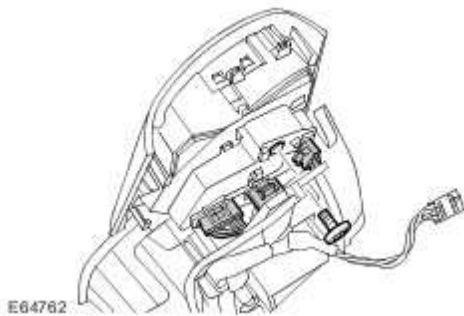
2 . Install the air bag housing.

- ▶ Secure the electrical harness.
- ▶ Install the Torx bolts and tighten to 6 Nm (4 lb.ft).



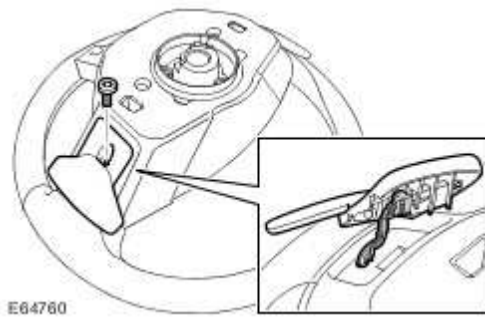
3 . Install the steering wheel switch assembly.

- ▶ Connect and secure the electrical connectors.
- ▶ Tighten the Torx bolt to 3 Nm (2 lb.ft).
- ▶ Repeat the above procedure on the opposite hand.



4 . Install the upshift and downshift paddle switches.

- ▶ Connect and secure the electrical connector.
- ▶ Tighten to 3 Nm.
- ▶ Repeat the above procedure on the opposite hand.



- 5
- 
CAUTION: Make sure that the arrow on the cassette is centered and pointing vertically prior to the steering wheel installation. On removal of the special tool keep the clockspring cables taught to prevent the cassette moving from the set position. Do not allow the clockspring to unwind. Failure to follow this instruction may result in damage to the component.

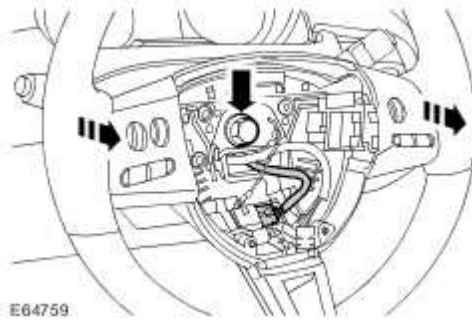
Remove the special tool.



- 6
- 
CAUTION: Check the alignment arrow is still in the vertical position with the wheels straight ahead to make sure that the directional indicator cancellation is central.

Install the steering wheel.

-  Position the electrical harness.
-  Tighten the bolt to 40 Nm (30 lb.ft).
-  Connect the electrical connector.



7 . Install the driver air bag module.

For additional information, refer to Driver Air Bag Module (76.73.39)

8 . Connect the battery ground cable and install the cover.

For additional information, refer to Specifications

Clockspring

Special Service Tools



E43628

Clockspring locking tool
211-326

Removal



WARNING: Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.



WARNING: Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment. Failure to follow this instruction may result in personal injury.



WARNING: Do not set a live air bag module down with the trim cover face down. Failure to follow this instruction may result in personal injury.



WARNING: After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards. Failure to follow this instruction may result in personal injury.



WARNING: Never probe the connectors on the air bag module. Doing so may result in air bag deployment, which may result in personal injury. Failure to follow this instruction may result in personal injury.



WARNING: Air bag modules with discolored or damaged trim covers must be replaced, not repainted.



WARNING: Vehicle sensor orientation is critical for correct system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. If damaged, replace the sensor whether or not the air bag is deployed.



WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Failure to follow this instruction may result in personal injury.



CAUTION: Make sure the wheels are in the straight-ahead position. Failure to follow this instruction may result in damage to the component.

- 1 . Remove the cover and disconnect the battery ground cable.

For additional information, refer to

- 2 . Make the SRS system safe.

For additional information, refer to

- 3 .

For additional information, refer to Driver Air Bag Module (76.73.39)

- 4



- . **CAUTION:** Make sure that special tool 211-326 is installed to the clockspring.



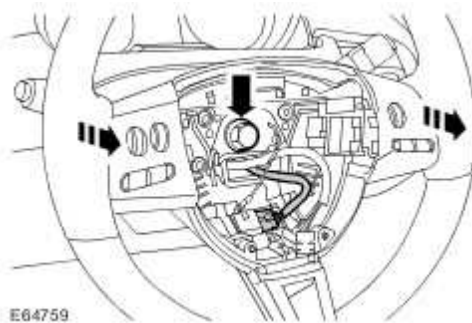
CAUTION: Make sure that the road wheels are in the straight ahead position, failure to follow this instruction may result in damage to the vehicle.

NOTE:

Note the fitted position.

Remove the steering wheel.

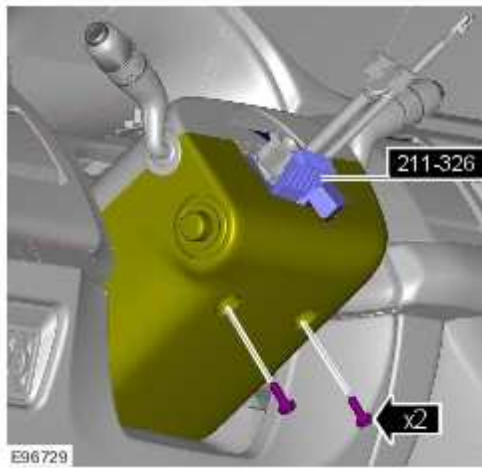
- ▶ Disconnect the electrical connector.
- ▶ Loosen, but do not fully remove the bolt.
- ▶ Release the steering wheel from the spline.
- ▶ Remove the bolt.
- ▶ Release the electrical harness.



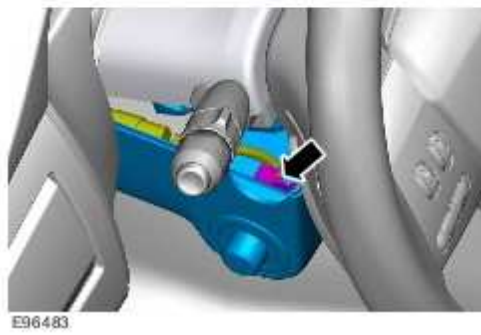
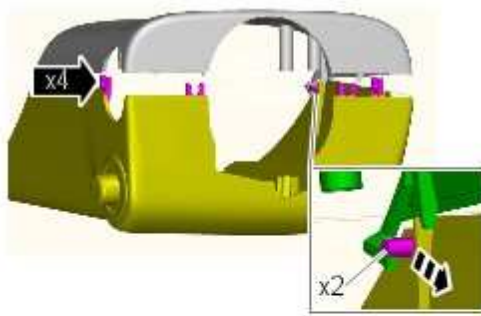
5



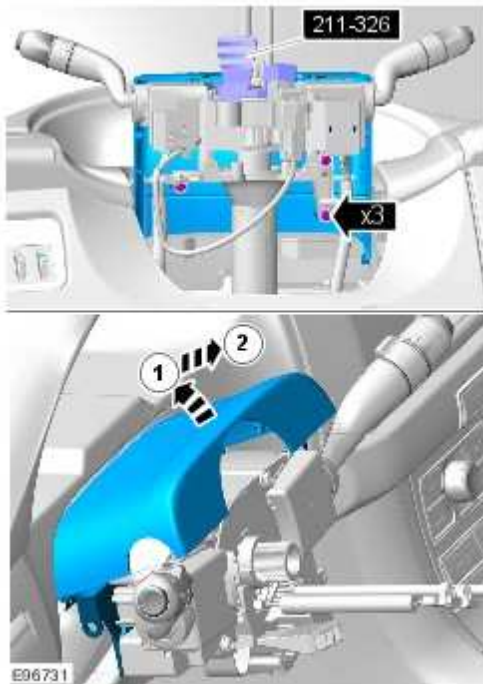
CAUTION: Failing to install the special tool to the clockspring may result in damage to the vehicle.



6.

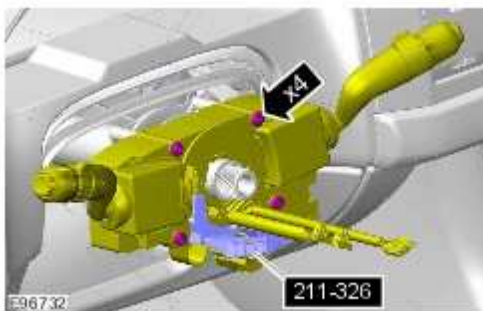


7.

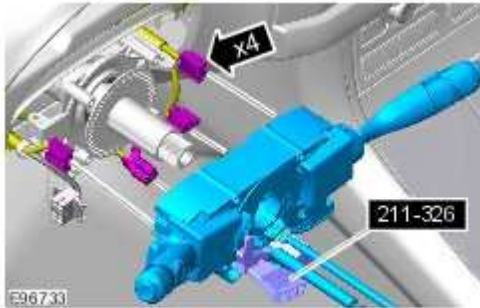


- 8  **CAUTION:** Failing to install the special tool to the clockspring may result in damage to the vehicle.

TORQUE: 6 Nm

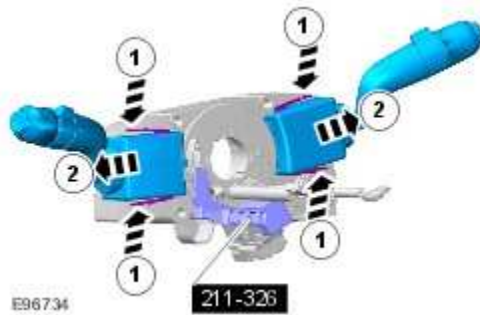


- 9  **CAUTION:** Make sure no damage is occurred to the electrical connectors. Failure to follow this instruction may result in damage to the vehicle.

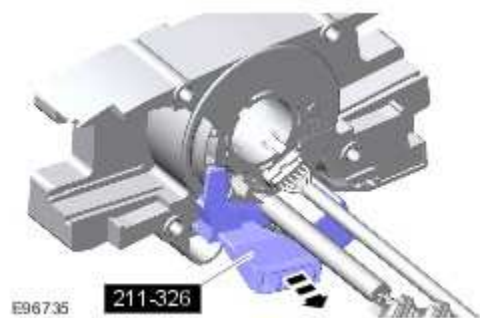


10 . NOTE:

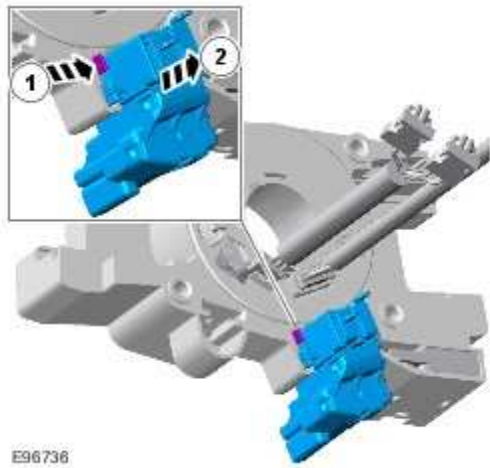
Do not disassemble further if the component is removed for access only.



11 . Remove the special tool.



12 .



Installation

1 . To install, reverse the removal procedure.

2



CAUTION: Make sure that special tool 211-326 is installed to the clockspring.



CAUTION: Make sure that the arrow on the cassette is centered and pointing vertically prior to the steering wheel installation. On removal of the special tool, keep the clockspring cables taught to prevent the cassette moving from the set position. Failure to follow this instruction may result in damage to the component.

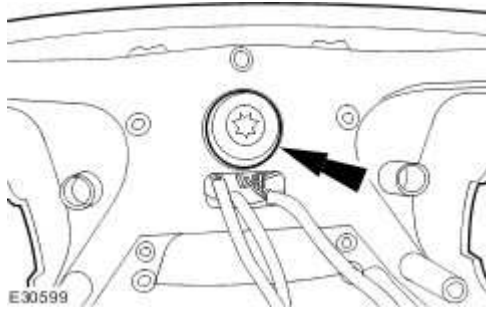
NOTE:

Make sure that the road wheels are in the straight ahead position, failure to follow this instruction may result in damage to the vehicle.

Install the steering wheel.



3 . Tighten to 65 Nm.



4 . Connect the battery ground cable and install the cover.
For additional information, refer to

211-05 : Steering column switch

Specifications

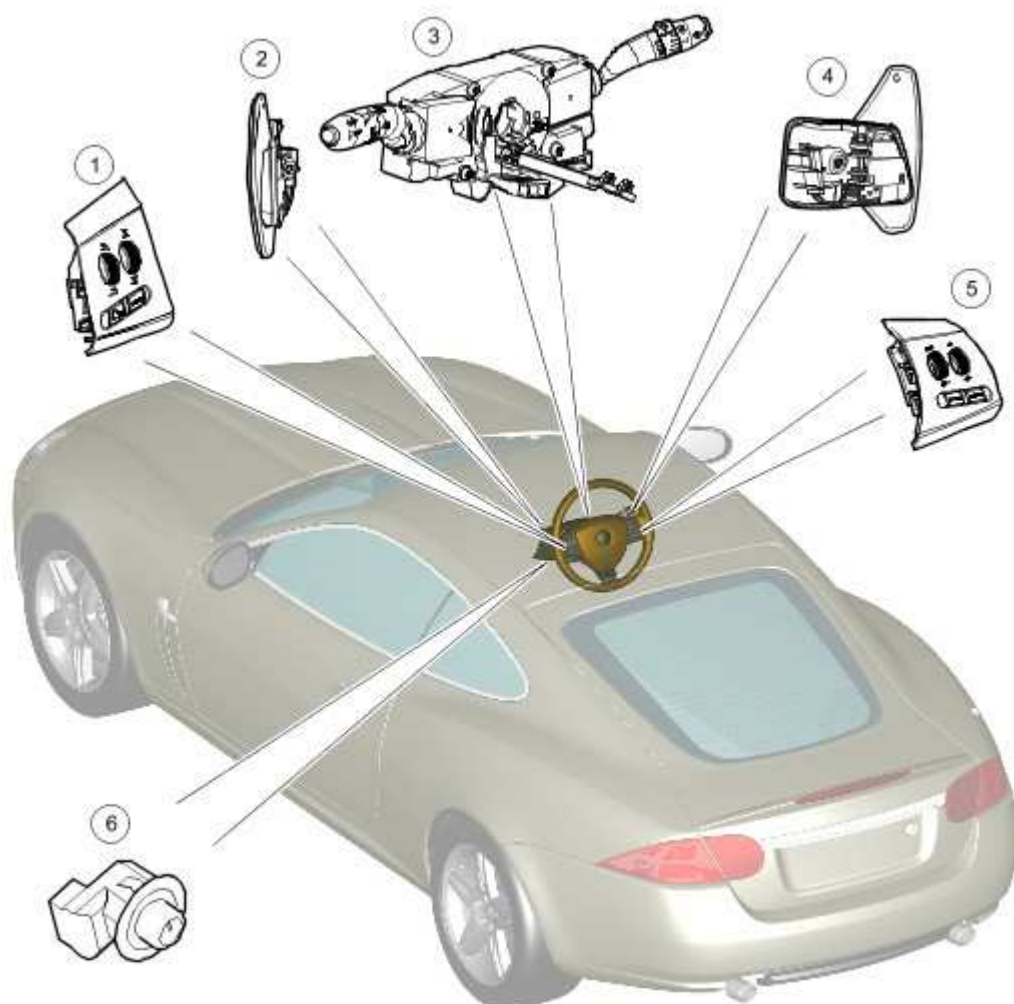
Specifications

Torque Specifications

Item	Nm	lb-ft	lb-in
Gearshift paddle switch	2.5	-	22
Speed and audio control switch	3.5	-	31
Steering column lock actuator	9	7	80

Steering Column Switches

COMPONENT LOCATION



E63020

Item	Part Number	Description
1		Audio and telephone switches
2		Left Hand (LH) (-) gear change paddle switch
3		Steering column multifunction switches and clockspring

4		Right Hand (RH) (+) gear change paddle switch
5		Speed control switches (Adaptive Speed Control switch pack shown, non adaptive speed control switch pack has a single thumbwheel)
6		Steering column adjustment switch

INTRODUCTION

The steering column switches comprise the following:

- Steering column multifunction switch
- Steering column adjustment switch
- Steering wheel mounted audio, telephone and speed control switches
- Heated steering wheel contact module.

The steering column multifunction switch is situated on the steering column and consists of the wiper switch and the direction indicator/lighting, trip computer switch.

The RH multifunction switch controls the following windshield wiper functions:

- Flick wipe
- Intermittent wipe
- Slow speed wipe
- High speed wipe
- Wash/Wipe
- Headlamp powerwash
- Rain sensing / variable wipe selection.

For additional information, refer to Wipers and Washers (501-16)

The LH multifunction switch controls the following lighting functions:

- Turn signal indicators
- Side lamps
- Headlamps
- Auto lamps
- High/low beam
- Headlamp flash
- Headlamp timer
- Trip computer.

For additional information, refer to Exterior Lighting (417-01)

For additional information, refer to Information and Message Center (413-08)

The steering column adjustment switch is located in the steering column lower shroud on the LH side. The switch is a four position 'joystick' which controls reach and rake adjustment.

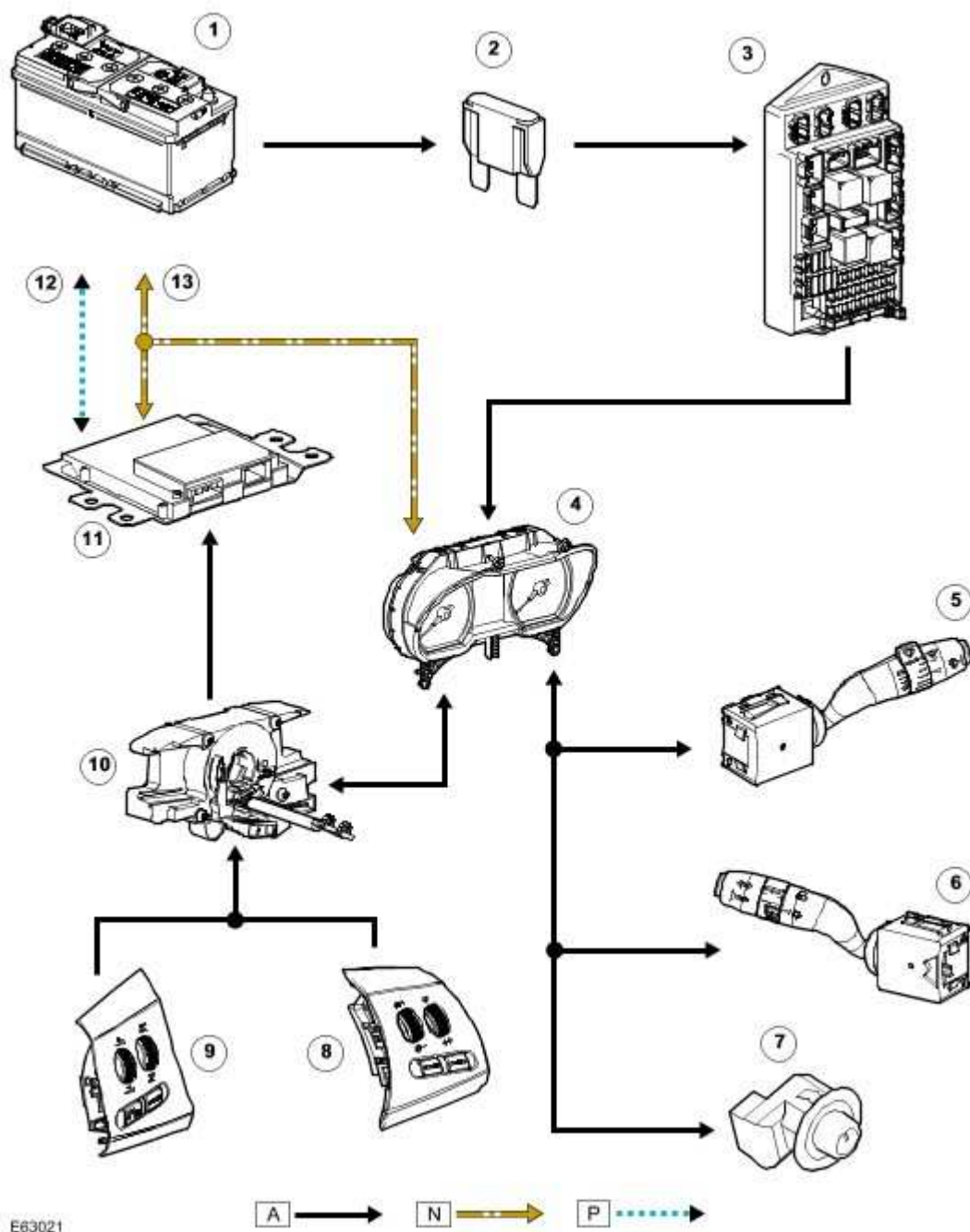
The trip button allows the driver to cycle through an option menu and also reset trip cycle mileage calculations. The trip computer information is displayed in the instrument cluster message center.

Steering wheel mounted switches on the LH side of the driver's airbag control the audio and telephone functions. Switches on the RH side of the driver's airbag control the speed control functions.

CONTROL DIAGRAM

NOTE:

A = Hardwired; **N** = Medium speed CAN Bus; **P** = Fiber Optic MOST



E63021

Item	Part Number	Description
1		Battery
2		Megafuse (175A)
3		Central Junction Box (CJB)

4		Instrument cluster
5		Steering column RH multifunction switch
6		Steering column LH multifunction switch
7		Steering column adjustment switch
8		Speed control switches (Adaptive Speed Control switch pack shown, non adaptive speed control switch pack has a single thumbwheel)
9		Audio/telephone switches
10		Clockspring
11		Information and entertainment module
12		MOST connection to other vehicle systems
13		Medium speed CAN bus to other vehicle systems

Steering Column Switches

Principle of Operation

For a detailed description of the steering column switches, refer to the relevant Description and Operation section in the workshop manual.

Steering Column Switches

Inspection and Verification

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

Mechanical	Electrical
• Switches • Steering column lock	• Fuse(s) • Electrical connector(s) • Wiring Harness

- 3 . If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
- 4 . If the cause is not visually evident, check for DTCs and refer to the DTC Index.

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 or a component 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/component.

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 extra information read by the manufacturer-approved diagnostic system).

NOTE:

When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current 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:

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
B100D51	Column lock authorisation	Not programmed	Check ignition, power and ground supplies to steering column lock and instrument cluster. Re-synchronise ID by re-configuring the steering column lock as a new module
B100D62	Column lock authorisation - signal compare failure	- CAN fault - Steering column lock fault - Instrument cluster fault - Incorrect module installed (Steering column lock/Instrument cluster) - Target ID synchronisation error following re-programming - Noise/EMC related error	Check CAN network between steering column lock and instrument cluster. Check power and ground supplies to steering column lock and instrument cluster. Confirm the correct modules are installed. Re-synchronize ID by re-configuring the steering column lock as new. Check CAN network for interference/EMC related issues
B100D64	Column lock	- CAN fault - Steering column lock fault	Check CAN network to steering

	authorisation - signal plausibility failure	Instrument cluster fault	column lock. Check power and ground supplies to steering column lock and instrument cluster
B100D87	Column lock authorisation - missing message	- CAN fault - Steering column lock fault - Instrument cluster fault - Low voltage at steering column lock < 8V	Check CAN network between steering column lock and instrument cluster. Check power and ground supplies to steering column lock and instrument cluster
U000188	High speed CAN communication bus	Vehicle CAN bus off condition	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U030000	Internal control module software incompatibility	Invalid configuration message is received	Re-configure the RJB using the manufacturer approved diagnostic system. Clear the DTC and retest. If the DTC is still logged suspect the steering column lock, refer to the new module installation note at the top of the DTC Index
U300049	Control Module	Internal electronic failure	Install a new steering column lock, refer to the new module installation note at the top of the DTC Index
U300087	Control Module	Missing message	Re-configure the RJB using the manufacturer approved diagnostic system. Check steering column lock for DTCs and refer to the DTC Index. Check CAN network integrity using the manufacturer approved diagnostic system
U300281	Vehicle Identification Number (VIN)	Vehicle/component mismatch. Corrupt VIN data being transmitted, module previously installed to other vehicle	Install original module, check for DTCs and refer to relevant DTC Index

Steering Column Lock Actuator (57.40.41)

Special Service Tools



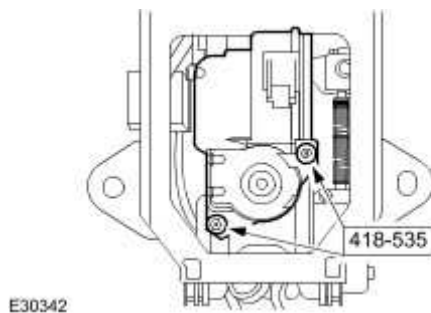
5 point security torx bit
418-535

Removal

1 . Remove the steering column. <<211-04>>

2 Remove the steering column lock actuator.

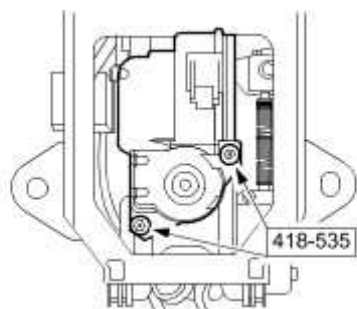
► Using the special tool, remove the steering column lock actuator retaining bolts.



Installation

1 . To install, reverse the removal procedure.

► Tighten to 9 Nm.



E30342

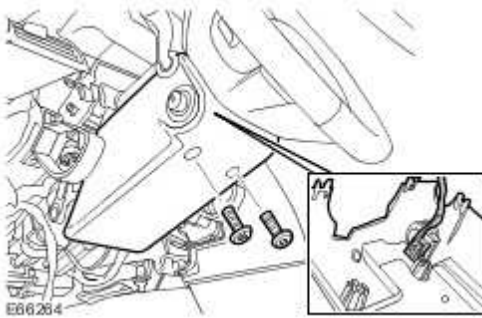
Steering Column Multifunction Switch LH (86.65.78)

Removal

- 1 Remove the steering column lower cowl.

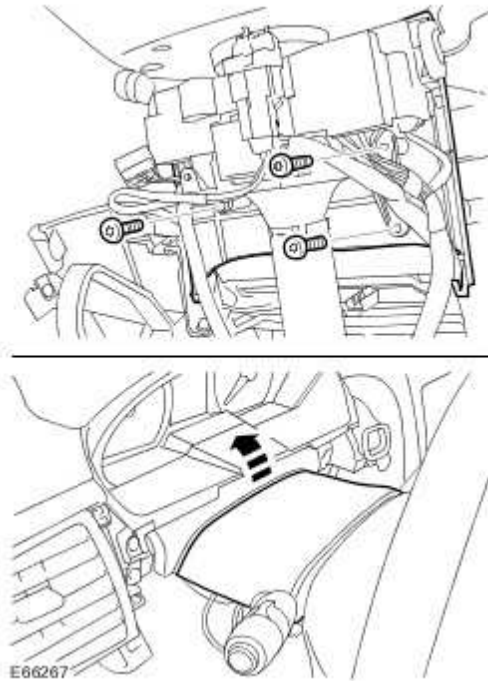
▶ Remove the 2 screws.

▶ If installed, disconnect the steering column and foot pedal control switch electrical connector.



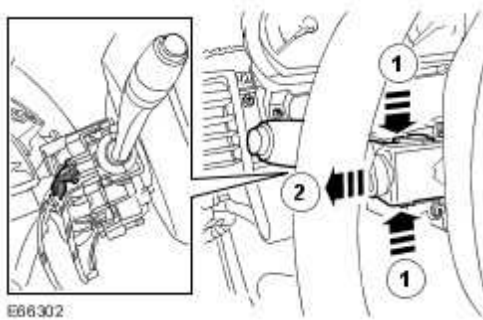
- 2 . Remove the steering column upper cowl.

▶ Remove the 3 screws.



3 . Remove the steering column multifunction switch.

- ▶ Depress the 2 clips.
- ▶ Disconnect the electrical connector.



Installation

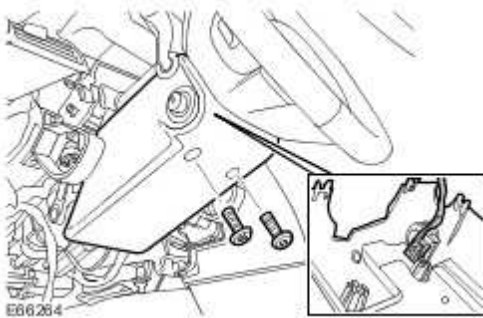
- 1 .  **CAUTION:** Make sure the electrical harness is not trapped during the installation.

To install, reverse the removal procedure.

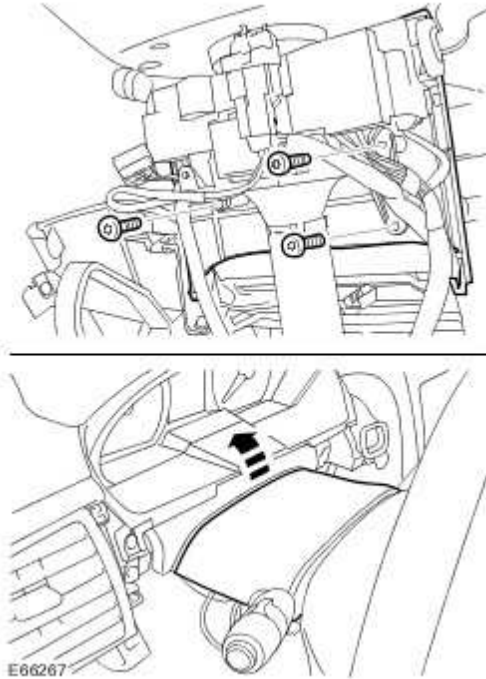
Steering Column Multifunction Switch RH (86.65.41)

Removal

- 1 . Remove the cover and disconnect the battery ground cable.
For additional information, refer to Specifications
- 2 . Make the SRS system safe.
For additional information, refer to General Service Information
- 3 . Remove the instrument panel, lower trim panel.
For additional information, refer to Instrument Panel Lower Trim Panel (76.46.11)
- 4 . Remove the steering column lower cowl.
 - ▶ Remove the 2 screws.
 - ▶ If installed, disconnect the steering column and foot pedal control switch electrical connector.



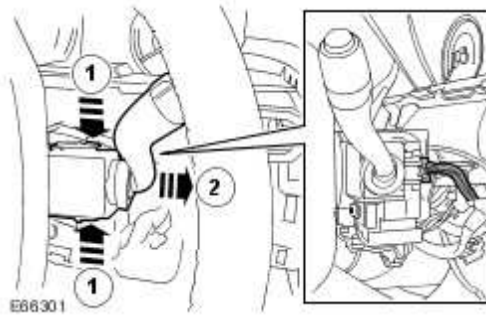
- 5 . Remove the steering column upper cowl.
 - ▶ Remove the 3 screws.



6 . Remove the steering column multifunction switch.

▶ Disconnect the electrical connector.

▶ Depress the 2 clips.



Installation

1 . Install the multifunction switch.

▶ Align the lugs and secure the clips.

 Connect the electrical connector.

2 . Install the steering column upper cowl.

 Install the screws.

3 Install the steering column lower cowl.

 If installed, connect the steering column and foot pedal switch electrical connector.

 Secure in the clips.

 Install the screws.

4 . Install the instrument panel, lower trim panel.

For additional information, refer to Instrument Panel Lower Trim Panel (76.46.11)

5 . Connect the battery ground cable and install the cover.

For additional information, refer to Specifications