Published: 28-Nov-2011

Suspension System - General Information -

Coil Spring Suspension

Item	Specification
Type:	
Front	Independent with single rate coil spring, twin tube damper and high stress anti-roll bar
Rear	Independent with dual rated coil spring, twin tube damper and anti-roll bar

Air Spring Suspension

Item	Specification
Type	Independent with twin tube damper, anti-roll bars and air springs with multiple, driver selectable ride heights - Standard, off-road and access.

Steering Geometry - Front

 CAUTION: When checking or adjusting front or rear steering geometry, the vehicle must either have a full fuel tank or have sufficient weight placed in the vehicle's load space to give the equivalent weight of a full fuel tank. The weight must be evenly distributed at the front and the right hand side of the load space. The fuel tank capacity is 86.3 litres (18.9 Imperial gallons) (22.7 US gallons). Depending on the amount of fuel in the tank, calculate the amount of weight which must be added:

- 1 litre of fuel weighs 0.8 kg (1.7 pounds)
- 1 Imperial gallon of fuel weighs 3.6 kg (8.0 pounds)
- 1 US gallon of fuel weighs 3.0 kg (6.7 pounds)

Suspension at Standard Ride Height	Coil Spring Suspension	Dynamic (Air) Suspension
LHD		
LH Camber	-9' ± 45' (-0.15º ± 0.75º)	-9' ± 45' (-0.15º ± 0.75º)
RH Camber	-30' ± 45' (-0.5º ± 0.75º)	-30' ± 45' (-0.5º ± 0.75º)
Cross Camber	21' ± 45' (-0.35º ± 0.75º)	21' ± 45' (-0.35º ± 0.75º)
LH Castor	3º52' ± 45' (3.86º ± 0.75º)	3º52' ± 45' (3.86º ± 0.75º)
RH Castor	4º10' ± 45' (4.17º ± 0.75º)	4º10' ± 45' (4.17º ± 0.75º)
Castor Balance	-19' ± 45' (0.31º ± 0.75º)	-19' ± 45' (0.31º ± 0.75º)
Total Toe	10' ± 12' (0.16º ± 0.20º)	10' ± 12' (0.16º ± 0.20º)
RHD		
LH Camber	-30' ± 45' (-0.5º ± 0.75º)	-30' ± 45' (-0.5º ± 0.75º)
RH Camber	-30' ± 45' (-0.5º ± 0.75º)	-30' ± 45' (-0.5º ± 0.75º)
Cross Camber	0' ± 45' (0.0º ± 0.75º)	0' ± 45' (0.0º ± 0.75º)
LH Castor	4º1' ± 45' (4.02º ± 0.75º)	4º1' ± 45' (4.02º ± 0.75º)
RH Castor	4º1' ± 45' (4.02º ± 0.75º)	4º1' ± 45' (4.02º ± 0.75º)
Castor Balance	0' ± 45' (0.0º ± 0.75º)	0' ± 45' (0.0º ± 0.75º)
Total Toe	10' ± 12' (0.16º ± 0.20º)	10' ± 12' (0.16º ± 0.20º)

Steering Geometry - Rear

Suspension at Standard Ride Height	Coil Spring Suspension	Dynamic (Air) Suspension
LH Camber	-30' ± 45' (-0.5º ± 0.75º)	-45' ± 45' (-0.75º ± 0.75º)
RH Camber	-30' ± 45' (-0.5º ± 0.75º)	-45' ± 45' (-0.75º ± 0.75º)
LH Toe	7' ± 6' (0.12º ± 0.10º)	7' ± 6' (0.12º ± 0.10º)
RH Toe	7' ± 6' (0.12º ± 0.10º)	7' ± 6' (0.12º ± 0.10º)
Thrust Angle	0' ± 8' (0º ± 0.14º)	0' ± 8' (0º ± 0.14º)
Total Toe	14' ± 8' (0.24º ± 0.14º)	14' ± 8' (0.24º ± 0.14º)

Published: 11-May-2011

Suspension System - General Information - Suspension System

Diagnosis and Testing

Principle of Operation

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

Front Suspension (204-01 Front Suspension, Description and Operation),
Rear Suspension (204-02 Rear Suspension, Description and Operation).

Inspection and Verification

WARNING: Before carrying out a road test, make sure the vehicle is safe to do so. Failure to follow this instruction may result in personal injury.

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 checked and/or the donor vehicle.

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. **1.** Gather as much information from the driver as possible and verify the customer concern by carrying out a road test, as closely as possible reproducing the conditions under which the fault occurs.
2. **2.** Visually inspect for obvious signs of mechanical damage.

Visual Inspection

Mechanical
• Tire pressures • Damaged wheels or tires • Wheel bearing(s) • Loose or damaged front or rear suspension components • Loose, damaged or missing suspension fastener(s) • Damaged or leaking air suspension components • Worn or damaged suspension bushing(s) • Loose, worn or damaged steering system components • Damaged axle components • Damaged Chassis

3. **3.** If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart.
4. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Crabbing	• Incorrect rear thrust angle • Front or rear suspension components	Check the rear alignment. REFER to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures). Check the front and rear suspension for signs of damage or wear.
Drift/Pull/Wander	• Tire pressures • Uneven tire wear • Damaged steering components • Wheel alignment • Brake drag • Unevenly loaded or overloaded vehicle	Check and adjust the tire pressures (see visual inspection). Check for uneven tire wear, investigate the cause and rectify as necessary. Check the steering for wear/damage. Check and adjust the wheel alignment as necessary. Check for binding brakes, rectify as necessary. Advise the driver of the load issues.
Front bottoming or riding low	• Damaged suspension components • Air spring fault	Check the suspension components for damage. Check the dynamic suspension. REFER to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Diagnosis and Testing).
Uneven tire wear	• Incorrect tire pressure (rapid center rib or inner and outer edge wear) • Incorrect front or rear toe (rapid inner or outer edge wear) • Incorrect camber (rapid inner or outer edge wear) • Tires out of balance	Check and adjust the tire pressures (see visual inspection). Check and adjust the wheel alignment as necessary. REFER to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures). Balance the wheels and tires as necessary.

Symptom	Possible Causes	Action
	(tires cupped or dished)	
Harsh ride	• Damaged suspension components • Air spring fault	Check the suspension components for damage. Check the dynamic suspension. REFER to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Diagnosis and Testing).
Shimmy or wheel tramp	• Wheels/tires • Loose wheel nut(s) • Loose front suspension fasteners • Front wheel bearing(s) fault • Worn or damaged suspension component bushing • Loose, worn or damaged ball joint(s) • Loose, worn or damaged steering components • Front wheel alignment	Check the wheels and tires for condition and balance. Check and tighten the wheel nuts and suspension fasteners to specification. Check the front wheel bearings, suspension bushings, ball joints and steering components for wear or damage. Check and adjust the wheel alignment as necessary. REFER to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures).
Poor return ability of the steering (self-centering)	• Steering column • Ball joints • Steering components	Check the steering column universal joints, etc. Check the ball joints and other steering components
Sway or roll	• Loose front or rear stabilizer bar • Worn lower suspension arm stabilizer bar insulators • Air spring fault	Check the stabilizer bar security and condition. Rectify as necessary. Check the function of the active stabilization system (where installed). REFER to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Diagnosis and Testing). Check the air springs. REFER to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Diagnosis and Testing).
Vehicle leans to one side	• Front or rear suspension components • Air spring fault	Check the front and rear suspension. Check the air springs. REFER to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Diagnosis and Testing).

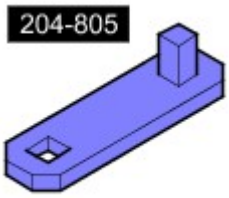
DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Published: 27-Jun-2011

Suspension System - General Information - Four-Wheel Alignment

General Procedures

Special Tool(s)	
 E137184	204-805

• CAUTIONS:

Make sure the vehicle is on a flat level surface.

Make sure the tire pressures are within specification.

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

Make sure the vehicles fuel tank is full, if not distribute extra weight evenly over the fuel tank area to represent a full tank of fuel.

Make sure there are no heavy objects in the vehicle.

Make sure the air suspension is set to NORMAL ride height.

Make sure the steering is in the straight ahead position.

Make sure the slip plates (turntables) are free to move before adjusting the geometry.

• NOTE: This procedure can be used for vehicles with either air or coil spring suspension.

1. 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.

2. Check and adjust tire pressures.

3. Position the vehicle on a calibrated, level, vehicle lift.

4. Release the vehicle parking brake.

5. Vehicles with dynamic suspension: Using the approved diagnostic tool, check the air suspension control module for fault codes and clear as required.

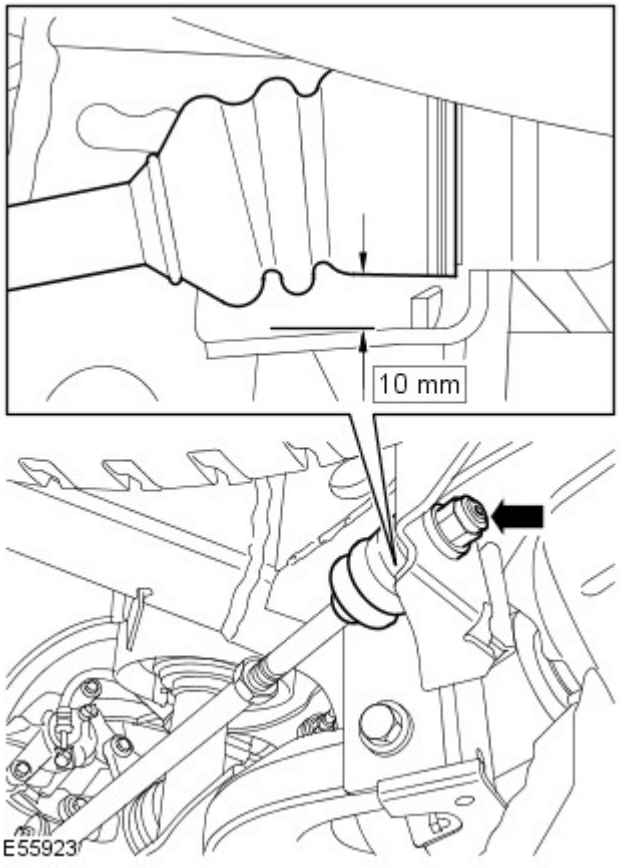
6. Vehicles with dynamic suspension: Using the diagnostic tool, set vehicle to 'Geometry Set Mode', using the instructions below. Putting the vehicle into this mode will make sure that the ride heights are controlled more accurately.

1. Select the 'Configuration' tab
2. Select 'Set up and Configure'.
3. Select 'Air Suspension'.
4. Select 'Suspension Geometry Set Up'.
5. Select 'Tight Tolerance Mode'.
6. Follow the on-screen instructions until the set up process has finished.

7. NOTE: If rear camber adjustment is required, loosen the rear camber adjustment bolts enough to allow adjustment before starting any other wheel alignment adjustments. Do not fully loosen the rear camber adjustment bolts.

Using only four wheel alignment equipment approved by Land

Rover, check and adjust the wheel alignment.

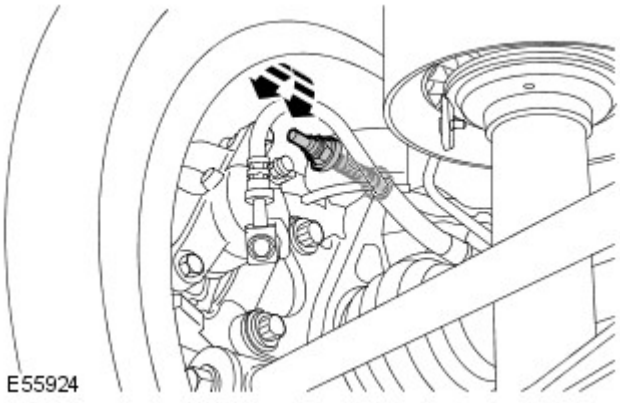


8. CAUTION: Make sure the toe link anti-rotation tang is fully seated in the integrated body frame before tightening the toe link retaining nut. Failure to follow this instruction will result in damage to the toe link or integrated body frame.

• NOTE: This step is only required if the toe links have been removed or replaced.

Adjust the rear bump steer.

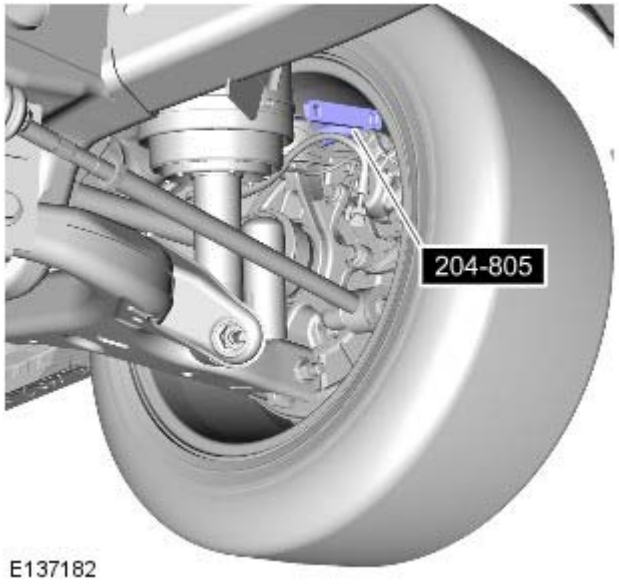
- Loosen the toe link inner ball joint retaining nut.
- Set the gap, between the underside of the toe link rubber boot and the integrated body frame bracket, to 10 mm (0.473 in).
- Tighten the toe link inner ball joint retaining nut to 133 Nm (98 lb.ft)
- Repeat the above procedure for the other side.



9. Adjust the rear camber.

- Loosen the rear camber adjusting bolts.
- Rotate the rear camber adjusting bolt until the correct value is obtained.
- Repeat the above procedure for the other side.
- Tighten the rear camber adjusting bolts.

10. Install the special tool and a suitable socket to the rear camber adjusting bolt retaining nut.



E137182

11. NOTE: The torque wrench must be installed in a direct line with the special tool, as shown.

• NOTE: **Calculate the torque wrench setting using the formula below.**

• NOTE: Key to letters:

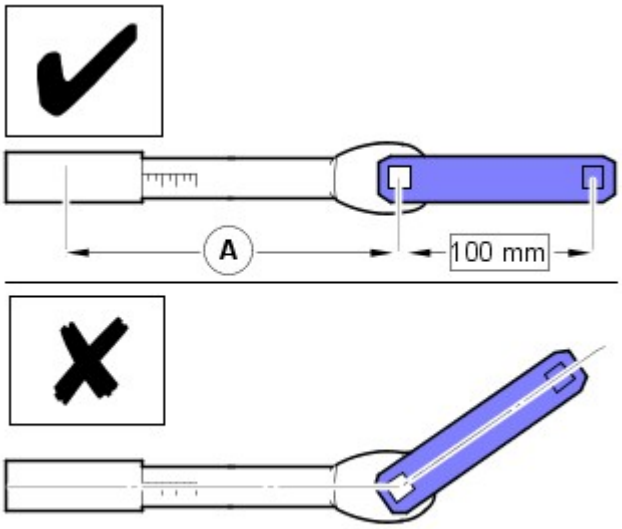
- **A** = Effective length of the torque wrench, measured in mm.

Formula:

- **Torque wrench setting (Nm) = (133xA)/(A+100)**

Using the special tool, a suitable extension bar and a torque wrench, fully tighten the camber adjusting bolt retaining nut.

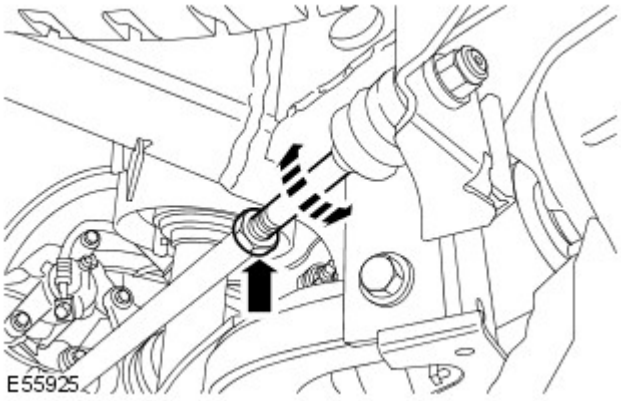
- Use the torque wrench setting calculated above.
- Repeat the above procedure for the other side.

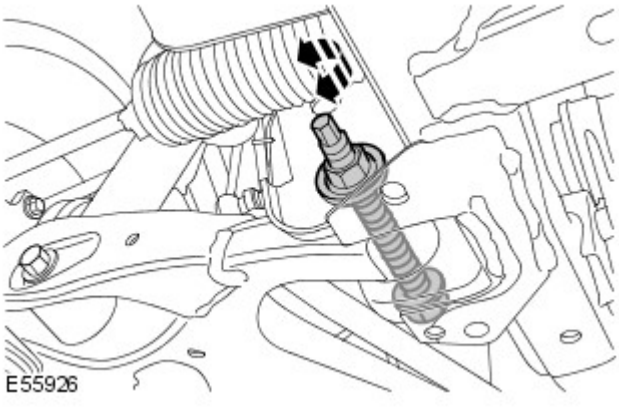


E137185

12. Adjust the rear toe.

- Loosen the toe link adjustment locking nut.
- Rotate the toe link inner ball joint until the correct rear toe value is obtained.
- Tighten the toe link adjustment locking nut to 130 Nm (96 lb.ft).
- Repeat the above procedure for the other side.
- Repeat the rear toe measurement.

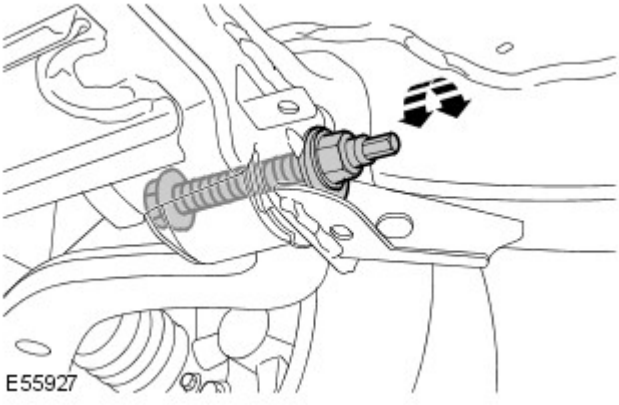

E55925


E55926

13. CAUTION: Make sure the slip plates (turntables) are free to move before adjusting the geometry.

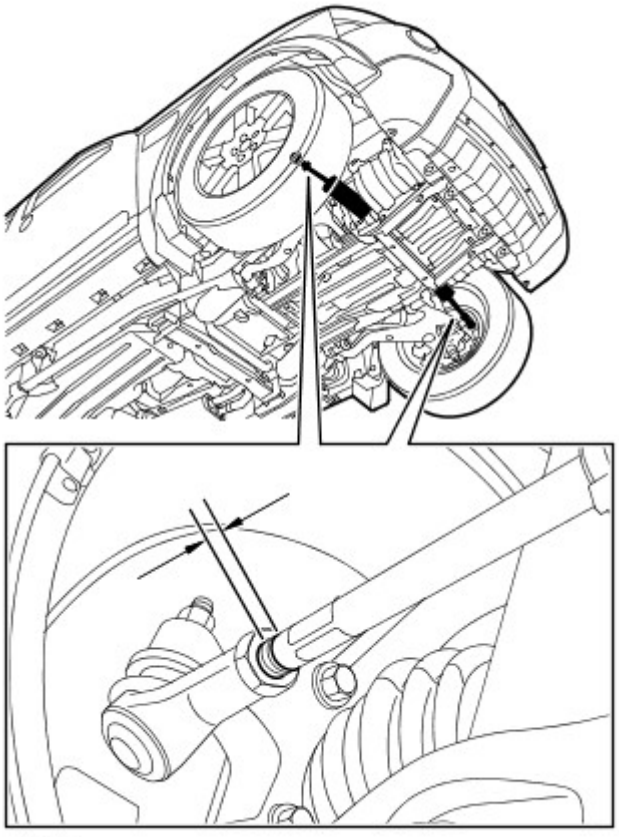
Adjust the front camber.

- Loosen the lower arm front camber adjusting bolt.
- Rotate the front camber adjusting bolt until the correct value is obtained.
- Tighten the lower arm front camber adjusting bolt to 275 Nm (203 lb.ft).
- Repeat the above procedure for the other side.


E55927

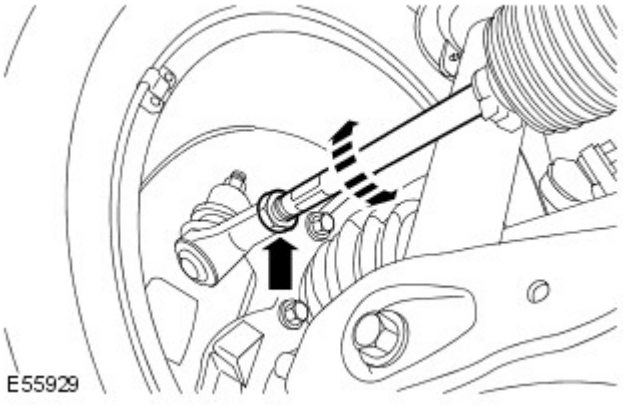
14. Adjust the front castor.

- Loosen the lower arm rear castor adjusting bolt.
- Rotate the castor adjusting bolt until the correct value is obtained.
- Tighten the lower arm rear castor adjusting bolt.
- Repeat the above procedure for the other side.
- Repeat the castor measurement.
- Repeat the above procedure until both castors achieve the correct value.
- Tighten the lower arm rear castor adjusting bolts to 275 Nm (203 lb.ft).


E55928

15. Align the steering to straight ahead.

- Measure the length of the exposed thread on each track rod.
- If the exposed thread lengths differ by more than two millimetres:
- Stage one: Loosen one track rod end locking nut.
- Stage two: Rotate the track rod until the lengths of the exposed threads on both track rods are equal.
- Stage three: Tighten the track rod end locking nut.
- Stage four: Rotate the steering wheel until both front toe measurements are equal.



16. Adjust the front toe.

- Loosen the track rod end locking nuts.
- Rotate the track rods to adjust each individual front toe to the correct value.
- Tighten the track rod end locking nuts to 53 Nm (39 lb.ft).

17. Vehicles with dynamic suspension: Using the diagnostic tool, return the vehicle to 'Normal Mode'.

1. Select the 'Configuration' tab
2. Select 'Set up and Configure'.
3. Select 'Air Suspension'.
4. Select 'Suspension Geometry Set Up'.
5. Select 'Normal Mode'.
6. Follow the on-screen instructions until the normal mode process has finished.

18. Calibrate the steering angle sensor using the diagnostic tool.

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Suspension System - General Information - Front Wheel Bearing and Wheel Hub Runout Check

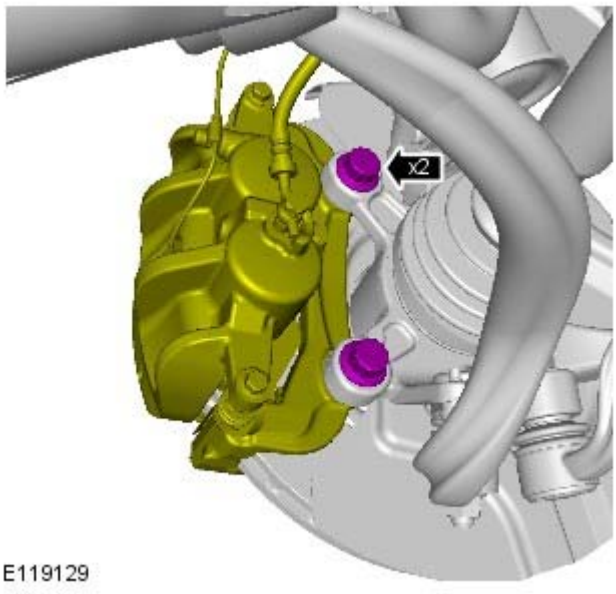
General Procedures

- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.
- NOTE: LH illustration shown, RH is similar.

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

Raise and support the vehicle.

2. Remove the road wheel.



E119129

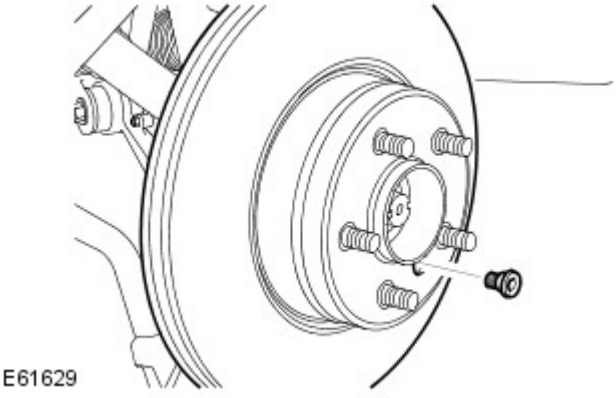
3. CAUTIONS:

Do not allow the brake caliper to hang on the brake hose.

LH side: Do not allow the brake caliper to hang on the brake pad wear warning sensor lead.

- NOTE: Models with standard brakes shown, models with high performance brakes similar.

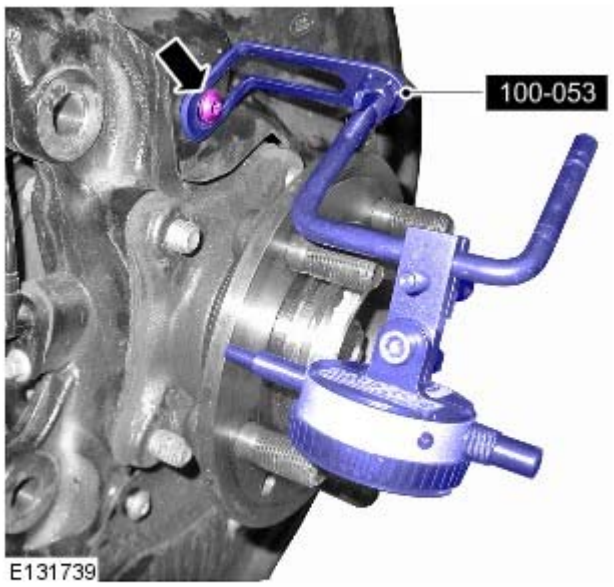
Release the brake caliper and tie aside.


E61629

4. Remove the front brake disc.

- Remove the Allen screw.

5. Thoroughly clean the hub mounting face.



6. Using special tool (100-053) mount a Dial Test Indicator (DTI) to and secure to the backplate using the upper backplate fixing.

7. CAUTION: Make sure the DTI is positioned clear of the wheel studs.

Position the DTI probe on the outer edge of the hub face.

8. Zero the DTI and rotate the hub one complete revolution to measure hub runout.

9. Remove the DTI.

10. Install the brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

11. Install the brake caliper and tighten the bolts. TORQUE: 275 Nm

12. Install the road wheel and tighten nuts to 140Nm (103 lb-ft).

13. Repeat the above procedure on the opposite side.

14. Depress the brake pedal several times to set brake pads.

15. Lower the vehicle.

Published: 11-May-2011

Front Suspension -

Coil Spring Suspension

Item	Specification
Road spring color coding:	
	YELLOW/BLUE
	YELLOW/GREY
	YELLOW

Note: The first color indicates the fitted position of the spring on the vehicle i.e. front. The secondary color identifies the thickness of the isolator which is fitted to a particular spring to ensure that the vehicle ride height is maintained within specified limits. Replacement springs will be supplied with the appropriate isolator fitted.

Torque Specifications

Description	Nm	lb-ft
* Stabilizer bar link nuts	115	85
Stabilizer bar clamp nuts	115	85
Front axle crossmember bolts	115	85
Shock absorber and spring assembly to lower arm bolt	300	221
Shock absorber top mounting nuts	70	52
* Shock absorber upper bush rebound plate nut	98	72
Heat shield bolts	10	7
* Upper arm and wheel knuckle nut	70	52
* Tie-rod end ball joint nut	76	56
Brake hose retaining bracket to wheel knuckle bolt	22	16
*+ Halfshaft retaining nut	230	169
Brake hose to upper arm bolt	22	16
Upper arm nuts and bolts	175	129
Radiator access panel bolts	10	7
Wheel hub bolts	115	85
Brake disc dust shield bolts	10	7
Lower arm bolts	275	203
Lower arm ball joint retaining nut	115	85
Lower arm front camber adjusting bolt	275	203
Lower arm rear castor adjusting bolts	275	203
Toe link inner ball joint retaining nut	133	98
Rear camber adjusting bolts	133	98
Track rod end locking nuts	53	39
Wheel speed sensor bolt	10	7
Axle carrier bushing bolt - M14	105	77
Axle carrier bracket bolts	80	59
Road wheel nuts	140	103

*** New nut/bolts must be fitted**

+ Stake nut on completion

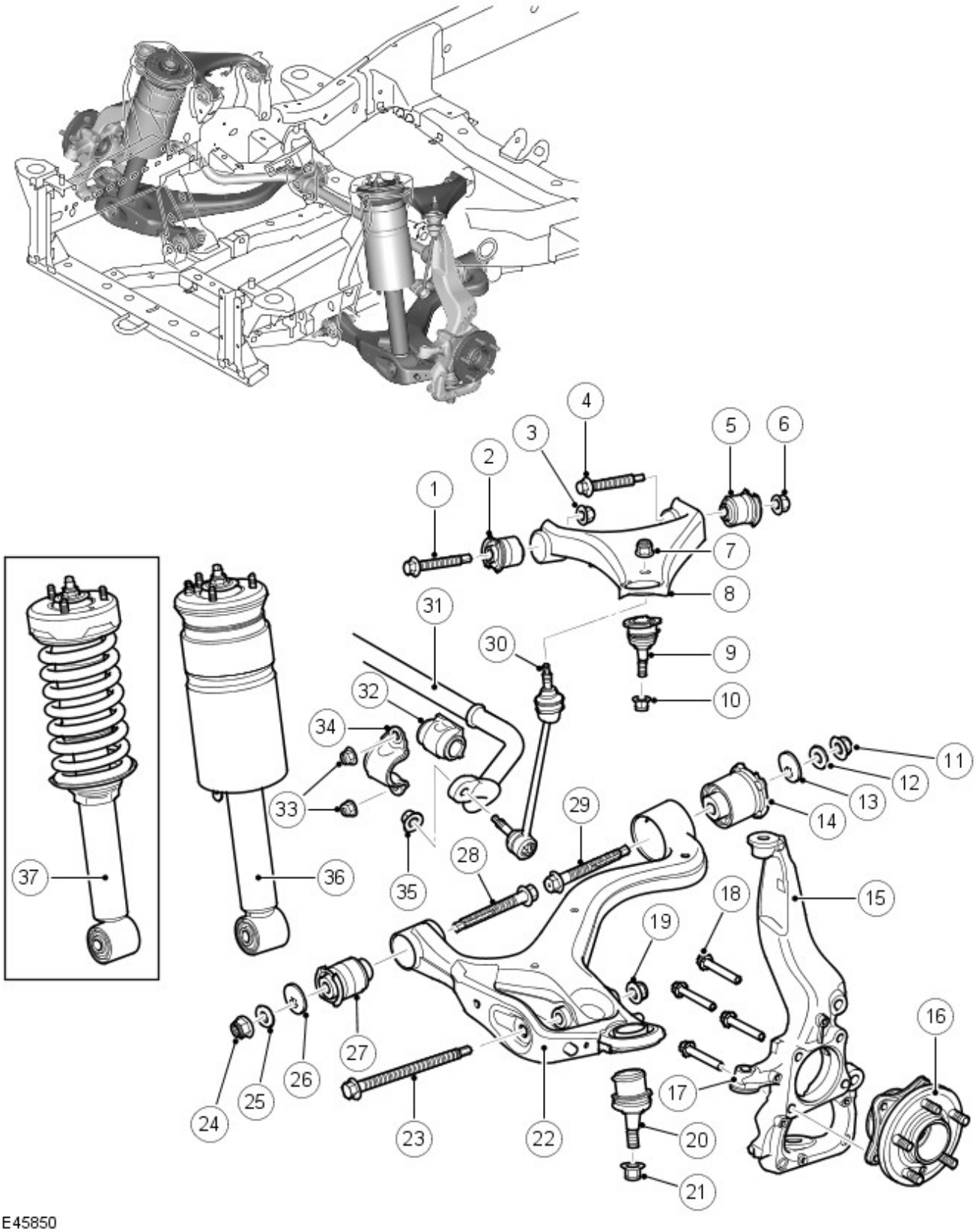
Published: 11-May-2011

Front Suspension - Front Suspension

Description and Operation

Front Suspension Component Layout

- NOTE: Air suspension version shown



E45850

Item	Part Number	Description
1	-	Flanged bolt (Upper control arm forward bush)
2	-	Bush - forward (Upper control arm)
3	-	Nut (Upper control arm forward bush)
4	-	Flanged bolt (Upper control arm forward bush)

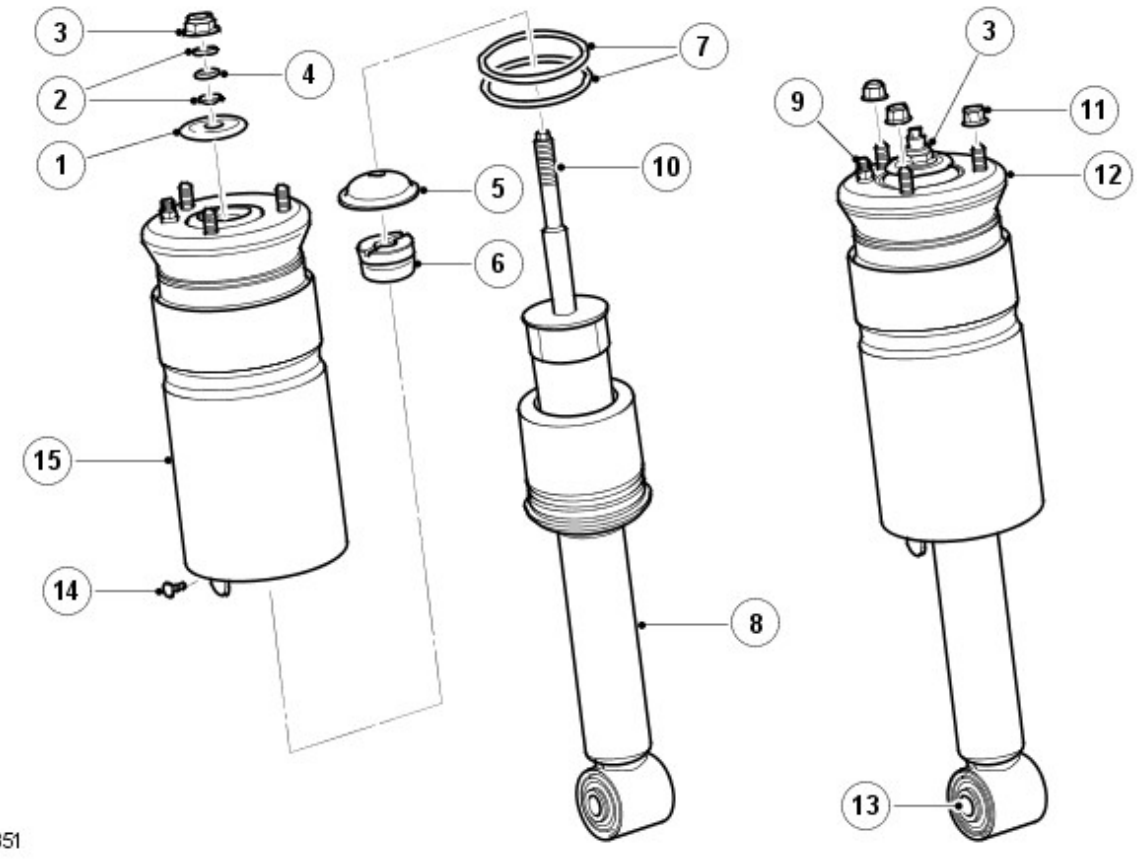
5	-	Bush - rearward (Upper control arm)
6	-	Nut (Upper control arm rearward bush)
7	-	Nut (Anti-roll bar link to upper control arm)
8	-	Upper control arm
9	-	Ball joint (Upper control arm to swivel hub)
10	-	Nut (Ball joint to swivel hub attachment)
11	-	Nut (Lower control arm rearward bush)
12	-	Flat washer
13	-	Cam washer (Lower control arm rearward bush)
14	-	Bush - rearward (lower control arm)
15	-	Wheel knuckle
16	-	Wheel hub and bearing assembly
17	-	Steering rack attachment
18	-	Wheel hub bolt (4 off)
19	-	Nut (Damper assembly lower attachment)
20	-	Ball joint (Lower control arm to swivel hub)
21	-	Nut (Ball joint to swivel hub attachment)
22	-	Lower control arm (air suspension version shown)
23	-	Bolt (Damper assembly lower attachment)
24	-	Nut (Lower control arm forward bush)
25	-	Flat washer
26	-	Cam washer (Lower control arm forward bush)
27	-	Lower control arm forward bush
28	-	Bolt (Lower control arm forward bush)
29	-	Bolt (Lower control arm rearward bush)
30	-	Anti-roll bar link
31	-	Anti-roll bar
32	-	Anti-roll bar bush
33	-	Nut (anti-roll bar bracket)
34	-	Anti-roll bar bracket
35	-	Nut (anti-roll bar link to anti-roll bar)
36	-	Damper assembly (air)
37	-	Damper assembly (coil spring)

GENERAL

The front suspension is a fully independent design which offers a reduction in unsprung weight over the beam axle design fitted to previous Land Rover models. The front suspension comprises an upper control arm, a lower control arm, a wheel knuckle and hub, an anti-roll bar and links assembly and a damper assembly. The damper can have a coil spring or air spring, both damper types use a similar design. The suspension components are common to both coil and air spring versions.

The suspension control arms have been designed for maximum ground clearance and also allow for adjustment of the camber and castor using cam adjusters.

DAMPER MODULE - AIR SUSPENSION



Item	Part Number	Description
1	-	Rebound washer*
2	-	O-ring - damper rod (2 off)*
3	-	Self-locking nut*
4	-	Spacer - damper rod*
5	-	Bump washer
6	-	Spring aid*
7	-	O-ring - air spring sleeve support (2 off)*
8	-	Damper assembly*
9	-	Voss air fitting
10	-	Damper rod
11	-	Self-locking nut (3 off)
12	-	Top mount
13	-	Bush
14	-	Retaining pin - air spring assembly*
15	-	Air spring assembly*

• NOTE: * shows service items

The damper module comprises an air spring assembly, top mount and a damper assembly. The damper and air spring are only serviceable as complete assemblies.

Damper

The damper assembly is a twin tube design with the conventional coil spring replaced by the air spring. The lower end of the damper is fitted with a bush and is attached to the lower control arm with a bolt and nut.

The damper functions by restricting the flow of hydraulic fluid through internal galleries within the damper. The damper rod moves axially within the damper, its movement limited by the flow of fluid through the galleries, providing damping of undulations in the terrain. The damper rod is sealed at its exit point from the damper body to maintain the fluid within the unit and to prevent the ingress of dirt and moisture. The seal also incorporates a wiper to keep the rod clean.

Air Spring

The air spring comprises an aluminium restraining cylinder, top mount, spring aid, air sleeve and an inner support sleeve.

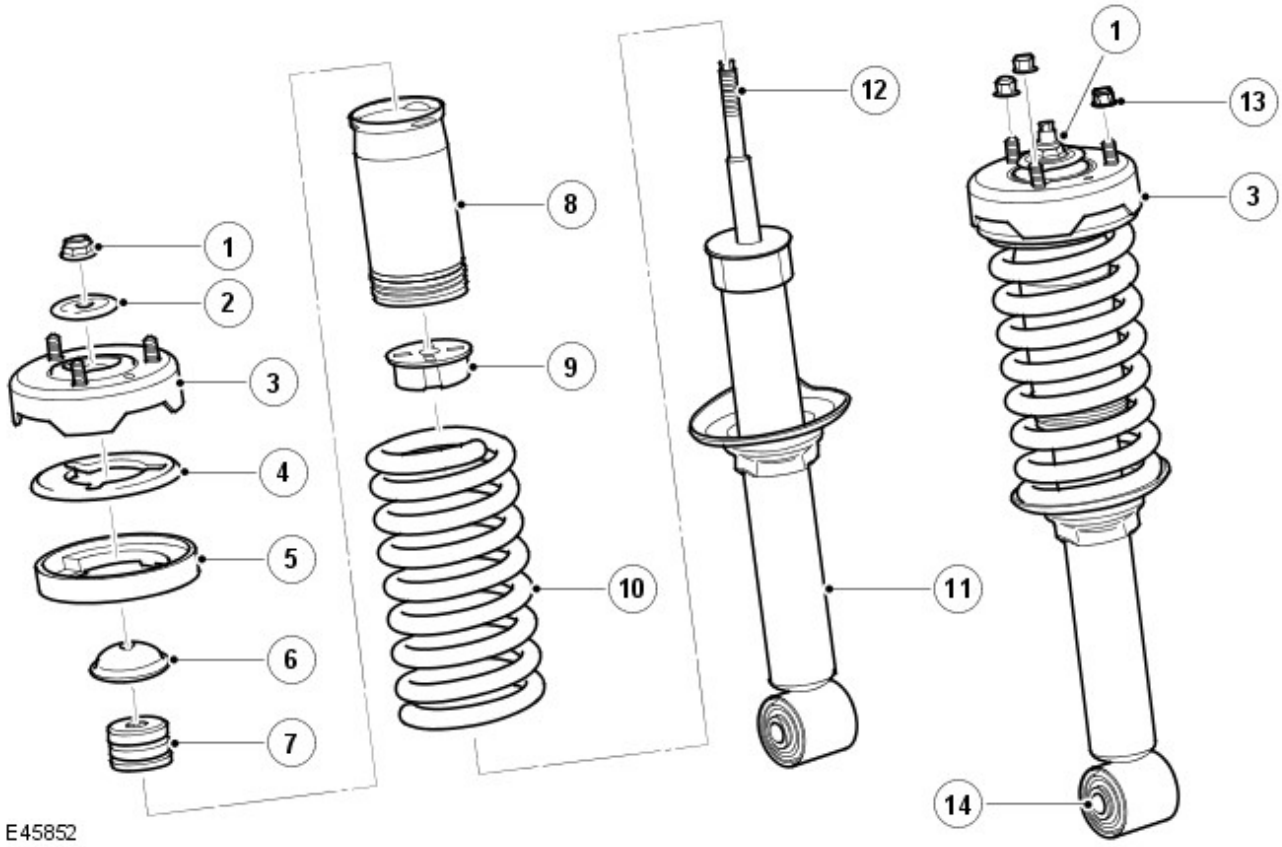
The air sleeve is made from a flexible rubber material which allows the sleeve to roll up and down the air spring piston as the vehicle changes height. The air sleeve is attached to the restraining cylinder and support sleeve by crimp rings which provide an air tight seal. The support sleeve contains a seal carrier which has two O-rings sealing the support sleeve and two O-rings sealing to the damper body. The top of the air sleeve is crimped to the top mount which attaches to the chassis frame with 3 integral studs and self-locking nuts.

A spring aid is fitted to the damper rod and prevents the top mount contacting the top of the damper during full suspension compression and assists the suspension tune. The lower end of the air spring is located over the damper body and seats on a fabricated seat on the damper body. The air sleeve is positively attached to the seat with a retaining pin. The damper rod is located through a central hole in the top mount. The rod is threaded at its outer end. A self-locking nut secures the air spring to the damper rod.

The top mount is an integral part of the air spring and is fitted with a bush and rebound washer. A bump washer is located between the top mount plate and the damper rod. The top mount is secured to the damper rod with a self-locking nut. The top mount attaches to a housing on the chassis with 3 integral studs and self-locking nuts. The top mount also incorporates a 6 mm Voss air fitting which allows for the attachment of the air harness.

A gaitor is available as a dealer fit component. The gaitor is similar to the one fitted to the rear air damper module and is available if a customer experiences dirt and debris becoming trapped between the air sleeve and the restraining cylinder under certain terrain conditions.

DAMPER MODULE - COIL SPRING SUSPENSION



Item	Part Number	Description
1	-	Self locking nut
2	-	Rebound washer
3	-	Top mount assembly
4	-	Spring spacer (selective)
5	-	Spring isolator
6	-	Bump washer
7	-	Spring aid
8	-	Dust tube
9	-	Bump cup
10	-	Coil spring
11	-	Damper
12	-	Damper rod
13	-	Self locking nut (3 off)
14	-	Bush

The coil spring damper module comprises a damper, coil spring and top mount.

Damper

The damper assembly is a twin tube design with the conventional coil spring located on a welded spring seat on the damper tube. The lower end of the damper is fitted with a bush and is attached to the lower control arm with a bolt and nut.

The damper functions by restricting the flow of hydraulic fluid through internal galleries within the damper. The damper rod moves axially within the damper, its movement limited by the flow of fluid through the galleries, providing damping of undulations in the terrain. The damper rod is sealed at its exit point from the damper body to maintain the fluid within the unit and to prevent the ingress of dirt and moisture. The seal also incorporates a wiper to keep the rod clean.

The damper rod is located through a central hole in the top mount. The rod is threaded at its outer end. A self-locking nut secures the top mount to the damper rod.

A spring aid is fitted to the damper rod and prevents the top mount contacting the top of the damper during full suspension compression and also assists the suspension tune.

Spring and Top Mount

The coil spring fitted differs with vehicle specification. Each spring is colour coded to identify its rating and fitment

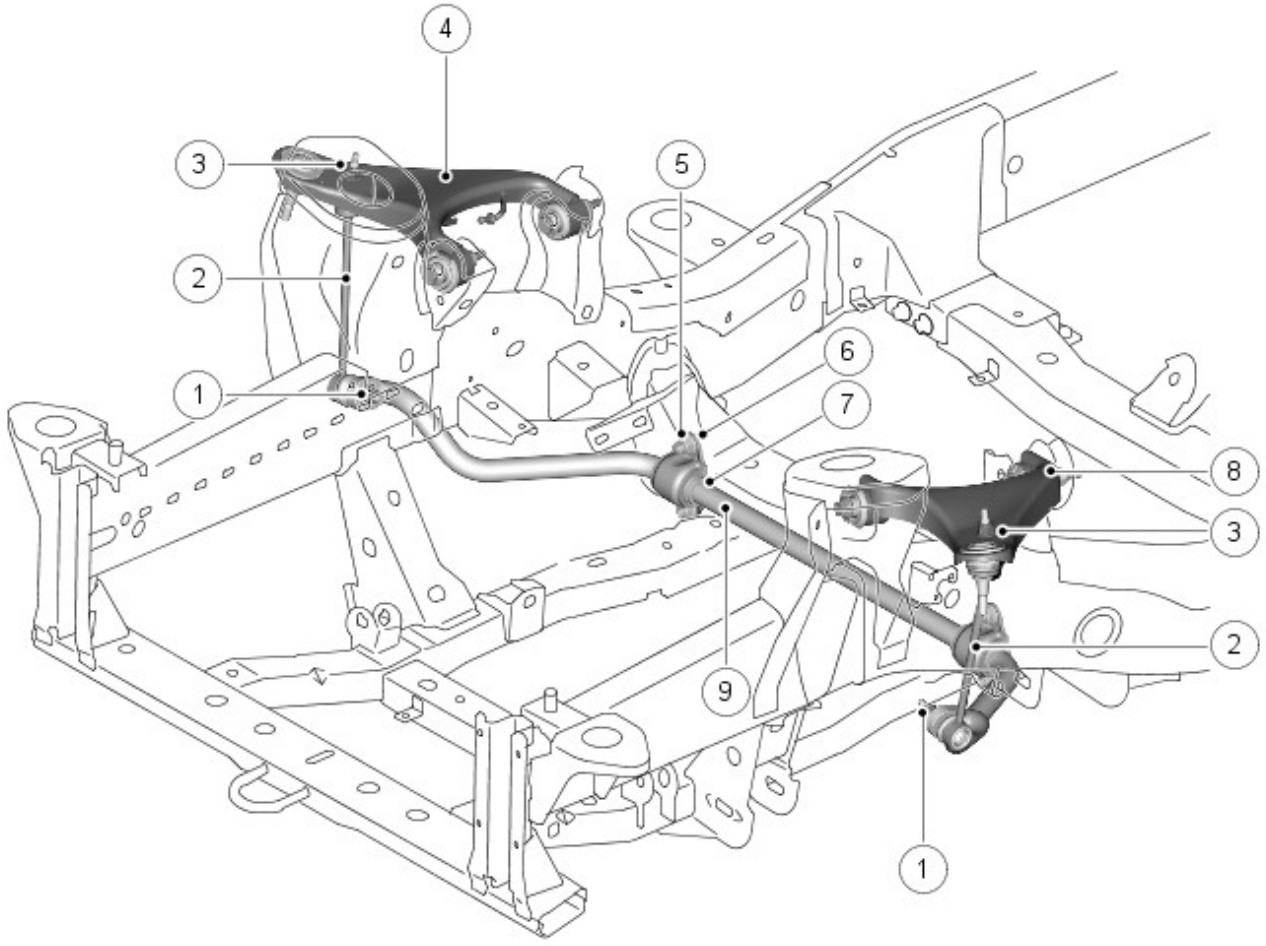
requirements.

The coil spring is located in a spring seat which is an integral part of the damper body. The design of the spring seat prevents the spring rotating. The opposite end of the coil spring is located in a spring isolator which is fitted in the top mount. The spring isolator is made from rubber and prevents any noise produced during damper and spring compression/extension from being transmitted to the vehicle body.

The top mount is fitted with a bush and rebound washer which are located between the top mount plate and the damper rod, a self locking nut secures the damper rod to the top mount. The top mount attaches to a housing on the chassis with 3 integral studs and self-locking nuts.

The spring is fitted with spring spacers which are located between the spring isolator and the top mount. The spring spacers control the length of the spring to maintain the correct trim height. The spring spacers are colour coded and are supplied with a replacement spring.

ANTI-ROLL BAR



E45853

Item	Part Number	Description
1	-	Nut - link to anti-roll bar (2 off)
2	-	Link (2 off)
3	-	Nut - link to upper control arm (2 off)
4	-	RH upper control arm
5	-	Nut (4 off)
6	-	Bracket (2 off)
7	-	Bush (2 off)
8	-	LH upper control arm
9	-	Anti-roll bar

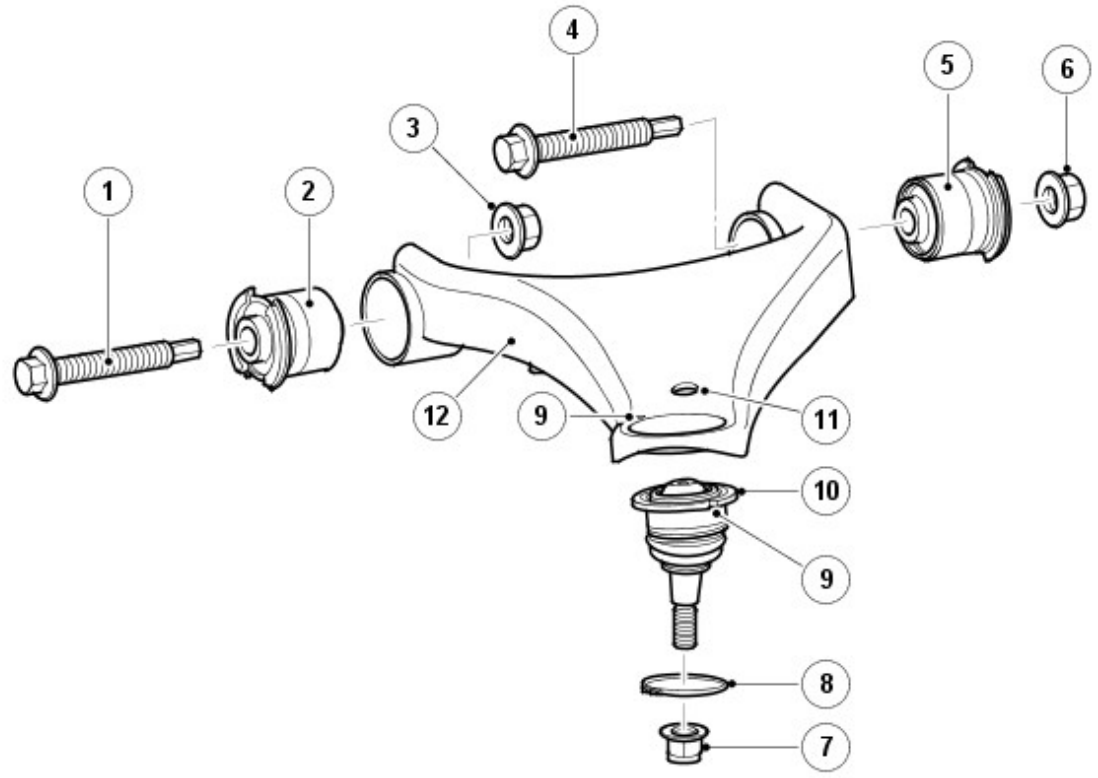
The anti-roll bar is fabricated from induction hardened, solid spring steel bar. The anti-roll bar operates, via a pair of links,

from their attachment to the upper control arm.

The anti-roll bar is attached to the forward face of the chassis front cross member. The anti-roll bar is attached to the cross member with two, Teflon lined bushes. Brackets, which are pressed onto the bushes, are attached to the cross member with nuts, screwed onto studs in the cross member. The anti-roll bar has crimped, 'anti-shuffle' collars pressed in position on the inside edges of the bushes. The collars prevent sideways movement of the anti-roll bar.

The ends of the anti-roll bar are attached to the upper control arms via links. This allows the anti-roll bar to move with the wheel travel providing maximum effectiveness. Each link has a ball joint at each end. The top ball joint is attached to the link, parallel with the link axis. The ball joint is located in a hole in the upper control arm and secured with a self-locking nut. The bottom ball joint is attached to the link at 90 degrees to the link axis. The ball joint is located in a hole in the end of the anti-roll bar and secured with a self-locking nut. The links are not handed and therefore can be fitted to either side of the anti-roll bar.

UPPER CONTROL ARM



E45854

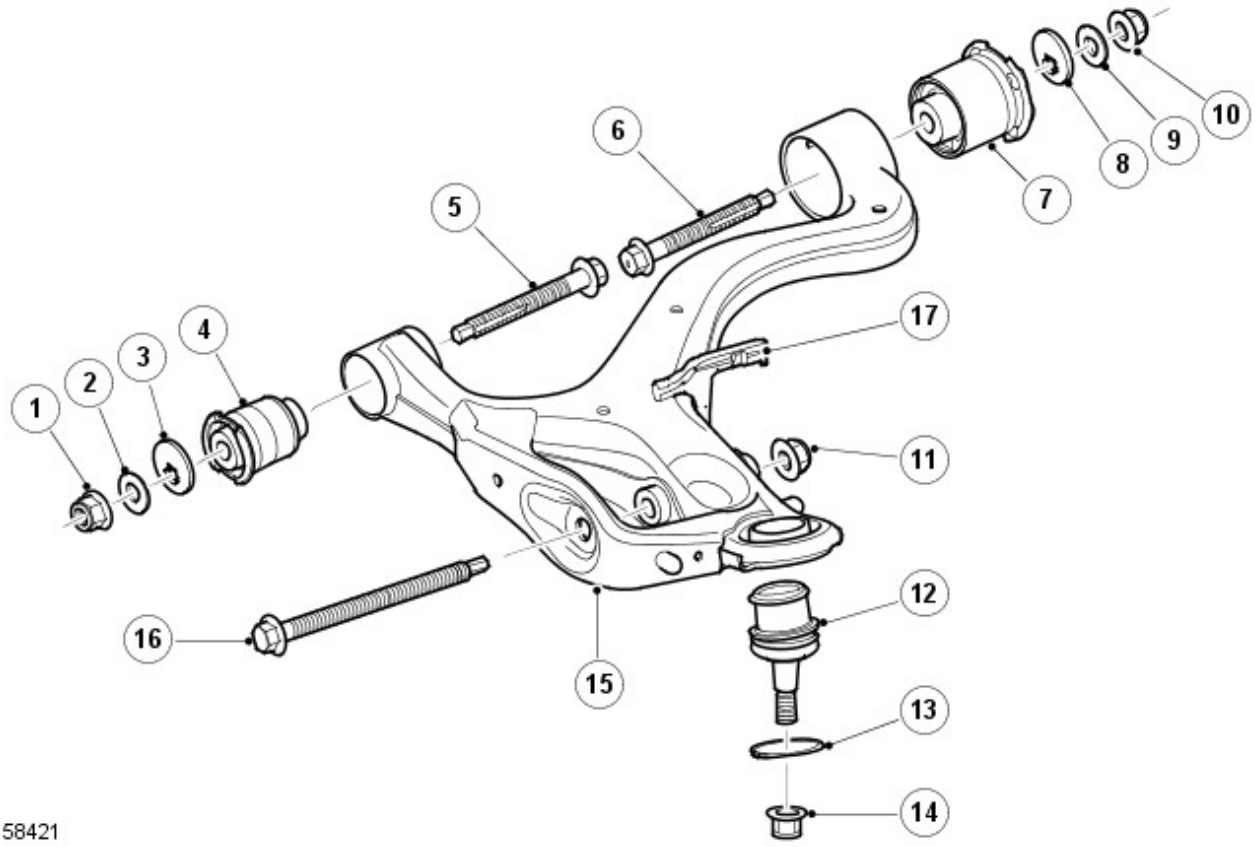
Item	Part Number	Description
1	-	Flanged bolt
2	-	Bush
3	-	Self locking nut
4	-	Flanged bolt
5	-	Bush
6	-	Self locking nut
7	-	Self locking nut
8	-	Circlip
9	-	Timing marks
10	-	Ball joint
11	-	Anti-roll bar link attachment hole
12	-	Upper control arm

The upper control arm assembly comprises, the control arm, two bushes and a ball joint. The upper control arm is a pressed steel fabrication. Its outer end has a hole to accept the ball joint. A small indentation is located adjacent to the ball joint hole and is used to obtain the correct orientation of the ball joint. A smaller hole near the ball joint provides for the attachment of the anti-roll bar link. The underside of the upper control arm has a bracket for attachment of the height sensor link arm and two further brackets which secure the brake hose, pad wear sensor and wheel speed sensor cables.

The inner end of the arm has two fabricated bush housings which are welded to the arm pressing. A bush is pressed into each housing. The bushes are located between lugs on the chassis and are secured with bolts and self-locking nuts through metal inserts in the centre of the bushes.

The ball joint in pressed into the upper control arm. The ball joint is an interference fit in the hole which prevents the ball joint from moving. A circlip is fitted to the ball joint to retain it in the hole. The top face of the ball joint has two semi-circular cut-outs. One of these cut-outs must be aligned with the small indentation in the upper control arm to ensure the correct operation of the ball joint.

LOWER CONTROL ARM



Item	Part Number	Description
1	-	Self locking nut
2	-	Flat washer
3	-	Cam washer
4	-	Bush
5	-	Special bolt
6	-	Bolt
7	-	Hydrobush
8	-	Cam washer
9	-	Flat washer
10	-	Self locking nut
11	-	Self locking nut - damper lower attachment
12	-	Ball joint
13	-	Circlip
14	-	Self locking nut
15	-	Lower control arm
16	-	Bolt - damper lower attachment
17	-	Jacking bracket (Vehicles with coil springs only)

The lower control arm assembly comprises, the control arm, two bushes and a ball joint. The lower control arm is a pressed steel fabrication with a hole at its outer end to accept the ball joint.

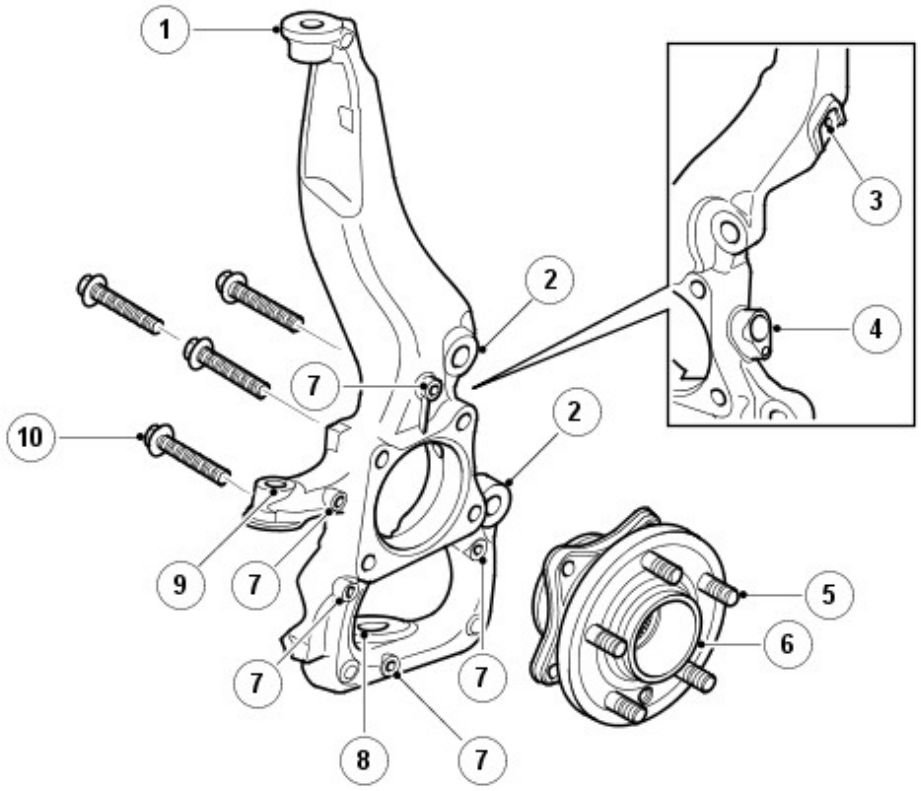
The inner end of the arm has two fabricated bush housings which are welded to the arm pressing. A bush is pressed into each housing. The rear bush is a hydrobush which provides a progressive increase in the hardness of the bush as the deflection of the wheel increases. The bushes are located between lugs on the chassis and are secured with bolts and self-locking nuts through metal inserts in the centre of the bushes. The forward bush, self-locking nut, has a cam washer located beneath it. The cam washer is located between lugs on the chassis bracket and its orientation can be adjusted to set the front camber. The rear bush, self-locking nut, also has a cam washer located beneath it. The cam washer is located between lugs on the chassis bracket and its orientation can be adjusted to set the front castor.

On vehicles fitted with coil springs only, a jacking bracket is located on the lower control arm.

A central aperture in the arm provides for the attachment of the damper module lower bush. The damper is secured with a long bolt which is positioned through holes in the arm and secured with a self-locking nut.

The ball joint is pressed into the lower control arm. The ball joint is an interference fit in the hole which prevents the ball joint from moving. A circlip is fitted to the ball joint to retain it in the hole.

WHEEL KNUCKLE, HUB AND BEARING ASSEMBLY



E45856

Item	Part Number	Description
1	-	Upper control arm attachment
2	-	Brake caliper attachment holes
3	-	Brake hose bracket attachment point
4	-	Wheel speed sensor location
5	-	Wheels studs
6	-	Wheel hub
7	-	Brake disc dust shield attachment holes
8	-	Lower control arm ball joint attachment
9	-	Steering rack ball joint attachment
10	-	Wheel hub bolts (4 off)

The wheel knuckle is a machined casting which is located between the ball joints of the upper and lower control arms. The knuckle has four clearance holes which allow for the fitment of four bolts which secure the wheel hub housing. A cast boss on the forward edge of the knuckle provides for attachment of the steering gear, tie rod ball joint.

The wheel hub and bearing assembly comprises the wheel hub housing, wheel hub and taper roller bearing. The wheel hub and bearing assembly is a non-serviceable component. Five M14 studs are pressed into the wheel hub and provide for the attachment of the road wheel with wheel nuts.

The wheel hub housing is a machined forging which houses a taper roller bearing. The housing has four threaded holes which provide for the attachment to the wheel knuckle with four bolts.

The wheel hub has a splined centre bore which mates with corresponding splines on the half shaft. Rotation of the half shaft is passed, via the splines, to the wheel hub which rotates on the taper roller bearing.

Published: 11-May-2011

Front Suspension - Front Stabilizer Bar

Removal and Installation

Removal

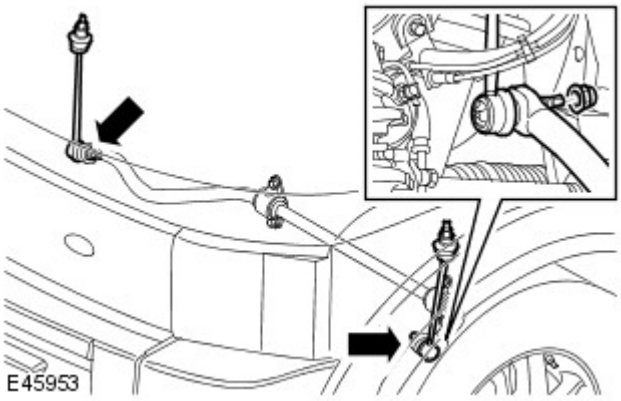
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the wheels and tires.

3. Disconnect both the stabilizer bar links from the stabilizer bar.

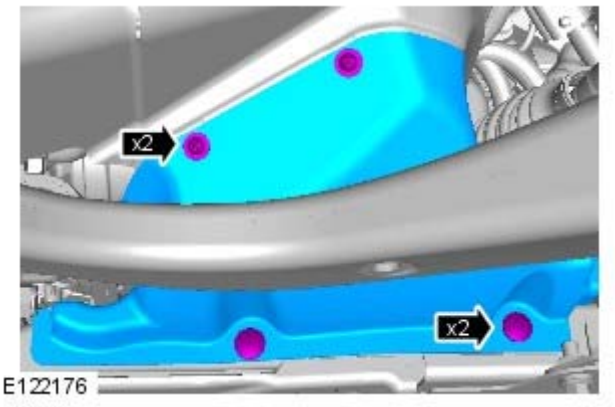
- Remove and discard the 2 nuts.



4. NOTE: RH side only.

Remove the fender splash shield lower extension panel.

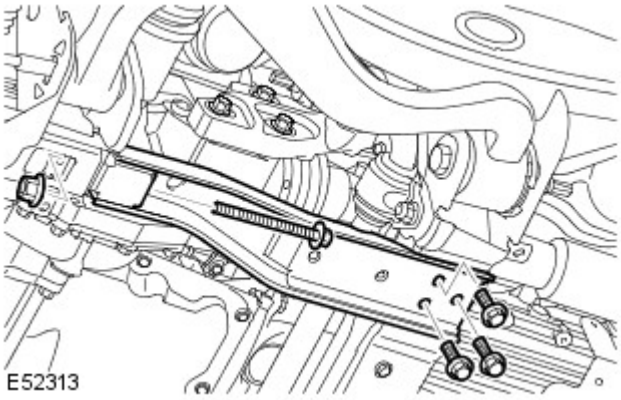
- Remove the 2 screws.
- Remove the 2 clips.

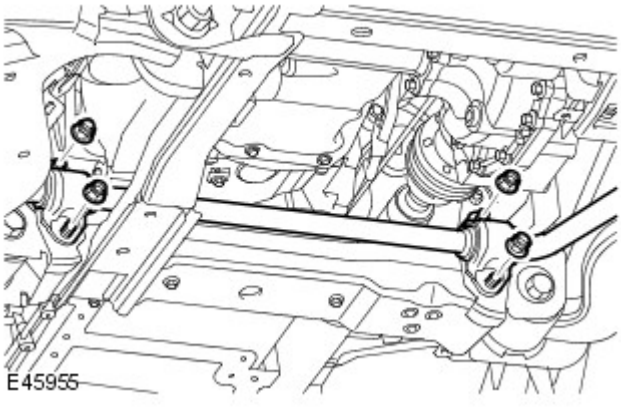


5. Remove the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

6. Remove the front axle crossmember.

- Remove the 4 bolts.





7. Remove the stabilizer bar bushing.

- Remove the 4 nuts.
- Remove the stabilizer bar clamps.

8. Remove the stabilizer bar.

- Remove the stabilizer bar out through the LH side wheel arch.

Installation

1. Install the stabilizer bar.

- Install the stabilizer bar through the LH side wheel arch.

2. Install the stabilizer bar bushing.

- Install the stabilizer bar clamps.
- Tighten the nuts to 115 Nm (85 lb.ft).

3. Install the front axle crossmember.

- Tighten the 4 bolts to 115 Nm (85 lb.ft).

4. Install the engine undershield.
For additional information, refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

5. NOTE: RH side only.

Install the fender splash shield lower extension panel.

- Install the 2 screws.
- Install the 2 clips.

6. Connect both stabilizer bar links to the stabilizer bar.

- Install new nuts and tighten to 115 Nm (85 lb.ft).

7. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Front Suspension - Front Stabilizer Bar Link

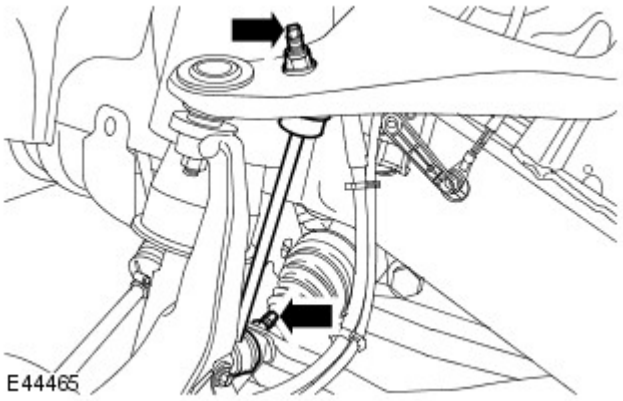
Removal and Installation

Removal

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

Raise and support the vehicle.

2. Remove the wheel and tire.



3. CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Remove the stabilizer bar link.

- Remove and discard the 2 nuts.

Installation

1. Install the stabilizer bar link.

- Tighten the nuts to 115 Nm (85 lb.ft).

2. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Front Suspension - Upper Arm Ball Joint

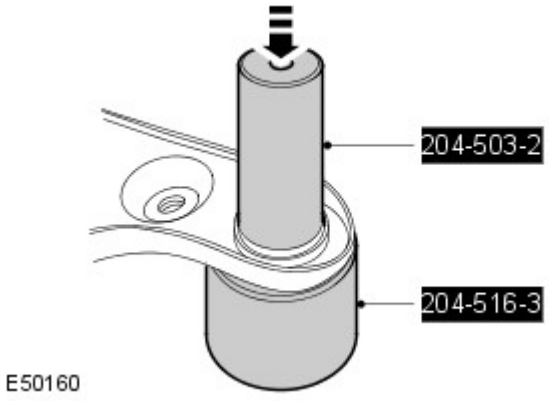
Removal and Installation

Special Tool(s)	
204-516/3  E50961	Ball joint remover 204-516/3 (LRT 64-026/3)
204-530-2  E50156	Ball joint remover 204-530-2
204-530-3  E50157	Ball joint installer 204-530-3
204-530-1  E50155	Ball joint installer 204-530-1

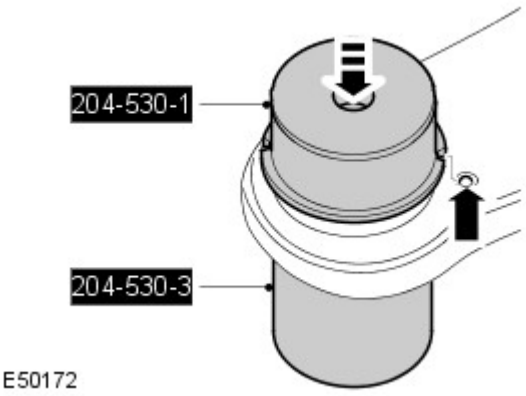
Removal

- NOTE: This procedures shows removal and installation of the upper arm ball joint.

1. Remove the upper arm.
   For additional information, refer to: Upper Arm (204-01 Front Suspension, Removal and Installation).
2. Remove the dust seal.
   - Remove the seal retainer.
   - Remove the circlip.
3. Using the special tools, remove the ball joint.

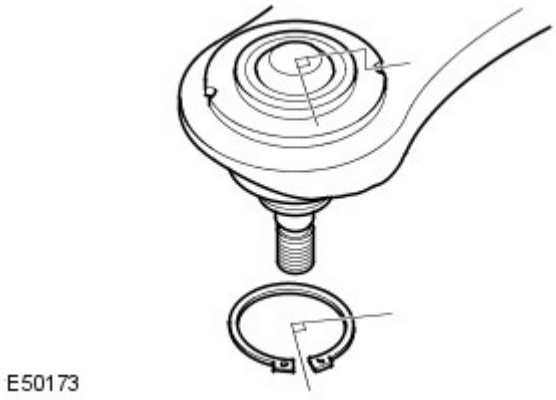


Installation



1. CAUTION: Make sure the timing marks are aligned.

Using the special tools, install the ball joint.



2. CAUTION: Circlip holes to be 90 degrees rotated from timing marks.

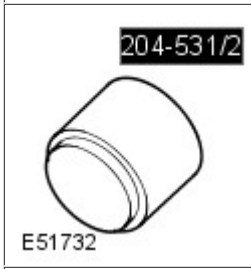
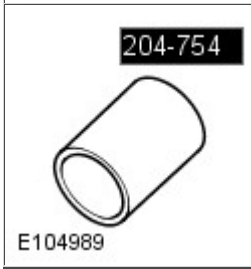
Install the circlip.

3. Install the upper arm.
For additional information, refer to: Upper Arm (204-01 Front Suspension, Removal and Installation).

Published: 11-May-2011

Front Suspension - Lower Arm Ball Joint

Removal and Installation

Special Tool(s)	
	Remover/installer front lower arm ball joint 204-531/3
	Remover/installer front lower arm ball joint 204-531/2
	Remover/installer front lower arm ball joint 204-531/1
	Remover/installer front lower arm ball joint 204-753
	Remover/installer front lower arm ball joint 204-754

Removal

All vehicles

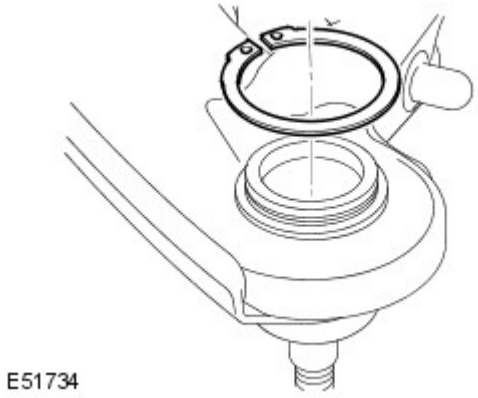
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

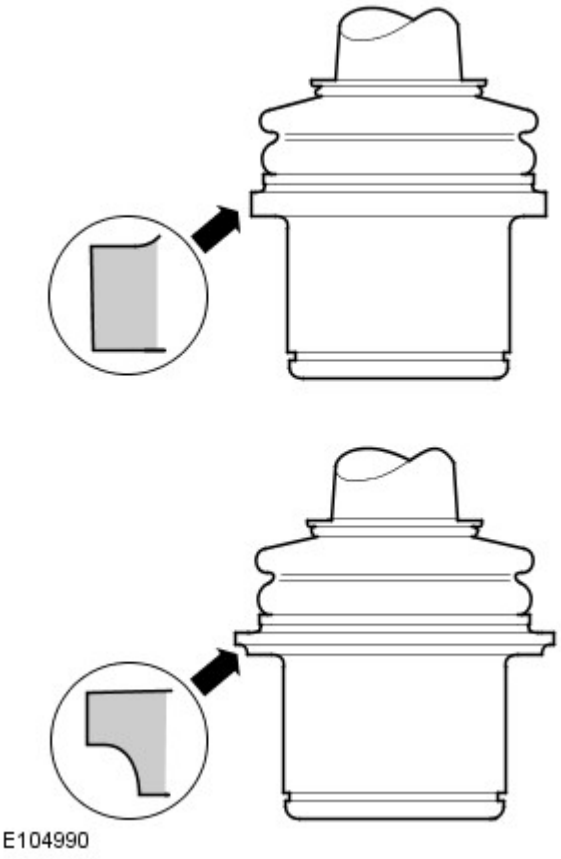
2. Remove the wheel and tire.

3. Remove the lower arm.
For additional information, refer to: Lower Arm (204-01 Front Suspension, Removal and Installation).

4. Remove the circlip.

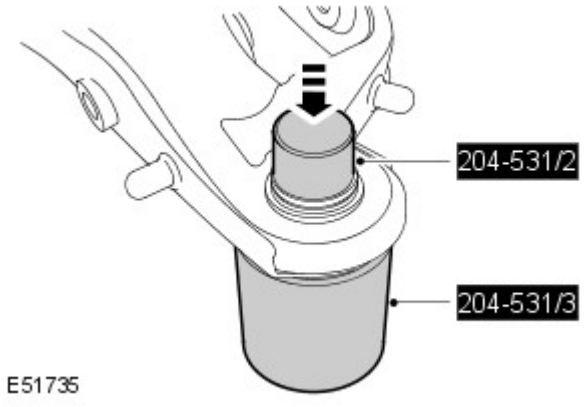


5. Inspect the installed ball joint to determine if a radius is present.



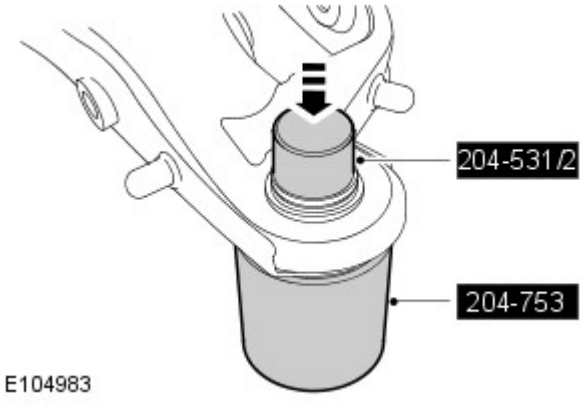
Ball joint without radius

6. Using the special tools, remove the ball joint.



Ball joint with radius

7. Using the special tools, remove the ball joint.

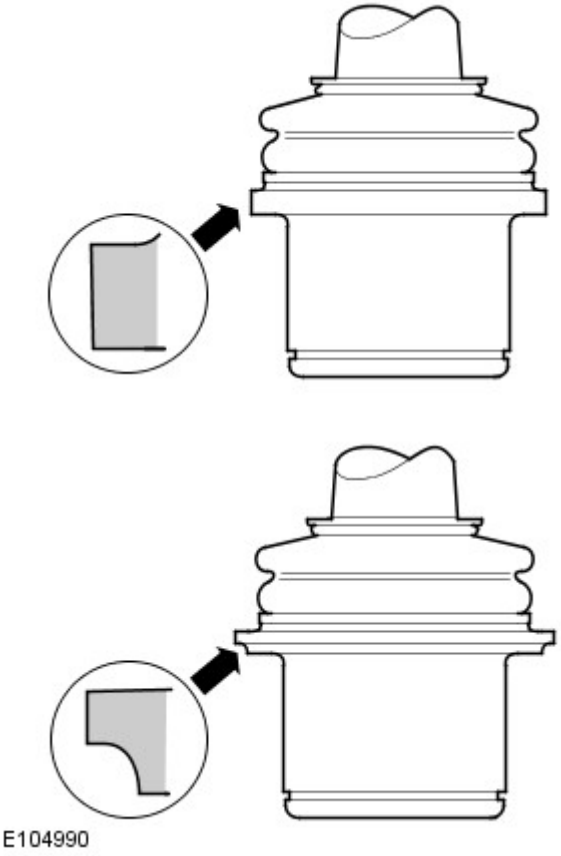


Installation

All vehicles

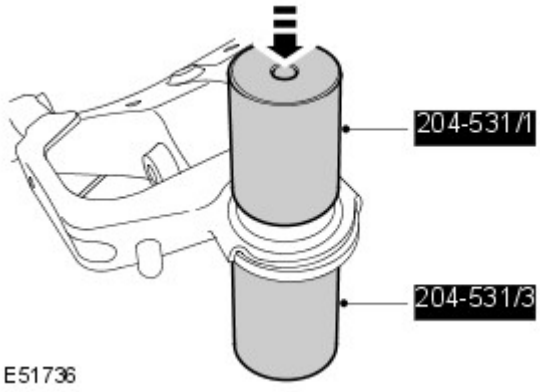
1. Clean the components.

2. Inspect the new ball joint to determine if a radius is present.



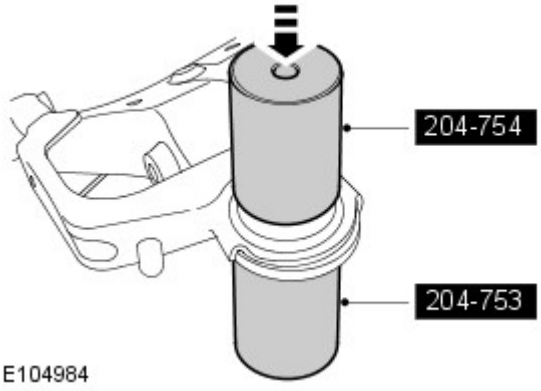
Ball joint without radius

3. Using the special tools, install the ball joint.



Ball joint with radius

4. Using the special tools, install the ball joint.



All vehicles

5. Install the circlip.

6. Install the lower arm.
For additional information, refer to: Lower Arm (204-01 Front Suspension, Removal and Installation).

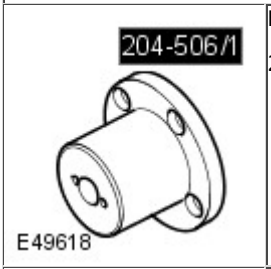
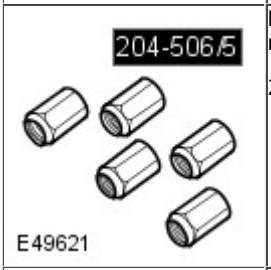
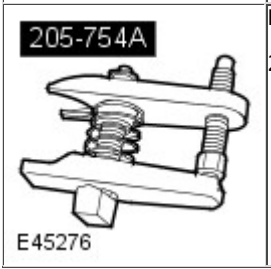
7. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 29-Sep-2011

Front Suspension - Wheel Knuckle

Removal and Installation

Special Tool(s)	
	Halfshaft remover/replacer 204-506/1(LRT-60-030/1)
	Halfshaft remover/replacer 204-506/2(LRT-60-030/2)
	Halfshaft remover/replacer 204-506/3(LRT-60-030/3)
	Retainers - halfshaft remover/replacer 204-506/5(LRT-60-030/5)
	Halfshaft installer adapter 204-506-01(LRT-60-030/4)
	Ball joint separator 205-754(LRT-54-027)

Removal

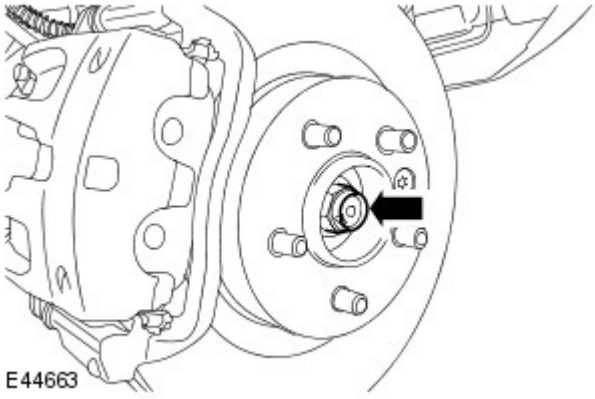
- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

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.

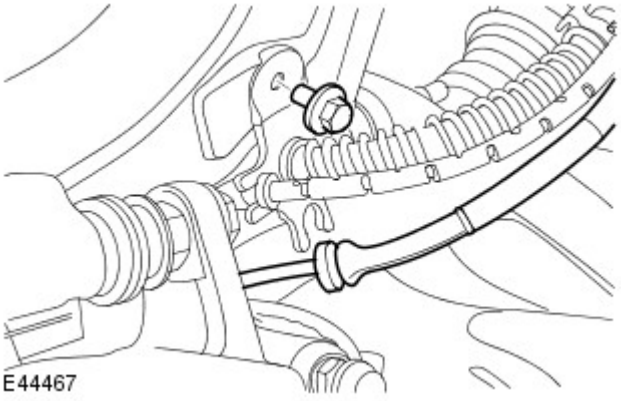
2. Remove the wheel and tire.

3. Loosen the halfshaft retaining nut.



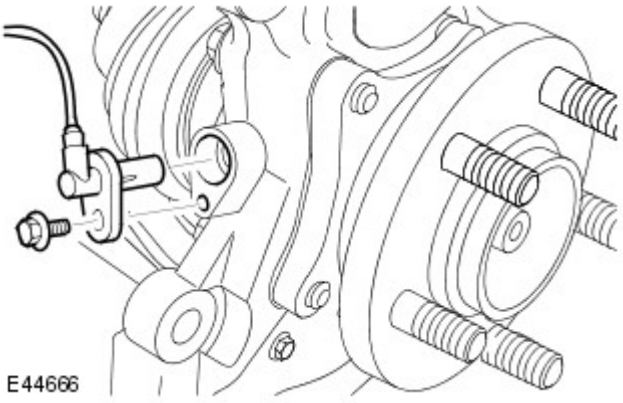
4. Release the brake hose bracket from the wheel knuckle.

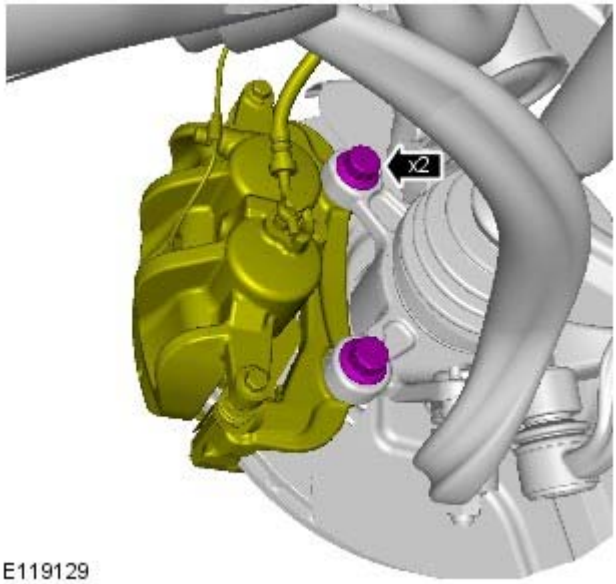
- Remove the bolt.



5. Release the wheel speed sensor from the wheel knuckle.

- Remove the bolt.





E119129

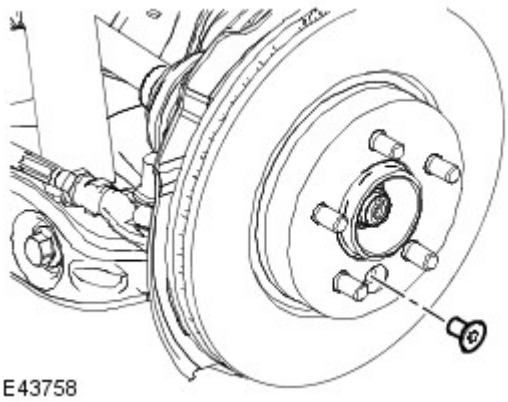
6. CAUTIONS:

⚠ Do not allow the brake caliper to hang on the brake hose.

⚠ LH side: Do not allow the brake caliper to hang on the brake pad wear warning sensor lead.

Remove the brake caliper and anchor plate.

- Remove the 2 bolts.
- Tie the brake caliper and brake caliper anchor plate assembly aside.


E43758

7. Remove the brake disc.

- Remove the Torx screw.

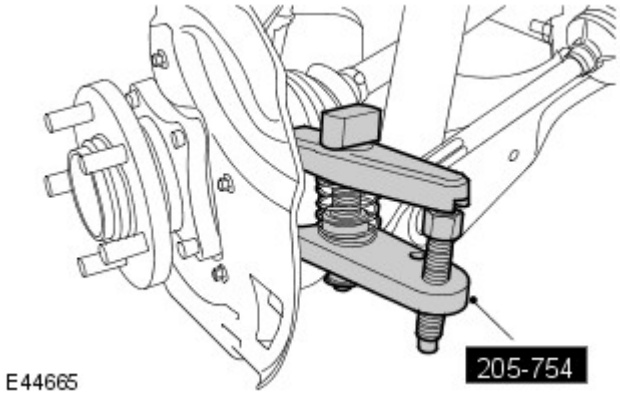
8. Remove the halfshaft retaining nut.

- Discard the nut.

9. Loosen the tie-rod end ball joint retaining nut.

10. Using the special tool, release the tie-rod end ball joint from the wheel knuckle.

- Discard the nut.



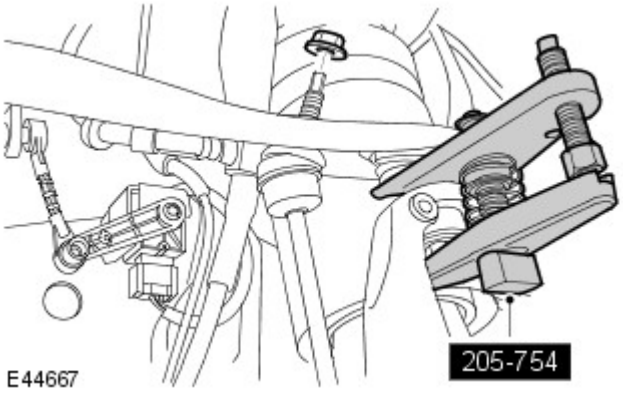
E44665

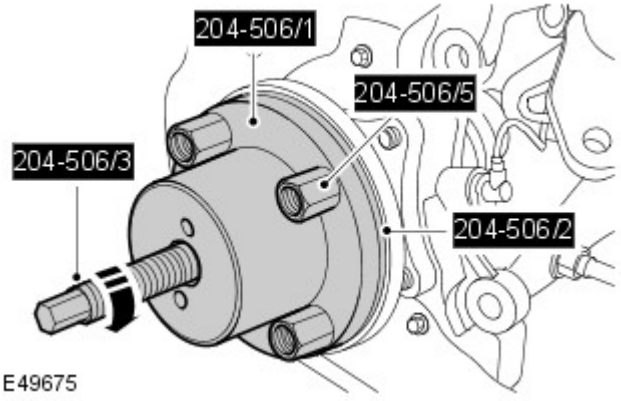
11. ⚠ CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Remove and discard the stabilizer bar link nut.

12. Loosen the upper arm retaining nut.

13. Using the special tool, release the upper arm ball joint.



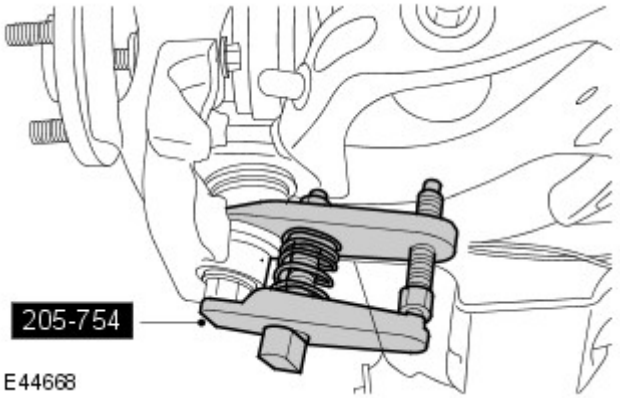


14. CAUTION: Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

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

15. Remove the lower ball joint retaining nut.

16. Using the special tool, release the lower ball joint from the steering knuckle.



17. CAUTION: The lower arm ball joint can be damaged by excessive articulation. The wheel knuckle must be fully supported at all times. Do not allow the wheel knuckle to hang on the lower arm. Failure to follow this instruction will result in damage to vehicle.

Remove the upper arm retaining nut.

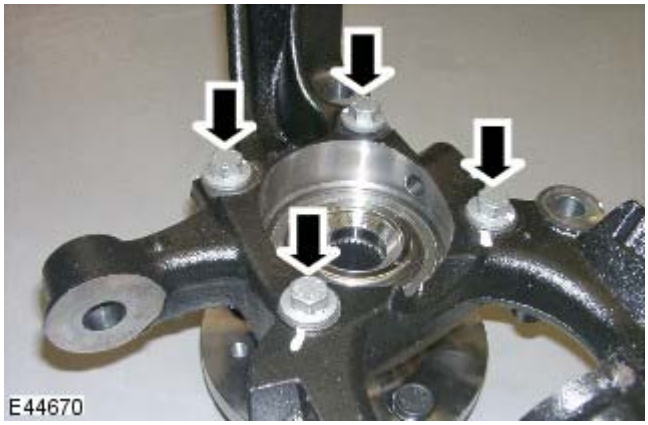
- Discard the nut.

18. NOTE: Do not disassemble further if the component is removed for access only.

Remove the wheel knuckle.

19. Remove the brake disc dust shield.

- Remove the four retaining bolts.



20. Remove the wheel hub.

- Remove the 4 bolts.

Installation

1. Clean the components.

2. Install the wheel hub.

- Tighten the 4 bolts to 115 Nm (85 lb.ft).

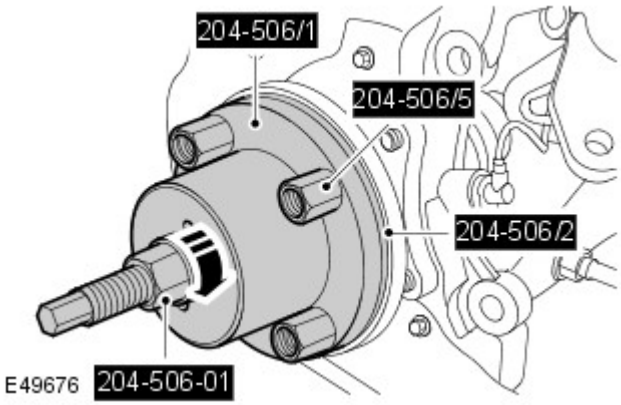
3. Install the brake disc dust shield.

- Tighten the 4 bolts to 10 Nm (7 lb.ft).

4. CAUTION: The lower arm ball joint can be damaged by excessive articulation. The wheel knuckle must be fully supported at all times. Do not allow the wheel knuckle to hang on the lower arm. Failure to follow this instruction will result in damage to vehicle.

With assistance, install the wheel knuckle.

5. Using the special tools, install the halfshaft in the wheel hub.



6. Connect the upper arm and wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

7. Secure the stabilizer bar link.

- Install a new nut and tighten to 115 Nm (85 lb.ft).

8. Tighten the lower arm ball joint retaining nut to 115 Nm (85 lb.ft).

9. Connect the tie-rod end ball joint.

- Install a new nut and tighten to 76 Nm (56 lb.ft).

10.  CAUTION: Install the halfshaft nut finger tight.

Install a new halfshaft retaining nut and lightly tighten.

11. Make sure the brake disc and hub mating surfaces are clean.

12. Install the brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

13. Install the brake caliper and anchor plate.

- Clean the brake caliper anchor plate using brake cleaning fluid.
- Tighten the bolts to 275 Nm (203 lb.ft).

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

Tighten the new halfshaft retaining nut to 230 Nm (170 lb.ft).

- Stake the nut to the halfshaft.

15. Install the wheel speed sensor.

- Tighten the bolt to 10 Nm (7 lb.ft).

16. Secure the brake hose retaining bracket to the wheel knuckle.

- Tighten the bolt to 22 Nm (16 lb.ft).

17. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

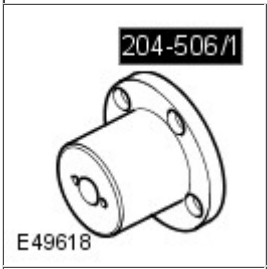
18. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 05-Sep-2011

Front Suspension - Front Wheel Bearing and Wheel Hub

Removal and Installation

Special Tool(s)	
	Halfshaft remover/replacer 204-506/1(LRT-60-030/1)
	Halfshaft remover/replacer 204-506/2(LRT-60-030/2)
	Halfshaft remover/replacer 204-506/3(LRT-60-030/3)
	Retainers - halfshaft remover/replacer 204-506/5(LRT-60-030/5)
	Halfshaft installer adapter 204-506-01(LRT-60-030/4)

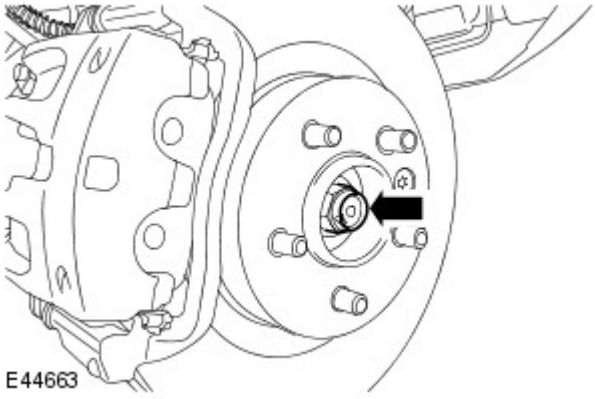
Removal

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.

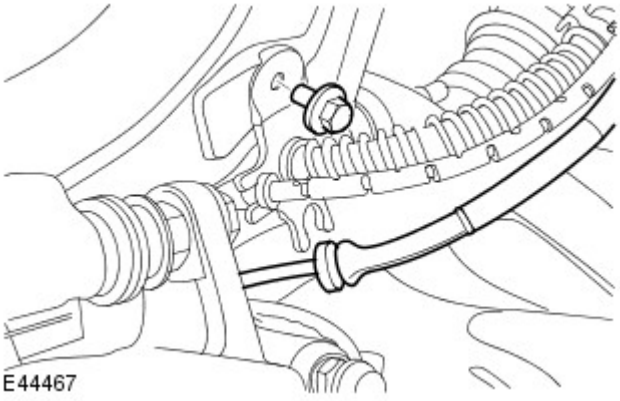
2. Remove the wheel and tire.

3. Loosen the halfshaft retaining nut.



4. Release the brake hose bracket from the wheel knuckle.

- Remove the bolt.



5. Remove the wheel speed sensor retaining bolt.

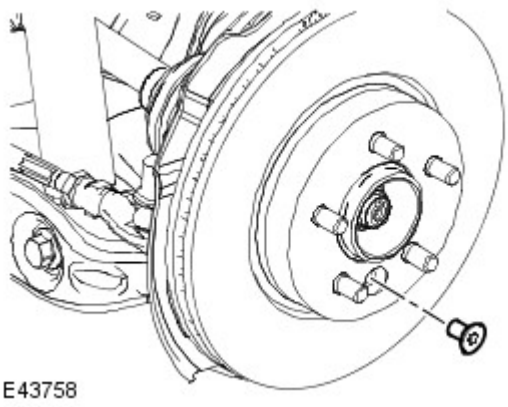
6. CAUTION: Do not allow the brake caliper to hang on the brake hose.

Release the brake caliper anchor plate from the wheel knuckle and tie the caliper aside.

- Tie aside complete with the wheel speed sensor.

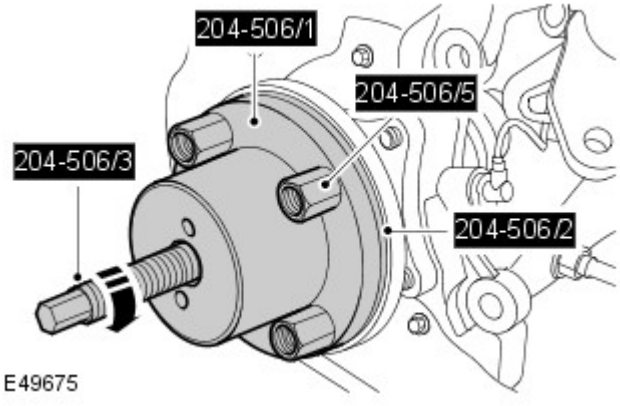
7. Remove the brake disc.

- Remove the Torx screw.



8. Remove the halfshaft retaining nut.

- Discard the nut.

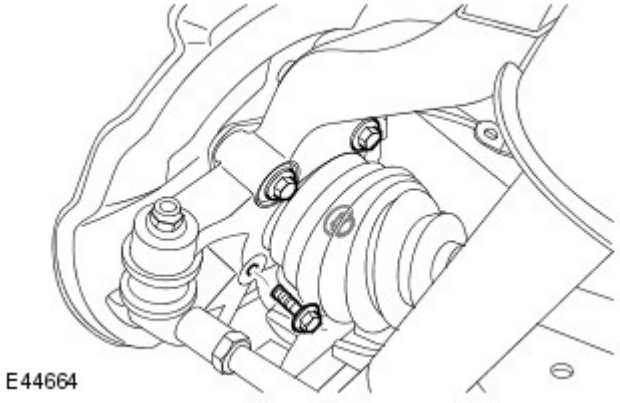


9. CAUTION: Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

Using the special tools, release the halfshaft from the wheel hub.

10. Remove the wheel hub.

- Remove the 4 bolts.

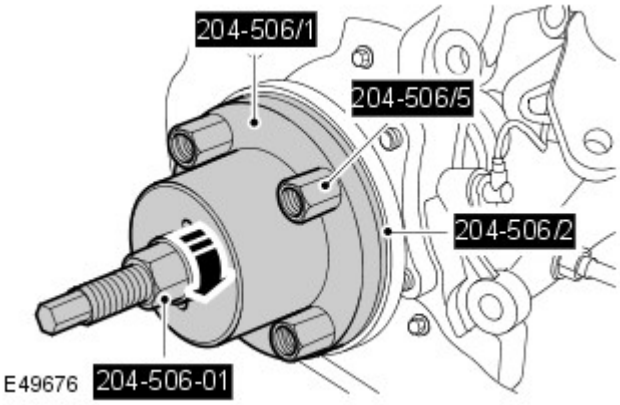


Installation

1. Clean the components.

2. Install the wheel hub.

- Using the special tools, install the halfshaft in the wheel hub.
- Tighten the 4 bolts to 115 Nm (85 lb.ft).



3. Install a new halfshaft retaining nut and lightly tighten.

4. Make sure the brake disc and hub mating surfaces are clean.

5. Install the brake disc.

- Tighten the Torx screw to 35 Nm (26 lb.ft).

6. Install the brake caliper and anchor plate.

- Install the wheel speed sensor.
- Tighten the bolts to 275 Nm (203 lb.ft).

7. Install the wheel speed sensor retaining bolt.

8. Secure the brake hose retaining bracket to the wheel knuckle.

- Tighten the bolt to 22 Nm (16 lb.ft).

9. CAUTION: Do not use air tools to install the nut. Failure

to follow this instruction may result in damage to the component.

Tighten the new halfshaft retaining nut to 230 Nm (170 lb.ft).

- Stake the nut to the halfshaft.

10. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

11. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Front Suspension - Shock Absorber and Spring Assembly

Removal and Installation

Removal

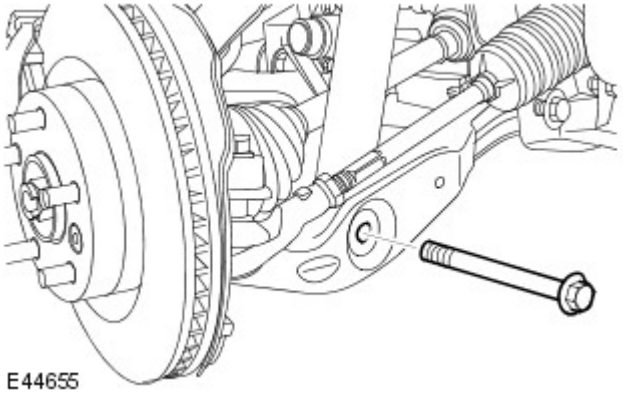
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

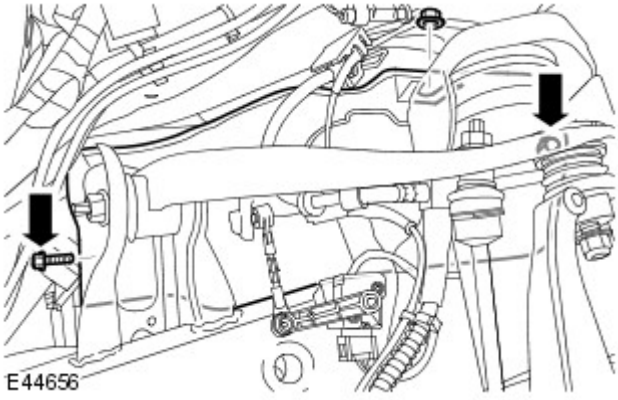
3. Disconnect the shock absorber and spring assembly from the lower arm.

- Remove the nut and bolt.



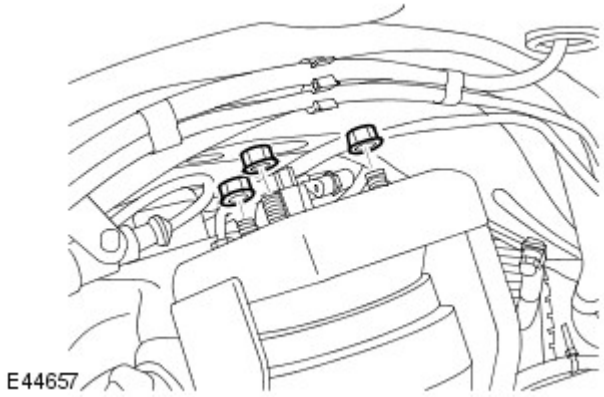
4. Release the heat shield for access to the shock absorber and spring assembly upper mounting inner nut.

- Remove the three retaining bolts.



5. Remove the shock absorber and spring assembly.

- Remove the three retaining bolts.



Installation

1. Install the shock absorber and spring assembly.

- Make sure the spring and shock absorber assembly top mounting to body mating faces are clean.
- Fit the nuts and tighten to 70 Nm (52 lb.ft).

2. Secure the heat shield.

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

3. Connect the shock absorber and spring assembly to the lower arm.

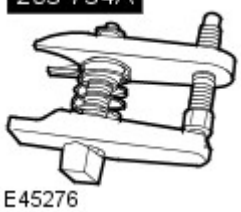
- Tighten the nut and bolt to 300 Nm (221 lb.ft).

4. Install the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

Published: 11-May-2011

Front Suspension - Upper Arm

Removal and Installation

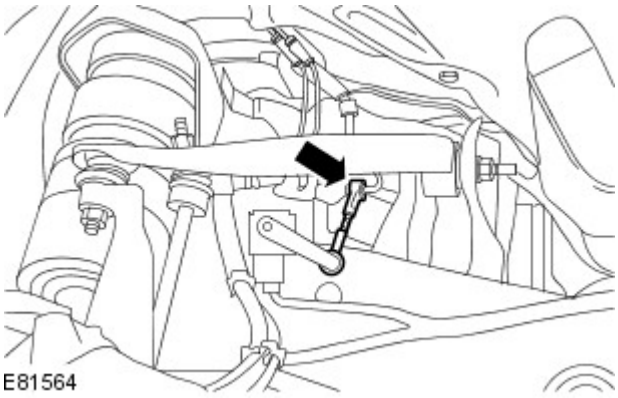
Special Tool(s)	
205-754A  E45276	Ball joint separator 205-754(LRT-54-027)

Removal

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

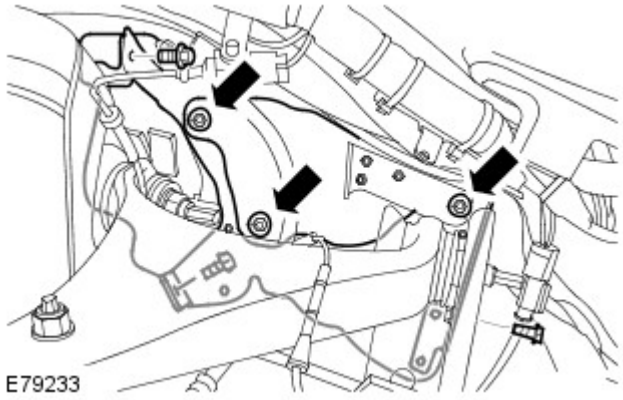
Raise and support the vehicle.

2. Remove the wheel and tire.


E81564

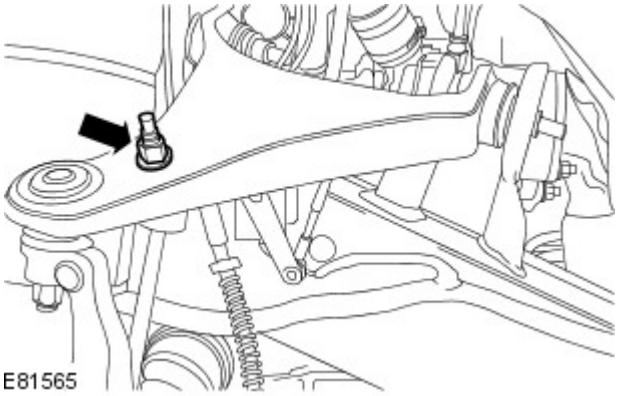
3. CAUTION: Do not use excessive force to disconnect the height sensor link.

Disconnect the height sensor link arm.


E79233

4. Remove the upper arm and brake line heat shields for access.

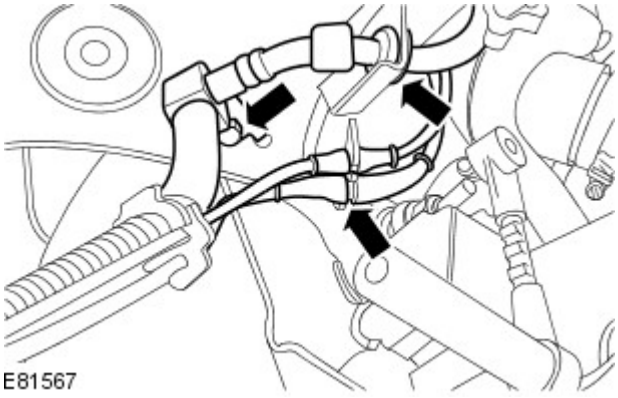
- Remove the 3 nuts.
- Remove the 3 bolts.


E81565

5. CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

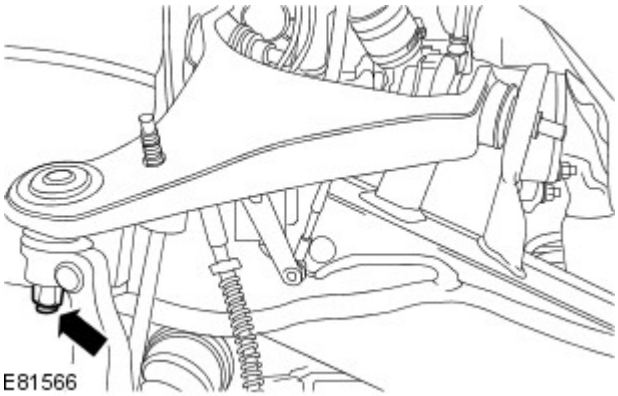
Remove the stabilizer bar link nut.

- Discard the nut.



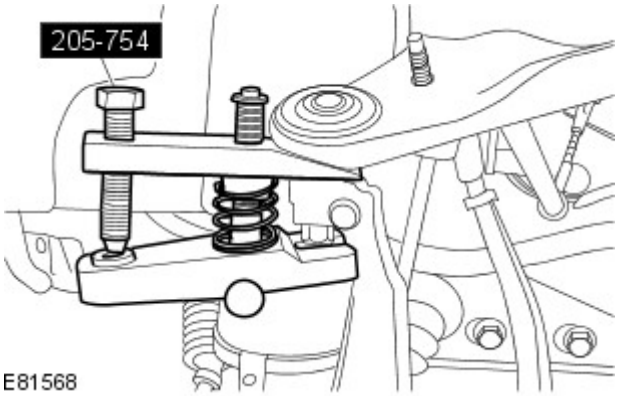
6. Release the brake hose and wheel speed sensor leads from the upper arm.

- Remove the bolt.



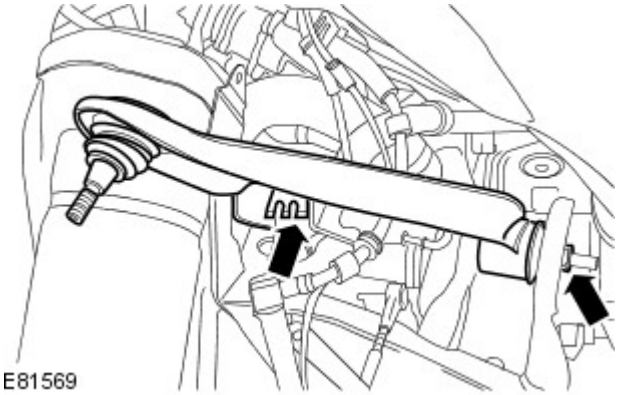
7. CAUTION: To prevent the wheel knuckle falling outwards and disconnection of the halfshaft inner joint, support the wheel knuckle.

Loosen the upper arm retaining nut.



8. Using the special tool, release the upper arm ball joint.

- Remove and discard the nut.



9. Remove the upper arm.

- Remove and discard the 2 nuts.

Installation

1. Install the upper arm.

- Fit the bolts but do not fully tighten at this stage.
- Install new nuts.

2. Connect the upper arm and wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

3. Secure the brake hose and wheel speed sensor leads to the upper arm.

- Tighten the bolt to 23 Nm (17 lb.ft).

4. Secure the stabilizer bar link.

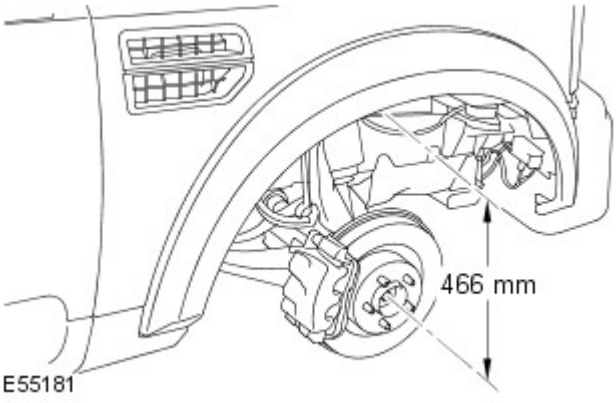
- Install a new nut and tighten to 115 Nm (85 lb.ft).

5. Install the upper arm and brake line heat shields.

- Install the 3 bolts.
- Install the 3 nuts.

6. Connect the height sensor link.

7. Set the height distance between the centre of the halfshaft end and the edge of the fender trim to 466 mm (18.34").



8. Tighten the 2 upper arm nuts and bolts to 175 Nm (129 lb.ft).

9. Install the wheel and tire.

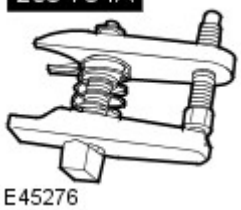
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

10. Using the Land Rover approved diagnostic system, calibrate the suspension ride height.
For additional information, refer to: Ride Height Adjustments (204-05 Vehicle Dynamic Suspension, General Procedures).

Published: 11-May-2011

Front Suspension - Lower Arm

Removal and Installation

Special Tool(s)	
205-754A  E45276	Ball joint separator 205-754(LRT-54-027)

Removal

1. Place vehicle into access mode.


E99855

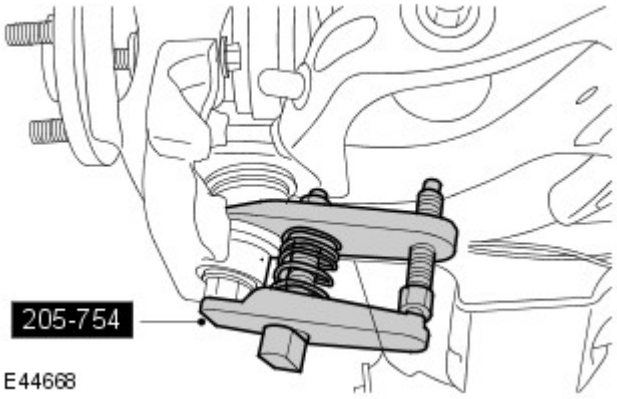
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

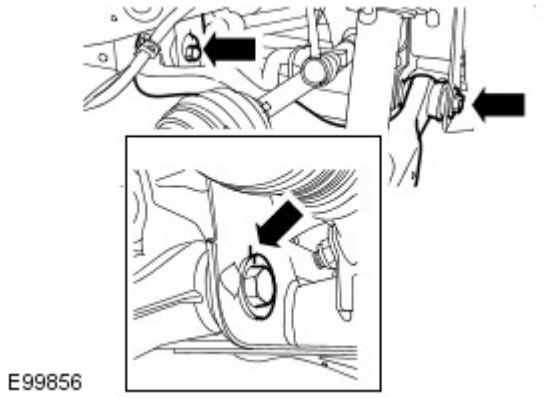
3. Remove the wheel and tire.

4. Remove the lower ball joint retaining nut.

5. Using the special tool, release the lower ball joint from the steering knuckle.

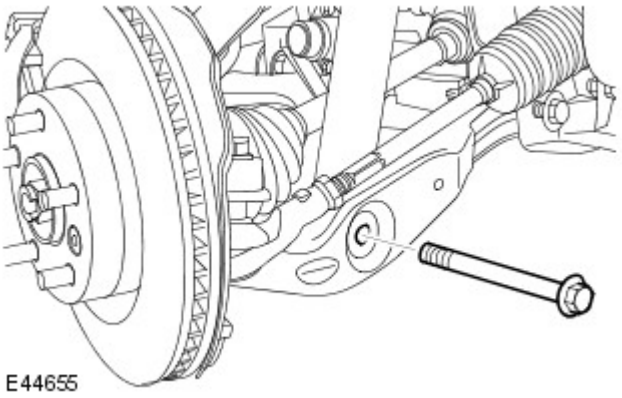


E44668



6. Mark the position of the bolts in relation to the chassis brackets.

- Remove the 2 bolts.



7. Disconnect the shock absorber and spring assembly from the lower arm.

- Remove the nut and bolt.

8. CAUTION: Only displace the wheel knuckle sufficiently outboard to release the lower arm past the undertray. This will prevent the inboard driveshaft joint from separating. Failure to follow this instruction may result in damage to the vehicle.

• NOTE: Make sure the steering is in the straight ahead position.

Remove the lower arm.

- Release the lower arm from the subframe and reposition downwards.
- Rotate the lower arm and position forward to release from the wheel knuckle.

Installation

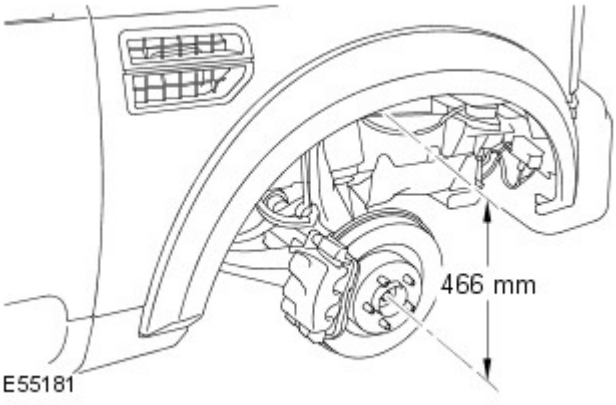
1. Install the lower arm.

- Fit the bolts but do not fully tighten at this stage.

2. CAUTION: The lower arm ball joint can be damaged by excessive articulation. Do not over articulate the ball joint. Failure to follow this instruction will result in damage to vehicle.

Connect the lower arm to the wheel knuckle.

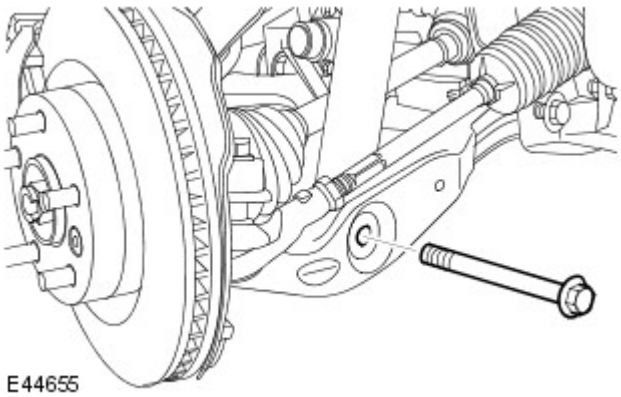
- Tighten the lower arm ball joint retaining nut to 115 Nm (85 lb.ft).



3. Set the height distance between the centre of the halfshaft end and the edge of the fender trim to 466 mm (18.34").

4. Tighten the lower arm bolts to 275 Nm (203 lb.ft).

- Align the bolts to the marks made previously.



5. Connect the shock absorber and spring assembly to the lower arm.

- Tighten the nut and bolt to 300 Nm (221 lb.ft).

6. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

7. Carry out the wheel alignment procedure.

Published: 11-May-2011

Front Suspension - Upper Arm Bushing

Removal and Installation

Special Tool(s)	
204-532/1  E55136	Receiver cup upper arm bushes 204-532/1
204-532/2  E55137	Remover upper arm bushes 204-532/2
204-532/3  E55138	Installer upper arm front bush 204-532/3
204-532/4  E55139	Installer upper arm rear bush 204-532/4

Removal

- NOTE: The bushings must be replaced in pairs, LH and RH sides.

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

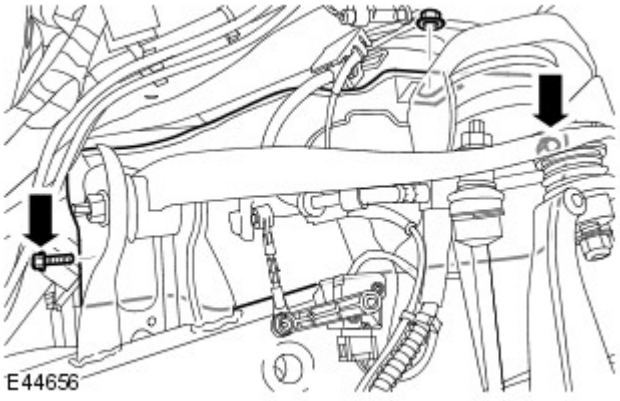
Raise and support the vehicle.

2. Remove the front wheels and tires.

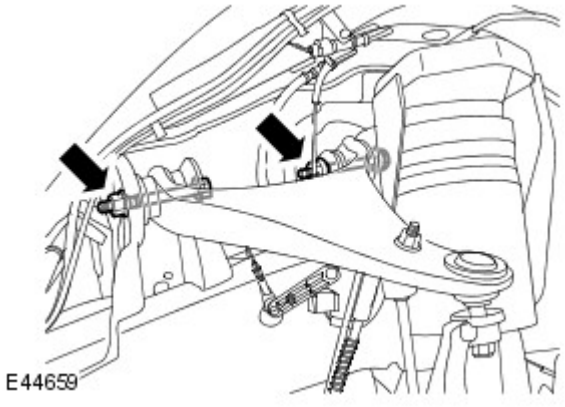
3. Remove the LH upper arm.
For additional information, refer to: Upper Arm (204-01 Front Suspension, Removal and Installation).

4. Release the heat shield for access to the upper arm bolts.

- Remove the nut.
- Remove the forward bolt and loosen the rearward bolt.



5. Loosen the upper arm bolts.

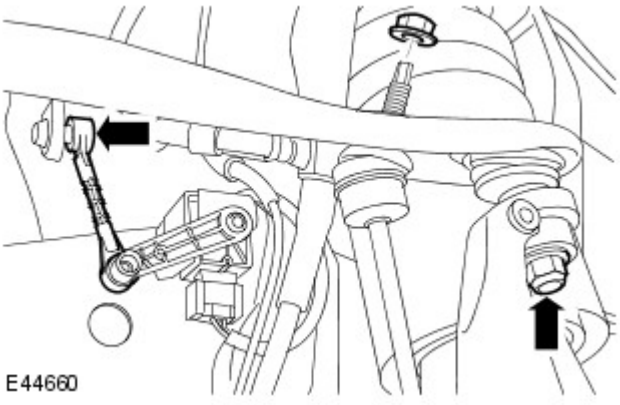


6. Disconnect the height sensor link arm.

7. CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Remove the stabilizer bar link nut.

- Discard the nut.

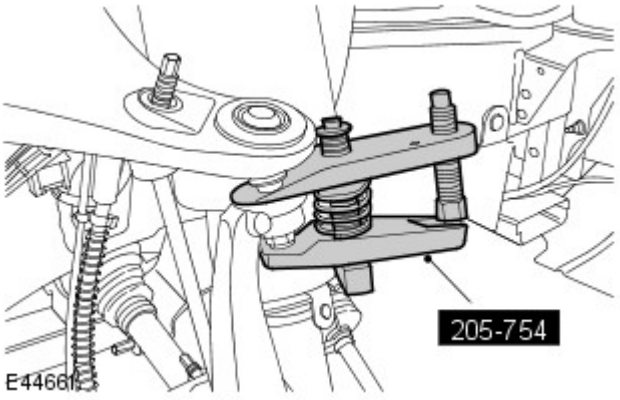


8. CAUTION: To prevent the wheel knuckle falling outwards and disconnection of the halfshaft inner joint, support the wheel knuckle.

Loosen the upper arm retaining nut.

9. Using the special tool, release the upper arm ball joint.

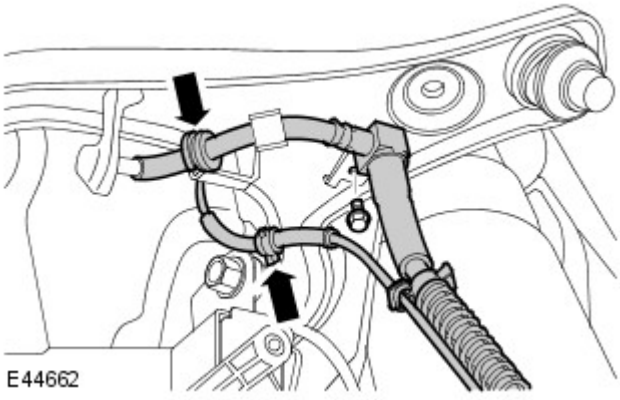
- Remove and discard the retaining nut.



10. Release the brake hose from the upper arm.

11. Release the wheel speed sensor lead from the upper arm.

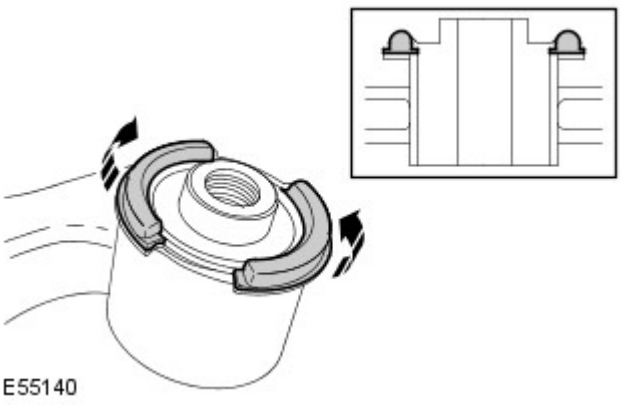
12. Remove the RH upper arm.



13. Note the position of the bushing in relation to the upper arm.

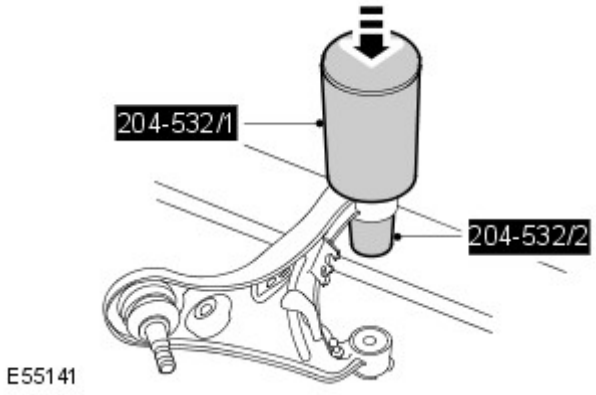
14. CAUTION: The bush flanges need to be removed to allow bush removal.

Using a suitable tool, bend over the bush flanges.



15. Using a hacksaw, remove the flange from the bushing, making sure the upper arm is not damaged.

16. Using the special tools, remove and discard the upper arm bushings.



Installation

1. CAUTION: Make sure the correct special tool is used to install the bushings to the correct depth.

Using the special tools, install the upper arm rear bushings.

- Align the arrow on the bush with the mark, previously made on the upper arm.

2. Using the special tools, install the upper arm front bushings.

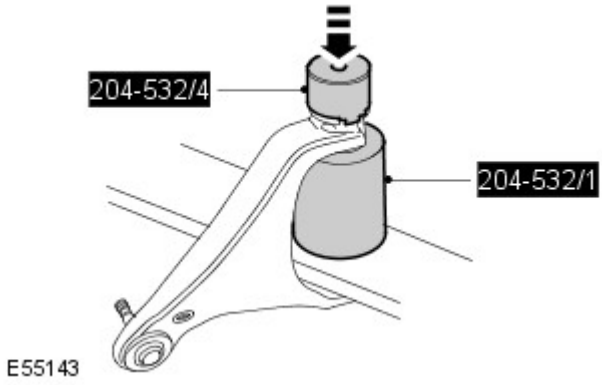
- Align the arrow on the bush with the mark, previously made on the upper arm.

3. Install the RH upper arm.

- Fit the bolts but do not fully tighten at this stage.

4. Secure the brake hose to the upper arm.

- Tighten the bolt to 22 Nm (17 lb.ft).



5. Secure the wheel speed sensor lead to the upper arm.

6. Connect the upper arm and wheel knuckle.

- Install a new nut and tighten to 70 Nm (52 lb.ft).

7. Secure the stabilizer bar link.

- Install a new nut and tighten to 115 Nm (85 lb.ft).

8. Connect the height sensor link arm.

9. Set the height distance between the centre of the halfshaft end and the edge of the fender trim to 466 mm (18.34").

10. Tighten the 2 upper arm nuts and bolts to 175 Nm (129 lb.ft).

11. Secure the heat shield.

12. Install the LH upper arm.
For additional information, refer to: Upper Arm (204-01 Front Suspension, Removal and Installation).

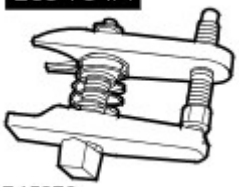
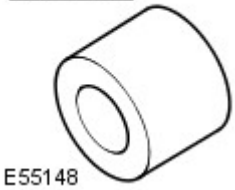
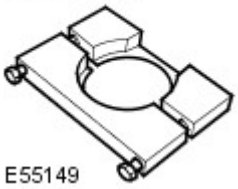
13. Install the front wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 23-Sep-2011

Front Suspension - Lower Arm Bushing

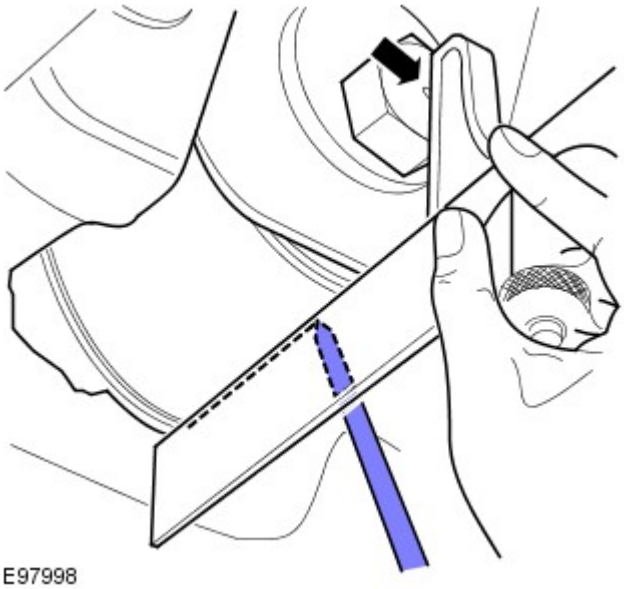
Removal and Installation

Special Tool(s)	
204-536/1  E55144	Receiver front lower arm front bush 204-536/1
204-536/2  E55145	Remover front lower arm front bush 204-536/2
204-536/3  E55146	Installer front lower arm front bush 204-536/3
205-754A  E45276	Ball joint separator 205-754(LRT-54-027)
204-535/1  E55147	Receiver lower arm rear bush 204-535/1
204-535/2  E55148	Remover lower arm rear bush 204-535/2
204-535/4  E55149	Remover plate lower arm rear bush 204-535/4

204-535/3  E55150	Installer lower arm rear bush 204-535/3
204-535/5  E55151	Installer/depth setter lower arm rear bush 204-535/5

Removal

- NOTE: If installing the front bushes, both front bushes must be replaced.
- NOTE: If installing the rear bushes, both rear bushes must be replaced.
- NOTE: Take note of the fitted position of the bush.


E97998

1. Make sure that the tire pressures are correct and that the vehicle is at the correct ride height.
For additional information, refer to: Ride Height Adjustments (204-05 Vehicle Dynamic Suspension, General Procedures).

2. Mark the position of the bushing in relation to the lower arm.

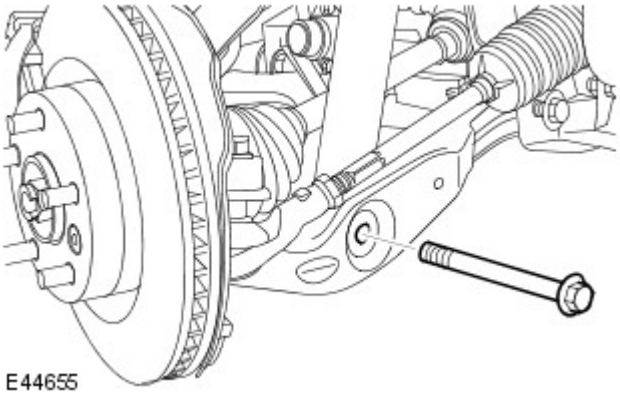
1. Using a spirit level type engineers square, align through the center of the bolt head retaining the lower arm rear bush with a perpendicular drop.
2. Align the rule of the engineers square along the lowest point on the circumference of the lower arm rear bush boss.
3. Apply a piece of tape to the arm and mark a horizontal line along the underside of the lower arm rear bush boss (parallel with the bush axis).
4. Make sure that the process is carried out on both right-hand side and left-hand side.

3. 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.

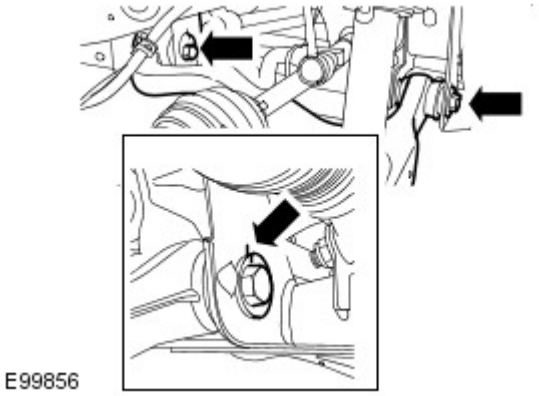
4. Remove the wheels and tires.

5. Remove the RH lower arm.
For additional information, refer to: Lower Arm (204-01 Front Suspension, Removal and Installation).


E44655

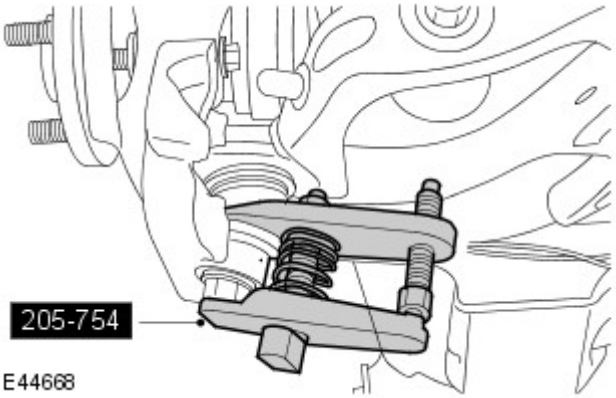
6. Disconnect the shock absorber and spring assembly from the LH lower arm.

- Remove the nut and bolt.


E99856

7. Mark the position of the bolts in relation to the chassis brackets.

- Remove the 2 bolts.



E44668

8. Remove the LH lower ball joint retaining nut.

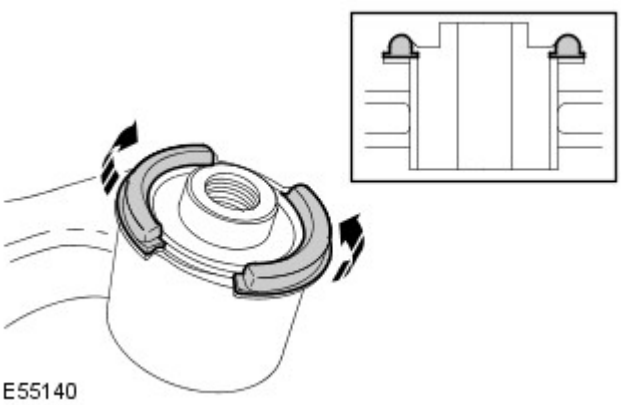
9. Using the special tool, release the LH lower ball joint from the steering knuckle.

10. Remove the LH lower arm.

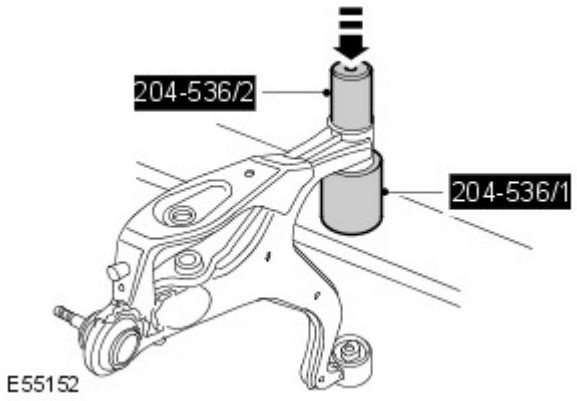
11. Note the position of the bushing in relation to the lower arm.

12. CAUTION: The bush flanges need to be removed to allow bush removal.

Remove the lower arm front bushing flanges.

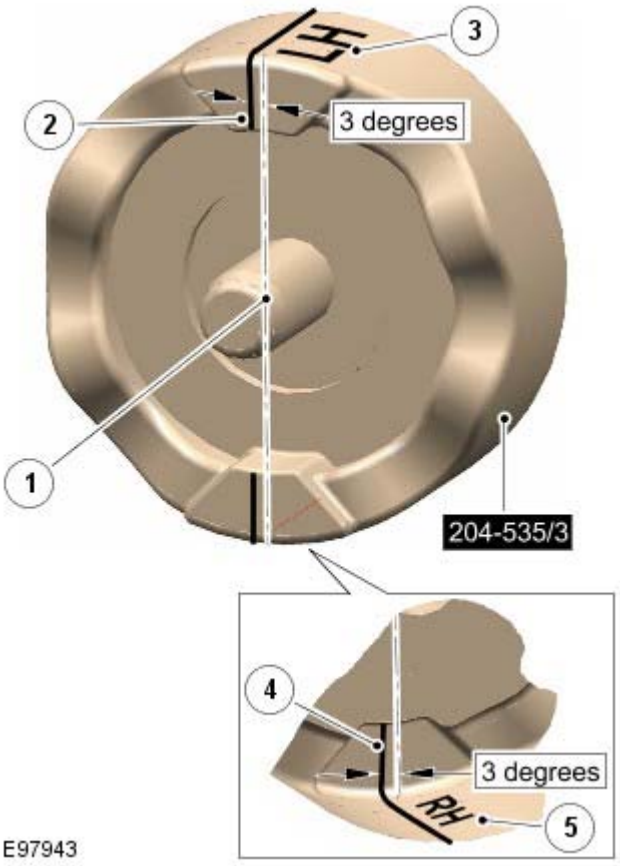

E55140

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

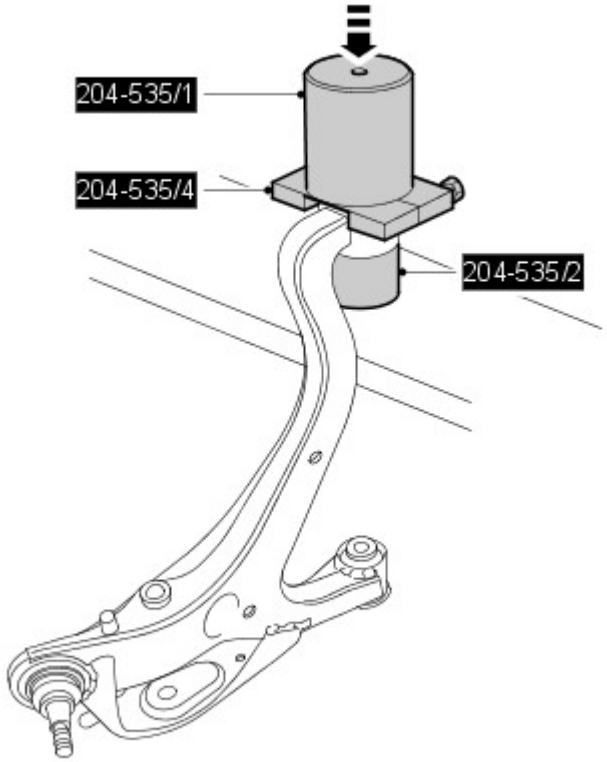


14. Apply alignment guide lines to installer tool (204-535/3).

1. Mark center line on installer tool.
2. Mark line across top surface 3 degrees to the left of center line.
3. Mark 'LH' on top surface.
4. Mark line across bottom surface 3 degrees to the left of the center line.
5. Mark 'RH' on bottom surface.

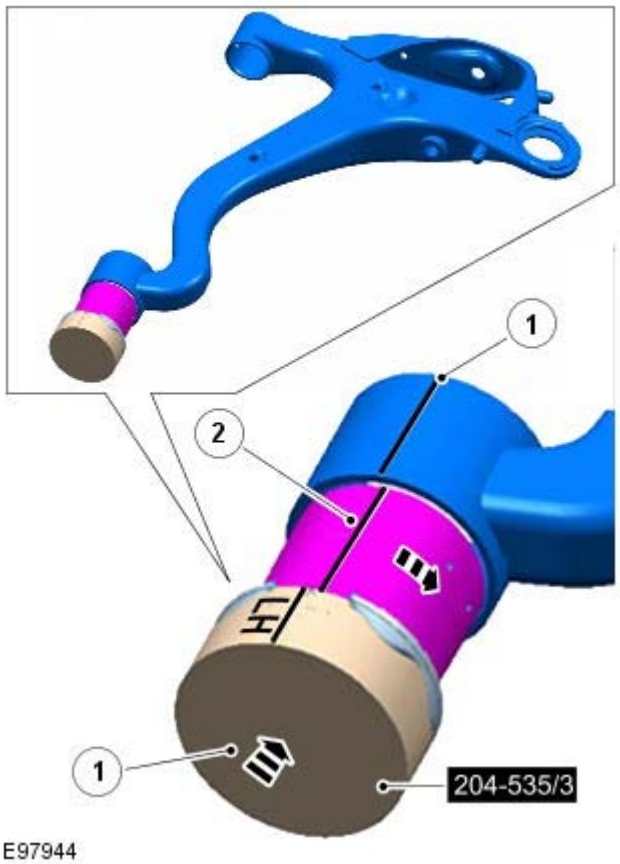


15. Using the special tools, remove and discard the lower arm rear bushings.



E55153

Installation



E97944

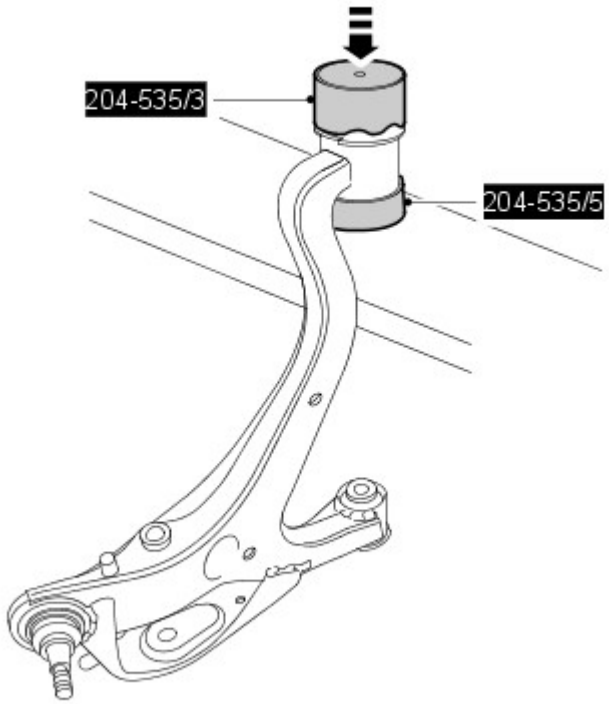
1. CAUTION: Make sure the bush is correctly aligned.

Mark the position of the bushing in relation to the lower arm.

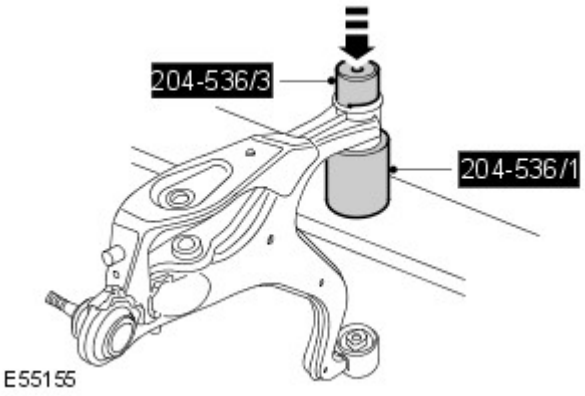
1. Make sure the correct marked side line 'RH' or 'LH' on the special tool (204-535/3) is aligned with the scribed line on the RH or LH bush to be installed.
2. Extend the line from the installer tool onto the bush using a marker pen. Using the marked line, align the bush to the lower arm before installing the bush.

2. CAUTION: Make sure the correct special tool is used to install the bushings to the correct depth.

Using the special tools, install the lower arm rear bushings.



E55154



E55155

3. CAUTION: Make sure the bush is correctly aligned.

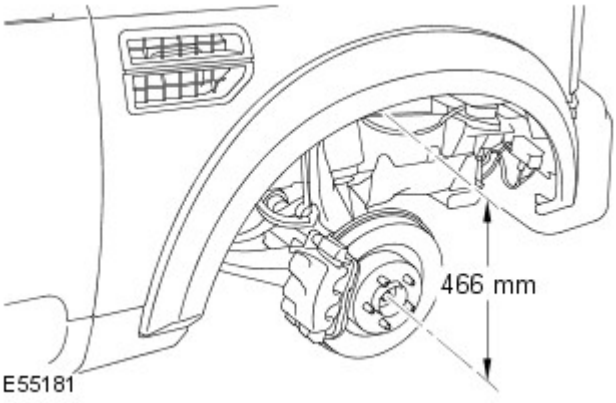
Using the special tools, install the lower arm front bushings

4. Install the LH lower arm.

- Fit the bolts but do not fully tighten at this stage.

5. Connect the shock absorber and spring assembly to the lower arm.

- Tighten the nut and bolt to 300 Nm (221 lb.ft).



6. Set the height distance between the centre of the halfshaft end and the edge of the fender trim to 466 mm (18.34").

7. Tighten the lower arm bolts to 275 Nm (203 lb.ft).

- Align the bolts to the marks made previously.

8. Connect the shock absorber and spring assembly to the lower arm.

- Tighten the nut and bolt to 300 Nm (221 lb.ft).

9. Install the RH lower arm.
For additional information, refer to: Lower Arm (204-01 Front Suspension, Removal and Installation).

10. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

11. Carry out the wheel alignment procedure.

Published: 11-May-2011

Front Suspension - Shock Absorber and Spring AssemblyTDV6 2.7L Diesel

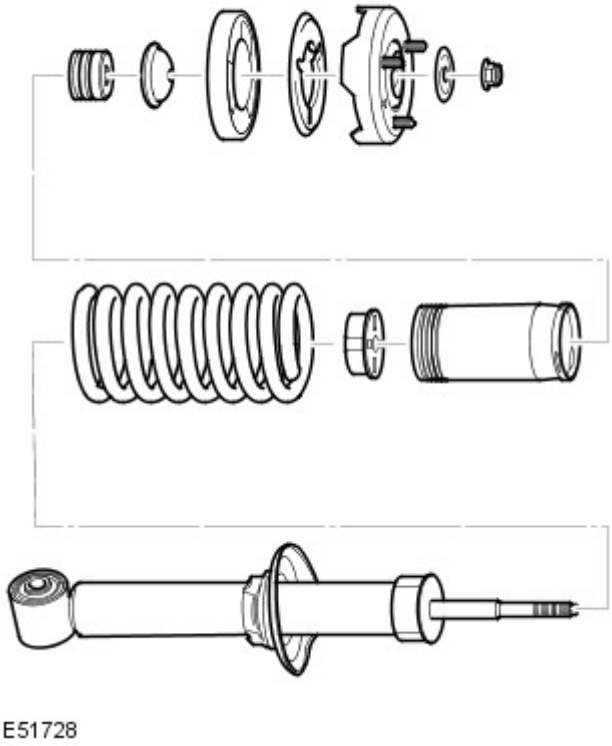
Disassembly and Assembly

Disassembly

- WARNINGS:

Ensure the spring compressor Safe Working Load (SWL) meets or exceeds the spring rating quoted in the Specifcations section.
For additional information, refer to: Specifications (204-00 Suspension System - General Information, Specifications).

Always follow the spring compressor manufacturer's instructions.



E51728

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: Shock Absorber and Spring Assembly (204-01 Front Suspension, Removal and Installation).

3. Install a suitable spring compressor in a vise.

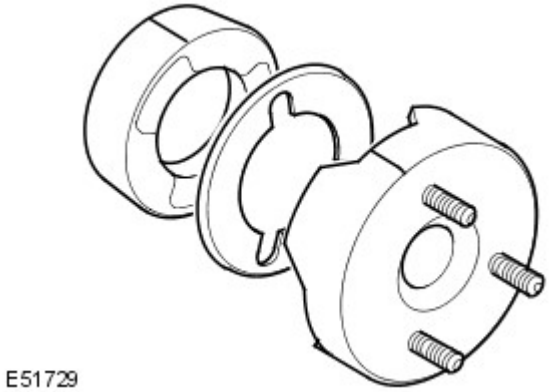
4. Install the shock absorber and spring assembly in the spring compressor.

- Compress the spring just sufficiently to relieve the spring tension.

5. Remove the shock absorber.

- Restrain the shock absorber spindle, remove and discard the nut.
- Remove the upper bush rebound plate and upper bush.
- Remove the upper mounting assembly.
- Remove the dust tube and rebound plate assembly.
- Remove the spring aid.

6. Remove the spring from the spring compressor.

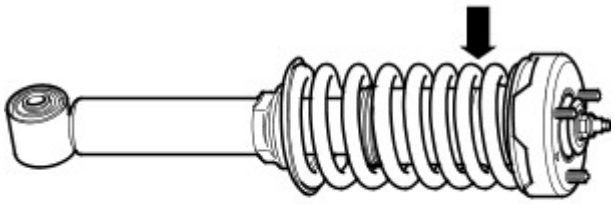


E51729

7. Clean and inspect the components for deterioration.

- To aid reassembly, mark the position of the rubber insulator in relation to the upper mounting plate.
- Remove the rubber insulator.
- Remove the spacer.
- Remove the rebound plate from the dust tube.

Assembly



E51726

1. Install the spring in the spring compressor.

- Make sure the spring is installed with the close coils positioned towards the top of the shock absorber.

2. Install the spring aid.

3. Install the dust tube.

- Install the rebound plate into the dust tube.

4. Install the shock absorber.

- Make sure the spring is correctly located in the spring seat.

5. Install the upper mounting.

- Install the spacer and rubber insulator, making sure the spacer drops over the stud heads and the insulator is aligned with the mark made previously.
- Install the upper bush and upper bush rebound plate.
- Install a new nut and tighten to 98 Nm (72 lb.ft).

6. Install the shock absorber and spring assembly.
For additional information, refer to: Shock Absorber and Spring Assembly (204-01 Front Suspension, Removal and Installation).

Published: 11-May-2011

Rear Suspension -

Coil Spring Suspension

Item	Specification
Road spring color coding - 5 Seat Model:	
	BROWN/WHITE
	BROWN/GREEN
	BROWN/ORANGE
	BROWN
Road spring color coding - 7 Seat Model:	
	RED/WHITE
	RED/GREEN
	RED/ORANGE
	RED

Note: The first color indicates the fitted position of the spring on the vehicle i.e. rear. The secondary color identifies the thickness of the isolator which is fitted to a particular spring to ensure that the vehicle ride height is maintained within specified limits. Replacement springs will be supplied with the appropriate isolator fitted.

General Specifications

Item	Specification
Gap between underside of the toe link rubber boot and the integrated body frame bracket	10.0 mm (0.394 in)
Height between the center of the halfshaft end and the edge of the fender trim	485 mm (19.10 in)

Torque Specifications

Description	Nm	lb-ft
Toe link bolt	175	129
* Toe link inner ball joint retaining nut	133	98
* Stabilizer bar link nuts	115	85
Stabilizer bar clamp bolts	62	46
Body mount retaining bolts	133	83
Shock absorber to the lower suspension arm nut and bolt	300	221
Shock absorber to suspension turret nuts	70	52
Lower arm to wheel knuckle bolt	175	129
Lower arm bolts	275	203
*+ Halfshaft retaining nut	350	258
Upper arm to wheel knuckle nut	133	98
Upper arm front bolt	175	129
Upper arm rear bolt	275	203
Brake tube unions	18	13
Rear camber adjusting bolts	133	98
Wheel speed sensor	9	7
Brake disc dust shield bolts	9	7
Parking brake cable coupling	8	6
Road wheel nuts	140	103

*** New nut must be installed**

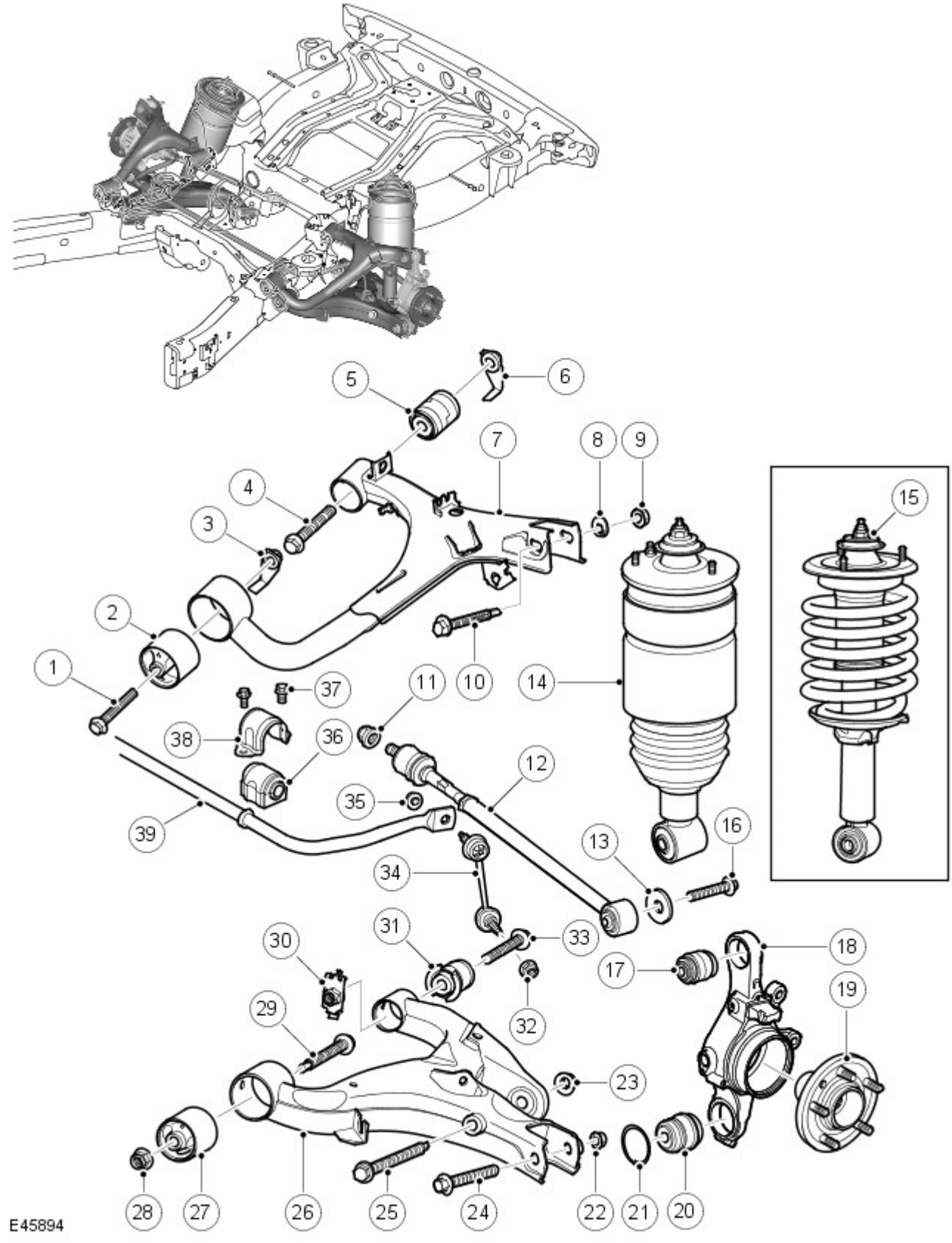
+ Nut must be staked after tightening

Published: 11-May-2011

Rear Suspension - Rear Suspension

Description and Operation

Rear Suspension Component Location



Item	Part Number	Description
1	-	Bolt (Upper control arm forward bush)
2	-	Bush - Forward (Upper control arm)
3	-	Caged nut (Upper control arm forward bush)
4	-	Bolt (Upper control arm rearward bush)

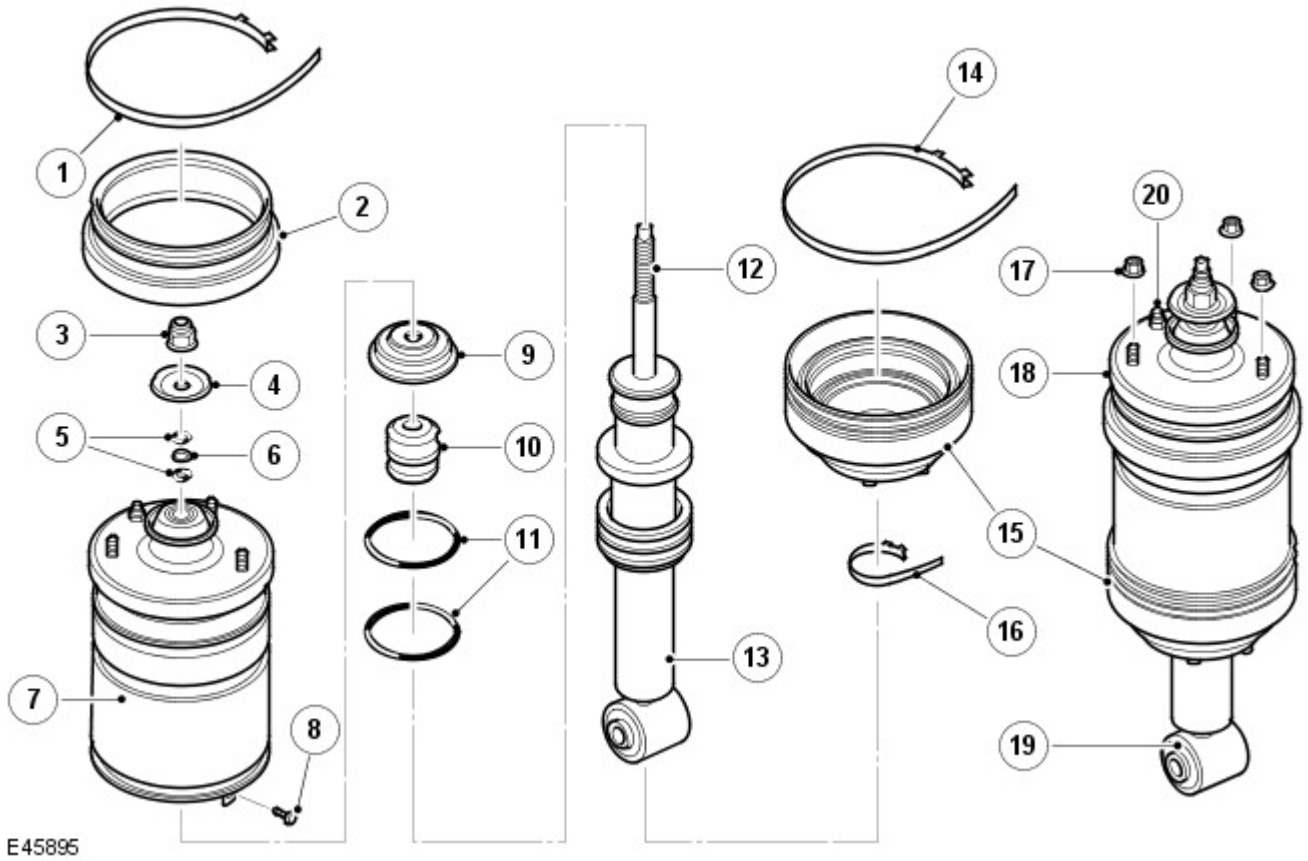
5	-	Bush - Rearward (Upper control arm)
6	-	Caged nut (Upper control arm rearward bush)
7	-	Upper control arm
8	-	Eccentric washer (Wheel knuckle upper ball joint)
9	-	Nut (Wheel knuckle upper ball joint)
10	-	Bolt (Wheel knuckle upper ball joint)
11	-	Special nut (Adjustable transverse toe link)
12	-	Adjustable transverse toe link
13	-	Washer (Adjustable transverse toe link)
14	-	Damper module assembly (Air)
15	-	Damper module assembly (Coil)
16	-	Bolt (Adjustable transverse toe link)
17	-	Ball joint (Wheel knuckle upper)
18	-	Wheel knuckle and bearing assembly
19	-	Wheel hub
20	-	Stake nut
21	-	Circlip
22	-	Wheel bearing
23	-	Ball joint (Wheel knuckle lower)
24	-	Circlip (Wheel knuckle lower ball joint)
25	-	Self-locking nut (Wheel knuckle lower ball joint)
26	-	Self-locking nut (Damper assembly lower attachment)
27	-	Bolt (Wheel knuckle lower ball joint)
28	-	Bolt (Damper assembly lower attachment)
29	-	Lower control arm
30	-	Bumpstop clip
31	-	Self-locking nut (Lower control arm forward bush)
32	-	Bush - Forward (Lower control arm)
33	-	Bolt (Lower control arm forward bush)
34	-	Nut and retainer (Lower control arm rearward bush)
35	-	Self-locking nut (Anti-roll bar link to lower control arm)
36	-	Bolt (Lower control arm rearward bush)
37	-	Bush - Rearward (Lower control arm)
38	-	Anti-roll bar link
39	-	Self-locking nut (Anti-roll bar link to anti-roll bar)
40	-	Anti-roll bar bush
41	-	Bolt (Anti-roll bar bracket)
42	-	Anti-roll bar
43	-	Anti-roll bar bracket
44	-	Bumpstop clip

GENERAL

The independent rear suspension offers a reduction in unsprung weight over the beam axle design fitted to previous Land Rover models. The rear suspension comprises an upper control arm, a lower control arm, a wheel knuckle and wheel hub, two spring damper modules and an anti-roll bar and links assembly. The damper modules use a similar design of damper which can be fitted with either a coil spring or an air spring.

The rear suspension control arms have been designed to give maximum ground clearance and also allow for the adjustment of the camber using a cam bolt and adjustment of toe and bump steer via an adjustable transverse link.

DAMPER MODULE - AIR SUSPENSION



Item	Part Number	Description
1	-	Strap*
2	-	Upper gaitor*
3	-	Self-locking nut*
4	-	Rebound washer*
5	-	O-ring - Damper rod*
6	-	Spacer - Damper rod*
7	-	Air spring*
8	-	Retaining pin - Air spring sleeve support*
9	-	Bump washer*
10	-	Spring aid*
11	-	O-ring - Air sleeve support (2 off)*
12	-	Damper rod
13	-	Damper assembly
14	-	Strap*
15	-	Lower gaitor*
16	-	Strap*
17	-	Self-locking nut (3 off)
18	-	Top mount assembly
19	-	Bush
20	-	Voss connector

• NOTE: * Shows service items

The damper module comprises an air spring assembly, top mount and a damper assembly. The damper and air spring are only serviceable as complete assemblies.

Damper

The damper assembly is a twin tube design with the conventional coil spring replaced by the air spring. The lower end of the damper is fitted with a bush and is attached to the lower control arm with a bolt and nut.

The damper functions by restricting the flow of hydraulic fluid through internal galleries within the damper. The damper rod moves axially within the damper, its movement limited by the flow of fluid through the galleries, providing damping of undulations in the terrain. The damper rod is sealed at its exit point from the damper body to maintain the fluid within the unit and to prevent the ingress of dirt and moisture. The seal also incorporates a wiper to keep the rod clean.

Air Spring

The air spring is similar in design to the air spring used on the front suspension.

The air spring comprises an aluminium restraining cylinder, top mount, spring aid, air sleeve and an inner support sleeve.

The air sleeve is made from a flexible rubber material which allows the sleeve to roll up and down the air spring piston as the vehicle changes height. The air sleeve is attached to the restraining cylinder and the support sleeve with crimp rings which provide an air tight seal. The support sleeve contains a seal carrier which has two O-rings sealing the support sleeve

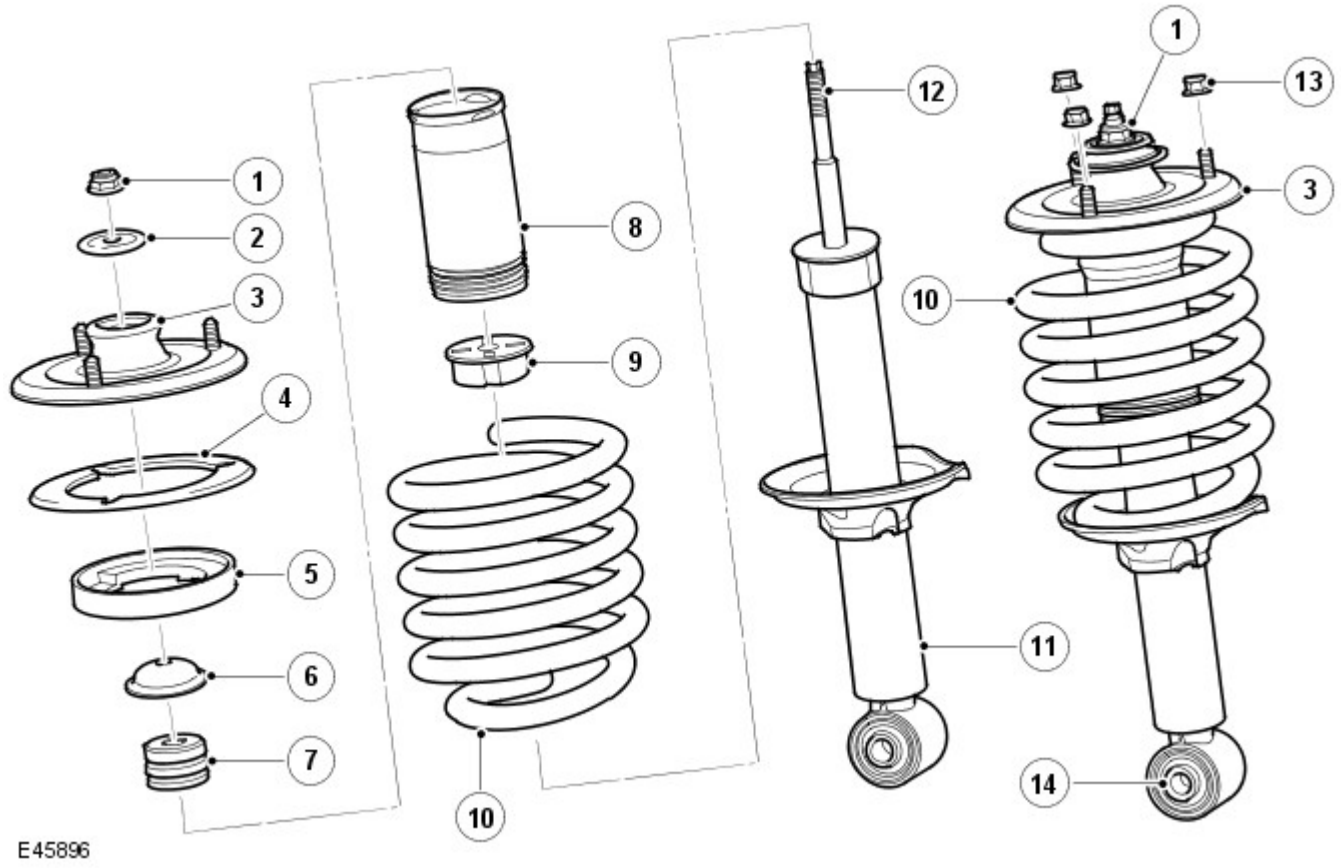
and two O-rings sealing to the damper body. The top of the air sleeve is crimped to the top mount which attaches to a mounting on the chassis with 3 integral studs and self-locking nuts.

A spring aid is fitted to the damper rod and prevents the top mount contacting the top of the damper during full suspension compression and assists the suspension tune. The lower end of the air spring is located over the damper body and seats on a fabricated seat on the damper body. The air sleeve is positively attached to the seat with a retaining pin. The damper rod is located through a central hole in the top mount. The rod is threaded at its outer end and accepts a self-locking nut which secures the air spring to the damper rod.

The top mount is an integral part of the air spring and is fitted with a bush and rebound washer which are located between the top mount plate and the damper rod. A self locking nut secures the damper rod to the top mount. The top mount attaches to a housing on the chassis with 3 integral studs and self-locking nuts. The top mount also incorporates a 6 mm Voss air fitting which allows for the attachment of the air harness.

The air spring is fitted with two gaitors. The upper gaitor is fitted between the top mount and the air spring restraining cylinder. The lower gaitor is secured to the lower end of the restraining cylinder and the damper body with metal straps. The gaitors prevent dirt and debris becoming trapped between the air sleeve and the restraining cylinder.

DAMPER MODULE - COIL SPRING SUSPENSION



Item	Part Number	Description
1	-	Self locking nut
2	-	Rebound washer
3	-	Top mount assembly
4	-	Spring spacer (selective)
5	-	Spring isolator
6	-	Bump washer
7	-	Spring aid
8	-	Dust tube
9	-	Bump cup
10	-	Coil spring
11	-	Damper
12	-	Damper rod
13	-	Self locking nut (3 off)
14	-	Bush

The coil spring damper module comprises a damper, a coil spring and a top mount.

Damper

The damper assembly is a similar design to the front suspension damper, with a twin tube design with an spring seat attached to the damper body. The lower end of the damper is fitted with a bush and is attached to the lower control arm with a bolt and self-locking nut. The damper functions by restricting the flow of hydraulic fluid through internal galleries within the damper.

The damper rod moves axially within the damper, its movement limited by the flow of fluid through the galleries, providing

damping of undulations in the terrain. The damper rod is sealed at its exit point from the damper body to maintain the fluid within the unit and to prevent the ingress of dirt and moisture. The seal also incorporates a wiper to keep the rod clean.

The damper rod is located through a central hole in the top mount. The rod is threaded at its outer end and a self-locking nut secures the top mount to the damper rod.

A spring aid is fitted to the damper rod and prevents the top mount contacting the top of the damper during full suspension compression and assists the suspension tune.

Spring and Top Mount

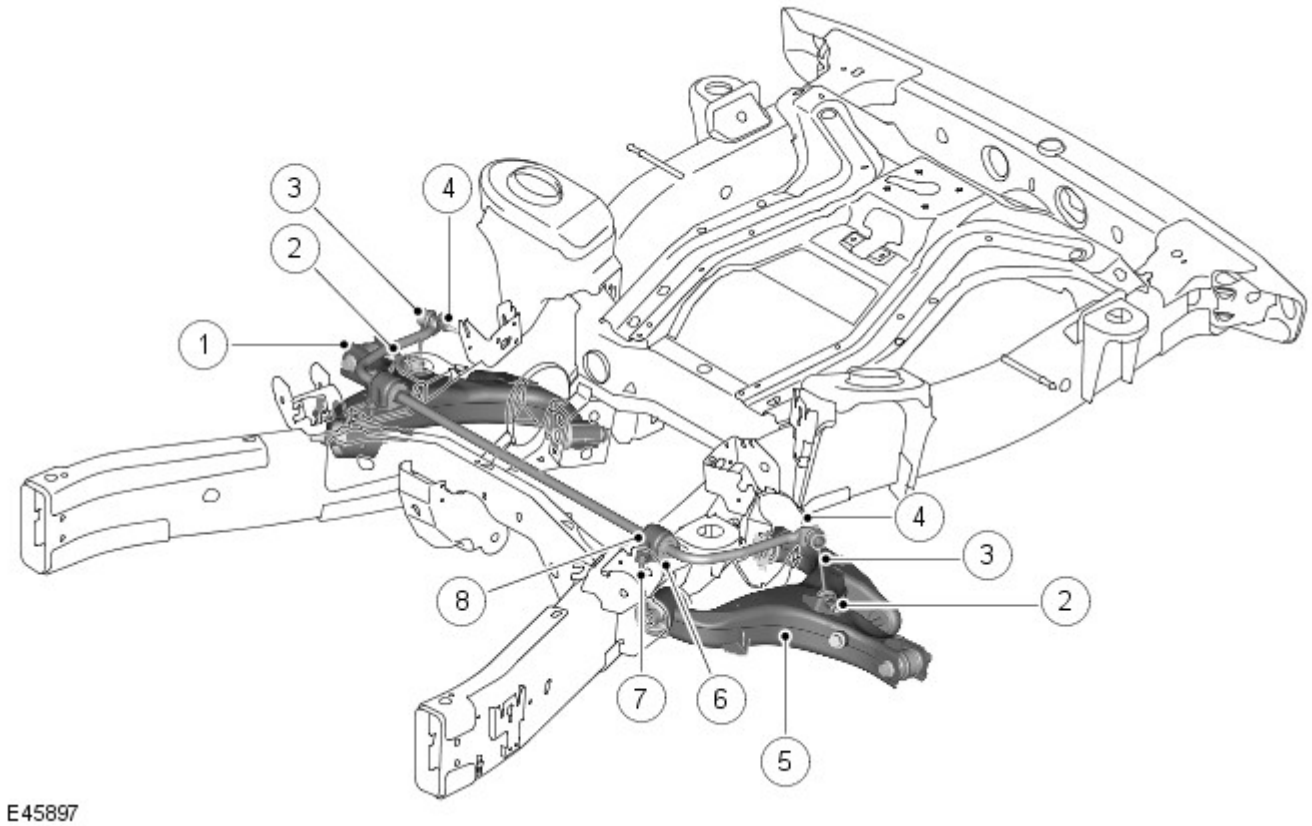
The coil spring fitted differs with vehicle specification. Each spring is color coded to identify its rating and fitment requirements.

The coil spring is located in a spring seat which is an integral part of the damper body. The design of the spring seat prevents the spring rotating. The opposite end of the coil spring is located in a spring isolator which is fitted in the top mount. The spring isolator is made from rubber and prevents any noise produced during spring and damper compression/extension from being transmitted to the vehicle body. Three types of spring isolator are available which allow for differences in vehicle specification.

The top mount is fitted with a bush and a rebound washer which are located between the top mount plate and the damper rod. The top mount is secured to the damper rod with a self-locking nut. The top mount attaches to a housing on the vehicle chassis with three integral studs and self-locking nuts.

The spring is fitted with spring spacers which are located between the spring isolator and the top mount. The spring spacers control the length of the spring to maintain the correct trim height. The spring spacers are colour coded and are supplied with a replacement spring.

ANTI-ROLL BAR



E45897

Item	Part Number	Description
1	-	RH lower control arm
2	-	Nut - link to lower control arm (2 off)
3	-	Link (2 off)
4	-	Nut - link to anti-roll bar (2 off)
5	-	LH lower control arm
6	-	Bush (2 off)
7	-	Bolt (4 off)
8	-	Bracket (2 off)

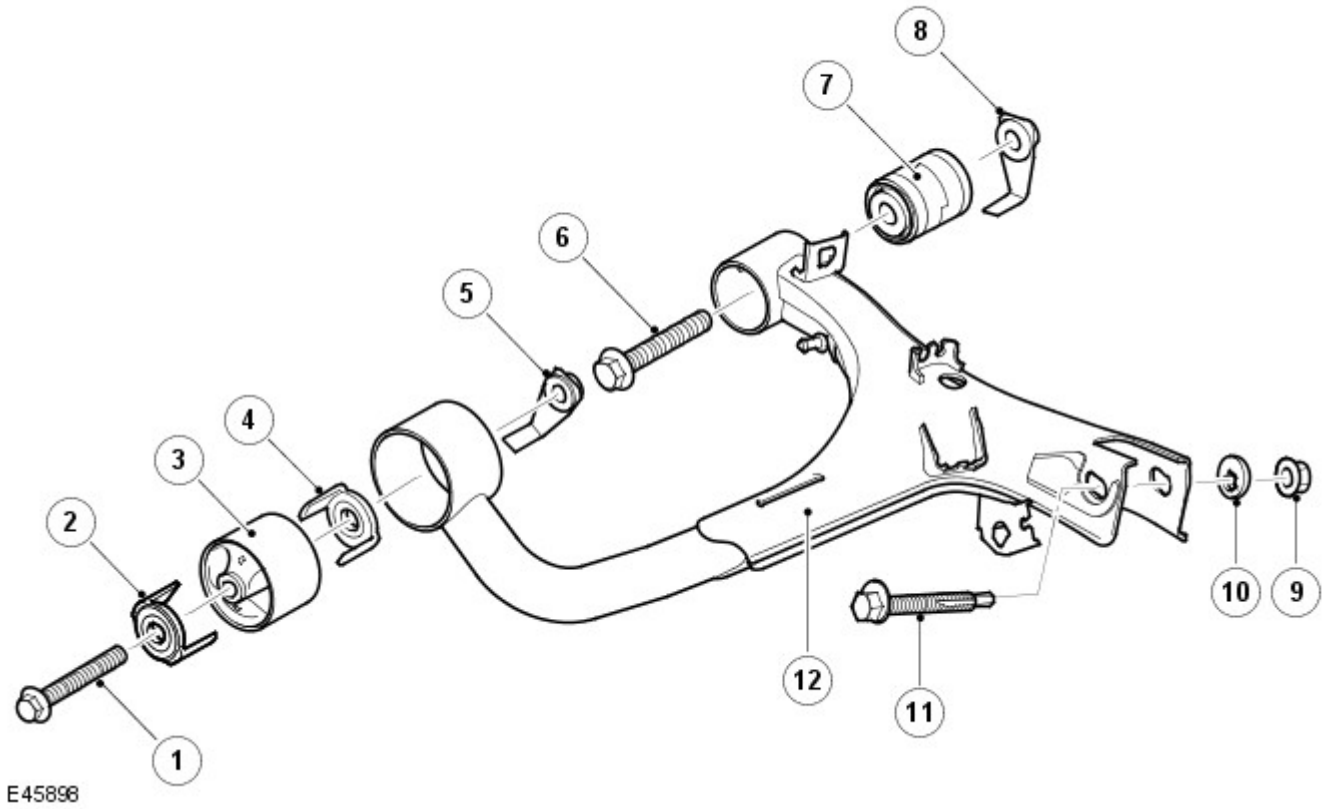
The anti-roll bar is fabricated from heat treated, solid, spring steel bar. The anti-roll bar operates, via a pair of links, from its attachment to the lower control arms.

The anti-roll bar is located on the upper face of a combined body mount and anti-roll bar bracket which is welded to each chassis side member. The anti-roll bar is attached to the brackets with two, Teflon lined bushes. The bushes are fitted with brackets, which are pressed onto the bushes and secured to the chassis brackets with bolts.

The anti-roll bar has crimped, 'anti-shuffle' collars pressed into position on the inside edges of the bushes. The collars prevent sideways movement of the anti-roll bar.

The ends of the anti-roll bar are attached to the lower control arms via links. This allows the anti-roll bar to move with the wheel travel providing maximum effectiveness. Each link has a ball joint at each end. The top ball joint is attached to the link at 90 degrees to the link axis and is located in a hole in the end of the anti-roll bar and secured with a self locking nut. The bottom ball joint is also attached to the link at 90 degrees to the axis of the link and is located a hole in a bracket on the lower control and arm and secured with a self-locking nut. The links are not handed and therefore can be fitted to either side of the anti-roll bar.

UPPER CONTROL ARM

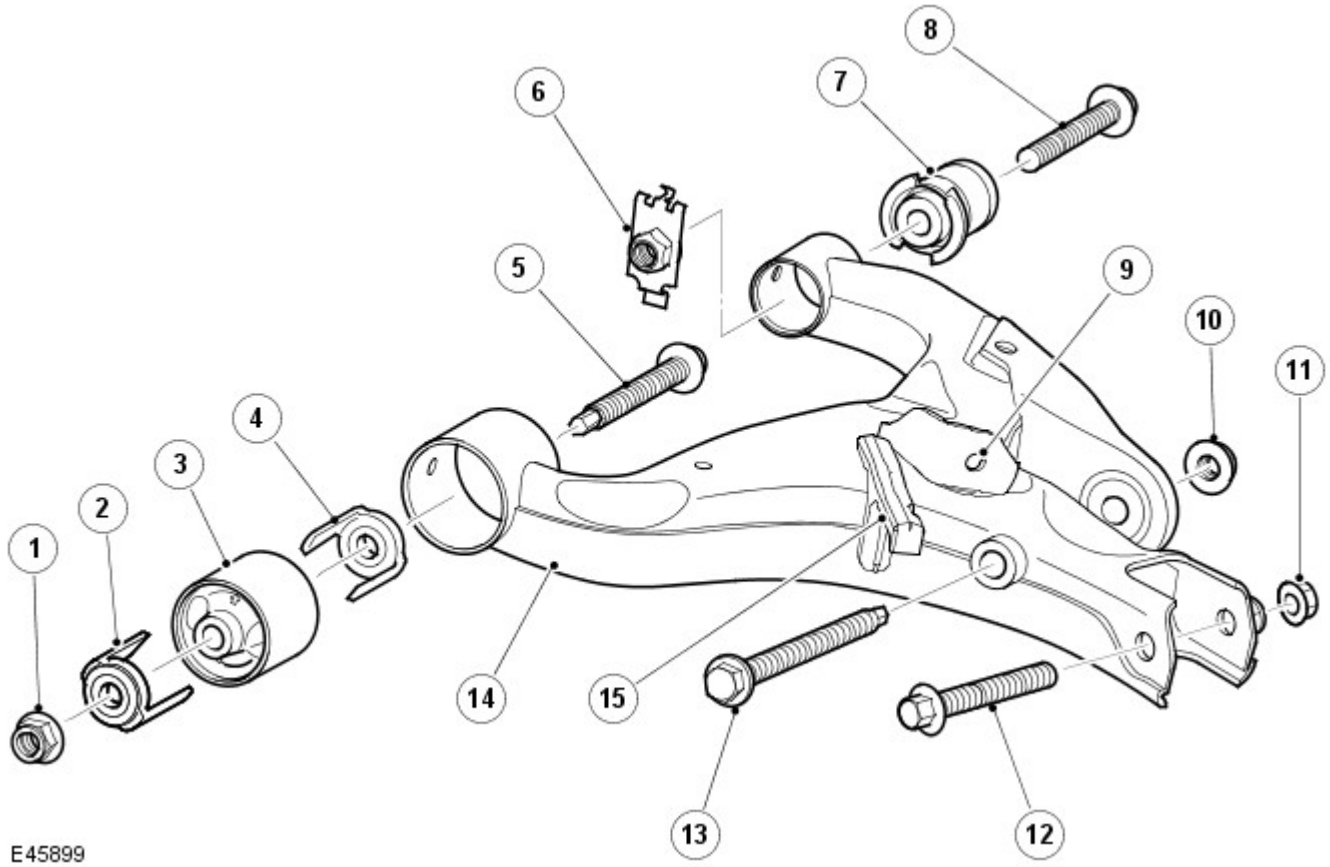


Item	Part Number	Description
1	-	Bolt
2	-	Bumpstop clip
3	-	Forward bush
4	-	Bumpstop clip
5	-	Caged nut
6	-	Bolt
7	-	Rearward bush
8	-	Caged nut
9	-	Self-locking nut - upper knuckle ball joint
10	-	Eccentric washer - upper knuckle ball joint
11	-	Cam bolt - upper knuckle ball joint
12	-	Upper control arm

The upper control arm locates in brackets on the upper surface of each chassis side member. The upper control arm assembly comprises the control arm and two bushes. The upper control arm is a pressed steel fabrication. Its outer end has two brackets with slotted holes which locate the upper ball joint of the knuckle. The ball joint is secured in the upper control arm with a cam bolt, eccentric washer and a self-locking nut. The cam bolt and the eccentric washer allow for the adjustment of the wheel camber.

Two fabricated tubular housings provide the location for the forward and rearward bushes. The bushes, which are pressed into the housings, locate between brackets on the chassis side members and are secured with bolts and caged nuts through metal inserts in the centre of the bushes.

LOWER CONTROL ARM



Item	Part Number	Description
1	-	Self-locking nut
2	-	Clip
3	-	Forward bush
4	-	Clip
5	-	Bolt
6	-	Nut and retainer
7	-	Rearward bush
8	-	Bolt
9	-	Anti-roll bar link bracket
10	-	Self-locking nut - damper lower attachment
11	-	Self-locking nut - knuckle upper ball joint attachment
12	-	Bolt - knuckle upper ball joint attachment
13	-	Bolt - damper lower attachment
14	-	Lower control arm
15	-	Jacking bracket (Vehicles with coil springs only)

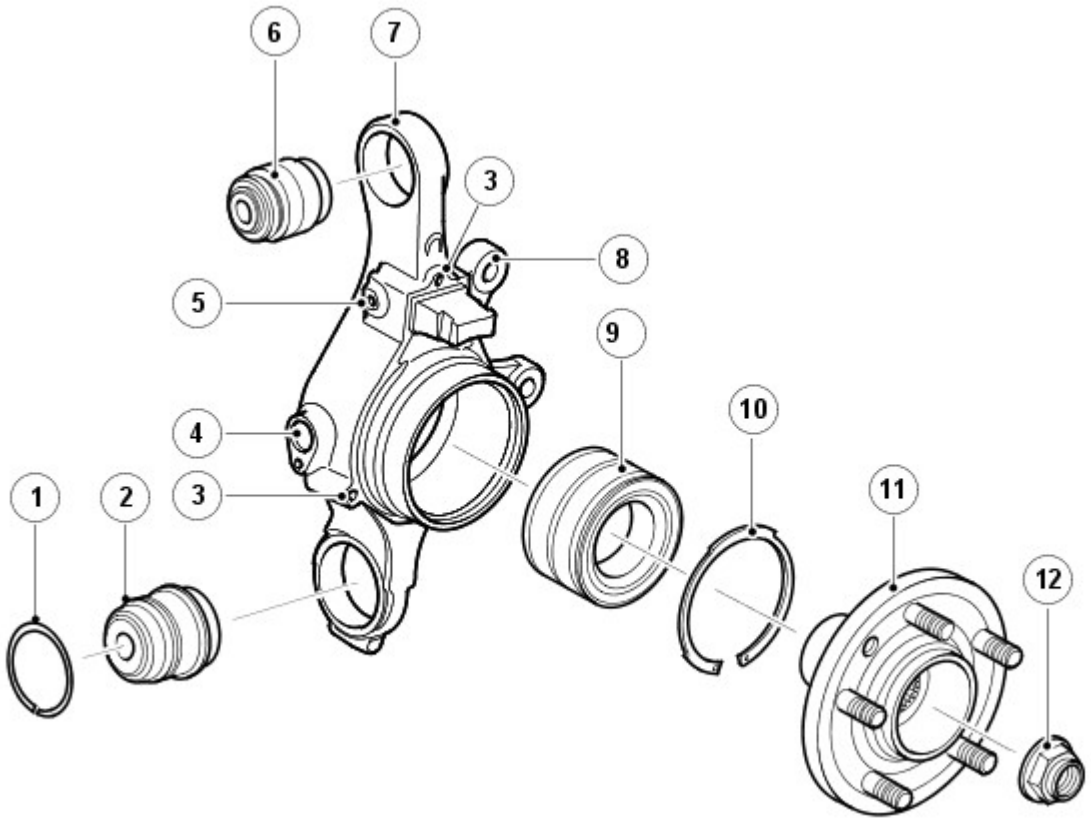
The lower control arm locates in brackets on the lower surface of each chassis side member. The lower control arm assembly comprises the control arm and two bushes. The lower control arm is a pressed steel fabrication. Its outer end has two brackets which locate the lower ball joint of the knuckle. The ball joint is secured with a bolt and self-locking nut. The lower control arm also provides for the attachment of the damper bush which is secured with a bolt and a self-locking nut.

A bracket, welded to the upper surface of the lower control arm, allows for the attachment of the anti-roll bar link, bottom ball joint which is secured with a self-locking nut.

Two fabricated tubular housings provide the location for the forward and rearward bushes. The bushes, which are pressed into the housings, locate between brackets on the chassis side members. The forward bush is secured to the chassis bracket with a bolt and self-locking nut. The rearward bush is secured to the chassis bracket with a bolt and a nut and retainer. The nut and retainer allows for easy installation or removal of the bolt by removing the requirement to hold the self-locking nut when installing or removing the bolt.

On vehicles fitted with coil springs only, a jacking bracket is located on the lower control arm.

WHEEL KNUCKLE, WHEEL HUB AND BEARING ASSEMBLY



E45900

Item	Part Number	Description
1	-	Circlip - lower ball joint
2	-	Ball joint - lower
3	-	Park brake assembly attachment holes
4	-	Wheel speed sensor location
5	-	Wheel speed sensor cable bracket attachment
6	-	Ball joint - upper
7	-	Knuckle
8	-	Brake caliper attachment holes
9	-	Wheel bearing
10	-	Circlip - wheel bearing retention
11	-	Nut - halfshaft
12	-	Wheel hub
13	-	Wheel studs

The wheel knuckle is a machined forging which is located between the upper and lower control arms. The knuckle is fitted with two ball joints which are pressed into the knuckle, with the lower ball joint being secured with a circlip. The ball joints are positioned between brackets on the upper and lower control arms and secured to the arms with a bolt and self-locking nut.

The wheel knuckle provides the location for the rear wheel taper roller bearing, which is pressed into a machined bore and retained with a circlip. The wheel bearing is a serviceable item. The knuckle has a machined bore which provides the location for the wheel speed sensor. Four threaded holes allow for the attachment of the park brake assembly. A cast boss on the knuckle provides positive location for the park brake assembly. Two bosses on the knuckle casting provide the attachment points for the rear brake caliper.

The wheel hub is a machined casting which is pressed into the wheel bearing in the knuckle. The hub has a splined centre bore which mates with corresponding splines on the halfshaft. Five M14 studs are pressed into the wheel hub and provide for the attachment of the road wheel with wheel nuts. Rotation of the halfshaft is passed, via the splines, to the wheel hub which rotates on the taper roller bearing.

Published: 11-May-2011

Rear Suspension - Upper Arm Ball Joint

Removal and Installation

Special Tool(s)	
 E49576	Remover/installer rear upper arm ball joint 204-525/1
 E49575	Remover/installer rear upper arm ball joint 204-525/2
 E49574	Remover/installer rear upper arm ball joint 204-525/3

Removal

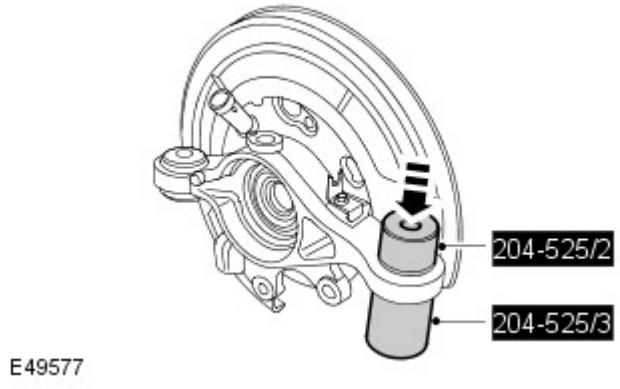
1. WARNING: Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Remove the wheel knuckle.
For additional information, refer to: Wheel Knuckle (204-02 Rear Suspension, Removal and Installation).

3. Using the special tools, remove the ball joint.

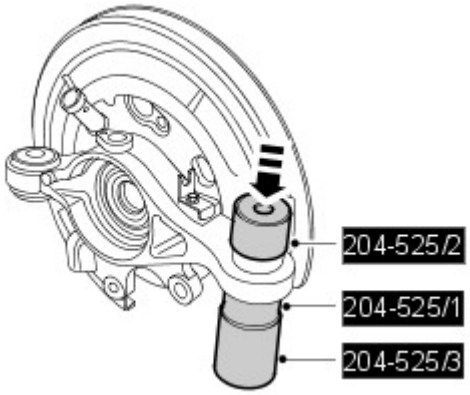
- Position machined face against the special tool.



E49577

Installation

1. Clean the components.



E49578

2. CAUTIONS:

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

⚠ If the push in force is less than 10 kN the wheel knuckle must be replaced.

Using the special tools, install the ball joint.

- Position machined face against the special tool.

3. Install the wheel knuckle.
For additional information, refer to: Wheel Knuckle (204-02 Rear Suspension, Removal and Installation).

4. Install the wheel and tire.

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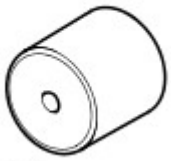
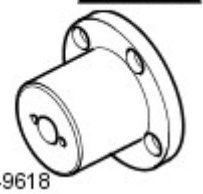
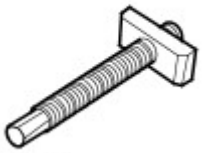
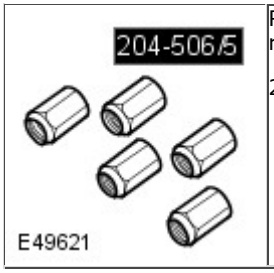
Rear Suspension - Lower Arm Ball Joint

Removal and Installation

Special Tool(s)	
204-516/1  E46795	Ball joint remover/installer 204-516/1 (LRT-64-026/1)
204-516/2  E50960	Ball joint remover/installer 204-516/2 (LRT-64-026/2)
204-516/3  E50961	Ball joint remover/installer 204-516/3 (LRT-64-026/3)
204-516/4  E50962	Ball joint remover/installer 204-516/4 (LRT-64-026/4)
204-506/1  E49618	Halfshaft remover/replacer 204-506/1 (LRT-60-030/1)
204-506/3  E49620	Halfshaft remover/replacer 204-506/3 (LRT-60-030/3)
204-506-01  E49622	Halfshaft installer adapter 204-506-01

	Retainers - halfshaft remover/replacer 204-506/5 (LRT-60-030/5)

Removal

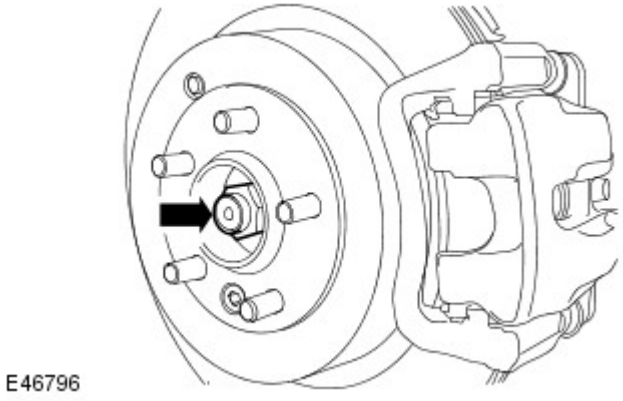
CAUTION: The bolt securing the toe link to the wheel knuckle must not be used more than 5 times. Mark the bolt head with a suitable centre punch.

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.

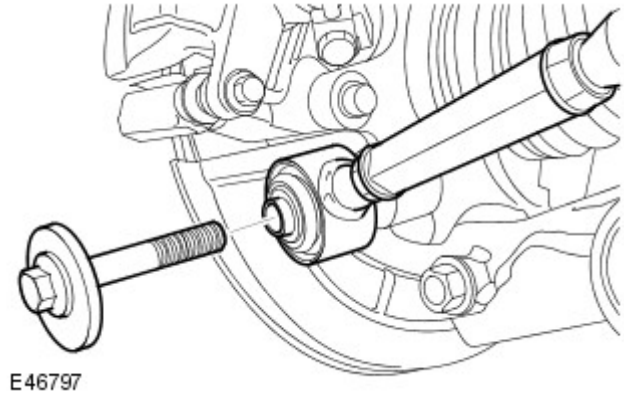
2. Remove the wheel and tire.

3. Loosen the halfshaft retaining nut.

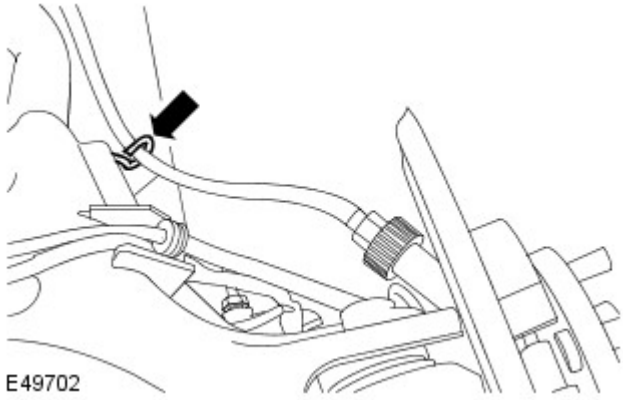


4. Disconnect the toe link.

- Remove the bolt.



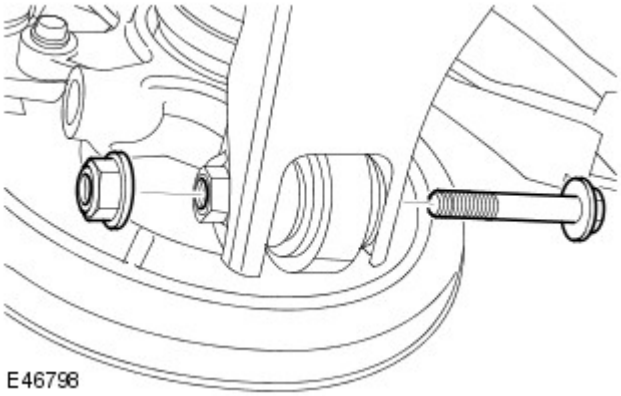
5. Release the parking brake cable from the lower arm.



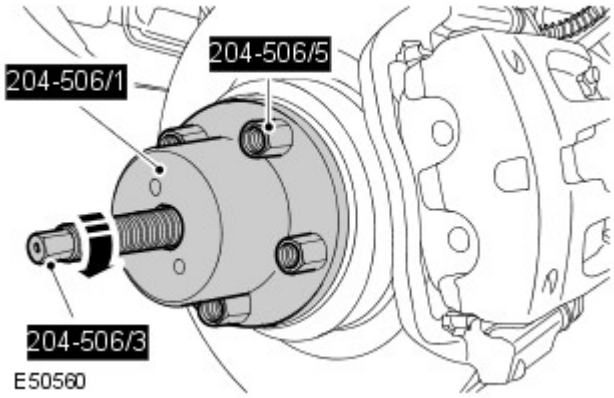
6. Remove the halfshaft retaining nut.

7. Release the knuckle from the lower arm.

- Remove the bolt.


E46798

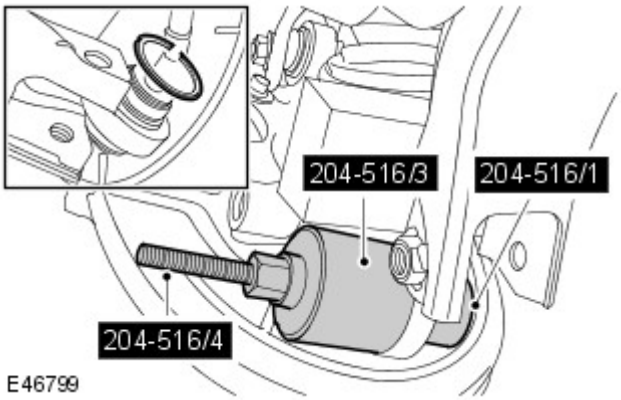
8. Using the special tools, release the halfshaft from the wheel hub.



E50560

9. Using the special tool, remove the lower arm ball joint.

- Support the wheel knuckle to give access to the lower ball joint.
- Remove and discard the snap ring.



E46799

Installation

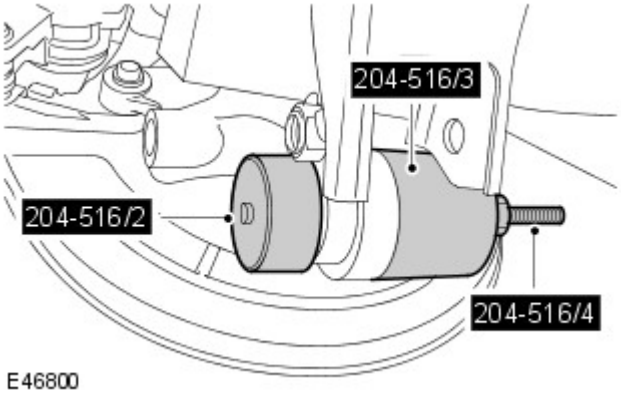
1. CAUTIONS:

If the push in force is less than 17 kN the wheel knuckle must be replaced.

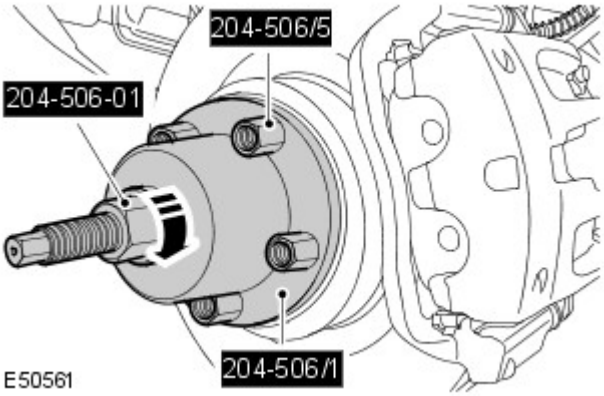
Make sure the ball joint in installed from the chamfered side of the wheel knuckle.

Using the special tool, install the lower arm ball joint.

- Install the snap ring.



E46800



2. Using the special tools, install the halfshaft in the wheel hub.

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

Connect the lower arm to the wheel knuckle.

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

4. Install a new halfshaft retaining nut and lightly tighten.

5. Secure the parking brake cable.

6. CAUTION: Do not use a bolt that has been installed more than 5 times. Check the bolt head for centre punch marks. A bolt head with 4 centre punch marks indicates the bolt has been installed 5 times and must be replaced.

Connect the toe link.

- Tighten the bolt to 175 Nm (129 lb.ft).
- Mark the bolt head with a centre punch, to indicate the number of times it has been used.

7. Tighten the halfshaft retaining nut to 350 Nm (258 lb.ft).

- Stake the nut to the halfshaft.

8. Install the wheel and tire.

9. Carry out the wheel alignment procedure.

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Rear Suspension - Wheel Bearing and Wheel Hub

Removal and Installation

Special Tool(s)	
	Rear wheel bearing remover/installer 204-509/10(LRT-60-033/10)
	Rear wheel bearing remover/installer 205-802/1
	Rear wheel bearing remover/installer 205-802/2
	Rear wheel bearing remover/installer 205-802/3
	Rear wheel bearing remover/installer 205-802/4
	Rear wheel bearing remover/installer 205-802/5

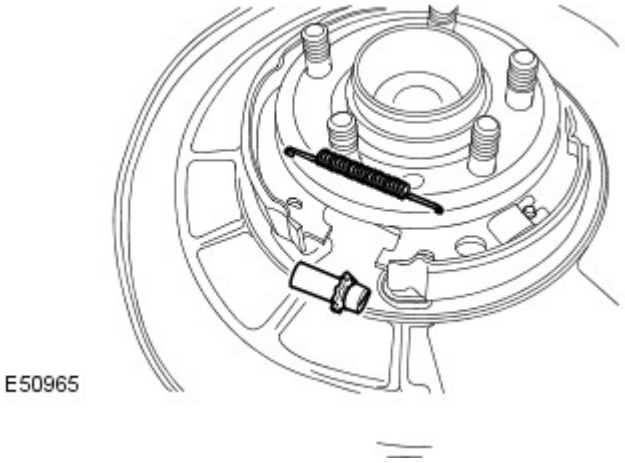
Removal

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.

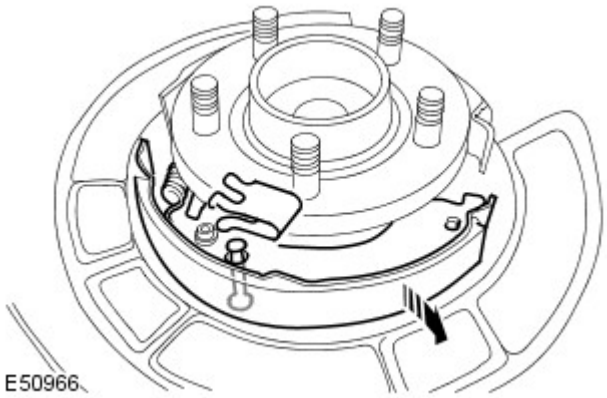
2. Remove the wheel knuckle.
For additional information, refer to: Wheel Knuckle (204-02 Rear Suspension, Removal and Installation).

3. Remove the adjuster and return spring.



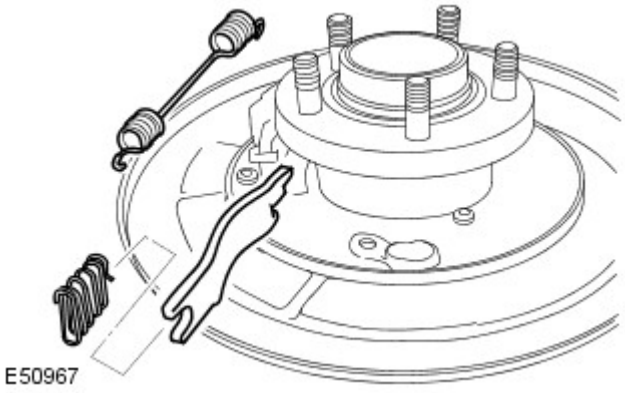
4. Remove the primary brake shoe.

- Remove the hold-down spring and retaining pin.
- Pivot the shoe to release it from the spreader plate and return spring.



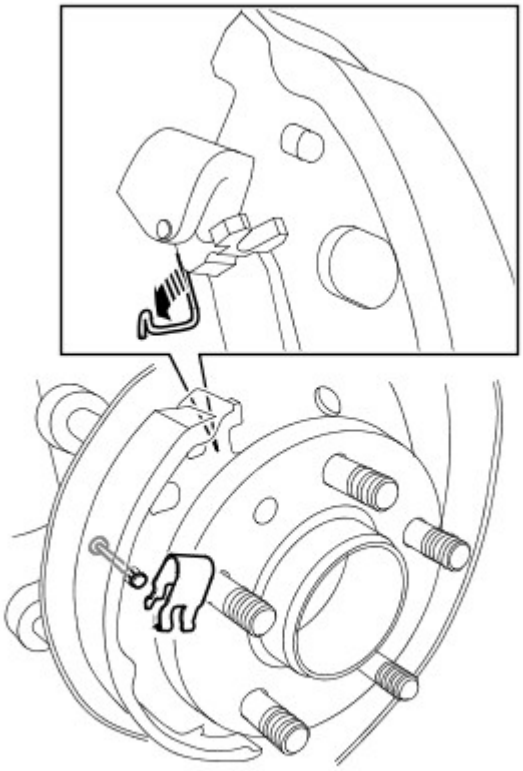
5. Remove the spreader plate and spring.

6. Remove the return spring.



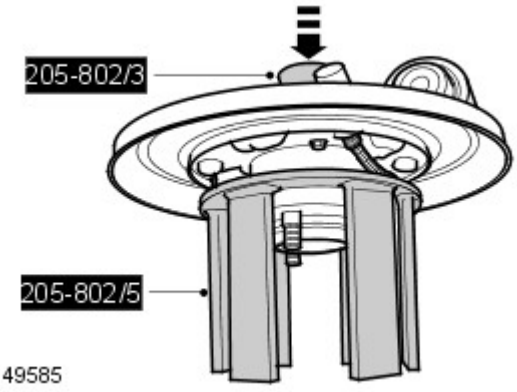
7. Remove the secondary brake shoe.

- Remove the hold-down spring and retaining pin.
- Disconnect the parking brake cable retaining spring from the brake shoe lever.



E50181

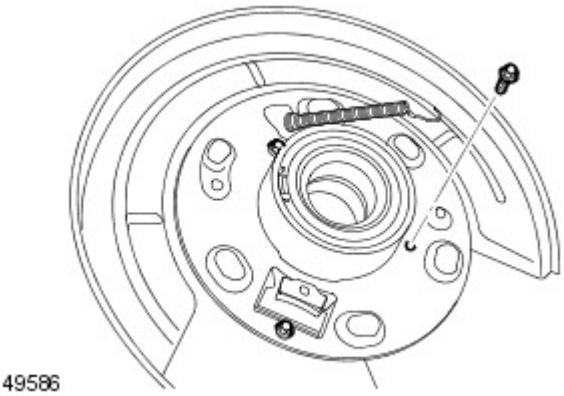
8. Using the special tools, remove the drive flange.



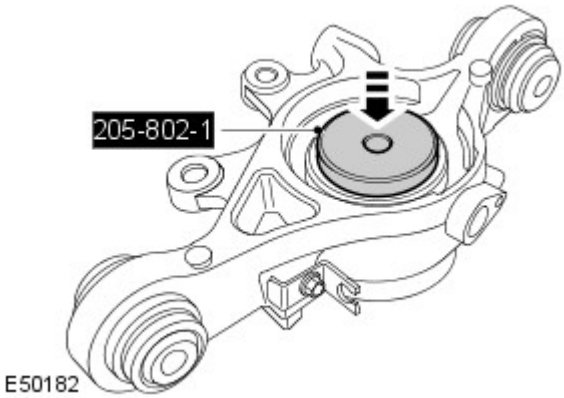
E49585

9. Remove the brake disc dust shield.

- Remove the 3 screws.



E49586



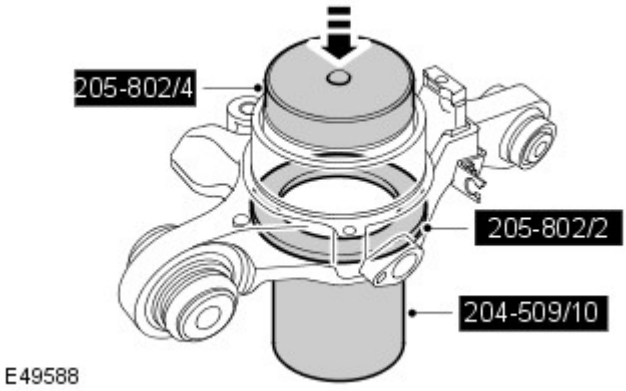
10. Using the special tools, remove the wheel bearing.

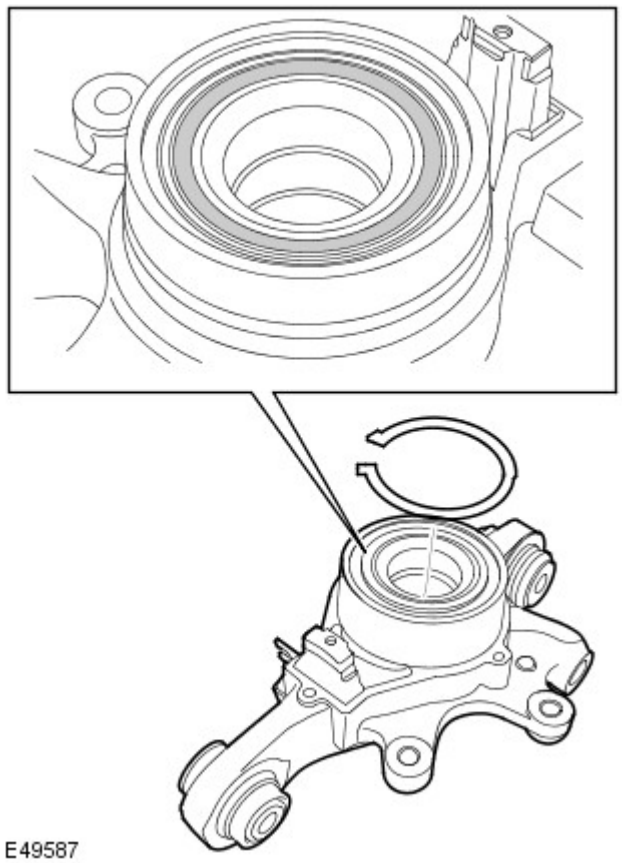
- Remove the circlip.

Installation

1. Clean the components.

2. Using the special tools, install the wheel bearing.





3. CAUTION: Make sure that the bearing seal is not damaged when installing the circlip.

Install the circlip.

4. Install the brake disc dust shield.

- Tighten the bolts to 9 Nm (7 lb.ft).

5. WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

Clean the backing plate and apply grease to the brake shoe contacts.

6. Clean the adjuster and set it to its minimum extension.

7. Install the secondary brake shoe.

- Connect the parking brake cable retaining spring to the brake shoe lever, making sure the spring is not twisted.
- Install the hold-down spring and retaining pin.

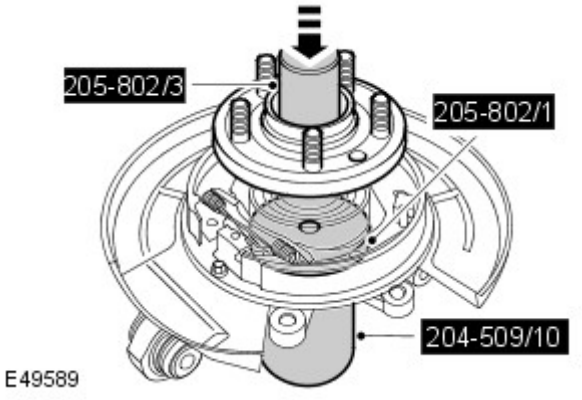
8. Install the primary brake shoe.

- Install the spreader plate and the spring.
- Install the return spring.
- Install the hold-down spring and retaining pin.

9. Install the return spring.

10. Install the brake shoe adjuster.

11. Using the special tools, install the drive flange.



12. Install the wheel knuckle.
For additional information, refer to: Wheel Knuckle (204-02 Rear Suspension, Removal and Installation).

Published: 11-May-2011

Rear Suspension - Rear Stabilizer Bar

Removal and Installation

Removal

CAUTION: It is possible to install the stabilizer bar incorrectly. Note the position of the stabilizer bar before 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.

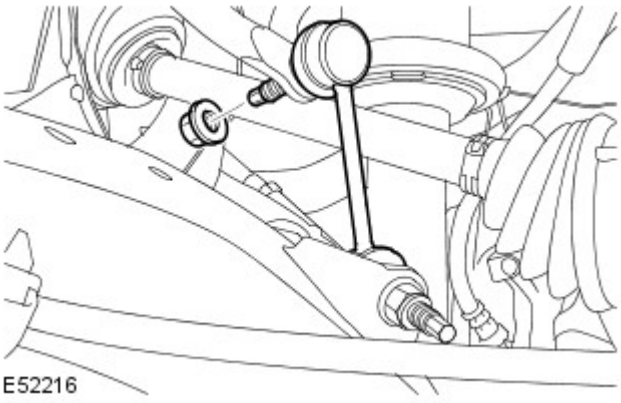
2. Remove the wheel and tire.

3. Remove the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

4. Remove the spare wheel and tire.

5. Raise the vehicle.

6. Remove the rear wheels and tires.


E52216

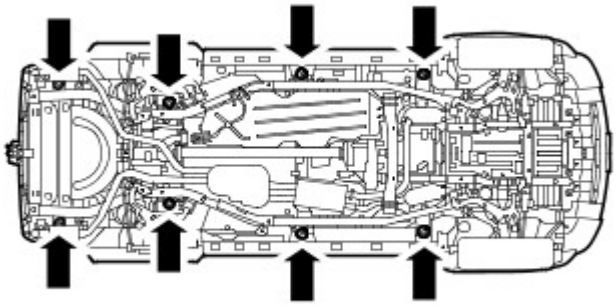
7. CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Release both stabilizer bar links.

- Remove and discard the 2 nuts.

8. Remove the body mount retaining bolts.

- Remove the 8 bolts.

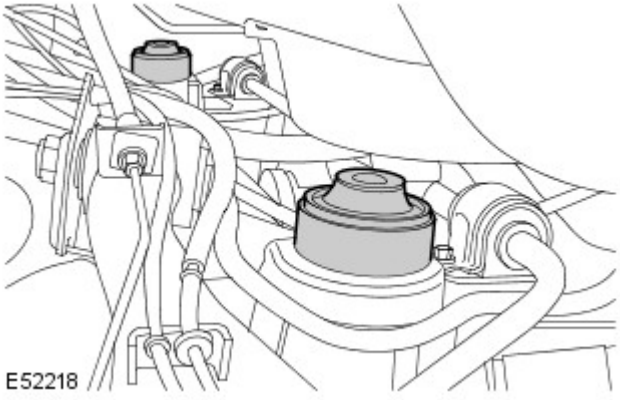

E52217

9. CAUTION: Only raise the body sufficiently to remove the body mount.

Carefully raise the body.

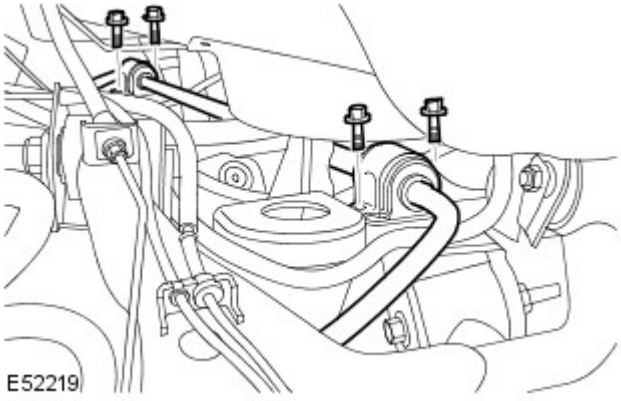
- Using suitable stands, raise the body to release the body mounts.

10. Remove the 2 rear body mounts.



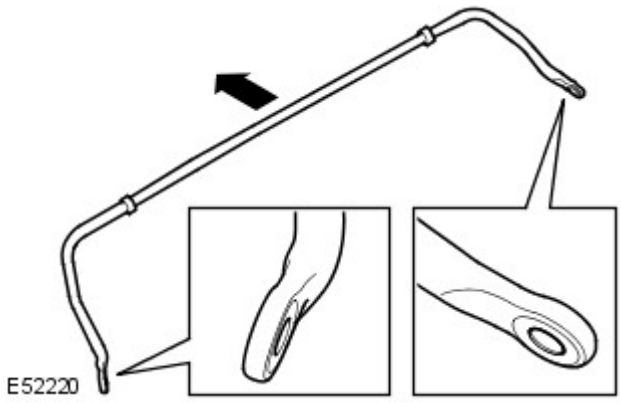
11. Remove the stabilizer bar bushing.

- Remove the stabilizer bar clamps.
- Remove the 4 bolts.



12. CAUTION: Mark the position of the stabilizer bar.

Remove the stabilizer bar.



Installation

1. CAUTION: Make sure the stabilizer bar is correctly installed.

Install the stabilizer bar.

2. Install the stabilizer bar bushing.

3. Install the stabilizer bar clamps.

- Tighten the 4 retaining bolts to 62 Nm (46 lb.ft).

4. Install the body mounts.

5. Lower the body.

- Remove the stands.

6. Install the body mount retaining bolts.

- Tighten the 8 retaining bolts to 133 Nm (98 lb.ft).

7. Attach both stabilizer bar links.

- Tighten the nuts to 115 Nm (85 lb.ft).

8. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

9. Lower the vehicle.

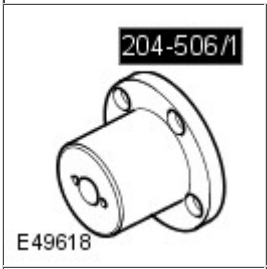
10. Install the spare wheel and tire.

11. Install the rear bumper cover.
For additional information, refer to: Rear Bumper Cover (501-19 Bumpers, Removal and Installation).

Published: 18-May-2011

Rear Suspension - Wheel Knuckle

Removal and Installation

Special Tool(s)	
	Halfshaft remover/replacer 204-506/1(LRT-60-030/1)
	Halfshaft remover/replacer 204-506/2(LRT-60-030/2)
	Halfshaft remover/replacer 204-506/3(LRT-60-030/3)
	Retainers - halfshaft remover/replacer 204-506/5(LRT-60-030/5)
	Halfshaft installer adapter 204-506-01(LRT-60-030/4)

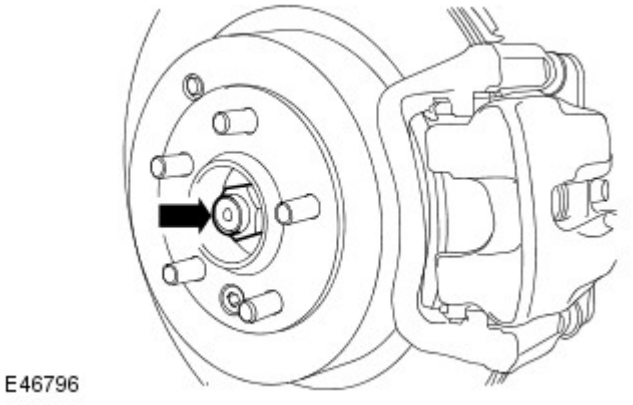
Removal

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 wheels and tires.

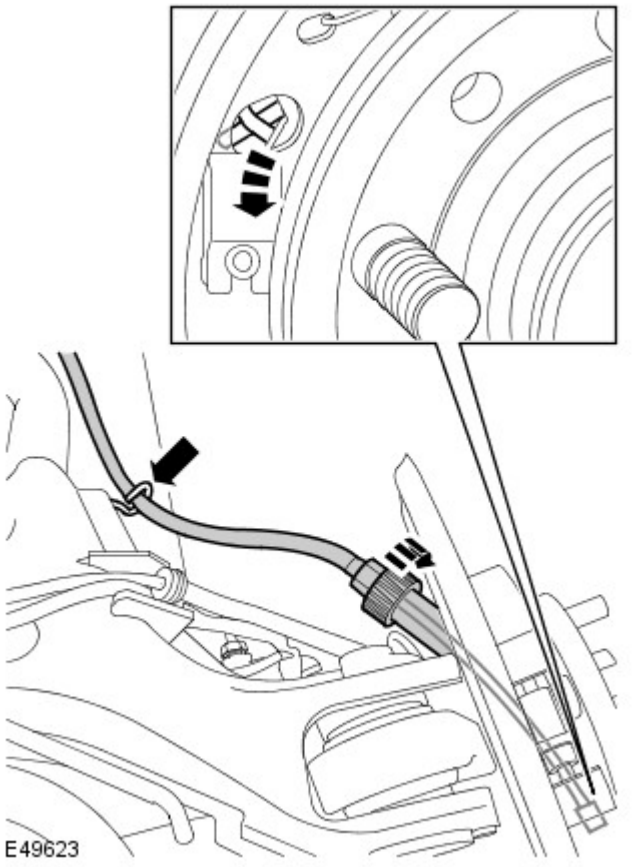
3. Loosen the halfshaft retaining nut.



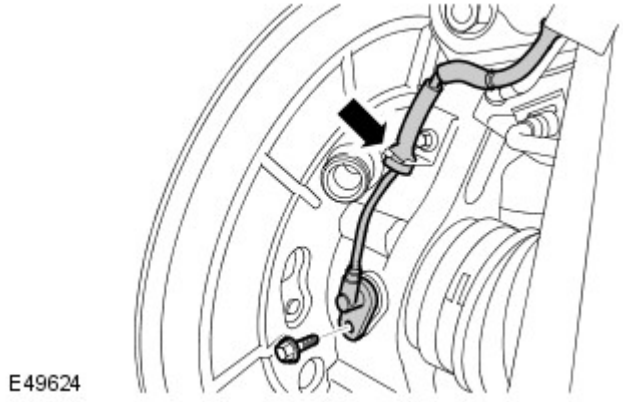
4. Remove the brake disc.
For additional information, refer to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation).

5. Release the parking brake cable.

- Disconnect the parking brake cable from the brake shoe lever.
- Disconnect the parking brake cable from the backplate.
- Release the cable from the lower arm.

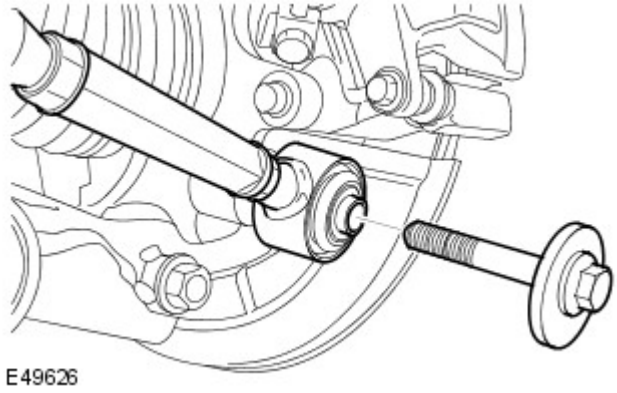


6. Release the wheel speed sensor from the wheel knuckle.



7. Disconnect the toe link.

- Remove and discard the bolt.

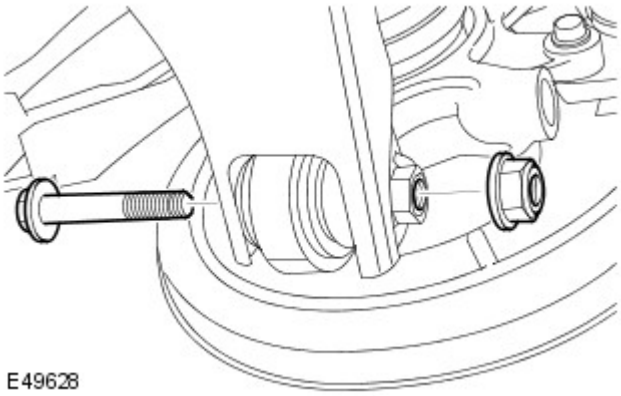


8. Remove the halfshaft retaining nut.

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

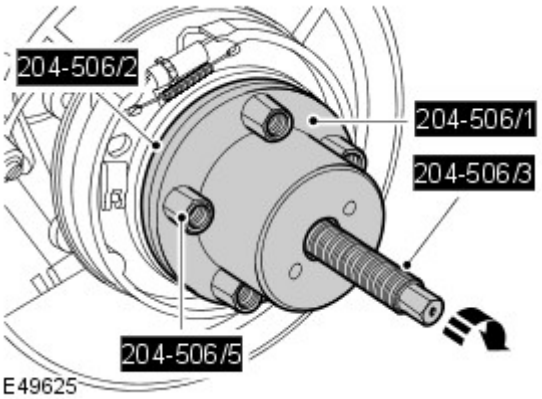
Release the knuckle from the lower arm.

- Remove the bolt.



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

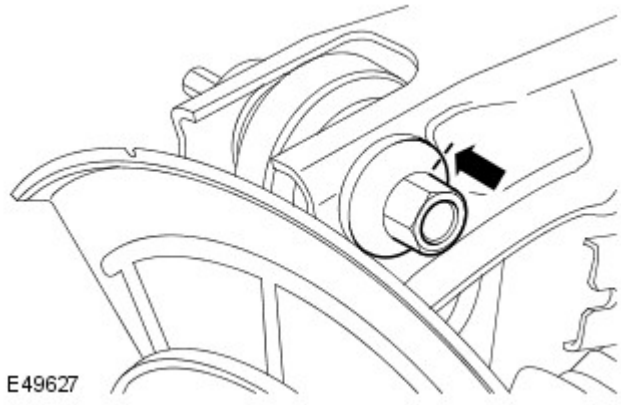
Using the special tools, release the halfshaft from the wheel hub.



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

Disconnect the upper arm from the wheel knuckle.

- Mark the position of the bolt in relation to the upper arm.
- Remove the nut and bolt.
- Discard the nut.



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

Remove the wheel knuckle.

Installation

1. Clean the components.

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

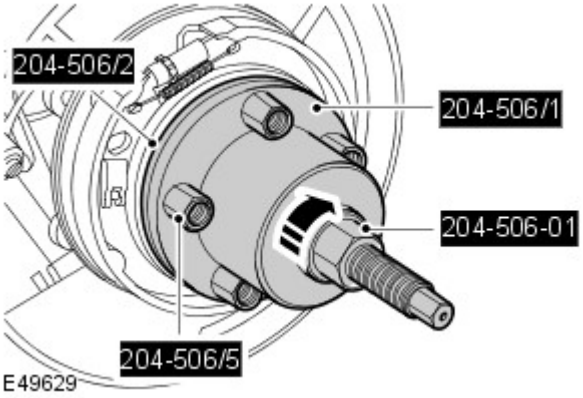
Install the wheel knuckle.

- Locate the halfshaft.

3. Connect the upper arm and wheel knuckle.

- Align the bolt to the marks made previously.
- Install a new nut and tighten to 133 Nm (98 lb.ft).

4. Using the special tools, install the halfshaft in the wheel hub.



5. CAUTION: Install the halfshaft nut finger tight.

Install a new halfshaft retaining nut and lightly tighten.

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

Connect the lower arm to the wheel knuckle.

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

7. Connect the toe link.

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

8. Install the wheel speed sensor.

- Tighten the bolt to 9 Nm (7 lb.ft).

9. Locate the parking brake cable to the backplate.

- Connect the cable to the brake shoe lever.
- Tighten the coupling to 8 Nm (6 lb.ft).
- Secure the parking brake cable to the lower arm.

10. Install the brake disc.
For additional information, refer to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation).

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

Tighten the halfshaft retaining nut to 350 Nm (258 lb.ft).

- Stake the nut to the halfshaft.

12. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

13. Carry out the wheel alignment procedure.

Published: 11-May-2011

Rear Suspension - Upper Arm Bushing

Removal and Installation

Special Tool(s)	
	Remover/installer - rear suspension upper arm front bushing 204-528/1
	Remover/installer - rear suspension upper arm front bushing 204-528/2
	Remover/installer - rear suspension upper arm front bushing 204-528/3
	Remover/installer rear suspension upper arm rear bushing 204-527/1
	Remover/installer rear suspension upper arm rear bushing 204-527/2
	Remover/installer rear suspension upper arm rear bushing 204-527/3

Removal

- NOTE: The bushings must be replaced in pairs, LH and RH sides.

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 wheels and tires.

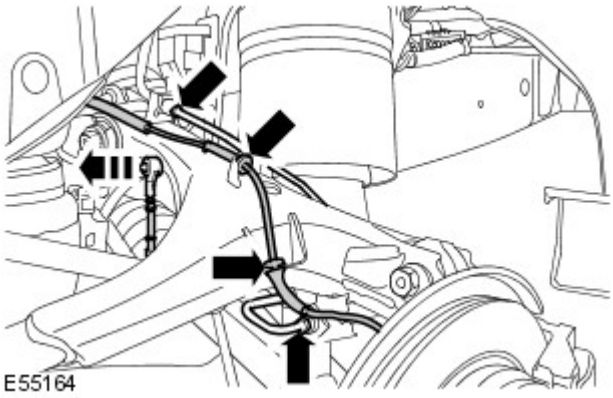
3. CAUTION: Always plug any open connections to prevent contamination.

Remove the brake tube.

- Disconnect the 2 brake tube unions.
- Remove the brake hose clips and release the hoses.
- Release the brake tube from the clip.

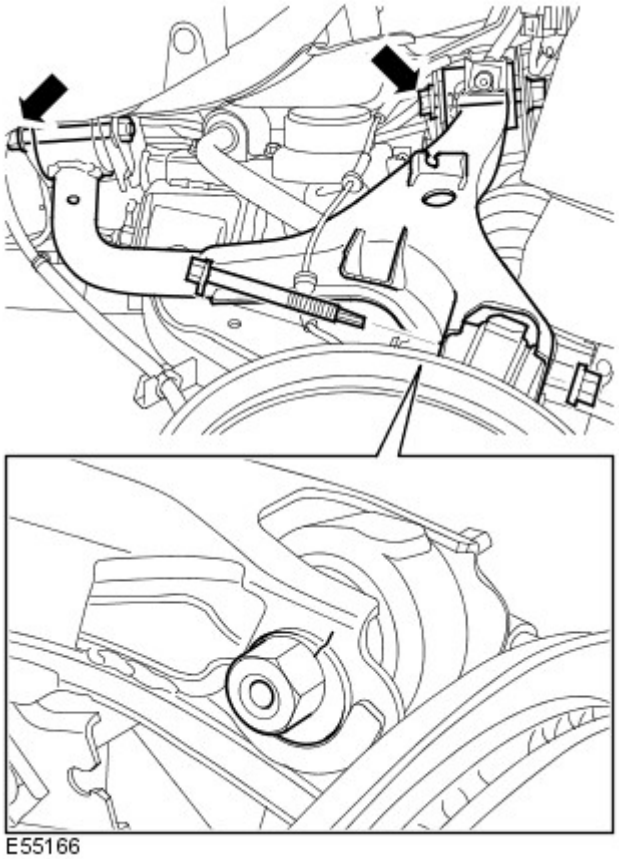
4. Disconnect the height sensor link.

5. Release the wheel speed sensor lead.


E55164

6. Remove the LH upper arm.

- Loosen the upper arm bolts.
- Mark the position of the bolt in relation to the upper arm.
- Disconnect the upper arm from the wheel knuckle.
- Remove the upper arm bolts.


E55166

7. Remove the RH upper arm.
For additional information, refer to: Upper Arm (204-02 Rear Suspension, Removal and Installation).

8. Mark the position of the bushing in relation to the upper arm.

9. Using the special tools, remove and discard the rear upper arm front bushing.

10. Using the special tools, remove and discard the rear upper arm rear bushing.

Installation

1. CAUTIONS:

Make sure the bush is correctly aligned.

Make sure the correct special tool is used to install the bushings to the correct depth.

Using the special tools, install the rear upper arm front bushing.

2. CAUTION: Make sure the bush is correctly aligned.

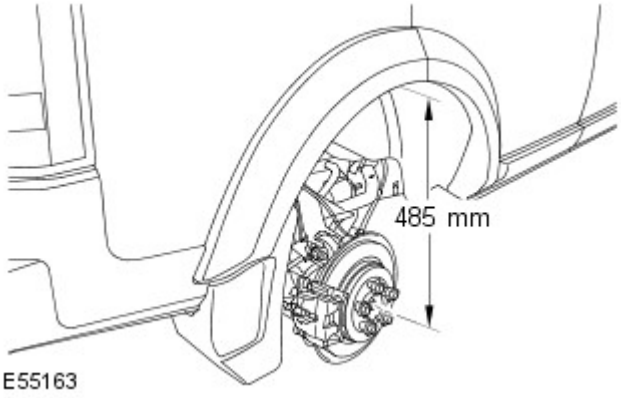
Using the special tools, install the rear upper arm rear bushing.

3. Install the LH upper arm.

- Fit the bolts but do not fully tighten at this stage.

4. Set the height between the center of the halfshaft end and the edge of the fender trim to 485 mm (19.10").

- Support with an axle stand.



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

Connect the upper arm and wheel knuckle.

- Align the bolt to the marks made previously.
- Tighten the bolt to 133 Nm (98 lb.ft).

6. Tighten the upper arm front bolt to 175 Nm (129 lb.ft).

7. Tighten the upper arm rear bolt to 275 Nm (203 lb.ft).

8. Secure the wheel speed sensor lead.

9. Secure the brake pad wear indicator sensor lead.

10. Connect the height sensor link.

11. Install the brake tube.

- Tighten the brake tube unions to 18 Nm (13 lb.ft).

12. Install the RH upper arm.
For additional information, refer to: Upper Arm (204-02 Rear Suspension, Removal and Installation).

13. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

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Rear Suspension - Rear Stabilizer Bar Link

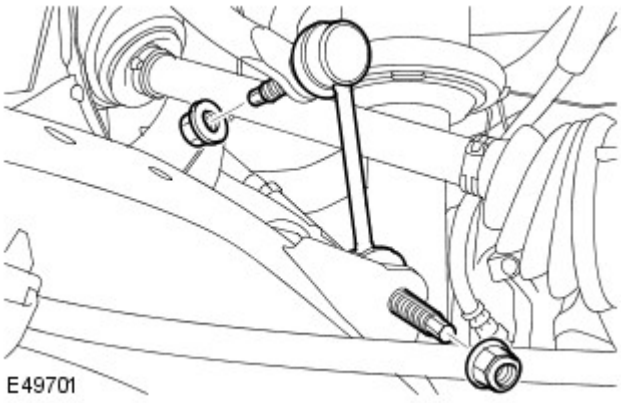
Removal and Installation

Removal

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

Raise and support the vehicle.

2. Remove the wheel and tire.



3. CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Remove the stabilizer bar link.

- Remove and discard the 2 nuts.

Installation

1. Install the stabilizer bar link.

- Tighten the nuts to 115 Nm (85 lb.ft).

2. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

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Rear Suspension - Lower Arm

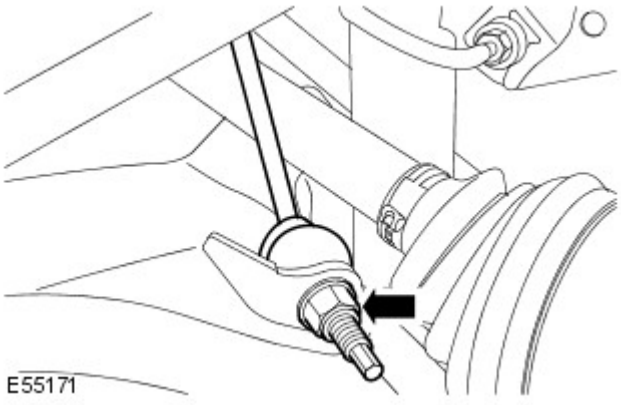
Removal and Installation

Removal

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

Raise and support the vehicle.

2. Remove the wheel and tire.



3. CAUTION: Use a wrench on the hexagon provided to prevent the ball joint rotating.

Release the stabilizer bar link.

- Remove and discard the retaining nut.

4. Loosen the 2 lower arm bolts.

5. Disconnect the shock absorber and spring assembly from the lower arm.

- Remove the nut and bolt.

6. Release the parking brake cable.

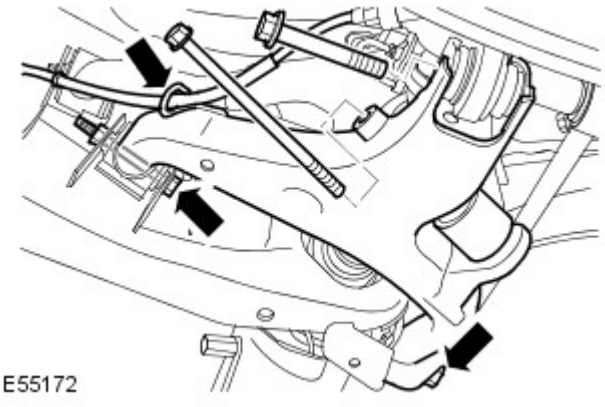
7. Remove the 2 lower arm bolts.

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

Release the knuckle from the lower arm.

- Remove the bolt.

9. Remove the lower arm.



Installation

1. Install the lower arm.

- Fit the bolts but do not fully tighten at this stage.

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

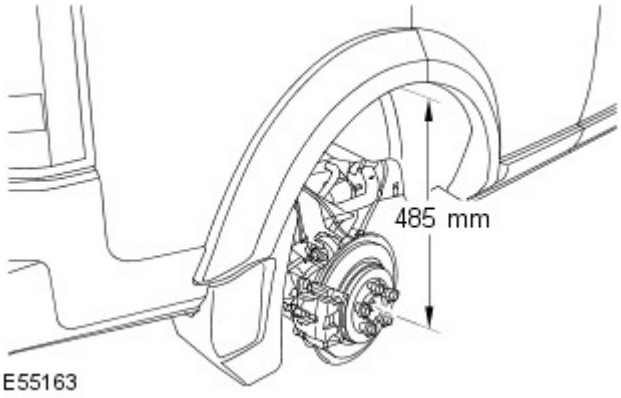
Connect the lower arm to the wheel knuckle.

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

3. Connect the shock absorber and spring assembly to the lower arm.

- Tighten the nut and bolt to 300 Nm (221 lb.ft).

4. Set the height between the center of the halfshaft end and the edge of the fender trim to 485 mm (19.10'').



5. Tighten the lower arm bolts to 275 Nm (203 lb.ft).

6. Secure the parking brake cable.

7. Connect the stabilizer link.

- Install a new nut and tighten to 115 Nm (85 lb.ft).

8. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

9. Carry out the wheel alignment procedure.

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Rear Suspension - Upper Arm

Removal and Installation

Removal

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

Raise and support the vehicle.

2. Remove the wheel and tire.

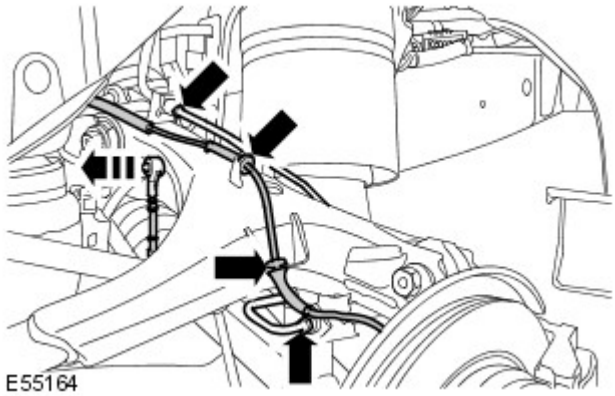
3. CAUTION: Always plug any open connections to prevent contamination.

Remove the brake tube.

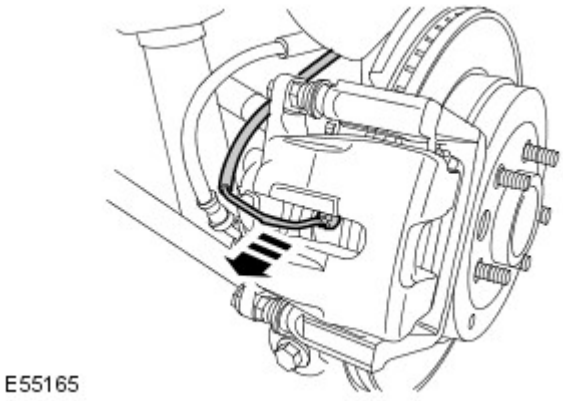
- Disconnect the 2 brake tube unions.
- Remove the brake hose clips and release the hoses.
- Release the brake tube from the clip.

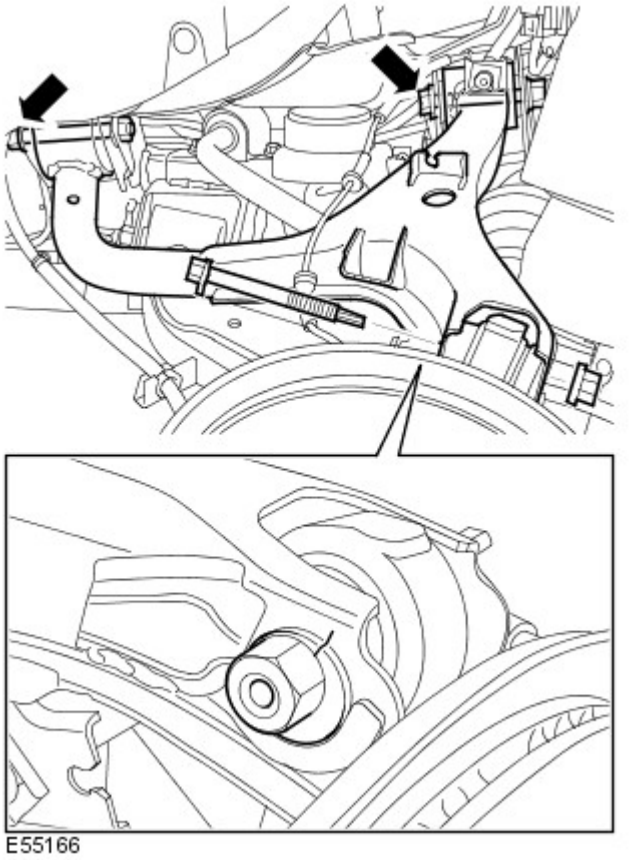
4. Disconnect the height sensor link.

5. Release the wheel speed sensor lead.



6. RH side only: Release the brake pad wear indicator sensor lead.




E55166

7. Remove the upper arm.

- Loosen the upper arm bolts.
- Mark the position of the bolt in relation to the upper arm.
- Remove the nut and bolt, then release the upper arm from the wheel knuckle.
- Remove the upper arm bolts.

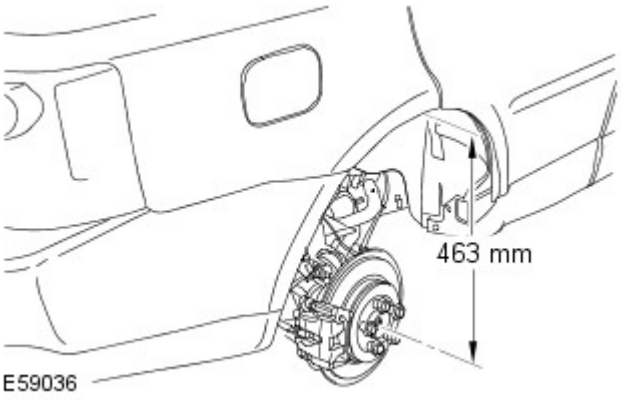
Installation

1. Install the upper arm.

- Fit the bolts but do not fully tighten at this stage.

2. Set the height, between the center of the halfshaft end and the edge of the fender trim, to 463 mm (18.23").

- Support with an axle stand.



E59036

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

Connect the upper arm and wheel knuckle.

- Align the bolt to the marks made previously.
- Tighten the bolt to 133 Nm (98 lb.ft).

4. Tighten the upper arm front bolt to 175 Nm (129 lb.ft).
5. Tighten the upper arm rear bolt to 275 Nm (203 lb.ft).
6. Secure the wheel speed sensor lead.
7. Secure the brake pad wear indicator sensor lead.
8. Connect the height sensor link.
9. Install the brake tube.

- Tighten the brake tube unions to 18 Nm (13 lb.ft).

10. Bleed the brake system.
For additional information, refer to: Component Bleeding (206-00 Brake System - General Information, General Procedures).

11. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

12. Carry out the wheel alignment procedure.

Published: 11-May-2011

Rear Suspension - Toe Link

Removal and Installation

Removal

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

Raise and support the vehicle.

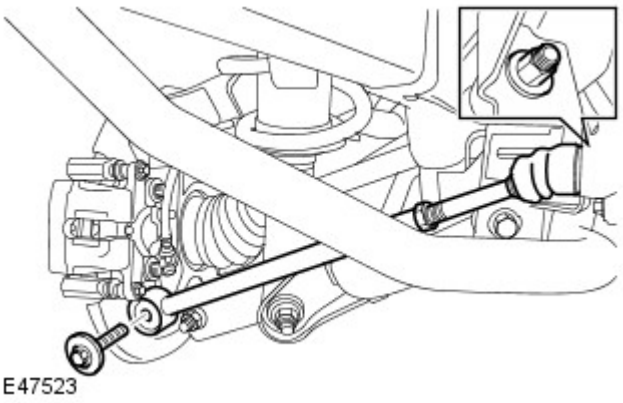
2. Remove the wheel and tire.

3. Disconnect the toe link.

- Remove and discard the bolt.

4. Remove the toe link.

- Remove and discard the nut.



Installation

1. CAUTION: Make sure the toe link anti-rotation tang is fully seated in the integrated body frame before tightening the toe link retaining nut. Failure to follow this instruction will result in damage to the toe link or integrated body frame.

Install the toe link.

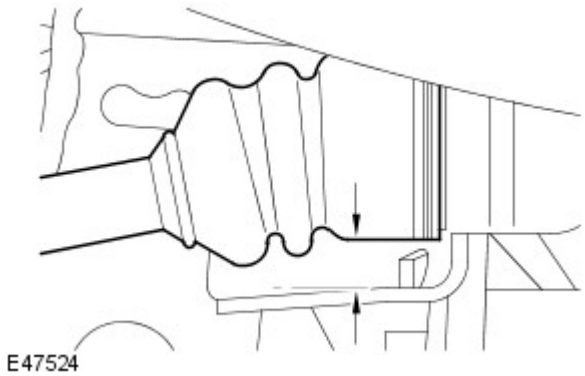
- Install a new nut and lightly tighten.

2. Connect the toe link.

- Using a M14 X 2 tap, cean the threads of the knuckle fixing hole. Blow out debris with an air-line.
- Tighten the new bolt to 175 Nm (129 lb.ft).

3. Set the gap, between the underside of the toe link rubber boot and the integrated body frame bracket, to 10 mm (0.473 in).

- Tighten the toe link inner ball joint retaining nut to 133 Nm (98 lb.ft)



4. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

5. Carry out the wheel alignment procedure.

Published: 11-May-2011

Rear Suspension - Lower Arm Bushing

Removal and Installation

Special Tool(s)	
204-526/1  E55175	Receiver rear lower arm front bush 204-526/1
204-526/2  E55176	Remover rear lower arm front bush 204-526/2
204-526/3  E55177	Installer rear lower arm front bush 204-526/3
204-532/1  E55178	Receiver rear lower arm rear bush 204-540/1
204-540/2  E55179	Remover rear lower arm rear bush 204-540/2
204-540/3  E55180	Installer rear lower arm rear bush 204-540/3

Removal

- NOTE: The bushings must be replaced in pairs, LH and RH sides.

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 wheels and tires.

3. Remove the LH lower arm.

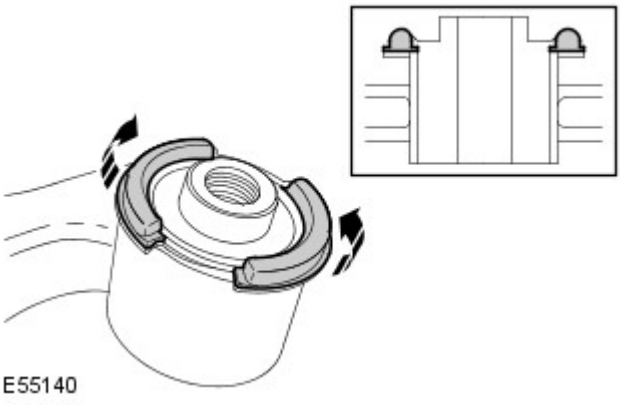
For additional information, refer to: Lower Arm (204-02 Rear Suspension, Removal and Installation).

4. Remove the RH lower arm.
5. Note the position of the bushing in relation to the lower arm.
6. CAUTION: The bush flanges need to be removed to allow bush removal.

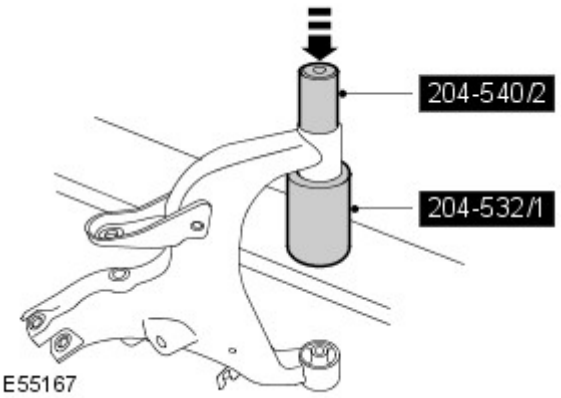
• NOTE: Take note of the fitted position of the bush.

Using a suitable tool, bend over the bush flanges.

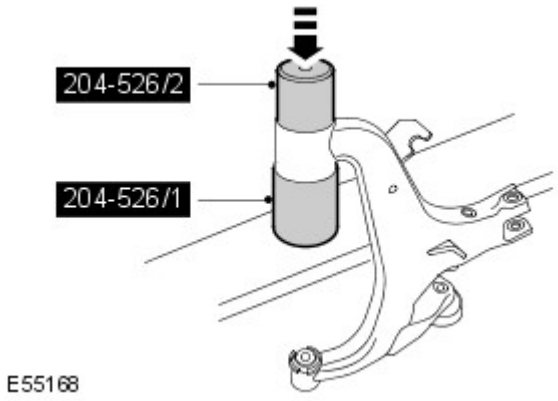
7. Using a hacksaw, remove the flange from the bushing, making sure the upper arm is not damaged.



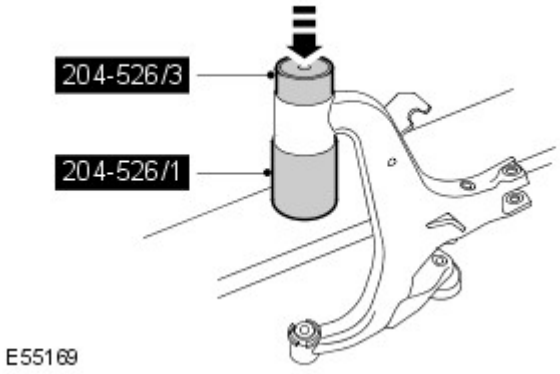
8. Using the special tools, remove and discard the lower arm rear bushings.



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



Installation

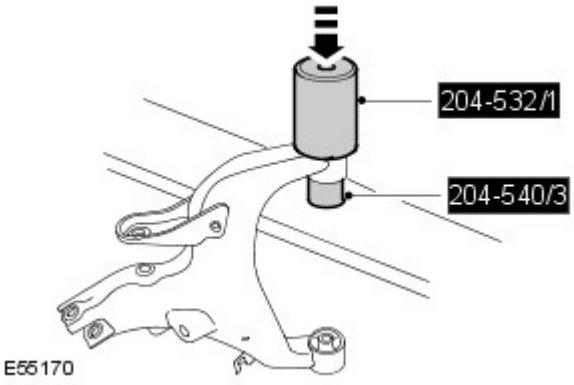


1. CAUTIONS:

Make sure the bush is correctly aligned.

Make sure the correct special tool is used to install the bushings to the correct depth.

Using the special tools, install the lower arm front bushings



2. CAUTION: Make sure the bush is correctly aligned.

Using the special tools, install the lower arm rear bushings.

3. Install the LH lower arm.
For additional information, refer to: Lower Arm (204-02 Rear Suspension, Removal and Installation).

4. Install the RH lower arm.

5. Install the wheels and tires.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

6. Carry out the wheel alignment procedure.

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Rear Suspension - Shock Absorber and Spring AssemblyTDV6 2.7L Diesel

Removal and Installation

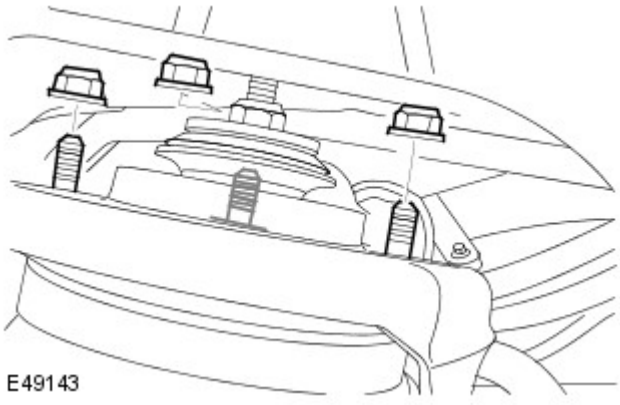
Removal

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

Raise and support the vehicle.

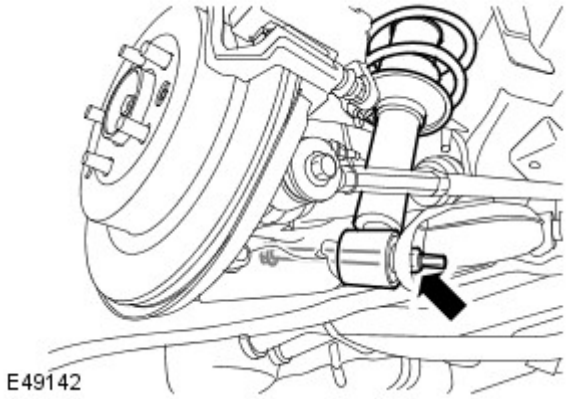
2. Remove the wheel and tire.

3. Loosen the 3 spring and shock absorber retaining nuts.

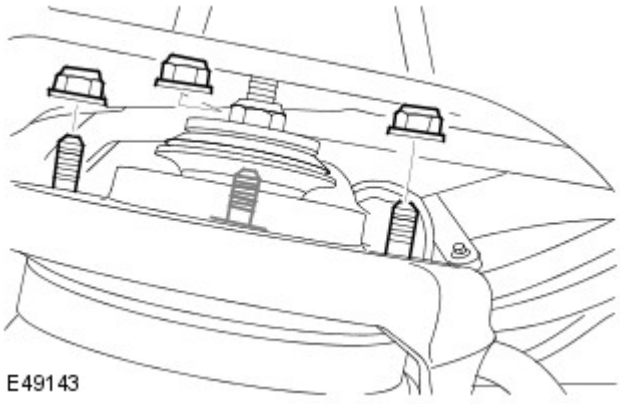


4. Disconnect the shock absorber and spring assembly from the lower arm.

- Using a jack and a suitable block of wood, support the base of the shock absorber.
- Remove the nut and bolt.



5. Remove the shock absorber and spring assembly retaining nuts.



6. Remove the shock absorber and spring assembly.

Installation

1. Install the shock absorber and spring assembly.

- Make sure the spring and shock absorber assembly top mounting to body mating faces are clean.
- Install the nuts but do not fully tighten at this stage.

2. Connect the shock absorber and spring assembly to the lower arm.
   - Tighten the nut and bolt to 300 Nm (221 lb.ft).
   - Tighten the three retaining nuts to 70 Nm (52 lb.ft).
3. Install the wheel and tire.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

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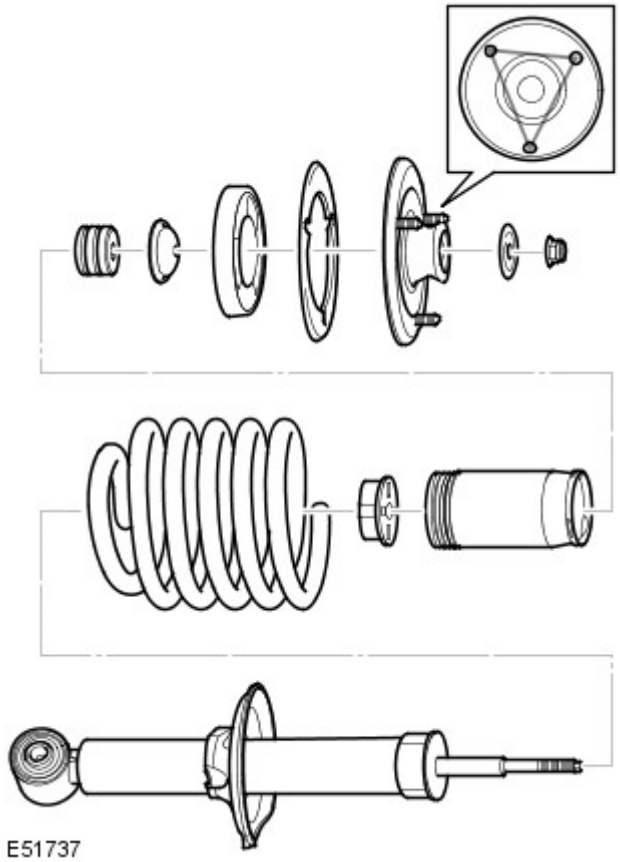
Rear Suspension - Shock Absorber and Spring AssemblyTDV6 2.7L Diesel

Disassembly and Assembly

Disassembly

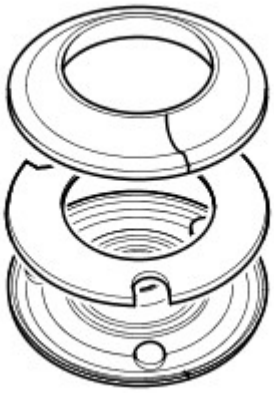
WARNING: Ensure the spring compressor Safe Working Load (SWL) meets or exceeds the spring rating quoted in the Specifcations section.

1. Raise and support the vehicle.
2. Remove the wheel and tire.
3. Remove the shock absorber and spring assembly.
   For additional information, refer to: Shock Absorber and Spring Assembly - TDV6 2.7L Diesel (204-02 Rear Suspension, Removal and Installation).
4. Install a suitable spring compressor in a vise.
5. Install the shock absorber and spring assembly in the spring compressor.
   - Compress the spring just sufficiently to relieve the spring tension.
6. Remove the shock absorber.
   - Restrain the shock absorber spindle, remove and discard the nut.
   - Remove the upper bush rebound plate and upper bush.
   - Remove the upper mounting assembly.
   - Remove the dust tube and rebound plate assembly.
   - Remove the spring aid.



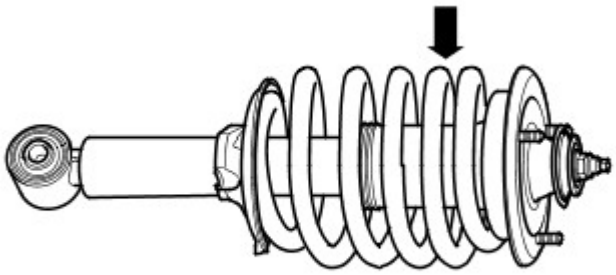
7. Remove the spring from the spring compressor.

Assembly



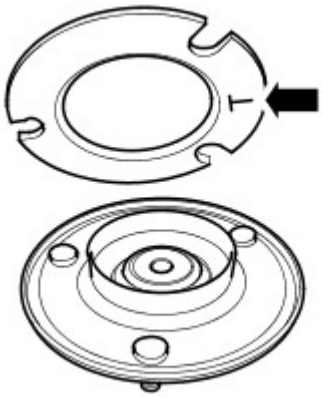
E51738

1. Clean and inspect the components for deterioration.
   - Remove the rubber insulator.
   - Remove the spacer.
   - Remove the rebound plate from the dust tube.



E51740

2. Install the spring in the spring compressor.
   - Make sure the spring is installed with the close coils positioned towards the top of the shock absorber.
3. Install the spring aid.
4. Install the dust tube.
   - Install the rebound plate into the dust tube.
5. Install the shock absorber.
   - Make sure the spring is correctly located in the spring seat.
6. Install the upper mounting.
   - Install the spacer and rubber insulator, making sure the spacer drops over the stud heads.
   - Install the upper bush and upper bush rebound plate.
   - Install a new nut and tighten to 98 Nm (72 lb.ft).



E51739

7. Install the shock absorber and spring assembly.
   For additional information, refer to: Shock Absorber and Spring Assembly - TDV6 2.7L Diesel (204-02 Rear Suspension, Removal and Installation).
8. Install the wheel and tire.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

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Wheels and Tires -

Wheels

Wheel type	Wheel size
Alloy wheel	7J x 17
Alloy wheel	8J x 18
Alloy wheel	8J x 19
Alloy wheel	8.5J x 20
Reduced size spare wheel - Steel	5.5J x 19

• CAUTIONS:

 With reduced size spare wheel fitted, do not exceed 50 mph (80 kph) and replace with standard size wheel at earliest opportunity.

 Do not use power tools when operating the spare wheel winch, raise and lower winch manually using hand tools only.

Tire Sizes - Standard Fit

Wheel size	Tire size	Tire load index
7J x 17 - Alloy	235/70 R17H - All terrain	111
8J x 18 - Alloy	255/60 R18V - All terrain	112
8J x 19 - Alloy	255/55 R19V - All terrain	111
8.5J x 20 - Alloy	255/50 R20Y - All terrain	109

 CAUTION: Inner tubes must not be fitted with any of these tires.

Tire Sizes - Accessory Fit

Wheel size	Tire size	Tire load index
8J x 19 - Alloy	255/55 R19 - Mud terrain	111
8J x 19 - Alloy	255/55 R19 - Sand	111

 CAUTION: Inner tubes must not be fitted with any of these tires.

Tire Pressures - Not NAS/Gulf/Brazil Vehicles

Loading condition	bars	lbf/in²	kPa
Normal operating conditions - Up to 4 people:			
Front	2.3	33	230
Rear	2.5	36	250
Vehicle loaded to maximum gross vehicle weight:			
Front	2.5	36	250
Rear	2.9	42	290
Reduced size spare wheel	4.2	60	420
*** Standard size spare wheel**	2.9	42	290

 CAUTION: * The standard size spare wheel tire should be inflated to the maximum gross vehicle weight pressure and the pressure for the front or rear wheel locations must be adjusted accordingly if the wheel is to be used under conditions other than with the vehicle loaded to maximum gross vehicle weight.

Tire Pressures - NAS/Gulf/Brazil Vehicles

Loading condition	bars	lbf/in²	kPa
All conditions			
Front	2.5	36	250
Rear	2.9	42	290
Reduced size spare wheel	4.2	60	420
*** Standard size spare wheel**	2.9	42	290

 CAUTION: The standard size spare tyre should be inflated to the highest recommended pressure when stored on the vehicle. The inflation pressure must be adjusted to suit the axle location when the spare is used to replace a punctured road tyre."

General Specification

Item	Make	Location
Tire low pressure sensor	Continental/Siemens	On inside of wheel rim
Tire pressure sensor initiator:		
Front	Continental/Siemens	Attached to the fender splash shield adjacent to the front bumper
Rear	Continental/Siemens	Attached to the fender splash shield adjacent to the rear bumper

Recommended Lubricant

Application	Land Rover Part No.
Wheel hub spigot	RYL 105020

Torque Specifications

Description	Nm	lb-ft
* Road wheel nuts	140	103
Tire low pressure sensor	8	6

*** Wheel nuts must be tightened by diagonal selection**

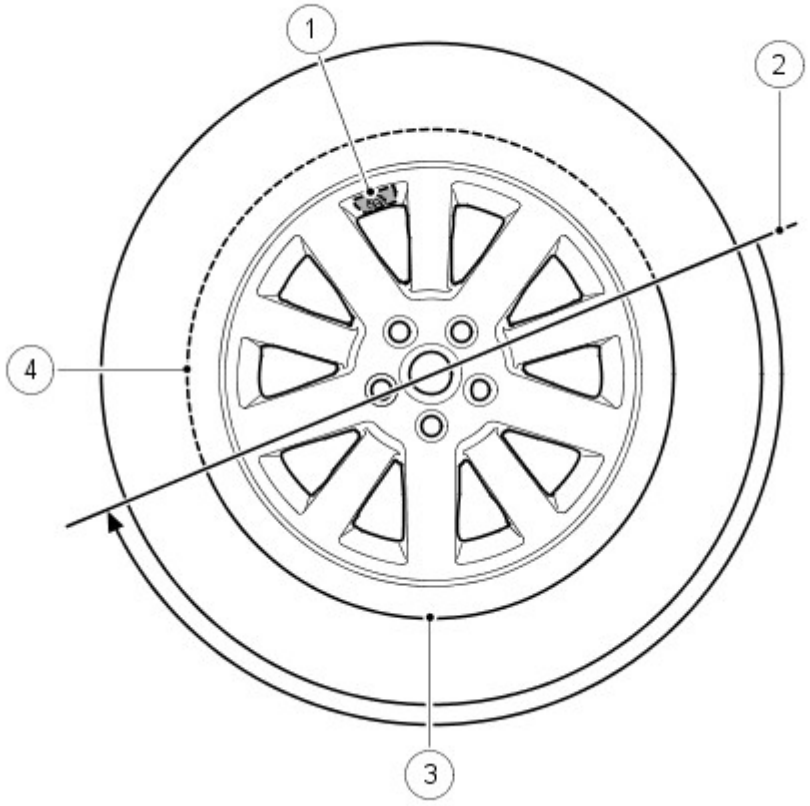
Published: 11-May-2011

Wheels and Tires - Wheels and Tires

Description and Operation

TIRES

Care must be taken when removing and refitting tires to ensure that the tire pressure sensor is not damaged.



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.

When using the tire removal machine, the fitting arm start position must be positioned as shown in the tire changing illustration. The wheel can then be rotated through 180 degrees in a counterclockwise direction. This will relieve the high 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.

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, positioned on the driver's side B-pillar, 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.

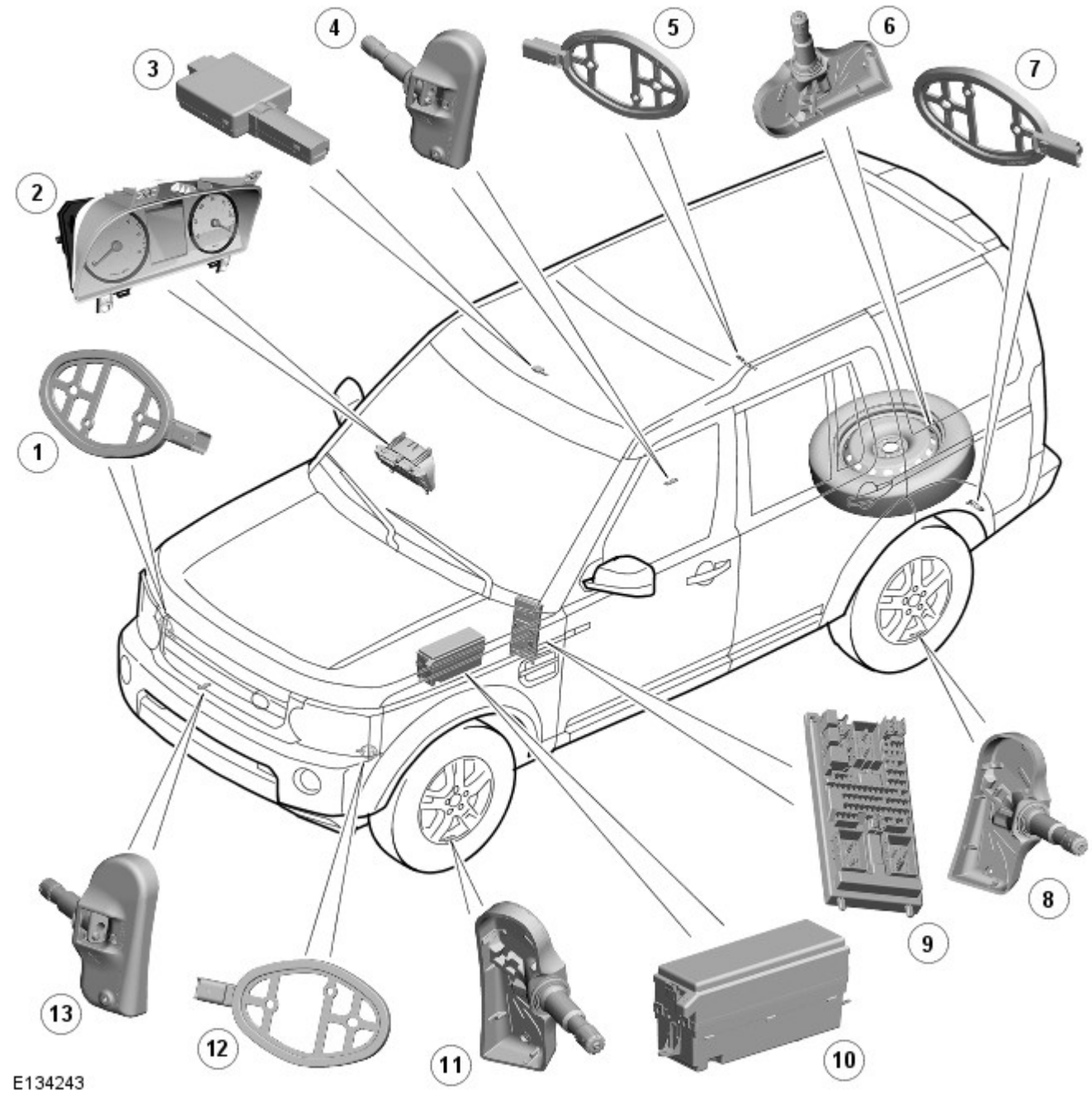
This label must not be removed from the vehicle. The label information will only define the specification of the vehicle as it came off the production line. It will not include dealer or owner fitted accessory wheels and tires of differing size from the original fitment.

• NOTE: If tires and wheels of a non-standard size are fitted to the vehicle, the car configuration file must be updated using a Land Rover approved diagnostic system.

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 Land Rover parts and will be printed specifically for the supplied VIN of the vehicle.

TIRE PRESSURE MONITORING SYSTEM (TPMS)

Tire Pressure Monitoring System - Component Location



Item	Part Number	Description
1	-	RH (right-hand) front initiator
2	-	Instrument cluster
3	-	TPMS RF receiver
4	-	RH rear tire pressure sensor
5	-	RH rear initiator
6	-	Spare tire pressure sensor
7	-	LH (left-hand) rear initiator
8	-	LH rear tire pressure sensor
9	-	CJB (central junction box)
10	-	EJB (engine junction box)
11	-	LH front tire pressure sensor
12	-	LH front initiator
13	-	RH front tire pressure sensor

The purpose of the Tire Pressure Monitoring System (TPMS) is to assist the driver in maintaining the vehicle's tire pressures at the optimum level in order to:

- 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 in relevant markets.

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

• NOTE: During a 'blow out' a very rapid reduction in pressure is experienced. The system is not intended to warn the driver of a 'blow out', since it is not possible to give the driver sufficient warning that such an event is occurring, due to its

short duration. The design of the TPMS is to assist the driver in keeping the tires at the correct pressure, which will tend to reduce the likelihood of a tire 'blow out' occurring.

• NOTE: TPMS is inhibited when the vehicle is in Delivery mode. For more details on Delivery mode refer to the PDI manual.

A single TPMS hardware configuration is used. TPMS status information is relayed to the driver with a message displayed in the instrument cluster message center and a amber warning indicator.

Tire Location

Because of the requirement for different pressure targets and thresholds for the front and rear tires, the CJB can identify the location of the tires on the vehicle, and assign a received tire pressure sensor identification to a specific position on the vehicle (i.e. FL (front left), FR (front right), RL (rear left) or RR (rear right)).

Tire location is performed automatically by the CJB using an auto-location function. This function requires no manual intervention by the driver. The CJB can automatically learn the position of tires on the vehicle if the tire pressure sensors or their positions are changed on the vehicle.

The tire learn and location process is ready to commence when the vehicle has been stationary or is traveling at less than 12 mph (20 km/h) for 15 minutes. This is known as 'parking mode'. The learn/locate process requires the vehicle to be driven at speeds of more than 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.

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

- one or more tire pressure sensors have been replaced
- one or more tire pressure sensor identifications are missing
- one or more 'alien' identifications are being received, i.e. the CJB can reject identifications from tire pressure sensors that do not belong to the vehicle
- the spare tire and one of the tires in use on the vehicle have exchanged position on the vehicle.

If the tire pressure sensors fitted to the running wheels (not the spare) are changed, the CJB can learn the new sensor identifications automatically. The learn function requires no manual intervention by the driver.

If a new sensor is fitted to the spare tire it must have its identification code programmed into the CJB using a Land Rover approved diagnostic system, or used on the vehicle as a 'running' wheel and the vehicle driven for 15 minutes at more than 12.5 mph (20 km/h).

Spare Tire Identification

Depending on the vehicle specification, the spare tire may or may not be fitted with a tire pressure sensor.

• NOTE: Tire pressure sensors cannot be fitted to steel space saver spare wheels.

If the spare tire is fitted with a tire pressure sensor, the CJB can detect it, determine that it is the spare tire and monitor its pressure and issue warnings to the driver accordingly. If the CJB expects the spare tire to be fitted with a tire pressure sensor and it does not, the CJB will not show a fault to the driver, however a fault code will be stored in the CJB.

If the spare tire is being monitored and the driver replaces a flat 'running' tire with the spare tire, the CJB will not continually warn the driver that the original flat tire (now in the spare position) is flat. This prevents distraction of the driver by constant pressure warnings being issued. The driver is reminded by a message displayed for 20 seconds at each ignition on cycle that the spare tire is flat.

System Operation

Each time the vehicle is driven, the CJB transmits a Low Frequency (LF) (125 KHz) signal to each initiator in turn. This is received by the tire pressure sensor which transmits a Radio Frequency (RF) (315 or 433 MHz depending on market) signal to the RF receiver. This signal contains coded data which corresponds to sensor identification, air pressure, air temperature and acceleration data. This signal is communicated to the CJB via a K-bus line.

The system enters 'parking mode' after the vehicle speed has been less than 12.5 mph (20 km/h) for 12 minutes. In parking mode the tire pressure sensors transmit a coded signal to the CJB once every 13 hours. If the tire pressure decreases by more than 1 lbf/in^2 (0.6 bar) the sensor will transmit more often if pressure is being lost.

The spare tire sensor transmits a signal every 13 hours in the same manner as the road wheels when in parking mode. If the tire pressure decreases by more than 1 lbf/in^2 (0.6 bar) the sensor will transmit more often if pressure is being lost.

As each wheel responds to the LF signal from the CJB, it is assigned a position on the vehicle and is monitored for the remainder of that drive cycle in that position.

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

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

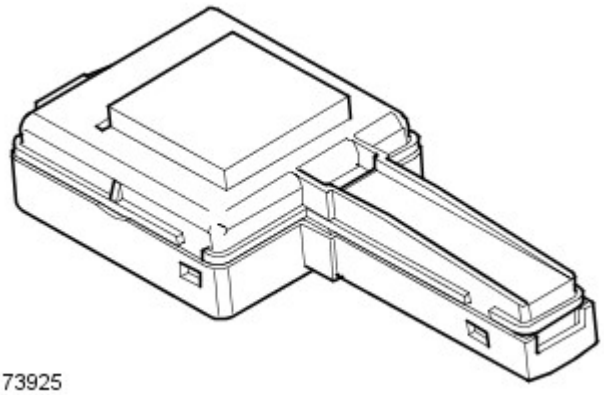
Each tire pressure sensor responds in turn so the CJB can establish the sensor positions at the start of the drive cycle.

This process is repeated up to three times but less if the sensor positions are already known in the CJB. The process is known as 'Auto Location' and takes 7 to 8 minutes to complete. During this period the tire sensors transmit at regular intervals, once every 15 seconds. For the remainder of the drive cycle the tire sensors transmit once every 60 seconds or if a change in tire pressure is sensed until the vehicle stops and the system returns to parking mode.

Once the wheel position is established, the initiators stop firing a signal and do not fire again until the vehicle has been parked for more than 15 minutes. The signal transmissions from each wheel sensor continue at 1 minute intervals whilst the vehicle is being driven. This transmission is to monitor the tire pressure.

At 25% deflation the amber warning indicator in the instrument cluster is illuminated and an appropriate message displayed in the message center.

RF Receiver

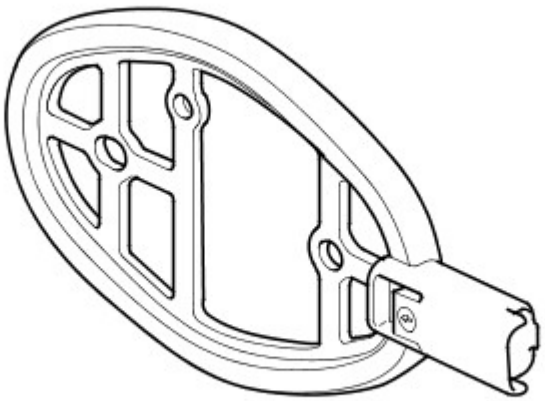


E73925

The RF receiver is mounted behind the overhead console and connects to the vehicle harness via a fly lead.

The RF receiver receives transmissions from each of the tire pressure sensors via an internal antenna. This information is then communicated to the CJB via a dedicated Local Interconnect Network (K-bus).

Initiator



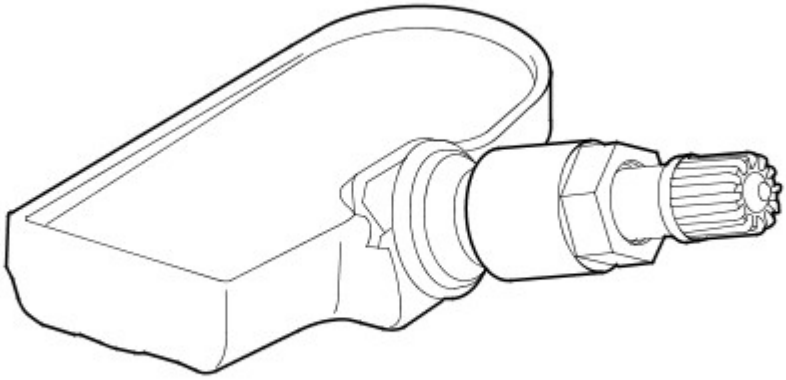
E45552

The initiators are located at the front of the front wheel arches and at the rear of the rear wheel arches and are secured with two scrivets. The TPMS has four initiators and each has a connector which connects with the body harness.

The initiator is a passive, Low Frequency (LF) transmitter. Each initiator provides an auto-location feature to identify tire positions on the vehicle and transmit that data to the CJB.

The CJB energizes each initiator in turn using LF drivers. The corresponding tire pressure sensor detects the resulting LF transmission and responds by initiating an RF transmission of its data. This data is received by the RF receiver and communicated to the CJB via a K-bus. The CJB can then determine which sensor is transmitting and its location on the vehicle.

Tire Pressure Sensor



E45553

The TPMS system uses ‘active’ tire pressure sensors which are mounted on each wheel, inside the tire cavity. The sensor is retained in position by the valve attachment to the wheel structure. The sensors transmit their RF signals at either 315 MHz or 433 MHz dependent on market requirements.

The sensors periodically measure the pressure and temperature of the air inside the tire plus the centripetal acceleration acting on the sensor. These measurements are transmitted periodically to the RF receiver located behind the overhead console.

The tire pressure sensors are self-contained units which have no electrical connections into or out of the sensor.

The care points detailed in the 'Tires' section of this chapter must be followed to avoid damage to the sensor. If the sensor is replaced, the nut, seal and washer must also be replaced and the sensor tightened to the correct torque value as given in the Service Repair manual.

The RF transmission from the sensor contains a unique identification code in its transmission data, so that the CJB can identify the tire on the vehicle. If the sensor is replaced on a 'running' wheel, the new sensor identification will be learnt when the vehicle is first driven at a speed of more than 12.5 mph (20 km/h) for 15 minutes. If a new sensor is fitted to the spare wheel, the identification for that sensor must be programmed into the CJB using a Land Rover approved diagnostic system or that wheel will not be monitored. The code is provided on a label with the complete wheel and tire assembly when new and is also printed on the casing of each sensor.

The replacement spare wheel may also be programmed to the vehicle by using it as a 'running' wheel for 15 minutes at more than 12.5 mph (20 km/h), then replacing it to the spare wheel position.

In order to conserve battery power, the tire sensor module uses different transmission rates when the wheel is stationary or moving. The wheel speed required to change between the stationary and moving transmission rates is very low to allow for the requirement for slow off-road driving.

Instrument Cluster Indications

E134246

Item	Part Number	Description
1	-	Message center
2	-	Amber warning indicator

The warning indications to the driver are common on all vehicles fitted with TPMS. Warnings are conveyed by an amber light emitting diode (LED) warning indicator and a text message displayed in the message center.

The warning indicator and message center are driven by CAN messages from the CJB. The warning indicator is illuminated by the cluster software for 3 seconds when the vehicle is in power mode 6 for a bulb check.

For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

Controller Area Network (CAN)

The CJB sends and receives a number of digital messages via the medium speed controller area network (CAN). The received messages are used for the operation of the TPMS. The transmitted messages comprise of TPMS status and requests to the instrument cluster to illuminate warnings indicators and/or display messages in the message center.

Transmitted Messages

The CJB transmits the messages shown in the following table.

Message	Received By
TPMS diagnostic response	A Land Rover approved diagnostic system.
TPMS amber warning indicator request at 25% tire deflation	Instrument cluster
TPMS message display request	Instrument cluster

Diagnostics

The CJB has a diagnostic connection via the medium speed CAN to enable system status and faults to be retrieved using a Land Rover approved diagnostic system.

Additionally, an on-board diagnostic routine within the CJB constantly monitors the system and alerts the driver to system faults by illuminating the amber warning indicator and/or displaying a message in the instrument cluster message center.

Fault Detection

If a sensor fails, the amber warning indicator in the instrument cluster will be illuminated. A message 'XX Tyre Not Monitored' will be displayed in the message center in addition to the amber warning indicator.

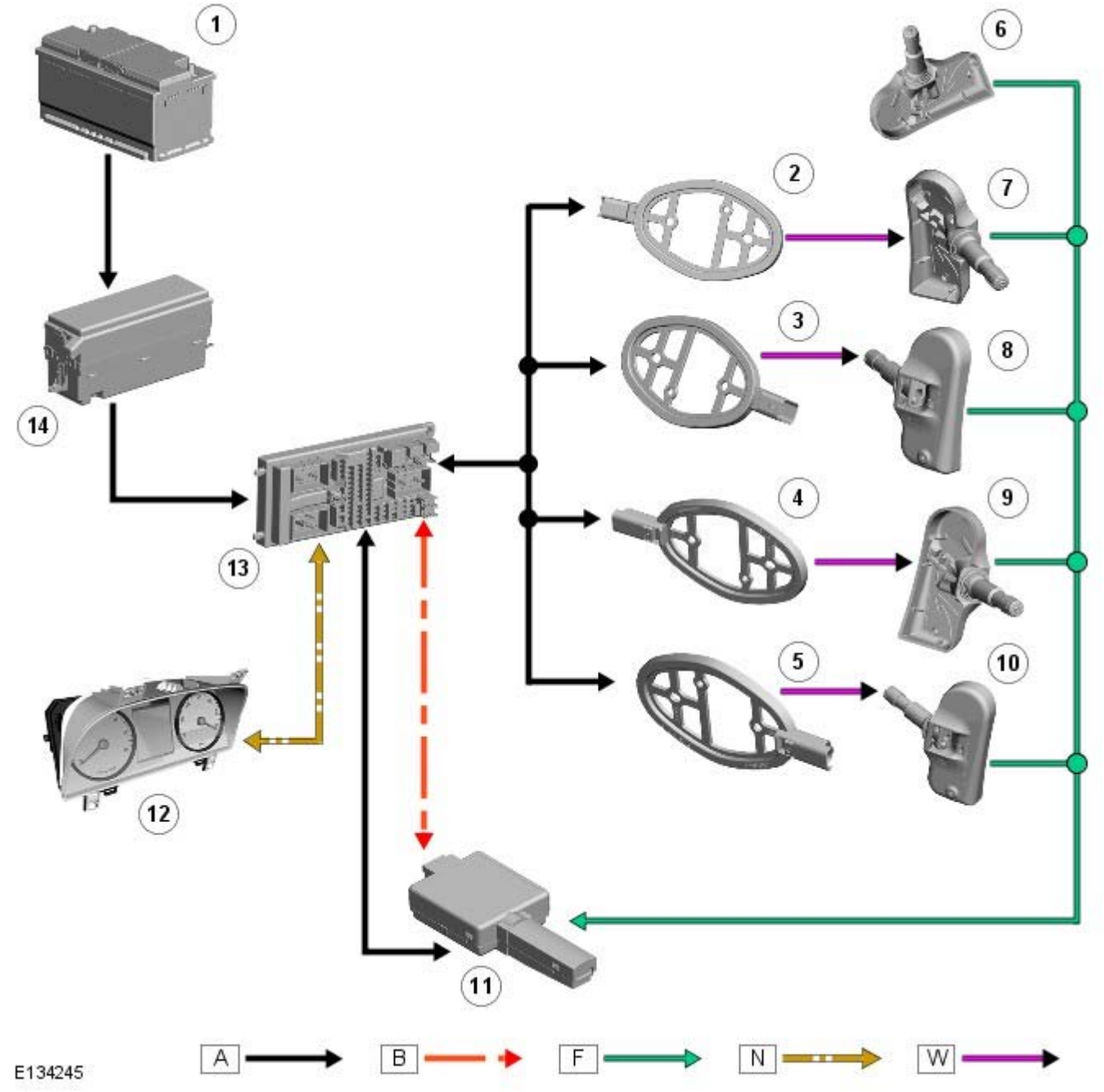
- NOTE: 'XX' is the tire position on the vehicle, e.g. FL (front left), FR (front right), RL (rear left) or RR (rear right).

If more than one sensor fails or the CJB develops a fault, the amber warning indicator will be illuminated. A message 'Tyre Monitoring System Fault' will be displayed in the message center in addition to the amber warning indicator. This fault could also be caused if RF interference near the vehicle affects the system signal reception. When the interference has ceased, the fault will be automatically cancelled and the TPMS will operate normally.

If a tire pressure sensor battery voltage becomes low, the sensor transmits a message to the CJB. The CJB stores the low battery condition as a fault flag in its memory with no other visual warnings displayed. If the battery fails, the sensor will stop transmitting and the CJB will transmit a message to display 'FL Tyre Not Monitored' for example in the message center. The dealer should interrogate the CJB for the fault flag using a Land Rover approved diagnostic system to determine the cause of the message. If the battery has failed, the sensor must be replaced and the stored fault flags removed using a Land Rover approved diagnostic system. The CJB will learn the identification of the new sensor when the vehicle is driven. If the replaced sensor is fitted to the spare wheel (if fitted), its identification must be manually programmed into the CJB using a Land Rover approved diagnostic system or by using it as a 'running' wheel for 15 minutes at more than 12.5 mph (20 km/h), then replacing it to the spare wheel position.

CONTROL DIAGRAM

• NOTE: **A** = Hardwired; **B** = K-Bus; **F** = RF Transmission; **N** = Medium Speed CAN Bus; **W** = LF Transmission



Item	Part Number	Description
1	-	Battery
2	-	RH rear initiator
3	-	LH rear initiator
4	-	RH front initiator
5	-	LH front initiator
6	-	Spare tire pressure sensor
7	-	RH rear tire pressure sensor
8	-	LH rear tire pressure sensor
9	-	RH front tire pressure sensor
10	-	LH front tire pressure sensor
11	-	TPMS RF receiver

12	-	Instrument Cluster
13	-	CJB
14	-	EJB

Published: 21-Oct-2011

Wheels and Tires - Wheels and Tires

Diagnosis and Testing

Principles of Operation

For a detailed description of the wheels and tires, refer to the relevant Description and Operation section in the workshop manual.
REFER to: Wheels and Tires (204-04 Wheels and Tires, Description and Operation) /
Wheels and Tires (204-04, Description and Operation).

Inspection and Verification

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

1. **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:
     - Rotate wheels approximately 180 degrees
     - 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 wheel arch Tire Pressure Monitoring System Antennas and check for system DTCs. External visual damage to the tire low pressure sensors and air leaks will not cause system fault warnings (note: nut and seal system should be replaced at each tyre change using the available service kit). 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. **2.** Check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Central Junction Box (CJB) (100-00 General Information, Description and Operation).

Pinpoint Tests

<table>
<tr><th colspan="3">PINPOINT TEST A : U201F11 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO GROUND</th></tr>
<tr><th>TEST CONDITIONS</th><th colspan="2">DETAILS/RESULTS/ACTIONS</th></tr>
<tr><td colspan="3">A1: U201F11 VERIFY EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO GROUND</td></tr>
<tr><td></td><td colspan="2">1 Ignition OFF.</td></tr>
<tr><td></td><td colspan="2">2 Disconnect the Tire Pressure Monitoring System Receiver electrical connector, C2875.</td></tr>
<tr><td></td><td colspan="2">3 Measure the resistance between
<table><tr><th>C2875, harness side</th><th>Battery</th></tr><tr><td>Pin 1</td><td>Negative terminal</td></tr></table></td></tr>
<tr><td></td><td colspan="2">Is the resistance less than 5 Ohms?
Yes
GO to A2.
No
GO to A3.</td></tr>
<tr><td colspan="3">A2: U201F11 CHECK THE EXTERNAL RECEIVER DATA LINE CIRCUIT FOR SHORT CIRCUIT TO GROUND</td></tr>
<tr><td></td><td colspan="2">1 Disconnect the Body Control Module electrical connector, C0580.</td></tr>
</table>

	2 Measure the resistance between

C2875, 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.
A3: U201F11 CHECK THE TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER FOR SHORT CIRCUIT TO GROUND	
	1 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C2875.
	2 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.
	Is the DTC U201F11 set? **Yes** Replace Tire Pressure Monitoring Receiver. **No** Investigate possible cause of intermittent failure.
A4: U201F11 CHECK THE BODY CONTROL MODULE FOR SHORT CIRCUIT TO GROUND	
	1 Reconnect the Body Control Module electrical connector, C0580.
	2 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C2875.
	3 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.
	Is the DTC U201F11 set? **Yes** Replace Body Control Module. **No** Investigate possible cause of intermittent failure.

PINPOINT TEST B : U201F12 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO POWER

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: U201F12 VERIFY EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO POWER	
	1 Ignition OFF.
	2 Disconnect the Tire Pressure Monitoring System Receiver electrical connector, C2875.
	3 Measure the resistance between

C2875, harness side	Battery
Pin 1	Positive terminal

	Is the resistance less than 5 Ohms? **Yes** GO to B2. **No** GO to B3.
B2: U201F12 CHECK THE EXTERNAL RECEIVER DATA LINE CIRCUIT FOR SHORT CIRCUIT TO POWER	
	1 Disconnect the Body Control Module electrical connector, C0580.
	2 Measure the resistance between

C2875, 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 B4.
B3: U201F12 CHECK THE TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER FOR SHORT CIRCUIT TO POWER	
	1 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C2875.
	2 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.
	Is the DTC U201F12 set? **Yes** Replace Tire Pressure Monitoring Receiver. **No** Investigate possible cause of intermittent failure.
B4: U201F12 CHECK THE BODY CONTROL MODULE FOR SHORT CIRCUIT TO POWER	
	1 Reconnect the Body Control Module electrical connector, C0580.
	2 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C2875.
	3 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.
	Is the DTC U201F12 set? **Yes** Replace Body Control Module. **No** Investigate possible cause of intermittent failure.

PINPOINT TEST C : U201F87 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE MISSING MESSAGE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: U201F87 VERIFY EXTERNAL RECEIVER DATA LINE MISSING MESSAGE	
	1 Using manufacturer approved diagnostic system run On Demand Self Test (0x0202).

	Is the DTC U201F87 set? **Yes** GO to C2. **No** Investigate possible cause of intermittent failure.
C2: U201F87 CHECK EXTERNAL RECEIVER DATA LINE CIRCUIT	
	1 Ignition OFF.
	2 Disconnect the Tire Pressure Monitoring System Receiver electrical connector, C2875.
	3 Disconnect the Body Control Module electrical connector, C0580.
	4 Measure the resistance between

C2875, harness side	C0580, harness side
Pin 1	Pin 25

	Is the resistance less than 5 ohms? **Yes** GO to C3. **No** REPAIR the high resistance/open circuit in wiring harness.
C3: U201F87 CHECK EXTERNAL RECEIVER	
	1 Reconnect the Body Control Module electrical connector, C0580.
	2 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C2875.
	3 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.
	Is the DTC U201F87 set? **Yes** Replace Tire Pressure Monitoring Receiver.GO to C4. **No** Investigate possible cause of intermittent failure.
C4: U201F87 CHECK BODY CONTROL MODULE.	
	1 Using manufacturer approved diagnostic system run On Demand Self Test **(0x0202)**.
	Is the DTC U201F87 set? **Yes** Replace Body Control Module. **No** Test is complete. No further action is required.

PINPOINT TEST D : C1A5693, C1A5893, C1A6093, C1A6293 DEFECTIVE RUNNING TIRE LOW PRESSURE SENSOR OR RECEIVER

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: C1A5693, C1A5893, C1A6093, C1A6293 CHECK FOR ADDITIONAL DTCS	
	1 Using manufacturer approved diagnostic system check for additional DTCs C1A5693, C1A5893, C1A6093, C1A6293, with identical time stamps.
	Have all four DTCs logged with identical time stamps in the Body Control module? **Yes** Diagnose and fix DTCs related to the tire pressure monitoring receiver. **No** Using manufacturer approved diagnostic system, perform diagnostic routine to verify reception of all tire low pressure sensors, by carrying out 'TPMS wheel unit & receiver reception test' from set up and configuration application and complete remedial actions.

PINPOINT TEST E : C1D1800 LOCALIZATION FAILURE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: C1D1800 ESTABLISH THE LOCATIONS OF THE TIRE LOW PRESSURE SENSOR LOCALIZATION FAILURES	
	• NOTE: To clear or reset information read in datalogger signal 'Unsuccessful wheel position triggering statistic' (0x4149) Use manufacturer approved diagnostic system and carry out 'Reset/ Clear Specified Function' (0x040E) from Special Applications. 1 Using manufacturer approved diagnostic system read datalogger signal 'Unsuccessful wheel position triggering statistic' (0x4149) to establish the locations of the tire low pressure sensor localization failures.
	Have the locations of the tire low pressure sensor localization failures been identified? **Yes** GO to E2. **No** Investigate possible cause of intermittent failure.
E2: C1D1800 CHECK FOR ADDITIONAL LF INITIATOR CIRCUIT DTCS	
	1 Using manufacturer approved diagnostic system check for additional DTCs C1A5712, C1A5714, C1A5912, C1A5914, C1A6112, C1A6114, C1A6312, C1A6314.
	Are any of the following DTCs logged C1A5712, C1A5714, C1A5912, C1A5914, C1A6112, C1A6114, C1A6312, C1A6314? **Yes** Refer to the DTC Index. Check for possible causes for each of the logged DTCs and carry out the repair operations specified. **No** GO to E3.
E3: C1D1800 CHECK FOR ADDITIONAL TIRE LOW PRESSURE SENSOR DTCS	
	1 Using manufacturer approved diagnostic system check for additional DTCs C1A5693, C1A5893, C1A6093, C1A6293, C1D2105.

	Are any of the following DTCs logged C1A5693, C1A5893, C1A6093, C1A6293, C1D2105? **Yes** Refer to the DTC Index. Check for possible causes for each of the logged DTCs and carry out the repair operations specified. **No** GO to E4.
E4: C1D1800 CHECK INITIATORS ARE CORRECTLY INSTALLED	
	1 Check for correct installation of Initiators for the locations identified. REFER to: (204-04 Wheels and Tires) Tire Pressure Monitoring System (TPMS) Front Antenna (Removal and Installation), Tire Pressure Monitoring System (TPMS) Rear Antenna (Removal and Installation).
	Are the Initiators correctly installed? **Yes** GO to E5. **No** Install Initiators to the correct locations.
E5: C1D1800 CHECK FOR SHORT CIRCUIT IN INITIATOR HARNESS	
	1 Ignition OFF. 2 Disconnect the Body Control Module electrical connector, C0584 (Front LF Initiators). 3 Disconnect the Body Control Module electrical connector, C0586 (Rear LF Initiators). 4 Measure the resistance of Front Right Hand Initiator.

C0584, harness side	C0584, harness side
Pin 1	Pin 2

5 Measure the resistance of Front Left Hand Initiator.

C0584, harness side	C0584, harness side
Pin 14	Pin 15

6 Measure the resistance of Rear Right Hand Initiator.

C0586, harness side	C0586, harness side
Pin 30	Pin 31

7 Measure the resistance of Rear Left Hand Initiator.

C0586, harness side	C0586, harness side
Pin 18	Pin 19

	Are any of the Initiator resistance measurements less than 1 Ohm? **Yes** REPAIR 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(s) identified. REFER to: Tire Low Pressure Sensor (204-04 Wheels and Tires, Removal and Installation).

PINPOINT TEST F : C1D2105 MISSING, INCOMPATIBLE OR DEFECTIVE RUNNING TIRE LOW PRESSURE SENSOR(S) OR RECEIVER	
TEST CONDITIONS	**DETAILS/RESULTS/ACTIONS**
F1: C1D2105 CHECK FOR CORRECT WHEEL AND TIRE ASSEMBLY AND TIRE LOW PRESSURE SENSORS	
	• 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 or space saver spare wheel. 1 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** Using manufacturer approved diagnostic system, perform diagnostic routine to verify reception of all tire low pressure sensors, by carrying out 'TPMS wheel unit & receiver reception test' from set up and configuration application and complete remedial actions. **No** If agreed with the customer, install the correct wheel and tire assembly or tire low pressure sensor(s), of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application. (Note: If the datalogger signal 'Number Of Missing Tire Pressure Wheel Units' is 4 and the Instrument Panel Cluster displays text message 'Tire Pressure Monitoring Unavailable', the system has detected winter tire installation, as detailed in the owner's manual. Confirm why the vehicle has non-TPMS wheel & tire assemblies installed before installing tire low pressure sensors, which are not to be claimed under vehicle warranty.)

Component Tests

Wheels and Tires

For wheel and tire specification information (pressures, torques, etc).
REFER to: Specifications (204-04 Wheels and Tires, 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 manufacturer 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 manufacturer 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. **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.
  REFER to: Specifications (204-04 Wheels and Tires, 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.

Published: 16-Aug-2011

Wheels and Tires - Tire Low Pressure Sensor

Removal and Installation

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.

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

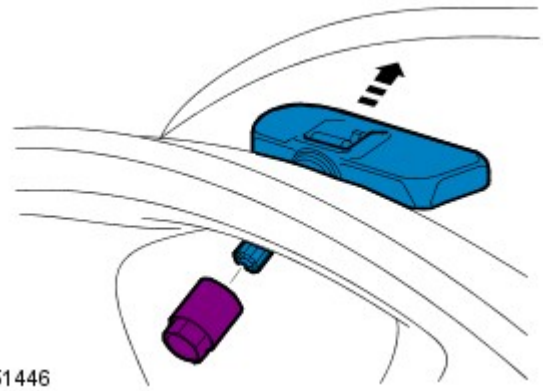
Remove the tire from the wheel.

4. CAUTIONS:

Do not push on the valve.

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

If the tire low pressure sensor is to be re-installed, a new washer, seal, nut and silver coloured nickel valve core must be installed.



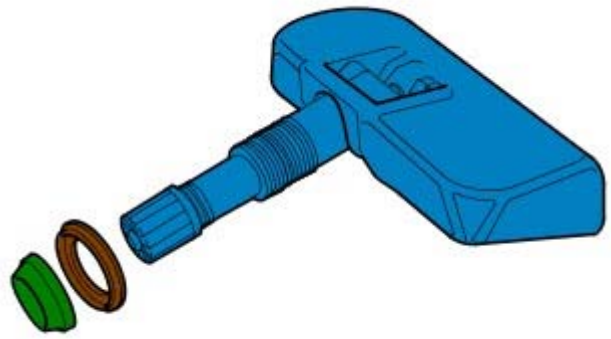
E51446

Remove the tire low pressure sensor.

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

5. 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.

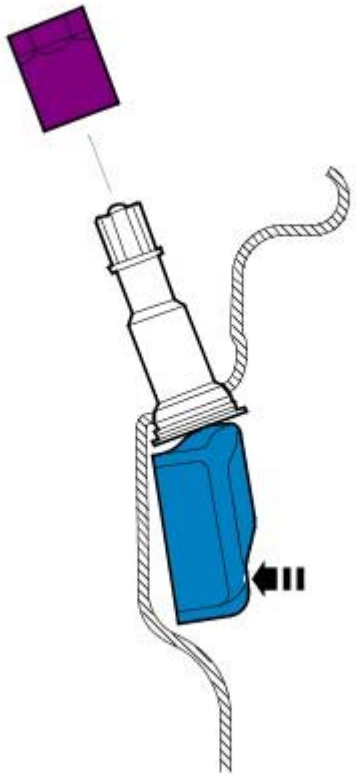


E51447

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.



E51449

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 when the vehicle is first 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 T4. The identifcation code is provided on a label with the complete assembly and is also printed on the casing of each sensor.

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.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 11-May-2011

Wheels and Tires - Tire Pressure Monitoring System (TPMS) Front Antenna

Removal and Installation

Removal

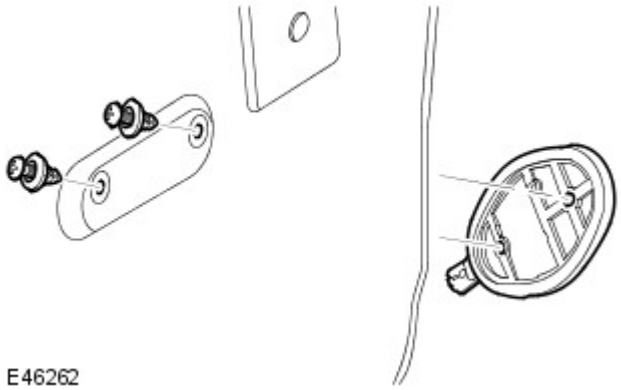
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

3. Remove the tire pressure antenna.

- Remove the 2 retainers.



Installation

1. To install, reverse the removal procedure.

2. Initiate a new tire pressure antenna using T4.

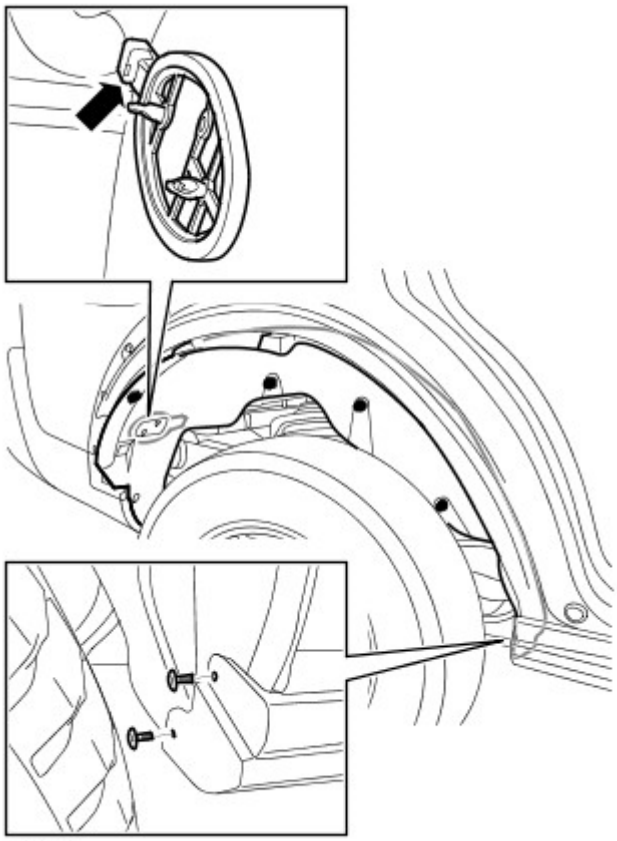
Published: 11-May-2011

Wheels and Tires - Tire Pressure Monitoring System (TPMS) Rear Antenna

Removal and Installation

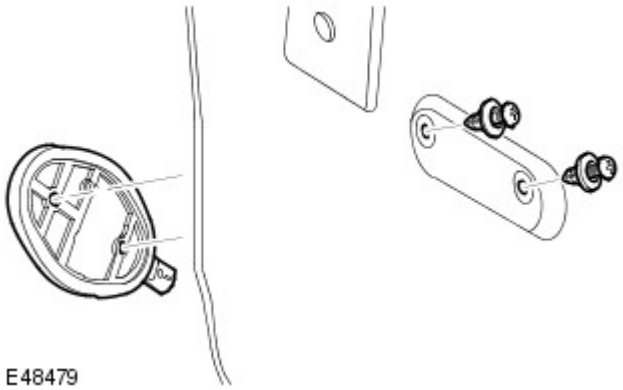
Removal

1. Remove the fender moulding.
   For additional information, refer to: Rear Quarter Panel Moulding (501-08 Exterior Trim and Ornamentation, Removal and Installation).
2. Remove the fender splash shield.
   - Remove the 2 screws.
   - Remove the 6 retainers.
   - Disconnect the electrical connector.



E48478

3. Remove the tire pressure antenna.
   - Remove the 2 retainers.



E48479

Installation

1. To install, reverse the removal procedure.
2. Initiate a new tire pressure antenna using T4.

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Vehicle Dynamic Suspension -

Air Suspension - General Specification

Item	Specification
Ride height:	
Off road	55 mm (2.1 in) above standard
Access - reselectable whilst vehicle is moving	50 mm (1.9 in) below standard
Trim height	Configured using T4 plus special tools
Height sensors:	
Location	4 per vehicle - one sensor for each wheel
Height sensor arm colour coding:	
Left hand side, front and rear	WHITE
Right hand side, front and rear	BLACK
Height sensor operating voltages:	
Supply voltage	5 volts - supplied by air suspension ECU
Output voltage	**Left hand front and right hand rear** - Decreases to 0.5 volts with bump travel. **Right hand front and left hand rear** - Decreases to 4.5 volts with bump travel
Spring/damper modules:	
Type	Guided air spring surrounding twin tube damper
Pressures:	
Normal - Front	800 to 1000 kPa (8.0 to 10.0 bar) (116.0 to 145.0 lbf/in²)
Normal - Rear	500 to 800 kPa (5.0 to 8.0 bar) (72.5 to 116.0 lbf/in²)
Burst pressure	3500 kPa (35 bar) (507.5 lbf/in²)
Maximum spring pressure - Full bump at gross vehicle weight	Approximately 2700 kPa (27 bar) (391.5 lbf/in²)
Air compressor:	Supplied with air drier, electrically switched, pilot operated exhaust valve and double temperature sensors
Controlled by	ECU
Maximum pressure	1680 kPa (16.8 bar) (243.6 lbf/in²)
Air reservoir:	
Volume	9 litres (0.31 cu.ft)
Working pressure	1750 kPa (17.5 bar) (253.75 lbf/in²)
Maximum operating pressure	2300 kPa (23 bar) (333.5 lbf/in²)
Reservoir valve block	Incorporates pressure sensor to monitor spring and air reservoir pressures
Valve blocks:	
Front	2 corner valves, 1 cross link valve - all mounted on front bumper armature
Rear	2 corner valves, 1 cross link valve - all mounted on left hand rear spring tower

General Specifications

Item	Specification
Gap between underside of the toe link rubber boot and the chassis bracket	10.0 mm (0.393 in)

Torque Specifications

Description	Nm	lb-ft
Air suspension compressor bolts	10	7
Air suspension compressor lower cover bolts	10	7
Voss connector to the front solenoid valve block	2.5	1.7
Voss connector to the front and rear air springs	3.5	2.6
Voss connector to the rear solenoid valve block	2.5	1.7
Voss connector to the air suspension reservoir	5	4
Voss connector to the air suspension reservoir solenoid valve block	2.5	1.7
Air suspension control module bolt	10	7
Air suspension reservoir bolts	23	17
* Stabilizer bar link nuts	115	85
Toe link bolt	175	129
Toe link inner ball joint retaining nut	133	98
Toe link nut	103	76
Toe link adjustment locking nut	130	96
Lower front arm camber adjusting bolt	275	203
Lower arm rear castor adjusting bolts	275	203
Track rod end locking nuts	53	39
Rear camber adjusting bolts	133	98
Front and rear air spring/shock absorber to the suspension turret nuts	63	46
Front and rear air spring/shock absorber to the lower suspension arm nut and bolt	300	221
* Front and rear air spring/shock absorber top nut	98	72
Heat shield bolts	10	7
*+ Halfshaft nut	350	258
Wheel speed sensor bolt	10	7
Brake disc dust shield bolts	10	7
Wheel hub bolts	115	85
* Lower arm ball joint retaining nut	115	85
* Tie-rod end ball joint	76	56
Suspension height sensor Torx bolts	2.2	1.5
Road wheel nuts	140	103

*** New nut must be fitted**

+ Stake nut on completion of tightening

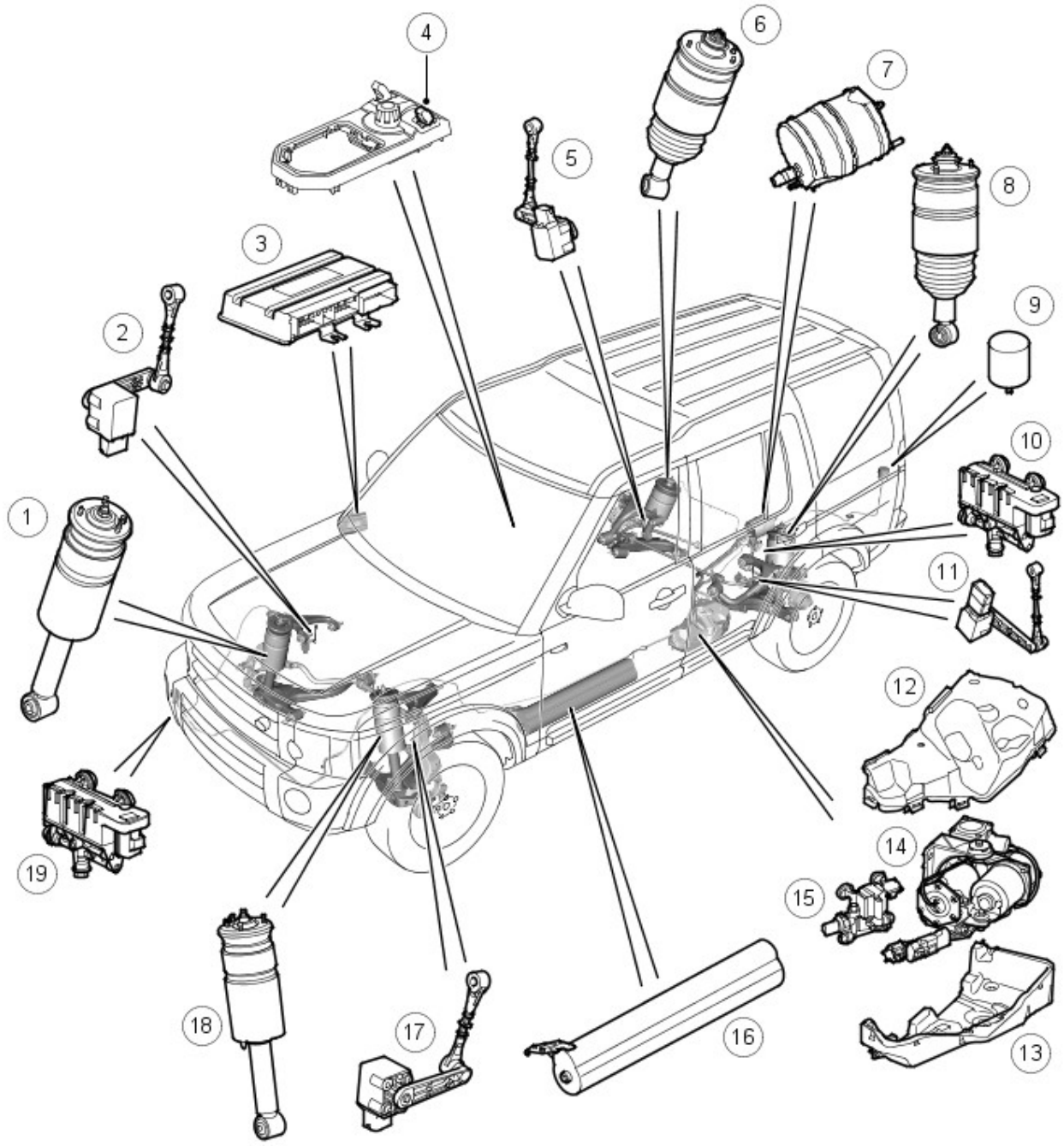
Published: 11-May-2011

Vehicle Dynamic Suspension - Vehicle Dynamic Suspension

Description and Operation

Dynamic Suspension - Component Location

- NOTE: Right hand drive vehicle shown



E45174

Item	Part Number	Description
1	-	Front RH air spring damper module
2	-	Front RH height sensor
3	-	Air suspension control module
4	-	Air suspension control switch
5	-	Rear RH height sensor
6	-	Rear RH air spring damper module
7	-	Air supply unit silencer

8	-	Rear LH air spring damper module
9	-	Air filter
10	-	Rear valve block
11	-	Rear LH height sensor
12	-	Upper acoustic cover
13	-	Lower acoustic cover
14	-	Air supply unit
15	-	Reservoir valve block
16	-	Air reservoir
17	-	Front LH height sensor
18	-	Front LH air spring damper module
19	-	Front valve block

GENERAL

• NOTE: This section covers the air suspension control system.

Front suspension is detailed in a separate section.
For additional information, refer to: Front Suspension (204-01 Front Suspension, Description and Operation).

Rear suspension is detailed in a separate section.
For additional information, refer to: Rear Suspension (204-02 Rear Suspension, Description and Operation).

Terrain Response™ is detailed in a separate section.
For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Diagnosis and Testing).

The dynamic suspension system is a four corner air suspension system which is fitted to higher specification vehicles in place of the conventional damper and coil spring suspension used on non-air suspension models.

The dynamic suspension system is electronically controlled by an air suspension control module which controls the air supply unit, reacts to inputs from four height sensors and distributes air around the system via valve blocks.

The main air suspension system components are:

- Air suspension control module
- Air supply unit
- Four height sensors
- Three valve block assemblies
- Reservoir
- Air harness
- Four suspension air spring damper modules.

The four corner air suspension system maintains the vehicle height under all operating conditions by controlling the mass of air in the air springs. The air suspension control module uses signals from the four height sensors to maintain the correct suspension height. This is achieved by operating pneumatic control valves to increase or decrease the mass of air in the air spring damper modules.

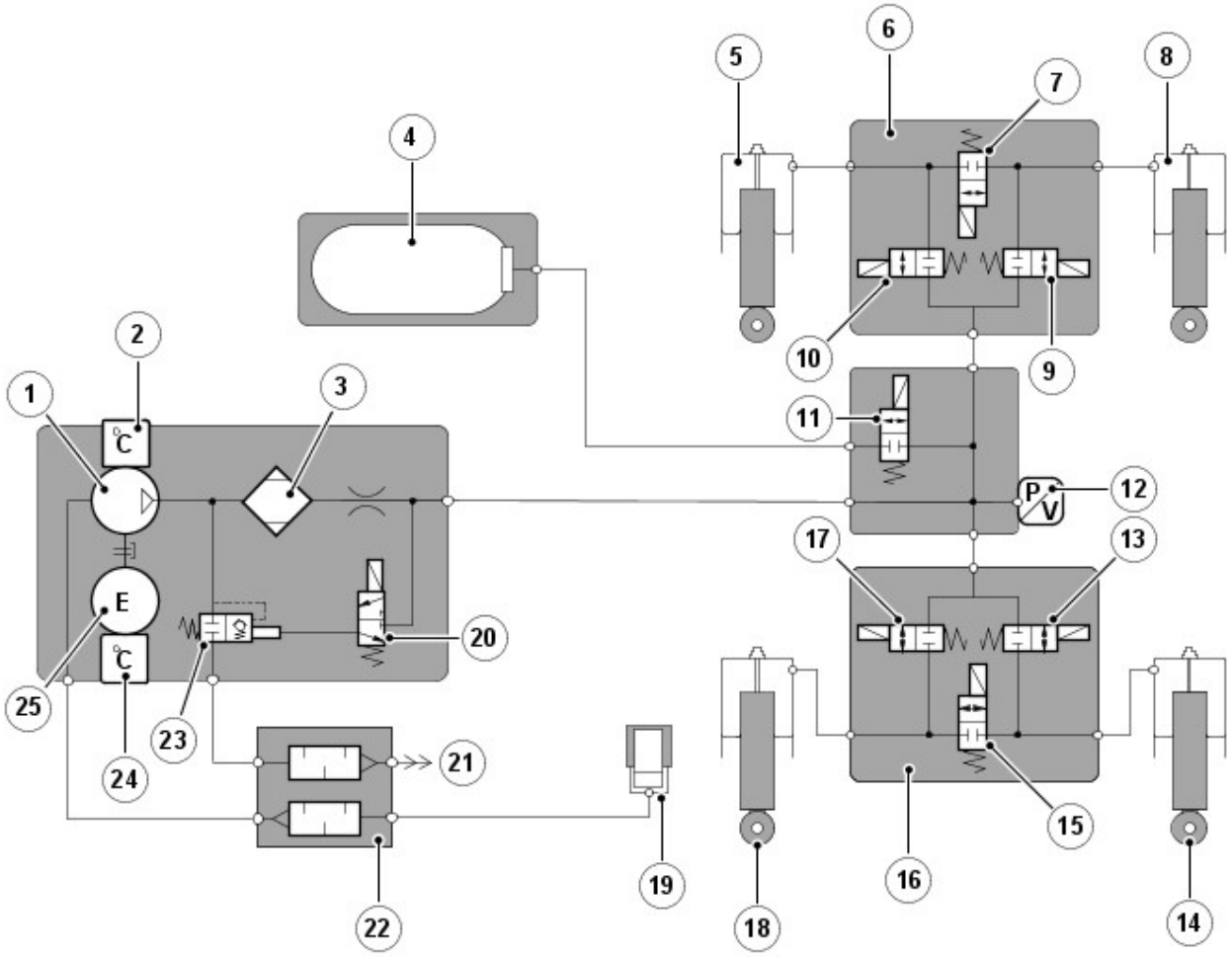
The air suspension system has three driver selectable, pre-determined ride heights. A driver interface indicates the selected ride height and direction of movement. Additional information is also relayed to the driver via the instrument cluster message center (where fitted) and by audible warnings also transmitted by the instrument cluster.

Height changes can only be made when the engine is running and the driver's and passenger doors are closed.

Access height can be selected with the engine not running, within 40 seconds of moving the ignition switch to the off position provided the driver's door has not been opened in this time.

The air suspension can be controlled manually by the driver using a switch on the center console to select the required height change.

Schematic Pneumatic Circuit



E45175

Item	Part Number	Description
1	-	Compressor
2	-	Compressor temperature sensor
3	-	Air dryer
4	-	Reservoir
5	-	Front LH air spring damper module
6	-	Front valve block
7	-	Cross link valve
8	-	Front RH air spring damper module
9	-	Front RH corner valve
10	-	Front LH corner valve
11	-	Reservoir control valve
12	-	Pressure sensor
13	-	Rear RH corner valve
14	-	Rear RH air spring damper module
15	-	Cross link valve
16	-	Rear valve block
17	-	Rear LH corner valve
18	-	Rear LH air spring damper module
19	-	Inlet air filter
20	-	Pilot exhaust valve
21	-	Exhaust
22	-	Air silencer
23	-	Pressure relief and exhaust valve
24	-	Motor temperature sensor
25	-	Electric motor

OPERATING MODES

Using the air suspension switch, the driver is able to manually select one of four ride states:

- ON-ROAD - this height is the normal operating height of the vehicle
- OFF-ROAD - this height is higher than the on-road height and provides improved ground clearance, approach, departure and breakover angles
- ACCESS - this height is lower than the on-road height and makes entering and exiting the vehicle easier for the occupants
- CRAWL (Locked at access) - this height allows the vehicle to be driven at the access height at low speeds to provide increased roof clearance in low car parks etc.

• NOTE: Vehicle height changes are prevented if the air suspension control module receives a 'Door Open' signal from the Central Junction Box (CJB).

An additional 'TRANSPORTATION' mode is also available but is only selectable using the Land Rover approved diagnostic equipment.

An additional function allows the vehicle to be raised or lowered from outside of the vehicle when the vehicle is stationary. For example, this may assist with the attachment of a trailer and is achieved using the buttons on the remote handset and the ignition switch in the off position. The remote handset can be programmed to perform a number of additional functions.
For additional information, refer to: Handles, Locks, Latches and Entry Systems (501-14 Handles, Locks, Latches and Entry Systems, Description and Operation).

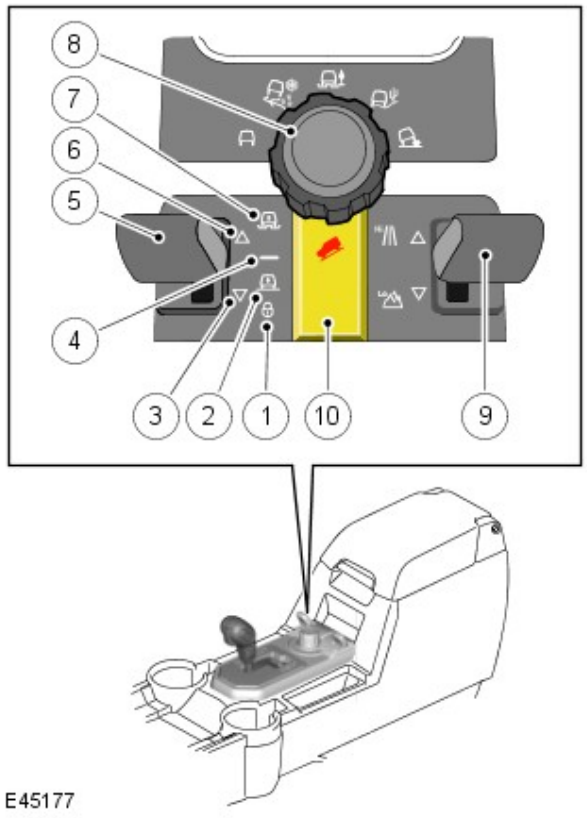
If the air suspension control module senses that the vehicle has grounded and lost traction, the control module can temporarily increase and/or redistribute the volume of air supplied to the affected air spring(s) to maximize the available traction. This is known as extended mode and will be indicated to the driver by the lamps on the air suspension switch flashing, and messages displayed in the instrument cluster message center.

If the air suspension control module senses that the vehicle is prevented from moving upwards or downwards during a height change or leveling correction, the control module will adopt a safe state and further height changes will be suspended.

If a fault is detected by the air suspension control module, the control module will reduce the system functionality dependent on the type and severity of the fault. The control module will also store a fault code which can be retrieved using the Land Rover approved diagnostic equipment. If a severe fault occurs, the control module will attempt to put the vehicle in a safe condition. A fault is relayed to the driver by the illumination of the air suspension warning indicator, the instrument cluster message center and an audible warning emitted from the instrument cluster.

If the detected fault is minor and does not affect vehicle safety, the air suspension warning indicator in the instrument cluster will illuminate in an amber color and the fault should be rectified at the earliest opportunity. If a more severe fault is detected, the warning indicator will illuminate in a red color above 31 mph (50 km/h) vehicle speed, and the vehicle should be driven with care until the fault is rectified. An audible warning is emitted by the instrument cluster sounder when the warning indicator is illuminated. The indicator will change to an amber color and the audible warning will stop when the vehicle speed is reduced.

Air Suspension Switch Mode Lamps



Item	Part Number	Description
1	-	Crawl mode lamp
2	-	Access mode lamp
3	-	Lowering lamp
4	-	On-road mode lamp
5	-	Air suspension switch
6	-	Raising lamp
7	-	Off-road mode lamp
8	-	Terrain Response™ rotary control
9	-	Transfer box range switch
10	-	Hill Descent Control (HDC) switch

On-Road Mode

This is the normal ride height for the vehicle.

Off-Road Mode

Off-road mode will only be activated if the vehicle speed is less than 25 mph (40 km/h). The vehicle will be raised 55 mm (2.2 in) higher than the on-road mode to provide additional body clearance and improved approach, departure and breakover angles. If the vehicle speed exceeds 31 mph (50 km/h), the air suspension control module will automatically lower the vehicle to the on-road mode height. At 25 to 28 mph (40 to 45 km/h) a message is displayed in the message center to warn the driver to slow down or the vehicle will lower.

• NOTE: The suspension can be automatically set to off-road mode when some Terrain Response programs and low range are selected.

Access Mode

Access mode lowers the vehicle body height by 50 mm (2 in) and provides easier entry, exit and loading of the vehicle. Access mode can be pre-selected when the vehicle is moving. The vehicle will partly lower as the vehicle speed decreases, lowering to the full access mode height when the vehicle reaches 5 mph (8 km/h). If the required road speed is not reached within a predetermined time, the air suspension will return the vehicle to the previously selected height.

Access mode can be selected at any vehicle speed. When access mode is selected, the response of the air suspension system will depend on the vehicle speed:

- If the vehicle speed is more than 12.5 mph (20 km/h), the air suspension control module will wait for up to one minute for the vehicle speed to be reduced. The access mode lamp and the lowering lamp will flash while the air suspension control module waits for the vehicle speed to be reduced, the on-road mode lamp will remain illuminated. If the vehicle speed is not reduced sufficiently, the access mode request will be cancelled after 1 minute.
- If the vehicle speed is less than 12.5 mph (20 km/h), the air suspension control module will lower the suspension to a part lowered height and will remain at this height for up to one minute. The on-road mode lamp will extinguish as the air suspension control module lowers the suspension to the part lowered height. The access mode lamp and the lowering lamp will illuminate. When part lowered is reached, the 'lower' lower lamp will flash. If the vehicle speed is not reduced to less than 5 mph (8 km/h) in the one minute period, the access mode request will be cancelled.
- If the vehicle speed is less than 5 mph (8 km/h), the suspension will be lowered to access mode immediately. The access mode lamp and the lowering lamp will illuminate. When the access mode height is reached, the lowering lamp will be extinguished.

Access height may be selected up to 40 seconds after the ignition is turned off, provided that the driver's door has not been opened within this time.

The suspension will automatically rise from access mode when the vehicle speed exceeds 6.2 mph (10 km/h). If access mode was selected directly from off-road mode then the system will return to off-road mode when the vehicle speed exceeds 6.2 mph (10 km/h). Otherwise the system will lift the suspension to On-road height.

Selecting Access Mode Directly from Off-Road Mode

When the suspension is in off-road mode height, pressing the air suspension switch once and then a second time before the lowering lamp is extinguished, the control module will lower the suspension to access mode height. The control module will remember to return the suspension to off-road height automatically if the vehicle speed increases above 6.2 mph (10 km/h).

Crawl (Locked at Access) Mode

Crawl mode allows the vehicle to driven at access height. The vehicle is locked in access height and can be selected at a speed of less than 21.7 mph (35 km/h) and can be driven at low speeds to improve clearance in areas with restricted headroom, i.e. car parks. If the vehicle exceeds 24.8 mph (40 km/h), crawl mode will be cancelled and the vehicle will return to on-road height.

Crawl mode allows the vehicle to be driven at low speeds with the suspension locked at the access mode height. This allows the vehicle to be driven in low car parks etc. with increased roof clearance.

Crawl mode can be selected from Normal or Access ride heights up to 21.7 mph (35 km/h), with a long press of the switch in the down direction. The access mode lamp and the crawl mode lamp will be illuminated. When the control module is in crawl mode, on-road mode height will be selected automatically if the vehicle speed exceeds 25 mph (40 km/h). At 18.6 to 21.7 mph (30 to 35 km/h) a message is displayed in the message center to warn the driver to slow down or the vehicle will raise. Crawl mode can also be manually cancelled by moving the switch in the up direction for 1 second. The crawl mode lamp will be extinguished.

Automatic Height Change Warnings

When the suspension is in off-road mode, access mode or crawl mode height, the air suspension control module will change the suspension height automatically when the vehicle speed exceeds predetermined thresholds.

When the suspension is at off-road mode or crawl mode height, the control module issues a warning to advise the driver that the vehicle is approaching the speed threshold. The instrument cluster sounder will emit a chime, a message will be displayed in the message center and the on-road mode lamp and either the raising or lowering lamp will flash.

The off-road mode or crawl mode height speed warning is removed when the vehicle speed is reduced.

SPECIAL MODES

Door Open Functionality

If one or more of the vehicle doors are opened during a height change when the vehicle is stationary, the air suspension control module will restrict further height change. The door open signal is transmitted by the CJB on the high speed CAN bus and received by the air suspension control module. This keeps the vehicle level to the set height when a door opens to allow for changes in loading conditions.

A hardwired door status signal is also transmitted from the CJB to the air suspension control module. This signal provides door status information when the high speed CAN bus is off, i.e.; during periodic re-leveling.

The lamp on the air suspension switch for the target mode height will remain illuminated and the raising or lowering lamp will

flash.

If all of the doors are closed within 90 seconds, the height change will resume. If the 90 second period is exceeded and all of the doors are not closed, the height change will be cancelled. The mode lamps showing the previously selected height and the target height will be illuminated. The mode height change can be reselected by operating the switch, however, if the vehicle is driven at speed of more than 5 mph (8 km/h) the control module will continue to raise or lower the vehicle to the target mode height.

Extended Mode

If the vehicle becomes grounded and the traction control becomes operational, the air suspension control module automatically increases the mass of air in the air springs to raise the vehicle clear of the obstruction. Extended mode is activated automatically and cannot be selected manually.

When the air suspension control module has activated the extended mode, the off-road mode lamp will flash if the suspension is above off-road mode height. The off-road mode and on-road mode lamps will flash if the suspension is between off-road mode and on-road mode heights. The on-road mode and access mode lamps will flash if the suspension is between on-road mode and access mode. A message will also be displayed in the message center.

To exit the extended mode, press the air suspension switch briefly in the up or down position or drive the vehicle at a speed of more than 2 mph (3 km/h) for 45 seconds.

Additional Lift in Extended Mode

In later software a feature is available to provide additional body clearance when in extended mode. When extended mode has been invoked and the automatic lifting of the vehicle is complete, the driver can request an additional lift of the vehicle. This can be particularly useful when extended mode has to be activated on soft surfaces.

The additional lift can be requested once the raising lamp has extinguished. Press and hold the switch in the up direction for 3 seconds whilst simultaneously depressing the brake pedal. A chime from the instrument cluster will sound to confirm that the request has been accepted. The raising symbol will be illuminated while the vehicle is being lifted.

Suspension Prevented From Moving

If the air suspension control module is attempting to change the suspension height and it detects that the suspension is prevented from moving, the control module will stop all suspension movement. This can be caused by jacking the vehicle, attempting to lower the vehicle onto an object or raising the vehicle against an obstruction.

The air suspension switch lamps operate as described for extended mode and the same message is displayed in the message center. To start the air suspension system operating, press the air suspension switch briefly in the up or down position, or drive the vehicle at a speed of more than 2 mph (3 km/h) for 45 seconds.

High Speed Mode

In later software a high speed mode is introduced. High speed mode is a non-selectable, automatic mode which lowers the vehicle height by 20 mm to improve vehicle handling. This feature is fully automated and is 'invisible' to the driver.

If the vehicle speed exceeds 100 mph (160 km/h) for more than 5 seconds, the air suspension control module initiates the high speed mode. When the vehicle speed reduces to less than 80 mph (130 km/h) for more than 30 seconds, the vehicle returns to 'on-road' height. This function is cancelled if a trailer is connected to the trailer socket.

Periodic Re-leveling

When the vehicle is parked, the air suspension control module 'wakes up' two hours after the ignition was last switched off and then once every six hours. The vehicle height is checked and if the vehicle is not level within a pre-set tolerance, small downwards height adjustments may be made automatically.

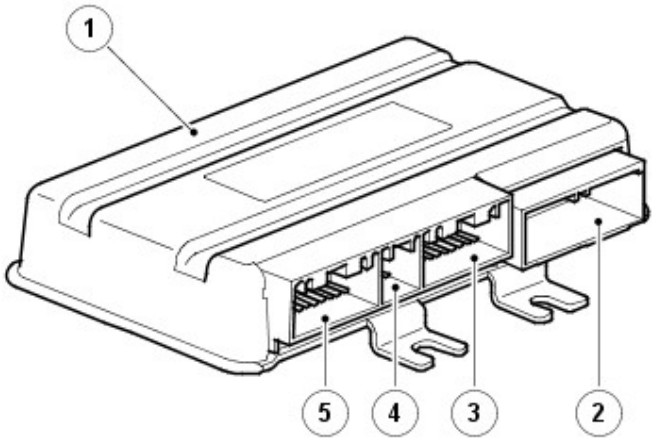
Transportation Mode

Transportation mode is a factory set mode which locks the suspension to enable the vehicle to be safely lashed to a transporter. Transportation mode can only be selected or deselected using the Land Rover approved diagnostic equipment.

When the ignition switch is switched off, the vehicle will be lowered onto the bump stops. This ensures that the securing straps do not become loose should air leak from the air springs.

When the engine is running, the air supply unit will operate to raise the vehicle height, allowing the vehicle to be loaded. When the ignition switch is subsequently switched off, the vehicle will again lower onto the bump stops. An audible warning will be emitted from the instrument cluster sounder until the vehicle has reached the higher transportation height.

AIR SUSPENSION CONTROL MODULE



E45176

Item	Part Number	Description
1	-	Air suspension control module
2	-	Connector C2321
3	-	Connector C2320
4	-	Connector C2030
5	-	Connector C0867

The air suspension control module is located behind the instrument panel, on the driver's side 'A' pillar. The control module is attached to the 'A' pillar with a single screw and two plastic clips.

Calibration

A calibration routine is performed using the Land Rover approved diagnostic equipment to access the position of each corner of the vehicle, and record the settings in the ECU memory. Once set, the calibration is not required to be performed unless the air suspension control module is removed or replaced, a height sensor is removed or replaced or a suspension arm to which the sensor is connected is removed or replaced. If the removed height sensor is subsequently refitted, the calibration procedure will have to be performed to ensure the integrity of the system.

If the air supply unit, the reservoir, a valve block, a damper module or the air harness is removed or replaced, the system will not require recalibration.

Inputs and Outputs

The air suspension control module uses four harness connectors for all inputs and outputs.

The air suspension control module uses inputs received on the CAN bus from other vehicle systems. The system uses longitudinal acceleration, lateral acceleration, steering angle and wheel speed data to control the suspension operation in differing driving conditions.

The system will react differently if one or more of these data inputs is missing or incorrect, for example, if the steering angle sensor is missing or incorrect, the air suspension control module assumes a default value of zero which may result in some unnecessary leveling activity.

Air Supply Unit Relay

The air supply unit relay is located in the battery junction box in the engine compartment. The relay is connected directly to the battery via fusible link 10E (60A). The relay coil is connected to and controlled by the air suspension control module. The relay is used by the air suspension control module to control the operation of the compressor.

When air supply unit operation is required, the air suspension control module supplies power and ground for the relay coil which energizes, closing the relay contacts. This allows battery voltage via the fusible link to pass through the relay and operate the air supply unit electric motor and the compressor.

The battery voltage is also passed from the relay, via a splice joint in the harness, to the air suspension control module and is used as a signal that the relay is operating.

System Inhibits

A number of conditions exist where a change of ride height is undesirable. To counter this, the air suspension control module is programmed with a number of system inhibits. If any of the conditions detailed below exist, the air suspension control module will suspend height changes and height corrections.

Compressor

The temperature sensors located within the compressor protect the compressor from overheating. If the compressor temperature rises above set limits, the air suspension control module will inhibit the compressor operation. These limits are shown in the following table:

Compressor Head Temperature Sensor

	Lifting	Filling Reservoir
Stop	140°C (284°F)	130°C (266°F)
Start	120°C (248°F)	110°C (230°F)

Compressor Brush Temperature Sensor

	Lifting	Filling Reservoir
Stop	140°C (284°F)	130°C (266°F)
Start	120°C (248°F)	110°C (230°F)

Cornering

If the air suspension control module registers a cornering force greater than 0.2g it will inhibit all height changes and corrections. The system will remain inhibited until the cornering force falls to less than 0.15g. The air suspension control module receives a message from the lateral acceleration sensor (which is an integral part of the ABS yaw rate sensor) on the high speed CAN bus for the cornering force.

Rapid Acceleration

If the air suspension control module registers a rapid acceleration greater than 0.2g it will inhibit all height changes and corrections. The system will remain inhibited until the rapid acceleration falls to less than 0.15g. Acceleration is calculated by the air suspension control module from a vehicle speed signal received via the high speed CAN bus.

Rapid Deceleration

If the air suspension control module registers a rapid deceleration smaller than -0.2g it will inhibit all height changes and corrections. The system will remain inhibited until the rapid deceleration rises above -0.15g. Deceleration is calculated by the air suspension control module from a vehicle speed signal received via the high speed CAN bus.

Vehicle Jack

The air suspension control module will inhibit all height changes and corrections if it detects a corner lowering too slowly for more than 1.2 seconds. This is interpreted as the corner identified as moving too slowly being supported on a jack. In this situation, the corner height will not change when air is released from the air spring because the jack acts as a mechanical prop. The system will remain inhibited until any of the following conditions exist:

- The air suspension switch is moved to the up or down position
- Vehicle speed rises to more than 2 mph (3 km/h) for more than 45 seconds.

Door Open

The air suspension control module will stop all height change requests while any of the doors are open. Vehicle leveling continues with a door open by keeping the vehicle at the height when the door was opened if the vehicle load changes.

Diagnostics

The air suspension control module can store fault codes which can be retrieved using the Land Rover approved diagnostic equipment. The diagnostic information is obtained via the diagnostic socket which is located in the lower instrument panel closing panel, on the driver's side, below the steering column.

The diagnostic socket allows the exchange of information between the various control modules on the bus systems, and the Land Rover approved diagnostic equipment. This allows the fast retrieval of diagnostic information and programming of certain functions using the Land Rover approved diagnostic equipment.

Fault Detection

The air suspension control module performs fault detection and plausibility checks. Fault detection is limited to faults that the control module can directly measure as follows:

- Sensor electrical hardware faults
- Valve electrical hardware faults
- Sensor and actuator supply faults
- Bus failures
- Control module hardware errors.

Plausibility checks are checks on signal behavior, as follows:

- Average height does not change correctly
  - Height changes too slowly
- Gallery pressure
  - Does not increase fast enough when reservoir filling requested
  - Increases when system is inactive
  - Too low when lifting is requested
  - Increases too rapidly when filling reservoir
  - Does not decrease when gallery is vented
  - Pressure varies too much when inactive.
- Compressor temperature
  - Sensor voltage too large - head and brush sensors (short circuit to battery)
  - Takes too long to be readable after suitable compressor run time - head and brush sensors
  - Does not increase when compressor active - head sensor only
- Sensor activity
  - Signal floating
  - Constant articulation when moving

When a fault is detected, the air suspension control module will attempt to maintain a comfortable ride quality and where possible will retain as much functionality as possible.

The system functionality depends on the severity of the fault.

Faults

Faults are categorized into order of severity and effect on the system as follows (with 1. being a minor fault and 5. being a major fault):

- Height sensor faults (hardware faults) and reservoir valve block failure
  - Retain full functionality with no 'refinements', e.g. cross-link valves inoperative, no compensation for uneven surfaces.
- Pressure sensor faults, compressor faults, corner valves stuck shut
  - Road speed signal not available
  - Vehicle returns to on-road mode height when next requested

- Levels at 'current' height.
- Reservoir valve stuck open, exhaust valve stuck shut if below on-road mode height, corner valves stuck open if above on-road mode height
  - Vehicle returns to on-road mode height when next requested
  - Does not level at 'current' height.
- Failure of multiple height sensors, cross-articulation when driving, calibration corrupted
  - Vehicle lowers to bump stops.
- ABS module failure, CAN bus failure
  - If the air suspension control module loses communications with the ABS module or the ABS module reports a fault, the air suspension control module immediately returns to the 'default' height, which is below the on-road ride height. Once at the default height, the control module will continue to level the vehicle at this height. It is unlikely that the fault will be in the air suspension control module. When the fault is repaired, the air suspension control module will resume full functionality but the error will remain in the control module memory.

For major faults the control module will not level the vehicle at the 'current' ride height. The control module freezes height changes until it receives a manual or automatic request for height change. The control module will return to standard height if possible and freezes once standard height is achieved.

If the suspension is above the on-road height and the air suspension control module cannot lower the suspension, all height changes will be frozen. The control module will issue a message on the high speed CAN bus which is received by the instrument cluster which displays a maximum advisable speed in the message center. an immediate 'freeze' of the vehicle height is caused by the following:

- Failure of more than one height sensor - vehicle on bump stops
- Implausible articulation symptoms detected - vehicle on bump stops
- Valve or solenoid failure - corner valve stuck open below on-road mode height or exhaust valve stuck shut above on-road mode height
- Stuck corner or whole vehicle (diagnosed using plausibility of the sensor inputs).

If height change is not possible, e.g. exhaust valve failed closed at off-road height or compressor failed at access height, the control module will not level or change height.

If the air suspension control module has a hardware fault, the control module will disable all air suspension functions. Detectable hardware errors include memory error, control module failure, calibrations errors.

Fault Messages

The air suspension has two methods which it can use to inform the driver of a fault in the air suspension system; the air suspension switch LED's and the instrument cluster message center.

When minor faults occur and the air suspension control module is able to level the vehicle to the 'current' ride height, the air suspension switch LED's will display the current ride height.

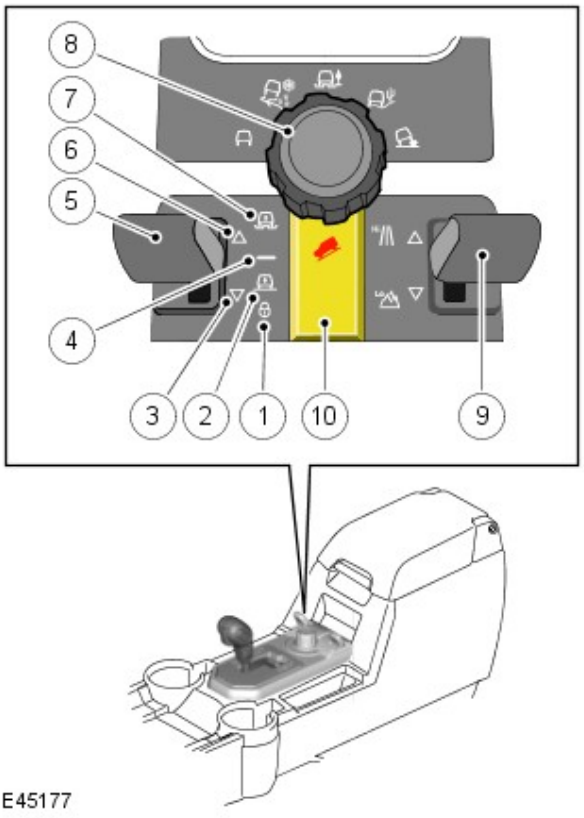
If the air suspension control module suffers a major failure and there is no air suspension control, all the control switch LED's will remain off.

If a fault occurs and the air suspension control module can determine the ride height and the vehicle is not above on-road mode height, the driver will be notified via an 'air suspension fault max speed 30 mph (50 km/h)' message, displayed in the message center.

If the control module cannot determine the height of the vehicle, or the vehicle is above on-road mode height, cannot be lowered and the vehicle speed is too high, an air suspension fault message is displayed.

If the vehicle is restricted to on-road mode height an air suspension fault normal height only message is displayed.

AIR SUSPENSION SWITCH



Item	Part Number	Description
1	-	Crawl mode lamp
2	-	Access mode lamp
3	-	Lowering lamp
4	-	On-road mode lamp
5	-	Air suspension switch
6	-	Raising lamp
7	-	Off-road mode lamp
8	-	Terrain Response™ rotary control
9	-	Transfer box range switch
10	-	Hill Descent Control (HDC) switch

The air suspension control switch is located in the center console, behind the manual or automatic transmission selector lever. The switch is a three position, non-latching switch which allows selection of the following driver selectable modes:

- Off-road mode
- On-road mode
- Access mode
- Crawl (locked at access) mode.

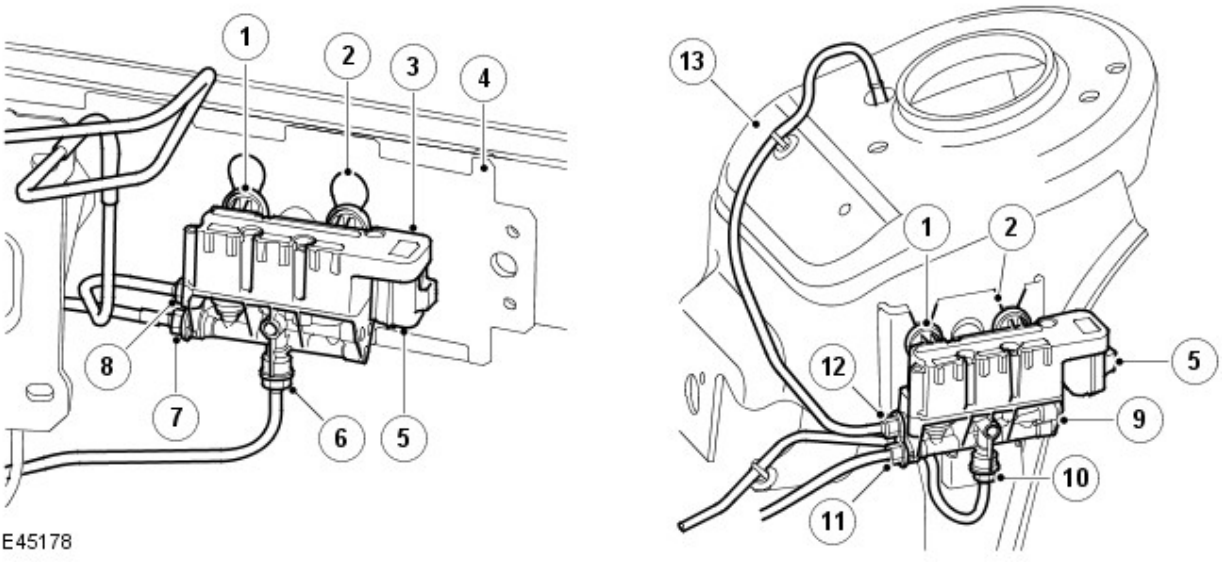
The air suspension switch can be moved forwards or backwards from its central position. The switch is non-latching and returns to the central position when released. The switch completes an earth path to the air suspension control module when operated. This earth path is completed on separate wires for the raise and lower switch positions, allowing the control module to determine which selection the driver has made.

The switch has six symbols which illuminate to show the current selected height and the direction of movement. The raise and lower symbols will flash and a warning tone will be emitted from the instrument cluster sounder when a requested height change is not allowed, i.e. vehicle speed too fast.

A flashing symbol indicates that the air suspension system is in a waiting state or that the system will override the driver's selection because the speed threshold is too high.

The driver can also ignore the system's warnings signals and allow the height to change automatically. For example, increasing the vehicle speed to more than 25 mph (40 km/h) will cause the control module to automatically change the ride height from off-road mode to on-road mode.

FRONT AND REAR AXLE VALVE BLOCKS



E45178

Item	Part Number	Description
1	-	Isolation rubber mounts (3 off)
2	-	Location slots
3	-	Front valve block, valves and solenoid assembly
4	-	Front bumper armature
5	-	Electrical connector
6	-	LH air spring damper module air harness connection
7	-	Air inlet/outlet connection
8	-	RH air spring damper module air harness connection
9	-	Rear valve block, valves and solenoid assembly
10	-	RH air spring damper module air harness connection
11	-	Air inlet/outlet connection
12	-	LH air spring damper module air harness connection
13	-	Rear suspension turret

The front and rear axle valve blocks are similar in their design and construction and control the air supply and distribution to the front or rear pairs of air spring damper modules respectively. The difference between the two valves is the connections from the valve block to the left and right hand air spring damper modules and the valve size. It is important that the correct valve block is fitted to the correct axle. Fitting the incorrect valve block will not stop the air suspension system from functioning but will result in slow raise and lower times and uneven raising and lowering between the front and rear axles.

The front valve block is attached to the right hand end of the front bumper armature assembly. The valve block has three attachment lugs which are fitted with isolation rubber mounts. The rubber mounts locate in slots in the armature. The valve lugs locate in the holes above the slots and are pushed downwards into positive location in the slots.

The rear valve block is located on the forward face of the left hand rear suspension turret. The valve block has three attachment lugs which are fitted with isolation rubber mounts which locate in a bracket with three slotted holes. The bracket is attached to the left hand side of the chassis. The isolation rubber mounts locate in the 'V' shaped slots and are pushed downwards into positive location in the slots.

The front and rear valve blocks each have three air pipe connections which use 'Voss' type air fittings. One connection is an air pressure inlet/outlet from the reservoir valve block. The remaining two connections provide the pressure connections to the left and right hand air springs.

Each valve block contains three solenoid operated valves; two corner valves and one cross-link valve. Each of the valve solenoids is individually controlled by the air suspension control module. The solenoids have a resistance value of 2 Ohms at a temperature of 20°C (68°F).

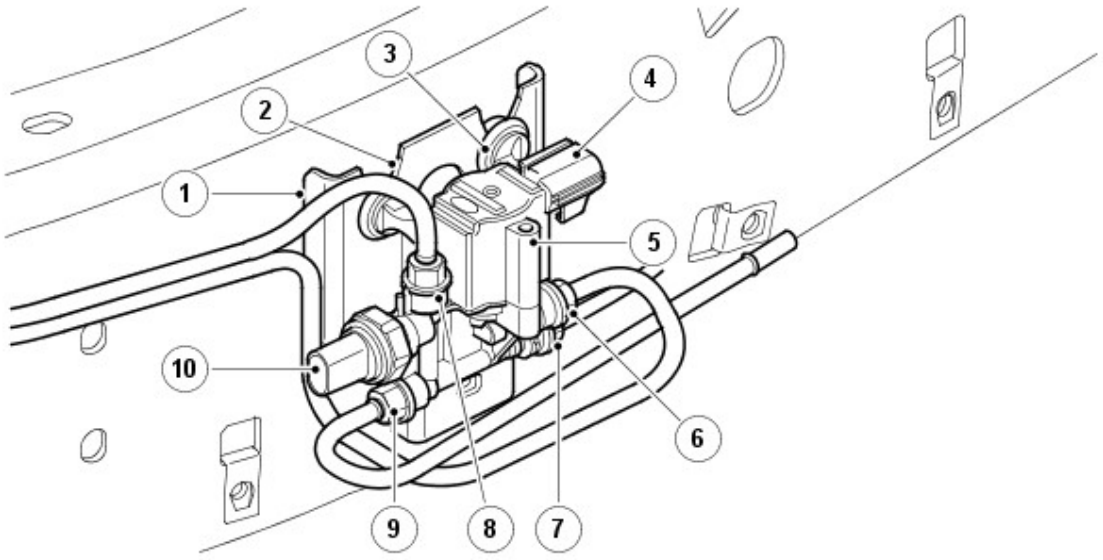
Corner Valves

The corner valves control the flow of air into and out of the individual air springs. When the solenoid is de-energized, the corner valves are held in a closed position by internal springs. When the solenoid is energized, the valve armature moves and allows air to flow into or out of the air spring.

Cross Link Valves

The cross-link valve provides a connection between the two air springs on the same axle. When de-energized, the cross-link valve prevents air passing from one air spring to another. When the solenoid is energized, the valve spool moves and allows air to pass from one air spring to the other. This increases wheel articulation and improves ride comfort at low vehicle speeds.

RESERVOIR VALVE BLOCK



Item	Part Number	Description
1	-	Chassis mounting bracket
2	-	Location slot
3	-	Isolation rubber mounts (3 off)
4	-	Electrical connector
5	-	Reservoir valve block, valves and solenoid assembly
6	-	Reservoir connection
7	-	Rear valve block connection
8	-	Front valve block connection
9	-	Air supply unit connection
10	-	Pressure sensor

The reservoir valve block controls the storage and distribution of air from the reservoir. The reservoir valve block also contains the system pressure sensor.

The reservoir valve block is attached to a bracket on the outside of the left hand chassis rail, between the reservoir and the air supply unit. The valve block is located within the air supply unit acoustic box to protect it from dirt ingress and damage from stones. The valve block has three attachment lugs which are fitted with isolation rubber mounts which locate in the chassis bracket which has three slotted holes. The isolation rubber mounts locate in the 'V' shaped slots and are pushed downwards into positive location in the slots.

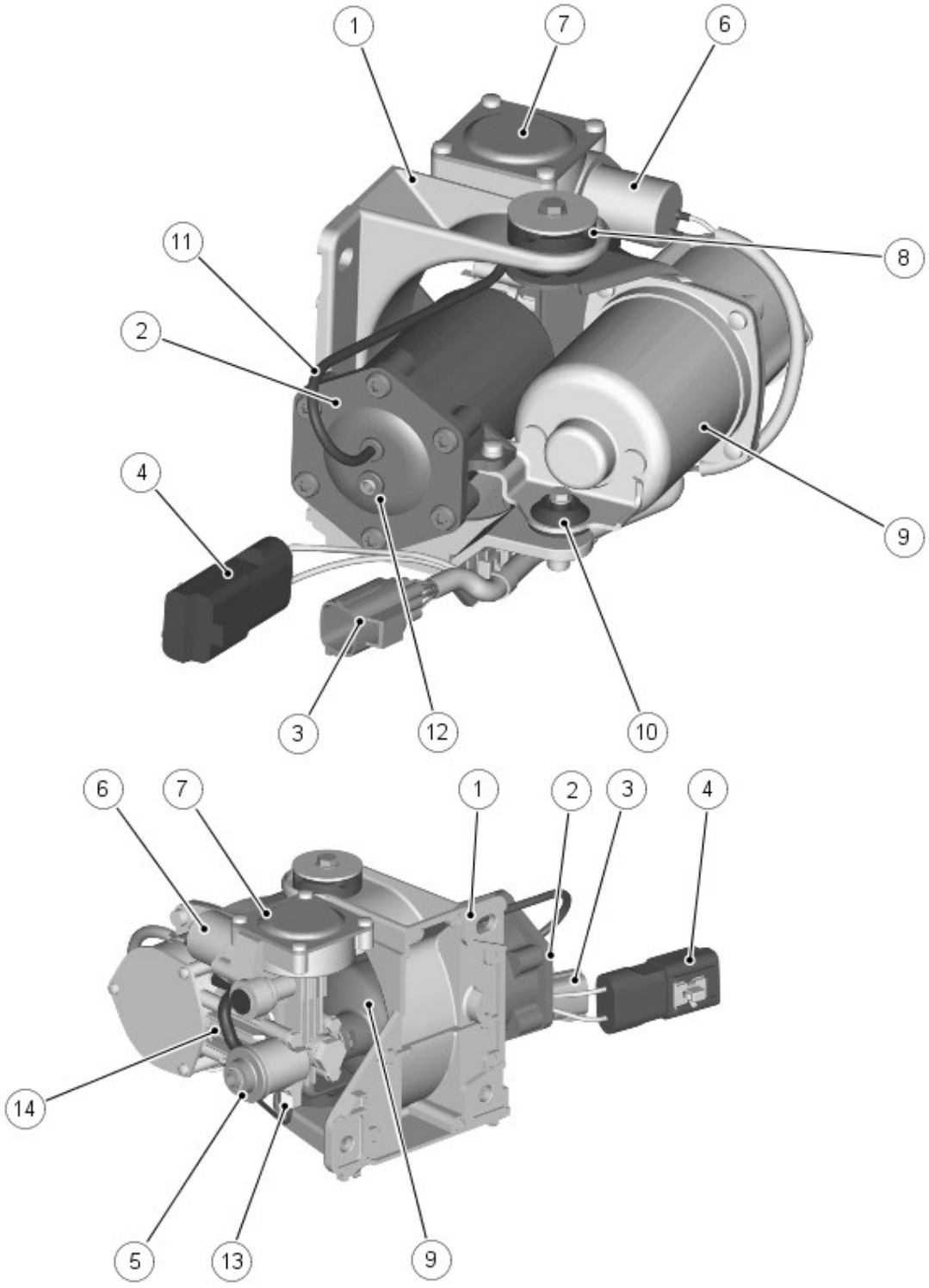
The valve block has four air pipe connections which use 'Voss' type air fittings. The connections provide for air supply from the air supply unit, air supply to and from the reservoir and air supply to and from the front and rear valve blocks. The connections from the air supply unit and the front and rear control valves are all connected via a common gallery within the valve and therefore are all subject to the same air pressures.

The valve block contains a solenoid operated valve which is controlled by the air suspension control module. The solenoid valve controls the pressure supply to and from the reservoir. The solenoid has a resistance value of 2 Ohms at a temperature of 20°C (68°F). When energized, the valve spool moves allowing air to pass to or from the reservoir.

The valve block also contains a pressure sensor which can be used to measure the system air pressure in the air springs and the reservoir. The pressure sensor is connected via a harness connector to the air suspension control module. The control module provides a 5V reference voltage to the pressure sensor and monitors the return signal voltage from the sensor.

Using this sensor, the control module controls the air supply unit operation and therefore limits the nominal system operating pressure to 244 lbf/in^2 (16.8 bar gage).

AIR SUPPLY UNIT

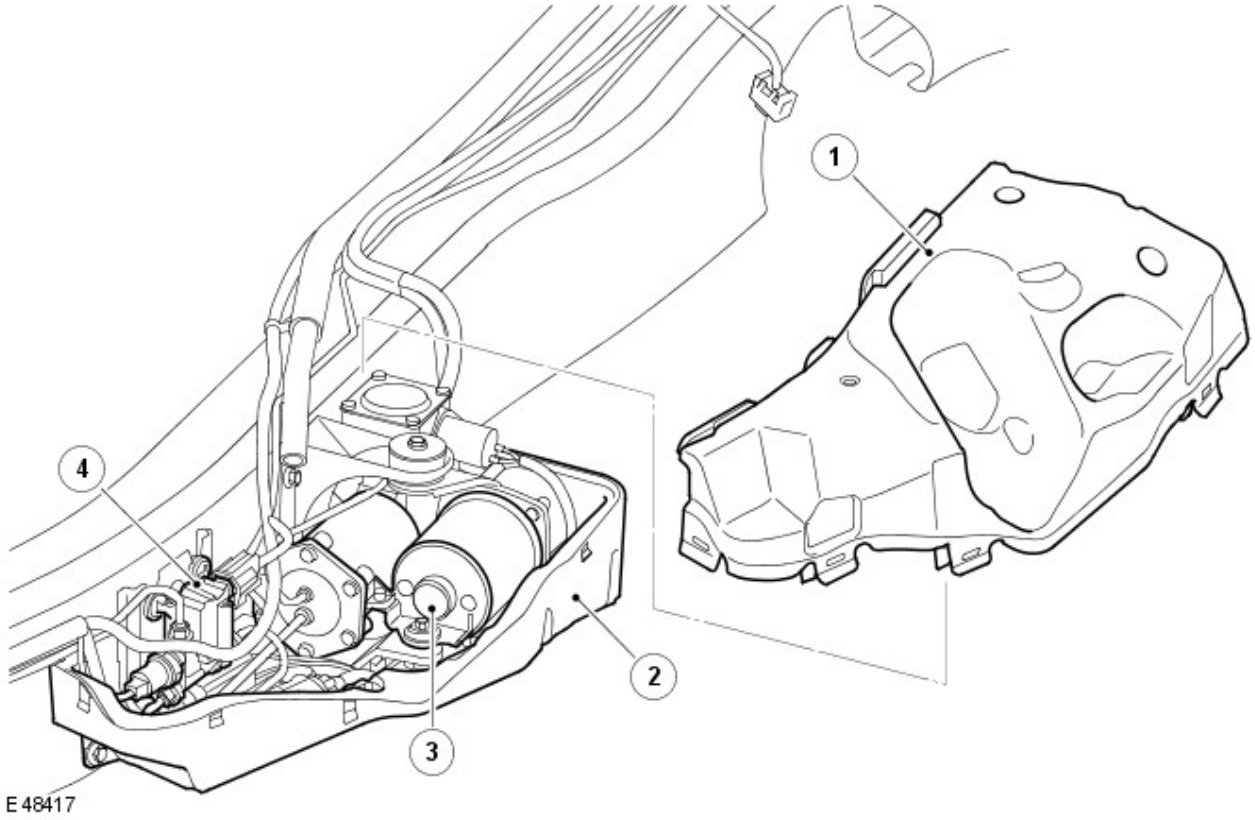


E45180

Item	Part Number	Description
1	-	Mounting bracket
2	-	Air dryer
3	-	Pilot exhaust valve solenoid and temperature sensors harness connector
4	-	Motor harness connector
5	-	Intake port
6	-	Pilot exhaust valve
7	-	Exhaust valve
8	-	Isolation mounting rubber (2 off)
9	-	Electric motor
10	-	Isolation mounting rubber (1 off)
11	-	Pilot air pipe
12	-	High pressure supply to air suspension system
13	-	Compressor cylinder head temperature sensor
14	-	Compressor

The air supply unit is located on the outside of the left hand chassis rail, forward of the upper control arm. The unit is attached to the chassis rail with three bolts and is protected by an acoustic box.

Acoustic Box



Item	Part Number	Description
1	-	Upper cover
2	-	Lower cover
3	-	Air supply unit
4	-	Reservoir valve block

The acoustic box, which comprises of two parts; upper and lower, surrounds the air supply unit. The acoustic box is a plastic molding which is lined with an insulating foam which controls the operating noise of the air supply unit. The reservoir valve block is also located in the acoustic box, forward of the air supply unit.

The air supply unit comprises the following major components:

- A piston compressor
- A 12V electric motor
- A solenoid operated pilot valve
- An exhaust valve
- An air dryer unit

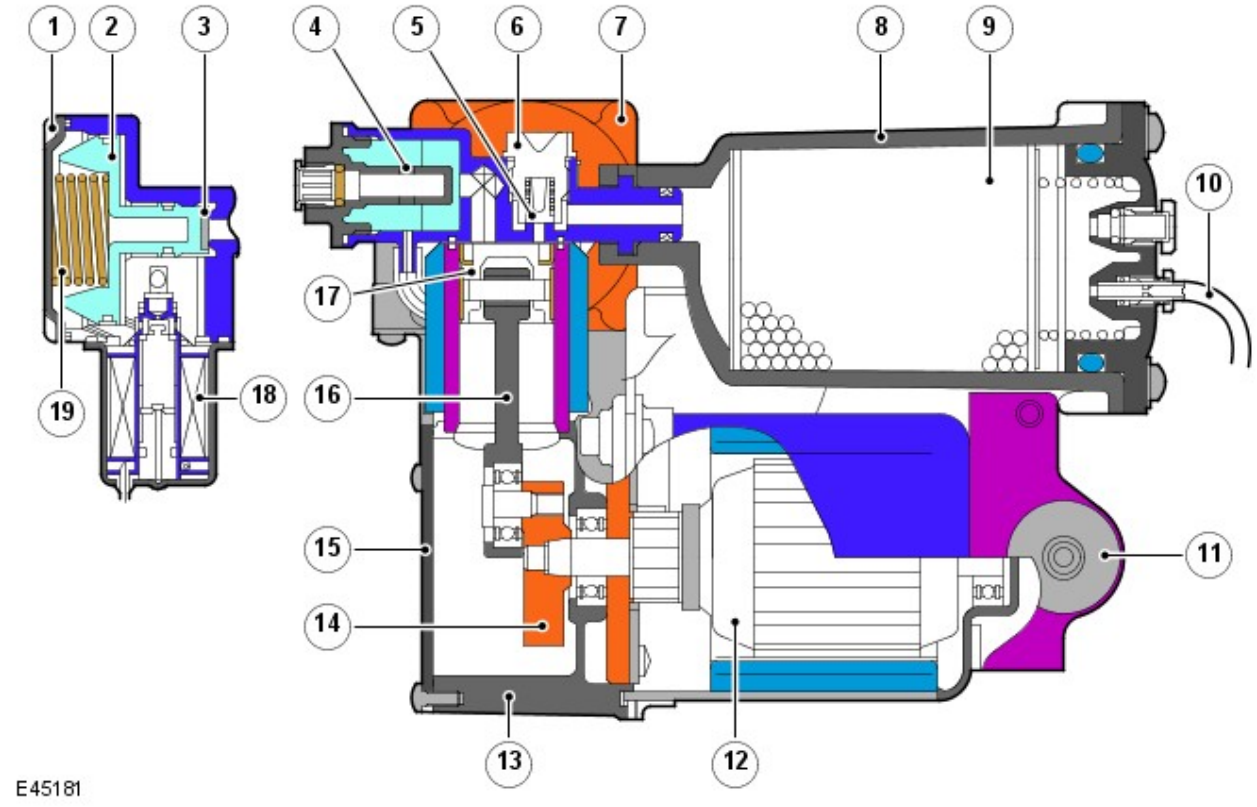
The air supply unit can be serviced in the event of component failure, but is limited to the following components; air dryer, pilot exhaust pipe and the rubber mounts.

The air supply unit is attached to a bracket which is bolted to the chassis. The unit is mounted to the bracket with flexible isolation mounting rubbers which assist with preventing operating noise being transmitted to the chassis.

Removal of the air supply unit does not require the whole air suspension system to be depressurized. The front and rear valve blocks and the reservoir valve block are normally closed when de-energized, preventing air pressure in the air springs and the reservoir escaping when the unit is disconnected.

There are a number of conditions that will inhibit operation of the air supply unit. It is vitally important that these system inhibits are not confused with a system malfunction. A full list of air supply unit inhibits are given in the air suspension control module section in this chapter.

Air Supply Unit - Sectional View



Item	Part Number	Description
1	-	Exhaust valve cap
2	-	Plunger
3	-	Valve seat
4	-	Intake silencer port
5	-	Delivery valve
6	-	Valve guide
7	-	Cylinder head
8	-	Dryer case
9	-	Desiccant
10	-	Pilot exhaust line
11	-	Isolation rubber mount
12	-	Motor assembly
13	-	Crankcase
14	-	Crank
15	-	Crankcase cover
16	-	Connecting rod
17	-	Piston
18	-	Pilot exhaust valve
19	-	Spring - pressure relief

Pilot Exhaust Valve

A solenoid operated pilot exhaust valve is connected to the air delivery gallery, downstream of the air dryer. The pilot valve, when opened, operates the main compressor exhaust valve. This allows the air springs to be deflated when required.

When the solenoid is energized, pilot air moves the exhaust valve plunger, allowing pressurized air from the air springs and/or reservoir to pass via the reservoir control valve to the air supply unit.

The solenoid has a resistance value of 4 Ohms at a temperature of 20°C (68°F).

Exhaust Valve

The exhaust valve has three functions. It operates in conjunction with the pilot exhaust valve to allow air to be exhausted from the air springs and/or the reservoir as described previously.

The valve also protects the system from over-pressure. The valve is connected into the main pressure gallery which is always subject to the system pressure available in either the air springs or the reservoir. The valve is controlled by a spring which restricts the maximum operating pressure to between 333.5 to 370 lbf/in^2 (23.0 to 25.5 bar).

The minimum pressure in the system is also controlled by the exhaust valve to ensure that, even when deflated, the air springs contain a positive pressure of approximately 14.5 lbf/in^2 (1 bar gage) with respect to atmosphere. This protects the air spring by ensuring it can still 'roll' over the piston without creasing.

Electric Motor

The electric motor is a 12V dc motor with a nominal operating voltage of 13.5V. The motor drives a crank which has an eccentric pin to which the compressor connecting rod is attached.

The motor is fitted with a temperature sensor on the brush PCB assembly. The sensor is connected to the air suspension control module which monitors the temperature and can suspend motor operation if an overheat condition occurs.

Compressor

The compressor comprises a motor driven connecting rod and piston which operate in a cylinder with a cylinder head. The motor rotates the crank moving the piston up and down in the cylinder bore. The air in the cylinder is compressed with the up stroke and is passed via delivery valve, through the air dryer into the system.

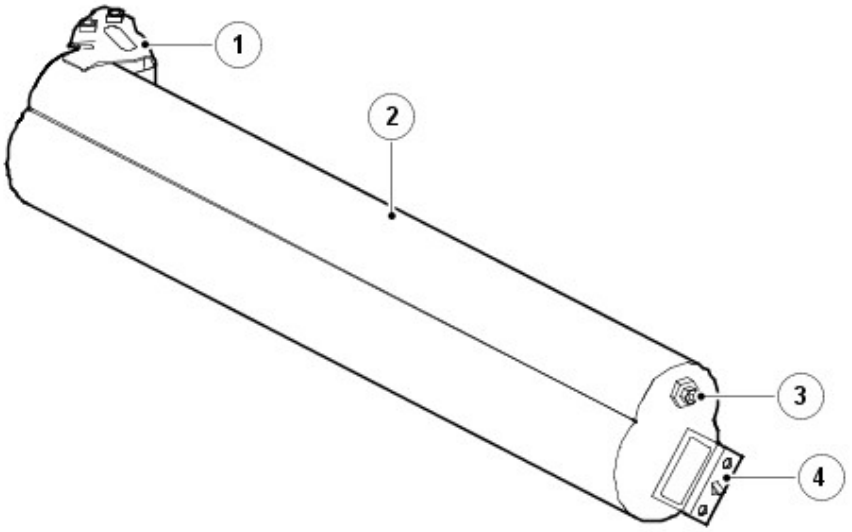
Air Dryer

The air dryer is an integral part of the air supply unit. The air dryer contains a desiccant which absorbs moisture. Pressurized air is passed through the air dryer which removes any moisture in the compressed air before it is passed to the reservoir and/or the system

When the air is exhausted from the system, the returning air is passed through the air dryer, regenerating the air dryer by removing moisture from the desiccant and expelling it to atmosphere via the exhaust.

The air dryer is an essential component in the system ensuring that only dry air is present in the system. If moist air is present in the system, freezing can occur, resulting in poor system operation or component malfunction/failure.

AIR RESERVOIR



E45182

Item	Part Number	Description
1	-	Front bracket
2	-	Reservoir
3	-	Air hose connection to reservoir valve block
4	-	Rear bracket

The reservoir is an air storage vessel which provides fast air suspension lift times by the immediate availability of pressurized air into the system.

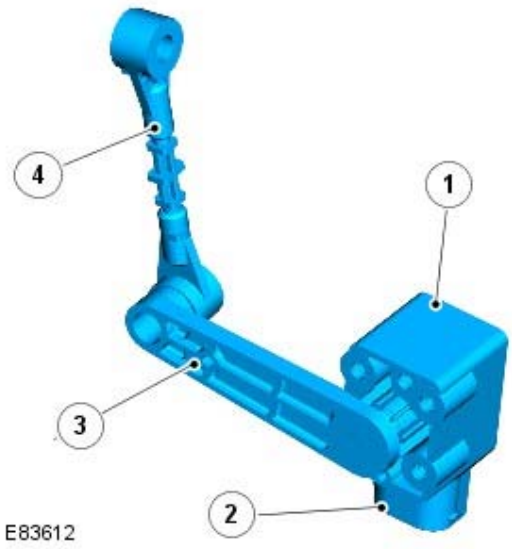
The reservoir is a steel fabrication and is located on the outside of the left hand chassis rail, in front of the air supply unit. The reservoir has a bracket at each end which attach to the body mounting brackets on the chassis.

The rearward end of the reservoir has a 'Voss' air fitting which provides for the connection of the air hose between the reservoir and the reservoir valve block.

The reservoir has a capacity of 550 in^3 (9 liters). The nominal working pressure of the reservoir is 243.6 lbf/in^2 (16.8 bar gage), with a maximum pressure of 333.5 lbf/in^2 (23 bar gage).

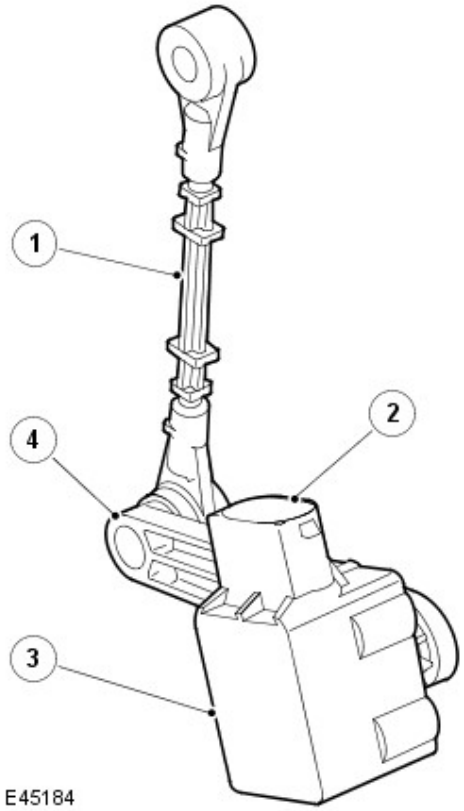
HEIGHT SENSORS

Front Height Sensor



Item	Part Number	Description
1	-	Sensor body
2	-	Electrical connector
3	-	Lever arm
4	-	Drop link

Rear Height Sensor



Item	Part Number	Description
1	-	Drop link
2	-	Electrical connector
3	-	Sensor body
4	-	Lever arm

A height sensor is fitted in each corner of the vehicle to monitor the ride height of the vehicle. The sensor bodies are attached with screws to brackets on the chassis rails.

Each sensor comprises a sensor body which contains a single track rotary potentiometer, a lever arm and a drop link.

The sensor lever arm has a drop link which provides the connection between the sensor and the suspension control arm. The drop link is a serviceable component and is a push fit to the lever arm and the suspension control arm.

The sensors are connected via their harness connector to the air suspension control module which receives the signal output from each sensor and, using preprogrammed information, converts the signal to a height for each sensor position.

The front and rear sensors are handed and are colored coded for identification as follows:

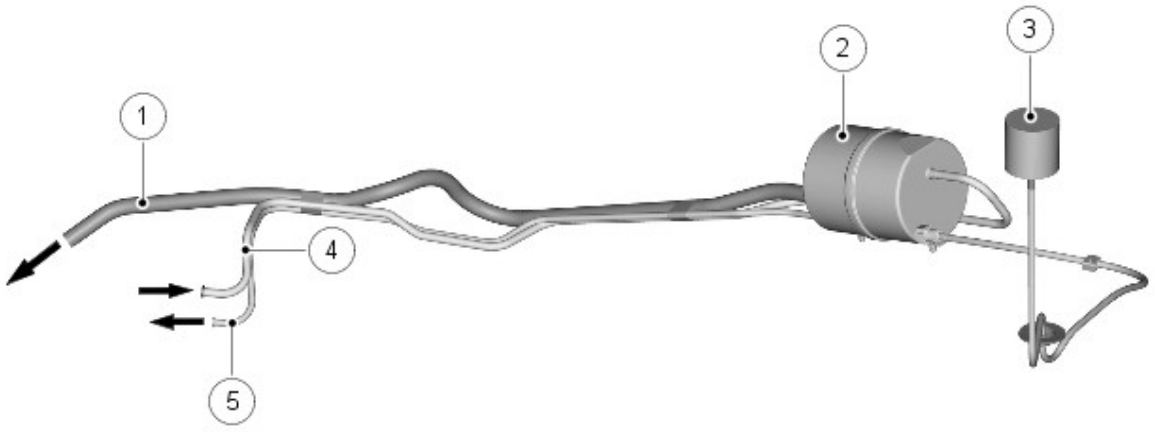
- Right hand front and rear - black colored lever
- Left hand front and rear - white colored lever.

Calibration

A calibration routine is performed using the Land Rover approved diagnostic equipment to read the position of each corner of the vehicle, and record the settings in the ECU memory. Once set, the calibration is not required to be performed unless the air suspension control module is removed or replaced, a height sensor is removed or replaced or a suspension arm to which the sensor is connected is removed or replaced. If the removed height sensor is subsequently refitted, the calibration procedure will have to be performed to ensure the integrity of the system.

If a replacement drop link is fitted, recalibration is not required providing the sensor body is not removed from its mounting bracket.

AIR SILENCER AND INLET AIR FILTER



E45185

Item	Part Number	Description
1	-	Exhaust (to atmosphere)
2	-	Inlet and exhaust silencer
3	-	Air inlet filter
4	-	Exhaust air from air supply unit
5	-	Air inlet supply to air supply unit

The air silencer is required to limit any noise produced from the air supply unit during inflation or deflation of the air springs.

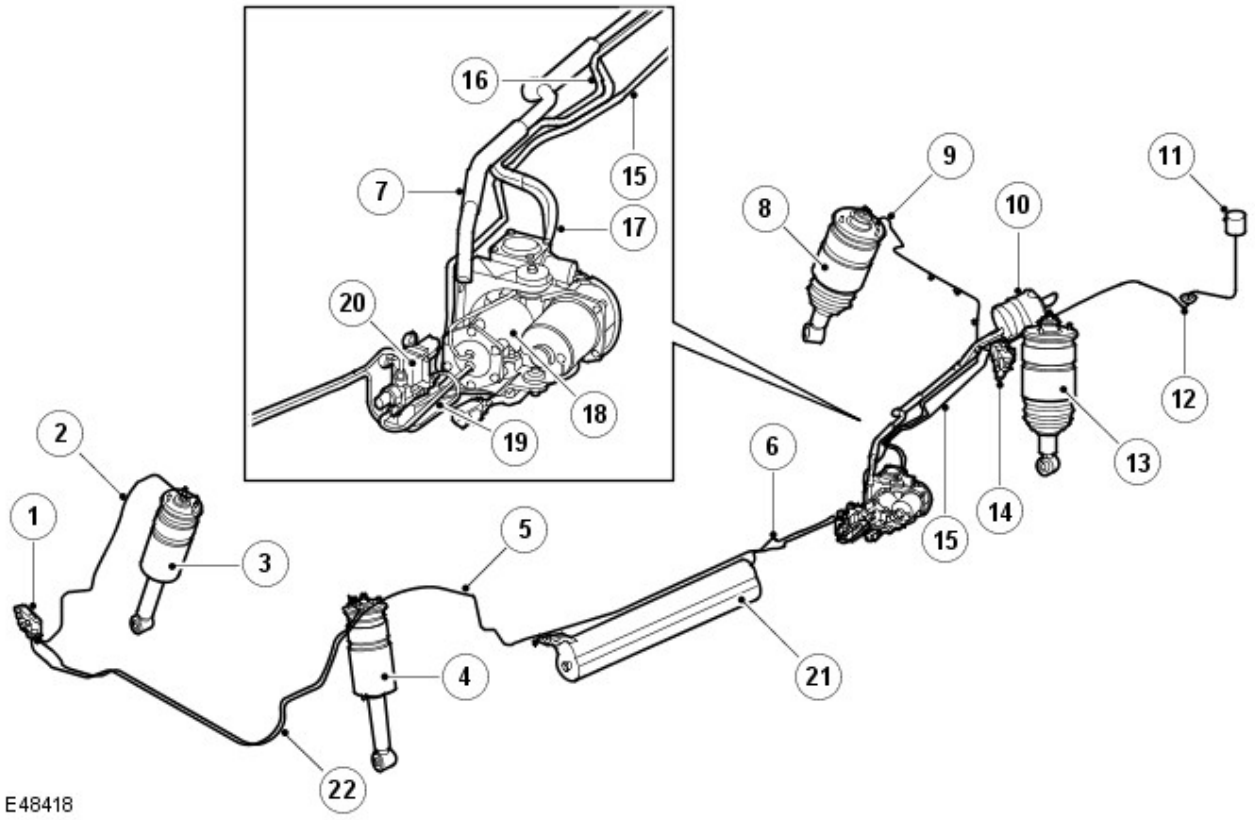
The silencer comprises two plastic molded cans bonded together and contains two blocks of silencing foam. A pipe connection is molded onto each end of the silencer and provide for the attachment of the exhaust air to atmosphere pipe and the exhaust air pipe from the air supply unit.

A secondary chamber, located around the outside of the exhaust chamber forms the silencer for the inlet air. Pipe connections are molded onto each end of the intake silencer and provide for the attachment of the air inlet pipe from the inlet air filter and the air inlet pipe to the air supply unit. The intake air silencer is a hollow chamber with no noise reduction foam filling.

The air intake filter is connected via a pipe to the intake silencer chamber of the air silencer unit. The filter is located in the rear left hand corner of the body, away from possible sources of dirt and moisture.

The filter contains a foam element which removes particulate matter from the inlet air before it reaches the silencer or the air supply unit.

AIR HARNESS



Item	Part Number	Description
1	-	Front axle valve block
2	-	Pipe - Front axle valve block to front RH air spring damper module
3	-	Front RH air spring damper module
4	-	Front LH air spring damper module
5	-	Pipe - Reservoir valve block to front axle valve block
6	-	Pipe - Reservoir valve block to reservoir
7	-	Pipe - Exhaust
8	-	Rear RH air spring damper module
9	-	Pipe - Rear axle valve block to rear RH air spring damper module
10	-	Air silencer assembly
11	-	Air inlet filter
12	-	Pipe - Main inlet
13	-	Rear LH air spring damper module
14	-	Rear axle valve block
15	-	Pipe - Reservoir valve block to rear axle valve block
16	-	Pipe - Compressor inlet
17	-	Pipe - Compressor exhaust
18	-	Air supply unit
19	-	Pipe - Air supply unit to reservoir valve block
20	-	Reservoir valve block
21	-	Reservoir
22	-	Pipe - Front axle valve block to front LH air spring damper module

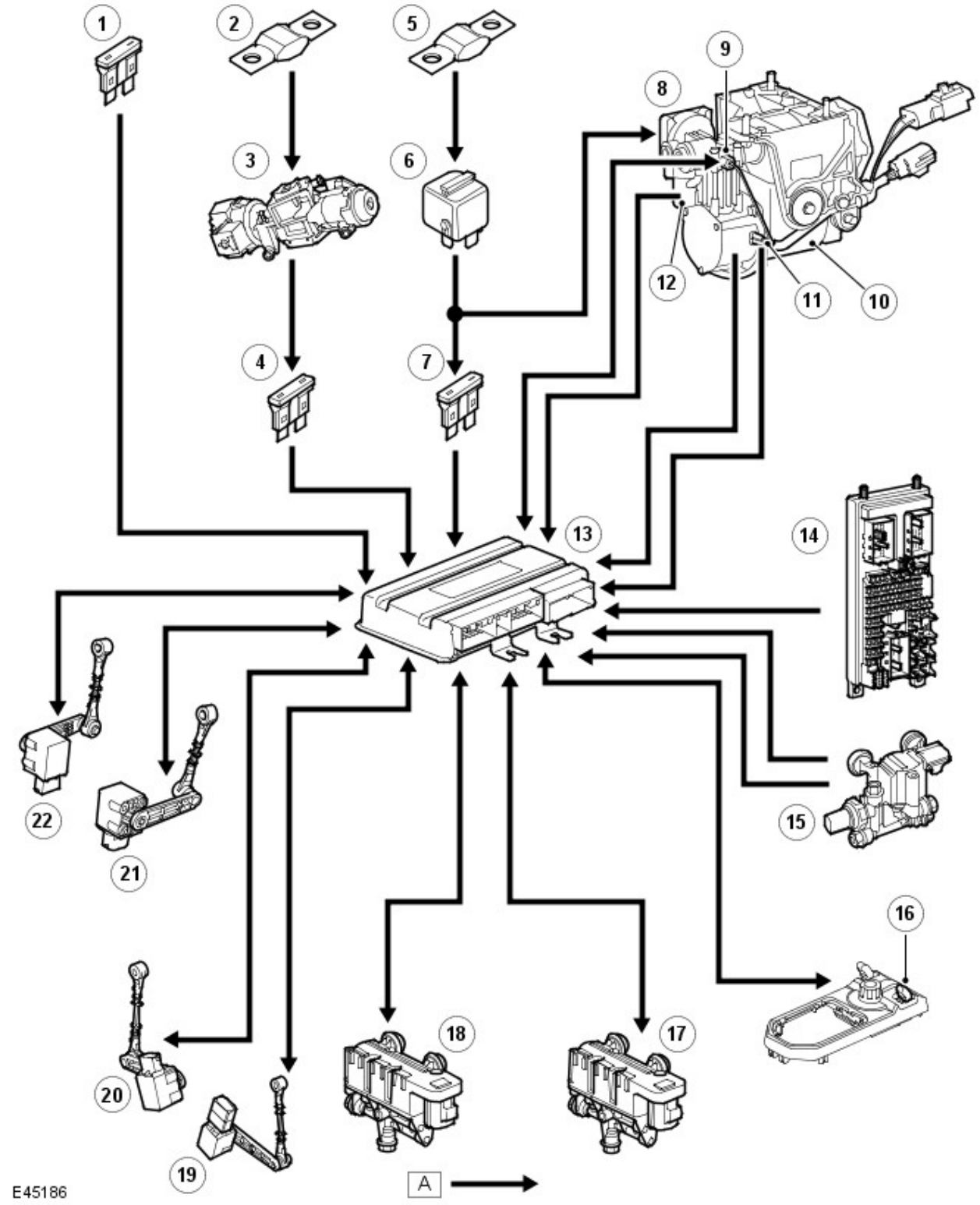
The air harness comprises ten separate nylon pipes which are connected between the system components with Voss connectors. The pipes have the following diameters:

Pipe	Diameter
High pressure pipes	6 mm
Compressor inlet pipe	8 mm
Inlet filter to silencer	8 mm
Compressor exhaust pipe	10 mm
Silencer exhaust pipe	19 mm

If a pipe becomes damaged, an in-line connector is available for repair purposes. The pipes are secured to the body and the chassis with a number of plastic clips.

CONTROL DIAGRAM

- NOTE: **A** = Hardwired



Item	Part Number	Description
1	-	Fuse 26E (20A)
2	-	Fusible link 11E (30A)
3	-	Ignition switch
4	-	Fuse 35P (5A)
5	-	Fusible link 10E (60A)
6	-	Air supply unit relay
7	-	Fuse 3E (5A)
8	-	Air supply unit
9	-	Compressor temperature sensor
10	-	Motor
11	-	Motor temperature sensor
12	-	Exhaust valve solenoid
13	-	Air suspension control module
14	-	Central junction box
15	-	Reservoir control valve
16	-	Air suspension switch

17	-	Front control valve
18	-	Rear control valve
19	-	RH rear height sensor
20	-	LH rear height sensor
21	-	RH front height sensor
22	-	LH front height sensor

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Vehicle Dynamic Suspension - Vehicle Dynamic Suspension

Diagnosis and Testing

Principle of Operation

For a detailed description of the Vehicle Dynamic Suspension System and operation, refer to the relevant Description and Operation section of the workshop manual.
REFER to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Description and Operation).

Inspection and Verification

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

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

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

Visual Inspection

Mechanical	Electrical
• Air leakage • Air springs • Reservoir • Compressor • Compressor air filter • Pipework and unions • Sensor installation • Valve block(s) • Suspension components	• Battery • Fuse(s) • Wiring harness physical damage or water ingress • Loose or corroded electrical connectors • Air suspension control switch • Controller Area Network (CAN) circuits • Sensors • Actuators • Valve block(s) • Air suspension control module

3. **3.** If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart.
4. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Message	Possible Other Warnings	Possible Causes	Action
Vehicle on bump stops	• Suspension fault	• Two chimes repeated regularly Red indicator permanently illuminated	• Water ingress to wiring harness or connectors • Air leak(s) • Vehicle in transportation mode • System not calibrated or calibration corrupt • Implausible articulation symptoms detected • Failure of multiple height sensors • Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Visually inspect the system for air leakage. Check the system mode and calibration using the approved diagnostic system. Check for implausible articulation symptoms, i.e. height sensor or linkage fault, deflated air spring, under inflated tire etc. Note implausible articulation symptoms may be caused by an un-calibrated height sensor. Check for height sensor DTCs and refer to the DTC index. Refer to the warranty policy and procedures manual if a module is suspect.
Vehicle does not sit level	• Suspension fault	• Two chimes repeated regularly Red indicator permanently illuminated	• Water ingress to wiring harness or connectors • Air leak(s) • Calibration corrupt • cross-link valve fault • Height sensor fault • Reservoir valve stuck open • Exhaust valve stuck closed • Corner valves stuck open • Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Visually inspect the system for air leakage and refer to the guided diagnostic routine on the approved diagnostic system. Check the system calibration using the approved diagnostic system. For front and rear cross link valve tests refer to the guided diagnostic routine on the approved diagnostic system. Check for height sensor DTCs and refer to the DTC index. For reservoir and exhaust valve tests refer to the guided diagnostic routine on the approved diagnostic system. Check for corner valve

Symptom	Possible Message	Possible Other Warnings	Possible Causes	Action
				DTCs and refer to the DTC index. Refer to the warranty policy and procedures manual if a module is suspect.
Vehicle sits too low	• Suspension fault • Hill descent control (HDC) fault, system not available • Dynamic stability control (DSC)	• Two chimes, amber indicator permanently illuminated • One chime • DSC amber indicator permanently illuminated • ABS indicator permanently illuminated	• Water ingress to wiring harness or connectors • Air leak(s) • Air suspension compressor temperature sensor fault • Inlet air filter blockage/restriction • Air suspension compressor fault • Exhaust valve stuck/sticking • Air suspension control module lost communication with ABS module • ABS fault. • Air suspension control module failure	Visually inspect the wiring harness and connectors for water ingress. Visually inspect the system for air leakage. For air compressor temperature sensor, inlet air filter, exhaust valve and air compressor tests refer to the guided diagnostic routine on the approved diagnostic system. For Air suspension control module lost communication with ABS module, refer to the lost communication codes statement at the end of this table. Check for ABS DTCs, Refer to the relevant section of the workshop manual. Refer to the warranty policy and procedures manual if a module is suspect.
Vehicle sits too high	• Suspension fault	• Two chimes, amber indicator permanently illuminated	• Reservoir valve stuck open • Exhaust valve stuck closed • Corner valves stuck open • Air suspension control module failure	For reservoir valve and exhaust valve tests refer to the guided diagnostic routine on the approved diagnostic system. Check for corner valve DTCs and refer to the DTC index. Refer to the warranty policy and procedures manual if a module is suspect.
System detects extended mode unnecessarily when lowering	• -	• -	• Crossed gallery and air spring pipes • Incorrect valve block installed to front or rear • Damage or blockage in air harness	Refer to the guided diagnostic routine on the approved diagnostic system.
Vehicle leans/tilts after being left over-night or for some days	• -	• -	• Leaking air spring(s) • Leak from corner valve to gallery • Exhaust valve stuck open	Refer to the guided diagnostic routine on the approved diagnostic system.
After vehicle left over-night or for some days system regularly indicates "Suspension vehicle raising slowly" when first driving off	• Suspension vehicle raising slowly	• -	• Leaking air spring(s) • Leaking reservoir	Refer to the guided diagnostic routine on the approved diagnostic system.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Air Suspension Control Module (RLM) (100-00 General Information, Description and Operation).

Air Suspension Deflation Exit Routine

1. **1.** Key on, engine off.
2. **2.** Key off.
3. **3.** Press and release raise switch.
4. **4.** Press and release lower switch.
5. **5.** Key on, engine off.
6. **6.** Key on, engine running.
7. **7.** Press and release raise switch twice.

8. **8.** Press and release lower switch twice.
9. **9.** Press and release raise switch.

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Vehicle Dynamic Suspension - Air Suspension System Depressurize and Pressurize

General Procedures

- WARNINGS:

 A small amount of air pressure will be left in the air suspension system.

 Eye protection must be worn.

 Wear protective gloves.

- CAUTIONS:

 Make sure tailgate, hood and all doors are closed.

 Make sure the vehicle is in a clear working area.

1.  WARNING: The air suspension system is pressurised up to 16.8 bar (244 lbf/in²). Make sure no dirt or grease enters the system. Always wear hand, eye and ear safety standard protection when working on the system.

Using T4, depressurize the air suspension.

2. Using T4, pressurize the air suspension.

- Start and run the engine.

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Vehicle Dynamic Suspension - Ride Height Adjustments

General Procedures

Special Tool(s)	
204-557B  E95131	Gauge, Ride height 204-557B

• CAUTIONS:

Make sure the wheels and tires, tie rod ends, suspension joints and wheel bearings are free from damage, wear and free play.

Make sure there are no heavy objects in the vehicle.

The ride height must be measured with the vehicle weight supported by the suspension.

With the engine running and all vehicle doors closed, make sure the air suspension is functioning and the vehicle height can be raised and lowered using the air suspension switch.

Drive the vehicle on to a flat, level surface.

Make sure the steering wheel is in the straight ahead position.

• NOTE: This procedure must be carried out after replacement of the air suspension control module, removal or replacement of a height sensor, removal or replacement of the front or rear suspension arms, replacement of body panels incorporating suspension fixing points.

1. CAUTION: Make sure the vehicle is not moved once it has been positioned to take measurements.

Position the vehicle on a flat level surface.

2. Connect the diagnostic tool to the vehicle data link connector (DLC).

- Connect the vehicle data link cable into the vehicle communications module.
- Connect the diagnostic tool USB Lead into the vehicle communications module.
- Connect the data link cable to the data link connector.
- Connect the diagnostic tool USB lead to the diagnostic tool USB port.

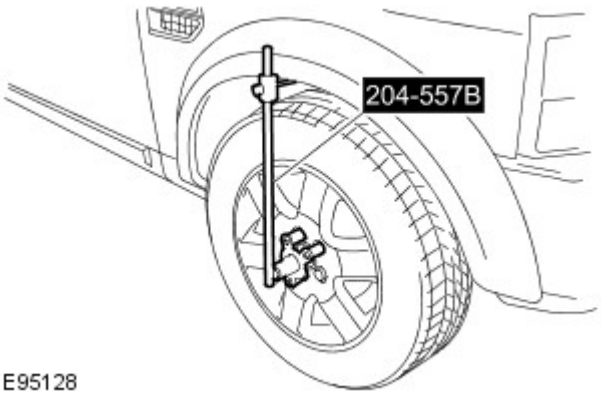
3. CAUTION: Make sure the ignition switch is turned off, the park brake is on and the selector lever is in park.

• NOTE: IDS already loaded with the latest issue of software.

Switch IDS on and navigate to the vehicle identification number (VIN) input screen.

4. Enter the vehicle identification number (VIN) and navigate to the vehicle configuration menu.

- Select setup and configuration.
- Select air suspension height calibration and read all warnings and cautions.
- Follow the on-screen prompts.



E95128

5. CAUTION: The diagnostic tool will cause the vehicle height to change during some parts of the calibration process.

• NOTE: Do not install the special tool over a locking wheel nut.

• NOTE: Make sure the special tool is square to the wheel face with the measuring rod in a vertical position.

• NOTE: Take the measurement from the top edge of the slider on the special tool.

• NOTE: Make sure the fender splash shields are correctly fitted.

Once in the suspension height measurement screen, use the special tool to measure and record the height setting from each wheel center to the wheel arch.

- Follow the on-screen prompts.

6. After successful calibration of the air suspension switch off the diagnostic tool and return to its original position.

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Vehicle Dynamic Suspension - Air Leaks

General Procedures

Special Tool(s)	
 E59716	Hose Cutter 204-494 (LRT 60-002)

1. CAUTION: Any leak detection spray used must have a corrosion inhibitor, and must not cause damage to paintwork, plastics, metals or plastic lines.

• NOTE: The recommended leak detection spray is GOTEC LDS, Landrover part number STC 1090.

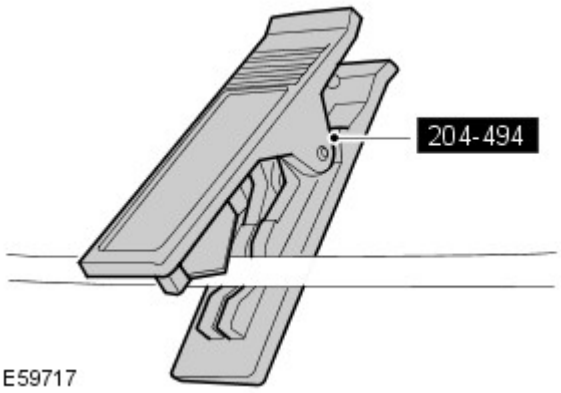
The recommended leak detection spray should be used to identify any suspected leaks. This procedure should also be used where any of the air suspension components have been disturbed.

2. Clean around the area of the suspected air leak.

3. Using the recommended leak detection spray, spray around all of the air suspension components, working systematically until the source of the air leak has been found.

4. If any of the air suspension components are found to be leaking e.g. air spring, compressor, reservoir or a solenoid valve block, repair is effected by replacement only.

5. Using T4, depressurize the air suspension system.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).



E59717

6. CAUTIONS:

Different air lines in the air suspension system have different material properties and wall thicknesses. It is important, in order to prevent subsequent air line failure, that the new air line material and wall thicknesses are identical to those of the air line being removed.

Replacement air line must be cut from a new air line with the equivalent Land Rover part number as the one being replaced. Do not use air line cut from a roll or coil.

Any existing heatsleeves and abrasion sleeves must be replaced as part of the repair.

Air line connectors should be positioned in areas away from heat sources such as the exhaust system, and away from any section of air line with a heat shield installed.

Do not trim air line ends. If the end of the air line is damaged, the air line must be cut and a new section added using a Land Rover approved air line connector, or the air line must be renewed completely.

• NOTE: Air lines must only be cut using either Hose cutter 204-494 (LRT 60-002), available from SPX LTD or Hose cutter YA1000A, available from Snap-On Tools. Make sure the cut air line end is free from damage or burrs.

• NOTE: Only Land Rover approved air lines have been tested to the correct pressure and temperature specifications.

• NOTE: Only the Land Rover approved air line connector, RYC500210, has been tested to the correct pressure and temperature specifications.

- NOTE: If the markings or tape adjacent to the air line connections are removed when cutting air lines, the cut end of the air line must be clearly marked with a suitable colored tape or paint mark.

If the source of the air leak is found to be an air line connection, renew the Voss connector and, if required, the end of the air line. Using the special tool, cut off the damaged end of the air line and replace with new Land Rover approved air line and air line connectors as required.

7. If the source of the air leak is found to be in a section of air line, either; renew the air line, or, using the special tool, cut out the damaged section of air line and replace with new Land Rover approved air line, and air line connectors, as required.

8. NOTE: If the repair has been unsuccessful repeat the above steps until the air leak is rectified.

Using T4, pressurize the air suspension system.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

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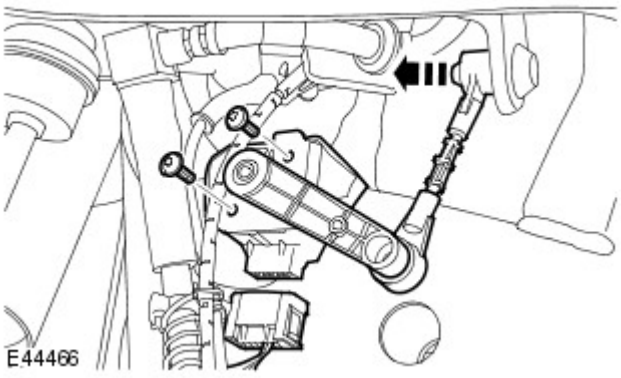
Vehicle Dynamic Suspension - Suspension Height Sensor

Removal and Installation

Removal

- NOTE: This procedure covers removal and installation of both the front and rear suspension height sensors.
- NOTE: The right hand sensor has a black colored lever and the left hand sensor has a white colored lever.



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. CAUTION: Do not use excessive force to disconnect the height sensor link.

Remove the suspension height sensor.

- Disconnect the height sensor link.
- Disconnect the electrical connector.
- Remove the 2 Torx screws.

Installation

1. CAUTION: Make sure the Torx screw is not over tightened. Failure to follow this instruction will result in damage to the vehicle.

To install, reverse the removal procedure.

- Tighten the screws to 3 Nm (2 lb.ft).

2. Using Land Rover approved diagnostic equipment, calibrate the ride hight.

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Vehicle Dynamic Suspension - Air Suspension Reservoir

Removal and Installation

Removal

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

Raise and support the vehicle.

2. Using T4, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

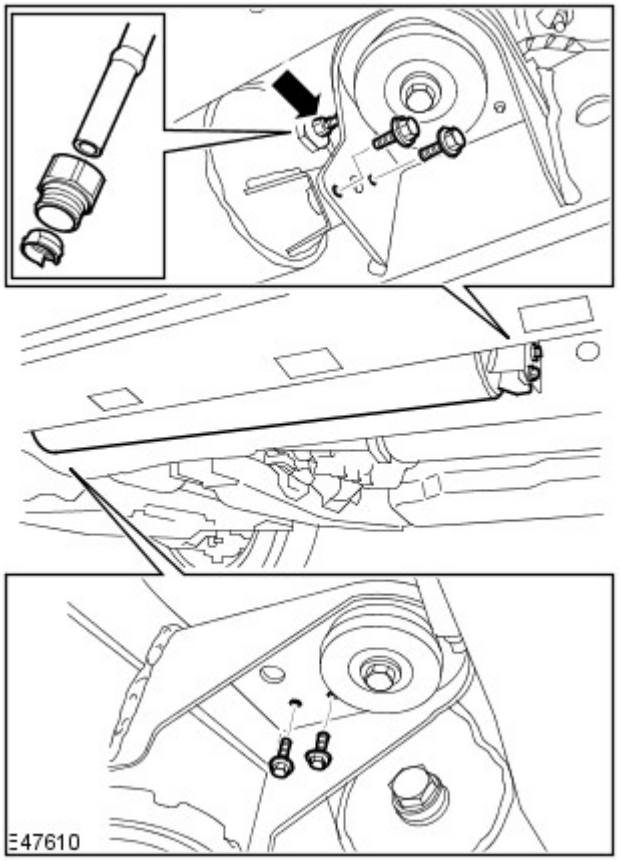
3. CAUTIONS:

Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

The air line must only be disconnected by removal of the voss connector. Do not remove the air line retaining boss from the air suspension reservoir. Failure to follow this instruction may result in damage to the vehicle.

Visually inspect the air line ends for damage or wear. Repair or replace the air line as necessary.

Disconnect the air line from the air suspension reservoir.



4. Remove the air suspension reservoir.

- Remove the 4 bolts.

5. Remove the Voss connector from the air line.

- Remove and discard the collet and the union.

Installation

1. CAUTION: Make sure the new Voss connector is installed and fully tightened with the alignment plug installed.

Install a new Voss connector to the air reservoir.

- Tighten the new Voss connector to 5 Nm (4 lb.ft).

3. Install the air suspension reservoir.

- Locate the air reservoir to the chassis brackets, fit the bolts and tighten to 23 Nm (17 lb.ft).

3. Using T4, pressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

- Fully seat the air line into the Voss connector.
- Pull on the air line to make sure it is fully installed into the Voss connecter.

Published: 11-May-2011

Vehicle Dynamic Suspension - Air Suspension Control Module

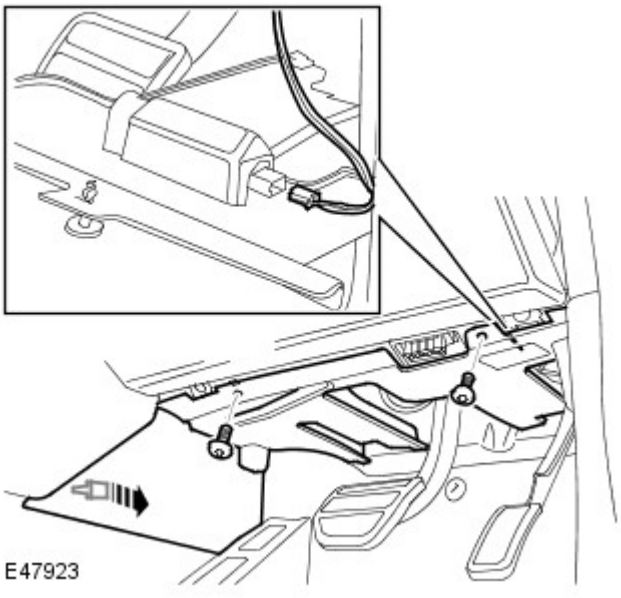
Removal and Installation

Removal

1. Driver side: Remove the cowl side trim panel.
For additional information, refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

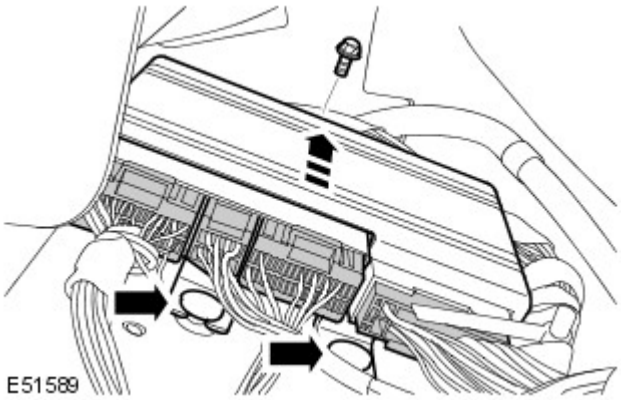
2. Remove the closing trim panel.

- Release the clip.
- Remove the 2 screws.
- Disconnect the electrical connector.



3. Remove the air suspension control module.

- Disconnect the 4 electrical connectors.
- Remove the bolt.
- Release from the 2 clips.



Installation

1. Install the air suspension control module.

- Secure with the clips.
- Connect the electrical connectors.
- Tighten the bolt to 9 Nm (7 lb.ft).

2. Install the closing trim panel.

- Connect the electrical connector.
- Secure the clip.
- Tighten the screws.

3. Install the cowl side trim panel.
For additional information, refer to: Cowl Side Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

4. Initiate a new control module using T4.

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Vehicle Dynamic Suspension - Air Suspension Reservoir Solenoid Valve Block

Removal and Installation

Removal

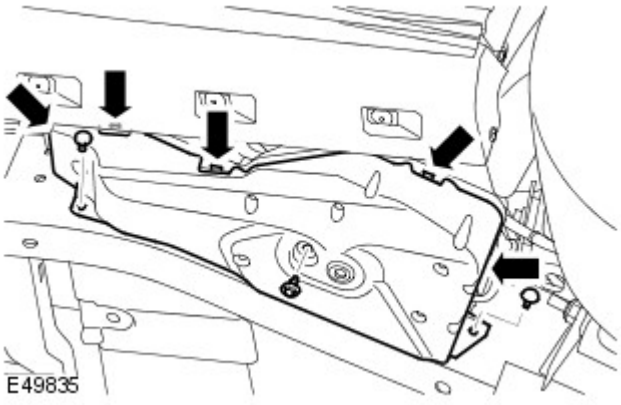
1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Using T4, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

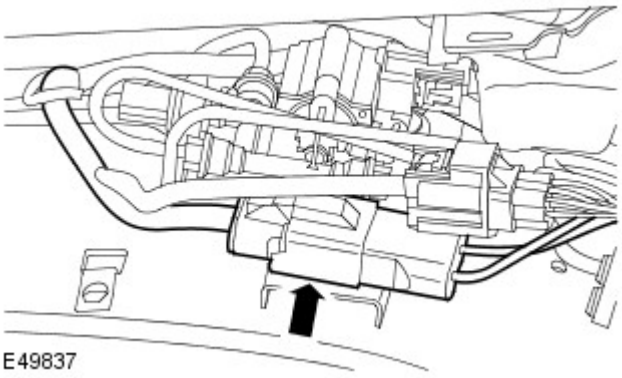
3. Remove the air suspension compressor lower cover.

- Remove the 3 bolts.
- Release the 5 clips.



4. Move the air compressor electrical connector aside.

- Release the 2 clips.



5. CAUTIONS:

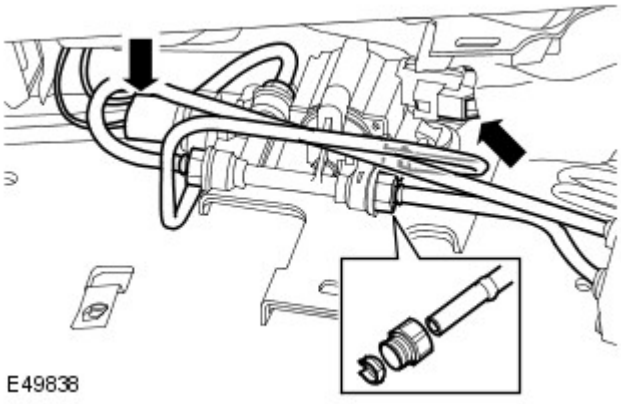
Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Visually inspect the air line ends for damage or wear. Repair or replace the air line as necessary.

• NOTE: Note the air line fitted positions.

Remove the air suspension reservoir solenoid valve block.

- Disconnect the 4 air lines.
- Disconnect the 2 electrical connectors.
- Release the valve block 3 rubber insulators.



6. Remove the Voss connectors.

- Remove and discard the collets and the unions.

Installation

1.  CAUTION: Make sure the new Voss connector is installed and fully tightened with the alignment plug installed.

• NOTE: New air suspension components are supplied with new Voss connectors tightened to the correct torque. Do not install new voss connectors if a new component is being installed.

Install new Voss connectors to the air suspension reservoir solenoid valve block.

- Tighten to 2.5 Nm (1.7 lb.ft).

2. NOTE: Make sure the valve block does not become detached during connection of the air lines.

Install the air suspension reservoir solenoid valve block.

- Secure the 3 valve block rubber insulators.
- Connect the electrical connectors.
- Connect the air lines into the Voss connector.
- Pull on each air line to make sure it is fully installed into the Voss connecter.

3. Secure the air compressor electrical connector.

4. Install the air suspension compressor lower cover.

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

5. Using T4, pressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

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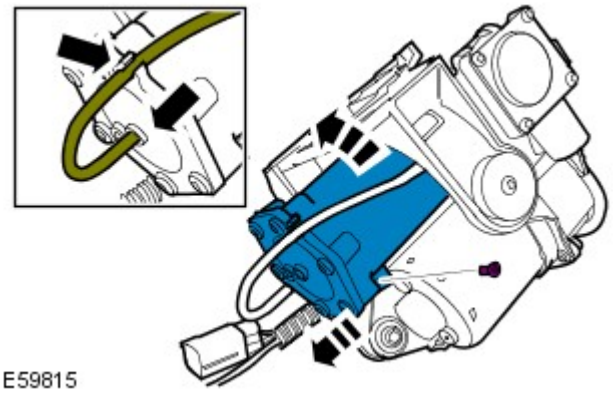
Vehicle Dynamic Suspension - Air Suspension Compressor Drier

Removal and Installation

Removal

CAUTION: If a new air suspension compressor, air compressor drier or air compressor delivery valve kit is installed due to failure, an air compressor relay must be installed. Failure to follow this instruction may result in damage to the air suspension system components.


E59815

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 suspension compressor.
   For additional information, refer to: Air Suspension Compressor (204-05 Vehicle Dynamic Suspension, Removal and Installation).

3. 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.

   Disconnect the air line from the air suspension compressor drier.

   - Release the air line from the retaining clip.

4. NOTE: If equipped, note the position of the air suspension compressor retaining cable.

   Remove the air suspension compressor drier.

   - Remove the retaining screw.
   - Remove and discard the O-ring seal.

Installation

1. Install a new O-ring seal.

   - Lubricate the O-ring with a lithium based grease.

2. NOTE: If equipped, make sure the air suspension compressor retaining cable is correctly routed around the compressor cylinder head.

   Install the air suspension compressor drier.

   - Install the retaining screw and tighten to 3 Nm (2.2 lb.ft).

3. CAUTIONS:

   Visually inspect the air line ends for damage or wear. Replace the air line as necessary.

   Pull on the air line to make sure it is securely intalled in the connector.

   Connect the air line to the air suspension compressor drier.

   - Attach the air line to the retaining clip.

4. Install the air suspension compressor.
   For additional information, refer to: Air Suspension Compressor

(204-05 Vehicle Dynamic Suspension, Removal and Installation).

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Vehicle Dynamic Suspension - Air Suspension Compressor

Removal and Installation

Removal

WARNING: Steps 1 and 2 must be carried out within 10 minutes of each other, failure to follow this instruction may result in personnel injury.

CAUTION: If a new air suspension compressor, air compressor drier or air compressor delivery valve kit is installed due to failure, an air compressor relay must be installed. Failure to follow this instruction may result in damage to the air suspension system components.

1. CAUTION: Make sure the ignition switch is turned off, the park brake is on and the selector lever is in park position.

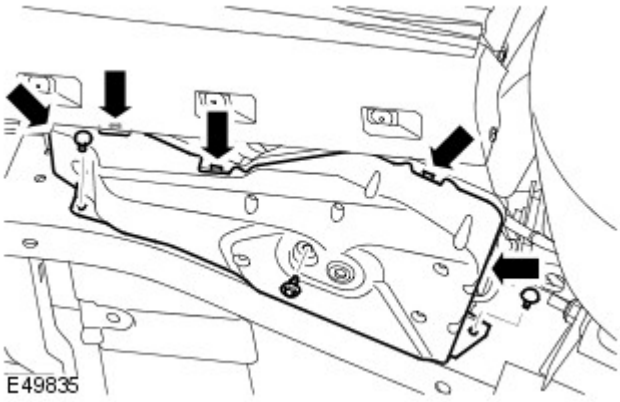
Open the front door.

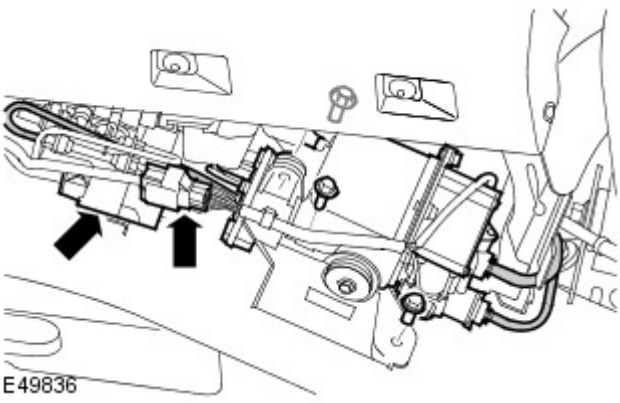
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle, make sure at least one of the wheels is off the ground.

3. Remove the air suspension compressor lower cover.

- Remove the bolt.
- Release the 5 clips.





4. CAUTION: Always plug any open connections to prevent contamination.

• NOTE: Access to the top compressor fixing bolt is very restricted. It is advisable to use a 3/8 inch drive socket with a flexible coupling.

Remove the air suspension compressor.

- Disconnect the 3 air lines.
- Disconnect the 2 electrical connectors.
- Remove the 3 bolts.

Installation

1. CAUTIONS:

Make sure that the wiring harness and the air suspension pipes are not trapped behind the air suspension compressor bracket.

Make sure the air suspension compressor upper cover is correctly positioned.

• NOTE: Install the upper retaining bolt, but do not fully tighten, before installing the 2 lower retaining bolts.

Install the air suspension compressor.

- Tighten the bolts to 23 Nm (17 lb.ft).
- Connect the air lines.
- Connect the electrical connectors.

2. CAUTIONS:

 Make sure the air suspension exhaust pipe is correctly located in to the air suspension upper cover.

 Make sure the air suspension compressor upper cover is correctly positioned.

Install the air suspension compressor lower cover.

- Install the bolt and tighten to 9 Nm (7 lb.ft).

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Vehicle Dynamic Suspension - Air Suspension Front Solenoid Valve Block

Removal and Installation

Removal

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

Raise and support the vehicle.

2. Remove the RH fender splash shield.
For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

3. Using T4, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

4. CAUTIONS:

Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

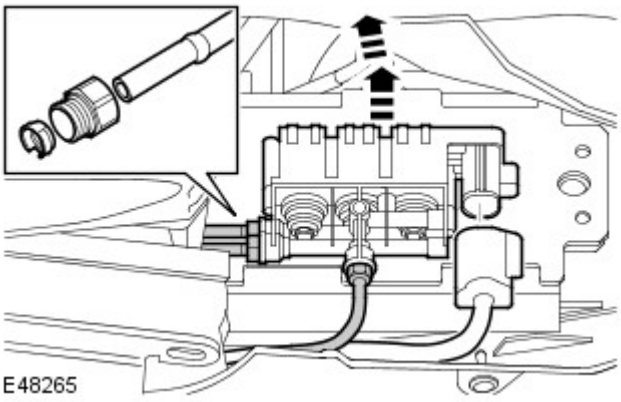
Visually inspect the air line ends for damage or wear. Repair or replace the air line as necessary.

• NOTE: Note the air line fitted positions.

Disconnect the 3 air lines from the air suspension front solenoid valve block.

5. Remove the air suspension front solenoid valve block.

- Disconnect the electrical connector.
- Release the valve block 3 rubber insulators.



6. Remove the Voss connectors from the air lines.

- Remove and discard the collet and the union.

Installation

1. CAUTION: Make sure the new Voss connector is installed and fully tightened with the alignment plug installed.

• NOTE: New air suspension components are supplied with new Voss connectors tightened to the correct torque. Do not install new voss connectors if a new component is being installed.

Install new Voss connectors to the air suspension front solenoid valve block.

- Tighten to 2.5 Nm (1.7 lb.ft).

2. NOTE: Make sure the valve block does not become detached during connection of the air lines.

Install the air suspension front solenoid valve block.

- Secure the 3 valve block rubber insulators.
- Connect the air lines into the Voss connector.

- Pull on each air line to make sure it is fully installed into the Voss connecter.
- Connect the electrical connector.

3. Using T4, pressurize the air suspension.
   For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).
4. Install the RH fender splash shield.
   For additional information, refer to: Fender Splash Shield (501-02 Front End Body Panels, Removal and Installation).

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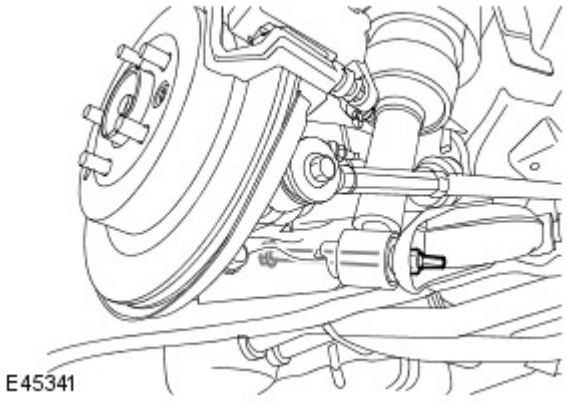
Vehicle Dynamic Suspension - Rear Air Spring

Removal and Installation

Removal

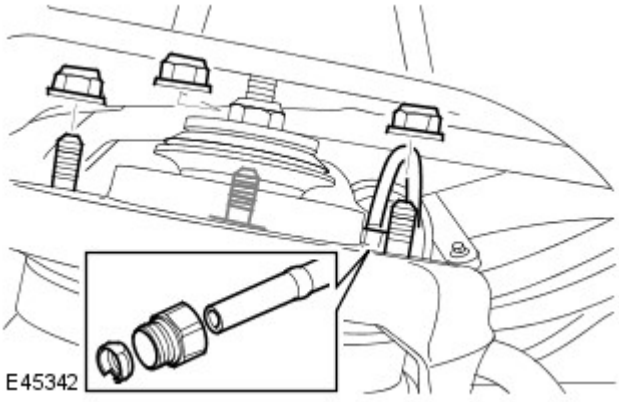
• NOTE: Only the air spring being removed needs to be depressurised.


E45341

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.
3. Using T4, depressurise the air suspension.
   For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).
4. Disconnect the rear air spring from the lower arm.
   - Remove the nut and bolt.


E45342

5. CAUTION: Always plug any open connections to prevent contamination.

   Disconnect the air line.

6. Using a trolley jack, support the rear air spring assembly.
7. Remove 3 rear air spring retaining nuts.
8. Remove the rear air spring.
9. Remove the Voss connector from the air line.
   - Remove the collet and the union.

Installation

1. Install a new Voss connector to the air spring.
   - Tighten to 3.5 Nm (2.6 lb.ft)
2. Install the rear air spring.
3. Connect the shock absorber and spring assembly to the lower arm.
   - Make sure the spring and shock absorber assembly top mounting to body mating faces are clean.
   - Tighten the nut and bolt to 300 Nm (221 lb.ft).
   - Connect the air line into the Voss connector.
4. Using T4, pressurise the air suspension.
   For additional information, refer to: Air Suspension System
   - Fit the nuts and tighten to 63 Nm (46 lb.ft).

Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

5. Install the wheel and tire.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

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Vehicle Dynamic Suspension - Air Suspension Muffler

Removal and Installation

Removal

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

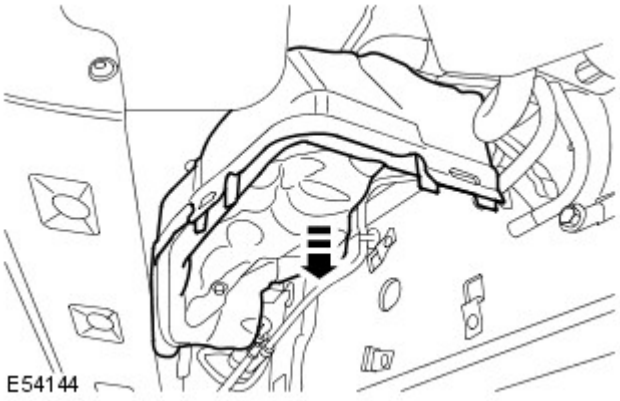
Raise and support the vehicle.

2. Remove the muffler assembly.
For additional information, refer to: Muffler (309-00B Exhaust System - 4.4L, Removal and Installation).

3. Remove the evaporative emissions canister.
For additional information, refer to: Evaporative Emission Canister (303-13B Evaporative Emissions - V8 5.0L Petrol, Removal and Installation).

4. Remove the air suspension compressor.
For additional information, refer to: Air Suspension Compressor (204-05 Vehicle Dynamic Suspension, Removal and Installation).

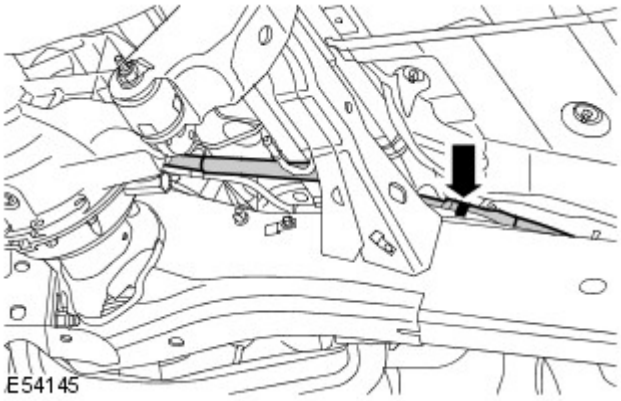
5. Remove the air suspension compressor upper cover.



6. Disconnect the air suspension intake filter pipe.

7. Remove the air suspension muffler.

- Release clip from the air suspension muffler pipe.
- Release the air suspension compressor to air suspension silencer pipes.



Installation

1. Install the air suspension muffler.

- Locate the air suspension muffler pipes.
- Secure the clip.

2. Connect the air suspension intake filter.

3. CAUTION: Make sure the air suspension compressor upper cover is correctly positioned.

Install the air suspension compressor upper cover.

4. Install the air suspension compressor.
For additional information, refer to: Air Suspension Compressor

(204-05 Vehicle Dynamic Suspension, Removal and Installation).

5. Install the evaporative emissions canister.
   For additional information, refer to: Evaporative Emission Canister (303-13B Evaporative Emissions - V8 5.0L Petrol, Removal and Installation).
6. Install the muffler assembly.
   For additional information, refer to: Muffler (309-00B Exhaust System - 4.4L, Removal and Installation).

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Vehicle Dynamic Suspension - Air Suspension Rear Solenoid Valve Block

Removal and Installation

Removal

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

Raise and support the vehicle.

2. Remove the LH rear wheel and tire.

3. Using T4, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

4. CAUTIONS:

Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Visually inspect the air line ends for damage or wear. Repair or replace the air line as necessary.

• NOTE: Note the air line fitted positions.

Disconnect 3 air lines from the rear valve block.

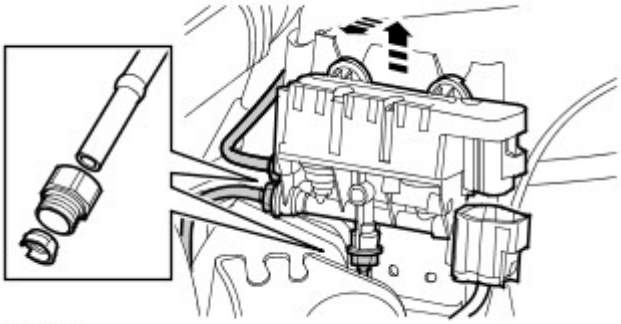
5. Disconnect the electrical connector.

6. Remove the rear valve block.

- Release the valve block 3 rubber insulators.

7. Remove the Voss connectors from the air lines.

- Remove and discard the collets and the unions.



E48266

Installation

1. NOTE: New air suspension components are supplied with new Voss connectors tightened to the correct torque. Do not install new voss connectors if a new component is being installed.

Install new Voss connectors to the rear valve block.

- Tighten to 2.5 Nm (1.7 lb.ft).

2. Install the rear valve block.

- Secure the 3 valve block rubber insulators.
- Connect the electrical connector.
- Connect the air lines into the Voss connector.
- Pull on each air line to make sure it is fully installed into the Voss connecter.

3. Using T4, pressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

4. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

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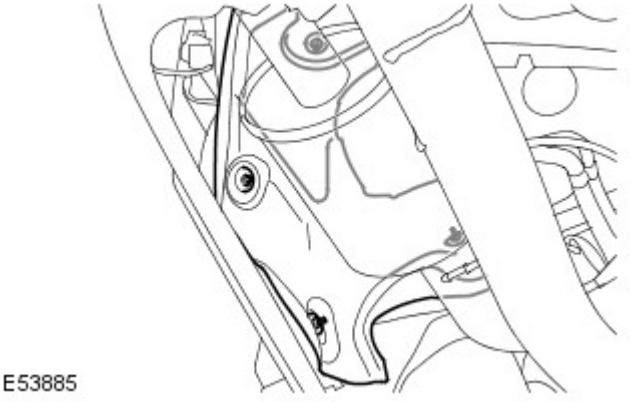
Vehicle Dynamic Suspension - Air Suspension Air Filter

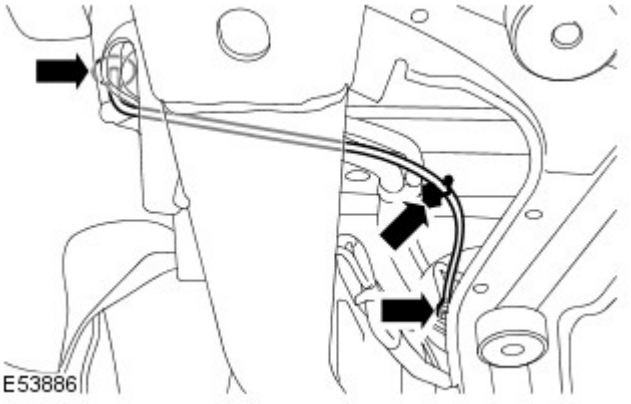
Removal and Installation

Removal

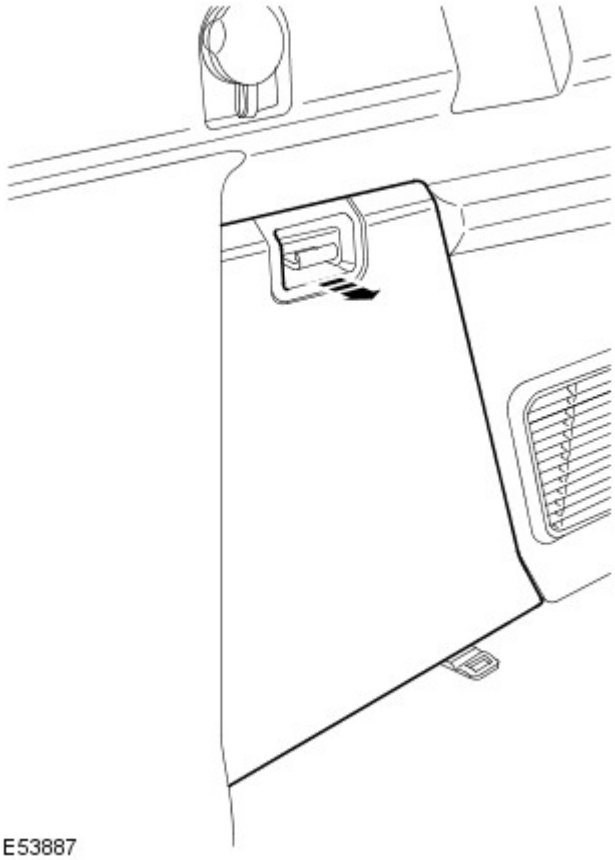
1. Open the liftgate and tailgate.
2. Remove the spare wheel and tire.
3. Remove the 4 nuts securing the LH rear tail pipe heat shield.



4. Reposition the LH rear tail pipe heat shield.
5. Disconnect the air suspension intake filter pipe.
6. Detach the air suspension intake filter.
   - Release the grommet.
   - Release from the clip.

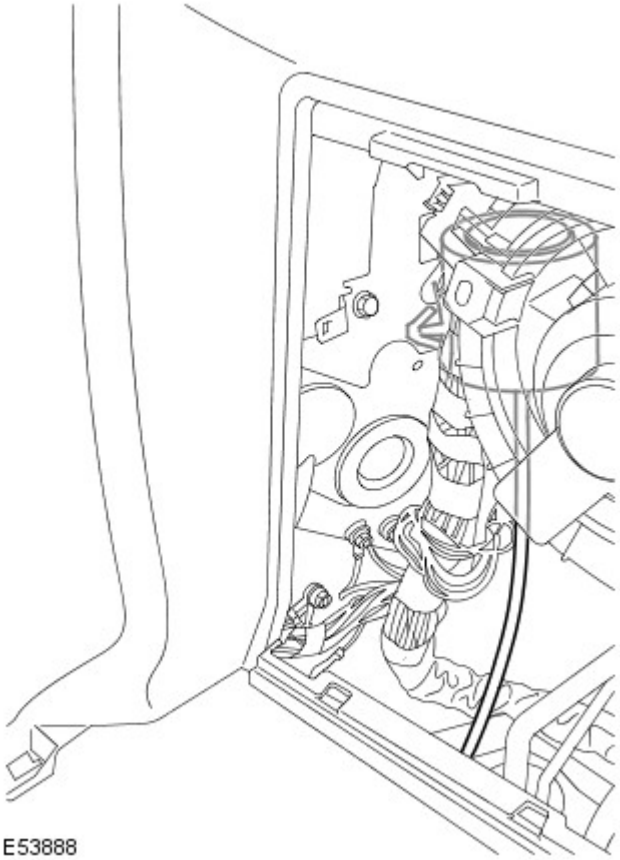


7. Remove the LH lower rear quarter trim access panel.



E53887

8. Remove the air suspension intake filter.



E53888

Installation

1. Install the air suspension intake filter.

- Install the grommet.

2. Install the LH lower rear quarter trim access panel.
3. Attach the air suspension intake filter.
4. Connect the air suspension intake filter.
5. Reposition the LH rear tail pipe heat shield.
    - Install the nuts.
6. Install the spare wheel and tire.
7. Close the liftgate and tailgate.

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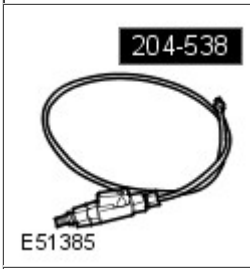
Vehicle Dynamic Suspension - Front Air Shock Absorber

Removal and Installation

Special Tool(s)	
 E51385	Air spring tester 204-538
 E99789	Remover front air shocker absorber spindle nut 204-700

Removal

- NOTE: This procedure should also be used to remove the front air spring.

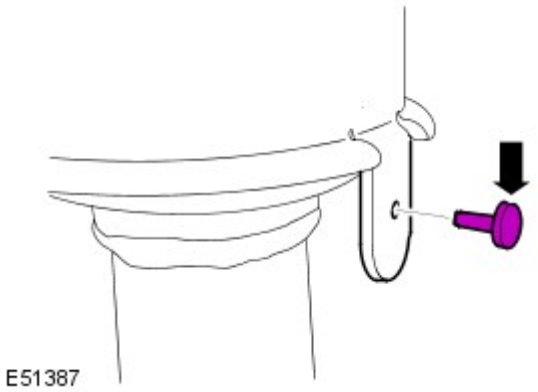
1. Remove the front shock absorber and air spring assembly. For additional information, refer to: Front Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).

2. NOTE: If no leak is detected, investigate other areas of the air suspension for faults.

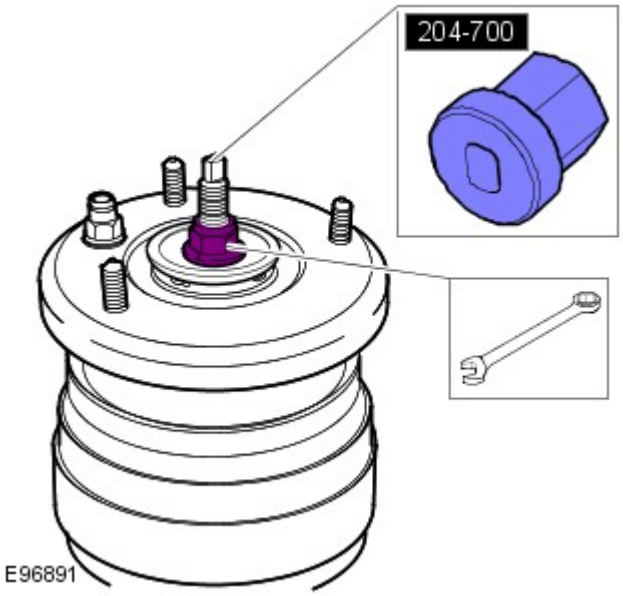
Check the assembly for leaks.

- Inflate the module to 4 bar and check for pressure loss using leak detector spray.
- If a leak is suspected, immerse the shock absorber and air spring assembly in a tank of water to locate the source of the leak and mark the area.

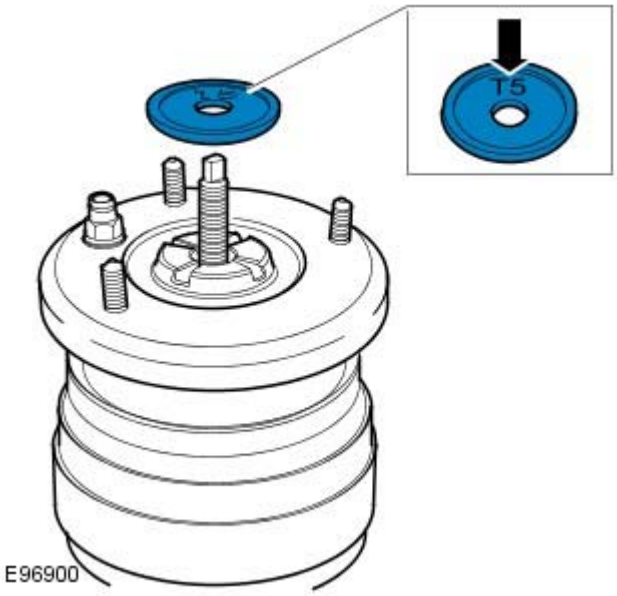
3. Remove the nylon retaining pin.


E51387

4. Using the special tool, remove the nut.



5. Remove the rebound washer.

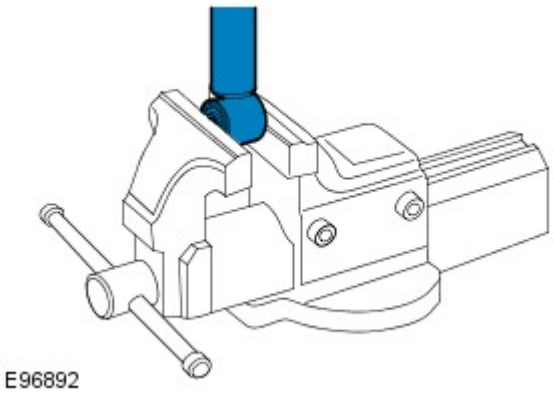


6. CAUTIONS:

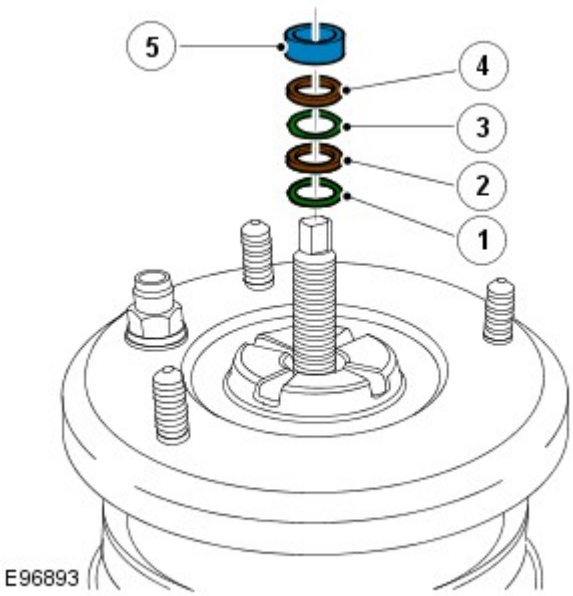
Make sure protective jaws are installed to the vice. Failure to follow this instruction may result in damage to the component.

Do not clamp the shock absorber tube. Failure to follow this instruction may result in damage to the component.

Position the front shock absorber and air spring assembly in a vice.

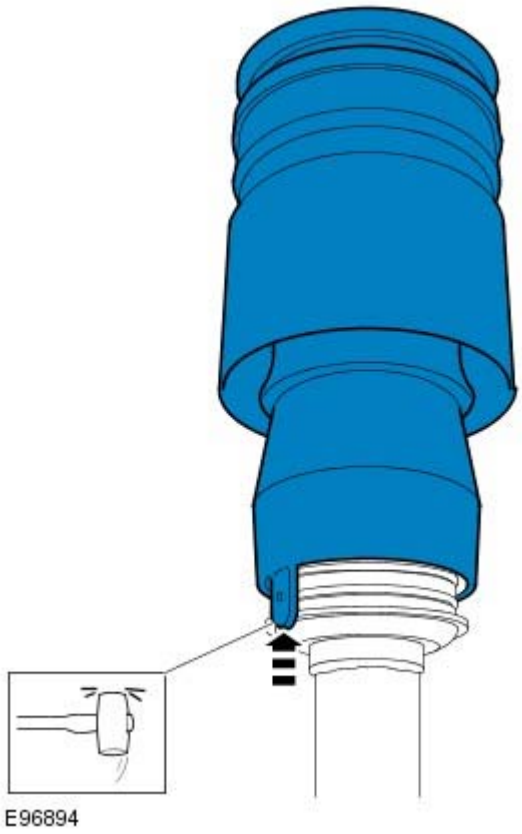


7. Remove and discard the 3 spacers and 2 O-ring seals.



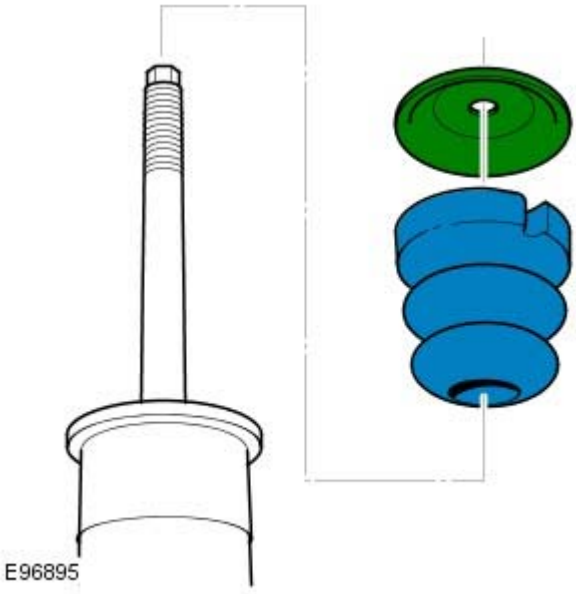
8. Remove the air spring.

- Using a soft faced mallet, gently tap the sleeve support upwards to release it from the O-ring seals.

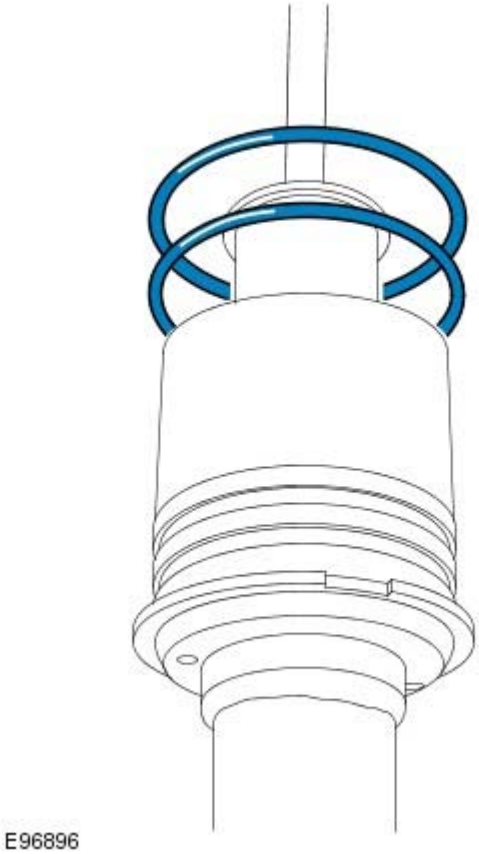


9. NOTE: Note the fitted position.

Remove the bump plate and spring aid.

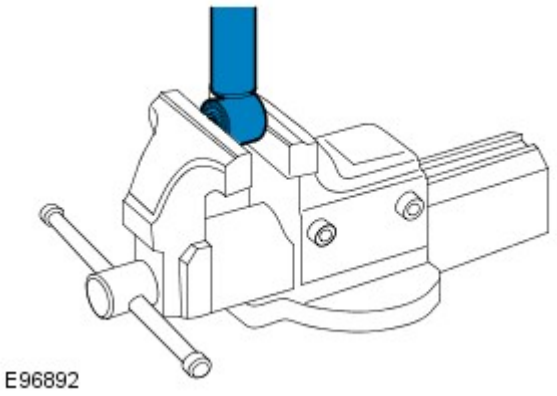

E96895

10. Remove and discard the 2 large black O-ring seals from the lower seal carrier.


E96896

11. Remove the front shock absorber and air spring assembly from the vice.

Installation

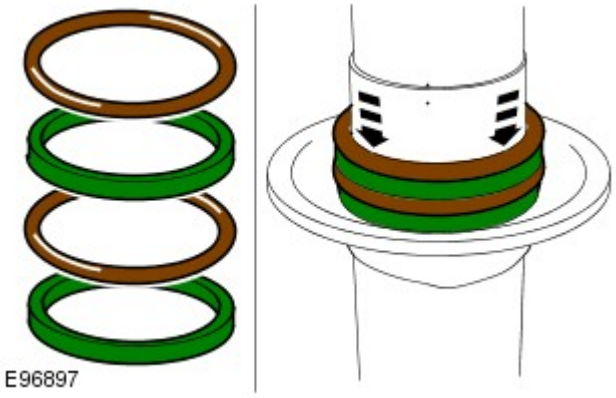

E96892

1. CAUTIONS:

Make sure protective jaws are installed to the vice. Failure to follow this instruction may result in damage to the component.

Do not clamp the shock absorber tube. Failure to follow this instruction may result in damage to the component.

Position the front shock absorber and air spring assembly in a vice.

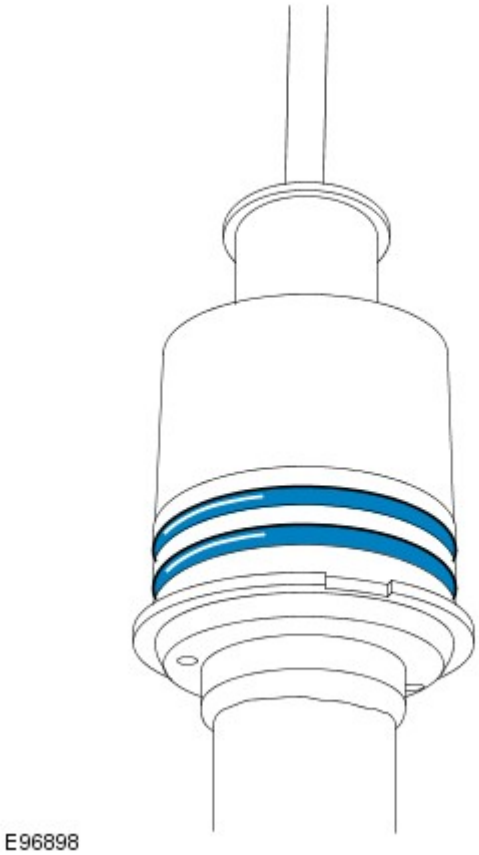

E96897

2. CAUTION: Use compressed air and lint free non-flocking material.

Clean the components.

3. Lift the seal carrier to expose the O-ring seal stack.

- Make sure that the damper body O-ring seals and spacers are fully seated to the spring seat.


E96898

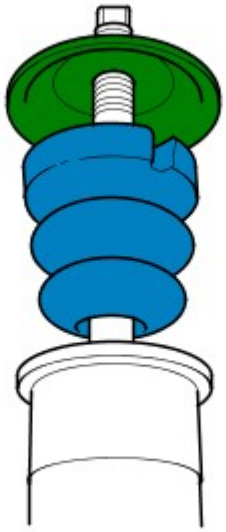
4. CAUTION: Take care not to damage the O-ring seals during installation.

Install new O-ring seals to the seal carrier.

- Apply loctite 8021 (silicon-based oil) to the O-ring seals.

5. NOTE: Make sure that these components are installed to the noted removal position.

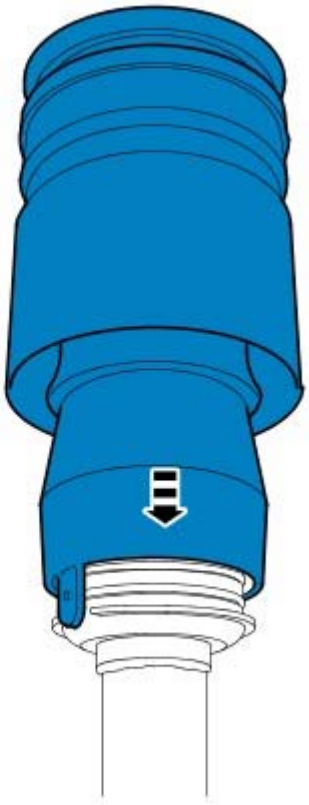
Install the bump plate and spring aid.



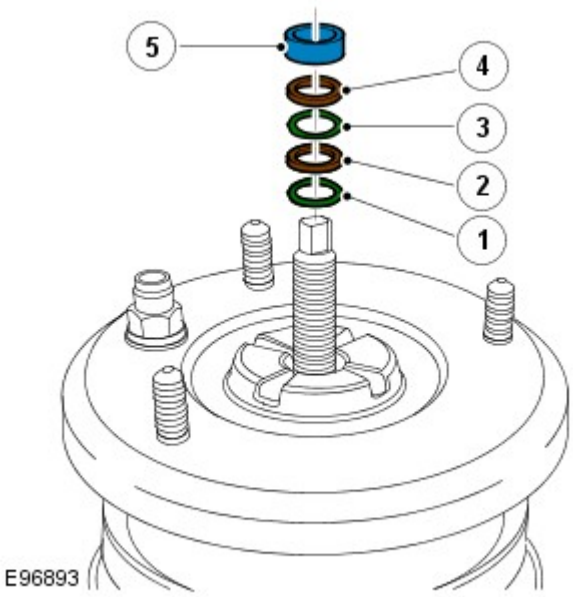
E96899

6. Install the air spring.

- Align the sleeve support with the first O-ring seal making sure that the location tag is correctly aligned with the spring seat cut-out.



E99908



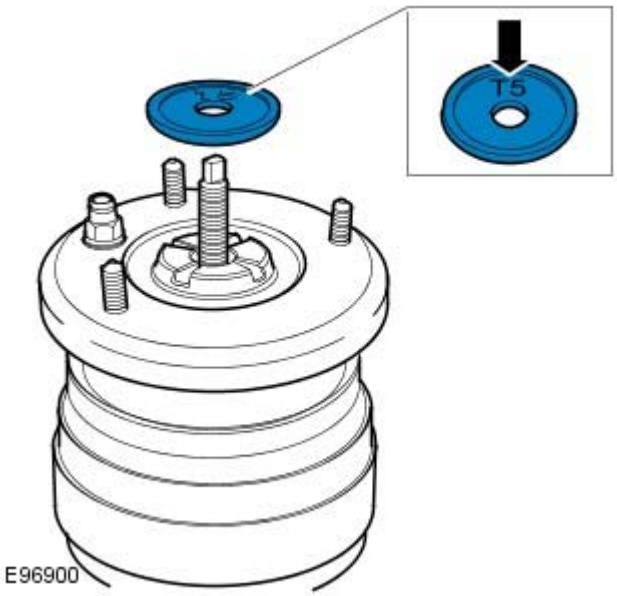
7. CAUTIONS:

Make sure that the threads of the front air shock absorber are covered with protective tape.

Take care not to damage the O-ring seals during installation.

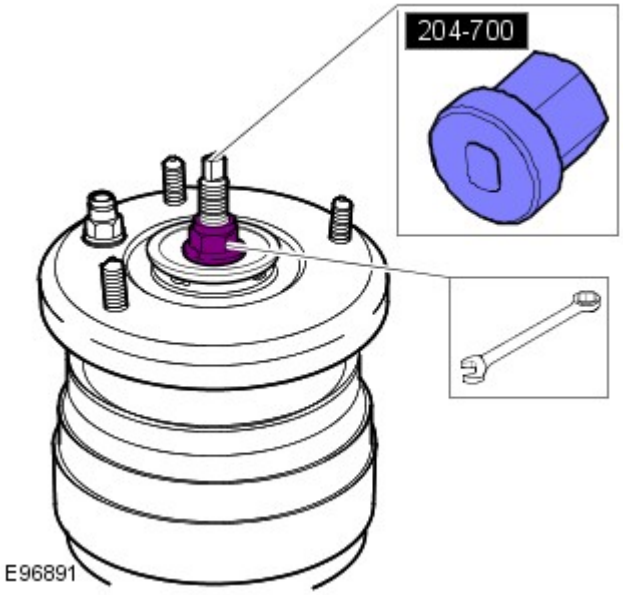
Install the components in the following order:

1. O-ring seal
2. Spacer
3. O-ring seal
4. Spacer
5. Spacer

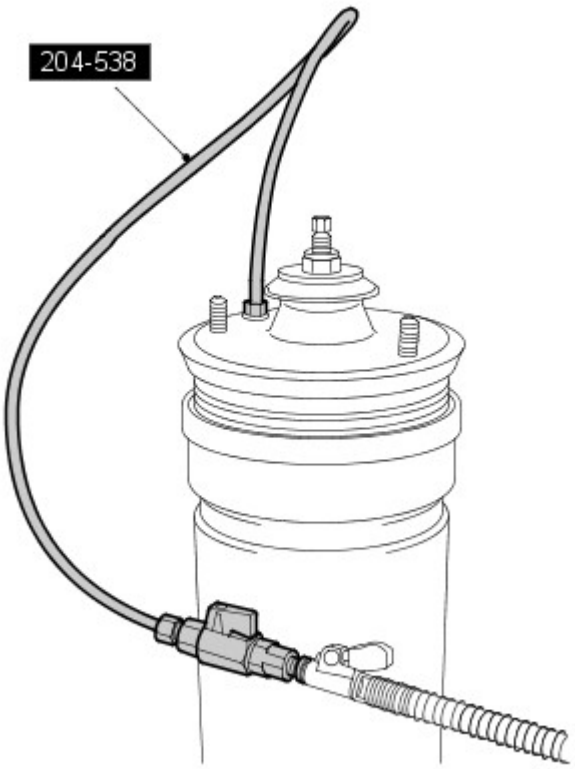


8. NOTE: The "T5" stamp on the upper face of the rebound washer must be visable after assembly.

Install the rebound washer.



9. Install a new nut and using the special tool, and tighten to 98 Nm (72 lb.ft).



E51445

10. CAUTIONS:

The air supply must be free of any moisture.

If during disassembly the air sleeve is unrolled, the air sleeve may inflate incorrectly (to one side). If this occurs, release the air pressure, and insert a suitable tool that will not damage the air sleeve or piston (a screw driver handle), into the side opposite the bulge. Inflate and deflate until the air sleeve inflates correctly (the air sleeve will be uniform inside the shroud).

• NOTE: To prevent damage when seating the sleeve support over the large black O-rings, compressed air should be used to inflate the air spring.

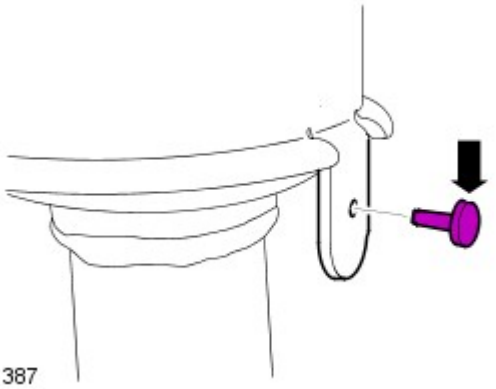
Using the special tool coupled to a tire inflator with a gauge, apply approximately 2 bar of air pressure to the air spring to fully seat the sleeve support over the O-ring seals.

11. Check the assembly for leaks.

- Inflate the module to 4 bar and check for pressure loss using leak detector spray.
- If a leak is suspected, immerse the shock absorber and air spring assembly in a tank of water to locate the source of the leak.

12. Depressurize and remove the special tool from the shock absorber and air spring assembly.

13. Install the nylon retaining pin.



E51387

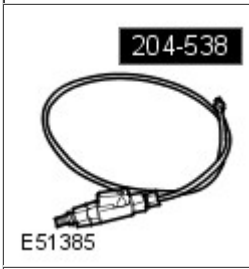
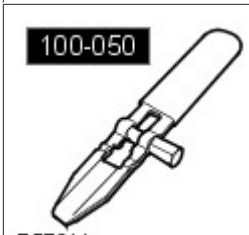
14. NOTE: Install a new air spring pipe connector.

Install the front shock absorber and air spring assembly. For additional information, refer to: Front Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).

Published: 11-May-2011

Vehicle Dynamic Suspension - Rear Air Shock Absorber

Removal and Installation

Special Tool(s)	
 E51385	Air spring tester 204-538
 E57611	Band-it Thrift tool 100-050 (LRT-99-019)

Removal

- NOTE: This procedure should also be used to remove the rear air spring.

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

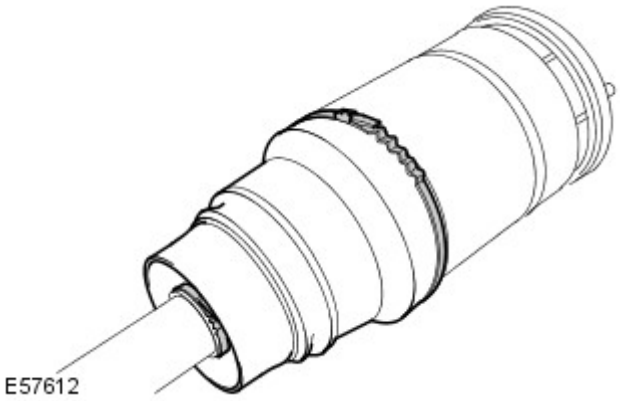
Raise and support the vehicle.

2. Remove the wheel and tire.

3. Remove the shock absorber and spring assembly.
For additional information, refer to: Rear Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).

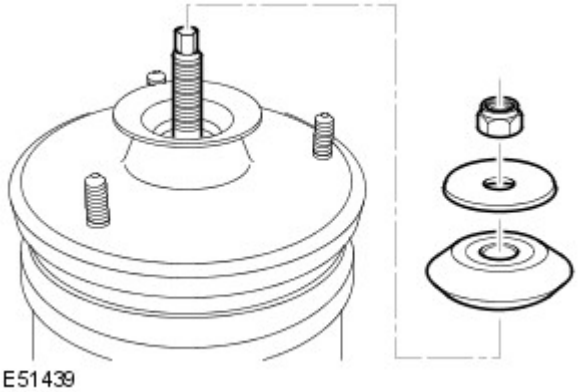
4. Remove the gaiter.

- Remove and discard the 2 straps.

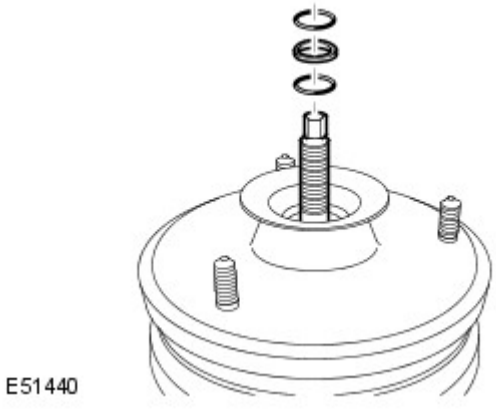

E57612

5. Remove the nut, rebound washer and rubber bushing.

- Discard the nut.

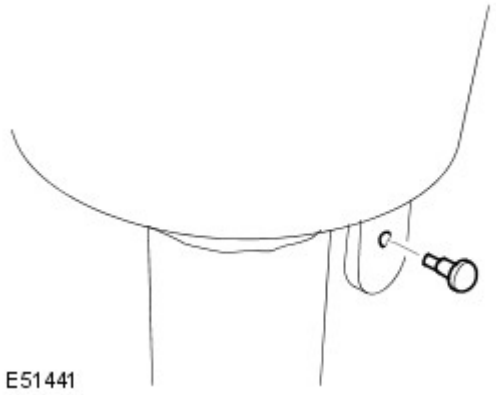

E51439

6. Remove and discard the O-ring seals and spacer.



E51440

7. Remove the nylon retaining pin.

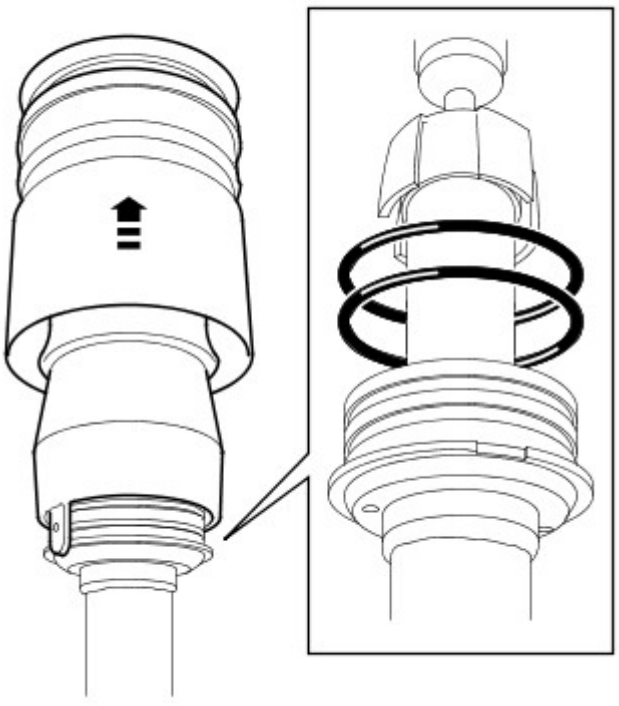


E51441

8. Remove the rebound plate and spring aid.

9. Remove the air spring.

- Using a soft faced mallet, gently tap the sleeve support upwards to release it from the O-ring seals.
- Remove and discard the 2 O-ring seals.



E51442

10. Remove the shock absorber from the vise.

Installation

1. Install the shock absorber in the vise.

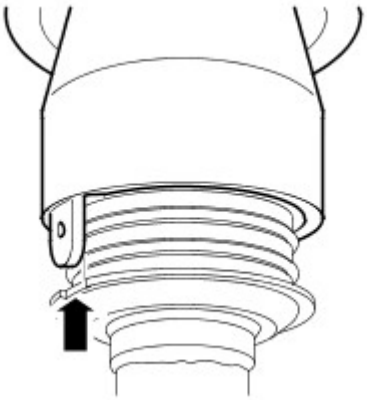
2. Clean the components.

3. Lubricate and install new O-rings to the seal carrier.

4. Install the spring aid and rebound plate.

5. Install the air spring.

- Align the piston with the first O-ring seal, making sure the location tag is correctly aligned.

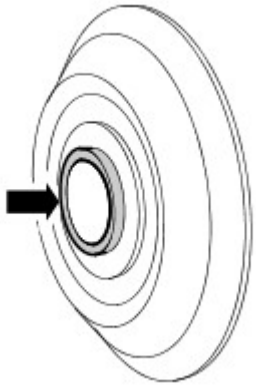


E51443

6. Install the new O-ring seals and spacer, taking care not to damage the seals.

7. Install the rubber bushing and rebound washer.

- Make sure the formed insert on the bushing is located against the O-ring seal.



E51444

8. Install and lightly tighten the nut.

9. CAUTIONS:

The air supply must be free of any moisture.

If during disassembly the air sleeve is unrolled, the air sleeve may inflate incorrectly (to one side). If this occurs, release the air pressure, and insert a suitable tool that will not damage the air sleeve or piston (a screw driver handle), into the side opposite the bulge. Inflate and deflate until the air sleeve inflates correctly (the air sleeve will be uniform inside the shroud).

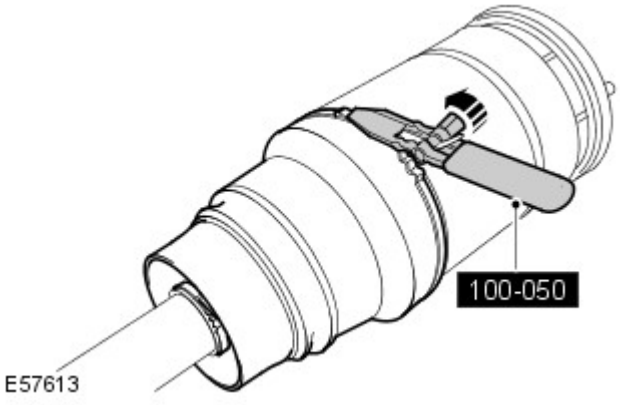
Install the air spring piston over the O-ring seals.

- Using the special tool coupled to a tire inflator with a gauge, apply approximately 2 bar of air pressure to the air spring to fully seat the piston over the O-ring seals.

10. Tighten the top nut to 98 Nm (72 lb.ft).

11. Check the assembly for leaks.

- Inflate the module to 4 bar and check for pressure loss.
- If a leak is suspected, immerse the spring and shock absorber assembly in a tank of water to locate the source of the leak.



12. Install the gaiter.

- Using the special tool, install new straps.

13. Install the shock absorber and spring assembly.
For additional information, refer to: Rear Shock Absorber and Air Spring Assembly (204-05 Vehicle Dynamic Suspension, Removal and Installation).

Published: 11-May-2011

Vehicle Dynamic Suspension - Front Shock Absorber and Air Spring Assembly

Removal and Installation

Removal

• NOTE: Only the air spring being removed needs to be depressurized.

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

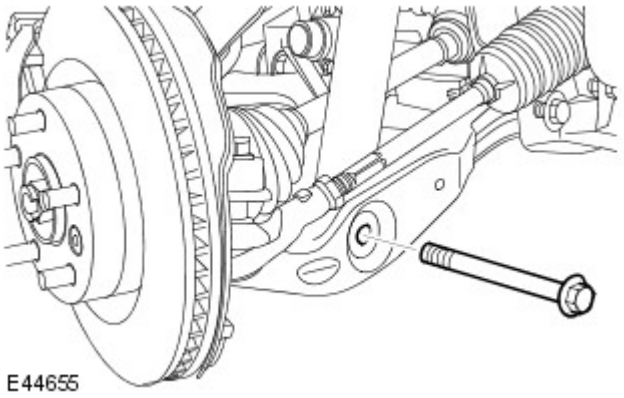
Raise and support the vehicle.

2. Remove the wheel and tire.

3. Using the Land Rover approved diagnostic system, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

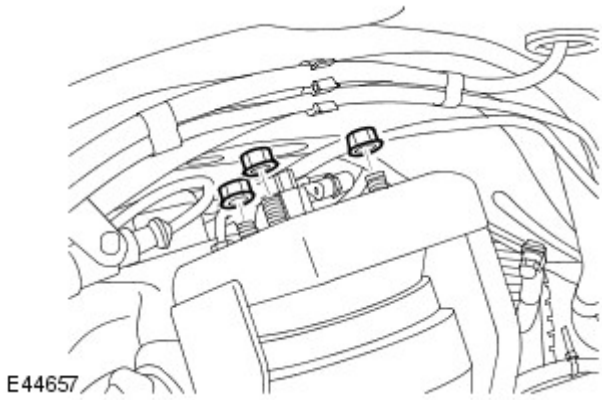
4. Disconnect the shock absorber and air spring assembly from the lower arm.

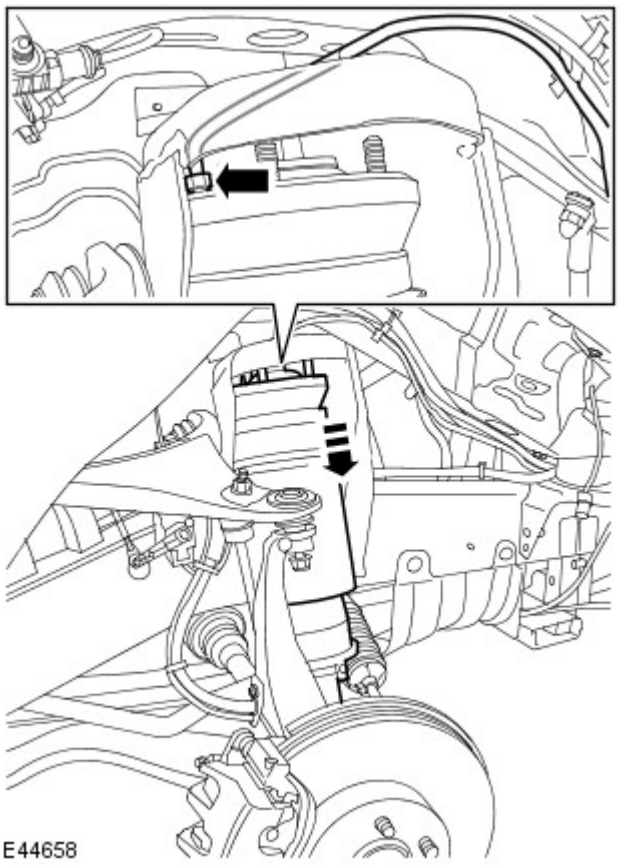
- Remove the nut and bolt.



5. Release the shock absorber and air spring assembly.

- Remove the 3 nuts.





6. CAUTION: Always plug any open connections to prevent contamination.

Reposition the shock absorber and air spring assembly.

- Disconnect the air line.

7. Remove the shock absorber and air spring assembly.

8. Remove the Voss connector from the air line.

- Remove and discard the collet and the union.

Installation

1. CAUTION: Make sure the new Voss connector is installed and fully tightened with the alignment plug installed.

Install a new Voss connector to the air spring.

- Tighten to 3.5 Nm (2.6 lb.ft)

2. NOTE: Remove and discard the blanking caps.

• NOTE: Clean the component mating faces.

Install the shock absorber and air spring assembly.

- Connect the air line into the Voss connector.
- Pull on the air line to make sure it is fully installed into the Voss connector.
- Install the nuts and tighten to 63 Nm (46 lb.ft).

3. Connect the shock absorber and air spring assembly to the lower arm.

- Tighten the nut and bolt to 300 Nm (221 lb.ft).

4. Using the Land Rover approved diagnostic system, pressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

5. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

Published: 01-Dec-2011

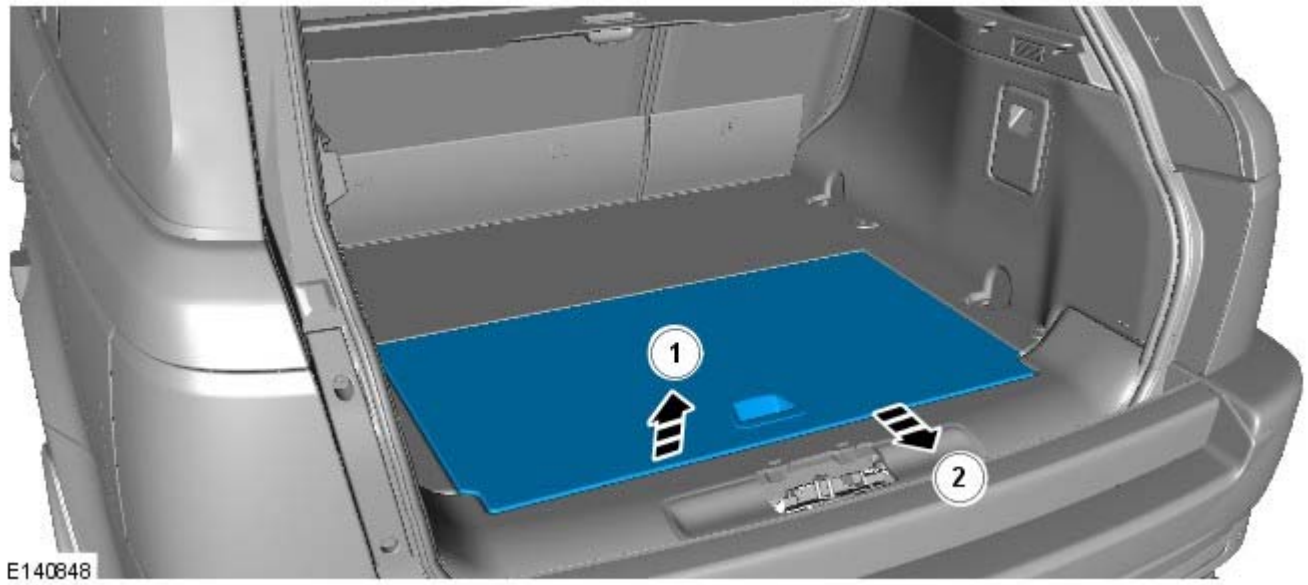
Vehicle Dynamic Suspension - Rear Shock Absorber and Air Spring Assembly

Removal and Installation

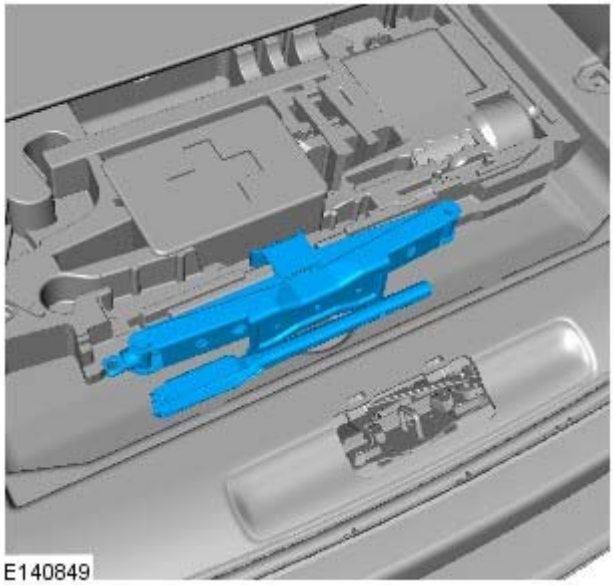
Removal

- NOTE: Only the air spring being removed needs to be depressurised.
- NOTE: RH illustration shown, LH is similar.

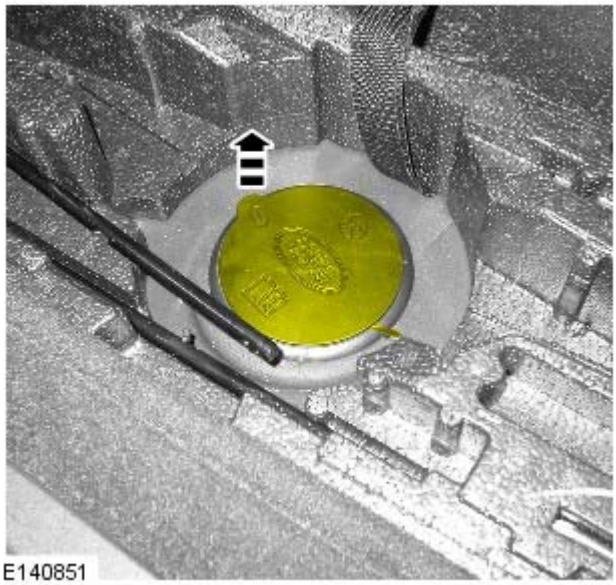
1. Using the Land Rover approved diagnostic system, depressurize the air suspension.
   For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).
2. Remove the loadspace floor panel.



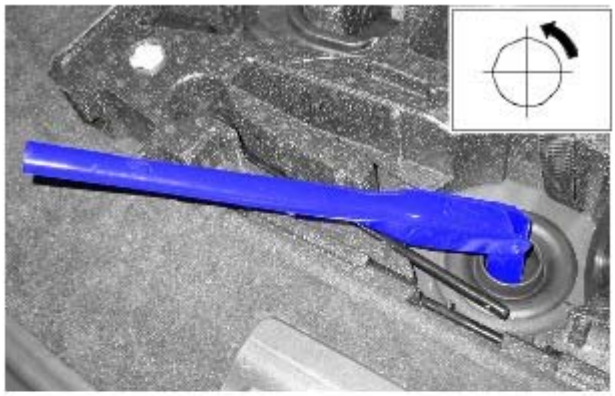
3. Remove the jack and wheel brace.



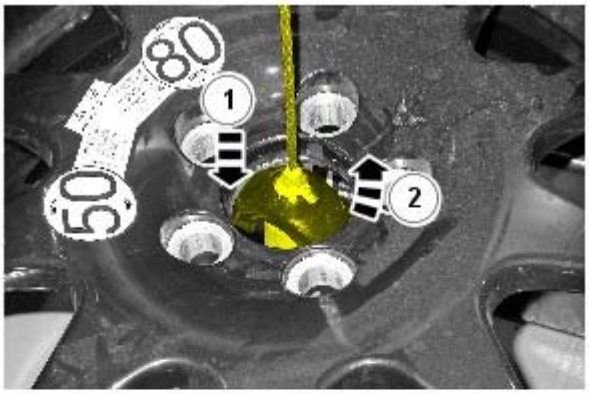
4. Remove the spare wheel/tool compartment cover.


E140851

5. Lower the spare wheel and tire.




E140852



6. Remove the spare wheel.

- Disconnect the spare wheel release strap and position aside.

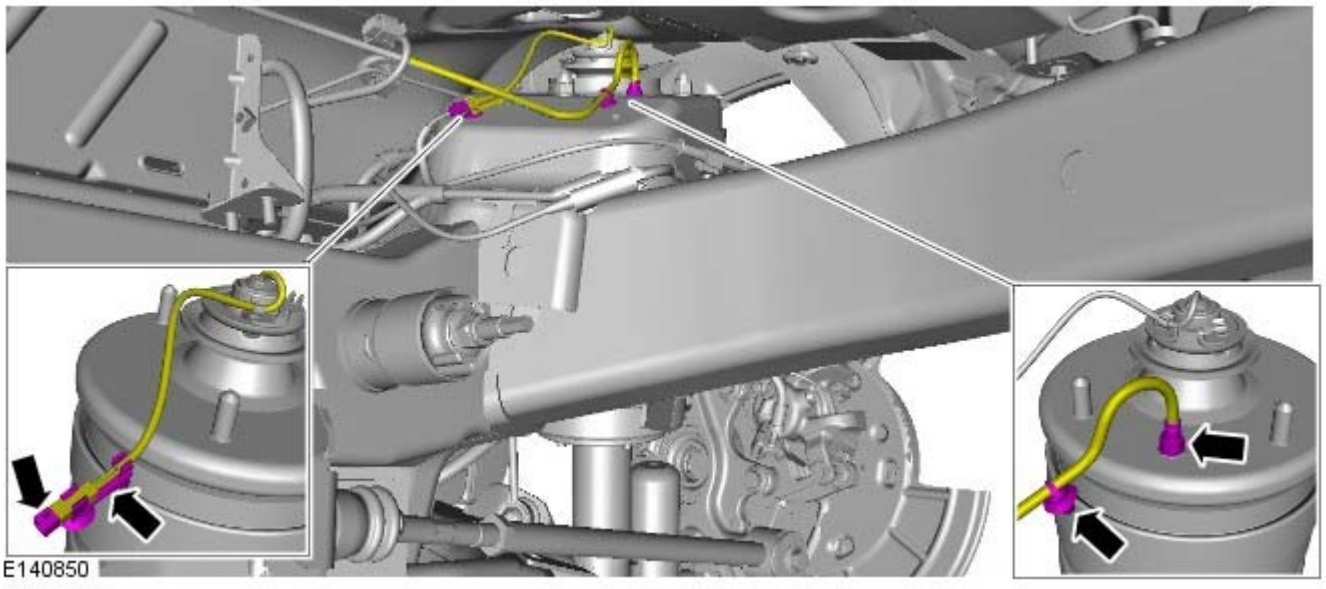
7. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

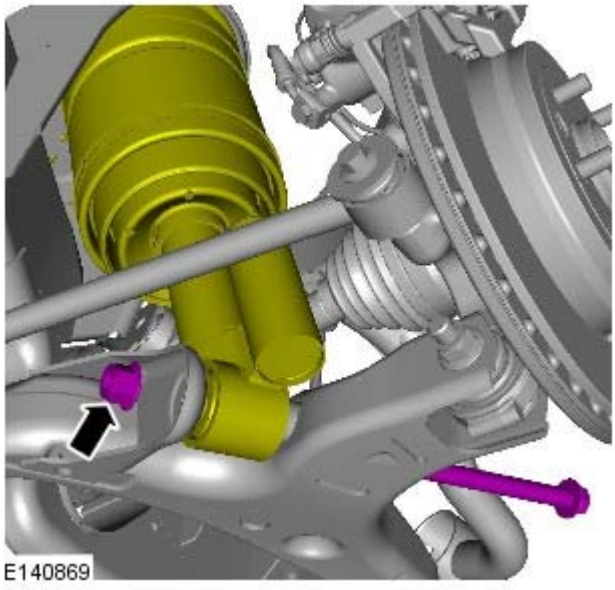
8. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

Remove the Voss connector from the air line.

- Remove and discard the collet and the union.
- Disconnect the active damping wiring.

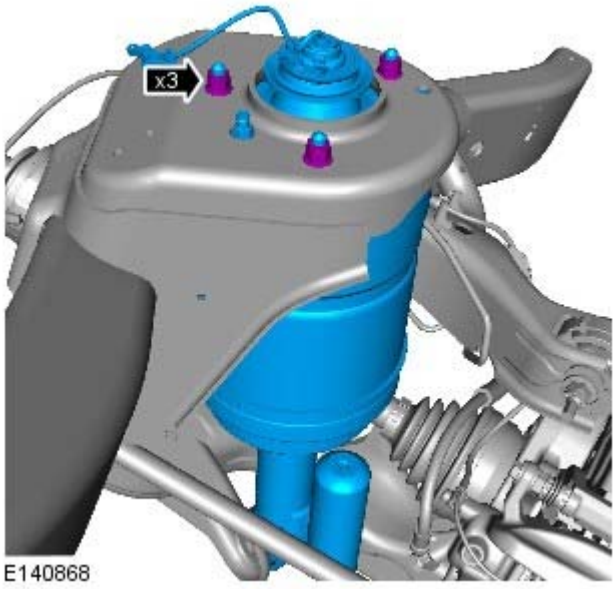


9. Remove the wheel and tire.



10. Disconnect the shock absorber and air spring assembly from the lower arm.

- Remove the nut and bolt.



11. Remove the three shock absorber and air spring retaining nuts.

- Remove the shock absorber and air spring assembly.

Installation

1. Install the shock absorber and air spring assembly.

- Make sure the shock absorber and air spring assembly top mounting to body mating faces are clean.
- Fit the nuts and tighten to 63 Nm (46 lb.ft).
- Connect the air line into the Voss connector.
- Tug on the air line to make sure it is fully installed into the Voss connecter.

2. Connect the shock absorber and air spring assembly to the lower arm.

- Tighten the nut and bolt to 300 Nm (221 lb.ft).

3. CAUTION: Make sure the new Voss connector is installed and fully tightened with the alignment tool.

Install a new Voss connector to the air spring.

- Tighten to 3.5 Nm (2.6 lb.ft).

4. Install the wheel and tire.

- Tighten the wheel nuts to 140 Nm (103 lb.ft).

5. Lower the vehicle on the lift.

6. Connect the spare wheel release strap to the spare wheel and tire.

- Attach the active damping wiring.

7. Install the spare wheel and tire.

- Raise the spare wheel and tire.

8. Install the spare wheel/tool compartment cover.

9. Install the jack and wheel brace.

10. Install the loadspace floor panel.

11. Using the Land Rover approved diagnostic system, pressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

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Vehicle Dynamic Suspension - Air Suspension Pressure Sensor

Removal and Installation

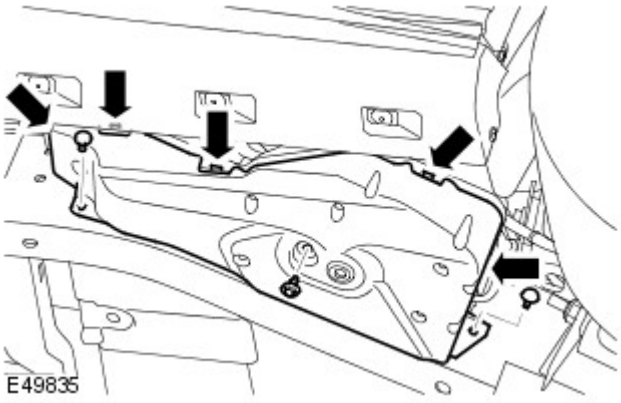
Removal

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

Raise and support the vehicle.

2. Remove the air compressor housing cover.

- Remove the 3 bolts.
- Release the 5 clips.



3. Using T4, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

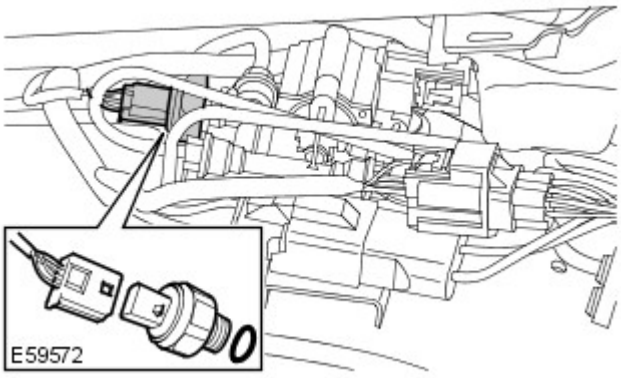
4. NOTE: Make sure the valve block does not become detached during removal of the air pressure sensor.

Disconnect the electrical connector.

5. CAUTION: Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.

Remove the air pressure sensor.

- Remove and discard the O-ring seal.



Installation

1. NOTE: Make sure the valve block does not become detached during installation of the air pressure sensor.

Install the air pressure sensor.

- Install a new O-ring seal.
- Tighten to 5 Nm (4 lb.ft).

2. Connect the electrical connector.

3. Using T4, pressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

4. CAUTIONS:

Make sure the air suspension compressor upper cover is correctly positioned.

 Make sure the air suspension exhaust pipe is correctly located in to the air suspension upper cover.

Install the air compressor housing cover.

- Install the bolts and tighten to 9 Nm (7 lb.ft).

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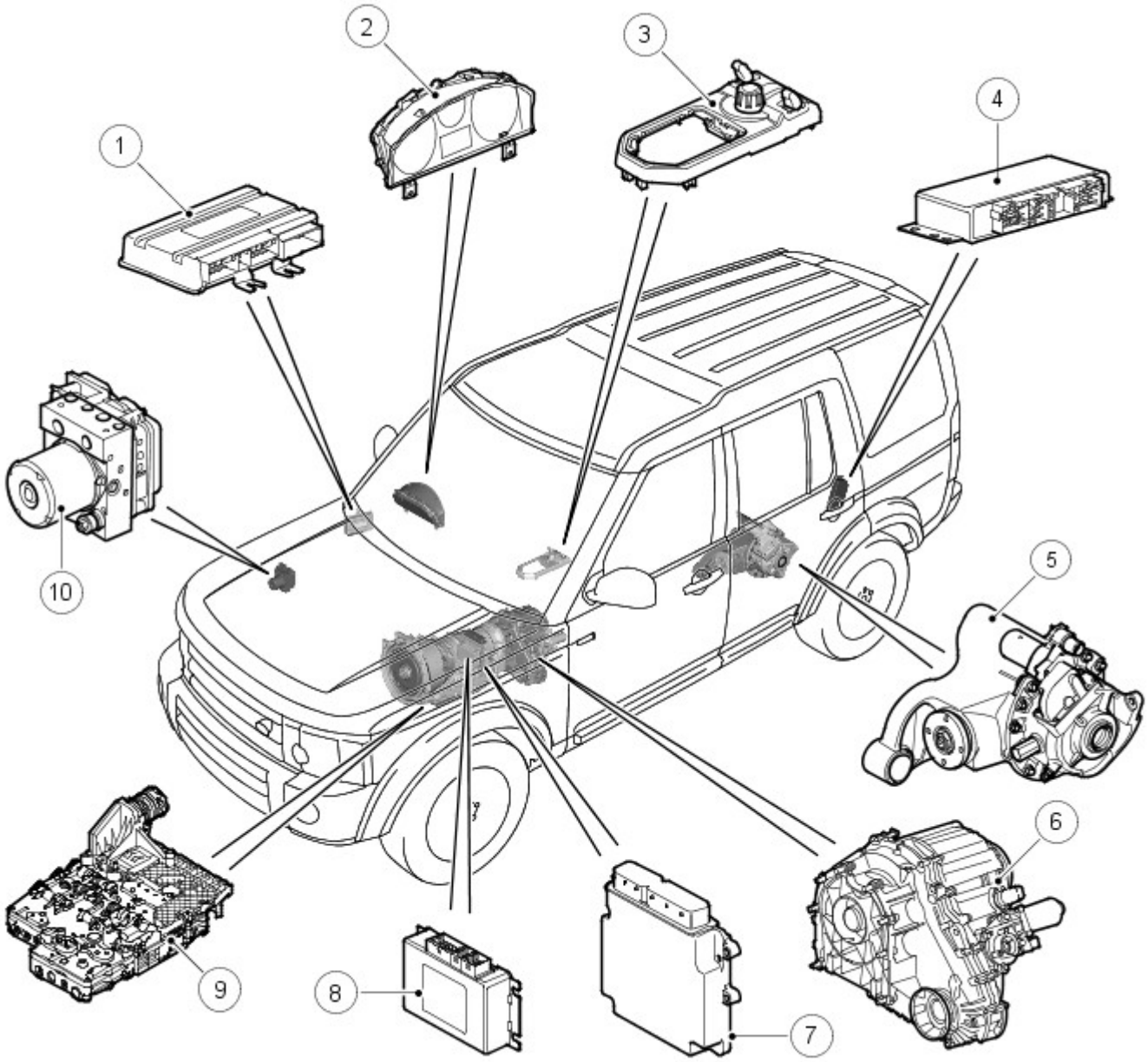
Ride and Handling Optimization - Ride and Handling Optimization

Description and Operation

Terrain Response - Component Location



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Item	Part Number	Description
1	-	Air suspension control module
2	-	Instrument cluster
3	-	Terrain Response rotary control and control module
4	-	Rear differential control module (if fitted)
5	-	Rear differential
6	-	Transfer box (center differential and high/low range)
7	-	Engine control module
8	-	Transfer box control module
9	-	Transmission control module (automatic transmission only)
10	-	ABS module

GENERAL

The Terrain Response™ system allows the driver to select a program which aims to provide the optimum settings for traction and performance for the prevailing terrain conditions. The system cannot be switched off. The 'special programs off' is the default program and covers all general driving conditions. Four specific terrain programs are selectable to cover all terrain surfaces.

The system is controlled by a rotary control located on the center console, rearward of the selector lever (automatic transmission) or gearshift lever (manual transmission). The rotary control allows the selection of one of the following five programs:

- Special programs off
- Grass/Gravel/Snow
- Mud/Ruts
- Sand
- Rock crawl.

The rotary control can be rotated through 360 degrees or more in either direction and selects each program in turn. When Terrain Response is fitted to a vehicle, a hi-line instrument cluster will also be fitted which will display the selected program in the message center.

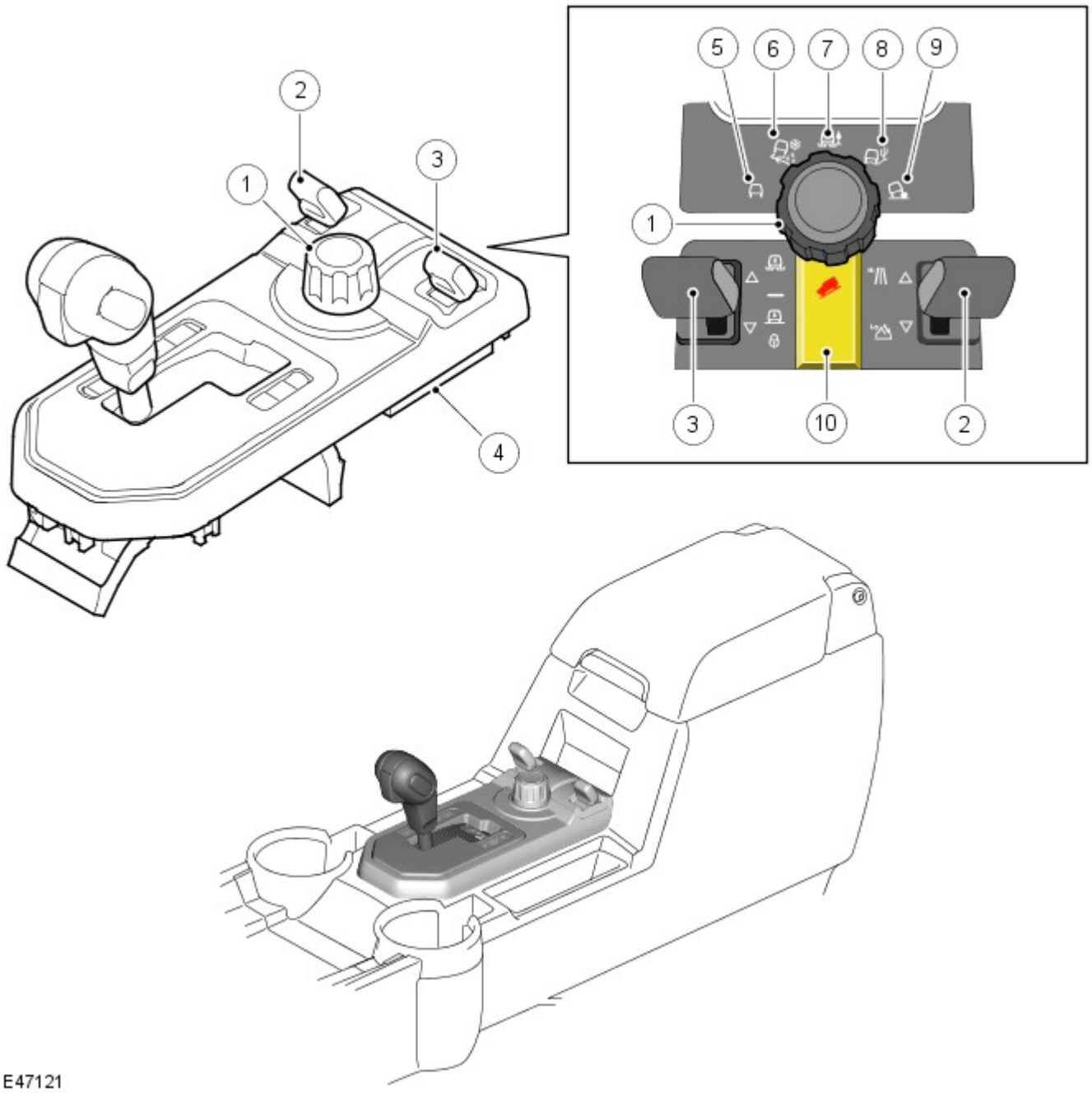
The Terrain Response system uses a combination of a number of vehicle subsystems to achieve the required vehicle characteristics for the terrain selected. The following subsystems make up the Terrain Response system:

- Engine management system
- Automatic transmission (if fitted)
- Transfer box (center differential)
- Rear differential (electronically controlled)
- Brake system (ABS/DSC/ETC/HDC functions)
- Air suspension.

A Terrain Response control module is located below the rotary control. The control module detects the selection made on the rotary control and transmits a signal on the high speed CAN which is received by each of the subsystem control modules. Each of the affected control modules contain software which applies the correct operating parameters to their controlled system for the Terrain Response program selection made. Each control module also provides a feedback for the selected program so that the Terrain Response control module can check that all systems have changed to the correct operating parameters.

Information is displayed in the instrument cluster message center which informs the driver of improvements which can be made to the vehicle operating parameters to optimise the vehicle for the prevailing conditions. Inexperienced off-road drivers may benefit from the automatic assistance of the Terrain Response system and the driver information. Experienced off-road drivers can select the specific programs for extreme conditions to access control over the vehicle systems (e.g., throttle shift maps or traction settings) which are not accessible on vehicles without Terrain Response.

TERRAIN RESPONSE ROTARY CONTROL AND MODULE



Item	Part Number	Description
1	-	Terrain Response rotary control
2	-	Transfer box high/low range switch
3	-	Air suspension switch
4	-	Terrain Response control module
5	-	Special programs off
6	-	Grass/gravel/snow program
7	-	Mud/ruts program
8	-	Sand program
9	-	Rock/crawl program
10	-	HDC switch

The Terrain Response rotary control is located in the center console and allows the selection of five operating programs. Each program is denoted by a symbol which represents the terrain encountered. The rotary control can be rotated to select the required program. The control will only select the last program in its direction of rotation. Further rotation of the control once the last program in either direction has been selected, will have no effect, e.g. once rock crawl has been selected, further rotation in a clockwise direction will have no effect.

The Terrain Response control module is located below the rotary control. The module is connected via a harness connector which also contains the wiring for the HDC switch, the transfer box high/low range switch, the air suspension switch and the switch illumination circuits. The control module and switch uses four of these wires for a 12V battery supply when the ignition switch is in ignition position II, a ground and high speed CAN positive and negative.

TERRAIN RESPONSE OPERATION

The following vehicle subsystem control modules are used for the Terrain Response system:

- Engine management (engine control module)
- Transmission control (transmission control module - automatic transmission only)
- Transfer box control (transfer box control module)
- Rear differential control (rear differential control module - if fitted)
- Air suspension control (air suspension control module)
- Brake system (ABS/DSC/ETC/HDC functions) (ABS module)

Each subsystem operates in different ways in relation to the selected Terrain Response program to achieve the optimum traction, stability and ease of control for the terrain encountered. The system has a safety factor built in which ensures that any program can be safely used on any surface, even when an inappropriate program selection has been made.

Engine Management System (EMS)

The EMS varies the throttle pedal response to control the engine torque output. The EMS can change the throttle maps to change the amount of torque per percentage of pedal travel. The EMS can also change the throttle response to control the allowed torque change relative to the percentage pedal travel.

Each terrain program uses a combination of operating parameters for each subsystem. Changing between terrain programs initiates a different set of operating characteristics which will be noticeable to the driver. The driver will notice differences in engine and throttle response when, for example, the throttle pedal is held in a constant position and the terrain program is changed from grass/gravel/snow to sand, the driver will notice the torque and engine speed increase. If the terrain program is changed from sand to grass/gravel/snow the driver will notice a reduction in torque and engine speed.

• NOTE: The change in torque and engine speed can take approximately 30 seconds and care must be taken not to confuse the Terrain Response system operation with an EMS fault.

Transmission Control

The transmission control module changes the shift maps for the Terrain Response program selected. This changes the shift points providing early or late upshifts and downshifts.

On slippery surfaces the transmission will select 2nd gear in high range or 3rd gear in low range for starting from a standstill to minimise wheel slip. In muddy conditions the transmission will provide maximum torque output from the transmission. In sand the transmission will provide an output which passes maximum engine power from the transmission.

In rock crawl special program (low range) the transmission will select 1st gear for driving off.

Sport mode is only available when the general program is selected and the transfer box is in high range. Sport mode is disabled in low range and all Terrain Response special programs. CommandShift™ is available in any program and also in high or low range.

If the transmission is in 'Sport' mode and a special program is subsequently selected, the transmission will automatically change to manual 'CommandShift™' mode. If a special program is already selected and the transmission selector lever is moved from drive 'D' to the 'Sport' mode position, the transmission will automatically change to 'CommandShift™' mode.

Transfer Box and Rear Differential Control

The transfer box electronically controlled differential and the rear electronically controlled differential (if fitted) are treated as one system. The electronic rear differential is an optional fitment on vehicles fitted with the Terrain Response system. The differential control has two operating strategies; pre-emptive and reactive.

The pre-emptive strategy anticipates and predicts the locking torque value required for each differential to minimise slip and maximise stability. Each Terrain Response program has a different threshold and input criteria for the pre-emptive strategy. The pre-emptive strategy improves vehicle traction and composure by avoiding wheel spin. This is achieved by anticipating the amount of differential lock required for the program selected. For example, a high locking torque would be applied for rock crawl or slippery surfaces.

The reactive strategy varies the amount of locking torque in response to the actual slip level and the dynamic behaviour of the vehicle. Each Terrain Response program has a different threshold and input for the reactive strategy. The reactive strategy improves vehicle traction and composure by eliminating any wheel spin which has occurred after the pre-emptive strategy was applied. The locking response applied is applicable to the terrain program selected, for example, very sensitive on slippery surfaces to provide maximum traction and minimise surface damage.

The locking torque calculations use various signals from other subsystems, for example, engine torque, throttle position, selected gear, steering angle, vehicle speed, lateral acceleration, yaw behaviour.

The Dynamic Stability Control function of the ABS system can override the Terrain Response differential control and reduce any applied locking torque during DSC action.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

Air Suspension Control

The air suspension control module contains a strategy which provides automatic switching between normal and off-road heights. Changes in vehicle height settings will be relayed to the driver via the instrument cluster message center and LED illuminated icons on the switch. The automatic selection and deselection of the vehicle height provides automatic increase and decrease in ground clearance and aims to provide maximum benefit to the selected terrain program.

On a vehicle fitted with a correctly installed, Land Rover approved trailer socket, if an electrical load is sensed on the trailer socket, height changes are prohibited and the message center displays a message advising that a trailer is connected and off-road height is not automatically selected. The driver can raise the suspension manually using the air suspension switch.

• NOTE: The prohibiting of the automatic ride height selection is only operational if a Land Rover approved trailer socket is fitted and an electrical load is sensed on the socket.

ABS Control

The ABS module controls several vehicle functions and adjusts the operating parameters of these functions to optimise the selected Terrain Response program.

Traction control uses different slip/acceleration thresholds to improve traction and vehicle composure. For example, the system sensitivity is increased on slippery surfaces to reduce wheel spin.

If DSC is switched off (with the DSC switch on the instrument panel) when using a Terrain Response special program, if the special program is subsequently changed for a different program DSC is automatically switched back on.

The stability control uses different threshold values for the selected program to automatically reduce DSC intervention, removing the requirement for the driver to disable the DSC system in order to reduce engine intervention which is sometimes induced in extreme off-road conditions. In extreme sand conditions, there may be an additional benefit of disabling the DSC function using the DSC switch on the instrument panel in addition to selecting the sand program.

HDC is automatically switched on or off and target speeds are adjusted in response to the Terrain Response program selected. The responsiveness of the HDC function is also increased where required.

Automatic operation of HDC aims to assist the driver by switching the system on or off when it is of most benefit. Target speeds for HDC operation are also adjusted according the vehicle operating conditions.

Incorrect Program Usage

Selection of an inappropriate program is discouraged in the following ways:

- The active program icon is continually displayed in the instrument cluster message center
- The Terrain Response control module 'locks' out certain functions in some programs, e.g. ,
  - cruise control is only available with the special programs off or grass/gravel/snow program
  - transmission 'Sport' mode is deactivated in all special programs.
- In any special program, except the grass/gravel/snow program, when the ignition has been in the off position continually for more than 6 hours, the Terrain Response system defaults to the Special Programs Off
- When in the grass/gravel/snow program, the Terrain Response system will never default to the Special Programs Off. This is to allow for drivers in cold climates where continuous use of the grass/gravel/snow program would be beneficial
- The rock crawl program is only available with the transfer box in low range.

Selection of an inappropriate program for the terrain conditions will not endanger the driver or cause damage to the vehicle. Continued use of an inappropriate program may reduce the life of some components. The driver may notice reduced vehicle response, with the engine and transmission being less responsive than in the special programs off. Also, in some programs, HDC will remain on, signified by illumination of the HDC indicator in the instrument cluster. The driver may also notice torque 'wind-up' in the center and rear differentials causing a 'braking' effect when the vehicle is manoeuvred in some special programs.

The use of the special programs in the Terrain Response system is monitored by the Terrain Response control module which records the mileage and time the vehicle has operated in a specific program in high and low range. This information can be retrieved using T4 and used by the dealer technician to check customer concerns, e.g. high fuel consumption which may be due to continued use of a certain program.

Driver Information

The high specification instrument cluster fitted to all vehicles with Terrain Response, contains a message center which displays vehicle information to the driver. The message center contains the Terrain Response program icons which display the currently selected program. If no symbol is displayed, no special program is selected and the system is in special programs off.

Any required changes to the subsystems are also passed to the driver in the form of indicator illumination in the instrument cluster or appropriate messages in the message center, HDC off or air suspension height change for example.

In certain operating conditions, the Terrain Response system also displays advice or warning messages to ensure the driver is using the vehicle to its full potential, e.g.,

- Steering angle is displayed in the message center to avoid driving in deep ruts with steering lock applied
- gear information is displayed to recommend a gear for slippery conditions
- if the system automatically provided off road ride height, but the driver subsequently lowers the vehicle to normal height, then the system may advise that this will cause a risk of grounding.

The messages which can be displayed in the instrument cluster message center are detailed in the Information and Message Center section.
For additional information, refer to: Information and Message Center (413-08, Description and Operation).

DIAGNOSTICS

The Terrain Response control module stores information on detected Terrain Response faults and CAN errors which can be interrogated using T4. The Terrain Response sub-systems and the instrument cluster also store fault information relating to CAN errors from the Terrain Response control module.

The control module also stores the miles travelled and time elapsed in high range for the individual programs and in low range for use of all programs which can also be retrieved using T4. This information aids diagnosis of the Terrain Response system and also provides an indication of Terrain Response system abuse by the driver which can lead to premature component failure.

Terrain Response System Fault Diagnosis

Terrain Response relies on the correct functionality of the five sub-systems. If one of the sub-systems develops a fault, the Terrain Response system will not function, even though the fault is not in the Terrain Response system. The Terrain

Response control module and rotary control should only be investigated if there are no apparent faults in any of the sub-systems. If a fault in a sub-system is subsequently corrected, the Terrain Response system will function normally after an ignition on and off cycle.

Terrain Response Sub-System Faults

If a fault occurs in a sub-system, the driver is alerted by the illumination of a warning indicator and/or an appropriate message for that sub-system in the instrument cluster message center. There will be no warning of a Terrain Response system fault.

When a sub-system fault is present and the driver attempts to select a different Terrain Response program using the rotary control or at the next ignition on cycle, a message 'SYSTEM FAULT SPECIAL PROGRAMS NOT AVAILABLE' will appear in the message center. This implies that the Terrain Response system has a fault, but only because a sub-system fault is preventing its operation. This message will be displayed for 5 seconds per ignition cycle, but is repeated if a further selection is made by the driver using the Terrain Response rotary control or at the next ignition on cycle.

• NOTE: The message 'SYSTEM FAULT SPECIAL PROGRAMS NOT AVAILABLE' can also be generated by a fault in the Terrain Response rotary control or control module. See following section for details of rotary control or control module faults.

It is not possible for the Terrain Response control module to cause any fault behaviour (warning indicator illumination or message generation) in any of the five sub-systems. Illumination of a sub-system warning indicator and/or a sub-system related message will never be associated with a Terrain Response control module or Terrain Response system fault.

The sub-system control modules can detect a fault with the CAN signal from the Terrain Response control module. If a fault in the Terrain Response system is detected, the sub-system control modules will operate in the 'special programs off' setting. The sub-system control modules will record a fault code for a failure of the Terrain Response CAN signal. These faults can be retrieved using T4 and will provide useful information to indicate investigation of the Terrain Response control module or the CAN network.

Terrain Response Rotary Control or Control Module Fault

If a fault occurs in the Terrain Response rotary control, all rotary control icon amber LEDs will be turned off (background illumination will remain on) and rotation of the rotary control is ignored. The instrument cluster message center will display a message 'SYSTEM FAULT SPECIAL PROGRAMS NOT AVAILABLE' when the fault occurs, if the fault is present and the driver attempts to select a special program (if the control module is able to do this) or at the next ignition on cycle.

If a failure of a rotary control icon amber LED occurs, the Terrain Response system will still function. Any selected special program will default to 'special programs off' at every ignition on cycle, with the exception of the grass/gravel/snow program.

The Terrain Response rotary control and the control module are an integral unit. If a fault occurs in either component, the whole unit will require replacement.

CAN Faults

If a CAN fault exists and prevents Terrain Response system operation, all of the Terrain Response rotary control icon LEDs will be illuminated and rotation of the rotary control is ignored.

If the instrument cluster does not receive a Terrain Response system CAN message from the Terrain Response Control module, the message 'SYSTEM FAULT SPECIAL PROGRAMS NOT AVAILABLE' will be displayed when the fault occurs and will be repeated at every ignition on cycle.

User Error

The following incorrect usage of the system may be misinterpreted as a system fault:

- Engine not running - Program changes and driver advisory messages are only available with the engine running
- Rock crawl program selected but transfer box in high range
- Special program change attempted with DSC or ABS active (this includes ABS cycling which is operational when HDC is being used on slippery or loose surfaces).
- Special program change attempted with overheat condition present on center or rear differential.

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Ride and Handling Optimization - Ride and Handling Optimization

Diagnosis and Testing

Principles of Operation

Ride and handling optimization incorporates the terrain response system which links a number of modules around the vehicle to give the best combination of settings in the different systems.

For a detailed description of the Ride and Handling System and operation, refer to the relevant Description and Operation section of the workshop manual.
REFER to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation).

Inspection and Verification

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

• NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

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

Visual Inspection

Mechanical	Electrical
• Tire condition, pressures, etc • Driveline components (correct installation, damage, etc) • Engine components (correct installation, damage, etc) • Transmission components (correct installation, damage, etc) • Suspension components (correct installation, damage, etc)	• Fuses • Harnesses/Connectors • Terrain response module • Engine Control Module (ECM) • Transmission Control Module (TCM) • Transfer case control module • Anti-lock Braking (ABS) control module • Rear differential control module • Dynamic suspension control module • Controller Area Network (CAN) circuits

3. **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. **4.** If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Because the overall function of the system is dependent on sub-systems, it is possible to misinterpret displays in the message center as being terrain response faults when they are actually a result of a fault in one of the sub-systems.

Refer to the table below for help in deciding when to investigate terrain response faults and when the fault is likely to be in a sub-system.

Symptom	Description	Possible Causes	Action
Message center display indicating a sub-system fault	The message center indicates to the driver that a fault has occurred and in which sub-system	• Any sub-system fault supported by the message center	For details of the available messages, refer to the relevant section of the workshop manual. Carry out a complete vehicle DTC read and follow the diagnostic routine(s) indicated.
Message center display: **System fault special programs not available**, terrain response switch operation normal	This message will display when a sub-system fault has occurred if the driver attempts to change the special program, and at each ignition on cycle for 5 seconds until the fault is rectified	• Any sub-system fault supported by the message center	For details of the available messages, refer to the relevant section of the workshop manual. Carry out a complete vehicle DTC read and follow the diagnostic routine(s) indicated.
Message center display: **System fault special programs not available**, **ALL** terrain response switch LEDs illuminated	CAN circuit errors	• CAN circuit: short circuit to ground • CAN circuit: short circuit to power • CAN circuit: high resistance	Carry out a complete vehicle DTC read and follow the diagnostic routine(s) indicated.
Special program changes not available	User error	• Engine not running • Rock crawl selected with transfer box in high range • Special program change attempted with ABS or DSC active - This includes ABS	Refer to the relevant section of the workshop manual. Make sure that the driver is familiar with the correct operation of the system.

Symptom	Description	Possible Causes	Action
		cycling as part of HDC • Special program change attempted with an overheat condition present in the center or rear differential	

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Terrain Response Control Module (ATCM) (100-00 General Information, Description and Operation).

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Ride and Handling Optimization - Ride and Handling Optimization Switch

Removal and Installation

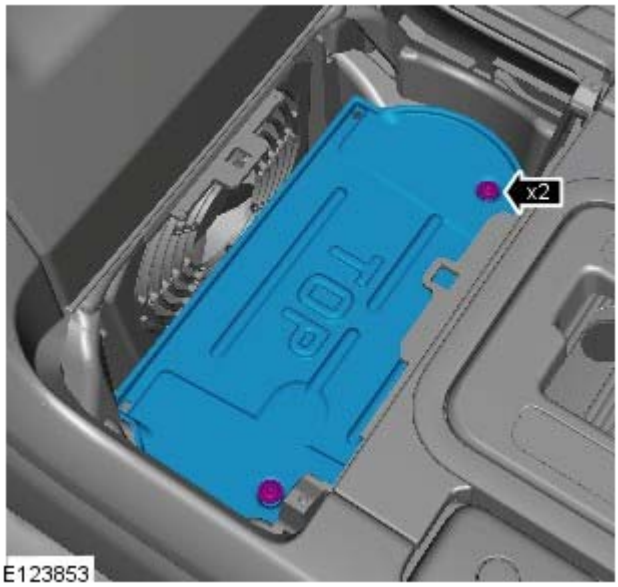
Removal

- NOTE: Removal steps in this procedure may contain installation details.
- NOTE: **Some variation in the illustrations may occur, but the essential information is always correct.**
- NOTE: Make sure that the gear selector lever is in position N before removing any components.

1.

2.

3.



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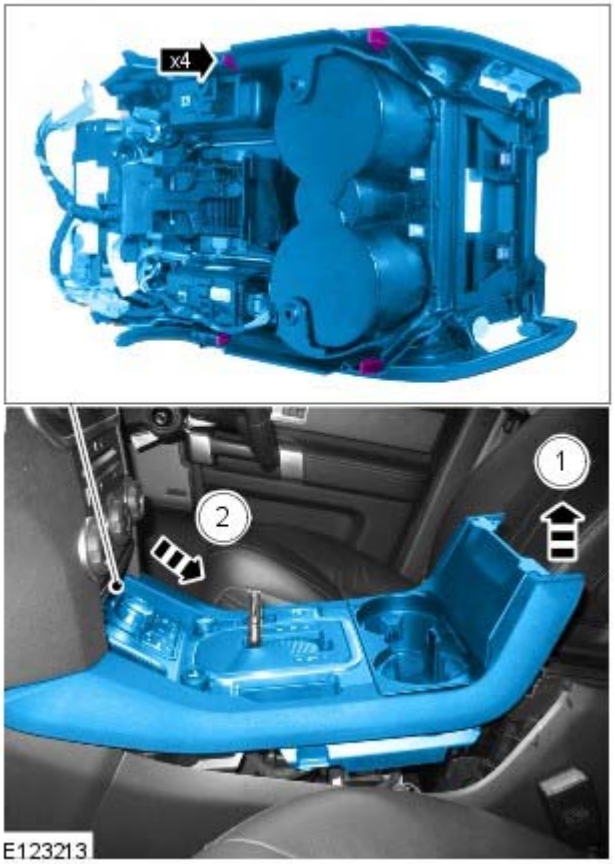

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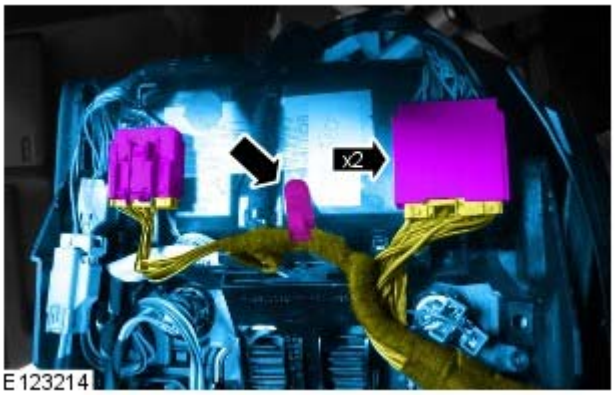

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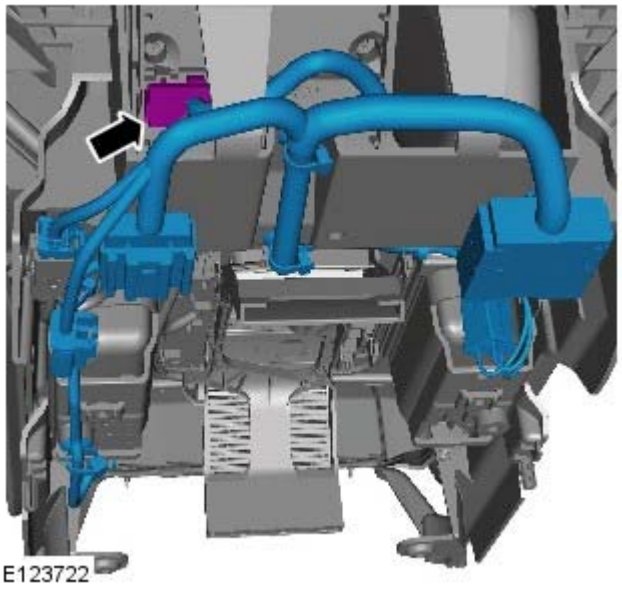
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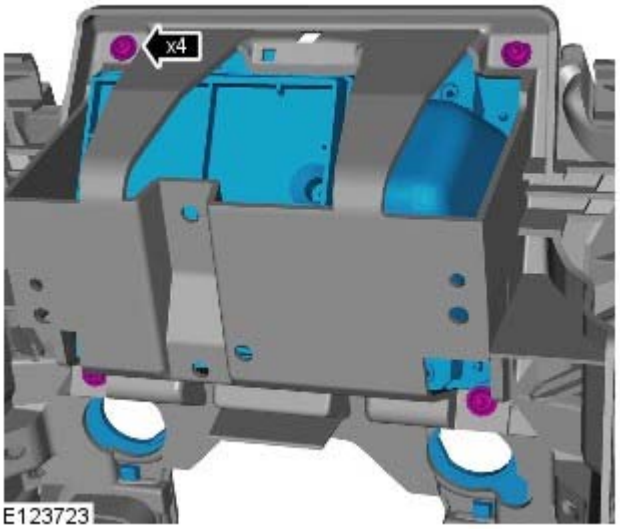

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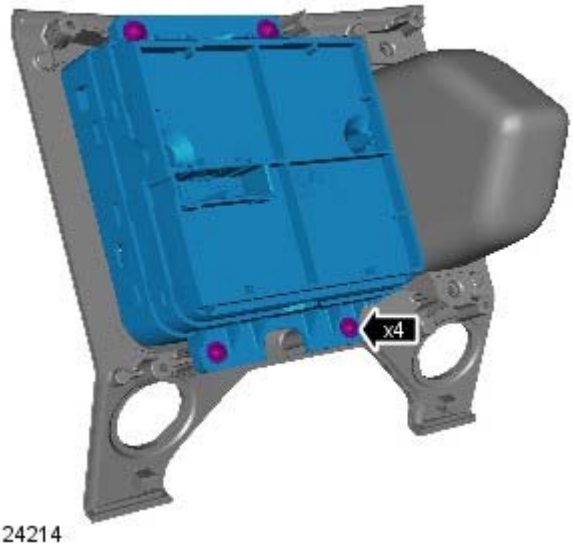

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Installation

1. To install, reverse the removal procedure.