2012.0 RANGE ROVER (LM), 204-02

REAR SUSPENSION

DIAGNOSIS AND TESTING

For additional information.

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

2012.0 RANGE ROVER (LM), 204-02

REAR SUSPENSION

LOWER ARM (G836589)

REMOVAL AND INSTALLATION

64.35.54	ARM ASSEMBLY – LOWER – ONE SIDE – RENEW	ALL DERIVATIVES	1	USED WITHINS	+

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.

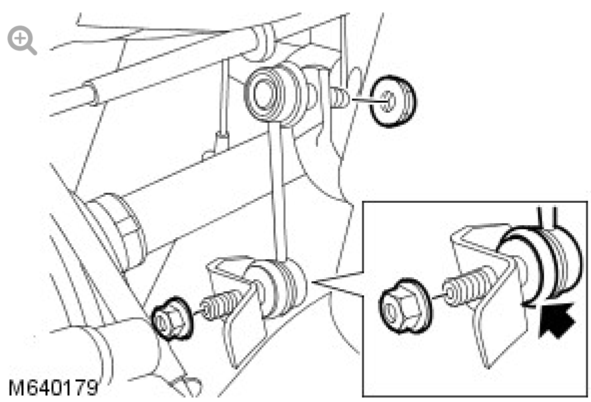
2. Using the Land Rover approved diagnostic system, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05, General Procedures).

3. Remove the rear wheels and tires.

4.

CAUTION:

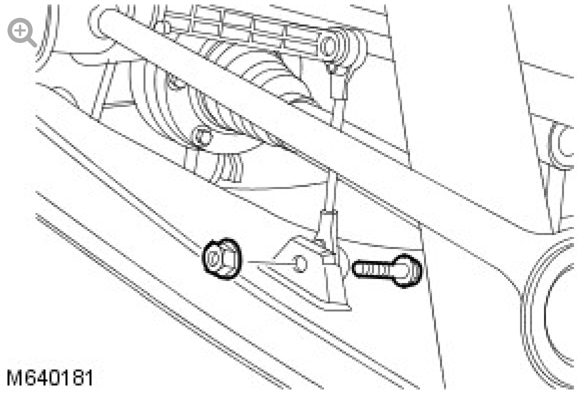
Note the fitted position of the special washer.



Remove the LH stabilizer bar link.

- Remove the 2 nuts.
- Collect the washer.

5.

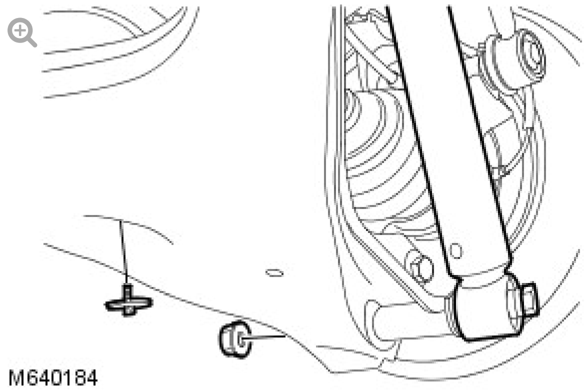


Release the height sensor link.

- Remove the nut.

6. Using a suitable hydraulic jack, support the lower arm.

7.



Release the shock absorber from the lower arm.

- Remove the bolt.

8.

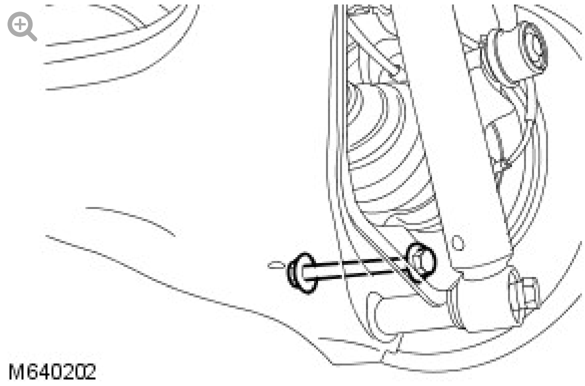
CAUTION:

Do not extend or compress the air spring.

Release the rear air spring from the lower arm.

- Remove the bolt.

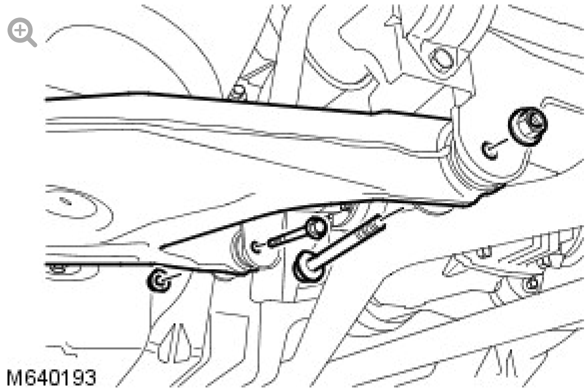
9.



Release the wheel knuckle from the lower arm.

- Remove and discard the nut and bolt.

10.



Remove the lower arm.

- Remove and discard the 2 bolts.

11. Repeat the procedure for the RH side.

INSTALLATION

1.

CAUTION:

Only tighten the nuts and bolts when the suspension is in the normal drive position.

NOTE:

Make sure that new nuts and bolts are installed.

Install the lower arm.

- Locate the air spring in the lower arm.
- Tighten the nuts and bolts to 165 Nm (121 lb.ft).

2. **CAUTION:**

   Only tighten the nuts and bolts when the suspension is in the normal drive position.

   NOTE:

   Make sure that new nuts and bolts are installed.

   Secure the wheel knuckle to the lower arm.

   - Tighten the nut and bolt to 250 Nm (184 lb.ft).

3. Secure the air spring to the lower arm.
   - Tighten the bolt to 7 Nm (5 lb.ft).
4. Secure the shock absorber to the lower suspension arm.
   - Tighten the bolt to 110 Nm (81 lb.ft).
5. Secure the height sensor link.
   - Tighten the nut to19 Nm (14 lb.ft).
6. Install the LH stabilizer bar link.
   - Install the special washer.
   - Tighten the nuts to 100 Nm (74 lb.ft).
7. Repeat the procedure for the RH side.
8. Using the Land Rover approved diagnostic system, pressurize the

air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05, General Procedures).

9. Install the rear wheels and tires.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

REAR SUSPENSION

LOWER ARM BALL JOINT (G836580)

REMOVAL AND INSTALLATION

64.15.08	BALL JOINT - LOWER - LEFT/EACH - RENEW	ALL DERIVATIVES	0.8	USED WITHINS	+

SPECIAL TOOL(S)

204-516/1(LRT-

64-026/1)

Ball joint remover/installer

204-516/2(LRT-64-026/2)

Ball joint remover/installer

204-516/3(LRT-64-026/3)

Ball joint remover/installer

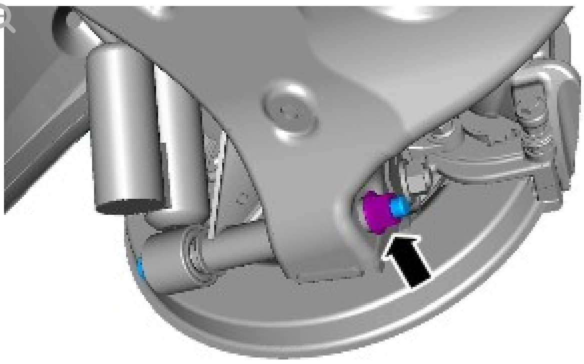
204-516/4(LRT-64-026/4)

Ball joint remover/installer

REMOVAL

1. Remove the tie rod.

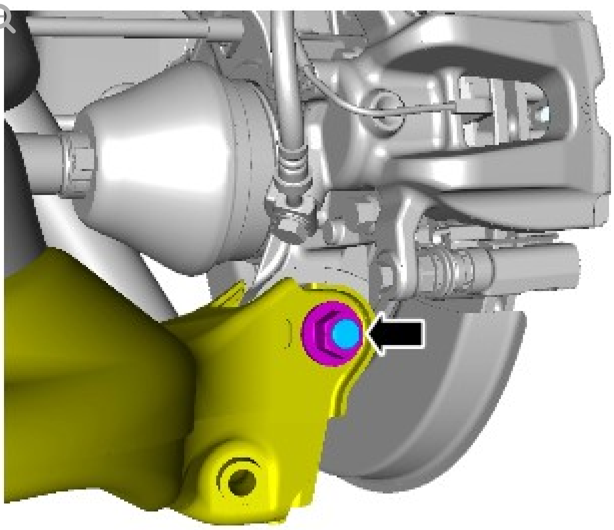
   For additional information, refer to: Toe Link (204-02 Rear Suspension, Removal and Installation).

2. 

   E124317

   Position jack under damper mounting bracket to support lower arm.

   - Release the damper from the lower arm.
   - Remove the nut and bolt.

3. 

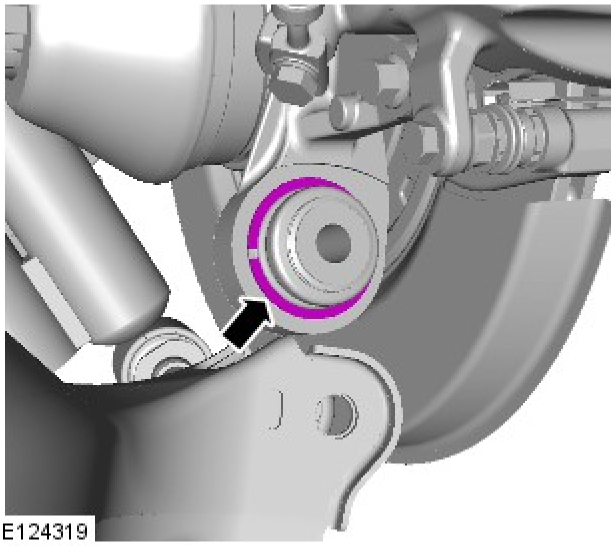
   E124321

   Remove and discard nut and bolt securing lower arm to hub.

4. Lower support jack.

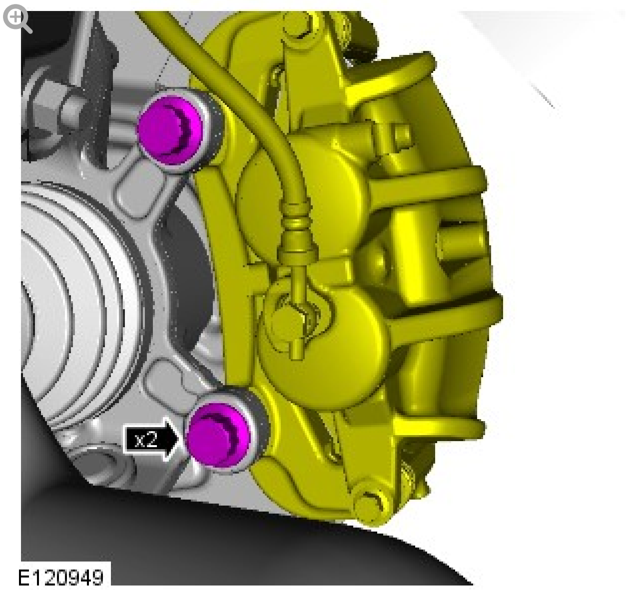
5. Release hub from lower arm and support to give access to ball joint.

6. 



Remove and discard the circlip.

7.



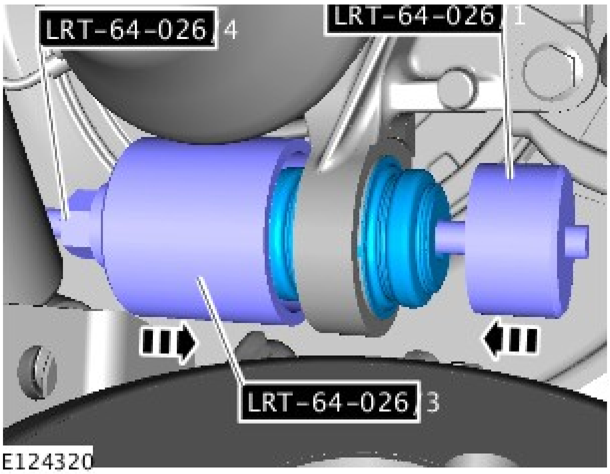
Remove 2 bolts securing brake caliper to hub. Release caliper from hub and tie aside.

8. Remove Allen screw securing brake disc to drive flange.

9. Remove the brake disc.

10. Remove lower bolt securing brake disc backplate to hub for access.

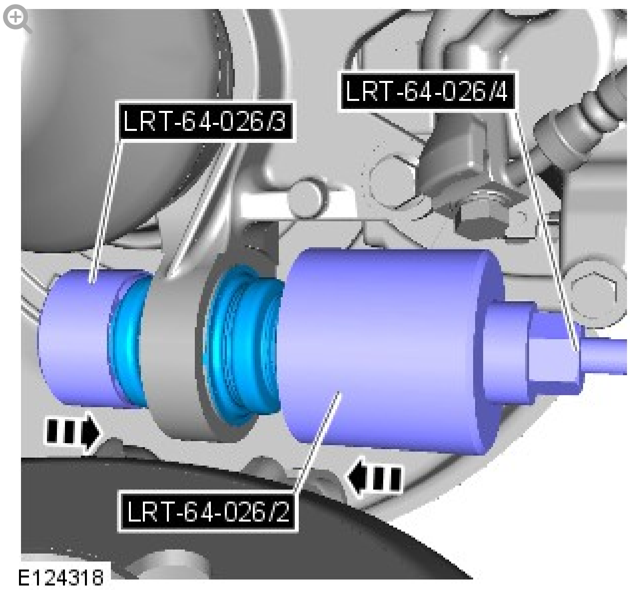
11.



Remove ball joint using LRT-64-026/1 with LRT-64-026/3. (RH side illustrated)

INSTALLATION

1. Clean ball joint and location in hub.

2. 

Fit ball joint with circlip groove facing towards rear using LRT-64-026/3 with LRT-64-026/2

3. Fit new circlip.

4. Clean lower arm and hub mating faces.

5. Align hub to lower arm, fit new nut and bolt.
    - Tighten the bolt to 250Nm (184 lb.ft)

6. Install the bolt securing the brake disc backplate to hub.
    - Tighten bolt to 10Nm (7 lb.ft)

7. Ensure mating surfaces of disc and drive flange are clean.

8. Install the disc to the flange, install the screw.
    - Tighten screw to 16Nm (12 lb.ft)

9. Install the caliper to the rear hub.
    - Tighten bolts to 65Nm (48 lb.ft)

10. Secure the spring and damper assembly to the lower arm.
    - Tighten the bolt to 110 Nm (81 lb.ft).

11. Fit tie rod.
    For additional information, refer to: Toe Link (204-02 Rear Suspension, Removal and Installation).

12. Check, and if necessary, adjust the wheel alignment.
    For additional information, refer to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures).

REAR SUSPENSION

LOWER ARM BUSHING (G836592)

REMOVAL AND INSTALLATION

SPECIAL TOOL(S)

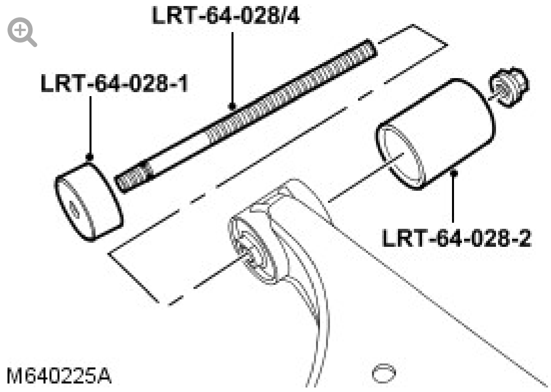
	204-518 Remover/Installer (LRT-64-028)

REMOVAL

1. Raise and support the vehicle.

2. Remove the rear wheels and tires.

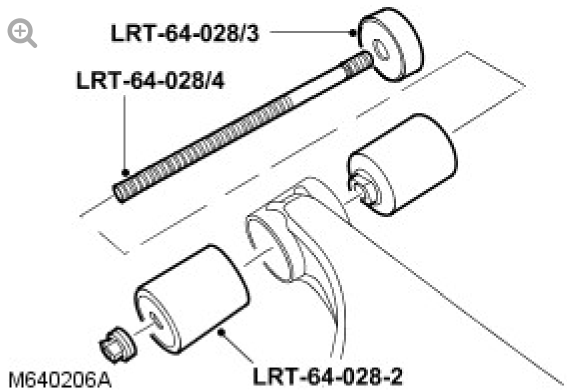
3. Remove the lower arms.
   For additional information, refer to: Lower Arm (204-02, Removal and Installation).

4. 

   Using the special tools, remove the LH lower arm bushes.

5. Repeat the procedure for the RH side.

INSTALLATION

1. 

   Using the special tools, install the LH lower arm bushes.

2. Repeat the procedure for the RH side.

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

4. Install the rear wheels and tires.

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

2012.0 RANGE ROVER (LM), 204-02

REAR SUSPENSION

REAR SHOCK ABSORBER

(G1307934)

64.30.02	DAMPER – ONE SIDE – RENEW	ALL DERIVATIVES	0.7	USED WITHINS	+

REMOVAL

CAUTIONS:

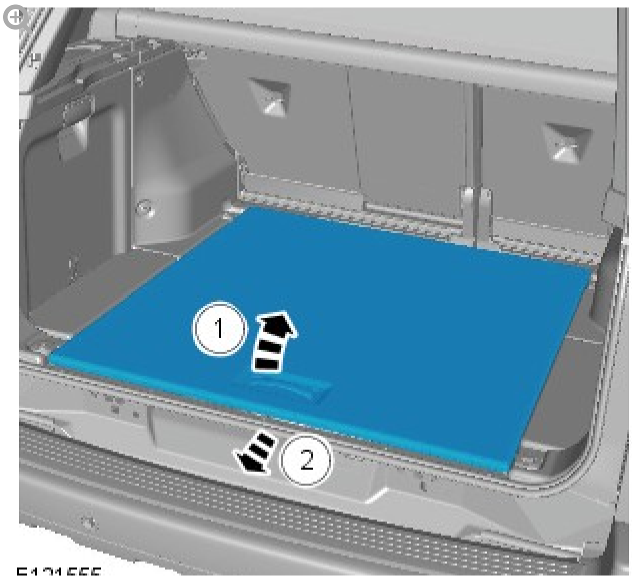
- Do not depressurise the air suspension system before raising the vehicle.
- The weight of the vehicle must be supported before the suspension is depressurised.

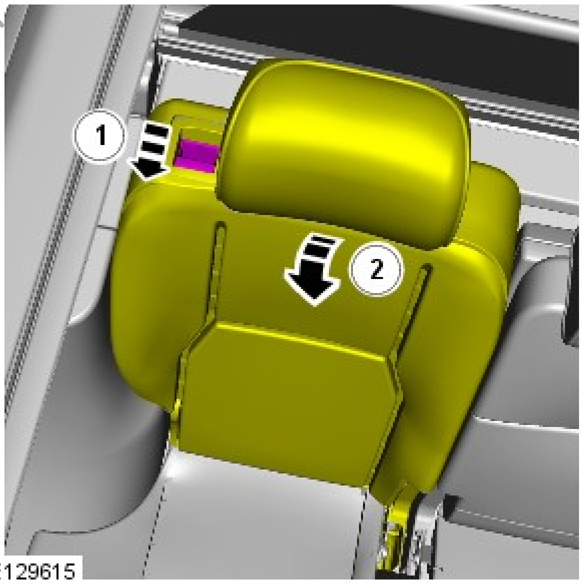
NOTES:

- RH illustration shown, LH is similar.
- Removal steps in this procedure may contain installation details.

All vehicles

1.



2. 

E129615

3. **WARNING:**

> Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

4.
- Remove the RH rear wheel and tire.
- *Torque:* **140 Nm**

5. **CAUTION:**

> Do not allow the suspension arm to hang unsuported on the air suspension spring.

Position jack under damper mounting bracket to support lower arm.

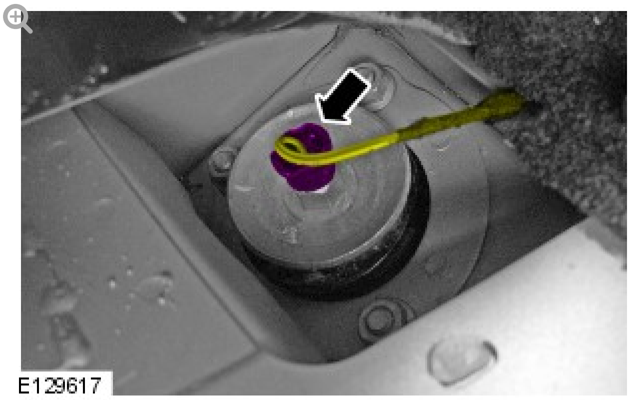
6. **NOTE:**

> It is not necessary to depressurise the whole system, only the side from which the suspension component is being replaced.

Refer to: Air Suspension System Depressurize and Pressurize (204-05, General Procedures).

Vehicles with active damping

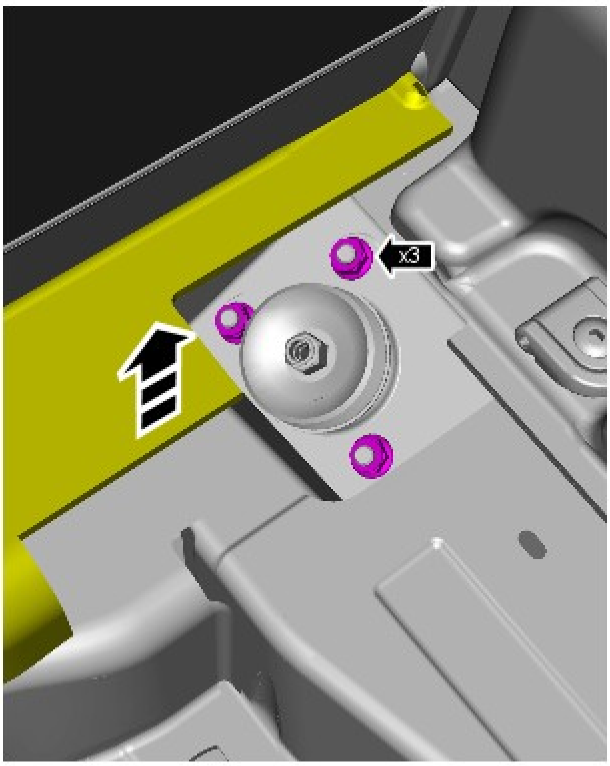
1.



E129617

All vehicles

1.

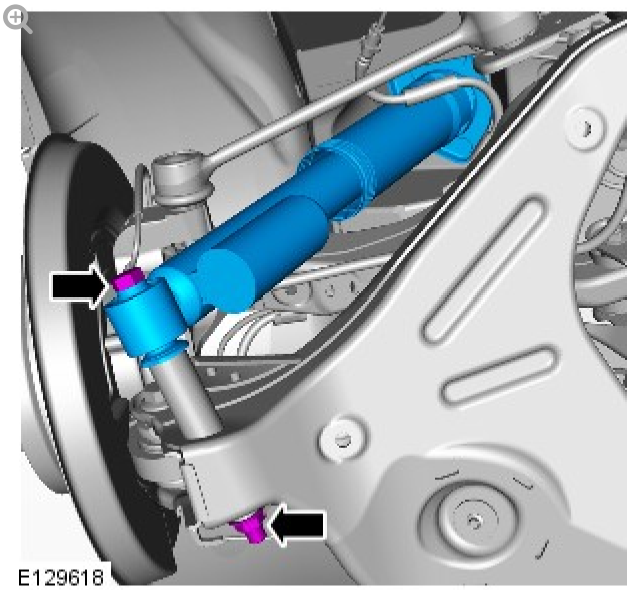


E129616

Torque: **60 Nm**

2. **NOTE:**

Align to the orientation noted on removal.



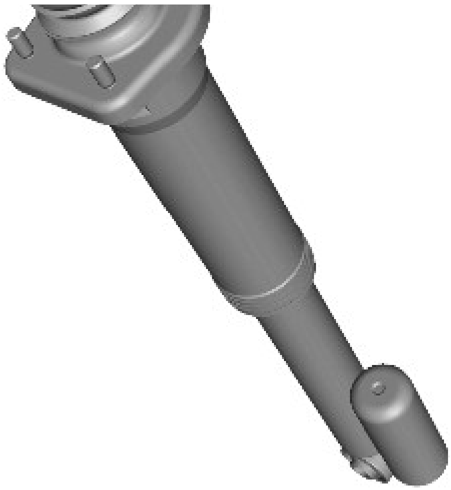
Torque: **90 Nm**

3. **CAUTION:**

Make sure that a new component is installed.

NOTE:

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



E129619

INSTALLATION

1. To install, reverse the removal procedure.

REAR SUSPENSION

REAR STABILIZER BAR (G836583)

REMOVAL AND INSTALLATION

64.35.08	STABILIZER BAR - RENEW	AJ V8, SUPERCHARGED	1.3	USED WITHINS	+

REMOVAL

1. **WARNING:**

Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Remove the LH rear air spring.

For additional information, refer to: Rear Air Spring (204-05 Vehicle Dynamic Suspension, Removal and Installation).

3. Disconnect the battery ground cable.

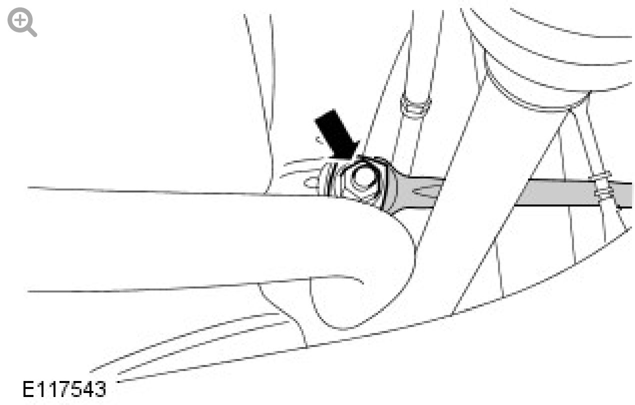
For additional information, refer to: Specifications (414-00, Specifications).

4. Remove the exhaust system.

For additional information, refer to: Exhaust System (309-00, Removal and Installation).

5. **NOTES:**

- LH illustration shown, RH is similar.
- Use an additional wrench to prevent the ball joint rotating.

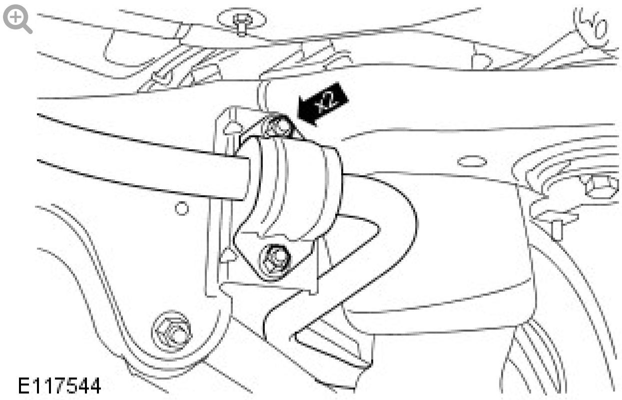


Release the stabilizer bar links from the stabilizer bar.

- Remove the stabilizer bar link nut.
- Repeat procedure for the other side.

6. **NOTES:**

- RH illustration shown, LH is similar.
- Note the fitted position of the stabilizer bar and bushings to aid installation.



Remove the stabilizer bar.

- Remove the 2 nuts.
- Repeat procedure for the other side.

INSTALLATION

1. Install the stabilizer bar.
   - Stage 1: 56 Nm.
   - Stage 2: 56 Nm.

2. **NOTE:**

   Use an additional wrench to prevent the ball joint rotating.

   Connect both rear stabilizer bar links to the stabilizer bar.

   - Tighten the nuts to 100 Nm.

3. Install the exhaust system.
   For additional information, refer to: Exhaust System (309-00, Removal and Installation).

4. Connect the battery ground cable.

   For additional information, refer to: Specifications (414-00, Specifications).

5. Install the LH rear air spring.

   For additional information, refer to: Rear Air Spring (204-05 Vehicle Dynamic Suspension, Removal and Installation).

REAR SUSPENSION

REAR STABILIZER BAR – ARMOURED (G840049)

REMOVAL AND INSTALLATION

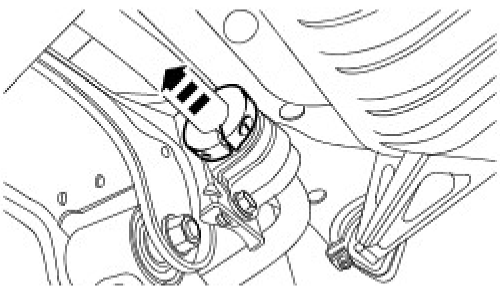
64.35.08	STABILIZER BAR – RENEW	AJ V8, SUPERCHARGED	1.3	USED WITHINS	+

REMOVAL

NOTE:

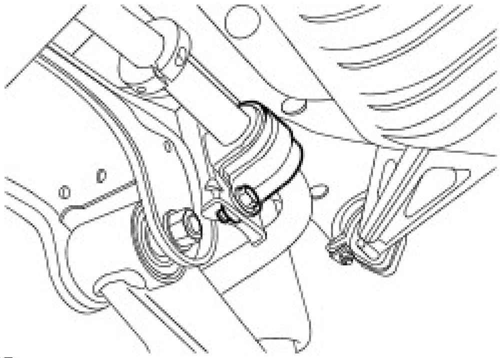
The stabilizer bar bushes can be replaced with the stabilizer bar fitted to the vehicle.

1. Carry out steps 1 to 3 as detailed in the Range Rover Workshop Manual.

2. 

E72404

Slacken screws securing the anti-shuffle collars and slide the collars along the stabilizer bar.

3. 

E72405

Remove 2 nuts securing each stabilizer bar bush clamp.

4. Carry out steps 5 and 6 as detailed in the Range Rover Workshop Manual.

INSTALLATION

1. Carry out steps 1 and 2 as detailed in the Range Rover Workshop Manual.

2. Align stabilizer bar bush clamps, fit nuts and tighten to 45 to 65 Nm (35 to 48 lbf.ft).

3. Position anti-shuffle collars adjacent to each stabilizer bar clamp and tighten the screws to 9 Nm (7 lbf.ft).

4. Carry out steps 4 and 5 as detailed in the Range Rover Workshop Manual.

2012.0 RANGE ROVER (LM), 204-02

REAR SUSPENSION

REAR STABILIZER BAR LINK

(G836588)

(G836588)

REMOVAL AND INSTALLATION

64.35.24	LINK – STABILIZER BAR – RENEW	ALL DERIVATIVES	0.3	USED WITHINS	+

REMOVAL

1. **WARNING:**

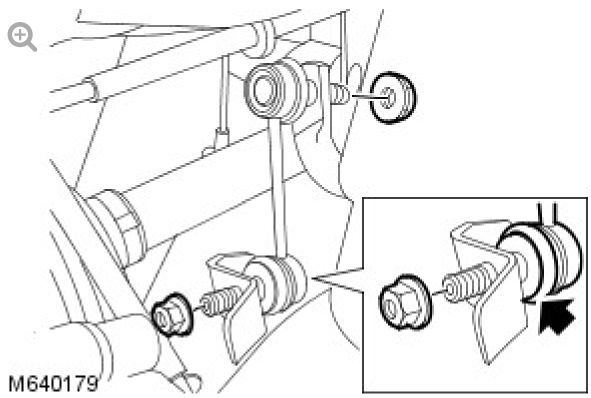
   Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise the rear of the vehicle.

2. Remove the wheel and tire.

3. **CAUTION:**

   Note the fitted position of the special washer.

   Remove the stabilizer bar link.

   - Remove the 2 nuts.

- Collect the washer.

INSTALLATION

1. Install the stabilizer bar link.
   - Install the special washer.
   - Tighten the nuts to 100 Nm (74 lb.ft).
2. Install the wheel and tire.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

2012.0 RANGE ROVER (LM), 204-02

REAR SUSPENSION

UPPER ARM – V8 5.0L PETROL/V8 S/C 5.0L PETROL (G1234453)

REMOVAL AND INSTALLATION

64.35.60	ARM ASSEMBLY – UPPER – ONE SIDE – RENEW	5000 CC, AJ V8	1.4	USED WITHINS	+

REMOVAL

1. Raise and support the vehicle.

2. Remove the exhaust system.
For additional information, refer to: Exhaust System (309-00, Removal and Installation).

3. Remove the wheel and tire.

4. Using the Land Rover approved diagnostic system, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05, General Procedures).

5. 

Release the anti-lock brake system (ABS) wiring harness.

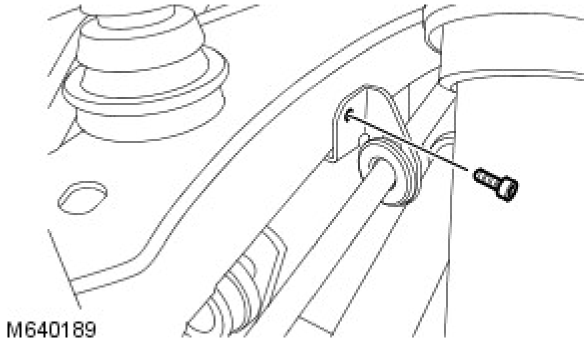
- Release the 3 clips.

6. Release the brake pipe.

- Remove the 2 bolts.

7. **NOTE:**

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



Release the parking brake cable.

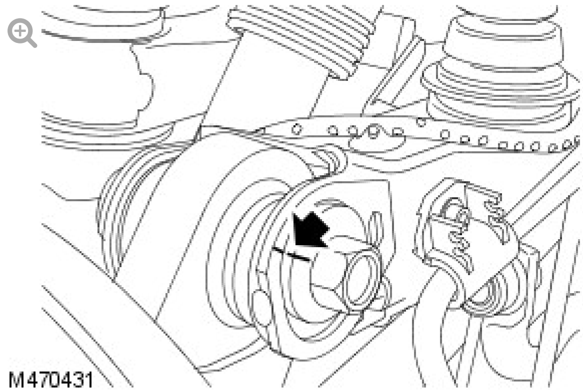
- Remove the bolt.

8. Using a suitable hydraulic jack, support the lower arm.

9.

CAUTION:

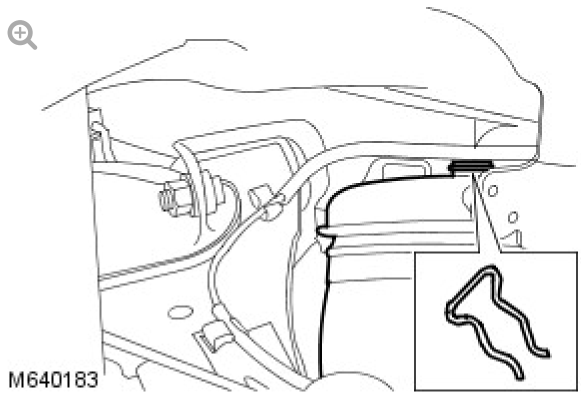
Note the position of the bolt.



Release the wheel knuckle from the upper arm.

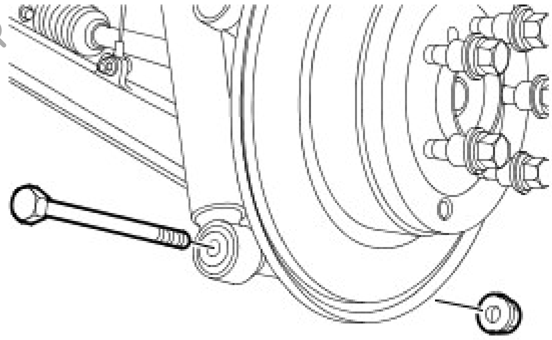
- Remove and discard the nut and bolt.

10.



Release the air suspension spring.

- Remove the clip.

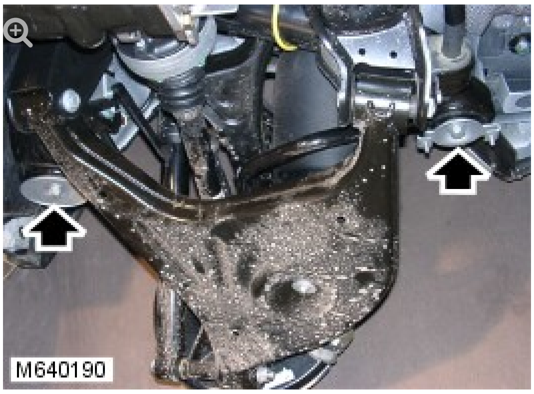
11. 

M640177

Release the rear shock absorber from the lower suspension arm.

- Remove the bolt.

12. Using a suitable hydraulic jack, support the rear subframe.

13. 

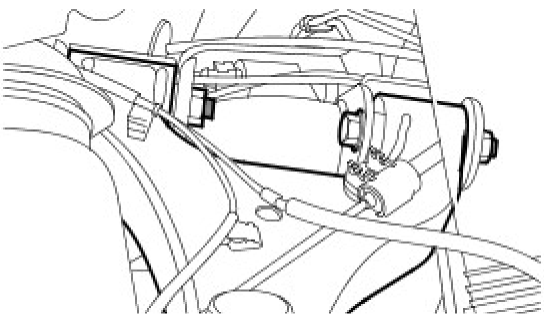
M640190

Release the rear subframe.

- Remove the 2 bolts.

14. Lower the subframe to a maximum of 75mm (2.95 inches).

- Remove the 2 washers.

15. 


M640191

Remove the upper arm.

- Remove the 2 bolts.

INSTALLATION

1. **CAUTION:**

   Only tighten the nuts and bolts when the suspension is in the normal drive position.

   Install the upper arm.

   - Tighten the bolts to 165 Nm (122 lb.ft).

2. Secure the rear subframe.

   - Install the washers.
   - Tighten the bolts to 180 Nm (133 lb.ft).

3. Secure the rear shock absorber to the lower suspension arm.

   - Tighten the nuts and bolts to 90 Nm (66 lb.ft).

4. Secure the air suspension spring.

   - Install the clip.

5. **CAUTION:**

   Only tighten the nuts and bolts when the suspension is in the normal drive position.

   Secure the wheel knuckle to the upper arm.

   - Install a new nut and bolt, and tighten to 165 Nm (122 lb.ft).

6. Secure the parking brake cable.
   - Tighten the bolt to 5 Nm (4 lb.ft).

7. Secure the brake pipe.
   - Tighten the bolts to 5 Nm (4 lb.ft).

8. Secure the ABS harness.
   - Secure the clips.

9. Using the Land Rover approved diagnostic system, pressurize the air suspension.
   For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05, General Procedures).

10. Install the wheel and tire.
    - Tighten the wheel nuts to 140 Nm (103 lb.ft).

11. Install the exhaust system.
    For additional information, refer to: Exhaust System (309-00, Removal and Installation).

2012.0 RANGE ROVER (LM), 204-02

REAR SUSPENSION

UPPER ARM BALL JOINT (G836579)

REMOVAL AND INSTALLATION

REMOVAL

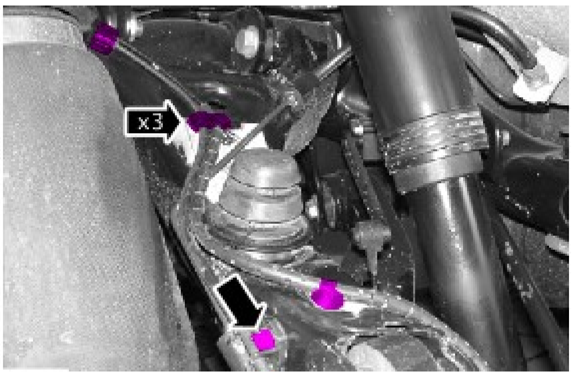
1. **WARNING:**

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

Raise rear of vehicle and support under body.

2. Remove road wheel.

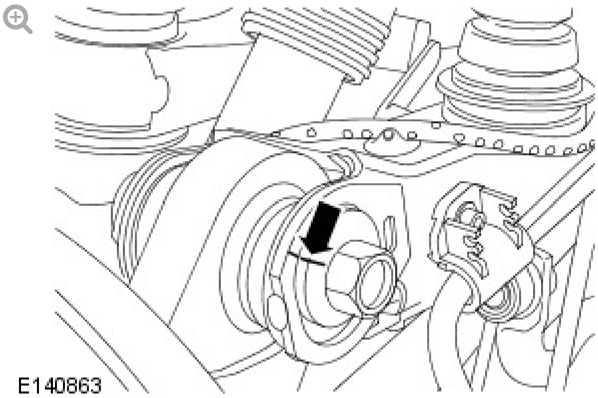
3.



Release ABS sensor lead from upper arm.

4. Remove Allen screw securing brake pipe.

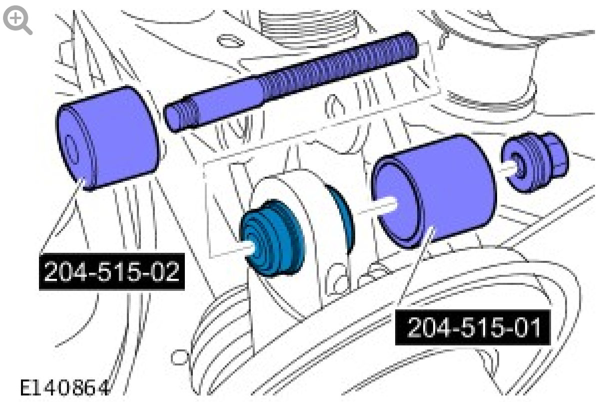
5. Position jack under damper mounting bracket to support lower arm.

6. 

Reference mark eccentric in relationship to upper arm.

7. Remove and discard nut and bolt securing hub to upper arm.

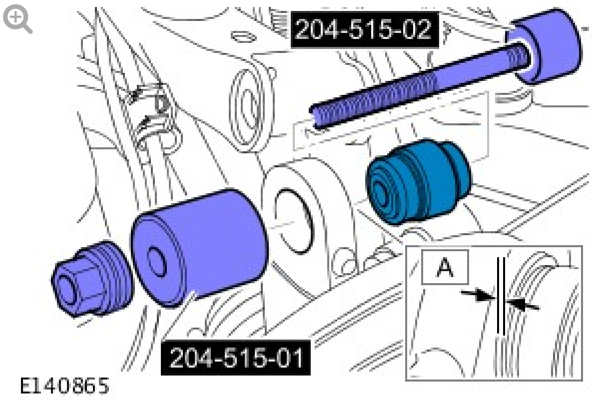
Release hub from arm.

8. 

Remove ball joint using LRT-64-025/1 with LRT-64-025/2, (RH side illustrated).

INSTALLATION

1. Clean ball joint and location in hub.

2. 

Fit ball joint with chamfer facing towards rear using LRT-64-025/1 with LRT-64-025/2 to give protrusion 'A' from machined face. Protrusion 'A' = 0.75 mm (0.030 in.).

3. Align hub to upper arm, fit new nut and bolt, align eccentric to reference mark and lightly tighten.

4. Fit Allen screw securing brake pipe to upper arm and tighten to 5 Nm (3.7 lbf.ft).

5. Secure ABS sensor lead.

6. Fit road wheel and tighten nuts to 140 Nm (103 lbf.ft).

7. Lower vehicle.

8. Check wheel alignment.

9. Tighten bolt securing upper arm to hub to 165 Nm (121 lbf.ft).

2012.0 RANGE ROVER (LM), 204-02

REAR SUSPENSION

UPPER ARM BUSHING - V8

5.0L PETROL/V8 S/C 5.0L PETROL (G1234454)

REMOVAL AND INSTALLATION

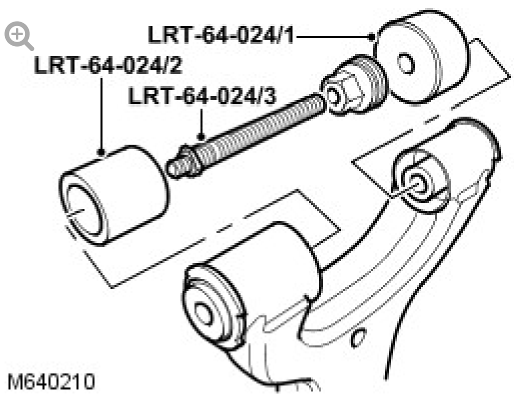
SPECIAL TOOL(S)

204-514	Bush remover/installer

REMOVAL

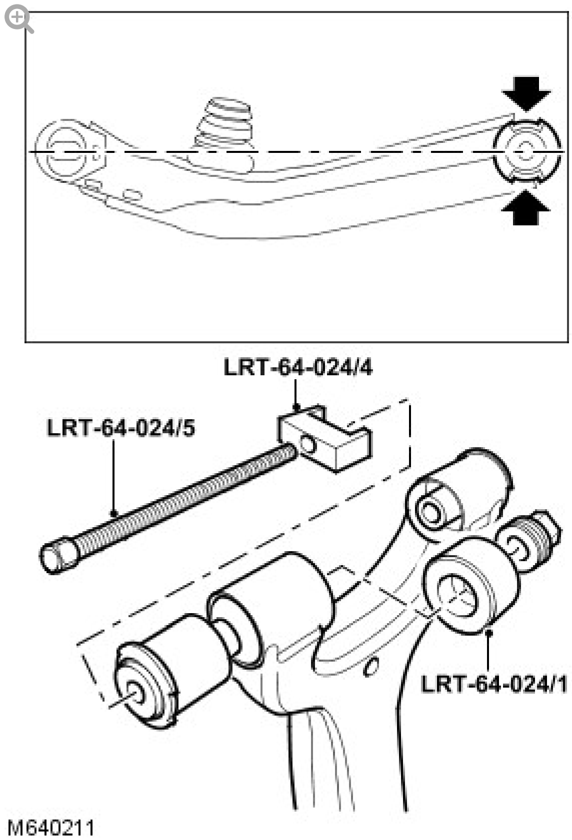
1. Raise and support the vehicle.
2. Remove the wheel and tire.
3. Remove the upper arm.
   For additional information, refer to: Upper Arm - 5.0L (204-02, Removal and Installation).
4. **NOTE:**

Secure the upper arm in a suitable vice.



Using the special tools, remove the upper arm bushes.

INSTALLATION

1. 

Using the special tools, install the upper arm bushes.

- Align the bushes as shown.

2. Install the upper arm.

For additional information, refer to: Upper Arm - 5.0L (204-02, Removal and Installation).

3. Install the wheel and tire.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

2012.0 RANGE ROVER (LM), 204-02

REAR SUSPENSION

WHEEL BEARING AND WHEEL HUB (G1234455)

REMOVAL AND INSTALLATION

64.15.14	BEARING(S) – HUB – ONE SIDE – RENEW	ALL DERIVATIVES	2.6	USED WITHINS	+

SPECIAL TOOL(S)

204-509-1(LRT-60-033/1)

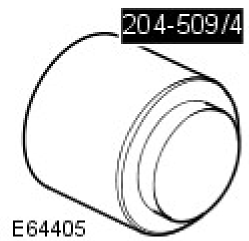
Remover

204-509-2(LRT-60-033/2)

Remover

204-509-3(LRT-60-033/5)

Remover



204-509-4(LRT-60-033/6)

Remover

204-509-

204-509-6(LRT-60-033/8)

Remover 2 off

204-509-7(LRT-60-033/9)

Remover

204-509/10(LRT-60-033/10)

Rear wheel bearing remover/installer

204-509-9(LRT-60-033/11)

Installer

(LRT-60-033/12)

Installer 204-509-8

REMOVAL

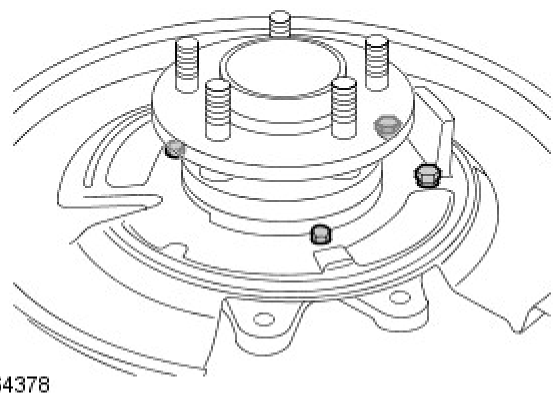
1. **WARNING:**

   > Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Remove the rear wheels and tires

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

4. 

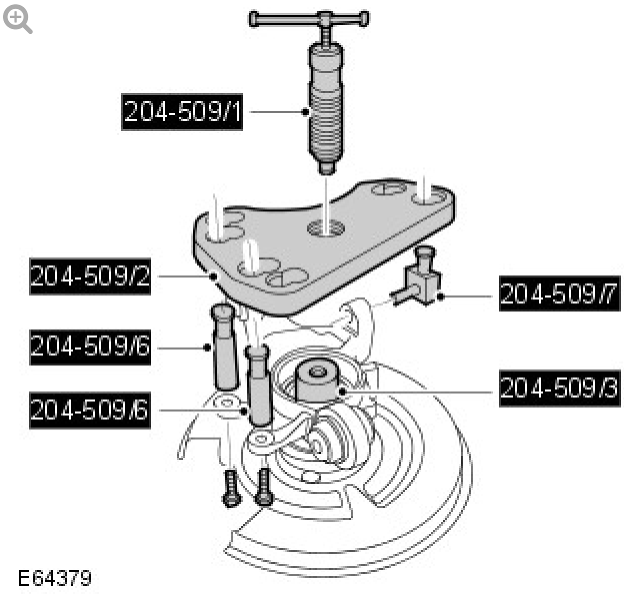
   E64378

   Release the brake disc shield.

   - Remove the 4 bolts.

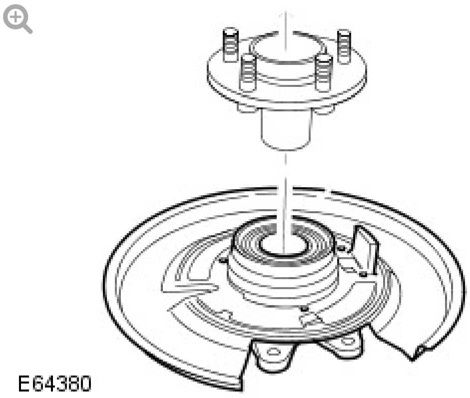
5. **NOTE:**

The bearing track will remain on the wheel hub.



Using the special tools, remove the wheel hub.

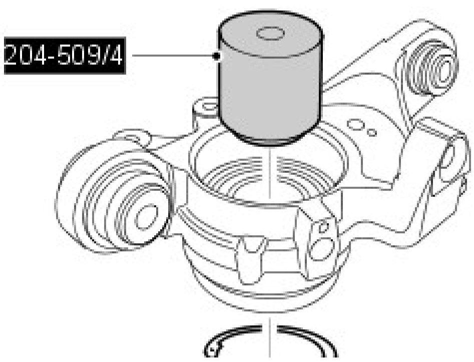
6.



Remove the brake disc shield.

7. Remove the special tools.

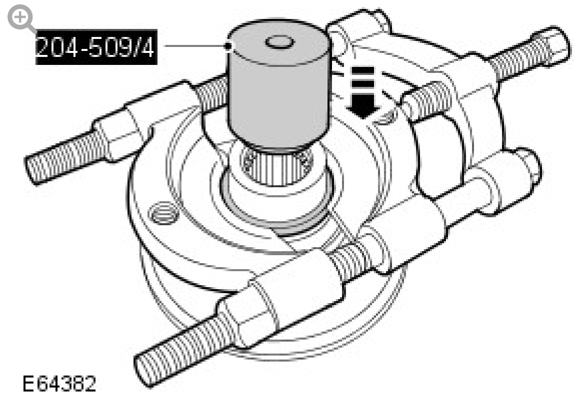
8.



Using the special tools, press out the rear wheel bearing.

- Remove and discard the circlip.

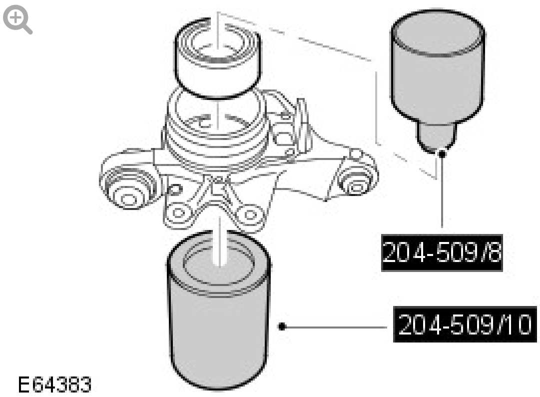
9.



Using a bearing separator and the special tool, remove the rear wheel bearing inner track.

INSTALLATION

1.



Using the special tools, install the rear wheel bearing.

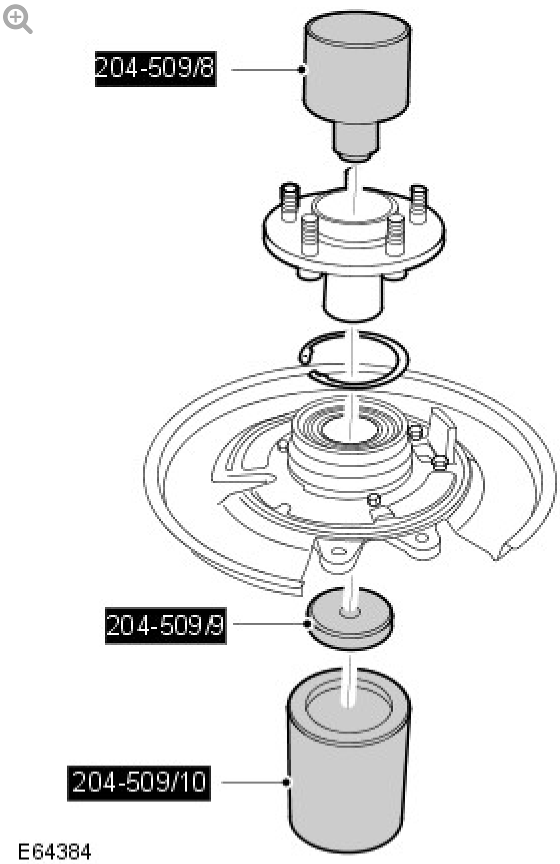
- Clean the component mating faces.
- Install a new circlip.

2. Install the brake disc shield.

- Clean the component mating faces.
- Tighten the M8 bolts to 25 Nm (18 lb.ft).

- Tighten the M6 bolts to 10 Nm (7 lb.ft).

3.



Using the special tools, press the wheel hub into the rear wheel bearing.

- Clean the component mating faces.

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

5. Install the wheels and tires.

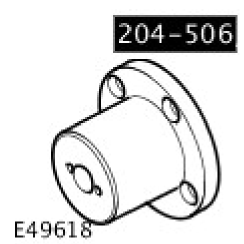
- Tighten the wheel nuts to 140 Nm (103 lb.ft).

REAR SUSPENSION

WHEEL KNUCKLE (G1234456)

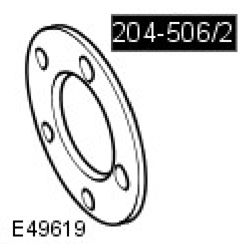
REMOVAL AND INSTALLATION

SPECIAL TOOL(S)



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)

Halfshaft remover/replacer

204-506/5(LRT-60-030/5)

Retainers - halfshaft remover/replacer

204-506-01(LRT-60-030/4)

Halfshaft installer adapter

REMOVAL

NOTE:

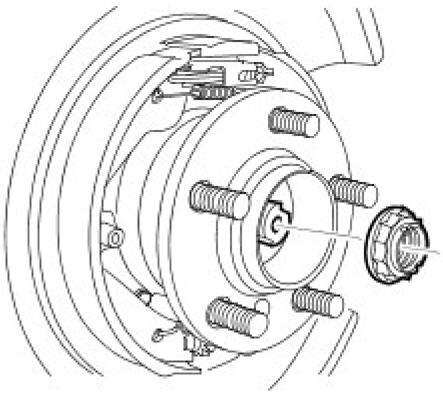
If a new knuckle is installed a new wheel bearing must be installed.

1. **WARNING:**

Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Remove the rear wheels and tires

3. 

E63923

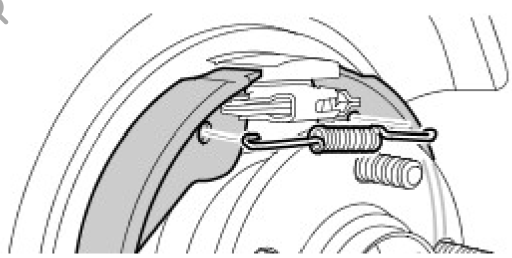
With assistance, remove and discard the halfshaft retaining nut.

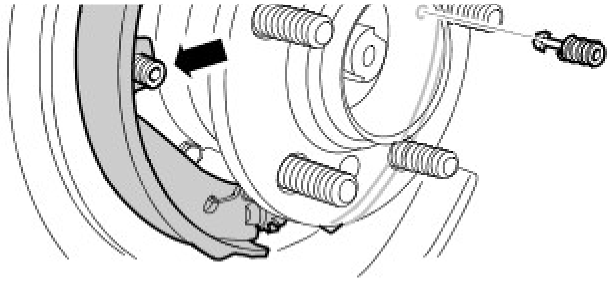
- Release the nut stake.

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

5. **NOTE:**

Rotate the parking brake shoe retainers through 90 degrees to release them from the back plate.



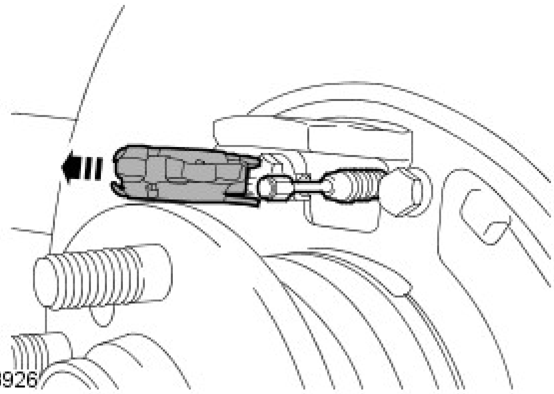


E63924

Remove the parking brake shoes as an assembly with the lower spring and the adjuster.

- Remove the brake shoe upper return spring.
- Remove both shoe retainers.

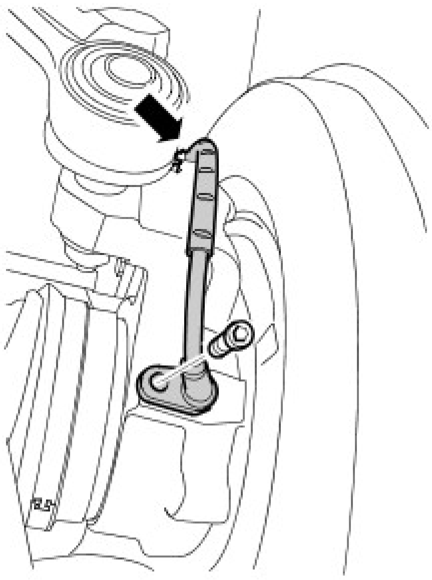
6.



E63926

Remove the parking brake shoe expander.

7.



E63928

Disconnect the rear wheel speed sensor.

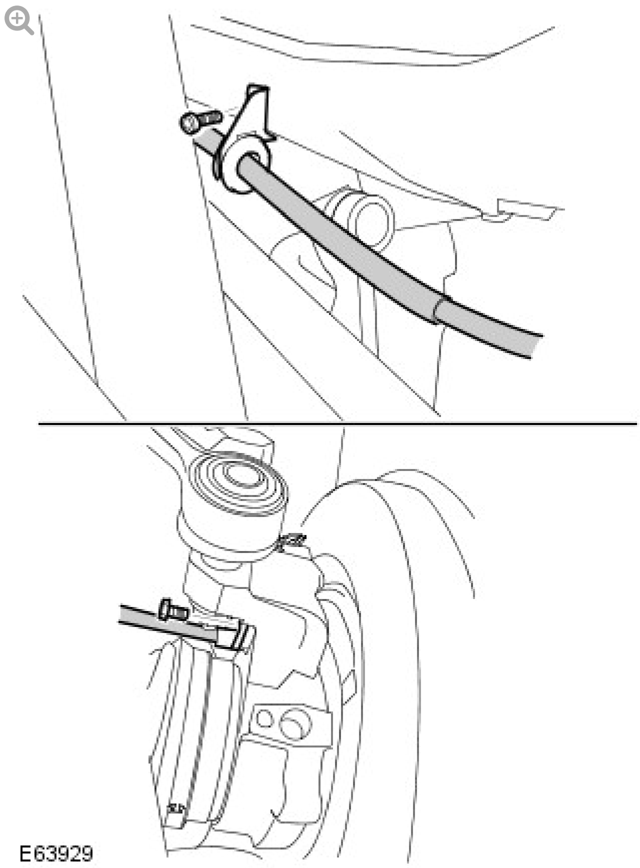
- Release the clip.
- Remove the Allen screw.

8. Release the parking brake cable clip.

- Remove the Allen screw.

9. **NOTE:**

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

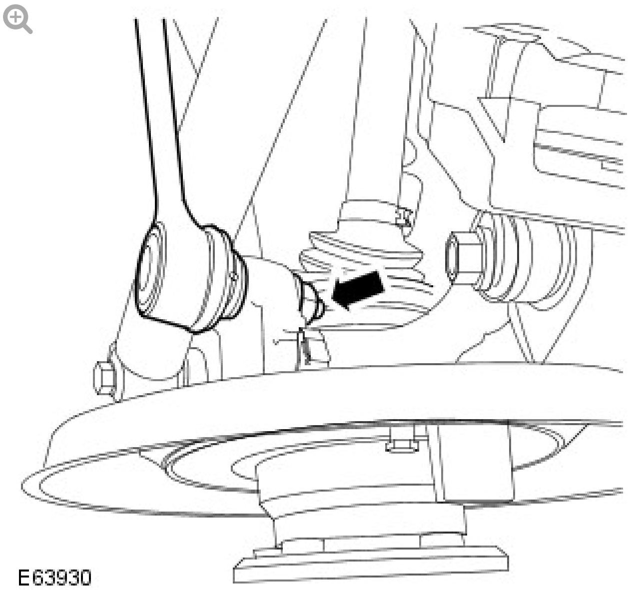


Disconnect the parking brake cable from the wheel knuckle.

- Remove the bolt.

10. **NOTE:**

Use an additional wrench to prevent the component from rotating.



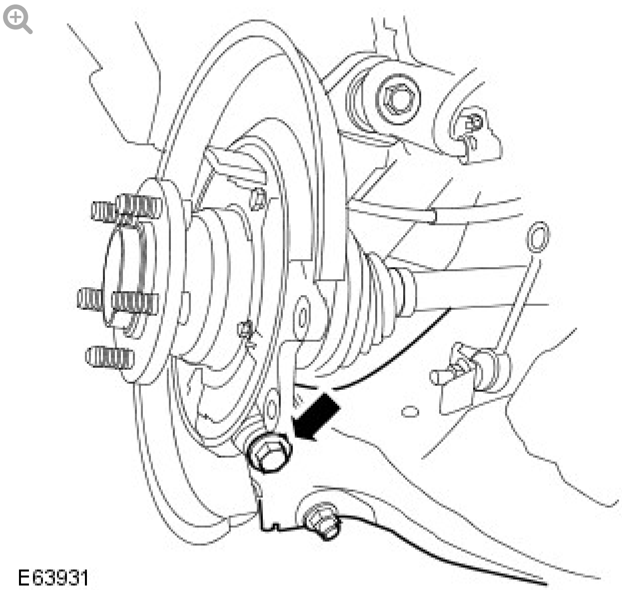
Release the toe link.

- Remove the nut.

11.

CAUTION:

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



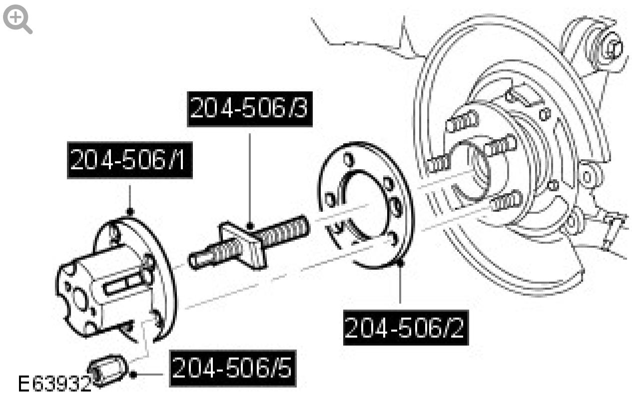
Release the lower arm.

- Using a trolley jack, support the lower arm.
- Remove and discard the nut and bolt.

12.

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.

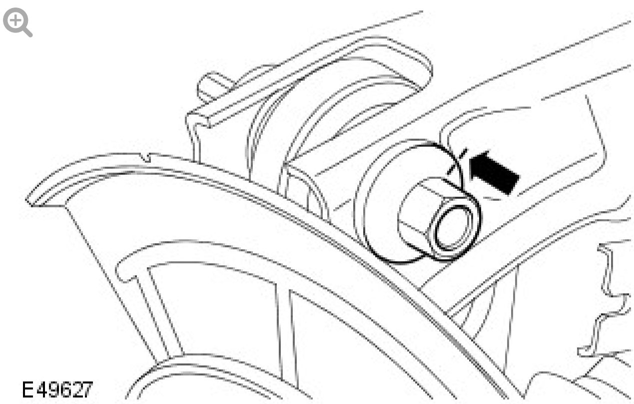


Using the special tools, release the halfshaft from the wheel hub.

13.

CAUTIONS:

- Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.
- Mark the position of the bolt in relation to the arm.



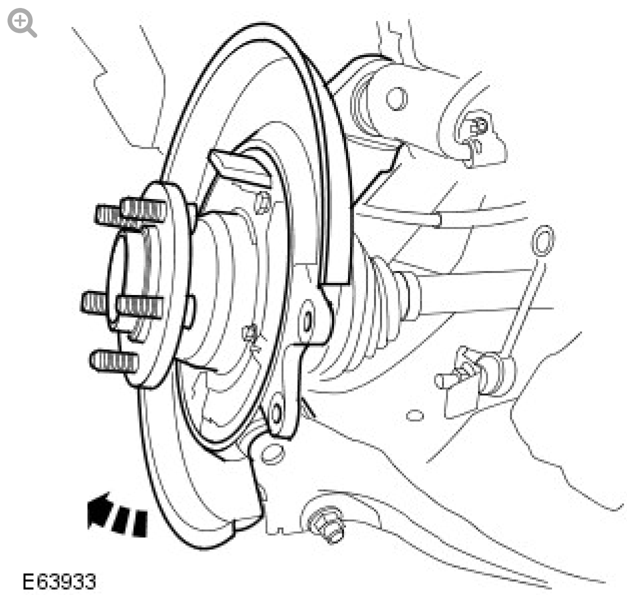
Release the upper arm.

- Remove the special bolt and discard the nut.
- Remove the special washer.

14.

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.

CAUTION:

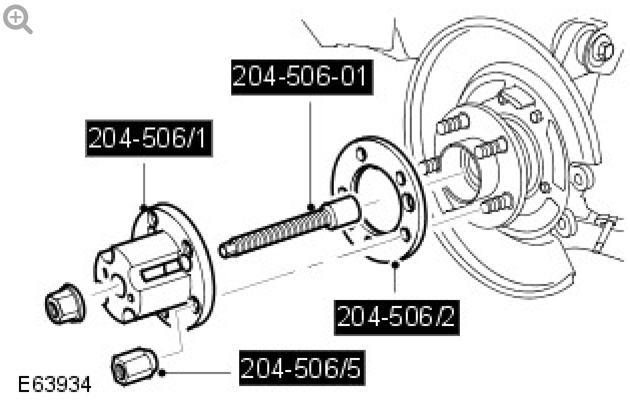
Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

Install the wheel knuckle.

- Clean the component mating faces.
- Lightly lubricate the halfshaft splines.

- Connect to the tie rod.
- Install the special bolt to the upper arm.

2. Secure the upper arm and wheel knuckle.
   - Align the bolt to the marks made previously.
   - Install the special washer.
   - Install a new nut and lightly tighten.

3. 

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

4. **CAUTION:**

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

   Secure the lower arm and wheel knuckle.
   - Install a new nut and bolt and tighten to 250 Nm (184 lb.ft).

5. **CAUTION:**

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

   NOTE:

Use an additional wrench to prevent the component from rotating.

Install the toe link nut and tighten it to 165 Nm (121 lb.ft).

6. **CAUTION:**

   Install the nuts finger tight before final tightening.

   Install a new halfshaft retaining nut and lightly tighten.

7. Install the parking brake cable.
   - Clean the component mating faces.
   - Tighten the bolt to 8 Nm (6 lb.ft)

8. Secure the parking brake cable clip.
   - Tighten the Allen screw to 5 Nm (4 lb.ft)

9. Install the rear wheel speed sensor.
   - Clean the component mating faces.
   - Tighten the Allen screw to 8 Nm (6 lb.ft).
   - Secure the lead in the clip.

10. Install the parking brake shoe expander.
    - Clean the component mating faces.

11. Install the parking brake shoes.
    - Clean the component mating faces.
    - Install the retainers.
    - Install the return spring.

12. Install the brake disc.

For additional information, refer to: Brake Disc (206-04 Rear Disc Brake, Removal and Installation).

13. **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 420 Nm (311 lb.ft).

- Stake the nut to the halfshaft.

14. Install the wheels and tires.

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

15. Tighten the upper arm to wheel knuckle nut and bolt to 165 Nm (121 lb.ft).

16. Check, and if necessary, adjust the wheel alignment.
    For additional information, refer to: Four-Wheel Alignment (204-00 Suspension System - General Information, General Procedures).

2012.0 RANGE ROVER (LM), 204-02

REAR SUSPENSION

TOE LINK (G1610242)

REMOVAL AND INSTALLATION

64.35.09	TIE-ROD – RENEW	ALL DERIVATIVES	0.3	USED WITHINS	+

REMOVAL

CAUTION:

Calibration of the air suspension system must be carried out if the suspension height sensor is loosened or removed.

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.

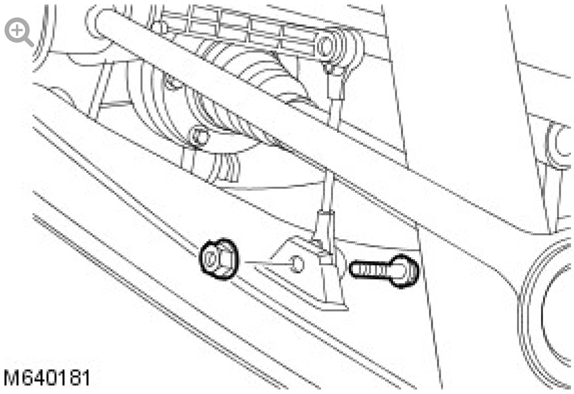
3. **NOTE:**

   Discard the nut.

Release the toe link from the wheel knuckle.

- Remove the nut.

4.



Release the height sensor link.

- Remove the nut and bolt.

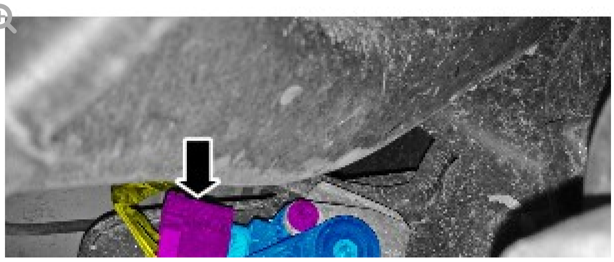
5.

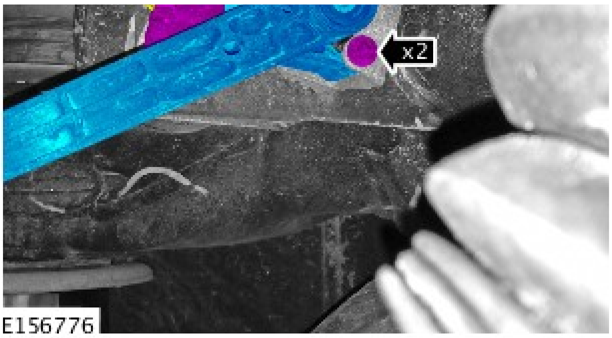
CAUTION:

Make sure that the wiring harness into the back of the electrical connector is not pulled tightly and exits the electrical connector with a good bend radius.

NOTE:

There should be 25 to 50mm of un-taped wiring out of the back of the connector. If the taping goes closer to the connector than this then the excess should be removed.

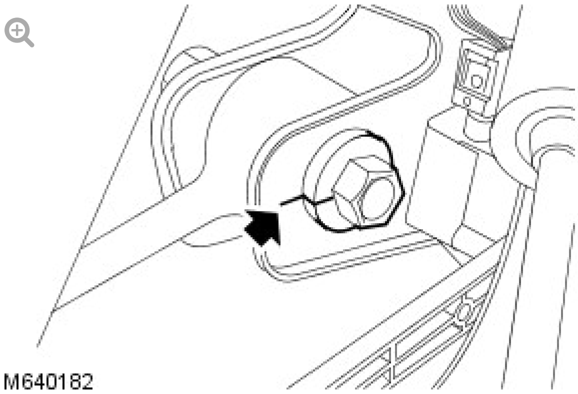




Remove the height sensor.

- Disconnect the electrical connector.
- Remove the retaining bolts.

6.



Mark the position of the bolt.

7. Remove the toe link.

- Remove and discard the bolt.
- Collect the special washer.

INSTALLATION

1.

CAUTION:

Only tighten the nuts and bolts when the suspension is in the normal drive position.

Install the toe link.

- Install a new bolt.
- Align the bolt to the marks made previously.
- Install the special washer.
- Tighten the nut and bolt to 165 Nm (121 lb.ft).

2. Secure the toe link to the wheel knuckle.
   - Tighten the nut to 165 Nm (121 lb.ft).

3. Install the height sensor.
   - Install the retaining bolts and tighten to 2.5 Nm.
   - Connect the electrical connector.

4. Secure the height sensor link.
   - Tighten the nut and bolt to19 Nm (14 lb.ft).

5. Install the wheel and tire.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

6. 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).

7. Check, and if necessary, adjust the wheel alignment.

2012.0 RANGE ROVER (LM), 204-04

WHEELS AND TIRES

SPECIFICATIONS

Wheels

NOTE:

Vehicles may be fitted with a Temporary Spare or a Full Sized Spare wheel.

WHEEL TYPE	WHEEL SIZE
Alloy wheel	▪ 8J x19 ▪ 8.5J x20
Steel (temporary spare) wheel	5.5J x19

Tire Size

NOTES:

- The tire size is displayed on the outer wall of each tire.
- All Range Rover tyres are rated as XL (Extra Load) or ‘Reinforced’
- Tyre brand fitted can depend upon the Market in which the vehicle is sold and/or the wheel style fitted, and/or the specific derivative.
- Supercharged vehicles must have 20” wheels & tyres and may not be fitted with the 20” Pirelli Tyre.
- The Michelin Tyres may only be fitted in the Single Load Condition markets identified below.

WHEEL SIZE	TIRE SIZE	TIRE LOAD INDEX
19 inch - Alloy	255/55 R19	▪ 111V Pirelli Scorpion Zero ▪ 111V Michelin Latitude Tour HP
20 inch - Alloy	255/50 R20	▪ 109Y Pirelli Scorpion Zero ▪ 109Y Continental CrossContact UHP ▪ 109Y Michelin Latitude Diamaris
19 inch – Steel Spare	175/80 R19	122M Continental CST Space Saver

Tire Pressures - RoW vehicles (Dual Load Conditions)

LOADING CONDITION	BAR	LB/IN²	KPA
Normal operating conditions:**			
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

**** Normal operating conditions: Carrying up to 4 passengers and luggage**

Tire Pressures – NAS/Gulf/Brazil vehicles (Single Load Condition)

LOADING CONDITION	BAR	LB/IN²	KPA
All operating conditions:			
Front	2.5	36	250
Rear	2.9	42	290

Tire Pressures – Temporary Spare

LOADING CONDITION	BAR	LB/IN²	KPA
All operating conditions:	4.2	60	420

2012.0 RANGE ROVER (LM), 204-04

WHEELS AND TIRES

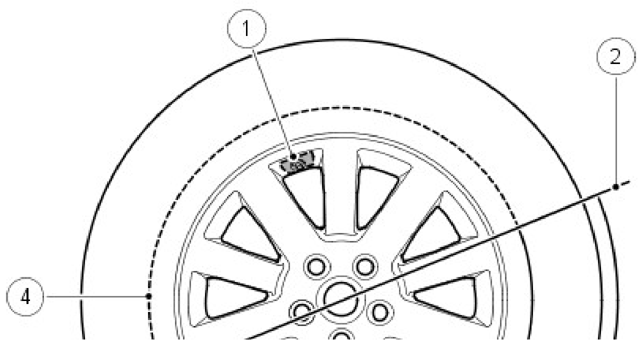
DESCRIPTION AND OPERATION

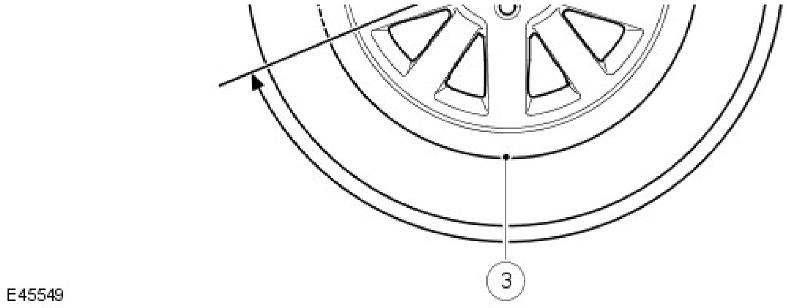
TIRES

NOTE:

The TPMS valve should be serviced using the suitable service kit, each time the tyre is dismounted, to ensure an air tight seal. Attention should be made to the detail of fitting this kit.

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





ITEM	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.

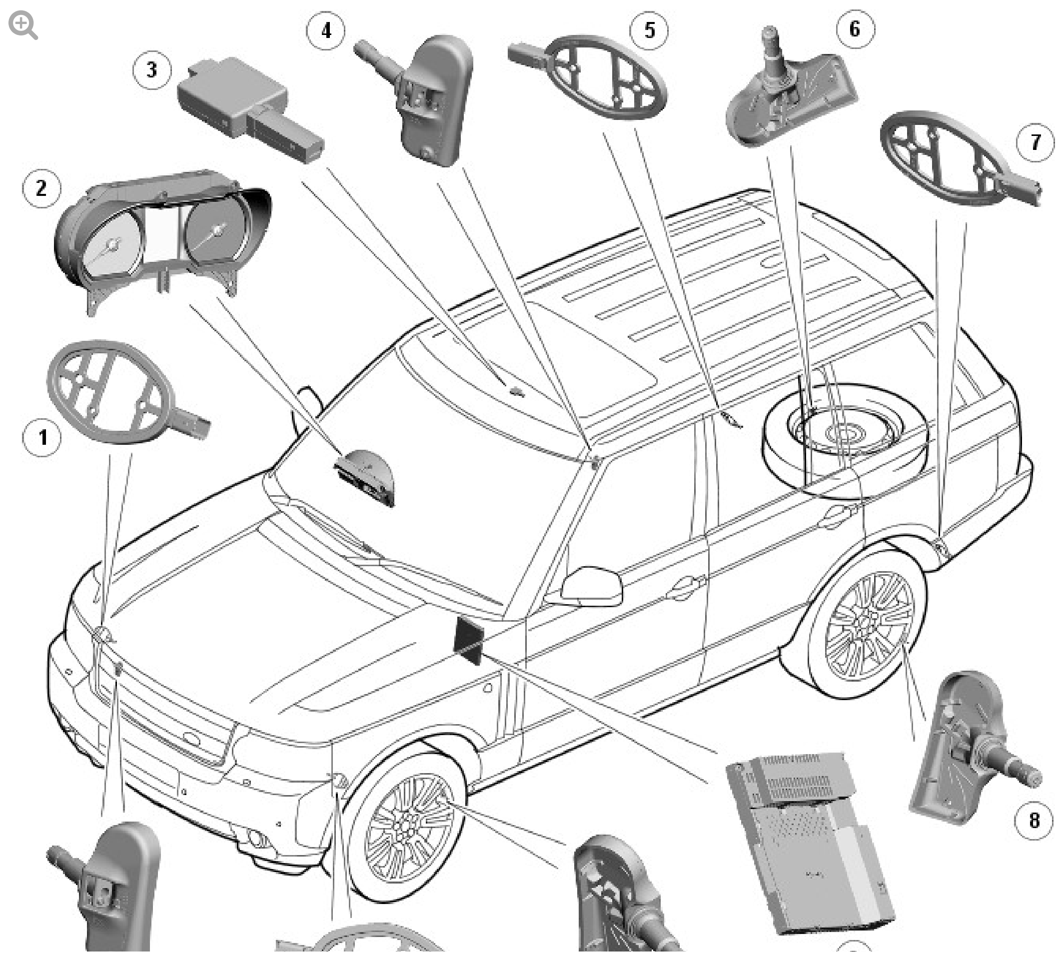
NOTE:

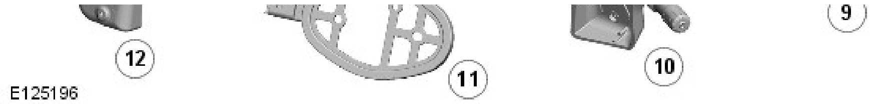
If tires and wheels of a non-standard size are fitted to the vehicle, the car configuration file must be updated using a Land Rover approved diagnostic system.

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	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	Integrated Head Unit (IHU)
10	LH front tire pressure sensor
11	LH front initiator
12	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.

NOTES:

- 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.
- 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 (central junction box) 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 12.5 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 12.5 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

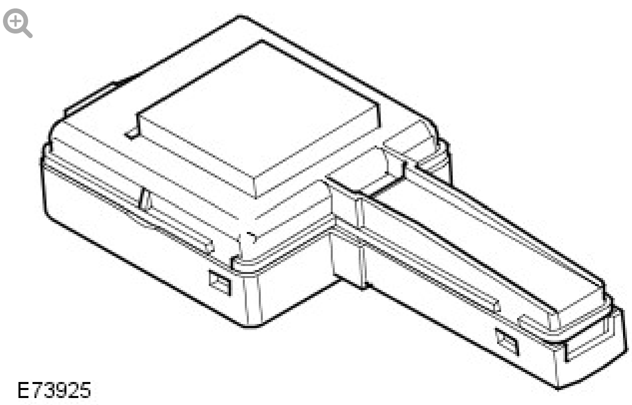
- 6 second pause
- Rear left
- 6 second pause.

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.

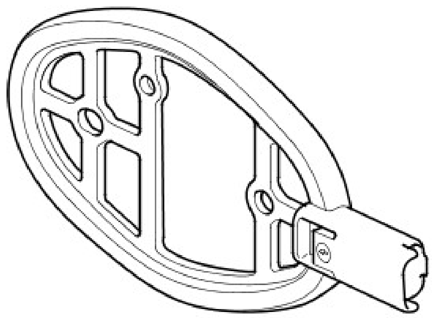
RF RECEIVER



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



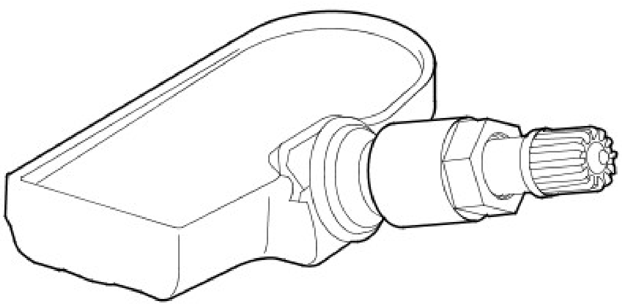
E45552

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

E125427

ITEM	DESCRIPTION
1	Amber warning indicator
2	Message center

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).

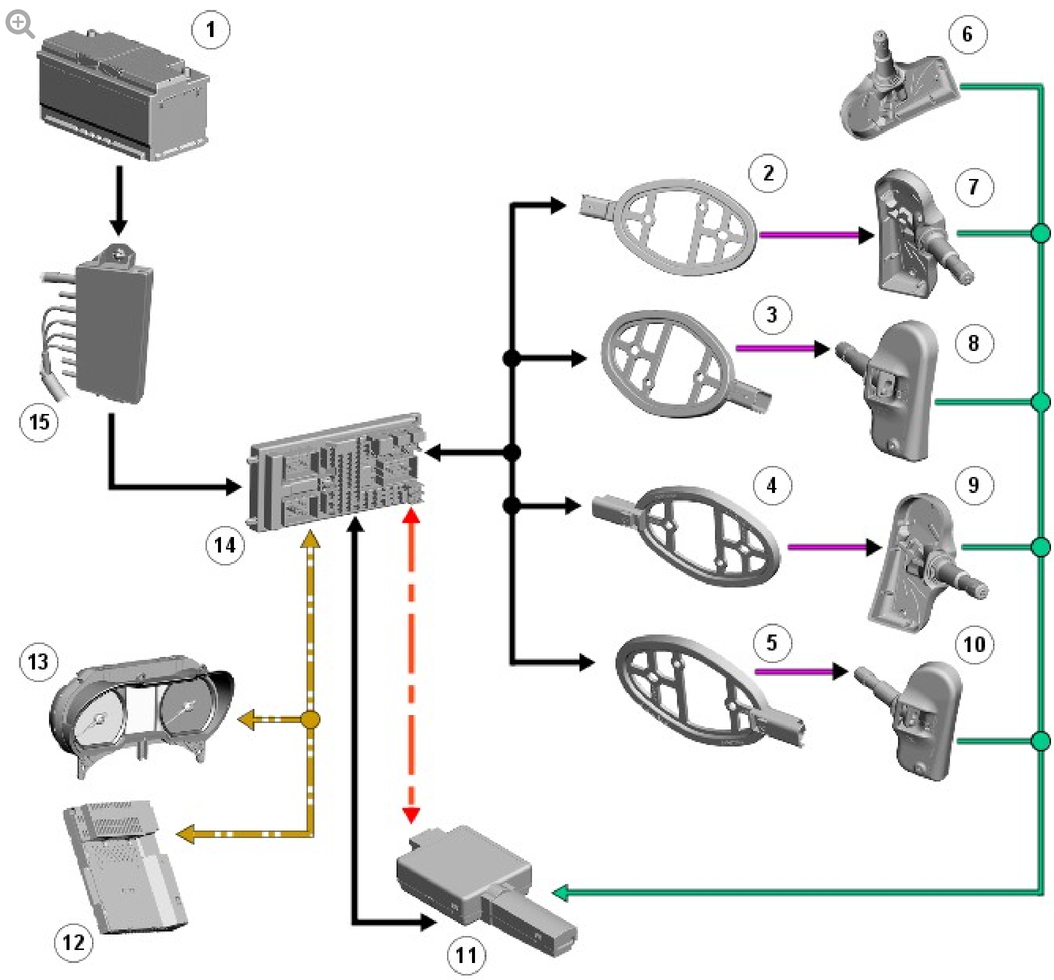
If more than one sensor fails or the CJB develops a fault, the amber warning indicator will be illuminated. A message 'Tyre Monitoring System Fault' will be displayed in the message center in addition to the amber warning indicator. This fault could also be caused if RF interference near the vehicle 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 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	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	Integrated Head Unit (IHU)
13	Instrument cluster
14	CJB
15	BJB (battery junction box)

WHEELS AND TIRES

DESCRIPTION AND OPERATION

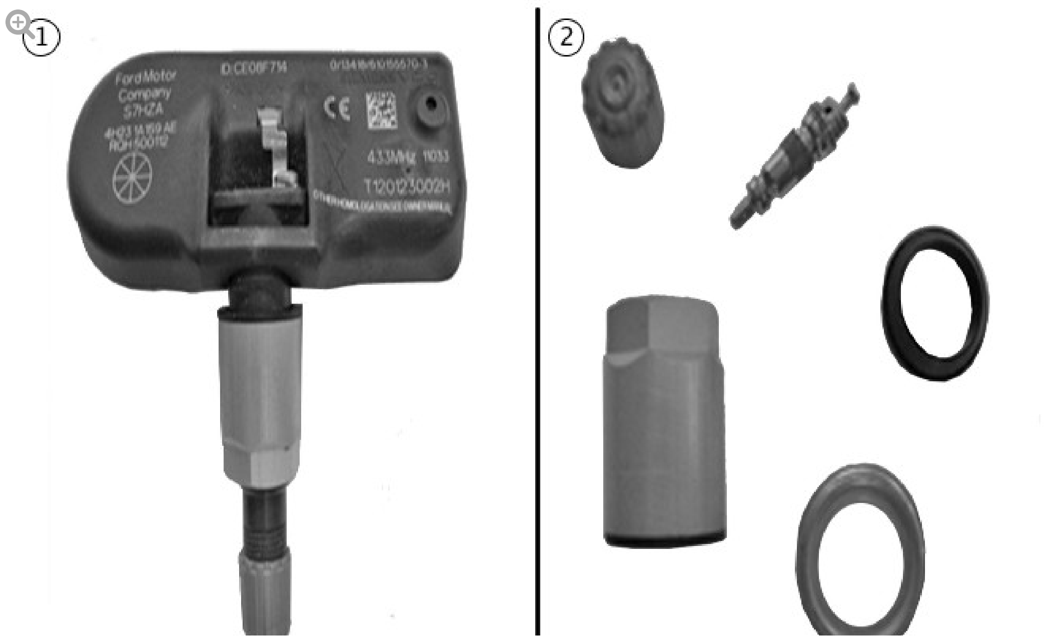
NOTES:

- The majority of TPMS **"faults"**, are not genuine component faults, but low pressure warnings, indicating the tyres have lost air, and have reached the point where the TPMS ISO light has been illuminated.
- There is also a TPMS diagnostic flow mapped into the approved Jaguar diagnostic tool, helping technicians to diagnose different possible faults.

TPMS valve snaps

If the TPMS valve has snapped, then inspect the TPMS wheel unit and decide if it is a two part construction, or is a one piece part.

If the TPMS wheel unit is a TG1B wheel unit, then replace the wheel unit with the same part (subject to supersession as per the Land Rover Electronic Parts Catalogue).



E196865

1 TG1B Valve - complete valve.

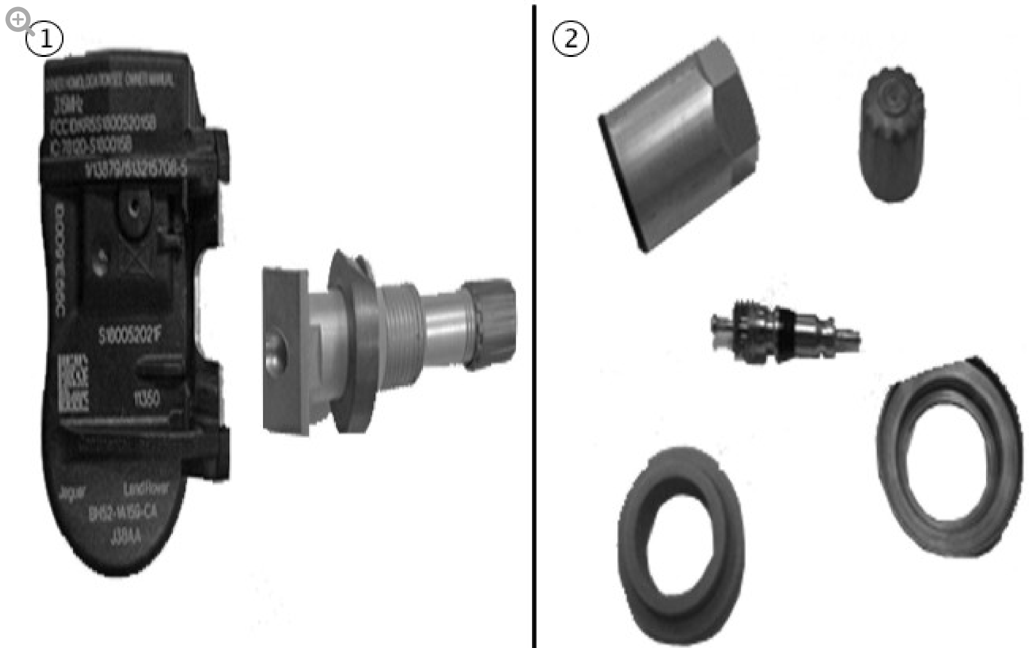
2 TG1B - Service kit.

NOTE:

> Please note that Jaguar Land Rover does not cover the snapped/damaged TPMS under warranty, this is not a manufacturing defect.

If the TPMS wheel unit is a TG1C, two part TPMS wheel unit, where the valve stem can be separated use part number LR043162, valve stem kit containing 5 replacement valve stems, nuts and washers.

UK markets only - valve stem kit with a shorter valve stem use part number LR077043.



E196867

1 TG1C Modular Valve, split in two halves mechanical and electronic modules - available as 5 piece set and as 1 piece.

2 TG1C Valve - whole/entire valve.

NOTE:

> Please note that Jaguar Land Rover does not cover the snapped/damaged TPMS under warranty, this is not a manufacturing defect.

1. TPMS Instrument Cluster Warnings

Turn the ignition on and look at the instrument cluster.

Does the TPMS ISO symbol flash for 72 seconds, and then stay on permanent: Yes go to **section 2.0**.

Is the TPMS ISO Symbol illuminated permanently on the instrument cluster? Yes go to **section 1.1**.

If the TPMS ISO symbol does not illuminate: There is no fault or problem present on the vehicle at this time.

Ask the customer if they have used a spare wheel fitted with a rubber valve, as this will cause a TPMS symptom fault to be displayed, this is expected behaviour, and there is no fault with the TPMS system. The use of a spare wheel is described in the vehicle handbook.

Ask the customer if the instrument cluster displayed one or more wheels at 0 pressure. If yes go to **section 1.2**.

Ask the customer if the instrument cluster displayed a warning TPMS message. If yes go to **section 1.3**.

Ask the customer if the TPMS fault message came on during a drive, and if the message cleared during a drive cycle. If the customer does indicate this happened, ask the customer if they have used additional accessories in the vehicle such as: USB chargers, insurance cameras, DC-DC converters, cool boxes, satellite navigation and radar detectors, when the TPMS fault light came on. If the answer is yes, ask the customer to remove the items, and see if the TPMS fault light does not come on, during the next drive cycles.

1.1 Low Pressure Warnings

When the TPMS ISO symbol is illuminated permanently, or comes on during a drive cycle, the TPMS system has detected that one or more tires are below the 80% requirement of the required pressure. The required pressure in the tire changes due to the temperature of the air inside the tire, being heated by the tire movement.

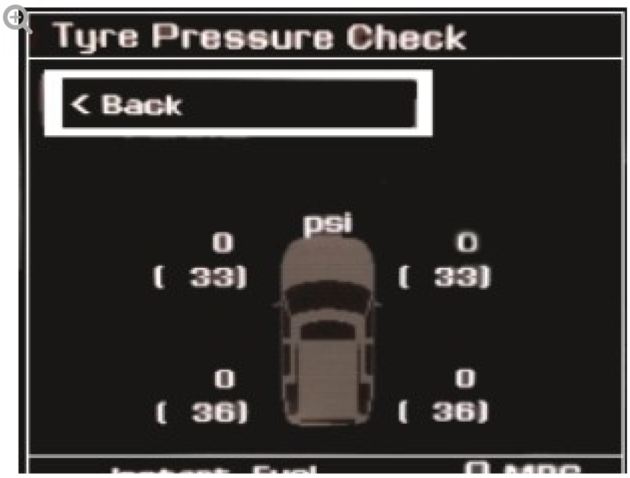
The instrument cluster will display an image of the vehicle showing which tire(s) are below the 80% of the required pressure. If only one wheel is low pressure then that wheel will be highlighted in yellow showing the actual pressure and the Recommended Cold Pressure (RCP) to inflate to.

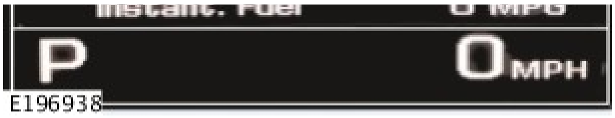
The message to check all tires is highlighted because if the tire has naturally lost air, then the other three tires will also be close to the threshold to set the warning.

Using the instrument cluster menu, use the menu and arrow keys on the steering wheel to navigate to the TPMS menu, and select the pressure check option. View the pressures of the tires, and add air to the tires as required. The correct pressure is shown in the pressure menu, on the instrument cluster. The Recommended Cold Pressure (RCP) is also shown on the tire label at the bottom of the B-pillar.

The instrument cluster should update as air is being placed into the tires. If the instrument cluster does not update, then drive the vehicle for 3 minutes above 15 Mph. This will make sure the RF signals from the TPMS wheel units are received.

1.2 Instrument cluster displays one or more tires at 0 pressure without an ISO TPMS symbol illuminated





If the instrument cluster is showing one or more tires at 0 pressure, then inflate the tire by 300kPa, and check the instrument cluster to see if the tire pressure has updated. If not then drive the vehicle for 8 minutes above 20 Kph for the TPMS sensors to localise.

1.3 TPMS warning messages

1.3.1 Non EU or Non NAS market TPMS warning messages

In non EU or non NAS markets, when rubber valves are fitted, the TPMS instrument cluster will display the message **"Tire monitoring not available"**, after 10 minutes of driving. The instrument cluster message **"Tire monitoring not available"**, will come on every subsequent ignition cycle, until the TPMS sensors are re-fitted.

The instrument cluster message **"Tire Pressure Monitoring Available"**, will be displayed on the instrument cluster when all four TPMS wheel sensors have been detected, and will display for 20 seconds.

1.3.1 All market warning messages

The instrument cluster message **"Tire Pressures too low for high speed"** and the TPMS ISO symbol will be displayed when the tire pressures are 80% below the required pressure for high speed driving.

The instrument cluster and the tire pressure label at the bottom of the B-pillar on the driver's side of the vehicle will show the required tire pressures for high speed driving.

1.4 NAS market

The load setting of the vehicle may be changed in the load setting menu, (vehicle dependant).

1.4.1 The instrument cluster message, **"Tire Pressure set for Light"**, is a reminder that the load switching has been set to the light setting, and are the lower of the tire pressures recommended.

1.4.2 The instrument cluster message, **"Tire Pressures set for Normal"**, is a reminder that the load switching has been set the normal setting, and is the highest tire pressures recommended.

1.5 EU and ROW markets

The load setting of the vehicle may be changed in the load setting menu, (vehicle dependant).


E196946

1.5.1 The instrument cluster message, **"Tire Pressure set for light"**, is a reminder that the load switching has been set to the light setting, and are the lower of the tire pressures recommended.

1.5.2 The instrument cluster message, **"Tire Pressures set for Heavy"**, is a reminder that the load switching has been set the Heavy setting, and is the highest tire pressures recommended.

2.0 TPMS faults

2.1 Wheel cannot be detected.

Using the instrument cluster menu, with the ignition on and the vehicle stationary, does the instrument cluster show one or more wheels with a yellow cross highlighted above the wheel? No then go to **section 2.2**.

E196947

Check the wheel(s) to see if a rubber valve has been fitted. If it has, replace with a TPMS valve. **Jaguar Land Rover will not pay for the warranty.**

If the wheel has a TPMS valve go to **section 2.2**.

2.2 TPMS Fault messages

Plug in the approved Jaguar diagnostic tool and read the DTCs from the TPMS wheel unit.

2.2.1 NAS markets only

NAS market note the TPMS frequency has been set to 433 MHz from 16MY for all vehicles.

VIN change for 433 MHz, for earlier model years.

- Discovery LR4 (L319) 14MY starting with VIN LA696287.
- Range Rover LG (L405) 14MY starting with VIN LG140913.
- Range Rover Sport LW (L494) 14MY starting with VIN LW319924.
- Range Rover Evoque LV (L538) 15MY 433 MHz starting with VIN SALVA2BC7FH933449.
- Freelander 2 LR2 (L359) stayed on 315 MHz.

2.2.1 EU Markets

EU markets the TPMS system is always 433 MHz.

2.2.2 Wheel units not recognised from start of a drive cycle

C1D21-05 (Any wheel unit - Failed reception from beginning of TPMS Drive cycle).

Possible Causes:

1. Rubber valve fitted go to **section 2.1**.
2. 315 MHz TPMS wheel unit fitted on a 433 MHz vehicle. NAS markets Inspect wheel unit, if a 315 MHz wheel unit fitted Jaguar Land Rover will not pay for a replacement.
3. TPMS wheel unit in ship mode (turned off), customer purchased part, Using a handheld LF tool, turn the TPMS wheel unit on. Jaguar Land Rover will not pay for this as customer purchased.
    - If no TPMS LF hand tool available, then change the TPMS wheel unit to a new one. Jaguar Land Rover will not pay for a replacement, as part not purchased through approved process.
4. The TPMS wheel unit battery has failed or the wheel unit has been damaged when tire was replaced.

Replace the identified wheel unit.

NOTE:

Please note that Jaguar Land Rover does not cover these cost under warranty, this is not a manufacturing defect.

2.2.3 Wheel units not recognised during a drive cycle

C1A56-93 (Left Front Tire Pressure Sensor and Transmitter assembly no operation (During TPMS drive cycle).

C1A58-93 (Right Front Tire Pressure Sensor and Transmitter assembly no operation (During TPMS drive cycle).

C1A60-93 (Left rear Tire Pressure Sensor and Transmitter assembly no operation (During TPMS drive cycle).

C1A62-93 (Right rear Tire Pressure Sensor and Transmitter assembly no operation (During TPMS drive cycle).

Causes:

1. One or more wheels swapped over in less than 15 minutes (winter wheel warehouse replacement).
2. RF interference of the TPMS signal from the wheel units to the receiver.
3. TPMS wheel unit damaged.
4. Battery failing, (wheel unit over 6 years old).

Go to **section 3.0**.

2.2.4 Wheel unit localisation

C1D18-00 Wheel localisation failed.

The TPMS system needs to receive the RF transmissions from all 4 wheel units, to enable the location of the TPMS wheel unit and the TPMS wheel unit ID to be matched. If a rubber valve has been fitted to a wheel, or the TPMS sensor is not transmitting, then on the fourth journey, (greater than 10 mins), a localisation DTC will be set.

Make sure all 4 TPMS wheel units are working using the approved Jaguar Land Rover diagnostic tool deflation test.

If there is RF interference, this can cause the localisation to fail.

Check the initiators are correctly located in the wheel arches, as they can be connected into the circuits from the CJB/BCM, but might not be correctly located, especially if the bumper has been changed.

Go to section 3.0

2.2.5 K line serial interface communication problems between Central Junction Box (CJB) or Body Control Module (BCM) and the TPMS receiver

U201F-87(External Receiver missing message) – open circuit

U201F-11(External Receiver short to Ground)

U201F-12(External Receiver Short to battery)

Check the software of the BCM/CJB, (Central Junction Box).

If the CJB/BCM software revision for the following vin ranges is earlier than AJ, make sure the software update is actioned:

- L405 Range Rover (LG), model years: 2014 – 2015, VIN range: LG124984 – LG203069
- L494 Range Rover Sport (LW), model years: 2014 – 2015, VIN range: LW600000 – LW603392
- L494 Range Rover Sport (LW), model years: 2014 – 2015,VIN range: LW000015 – LW509446.
- L538 Range Rover Evoque (LV), model years: 2014 – 2015, VIN range: LV856653 – LV996110
- L538 Range Rover Evoque (LV), model years: 2015, VIN range: LV000007 –

LV011753

2.2.6 External receiver internal failure

U201F-04, ignore any other DTCs

Check tire pressure monitoring system RF receiver fuse.

Clear the DTC and retest. If fault persists, check and install a new tire pressure monitoring system RF receiver.

2.2.7 Initiator Circuit DTCs

C1A61-14(Left rear initiator Circuit short to ground or open)

C1A61-12(Left Rear initiator Short to battery)

C1A63-14(Right rear initiator Circuit short to ground or open)

C1A63-12(Right Rear initiator Short to battery)

C1A59-14(Right Front initiator Circuit short to ground or open)

C1A59-12(Right Front initiator Short to battery)

C1A57-14(Left Front initiator Circuit short to ground or open)

C1A57-12(Left Front initiator Short to battery)

NOTE:

> Two or more of the above DTCs may be set with DTC C1D18-00. If that is the case C1D18-00 should be ignored and the fault causing the above DTCs should be fixed.

Check for either open circuit, short to ground, short to power (depending on occurring DTC description above). Please check, as well, if the connector is correctly latched.

3.0 Wheel unit investigation

Break the bead and inspect the TPMS wheel unit and compare the wheel unit ID, with the wheel ID as read by the approved Jaguar Land Rover diagnostic tool. If the TPMS wheel IDs are different, programme the new wheel ID into the approved Jaguar Land Rover diagnostic tool, and run the deflation test. Make sure the TPMS wheel unit is working.

If the TPMS wheel unit is not detected with the new wheel unit, then ask the customer where the TPMS wheel unit was purchased. The wheel unit is in ship mode, and needs to be put into park mode with a LF tool.

NOTE:

> Jaguar Land Rover will not pay the warranty for this claim, this is not a manufacturing defect.

2012.0 RANGE ROVER (LM), 204-04

WHEELS AND TIRES

DIAGNOSIS AND TESTING

PRINCIPLES OF OPERATION

For a detailed description of the Tire Pressure Monitoring System, 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).

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.

NOTES:

- If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.
- When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.
- Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern

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

Visual Inspection

MECHANICAL	ELECTRICAL
▪ Wheels/tires ▪ Tire pressure sensors	▪ Fuses ▪ Wiring harnesses and connectors ▪ Central junction box ▪ Tire pressure sensors

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

1. 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

1. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Tire pressure monitoring system warning indicator illuminated continuously	▪ One or more tires punctured / incorrectly inflated	**NOTE:** To extinguish the warning indicator/message, it is essential that the tire pressures are adjusted to the correct pressure with the ignition set to on. It is not necessary to drive the vehicle to extinguish the warning indicator/message; changing the tire pressure causes the tire pressure sensor to transmit new data. ▪ Check the tires for punctures. Check the tire pressures and correct as necessary
Tire pressure monitoring system warning indicator flashing for 75 seconds and then illuminated continuously	▪ Tire pressure monitoring system fault	▪ Using the manufacturer approved diagnostic system, check the central junction box for related DTCs and refer to the relevant DTC index

TIRE PRESSURE CHECK AND ADJUSTMENT

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.

The tire pressures should be checked using a calibrated tire pressure gauge and when the tires are cold (vehicle parked in the ambient temperature for at least one hour, not in a garage with an artificial ambient temperature).

If the tire pressure warning indicator/message does not clear within two minutes of adjusting the tire pressures, it is likely that the gauge is not correctly calibrated or the tires are warm. Perform the following steps until the warning has cleared:

1. Rotate the wheels by 180°
1. Increase the tire pressures by 3psi
1. Wait a further two minutes
1. Reset the tire pressures to the correct pressure

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: Module Name: Central Junction Box (100-00 General Information, Description and Operation).

PINPOINT TESTS

PINPOINT TEST A : U201F-11 TESTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: U201F-11 TEST 1	

	1 Set the ignition to off
	2 Disconnect tire pressure monitoring system RF receiver connector C2875
	3 Measure the resistance between: C2875, HARNESS SIDE | BATTERY Terminal 1 | Negative terminal
	Is the resistance less than 5 ohms? **Yes** GO to A2. **No** GO to A3.

A2: U201F-11 TEST 2

	1 Disconnect central junction box connector C0580
	2 Measure the resistance between: C2875, HARNESS SIDE | BATTERY Terminal 1 | Negative terminal
	Is the resistance less than 5 ohms? **Yes** Refer to the electrical circuit diagrams and check the tire pressure monitoring system RF receiver LIN circuit for short circuit to ground. Repair the LIN circuit as necessary **No** GO to A4.

A3: U201F-11 TEST 3

	1 Reconnect tire pressure monitoring system RF receiver connector C2875
	2 Using the manufacturer approved diagnostic system, clear the DTCs
	3 Set the ignition to off
	4 Set the ignition to on
	5 Read DTCs
	Is DTC U201F-11 set? **Yes** Install a new tire pressure monitoring system RF receiver **No** Investigate possible cause of intermittent failure

A4: U201F-11 TEST 4	
	1 Reconnect central junction box connector C0580
	2 Reconnect tire pressure monitoring system RF receiver connector C2875
	3 Using the manufacturer approved diagnostic system, clear the DTCs
	4 Set the ignition to off
	5 Set the ignition to on
	6 Read DTCs
	Is DTC U201F-11 set? **Yes** Install a new central junction box **No** Investigate possible cause of intermittent failure

PINPOINT TEST B : U201F-12 TESTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: U201F-12 TEST 1	
	1 Set the ignition to off
	2 Disconnect tire pressure monitoring system RF receiver connector C2875
	3 Measure the resistance between: C2875, HARNESS SIDE: Terminal 1 — BATTERY: Positive terminal
	Is the resistance less than 5 ohms? **Yes** GO to B2. **No** GO to B3.
B2: U201F-12 TEST 2	
	1 Disconnect central junction box connector C0580
	2 Measure the resistance between: C2875, HARNESS SIDE: Terminal 1 — BATTERY: Positive terminal

C2875, HARNESS SIDE	BATTERY
Terminal 1	Positive terminal

	Is the resistance less than 5 ohms? **Yes** Refer to the electrical circuit diagrams and check the tire pressure monitoring system RF receiver LIN circuit for short circuit to power. Repair the LIN circuit as necessary **No** GO to B4.
B3: U201F-12 TEST 3	
	1 Reconnect tire pressure monitoring system RF receiver connector C2875
	2 Using the manufacturer approved diagnostic system, clear the DTCs
	3 Set the ignition to off
	4 Set the ignition to on
	5 Read DTCs
	Is DTC U201F-12 set? **Yes** Install a new tire pressure monitoring system RF receiver **No** Investigate possible cause of intermittent failure
B4: U201F-12 TEST 4	
	1 Reconnect central junction box connector C0580
	2 Reconnect tire pressure monitoring system RF receiver connector C2875
	3 Using the manufacturer approved diagnostic system, clear the DTCs
	4 Set the ignition to off
	5 Set the ignition to on
	6 Read DTCs
	Is DTC U201F-12 set? **Yes** Install a new central junction box **No** Investigate possible cause of intermittent failure

PINPOINT TEST C : U201F-87 TESTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: U201F-87 TEST 1	
	1 Using a multimeter, measure and record the battery voltage (reference voltage)

	2 Connect the multimeter to tire pressure monitoring system RF receiver connector C2875 terminals 3 and 2
	Is the measured voltage less than battery voltage? **Yes** Repair the tire pressure monitoring system RF receiver power/ground circuit as necessary **No** GO to C2.

C2: U201F-87 TEST 2

	1 Disconnect tire pressure monitoring system RF receiver connector C2875
	2 Disconnect central junction box connector C0580
	3 Measure the resistance between:

C2875, HARNESS SIDE	C0580, HARNESS SIDE
Terminal 1	Terminal 25

	Is the resistance less than 5 ohms? **Yes** GO to C3. **No** Refer to the electrical circuit diagrams and check the tire pressure monitoring system RF receiver LIN circuit for open circuit, high resistance. Repair the LIN circuit as necessary

C3: U201F-87 TEST 3

	1 Reconnect central junction box connector C0580
	2 Reconnect tire pressure monitoring system RF receiver connector C2875
	3 Using the manufacturer approved diagnostic system, clear the DTCs
	4 Set the ignition to off
	5 Set the ignition to on
	6 Read DTCs
	Is DTC U201F-87 set? **Yes** Install a new tire pressure monitoring system RF receiver. GO to C4. **No** Investigate possible cause of intermittent failure

C4: U201F-87 TEST 4

	1 Using the manufacturer approved diagnostic system, clear the DTCs

	2 Set the ignition to off
	3 Set the ignition to on
	4 Read DTCs
	Is DTC U201F-87 set? **Yes** Install a new central junction box **No** Test is complete. No further action is required

PINPOINT TEST D : C1D18-00 TESTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: C1D18-00 TEST 1	
	1 Establish the locations of the tire pressure sensor localization failures: Using the manufacturer approved diagnostic system, check datalogger signals: ▪ Wheel Position Triggering Statistic, Identifier 1, Unsuccessful triggering (0x4149) ▪ Wheel Position Triggering Statistic, Identifier 2, Unsuccessful triggering (0x4149) ▪ Wheel Position Triggering Statistic, Identifier 3, Unsuccessful triggering (0x4149) ▪ Wheel Position Triggering Statistic, Identifier 4, Unsuccessful triggering (0x4149)
	Have the locations of the tire pressure sensor localization failures been identified? **Yes** GO to D2. **No** Investigate possible cause of intermittent failure
D2: C1D18-00 TEST 2	
	1 Using the manufacturer approved diagnostic system, check the central junction box for tire pressure sensor related DTCs
	Are any tire pressure sensor related DTCs set? **Yes** Refer to the relevant DTC index and perform the relevant corrective actions **No** GO to D3.
D3: C1D18-00 TEST 3	
	1 Using the manufacturer approved diagnostic system, check the central junction box for initiator related DTCs
	Are any initiator related DTCs set?

Are any initiator related DTCs set?

Yes

Refer to the relevant DTC index and perform the relevant corrective actions

No

GO to D4.

D4: C1D18-00 TEST 4

1 Check for correct installation of the initiator(s) in the location(s) identified

Are the initiator(s) correctly installed?

Yes

GO to D5.

No

Install the initiators correctly

D5: C1D18-00 TEST 5

1 Set the ignition to off

2 Disconnect central junction box connector C0584 (front initiators)

3 Disconnect central junction box connector C0586 (rear initiators)

4 Measure the resistance of the front right initiator circuit

C0584, HARNESS SIDE	C0584, HARNESS SIDE
Terminal 1	Terminal 2

5 Measure the resistance of the front left initiator circuit

C0584, HARNESS SIDE	C0584, HARNESS SIDE
Terminal 14	Terminal 15

6 Measure the resistance of the rear right initiator circuit

C0586, HARNESS SIDE	C0586, HARNESS SIDE
Terminal 30	Terminal 31

7 Measure the resistance of the rear left initiator circuit

C0586, HARNESS SIDE	C0586, HARNESS SIDE
Terminal 18	Terminal 19

	Are any of the initiator resistance measurements less than 1 Ohm? **Yes** Repair the short circuit as necessary **No** Install new tire pressure sensor(s) in the locations identified

2012.0 RANGE ROVER (LM), 204-04

WHEELS AND TIRES

DIAGNOSIS AND TESTING

PRINCIPLES OF OPERATION

NOTE:

Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

For a detailed description of the Wheels and Tires refer to the relevant description and operation section in the workshop manual.

TIRE CHIP & CHUNK

NOTE:

If the level of chip and chunking is excessive or overall tire condition is poor the tire should be treated as any damaged/punctured tire. Where detrimental damage to the tire is evident, it must be reported to the customer with recommendations to accordingly replace damaged tires.

Symptoms

Typical example of a serviceable tire exhibiting chip and chunk phenomenon

Possible Causes:

Tire Chip and Chunk is a phenomenon that may develop on the tire tread when vehicles are driven on rough gravel or aggressive road surfaces. Typically the tread may lose small pieces of tread rubber within and around the periphery of the tread block. This loss of rubber ultimately leads, with extended usage, to an overall rough appearance to the tread area of the tire.

Action:

When a customer contacts a retailer concerning the chip and chunk phenomenon, dealers must:

- Conduct a thorough evaluation of the tire condition and, where no

- Conduct a thorough evaluation of the tire condition and, where no detrimental damage has occurred, inform the customer that the chip and chunk condition does not affect the overall tire integrity or significantly affect performance
- Inform the customers of the conditions that generate chip and chunk phenomenon

Complaints associated with this phenomenon must initially include a thorough examination of the vehicles tires for the following:

- Excessive chip and chunk (tread cuts or loss of tread block section, extending deep into the tread rubber beyond the tread wear indicators or in the shoulder area extending beyond the groove depth)
- Cuts and bulges especially within the sidewall
- Overall tire condition including tread depth.

Where the tires do not exhibit excessive chip and chunk, cuts, sidewall bulges and are in generally good condition the customer should be advised that the condition does not affect the overall tire integrity or significantly affect performance and as such are serviceable.

TIRE FLAKING

NOTES:

- If the level of tire flaking is excessive or overall tire condition is poor the tire should be treated as any damaged/punctured tire. Where detrimental damage to the tire is evident, it must be reported to the customer with recommendations to accordingly replace damaged tires.
- Perform a tread depth measurement to make sure the tire is within local regulations. If specifications are not met inform customer that they require replacement.

Symptoms

Typical example of a serviceable tire exhibiting tire flaking phenomenon

Typical example of a serviceable tire exhibiting tire flaking phenomenon

Possible Causes:

Tire Flake damage may develop on the outer sections of the tire tread when vehicles are driven enthusiastically and peak available grip has been surpassed. Typically the tread may lose small pieces of tread rubber within and around the periphery of the tread blocks on the outer sections of the tire.

Action:

When a customer contacts a retailer concerning the tire flaking phenomenon, dealers must:

- Conduct a thorough evaluation of the tire condition and determine that they are seeing flake damage on the outer sections of the tire. If damage is seen in the central tread, please refer to the Tire Chip & Chunk section
- Inform the customers of the driving styles that generate tire flaking (Mid corner understeer that generates high pitched tire noise, and/or over application on throttle inputs when exiting junctions that cause the traction control light to come on).

Complaints associated with this phenomenon must initially include a thorough examination of the vehicles tires for the following:

- Excessive flaking (tread cuts or loss of tread block section, extending deep into the tread rubber beyond the tread wear indicators or in the shoulder area extending beyond the groove depth)
- Cuts and bulges especially within the sidewall
- Overall tire condition including tread depth.

Where the tires do not exhibit excessive flaking, cuts, sidewall bulges and are in generally good condition the customer should be advised that the condition does not affect the overall tire integrity or significantly affect performance and as such are serviceable.

DTC INDEX

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

WHEELS AND TIRES

TIRE LOW PRESSURE SENSOR (G552497)

REMOVAL AND INSTALLATION

74.10.05	SENSOR - TIRE PRESSURE MONITORING SYSTEM (TPMS) - RENEW	ALL DERIVATIVES	0.4	USED WITHINS	+

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.

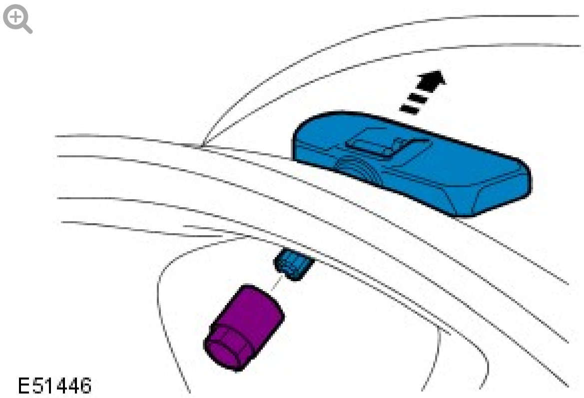
3. **CAUTION:**

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:**

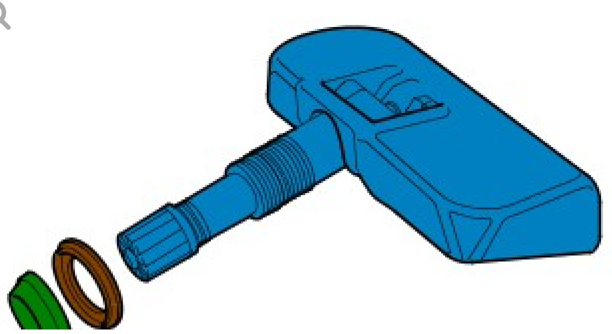
- Do not push on the valve.
- If the tire low pressure sensor is to be re-installed, a new washer, seal and nut must be installed.



Remove the tire low pressure sensor.

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

5.



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If necessary, install a new seal and washer.

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

INSTALLATION

1. **CAUTION:**

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

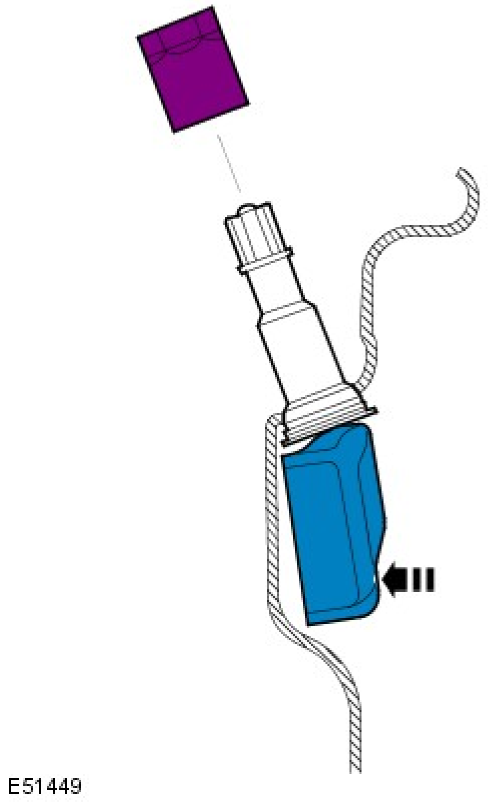
Clean the component mating faces.

2. **CAUTION:**

Do not apply any lubricant to the new valve.

NOTE:

If the sensor is replaced on a 'running' wheel, the new sensor identification will be learnt 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 8 Nm (6 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).

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WHEELS AND TIRES

TIRE PRESSURE MONITORING SYSTEM (TPMS) FRONT ANTENNA (G552498)

REMOVAL AND INSTALLATION

86.53.16	ANTENNA – FRONT WHEEL – TIRE PRESSURE MONITORING SYSTEM (TPMS) – RENEW	ALL DERIVATIVES	0.4	USED WITHINS	+

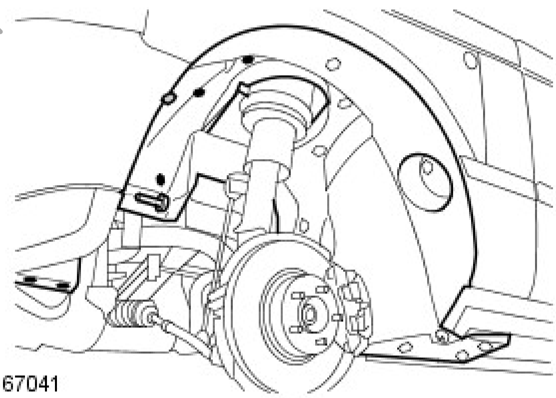
REMOVAL

1. **WARNING:**

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

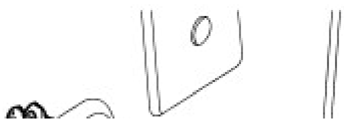
Raise and support the vehicle.

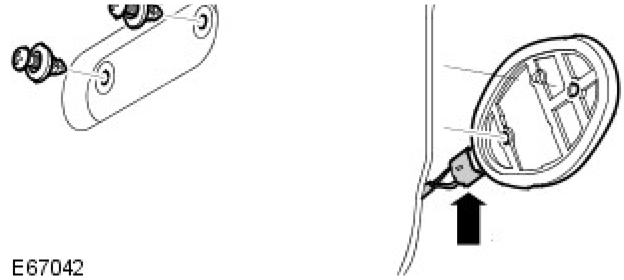
2. Remove the front wheel.

3. 

Release the front of the fender splash shield.

- Remove the plastic nut.
- Remove the 6 screws.

4. 



Remove the tire pressure antenna.

- Disconnect the electrical connector.
- Release the 2 clips.

INSTALLATION

1. Install the tire pressure antenna.
   - Install the 2 clips.
   - Connect the electrical connector.
2. Secure the fender splash shield.
   - Tighten the screws.
   - Tighten the nut.
3. Install the front wheel.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).

2012.0 RANGE ROVER (LM), 204-04

WHEELS AND TIRES

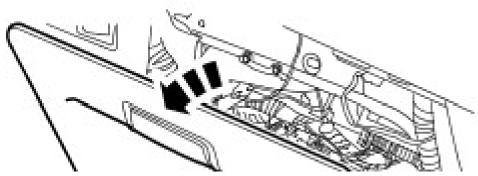
TIRE PRESSURE MONITORING SYSTEM (TPMS) MODULE (G552432)

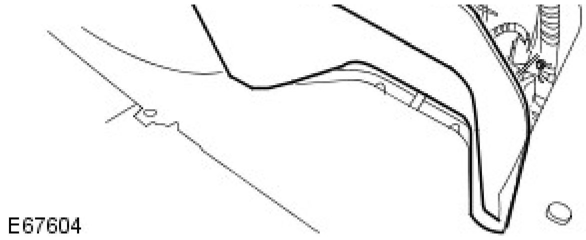
REMOVAL AND INSTALLATION

86.54.05	MODULE - TIRE PRESSURE MONITORING - RENEW	ALL DERIVATIVES	0.1	USED WITHINS	+

REMOVAL

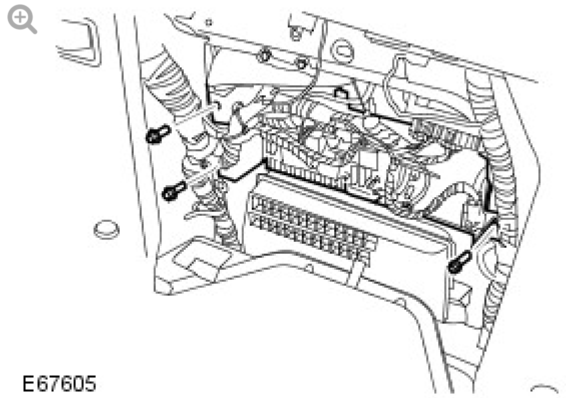
1.





Remove the access panel from the loadspace RH trim panel.

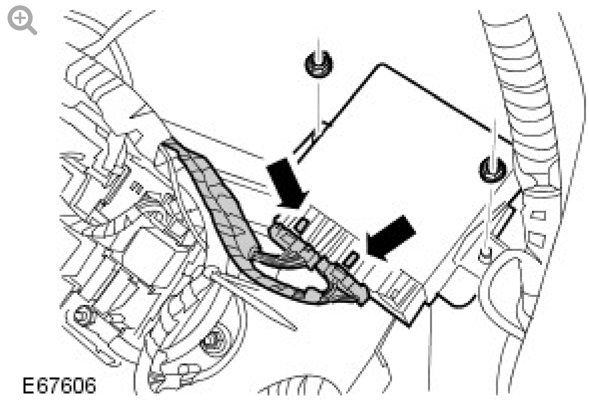
2.



Release the auxiliary junction box mounting bracket.

- Remove the 3 bolts.

3.



Remove the tire pressure monitoring module.

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

INSTALLATION

1. Install the tire pressure monitoring module.

- Tighten the nuts.
- Connect the electrical connectors.

2. Secure the auxiliary junction box mounting bracket.
    - Tighten the bolts to 6 Nm (4 lb.ft).

3. Install the access panel.

4. Using WDS, initiate a new control module.

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WHEELS AND TIRES

TIRE PRESSURE MONITORING SYSTEM (TPMS) REAR ANTENNA (G552499)

REMOVAL AND INSTALLATION

86.53.17	ANTENNA - REAR WHEEL - TIRE PRESSURE MONITORING SYSTEM - (TPMS) - RENEW	ALL DERIVATIVES	0.2	USED WITHINS	+

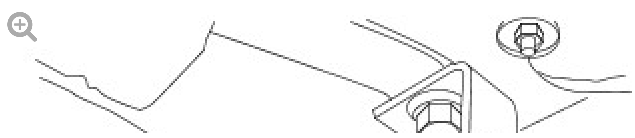
REMOVAL

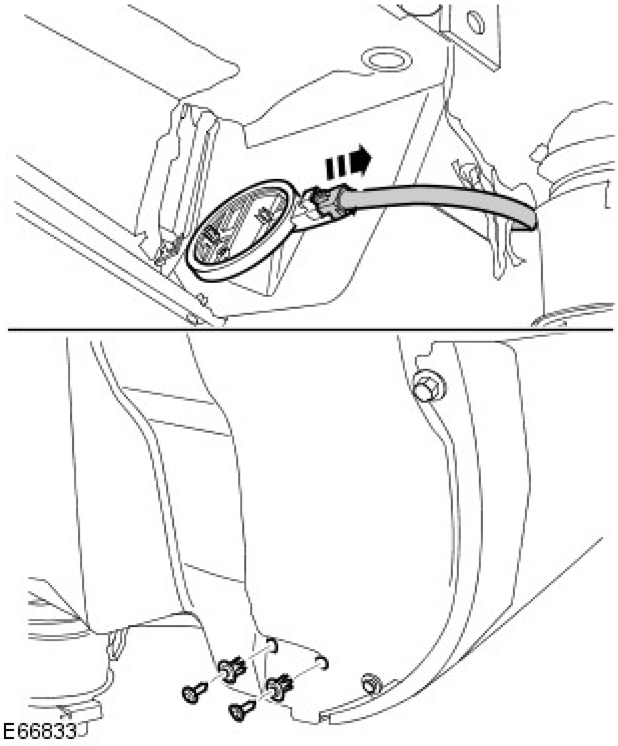
1. **WARNING:**

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

   Raise and support the vehicle.

2. Remove the rear wheel and tire.

3. 



Remove the tire pressure antenna.

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

INSTALLATION

1. To install, reverse the removal procedure.

2. Install the wheel and tire.

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

3. Initiate a new tire pressure antenna using T4.

2012.0 RANGE ROVER (LM), 204-04

WHEELS AND TIRES

WHEEL AND TIRE (G871873)

REMOVAL AND INSTALLATION

ROAD

60.25.06	WHEEL – ALLOY – RENEW – INCLUDES CHANGING TIRE, VALVE AND BALANCING ASSEMBLY	ALL DERIVATIVES	0.5	USED WITHINS	+
74.10.06	WHEEL AND TIRE ASSEMBLY – EACH – REMOVE FOR ACCESS AND REFIT	ALL DERIVATIVES	0.2	USED WITHINS	+

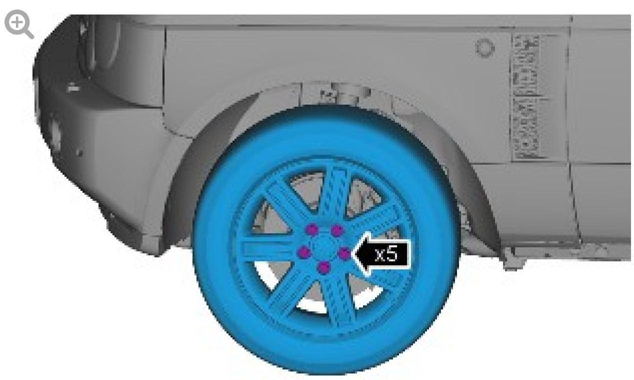
1. **WARNING:**

   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. **NOTE:**

   Left-hand shown, right-hand similar.



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Remove the wheel and tire.

- Remove the 5 nuts.

INSTALLATION

1. **CAUTION:**

> Apply a small amount of grease to the hub and wheel mating surfaces before installation. Make sure the grease does not come into contact with the vehicles braking components and the wheel stud threads. Failure to follow these instructions may result in personal injury.

To install, reverse the removal procedure.

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

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

SPECIFICATIONS

Air Suspension - General Specification

ITEM	SPECIFICATION
Ride height:	
Off road	55 mm (2.1 in) above standard
Access - reselectable whilst vehicle is moving	40 mm (1.6 in) below standard
High speed mode - non-selectable	20 mm (0.8 in) below standard
Trim height	Configured using the Land Rover approved diagnostic system
Height	

Height sensors:	
Location	Mounted to front and rear subframes with mechanical linkage to suspension lower arms
Height sensor arm color 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 control module
Output voltage	**Left-hand and right-hand rear:** Voltage decreases with compression and increases with rebound **Left-hand and right-hand front:** Voltage increases with compression and decreases with rebound
Spring/damper module types:	
Front	Unguided air spring surrounding twin tube damper
Rear	Unguided air spring, separate mono-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)
Air supply unit:	Comprises a piston compressor, 12 volt electric motor, solenoid operated exhaust pilot valve, pressure relief valve, air dryer unit and two silencers
Controlled by	Air suspension control module
Working pressure	1450 kPa (14.5 bar) (210.3 lbf/in²)
Maximum pressure	2700 kPa (27 bar) (391.6 lbf/in²)
Air reservoir:	
Volume	10.2 liters (622 cu.in)
Nominal working pressure	1440-1550 kPa (14.4-15.5 bar) (208.85-224.8 lbf/in²)

Maximum operating pressure	2200 kPa (22 bar) (319 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 at rear of right-hand front wheel arch behind liner
Rear	2 corner valves, 1 cross link valve - all mounted at right-hand rear wheel arch behind liner, adjacent to the fuel filler pipe

Torque Specifications

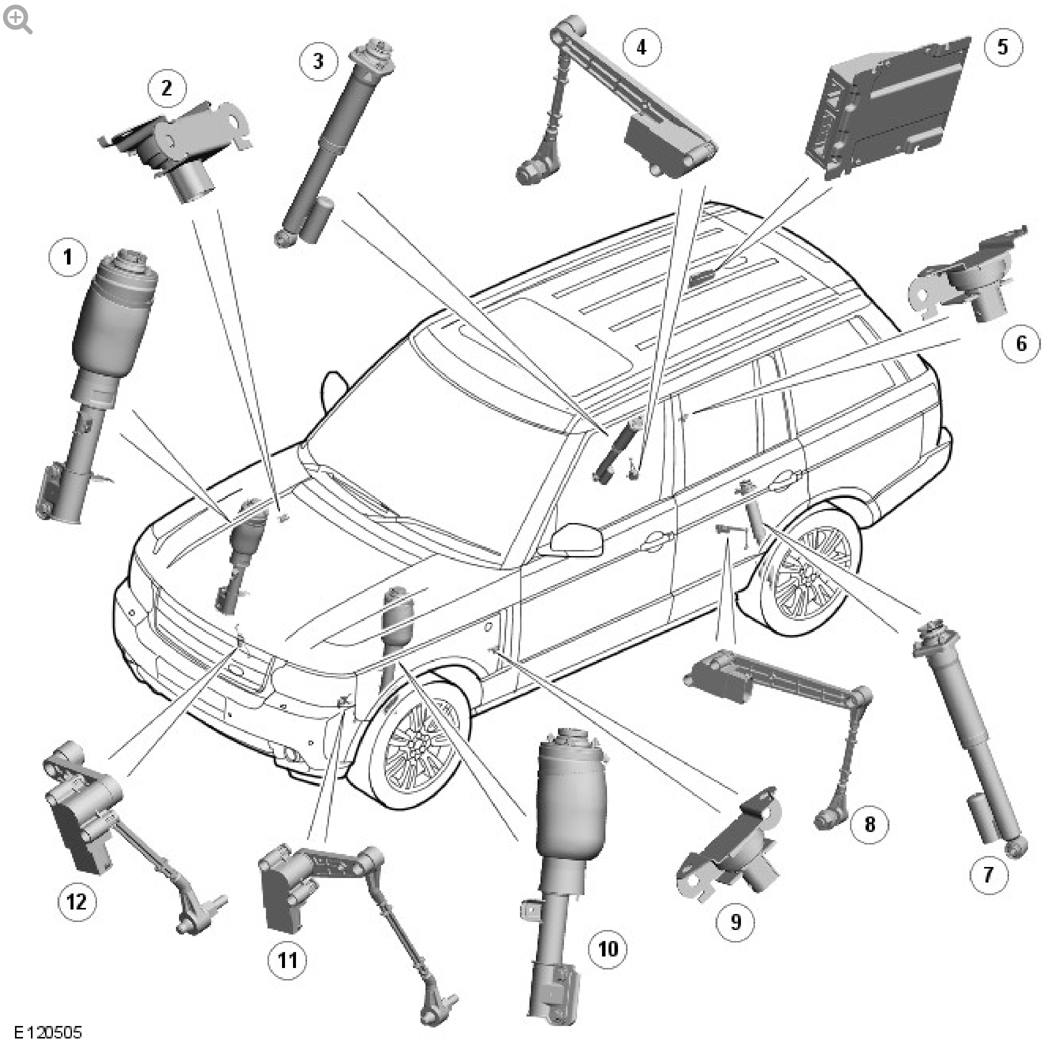
DESCRIPTION	NM	LB-FT
Air suspension compressor mounting bolts	10	7
Air suspension compressor upper and lower cover bolts	10	7
Voss connector to the front solenoid valve block	2.5	1.7
Voss connector to the rear solenoid valve block	2.5	1.7
Voss connector to the air suspension reservoir	5	4
Air suspension reservoir bolts:		
M6 bolt	10	7
Torx bolt	25	18
Air suspension pressure switch	5	4
Air suspension compressor drier screw	3	2.2
Air suspension compressor muffler bolts	10	7
Suspension height sensor Torx bolts	2	1.5

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

DESCRIPTION AND OPERATION

COMPONENT LOCATION



ITEM	DESCRIPTION

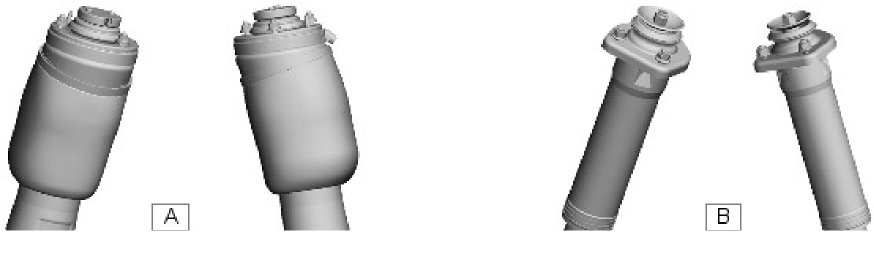
1	RH (right-hand) Front Shock Absorber Assembly
2	RH Front Accelerometer
3	RH Rear Shock Absorber Assembly
4	RH Rear Height Sensor
5	Adaptive Damping Module (ADM)
6	RH Rear Accelerometer
7	LH (left-hand) Rear Shock Absorber Assembly
8	LH Rear Height Sensor
9	LH Front Accelerometer
10	LH Front Shock Absorber Assembly
11	LH Front Height Sensor
12	RH Front Height Sensor

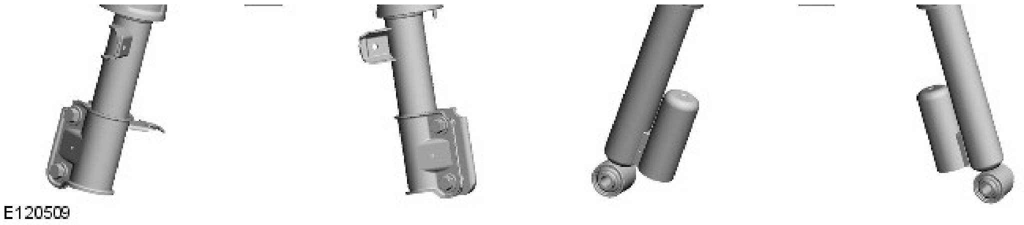
Continuously variable damping, known as Adaptive Dynamics, is available on Range Rover. Adaptive dynamics is an electronically controlled suspension system which continuously adjusts the damping characteristics of the suspension dampers in reaction to the current driving conditions.

Application of adaptive dynamics can be either a standard or option fit, dependant on vehicle variant.

The system is controlled by an Adaptive Damping Module (ADM). The ADM receives signals from three accelerometers, four suspension height sensors and from other vehicle systems to determine vehicle state, body and wheel motions and driver inputs. These signals are used by the ADM to continuously control the damping characteristics of each damper to the appropriate level resulting in optimum body control and vehicle ride.

DAMPERS





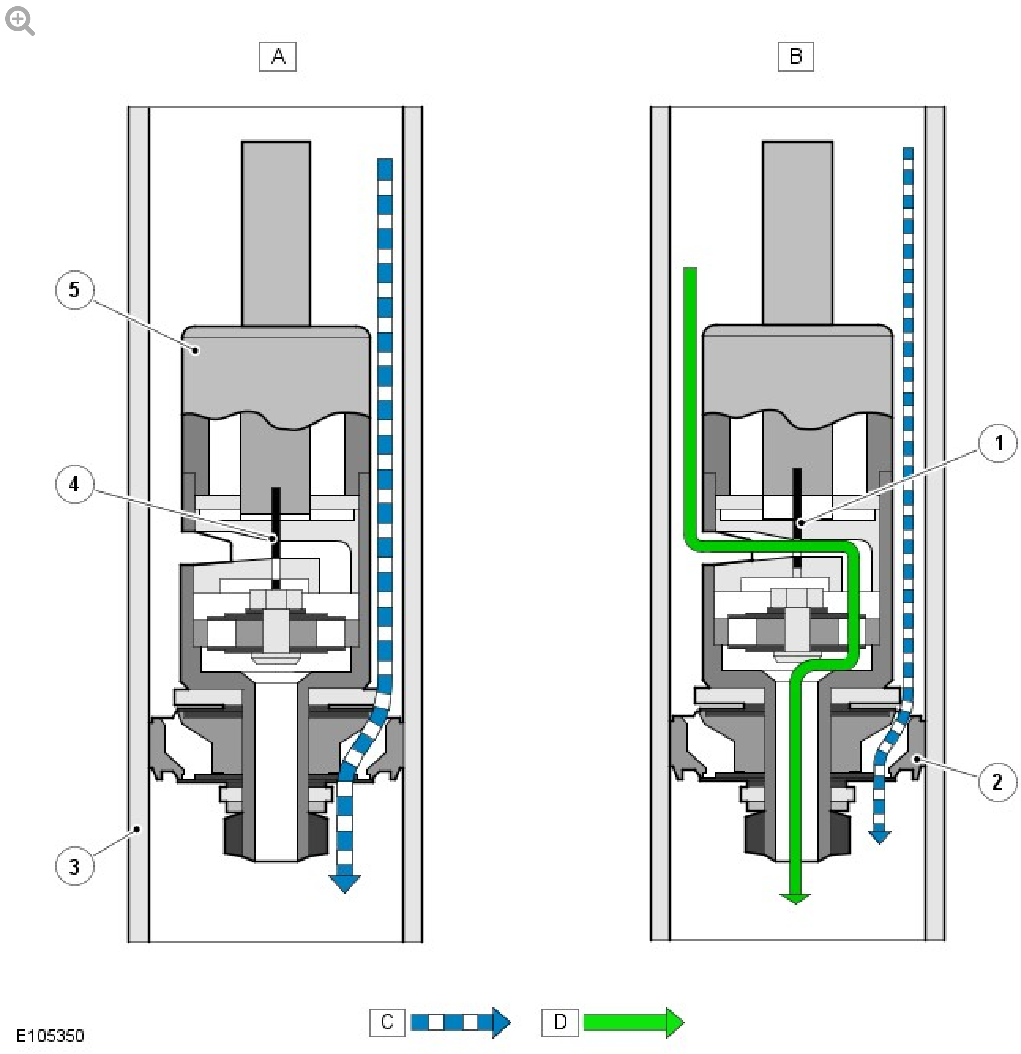
ITEM	DESCRIPTION
A	Front Dampers
B	Rear Dampers

The adaptive dynamics dampers are monotube, nitrogen gas and oil filled units. The dampers are continuously variable, which allows the damping force to be electrically adjusted when the vehicle is being driven. The dampers provide the optimum compromise between vehicle control and ride comfort. To maintain wheel travel, the rear dampers feature an additional external accumulator. This is to provide adequate rebound travel by recovering the volume through the external source. All the dampers have an electrical connector on the end of the piston rod, in the center of the top mount.

In each damper, the damping adjustment is achieved by a solenoid operated variable orifice, which opens up an alternative path for oil flow within the damper. When de-energized the bypass is closed and all the oil flows through the main (firm) piston. When energized the solenoid moves an armature and control blade, which work against a spring. The control blade incorporates an orifice which slides inside a sintered housing to open up the bypass as required. In compression, oil flows from the lower portion of the damper through a hollow piston rod, a separate soft (comfort) valve, the slider housing and orifice and into the upper portion of the damper, thereby bypassing the main (firm) valve. In rebound the oil flows in the opposite direction.

In the firm setting oil flows through the main (firm) valve only, but when the bypass is opened by any amount the oil flows through both valves in a pressure balance. When fully energized the solenoid moves the armature and therefore the slider to the maximum extension and opens the orifice completely. The damper operates continuously between these two boundary conditions.

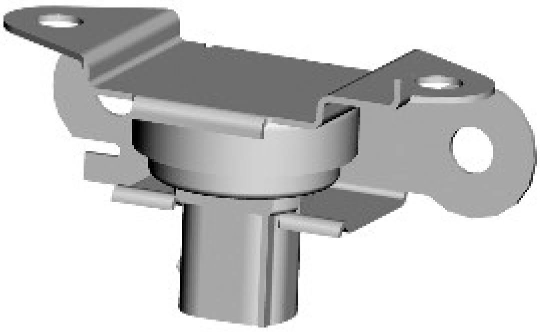
The solenoid in each damper is operated by a 526 Hz PWM signal from the ADM. When fully energized, the ADM applies a 1.5 A current to operate the damper in the soft setting. When de-energized (0.0 A) the damper is in the firm setting. The current varies continuously as required to increase and decrease the damping individually in each of the dampers.



ITEM	DESCRIPTION
A	Firm Setting
B	Soft Setting
C	Main Oil Flow
D	Bypass oil flow
1	Bypass valve (open)
2	Main valve

3	Tube
4	Bypass valve (closed)
5	Piston and rod assembly

ACCELEROMETERS



E105087

Three accelerometers are used in the adaptive dynamics system.

Accelerometers locations are as follows

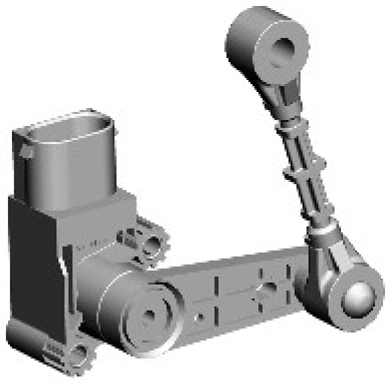
- Front left A pillar area (behind front wing)
- Front right A pillar area (behind front wing)
- Right rear luggage floor
- Center front bulkhead area (below wind shield)
- Right rear luggage area (behind light unit)
- Left rear luggage area (below rear window)

The accelerometers measure acceleration in the vertical plane and output a corresponding analogue signal to the ADM. The algorithms in the ADM calculate the heave, pitch and roll motions of the vehicle, which are used by the controller to control road induced body modes.

Each accelerometer is connected to the ADM via three wires, which supply ground, 5 V supply and signal return.

The sensing element comprises a single parallel plate capacitor, one plate of which moves relative to the other dependant on the force (acceleration) applied. This causes the capacitance to change as a function of applied acceleration. This capacitance is compared with a fixed reference capacitor in a bridge circuit and the signal is processed by means of a dedicated integrated circuit to generate an output voltage that varies as a function of applied acceleration. The sensors output a signal voltage of approximately 1 V/g ± 0.05 V/g.

HEIGHT SENSORS

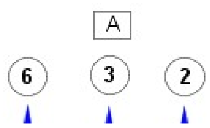


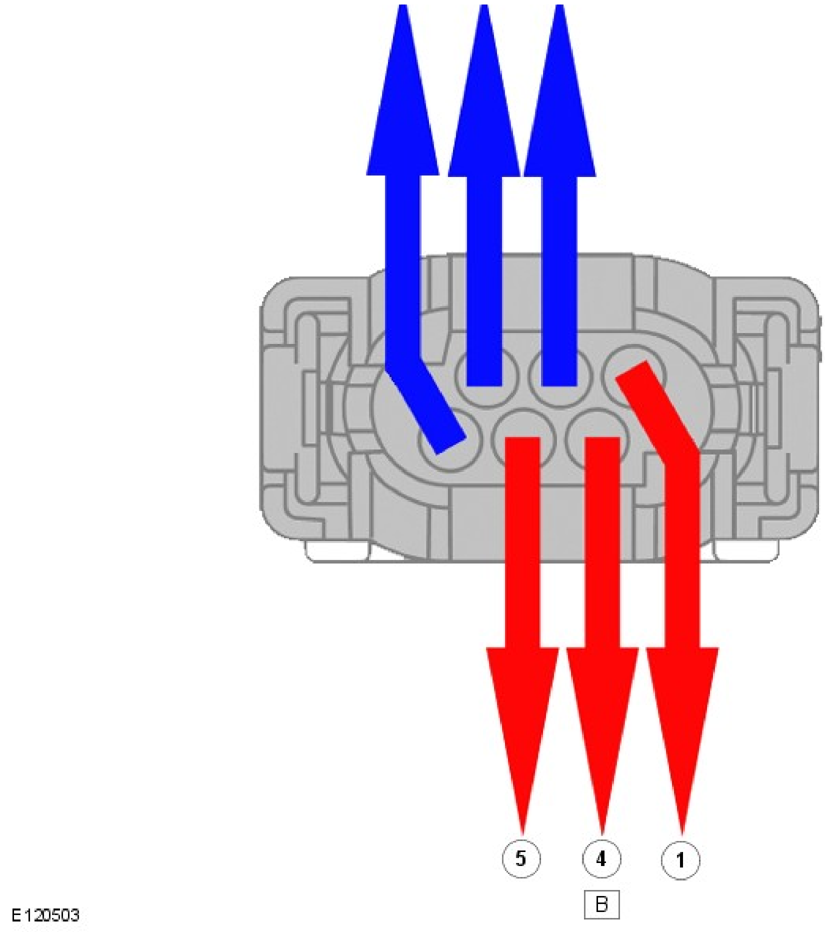
E105088

The four suspension height sensors that are used in the air suspension system also supply input to the adaptive dynamics system, two for the front suspension and two for the rear suspension. A front suspension height sensor is attached to each side of the front subframes and connected by a sensor arm and sensor link to the related lower lateral arm of the front suspension. A rear suspension height sensor is attached to each side of the rear subframe and connected by a sensor arm and sensor link to the related upper control arm of the rear suspension. On each suspension height sensor, the sensor arm and sensor link convert linear movement of the suspension into rotary movement of the sensor shaft.

The suspension height sensors measure suspension displacement at each corner of the vehicle and output a corresponding analogue signal to the ADM. The algorithms in the ADM calculate the position, velocity and frequency content of the signals and use the results for wheel control.

HEIGHT SENSOR WIRING

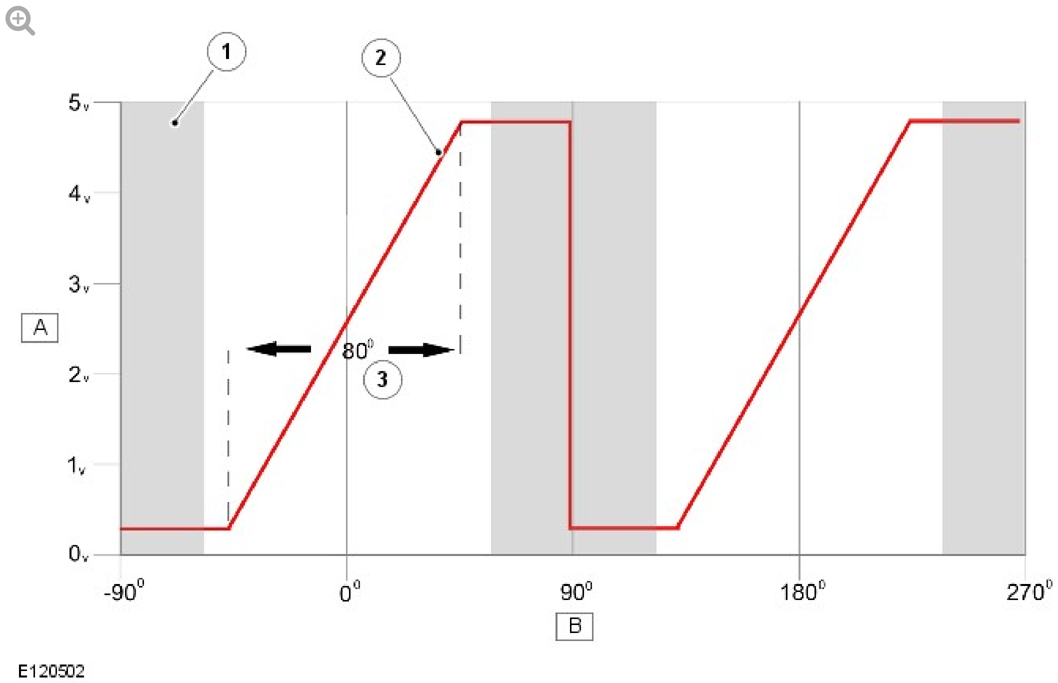




ITEM	DESCRIPTION
A	Adaptive Damping Module
B	Air Suspension Module
1	Ground
2	Ground
3	5v Supply
4	Signal Output (Air Suspension)
5	5v Supply
6	Signal Output (ADM)

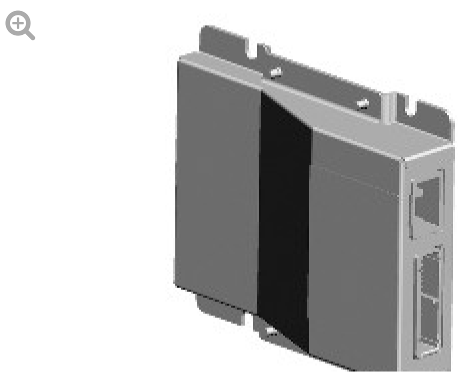
The sensing element consists of an array of hall effect devices arranged to measure the direction of the magnetic field of a small magnet attached to the end of the sensor shaft. As the sensor shaft rotates, so do the lines of magnetic flux from the magnet. The signals from the Hall effect elements are processed by means of a dedicated integrated circuit to generate an output voltage that varies as the sensor shaft is rotated. The sensor has a measurement range of ± 40° around its nominal position and the nominal sensitivity is 57 mV/° of shaft rotation. The graphic below [Fig:9] describes the repetition of the output signal as the sensor is rotated through and beyond 40°

Height Sensor Voltage



ITEM	DESCRIPTION
A	Sensor voltage
B	Angle of rotation
1	Outside measuring range
2	Voltage output
3	40 degree measuring range

ADAPTIVE DAMPING MODULE (ADM)



E105086

The adaptive damping module (ADM) is located in the RH rear quarter panel.

GENERAL

The air suspension system is a four corner system which is fitted to all models.

The 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
- Two front struts incorporating air spring damper modules
- Two rear air spring modules.
- Adaptive Damping Module (ADM)
- Air Suspension Switch

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, irrespective of vehicle load. Additionally, the system allows the driver to request ride height changes to improve off-road performance or ease access or loading. The system automatically adjusts the ride height to improve the vehicle handling and dynamics when speed increases or decreases. This is achieved by operating pneumatic control valves to increase or decrease the mass of air in the air springs.

The air suspension system has three driver selectable, pre-determined ride heights and an automated high speed ride height. A driver interface indicates the selected ride height and height change movement. Additional information is also relayed to the driver via the instrument cluster message center and by audible warnings also transmitted by the instrument cluster.

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

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

Access height can be selected using a switch on the floor console or a switch on the drivers door.

The system will temporarily inhibit height adjustments when the vehicle is subject to cornering, heavy acceleration or heavy braking. The inhibit function prevents unsettling of the vehicle by increasing the effective spring rates.

Height changes are also restricted for safety reasons, when a door is opened and the vehicle is stationary for example.

The air suspension system fitted to Range Rover is controlled by the air suspension control module which is located behind the RH rear quarter panel. The control module monitors the height of each corner of the vehicle via four height sensors, which are mounted in-board of each road wheel. The control module also performs an 'on-board diagnostic' function to perform 'health checks' on the system. If faults are detected, codes are stored in the control module and can be retrieved using the Land Rover approved diagnostic system.

The suspension geometry changes when moving from off-road to access heights. See the following table for data:

	FRONT	REAR
Toe change	30 mins	10 mins

Camber change	90 mins	90 mins

RIDE HEIGHT TOLERANCE CONTROL

The air suspension control module has two ride height tolerance bands; normal tolerance and tight tolerance.

The control module considers the vehicle to be at target height if the current height is within the appropriate tolerance band. Height adjustments are not made until the vehicle height falls outside of the tolerance band for a pre-determined time. The time period is different depending on if the vehicle is moving or stationary. The tolerance bands are as follows:

- Normal ± 10 mm
- Tight ± 3 mm.

The tight tolerance band is only used if set by the Land Rover approved diagnostic system for diagnostic purposes or when the vehicle has been stationary for more than 5 minutes.

OPERATING MODES

The driver can manually select, using the air suspension switch, 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 mode allows the vehicle to be driven at the access height at low speeds to provide increased roof clearance in low car parks etc.

HIGH SPEED - A non-selectable, automatic high speed mode is provided which lowers the vehicle height to improve vehicle handling.

NOTE:

NOTE:

> Vehicle height changes are restricted if the air suspension control module receives a 'Door Open' signal and the speed is less than 5 mph (8 km/h).

A complete vehicle delivery mode is available but is only selectable using the Land Rover approved diagnostic system. When this mode is active most vehicle systems, in addition to the air suspension, are inhibited or restricted to a minimal functionality. In this mode the air suspension is set to the transportation mode.

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.

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 system. 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 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 instrument cluster message center will display the message 'SUSPENSION FAULT' and a chime will be emitted. The fault should be investigated and rectified as soon as possible.

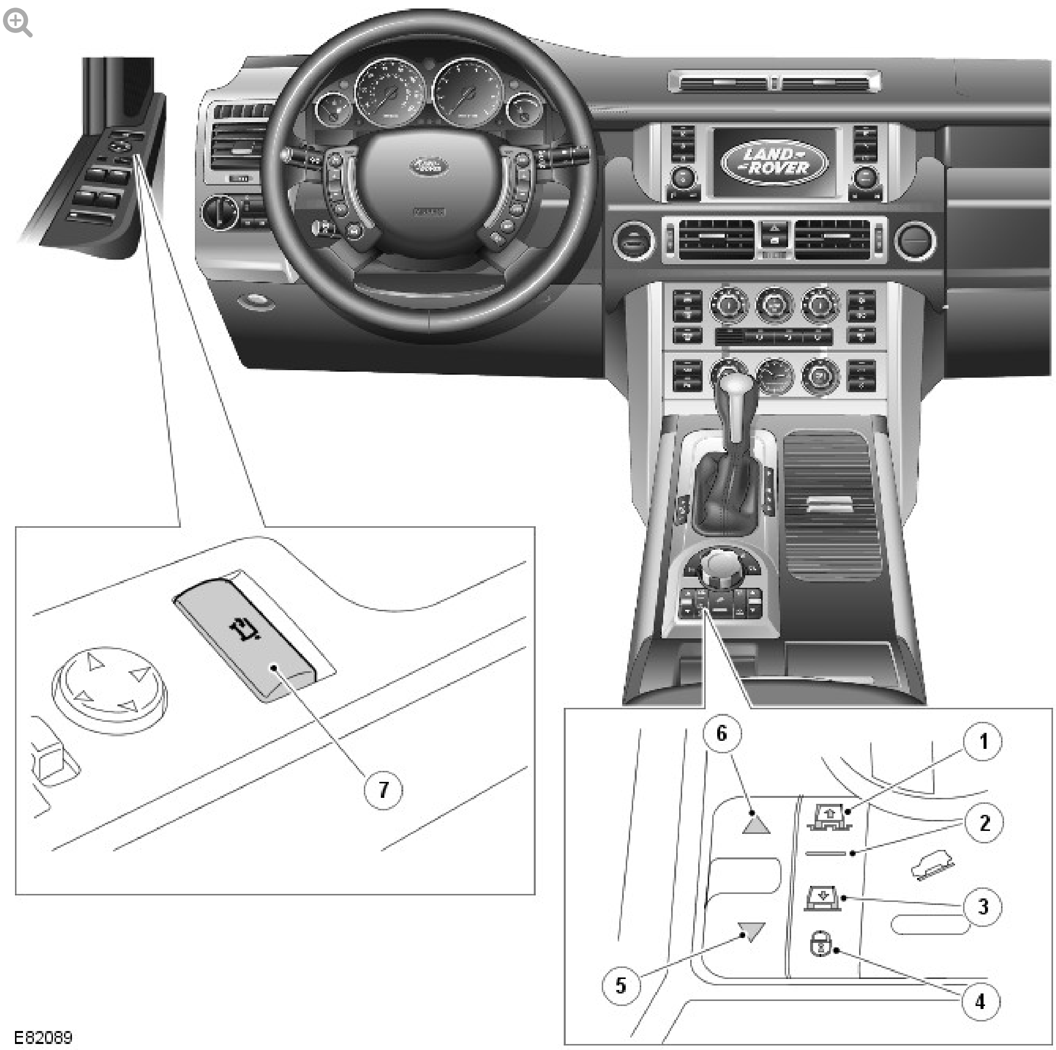
If the detected fault is more serious, the message center will display the message 'SUSPENSION FAULT NORMAL HEIGHT ONLY' and a chime will be emitted. The fault should be investigated and rectified as soon as possible.

If a fault is detected within the DSC (dynamic stability control) the message 'SUSPENSION LOWERED FOR SAFETY' and a chime will be emitted. This is not a fault with the air suspension system. The fault should be investigated and rectified as soon as possible.

If the detected fault is more severe the message center will display the message 'SUSPENSION FAULT MAX SPEED 50KPH' and two chimes will be emitted every thirty seconds if this speed is exceeded. The message will change to 'SUSPENSION FAULT' when the vehicle speed is reduced to less than 31 mph (50 km/h). The vehicle should be driven slowly until the fault is rectified.

All information messages will be displayed for four seconds.

Air Suspension Control Switch



ITEM	DESCRIPTION
1	Off-road height light emitting diode (LED)
2	On-road (normal) height LED
3	Access height LED
4	Crawl mode LED
5	Height change (lowering) switch and LED
6	Height change (raising) switch and LED
7	Drivers door module access switch

ON-ROAD MODE

This is the normal ride height for the vehicle.

OFF-ROAD MODE

Off-road mode will only be selectable 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.

ACCESS MODE

Access mode lowers the vehicle body height by 40 mm (1.6 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 LED and the lowering LED 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 LED will illuminate. When part lowered is reached, the lowering LED 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 LED and the lowering LED will illuminate. When the access mode height is reached, the lowering LED 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 'Access' height change switch once, or pressing the lowering switch twice before the lowering LED 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).

Alternatively, pressing the drivers door module access switch once will perform the same function.

CRAWL (LOCKED AT ACCESS) MODE

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 up to 21.7 mph (35 km/h) with a long press of the switch in a 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 24.8 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 now be extinguished.

HIGH SPEED MODE

High speed mode is a non-selectable, automatic mode which lowers the vehicle height by 20mm 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 five 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 the On-Road height. This function is cancelled if a trailer is connected to the trailer socket.

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 a predetermined threshold.

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 LED and either the raising or lowering LED 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 LED on the air suspension LED display for the target mode height will remain illuminated and the raising or lowering LED will flash.

If all of the doors are closed within 90 seconds, the height change will resume. If the 90 second period is exceeded, the message 'CONFIRM REQUIRED SUSPENSION HEIGHT' will be displayed in the instrument cluster.

EXTENDED MODES

Raise Inhibit Raise inhibit is a reactive mode invoked when the following conditions are satisfied, vehicle speed below 10kph and vehicle raising very slowly. Raise inhibit is normally invoked when vehicle is lifting against an obstacle, it can also be used when the vehicle is winching or is tethered down.

JackingJacking is a reactive mode invoked when the following conditions are satisfied, vehicle stationary, system attempts to level the vehicle down and rate of vehicle lowering is below a predefined threshold for a predefined time. Jacking mode is normally invoked under the following conditions, vehicle jacking or vehicle grounded and stationary

Lower Inhibit Lower inhibit is a reactive mode invoked when the following conditions are satisfied, vehicle stationary, rate of vehicle lowering is below a predefined threshold for a predefined time. Lower inhibit is normally invoked under the following conditions, vehicle lowered onto an obstacle during a height change.

Belly-Out Belly-Out is a pro-active mode invoked when the following conditions are satisfied, vehicle moving and speed is below 50kph, traction activity is induced on axle pairs for fixed period of time and wheel heights above a predetermined threshold on coinciding axle pairs for the same fixed period of time. Belly-Out is normally invoked under the following condition, vehicle is attempting to move and with low levels of traction and supported by an obstacle.

Additional Lift Additional lift may be beneficial for extracting a stuck vehicle or trying to negotiate obstacles requiring pure ground clearance where a loss of articulation caused by the increase in ride height is acceptable. Additional lift can be activated the vehicle must be in 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 alternatively drive the vehicle at a speed of more than 2 mph (3 km/h) for 45 seconds.

ADDITIONAL LIFT 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 been activated on soft surfaces.

The additional lift can be requested once the height change LED has extinguished. Press and hold the air suspension switch in the up position 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 LED will be illuminated while the vehicle is being accepted. The raising LED 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 re-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.

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 twenty four 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. The suspension transportation mode is automatically set when the vehicle is configured for delivery mode using the Land Rover approved diagnostic system. Delivery mode also affects other vehicle systems which are inhibited or restricted to a minimal functionality.

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 transportation mode is active, the air suspension switches are disabled. Periodic re-leveling is also disabled.

When the engine is started, the air suspension control module will cause the vehicle to rise to a height of –20mm to allow sufficient ground clearance for the vehicle to be loaded. While the height is changing, all the LED's in the air suspension control switch will flash and a chime will be emitted by the instrument cluster. When the height of –20mm is reached, all the LED's will illuminate continuously and the chime will stop.

When the engine is switched off, the air suspension control module will cause the vehicle to lower to a height of –60mm to allow the vehicle to be strapped down. While the height is changing, all the LED's in the air suspension control switch will flash. When the height of –60mm is reached, all the LED's will illuminate continuously.

CALIBRATION MODE

This mode is used when the air suspension control module has been replaced or a height sensor or suspension component has been dismantled or replaced.

The following conditions apply when the vehicle is in calibration mode:

- The ride height is set to tight tolerance
- Fault reaction to vehicle identification number (VIN) mis-match with the Car Configuration File (CCF) is disabled
- The raise, lower, access and hold switches are disabled
- System is controlled to on-road height only.
- Message "Air suspension not in customer mode" is displayed in the instrument pack.

AIR SUSPENSION COMPONENTS

The air suspension comprises the following:

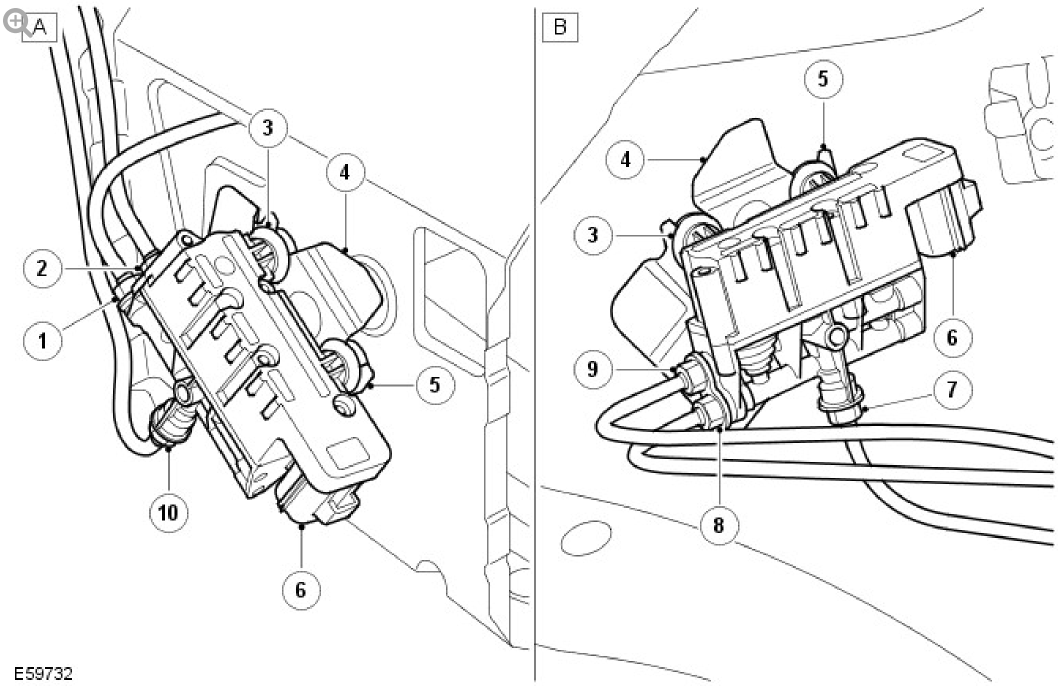
- Two front struts incorporating air springs
- Two rear air springs
- Front and rear valve blocks
- Reservoir valve block incorporating a pressure sensor
- An air reservoir

- Four height sensors
- Air supply unit
- Air suspension control module
- Air supply pipes
- Air suspension control switch.

The air suspension system is controlled by the air suspension control module. The control module is located in the RH rear quarter panel.

VALVE BLOCKS

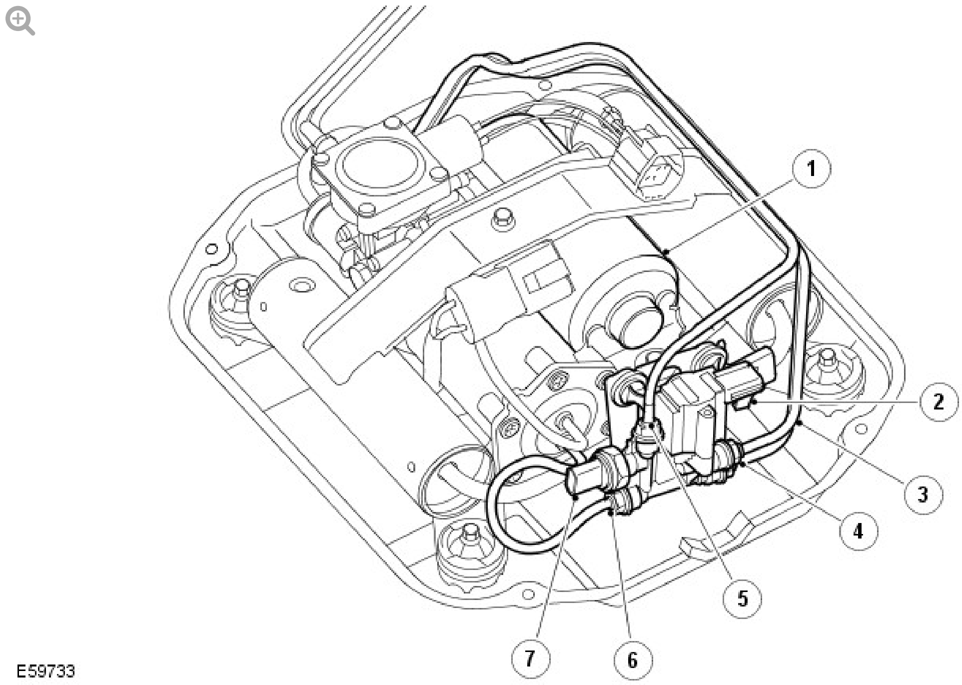
Front and Rear Valve Blocks



ITEM	DESCRIPTION
A	Front valve block
B	Rear valve block
1	Air inlet/outlet to reservoir valve block (Blue pipe)
2	RH front air spring harness connection (Yellow pipe)
3	Isolation rubber mounts
4	Mounting bracket
5	Location slots

6	Electrical connector
7	right-hand (RH) rear air spring harness connection (Yellow pipe)
8	Air inlet/outlet to reservoir valve block (Blue pipe)
9	left-hand (LH) rear air spring harness connection (Black pipe)
10	LH front air spring harness connection (Black pipe)

Reservoir Valve Block



ITEM	DESCRIPTION
1	Air supply unit
2	Electrical connector
3	Air harness connection to reservoir (Black pipe)
4	Air inlet/outlet to rear valve block (Blue pipe)
5	Air inlet/outlet to front valve block (Blue pipe with white tape)
6	Air harness connection to air supply unit (Black pipe)
7	Pressure sensor

Front and Rear Valve Blocks

The front and rear 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 and may result in misleading diagnostic trouble code (DTC)'s being set.

The front valve block is attached to a bracket at the rear of the right hand front wheel arch, behind the wheel arch liner. The valve block has three attachment lugs which are fitted with isolation rubber mounts. The rubber mounts locate in 'V' shaped slots in the bracket. 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 attached to a bracket at the top of the right hand rear wheel arch, behind the wheel arch liner and adjacent to the fuel filler pipe. The valve block has three attachment lugs which are fitted with isolation rubber mounts which locate in the bracket in three slotted holes. 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.

Reservoir Valve Block

The four way reservoir valve block is located in the air supply unit sealed housing. The valve block is attached to a bracket at the rear of the air supply unit on three attachment lugs which are fitted with isolation rubber mounts.

The isolation rubber mounts locate in the 'V' shaped slots in the bracket and are pushed downwards into positive location in the slots.

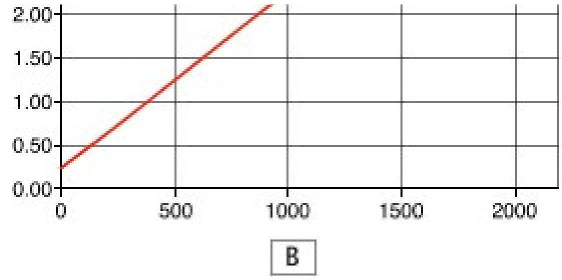
The valve block controls the storage and distribution of air from the air supply unit and the reservoir and contains an integral system pressure sensor.

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 block 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 air supply to and from the reservoir. When energized, the solenoid opens the valve 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 14.5 bar gage (210 lbf/in^2).

The following graph shows nominal pressure values against sensor output voltage.



E61677

ITEM	DESCRIPTION
A	Output voltage (V)
B	Pressure (kPa)

Removal of the reservoir valve block will require full depressurization of the reservoir. The valve block is a non-serviceable item and should not be disassembled other than for replacement of the pressure sensor.

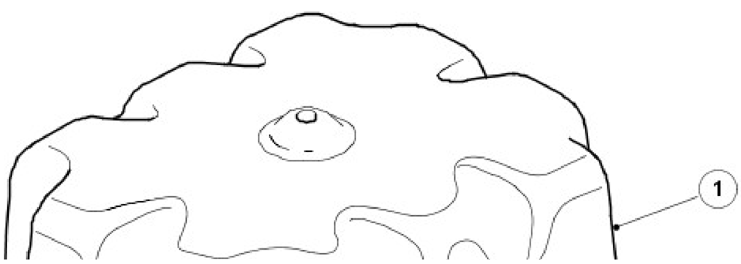
Valve Block Solenoid Specifications

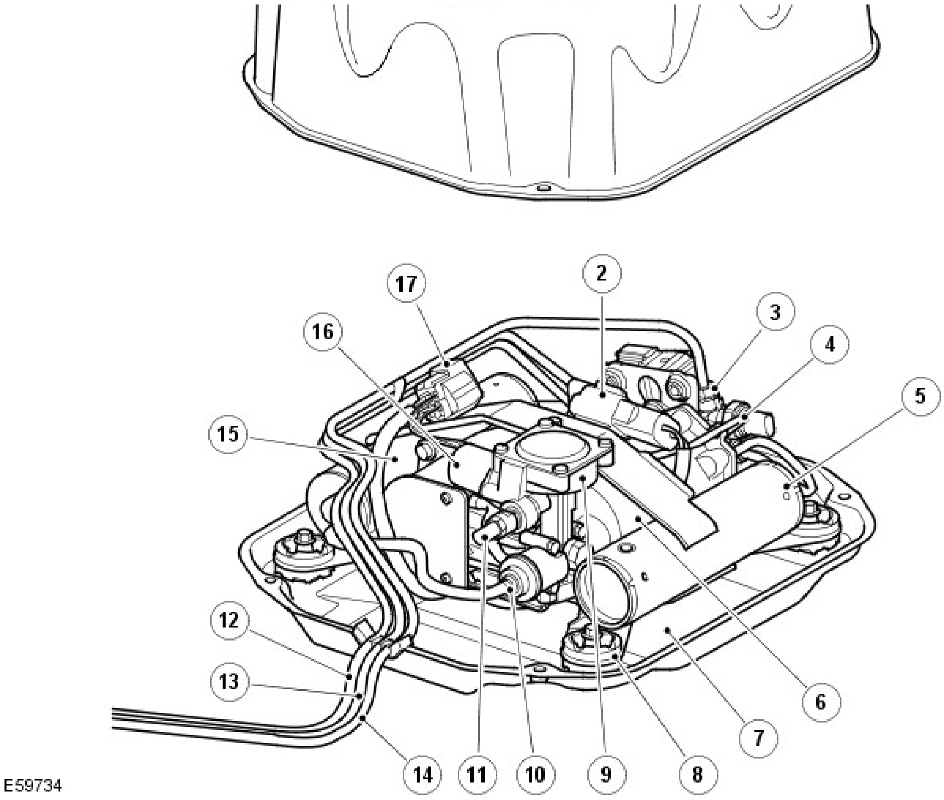
DESCRIPTION	VALUE
Coil resistance at 20°C (68°F)	2.05 Ohms ± 10%

NOTE:

Resistance values will vary with coil temperature. Resistance of test leads must be measured before any readings are taken. Resistance value of the test leads must be subtracted from final solenoid resistance value.

AIR SUPPLY UNIT





ITEM	DESCRIPTION
1	Cover
2	Motor electrical connector
3	Reservoir valve block
4	Pilot air pipe
5	Secondary silencer
6	Air dryer
7	Base plate
8	Rubber mount (4 off)
9	Exhaust valve
10	Intake pipe
11	Exhaust silencer
12	Air harness to front valve block
13	Air harness to reservoir
14	Air harness to rear valve block
15	Secondary silencer
16	Pilot exhaust valve

17	Solenoid and sensors electrical connector

The air supply unit fitted from 2006MY is an improved unit providing quieter operation. Two silencer units are incorporated into the unit assembly to reduce operating noise.

The air supply unit is located in a housing which is mounted in the spare wheel well and secured with four bolts into threaded inserts to the vehicle floorpan. The unit is isolated from the vehicle body via four rubber isolation mounts.

The reservoir valve block is also located within the housing on a separate bracket at the rear of the unit.

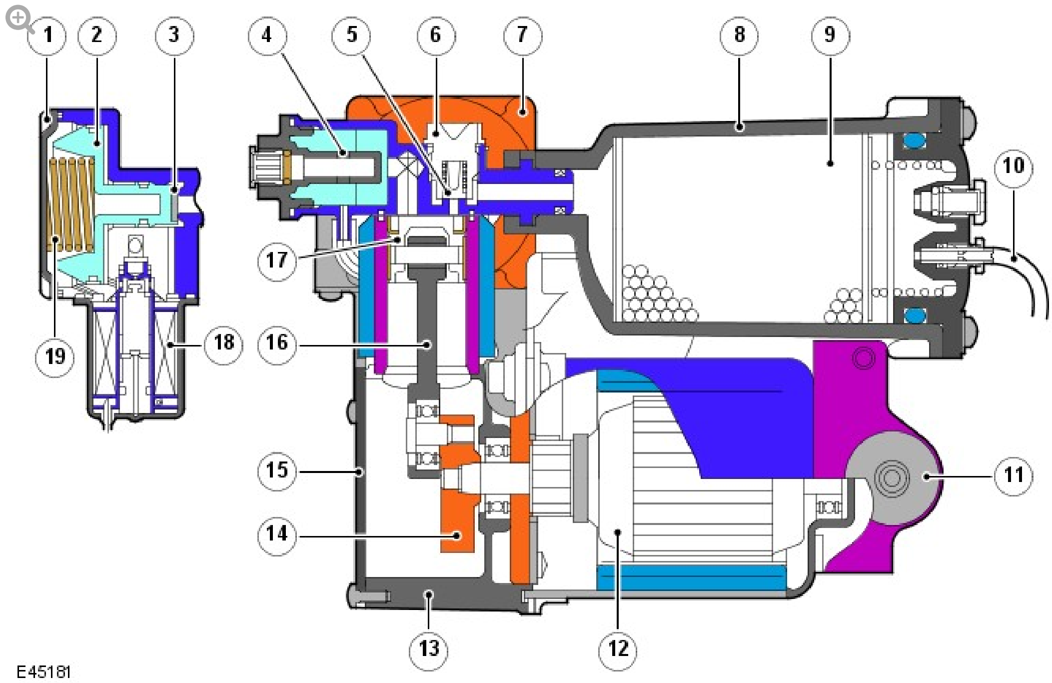
The unit is connected to the system via a single air pipe to the reservoir valve block. Three air pipes from the reservoir valve block pass through an aperture in the unit housing and through a grommet in the wheel well. It is important to ensure that this grommet is not disturbed and correctly installed. Incorrect fitment will allow water to enter the wheel well leading to possible damage to and failure of the air supply unit.

The unit comprises a piston compressor, a 12V electric motor, a solenoid operated exhaust pilot valve, a pressure relief valve, an air dryer unit and two silencers.

The electric motor, compressor, air dryer and pressure limiting and exhaust valve are mounted on a frame which in turn is mounted on flexible rubber mountings to reduce operating noise. The unit is mounted on a pressed base plate which is located on the floor of the wheel well. The unit is protected by a pressed cover which is lined with an insulating foam further limiting the operating noise.

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. 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.



ITEM	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 air pipe
11	Isolation rubber mount (not fitted to Range Rover)
12	Motor assembly

13	Crankcase
14	Crank
15	Crankcase cover
16	Connecting rod
17	Piston
18	Pilot exhaust valve
19	Spring - slave valve (pressure relief)

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 Printed Circuit Board (PCB) assembly. The sensor is connected to the air suspension control module which monitors the motor temperature and can suspend motor operation if the operating thresholds are exceeded.

The following table shows the control module operating parameters for the differing air supply unit functions and the allowed motor operating temperatures.

Motor Operating Temperatures

	LEVELING	RESERVOIR FILLING

PRINCIPLES OF OPERATION

For additional information on the operation of the Air Suspension system, refer to the relevant section of the workshop manual.

INSPECTION AND VERIFICATION

CAUTION:

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

1. Verify the customer concern.

1. Confirm which, if any, warning lights and/or messages were displayed on the instrument cluster. For a list of messages, refer to the relevant section of the workshop manual.

1. Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

MECHANICAL	ELECTRICAL
▪ Air leakage ▪ Air springs ▪ Reservoir ▪ Compressor ▪ Compressor air filter ▪ Pipework and unions ▪ Sensor installation ▪ Valve block(s)	▪ 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 ▪ Valve block(s) ▪ Air suspension control module

1. If an obvious cause for an observed or reported concern is found

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

1. Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

SYMPTOM CHART

SYMPTOM	POSSIBLE MESSAGE	POSSIBLE CAUSES	ACTION
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 - Faulty height sensor	Where possible, 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	Where possible, refer to the guided diagnostic routine on the approved diagnostic system.
After vehicle left over-night or for some days system regularly	- Suspension vehicle	- Leaking air	Where possible, refer to the

some days system regularly indicates "Suspension vehicle raising slowly" when first driving off	vehicle raising slowly	air spring(s) ▪ Leaking reservoir	refer to the guided diagnostic routine on the approved diagnostic system.
Changes between different ride-heights are not smooth	▪ -	▪ Faulty height sensor	Where possible, 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: (100-00)

Diagnostic Trouble Code (DTC) Index - DTC: Module Name: Adaptive Damping Control Module (Description and Operation),
Diagnostic Trouble Code (DTC) Index - DTC: Module Name: Air Suspension Control Module (Description and Operation).

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

AIR SUSPENSION SYSTEM DEPRESSURIZE AND PRESSURIZE (G892809)

GENERAL PROCEDURES

60.50.38	SUSPENSION - DEPRESSURISE - REPRESSURISE	ALL DERIVATIVES	0.3	USED WITHINS	+

WARNINGS:

- A small amount of air pressure will be left in the air suspension system.

- Eye protection must be worn.

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 is pressurised. Make sure dirt or grease does not enter the system. Always wear hand, eye and ear safety standard protection when working on the system.

   Using the Land Rover approved diagnostic system, depressurize the air suspension.

   - Follow the on-screen prompts.

2. Disconnect the Land Rover approved diagnostic system from the vehicle.

VEHICLE DYNAMIC SUSPENSION

RIDE HEIGHT ADJUSTMENTS

(G1234886)

GENERAL PROCEDURES

60.90.03	CALIBRATE - AIR SUSPENSION	ALL DERIVATIVES	0.3	USED WITHINS	+

SPECIAL TOOL(S)

204-557B

Gauge, Ride height

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.

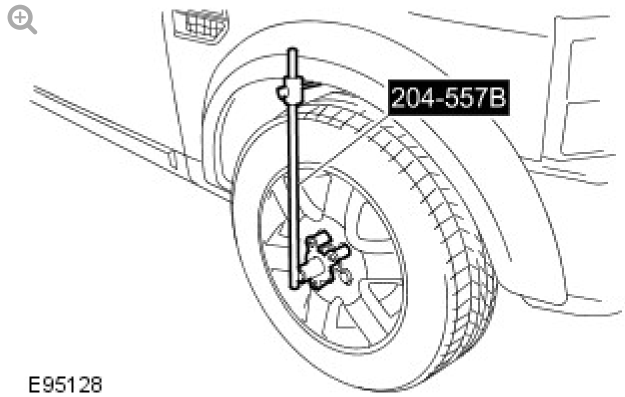
5. **CAUTION:**

   The diagnostic tool will cause the vehicle height to change during some parts of the calibration process.

   NOTES:

   - Do not install the special tool over a locking wheel nut.
   - Make sure the special tool is square to the wheel face with the measuring rod in a vertical position.

- Take the measurement from the top edge of the slider on the special tool.
- 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.

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

AIR SUSPENSION AIR FILTER

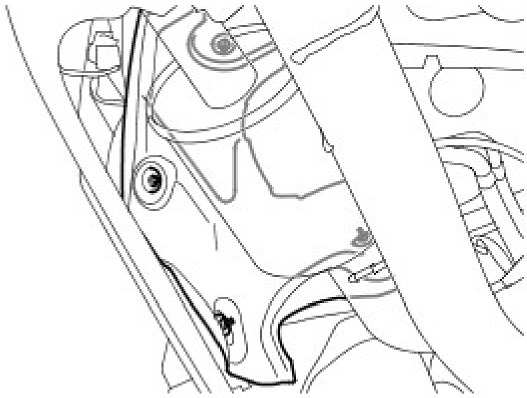
(G426769)

REMOVAL

1. Open the liftgate and tailgate.

2. Remove the spare wheel and tire.

3.



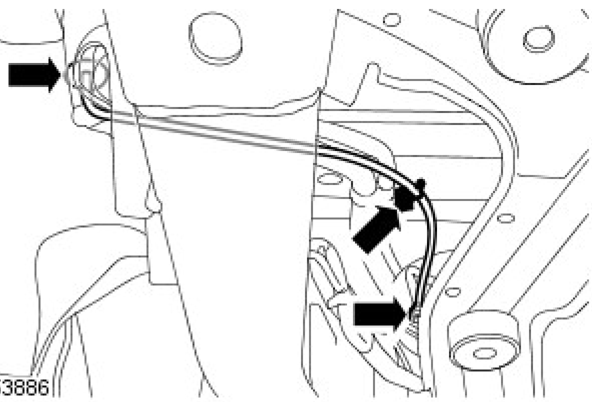
E53885

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.



E53886

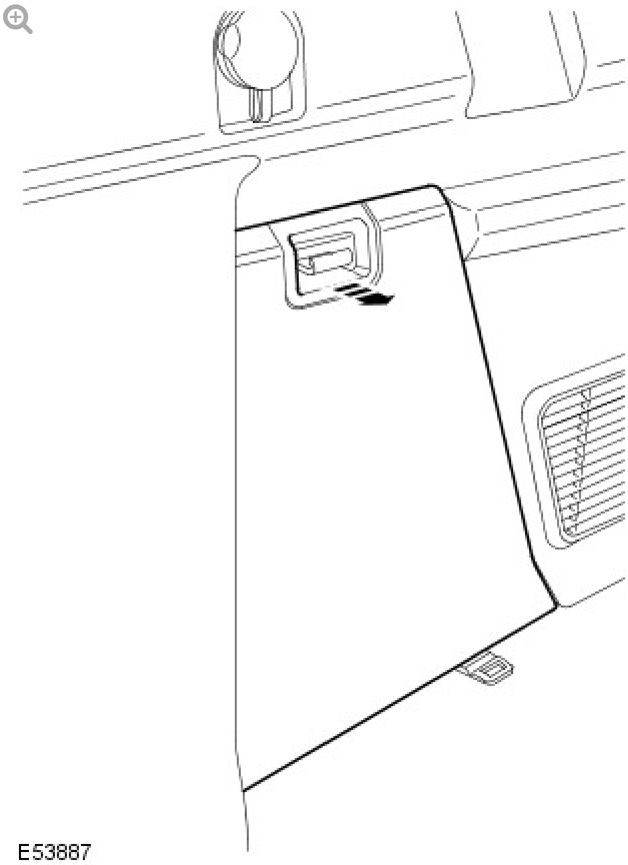
Detach the air suspension intake filter.

- Release the grommet.

- Release the grommet.

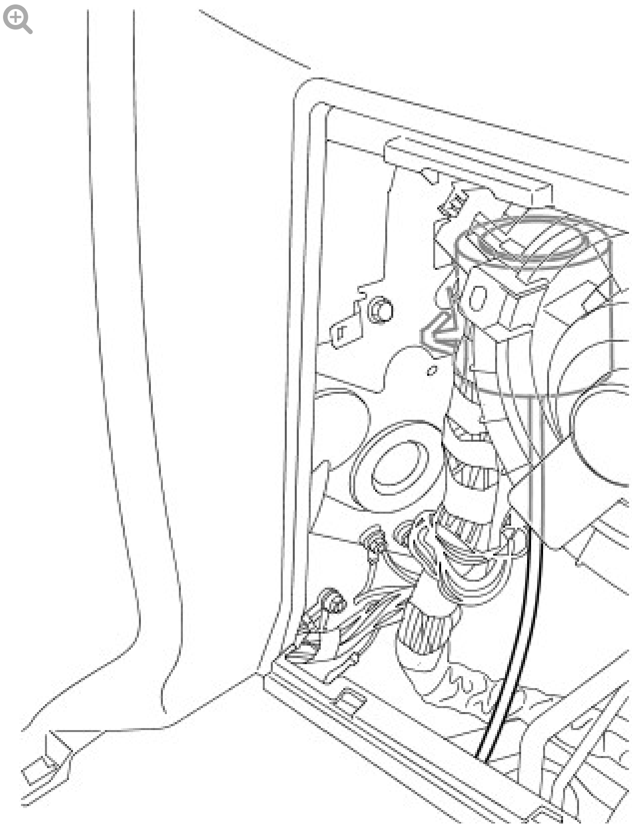
- Release from the clip.

7.



Remove the LH lower rear quarter trim access panel.

8.



E53888 

Remove the air suspension intake filter.

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.

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

AIR SUSPENSION COMPRESSOR (G1234884)

REMOVAL AND INSTALLATION

60.50.10	COMPRESSOR – RENEW	5000 CC, AJ V8	0.8	USED WITHINS	+

REMOVAL

CAUTION:

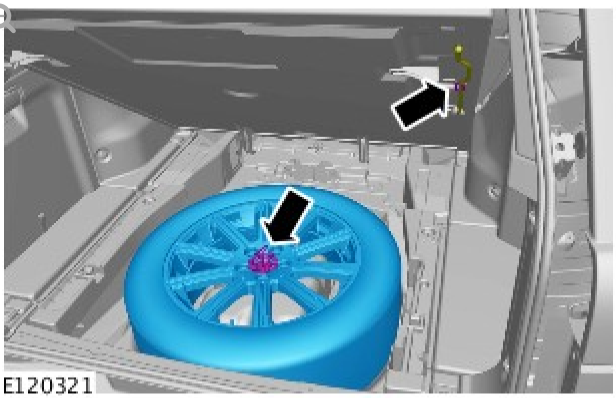
If a new air suspension compressor, air compressor drier or air compressor delivery valve kit is installed due to failure, an air compressor relay must be installed. Failure to follow this instruction may result in damage to the air suspension system components.

NOTES:

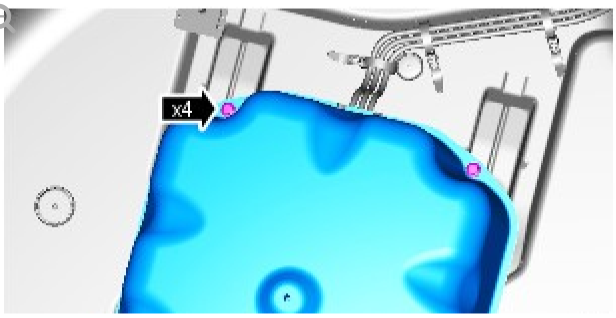
- Removal steps in this procedure may contain installation details.
- Lower the suspension ride height to access level, using the ride height control switches.

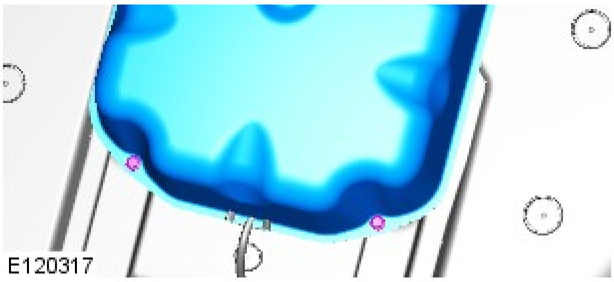
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Charging System - General Information, Specifications).

2. For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

3. 

   Remove the spare wheel and tire.

4. 

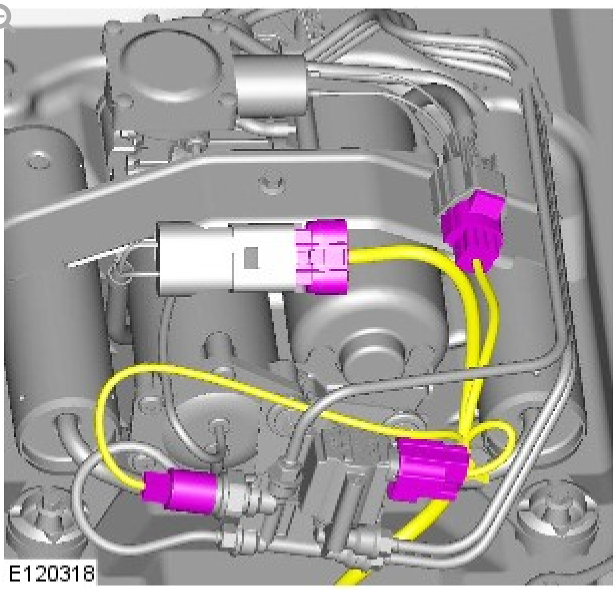


- TORQUE: 10 Nm

5.

CAUTION:

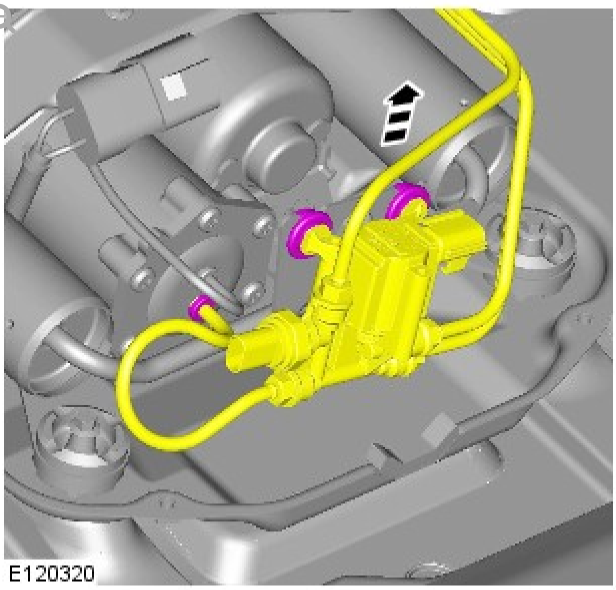
Before disconnecting or removing the components, ensure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.



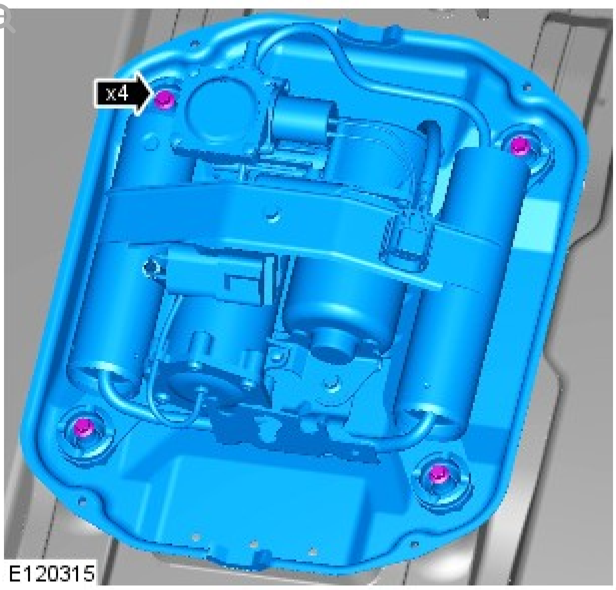
6.

CAUTIONS:

- 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.
- Visually inspect the air line ends for damage or wear. Replace the air line as necessary.



7.

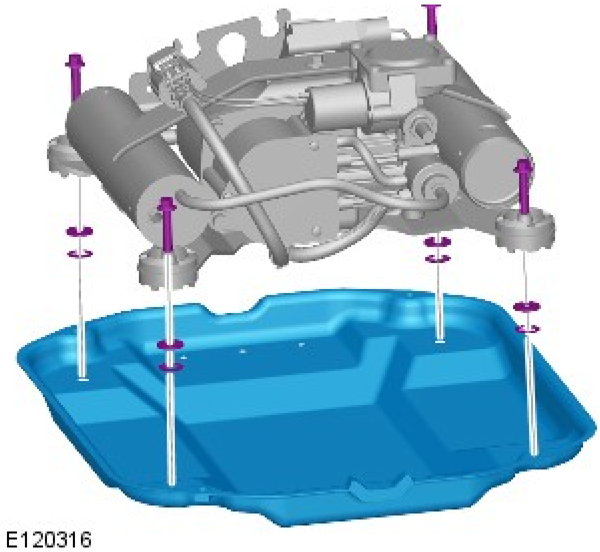


- TORQUE: 10 Nm

8.

NOTES:

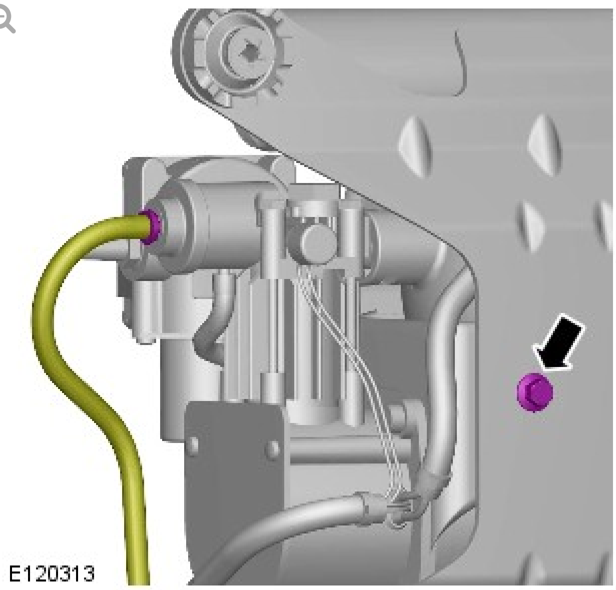
- Do not disassemble further if the component is removed for access only.
- Note the fitted position of the washers.



9.

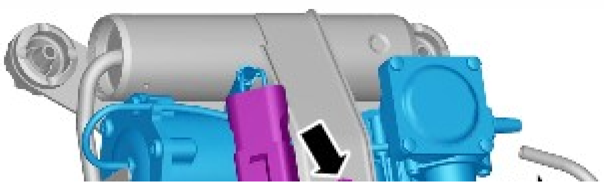
CAUTION:

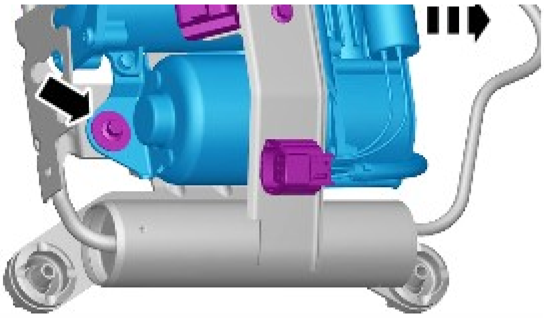
Visually inspect the air line ends for damage or wear. Replace the air line as necessary.



- TORQUE: 10 Nm

10.





E120314

Remove the air suspension compressor.

- TORQUE: 10 Nm

INSTALLATION

1. To install, reverse the removal procedure.

VEHICLE DYNAMIC SUSPENSION

AIR SUSPENSION COMPRESSOR DRIER (G1234885)

REMOVAL AND INSTALLATION

60.50.09	AIR DRYER - RENEW	5000 CC, AJ V8	0.8	USED WITHINS	+

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.

NOTE:

Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

For additional information, refer to: Specifications (414-00 Charging System - General Information, Specifications).

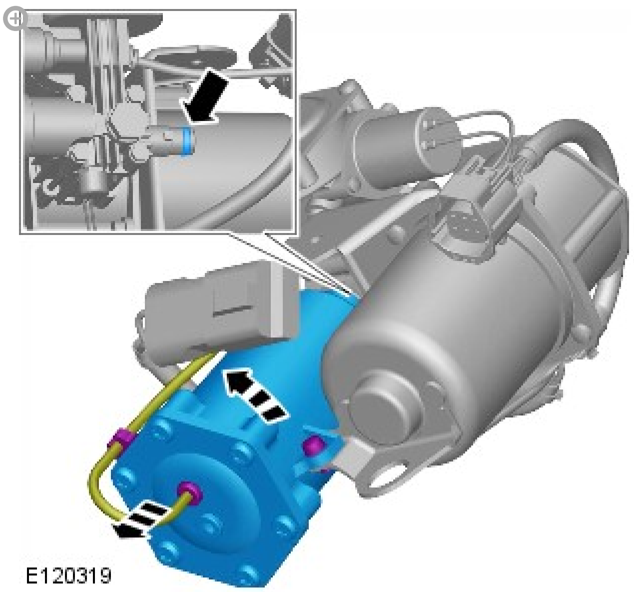
2. Remove the air suspension compressor.
For additional information, refer to: Air Suspension Compressor (204-05 Vehicle Dynamic Suspension, Removal and Installation).

3. **CAUTIONS:**

- 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.
- Visually inspect the air line ends for damage or wear. Replace the air line as necessary.

NOTE:

Remove and discard the O-ring seal.



- TORQUE: 3 NmLubricate the O-ring with a lithium based grease.

INSTALLATION

INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

AIR SUSPENSION CONTROL MODULE

MODULE (G1226133)

REMOVAL AND INSTALLATION

60.50.04	ELECTRONIC CONTROL UNIT - RENEW	5000 CC, AJ V8	0.2	USED WITHINS	+
60.50.04	ELECTRONIC CONTROL UNIT - RENEW	ALL DERIVATIVES	0.6	USED WITHINS	+

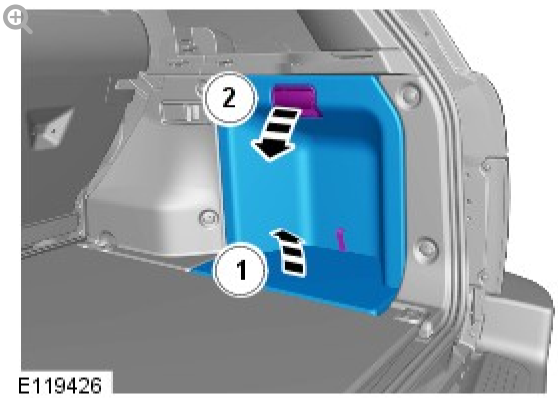
REMOVAL

NOTE:

Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

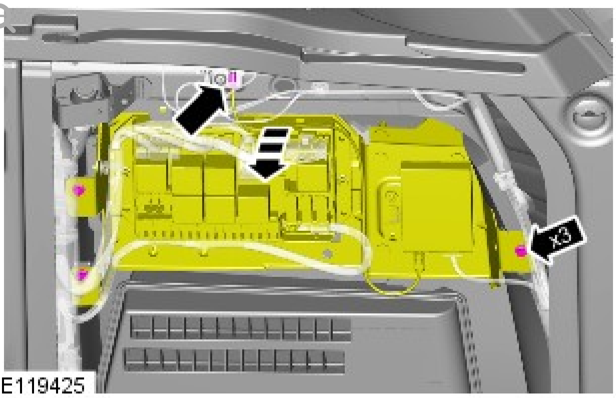
   For additional information, refer to: Specifications (414-00, Specifications).

2. 

3. **CAUTION:**

   Take extra care not to damage the wiring harnesses.

Take extra care not to damage the wiring harnesses.

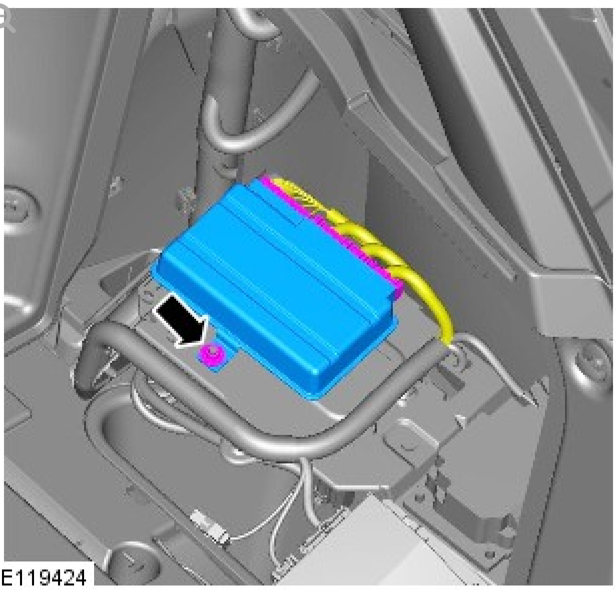


- TORQUE: 8 Nm

4.

CAUTION:

Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean.



- TORQUE: 9 Nm

INSTALLATION

1. To install, reverse the removal procedure.

2. **CAUTION:**

> Calibration of the air suspension system must be carried out after the following components have been replaced: air suspension control module, suspension height sensor, suspension components and body panels incorporating suspension fixing points.

Configure the air suspension control module using the diagnostic tool.

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

AIR SUSPENSION FRONT SOLENOID VALVE BLOCK (G939467)

REMOVAL AND INSTALLATION

60.50.11	VALVE BLOCK ASSEMBLY – RENEW	ALL DERIVATIVES	1	USED WITHINS	+

REMOVAL

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Charging System - General Information, Specifications).

2. **WARNING:**

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

   Raise and support the vehicle.

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

4. Using T4, depressurize the air suspension.
   For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

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.

   NOTE:

   Note the air line fitted positions.

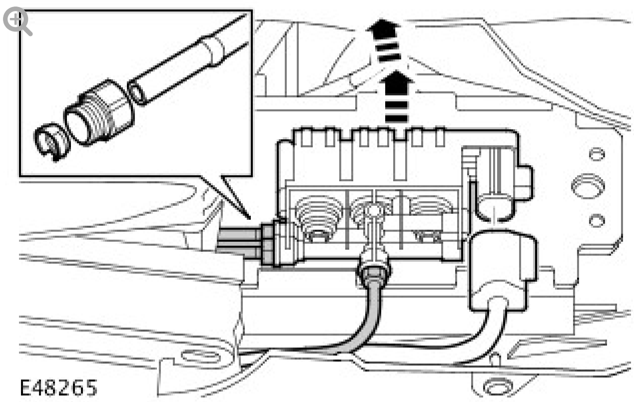
   Disconnect the 3 air lines from the air suspension front solenoid valve block.

6. Remove the air suspension front solenoid valve block.

- Disconnect the electrical connector.
- Release the 3 valve block rubber insulators.

7. **CAUTIONS:**

- Break the voss collet to remove, attempting to slide the collet from the air line will result in damage.
- Visually inspect the air line ends for damage or wear. Repair or replace the air line as necessary.



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. 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).

VEHICLE DYNAMIC SUSPENSION

AIR SUSPENSION MUFFLER

(G522573)

REMOVAL AND INSTALLATION

64.50.01	SILENCER – AIR EXHAUST – RENEW	ALL DERIVATIVES	0.2	USED WITHINS	+

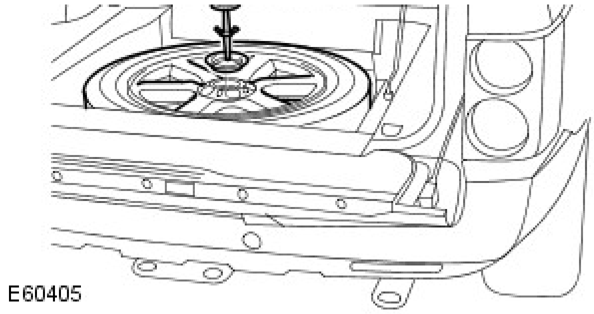
REMOVAL

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).

2. Remove the loadspace floor panel.

3. Release the wing nut securing the spare wheel to the air suspension compressor housing. Remove the bolt and collect the cup.

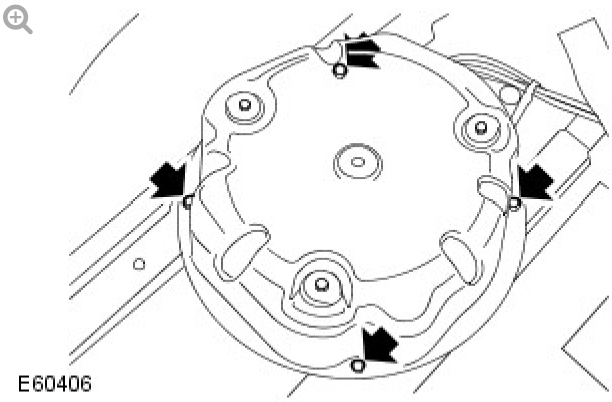
4. 



Remove the spare wheel.

- Close the tailgate and install the spare wheel release strap.
- Open the tailgate.
- Disconnect the spare wheel release strap and position aside.

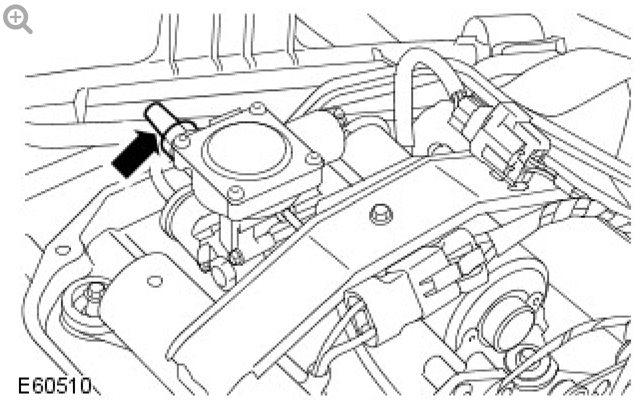
5.



Remove the air suspension compressor cover.

- Remove the 4 bolts.

6.



Remove the air suspension compressor muffler.

- Depress the retaining clip.

1. Install the air suspension compressor muffler.
   - Clean the component mating faces.

2. **CAUTIONS:**

   - Make sure the air suspension compressor upper cover is correctly positioned.
   - Make sure the electrical harness and air lines are not trapped.

   Install the air suspension compressor upper cover.
   - Tighten the bolts to 10 Nm (7 lb.ft).

3. Install the spare wheel and tire.
   - Install the cup washer and bolt, tighten the wing nut.

4. Install the loadspace floor panel.

5. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

AIR SUSPENSION REAR SOLENOID VALVE BLOCK (G939468)

REMOVAL AND INSTALLATION

64.50.11	VALVE BLOCK ASSEMBLY – RENEW	ALL DERIVATIVES	0.9	USED WITHINS	+

REMOVAL

1. **WARNING:**

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

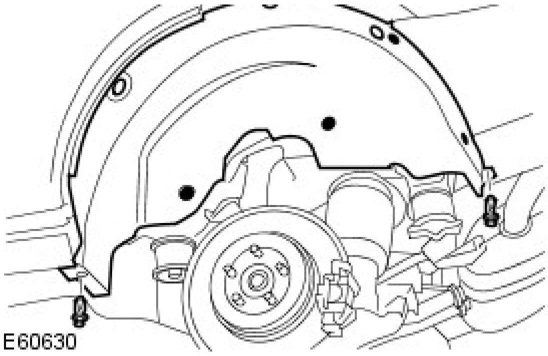
    Raise and support the vehicle.

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. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Charging System - General Information, Specifications).

4. **NOTE:**

    Wheel shown removed for clarity.



Remove the RH rear fender splash shield.

- Remove the 2 clips securing the rear fender splash shield to the bumper and rocker panel.
- Remove the 3 plastic nuts.
- Remove the 4 screws.
- Remove the fender seal
- Disconnect the tire pressure antenna electrical connector.

5.

CAUTIONS:

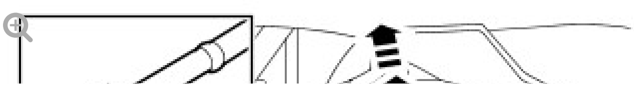
- Before the disconnection or removal of any components, ensure the area around joint faces and connections are clean. Plug any open connections to prevent contamination.
- Visually inspect the air line ends for damage or wear. Repair or replace the air line as necessary.

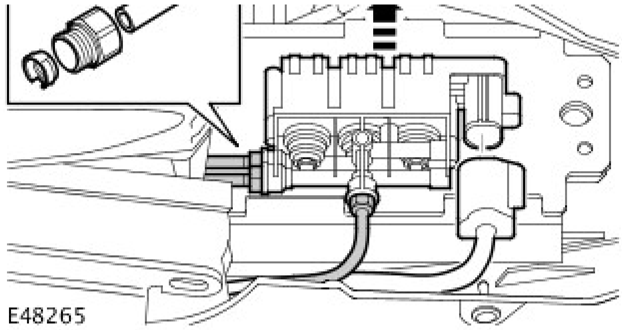
NOTE:

Note the air line fitted positions.

Disconnect the 3 air lines from the air suspension rear solenoid valve block.

6.





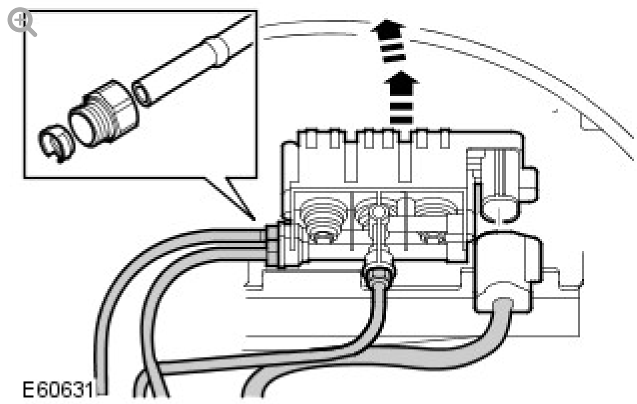
Remove the air suspension rear solenoid valve block.

- Disconnect the electrical connector.
- Release the 3 valve block rubber insulators.

7.

CAUTION:

Break the Voss collet to remove, attempting to slide the collet from the air line will result in damage.



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 rear 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 rear 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. Install the RH fender splash shield.

   - Install the plastic nuts.
   - Install the screws.
   - Install the clips.
   - Install the fender seal.

4. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Charging System - General Information, Specifications).

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).

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

AIR SUSPENSION RESERVOIR (G939469)

REMOVAL AND INSTALLATION

60.50.03	AIR SUSPENSION RESERVOIR – RENEW	ALL DERIVATIVES	0.7	USED WITHINS	+

REMOVAL

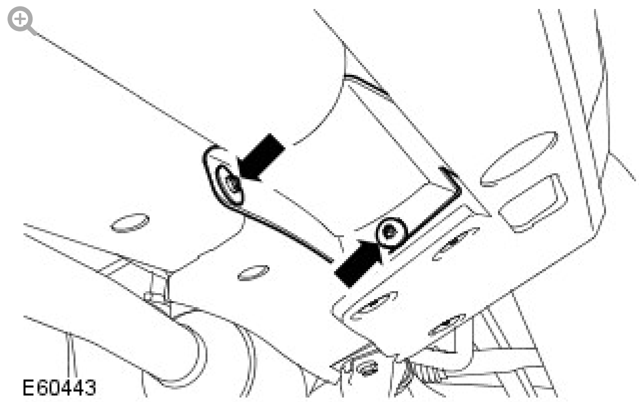
1. Using T4, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05 Vehicle Dynamic Suspension, General Procedures).

2. **WARNING:**

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

Raise and support the vehicle.

3. Disconnect the battery ground cable.
For additional information, refer to: Specifications (414-00 Charging System - General Information, Specifications).

4. 

Remove the closing panel.

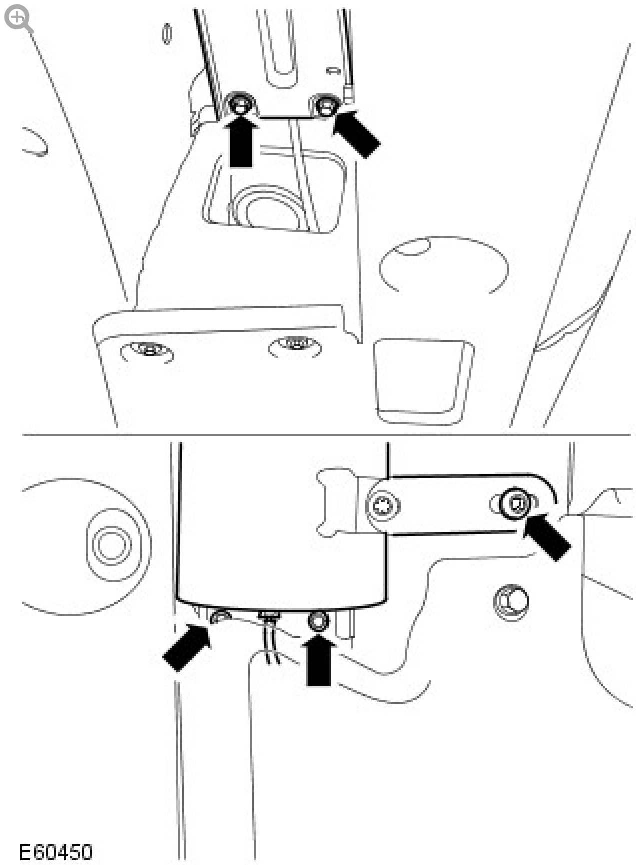
- Remove the 2 nuts.

5. **WARNING:**

The air suspension system is pressurised up to 16.8 bar (244 lbf/in). Make sure no dirt or grease enters the system. Always wear hand, eye and ear safety standard protection when working on the system working on the system.

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.



E60450

Remove the air suspension reservoir.

- Position a transmission jack to support the component.
- Remove the Torx bolt.
- Remove the 4 bolts.
- Lower the component for access to the Voss connector.

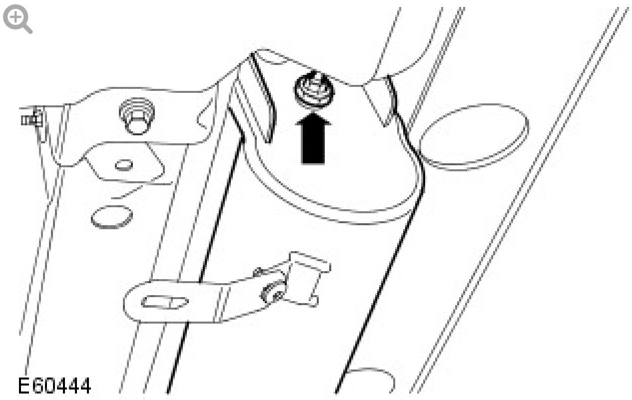
6.

CAUTIONS:

- The air line must only be disconnected by removal of the Voss connector. Do not remove the air line retaining boss

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.

- Break the Voss collet to remove, attempting to slide the collet from the air line will result in damage.

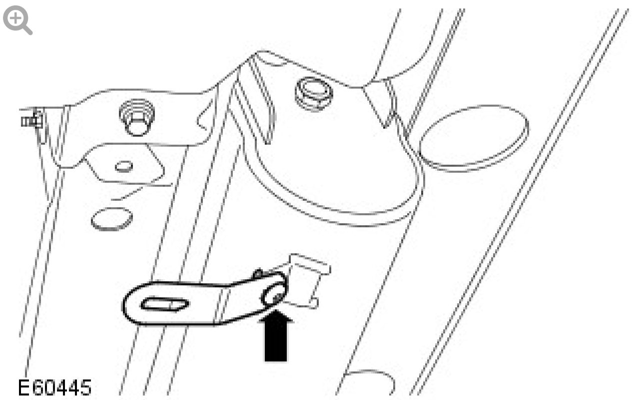


Disconnect the reservoir air line.

- Remove and discard the Voss connector and collet.

7. **NOTE:**

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



Remove the support bracket.

- Remove the Torx bolt.

INSTALLATION

1. Install the support bracket.
   - Tighten the Torx bolt to 25 Nm (18 lb.ft).

2. **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 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.
   - Position a transmission jack to support the component.
   - Remove the Voss collet alignment peg.
   - Connect the air line.
   - Tighten the M6 bolts to 10 Nm (7 lb.ft).
   - Tighten the Torx bolt to 25 Nm (18 lb.ft).

4. Install the closing panel.
   - Install the nuts.

5. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Charging System - General Information, Specifications).

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

AIR SUSPENSION RESERVOIR SOLENOID VALVE BLOCK (G522571)

REMOVAL AND INSTALLATION

60.50.05	VALVE BLOCK – AIR RESERVOIR – RENEW	ALL DERIVATIVES	0.7	USED WITHINS	+

REMOVAL

1. Using T4, depressurize the air suspension.
   For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05, General Procedures).

2. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).

3. Remove the air suspension pressure switch.

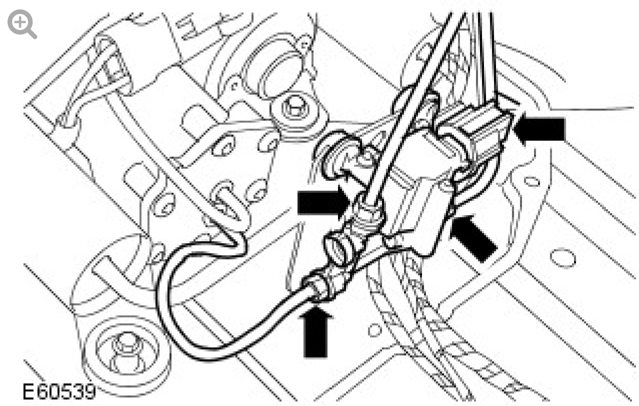
For additional information, refer to: Air Suspension Switch (204-05, Removal and Installation).

4. **CAUTIONS:**

- 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.
- Break the Voss collet to remove, attempting to slide the collet from the air line will result in damage.

NOTE:

Note the air line fitted positions.



Remove the air suspension reservoir solenoid valve block.

- Disconnect the electrical connector.
- Release the air suspension reservoir solenoid valve block, from the compressor mounting bracket.
- Disconnect the 3 air lines.
- Remove and discard the Voss connector collets and unions from the air lines.
- Remove the 3 rubber insulators.

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 the air suspension reservoir solenoid valve block.

   - Install the rubber insulators.
   - Remove the Voss collet alignment pegs.
   - Connect the air lines.
   - Mount the air suspension reservoir valve block.
   - Connect the electrical connector.

2. Install the air suspension pressure switch.
   For additional information, refer to: Air Suspension Switch (204-05, Removal and Installation).

3. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).

4. Using T4, pressurize the air suspension.
   For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05, General Procedures).

VEHICLE DYNAMIC SUSPENSION

AIR SUSPENSION SWITCH

(G297502)

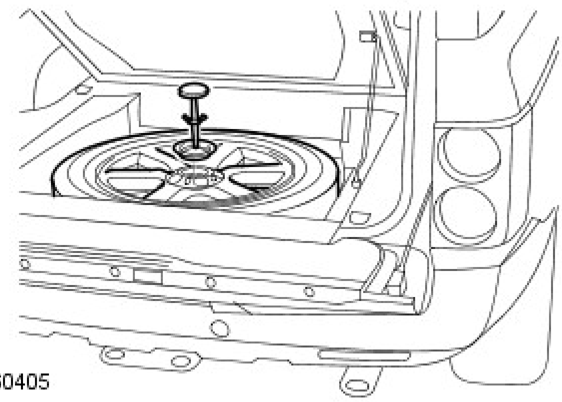
REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).

2. Remove the loadspace floor panel.

3. Release the wing nut securing the spare wheel to the air suspension compressor housing. Remove the bolt and collect the cup.

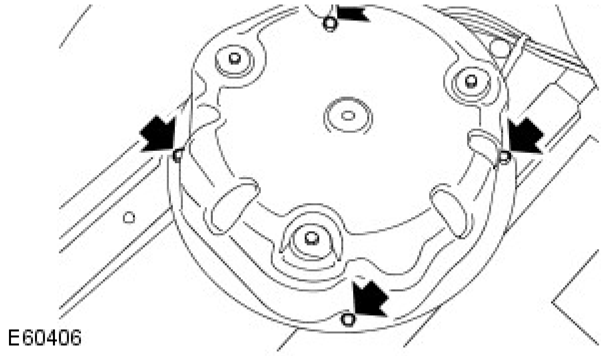
4. 

   E60405

   Remove the spare wheel and tire.

   - Close the tailgate and install the spare wheel release strap.
   - Open the tailgate.
   - Disconnect the spare wheel release strap and position aside.

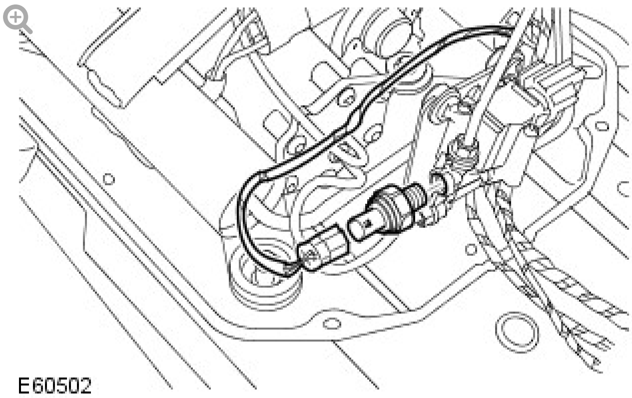
5. 



Remove the air suspension compressor cover.

- Remove the 4 bolts.

6.



Remove the air suspension pressure switch.

- Disconnect the electrical connector.
- Remove and discard the O-ring seal.

INSTALLATION

1. Install the air suspension pressure switch.
   - Clean the component mating faces.
   - Install a new O-ring seal.
   - Tighten the air suspension pressure switch to 5 Nm (4 lb.ft).
   - Connect and secure the electrical connector.

2. **CAUTIONS:**

- Make sure the air suspension compressor upper cover is correctly positioned.
- Make sure the electrical harness and air lines are not trapped.

Install the air suspension compressor upper cover.

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

3. Install the spare wheel and tire.
   - Install the cup washer and bolt, tighten the wing nut.
4. Install the loadspace floor panel.
5. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

FRONT AIR SPRING (G1615406)

REMOVAL AND INSTALLATION

60.21.01	AIR SPRING ASSEMBLY – ONE SIDE – RENEW	ALL DERIVATIVES	1	USED WITHINS	+

60.21.07	AIR SPRING - ONE SIDE - RENEW	ALL DERIVATIVES	1.1	USED WITHINS	+

SPECIAL TOOL(S)

204-538

Air spring tester

REMOVAL

1. **WARNING:**

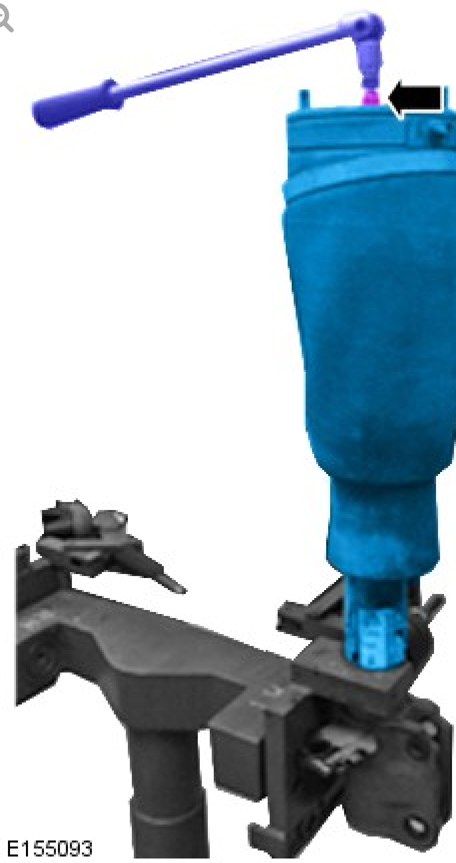
   Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

2. For additional information, refer to: Shock Absorber and Spring Assembly (204-01 Front Suspension, Removal and Installation).

3. **NOTE:**

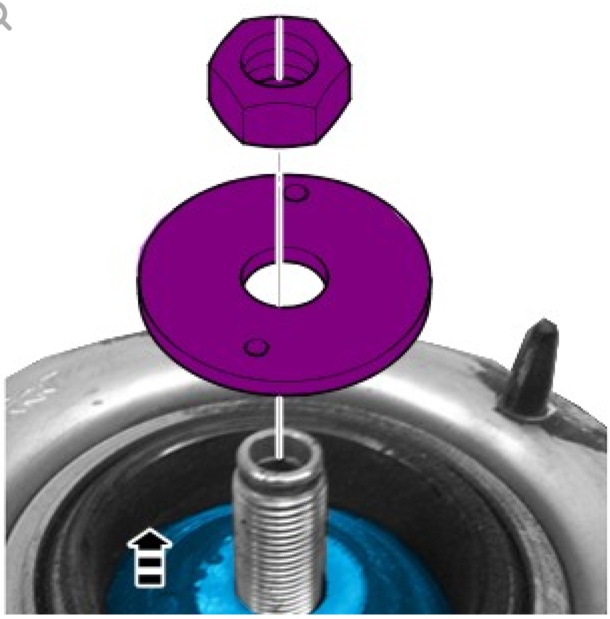
   Mount the assembly in a vertical position.



Using a 8mm allen key and a suitable tool remove the top nut.

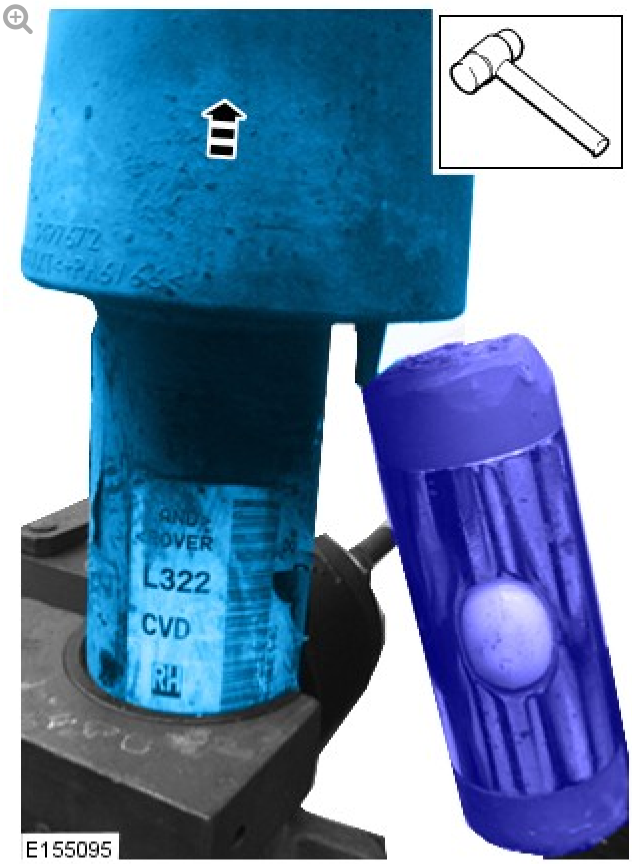
4. **NOTE:**

Retain the washer for further use.



Remove the upper bush.

5.

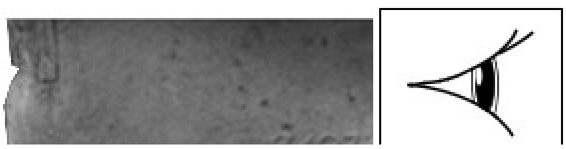


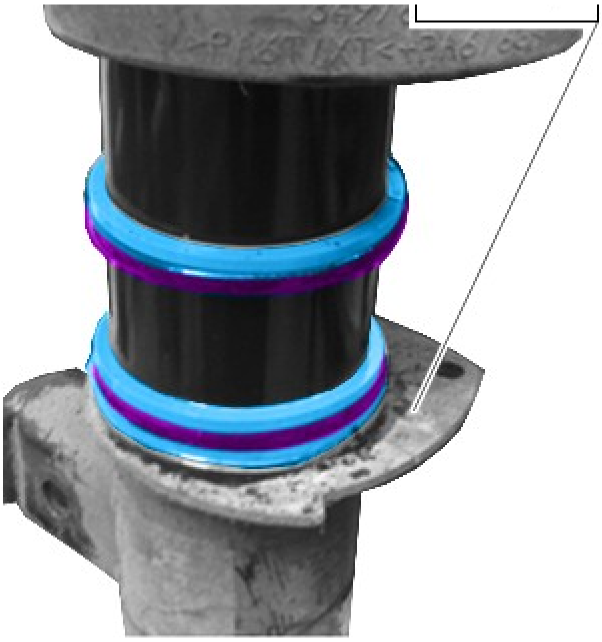
Using a suitable soft hammer tap the plastic piston in the vertical direction to raise it off the spring seat and remove it from the O-rings.

6.

CAUTION:

Remove any dirt from this area before installing.





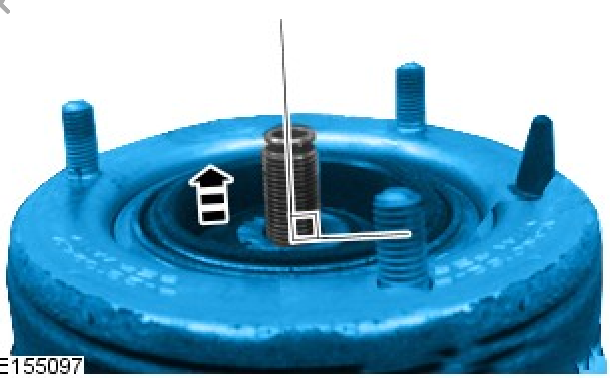
E155096

Raise the piston off the spring seat.

7.

CAUTION:

Before pushing the top mount off the damper rod make sure you have squared up the top mount to the vertical axis as it will be force tilted due to the air spring.



E155097

Lift off the top mount from the damper rod, push up in a vertical direction.

INSTALLATION

1. **CAUTION:**

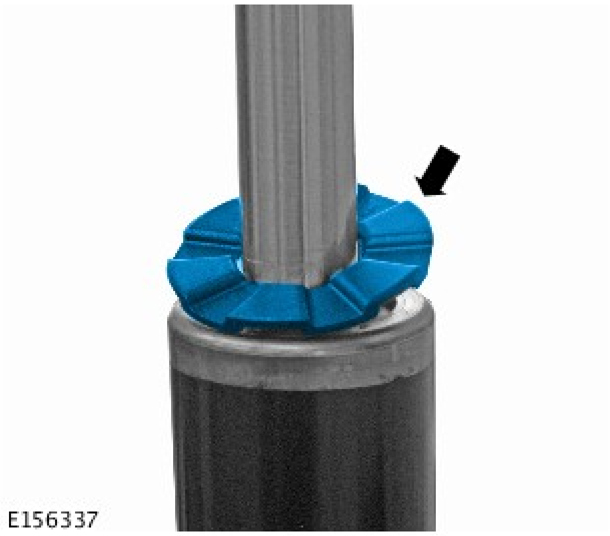
Make sure this area is clean from any dirt.

NOTE:

When the air spring is removed the spring aid, bump washer, O-rings and spacer from the damper rod will be displaced.

2. **NOTE:**

Make sure the plastic washer is installed flat to the base prior to installing the spring aid



Install new plastic washer as shown.

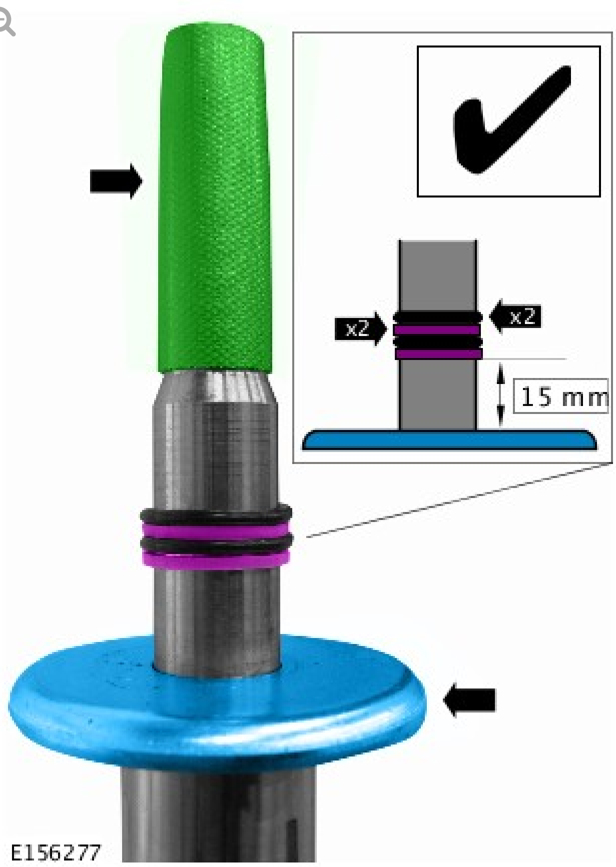
3.

Install the new spring aid.

4.

NOTE:

Use a suitable protective tape as protection and then pass the spacers and O-rings over the thread, remove the tape after the O-rings are installed.



Place the O-rings and spacers in the following order, spacer, O-ring, spacer and O-ring. Place the new bump washer on damper tenon prior to installing the seals.

5.

CAUTION:

Make sure the location washer is installed in the correct orientation with the outer lip facing downwards.

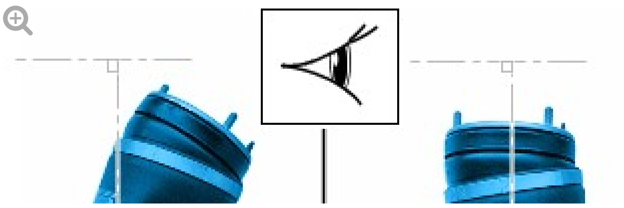
6.

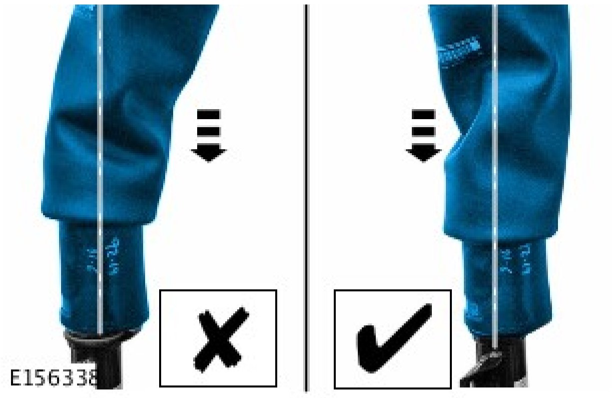
Install the lower O-rings and spacers as follows, spacer, O-ring, spacer, O-ring and spacer.

7.

NOTE:

Before pushing the top mount home on the damper tenon and O-rings, check the correct handed markings on the air sleeve, and then square up the top mount to be at 90 degrees with the axis of the damper





Place the new air spring over the damper rod, entering the damper tenon through the top mount. Lower the piston on the O-rings and push down on the spring seat.

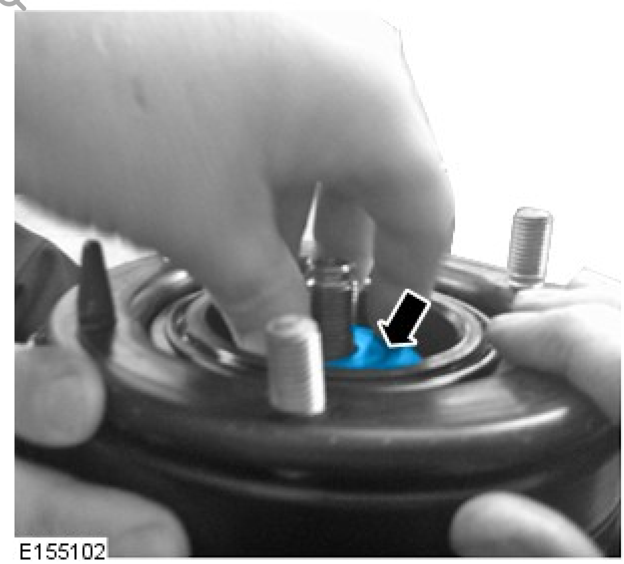
8.

NOTE:

> Make sure the protective tape is removed prior to installing the air sleeve and the locating tab on the piston enters the hole in the spring seat.

Install the new air sleeve.

9.



Install the upper rubber bush onto the damper tenon.

10.

Install the rebound washer.

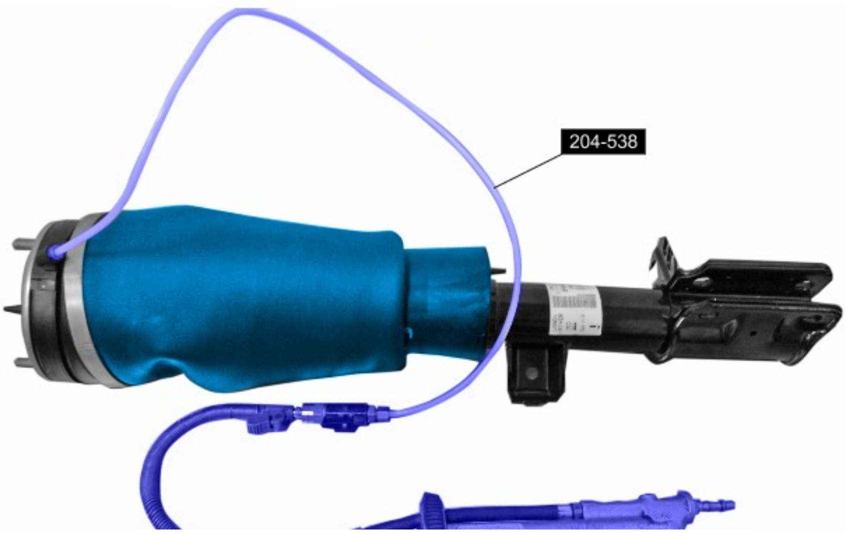
11.

Torque 90 Nm

12.

CAUTIONS:

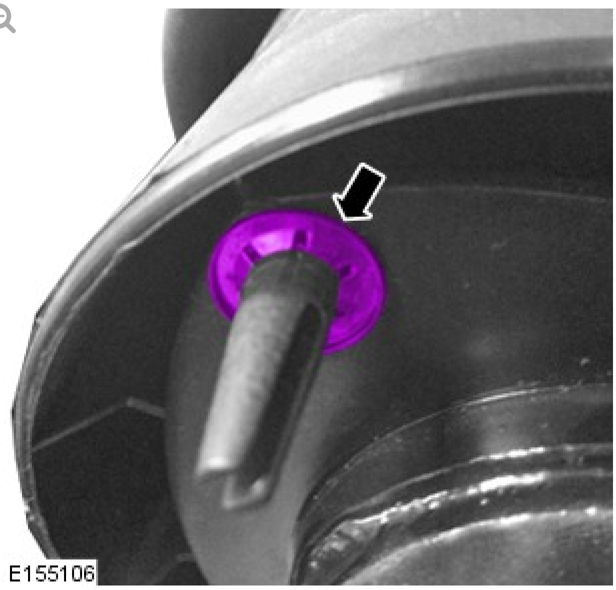
- Keep hands and fingers away from the area during inflation.
- The shock absorber must be securely mounted in a suitable clamp before carrying out this step.



E159309

Using the special tool coupled to a tire inflator with a gauge, apply approximately 5 bar of air pressure to the air spring to fully seat the piston over the O-rings.

13.



E155106

Install the spring clip onto the piston peg below the spring seat using a suitable tool.

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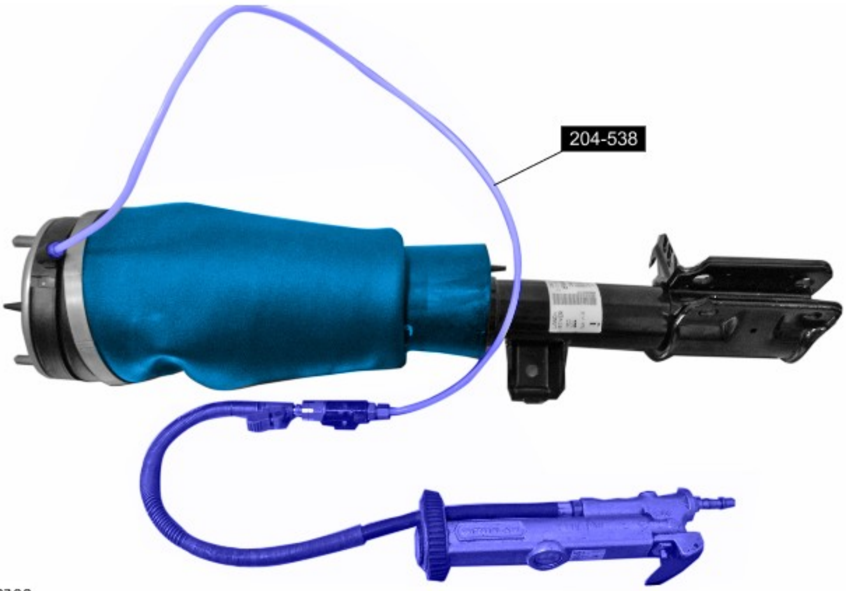
14. Carry out an air leak test using a suitable water bath.

15.



E159309

Using the special tool deflate the air spring.

Using the special tool deflate the air spring.

16. For additional information, refer to: Shock Absorber and Spring Assembly (204-01 Front Suspension, Removal and Installation).

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

REAR AIR SHOCK ABSORBER

(G522575)

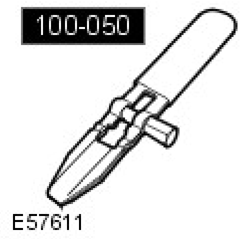
REMOVAL AND INSTALLATION

64.30.02	DAMPER - ONE SIDE - RENEW	ALL DERIVATIVES	0.7	USED WITHINS	+

SPECIAL TOOL(S)

204-538

Air spring tester



100-050 (LRT-99-019)

Band-it Thrift tool

REMOVAL

NOTE:

This procedure should also be used to remove the rear air spring.

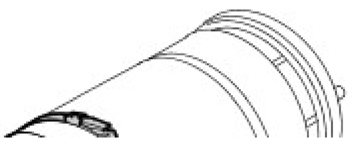
1. **WARNING:**

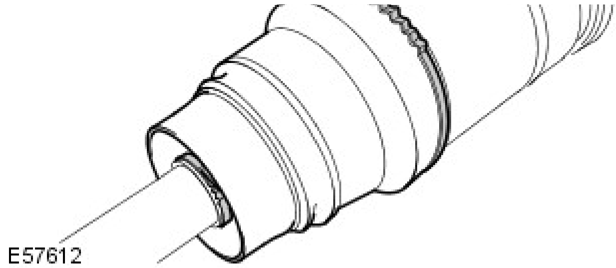
   Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   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, Removal and Installation).

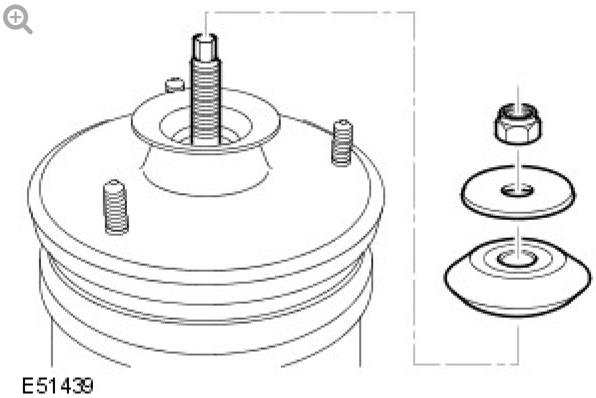
4. 



Remove the gaiter.

- Remove and discard the 2 straps.

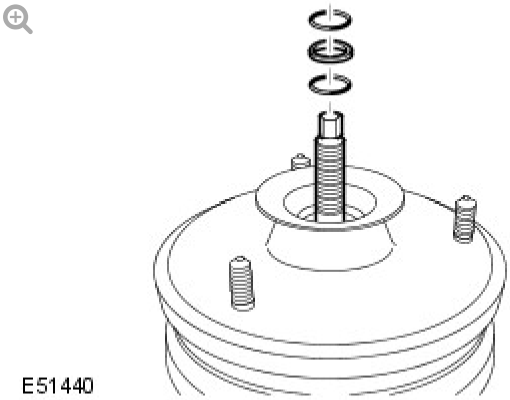
5.



Remove the nut, rebound washer and rubber bushing.

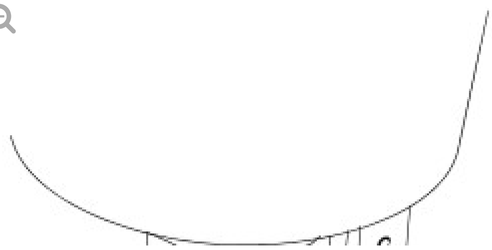
- Discard the nut.

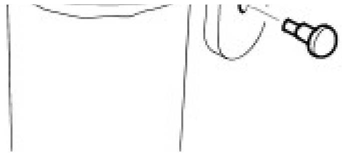
6.



Remove and discard the O-ring seals and spacer.

7.

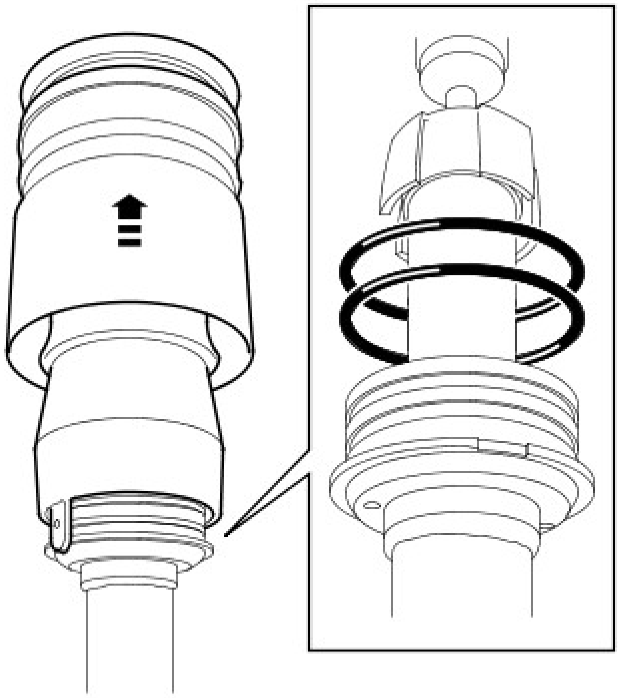




Remove the nylon retaining pin.

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.

10. Remove the shock absorber from the vise.

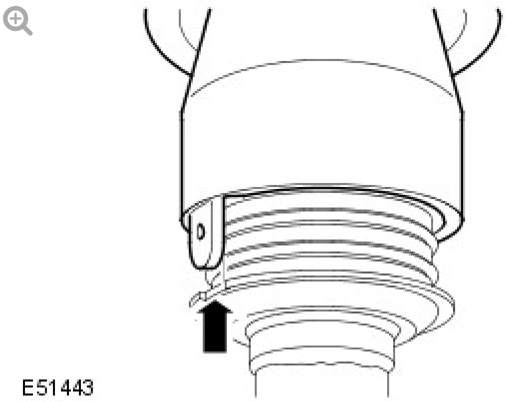
INSTALLATION

1. Install the shock absorber in the vise.

2. Clean the components.

3. Lubricate and install new O-rings to the seal carrier.

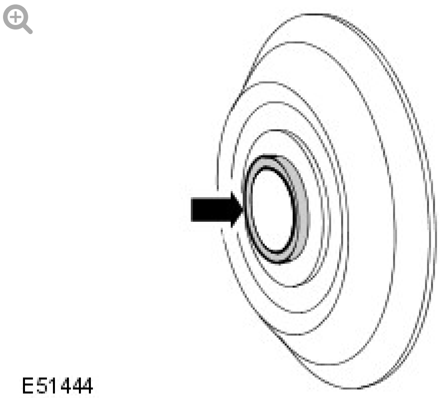
4. Install the spring aid and rebound plate.

5. 

Install the air spring.

- Align the piston with the first O-ring seal, making sure the location tag is correctly aligned.

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.

8. Install and lightly tighten the nut

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.

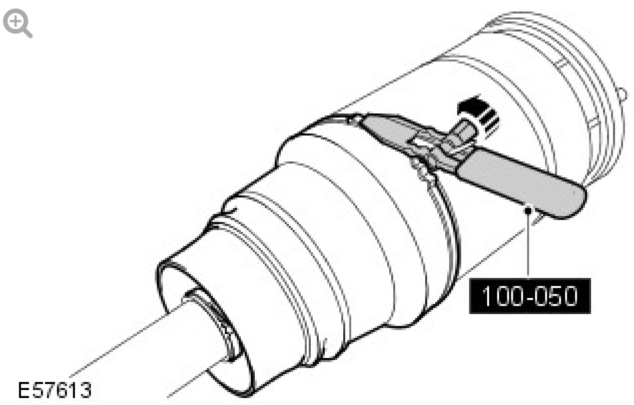
- Using the special tool coupled to a tire inflator with a gauge, apply approximately 2 bar of air pressure to the air spring to fully seat the piston over the O-ring seals.

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, Removal and Installation).

VEHICLE DYNAMIC SUSPENSION

REAR AIR SPRING (G915486)

REMOVAL AND INSTALLATION

REMOVAL

CAUTION:

Do not depressurize the air suspension system before raising the vehicle.

NOTE:

It is not necessary to depressurize the whole system, only the side from which the suspension air spring is being replaced.

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.

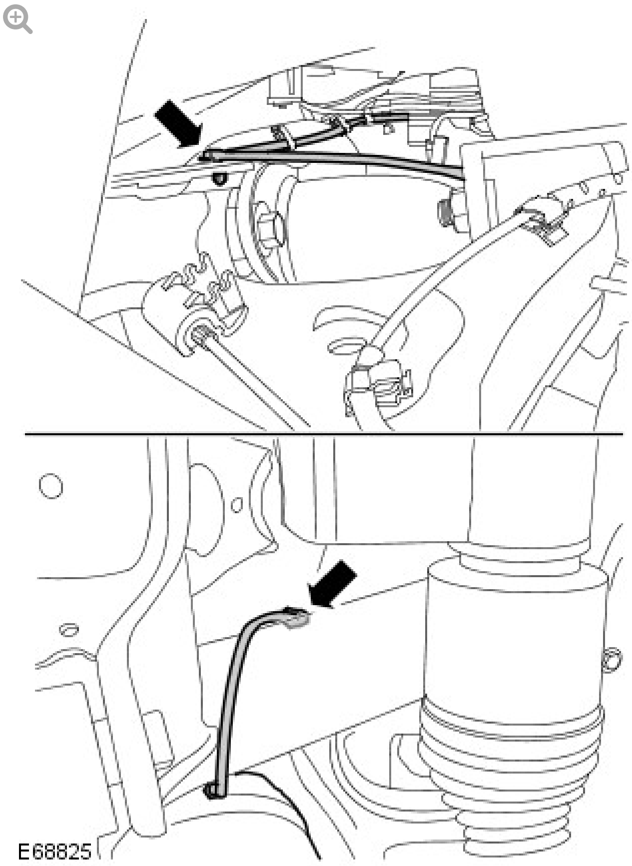
2. Remove the road wheel.

3. **NOTE:**

   It is not necessary to depressurize the whole system, only the side from which the suspension air spring is being replaced.

Using the Land Rover approved diagnostic system, depressurize the air suspension.
For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05, General Procedures).

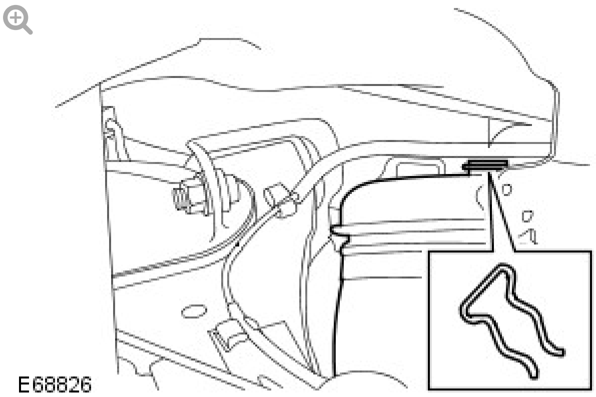
4.



Release the air suspension air line.

- Release from the 2 clips.

5.

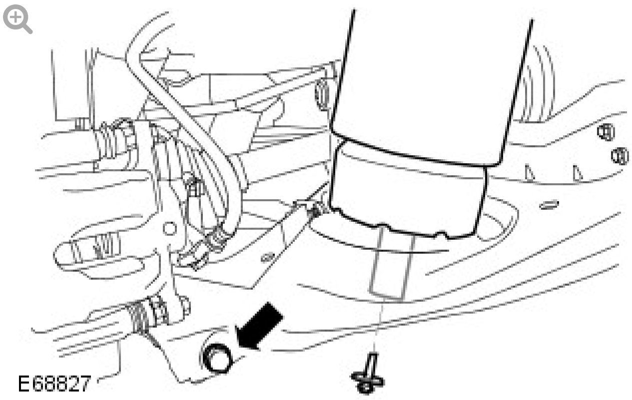


Release the rear air spring from the sub-frame.

- Remove the clip.

6. Release the rear air spring from the lower arm.

   - Remove the screw.

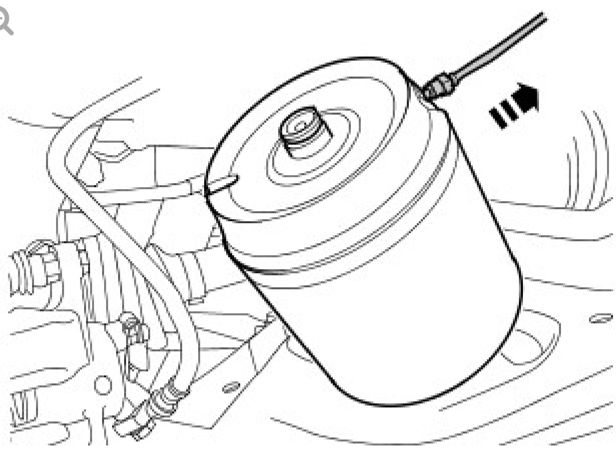
7. 

   Release the damper from the lower arm.

   - Remove the bolt and discard the nut.

8. **CAUTIONS:**

   - Do not remove the Voss connector from the air line. Removal of the connector from the line could cause the connector to scratch the line and increase the likelihood of a leak.
   - Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

E68980

With assistance, remove the rear air spring.

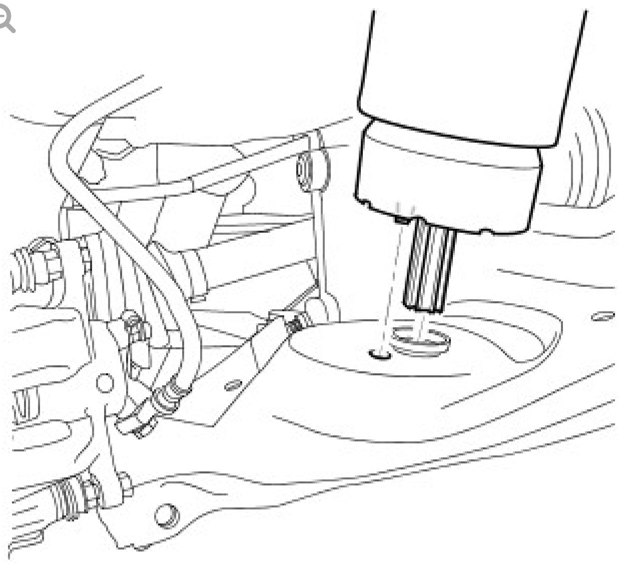
- Lower the suspension arms.
- Release the rear air spring.
- Disconnect the air line.

INSTALLATION

1.

CAUTIONS:

- Align the air suspension spring to the lower arm.
- Do not tighten the union fully until the air suspension spring is correctly aligned.
- Do not extend or compress the air spring.



E68828

With assistance, install the rear air spring.

- Clean the components mating faces.
- Connect the air suspension air line.

- Connect the air suspension air line.
- Tighten the union to 4 Nm (3 lb.ft).

2. Secure the rear air spring to the lower arm.
   - Tighten the screw to 7 Nm. (5 lb.ft).

3. **CAUTION:**

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

   Engage the damper with the lower arm.
   - Install bolt and tighten new nut to 110 Nm (81 lb.ft).

4. Secure the air suspension air line.
   - Secure in the 2 clips.

5. **NOTE:**

   Pressurize the system sufficiently to expand the air suspension spring to its upper location.

   Secure the rear air spring to the sub-frame.
   - Install the clip.

6. Using the Land Rover approved diagnostic system, pressurize the air suspension.
   For additional information, refer to: Air Suspension System Depressurize and Pressurize (204-05, General Procedures).

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

2012.0 RANGE ROVER (LM), 204-05

VEHICLE DYNAMIC SUSPENSION

SUSPENSION HEIGHT SENSOR (G892811)

REMOVAL AND INSTALLATION

60.36.01	SENSOR – HEIGHT –	ALL	0.2	USED	+

REMOVAL

NOTES:

- This procedure covers removal and installation of both the front and rear suspension height sensors.
- LH height sensor arms are colour coded white. RH height sensor arms are colour coded black.

1. **WARNING:**

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

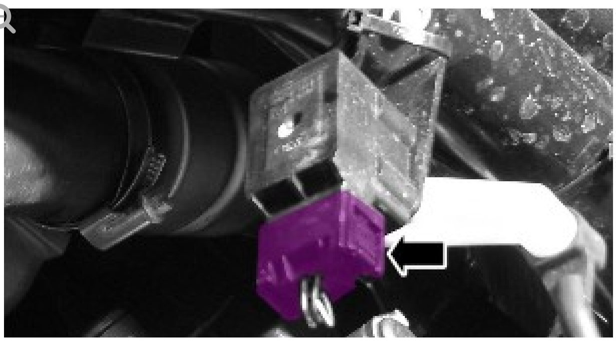
Raise and support the vehicle.

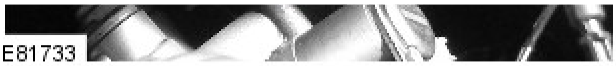
2. **CAUTION:**

Note the position of the wiring harness.

NOTE:

LH front height sensor shown, other height sensors similar.





Disconnect the height sensor electrical connector.

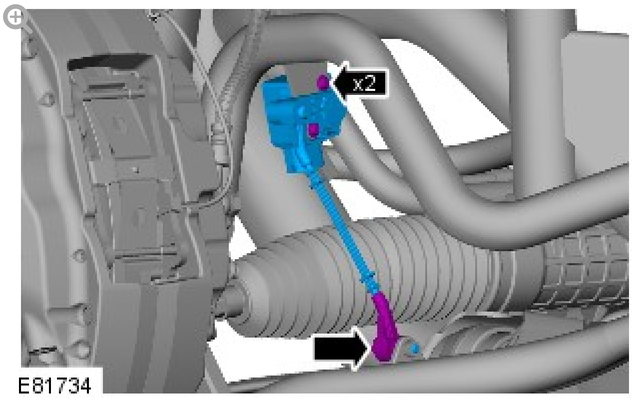
3.

CAUTION:

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

NOTE:

LH front height sensor shown, other height sensors similar.



Remove the suspension height sensor.

- Disconnect the height sensor link.
- Remove the 2 screws.

INSTALLATION

1.

CAUTION:

Make sure that the wiring harness into the back of the electrical connector is not pulled tightly and exits the electrical connector with a good bend radius.

NOTE:

There should be 25 to 50mm of un-taped wiring out of the back of the connector. If the taping goes closer to the connector than this then the excess should be removed.

To install, reverse the removal procedure.

- Tighten the screws to 2.5 Nm (1.7 lb.ft).

2.

CAUTION:

Calibration of the air suspension system must be carried out if the suspension height sensor is loosened or removed.

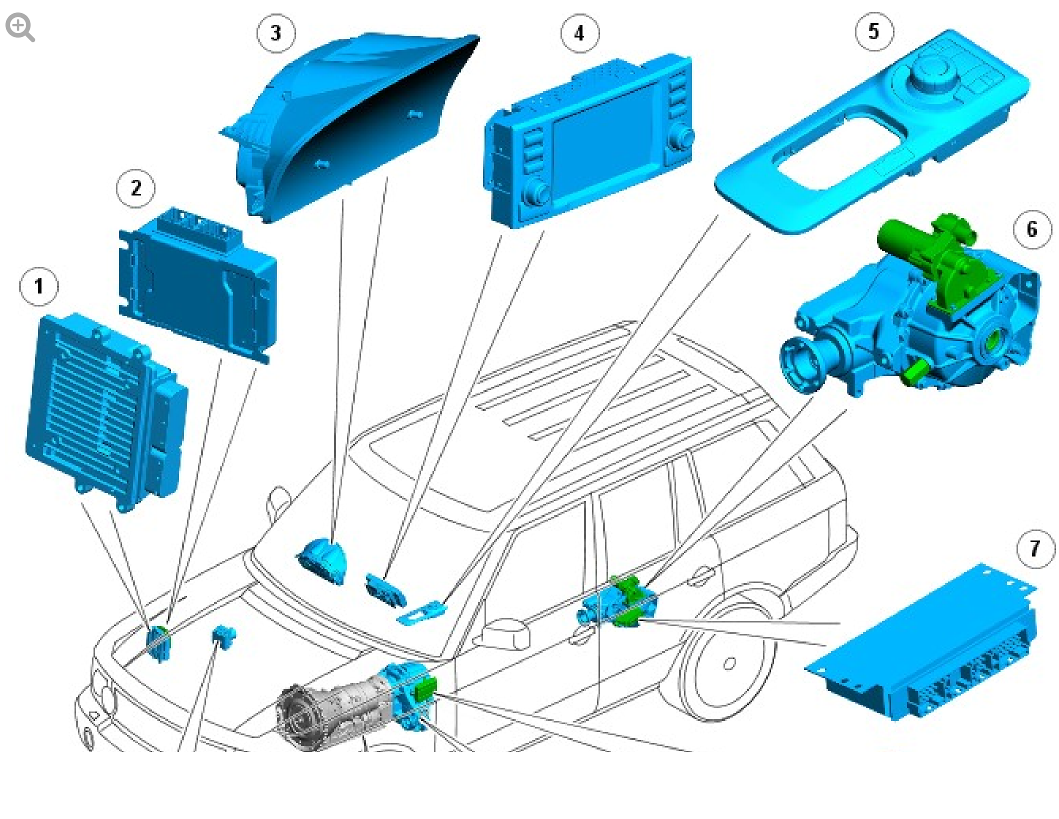
Using the Land Rover approved diagnostic system, calibrate the suspension ride height.
For additional information, refer to: Ride Height Adjustments (204-05, General Procedures).

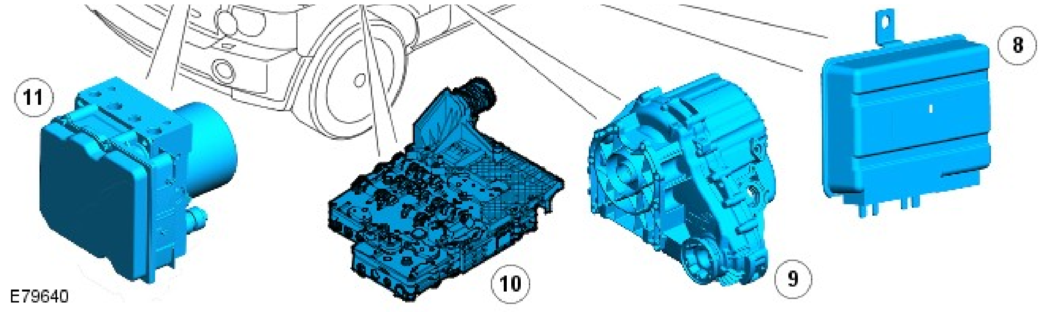
2012.0 RANGE ROVER (LM), 204-06

RIDE AND HANDLING OPTIMIZATION

DESCRIPTION AND OPERATION

Terrain Response - Component Location





ITEM	DESCRIPTION
1	engine control module (ECM)
2	Transfer box control module
3	Instrument cluster
4	Touch Screen Display (TAD)
5	Terrain Response rotary control (shown), or rocker switch
6	Rear differential
7	Rear differential control module
8	Air suspension control module
9	Transfer box (center differential and high/low range)
10	transmission control module (TCM)
11	anti-lock brake system (ABS) module

INTRODUCTION

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.

Depending on vehicle specification the system is controlled by either a rotary control or rocker switch located on the floor console, rearward of the transmission selector lever. Both of these controls allow the selection of one of the following five programs:

- Special programs off
- Grass/Gravel/Snow
- Mud/Ruts
- Sand
- Rock crawl.

The rotary-control type selector can be rotated through 360 degrees or more in either direction to select each program in turn. Whereas the rocker-switch type selector moves forward or back through the five program selections. The instrument cluster 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
- Transfer box (center differential)
- Rear differential (electronically controlled)
- Brake system (DSC/ETC/HDC functions)
- Air suspension.

A Terrain Response control module is located, depending on specification, below the rotary control or rocker switch. The control module detects the program selection made and transmits a signal on the high speed controller area network (CAN) bus which is received by each of the subsystem control modules.

Each of the affected sub-system control modules contain software which applies the correct operating parameters to their controlled system for the Terrain Response program selection made.

They also provide 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 optimize 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 for example, transmission shift maps, accelerator pedal maps or traction settings.

TERRAIN RESPONSE

TERRAIN RESPONSE CONTROLS

The type of Terrain Response control fitted will depend on the specification of the vehicle.

When the vehicle is fitted with a gear selector lever, Terrain Response selection is via a rotary control. There are five Terrain Response programs marked around the control.

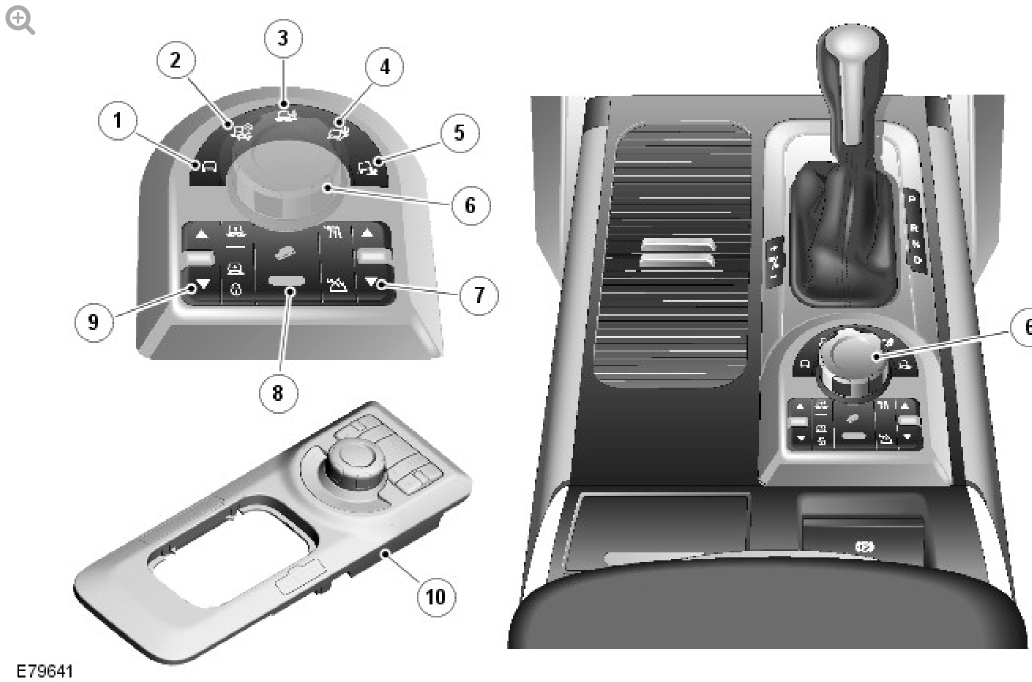
When the vehicle is fitted with a rotary drive selector, Terrain Response selection is via a rocker switch. The switch is used to move forward or back through the five program selections.

Each program is denoted by a symbol which represents the terrain encountered.

Information relating to the suitability of each selected program on different types of surface, is given on the touch screen, via the '4 x 4 Info' soft key. The displayed text is relevant to the currently selected program.

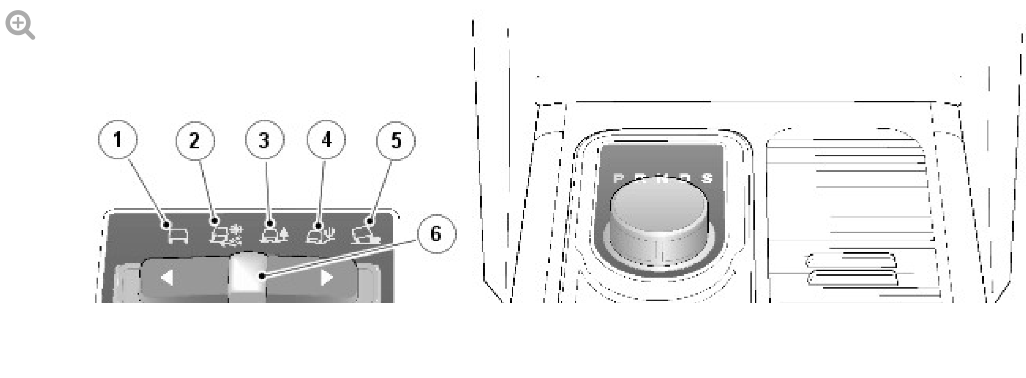
The Terrain Response control module is located below either the Terrain Response control. The module is connected via a harness connector which also contains the wiring for the: Hill Descent Control (HDC) switch, transfer box high/low range switch, air suspension control switch and the switch illumination circuits.

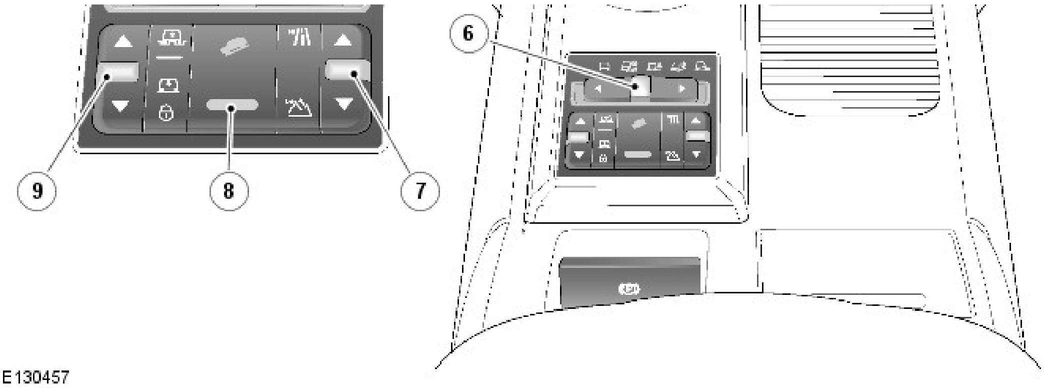
Rotary-Control Type Selector



ITEM	DESCRIPTION
1	Special programs off
2	Grass/gravel/snow program
3	Mud/ruts program
4	Sand program
5	Rock crawl program
6	Terrain Response rotary control
7	Transfer box high/low range switch
8	Hill Descent Control (HDC) switch
9	Air suspension control switch
10	Terrain Response control module

Rocker-Switch Type Selector





ITEM	DESCRIPTION
1	Special programs off
2	Grass/gravel/snow program
3	Mud/ruts program
4	Sand program
5	Rock crawl program
6	Terrain Response rocker switch
7	Transfer box high/low range switch
8	Hill Descent Control (HDC) switch
9	Air suspension control switch

PRINCIPLES OF OPERATION

The following vehicle subsystem control modules are used for the Terrain Response system:

- Engine management (ECM)
- Transmission control (TCM)
- Transfer box control (transfer box and center differential control module)
- Rear differential control (rear differential control module - if fitted)
- Air suspension control (air suspension control module)
- Brake system (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 accelerator pedal response to control the engine torque output. The EMS can change the accelerator pedal maps to change the amount of torque per percentage of pedal travel. The EMS can also change the accelerator 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 accelerator response when, for example, the accelerator 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 TCM 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 minimize 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 only) 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 when any Terrain Response special program is selected. 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 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 minimize slip and maximize 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 behavior 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 torque applied is applicable to the terrain program selected, for example, very sensitive on slippery surfaces to provide maximum traction and minimize surface damage.

The Dynamic Stability Control (DSC) function of the ABS can override the Terrain Response differential control and reduce any applied locking torque during DSC action.

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 light emitting diode (LED) illuminated icons on the switch. The automatic selection of off-road ride height provides an increase 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.

BRAKE SYSTEM CONTROL

The ABS module controls several vehicle functions and adjusts the operating parameters of these functions to optimize 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.

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, for example:
  - adaptive speed control or speed control are only available with the 'special programs off' or 'grass/gravel/snow program' selected,
  - 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 six 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 immediate damage to the vehicle. Although, 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 an approved Land Rover diagnostic system 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 instrument cluster 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 an approved Land Rover diagnostic system. 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 traveled 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 an Land Rover approved diagnostic system. 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 control selector 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 control selector or at the next ignition on cycle, a message 'SYSTEM FAULT SPECIAL PROGRAMS NOT 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 control selector 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 control selector 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 behavior (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 bus 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 bus signal. These faults can be retrieved using an approved Land Rover diagnostic system and will provide useful information to indicate investigation of the Terrain Response control module or the CAN bus network.

Terrain Response Control Selector or Control Module Fault

If a fault occurs in the Terrain Response control selector, all control icon amber LED's will be turned off (background illumination will remain on) and selection of the 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 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 control selector and the control module are an integral unit. If a fault occurs in either component, the whole unit will require replacement. **BEFORE REPLACING THE TERRAIN RESPONSE CONTROL MODULE, ENSURE THAT THE FAULT IS NOT IN ANY OF THE SUB-SYSTEM MODULES.**

CAN Bus Faults

If a CAN bus fault exists and prevents Terrain Response system operation, all of the Terrain Response control icon LED's will be illuminated and the control selection ignored.

If the instrument cluster does not receive a Terrain Response system CAN bus 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.

RIDE AND HANDLING OPTIMIZATION

DIAGNOSIS AND TESTING

PRINCIPLES OF OPERATION

Ride and handling optimization incorporates the adaptive damping system and also 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 information on the description and operation of the system, refer to the relevant Description and Operation section of the workshop manual.

INSPECTION AND VERIFICATION

CAUTION:

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

1. Verify the customer concern.

1. Visually inspect for obvious mechanical or electrical faults.

Visual Inspection

MECHANICAL	ELECTRICAL
▪ Tire condition, pressures, etc	▪ Fuses

▪ Driveline components (correct installation, damage, etc) ▪ Engine components (correct installation, damage, etc) ▪ Transmission components (correct installation, damage, etc) ▪ Suspension components (correct installation, damage, etc)	▪ Harnesses/Connectors ▪ Terrain Response Control Module (ATCM) ▪ Engine Control Module (ECM) ▪ Transmission Control Module (TCM) ▪ Transfer Case Control Module (TCCM) ▪ ABS Control Module ▪ Rear Differential Control Module (RDCM) ▪ Air Suspension Control Module (SUMB) ▪ Controller Area Network (CAN) circuits

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

1. Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
    - Make sure that all DTCs are cleared following rectification.

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	For details of the available messages, refer to the relevant section of the workshop manual.

		center	Carry out a complete vehicle DTC read and follow the diagnostic routine(s) indicated.
Message center display: **TERRAIN RESPONSE 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: **TERRAIN RESPONSE – 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 cycling as part of HDC ▪ Special program change attempted with an overheat condition present in	Refer to the relevant section of the workshop manual. Make sure that the driver is familiar with the correct operation of the system.

		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.

2012.0 RANGE ROVER (LM), 204-06

RIDE AND HANDLING OPTIMIZATION

RIDE AND HANDLING OPTIMIZATION SWITCH (G850403)

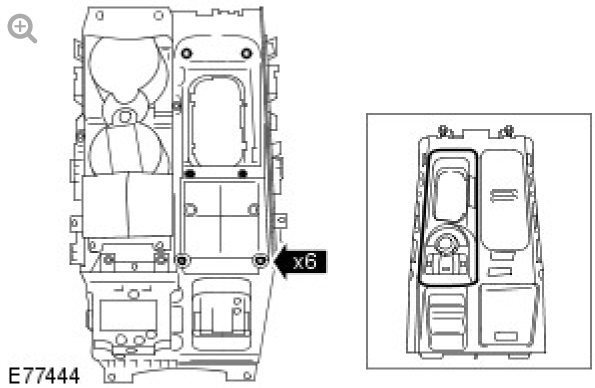
REMOVAL AND INSTALLATION

86.65.11	SWITCH – TERRAIN RESPONSE™ – RENEW	ALL DERIVATIVES	0.5	USED WITHINS	+

REMOVAL

1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).

2. Remove the floor console upper panel.
   For additional information, refer to: Floor Console Upper Panel (501-12, Removal and Installation).

3. 

   Remove the ride and handling optimization switch.

   - Remove the 6 screws.

INSTALLATION

1. Install the ride and handling optimization switch.

   - Install the 6 screws.

2. Install the floor console upper panel.
   For additional information, refer to: Floor Console Upper Panel (501-12, Removal and Installation).

3. Connect the battery ground cable.

8. Connect the battery ground cable.

For additional information, refer to: Specifications (414-00, Specifications).

2012.0 RANGE ROVER (LM), 205-00

DRIVELINE SYSTEM – GENERAL INFORMATION

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

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

Driveshaft (205-01 Driveshaft, Description and Operation),
Universal Joints (205-01 Driveshaft, Description and Operation),
Rear Drive Axle and Differential (205-02 Rear Drive Axle/Differential, Description and Operation),
Front Drive Axle and Differential (205-03 Front Drive Axle/Differential, Description and Operation),
Front Drive Halfshafts (205-04 Front Drive Halfshafts, Description and Operation),

Halfshaft Joint (205-04 Front Drive Halfshafts, Description and Operation), Rear Drive Halfshafts (205-05 Rear Drive Halfshafts, 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. Verify the customer concern.
    - If a road test is necessary make sure the vehicle is safe to do so.

1. Visually inspect for obvious signs of mechanical damage.

Visual Inspection

MECHANICAL
▪ Wheel rim and tire damage or runout ▪ Check all the driveshafts and halfshafts for damage including dents, cracks and excessive runout ▪ Check all the CV joint gaiters for splits, damage and security ▪ Check all the driveshafts and halfshafts for correct alignment ▪ Check the driveshaft mounting bolts security ▪ Check all the driveshaft and halfshaft joints for excessive movement ▪ Check the rear driveshaft centre support bearing for security, damage and excessive wear ▪ Check the front and rear differential mounting bolts and bushes for wear, damage and security

- Check the front and rear differentials for oil leaks

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

1. 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
Vibration through the vehicle body at a specified speed	▪ Road wheel imbalance ▪ Driveshaft imbalance	Road test the vehicle. If the vibration is only at a specified speed, balance the road wheels. Test for normal operation. Disconnect the rear driveshaft. Check CV and universal joints for smooth and full movement. Disconnect the front driveshaft. Check CV joints for smooth and full movement. If any joints are faulty, replace the driveshaft. Test for normal operation.
Vibration through the vehicle body at all speeds	▪ Misalignment of the rear driveshaft ▪ Bent or misaligned stub axle	Road test the vehicle. Check the rear driveshaft for correct alignment through the centre support bearing. Rectify as necessary. Test for normal operation. Check for a damaged or bent stub axle. Rectify as necessary.
Rumbling noise from the rear of the vehicle varying at different vehicle speed and load	▪ Rear differential bearings worn ▪ Rear wheel bearings worn ▪ Rear driveshaft centre support bearing worn	Using a suitable listening device (e.g. stethoscope) listen to the rear differential pinion bearings and output bearings, the rear wheel bearings and the rear driveshaft centre bearing. Rectify as necessary. Test for normal operation.
Rumbling noise from the front of the	▪ Front differential bearings	Using a suitable listening device (e.g. stethoscope) listen to the front differential pinion bearings and output bearings and the front wheel bearings.

vehicle varying at different vehicle speed and load	worn ▪ Front wheel bearings worn	Rectify as necessary. Test for normal operation.
Whining noise from the rear of the vehicle during acceleration and overrun conditions	▪ Rear differential gears worn or damaged	Check and top up the rear differential oil level if necessary. Using a suitable listening device (e.g. stethoscope) listen to the rear differential. Replace the rear differential unit if there is excessive gear noise.
Whining noise from the front of the vehicle during acceleration and overrun conditions	▪ Front differential gears worn or damaged	Check and top up the front differential oil level if necessary. Using a suitable listening device (e.g. stethoscope) listen to the front differential. Replace the front differential unit if there is excessive gear noise.
Knocking, clicking or clunking noise from rear of vehicle during acceleration and overrun conditions	▪ Rear driveshaft joint fixings insecure ▪ Rear driveshaft joints worn or damaged ▪ Rear halfshaft joints or splined shaft worn or damaged ▪ Rear differential internal components worn or damaged	Disconnect the rear driveshaft. Check joint mounting bolt holes for elongation. Check the joints. Disconnect the rear halfshafts. Check the shaft splines for wear or damage. Check the CV joints. Rectify as necessary. With the rear driveshaft and halfshafts disconnected, check the rear differential for tight spots or excessive play. Rectify as necessary.
Knocking, clicking or clunking noise from front of vehicle during acceleration and overrun conditions	▪ Front driveshaft CV joints worn or damaged ▪ Front halfshaft joints or splined shaft worn or damaged ▪ Front	Disconnect the front driveshaft. Check joint mounting bolt holes for elongation. Check the joints. Disconnect the front halfshafts. Check the shaft splines for wear or damage. Check the CV joints. Rectify as necessary. With the front driveshaft and halfshafts disconnected check the front differential for tight spots or excessive play. Rectify as necessary.

	- Front differential internal components worn or damaged	

DTC INDEX

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

2012.0 RANGE ROVER (LM), 205-01

DRIVESHAFT

SPECIFICATIONS

Front Drive (Propeller) Shaft

Item	Specification
Type	One piece, variable length steel tube.
Constant velocity joints	Plunging type, installed at front and rear.

Rear Drive (Propeller) Shaft

Item	Specification
Type	Two piece, variable length steel tube with isolated centre bearing and swaged front section to provide controlled collapse of the shaft during a crash.
Constant velocity joints	Plunging constant velocity joints are positioned at the front and rear of the shaft with a, fixed Hookes type universal joint at the centre.

Torque Specifications

DESCRIPTION	NM	LB-FT
*** Front driveshaft to front axle drive flange Torx bolts:**		
Stage 1	45	33
Stage 2	Further 90°	Further 90°
*** Front driveshaft to transfer case drive flange Torx bolts:**		
Stage 1	45	33
Stage 2	Further 90°	Further 90°
*** Rear driveshaft to rear axle drive flange Torx bolts**		

*** Rear driveshaft to rear axle drive flange Torx bolts**		
Stage 1	42	31
Stage 2	Further 45°	Further 45°
*** Rear driveshaft to transfer case drive flange Torx bolts**		
Stage 1	42	31
Stage 2	Further 45°	Further 45°
Rear driveshaft center bearing bolts	21	15
Fuel tank heat shield bolts	5	4
Fuel tank heat shield nuts	3	2

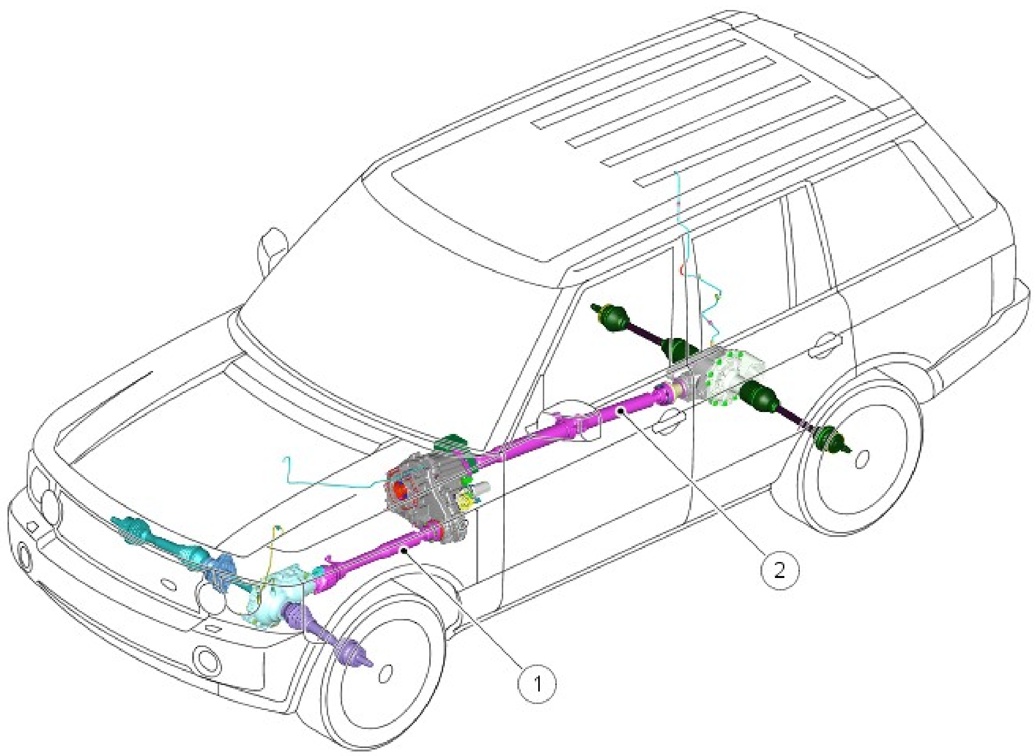
*** New 'Patched' Torx bolts must be installed**

2012.0 RANGE ROVER (LM), 205-01

DRIVESHAFT

DESCRIPTION AND OPERATION

DRIVESHAFT - COMPONENT LOCATION



E59392

ITEM	DESCRIPTION
1	Front driveshaft
2	Rear driveshaft assembly

GENERAL

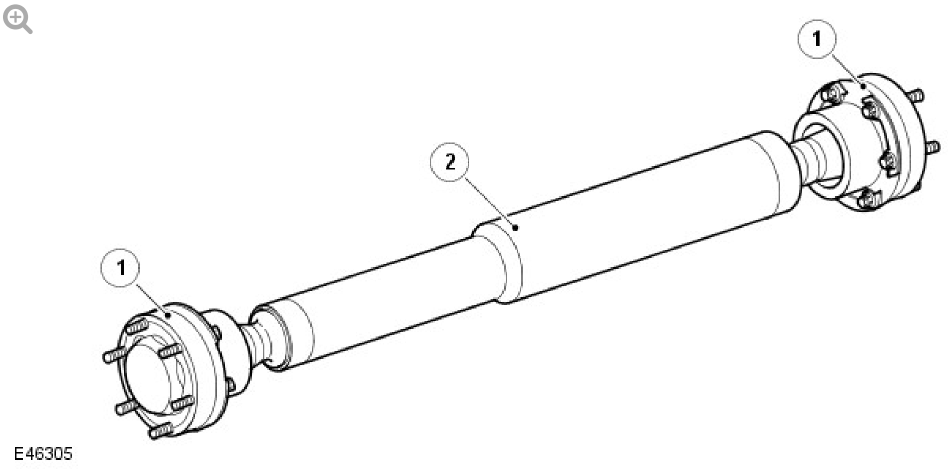
Drive shafts are used to transmit drive from the transfer box to the front and rear differentials.

The front drive shaft is a 1-piece unit, connected to the transfer box and front differential unit via Constant Velocity (CV) joints.

The rear drive shaft is a 2-piece unit, supported on a central bearing due to its increased length. The rear drive shaft is connected to the transfer box and the rear differential via CV joints. These joints allow for angular deviations of the drive shaft due to acceleration and braking.

The front and rear drive shafts are not serviceable items and a failure will require the replacement of the complete drive shaft assembly.

FRONT DRIVESHAFT



ITEM	DESCRIPTION
1	CV joint
2	Front drive shaft

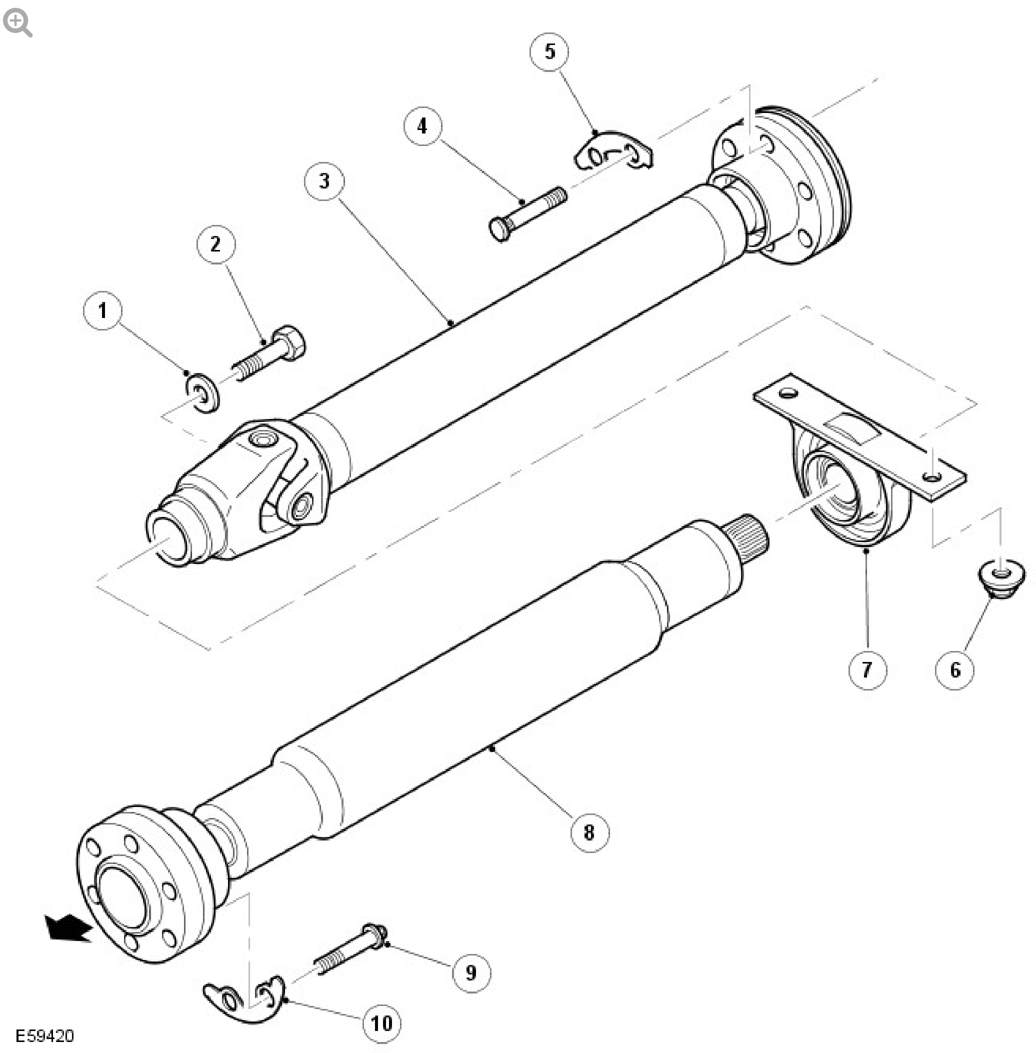
The front drive shaft is constructed from 1.7 mm wall tubular steel. A CV joint is attached to each end of the drive shaft (see 'Halfshaft Joint' section for more information on CV joints). The shaft has an overall nominal length of 681 mm.

Each CV joint has 6 holes, which allow for attachment to the input flange of the front differential and the front output flange of the transfer box. The CV joints are secured to the front differential and transfer box with 6 Torx head adhesive retained bolts.

Three compression link washers are fitted under each pair of bolts. The washers are required to prevent compression of the CV joints attachment flange.

A shroud is pressed over the CV joint. The shroud seals to the joint body using an internal gasket and to the front output flange of the transfer box using an end cap and internal gasket. This prevents the ingress of dirt and moisture. The CV joints allow for movement of the drive shaft caused by small movements in the transmission and transfer box mountings.

REAR DRIVESHAFT ASSEMBLY



ITEM	DESCRIPTION
1	Washer
2	Bolt
3	Driveshaft - Front
4	Bolt M12 (6 off)
5	Shim (3 off)
6	Nut (2 off)
7	Shaft bearing assembly

8	Driveshaft - Rear
9	Bolt M12 (6 off)
10	Shim (3 off)

The rear driveshaft comprises front and rear shaft assemblies and a centrally mounted shaft bearing. The rear driveshaft has an overall length of 1282 mm.

FRONT SHAFT ASSEMBLY

The front shaft assembly incorporates a crash feature within the tube, which controls the collapse of the drive shaft during a crash.

The front shaft assembly comprises a CV joint at the front and a splined shaft at the rear. The front shaft comprises a tube with welded, splined shafts at each end.

The forward splined shaft accepts the CV joint, which is secured with a circlip. The CV joint is packed with grease and sealed on both sides with metal shrouds to prevent the ingress of dirt and moisture. The CV joint (transfer box end) has 6 radial holes, which provide for the attachment to the transfer box rear output flange. The joint is secured to the output flange with 6 bolts, which screw into threaded holes in the flange. Three compression link washers are fitted under each pair of bolts. The CV joint is not a serviceable component and a failure would require replacement of the rear driveshaft assembly. The rear splined shaft mates with splines in the rear shaft universal joint and is pressed in and fixed with Locktite. A threaded hole is provided in the splined shaft to secure the front and rear driveshaft sections together. A machined surface on the shaft accepts the shaft bearing, which is a press fit.

SHAFT BEARING ASSEMBLY

The shaft bearing assembly comprises a pressed steel housing, a rubber bush and a ball bearing. The rubber bush is bonded into the housing. An internal metal ring, bonded to the bush, allows for the bearing to be press fitted into it. The rubber bush allows for small deviations in alignment and also absorbs vibrational forces. The shaft bearing assembly is located on studs, which are integral with the body, and secured with flanged nuts.

REAR SHAFT ASSEMBLY

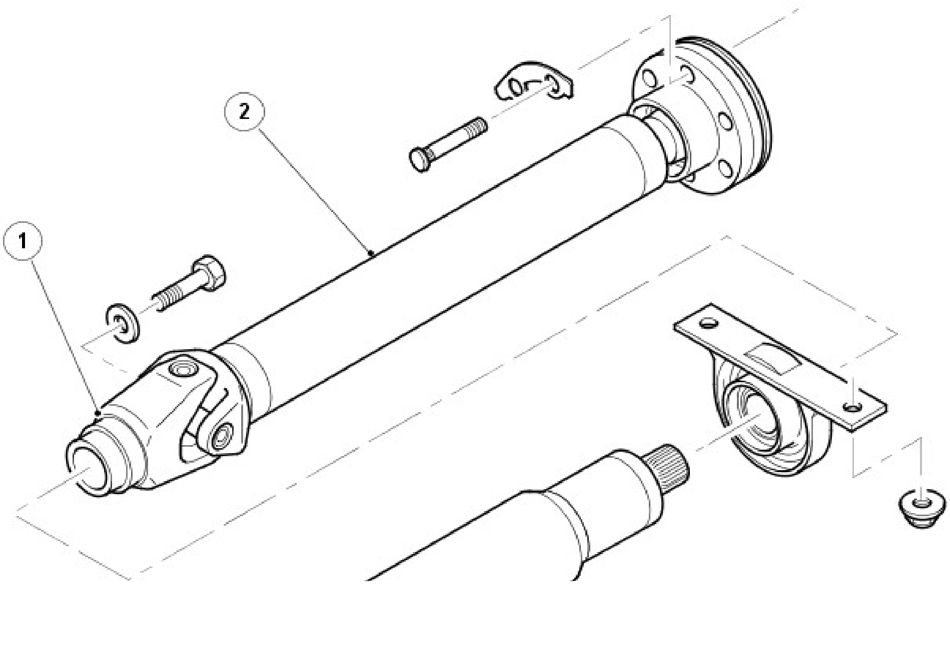
The rear shaft assembly comprises a universal joint at the front and a CV joint at the rear. The rear shaft comprises a tube with the welded universal joint at one end and a welded splined shaft at the opposite end.

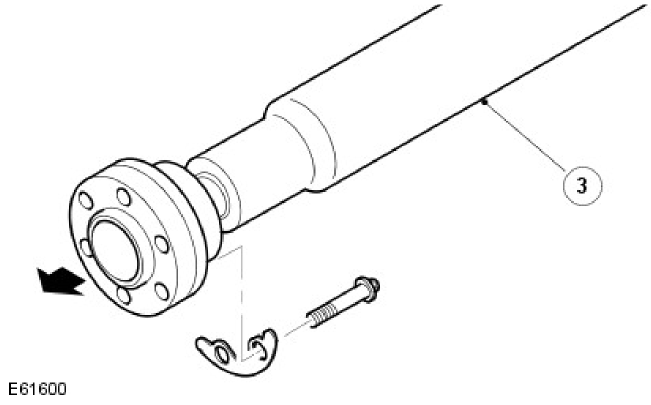
The opposite end of the universal joint has a splined bore, which mates with the splined shaft on the rear of the front shaft assembly. A bolt and washer is fitted through the splined bore and screws into the splined shaft on the front shaft assembly, securing the front and rear shaft assemblies together.

The rear CV joint (final drive end) has 6 radial holes, which provide for the attachment to the rear differential input flange. The joint is secured to the input flange with 6 torx bolts, which screw into threaded holes in the flange. Three compression link washers are fitted under each pair of bolts. The rear splined shaft mates with splines in the rear shaft CV joint hub and is pressed in and fixed with Locktite.

DRIVESHAFT

DESCRIPTION AND OPERATION





ITEM	DESCRIPTION
1	Universal joint
2	Rear shaft assembly
3	Front shaft assembly

The rear driveshaft is a 2-piece unit with a universal joint connecting the rear shaft assembly to the front shaft assembly. This configuration allows for angular deviations of the driveshaft due to acceleration and braking.

The rear shaft assembly comprises a tube with the welded universal joint at the front and a Constant Velocity (CV) joint at the rear. The front shaft assembly comprises a tube with a CV joint at the front and a welded splined shaft at the rear.

The front splined shaft mates with splines in the rear shaft universal joint. A threaded hole is provided in the splined shaft to secure the front and rear shaft assemblies together.