# COMPONENT BLEEDING - VEHICLES WITH: STANDARD BRAKES (G1225243)

## GENERAL PROCEDURES

**WARNING:**

If any components upstream of the Hydraulic Control Unit (HCU), including the HCU itself are replaced, the brake system must be bled using Land Rover approved diagnostic equipment. This will ensure that all air is expelled from the new component(s).

**CAUTION:**

LH illustration shown, RH is similar.

**NOTES:**

- Bleeding of the complete brake system must be carried out using Land Rover approved diagnostic equipment. The following manual procedure covers bleeding the brake system for components down stream of the HCU, where only the primary or secondary brake circuits have been disturbed in isolation. Partial bleeding of the hydraulic system is only permissible if a brake tube or hose has been disconnected with only minimal loss of fluid.

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

1. **WARNING:**

   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Check that the brake fluid lines are secure and that there are no signs of a brake fluid leak. If a brake fluid leak is detected, investigate and rectify the cause of the leak before bleeding the brakes.

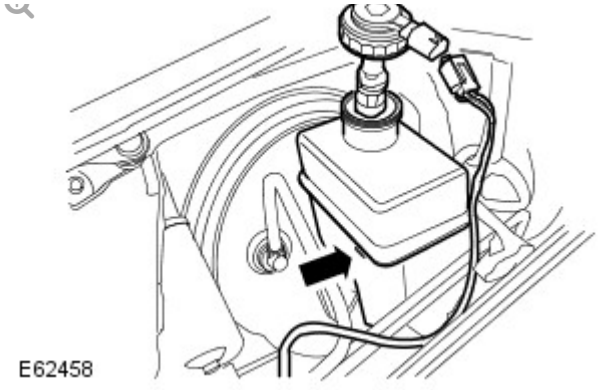
3. Pump the brake pedal until the brake vacuum assistance is exhausted.

4. **WARNING:**

   Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.

   **CAUTIONS:**

   - Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.
   - The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.




Remove the brake fluid reservoir cap.

- Disconnect the brake fluid reservoir electrical connector.
- Fill the brake fluid reservoir to the MAX mark.

5. Install the bleed tube to the brake caliper bleed screw and immerse the free end of the bleed tube in a bleed jar containing a small quantity of approved brake fluid.
   - Hold the bleed container at least 300 mm above the Caliper that is being bled.

6. Loosen the bleed screw by one-half turn to three-quarters of a turn.

7. **CAUTION:**

   The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.

   With assistance, depress the brake pedal steadily through to 2/3 of its full stroke.

8. With the brake pedal held down, close bleed screw and then return the brake pedal to 1/3 of its full stroke and hold.

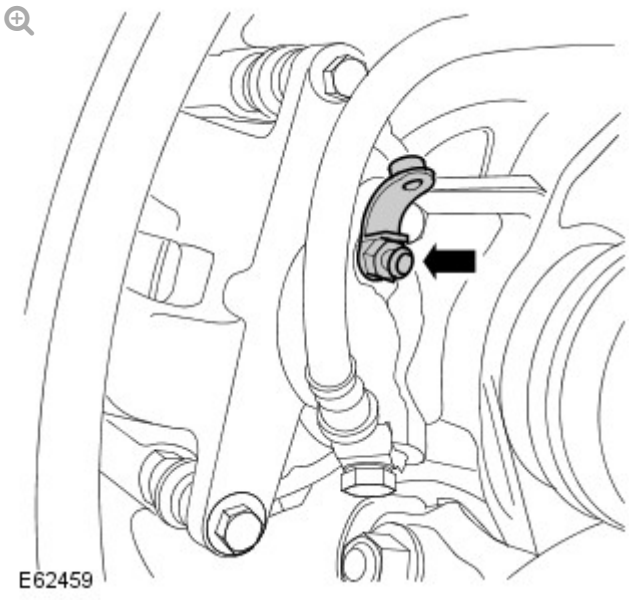
9. Repeat steps 7 and 8, 28 times for the rear brake and 10 times for the front brake.

10. At the end of the bleed process, depress and hold the brake pedal down.

down.

11. **CAUTION:**

> Make sure the bleed screw cap is installed after bleeding. This will prevent corrosion to the bleed screw.




With the brake pedal fully depressed, tighten the bleed screw.

- On vehicles with high performance brakes, tighten the front caliper bleed screw to 19 Nm (14 lb.ft).
- On vehicles with standard brakes, tighten the front caliper bleed screw to 10 Nm (7 lb.ft).
- Tighten the rear caliper bleed screws to 10 Nm (7 lb.ft).

12. Fill the brake fluid reservoir to the MAX mark.

13. Apply the brakes and check for leaks.

14. Install the brake fluid reservoir cap.
    - Connect the brake fluid reservoir electrical connector.

15. On completion, road test the vehicle and check the brake pedal operation. The pedal travel should be short with a firm feel.

2012.0 RANGE ROVER (LM), 206-00

BRAKE SYSTEM – GENERAL INFORMATION

# BRAKE SYSTEM BLEEDING

(G840075)

GENERAL PROCEDURES

| | | | | | |
|---|---|---|---|---|---|
| 70.25.02 | BRAKES - COMPLETE SYSTEM - BLEED | ALL DERIVATIVES | 0.7 | USED WITHINS | + |
| 70.25.02.36 | BRAKES - COMPLETE SYSTEM - BLEED - BREMBO/SPORTS BRAKES FITTED | ALL DERIVATIVES | 0.8 | USED WITHINS | + |

### Front caliper


### Rear caliper


**NOTE:**

Bleeding of the brake system can be carried out using the procedures given on TestBookT4, or by following the manual procedure given below.

1. The Brake bleed procedure is identical to that given in the Range Rover Workshop Manual.

2. Ensure that the system is bled through both bleed screws on each calliper.

2012.0 RANGE ROVER (LM), 206-03

# FRONT DISC BRAKE

## SPECIFICATIONS

| Item | Specification |
|---|---|
| Disc type | Ventilated |
| **Disc diameter:** | |
| Vehicles without High performance brakes | 360 mm (14.2 in) |
| Vehicles with High performance brakes | 380 mm (15.0 in) |
| **Disc thickness:** | |
| **Vehicles without High performance brakes:** | |
| New | 30.0 mm (1.18 in) |
| Service limit | 27.0 mm (1.063 in) |
| Maximum disc run-out - disc installed | 0.05 mm (0.002 in) |
| **Vehicles with High performance brakes:** | |

| | |
|---|---|
| New | 34.0 mm (1.34 in) |
| Service limit | 31.0 mm (1.22 in) |
| Maximum disc run-out - disc installed | 0.05 mm (0.002 in) |
| **Vehicles without High performance brakes:** | |
| Caliper type | Sliding pin, twin piston |
| Piston diameter | 48.0 mm (1.9 in) |
| Pad minimum thickness | 3.0 mm (0.12 in) |
| **Vehicles with High performance brakes:** | |
| Caliper type | Fixed, six piston |
| Piston diameter | 40/38/36 mm (1.57/1.50/1.42 in) |
| Pad minimum thickness | 3.0 mm (0.12 in) |
| **Brake pad wear warning lead:** | |
| Location | Front left hand brake pad |
| Activates at | 75% of pad life utilised |

### Torque Specifications Vehicles without High performance Brakes

| DESCRIPTION | NM | LB-FT |
|---|---|---|
| Brake caliper bleed screw | 10 | 7 |
| Brake disc retaining bolt | 16 | 12 |
| Brake caliper anchor plate to hub bolts: | 275 | 202 |
| Brake caliper housing to anchor plate bolts | 35 | 26 |
| Brake hose union | 32 | 24 |

### Torque Specifications Vehicles with High performance Brakes

| DESCRIPTION | NM | LB-FT |
|---|---|---|
| Brake caliper bleed screw | 19 | 14 |
| Brake disc retaining bolt | 16 | 12 |
| Brake caliper retaining bolts: | 275 | 202 |
| Brake hose union | 32 | 24 |
| Brake pad centre bolt | 30 | 22 |

| | | |
|---|---|---|
| Brake pad centre bolt | 30 | 22 |

# FRONT DISC BRAKE

## SPECIFICATIONS

| Item | Specification |
|---|---|
| Disc type | Ventilated |
| **Disc diameter:** | |
| Vehicles without Brembo brakes | 340 mm (13.5 in) |
| Vehicles with Brembo brakes | 360 mm (14.1 in) |
| **Disc thickness:** | |
| New | 30.0 mm (1.18 in) |
| Service limit | 27.0 mm (1.10 in) |
| Maximum disc run-out - disc installed | 0.05 mm (0.002 in) |
| **Vehicles without Brembo brakes:** | |
| Caliper type | Sliding pin, twin piston |
| Piston diameter | 48.0 mm (1.9 in) |
| Pad minimum thickness | 3.0 mm (0.12 in) |
| **Vehicles with Brembo brakes:** | |
| Caliper type | Fixed, opposing four piston |
| Piston diameter | 46 mm (1.8 in) |
| Pad minimum thickness | 3.0 mm (0.12 in) |
| **Brake pad wear warning lead:** | |
| Location | Front left hand brake pad |
| Activates at | 75% of pad life utilised |

## Torque Specifications Vehicles without Brembo Brakes

| DESCRIPTION | NM | LB-FT |
|---|---|---|
| Brake caliper bleed screw | 14 | 10 |
| * Brake disc retaining bolt | 16 | 12 |
| * Brake caliper anchor plate bolts: | | |
| Stage 1 | 65 | 48 |
| Stage 2 | Further 90° | Further 90° |
| * Brake caliper housing to anchor plate bolts | 35 | 26 |
| Brake hose union | 32 | 24 |

*** New bolts must be installed**

## Torque Specifications Vehicles with Brembo Brakes

| DESCRIPTION | NM | LB-FT |
|---|---|---|
| Brake caliper bleed screw | 19 | 14 |
| * Brake disc retaining bolt | 16 | 12 |
| * Brake caliper retaining bolts: | | |
| Stage 1 | 65 | 48 |
| Stage 2 | Further 90° | Further 90° |
| Brake hose union | 32 | 24 |

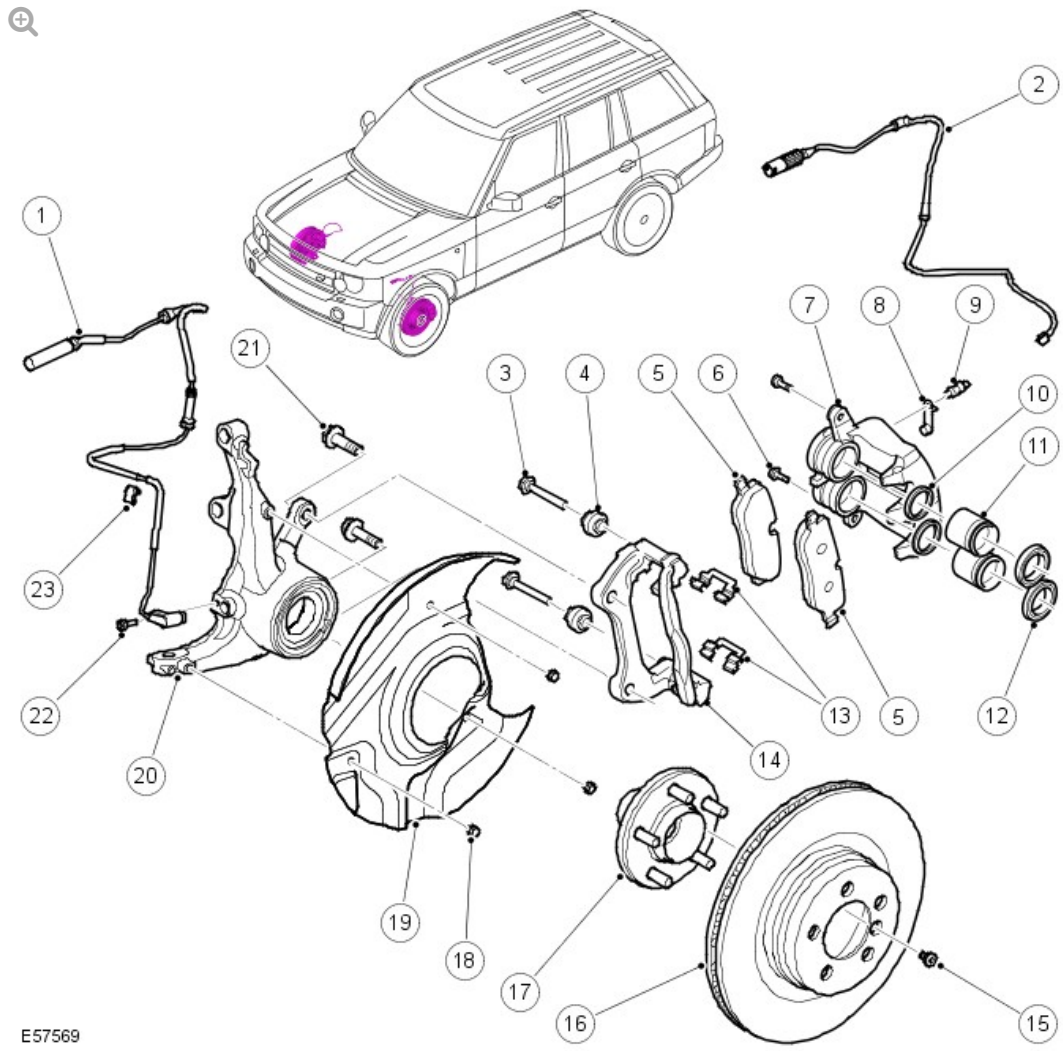
*** New bolts must be installed**

2012.0 RANGE ROVER (LM), 206-03

# FRONT DISC BRAKE

DESCRIPTION AND OPERATION

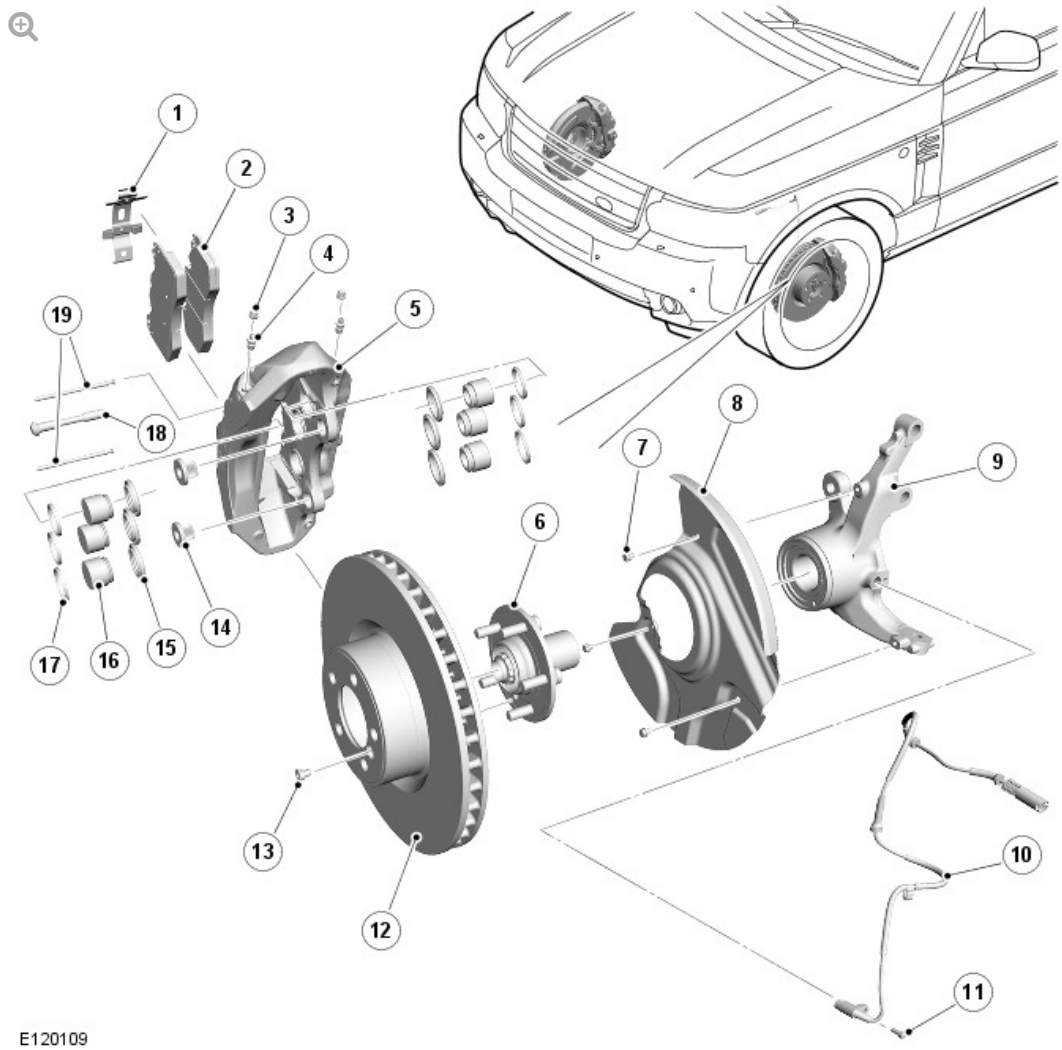
## COMPONENT LOCATIONS - Standard Brakes




| ITEM | DESCRIPTION |
|---|---|
| 1 | Wheel speed sensor |
| 2 | Brake pad wear sensor lead |
| 3 | Guide pin (2 off) |
| 4 | Guide pin dust cover (2 off) |
| 5 | Brake pad |
| 6 | Guide pin bolt (2 off) |
| 7 | Caliper body |
| 8 | Bleed screw dust cap |
| 9 | Bleed screw |
| 10 | Piston seal (2 off) |
| 11 | Piston (2 off) |

| | |
|---|---|
| 11 | Piston (2 off) |
| 12 | Piston dust cover (2 off) |
| 13 | Brake pad retainers |
| 14 | Caliper carrier |
| 15 | Brake disc holding screw |
| 16 | Brake disc |
| 17 | Drive flange assembly |
| 18 | Dust shield screw (3 off) |
| 19 | Dust shield |
| 20 | Front wheel knuckle |
| 21 | Caliper bolt (2 off) |
| 22 | Wheel speed sensor cap screw |
| 23 | Cable clip |

## COMPONENT LOCATION - High Performance Brakes



-

| ITEM | DESCRIPTION |
|---|---|
| 1 | Brake pad anti-rattle spring |
| 2 | Brake pad |
| 3 | Bleed screw dust caps (x 2) |
| 4 | Bleed screw (x 2) |
| 5 | Caliper body |
| 6 | Drive flange assembly |
| 7 | Dust shield screw (x 3) |
| 8 | Dust shield |
| 9 | Front wheel knuckle |
| 10 | Wheel speed sensor |
| 11 | Wheel speed sensor screw |
| 12 | Brake disc |
| 13 | Brake disc retaining bolt |
| 14 | Caliper thread insert (x 2) |
| 15 | Piston dust cover (x 6) |
| 16 | Piston (x 6) |
| 17 | Piston seal (x 4) |
| 18 | Caliper bridge bolt |
| 19 | Brake pad retaining pins (x 2) |

## GENERAL

The front brakes on all models feature ventilated brake discs with different diameter brake discs dependant on the vehicle variant.
For additional information, refer to: Specifications (206-03, Specifications).

The standard-brakes feature twin-piston sliding calipers and the high-performance brakes feature 6 piston fixed calipers.

performance brakes feature 6 piston fixed calipers.

On all models the brake caliper is attached to the rear of the front knuckle. The brake pads are made from an asbestos free material. The inboard brake pad of the left front brake incorporates a wear sensor.

With the standard brake sliding calipers, when hydraulic pressure is supplied to the caliper, the pistons extend and force the inner pad against the brake disc. The caliper body reacts and slides on the guide pins to bring the outer pad into contact with the brake disc.

With the high performance fixed calipers, when hydraulic pressure is supplied to the caliper, the three pairs of opposed pistons extend in the caliper. The three pistons in each side of the caliper force their related brake pads against the brake disc.

The front brake pad wear sensor is connected in series with the rear brake pad wear sensor, between the instrument cluster and ground. When a brake pad incorporating a brake pad wear sensor is approximately 75% worn, the brake pad wear sensor goes open circuit. When the instrument cluster detects the open circuit, it illuminates the brake warning indicator, displays an appropriate warning in the message center and sounds a warning chime. For additional information, refer to: Instrument Cluster (413-01, Description and Operation).

At the beginning of each ignition cycle, the instrument cluster performs a bulb check on the brake warning indicator.

2012.0 RANGE ROVER (LM), 206-03

# FRONT DISC BRAKE

## DIAGNOSIS AND TESTING

For additional information.

REFER to: Brake System (206-00, Diagnosis and Testing).

FRONT DISC BRAKE

# BRAKE DISC – VEHICLES WITH: STANDARD BRAKES

(G1224076)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.12.10 | DISC – FRONT – EACH – RENEW | ALL DERIVATIVES | 0.5 | USED WITHINS | + |
| 70.12.33 | DISC – REAR – EACH – RENEW | ALL DERIVATIVES | 0.9 | USED WITHINS | + |

## REMOVAL

**WARNING:**

If installing a new brake disc, install new brake pads.

**CAUTION:**

Brake discs must be renewed in pairs.

**NOTES:**

- LH illustration shown, RH is similar.
- Some variation in the illustrations may occur, but the essential information is always correct.
- The brake pad wear warning indicator sensor must be replaced each time the brake pads are serviced.

1. **WARNING:**

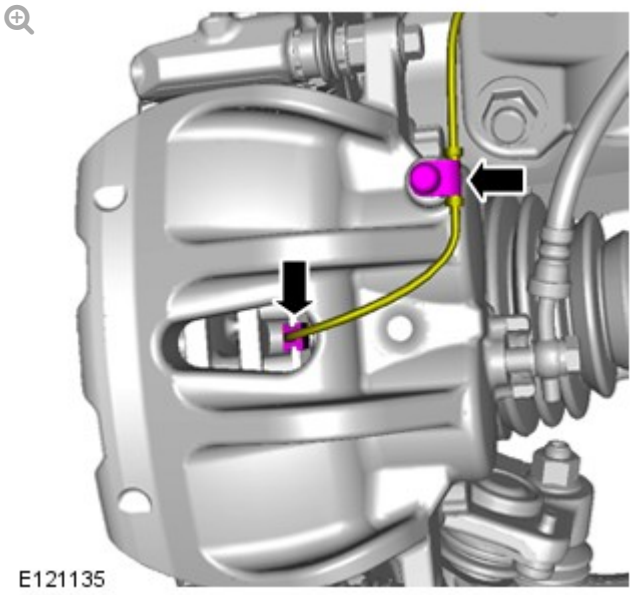
   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Remove the front wheel and tire.

3. **CAUTION:**

   The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.

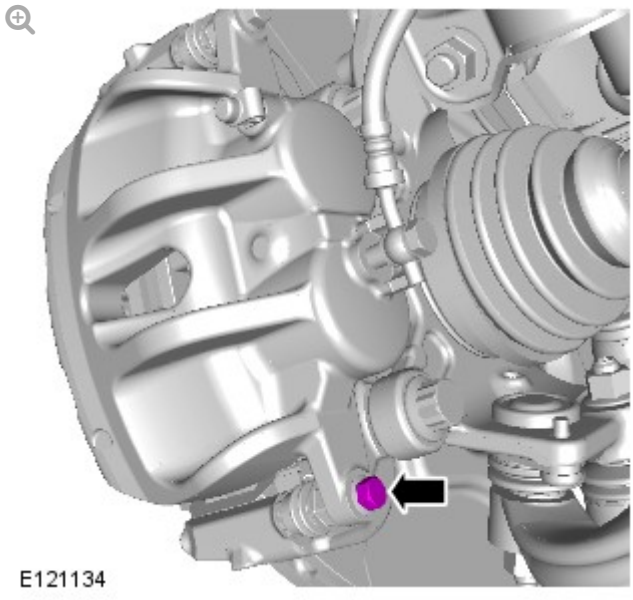


LH side front: Disconnect the brake pad wear indicator sensor wiring harness.

4.

**NOTE:**

Use an additional wrench to prevent the component from rotating.

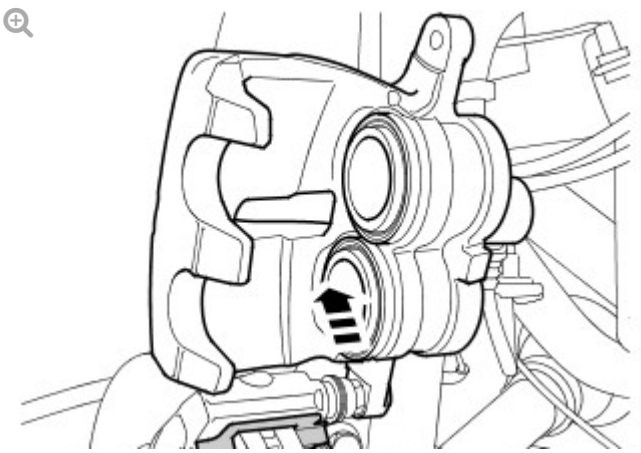


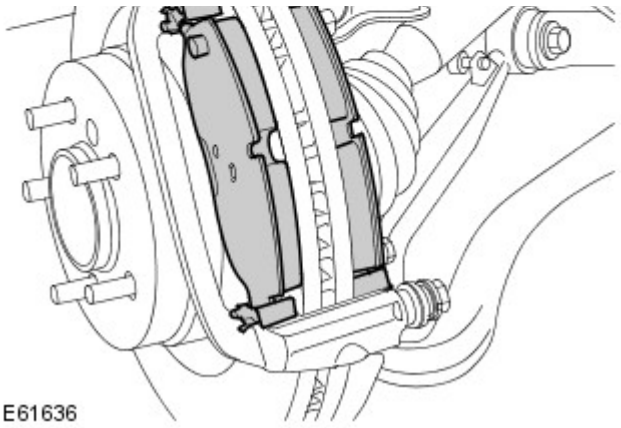

Remove the brake caliper lower bolt.

5.

**NOTE:**

Note the orientation of the brake pads.





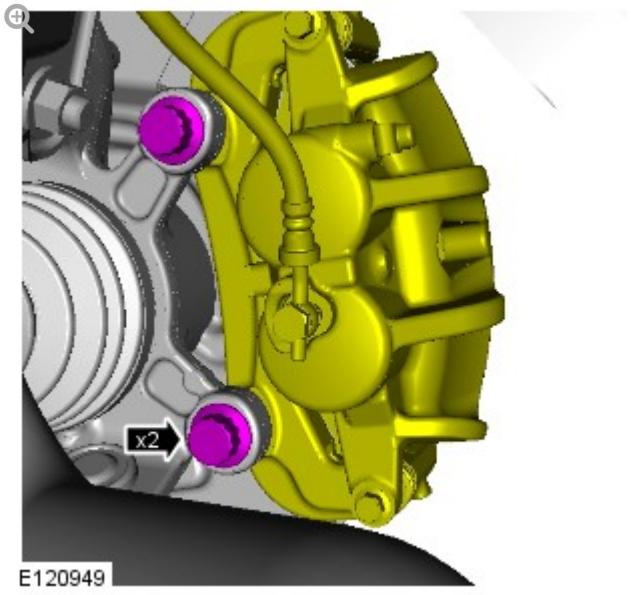

Remove the brake pads.

- Rotate the brake caliper upwards.
- Remove the 2 clips.

6.

**CAUTION:**

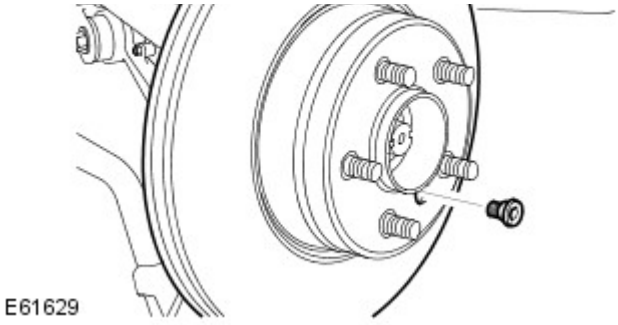
Do not allow the brake caliper to hang on the brake hose.




Remove the brake caliper.

- Remove the brake caliper anchor bolts.
- Tie the brake caliper aside.

7.




Remove the front brake disc.

- Remove the Allen screw.

## INSTALLATION

1. Make sure the brake disc and hub mating surfaces are clean.
2. Install the brake disc.
   - Tighten the Allen screw to 16 Nm (12 lb.ft).
3. Install the brake caliper.
   - Clean the component mating faces.
   - Tighten the bolts to 275 Nm (203 lb.ft).
4. **WARNING:**

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

   Clean the brake caliper housing and anchor plate using brake cleaning fluid.
5. Inspect the caliper piston and slide pin seals for damage.
6. **CAUTIONS:**

   - The brake caliper should move freely on both slide pins.

- The brake caliper should move freely on both slide pins.
- If necessary, renew the components.

Check the slide pins for correct operation.

7. **CAUTION:**

Check the brake fluid reservoir level before pushing the piston back, failure to follow this instruction may result in damage to the vehicle.

**NOTE:**

As the piston is pushed back into the caliper housing, the brake fluid level in the reservoir will rise. Do not allow the reservoir to overflow.

Press the pistons into the caliper housing.

8. **NOTE:**

Make sure the brake pads are installed in the correct orientation.

Install the brake pads.

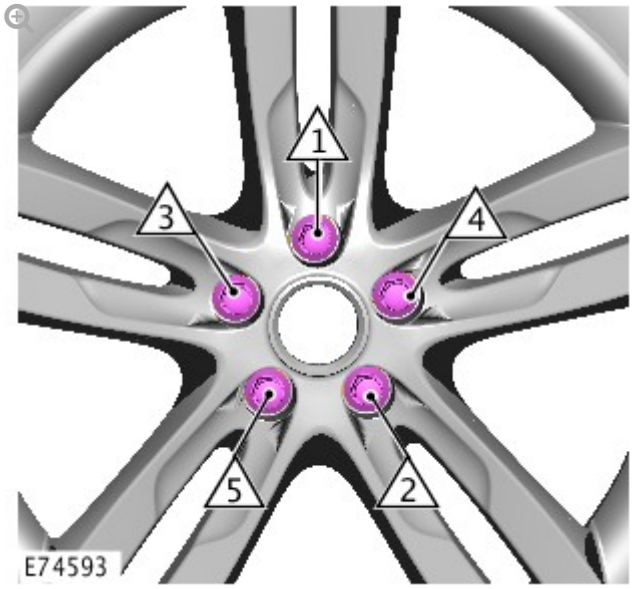
- Install the 2 clips.
- Apply a suitable amount of the supplied grease to the mating faces of the brake pads and brake calipers.

9. Rotate the brake caliper downwards.
   - Tighten the bolt to 32 Nm (24 lb.ft).

10. LH side front: Connect the brake pad wear indicator wiring harness.

11. **NOTE:**

Tighten the wheel nuts in the sequence shown:




Install the wheels and tires.

- Stage 1 : 4Nm
- Stage 2 : 70Nm
- Stage 3 : 140Nm

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

2012.0 RANGE ROVER (LM), 206-03

FRONT DISC BRAKE

# BRAKE DISC – VEHICLES WITH: HIGH PERFORMANCE

# WITH: HIGH PERFORMANCE BRAKES (G1224070)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.12.10 | DISC - FRONT - EACH - RENEW | ALL DERIVATIVES | 0.5 | USED WITHINS | + |
| 70.12.33 | DISC - REAR - EACH - RENEW | ALL DERIVATIVES | 0.9 | USED WITHINS | + |

## REMOVAL

**WARNING:**

If installing a new brake disc, install new brake pads.

**CAUTION:**

Brake discs must be renewed in pairs.

**NOTES:**

- LH illustration shown, RH is similar.
- The brake pad wear warning indicator sensor must be replaced each time the brake pads are serviced.

1. **WARNING:**

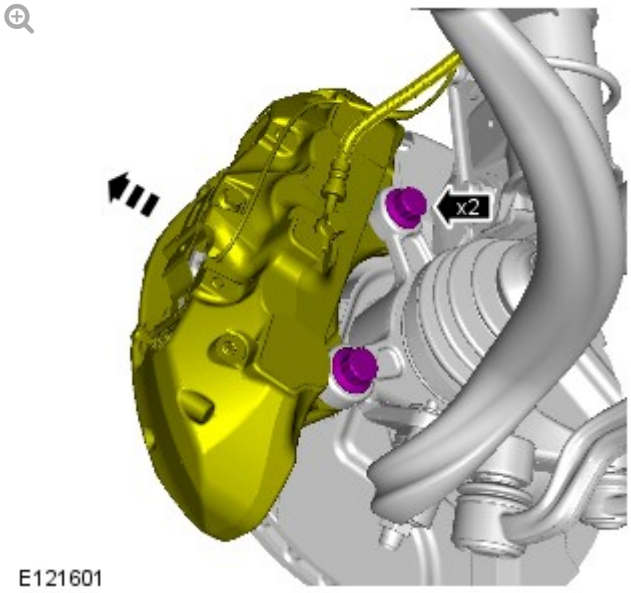
   Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

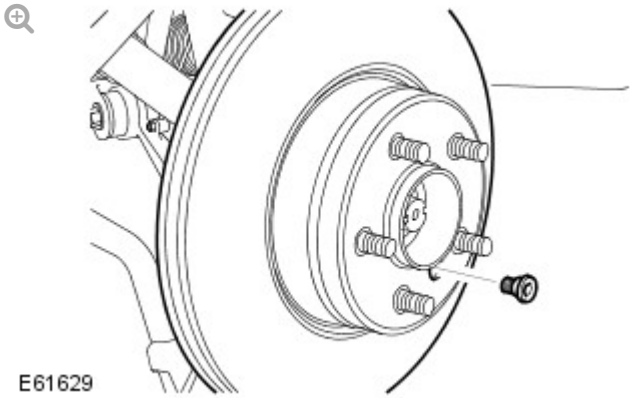
3. **CAUTIONS:**

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




Remove the brake caliper anchor bolts.

- Release the brake caliper.
- Tie the brake caliper aside.

4. 

Remove the brake disc.

- Remove the Allen screw.

## INSTALLATION

1. Make sure the brake disc and hub mating surfaces are clean.
2. Install the brake disc.
   - Tighten the Allen screw to 16 Nm (12 lb.ft).
3. Install the brake caliper and tighten the bolts to 275 Nm (203 lb.ft)
   - Clean the component mating faces.
4. Install the wheel and tire.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).
5. Depress the brake pedal several times, check the fluid level in the brake fluid reservoir and top-up with brake fluid if necessary.

2012.0 RANGE ROVER (LM), 206-03

FRONT DISC BRAKE

# BRAKE PADS – VEHICLES WITH: STANDARD BRAKES

(G1224077)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.40.02 | SHOES/PADS – FRONT – SET – RENEW | ALL DERIVATIVES | 0.7 | USED WITHINS | + |
| 70.40.02.36 | SHOES/PADS – FRONT – SET – RENEW – BREMBO/SPORTS | ALL DERIVATIVES | 0.8 | USED WITHINS | + |

| | | | | | |
|---|---|---|---|---|---|
| | BREMBO/SPORTS BRAKES FITTED | | | | |
| 70.40.03 | SHOES/PADS - REAR - SET - RENEW | ALL DERIVATIVES | 0.7 | USED WITHINS | + |

## REMOVAL

**WARNING:**

Brake pads must be renewed in axle sets only, otherwise braking efficiency may be impaired.

**NOTES:**

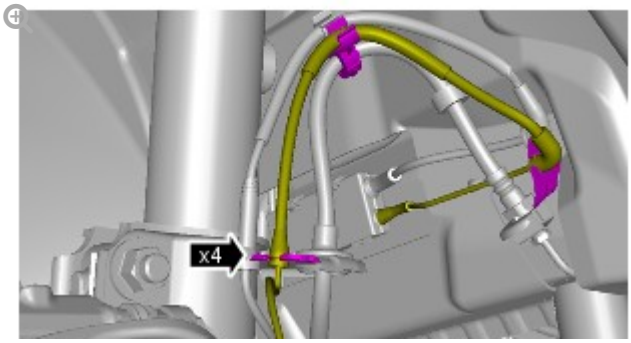
- Some variation in the illustrations may occur, but the essential information is always correct.
- The brake pad wear warning indicator sensor must be replaced each time the brake pads are serviced.

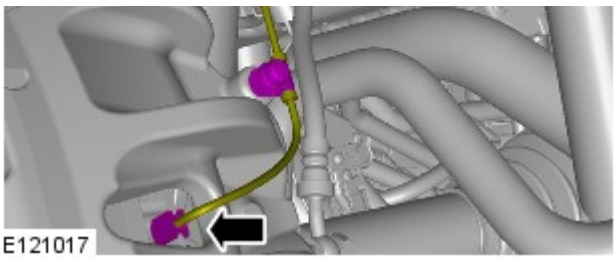
1. **WARNING:**

   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

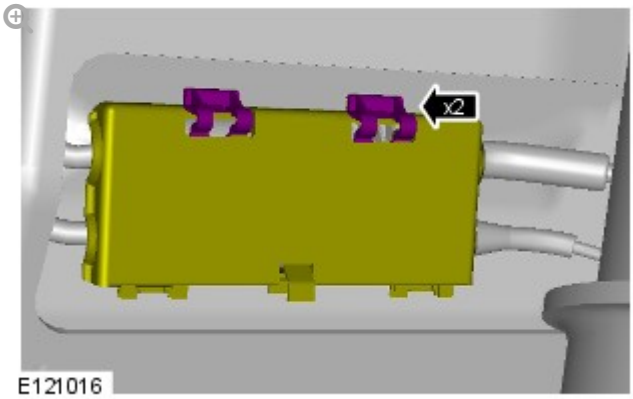
2. Remove the wheels and tires.

3. 



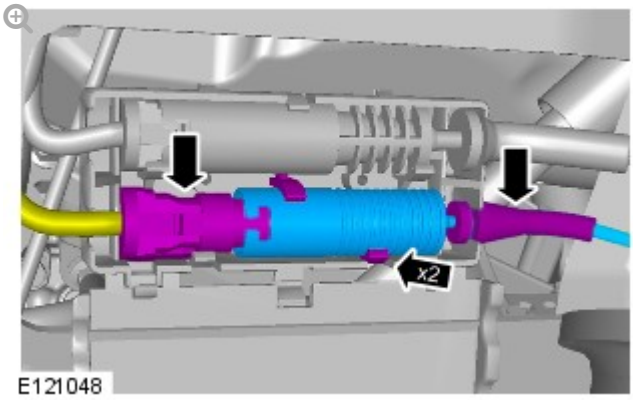

LH side front: Disconnect the brake pad wear indicator sensor wiring harness.

4.




Release the antilock brake system (ABS) junction box cover.

5.

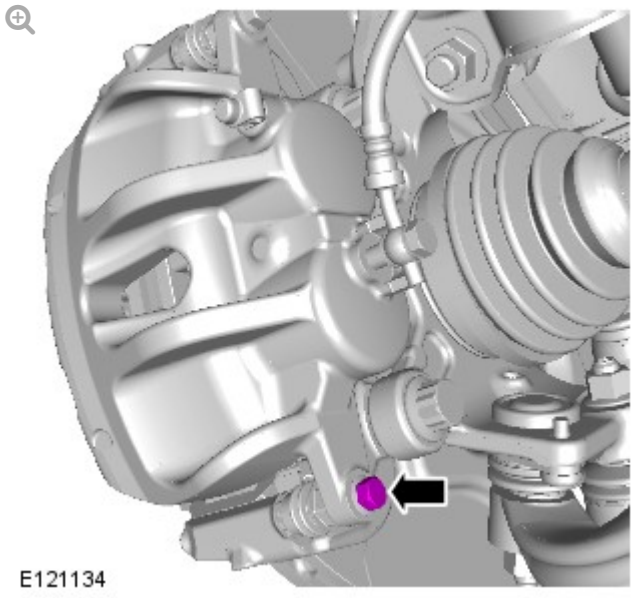



LH side front: Release and disconnect the brake pad wear indicator wiring harness.

6.

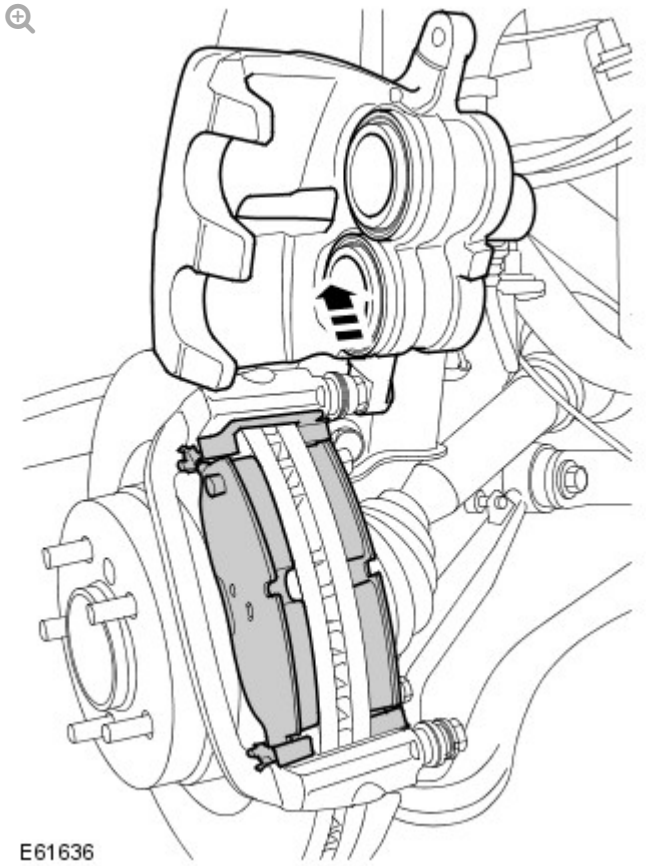
**NOTE:**

Use an additional wrench to prevent the component from rotating.




Remove the brake caliper lower bolt.

7.




Remove the brake pads.

- Rotate the brake caliper upwards.
- Remove the 2 clips.

8. Repeat the above 2 steps for the other side.

## INSTALLATION

1. **WARNING:**

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

   Clean the brake caliper housing and anchor plate using brake cleaning fluid.

2. Inspect the caliper piston and slide pin seals for damage.

3. **CAUTIONS:**

   - The brake caliper should move freely on both slide pins.
   - If necessary, renew the components.

   Check the slide pins for correct operation.

4. **CAUTION:**

   Check the brake fluid reservoir level before pushing the piston back, failure to follow this instruction may result in damage to the vehicle.

   **NOTE:**

   As the piston is pushed back into the caliper housing, the brake fluid level in the reservoir will rise. Do not allow the reservoir to overflow.

Press the pistons into the caliper housing.

5. Install the brake pads.
   - Install the 2 clips.
   - Apply a suitable amount of the supplied grease to the mating faces of the brake pads and brake calipers.

6. Rotate the brake caliper downwards.
   - Tighten the bolt to 32 Nm (24 lb.ft).

7. Repeat the above procedure for the other side.

8. LH side front: Connect and attach the brake pad wear indicator wiring harness electrical connection.

9. Secure the ABS junction box cover.

10. LH side front: Connect the brake pad wear indicator wiring harness.

11. **NOTE:**

    Tighten the wheel nuts in the sequence shown:

    Install the wheels and tires.
    - Stage 1 : 4Nm
    - Stage 2 : 70Nm
    - Stage 3 : 140Nm

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

FRONT DISC BRAKE

# BRAKE PADS – VEHICLES WITH: HIGH PERFORMANCE BRAKES (G1224071)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.40.02 | SHOES/PADS – FRONT – SET – RENEW | ALL DERIVATIVES | 0.7 | USED WITHINS | + |
| 70.40.02.36 | SHOES/PADS – FRONT – SET – RENEW – BREMBO/SPORTS BRAKES FITTED | ALL DERIVATIVES | 0.8 | USED WITHINS | + |
| 70.40.03 | SHOES/PADS – REAR – SET – RENEW | ALL DERIVATIVES | 0.7 | USED WITHINS | + |

## REMOVAL

**WARNING:**

Brake pads must be renewed in axle sets only. Failure to follow this instruction may result in braking efficiency being impaired.

**NOTE:**

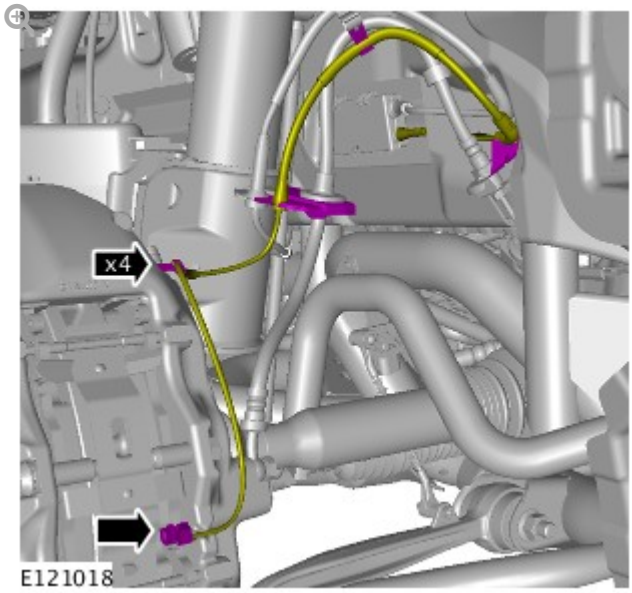
The brake pad wear warning indicator sensor must be replaced each time the brake pads are serviced.

1. **WARNING:**

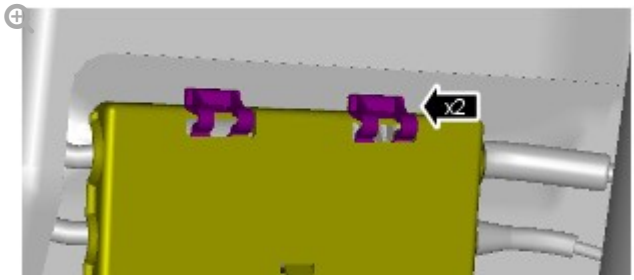
   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Remove the wheels and tires.

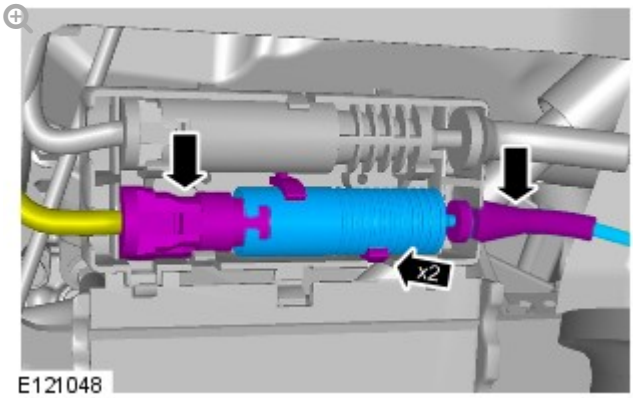
3. 


   LH side front: Disconnect the brake pad wear indicator sensor wiring harness.

4. 


Release the antilock brake system (ABS) junction box cover.

5.

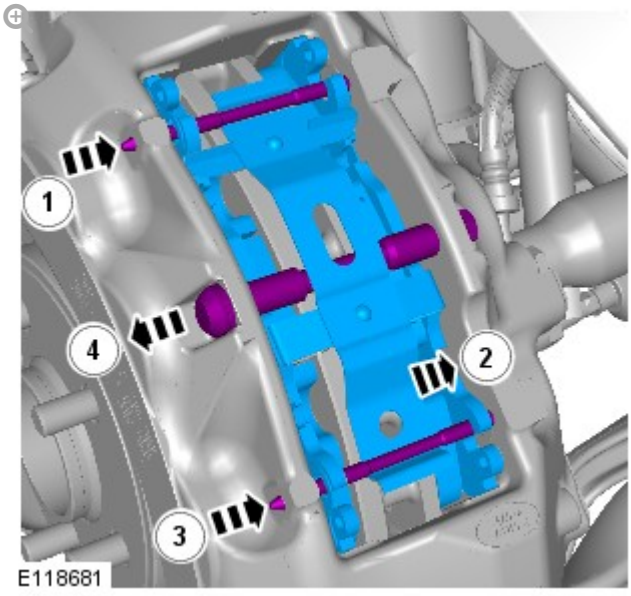



LH side front: Release and disconnect the brake pad wear indicator wiring harness.

6.

**NOTES:**

- Note the orientation of the brake pads.
- Note the orientation of the anti-rattle spring prior to removal.



Remove the front brake pads.

- Remove the 2 retaining pins.
- Remove the anti-rattle spring.
- Remove the bridge bolt from the centre of the caliper.

7. Repeat the above step for the other side.

## INSTALLATION

1. **WARNING:**

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

   Clean the components.

2. Inspect the caliper piston seals for damage.

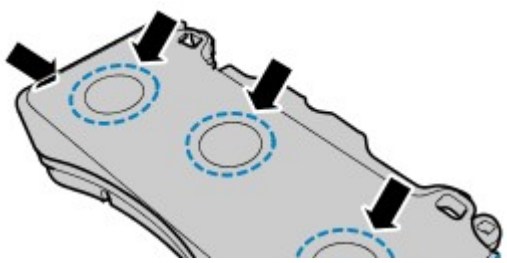
3. Position a bleed jar containing a small quantity of approved brake fluid. Connect the bleed tube to the bleed screw and loosen the screw.

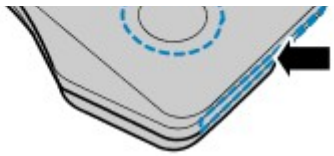
4. Press the pistons into the caliper housing.

   - Tighten the bleed screw to 19 Nm (14 lb.ft).

5. Repeat the above process for the other 3 pistons.

6. Disconnect the bleed tube and remove the jar.

7. 



E126734

Apply grease LR020972 (Molykote CU7439 plus) to the areas indicated on the brake pads.

8. **NOTES:**

   - Make sure the brake pads are installed in the correct orientation.
   - Make sure the anti-rattle spring is installed in the correct orientation.

   Install the brake pads.

   - Tighten the bridge bolt to 30 Nm (22 lb.ft.).
   - Position the anti-rattle spring.
   - Install the pins, making sure the pin collets are fully engaged in the caliper.

9. Repeat the above procedure for the other side.

10. LH side front: Connect the brake pad wear indicator wiring harness electrical connection.

11. Secure the ABS junction box cover.

12. LH side front: Connect the brake pad wear indicator wiring harness.

13. Install the wheels and tires.

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

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

2012.0 RANGE ROVER (LM), 206-03

FRONT DISC BRAKE

# BRAKE CALIPER - VEHICLES

# BRAKE CALIPER - VEHICLES WITH: STANDARD BRAKES

(G1224078)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.55.02 | BRAKE CALIPER - FRONT - EACH - RENEW | ALL DERIVATIVES | 0.5 | USED WITHINS | + |
| 70.55.24 | HOUSING ASSEMBLY - BRAKE CALIPER - FRONT - EACH - RENEW | ALL DERIVATIVES | 0.5 | USED WITHINS | + |
| 70.55.25 | HOUSING ASSEMBLY - BRAKE CALIPER - REAR - EACH - RENEW | ALL DERIVATIVES | 0.5 | USED WITHINS | + |

## REMOVAL

**CAUTION:**

LH illustration shown, RH is similar.

**NOTE:**

Removal steps in this procedure may contain installation details.

1. **WARNING:**

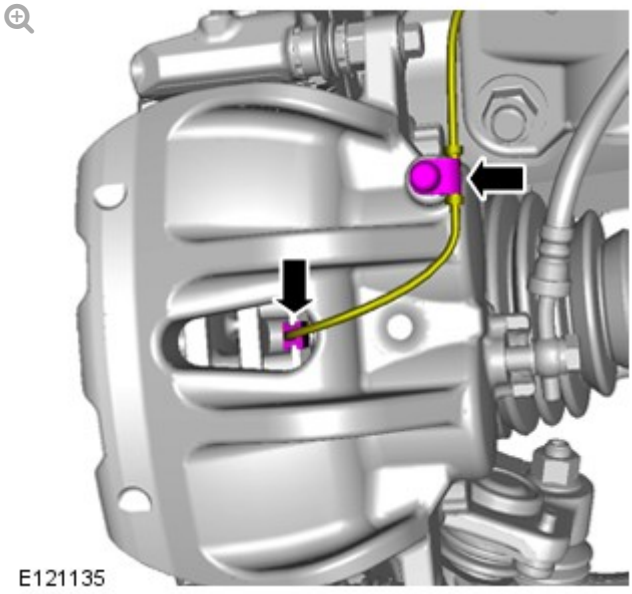
Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

3. **CAUTION:**

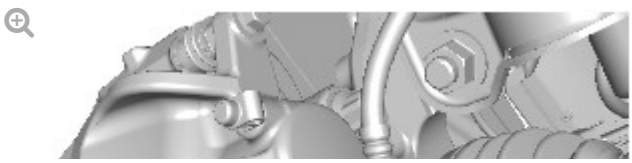
The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.

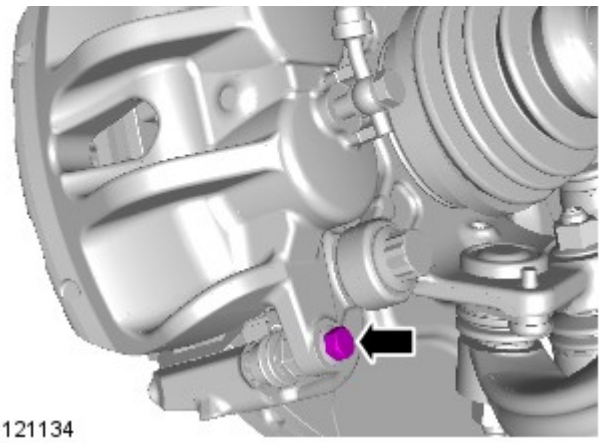



LH side only: Disconnect the brake pad wear indicator sensor.

4. **NOTE:**

Use an additional wrench to prevent the component from rotating.






Remove the brake caliper lower bolt.

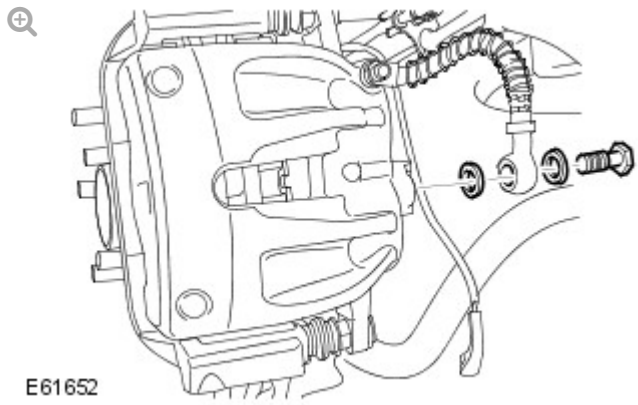
5.

**WARNING:**

Be prepared to collect escaping fluid.

**CAUTION:**

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



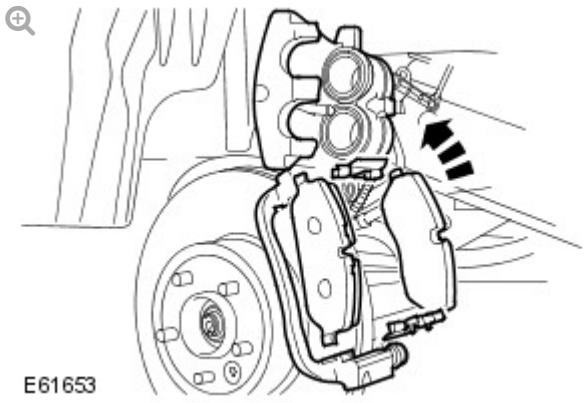

Disconnect the brake hose from the brake caliper.

- Remove the union.
- Remove and discard the two sealing washers.
- Install blanking caps to the exposed ports.

6.

**NOTE:**

Note the orientation of the brake pads.



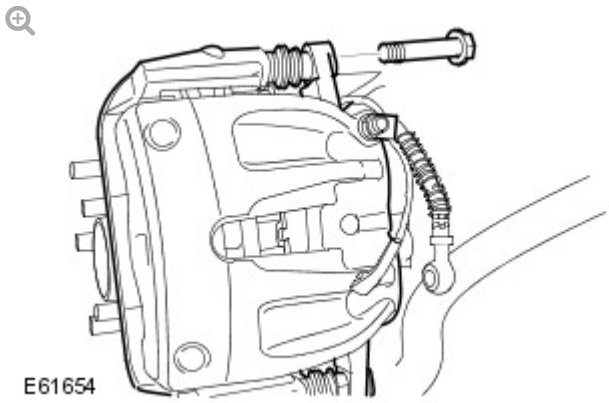

Remove the brake pads.

- Rotate the brake caliper upwards.
- Remove the two clips.

7.

**NOTE:**

Use an additional wrench to prevent the component from rotating.




Remove the brake caliper housing.

- Remove the brake caliper upper bolt.
- Remove the brake caliper housing.

- Remove the brake caliper housing.

## INSTALLATION

1. **WARNING:**

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

   Clean the brake caliper housing and anchor plate using brake cleaning fluid.

2. **CAUTIONS:**

   - The brake caliper should move freely on both slide pins.
   - If necessary, renew the components.

   Check for correct operation.

   - Check the caliper slide pins.
   - Check the condition of the caliper slide pin seals.

3. **NOTE:**

   Use an additional wrench to prevent the component from rotating.

   Install the brake caliper.

   - Tighten the brake caliper upper bolt to 35 Nm (26 lb.ft).

4. **NOTE:**

   Make sure the brake pads are installed in the correct orientation.

orientation.

Install the brake pads.

- Install the two clips.
- Apply a suitable amount of the supplied grease to the mating faces of the brake pads and brake calipers.

5. **NOTE:**

   Use an additional wrench to prevent the component from rotating.

   Rotate the brake caliper downwards.

   - Tighten the brake caliper lower bolt to 35 Nm (26 lb.ft).

6. Connect the brake hose to the brake caliper.
   - Clean the component mating faces.
   - Remove the blanking caps from the ports.
   - Install new sealing washers.
   - Tighten the brake hose union to 32 Nm (24 lb.ft).

7. LH side only: Connect the brake pad wear indicator sensor.
   - Secure in the clip.

8. Bleed the brake caliper.
   For additional information, refer to: Component Bleeding - Vehicles With: Standard Brakes (206-00, General Procedures).

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

2012.0 RANGE ROVER (LM), 206-03

FRONT DISC BRAKE

# BRAKE CALIPER – VEHICLES WITH: HIGH PERFORMANCE BRAKES (G1224072)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.55.02 | BRAKE CALIPER – FRONT – EACH – RENEW | ALL DERIVATIVES | 0.5 | USED WITHINS | + |

| | | | | | |
|---|---|---|---|---|---|
| 70.55.24 | HOUSING ASSEMBLY - BRAKE CALIPER - FRONT - EACH - RENEW | ALL DERIVATIVES | 0.5 | USED WITHINS | + |
| 70.55.25 | HOUSING ASSEMBLY - BRAKE CALIPER - REAR - EACH - RENEW | ALL DERIVATIVES | 0.5 | USED WITHINS | + |

## REMOVAL

**CAUTION:**

LH illustration shown, RH is similar.

**NOTES:**

- Removal steps in this procedure may contain installation details.
- Some variation in the illustrations may occur, but the essential information is always correct.

1. **WARNING:**

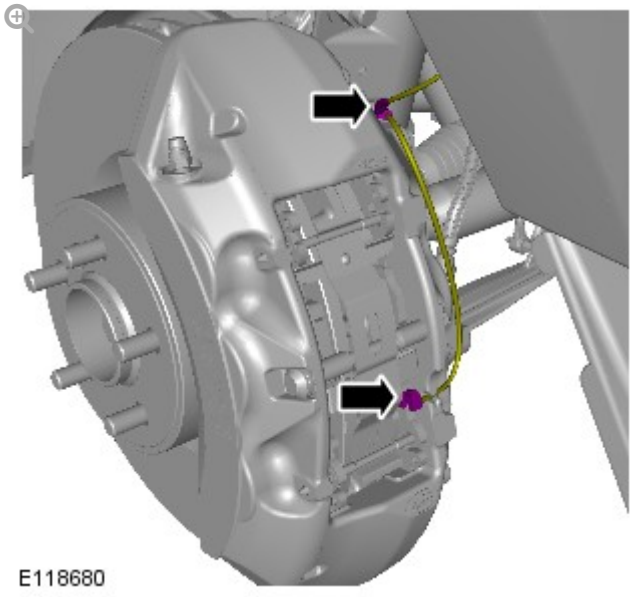
   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Remove the wheel and tire.

3. **CAUTION:**

The brake pad wear indicator sensor, which is installed on the left hand side only, is easily damaged. Do not use a lever to remove the sensor.



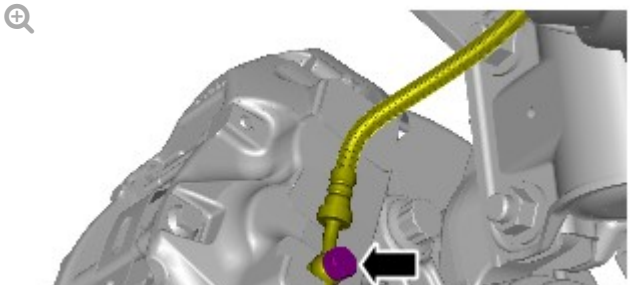

4.

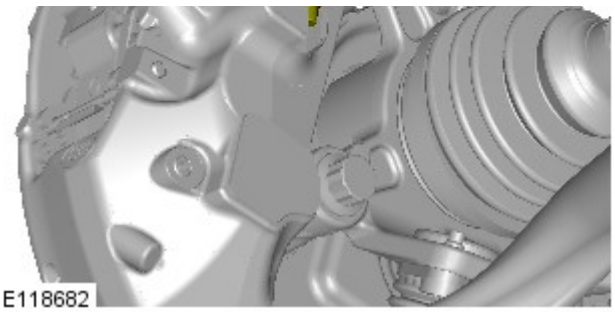
**WARNING:**

Be prepared to collect escaping fluid.

**CAUTIONS:**

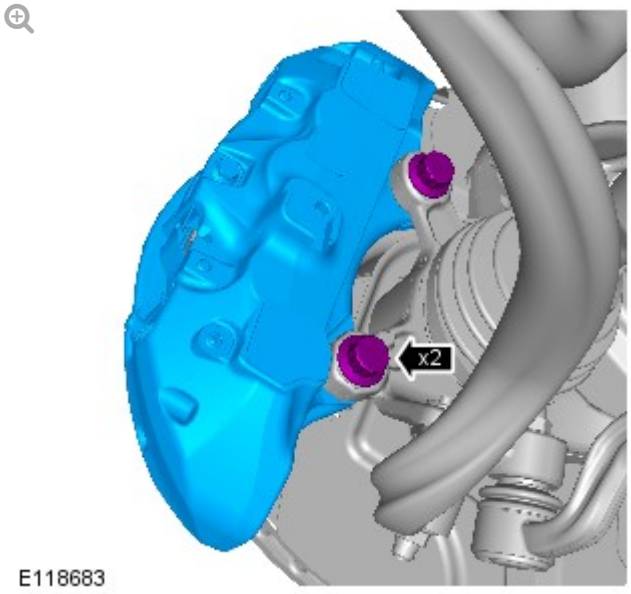
- Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.
- Make sure that new sealing washers are installed.






TORQUE: 32 Nm

5. For additional information, refer to: Brake Pads - Vehicles With: High Performance Brakes (206-03, Removal and Installation).

6. 


TORQUE: 275 Nm

## INSTALLATION

1. To install, reverse the removal procedure.

2. Bleed the brake system.
For additional information, refer to: Component Bleeding - Vehicles With: High Performance Brakes (206-00, General Procedures).

2012.0 RANGE ROVER (LM), 206-04

# REAR DISC BRAKE

SPECIFICATIONS

| Item | Specification |
|---|---|
| Disc type | Ventilated |
| Disc diameter - Vehicles with standard brakes | 354 mm (13.9 in) |
| Disc diameter - Vehicles with high performance brakes | 365 mm (14.4 in) |
| **Disc thickness:** | |
| New | 20.0 mm (0.78 in) |
| Service limit | 18.0 mm (0.71 in) |
| Maximum disc run-out - disc installed | 0.09 mm (0.003 in) |
| Caliper type | Sliding pin, single piston |
| Piston diameter | 45.0 mm (1.7 in) |
| Pad minimum thickness | 3.0 mm (0.12 in) |
| **Brake pad wear warning lead:** | |
| Location | Rear right hand brake pad |
| Activates at | 75% of pad life utilised |

## Torque Specifications

| DESCRIPTION | NM | LB-FT |
|---|---|---|

| DESCRIPTION | NM | LB-FT |
|---|---|---|
| Brake caliper bleed screw | 10 | 7 |
| Brake hose union | 32 | 24 |
| Brake disc retaining bolt | 16 | 12 |
| * Brake caliper anchor plate to hub bolts: | | |
| Stage 1 | 65 | 48 |
| Stage 2 | Further 90° | Further 90° |
| Brake caliper housing to anchor plate bolts | 35 | 26 |

*** New bolts must be installed**

2012.0 RANGE ROVER (LM), 206-04

# REAR DISC BRAKE

# REAR DISC BRAKE

SPECIFICATIONS

| Item | Specification |
|---|---|
| Disc type | Ventilated |
| Disc diameter | 350 mm (13.5 in) |
| **Disc thickness:** | |
| New | 20.0 mm (0.78 in) |
| Service limit | 17.0 mm (0.67 in) |
| Maximum disc run-out - disc installed | 0.09 mm (0.003 in) |
| Caliper type | Sliding pin, single piston |
| Piston diameter | 45.0 mm (1.7 in) |
| Pad minimum thickness | 3.0 mm (0.12 in) |
| **Brake pad wear warning lead:** | |
| Location | Rear right hand brake pad |
| Activates at | 75% of pad life utilised |

## Torque Specifications

| DESCRIPTION | NM | LB-FT |
|---|---|---|
| Brake caliper bleed screw | 14 | 10 |
| Brake hose union | 32 | 24 |
| * Brake disc retaining bolt | 16 | 12 |
| * Brake caliper anchor plate bolts: | | |
| Stage 1 | 15 | 11 |
| Stage 2 | Further 60° | Further 60° |
| * Brake caliper housing to anchor plate bolts | 35 | 26 |

*** New bolts must be installed**

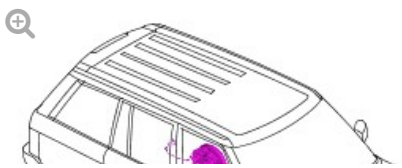
2012.0 RANGE ROVER (LM), 206-04

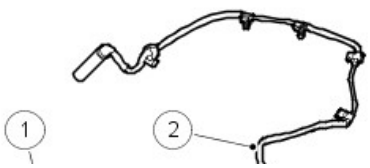
# REAR DISC BRAKE

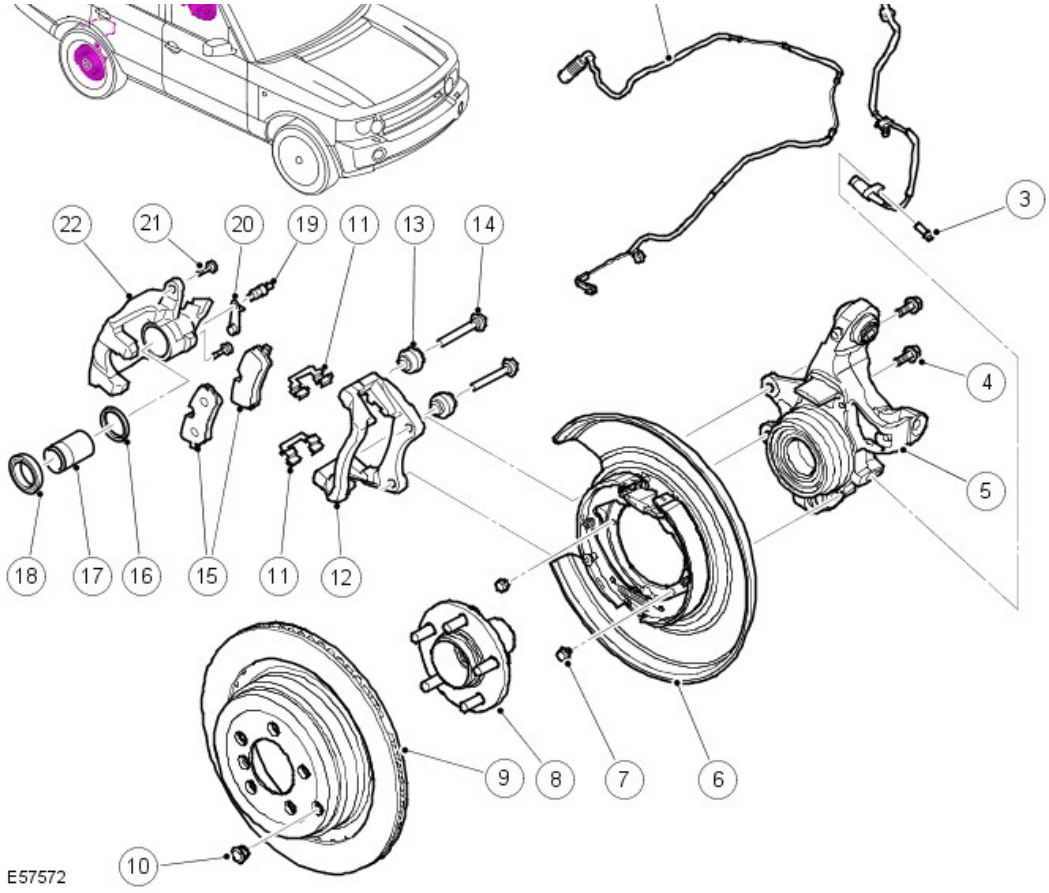
DESCRIPTION AND OPERATION

## COMPONENT LOCATION

### COMPONENT LOCATIONS








| ITEM | DESCRIPTION |
|---|---|
| 1 | Brake pad wear sensor lead |
| 2 | Wheel speed sensor |
| 3 | Wheel speed sensor bolt |
| 4 | Caliper bolt (x 2) |
| 5 | Rear knuckle |
| 6 | Backplate assembly and dust shield |
| 7 | Dust shield screw (x 2) |
| 8 | Drive flange assembly |
| 9 | Brake disc |
| 10 | Brake disc retaining bolt |
| 11 | Brake pad retainers |
| 12 | Caliper carrier |
| 13 | Guide pin dust cover (x 2) |
| 14 | Guide pin (x 2) |
| 15 | Brake pad |

| | |
|---|---|
| 15 | Brake pad |
| 16 | Piston seal |
| 17 | Piston |
| 18 | Piston dust cover |
| 19 | Bleed screw |
| 20 | Bleed screw dust cap |
| 21 | Guide pin bolts (x 2) |
| 22 | Caliper body |

## GENERAL

The rear brakes on all models feature ventilated brake discs with different diameter brake discs dependant on the vehicle variant.
For additional information, refer to: Specifications (206-04, Specifications).

The brakes feature single piston sliding calipers with the brake caliper attached to the rear of the rear knuckle. The brake pads are made from an asbestos free material. The inboard brake pad of the right rear brake incorporates a wear sensor.

When hydraulic pressure is supplied to the caliper, the piston extends and forces the inner pad against the disc. The caliper body reacts and slides on the guide pins to bring the outer pad into contact with the disc.

The rear brake pad wear sensor is connected in series with the front brake pad wear sensor, between the instrument cluster and ground. When a brake pad incorporating a brake pad wear sensor is approximately 75% worn, the brake pad wear sensor goes open circuit. When the instrument cluster detects the open circuit, it illuminates the brake warning indicator, displays an appropriate warning in the message center and sounds a warning chime.
For additional information, refer to: Instrument Cluster (413-01, Description and Operation).

At the beginning of each ignition cycle, the instrument cluster performs a bulb check on the brake warning indicator: the indicator is illuminated amber for 1.5 seconds, then red for 1.5 seconds.

The parking brake is common on all models.

For additional information, refer to: Parking Brake (206-05, Description and Operation).

2012.0 RANGE ROVER (LM), 206-04

# REAR DISC BRAKE

## DIAGNOSIS AND TESTING

For additional information.

REFER to: Brake System (206-00, Diagnosis and Testing).

REAR DISC BRAKE

# BRAKE DISC (G1224635)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.12.33 | DISC - REAR - EACH - RENEW | ALL DERIVATIVES | 0.9 | USED WITHINS | + |

## REMOVAL

**WARNING:**

If installing a new brake disc, install new brake pads.

**CAUTION:**

Brake discs must be renewed in pairs.

**NOTES:**

- If the parking brake shoes or the brake discs have been removed for access to other components then DO NOT carry out the bedding in procedure.
- The brake pad wear warning indicator sensor must be replaced each time the brake pads are serviced.
- RH illustration shown, LH is similar.

1. Using the Land Rover approved diagnostic system, drive the parking brake to the 'mounting position'.

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

3. **WARNING:**

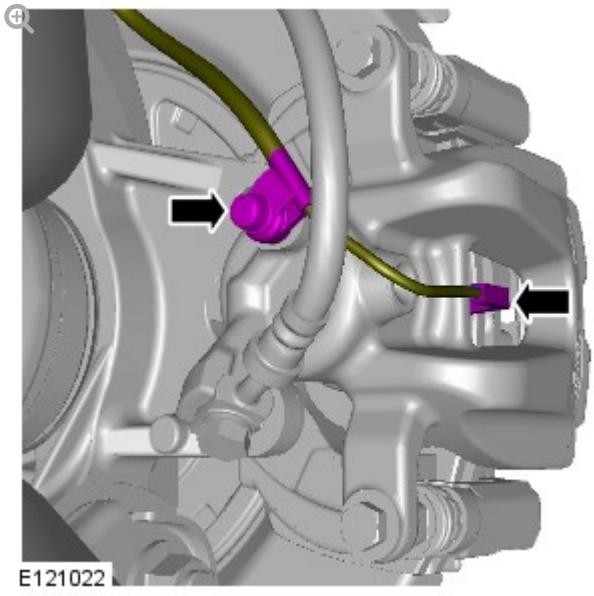
   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

4. Remove the rear wheels and tires.

5. **CAUTION:**

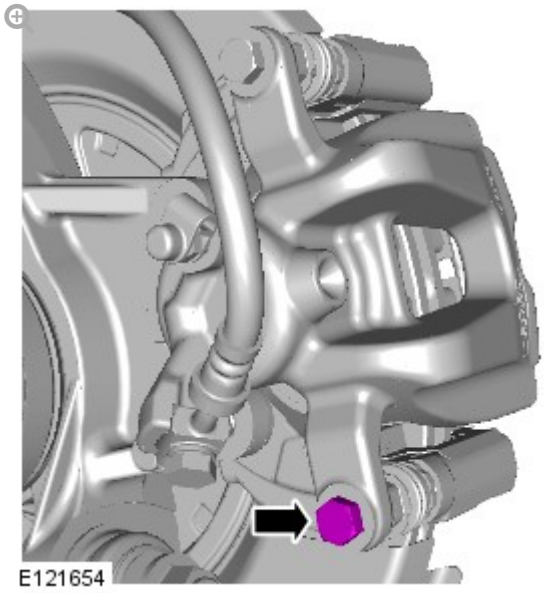
   The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.




   RH side rear: Disconnect the brake pad wear indicator sensor wiring harness.

6. **NOTE:**

Use an additional wrench to prevent the component from rotating.

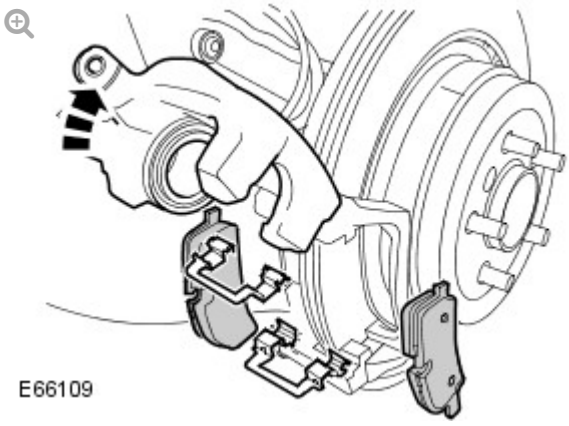



Remove the brake caliper lower bolt.

7.

**NOTE:**

Note the orientation of the brake pads.




Remove the brake pads.

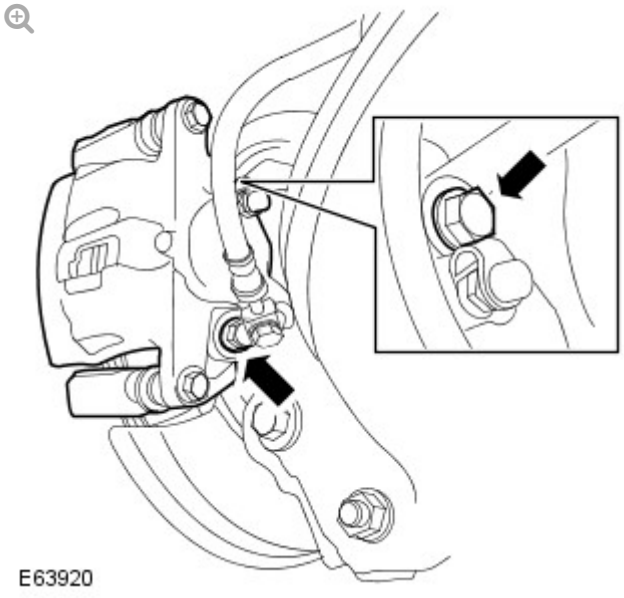
- Rotate the brake caliper upwards.
- Remove the 2 clips.

8.

**CAUTION:**

**CAUTION:**

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



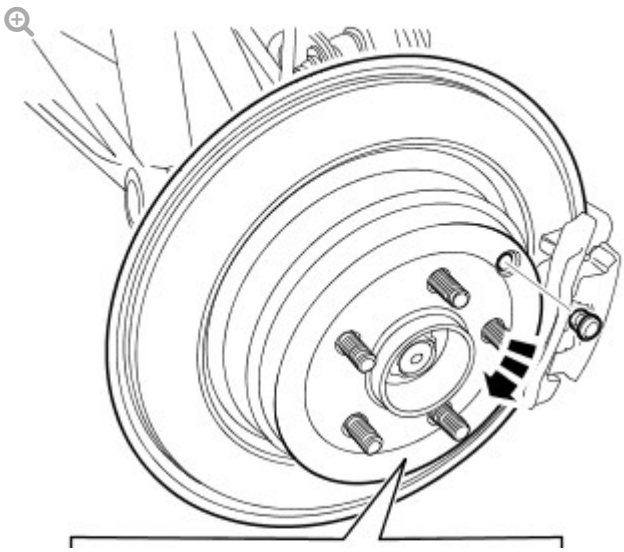

Remove the brake caliper anchor bolts.

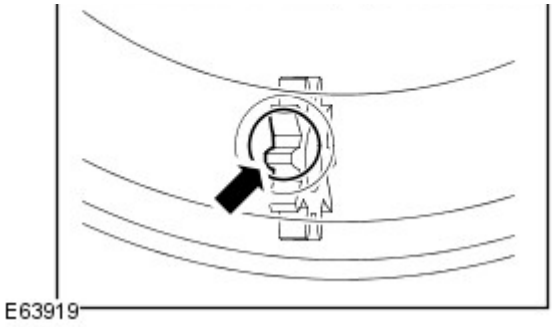
- Release the brake caliper.
- Tie the brake caliper aside.

9.

**NOTE:**

Rotate the rear brake disc to locate the parking brake shoe adjuster.

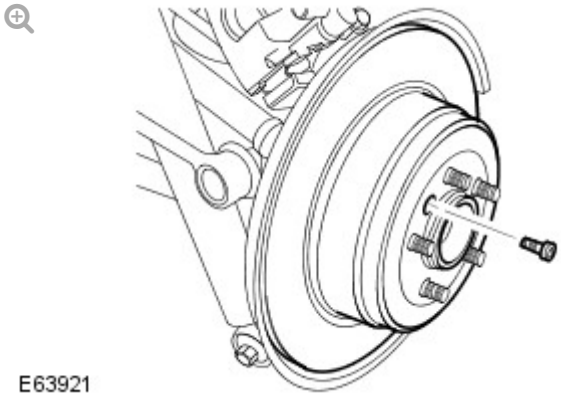





Release the parking brake shoe adjustment.

- Remove the parking brake shoe adjuster access plugs.
- Rotate the parking brake shoe adjuster.

10.




Remove the rear brake disc.

- Remove the Allen screw.

## INSTALLATION

1. Make sure that the rear brake disc and hub mating surfaces are clean.

2. Install the rear brake disc.
   - Tighten the Allen screw to 16 Nm (12 lb.ft).

3. Install the brake caliper anchor bolts
   - Clean the component mating faces.
   - Tighten the bolts to 65 Nm (48 lb.ft). plus a further 90 degrees

degrees.

4. **WARNING:**

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

Clean the brake caliper housing and anchor plate using brake cleaning fluid.

5. Inspect the caliper piston and slide pin seals for damage.

6. **CAUTIONS:**

> - The brake caliper should move freely on both slide pins.
> - If necessary, renew the components.

Check the slide pins for correct operation.

7. **CAUTION:**

> Check the brake fluid reservoir level before pushing the piston back, failure to follow this instruction may result in damage to the vehicle.

**NOTE:**

> As the piston is pushed back into the caliper housing, the brake fluid level in the reservoir will rise. Do not allow the reservoir to overflow.

Press the piston into the caliper housing.

8. **CAUTION:**

CAUTION:

If installed, the adhesive strips covering the outer brake pads must be removed before installation. Failure to follow this instruction may result in damage to the vehicle.

If installed, remove the adhesive strips from the 2 outer brake pads.

9. NOTE:

Make sure the brake pads are installed in the correct orientation.

Install the brake pads.

- Install the 2 clips.

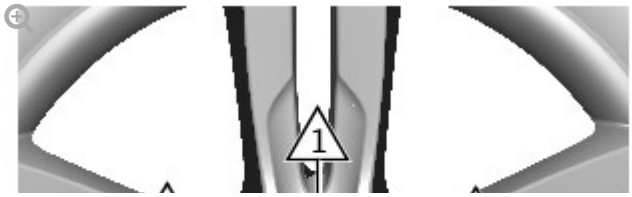
10. Rotate the brake caliper downwards.
    - Tighten the bolt to 32 Nm (24 lb.ft).

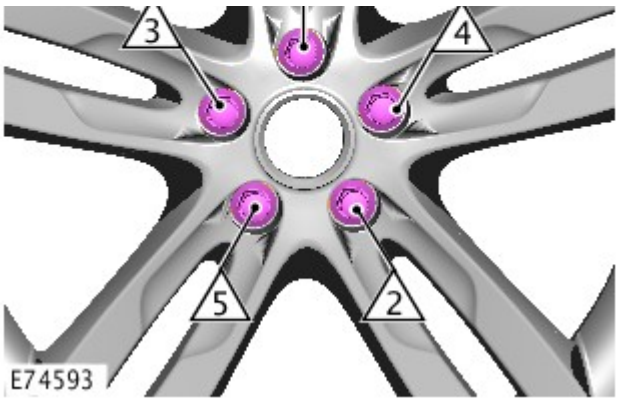
11. RH side rear: Connect the brake pad wear indicator sensor wiring harness.

12. Adjust the parking brake.
    For additional information, refer to: Parking Brake Shoe and Lining Adjustment (206-05 Parking Brake and Actuation, General Procedures).

13. NOTE:

Tighten the wheel nuts in the sequence shown:






Install the wheels and tires.

- Stage 1 : 4Nm
- Stage 2 : 70Nm
- Stage 3 : 140Nm

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

2012.0 RANGE ROVER (LM), 206-04

REAR DISC BRAKE

# BRAKE PADS (G1224636)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.40.02 | SHOES/PADS – FRONT – SET – RENEW | ALL DERIVATIVES | 0.7 | USED WITHINS | + |
| | SHOES/PADS – | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 70.40.02.36 | FRONT - SET - RENEW - BREMBO/SPORTS BRAKES FITTED | ALL DERIVATIVES | 0.8 | USED WITHINS | + |
| 70.40.03 | SHOES/PADS - REAR - SET - RENEW | ALL DERIVATIVES | 0.7 | USED WITHINS | + |

## REMOVAL

**WARNING:**

Brake pads must be renewed in axle sets only, otherwise braking efficiency may be impaired.

**NOTES:**

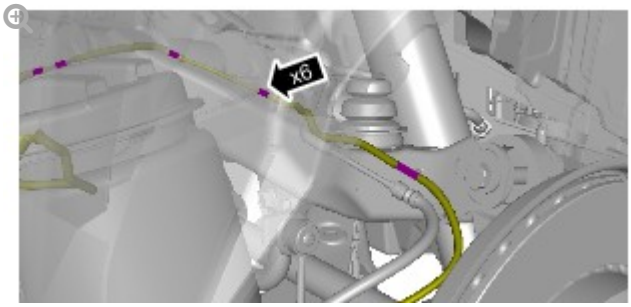
- RH illustration shown, LH is similar.
- The brake pad wear warning indicator sensor must be replaced each time the brake pads are serviced.

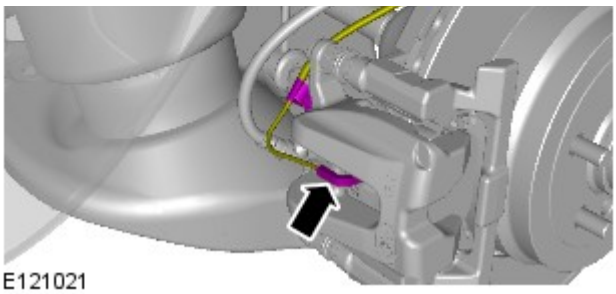
1. **WARNING:**

   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

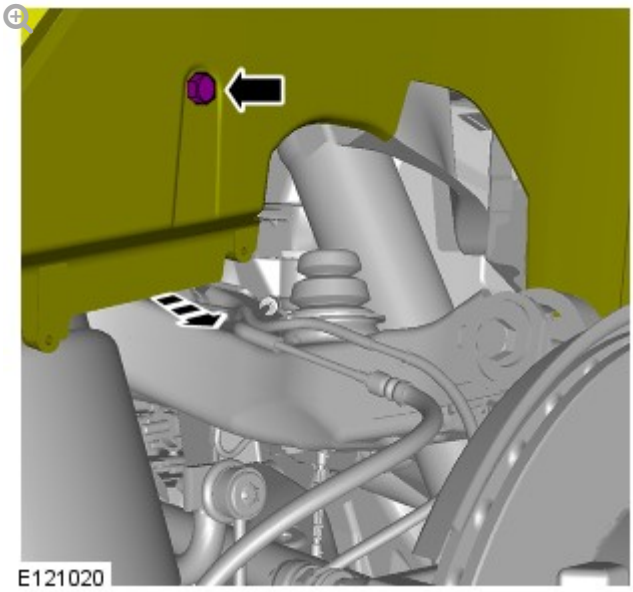
2. Remove the wheels and tires.

3. 


E121021

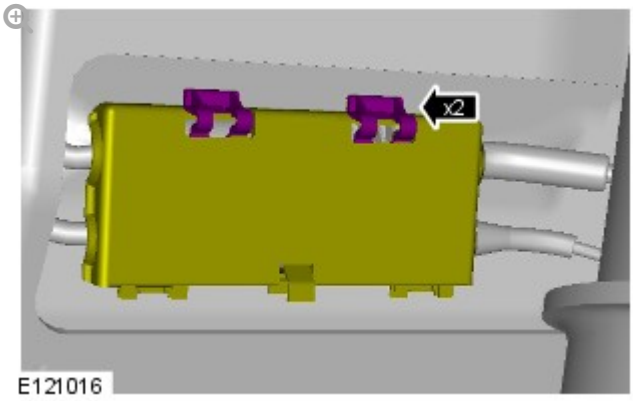
RH side rear: Disconnect the brake pad wear indicator sensor wiring harness.

4.


E121020

RH side rear: Move the fender splash shield aside for access.

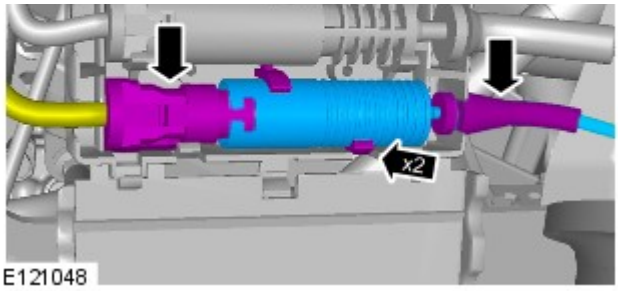
5.



E121016

Release the antilock brake system (ABS) junction box cover.

6.

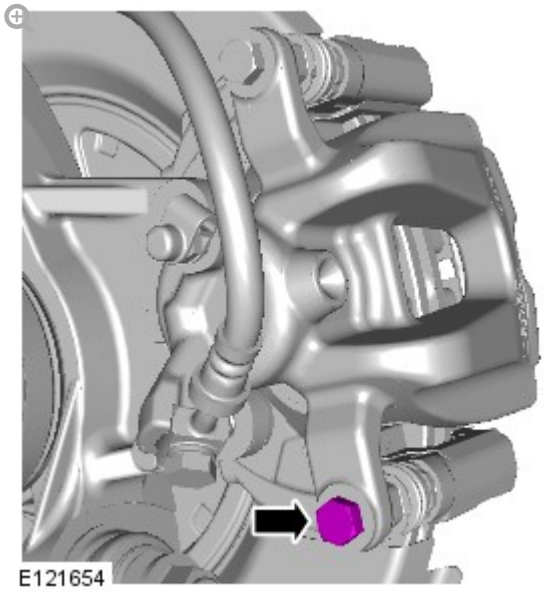



RH side rear: Release and disconnect the brake pad wear indicator wiring harness.

7.

**NOTE:**

Use an additional wrench to prevent the component from rotating.

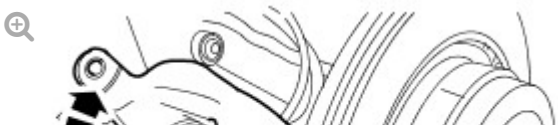


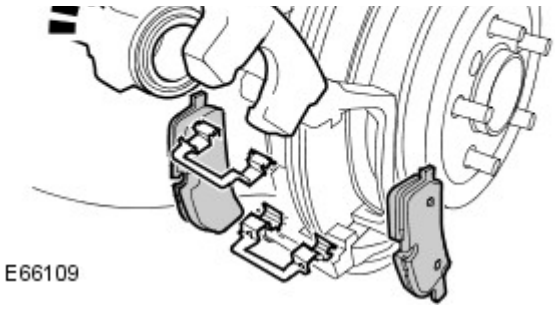

Remove the brake caliper lower bolt.

8.

**NOTE:**

Note the fitted position.






Remove the brake pads.

- Rotate the brake caliper upwards.
- Remove the 2 clips.

9. Repeat the above 2 steps for the other side.

## INSTALLATION

1. **WARNING:**

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

Clean the brake caliper housing and anchor plate using brake cleaning fluid.

2. Inspect the caliper piston and slide pin seals for damage.

3. **CAUTIONS:**

> - The brake caliper should move freely on both slide pins.
> - If necessary, renew the components.

Check the slide pins for correct operation.

4. **CAUTION:**

Check the brake fluid reservoir level before pushing the piston back, failure to follow this instruction may result in damage to the vehicle.

**NOTE:**

As the piston is pushed back into the caliper housing, the brake fluid level in the reservoir will rise. Do not allow the reservoir to overflow.

Press the piston into the caliper housing.

5. **CAUTION:**

   If installed, the adhesive strips covering the outer brake pads must be removed before installation. Failure to follow this instruction may result in damage to the vehicle.

   If installed, remove the adhesive strips from the 2 outer brake pads.

6. Install the brake pads.
   - Install the 2 clips.

7. Rotate the brake caliper downwards.
   - Tighten the bolt to 32 Nm (24 lb.ft).

8. Repeat the above procedure for the other side.

9. RH side rear: Connect and attach the brake pad wear indicator wiring harness electrical connection.

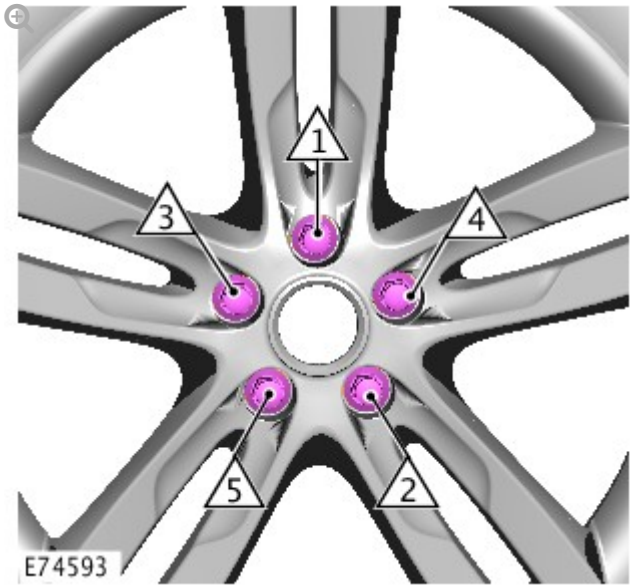
10. Secure the ABS junction box cover.

11. Secure the fender splash shield.

12. RH side rear: Connect the brake pad wear indicator sensor wiring harness.

13. **NOTE:**

Tighten the wheel nuts in the sequence shown:




Install the wheels and tires.

- Stage 1 : 4Nm
- Stage 2 : 70Nm
- Stage 3 : 140Nm

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

2012.0 RANGE ROVER (LM), 206-04

REAR DISC BRAKE

# BRAKE CALIPER (G1224637)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.55.25 | HOUSING ASSEMBLY – BRAKE CALIPER – REAR – EACH – RENEW | ALL DERIVATIVES | 0.5 | USED WITHINS | + |

## REMOVAL

**NOTES:**

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

1. **WARNING:**

Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Remove the wheel and tire.

3. **CAUTION:**

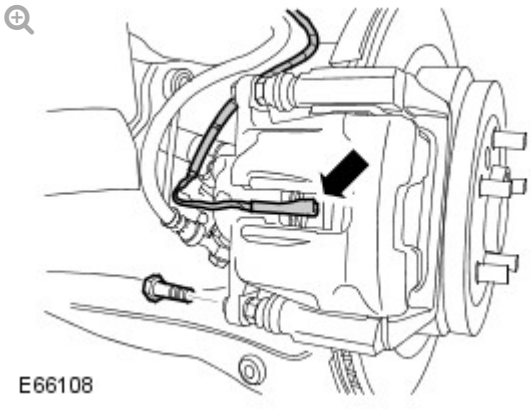
The brake pad wear indicator sensor is easily damaged. Do not use a lever to remove the sensor. Use fingers only.

RH side only: Disconnect the brake pad wear indicator sensor.

- Release from the clip.

4. **NOTE:**

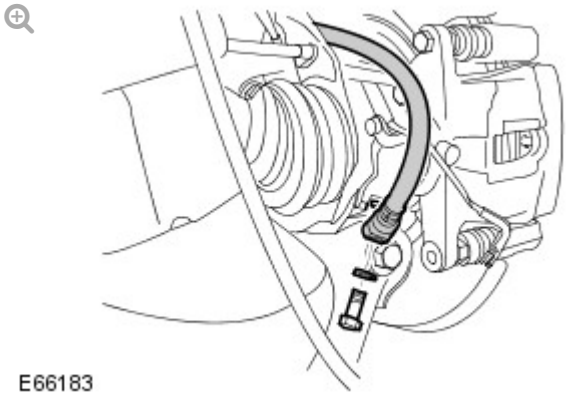
Use an additional wrench to prevent the component from rotating.




Remove the brake caliper lower bolt.

5. **CAUTION:**

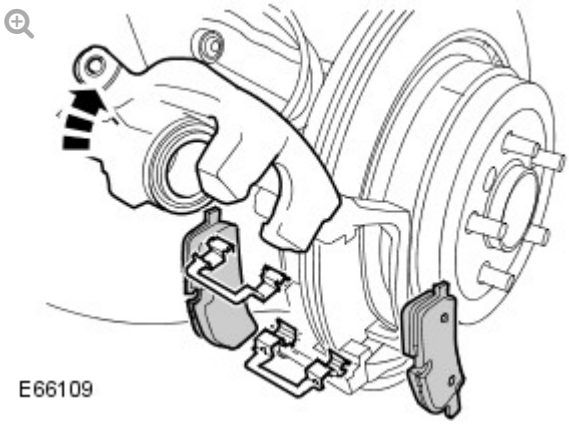
Before disconnecting or removing components, ensure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.




Disconnect the brake hose from the brake caliper.

- Remove the union.
- Remove and discard the two sealing washers.
- Install blanking caps to the exposed ports.

6.



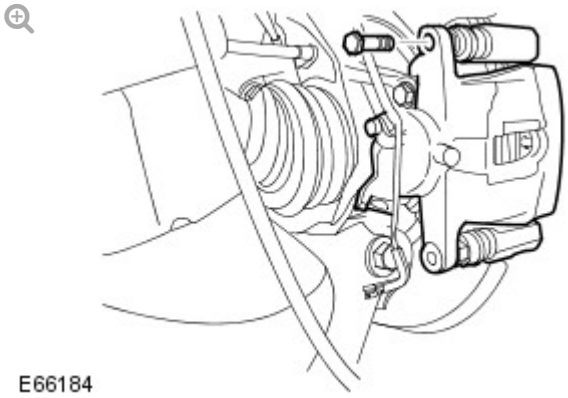

Remove the brake pads.

- Rotate the brake caliper upwards.
- Remove the two clips.

7.

**NOTE:**

Use an additional wrench to prevent the component from rotating.




Remove the brake caliper housing.

- Remove the brake caliper upper bolt.

## INSTALLATION

1.

**WARNING:**

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

Clean the brake caliper housing and anchor plate using brake cleaning fluid.

2.

**CAUTIONS:**

- The brake caliper should move freely on both slide pins.
- If necessary, renew the components.

Check the caliper slide pins.

- Check for correct operation.
- Check the condition of the caliper slide pin seals.

3.

5.

**NOTE:**

> Use an additional wrench to prevent the component from rotating.

Install the brake caliper.

- Tighten the brake caliper upper bolt to 35 Nm (26 lb.ft).

4. Install the brake pads.
   - Install the two clips.

5.

**NOTE:**

> Use an additional wrench to prevent the component from rotating.

Secure the brake caliper.

- Rotate the brake caliper downwards.
- Tighten the brake caliper lower bolt to 35 Nm (26 lb.ft).

6. Connect the brake hose to the brake caliper.
   - Clean the component mating faces.
   - Remove the blanking caps from the ports.
   - Install new sealing washers.
   - Tighten the brake hose union to 32 Nm (24 lb.ft).

7. Connect the brake pad wear indicator sensor.

8. Bleed the brake system.
   For additional information, refer to: Component Bleeding - Vehicles With: Standard Brakes (206-00, General Procedures).

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

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

# PARKING BRAKE AND ACTUATION

SPECIFICATIONS

## General Specification

| Item | Specification |
|---|---|
| Operation | Twin shoe (leading/trailing) operating on rear wheels, controlled from a floor console EPB switch via an actuator and twin cables. |
| Minimum brake lining material thickness | 2.0 mm (0.078 in) |

## Torque Specifications

| DESCRIPTION | NM | LB-FT |
|---|---|---|
| * Rear brake disc retaining bolt | 16 | 12 |
| * Brake caliper anchor plate to wheel knuckle bolts: | | |
| Stage 1 | 15 | 11 |
| Stage 2 | Further 60° | Further 60° |
| * Brake caliper to anchor plate bolts | 35 | 26 |
| Parking brake cable to wheel knuckle bolt | 8 | 6 |
| Parking brake cable to upper arm support clip bolt | 5 | 4 |
| Parking brake actuator bolts | 9 | 7 |
| Parking brake cable to actuator nut | 6 | 4 |

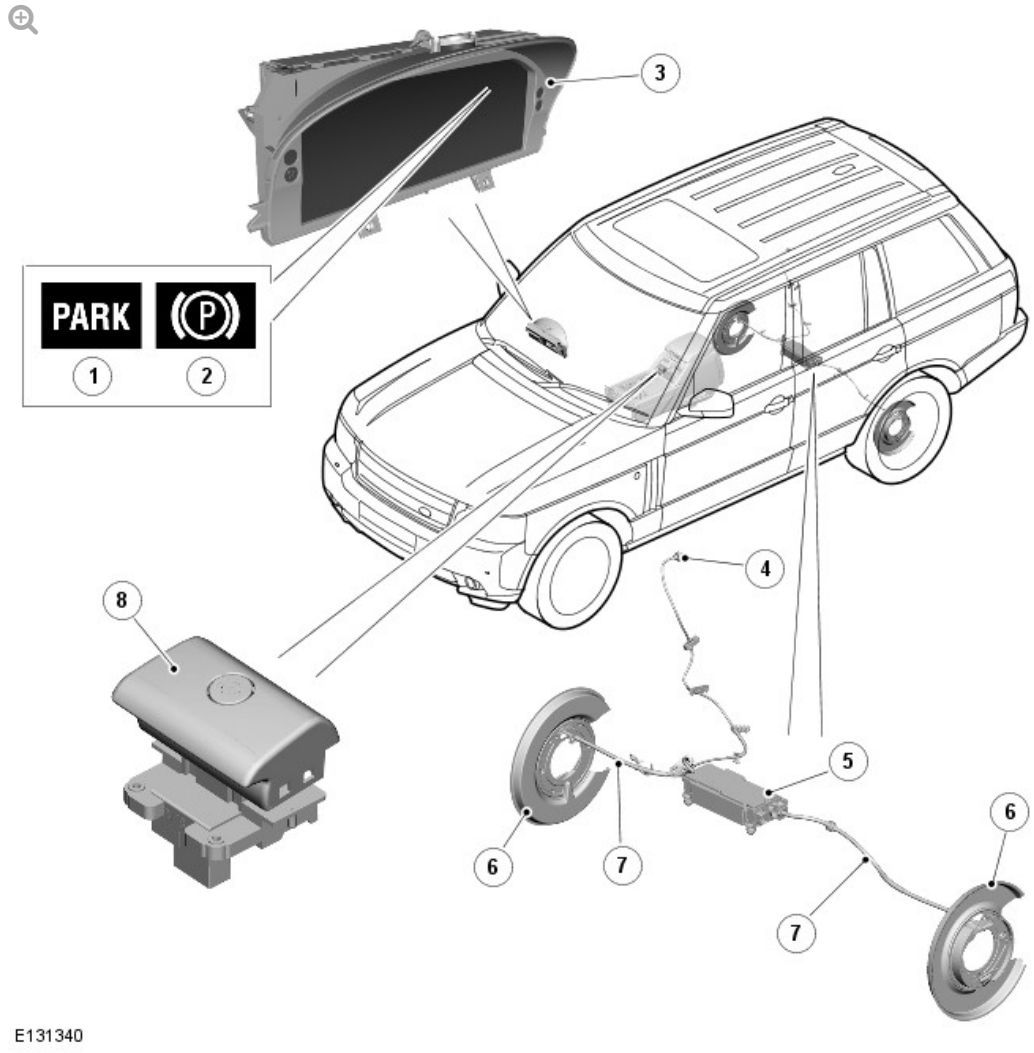
*** New nuts/bolts must be installed**

2012.0 RANGE ROVER (LM), 206-05

# PARKING BRAKE AND ACTUATION

DESCRIPTION AND OPERATION

COMPONENT LOCATION




| ITEM | DESCRIPTION |
|---|---|
| 1 | Parking brake indicator - USA market |
| 2 | Parking brake indicator - ROW markets |
| 3 | Instrument cluster |
| 4 | Emergency release cable |
| 5 | Parking brake module |
| 6 | Dust shield and parking brake shoes |
| 7 | Parking brake cable |
| 8 | Parking brake switch |

## OVERVIEW

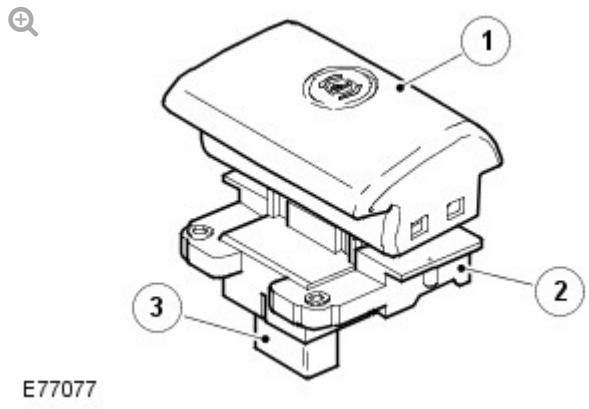
The parking brake is an electrically actuated system that operates drum brakes integrated into the rear brake discs. The parking brake system

consists of:

- A parking brake switch.
- Left and right drum brakes.
- Left and right brake cables.
- An emergency release cable.
- Two parking brake indicators.
- A parking brake module.

The parking brake is operated by the parking brake module, which adjusts the tension of the brake cables to apply and release the drum brakes. Operation of the parking brake module is initiated by the parking brake switch.

## PARKING BRAKE SWITCH




| ITEM | DESCRIPTION |
|---|---|
| 1 | Operating handle |
| 2 | Switch body |
| 3 | Electrical connector |

The parking brake switch is used by the driver to apply and release the parking brake, and is installed in the center console adjacent to the gear shift lever. An electrical connector on the back of the switch provides the interface with the vehicle wiring. A brake symbol on the switch illuminates

when the exterior lamps are selected on.

There are 3 states for the parking brake switch:

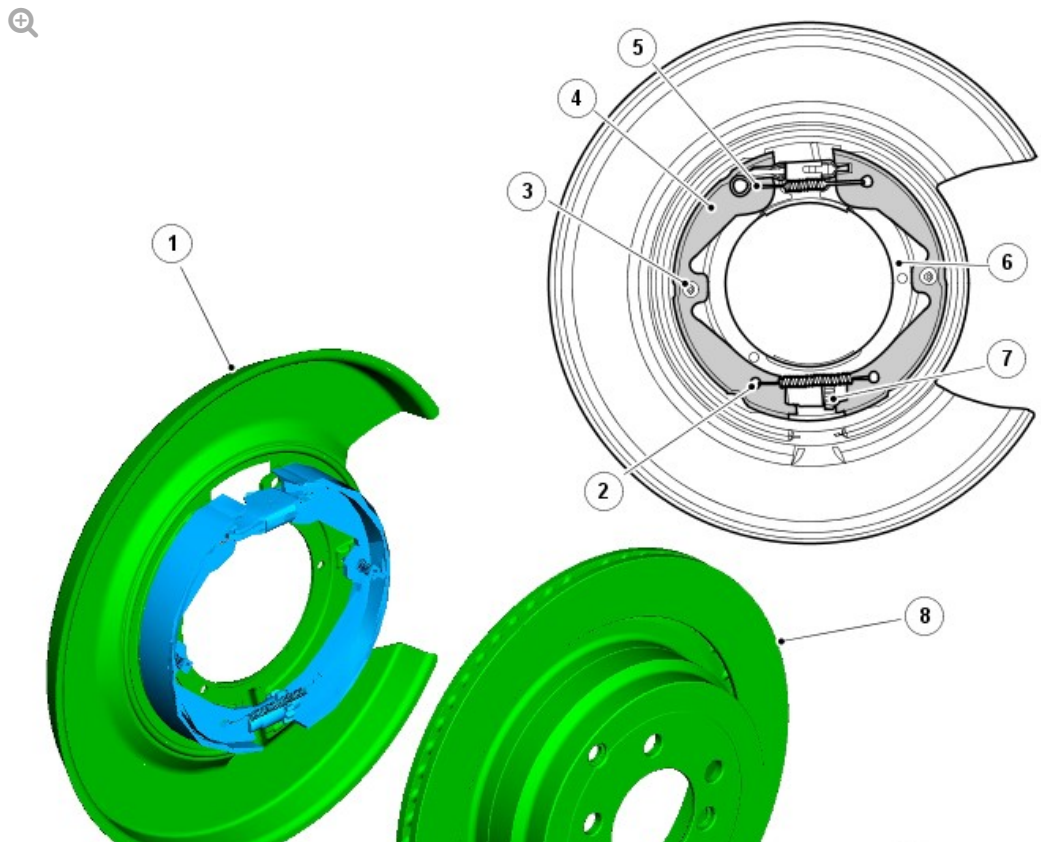
- Apply request, when the handle of the parking brake switch is pulled up.
- Release request, when the handle of the parking brake switch is pushed down.
- Idle, when the handle of the parking brake switch is in the central or rest position.

Microswitches, incorporated into the parking brake switch, are activated by the handle of the parking brake switch. To determine the operating state of the parking brake switch, the parking brake module monitors the activity of the microswitches.

## DRUM BRAKES

**NOTE:**

right-hand (RH) brake shown, left-hand (LH) brake similar




| ITEM | DESCRIPTION |
|---|---|
| 1 | Dust shield |
| 2 | Adjuster spring |
| 3 | Shoe locating pin and clip |
| 4 | Brake shoe |
| 5 | Return spring |
| 6 | Backplate |
| 7 | Toothed wheel adjuster |
| 8 | Rear brake disc |
| 9 | Adjuster access plug |

**WARNING:**

The parking brake may not switch off until 20 minutes after the ignition is switched off. Automatic re-apply of the parking brake is possible and is not eliminated until this period has expired.

**CAUTION:**

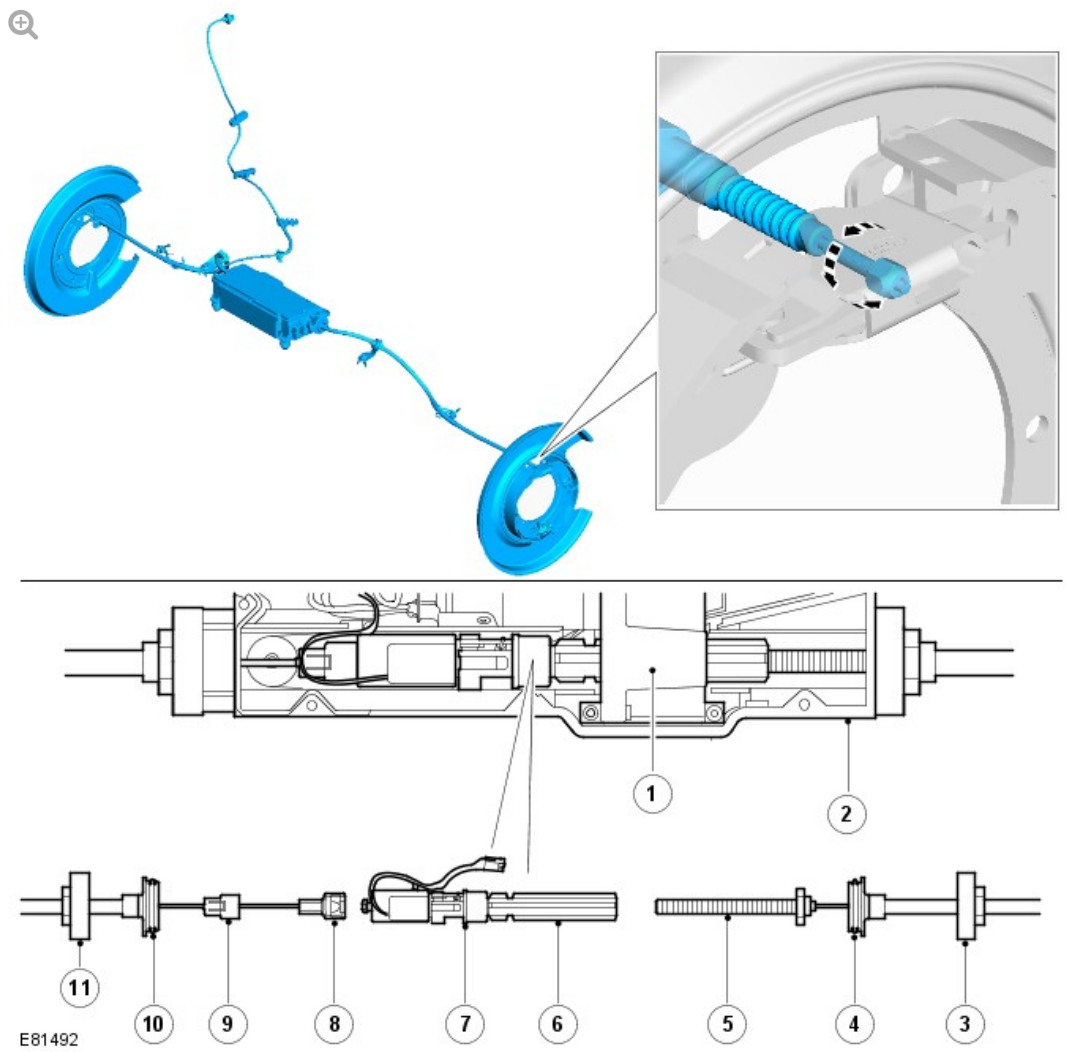
The parking brake module must be isolated from electrical power before attempting to remove a brake disc from the vehicle. Operation of the parking brake switch while a brake disc is removed may cause the actuating mechanism in the parking brake module to seize.

Each drum brake consists of a pair of brake shoes installed on a backplate attached to the rear hub carrier.

When the parking brake module tensions the brake cables, the movement is transmitted to an expander, which acts on both brake shoes. Brake shoe to drum clearance is set with a manual adjuster, which is accessed through a hole in the brake disc. The adjuster is a conventional toothed wheel adjuster.

After replacement of the brake shoes or brake discs, a bedding in procedure must be performed to ensure the drum brakes operate satisfactorily.
For additional information, refer to: Parking Brake Shoes Bedding-In (206-05, General Procedures).

## BRAKE CABLES




| ITEM | DESCRIPTION |
|---|---|
| 1 | Gearbox |

| | |
|---|---|
| 2 | Parking brake module housing |
| 3 | Cable nut |
| 4 | Sealing collar |
| 5 | Threaded connector |
| 6 | Spline shaft |
| 7 | Force sensor |
| 8 | Shoe |
| 9 | Locking cover |
| 10 | Sealing collar |
| 11 | Cable nut |

**WARNING:**

The parking brake may not switch off until 20 minutes after the ignition is switched off. Automatic re-apply of the parking brake is possible and is not eliminated until this period has expired.

**CAUTION:**

The parking brake module must be isolated from electrical power before attempting to remove a brake disc from the vehicle. Operation of the parking brake switch while a brake disc is removed may cause the actuating mechanism in the parking brake module to seize.

The brake cables consist of Bowden cables installed between the parking brake module and the drum brakes. The outer cable is attached to the respective wheel knuckle with a screw. The inner cable attaches to the expander and is secured in position with a nipple. In the parking brake module, the two inner cables are joined together via the force sensor and the spline shaft.

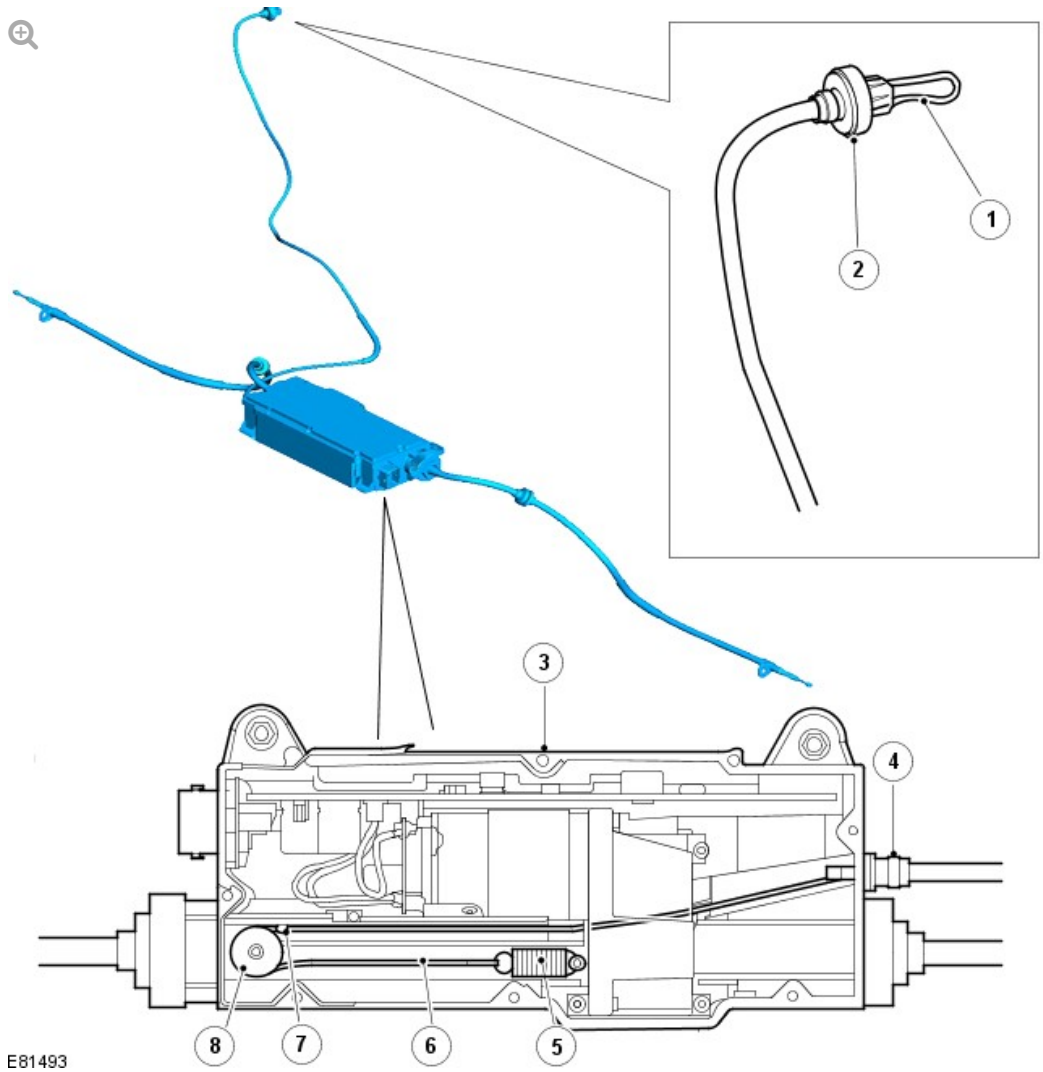
The inner cable of the RH brake cable is connected to a nipple on the force sensor by a 'shoe' on the end of the cable; a locking cover keeps the shoe

engaged with the nipple.

The inner cable of the LH brake cable is connected to the spline shaft by a threaded connector (LH thread); a squared flange at the end of the threaded connector locates in the housing of the parking brake module, to prevent the threaded connector from turning with the spline shaft.

When the spline shaft turns, the threaded connector of the LH brake cable is screwed into or out of the spline shaft, which changes the effective length of the inner cables and operates the drum brakes. The ability of the spline shaft to move axially in the gearbox equalizes the load applied by the inner cables to the two drum brakes.

## EMERGENCY RELEASE CABLE




| ITEM | DESCRIPTION |
| --- | --- |
| 1 | Pulley |

| | |
|---|---|
| 1 | Pull ring |
| 2 | Quick release fitting |
| 3 | Parking brake module |
| 4 | Sealing collar |
| 5 | Spring |
| 6 | Inner cable |
| 7 | Nipple |
| 8 | Pulley wheel |

The emergency release cable allows the parking brake to be mechanically released in the event that:

- The parking brake is not able to be electrically released due to a system fault.
- The battery is disconnected or battery voltage decreases below 7.5 volts while the parking brake is applied, preventing electrical release of the parking brake.

The parking brake is mechanically released by disconnecting the force sensor from the spline shaft in the parking brake module. During normal operation, the force sensor and the spline shaft are locked together by a lever operated pawl on the end of the spline shaft, which engages with a spigot on the force sensor.

The emergency release cable is a Bowden cable installed between the parking brake module and the luggage compartment. In the luggage compartment, a pull ring is installed on the end of the inner cable. The pull ring is designed to fit the hook on the end of the jack handle , and when used in combination with a screwdriver shaft, can be used to pull on the cable.

The pull required to release the latch is approximately 200 N (45 lbf). When the pull ring of the emergency release cable is released, the spring in the parking brake module retracts the inner cable and the nipple moves away from the pawl operating lever.

After the emergency release cable has been used to release the parking

brake, the next time an apply selection is made with the parking brake switch, the parking brake module automatically runs through a latching procedure to reconnect the spline shaft with the force sensor. The parking brake module turns the spline shaft so that it moves towards the force sensor. The pawl of the spline shaft then re-engages with the spigot of the force sensor. A second apply selection with the parking brake switch is required to apply the parking brake.

## PARKING BRAKE INDICATORS


E131341

| ITEM | DESCRIPTION |
|---|---|
| 1 | Parking brake indicator - USA market |
| 2 | Parking brake indicator - ROW markets |

The parking brake indicator illuminates red when the brake has been correctly applied.

If a fault is detected the warning lamp will flash red or illuminate yellow continuously and a 'PARKBRAKE' message will be displayed in the message center.For additional information, refer to:

Instrument Cluster (413-01, Description and Operation),
Information and Message Center (413-08, Description and Operation).

**NOTE:**

The red brake warning indicator will continue to be illuminated for at

least ten seconds after the ignition has been turned off.

## PARKING BRAKE MODULE

The parking brake module monitors external and internal inputs and adjusts the tension of the brake cables to operate the drum brakes.

The parking brake module is installed directly on the rear subframe. Two rubber mounts, installed on lugs on the underside of the parking brake module, locate in holes in the subframe. The remaining corners of the parking brake module are secured to the subframe with shoulder bolts.

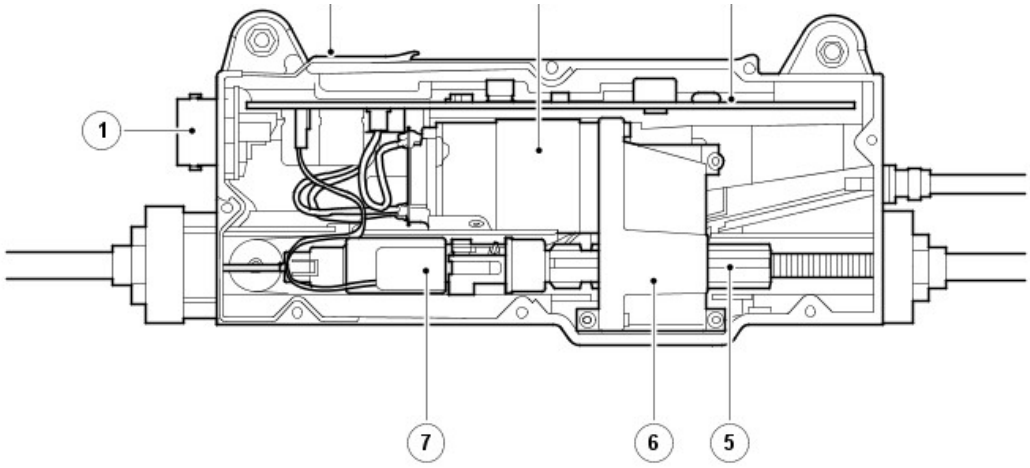
The main components of the parking brake module are:

- A PCB (printed circuit board) incorporating the ASIC (application specific integrated circuit) for control of the parking brake.
- An electric motor.
- A gearbox.
- A splined shaft.
- A force sensor.

The splined shaft and the force sensor are connected together by a latch on the end of the splined shaft. The splined shaft rotates on the latch and moves axially in the gearbox. The latch and the force sensor slide in a channel in the body of the parking brake module.

To apply or release the drum brakes, the parking brake module controls the operation of the electric motor to drive the gearbox. The gearbox rotates the splined shaft to increase or decrease the tension in the brake cables. The parking brake module monitors the load exerted by the brake cables using the input from the force sensor.

**Interior of Parking Brake Module**




E81494

| ITEM | DESCRIPTION |
|---|---|
| 1 | Electrical connector |
| 2 | Housing |
| 3 | Electric motor |
| 4 | PCB |
| 5 | Splined shaft |
| 6 | Gearbox |
| 7 | Force sensor |

## INPUTS AND OUTPUTS

A 32 pin electrical connector on the RH side of the parking brake module provides the interface between the PCB and the vehicle wiring.

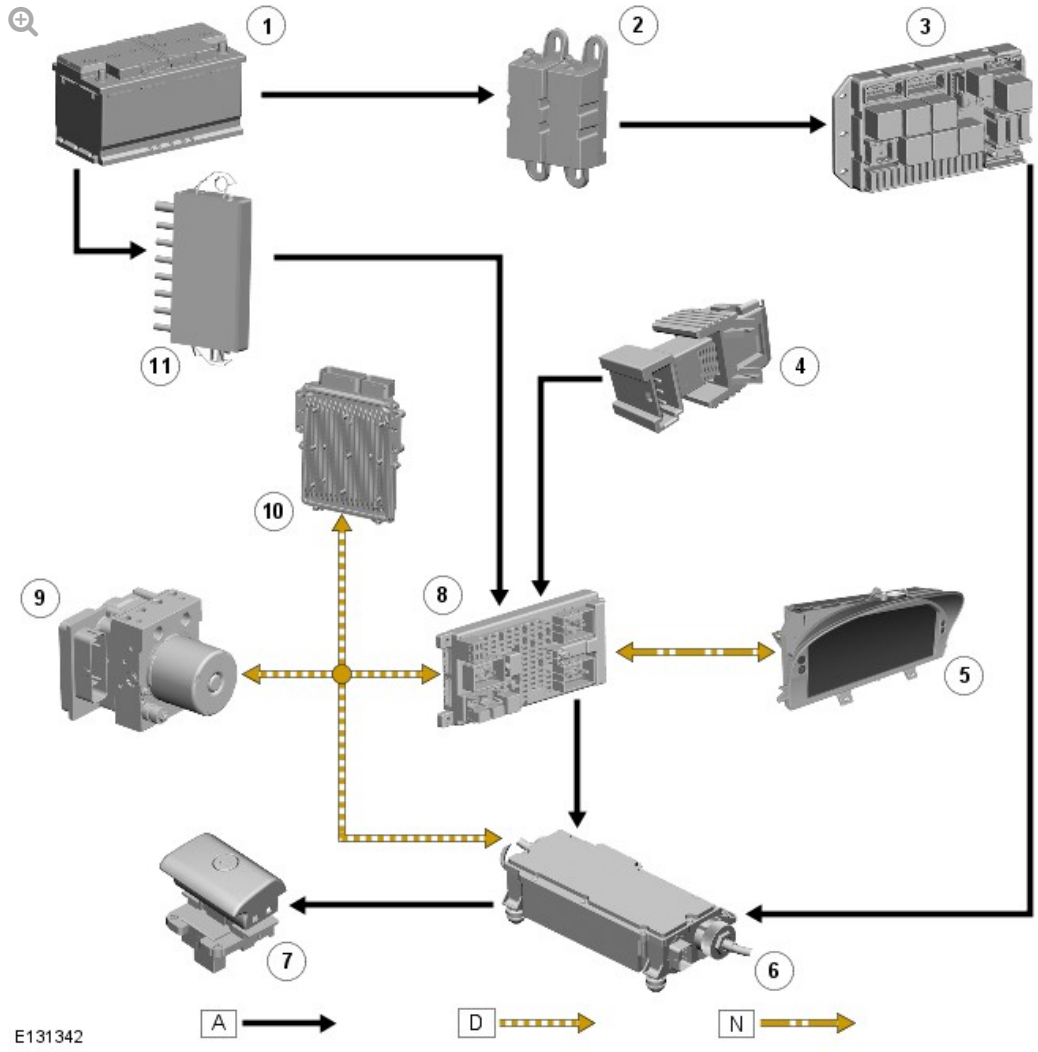
The parking brake module is powered by two permanent battery power feeds from the auxiliary junction box (AJB). A third connection with the central junction box (CJB) provides a battery voltage signal when the ignition switch is in position II (ignition). Other hardwired inputs include those from the parking brake switch.

In addition to the hardwired connections, the parking brake module is connected to the high speed controller area network (CAN) bus to enable communication with other vehicle systems.

## CONTROL DIAGRAM

NOTE:

**A** = Hardwired connection; **D** = High speed CAN bus; **N** = Medium speed CAN (controller area network) bus.




| ITEM | DESCRIPTION |
|---|---|
| 1 | Battery |
| 2 | BJB (battery junction box) - 2 |
| 3 | RJB (rear junction box) |
| 4 | Brake pedal switch |
| 5 | Instrument cluster |
| 6 | Parking brake module |

| | |
|---|---|
| 7 | Parking brake switch |
| 8 | CJB (central junction box) |
| 9 | anti-lock brake system (ABS) module |
| 10 | ECM (engine control module) |
| 11 | BJB |

## PRINCIPLES OF OPERATION

The parking brake can be applied at any time provided sufficient battery power is available. For the parking brake to be released, various pre-conditions are required. The parking brake has manual and automatic actuating modes, to cater for different operating circumstances, as detailed in the following table:

### Actuating Modes

| MODE | PRE-CONDITIONS | DRIVER ACTION |
|---|---|---|
| Static apply | Vehicle speed less than 2.5 km/h (1.6 mph). | Pull up parking brake switch. |
| Static release | 1. Vehicle speed less than 2.5 km/h (1.6 mph).<br>2. Engine running.<br>**OR**<br>Ignition switch in position II and brake pedal or accelerator pedal pressed. | Press down parking brake switch. |
| Dynamic apply | Vehicle speed more than 2.5 km/h (1.6 mph). | Pull up parking brake switch as required. |
| Dynamic release | Vehicle speed more than 2.5 km/h (1.6 mph). | Release (to neutral position) or press down parking brake switch. |
| DAR (drive away release) | 1. Ignition switch in position II.<br>2. Transmission in gear 1, 2 or R (with high range selected) or 1, 2, 3 or R (with low range selected).<br>3. Accelerator pedal pressed more than 5%. | None. Parking brake released automatically on drive away. |

#### OPERATING VOLTAGES

Actuation of the parking brake (apply or release) is only started if the power supply to the parking brake module is within 9 to 18 volts. At any voltage in this range, the parking brake module is able to tighten the brake cables to

the maximum, to fully apply the parking brake, although at voltages between 9 and 10.5 volts the actuation time may exceed 1.0 second.

During a parking brake actuation:

- If the power supply to the parking brake module decreases to less than 8.3 volts, the parking brake module continues the actuation, but stores a related diagnostic trouble code (DTC). If the ignition is on, the parking brake module also signals the instrument cluster to illuminate the amber parking brake warning indicator and flash the red parking brake warning indicator. On the instrument cluster, a message advising there is a parking brake fault is shown in the message center. The warning indications are discontinued if the power supply voltage increases to 8.3 volts or more.
- If the power supply voltage decreases to less than 7.5 volts, the parking brake module discontinues the actuation. Actuation is automatically resumed if the power supply voltage subsequently increases to 7.5 volts or more and the parking brake switch request is still valid.
- If the power supply voltage decreases below 6.5 volts, the parking brake function is disabled for the remainder of the ignition cycle.
- If the power supply voltage increases to more than 18.0 volts, the parking brake module immediately disables the parking brake function and stores a related DTC. If the ignition is on, the parking brake module also signals the instrument cluster to illuminate the amber parking brake warning indicator and flash the red parking brake warning indicator. On the instrument cluster, a message advising that the parking brake has a fault and is not functioning is shown in the message center. The parking brake function remains disabled until the power supply voltage is within 9 to 18 volts again. When the power supply voltage is within 9 to 18 volts again, the warning indications are cancelled and actuation is automatically resumed if the parking brake module is in a dynamic mode of operation with a valid parking brake switch request.

**NOTE:**

The instrument cluster shuts down below 8 volts, so warning indications and messages are not displayed below 8 volts. CAN transmission stops if battery voltage drops below 7.0 volts and re-

transmission stops if battery voltage drops below 7.0 volts and re starts when voltage goes above 7.5 volts.

### SLEEP MODE

To reduce quiescent drain on the vehicle battery, the parking brake module incorporates a sleep mode. The parking brake module enters the sleep mode, provided the ignition is off and there are no signals from the wheel speed sensors, when one of the following occurs:

- 20 minutes elapse after the last actuation of the parking brake.
- If no actuation occurred, 20 minutes elapse after the ignition is switched off.

The parking brake module wakes up from the sleep mode when one of the following occurs:

- An apply or release request is made with the parking brake switch.
- The ignition is turned on.

The parking brake module wakes up within 500 ms. The high speed CAN bus is activated within 200 ms maximum.

When the parking brake module is woken with a release request from the parking brake switch, the parking brake module ignores the request but illuminates the red brake warning indicator. The parking brake module extinguishes the red brake warning indicator and goes back to sleep immediately the switch is released to the neutral position.

When the parking brake module is woken with an apply request from the parking brake switch, if the parking brake is already applied the parking brake module ignores the request but illuminates the red brake warning indicator. The parking brake module extinguishes the red brake warning indicator and goes back to sleep immediately the switch is released to the neutral position. If the parking brake is in the released condition when the apply request is made, the parking brake module illuminates the red brake warning indicator and applies the parking brake. The parking brake module extinguishes the red brake warning indicator and goes back to sleep 3 minutes after the apply activation, or immediately after the switch is

released to the neutral position, whichever occurs first.

### DYNAMIC APPLY

In the dynamic apply mode, if the vehicle speed is more than 10 km/h (6.25 mph) when the parking brake switch is selected to apply, the parking brake module requests the ABS module to activate the disc brakes on all four wheels. When the vehicle comes to a standstill, the parking brake module statically applies the parking brake. Once the static load is achieved, the hydraulic pressure is removed. If the parking brake switch is released to the neutral position, or pressed down to the release position, during dynamic apply, braking is cancelled.

The ABS module monitors the deceleration rate using the wheel speed sensor signals, and adjusts the hydraulic pressure to the disc brakes as required to achieve the required rate. All of the anti-lock control - traction control system brake functions remain enabled in the dynamic apply mode.

The parking brake module incorporates two fallback functions for the dynamic apply mode:

- Fallback 1 is invoked if vehicle speed is between 2.5 km/h (1.25 mph) and $V_{max}$ when the parking brake switch is selected to apply and the ABS module is unable to fulfil a hydraulic request. When fallback 1 is invoked, the parking brake module decelerates the vehicle using only the parking brake. The parking brake module monitors the deceleration rate using the wheel speed information from the ABS module, and adjusts the tension of the brake cables to achieve the required rate. During deceleration the parking brake module also uses the wheel speed inputs from the ABS module to operate an anti-lock function for the rear wheels. When vehicle speed decreases to 2.5 km/h (1.25 mph) the parking brake module changes to the static apply mode.
- Fallback 2 is invoked if the ABS module fails. In this instance the parking brake module monitors the output shaft speed sensor on the transmission to determine if a static or dynamic condition exists.
- Fallback 3 is invoked if there is a loss of communication between the parking brake module and the CAN bus has failed. When fallback 3 is invoked, the parking brake module decelerates the vehicle using only the parking brake. The parking brake module tightens the brake cables under

the control of the driver, no anti-lock function is available.

While dynamic apply is active, including fallback 1, 2 and fallback 3, the parking brake module also outputs high speed CAN bus signals to:

- The ABS module, to apply the stop lamps.
- The instrument cluster, to sound an intermittent warning buzzer, at 0.5 second on, 1.0 second off.
- The instrument cluster, to illuminate the red parking brake warning indicator. The indicator is permanently illuminated except in fallback 3, when it flashes.

### DAR PRE-ARMING

The DAR pre-arming function operates when the transfer box is in high range to reduce the parking brake release time during DAR and to provide a smooth take-off. DAR pre-arming is invoked when:

- The ignition switch is in position II.
- The transmission is in gear 1, 2 or R.
- The vehicle is stationary.
- No failsafe tighten actuation has occurred.

### AUTOMATIC LOAD ADJUSTMENT

While the ignition is on, the parking brake module constantly monitors the input from the force sensor. If the tension of the brake cables goes outside the limits for a given operating mode, the parking brake module automatically restores the tension within limits.

**Failsafe Tighten.** If, during DAR pre-arming, the vehicle moves, then the maximum cable force is reinstated for the remainder of that ignition cycle.

**Automatic Apply.** While the parking brake is applied, if the tension of the brake cables decreases by a prescribed amount from the initial setting, the parking brake module automatically restores the tension to the initial setting.

**Automatic Release.** While the parking brake is released, if the tension of the brake cables increase to a prescribed amount, the parking brake module

automatically reduces the tension to zero.

### PARKING BRAKE SWITCH MONITORING

The parking brake module monitors for the following types of fault in the parking brake switch system:

- Short circuits between a pull-down transistor in the parking brake module and battery voltage.
- Broken wires and microswitches.
- Plausibility.

If a fault is detected, the parking brake module stores a related fault code.

The parking brake switch has a degree of in-built redundancy. If a single microswitch fault is detected the parking brake module can still determine the operating state of the parking brake switch. Short circuits or multiple failures cause the parking brake module to disable the parking brake switch for the remainder of the ignition cycle. The parking brake module also disables the parking brake switch if a plausibility fault occurs. However, since plausibility faults are usually caused by incomplete operation of the parking brake switch, the parking brake switch is re-enabled if the parking brake module subsequently establishes a plausible operating state.

If a single microswitch fault is detected, the parking brake module signals the instrument cluster to illuminate the amber parking brake warning indicator. The parking brake module also signals the instrument cluster to display a message advising there is a parking brake fault. During an apply actuation, the parking brake module also signals the instrument cluster to flash the red parking brake warning indicator.

For all other fault types, the parking brake module signals the instrument cluster to illuminate the amber parking brake warning indicator and to display a message advising the parking brake has a fault and is not functioning. If it makes an apply actuation, the parking brake module signals the instrument cluster to flash the red parking brake warning indicator for the remainder of the ignition cycle.

On the next ignition cycle, the warning indicators and the messages are only activated if the fault is still present, although the DTC is retained by the

activated if the fault is still present, although the DTC is retained by the parking brake module until cleared by the Land Rover approved diagnostic system.

2012.0 RANGE ROVER (LM), 206-05

# PARKING BRAKE AND ACTUATION

DIAGNOSIS AND TESTING

## PRINCIPLES OF OPERATION

For additional information on the Parking Brake 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. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection**

| MECHANICAL | ELECTRICAL |
|---|---|
| ▪ Parking brake cable(s) condition and installation<br>▪ Parking brake shoes condition and installation<br>▪ Parking brake drums (integrated into rear brake discs)<br>▪ Parking brake actuator module condition and installation | ▪ Parking brake indicators<br>▪ Fuses<br>▪ Wiring harness/electrical connectors<br>  ▪ Check for bent/corroded pins<br>▪ Controller Area Network (CAN) circuits<br>▪ Parking brake switch<br>▪ Parking brake actuator module |

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

1. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart below, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

## SYMPTOM CHART

| SYMPTOM | POSSIBLE CAUSES | ACTION |
|---|---|---|
| Parking brake will not engage or release | ▪ Parking brake cables fouled, trapped or damaged<br>▪ Parking brake cables incorrectly routed or fixed<br>▪ Parking brake shoes, linings worn/contaminated<br>▪ Parking brake drums (integrated | Check the parking brake cables for fouling, trapping or damage. Check the cables for correct routing. Check that the cable end fitting connector(s) are correctly installed to the operating lever(s). Inspect the parking brake shoes and drums for condition/wear/contamination. Check the parking brake shoes for correct adjustment. Refer to workshop manual section 206-05. Check the operation of the parking brake actuator module, check for damage and/or excessive noise during operation. Check for parking brake actuator module DTCs. |
| Low parking brake efficiency/parking brake | | |

| | | |
|---|---|---|
| brake sticking/binding | into rear brake discs)<br>▪ Parking brake shoes incorrectly adjusted following replacement<br>▪ Parking brake actuator module malfunction | |

## 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: Parking Brake Module (100-00, Description and Operation).

## BRAKE BEDDING MODE

Bedding mode is a special mode available in the parking brake module (PBM) that disables the stability assist system (ABS) and allows the parking brake to provide the braking force rather than the conventional braking system whilst the vehicle is moving at a velocity of >3kph. This mode is entered via a series of brake pedal presses and switch applications, full details on this procedure is available in the relevant section of the workshop manual. If brake bedding mode is entered accidentally by the driver the RED warning lamp will flash in the Instrument Pack, the module will return to normal operational mode when the ignition has been cycled. This DTC (C110468) is intended to highlight the fact that although the RED lamp was illuminated there was no fault present in the control module.
REFER to: Parking Brake Shoes Bedding-In (206-05 Parking Brake and Actuation, General Procedures).

## DRIVE CYCLES

Drive Cycle 1 Description

- Ignition On

- Make sure that no parking brake activation (diagnostic command or switch input) is attempted for a minimum of 3 seconds
- Retest for functionality

Drive Cycle 2 Description

- Ignition On
- Drive vehicle at a constant speed of 20KPH (13MPH) or slightly above in 2nd gear
- At a constant speed of 20KPH (13MPH) or slightly above apply the parking brake via the parking brake switch
- Press the brake pedal

Drive Cycle 3 Description

- Ignition On
- Make sure that the vehicle is stationary and that the parking brake is released
- Pull the parking brake switch to the apply position and hold in this position until the parking brake motor has stopped (this may take up to 5 seconds)
- Release the parking brake switch to the idle position, leave in the idle position for 2 seconds
- Push the parking brake switch to the release position (while pressing the brake pedal) and keep in this position until the parking brake motor has stopped (this may take up to 5 seconds)
- Release the parking brake switch to the idle position

# PARKING BRAKE SHOE AND LINING ADJUSTMENT (G899412)

GENERAL PROCEDURES

| | | | | | |
|---|---|---|---|---|---|
| 70.40.11 | SHOES - PARKING BRAKE - ADJUST | ALL DERIVATIVES | 0.4 | USED WITHINS | + |

1. Check operation of the electronic parking brake.

2. Release the electronic parking brake.
   - Press the brake pedal and press the parking brake switch down to release the parking brake. Check that the warning light goes out.
   - Turn the ignition key to position '0' and remove the key.

3. **WARNING:**

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

   Raise and support the vehicle.

4. Remove the rear wheels and tires.

5. Remove the parking brake shoe adjuster access plugs.

6.

**NOTE:**

Rotate the rear brake disc to locate the parking brake shoe adjuster.

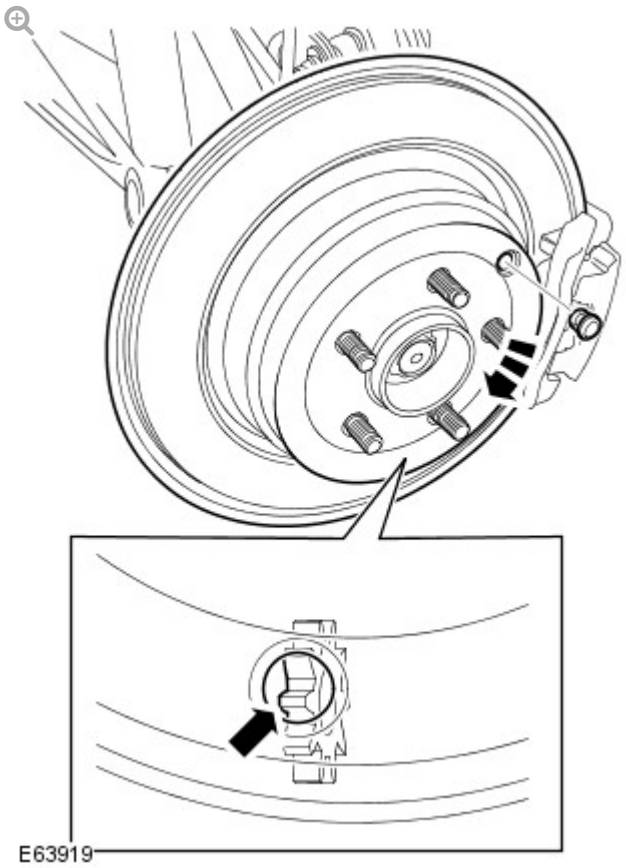
Rotate the parking brake shoe adjuster until resistance is felt and the rear brake disc will not rotate.

- Apply and release the parking brake several times to centralize the parking brake shoes, re-adjust if required.

7.

**NOTE:**

Rotating the parking brake shoe adjuster backwards will move the parking brake shoes away from the parking brake drum.




Rotate the parking brake shoe adjuster back 8 clicks.

8. Repeat the above procedure for the other side.

9. Install the parking brake shoe adjuster access plugs.

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

11. **CAUTION:**

    The parking brake shoe bedding-in procedure must be carried out if new parking brake shoes or new rear brake discs are installed.

    **NOTE:**

    It is not necessary to carry out the parking brake shoe bedding-in procedure if the parking brake shoes have been removed for access to other components.

    If necessary, carry out the parking brake shoe bedding-in procedure.
    For additional information, refer to: Parking Brake Shoes Bedding-In (206-05, General Procedures).

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PARKING BRAKE AND ACTUATION

# PARKING BRAKE SHOES BEDDING-IN (G899410)

GENERAL PROCEDURES

| | | | | | |
|---|---|---|---|---|---|
| 70.40.12 | SHOES – PARKING BRAKE – BEDDING IN | ALL DERIVATIVES | 0.3 | USED WITHINS | + |

**NOTE:**

This procedure must be carried out if, new parking brake shoes are fitted, new rear brake discs are fitted or if the vehicle has been mud wading (not water) for more than 50 miles.

1. Carry out the parking brake shoe bedding-in procedure.

2. **NOTE:**

   The parking brake shoes 'bedding-in procedure' mode will remain active for the remainder of the ignition cycle, or until the vehicle speed exceeds 31 mph (50 kph). If the procedure needs to be re-entered, the entry actions must be repeated.

   To enter the parking brake shoes 'bedding-in procedure' mode.

   - Start and run the engine.
   - Apply the brake pedal 3 times within 10 seconds and hold applied after the 3rd application.
   - Apply the electronic parking brake switch 4 times, followed by 3 release applications within 10 seconds.

3. Once the parking brake shoes 'bedding-in procedure' mode has been entered, the parking brake warning lamp will flash and the parking brake shoes can be bedded-in. Conduct 10 repeated stops from 30 - 35 kph (19 - 22 mph), followed by a 500 metre (547 yard) interval between each stop to allow the parking brake actuator and rear brakes to cool.

   - The electronic parking brake brake force will be increased

up to the dynamic maximum so long as the switch is held in the applied position.

- If the switch is released to either the NEUTRAL or OFF positions, the electronic parking brake will be released.
- The parking brake actuator and rear brakes MUST be allowed to cool between applications, either by driving at 19 mph (30 kph) for 500 metres (547 yards) or remaining stationary for 1 minute between each application.

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PARKING BRAKE AND ACTUATION

# PARKING BRAKE CABLE ADJUSTMENT (G839682)

## GENERAL PROCEDURES

**NOTE:**

On some vehicles, the rear discs have been manufactured WITHOUT the adjuster access hole. On these vehicles, the handbrake will have to be adjusted by removing the rear discs, progressively turning the adjuster and refitting the discs until the required handbrake operation is achieved.

1. The Handbrake adjustment procedure is identical to that given in the Range Rover Workshop Manual.

# PARKING BRAKE ACTUATOR

(G850440)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.35.48 | ACTUATOR – ELECTRIC PARKING BRAKE – RENEW | AJ V8, SUPERCHARGED | 2.6 | USED WITHINS | + |

## REMOVAL

**CAUTION:**

It is essential that absolute cleanliness is observed when working on the parking brake actuator. Always cover any open orifices using lint free non-flocking material to prevent the ingress of foreign matter. Failure to follow this instruction may result damage to the components.

**NOTE:**

It is not necessary to carry out the parking brake shoe 'bedding-in procedure' if the rear brake discs or parking brake shoes have been removed for access to other components.

1. Release the electronic parking brake.

2. Using the Land Rover approved diagnostic system, drive the parking brake to the mounting position.

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

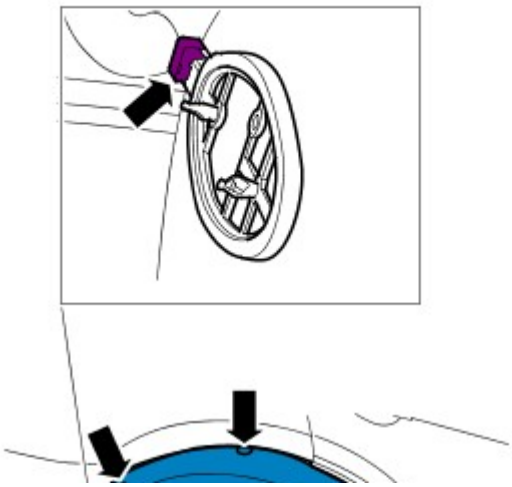
4. Disconnect the battery ground cable.
   For additional information, refer to: Specifications (414-00 Charging System - General Information, Specifications).

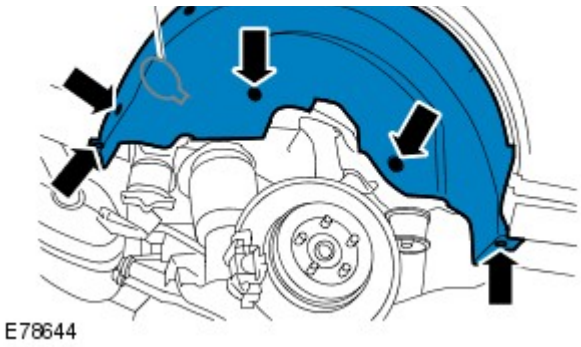
5. **WARNING:**

   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.

6. Remove the rear wheels and tires.
   For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

7. 

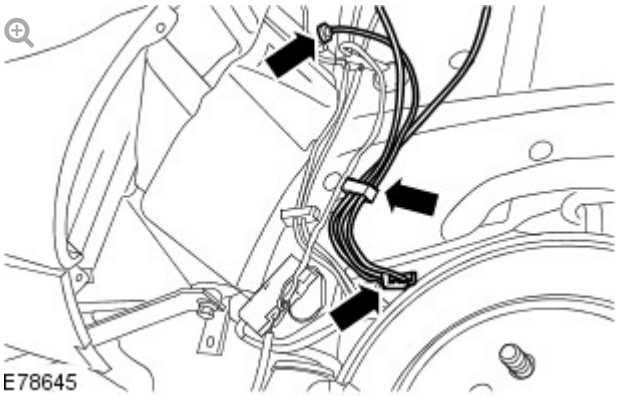



Remove the RH rear fender splash shield.

- Remove the 4 screws.
- Remove the nut.
- Remove the scrivet.
- Remove the clip.
- Disconnect the tire pressure antenna electrical connector.

8. **NOTE:**

Note the routing of the parking brake emergency release cable.




Release the parking brake emergency release cable and rear suspension spring air lines.

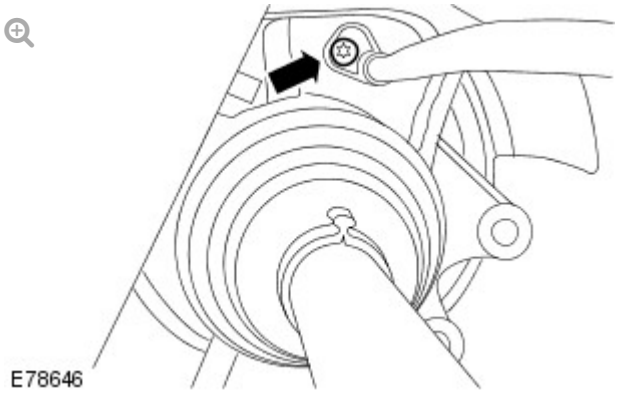
- Release the parking brake emergency release cable.
- Release from the 2 clips.

9. Remove the rear brake discs.

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

10. **NOTE:**

> Right-hand shown, left-hand similar.




Remove the parking brake cable bolt from the rear wheel knuckle.

11. **NOTE:**

> Left-hand shown, right-hand similar.

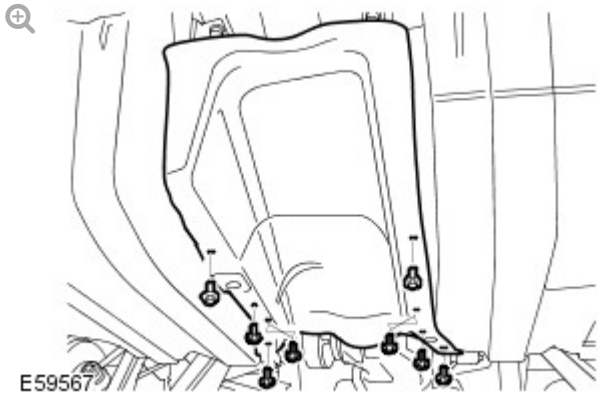
Release the parking brake cables.

1. Pull the parking brake cable sleeve away from the parking brake shoe expander.
2. Pull the parking brake cable towards the parking brake shoe expander.
3. Release the parking brake cable from the parking brake shoe expander.

12. Remove the exhaust system. For additional information, refer to:
Exhaust System (309-00 Exhaust System - 4.2L, Removal and Installation),
Exhaust System (309-00 Exhaust System - 4.4L, Removal and Installation),
Exhaust System - Vehicles Without: Diesel Particulate Filter (DPF)

(309-00 Exhaust System - 3.6L (TdV8) Diesel, Removal and Installation),
Exhaust System - Vehicles With: Diesel Particulate Filter (DPF) (309-00 Exhaust System - 3.6L (TdV8) Diesel, Removal and Installation).

13.



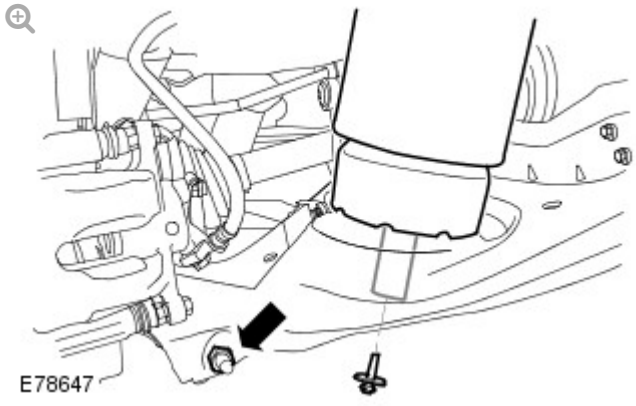

Remove the fuel tank heat shield.

- Remove the 8 screws.

14.

**NOTE:**

Left-hand shown, right-hand similar.




Release the rear air spring from the lower suspension arm.

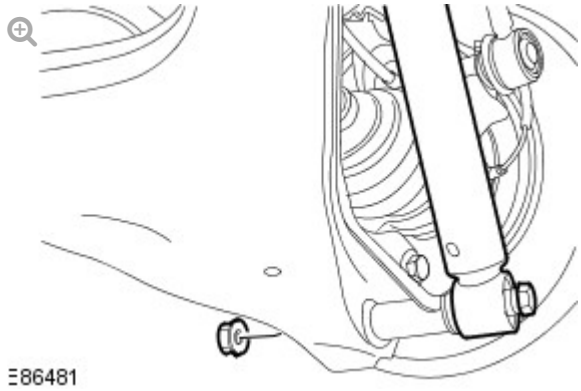
- Remove the screw.

15.

**NOTE:**

Left-hand shown, right-hand similar.

Left-hand shown, right-hand similar.

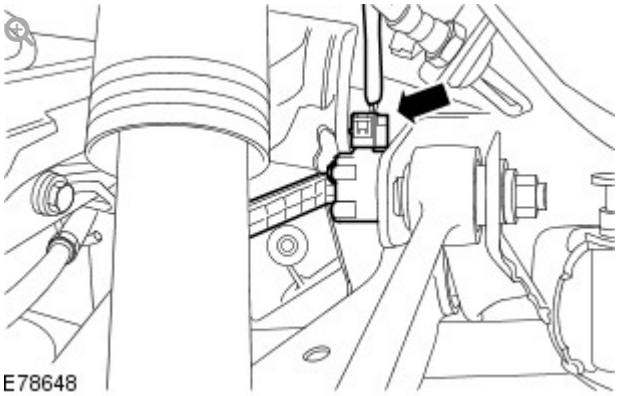



Release the rear shock absorber from the lower suspension arm.

- Remove the bolt and discard the nut.

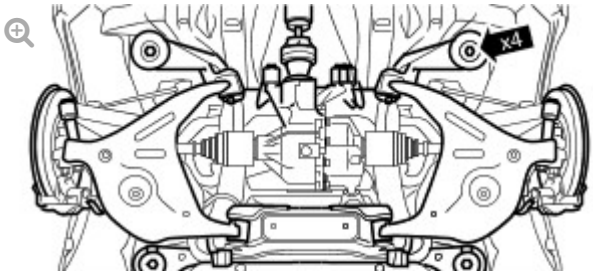
16. **NOTE:**

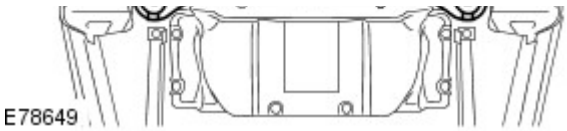
Right-hand shown, left-hand similar.




Disconnect both rear suspension height sensor electrical connectors.

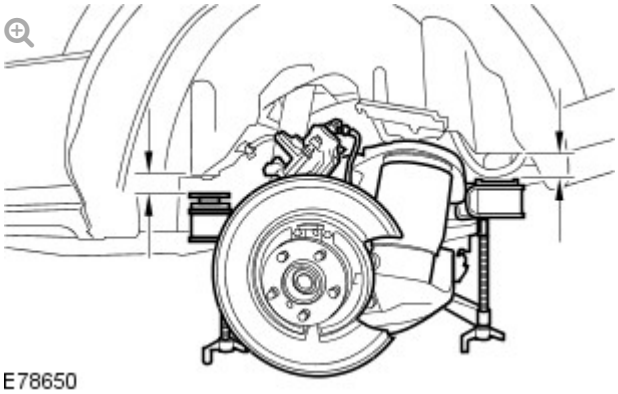
17. Using a suitable hydraulic jack, support the rear subframe.

18. 


E78649

Remove the 4 rear subframe mounting bolts.

19.

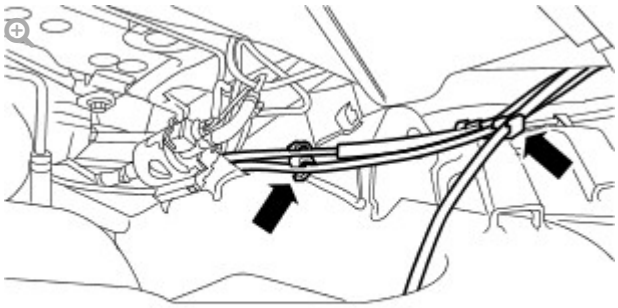

E78650

Lower the rear subframe to a maximum of 20 mm (0.78 inches).

20.

**NOTE:**

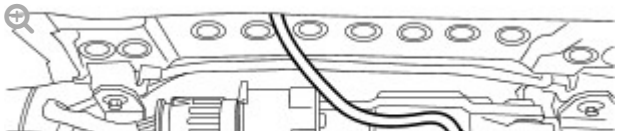
Note the routing of the parking brake emergency release cable.

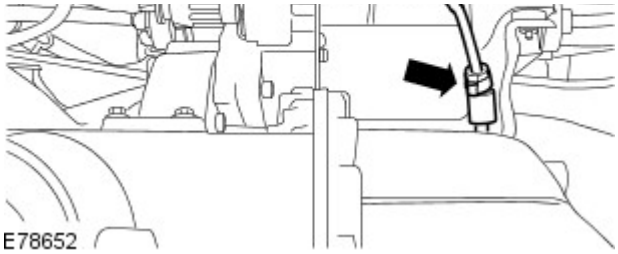

E78651

Release the parking brake emergency release cable and rear suspension spring air lines.

- Release from the 2 clips.

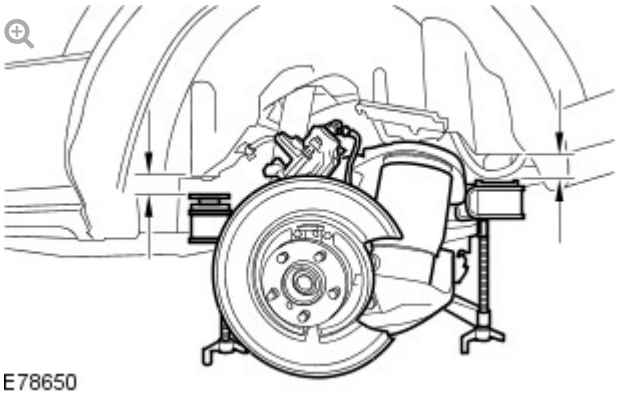
21.






Disconnect the differential case breather line.

22.



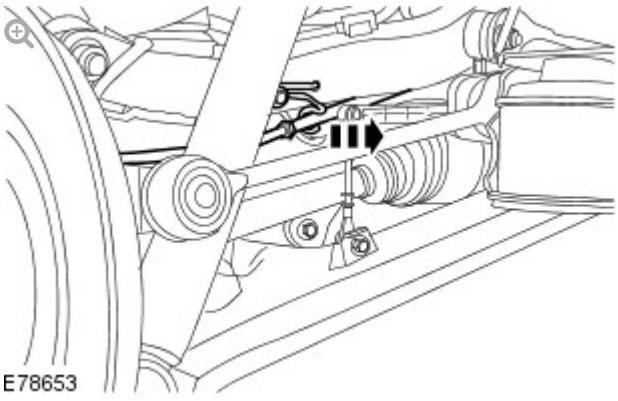

Lower the rear subframe to a maximum of 40 mm (1.57 inches).

- Collect the spacers from the mountings.

23.

**NOTE:**

Right-hand shown, left-hand similar.



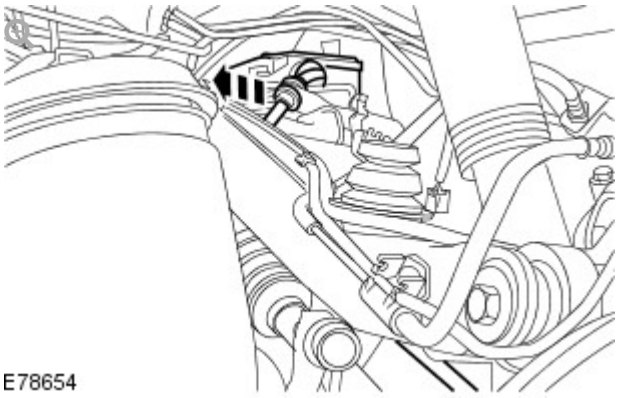

Release the parking brake cable clip from the upper suspension arm.

- Remove the bolt.

24.

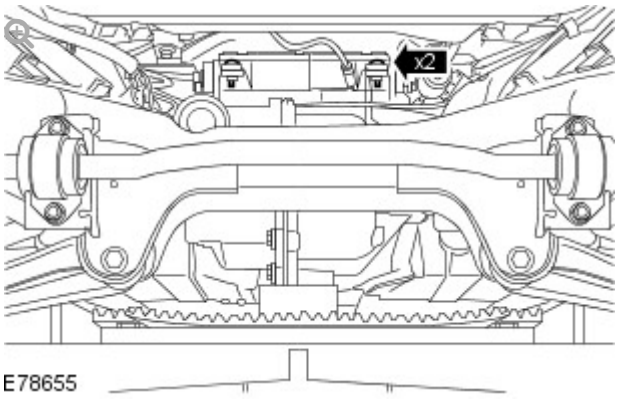
**NOTE:**

Right-hand shown, left-hand similar.




Release the parking brake cable from the rear subframe clip.

25.

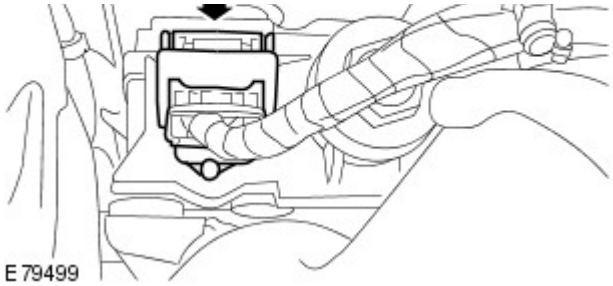



Remove the 2 parking brake actuator bolts.

26.

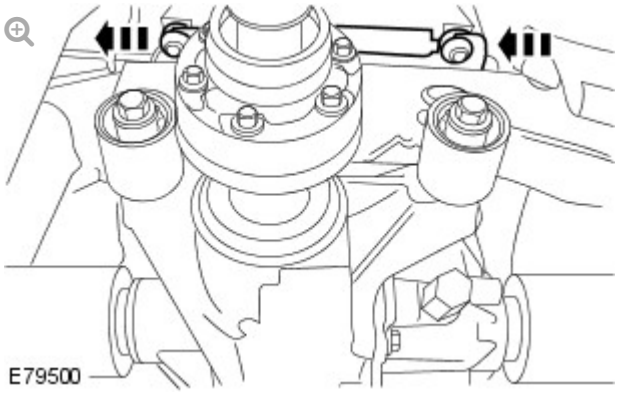
**CAUTIONS:**

- Make sure that the area around the component is clean and free of foreign material.
- It is imperative that no damage is caused to the electrical connector or the module.
- Do not touch the electrical connections.




Disconnect the parking brake actuator electrical connector.

27.




Remove the parking brake actuator and cable assembly.

- Release the 2 front rubber mounts.

## INSTALLATION

1. Install the parking brake actuator and cable assembly.
   - Attach the 2 front rubber mounts.

2. **CAUTION:**

   Do not touch the electrical connections.

   Connect the parking brake actuator electrical connector.

3. Install the parking brake actuator bolts and tighten to 9 Nm (7 lb.ft)

4. **NOTE:**

Right-hand shown, left-hand similar.

Install the parking brake cable to the rear subframe clip.

5. **NOTE:**

   Right-hand shown, left-hand similar.

   Install the parking brake cable clip to the upper suspension arm.

   - Install the bolt.

6. Connect the differential case breather line.

7. Attach the parking brake emergency release cable and rear suspension spring air lines.

   - Secure in the 2 clips.

8. Raise the rear subframe and locate on the dowels.

   - Install the spacers to the rear subframe mountings.

9. **CAUTION:**

   Make sure that the spacers are correctly located to the bushes prior to tightening.

   Install the 4 rear subframe mounting bolts and tighten to 165 Nm (122 lb.ft)

10. Connect both rear suspension height sensor electrical connectors.

11. **NOTE:**

    Left-hand shown, right-hand similar.

Attach the rear shock absorber to the lower suspension arm.

- Install the screw, but do not fully tighten at this stage.

12.

**NOTE:**

Left-hand shown, right-hand similar.

Attach the rear air spring to the suspension lower arm.

- Tighten the screw to 7 Nm. (5 lb.ft).

13. Install the fuel tank heat shield.

- Install the 8 screws.

14. Install the exhaust system. For additional information, refer to: Exhaust System (309-00 Exhaust System - 4.2L, Removal and Installation), Exhaust System (309-00 Exhaust System - 4.4L, Removal and Installation), Exhaust System - Vehicles Without: Diesel Particulate Filter (DPF) (309-00 Exhaust System - 3.6L (TdV8) Diesel, Removal and Installation), Exhaust System - Vehicles With: Diesel Particulate Filter (DPF) (309-00 Exhaust System - 3.6L (TdV8) Diesel, Removal and Installation).

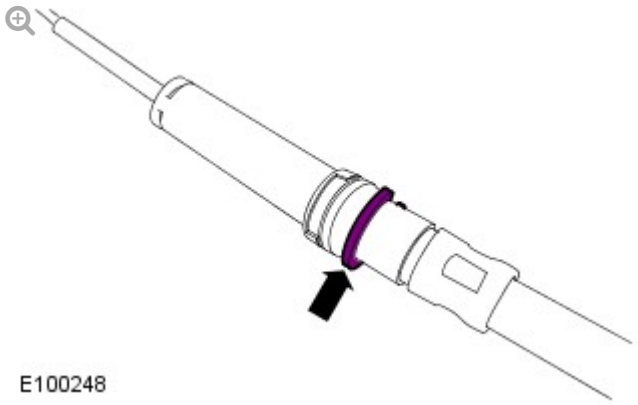
15.

**CAUTION:**

Make sure that the parking brake cable latches correctly into the parking brake shoe expander.

**NOTE:**

Make sure that the brake cable circlip is positioned as shown.




Attach the parking brake cables.

- Push the parking brake cable through the wheel knuckle into the parking brake shoe expander.

16. **NOTE:**

Right-hand shown, left-hand similar.

Install the parking brake cable bolt to the rear wheel knuckle and tighten to 8 Nm (6 lb.ft).

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

18. Attach the parking brake emergency release cable and rear suspension spring air lines.

- Secure the 2 clips.
- Install the parking brake emergency release cable.

19. Install the RH rear fender splash shield.

- Install the clip.
- Install the scrivet.
- Install the nut.
- Install the 4 screws.

20. Install the rear wheels and tires.
For additional information, refer to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation).

21. **CAUTION:**

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

Tighten the rear shock absorber lower nuts and bolts to 110 Nm (81 lb.ft).

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

23. Using the Land Rover approved diagnostic system, read, evaluate and clear any fault codes from the parking brake actuator memory.

24. Using the Land Rover approved diagnostic system, calibrate the parking brake actuator on an even surface.

25. Test the parking brake for correct operation.

**1.** Raise the rear subframe and locate on the dowels.

- Install the spacers to the rear subframe mountings.

2012.0 RANGE ROVER (LM), 206-05

PARKING BRAKE AND ACTUATION

# PARKING BRAKE CABLE LH

(G850438)

## REMOVAL

**CAUTIONS:**

- It is essential that absolute cleanliness is observed when working on the parking brake actuator. Always cover any open orifices using lint free non-flocking material to prevent the ingress of foreign matter. Failure to follow this instruction may result damage to the components.
- The parking brake actuator fault memory must not be erased.

**NOTES:**

- If the parking brake system has completed less than 50,000 cycles it is permissible to replace the parking brake cables. If over 50,000 cycles have been completed, then the parking brake cables can only replaced as part of the parking brake actuator and cable assembly. The parking brake cycle count can be checked using the Land Rover approved diagnostic system, (ON/OFF = 1 cycle). If a parking brake cable becomes detached whilst the vehicle is being driven, a 'parking brake actuator unblocking procedure' may be required using the Land Rover approved diagnostic system. If a parking brake cable breaks then the complete parking brake actuator and cable assembly should be replaced.
- It is not necessary to carry out the parking brake shoe 'bedding-in procedure' if the rear brake discs or parking brake shoes have been removed for access to other components.

1. Using the Land Rover approved diagnostic system, drive the parking brake to the mounting position.

2. **WARNING:**

**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, Specifications).

4. Remove the rear wheels and tires.

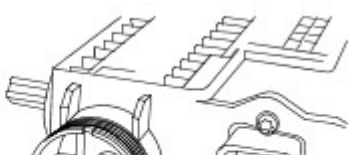
5. **NOTE:**

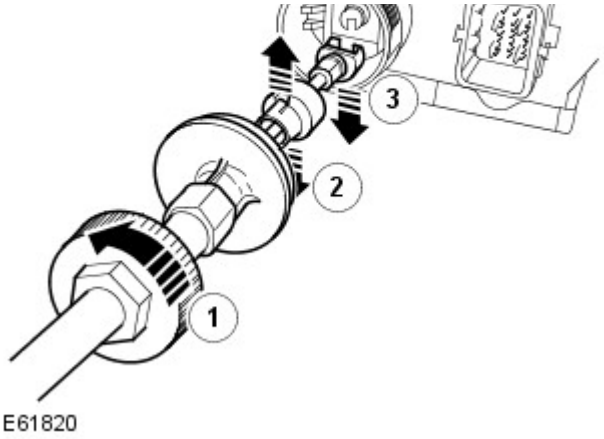
   The thread is left handed.

   Remove the RH parking brake cable.
   For additional information, refer to: Parking Brake Cable RH (206-05, Removal and Installation).

6. **CAUTIONS:**

   - Make sure that the area around the component is clean and free of foreign material.
   - Make sure that no dirt or moisture enters the parking brake actuator during parking brake cable replacement.
   - It is imperative that no damage is caused to the electrical connector or the module.
   - Do not touch the electrical connections.






Remove the LH parking brake cable.

- Release the nut.
- Release the parking brake cable clip.
- Release and remove the parking brake cable.

## INSTALLATION

1. Install the LH parking brake cable.
   - Attach the parking brake cable.
   - Install the parking brake cable clip.
   - Tighten the nut to 6 Nm (4 lb.ft).
2. Install the RH parking brake cable.
   For additional information, refer to: Parking Brake Cable RH (206-05, Removal and Installation).
3. Install the rear wheels and tires.
   - Tighten nuts to 140 Nm (103 lb.ft).
4. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).
5. **CAUTION:**

The parking brake actuator fault memory must not be erased.

Test the parking brake for correct operation.

2012.0 RANGE ROVER (LM), 206-05

PARKING BRAKE AND ACTUATION

# PARKING BRAKE CABLE RH

(G850439)

## REMOVAL AND INSTALLATION

### REMOVAL

**CAUTIONS:**

- It is essential that absolute cleanliness is observed when working on the parking brake actuator. Always cover any open orifices using lint free non-flocking material to prevent the ingress of foreign matter. Failure to follow this instruction may result damage to the components.

- The parking brake actuator fault memory must not be erased.

**NOTES:**

- If the parking brake system has completed less than 50,000 cycles it is permissible to replace the parking brake cables. If over 50,000 cycles have been completed, then the parking brake cables can only replaced as part of the parking brake actuator and cable assembly. The parking brake cycle count can be checked using the Land Rover approved diagnostic system, (ON/OFF = 1 cycle). If a parking brake cable becomes detached whilst the vehicle is being driven, a 'parking brake actuator unblocking procedure' may be required using the Land Rover approved diagnostic system. If a parking brake cable breaks then the complete parking brake actuator and cable assembly should be replaced.
- It is not necessary to carry out the parking brake shoe 'bedding-in procedure' if the rear brake discs or parking brake shoes have been removed for access to other components.

1. Using the Land Rover approved diagnostic system, drive the parking brake to the mounting position.

2. **WARNING:**

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

   Raise and support the vehicle.

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

4. Remove the rear wheels and tires.

5. Remove the parking brake actuator and cable assembly.
For additional information, refer to: Parking Brake Actuator - 3.6L (TdV8) Diesel (206-05, Removal and Installation).

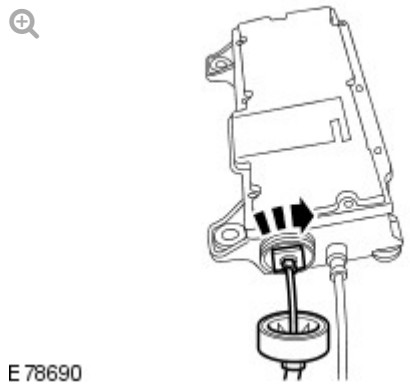
6.

**CAUTIONS:**

- Make sure that the area around the component is clean and free of foreign material.
- Make sure that no dirt or moisture enters the parking brake actuator during parking brake cable replacement.
- It is imperative that no damage is caused to the electrical connector or the module.
- Do not touch the electrical connections.

**NOTE:**

The thread is left handed.




Remove the RH parking brake cable.

- Release the nut.
- Release and remove the parking brake cable.

## INSTALLATION

1. **NOTE:**

   Apply a suitable amount of the supplied grease to the RH parking brake cable threads.

   Install the RH parking brake cable.

   - Screw the parking brake cable in 5 complete turns.
   - Tighten the nut to 6 Nm (4 lb.ft).

2. Install the parking brake actuator and cable assembly.
   For additional information, refer to: Parking Brake Actuator - 3.6L (TdV8) Diesel (206-05, Removal and Installation).

3. Install the rear wheels and tires.

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

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

5. **CAUTION:**

   The parking brake actuator fault memory must not be erased.

   Test the parking brake for correct operation.

PARKING BRAKE AND ACTUATION

# PARKING BRAKE SHOES (G1226173)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.40.09 | SHOES - REAR SET - RENEW | ALL DERIVATIVES | 1.6 | USED WITHINS | + |

## REMOVAL

**CAUTION:**

LH illustration shown, RH is similar.

**NOTE:**

If the parking brake shoes or the brake discs have been removed for access to other components then DO NOT carry out the bedding in procedure.

1. Using the Land Rover approved diagnostic system, drive the parking brake to the 'mounting position'.

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

Specifications).

3. **WARNING:**

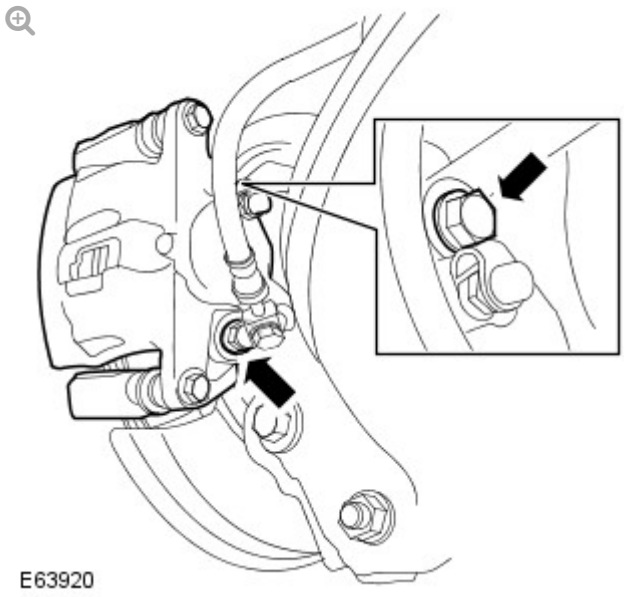
> Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

4. Remove the rear wheels and tires

5. **CAUTION:**

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

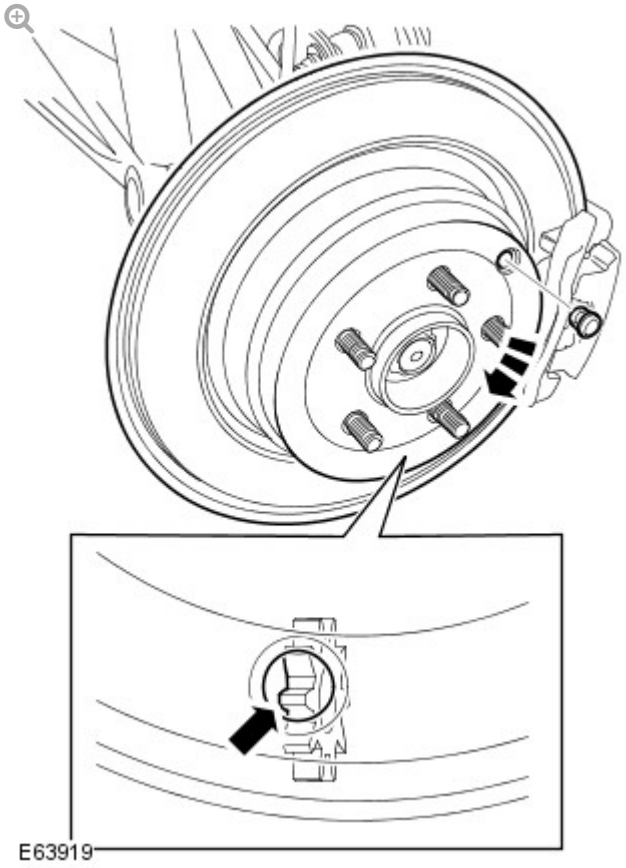



Remove and discard the 2 bolts.

- Tie the brake caliper aside.

6. **NOTE:**

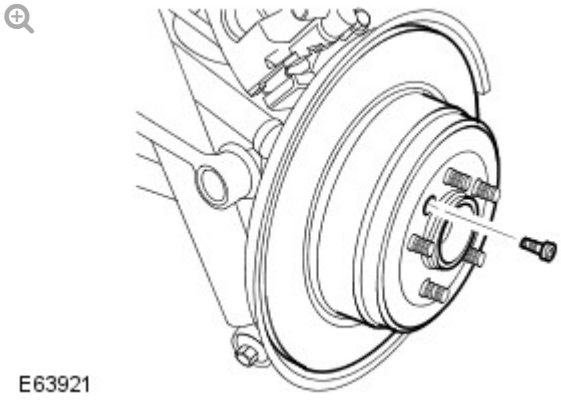
> Rotate the rear brake disc to locate the parking brake shoe adjuster.




Release the parking brake shoe adjustment.

- Remove the parking brake shoe adjuster access plug.
- Release the the parking brake shoe adjuster to the minimum adjustment.

7.



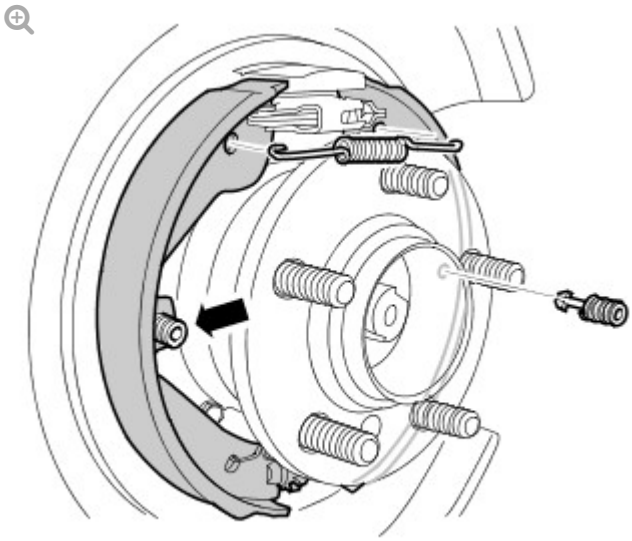

Remove the rear brake disc.

- Remove the Allen screw.

8.

**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 parking brake shoe lower spring and the parking brake shoe adjuster.

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

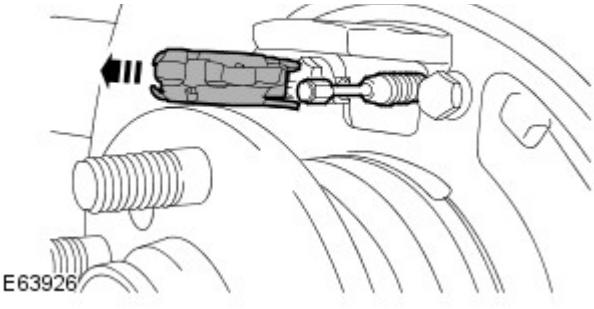
9.

E68677

Remove the parking brake shoe adjuster.

- Remove the parking brake shoe lower return spring.
- Remove the parking brake shoes.

10.




Remove the parking brake shoe expander.

11. Repeat the above procedure for the other side.

## INSTALLATION

1. **WARNING:**

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

   Install the parking brake shoe expander.

   - Clean the component mating faces.

2. **NOTE:**

   Apply grease of the correct specification sparingly to the adjuster threads.

   Install the parking brake shoe adjuster.

   - Clean the adjuster and set it to its minimum extension.
   - Install the parking brake shoe lower return spring.
   - Assemble the parking brake shoes.

3. Install the parking brake shoes.

   - Clean the component mating faces.

- Install both parking brake shoe retainers.
- Install the parking brake shoe upper return spring.

**CAUTION:**

Brake discs must be renewed in pairs.

4. Install the rear brake disc.
   - Make sure that the rear brake disc and hub mating surfaces are clean.
   - Tighten the Allen screw to 16 Nm (12 lb.ft).
5. Install the brake caliper.
   - Clean the component mating faces.
   - Tighten the new bolts to 65 Nm (48 lb.ft), then a further 90 degrees.
6. Repeat the above procedure for the other side.
7. Adjust the parking brake shoes.
   For additional information, refer to: Parking Brake Shoe and Lining Adjustment (206-05, General Procedures).
8. Install the rear wheels and tires.
   - Tighten the wheel nuts to 140 Nm (103 lb.ft).
9. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).

**CAUTION:**

Brake discs must be renewed in pairs.

1. Install the rear brake disc.
    - Make sure that the rear brake disc and hub mating surfaces are clean.
    - Tighten the Allen screw to 16 Nm (12 lb.ft).

2012.0 RANGE ROVER (LM), 206-05

PARKING BRAKE AND ACTUATION

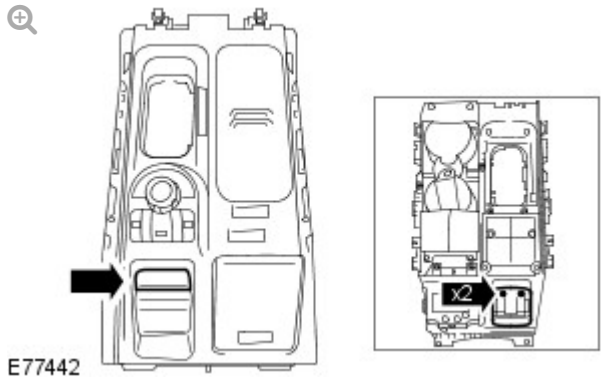
# PARKING BRAKE SWITCH (G898391)

| | | | | | |
|---|---|---|---|---|---|
| 70.35.46 | SWITCH - ELECTRIC PARKING BRAKE - 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 parking brake switch.
   - Remove the parking brake switch trim panel.
   - Remove the 2 screws.

## INSTALLATION

1. Install the parking brake switch.
   - Install the 2 screws.
   - Install the parking brake switch trim panel.

- Install the parking brake switch trim panel.

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

2012.0 RANGE ROVER (LM), 206-06

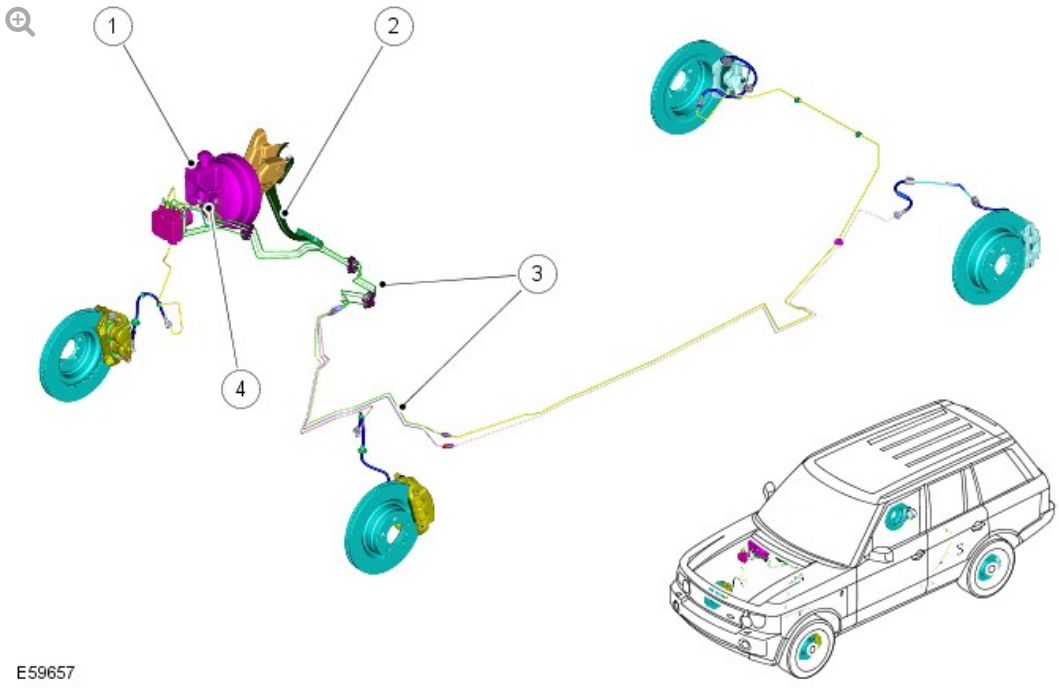
# HYDRAULIC BRAKE ACTUATION

## DESCRIPTION AND OPERATION

### COMPONENT LOCATION

**NOTES:**

- 4.4L V8 vehicle shown, other vehicles similar
- right-hand drive (RHD) installation shown, left-hand drive (LHD) installation similar



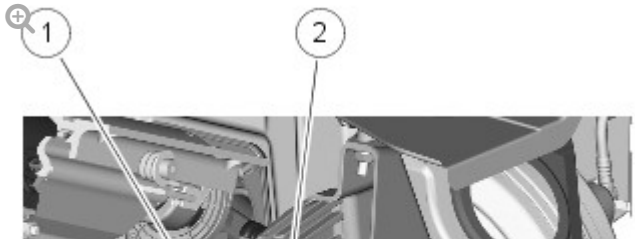

| ITEM | DESCRIPTION |
|---|---|
| 1 | Brake fluid reservoir |
| 2 | Brake pedal |
| 3 | Brake pipes and hoses |
| 4 | Brake master cylinder |

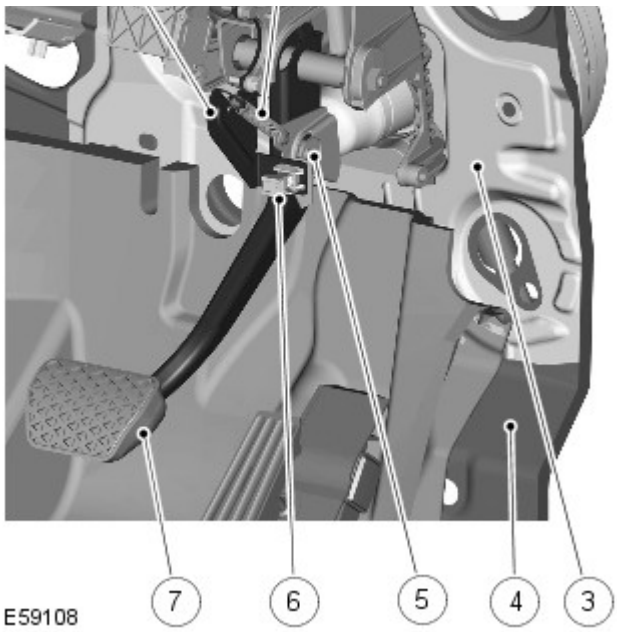
## OVERVIEW

Hydraulic brake actuation consists of:

- The brake pedal.
- The brake master cylinder and reservoir.
- The hydraulic pipes and hoses.

## BRAKE PEDAL



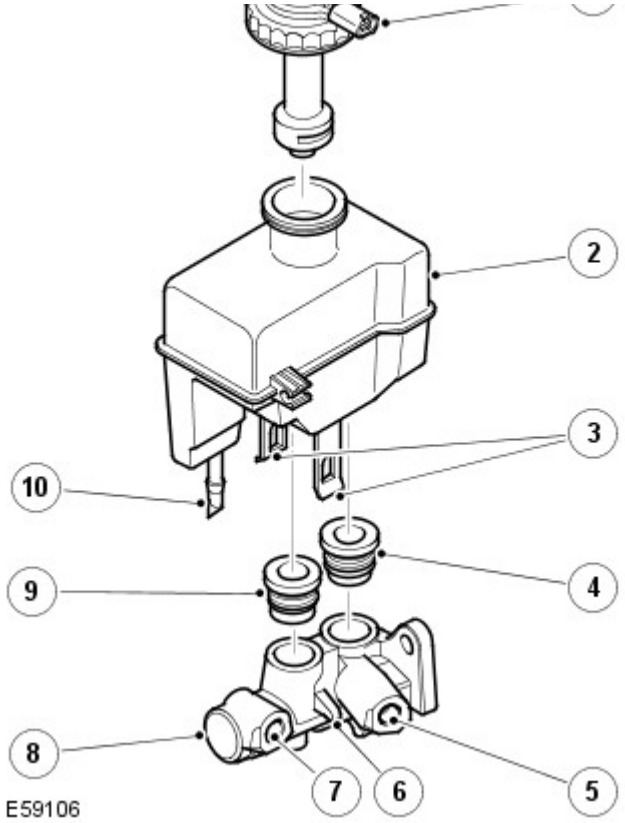



| ITEM | DESCRIPTION |
|---|---|
| 1 | Brake pedal bracket |
| 2 | Pedal return spring |
| 3 | Brake pedal bracket reinforcement |
| 4 | Engine bulkhead |
| 5 | Clevis pin and clip |
| 6 | Stop lamp switch |
| 7 | Brake pedal |

The brake pedal is mounted in a bracket attached to the rear side of the engine bulkhead. A clevis pin and clip connect the brake pedal to the push rod of the brake booster.

The stop lamp switch is mounted in the brake pedal bracket and operated by the brake pedal.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

## BRAKE MASTER CYLINDER AND RESERVOIR




| ITEM | DESCRIPTION |
|---|---|
| 1 | Brake fluid reservoir cap and level switch |
| 2 | Brake fluid reservoir |
| 3 | Reservoir securing straps |
| 4 | Primary inlet seal |
| 5 | Primary outlet port |
| 6 | Reservoir securing lug |
| 7 | Secondary outlet port |
| 8 | Cylinder housing |
| 9 | Secondary inlet seal |
| 10 | Outlet for pre-charge pump (reference - not used) |

The master cylinder assembly produces hydraulic pressure to operate the brakes when the brake pedal is pressed. The assembly is attached to the front of the brake servo assembly, and comprises a cylinder containing two pistons in tandem. The rear piston produces pressure for the primary circuit and the front piston produces pressure for the secondary circuit.

When the brake pedal is pressed, the front push rod in the brake servo assembly pushes the primary piston along the cylinder bore. This produces pressure in the primary pressure chamber which, in conjunction with the primary spring, overcomes the secondary spring and simultaneously moves the secondary piston along the cylinder bore. The initial movement of the pistons, away from the piston stops, closes the primary and secondary center valves.

Further movement of the pistons then pressurizes the fluid in the primary and secondary pressure chambers, and thus the brake circuits. The fluid in the chambers, behind the pistons, is unaffected by movement of the pistons and can flow unrestricted through the feed holes between the chambers and the reservoir. When the brake pedal is released, the primary and secondary springs push the pistons back down the bore of the cylinder. As the pistons contact the piston stops, the primary and secondary center valves open, which allows fluid to circulate between the reservoir, through the center valves, the chambers behind the pistons and the feed holes.

The brake fluid reservoir is located on top of the master cylinder assembly. The reservoir is internally divided to provide an independent supply of fluid to each brake circuit, and so prevent a single fluid leak from disabling both primary and secondary brake circuits. Should a failure occur in one circuit, the remaining circuit will still operate effectively, although brake pedal travel and vehicle braking distances will increase.

A fluid level switch is incorporated into the reservoir cap:

- With sufficient fluid in the reservoir the contacts of the fluid level switch are closed.
- When the fluid level drops below allowable limits, the switch contacts open.

Since the normal position is closed, this circuit is monitored for shorts to + and ground.

The anti-lock brake system (ABS) module monitors the input from the fluid level switch and issues a low fluid level signal to the lighting control module (LCM) on the controller area network (CAN) if the switch opens.

If the low fluid level signal is momentary, the LCM signals the instrument cluster of the condition. The instrument cluster then informs the ABS module over the CAN bus. If the signal is received prior to the activation of the pre-charge pump, the pre-charge pump activation is delayed.

If the signal is present for more then 25 seconds, the LCM issues two I bus messages for the instrument cluster:

- Display CHECK BRAKE FLUID in the message center.
- Notify the ABS module, via CAN, that the fluid level has been low for more than 25 seconds.

The ABS module immediately switches DSC functions off and sends a CAN signal to the instrument cluster to continuously illuminate the DSC warning indicator.

## BRAKE PIPES AND HOSES

The brake pipes and hoses connect the master cylinder to the wheel brakes via the hydraulic control unit. The pipes are arranged to provide a front and rear split braking system. The brakes on the front axle are operated by the primary system; the brakes on the rear axle are operated by the secondary system.

2012.0 RANGE ROVER (LM), 206-06

# HYDRAULIC BRAKE ACTUATION

## DIAGNOSIS AND TESTING

For additional information.

REFER to: Brake System (206-00, Diagnosis and Testing).

2012.0 RANGE ROVER (LM), 206-06

HYDRAULIC BRAKE ACTUATION

# BRAKE FLUID RESERVOIR

[G1225597]

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.25.31 | RESERVOIR - BRAKE FLUID - RENEW | ALL DERIVATIVES | 0.7 | USED WITHINS | + |

## REMOVAL

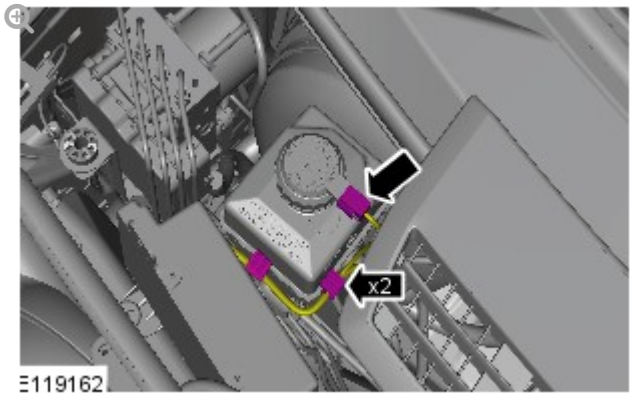
**CAUTION:**

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

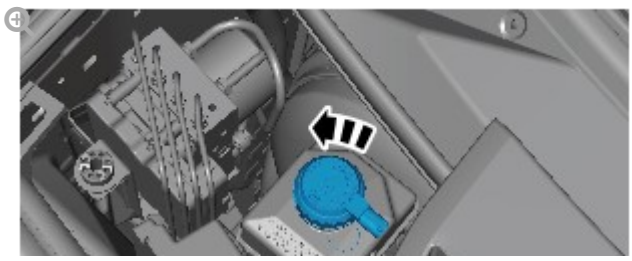
**NOTE:**

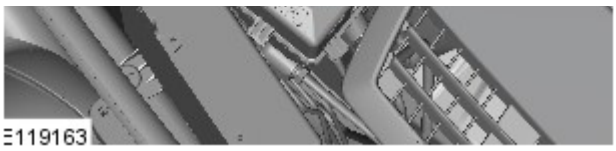
Removal steps in this procedure may contain installation details.

1.

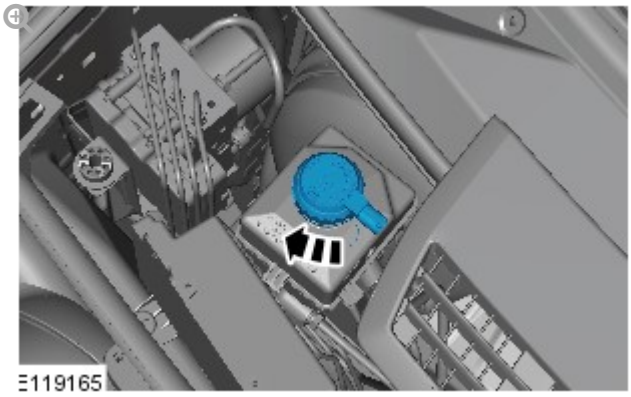



2.






3. Using a suitable suction device drain the brake fluid resrvoir.

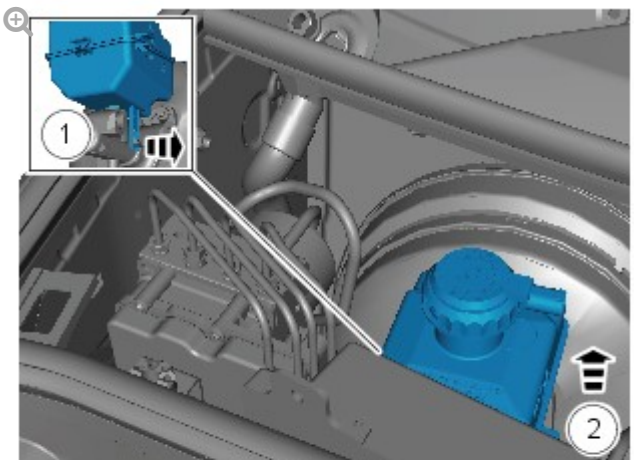
4. 

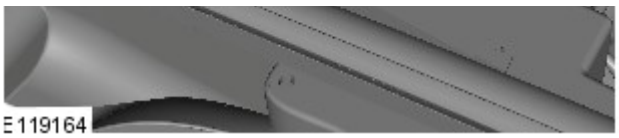

5. **CAUTIONS:**

- Make sure that all openings are sealed. Use new blanking plugs.
- Be prepared to catch escaping fluid.

**NOTE:**

Discard the seals.






1. Release the both locking tangs.

1. Remove the brake fluid reservoir.

## INSTALLATION

All vehicles

1.

**NOTES:**

- Remove and discard the blanking plugs.
- Install new seals.

To install, reverse the removal procedure.

Vehicles with standard brakes

1. Bleed the braking system.
   Refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00, General Procedures).

Vehicles with high performance brakes

1. Bleed the braking system.
   Refer to: Brake System Bleeding - Vehicles With: High Performance Brakes (206-00, General Procedures).

2012.0 RANGE ROVER (LM), 206-06

HYDRAULIC BRAKE ACTUATION

# BRAKE MASTER CYLINDER

(G1225587)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.30.08 | CYLINDER<br>- MASTER<br>- TANDEM<br>- RENEW | ALL DERIVATIVES | 0.8 | USED WITHINS | + |

## REMOVAL

**NOTES:**

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

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

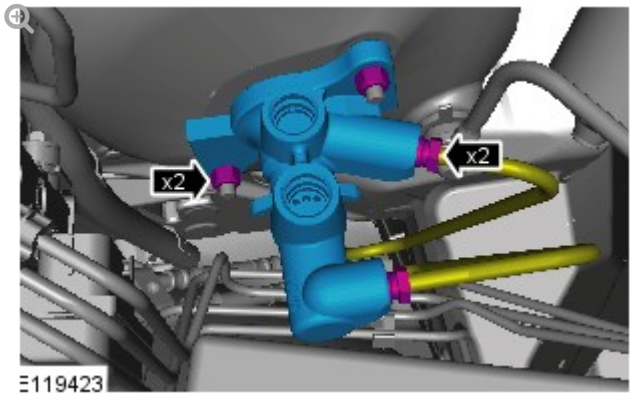
2. Refer to: Brake Fluid Reservoir (206-06 Hydraulic Brake Actuation, Removal and Installation).

3. **CAUTION:**

   Make sure that all openings are sealed. Use new blanking caps.

   **NOTES:**

   - Discard the retaining nuts.
   - Remove and discard the O-ring seal.




*Torque:*

Retaining nuts **23 Nm**

Brake pipe unions **16 Nm**

## INSTALLATION

All vehicles

1. **WARNING:**

   Make sure that new retaining nuts are installed.

   **NOTES:**

   - Install a new O-ring seal.
   - Remove and discard the blanking caps.

   To install, reverse the removal procedure.

Vehicles with standard brakes

1. Bleed the braking system.
   Refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00 Brake System - General Information, General Procedures).

Vehicles with high performance brakes

1. Bleed the braking system.
   Refer to: Brake System Bleeding - Vehicles With: High Performance Brakes (206-00 Brake System - General Information, General Procedures).

2012.0 RANGE ROVER (LM), 206-06

HYDRAULIC BRAKE ACTUATION

# BRAKE PEDAL (G419761)

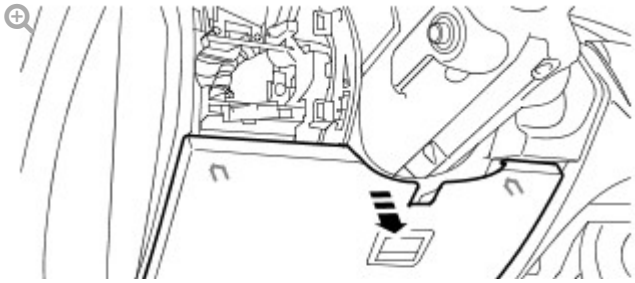
REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.35.01 | PEDAL – BRAKE – RENEW | ALL DERIVATIVES | 2.5 | USED WITHINS | + |

## REMOVAL

1. Remove the headlamp switch.
   For additional information, refer to: Headlamp Switch (417-01 Exterior Lighting, Removal and Installation).

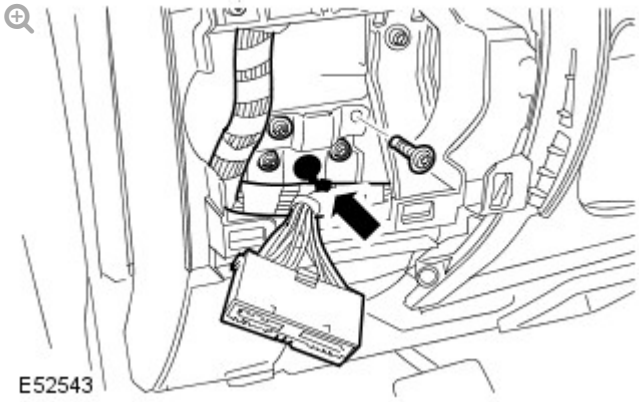
2. Remove the stoplamp switch.
   For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

3. 


Remove the instrument panel access panel.

- Release the 2 clips.

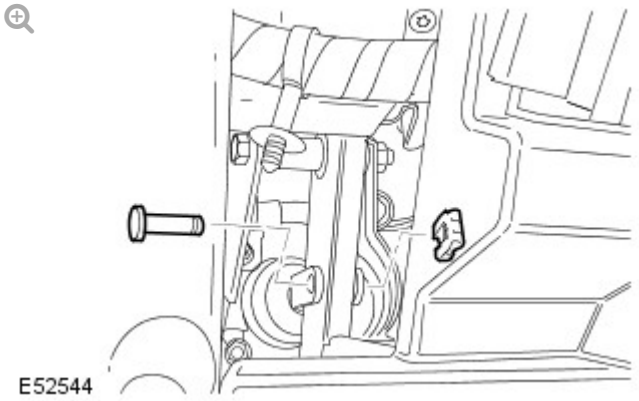
4.




Remove the brake pedal bracket.

- Release the wiring harness clip.
- Remove the 4 Torx bolts.

5.




Remove the brake pedal clevis pin.

- Remove the clip.

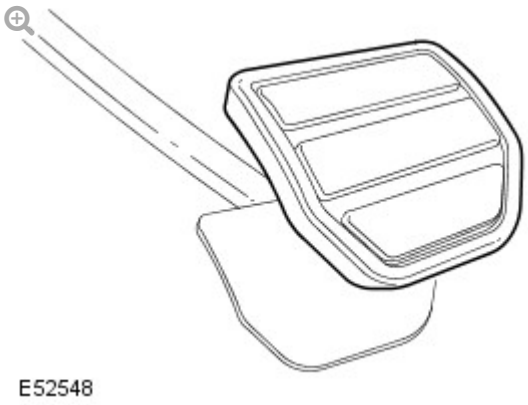
6.


Remove the brake pedal.

- Remove the nut and bolt.

7. **NOTE:**

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




Remove the brake pedal pad.

## INSTALLATION

1. Install the brake pedal pad.

2. Install the brake pedal.
   - Clean the component mating faces.
   - Tighten the nut and bolt to 45 Nm (33 lb.ft).

3. Install the brake pedal clevis pin.
   - Install the clip.

4. Install the brake pedal bracket.
   - Tighten the Torx bolts to 10 Nm (7 lb.ft).
   - Secure the wiring harness.

5. Install the instrument panel access panel.
   - Secure with the clips.

6. Install the stoplamp switch.
   For additional information, refer to: Stoplamp Switch (417-01 Exterior Lighting, Removal and Installation).

7. Install the headlamp switch.
   For additional information, refer to: Headlamp Switch (417-01 Exterior Lighting, Removal and Installation).

2012.0 RANGE ROVER (LM), 206-06

HYDRAULIC BRAKE ACTUATION

# BRAKE PEDAL AND BRACKET

(G928023)

## REMOVAL AND INSTALLATION

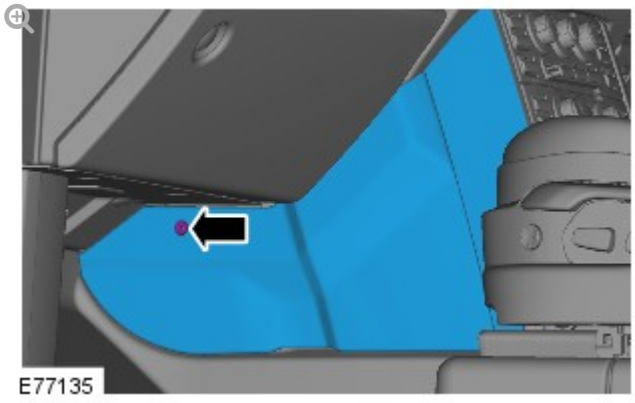
| | | | | | |
|---|---|---|---|---|---|
| 70.35.01 | PEDAL - BRAKE - RENEW | ALL DERIVATIVES | 2.5 | USED WITHINS | + |
| 70.35.03 | PEDAL BOX - RENEW | ALL DERIVATIVES | 0.4 | USED WITHINS | + |

## REMOVAL

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

2. **NOTE:**

   LH illustration shown, RH is similar.

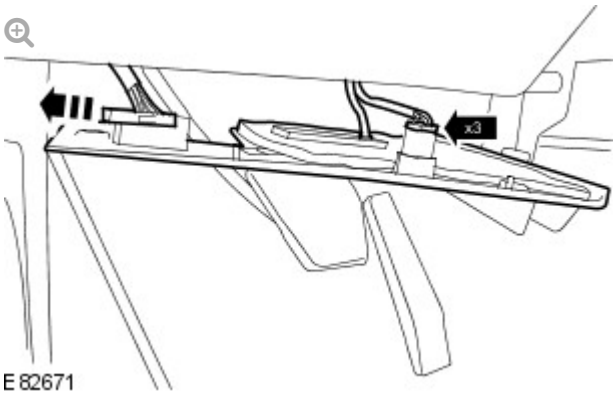



Remove the floor console extension.

- Remove the screw.

- Release the 2 clips.

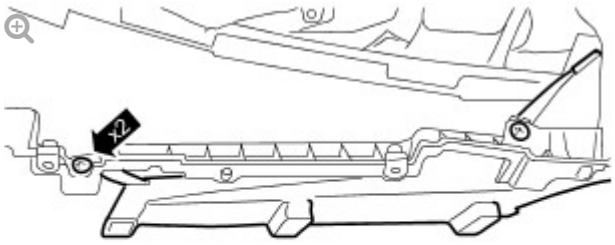
3.




Remove the driver side closing trim panel.

- Remove the 3 screws.
- Disconnect the footwell lamp electrical connector.
- Release the vehicle diagnostic socket.

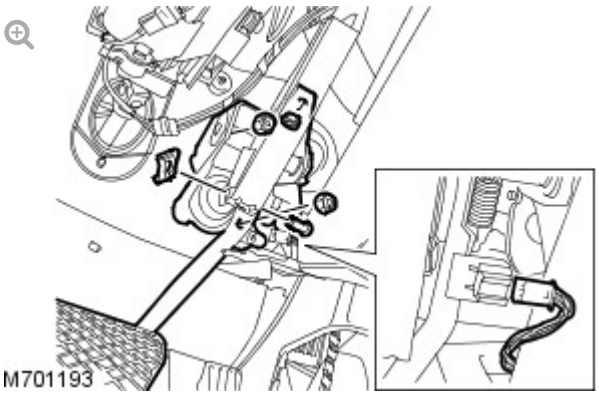
4.




Remove the driver side footwell duct.

- Remove the 2 screws.

5.




Release the brake booster push rod from the brake pedal.

- Remove the clip.
- Remove the pin.

6. Remove the brake pedal and bracket.
   - Disconnect the stoplamp switch electrical connector.
   - Remove and discard the 3 nuts.
   - Reposition the brake booster and brake master cylinder.

7. **NOTE:**

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

   Remove the stoplamp switch.
   - Release the clip.

8. Remove the stoplamp switch bracket.
   - Remove the 2 nuts and 2 bolts.
   - Remove the brake pedal return spring.

## INSTALLATION

1. Install the stoplamp switch bracket.
   - Install the brake pedal return spring.
   - Tighten the nuts and bolts to 10 Nm (7 lb.ft).

2. Install the stoplamp switch.
   - With the brake pedal released, make sure the stoplamp switch is in contact with the brake pedal.

3. **WARNING:**

Make sure that new nuts are installed.

**CAUTION:**

The nuts must be re-torqued after 20 minutes.

Install the brake pedal and bracket.

- Reposition the brake booster and brake master cylinder.
- Tighten the nuts to 26 Nm (19 lb.ft).

4. Secure the brake booster push rod to the brake pedal.
   - Install the pin.
   - Install the clip.
5. Install the driver side footwell duct.
   - Tighten the screws.
6. Install the driver side closing trim panel.
   - Connect the footwell lamp electrical connector.
   - Secure the vehicle diagnostic socket.
   - Tighten the screws.
7. Install the floor console extension.
   - Secure the clips.
   - Tighten the screw.
8. Connect the battery ground cable.
   For additional information, refer to: Specifications (414-00, Specifications).

2012.0 RANGE ROVER (LM), 206-07

# POWER BRAKE ACTUATION

SPECIFICATIONS

## General Specifications

| ITEM | SPECIFICATION |
|---|---|
| Boost ratio | 8:1 |

## Torque Specifications

| DESCRIPTION | NM | LB-FT |
|---|---|---|

| | | |
|---|---|---|
| Brake vacuum pump bolts - 5.0L engine | 12 | 9 |
| Brake vacuum pump stud - 4.4D (TdV8) engine | 13 | 10 |
| Brake vacuum pump nut - 4.4D (TdV8) engine | 23 | 17 |
| Brake vacuum pump bolts - 4.4D (TdV8) engine | 23 | 17 |
| Brake booster nuts | 23 | 17 |

2012.0 RANGE ROVER (LM), 206-07

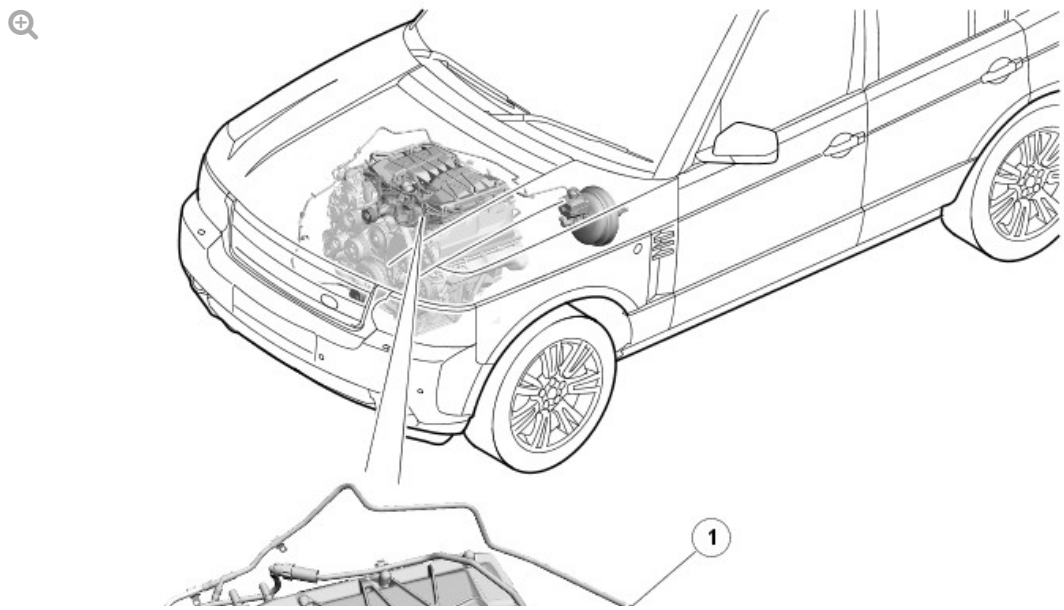
# POWER BRAKE ACTUATION

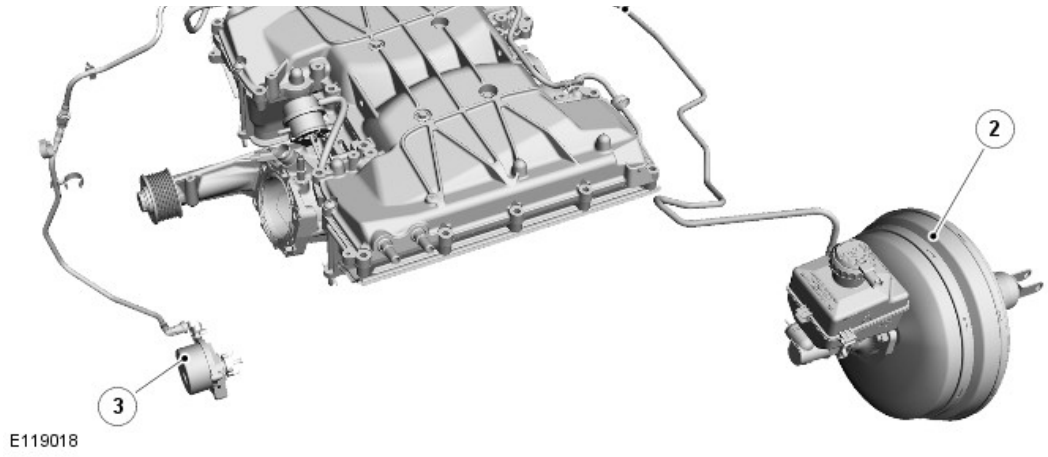
DESCRIPTION AND OPERATION

## COMPONENT LOCATION – 5.0L SUPERCHARGED

**NOTE:**

left-hand drive (LHD) installation shown, right-hand drive (RHD) installation similar



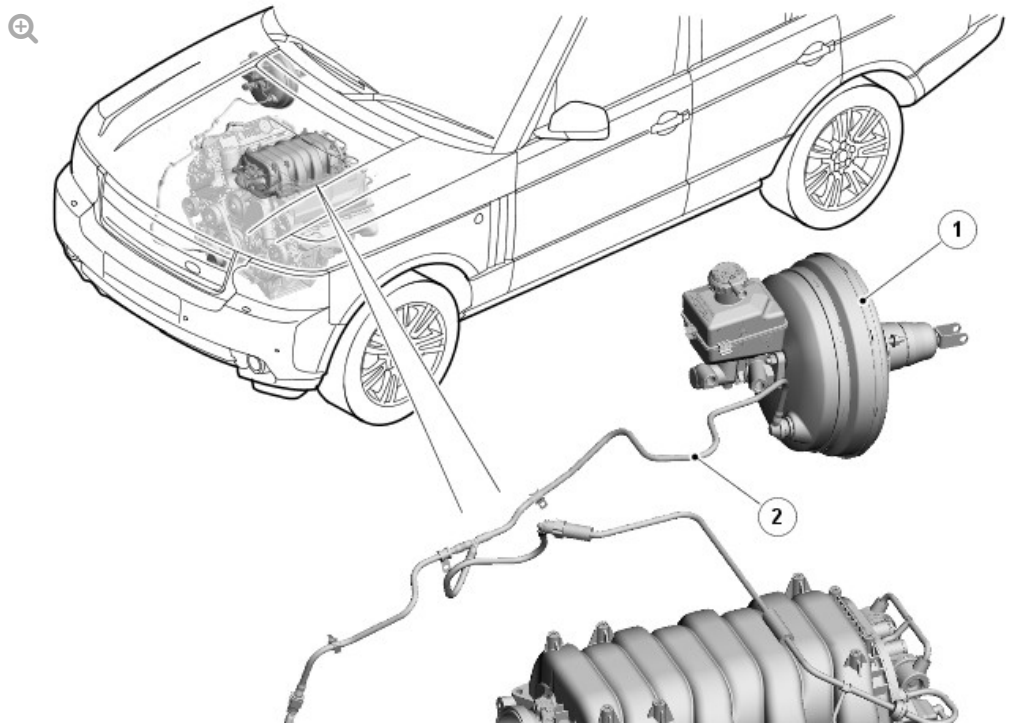


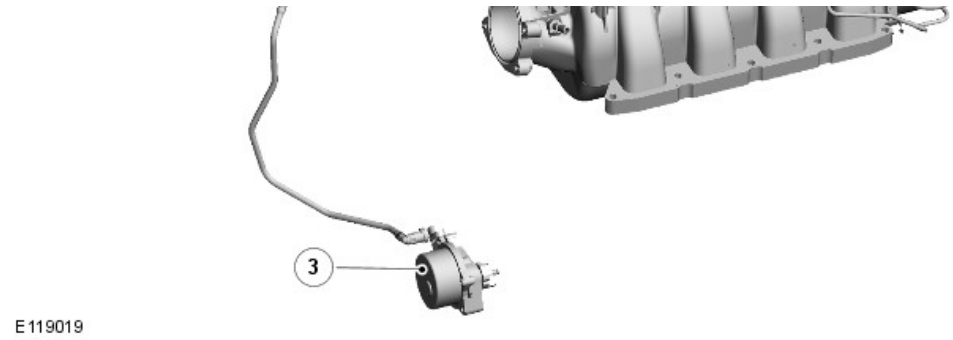

| ITEM | DESCRIPTION |
|---|---|
| 1 | Vacuum pipes |
| 2 | Brake booster |
| 3 | Vacuum pump |

## COMPONENT LOCATION – 5.0L NATURALLY ASPIRATED

**NOTE:**

RHD installation shown, LHD installation similar



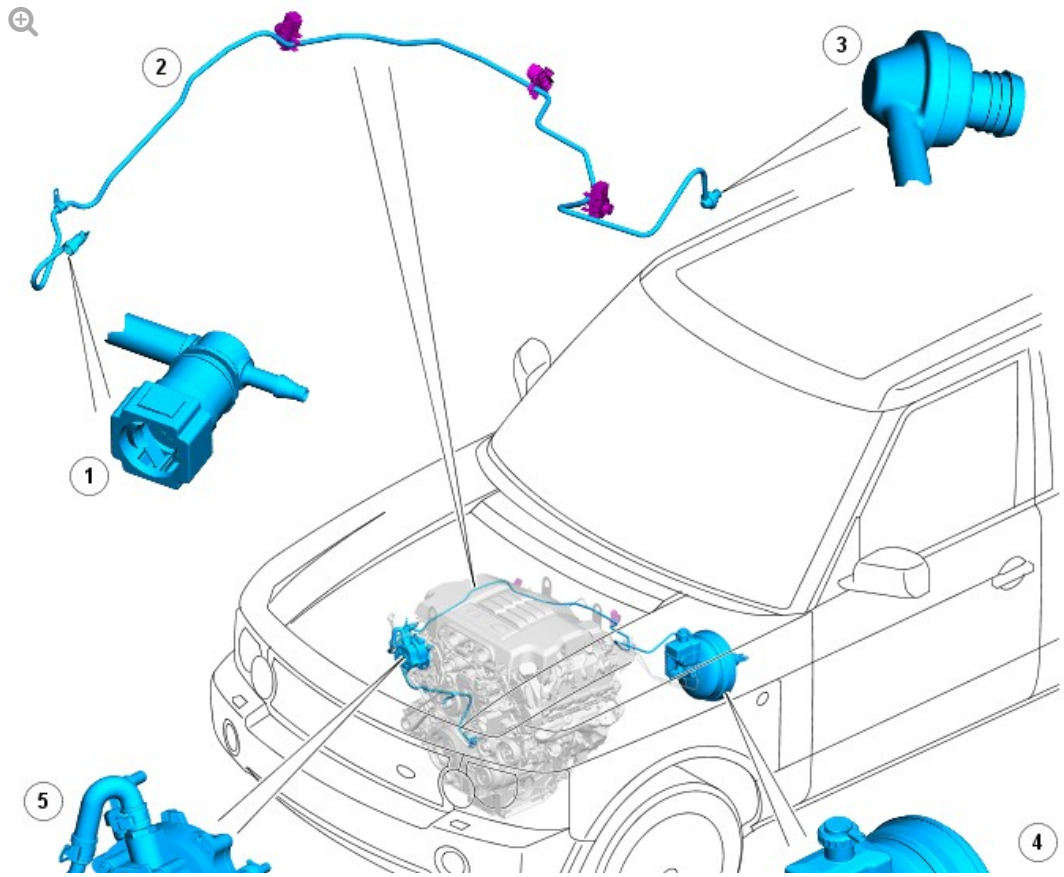



| ITEM | DESCRIPTION |
|---|---|
| 1 | Brake booster |
| 2 | Vacuum pipes |
| 3 | Vacuum pump |

## COMPONENT LOCATION – TDV8

**NOTE:**

LHD installation shown, RHD installation similar




| ITEM | DESCRIPTION |
|---|---|
| 1 | Vacuum pipe connection to vacuum pump |
| 2 | Vacuum pipe and check valve |
| 3 | Check valve |
| 4 | Brake booster |
| 5 | Vacuum pump |

## OVERVIEW

Power assistance for the brakes is provided by a vacuum operated brake booster. Vacuum is produced by an engine driven vacuum pump.

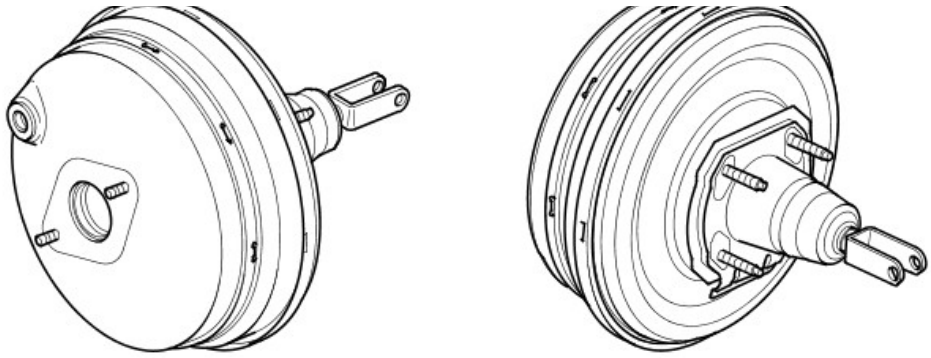
## VACUUM PIPES

Plastic vacuum pipes connect the brake booster to the vacuum source. Check valves are incorporated into the vacuum pipes.

On gasoline vehicles the connection with the brake booster contains a check valve to maintain the vacuum in the brake booster. An in-line check valve near the connection with the intake manifold prevents air being drawn from the intake manifold and fuel vapor from entering the pipes.

On TdV8 vehicles there is a single check valve integrated into the vacuum pipe connection with the brake booster. The check valve maintains a vacuum in the brake booster when the engine is running at low speeds, and the vacuum pump is operating at less than the optimum.

## BRAKE BOOSTER



E49905

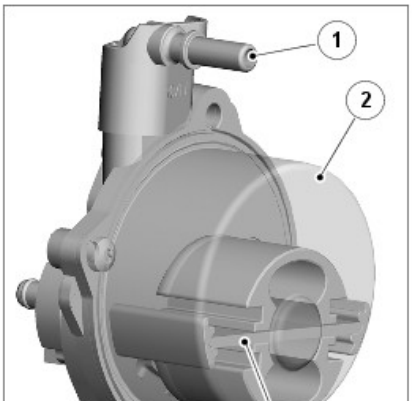
The brake booster provides power assistance to increase the braking effort applied by the driver. The assembly is attached to the front of the pedal box and comprises a circular housing containing a diaphragm, push rods, valve and filter. A push rod at the rear of the housing protrudes through an aperture in the bulkhead and is connected to the brake pedal.

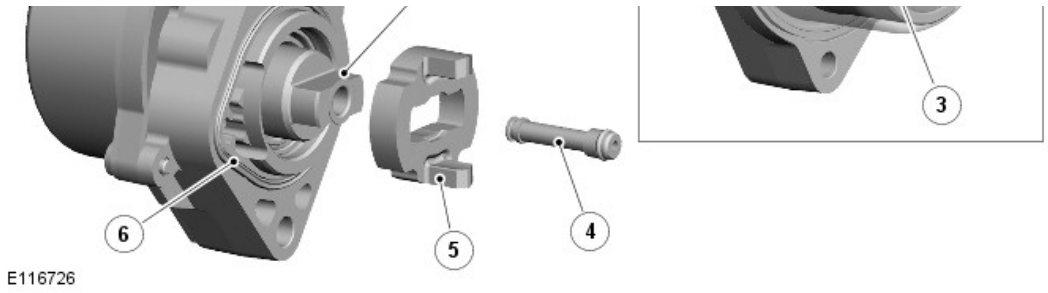
The vacuum pipe is connected to a port in the front face of the brake booster housing.

With the brake pedal released and the engine running, a vacuum is present on both sides of the diaphragm. When the brake pedal is pressed, the rear push rod moves forward and opens the valve to allow atmospheric pressure through the filter into the pedal side of the diaphragm. The pressure differential acting on both sides of the diaphragm increases the pressure being applied by the brake pedal.

In the event that the brake booster fails, the hydraulic system will still function but will require greater pedal effort due to the lack of vacuum assistance.

## VACUUM PUMP – V8 5.0L

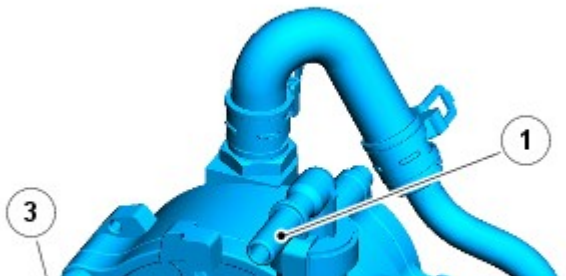


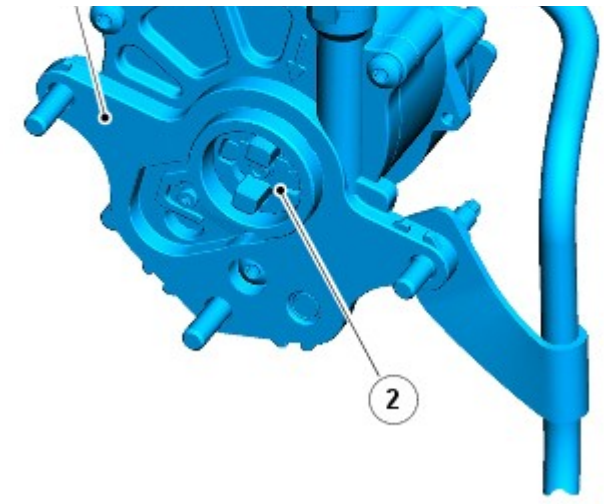

| ITEM | DESCRIPTION |
|---|---|
| 1 | Vacuum pipe connection |
| 2 | Cover |
| 3 | Vane |
| 4 | Oil tube |
| 5 | Drive gear |
| 6 | Seal |
| 7 | Rotor |

The vacuum pump is a mechanically driven vane pump installed on the front of the engine sump body and driven by the auxiliary camshaft. Two bolts attach the vacuum pump to the sump body. A seal is installed in a groove on the mating face of the vacuum pump.

The vacuum pump drive gear locates on the end of the rotor and engages with slots in the front of the auxiliary camshaft. An oil tube in the center of the rotor supplies engine oil from the auxiliary camshaft to lubricate the vacuum pump. Exhaust air from the vacuum pump is expelled into the engine sump through the sump body.

## VACUUM PUMP – TDV8






E89530

| ITEM | DESCRIPTION |
|---|---|
| 1 | Vacuum pump connection to brake booster |
| 2 | Camshaft drive lobe |
| 3 | Mounting flange |

The Vacuum required for brake booster operation on TdV8 vehicles is provided by an engine driven vacuum pump. The vacuum pump is a radial vane type pump mounted to the front of the right-hand (RH) cylinder head which is driven by the intake camshaft. The vacuum pipe from the brake booster connects to an elbow on the rim of the vacuum pump.

The vacuum pump is lubricated and cooled by engine oil supplied to a port in the front face of the vacuum pump from a gallery in the cylinder head. The oil return is through a vent in the front face of the pump into a drain cavity in the cylinder head. Air extracted from the brake booster is vented into the drain cavity with the returning engine oil.

The vacuum pump is also used to supply vacuum for operation of the following components:

- The exhaust gas recirculation (EGR) system.
  For additional information, refer to: Electronic Engine Controls (303-14C, Description and Operation).
- The adaptive engine mounts.
  For additional information, refer to: Electronic Engine Controls (303-14C,

Description and Operation).

2012.0 RANGE ROVER (LM), 206-07

# POWER BRAKE ACTUATION

# POWER BRAKE ACTUATION

## DIAGNOSIS AND TESTING

For additional information.

REFER to: Brake System (206-00, Diagnosis and Testing).

2012.0 RANGE ROVER (LM), 206-07

POWER BRAKE ACTUATION

# BRAKE BOOSTER – RHD AWD

(G1225841)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.50.01 | BRAKE BOOSTER ASSEMBLY – RENEW | RIGHT HAND DRIVE | 1.5 | USED WITHINS | + |

## REMOVAL

**NOTE:**

Removal steps in this procedure may contain installation details.

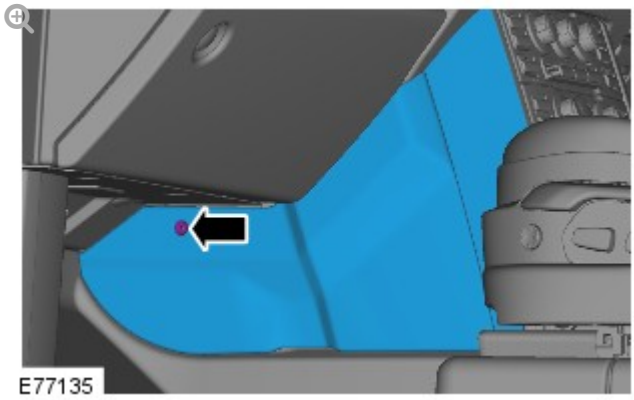
1. Disconnect the battery ground cable.
   Refer to: Specifications (414-00, Specifications).

2. Refer to: Anti-Lock Brake System (ABS) Module - 5.0L, RHD (206-09A, Removal and Installation).

3. Refer to: Brake Master Cylinder (206-06, Removal and Installation).

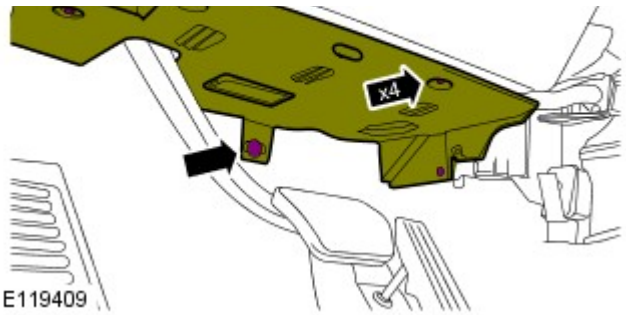
4. **NOTE:**

   LH illustration shown, RH is similar.




5. **NOTE:**

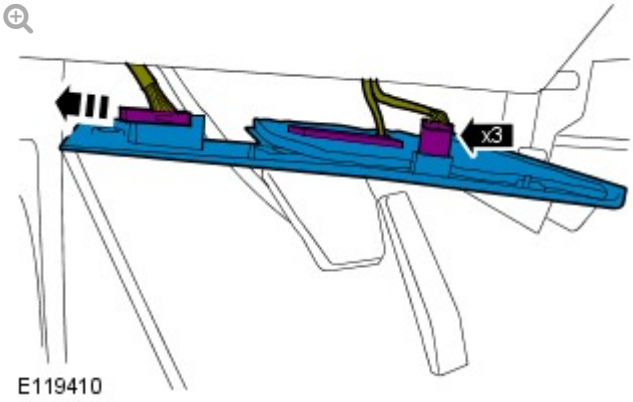
   LH illustration shown, RH is similar.




6.

**NOTE:**

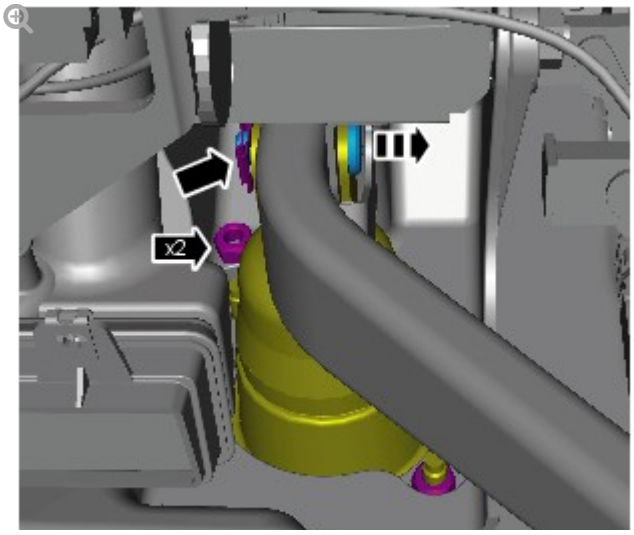
LH illustration shown, RH is similar.




7.

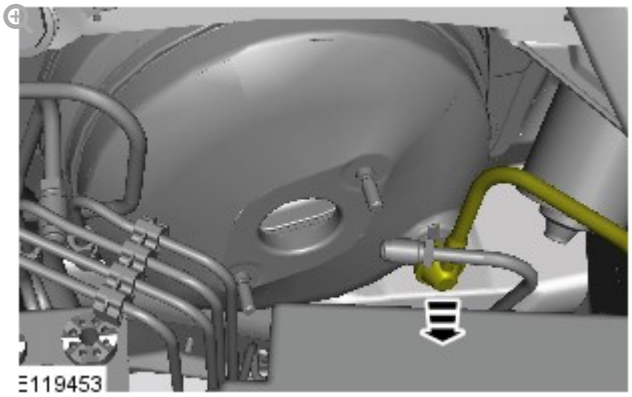
**NOTE:**

LH illustration shown, RH is similar.




*Torque:* **25 Nm**

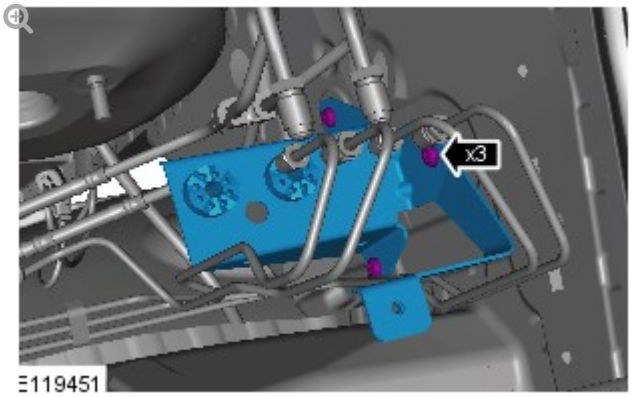
8.




9.

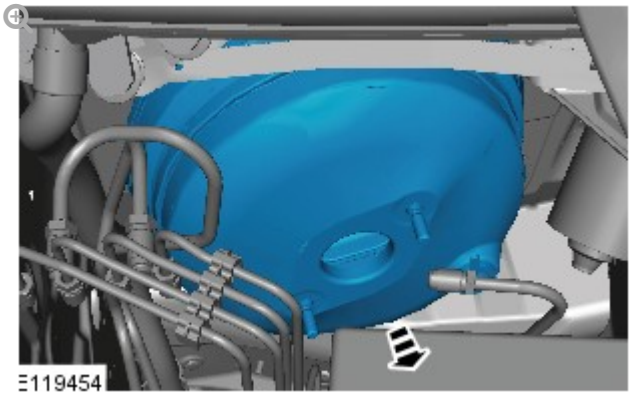
**NOTE:**

LH illustration shown, RH is similar.




*Torque:* **5 Nm**

10.



## INSTALLATION

All vehicles

1. To install, reverse the removal procedure.

Vehicles with standard brakes

1. Bleed the braking system.
   Refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00, General Procedures).

Vehicles with high performance brakes

1. Bleed the braking system.
   Refer to: Brake System Bleeding - Vehicles With: High Performance Brakes (206-00, General Procedures).

POWER BRAKE ACTUATION

# BRAKE VACUUM PUMP – V8 5.0L PETROL/V8 S/C 5.0L PETROL (G1225279)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.50.19 | VACUUM PUMP – BRAKE BOOSTER – RENEW | 5000 CC, AJ V8 | 1.3 | USED WITHINS | + |
| 70.55.02 | BRAKE CALIPER – FRONT – EACH – RENEW | ALL DERIVATIVES | 0.5 | USED WITHINS | + |

## REMOVAL

**NOTE:**

Removal steps in this procedure may contain installation details.

1. **WARNING:**

   Make sure to support the vehicle with axle stands.

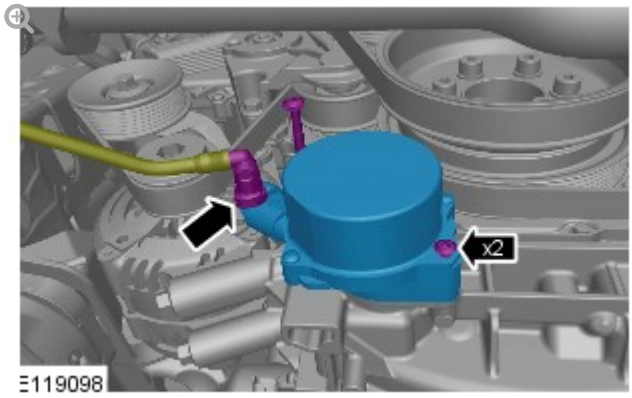
   Raise and support the vehicle.

2. Refer to: Radiator Splash Shield (501-02, Removal and Installation).

3. Refer to: Engine Oil Draining and Filling (303-01B, General Procedures).

4. **NOTE:**

   Discard the O-ring seal.




*Torque:* **12 Nm**

## INSTALLATION

1. **NOTE:**

   Install a new O-ring seal.

   To install, reverse the removal procedure.

To install, reverse the removal procedure.

# ANTI-LOCK CONTROL - TRACTION CONTROL

SPECIFICATIONS

## General Specifications

| ITEM | SPECIFICATION |
|---|---|
| System type | Bosch 8.0 Anti-lock braking system with Electronic Brake Distribution (EBD), Corner Brake Control (CBC), Electronic Traction Control (ETC), Hill Descent Control (HDC), Anti-roll Mitigation (ARM), Emergency Brake Assist (EBA), and Dynamic Stability Control (DSC) |
| Wheel speed sensor type | Bosch DF11im |
| Wheel speed sensor location | Front and rear knuckles with the active directional sensor acting on the driveshaft pole wheel |
| Yaw rate sensor type | Bosch DRS MM3.10 |

## Torque Specifications

| DESCRIPTION | NM | LB-FT | LB-IN |
|---|---|---|---|
| Front wheel speed sensor bolt | 9 | - | 80 |
| Front brake caliper anchor plate bolts | 275 | 202 | - |
| Front brake caliper housing bolts | 32 | 24 | - |
| Front brake hose retaining bracket to wheel knuckle bolt | 25 | 18 | - |
| Rear wheel speed sensor to wheel knuckle bolt | 9 | - | 80 |
| Anti-lock braking system (ABS) module mounting bracket nuts | 8 | - | 71 |
| ABS module to mounting bracket nuts | 23 | 17 | - |
| Brake tube union nuts | 18 | 13 | - |

| | | | |
|---|---|---|---|
| Brake tube union nuts | [illegible] | [illegible] | [illegible] |
| Yaw rate sensor bolts | 6 | - | 53 |
| Wheel retaining nuts | 140 | 103 | - |

2012.0 RANGE ROVER (LM), 206-09

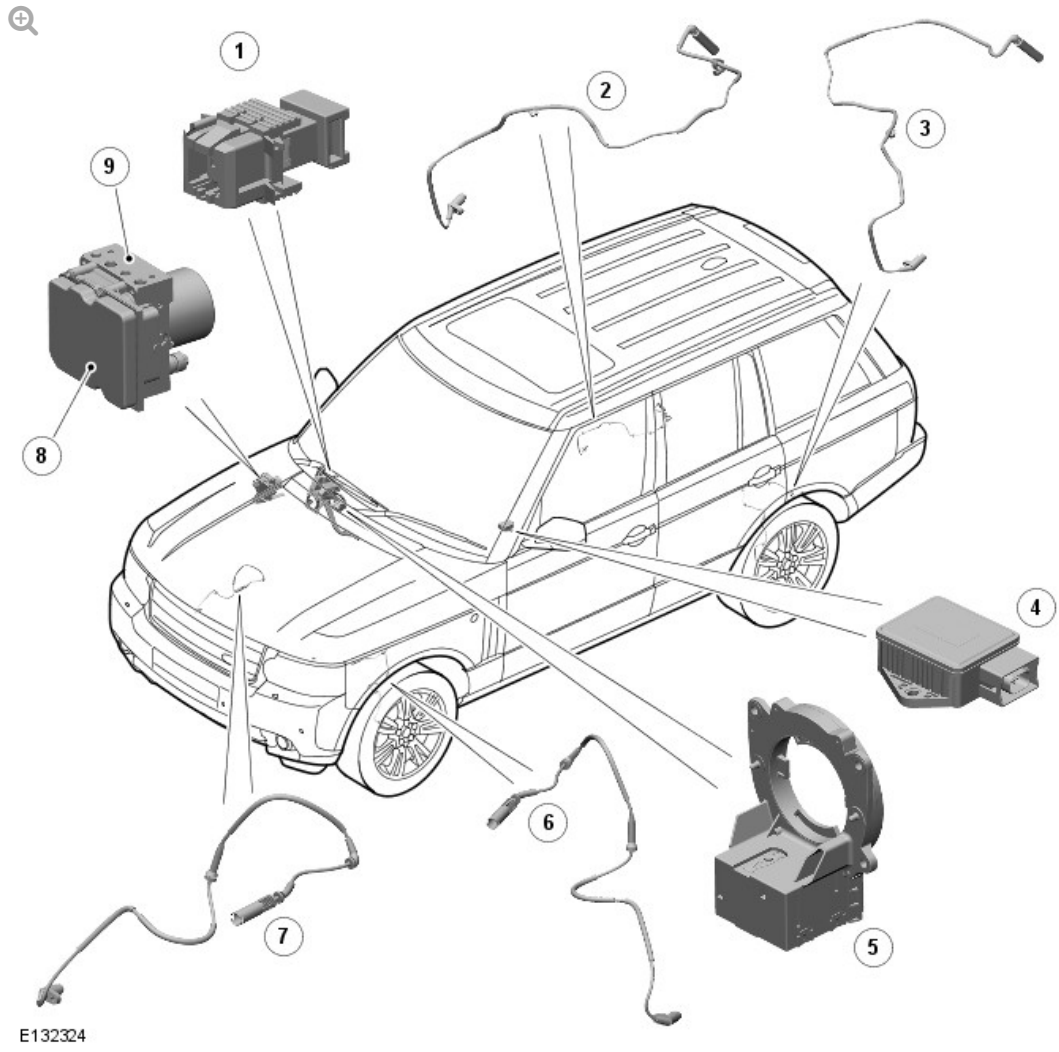
# ANTI-LOCK CONTROL - TRACTION CONTROL

DESCRIPTION AND OPERATION

## COMPONENT LOCATION - SHEET 1 OF 2

**NOTE:**

RHD (right-hand drive) vehicle shown, LHD (left-hand drive) similar.

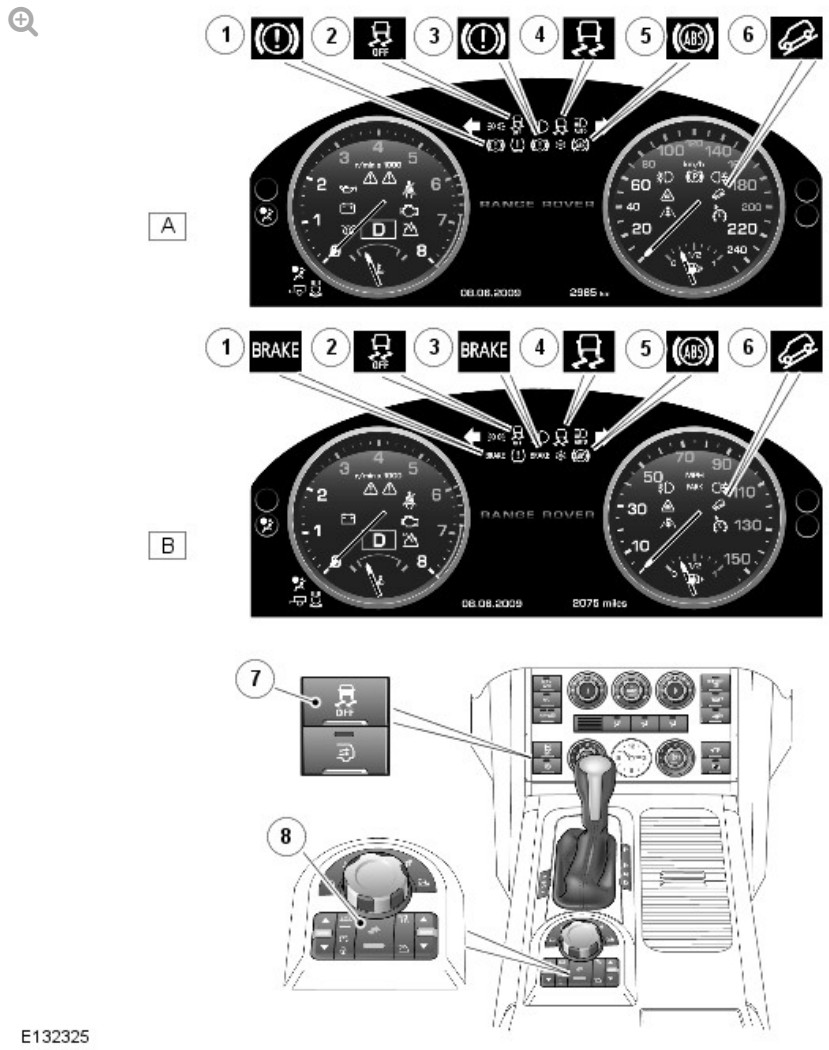



| ITEM | DESCRIPTION |
|---|---|
| 1 | Stoplamp switch |
| 2 | RH (right-hand) rear wheel speed sensor |
| 3 | LH (left-hand) rear wheel speed sensor |
| 4 | Yaw rate and lateral acceleration sensor |
| 5 | Steering angle sensor |
| 6 | LH front wheel speed sensor |
| 7 | RH front wheel speed sensor |
| 8 | ABS (anti-lock brake system) module |
| 9 | HCU (hydraulic control unit) |

## COMPONENT LOCATION – SHEET 2 OF 2

**NOTE:**

LHD vehicle shown, RHD similar.




| ITEM | DESCRIPTION |
|---|---|
| A | Instrument cluster - ROW markets |
| B | Instrument cluster - USA markets |
| 1 | Brake system warning indicator (amber) |
| 2 | DSC (dynamic stability control) OFF warning indicator (amber) |
| 3 | Brake system warning indicator (red) |

| | |
|---|---|
| 4 | DSC warning indicator (amber) |
| 5 | ABS warning indicator (amber) |
| 6 | HDC (hill descent control) warning indicator (green) |
| 7 | DSC switch |
| 8 | HDC switch |

## OVERVIEW

The anti-lock control - traction control system features a Bosch ESP®plus8.1 modulator, which is an integrated four-channel HCU and ABS module.

The ABS module is connected to the high speed CAN (controller area network) bus, and actively interacts with other vehicle system control modules and associated sensors to receive and transmit current vehicle operating information.

When required, the ABS module will actively intervene and operate the HCU during braking or vehicle maneuvers to correct the vehicle attitude, stability, traction or speed. During incidents of vehicle correction, the ABS module may also request the ECM (engine control module) to control engine power in order to further stabilize and correct the vehicle.

To provide full system functionality, the anti-lock control - traction control system comprises the following components:

- DSC switch.
- HDC switch.
- Four wheel speed sensors.
- Steering angle sensor.
- Yaw rate and lateral acceleration sensor.
- Stoplamp switch.
- Instrument cluster warning indicators.
- Integrated HCU and ABS module.

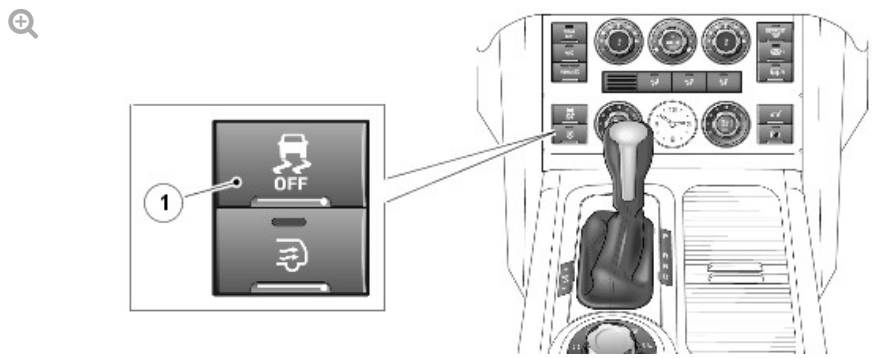
The anti-lock control - traction control system provides the following brake

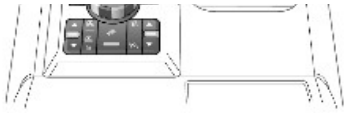
functions that are designed to assist the vehicle or aid the driver:

- ABS.
- ARM (active roll mitigation).
- CBC (corner brake control).
- DSC.
- EBD (electronic brake force distribution).
- Electronic brake prefill.
- ETC (electronic traction control).
- EBA (emergency brake assist).
- EDC (engine drag-torque control).
- EUC (enhanced understeer control).
- Gradient acceleration control.
- Gradient release control.
- HDC.
- Hill start assist.
- Trailer stability assist.

The HDC function is enabled either manually using the HDC switch, or automatically by the terrain response system, in the ignition on and engine running power modes. All of the other brake functions are automatically enabled in the ignition on and engine running power modes. The DSC function can be selected off using the DSC switch.

## DYNAMIC STABILITY CONTROL SWITCH





E132326

| ITEM | DESCRIPTION |
| --- | --- |
| 1 | DSC switch |

The DSC switch allows the DSC function to be selected off. Although Land Rover recommend that DSC is selected on for all normal driving conditions, it may be beneficial to de-select DSC to maximize traction under the following conditions:

- If the vehicle needs to be rocked out of a hollow or a soft surface.
- Driving on loose surfaces or with snow chains.
- Driving in deep sand, snow or mud.
- On tracks with deep longitudinal ruts.

The DSC switch is a non-latching switch installed in the center console switch pack. Pressing the DSC switch connects an ignition power feed to the ABS module. With the first press of the DSC switch, the ABS module disables the DSC functions. When the DSC switch is pressed again, the ABS module re-enables the DSC functions. The DSC switch must be pressed for a minimum of 0.3 s for the ABS module to react. The DSC function is re-enabled at the beginning of each ignition cycle.

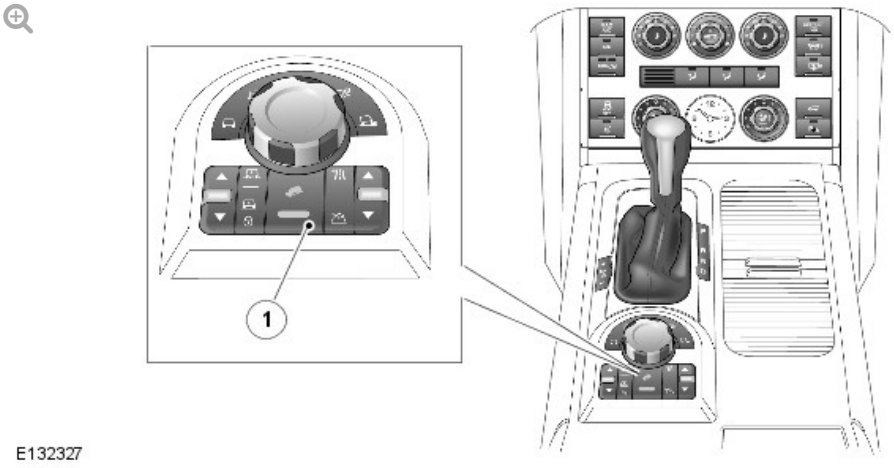
The status of the DSC switch selection is shown by the DSC OFF warning indicator. The DSC OFF warning indicator is extinguished while DSC is selected on, and continuously illuminated while DSC is selected off.

A DSC switch request to disable DSC is ignored by the ABS module if the air suspension system has failed, or is in off-road height at speeds above 60 km/h (37.5 mph).

To guard against incorrect operation or a broken switch, if the input from the DSC switch is held high for more than one minute, a DTC (diagnostic trouble code) is stored in the ABS module.

Even if DSC is deselected, driving maneuvers with extreme yaw or lateral acceleration may trigger DSC activity to assist vehicle stability.

## HILL DESCENT CONTROL SWITCH



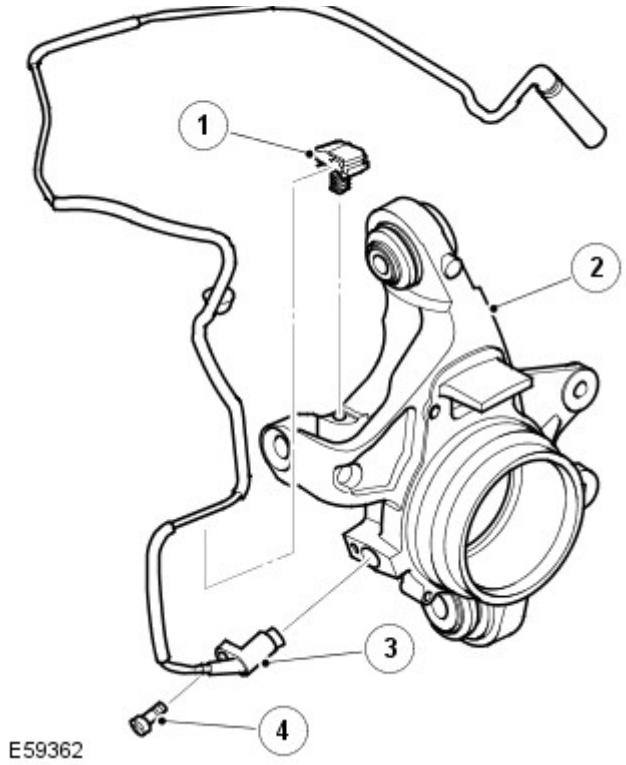

| ITEM | DESCRIPTION |
|---|---|
| 1 | HDC switch |

The HDC switch controls the selection of the HDC function.

The HDC switch is a non-latching switch installed on the floor console, to the rear of the gear selector lever. Pressing and releasing the HDC switch momentarily connects an ignition power feed to the ABS module. With the first press and release of the HDC switch, the ABS module enables operation of the HDC function. When the HDC switch is pressed and released again, the ABS module disables operation of the HDC function.

To guard against incorrect operation or a broken switch, if the switch is pressed for more than 10 seconds no change of state occurs. If the input from the HDC switch is held high for more than one minute, a DTC is stored in the ABS module.

## WHEEL SPEED SENSORS




| ITEM | DESCRIPTION |
|---|---|
| 1 | Cable clip |
| 2 | Hub assembly |
| 3 | Wheel speed sensor |
| 4 | Screw |

An active wheel speed sensor is installed in each wheel hub to provide the ABS module with a rotational speed signal from each road wheel. The head of each wheel speed sensor is positioned close to a 48 tooth sensor ring on the outer diameter of the constant velocity joint of the drive halfshaft. A flying lead connects each sensor to the vehicle wiring.

The wheel speed sensors each have a power supply connection and a signal connection with the ABS module. When the ignition switch is on, the ABS module supplies power to the wheel speed sensors and monitors the return signals. Any rotation of the drive halfshafts induces current fluctuations in the return signals which are converted into individual wheel speeds and the overall vehicle speed by the ABS module.

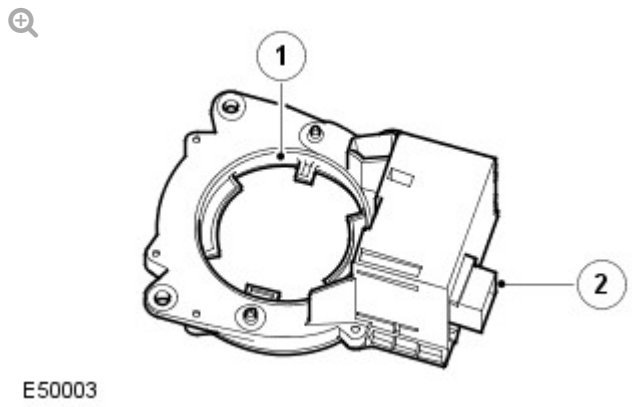
The ABS module outputs the individual wheel speeds and the vehicle speed on the high speed CAN bus for use by other systems. The quality of the

vehicle speed signal is also broadcast on the high speed CAN bus. If all wheel speed signals are available to calculate vehicle speed from, the quality of the vehicle speed signal is set to 'data calculated within specified accuracy'. If one or more wheel speed sensors is faulty, the quality of the vehicle speed signal is set to 'accuracy outside specification'.

The ABS module monitors the wheel speed sensor circuits for faults. If a fault is detected the ABS module stores a DTC and illuminates the appropriate warning indicators, depending on the system functions affected (DSC/ETC, ABS, EBA/EBD, HDC). A warning chime sounds and a related message is shown in the message center.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

Since the wheel speed sensors are active devices, a return signal is available when the road wheels are not turning, which enables the ABS module to check the sensors while the vehicle is stationary. In addition, the direction of travel of each wheel can be sensed. This information is broadcast on the high speed CAN bus for use by other systems.

## STEERING ANGLE SENSOR




| ITEM | DESCRIPTION |
|---|---|
| 1 | Gear wheel |
| 2 | Electrical connector |

The steering angle sensor measures the steering wheel angle, and the rate

of steering wheel angle speed. The measurements are output on the high speed CAN bus together with a quality factor signal, and are used by the ABS module and the rear differential control module for ARM, CBC and DSC operation.

The steering angle sensor is fixed to the pivot bracket of the steering column by three screws. A gear wheel in the steering angle sensor engages with a plastic drive collar fixed onto the lower shaft of the column. Inside the steering angle sensor, the gear wheel meshes with a gear train containing magnets. A multipin electrical connector provides the interface between the vehicle wiring and integrated circuits in the steering angle sensor.

The steering angle sensor operates with the MR (magneto resistive) effect to evaluate the direction of magnetic fields, and measure the angular position of the lower shaft to provide the steering wheel angle. When the steering wheel turns, the steering column lower shaft rotates the gear wheel within the steering angle sensor. The gear wheel drives the gear train and rotates the magnets located on the gears. The direction of the magnetic field is constantly monitored by the steering angle sensor and is converted into a steering wheel angle, and steering wheel angle speed.

The steering angle sensor performs a plausibility check of the steering wheel angle each time the following conditions co-exist:

- The vehicle is traveling in a straight line.
- The vehicle speed is between 20 and 25 km/h (12.5 and 15.6 mph).
- The transfer box is in high range.
- The brake pedal is not pressed.
- There is no ABS, DSC or ETC activity.

The steering angle sensor uses inputs of wheel speed, yaw rate and lateral acceleration to determine when the vehicle is traveling in a straight line. When all of the conditions co-exist, the steering angle sensor checks the steering angle is between 0 ± 15°. If the steering angle is outside the limits on two successive checks, the steering angle sensor changes the quality factor signal to 'outside specification' for the remainder of the ignition cycle and stores a DTC. At the beginning of each ignition cycle the quality factor signal is reset to 'within specified accuracy'.

signal is reset to "within specified accuracy".

The status of the steering angle sensor is able to be determined using Land Rover approved diagnostic equipment.

If the steering angle sensor is renewed, the new sensor must be calibrated using Land Rover approved diagnostic equipment. The steering angle sensor must also be re-calibrated any time it is disturbed from the steering column, or if the upper and lower steering columns are separated.

## YAW RATE AND LATERAL ACCELERATION SENSOR

E132328

The yaw rate and lateral acceleration sensor is located beneath the floor console and provides information of vehicle yaw rate and lateral acceleration to the ABS module. The sensor is internally damped to isolate it from body vibrations and is secured to the transmission tunnel with two bolts.

When the ignition is on, the yaw rate and lateral acceleration sensor receives a power feed from the CJB (central junction box). Yaw rate and lateral acceleration values are transmitted to the ABS module on a private high speed CAN bus. In addition to using the inputs for brake control functions, the ABS module also broadcasts the yaw rate and lateral acceleration values on the vehicle high speed CAN bus for use by other systems.

The ABS module monitors the yaw rate and lateral acceleration sensor for faults and can be interrogated using Land Rover approved diagnostic equipment. If a fault is detected, the ABS module stores a related DTC and transmits a high speed CAN bus signal to the instrument cluster to illuminate the DSC, HDC and brake warning indicators. The instrument

cluster will also sound a warning chime and display a DSC fault message in the message center.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

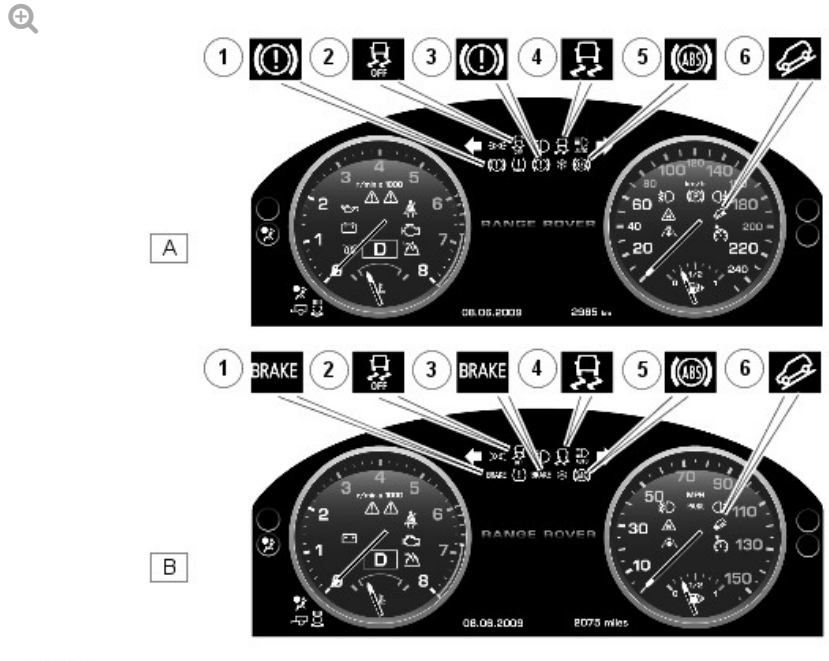
## STOPLAMP SWITCH

The stoplamp switch is mounted in the brake pedal bracket and operated by the brake pedal. The stoplamp switch is a Hall effect switch with dual status outputs. Both of the outputs are supplied to the ECM. One of the outputs is also supplied to the CJB, for operation of the stoplamps. The ECM broadcasts the status of the stoplamp switch on the high speed CAN for use by other systems.

Power for the stoplamp switch is provided by an ignition feed from the CJB. The power circuit is completed by a ground connection from the stoplamp switch to a ground header on the body.

When the brake pedal is not pressed, the outputs from the stoplamp switch are low, between 0 and 2 V. When the brake pedal is pressed the outputs are pulled high to between 8 V and battery voltage.

## WARNING INDICATORS



| ITEM | DESCRIPTION |
|---|---|
| 1 | Brake system warning indicator (amber) |
| 2 | DSC OFF warning indicator (amber) |
| 3 | Brake system warning indicator (red) |
| 4 | DSC warning indicator (amber) |
| 5 | ABS warning indicator (amber) |
| 6 | HDC warning indicator (green) |

The instrument cluster contains two types of warning indicator to display the operating status of the selected anti-lock control/traction control functions. The warning indicators provide a visual notification of either a system warning or system information to the driver.

## HYDRAULIC CONTROL UNIT

The HCU is a four-channel unit that modulates the supply of hydraulic pressure to the brakes under control of the ABS module.

The HCU is installed in the engine compartment, on three mounting bushes attached to the driver side inner fender. Hydraulic pipes connect the HCU to the master cylinder and the brake calipers.
For additional information, refer to: Hydraulic Brake Actuation (206-06 Hydraulic Brake Actuation, Description and Operation).

The primary and secondary outlets of the master cylinder are connected to the primary and secondary circuits within the HCU. The primary circuit in the HCU has separate outlet ports to the front brakes. The secondary circuit in the HCU has separate outlet ports to the rear brakes. Each of the circuits in the HCU contains the following components to control the supply of hydraulic pressure to the brakes:

- A normally open, solenoid operated, pilot valve, to enable active braking.
- A normally closed, solenoid operated, priming valve, to connect the brake fluid reservoir to the return pump during active braking.
- A return pump to generate hydraulic pressure for active braking, and

A return pump to generate hydraulic pressure for active braking, and return brake fluid to the reservoir.

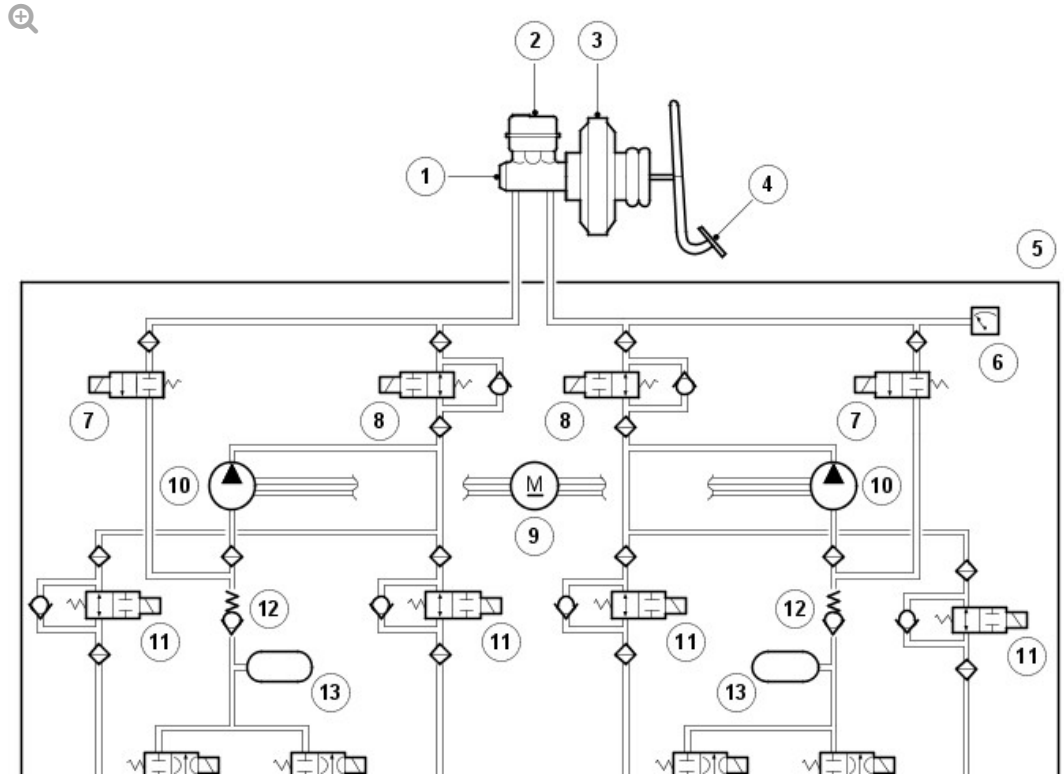
- Normally open, solenoid operated, inlet valves and normally closed, solenoid operated, outlet valves, to modulate the hydraulic pressure in the individual brakes.
- An accumulator and a relief valve to allow the fast release of pressure from the brakes.
- Filters to protect the components from contamination.

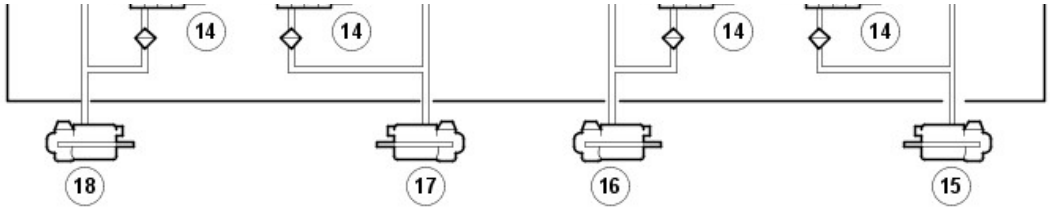
The primary circuit also incorporates a pressure sensor to provide the ABS module with a hydraulic pressure signal.

Contact pins on the HCU mate with contacts on the ABS module to provide the electrical connections from the ABS module to the return pump motor and the pressure sensor. The solenoids that operate the valves are installed in the ABS module.

A replacement HCU is supplied pre-filled. After installation on the vehicle, the Land Rover approved diagnostic system must be used to operate the solenoid valves and the return pump to ensure correct bleeding of the HCU and brake circuits.

**Schematic of Hydraulic Control Unit**



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| ITEM | DESCRIPTION |
|---|---|
| 1 | Master cylinder |
| 2 | Reservoir |
| 3 | Brake booster |
| 4 | Brake pedal |
| 5 | HCU |
| 6 | Pressure sensor |
| 7 | Priming valve |
| 8 | Pilot valve |
| 9 | Return pump motor |
| 10 | Return pump |
| 11 | Inlet valve |
| 12 | Relief valve |
| 13 | Accumulator |
| 14 | Outlet valve |
| 15 | Left front brake |
| 16 | Right front brake |
| 17 | Right rear brake |
| 18 | Left rear brake |

The HCU has three operating modes: Normal/EBD, ABS braking and active braking.

### NORMAL BRAKING/ELECTRONIC BRAKE FORCE DISTRIBUTION MODE

Initially, all of the solenoid operated valves are de-energized. Operating the brake pedal produces a corresponding increase or decrease of pressure in

the brakes, through the open pilot valves and inlet valves. If the ABS module determines that EBD is necessary, it energizes the inlet valves for the brakes of the trailing axle, to isolate the brakes from any further increase in hydraulic pressure.

### ABS BRAKING MODE

If the ABS module determines that ABS braking is necessary, it energizes the inlet and outlet valves of the related brake and starts the return pump. The inlet valve closes to isolate the brake from pressurized fluid; the outlet valve opens to release pressure from the brake into the accumulator and the return pump circuit. The reduced pressure allows the wheel to accelerate. The ABS module then operates the inlet and outlet valves to modulate the pressure in the brake to apply the maximum braking effort without locking the wheel. Control of the valves for each wheel takes place individually.

### ACTIVE BRAKING MODE

The active braking mode is used to generate and control hydraulic pressure to the brakes for functions other than ABS braking, for example: DSC, EBA, ETC, HDC and dynamic application of the parking brake.

For active braking, the ABS module energizes the pilot valves and priming valves, starts the return pump and energizes all of the inlet valves. Brake fluid, drawn from the reservoir through the master cylinder and priming valve, is pressurized by the return pump and supplied to the inlet valves. The ABS module then operates the inlet valves and outlet valves, as required, to modulate the pressure in the individual brakes. Some noise may be generated during active braking.

## ANTI-LOCK BRAKE SYSTEM MODULE

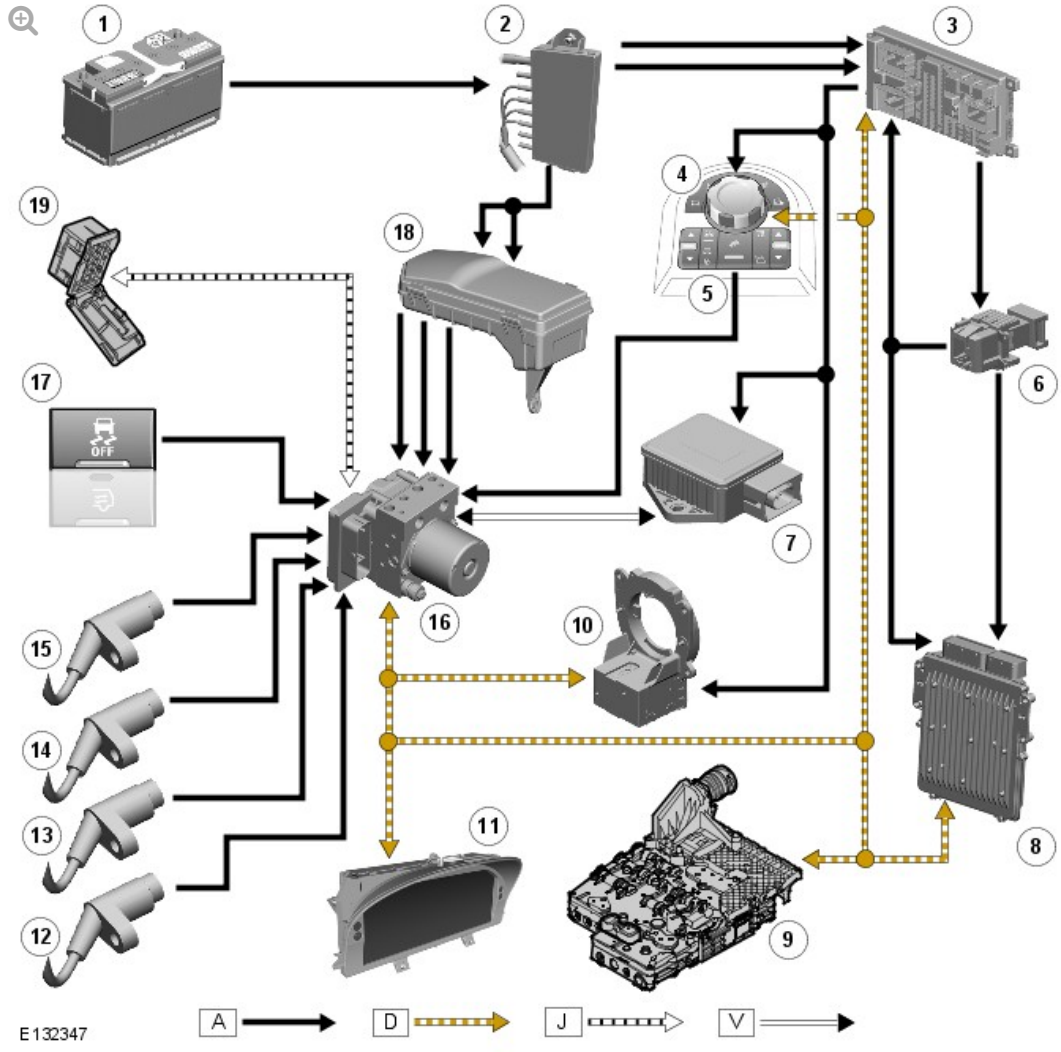
The ABS module controls the brake functions using the HCU to modulate hydraulic pressure to the individual wheel brakes.

The ABS module is attached to the HCU, on the driver side inner fender in the engine compartment. A multipin connector provides the electrical interface between the ABS module and the vehicle wiring.

## CONTROL DIAGRAM

**NOTE:**

A = Hardwired; D = High speed CAN bus; J = Diagnostic ISO 9141 K line; V = Private CAN bus.




ECM

| ITEM | DESCRIPTION |
|---|---|
| 1 | Battery |
| 2 | BJB (battery junction box) |
| 3 | CJB |
| 4 | Terrain response rotary control and control module |
| 5 | HDC switch |
| 6 | Stoplamp switch |

| | |
|---|---|
| 6 | Stoplamp switch |
| 7 | Yaw-rate and lateral acceleration sensor |
| 8 | TCM (transmission control module) |
| 9 | TCM (transmission control module) |
| 10 | Steering angle sensor |
| 11 | Instrument cluster |
| 12 | Wheel speed sensor |
| 13 | Wheel speed sensor |
| 14 | Wheel speed sensor |
| 15 | Wheel speed sensor |
| 16 | ABS module |
| 17 | DSC switch |
| 18 | EJB (engine junction box) |
| 19 | Diagnostic socket |

## OPERATION

### ANTI-LOCK BRAKE SYSTEM

ABS controls the speed of all road wheels to ensure optimum wheel slip when braking at the adhesion limit. This prevents the wheels from locking in order to retain effective steering control of the vehicle.

On the front axle, the brake pressure is modulated separately for each wheel. On the rear axle, brake pressure is modulated by select low. Select low applies the same pressure to both rear brakes, with the pressure level being determined by the wheel on the lower friction surface. This maintains rear stability on split friction surfaces.

### ACTIVE ROLL MITIGATION

The ARM function uses the brake system and engine torque control to attempt to restore vehicle stability if the vehicle is forced into such a harsh manoeuver that it risks tipping over.

The ABS module monitors driver inputs and vehicle behavior using various powertrain signals and inputs from the wheel speed sensors, steering angle

powertrain signals and inputs from the wheel speed sensors, steering angle sensor and the yaw-rate and lateral acceleration sensor. These are compared with modeled behavior and, if vehicle behavior reaches a given risk level, the ABS module initiates a reduction in engine power, or brakes one or more wheels sufficiently to correct the vehicle stability and assist the driver remain in control.

While the ignition is on, ARM is permanently enabled, even when DSC is selected off.

### CORNER BRAKE CONTROL

CBC influences the brake pressures, below the DSC and ABS thresholds, to counteract the yawing moment produced when braking in a corner. CBC produces a correction torque by limiting the brake pressure on one side of the vehicle.

### DYNAMIC STABILITY CONTROL

DSC uses the brakes and engine torque control to help maintain the lateral stability of the vehicle. While the ignition is on the DSC function is permanently enabled unless selected off by the DSC switch. Even if DSC is deselected, driving maneuvers with extreme yaw or lateral acceleration may trigger DSC activity to assist vehicle stability.

DSC enhances driving safety in abrupt maneuvers and in understeer or oversteer situations that may occur in a bend. The ABS module monitors the yaw-rate and lateral acceleration of the vehicle, and the steering input, then selectively applies individual brakes and signals for engine torque adjustments to reduce understeer or oversteer.

In general: in an understeering situation, the inner wheels are braked to counteract the yaw movement towards the outer edge of the bend. In an oversteering situation, the outer wheels are braked to prevent the rear end of the vehicle from pushing towards the outer edge of the bend.

The ABS module monitors the tracking stability of the vehicle using inputs from the wheel speed sensors, the steering angle sensor and the yaw-rate and lateral acceleration sensor. The tracking stability is compared with stored target data and, whenever the tracking stability deviates from the target data, the ABS module intervenes by applying the appropriate brakes. When the DSC function is active, the ABS module also signals the TCM to

When the DSC function is active, the ABS module also signals the TCM to prevent gear shifts, and the instrument cluster to flash the DSC warning indicator.

If necessary, the ABS module also signals:

- The ECM, to reduce engine torque.
- The transfer box control module, to adjust the locking torque of the center differential.
- The active on-demand coupling module, to adjust the locking torque of the rear differential.

The DSC function overrides the differential locking torque requests from the terrain response system.

If DSC is selected off, a DSC system off message is displayed in the message center.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

### ELECTRONIC BRAKE FORCE DISTRIBUTION

EBD limits the brake pressure applied to the rear wheels. When the brakes are applied, the weight transfer of the vehicle reduces the adhesion of the rear wheels on the road surface. This may cause the rear wheels to slip and make the vehicle unstable.

EBD uses the ABS hardware to automatically optimize the pressure of the rear brakes, below the point where ABS intervention is normally invoked. Only the rear wheels are under EBD control.

### ELECTRONIC BRAKE PREFILL

Electronic brake prefill senses any rapid throttle lift off, activating a small brake hydraulic pressure build-up of approximately 3 to 5 bar (43.5 to 72.5 $lbf/in^2$) in anticipation of the brakes being applied. This gives a quicker brake pedal response and consequently slightly shorter stopping distances.

When the ABS module detects rapid throttle lift off (from the signals received from the ECM over the high speed CAN bus), it controls the HCU to apply a low brake pressure to assist in a quicker brake application.

### ELECTRONIC TRACTION CONTROL

ETC attempts to optimize forward traction by reducing engine torque or braking a spinning wheel until traction is restored.

ETC is activated if an individual wheel speed is above that of the vehicle reference speed (positive slip) and the brake pedal is not pressed. The spinning wheel is braked, allowing the excess torque to be transmitted to the non spinning wheels through the drive line. If necessary, the ABS module also transmits a high speed CAN bus message to the ECM requesting a reduction in engine torque.

Torque reduction requests are for either a slow or fast response. A slow response requests a reduction of throttle angle; a fast response requests an ignition cut-off.

When the DSC function is selected off with the DSC switch, the engine torque reduction feature is disabled.

When the ETC function is active the ABS module also signals the TCM to prevent gear shifts.

### EMERGENCY BRAKE ASSIST

EBA assists the driver during emergency braking situations by automatically maximizing the braking effort. There are two situations when the ABS module will invoke EBA:

- When the brake pedal is pressed very suddenly.
- When the brake pedal is pressed hard enough to bring the front brakes into ABS operation.

When the brake pedal is pressed very suddenly, the ABS module increases the hydraulic pressure to all of the brakes until the threshold for ABS operation is reached. This applies the maximum braking effort for the available traction. The ABS module monitors for the sudden application of the brakes using the stoplamp switch status broadcast on the high speed CAN by the ECM, and from the pressure sensor within the HCU. With the brake pedal pressed, if the rate of increase of hydraulic pressure exceeds the predetermined limit, the ABS module invokes emergency braking.

When the brake pedal is pressed hard enough to bring the front brakes into ABS operation, the ABS module increases the hydraulic pressure to the rear brakes up to the ABS threshold.

EBA operation continues until the driver releases the brake pedal enough for the hydraulic pressure in the HCU to fall below a pre-determined threshold value stored in the ABS module.

### ENGINE DRAG-TORQUE CONTROL

EDC prevents wheel slip caused by any of the following:

- A sudden decrease in engine torque when the accelerator is suddenly released.
- A downshift using the CommandShift™.

When the ABS module detects the onset of wheel slip without the brakes being applied, it transmits a message to the ECM via the high speed CAN bus to request a momentary increase in engine torque.

### ENHANCED UNDERSTEER CONTROL

Understeer logic control monitors the vehicle for understeer by comparing signals from the yaw rate and lateral acceleration sensor with signals from the steering angle sensor and wheel speed sensors.

When the ABS module detects the onset of understeer, it signals the ECM via the high speed CAN bus to request a decrease in engine torque. If required the ABS module will control the HCU to apply brake pressure to the inside rear wheel to correct the understeer. If the vehicle continues to understeer, enhanced understeer control is activated and uses multiple brakes (maximum of three brakes) to rapidly reduce the vehicle speed.

### GRADIENT ACCELERATION CONTROL

Gradient acceleration control is an automatic feature and is always available when HDC is not selected.

When HDC is not selected, gradient acceleration control will intervene to limit downhill acceleration on a steep descent.

The feature uses generated brake pressure to control acceleration in situations where the driver could lose control of the vehicle on a steep

situations where the driver could lose control of the vehicle on a steep incline.

Gradient acceleration control keeps the vehicle to a speed and throttle pedal dependant acceleration limit when the vehicle is moving in the intended direction of travel, for example:

- Descending an incline forwards, with D (drive) selected.
- Descending an incline backwards, with R (reverse) selected.

When the vehicle is moving against the intended direction of travel, for example: descending a slope, but facing uphill with D selected, gradient acceleration control will prevent the vehicle accelerating above 5 km/h (3 mph) for up to 20-30 seconds to aid the driver in re-establishing control of the vehicle.

### GRADIENT RELEASE CONTROL

Gradient release control is an automatic feature which is always available when HDC is selected.

If the vehicle is brought to a standstill on a slope using the foot brake, gradient release control will become active (except in the terrain response, sand program). Subsequently, when the foot brake is released gradient release control will automatically delay and graduate the brake release. This allows time for the foot to be moved from the brake pedal to the accelerator pedal so that the vehicle can move smoothly away.

When descending a hill, a similar brake hold and gradual release is employed to provide a smooth transition into HDC. Gradient release control operates in forward and reverse gears and requires no driver intervention.

### HILL DESCENT CONTROL

HDC uses brake intervention to control vehicle speed and acceleration during low speed descents in off-road and low grip on-road conditions. Generally, equal pressure is applied to all four brakes, but pressure to individual brakes can be modified by the ABS and DSC functions to retain stability. Selection of the HDC function is controlled by the HDC switch and the terrain response rotary control located on the floor console. HDC operates in both high and low ranges, at vehicle speeds up to 50 km/h (31.3 mph).

mph).

**WARNING:**

Incorrect use of the HDC function may compromise the stability of the vehicle, resulting in a dangerous and uncontrolled hill descent. Driving with the transmission in neutral while HDC is active will prevent engine braking from assisting the vehicle. The brakes will overheat and induce the HDC fade out strategy. In this condition there will be no control over the vehicle during a descent.

**NOTE:**

With the HDC function selected, HDC is operative even when the transmission is in the neutral. It is not recommended to drive the vehicle further than is absolutely necessary with HDC selected and the transmission in neutral.

HDC may be used in D, R and CommandShift 1 in high range, and in D, R and all CommandShift gears in low range. When in D, the TCM will automatically select the most appropriate gear.

HDC can be selected at speeds up to 80 km/h (50 mph), but will only be enabled at speeds below 50 km/h (31.3 mph). When HDC is selected:

- At speeds up to 50 km/h (31.3 mph), the HDC information warning indicator is permanently illuminated if a valid gear is selected.
- At speeds from between 50 to 80 km/h (31 to 50 mph) the HDC information warning indicator flashes and a message advising that the speed is too high is displayed in the message center. If the HDC switch is pressed while vehicle speed is more than 80 km/h (50 mph), the HDC information warning indicator will not illuminate and HDC will not be selected.
- If the speed increases to 80 km/h (50 mph), the HDC function is switched off, the information warning indicator is extinguished, a warning chime sounds and a message advising that HDC has been switched off is

displayed in the message center.

When HDC is enabled, the ABS module calculates a target deceleration value by comparing the set speed to the actual vehicle speed. The ABS module then operates the HCU in the active braking mode as required to achieve and maintain the target speed.

During active braking for HDC, the ABS module sends a high speed CAN message to the CJB to operate the stoplamps.
For additional information, refer to: Exterior Lighting (417-01 Exterior Lighting, Description and Operation).

Applying the foot brake during active braking may result in a pulse through the brake pedal.

The target speed varies between minimum and maximum values for each gear and transmission range, depending on driver input with the accelerator pedal. If the accelerator pedal is not operated, the ABS module adopts a default target speed.

**Low Range Target Speeds**

| TARGET SPEED | SPEED, KM/H (MPH) | |
|---|---|---|
| | GEARS 1, R | GEARS D, 2 TO 6 |
| Default | 3.5 (2.19) | 6 (3.75) |
| Minimum | 3.5 (2.19) | 3.5 (2.19) |
| Maximum | 20 (12.5) | 20 (12.5) |

**High Range Target Speeds**

| TARGET SPEED | SPEED, KM/H (MPH) | |
|---|---|---|
| | GEARS 1, R | GEARS D, 2 TO 6 |
| Default | 6 (3.75) | 10 (6.25) |
| Minimum | 6 (3.75) | 6 (3.75) |
| Maximum | 20 (12.5) | 20 (12.5) |

As well as varying the target speed with the accelerator pedal, the target

speed may also be varied by pressing the speed control '+' and '-' buttons (where fitted). For additional information, refer to:

Speed Control (310-03A Speed Control - TDV8 3.6L Diesel, Description and Operation),
Speed Control (310-03C Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol, 5.0L, Description and Operation).

During changes of target speed, the ABS module limits deceleration and acceleration to -0.5 m/s2 (-1.65 ft/s²) and +0.5 m/s2 (+1.65 ft/s²) respectively.

To provide a safe transition from active braking to brakes off, the ABS module invokes a fade out strategy that gradually releases the braking effort during active braking. The fade out strategy occurs if any of the following conditions are detected during active braking:

- HDC selected off with the HDC switch.
- Failure of a component used by HDC, but not critical to the fade out function.
- Accelerator pedal pressed when transmission is in neutral.
- Brake overheat.

If fade out is invoked because of deselection or component failure, the HDC function is cancelled by the ABS module. If fade out is invoked because the accelerator pedal is pressed with the transmission in neutral, or because of brake overheat, the HDC function remains in standby and resumes operation when the accelerator pedal is released or the brakes have cooled.

The fade out strategy increases the target speed, at a constant acceleration rate of 0.5 m/s² (1.65 ft/s²), until the maximum target speed is reached or until no active braking is required for 0.5 s. If the accelerator pedal is positioned within the range that influences target speed, the acceleration rate is increased to 1.0 m/s² (3.3 ft/s²).

When fade out is invoked because of component failure, a warning chime is sounded, the HDC information warning indicator is extinguished and a message advising there is a fault is displayed in the message center.

When fade out is invoked because of brake overheat, a message advising that HDC is temporarily unavailable is displayed. At the end of fade out, the HDC information warning indicator flashes. The message is displayed, while HDC remains selected, until the brakes have cooled.

To monitor for brake overheat, the ABS module monitors the amount of braking activity and, from this, estimates the temperature of each brake. If the estimated temperature of any brake exceeds a preset limit, the ABS module invokes the fade out strategy. After the fade out cycle, the HDC function is re-enabled when the ABS module estimates that all of the brake temperatures are at less than 64% of the temperature limit.

When HDC is selected off, the instrument cluster message center displays a system off message.

### HILL START ASSIST

Hill start assist is an automatic feature that operates in a similar manner to gradient release control, but does not require HDC to be active. The feature is not driver selectable and there is no indication to the driver when in operation.

On steep slopes, hill start assist will hold a portion of the driver generated brake pressure for a short time to allow the driver to move their foot from the brake pedal to the throttle pedal without the vehicle rolling back.

The system will release the brake pressure in a controlled manner, either after the timer has expired or if the driver has generated sufficient drive-torque to move the vehicle forward up the hill.

The timer function is controlled by the ECM and transmitted to the ABS module on the high speed CAN bus.

### TRAILER STABILITY ASSIST

When the trailer electrical socket is connected, trailer stability assist operates automatically to enhance the existing DSC and terrain response functions of the vehicle when towing. The system detects sway movements caused by trailer oscillations at speeds in excess of 60 km/h (37 mph) and acts to eliminate them. It does this through braking and engine management. Braking management counterbalances the sway movement

through symmetric and asymmetric braking, thereby slowing the vehicle and eliminating the oscillations. Engine management adapts engine torque output to support the braking management in stabilizing the vehicle and trailer.

Typical conditions when sway can occur include:

- Changing highway lanes.
- Traversing a lengthy bend.
- Acceleration.
- Braking.

The capability of trailer stability assist to respond early to the beginning of trailer-sway makes the system almost unnoticeable under normal driving conditions and keeps the vehicle and trailer under safe control. Trailer stability assist requires no input from the driver and operates up to the maximum vehicle speed.

Trailer stability assist will not operate while DSC is switched off.

2012.0 RANGE ROVER (LM), 206-09

# ANTI-LOCK CONTROL - TRACTION CONTROL

## DIAGNOSIS AND TESTING

### PRINCIPLE OF OPERATION

For additional information on the Anti-Lock Control - Traction Control system, refer to the relevant Description and Operation section in 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 size, condition and installation<br>▪ Wheel speed sensor condition and installation<br>▪ Steering Angle Sensor (SAS) condition and installation<br>▪ Yaw rate sensor and accelerometer condition and installation<br>▪ Hydraulic control unit (with attached ABS module) condition and installation | ▪ Fuses<br>▪ Harnesses and connectors<br>▪ Warning lamp operation<br>▪ Wheel speed sensors<br>▪ Central Junction Box<br>▪ HDC switch<br>▪ DSC switch<br>▪ Stop lamp switch<br>▪ Yaw rate sensor and accelerometer<br>▪ Steering Angle Sensor (SAS)<br>▪ ABS module<br>▪ 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. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

## DTC INDEX

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Module Name: Anti-Lock Braking System (100-00, Description and Operation).

# ANTI-LOCK BRAKE SYSTEM (ABS) MODULE - TDV8 3.6L DIESEL/TDV8 4.4L DIESEL/V8 5.0L PETROL/V8 S/C 5.0L PETROL (G1225900)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.65.49 | HYDRAULIC CONTROL UNIT - RENEW | RIGHT HAND DRIVE | 0.9 | USED WITHINS | + |

## REMOVAL

**NOTES:**

- The hydraulic control unit (HCU) mounted to the ABS module cannot be serviced separately. If the HCU requires replacement, then the ABS module must be replaced as a complete assembly.
- Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.
   Refer to: Specifications (414-00, Specifications).

2. **CAUTIONS:**

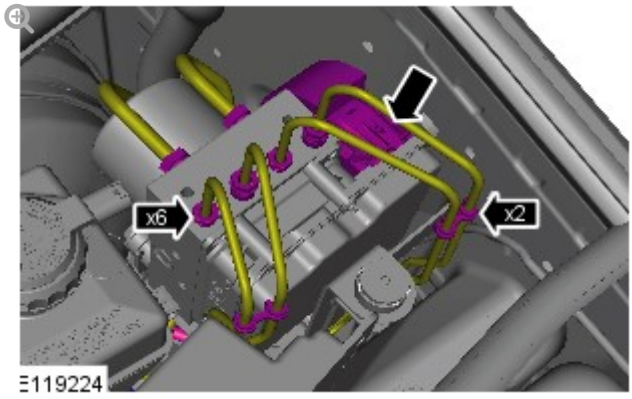
   - Make sure that the area around the component is clean and

free of foreign material.

- Make sure that all openings are sealed. Use new blanking caps.
- If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

**NOTES:**

- Note the position of the components prior to removal.
- Some fluid spillage is inevitable during this operation.

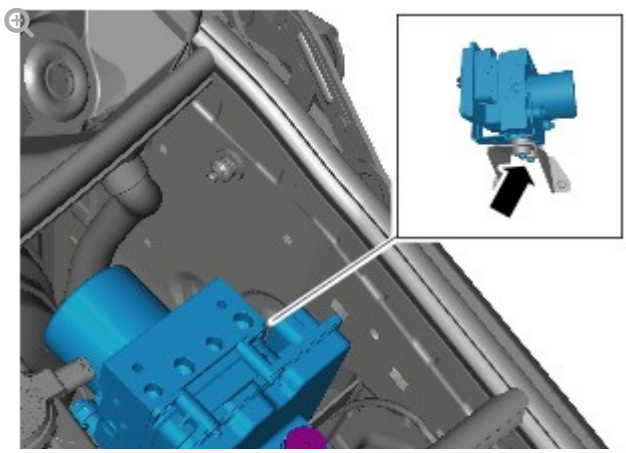


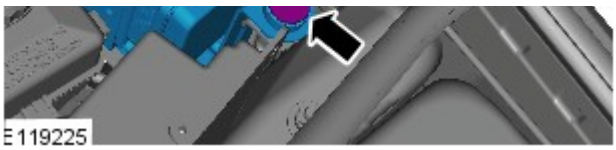

*Torque:* **18 Nm**

3.

**NOTE:**

Note the orientation of the locating pins.



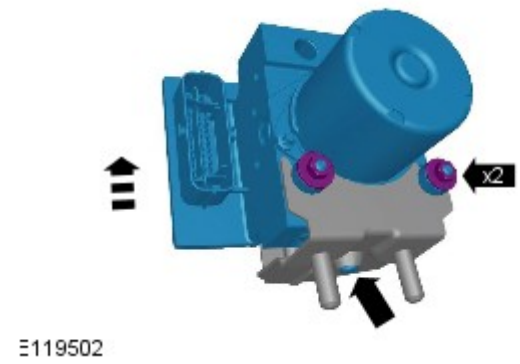



*Torque:* **9 Nm**

4.

**NOTES:**

- Do not disassemble further if the component is removed for access only.
- Note the orientation of the locating pin.
- Loosen but do not remove the 2 retaining nuts.




*Torque:* **9 Nm**

## INSTALLATION

All vehicles

1.

**CAUTIONS:**

- If accidentally dropped or knocked install a new ABS module.
- Make sure that these components are installed to the noted removal position.

**NOTES:**

- Make sure the ABS module locating grommets are correctly seated in the retaining bracket before installing the ABS module.
- Make sure the ABS module locating pin is correctly located in the grommet, and the 2 isolators are fully seated in the bracket slots.

To install, reverse the removal procedure.

Vehicles with standard brakes

1. Bleed the braking system.
   Refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00, General Procedures).

Vehicles with high performance brakes

1. Bleed the braking system.
   Refer to: Brake System Bleeding - Vehicles With: High Performance Brakes (206-00, General Procedures).

2012.0 RANGE ROVER (LM), 206-09

ANTI-LOCK CONTROL - TRACTION CONTROL

# ANTI-LOCK BRAKE SYSTEM (ABS) MODULE – TDV8 3.6L DIESEL/TDV8 4.4L DIESEL/V8 5.0L PETROL/V8 S/C 5.0L PETROL (G1225901)

| | | | | | |
|---|---|---|---|---|---|
| 70.65.49 | HYDRAULIC CONTROL UNIT - RENEW | RIGHT HAND DRIVE | 0.9 | USED WITHINS | + |

## REMOVAL

**NOTES:**

- The hydraulic control unit (HCU) mounted to the ABS module cannot be serviced separately. If the HCU requires replacement, then the ABS module must be replaced as a complete assembly.
- Removal steps in this procedure may contain installation details.

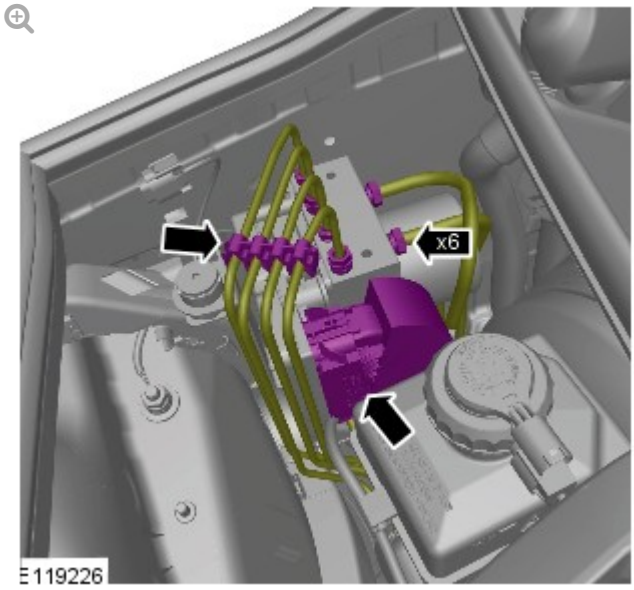
1. Disconnect the battery ground cable.
   Refer to: Specifications (414-00, Specifications).

2. **CAUTIONS:**

   - Make sure that the area around the component is clean and free of foreign material.
   - Make sure that all openings are sealed. Use new blanking caps.
   - If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

   **NOTES:**

   - Note the position of the components prior to removal.
   - Some fluid spillage is inevitable during this operation.

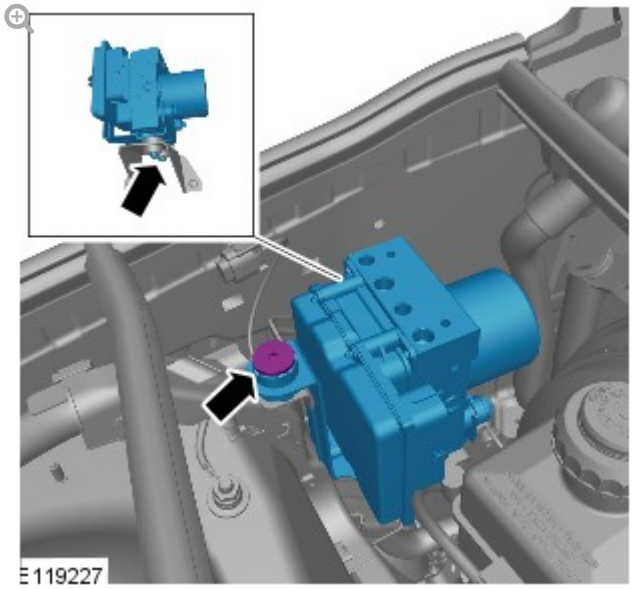



*Torque:* **18 Nm**

3.

**NOTE:**

Note the orientation of the locating pins.




*Torque:* **9 Nm**

4.

**NOTES:**

- Do not disassemble further if the component is removed

- Do not disassemble further if the component is removed for access only.
- Note the orientation of the locating pin.
- Loosen but do not remove the 2 retaining nuts.


*Torque:* **9 Nm**

## INSTALLATION

All vehicles

1.

**CAUTIONS:**

- If accidentally dropped or knocked install a new ABS module.
- Make sure that these components are installed to the noted removal position.

**NOTES:**

- Make sure the ABS module locating grommets are correctly seated in the retaining bracket before installing the ABS module.
- Make sure the ABS module locating pin is correctly located in the grommet, and the 2 isolators are fully seated in the

bracket slots.

To install, reverse the removal procedure.

Vehicles with standard brakes

1. Bleed the braking system.
   Refer to: Brake System Bleeding - Vehicles With: Standard Brakes (206-00, General Procedures).

Vehicles with high performance brakes

1. Bleed the braking system.
   Refer to: Brake System Bleeding - Vehicles With: High Performance Brakes (206-00, General Procedures).

2012.0 RANGE ROVER (LM), 206-09

ANTI-LOCK CONTROL - TRACTION CONTROL

# FRONT WHEEL SPEED SENSOR (G1226031)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.65.30 | SENSOR AND HARNESS - FRONT WHEEL - EACH - RENEW | ALL DERIVATIVES | 0.5 | 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. **WARNING:**

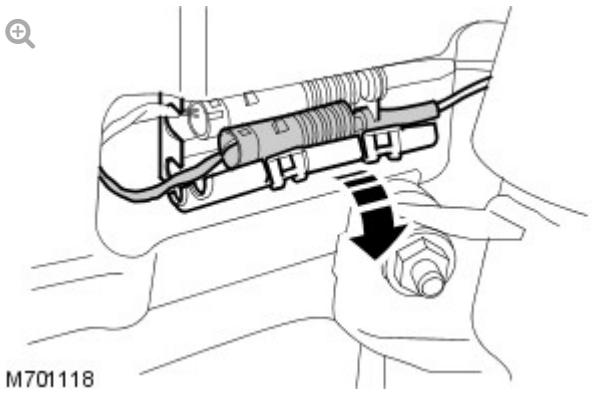
   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

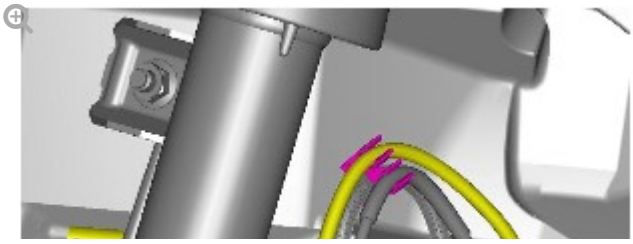
3. Remove the front wheel and tire.
   - TORQUE: 140 Nm

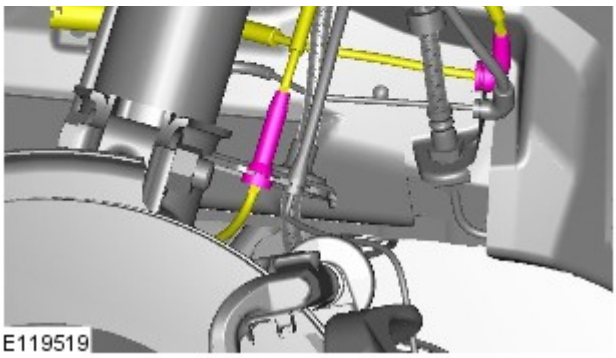
4. **CAUTION:**

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




   Disconnect the wheel speed sensor electrical connector.

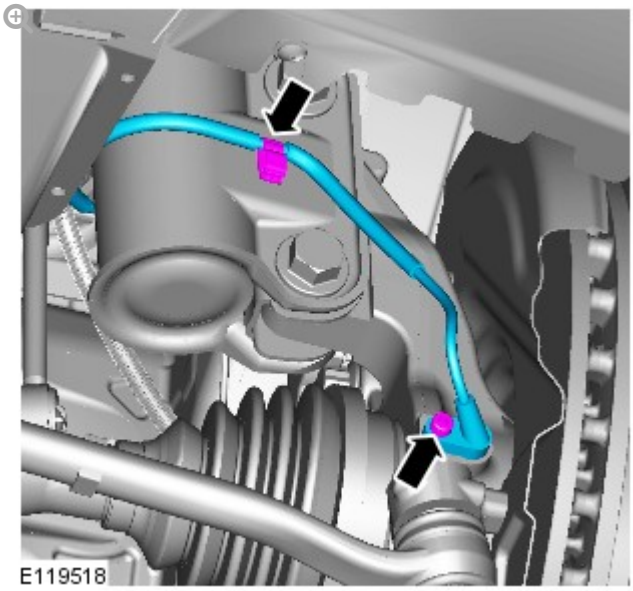
5. 




6.

**CAUTIONS:**

- Make sure that the component is clean, free of foreign material and lubricant.
- Make sure that the mating faces are clean and free of foreign material.
- Make sure that the sensor tip is clean and free of foreign material.




Remove the front wheel speed sensor.

- TORQUE: 8 Nm

## INSTALLATION

1. To install, reverse the removal procedure.
    - Using the approved Land Rover diagnostic system, clear the fault codes from the ABS ECU.

ANTI-LOCK CONTROL - TRACTION CONTROL

# REAR WHEEL SPEED SENSOR (G1226032)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.65.31 | SENSOR AND HARNESS - REAR WHEEL - EACH - 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 Charging System - General Information, Specifications).

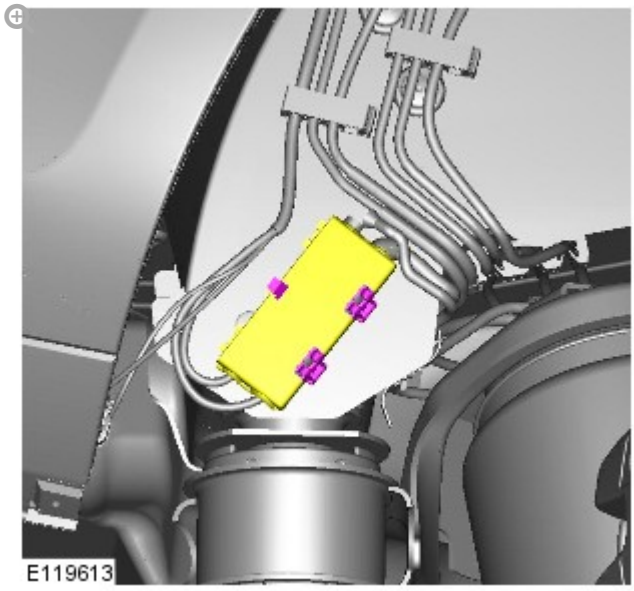
2. **WARNING:**

   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

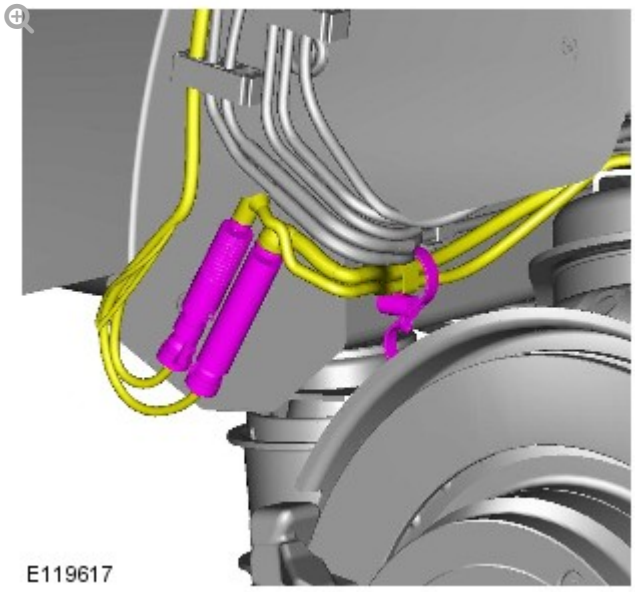
3. For additional information, refer to: Rear Fender Splash Shield (501-08 Exterior Trim and Ornamentation, Removal and Installation).

4.




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.

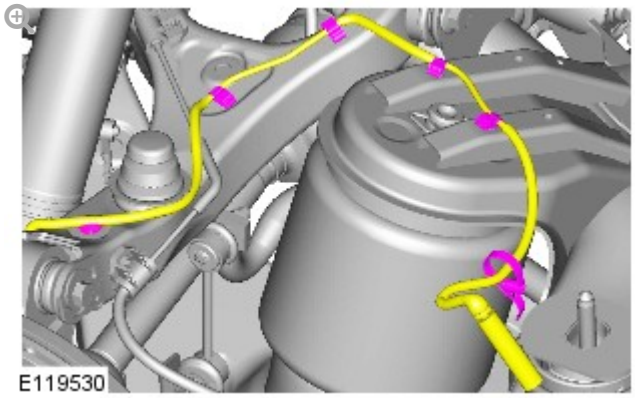



6.

6.

**NOTE:**

Left hand shown, right hand similar.



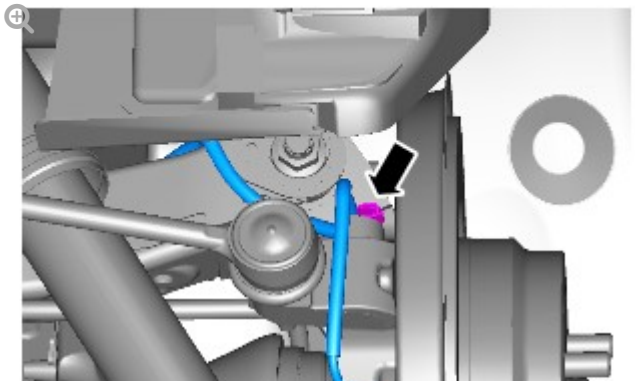

7.

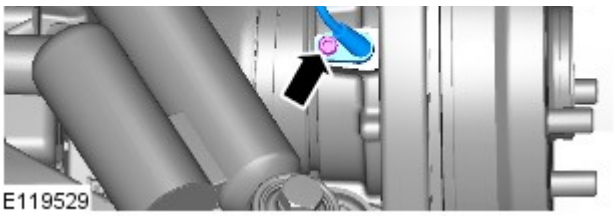
**CAUTIONS:**

- Make sure that the component is clean, free of foreign material and lubricant.
- Make sure that the mating faces are clean and free of foreign material.
- Make sure that the sensor tip is clean and free of foreign material.

**NOTE:**

Left hand shown, right hand similar.






- TORQUE: 8 Nm

## INSTALLATION

1. To install, reverse the removal procedure.
2. Configure the anti-lock brake system (ABS) module using the diagnostic tool.

2012.0 RANGE ROVER (LM), 206-09

# ANTI-LOCK CONTROL - STABILITY ASSIST

SPECIFICATIONS

## General Specification

## General Specification

| ITEM | SPECIFICATION |
|---|---|
| Yaw rate sensor | Bosch DRS MM3.10 |

## Torque Specifications

| DESCRIPTION | NM | LB-FT |
|---|---|---|
| Yaw rate sensor retaining bolts | 6 | 4 |

2012.0 RANGE ROVER (LM), 206-09

ANTI-LOCK CONTROL - STABILITY ASSIST

# YAW RATE SENSOR (G1341819)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 70.70.35 | SENSOR - DYNAMIC STABILITY CONTROL (DSC) - RENEW | ALL DERIVATIVES | 1.1 | USED WITHINS | + |

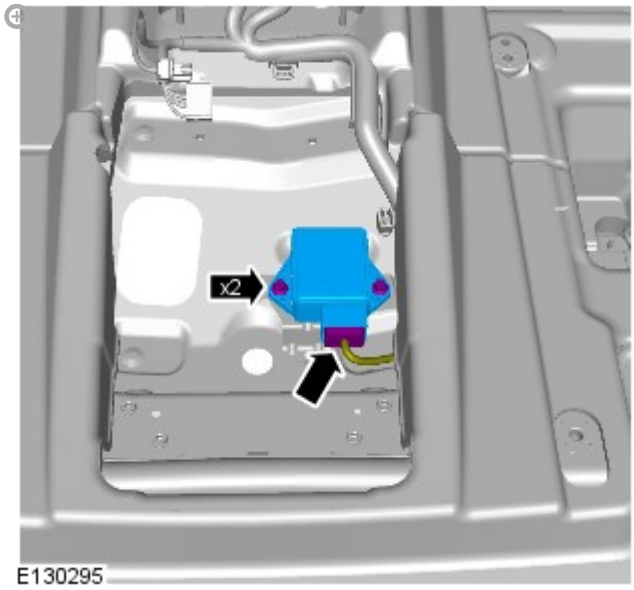
## REMOVAL

**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. For additional information, refer to: Floor Console (501-12, Removal and Installation).

3. 


   TORQUE: 6 Nm

## INSTALLATION

1. To install, reverse the removal procedure.

2. Using the Land Rover approved diagnostic system, calibrate a new yaw rate sensor.