FOUR-WHEEL DRIVE SYSTEMS

# TRANSFER CASE CLUTCH SOLENOID (G1549892)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 41.30.08 | SOLENOID - CLUTCH CONTROL - RENEW | ALL DERIVATIVES | 0.3 | USED WITHINS | + |

## REMOVAL

1. **WARNING:**

   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Drain the transfer case.
   Refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

3. **CAUTION:**

   Connect the diagnostic tool, prior to removal of the solenoid. Carry out the diagnostic service function **transfer case – solenoid replacement**.

**NOTES:**

- Some fluid spillage is inevitable during this operation.
- Note the orientation of the electrical connector prior to removal.

4.

## INSTALLATION

1.

**CAUTIONS:**

- Failure to energise the solenoid to aid installation of the arm, may result in damage to the shift fork once the component is installed and the system is operated.
- Make sure the seal is installed correctly.
- Make sure that new bolts are installed.
- Make sure that the electrical connector is installed in the correct orientation as noted in the removal step.
- Make sure that the component sits flush to the transfer case.

**NOTE:**

**Tighten the retaining bolts evenly and progressively.**

Connect the electrical connector and energise the solenoid (use the service function **transfer case – solenoid replacement** to assist with energising the solenoid) to allow the arm to extend and correctly locate into the shift fork.
*Torque:* **5 Nm**

2. 

3. Fill the transfer case.
Refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

4. Using the approved diagnostic equipment, clear all diagnostic trouble code(s) (DTCs) and check for correct operation.

FOUR-WHEEL DRIVE SYSTEMS

# FOUR-WHEEL DRIVE (4WD) CONTROL MODULE (G1707089)

REMOVAL AND INSTALLATION

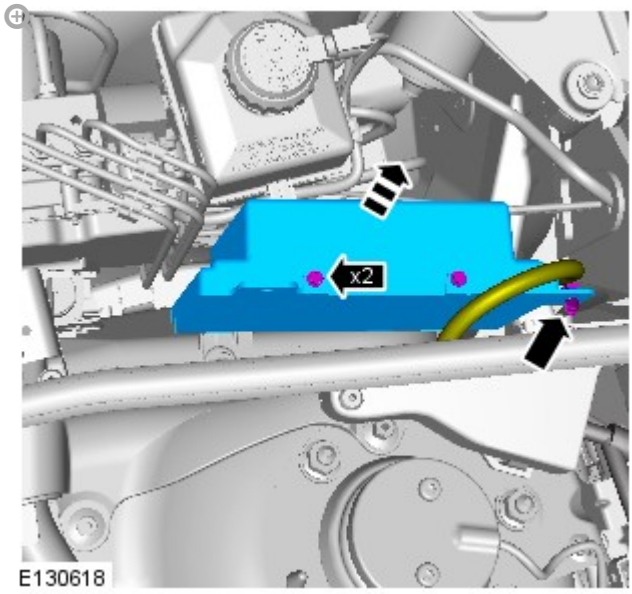
| | | | | | |
|---|---|---|---|---|---|
| 41.30.01 | ELECTRONIC CONTROL UNIT – RATIO CONTROL – RENEW | ALL DERIVATIVES | 0.1 | USED WITHINS | + |

## REMOVAL

**NOTES:**

- Removal steps in this procedure may contain installation details.
- RHD shown, LHD is similar.

1.




TORQUE: 1.6 Nm

2.

## INSTALLATION

1. To install, reverse the removal procedure.

2. Connect the Land Rover approved diagnostic equipment.
    1. Clear any Diagnostic Trouble Codes (DTCs).
    2. Start the diagnostic service function **transfer case-transfer case replacement**.
    3. Clear any Diagnostic Trouble Codes (DTCs) after calibration and check for correct operation.

# TRANSFER CASE

SPECIFICATIONS

## Sealers and Lubricants

| ITEM | SPECIFICATION |
|---|---|
| * Recommended oil | Shell TF 0753 |
| Capacity - Wet and dry fill | 1.5 litres, (2.6 pints) (1.5 US quarts) |
| Input shaft splines grease | Weicon TL7391 |

**CAUTION:**

* Do not use any lubricant other than that specified

ModelDD295TypeTwo speed, permanent four wheel drive transfer box

having synchronised shift on the move facility with an actively controlled wet clutch and 50/50 torque split across the centre differentialClutch typeWet, multi-plateMaximum torque capacity 2500 Nm (1842.5 lb-ft)Ratios:High1:1Low2.93:1Maximum shift speeds:High to low ratio40 kph (24.8 mph)Low to high ratio60 kph (37.2 mph)

| ITEM | SPECIFICATION |
|---|---|

### Torque Specifications

| DESCRIPTION | NM | LB-FT |
|---|---|---|
| Transfer case fluid drain plug M16 | 22 | 16 |
| Transfer case fluid filler/level plug M16 | 22 | 16 |
| Transfer case fluid drain plug M18 | 28 | 21 |
| Transfer case fluid filler/level plug M18 | 28 | 21 |
| Transmission support insulator to transfer case bolts | 60 | 44 |
| Transfer case to transmission bolts | 45 | 33 |
| + Transfer case shift motor bolts | 35 | 26 |
| + Transfer case clutch control solenoid bolts | 5 | 4 |
| + Transfer case high / low range sensor bolts | 5 | 4 |
| *** Front driveshaft to transfer case output flange:** | | |
| Stage 1 | 45 | 33 |
| Stage 2 | Further 90° | Further 90° |

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

**+ New bolts must be used when a new component is installed**

# TRANSFER CASE

## DIAGNOSIS AND TESTING

### PRINCIPLES OF OPERATION

For a detailed description of the Transfer Case, refer to the relevant Description and Operation section in the workshop manual. REFER to: Four-Wheel Drive Systems (308-07A Four-Wheel Drive Systems, Description and Operation).

### INSPECTION AND VERIFICATION

**CAUTION:**

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

**NOTES:**

- If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.
- When performing voltage or resistance tests, always use a digital

- When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.
- Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern

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

**Visual Inspection**

| MECHANICAL | ELECTRICAL |
| --- | --- |
| ▪ Transfer case<br>▪ Driveshafts<br>▪ Differentials<br>▪ Halfshafts<br>▪ Fluid leaks<br>▪ Wheels and tires<br>  ▪ Sizes<br>  ▪ Pressures<br>  ▪ Condition<br>  ▪ Wear (tread depth, even/uneven wear) | ▪ Fuses<br>▪ Wiring harnesses and connectors<br>▪ Transfer case control module<br>▪ High/low range switch |

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

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

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

## SYMPTOM CHART

| SYMPTOM | POSSIBLE CAUSES | ACTION |
| --- | --- | --- |
| Warning message/gearbox fault displayed on instrument cluster | ▪ Transfer case system fault | ▪ Using the manufacturer approved diagnostic system, perform routine - Inline diagnostic unit 2 non-intrusive test - Transfer case<br>▪ Pass - Recheck operation<br>▪ Fail - Refer to the relevant DTC index |
| No drive to the front and rear wheels | ▪ Front/rear driveshaft failure/disconnected<br>▪ Front/center/rear differential failure<br>▪ Front/rear left/right halfshaft failure/disconnected<br>▪ Transfer case system failure<br>▪ Transfer case in Neutral<br>▪ Transfer case calibration failure | ▪ Check the integrity of the front and rear driveshafts<br>▪ Check the integrity of the front, center and rear differentials<br>▪ Check the integrity of the halfshafts<br>▪ Using the manufacturer approved diagnostic system, check the transfer case control module for related DTCs and refer to the relevant DTC index<br>▪ GO to Pinpoint Test **B.**<br>▪ Using the manufacturer approved diagnostic system, perform routine - Transfer Case Replacement |
| No drive to the front axle | ▪ Transfer case clutch worn/burnt | ▪ Check the integrity of the driveshafts, differentials and halfshafts. Rectify as necessary. Check the vehicle history for driveline failures. If a driveline failure has occurred, drain and refill the transfer case fluid, and perform routine - Transfer Case Replacement. Clear the DTCs and re-test. If the fault persists, GO to Pinpoint Test **C.** |
| No drive to the front and rear wheels - Automatic transmission gear selection operating correctly | ▪ Transfer case calibration failure<br>▪ Transfer case solenoid circuit short circuit to ground, short circuit to power, open circuit, high resistance<br>▪ Transfer case actuator position sensor signal A circuit short circuit to ground, short | ▪ Using the manufacturer approved diagnostic system, check the transfer case control module for related DTCs and refer to the relevant DTC index. Check if the range change actuator is audible during operation. GO to Pinpoint Test **B.** . Clear the DTCs and retest<br>▪ GO to Pinpoint Test **E.**<br>▪ GO to Pinpoint Test **G.**<br>▪ GO to Pinpoint Test **H.**<br>▪ GO to Pinpoint Test **D.** |

| | | |
|---|---|---|
| | circuit to power, open circuit, high resistance<br>▪ Transfer case actuator position sensor signal B circuit short circuit to ground, short circuit to power, open circuit, high resistance<br>▪ Transfer case actuator circuit short circuit to ground, short circuit to power, open circuit, high resistance<br>▪ Transfer case range change mechanism obstructed<br>▪ Transfer case range change mechanism not calibrated correctly<br>▪ Transfer case control module power or ground circuit open circuit, high resistance<br>▪ Battery/charging system fault | ▪ Using the manufacturer approved diagnostic system, check the transfer case control module for related DTCs and refer to the relevant DTC index. Check if the range change actuator is audible during operation. GO to Pinpoint Test **B.**<br>▪ Using the manufacturer approved diagnostic system, perform routine - Transfer Case Replacement. Check the transfer case control module for related DTCs and refer to the relevant DTC index. GO to Pinpoint Test **B.**<br>▪ Refer to the electrical circuit diagrams and check the transfer case control module power and ground circuits for open circuit, high resistance. Repair the wiring harness as necessary<br>▪ Refer to the relevant section of the workshop manual and check the battery and charging system |
| Range change inoperative | ▪ Transfer case system fault<br>▪ Transfer case requires calibration (after installing a new component)<br>▪ Transfer case too cold<br>▪ Transfer case control module internal temperature above threshold<br>▪ Transfer case range change mechanism obstructed<br>▪ Automatic transmission drag | **NOTES:**<br>▪ Transfer case range changes are inhibited when the transfer case actuator temperature is above 100°C or below -30°C. Only one transfer case range change per minute is permitted when the transfer case actuator temperature is between -30°C and 0°C.<br>▪ Transfer case range changes are inhibited when the transfer case control module internal temperature is above 100°C.<br>▪ Using the manufacturer approved diagnostic system, perform routine |

| | | |
|---|---|---|
| | torque excessively high<br>▪ Transfer case control module power or ground circuit open circuit, high resistance<br>▪ Battery/charging system fault | diagnostic system, perform routine - Inline diagnostic unit 2 non-intrusive test - Transfer case<br>▪ Using the manufacturer approved diagnostic system, check the transfer case control module for related DTCs and refer to the relevant DTC index<br>▪ Using the manufacturer approved diagnostic system, perform routine - Transfer Case Replacement<br>▪ Drive the vehicle to warm the transfer case and retest. Using the manufacturer approved diagnostic system, check datalogger signal - Motor Temperature (0xD11C)<br>▪ Using the manufacturer approved diagnostic system, check datalogger signals - ECU Internal Temperature (0xD117) - and - Motor Temperature (0xD11C) - and - Motor Over Temperature Events (0xD11F)<br>▪ Using the manufacturer approved diagnostic system, perform routine - Transfer Case Replacement. If the routine fails, check if the range change actuator is audible during operation. GO to Pinpoint Test **B.**<br>▪ GO to Pinpoint Test **I.**<br>▪ Refer to the electrical circuit diagrams and check the transfer case control module power and ground circuits for open circuit, high resistance. Repair the wiring harness as necessary<br>▪ Refer to the relevant section of the workshop manual and check the battery and charging system |
| Off road traction reduced and warning message: TRANSMISSION OVERHEAT SLOW DOWN | ▪ Center differential temperature is approaching the overheat threshold<br>▪ Transfer case fluid level low | **NOTE:**<br>This warning message may be induced by prolonged off road driving.<br>▪ Using the manufacturer approved diagnostic system, check the transfer case control module for related DTCs and refer to the relevant DTC index. Check datalogger signals - ECU Internal Temperature (0xD117) - and - Motor Temperature (0xD11C) - and - Motor Over Temperature Events |

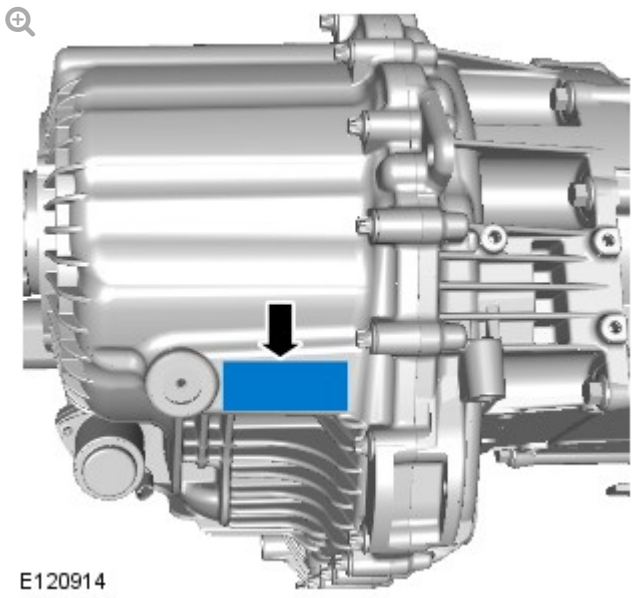
| | | |
|---|---|---|
| | | Motor Over Temperature Events (0xD11F)<br>▪ Check the transfer case for fluid leaks. Refer to the relevant section of the workshop manual and check the transfer case fluid level |
| Off road traction reduced and warning message: TRANSMISSION FAULT – TRACTION REDUCED | ▪ Center differential clutch has failed - Operating as an open differential<br>▪ Transfer case control module has stopped transmitting on the CAN bus and defaults to open center differential | ▪ Using the manufacturer approved diagnostic system, check the transfer case control module for related DTCs and refer to the relevant DTC index<br>▪ Using the manufacturer approved diagnostic system, perform a CAN network integrity test. Refer to the electrical circuit diagrams and check the high speed CAN bus circuit for short circuit to ground, short circuit to power, open circuit, high resistance. Repair the wiring harness as necessary |
| Judder during low speed manoeuvring with high steering inputs | ▪ Excessive difference in tire circumference due to incorrect size, incorrect pressure or wear<br>▪ Transfer case fluid degraded<br>▪ Transfer case control module is not configured correctly<br>▪ Transfer case requires calibration (after installing a new component)<br>▪ Transfer case clutch not disengaged fully due to water contamination of the transfer case fluid<br>▪ Front/rear left/right halfshaft failure/disconnected<br>▪ Rear differential clutch not disengaged fully due to water contamination of the rear differential fluid (active differential) | ▪ Check the tire sizes, pressures and condition<br>▪ Refer to the relevant section of the workshop manual and drain the transfer case fluid. Flush the transfer case with new fluid and re-fill<br>▪ Using the manufacturer approved diagnostic system, re-configure the transfer case control module with the latest level software<br>▪ GO to Pinpoint Test **C.**<br>▪ GO to Pinpoint Test **A.**<br>▪ Check the integrity of the halfshafts<br>▪ Refer to the relevant section of the workshop manual and check the rear differential fluid level/condition |

| | | |
|---|---|---|
| Excessively loud clunk during transfer case range change | ▪ Transfer case requires calibration (after installing a new component)<br>▪ Transfer case control module is not configured correctly | **NOTE:**<br>During a transfer case range change, a mechanical noise may be audible. This is normal and does not indicate a fault.<br>▪ Using the manufacturer approved diagnostic system, perform routine - Transfer Case Replacement. Check the transfer case control module for related DTCs and refer to the relevant DTC index. If the fault persists, GO to Pinpoint Test **C.**<br>▪ Using the manufacturer approved diagnostic system, re-configure the transfer case control module with the latest level software |
| Excessively loud clunk when ignition is set to off (transfer case cycles to rest position) | ▪ Transfer case requires calibration (after installing a new component)<br>▪ Transfer case control module is not configured correctly<br>▪ Transfer case clutch worn/burnt | **NOTE:**<br>During a transfer case range change, a mechanical noise may be audible. This is normal and does not indicate a fault.<br>▪ Using the manufacturer approved diagnostic system, perform routine - Transfer Case Replacement. Check the transfer case control module for related DTCs and refer to the relevant DTC index<br>▪ Using the manufacturer approved diagnostic system, re-configure the transfer case control module with the latest level software<br>▪ GO to Pinpoint Test **C.** |
| Whining noise | ▪ Transfer case bearing/chain wear | ▪ sing the manufacturer approved diagnostic system, perform routine - Inline diagnostic unit 2 noise, vibration and harshness diagnostic test - Transfer case<br>▪ Refer to the relevant section of the workshop manual and install a new transfer case chain<br>▪ Refer to the relevant section of the |

| | | |
|---|---|---|
| | | ▪ Refer to the relevant section of the workshop manual and install a new transfer case rear output shaft bearing |
| Transfer case fluid burnt (darker color than normal) | ▪ Excessive off-road driving<br>▪ Transfer case clutch worn/burnt<br>▪ Electric rear differential fault | **NOTE:**<br>Some small particles may be present in the transfer case fluid. This is normal and does not indicate a fault.<br>▪ Refer to the relevant section of the workshop manual and drain and refill the transfer case fluid. Using the manufacturer approved diagnostic system, perform routine - Transfer Case Replacement. Check the transfer case control module for related DTCs and refer to the relevant DTC index<br>▪ Check the integrity of the driveshafts, differentials and halfshafts. Rectify as necessary. Check the vehicle history for driveline failures. If a driveline failure has occurred, drain and refill the transfer case fluid, and perform routine - Transfer Case Replacement. Clear the DTCs and re-test. If the fault persists, GO to Pinpoint Test **C.**<br>▪ Using the manufacturer approved diagnostic system, check the rear differential control module for related DTCs and refer to the relevant DTC index |
| Fluid leak | ▪ Transfer case breather pipe blocked<br>▪ Input shaft seal failure<br>▪ Front output shaft seal failure<br>▪ Rear output shaft seal failure<br>▪ Actuator seal failure<br>▪ Solenoid seal failure<br>▪ Mating face seal failure | ▪ Check the transfer case breather pipe for blockages<br>▪ Install a new input shaft seal<br>▪ Install a new front output shaft seal<br>▪ Install a new rear output shaft seal<br>▪ Install a new actuator seal<br>▪ Install a new solenoid seal<br>▪ Re-seal the transfer case mating faces |

| | | |
|---|---|---|
| Transfer Case Replacement routine fails repeatedly | ▪ Transfer case clutch worn/burnt<br>▪ Automatic transmission drag torque excessively high<br>▪ Transfer case control module power or ground circuit open circuit, high resistance<br>▪ Battery/charging system fault | ▪ Check the integrity of the driveshafts, differentials and halfshafts. Rectify as necessary. Check the vehicle history for driveline failures. If a driveline failure has occurred, GO to Pinpoint Test **C.**<br>▪ GO to Pinpoint Test **I.**<br>▪ Refer to the electrical circuit diagrams and check the transfer case control module power and ground circuits for open circuit, high resistance. Repair the wiring harness as necessary<br>▪ Refer to the relevant section of the workshop manual and check the battery and charging system |
| Actuator temperature sensor DTC set | ▪ Actuator temperature sensor circuit short circuit to ground, short circuit to power, open circuit, high resistance | ▪ GO to Pinpoint Test **F.** |

## TRANSFER CASE SERIAL NUMBER LOCATION




There are two numbers stamped onto the transfer case. The first is the part number and the second is the serial number.

## TRANSFER CASE ROUTINES

When new transfer case components are installed, the relevant routine must be performed using the manufacturer approved diagnostic system:

- Transfer case control module - Transfer Case Replacement routine
- Transfer case actuator - Transfer Case Replacement routine
- Transfer case - Transfer Case Replacement routine
- Transfer case mode selector solenoid - Solenoid Replacement routine
- Transfer case mode selector position sensor - Absolute Position Sensor Replacement routine

## DRIVE CYCLE

To validate a transfer case repair, the following drive cycle must be completed:

1. Drive the vehicle a short distance and halt and drive away at least twice
1. Select low range and then select high range (vehicle not moving)
1. Halt the vehicle and select Neutral (manual transmission) or Park (automatic transmission)
1. Set the ignition to off
1. Wait until the transmission control switch Park LED has extinguished (automatic transmission)
1. Start the engine
1. Drive the vehicle until the engine, transmission and transfer case are at normal operating temperature
1. Repeat steps 1 to 5

## TRANSFER CASE REPLACEMENT ROUTINE

**WARNING:**

Stand clear of the vehicle when performing the Transfer Case Replacement routine, as the vehicle may move forward/rearward suddenly. Failure to follow this instruction may result in injury.

**NOTE:**

When performing the Transfer Case Replacement routine, the transmission should be set to Neutral and the parking brake set to off. Chock the wheels to prevent the vehicle moving excessively (do not apply the brakes as the vehicle must be allowed to move forward/rearward slightly). Failure to follow this instruction will cause the routine to fail.

The Transfer Case Replacement routine should be performed after installing a new transfer case or to calibrate the transfer case mechanism.

## TRANSFER CASE CLUTCH CALIBRATION ANGLE RESULTS TABLE

**NOTE:**

Transfer case clutch calibration angles are displayed as negative values. When assessing the results, the size of the angle should be considered (not the absolute value). For example, -20° is greater than -10° (because the angle is greater).

| RESULTS | MEANING | ACTION |
|---|---|---|
| Result 1 and Result 2 angles between -20° and -60° and within 10° of each other | Minimal clutch wear (as new) | No action necessary |
| Result 1 angle or Result 2 angle greater than -170° | Maximum clutch wear | Install a new transfer case |

| | | |
|---|---|---|
| Result 1 angle less than Result 2 angle by 10° or more | Clutch discs burnt | Install a new transfer case and check for driveline failures |
| Result 1 angle greater than Result 2 angle by 10° or more | Clutch discs damaged due to water ingress | Install a new transfer case |

## PINPOINT TESTS

**NOTE:**

Some small particles may be present in the transfer case fluid. This is normal and does not indicate a fault.

| PINPOINT TEST A : FLUID CONDITION TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| | A1: FLUID CONDITION - PARTICLES |
| | **1** Drain a sample of fluid from the transfer case. |
| | **2** Check the fluid for solid particles. |
| | Are any large solid particles present in the transfer case fluid?<br>**Yes**<br>Install a new transfer case.<br>**No**<br>GO to Pinpoint Test **C.** |

**NOTE:**

Perform this test with the engine running and the vehicle stationary.

| PINPOINT TEST B : ACTUATOR POSITION TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| | B1: ACTUATOR POSITION DATALOGGER SIGNAL |
| | **1** Using the manufacturer approved diagnostic system, check datalogger signal - Actuator Position (0xD123). |
| | **2** Operate the range change switch to engage high range and low |

| | |
|---|---|
| | range three times each, and check the Actuator Position value for each event:<br>▪ High range: >= 9 mm<br>▪ Neutral: = 0 mm<br>▪ Low range: <= -9 mm |
| | Does the Actuator Position value match the expected value?<br>**Yes**<br>No fault found.<br>**No**<br>Perform routine - Transfer Case Replacement. Clear the DTCs and re-test. If the fault persists, install a new transfer case. |

**NOTES:**

- The clutch calibration angle value can be used to assess the wear state of the transfer case clutch discs.
- The difference between successive clutch calibration angle values can be used to assess the condition of the transfer case clutch discs.
- Transfer case clutch calibration angles are displayed as negative values. When assessing the results, the size of the angle should be considered (not the absolute value). For example, -20° is greater than -10° (because the angle is greater).

| PINPOINT TEST C : CLUTCH CALIBRATION ANGLE TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| C1: CLUTCH CALIBRATION ANGLE - FIRST READ | |
| | **1** Start the engine. |
| | **2** Using the manufacturer approved diagnostic system, check datalogger signal - Internal Variable Clutch Calibration Angle (0xD902). Record the value (this is Result 1). |
| | Is Result 1 greater than -170°?<br>**Yes**<br>Install a new transfer case.<br>**No**<br>GO to C2. |
| C2: CLUTCH CALIBRATION ANGLE - SECOND READ | |
| | |

| | |
|---|---|
| | **NOTE:**<br>If the routine fails because the clutch cannot be calibrated, contact Dealer Technical Support.<br>**1** Using the manufacturer approved diagnostic system, perform routine - Transfer Case Replacement. |
| | **2** Check datalogger signal - Internal Variable Clutch Calibration Angle (0xD902). Record the value (this is Result 2). |
| | Do Result 1 and Result 2 differ by greater than 10°?<br>**Yes**<br>Install a new transfer case.<br>**No**<br>No fault found. |

**NOTE:**

The nominal resistance of the transfer case actuator is 1.0 Ω.

| PINPOINT TEST D : TRANSFER CASE ACTUATOR CIRCUIT TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| D1: TRANSFER CASE WIRING HARNESS AND ACTUATOR LOW RESISTANCE | |
| | **1** Set the ignition to off. |
| | **2** Disconnect the largest wiring harness connector from the transfer case control module. |
| | **3** Connect an ohm-meter to terminal 15 and terminal 18 of the transfer case control module wiring harness connector. |
| | **4** Measure the resistance. |
| | Is the measured resistance less than 0.5 Ω?<br>**Yes**<br>Resistance too low. GO to D2.<br>**No**<br>Resistance not too low. GO to D3. |
| D2: TRANSFER CASE ACTUATOR LOW RESISTANCE | |
| | **1** Disconnect the wiring harness connector from the transfer case actuator. |
| | **2** Connect an ohm-meter to terminal 1 and terminal 8 of the transfer case actuator. |
| | **3** Measure the resistance. |

| | |
|---|---|
| | 3 Measure the resistance. |
| | Is the measured resistance less than 0.5 Ω?<br>**Yes**<br>Resistance too low. Install a new transfer case actuator.<br>**No**<br>Resistance not too low. Check the transfer case actuator wiring harness for short circuit between the wires. Repair the wiring harness as necessary. |

| D3: TRANSFER CASE WIRING HARNESS AND ACTUATOR HIGH RESISTANCE | |
|---|---|
| | 1 Connect an ohm-meter to terminal 15 and terminal 18 of the transfer case control module wiring harness connector. |
| | 2 Measure the resistance. |
| | Is the measured resistance greater than 15.0 Ω?<br>**Yes**<br>Resistance too high. **GO to D4**.<br>**No**<br>Resistance not too high. **GO to D5**. |

| D4: TRANSFER CASE ACTUATOR HIGH RESISTANCE | |
|---|---|
| | 1 Disconnect the wiring harness connector from the transfer case actuator. |
| | 2 Connect an ohm-meter to terminal 1 and terminal 8 of the transfer case actuator. |
| | 3 Measure the resistance. |
| | Is the measured resistance greater than 15.0 Ω?<br>**Yes**<br>Resistance too high. Install a new transfer case actuator.<br>**No**<br>Resistance not too high. Check the transfer case actuator wiring harness for open circuit, high resistance. Repair the wiring harness as necessary. |

| D5: TRANSFER CASE WIRING HARNESS AND ACTUATOR SHORT CIRCUIT TO GROUND | |
|---|---|
| | 1 Connect an ohm-meter to terminal 15 of the transfer case control module wiring harness connector and ground. |
| | 2 Measure the resistance. |
| | Is the measured resistance infinitely high (open circuit)?<br>**Yes**<br>No short circuit to ground. No fault found.<br>**No**<br>Short circuit to ground. **GO to D6**. |

| D6: TRANSFER CASE ACTUATOR SHORT CIRCUIT TO GROUND | |
|---|---|
| | 1 Disconnect the wiring harness connector from the transfer case actuator. |

| | |
|---|---|
| | **2** Connect an ohm-meter to terminal 15 of the transfer case control module wiring harness connector and ground. |
| | **3** Measure the resistance. |
| | Is the measured resistance infinitely high (open circuit)?<br>**Yes**<br>Short circuit to ground. Install a new transfer case actuator.<br>**No**<br>No short circuit to ground. Check the transfer case actuator wiring harness for short circuit to ground. Repair the wiring harness as necessary. |

| PINPOINT TEST E : TRANSFER CASE SOLENOID CIRCUIT TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| E1: TRANSFER CASE WIRING HARNESS AND SOLENOID LOW RESISTANCE | |
| | **1** Set the ignition to off. |
| | **2** Disconnect the largest wiring harness connector from the transfer case control module. |
| | **3** Connect an ohm-meter to terminal 12 and terminal 9 of the transfer case control module wiring harness connector. |
| | **4** Measure the resistance. |
| | Is the measured resistance less than 0.2 Ω?<br>**Yes**<br>Resistance too low. GO to E2.<br>**No**<br>Resistance not too low. GO to E3. |
| E2: TRANSFER CASE SOLENOID LOW RESISTANCE | |
| | **1** Disconnect the wiring harness connector from the transfer case solenoid. |
| | **2** Connect an ohm-meter to terminal 1 and terminal 2 of the transfer case solenoid. |
| | **3** Measure the resistance. |
| | Is the measured resistance less than 0.2 Ω?<br>**Yes**<br>Resistance too low. Install a new transfer case solenoid.<br>**No**<br>Resistance not too low. Check the transfer case solenoid wiring harness for short circuit between the wires. Repair the wiring harness as necessary. |
| E3: TRANSFER CASE WIRING HARNESS AND SOLENOID HIGH RESISTANCE | |
| | **1** Connect an ohm-meter to terminal 12 and terminal 9 of the transfer case control module wiring harness connector. |

| | |
|---|---|
| | **2** Measure the resistance. |
| | Is the measured resistance greater than 10 Ω?<br>**Yes**<br>Resistance too high. **GO to E4**.<br>**No**<br>Resistance not too high. **GO to E5**. |

E4: TRANSFER CASE SOLENOID HIGH RESISTANCE

| | |
|---|---|
| | **1** Disconnect the wiring harness connector from the transfer case solenoid. |
| | **2** Connect an ohm-meter to terminal 1 and terminal 2 of the transfer case solenoid. |
| | **3** Measure the resistance. |
| | Is the measured resistance greater than 10 Ω?<br>**Yes**<br>Resistance too high. Install a new transfer case solenoid.<br>**No**<br>Resistance not too high. Check the transfer case solenoid wiring harness for open circuit, high resistance. Repair the wiring harness as necessary. |

E5: TRANSFER CASE WIRING HARNESS AND SOLENOID SHORT CIRCUIT TO GROUND

| | |
|---|---|
| | **1** Connect an ohm-meter to terminal 12 of the transfer case control module wiring harness connector and ground. |
| | **2** Measure the resistance. |
| | Is the measured resistance infinitely high (open circuit)?<br>**Yes**<br>No short circuit to ground. No fault found.<br>**No**<br>Short circuit to ground. **GO to E6**. |

E6: TRANSFER CASE SOLENOID SHORT CIRCUIT TO GROUND

| | |
|---|---|
| | **1** Disconnect the wiring harness connector from the transfer case solenoid. |
| | **2** Connect an ohm-meter to terminal 12 of the transfer case control module wiring harness connector and ground. |
| | **3** Measure the resistance. |
| | Is the measured resistance infinitely high (open circuit)?<br>**Yes**<br>Short circuit to ground. Install a new transfer case solenoid.<br>**No**<br>No short circuit to ground. Check the transfer case solenoid wiring harness for short circuit to ground. Repair the wiring harness as necessary. |

| PINPOINT TEST F : TRANSFER CASE ACTUATOR TEMPERATURE SENSOR CIRCUIT TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| F1: TRANSFER CASE WIRING HARNESS AND ACTUATOR TEMPERATURE SENSOR LOW RESISTANCE | |
| | **1** Set the ignition to off. |
| | **2** Disconnect the largest wiring harness connector from the transfer case control module. |
| | **3** Connect an ohm-meter to terminal 5 and terminal 2 of the transfer case control module wiring harness connector. |
| | **4** Measure the resistance. |
| | Is the measured resistance less than 1 kΩ?<br>**Yes**<br>Resistance too low. **GO to F2**.<br>**No**<br>Resistance not too low. **GO to F3**. |
| F2: TRANSFER CASE ACTUATOR TEMPERATURE SENSOR LOW RESISTANCE | |
| | **1** Disconnect the wiring harness connector from the transfer case actuator. |
| | **2** Connect an ohm-meter to terminal 4 and terminal 7 of the transfer case actuator. |
| | **3** Measure the resistance. |
| | Is the measured resistance less than 1 kΩ?<br>**Yes**<br>Resistance too low. Install a new transfer case actuator.<br>**No**<br>Resistance not too low. Check the transfer case actuator wiring harness for short circuit between the wires. Repair the wiring harness as necessary. |
| F3: TRANSFER CASE WIRING HARNESS AND ACTUATOR TEMPERATURE SENSOR HIGH RESISTANCE | |
| | **1** Connect an ohm-meter to terminal 5 and terminal 2 of the transfer case control module wiring harness connector. |
| | **2** Measure the resistance. |
| | Is the measured resistance greater than 30 kΩ?<br>**Yes**<br>Resistance too high. **GO to F4**.<br>**No**<br>Resistance not too high. **GO to F5**. |
| F4: TRANSFER CASE ACTUATOR TEMPERATURE SENSOR HIGH RESISTANCE | |
| | **1** Disconnect the wiring harness connector from the transfer case |

| | |
|---|---|
| | actuator. |
| | **2** Connect an ohm-meter to terminal 4 and terminal 7 of the transfer case actuator. |
| | **3** Measure the resistance. |
| | Is the measured resistance greater than 30 kΩ?<br>**Yes**<br>Resistance too high. Install a new transfer case actuator.<br>**No**<br>Resistance not too high. Check the transfer case actuator wiring harness for open circuit, high resistance. Repair the wiring harness as necessary. |
| F5: TRANSFER CASE WIRING HARNESS AND ACTUATOR TEMPERATURE SENSOR SHORT CIRCUIT TO GROUND | |
| | **1** Connect an ohm-meter to terminal 5 of the transfer case control module wiring harness connector and ground. |
| | **2** Measure the resistance. |
| | Is the measured resistance infinitely high (open circuit)?<br>**Yes**<br>No short circuit to ground. No fault found.<br>**No**<br>Short circuit to ground. GO to F6. |
| F6: TRANSFER CASE ACTUATOR TEMPERATURE SENSOR SHORT CIRCUIT TO GROUND | |
| | **1** Disconnect the wiring harness connector from the transfer case actuator. |
| | **2** Connect an ohm-meter to terminal 5 of the transfer case control module wiring harness connector and ground. |
| | **3** Measure the resistance. |
| | Is the measured resistance infinitely high (open circuit)?<br>**Yes**<br>Short circuit to ground. Install a new transfer case actuator.<br>**No**<br>No short circuit to ground. Check the transfer case actuator wiring harness for short circuit to ground. Repair the wiring harness as necessary. |

| PINPOINT TEST G : TRANSFER CASE ACTUATOR POSITION SENSOR SIGNAL A CIRCUIT TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| G1: TRANSFER CASE WIRING HARNESS AND ACTUATOR POSITION SENSOR SIGNAL A LOW RESISTANCE | |
| | **1** Set the ignition to off. |

| | |
|---|---|
| | **2** Disconnect the largest wiring harness connector from the transfer case control module. |
| | **3** Connect an ohm-meter to terminal 1 and terminal 2 of the transfer case control module wiring harness connector. |
| | **4** Measure the resistance. |
| | Is the measured resistance less than 16 kΩ?<br>**Yes**<br>Resistance too low. **GO to G2**.<br>**No**<br>Resistance not too low. **GO to G3**. |

G2: TRANSFER CASE ACTUATOR POSITION SENSOR SIGNAL A LOW RESISTANCE

| | |
|---|---|
| | **1** Disconnect the wiring harness connector from the transfer case actuator. |
| | **2** Connect an ohm-meter to terminal 6 and terminal 7 of the transfer case actuator. |
| | **3** Measure the resistance. |
| | Is the measured resistance less than 16 kΩ?<br>**Yes**<br>Resistance too low. Install a new transfer case actuator.<br>**No**<br>Resistance not too low. Check the transfer case actuator wiring harness for short circuit between the wires. Repair the wiring harness as necessary. |

G3: TRANSFER CASE WIRING HARNESS AND ACTUATOR POSITION SENSOR SIGNAL A HIGH RESISTANCE

| | |
|---|---|
| | **1** Connect an ohm-meter to terminal 1 and terminal 2 of the transfer case control module wiring harness connector. |
| | **2** Measure the resistance. |
| | Is the measured resistance greater than 20 kΩ?<br>**Yes**<br>Resistance too high. **GO to G4**.<br>**No**<br>Resistance not too high. **GO to G5**. |

G4: TRANSFER CASE ACTUATOR POSITION SENSOR SIGNAL A HIGH RESISTANCE

| | |
|---|---|
| | **1** Disconnect the wiring harness connector from the transfer case actuator. |
| | **2** Connect an ohm-meter to terminal 6 and terminal 7 of the transfer case actuator. |
| | **3** Measure the resistance. |
| | Is the measured resistance greater than 20 kΩ? |

| | |
|---|---|
| | **Yes**<br>Resistance too high. Install a new transfer case actuator.<br>**No**<br>Resistance not too high. Check the transfer case actuator wiring harness for open circuit, high resistance. Repair the wiring harness as necessary. |
| G5: TRANSFER CASE WIRING HARNESS AND ACTUATOR POSITION SENSOR SIGNAL A SHORT CIRCUIT TO GROUND | |
| | **1** Connect an ohm-meter to terminal 1 of the transfer case control module wiring harness connector and ground. |
| | **2** Measure the resistance. |
| | Is the measured resistance infinitely high (open circuit)?<br>**Yes**<br>No short circuit to ground. No fault found.<br>**No**<br>Short circuit to ground. GO to G6. |
| G6: TRANSFER CASE ACTUATOR POSITION SENSOR SIGNAL A SHORT CIRCUIT TO GROUND | |
| | **1** Disconnect the wiring harness connector from the transfer case actuator. |
| | **2** Connect an ohm-meter to terminal 1 of the transfer case control module wiring harness connector and ground. |
| | **3** Measure the resistance. |
| | Is the measured resistance infinitely high (open circuit)?<br>**Yes**<br>Short circuit to ground. Install a new transfer case actuator.<br>**No**<br>No short circuit to ground. Check the transfer case actuator wiring harness for short circuit to ground. Repair the wiring harness as necessary. |

| PINPOINT TEST H : TRANSFER CASE ACTUATOR POSITION SENSOR SIGNAL B CIRCUIT TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| H1: TRANSFER CASE WIRING HARNESS AND ACTUATOR POSITION SENSOR SIGNAL B LOW RESISTANCE | |
| | **1** Set the ignition to off. |
| | **2** Disconnect the largest wiring harness connector from the transfer case control module. |
| | **3** Connect an ohm-meter to terminal 6 and terminal 2 of the transfer case control module wiring harness connector. |
| | **4** Measure the resistance. |

| | |
|---|---|
| | Is the measured resistance less than 16 kΩ?<br>**Yes**<br>Resistance too low. **GO to H2**.<br>**No**<br>Resistance not too low. **GO to H3**. |

| H2: TRANSFER CASE ACTUATOR POSITION SENSOR SIGNAL B LOW RESISTANCE | |
|---|---|
| | **1** Disconnect the wiring harness connector from the transfer case actuator. |
| | **2** Connect an ohm-meter to terminal 2 and terminal 7 of the transfer case actuator. |
| | **3** Measure the resistance. |
| | Is the measured resistance less than 16 kΩ?<br>**Yes**<br>Resistance too low. Install a new transfer case actuator.<br>**No**<br>Resistance not too low. Check the transfer case actuator wiring harness for short circuit between the wires. Repair the wiring harness as necessary. |

| H3: TRANSFER CASE WIRING HARNESS AND ACTUATOR POSITION SENSOR SIGNAL B HIGH RESISTANCE | |
|---|---|
| | **1** Connect an ohm-meter to terminal 6 and terminal 2 of the transfer case control module wiring harness connector. |
| | **2** Measure the resistance. |
| | Is the measured resistance greater than 20 kΩ?<br>**Yes**<br>Resistance too high. **GO to H4**.<br>**No**<br>Resistance not too high. **GO to H5**. |

| H4: TRANSFER CASE ACTUATOR POSITION SENSOR SIGNAL B HIGH RESISTANCE | |
|---|---|
| | **1** Disconnect the wiring harness connector from the transfer case actuator. |
| | **2** Connect an ohm-meter to terminal 2 and terminal 7 of the transfer case actuator. |
| | **3** Measure the resistance. |
| | Is the measured resistance greater than 20 kΩ?<br>**Yes**<br>Resistance too high. Install a new transfer case actuator.<br>**No**<br>Resistance not too high. Check the transfer case actuator wiring harness for open circuit, high resistance. Repair the wiring harness as necessary. |

| H5: TRANSFER CASE WIRING HARNESS AND ACTUATOR POSITION SENSOR SIGNAL B SHORT CIRCUIT TO GROUND |
|---|

| | |
|---|---|
| | **1** Connect an ohm-meter to terminal 6 of the transfer case control module wiring harness connector and ground. |
| | **2** Measure the resistance. |
| | Is the measured resistance infinitely high (open circuit)?<br>**Yes**<br>No short circuit to ground. No fault found.<br>**No**<br>Short circuit to ground. GO to H6. |

| H6: TRANSFER CASE ACTUATOR POSITION SENSOR SIGNAL B SHORT CIRCUIT TO GROUND | |
|---|---|
| | **1** Disconnect the wiring harness connector from the transfer case actuator. |
| | **2** Connect an ohm-meter to terminal 6 of the transfer case control module wiring harness connector and ground. |
| | **3** Measure the resistance. |
| | Is the measured resistance infinitely high (open circuit)?<br>**Yes**<br>Short circuit to ground. Install a new transfer case actuator.<br>**No**<br>No short circuit to ground. Check the transfer case actuator wiring harness for short circuit to ground. Repair the wiring harness as necessary. |

| PINPOINT TEST I : AUTOMATIC TRANSMISSION DRAG TORQUE TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| | I1: TRANSFER CASE RANGE CHANGE TEST |
| | **1** Stop the vehicle on a flat level surface. |
| | **2** Allow the engine to idle. |
| | **3** Set the automatic transmission to Neutral. |
| | **NOTE:**<br>The vehicle may creep forward when the brakes are released. Allow the vehicle to move if necessary.<br>**4** Release the brakes. |
| | **5** Attempt a transfer case range change. |
| | Was the transfer case range change successful?<br>**Yes** |

| | |
|---|---|
| | Automatic transmission drag torque excessively high and resisting a transfer case range change when the vehicle is stationary. Refer to the relevant section of the workshop manual and check the automatic transmission.<br>**No**<br>Automatic transmission drag torque normal. |

## 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: Transfer Case Control Module (100-00 General Information, Description and Operation).

2012.0 RANGE ROVER (LM), 308-07

TRANSFER CASE

# TRANSFER CASE DRAINING AND FILLING (G510664)

| | | | | | |
|---|---|---|---|---|---|
| 41.20.04 | TRANSFER GEARBOX DRAIN AND REFILL | ALL DERIVATIVES | 0.2 | USED WITHINS | + |

All vehicles

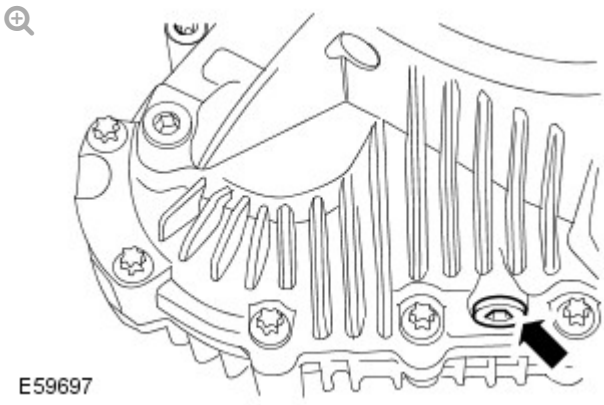
1. **WARNING:**

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

   Raise and support the vehicle.

2. Position a container to collect the fluid.

Vehicles with petrol engine

1. 


   Remove the fluid drain plug.

   - Clean the immediate area.
   - Remove and discard the sealing washer.

Vehicles with diesel engine

1.


Remove the fluid drain plug.

- Clean the immediate area.
- Remove and discard the sealing washer.

All vehicles

1. Allow the fluid to drain.

Vehicles with petrol engine

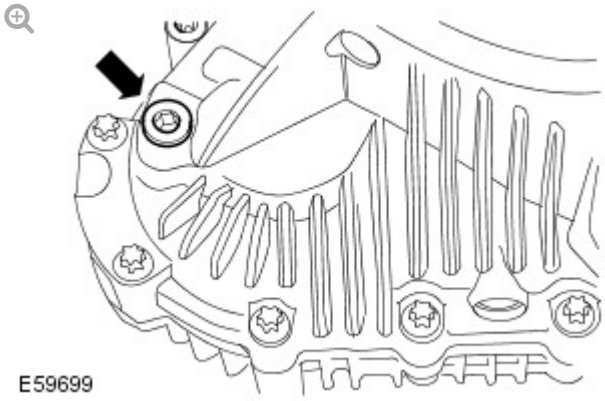
1. Install the drain plug and tighten it to; M16 plug: 22 Nm (16 lb.ft), M18 plug: 28 Nm (21 lb ft).
   - Clean the component mating faces.
   - Install a new sealing washer.

Vehicles with diesel engine

1. Install the drain plug and tighten it to; M16 plug: 22 Nm (16 lb.ft), M18 plug: 28 Nm (21 lb ft).
   - Clean the component mating faces.
   - Install a new sealing washer.

Vehicles with petrol engine

1.




Remove the fluid filler/level plug.

- Clean the immediate area.
- Remove and discard the sealing washer.

Vehicles with diesel engine

1.


Remove the fluid filler/level plug.

- Clean the immediate area.
- Remove and discard the sealing washer.

All vehicles

1. Refill transfer case with the recommended fluid, until the fluid is level with bottom of filler/level plug hole.

Vehicles with petrol engine

1. Install the fluid filler/level plug and tighten to; M16 plug: 22 Nm (16 lb.ft), M18 plug: 28 Nm (21 lb ft).
   - Clean the component mating faces.
   - Install a new sealing washer.

Vehicles with diesel engine

1. Install the fluid filler/level plug and tighten to; M16 plug: 22 Nm (16 lb.ft), M18 plug: 28 Nm (21 lb ft).
   - Clean the component mating faces.
   - Install a new sealing washer.

TRANSFER CASE

# TRANSFER CASE INPUT SHAFT SEAL – V8 5.0L PETROL/V8 S/C 5.0L PETROL (G1225939)

IN-VEHICLE REPAIR

| | | | | | |
|---|---|---|---|---|---|
| 41.20.50 | OIL SEAL – INPUT SHAFT – RENEW | 5000 CC, AJ V8 | 2.2 | USED WITHINS | + |

SPECIAL TOOL(S)


## 308-598

Oil seal installer


## 100-012

Slide hammer

## 100-012-01

Slide hammer adaptor


## 308-375

Seal remover input and output

## REMOVAL

**NOTE:**

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

1. **WARNING:**

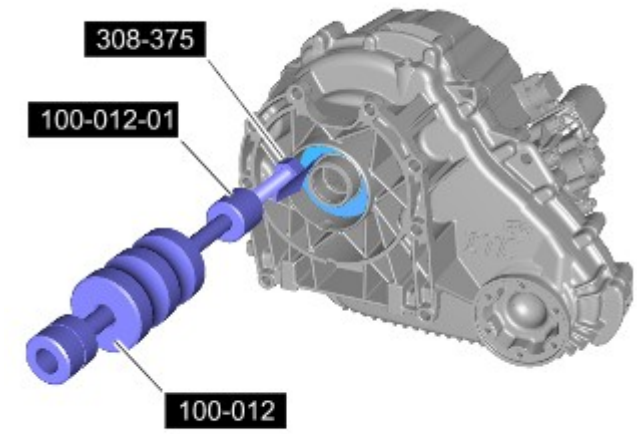
   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Remove the transfer case.
   For additional information, refer to: Transfer Case - 5.0L NA V8 - AJ133/5.0L SC V8 - AJ133 (308-07, Removal).

3. **CAUTION:**

   Care must be taken to avoid damage to the seal register and running surface.



E131138

Carefully remove and discard the oil seal.

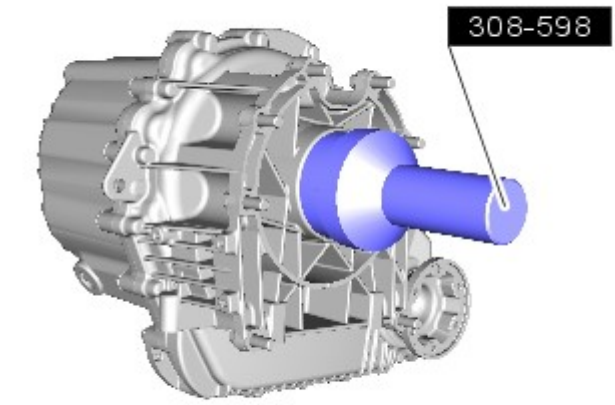
- Use the special tools.

## INSTALLATION

1.

**CAUTION:**

Oil seals must be fitted dry.




E50943

Install a new seal.

- Clean the seal register.
- Use the special tool.

2. Install the transfer case.
For additional information, refer to: Transfer Case - 5.0L NA V8 - AJ133/5.0L SC V8 - AJ133 (308-07B, Installation).

TRANSFER CASE

# TRANSFER CASE CHAIN (G1704925)

REMOVAL AND INSTALLATION

## REMOVAL

1. Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. Refer to: Transfer Case - V8 5.0L Petrol/V8 S/C 5.0L Petrol (308-07B Transfer Case, Removal).
   Refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).
   Refer to: Transfer Case - TDV8 4.4L Diesel (308-07B Transfer Case, Removal).

3. With assistance, secure the transfer case with it's transmission mating face down on a flat surface.

4. 

5. **WARNING:**

   Eye protection must be worn.

**CAUTION:**

Make sure the bolt holes are clean and free from swarf.

6.

**WARNING:**

Eye protection must be worn.

**CAUTION:**

Make sure the bolt holes are clean and free from swarf.

7.

**CAUTION:**

Care must be taken when turning the transfer case over. The transfer case halves must not be allowed to separate.

With assistance, release the transfer case and secure with the rear face of the transfer case facing down on a flat surface.

8.

**CAUTION:**

Care must be taken to avoid damaging the mating surfaces.

Using a soft faced mallet, release the front casing.

9.

10.

**CAUTION:**

The shaft may be tight on the bearing. Care must be taken when removing the component.

## INSTALLATION

1.

**CAUTION:**

Make sure that the front driveshaft gear bearing is fully seated before installing the new chain and gear.

2.

**CAUTION:**

Make sure that the clutch assembly is correctly located as illustrated.

3.

**CAUTION:**

Make sure that the clutch assembly is correctly located as illustrated.

4. **CAUTION:**

Make sure that the chain is installed with the chain link facing down.

5. 

Apply a 2mm bead of sealant to one surface of the transfer case mating faces, as shown.

6. **CAUTIONS:**

- Make sure that the input shaft spacer is correctly located.
- The input shaft and fluid pump assembly must be supported and held in place by hand, until it is located securely into the clutch assembly.

Install the front half of the case.

7. **CAUTION:**

Care must be taken when turning the transfer case over. The transfer case halves must not be allowed to separate.

With assistance, release the transfer case and secure with it's transmission mating face down on a flat surface.

8. **CAUTION:**

Only tighten the bolts finger-tight at this stage.

9. 

*Torque:* **10 Nm**

10. 

*Torque:* **35 Nm**

11. 

*Torque:* **35 Nm**

12. 

*Torque:* **75 Nm**

13. Refer to: Transfer Case - V8 5.0L Petrol/V8 S/C 5.0L Petrol (308-07B Transfer Case, Installation).
Refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Installation).
Refer to: Transfer Case - TDV8 4.4L Diesel (308-07B Transfer Case

Refer to: Transfer Case - TDV6 4.4L Diesel (308-07B Transfer Case, Installation).

14. Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2012.0 RANGE ROVER (LM), 308-07

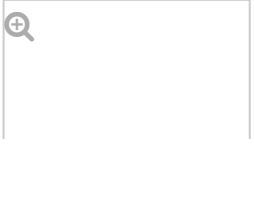
TRANSFER CASE

# TRANSFER CASE FRONT OUTPUT SEAL (C1707005)

# OUTPUT SEAL (GT707005)

REMOVAL AND INSTALLATION

## SPECIAL TOOL(S)

| | |
|---|---|
|  | 205-818 Installer, Seal |
|  | 308-620 Installer, Seal |
|  | 308-636 Installer |
|  | JLR-308- |

| | |
|---|---|
| | 926<br>Support Tool, Transfer Case |
|  | JLR-308-933<br>Remover, Transfer Case Flange |

## REMOVAL

**NOTE:**

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

1. **WARNING:**

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

   Raise and support the vehicle.

2. Refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

3. Refer to: Transfer Case - V8 5.0L Petrol/V8 S/C 5.0L Petrol (308-07B

3. Refer to: Transfer Case - V8 5.0L Petrol/V8 S/C 5.0L Petrol (308-07B Transfer Case, Removal).
   Refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).
   Refer to: Transfer Case - TDV8 4.4L Diesel (308-07B Transfer Case, Removal).

4. With assistance, secure the transfer case with it's transmission mating face down on a flat surface.

5. 

6. **WARNING:**

   Eye protection must be worn.

   **CAUTION:**

   Make sure the bolt holes are clean and free of swarf.

7. **WARNING:**

   Eye protection must be worn.

   **CAUTION:**

   Make sure the bolt holes are clean and free of swarf.

8. **CAUTION:**

> Care must be taken when turning the transfer case over. The transfer case halves must not be allowed to separate.

With assistance, release the transfer case and secure with the rear face of the transfer case facing down on a flat surface.

9. **CAUTION:**

> Care must be taken to avoid damage to the mating surfaces.

Using a soft faced mallet, release the front casing.

10. Remove the sealant from the transfer case mating faces.

11. 

12. 

*Special Tool(s):* JLR-308-926

13. **CAUTION:**

> Make sure that the special tool is correctly located. This will make sure that the snap ring is fully compressed during the next step.

*Special Tool(s):* JLR-308-933

14. **CAUTIONS:**

> - Do not use excessive force whilst removing the flange assembly.
> - Discard the snap ring.

*Special Tool(s):* JLR-308-933

15. 

16. 

## INSTALLATION

**CAUTION:**

> During the installation, make sure that all components are clean and free from foreign material.

1. 

Position the special tool as shown, to support the transfer case during the next step.
*Special Tool(s):* JLR-308-926

2. **CAUTIONS:**

- The chamfer on the bearing inner track must face the seal.
- The transfer case must be supported by the special tool on a flat surface during this step.

Install the bearing.
*Special Tool(s):* 308-620, JLR-308-926

3. 

Install the seal.
*Special Tool(s):* 308-636

4. **CAUTIONS:**

- Centralise the snap ring in the snap ring groove before installing the output flange.
- Extreme care is necessary to make sure the snap ring enters the bearing squarely.
- Install a new snap ring.

Using the special tool and with assistance, install the drive flange.
*Special Tool(s):* 205-818

5. **CAUTION:**

Make sure that the oil pump is installed over its location peg.

6. Clean the magnetic filter.

7. **CAUTION:**

> Make sure that the clutch assembly is correctly located as illustrated.

8. **CAUTION:**

> Make sure that the clutch assembly is correctly located as illustrated.

9. 

Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.

10. **CAUTIONS:**

> - Make sure that the input shaft spacer is correctly located.
> - The input shaft and fluid pump assembly must be supported and held in place by hand, until it is located securely into the clutch assembly.

Install the front half of the transfer case.

11. **CAUTION:**

> Care must be taken when turning the transfer case over. The transfer case halves must not be allowed to separate.

With assistance, release the transfer case and secure with it's transmission mating face down on a flat surface.

12. **CAUTION:**

> Only tighten the bolts finger-tight at this stage.

13. *Torque:* **10 Nm**

14. *Torque:* **35 Nm**

15. *Torque:* **35 Nm**

16. *Torque:* **75 Nm**

17. With assistance, release the transfer case from the flat surface.

18. Refer to: Transfer Case - V8 5.0L Petrol/V8 S/C 5.0L Petrol (308-07B Transfer Case, Installation).
    Refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Installation).
    Refer to: Transfer Case - TDV8 4.4L Diesel (308-07B Transfer Case, Installation).

19. Refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

# TRANSFER CASE FRONT OUTPUT SHAFT BEARING

(G1707006)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 41.20.08 | BEARING – FRONT OUTPUT SHAFT – RENEW | 5000 CC, AJ V8 | 3.9 | USED WITHINS | + |

## REMOVAL

1. The transfer case front output shaft bearing must be serviced with the seal as a pair.
   Refer to: Transfer Case Front Output Seal (308-07B Transfer Case, Removal and Installation).

## INSTALLATION

1. To install, reverse the removal procedure.

TRANSFER CASE

# TRANSFER CASE REAR OUTPUT SEAL (G1707007)

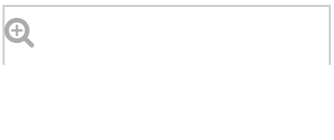
REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 41.20.54 | OIL SEAL(S) - REAR OUTPUT SHAFT - RENEW | 5000 CC, AJ V8 | 4 | USED WITHINS | + |

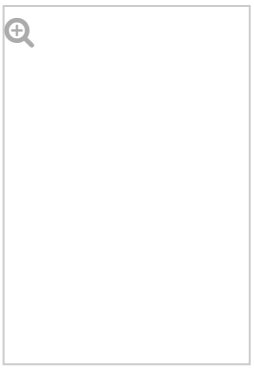
## SPECIAL TOOL(S)

204-525-1

Replacer, Drive Flange



205-726

| | | |
|---|---|---|
| | | Remover/Installer, Wheel Hub Bearing |
|  | 308-637 | Installer |
|  | JLR-308-927 | Support Tool, Transfer Case |
|  | JLR-308-931 | Remover, Transfer Case Flange |

REMOVAL

## REMOVAL

**NOTE:**

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

1. **WARNING:**

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

   Raise and support the vehicle.

2. Refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

3. Refer to: Transfer Case - V8 5.0L Petrol/V8 S/C 5.0L Petrol (308-07B Transfer Case, Removal).
   Refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Removal).
   Refer to: Transfer Case - TDV8 4.4L Diesel (308-07B Transfer Case, Removal).

4. With assistance, secure the transfer case with it's transmission mating face down a flat surface.

5. 

6. **WARNING:**

   Eye protection must be worn.

   **CAUTION:**

Make sure the bolt holes are clean and free of swarf.

7.

**WARNING:**

Eye protection must be worn.

**CAUTION:**

Make sure the bolt holes are clean and free of swarf.

8.

**CAUTION:**

Care must be taken to avoid damage to the mating surfaces.

Using a soft faced mallet, release the rear casing.

9.

10.

Locate the magnetic filter. The filter may have dropped into the front housing in the previous step.

11. **CAUTION:**

> Make sure that the mating faces are clean and free of foreign material.

Remove the sealant from the transfer case mating faces.

12. 

Remove the spacer.

13. 

14. **NOTE:**

> Remove as an assembly.

15. 

*Special Tool(s):* JLR-308-927

16. **CAUTION:**

> Make sure that the special tool is correctly located. This will make sure that the snap ring is fully compressed during the next step.

*Special Tool(s):* JLR-308-931

17. **CAUTIONS:**

- Do not use excessive force whilst removing the flange assembly.
- Discard the snap ring.

*Special Tool(s):* JLR-308-931

18. 

19. 

20. 

21. With assistance, release the transfer case from the flat surface.

## INSTALLATION

**CAUTION:**

During the installation, make sure that all components are clean and free from foreign material.

1. 

Position the special tool as shown, to support the transfer case

Position the special tool as shown, to support the transfer case during the next step.
*Special Tool(s):* JLR-308-927

2. **CAUTION:**

> The chamfer on the bearing inner track must face the seal.

Install the bearing.
*Special Tool(s):* 205-726

3. 

4. 

Install the seal.
*Special Tool(s):* 308-637

5. **CAUTIONS:**

> - Centralise the snap ring in the snap ring groove before installing the output flange.
> - Extreme care is necessary to make sure the snap ring enters the bearing squarely.
> - Install a new snap ring.

Using the special tool and with assistance, install the drive flange.
*Special Tool(s):* 204-525-1

6. With assistance, secure the rear half of the transfer case with it's rear face down on a flat surface.

7. 

Install the spacer.

8. **NOTE:**

> Rotate the differential to engage the splines.

9. **NOTE:**

> Rotate the assembly to engage the clutch plates.

10. 

11. **CAUTION:**

> Make sure that the front driveshaft gear bearing is fully seated before installing the chain and gear.

12. **CAUTION:**

Make sure that the chain is installed with the dark links facing down.

**NOTE:**

The relieved splined inner diameter of the sprocket must face up as shown.

13. **CAUTION:**

Make sure that the component is clean and free of foreign material .

14. Apply a 2 mm bead of sealant to one surface of the transfer case mating face, as shown.

15. **CAUTIONS:**

- Make sure that the input shaft spacer is located correctly.
- The input shaft and fluid pump assembly must be supported and held in place by hand, until it is located securely into the clutch assembly.

Install the front half of the transfer case.

16. **CAUTION:**

> Care must be taken when turning the transfer case over. The transfer case halves must not be allowed to separate.

With assistance, release the transfer case and secure with it's transmission mating face down on a flat surface.

17. **CAUTION:**

> Only tighten the bolts finger-tight at this stage.

18. 

*Torque:* **10 Nm**

19. 

*Torque:* **35 Nm**

20. 

*Torque:* **35 Nm**

21. 

*Torque:* **75 Nm**

22. With assistance, release the transfer case from the flat surface.

23. Refer to: Transfer Case - V8 5.0L Petrol/V8 S/C 5.0L Petrol (308-07B Transfer Case, Installation).
Refer to: Transfer Case - TDV8 3.6L Diesel (308-07B Transfer Case, Installation).
Refer to: Transfer Case - TDV8 4.4L Diesel (308-07B Transfer Case, Installation).

24. Refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

TRANSFER CASE

# TRANSFER CASE REAR

# TRANSFER CASE REAR OUTPUT SHAFT BEARING

(G1707008)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 41.20.19 | BEARING - REAR OUTPUT SHAFT - RENEW | 5000 CC, AJ V8 | 4 | USED WITHINS | + |

## REMOVAL

1. The transfer case rear output shaft bearing must be serviced with the seal as a pair.
   Refer to: Transfer Case Rear Output Seal (308-07B Transfer Case, Removal and Installation).

## INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 308-07

TRANSFER CASE

# TRANSFER CASE – V8 5.0L PETROL/V8 S/C 5.0L PETROL (G1345573)

## REMOVAL

| | | | | | |
|---|---|---|---|---|---|
| 41.20.25.99 | TRANSFER GEARBOX - REMOVE FOR ACCESS AND REFIT | 5000 CC, AJ V8 | 2.1 | USED WITHINS | + |

| | | | | | |
|---|---|---|---|---|---|
| 44.24.02 | LUBRICATION SYSTEM - DRAIN AND REFILL | 5000 CC, AJ V8 | 0.9 | USED WITHINS | + |
| 86.54.14 | SENSOR - PARKING AID - REAR - EACH - RENEW | ALL DERIVATIVES | 0.1 | USED WITHINS | + |

## REMOVAL

### SPECIAL TOOL(S)

303-1069

Adapter, Wrench

### GENERAL EQUIPMENT

| EQUIPMENT NAME |
|---|
| Transmission jack |
| Vehicle/axle stands |
| Wooden Block |

1. **WARNING:**

   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. **NOTE:**

   Do not carry out this step if the component removed for access only.

   Refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

3. Refer to: Transmission Support Crossmember - V8 5.0L Petrol/V8 S/C 5.0L Petrol (502-02 Full Frame and Body Mounting, Removal and Installation).

4. **CAUTIONS:**

   - Mark the position of the driveshaft flange in relation to the drive pinion flange.
   - To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

   - Remove the 6 Torx bolts and washers.

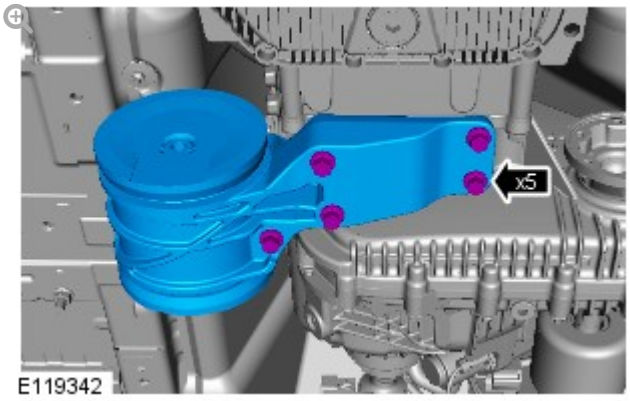
5. **NOTE:**

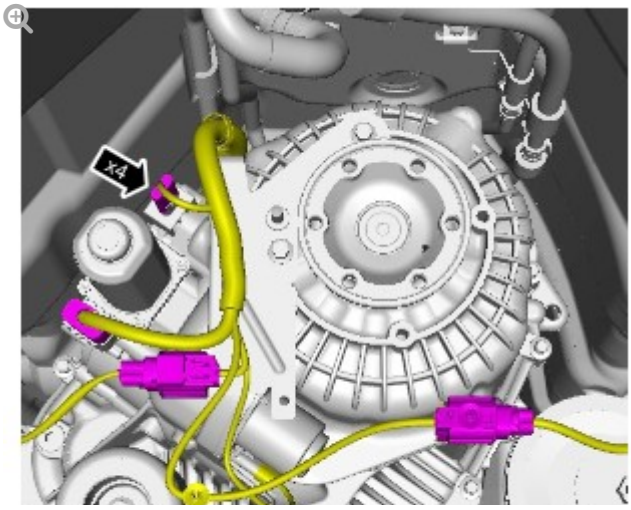
   Components removed for clarity.

- Using a suitable tie strap, secure the driveshaft above the transfer case.

6. **CAUTIONS:**

- Mark the position of the driveshaft flange in relation to the drive pinion flange.
- To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.
- Discard the bolts.

7. 


8. 


9. **CAUTION:**

Always plug any open connections to prevent contamination.

10. **WARNING:**

Secure the component to the transmission jack.

- *General Equipment:* Transmission jack
- *General Equipment:* Vehicle/axle stands
- *General Equipment:* Wooden Block

11. *Special Tool(s):* 303-1069

12. **CAUTION:**

Do not carry out this step if a new transfer box is to be installed.

# TRANSFER CASE – V8 5.0L PETROL/V8 S/C 5.0L PETROL (G1345574)

INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 41.20.25.99 | TRANSFER GEARBOX – REMOVE FOR ACCESS AND REFIT | 5000 CC, AJ V8 | 2.1 | USED WITHINS | + |
| 44.24.02 | LUBRICATION SYSTEM – DRAIN AND REFILL | 5000 CC, AJ V8 | 0.9 | USED WITHINS | + |
| 86.54.14 | SENSOR – PARKING AID – REAR – EACH – RENEW | ALL DERIVATIVES | 0.1 | USED WITHINS | + |

INSTALLATION

## SPECIAL TOOL(S)

| | |
|---|---|
| | 303–1069 Adapter, Wrench |

## GENERAL EQUIPMENT

| EQUIPMENT NAME |
|---|
| Transmission jack |
| Vehicle/axle stands |
| Wooden Block |

1. **NOTE:**

   This step is only required if previously removed.

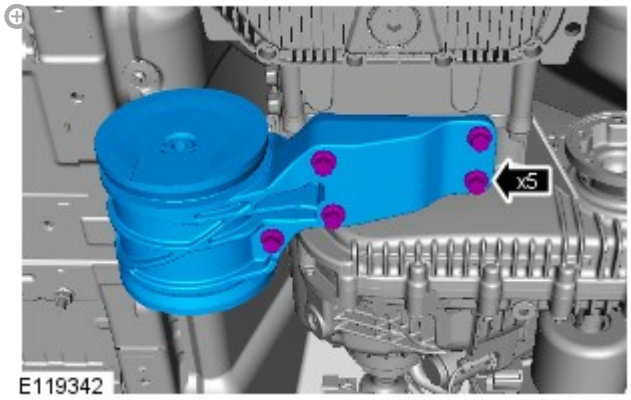
2. - Clean the component mating faces.

- Lubricate input shaft splines with 'Weicon TL7391' grease.
- *General Equipment:* Transmission jack
- *General Equipment:* Vehicle/axle stands
- *General Equipment:* Wooden Block

3.

- *Special Tool(s):* 303-1069
- *Torque:* **45 Nm**

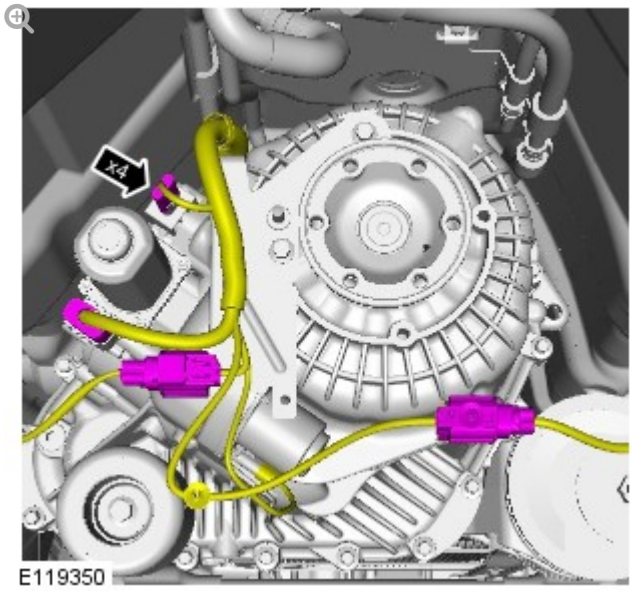
4.




*Torque:* **60 Nm**

5.

6.



7. **NOTE:**

A small amount of oil may weep from the driveshaft joints during storage. The loss of this oil will not affect the operation or durability of the joint.

- Clean the component mating faces.
- *Torque:*
  Stage 1 **44 Nm**
  Stage 2 **45°**

8. **CAUTION:**

Make sure that new bolts are installed.

*Torque:*
Stage 1 **45 Nm**
Stage 2 **90°**

9. Refer to: Transmission Support Crossmember - V8 5.0L Petrol/V8 S/C 5.0L Petrol (502-02 Full Frame and Body Mounting, Removal and Installation).

10. **NOTE:**

Do not carry out this step if the component removed for access only.

Refer to: Transfer Case Draining and Filling (308-07B Transfer Case, General Procedures).

11.

**NOTE:**

Do not carry out this step if the component removed for access only.

1. Connect the Land Rover approved diagnostic equipment.
1. Start the diagnostic service function **transfer case-transfer case replacement.**
1. Clear any Diagnostic Trouble Codes (DTCs) after calibration and check for correct operation.

2012.0 RANGE ROVER (LM), 309-00

# EXHAUST SYSTEM – V8 5.0L

# EXHAUST SYSTEM - V8 5.0L PETROL/V8 S/C 5.0L PETROL

SPECIFICATIONS

## Torque Specifications

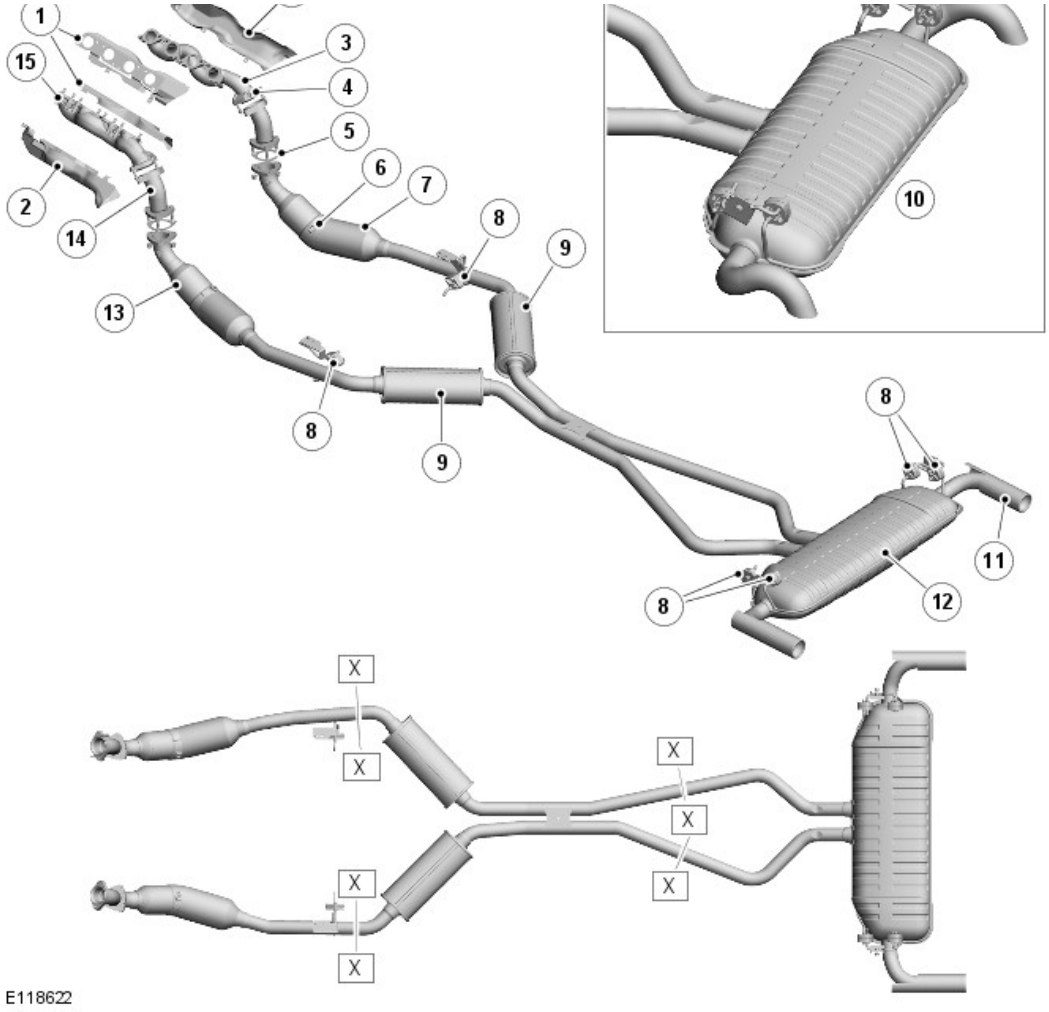
| DESCRIPTION | NM | LB-FT | LB-IN |
|---|---|---|---|
| Stub pipe to Exhaust manifold | 25 | 18 | - |
| Stub pipe to Exhaust System | 47 | 35 | - |
| Rubber mounting retaining nuts | 47 | 35 | - |

2012.0 RANGE ROVER (LM), 309-00

# EXHAUST SYSTEM – V8 5.0L PETROL/V8 S/C 5.0L PETROL

DESCRIPTION AND OPERATION

## 5.0L V8 COMPONENT LOCATION – FROM 2010MY




| ITEM | DESCRIPTION |
|---|---|
| X - X | Service repair cut point |
| 1 | Exhaust manifold gasket (2 off) |
| 2 | Exhaust manifold heat shield (2 off) |
| 3 | Right Hand (RH) exhaust manifold |
| 4 | Pre-catalyst heated oxygen sensor (HO2S) threaded boss (1 per manifold) |
| 5 | Gasket (2 off) |
| 6 | Post starter catalyst HO2S threaded boss (1 per catalyst) |
| 7 | Main catalyst (2 off) |
| 8 | Rubber mounting |
| 9 | Centre silencer (2 off) |
| 10 | Naturally aspirated rear silencer and tail pipes |
| 11 | Tail pipe trim (Supercharger only) |
| 12 | Supercharger rear silencer and tail pipes |

| | |
|---|---|
| 13 | Starter catalyst (2 off) |
| 14 | Stub pipe (2 off) |
| 15 | Left Hand (LH) exhaust manifold |

## EXHAUST SYSTEM

The 5.0L V8 stainless steel exhaust system is supplied from the factory as a one-piece assembly and is connected to the engine with two exhaust manifolds. It is attached to the underside of the body with six rubber mountings.

The system comprises 2 stub pipes which are used to connect the system to the exhaust manifold. The stub pipes connect to the system with 3 studs and locknut. A gasket seals the joint between the stub pipe and the system.

A catalytic converter is welded into each down pipe in the system and comprises a starter catalyst and a main catalyst. An intermediate pipe is welded to the opposite end of each catalytic converter and connect into welded joints with the 2 centre silencers. Each centre silencer has a capacity of 5 litres. Three baffle plates inside the silencer are connected by tubes with the rear most tube being perforated. The two compartments between the two rear most baffle plates are packed with steel wool and glass fibre packing to absorb combustion noise as the exhaust gasses pass through the silencer.

A connecting pipe is welded between each centre silencer and the rear silencer assembly. Internally the rear silencer assembly is divided into two independent silencers each with its own tailpipe. The tailpipes on the naturally aspirated derivative are curved downwards and not visible from the rear of the vehicle. The tail pipes on supercharger vehicles are straight and fitted with a stainless steel finisher.

The rear silencer is divided into 2 separate compartments, although the centre baffle plate which divides them has a perforated section to allow gasses to pass from one side to the other. Each compartment has 2 baffle plates connected by an inlet tube. The inlet tube allows gasses to pass into the centre compartment through a perforated section and the remaining

gasses are passed into the outer compartment. The outer compartment is packed with steel wool and glass fibre to further absorb combustion noise as exhaust gasses pass between the baffle plate and exit through the tail pipe.

Although supplied from the factory as a one-piece, welded assembly, in service sections of the system can be replaced individually. Service joints are identified by indentations on the pipes, to show where the exhaust pipes can be cut to accommodate the replacement service sections.

After the replacement sections are positioned, the system integrity is restored by sealing the service joints with one piece repair sleeves.

## EXHAUST MANIFOLDS

The fabricated stainless steel twin skin exhaust manifolds are unique for each cylinder bank. Spacers on the securing bolts allow the manifolds to expand and retract with changes of temperature while maintaining the clamping loads. Heat shields are integrated into the exhaust manifold gaskets. Each manifold has a threaded port near to its outlet which allows for the fitment of the pre-catalyst HO2S.

## CATALYTIC CONVERTERS

The engine management system provides accurately metered quantities of fuel to the combustion chambers to ensure the most efficient use of fuel and to minimise the exhaust emissions. A threaded boss is located on each manifold and a and another threaded boss is located between the starter and the main catalyst to house the pre and post catalyst oxygen sensors. The engine management system monitors the sensors and uses the information to further improve the fuelling and exhaust emissions.

To further reduce the carbon monoxide and hydrocarbons content of the exhaust gases, two catalytic converters are integrated into the front down pipe from each exhaust manifold. In the catalytic converter the exhaust gases are passed through honeycombed ceramic elements coated with a special surface treatment called 'washcoat'. The washcoat increases the surface area of the ceramic elements by a factor of approximately 7000. On

top of the washcoat is a coating containing metals, which are the active constituent for converting harmful emissions into inert by-products. The metals add oxygen to the carbon monoxide and the hydrocarbons in the exhaust gases, to convert them into carbon dioxide and water respectively.

Two catalytic converters are used in each cylinder bank down pipe. A starter and main catalyst are located below the downpipe flange. The starter catalyst is monitored by two HO2S (heated oxygen sensor)'s. The main catalyst is not monitored.

2012.0 RANGE ROVER (LM), 309-00

# EXHAUST SYSTEM – V8 5.0L PETROL/V8 S/C 5.0L PETROL

## DIAGNOSIS AND TESTING

### PRINCIPLE OF OPERATION

For a detailed description of the exhaust system, refer to the relevant Description and Operation section of the workshop manual. REFER to: Exhaust System (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Description and Operation).

### INSPECTION AND VERIFICATION

**CAUTION:**

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

**NOTE:**

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

1. Verify the customer concern.

1. Visually inspect for obvious signs of mechanical or electrical damage.

**Visual Inspection**

| MECHANICAL | ELECTRICAL |
|---|---|
| ▪ Leaks<br>▪ Metal fatigue<br>▪ Pipes<br>▪ Catalytic converter<br>▪ Muffler(s)<br>▪ Joints<br>▪ Mountings<br>▪ Clearance around components | ▪ Fuses<br>▪ Wiring harness<br>▪ Electrical connector(s)<br>▪ Sensor(s)<br>▪ Engine Control Module (ECM) |

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

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

## SYMPTOM CHART

| SYMPTOM | POSSIBLE CAUSES | ACTION |
|---|---|---|
| Noisy or leaking exhaust | ▪ Exhaust system/components | Install new components as necessary. Refer to the relevant section of the workshop manual. |
| Lack of | ▪ Air intake system | Check the air intake system. Check for a blocked |

| | | |
|---|---|---|
| Lack of power | - Air intake system fault<br>- Restricted exhaust system<br>- Low fuel pressure | Check the air intake system. Check for a blocked catalytic converter or muffler, install new components as necessary. Check the fuel pressure. Refer to the relevant section of the workshop manual. |

## DTC INDEX

For a complete list of all Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - V8 5.0L Petrol/V8 S/C 5.0L Petrol (100-00 General Information, Description and Operation).

EXHAUST SYSTEM - V8 5.0L PETROL/V8 S/C 5.0L PETROL

# EXHAUST SYSTEM (G1224565)

## REMOVAL AND INSTALLATION

### GENERAL EQUIPMENT

| EQUIPMENT NAME |
| --- |
| Transmission jack |

## REMOVAL

**NOTE:**

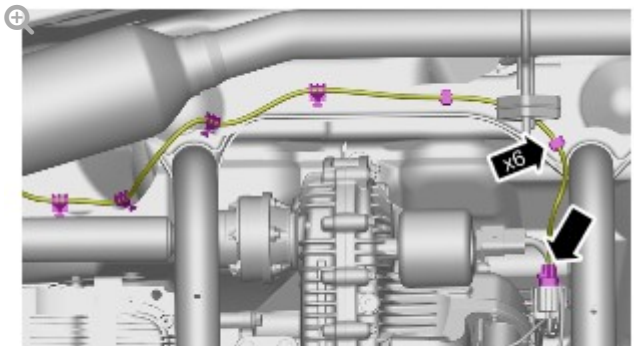
Removal steps in this procedure may contain installation details.

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

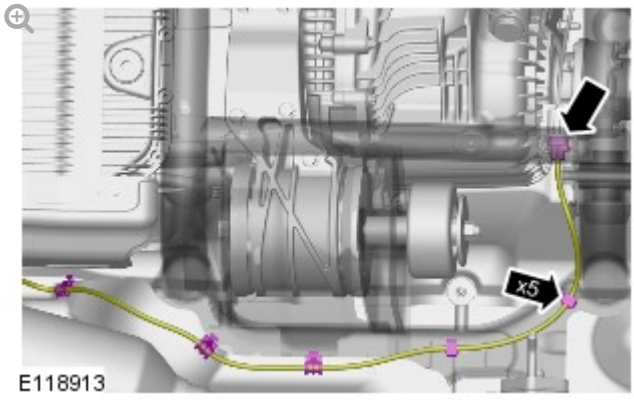
2. **WARNINGS:**

   - Make sure to support the vehicle with axle stands.
   - Observe due care when working near a hot exhaust system.

   Raise and support the vehicle.

3. 


4.




5.

**CAUTION:**

Make sure that the exhaust system is supported with suitable retaining straps.

**NOTE:**

Left-hand shown, right-hand similar.

*Torque:* **47 Nm**

6.

**CAUTION:**

Make sure that the exhaust system is supported with suitable retaining straps.

*Torque:* **47 Nm**

7. **CAUTION:**

> Make sure that the exhaust system is supported with suitable retaining straps.

*General Equipment:* Transmission jack
*Torque:* **47 Nm**

8. **NOTES:**

> - Do not disassemble further if the component is removed for access only.
> - Some variation in the illustrations may occur, but the essential information is always correct.

## INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 309-00

EXHAUST SYSTEM - V8 5.0L PETROL/V8 S/C 5.0L PETROL

# CATALYTIC CONVERTER LH

(G1298266)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 17.50.03 | CATALYTIC CONVERTER - LH - | 5000 CC, AJ V8 | 0.5 | USED WITHINS | + |

RENEW

## SPECIAL TOOL(S)


310-121(LRT-19-014)

Wrench, HO2S


100-051(LRT-99-027)

Pipe cutter-exhaust

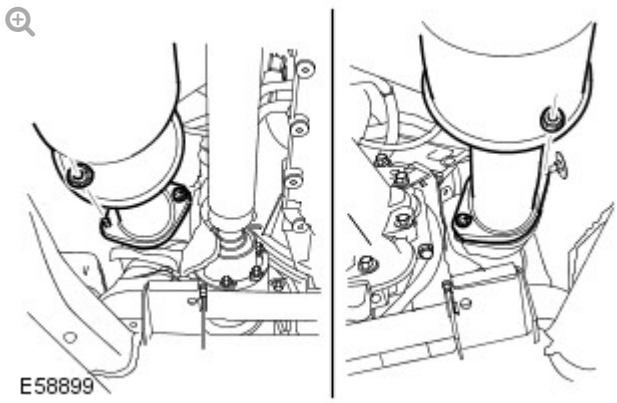
## REMOVAL

1. **WARNING:**

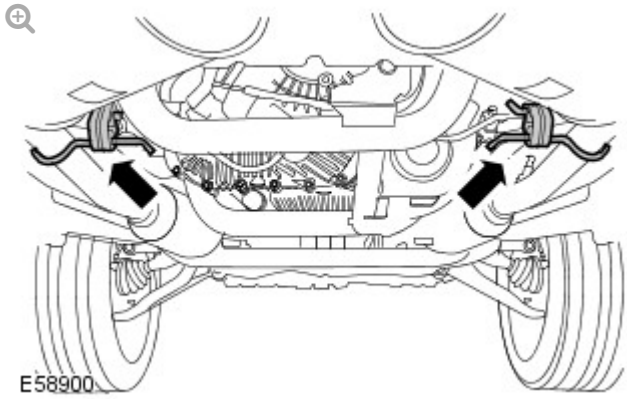
> Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

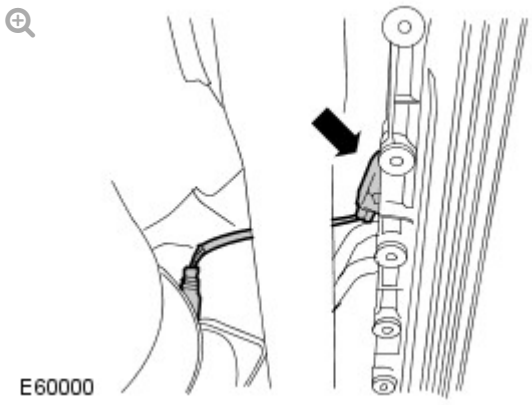
2. Disconnect the LH catalytic converter from the exhaust manifold.
   - Remove and discard the 2 nuts.

3. 


   Disconnect the RH catalytic converter from the exhaust manifold.
   - Remove and discard the 2 nuts.

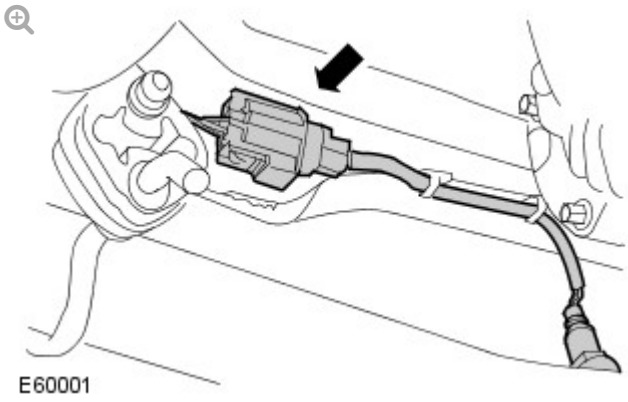
4. 


   Disconnect the 2 front exhaust hangers.

5. 


   Disconnect the LH heated oxygen sensor (HO2S) electrical connector.

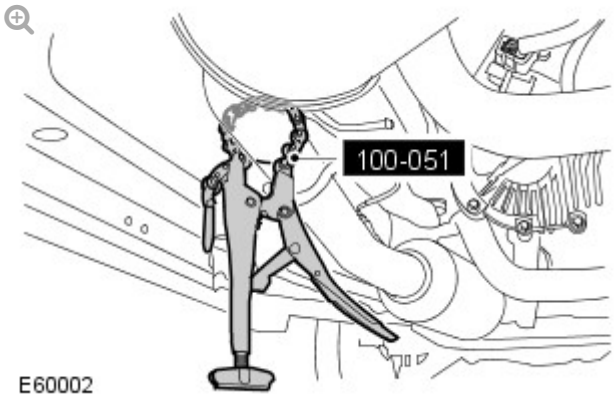
6.




Disconnect the LH catalyst monitor sensor electrical connector.

- Release the wiring harness.

7.

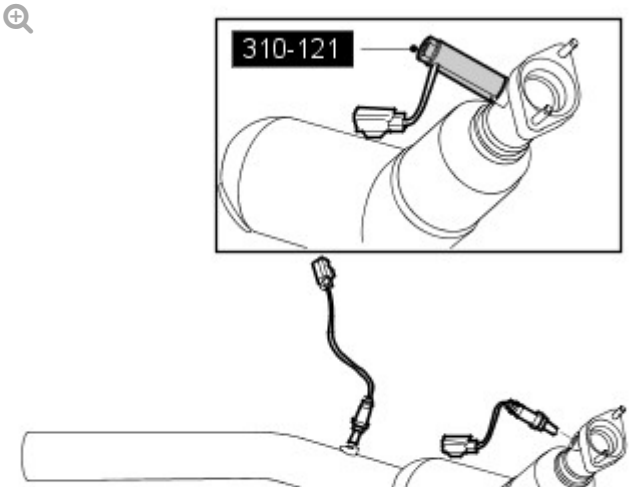



Remove the LH catalytic converter.

- Using the special tool, cut the exhaust pipe at the point indicated by a depression in the pipe.

8. Using the special tool, remove the HO2S.

9.



E60003

Using the special tool, remove the catalyst monitor sensor.

## INSTALLATION

1.

**CAUTION:**

Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

Using the special tool, install the catalyst monitor sensor.

- Clean the components.
- Apply an anti-seize compound to the thread of the sensor.
- Tighten the catalyst monitor sensor to 45 Nm (33 lb.ft).

2.

**CAUTION:**

Make sure the anti-seize compound does not contact the HO2S tip.

Using the special tool, install the HO2S.

- Clean the components.
- Apply an anti-seize compound to the thread of the sensor.
- Tighten the HO2S to 45 Nm (33 lb.ft).

3.

**NOTE:**

Do not tighten the retaining clamp at this stage.

Install the LH catalytic converter.

- Clean the components.
- Install the retaining clamp.

4. Attach the exhaust hangers.

5. Position the RH catalytic converter to the exhaust manifold.
   - Clean the components.
   - Tighten the new nuts to 20 Nm (15 lb.ft).

6. Position the LH catalytic converter to the exhaust manifold.
   - Clean the components.
   - Tighten the new nuts to 20 Nm (15 lb.ft).

7. Align the LH catalytic converter and tighten the retaining clamp to 55 Nm (40 lb.ft).

2012.0 RANGE ROVER (LM), 309-00

EXHAUST SYSTEM - V8 5.0L PETROL/V8 S/C 5.0L PETROL

# CATALYTIC CONVERTER RH

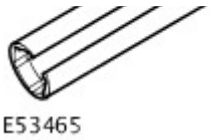
(G1298267)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 17.50.04 | CATALYTIC CONVERTER - RH - RENEW | 5000 CC, AJ V8 | 0.5 | USED WITHINS | + |
| 17.50.04 | CATALYTIC CONVERTER - RH - RENEW | AJ V8, SUPERCHARGED | 0.6 | USED WITHINS | + |

SPECIAL TOOL(S)


310-121(LRT-19-




014)

Wrench, HO2S


100-051(LRT-99-027)

Pipe cutter-exhaust

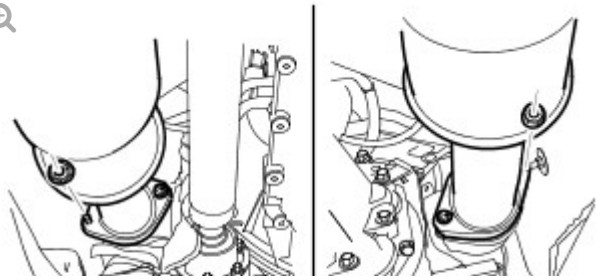
## REMOVAL

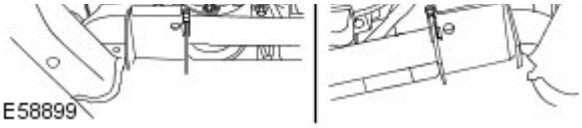
1. **WARNING:**

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

   Raise and support the vehicle.

2. Disconnect the LH catalytic converter from the exhaust manifold.
   - Remove and discard the 2 nuts.

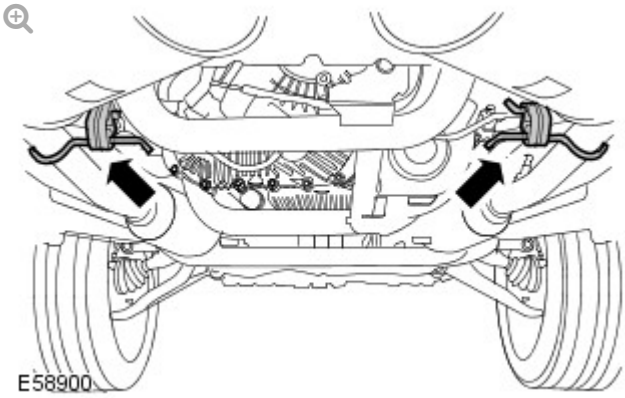
3. 




Disconnect the RH catalytic converter from the exhaust manifold.

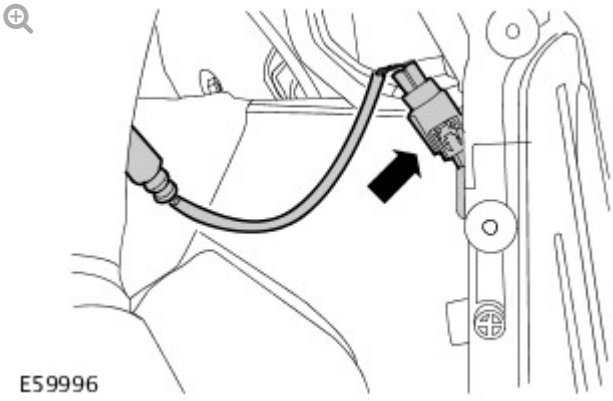
- Remove and discard the 2 nuts.

4.




Disconnect the 2 front exhaust hangers.

5.




Disconnect the RH heated oxygen sensor (HO2S) electrical connector.

6.

Disconnect the RH catalyst monitor sensor electrical connector.

- Release the wiring harness.

7.

Remove the RH catalytic converter.

- Using the special tool, cut the exhaust pipe at the point indicated by a depression in the pipe.

8. Using the special tool, remove the HO2S.

9. 

Using the special tool, remove the catalyst monitor sensor.

## INSTALLATION

1. **CAUTION:**

> Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

Using the special tool, install the catalyst monitor sensor.

- Clean the components.
- Apply an anti-seize compound to the thread of the sensor.
- Tighten the catalyst monitor sensor to 45 Nm (33 lb.ft).

2. **CAUTION:**

> Make sure the anti-seize compound does not contact the HO2S tip.

Using the special tool, install the HO2S.

- Clean the components.
- Apply an anti-seize compound to the thread of the sensor.
- Tighten the HO2S to 45 Nm (33 lb.ft).

3. **NOTE:**

   Do not tighten the retaining clamp at this stage.

   Install the RH catalytic converter.

   - Clean the components.
   - Install the retaining clamp.

4. Attach the exhaust hangers.

5. Position the RH catalytic converter to the exhaust manifold.
   - Clean the components.
   - Tighten the new nuts to 20 Nm (15 lb.ft).

6. Position the LH catalytic converter to the exhaust manifold.
   - Clean the components.
   - Tighten the new nuts to 20 Nm (15 lb.ft).

7. Align the RH catalytic converter and tighten the retaining clamp to 55 Nm (40 lb.ft).

EXHAUST SYSTEM - V8 5.0L PETROL/V8 S/C 5.0L PETROL

# FRONT MUFFLER (G1307407)

## REMOVAL AND INSTALLATION

### SPECIAL TOOL(S)

100-051

Cutter, Exhaust Pipe

## REMOVAL

1. Raise and support the vehicle.
2. **CAUTION:**

   Make sure that the exhaust system is supported with a suitable transmission stand.

   **NOTE:**

Using the special tool, cut the exhaust pipe at the marked position.

- *Special Tool(s):* 100-051

3. **NOTE:**

Using the special tool, cut the exhaust pipe at the marked position.

4. **NOTE:**

Using the special tool, cut the exhaust pipe at the marked position.

5. **NOTE:**

Using the special tool, cut the exhaust pipe at the marked position.

6. 

## INSTALLATION

1. 

2. 

3. 

   *Torque:* **55 Nm**

4. 

   *Torque:* **55 Nm**

5. 

   *Torque:* **55 Nm**

6. 

   *Torque:* **55 Nm**

7. Lower the vehicle.

EXHAUST SYSTEM - V8 5.0L PETROL/V8 S/C 5.0L PETROL

# REAR MUFFLER (G1307408)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 30.10.22 | TAILPIPE AND MUFFLER | AJ V8, SUPERCHARGED | 0.4 | USED WITHINS | + |

## SPECIAL TOOL(S)

| | |
|---|---|
|  | 100–051<br>Cutter, Exhaust Pipe |

## REMOVAL

1. Raise and support the vehicle.

2. **CAUTION:**

   Make sure that the exhaust system is supported with a suitable transmission stand.

   - *Special Tool(s):* 100-051

3. 

4. 

5. 

6. 

## INSTALLATION

1. 

2. 

3. 

4. 

5. 

6. 

   *Torque:* **55 Nm**

7. Lower the vehicle.

2012.0 RANGE ROVER (LM), 310-00

# FUEL SYSTEM – GENERAL INFORMATION

SPECIFICATIONS

## Torque Specifications

| ITEM | NM | LB-FT | LB-IN |
|---|---|---|---|
| Rear seat locking down bar bolts | 45 | 33 | - |
| Fuel tank access cover nuts | 10 | 7 | - |
| Fuel pump and sender unit locking ring | 35 | 26 | - |

FUEL SYSTEM - GENERAL INFORMATION

# DIESEL FILTER WATER DRAIN-OFF (G899813)

## GENERAL PROCEDURES

**WARNINGS:**

- The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.
- Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.
- Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.
- If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.
- Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

**CAUTION:**

Diesel fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is therefore essential that absolute

cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.

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

2. 

   Drain the fuel filter element.
   - Disconnect the water-in-fuel sensor electrical connector.
   - Attach a suitable drain tube to the water-in-fuel sensor drain port.
   - Loosen the water-in-fuel sensor one complete turn and allow the fuel to drain into a container.
   - Remove the drain tube.
   - Remove the container.

3. Tighten the water-in-fuel sensor.

4. Connect the water-in-fuel sensor electrical connector.

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

6. Bleed the fuel system.
   For additional information, refer to: Low-Pressure Fuel System Bleeding - 3.6L (TdV8) Diesel (310-00, General Procedures).

2012.0 RANGE ROVER (LM), 310-00

FUEL SYSTEM - GENERAL INFORMATION

# FUEL SYSTEM PRESSURE RELEASE – V8 5.0L PETROL/V8 S/C 5.0L PETROL (G1224074)

GENERAL PROCEDURES

| | | | | | |
|---|---|---|---|---|---|
| 19.50.02 | FUEL SYSTEM - DEPRESSURISE | 5000 CC, AJ V8 | 0.1 | USED WITHINS | + |
| 19.50.02 | FUEL SYSTEM - DEPRESSURISE | AJ V8, SUPERCHARGED | 0.3 | USED WITHINS | + |

## DRAINING

1. **WARNING:**

   Refer to: Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Remove the fuel pump fuse.

3. Remove the fuel filler cap.

4. Start the engine and allow it to idle until the engine stalls.

5. Crank the engine for approximately five seconds to make sure that the fuel rail pressure is released.

## FILLING

1. **NOTE:**

   Make sure all repairs have been carried out before proceeding to the following steps.

   Install the fuel pump fuse.

2. Install the fuel filler cap..

3. Read and clear stored DTC fault codes.

2012.0 RANGE ROVER (LM), 310-00

FUEL SYSTEM – GENERAL INFORMATION

# FUEL TANK DRAINING (G1328580)

GENERAL PROCEDURES

| | | | | |
|---|---|---|---|---|
| 19.55.02 | TANK – DRAIN FUEL | ALL DERIVATIVES | 0.8 | USED WITHINS + |

## SPECIAL TOOL(S)


### 310–118

Fuel Tank Sender Wrench

**WARNINGS:**

- Place the vehicle in a well ventilated, quarantined area and arrange ' No Smoking/Petrol Fumes' signs about the vehicle.
- Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.
- Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.
- The spilling of fuel is unavoidable during this operation. Ensure that all necessary precautions are taken to prevent fire and explosion.

**CAUTION:**

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

**NOTE:**

Removal steps in this procedure may contain installation details.

1. For additional information, refer to: Diesel Fuel System Health and Safety Precautions (100-00, Description and Operation).

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

3. Open the fuel filler door and remove the cap.

4. Connect the fuel tank drain equipment ground cable to the vehicle.

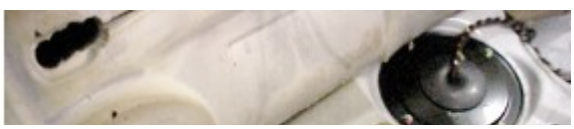
5. Remove the fuel from the fuel tank, via the filler neck, using the fuel tank draining equipment. Follow the manufacturer's operating instructions.

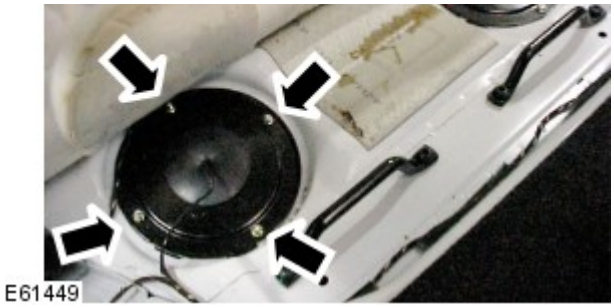
6. Remove the RH C-pillar lower trim panel.
   For additional information, refer to: C-Pillar Lower Trim Panel (501-05, Removal and Installation).

7. Remove the LH C-pillar lower trim panel.
   For additional information, refer to: C-Pillar Lower Trim Panel (501-05, Removal and Installation).

8. Remove the loadspace floor panel.

9. Tie aside the floor carpet.
   - Remove the rear seat locking down bars.
   - Tighten the bolts to 45 Nm.

10. 




Remove the LH fuel tank access cover.

- Remove the 4 nuts.
- Tighten the nuts to 10 Nm.

11.

Remove the LH fuel sender cover.

- Using the special tool, remove the fuel sender cover locking ring.
- Release the LH fuel sender cover.
- Tighten the locking ring to 35 Nm.

12.

Remove the remaining fuel from the fuel tank, via the LH sender unit access aperture, using the fuel tank draining equipment. Follow the manufacturer's operating instructions.

13. To install, reverse the removal procedure.

# FUEL TANK AND LINES – V8 5.0L PETROL/V8 S/C 5.0L PETROL

SPECIFICATIONS

## Capacity

| ITEM | LITERS |
|---|---|
| Fuel tank capacity | 104.5 (total) |

## General Specifications

| ITEM | SPECIFICATIONS |
|---|---|
| Fuel system | Electronic - returnless |
| Fuel tank | Multi layer plastic |
| Fuel tank sender units | Two - Left and right - Left-hand sender is attached to the frame of the Jet pump and the right-hand sender is attached to the fuel pump swirl pot |
| Fuel filter | Located in the fuel tank - if the fuel filter becomes blocked a new fuel pump and sender unit must be installed |
| Fuel pump | Dual stage electric - submersible - located in fuel tank |
| System pressure | 4.5 bar - 65.3 lbf/in2 |
| Starting pressure | 6.3 bar - 91.4 lbf/in2 |

## Torque Specifications

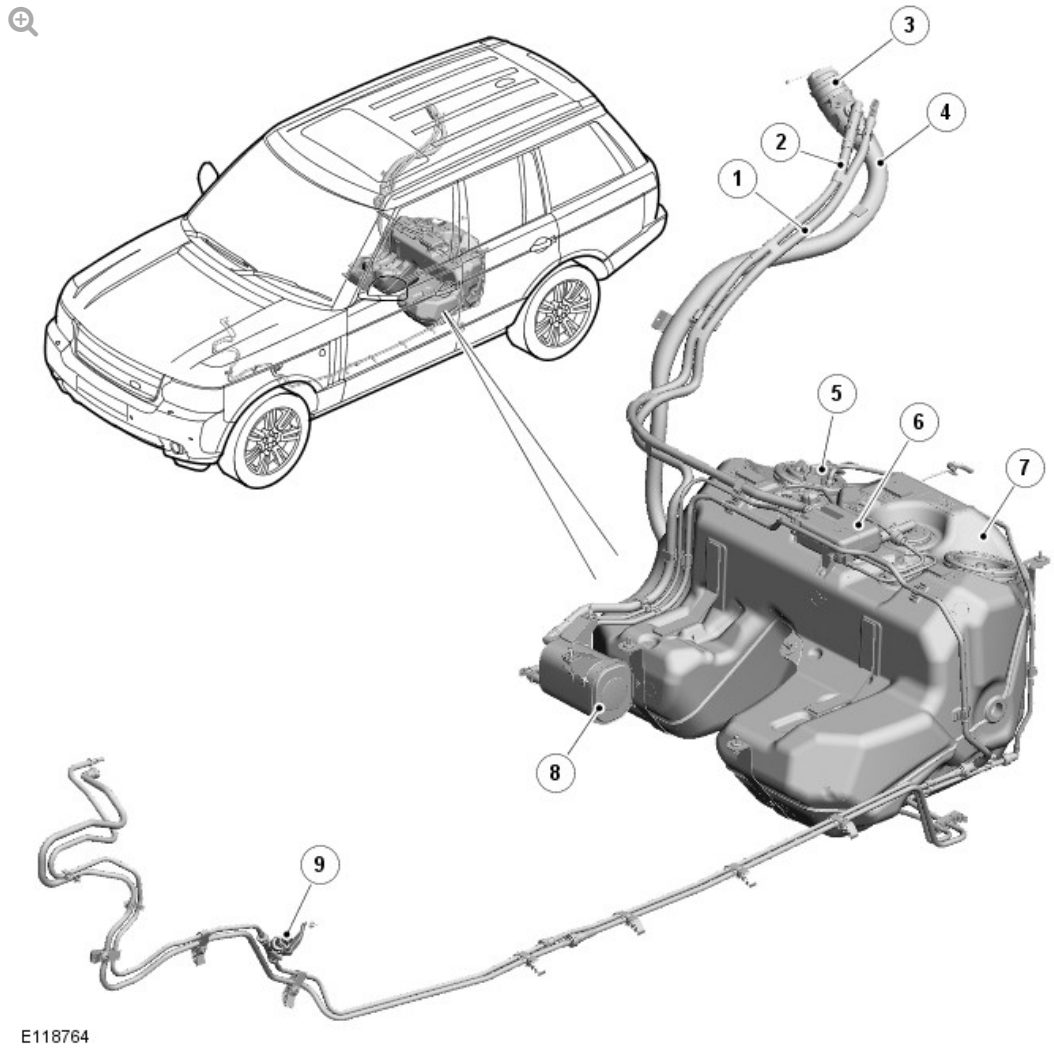
| ITEM | NM | LB-FT | LB-IN |
|---|---|---|---|
| Fuel tank filler pipe bracket M6 retaining nut | 9 | - | 80 |
| Fuel tank filler pipe bracket M5 retaining nut | 4 | - | 35 |
| Fuel tank shield retaining bolts | 22 | 16 | - |
| Fuel tank shield retaining nuts | 22 | 16 | - |
| Fuel tank heat shield retaining screws | 5 | - | 44 |
| Fuel tank retaining bolts | 19 | 14 | - |
| Evaporative emissions canister retaining bolts | 19 | 14 | - |
| Fuel / vapor tube bracket to underbody retaining bolts | 7 | - | 62 |
| Fuel tank access cover retaining nuts | 10 | 7 | - |
| Fuel pump and sender unit locking ring | 35 | 26 | - |

2012.0 RANGE ROVER (LM), 310-01

# FUEL TANK AND LINES – V8 5.0L PETROL/V8 S/C 5.0L PETROL

DESCRIPTION AND OPERATION

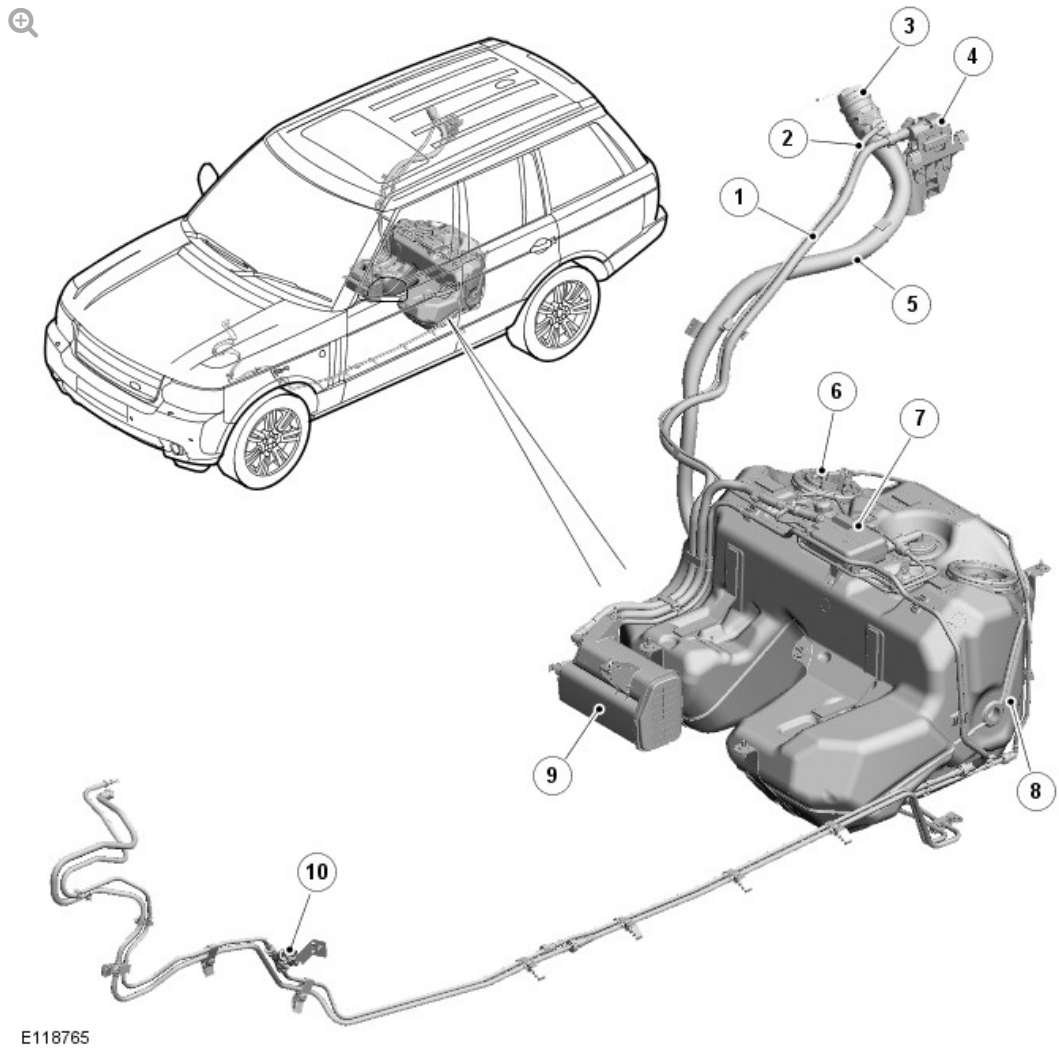
## 5.0L V8 FUEL TANK AND LINES COMPONENT LOCATION (ALL EXCEPT NAS)




| ITEM | DESCRIPTION |
|---|---|
| 1 | Charcoal canister breather pipe |
| 2 | Fuel tank breather pipe |
| 3 | Filler pipe cap |
| 4 | Filler pipe |
| 5 | Fuel delivery module |
| 6 | Vapor separator |
| 7 | Fuel tank |

| | |
|---|---|
| 8 | Charcoal canister |
| 9 | Fuel low pressure sensor |

## 5.0L V8 FUEL TANK AND LINES COMPONENT LOCATION (NAS ONLY)




| ITEM | DESCRIPTION |
|---|---|
| 1 | Charcoal canister breather pipe |
| 2 | Fuel tank breather pipe |
| 3 | Filler pipe cap |
| 4 | DMTL pump |
| 5 | Filer pipe |
| 6 | Fuel delivery module |
| 7 | Vapor separator |

| | |
|---|---|
| 8 | Fuel tank |
| 9 | Charcoal canister |
| 10 | Fuel low pressure sensor |

## GENERAL

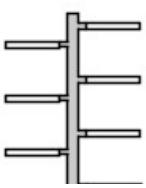
The major components of the 5.0L V8 fuel system comprises a fuel tank, a fuel delivery module, a fuel filler assembly and two fuel level sensors.

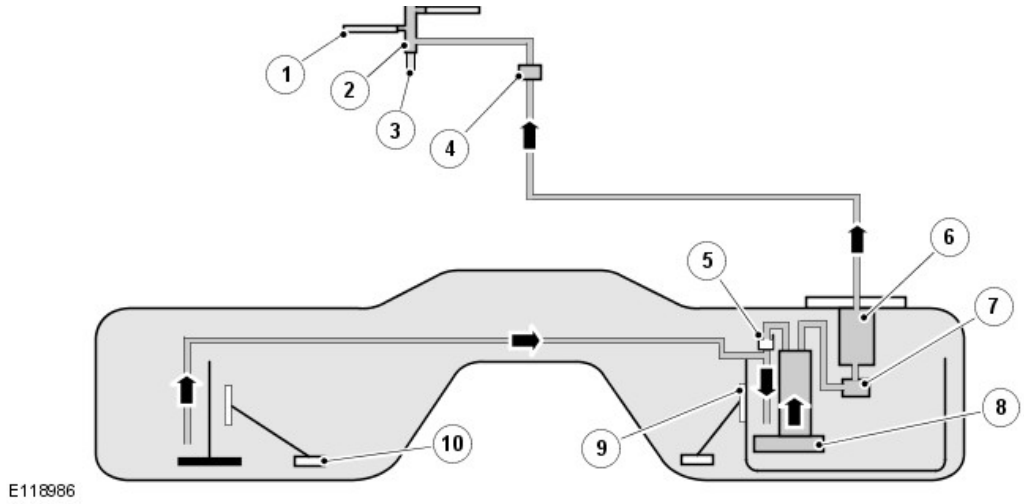
The 5.0L V8 fuel system uses a returnless fuel system which comprises a fuel pump mounted in the fuel tank to deliver fuel at a constant flow and pressure to the fuel rails which supply fuel to all fuel injectors.

The fuel pump operation is regulated by a FPDM (fuel pump driver module) which is controlled by the engine management system. The driver module regulates the flow and pressure supplied by controlling the operation of the fuel pump using a PWM (pulse width modulation) output.

The fuel rails and the injectors are described in Fuel Charging and Controls – 5.0L V8.
For additional information, refer to: Fuel Charging and Controls (303-04D Fuel Charging and Controls - V8 5.0L Petrol, Description and Operation) / Fuel Charging and Controls (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Description and Operation).
Fuel system emission control is described in Engine Emission Control - 5.0L V8
For additional information, refer to: Electronic Engine Controls (303-14C Electronic Engine Controls - V8 5.0L Petrol, Description and Operation) / Electronic Engine Controls (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Description and Operation).

## FUEL SYSTEM SCHEMATIC DIAGRAM






| ITEM | DESCRIPTION |
|---|---|
| 1 | Fuel injector (8 off) |
| 2 | Fuel rail |
| 3 | Fuel High Pressure (HP) sensor |
| 4 | Fuel LP sensor |
| 5 | Jet pump |
| 6 | Fuel filter |
| 7 | Pressure relief valve |
| 8 | Fuel pump module assembly |
| 9 | Right Hand (RH) fuel level sensor |
| 10 | Left Hand (LH) fuel level sensor |

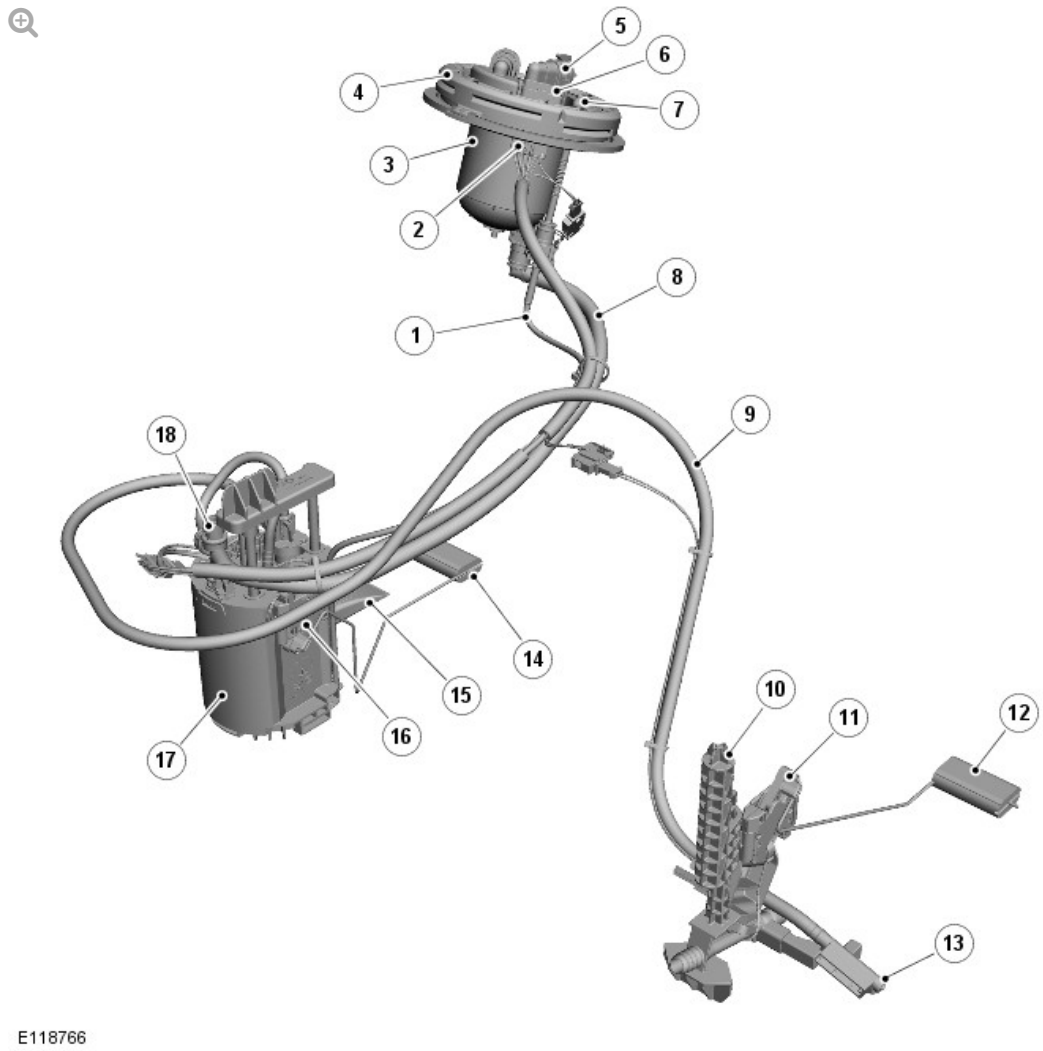
## FUEL TANK

The fuel tank is constructed from moulded plastic and is mounted under the rear seat floor pan, forward of the rear suspension. The fuel tank has a capacity of 104.5 liters (27.6 US gallons). The tank is a saddle tank design with a fuel delivery module located inside the tank to collect the fuel from each side of the tank.

A vapor separator is attached to the top of the tank. The vapor separator collects liquid fuel and returns it back to the fuel tank via the LH (left-hand) roll over valve.

The fuel tank is the same tank introduced for 2006MY vehicles but with revised fuel delivery modules for 2010MY 5.0L V8 vehicles.

## FUEL DELIVERY MODULE




| ITEM | DESCRIPTION |
|---|---|
| 1 | Fuel outlet pipe to FFBH pump connection |
| 2 | Electrical connector |
| 3 | Fuel filter |
| 4 | Top flange assembly |
| 5 | Pressure outlet to fuel rail |
| 6 | Harness connector |
| 7 | Outlet for FFBH pump (if fitted) |
| 8 | Pressure feed pipe to filter |

| | |
|---|---|
| 9 | Suction pipe |
| 10 | Remote level sensor and fuel pick-up |
| 11 | LH fuel level sensor |
| 12 | Level sensor float |
| 13 | Fuel pick-up |
| 14 | Level sensor float |
| 15 | Fuel inlet filter |
| 16 | RH (right-hand) fuel level sensor |
| 17 | Fuel pump |
| 18 | Pressure relief valve |

The fuel delivery module is a new design for 5.0L V8 2010MY vehicles. The module is located inside the fuel tank and comprises three main components; a fuel pump, a remote fuel pick-up and a top flange assembly.

### FUEL PUMP

The fuel pump is a variable-speed rotary-vane type, which operates in a fuel pump module located in the RH side of the fuel tank. A venturi transfer pump is located in the RH side of the tank. The fuel pump module is secured in the fuel tank with a bayonet style locking ring that is welded into the tank structure. The fuel pump module has an integral top plate for the external pipe work and electrical connectors.

The fuel pump delivers fuel at a maximum pressure of 630 kPa (6.3 bar; 91.4 lbf/in.$^2$) to the filter bowl in the top flange.

The pump has a spring loaded top plate which secures the pump by compression in its location in the front RH side of the fuel tank. The electric pump is located in a plastic swirl pot which collects fuel from the base of the fuel tank via a filter.

The fuel level sensor the right hand side of the tank is attached to the outside of the swirl pot.

The fuel pump is a serviceable component and access to the pump is by removal of the top flange.

### REMOTE FUEL PICK-UP AND LEVEL SENSOR ASSEMBLY

The remote fuel pick-up is located in the front LH side of the fuel tank. The fuel pick-up has a spring loaded frame which secures the assembly by compression in the fuel tank.

The fuel system incorporates two jet pumps. One jet pump is integrated into the fuel pump and draws fuel from the RH side of the fuel tank. The other jet pump is located on the fuel delivery module on the RH side of the tank. There is a pipe that is located in the LH side of the tank that allows fuel to be drawn over from the LH side of the tank, delivering fuel into the swirl pot. The jet pumps operate on a venturi effect created by the fuel at pump output pressure passing through the jet pump. This draws additional fuel from the LH side of the tank through ports in the jet pump body, delivering additional fuel to the swirl pot.

The fuel level sensor for the LH side of the fuel tank is attached to the fuel pick-up frame. The fuel pick-up and the level sensor are serviceable components and access is by removal of the flange cover on the top LH side of the fuel tank.

### TOP FLANGE ASSEMBLY

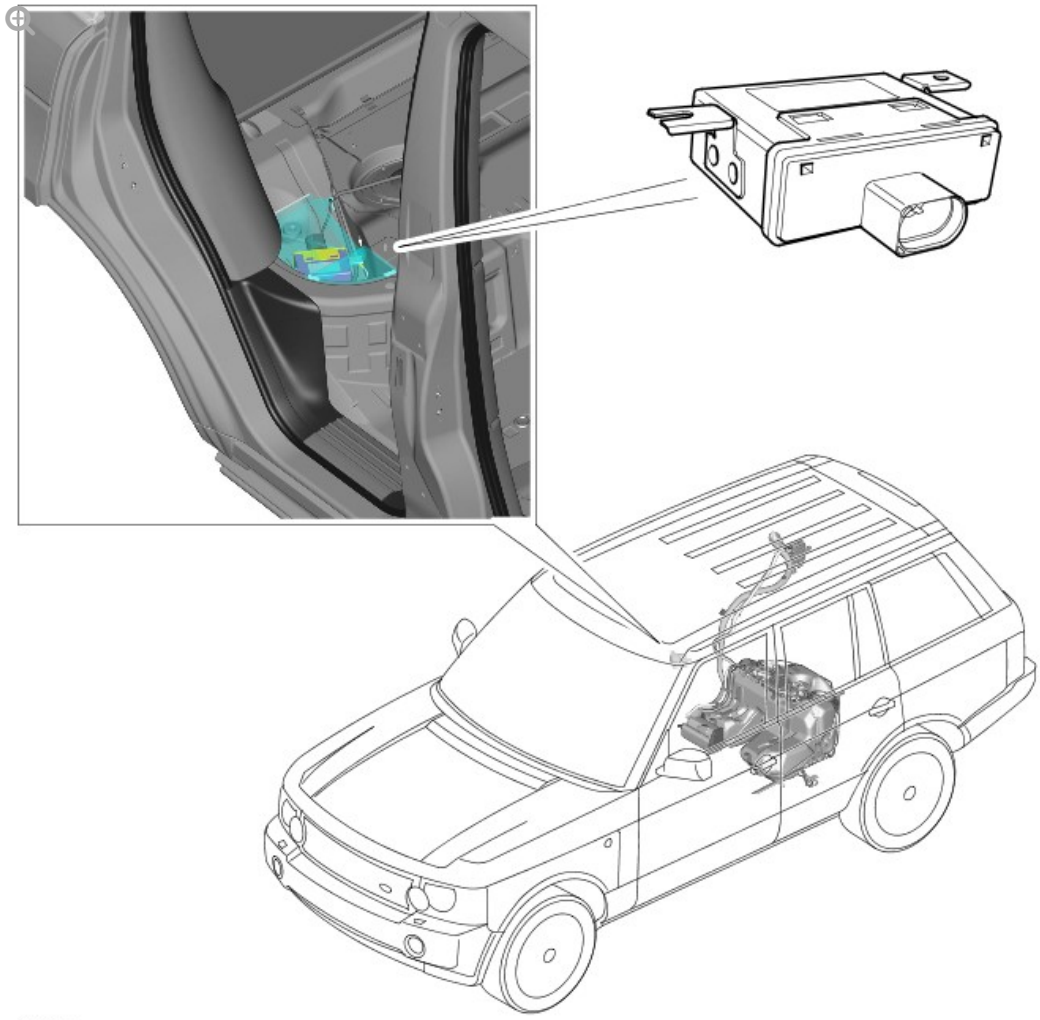
The top flange is located on the top RH side of the fuel tank. The flange assembly is sealed in the tank with a with a sealing ring. A locking ring secures the flange assembly in the tank and requires a special tool for removal.

The outer surface of the flange has two outlets with quick-fit connections. One connection is the pressure outlet to the fuel rail, the second outlet is the fuel supply to the Fuel Fired Booster Heater (FFBH) pump, if fitted.
For additional information, refer to: Auxiliary Climate Control (412-02C Auxiliary Climate Control, Description and Operation).
An electrical connector is located adjacent to the pipe connections and provides the electrical interface to the fuel pump and the level sensors.

On the underside of the flange, inside the tank, is a moulded housing which contains the non-serviceable fuel filter. Fuel from the fuel pump enters the base of the housing and passes through the filter before exiting the tank to the fuel rail or the FFBH pump, if fitted. An electrical connection on the base

of the filter housing provides a ground for the filter.

## FUEL PUMP DRIVER MODULE (FPDM)



E60118

The FPDM is attached to and located under a cover which is located below the RH side of the rear seat cushion.

The fuel pump operation is regulated by the FPDM which is controlled by the ECM (engine control module). The FPDM regulates the flow and pressure supplied by controlling the operation of the fuel pump using a PWM output.

The FPDM is powered by a supply from the fuel pump relay in the EJB (engine junction box). The fuel pump relay is energized on opening the driver's door or when power mode 9 engine crank is initiate using the stop/start button. The FPDM supplies power to the fuel pump, and adjusts the power to control the speed of the fuel pump and thus the pressure and

flow in the fuel delivery line.

A PWM signal from the ECM tells the FPDM the required speed for the fuel pump. The on time of the PWM signal represents half the fuel pump speed, e.g. if the PWM signal has an on time of 50%, the FPDM drives the pump at 100%.

The FPDM will only energize the fuel pump if it receives a valid PWM signal, with an on time of between 4% and 50%. To switch the fuel pump off, the ECM transmits a PWM signal with an on time of 75%.

The output pressure from the fuel pump will change with changes of engine demand and fuel temperature. The ECM monitors the input from the fuel rail LP sensor and adjusts the speed of the fuel pump as necessary to maintain a nominal output pressure of 450 kPa (4.5 bar; 65.3 lbf/in.$^2$), except during engine start-up. At engine start-up the target pressure for the fuel delivery line is 630 kPa (6.3 bar; 91.4 lbf/in.$^2$).

If the SRS (supplemental restraint system) outputs a crash signal on the high speed CAN (controller area network) bus, the ECM de-energizes the fuel pump relay to prevent any further fuel being pumped to the engine.

If the ECM does not detect pressure in the fuel delivery line, it stops, or refuses to start the engine and stores the appropriate DTC (diagnostic trouble code).

The ECM receives a monitoring signal from the FPDM. Any DTC's produced by the FPDM are stored by the ECM.

DTC's can be retrieved from the ECM using an approved Land Rover diagnostic system. The FPDM itself cannot be interrogated by the approved Land Rover diagnostic system.

## FUEL LEVEL SENSORS

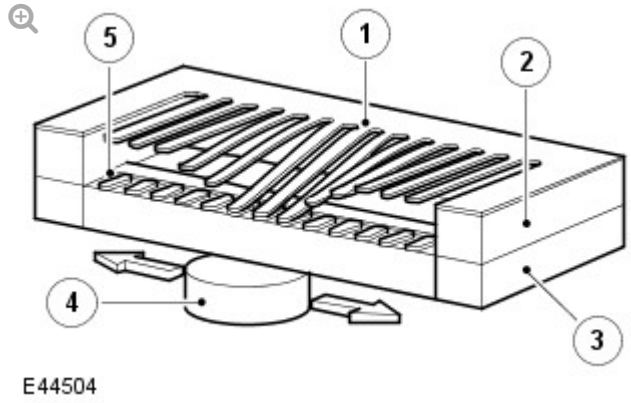
Two fuel level sensors are used in the fuel tank to measure the amount of remaining fuel in the LH and RH sides of the fuel tank. The LH level sensor is attached to the frame of the fuel pick-up and the RH level sensor is attached to the fuel pump swirl pot. The sensors are connected to the vehicle wiring harness via a connector on the outer face of the top flange assembly.

harness via a connector on the outer face of the top flange assembly.

The sensors are a MAgnetic Passive Position Sensor (MAPPS) which provides a variable resistance to ground for the output from the fuel gauge. The sensor is sealed from the fuel preventing contamination of the contacts and increasing reliability. The front and rear fuel level sensors are connected to the external electrical connector on the flange via the connectors on the underside of the fuel pump module flange.

The sensor comprises a series of 51 film resistors mounted in an arc on a ceramic surface. The resistors are wired in series with individual contacts. A soft magnetic foil with 51 flexible contacts is mounted a small distance above the film resistors. A magnet, located below the ceramic surface, is attached to the sender unit float arm. As the float arm moves, the magnet follows the same arc as the film resistors. The magnet pulls the flexible contacts onto the opposite film resistor contacts forming an electrical circuit.

SENSOR OPERATING PRINCIPLE




| ITEM | DESCRIPTION |
|---|---|
| 1 | Magnetic foil |
| 2 | Spacer |
| 3 | Ceramic surface |
| 4 | Magnet |
| 5 | Resistance film |

The film resistors are arranged in a linear arc with resistance ranging from 51.2 to 992.11 Ohms. The electrical output signal output is proportional to

the amount of fuel in each side of the tank and the position of the float arms. The measured resistance is processed by the instrument cluster to implement an anti-slosh function. This monitors the signal and updates the fuel gauge pointer position at regular intervals, preventing constant pointer movement caused by fuel movement in the tank due to cornering or braking.

A warning indicator is incorporated in the instrument cluster and illuminates when the fuel level is at or below 10 liters (2.64 US gallons).

The fuel level sender signals are converted into a CAN bus message by the instrument cluster as a direct interpretation of the fuel tank contents in liters. The ECM uses the CAN bus message to store additional OBD (on-board diagnostic) P Codes for misfire detection when the fuel level is below a predetermined capacity.

**Left Hand Fuel Level Sensor Resistance/Fuel Gauge Read out Table**

**NOTE:**

These figures are with the vehicle on level ground. Sensor readings will differ with varying vehicle inclinations.

| SENDER UNIT RESISTANCE, OHMS | NOMINAL GAUGE READING |
|---|---|
| 51 | Empty |
| 84 | Low fuel level illumination (12.5L) |
| 375 | Half full |
| 911 | Full |

**Right Hand Fuel Level Sensor Resistance/Fuel Gauge Read out Table**

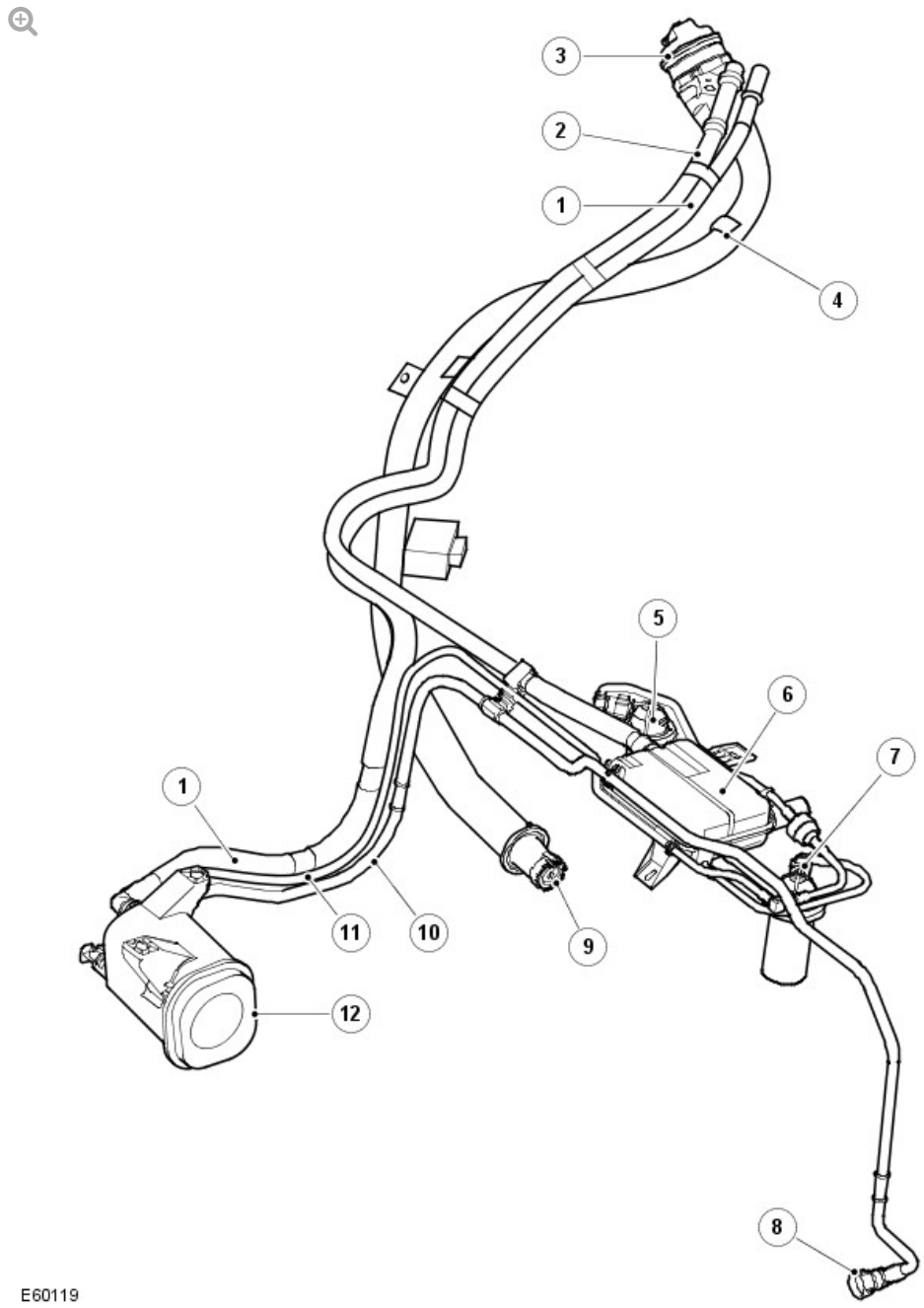
**NOTE:**

These figures are with the vehicle on level ground. Sensor readings will differ with varying vehicle inclinations.

| SENDER UNIT RESISTANCE, OHMS | NOMINAL GAUGE READING |
|---|---|
| 86 | Empty |
| 160 | Low fuel level illumination (12.5L) |
| 441 | Half full |
| 944 | Full |

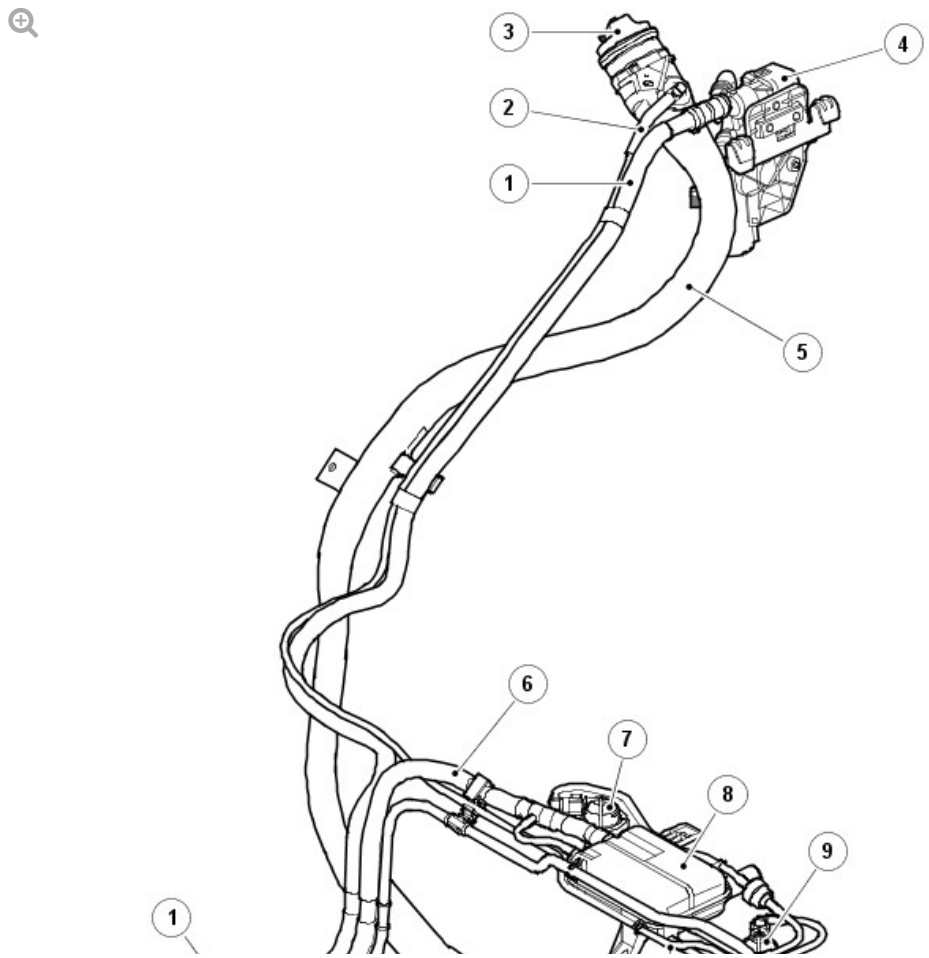
## FUEL FILLER PIPE AND TANK BREATHER ASSEMBLY

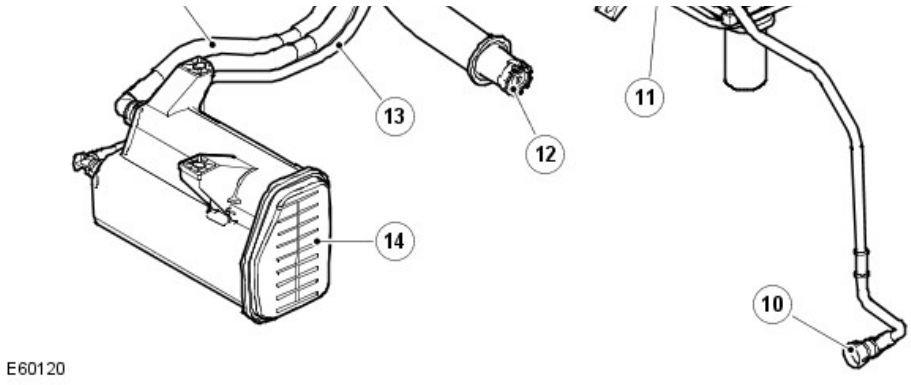
### Fuel Filler Pipe Assembly (All Except NAS)



| ITEM | DESCRIPTION |
|---|---|
| 1 | Charcoal canister breather pipe |
| 2 | Fuel tank breather pipe |
| 3 | Filler head cap |
| 4 | Filler pipe |
| 5 | Roll over valve |
| 6 | Vapor separator |
| 7 | Roll over valve |
| 8 | Connection pipe to purge valve |
| 9 | Filler pipe tank connection and spitback flap |
| 10 | Purge pipe |
| 11 | Fuel tank vapor vent pipe |
| 12 | Charcoal canister |

## Fuel Filler Pipe Assembly (NAS Only)






| ITEM | DESCRIPTION |
|---|---|
| 1 | Charcoal canister breather pipe to DMTL pump |
| 2 | Fuel tank breather pipe |
| 3 | Filler head cap |
| 4 | DMTL pump |
| 5 | Filler pipe |
| 6 | Fuel tank vapor vent pipe |
| 7 | Roll over valve |
| 8 | Vapor separator |
| 9 | Roll over valve |
| 10 | Connection pipe to purge valve |
| 11 | Fuel tank vapor vent pipe |
| 12 | Filler pipe tank connection |
| 13 | Purge pipe |
| 14 | Charcoal canister |

The fuel filler head is positioned at the rear of the vehicle, above the right hand rear wheel. The filler head and cap is covered by a moulded plastic cover which is electrically locked when the vehicle is locked.

The filler cap is a conventional screw in type which is secured to the vehicle with a lanyard. The filler cap must be securely fitted to ensure that the tank venting system is sealed. The cap has a locking mechanism which gives an audible click when the cap is correctly tightened.

Failure to correctly secure the filler cap will result in vapor being lost from the system. On NAS Vehicles, if the cap is incorrectly secured when the engine management system operates the Diagnostic Monitoring Tank Leakage (DMTL) system, the loss of vapor will be detected as a leak and the MIL lamp will be illuminated.

The filler head is a stainless steel fabrication. A bracket provides for the attachment of the filler head to the vehicle body.

A connection on the rear of the filler head allows for the connection of the fuel tank breather pipe from the vapor separator on ROW vehicles and from the roll over valves on NAS vehicles.

The fuel filler pipe locates in the tank and incorporates a spitback flap in the tank end of the pipe. The flap is a spring loaded cover which acts as a 1-way valve, allowing the tank to be filled but preventing fuel leaving the tank into the filler pipe.

All vehicles have a charcoal canister breather pipe which is connected from the charcoal canister and is routed alongside the fuel filler pipe to the filler head. The filler head end of this pipe is connected differently depending on market as follows:

- On ROW vehicles the breather pipe is fitted with a mesh and allows fresh air to be drawn into the charcoal canister when fuel vapor is being purged from the system.
- On NAS vehicles the breather pipe is connected to the DMTL pump. Fresh air is drawn into the pipe via a DMTL filter integral with the pump when fuel vapor is being purged from the system. When the DMTL system is active, the breather pipe is closed by the pump, sealing the system and allowing the system to be pressure checked for leakage.

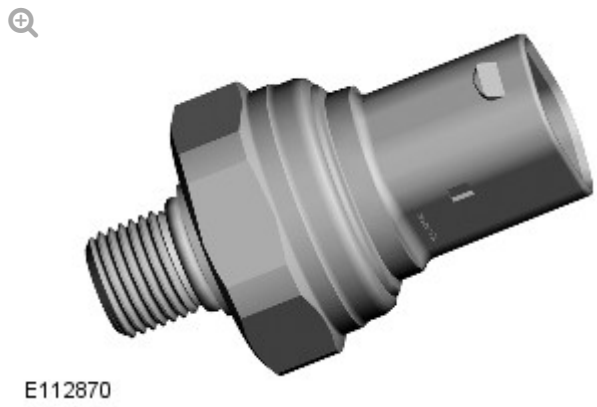
For information on the charcoal canister and purging system refer to the evaporative emissions section.
For additional information, refer to: Engine Emission Control (303-08C Engine Emission Control - V8 5.0L Petrol, Description and Operation).

A second pipe is routed alongside the charcoal canister breather pipe. On ROW vehicles, this pipe is the fuel tank breather pipe from the vapor

separator and is connected into the fuel filler pipe near to the filler head. On NAS vehicles, this pipe is smaller in diameter and also serves as the fuel tank breather pipe. The pipe is not connected to the vapor separator but allows fuel vapor from the right hand roll over valve to vent into the connection with the fuel filler pipe near to the filler head.

A pipe is routed across the top of the tank in front of the vapor separator. This pipe connects the charcoal canister to the purge valve located in the engine compartment.

## FUEL LOW PRESSURE (LP) SENSOR


E112870

The fuel LP sensor supplies a pressure signal to the ECM to enable closed loop control of the fuel pump. The fuel LP sensor is installed in a manifold in the fuel delivery line. The manifold is located in the rear of the front LH wheelarch, behind the splash shield.

# FUEL TANK AND LINES – V8 5.0L PETROL/V8 S/C 5.0L PETROL

## DIAGNOSIS AND TESTING

### PRINCIPLE OF OPERATION

For a detailed description of the fuel tank and lines system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Fuel Tank and Lines (310-01C Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Description and Operation).

### INSPECTION AND VERIFICATION

**WARNINGS:**

- Eye protection must be worn at all times when working on or near any fuel related components. Failure to follow this instruction may result in personal injury.
- This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow this instruction may result in personal injury.
- After carrying out repairs, the fuel system must be checked visually for leaks. This should be done after the engine has been run, but with the engine switched **OFF**. Failure to follow this instruction may result in personal injury.
- If taken internally, **DO NOT** induce vomiting. Seek immediate medical attention. Failure to follow this instruction may result in personal injury.
- If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention. Failure to follow this instruction may result in personal injury.
- Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention. Failure to follow this instruction may result in personal injury.

**CAUTIONS:**

- Before disconnecting any part of the system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into the fuel system. Failure to follow this instruction may result in damage to the vehicle.
- It is essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in damage to the vehicle.
- Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of

a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

**NOTES:**

- Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.
- When measuring fuel sender resistance values with a multimeter, it is critical to use the correct multimeter setting. The multimeter should **not** be on the 'Auto' setting and **must** be set to 'Manual'. This will help prevent incorrect diagnosis and unnecessary replacement of fuel senders. If the multimeter range is set at 'Auto' then, during a sweep of the sender from 50 Ohms to 998 Ohms, the multimeter has to change its measurement range. For approximately 1 second, during the range switch over point, the multimeter display indicates an open circuit. This can lead to a mis-diagnosis of a fuel sender fault.

**1.** Verify the customer concern

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

**Visual Inspection**

| MECHANICAL | ELECTRICAL |
|---|---|
| ▪ Low/contaminated fuel<br>▪ Fuel supply/return line(s)<br>▪ Fuel tank and filler pipe<br>▪ Fuel leak(s)<br>▪ Fuel filler cap<br>▪ Fuel filter<br>▪ Push connect fittings<br>▪ Fuel pump | ▪ Fuses<br>▪ Links<br>▪ Relays<br>▪ Fuel Pump Driver Module (FPDM)<br>▪ Fuel pump module<br>▪ Sensor(s)<br>▪ Engine control module (ECM)<br>▪ Central Junction Box (CJB)<br>▪ Restraints Control Module (RCM) |

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

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

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

## SYMPTOM CHART

| SYMPTOM | POSSIBLE CAUSES | ACTION |
|---|---|---|
| Engine cranks, but does not fire | ▪ Engine breather system disconnected/restricted<br>▪ Ignition system<br>▪ Fuel system<br>▪ Electronic engine control | ▪ Ensure the engine breather system is free from restriction and is correctly installed<br>▪ Check for ignition system, fuel system and electronic engine control DTCs and refer to the relevant DTC Index |
| Engine cranks and fires, but will not start | ▪ Evaporative emissions purge valve<br>▪ Fuel pump<br>▪ Spark plugs<br>▪ HT short to ground (tracking) check rubber boots for cracks/damage<br>▪ Ignition system | ▪ Check for evaporative emissions, fuel system and ignition system related DTCs and refer to the relevant DTC Index |
| Difficult cold start | ▪ Engine coolant level/anti-freeze content<br>▪ Battery<br>▪ Electronic engine controls<br>▪ Fuel pump<br>▪ Purge valve | ▪ Check the engine coolant level and condition<br>▪ Ensure the battery is in a fully charged and serviceable condition<br>▪ Check for electronic engine controls, engine emissions, fuel system and evaporative emissions system related DTCs and refer to the relevant DTC Index |
| Difficult hot start | ▪ Injector leak<br>▪ Electronic engine control<br>▪ Purge valve<br>▪ Fuel pump | ▪ Check for injector leak, install new injector as required<br>▪ Check for electronic engine controls, evaporative emissions, fuel system, ignition system and engine emission system related |

| | | |
|---|---|---|
| | ▪ Ignition system | DTCs and refer to the relevant DTC Index |
| Difficult to start after hot soak (vehicle standing, engine off, after engine has reached operating temperature) | ▪ Injector leak<br>▪ Electronic engine control<br>▪ Purge valve<br>▪ Fuel pump<br>▪ Ignition system | ▪ Check for injector leak, install new injector as required<br>▪ Check for electronic engine controls, evaporative emissions, fuel system, ignition system and engine emission system related DTCs and refer to the relevant DTC Index |
| Engine stalls soon after start | ▪ Breather system disconnected/restricted<br>▪ ECM relay<br>▪ Electronic engine control<br>▪ Ignition system<br>▪ Air intake system restricted<br>▪ Air leakage<br>▪ Fuel lines | ▪ Ensure the engine breather system is free from restriction and is correctly installed<br>▪ Check for electronic engine control, ignition system and fuel system related DTCs and refer to the relevant DTC Index<br>▪ Check for blockage in air filter element and air intake system<br>▪ Check for air leakage in air intake system |
| Engine hesitates/poor acceleration | ▪ Fuel pressure, fuel pump, fuel lines<br>▪ Injector leak<br>▪ Air leakage<br>▪ Electronic engine control<br>▪ Throttle motor<br>▪ Restricted accelerator pedal travel (carpet, etc)<br>▪ Ignition system<br>▪ Transmission malfunction | ▪ Check for fuel system related DTCs and refer to the relevant DTC Index<br>▪ Check for injector leak, install new injector as required<br>▪ Check for air leakage in air intake system<br>▪ Ensure accelerator pedal is free from restriction<br>▪ Check for electronic engine controls, ignition, engine emission system and transmission related DTCs and refer to the relevant DTC Index |
| Engine backfires | ▪ Fuel pump/lines<br>▪ Air leakage<br>▪ Electronic engine controls<br>▪ Ignition system<br>▪ Sticking variable camshaft timing (VCT) | ▪ Check for fuel system failures<br>▪ Check for air leakage in intake air system<br>▪ Check for electronic engine controls, ignition system and VCT system related DTCs and refer to the relevant DTC Index |

| | | |
|---|---|---|
| | hub | |
| Engine surges | ▪ Fuel pump/lines<br>▪ Electronic engine controls<br>▪ Throttle motor<br>▪ Ignition system | ▪ Check for fuel system failures<br>▪ Check for electronic engine controls, throttle system and ignition system related DTCs and refer to the relevant DTC Index |
| Engine detonates/knocks | ▪ Fuel pump/lines<br>▪ Air leakage<br>▪ Electronic engine controls<br>▪ Sticking VCT hub | ▪ Check for fuel system failures<br>▪ Check for air leakage in intake air system<br>▪ Check for electronic engine controls and VCT system related DTCs and refer to the relevant DTC Index |
| No throttle response | ▪ Electronic engine controls<br>▪ Throttle motor | ▪ Check for electronic engine controls and throttle system related DTCs and refer to the relevant DTC Index |
| Poor throttle response | ▪ Breather system disconnected/restricted<br>▪ Electronic engine controls<br>▪ Transmission malfunction<br>▪ Traction control event<br>▪ Air leakage | ▪ Ensure the engine breather system is free from restriction and is correctly installed<br>▪ Check for electronic engine controls, transmission and traction control related DTCs and refer to the related DTC Index<br>▪ Check for air leakage in intake air system |
| Fuel gauge reading empty with fuel in the fuel tank | ▪ Active fuel level sensor circuit open circuit<br>▪ Passive fuel level sensor circuit open circuit<br>▪ Instrument cluster internal failure | ▪ Using the manufacturer approved diagnostic system, perform the guided diagnostic routine - Fuel Level Sensor Test |
| Fuel gauge not reading empty with no fuel in the fuel tank | ▪ Jet pump fault<br>▪ Fuel crossover tube blocked or leaking | ▪ Using the manufacturer approved diagnostic system, check datalogger signals - Fuel Level Sensor "pump/active/A" (0xD908) - Fuel Level Sensor "eject/passive/B" (0xD907). Refer to the table below. If the right sensor reads empty when the left sensor reads more |

| | | |
|---|---|---|
| | | when the left sensor reads more than empty, check that the jet pump is transferring fuel from the left side to the right side |
| Fuel gauge reading is inaccurate | ▪ Electric park brake control module longitudinal acceleration sensor fault may result in misleading inclination readings transmitted to the instrument cluster via the CAN network<br>▪ Active fuel level sensor circuit open circuit<br>▪ Passive fuel level sensor circuit open circuit<br>▪ Instrument cluster internal failure | ▪ Using the manufacturer approved diagnostic system, check the electric park brake control module for longitudinal acceleration sensor related DTCs. If DTCs C0062-01, C0062-02 or C0062-54 are present, refer to the DTC index for the appropriate remedial actions. Clear DTCs and retest<br>▪ If fault persists, using the manufacturer approved diagnostic system, perform the guided diagnostic routine - Fuel Level Sensor Test |

## FUEL GAUGE, RESISTANCE, VOLTAGE AND FUEL TANK LEVEL COMPARISON CHART

Use the chart to determine fuel tank fuel volume versus fuel gauge reading to determine the fuel level symptom and fault.

**NOTES:**

- The vehicle must be parked on a level surface to obtain an accurate fuel level gauge reading.
- The actual values may vary, according to the quantity of fuel in the left and right sides of the fuel tank.

**Volume, Resistance and Voltage Values**

407.60

| GAUGE READING | FILL VOLUME (L) | FUEL LEVEL SENSOR "PUMP/ACTIVE/A" (0XD908) - RIGHT SIDE | | FUEL LEVEL SENSOR "EJECT/PASSIVE/B" (0XD907) - LEFT SIDE | |
|---|---|---|---|---|---|
| | | RESISTANCE (Ω) | VOLTAGE (V) | RESISTANCE (Ω) | VOLTAGE (V) |

| | | | | | |
|---|---|---|---|---|---|
| | 0 | 51.60 | 0.37 | 51.90 | 0.38 |
| | 1 | 51.60 | 0.37 | 51.90 | 0.38 |
| | 2 | 59.80 | 0.42 | 51.90 | 0.38 |
| | 3 | 75.90 | 0.52 | 51.90 | 0.38 |
| | 4 | 84.60 | 0.57 | 51.90 | 0.38 |
| | 5 | 102.10 | 0.69 | 51.90 | 0.38 |
| Empty | 6 | 111.20 | 0.73 | 51.90 | 0.38 |
| | 8 | 130.20 | 0.84 | 51.90 | 0.38 |
| | 10 | 150.60 | 0.94 | 51.90 | 0.38 |
| | 12 | 171.50 | 1.04 | 51.90 | 0.38 |
| | 14 | 193.90 | 1.15 | 51.90 | 0.38 |
| | 16 | 217.20 | 1.25 | 51.90 | 0.38 |
| | 18 | 241.40 | 1.36 | 51.90 | 0.38 |
| | 20 | 267.50 | 1.46 | 51.90 | 0.38 |
| | 22 | 295.50 | 1.56 | 51.90 | 0.38 |
| | 24 | 325.80 | 1.67 | 51.90 | 0.38 |
| | 26 | 357.10 | 1.77 | 51.90 | 0.38 |
| | 28 | 390.60 | 1.88 | 51.90 | 0.38 |
| | 30 | 407.60 | 1.93 | 51.90 | 0.38 |
| | 32 | 407.60 | 1.93 | 68.10 | 0.48 |
| | 34 | 1.93 | 84.70 | 0.57 | |
| | 36 | 407.60 | 1.93 | 102.40 | 0.68 |
| | 38 | 407.60 | 1.93 | 121.10 | 0.78 |
| | 40 | 407.60 | 1.93 | 140.60 | 0.90 |
| | 42 | 407.60 | 1.93 | 150.70 | 0.94 |
| | 44 | 407.60 | 1.93 | 161.60 | 1.01 |
| | 46 | 407.60 | 1.93 | 183.00 | 1.11 |
| ¼ | 48 | 407.60 | 1.93 | 194.40 | 1.16 |
| | 50 | 407.60 | 1.93 | 217.50 | 1.26 |
| | 52 | 407.60 | 1.93 | 230.20 | 1.31 |

| | | | | | |
|---|---|---|---|---|---|
| | 52 | 407.60 | 1.93 | 230.20 | 1.31 |
| | 54 | 407.60 | 1.93 | 244.00 | 1.39 |
| | 56 | 407.60 | 1.93 | 268.50 | 1.47 |
| ½ | 58 | 407.60 | 1.93 | 282.00 | 1.52 |
| | 60 | 407.60 | 1.93 | 296.50 | 1.57 |
| | 62 | 407.60 | 1.93 | 311.70 | 1.63 |
| | 64 | 407.60 | 1.93 | 341.80 | 1.73 |
| | 66 | 407.60 | 1.93 | 357.50 | 1.78 |
| | 68 | 407.60 | 1.93 | 374.10 | 1.85 |
| | 70 | 426.30 | 1.99 | 391.10 | 1.89 |
| | 72 | 444.60 | 2.03 | 408.80 | 1.94 |
| | 74 | 464.40 | 2.09 | 427.40 | 2.00 |
| | 76 | 484.10 | 2.14 | 445.80 | 2.04 |
| | 78 | 505.40 | 2.19 | 465.30 | 2.10 |
| | 80 | 526.70 | 2.23 | 485.30 | 2.15 |
| | 82 | 550.10 | 2.29 | 506.60 | 2.20 |
| | 84 | 574.40 | 2.36 | 528.10 | 2.25 |
| | 86 | 600.40 | 2.41 | 551.10 | 2.30 |
| ¾ | 88 | 626.20 | 2.46 | 598.90 | 2.40 |
| | 90 | 652.70 | 2.51 | 624.50 | 2.46 |
| | 92 | 679.20 | 2.56 | 651.70 | 2.51 |
| | 94 | 707.20 | 2.62 | 679.70 | 2.57 |
| | 96 | 770.50 | 2.72 | 738.70 | 2.67 |
| Full | 98 | 803.00 | 2.77 | 770.30 | 2.72 |
| | 100 | 836.40 | 2.82 | 836.60 | 2.82 |
| | 102 | 911.10 | 2.93 | 872.40 | 2.87 |
| | 104 | 950.90 | 2.97 | 950.60 | 2.97 |
| | 105 | 992.10 | 3.02 | 993.10 | 3.03 |

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

REFER to: Diagnostic Trouble Code (DTC) Index - V8 5.0L Petrol/V8 S/C 5.0L Petrol (100-00 General Information, Description and Operation).

FUEL TANK AND LINES - V8 5.0L PETROL/V8 S/C 5.0L PETROL

# FUEL PUMP MODULE (G1224129)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 19.45.03 | PUMP - INTEGRAL - FUEL TANK - REAR - RENEW | 5000 CC, AJ V8 | 1.3 | USED WITHINS | + |

## SPECIAL TOOL(S)


**310-118(LRT-19-009)**

Wrench, Fuel Tank Module

## 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).

1. For additional information, refer to: Fuel System Pressure Release - 5.0L (310-00, General Procedures).

2. For additional information, refer to: Fuel Tank Draining (310-00, General Procedures).

3. For additional information, refer to: Fuel Filter (310-01, Removal and Installation).

4. 

   TORQUE: 10 Nm

5. **CAUTION:**

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

   TORQUE: 35 Nm

   - Using the special tool, remove the fuel sender cover locking ring.

6. **CAUTION:**

Take extra care not to damage the fuel tank level sensor float and arm.

- Depress the clips and release the lower part of the pump and sender unit rearward.
- Withdraw from the fuel tank.

7. **CAUTION:**

Take extra care not to damage the fuel tank level sensor float and arm.

## INSTALLATION

1. To install, reverse the removal procedure.

2. **CAUTIONS:**

- Make sure the fuel pump and sender unit is correctly installed in to the retaining bracket in the fuel tank.
- Take extra care not to damage the fuel tank level sensor float and arm.
- Install a new seal.

**NOTE:**

Make sure the locating tang is installed in the correct position.

3.

**CAUTIONS:**

- Make sure the fuel pump and sender unit is correctly installed in to the retaining bracket in the fuel tank.
- Take extra care not to damage the fuel tank level sensor float and arm.
- Install a new seal.

**NOTE:**

Make sure the locating tang is installed in the correct position.

2012.0 RANGE ROVER (LM), 310-01

FUEL TANK AND LINES – V8 5.0L PETROL/V8 S/C 5.0L PETROL

# FUEL TANK FILLER PIPE (G1224130)

| | | | | | |
|---|---|---|---|---|---|
| 19.55.07 | FILLER PIPE – FUEL TANK – RENEW | 5000 CC, AJ V8 | 2.1 | USED WITHINS | + |

## REMOVAL

### WARNINGS:

- After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow this instruction may result in personal injury.
- After the fuel tank drain is complete always fit the sealing covers over the drain ports. Failure to do so will mean that fuel vapor can escape.
- This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.
- Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

### CAUTIONS:

- Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.
- Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

**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:**

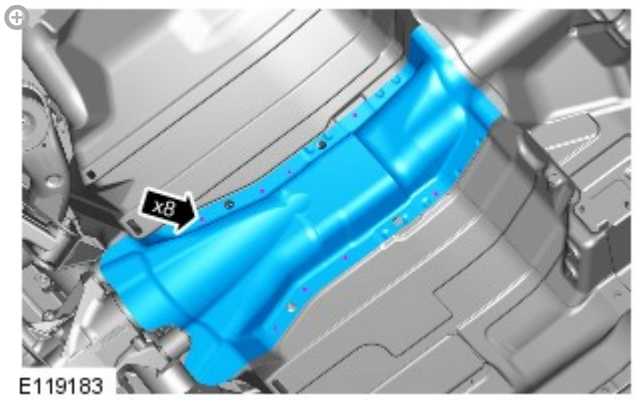
   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. For additional information, refer to: Fuel Tank Draining (310-00, General Procedures).

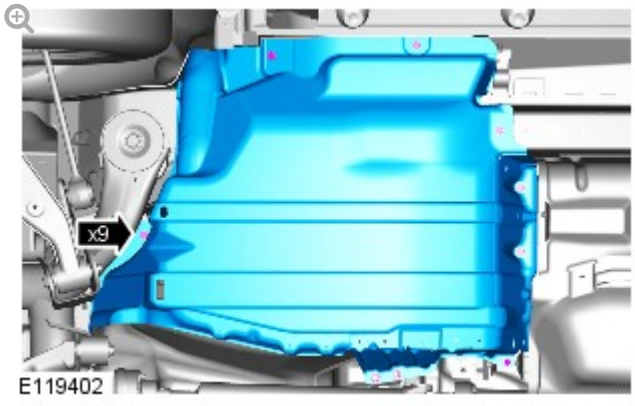
4. For additional information, refer to: Exhaust System (309-00, Removal and Installation).

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

6. 


   TORQUE: 5 Nm

7.




TORQUE: 25 Nm

- Remove the 7 bolts.
- Remove the 2 nuts.

8.

**CAUTION:**

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

- Remove and discard the hose clip.
- Install a new clip.
- Install blanking caps to the exposed ports.

9. Position a container to collect the fuel spillage.

10.

11. Remove the container.
    - Dispose of the collected fuel in accordance with local regulations.
    - Clean any fuel residue remaining in the container.

- Clean any fuel residue remaining in the container.

12. 

13. 

    TORQUE M6: 9 Nm TORQUE M5: 4 Nm

## INSTALLATION

1. To install reverse the removal procedure.

FUEL TANK AND LINES - V8 5.0L PETROL/V8 S/C 5.0L PETROL

# FUEL TANK (G1224132)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 19.55.01 | TANK - RENEW | 5000 CC, AJ V8 | 3.7 | USED WITHINS | + |

SPECIAL TOOL(S)


310-118(LRT-19-


009)

Wrench, Fuel Tank Module

## REMOVAL

### WARNINGS:

- After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow this instruction may result in personal injury.
- After the fuel tank drain is complete always fit the sealing covers over the drain ports. Failure to do so will mean that fuel vapor can escape.
- This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

### CAUTIONS:

- Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.
- Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

**NOTE:**

Removal steps in this procedure may contain installation details.

1. **WARNING:**

   For additional information, refer to: Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions (100-00, Description and Operation).

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

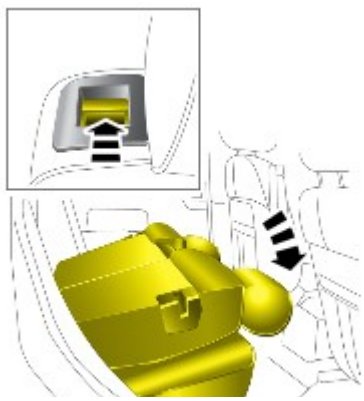
3. **WARNING:**

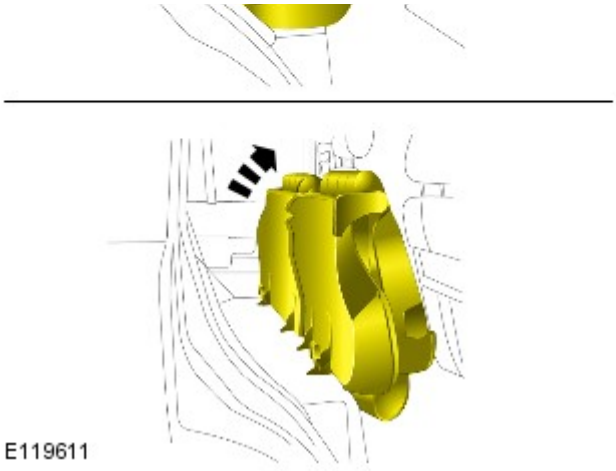
   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

4. For additional information, refer to: Fuel System Pressure Release - 5.0L (310-00, General Procedures).

5. For additional information, refer to: Fuel Tank Draining (310-00, General Procedures).

6. 

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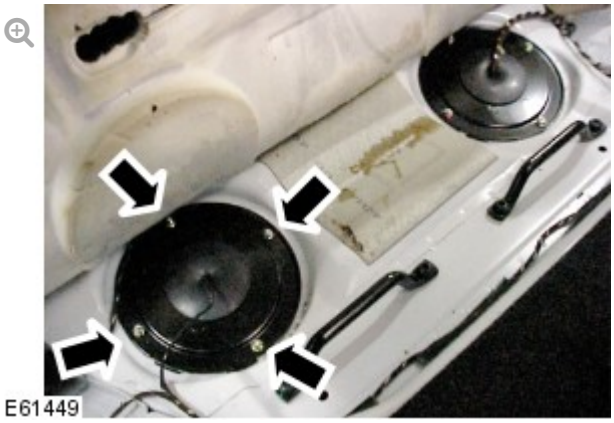
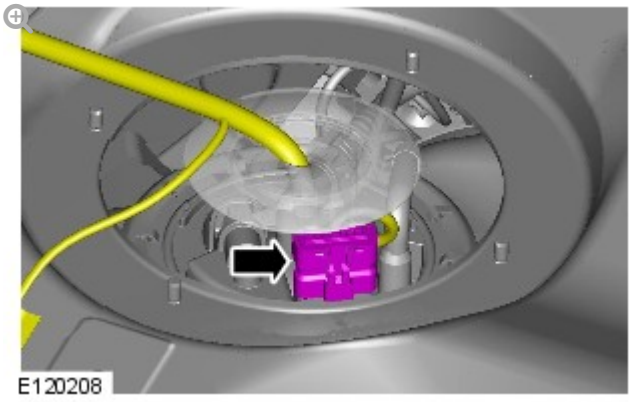



Remove the 4 nuts and remove the fuel tank RH access cover.

- TORQUE: 10 Nm

8.

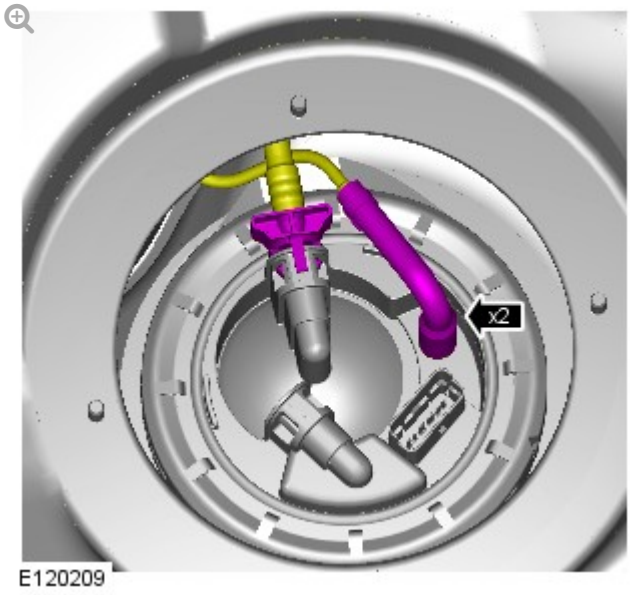



9.

**CAUTION:**

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

open connections to prevent contamination.



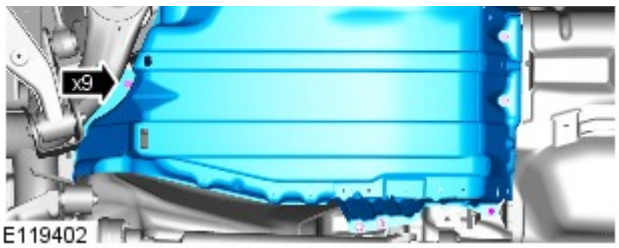

10. For additional information, refer to: Rear Subframe - 5.0L (502-00, Removal and Installation).

11. **CAUTION:**

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

12. **NOTE:**

Right-hand shown, left-hand similar.



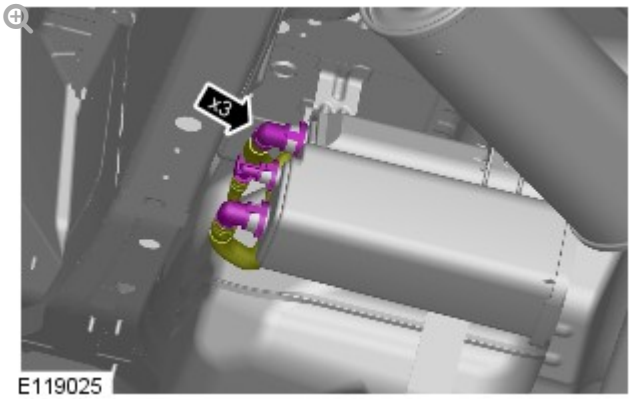

- TORQUE: 22 Nm

13.

**CAUTION:**

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

14.

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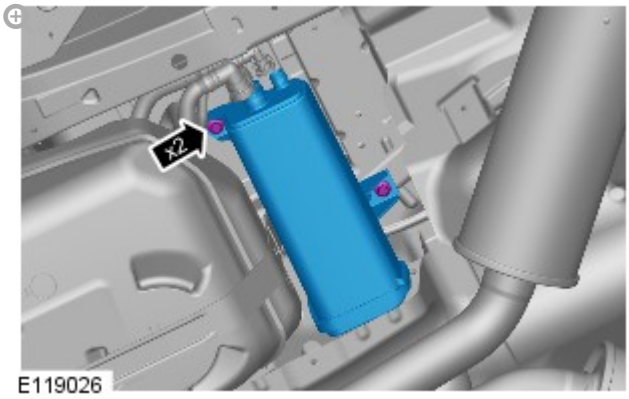


- TORQUE: 19 Nm

16.

17. **CAUTION:**

Position the breather hose and vent hose through the vehicle body during the fuel tank removal operation.

**NOTE:**

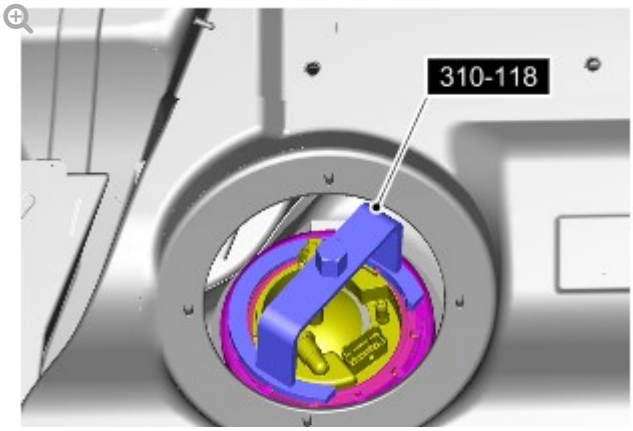
Do not disassemble further if the component is removed for access only.

With assistance, remove the fuel tank.

- TORQUE: 19 Nm

18. **NOTE:**

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

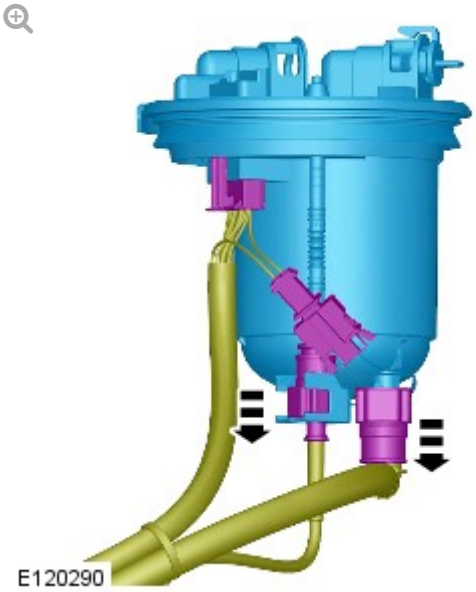



TORQUE: 35 Nm

19.

**CAUTION:**

Be prepared to collect escaping fuel.




20.

**NOTE:**

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

TORQUE: 35 Nm

21.

**CAUTION:**

Take extra care not to damage the fuel tank level sensor float and arm.

- Depress the clips and release the lower part of the pump and sender unit rearward.
- Withdraw from the fuel tank.

22. 

## INSTALLATION

1. **CAUTION:**

Position the breather hose and vent hose through the vehicle body during the fuel tank installation operation.

To install, reverse the removal procedure.

FUEL TANK AND LINES - V8 5.0L PETROL/V8 S/C 5.0L PETROL

# FUEL FILTER (G1224133)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 19.25.02 | FILTER - MAIN - RENEW | 5000 CC, AJ V8 | 0.3 | USED WITHINS | + |

## SPECIAL TOOL(S)


**310-118(LRT-19-009)**

Wrench, Fuel Tank Module

## REMOVAL

**WARNINGS:**

- After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow this instruction may result in personal injury.
- This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.

**CAUTIONS:**

- Always carry out the cleaning process before carrying out any repairs to the fuel injection system components. Failure to follow this instruction may result in foreign matter ingress to the fuel injection system.
- Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

**NOTE:**

Removal steps in this procedure may contain installation details.

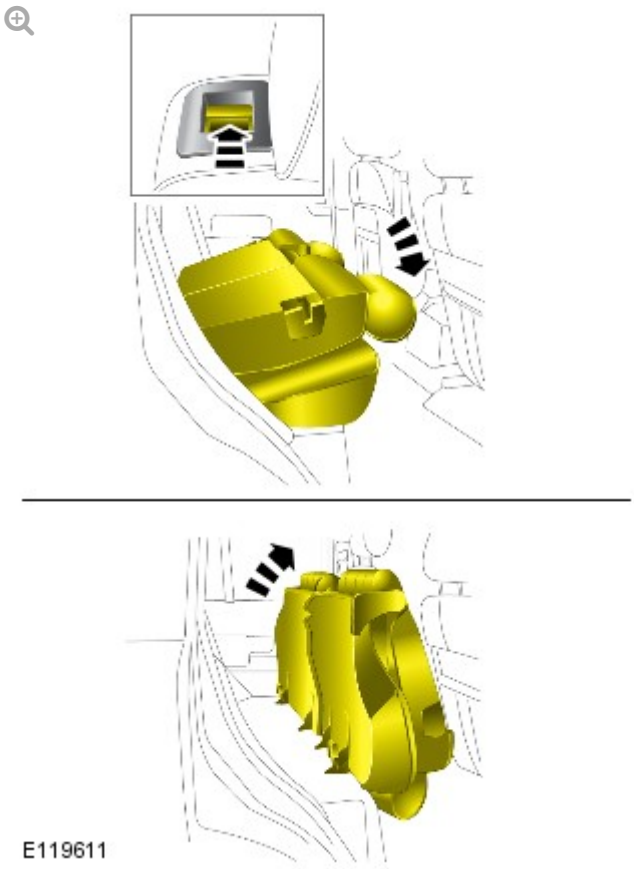
1. **WARNING:**

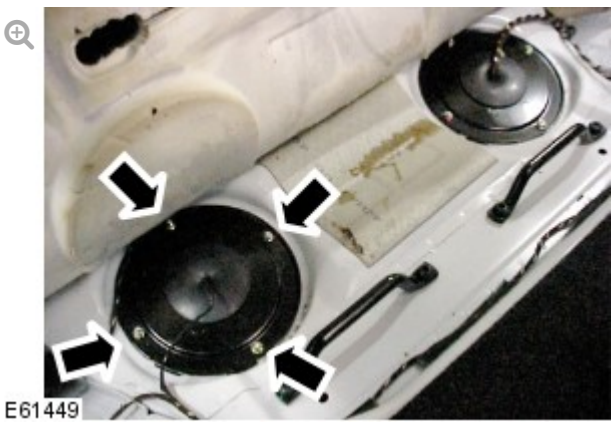
   For additional information, refer to: Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions (100-00, Description and Operation).

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

Specifications).

3. For additional information, refer to: Fuel System Pressure Release - 5.0L (310-00, General Procedures).

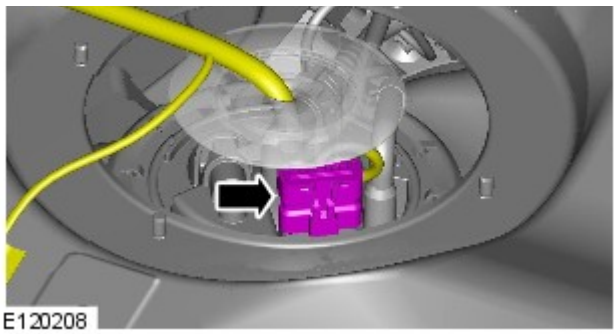
4. 


5. 

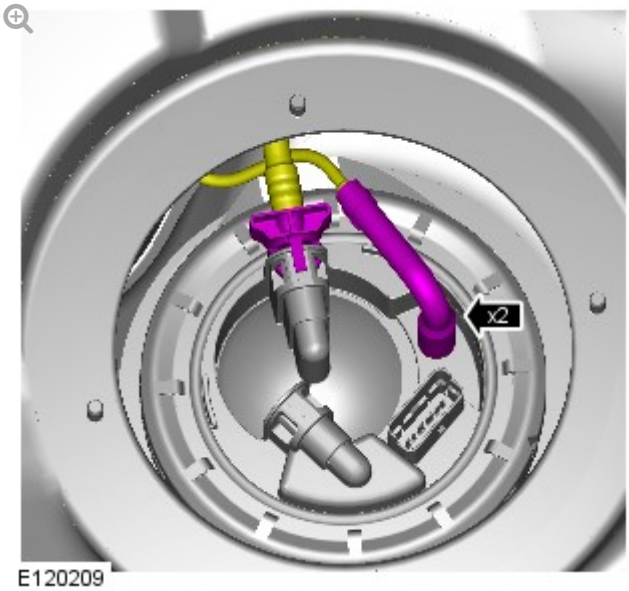

Remove the 4 nuts and remove the fuel tank access cover.

- TORQUE: 10 Nm

6. 

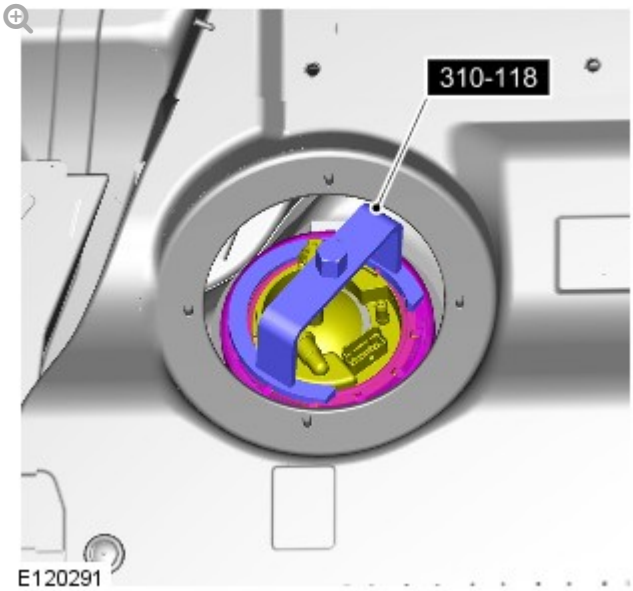

E120208

7.



E120209

8.



E120291

- TORQUE: 35 Nm

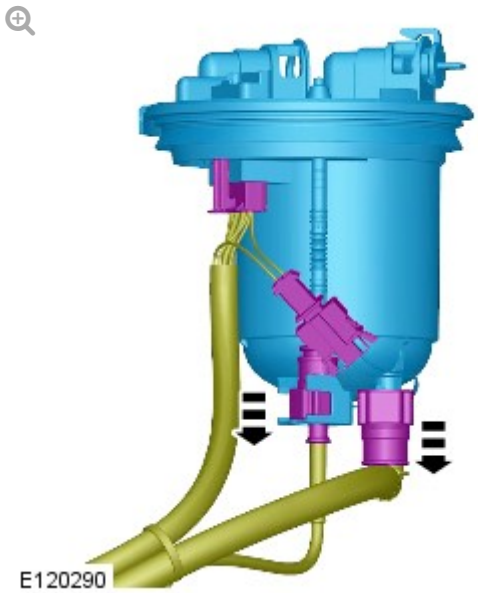
9.

**WARNING:**

Be prepared to collect escaping fuel.

**CAUTION:**

A new O-ring seal is to be installed.




## INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 310-03

# SPEED CONTROL – V8 5.0L PETROL/V8 S/C 5.0L

# PETROL, 5.0L

## SPECIFICATIONS

| ITEM | SPECIFICATION |
|---|---|
| Speed control sensor vertical alignment | 90° ± 1.2° |

| DESCRIPTION | NM | LB-FT | LB-IN |
|---|---|---|---|
| Speed control sensor bracket to front bumper beam retaining nuts | 9 | - | 80 |
| Speed control switch retaining bolts | 2 | - | 18 |

2012.0 RANGE ROVER (LM), 310-03

# SPEED CONTROL – V8 5.0L PETROL/V8 S/C 5.0L PETROL, 5.0L

DESCRIPTION AND OPERATION

## COMPONENT LOCATION 5.0L V8

| ITEM | DESCRIPTION |
| --- | --- |

| | |
|---|---|
| 1 | Anti-lock Brake System (ABS) module |
| 2 | Stop lamp switch |
| 3 | Instrument cluster |
| 4 | Steering wheel mounted speed control switches and steering wheel switch module |
| 5 | Central Junction box (CJB) |
| 6 | ECM (engine control module) |
| 7 | APP (accelerator pedal position) sensor |
| 8 | Adaptive speed control radar module |

## INTRODUCTION

There are two variants of speed control available; a standard system and an adaptive system. The standard system maintains a set speed selected by the driver until operation is suspended or cancelled by a further input from the driver. The adaptive system includes the same functionality as the standard system, but also has the ability to:

- Reduce vehicle speed, to less than the set speed, in order to maintain a selected distance behind a slower moving vehicle
- Accelerate the vehicle back to the set speed, once the way ahead is clear, after reducing the set speed because of a slower moving vehicle
- Alert the driver when rapidly approaching a slower moving vehicle.

Both systems are controlled by the Engine Control Module (ECM).

The standard system and the adaptive system both have the following components:

- Accelerate set **+** switch
- Decelerate **-** switch
- RESUME switch
- CANCEL switch.

Both systems also use:

- The ECM
- The stop lamp switch and the CANCEL switch
- The Accelerator Pedal Position (APP) sensor.

The adaptive system incorporates the following additional components:

- An adaptive speed control module
- An adaptive speed control sensor
- Forward alert - selected by RH (right-hand) instrument cluster menu button on steering wheel
- A time gap switch
- An interface to the Anti-lock Brake System (ABS).

## STANDARD SPEED CONTROL

The standard speed control system is integrated with the within the ECM (engine control module) and uses fueling intervention to automatically maintain a set vehicle speed. Once engaged, the system can also be used to accelerate the vehicle without using the accelerator pedal.

The standard speed control system also uses inputs from the Stop lamp switch, the APP (accelerator pedal position) sensor, the ECM and the ABS (anti-lock brake system) module.

The standard speed control is operated by the driver using only the steering wheel switches. When standard speed control is active, the ECM controls the electronic throttle to adjust the fuel supply as required to maintain the set speed.

The minimum set speed for standard speed control is 20 mph (32 km/h). Speed control is automatically suspended if the following conditions apply:

- Vehicle speed falls below 20 mph (32 km/h)
- The brake pedal is pressed
- The cancel button is pressed

- Neutral, park or reverse gear is selected
- The difference between actual speed and the set speed is too great
- When the maximum (limited) vehicle speed is reached
- If the accelerator pedal is used to accelerate beyond the set speed for too long
- Engine speed too high (cancel limit set just below red line).

### STANDARD SPEED CONTROL SWITCHES

| ITEM | DESCRIPTION |
|---|---|
| 1 | Set speed + accelerate switch |
| 2 | Decelerate - switch |
| 3 | RESUME switch |
| 4 | CANCEL switch |

There are 4 standard speed control switches:

- Set speed **+** accelerate switch
- Decelerate **-** switch
- Cancel switch
- Resume switch.

The standard speed control switches are located on the LH (left-hand) side of the steering wheel. The switches are resistive ladder type switches which vary the resistance of a 5 volt signal sent to them. The resistive ladder is wired to the Steering Wheel Module (SWM), the SWM is a LIN (local interconnect network) node which transmits the data to the CJB (central junction box) which gateways the data onto the high speed CAN (controller area network) bus. In the event of the ECM logging a cruise switch fault DTC (diagnostic trouble code), fault finding should start at the SWM and clockspring. The ECM diagnostic detects that the SWM hasn't provided an updated live counter.

The LIN bus is shared with the keyless vehicle module and docking of the key may cause cruise to become unavailable. This is due to the security module taking over the LIN bus during the key check.

### Engage Speed Control

Speed control is engaged by pressing the set speed accelerate **+** switch. Once engaged the speed can be increased by one of 3 methods:

- Press and hold the set speed accelerate **+** switch which will cause the vehicle to accelerate. When the switch is released the attained speed will be set as the cruise speed.
- Repeatedly pressing the set speed accelerate **+** switch. Each press increases the vehicle speed by 1 mph (2 km/h).
- Use the accelerator pedal to increase the vehicle speed. Once the required speed is reached, a single press of the set speed accelerate **+** switch will set the cruise speed.

When the target speed has been set, a green marker will appear on the outer circumference of the speedometer in the instrument cluster, adjacent to the set speed. If the set speed is changed the marker will move accordingly.

### Reduce Cruising Speed

The set speed can be reduced by pressing and holding the decelerate - switch until the required speed is reached. When the switch is released the speed is reset at that value. The set speed can be reduced incrementally by pressing and releasing the decelerate - switch. Each press will reduce the speed by 1 mph (2 km/h).

### Set Speed Adjustment

Speed control adjustment is limited around the current vehicle speed. This means speed adjustment won't occur when resuming or if the vehicle speed is noticeably different to set speed. This is noticeable when resuming speed control and a large difference exists between the set speed and the current speed. The driver can set a new speed, but can't adjust the old speed.

### Suspend Speed control

Suspending Speed Control means speed control has been deactivated without loss of the memory speed. In all suspend events the memory speed is maintained. Speed control can be suspended numerous events, as described in the general description, there are some additional suspend conditions:

- Park, Reverse or Neutral selected using transmission gear selector
- Hill Descent Control (HDC) has been selected
- Low range has been selected on the transfer box
- Cancel button has been pressed.

A single press of the RESUME switch will resume speed control at the previously set speed.

**NOTE:**

In the event that a memory speed has been lost during a driving cycle, confirm with the customer if the "Cruise Not Available" message was observed. Loss of memory speed implies a fault has occurred.

## ADAPTIVE SPEED CONTROL

The adaptive speed control system uses a forward looking radar module to scan the road ahead, looking for objects that are moving at a different rate to itself. When a target is identified the adaptive speed control system will monitor the time gap between it and the target vehicle. When that gap falls below a set driver selected level, the adaptive speed control system will intervene slowing the vehicle by backing off the throttle and/or applying the brakes, until the correct gap is attained. The driver can choose between four gap settings, 1, 1.4, 1.8 and 2.2 seconds.

The system will detect but not react to the following:

- Vehicles in the oncoming lane
- Stationary vehicles
- Pedestrians
- Vehicles not in the same lane.

Adaptive speed control is active when the vehicle is moving at a minimum speed of 20 mph (32 km/h) and a maximum speed of 112 mph (180 km/h). Activate adaptive speed control by pressing the set speed + switch to select a set speed, as described for standard speed control. The adaptive speed control system will maintain the set speed, but will reduce the vehicle's speed when it detects a slower vehicle ahead.

It is important to note that the system is intended for use in limited driving situations, does not remove control and responsibility from the driver, and at all times can be quickly overridden. The adaptive speed control system is not a collision warning system and will not react to stationary objects. The system does not operate below a minimum speed of approximately 20 mph (32 km/h) since it is unsuitable for use in cities or congested traffic. The system is best suited to main roads/ highways with gradual bends.

The ECM, throttle body and throttle control are unchanged from those used for the standard speed control variants.

### RADAR SENSING

The adaptive speed control system is based on the use of a front mounted electronic radar module. The module transmits a radar beam forward of the vehicle and detects the returning signals reflected off other vehicles and objects ahead.

The radar beam is electronically scanned at a rate of 20 sweeps/second across a total arc of 20° centered on the longitudinal axis of the vehicle. The radar operates at millimetric wavelengths (76 - 77 GHz) and transmits a frequency modulated continuous wave signal at a relatively low power level (no high power pulses). The radar provides a list of 64 targets.

With the ignition ON, the adaptive speed control radar module is powered up but no radar transmissions are emitted until the vehicle is in motion. The radar module detects three primary parameters of objects within the

scanned arc. These are:

- Range
- Relative velocity
- Angle.

**Range**

The radar module detects the presence and ranges of different vehicles and objects within the scanned arc up to a distance of approximately 130 meters (426.5 feet). The transmitted signal frequency changes continuously in a cyclic pattern (modulation). This means that, in the time taken for the signal wave front, to travel to and from a target vehicle (or other object), the transmission frequency will have changed. The difference between the received signal frequency and the new transmission frequency is proportional to the distance between the transmitting vehicle and the target vehicle.

**Relative Velocity**

When the signal is reflected off a vehicle moving at a different speed (opening or closing gap) an effect known as the Doppler shift causes an extra frequency modulation to be imposed on the signal. This Doppler frequency varies with the relative speed of the vehicle being followed, enabling the system to differentiate between vehicles traveling at different speeds and also between moving vehicles and stationary objects.

**Angle**

The antenna consists of several receivers; if an object is offset from the vehicle centre line, there will be a small time difference between the receive time on the near side compared to the far side. The radar can use this time difference to measure the angular position of the object. This enables the system to distinguish between vehicles in different lanes and between vehicles and roadside objects.

FOLLOW MODE

A set speed is selected in the normal speed control manner and this speed is maintained until a slower vehicle is encountered in the lane ahead. When

the vehicle ahead comes within the effective range of the radar sensor, the system identifies it as a target vehicle and an icon is illuminated on the instrument cluster to indicate that the system is in "follow mode". When the distance between the two vehicles closes to a set time gap, the adaptive speed control system closes the throttle and if necessary applies the brakes to maintain the set time gap. Follow mode is effectively a closed loop system. If several vehicles are ahead, the closest vehicle is chosen as the target to follow. If the target vehicle moves out of radar range, or if either vehicle changes lane or drops below the minimum operating speed, the system exits follow mode and the follow mode icon is extinguished. The adaptive speed control system will only raise its speed to the originally set speed, it will not accelerate past this speed to maintain a time gap.

Driver operation of the foot brake or control switches will immediately cancel adaptive speed control.

When the vehicle is in follow mode the Forward Alert warning indicator is illuminated in the instrument cluster and the current gap setting will be displayed in the message center.

| ITEM | DESCRIPTION |
|---|---|
| 1 | Forward Alert active (green) |
| 2 | Adaptive Speed Control active (amber) |
| 3 | Speed control active (green) |

### SYSTEM RESTRICTIONS

The adaptive speed control system is only intended to provide enhanced speed control as described above in certain restricted conditions. The following illustration show circumstances where the adaptive speed control system may brake late or unexpectedly. The driver is required to intervene in these situations.

The following points should be noted:

- Automatic braking is limited to approximately 30% of full pressure (0.3 G

- Automatic braking is limited to approximately 50% of full pressure (0.5 G deceleration) and is intended to provide a smooth, gradual deceleration in follow mode conditions. Harsh braking by the target vehicle or following the target vehicle down to very low speeds or to a halt will require driver intervention on the brakes
- While the radar sensor detects moving and stationary targets for assessment of the environment ahead, the system does not react to or provide any control in situations other than follow mode conditions. Stationary or slow moving vehicles (below 6 mph (10 km/h)), pedestrians, objects on the road and oncoming vehicles in the same lane are not recognized.

**WARNING:**

It must be emphasized that the adaptive speed control system is not a collision warning or avoidance system and that, other than the limited conditions of follow mode, driver intervention will be necessary to control the vehicle speed.

The following illustration shows circumstances where the adaptive speed control system may brake late or unexpectedly. The driver is required to intervene in these situations.

| ITEM | DESCRIPTION |
|---|---|
| 1 | Driving on a different line to the vehicle in front. |
| 2 | Vehicles that merge into the same lane are only detected once they have moved fully into the lane. |
| 3 | On bends in the road there can be issues with detection of the vehicle in front when going into and coming out of a bend. |

In follow mode, some situations may cause target ambiguities for the detection system. These situations include:

- The nearby presence of a third vehicle when driving on a line slightly

offset to the target vehicle

- Vehicles edging into the lane ahead which are not detected by the system until they have moved into the radar beam.

On the approach to, or exit from a bend, a target vehicle may be lost or a new target acquired as vehicles ahead change their angular position with respect to the radar sensor. On a straight road, if the sensing vehicle is in follow mode below its selected set speed, losing the target vehicle will cause the sensing vehicle to accelerate to this set speed. This acceleration is undesirable either on, or entering a bend when the target is suddenly lost, and in this situation the system inhibits the resumption of the set speed.

The speed control system compares vehicle speed data from the ABS module with the relative speed of an external object as detected by the radar sensor to ascertain whether the object is stationary or not.

**NOTE:**

If tires are fitted which are different in diameter from those specified for the vehicle, the vehicle speed, calculated by the ABS module, will not be the true road speed. This situation may cause stationary objects to be falsely identified as moving vehicles and result in automatic deceleration on a clear road.

The radar continuously monitors both moving vehicles and stationary objects to determine if it can 'see' normally. If the radar can detect only a few objects it may be blocked by an accumulation of snow or mud or a physical blockage such as wet paper or an incorrectly located number plate. In a few empty roads areas where there are few roadside objects or other vehicles to detect, it may determine that it is blocked and inhibit adaptive speed control; a DTC is recorded in this instance. The system will reset after the ignition is cycled. In this case the module is not faulty and should not be replaced.

ADAPTIVE SPEED CONTROL SWITCHES

| ITEM | DESCRIPTION |
|---|---|
| 1 | Set speed + accelerate switch |
| 2 | Decelerate - switch |
| 3 | Gap decrease switch |
| 4 | Gap increase switch |
| 5 | RESUME switch |
| 6 | CANCEL switch |

The adaptive speed control system is controlled from the LH steering wheel switches. The switches are the same as used for normal speed control with the addition of 2 time gap setting switches. The time gap setting switches allows the driver to adjust the time gap to one of four pre-set time gaps. The selected time gap is displayed in the vehicle message center.

The time gap will return to the default gap (the third setting) each time the ignition is cycled.

### ADAPTIVE SPEED CONTROL RADAR MODULE

The adaptive speed control radar module is located on the RH side behind the front bumper cover. The radar module is connected to the other vehicle systems via the high speed CAN bus. If the unit is replaced in service the unit must be re-levelled vertically using a level gauge (digital or bubble type).

Horizontal alignment is achieved by putting the module in service mode with an approved Land Rover diagnostic system. The vehicle is then driven for a short period while the sensor calibrates itself. Calibration is complete when the 'follow' icon in the instrument cluster stops flashing.

### FORWARD ALERT

Limited detection and warning of objects ahead is provided during adaptive speed control operation by the Forward Alert warning. The enhanced Forward Alert warning provides additional warnings when the adaptive speed control is not engaged. If an object is detected close ahead, a warning tone will be emitted and a Forward Alert message will be displayed.

The brake will not be applied.

The Forward Alert system is active when the warning indicator in the instrument cluster is illuminated. Forward Alert does not initiate any action, the driver must take the appropriate action when the message is displayed. The system monitors driver intervention and may not issue the warning if the driver has taken the appropriate action (braking, steering or indicating) early enough.

The sensitivity of the warning can be changed using the gap increase and decrease switches when the adaptive cruise control is not active. Confirmation of the gap change is given by Forward Alert being displayed in the message center.

Forward Alert can be switched on or off by the driver using the instrument cluster menu selection.

### ADVANCED EMERGENCY BRAKE ASSIST

**WARNING:**

> Advanced Emergency Brake Assist is an additional safety system and is not intended to override driver responsibility for driving with care and attention.

On vehicles fitted with the Advanced Emergency Brake Assist system, brake response is improved during emergency braking when a moving vehicle is detected close ahead. The system activates if the risk of collision increases after the Forward Alert warning is issued.

After a Forward Alert warning is displayed, the brakes are automatically applied gently in preparation for rapid braking. If the brake pedal is then pressed quickly then braking is fully implemented by the Emergency Brake Assist system, even if the pressure on the brake pedal is light.
For additional information, refer to: Anti-Lock Control - Traction Control (206-09A Anti-Lock Control - Traction Control, Description and Operation).

Advanced Emergency Brake Assist is available at speed above 5 mph (7 km/h) and will function even when Forward Alert and adaptive cruise control

are switched off.

If a fault occurs in the system a message Forward Alert Unavailable is displayed in the message center. Advanced Emergency Brake Assist will not be available until the fault is rectified.

## CONTROL DIAGRAM

**NOTE:**

**A** = Hardwired; **D** = High Speed CAN bus, **O** = LIN bus; **U** = Private CAN bus

| ITEM | DESCRIPTION |
|---|---|
| 1 | APP sensor |
| 2 | Stop lamp switch |
| 3 | Electric throttle |
| 4 | ECM |
| 5 | TCM (transmission control module) |
| 6 | Instrument cluster |
| 7 | Clockspring |
| 8 | Steering wheel speed control switches (adaptive speed control version shown) |
| 9 | ABS (anti-lock brake system) module |
| 10 | Diagnostic socket |
| 11 | Transmission selector |
| 12 | Adaptive speed control radar Module (adaptive speed control system only) |

2012.0 RANGE ROVER (LM), 310-03

# SPEED CONTROL – V8 5.0L PETROL/V8 S/C 5.0L PETROL, 5.0L

DIAGNOSIS AND TESTING

## PRINCIPLES OF OPERATION

There are two options of speed control available, adaptive speed control and non-adaptive speed control. For a detailed description of the speed control systems, refer to the relevant Description and Operation section in the workshop manual. REFER to: Speed Control (310-03B, Description and Operation).

## INSPECTION AND VERIFICATION

**1.** Verify the customer concern.

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

**Visual Inspection**

| MECHANICAL | ELECTRICAL |
| --- | --- |
| ▪ Speed control sensor<br>▪ Ensure the speed control sensor is free from | ▪ Fuses<br>▪ Wiring harness |

| | |
|---|---|
| obstructions<br>▪ Speed control module | ▪ Electrical connector(s)<br>▪ Steering wheel switches<br>▪ Brake switch<br>▪ Speed control sensor<br>▪ Speed control module<br>▪ Engine Control Module (ECM) |

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

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

## SPEED CONTROL SENSOR ADJUSTMENT (VEHICLES WITH ADAPTIVE SYSTEM INSTALLED)

An incorrectly aligned speed control sensor can cause incorrect system operation. Before starting any repair work on the speed control system, on vehicles with the adaptive system installed, check the adjustment of the speed control sensor.

## SYMPTOM CHART

| SYMPTOM | POSSIBLE CAUSE | ACTION |
|---|---|---|
| Speed control inhibited or disabled | ▪ Default mode enabled<br>▪ Supply voltage to speed control module<br>▪ Supply voltage to speed control sensor<br>▪ Steering wheel speed | ▪ Check for Network related DTCs that could be caused by power failure to the module or sensor and refer to DTC Index.<br>▪ Check for steering wheel speed control switch and circuit faults.<br>▪ Check for engine throttle position sensor DTCs and refer to the relevant DTC Index.<br>▪ Check for brake switch faults. |

| | | |
|---|---|---|
| | wheel speed control switch(s)<br>▪ Steering wheel speed control switch circuit<br>▪ Throttle sensors<br>▪ Brake switch | |
| Unable to regulate/adjust vehicle speed | ▪ Steering wheel switch malfunction | ▪ Check for steering wheel speed control switch and circuit faults. |
| Unable to cancel speed control from steering wheel | ▪ Steering wheel switch malfunction | ▪ Check for steering wheel speed control switch and circuit faults. |
| Unable to cancel speed control from brake pedal | ▪ Brake switch malfunction | ▪ Check for brake switch faults. |

## DTC INDEX

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

2012.0 RANGE ROVER (LM), 310-03

SPEED CONTROL – V8 5.0L PETROL/V8 S/C 5.0L PETROL, 5.0L

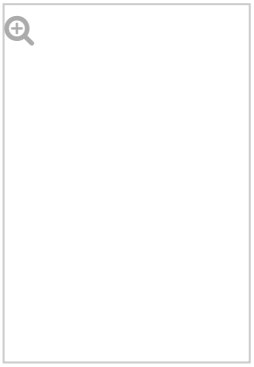
# SPEED CONTROL SENSOR

# SPEED CONTROL SENSOR ADJUSTMENT (G1348360)

GENERAL PROCEDURES

| | | | | | |
|---|---|---|---|---|---|
| 19.25.02 | FILTER - MAIN - RENEW | 5000 CC, AJ V8 | 0.3 | USED WITHINS | + |
| 19.75.27 | SPEED CONTROL SENSOR - CHECK AND ADJUST ALIGNMENT | ALL DERIVATIVES | 1 | USED WITHINS | + |

## SPECIAL TOOL(S)



310-148

Setting Tool, Speed Control

**NOTES:**

- Removal steps in this procedure may contain installation details.
- This procedure details how to adjust the speed control sensor vertically. There is no horizontal adjustment required.

1. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

2. **CAUTION:**

   Drive the vehicle on to a flat, level surface.

Set the air suspension ride height to the STANDARD setting.

3. **NOTES:**

   - Using the special tool, check the speed sensor is level, (+/- 0.5 degree).
   - Make sure that the special tool is installed to the front of the speed control sensor as it is shown in the illustration to check the level.

*Special Tool(s):* 310-148

4. **NOTES:**

   - The speed sensor has no mechanical horizontal adjustment.
   - Rotate the vertical adjuster.

Using the special tool, set the speed control sensor.

5. Refer to: Front Bumper Cover (501-19 Bumpers, Removal and Installation).

# SPEED CONTROL DEACTIVATOR SWITCH (G1224175)

REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 19.75.35 | SWITCH - BRAKE - RENEW | ALL DERIVATIVES | 0.1 | USED WITHINS | + |

## REMOVAL

**NOTE:**

Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01, General Procedures).

2. 

3. 

4. **CAUTION:**

   Make sure that the brake pedal remains in the rest position during this procedure.

5. **CAUTION:**

   Make sure that the brake pedal remains in the rest position during this procedure.

6. **CAUTION:**

   Make sure that the brake pedal remains in the rest position

during this procedure.

## INSTALLATION

1. To install, reverse the removal procedure.

# SPEED CONTROL SENSOR

(G1348271)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 19.75.35 | SWITCH – BRAKE – RENEW | ALL DERIVATIVES | 0.1 | 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. **WARNING:**

   Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

3. Refer to: Front Bumper Cover (501-19, Removal and Installation).

4. 

*Torque:* **20 Nm**

5. 

6. 

7. 

*Torque:* **9 Nm**

8. 

9. 

## INSTALLATION

**CAUTION:**

Make sure the ball and socket are fully engaged.

1. To install, reverse the removal procedure.

2. Refer to: Speed Control Sensor Adjustment (310-03, General

Procedures).

3. Refer to: Front Bumper Cover (501-19, Removal and Installation).

4. Connect the battery ground cable.
   Refer to: Specifications (414-00, Specifications).

# SPEED CONTROL SWITCH

(G1224178)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 19.75.41 | SWITCH – SPEED CONTROL – RENEW | ALL DERIVATIVES | 0.2 | USED WITHINS | + |

## REMOVAL

**NOTE:**

Removal steps in this procedure may contain installation details.

1. Refer to: Standard Workshop Practices (100-00, Description and Operation).
2. Disconnect the battery ground cable.
   Refer to: Specifications (414-00, Specifications).
3. Refer to: Driver Air Bag Module (501-20, Removal and Installation).
4. 

   *Torque:* **2 Nm**

## INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 412-00

# CLIMATE CONTROL SYSTEM – GENERAL INFORMATION

## SPECIFICATIONS

### Lubricants, Fluids, Sealers and Adhesives

| DESCRIPTION | SPECIFICATION |
|---|---|
| Air conditioning (A/C) refrigerant | HFC 134a |
| A/C compressor oil | ND-OIL8 or Sanden SP10 |

## Capacities

| DESCRIPTION | GRAMMES |
|---|---|
| A/C refrigerant - vehicles fitted with 2 zone - vehicles with 3.6 diesel | 700 |
| A/C refrigerant - vehicles fitted with 2 zone - vehicles with 5.0L | 750 |
| A/C refrigerant - vehicles fitted with 4 zone - vehicles with 3.6 diesel | 880 |
| A/C refrigerant - vehicles fitted with 4 zone - vehicles with 5.0L | 930 |

## Refrigerant Oil Adding Capacities

**NOTE:**

Rotate the A/C compressor shaft at least 6 to 8 turns when draining the refrigerant oil.

| ITEM | MILLILITERS |
|---|---|
| A/C condenser core | Add 33 |
| A/C evaporator | Add 46 |
| A/C compressor | 1. Drain old A/C compressor. With drain plug removed and ports uncapped, rotate shaft to remove A/C compressor oil and measure the amount of oil captured. 2. Drain new A/C compressor into a clean vessel. With drain plug removed and ports uncapped, rotate shaft to remove oil. Then add back a quantity of the new oil that is identical to the quantity of oil removed from the old A/C compressor. However, if this quantity is less than 30ml, then make it up to 30ml. |
| A/C lines - if air conditioning has been operational. | Add 10 per A/C line |
| A/C system after flushing - with compressor included - vehicles fitted with 2 zone - vehicles with 3.6 diesel | Add 120 |
| A/C system after flushing - with compressor included - vehicles fitted with | Add 110 |

| | |
|---|---|
| 2 zone - vehicles with 5.0L | |
| A/C system after flushing - with compressor included - vehicles fitted with 4 zone - vehicles with 3.6 diesel | Add 170 |
| A/C system after flushing - with compressor included - vehicles fitted with 4 zone - vehicles with 5.0L | Add 200 |
| A/C system after flushing - without a new compressor installed - remaining A/C compressor oil is to be drained - vehicles fitted with 2 zone - vehicles with 3.6 diesel | Add 120 |
| A/C system after flushing - without a new compressor installed - remaining A/C compressor oil is to be drained - vehicles fitted with 2 zone - vehicles with 5.0L | Add 110 |
| A/C system after flushing - without a new compressor installed - remaining A/C compressor oil is to be drained - vehicles fitted with 4 zone - vehicles with 3.6 diesel | Add 170 |
| A/C system after flushing - without a new compressor installed - remaining A/C compressor oil is to be drained - vehicles fitted with 4 zone - vehicles with 5.0L | Add 200 |
| A/C system after flushing - vehicles | - |

| | |
|---|---|
| fitted with 2 zone - with a new compressor installed - A/C compressor supplied with 120ml | |
| A/C system after flushing - vehicles fitted with 2 zone - with a new compressor installed - A/C compressor supplied with 110ml | - |
| A/C system after flushing - vehicles fitted with 4 zone - with a new compressor installed - A/C compressor supplied with 120ml | Add 50 |
| A/C system after flushing - vehicles fitted with 4 zone - with a new compressor installed - A/C compressor supplied with 110ml | Add 90 |

2012.0 RANGE ROVER (LM), 412-00

# CLIMATE CONTROL SYSTEM – GENERAL INFORMATION

## DIAGNOSIS AND TESTING

### PRINCIPLES OF OPERATION

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

Air Distribution and Filtering (412-01A Air Distribution and Filtering, Description and Operation),
Auxiliary Heater (412-02B Auxiliary Heating, Description and Operation),
Air Conditioning (412-03A Air Conditioning, Description and Operation),
Auxiliary Climate Control (412-03B Auxiliary Climate Control, Diagnosis and Testing).

### INSPECTION AND VERIFICATION

**WARNING:**

Servicing must be carried out by personnel familiar with both vehicle system and the charging and testing equipment. All operations must be carried out in a well ventilated area away from open flame and heat sources.

**CAUTION:**

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

**NOTES:**

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

**1.** Verify the customer concern

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

**Visual Inspection**

| MECHANICAL | ELECTRICAL |
| --- | --- |
| ▪ Coolant level | ▪ Fuses |

| | |
|---|---|
| ▪ Hoses<br>▪ Coolant pump<br>▪ Cabin air filter<br>▪ Primary drive belt<br>▪ Air conditioning compressor<br>▪ Thermostatic expansion valve<br>▪ Receiver drier<br>▪ Air conditioning condenser<br>▪ Refrigerant pipes<br>▪ Fuel fired booster heater<br>▪ Fuel fired booster heater fuel pump<br>▪ Fuel fired booster heater fuel pipes | ▪ Wiring harnesses and connectors<br>▪ Blower<br>▪ Air conditioning compressor electronic control valve<br>▪ Electric cooling fan<br>▪ Automatic temperature control module<br>▪ Refrigerant pressure sensor |

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

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

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

## AIR CONDITIONING SYSTEM PERFORMANCE CHECK

**NOTES:**

- Normal pressures for a correctly charged and working system are 1.0 bar to 2.0 bar (low pressure system) and 11.0 bar to 15.0 bar (high pressure system).
- Normal temperature (measured at the center air vent) for a correctly charged and working system is -7°C to -2°C when the ambient temperature is 20°C.

When a failure symptom has been reproduced, refer to the symptom chart. After completing a repair, the air conditioning performance check should be repeated to confirm that the repair is successful.

1. Close the valves on the air conditioning station
1. Connect the air conditioning station to the vehicle charging ports
1. Check that the gauges register pressure
1. Open all doors and the tailgate
1. Start the engine
1. Set the temperature to the lowest setting (all zones)
1. Set the blower speed to maximum
1. Set the recirculate switch to on
1. Set the air conditioning to on and check that the air conditioning compressor clutch engages and that the gauges register a change in pressure
1. Insert a temperature probe into the centre air vent
1. Raise engine speed to 1500rpm and maintain this speed for 5 minutes
1. Check the pressure gauge readings

1. Check the temperature reading

## SYMPTOM CHART

| SYMPTOM | POSSIBLE CAUSES | ACTION |
|---|---|---|
| No refrigerant in air conditioning system (no | ▪ Refrigerant leak | ▪ GO to Pinpoint Test **A.** |

| | | |
|---|---|---|
| pressure registered on gauges) | | |
| Air conditioning compressor clutch not engaging | ▪ Air conditioning compressor clutch circuit short circuit to ground, short circuit to power, open circuit, high resistance<br>▪ Refrigerant undercharged | ▪ Refer to the electrical circuit diagrams and check the air conditioning compressor clutch circuit for short circuit to ground, short circuit to power, open circuit, high resistance<br>▪ GO to Pinpoint Test **B.** |
| Air conditioning inoperative (no change in pressure when setting the air conditioning to on) | ▪ Climate control system fault<br>▪ Air conditioning compressor internal failure | ▪ Using the manufacturer approved diagnostic system, check the automatic temperature control module for related DTCs and refer to the relevant DTC index<br>▪ GO to Pinpoint Test **C.** |
| Air conditioning operates briefly and then switches off | ▪ Electric cooling fan inoperative<br>▪ Air conditioning condenser airflow obstructed<br>▪ Refrigerant overcharged | ▪ Check the operation of the electric cooling fan<br>▪ Check the air conditioning condenser for external obstructions<br>▪ Using the manufacturer approved equipment, recover the refrigerant. Evacuate and recharge the air conditioning system with the correct quantity of refrigerant and oil |
| High and low pressure system pressures **unstable** | ▪ Refrigerant contaminated<br>▪ Air conditioning compressor internal failure | ▪ GO to Pinpoint Test **D.** |
| High and low pressure system pressures **normal** and insufficient cooling | ▪ Excessive volume of oil in the refrigerant or refrigerant contaminated | ▪ Using the manufacturer approved equipment, recover the refrigerant. Evacuate and recharge the air conditioning system with the correct quantity of refrigerant and oil |
| High and low pressure system pressures **too high** | ▪ Electric cooling fan inoperative<br>▪ Air conditioning condenser airflow obstructed | ▪ GO to Pinpoint Test **E.** |

| | | |
|---|---|---|
| | ▪ obstructed<br>▪ Thermostatic expansion valve internal failure<br>▪ Refrigerant overcharged<br>▪ Air conditioning compressor internal failure | |
| High and low pressure system pressures **too low** | ▪ Refrigerant undercharged<br>▪ Low pressure pipe damaged/restricted | ▪ GO to Pinpoint Test **B.** |
| Low pressure system pressure **too high** and high pressure system pressure **too low** | ▪ Air conditioning compressor electronic control valve circuit short circuit to ground, short circuit to power, open circuit, high resistance<br>▪ Air conditioning compressor electronic control valve internal failure | ▪ GO to Pinpoint Test **F.** |
| Low pressure system pressure **too low** and high pressure system pressure **too high** and frost present on the liquid pipe from the condensor | ▪ Liquid pipe from the condensor is restricted<br>▪ Receiver drier restricted | ▪ Check the liquid pipe from the condensor for damage and restrictions. Install a new pipe as necessary<br>▪ Install a new receiver drier as necessary |
| Noise from air conditioning system | ▪ Air conditioning compressor pulley bearing<br>▪ Air conditioning compressor pulley foul condition<br>▪ Air conditioning compressor clutch operation excessively noisy<br>▪ Air conditioning compressor internal failure<br>▪ Thermostatic expansion valve | ▪ GO to Pinpoint Test **G.** |

| | | |
|---|---|---|
| | internal failure<br>▪ Refrigerant undercharged<br>▪ Refrigerant overcharged<br>▪ Air conditioning pipe(s) fouling body | |

## PINPOINT TESTS

**CAUTION:**

When charging the system with nitrogen, the pressure should be regulated to 7.0 bar.

**NOTE:**

This test is performed with the engine **not** running.

| PINPOINT TEST A : LEAK TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| | A1: LEAK TEST 1 |
| | **1** Charge the air conditioning system with nitrogen |
| | **2** Isolate the nitrogen supply |
| | **3** Monitor the pressure gauge and check for leaks for 30 minutes |
| | Has the source of the leak been identified?<br>**Yes**<br>Rectify the leak as necessary. Install a new receiver drier. Using the manufacturer approved equipment, evacuate and recharge the air conditioning system with the correct quantity of refrigerant and oil<br>**No**<br>GO to A2. |
| | A2: LEAK TEST 2 |
| | **1** Using the manufacturer approved equipment, evacuate and recharge the air conditioning system with the correct quantity of |

| | |
|---|---|
| | refrigerant and oil |
| | 2 Using the manufacturer approved refrigerant leak detector, check for a refrigerant leak |
| | Was a refrigerant leak detected?<br>**Yes**<br>Using the manufacturer approved equipment, recover the refrigerant. Repair the leak as necessary. Evacuate and recharge the air conditioning system with the correct quantity of refrigerant and oil<br>**No**<br>Repair complete |

| PINPOINT TEST B : LOW AND HIGH PRESSURE SYSTEM PRESSURES TOO LOW TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| B1: LOW AND HIGH PRESSURE SYSTEM PRESSURES TOO LOW TEST 1 | |
| | 1 Stop the engine |
| | 2 Using the manufacturer approved refrigerant leak detector, check for a refrigerant leak |
| | Was a refrigerant leak detected?<br>**Yes**<br>Using the manufacturer approved equipment, recover the refrigerant. Repair the leak as necessary. Evacuate and recharge the air conditioning system with the correct quantity of refrigerant and oil<br>**No**<br>GO to B2. |
| B2: LOW AND HIGH PRESSURE SYSTEM PRESSURES TOO LOW TEST 2 | |
| | 1 Using the manufacturer approved equipment, recover the refrigerant |
| | 2 Compare the weight of recovered refrigerant to that specified for the vehicle |
| | Was the weight of the recovered refrigerant less than specified for the air conditioning system?<br>**Yes**<br>Using the manufacturer approved equipment, evacuate and recharge the air conditioning system with the correct quantity of refrigerant and oil<br>**No**<br>Check the low pressure pipes for external damage and restrictions. Repair as necessary |

| PINPOINT TEST C : COMPRESSOR MECHANICAL TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| C1: COMPRESSOR MECHANICAL TEST 1 | |

| C1: COMPRESSOR MECHANICAL TEST 1 | |
|---|---|
| | **1** Remove the primary drive belt |
| | **2** Rotate the air conditioning compressor shaft by hand and check for smooth rotation |
| | Does the air conditioning compressor shaft rotate smoothly?<br>**Yes**<br>Tests inconclusive<br>**No**<br>Install a new air conditioning compressor |

| PINPOINT TEST D : LOW AND HIGH PRESSURE SYSTEM PRESSURES UNSTABLE TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| D1: LOW AND HIGH PRESSURE SYSTEM PRESSURES UNSTABLE TEST 1 | |
| | **1** Start the engine |
| | **2** Set the air conditioning to on |
| | **3** Check the pressure gauge readings |
| | **4** Set the air conditioning to off |
| | **5** Check the pressure gauge readings |
| | Do the pressure gauge readings equalise immediately when the air conditioning is set to off?<br>**Yes**<br>Air conditioning compressor internal failure. Install a new air conditioning compressor<br>**No**<br>Air or moisture present in the air conditioning system. Using the manufacturer approved equipment, recover the refrigerant. Install a new receiver drier. Evacuate and recharge the air conditioning system with the correct quantity of refrigerant and oil |

| PINPOINT TEST E : LOW AND HIGH PRESSURE SYSTEM PRESSURES TOO HIGH TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| E1: LOW AND HIGH PRESSURE SYSTEM PRESSURES TOO HIGH TEST 1 | |
| | **1** Start the engine |
| | **2** Set the air conditioning to on |
| | **3** Check the operation of the electric cooling fan |
| | Is the electric cooling fan operating?<br>**Yes** |

| | |
|---|---|
| | Yes<br>GO to E2.<br>**No**<br>Check for foreign objects jamming the electric cooling fan. Refer to the electrical circuit diagrams and check the electric cooling fan circuit for short circuit to ground, short circuit to power, open circuit, high resistance |

| E2: LOW AND HIGH PRESSURE SYSTEM PRESSURES TOO HIGH TEST 2 | |
|---|---|
| | **1** Stop the engine |
| | **2** Check the air conditioning condenser for external obstructions |
| | Are any external obstructions present?<br>**Yes**<br>Repair as necessary<br>**No**<br>GO to E3. |

| E3: LOW AND HIGH PRESSURE SYSTEM PRESSURES TOO HIGH TEST 3 | |
|---|---|
| | **1** Start the engine |
| | **2** Set the air conditioning to on |
| | **3** Check the pressure gauge readings |
| | **4** Set the air conditioning to off |
| | **5** Check the pressure gauge readings |
| | Do the pressure gauge readings equalise immediately when the air conditioning is set to off?<br>**Yes**<br>Air conditioning compressor internal failure. Install a new air conditioning compressor<br>**No**<br>GO to E4. |

| E4: LOW AND HIGH PRESSURE SYSTEM PRESSURES TOO HIGH TEST 4 | |
|---|---|
| | **1** Stop the engine |
| | **2** Using the manufacturer approved equipment, recover the refrigerant |
| | **3** Compare the weight of recovered refrigerant to that specified for the vehicle |
| | Was the weight of the recovered refrigerant greater than specified for the air conditioning system?<br>**Yes**<br>Using the manufacturer approved equipment, evacuate and recharge the air conditioning system with the correct quantity of refrigerant and oil<br>**No**<br>Thermostatic expansion valve internal failure. Install a new thermostatic expansion valve |

| PINPOINT TEST F : ELECTRONIC CONTROL VALVE TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| | F1: ELECTRONIC CONTROL VALVE TEST 1 |
| | **1** Start the engine |
| | **2** Set the air conditioning to on |
| | **3** Set the temperature to the lowest setting (all zones) |
| | **4** Set the blower speed to maximum |
| | **5** Set the recirculate switch to off |
| | **6** Using the manufacturer approved diagnostic system, check datalogger signal - Compressor/Motor Current (0x99AB) |
| | Is the datalogger signal value > 0.5A?<br>**Yes**<br>Air conditioning compressor electronic control valve internal failure. Refer to the electrical circuit diagrams and install a new air conditioning compressor electronic control valve<br>**No**<br>Refer to the electrical circuit diagrams and check the air conditioning compressor electronic control valve circuit for short circuit to ground, short circuit to power, open circuit, high resistance. Repair as necessary and retest |

| PINPOINT TEST G : AIR CONDITIONING SYSTEM NOISE TESTS | |
|---|---|
| TEST CONDITIONS | DETAILS/RESULTS/ACTIONS |
| | G1: AIR CONDITIONING SYSTEM NOISE TEST 1 |
| | **1** Reproduce the reported air conditioning system noise |
| | Is the noise present only when setting the air conditioning system to on?<br>**Yes**<br>GO to G3.<br>**No**<br>GO to G2. |
| | G2: AIR CONDITIONING SYSTEM NOISE TEST 2 |
| | **1** Reproduce the reported air conditioning system noise |
| | Is the noise present only when the air conditioning system to operating?<br>**Yes**<br>GO to G4.<br>**No**<br>GO to G7. |

| | |
|---|---|
| | **G3: AIR CONDITIONING SYSTEM NOISE TEST 3** |
| | **1** Set the air conditioning on and off repeatedly and check the noise made by the air conditioning compressor clutch |
| | Is the noise made by the air conditioning compressor clutch excessively loud (compare to another similar vehicle for reference)?<br>**Yes**<br>Refer to the relevant section of the workshop manual and install a new air conditioning compressor<br>**No**<br>No further action |
| | **G4: AIR CONDITIONING SYSTEM NOISE TEST 4** |
| | **1** Check the installation of the air conditioning pipes:<br>▪ Check that all brackets are present and secure<br>▪ Check for foul conditions |
| | Is the noise caused by a problem with the air conditioning pipe installation?<br>**Yes**<br>Rectify as necessary. Re-test the system<br>**No**<br>GO to G5. |
| | **G5: AIR CONDITIONING SYSTEM NOISE TEST 5** |
| | **1** Set the air conditioning to on and check assess the duration of the noise |
| | Does the noise occur for a short period immediately after setting the air conditioning to on?<br>**Yes**<br>Refer to the relevant section of the workshop manual and install a new thermostatic expansion valve. Re-test the system<br>**No**<br>GO to G6. |
| | **G6: AIR CONDITIONING SYSTEM NOISE TEST 6** |
| | **1** Using the manufacturer approved equipment, recover the refrigerant |
| | Was the weight of the recovered refrigerant different than specified for the air conditioning system?<br>**Yes**<br>Using the manufacturer approved equipment, evacuate and recharge the air conditioning system with the correct quantity of refrigerant and oil<br>**No**<br>GO to Pinpoint Test C. |
| | **G7: AIR CONDITIONING SYSTEM NOISE TEST 7** |
| | **1** Assess the source of the noise |

| | |
|---|---|
| | Is the noise caused by the air conditioning compressor (bearing, contact between rotating and fixed components)?<br>**Yes**<br>Refer to the relevant section of the workshop manual and install a new air conditioning compressor<br>**No**<br>No further action |

## DTC INDEX

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

Diagnostic Trouble Code (DTC) Index - DTC: Module Name: Climate Control Module (Description and Operation),
Diagnostic Trouble Code (DTC) Index - DTC: Module Name: Rear Climate Control Module (Description and Operation).

CLIMATE CONTROL SYSTEM – GENERAL INFORMATION

# AIR CONDITIONING (A/C) SYSTEM RECOVERY, EVACUATION AND CHARGING – V8 5.0L PETROL/V8 S/C 5.0L PETROL (G1345063)

## GENERAL PROCEDURES

| | | | | | |
|---|---|---|---|---|---|
| 82.30.02 | AIR CONDITIONING SYSTEM – DEPRESSURISE – EVACUATE – CAPTURE AND RECHARGE | 5000 CC, AJ V8 | 0.5 | USED WITHINS | + |

1.

**WARNING:**

Servicing must be carried out by personnel famillliar with both vehicle system and the charging and testing equipment. All operations must be carried out in a well ventilated area away from open flame and heat sources.

Refrigerant recovery.

2.

**NOTE:**

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

Remove the dust covers from the high and low pressure connections.

3. Connect the high and low pressure lines to the appropriate connections.

4. **WARNING:**

> Refrigerant must always be recycled before re-use to ensure that the purity of the refrigerant is high enough for safe use in the air conditioning system. Recycling should always be carried out with equipment which is design certified for compliance with SAE J2099 and SAE J2788. Other equipment may not recycle refrigerant to the required level of purity. R-134a Refrigerant Recover Recycling Recharging station must not be used with any other type of refrigerant. Refrigerant R-134a from domestic and comercial sources must not be used in motor vehicles air conditioning systems.

Following the manufacturer's instructions, recover the refrigerant from the A/C system.

- Measure and record the quantity of refrigerant oil recovered from the system.

5. **CAUTIONS:**

> - Make sure that all openings are sealed. Use new blanking caps.
> - Always follow the health and safety precautions when handling the refrigerant R-134a.
> - Collect the refrigerant in specialist equipment and reuse.

Disconnect the high and low pressure connections.

6. Evacuation.

7. Connect the high and low pressure lines to the appropriate connections.

8. Following the manufacturer's instructions, evacuate the A/C system.

9. **NOTE:**

> The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit ( eg. compressor seizure ), the system is leaking and refrigerant has been lost to atmosphere, or the refrigerant circuit has been open more than 24 hours, due to repair.

For additional information, refer to: Receiver Drier - 5.0L NA V8 - AJ133 (412-03A, Removal and Installation) / Receiver Drier - 5.0L SC V8 - AJ133 (412-03A, Removal and Installation).

10. **CAUTION:**

> The system must be evacuated immediatley before recharging commences. Delay between evacuation and recharging is not permitted

Recharging

11. Ensure the correct amount of oil is added to the A/C system before or during recharging.

12. Recharge the A/C system to the correct specification.
For additional information, refer to: Specifications - 3.6L V8 - TdV8/5.0L NA V8 - AJ133/5.0L SC V8 - AJ133 (412-00, Specifications).

13. Disconnect the high and low pressure connections.

14. **NOTE:**

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

Install and firmly tighten the caps that cover the high and low pressure connections.

2012.0 RANGE ROVER (LM), 412-01

# AIR DISTRIBUTION AND FILTERING

SPECIFICATIONS

## Torque Specification

| DESCRIPTION | NM | LB-FT |
|---|---|---|
| Plenum chamber nuts | 10 | 7 |

| | | |
|---|---|---|
| Plenum chamber nuts | 10 | 7 |
| Battery positive cable to bulkhead | 20 | 15 |

2012.0 RANGE ROVER (LM), 412-01

# AIR DISTRIBUTION AND FILTERING

DESCRIPTION AND OPERATION

## COMPONENT LOCATION

| ITEM | DESCRIPTION |
|---|---|
| 1 | Forced ventilation outlet |
| 2 | Windshield duct |
| 3 | Face level duct |
| 4 | Front footwell duct |
| 5 | Heater assembly |
| 6 | Rear footwell duct |
| 7 | Rear face duct |

| | |
|---|---|
| 8 | Rear blower |

## GENERAL

The air distribution and filtering system controls the distribution and quality of air supplied to the vehicle interior. The system consists of:

- Air ducts.
- Air registers and vents.
- A cabin air filter.

## AIR DUCTS

Air from the heater assembly is distributed around the vehicle interior through distribution ducts to outlets in the instrument panel, the front and rear footwells, and the rear of the cubby box between the front seats.

**Air Distribution**

## AIR REGISTERS AND VENTS

In the instrument panel, the air ducts are connected to fixed vents for the windshield and side windows and adjustable registers for face level air. An adjustable register is also installed on the rear of the cubby box for rear face level air. The footwell outlets are fixed vents formed in the end of the related air ducts.

## CABIN AIR FILTER

| ITEM | DESCRIPTION |
|---|---|

| | |
|---|---|
| 1 | Air outlet to heater assembly |
| 2 | Fixing lug |
| 3 | Door catch |
| 4 | Door |
| 5 | Particle or particle/odor filter |
| 6 | Inlet grille |
| 7 | Seal |

The cabin air filter consists of a serviceable particle filter, or a particle/odor filter, which is installed in the air inlet duct. The cabin air filter prevents odors and/or particulate matter from entering the vehicle with the fresh air.

# AIR DISTRIBUTION AND FILTERING

## DIAGNOSIS AND TESTING

For additional information.

REFER to: Climate Control System (412-00, Diagnosis and Testing).

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AIR DISTRIBUTION AND FILTERING

# CENTER REGISTERS (G874130)

## REMOVAL AND INSTALLATION

### REMOVAL

1. **CAUTION:**

   Care must be taken to avoid damage to the internal components of the center registers.

   

   Release the center registers.

   - Carefully release the 4 internal clips, apply an even outward pressure until the last clip is released.

2. 

   Remove the center registers.

   - Disconnect the 4 electrical connectors.
   - Release the temperature blend door control cable.

3. **NOTE:**

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

   Remove the hazard flasher switch.

## INSTALLATION

1. Install the hazard flasher switch.

2. Install the center registers.

   - Attach the temperature blend door control cable.

- Connect the 4 electrical connectors.
- Position and secure the clips.

2012.0 RANGE ROVER (LM), 412-01

AIR DISTRIBUTION AND FILTERING

# DRIVER SIDE REGISTER (G874116)

## REMOVAL AND INSTALLATION

### REMOVAL

1.

**CAUTION:**

Care must be taken to avoid damaging the driver side register internal components.

**NOTE:**

Left-hand shown, right-hand similar.

Remove the driver side register.

- Carefully release the 4 internal clips, apply an even outward pressure until the last clip is released.
- Disconnect the electrical connector.

## INSTALLATION

1. Install the driver side register.
   - Connect the electrical connector.
   - Position and secure the clips.

AIR DISTRIBUTION AND FILTERING

# DRIVER SIDE REGISTER TRIM PANEL (G874117)

## REMOVAL AND INSTALLATION

| | | | | | |
|---|---|---|---|---|---|
| 76.46.12 | TRIM PANEL - UPPER - DRIVERS'S SIDE - RENEW | ALL DERIVATIVES | 0.2 | USED WITHINS | + |

## REMOVAL

1. 

   Remove the instrument panel end trim panel.

   - Release sufficient door aperture seal for access.
   - Carefully release the 4 clips.

2. Remove the driver's side register.
   For additional information, refer to: Driver Side Register (412-01, Removal and Installation).

3. 

   Remove the driver side register trim panel.

   - Remove the 3 screws.

- Disconnect the headlamp switch electrical connector.

4. **NOTE:**

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

Remove the headlamp switch.

- Carefully release the 4 clips.

## INSTALLATION

1. Install the headlamp switch.
2. Install the driver side register trim panel.
   - Connect the headlamp switch electrical connector.
   - Install the 3 screws.
3. Install the driver's side register.
   For additional information, refer to: Driver Side Register (412-01, Removal and Installation).
4. Install the instrument panel end trim panel.
   - Carefully align and secure the clips.
   - Install the aperture seal.

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AIR DISTRIBUTION AND FILTERING

# PASSENGER SIDE REGISTER

(G874135)

REMOVAL AND INSTALLATION

## REMOVAL

1. **CAUTION:**

   Care must be taken to avoid damaging the passenger side register internal components.

   **NOTE:**

   Left-hand shown, right-hand similar.

   Remove the passenger side register.

   - Carefully release the 4 internal clips, apply an even outward pressure until the last clip is released.
   - Disconnect the electrical connector.

## INSTALLATION

1. Install the passenger side register.
   - Connect the electrical connector.
   - Position and secure the clips.