REFRIGERATION AND CHILLER UNIT – ULTIMATE

(G1468512)

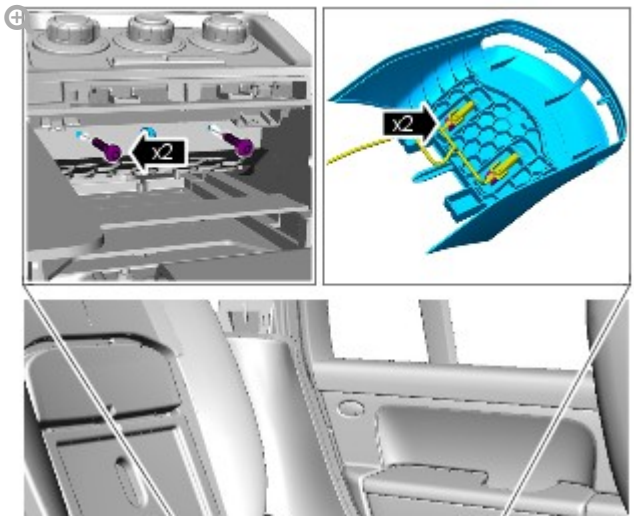
REMOVAL AND INSTALLATION

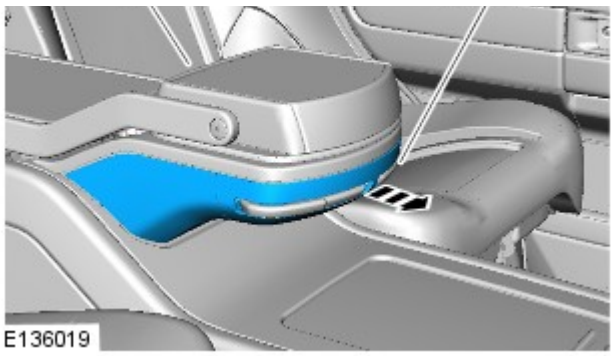
REMOVAL

NOTES:

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

1. Refer to: Rear Seat Center Console (501-12 Instrument Panel and Console, Removal and Installation).

2. 



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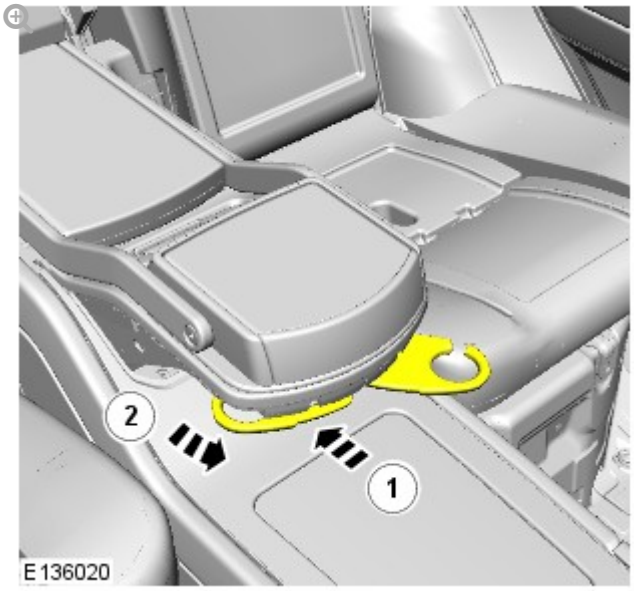

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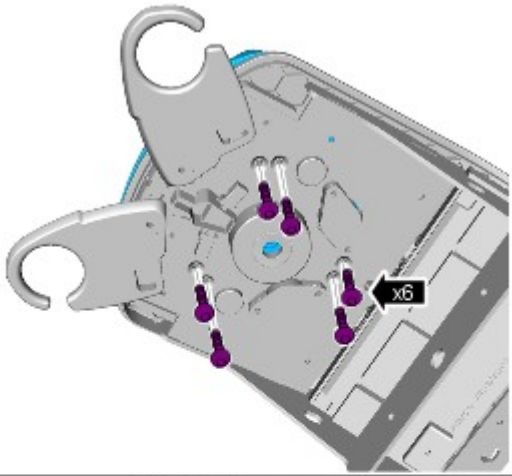
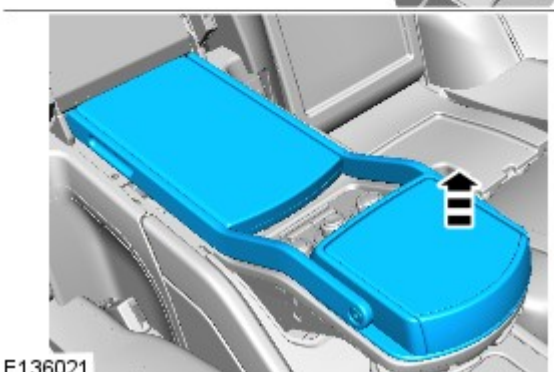


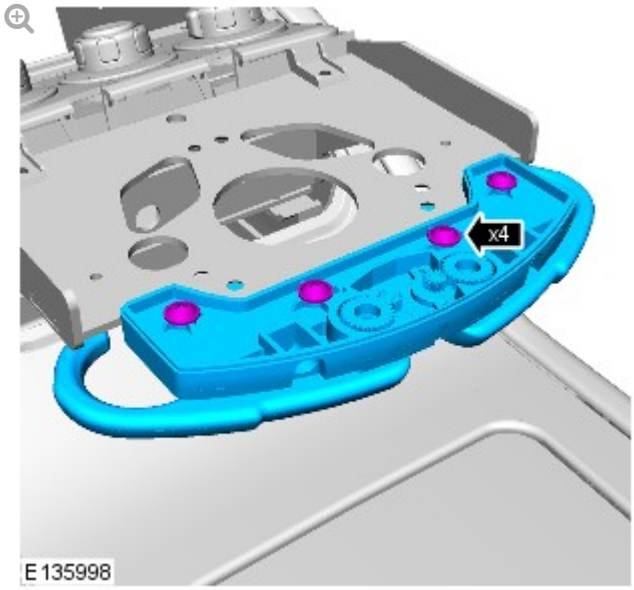


- *Torque:* **9 Nm**

5.

- *Torque:* **3 Nm**

6.



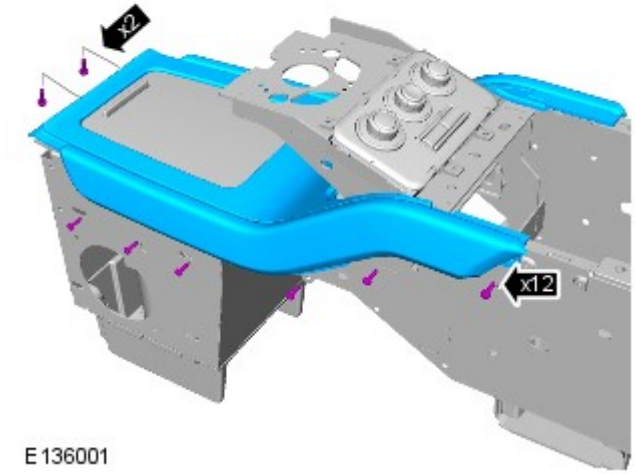
- *Torque:* **1 Nm**

7.

NOTE:

RH illustration shown, LH is similar.

8.

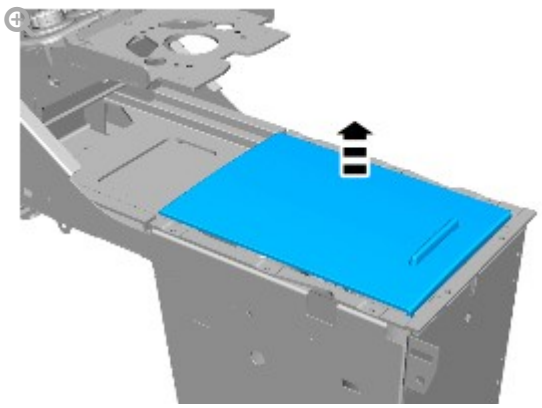


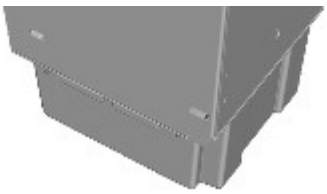
Torque:

Side **1.5 Nm**

Front **0.5 Nm**

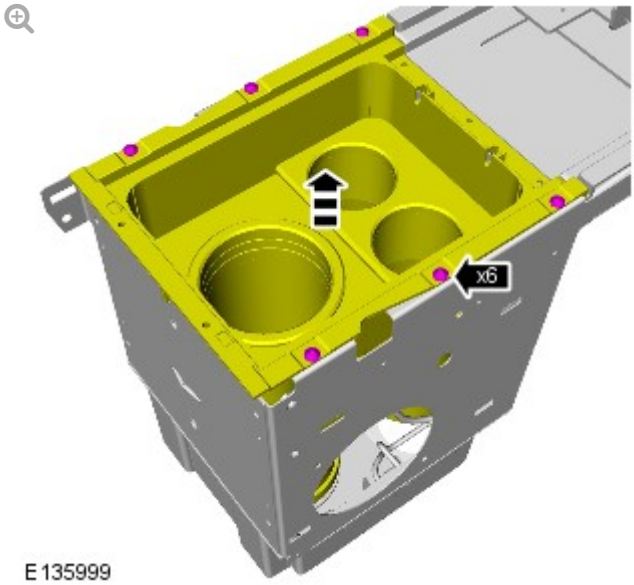
9.





E136000

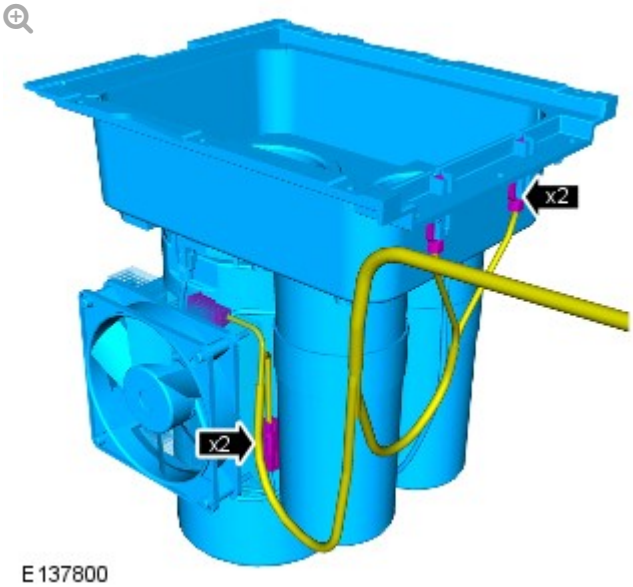
10.



E135999

- *Torque:* **1.5 Nm**

11.



E137800

INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 413-01

INSTRUMENT CLUSTER

SPECIFICATIONS

DESCRIPTION	NM	LB-FT
Steering column switch pack screw	3	2

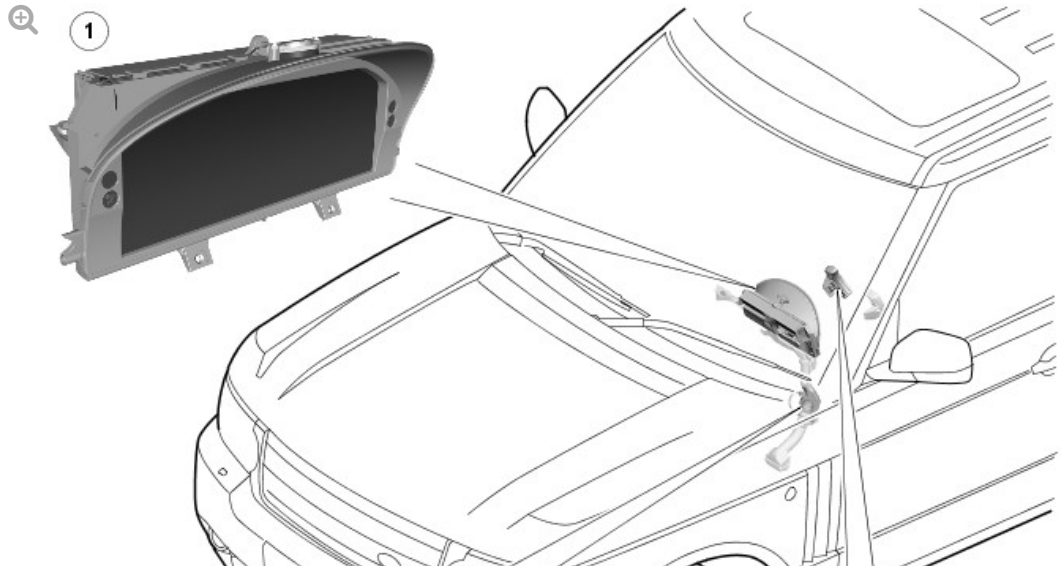
Steering column switch assembly	3	2

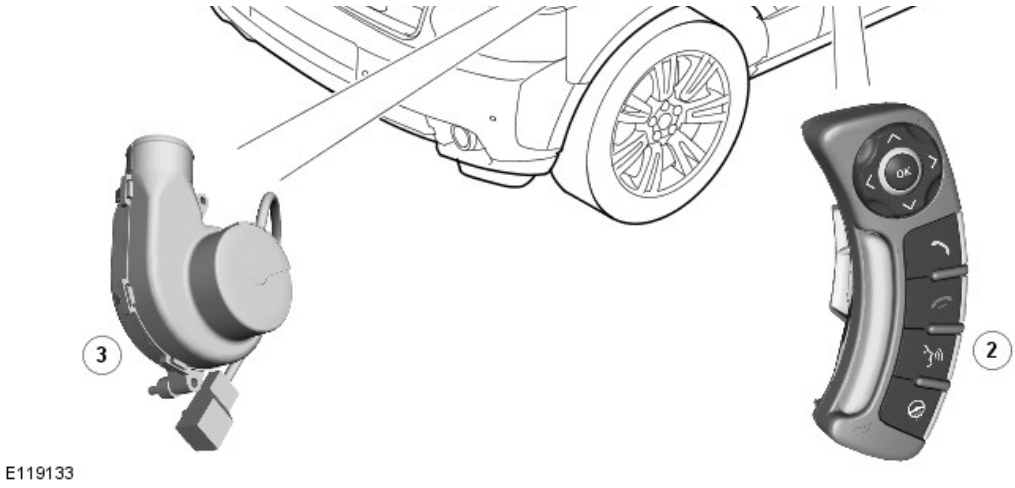
2012.0 RANGE ROVER (LM), 413-01

INSTRUMENT CLUSTER

DESCRIPTION AND OPERATION

INSTRUMENT CLUSTER – COMPONENT LOCATION





ITEM	DESCRIPTION
1	Instrument cluster
2	Instrument cluster menu control
3	Cooling fan

OVERVIEW

The instrument cluster for 2010MY is an all new high definition Thin Film Transistor (TFT) display.

Designed to look similar to a conventional instrument cluster for the main display, the new display can be continually reconfigured to prioritise and refine the information presented to the driver. All displays are 'virtual' gauges with the speedometer and the tachometer being the dominant features of the new display. Only 2 hardwired warning indicators remain; the airbag warning indicator and the security warning indicator. Both of these indicators are LED (light emitting diode)'s.

Two ambient light sensors; one on either side of the pack, (to ensure the brightest lighting conditions are detected) are used to adjust cluster illumination in response to prevailing lighting conditions.

The instrument cluster features a number of warning indicators. The warning indicators illuminate in one of four colors which indicate the level of importance of the warning as follows:

- Red – Warning

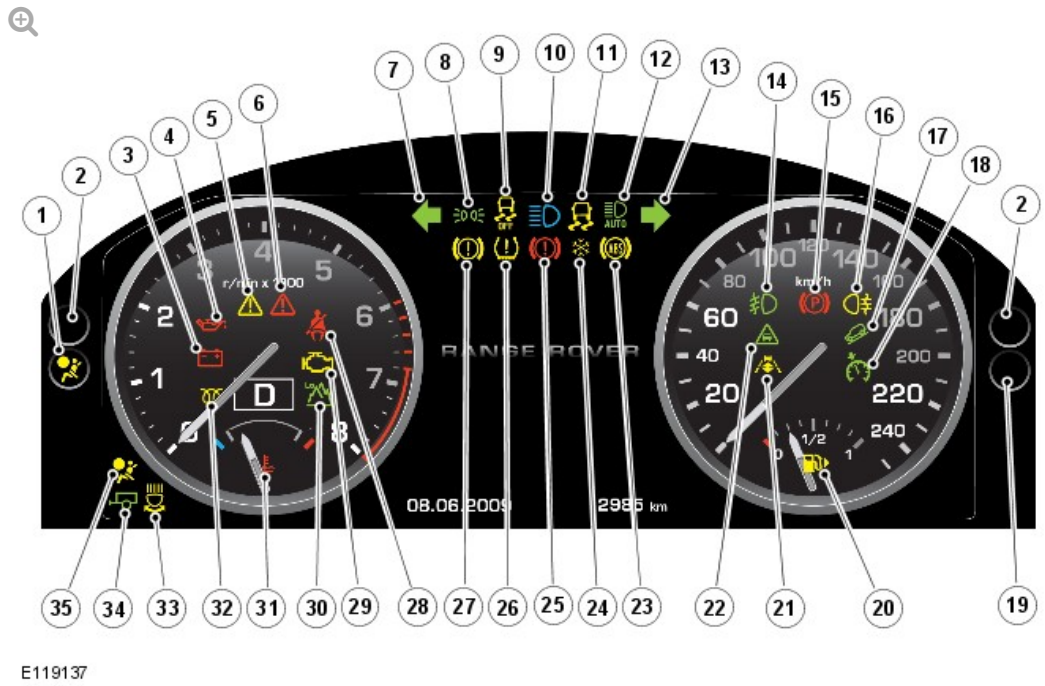
- Red = Warning
- Amber = Caution
- Green = System operative
- Blue = Headlamp high beam operative.

A feature and driver preference menu is available to allow the driver to select certain features and functions of the instrument cluster and change them to their personal preference. A menu control 'joy pad' is located on the RH (right-hand) side of the steering wheel and allows selection of the displayed functions and navigation of the menus. When selected, the menu is displayed in the center of the TFT screen which allows access to a number of vehicle functions.

DESCRIPTION

WARNING INDICATORS

Warning Indicators - All Markets Except NAS

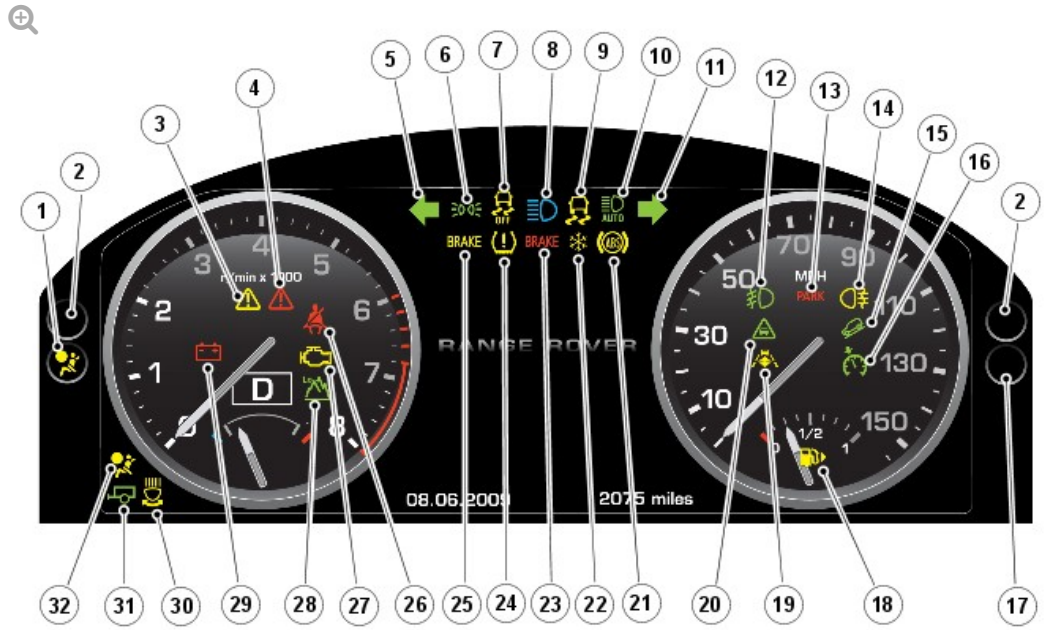


ITEM	DESCRIPTION
1	Airbag warning (amber)
2	Left Hand (LH) ambient light sensor (ref only)

3	Charge indicator (red)
4	Oil pressure warning (red) (diesel only)
5	Warning/information (amber)
6	Critical warning (red)
7	LH turn signal indicator (green)
8	Side lamps (green)
9	Dynamic Stability Control (DSC) off warning (amber)
10	High beam warning (blue)
11	DSC active warning (amber)
12	Automatic high beam active warning (amber)
13	Right Hand (RH) turn signal indicator
14	Front fog lamps active (green)
15	Park brake system warning (red)
16	Rear fog lamps active (amber)
17	Hill Descent Control (HDC) active (green)
18	Speed control active (green)
19	Security Light Emitting Diode (LED)
20	Low fuel warning (amber)
21	Adaptive Speed Control active (amber)
22	Forward alert active (green)
23	Anti-lock Brake System (ABS) warning (amber)
24	Frost warning (amber)
25	Brake system warning (red)
26	Tire pressure monitoring warning
27	Emergency brake assist warning (amber)
28	Seat belt warning (red)
29	Check engine MIL warning (amber)
30	Low range selected (green)
31	Oil temperature warning (red) (Diesel only)
32	Glow plug warning (amber)

33	Adaptive Front lighting System (AFS) warning (amber)
34	Trailer warning (green)
35	Airbag warning - secondary (amber)

Warning Indicators - NAS



E119136

ITEM	DESCRIPTION
1	Airbag warning (amber)
2	Left Hand (LH) ambient light sensor (ref only)
3	Warning/information (amber)
4	Critical warning (red)
5	LH turn signal indicator (green)
6	Side lamps (green)
7	Dynamic Stability Control (DSC) off warning (amber)
8	High beam warning (blue)
9	DSC active warning (amber)
10	Automatic high beam active warning (amber)
11	Right Hand (RH) turn signal indicator
12	Front fog lamps active (green)

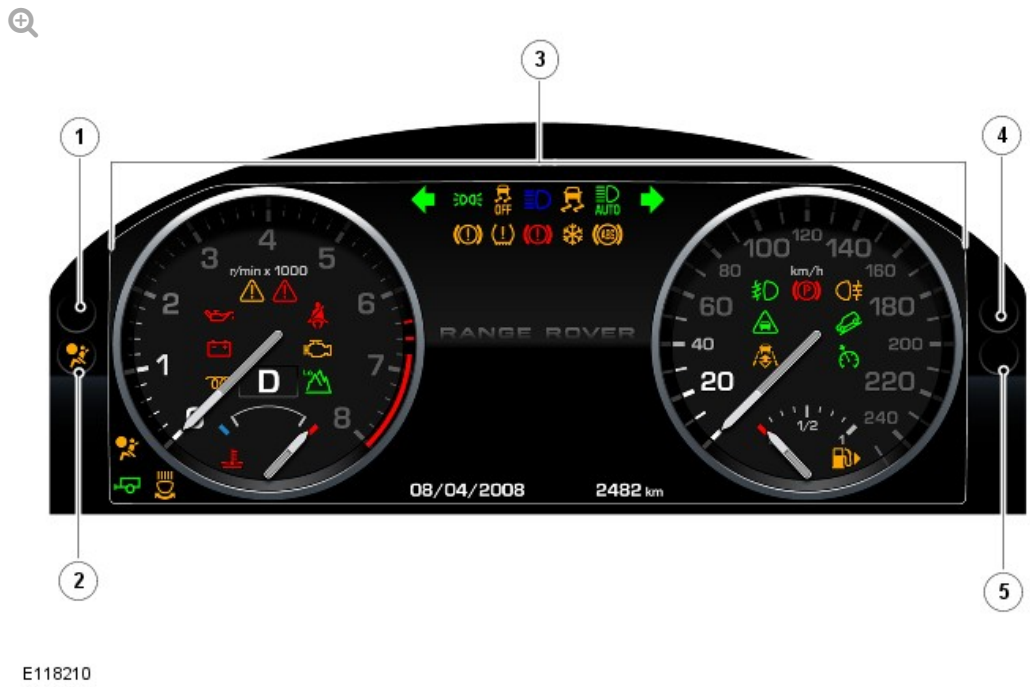
13	Park brake system warning (red)
14	Rear fog lamps active (amber)
15	Hill Descent Control (HDC) active (green)
16	Speed control active (green)
17	Security Light Emitting Diode (LED)
18	Low fuel warning (amber)
19	Adaptive Speed Control active (amber)
20	Forward alert active (green)
21	Anti-lock Brake System (ABS) warning (amber)
22	Frost warning (amber)
23	Brake system warning (red)
24	Tire pressure monitoring warning
25	Emergency brake assist warning (amber)
26	Seat belt warning (red)
27	Check engine MIL warning (amber)
28	Low range selected (green)
29	Charge indicator (red)
30	Adaptive Front lighting System (AFS) warning (amber)
31	Trailer warning (green)
32	Airbag warning - secondary (amber)

The warning indicators are mainly located in 3 groups; one in the speedometer display, one in the tachometer display and one group in a central position at the top of the TFT screen. A number of warning indicators are also located outside of these areas as shown on the illustrations.

There are 2 SRS (supplemental restraint system) warning indicators used. The primary SRS warning indicator is located on the LH (left-hand) side of the cluster and is a hardwired LED. A secondary SRS warning indicator is located to the bottom left of the speedometer and is only used in case of failure of the primary warning indicator for legislation requirements.

A hardwired LED is located on the RH side of the cluster and is used for the security LED.

TFT DISPLAY



E118210

ITEM	DESCRIPTION
1	LH ambient light sensor
2	Primary SRS warning indicator
3	Actual size of TFT screen
4	RH ambient light sensor
5	Security LED

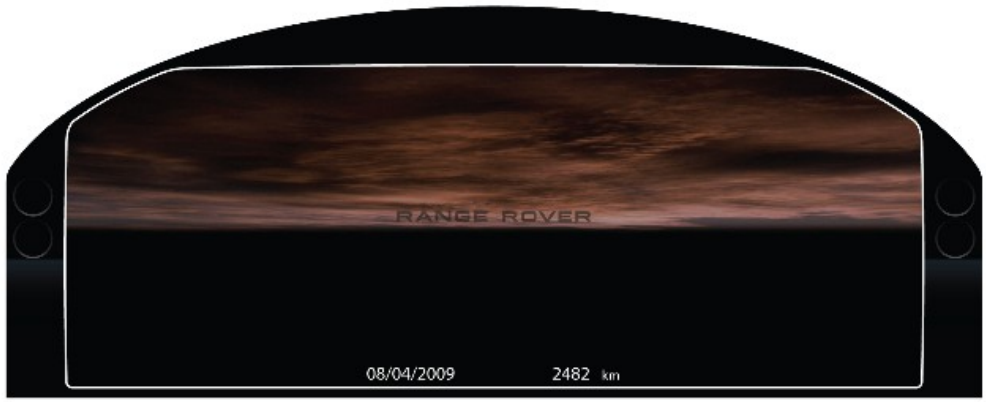
During a typical journey new events and priority messages can be continually updated on the display as and when required. For example, audio information displayed centrally can be replaced with the navigation instruction information or 4x4 information can be displayed in off road situations.

To ensure the brightest lighting conditions are detected, 2 ambient light sensors are located on each side of the cluster. They are used to adjust cluster illumination in response to prevailing lighting conditions. The cluster also has high-output bright LED backlighting and a smoked 'glass' screen

which helps prevent washout by reducing the amount of sunlight that can reach the screen directly. The TFT display screen also incorporates an anti-glare coating.

The full TFT screen measures 312 mm (12.3 inches) across its diagonal corners and is specified with 1280 horizontal and 480 vertical pixels. Because of the design of the instrument cluster binacle, not all of the screen is visible but the graphics are designed to display within the viewable area.

START-UP SCREEN



E120550

When the vehicle is locked the display goes off. When the vehicle is unlocked the display slowly illuminates to show the background image and display key information to the driver.

Pressing the stop/start button will initiate a full build of the screen display to display the speedometer and tachometer and also the warning indicators. When the engine is running a range of applicable instruments, messages and warning indicators will be displayed.

EVENT SCREENS

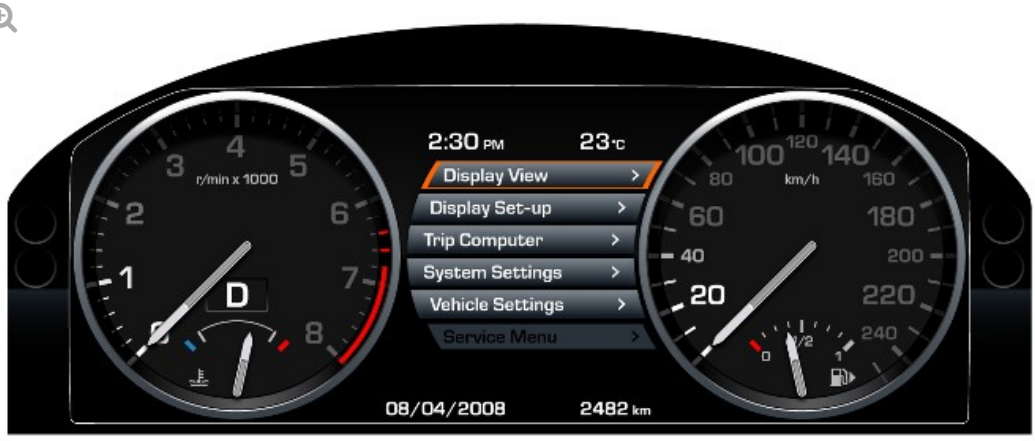
E120322

A large number of differing permutations of screens are available to cover all possible combinations of the available functions. The above illustration shows the 4X4 screen, but other screens are available to cover a range of vehicle functions.

Certain vehicle functions will overwrite the existing information displayed. Certain displays may move or be replaced to allow room for other displays as shown in the 4X4 display above. For example, the speedometer may move to the right a little to allow room for important vehicle functional to be displayed.

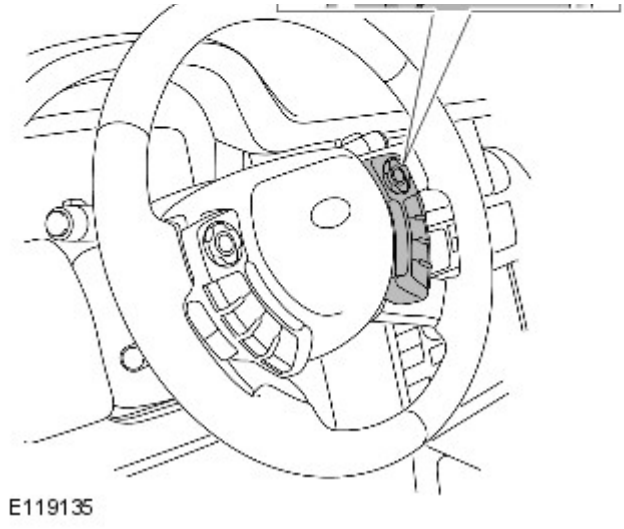
A number of features are also used to convey information to the driver. For example, if speed control is selected, the set speed is displayed as a marker in the speedometer outer ring.

INSTRUMENT CLUSTER MENU



E119134

The instrument cluster menu is only visible when any part of the menu control has been pressed. Menu selections can be made using the menu control to select the required menu option.



When the required selection is highlighted, pressing the 'OK' button will select that option. The screen will then display a sub-menu for that option or activate the selected item. Scroll arrows to the left of the menus allow the menu to be moved up or down to menu items that are not visible in the current view. If the arrow is displayed brightly this indicates that additional menu items are available in that direction.

The menu can be closed by pressing the left button on the menu control. If sub-menus are open, pressing and holding the left button on the menu control will close the sub-menus. The menu will close automatically if:

- no selection is made in the main menu within 10 seconds of opening
- a selection is made in the main menu and no further selection is made within 4 minutes. If a selection is made within the 4 minute period, the timer will reset and a further 4 minutes will elapse before the menu automatically closes if no further selections are made.

The current menu can be exited or to move from a sub-menu without making a selection, press the left arrow on the menu control.

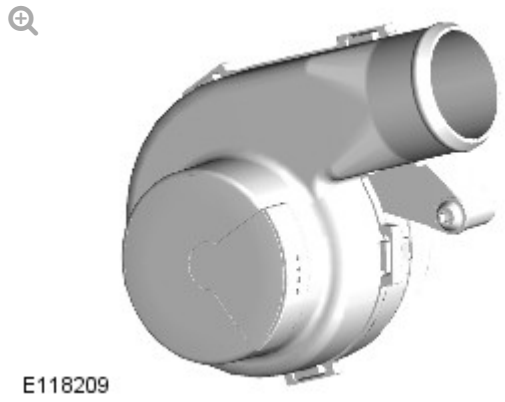
The following table shows the available menus and sub-menus and the options available within each menu.

MAIN MENU	SUB-MENU	FUNCTION
Main Menu	-	Closes the vehicle set-up and information menu.
Show	-	Displays all active warning messages.

Warnings		
Vehicle Set-Up	Forward Alert	Enable/Disable forward alert.
	Blind Spot Monitor	Enable/Disable blind spot monitoring system.
	High Beam Assist	Enable/Disable the Auto High Beam feature. Can also be used to configure the system for driving on the opposite side of the road.
	TPM Load Setting	Change the monitored tire pressures for the vehicle loading conditions.
	Alarm Sensors	Temporarily disable the interior space protection and the tilt sensor for the next time the vehicle is locked. The setting is automatically re-enabled when the vehicle is unlocked using the smart key.
	Reverse Dip Mirror	Enable/Disable automatic dipping of the exterior mirrors when reverse gear is selected.
	Drive-Away Locking	Enable/Disable automatic locking of the doors when the vehicle speed exceeds 8 km/h (5 mph).
	Easy Entry/Exit	Enable/Disable automatic movement of the steering column and the driver's seat when the ignition is turned off and on.
	2-Stage Unlocking	Enable/Disable the single-point entry door unlocking feature
	Headlamp Delay	Enable/Disable the headlamp delay feature and configure the amount of time the headlamps will remain on.
	Speed Alarm	Enable/disable speed alarm and also adjust the speed warning value.
Trip Computer	Trip A	Enable/Disable display of Trip A readings.
	Trip B	Enable/Disable display of Trip B readings.
	Trip Auto	Enable/Disable display of Trip Auto readings.
	Units	Select the units to be displayed in the message center.
Display Settings	Language	Select the language for the text displayed in the message center.
	Temperature	Select the units for the external temperature reading.
	Instruments	Change the appearance if the instrument cluster display.
Service Menu	VIN Display	Display the Vehicle Identification Number.
	Oil Level Display	Show the oil level display.

	Display	
	HBA Sensitivity	Change the sensitivity of the Auto High Beam system.

INSTRUMENT CLUSTER COOLING FAN



Due to the location of the instrument cluster, in hot climatic conditions there is a risk of over-temperature affecting performance. A cooling fan is used to maintain the temperature at an acceptable level. The fan is located near the steering column and blows air into ducting which is connected to the rear of the cluster. The ducting also channels air into the rear of the Touch Screen Display (TSD). The temperature is monitored internally within the instrument cluster and the fan is activated by the instrument cluster via a PWM (pulse width modulation) signal.

If instrument cluster temperatures are high, the fan can continue to operate for up to 5 minutes after the ignition is turned off to assist with cooling of the cluster and/or the TSD.

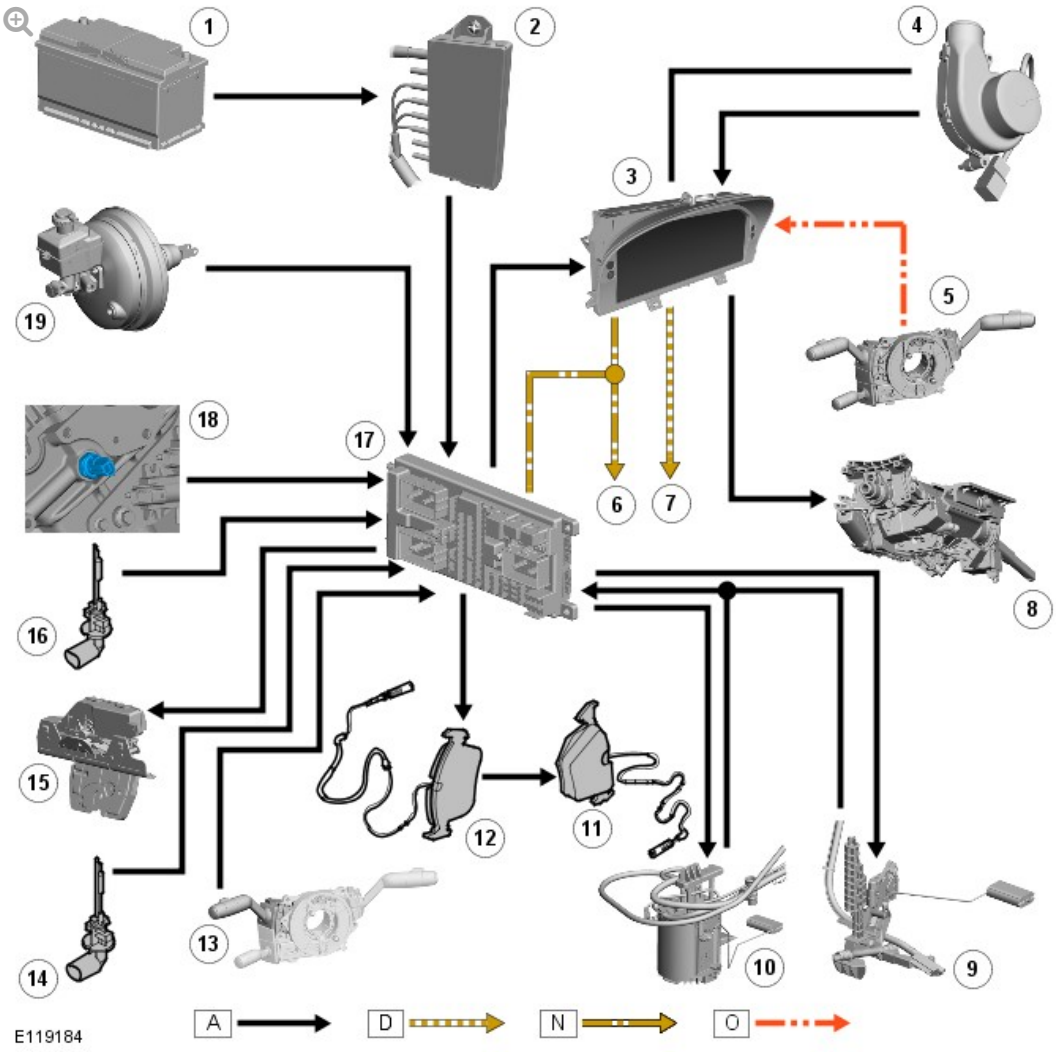
If a failure of the fan occurs, the instrument cluster has internal temperature sensors which will detect overheating and progressively reduce the backlighting of the display to reduce the heat generated within the cluster. In this way the cluster will self-limit the temperature to avoid overheating, at the expense of a loss of brightness at high temperatures.

OPERATION

Control Diagram

NOTE:

A = Hardwired; **D** = High Speed CAN bus; **N** = Medium speed CAN bus; **O** = LIN bus



ITEM	DESCRIPTION
1	Battery
2	Battery Junction Box (BJB)
3	Instrument cluster
4	Instrument cluster cooling fan
5	Clockspring
6	Medium speed CAN bus connection to other vehicle systems
7	High speed CAN bus connection to other vehicle systems
8	Steering column lock

9	LH fuel level sensor
10	RH fuel level sensor
11	Rear brake pad wear sensor
12	Front brake pad wear sensor
13	LH steering column multifunction switch
14	Washer fluid level sensor
15	Tailgate latch
16	Engine coolant level sensor
17	Central Junction Box (CJB)
18	Oil pressure switch (diesel only)
19	Brake fluid level sensor

Three processors within the instrument cluster manage communications between the vehicle and the cluster display and incorporate the operating software required to drive screen re-configurations.

The instrument cluster receives a permanent fused supply from the passenger compartment fusebox. The same power feed also provides a power supply to the instrument cluster cooling fan.

The cluster is connected to other vehicle systems and control modules via the medium speed CAN (controller area network) bus, high speed CAN bus and LIN (local interconnect network) bus connections.

The majority of information is passed to the instrument cluster from other system control modules on the high speed and medium speed CAN buses and also the LIN bus. However, some vehicle sensors are hardwired directly to the instrument cluster.

The security LED is controlled by a hardwired connection from the CJB (central junction box). A Field Effect Transistor (FET) within the CJB controls the output to the LED.

The steering lock control module is connected to a hardwired connection to the instrument cluster. Security information from other control modules is passed via the network buses and when the conditions are correct the

instrument cluster instructs the steering lock control module to unlock te steering column.

The clockspring is connected to the instrument cluster on a LIN bus connection. The LIN bus passes driver selections made on the steering wheel mounted switches to the instrument cluster for processing and transmission to other control modules.

The instrument cluster cooling fan is connected to the cluster with three wires. One wire provides the fan motor ground. The remaining 2 wires provide a monitor feedback to the cluster and a PWM output to control the fan speed.

2012.0 RANGE ROVER (LM), 413-01

INSTRUMENT CLUSTER

DIAGNOSIS AND TESTING

For a detailed description of the Instrument Cluster system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

INSPECTION AND VERIFICATION

1. Verify the customer concern.
1. Visually inspect for obvious signs of electrical damage.
1. With the ignition on, check the operation of the audio output from the instrument cluster integrated speakers by operating the turn signal indicators (left and right) and verifying that audible feedback (a ticking sound) is present.

Visual Inspection

ELECTRICAL
▪ Battery ▪ Fuses ▪ Central and battery junction boxes ▪ Megafuses ▪ Wiring harness ▪ Damaged, loose or corroded connectors ▪ Controller Area Network (CAN) circuits

- Instrument Cluster
- Central Junction Box (CJB)
- 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, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC INDEX

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

2012.0 RANGE ROVER (LM), 413-01

INSTRUMENT CLUSTER

INSTRUMENT CLUSTER (G1240255)

REMOVAL AND INSTALLATION

REMOVAL

WARNINGS:

- Persons working on the supplemental restraint system (SRS) must be fully trained and have been issued with the safety guidelines.
- Allow a period of 10 minutes to elapse after disconnecting the battery before undertaking any work on the SRS.
- The SRS electrical connectors are unique. DO NOT force, or attempt to connect electrical connectors to the wrong sockets.
- The correct procedures must always be used when working on SRS components.
- It is imperative that before any work is undertaken on the SRS system, the appropriate information is read thoroughly.
- Always disconnect both battery cables before beginning work on the SRS system. Disconnect the ground cable first. Never reverse connect the battery.
- Take extra care when handling SRS components.

NOTE:

When a new instrument cluster is to be installed, the Land Rover approved diagnostic system must be connected to the vehicle and the instrument cluster renewal procedure followed. This will allow vehicle coding data and current service interval data to be correctly installed to the new instrument cluster.

1. **NOTE:**

   Only carry out the following step if a new instrument cluster is to be installed.

Connect the Land Rover approved diagnostic system and begin the instrument cluster renewal procedure.

2. Refer to: Standard Workshop Practices (100-00 General Information, Description and Operation).

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

4. Refer to: Instrument Panel Upper Section (501-12 Instrument Panel and Console, Removal and Installation).

5. 

6. 

7. 

INSTALLATION

1. To install, reverse the removal procedure.

2. If a new instrument cluster has been installed, configure the new instrument cluster using the Land Rover approved diagnostic system.

HORN

HORN (G1226537)

REMOVAL AND INSTALLATION

86.30.10	HORN - EACH - RENEW	ALL DERIVATIVES	0.4	USED WITHINS	+

REMOVAL

NOTE:

Removal steps in this procedure may contain installation details.

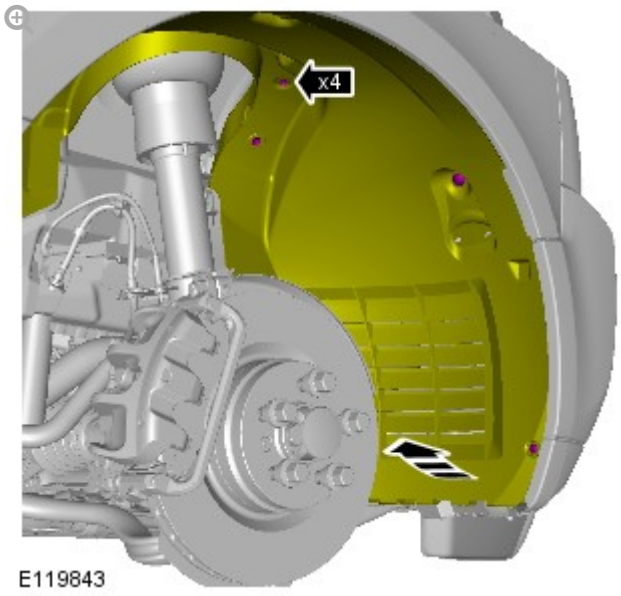
1. Disconnect the battery ground cable.
   Refer to: Specifications (414-00, Specifications).

2. **WARNING:**

   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

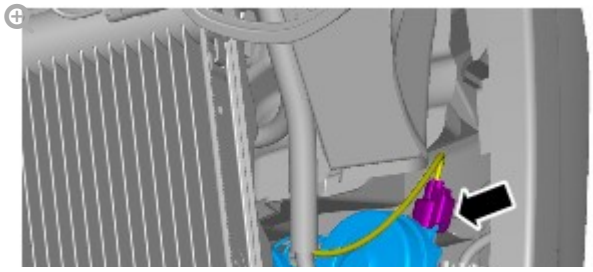
3. Remove the RH front wheel and tire.

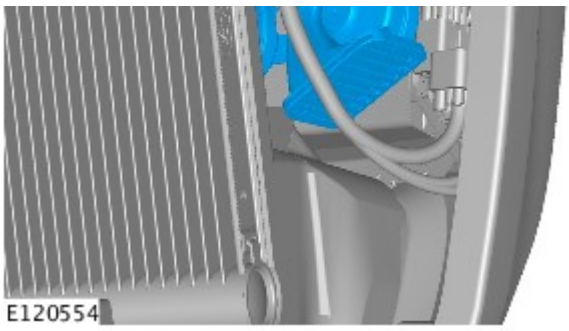
4. 

   Torque: **1.5 Nm**

5. **NOTE:**

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

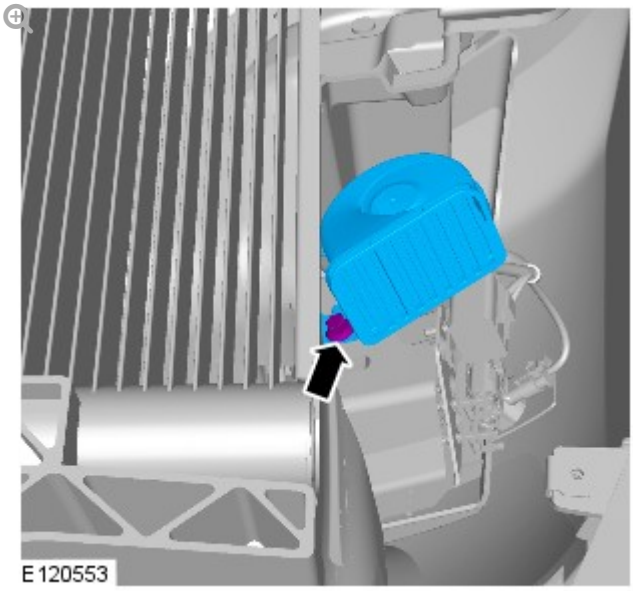




6.

NOTE:

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

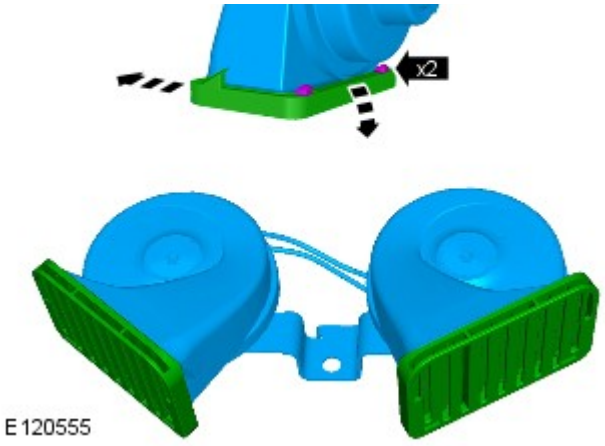


Torque: **20 Nm**

7.

NOTE:

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



INSTALLATION

1. To install, reverse the removal procedure.

HORN

HORN SWITCH (G300755)

REMOVAL AND INSTALLATION

86.30.01	SWITCH/PUSH - HORN - RENEW	ALL DERIVATIVES	0.2	USED WITHINS +

REMOVAL

WARNINGS:

- Persons working on the supplemental restraint system (SRS) must be fully trained and have been issued with the safety guidelines.
- Allow a period of 10 minutes to elapse after disconnecting the battery before undertaking any work on the SRS.
- The SRS electrical connectors are unique. DO NOT force, or attempt to connect electrical connectors to the wrong sockets.
- The correct procedures must always be used when working on SRS components.
- It is imperative that before any work is undertaken on the SRS system, the appropriate information is read thoroughly.
- Always disconnect both battery cables before beginning work on the SRS system. Disconnect the ground cable first. Never reverse connect the battery

connect the battery.

- Take extra care when handling SRS components.

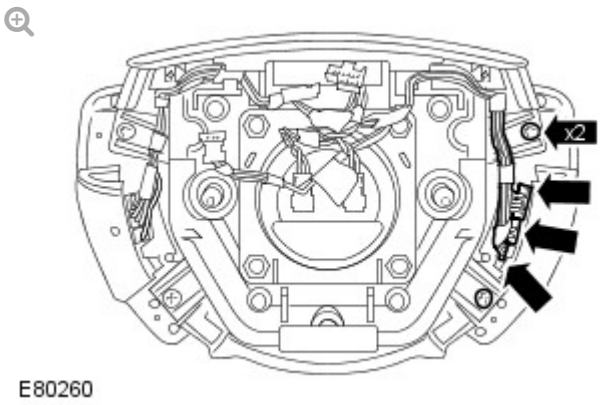
1. Make the air bag supplemental restraint system (SRS) safe.
   For additional information, refer to: Standard Workshop Practices (100-00, Description and Operation).

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

3. Remove the driver air bag module.
   For additional information, refer to: Driver Air Bag Module (501-20, Removal and Installation).

4. **NOTE:**

   Left-hand shown, right-hand similar.



Remove the horn switch.

- Disconnect the 3 electrical connectors.
- Remove the 2 screws.

INSTALLATION

1. Install the horn switch.
   - Connect the 3 electrical connectors.
   - Install the 2 screws and tighten to 3 Nm (2 lb.ft).

2. Install the driver air bag module.
   For additional information, refer to: Driver Air Bag Module (501-20, Removal and Installation).

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

CLOCK

CLOCK (G873436)

88.15.07	CLOCK - RENEW	ALL DERIVATIVES	0.2	USED WITHINS	+

REMOVAL

1. Remove the clock.
   For additional information, refer to: Climate Controlled Seat Switch (501-10, Removal and Installation).

INSTALLATION

1. Install the clock.
   For additional information, refer to: Climate Controlled Seat Switch (501-10, Removal and Installation).

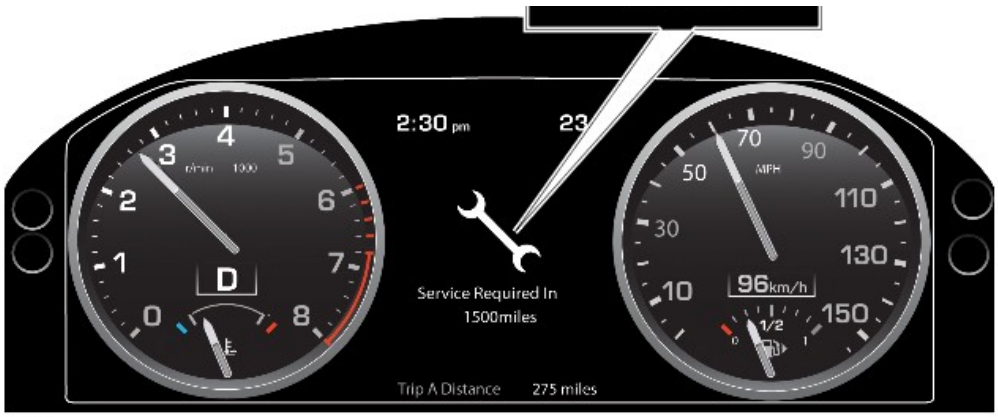
2012.0 RANGE ROVER (LM), 413-08

INFORMATION AND MESSAGE CENTER

DESCRIPTION AND OPERATION

INFORMATION AND MESSAGE DISPLAYS

Message Center



OVERVIEW

The instrument cluster for 2010MY is an all new high definition Thin Film Transistor (TFT) display.

Designed to look similar to a conventional instrument cluster for the main display, the new display can be continually reconfigured to prioritise and refine the information presented to the driver. All displays are 'virtual' gauges with the speedometer and the tachometer being the dominant features of the new display. Messages are displayed in a central position of the cluster.

The instrument cluster displays the following information to the driver:

- Odometer - Displays the total vehicle distance travelled
- Trip meter - There are 3 trip meters available; A, B and Auto. These display the total vehicle distance travelled since the last reset
- Ambient temperature - Displays the external ambient temperature in °C or °F
- Message center - Displays system information to the driver.

ODOMETER AND TRIP METER

The odometer is located in a central position at the bottom of the TFT screen. In addition to displaying the total distance the vehicle has travelled and also the date, this area of the display can also show the following information:

- Trip distance
- Trip average speed
- Trip average fuel consumption
- Instantaneous fuel consumption
- Range available on remaining fuel.

The above selections can be made by pressing the trip button on the end of the LH (left-hand) steering column multifunction switch repeatedly until the option required is reached.

There are 3 trip recordings available to view; A, B and automatic. The instrument cluster menu is used to select which trip recording is displayed.

The automatic trip is always available and is reset each time the engine is started and the vehicle moves. Previous trips can be added to form a continuous trip recording by pressing and holding the trip button when the automatic trip information is displayed. The message center will confirm that the previous journey information has been added and pressing and holding the trip button for 1 second will add the data. The previous trip information can also be deleted by pressing and holding the trip button when the automatic trip information is displayed. The message center will confirm deletion of the previous journey data and pressing and holding the trip button for 1 second will delete the previous trip information.

Trip A and B can be reset by the driver at any time. When the required trip information is displayed, pressing and holding the trip button for 2 seconds will erase the previous trip information stored. Resetting trip A or B will not affect the other trip information, for example, if trip A is reset, trip B will retain its information until it is reset.

AMBIENT TEMPERATURE

The ambient temperature is displayed in a central position at the top of the TFT screen. The temperature can be displayed in degrees F or C and this is selectable by the driver using the instrument cluster menu.

If the external temperature falls to 4°C (39°F) or below, the external

If the external temperature falls to 4°C (39°F) or below, the external temperature display by an orange snowflake symbol.

MESSAGE CENTER

The message center is located in a central position in the instrument cluster. Other displayed information may be temporarily removed to allow for the message to be displayed.

The majority of messages are generated by the cluster which monitors system status via the bus systems and displays system information messages as requested by the controlling module. Other system control modules are also capable of generating messages to display system status. Some messages are accompanied by a chime, which is requested by the control module generating the message and generated by the instrument cluster via the sounder, which is located on the top of the cluster.

The driver can view system status messages which are current in the instrument cluster RAM. Pressing and releasing the menu control displays current messages in priority order.

The messages are assigned priorities, depending on the effect on driving safety and driving ability of the vehicle. New messages are displayed and accompanied by a chime from the sounder. Messages are divided into priority groups P1, P2 and P3. The priority groups are as follows:

- **Priority Group P1** - This group includes messages which have a direct affect on the driving ability and safety of the vehicle, 'Gearbox Overheating' for example. This message requires an urgent and immediate reaction from the driver in response to the message. P1 messages are also accompanied by appropriate flashing warning indicator symbols adjacent to the message center. If more than one P1 message is present, each message is displayed in turn at 3 second intervals.
- **Priority Group P2** - This group includes messages which do not directly affect driving ability or safety of the vehicle. This message must be noted by the driver and the cause rectified as soon as possible. Each message is indicated once for a maximum of 23 seconds. They can be recalled by pressing and releasing the menu control.

- **Priority Group P3** - This group displays messages which relate to fluid levels, 'LOW SCREEN WASH' for example. Depending on the message, some messages are only displayed at the end of a journey, to avoid irritation to the driver.

Two other groups are defined as 'End of Journey Messages' and 'Special Messages S and S1', as follows:

- **End of Journey Messages** - Messages categorized as 'P1' and 'P2' error messages, are displayed again at the end of the journey. Error messages do not include messages such as 'Doors Open'. Messages in the 'P3' group are displayed after the 'P1' and 'P2' messages. New messages, which only occur at the end of a journey, 'Lights On' for example, are displayed according to their priority.
- **Special Messages S and S1** - These messages have the highest priority and cannot be overridden by messages in groups 'P1', 'P2' and 'P3'. They immediately overwrite any currently displayed messages. If more than one special message is present, the message with the highest priority is displayed, after the current displayed message has been shown for at least 1 second. S and S1 messages are not displayed between any symbols.

Some messages, especially S, S1 and P messages are accompanied by a chime from the sounder to alert the driver to their presence. At the end of a journey, a single chime precedes all end of journey messages.

The messages are displayed in a language applicable to the vehicle market configuration and can be changed using the instrument cluster menu. The following list shows the possible messages which can be displayed.

NOTE:

If the instruction given in the 'Action' column does not resolve the message display, use the Workshop Manual Diagnosis and Testing section for the applicable vehicle system to determine the fault and perform any additional action required.

Dealer should use an approved Land Rover diagnostic system and perform a

Dealer should use an approved Land Rover diagnostic system and perform a diagnostic routine to regenerate the DPF.Blind Spot System Not AvailableSuspension Locked At Access HeightAir suspension control switch 'Hold' button has been pressed when vehicle was in access heightNormal height has been selected by the driver or by exceeding automatic height change speed thresholds.Close Doors To Change HeightThe doors have been opened for more than 90 seconds while the suspension was changing ride height or the engine was turned off during suspension raising.Start Engine To Raise VehicleVehicle cannot be raised with engine off.Start engine to complete raise request.

MESSAGE	REASON	ACTION
Press [OK] to clear: Vehicle VIN: SALLNABA81A577879	Vehicle VIN display	None
Fuel Level Low	Fuel level in fuel tank has fallen below warning threshold	Replenish fuel tank.
Fuel Pump System Fault	ECM (engine control module) has detected a fault with the fuel system.	Diagnose fault using a Land Rover approved diagnostic system.
Washer Fluid Low	Washer fluid level is low and low level sensor has operated.	Replenish washer fluid.
Doors Open	One or more doors are open.	Close open doors.
Right Front Door Open	Right front door open.	Close right front door.
Tailgate Open	Tailgate open.	Close tailgate.
BONNET OPEN	Hood open.	Close hood
Left Front Door Open	Left front door open.	Close left front door.
Right Rear Door Open	Right rear door open.	Close right rear door.
Left Rear Door Open	Left rear door open.	Close left rear door.
Column Adjust	Column adjust switch has been operated.	None
Column Adjust Auto	Auto column adjust is operating.	None.
Pedal Adjust	Pedal adjust is operating.	None.

Memory 1 Settings Recalled	Memory 1 button has been pressed or smart key with memory 1 setting detected.	None
Memory 2 Settings Recalled	Memory 2 button has been pressed or smart key with memory 1 setting detected.	None
Memory 3 Settings Recalled	Memory 3 button has been pressed or smart key with memory 1 setting detected.	None
Memory 1 Settings Saved	Memory 1 settings have been saved.	None
Memory 2 Settings Saved	Memory 2 settings have been saved.	None
Memory 3 Settings Saved	Memory 3 settings have been saved.	None
Valet Mode	Valet mode has been requested by the driver.	none
Transport Mode	The vehicle systems are in transport mode.	Remove vehicle from transport mode using a Land Rover approved diagnostic system.
Alarm Sensors	Alerts the driver that the interior space monitoring has been re-enabled when the vehicle was unlocked with the smart key.	None
Smart Key recognised Press brake when starting	Smart key found by the keyless vehicle module when using the keyless start backup.	None
Smart Key Not Found Refer to Handbook	Keyless vehicle module has not recognised the smart key. Use the keyless start backup procedure to start the vehicle.	Identify reason smart key is not recognised using an approved Land Rover diagnostic system.
Press brake when starting	The start/stop button was pressed without the brake pedal depressed.	Depress the brake pedal before pressing the start/stop button.
Smart Key Battery Low	Keyless vehicle module has detected low battery power in the smart key.	Replace the smart key battery.

Gear Selector Not In Park	Gear selector is not in the PARK position.	Move gear selector to the PARK position.
Stop Switch Failure	Start/stop switch is not operating correctly.	Investigate cause of start/stop switch malfunction.
Steering Column Locked	Steering column is locked.	None
Ignition Is On	Start/stop switch has been pressed to activate ignition mode 6 (ignition on).	None
Engine Stop Button Pressed	Engine start/stop button has been pressed.	None
Headlamps Are Off	Headlamps have been switched off either manually or by the auto headlamps feature.	None
Lights On	Headlamps have been switched on either manually or by the auto headlamps system.	None
Autolamp Delay Off	Auto headlamp delay has be switched off by the driver.	None
Autolamp Delay 00:30	Auto headlamp delay timer has been changed to 30 seconds.	None
Autolamp Delay 01:00	Auto headlamp delay timer has been changed to 1 minute.	None
Autolamp Delay 02:00	Auto headlamp delay timer has been changed to 2 minutes.	None
Autolamp Delay	Auto headlamp delay is active.	None
Interior Lights Auto	The automatic interior lamps have been activated from the off mode.	None
Interior Lights Off	The automatic interior lamps have been switched off from the automatic mode.	None
Cruise Cancelled	Cruise control has been cancelled by the driver.	None

Cruise Override	The driver has operated the accelerator to increase the vehicle speed above the cruise set speed.	None
Gap	Forward alert system gap setting.	If required the gap setting can be adjusted using the steering wheel mounted switches.
Driver Intervene	Immediate action required by the driver to apply the brakes.	Apply brakes if required. May also be displayed if speed control system loses CAN (controller area network) messages when active.
Cruise Not Available	ECM has detected a fault with the engine management system or vehicle speed is outside threshold for cruise control operation.	Bring vehicle into speed control operating speed or diagnose fault using an approved Land Rover diagnostic system.
Radar Sensor Blocked	The adaptive speed control radar sensor has become dirty or obstructed.	Remove the obstruction or clean the radar sensor.
Driver Intervene Cruise Cancelled	The driver has applied the vehicle brakes and the speed control has been suspended.	Use the 'Resume' steering wheel switch to engage the speed control system.
Forward Alert Off	Forward alert has been switched off. No warning will be given for objects in the vehicle's forward direction.	None
Forward Alert	Forward alert has been switched on or the gap settings have changed.	None
Press [OK] To Set Warning Speed XX MPH (XX km/h)	Displayed when setting the ASL set speed.	None
Speed Alert	Displayed when the set speed is exceeded.	Reduce vehicle speed to below the current set speed.
Vehicle Held Press Accelerator To Resume	Forward alert is maintaining vehicle speed and distance.	None
Resume Inhibited	Forward alert is preventing further acceleration.	None
Forward Alert Not Available	ECM has detected a fault with forward alert	Diagnose the fault using an approved Land Rover Diagnostic

Available	fault with forward alert.	approved Land Rover Diagnostic system.
Forward Alert Radar Blocked	The forward alert radar has become dirty or obstructed.	Remove the obstruction or clean the radar sensor.
DSC On	Displayed for a short time when the DSC switch is operated to activate the DSC system.	None
DSC Off	Displayed for a short time when the DSC switch is operated to de-activate the DSC system.	None
TracDSC	Displayed for a short time when the DSC switch is operated to activate the TRAC DSC system.	None
Stability Control Not Available Drive With Care	The ABS (anti-lock brake system) module has detected a fault in the DSC system.	A fault has occurred in the DSC system. Interrogate ABS module for faults and diagnose using an approved Land Rover diagnostic system.
HDC ON	Displayed when the HDC switch is operated to activate the HDC system.	None
HDC OFF	Displayed when the HDC switch is operated to de-activate the HDC system.	None
HDC - Select Gear	Select D or R on transmission selector.	None
HDC Not Available System Fault	The ABS module has detected a fault in the HDC system.	A fault has occurred in the HDC system. Interrogate the ABS module for faults and diagnose using an approved Land Rover diagnostic system.
HDC Temporarily Unavailable	ABS module has determined brake usage has caused brake overheat.	Allow brakes to cool down. ABS module will remove message after predetermined time period of reduced brake usage.
HDC Not Available Speed Too High	Vehicle speed of more than 30 mph (50 km/h) is too high for HDC operation.	Reduce vehicle speed to less than 30 mph (50 km/h). HDC will resume operation below this speed.
Brake Fluid Low	Brake fluid level is low	Check braking system for leakage

	and low level sensor has operated.	and replenish brake fluid to correct level.
ABS Fault	The ABS module has detected a fault.	A fault has occurred in the ABS system. Interrogate the ABS module for faults and diagnose using an approved Land Rover diagnostic system.
EBD Fault	A fault is present in the braking system preventing EBD operation. Braking system will operate but EBD will not be available.	A fault has occurred in the EBD system. Interrogate the ABS module for faults and diagnose fault using an approved Land Rover diagnostic system.
Emergency Brake Assist Not Available	A fault is present in the braking system preventing EBA operation. Braking system will operate but EBA will not be available and additional brake pedal pressure may be required.	A fault has occurred in the EBA system. Interrogate the ADM for faults and diagnose fault using an approved Land Rover diagnostic system.
Adaptive Dynamics Fault	A fault has been detected by the Adaptive Damping Module (ADM).	Interrogate the ADM for faults and diagnose fault using an approved Land Rover diagnostic system.
E DIFF Not Available	Differential temperature has reached the overheat threshold. System deactivated until temperature returns within limits.	Allow differential to cool.
E DIFF Fault	Fault has occurred with electronic differential. System deactivated until fault rectified.	Interrogate the differential control module for faults and diagnose fault using an approved Land Rover diagnostic system.
Caution! Park Brake Applied	Parking brake has been applied when the vehicle moving at a speed 3 mph (5 km/h) or above.	None
Park Brake Fault	A fault is present in the parking brake system.	Interrogate the parking brake module for faults and diagnose using an approved Land Rover diagnostic system.
Press Foot Brake And Park Brake Switch To Release	Driver is trying to release the park brake without applying the foot brake.	Apply foot brake and parking brake to reset the parking brake module.
Park Brake Auto	A fault is present in the	Interrogate the parking brake

Release Unavailable	parking brake system or an input from another vehicle system is missing.	module for faults and diagnose using an approved Land Rover diagnostic system.
Park Brake Off Lift Switch To Apply	Parking brake manual release has been operated.	Lift parking brake switch to activate the parking brake and reset the manual release system.
Check Spare Tyre Pressure	Spare tire pressure is low	Inflate the spare tire to the highest pressure for the specified tire size.
Tyre Pressures Too Low For Speed. NOTE: Certain markets only	Tire pressure(s) too low for high speed driving.	Inflate the tires to the recommended pressure for high speed driving.
Tyre Pressure Monitoring System Fault	There is a fault with the Tire Pressure Monitoring system.	Check for visual faults/DTC (diagnostic trouble code)'s and diagnose using an approved Land Rover diagnostic system.
Check All Tyre Pressures	Pressure is low in one or more tires.	Check all tire pressures and inflate to the recommended pressures.
Front Right Tyre Pressure Not Monitored	Front Right tire low pressure sensor reception lost or missing.	Check for visual faults/DTC's and diagnose using an approved Land Rover diagnostic system.
Rear Right Tyre Pressure Not Monitored	Rear Right tire low pressure sensor reception lost or missing.	Check for visual faults/DTC's and diagnose using an approved Land Rover diagnostic system.
Front Left Tyre Pressure Not Monitored	Front Left tire low pressure sensor reception lost or missing.	Check for visual faults/DTC's and diagnose using an approved Land Rover diagnostic system.
Rear Left Tyre Pressure Not Monitored	Rear Left tire low pressure sensor reception lost or missing.	Check for visual faults/DTC's and diagnose using an approved Land Rover diagnostic system.
Rear Right Low Check All Tyre Pressures	Rear Right tire pressure is low	Inflate the Rear Right tire to the recommended pressure.
Front Left Low Check All Tyre Pressures	Front Left tire pressure is low.	Inflate the Front Left tire to the recommended pressure.
Front Right Low Check All Tyre Pressures	Front Right tire pressure is low.	Inflate the Front Right tire to the recommended pressure.
Rear Left Low Check All Tyre Pressures	Rear Left tire pressure is low.	Inflate the Rear Left tire to the recommended pressure.
Tyre Pressure	Tire low pressure sensor	Check for visual faults/DTC's and

Monitoring Not Available. NOTE: Certain markets only	reception missing.	diagnose using an approved Land Rover diagnostic system.
Tyre Pressure Monitoring Available. NOTE: Certain markets only	Tire low pressure sensor reception restored.	None
Tyre Pressure Monitoring Set For Light Load. NOTE: Certain markets only	Currently active load setting information.	None
Tyre Pressure Monitoring Set For Heavy Load. NOTE: Certain markets only	Currently active load setting information.	None
Water In Fuel See Handbook. NOTE: Diesel only	ECM has detected a signal from the water in fuel sensor on the fuel filter.	Drain the fuel filter as detailed in the Repair Procedures.
Charging System Fault	ECM has detected a fault in the charging system.	Interrogate the ECM using an approved Land Rover diagnostic system.
Low Battery Please Start Engine	Battery monitoring system has detected a low battery condition.	Start engine to prevent further discharge of vehicle battery. Check battery condition and charging system using an approved Land Rover diagnostic system.
Auto High Beam Sensor Blocked	The Auto High Beam control module has detected a restriction in the light levels detected by the image sensor.	Clean the image sensor and area of the windscreen in front of the sensor. Ensure no decals are placed in the windscreen to block the image sensor and no reflective items are on the instrument panel. Interrogate the control module using an approved Land Rover diagnostic system.
DPF Full See Handbook	ECM has detected diesel particulate filter is becoming blocked or has become blocked.	Drive the vehicle as described in the workshop manual to clean the filter.
DPF Full Visit Dealer	The DPF software in the ECM has detected the DPF is still blocked after the driver has performed the regeneration drive cycle.	
Coolant Level Low	ECM has detected a low coolant signal from the	Check the coolant system for leaks and replenish the coolant

	coolant signal from the engine coolant level sensor.	leaks and replenish the coolant reservoir as necessary.
Blind spot monitoring system has a fault or vehicle speed is below threshold for system operation. The amber alert LED (light emitting diode) is illuminated in the door mirrors.	Drive vehicle above threshold speed or investigate cause of fault.	
Blind Spot Sensor Blocked	A blind spot monitoring sensor has become dirty or obstructed. The amber alert LED is illuminated in the door mirrors.	Remove obstruction or clean the radar sensor.
Brake Pads Worn	A front or rear brake pad wear sensor contact has sent a pad wear signal to the instrument cluster.	Replace front and/or rear brake pads as necessary.
Service Required In XXXX miles (km)	ECM has detected service warning threshold of 1950 miles (3200 km) has been reached. ECM passes this information to the instrument cluster which rounds the mileage figure down to the nearest 50 miles (km).	Service vehicle as necessary and reset service interval using an approved Land Rover diagnostic system.
Service Required	ECM service warning countdown has reached 0 miles (km) and service is now due.	Service vehicle as necessary and reset service interval using an approved Land Rover diagnostic system.
Command Shift	CommandShift and has been selected by the driver using the transmission selector.	None
Low Range Selected	Low range has been selected by the driver using the range change button on the floor console.	None
High Range Selected	High range has been selected by the driver using the range change button on the floor console.	None

Select Neutral For Range Change	The driver has attempted to make a range change with the transmission selector in a position other than neutral (N).	Move transmission selector to neutral (N) position.
Speed Too High For Range Change	The driver has attempted to make a range change with the vehicle speed above the range change threshold.	Slow vehicle to within range change threshold speed.
Gearbox Overheating	TCM (transmission control module) has detected a transmission overheat.	Slow vehicle or stop to allow transmission to cool.
Reverse Gear Selected	TCM has detected driver has selected reverse gear using the transmission selector.	None
Camera System Fault	The proximity camera control module has developed a fault.	Diagnose the module using an approved Land Rover diagnostic system.
Suspension Lowered For Safety	Fault has occurred in the air suspension system or failure of another vehicle system has caused suspension system to lower to access height.	Investigate fault, check air suspension system for leakage and diagnose other systems using an approved Land Rover diagnostic system.
Slow Down Or Vehicle Will Raise	Vehicle speed is between 19 to 25 mph (30 to 40 km/h). Vehicle will automatically raise to on-road height from crawl if speed increases to 25 mph (40 km/h).	Keep vehicle speed below 25 mph (40 km/h).
Slow Down Or Vehicle Will Lower	Vehicle speed is between 25 to 31 mph (40 to 50 km/h). Vehicle will automatically lower to on-road height if speed increases 31 mph (50 km/h).	Keep vehicle speed below 31 mph (50 km/h).
Suspension Will Raise When System Cooled	Air suspension air supply unit compressor or motor is cooling down.	Lifting will resume when air supply unit compressor or motor has cooled beyond pre-set threshold.
Speed Too High To Change Height	Vehicle speed is too high for selected height change.	Reduce vehicle speed to within threshold for required height.
Vehicle Raising In	Vehicle is taking longer	Wait for suspension raising to be

Progress	than normal to raise.	completed if ground clearance is important.
Suspension In Extended Mode	Vehicle body has become grounded on an obstacle. The suspension will be lifted automatically if appropriate.	None
For Additional Suspension Press Raise Switch And Brake Pedal For 3 Seconds	The air suspension is in Extended Mode and additional suspension lifting is available if required by the driver.	Follow instructions if additional suspension lifting is required.
Re-Select Suspension Height If Clear Of Obstacle	Reminder message that vehicle is still in extended mode.	If extended mode is no longer required, press air suspension control 'lower' switch to return to normal levelling control.
Vehicle enters crawl mode until 'raise' switch pressed for more than 1 second or vehicle speed exceeds pre-determined threshold.		
Access Height Selected	Driver has pressed the lower switch or the door module access switch.	Vehicle will lower to access height if all operating parameters are met.
Normal Height Selected	Suspension ride height will change to normal.	
Off Road Height Selected	Driver has selected off-road height.	Suspension ride height will change to off-road.
Height request has been made but is prevented due to a door being open.	Close door(s).	
Confirm Required Suspension Height	Re-select the required ride height using the air suspension control switches or drive the car to achieve an automatic height selection.	
Suspension Fault	Air suspension control module has detected a system fault.	Investigate the fault and diagnose using an approved Land Rover diagnostic system.
Only Normal Height Available	Air suspension control has detected fault in the system. Only on-road	Investigate the fault and diagnose using an approved Land Rover diagnostic system.

	system. Only on-road height is available.	diagnostic system.
Suspension Fault Max Speed 30 MPH (50 km/h)	Air suspension control module has detected a fault in the system and is unable to control the height correctly.	Investigate the fault and diagnose using an approved Land Rover diagnostic system.
Vehicle Too Low	Applies only when the vehicle is in Transportation Mode. This message is displayed while the suspension is being lifted from the "Engine Off" to the "Engine On" height.	Wait for the "Engine On" height to be achieved before moving the vehicle on or off transportation equipment.
Air Suspension Not In Customer Mode	Air suspension system is not configured for customer use.	Use an approved Land Rover diagnostic system to configure the air suspension system correctly.
Special Programs Off	Advisory message to inform driver that current special program has been switched off and general program is active.	None
Grass Gravel Snow	Terrain Response rotary control has been moved to the Grass Gravel Snow position. Program will be selected after 2 seconds.	None
Mud-Ruts	Terrain Response rotary control has been moved to the Mud/Ruts position. Program will be selected after 2 seconds.	None
Sand	Terrain Response rotary control has been moved to the Sand position. Program will be selected after 2 seconds.	None
Rock Crawl	Terrain Response rotary control has been moved to the Rock Crawl position. Program will be selected after 2 seconds	None
Dynamic	Terrain Response rotary control has been moved to the Dynamic position. Program will be selected	None

	after 2 seconds.	
Program change in progress	Vehicle operating conditions prevent selection of program. This may be caused by ABS or DSC activity or electronically controlled differential.	If operating conditions change within 60 seconds, selected program will be activated..
Recommend starting in 2nd Gear for slippery conditions	May be advisable to pull away in gear other than 1st on slippery surfaces. Message will be displayed only once per ignition cycle.	Applies on automatic transmission vehicles when in Grass/Gravel/Snow program but low gear has been selected manually using CommandShift.
Recommend start in 3rd Gear for slippery conditions	May be advisable to pull away in gear other than 1st or 2nd when in low range on slippery surfaces. Message will be displayed only once per ignition cycle.	Applies on automatic transmission vehicles when in Grass/Gravel/Snow program but low gear has been selected manually using CommandShift.
Recommend Raising suspension to Off-Road height in **deep** mud ruts	Terrain Response mud/ruts special program message when in high range, displayed once every ignition cycle (Suspension raised automatically when in low range).	Raise suspension manually to off-road height if required.
Recommend Low Range is selected for Mud-Ruts Program	Terrain Response special program message displayed once every ignition cycle.	Select low range if required
Trailer Connected Off Road height not selected automatically	Terrain Response system would normally have provided off-road height automatically, but system has detected an electrical load on trailer socket.	If trailer or light board is connected, manually raise suspension to off-road height if safe to do so If nothing is connected to trailer socket, investigate trailer socket and/or Terrain Response system for fault.
CAUTION! Risk of grounding with suspension at Normal Height	Only displayed when system would have normally provided off-road height, but driver has manually lowered the suspension (or the suspension system is unable to raise the vehicle).	Raise suspension manually to off-road height if possible and where appropriate.
Select Low Range to activate Rock Crawl	Terrain Response Rock Crawl special program	Change transfer box to low range.

activate Rock Crawl	Crawl special program has been requested but transfer box is in high range.	
Terrain Response Special Programs unavailable	Terrain Response special program is selected but cannot be activated because of a sub-system fault (e.g. engine, transmission).	A fault exists in another sub-system used in the Terrain Response system. Use an approved Land Rover diagnostic system to interrogate other sub-system control modules for DTC's.
Terrain Response System Fault	Terrain Response special program is selected but cannot be activated because of a fault in the system itself.	A fault exists in the Terrain Response control module. Check other sub-system modules used in the Terrain Response system and then diagnose the Terrain Response control module using an approved Land Rover diagnostic system.
Grass Gravel Snow Program Selected	Driver has moved Terrain Response rotary control to Grass Gravel Snow program.	None
Mud-Ruts Program Selected	Driver has moved Terrain Response rotary control to Mud-Ruts program.	None
Sand Program Selected	Driver has moved Terrain Response rotary control to sand program.	None
Rock Crawl Program Selected	Driver has moved Terrain Response rotary control to rock crawl program.	None
Special Programs Off	Advisory message to inform driver that system is in special programs off.	None
Cruise Setspeed XXX mph (XXX km/h)	Displays the speed control set speed selected by the driver.	None
Cruise Standby	The speed control 'Cancel' button has been pressed.	Press the 'Resume' button to resume the set speed.
Cruise Engaged	The cruise control has engaged and holding the vehicle at the selected set speed.	None
Cruise Cancelled	Driver has pressed cancel switch.	Press the resume switch to resume speed control.
Cruise Override XXX	Driver has pressed	Release accelerator pedal to

Cruise Override XXX MPH (XXX km/h)	Driver has operated throttle to increase vehicle speed when using adaptive speed control.	Release accelerator pedal to re-engage adaptive speed control.
Speed Alarm	The set speed warning speed value has been exceeded.	Slow the vehicle to the set speed or access the instrument cluster menu to adjust the set speed for the speed alarm to the required value.
Press & Hold to reset Trip A	Press and hold the trip button to reset Trip A.	To reset the Trip A.
Press & Hold to reset Trip B	Press and hold the trip button to reset Trip B.	To reset the Trip B.
Press & Hold to Add or Remove last journey	Press and hold the trip button to add or remove the last journey to the displayed trip recorder.	None
Press [OK] To Clear Engine Oil Level OK	Engine oil level is at the correct level.	None
Press [OK] To Clear Overfilled Refer to handbook	Engine oil level is too high and has been overfilled. Do not drive the vehicle as this will cause serious engine damage.	Remove some oil from the engine and recheck the oil level. Top-up or remove further oil as necessary.
Press [OK] To clear Engine Oil Level Not Available	A fault exists in the engine oil level system.	Use an approved Land Rover diagnostic system to diagnose the fault.
Press [OK] To Clear Engine Oil Level Add XX Litre (Quart) Refer to handbook for oil type	Engine oil level requires replenishing to the correct level.	Add the suggested amount of engine oil, recheck level is correct.
Press [OK] To Clear Engine Oil Level Underfilled Refer to handbook for oil volume & type	Engine oil level is low.	Add engine oil and recheck that oil level is at the correct level.

GEAR POSITION DISPLAY

The gear position is displayed in the lower half of the tachometer display. It shows the current selector position P, R, N, D or S. When the transmission is in manual 'CommandShift' mode, the display will show the currently selected gear ratio S1, S2, S3, S4, S5 or S6.

selected gear ratio S1, S2, S3, S4, S5 or S6.

The gear position display is controlled by the TCM. The gear position is illuminated in response to CAN bus messages from the TCM.

The instrument cluster has no control over the gear position display, but monitors the controlling CAN bus messages. If the instrument cluster detects ten incorrect CAN bus messages, 'TRANS. FAILSAFE PROG' is illuminated in the message center. If a correct CAN bus message is received when the ignition is next switched on to ignition mode 6, the error is erased and the message removed.

SERVICE INTERVAL INDICATOR

The Service Interval Indicator is displayed in the message center. The indicator displays information calculated by the ECM to calculate the remaining distance to the next service based on the amount of fuel used since the last service interval indicator reset.

The ECM counts down the distance to engine service and the instrument cluster rounds this down to the nearest 50 miles (KM). The fuel used based count down starts from 3200 miles (km) displaying the required figure in the trip computer message center, for example 'Service Required in 1950 miles (km)'. When the ECM has calculated the distance to service is 0 miles (km), the ECM will request the instrument cluster to display 'Service Required' in the message center.

The ECM also monitors and calculates when the time to the next oil service is required and when an oil service is required, 'Service Required' is displayed in the message center. This message takes priority over the distance to service calculation.

The service information is displayed in the message center for 4 seconds at each ignition cycle. There is no minus figure if the service distance is exceeded, 'Service Required' is displayed until the ECM service counter is reset using an approved Land Rover diagnostic system via a CAN bus message from the instrument cluster.

WARNING DEVICES

SPECIFICATIONS

Torque Specifications

DESCRIPTION	NM	LB-FT
Low tire pressure module bolts	10	7

2012.0 RANGE ROVER (LM), 413-09

WARNING DEVICES

Component Location

1Right Hand Door Mirror Warning Lamp Right Hand Door Mirror Warning Lamp 2Right hand Blind Spot Monitoring Module Right hand Blind Spot Monitoring Module3Left Hand Blind Spot Monitoring Module 4Left Hand Door Mirror Warning Lamp Left Hand Door Mirror Warning Lamp

OVERVIEW

Eliminating blind spots is a major element in vehicle body design, but because of the structural requirements of B, C and D pillars, blind spots cannot be entirely eliminated. Statistics show that some accidents are directly attributable to drivers moving across into the path of overtaking vehicles that have not been seen in conventional mirrors. New mirror designs have improved the situation, but by remotely covering areas that cannot be seen either directly or by the vehicle mirrors, have led to the introduction of a radar-based blind spot monitoring system.

The blind spot monitoring system comprises:

- LH (left-hand) Blind spot monitoring sensor
- RH (right-hand) Blind spot monitoring sensor
- LH (left-hand) door mirror
- RH (right-hand) door mirror

The system uses two radar modules operating at a frequency of 24 GHz and each combining the radar face and electronic module in a single unit. The modules are located behind the rear bumper surface, symmetrically, one on each side of the car behind the rear wheels. They are side facing and inclined rearwards at an angle of 16 degrees, which is dictated by the shape at the rear of the vehicle. Each module is calibrated to detect a vehicle in the driver's blind spot. Once a vehicle is detected the module illuminates an amber warning 'alert icon' LED (light emitting diode) in the relevant exterior door mirror. If there is a fault or blockage with the blind spot monitoring

system an amber warning indicator dot LED (light emitting diode) is displayed in the exterior mirror and the message ‘blind spot monitoring not available’ or ‘blind spot sensor blocked’ is displayed in the instrument cluster message center.

When the system initiates, it performs a self-check, during which the warning icons in the mirrors illuminate alternately for a short period of time. Each module does a left/right determination check when the ignition is switched on. Each mirror has a different circuit configuration so that the modules can determine which mirror they are connected to. If a module detects the wrong mirror it will go into a fault condition.
The blind spot monitoring modules receive vehicle speed on the medium speed CAN (controller area network) and are inactive until the vehicle reaches 16kph (10mph).

Each Blind Spot Monitor module emits a radar field greater than the blind spot area. The actual blind spot area is calibrated into the module during its manufacture.

CAUTION:

The blind spot monitoring system is designed as a driver aid not a safety device. The driver should always exercise due care and attention whilst driving.

SYSTEM OPERATION

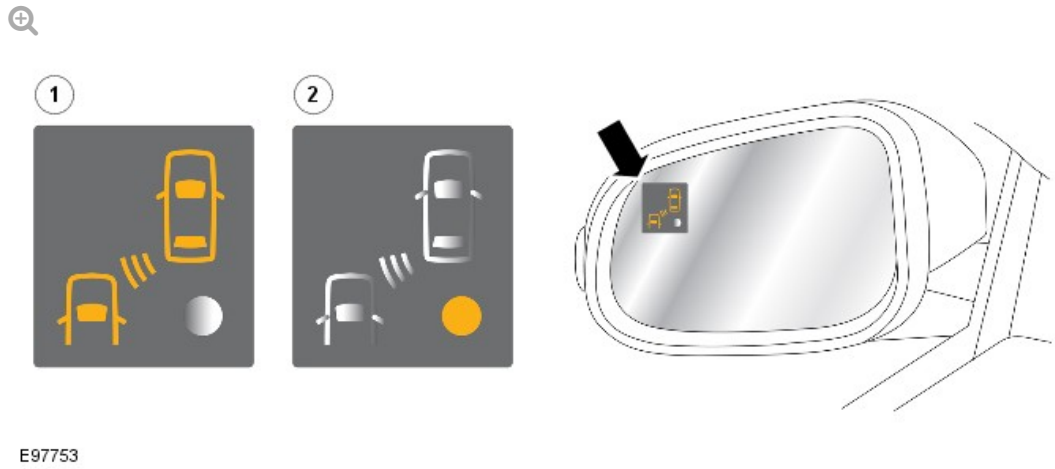
he purpose of the blind spot monitoring system is to detect an object moving with a positive velocity relative to the radar module, on either side of the vehicle, at a distance of up to 2.5 meters laterally and in an area from the door mirror up to 6.0 meters behind the module. These criteria identify an overtaking vehicle within the blind-spot area and within a typical carriageway lane width, while eliminating other objects that are not relevant, either because of their position, they are stationary, traveling in the opposite direction, or being overtaken. A vehicle is classed as a heavy goods vehicle, car or motorcycle. A motorcycle is defined as a minimum size of 2.0m long, 0.8m wide (widest point) and 1.1m high. The system is not affected by the mass of the

overtaking vehicle providing all identification criteria, including relative velocity of (16km/h - 10mph) or above, is met.
The system emits radar pulses and analyses the reflections, identifying anything that moves into the blind spot zone. Having detected another vehicle in the defined blind spot zone it alerts the driver by illuminating the amber alert icon located in the appropriate exterior mirror.

NOTE:

If an overtaking vehicle is detected on both sides of the vehicle simultaneously, the warning alert icons in both mirrors will illuminate.

The blind spot monitoring system lenses are shaped so as to minimize the visibility to other drivers. The LED (light emitting diode)'s are located towards the outside extremity of the mirror face, within the peripheral view of the driver but not in any area of the mirror where they could obscure or distract from the image.



ITEM	DESCRIPTION
1	Warning alert icon
2	System status warning indicator

The LED (light emitting diode) lighting sequence is as follows;

- Amber alert LED (light emitting diode) icon permanently lit - system operational, vehicle detected in blind spot area

- No LED (light emitting diode) ’s lit – system active no vehicle detected in blind spot area
- Amber status LED (light emitting diode) permanently lit - system not active or faulty

The system has operating limitations and is automatically turned off under certain operating conditions. During these operating conditions the amber status LED (light emitting diode) is permanently lit.The system operating limitations are as follows;

- The system is inactive until vehicle speed is greater than 16km/h - 10mph (amber status LED (light emitting diode) permanently lit)
- The system is inactive if an approved trailer is connected to the vehicle (amber status LED (light emitting diode) permanently lit)
- The system is inactive when reverse gear or park is selected (amber status LED (light emitting diode) permanently lit)

If either of the radar signals are blocked or distorted, for example by water, the radar face of the module is covered in mud, sleet or snow the system may detect this and be disabled with the amber status LED (light emitting diode) permanently lit together with a ‘blind spot monitoring blocked’ message displayed in the instrument cluster message center. The system is disabled until the blockage is cleared.

If there is a fault in the system the amber status LED (light emitting diode) is permanently lit and a ‘blind spot monitoring not available’ message displayed in the instrument cluster message center. The system is disabled until the fault is rectified.

System fault and blockage warnings are as follows;

- The system is disabled when the radar module signal is blocked (amber status LED (light emitting diode) permanently lit and instrument cluster message)
- The system is disabled by a fault (amber status LED (light emitting diode) permanently lit and instrument cluster message)

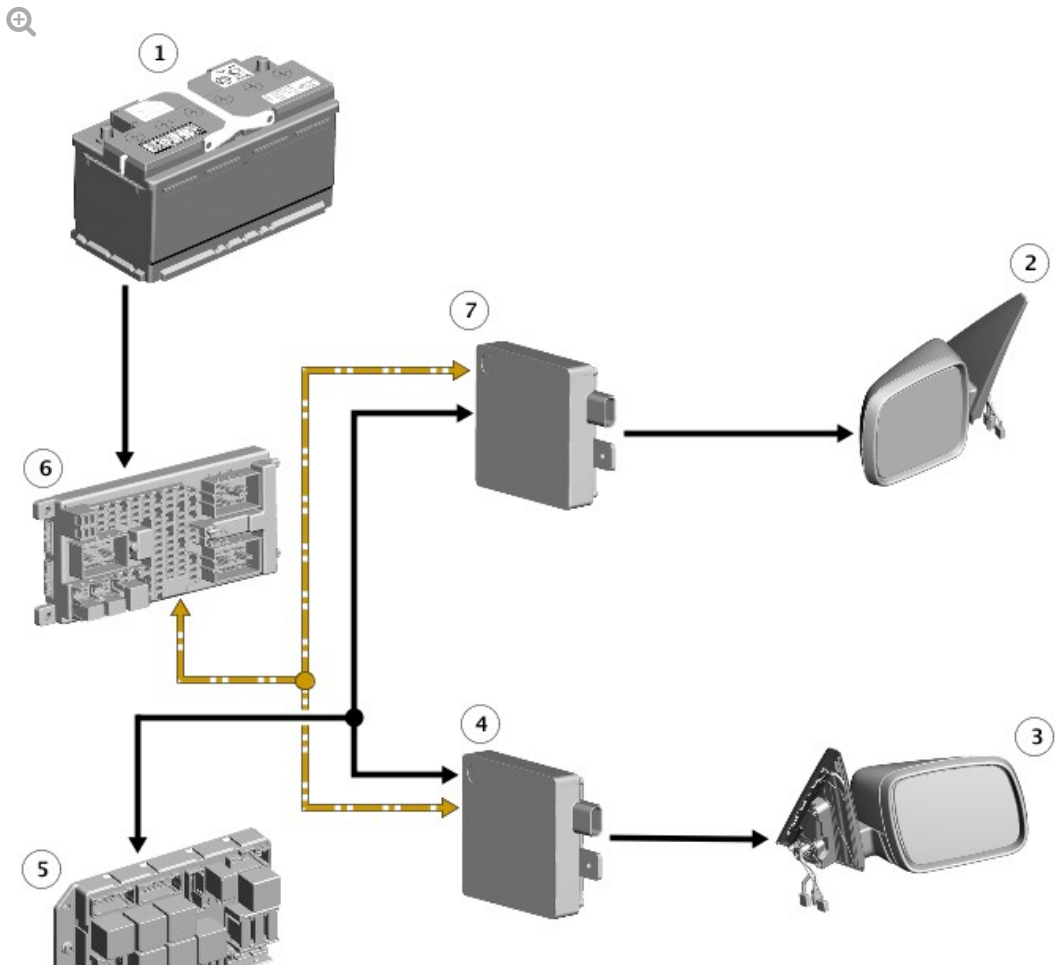
If there is a failure in the communication network and the warning LED (light emitting diode) 's cannot be displayed in the mirror, a failure message will be displayed in the instrument cluster message center.

When any faults are present in the system DTC (diagnostic trouble code) 's are stored in both blind spot monitoring modules appropriate to each module. Replacement of modules requires the right hand module to be configured using the Jaguar approved diagnostic equipment. Due to the fact that all modules are supplied as left hand modules the replacement left hand modules do not require configuring.
Calibration of the modules using the Jaguar approved diagnostic equipment enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

Control Diagram

NOTE:

A = Hardwired: N = Medium Speed CAN bus



5Rear Fuse Box7Left Hand Blind Spot Monitoring Module

ITEM	DESCRIPTION
1	Battery
2	Left Hand Door Mirror
3	Right Hand Door Mirror
4	Right Hand Blind Spot Monitoring Module
6	

2012.0 RANGE ROVER (LM), 413-09

WARNING DEVICES

DIAGNOSIS AND TESTING

PRINCIPLES OF OPERATION

For a detailed description of the Blindspot Monitoring system, refer to the relevant Description and Operation sections in the workshop manual.

INSPECTION AND VERIFICATION

CAUTION:

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

1. Verify the customer concern.

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

NOTE:

Particular attention should be paid to the following items where DTCs may not be logged:

- Check for contamination (e.g. dirt, grime, frosting, ice) around the blindspot monitoring sensors and clear.

Visual Inspection

MECHANICAL	ELECTRICAL
▪ Exterior rear view mirror glass ▪ Mud or sleet contamination around rear bumper area ▪ Blindspot Monitoring Modules	▪ Fuse(s) ▪ Relay(s) ▪ Wiring Harness ▪ Electrical connector(s) ▪ Blindspot Monitoring Modules

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
▪ The instrument cluster displays 'BSM System Fault' ▪ DTC B11C915 is logged within the left hand Blind Spot Monitoring module ▪ The Left Alert icon is constantly illuminated	▪ Left driver display alert LED circuit - short to power	Refer to the electrical circuit diagrams and check left driver display alert LED circuit for short to power
▪ The instrument cluster displays 'BSM System Fault' ▪ DTC B11C915 is logged within the left hand Blind Spot Monitoring module ▪ No short to power or open circuit fault on the driver display status LED circuit	▪ Left mirror ground circuit - open circuit	Refer to the electrical circuit diagrams and check the left mirror ground circuit for open circuit
▪ The instrument cluster displays 'BSM System Fault' ▪ DTC B11C915 is logged within the right hand Blind Spot Monitoring	▪ Right mirror ground circuit - open circuit	Refer to the electrical circuit diagrams and check the right mirror ground circuit for open circuit

module ▪ No short to power or open circuit fault on the driver display status LED circuit		
▪ The instrument cluster displays 'BSM System Fault' ▪ DTC U023200 is logged within the right hand Blind Spot Monitoring module ▪ The left driver display status LED does not illuminate when the vehicle is stationary, in Park and the ignition is on	▪ Left driver display status LED circuit - short to ground ▪ Suspect left hand module failure	Refer to the electrical circuit diagrams and check left driver display status LED circuit for short to ground. Clear DTC and re-test. If DTC remains suspect the left hand Blindspot Monitoring module. Check and install a new left hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index
▪ The instrument cluster displays 'BSM System Fault' ▪ DTC U023200 is logged within the right hand Blind Spot Monitoring module ▪ When the system is powered up the left driver display alert LED does not illuminate during the bulb self-checks	▪ Left driver display alert LED - short to ground, open circuit ▪ Suspect left hand module failure	Refer to the electrical circuit diagrams and check left driver display alert LED circuit for short to ground, open circuit. Clear DTC and re-test. If DTC remains suspect the left hand Blindspot Monitoring module. Check and install a new left hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index

▪ The instrument cluster displays 'BSM System Fault' ▪ DTC U023300 is logged within the left hand Blind Spot Monitoring module ▪ The right driver display status LED is constantly illuminated	▪ Right driver display status LED - short to power ▪ Suspect right hand module failure	Refer to the electrical circuit diagrams and check right driver display status LED circuit for short to power. Clear DTC and re-test. If DTC remains suspect the right hand Blindspot Monitoring module. Check and install a new right hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index
▪ The instrument cluster displays 'BSM System Fault' ▪ DTC U023300 is logged within the left hand Blind Spot Monitoring module ▪ When the system is powered up the right driver display status LED does not illuminate during the bulb self-checks	▪ Right driver display status LED - open circuit ▪ Suspect right hand module failure	Refer to the electrical circuit diagrams and check right driver display status LED circuit for open circuit. Clear DTC and re-test. If DTC remains suspect the right hand Blindspot Monitoring module. Check and install a new right hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index
▪ The instrument cluster displays 'BSM System Fault' ▪ DTC U023300 is logged within the left hand Blind Spot	▪ Right mirror ground circuit - open circuit ▪ Suspect right hand module	Refer to the electrical circuit diagrams and check the right mirror ground circuit for open circuit. Clear DTC and re-test. If DTC remains suspect the left hand Blindspot Monitoring module. Check and install a new left hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index

Spot Monitoring module • When the system is powered up both the right driver display LEDs do not illuminate during the bulb self-checks	module failure	

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: Blind Spot Monitoring System Module Left/Right (100-00, Description and Operation).

WARNING DEVICES

LOW TIRE PRESSURE MODULE (G300781)

REMOVAL AND INSTALLATION

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

REMOVAL

NOTE:

If the tire pressure module is to be replaced then T4 must be connected and the correct procedures adhered to, prior to battery disconnection.

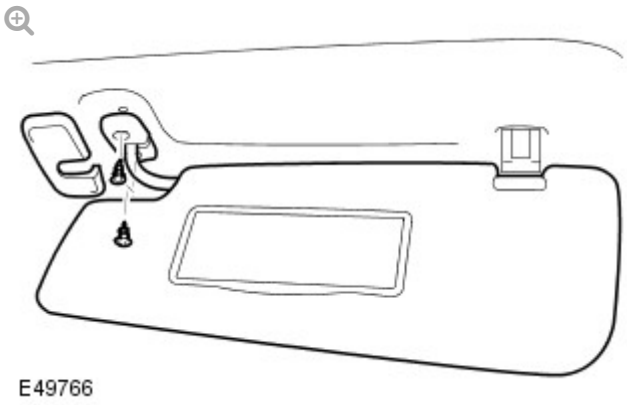
1. Disconnect the battery ground cable.
   For additional information, refer to: Specifications - Armoured (414-00 Battery and Charging System - General Information, Specifications)

Specifications).

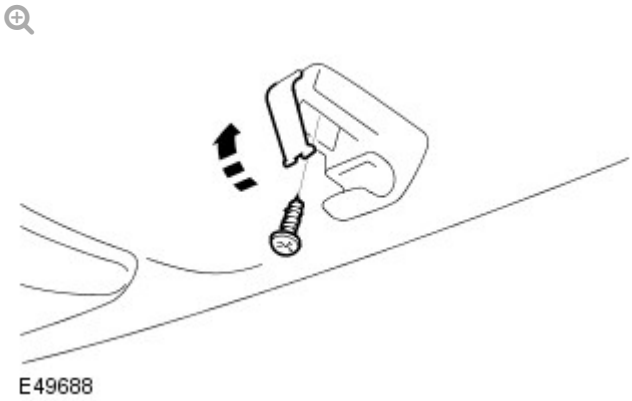
2. Remove the LH A-pillar upper trim panel.
   For additional information, refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Remove the LH B-pillar upper trim panel.
   For additional information, refer to: B-Pillar Upper Trim Panel (501-05, Removal and Installation).

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

5. 
   E49766

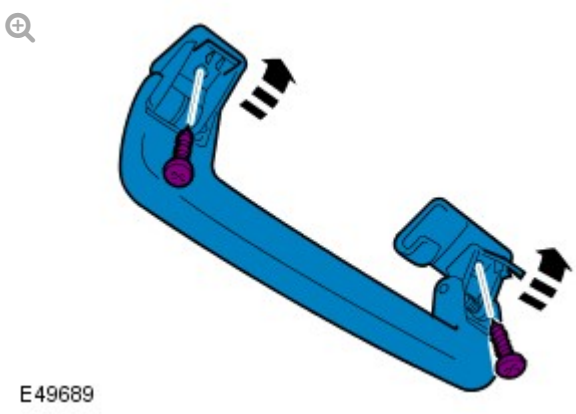
   Remove the LH sun visor.
   - Remove the cover.
   - Remove the 2 screws.
   - Disconnect the electrical connector.

6. 
   E49688

Remove the sun visor retaining clip.

- Release the screw cover.
- Remove the screw.

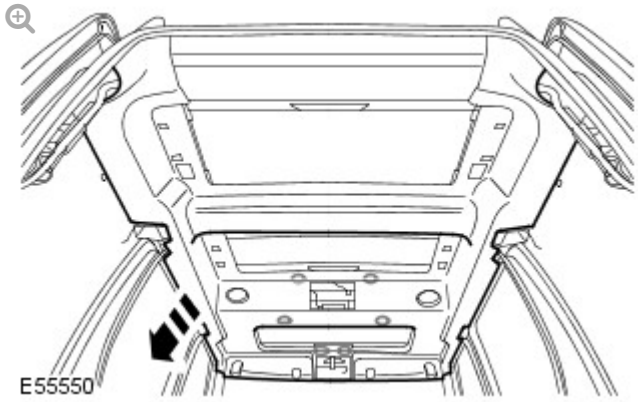
7.



Remove the LH passenger assist handles.

- Carefully release the 6 screw covers.
- Remove the 6 screws.

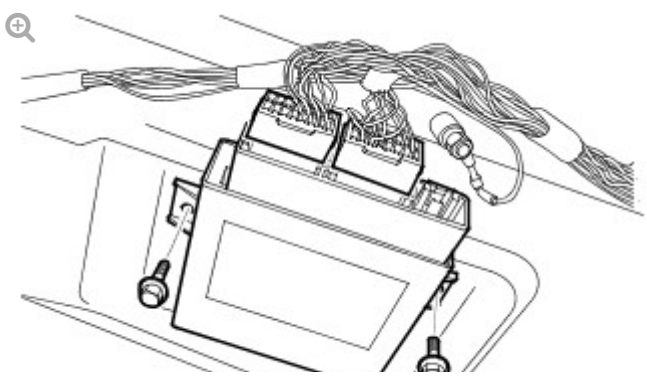
8.



Release the LH side of the headliner.

- Release the 6 clips.

9.



Remove the low tire pressure module.

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

INSTALLATION

1. Install the low tire pressure module.
   - Tighten the bolts to 10 Nm (7 lb.ft).
   - Connect the electrical connectors.
2. Secure the LH side of the headliner.
   - Carefully secure the clips.
3. Install the LH passenger assist handles.
   - Install the screws.
   - Install the screw covers.
4. Install the sun visor retaining clip.
   - Install the screw.
   - Install the screw cover.
5. Install the LH sun visor.
   - Install the screws.
   - Install the screw covers.
   - Connect the electrical connector.
6. Install the LH C-pillar upper trim panel.
   For additional information, refer to: C-Pillar Upper Trim Panel (501-05, Removal and Installation).
7. Install the LH B-pillar upper trim panel.

For additional information, refer to: B-Pillar Upper Trim Panel (501-05, Removal and Installation).

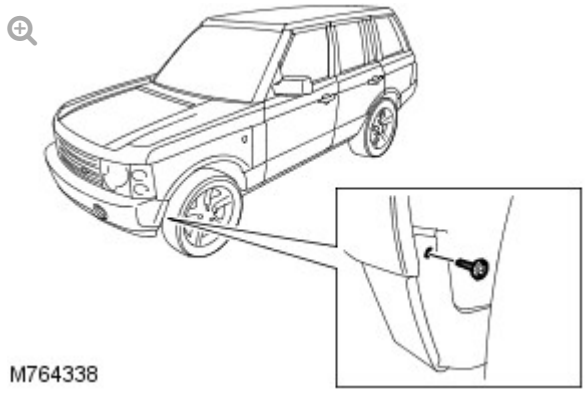
8. Install the LH A-pillar upper trim panel.
   For additional information, refer to: A-Pillar Trim Panel (501-05 Interior Trim and Ornamentation, Removal and Installation).

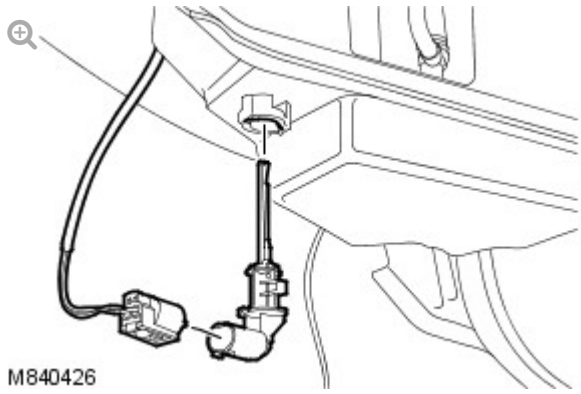
9. Connect the battery ground cable.
   For additional information, refer to: Specifications - Armoured (414-00 Battery and Charging System - General Information, Specifications).

LOW WASHER FLUID WARNING INDICATOR SWITCH (G916056)

REMOVAL AND INSTALLATION

REMOVAL

1. Turn the steering on to full lock for access.
2. Raise the vehicle on a lift.
3. 

   Remove the front bumper extension panel screw.
4. 

   Remove the low washer fluid warning indicator switch.

- Release the front lower edge of the fender splash shield for access.
- Disconnect the electrical connector.

INSTALLATION

1. Install the low washer fluid warning indicator switch.
   - Connect the low washer fluid warning indicator switch electrical connector.
2. Install the front bumper extension panel screw.
3. Lower the vehicle on the lift.
   - Turn the steering wheel to the straight ahead position.

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WARNING DEVICES

BLINDSPOT MONITORING SENSOR LH (G1247066)

REMOVAL AND INSTALLATION

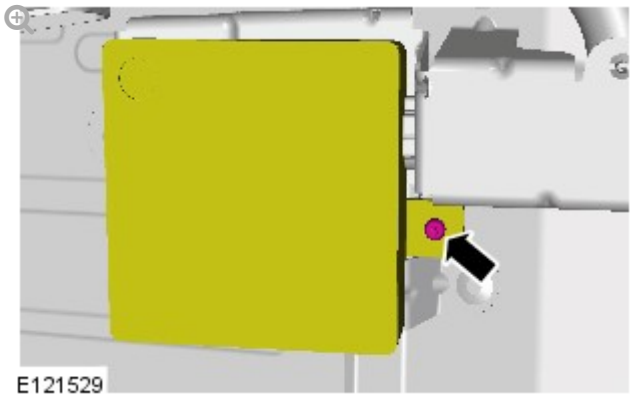
86.54.92	SENSOR - BLIND SPOT MONITORING - EACH - RENEW	ALL DERIVATIVES	0.5	USED WITHINS	+

REMOVAL

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

2. **NOTE:**

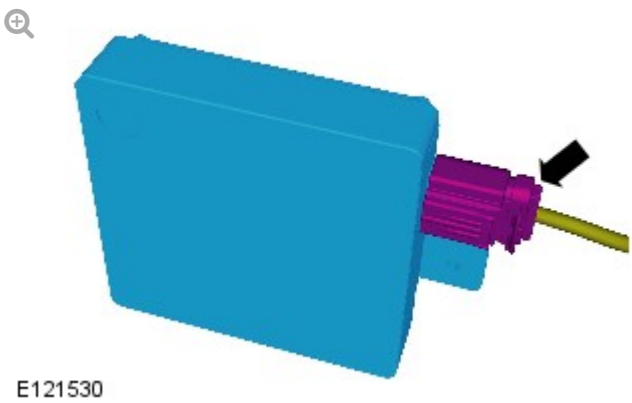
   LH illustration shown, RH is similar.


E121529

Torque: **2 Nm**

3. **NOTE:**

   LH illustration shown, RH is similar.


E121530

INSTALLATION

1. To install, reverse the removal procedure.

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ENGINE PROTECTION SYSTEM

SPECIFICATIONS

Torque Specifications

DESCRIPTION	NM	LB-FT
Passive anti-theft system (PATS) module bolts	10	7

PARKING AID

SPECIFICATIONS

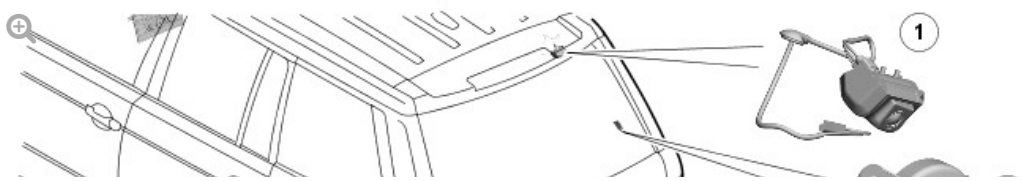
DESCRIPTION	NM	LB-FT
Parking aid module nuts	5	4

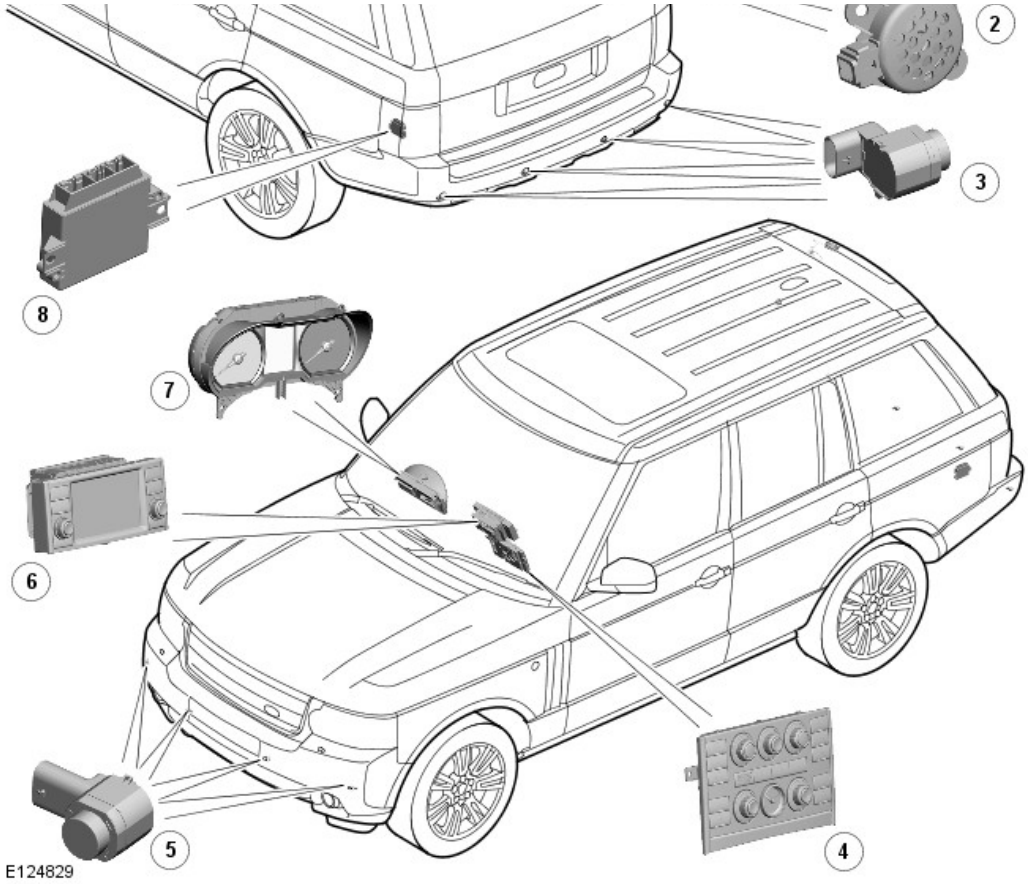
2012.0 RANGE ROVER (LM), 413-13

PARKING AID

DESCRIPTION AND OPERATION

COMPONENT LOCATION – PARKING AID





ITEM	DESCRIPTION
1	Rear view camera (if fitted)
2	Parking aid sounder
3	Rear parking sensor
4	Parking aid switch
5	Front parking sensor
6	Parking aid switch
7	Instrument Cluster
8	Parking aid module

OVERVIEW

The parking aid system provides an audible warning to the driver when any obstacles are in the path of the vehicle during forward and reverse parking manoeuvers. The system consists of 4 ultrasonic parking aid sensors in each bumper, a control module, a sounder and a switch. The system also uses the sounder driven by the instrument cluster.

At low speed, the parking aid module uses the sensors to monitor the area around the bumpers, then outputs a warning on the parking aid sounder or the instrument cluster sounder if an object is detected within a monitored area. As well as detecting solid objects such as posts, walls and other vehicles, the system can also detect less solid objects such as a wire mesh fence. Objects close to the ground may escape detection but, because of their low height, will not foul the vehicle.

Some vehicles may also be fitted with a rear view camera. The rear view camera provides the driver with a rear view image displayed on the touch screen display to assist when reversing the vehicle.

The rear view camera is located under the rear spoiler on the upper tail door, adjacent to the center high mounted stop lamp. The rear view camera is connected directly to the touch screen display via a co-axial cable. The rear view camera transmits a wide angle, color image of the area at the rear of the vehicle which is displayed on the touch screen display when reverse gear is selected.

PARKING AID SENSORS

The ultrasonic parking aid sensors are transceivers which are installed in inserts in the bumpers. All 8 sensors are identical and keyed to the inserts to ensure correct orientation.

When the system is active, the sensors transmit ultrasonic pulses. Any reflections from the pulses received by the transmitting and adjacent sensors are then converted to digital format and output to the parking aid module.

PARKING AID MODULE

The parking aid module is located next to the auxiliary junction box (AJB), behind the trim in the right-hand (RH) side of the luggage compartment.

INPUTS AND OUTPUTS

Three connectors provide the interface between the parking aid module and the vehicle wiring. The parking aid module is powered by the AJB. In

the vehicle wiring. The parking aid module is powered by the ASD. In addition to hardwired connections with the parking aid sensors, parking aid sounder and power supply, the parking aid module communicates with the instrument cluster on the medium speed CAN (controller area network).

PARKING AID SOUNDER

The parking aid sounder produces the audible warnings with which the parking aid module informs the driver of system status and objects detected at the rear of the vehicle. The parking aid sounder is installed behind the trim in the RH side of the luggage compartment, on the underside of the shelf.

The chime produced by the parking aid sounder has a lower tone than that produced by the instrument cluster sounder (which is used to warn of objects detected at the front of the vehicle), to enable the driver to differentiate between the two.

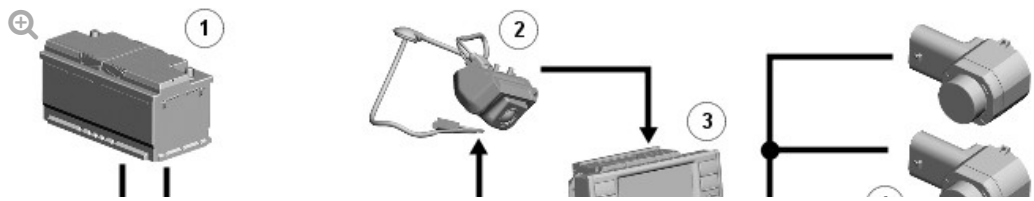
PARKING AID SWITCH

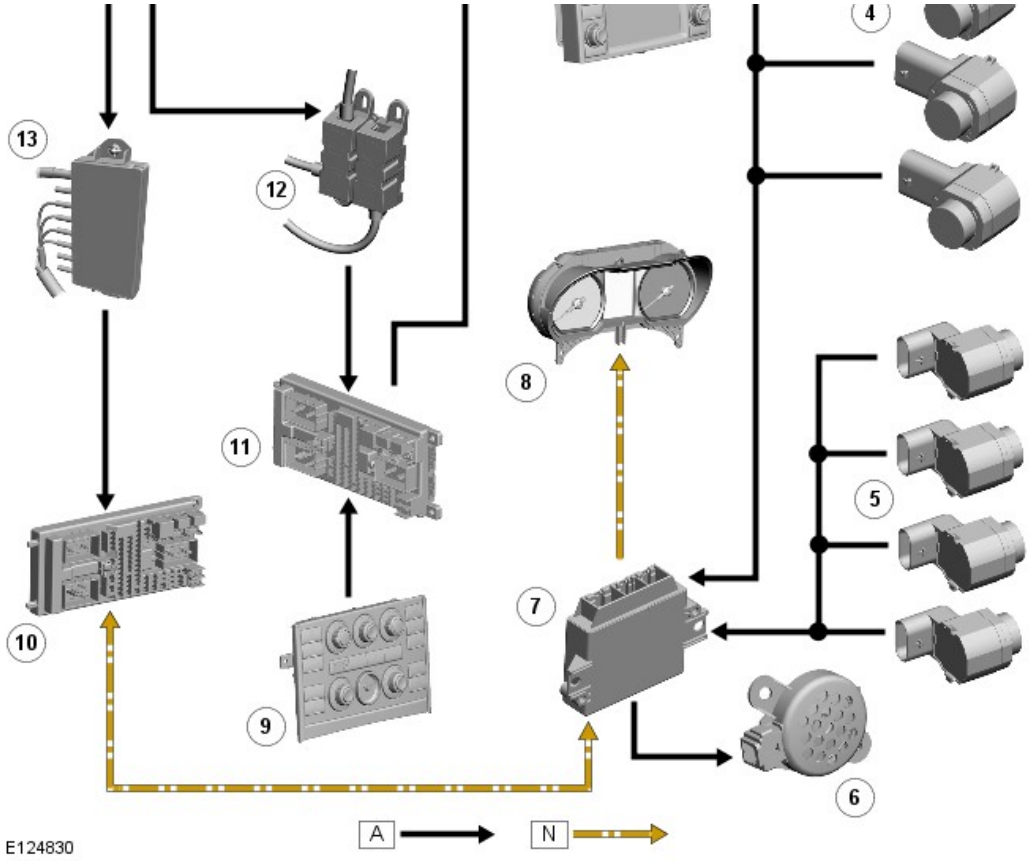
The parking aid switch is a non latching push switch installed on the center console for selecting the system on and off. When pressed, the switch connects a ground to the parking aid module. An orange light emitting diode (LED) above the switch indicates when the parking aid system is active. The LED is activated by a power feed from the parking aid module.

CONTROL DIAGRAM – PARKING AID

NOTE:

A = Hardwired; **N** = Medium speed controller area network (CAN) bus



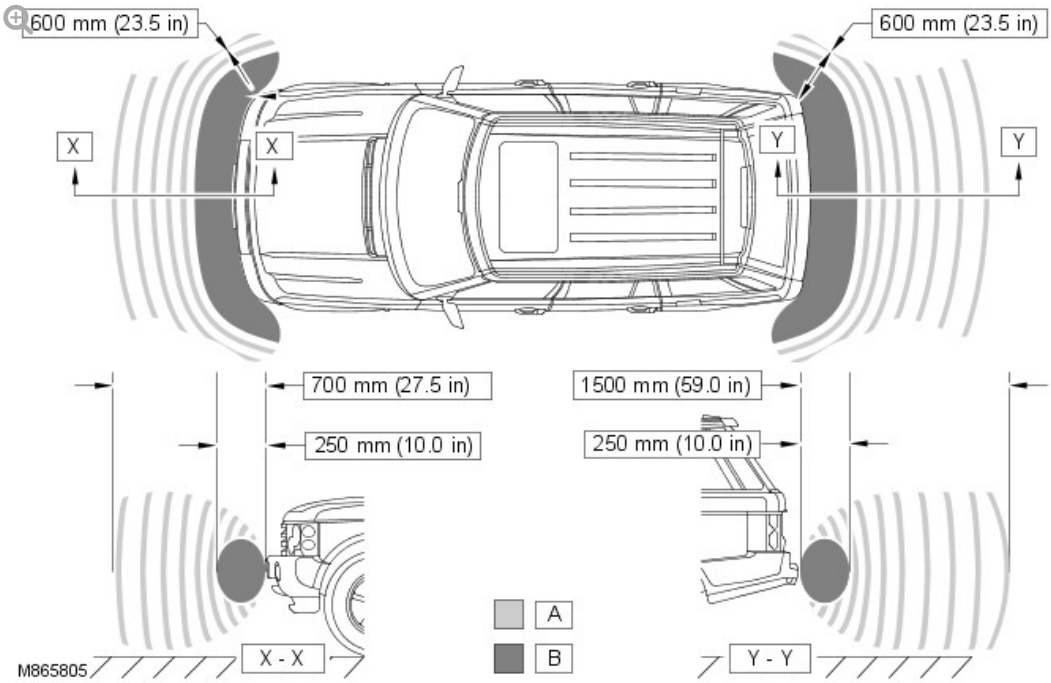


ITEM	DESCRIPTION
1	Battery
2	Rear veiw camera, central junction box (CJB)
3	TSD (touch screen display)
4	Front parking aid sensors
5	Rear parking aid sensors
6	Parking aid sounder
7	Park distance module
8	Instrument cluster
9	Parking aid switch
10	RJB (rear junction box) Rear parking aid sensors
11	CJB (central junction box)
12	BJB (battery junction box)
13	BJB 2

PRINCIPLES OF OPERATION

When the vehicle is in power mode 6 and either reverse gear is selected or the parking switch is pressed, both sets of acoustic sensors are activated. The parking aid module only activates the system if reverse is selected for more than 1 second, to avoid nuisance audible warnings when the gear selector lever is being moved between Drive and Park. The rear sensors are disabled when a trailer is connected to the vehicle.

Park Distance Control Detection Areas



When it activates the system, the parking aid module illuminates the indicator LED in the parking aid switch, switches on the parking aid sensors and generates a single chime on the parking aid sounder and the instrument cluster sounder to indicate the system is active. The parking aid module then processes the distance readings from the sensors to determine if there are any objects within the detection areas.

If there are no objects in the detection areas, there are no further audible warnings. If an object is detected, repeated audible warnings are produced on the parking aid sounder or the instrument cluster sounder as appropriate. The time delay between the audible warning tones decreases as the distance between the detected object and the vehicle decreases until, at approximately 250 mm (10 in), the audible warning tone is continuous.

After the initial detection of an object, if there is no decrease in the distance between the object and the vehicle:

- If the object is detected by one of the central acoustic sensors the time delay between audible warning tones remains constant
- If the object is detected by a corner transducer the audible warning tones stop after approximately 3 seconds.

The audible warning tones are discontinued when the gearbox selector lever is moved out of reverse, but will restart if the parking aid module detects a decrease in the distance between the vehicle and an object.

System operation is cancelled when the vehicle is in power mode 0. System operation is also cancelled if the vehicle travels more than 50 m (164 ft) or forward speed exceeds 19 mph (30 km/h).

The parking aid module software incorporates routines that compensate for the effect of ice, frost and rain on the parking aid sensors. Ice compensation occurs if the ambient temperature is less than 6°C (43°F).

DIAGNOSTICS

The parking aid module performs self check routines and checks the system wiring for short and open circuits. While the system is active the parking aid module also monitors the data from the parking aid sensors.

If a fault is detected, a related diagnostic trouble code (DTC) is stored in the non volatile memory of the parking aid module and either the front sensors, the rear sensors or the complete system is disabled, as appropriate. To advise the driver of the failure, the parking aid module flashes the indicator LED at 2 Hz and sounds a continuous warning tone for 3 seconds, in place of the normal short tone, when the system is activated.

DTC's can be accessed using the Land Rover approved diagnostic system, which communicates with the parking aid module via the instrument cluster and the medium speed CAN bus.

REAR VIEW CAMERA

When reverse gear is selected, the transmission control module (TCM) provides a reverse gear signal to the integrated head unit over the high

speed CAN bus. On receipt of the reverse gear signal, the integrated head unit will instruct the touch screen display to display the image from the rear view camera.

The rear view camera image is not displayed under the following circumstances:

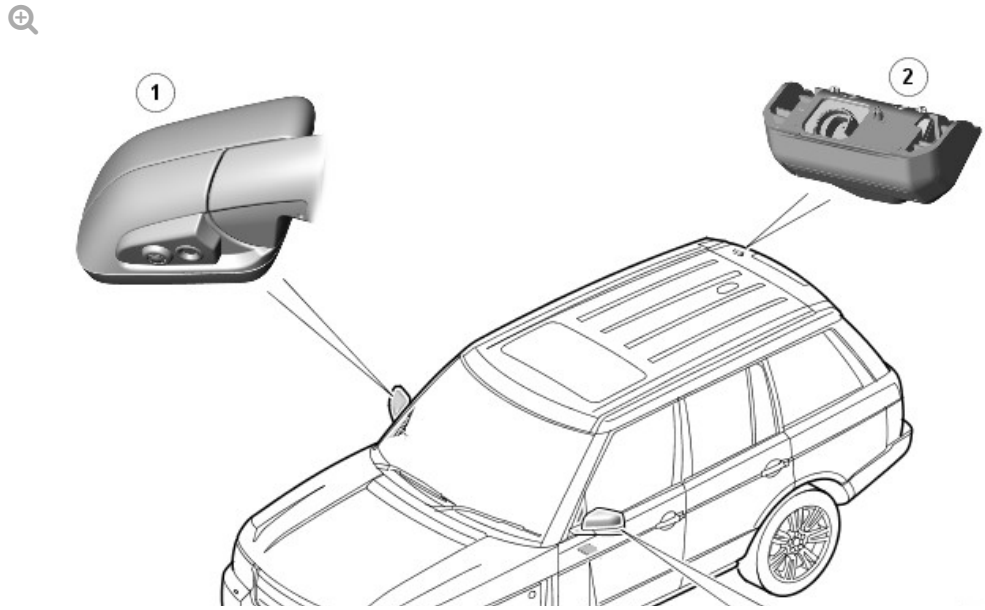
- The transmission is in 'D' drive and the vehicle speed is more than 16 km/h (10 mph)
- 'D' drive has been selected on the transmission for more than the 15 seconds time-out period and the vehicle speed is less than 16 km/h (10 mph).

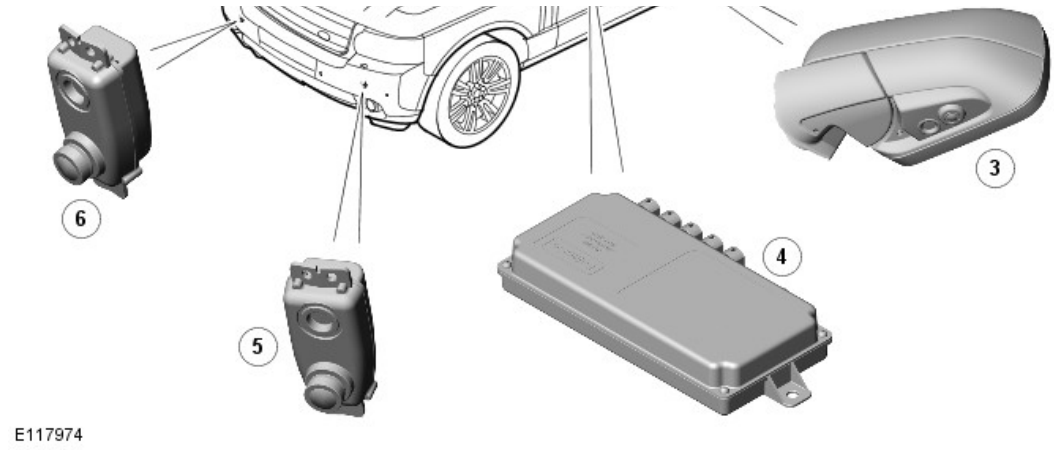
The rear view camera is selected by moving the transmission selector lever to 'R' reverse. The touch screen display changes automatically to rear view camera display. The rear view camera image can be cancelled at any time by pressing the 'return' icon in the top right hand corner of the touch screen display.

When the rear view camera is active, a disclaimer is displayed across the top of the touch screen display to warn the driver to take care when performing reverse manoeuvers.

PROXIMITY CAMERA SYSTEM

Proximity Camera Component Location





ITEM	DESCRIPTION
1	RH (right-hand) mirror camera
2	Rear view camera
3	LH (left-hand) mirror camera
4	Control module
5	LH front bumper camera
6	RH front bumper camera

OVERVIEW

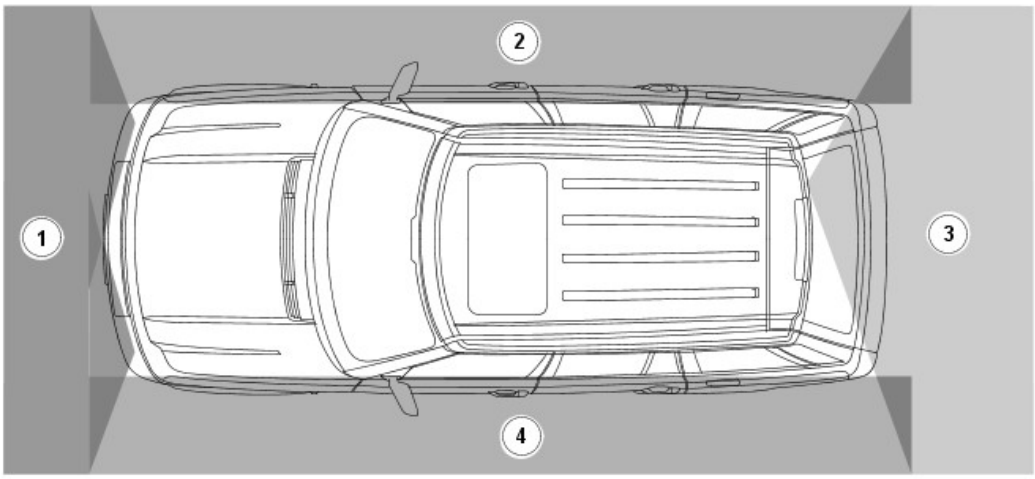
The proximity camera system provides the driver with a visual-aid when maneuvering the vehicle at low speeds. The system uses a dedicated control module to capture the camera data and display the resulting images on the TSD (Touch Screen Display), providing the driver with a 360° view around the vehicle. The camera system is also supported by various driving-aid features where graphical information and warnings are superimposed onto the images displayed on the TSD.

The proximity camera system uses five VGA (Video Graphic Array) resolution cameras:

- Two mounted in the front bumper
- One mounted in each door mirror
- One mounted in the tailgate spoiler.

Camera Coverage Zones

Camera Coverage Zones

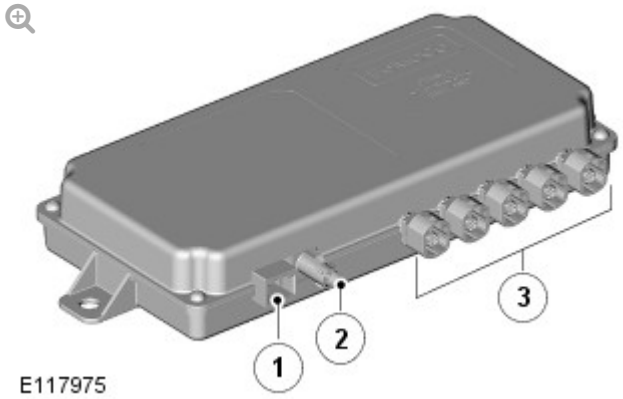


E117972

ITEM	DESCRIPTION
1	Front camera coverage zone
2	RH mirror camera coverage zone
3	Rear camera coverage zone
4	LH mirror camera coverage zone

SYSTEM DESCRIPTION

Proximity Camera Control Module



E117975

ITEM	DESCRIPTION
1	Power supply, ground and BUS connector
2	Connection to touch screen display
3	Five camera connections

The proximity camera control module is located under the left-hand-front seat; connections to the module include:

- medium speed CAN network
- five camera inputs
- video signal output to the TSD
- power supply and ground.

The control module gathers the camera images and analyses and alters them by adjusting perspectives and applying corrections. The resulting processed images are then relayed to the touch screen display via the NTSC (National Television System Committee) analogue video line.

The control module also adds guidance and warning overlays to the camera images to create the various driving-aid features supported by the camera proximity system; for example, visual direction is made available when reversing the vehicle.

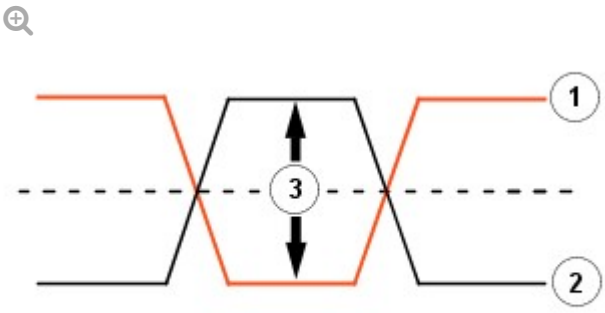
The module communicates with each individual camera via the LIN (local interconnect network) bus connection. This data link transmits diagnostic information, for example camera serial numbers and fault notifications to the control module. Camera adjustments, for instance a correction to color-balance are also communicated via the LIN bus link to the camera.

Image signals are relayed to the control module via the LVDS (Low Voltage Differential Signal) lines. The system uses the LVDS communication protocol to enable fast, interference-free data transmission. Data transmission speeds run in the region of 800 Mbps, this however is dependent on image content.

This LVDS communication link features a twisted pair of wires carrying a ‘high’ signal and a ‘low’ signal, similar to the high speed CAN with regard to a ‘mirrored’ signal. The voltage differential level operates between 250 -

450 mV.

LVDS Signal



E118323

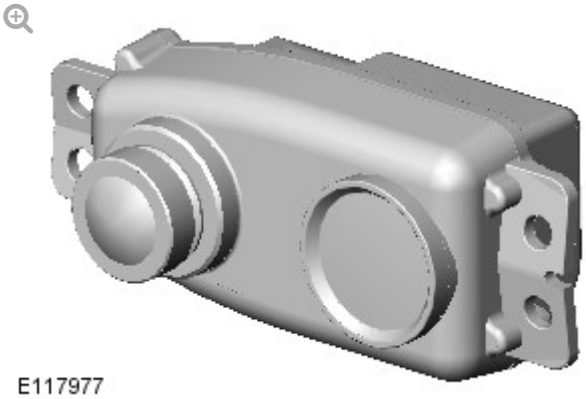
ITEM	DESCRIPTION
1	LVDS ‘low‘ signal
2	LVDS ‘high‘ signal
3	250 – 450 mV Differential

In addition to the data lines the camera receives a power supply and a ground from the control module.

NOTE:

Care must be taken when routing, disconnecting and reconnecting the camera harnesses.

Cameras

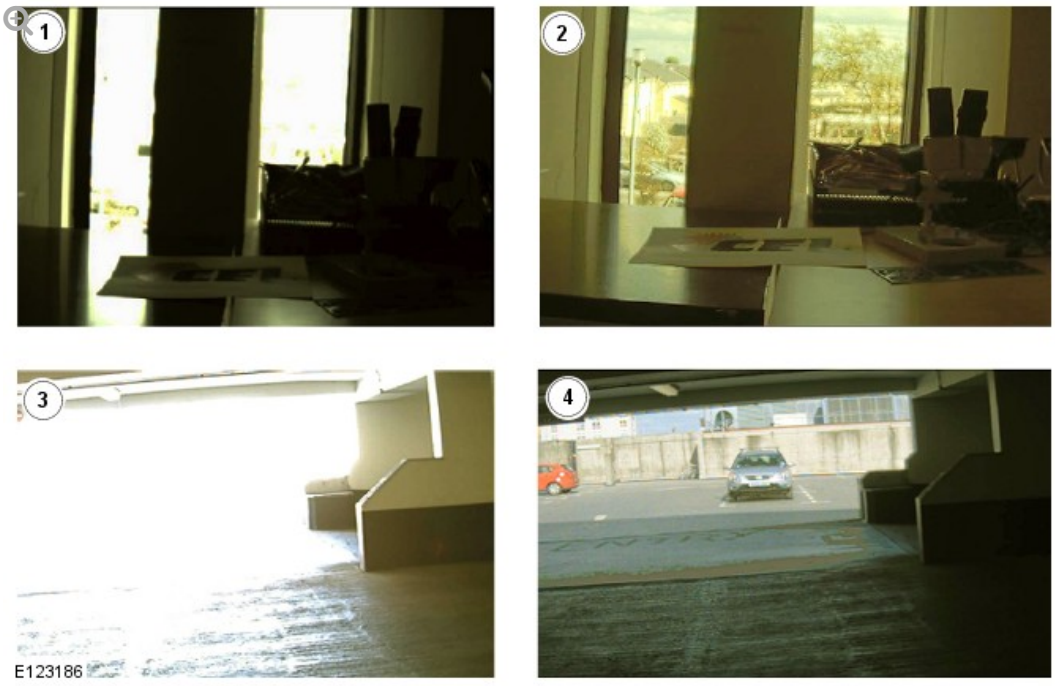


E117977

The system uses five VGA resolution cameras, permanently powered whenever the ignition is 'on'. Each camera provides an image covering a zone approximately 130° wide by 112° deep and is capable of capturing approximately thirty frames per second.

The cameras employ high-quality digital, HDR (High Dynamic Range) imaging, which is a set of techniques that allows a greater range of luminance between light and dark areas of an image scene. This allows HDR to more accurately represent the varying intensity levels found in the image scenes that can range from direct sunlight to deep shadows.

HDR Image Comparisons

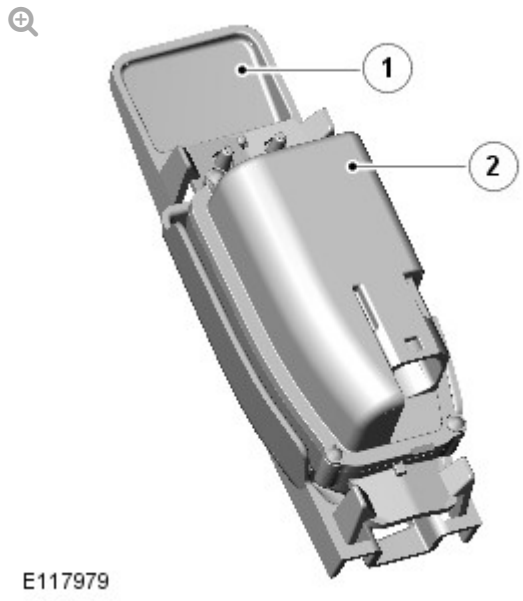


ITEM	DESCRIPTION
1	Shadow without HDR
2	Shadow with HDR
3	Sunlight without HDR
4	Sunlight with HDR

NOTE:

Reversing lights are crucial to successful night operation of the rear view camera.

Camera mounting



ITEM	DESCRIPTION
1	Camera ‘break free’ bracket
2	Camera

To reduce the cost of accident repair the mounting of the front bumper cameras feature a ‘snap free’ bracket. On impact, the bracket will release the camera preventing damage to the camera itself. Depending on the severity of the accident it may also be possible to reuse the brackets as they are manufactured from a memory type plastic.

The front cameras are not ‘handed’ so therefore interchangeable. This is also applicable for the door-mirror cameras, although these cameras do feature the approach lighting LED (light emitting diode) integral within the camera body.

The positioning accuracy of all the cameras is crucial for the successful operation of the proximity camera system. The camera housings are manufactured using metal to maintain a structural stability in high-ambient

temperatures. Without this stability a loss of image focus would be a possibility, therefore care must be taken when mounting the cameras in ensuring they sit correctly into their locations. Secure mounting of the cameras provides an initial 'build up' tolerance accurate to 2 mm. In the event of camera replacement a calibration routine must be performed.

CAMERA OBSTRUCTION DETECTION

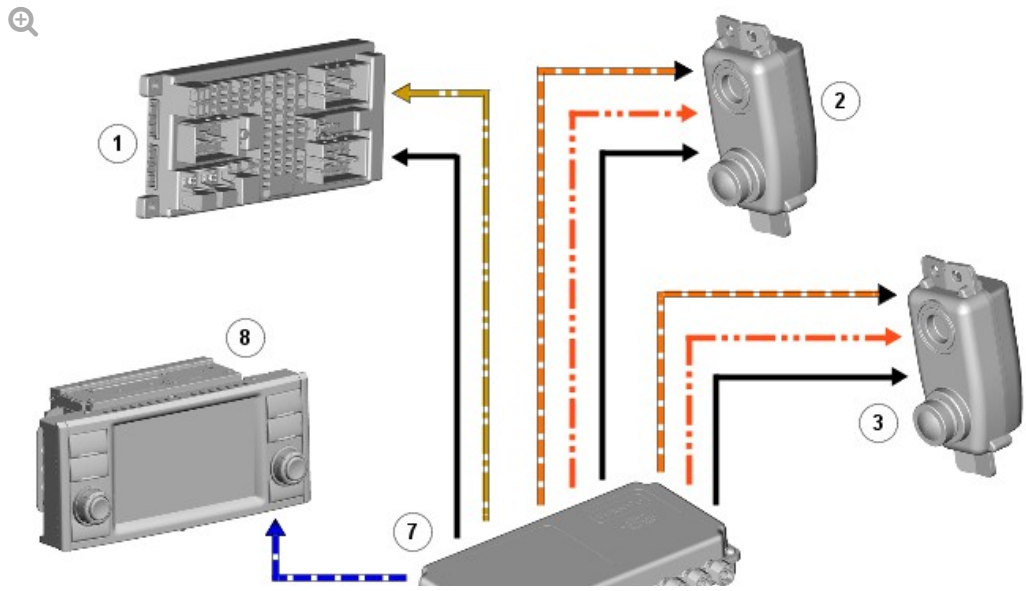
In the instance of soiling of the camera lens, the system has the capability to detect obstructions and notify the driver that the lens requires cleaning via a prompt in the TSD. The obscured camera scene is highlighted with an amber arrow.

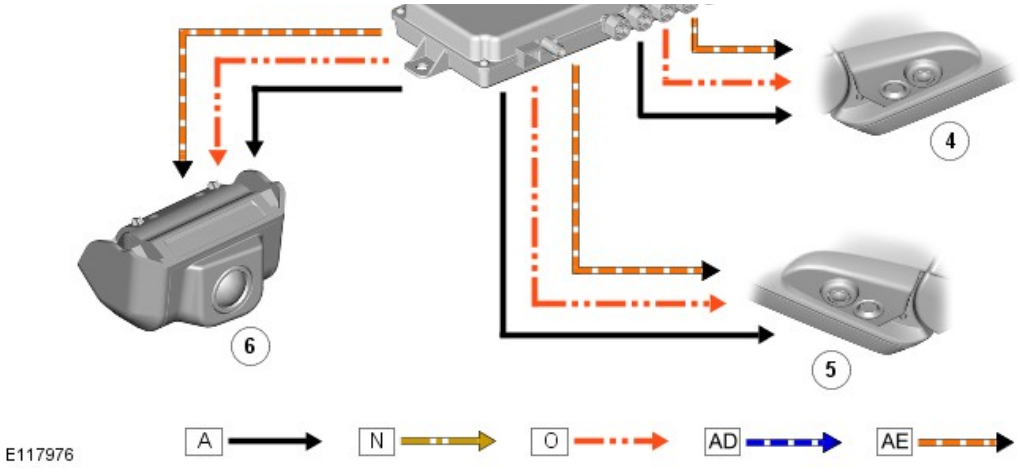
Camera obstruction detection operates by the system looking for non-moving particles on the captured image. The level of obstruction has to reach approximately 85% coverage of the lens before the obstruction notification is issued. To achieve this level of obstruction at the camera, the general vehicle soiling level will be very high and therefore obstruction of the camera is to be expected.

CONTROL DIAGRAM

NOTE:

A = Hardwired; **N** = Medium Speed CAN Bus; **O** = LIN Bus; **AD** = NTSC Signal; **AE** = LVDS Signal.





ITEM	DESCRIPTION
1	CJB
2	Front bumper camera
3	Front bumper camera
4	Mirror camera
5	Mirror camera
6	Rear view camera
7	Proximity camera control module
8	TSD

SYSTEM OPERATION

AUTOMATIC OPERATION

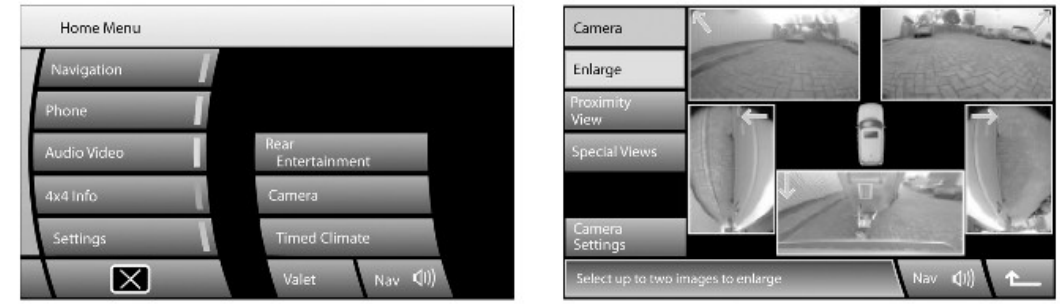
- With the ignition ‘on’ and either ‘Park’ or ‘Neutral’ selected the screen displays images of the area surrounding the vehicle.
- When either ‘Drive’ of ‘Reverse’ are selected the relevant camera view for the direction of movement is shown.
- Once the vehicle speed exceeds 18 km/h (11 mile/h) the images will automatically switch off.
- Once automatically switched off, the camera view will be disabled until:
  - another ignition cycle occurs and the system is automatically functioned, or

- the camera system is manually selected on the Touch Screen Display (TSD).

MANUAL OPERATION

- The camera home page is accessed using the ‘Cameras’ icon on the ‘Navigation’ home screen on the TSD.
- Camera views can be accessed when the vehicle is stationary with either ‘Park’ or ‘Neutral’ selected.
- Camera views can also be accessed when either ‘Drive’ or ‘Reverse’ are selected and will remain viewable when the vehicle is in motion.

SELECTING VIEWS



E117981

- Displayed on the home page are real-time images transmitted from each of the five cameras.
- Any two of the images can be selected and enlarged to view side-by-side on the screen.
- When viewing any two images, any single image can then be selected to view as a full screen image which can be zoomed and panned around using the magnifier and arrow icons.

MANUAL PROXIMITY VIEW

- Selecting proximity view from the camera home screen will display a combination of three images from the front passenger side cameras. These images provide the driver with an enhanced view of the area forward and opposite the driver.

REAR VIEW CAMERA

E139948

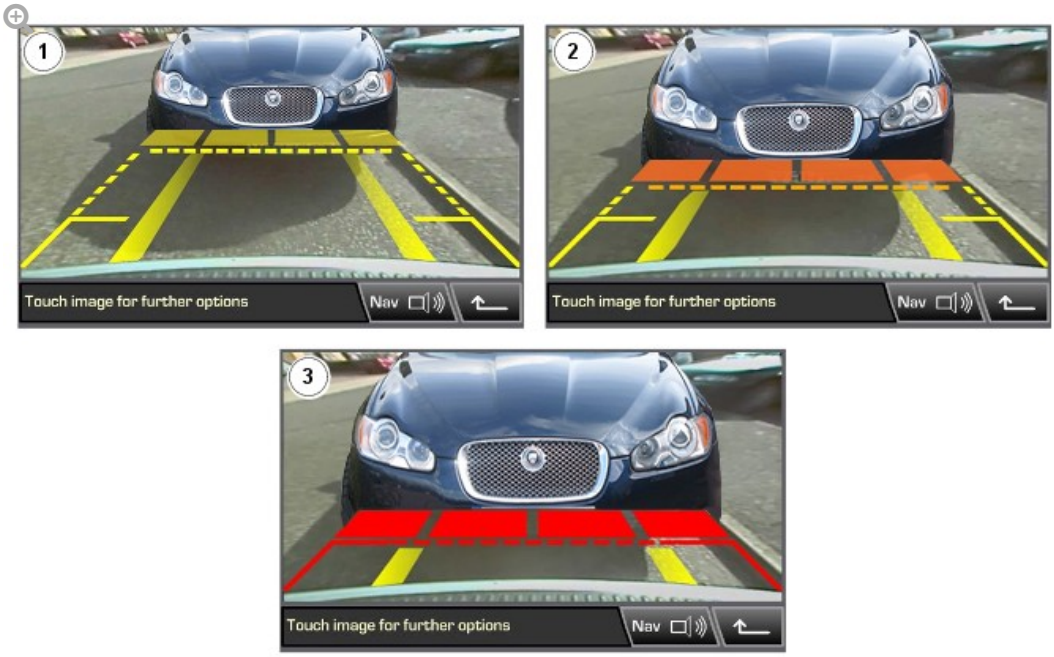
The rear view camera provides additional information to the driver when reversing the vehicle. When reverse gear is selected the camera integrated into the rear spoiler, automatically displays a wide-angle color image of the view from the rear of the vehicle onto the TSD.

The rear view images are overlaid with:

- Dashed lines representing the perimeter of the vehicle.
- Solid lines representing the predicted trajectory of the vehicle; calculated from the steering wheel angle sensor.
- Colored bars represent the amount of distance between the vehicle and the object being approached. Working in conjunction with the standard 'rear parking aid' this adds a visual representation to the existing audible warning. The distance data is received from the parking aid module via the medium speed CAN.

The reversing-aid graphics can be disabled for the current drive cycle in the settings menu.

Reversing Visual Warnings



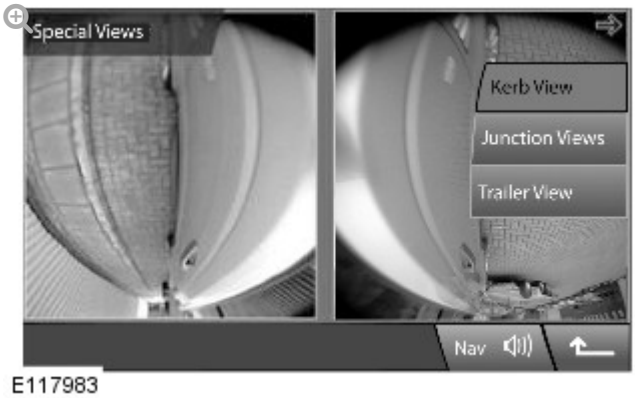
E117982

ITEM	DESCRIPTION
1	Object being approached - 'yellow strip' with steady intermittent warning tone
2	Object being approached - 'orange strip' with faster intermittent warning tone
3	Object being approached - 'red strip' with continuous warning tone

The rear view image will not be displayed when any of the following apply:

- Drive is selected for longer than 15 seconds.
- Drive is selected and the vehicle speed is greater than 18 km/h (11 mile/h).

SPECIAL VIEWS



E117983

The special views are a selection of pre-set views that provide the driver

with some useful driving aids. These can be considered as a shortcut to some pre-determined images that have been developed to assist the driver in various situations:

- Kerb view: downward view from the two door mirror cameras.
- Junction view: outward view from the two front cameras.
- Trailer view: rear camera view of trailer being towed.

SYSTEM CALIBRATION

To achieve viewing accuracy from the proximity cameras, strict tolerances are calibrated into the system when the vehicle is static. Continual dynamic adaptation of the system then takes place when the vehicle is in motion. This is an automated process performed by the proximity camera control module.

This level of accuracy must be maintained after any service procedures are performed on the vehicle that affects the proximity camera system. Should the control module or any one of the cameras require replacement, static re-calibration must be carried out using the approved Land Rover diagnostic equipment.

Camera replacement is detected by the proximity camera control module, through the recognition of a new serial number during the 'camera count' procedure that takes place during the 'ignition on' phase via the LIN. This detection will log a DTC (diagnostic trouble code) advising a calibration routine should be performed.

Alignment adjustments to the cameras are performed using the diagnostic equipment and the vehicle's TSD (touch screen display). During the calibration procedure, setup software in the control module overlays fine colored lines on the TSD highlighting reference points on the bodywork. For example, the mirror camera image must capture the side repeater indicator, the shut-line of the doors and the lower sill trim.

Direction arrows are pressed to shift the image in the desired direction to meet the reference points viewed on the TSD.

Adjustments include:

- Up
- Down
- Left
- Right
- Rotation

When the reference points correspond exactly, the setting is saved and the calibration procedure is complete for that camera.

NOTE:

> If body repairs are performed that affect the camera system, a calibration procedure must be executed after the repairs are completed.

SYSTEM FAULT

There are two possible types of fault relative to the cameras:

- Camera fault (no communication).
- Camera view obscured (see 'Camera Obstruction Detection' section for further information).

In the event of camera fault, a DTC is logged in the proximity camera control module and an icon is presented to the driver on the TSD (touch screen display) where the camera image would normally be viewed.

Each camera view has an orientation icon displayed in the top left hand corner and has two color states:

- Blue – ok
- Amber – camera problem

TOW ASSIST

Tow Assist aids the driver with the reversing of a trailer by displaying information on the TSD (touch screen display).

information on the TSD (touch screen display).

The system uses a tracking target sticker attached to the trailer to monitor and predict the direction of the trailer. Calculations are made by the proximity camera control module, based on the relationship of angles between the vehicle and trailer and the current steering wheel position.

Tow Assist becomes active when a trailer is attached to the vehicle and the trailer electrical plug is attached to the vehicle socket. The CJB detects the connection has been made and sends a message via the medium speed CAN to the proximity camera control module.

NOTE:

If the connection is not detected, setup can be manually prompted by touching the 'Tow Assist' icon on the 'Camera' menu.

TOW ASSIST – NEW TRAILER

When the CJB detects the trailer electrical plug has been connected, the trailer setup screen is displayed automatically on the TSD with the question: 'Has a trailer been connected?'

Selecting 'Yes' will bring up the first of a number of trailer setup screens. On first use the setup screens take the user through a series of configuration options for the connected trailer. To configure a new trailer select 'Add New' and then 'OK'.

Trailer Setup – Step 1 of 6

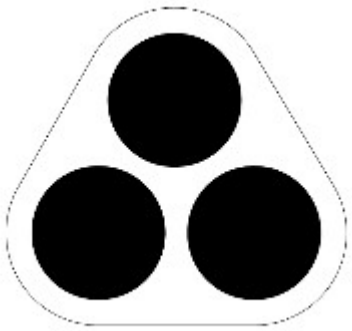
- Choose from the list of generic trailer descriptive names for the trailer attached, then select 'Next'.

Trailer Setup – Step 2 of 6

- Position the trailer straight behind the vehicle, to allow more accurate positioning of the target. Stick the self adhesive tracking target to the front of the trailer within the orange highlighted zone as displayed, then select 'Next'.
- The highlighted zone will turn green when the target sticker is correctly

positioned.

Tracking target sticker



E125745

Trailer Setup – Step 3 of 6

- Select the correct number of axles for the chosen trailer, then select ‘Next’.

Trailer Setup – Step 4 of 6

- Select the preferred camera view for use with this trailer, then select ‘Next’.

NOTE:

The Side Cameras view is more suited to tall and/or long trailers for example caravans. The Reverse Camera view is more suited to small and/or short trailers.

Trailer Setup – Step 5 of 6

- Using the numeric pad, enter the Hitch Length of the trailer, then select ‘Next’.

NOTE:

Hitch Length is the distance from the hitch point to the pivot point of the trailer. The pivot point will vary depending on the number of

axles, and will be:

- the center-line of the axle on a single axle trailer,
- the mid-point between the axles on a twin axle trailer,
- the center line of the center axle on a triple axle trailer.

Trailer Setup – Step 6 of 6

- Using the distance adjustment buttons, set the orange overlay graphics at the width of the trailer wheels, or trailer edges when a tall trailer is to be used, then select 'Finish'.

NOTE:

The orange overlay graphics determine the position of the trailer reverse guidance lines.

A confirmation message will appear to show that the trailer information has been retained.

Finally, highlight the trailer that has been memorized, and select 'OK'.

NOTE:

In order to learn the central position of the trailer, the vehicle must be driven forwards at less than 15mph with the steering wheel in the straight-ahead position. There is currently no confirmation for when this process has completed, however the status can be derived by selecting Reverse gear and noting the presence of message 'Trailer tracking in progress'. Whilst tracking feature is learning the central position, the trailer trajectory lines will appear in a light blue color, when process is complete they will change to a dark purple color.

The Tow Assist feature is now ready to use.

TOW ASSIST – PREVIOUSLY SAVED TRAILER

When the CJB detects the trailer electrical plug has been connected, the trailer setup screen is displayed automatically on the TSD with the question: ‘Has a trailer been connected?’

Selecting ‘Yes’ from the previous screen brings a list of pre-set, or previously saved, trailers. Highlight the required trailer, and select ‘OK’.

NOTE:

In order to learn the central position of the trailer, the vehicle must be driven forwards at less than 15mph with the steering wheel in the straight-ahead position. There is currently no confirmation for when this process has completed, however the status can be derived by selecting Reverse gear and noting the presence of message 'Trailer tracking in progress'. Whilst tracking feature is learning the central position, the trailer trajectory lines will appear in a light blue color, when process is complete they will change to a dark purple color.

The Tow Assist feature is now ready to use.

2012.0 RANGE ROVER (LM), 413-13

PARKING AID

DIAGNOSIS AND TESTING

PRINCIPLES OF OPERATION

For a detailed description of the parking aid system, characteristics and limitations refer to the relevant description and operation section in the workshop manual. REFER to: Parking Aid (413-13 Parking Aid, Description and Operation).

PARKING AID SYSTEM ON-BOARD SELF-TEST

As part of the strategy of the system if any DTCs are detected, a long high-pitched tone approx 3 seconds will sound and the parking aid switch (where fitted) indicator LED will flash 6 times at ignition on

- If a fault is present when the parking aid system is activated then the parking aid switch (where fitted) status LED will flash 6 times indicating an issue with front or rear parking aid sensors, wiring switch, parking aid control module or hard wired sounders

- The rear parking aid sounder/rear audio system will emit an error tone for approx 3 seconds at ignition on if a fault is detected with the front or rear sensors, the switch, or if there is a controller area network (CAN) bus error
- (Only applicable to vehicles fitted with front parking aid and a hard wired rear parking aid sounder). If there is a fault with the rear parking aid sounder the error tone will come from the front parking aid sounder unit (integral with the instrument cluster)

Audible and Visual Warnings when Parking Aid System is in Error State

REAR PARKING AID SYSTEM FITTED AND NO PARKING AID SYSTEM SWITCH FITTED	REAR PARKING AID SYSTEM FITTED AND PARKING AID SYSTEM SWITCH FITTED	FRONT AND REAR PARKING AID SYSTEM FITTED WITH PARKING AID SYSTEM SWITCH FITTED
A long high-pitched error tone will sound at Ignition On for approx 3 seconds	▪ A long high-pitched error tone will sound at ignition on for approx 3 seconds and the parking aid switch indicator LED will flash 6 times at ignition on. Every time the parking aid system is activated within the same ignition cycle, parking aid switch indicator LED will flash 6 times	▪ A long high-pitched error tone will sound at ignition on for approximately 3 seconds and the parking aid switch indicator LED will flash 6 times at ignition on. Every time the parking aid system is activated within the same ignition cycle the parking aid switch indicator LED will flash 6 times

INSPECTION AND VERIFICATION

CAUTIONS:

- 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.
- 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

- Do not apply any grease based products to any parking aid system connector or pins

NOTE:

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

1. Verify the customer concern

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

1. Ensure that the parking aid sensor face is clear of contamination that could affect the performance of the sensor

Visual Inspection

MECHANICAL	ELECTRICAL
▪ Parking aid sensor condition/damaged ▪ Parking aid sensor installation and holder ▪ Parking aid sensor alignment ▪ Parking aid sensor contamination ▪ Bumper cover(s) ▪ Vehicle ride height ▪ Non standard/non manufacturer approved accessories fitted	▪ Battery ▪ Fuse(s) ▪ Relays ▪ Wiring harness ▪ Electrical connector(s) ▪ Front parking aid sensor(s) ▪ Rear parking aid sensor(s) ▪ Parking aid switch and LED ▪ Parking aid control module ▪ Parking aid sounder ▪ Audio system

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

1. If the cause is not visually evident, check for diagnostic trouble codes (DTCs) and refer to the DTC index

Symptom Chart

CAUTION:

Do not apply any grease based products to any parking aid system connector or pins

NOTES:

- Please note if this diagnosis is being carried out on a vehicle without a hard wired parking aid speaker, ensure the in car infotainment system is fully functional and configured correctly
- Parking aid sensors that are painted incorrectly and not to the manufacturer standards, will not be considered in any warranty claim

SYMPTOM	POSSIBLE CAUSES	ACTION
NOTE: Permanent/Intermittent fault Parking aid system not functioning correctly. (No DTCs displayed)	▪ Front or rear parking aid sensors dirty ▪ Front or rear parking aid sensor position incorrect ▪ Front or rear parking aid sensor incorrectly installed ▪ Front or rear parking aid sensor coupling rings not installed/incorrectly installed ▪ Parking aid control	▪ Clean front or rear parking aid sensors ▪ Check the front or parking aid rear sensor position ▪ Check the front or rear parking aid sensor are correctly installed ▪ Check front or rear parking aid sensor coupling rings are installed/installed correctly ▪ Ensure all parking aid system connectors are correctly latched

	module or parking aid sensor connector not fully latched ▪ Parking aid sensors painted without being removed from the bumper assembly or not painted to the manufacturer specification	▪ Remove parking aid sensor and ensure correctly painted parking aid sensor is installed ▪ Parking aid sensors that are painted incorrectly and not to the manufacturer standards, will not be considered in any warranty claim
NOTE: Permanent/Intermittent fault Parking aid system not functioning correctly. (No DTCs displayed). System characteristics or environmental effects	▪ Parking aid sensors incorrectly mounted ▪ Incorrect vehicle ride height ▪ Dirty parking aid sensor face. Ice/snow covered sensor. Debris trapped between parking aid sensor and parking aid sensor body. Heavy rain or water splash from the ground ▪ Non standard, bumper, exhausts/tailpipes, tow bar or external spare wheel mounting ▪ Area around vehicle is not clear of obstacles such as channels, gutters or other items on the ground ▪ Exhaust gas and warm air clouds creating ghost echoes ▪ Vehicle not on level ground or next to a gradient ▪ Parking aid sensors painted without being removed from the bumper assembly or not	▪ Ensure the sensors are a tight fit in the holder and locked. Ensure the sensors are central in the holder and bumper and at the correct angle ▪ Ensure vehicle ride height is within the specified limits. Rectify as required ▪ Clean the sensor face as required. Defrost the sensor and dry as required. Clear any debris from the sensor and holder as required. Water flowing over the sensor is a system limitation. (no action required) ▪ Check for non standard, bumper, exhausts/tailpipe, tow bar or external spare wheel mounting that may be being detected by the parking aid system. Rectify as required ▪ Ensure the area around the vehicle is clear of any obstacles, move the vehicle to a suitable area before continuing diagnosis ▪ Ensure no exhaust gas or warm area clouds are in the area around the parking aid sensor detection range ▪ Ensure the vehicle is on level ground and clear of any ramps, potholes or

	painted to the manufacturer specification	speed bumps, move the vehicle to a suitable area before continuing diagnosis ▪ Remove parking aid sensor and ensure correctly painted parking aid sensor is installed ▪ Parking aid sensors that are painted incorrectly and not to the manufacturer standards, will not be considered in any warranty claim
Parking aid sensors are being returned with no faults found or signs of water ingress/corrosion	Possible issue with sensor connectors not latched correctly	▪ When either no/intermittent operation has been reported the following action should be taken ▪ 1. Using Datalogger, identify the position of the suspect parking aid sensor within the bumper ▪ 2. Visually locate the position of the suspect parking aid sensor. Inspect and provide details in claim if the sensor has any sign of physical damage ▪ 3. Remove the bumper. Disconnect the wiring at the main harness connector. Inspect the main harness connectors and terminals for signs of damage, backed out pins, corrosion and water ingress, or damage to the seals. Provide details in claim if any of the above symptoms are present ▪ 4. Attempt to remove the harness connector from the suspect parking aid sensor without using the connector latch i.e. lightly pull back on **ALL** wires together, ensuring the harness is held close to the back of the connector, not elsewhere on the wiring harness. **DO NOT**

wiring harness. **DO NOT** apply excessive force. If the connector can be removed without using the latch, provide details in claim if connector is loose. If the connector is fully latched, disconnect it from the sensor

- 5. Inspect and provide details in claim if the suspect sensor harness connector has any sign of water ingress/corrosion
- 6. Inspect and provide details in claim if the suspect parking aid sensor harness connector shows any sign that the terminals have backed-out of the connector or for any damage to the terminal seals. Replace/repair the harness as required and proceed
- 7. Remove the suspect parking aid sensor from the bumper. Inspect the parking aid sensor connector for signs of water ingress/corrosion. Provide details in claim if corrosion/water ingress is present
- 8. Exchange the suspect parking aid sensor with another parking aid sensor within the bumper that is performing correctly. Reconnect all sensors and reconnect the bumper main harness connector. Repeat step 1. Confirm if the original fault now appears at the new position of the suspect parking aid sensor, if so, proceed to step 10
- 9. If not, carry out the appropriate open circuit and short circuit checks between the original suspect parking aid sensor harness connector and the parking aid control

		module ▪ 10. Refit the parking aid sensors to their original position in the bumper ▪ 11. Reconnect the parking aid sensor to the bumper harness connector. Reconnect main harness connector and refit the bumper ▪ 12. Repeat Step 1. If fault is still present, **replace only the faulty sensor**

PINPOINT TEST A : PARKING AID SYSTEM NOT FUNCTIONING CORRECTLY WITH NO DTCS LOGGED	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: PERMANENT FAULT	
	1 When the parking aid system is activated, there is a vibration on the parking aid sensor membrane. This can be verified by touching the parking aid sensor face with a hard item such as a pencil, ball-pen, small screwdriver, or fingernail. **Ensure no damage is caused to sensor painted surface**
	Are the parking aid sensor(s) vibrating? **Yes** GO to A2. **No** GO to A5.
A2: SENSORS VIBRATING WITH PARKING AID FAULT	
	1 Clean the parking aid sensor face
	Parking aid system functioning correctly? **Yes** No further action required **No** GO to A3.
A3: SENSORS VIBRATING WITH PARKING AID FAULT	
	1 Check parking aid sensors correctly mounted. Parking aid sensor holder correctly mounted. Parking aid sensor decoupler ring fitted or fitted correctly. Parking aid sensor positioning correct. Parking aid sensor painted without being removed from the bumper assembly or not painted to manufacturer specification. Rectify as required
	Parking aid system functioning correctly? **Yes**

	No further action required **No** GO to A4.
A4: SENSORS VIBRATING WITH PARKING AID FAULT	
	1 Carry out speaker test. Only applicable to vehicles with rear hard wired parking aid speakers. Check the parking aid speaker wiring circuit and connector. Rectify as required. Check and install a new parking aid speaker as required. Vehicles with audio parking aid system. Confirm audio system is functioning correctly. Refer to the relevant section of the workshop manual
	Parking aid system functioning correctly **Yes** No further action required
A5: SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Isolate the fault to front or rear parking aid sensors
	Are all rear parking aid sensors vibrating? **Yes** GO to A6. **No** GO to A10.
A6: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Check the parking aid control module is correctly configured. Check and update the car configuration file as required
	Parking aid system functioning correctly? **Yes** No further action required **No** GO to A7.
A7: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Check the correct parking aid control module is installed to the vehicle
	Parking aid system functioning correctly? **Yes** No further action required **No** GO to A8.
A8: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 If all 4 front parking aid sensors are not vibrating, carry out harness test on common ground, power supply. Check main parking aid harness connector to bumper harness connector. Rectify as required
	Parking aid system functioning correctly? **Yes** No further action required **No** GO to A9.

A9: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Check and install a new parking aid control module as required. 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
	Parking aid system functioning correctly **Yes** No further action required
A10: REAR SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Check the parking aid control module is correctly configured. Check and update the car configuration file as required
	Parking aid system functioning correctly? **Yes** No further action required **No** GO to A11.
A11: REAR SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 If all 4 rear parking aid sensors are not vibrating, carry out harness test on common ground, power supply. Check main parking aid harness connector to bumper harness connector. Rectify as required
	Parking aid system functioning correctly **Yes** No further action required **No** GO to A12.
A12: REAR SENSORS NOT VIBRATING WITH PARKING AID FAULT	
	1 Check and install a new parking aid control module as required. 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
	Parking aid system functioning correctly **Yes** No further action required

PINPOINT TEST B : PARKING AID SYSTEM NOT FUNCTIONING CORRECTLY WITH NO DTCS LOGGED	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Clean the parking aid sensor face. Check for any damage to the parking aid sensor face. Rectify as required. Snow, water or ice on sensor face. Parking aid sensor face has been repainted to the incorrect thickness. Rectify as required

	Parking aid system functioning correctly? **Yes** No further action required **No** GO to B2.
B2: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Ensure the vehicle ride height is within manufacturer specified limits. Rectify as required
	Parking aid system functioning correctly? **Yes** No further action required **No** GO to B3.
B3: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Check for any non standard accessories are not fitted, such as tow bar, bike rack, body kit, modified exhaust, lighting or licence plate holder
	Parking aid system functioning correctly? **Yes** No further action required **No** GO to B4.
B4: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Limitations or characteristics of the parking aid system such as vehicle on a gradient, exhaust gas vapour, signal reflection
	Parking aid system functioning correctly? **Yes** No further action required **No** For a detailed description of the parking aid system, refer to the relevant description and operation section in the workshop manual. REFER to: **Parking Aid** (413-13 Parking Aid, Description and Operation).

DTC Index

For a list of diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Module Name: Parking Aid Module (100-00 General Information, Description and Operation).

PARKING AID

FRONT INNER PARKING AID SENSOR (G1225040)

REMOVAL AND INSTALLATION

86.54.21	SENSOR – PARKING AID – FRONT – INNER – RENEW	ALL DERIVATIVES	1	USED WITHINS	+

REMOVAL

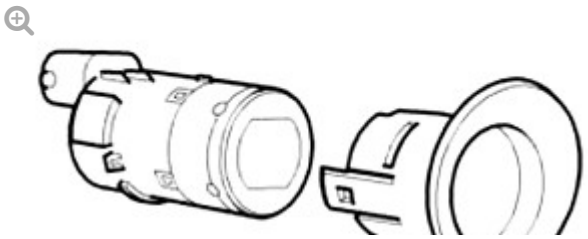
1. Remove the front bumper.
   For additional information, refer to: Front Bumper Cover (501-19, Removal and Installation).

2. **CAUTION:**

   Make sure damage does not occur to bumper cover. Failure to follow this instruction may result in damage to the vehicle.

   Remove the front inner parking aid sensor.

   - Release the clips.

3. 

E84959

Remove the parking aid sensor trim panel.

INSTALLATION

1. Install the parking aid sensor trim panel.
2. Install the front inner parking aid sensor.
3. Install the front bumper.
   For additional information, refer to: Front Bumper Cover (501-19, Removal and Installation).

2012.0 RANGE ROVER (LM), 413-13

PARKING AID

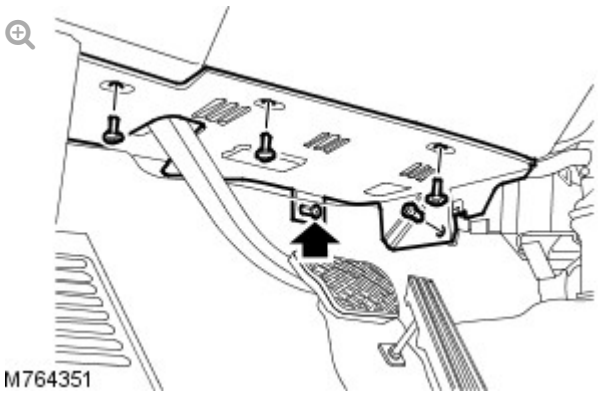
FRONT PARKING AID SPEAKER (G916058)

REMOVAL AND INSTALLATION

REMOVAL

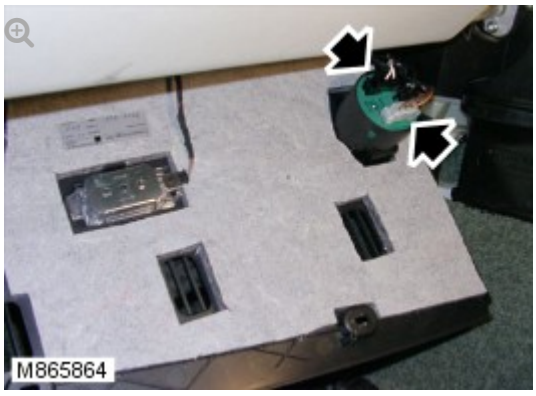
REMOVAL

1. Remove the floor console extension.
   For additional information, refer to: Floor Console Extension (501-12 Instrument Panel and Console, Removal and Installation).

2. 

   Release the driver side closing trim panel.

   - Remove the 4 screws.
   - Remove the clip.

3. 

   Remove the driver side closing trim panel.

   - Disconnect the 3 electrical connectors.

4. Remove the front parking aid speaker.

INSTALLATION

1. Install the front parking aid speaker.

2. Connect the electrical connectors.

3. Install the driver side closing trim panel.
   - Install the screws.
   - Install the clip.

4. Install the floor console extension.
   For additional information, refer to: Floor Console Extension (501-12 Instrument Panel and Console, Removal and Installation).

2012.0 RANGE ROVER (LM), 413-13

PARKING AID

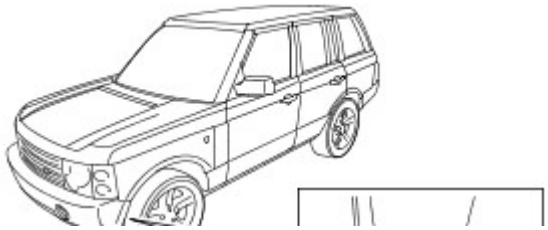
FRONT OUTER PARKING AID SENSOR (G916059)

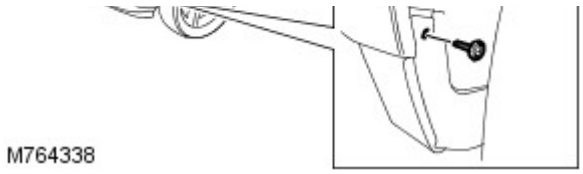
REMOVAL AND INSTALLATION

86.54.22	SENSOR – PARKING AID – FRONT – OUTER – RENEW	ALL DERIVATIVES	0.1	USED WITHINS	+

REMOVAL

1.





Remove the front bumper extension panel screw.

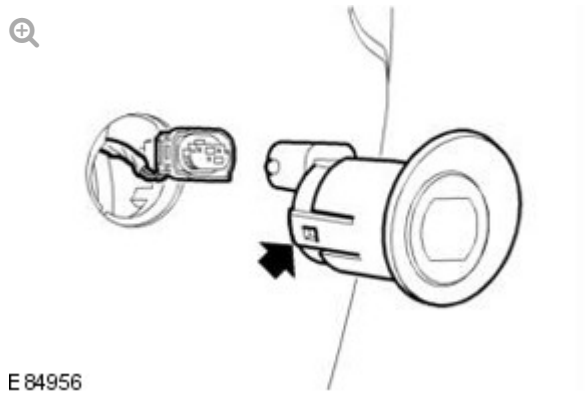
2. Release the front lower edge of the fender splash shield for access.

3. **CAUTION:**

Make sure damage does not occur to bumper cover. Failure to follow this instruction may result in damage to the vehicle.

NOTE:

Access to the parking aid sensor is gained from the rear of the bumper cover.



Remove the front outer parking aid sensor.

- Disconnect the electrical connector.

4. Remove the parking aid sensor trim panel.

INSTALLATION

1. Install the parking aid sensor trim panel.

2. **CAUTION:**

   Make sure damage does not occur to bumper cover. Failure to follow this instruction may result in damage to the vehicle.

   Install the front outer parking aid sensor.

   - Connect the electrical connector.

3. Install the front LH fender splash shield.

   - Install the screw.

PARKING AID

FRONT PARKING AID CAMERA (G1234817)

REMOVAL AND INSTALLATION

86.54.90	CAMERA - FRONT VIEW - EACH - RENEW	ALL DERIVATIVES	1.2	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:**

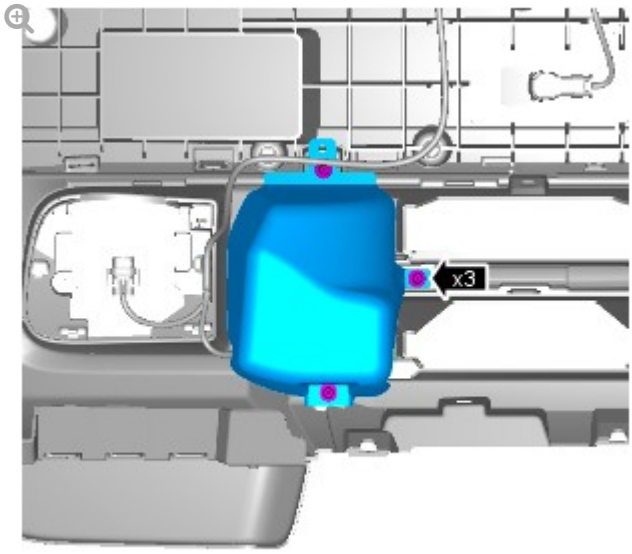
   Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

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

4. **CAUTION:**

LH illustration shown, RH is similar.

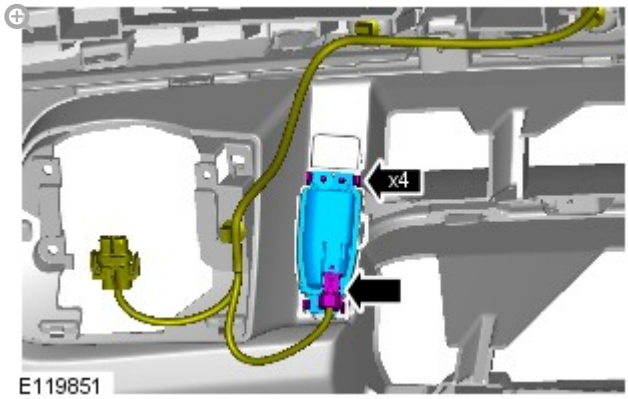


E119850

Torque: **9 Nm**

5. **CAUTION:**

LH illustration shown, RH is similar.



E119851

INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 413-13

PARKING AID

PARKING AID CAMERA (G916893)

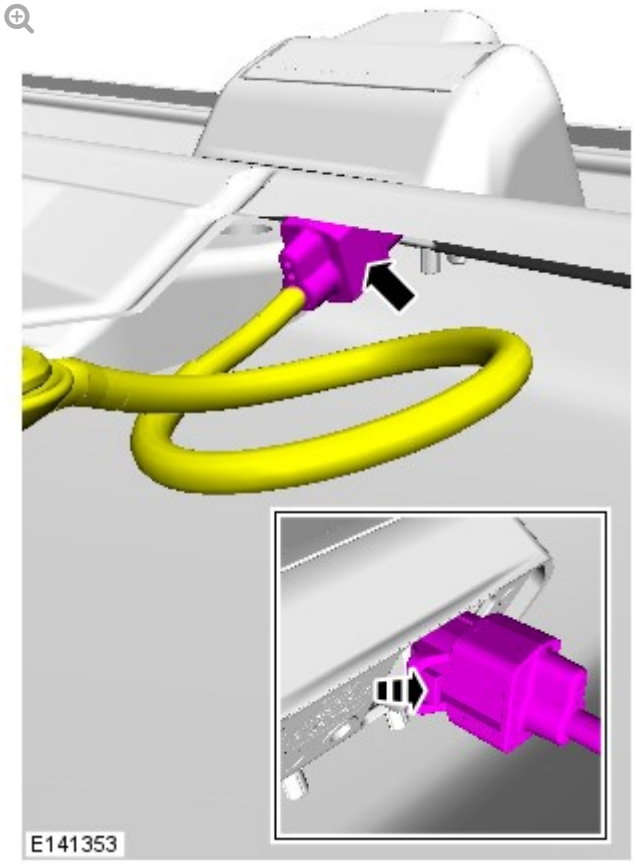
REMOVAL AND INSTALLATION

CAMERA –

86.54.40	CAMERA REAR VIEW - RENEW	ALL DERIVATIVES	0.4	USED WITHINS	+

REMOVAL

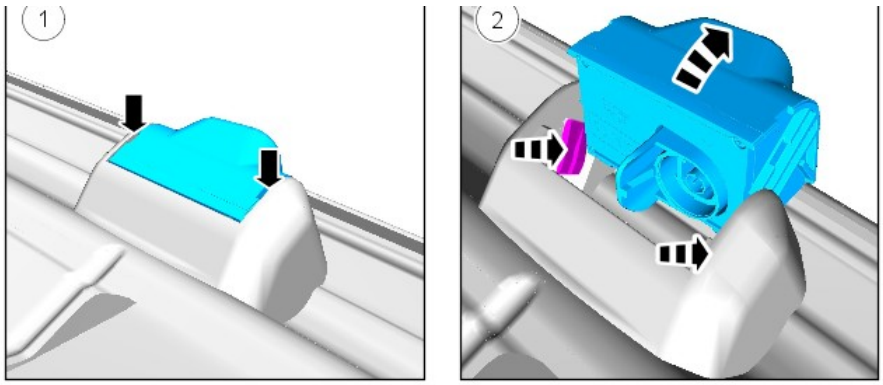
1. Remove the rear spoiler.
   For additional information, refer to: Rear Spoiler (501-08 Exterior Trim and Ornamentation, Removal and Installation).

2. 

   Disconnect the electrical connector.

3. **NOTE:**

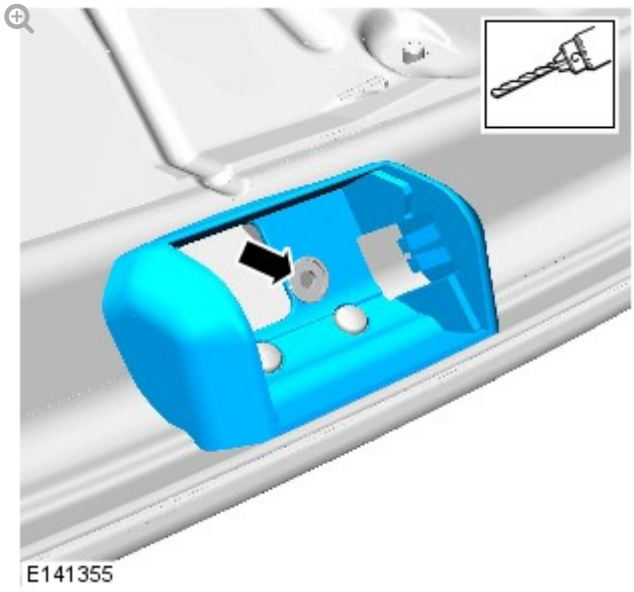
   Using a suitable tool release the parking aid camera.



E141354

Remove the parking aid camera.

4.



E141355

Remove the parking aid camera bracket.

- Drill out the rivet.
- Release the parking aid camera bracket, adhesive pads.

INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 413-13

PARKING AID

PARKING AID MODULE (G1246968)

REMOVAL AND INSTALLATION

86.54.10	MODULE – PARKING AID – RENEW	ALL DERIVATIVES	0.1	USED WITHINS	+

REMOVAL

NOTE:

If a new parking aid module is to be installed, configure the parking aid module using the Land Rover approved diagnostic system.

1. Disconnect the battery ground cable

1. Disconnect the battery ground cable.
   Refer to: Specifications (414-00, Specifications).
2. 
3. 

   Torque: **2 Nm**
4. 
5. 
6. Using the diagnostic tool, configure the parking aid module.

INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 413-13

PARKING AID

REAR PARKING AID SENSOR

(G916060)

REMOVAL AND INSTALLATION

86.54.14	SENSOR - PARKING AID - REAR - EACH - RENEW	ALL DERIVATIVES	0.1	USED WITHINS	+

REMOVAL

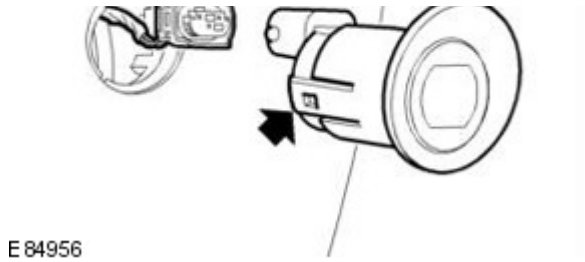
1.

CAUTION:

Make sure damage does not occur to bumper cover. Failure to follow this instruction may result in damage to the vehicle.

NOTE:

Access to the parking aid sensor is gained from the rear of the bumper cover.



Remove the rear parking aid sensor.

- Disconnect the electrical connector.

2. Remove the parking aid sensor trim panel.

INSTALLATION

1. Install the parking aid sensor trim panel.

2. **CAUTION:**

   Make sure damage does not occur to bumper cover. Failure to follow this instruction may result in damage to the vehicle.

   Install the rear parking aid sensor.

   - Connect the electrical connector.

2012.0 RANGE ROVER (LM), 413-13

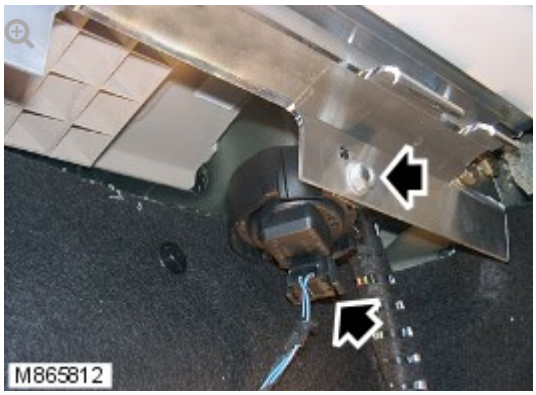
PARKING AID

REAR PARKING AID SPEAKER

(G916117)

86.54.19	SPEAKER – PARKING AID REAR – RENEW	ALL DERIVATIVES	0.1	USED WITHINS	+

REMOVAL

1. 

   Remove the access panel from the loadspace trim panel RH.

2. Disconnect the rear parking aid speaker electrical connector.

3. Remove the rear parking aid speaker.
   - Remove the nut.

INSTALLATION

1. Install the rear parking aid speaker.
   - Tighten the nut to 10 Nm (7 lb.ft).

2. Connect the rear parking aid speaker electrical connector.

3. Install the access panel to the loadspace trim panel RH.

2012.0 RANGE ROVER (LM), 413-13

PARKING AID

SIDE PARKING AID CAMERA

(G1247327)

REMOVAL AND INSTALLATION

86.54.94	CAMERA - SIDE - EACH - RENEW	ALL DERIVATIVES	0.2	USED WITHINS	+

REMOVAL

1. Refer to: Exterior Mirror Glass (501-09, Removal and Installation).

2. 

3. **NOTE:**

> Note the fitted position of the component/s prior to removal.

Torque: **0.5 Nm**

INSTALLATION

1. To install, reverse the removal procedure.

BATTERY AND CHARGING SYSTEM – GENERAL INFORMATION

SPECIFICATIONS

Battery

ENGINE VARINATS	ITEM	SPECIFICATIONS
Vehicles with 5.0L engine	Type	Flooded Lead Calcium
	Capacity	90 **Ah**
	Cold cranking amps to the rest of the world	800 **CCA**
	Cold cranking amps to Norway, Finland, Sweden, Russia, Canada	950 **CCA**
	Reserve capacity	150 minutes
Vehicles with 4.4L TdV8 engine	Type	Flooded Lead Calcium
	Capacity	90 **Ah**
	Cold cranking amps	950 **CCA**
	Reserve capacity	150 minutes
Vehicles with 3.6L TdV8 engine	Type	Low maintenance Lead-Silver-Calcium
	Capacity	90 **Ah**
	Cold cranking amps	950 **CCA**
	Reserve capacity	150 minutes

Battery Disconnect/Connect

CAUTIONS:

- The vehicle status and battery condition must be established before attempting battery disconnect/connect. Reference must then be made to the following table to establish the relevant procedure to be followed.
- After connecting the battery, the steering wheel must be turned to full left-hand and full right-hand lock with the engine running. This allows the dynamic stability control system to calibrate the steering wheel position. Failure to follow this instruction will result in a variety of instrument cluster warning lights being illuminated.

NOTES:

- If there is insufficient capacity in the battery to disarm the alarm, the alarm may sound on connection of the battery - turning the ignition key to position II will disarm the alarm.
- If a new battery is installed, the battery monitoring system (BMS) must be reset using Land Rover approved diagnostic equipment.

Vehicle status	**Battery charged**	**Battery discharged**
-	**Procedure**	**Procedure**
Engine running	1	-
Vehicle powered down, locked and alarmed	2	3
Vehicle unlocked	4	5

Procedure 1

Disconnect the battery	**Connect the battery**
1. If possible, apply the parking brake or chock	**1.** Make sure that all the electrical systems and ignition are switched **OFF**

the wheels	
2. Set the ignition to the **OFF** position.	**2.** Connect the battery **GROUND** cable
3. Wait 2 minutes for the engine management system to **POWER DOWN**	**3.** Reset electric window one-touch facility. Power window up to hard stop, release switch, reapply and hold for 1 second (relay in door will click). One touch should now work
4. Open the hood	-
5. Disconnect the battery **GROUND** cable	-

Procedure 2

Disconnect the battery	**Connect the battery**
1. Unlock the vehicle and disarm the alarm using the **UNLOCK** button on the key fob	**1.** Make sure that all the electrical systems and ignition are switched **OFF**
2. Enter the vehicle, set the ignition to the **ON** position, apply the parking brake or chock the wheels and then set the ignition to the **OFF** position.	**2.** Connect the battery **GROUND** cable
3. Wait 2 minutes for the engine management system to **POWER DOWN**	**3.** Reset electric window one-touch facility. Power window up to hard stop, release switch, reapply and hold for 1 second (relay in door will click). One touch should now work
4. Open the hood	-
5. Disconnect the battery **GROUND** cable	-

Procedure 3

Disconnect the battery	**Connect the battery**
1. Unlock the vehicle from the driver's door using the key	**1.** Make sure that all the electrical systems and ignition are switched **OFF**
2. Enter the vehicle, apply the parking brake or chock the wheels	**2.** Connect the battery **GROUND** cable
3. Open the hood	**3.** Set the ignition to the **ON** position.
4. Disconnect the	**4.** Reset electric window one-touch facility. Power window up

4. Disconnect the battery **GROUND** cable	**4.** Reset electric window one-touch facility. Power window up to hard stop, release switch, reapply and hold for 1 second (relay in door will click). One touch should now work

Procedure 4

Disconnect the battery	Connect the battery
1. Enter the vehicle, set the ignition to the **ON** position, apply the parking brake or chock the wheels and then set the ignition to the **OFF** position.	**1.** Make sure that all the electrical systems and ignition are switched **OFF**
2. Wait 2 minutes for the engine management system to **POWER DOWN**	**2.** Connect the battery **GROUND** cable
3. Open the hood	**3.** Reset electric window one-touch facility. Power window up to hard stop, release switch, reapply and hold for 1 second (relay in door will click). One touch should now work
4. Disconnect the battery **GROUND** cable	-

Procedure 5

Disconnect the battery	Connect the battery
1. Enter the vehicle, apply the parking brake or chock the wheels	**1.** Make sure that all the electrical systems and ignition are switched **OFF**
2. Open the hood	**2.** Connect the battery **GROUND** cable
3. Disconnect the battery **GROUND** cable	**3.** Set the ignition to the **ON**position.
	4. Reset electric window one-touch facility. Power window up to hard stop, release switch, reapply and hold for 1 second (relay in door will click). One touch should now work

Vehicle Jump (Emergency) Starting - Using Another Vehicle

WARNINGS:

- Take care when working near rotating parts of the engine.

- Prior to attempting to start the disabled vehicle, make sure that the parking brake is applied or suitably chock the wheels. Make sure that 'P' - PARK - Automatic Gearbox or NEUTRAL - Manual Gearbox is selected.
- Suitable eye protection must be worn when working in the vicinity of the battery.
- DO NOT attempt to start the disabled vehicle if it is suspected that the electrolyte in the battery is frozen.
- During normal use, batteries emit explosive hydrogen gas sufficient to cause severe explosions and capable of causing serious injury - keep sparks and naked lights away from the engine compartment.

CAUTIONS:

- Make sure that there is no physical contact between the donor and disabled vehicles other than the booster cables.
- Make sure that the slave battery/starting aid is of the 12 volt type.
- Make sure that all electrical systems and ignition are switched OFF prior to connecting the booster cables.
- Disconnect the booster cables prior to operating any electrical systems.

CARRY OUT THE FOLLOWING OPERATIONS IN THE SEQUENCE GIVEN
1. Connect one end of the RED (+) booster cable to the POSITIVE (+) battery terminal of the **DONOR** vehicle
2. Connect the other end of the RED (+) booster cable to the POSITIVE (+) battery terminal of the **DISABLED** vehicle
3. Connect one end of the BLACK (-) booster cable to the GROUND (-) battery terminal of the **DONOR** vehicle
4. Connect the other end of the BLACK (-) booster cable to a good earth point e.g. unpainted metal surface or engine mounting at least 0.5 m (19.7 in) from the battery or fuel lines on the **DISABLED** vehicle
5. Start the engine of the **DONOR** vehicle and allow it to idle for a few minutes
6. Start the engine of the **DISABLED** vehicle

7. Allow the engines of both vehicles to idle for a few minutes, then switch off the engine of the **DONOR** vehicle
8. Disconnect the BLACK (-) booster cable from the earth point of the **PREVIOUSLY DISABLED** vehicle
9. Disconnect the BLACK (-) booster cable from the battery of the **DONOR** vehicle
10. Disconnect the RED (+) booster cable from the **PREVIOUSLY DISABLED** vehicle
11. Disconnect the RED (+) booster cable from the battery of the **DONOR** vehicle

Vehicle Jump (Emergency) Starting - Using a Slave Battery/Starting Aid

CARRY OUT THE FOLLOWING OPERATIONS IN THE SEQUENCE GIVEN
1. Connect the end of the RED (+) booster cable to the POSITIVE (+) battery terminal of the vehicle
2. Connect the end of the BLACK (-) booster cable to the GROUND (-) battery terminal of the vehicle
3. Start the engine of the vehicle and allow it to idle
4. Disconnect the BLACK (-) booster cable from the battery terminal of the vehicle
5. Disconnect the RED (+) booster cable from the battery terminal of the vehicle

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BATTERY AND CHARGING SYSTEM – GENERAL INFORMATION

Battery

ITEM	SPECIFICATIONS
All Gasoline (Petrol) Models:	
Type	Maintenance free lead-calcium
Capacity	850 amps - 110 amp/hour
Reserve capacity	205 minutes @ 25 amps

Battery Disconnect/Connect

CAUTIONS:

- The vehicle status and battery condition must be established before attempting battery disconnect/connect. Reference must then be made to the following table to establish the relevant procedure to be followed.
- After re-connecting the battery, the steering wheel must be turned to full left-hand and right-hand lock (with engine running). This allows the DSC system to re-learn the steering wheel position. Failure to do so will result in a variety of instrument warning lights being illuminated.

Vehicle status	**Battery charged**	**Battery discharged**
	Procedure	**Procedure**
Engine running	1	
Vehicle powered down, locked and alarmed	2	3
Vehicle unlocked	4	5

Procedure 1

Disconnect battery	**Connect battery**

Disconnect battery	Connect battery
1. If possible, apply parking brake or alternatively, chock wheels	**1.** Ensure that all electrical loads are switched **OFF**
2. Switch off ignition	**2.** Connect battery leads - GROUND lead last
3. Wait 2 minutes for engine management system to 'power down'	
4. Open the hood	
5. Disconnect battery - GROUND lead first	

Procedure 2

Disconnect battery	Connect battery
1. Unlock the vehicle and disarm the alarm using the 'plip' button	**1.** Ensure that all electrical loads are switched **OFF**
2. Enter the vehicle, turn the ignition key to position II, apply the parking brake or chock the wheels and then turn the ignition key to position 0. Remove the key to 'power down' the ICE system	**2.** Connect battery leads - GROUND lead last
3. Wait 2 minutes for engine management system to 'power down'	
4. Open the hood	
5. Disconnect battery - GROUND lead first	

NOTE:

1. Disconnect battery - The door unlock process initialises the ICE system.

Procedure 3

Disconnect battery	Connect battery
1. Unlock the vehicle from the left hand front door using the key	**1.** Ensure that all electrical loads are switched **OFF**
2. Enter the vehicle, apply the parking brake or chock the wheels	**2.** Connect battery leads - GROUND lead last

3. Open the hood	**3.** Switch on ignition
4. Disconnect battery - GROUND lead first	

NOTE:

1. Connect battery - If there is insufficient capacity in the battery to disarm the alarm, the alarm may sound on reconnection of the battery - Step 3 will disarm the alarm

Procedure 4

Disconnect battery	**Connect battery**
1. Enter the vehicle, turn the ignition key to position II, apply the parking brake or chock the wheels and then turn the ignition key to position 0. Remove the key to 'power down' the ICE system	**1.** Ensure that all electrical loads are switched **OFF**
2. Wait 2 minutes for engine management system to 'power down'	**2.** Connect battery leads - GROUND lead last
3. Open the hood	
4. Disconnect battery - GROUND lead first	

Procedure 5

Disconnect battery	**Connect battery**
1. Enter the vehicle, apply the parking brake or chock the wheels	**1.** Ensure that all electrical loads are switched **OFF**
2. Open the hood	**2.** Connect battery leads - GROUND lead last
3. Disconnect battery - GROUND lead first	**3.** Switch on ignition

NOTE:

1. Connect battery - If there is insufficient capacity in the battery to disarm the alarm, the alarm may sound on reconnection of the battery

- Step 3 will disarm the alarm

Vehicle Jump (Emergency) Starting - Using Another Vehicle

CARRY OUT THE FOLLOWING OPERATIONS IN THE SEQUENCE GIVEN
1. Connect one end of the BLACK (-) booster cable to the GROUND (-) battery terminal of the **DONOR** vehicle
2. Connect the other end of the BLACK (-) booster cable to a good earth point e.g. unpainted metal surface or engine mounting at least 0.5 m (20.0 in) from the battery or fuel lines on the **DISABLED** vehicle
3. Connect one end of the RED (+) booster cable to the positive (+) battery terminal of the **DONOR** vehicle
4. Connect the other end of the RED (+) booster cable to the positive (+) battery terminal of the **DISABLED** vehicle
5. Start the engine of the **DONOR** vehicle and allow it to idle for a few minutes
6. Start the engine of the **DISABLED** vehicle
7. Allow engines of both vehicles to idle for a few minutes then switch off the engine of the **DONOR** vehicle
8. Disconnect the RED (+) booster cable from the battery of the **PREVIOUSLY DISABLED** vehicle
9. Disconnect the RED (+) booster cable from the battery of the **DONOR** vehicle
10. Disconnect the BLACK (-) booster cable from the earth point of the **PREVIOUSLY DISABLED** vehicle
11. Disconnect the BLACK (-) booster cable from the battery of the **DONOR** vehicle

WARNINGS:

- During normal use, batteries emit explosive hydrogen gas sufficient to cause severe explosions and capable of causing serious injury - keep sparks and naked lights away from the engine compartment.
- DO NOT attempt to start the disabled vehicle if it is suspected that the electrolyte in the battery is frozen.
- Suitable eye protection must be worn when working in the vicinity of the battery.
- Take care when working near rotating parts of the engine.

- Prior to attempting to start the disabled vehicle, ensure that the parking brake is applied or suitably chock the wheels. Ensure that 'P' - PARK - Automatic Gearbox or NEUTRAL - Manual Gearbox is selected.

CAUTIONS:

- Ensure that all electrical loads are switched OFF prior to connecting booster cables and disconnect booster cables prior to using any electrical equipment.
- Ensure that the battery of the DONOR vehicle is of 12 volt capacity and that all electrical loads on the disabled vehicle are switched OFF prior to connecting booster cables.
- Ensure that there is no physical contact between the donor and disabled vehicles other than the booster cables.

Vehicle Jump (Emergency) Starting - Using a Slave Battery/Starting Aid

CARRY OUT THE FOLLOWING OPERATIONS IN THE SEQUENCE GIVEN
1. Connect the end of the BLACK (-) booster cable to the ground (-) battery terminal of the vehicle
2. Connect the end of the RED (+) booster cable to the positive (+) battery terminal of the vehicle
3. Start the engine of the vehicle and allow it to idle
4. Disconnect the RED (+) booster cable from the battery terminal of the vehicle
5. Disconnect the BLACK (-) booster cable from the battery terminal of the vehicle

WARNINGS:

- During normal use, batteries emit explosive hydrogen gas sufficient to cause severe explosions and capable of causing serious injury - keep sparks and naked lights away from the engine compartment.
- DO NOT attempt to start the disabled vehicle if it is suspected that the electrolyte in the battery is frozen.

- Suitable eye protection must be worn when working in the vicinity of the battery.
- Take care when working near rotating parts of the engine.
- Prior to attempting to start the disabled vehicle, ensure that the parking brake is applied or suitably chock the wheels. Ensure that 'P' - PARK - Automatic Gearbox or NEUTRAL - Manual Gearbox is selected.

CAUTIONS:

- Ensure that all electrical loads are switched OFF prior to connecting booster cables and disconnect booster cables prior to using any electrical equipment.
- Ensure that the slave battery/starting aid are of 12 volt capacity and that all electrical loads on the disabled vehicle are switched OFF prior to connecting booster cables.

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BATTERY AND CHARGING SYSTEM – GENERAL INFORMATION

DESCRIPTION AND OPERATION

1. INTRODUCTION

This document defines the requirements for care and maintenance of batteries, and the standard of battery care at retailers for new vehicles.

This applies to all types of 12 Volt Lead Acid Batteries used in Jaguar and Land Rover vehicles whether they are conventional flooded technology or Absorbed Glass Mat (AGM – also known as Valve Regulated Lead Acid

(VRLA)) technology and also applies to both Primary, Secondary and Auxiliary Batteries. AGM batteries offer improved resistance to cycling as seen in stop start applications.

In order to prevent damage to the battery and ensure a satisfactory service life, all processes detailed within this document must be rigorously adhered to.

It is equally important therefore to note the following key points:

- All new vehicles leave the factory with either a transit relay installed and/or have a transit mode programmed into the vehicle control modules. The transit relay must be removed and the transit mode disabled (where applicable) using an approved diagnostic system, **NOT MORE THAN 72 HOURS** before the customer takes delivery.
- The battery can be discharged by the following mechanisms:
  - **Self Discharge**: - A lead acid battery will very slowly discharge itself due to its own internal chemical processes whether it is connected to a vehicle or not.
  - **Quiescent Discharge**: - The vehicle electrical systems when connected to the battery will draw charge from the battery.

12 Volt Lead Acid Batteries rely on internal chemical processes to create a voltage and deliver current. These processes and the internal chemical structure of the battery can be damaged if the battery is allowed to discharge over a number of weeks / months, or is left in a discharged state for a lengthy time period.

- **On vehicles with conventional ignition keys**, these must not be left in the ignition lock barrel when the transit relay has been removed, otherwise quiescent current will increase and the battery will discharge more rapidly.
- **For keyless vehicles**, the Smart Key must be stored at least 5m (16 ft) away from the vehicle when the vehicle is parked or stored.
- **AGM Batteries are fully sealed and cannot have the electrolyte level topped up.**

NOTE:

Retailers involved in the storage / handling of vehicles and replacement batteries have a responsibility to ensure that only a fully charged battery may be processed through the distribution selling chain.

2. GENERAL RULES FOR BATTERY CARE

2.1 RETAILER SHOWROOM/DEMONSTRATION VEHICLES

Vehicles used as retailer demonstrator(s), in a showroom, must be connected to a JLR approved showroom conditioner capable of delivering 50 Amps. This will prevent the battery from being damaged.

Vehicles used as retailer demonstrator(s), in a showroom, must be taken out of transit mode or have the transit relay removed. For additional information on the transit relay installation, refer to the **Transit Relay Installation Summary table**.

Vehicles used as retailer demonstrator(s), in a showroom, must have the starter motor, horn and wiper fuses removed as a minimum.
For additional information, refer to: Showroom Preparation (101-02 Showroom Preparation, Description and Operation).

WARNING:

Showroom conditioners are only required to be turned on during showroom opening hours, outside these hours switch off all showroom conditioners.

NOTE:

For retailers who do not have floor sockets installed in the showroom a slave battery process has been outlined below. The slave battery process is only a TEMPORARY process until floor sockets are installed into the showroom. The retailer is responsible for making sure the process is set up and is also responsible for the procurement of slave

batteries and other supporting equipment. The retailer is also responsible for developing a conformance plan to install floor sockets.

2.1.1 RECOMMENDED SLAVE BATTERY RESPONSIBILITIES/PROCESS

Showroom Representative Responsibilities

1. All vehicles in the retailer showroom that are being used for display purposes **MUST** be fitted with a slave battery if the JLR approved battery conditioner cannot be installed.
2. All vehicles fitted with a slave battery must be logged and tracked by a nominated showroom representative who has been trained in the Battery Care Requirements process. For additional information, Refer to the following Excellence training courses Battery Care Requirements EDASS00025_0814 and Good Battery Care EDAS400059_1114
3. A list of the vehicle VIN details must be provided to the department where the original vehicle battery will be stored and maintained
4. Make sure the installation of the slave battery is coordinated with the workshop department and installed in a timely manner
5. Check on a daily basis for a low battery warning display on the vehicle information display. If required, contact the workshop department to charge the slave battery.
6. Make sure that the slave battery condition is checked on a weekly basis using the Midtronics EXP-1080. If required, contact the workshop department to charge the slave battery
7. When the display vehicle has been sold, notify the workshop department to install the original battery (in a fully charged state) within 72 hours of vehicle handover to the customer
8. When the display vehicle is being returned to the vehicle storage compound, notify the workshop department to install the original battery (in a fully charged state), refit the transit relay (if required) and put the vehicle into transportation mode
9. Record all battery inspections and battery charging dates and supporting information on the showroom and slave battery report

supporting information on the showroom and slave battery report form.
For additional information, refer to: Showroom and Slave Battery Condition Report Form (414-00 Battery and Charging System - General Information, Description and Operation).

WORKSHOP REPRESENTATIVE RESPONSIBILITIES

1. Removal of the original vehicle battery from the vehicle
2. Installation of the slave battery to the display vehicle
3. Clearly label and identify a slave battery
4. Attach the slave battery identification tag JLR-415-010 (Available from the Jaguar Landrover equipment website) onto the vehicle keys identifying that the vehicle is fitted with a slave battery
5. Check, maintain and record the original battery condition information in accordance with the JLR storage procedure and policy.
   For additional information, refer to: Showroom and Slave Battery Condition Report Form (414-00 Battery and Charging System - General Information, Description and Operation).
6. Make sure the slave battery has the same part number as the original battery fitted to the display vehicle.
7. Make sure the TOPIx procedure is followed for the removal and replacement of the original vehicle battery
8. Install the original vehicle battery within 72 hours of vehicle handover to the customer
9. Make sure if the display vehicle is being returned to the vehicle storage compound the original battery is installed (in a fully charged state), refit the transit relay (if required) and put the vehicle into transportation mode
10. Remove the slave battery identification tag JLR-415-010 from the vehicle keys once the original battery has been refitted
11. The original battery should be stored separately and clearly identified with the VIN from the vehicle from which it was removed.

TRANSIT RELAY INSTALLATION SUMMARY

	JAGUAR	LAND ROVER

Vehicles with Transit Relay installed	X152, X250 and X351	L319, up to 16 MY L405 and L494
Vehicles without Transit Relay installed	X760, X260 and X761	L316, L359, L538, L550, from 17 MY L405 and L494

2.2 SOFTWARE REFLASH, SDD WORK OR IGNITION ON RELATED WORKSHOP ACTIVITIES

Due to the high electrical current demand and high depth of discharge that can occur during vehicle software re-flash activities, SDD work or ignition on (power mode 6) related work in the workshop, vehicles that are undergoing such activities MUST have a JLR approved power supply capable of delivering 50 Amps or more. Approved showroom conditioners can be found on the JLR tooling website.

CAUTION:

Do Not carry out any Software downloads with either or both the transit mode on or the transit relay fitted, this could damage vehicle modules.

2.3 EXTENDED VEHICLE REWORK

For any extended vehicle rework that results in consuming vehicle battery power a JLR approved power supply should be connected, refer to : Battery Support Unit connection procedure (414-00 battery and charging system - General information, General procedures).

2.4 JUMP STARTING NEW VEHICLES BEFORE THEY HAVE BEEN DELIVERED TO THE CUSTOMER

- It is the retailers responsibility to make sure the battery is not allowed to discharge by following the instructions and processes defined in this manual.
- However, if circumstances dictate that a new vehicle must be jump started due to a discharged battery whilst the vehicle is in the retailers care, **the battery on this vehicle must be replaced with a new one** prior to delivery to the customer at the retailers liability.
- The vehicle should also undergo investigation as to why the battery became discharged.

- Do not connect the jump starting cable to the negative (-) terminal of the battery. Always connect to the recommended earth point. As defined in the owners handbook or service documentation for that vehicle.

2.5 AGM BATTERIES

- **AGM batteries must not be charged above 14.8 Volts. Doing so will damage them.**
- AGM Batteries must be tested with a capable battery tester as **detailed in the Equipment section (Section 5) of this procedure.**

NOTE:

Under no circumstances should the battery be disconnected with the engine running because under these conditions the generator can give a very high output voltage. This high transient voltage will damage the electronic components in the vehicle. Loose or incomplete battery connections may also cause high transient voltage.

3. HEALTH AND SAFETY PRECAUTIONS

WARNINGS:

- BATTERY CELLS CONTAIN SULPHURIC ACID AND EXPLOSIVE MIXTURES OF HYDROGEN AND OXYGEN GASES. IT IS THEREFORE ESSENTIAL THAT THE FOLLOWING SAFETY PRECAUTIONS ARE OBSERVED.
- Batteries emit highly explosive hydrogen at all times, particularly during charging. To prevent any potential form of ignition occurring when working in the vicinity of a battery:
  - Do not smoke when working near batteries.
  - Avoid sparks, short circuits or other sources of ignition in the battery vicinity.
  - Switch off current before making or breaking electrical connections.

- Ensure battery charging area is well ventilated.
- Ensure the charger is switched off when: a) connecting to a battery; b) disconnecting from the battery.
- Always disconnect the ground cable from the battery terminal first and reconnect it last.

- Batteries contain poisonous and highly corrosive acid. To prevent personal injury, or damage to clothing or the vehicle, the following working practices should be followed when topping up, checking electrolyte specific gravity, removal, refitting or carrying batteries:
  - Always wear suitable protective clothing (an apron or similar), safety glasses, a face mask and suitable gloves.
  - If acid is spilled or splashed onto clothing or the body, it must be neutralized immediately and then rinsed with clean water. A solution of baking soda or household ammonia and water may be used as a neutralizer.
  - In the event of contact with the skin, drench the affected area with water. In the case of contact with the eyes, bathe the affected area with cool clean water for approximately 15 minutes and seek urgent medical attention.
  - If battery acid is spilled or splashed on any surface of a vehicle, it should be neutralized and rinsed with clean water.
  - Heat is generated when acid is mixed with water. If it becomes necessary to prepare electrolyte of a desired specific gravity, SLOWLY pour the concentrated acid into water (not water into acid), adding small amounts of acid while stirring. Allow the electrolyte to cool if noticeable heat develops. With the exception of lead or lead-lined containers, always use non-metallic receptacles or funnels. Do not store acid in excessively warm locations or in direct sunlight.
- Due to their hazardous contents, the disposal of batteries is strictly controlled. When a battery is scrapped, ensure it is disposed of safely, complying with local environmental regulations. If in doubt, contact your local authority for advice on disposal facilities.

4. BATTERY CARE REQUIREMENTS

4.1 RECEIPT OF A NEW VEHICLE

Within 24 hours of receipt of a new vehicle, a battery condition check must be carried out in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.

NOTES:

- The Midtronics software can be updated; refer to Administration bulletins to ensure the EXP-1080, GRX-3080 and GR1-3080 are up-to-date.
- Midtronics WiFi dongles are mandated; refer to special tool release notes titled “Wi-Fi pod upgrade to the EXP-1080 battery tester”. Ensure dongles are fitted at all times for the system to work correctly.
- The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.2 NEW VEHICLE STORAGE

If the vehicle is to be stored, transport mode MUST be programmed into the vehicle with the transit relay fitted as delivered. Certain vehicles do not have a transit relay fitted, these vehicles only need transport mode installed, For additional information, refer to the **Transit Relay Installation Summary**

table for transit relay installation.

Transit relay removal / vehicle placed in normal mode should only be completed a maximum of 72 hours prior to handover to customer

For vehicles without either a transit mode or transit relay the battery negative cable must be DISCONNECTED from the battery.

The battery must be tested and/or re-charged every 30 days and MUST be re-charged after every 90 day period.

NOTES:

- Transport mode is required to be set when a transit relay is installed to a vehicle to prevent damage to vehicle electrical modules.
- The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.3 PDI / DELIVERY TO CUSTOMER

Before the vehicle is handed over to the customer and as part of the PDI, the condition of the battery needs to be confirmed. The battery condition must be checked in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.

NOTE:

The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.4 REPLACEMENT BATTERIES FOR SERVICE

All service replacement batteries must have the battery condition checked within 24 hours of receipt and controlled on a 'First In First Out' basis to ensure batteries are not allowed to age unnecessarily.

For batteries in storage and not yet fitted to a vehicle, they must be stored in a cool/dry environment, not in direct sunlight or under any direct heat source. Any batteries exhibiting any forms of damage or corrosion must not be fitted to any vehicle. Any batteries which are dropped must be scrapped, this applies even if no external damage is apparent.

The battery condition must be checked every 30 days in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**.The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.5 BATTERY MAINTENANCE

- Any battery whether it is in a vehicle or a replacement part must be tested and/or re-charged every 30 days and MUST be re-charged after every 90 day period

day period.

- The battery must always be connected to a battery support unit during any diagnostic sessions, including software updates.
  For additional information, refer to: Battery Support Unit Connection Procedure (414-00 Battery and Charging System - General Information, General Procedures).

4.6 BATTERY TEST

Enhancement to the recommended battery test equipment software, has removed the need to physically remove battery surface charge before completing a Battery Test.

The battery may be tested either on a bench or on the vehicle.

NOTE:

Make sure the Ignition is OFF and the vehicle is powered down with the modules entering 'sleep mode' before commencing with the battery test.

Battery Test Types

Flooded Battery Testing

In some markets serviceable flooded Batteries are still in use, to test these correctly check the electrolyte level as outlined in the CONFIRMING ELECTROLYTE LEVEL section 9 in this procedure before any further testing. These batteries are identified with cell plugs on top of the battery.

All AGM and Flooded Battery Testing

The recommended Battery Tester has three types of Battery Test available for the technician to select:

1. Battery Test - The BATTERY TEST should be used on any battery that has started its warranty life cycle
   - The battery is in use and fitted to a vehicle registered to an

owner

2. PDI / Storage - The PDI / STORAGE test should be used on any battery that has not yet been entered into the warranty life cycle
   - The battery is fitted to a **NEW** vehicle, but the vehicle has not yet been sold/registered to an owner
3. Battery Storage - The BATT. STORAGE test should be used on any battery that has not yet been entered into the warranty life cycle
   - The battery is not in use and is a parts stock battery and has not yet been fitted to a vehicle

NOTE:

When BATT. STORAGE is selected, the technician must enter IDENTIFICATION data or a purchase order reference number for the battery being tested.

The battery condition must be checked in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.

NOTE:

The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

CAUTION:

DO NOT connect the tester to any other circuit or chassis point other than the battery negative terminal

than the battery negative terminal.

5. EQUIPMENT

All equipment used must be functionally capable of meeting the compliance requirements. Please refer to the approved equipment document (JLR 000015).

In the case of batteries fitted to a new vehicle at the retailer, battery condition should be measured using the appropriate hand-held Midtronics tester as follows:

BATTERY TYPE	BATTERY TESTER	BATTERY TESTER
	Jaguar	**Land Rover**
AGM & Flooded	Midtronics EXP1080, GRX-3080 & GR8-1180	Midtronics EXP1080, GRX-3080 & GR8-1180

The test results must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

NOTE:

All equipment must be calibrated

6 DETERMINING BATTERY CONDITION

TESTER RESULTS	ACTION
GOOD BATTERY	Return to service.
CHARGE AND RE-TEST	Fully charge battery as per the time to charge table on the EPX-1080. Re-test battery. If same result replace battery.
REPLACE	Verify surface charge removed. Disconnect battery from vehicle and

BATTERY OR BAD CELL BATTERY	re-test. If result repeats after surface charge removal, replace battery. **DO NOT RECHARGE**.
UNABLE TO DO TEST	Disconnect battery from vehicle and re-test.

7 BATTERY CHARGING

It is essential that a suitably ventilated defined area exists in each retailer for battery charging.

CAUTION:

> It is very important that when charging batteries using the traction charger or other stand-alone chargers that the charger is set for the correct type of battery before charging commences. If the wrong switch is selected the result would be a battery that is not charged fully and / or overheating can occur. Follow the manufacturers operating instructions.

Batteries **MUST BE** tested and if necessary charged every 30 days and charged after 90 days irrespective of any test. It is recommended that retailers always have fully charged batteries ready for use.

CAUTION:

> Do not charge AGM batteries with voltages over 14.8 Volts as this will damage the battery.

A designated controlled area must be allocated for scrap batteries and clearly controlled as such.

To bring a discharged but serviceable battery back to a fully charged condition proceed as follows:

- Check and if necessary top-up the battery electrolyte level. (Flooded maintainable batteries only)

- Charge the battery using a JLR approved charger as detailed in the approved equipment document following the manufacturers operating instructions.

NOTE:

When using the Midtronics Diagnostic Charger, automatic mode must always be used. After charging and analysis, the charger may display 'Top-Off Charging', Hit STOP To End. Do not stop charging until the current falls to 5A or less, otherwise the battery will not be fully charged.

Following charging, a post charge battery condition test must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**.

NOTE:

The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.
For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

8 BATTERY REPLACEMENT

CAUTION:

AGM and Flooded batteries are NOT interchangeable, only specified batteries must be must. Failure to follow this instruction will result in early battery failure.

If it is determined that a battery requires replacement, always refer to the appropriate section of the workshop manual for instructions on removing and installing the battery from the vehicle.

On in service vehicles fitted with a Battery Monitoring System (BMS), the BMS control module must be reset following the installation of a new battery. The BMS control module reset procedure must be performed using an approved diagnostic system.

9 CONFIRMING ELECTROLYTE LEVEL

WARNINGS:

- BEFORE CHECKING THE ELECTROLYTE LEVEL AND TOPPING-UP THE BATTERY WITH DISTILLED WATER, REFER TO THE HEALTH AND SAFETY PRECAUTIONS SECTION.
- AGM TECHNOLOGY BATTERIES ARE FULLY SEALED FOR LIFE AND NO ATTEMPT SHOULD BE MADE TO CHECK OR TOP UP THE ELECTROLYTE LEVEL.

NOTES:

- In hot climates more frequent checks of the battery electrolyte level and condition are required. If necessary, the battery cells can be topped up using distilled water.
- Only flooded batteries can have the electrolyte level topped up.

On certain flooded battery types the electrolyte level will need to be checked.

1 Make sure the battery is of a type suitable for topping up. These types of batteries will have cell plugs visible on the top face of the battery or a removable access panel to allow access to the cells.

2 On batteries with a clear or opaque case and level marks, check the

2 On batteries with a clear or opaque case and level marks, check the electrolyte level by visual inspection of the maximum level indicator mark on the battery casing, indicating adequate level above the battery separators.

3 On batteries with black cases, remove the cell plugs or access panel and ensure the electrolyte level is level with the indicator in the cell hole. A flashlight may be required to see the electrolyte level on this type of battery.

4 If the electrolyte level is low, top-up using **distilled water only**.

5 Refit the battery cell plugs.

6 Charge the battery for 1 hour using a recommended charger, if a GRX-3080 is used select manual charging for an hour.

7 Carry out a battery test using the recommended test equipment in line with **4.6 Battery Test & 5 Equipment**.

NOTE:

Maintenance free and Valve Regulated (AGM) batteries are sealed and therefore cannot be topped up.

CAUTION:

DO NOT overfill.

2012.0 RANGE ROVER (LM), 414-00

BATTERY AND CHARGING SYSTEM – GENERAL INFORMATION

DESCRIPTION AND OPERATION

VEHICLE QUIESCENT CURRENT TESTING

On vehicles fitted with a Battery Monitoring System (BMS), the diagnostic routine for quiescent drain testing in the approved Jaguar or Land Rover diagnostic system should be utilized.

If a customer complains of a vehicle battery that discharges continuously or when left for a prolonged period of time, it is recommended that a quiescent drain test is performed as described below.

The battery drain should be measured using the approved Jaguar or Land Rover diagnostic system or a Digital Volt Ohm Meter (DVOM). A procedure for quiescent drain measurement using the diagnostic system is available in the Diagnosis and Testing section of the Workshop Manual. The vehicle should be in the locked/armed state (for example vehicle alarm fully armed), all doors, hood and luggage compartment lid/tailgate are open and latched (so as to appear closed from an electrical point of view). The test should take place after the vehicle has entered shutdown mode. The time taken for this to occur after the ignition is switched off varies according to model (Refer to the Topix On line resource for details).

When the vehicle is armed, the effect of the security system Light Emitting Diode (LED) flashing is to cause a pulsation in the measured current drain. In this case, either the average current should be taken (using a DVOM with an averaging system) or the current reading taken, ignoring the brief high current peaks.

EQUIPMENT

Approved Jaguar or Land Rover diagnostic system with current probe **OR** DVOM with current probe.

METHOD OF MEASUREMENT

Using an Approved Jaguar or Land Rover Diagnostic System.

1. Switch off all electrical loads and ensure that the ignition is off (power mode 0)
2. Connect the current probe to the approved Jaguar or Land Rover diagnostic system
3. Calibrate the probe
4. Install a clamp around the battery lead/junction box lead
5. Go to the Quiescent Current Testing section in this procedure

Using a Digital Volt Ohm Meter (DVOM)

Do not use an in-line DVOM to measure the quiescent drain on vehicles fitted with an electronic throttle (for example Range Rover 2002MY onwards). The current exceeds the maximum amount the fuse in the DVOM is capable of handling.

1. Switch off all electrical loads and ensure that the ignition is off (power mode 0)
2. Connect the current probe to the DVOM
3. Calibrate the probe
4. Install a clamp around the battery lead/junction box lead
5. Go to the Quiescent Current Testing section in this procedure

QUIESCENT CURRENT TESTING

1. Switch ignition to 'on' or select ignition power mode 6 in keyless vehicles and switch to 'off' (power mode 0) (do not crank)
2. Remove key from ignition switch (if equipped)
3. Open and latch all doors, hood and luggage compartment lid or tailgate
4. Lock the vehicle using the remote function on the remote handset or smart key. (Single lock only to avoid volumetric alarm arming)
5. Remove any other potential electrical drains such as accessories plugged into accessory sockets
6. Record the amperage readings after the shutdown period referenced in the Topix on line resource for details. Note: all cars from 10MY onwards should be less than 30mA after 30 minutes (for exceptions see Land Rover Quiescent Drain Values table).
7. Record the final reading on the battery report form.

The preferred method of testing following an excessive current consumption figure is to use a current probe around individual junction box leads to the various suspected circuits to identify a potential cause. This is in preference to the old method of removing fuses for the following reasons:

- The drain may be caused by a control module remaining active and preventing the quiescent drain from reducing to normal levels
- The drain may be caused by a relay winding that is activated. Pulling the fuse can allow this to 'reset' and the drain will be lost and go un-diagnosed.

LAND ROVER QUIESCENT DRAIN VALUES

MODEL	SHUT DOWN PERIOD (MINUTES)	TYPICAL VALUES BATTERY DRAIN (MA)
Range Rover (LM) - Up to 2009MY	30	<30

Range Rover (LM) - From 2010MY	20 (after lock/arm condition) [2]	<30
	33 (unlocked)	<30
Range Rover (LG) From 2013MY	<10 (after lock/arm condition) [2]	<20
	<20 (unlocked)	<20
Range Rover Sport (LS) - Up to 2007MY	30	<30
Range Rover Sport (LS) - From 2007MY to 2010MY	30	<30
	33 (unlocked)	<30
Range Rover Sport (LS) - From 2010MY	10 (after lock/arm condition) [2]	<20
	30 (unlocked)	<20
Range Rover Sport (LW) - From 2014MY	10 (after lock/arm condition) [2]	<20
	<20 (unlocked)	<20
Range Rover Evoque (LV) - From 2012MY	20 (after lock and arm condition) [2]	<20
	<20 (unlocked)	<20
Discovery Series 2 (LT)	30	<30
Discovery 3/LR3 (LA) - Up to 2007MY	30	<30
Discovery 3/LR3 (LA) - From 2007MY to 2010MY	30	<30
	33 (unlocked)	<30
Discovery 4/LR4 (LA) - From 2010MY	<20 (after lock/arm condition) [2]	<20
	<20 (unlocked)	<20
	<20 (unlocked)	<20
Discovery Sport (LC) - From 2015MY	10 (after lock/arm condition) [2]	<20
	<20 (unlocked)	<20
Freelander (LN) - Up to 2007MY	30	<30
Freelander 2/LR2 (LF) - From 2007MY	35 (single locked or unlocked)	<25

	15 (double locked)	<25
Defender (LD) - 1998MY to 2007MY	30	<25
Defender (LD) - from 2007MY	<30	<30

NOTE:

1. The total current drain will be higher if certain approved accessories are fitted (for example: tracker, trailer module, etc.)
2. Applies to vehicles without Tire Pressure Monitoring System (TPMS). Vehicle shut-down period with TPMS is approximately 15 minutes.

2012.0 RANGE ROVER (LM), 414-00

BATTERY AND CHARGING SYSTEM – GENERAL INFORMATION

INFORMATION

DESCRIPTION AND OPERATION

NOTE:

Fields marked with * are mandatory and must be completed.

GENERAL INFORMATION							
*Vehicle Identification Number (VIN):				Vehicle Model:	Engine type:		
*Mileage:				*Repair Date:	-		
Customer Questions							
*1: What is the customer's reason for dealer visit? (tick symptoms as appropriate)				Non crank	Crank but non start	Warning message	Other:
*2: How long was the vehicle left prior to issue.				*			
*3: How was the car left (Locked/unlocked)				*			
*4: How did you access to the vehicle					Key fob	Manual key	Handle pull
*5: Has the vehicle required assistance for battery issues previously?						Yes	No
*6: Is the vehicle used? (tick symptoms as appropriate)				Daily	Every other day	Weekly	Less than weekly
*7: Average journey length				*			
*8: How many starts do you typically do in a day				*			
*9: Did the customer see any instrument pack warnings prior to the issue?				*			
*10: Have any of the features been used without the engine running in the last 3 days (if fitted?)	Radio	Power point accessory	CD	DVD	USB or IPOD connection	TV	Rear seat entertainment

11: Customer comments:- Please add any additional comments that are relevant.	*			
Diagnostics (Battery Testing)	-	-	-	-
1: Loose battery clamps	Yes	*	No	*
2: Loose hold down clamps	Yes	*	No	*
3: Corroded terminal posts	Yes	*	No	*
4: Physical damage/leaks	Yes		No	*
5: Low electrolyte (Flooded batteries only)	Yes	*	No	*
6: Battery Date Code	*			
7: FEAD belt tension	OK	*	Not OK	*
8: Quiescent Drain	mA	*		
9: Vent tube correctly installed	Yes	*	No	*
10: Number of Times Battery Charged:	*			
11: Remove the Surface (414-00 battery care requirements)	Yes	*	No	*
12: Battery voltage	*			
13: Midtronics test code before charging (EXP-1080)	*			
13a: If Midtronics indicates that the battery needs re-charging, charge the battery following instructions on the recommended battery charger	*			
13b: Midtronics test code after charge	*			
13c: Midtronics test code result after charge	*			
13d: If "good and re-charge" charge the battery following instructions on the recommended battery charger	*			
13e: If "charge and re-test" for both before and after the charge renew the battery	*			
13f: Only renew the battery if "renew battery", "bad cell" or charge and re-test has been displayed twice.	*			
Technician Comments:- Please add any additional comments that are relevant.				
*				
*				

*
*
*

2012.0 RANGE ROVER (LM), 414-00

BATTERY AND CHARGING SYSTEM – GENERAL INFORMATION

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

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

INSPECTION AND VERIFICATION

CAUTION:

Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being 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
▪ Generator ▪ Drive belt ▪ Drive belt tensioner ▪ Generator pulley ▪ Check the security of the generator fittings	▪ Generator ▪ Battery/battery connections ▪ Starter motor ▪ Harnesses and connectors ▪ Fuses ▪ Starter motor megafuse ▪ Charge warning indicator function ▪ Instrument Cluster (IC) ▪ 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
Charge warning indicator does not illuminate (ignition on, engine not running)	▪ Instrument cluster fault ▪ Engine Control Module fault (ECM)	▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Instrument Cluster (IC) for related DTCs and refer to the relevant DTC index ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Engine Control Module (ECM) for related DTCs and refer to the relevant DTC index
Charge warning indicator illuminates and the battery discharges (engine running)	▪ Accessory drive belt broken ▪ Generator pulley slipping on shaft ▪ Generator fault ▪ Battery cable fault ▪ LIN circuit fault ▪ Engine control module fault	▪ Check the auxiliary drive belt condition and tension ▪ Check that the pulley does not rotate independently of the generator ▪ Refer to the electrical circuit diagrams and test the generator circuit for short circuit to ground, short circuit to power, open circuit, high resistance ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Engine Control Module (ECM) for related DTCs and refer to the relevant DTC index ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Gateway Module (GWM) for related DTCs and refer to the relevant DTC index
Charge warning indicator illuminates intermittently (engine running)	▪ Auxiliary drive belt slipping ▪ Generator pulley slipping on shaft ▪ Battery cable fault ▪ Generator wiring fault ▪ Generator fault ▪ LIN bus	▪ Check the auxiliary drive belt condition and tension ▪ Check that the pulley does not rotate independently of the generator ▪ Refer to the electrical circuit diagrams and test the generator circuit for short circuit to ground, short circuit to power, open circuit, high resistance ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Engine Control Module (ECM) for related DTCs and refer to the relevant DTC index

	▪ LIN bus circuit fault	
Battery discharges without the charge warning indicator staying on	▪ Battery fault ▪ Battery quiescent drain ▪ Intermittent generator fault	▪ Refer to the relevant section of the workshop manual and test the battery ▪ Refer to the relevant section of the workshop manual and test the battery quiescent drain ▪ Using the manufacturer approved diagnostic system, check the Engine Control Module (ECM) for related DTCs and refer to the relevant DTC index ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Gateway Module (GWM) for related DTCs and refer to the relevant DTC index
Noise (mechanical)	▪ Auxiliary drive belt slipping ▪ Generator fault	▪ Check the auxiliary drive belt condition and tension ▪ Remove the auxiliary drive belt and check that the generator rotates freely

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 - TDV8 3.6L Diesel, DTC: Engine Control Module (Description and Operation),
Diagnostic Trouble Code (DTC) Index - V8 5.0L Petrol/V8 S/C 5.0L Petrol (Description and Operation).

BATTERY SUPPORT UNIT CONNECTION PROCEDURE

(G1917304)

GENERAL PROCEDURES

CONNECT

WARNINGS:

- Do not smoke or carry lighted tobacco or open flame of any type when working on or near the vehicles battery. Highly flammable vapors may be present and ignite. Failure to follow these instructions may result in personal injury.
- Avoid flames, sparks or lighted substances.
- Make sure that the battery is well ventilated while the battery support unit is connected.
- Switch off the current from the battery support unit before making any electrical connections or disconnections.
- The battery support unit must **never** be connected to both battery terminals. Always follow the safety warnings and documentation of

the device that is being used.

- The battery support unit ground cable must **always** be connected to the vehicle last and disconnected first.

CAUTION:

Do not carry out any software downloads with the vehicle in transit mode or with the transit relay installed.

NOTES:

- **This procedure covers connection instructions for the following vehicles;**
- - **LG / L405**
  - **LW / L494**
  - **LF / L359**
  - **LA / L319**
  - **LS / L320**
  - **LM / L322**
  - **LC / L550**
  - **LV / L538**
- **This procedure covers operating instructions for the following battery support units;**
- - **Traction BSU2-50 / 125**
  - **Fronius ACCTIVA Professional Flash**
  - **MIdtronics CX-Pro 50**
  - **Traction MPL-50**
  - **Midtronics PSC 700S**

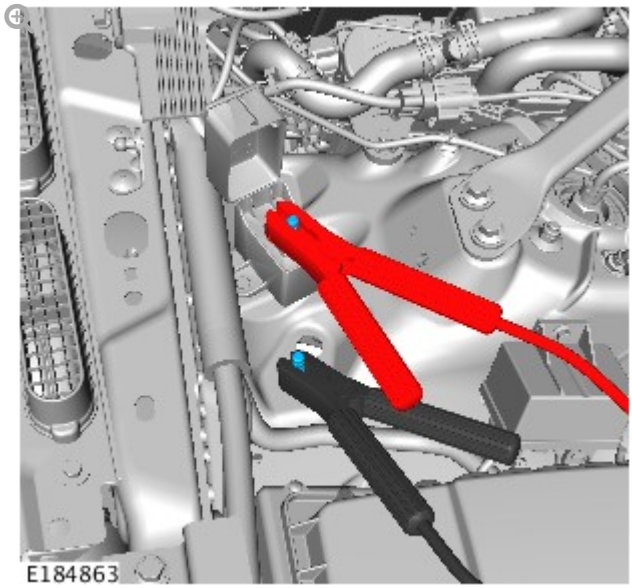
1.

WARNING:

Make sure that the cables are connected in the correct order.

NOTES:

- **This Step contains connection instructions for the following vehicles;**
- - **LG / L405**
  - **LW / L494**



1. Connect the battery support unit positive cable to the jump start positive terminal.
1. Connect the battery support unit ground cable to the jump start ground terminal.

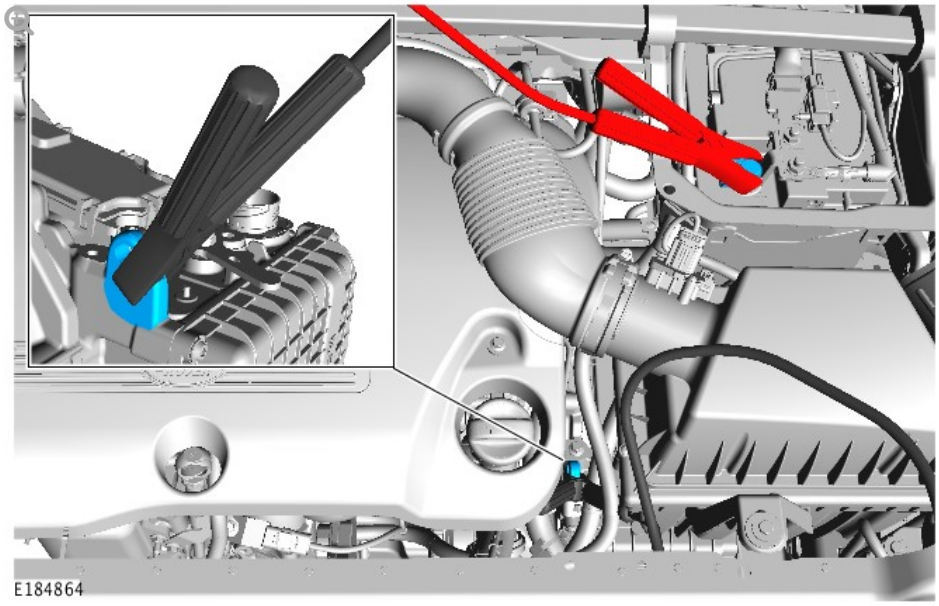
2.

WARNING:

Make sure that the cables are connected in the correct order.

NOTES:

- **This Step contains connection instructions for the following vehicles;**
- - **LC / L550**
  - **LF / L359**



1. Connect the battery support unit positive cable to the primary battery positive terminal.
1. Connect the battery support unit ground cable to the ground point, as illustrated.

3.

WARNING:

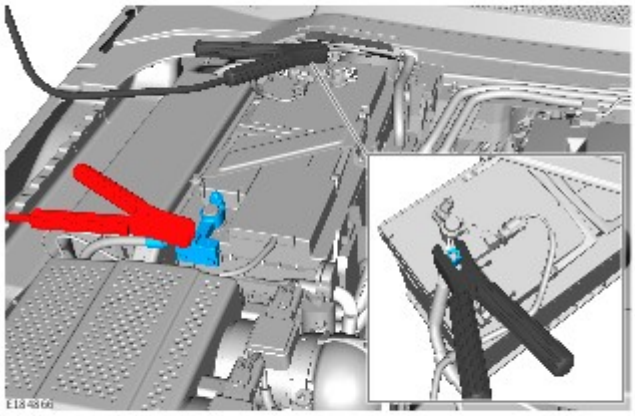
Make sure that the cables are connected in the correct order.

CAUTION:

Do not connect the battery support unit ground cable directly to the battery ground terminal. The battery monitoring system (BMS) must be between the battery support unit ground cable clamp and the battery ground terminal.

NOTES:

- **This Step contains connection instructions for the following vehicles;**
  - **LA / L319**
  - **LS / L320**
- Left hand drive shown, right hand drive is similar.



1. Connect the battery support unit positive cable to the primary battery positive terminal.
1. Connect the battery support unit ground cable to the primary battery ground cable, as illustrated.

4.

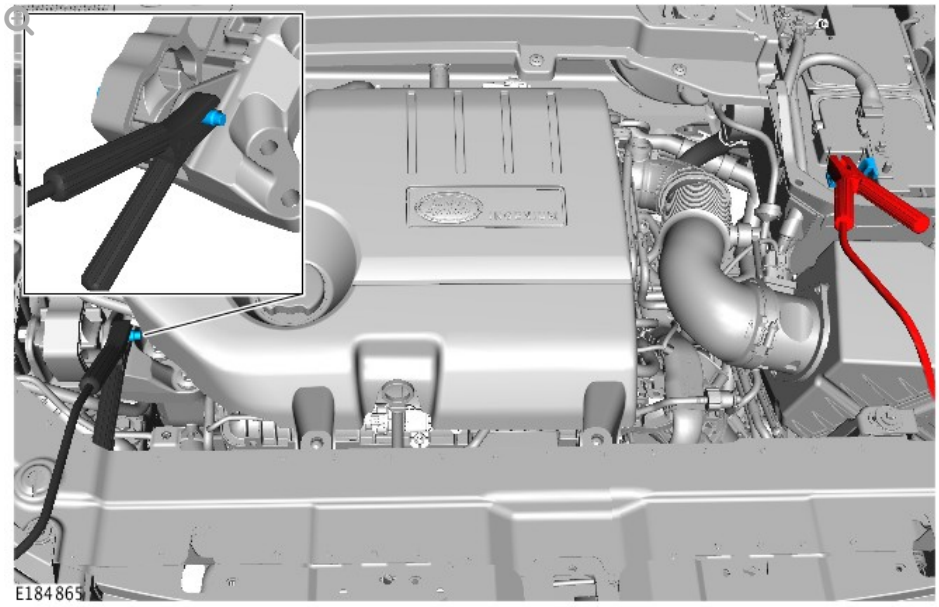
WARNING:

Make sure that the cables are connected in the correct order.

NOTES:

- **This Step contains connection instructions for the following vehicle;**

- LV / L538



1. Connect the battery support unit positive cable to the primary battery positive terminal.
1. Connect the battery support unit ground cable to the ground point, as illustrated.

5.

WARNING:

Make sure that the cables are connected in the correct order.

CAUTION:

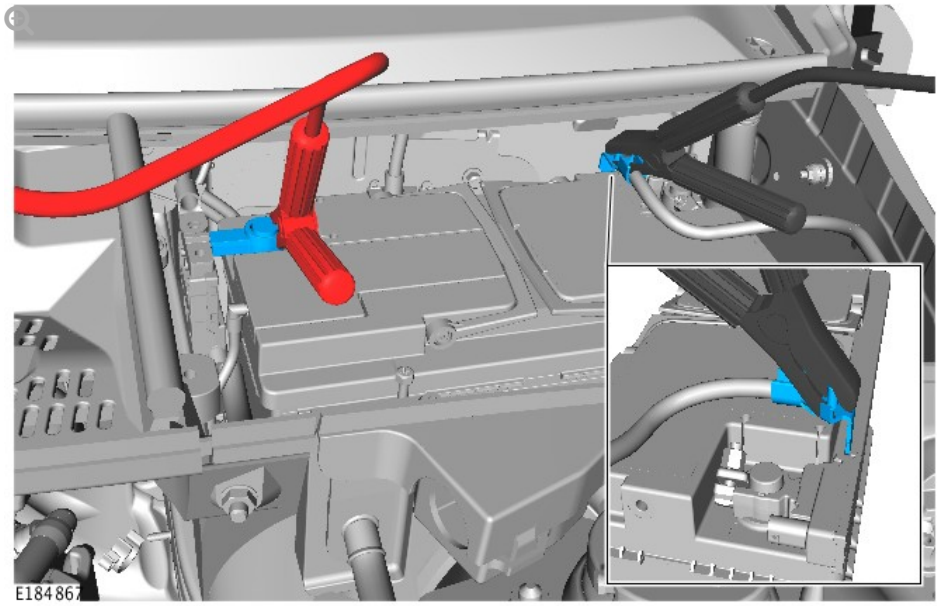
Do not connect the battery support unit ground cable directly to the battery ground terminal. The battery monitoring system (BMS) must be between the battery support unit ground cable clamp and the battery ground terminal.

NOTES:

- **This Step contains connection instructions for the**

following vehicle;

- LM / L322



1. Connect the battery support unit positive cable to the primary battery positive terminal.
1. Connect the battery support unit ground cable to the primary battery ground cable, as illustrated.

6.

CAUTION:

The Midtronics CX-Pro 50 can only support one vehicle at a time. It should not be used to support 2 vehicles at the same time.

NOTE:

This Step contains operating instructions for the Midtronics CX-Pro 50 battery support unit.

E184700

1. Connect the vehicle link cable to port 1 on the base of the battery support unit.

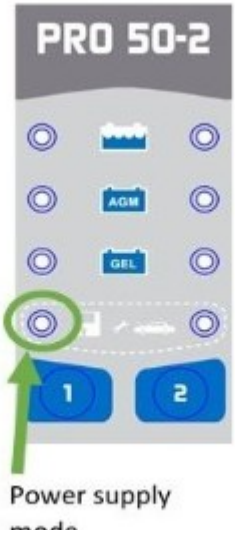
1. **NOTE:**

   Switch off any auxiliary systems, for example: headlamps, to reduce the electrical load on the battery support unit.

   Switch the ignition ON, but **do not** start the engine.

7. **NOTE:**

This Step contains operating instructions for the Midtronics CX-Pro 50 battery support unit.



E184728 mode

1.

NOTE:

A green light will confirm the battery support unit is switched ON

Switch ON the battery support unit.

1.

NOTE:

An orange light indicates that power is being supplied to the vehicle.

Use button 1 to select power supply mode.

1. The battery support unit is now ready for a diagnostic session.

8.

CAUTION:

The Traction Showroom Support Unit (SSU2) must not be used during diagnostic sessions. Only the Traction Battery Support Unit (BSU) / (BSU2) can be used.

NOTE:

This Step contains operating instructions for the Traction BSU2-50 / 125 battery support unit.

E184699

1. NOTE:

   Switch off any auxiliary systems, for example: headlamps, to reduce the electrical load on the battery support unit.

   Switch the ignition ON, but **do not** start the engine.

1. NOTE:

   Confirm that all 3 lights are illuminated green before starting a diagnostic session.

   Switch ON the battery support unit.

1. The battery support unit is now ready for a diagnostic session.

9. NOTE:

   This Step contains operating instructions for the Fronius ACCTIVA Professional Flash battery support unit.

E184698

1. **NOTE:**

   Switch off any auxiliary systems, for example: headlamps, to reduce the electrical load on the battery support unit.

   Switch the ignition ON, but **do not** start the engine.

1. **NOTE:**

   The unit will indicate on screen that it is supplying current.

   Switch ON the battery support unit and select external power supply mode (FSV / SPLY).

1. The battery support unit is now ready for a diagnostic session.

10. **NOTE:**

This Step contains operating instructions for the Traction MPL-50 battery support unit.

1. **CAUTIONS:**

   - The battery support unit must NOT be connected to an power supply at this stage.
   - Charging mode must not be selected.

Select battery support mode.

1. **NOTES:**

   - If the orange CHARGE lamp is illuminated for more than a few seconds;
   -
     - disconnect the battery support unit from the power supply
     - disconnect the cables from the vehicle
     - make sure the battery support mode is selected
     - reconnect the cables to the vehicle
     - reconnect the battery support unit to the power supply and

confirm the green READY lamp is illuminated.

Connect the battery support unit to the power supply, the green READY lamp should now be illuminated.

1. The battery support unit is now ready for a diagnostic session.

11.

CAUTION:

The Midtronics PSC 700S is only to be used in markets with 120V power supply.

NOTE:

This Step contains operating instructions for the Midtronics PSC 700S battery support unit.

E192494

1. Connect the battery support unit to the power supply and switch the battery support unit ON.
1. The battery support unit is now ready for a diagnostic session.

2012.0 RANGE ROVER (LM), 414-01

BATTERY, MOUNTING AND CABLES

Torque Specifications

ITEM	NM	LB-FT	LB-IN
Battery clamp bolt	9	-	80
Battery terminal nut	6	-	53
Battery tray to body bolt	5	-	44
Fuel fired booster heater to battery tray nut	10	7	-

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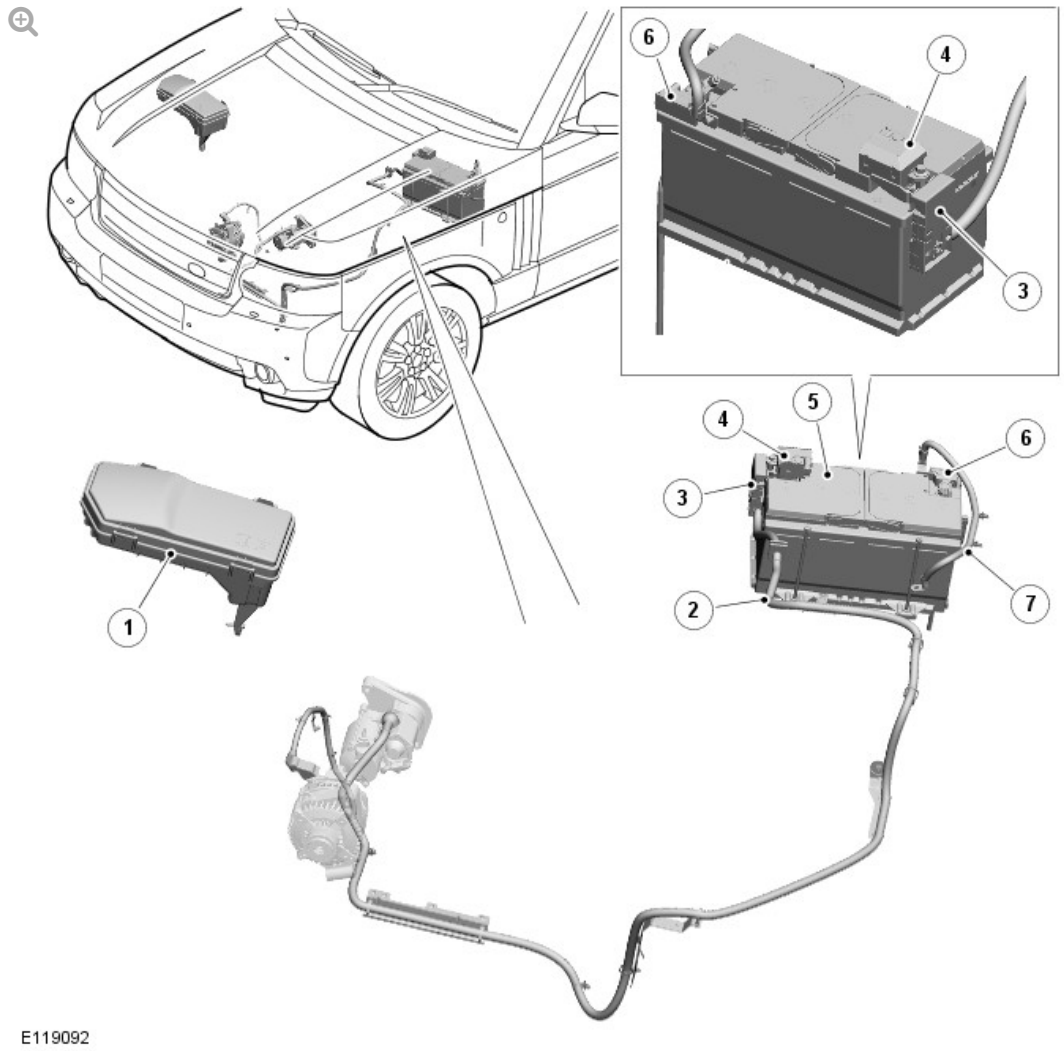
BATTERY, MOUNTING AND CABLES

DESCRIPTION AND OPERATION

COMPONENT LOCATION

NOTE:

Typical installation shown



ITEM	DESCRIPTION
1	Battery Junction Box (BJB)
2	+VE battery cable
3	Megafuse
4	Transit relay
5	Battery
6	Battery monitoring system module
7	-VE battery cable

INTRODUCTION

Mounted on the battery negative terminal is a battery monitoring system module. The battery monitoring system module is integral with the battery negative cable and is controlled by the ECM (engine control module). The

battery monitoring system module is connected to the CJB (central junction box) on a LIN (local interconnect network) bus and communicates with the ECM via the high speed CAN (controller area network) bus.

CAUTION:

> To avoid damaging the battery monitoring system module and maintain the correct system operation, always use a suitable body ground point rather than the battery negative terminal when connecting a slave power supply to the vehicle.

If a new battery is fitted to the vehicle, the battery monitoring system module will need to be reset using a Land Rover approved diagnostic system.

Fitted on the battery positive terminal is a transit relay. The transit relay must be removed from the vehicle during the Pre-Delivery Inspection (PDI). For additional information, refer to the PDI Manual.

BATTERY

Diesel variants use a 90 Ah/950 A SAE battery.

Petrol variants use a 90 Ah/800 A SAE battery, cold climate markets use a 90 Ah/950 A EN battery.

The battery is located in the engine compartment, on the passenger side. It sits in a tray and is secured with clamp plates and bolts.

The battery terminal posts allow for the battery cables to be connected with clamp type connections.

When removing the battery, ensure the alarm is disarmed and the ignition is switched off. Always disconnect the negative terminal first and then the positive. When refitting the battery, always fit the positive terminal first followed by the negative.

If the battery requires recharging, always use an approved constant current

charger, designed for lead-calcium batteries. DO NOT use a fast charger, as permanent damage to the battery may occur. Always ensure that the charger is connected to a suitable grounding point and not the battery negative terminal.

TRANSPORTATION RELAY

E120733

During production of the vehicle a transportation relay is installed on the battery positive terminal, to minimize battery drain during vehicle storage and delivery. The transportation relay provides an automatic means of disconnecting power from all of the electrical systems on the vehicle, but allows power to be easily restored to start and drive the vehicle during loading, unloading and storage.

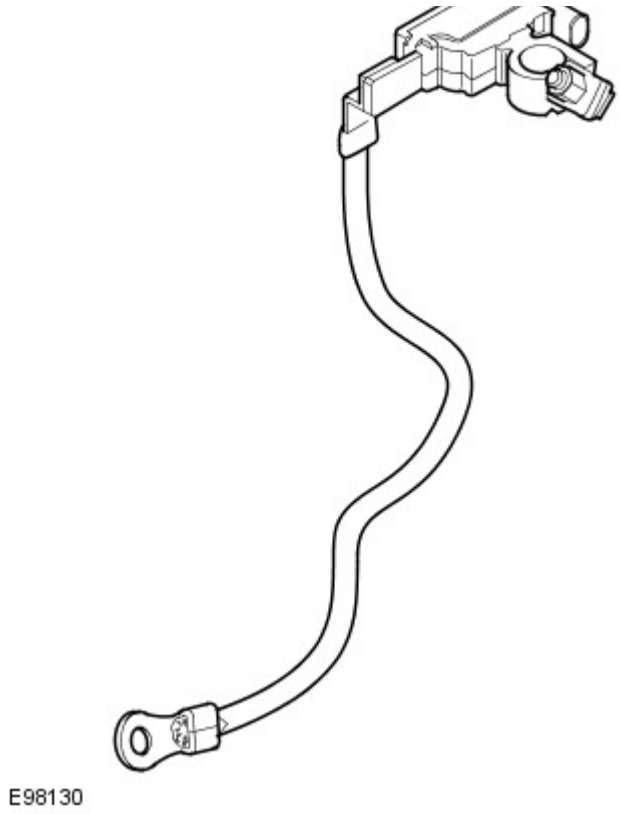
To start the vehicle when a transportation relay is installed press the hazard warning switch, this activates the transportation relay to power up and allow's the engine to be started. If the ignition is turned on but the engine is not started the vehicle will return transportation mode after 15 seconds.

The transportation relay must be removed from the vehicle prior to customer handover, but no more than 24 hours beforehand in accordance with the battery care procedure.

BATTERY MONITORING SYSTEM

NOTE:

Typical battery monitoring system module shown



The battery monitoring system module measures various battery parameters and calculates appropriate values to maintain optimum battery charging. The battery monitoring system module is connected to the CJB over a LIN bus connection. The CJB then forwards the values received on the LIN bus from the battery monitoring system module to the ECM over the high speed CAN bus.

The information received by the ECM is used to control the generator target setpoint and also to control the load management function which is in place to ensure that the vehicle loads are controlled in a manner which maximizes the attributes, whilst protecting the vehicle.

In the event of a system fault, a warning is displayed within the instrument cluster, DTC (diagnostic trouble code)'s are recorded in the appropriate modules (CJB / ECM) and a failsafe strategy is activated. The failsafe strategy includes the switching off of any loads which are controlled via the load management system to help maintain base vehicle function.

The Land Rover approved diagnostic system can be used to interrogate the DTC's from both ECM and CJB which will provide information relating to any existing or historic fault conditions. The diagnostic tester also has a diagnostic routine which is in place diagnose every component involved within the power supply system. The routine is self explanatory and provides

within the power supply system. The routine is self explanatory and provides a definitive result for each of the individual power supply system components to enable accurate diagnosis of any faults.

CAUTION:

> Due to the self-calibration routine, it is recommended that all power supply diagnostic testing is carried out using a Land Rover approved diagnostic system rather than a digital multimeter.

JUNCTION BOXES

A number of junction boxes are used to distribute power throughout the vehicle. For more information on fuse ratings and circuits protected, refer to the Electrical Circuit Diagrams.

BATTERY JUNCTION BOX

The BJB (battery junction box) is located in the engine compartment and is mounted on the bulkhead behind the battery. The BJB receives its power supply from the battery and contains 7 fusible links.

BATTERY JUNCTION BOX 2

The BJB 2 is mounted on the engine bulkhead, behind the battery. The BJB receives its power supply from the battery and contains 2 fusible links.

ENGINE JUNCTION BOX (EJB)

The EJB (engine junction box) is located in the engine compartment on the RH side and receives its power feed from the BJB 2.

CENTRAL JUNCTION BOX

The CJB is located behind the glove box and receives its power supplies from the BJB. The CJB is a "smart" fusebox and provides various vehicle level functions. The CJB contains fusible links, blade fuses and relays.

REAR JUNCTION BOX

The rear junction box is located on the RH (right-hand) side of the luggage compartment, behind the side trim casing. The rear junction box contains blade fuses and relays, and receives its main power supply from the BJB.

2012.0 RANGE ROVER (LM), 414-01

BATTERY, MOUNTING AND CABLES

DIAGNOSIS AND TESTING

PRINCIPLES OF OPERATION

For a detailed description of the battery system and operation, refer to the relevant Description and Operation section of the workshop manual REFER to: Battery and Cables (414-01 Battery, Mounting and Cables, 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.

NOTES:

- Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer-approved diagnostic system).
- When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.
- Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.
- If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

1. Verify the customer concern

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

Visual Inspection

MECHANICAL	ELECTRICAL
▪ Generator ▪ Drive belt ▪ Drive belt tensioner ▪ Generator pulley ▪ Check the security of the generator fixings	▪ Generator ▪ Battery ▪ Battery connections ▪ Starter motor ▪ Harnesses and connectors ▪ Fuses ▪ Charge warning indicator function ▪ 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, 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
▪ Battery power to vehicle interrupted	▪ High resistance between battery terminals and clamps	▪ GO to Pinpoint Test A.

MIDTRONICS EXP-1080 USER GUIDE

Carry out the following: -

Surface Voltage Removal Process

A vehicle which has had its battery charged or been driven in a **24** hour period before the test, must have its surface charge removed

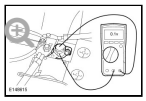
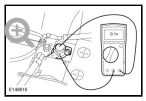
- 1. Turn on the ignition but do not start the vehicle
- 2. Switch the headlamps on high beam for a minimum of 3 minutes
- 3. Switch off the headlamps
- 4. Wait a minimum of 5 minutes before recording test results for any battery measurements

NOTE:

This test checks for high resistance between the battery terminal and the battery clamp.

NOTE:

This test checks for high resistance between the battery terminal and the battery clamp.

PINPOINT TEST A : VOLTAGE DROP	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	A1: GROUND CIRCUIT
	**1** Start the engine, turn on the following: ▪ (1) Air conditioning ▪ (2) Blower fan on full speed ▪ (3) Headlights on main beam ▪ (4) Heated screen - rear ▪ (5) Heated screen - front (if installed) ▪ (6) Heated seats (if installed)
	2 Connect the multimeter between the battery negative terminal and the battery clamp as shown in picture below (do not disconnect the battery at this stage)
	3 Set the multimeter to read DC voltage and record the reading
	Is reading equal to or below 0.1 volts? **Yes** GO to A2. **No** Switch all electrical loads and engine off, return the vehicle to an ignition off condition. Disconnect the battery negative clamp, clean clamp and terminal then reconnect and repeat test GO to A1.
	A2: POWER CIRCUIT
	**1** Start the engine, turn on the following: ▪ (1) Air conditioning ▪ (2) Blower fan on full speed ▪ (3) Headlights on main beam ▪ (4) Heated screen - rear ▪ (5) Heated screen - front (if installed) ▪ (6) Heated seats (if installed)
	2 Connect the multimeter between the battery positive terminal and

	2 Connect the multimeter between the battery positive terminal and the battery clamp as shown in picture below (do not disconnect the battery at this stage)
	3 Set the multimeter to read DC voltage and record the reading
	Is reading equal to or below 0.1 volts? **Yes** Carry out midtronics battery test procedure **No** Switch all electrical loads and engine off, return the vehicle to an ignition off condition. Disconnect the battery positive clamp, clean clamp and terminal then reconnect and repeat test **GO to A2**.

The following steps must be carried out to ensure correct operation of the EXP-1080 battery tester during the battery test procedure

CHECKS	ACTION
Battery fluid leakage, check for battery fluid leaks or damage to the battery casing	**NOTE:** If visible damage to the case is evident do not return battery under warranty. Replace the battery if there is any battery fluid leaks evident
Battery vent pipe routing	Check for routing, ensure there are no kinks
EXP-1080 fly lead, condition of clamps	Clean or replace as required
EXP-1080 fly lead connection	Confirm secure connection

NOTE:

The Midtronics EXP-1080 battery tester is suitable for testing flooded and absorbed glass mat (AGM) type batteries including Primary and Secondary batteries.

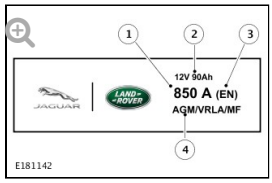
Testing a Battery

Using the Midtronics EXP-1080 battery tester, the following test procedure will confirm the serviceability of the battery (see Completing a Battery Test)

Battery Label Example

NOTE:

All AGM batteries are marked with AGM. Flooded batteries have no reference to being Flooded.



- 1. Battery Rating Units CCA (Cold Cranking Amps)
- 2. Battery voltage and Battery Ah rating
- 3. Battery rated units (battery standard EN or SAE)
- 4. Battery type (battery technology, AGM or Flooded)

Battery Test Types

The Midtronics EXP-1080 battery tester has three types of Battery Test avaliable to the technician to select:

Battery Test

- 1.The BATTERY TEST should be used on any battery that has started its warranty life cycle. The battery is in use and fitted to a vehicle registered to an owner

PDI / Storage

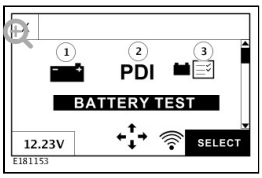
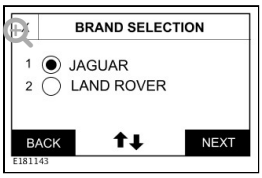
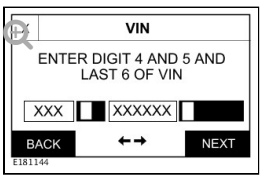
- 2.The PDI / STORAGE test should be used on any battery that has not yet been entered into the warranty life cycle. The battery is fitted to a NEW vehicle, but the vehicle has not yet been sold/registered to an owner

Battery Storage

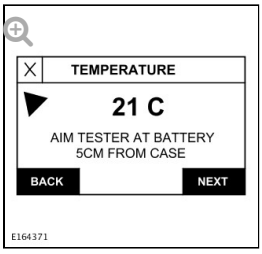
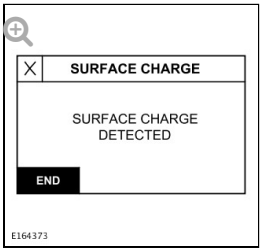
- 3. This BATT. STORAGE test should be used on any battery that has not yet been entered into the warranty life cycle. The battery is not in use and is a Parts Stock battery and has not yet been fitted to a vehicle

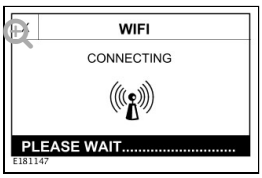
Completing a Battery Test

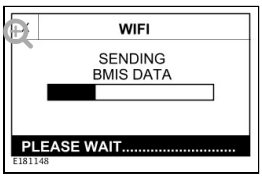
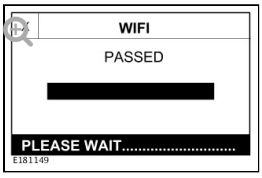
1	Connect the fly-lead to the Midtronics EXP-1080 battery tester
2	Connect the fly-leads to the battery terminals, black

	lead to the negative terminal, red lead to the positive terminal and confirm the connections are secure	
3	The battery tester will power ON automatically when connected to a battery	
4	MAIN MENU ▪ Select the correct BATTERY TEST using the arrow keys on the battery tester panel (see Battery Test Types) ▪ 1. BATTERY TEST ▪ 2. PDI / STORAGE ▪ 3. BATT. STORAGE **NOTE:** When BATT. STORAGE is selected, the technician must enter IDENTIFICATION data or a purchase order reference number for the battery being tested. The battery tester will then move on to BATTERY TYPE (Step 8). Select NEXT to continue	
5	BRAND SELECTION **NOTE:** This step is required for BATTERY TEST and PDI/STORAGE only. Select the correct brand of the vehicle battery being tested using the scroll arrow keys on the battery tester panel Select NEXT to continue	
6	VIN **NOTES:** ▪ This step is required for BATTERY TEST and PDI/STORAGE only. ▪ Letters SAL or SAJ may be different than displayed on the EXP-1080 if the vehicle is manufactured outside the United Kingdom, this will not effect the battery testing.	

	Enter the 4th and 5th digit followed by the last 6 of the VIN using the alphanumeric key pad on the battery tester panel	
	Select NEXT to continue	
7	BATTERY LOCATION	
	NOTES: ▪ This step is required for BATTERY TEST and PDI/STORAGE only. ▪ Selecting the correct battery details at this point is critical to getting the correct Battery Test Results.	
	Select IN VEHICLE if the battery is tested connected to the vehicle	
	NOTE: Make sure the Ignition is OFF and the vehicle is powered down with the modules entering 'sleep mode' before commencing with the battery test.	
	Select OUT OF VEHICLE only if the battery is out of the vehicle on a bench	
	Select NEXT to continue	
8	BATTERY TYPE	
	NOTES: ▪ All AGM batteries are marked with AGM. Flooded batteries have no reference to being Flooded. ▪ Selecting the correct battery details at this point is critical to getting the correct Battery Test Results.	
	Select the correct battery type (see Battery Label Example, Label 4) using the scroll arrow keys on the battery tester panel	
	Select NEXT to continue	
9	RATING UNITS	

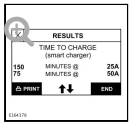
	NOTE: Selecting the correct battery details at this point is critical to getting accurate Battery Test Results. Select the correct battery rating from the battery label in brackets (see Battery Label Example, Label 3) using the scroll arrow keys on the battery tester panel Select NEXT to continue	
10	BATTERY RATING **NOTE:** Selecting the correct battery details at this point is critical to getting accurate Battery Test Results. Select the correct CCA rating (see Battery Label Example, Label 1) using the scroll arrow keys, or enter the rating with the numeric key pad on the battery tester panel Select NEXT to continue	
11	TEMPERATURE Aim the temperature sensor towards the battery casing (maintain distance of 5 cm) Select NEXT to continue	
12	TESTING The battery tester screen will now display clock hands rotating, the battery tester will automatically advance when the test has completed	
13	SURFACE CHARGE **NOTE:** This step will take place automatically only when required.	

	The SURFACE CHARGE test is an additional step required if the battery voltage is above 12.55v with a low CCA measured	
	▪ Follow the battery tester on screen instructions ▪ 1. Turn the ignition ON (position2) ▪ 2. Turn ON the headlights (high beam) until the Battery Tester shows- Turn OFF headlights ▪ 3. Turn the ignition OFF (position 0)	
14	BATTERY CHARGE	
	NOTES: ▪ This step will take place automatically only when required. ▪ To support a Warranty Claim, TEST CODE details for BEFORE CHARGING and AFTER CHARGING must be supplied in the technical comments box of the Warranty Claim.	
	Using the scroll arrow keys on the battery tester panel: Select BEFORE CHARGING if the battery has not been connected to a recommended mains charger and select NEXT to continue	
	Select AFTER CHARGING if the battery has been connected to a recommended mains charger for the recommended time shown on the result screen	
	Select NEXT to continue	
15	DEEP SCAN	
	NOTE: This step will take place automatically only when required.	
	The battery tester will display and complete an automated DEEP SCAN test only if required, then automatically advance when the DEEP SCAN test has completed	
16	CONNECTING to Wi-Fi	
	NOTES: ▪ A warning message is displayed if the battery	

	tester is unable to connect to a Wi-Fi network. Locate WIFI SETTINGS in the UTILITY MENU and follow the on screen instructions. ▪ If the battery tester is not fitted with a Wi-Fi pod, the battery tester will move on to RESULTS (Step 19). The battery tester will now use the A331 Wi-Fi pod (if installed) to connect to the local Wi-Fi network and connect to the Battery Management Information Service (BMIS) server	
17	SENDING BMIS DATA. **NOTE:** A warning message is displayed if the battery tester is unable to connect to the BMIS server. Your dedicated IT department may be required to complete all or some of the set up procedure. The battery test result data is now being transferred to the BMIS server	
18	BMIS DATA PASSED to SERVER The battery test result data has been successfully saved to the BMIS server	 GDS000016
19	RESULTS Review the battery test results and complete the appropriate actions (see Battery Tester Results Table)	.
20	TEST CODE **NOTES:** ▪ To support a Warranty Claim, TEST CODE details for Before Charging and After Charging must be supplied in the technical comments box of the Warranty Claim. ▪ To support a Warranty Claim, TEST CODE details for BEFORE CHARGING and AFTER CHARGING must be supplied in the technical comments box of the Warranty Claim.	.

	From the RESULTS display, view the TEST CODE using the scroll arrow keys on the battery tester panel	

Battery Tester Results Table

RESULTS	ACTION	
GOOD BATTERY	Return the battery to service	
CHARGE AND RE-TEST	**NOTE:** To support a Warranty Claim, TEST CODE details for Before Charging and After Charging must be supplied in the technical comments box of the Warranty Claim. When the battery test result equals CHARGE & RETEST, view the TIME TO CHARGE screen using the scroll arrow keys on the Battery Tester panel	
	Follow the 50AMP charge time for all vehicles, except Defender which can be charged with a 25 Amp charger	
	Follow the recommended action in the test results	
	If the second battery test result equals CHARGE & RETEST the battery must be replaced	
REPLACE BATTERY OR BAD CELL-REPLACE	▪ 1. Repeat the test with the battery disconnected from the vehicle. Ensure OUT OF VEHICLE is selected as the Battery Location for the repeat test ▪ 2. Follow the instructions as per the test result ▪ For a repeat REPLACE BATTERY or BAD-CELL test result, DO NOT ATTEMPT TO RECHARGE THE BATTERY, REPLACE THE BATTERY	
FROZEN BATTERY	Allow the battery to thaw naturally in workshop conditions and re-test	
UNABLE TO DO TEST	Disconnect the battery from the vehicle and re-test	

Flooded Battery Care Point

If the vehicle is equipped with a flooded battery, ensure the replacement battery is a flooded battery of the same specification (cold cranking

amperage (CCA), battery standard (EN/SAE) / amp hour rating (Ah)) as the original battery

Under no circumstances should you fit a flooded battery to a vehicle that originally had an AGM battery, unless formally instructed by Jaguar/Land Rover

AGM Battery Care Point

If the vehicle is equipped with an absorbed glass mat (AGM) battery, ensure the replacement battery is a AGM battery of the same specification (cold cranking amperage (CCA), battery standard (EN/SAE) / amp hour rating (Ah)) as the original battery. Replacing an AGM battery for a flooded type battery is likely to result in reduced battery life and should not be carried out, unless formally instructed by Jaguar/Land Rover

DTC INDEX

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

BATTERY (G1313542)

REMOVAL AND INSTALLATION

86.15.01	BATTERY(S) - EACH - RENEW	5000 CC, AJ V8	0.5	USED WITHINS	+

REMOVAL

NOTES:

- Some variation in the illustrations may occur, but the essential information is always correct.
- Removal steps in this procedure may contain installation details.
- If a new battery is installed, the battery monitoring system (BMS) must be reset using Land Rover approved diagnostic equipment.

All vehicles

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

2. Refer to: Engine Control Module (ECM) (303-14B Electronic Engine Controls - TDV8 4.4L Diesel, Removal and Installation).

3. **NOTE:**

   RHD illustration shown, LHD is similar.

4. **NOTES:**

   - RHD illustration shown, LHD is similar.
   - Disconnect the ground cable first.

Torque: **6 Nm**

5. **NOTE:**

   LHD illustration shown, RHD is similar.

Right-hand drive vehicles

1. 

   Torque: **9 Nm**

Left-hand drive vehicles

1. **CAUTION:**

   Make sure the component is aligned as shown.

All vehicles

1. **CAUTIONS:**

   - Make sure that the battery monitoring system (BMS) module wiring harness does not get caught beneath the battery securing clamp.
   - Make sure that the battery is positioned fully outboard on the battery tray and that no harnesses or hoses are trapped before securing the battery with the bolts.

   NOTE:

   RHD illustration shown, LHD is similar.

INSTALLATION

1. **CAUTION:**

   Make sure the battery monitoring system (BMS) electrical connector is connected to the module, before installing the BMS on to the battery terminal.

   NOTE:

   To install, reverse the removal sequence.

2. Refer to: Specifications (414-00 Battery and Charging System -

General Information, Specifications).

3. **NOTES:**

- This step is only necessary when installing a new battery.
- This step only applies to V8 5.0L and TDV8 4.4L variants.

Using Land Rover approved diagnostic equipment, reset the battery monitoring system (BMS).

2012.0 RANGE ROVER (LM), 414-01

BATTERY, MOUNTING AND CABLES

BATTERY TRAY (G1341964)

REMOVAL AND INSTALLATION

86.15.11	BATTERY CARRIER - RENEW	ALL DERIVATIVES	0.6	USED WITHINS	+

REMOVAL

NOTE:

Removal steps in this procedure may contain installation details.

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

2. **WARNING:**

   Make sure to support the vehicle with axle stands.

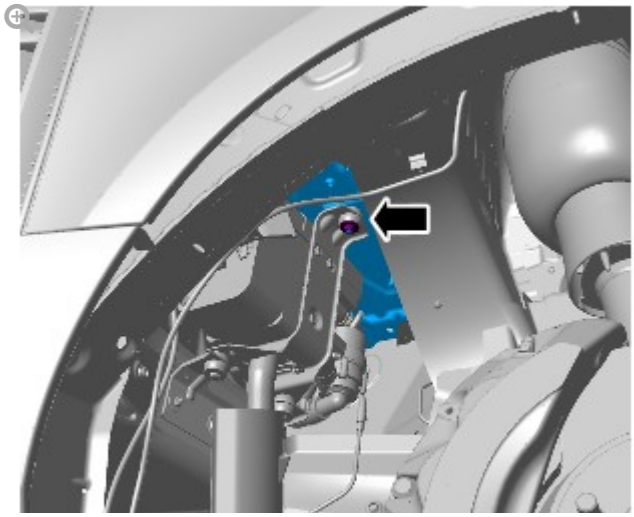
   Raise and support the vehicle.

3. For additional information, refer to: Battery (414-01, Removal and Installation).

4. For additional information, refer to: Fender Splash Shield (501-02, Removal and Installation).

5. **NOTE:**

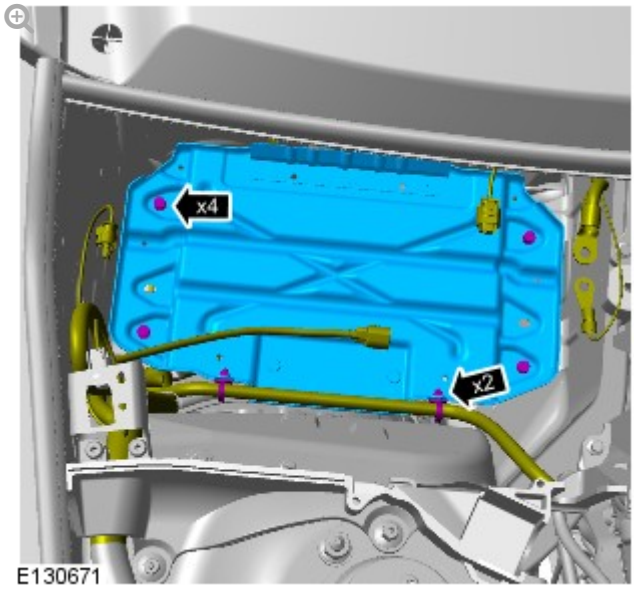
   LHD illustration shown, RHD is similar.



TORQUE: 10 Nm

6. **NOTE:**

LHD illustration shown, RHD is similar.



TORQUE: 5 Nm

INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 414-02

GENERATOR AND REGULATOR – V8 5.0L PETROL/V8 S/C 5.0L PETROL

SPECIFICATIONS

DESCRIPTION	NM	LB-FT	LB-IN
Generator retaining bolts	47	35	-
Battery positive cable retaining nut	12	9	-

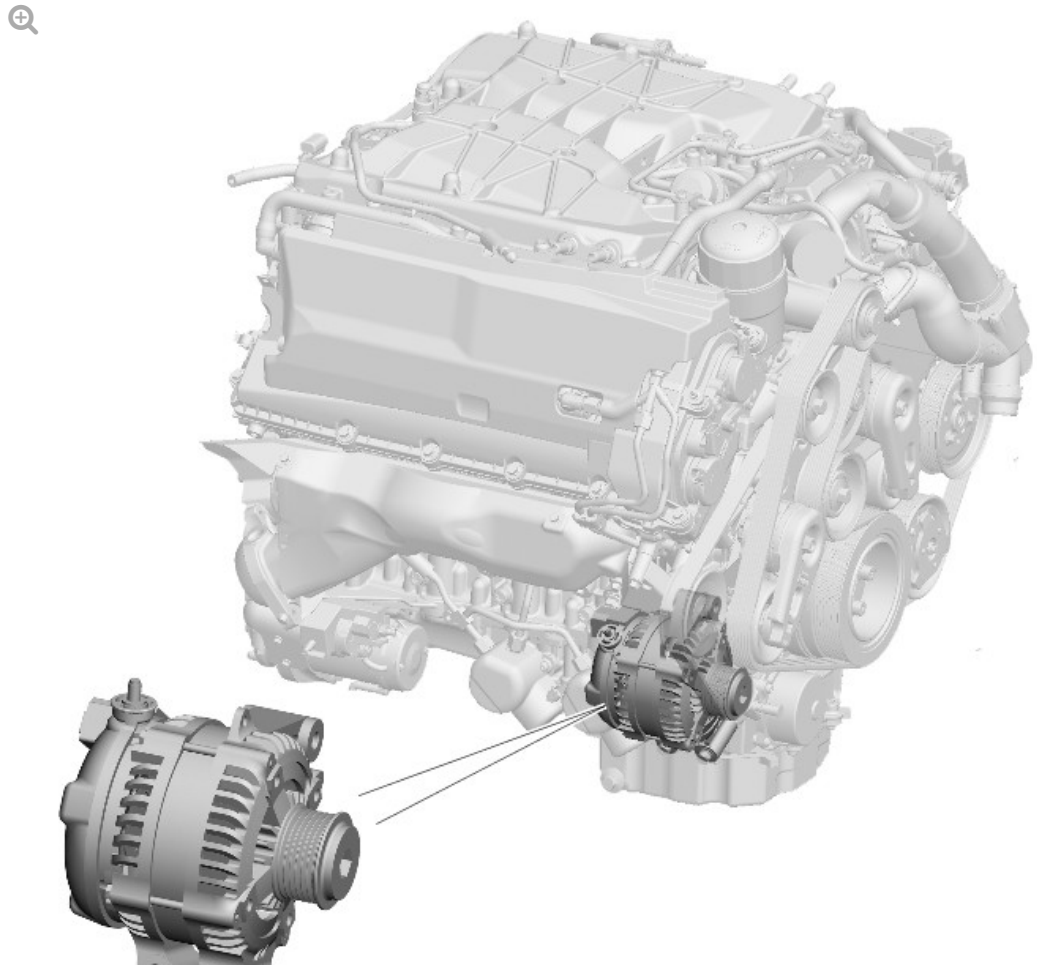
GENERATOR AND REGULATOR – V8 5.0L PETROL/V8 S/C 5.0L PETROL

DESCRIPTION AND OPERATION

COMPONENT LOCATION

NOTE:

Installation on supercharged engine shown, installation on naturally aspirated engine similar.



E116462

OVERVIEW

The generator is a self exciting type manufactured by Denso and is capable of producing an output current of 150 Amps. The generator is located at the front RH (right-hand) side of the engine, and is secured to an engine mounted bracket with a top pivot bolt and 2 lower bolts. The generator mountings provide the electrical ground connection for the generator.

The generator pulley is driven by the engine crankshaft pulley via the accessory drive belt.
For additional information, refer to: Accessory Drive (303-05A, Description and Operation).

The generator comprises the following major components:

- Stator
- Rotor
- Rectifier pack
- Regulator.

STATOR

The stator contains 3 sets of coils manufactured from copper wire with the ends formed into a 'star' connection. Rotation of the rotor within the stator produces an AC (alternating current) in the coils.

ROTOR

The rotor comprises a field winding, wound around an iron core and mounted on a common shaft. The ends of the common shaft form the magnetic north and south poles. The rotor is housed within the stator and mounted on bearings to provide smooth running and support, due to the side loading applied by the accessory drive belt tension.

During engine cranking when generator speed is low, the ignition switch supply provides an excitation current to the rotor via brushes and contact

slip rings at the end of the common shaft. As the generator speed increases the generator becomes self exciting.

RECTIFIER

The rectifier converts the AC current produced in the stator coils into DC (direct current) that is required by the vehicle electrical system. The rectifier also prevents current flow from the battery to the generator when the generator output voltage is less than the battery voltage.

The rectifier comprises 12 semi-conductor diodes, 6 mounted on the positive heat sink and 6 on the negative. The heat sink dissipates the resultant heat created in the electrical conversion process.

REGULATOR

The regulator provides a controllable variable voltage output from the generator and feedback of various parameters including fault information. A threaded copper post connection on the generator outer casing supplies the rectified and regulated DC current from the generator, via a large diameter cable to the battery positive terminal. A single pin electrical connector located on the rear outer casing provides a LIN (local interconnect network) interface for generator monitoring and control by the ECM (engine control module).

The Battery Monitoring system (BMS) monitors battery temperature and calculates the optimal charging voltage setpoint. This is sent via LIN to the CJB (central junction box) which in turn sends it to the ECM via the CAN (controller area network). The ECM then sends this voltage setpoint to the alternator via LIN. The entire system operates on a closed loop principle to maintain optimal battery terminal voltage.

The ECM monitors the generator for mechanical or electrical failure . If a fault is detected, DTC (diagnostic trouble code)'s are stored in the ECM memory and a message is communicated on the high speed CAN bus to the instrument cluster to illuminate the charge warning indicator lamp.
For additional information, refer to: Instrument Cluster (413-01, Description and Operation).

During engine starting, the charge warning indicator lamp is illuminated in the instrument cluster when the ignition is energized, and is extinguished

when the engine starts and there are no faults present on the charging system.

If the generator is close to being overloaded then an increased idle speed set point will be set which will optimise the amount of power available to operate vehicle features.

LOAD MANAGEMENT SYSTEM

The load management system comprises software resident in the ECM module.

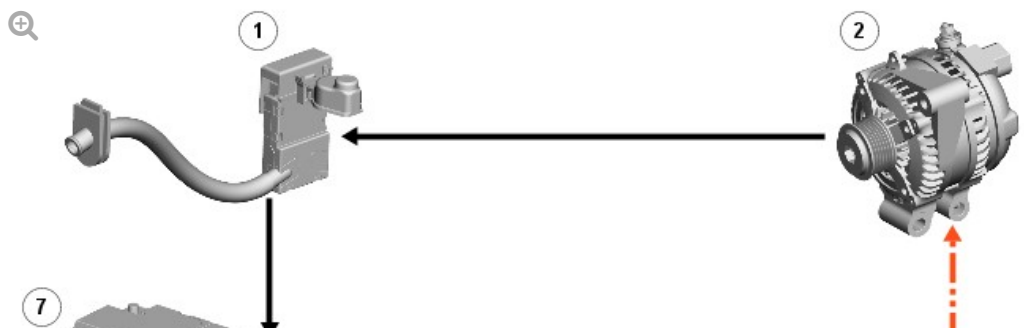
The purpose of load management is to protect the battery during abnormal usage of the vehicle. With the engine not running the system will request the systems on the Media Orientated System Transport (MOST) ring and the air suspension system to enter 'power save' mode. , A 'WARNING - LOW BATTERY' message will be displayed in the message center.
For additional information, refer to: Information and Message Center (413-08, Description and Operation).

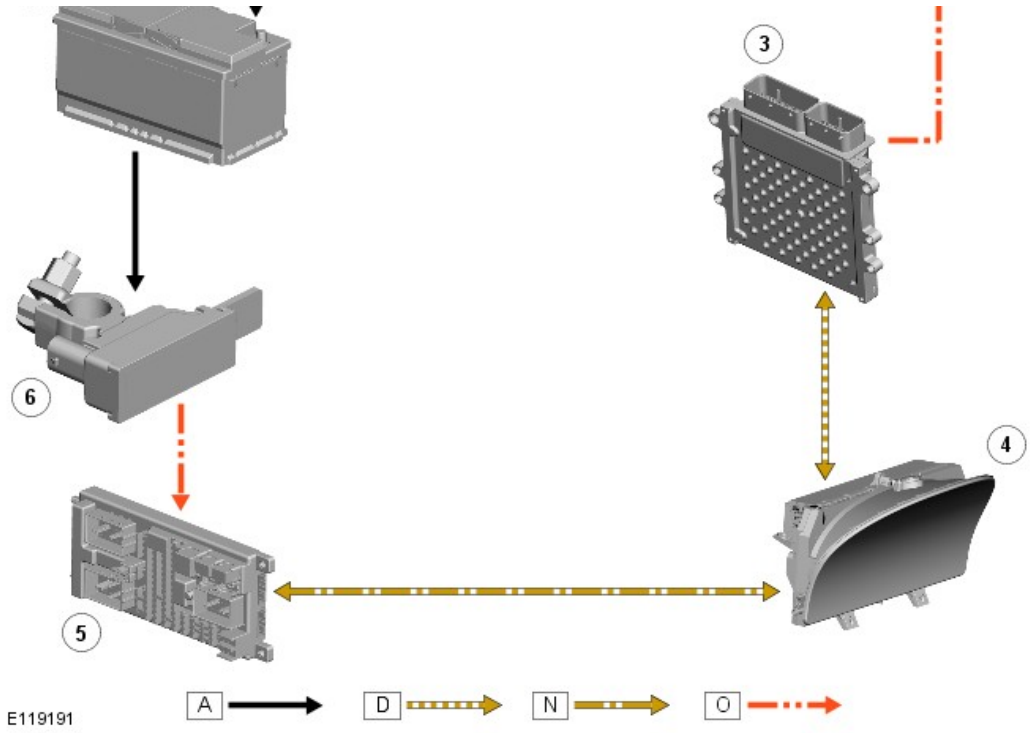
With the engine running the system will modulate features such as seat and screen heating to prevent the battery voltage becoming critically low to the point where the vehicle becomes un-operational.

CONTROL DIAGRAM

NOTE:

A = Hardwired; D = High speed CAN; N = Medium speed CAN; O = LIN bus





ITEM	DESCRIPTION
1	400 A megafuse
2	Generator
3	ECM (engine control module)
4	Instrument cluster
5	CJB (central junction box)
6	Battery monitoring system sensor
7	Battery

PRINCIPLES OF OPERATION

The output voltage required from the generator is calculated by the battery monitoring system. For additional information, refer to Battery, Mounting and Cables (414-01 Battery, Mounting and Cables, Description and Operation).

The battery monitoring system signals the required voltage to the ECM via the CJB and the instrument cluster. The ECM then transmits the required voltage on the LIN bus connection with the voltage regulator in the generator. The output from the generator is supplied to the battery through

the main battery positive cable.

The ECM will over-ride the voltage value requested by the battery monitoring system if it detects a fault in the generator. The ECM also signals the instrument cluster to display a warning message if it detects a fault with the generator.

2012.0 RANGE ROVER (LM), 414-02

GENERATOR AND REGULATOR – V8 5.0L PETROL/V8 S/C 5.0L PETROL

DIAGNOSIS AND TESTING

For additional information

For additional information.

REFER to: Charging System (414-00, Diagnosis and Testing).

GENERATOR AND REGULATOR – V8 5.0L PETROL/V8 S/C 5.0L PETROL

GENERATOR – V8 S/C 5.0L PETROL (G1224666)

REMOVAL AND INSTALLATION

86.10.02	ALTERNATOR – RENEW	5000 CC, AJ V8, SUPERCHARGED	1.1	USED WITHINS	+

REMOVAL

NOTE:

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

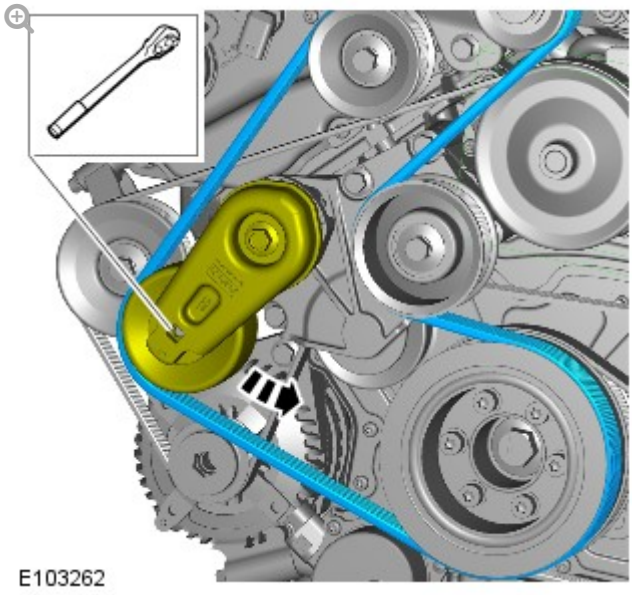
1. Disconnect the battery ground cable.
   Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

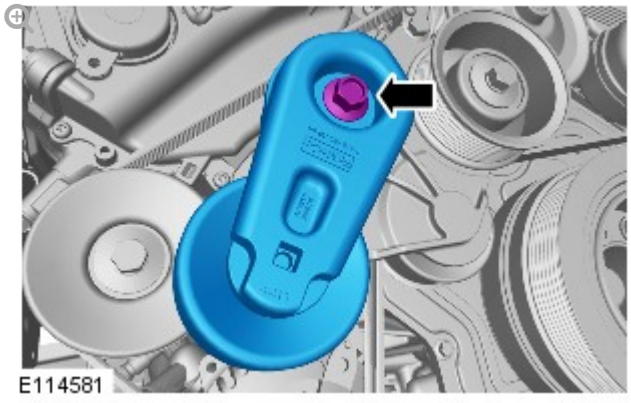
2. Refer to: Air Cleaner Outlet Pipe LH (303-12C, Removal and Installation).

3. Refer to: Air Cleaner Outlet Pipe RH (303-12C, Removal and Installation).

4. Refer to: Engine Undershield (501-02 Front End Body Panels, Removal and Installation).

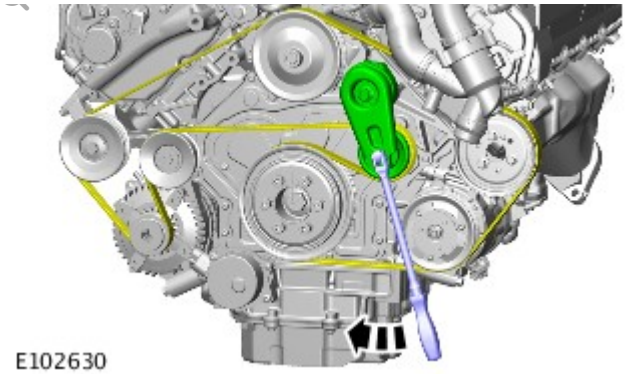
5. Refer to: Cooling Fan (303-03 Engine Cooling - V8 S/C 5.0L Petrol, Removal and Installation).

6. 

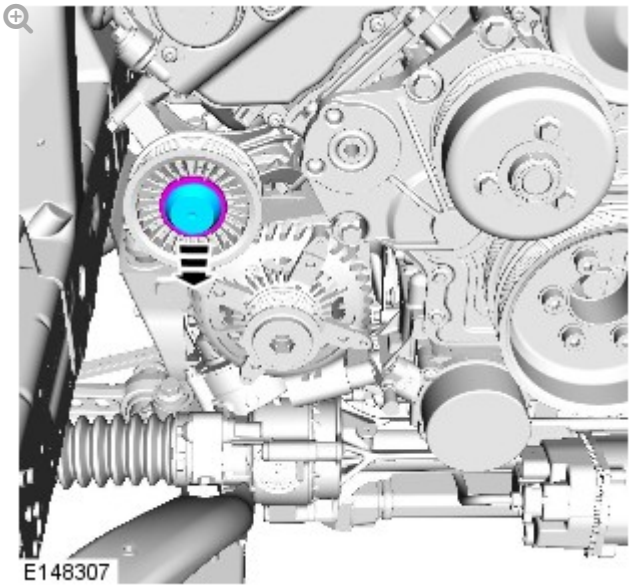
7. 

Torque: **40 Nm**

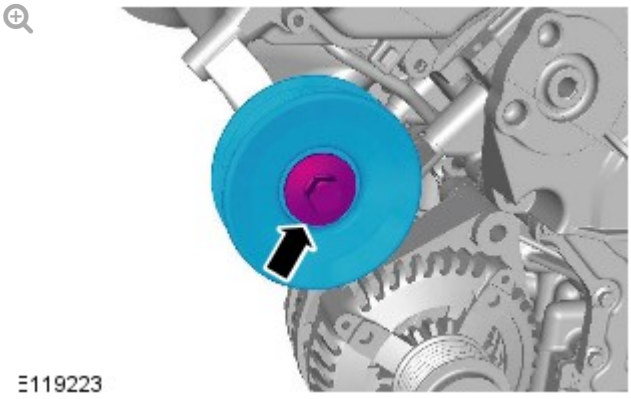
8. 



9.

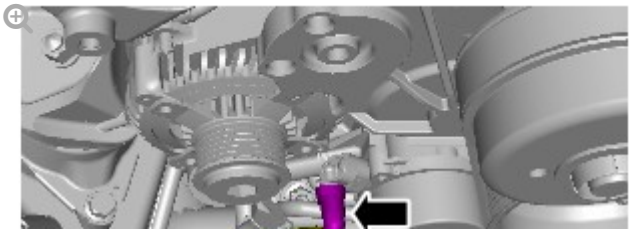


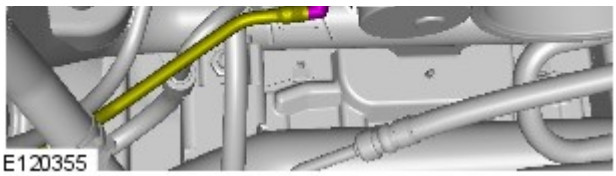
10.



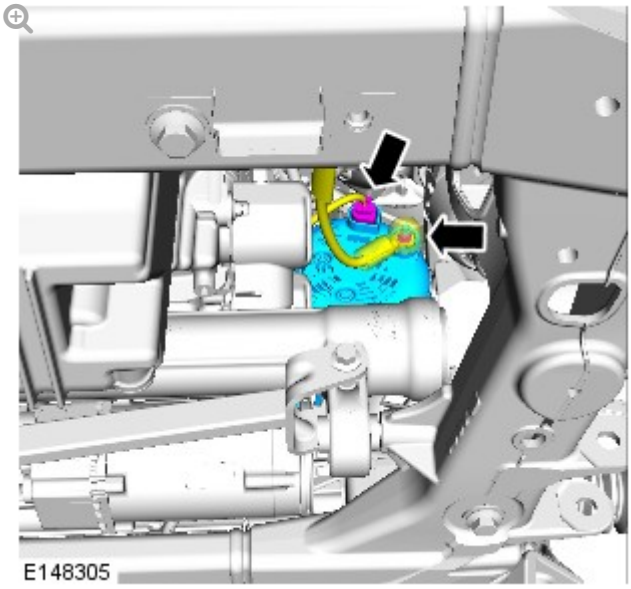
Torque: **40 Nm**

11.



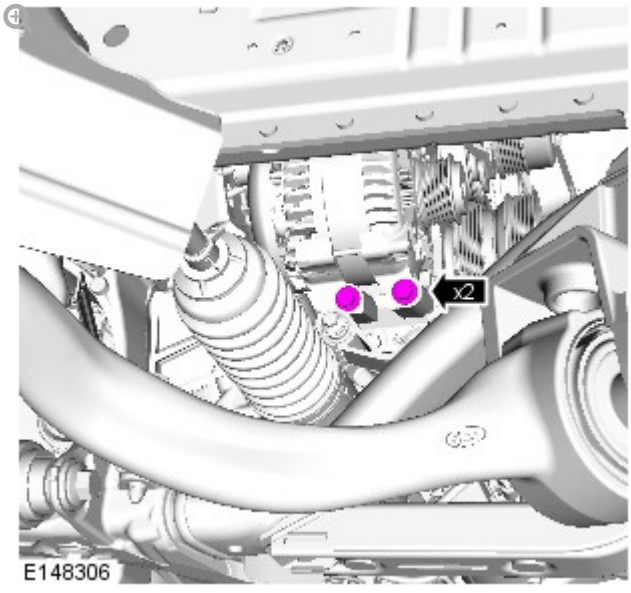


12.



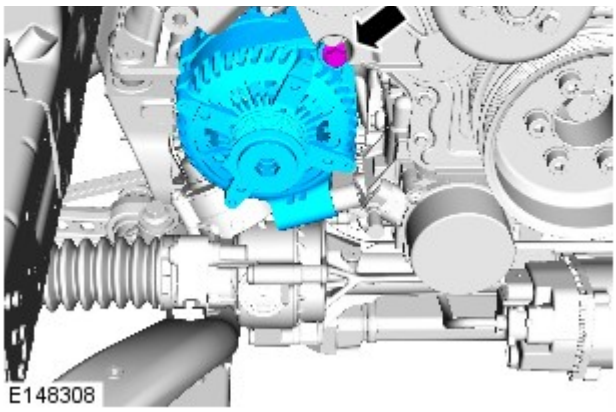
Torque: **12 Nm**

13.



Torque: **48 Nm**

14.



Torque: **48 Nm**

INSTALLATION

1. **CAUTIONS:**

   - Make sure that the accessory drive belt is correctly located on each pulley.
   - Clean and inspect the accessory drive belt pulleys for damage.

   To install, reverse the removal procedure.

INFORMATION AND ENTERTAINMENT SYSTEM – GENERAL INFORMATION

DESCRIPTION AND OPERATION

Map Update Applicability - Digital Versatile Disc (DVD) / Universal Serial Bus (USB) Flash Drive / Secure Digital (SD) Memory Card

VEHICLE	PRE - 10MY	10 MY	11 MY	12MY	13MY	14MY	15MY	16MY
XK (X150)	DVD	DVD	DVD	DVD (DVD Australia and New Zealand only)	DVD	DVD	DVD	DVD
F-Type (X152)	-	-	-	-	-	USB	USB	USB
XF (X250/X260)	DVD	DVD	DVD	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)
XJ (X351)	-	USB	USB	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB
XE (X760)	-	-	-	-	-	-	-	**InContro Touch** - SD Card, **InContro Touch Plus** -

								USB
Freelander (L359)	DVD	DVD	DVD	DVD	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)
Discovery 3 (L319)	DVD	-	-	-	-	-	-	-
Discovery 4 (L319)	-	External HD Service Tool	External HD Service Tool	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)
Discovery Sport (L550)	-	-	-	-	-	-	**InControl Touch** - SD Card, **InControl Touch Plus** - USB	**InContro Touch** - SD Card, **InContro Touch Plus** - USB
Range Rover Evoque	-	-	-	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB
Range Rover Sport (L320)	DVD	External HD Service Tool	External HD Service Tool	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	-	-	-
Range Rover Sport (L494)	-	-	-	-	-	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB
Range Rover (L322)	DVD	External HD Service Tool	External HD Service Tool	External HD Service Tool (DVD Australia	-	-	-	-

				Australia and New Zealand only)				
Range Rover (L405)	-	-	-	-	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB (DVD Australia and New Zealand only)	USB

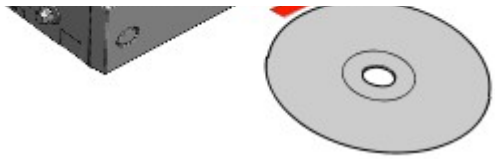
NOTE:

For vehicles using a Navigation Control Module (NCM), refer to SD Card Navigation Updates (Asia Navigation) below.

Mapping Regions

REGION	MAPPING AREA
1	North America (USA, Canada and Mexico)
2	Western and Eastern Europe
3	Japan
4	Middle East (Bahrain, Jordan, Kuwait, Oman, Qatar, Saudi Arabia and UAE
5	South Africa
6	South America (Brazil and Argentina)
7	Russia
8	Pacific (Australia and New Zealand)
9	South East Asia (Malaysia and Singapore)

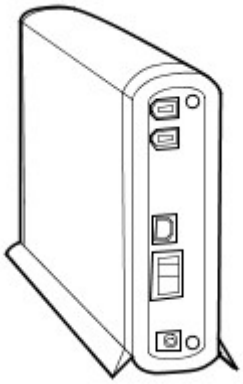
DVD MAP UPDATES



E142913

Vehicles equipped with the 'remote' Navigation Control Module (NCM) are supplied with either a DVD or SD memory card map update which is loaded into and left in the NCM. Map data is read directly from the DVD or SD memory card. This update can be performed by the customer.

EXTERNAL HARD DISC DRIVE SERVICE TOOL MAP UPDATES



E142915

Discovery 4, Discovery Sport, Range Rover Sport and Range Rover vehicles, equipped with a hard disc drive integrated into the Integrated Audio Module (IAM) or vehicles fitted with the Audio Head Unit (AHU), are updated at point of service. On 10MY Range Rover models the hard disc drive is integrated into the Touch Screen (TS). Dealers are supplied with a set of master pack map update DVD's which are loaded onto the dealer Jaguar/Land Rover approved diagnostic equipment. The map data is loaded from the diagnostic equipment onto the navigation tool hard disc drive. The map data is then loaded to the hard disc drive from the navigation tool hard drive.

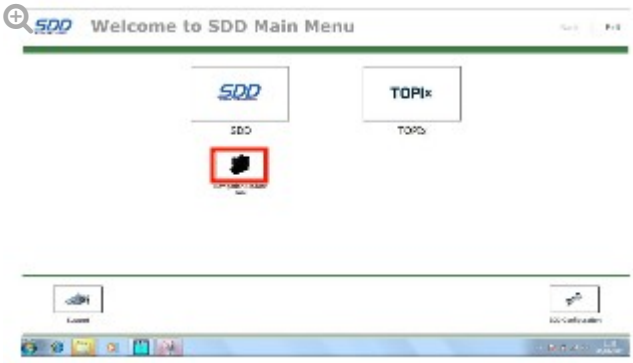
The following process should be used to update the map data:

NOTE:

The navigation update tool does not need the map data loading

every time. This is only necessary when a new map update DVD is released.

- Using the approved Jaguar/Land Rover diagnostic equipment select the navigation update tool.

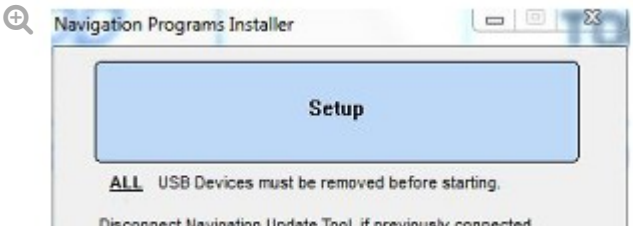


E142966

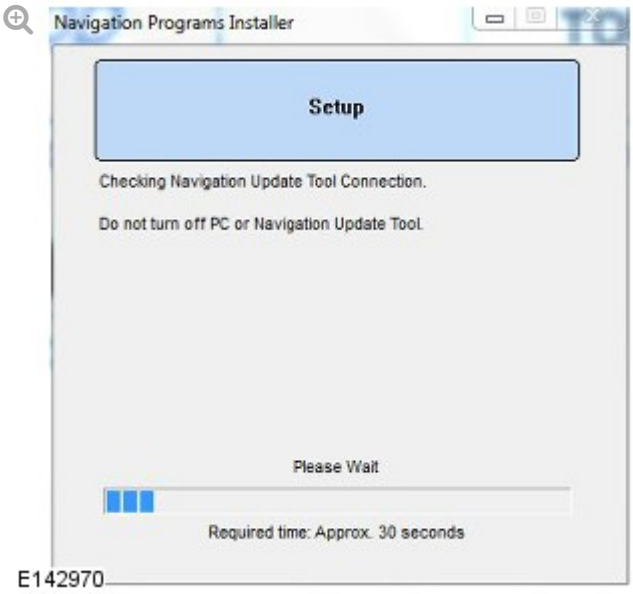
- Select **Setup** on the navigation update tool.

E142967

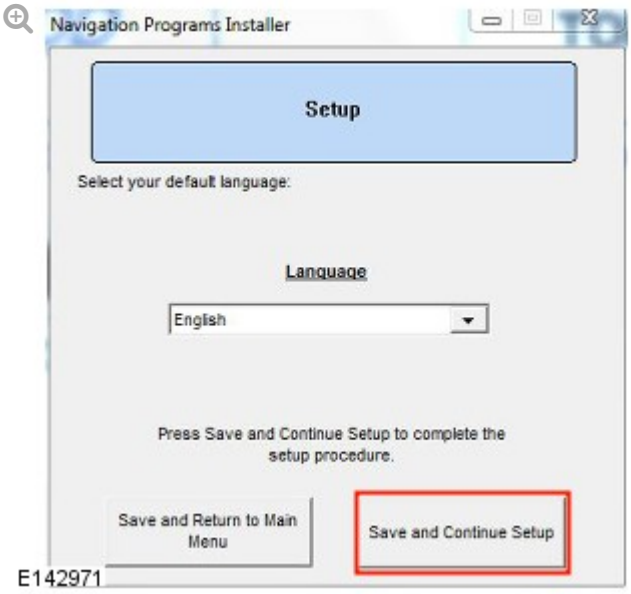
- Connect the navigation update tool to the Jaguar/Land Rover approved diagnostic equipment using the USB cable and select **Continue** to proceed.



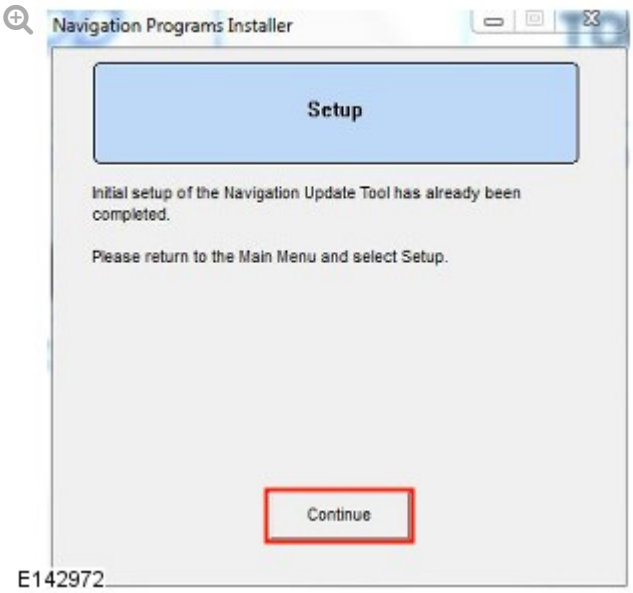
- The navigation update tool will check the connection.



- Select your preferred language from the drop down menu then select **Save and Continue Setup** to proceed.

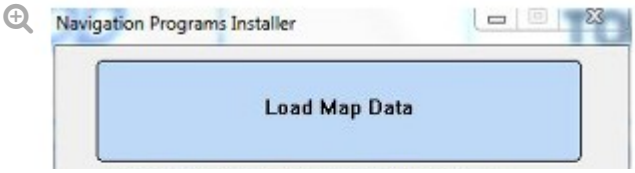


- When the navigation update tool confirms the initial setup is complete, select **Continue** to proceed.



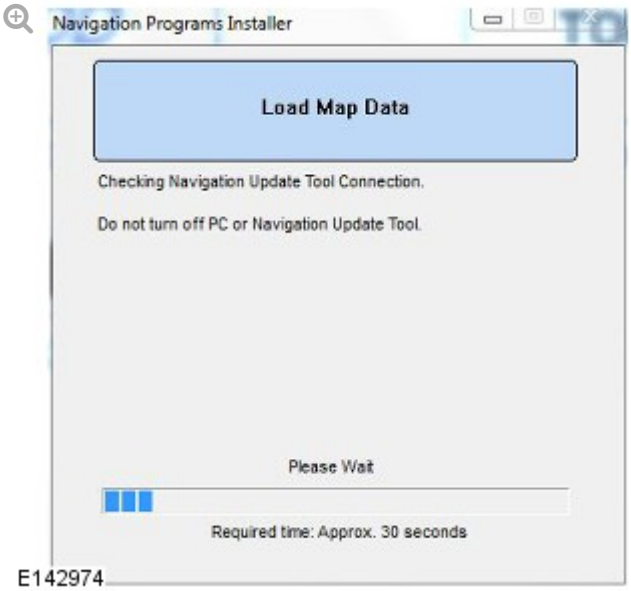
- The navigation update tool will return to the main menu screen, select **Load Map Data** to proceed.

- Disconnect, then reconnect the USB cable connecting the navigation update tool to the Jaguar/Land Rover approved diagnostic equipment, select **Continue** to proceed.



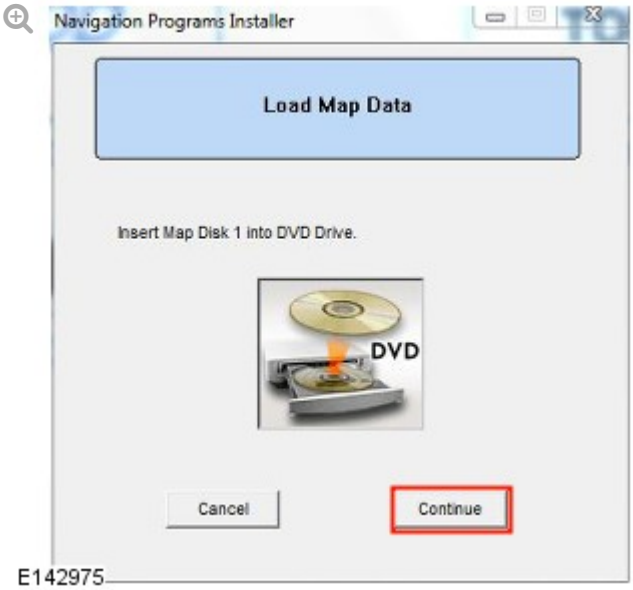
E142973

- The navigation update tool will check the connection.



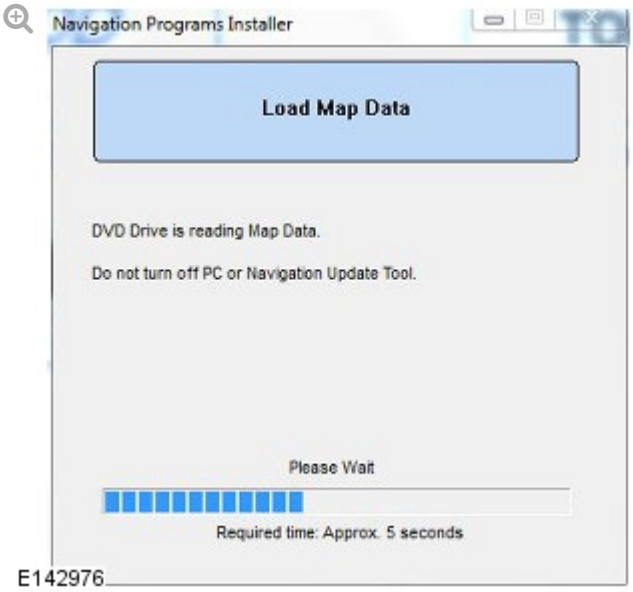
E142974

- Insert map update disk 1 into the DVD drive of the Jaguar/Land Rover approved diagnostic equipment and select **Continue** to proceed.

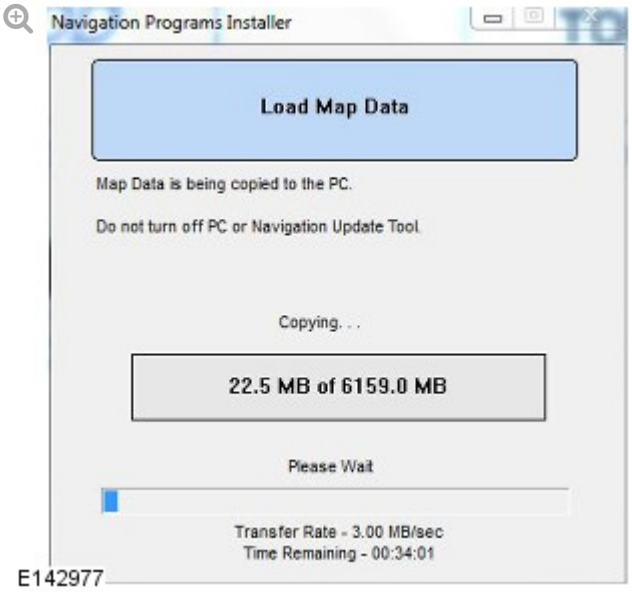


E142975

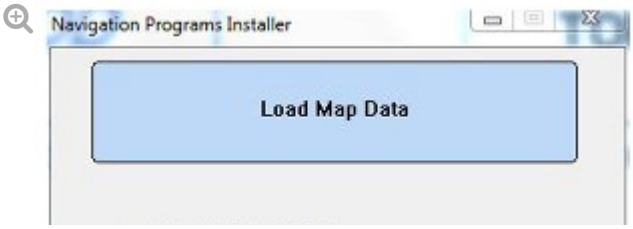
- The navigation update tool will read the map data.



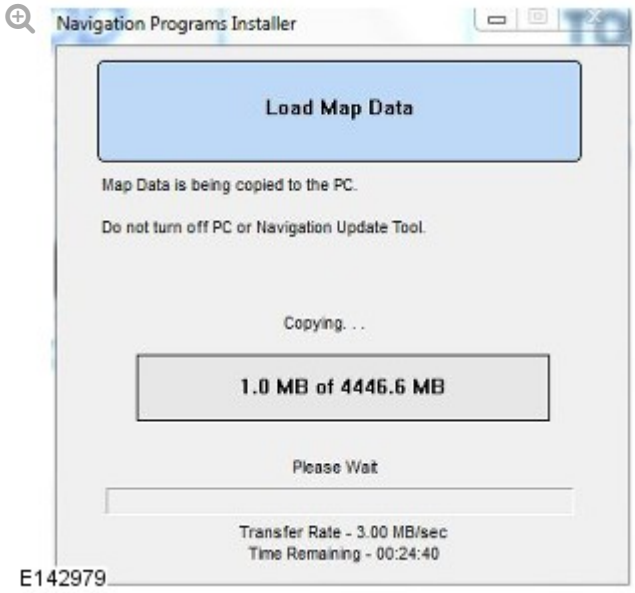
- Map data will be copied from disk 1 to the Jaguar/Land Rover approved diagnostic equipment.



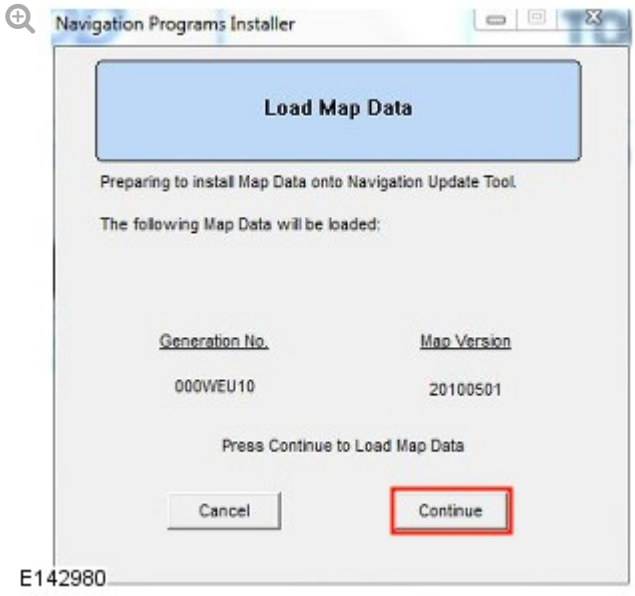
- Insert map update disk 2 into the DVD drive and press **Continue** to proceed.



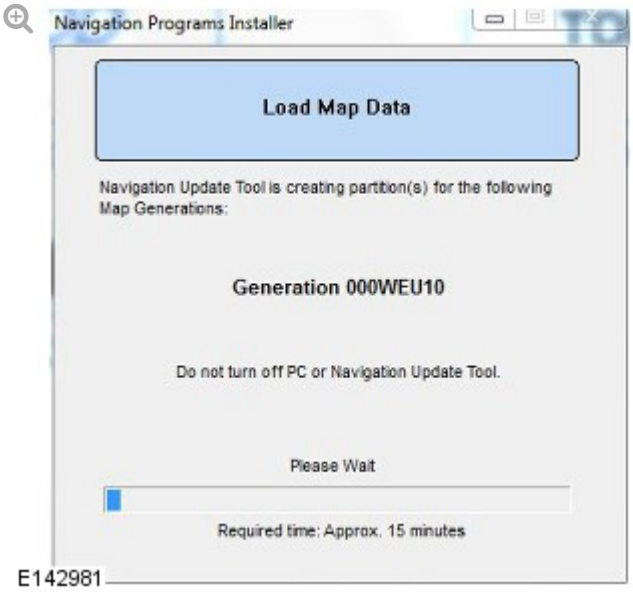
- Map data will be copied from disk 2 to the Jaguar/Land Rover approved diagnostic equipment.



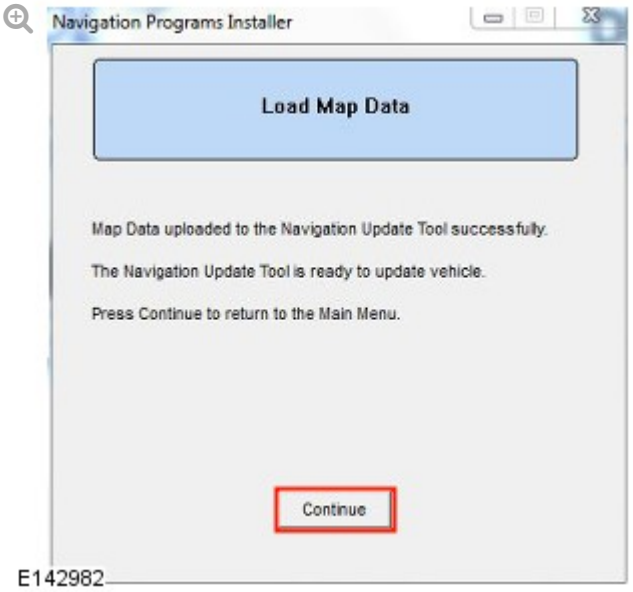
- Map data is now ready to be uploaded onto the navigation update tool, press **Continue** to proceed.



- The map data will be uploaded onto the navigation update tool.



- Map data upload is now complete.



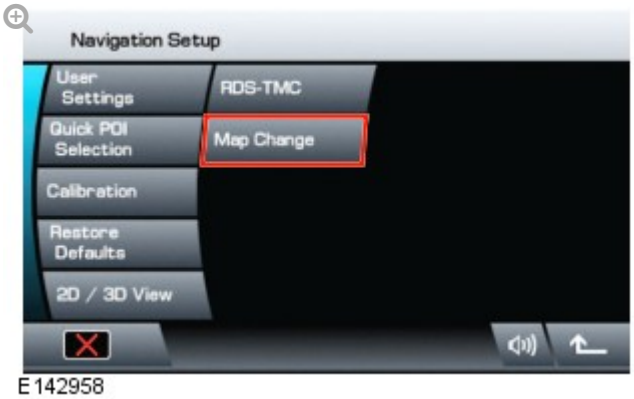
- Disconnect the navigation update tool from Jaguar/Land Rover approved diagnostic equipment.
- Connect the navigation update tool to the vehicle using the 'firewire' cable.
- Select **Navigation** using the TS display soft key.

E142956

- Select **Navigation Setup** using the TS soft key.

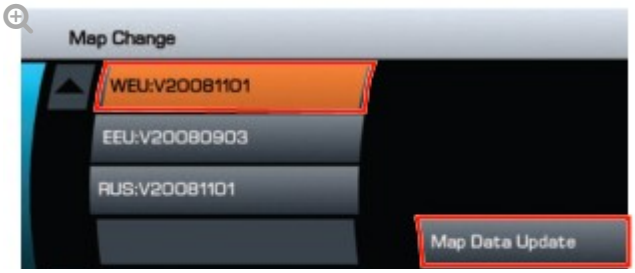
E142957

- Select **Map Change** using the TS.



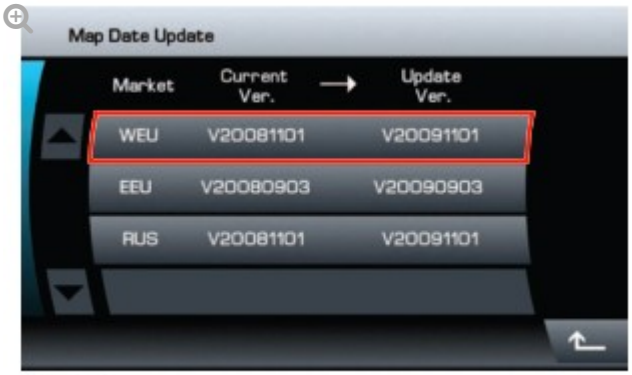
E142958

- Select map region using the TS display and select **Map Data Update** to proceed.



E142959

- The current map data version and the proposed update map data versions will be shown. Select the relevant region, using the related TS soft key to proceed.



E142960

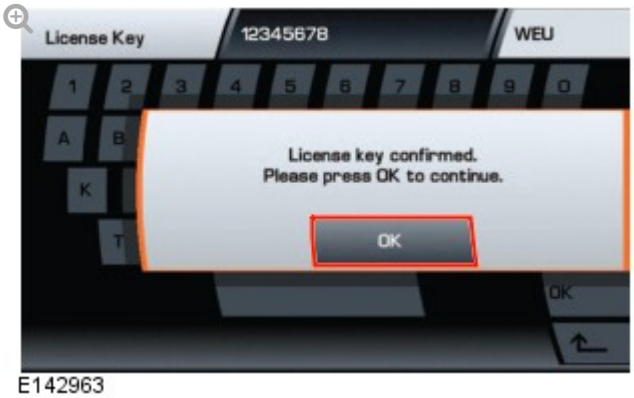
- Select **OK** to input the licence key using the TS.

E142961

- Input the licence key using the TS display and select **OK** to proceed.

E142962

- Select **OK** using the TS.

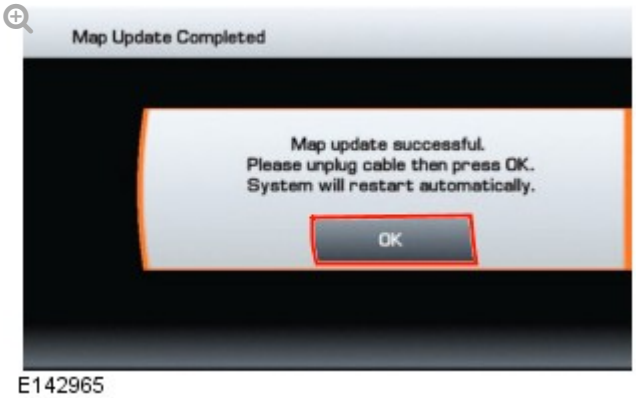


E142963

- The map update will begin.

E142964

- When the map update is complete a message will be shown in the TS, select **OK** to proceed using the TS soft key. The navigation system will restart with the new map data.



E142965

- Disconnect the navigation update tool from the vehicle.

USB MAP UPDATES

USB MAP UPDATES

E142914

All Gen 2.1 equipped vehicles are supplied with a USB map updates, these updates can be performed by the customer.

The following process should be used to update the map data:

- Start the engine.
- Navigate to the TS **Home Menu** screen.

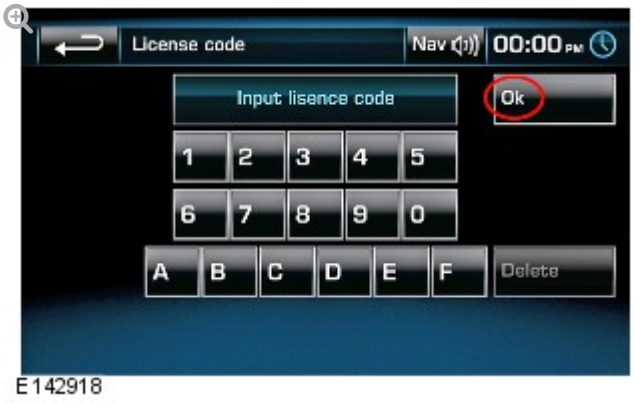
E142916

- Insert the USB memory stick containing the map data into the vehicle USB port.

E142914

- Select **Continue** on the TS to proceed with the installation of the map update.

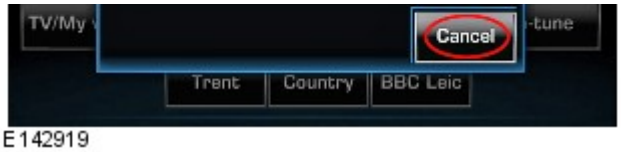
- Using the TS, enter the licence code and select **OK** to proceed.



- **NOTE:**

  Selecting 'Cancel' returns to the 'Home Menu' screen, the map update will continue to run in the background

  The map update will begin and a message will be displayed in the TS advising that navigation is unavailable.



E142919

- Map update progress can be viewed as a percentage of the completed download in the **Home Menu** screen.

E142920

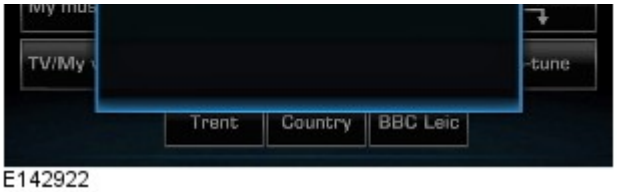
- When the update is complete a message is displayed informing the user.

E142921

- The navigation will restart upon completion of the map update.

NOTE:

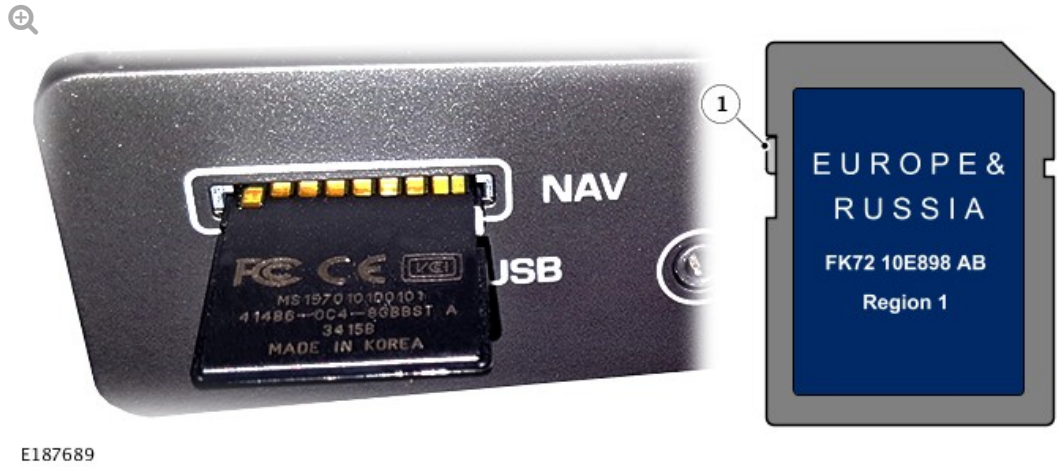
Remove USB stick immediately



E142922

- Turn off the engine.
- Exit, lock the vehicle and leave for at least 15 minutes before using the navigation system.

INCONTROL TOUCH MAP UPDATES



E187689

ITEM	DESCRIPTION
1	SD card write protection switch in unlocked position

Before inserting the SD card into the vehicle's navigation data storage device slot, Make sure that the write protection lock is in the 'unlocked' position as shown in the above image.

Make sure that the connections of the SD card are facing upwards before inserting it into the vehicle's navigation data storage device slot as shown in the above image.

InControl Touch Map Updates

The following process should be used to update the map data:

NOTE:

NOTE:

SD cards activated with a particular VIN will only operate in the vehicle with the matching VIN.

- Remove the previously activated SD card from the vehicle's navigation data storage device slot.
- Open the InControl Touch Map Updater. Insert the SD card into the Jaguar Land Rover (JLR) approved diagnostic equipment and follow the on-screen instructions for updating the card.
- After the update has completed remove the SD card from the map updater and insert the updated SD card into the vehicle's navigation data storage device slot.
- Switch the ignition on and Select 'Navigation' (press retry if the system is saying "cannot detect SD card" and the audio head unit will restart).
- Once the system has restarted confirm the map information is correct.

INCONTROL TOUCH PRO MAP INSTALLATION/UPDATES

To update the InControl Touch Pro Map system refer to section 101-01: Pre-Delivery Inspection Manual.

JAPANESE NAVIGATION

The Japanese satellite navigation system uses a separate navigation computer module.

The HDD in the Integrated Audio Module (IAM) is not used for navigation downloads in this market.

Map updates are supplied in DVD format. The DVD is loaded into the navigation control module. Map data is read directly from the DVD.

SD CARD NAVIGATION UPDATES (ASIA NAVIGATION)

The Asia market navigation system is an aftermarket unit.

Map updates are supplied in an SD card format. The SD card is loaded into the navigation control module. Map data is read directly from the SD card.

NOTE:

The following countries use SD card navigation updates.

COUNTRY
ANGOLA
ARGENTINA
AZERBAIJAN
BAHAMAS
BARBADOS
BENIN
BOTSWANA
BRAZIL
BRUNEI
BURUNDI
CAYMAN ISLANDS
CHILE
CHINA
COLOMBIA
EGYPT
FIJI
GHANA
HONG KONG
INDIA
INDONESIA
ISRAEL

JAMAICA
KENYA
LEBANON
LESOTHO
MALAWI
MALI
MAURITIUS
MONGOLIA
MOROCCO
MOZAMBIQUE
NAMIBIA
NIGER
NIGERIA
PERU
PHILIPPINES
RWANDA
SENEGAL
SOUTH AFRICA
SRI LANKA
SAINT LUCIA
SWAZILAND
TAIWAN
TANZANIA
THAILAND
TOGO
TUNISIA
UGANDA
URUGUAY
VENEZUELA
VIETNAM

ZAMBIA
ZIMBABWE

2012.0 RANGE ROVER (LM), 415-00

INFORMATION AND ENTERTAINMENT SYSTEM – GENERAL INFORMATION

DIAGNOSIS AND TESTING

PRINCIPLES OF OPERATION

For a detailed description of the Information and Entertainment System, refer to the relevant Description and Operation sections in the workshop manual. REFER to: Audio System (415-01A Audio Unit, 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, 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.
- All diagnostic equipment should comply with local legislation.
- Relevant diagnostic equipment should be regularly checked and calibrated according to the manufacturer's instructions.
- The workshop should be equipped with a full range of general equipment which is to be kept in good order and available to all suitably trained staff.
- Diagnostic equipment must meet the JLR Minimum Standards for general equipment as outlined in TOPIx

general equipment as outlined in TOPIX.

- 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
▪ Check all information and entertainment system modules ▪ Compact disc player jammed, not loading ▪ Scratched/dirty compact discs ▪ Speakers ▪ Switch(s) stuck or damaged	▪ Fuses ▪ Electrical harnesses ▪ Harness connectors ▪ Battery condition, state of charge

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	DISPLAY	POSSIBLE CAUSES	ACTION
Poor audio quality (all sources)	Display normal	▪ MOST harness connections loose ▪ MOST	▪ Check MOST harness connectors for security ▪ Check MOST

		harness connections contaminated ▪ MOST harness misrouted ▪ Too many bends ▪ Bend radius less than 25mm	harness connectors for contamination ▪ Check the routing of the MOST harness
Information and entertainment system inoperative	LED on power switch flashing. Touch screen displaying logo screen (if fault present at ignition on), 'greyed out' (if fault occurred while system in use) or blank	▪ MOST network fault	▪ REFER to: **Communications Network** (418-00 Module Communications Network, Diagnosis and Testing).
NOTE: Satellite Digital Audio Service (SDARS) applies to NAS market vehicles only No Satellite Digital Audio Service (SDARS) channels available	**No signal** or **Acquiring signal**	▪ Vehicle not in USA ▪ Poor signal reception ▪ Satellite Digital Audio Service (SDARS) system fault	▪ No fault to rectify ▪ The vehicle must have clear line of sight to a satellite, which means being outside and having no blockages between the vehicle and the satellite ▪ Using the manufacturer approved diagnostic system, check the Satellite Radio Control Module (SRCM) for related DTCs and refer to the relevant DTC index
NOTE: Satellite Digital	**Unsubscribed**	▪ Channel 184 is available without subscription	▪ No fault to rectify. Subscribe to Satellite Digital Audio

Audio Service (SDARS) applies to NAS market vehicles only Only one Satellite Digital Audio Service (SDARS) channel available (channel 184)		for a limited period (6 months)	Service (SDARS) to resume service
NOTE: Satellite Digital Audio Service (SDARS) applies to NAS market vehicles only No Satellite Digital Audio Service (SDARS) channels available after 6 months without subscribing	**Unsubscribed**	Channel 184 is available without subscription for a limited period (6 months)	▪ No fault to rectify. Subscribe to Satellite Digital Audio Service (SDARS) to resume service
NOTE: Satellite Digital Audio Service (SDARS) applies to NAS market vehicles only Some Satellite Digital Audio Service (SDARS) unavailable	**Unsubscribed**	▪ Adult channels blocked by subscription type (family package)	▪ No fault to rectify. Subscribe to Satellite Digital Audio Service (SDARS) full package to receive adult channels
NOTE: Satellite Digital Audio Service (SDARS) applies to NAS market vehicles only Satellite Digital Audio	**Unsubscribed**	▪ Payment not made	▪ No fault to rectify

Service (SDARS) pay channels unavailable			

SPEAKER DIAGNOSTICS

For Speaker Diagnostics please refer to section 415-01 Diagnosis and Testing - Speakers in the workshop manual.
REFER to: Speakers (415-01B Information and Entertainment System, Diagnosis and Testing).

DTC INDEX

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

2012.0 RANGE ROVER (LM), 415-00

INFORMATION AND ENTERTAINMENT SYSTEM – GENERAL INFORMATION

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

For a detailed description of the Cellular phone system and operation, refer to the relevant Diagnosis and Testing section of the workshop manual. REFER to: Cellular Phone (419-08, 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
▪ Check all information and entertainment system modules ▪ Speakers ▪ Switch(s) stuck or damaged	▪ Fuses ▪ Electrical harnesses ▪ Harness connectors ▪ Battery condition, state of charge

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

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

SYMPTOM CHART

SYMPTOM	ACTION
Unable to pair	▪ GO to Pinpoint Test **A.**
Not Auto Connecting	▪ GO to Pinpoint Test **B.**
Poor Quality Audio	▪ GO to Pinpoint Test **C.**

No Audio to 3rd Party	▪ GO to Pinpoint Test **D.**
No Audio from 3rd Party	▪ GO to Pinpoint Test **E.**
No Audio	▪ GO to Pinpoint Test **F.**

DTC INDEX

For a complete list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle refer to Section 100-00 of the Workshop Manual. REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Module Name: Bluetooth Module (100-00 General Information, Description and Operation).

PINPOINT TESTS

NOTE:

Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the bluetooth function is activated and the telephone handset is placed within the vehicle cabin area.

PINPOINT TEST A : UNABLE TO PAIR	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: 'NO PHONE FITTED' DISPLAY	
	1 Carry out checks to determine if 'No Phone Fitted' is shown on vehicle display.
	Is 'No Phone Fitted' displayed? **Yes** GO to A2. **No** Locate the connected telephone and if not Customer telephone, disconnect from the system.

A2: TELEPHONE BLUETOOTH DEVICE SEARCH	
	1 Carry out Bluetooth device search using Customer handset.
	Is 'Land Rover' identified in Bluetooth device list? **Yes** Select device from list, then continue with diagnosis.**GO to A3**. **No** Carry out further Bluetooth device search, to a maximum of 4 times, waiting approximately 20 seconds between searches. If 'Land Rover' still not identified in Bluetooth device list, set ignition status to OFF, wait approximately 30 seconds and set ignition status to ON. Carry out further Bluetooth device search, to a maximum of 4 times, waiting approximately 20 seconds between searches. If 'Land Rover' still not identified in Bluetooth device list, contact your local in market support for further assistance.
A3: TELEPHONE HANDSET ERROR	
	1 Check for any error shown on the telephone handset when 'Land Rover' is selected from the Bluetooth device list.
	Was an error immediately shown on the telephone handset? **Yes** Wait approximately 10 seconds then re-attempt selection, to a maximum of 4 times, waiting approximately 10 seconds between each attempt. If error still being displayed, contact your local in market support for assistance. **No** Enter PIN '2121' then continue with diagnosis.**GO to A4**.
A4: PIN ENTRY STATUS	
	1 Check for successful PIN entry.
	Was PIN entry successful? **Yes** **GO to A5**. **No** Wait approximately 10 seconds then re-attempt PIN entry, to a maximum of 4 times, waiting approximately 10 seconds between each attempt. If PIN entry is still un-successful, contact your local in market support for assistance.
A5: 'NO PHONE FITTED' DISPLAY	
	1 Carry out checks to determine if 'No Phone Fitted' is still shown on vehicle display.
	Is 'No Phone Fitted' still displayed? **Yes** From the telephone handset, select the connect option for the 'Land Rover' device identified in the Bluetooth device list. If 'No Phone Fitted' is still displayed, suspect a telephone handset fault. Carry out Pinpoint test again using known good telephone handset. **No** The telephone is paired and connected to the system. No further action is required for this symptom.

NOTE:

Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the bluetooth and auto connect functions are activated and the telephone handset is placed within the vehicle cabin area.

PINPOINT TEST B : NOT AUTOMATICALLY CONNECTING	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	B1: CUSTOMER TELEPHONE IN POSITION 1
	1 Carry out checks to determine if the Customer telephone is in position 1 in the Bluetooth Module device list.
	Is the Customer telephone in position 1? **Yes** GO to B2. **No** Advise Customer that delays in connection will occur if telephone is not listed in position 1.
	B2: BLUETOOTH CONNECTION
	1 Carry out checks to determine if Bluetooth connection to the vehicle has been achieved.
	Has Bluetooth connection to the vehicle been achieved? **Yes** No further action is required for this symptom. **No** GO to B3.
	B3: 'NO PHONE FITTED' DISPLAY
	1 Carry out checks to determine if 'Land Rover' is shown in the Customer Bluetooth telephone device display.
	Is 'Land Rover' identified in the Customer Bluetooth device list? **Yes** Select the device to connect then follow pairing instructions. **No** Carry out the 'Unable to Pair' Pinpoint Test.

NOTE:

Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.

PINPOINT TEST C : POOR QUALITY AUDIO	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	C1: SIGNAL STRENGTH
	1 Check the signal strength displayed on the telephone handset.
	Are at least two signal strength bars shown on the telephone handset display? **Yes** GO to C2. **No** Suspect GSM Network issue. This can explain intermittent audio and dropped calls, and the inability to initiate calls.
	C2: POOR AUDIO FROM THIRD PARTY ONLY
	1 Establish from Customer feedback/symptom if there is poor audio from the Third Party only.
	Is the poor audio from the Third Party only? **Yes** Suspect GSM Network issue. This can explain intermittent audio and dropped calls, and the inability to initiate calls. **No** GO to C3.
	C3: POOR AUDIO TO THIRD PARTY ONLY
	1 Establish from Customer feedback/symptom if there is poor audio to the Third Party only.
	Is the poor audio to the Third Party only? **Yes** Check and install a new microphone as necessary. **No** GO to C4.
	C4: POOR AUDIO WITH VEHICLE STATIONARY
	1 Establish from Customer feedback/symptom if there is poor audio when the vehicle is stationary only.
	Is the poor audio when the vehicle is stationary only? **Yes** Check and install a new microphone as necessary. **No** GO to C5.

C5: THIRD PARTY MOVING VEHICLE	
	1 Establish from Customer feedback/symptom if the Third Party is in a moving vehicle.
	Is the Third Party in a moving vehicle? **Yes** There are limitations to the way the system can improve audio, and in this situation it is not possible to determine the source of the audio degradation. **No** GO to C6.
C6: CUSTOMER HEARING ECHO	
	1 Establish from Customer feedback/symptom if the Customer is hearing an echo.
	Is the Customer hearing an echo? **Yes** Echo from the Third Party is not vehicle failure, it is the Third Party set-up. No further action is required for this symptom. **No** Contact your local in market support for assistance.

NOTE:

Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.

PINPOINT TEST D : NO AUDIO TO THIRD PARTY	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: MICROPHONE DIAGNOSTIC TROUBLE CODES (DTCS)	
	1 Using the Manufacturer approved diagnostic system, check for any logged microphone DTCs in Audio Front Control module.
	Is DTC B1D79-01 logged? **Yes** Carry out diagnosis of electrical failure as advised in Action column of DTC Index. **No** Contact your local in market support for assistance.

NOTE:

Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.

PINPOINT TEST E : NO AUDIO FROM THIRD PARTY	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	E1: 'IN CALL' DISPLAY
	1 Carry out checks to determine if 'In Call' is shown on the vehicle display.
	Is vehicle display showing 'In Call'? **Yes** Contact your local in market support for assistance. **No** Call has ended. No further action is required for this symptom.

NOTE:

Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.

PINPOINT TEST F : NO AUDIO	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	F1: AUDIO FROM THIRD PARTY
	1 Establish from Customer feedback/symptom if there is Audio from the Third Party.
	Is there Audio from the Third Party? **Yes** GO to F2. **No**

	No Refer to the 'No Audio From Third Party' Pinpoint test.**GO to E**.
F2: AUDIO TO THIRD PARTY	
	1 Establish from Customer feedback/symptom if there is Audio to the Third Party.
	Is there Audio to the Third Party? **Yes** **GO to F3**. **No** Refer to the 'No Audio To Third Party' Pinpoint test.**GO to D**.
F3: CD OR RADIO AUDIO	
	1 Establish from Customer feedback/symptom if there is Audio from the CD or Radio.
	Is there Audio from the CD or Radio? **Yes** **GO to F4**. **No** Suspect MOST ring fault, refer to electrical circuit diagrams and check/rectify MOST ring as necessary.
F4: TELEPHONE HANDSET AUDIO	
	1 Establish from Customer feedback/symptom if there is Audio from the telephone handset.
	Is there Audio from the telephone handset? **Yes** Ensure vehicle is parked. Disconnect and reconnect handset. If issue not resolved, contact your local in market support for assistance. **No** Contact you local in market support for assistance.

INFORMATION AND ENTERTAINMENT SYSTEM – GENERAL INFORMATION

DIAGNOSIS AND TESTING

PRINCIPLES OF OPERATION

For a detailed description of the navigation system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Navigation System (419-07 Navigation System, 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.

1. Verify the customer concern.

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

Visual Inspection

ELECTRICAL
▪ Battery

- ~~Battery~~
- Fuses
  - Central Junction Box
  - Battery Junction Box
  - Megafuses
- Wiring harness
- Damaged, loose or corroded connectors
- Touch Screen (TS)
- GPS antenna
- TV antenna
- Satellite antenna
- FM antenna
- Rear view camera
- Microphone
- Accessory USB unit
- Steering wheel controls
- Clock spring
- Integrated Head Unit (IHU)
- Audio Amplifier Module (AAM)
- Anti-lock Brake System (ABS) control module
- Wheel speed sensors
- Vehicle Information and Communication System (VICS) receiver - Japan only
- VICS beacon antenna - Japan only
- Controller Area Network (CAN) circuits
- Media Oriented System Transport (MOST) system
- Gigabit Video Interface (GVIF)
- Central Junction Box (CJB)
- Terrain Response (TR)
- Mobile telephone

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.

TOUCH SCREEN (TS) AND NAVIGATION DIAGNOSTICS

Fault codes and diagnostics can be retrieved/achieved using the manufacturer approved diagnostic system

Hard Key Test

The hard key test is used to check the operation of the hard switches.

If switch operation is normal, the switch colour on the screen will change when a hard switch is pressed. (Power switch operation cannot be checked on this screen.)

Touch Switch Test

The touch switch test calibrates the touch switch coordinates and checks touch switch operation.

Start Calibration - Calibrates the switch coordinates. Calibrate the coordinates by touching each of the "+" marks in the four corners of the screen.

NOTE:

> Do not touch any locations other than the "+" marks. (Touching other locations may invalidate the calibration.)

Touch Switch Check - Checks for deviation in the coordinates. Check the coordinates of the touched location by verifying the displayed values. Touch and hold "press here" to return to the previous screen. If there is a large deviation in the coordinates, calibrate the touch switch using the "Start Calibration" function.

DTC Information

Search for the meaning of the displayed DTC.

Vehicle Configuration

Display the status of each vehicle system.

Speed Lock Configuration - Display the status of compulsory navigation settings (setting status of switches that cannot be operated) when driving.

Configurations

Display primary system information.

Vehicle Signals

Display the status of vehicle signals inputted to the Touch Screen (TS). These signals include:

- Lights (on or off)
- Ambient light sensor voltage
- Backlight dimming duty
- Graphic illumination dimming duty
- Vehicle speed, GPS speed, MOST km/h
- Battery voltage
- Reverse gear / park brake position (electric park brake on or off)
- Speed inhibit
- MOST Fibre Optic Transceiver (FOT) temperature
- Output audio allocation

Video Inputs Test

This screen will allow the testing of video inputs that are connected to the Touch Screen (TS). These include:

- Rear view / proximity camera
- TV/DVD

Self Test

Performs system self-diagnosis and displays the diagnostic results.

If an abnormality is present, a DTC is displayed.

MOST Test

Display the MOST connection status, and reception/transmission messages related to MOST.

"Mpr" displays the number of MOST devices existing on MOST. When "0" or "1" is displayed, communication is not possible.

Colour bar

This function allows the technician to test the colours generated by the TSD. A second screen displays six solid colours, selecting the colour will fill the screen with the chosen colour and pressing the TSD again will revert back to the colour test screen.

Loading

Update the navigation program.

For details on the update method, refer to the "Navigation Update Tool" operation manual.

HDD information

Display information on the Hard Disc Drive (HDD).

SMART test (Self-Monitoring Analysis and Reporting Technology) is initiated from this screen

Vehicle information

Display information on the vehicle.

- Car configuration - Displays information on vehicle environment settings.
  - Unit (distance) - Units of distance
  - Unit (time) - Units of time
  - Language - Displayed language
  - Fuel information - Remaining fuel quantity
  - Mileage information - Vehicle mileage display

    - Time information - Current time display
    - Override information - Status of switch operation inhibitions (Setting status of switches that cannot be operated.)
- GPS information - Display GPS related information.
    - Received position - Displays the latitude and longitude (displayed in degrees, minutes, and seconds) for the position information calculated by GPS.
    - Map matched position - Displays the latitude and longitude (displayed in degrees, minutes, and seconds) for the position information being used for map matching.
    - Satellites - Number of acquired satellites.
    - Current address - Address of the current location.
    - Satellite Information - Displays satellite information for up to 12 GPS satellite search targets.
    - Measurement HDOP - Positioning accuracy.
    - Status - Positioning status.
    - Date - Displays the current date and time in the following order: day, month, year, hour, minute, second. The year is displayed using the four-digit western calendar; time is displayed in Greenwich Mean Time (GMT).
- Vehicle sensor - Display vehicle signals inputted to the Touch Screen (TS).
    - REV - Reverse signal status.
    - Speed - Current vehicle speed.
    - Speed pulse count - Speed pulse count value.
    - Distance calibration - Learning information for distance calibration.
    - Voltage/Offset - Gyro sensor output voltage value/voltage correction value.
    - Relative bearing - Relative bearing (0° when navigation is started.)
    - Gyro sense - Learning value for gyro sensitivity.
    - Reset - Resets the gyro sensor relative bearing value.
- RDS-TMC information - Display RDS-TMC related information.

- Date/time (GMT) - Date and time for the TMC signal.
- Frequency - TMC signal frequency.
- PI code - Personal identification code for the broadcast station.
- PS name - Broadcast station name.
- Country code - Database country code.
- LTN - Database location number (location table number.)
- Service ID - Service provider identification number.
- Air data - TMC data.

Microphone

Check the volume for the voice recognition microphone inputted to the Touch Screen (TS). These include:

- PTT switch status - Checks the PTT switch connection. When the PTT switch is pressed, a signal will be outputted, and the indicator displays in green.
- Microphone input level judging - If a sampling of the user's voice command is at or above the threshold value, the indicator displays in blue.
- Microphone level - Displays the microphone input level.

Voice output check

Check the audio output.

- ON (Normal) - Outputs ADPCM voice (1 kHz sine wave) for five seconds.
- ON (Max) - Outputs ADPCM voice (maximum 1 kHz sine wave) for five seconds.

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSE	ACTION
Black screen (navigation and audio screens do not display.)	▪ Temperature in passenger compartment too low	▪ GO to Pinpoint Test **A.**

	▪ Condensation in passenger compartment ▪ Electrical harness open/short circuit, disconnected ▪ Component failure	
The navigation screen does not display, even when the "NAVIGATION" button is pressed (screen does not change.)	▪ Electrical harness open/short circuit, disconnected ▪ Component failure	▪ GO to Pinpoint Test **B.**
The hard switches do not respond.	▪ Component failure ▪ Switch failure	▪ GO to Pinpoint Test **C.**
The audio screen cannot be operated (does not display.)	▪ Media Oriented System Transport (MOST) system ▪ Electrical harness open/short circuit, disconnected	▪ GO to Pinpoint Test **D.**
The screen does not dim.	▪ Electrical harness open/short circuit, disconnected ▪ Component failure	▪ GO to Pinpoint Test **E.**
Noise on the screen, screen colour is abnormal.	▪ Electrical harness open/short circuit, disconnected ▪ Component failure	▪ GO to Pinpoint Test **F.**
The touch switches do not respond.	▪ Electrical harness open/short circuit, disconnected ▪ Component failure	▪ GO to Pinpoint Test **G.**
There is considerable deviation between the displayed vehicle position and the actual position.	▪ Electrical harness open/short circuit, disconnected ▪ Component failure	▪ GO to Pinpoint Test **H.**
The GPS no reception mark does not	▪ Electrical harness	▪ GO to

disappear.	open/short circuit, disconnected ▪ Component failure ▪ No reception from satellite	Pinpoint Test **I.**
No sound is emitted.	▪ Electrical harness open/short circuit, disconnected ▪ Component failure ▪ Incorrect system settings	▪ GO to Pinpoint Test **J.**
There is no navigation voice guidance.	▪ Volume level set too low ▪ The amplifier and speakers are incorrectly connected	▪ GO to Pinpoint Test **K.**
Voice recognition does not function.	▪ Electrical harness open/short circuit, disconnected ▪ Component failure	▪ GO to Pinpoint Test **L.**
The vehicle position rotates randomly.	▪ Electrical harness open/short circuit, disconnected ▪ Component failure ▪ Vehicle on a turntable in a parking building	▪ GO to Pinpoint Test **M.**
The vehicle mark display is unstable.	▪ Electrical harness open/short circuit, disconnected ▪ Component failure ▪ No reception from satellite	▪ GO to Pinpoint Test **N.**
The vehicle position does not update.	▪ HDD contaminated/damaged ▪ Electrical harness open/short circuit, disconnected ▪ Component failure	▪ GO to Pinpoint Test **O.**

The map display is incomplete.	▪ HDD contaminated/damaged ▪ Electrical harness open/short circuit, dis-connected ▪ Component failure	▪ GO to Pinpoint Test **P.**
Calls cannot be received or placed with Bluetooth®; Bluetooth® cannot connect with the vehicle.	▪ Incompatible Bluetooth® telephone ▪ Incorrect initial connection settings ▪ Electrical harness open/short circuit, dis-connected ▪ Component failure	▪ GO to Pinpoint Test **Q.**
The map cannot be updated.	▪ Refer to the "Navigation Update Tool" operation manual	▪ Refer to the "Navigation Update Tool" operation manual
An error screen displays on the navigation screen.	▪ Access to the map data has not been granted	▪ GO to Pinpoint Test **R.**
The dual view cannot be switched.	▪ Incorrect car configuration data received ▪ Media Oriented System Transport (MOST) system ▪ Component failure	▪ GO to Pinpoint Test **S.**

PINPOINT TESTS

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 Program is in operation, prior to the installation of a new module/component.

- The built in diagnostics are accessed as follows:
  - 1.With the vehicle at rest, place the ignition switch "ON", or start the engine.
  - 2. Press and hold the TSD in the centre at the top of the screen for approximately 5 seconds and then press and hold the TSD at the top left corner of the screen for approximately 5 seconds.
  - 3. A 'Diag PIN Entry' box will appear' Type in the access code 753.
  - 4.Once this code has been accepted the Diagnostic Menu screen will be displayed.

PINPOINT TEST A : BLACK SCREEN (NAVIGATION AND AUDIO SCREENS DO NOT DISPLAY.)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	A1: THE SCREEN SAVER FUNCTION WORKS
	1 Check the screen saver function works.
	Does the screen saver function work? **Yes** Operation is normal. **No** Proceed to the next step.GO to A2.
	A2: THE DISPLAY BACKLIGHT EMITS LIGHT
	1 Check the display backlight emits light.
	Does the display backlight emits light? **Yes** Proceed to the next step. **No** GO to A12.
	A3: THE SCREEN IS TURNED OFF
	1 Check the screen is not turned off.
	Do the navigation and audio screens display when the screen is turned on? **Yes** Operation is normal. **No** GO to A4

	GO to A1.
A4: THE VEHICLE INTERIOR TEMPERATURE IS -20°C OR LESS	
	1 Check the cabin internal temperature.
	Is the cabin internal temperature -20°C or lower? **Yes** Raise the cabin internal temperature, re-test the vehicle. **No** GO to A5.
A5: CONDENSATION IS FORMING INSIDE THE VEHICLE	
	1 Check for condensation occurring inside the passenger compartment.
	Is condensation occurring inside the passenger compartment? **Yes** Dry out the passenger compartment, re-test the vehicle. **No** GO to A6.
A6: THE LED FOR THE POWER SUPPLY BUTTON IS FLASHING. (RANGE ROVER ONLY)	
	1 Check the status of the audio power button LED.
	Is the audio power button flashing? **Yes** Carry out MOST Ring diagnostics to locate fault. **No** GO to A7.
A7: ONLY THE NAVIGATION SCREEN OR AUDIO SCREEN IS BLACK	
	1 Check to see if only the navigation screen is blank.
	Is only the navigation screen blank? **Yes** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index. **No** GO to A8.
A8: ONLY THE BACK MONITOR SCREEN IS BLACK	
	1 Check to see if only the audio screen is blank.
	Is only the audio screen blank? **Yes** Proceed to the next step. **No** GO to A10.
A9: AFTER INITIATING THE "VIDEO INPUT TEST" DIAGNOSIS, VIDEO CAN BE DISPLAYED	
	1 Carry out the "Video Input Test" diagnosis' (PIN code 753).
	Are the results of the "Video Input Test" diagnosis' normal?

	Yes Re-check the system. **No** Refer to the electrical circuit diagrams and check the cameras control module.
A10: ONLY THE TV SCREEN IS BLACK	
	1 Check to see if only the TV screen is black.
	Is only the TV screen blank? **Yes** Proceed to the next step. **No** GO to A12.
A11: AFTER INITIATING THE "VIDEO INPUT TEST" DIAGNOSIS, VIDEO CAN BE DISPLAYED	
	1 Carry out the "Video Input Test" diagnosis' (PIN code 753).
	Are the results of the "Video Input Test" diagnosis' normal? **Yes** Re-check the system. **No** Refer to the electrical circuit diagrams and check the TV control module.
A12: THE CONNECTIONS BETWEEN THE VISUAL NAVIGATION AND POWER SUPPLY WIRING HARNESS AND CONNECTORS ARE CORRECT	
	1 Check the display and power supply harness, power, auxiliary and ground circuits, for short, open circuits and are correctly connected.
	Was a fault identified with the display and power supply harness, power auxiliary and ground connections? **Yes** Rectify the fault and re-test the vehicle. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.

NOTE:

When re-confirming the symptoms after inspecting the wiring harness/connector, turn the ignition status to OFF, wait for the Audio power button LED on the display to turn OFF, then turn the ignition status to ON and run the diagnosis again from the beginning.

NOTE:

15 minutes are required for the program to update. If the ignition is accidentally turned OFF, turn the ignition ON again, and wait for 15 minutes.

PINPOINT TEST B : THE NAVIGATION MAP SCREEN DOES NOT DISPLAY, EVEN WHEN THE "NAVIGATION" BUTTON IS PRESSED (SCREEN DOES NOT CHANGE.)	
When re-confirming the symptoms after inspecting the wiring harness/connector, turn the ignition status to OFF, wait for the Audio power button LED on the display to turn OFF, then turn the ignition status to ON and run the diagnosis again from the beginning.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: NO RESPONSE TO PRESSING NAVIGATION MENU	
	1 Check that the ignition was not turned 'OFF' during a navigation software update.
	Was the ignition turned 'OFF' during a navigation software update? **Yes** Wait for 15 minutes with the ignition ON. Then turn the ignition to OFF then ignition ON. **No** Refer to electrical circuit diagrams and check integrity of navigation system wiring harness and connectors. GO to B2.
B2: NO RESPONSE TO PRESSING NAVIGATION MENU	
	1 Wait for 15 minutes with the ignition ON. Then turn the ignition to OFF then ignition ON.
	Does the navigation screen displays when the "NAVIGATION" button is pressed. **Yes** Operation is normal. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.

PINPOINT TEST C : THE HARD SWITCHES DO NOT RESPOND.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CHECK FOR FOREIGN OBJECTS	
	1 Check for foreign objects near to the button.
	Are there any foreign objects close to the button causing it to be pressed?

	Yes Remove foreign objects and re-test vehicle. **No** GO to C2.
C2: DISPLAY DIAGNOSTICS CHECK	
	1 Check to see if the display diagnostics can be displayed.
	Can the display diagnostics be displayed? **Yes** Proceed to the next step. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.
C3: HARD KEY TEST	
	1 Carry out the display diagnostics hard key test.
	Is the operation normal when carrying out the display diagnostics hard key test? **Yes** Operation is normal. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.

PINPOINT TEST D : THE AUDIO SCREEN CANNOT BE OPERATED (DOES NOT DISPLAY.)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CD CHANGER CHECK	
	1 Check to see if a CD changer is installed.
	Is a CD changer installed? **Yes** Proceed to the next step. **No** Normal operation, CD screen will not be displayed when there is no CD changer installed.
D2: THE AUDIO SCREEN DISPLAYS WHEN THE "AUDIO VIDEO" HARD SWITCH IS PRESSED.	
	1 The audio screen displays when the "AUDIO VIDEO" hard switch is pressed.
	Does the audio screen displays when the "AUDIO VIDEO" hard switch is pressed? **Yes** Proceed to the next step. **No** Refer to the hard switches do not respond diagnosis.
D3: THE AUDIO SCREEN DISPLAYS WHEN "AUDIO VIDEO" ON THE "HOME	

MENU" IS PRESSED.	
	1 The audio screen displays when "Audio Video" on the "Home Menu" is pressed.
	Does the audio screen displays when "Audio Video" on the "Home Menu" is pressed? **Yes** Proceed to the next step. **No** Refer to the touch switches do not respond diagnosis.
D4: EACH SWITCH (AM FM, CD, IPOD/USB, TV/DVD.) ON THE AUDIO SCREEN RESPONDS.	
	1 Each switch (AM FM, CD, iPod/USB, TV/DVD.) on the audio screen responds.
	Does each switch (AM FM, CD, iPod/USB, TV/DVD.) on the audio screen respond? **Yes** Carry out MOST Ring diagnostics to locate fault. **No** GO to D5.
D5: THE IGNITION IS TURNED FROM IGNITION ON TO OFF, AND AFTER WAITING FOR APPROXIMATELY 30 SECONDS, THE TOUCH SCREEN DISPLAY (TSD) POWER SUPPLY LED WENT OUT. WHEN THE IGNITION IS TURNED TO ON, THE AUDIO SCREEN CAN BE OPERATED.	
	1 The ignition is turned from Ignition ON to OFF, and after waiting for approximately 30 seconds, the Touch Screen Display (TSD) power supply LED went out.
	When the ignition is turned to ON, can the audio screen be operated? **Yes** Operation is normal. **No** Carry out MOST Ring diagnostics to locate fault.

PINPOINT TEST E : THE SCREEN DOES NOT DIM.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: CHECK FOR FOREIGN OBJECTS	
	1 Check for foreign objects adhered to the display light sensor. ▪ Range Rover - Top right of display ▪ Discovery/Range Rover Sport - Instrument panel
	Are there any foreign objects adhered to the display light sensor? **Yes** Remove foreign objects and re-test vehicle. **No** GO to E2.

E2: DISPLAY LIGHT SENSOR CHECK	
	1 Check to see if display screen switches to low light when sensor is covered.
	Does the display screen switch to low light when the sensor is covered? **Yes** Operation is normal. **No** GO to E3.
E3: VEHICLE LIGHT SWITCH TESTS	
	1 Check to see if display screen switches to low light when the vehicle light switch is pressed.
	2 When the vehicle exterior lights are switched on, check diagnostic menu "Vehicle Signals" lights on the diagnostics screen is "ON."
	Does the display screen switch to low light when the vehicle light switch is pressed? **Yes** Operation is normal. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.

PINPOINT TEST F : NOISE ON THE SCREEN; SCREEN COLOUR IS ABNORMAL.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: DISPLAY POWER AND GROUND CHECKS	
	1 Refer to electrical circuit diagrams and check battery power and power ON relay voltage, and ground resistance.
	Is the battery power and power ON relay voltage between 10.5 and 16 volts, and continuity to ground? **Yes** Proceed to the next step. **No** Check and rectify the vehicle wiring harness and connectors.
F2: CONTRAST CHECK	
	1 Check to see if the screen colour is normal when the screen setting (contrast) is re-ret to the default values.
	Is the screen colour normal with the default values? **Yes** Operation is normal. **No** GO to F3.
F3: CABIN INTERNAL TEMPERATURE CHECK	

	1 Check the cabin internal temperature.
	Is the cabin internal temperature -20°C or lower? **Yes** Raise the cabin internal temperature and re-test. **No** GO to F4.
F4: ADDITIONAL SCREEN CHECKS	
	1 Check all other screens.
	Are all other screens beside the navigation display screen normal? **Yes** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index. **No** GO to F5.
F5: COLOUR BAR CHECK	
	1 Carry out the display diagnostics colour bar check test.
	Are the results of the display diagnostics colour bar check normal? **Yes** Operation is normal. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.

PINPOINT TEST G : THE TOUCH SWITCHES DO NOT RESPOND.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: TOUCH SWITCH TEST	
	1 The touch switches not responding on the navigation screen only
	Are the touch switches not responding on the navigation screen only? **Yes** Proceed to the next step. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.
G2: TOUCH SWITCH CHECK	
	1 Carry out the touch switch check in the display diagnostics.
	Are the results of the display diagnostics touch switch check normal? **Yes** Check the symptoms again.Operation is normal. **No** GO to G3.
G3: START CALIBRATION ROUTINE	
	1 Carry out the start calibration routine from the display diagnostics

	1 Carry out the start calibration routine from the display diagnostics touch switch test.
	Is normal operation resumed after correction? **Yes** Operation is normal. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.

NOTE:

Refer to diagnostic menu "Vehicle Sensor" – Distance Calibration, this value should be approximately 200mm, a large deviation from this value indicates a speed signal fault or incorrect wheel size.

PINPOINT TEST H : THERE IS CONSIDERABLE DEVIATION BETWEEN THE DISPLAYED VEHICLE POSITION AND THE ACTUAL POSITION.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	H1: GPS MARK DISPLAY CHECK
	1 The GPS no reception mark is displayed.
	Is the GPS no reception mark displayed on the display screen? **Yes** Refer to GPS no reception mark does not disappear diagnosis. **No** GO to H2.
	H2: LOCATION CHECK
	1 Check for symptom occurring in particular locations - parallel roads, elevated roads, loop roads, parking centres (buildings) etc.
	Does the symptom occur in a particular location? **Yes** In places where the vehicle position is hard to specify, the vehicle position may be matched incorrectly and result in position discrepancies. Additionally, a new road layout will mean the Gyro does not match the map position. **No** Proceed to the next step.
	H3: DISTANCE CALIBRATION CHECK
	1 Check to see if distance calibration is being performed.
	Is distance calibration being performed? **Yes** Monitor the condition until distance calibration is complete (drive for over 10km/6.2 miles)

	No GO to H4.
H4: VEHICLE SIGNAL INSPECTION	
	1 Check vehicle sensor display screen, from vehicle information diagnostics menu for the following: vehicle speed signal, REV: ON is indicated when the gear shift lever is in the REV position and gyro sensor input status are normal.
	Are the vehicle speed signal, REV signal, and gyro sensor input status normal? **Yes** GO to H5. **No** Refer to the electrical circuit diagrams and check the integrity of the wiring harness and connectors, and CAN circuit, to the Touch Screen Display (TSD).
H5: TIRE CHECK	
	1 Check to see if new tires have recently been installed.
	Have new tires been recently installed? **Yes** From the navigation map screen, enter the navigation menu, select navigation setup then select calibration, press 'Distance' then drive the vehicle for 10 to 20 km. Operation will return to normal after performing distance calibration and driving the vehicle for 10 to 20 km. **No** Adjust the current location, and after the GPS no signal mark has disappeared, drive the vehicle for a while to monitor conditions.

NOTES:

- Move the vehicle to an open area, radio waves from satellites may not be received inside buildings.
- Correct the vehicle cursor to the current location.

PINPOINT TEST I : THE GPS NO RECEPTION MARK DOES NOT DISAPPEAR.	
Move the vehicle to an open area, radio waves from satellites may not be received inside buildings.	
Correct the vehicle cursor to the current location.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I1: RETRO-INSTALL INSTALLATIONS CHECK	

	1 Check to see if there are any retro-install installations (anti-theft, radar, etc.)
	Are there any retro-install installations? **Yes** GO to I2. **No** GO to I3.
I2: RETRO-INSTALL INSTALLATIONS RF CHECK	
	1 Turn power supply (including back-up power) to OFF status.
	Does the GPS no reception mark disappear? **Yes** GPS reception may deteriorate when devices receiving radio waves are retro-installed. Alter the position of the retro-install device, and re-test vehicle. **No** GO to I4.
I3: SATELLITE RECEPTION CHECKS	
	1 Check to see if a 'P' or 'T' is displayed in the 'STS' column of the navigation diagnostics GPS information screen after 10 minutes have passed.
	Is a 'P' or a 'T' displayed? **Yes** Wait for reception of another satellite so that position calculation can be performed. **No** Refer to the electrical circuit wiring diagrams and check the integrity of the wiring harness and connectors to the GPS antenna.Proceed to the next step.
I4: GPS ANTENNA REPLACEMENT	
	1 Install a new GPS antenna.
	Does the GPS no signal mark disappears when the GPS antenna is replaced. **Yes** Fault has been rectified. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.

PINPOINT TEST J : NO SOUND IS EMITTED.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J1: SOUND OUTPUT CHECK	
	1 Check sound output across all systems.
	Is there no sound output across all systems?

	Yes GO to J2. **No** GO to J3.

J2: VOLUME LEVEL CHECK	
	1 Check the volume level is not set too low.
	Is the volume level set too low? **Yes** Increase the volume level and re-test vehicle. **No** GO to J3.

J3: INTEGRITY OF AMPLIFIER AND SPEAKER WIRING.	
	1 The amplifier and speaker wiring harnesses are correctly connected.
	Are the amplifier and speaker wiring harnesses correctly connected? **Yes** Check the MOST devices.GO to J4. **No** Refer to the electrical circuit diagrams and check integrity of amplifier and speaker wiring harness and connections.

J4: ONLY VOICE RECOGNITION DOES NOT OUTPUT	
	1 Check to see if only voice recognition does not output.
	Is there no output only from the voice recognition? **Yes** GO to J5. **No** Proceed to step 8.

J5: VOICE GUIDANCE	
	1 Check the volume level for voice guidance is not set too low.
	Is the volume level for voice guidance set too low? **Yes** Increase the volume level and re-test vehicle. **No** GO to J6.

J6: VOICE GUIDANCE SETTINGS	
	1 Check to see if the voice guidance is set to 'OFF' in the navigation settings.
	Is the voice guidance set to 'OFF' in the navigation settings? **Yes** Set to 'ON' and re-test the vehicle. **No** GO to J7.

J7: ADDITIONAL ITEMS	
	1 Check to see if the following items apply. - There is no destination set.

	▪ There is no destination set ▪ There is no movement along the route
	Do the two items apply? **Yes** Normal operation, confirm customer symptom and re-test vehicle. **No** Check MOST connection at the Touch Screen Display (TSD), check the MOST devices.Proceed to the next step.
J8: ONLY VOICE RECOGNITION DOES NOT OUTPUT	
	1 Check to see if only voice recognition does not output.
	Is there no output only from the voice recognition? **Yes** Refer to the there is no navigation voice guidance diagnosis. **No** GO to J9.
J9: SOUND IS ONLY ABSENT WHEN USING THE AUDIO SYSTEM OR TELEPHONE.	
	1 Check to see if sound is only absent when using the audio system or telephone.
	Does only the audio system or telephone sound not output? **Yes** Check MOST connection at the Touch Screen Display (TSD), check the MOST devices. **No** Refer to the electrical circuit diagrams and check integrity of wiring harness and connections.

PINPOINT TEST K : THERE IS NO NAVIGATION VOICE GUIDANCE.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
K1: SOUND MISSING AUDIO SYSTEM ONLY	
	1 Sound is only absent from the audio system (CD, radio.)
	Is sound only absent from the audio system (CD, radio.)? **Yes** GO to K4. **No** Proceed to the next step.
K2: VOICE MISSING NAVIGATION SYSTEM ONLY	
	1 Voice is only absent from the navigation system.
	Is voice only absent from the navigation system? **Yes** GO to K3. **No**

	GO to K3.
K3: NAVIGATION VOICE GUIDANCE CANNOT BE HEARD	
	1 Operate the navigation replay switch and raise the volume.
	Can navigation voice guidance be heard after pressing the navigation replay switch, and raising the volume? **Yes** Operation is normal. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.
K4: INTEGRITY OF AMPLIFIER AND SPEAKER WIRING.	
	1 The amplifier and speaker wiring harnesses are correctly connected.
	Are the amplifier and speaker wiring harnesses correctly connected? **Yes** GO to K5. **No** Refer to the electrical circuit diagrams and check integrity of amplifier and speaker wiring harness and connections.
K5: VOLUME LEVEL CHECK	
	1 Check the volume level is not set too low.
	Is the volume level set too low? **No** Increase the volume level and re-test vehicle. **No** Refer to the electrical circuit diagrams and check integrity of complete audio system.

PINPOINT TEST L : VOICE RECOGNITION DOES NOT FUNCTION.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
L1: AUDIO SOUND IS MUTED WHEN PTT SWITCH IS DEPRESSED	
	1 Check to see if the audio sound is muted when the PTT switch is depressed.
	Is the audio sound muted? **Yes** GO to L3. **No** GO to L2.
L2: PTT SWITCH STATUS	
	1 Check to see if the PTT switch status is ok in the navigation diagnostics, manual check, microphone test.
	Is the PTT switch status, in navigation diagnostics, ok? **Yes**

	Check MOST connection at the Touch Screen Display (TSD), check the MOST devices. **No** Replace the MOST master, or the gateway module.

L3: TALK BACK	
	1 Check to see if there is talk back when other voice recognition demands are executed.
	Is there talk back? **Yes** System operation is normal, (advise change in manner of speech, as incorrect recognition is occurring). **No** GO to L4.

L4: HARNESS/CONNECTOR CHECKS	
	1 Refer to the electrical circuit diagrams and check integrity of Touch Screen Display (TSD) harness and connections.
	Has a fault been identified with the Touch Screen Display (TSD) harness or connections? **Yes** Rectify the fault and re-test the vehicle. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.

PINPOINT TEST M : THE VEHICLE POSITION ROTATES RANDOMLY.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
M1: VEHICLES CURRENT POSITION MARK TURNS ON ITS OWN	
	1 Determine if the ignition status was turned to Auxiliary or On, while the vehicle was on a turntable in a parking building etc.
	Was ignition status set to Auxiliary or On? **Yes** The angular speed of the vehicle at the time of the ignition status change will be logged as the standard value. To re-set the standard value, turn ignition status to 'OFF' then to 'Auxiliary' or 'On' with the vehicle stationary. Re-test the vehicle. **No** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index.

PINPOINT TEST N : THE VEHICLE MARK DISPLAY IS UNSTABLE.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
N1: VEHICLE SPEED SIGNAL	
	1 The vehicle speed signal is being properly inputted under "Vehicle

	1 The vehicle speed signal is being properly inputted under "Vehicle Sensor" on the "Vehicle information" diagnostics screen.
	Is the vehicle speed input correctly? Note: MOST and navigation system module speeds are approximately the same. **Yes** GO to N2. **No** Carry out MOST ring circuit checks.Check the Anti-Lock Brake System Module for related DTCs and refer to the relevant DTC Index.Carry out network integrity tests using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check CAN circuits if required. Repair wiring harness as required.Rectify the fault and re-test the vehicle.
N2: CHECK NUMBER OF SATELLITES	
	1 "0" is displayed in the "Satellites" column under "GPS Information" (on the "Vehicle information" diagnostics screen.)
	Is the number of satellites displayed on the screen 0? **Yes** Refer to GPS no reception mark does not disappear diagnosis. **No** GO to N3.
N3: CHECK IF SYMPTOMS ARE OCCURRING IN PARTICULAR LOCATIONS	
	1 Confirm if the 'car current position not stable' symptom is occurring in particular locations.
	Is the 'car current position not stable' symptom occurring in particular locations? **Yes** System operation is normal. Signal reflections from buildings or a particular location may be responsible. **No** Refer to GPS no reception mark does not disappear diagnosis.

PINPOINT TEST O : THE VEHICLE POSITION DOES NOT UPDATE.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
O1: VEHICLE POSITION DOES NOT UPDATE	
	1 Check the GPS no reception mark.
	Has the GPS no reception mark disappeared? **Yes** GO to O2. **No** Refer to GPS no reception mark does not disappear diagnosis.
O2: VEHICLE POSITION DOES NOT UPDATE	
	1 Check the map screen scroll function.
	Can the map screen be touched scrolled?

	Yes GO to O3. **No** Initiate the "SMART test" on the "HDD information" diagnostics screen.
O3: VEHICLE POSITION DOES NOT UPDATE	
	1 The vehicle speed signal is being properly inputted under "Vehicle Sensor" on the "Vehicle information" diagnostics screen.
	Is the vehicle speed input correctly? Note: MOST and navigation system module speeds are approximately the same. **Yes** Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index. **No** Carry out MOST ring circuit checks.Check the Anti-Lock Brake System Module for related DTCs and refer to the relevant DTC Index.Carry out network integrity tests using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check CAN circuits if required. Repair wiring harness as required.Rectify the fault and re-test the vehicle.

PINPOINT TEST P : THE MAP DISPLAY IS INCOMPLETE.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
P1: MAP DISPLAY IS INCOMPLETE	
	1 Check to see if the map screen displays correctly when it is touch scrolled.
	Does the map screen display correctly when it is touch scrolled? **Yes** GO to P2. **No** Initiate the "SMART test" on the "HDD information" diagnostics screen.
P2: MAP DISPLAY IS INCOMPLETE	
	1 Check to see if the map screen scale can be reduced.
	Can the map screen scale be reduced? **Yes** GO to P3. **No** Initiate the "SMART test" on the "HDD information" diagnostics screen.
P3: MAP DISPLAY IS INCOMPLETE	
	1 Check to see if a point of interest search can be performed.
	Can a point of interest search be performed? **Yes** Check and install a new Touch Screen Display (TSD) as required. Refer

	Check and install a new Touch Screen Display (TSD) as required. Refer to the new module/component installation note at top of DTC Index. **No** Initiate the "SMART test" on the "HDD information" diagnostics screen.

PINPOINT TEST Q : CALLS CANNOT BE RECEIVED OR PLACED WITH BLUETOOTH®; BLUETOOTH® CANNOT CONNECT WITH THE VEHICLE.	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	Q1: DISPLAY CHECK
	1 Press the telephone button.
	Is 'Telephone not connected' displayed on the screen? **Yes** GO to Q2. **No** Proceed to step 7.
	Q2: BLUETOOTH® COMPATIBILITY CHECK
	1 Check to see if the telephone handset is Bluetooth® compatible.
	Is the telephone handset Bluetooth® compatible? **Yes** GO to Q3. **No** Use a Bluetooth® compatible telephone handset.
	Q3: HANDSET POWER CHECK
	1 Check to see if the handset is switched 'ON'.
	Is the telephone handset switched 'ON'? **Yes** GO to Q4. **No** Switch handset 'ON' and re-test.
	Q4: INITIAL CONNECTION SETTINGS
	1 Check to see if the initial connection settings to the in-vehicle system have been performed.
	Have the initial connection settings to the in-vehicle system been performed? **Yes** GO to Q5. **No** Perform the initial connection settings.
	Q5: HANDSET COMMUNICATION CHECK
	1 Check to see if the telephone handset recognizes the in-vehicle system.
	Does the telephone handset recognize the in-vehicle system?

	Does the telephone handset recognize the in-vehicle system? **Yes** GO to Q6. **No** Re-test using a different Bluetooth® compatible telephone handset. If the fault is still evident, suspect the telephone module. Refer to the new module/component installation note at the top of this procedure.
	Q6: HANDSET COMMUNICATION CHECK
	1 Switch the Bluetooth® telephone handset 'OFF' then back 'ON' again.
	Does the telephone handset recognize the in-vehicle system? **Yes** Operation is normal. **No** Suspect the telephone module. Refer to the new module/component installation note at the top of this procedure.
	Q7: HANDSET COMMUNICATION CHECK
	1 Check to see if the telephone is within communications range.
	Is the telephone within a 10 metre range of the bluetooth® telephone module? **Yes** GO to Q8. **No** Move the telephone handset to within a 10 metre range of the Bluetooth® telephone module.
	Q8: HANDSET COMMUNICATION CHECK
	1 Check to see if when transmitting, the telephone handset is also receiving.
	When transmitting, is the telephone handset also receiving? **Yes** Check MOST connection at the Touch Screen Display (TSD), check the MOST devices.

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AUDIO UNIT

SPECIFICATIONS

Torque Specifications

DESCRIPTION	NM	LB-FT
Audio unit to audio unit bracket screws	1	1
Compact disc (CD) changer	1	1
Amplifier mounting bracket side bolts	9	7
Amplifier mounting bracket bottom bolts	5	4
Amplifier bolts	5	4
Antenna nuts	6	4

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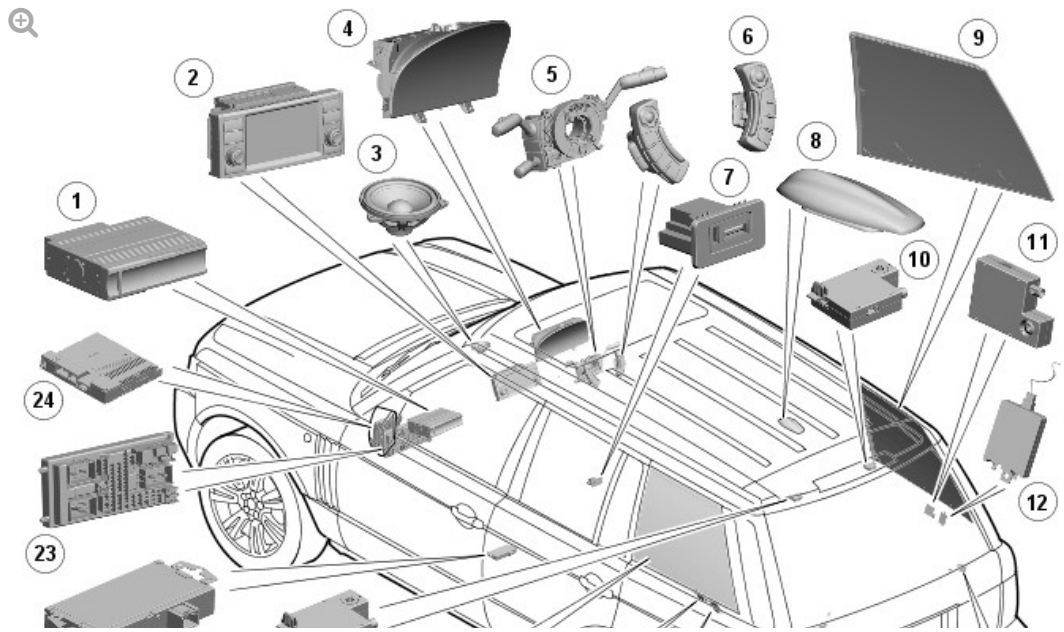
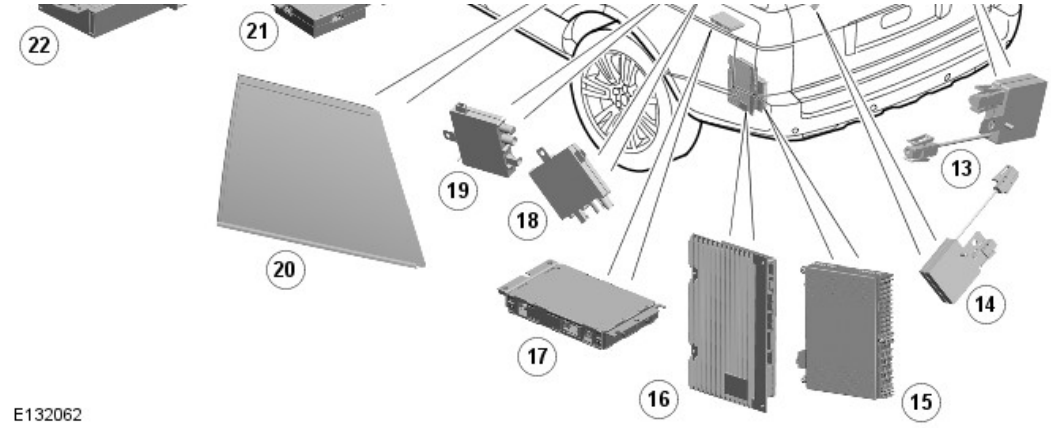
AUDIO UNIT

DESCRIPTION AND OPERATION

AUDIO SYSTEM COMPONENT LOCATION





ITEM	DESCRIPTION
1	compact disc (CD) autochanger
2	Touch Screen Display (TSD)
3	Speakers
4	Instrument cluster
5	Clock spring
6	Steering wheel switches
7	Portable audio interface
8	Roof pod antenna DAB or SDARS (NAS and Canada only) with / without GPS (Navigation)
9	Right Hand (RH) glass antenna (DAB/TV/Auxiliary park heating)
10	VICS Amplifier (Japan only)) or Traffic Management Channel (TMC)
11	Digital Audio Broadcast (DAB) antenna amplifier
12	RH Rear TV / Auxiliary park heating antenna amplifier (Ref only)
13	Antenna filter
14	Antenna filter
15	Hybrid Digital (HD) radio module
16	Audio amplifier
17	SDARS receiver (NAS only)
18	Left Hand (LH) TV antenna amplifier (Ref only)
19	AM/FM / diversity antenna amplifier
20	LH glass antenna (AM/FM/Diversity/TV)
21	FM antenna amplifier

22	Portable audio module
23	Central Junction Box (CJB)
24	Integrated Head Unit (IHU)

GENERAL

Three levels of the system are available and both systems use the dual view Touch Screen Display (TSD) as their interface. One system is based around a Harman/Kardon DSP audio amplifier while the other two are based around the Harman/Kardon Logic7 and Logic7 HD 1200W Premium audio amplifier.

NOTE:

Due to legislation, the NAS markets do not receive the dual-view TSD option. A single view TSD is available in these markets. Where markets allow, dual view TSD is available with the Logic7 and Logic7 HD Premium systems.

It is also possible to specify extras to the audio system to extend its capabilities. These options include:

- Telephone
- Satellite navigation
- Television / Teletext
- Voice recognition system (navigation and telephone)
- Rear Seat Entertainment (RSE).
- Digital radio - DAB/SDARS/HD

MOST

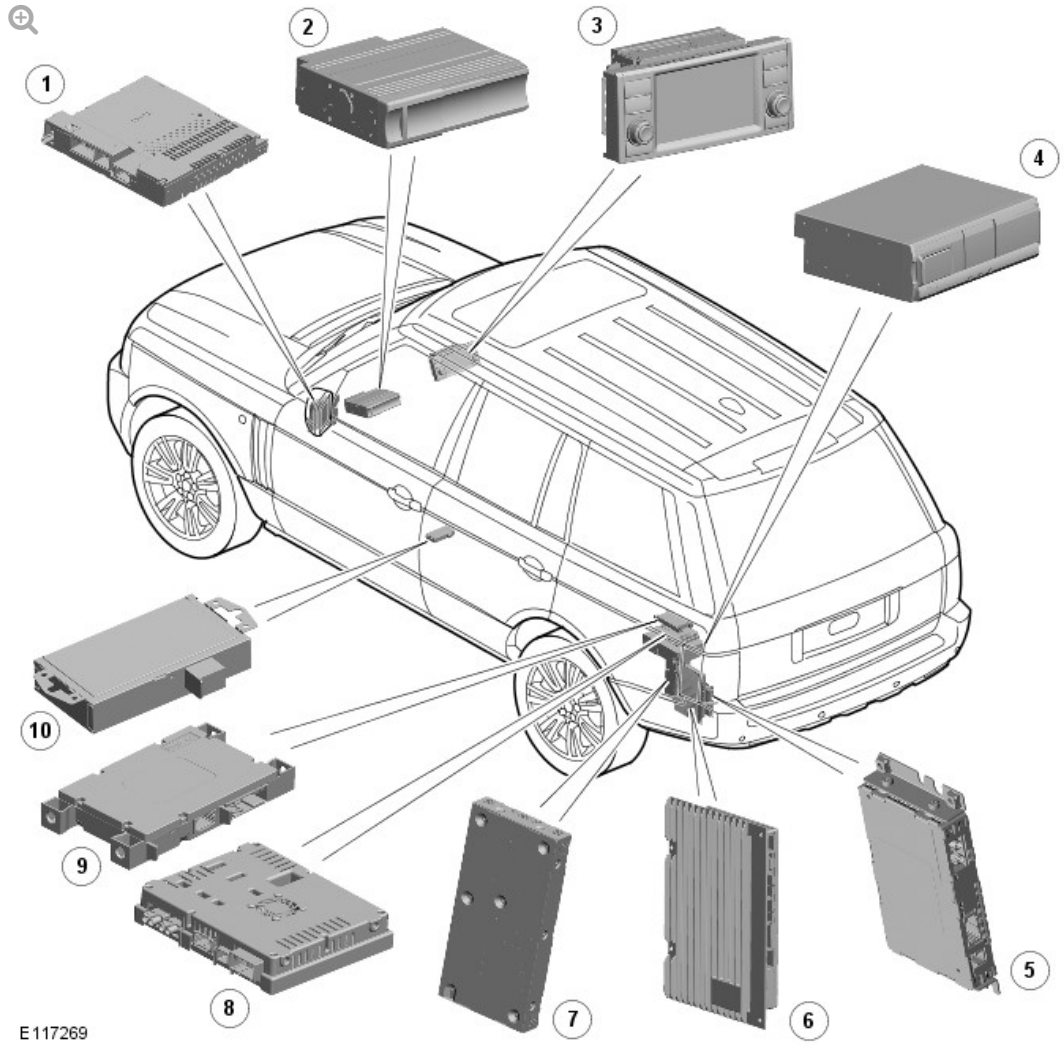
The components of the complete audio/infotainment system are all connected on the Media Orientated Systems Transport (MOST) ring. The MOST ring is a fibre optic communications bus for multi media applications. Sound and control information is passed around the MOST ring and can be

Sound and control information is passed around the MOST ring and can be picked up by any of the systems units. For example, sound information is sent from the CD autochanger along the MOST ring and is collected by the audio amplifier which then outputs the sound to the speakers.

MOST Components

NOTE:

Not all the components shown are related to the audio system, but form part of the MOST ring.



ITEM	DESCRIPTION
1	Integrated Head Unit (IHU)
2	Compact Disc (CD) autochanger

3	Touch Screen Display (TSD)
4	DVD autochanger
5	Digital Radio (DAB/SDARS/HD)
6	Audio amplifier
7	Rear Seat Entertainment (RSE) module
8	Television (TV) tuner
9	Telephone module
10	Portable audio module

MOST technology uses a plastic optical fibre which forms a network connecting the audio and multimedia system components. Each component in the ring is connected to the plastic optical fibre through a device known as a Fibre Optical Transceiver (FOT). Each FOT has two optical connections; one connection is sensitive to light and is the input and the second connection forms the light source and is the output. The system operates by connecting the output from one FOT to the input of another FOT.

The light signals are sent in one direction only and are formed in the following way:

- Electrical signals are converted into an electrical current
- The current then drives a light emitting diode (LED) in the FOT to produce a high intensity red light
- The LED transmits the light through a fibre optic cable
- A photo diode in the FOT at the opposite end of the fibre optic cable detects the light.

The following components are connected to the MOST ring:

- Integrated Head Unit (IHU)
- Touch Screen Display (TSD)
- SDARS receiver (NAS and Canada only)
- Digital radio module (DAB and SDARS/HD (NAS and Canada only)
- TV tuner

- Audio amplifier
- Rear Seat Entertainment (RSE) module
- Telephone module
- Portable audio interface module
- CD autochanger.

The IHU is the timing master for the MOST system. The IHU controls and manages the MOST ring and the system components. It is also responsible for the MOST security system. Each component in the MOST ring has a unique serial number. The component serial number is stored in a registry file in the instrument cluster. If any component serial number is not recognized, the entire audio system will not function.

A replaced component requires its serial number to be programmed in the instrument cluster registry using Land Rover approved diagnostic equipment. If the instrument cluster is replaced, the complete system will not function until the instrument cluster is programmed with the component serial numbers using Land Rover approved diagnostic equipment.

MOST DIAGNOSTICS

A light box is used to diagnose the MOST system. The light box emits a visible, high intensity red light which can be connected into the ring at any point to test the ring integrity. The light box is used in conjunction with Land Rover approved diagnostic equipment.

Disconnecting a MOST connector will reveal if the high intensity red light is visible. Do not view the red light directly. If a break occurs in the MOST ring fault codes are stored in the IHU which can be retrieved using Land Rover approved diagnostic equipment.

CENTRAL JUNCTION BOX (CJB) GATEWAY FUNCTION

The CJB (central junction box) incorporates a gateway function. The gateway function is the link between the vehicle bus systems and the audio system MOST ring. When the vehicle is unlocked, the CJB receives a system 'wake-up' message on the controller area network (CAN) bus. This message

is then passed to the integrated head unit (IHU) which then 'wakes-up' the MOST ring components by energizing the infotainment relay.

SYSTEM SECURITY

The gateway function stores a unique serial number for each component in the infotainment system. This new system, known as 'Security on MOST' replaces the radio codes used on previous audio systems.

During vehicle production, the serial number of each component is extracted from its memory and stored in the CJB. At every subsequent ignition on cycle, the Integrated Head Unit (IHU) reads the serial number for each component and compares them to the stored serial numbers in the CJB. If an incorrect code detected the MOST system will shut down and the infotainment system will not function.

If an infotainment component is replaced, Land Rover approved diagnostic equipment will be required to disable the security on MOST feature. A file is downloaded which extracts the new serial number from the replacement component and records it in the CJB. Land Rover approved diagnostic equipment is used to re-enable the security on MOST feature and restore the system security.

INFOTAINMENT RELAY

An infotainment relay is located in the CJB. The relay receives a permanent power supply from fusible link 2B in the BJB (battery junction box). The relay coil is controlled by the IHU which provides a ground for the coil. When a vehicle unlocked signal is transmitted on the CAN bus, the message is received by the IHU which provides a ground for the relay, closing the contacts and supplying power to the audio/infotainment system components. The IHU maintains the relay in an energized condition for a period of time after the ignition is in the off mode 0 to allow time for the navigation computer to 'power down' and also to allow a faster system start-up if the system is required subsequently.

AUDIO SYSTEM

Three levels of audio system are available@

The Hi-Fidelity Digital Signal Processor (DSP) Harman Kardon audio system comprises:

- DSP amplifier
- Touch Screen Display (TSD)
- Integrated Head Unit (IHU)
- Six disc CD autochanger
- Portable audio interface
- 11 Speakers

The Hi-Fidelity Logic7 Harman Kardon audio system comprises:

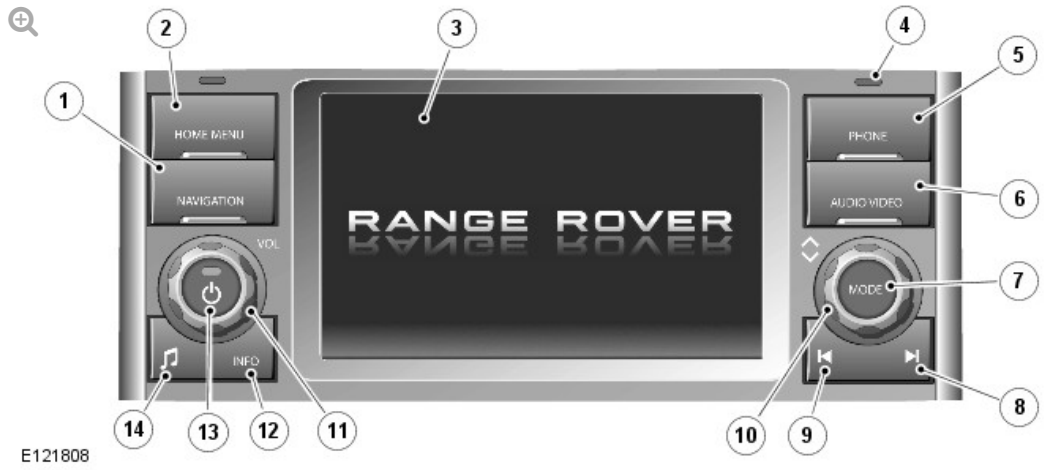
- Logic7 amplifier
- TSD
- IHU
- Six disc CD autochanger
- Portable audio interface
- 14 Speakers

The Hi-Fidelity Logic7 HD 1200W Premium Harman Kardon audio system comprises:

- Logic7 HD 1200W amplifier
- TSD
- IHU
- Six disc CD autochanger
- Portable audio interface
- 19 Speakers (5 co-axial)

The systems have the option of Digital Audio Broadcast (DAB) radio or High Definition (HD) digital broadcast radio or Satellite Digital Audio Radio Service (SDARS) (NAS and Canada only). The DAB and HD options are not available in all markets and are dependent on service availability.

TOUCH SCREEN DISPLAY



ITEM	DESCRIPTION
1	Navigation
2	Home menu
3	Touch screen display
4	Light sensor
5	Telephone
6	Audio/Video
7	Search up/increase
8	Mode
9	Search down/decrease
10	Scroll up/down
11	Volume
12	Information
13	Audio on/off
14	Tone

The Touch Screen Display (TSD) is located in the center of the instrument panel and is the driver control interface for the infotainment system. The TSD is connected to the MOST ring and communicates with the other components in the audio/infotainment system.

The TSD provides driver display and control of the audio system, telephone

The TSD provides driver display and control of the audio system, telephone, the rear view camera, proximity cameras, VentureCam™, the Traffic Message Channel (TMC) and the navigation system.

The TSD also communicates with the RSE module via a co-axial cable. The TSD processes its own video for system operation but receives the video image data from the RSE via the co-axial cable.

The RSE and other systems are operated by a combination of the physical buttons located on each side of the screen and the 'virtual' buttons displayed on the touch screen. For clarification, the physical buttons are referred to as 'buttons' and the touch screen virtual buttons are referred to as 'icons'.

The TSD is a seven inch touch sensitive, 1280 X 480 pixels LCD (liquid crystal display) VGA screen. The dual-view TSD allows the front seat passenger to view television and video images when the car is being driven. The dual-view screen allows the driver to see the navigation or other system screens but not the TV or video when the vehicle is moving. The screen can be switched between single and dual view using AUDIO VIDEO switch on the TSD.

NOTE:

Due to legislation, the NAS markets do not receive this dual-view option. A single view display is available in these markets.

The dual-view TSD uses Parallax Barrier Shutter Technology to alternately hide and reveal columns of pixels to the left and right hand views of the screen. The display comes with a specially designed agar coating to help prevent sunlight bleaching.

Care should be taken with the TSD to ensure its correct operation:

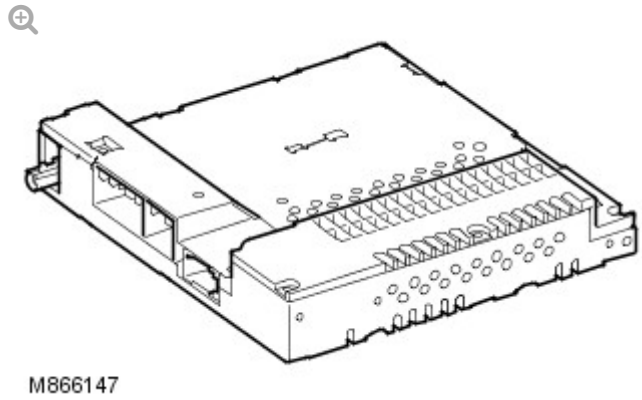
- The screen should be cleaned with a lightly, water moistened cloth. Do not use chemical agents or domestic products to clean the screen or any part of the surround.
- Only use your finger to operate the touch screen. Ensure you only use one

finger to avoid incorrect entries.

- A short light press of the touch screen is sufficient. Excessive pressure can damage the screen.

The TSD also incorporates a 40 GB hard disc drive which is used for storing the navigation data and maps. The disc drive cannot store audio files.
For additional information, refer to: Navigation System (419-07, Description and Operation).

INTEGRATED HEAD UNIT (IHU)



The Integrated Head Unit (IHU) is located behind the glove compartment mounted CD autochanger. The IHU is secured to the instrument panel support frame. The IHU contains the radio functionality for the audio system and communicates on the MOST ring with the components in the audio system. The IHU is also the timing master for the MOST ring. The IHU is the controls and manages the MOST ring and provides the allocations of channels, system power management and the functionality and co-ordination of the other system components.

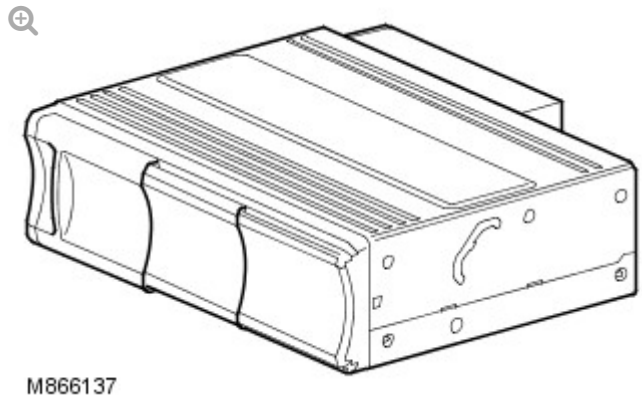
The IHU also controls the operation of the infotainment relay. The infotainment relay is located in the CJB and the relay coil is controlled by the IHU which provides a ground for the coil. The relay supplies power to a number of the audio system components.

Radio signals are received by antennae located in the left hand rear quarter window and the rear screen. An frequency modulation (FM) antenna amplifier is located in the upper taildoor and passes amplitude modulation (AM)/FM signals from the rear screen antennae to the IHU. A diversity antenna is located in the left hand rear quarter window. A FM diversity

antenna amplifier is located behind the left hand luggage compartment trim panel, below the window and passes FM radio signals from the rear quarter window diversity antenna to the IHU. The FM diversity system uses a multi-antenna system which selects the strongest signals from the antennae. In weak signal areas the amplifier uses an integral ultrasonic noise detector to find the least distorted antenna signal to ensure maximum reception quality is maintained.

Diagnostic messages retrieved via Land Rover approved diagnostic equipment are routed from the IHU through the instrument pack, prior to being transferred to the diagnostic socket.

6 DISC CD AUTOCHANGER



The six disc CD autochanger is located at the rear of the glove compartment. The CD autochanger is a standard fitment on all 2005 MY Range Rovers. The CD autochanger is capable of playing audio CDs and MP3 CDs. The autochanger uses a six disc magazine which is loaded into an aperture on the front of the unit.

The CD autochanger is connected on the MOST ring and receives a permanent fused power supply from the passenger compartment fusebox.

SATELLITE DIGITAL AUDIO RADIO SERVICE (SDARS) (NAS AND CANADA VEHICLES ONLY)

SDARS is a satellite based radio service which is available in the United States of America (USA) and Canada. Digitally encoded audio transmissions are broadcast to receivers from two satellites or from ground based repeater stations. It is possible for the SDARS transmissions to be received

in northern Mexico but reception is not guaranteed outside of the USA or Canada.

The service is provided by a company called Sirius. The service comprises over 100 channels of digital entertainment which is provided by subscription requiring a monthly payment.

Operation of the SDARS system is the same as the radio operation with selections made using the TSD icons or controls on the TSD.

The SDARS system requires additional components to be added to the audio system. An SDARS antenna is located in the roof mounted pod and a receiver is located in the LH (left-hand) side of the luggage compartment to allow reception of the service.

The customer must subscribe to receive the SDARS service. If the user selects a channel to which subscription is not authorised, the TSD will display the telephone number of the SDARS providers subscription service. The telephone number is stored in the IHU and can be changed or amended using Land Rover approved diagnostic equipment.

SDARS ANTENNA

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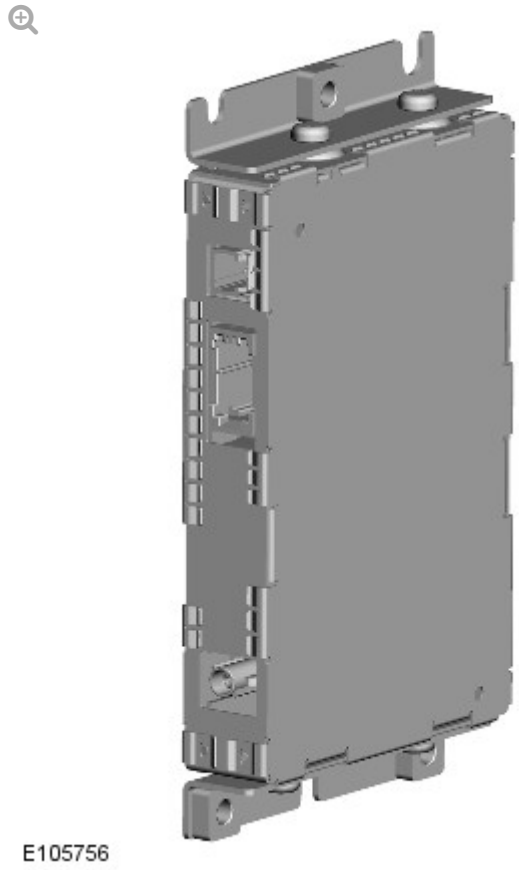
The SDARS antenna is located in the roof pod and is shared with the telephone system and the navigation system where fitted. The roof pod is located externally in a central position towards the rear of the roof.

The roof pod contains two antennas for the SDARS system. One receives the digital transmissions from the SDARS satellites and the second receives transmissions from the ground based repeater stations.

The SDARS antennas are connected to the SDARS receiver using co-axial cables.

SDARS RECEIVER

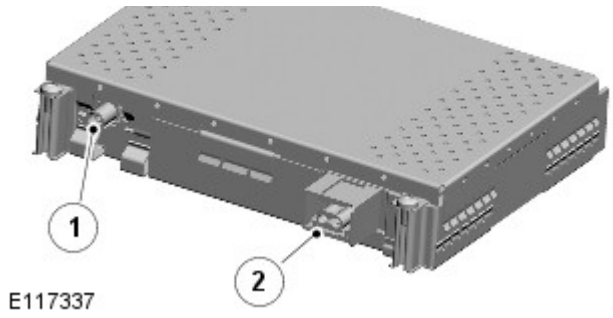


The SDARS receiver is a dedicated SDARS head unit and tuner which is controlled by the IHU on the MOST ring. The receiver is located in the LH rear of the luggage compartment.

The receiver processes the signals from the SDARS antennas. The signals are filtered and the receiver determines which of the two signals is the strongest with the least distortion to use for the audio output. For example, if the vehicle drives into a tunnel, the receiver will change from a satellite signal to a repeater station signal to maintain the strongest signal.

The receiver also contains software and hardware to allow digital reception in Canada in addition to the USA.

HYBRID DIGITAL (HD) RADIO



ITEM	DESCRIPTION
1	Antenna connector
2	Power, ground and MOST connector

Hybrid Digital (HD) radio is a ‘free to air’ alternative to the SDARS subscription system. The HD module is designed to receive and convert radio signals transmitted by stations sending out a hybrid signal (both analogue and digital) in both AM and FM frequencies. As it is digital, textual data such as song titles can also be displayed.

HD radio does not require a dedicated antenna. It uses the existing AM/FM antennas. If HD radio is specified to the vehicle, the output from the antenna amplifier is diverted to the HD module instead of the IHU tuner

NOTE:

Not all radio stations will provide the HD element of the broadcast.

HD Radio provides digital signals to improve standard AM/FM audio quality. It also provides additional secondary HD channels on FM, when available.

The HD broadcast is carried with an existing AM/FM signal. This means that if the HD signal is unavailable, the analogue (AM/FM) signal is automatically selected.

HD radio stations simultaneously transmits a digital version of the analog broadcast and also provide a second digital channel, which can be used for alternate radio programming or data services such as song information, weather reports and car navigation updates.

HD radio transmits the digital signals in unused portions of the same channel as the analogue AM and FM signals, known as In-Band On-Channel (IBOC). As a result, radios are more easily designed to pick up both signals and tune into the station's analogue (AM/FM) signal first and then look for a digital signal.

AUDIO SYSTEM DIAGNOSTICS

The TSD can store diagnostic fault codes to enable diagnosis of system malfunctions. The fault codes can be accessed using Land Rover approved diagnostic equipment or by using the on-board diagnostic routine available on the TSD. Refer to the TSD section for details.

DIGITAL AUDIO BROADCAST (DAB)

The DAB module is located in the Left Hand (LH) side of the luggage compartment. DAB is available for most European markets and gives access to digital radio channels for better sound quality and enhanced functionality depending on local service availability.

The system receives reception signals from the following sources to ensure optimum signal strength:

- DAB L-band antenna located in the roof pod antenna module
- DAB band III antenna located in the RH rear side window.

The DAB module is a dedicated receiver/tuner which is controlled by the IHU on the MOST ring. The module processes the signals from the DAB antennas. Digital information is transmitted on the MOST ring and processed by the IHU. The processed information is sent out to the audio amplifier, converted to analogue then broadcast through the speaker system.

DIAGNOSTICS

Digital radio transmission does not always produce a higher resolution sound. This is very much dependant on the compression rate the provider is transmitting the signal.

Coverage of the digital network is still relatively young in terms of development and is constantly evolving. The United Kingdom for example currently enjoys a coverage of more than 85%, France in comparison is limited to a 20% coverage. Prior to any diagnostic action in the event of a customer reception complaint consider the following:

- DAB reception depends on local channels/stations and their signal strength
- Reception is affected by tunnels, hills, tall buildings or densely tree-lined roads.

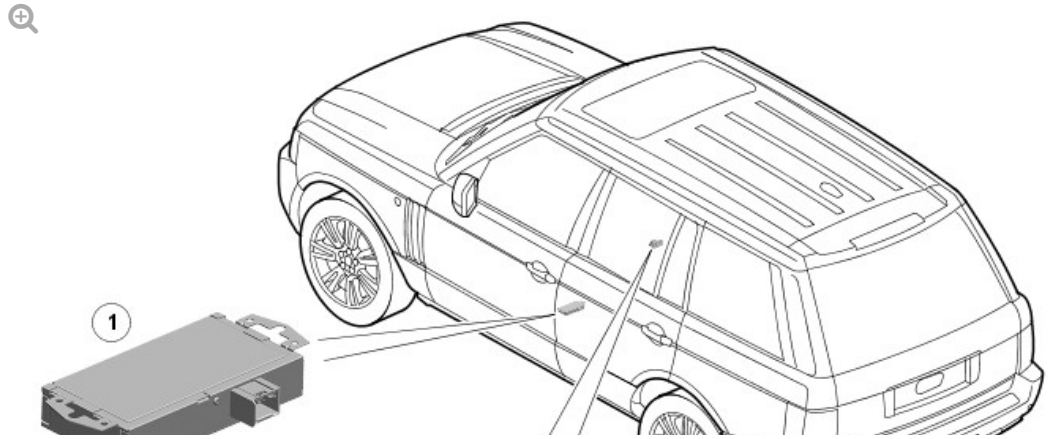
Try using a stored channel with proven strength in your area to demonstrate.

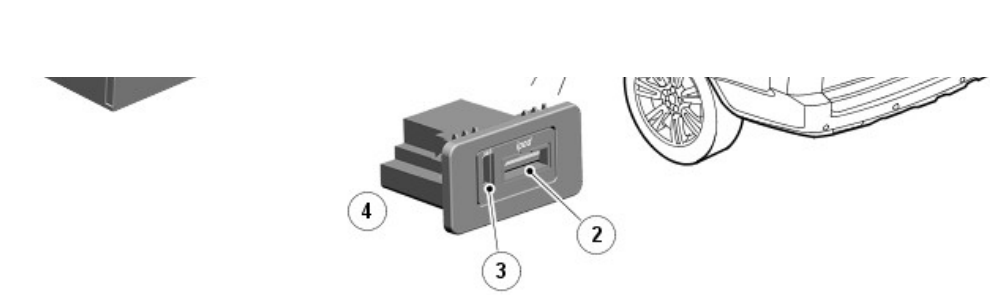
During periods of signal strength deterioration, the DAB system is designed to notify the driver that the signal is weak. As an alternative to muting the sound, possibly replicating a fault symptom to the driver, the over-laying of a 'bubbling' sound is deliberately produced during the transmission. This sound should also not be perceived as a fault, no further diagnosis is required in this instance.

NOTE:

The DAB system will not revert to a FM station in the event of signal loss.

PORTABLE AUDIO INTERFACE





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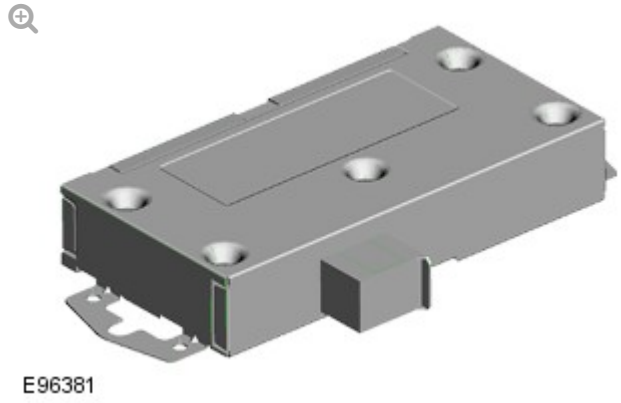
ITEM	DESCRIPTION
1	Portable audio module
2	iPod port
3	USB port
4	Portable audio interface

Portable audio devices can be connected to the interface panel, located in the front center armrest. Auxiliary devices can be connected to the AUX socket in the Audio Visual Input Output (AVIO) panel at the rear of the floor console.

The portable audio interface system comprises a portable audio interface module, which is located below the driver's seat, and an interface panel located in the center armrest cubby box.

Portable Audio Module



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Portable devices that can be connected include:

- USB mass storage devices (for example a memory stick). Devices must use FAT or FAT32 file format

- iPod® (iPod Classic®, iTouch®, iPhone® and Nano® are supported - full functionality for older devices cannot be guaranteed). iPod Shuffle® functionality cannot be guaranteed

NOTE:

iPod® is a trademark of Apple Computer Inc., registered in the US and other countries.

A dedicated iPod lead is available from Land Rover Dealers.

Auxiliary device (personal audio, MP3 players, all iPods®)

If an iPod® or mass storage device is connected, use the TSD to operate and search the device. Many of the controls are similar to those available for CD (compact disc) play.

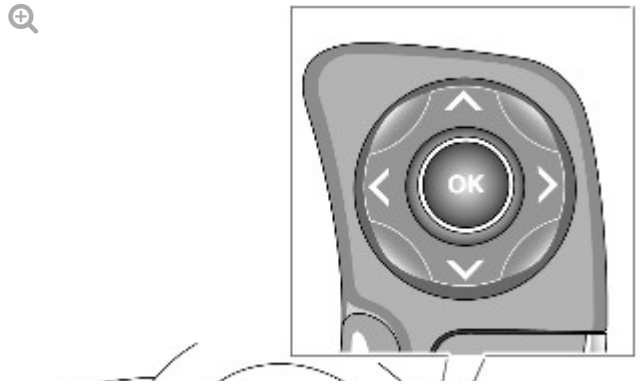
If you are using any portable media device via the AUX socket, then playback control must be from the device itself.

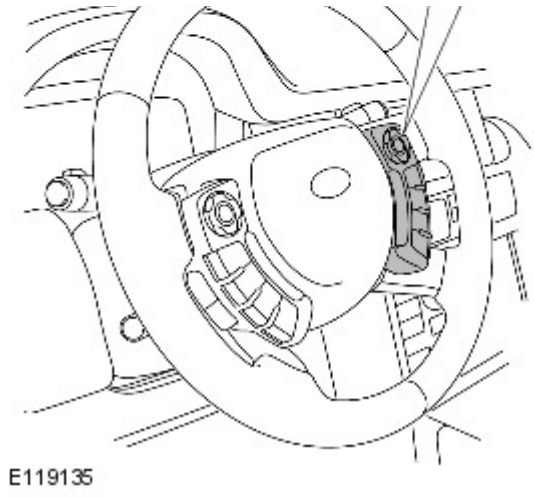
NOTES:

- an iPod shuffle may be connected via the AUX socket.
- The audio system will play MP3, WMA, WAV and AAC files.

Refer to the Owners Handbook for details of portable audio interface operation.

STEERING WHEEL SWITCHES





The audio system can be controlled using steering wheel mounted control to adjust audio settings.

Four positions on the switch control volume up, volume down, search up and search down.

The steering wheel audio control switches are hardwired to steering wheel module. The module converts the switch selections into LIN (local interconnect network) bus messages which are passed via the rotary coupler to the CJB. These signals are then passed from the CJB to the IHU to control the requested audio functions.

INITIAL SCREEN DISPLAY

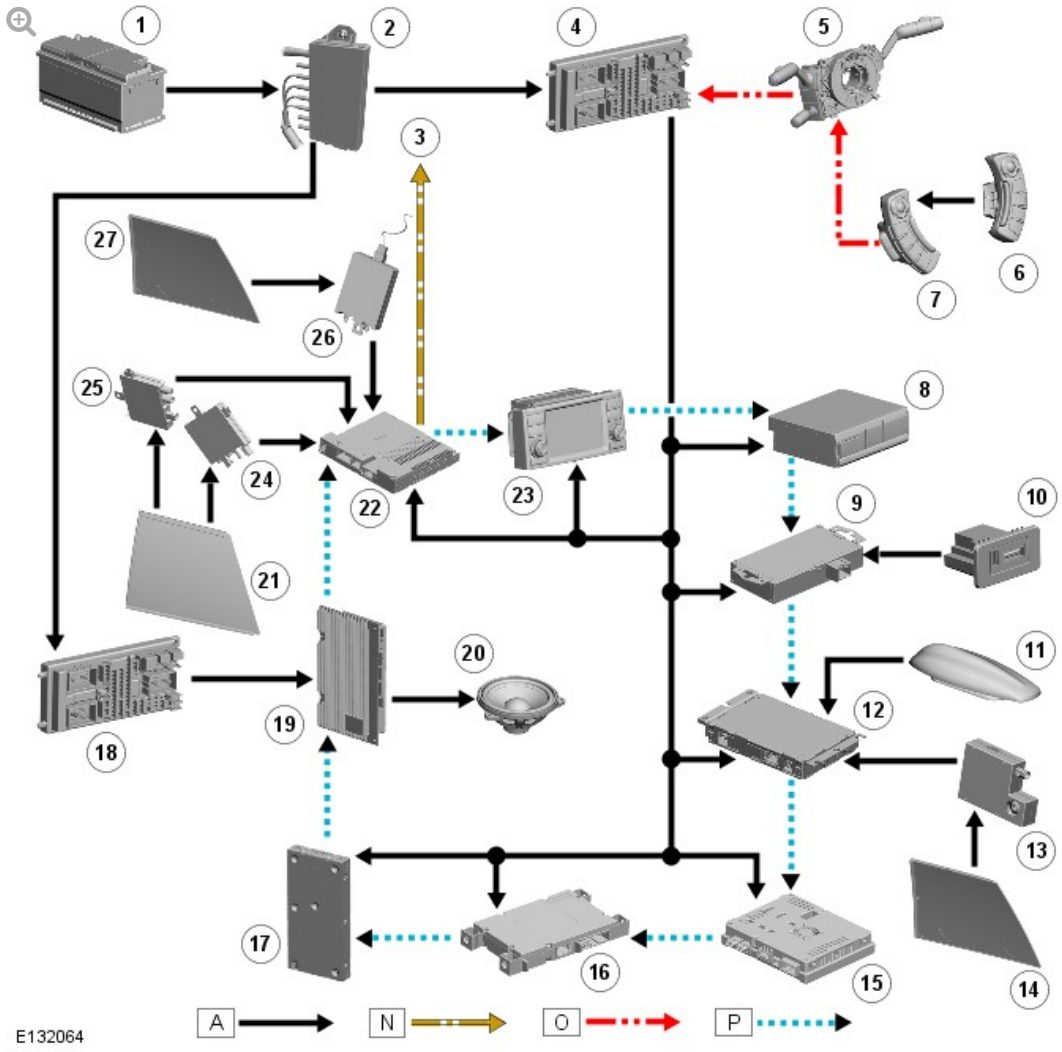
Once powered the TSD will initially display the 'Range Rover' image for a short time followed by the last displayed screen or menu. On a new vehicle, when the system is operated for the first time, the system will display the 'Home' menu to allow the user to adjust the factory default settings. The system settings are set to suit the market to which the vehicle is to be delivered. These can be changed by the customer to suit their preferences.

The infotainment system can be operated at times when the ignition is in the off mode and is known as one hour mode. Pressing the audio on/off button will power the system for a period of one hour. After the one hour period, the system will power down to avoid excessive drain on the vehicle battery.

AUDIO SYSTEM CONTROL DIAGRAM

NOTES:

- Not all the components shown are related to the audio system, but form part of the MOST ring.
- **A** = Hardwired, **N** = Medium Speed CAN bus, **O** = LIN Bus, **P** = MOST



ITEM	DESCRIPTION
1	Battery
2	Battery Junction Box (BJB)
3	Medium Speed Controller Area Network (CAN) bus to other systems
4	Central Junction box (CJB)
5	

5	Clockspring
6	RH steering wheel switch module
7	Left Hand (LH) steering wheel switch module
8	Compact Disc (CD) autochanger
9	Portable audio module
10	Portable audio interface
11	Roof pod (SDARS/DAB)
12	SDARS/HD/DAB module
13	DAB Antenna amplifier
14	RH side window DAB antenna
15	TV module
16	Telephone module
17	Rear Seat Entertainment (RSE) module
18	Rear Junction Box (RJB)
19	Audio amplifier
20	Speakers
21	Left Hand (LH) glass antenna (AM/FM/Diversity/TV)
22	Integrated Head Unit (IHU)
23	Touch Screen Display (TSD)
24	AM/FM antenna amplifier
25	AM/FM diversity antenna amplifier
26	FM antenna amplifier
27	Right Hand (RH) glass antenna (DAB/TV/Auxiliary park heating)