

2012.0 RANGE ROVER (LM), 415-01

AUDIO UNIT

DESCRIPTION AND OPERATION

AUDIO SYSTEM COMPONENT LOCATION - RANGE ROVER ULTIMATE - SHEET 1 OF 2



ITEM	DESCRIPTION
1	Integrated Head Unit (IHU)
2	compact disc (CD) autochanger
3	Speakers
4	Touch Screen Display (TSD)
5	Instrument cluster
6	Clock spring
7	Steering wheel switches
8	RH rear seat audio control switch
9	Portable audio interface
10	LH rear seat audio control switch
11	Portable audio module
12	Central Junction Box (CJB)
13	Rear Entertainment Control Module (RECM)

AUDIO SYSTEM COMPONENT LOCATION - RANGE ROVER ULTIMATE - SHEET 2 OF 2



ITEM	DESCRIPTION
1	Rear seat audio control relay
2	Roof pod antenna DAB or SDARS (NAS and Canada only) with / without GPS (Navigation)
3	VICS Amplifier (Japan only)) or Traffic Management Channel (TMC)
4	Right Hand (RH) glass antenna (DAB/TV/Auxiliary park heating)
5	Digital Audio Broadcast (DAB) antenna amplifier
6	RH Rear TV / Auxiliary park heating antenna amplifier (Ref only)
7	Rear entertainment junction box
8	Antenna filter
9	Antenna filter
10	Hybrid Digital (HD) radio module
11	Audio amplifier
12	SDARS receiver (NAS only)
13	Left Hand (LH) TV antenna amplifier (Ref only)
14	AM/FM / diversity antenna amplifier
15	LH glass antenna (AM/FM/Diversity/TV)
16	FM antenna amplifier

GENERAL

The Range Rover Ultimate audio system comprises a Logic7 HD 1200W Premium audio amplifier, 19 speaker system which uses the dual view Touch Screen Display (TSD) as its interface.

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 fitted with the Logic7 HD Premium systems.

Additional audio/multimedia features on the Range Rover Ultimate are:

- Telephone
- Satellite navigation
- Television / Teletext
- Voice recognition system (navigation and telephone)
- Digital radio - DAB/SDARS/HD
- Apple iPad® integration.

NOTE:

iPad is a trademark of Apple Inc., registered in the U.S.A. and other countries

M O S T

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 multimedia applications. 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	Digital Radio (DAB/SDARS/HD)
5	Audio amplifier
6	Television (TV) tuner
7	Telephone module
8	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
- 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.

NOTE:

On Range Rover Ultimate vehicles, software downloads to the Integrated Head Unit (IHU) or any component on the MOST ring requires the disconnection of the Rear Entertainment Control Module (RECM) from the medium speed controller area network (CAN) bus. Refer to the Audio/Video System Software Downloads section in the Video System section.

For additional information, refer to: Video System (415-07, Description and Operation).

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 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 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.

REAR ENTERTAINMENT CONTROL MODULE (RECM)

The RECM is an additional component unique to Range Rover Ultimate. The RECM is located on a bracket, adjacent to the CD autochanger in the rear of the glove compartment.

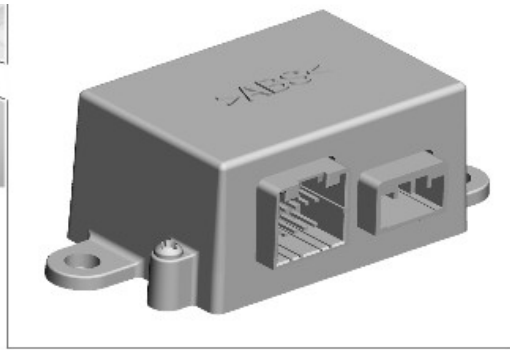
The RECM provides a gateway between the IHU and the medium speed CAN (controller area network) bus system. In response to inputs from the rear audio control switches, the RECM manipulates CAN messages for audio control and routes the Apple iPad audio output into the vehicle audio system.

For further details on the RECM refer to the Video section.

For additional information, refer to: Video System (415-07, Description and Operation).

REAR SEAT AUDIO CONTROL RELAY





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The rear seat audio control relay is an additional component unique to Range Rover Ultimate. The relay is located at the rear of the front floor console, below the rear passenger compartment air vents. The module is secured to the front floor console with two flange bolts.

The rear seat audio control relay receives audio output from an individual iPad and forwards the output to the IHU. The relay ensures that only the output from one iPad is passed to the IHU for audio through the vehicle speaker system.

For additional information, refer to: Video System (415-07, Description and Operation).

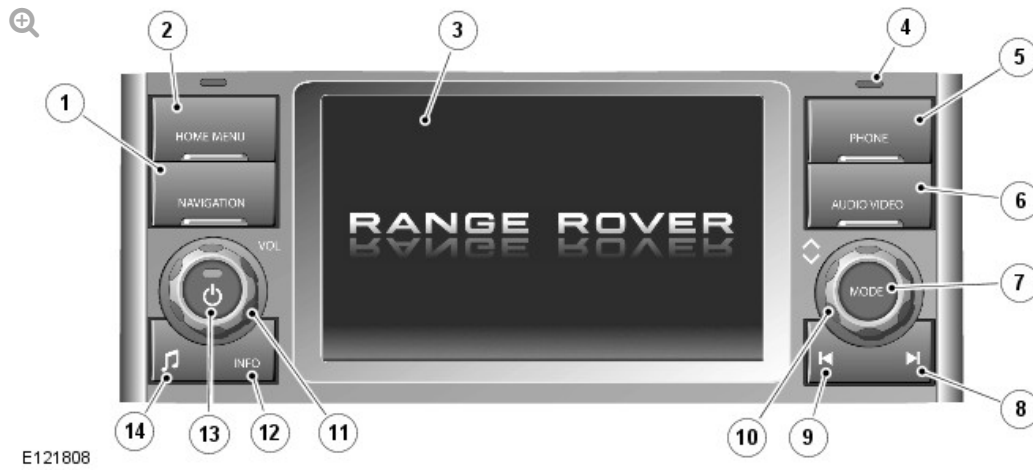
AUDIO SYSTEM

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 rear view camera, proximity cameras, VentureCam™, the Traffic Message Channel (TMC) and the navigation system.

The 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 the 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.

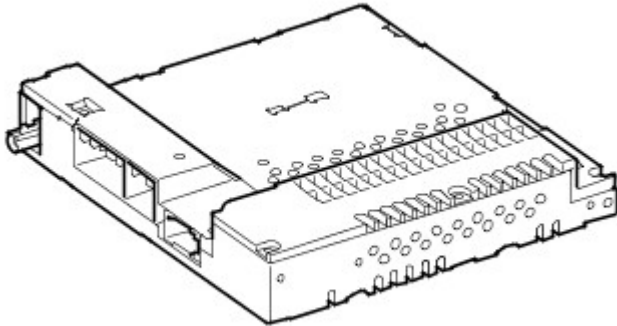
Care should be taken with the TSD to ensure its correct operation:

- 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 a finger to operate the touch screen. Ensure only use one finger is used 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)



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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 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.

On the Range Rover Ultimate, the IHU is connected via the medium speed CAN bus to the Rear Entertainment Control Module (RECM). CAN messages for audio control pass through the RECM which operates as a CAN gateway for the IHU. The RECM passes on audio volume, channel skip and audio source messages from the rear seat audio switches to the IHU. For further details on the RECM and its functions, refer to the Video section For additional information, refer to: Video System (415-07, Description and Operation).

Radio signals are received by antennae located in the left hand rear quarter window and the rear screen. An frequency modulation (FM) antenna

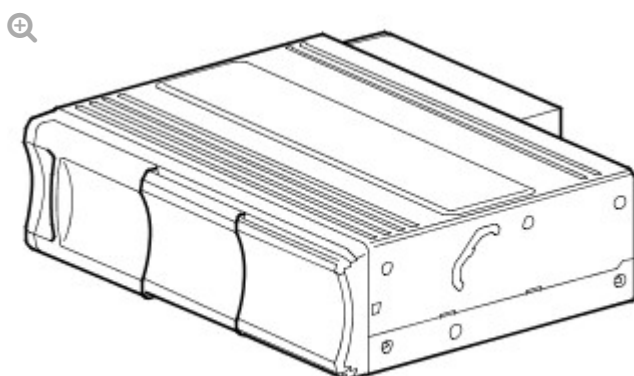
amplifier is located in the upper taildoor and passes amplitude modulation (AM)/FM signals from the rear screen antennae to the IHU. A diversity antenna is located in the left hand rear quarter window. A FM diversity antenna amplifier is located behind the left hand luggage compartment trim panel, below 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.

NOTE:

On Range Rover Ultimate vehicles, software downloads to the Integrated Head Unit (IHU) or any component on the MOST ring requires the disconnection of the Rear Entertainment Control Module (RECM) from the medium speed CAN bus. Refer to the Audio/Video System Software Downloads section in the Video System section. For additional information, refer to: Video System (415-07, Description and Operation).

6 DISC CD AUTOCHANGER



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The six disc CD autochanger is located at the rear of the glove compartment. The CD autochanger is a standard fitment on all Range Rover

models. The CD autochanger is capable of playing audio CD's and MP3 CD's. 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 CJB.

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

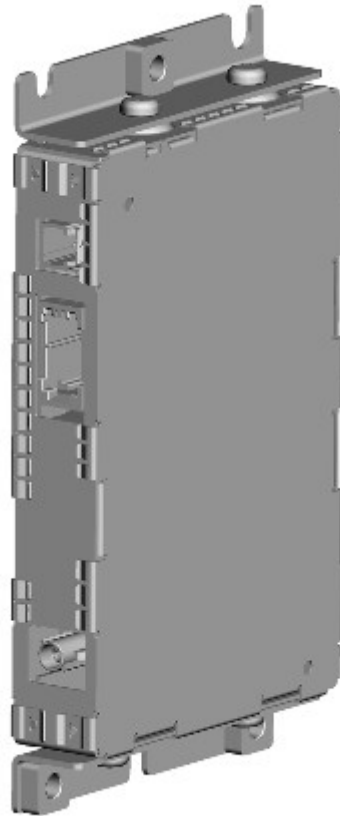


The SDARS antenna is located in the roof pod and is shared with the telephone system and the navigation system where fitted. The roof pod is located externally in a central position towards the rear of the roof.

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



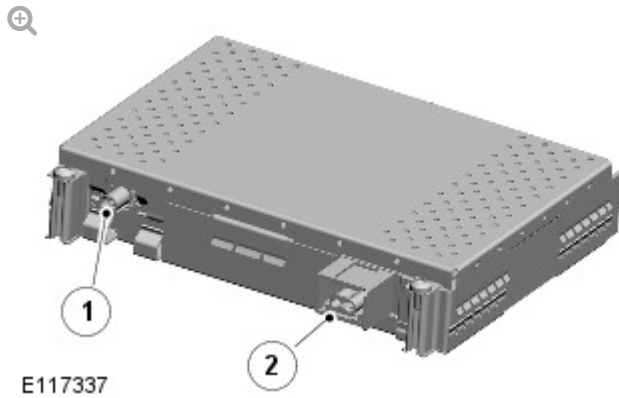
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The SDARS receiver is a dedicated SDARS head unit and tuner which is controlled by the IHU on the MOST ring. The receiver is located in the LH rear of the luggage compartment.

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 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 (right-hand) 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:

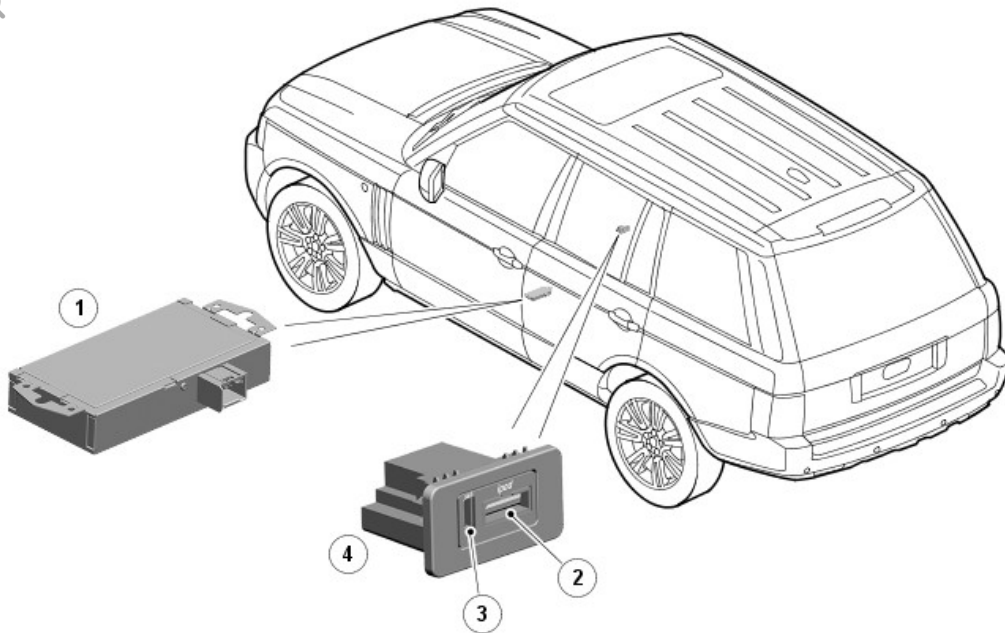
- DAB reception depends on local channels/stations and their signal strength
- Reception is affected by tunnels, hills, tall buildings or densely tree-lined roads.

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.



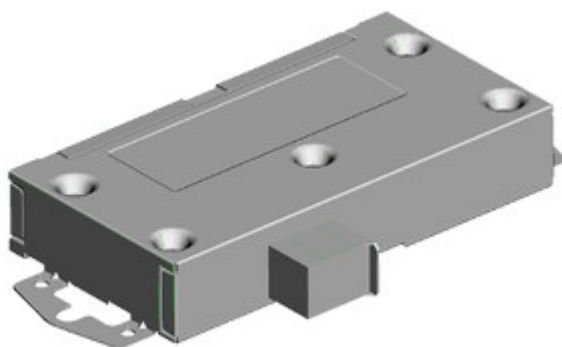
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ITEM	DESCRIPTION
1	Portable audio module
2	iPod port
3	USB port
4	Portable audio interface

Portable audio devices can be connected to the interface panel, located in the front center armrest.

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®, iPod® Nano®, iPod® touch® and iPhone® 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 U.S.A. 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, the TSD is used to operate and search the device. Many of the controls are similar to those available for CD (compact disc) play.

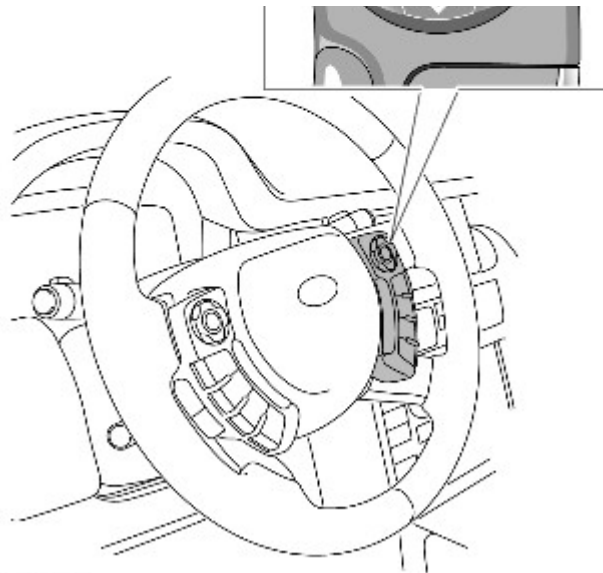
NOTE:

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





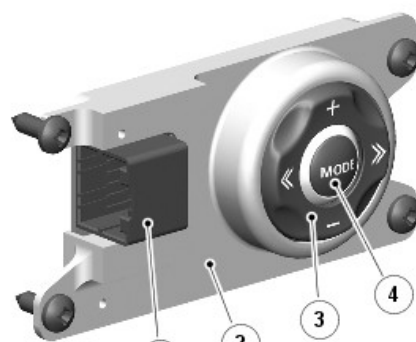
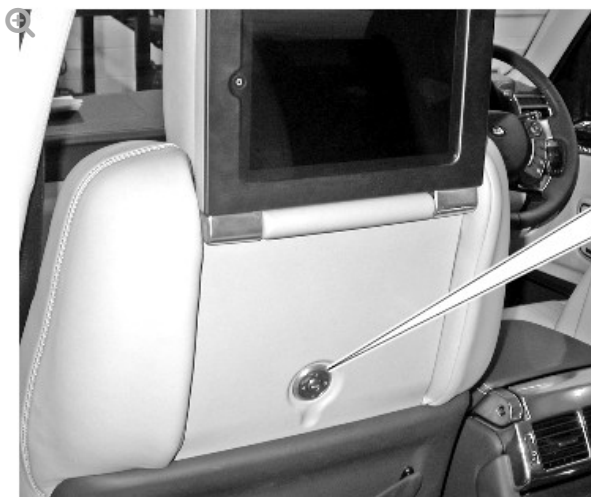
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The audio system can be controlled using steering wheel mounted control to adjust audio settings.

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 clockspring to the CJB. These signals are then passed from the CJB to the IHU to control the requested audio functions.

REAR SEAT AUDIO CONTROL SWITCHES



ITEM	DESCRIPTION
1	Electrical connector
2	Housing
3	Audio volume and skip switch
4	MODE select switch

A rear seat audio control switch is located in the rear of each front seat, behind the iPad docking station lid and are unique to the Range Rover Ultimate. The switches are accessed by raising the iPad docking station.

Each rear seat audio control switch is connected directly to the RECM. The RECM processes the switch operation and converts the switch operation into CAN messages to the IHU to control the audio output and mode selection.

For additional information, refer to: Video System (415-07, Description and Operation).

INITIAL TSD 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 0 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	Clockspring
6	Right Hand (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 audio control switch - LH
18	Rear audio control switch - RH
19	Speakers

20	Audio amplifier
21	Rear entertainment junction box
22	iPad - LH
23	iPad - RH
24	Rear seat audio control relay
25	Rear Entertainment Control Module (RECM)
26	Rear Junction Box (RJB)
27	Left Hand (LH) glass antenna (AM/FM/Diversity/TV)
28	AM/FM diversity antenna amplifier
29	AM/FM antenna amplifier
30	Integrated Head Unit (IHU)
31	Touch Screen Display (TSD)
32	FM antenna amplifier
33	Right Hand (RH) glass antenna (DAB/TV/Auxiliary park heating)

2012.0 RANGE ROVER (LM), 415-01

AUDIO UNIT

AUDIO UNIT (G910521)

REMOVAL AND INSTALLATION

REMOVAL

WARNINGS:

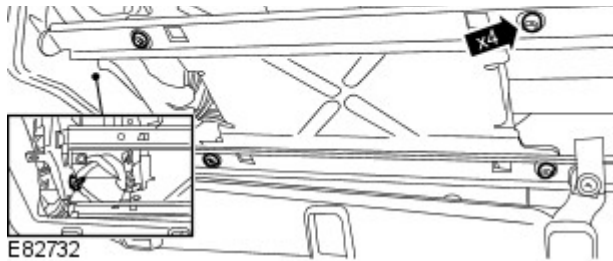
- Persons working on the supplemental restraint system (SRS) must be fully trained and have been issued with the safety guidelines.
- Allow a period of 10 minutes to elapse after disconnecting the battery before undertaking any work on the SRS.
- The SRS electrical connectors are unique. DO NOT force, 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.

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

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

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3. Remove the lower glove compartment.
For additional information, refer to: Lower Glove Compartment (501-12, Removal and Installation).

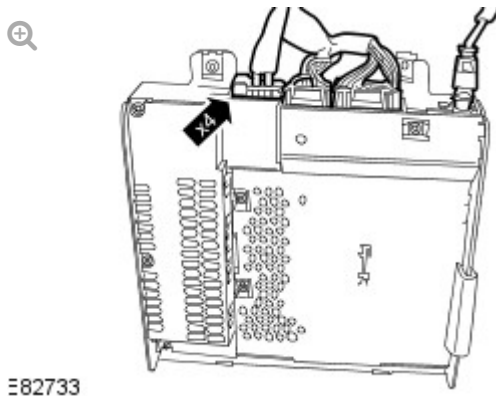
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4. 



Release the audio unit.

- Remove the 4 screws.
- Release the wiring harness clip.

5.



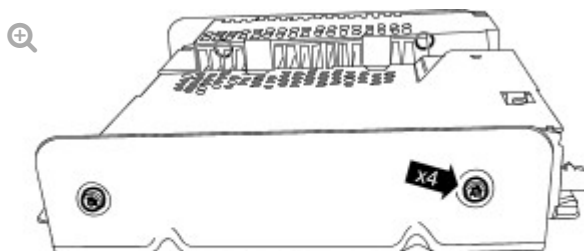
Remove the audio unit.

- Disconnect the 2 electrical connectors.
- Disconnect the coaxial cable connector.
- Disconnect the optical connector.

6.

NOTE:

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



E82734

Disassemble the audio unit from the carrier bracket.

- Remove the 4 screws.
- Remove the audio unit.

INSTALLATION

1. Assemble the audio unit to the carrier bracket.

- Install the screws.

2. Install the audio unit.

- Connect the electrical connectors.
- Connect the coaxial cable connector.
- Connect the optical connector.

3. Secure the audio unit.

- Secure the wiring harness clip.
- Install the screws.

4. Install the lower glove compartment.

For additional information, refer to: Lower Glove Compartment (501-12, Removal and Installation).

5. Connect the battery ground cable.

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

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AUDIO UNIT

AUDIO AMPLIFIER (G928044)

REMOVAL AND INSTALLATION

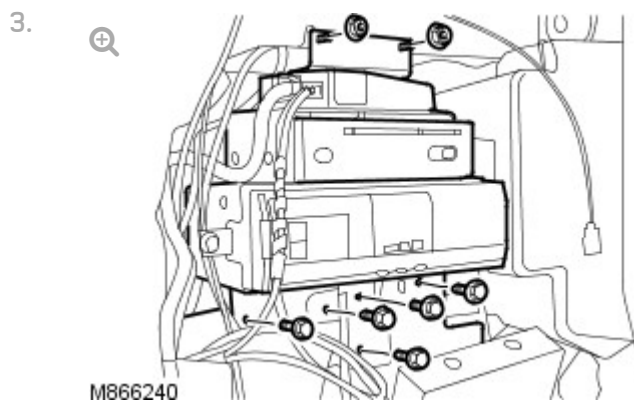
86.50.36	AMPLIFIER - POWER - RENEW	ALL DERIVATIVES	1.1	USED WITHINS	+
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REMOVAL

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

2. Remove the information and entertainment module.

For additional information, refer to: Information and Entertainment Module (419-10, Removal and Installation).

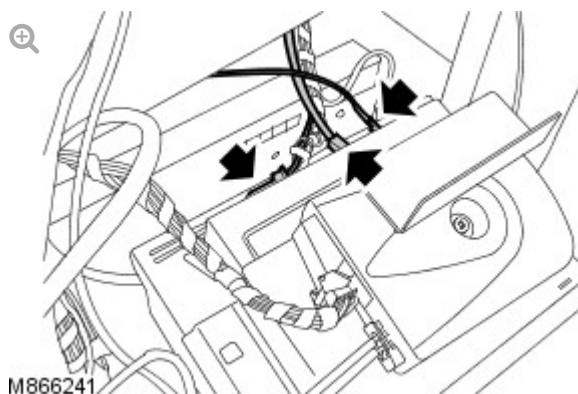


Release the information and entertainment assembly.

- Remove the 5 bolts.
- Remove the 2 nuts.

4. **CAUTION:**

Cover fiber optic cable connectors to minimize dust ingress and avoid bending the cables in a radius of less than 30 mm.



Reposition the information and entertainment assembly for access.

- Disconnect the 2 coaxial cable connectors.
- Disconnect the 3 electrical connectors.
- Disconnect the 3 optical connectors.

5. Remove the information and entertainment assembly.

6.

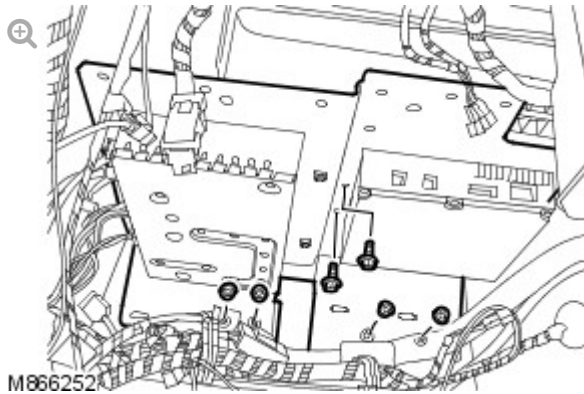
CAUTION:

Cover fiber optic cable connectors to minimize dust ingress and avoid bending the cables in a radius of less than 30 mm.

Remove the satellite radio tuner (NAS variants only).

- Disconnect the optical connector.
- Disconnect the electrical connector.
- Remove the bolt.

7.



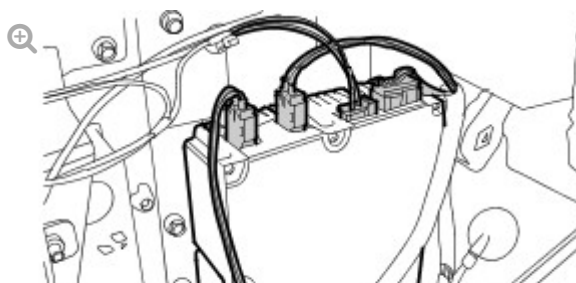
Release the audio unit amplifier and television (TV) receiver assembly.

- Remove the 2 bolts and 4 nuts securing the audio unit amplifier and TV receiver mounting bracket.

8.

CAUTION:

Cover fiber optic cable connectors to minimize dust ingress and avoid bending the cables in a radius of less than 30 mm.





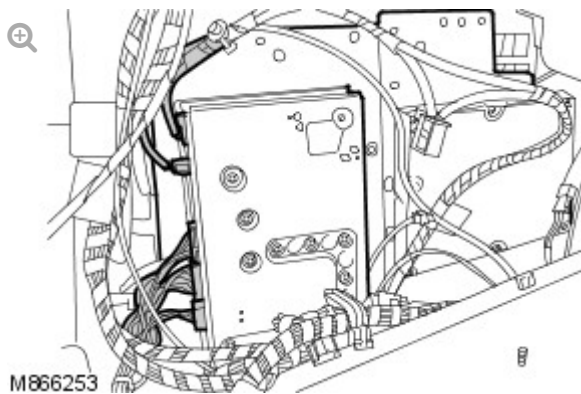
Disconnect the TV receiver connections.

- Disconnect the optical connector.
- Disconnect the 3 electrical connectors.

9.

CAUTION:

Cover fiber optic cable connectors to minimize dust ingress and avoid bending the cables in a radius of less than 30 mm.



Disconnect the audio unit amplifier connections.

- Disconnect the audio unit amplifier 2 optical connectors.
- Disconnect the 3 electrical connectors.
- Release the wiring harness clip.

10. Remove the audio unit amplifier and TV receiver assembly.

11. Remove the audio unit amplifier.

- Remove the 4 bolts.

INSTALLATION

1. Install the audio unit amplifier to the mounting bracket.

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

2. Install the audio unit amplifier and TV receiver assembly.

- Connect the electrical connectors.
- Connect the optical connectors.
- Secure the wiring harness clip.

3. Secure the audio unit amplifier and TV receiver assembly.

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

4. Install the satellite radio tuner (NAS variants only).

- Tighten the bolt to 10 Nm (7 lb.ft).
- Connect the electrical connector.
- Connect the optical connector.

5. Install the information and entertainment assembly.

- Connect the coaxial cable connectors.
- Connect the electrical connectors.
- Connect the optical connector.
- Tighten the bolts to 10 Nm (7 lb.ft).

6. Install the information and entertainment module.

For additional information, refer to: Information and Entertainment Module (419-10, Removal and Installation).

7. Connect the battery ground cable.

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

8. Using the Land Rover approved diagnostic equipment, follow the on-screen instructions and configure the audio unit amplifier.

2012.0 RANGE ROVER (LM), 415-01

AUDIO UNIT

COMPACT DISC (CD) CHANGER (G874148)

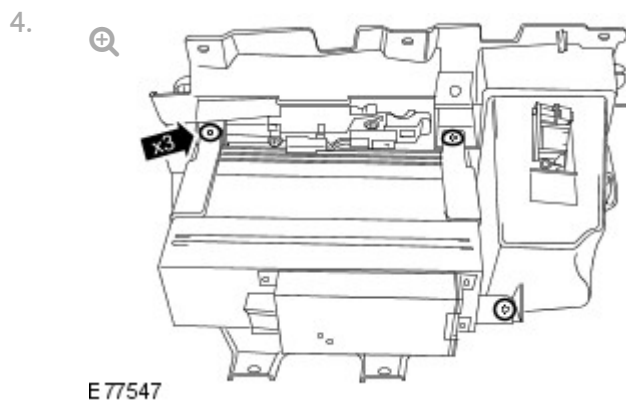
REMOVAL AND INSTALLATION

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.

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 upper glove compartment.
For additional information, refer to: Upper Glove Compartment (501-12, Removal and Installation).

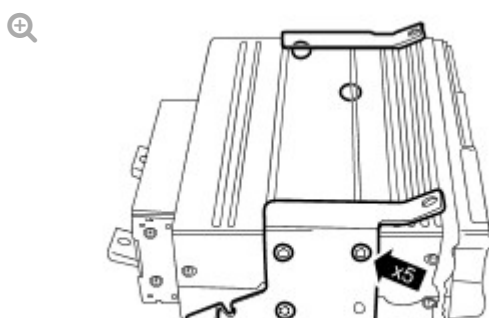


Remove the compact disc (CD) changer.

- Remove the 3 screws.

5. **NOTES:**

- Do not disassemble further if the component is removed for access only.
- Right-hand shown, left-hand similar.





Remove the bracket from the CD changer.

- Remove the 5 screws.

INSTALLATION

1. Install the CD changer bracket.

- Install the 5 screws.

2. Install the CD changer.

- Install the 3 screws.

3. Install the upper glove compartment.

For additional information, refer to: Upper Glove Compartment (501-12, Removal and Installation).

4. Connect the battery ground cable.

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

2012.0 RANGE ROVER (LM), 415-01

AUDIO UNIT

INTEGRATED CONTROL PANEL (ICP) (G1246641)

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:

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

-
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).
-

For additional information, refer to: Specifications (501-02, Specifications).

-
3. Remove the instrument panel upper section.

For additional information, refer to: Instrument Panel Upper Section (501-12, Removal and Installation).

-
4. 

Remove the 4 screws securing the integrated control panel (ICP) bracket to the instrument panel.

-
5. 

Remove the ICP assembly.

- Disconnect the electrical connectors.
- Disconnect the co-axial cables.

-
- 6.

NOTE:

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



Remove the ICP from the ICP bracket.

- Remove the 4 screws.

INSTALLATION

-
1. Install the ICP to the ICP bracket.

- Install the 4 screws.

-
2. Install the ICP assembly.

2. Install the ICP assembly.

- Connect the electrical connectors.
- Connect the co-axial cables.

3. Install the screws securing the ICP to the instrument panel.

4. Install the instrument panel upper section.

For additional information, refer to: Instrument Panel Upper Section (501-12, Removal and Installation).

5. Connect the battery ground cable.

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

2012.0 RANGE ROVER (LM), 415-01

AUDIO UNIT

SATELLITE RADIO TUNER

[G1246452]

REMOVAL AND INSTALLATION

86.50.84	RECEIVER - SDARS - RENEW	ALL DERIVATIVES	0.3	USED WITHINS	+
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REMOVAL

CAUTION:

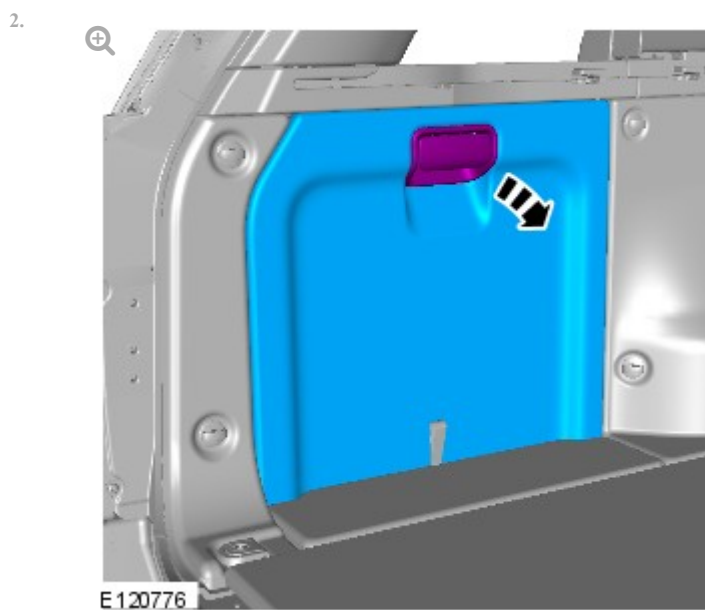
Cover fiber optic cable connectors to minimize dust ingress and avoid

bending the cables in a radius of less than 30 mm.

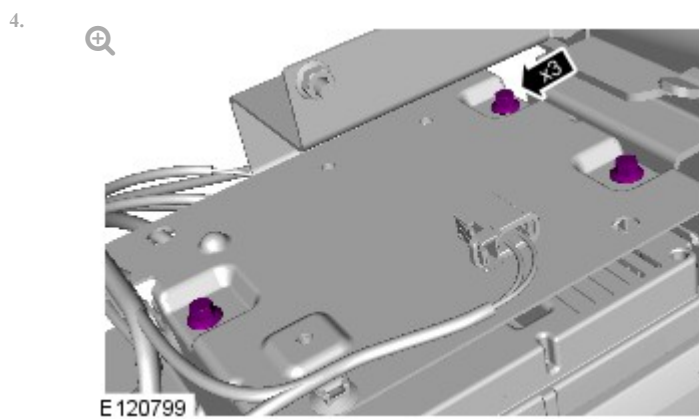
NOTE:

Removal steps in this procedure may contain installation details.

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

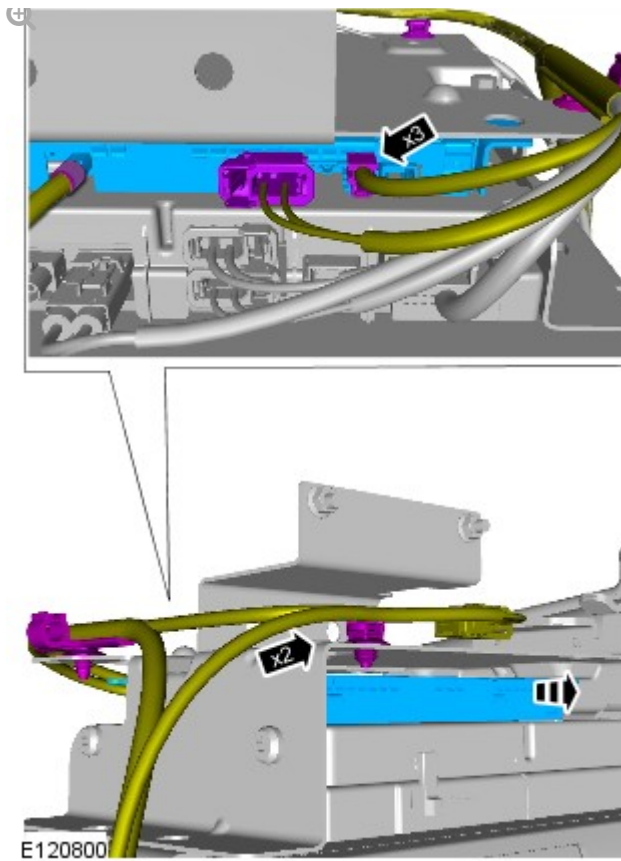


3. Refer to: Bluetooth Module (419-08, Removal and Installation).



Torque: 8 Nm

- 5.



INSTALLATION

1. To install, reverse the removal procedure.
2. Using the diagnostic tool, follow the on-screen instructions and configure the satellite radio.

2012.0 RANGE ROVER (LM), 415-01

AUDIO UNIT

STEERING WHEEL AUDIO CONTROLS [G1240114]

REMOVAL AND INSTALLATION

REMOVAL

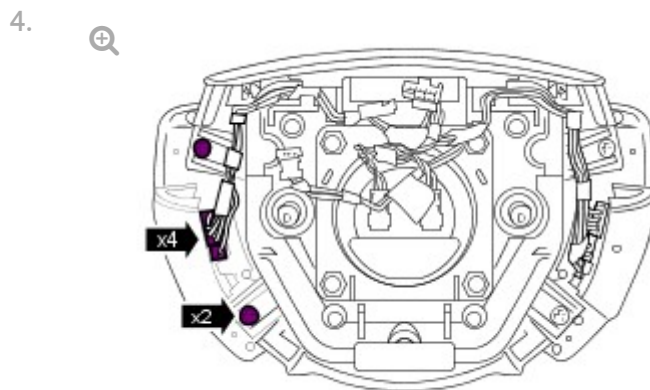
WARNINGS:

- 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.

-
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).



E120666

Remove the steering wheel audio controls.

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

INSTALLATION

-
1. Install the steering wheel audio controls.
 - Connect the 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).

2012.0 RANGE ROVER (LM), 415-01

AUDIO UNIT

TELEVISION (TV) AMPLIFIER AND FUSE FIRED BOOSTER

HEATER TRANSCEIVER UNIT

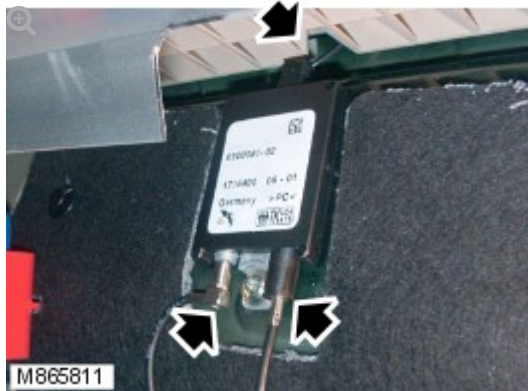
(G928046)

REMOVAL AND INSTALLATION

REMOVAL

1. Remove the access panel from the loadspace trim panel RH.

2.



Disconnect the 2 coaxial cables from the television (TV) amplifier and fuel fired booster heater transceiver unit.

3. Release the TV amplifier and fuel fired booster heater transceiver unit.
4. Remove the TV amplifier and fuel fired booster heater transceiver unit.
 - Disconnect the electrical connector.

INSTALLATION

1. Install the TV amplifier and fuel fired booster heater transceiver unit.
 - Connect the electrical connector.

-
2. Secure the TV amplifier and fuel fired booster heater transceiver unit.
 - Tighten the bolt to 6 Nm (4 lb.ft).

 3. Connect the TV amplifier and fuel fired booster heater transceiver unit.

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

2012.0 RANGE ROVER (LM), 415-01

AUDIO UNIT

TELEVISION (TV) RECEIVER

[G1240239]


REMOVAL AND INSTALLATION

REMOVAL

NOTE:

Removal steps in this procedure may contain installation details.

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

2. 

3. **CAUTIONS:**

- Take extra care not to damage the wiring harnesses.
- Make sure that the fiber optic cables are not bent to a radius of less than 25 mm.



Torque: 10 Nm

4. **NOTE:**

Component illustrated, removed for clarity.



Torque: 10 Nm

5. **NOTE:**

New units must be configured using the Programmable Module Installation Routine in the diagnostic tool.



INSTALLATION

1. To install, reverse the removal procedure.





2012.0 RANGE ROVER (LM), 415-01

AUDIO UNIT

DIGITAL AUDIO MODULE (G1247259)

REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the battery ground cable.
Refer to: Specifications (414-00, Specifications).
2. Refer to: Rear Quarter Trim Panel (501-05, Removal and Installation).
3. 
4. 
5. 
6. 

7.



Torque: 10 Nm

8.



Torque: 10 Nm

9.



Torque: 10 Nm

10.



Torque: 5 Nm

11.

CAUTIONS:

- Make sure that excessive force is not used. Failure to follow this instruction may result in damage to the vehicle.
- Take extra care not to damage the wiring harnesses.



Torque: 10 Nm

12.

NOTE:

Component illustrated, removed for clarity.



13.

NOTE:

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



Torque: 10 Nm

14.



Torque: 10 Nm

15.



Torque: 10 Nm

INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 415-01

INFORMATION AND ENTERTAINMENT SYSTEM

DESCRIPTION AND OPERATION

Refer to the Audio section

For additional information, refer to: Audio System (415-01A, Description and Operation).

and the Video section

For additional information, refer to: Video System (415-07, Description and Operation).

for details of the Range rover Ultimate rear entertainment system.

2012.0 RANGE ROVER (LM), 415-01

INFORMATION AND ENTERTAINMENT SYSTEM

DIAGNOSIS AND TESTING

PRINCIPLES OF OPERATION

For a detailed description and operation of the information and entertainment system, refer to the relevant description and operation section of the workshop manual.

INSPECTION AND VERIFICATION

CAUTION:

Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked 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.
- 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
<ul style="list-style-type: none"> ▪ Check all audio system modules ▪ Compact disc player jammed, not loading ▪ Scratched/dirty compact discs ▪ Speakers ▪ Switch(s) stuck or damaged ▪ Loose items in door pockets or glove box rattling 	<ul style="list-style-type: none"> ▪ 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

SPEAKER DIAGNOSTICS

The symptom chart below should be used when diagnosing speaker faults and must be worked through prior to replacing any speakers

REPORTED SYMPTOM	SYMPTOM DESCRIPTION	POTENTIAL CAUSES (FOR GUIDANCE ONLY)	RECOMMENDED ACTION
<ul style="list-style-type: none"> ▪ Speaker Buzz 	<ul style="list-style-type: none"> ▪ Periodic high frequency sound (sounds like an insect buzzing) 	<ul style="list-style-type: none"> ▪ Resonance in a trim component, e.g. NVH (noise, vibration and harshness) insulating cloth against speaker grill mesh ▪ Lack of retention of interior and exterior trim panels ▪ Loose harness/harness clips 	<ul style="list-style-type: none"> ▪ 1. Replicate fault and confirm audio source(s) affected: DAB/CD/Bluetooth via phone/USB via phone/USB via iPod®/AM/FM radio ▪ 2. If fault is specific to one source, audio source must be investigated further as a speaker failure in this

		<ul style="list-style-type: none"> ▪ Labels vibrating against trim/nearby components ▪ Nearby modules vibrating against trim/BIW ▪ Mechanical failure of internal speaker component 	<p>instance is less likely, e.g. if issue is only seen on DAB, check DAB module is fully functioning correctly and software is up to date</p> <ul style="list-style-type: none"> ▪ 3. Confirm if issue is heard on stereo and/or surround sound settings ▪ 4. Isolate the customer symptom to specific vehicle area using balance and fade audio settings. Check for any loose objects in the area, e.g. pens, keys, coins, etc ▪ 5. Check for any previous work carried out in this area by referring to DDW to help in diagnosing the issue ▪ 6. Check SDD/Topix for any audio related SSM/TSB and software updates. Carry out service updates as required. Retest to confirm if issue is resolved
<ul style="list-style-type: none"> ▪ Speaker Rattle 	<ul style="list-style-type: none"> ▪ Sounds like loose components rattling around in / near the speaker 	<ul style="list-style-type: none"> ▪ Loose trim ▪ Loose items in or around speaker ▪ Loose fixings ▪ Debris inside speaker ▪ Loose harness 	<ul style="list-style-type: none"> ▪ 7. Apply pressure by hand to door/trim panel and nearby modules (i.e. switchpacks) to confirm if there is a change in symptom sound ▪ 8. If issue is still present, or condition changes by applying pressure to the trim, remove internal trim and apply gentle pressure to components within the door to see if sound changes. This will also allow access to relevant speaker
<ul style="list-style-type: none"> ▪ Speaker Hiss / Static 	<ul style="list-style-type: none"> ▪ Wideband noise (White Noise) / interference (such as experienced from a poorly tuned radio signal) 	<ul style="list-style-type: none"> ▪ Loose connection at speaker ▪ Loose connection at amplifier ▪ Loose connection at audio head unit ▪ Non JLR-approved equipment installed (e.g. USB cables) ▪ Damage to harness 	<ul style="list-style-type: none"> ▪ 9. If symptom condition is unchanged by applying pressure to the trim, examine trim

		<p>connected to the speaker</p> <ul style="list-style-type: none"> ▪ Audio amplifier fault ▪ Audio head unit fault 	<p>to find source of audio issue and fix as appropriate using Squeaks and Rattle kit LTB00389. If audio issue is still present then move to step 10</p> <ul style="list-style-type: none"> ▪ 10. Check around front face of speaker for any loose items that may be touching the speaker, e.g. debris, loose fixings, etc ▪ 11. Check all speaker fixing screws are secure and correctly torqued, refer to workshop manual for correct torque figures
<ul style="list-style-type: none"> ▪ Speaker Crackle 	<ul style="list-style-type: none"> ▪ Electrical crackling noise (such as from a loose electrical connection) ▪ A rapid succession of short sharp noises ▪ Electrical interference 	<ul style="list-style-type: none"> ▪ Loose connection at speaker ▪ Loose connection at amplifier ▪ Loose connection at audio head unit ▪ Non JLR-approved equipment installed (e.g. USB cables) ▪ Damage to harness connected to the speaker ▪ Audio amplifier fault ▪ Audio head unit fault ▪ Internal electrical issue in speaker 	<ul style="list-style-type: none"> ▪ 12. Check harness assembly is not vibrating against speaker unit or nearby trim/components and that it is clipped and routed correctly ▪ 13. Check harness assembly is not trapped or impeding the speaker unit and rectify as required ▪ 14. Check harness assembly connections are fully inserted and secured to speaker and amplifier. Also check harnesses are securely connected to nearby components ▪ 15. Check for harness damage and repair/replace as required ▪ 16. If a gasket is present on speaker, without removing the speaker visually check it is correctly seated against speaker surface and not noticeably damaged
<ul style="list-style-type: none"> ▪ Speaker Distorted 	<ul style="list-style-type: none"> ▪ No significant symptoms 	<ul style="list-style-type: none"> ▪ Loose trim ▪ Non JLR-approved 	<ul style="list-style-type: none"> ▪ 17. If audio issue is still present, remove speaker from mounting, retest

	<p>extraneous noise, but audio reproduction is not as expected e.g. is not clean sounding</p>	<p>equipment installed (e.g. USB cables)</p> <ul style="list-style-type: none"> ▪ Resonance in a trim component, e.g. NVH (noise, vibration and harshness) insulating cloth against speaker grill mesh ▪ Lack of retention of interior and exterior trim panels, nearby harnesses/components ▪ Mechanical failure of internal speaker component 	<p>meanings, retest speaker in hand to see if the fault is still present</p> <ul style="list-style-type: none"> ▪ 18. Check for debris in speaker and remove. Retest speaker in hand ▪ 19. Check for damage to speaker and replace speaker if damage is present ▪ 20. Connect new speaker to harness, check new speaker in hand to ensure fault has been rectified. If issue has been resolved, reassemble trim with new trim retention clips ▪ 21. Check if audio issue is still present. If issue has been resolved, reassemble trim and retest. If issue is still present, contact JLR Dealer Technical Support following the guidelines in the policy and procedures manual
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PINPOINT TESTS FOR SUSPECTED SPEAKER FAULTS

NOTE:

See separate Pinpoint Tests (below) for sub-woofer faults

PINPOINT TEST A : NO SOUND OUTPUT FROM SPEAKER(S)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: NO SOUND OUTPUT FROM SPEAKER(S)	
	<p>1 Check speaker operation</p>
	<p>Is the harness connector securely connected to the audio head unit and the speaker unit(s)?</p> <p>Yes</p>

	<p>Proceed to the next step GO to A2.</p> <p>No Reconnect wiring harness to audio head unit/speaker unit(s)</p>
A2: NO SOUND OUTPUT FROM SPEAKER(S)	
	<p>1 Check audio head unit operation</p>
	<p>Is the audio head unit operational?</p> <p>Yes Proceed to the next step GO to A3.</p> <p>No Check the integrity of the power supply circuits/fuses to the audio head unit and rectify as required</p>
A3: NO SOUND OUTPUT FROM SPEAKER(S)	
	<p>1 Check which speakers are operational</p>
	<p>Are all speakers working?</p> <p>Yes Proceed to the next step GO to Pinpoint Test B.</p> <p>No Use the fader control to direct audio output to different speaker locations to establish which units are non-operational. Refer to the electrical circuit diagrams and check the circuits between the audio head unit and the affected speaker units for short circuit to ground, open circuit, high resistance. Repair circuit(s) as required. If fault persists, replace non-operational speaker unit(s) as required</p>

PINPOINT TEST B : POOR OR WEAK SOUND OUTPUT FROM SPEAKER(S)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: POOR OR WEAK SOUND OUTPUT FROM SPEAKER(S)	
	<p>1 Check connections to speaker units</p>
	<p>Are the connectors inserted securely into the speaker units?</p> <p>Yes Proceed to the next step GO to B2.</p> <p>No Ensure all connectors are securely attached to the speaker units</p>
B2: POOR OR WEAK SOUND OUTPUT FROM SPEAKER(S)	
	<p>1 Check integrity of vehicle power supply fuses</p>
	<p>Are the vehicle/audio head unit power supply fuses functional?</p> <p>Yes Proceed to the next step GO to B3.</p> <p>No Replace fuse(s) as required</p>
B3: POOR OR WEAK SOUND OUTPUT FROM SPEAKER(S)	
	<p>1 Check power and ground circuits to the infotainment system components</p>

	<p>Are all the necessary power and ground feeds present?</p> <p>Yes Proceed to the next step GO to B4.</p> <p>No Refer to the electrical circuit diagrams and check the infotainment power and ground circuits for short circuit to ground, open circuit, high resistance. Repair circuit(s) as required</p>
--	---

B4: POOR OR WEAK SOUND OUTPUT FROM SPEAKER(S)

	<p>1 Check power supply voltage at power supply connectors</p>
	<p>Is the power supply voltage measured at the power supply connectors between 12 and 14 volts?</p> <p>Yes No further action</p> <p>No Refer to the electrical circuit diagrams and check the infotainment power supply circuits for short circuit to ground, open circuit, high resistance. Repair circuit(s) as required. Refer to the relevant section of workshop manual and battery care manual. Check battery state of charge and starting/charging system performance and rectify as required</p>

PINPOINT TEST C : SPEAKER VIBRATING (BUZZING) EXCESSIVELY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: SPEAKER VIBRATING (BUZZING) EXCESSIVELY	
	<p>1 Check for extreme bass/treble settings</p>
	<p>Is the audio system output settings for bass and/or treble set too high?</p> <p>Yes Adjust settings to appropriate levels</p> <p>No Proceed to the next step GO to C2.</p>
C2: SPEAKER VIBRATING (BUZZING) EXCESSIVELY	
	<p>1 Check speaker unit(s) fixing screws are securely fastened</p>
	<p>Are all speaker fixing screws fully secured to the surrounding trim?</p> <p>Yes Proceed to the next step GO to C3.</p> <p>No Tighten the fixing screws to the correct torque as directed in the workshop manual</p>
C3: SPEAKER VIBRATING (BUZZING) EXCESSIVELY	
	<p>1 Check if the wiring harness is resting against the internal surface of the speaker</p>
	<p>Is there any cabling or other parts of the wiring harness resting against the internal surface of the speaker?</p> <p>Yes</p>

	<p>Re-route and secure the wiring harness so that it is not resting against any internal surfaces of the speaker</p> <p>No Proceed to the next step GO to C4.</p>
C4: SPEAKER VIBRATING (BUZZING) EXCESSIVELY	
	<p>1 Check security of trim, harnesses and paper labels in the vicinity of the speaker units</p>
	<p>Are these items secure in the vicinity of the speaker units?</p> <p>Yes Proceed to the next step GO to C5.</p> <p>No Check whether gentle contact with these items, where appropriate, relieves symptoms. If symptoms are relieved, fix source securely and prevent vibration</p>
C5: SPEAKER VIBRATING (BUZZING) EXCESSIVELY	
	<p>1 Remove speaker and hold in hand, taking care not to hold any moving parts of the assembly and not to damage the foam gaskets</p>
	<p>Does buzzing persist with speaker in hand?</p> <p>Yes Check for obvious debris in speaker. If there is debris and no damage, remove debris and retest for buzzing – if buzzing is fixed re-fit speaker, else replace speaker. If speaker is damaged, GO to C6.</p> <p>No Re-fit speaker and further investigate rattle due of nearby trim, modules, harnesses and components</p>
C6: SPEAKER VIBRATING (BUZZING) EXCESSIVELY	
	<p>1 Check for an obvious source of damage to prevent any replacement also becoming damaged</p>
	<p>Is there an obvious source of the speaker damage?</p> <p>Yes Remedy source of damage and fit replacement speaker</p> <p>No Fit replacement speaker</p>
C7: AUDIO OUTPUT DISTORTED	
	<p>1 Check for extreme bass/treble settings</p>
	<p>Is the audio system output settings for bass and/or treble set too high?</p> <p>Yes Adjust settings to appropriate levels</p> <p>No No further action</p>

Pinpoint Tests For Suspected Sub-Woofer Faults

NOTE:

See separate Pinpoint Tests (above) for other speaker faults

PINPOINT TEST D : NO SOUND OUTPUT FROM SUB-WOOFER

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: NO SOUND OUTPUT FROM SUB-WOOFER	
	<p>1 Check sub-woofer operation</p>
	<p>Is the harness connector securely connected to the audio amplifier module and the sub-woofer unit?</p> <p>Yes Proceed to the next step GO to D2.</p> <p>No Reconnect wiring harness to audio amplifier module/sub-woofer unit</p>
D2: NO SOUND OUTPUT FROM SUB-WOOFER	
	<p>1 Check Integrated Audio Module (IAM) operation</p>
	<p>Is the integrated audio module operational?</p> <p>Yes Proceed to the next step GO to D3.</p> <p>No Check the integrity of the power supply circuits/fuses to the integrated audio module and rectify as required. Check the integrated audio module for related DTCs and refer to the relevant DTC index</p>
D3: NO SOUND OUTPUT FROM SUB-WOOFER	
	<p>1 Check which sub-woofers are operational</p>
	<p>Are all sub-woofers working?</p> <p>Yes Proceed to the next step GO to D4.</p> <p>No Use the fader control to direct audio output to different sub-woofer locations to establish which units are non-operational. Refer to the electrical circuit diagrams and check the circuits between the audio amplifier module and the affected sub-woofer units for short circuit to ground, open circuit, high resistance. Repair circuit(s) as required. If fault persists, replace non-operational sub-woofer unit(s) as required</p>
D4: NO SOUND OUTPUT FROM SUB-WOOFER	
	<p>1 Check for any visible loose harness connections on sub-woofer drive unit</p>
	<p>Are there any visible loose harness connections (ie: loose wires / pins) on the sub-woofer</p> <p>Yes Replace the sub-woofer unit(s) as required</p> <p>No No further action</p>

PINPOINT TEST E : POOR OR WEAK SOUND OUTPUT FROM SUB-WOOFER(S)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: POOR OR WEAK SOUND OUTPUT FROM SUB-WOOFER	
	1 Check connections to sub-woofer units
	Are the connectors inserted securely into the sub-woofer units? Yes Proceed to the next step GO to E2. No Ensure all connectors are securely attached to the sub-woofer units
E2: POOR OR WEAK SOUND OUTPUT FROM SUB-WOOFER	
	1 Check integrity of vehicle power supply fuses
	Are the vehicle/audio amplifier module power supply fuses functional? Yes Proceed to the next step GO to E3. No Replace fuse(s) as required
E3: POOR OR WEAK SOUND OUTPUT FROM SUB-WOOFER(S)	
	1 Check power and ground circuits to the infotainment system components
	Are all the necessary power and ground feeds present? Yes Proceed to the next step GO to E4. No Refer to the electrical circuit diagrams and check the infotainment power and ground circuits for short circuit to ground, open circuit, high resistance. Repair circuit(s) as required
E4: POOR OR WEAK SOUND OUTPUT FROM SUB-WOOFER(S)	
	1 Check power supply voltage at power supply connectors
	Is the power supply voltage measured at the power supply connectors between 12 and 14 volts? Yes No further action No Refer to the electrical circuit diagrams and check the infotainment power supply circuits for short circuit to ground, open circuit, high resistance. Repair circuit(s) as required. Refer to the relevant section of workshop manual and battery care manual. Check battery state of charge and starting/charging system performance and rectify as required

PINPOINT TEST F : SUB-WOOFER VIBRATING (BUZZING) EXCESSIVELY	
TEST	

CONDITIONS

DETAILS/RESULTS/ACTIONS

F1: SUB-WOOFER VIBRATING (BUZZING) EXCESSIVELY

	<p>1 Check for extreme bass/treble settings</p>
	<p>Is the audio system output settings for bass and/or treble set too high? Yes Adjust settings to appropriate levels No Proceed to the next step GO to F2.</p>

F2: SUB-WOOFER VIBRATING (BUZZING) EXCESSIVELY

	<p>1 Check sub-woofer unit(s) fixing screws to body are securely fastened</p>
	<p>Are all sub-woofer fixing screws fully secured to the body ? Yes Proceed to the next step GO to F3. No Tighten the fixing screws to the correct torque as directed in the workshop manual</p>

F3: SUB-WOOFER VIBRATING (BUZZING) EXCESSIVELY

	<p>1 Check security of trim, harnesses and paper labels in the vicinity of the subwoofer(s)</p>
	<p>Are these items secure in the vicinity of the subwoofer(s)? Yes Proceed to the next step GO to F4. No Check whether gentle contact with these items, where appropriate, relieves symptoms. If symptoms are relieved, fix source securely and prevent vibration</p>

F4: SUB-WOOFER VIBRATING (BUZZING) EXCESSIVELY

	<p>1 Remove subwoofer unit(s) (do not disassemble part) and hold in hand, taking care not to hold any moving parts of the assembly and not to damage the foam gaskets</p>
	<p>Does buzzing persist with subwoofer unit(s) in hand? Yes Check for obvious debris in subwoofer unit(s). If there is debris and no damage, remove debris and retest for buzzing – if buzzing is fixed re-fit subwoofer unit(s), else replace subwoofer unit(s). If subwoofer unit(s) damaged, GO to F5. No Re-fit subwoofer unit(s) and further investigate rattle due of nearby trim, modules, harnesses and components</p>

F5: SUB-WOOFER VIBRATING (BUZZING) EXCESSIVELY

	<p>1 Check for an obvious source of damage to prevent any replacement also becoming damaged</p>
	<p>Is there an obvious source of the subwoofer unit(s) damage? Yes</p>

	Remedy source of damage and fit replacement subwoofer unit(s) No Fit replacement subwoofer unit(s)
--	---

PINPOINT TEST G : SUB-WOOFER AUDIO OUTPUT DISTORTED

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
-----------------	-------------------------

G1: SUB-WOOFER AUDIO OUTPUT DISTORTED

	1 Check for extreme bass/treble settings
	Is the audio system output settings for bass and/or treble set too high? Yes Adjust settings to appropriate levels No Re-check possible sub-woofer faults GO to Pinpoint Test D .

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), 415-01

INFORMATION AND ENTERTAINMENT SYSTEM

IPAD DOCKING STATION - ULTIMATE (G1393707)

REMOVAL AND INSTALLATION

REMOVAL

NOTE:

Removal steps in this procedure may contain installation details.

1. 

2. 

3. 

4.



INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 415-01

INFORMATION AND ENTERTAINMENT SYSTEM




REAR SEAT AUDIO CONTROL SWITCH - ULTIMATE (G1393708)

REMOVAL AND INSTALLATION

REMOVAL

NOTE:

Removal steps in this procedure may contain installation details.

1. 
2. 
3. 

INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 415-01

INFORMATION AND ENTERTAINMENT SYSTEM

REAR AUDIO CONTROL RELAY - ULTIMATE (G1468513)

REMOVAL AND INSTALLATION

REMOVAL

NOTE:

Removal steps in this procedure may contain installation details.

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

2. 

Torque: 9 Nm

3. 

Torque: 5 Nm

INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 415-02

ANTENNA

DESCRIPTION AND OPERATION

The antenna systems fitted to the vehicle comprise:

- AM (glass mounted)
- FM (glass mounted)
- Double FM 2 and 3 diversity (glass mounted, where fitted)
- TV (glass mounted, where fitted)
- GPS (global positioning system) antenna (roof mounted pod)
- SDARS (roof mounted NAS only)
- VICS antenna and beacon antenna (Japan only where fitted).
- DAB antenna (roof mounted pod and glass mounted where fitted).

SCREEN AERIAL COMPONENTS



ITEM

DESCRIPTION

ITEM	DESCRIPTION
1	Side screen Television and diversity radio aerials
2	Rear screen aerial amplifier
3	Roof pod (GPS, DAB band-L and SDARS)
4	Side screen television and DAB aerials
5	DAB aerial amplifier
6	Television aerial amplifier (vehicles with TV fitted only)
7	Alternative television aerial for telestart (vehicles with TV and telestart fitted only)
8	Rear screen aerial suppressor
9	Rear screen radio aerial
10	Rear screen aerial suppressor
11	Television aerial amplifier
12	Side screen radio diversity aerial amplifier

AM / FM ANTENNAS

FM Antenna Amplifier



The AM (amplitude modulation)/FM (frequency modulation) antennas are located in the side and rear window. All vehicles are equipped with FM diversity tuning. This system ensures that the best quality signal is used by the radio system to ensure the best possible FM reception. The standard AM/FM antenna is screen mounted in the LH (left-hand) rear side window and is connected to an antenna amplifier located above the screen. The diversity system uses the same side window antenna and amplifier but also uses a rear heated screen element antenna and an FM antenna amplifier mounted at the top of the rear screen in the tail gate for FM 2 and 3.

DIGITAL AUDIO BROADCASTING (DAB) ANTENNAS



ITEM	DESCRIPTION
1	Roof pod DAB band-L
2	Antenna amplifier DAB band-III

The DAB antennas are located in the RH (right-hand) rear side window (band-III) and in the roof mounted pod (band-L). The two antenna circuits each have a co-axial connection to the DAB module. DAB signals are transmitted on either DAB band III (174 - 240 MHz) or DAB band-L (1452 - 1492 MHz). Some countries may only use the band III signals, while others may only use the band-L signals. Some countries use both frequency ranges within the same geographical area. The type of DAB signal received depends on the vehicle market location. The DAB antennas are designed with 50 ohm output impedance. The DAB receiver is fitted with 50 ohm fakra II connectors to ensure compatibility with the antenna. For optimum performance 50 ohm low loss coaxial cable is used between the antenna and receiver.

VICS/TMC ANTENNA MODULE



The Traffic Message Channel (TMC) signals are received through the normal radio signals via the RDS network. The signals are routed separately from the radio signals via a separate antenna amplifier located on the RH rear side window.

For additional information, refer to: [Navigation System](#) (419-07 Navigation System, Description and Operation).

. The module is fitted to the tailgate inner panel above the rear windscreen.

TV ANTENNA

TV Antenna Amplifier



Where a television system is specified there are four TV antenna elements two in each of the rear side windows. Each element has an antenna amplifier which is connected to the TV tuner module by a coaxial cable.

For additional information, refer to: [Video System](#) (415-07 Video System, Description and Operation).

If a vehicles fitted with telestart the RH module is a combined TV/telestart amplifier.

ROOF MOUNTED POD

Roof Mounted Antenna Pod



The roof mounted pod contains several antennas:

- GPS antenna
- SDARS antenna (NAS only).
- DAB antenna (band-L)

The roof mounted pod is a standard fit on all vehicles.

SATELLITE DIGITAL AUDIO RADIO SYSTEM (SDARS) ANTENNA (NAS ONLY)

The SDARS antenna is located in the roof mounted pod, which is located in the center of the roof at the rear of the vehicle. The SDARS antenna has one connection to the SDARS tuner for both satellite transmissions.

Antenna element:

- A printed dipole antenna for receiving satellite signals

The two antennas allow the system to receive SDARS transmissions in built up areas where signals from satellites would normally be blocked.

For additional information, refer to: [Audio System](#) (415-01A Audio Unit, Description and Operation).

GPS ANTENNA

The GPS antenna is located in the roof mounted pod. The GPS antenna is connected to the navigation computer by a coaxial cable.

For additional information, refer to: [Navigation System](#) (419-07 Navigation System, Description and Operation).

DIGITAL AUDIO BROADCASTING ANTENNA

The DAB band-L antenna is mounted within the roof mounted pod.

VICS ANTENNAS (JAPAN ONLY)

VICS Beacon Antenna



The VICS control module is intergrated into the touch screen display. The Control module uses an infra red beacon antenna located in the middle on top of the instrument panel adjacent to the sunlight sensor and an antenna amplifier located on the RH top of the tailgate.

For additional information, refer to: [Navigation System](#) (419-07 Navigation System, Description and Operation).

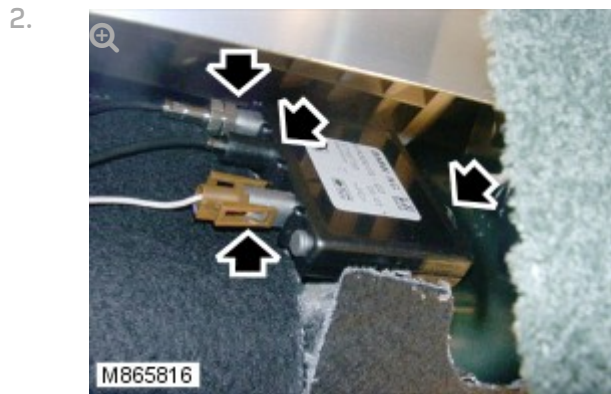
ANTENNA

ANTENNA MODULE (G300886)

REMOVAL AND INSTALLATION

REMOVAL

1. Remove the access panel from the loadspace trim panel LH.



Disconnect the antenna module coaxial cable connector.

3. Disconnect the antenna module electrical connector.

4. Disconnect the coaxial cable connector.

- Release the nut.

5. Remove the antenna module.

- Remove the bolt.

INSTALLATION

1. Install the antenna module.

- Tighten the bolt to 6 Nm (4 lb.ft).

2. Connect the antenna module coaxial cable connector.

- Tighten the nut.

3. Connect the antenna module coaxial cable connector.

4. Connect the antenna module electrical connector.

5. Install the access panel to the loadspace trim panel LH.

2012.0 RANGE ROVER (LM), 415-03

SPEAKERS

SPECIFICATIONS

Torque Specifications

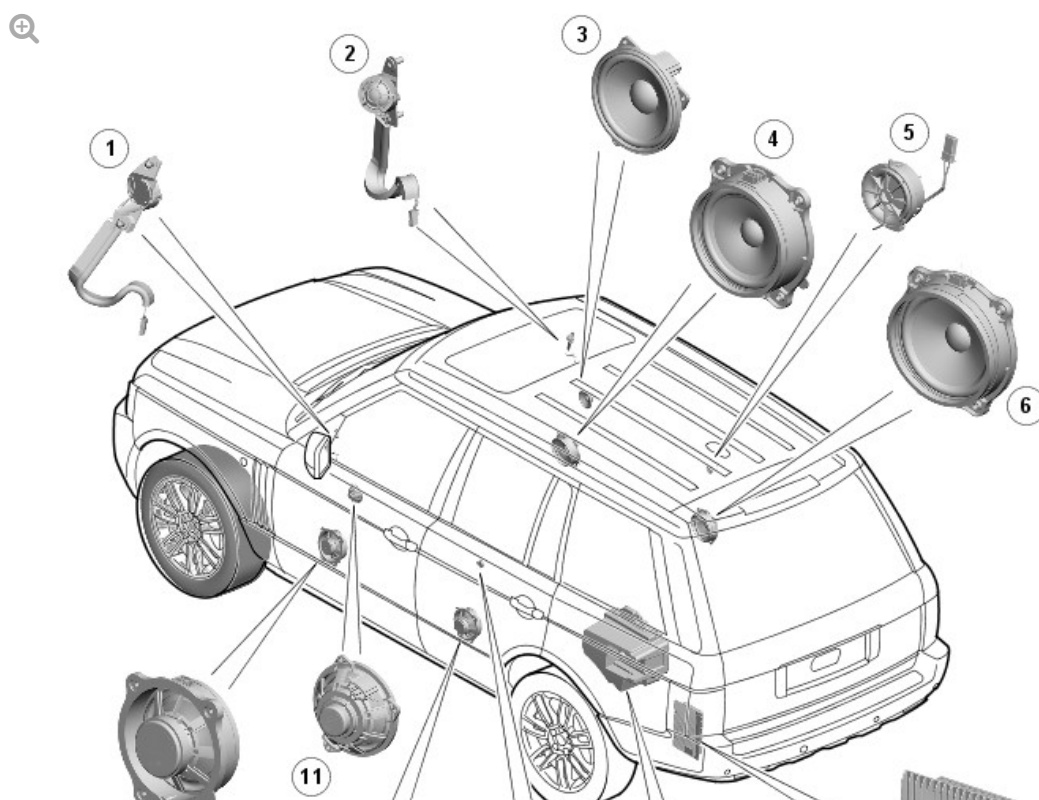
DESCRIPTION	NM	LB-FT
Tailgate speaker to casing bolts	10	7
Tailgate speaker to tailgate Torx screws	10	7

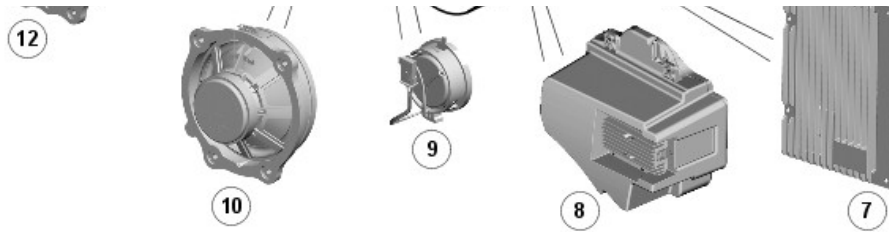
2012.0 RANGE ROVER (LM), 415-03

SPEAKERS

DESCRIPTION AND OPERATION

SPEAKER COMPONENT LOCATION - DSP SYSTEM

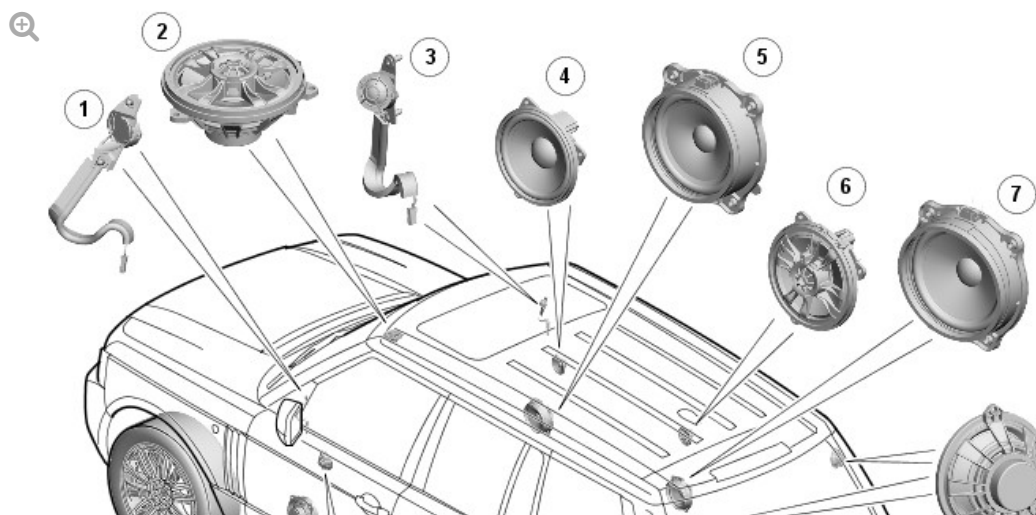


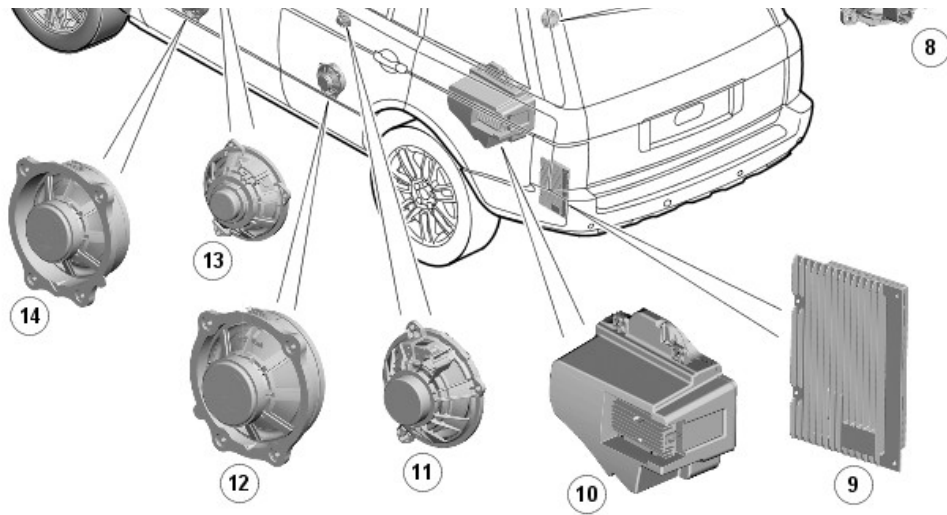


E132159

ITEM	DESCRIPTION
1	left-hand (LH) front door tweeter
2	right-hand (RH) front door tweeter
3	RH front door mid-range
4	Center fill speaker - Logic7 only
5	RH front door woofer
6	RH rear door mid-high range
7	Audio amplifierRH rear door mid-woofer
8	Subwoofer
9	LH rear door mid-high range
10	LH rear door mid-woofer
11	LH front door mid-range
12	LH front door woofer

SPEAKER COMPONENT LOCATION - LOGIC7/LOGIC7 HD 1200W PREMIUM SYSTEM



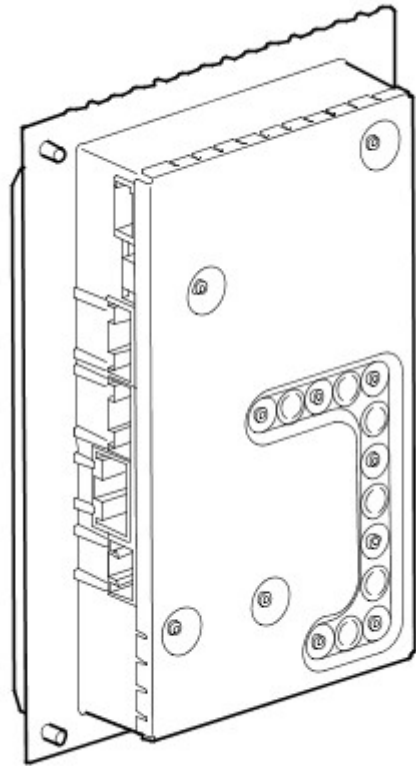


E132160

ITEM	DESCRIPTION
1	LH front door tweeter
2	Center fill speaker (co-axial speaker on 1200W Premium system)
3	RH front door tweeter
4	RH front door mid-range
5	RH front door woofer
6	RH rear door mid-high range (co-axial speaker on 1200W Premium system)
7	RH rear door mid-woofer
8	E pillar surround (2 off) (co-axial speaker on 1200W Premium system)
9	Audio amplifier
10	Subwoofer
11	LH rear door mid-high range (co-axial speaker on 1200W Premium system)
12	LH rear door mid-woofer
13	LH front door mid-range
14	LH front door woofer

The speaker configuration depends on the level of audio unit fitted to the vehicle. Three systems are available; DSP, Logic7 and Logic7 HD Premium. The following details the speaker configuration and control for each system.

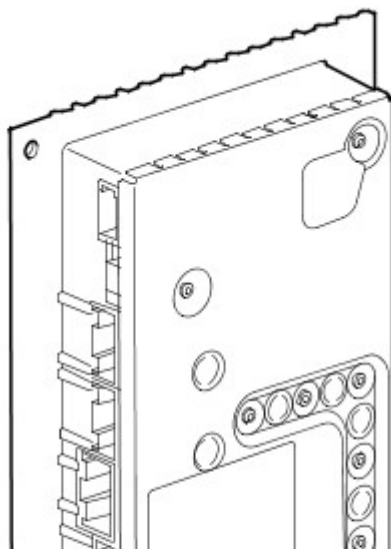
DSP SYSTEM AMPLIFIER

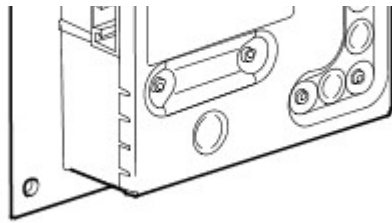


M866139

The Digital Sound Processor (DSP) amplifier is located in the rear LH side of the luggage compartment. The DSP amplifier drives 11 speakers; two front door mid-range, four front and rear door bass, four front and rear door tweeters on eight channels and a passive subwoofer. The amplifier produces 320 Watts of digital amplification to power the speakers.

HARMAN KARDON LOGIC7/LOGIC7 HD
1200W PREMIUM SYSTEM AMPLIFIER





M866140

The Logic7 and Logic7 HD 1200W Premium system amplifiers are located in the rear LH side of the luggage compartment.

LOGIC7 SYSTEM

The Logic7 amplifier drives 14 speakers on 5.1 surround channels; two front door mid-range, four front and rear door bass woofers, two front and rear door tweeters on eight channels and a passive subwoofer as on the DSP system, but with two additional surround sound speakers located in the upper tail door and a center surround speaker located in the fascia.

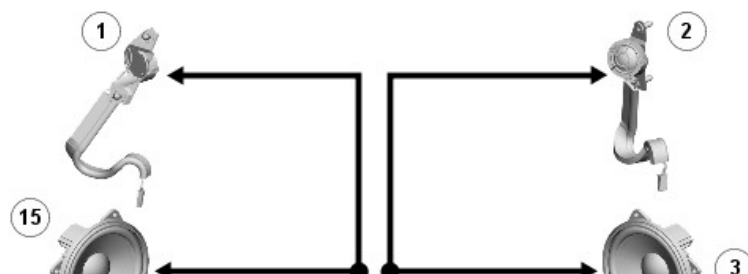
The Logic 7 system amplifier produces 720W of digital amplification to power the speakers.

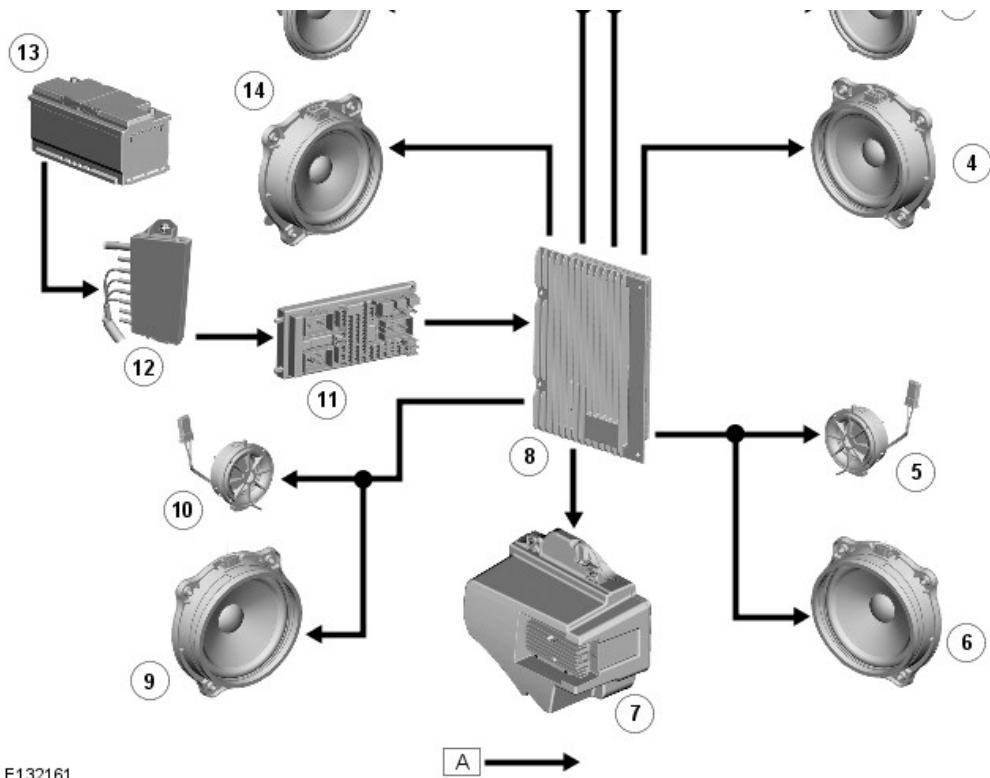
LOGIC7 HD 1200W PREMIUM SYSTEM

The Logic7 HD 1200W Premium system amplifier drives 19 speakers on 5.1 surround channels; two front door mid-range, two front door bass woofers, two front mid range, two front tweeters, two rear door bass woofers, two rear door co-axial mid-high range, a passive subwoofer as on the DSP system, with a co-axial surround sound speaker located in each E pillar and a center co-axial surround speaker located in the instrument panel.

The Logic7 HD 1200W Premium system amplifier produces 1200 Watts of digital amplification to power the speakers.

CONTROL DIAGRAM - DSP SPEAKER SYSTEM

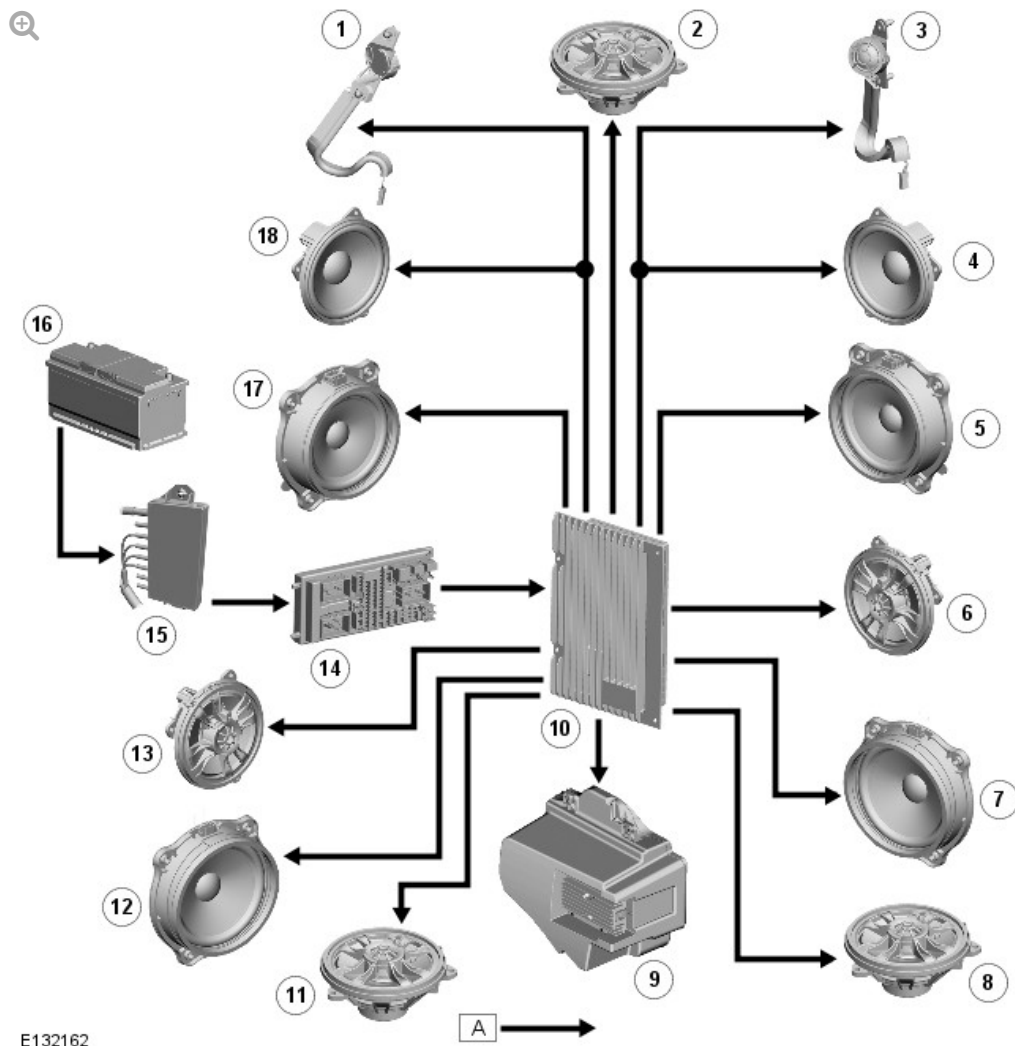




E132161

ITEM	DESCRIPTION
1	LH front door tweeter
2	RH front door tweeter
3	RH front door mid-range speaker
4	RH front door woofer
5	RH rear door high range speaker
6	RH rear door mid-woofer
7	Subwoofer
8	DSP amplifier
9	LH
10	LH rear door high range
11	Rear Junction box (RJB)
12	Battery Junction Box (BJB)
13	Battery
14	LH front door woofer
15	LH front door mid-range

CONTROL DIAGRAM - LOGIC7/LOGIC7 HD 1200W PREMIUM SPEAKER SYSTEM



ITEM	DESCRIPTION
1	LH front door tweeter
2	Center fill speaker (co-axial speaker on 1200W Premium system)
3	RH front door tweeter
4	RH front door mid-range speaker
5	RH front door woofer
6	RH rear door mid-high range speaker (co-axial on 1200W Premium system)
7	RH rear door mid-woofer
8	RHE pillar surround (co-axial on 1200W Premium system)
9	Subwoofer
10	Logic7 amplifier

11	LHE pillar surround (co-axial on 1200W Premium system)
12	LH mid-woofer
13	LH rear door mid-high range (co-axial on 1200W Premium system)
14	Rear Junction box (RJB)
15	Battery Junction Box (BJB)
16	Battery
17	LH front door woofer
18	LH front door mid-range

2012.0 RANGE ROVER (LM), 415-03

SPEAKERS

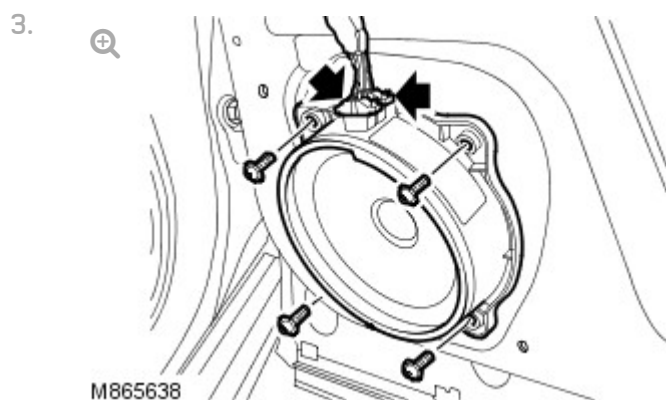
FRONT DOOR SPEAKER (G428407)

REMOVAL AND INSTALLATION

86.50.10	SPEAKER - FRONT DOOR - RENEW	ALL DERIVATIVES	0.5	USED WITHINS	+
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REMOVAL

1. Remove the front door trim panel.
For additional information, refer to: [Front Door Trim Panel - Armoured](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
 2. Remove the front door speaker wiring harness.
-



Remove the front door speaker.

- Remove the 4 screws.
 - Disconnect the electrical connector.
-

INSTALLATION

INSTALLATION

1. Install the front door speaker.

- Connect the electrical connector.
- Install the screws.

2. Install the front door speaker wiring harness.

3. Install the front door trim panel.

For additional information, refer to: [Front Door Trim Panel - Armoured](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2012.0 RANGE ROVER (LM), 415-03

SPEAKERS

REAR DOOR SPEAKER (G428408)

REMOVAL AND INSTALLATION

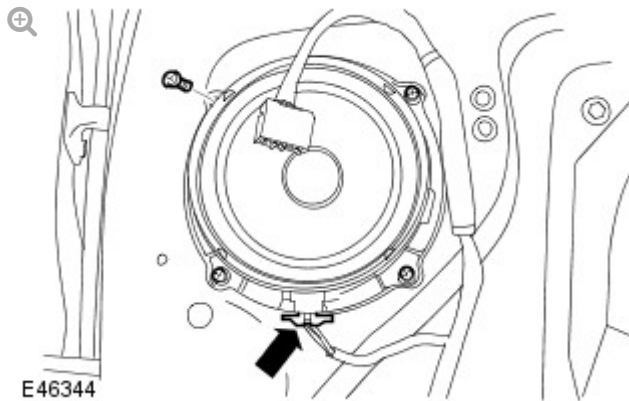
86.50.12	SPEAKER - REAR - RENEW	ALL DERIVATIVES	0.3	USED WITHINS	+
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REMOVAL

1. Remove the rear door trim panel.

For additional information, refer to: Rear Door Trim Panel (501-05, Removal and Installation).

- 2.



Remove the speaker.

- Disconnect the electrical connector.
 - Remove the 4 screws.
-

INSTALLATION

1. Install the speaker

- Tighten the screws.
 - Connect the electrical connector.
-

2. Install the rear door trim panel.

For additional information, refer to: Rear Door Trim Panel (501-05, Removal and Installation).

2012.0 RANGE ROVER (LM), 415-03

SPEAKERS

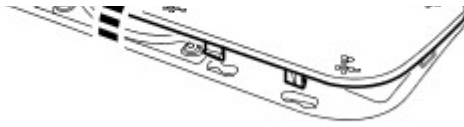
INSTRUMENT PANEL SPEAKER (G874151)

REMOVAL AND INSTALLATION

86.50.11	SPEAKER - INSTRUMENT PANEL UPPER SECTION - RENEW	ALL DERIVATIVES	0.1	USED WITHINS	+
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REMOVAL

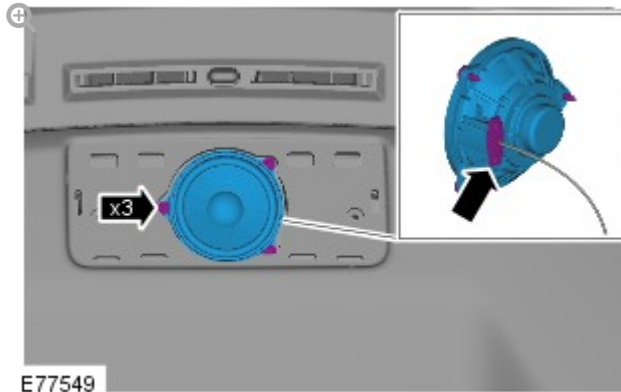




E66320

Remove the instrument panel center speaker grille.

2.



Remove the instrument panel speaker.

- Remove the 3 screws.
- Disconnect the electrical connector.

INSTALLATION

1. Install the instrument panel speaker.
 - Connect the electrical connector.
 - Tighten the 3 screws.
2. Install the instrument panel center speaker grille.

2012.0 RANGE ROVER (LM), 415-03

SPEAKERS

QUARTER PANEL SPEAKER

[G300896]

REMOVAL AND INSTALLATION

REMOVAL

NOTE:

The procedure to remove the quarter panel speaker is shown in the D-pillar trim panel procedure.

-
1. Remove the D-pillar trim panel.
For additional information, refer to: D-Pillar Trim Panel (501-05, Removal and Installation).

INSTALLATION

-
1. Install the D-pillar trim panel.
For additional information, refer to: D-Pillar Trim Panel (501-05, Removal and Installation).

2012.0 RANGE ROVER (LM), 415-03

SPEAKERS

TAILGATE SPEAKER (G371272)

REMOVAL AND INSTALLATION

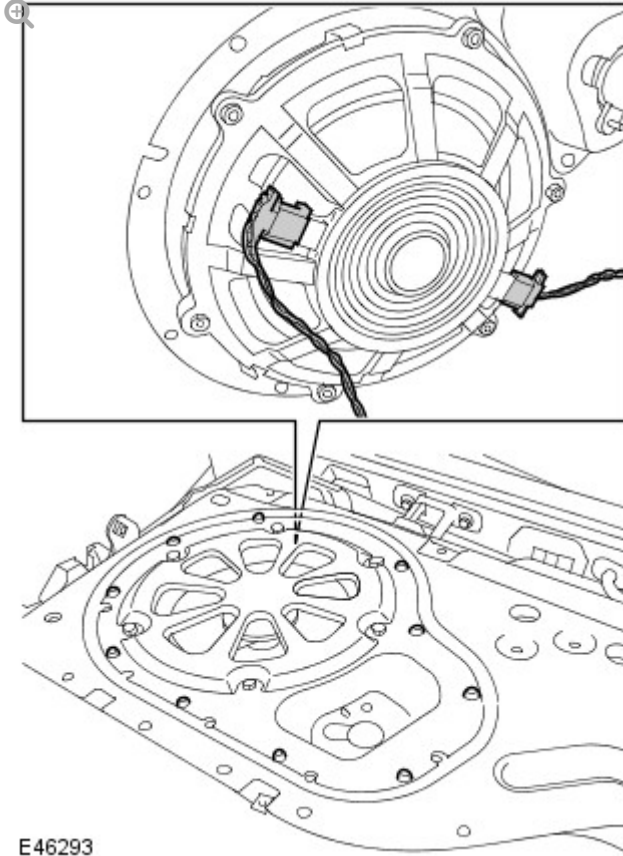
REMOVAL

REMOVAL

1. Remove the tailgate trim panel.

For additional information, refer to: [Tailgate Trim Panel \(501-05 Interior Trim and Ornamentation, Removal and Installation\)](#).

- 2.



Remove the tailgate speaker assembly.

- Remove the 10 Torx bolts.
- Disconnect the 2 electrical connectors.

- 3.

NOTE:

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





Remove the tailgate speaker.

- Remove the 6 bolts.

INSTALLATION

1. Install the tailgate speaker.

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

2. Install the tailgate speaker assembly.

- Connect the electrical connectors.
- Tighten the Torx bolts to 10 Nm (7 lb.ft).

3. Install the tailgate trim panel.

For additional information, refer to: [Tailgate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2012.0 RANGE ROVER (LM), 415-03

SPEAKERS

FRONT DOOR TRIM PANEL SPEAKER (G1531995)

REMOVAL AND INSTALLATION

REMOVAL

1. Refer to: [Front Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
- 2.

CAUTION:

Make sure that only the head of the fixing is removed. Do not drill any deeper than necessary.



3.



4.

CAUTION:

Make sure that only the head of the fixing is removed. Do not drill any deeper than necessary.



5.



6.

NOTE:

Remove the speaker from the speaker bracket.



INSTALLATION

1.



2.



3.





4.



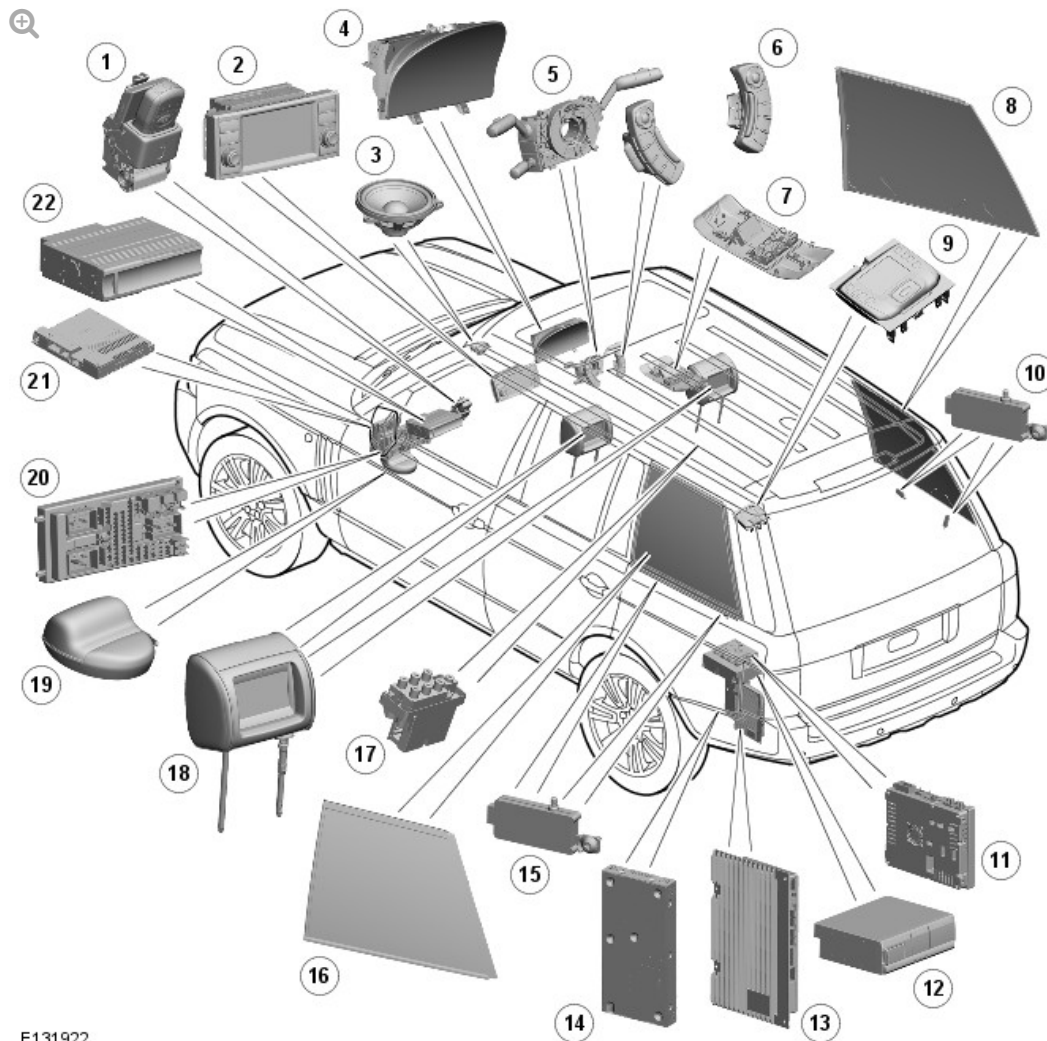
5. Refer to: [Front Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2012.0 RANGE ROVER (LM), 415-07

VIDEO SYSTEM

DESCRIPTION AND OPERATION

ENTERTAINMENT SYSTEM - COMPONENT LOCATION



ITEM

DESCRIPTION

1

VentureCam™

2	TSD (touch screen display)
3	Speakers
4	Instrument cluster
5	Clockspring
6	Steering wheel switches
7	Headphone transmitter module
8	TV RF antenna - right-hand (RH)
9	RSE remote control and docking station
10	TV antenna RF amplifiers
11	TV tuner
12	digital versatile disc (DVD) autochanger
13	Audio amplifier
14	Rear Seat Entertainment (RSE) module
15	TV antenna RF amplifiers
16	TV RF antenna - LH (left-hand)
17	Audio Visual Input Output (AVIO) panel
18	liquid crystal display (LCD) screens
19	Headphones
20	CJB (central junction box)
21	IHU (integrated head unit)
22	CD (compact disc) autochanger

GENERAL

The fibre optic, Media Orientated System Transport (MOST) based system provides video and audio entertainment for the rear seat occupants. The system allows DVD video and TV to be viewed on two RSE LCD screens, listen to audio output via the vehicle speakers or cordless headphones or display video images on the RSE LCD screens from an external source, such as a video player or games console. The video images can also be displayed on the Touch Screen Display (TSD) if the vehicle is below a predetermined speed threshold or has dual view TSD fitted.

speed threshold or has duel view TSD filled.

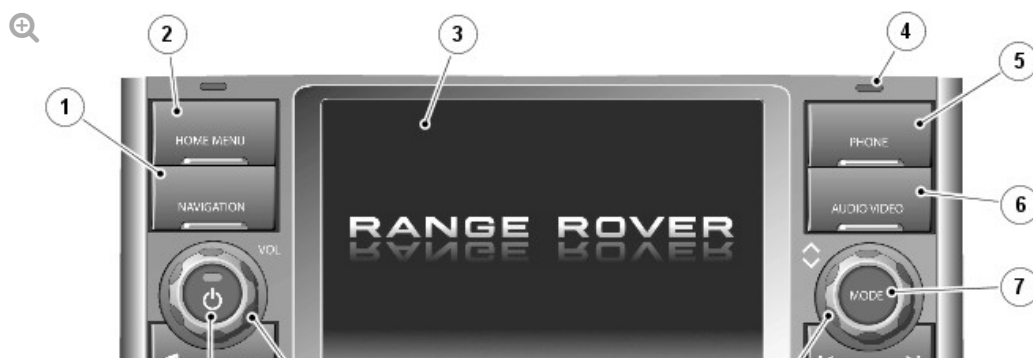
The system comprises the following components:

- RSE Module
- TV Tuner
- Four TV Antennae
- Four TV Antenna amplifiers
- Two RSE LCD screens
- DVD autochanger
- RSE remote control
- Headphone transmitter module
- Cordless headphones
- AVIO panel.

The RSE system also uses other components which form part of the audio system as follows:

- TSD
- Steering wheel switches
- compact disc (CD) autochanger
- Audio amplifier
- Vehicle speakers
- IHU

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 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 TSD also 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 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.

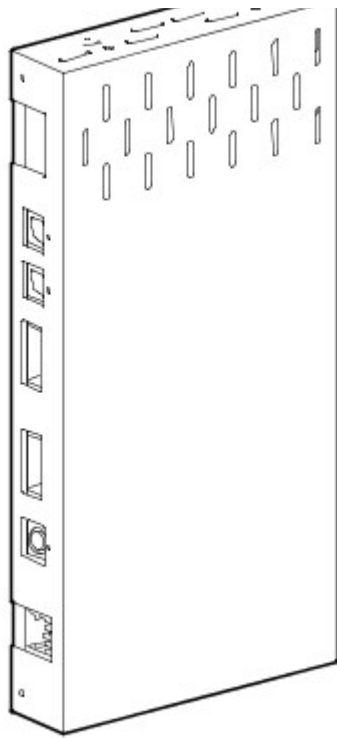
The dual-view TSD uses Parallax Barrier Shutter Technology to alternately hide and reveal columns of pixels to the left and right hand views of the screen. The display comes with a specially designed agar coating to help prevent sunlight bleaching.

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.

REAR SEAT ENTERTAINMENT MODULE





M866142

The Rear Seat Entertainment (RSE) module is located in the left-hand (LH) rear corner of the luggage compartment. The RSE module is an interface between the video and audio inputs from other system components and the video display and audio outputs.

The RSE module communicates with the audio systems via the MOST connection. Audio output from the DVD autochanger and the AVIO panel is processed by the module and passed on the MOST ring to the audio amplifier to allow audio output to be played on the vehicle speakers or on the cordless headphones.

Video input from the TV tuner, DVD autochanger and the Audio Video Input/Output (AVIO) panel is also processed by the module and passed to the two RSE LCD screens and the TSD on separate video connections. The RSE module also controls the power supplies to the RSE LCD screens and relays the infra-red remote control signals received by the RSE LCD screen infra-red sensors to the DVD autochanger. The infra-red signals are passed from the RSE LCD screens to the RSE module on a bus system known as the IS bus.

The DVD autochanger outputs some of its information to the RSE module on an Alpine proprietary bus known as the Ai Net. The Ai Net is a bus system used to communicate between the RSE module and the DVD

autochanger.

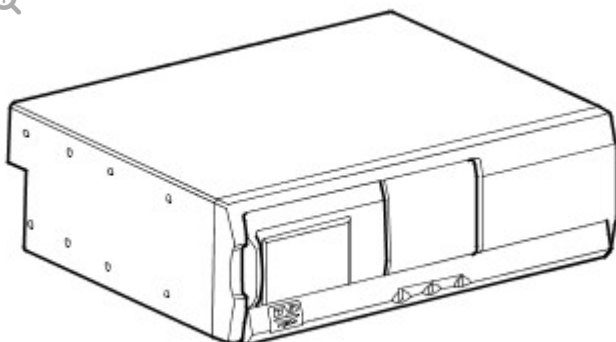
The RSE module has two modes of operation; engine running mode and reduced operation mode. With the engine running the RSE module has full functionality. When the engine is not running the RSE module has reduced functionality to prevent excessive drain on the vehicle battery. The reduced functionality comprises a reduced audio volume and time limit on system operation.

The reduced audio volume is only active when the engine is not running. The audio volume is limited to a maximum of setting of 12 to reduce battery consumption. If the volume was set at a higher level than this when the engine was running, when the engine is subsequently started, the volume level will gradually increase to the previously selected setting. This prevents the user being distracted by a sudden increase in volume.

The time limit operation is active when the key is removed from the ignition and the system is manually switched on using the TSD. The system will operate for a maximum of one hour. The battery voltage is continually monitored by the IHU. If the IHU detects that the battery voltage has fallen to a predetermined level, the IHU will shut the infotainment system down to prevent further battery drain. Once the system has shut down due to low battery voltage, it can only be restarted when the engine is running and the battery voltage has risen above the threshold level for more than one minute.

The module is connected into the infotainment system with five harness connectors.

DVD AUTOCHANGER



1000111

The DVD autochanger is located in the LH rear corner of the luggage compartment. The DVD player is a six disc design which will accept DVD movies, video CD (VCD) and music CD on CD-R or CD-RW. The discs are housed in a magazine to allow six discs to be stored in the unit. Additional magazines can be purchased to allow greater flexibility. The magazine is accessible via a sliding door on the front of the unit. An eject button, located behind the door automatically ejects the magazine from the unit when pressed.

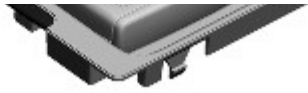
The DVD autochanger is operated using a remote control unit supplied with the vehicle. The remote control is an infra-red unit which transmits the infra-red signal to receivers located in each RSE LCD screen.

The DVD autochanger receives the remote control information from the RSE LCD screens on a bus system known as the IS bus to the RSE module. The information is then passed from the RSE module on an Alpine proprietary bus known as the Ai Net to the DVD autochanger. The Ai Net is a bus system used to communicate between the RSE module and the DVD autochanger.

A Sony Philips Digital Interface Format (SPDIF) is used to output the audio from the DVD autochanger to the audio amplifier. The SPDIF is an optical system connected between the DVD autochanger and the audio amplifier. SPDIF is a standard audio file transfer format which allows the transfer of digital audio signals from one device to another without having to be converted first to an analog format which maintains the viability of the digital audio signal.

REAR SEAT ENTERTAINMENT (RSE) REMOTE CONTROL



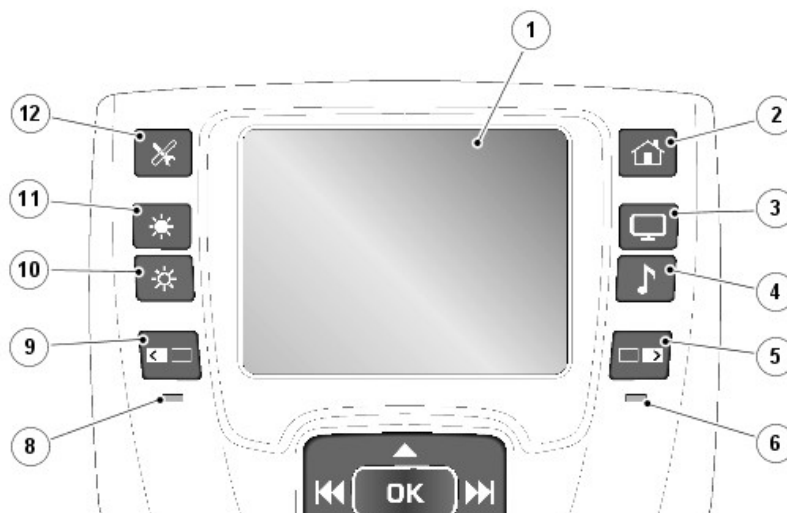


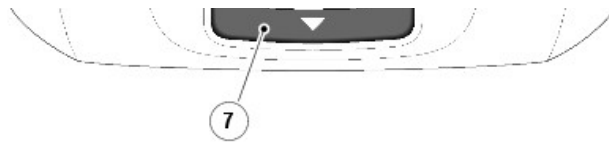
The RSE remote control allows independent multimedia control for left and right rear seat passengers.

The remote control is a dockable unit with a small TSD and a number of buttons to control the audio/video functions. The remote control is stored in the rear center armrest and can be used in the docked position or hand held. When the unit is docked charging is provided to the 3.7 volt 1200mAh Li-ion battery. When fully charged the remote control can have up to 3 hours 20 minutes of continuous use. The remote control is charged when in the armrest docking station. From empty to 90% charge takes approximately 2.5 hours.

The charging is powered via an infotainment relay which is located in the CJB directly to the RSE docking station. Part of the transmission encoding from the remote control includes the battery status which is passed to the RSE module. If the battery charge becomes low a message is displayed advising to dock and recharge the remote control. The remote control has three power modes as follows:

POWER MODE	OPERATING CONDITION
Operation mode	Fully operational
Sleep mode	Screen and backlight illumination off
Shut down mode	Internal sleep mode (will take approximately 3 seconds to reboot)





E 129907

ITEM	DESCRIPTION
1	Touch Screen Display (TSD)
2	Home button
3	Video button
4	Audio button
5	Right Hand (RH) screen select button
6	RH screen selection indicator
7	Five-way switch - Cursor movement and option selection button
8	Left Hand (LH) screen selection indicator
9	LH screen select button
10	Touch screen display brightness decrease button
11	Touch screen display brightness increase button
12	Touch screen display settings button

The remote control controls for example radio, CD/DVD, plug-in audio devices and TV selection by displaying options on the remote control TSD. The options then activate menus in the RSE headrest mounted screen which can be navigated using a five-way switch on the remote control. For example, the user can select and press a soft key on the remote control TSD to activate a list of available radio stations in the RSE screen and then use the five-way switch to browse the list and select a radio station.

Part of the Pre-Delivery Inspection (PDI) procedure includes an initial set-up of the remote control (for example language selection). This can be performed with the remote control docked in the armrest. The remote handset battery can then be inserted by the dealer prior to delivery. Located behind the battery cover is a reset button which restores the default settings.

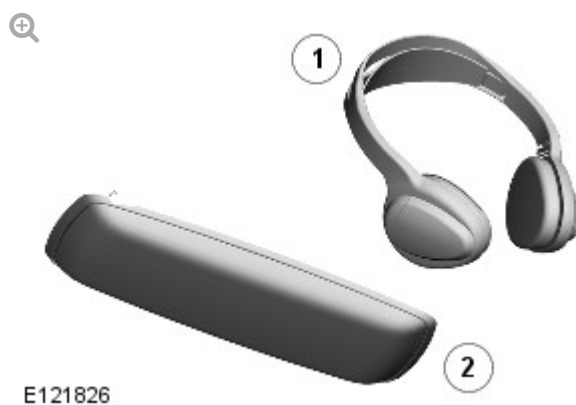
The remote control transmits an infra-red digital signal in response to

operation of a button or soft key. The infra-red signal is received by a receiver sensor located on each RSE LCD screen and is passed, via an IS bus to the RSE module and from the RSE module on an Alpine proprietary bus known as the Ai Net, to the DVD autochanger. The remote control also allows selection of an auxiliary input from the AVIO panel (video or games console) or selection of audio (radio or CD).

When docked, communication from the remote handset takes place via two data lines into the RSE module. This link also enables software updates and configurations sent from the RSE module, for example, a language change requested by the user. This link from the RSE module to the docking station is a basic two-wire interface designed for remote control data rates (approx 38Kbit/sec.). It is protected against short to battery or ground on the output pin.

The remote control is powered by a rechargeable battery located in the rear of the control and is accessible by removing a sliding cover. When inserting the battery it is important that the battery polarity is observed as marked in the battery compartment.

WHITEFIRE® DIGITAL WIRELESS HEADPHONES AND TRANSMITTER



E121826

ITEM	DESCRIPTION
1	Whitefire® digital wireless headphones
2	Whitefire® digital infrared transmitter

The RSE headphone transmitter is located in a central position in the rear roof console. The transmitter comprises a printed circuit board and sixteen infra-red light emitting diode (LED) transmitters positioned radially facing the rear of the vehicle.

The headphone transmitter is connected to the audio amplifier. Audio output is passed from the amplifier on a harness to the transmitter. The audio signals are then converted by the transmitter into infra-red signals which are passed via the sixteen transmitters and received by the headphones infra-red sensors.

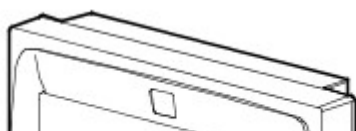
The transmitter is connected to the infotainment system using an 8 pin harness connector.

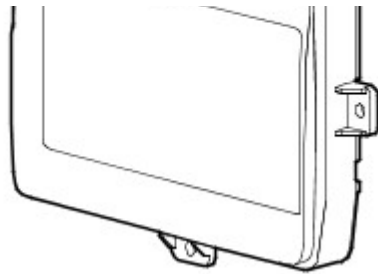
The system can support up to two pairs of cordless headphones. The headphones have an adjustable headband which operates on a ratchet mechanism.

The LH side of the headphone houses the infra-red receiver sensors which collect the transmitted signals from the RSE headphone transmitter, two AAA batteries located below a sliding cover and the power on/off switch. When inserting the batteries it is important that the battery polarity is observed as marked in the battery compartment.

The RH side of the headphone houses the volume control, a channel switch and a power 'ON' LED. The volume control is a rotary control to allow the user to adjust the volume output of the headphones. The channel switch allows the source frequency to be changed preventing interference with other infra-red systems. The power 'ON' LED is illuminated when the on/off switch on the LH headphone is pressed. This will remain on and the headphones powered until the switch is pressed for a second time. If the headphones have not received an infra-red signal from the transmitter for several minutes, they will automatically switch off to prevent battery drain.

LCD SCREENS





M866194

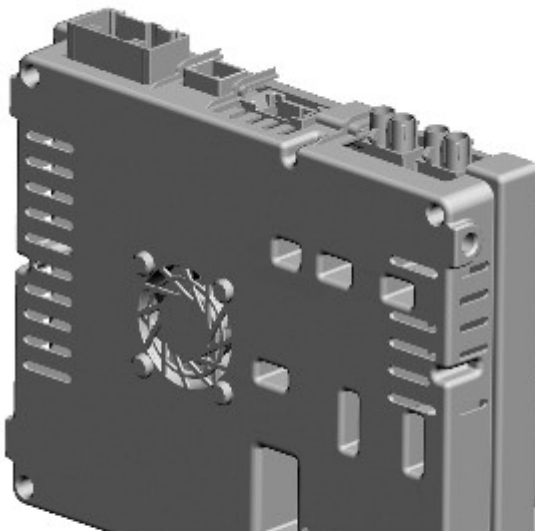
The RSE LCD screens are located in the rear of the front seat head restraints. The screen is secured in the head restraint with three screws which are covered by a removable surround. The screen is a 6.5 inch, auto dimming, high resolution LCD monitor, manufactured by Alpine

An infra-red receiver sensor is located centrally in the upper screen surround. The receiver sensor receives infra-red transmissions from the DVD remote control and passes them to the DVD autochanger, via the RSE module on a bus system known as the IS bus. All screen settings can be changed using the RSE remote control.

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.

Each RSE LCD screen is connected to the infotainment system using a 20 pin harness connector.

TV TUNER





E128344

The TV tuner is located in the left hand rear corner of the luggage compartment. The TV tuner allows the rear seat occupants to view television transmissions on the RSE LCD screens. The front seat occupants can also view the TV transmissions on the TSD but only if duel view TSD is installed or the vehicle is stationary. The TV tuner is capable of receiving local terrestrial TV transmissions in most locations.

The TV tuner is connected on the MOST ring which it uses to output its audio signals to the amplifier. Video output from the tuner is on a screened co-axial cable to the RSE module. Four further connections provide for the signal input from four TV antenna amplifiers and four antennae.

The TV tuner contains three internal tuners. Two of the tuners are connected to the antennae. These tuners receive the audio and visual signals. The tuner with the strongest signal is automatically used to display the required TV channel.

The third internal tuner is connected to only one of the antennae and is used to scan the locality for receivable channels. The tuner can detect different frequencies transmitting the same channel and can select the strongest signal for use.

To cope with changes in technology, the TV tuner is able to receive both analogue and digital TV signals. In certain areas both analogue and digital signal strengths will vary. When in an area of weak reception, you may experience a break-up in picture and sound quality, or a blank screen and audio muting. It may be of benefit to retune the viewed station, and possibly switch between analogue and digital TV stations.

The TV tuner is connected to the infotainment system using four harness connectors.

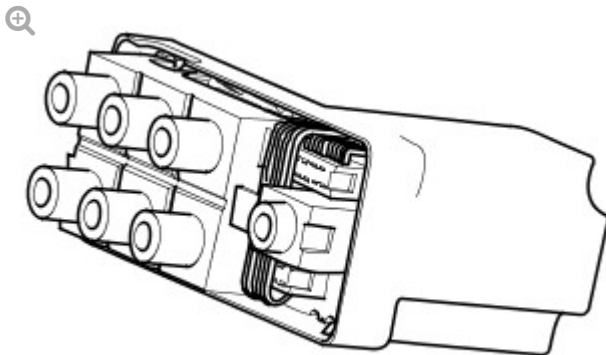
NOTE:

On vehicles with remote park heating, the RH rear antenna is fitted with a combined remote park heating/TV antenna amplifier.

Two TV antennae are located in each rear side quarter window. There are three antennae in each window; the forward antenna is a high frequency antenna and the rearward antenna is a low frequency antenna. A third antenna, located between the two TV antennae is for radio reception.

Each antenna is connected directly to a TV RF antenna amplifier which is located just below the rear quarter panel, behind the trim. The four TV antenna amplifiers boost the received RF signal before it is collected and processed by the TV tuner. The TV antennae can receive RF signals of between 48 and 860 MHz.

AUDIO VISUAL INPUT OUTPUT PANEL



E83062

The AVIO panel is located at the rear of the floor console. The panel provides for the connection of auxiliary audio and video inputs from an external source, such as a games console, via seven plugs on the panel. The plugs are covered by a lift up panel.

Two sets of video and audio phono plugs are provided and are designated as AV1 and AV2. The plugs are connected to the RSE module and allow the auxiliary input video to be played on the RSE LCD screens and the audio to be played on the vehicle speakers or on the cordless headphones. The

be played on the vehicle speakers or on the cordless headphones. The auxiliary input video cannot be displayed on the TSD.

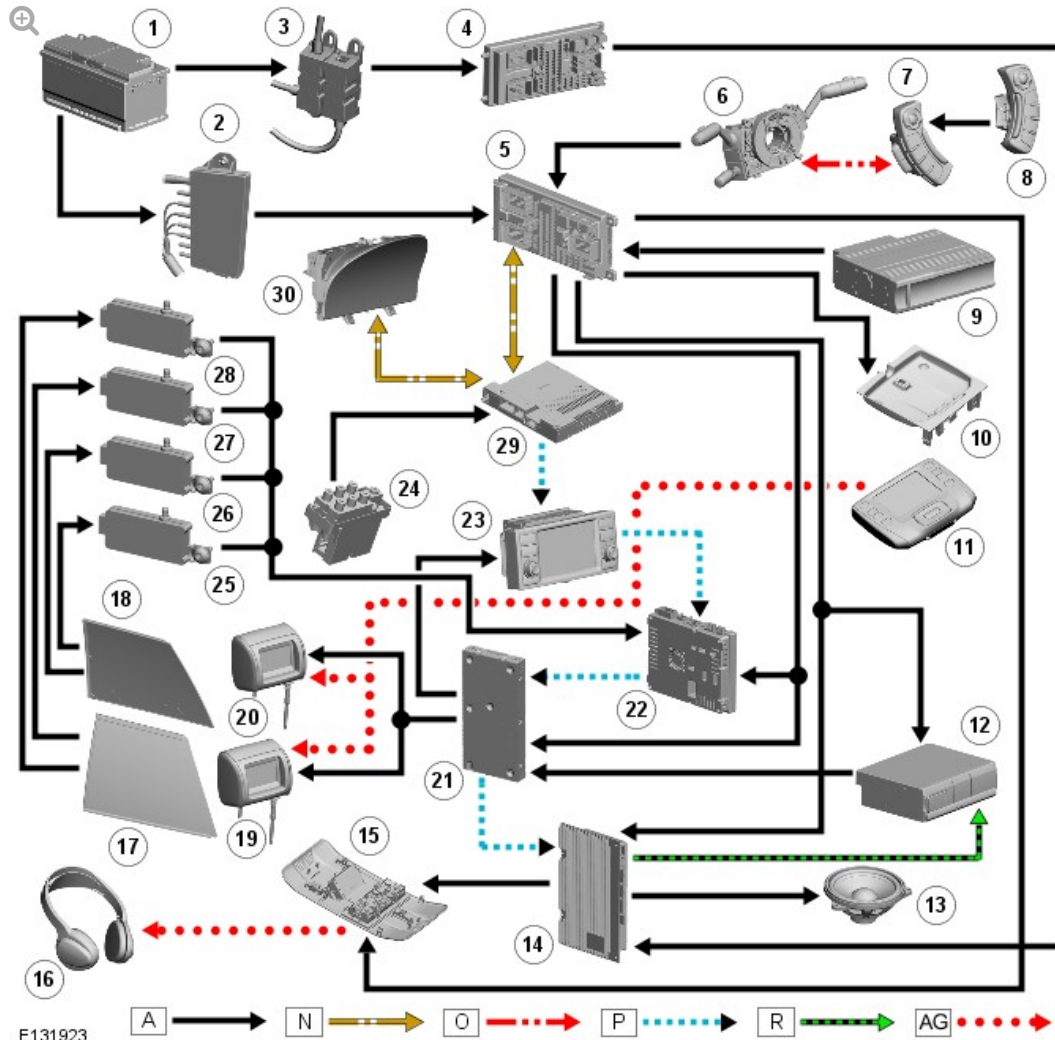
An additional single, 3.5mm jack plug allows for the attachment of an auxiliary audio input, such as a personal stereo or MP3 player. This plug is connected directly to the IHU and allows audio to be played on the vehicle speakers.

The AVIO panel is connected to the infotainment system using two harness connectors.

CONTROL DIAGRAM

NOTE:

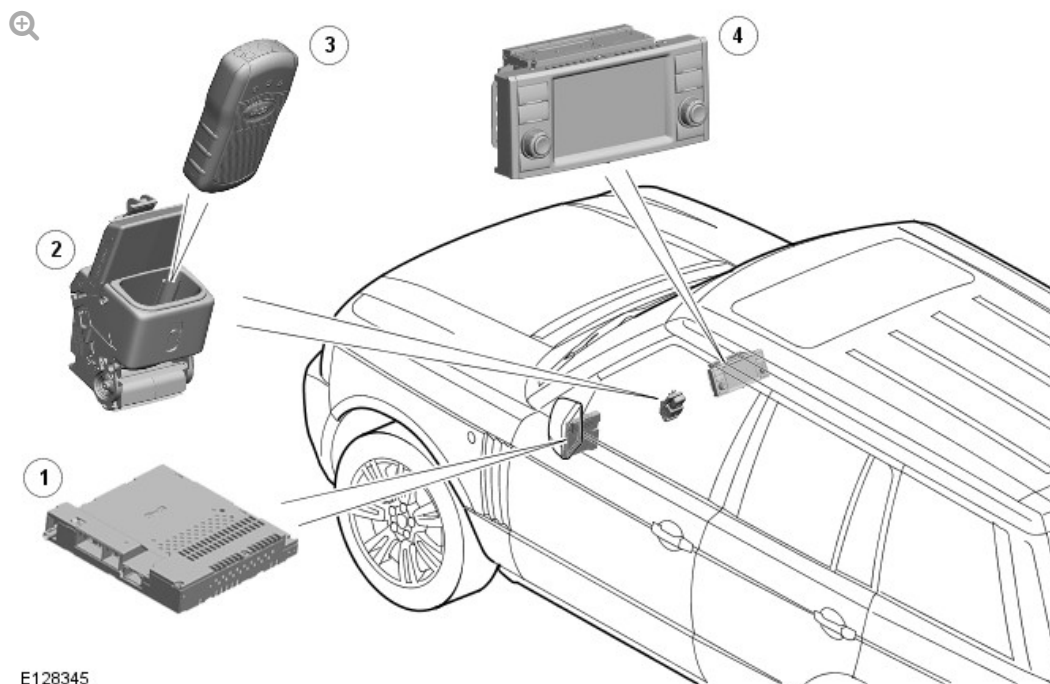
A = Hardwired; **N** = Medium Speed CAN Bus; **O** = Lin Bus; **P** = MOST
R = SPDIF (Sony); **AG** = Infra Red



ITEM	DESCRIPTION
1	Battery
2	BJB (battery junction box)
3	BJB2 (battery junction box 2)
4	RJB (rear junction box)
5	CJB
6	Clockspring
7	LH steering wheel switch
8	RH (right-hand) steering wheel switch
9	CD autochanger
10	RSE remote control docking station
11	RSE remote control
12	DVD autochanger
13	Speakers
14	Audio amplifier
15	Headphone transmitter module
16	Whitefire® Headphones (cordless)
17	TV RF antenna - LH
18	TV RF antenna - RH
19	LHLCD screen
20	RHLCD screen
21	RSE module
22	TV tuner
23	TSD
24	AVIO panel
25	TV antenna RF amplifier
26	TV antenna RF amplifier
27	TV antenna RF amplifier

28	TV antenna RF amplifier
29	IHU
30	Instrument cluster

VENTURECAM™ - COMPONENT LOCATION



E128345

ITEM	DESCRIPTION
1	IHU (integrated head unit)
2	VentureCam™ docking station
3	VentureCam™
4	TSD (touch screen display)

GENERAL

VentureCam™ consists of one or more remote cameras which transmit their images onto the Touch Screen Display (TSD) to provide the driver with a number of benefits, for example manoeuvring the vehicle or connecting a trailer. Additionally, the system can receive video transmissions from other compatible camera units such as a home CCTV camera. The system can support up to sixteen VentureCam's and an additional four external video

input units.

The system comprises one or more VentureCam's and a docking station. The system is connected into the infotainment system and the video images are displayed on the TSD.

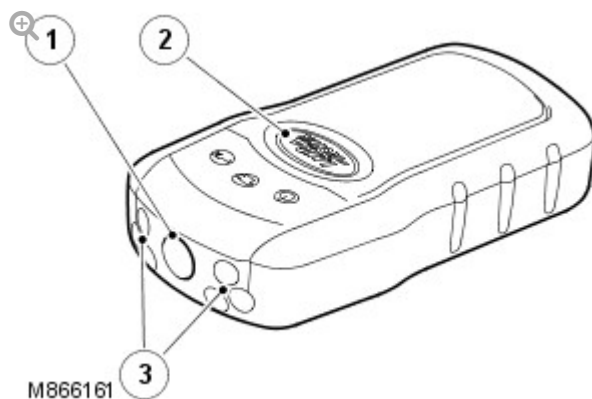
The VentureCam™ receives signals via a UHF transmission from the docking station for remote operation of the camera. The frequencies can be 433 MHz or 915 MHz depending on the market. The VentureCam™ transmits its video images to the docking station on a 2.4 GHz RF microwave transmission. The video is provided in an NTSC format at 25 frames per second. The microwave transmission is limited to an output of 10 mW to avoid conflicting with broadcasting legislation in most countries.

The VentureCam™ can receive and transmit signals at a distance of between 20 and 30 meters (65 and 98 feet). This range is dependant on the surrounding environment, i.e. the signals may be blocked or limited by buildings, vehicles etc.

The VentureCam™ system is connected to the TSD for video display by a co-axial cable. A controller area network (CAN) connection allows the Integrated Head Unit (IHU) to communicate with the docking station for transmission of infotainment relay energized signals etc.

VentureCam™ can be accessed by selecting 4X4i information on the TSD using a physical button or an icon on the screen. VentureCam™ is then selected by pressing the camera icon on the TSD.

VENTURECAM™



ITEM	DESCRIPTION
1	Camera lens
2	Control switch
3	LED

The VentureCam™ is a compact unit containing hardware and software for control of video image capture and transmission, six red LED for an additional light source and a control button.

The control button allows the VentureCam™ to be switched on or off and to activate the LED. The selections are made sequentially with the button, e.g.; the first press switches the camera function on, the second press switches the camera off and switches the LED on (torch function) and a third press switches the whole unit off. Using this button on the VentureCam™, only the camera or the torch function can be selected, they cannot be selected to work together at the same time. However, when in the camera function mode, the LED can also be made active by pressing the torch icon visible in the TSD. This will allow the LED to enhance the VentureCam™ view in low ambient light levels.

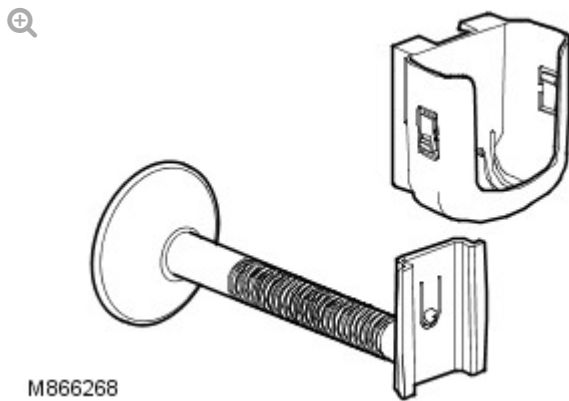
When the camera mode is selected, by pressing the button once, the area around the 'Land Rover' logo button is illuminated in a green color. If the illumination flashes, this indicates that the camera is awaiting a command from the TSD.

The VentureCam™ has an integral re-chargeable battery which, when fully charged, allows approximately 3 hours continuous use of video transmission. If the unit is used solely as a torch with only the LED illuminated, the battery will provide approximately 4 hours continued use. The VentureCam™ battery has a serviceable life of approximately 8 to 10 years, depending on its usage. The battery cannot be replaced separately, so if the battery fails, the VentureCam™ must be replaced.

The VentureCam™ is an electronic device and therefore should be handled with care. If the unit becomes dirty, clean only with a damp cloth, do not use detergents or solvent based cleaners. Avoid high temperatures, do not store the VentureCam™ in direct sunlight, always store in the desiccant

store the VentureCam™ in direct sunlight, always store in the docking station, glovebox or door pocket.

VENTURECAM™ MOUNT



An accessory mount is available with a suction cup which allows the VentureCam™ to be located inside or outside the vehicle. The holder has a removable holster into which the VentureCam™ is secured. The holster has a standard camera thread which allows it to be mounted on a tripod for instance. The suction cup has a control lever which creates a vacuum to provide the suction to secure the mount. To release the suction cup, lower the lever to release the vacuum.

BATTERY CHARGING

The battery is re-charged when the unit is in the docking station. Two spring loaded pins in the docking station connect with contacts on the VentureCam™. The charging will occur only when the VentureCam™ is in the docking station and the ignition switch is in position II. Power is supplied direct from the vehicle battery via a fuse in the central junction box (CJB) and is permanently live. However, charging will only occur when the IHU receives an ignition on signal via the CAN. The IHU then sends a charge message to the docking station via its CAN connection. The docking station software will allow further charging of the battery for a period of 30 minutes after an ignition off signal is received from the IHU.

The battery condition is shown on the TSD VentureCam™ display. A charge level indicator is displayed to indicate the charge level of the VentureCam™ battery.

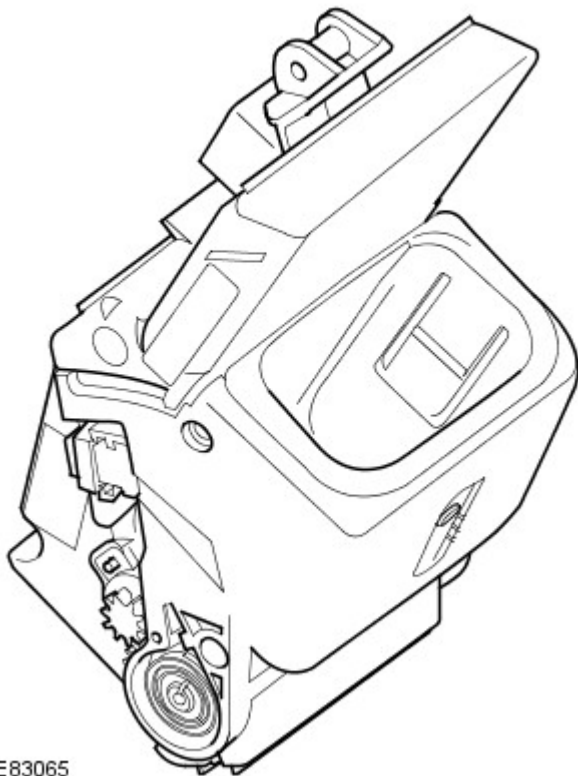
One segment on the battery display indicates that the battery is almost fully discharged. The docking station will apply a slow charge to the battery to

ensure the battery charge is fully recovered and may stay in this mode for a long period of time, depending on how low the battery charge has become. If a rising row of segments is indicated on the battery display, the docking station is applying a fast charge to the battery and will fully charge the battery in the minimum period of time. A complete and stationary row of segments indicates a fully charged battery.

If the battery is completely discharged, it will take approximately 2 hours of continuous charging with the vehicle engine running to restore the battery to a fully charged condition.

It is recommended that the VentureCam™ is stored in the docking station when not in use. The docking station will ensure that the battery is kept at the optimum charge level. If the customer has more than one VentureCam™, it is recommended that the units are cycled on a weekly basis to ensure that the battery charge level is maintained.

DOCKING STATION



The docking station is located in the upper glovebox. When the VentureCam™ is installed into the docking station, the illumination around

ventureCam™ is installed into the docking station, the illumination around the 'Land Rover' logo button changes to a green color to indicate that a good connection has been established with the charging contacts and that charging has commenced.

The docking station receives a permanent battery feed via a fuse in the CJB. A CAN connection provides a link with the IHU for transfer of information. A co-axial cable transmits the video signals from the docking station to the TSD.

The software contained within the docking station contains a power management strategy which monitors ignition status via CAN messages from the IHU and controls power operation for battery charging for a 30 minute period after the ignition is switched off.

VENTURECAM™ OPERATION

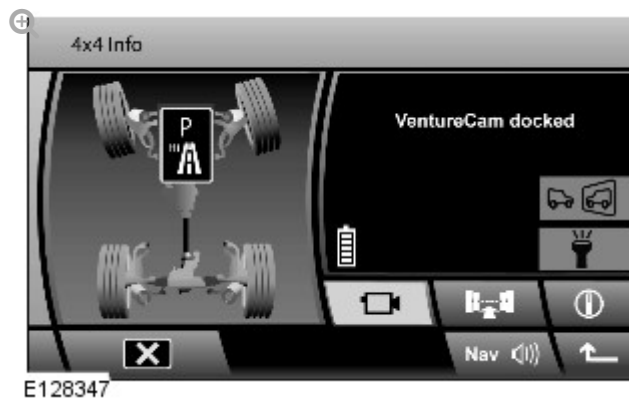
The VentureCam™ image is accessed using the 4X4I off-road information screen on the TSD. Each VentureCam™ must be learnt and saved to the memory before it can be used. If more than one VentureCam™ is configured to the system, each one can be selected in turn using the camera selection icons.

The VentureCam™ screen is accessed by pressing the VentureCam™ 'movie camera' icon at the bottom of the screen. The right hand side of the TSD will display a black screen with text stating 'VentureCam™ Docked' if a VentureCam™ is known to the system and located in the docking station. The chassis view will remain on the left hand side of the TSD until the VentureCam™ icon is pressed again. The chassis view will then be replaced with camera select information.



The currently selected camera icon is highlighted. Scrolling up or down the available camera's allows selection of a different VentureCam™ or an external video input.

A new VentureCam™ can be added to the system by placing the VentureCam™ into the docking station. A small window will appear prompting to 'Learn Camera'. Selecting 'OK' saves the VentureCam™ into the memory. A second window will appear asking if the user wants to use the new VentureCam™ now. Selecting 'Use Now' will use the new VentureCam™, selecting close will continue with the VentureCam™ highlighted in the camera select list. When a new VentureCam™ is added, it will be placed in the first numerically available position in the list.



VentureCam™s can also be deleted from the memory by selecting the applicable camera input to be deleted and pressing the 'Delete' icon on the TSD. A small window will appear asking for confirmation of the deletion. Selecting 'OK' deletes that VentureCam™ from the list and leaves that position empty.

If using the VentureCam™ to reverse the vehicle, the view seen on the screen can become confusing to the driver. To assist with this, a mirror view is available which reverses the image similar to that seen in the rear view mirror.

The VentureCam™ should not be used unless the vehicle is off-road. The VentureCam™ should only be used on the exterior of the vehicle. The mount could cause injury if attached to the vehicle interior and an accident occurs.

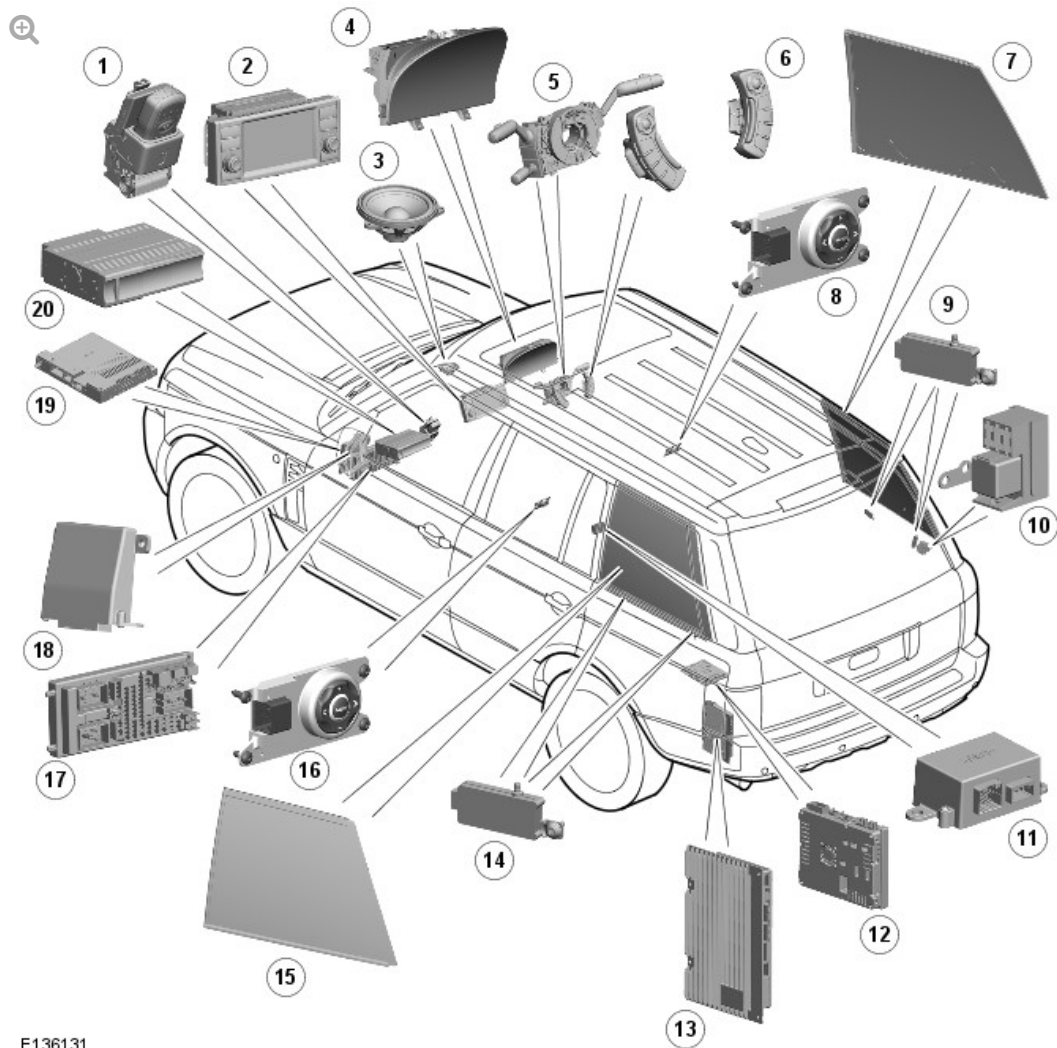
2012.0 RANGE ROVER (LM), 415-07

VIDEO SYSTEM

DESCRIPTION AND OPERATION

VIDEO AND ENTERTAINMENT SYSTEM

COMPONENT LOCATION - RANGE ROVER ULTIMATE



E136131

ITEM	DESCRIPTION
1	VentureCam™
2	Touch Screen Display (TSD)
3	Speakers
4	Instrument cluster
5	Clockspring
6	Steering wheel switches
7	TV Radio Frequency (RF) antenna - Right Hand (RH)
8	Rear seat audio control switch RH
9	TV antenna RF amplifier
10	Rear entertainment junction box

11	Rear seat audio control relay
12	TV tuner
13	Audio amplifier
14	TV antenna RF amplifier
15	TV RF antenna - Left Hand (LH)
16	Rear seat audio control switch LH
17	Central Junction Box (CJB)
18	Rear Entertainment Control Module (RECM)
19	Integrated Head Unit (IHU)
20	Compact Disc (CD) autochanger

GENERAL

The fibre optic, Media Orientated System Transport (MOST) based system provides audio entertainment for the front and rear seat occupants. The system allows TV to be viewed on front Touch Screen Display (TSD) and listen to audio output via the vehicle speakers. The TV video images can only be displayed on the TSD if the vehicle is below a predetermined speed threshold or has dual view TSD fitted.

The Range Rover Ultimate includes an Apple iPad based rear entertainment system, with Bluetooth® keyboard and headphones. Rear seat passengers can control the vehicle audio output using a rear seat audio control switch to select audio input mode, volume settings and channel or CD track skip functions.

The Range Rover Ultimate audio/infotainment system comprises the following components:

- TV Tuner
- Four TV antennas
- Four TV Antenna amplifiers
- TSD
- Steering wheel switches

- Steering wheel switches
- compact disc (CD) autochanger
- Audio amplifier
- Vehicle speakers
- Integrated Head Unit (IHU).

The rear seat entertainment system uses additional components in conjunction with the audio system as follows:

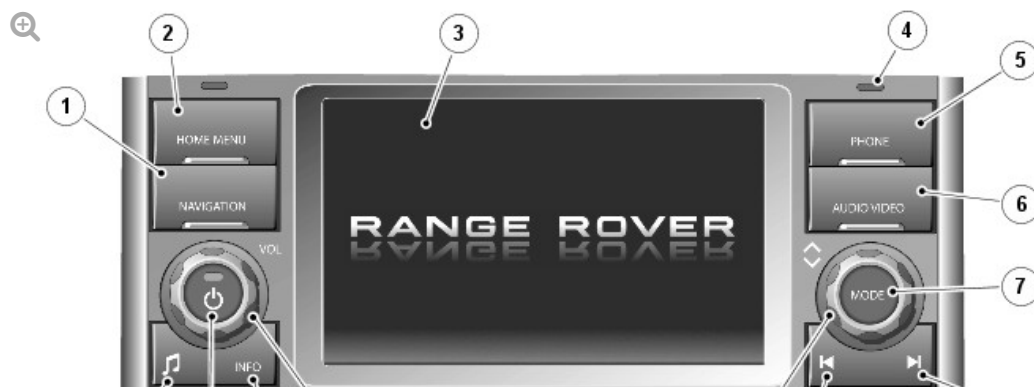
- Rear Entertainment Control Module (RECM)
- Two iPad docking stations
- Two rear seat audio control switches
- Bluetooth keyboard
- Bluetooth headphones
- Rear seat audio control relay
- Rear entertainment junction box.

NOTE:

iPad is a trademark of Apple Inc., registered in the U.S.A. and other countries

FRONT VIDEO SYSTEM - RANGE ROVER ULTIMATE

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 audio/infotainment system. The TSD is connected to the Media Orientated System Transport (MOST) ring and communicates with the other components in the audio/infotainment system.

The TSD provides driver display and control of the audio system, television, telephone, the rear view camera, proximity cameras, VentureCam™, the Traffic Message Channel (TMC) and the navigation system.

The audio/infotainment 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 the AUDIO VIDEO switch on the TSD.

NOTE:

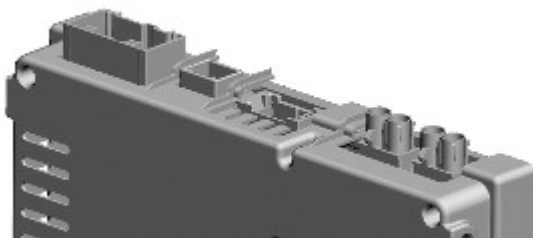
Due to legislation, the NAS markets do not receive the dual-view TSD. A single view TSD is available in these markets.

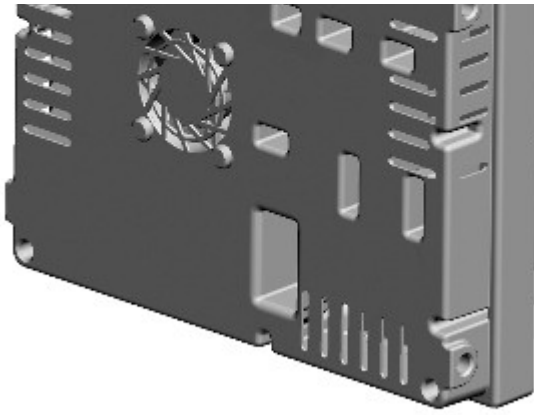
The dual-view TSD uses Parallax Barrier Shutter Technology to alternately hide and reveal columns of pixels to the left and right hand views of the screen. The display comes with a specially designed agar coating to help prevent sunlight bleaching.

Care should be taken with the TSD to ensure its correct operation:

- The screen should be cleaned with specially designed cloth supplied with the vehicle literature pack. 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.

TV TUNER





E128344

The TV tuner is located in the left hand rear corner of the luggage compartment. The TV tuner allows the front seat occupants to view the TV transmissions on the TSD, but only if duel view TSD is installed or the vehicle is stationary. The TV tuner is capable of receiving local terrestrial TV transmissions in most locations.

The TV tuner is connected on the MOST ring which it uses to output its audio signals to the amplifier. Video output from the TV tuner is on a screened co-axial cable to the TSD. Four further connections provide for the signal input from four TV antenna amplifiers and four antennas.

The TV tuner contains three internal tuners. Two of the tuners are connected to the antennas. These tuners receive the audio and visual signals. The tuner with the strongest signal is automatically used to display the required TV channel.

The third internal tuner is connected to only one of the antennas and is used to scan the locality for receivable channels. The tuner can detect different frequencies transmitting the same channel and can select the strongest signal for use.

To cope with changes in technology, the TV tuner is able to receive both analogue and digital TV signals. In certain areas both analogue and digital signal strengths will vary. When in an area of weak reception, you may experience a break-up in picture and sound quality, or a blank screen and audio muting. It may be of benefit to retune the viewed station, and possibly switch between analogue and digital TV stations.

The TV tuner is connected to the infotainment system using four harness connectors.

TV ANTENNAS

NOTE:

On vehicles with remote park heating, the right-hand (RH) rear antenna is fitted with a combined remote park heating/TV antenna amplifier.

Two TV antennas are located in each rear side quarter window. There are three antennas in each window; the forward antenna is a high frequency antenna and the rearward antenna is a low frequency antenna. A third antenna, located between the two TV antennas is for radio reception.

Each antenna is connected directly to a TV RF antenna amplifier which is located just below the rear quarter panel, behind the trim. The four TV antenna amplifiers boost the received RF signal before it is collected and processed by the TV tuner. The TV antennas can receive RF signals of between 48 and 860 MHz.

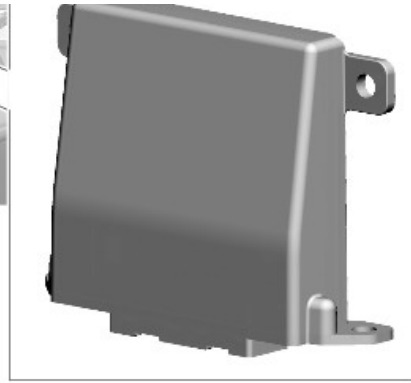
REAR ENTERTAINMENT SYSTEM - RANGE ROVER ULTIMATE

REAR ENTERTAINMENT CONTROL MODULE (RECM)

NOTE:

CD autochanger removed from illustration for clarity.





E136132

The RECM is located on a bracket, adjacent to the CD (compact disc) autochanger in the rear of the glove compartment.

The RECM provides a gateway between the Integrated Head Unit (IHU) and the medium speed CAN (controller area network) bus system. In response to inputs from the rear audio control switches, the RECM manipulates CAN messages for audio control and routes the Apple iPad audio output into the vehicle audio system.

The RECM also controls the power supply to the chiller unit in the rear floor console. The RECM provides a ground for the relay in the rear entertainment junction box when either the battery saver relay or infotainment relay supplies power to the RECM. When the relay contacts are closed, power is supplied to the chiller unit. The chiller will operate when either the battery saver relay or infotainment relay in the CJB (central junction box) is energized and the switch on the top of the chiller is turned to the on position. This allows the chiller to begin cooling as soon as the vehicle is unlocked or alternatively, to continue cooling when the ignition is turned off but the infotainment system remains active.

The RECM receives three power supplies:

- One power supply is spliced into the power supply connector for the portable audio module. This supply originates from a fused supply (fuse 67P 15A) in the CJB and is controlled by the infotainment relay. The connection is used by the RECM to monitor the status of the infotainment relay.
- The second power supply originates from a splice into the glove compartment lamp connector power supply. The supply originates from a fused supply (fuse 57P 10A) in the CJB and is controlled by the battery

saver relay. The connection is used by the RECM to monitor the status of the battery saver relay.

- The third supply is a fused (5A) permanent battery supply from the rear entertainment junction box.

The RECM contains an isolated charger for the iPads. The charger provides a regulated 5V output to each iPad for charging of the iPad internal battery. The RECM activates the charging function when it receives a power supply from either the battery saver relay or the infotainment relay. The RECM has a maximum current draw of 2.0A with both iPads charging from a fully discharged state.

To protect the vehicle battery, the RECM will disable iPad charging when the voltage at the permanent battery connection on the RJB (rear junction box) falls below 11.0V. Under this condition, iPad charging will be re-enabled once the voltage at the permanent battery connection on the RJB exceeds 11.5V or the RECM is reset at a voltage above 11.0V. Similarly, the RECM will disable iPad charging when the voltage at the RJB permanent battery connection exceeds 18.0V. Under this condition, the iPad charging will be re-enabled once the voltage at the RJB permanent battery connection falls below 15.5V or the RECM is reset at a voltage below 18.0V.

Each rear seat audio control switch is connected to the RECM. Operation of the switch positions creates a ground path to the RECM. The switch selection is detected by the RECM which then modifies a CAN message which is passed to the IHU to perform the requested function.

The RECM controls the rear floor console mood lighting. The RECM receives a PWM (pulse width modulation) input from the instrument panel illumination circuit. The PWM duty-cycle is dependant on the position of the instrument panel illumination dimmer rheostat. The RECM monitors the PWM input and produces a PWM output on the ground connection to the rear floor console mood lighting LED (light emitting diode)'s.

For additional information, refer to: Interior Lighting (417-02, Description and Operation).

The RECM also controls the operation of the relays in the rear seat audio control relay. On receipt of the request from the 'MODE' switch on one of the rear seat audio control switches, the RECM energizes or de-energizes

the rear seat audio control switches, the RECM energizes or de-energizes the relays to switch the audio output from the requested iPad.

The RECM has four ground connections which are connected at connector C2561 at the base of the driver's side 'A' pillar. This also provides the ground connections for the rear seat audio control switches.

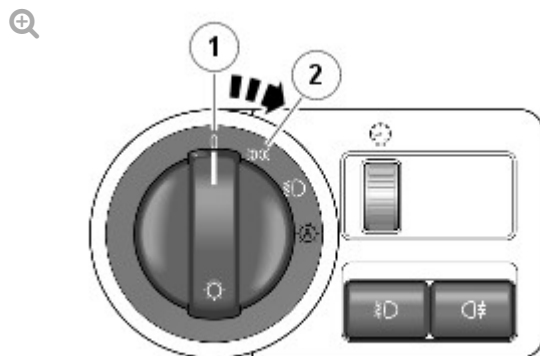
Test Mode

The RECM has a test mode which allows various functions of the RECM to be tested for correct operation.

When the system is powered up by either the infotainment relay or the battery saver relay becoming active, the RECM monitors the input from the instrument panel lighting circuit.

If, within 15 seconds of the infotainment relay becoming active, the RECM detects the five separate changes of instrument panel light input status generated by the lighting control switch being switched from off to on (side lamp position) five times, the RECM will enter test mode.

Test Mode Activation Using Lighting Control Switch

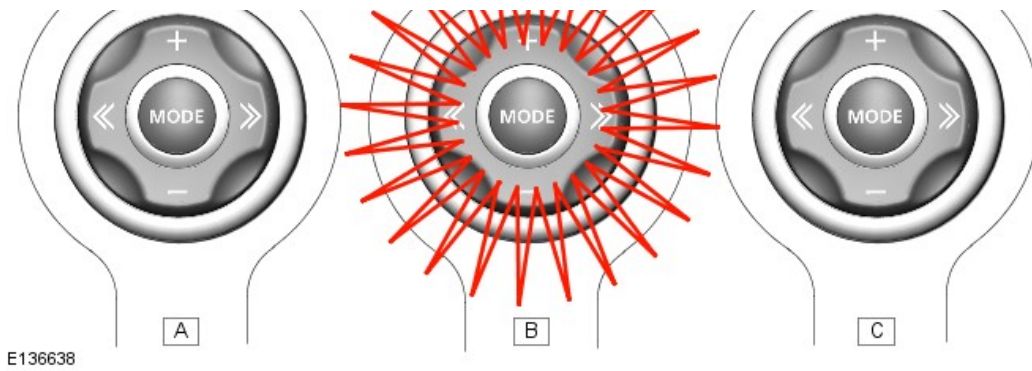


E136637

Confirmation of entering test mode is given by the LH (left-hand) and RH (right-hand) rear seat audio control switch MODE lamps being illuminated for 3 seconds.

Entry to Test Mode Confirmation





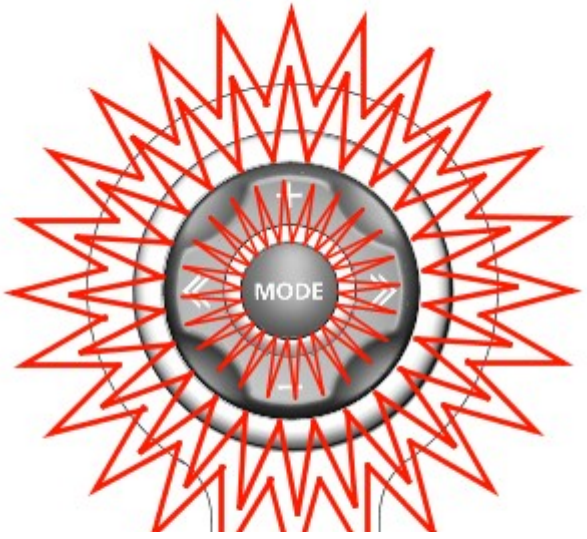
E136638

ITEM	DESCRIPTION
A	Before test mode
B	Test mode entered (3 second flash)
C	Ready to display status

The following functions are available in test mode:

- Operate medium speed CAN bus gateway
 - Each rear seat audio control switch will flash in a red color to indicate CAN activity. If the LH switch is not flashing, then there is a problem with the CAN bus between the RECM and the IHU. If the RH switch is not flashing in a red color, there is a problem with the CAN bus between the RECM and the rest of the modules on the vehicle medium speed CAN bus.

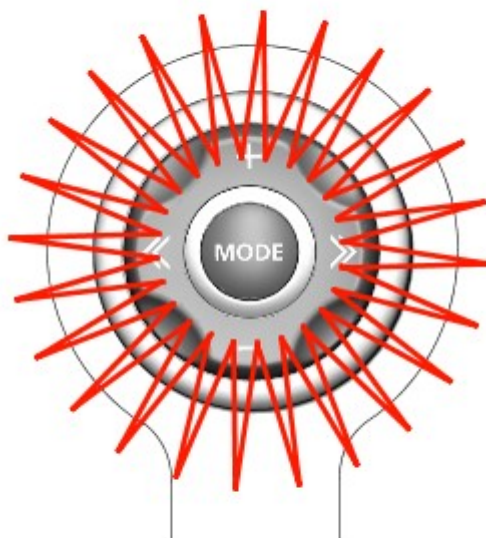
CAN Gateway Activity



E136639

- Enable instrument panel illumination
 - The rear seat audio control switch backlighting will be permanently illuminated in green while RECM is in test mode,
- Cycle the chiller relay in the rear seat audio control relay every 2 seconds
 - The LED in the on/off switch for the chiller unit will flash on and off to show the relay is operating.
- Disable normal function for rear seat audio control switches
 - The rear seat audio control switch function will not operate the normal function while RECM is in test mode.
- Illuminate both MODE switches continuously when any switch is pressed on the rear seat audio control switches
 - Any button press (volume +/-, skip >>/<< and MODE) will cause both rear seat audio control switches to illuminate in a red color.

Rear Audio Control Switch Function



The RECM will exit test mode if none of the rear audio control switches are pressed for 30 seconds or the power to the module is reset.

Audio/Video System Software Downloads

Due to the complexity of the Audio/Video system, software uploads from the Land Rover approved diagnostic system to the IHU or any component in the MOST ring requires the disconnection of the RECM from the medium speed CAN bus. A by-pass procedure allows the medium speed CAN connections to the RECM to be re-routed to by-pass the module.

NOTE:

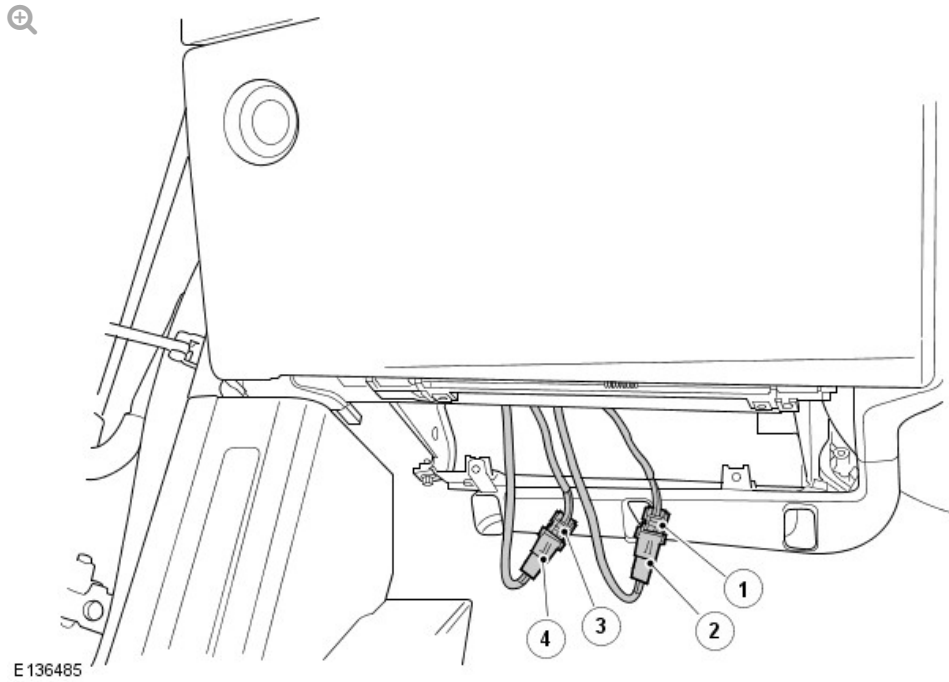
This procedure is not required for DTC (diagnostic trouble code) retrieval or any other diagnostic procedures.

The RECM harness has been designed so that disconnection from the CAN bus is a simple process. The RECM harness uses two in-line connectors, each containing two terminal pins. These are located approximately 300 mm from the RECM and are secured at the rear of the glove compartment with cable ties to the vehicle body harness.

The by-pass procedure is as follows:

1. Remove 3 screws and remove the passenger side closing panel from below the glove compartment. Disconnect the electrical connector from the footwell lamp.
2. Identify the two in-line connectors which are secured with a cable tie to the vehicle main body harness behind the glove compartment. Removal of the cable tie improves access. Note the order in which the connectors are joined to help with restoring the connections after the procedure has been performed. The RECM connectors are identified by a label on the harness.

Connectors before disconnection

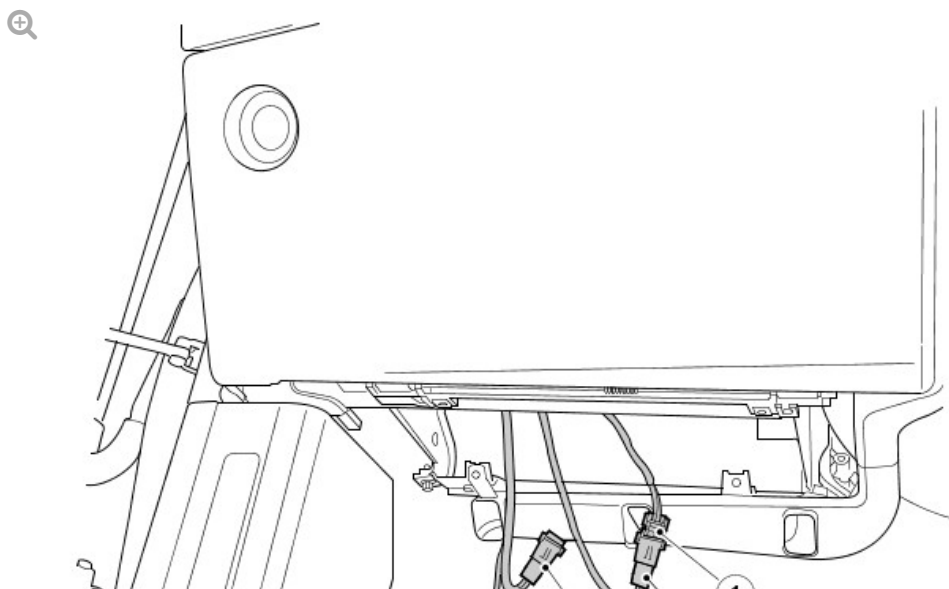


3. Disconnect the two in-line connectors 1 and 2, and 3 and 4. Identify the male connector (4) leading to the IHU and plug into the female connector (1) leading to the medium speed CAN bus. Leave both connector halves (2 and 3) associated with the RECM disconnected.

NOTE:

Connector gender is denoted by the connector terminal pins and not the connector housing.

Connectors ready for software download





4. Using the approved Land Rover diagnostic equipment, complete the software download.
5. Once the download is complete, disconnect the in-line connectors and reconnect as noted in step 2.
6. Reconnect the footwell lamp connector and replace the passenger side closing panel and secure with 3 screws.

REAR SEAT AUDIO CONTROL SWITCHES



ITEM	DESCRIPTION
1	Electrical connector
2	Housing
3	Audio volume and skip switch
4	MODE select switch

A rear seat audio control switch is located in the rear of each front seat, behind the iPad docking station. The switches are unique to the Range Rover Ultimate. The switches are accessed by raising the iPad docking

station.

NOTE:

The iPad cannot be switched on or off or woken up using the rear seat audio control switches.

The switch is secured behind the seat backboard cover with four self tapping screws. The switch is connected electrically by an additional harness located in each front seat. The harness also supplies iPad power from the RECM and audio signals from the iPad docking station connector to the rear seat audio control relay.

Each rear seat audio control switch is connected directly to the RECM. The RECM processes the switch operation and converts the switch operation into CAN messages to the IHU to control the audio output and mode selection.

Both rear seat audio control switches receive a permanent fused (10A) power supply from the rear entertainment junction box.

The signals from each switch to the RECM are common, except for the MODE switches. The status of each switch is monitored by the RECM for volume, skip, MODE LH and MODE RH. Pressing a switch will cause the RECM to modify an existing CAN message and pass it to the IHU. Both MODE switches will perform the same function provided they are pressed momentarily. The switch operation is performed once the switch press has been confirmed by the RECM. The MODE switch function is only processed once the switch has been released.

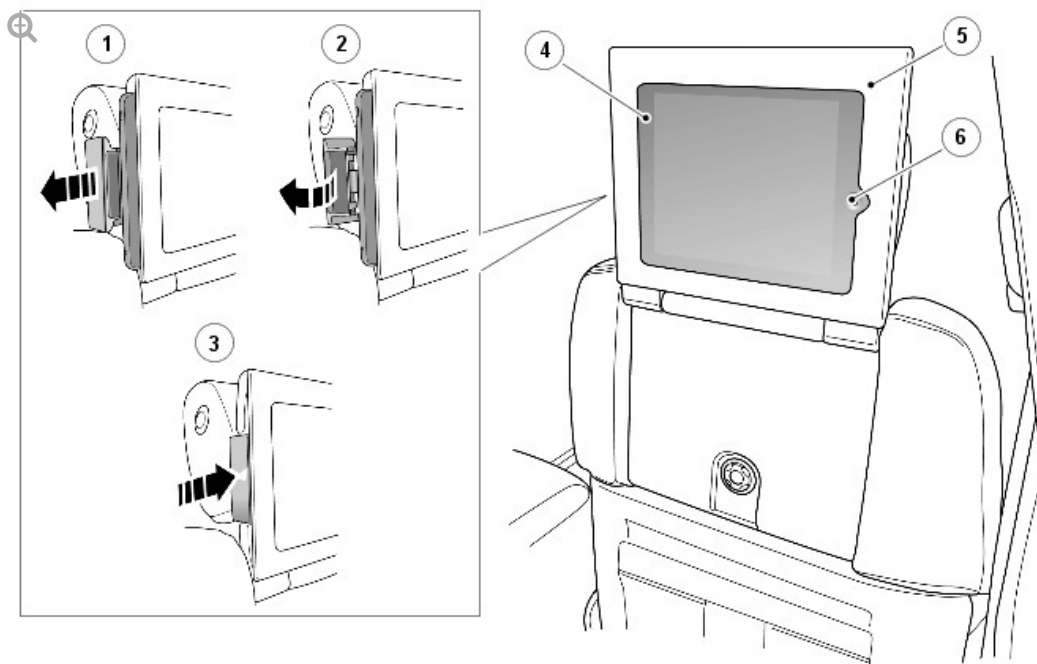
Pressing and holding the MODE switch for 3 seconds selects the iPad associated with the switch for audio output via the vehicle audio system. The switching between the two iPads is controlled by the rear seat audio control relay. The audio source selection is confirmed by the MODE switch being illuminated in a red color for 0.5 seconds.

The MODE switches can also be used to change the audio system source. The options are displayed on the TSD and the MODE switch can be used to

scroll through the options to select the required audio source. iPad audio is selected by choosing the 'AUX' option on the TSD.

The rear seat audio control switches can be disabled with the rear window isolation switch. The RECM receives a CAN message for the status of the rear window isolation switch and will turn off the illumination to both rear audio control switches. The MODE switch operation of the rear seat audio control relay however, is not affected by the status of the rear window isolation switch.

IPAD DOCKING STATION



E136133

ITEM	DESCRIPTION
1	Pull to unlatch iPad from docking station
2	Pivot lever to remove iPad from docking station
3	Push to install iPad and lock with lever
4	iPad
5	Casing, latch and docking station assembly
6	iPad mode button

CAUTION:



The docking station is only compatible with the iPad version it was designed for. For example, attempting to dock an iPad2 into a docking station for an iPad1 may damage both the iPad and the docking station.

An iPad docking station is located in the rear of each front seat. Each docking station comprises a moveable lid, which contains an iPad casing and latch assembly and a harness assembly.

When the lid is in its stowed position, the lid sits in a cut out in the rear seat back. The lid is secured with magnets to retain it in the closed position. The lid is lifted through 180 degrees to access the iPad and docking station and the rear seat audio control switch.

When the lid is up, the iPad is accessible and can be switched on using the main on/off switch in the top RH corner of the iPad. The mode button on the iPad is used to select the iPad functions.

NOTE:

The iPad cannot be switched on or off using the rear seat audio control switches. The iPad must be switched on using the main on/off switch in the top RH corner of the iPad. If the iPad is on and in sleep mode, it can be woken up using the mode button on the iPad.

The iPad can be removed from the docking station by pulling the latch outwards to release the iPad from the docking station and electrical connector. Rotating the latch allows the iPad to then be pulled from the casing and latch assembly. The iPad is automatically disconnected from the harness connector when it is removed. Fitting the iPad is achieved by sliding the iPad, correctly orientated, into the casing and latch assembly. The iPad, when pushed fully into the casing, will engage with the harness connector for audio and charging and the latch will click to secure the iPad in the casing.

The iPad will charge when the RECM receives a power supply from either the battery saver relay or the infotainment relay.

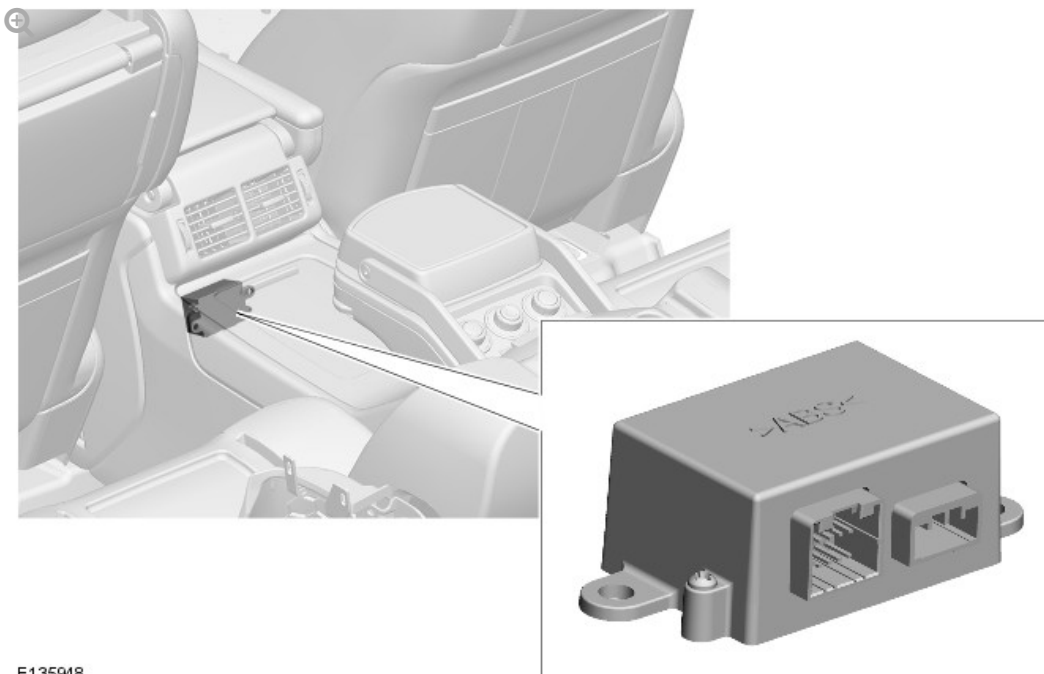
BLUETOOTH KEYBOARD AND HEADPHONES

A Bluetooth® keyboard and headphones are supplied for use with the iPads.

Both the keyboard and headphones require pairing with the iPads and this should be performed in accordance with the instructions supplied with the iPad and the accessory.

The keyboard has a specific shaped slot in the rear floor console stowage box for storage. The headphones can be stored in the pocket in the rear of each front seat.

REAR SEAT AUDIO CONTROL RELAY



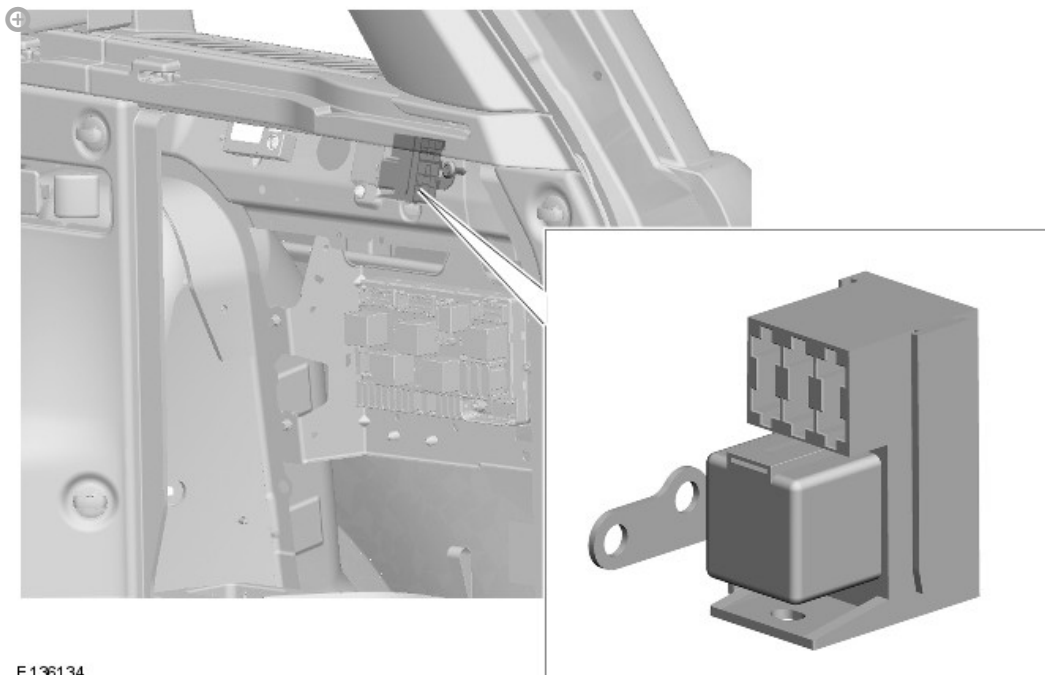
The rear seat audio control relay is an additional component unique to Range Rover Ultimate. The relay is located at the rear of the front floor console, below the rear passenger compartment air vents. The relay is secured to the front floor console with two flange bolts.

The rear seat audio control relay receives audio output from an individual iPad and forwards the output to the IHU. The control relay ensures that only the output from one selected iPad is passed to the IHU for audio through the vehicle speaker system. Audio output from both iPads cannot be passed to the IHU simultaneously.

The rear seat passenger(s) can select which iPad audio output should be connected to the vehicle audio system by pressing and holding the MODE switch on the required side for more than 3 seconds. This is received by the RECM which confirms the selection by illuminating the MODE switch in a red color for 0.5 seconds. The RECM simultaneously outputs another continuous signal to the rear seat audio control relay to switch the applicable left and right audio outputs and the applicable audio ground connections via three relays within the relay.

The selected iPad for the audio output is not stored when the ignition is in off mode and the relay in the rear entertainment junction box is de-energized. A default start-up routine always activates the iPad on the RH side of the vehicle.

REAR ENTERTAINMENT JUNCTION BOX



The rear entertainment junction box is located in the RH rear of the luggage compartment, above the RJB. The junction box is secured to the vehicle body by an integral bracket using a bolt and a scrivet.

The rear entertainment junction box contains two fuses and one relay. The two fuses, F1 (5A) and F2 (10A), supply a permanent battery supply to the RECM and the rear seat audio control switches respectively. Fuse F2 also supplies the rear console mood lighting, the rear seat audio control relay, the rear stowage bin illumination and the chiller unit circuits.

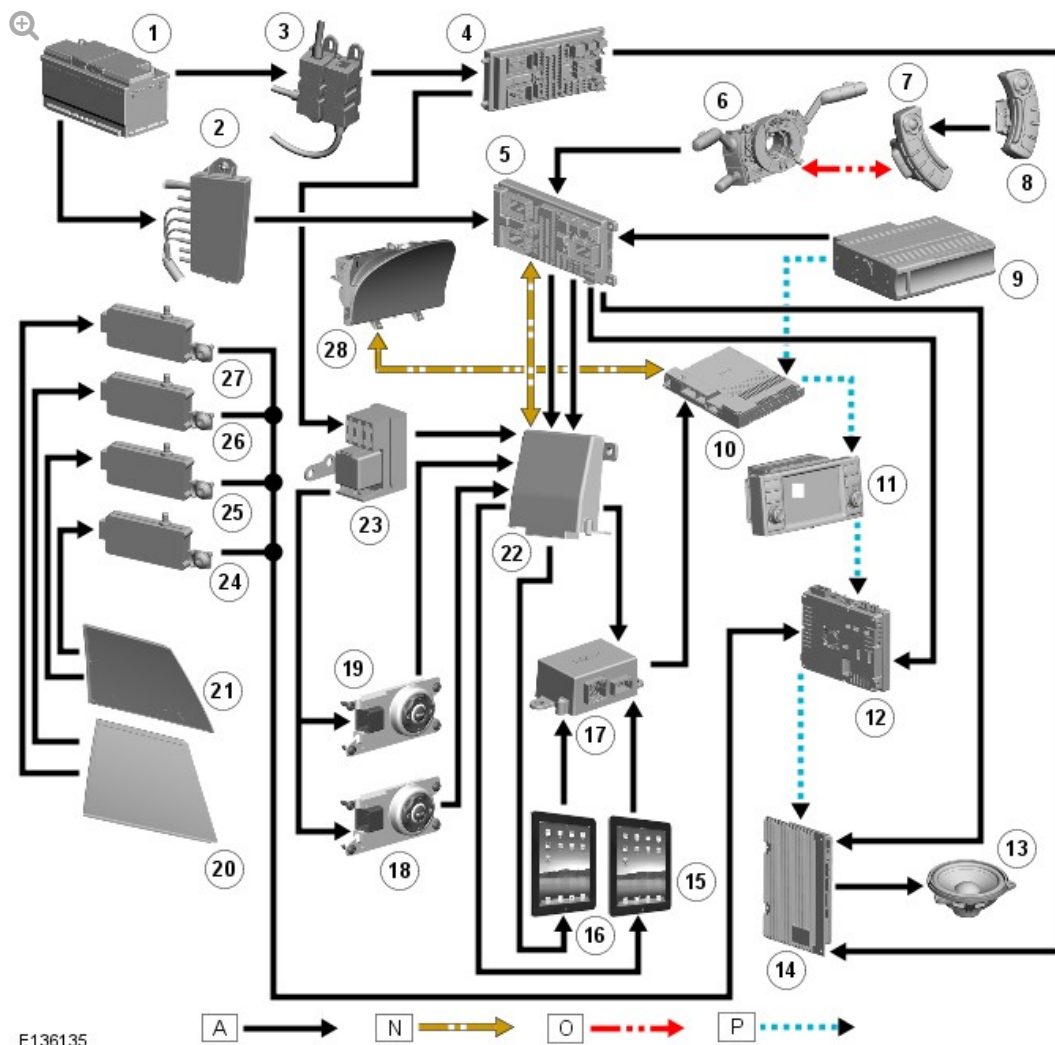
The relay in the junction box is controlled by the RECM and supplies battery power to the chiller unit and the rear stowage bin illumination.

For additional information, refer to: Refrigeration (412-05, Description and Operation).

CONTROL DIAGRAM - VIDEO AND ENTERTAINMENT SYSTEM - RANGE ROVER ULTIMATE

NOTE:

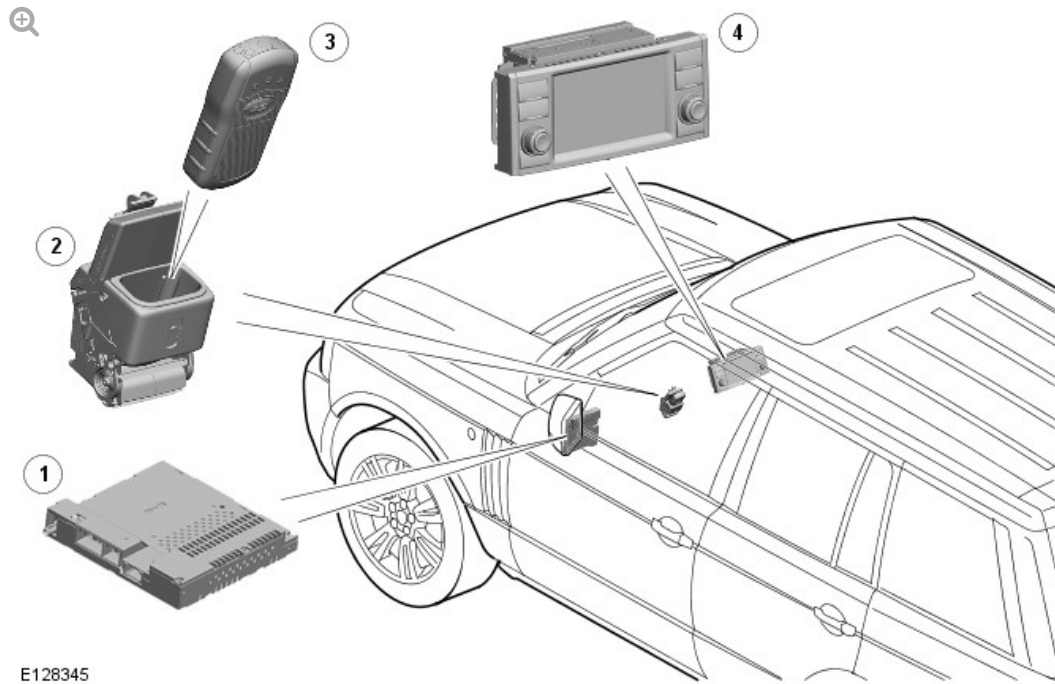
A = Hardwired; **N** = Medium Speed CAN Bus; **O** = LIN Bus; **P** = MOST **R** = SPDIF (Sony); **AG** = Infra Red



ITEM

DESCRIPTION

1	Battery
2	BJB (battery junction box)
3	BJB2 (battery junction box 2)
4	RJB
5	CJB
6	Clockspring
7	LH steering wheel switch
8	RH steering wheel switch
9	CD autochanger
10	Integrated Head Unit (IHU)
11	Touch Screen Display (TSD)
12	TV tuner
13	Speakers
14	Audio amplifier
15	RH iPad and docking station
16	LH iPad and docking station
17	Rear seat audio control relay
18	LH Rear seat audio control switch
19	RH Rear seat audio control switch
20	TV RF antenna - LH
21	TV RF antenna - RH
22	Rear Entertainment Control Module (RECM)
23	Rear entertainment junction box
24	TV antenna RF amplifier
25	TV antenna RF amplifier
26	TV antenna RF amplifier
27	TV antenna RF amplifier
28	Instrument cluster



E128345

ITEM	DESCRIPTION
1	IHU (integrated head unit)
2	VentureCam™ docking station
3	VentureCam™
4	TSD (touch screen display)

GENERAL

VentureCam™ consists of one or more remote cameras which transmit their images onto the Touch Screen Display (TSD) to provide the driver with a number of benefits, for example manoeuvring the vehicle or connecting a trailer. Additionally, the system can receive video transmissions from other compatible camera units such as a home Closed Circuit Television (CCTV) camera. The system can support up to sixteen VentureCam's and an additional four external video input units.

The system comprises one or more VentureCam's and a docking station. The system is connected into the infotainment system and the video images are displayed on the TSD.

The VentureCam™ receives signals via a Ultra High Frequency (UHF)

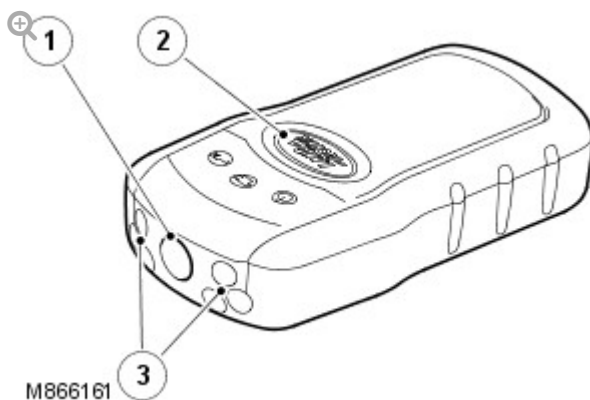
The VentureCam™ receives signals via a Ultra High Frequency (UHF) transmission from the docking station for remote operation of the camera. The frequencies can be 433 MHz or 915 MHz depending on the market. The VentureCam™ transmits its video images to the docking station on a 2.4 GHz RF microwave transmission. The video is provided in an NTSC format at 25 frames per second. The microwave transmission is limited to an output of 10 mW to avoid conflicting with broadcasting legislation in most countries.

The VentureCam™ can receive and transmit signals at a distance of between 20 and 30 meters (65 and 98 feet). This range is dependant on the surrounding environment, i.e. the signals may be blocked or limited by buildings, vehicles etc.

The VentureCam™ system is connected to the TSD for video display by a co-axial cable. A controller area network (CAN) connection allows the Integrated Head Unit (IHU) to communicate with the docking station for transmission of infotainment relay energized signals etc.

VentureCam™ can be accessed by selecting 4X4i information on the TSD using a physical button or an icon on the screen. VentureCam™ is then selected by pressing the camera icon on the TSD.

VENTURECAM™



ITEM	DESCRIPTION
1	Camera lens
2	Control switch
3	light emitting diode (LED)

The VentureCam™ is a compact unit containing hardware and software for control of video image capture and transmission, six red LED for an additional light source and a control button.

The control button allows the VentureCam™ to be switched on or off and to activate the LED. The selections are made sequentially with the button, e.g.; the first press switches the camera function on, the second press switches the camera off and switches the LED on (torch function) and a third press switches the whole unit off. Using this button on the VentureCam™, only the camera or the torch function can be selected, they cannot be selected to work together at the same time. However, when in the camera function mode, the LED can also be made active by pressing the torch icon visible in the TSD. This will allow the LED to enhance the VentureCam™ view in low ambient light levels.

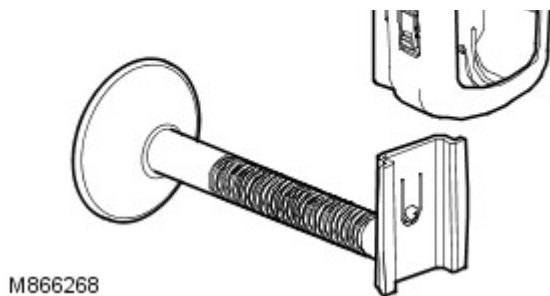
When the camera mode is selected, by pressing the button once, the area around the 'Land Rover' logo button is illuminated in a green color. If the illumination flashes, this indicates that the camera is awaiting a command from the TSD.

The VentureCam™ has an integral re-chargeable battery which, when fully charged, allows approximately 3 hours continuous use of video transmission. If the unit is used solely as a torch with only the LED illuminated, the battery will provide approximately 4 hours continued use. The VentureCam™ battery has a serviceable life of approximately 8 to 10 years, depending on its usage. The battery cannot be replaced separately, so if the battery fails, the VentureCam™ must be replaced.

The VentureCam™ is an electronic device and therefore should be handled with care. If the unit becomes dirty, clean only with a damp cloth, do not use detergents or solvent based cleaners. Avoid high temperatures, do not store the VentureCam™ in direct sunlight, always store in the docking station, glove compartment or door pocket.

VENTURECAM™ MOUNT





An accessory mount is available with a suction cup which allows the VentureCam™ to be located inside or outside the vehicle. The holder has a removable holster into which the VentureCam™ is secured. The holster has a standard camera thread which allows it to be mounted on a tripod for instance. The suction cup has a control lever which creates a vacuum to provide the suction to secure the mount. To release the suction cup, lower the lever to release the vacuum.

BATTERY CHARGING

The battery is re-charged when the unit is in the docking station. Two spring loaded pins in the docking station connect with contacts on the VentureCam™. The charging will occur only when the VentureCam™ is in the docking station and the ignition switch is in position II. Power is supplied direct from the vehicle battery via a fuse in the central junction box (CJB) and is permanently live. However, charging will only occur when the IHU receives an ignition on signal via the CAN. The IHU then sends a charge message to the docking station via its CAN connection. The docking station software will allow further charging of the battery for a period of 30 minutes after an ignition off signal is received from the IHU.

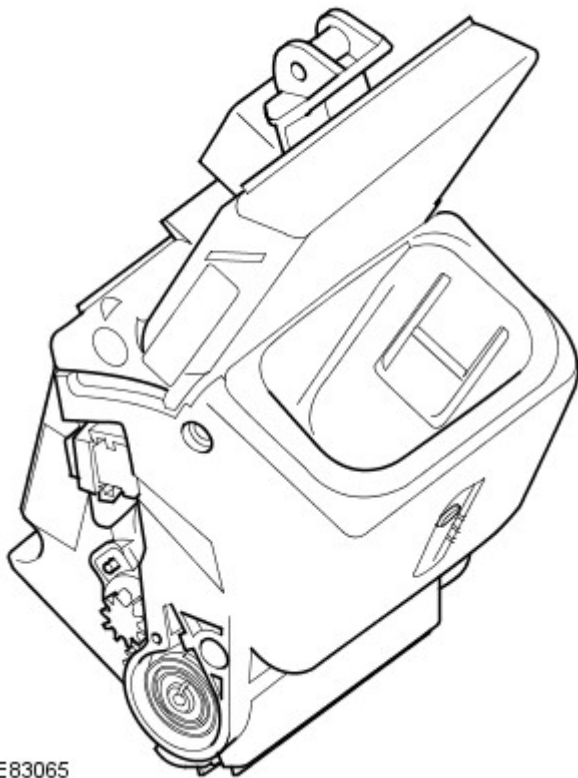
The battery condition is shown on the TSD VentureCam™ display. A charge level indicator is displayed to indicate the charge level of the VentureCam™ battery.

One segment on the battery display indicates that the battery is almost fully discharged. The docking station will apply a slow charge to the battery to ensure the battery charge is fully recovered and may stay in this mode for a long period of time, depending on how low the battery charge has become. If a rising row of segments is indicated on the battery display, the docking station is applying a fast charge to the battery and will fully charge the battery in the minimum period of time. A complete and stationary row of segments indicates a fully charged battery.

If the battery is completely discharged, it will take approximately 2 hours of continuous charging with the vehicle engine running to restore the battery to a fully charged condition.

It is recommended that the VentureCam™ is stored in the docking station when not in use. The docking station will ensure that the battery is kept at the optimum charge level. If the customer has more than one VentureCam™, it is recommended that the units are cycled on a weekly basis to ensure that the battery charge level is maintained.

DOCKING STATION



The docking station is located in the upper glove compartment. When the VentureCam™ is installed into the docking station, the illumination around the 'Land Rover' logo button changes to a green color to indicate that a good connection has been established with the charging contacts and that charging has commenced.

The docking station receives a permanent battery feed via a fuse in the CJB. A CAN connection provides a link with the IHI for transfer of information. A

A CAN connection provides a link with the IHU for transfer of information. A co-axial cable transmits the video signals from the docking station to the TSD.

The software contained within the docking station contains a power management strategy which monitors ignition status via CAN messages from the IHU and controls power operation for battery charging for a 30 minute period after the ignition is switched off.

VENTURECAM™ OPERATION

The VentureCam™ image is accessed using the 4X4i off-road information screen on the TSD. Each VentureCam™ must be learnt and saved to the memory before it can be used. If more than one VentureCam™ is configured to the system, each one can be selected in turn using the camera selection icons.

The VentureCam™ screen is accessed by pressing the VentureCam™ 'movie camera' icon at the bottom of the screen. The right hand side of the TSD will display a black screen with text stating 'VentureCam™ Docked' if a VentureCam™ is known to the system and located in the docking station. The chassis view will remain on the left hand side of the TSD until the VentureCam™ icon is pressed again. The chassis view will then be replaced with camera select information.



The currently selected camera icon is highlighted. Scrolling up or down the available camera's allows selection of a different VentureCam™ or an external video input.

A new VentureCam™ can be added to the system by placing the

VentureCam™ into the docking station. A small window will appear prompting to 'Learn Camera'. Selecting 'OK' saves the VentureCam™ into the memory. A second window will appear asking if the user wants to use the new VentureCam™ now. Selecting 'Use Now' will use the new VentureCam™, selecting close will continue with the VentureCam™ highlighted in the camera select list. When a new VentureCam™ is added, it will be placed in the first numerically available position in the list.



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VIDEO SYSTEM

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

For a detailed description of the video system and operation, refer to the relevant Diagnosis and Testing section of the workshop manual. REFER to: Video System (415-07 Video 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.

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
<ul style="list-style-type: none">▪ Front touch screen display (TSD) installation and condition▪ Rear seat entertainment (RSE) screen installation and condition▪ Digital versatile disc (DVD) multi-changer installation and condition▪ Television antennae (two in each rear side window)	<ul style="list-style-type: none">▪ Fuses▪ Electrical harnesses▪ Fibre optic cable harnesses▪ Infotainment relay▪ Display screens▪ DVD multi-changer▪ Television tuner module▪ RSE module▪ Television antenna amplifiers (4)▪ Remote control and batteries

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 relevant DTC Index.

SYMPTOM	POSSIBLE CAUSES	ACTION
The DVD does not operate	<ul style="list-style-type: none"> ▪ DVD multi-changer fuse blown ▪ No power to display screens ▪ Condensation 	Check the DVD circuits for a short circuit causing fuse failure and rectify as necessary. Refer to the electrical guides. Check for power to the display screens, rectify as necessary. Refer to the electrical guides. Wait at least one hour for the condensation to dry out.
Remote control operation is unstable	<ul style="list-style-type: none"> ▪ Handset batteries low on power ▪ Remote control receiver sensor or transmitter is dirty 	Check and renew the batteries as necessary. Check and clean the receiver and transmitter as necessary.
There is no picture	<ul style="list-style-type: none"> ▪ The display screen is set to an incorrect mode 	Use the switch on the back of the handset to select the correct mode.
Playback does not start	<ul style="list-style-type: none"> ▪ Disc is loaded upside-down ▪ An incorrect format of disc is loaded ▪ Parental lock is set ▪ The setup menu is displayed 	Check that the disc is correctly loaded. Check that the disc format is compatible. Cancel parental lock or check the rating of the disc. Press SET for at least 2 seconds to turn the setup menu off.
The picture is unclear or noisy	<ul style="list-style-type: none"> ▪ The disc is being fast forwarded or rewound ▪ The vehicle battery power is low 	The picture may be slightly distorted in fast forward or rewind modes. Check the vehicle battery condition and state of charge.

The image "freezes"	<ul style="list-style-type: none"> ▪ The disc is scratched 	Load an undamaged disc.
NO MAG is displayed	<ul style="list-style-type: none"> ▪ There is no magazine loaded into the DVD multi-changer 	Load a magazine.
NO DISC is displayed	<ul style="list-style-type: none"> ▪ There is no disc loaded into the magazine ▪ The disc is dirty 	Load a disc into the magazine. Clean the disc as necessary.
REGIONAL CODE VIOLATION is displayed	<ul style="list-style-type: none"> ▪ The disc loaded does not match the regional code number 	Load a disc which matches the regional code number.
VIDEO SIGNAL IS NOT CORRECT is displayed	<ul style="list-style-type: none"> ▪ An NTSC disc is loaded into a PAL system, or vice versa 	Load a disc of the correct format.
HI TEMP is displayed	<ul style="list-style-type: none"> ▪ The system protective circuit is activated as it has detected a high temperature 	Turn the power OFF on the unit and then back on again. If the display does not clear, leave the power off until the temperature decreases and turn the power ON again.

DTC INDEX

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

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VIDEO SYSTEM

DIGITAL VERSATILE DISC (DVD) PLAYER (G1240251)

REMOVAL AND INSTALLATION

REMOVAL

NOTE:

Removal steps in this procedure may contain installation details.

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

2. 

3. **CAUTIONS:**

- Take extra care not to damage the wiring harnesses.
- Make sure that the fiber optic cables are not bent to a radius of less than 25 mm.



Torque: 10 Nm

4.

CAUTION:

Make sure that the fiber optic cables are not bent to a radius of less than 25 mm.

NOTE:

Component illustrated, removed for clarity.



Torque: 1 Nm

5.

CAUTION:

Make sure that the fiber optic cables are not bent to a radius of less than 25 mm.

NOTE:

Component illustrated, removed for clarity.



Torque: 1 Nm

6.

NOTE:

New units must be configured using the Programmable

Module Installation Routine in the diagnostic tool.



INSTALLATION

1. To install, reverse the removal procedure.

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VIDEO SYSTEM

PORTABLE CAMERA (61240115)

REMOVAL



Release and remove the portable camera from the portable camera docking station.

INSTALLATION

1. Install the portable camera to the portable camera docking station.
-

2. **NOTES:**

- Only carry out the following step if a new portable camera is to be installed.
- A new portable camera may take up to 5 minutes to respond with the ignition switched on.

Configure the portable camera using the integrated control panel (ICP).

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VIDEO SYSTEM

PORTABLE CAMERA DOCKING STATION [G1240116]

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.

1. Make the air bag supplemental restraint system (SRS) safe.

For additional information, refer to: Standard Workshop Practices (100-00, Description and Operation).

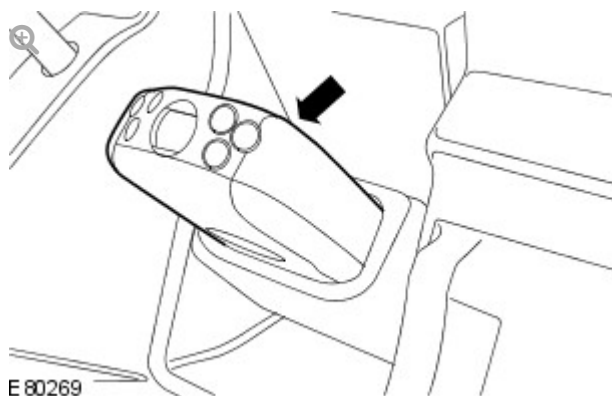
2. Disconnect the battery ground cable.

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

3. Remove the upper glove compartment.

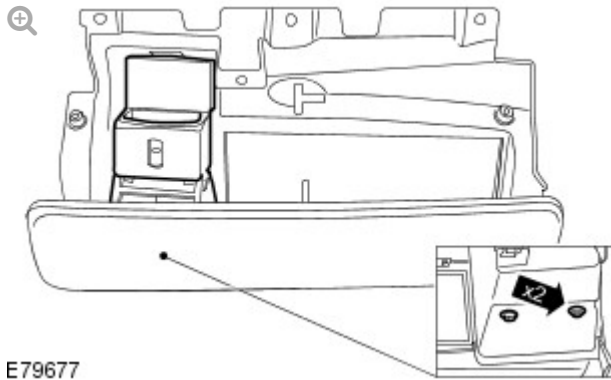
For additional information, refer to: Upper Glove Compartment (501-12, Removal and Installation).

4.



Release and remove the portable camera from the portable camera docking station.

5.



Remove the portable camera docking station.

- Remove the 2 screws.

INSTALLATION

1. Install the portable camera docking station.
 - Install the screws and tighten to 2 Nm (2 lb.ft).
2. Install the portable camera to the portable camera docking station.
3. Install the upper glove compartment.

For additional information, refer to: Upper Glove Compartment (501-12, Removal and Installation).
4. Connect the battery ground cable.

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

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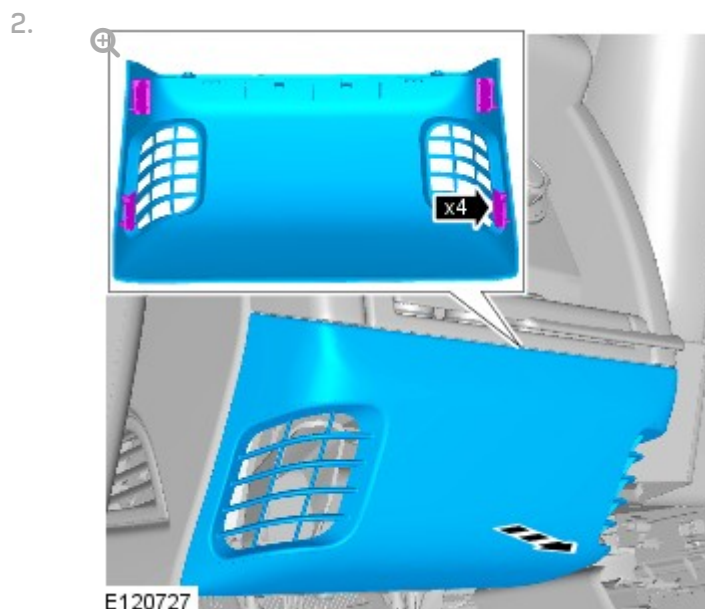
VIDEO SYSTEM

REAR PASSENGER ENTERTAINMENT CONTROL PANEL (G1240220)

REMOVAL AND INSTALLATION

REMOVAL

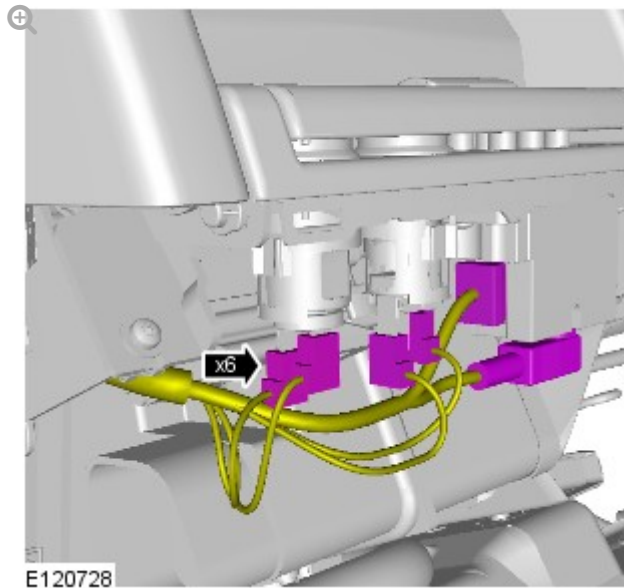
1. Remove the register.
For additional information, refer to: Register (412-03, Removal and Installation).
-



Remove the rear floor register.

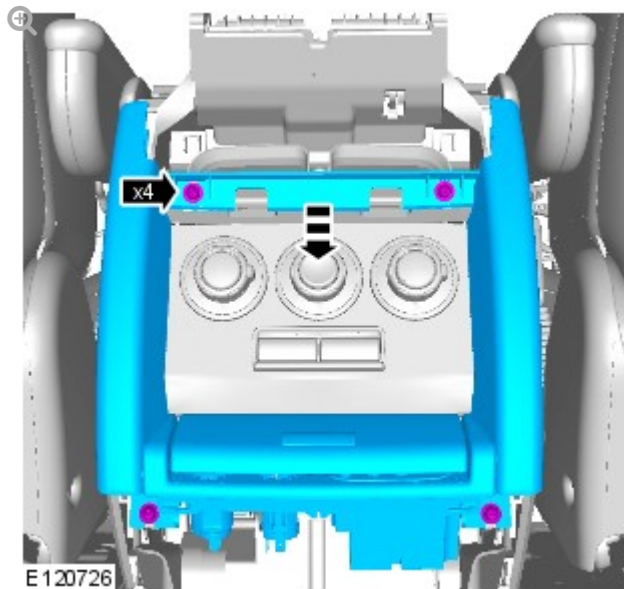
- Release the 4 clips.

3.



Disconnect the 6 electrical connectors.

4.



Remove the floor console rear trim panel.

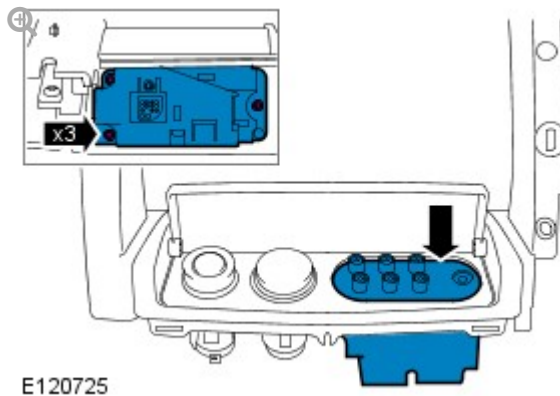
- Remove the 4 screws.

5.

NOTE:

Do not disassemble further if the component is removed for

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



Remove the rear passenger entertainment control panel.

- Remove the 3 screws.

INSTALLATION

1. Install the rear passenger entertainment control panel.
 - Install the screws and tighten to 1 Nm (1lb.ft).
2. Install the floor console rear trim panel.
 - Install the screws and tighten to 2 Nm (2 lb.ft).
3. Connect the 6 electrical connectors.
4. Install the rear floor register.
 - Secure the 4 clips.
5. Install the register.

For additional information, refer to: Register (412-03, Removal and Installation).

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EXTERIOR LIGHTING

SPECIFICATIONS

General specifications

Item	Specification	Rating
Low beam headlamp bulb - vehicles with conventional headlamps	Halogen H7 Long Life (LL)	55W
High beam headlamp bulb - vehicles with conventional headlamps	Halogen H7 LL	55W
High intensity discharge headlamp bulb - low and high beam	D3S	35W
Cornering lamp	2 LED's - high output	-
Static bending lamp	2 LED's - high output	-
Front fog lamp bulb	Halogen H11	55W
Rear fog lamp	3 LED's - high output	-
Front turn signal lamp	12 LED's	-
Rear turn signal lamp	12 LED's	-
Side repeater lamp bulb	Capless	5W
Front side lamp	14 LED's	-
Stop lamp	19 LED's	-
High mounted stop lamp (HMSL)	20 LED's	-
Tail lamp	21 LED's	-
License plate lamp bulb	Festoon	5W
Reversing lamp bulb	Bayonet H6W	6W
Side marker lamp bulb - front and rear- Federal	1 LED	-

WARNING:

Refer to the general information - electrical precautions section of this manual prior to carrying out any procedures on the high intensity discharge headlamp system installed to certain vehicles.

Torque specifications

ITEM	NM	LB-FT	LB-IN
Adaptive front lighting module bolts	10	7	-
Front fog lamp bolts	2.5	-	22
Headlamp bolts	4	-	35
Rear lamp bolts	2	-	18

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EXTERIOR LIGHTING

DESCRIPTION AND OPERATION

EXTERIOR LIGHTING COMPONENT
LOCATION



ITEM	DESCRIPTION
1	Front turn signal indicator LED's
2	High/low beam headlamp

3	High beam (fill in) lamp
4	Side lampsLED (light emitting diode)'s
5	Static bending/cornering lamp (if fitted)
6	Rain/light sensor
7	Front fog lamp
8	Turn signal indicator side repeater
9	Adaptive Front lighting System (AFS) control module (if fitted)
10	Hazard warning lamp switch
11	High mounted stop lamp
12	Reversing lamps
13	License plate lamps
14	Turn signal indicator
15	Fog lamp
16	Tail lamps
17	Stop lamp
18	Lighting control switch
19	Left hand steering column multifunction switch
20	Auto High Beam control module (inside mirror body)

OVERVIEW

The exterior lighting is controlled by the Central Junction Box (CJB). The CJB controls the following vehicle functions:

- Control and monitoring of exterior lamps including turn signal indicators and hazard warning functionality
- Illumination dimmer control of instrument cluster and all interior switch illumination
- Communication and control and monitoring of trailer lighting via the trailer module
- Monitoring and evaluation of check control inputs from other system control modules and output of applicable messages in the instrument

control modules and output of applicable messages in the instrument cluster message center.

The CJB is connected to the medium speed Controller Area Network (CAN) bus and communicates with other vehicle systems via the instrument cluster. The CJB contains a microprocessor which performs the control, monitoring and evaluation functions.

A combined rain/light sensor is fitted which controls the automatic wiper operation and the automatic lighting function.

An Auto High Beam system can also be fitted which automatically controls the high beam headlamps.

The exterior lighting system comprises the following exterior lamps:

- Front and rear side lamps
- License plate lamps
- Side marker lamps (if fitted)
- Front and rear turn signal indicator lamps
- Turn signal indicators side repeater lamps
- Stop lamps and high mounted stop lamp
- Reversing lamps
- Rear fog lamps
- Front fog lamps
- Static bending lamps (if fitted - AFS headlamp except NAS)
- Low and high beam headlamps
- Adaptive Front lighting System (AFS) (if fitted).

EXTERIOR LAMP BULBS

The following table shows the bulbs used for the exterior lighting system and their type and specification.

Exterior Lamps Bulb Type/Rating Table

BULB	TYPE	RATING
------	------	--------

Bi-Xenon™ headlamps - Low/High beam	Xenon D3S	35W
Headlamps - High beam 'fill-in'	Halogen H7 LL	55W
Static bending lamp (all except NAS)	2 LED's (high output)	-
Front fog lamps	Halogen H11	-
Rear fog lamps	3 LED's (high output)	-
Turn signal indicators - Front	12 LED's	-
Turn signal indicators - Rear	12 LED's	-
Turn signal indicator side repeaters	Capless WY5W	5W
Stop lamps	19 LED's	-
Tail lamps	21 LED's	-
High mounted stop lamp	20 LED's	-
License plate lamps	Festoon	5W
Reversing lamps	Bayonet H6W	6W
NAS - Side marker lamp (front/rear)	1 LED	-
Front side lamps	14 LED's	-

The bulbs and the Light Emitting Diode (LED)'s are driven by Metal Oxide Semiconductor Field Effect Transistors (MOSFETs) within the Central Electronics Module (CEM) which is an integral component of the CJB. An exception to this is the rear tail lamps, front fog lamps and reverse lamps which are supplied with power via relays within the CJB and are protected by conventional fuses.

CENTRAL JUNCTION BOX

The CJB is located behind the glove compartment and is connected to the vehicle wiring harness with 8 multiplugs.

The CJB receives four permanent battery power supplies via the Battery Junction Box (BJB).

The lighting circuits are not all protected by conventional fuses as some are protected by Metal Oxide Semiconductor Field Effect Transistors (MOSFETs). The control circuitry within the CJB and the CJB for each

individual circuit can detect and isolate a problem circuit.

Failure of a lamp is not notified to the driver. If a turn signal indicator fails the turn signal warning indicator in the instrument cluster will flash at double speed.

INPUT SIGNALS FOR LAMP CONTROL

The CJB receives inputs from the following switches:

- Lighting control switch for side lamps, headlamps and auto headlamps
- Momentary push switches for front and rear fog lamps
- Left hand steering column multifunction switch for turn signal indicators and high beam/headlamp flash and Auto High Beam system
- Brake pedal switch
- Momentary push switch for hazard warning.

The switches are supplied with a 10mA supply from the CJB and switch to ground when operated. The CJB detects that a switch has been operated (ON) when its closing resistance is less than 100 Ohm and is detected as OFF when its resistance is more than 10K Ohm.

The lighting control switch uses a binary system which is detected by the CJB which determines the selected position. The output from the lighting control switch is shown in the following table:

SWITCH STATE	SWITCH 1	SWITCH 2
Off	1	1
Side lamps	1	0
Headlamps	0	0
Auto headlamps	0	1

The CJB also receives ignition status via hard wired connections from the stop/start switch.

A reverse gear engaged signal is also received on the high speed CAN bus from the Transmission Control Module (TCM) to enable the CJB to activate the reverse lamps.

The CJB can receive a hazard warning indicator activation message from the Restraints Control Module (RCM), via the high speed CAN bus, in the event of a crash. The CJB can also activate the hazard warning indicators to signify vehicle locking to the driver.

On vehicles with Auto High Beam, the auto high beam control module outputs signals on the medium speed CAN bus to the CJB to control the high beam headlamps.

CIRCUIT PROTECTION

Operation of the lamps is performed using overload proof Metal Oxide Semiconductor Field Effect Transistors (MOSFETs). The MOSFETs can detect overload, load interruption with the lamps switched on and short circuit to positive with the lamps switched off.

The MOSFETs are protected against short circuits, removing the requirement for the lamps circuits to be protected by fuses. The MOSFETs respond to heat generated by increased current flow caused by a short circuit. Normally this would cause the fuse to blow. The MOSFETs react to the heat increase and cut the supply to the affected circuit. Once the fault has been rectified or the MOSFET has cooled, the MOSFET will automatically reset and operate the circuit normally.

If an overload occurs, the current flow is dependant on the temperature of the related MOSFET and can be up to 20 times the rated current of the lamp. The MOSFET heats up and deactivates the load applied to the circuit. When the MOSFET cools the circuit is once again reactivated. This thermal cycling occurs continuously in the event of an overload occurring.

A number of lamps are controlled by relays and these circuits are protected by conventional fuses.

BULB MONITORING

Bulb failure monitoring is performed by the CJB processor. The lamps are cold and warm monitored by the MOSFETs in order to detect bulb failure.

NOTE:

Relay controlled lamps have no diagnostic monitoring.

The CJB processor provides outputs to each MOSFET. The output switches the MOSFET to supply the required output to power the applicable lighting circuit. The microprocessor evaluates the circuits by detecting the returned signals from the controlling MOSFET.

When the bulb or LED is functioning normally, the output signal voltage from the controlling MOSFET is 0V. If a bulb or LED in the circuit fails, an open circuit occurs and the MOSFET outputs a signal of 5V to the processor. The signal is interpreted as a bulb or LED failure and generates a Diagnostic Trouble Code (DTC) which can be retrieved using an approved Land Rover diagnostic system.

Warm monitoring is performed continuously when the lights are switched on by evaluating the diagnostic output of the MOSFET switches. Cold monitoring is performed at 32 second intervals when the lights are switched off. The MOSFETs briefly switch on the lights for approximately 1 millisecond (this is insufficient to illuminate the bulb or LED) and checks the bulb or LED as per warm monitoring.

Cold monitoring is not possible for the low/high beam headlamps of vehicles using xenon bulbs. On these vehicles the cold monitoring of the low/high beam headlamps is switched off in the CJB. The CJB detects a failed xenon bulb via a reduction in current flow to the affected headlamp's xenon control module.

When a xenon bulb fails, the control module's current consumption falls to 60mA, which the CJB detects as unsuccessful bulb illumination.

ALARM INDICATIONS

The CJB can also display alarm visual indications for alarm arm, disarm and triggered conditions.

If the hazard warning lamps are active when a lock or unlock request is made, the hazard warning cycle is interrupted to allow the visual indication of the requested lock cycle. When visual indication is completed, the hazard warning operation will continue.

If the vehicle is involved in crash of a severity for the RCM to initiate deployment of the airbags, the control module outputs a hazard warning lamps on request on the medium speed CAN bus to the CJB. The hazard warning lamps will be activated and will continue until the RCM outputs a message to deactivate the hazard warning lamps.

REDUNDANT DATA STORAGE

The CJB stores data relating to the Vehicle Identification Number (VIN), total mileage and service interval indicator. This data is received by the CJB from the instrument cluster and used as a back-up in the event of instrument cluster replacement.

If the CJB is to be replaced, an approved Land Rover diagnostic system must be connected to the vehicle and the CJB replacement procedure followed to ensure that the stored data is transferred to the new unit.

LOW VOLTAGE OPERATION

If the battery voltage falls below 11.2V, the CJB operates the minimum lighting to preserve the remaining battery charge.

CRASH SIGNAL ACTIVATION

In the event of an accident of a severity to activate and deploy the airbags, the Restraints Control Module (RCM) requests various electrical operations to assist with the crash situation. The RCM requests via the bus systems to the CJB to activate the hazard warning lamps.

SECURITY SYSTEM ACTIVATION

In the event of the security system being triggered, the CJB requests activation of the hazard warning lamps.

INSTRUMENT PANEL AND SWITCH ILLUMINATION DIMMING

The CJB controls the instrument cluster backlighting illumination and also illumination of all instrument panel switches.

The CJB supplies a power output to all switch illumination bulbs at a voltage determined by the position of the manual dimmer rheostat. The switch illumination is activated when the lighting control switch is in the side lamp or headlamp position.

DIAGNOSTICS

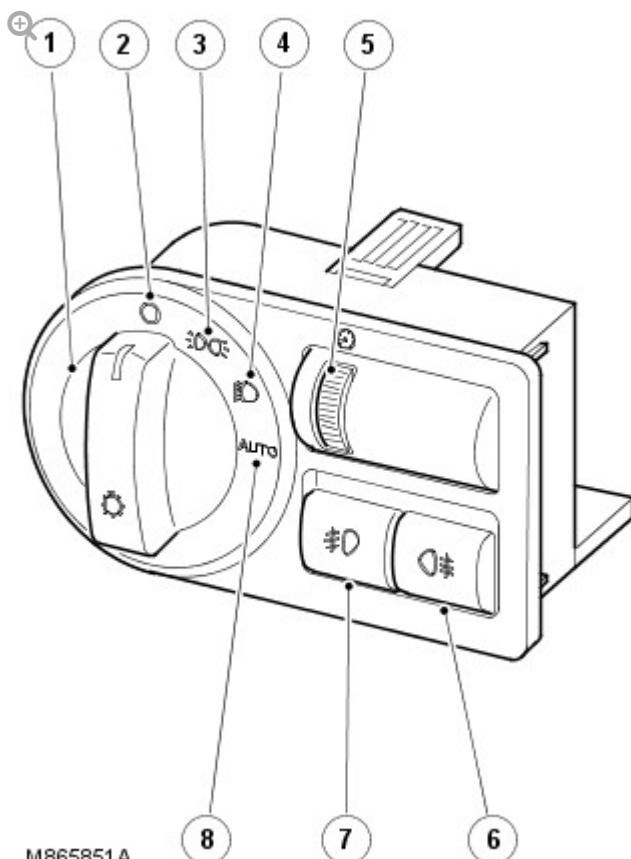


ITEM	DESCRIPTION
1	Cover
2	Diagnostic socket

The diagnostic socket allows for the transfer of information between the CJB and the approved Land Rover diagnostic system. The diagnostic socket is located in the lower instrument panel, above the pedals. The socket is secured in the instrument panel and protected by a hinged cover.

The CJB has diagnostic capabilities and stores fault codes relating to the lighting systems. The xenon control modules cannot be interrogated via the CJB.

LIGHTING CONTROL SWITCH



M865851 A

ITEM	DESCRIPTION
1	Lighting control rotary switch
2	Off position
3	Side lamps position
4	Headlamps position
5	Instrument illumination dimmer rheostat
6	Rear fog lamp switch
7	Front fog lamp switch
8	Auto position

The lighting control switch is located in the instrument panel between the steering column and the driver's door. The switch comprises a four position rotary switch for controlling side lamps and headlamps, a thumbwheel rheostat which manually controls the instrument panel and interior switch night illumination, and momentary push switches for front and rear fog lamps.

The rotary side and headlamp control switch has 2 connections to the CJB. These 2 connections supply a hardwired binary code to the CJB which correspond to the switch position selection made.

The front and rear fog lamp switches operate by completing earth paths for a reference voltage from the CJB when the switch is pressed. The fog lamp switches are momentary, non-latching switches which briefly complete an earth path which is sensed by the CJB.

LIGHTING CONTROL SWITCH ILLUMINATION

When the stop/start switch is pressed to activate the accessory or ignition power modes, the switch legends on the lighting control switch are illuminated at maximum brightness when the lighting control switch is in the 'O' (off) position. When the lighting control switch is rotated to the side, headlamp or AUTO position the legend illumination is dimmed.

GENERAL

Two types of headlamp are available; Bi-xenon™ or Adaptive Front lighting System (AFS).

The headlamps are located on the bonnet locking platform. Each headlamp is secured at the top to the bonnet locking platform with 1 screw, 1 screw at the bottom to the front bumper support bracket, 1 screw on the fender edge bracket and 1 screw on the headlamp mounting panel. Headlamp removal is facilitated by removal of the radiator grille, front bumper and removal of the 4 headlamp attachment screws.

Headlamp removal is not required for replacement of the xenon or halogen bulbs. The rear of the headlamp unit has removable access covers which allow access to the bulbs and tourist lever.

A large cover, which is rotated counter-clockwise to remove, allows access to the low/high beam xenon bulb.

A second cover, on the inboard side of the headlamp, can be removed to allow access to the high beam 'fill-in' lamp halogen bulb. The bulb is mounted in a holder with an extended end to aid removal.

The turn signal indicators, side lamps, static bending lamp (where fitted) and the side marker lamp (where fitted) are LED's. None of the LED's are serviceable items.

In all markets except NAS, the headlamps have two adjustment screws which allow for the manual setting of the vertical and horizontal beam alignment. A 6mm Allen key is used to rotate the adjusters to achieve the required setting. The inboard adjuster controls the vertical aiming and the outboard adjuster controls the horizontal aiming.

On NAS vehicles the headlamp is regarded as 'Visual Optically Left' (VOL) aiming. There is no horizontal adjustment. Refer to the Service Repair Procedures manual for headlamp alignment data and procedures.

Each headlamp has an integral sixteen pin connector which provides inputs and outputs for the various functions of the headlamp assembly. The usage

of the pins differs between model variants. Refer to the Electrical Library and circuit diagrams for pin details.

Two breathers are located on the rear of the headlamp housing. The Goretex breathers allow air flow in and out of the headlamp but prevent the ingress of moisture from rain, road spray or washing. If condensation occurs within the headlamp, check that the breathers are not blocked with mud etc before further action is taken.

HEADLAMP OPERATION

The lamps contained within the headlamp assembly have differing functionality depending on the function selected.

The low beam headlamps are switched on when the ignition is in power mode 6 (ignition on) and:

- the lighting control switch is the headlamp position or
- the lighting control switch is in the 'AUTO' position and a 'lights on' signal is received by the CJB from the rain/light sensor.

The low beam headlamps can also be operated by the headlamp delay feature.

The high beam headlamps are switched on when the ignition is in power mode 6 (ignition on) and:

- the lighting control switch is in the headlamp position or the headlamps are activated by the AUTO feature and the left hand steering column multifunction switch is pushed forward, away from the driver or
- the headlamp flash function is operated by pulling the left hand steering column multifunction switch towards the driver or
- the auto high beam system is active.

COMMON HEADLAMP FEATURES

Turn Signal Indicators

The turn signal indicator LED's are located in 3 rows of 4 LED's in the outer part of the headlamp assembly. The LED's are not serviceable components. The LED's are controlled by an LED control module located at the rear of

the headlamp assembly.

Side Lamps

The side lamp LED's are located in a circular pattern around the circumference of the both the xenon projector module (8 LED's) and the halogen high beam fill-in lamp (6 LED's). The LED's are not serviceable components. The LED's are controlled an LED control module located at the rear of the headlamp assembly.

Side Marker Lamps (NAS only)

The side marker lamp LED is located in a molded receptacle in the outer edge of the headlamp. The side marker lamp illuminates a small rectangular section between the orange side reflectors on the outside of the headlamp. The LED is not a serviceable component.

Tourist Lever

A tourist lever mechanism is located on the side of the xenon projector module. This mechanism moves a flap to blank off a portion of the beam spread to enable the vehicle to be driven in opposite drive hand markets without applying blanking decals to the headlamp lens.

The position of the tourist lever varies between headlamp variants and drive hand markets. The following lists detail the lever location and positions for home and opposite drive hand markets.

For RH side headlamps, the tourist function is operated by pushing up the lever. The delivery condition is with the tourist lever pushed down. For LH (left-hand) side headlamps , the tourist function is operated by pushing the lever down. The delivery condition is with the tourist lever pushed up.

Bi-Xenon™ / AFS Headlamps

- UK Left Hand (LH) side headlamp: tourist lever on the fender side
- UK Right Hand (RH) side headlamp: tourist lever on the grille side
- ROW LH side headlamp: tourist lever on the grille side
- ROW RH side headlamp: tourist lever on the fender side

For all xenon and AFS headlamp variants the tourist function is operated by pushing the lever down. The delivery condition is with the tourist lever pushed up.

STATIC HEADLAMP LEVELING - XENON HEADLAMPS

Static vehicle headlamp leveling is performed by the air suspension system and the air suspension control module. The suspension system constantly monitors the vehicle attitude and adjusts the height of the front and/or rear of the vehicle accordingly. This maintains the correct vehicle attitude and consequently maintains the correct headlamp beam alignment.

The vehicle leveling system is fully automatic, therefore the lighting control switch does not have a manual leveling rotary control.

XENON HEADLAMPS



ITEM

DESCRIPTION

1	Static bending / cornering lamp LED's (where fitted)
2	Side marker lamp (NAS only)
3	Turn signal indicator LED's (12 off)
4	Headlamp mounting locations
5	Bi-xenon™ projector module
6	Side lamp LED's (14 off)
7	High beam halogen 'fill-in' lamp
8	Breather (2 off)
9	Horizontal beam adjuster
10	Cover - bi-xenon™ headlamp bulb and tourist lever
11	LED control module - side lamps and side marker lamp (NAS only)
12	Xenon control module
13	Vertical beam adjuster
14	LED control module - turn signal indicator and static bending lamp (if fitted)
15	Electrical connector
16	Cover - high beam 'fill-in' lamp

Safety Precautions

WARNING:

The Xenon system generates up to 28000 volts and contact with this voltage could lead to fatality. Make sure that the headlamps are switched off before working on the system.

The following safety precautions must be followed when working on the xenon headlamp system:

- **DO NOT** attempt any procedures on the xenon headlamps when the lights are switched on
- Handling of the D3S xenon bulb must be performed using suitable protective equipment, e.g. gloves and goggles. The glass part of the bulb must not be touched

must not be touched

- Xenon bulbs must be disposed of as hazardous waste
- Only operate the lamp in a mounted condition in the reflector.

The headlamps use a complex surface reflector for the halogen high beam 'fill-in' lamp. This type of lamp has the reflector divided into separate parabolic segments, with each segment having a different focal length. A halogen H7LL 55W bulb is retained in an extended holder. The holder is secured in the rear of the high beam 'fill-in' lamp lens by rotating clockwise.

The xenon headlamp is known as 'Bi-Xenon™' (the Bi-Xenon™ trademark is the property of Hella KGaA Hueck & Co., Germany) because it operates as both a low and high beam unit. The xenon bulb is located in a projector module which comprises an ellipsoidal lens with a solenoid controlled shutter to change the beam output from low to high.

NOTE:

If the lighting control switch is in the 0 (off) position, the xenon lamps do not operate when the high beam 'flash' function is operated. If the lighting switch is in the headlamp position or the 'AUTO' position with the low beam headlamp active, the xenon low beam will remain on when the high beam 'flash' function is operated.

The xenon headlamp system is controlled by the CJB using a xenon control module and an igniter for each headlamp. The xenon control modules and the igniters provide the regulated power supply required to illuminate the xenon bulbs through their start-up phases of operation.

The xenon bulb is located in the rear of the projector module. The D3S xenon bulb incorporates an integral igniter unit and both components must be replaced if the bulb fails.

Xenon/Halogen Headlamp Beam Comparison



ITEM	DESCRIPTION
A	Bi-Xenon™
B	Halogen

The xenon headlamp is a self contained unit located within the headlamp assembly. The unit comprises a reflector, an adaptor ring, the lens, a shutter controller and the xenon bulb, which as an assembly is known as the projector module.

The reflector is curved and provides the mounting for the xenon bulb. The bulb locates in a keyway to ensure correct alignment in the reflector. The bulb is an integral part of the igniter and is electrically connected by a connector located in the igniter unit.

The shutter controller is a solenoid which operates the shutter mechanism via a lever. The shutter is used to change the beam projection from low beam to high beam and visa versa.

The xenon bulbs illuminate when an arc of electrical current is established between two electrodes within the bulb. The xenon gas sealed in the bulb reacts to the electrical excitation and the heat generated by the current flow to produce the characteristic blue/white light.

To operate at full efficiency, the xenon bulb goes through three stages of operation before full output for continuous operation is achieved. The three phases are; start-up phase, warm-up phase and continuous phase.

In the start-up phase, the bulb requires an initial high voltage starting pulse of up to 30000 volts to establish the arc. This is produced by the igniter. The warm-up phase begins once the arc is established. The xenon control module regulates the supply to the bulb to 2.6A which gives a lamp output of 75W. During this phase, the xenon gas begins to illuminate brightly and the environment within the bulb stabilizes ensuring a continual current flow between the electrodes. When the warm-up phase is complete, the xenon control module changes to continuous phase. The supply voltage to the bulb is reduced and the operating power required for continual operation is reduced to 35W. The process from start-up to continuous phase is completed in a very short time

completed in a very short time.

The xenon system is controlled by the CJB, the two xenon control modules and the two igniters. The xenon control modules (one per headlamp) receive an operating voltage from the CJB when the headlamps are switched on. The modules regulate the power supply required through the phases of start-up.

The igniters (one per headlamp) generate the initial high voltage required to establish the arc. The igniters have integral coils which generate high voltage pulses required for start-up. Once the xenon bulbs are operating, the igniters provide a closed circuit for regulated power supply from the control modules.

ADAPTIVE FRONT LIGHTING SYSTEM (AFS) HEADLAMPS

The AFS headlamp is similar in its construction to the xenon headlamp described previously. The projector module is constructed and operates as described for the xenon headlamp with the addition of the AFS system which allows the projector module to be moved vertically and horizontally by stepper motors. The following description covers the additional differences to the xenon headlamp with AFS.

The AFS is a system to improve driver visibility under differing driving conditions. AFS provides a larger visible area which is illuminated when cornering by adjusting the position of the beam distribution on the road. Horizontal adjustment is made automatically to the most suitable orientation for the driving conditions using steering angle and information from other vehicle sensors.

AFS includes the dynamic headlamp leveling system described in the 'Headlamp Leveling' section of this document. The bi-xenon™ module within the headlamp is controlled by actuator motors which rotate the projector module on its vertical and horizontal axes to adjust the beam output to suit the cornering conditions and vehicle inclination. Only the bi-xenon™ lamp projector module swivels, the halogen high beam lamp unit remains static.

The AFS is controlled by an AFS control module which is located on the instrument panel frame, behind the glove compartment. The module is connected to and controls an AFS power module located inside the

connected to the control unit. The power module receives signals from the headlamp housing. Signals from the AFS control module are processed by the AFS power module which powers stepper motors to adjust the vertical and horizontal alignment of the projector module. The AFS power module also controls and regulates the operation of the static bending lamp (if fitted) which is requested by the AFS control module but controlled by the CJB.

AFS Concept



ITEM	DESCRIPTION
A	Conventional headlamp beam distribution
B	AFS headlamp beam distribution

The AFS xenon headlamp construction is similar to the non-AFS xenon headlamp assembly. The AFS headlamp has a xenon control module located on the underside of the lamp assembly. An additional AFS power module is located inside the headlamp housing. The AFS power modules supply the correct voltage to the stepper motors which control the positioning and movement of the AFS projector module.

The AFS assembly contains an additional carrier frame which provides the location for the AFS actuators. The remaining lamps are as described previously for the xenon headlamp. The AFS headlamp also incorporates a static bending/cornering lamp (except on NAS market vehicles).

The carrier frame is attached to the AFS vertical actuator. The projector module has a central pivot point which allows the module to move horizontally in response to operation of the AFS horizontal actuator.

The AFS actuators are bi-polar (2 phase) dc stepper motors which are driven by a power output from the AFS power module. Each stepper motor receives its position information from the AFS control module via the applicable AFS power module. When the actuators are powered to their requested positions, a holding current is applied to maintain the actuator

position.

The actuators do not supply a positional feedback signal to the AFS control module. Each stepper motor requires referencing each time the AFS system becomes active. When the AFS system is active, each vertical actuator is driven in the low beam position and each horizontal actuator is driven to an inboard position until a mechanical stop in the actuator is reached. Once the stop is reached a step counter in the AFS control module is set to zero and the actuator is then powered to the operating position as determined by the AFS control module software.

The AFS control module receives front and rear suspension height data and vehicle speed signals from the ABS module to adjust the projector module vertically to increase the beam range as the vehicle speed increases.

AFS CONTROL MODULE

The AFS control module is located on the instrument panel frame, behind the glove compartment.

The AFS control module is a dual functionality unit which also incorporates software to control the dynamic headlamp leveling. The AFS control module is connected to the high speed CAN bus and receives inputs from other vehicle systems on the status of the following parameters:

- Steering angle
- Vehicle speed
- Headlamp status
- Engine running
- Reverse gear selected
- Automatic lighting on.

The AFS will only operate when the AFS control module receives an engine running signal on the CAN bus. When the engine running signal is received the AFS control module performs an initialization routine.

The AFS will also function when the lighting control switch is in the AUTO position and the AFS control module receives a lights on signal from the rain/light sensor and an engine running signal.

The AFS control module then monitors the inputs from the other vehicle systems to control the AFS functionality according to cornering (steering) angles and vehicle speed.

The AFS control module is connected to each AFS power module on a private Local Interconnect Network (LIN) bus. The power modules read operating values supplied from the AFS control module and control the output drivers for the stepper motor actuators inside the headlamp assembly.

AFS OPERATION

The AFS controls the swiveling angle of each projector module using speed and steering angle signals. The angles of each projector module differ to give the correct spread of light, e.g. when turning left, the left hand projector module will have a greater swiveling angle than the right hand projector module.

INITIALIZATION PROCEDURE

When the AFS control module receives an ignition on signal, the control module performs the initialization procedure which ensures that the headlamps are correctly aligned on both their vertical and horizontal axes.

The AFS swivel initialization starts less than 1 second after the headlamp leveling initialization is activated to ensure that the headlamps are at or below the 0 degree position in the vertical axis, thus preventing glare to oncoming vehicles. The AFS swivel initialization is completed in less than 2.5 seconds. The LH and RH AFS actuator motors are powered from the 0 degree position to a small movement to the inboard position, then another small movement to the outboard position and then back to the 0 degree position.

FAILURE MODE

In the event of a failure of the AFS system, a warning indicator in the instrument cluster is illuminated to warn the driver. The AFS warning indicator illuminates when the ignition is in power mode 6 (ignition on) and will flash continuously until the fault is rectified. The AFS warning indicator will also be illuminated if a failure of the steering angle sensor or the vehicle speed signal is detected.

Illumination of the AFS warning indicator does not necessarily mean that there is a fault with the AFS system. The fault may be caused by a failure of another system preventing the AFS system operating correctly.

The AFS control module performs a diagnostic routine every time AFS is requested. If any fault is found, the AFS control module will suspend the operation of the AFS function.

If the AFS leveling system has failed with the xenon projector module in a position other than the correct straight ahead position, the AFS control module will attempt to drive the projector module to a position a small amount lower than the standard position. If the swivel function has failed, the AFS control module will lower the projector module using the leveling actuator motors to a position much lower than standard to prevent excess glare to oncoming vehicles.

The AFS control module software can detect an internal failure of the control module control circuits. The control module will power the projector modules to the zero position and prevent further operation.

Faults can be investigated by interrogating the AFS control module using the Land Rover recommended diagnostic tool to check for fault codes.

STATIC BENDING/CORNERING LAMPS

NOTE:

The static bending/cornering lamps are not fitted to NAS vehicles with AFS headlamps

The static bending/cornering lamps, which are a standard feature on AFS headlamps, are designed to illuminate the direction of travel when cornering at low speeds. The static bending/cornering lamp functionality, which is controlled by the CJB, is unique to vehicles with AFS headlamps and operates using inputs from the steering angle sensor.

The static bending/cornering lamp LED's are incorporated into the outer part of the headlamp assembly. The design of the lens projects a spread of

light from the vehicle at approximately 45 degrees to the vehicle axis.

The static bending/cornering lamp uses 2 high power LED's located in the headlamp housing. The LED's are not serviceable components.

Cornering Lamp Functionality

The cornering lamps are designed to illuminate the direction of travel when cornering at low speeds. The design of the lens projects a spread of light from the vehicle at approximately 45 degrees to the vehicle axis.

The cornering lamps are controlled by the LH steering column multifunction switch with the lighting control switch in the headlamp position and the ignition switch in power mode 6 (ignition on). The cornering lamps are supplied power with power mode 6 to ensure that they do not function with the headlamp delay feature. The cornering lamps are deactivated if the vehicle speed exceeds 25 mph (40 km/h) at which point the static bending lamp functionality is activated.

Only one cornering lamp will illuminate at any one time. If the LH turn signal indicators are selected on, the left hand cornering lamp will be illuminated and visa versa, providing the vehicle speed and lighting control switch positions are correct.

Static Bending Lamp Functionality

The static bending lamps operate with a steering angle sensor CAN signal and vehicle speed signal which is received by the AFS control module and the CJB. The AFS control module sends a static bending lamp on request to the CJB which activates the static bending lamp LED's

When the operation parameters of the lamp are reached, the CJB illuminates the static bending lamp LED's on using a full power Pulse Width Modulation (PWM) voltage. When the lamp is switched off, the CJB fades the LED's off by decreasing the PWM voltage in a linear manner.

AUTOMATIC HEADLAMPS

The automatic headlamp function is a driver assistance system. The driver can override the system operation by selection of side lamps or headlamps

on if the ambient light conditions require front and rear lighting to be active.

The automatic headlamp system uses a rain/light sensor which is connected via the Local Interconnect Network (LIN) bus to the CJB to control the headlamp functionality. The light sensor is incorporated in the rain/light sensor located on the inside of the windshield, below the rear view mirror. The wiper system also uses the rain/light sensor for automatic wiper operation. Refer to the Wipers and Washers section for details of the rain/light sensor and automatic wiper operation. For additional information refer to Wipers and Washers 501-16.

The light sensor measures the ambient light around the vehicle in a vertical direction and also the angular light level from the front of the vehicle. The rain/light sensor uses vehicle speed signals, wiper switch position and the park position of the front wipers to control the system.

The rain/light sensor can detect if the vehicle has entered a tunnel or similar environment and will activate the headlamps on entry to the tunnel when the ambient and forward light levels have fallen quickly. When the tunnel is exited, the rain/light sensor detects the sudden increase in light levels and requests the lights to be switched off.

Certain light and weather conditions are not detected accurately by the rain/light sensor. The driver should override the automatic headlamps function if in any doubt about weather conditions and the requirement for exterior lights to be active.

The automatic headlamp operation uses ambient light levels which are monitored by a photodiode incorporated in the rain/light sensor. The rain/light sensor sends a lights on/off request to the CJB via the LIN bus, which responds by switching on the low beam headlamps, front side lamps and rear tail lamps. The automatic headlamps are activated under the following conditions:

- Twilight
- Darkness
- Rain
- Snow

- Tunnels
- Underground or multi-level car parks.

Operation of the automatic headlamps requires the ignition to be in power mode 6 (ignition on), the lighting control switch to be in the 'AUTO' position and a lights on request signal from the light sensor.

If the automatic headlamp function has been selected and the ambient light falls below a pre-defined level then the front and rear fog lamps can be manually activated. If the ambient light rises above that level then the fog lamps will be deactivated along with the rest of the lamps. If the ambient light then falls below this level again the lamps will be activated, but the fog lamps which were previously selected will not.

HIGH BEAM ASSIST



ITEM	DESCRIPTION
1	Rear view mirror calibration bracket
2	Ambient light sensor (High beam assist)
3	Rain/light sensor (Auto headlamps)
4	Image sensor
5	High beam assist control module (inside mirror body)

High beam assist is a driving aid which automatically controls the high beam function. If required, the system can be overridden by the driver.

CAUTION:

The high beam assist system is designed as a driving aid only. Should the road conditions require, it is the driver's responsibility to consider other road users and operate the high beam headlamps in a safe manner. In certain circumstances the driver will be required to

intervene.

High Beam Assist Warning Indicator



ITEM	DESCRIPTION
1	Warning indicator (green)

The high beam assist system is controlled by a high beam assist control module which is located in the interior rear view mirror body and by the CJB. The module and the CJB are connected via the medium speed CAN bus.

The high beam assist control module receives a power supply from the CJB when the ignition is in power mode 6 (ignition on). The rear view mirror also includes a low resolution camera (image) sensor which detects headlamps and tail lamps of preceding vehicles. The sensor is connected to the control module which evaluates the image data, checking for light intensity and location.

If conditions are correct, the control module will activate the high beam assist by sending a high or low beam request message to the CJB via the medium speed CAN bus. The CJB then controls the shutter in the Xenon projector module together with the high beam fill-in lamp.

HIGH BEAM ASSIST OPERATION

The high beam assist operates as part of the automatic headlight system. When driving at night with the lighting control switch in the automatic position and the LH steering column multifunction switch in the central position, with sufficient darkness (approximately 1 lux or less) and a suitable road speed, the high beam assist will automatically operate the high beam lighting when necessary. A warning symbol in the instrument cluster confirms to the driver when the high beam assist system is selected and enabled.

NOTES:

- The function of the normal 'blue' high beam indicator remains unchanged and it always reflects the actual status of the high beam lamps
- The exterior lighting 'on' threshold for the auto headlamps system is approximately 100 lux which is measured by the rain/light sensor. At light levels below this value the low beam headlamps and exterior lights will be switched on. The high beam assist will not function until the light level has reached approximately 1 lux. At light levels above 1 lux high beam is not required and therefore is not activated.

Activation (system ready)

High beam assist will only activate and illuminate the warning indicator to show system is ready or 'primed' for high beam control, when the following conditions are met:

- High beam assist has been first 'enabled' via the instrument cluster menu
- Lighting control switch is in the 'Auto' position
- LH steering column multifunction switch in the central position
- The ambient light level is below 100 lux – refer to 'Light Levels' section that follows
- The system has not been overridden or cancelled – refer to 'Override' section that follows
- The camera (image) sensor view is not blocked.

High Beam Control

When activated, high beam assist will switch the headlamps to high beam when all the following conditions occur:

- No relevant oncoming traffic
- No relevant preceding traffic

- In non-urban environment, i.e. with no street lighting
- Ambient light level is below 1 lux – refer to 'Light Levels' section that follows
- Road speed is suitable – refer to 'Road Speed' section that follows.

Low Beam Control

When activated, high beam assist will switch the headlamps to low beam when any of the following conditions occur:

- Relevant Oncoming traffic is present
- Relevant Preceding traffic is present
- In urban environment, i.e. with street lighting
- Ambient light level is above 1 lux – refer to 'Light Levels' section that follows
- Road speed is not suitable – refer to 'Road Speed' section that follows
- Unrecognisable reflective inputs from road signs or markings – refer to 'System Limitations' section that follows.

Light Levels

The exterior lighting 'on' threshold for the normal 'auto headlamps' feature is approximately 100 lux and is measured by the windscreen mounted 'rain/light' sensor. When the light level falls to this value the low beam headlamps and exterior lights will be switched on together with the high beam assist warning indicator.

This warns the driver that the system is activated and ready to automatically switch on the high beam headlamps when the light level falls a little further to approximately 1 lux, as measured by the 'ambient light sensor' located in the mirror body. High beam is generally not required with light levels above 1 lux.

Road Speed

A road speed signal is received by the CJB from the Anti-lock Braking System (ABS) module via the high speed CAN bus. When the other activation conditions are correct, the CJB will switch the headlamps to high

activation conditions are correct, the CJB will switch the headlamps to high beam when the road speed has increased above 40 km/h (25 mph).

When the road speed falls to below 24 km/h (15mph), the CJB will switch the headlamps to low beam. The 10 mph (15 km/h) difference between the on and off road speed thresholds prevents the system continually switching between high and low beam at low speeds.

Override

The driver can manually override the high beam assist system at any time. When the high beam assist system is activated, pulling the LH steering column multifunction switch to the high beam 'flash' position or pushing it forward to the high beam position will de-activate the system and the high beam assist warning indicator in the instrument cluster will extinguish.

When the multifunction switch is returned to the central position, from a forward high beam position, the system is re-activated and the high beam assist warning indicator will illuminate again.

Correct Performance

In addition, high beam assist will only exhibit best performance if all of the following conditions are met:

- No false inputs are received by the camera (image) sensor, such as reflected light from certain static signs – refer to 'System Limitations' section that follows
- Headlamps are correctly aligned
- High beam assist system has been set for correct 'hand of traffic' via the driver menu settings – refer to 'Setting Hand of Traffic' section that follows
- Headlamps have been set for correct 'hand of traffic' via the mechanical tourist lever in headlamp casing – refer to 'Setting Hand of Traffic' section that follows
- Camera (image) sensor has been through a self learning 'auto aim' calibration procedure if any components have been replaced – refer to 'Calibration' section that follows

- There are no large reflective items, white papers, etc., sitting on top of the dash board in near view of the camera (image) sensor, or stickers placed directly in front of the camera (image) sensor

Driver Menu Features

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EXTERIOR LIGHTING

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

For a detailed description of the headlamp leveling system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Exterior Lighting (417-01 Exterior Lighting, 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
<ul style="list-style-type: none"> ▪ Headlamp leveling motor(s) and linkage(s) condition and installation ▪ Lighting control switch and installation ▪ Left-hand steering column multifunction switch and installation 	<ul style="list-style-type: none"> ▪ Fuses ▪ Wiring harness ▪ Loose or corroded connector(s) ▪ Battery Junction Box (BJB) ▪ Central Junction Box (CJB) ▪ Adaptive Front Lighting System (AFS) module ▪ Headlamp power modules ▪ Engine Control Module (ECM) ▪ Anti-lock Brake System (ABS) control module ▪ Air suspension control module ▪ Local Interconnect Network (LIN) circuits ▪ Controller Area Network (CAN) circuits

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

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

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Headlamp leveling	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Leveling 	Check the fuse(s) condition. Check the headlamp leveling motor and linkage condition. Check the

system inoperative	<ul style="list-style-type: none"> ▪ Leveling motor/linkage fault ▪ Headlamp leveling circuit fault ▪ Air suspension system fault 	headlamp leveling circuit. Refer to the electrical guides. Check for DTCs indicating headlamp leveling circuit and air suspension system fault(s).
Headlamp alignment incorrect		

D T C I N D E X

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

Diagnostic Trouble Code (DTC) Index - DTC: Module Name: Central Junction Box (Description and Operation),

Diagnostic Trouble Code (DTC) Index - DTC: Module Name: Headlamp Control Module A (Description and Operation),

Diagnostic Trouble Code (DTC) Index - DTC: Module Name: Headlamp Control Module B (Description and Operation).

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EXTERIOR LIGHTING

PRINCIPLE OF OPERATION

For a detailed description of the exterior lighting system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: [Exterior Lighting](#) (417-01 Exterior Lighting, Description and Operation).

SAFETY INFORMATION

WARNING:

The xenon headlamp system generates up to 28,000 volts. Make sure that the headlamps are switched off before working on the system. Failure to follow this instruction may result in personal injury.

The following safety precautions must be followed when working on the xenon headlamp system:

1. DO NOT attempt any procedures on the xenon headlamps when the lights are switched on.
1. Handling of the xenon bulb must be performed using suitable protective equipment, e.g. gloves and goggles. The glass part of the bulb must not be touched.
1. Xenon bulbs must be disposed of as hazardous waste.
1. Only operate the lamp in a mounted condition in the reflector.

There are comprehensive instructions on the correct procedures for xenon headlamp system repairs in the workshop manual, refer to section 100-00 - General Information, Standard Workshop Procedures.

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
<ul style="list-style-type: none">▪ Headlamp(s) condition and installation▪ Bulb(s) and installation▪ Bulb holder(s) and installation▪ Lighting control switch and installation▪ Left-hand steering column multifunction switch and installation	<ul style="list-style-type: none">▪ Fuses▪ Relays▪ Wiring harness▪ Loose or corroded connector(s)▪ Battery Junction Box (BJB)▪ Central Junction Box (CJB)▪ Adaptive Front Lighting System (AFS) module▪ Headlamp power modules▪ Instrument Cluster (IPC)▪ Steering Angle Sensor Module (SASM)▪ Transmission Control Module (TCM)▪ Engine Control Module (ECM)▪ Anti-lock Brake System (ABS) control module

- Air Suspension Control module
- Local Interconnect Network (LIN) circuits
- Controller Area Network (CAN) circuits

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

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

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Low beam lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Bulb failure ▪ Fuse(s) blown ▪ Circuit fault ▪ Lighting control switch fault 	Check the bulb and fuse condition. Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch operation. Refer to the electrical guides. Check for DTCs indicating a headlamp or related circuit fault.
High beam lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Left-hand steering column multifunction switch fault 	
Low beam lamp(s) dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Tourist lever set in the wrong position ▪ Circuit fault 	Check the bulb condition and rating. Check the tourist lever is set correctly. Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Refer to the electrical guides.
High beam lamp(s) dim	<ul style="list-style-type: none"> ▪ Lighting control switch fault ▪ Left-hand steering 	

	column multifunction switch fault	
Low beam lamp(s) stuck on	<ul style="list-style-type: none"> ▪ Circuit fault ▪ Lighting control switch fault ▪ Left-hand steering column multifunction switch fault 	Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch operation. Check the headlamp timer function. Refer to the electrical guides. Check for DTCs indicating a headlamp circuit fault.
High beam lamp(s) stuck on	<ul style="list-style-type: none"> ▪ Headlamp timer function fault 	
Headlamp low/high beam switching function inoperative	<ul style="list-style-type: none"> ▪ Circuit fault ▪ Left-hand steering column multifunction switch fault ▪ Xenon lamp shutter mechanism fault 	Check the headlamp circuits. Check the left-hand steering column multifunction switch operation. Check the xenon lamp shutter mechanism operation. Refer to the electrical guides. Check for DTCs indicating a headlamp circuit fault.
Warning lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Lighting control switch fault ▪ Left-hand steering column multifunction switch inoperative ▪ Circuit fault ▪ Instrument cluster fault 	Check the fuse(s). Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.

FRONT AND REAR LAMP CONDENSATION

Some customers may complain of condensation/mist inside exterior lamps.

Condensation/mist is a natural phenomenon which can occur when there is a temperature difference between the inside and outside of the lamp unit. This condensation is considered to be as a result of normal atmospheric conditions and replacing the light unit will not correct this symptom. With the introduction of clear lenses condensation is likely to be more noticeable but does not affect the performance of the lamp. Condensation will clear when the lights have been on for some length of time and in warmer ambient temperatures

A lamp that exhibits condensation should be evaluated after a drying time where all the functions have been operated for a minimum of 30 minutes. If the condensation has started to clear during this time it indicates that the lamp sealing has NOT been breached and will eventually clear. The lamp must NOT be replaced

CAUTION:

Make sure that bulb covers are correctly installed and make sure that all breathers (tubes or membrane patches) are free from dirt and debris and are fitted correctly as these can all lead to the formation of condensation. If any of these are determined to be the cause of the condensation, measures should be taken to dry out the lamps and to make sure that the bulb covers are installed correctly

NOTES:

- The Owner's handbook clearly states that condensation may form on the inside of lamp lenses and is caused by atmospheric conditions. That it is not detrimental to lamp performance and will clear during normal usage
- Pools of water and high levels of condensation would indicate that the lamps sealing has been compromised. Check for damage and inspect the condition of caps and breathers
- Differing layout on the opposing sides of the vehicle can lead to different levels of condensation inside the lamps from side to side. As a result of this the rate at which condensation clears may also

differ from side to side

- Photographic evidence of the condensation levels prior to and after drying time should be provided with every returned part. Failure to do so may result in the claim being rejected
- This information bulletin contains examples of normal condensation generated from atmospheric conditions. A thin mist can form on the interior of clear plastic lenses, this is not detrimental to the lamp's performance. This thin mist will eventually clear through normal use, exiting through the lamp's venting system

Condensation or moisture can be more noticeable during the months of spring and autumn when there is a likelihood of a higher moisture content in the air. It can occur when there is a temperature difference on either side of the lens surface. This can often be seen in the evening and morning sunshine or when cold water makes contact with a warm lamp lens. When a lamp is warmed unevenly by the sunshine the surface area in direct sunlight will be approximately 10°C higher than the remainder of the lamp. When warm air circulates within the lamp and makes contact with the colder surfaces moisture can appear on the lens as water condenses out of the warmer air. Condensation may occur when washing a vehicle with cold water on a warm day or when the lamps are warm and vice versa. This is the same phenomena as with the formation of dew on the surface of a glass window pane

The following illustration demonstrates the process:



1. Moisture formation

1. Cool surfaces

1. Air circulation (convection)

1. Warm surfaces

Shown below are examples of normal exterior lamp condensation. This

would NOT be covered by warranty and the lamp(s) should not be replaced

In the photographs shown below, there are no visible streaks, drip marks or droplets in the condensation mist



In the photographs shown below, the condensation mist does not obstruct the view of the lamp interior



Shown below are examples of abnormal exterior lamp condensation that may be covered by warranty. Warranty may be accepted providing the lamp does not exhibit any visible signs of external damage

In the photographs shown below, note the large water droplets



In the photographs shown below, note the drip marks or streaks in the condensation



In the photograph shown below, note the standing water within the lamp



In the photograph shown below, note the thick mist covering the lens with water droplets



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

[Diagnostic Trouble Code \(DTC\) Index - DTC: Module Name: Headlamp Control Module A](#) (Description and Operation),
[Diagnostic Trouble Code \(DTC\) Index - DTC: Module Name: Headlamp Control Module B](#) (Description and Operation).

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

For a detailed description of the exterior lighting system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Exterior Lighting (417-01 Exterior Lighting, 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
<ul style="list-style-type: none">▪ Stoplamp condition and installation▪ Bulbs and installation▪ Bulb holders and installation▪ Stoplamp switch condition and installation	<ul style="list-style-type: none">▪ Fuses▪ Wiring harness▪ Loose or corroded connector(s)▪ Hill descent relay▪ Battery Junction Box (BJB)▪ Central Junction Box (CJB)▪ Anti-lock Braking Control module (ABS)▪ Controller Area Network (CAN) circuits

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

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

(DTCs) and refer to the relevant DTC Index.

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Stoplamp(s) inoperative	<ul style="list-style-type: none"> ▪ Bulb failure ▪ LED lamp failure ▪ Fuse(s) blown ▪ Circuit fault ▪ Stoplamp switch fault 	Check the bulb, LED lamp and fuse condition. Check the stoplamp circuits. Check the stoplamp switch function. Refer to the electrical guides. Check for DTCs indicating a stoplamp circuit fault.
Stoplamp(s) dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Circuit fault 	Check the bulb condition and rating. Check the stoplamp circuits. Refer to the electrical guides.
Stoplamp(s) stuck on	<ul style="list-style-type: none"> ▪ Stoplamp switch fault ▪ Circuit fault ▪ Hill descent relay circuit fault 	Check the stoplamp switch function. Check the stoplamp circuits. Refer to the electrical guides. Check for DTCs indicating a stoplamp circuit fault.

DTC INDEX

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

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

For a detailed description of the exterior lighting system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Exterior Lighting (417-01 Exterior Lighting, 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.

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
<ul style="list-style-type: none"> ▪ Turn signal lamp(s) condition and installation ▪ Cornering lamp(s) condition and installation ▪ Bulbs and installation ▪ Bulb holders and installation ▪ Lighting control switch and installation ▪ Left-hand steering column multifunction switch and installation ▪ Hazard lamp switch condition and installation 	<ul style="list-style-type: none"> ▪ Fuses ▪ Wiring harness ▪ Loose or corroded connector(s) ▪ Battery Junction Box (BJB) ▪ Central Junction Box (CJB) ▪ Steering angle sensor ▪ Anti-lock Braking Control Module (ABS) ▪ Instrument Cluster (IPC) ▪ Adaptive Front Lighting System (AFS) module ▪ Restraints Control Module ▪ Controller Area Network (CAN) circuits

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

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

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Turn signal/hazard	<ul style="list-style-type: none"> ▪ Bulb failure ▪ Fuse(s) 	Check the bulb and fuse condition. Check the turn signal/hazard lamp circuits. Check the left-hand

lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Circuit fault ▪ Left-hand steering column multifunction switch fault ▪ Hazard lamp switch fault 	steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides. Check for DTCs indicating a turn signal/hazard lamp circuit fault.
Turn signal/hazard lamp(s) dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Circuit fault ▪ Left-hand steering column multifunction switch fault ▪ Hazard lamp switch fault 	Check the bulb condition and rating. Check the turn signal/hazard lamp circuits. Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides.
Turn signal/hazard lamp(s) stuck on	<ul style="list-style-type: none"> ▪ Left-hand steering column multifunction switch fault ▪ Hazard lamp switch fault ▪ Circuit fault 	Check the turn signal/hazard lamp circuits. Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Refer to the electrical guides. Check for DTCs indicating a turn signal/hazard lamp circuit fault.
Warning lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Left-hand steering column multifunction switch inoperative ▪ Hazard lamp switch inoperative ▪ Circuit fault ▪ Instrument cluster fault 	Check the fuse(s). Check the left-hand steering column multifunction switch function. Check the hazard lamp switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.
Cornering lamp(s)	<ul style="list-style-type: none"> ▪ Bulb failure 	Check the bulb and fuse condition. Check cornering lamp circuits. Check the lighting control switch

inoperative	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Circuit fault ▪ Left-hand steering column multifunction switch fault ▪ Lighting control switch fault 	function. Check the left-hand steering column multifunction switch function. Refer to the electrical guides. Check for DTCs indicating a cornering lamp circuit fault.
Cornering lamp(s) dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Circuit fault ▪ Left-hand steering column multifunction switch fault ▪ Lighting control switch fault 	Check the bulb condition and rating. Check the cornering lamp circuits. Check the left-hand steering column multifunction switch function. Check the lighting control switch function. Refer to the electrical guides.
Cornering lamp(s) stuck on	<ul style="list-style-type: none"> ▪ Left-hand steering column multifunction switch fault ▪ Lighting control switch fault ▪ Circuit fault 	Check the cornering lamp circuits. Check the left-hand steering column multifunction switch function. Check the lighting control switch function. Refer to the electrical guides. Check for DTCs indicating a cornering lamp circuit fault.

DTC INDEX

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

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

For a detailed description of the exterior lighting system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: [Exterior Lighting](#) (417-01 Exterior Lighting, 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
<ul style="list-style-type: none">▪ Rear lamp(s) condition and installation▪ License lamp(s) condition and installation	<ul style="list-style-type: none">▪ Fuses▪ Relays

<ul style="list-style-type: none"> ▪ Bulbs and installation ▪ Bulb holders and installation ▪ Lighting control switch and installation ▪ Rain/Light sensor condition and installation 	<ul style="list-style-type: none"> ▪ Wiring harness ▪ Loose or corroded connector(s) ▪ Battery Junction Box (BJB) ▪ Central Junction Box (CJB) ▪ Rain/Light sensor control module ▪ Local Interconnect Network (LIN) circuits ▪ Controller Area Network (CAN) circuits
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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 relevant DTC Index.

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Rear/License lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Bulb failure ▪ Fuse(s) blown ▪ Circuit fault ▪ Lighting control switch fault 	Check the bulb and fuse condition. Check the rear/license lamp circuits. Check the lighting control switch function. Refer to the electrical guides. Check for DTCs indicating a rear/license lamp circuit fault.
Rear/License lamp(s) dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Circuit fault ▪ Lighting control switch fault 	Check the bulb condition and rating. Check the rear/license lamp circuits. Check the lighting control switch function. Refer to the electrical guides.

Rear/License lamp(s) stuck on	<ul style="list-style-type: none"> ▪ Circuit fault ▪ Lighting control switch fault 	Check the rear/license lamp circuits. Check the lighting control switch function. Refer to the electrical guides. Check for DTCs indicating a rear/license lamp circuit fault.
Rear/License lamp(s) inoperative when the automatic headlamp switch option is selected	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Lighting control switch fault ▪ Circuit fault ▪ Rain/Light sensor fault ▪ LIN circuit fault 	Check the fuse(s). Check the lighting control switch function. Check the automatic headlamp circuit. Refer to the electrical guides. Check for DTCs indicating a rain/light sensor or LIN system fault.

FRONT AND REAR LAMP CONDENSATION

Some customers may complain of condensation/mist inside exterior lamps. Condensation/mist is a natural phenomenon which can occur when there is a temperature difference between the inside and outside of the lamp unit. This condensation is considered to be as a result of normal atmospheric conditions and replacing the light unit will not correct this symptom. With the introduction of clear lenses condensation is likely to be more noticeable but does not affect the performance of the lamp. Condensation will clear when the lights have been on for some length of time and in warmer ambient temperatures

A lamp that exhibits condensation should be evaluated after a drying time where all the functions have been operated for a minimum of 30 minutes. If the condensation has started to clear during this time it indicates that the lamp sealing has NOT been breached and will eventually clear. The lamp must NOT be replaced

CAUTION:



Make sure that bulb covers are correctly installed and make sure that all breathers (tubes or membrane patches) are free from dirt and debris and are fitted correctly as these can all lead to the formation of condensation. If any of these are determined to be the cause of the condensation, measures should be taken to dry out the lamps and to make sure that the bulb covers are installed correctly

NOTES:

- The Owner's handbook clearly states that condensation may form on the inside of lamp lenses and is caused by atmospheric conditions. That it is not detrimental to lamp performance and will clear during normal usage
- Pools of water and high levels of condensation would indicate that the lamps sealing has been compromised. Check for damage and inspect the condition of caps and breathers
- Differing layout on the opposing sides of the vehicle can lead to different levels of condensation inside the lamps from side to side. As a result of this the rate at which condensation clears may also differ from side to side
- Photographic evidence of the condensation levels prior to and after drying time should be provided with every returned part. Failure to do so may result in the claim being rejected
- This information bulletin contains examples of normal condensation generated from atmospheric conditions. A thin mist can form on the interior of clear plastic lenses, this is not detrimental to the lamp's performance. This thin mist will eventually clear through normal use, exiting through the lamp's venting system

Condensation or moisture can be more noticeable during the months of spring and autumn when there is a likelihood of a higher moisture content in the air. It can occur when there is a temperature difference on either side of the lens surface. This can often be seen in the evening and morning sunshine or when cold water makes contact with a warm lamp lens. When a

lamp is warmed unevenly by the sunshine the surface area in direct sunlight will be approximately 10°C higher than the remainder of the lamp. When warm air circulates within the lamp and makes contact with the colder surfaces moisture can appear on the lens as water condenses out of the warmer air. Condensation may occur when washing a vehicle with cold water on a warm day or when the lamps are warm and vice versa. This is the same phenomena as with the formation of dew on the surface of a glass window pane

The following illustration demonstrates the process:



1. Moisture formation

1. Cool surfaces

1. Air circulation (convection)

1. Warm surfaces

Shown below are examples of normal exterior lamp condensation. This would NOT be covered by warranty and the lamp(s) should not be replaced

In the photographs shown below, there are no visible streaks, drip marks or droplets in the condensation mist



In the photographs shown below, the condensation mist does not obstruct the view of the lamp interior



Shown below are examples of abnormal exterior lamp condensation that may be covered by warranty. Warranty may be accepted providing the lamp does not exhibit any visible signs of external damage

In the photographs shown below, note the large water droplets



In the photographs shown below, note the drip marks or streaks in the condensation



In the photograph shown below, note the standing water within the lamp



In the photograph shown below, note the thick mist covering the lens with water droplets



D T C I N D E X

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

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

For a detailed description of the exterior lighting system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Exterior Lighting (417-01 Exterior Lighting, 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
<ul style="list-style-type: none">▪ Front fog lamp condition and installation▪ Bulb and installation▪ Bulb holder and installation▪ Adjuster screw▪ Fog lamp switch condition and installation	<ul style="list-style-type: none">▪ Fuses▪ Wiring harness▪ Loose or corroded connector(s)▪ Fog lamp relay▪ Fog lamp warning indicator▪ Fog lamp switch▪ Battery Junction Box (BJB)▪ Central Junction Box (CJB)

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 relevant DTC Index.

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Fog lamp inoperative	<ul style="list-style-type: none"> ▪ Bulb failure ▪ Fuse(s) blown ▪ Circuit fault ▪ Switch inoperative 	Check the bulb condition. Check the fuse(s). Check the fog lamp circuits. Check the switch function. Refer to the electrical guides.
Fog lamp dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Circuit fault ▪ Switch fault 	Check the bulb condition and rating. Check the fog lamp circuits. Check the switch function. Refer to the electrical guides.
Fog lamp lighting coverage poor	<ul style="list-style-type: none"> ▪ Fog lamp alignment incorrect 	Check and adjust fog lamp alignment.
Warning lamp inoperative	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Switch inoperative ▪ Circuit fault ▪ Instrument cluster fault 	Check the fuse(s). Check the switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster fault.

DTC INDEX

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

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

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

For a detailed description of the exterior lighting system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Exterior Lighting (417-01 Exterior Lighting, 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
<ul style="list-style-type: none"> ▪ Rear fog lamp condition and installation ▪ Bulb holder and installation ▪ Bulb and installation ▪ Fog lamp switch condition and installation 	<ul style="list-style-type: none"> ▪ Fuses ▪ Wiring harness ▪ Loose or corroded connector(s) ▪ Fog lamp relay ▪ Fog lamp warning indicator ▪ Fog lamp switch ▪ Battery Junction Box (BJB) ▪ Central Junction Box (CJB)

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 relevant DTC Index.

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Fog lamp inoperative	<ul style="list-style-type: none"> ▪ Bulb failure ▪ Fuse(s) blown ▪ Circuit fault 	Check the bulb condition. Check the fuse(s). Check the fog lamp circuits. Check the switch function. Refer to the electrical guides.

	<ul style="list-style-type: none"> ▪ Switch inoperative 	
Fog lamp dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Circuit fault ▪ Switch fault 	Check the bulb condition and rating. Check the fog lamp circuits. Check the switch function. Refer to the electrical guides.
Warning lamp inoperative	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Switch inoperative ▪ Circuit fault ▪ Instrument cluster fault 	Check the fuse(s). Check the switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster fault.

DTC INDEX

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

EXTERIOR LIGHTING

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

For a detailed description of the exterior lighting system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Exterior Lighting (417-01 Exterior Lighting, 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
▪ Reversing lamp condition and installation	▪ Fuses

<ul style="list-style-type: none"> ▪ Bulb and installation ▪ Bulb holder and installation 	<ul style="list-style-type: none"> ▪ Wiring harness ▪ Loose or corroded connector(s) ▪ Reversing lamp relay ▪ Battery Junction Box (BJB) ▪ Central Junction Box (CJB) ▪ Transmission Control Module (TCM) ▪ Controller Area Network (CAN) circuits
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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 relevant DTC Index.

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Reversing lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Bulb failure ▪ Fuse(s) blown ▪ Circuit fault ▪ Missing reversing switch signal 	Check the bulb and fuse condition. Check the reversing lamp circuits. Refer to the electrical guides. Check for DTCs indicating a reversing lamp circuit fault.
Reversing lamp(s) dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Circuit fault 	Check the bulb condition and rating. Check the reversing lamp circuits. Refer to the electrical guides.

DTC INDEX

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

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

For a detailed description of the exterior lighting system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Exterior Lighting (417-01 Exterior Lighting, 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:

- Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.
- Prior to carrying out fault diagnosis of the trailer lamp system, verify the operation of the towing vehicle lighting system with the trailer lighting plug(s) disconnected from the vehicle socket(s).

1. Verify the customer concern.

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

Visual Inspection

MECHANICAL	ELECTRICAL
<ul style="list-style-type: none">▪ Trailer lamp(s) condition and installation▪ Bulbs and installation▪ Bulb holders and installation▪ Trailer socket(s), plug(s) and installation	<ul style="list-style-type: none">▪ Fuses▪ Relays▪ Stop lamp switch▪ Wiring harness▪ Loose or corroded connector(s)▪ Trailer socket(s) ground circuit(s)▪ Battery Junction Box (BJB)▪ Central Junction Box (CJB)▪ Trailer fuse box

- Trailer relay box
- Instrument Cluster (IPC)
- Controller Area Network (CAN) circuits

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

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

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Trailer brake lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Bulb failure ▪ Fuse(s) blown ▪ Circuit fault ▪ Brake lamp switch fault 	Check the bulb and fuse condition. Check the trailer brake lamp circuit. Check the brake lamp switch function. Refer to the electrical guides.
Trailer brake lamp(s) dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Circuit fault ▪ Brake lamp switch fault 	Check the bulb condition and rating. Check the trailer brake lamp circuit. Check the brake lamp switch function. Refer to the electrical guides.
Trailer brake lamp(s) stuck on	<ul style="list-style-type: none"> ▪ Circuit fault ▪ Brake lamp switch fault 	Check the trailer brake lamp circuits. Check the brake lamp switch function. Refer to the electrical guides.

Trailer fog lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Bulb failure ▪ Fuse(s) blown ▪ Circuit fault 	Check the bulb and fuse condition. Check the trailer fog lamp circuit. Refer to the electrical guides.
Trailer fog lamp(s) dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Circuit fault 	Check the bulb condition and rating. Check the trailer fog lamp circuit. Refer to the electrical guides.
Trailer fog lamp(s) stuck on	<ul style="list-style-type: none"> ▪ Circuit fault 	Check the trailer fog lamp circuit. Refer to the electrical guides.
Trailer tail and number plate lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Bulb failure ▪ Fuse(s) blown ▪ Circuit fault ▪ Trailer side lamp relay fault 	Check the bulb and fuse condition. Check the trailer tail and number plate lamp circuit. Check the trailer tail and number plate lamp relay function. Refer to the electrical guides.
Trailer tail and number plate lamp(s) dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Circuit fault ▪ Trailer side lamp relay fault 	Check the bulb condition and rating. Check the trailer tail and number plate lamp circuit. Check the trailer side lamp relay function. Refer to the electrical guides.
Trailer tail and number plate lamp(s) stuck on	<ul style="list-style-type: none"> ▪ Circuit fault ▪ Trailer tail and number plate lamp relay fault 	Check the trailer tail and number plate lamp circuit. Check the trailer tail and number plate lamp relay function. Refer to the electrical guides.
Trailer turn signal lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Bulb failure 	Check the bulb and fuse condition. Check the trailer turn signal lamp circuit. Refer to the electrical guides.

inoperative	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Circuit fault 	
Trailer turn signal lamp(s) dim	<ul style="list-style-type: none"> ▪ Incorrect bulb rating ▪ Circuit fault 	Check the bulb condition and rating. Check the trailer turn signal lamp circuits. Refer to the electrical guides.
Trailer turn signal lamp(s) stuck on	<ul style="list-style-type: none"> ▪ Circuit fault 	Check the bulb and fuse condition. Check the trailer turn signal lamp circuit. Refer to the electrical guides.
Trailer reverse lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Bulb failure ▪ Fuse(s) blown ▪ Circuit fault ▪ Trailer reverse lamp relay fault 	Check the bulb and fuse condition. Check the trailer reverse lamp circuit. Check the trailer reverse lamp relay function. Refer to the electrical guides.
Trailer reverse lamp(s) dim	<ul style="list-style-type: none"> ▪ Circuit fault ▪ Trailer reverse lamp relay fault 	Check the bulb condition and rating. Check the trailer reverse lamp circuit. Check the trailer reverse lamp relay function. Refer to the electrical guides.
Trailer reverse lamp(s) stuck on	<ul style="list-style-type: none"> ▪ Circuit fault ▪ Trailer reverse lamp relay fault 	Check the trailer reverse lamp circuit. Check the trailer reverse lamp relay function. Refer to the electrical guides.
Warning lamp(s) inoperative	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Circuit fault ▪ Instrument cluster fault 	Check the fuse(s). Check the warning lamp circuit. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.

Trailer socket battery feed missing	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Circuit fault 	Check the fuse condition. Check the trailer battery feed circuit. Refer to the electrical guides.
Trailer socket ignition feed missing	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Circuit fault ▪ Trailer socket relay faulty 	Check the fuse condition. Check the trailer ignition feed circuit. Check the trailer ignition feed relay operation. Refer to the electrical guides.

DTC INDEX

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

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

DIAGNOSIS AND TESTING

PRINCIPLE OF OPERATION

For a detailed description of the exterior lighting system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Exterior Lighting (417-01 Exterior Lighting, 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
<ul style="list-style-type: none">▪ Lighting control switch and installation▪ Rain/Light sensor condition and installation▪ Wiper control switch and installation	<ul style="list-style-type: none">▪ Fuses▪ Relays▪ Wiring harness▪ Loose or corroded connector(s)▪ Battery Junction Box (BJB)▪ Central Junction Box (CJB)▪ Rain/Light sensor control module▪ Local Interconnect Network (LIN) circuits▪ Controller Area Network (CAN) circuits

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

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

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Side and headlamp(s) inoperative when the automatic headlamps	<ul style="list-style-type: none">▪ Fuse(s) blown	Check the fuse(s). Check the lighting and wiper control switch functions. Check the automatic headlamps circuit. Refer to the electrical wiring

<p>automatic headlamp switch option is selected</p>	<ul style="list-style-type: none"> ▪ Lighting control switch fault ▪ Wiper control switch fault ▪ Circuit fault ▪ Rain/Light sensor fault ▪ LIN circuit fault 	<p>headlamp circuit. Refer to the electrical guides. Check for DTCs indicating a rain/light sensor or LIN system fault.</p>
<p>Automatic headlamp switch illumination inoperative</p>	<ul style="list-style-type: none"> ▪ Fuse(s) blown ▪ Lighting control switch fault ▪ Circuit fault ▪ Automatic headlamp relay fault 	<p>Check the fuse(s). Check the lighting control switch function. Check the automatic headlamp relay circuit. Refer to the electrical guides. Check for DTCs indicating an automatic headlamp fault.</p>

DTC INDEX

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

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

HEADLAMP ADJUSTMENT

(G1225047)

GENERAL PROCEDURES

86.40.17	HEADLAMPS - PAIR - ALIGN BEAM	ALL DERIVATIVES	0.1	USED WITHINS	+
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CHECK

NOTES:

- With self leveling suspension, make sure the vehicle is at the standard ride height.
- The headlamp setting is 1.2 % below horizontal and parallel.

1. Align the headlamp beam setting equipment to one headlamp.
2. Switch the headlamps on and to dipped beam.

ADJUSTMENT

NOTES:

- With self leveling suspension, make sure the vehicle is at the standard ride height.
- The headlamp setting is 1.2 % below horizontal and parallel.

1. 

Adjust the headlamps.

2. To adjust the second headlamp, repeat the above procedure.

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

ADAPTIVE FRONT LIGHTING MODULE (G1224436)


REMOVAL AND INSTALLATION

REMOVAL

NOTE:

Removal steps in this procedure may contain installation details.


1. Disconnect the battery ground cable.
Refer to: Specifications (414-00, Specifications).
2. Refer to: Lower Glove Compartment (501-12, Removal and Installation).

3. 

Torque: 10 Nm

4. 

Torque: 10 Nm

5. 

INSTALLATION

1. **NOTES:**

- Do not calibrate if the module is removed for access only. Calibration is only required if a new module is installed.
- New units must be configured using the Programmable Module Installation Routine in the diagnostic tool.

To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

FRONT FOG LAMP (G1224438)

REMOVAL AND INSTALLATION

86.40.96	LAMP ASSEMBLY - FOG/DRIVING - RENEW	ALL DERIVATIVES	0.1	USED WITHINS	+
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REMOVAL

NOTES:

- Removal steps in this procedure may contain installation details.
- The ignition must be switched off.

1.

CAUTIONS:

- Protect the surrounding paintwork to avoid damage.
- Take extra care not to damage the clips.



2.

NOTE:

Support as necessary.



Torque: 2.5 Nm

3.

NOTE:

Support as necessary.



INSTALLATION

1.

NOTE:

The fog lamp beam should be set at 1.2% below the horizontal and parallel.

To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

HEADLAMP ASSEMBLY (G1224384)

REMOVAL AND INSTALLATION

REMOVAL

WARNING:

Vehicles fitted with Xenon headlamps, the following precautions must be observed. Failure to comply may result in exposure to ultra violet rays, severe electric shock, burns or the risk of explosion. Ensure the headlamps are switched off at all times. Eye and hand protection must be worn. Never switch on the lamps or test the bulbs with the lamp holder released from the headlamp.

NOTES:

- Removal steps in this procedure may contain installation details.
- The ignition must be switched off.
- Right-hand shown, left-hand similar.

1. Disconnect the battery ground cable.
Refer to: Specifications (414-00, Specifications).
2. Refer to: Front Bumper Cover (501-19, Removal and Installation).

3.





Torque: 4 Nm

4.



INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

HEADLAMP BULB (G1235731)

REMOVAL AND INSTALLATION

REMOVAL

CAUTIONS:


- LH illustration shown, RH is similar.
- Make sure that the headlamps are not switched on with the headlamp bulb electrical connectors disconnected.

NOTES:

- The ignition must be switched off.
- Removal steps in this procedure may contain installation details.

1. Refer to: Headlamp Adjustment (417-01, General Procedures).

2. 

3. 

INSTALLATION

1. To install, reverse the removal procedure.

2012.0 RANGE ROVER (LM), 417-01

EXTERIOR LIGHTING

HEADLAMP SWITCH (G452330)

REMOVAL AND INSTALLATION

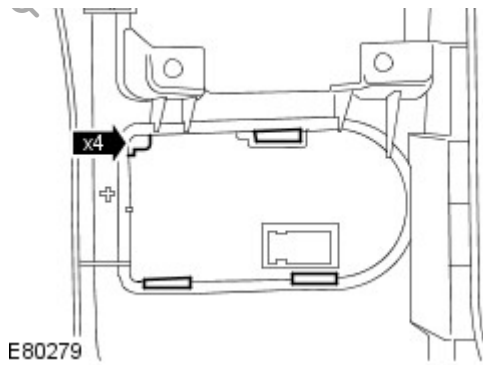
86.65.09	SWITCH - MASTER LIGHTING - RENEW	ALL DERIVATIVES	0.2	USED WITHINS	+
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REMOVAL

1. Remove the driver side register trim panel.
For additional information, refer to: Driver Side Register Trim Panel (412-01, Removal and Installation).
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2.





Remove the headlamp switch.

- Carefully release the 4 clips.

INSTALLATION

1. Install the headlamp switch.
2. Install the driver side register trim panel.
For additional information, refer to: Driver Side Register Trim Panel (412-01, Removal and Installation).

