

Part Number

Published: 11-May-2011

Instrument Cluster - Instrument Cluster

Description and Operation

COMPONENT LOCATION - UK



E76920

| Item | Part Number | Description |
|------|-------------|---|
| 1 | - | Tachometer |
| 2 | - | Engine temperature gage |
| 3 | - | Fuel level gage |
| 4 | - | Speedometer |
| 5 | - | Message center - high line instrument cluster only |
| 6 | - | Warning indicator lamp display - low line instrument cluster only |

NOTE: The 'Rest of World' instrument cluster is the same as the UK instrument cluster but does not have a miles per hour (mph) scale on the speedometer.

COMPONENT LOCATION - NORTH AMERICA



E80134

| Item | Description |
|------|---|
| 1 | Tachometer |
| 2 | Engine temperature gage |
| 3 | Fuel level gage |
| 4 | Speedometer |
| 5 | Message center - high line instrument cluster only |
| 6 | Warning indicator lamp display - low line instrument cluster only |

OVERVIEW

The instrument cluster is located in the instrument panel, above the steering column. The instrument cluster comprises analogue gages and a number of warning indicator lamps to display system status. High line instrument clusters also feature a Liquid Crystal Display (LCD) message center to provide vehicle operation details to the driver. The message center is located in a central position in the high line instrument cluster.

For additional information, refer to: [Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

Low line instrument clusters feature warning indicator lamps in place of the message center.

ANALOGUE GAGES

Tachometer

The tachometer is located on the Left Hand (LH) side of the instrument cluster and displays engine speeds of up to 8000 Revolutions Per Minute (RPM) on petrol variants, and 6000 RPM on diesel variants. The tachometer is driven by an engine speed signal, which originates from the Crankshaft Position (CKP) sensor. This signal is transmitted over the high speed Controller Area Network (CAN) bus by the Engine Control Module (ECM). The Central Junction Box (CJB) acts as a gateway and transmits the engine speed signal to the instrument cluster on the medium speed CAN bus. The signal is received by the instrument cluster microprocessor and the output from the microprocessor drives the tachometer.

Engine Temperature Gage

The engine temperature gage is located in the center of the instrument cluster and is driven by medium speed CAN bus messages from the CJB. The CJB receives an Engine Coolant Temperature (ECT) signal from the ECM over the high speed CAN bus when the vehicle enters power mode 6 (ignition on). The needle pointer position translates to the following approximate temperatures.

| Engine Coolant Temperature °C (°F) | | Pointer Position |
|------------------------------------|--------------|--------------------------------|
| Petrol | Diesel | |
| Ignition off | Ignition off | Park |
| 40 (104) | 40 (104) | Cold (blue segment) |
| 75 (167) | 75 (167) | Beginning of normal |
| 119 (246) | 113 (235) | End of normal |
| 125 (257) | 118 (244) | Beginning of hot (red segment) |
| 130 (266) | 123 (253) | End of hot |

If the ECT signal rises above 118 °C (244 °F) on diesel vehicles, or 127 °C (260 °F) on petrol vehicles, the instrument cluster will illuminate the high ECT warning indicator. If the instrument cluster fails to receive an ECT signal from the CJB, the engine coolant temperature gage will move to the 'end of hot' position and the warning indicator will be illuminated.

Fuel Level Gage

The fuel level gage is located in the center of the instrument cluster and displays fuel tank contents when the vehicle is in power mode 6. When the ignition is switched off, the pointer returns to the park position.

Two Magnetic Passive Position Sensors (MAPPS) are located in the saddle type fuel tank, one on either side. The resistance values for both sensors are measured by the CJB through a series of hardwired connections. The CJB converts both values to medium speed CAN messages for delivery to the instrument cluster. The instrument cluster uses the 2 CAN bus messages to calculate the total amount of fuel in both halves of the tank. The instrument cluster will also damp the total fuel value to eliminate constant pointer movement due to fuel moving in the tank.

The following table shows the approximate fuel tank level and the respective needle pointer position.

| Fuel Quantity Liters (US gallons) | | Pointer Position |
|-----------------------------------|-------------|---------------------------------------|
| Petrol | Diesel | |
| 0 (0) | 0 (0) | Mechanical zero |
| 1 (0.2) | 2.5 (0.6) | Below empty |
| 2.8 (0.7) | 3.8 (1) | Indicated empty |
| 11.9 (3.1) | 10.3 (2.7) | Low fuel level indicator illuminated |
| 13.9 (3.7) | 12.3 (3.2) | Low fuel level indicator extinguished |
| 16.9 (4.5) | 16.7 (4.4) | Quarter full |
| 33.8 (8.9) | 33.4 (8.8) | Half full |
| 50.8 (13.4) | 50 (13.2) | Three quarters full |
| 66.9 (17.7) | 68 (18) | Indicated full |
| 70.5 (18.6) | 70.5 (18.6) | Over full |

If the instrument cluster fails to receive the fuel level signals from the CJB the fuel level gage will move to the empty position and the low fuel level indicator will be illuminated.

Speedometer

The speedometer is located on the Right Hand (RH) side of the cluster and is available in 3 variants:

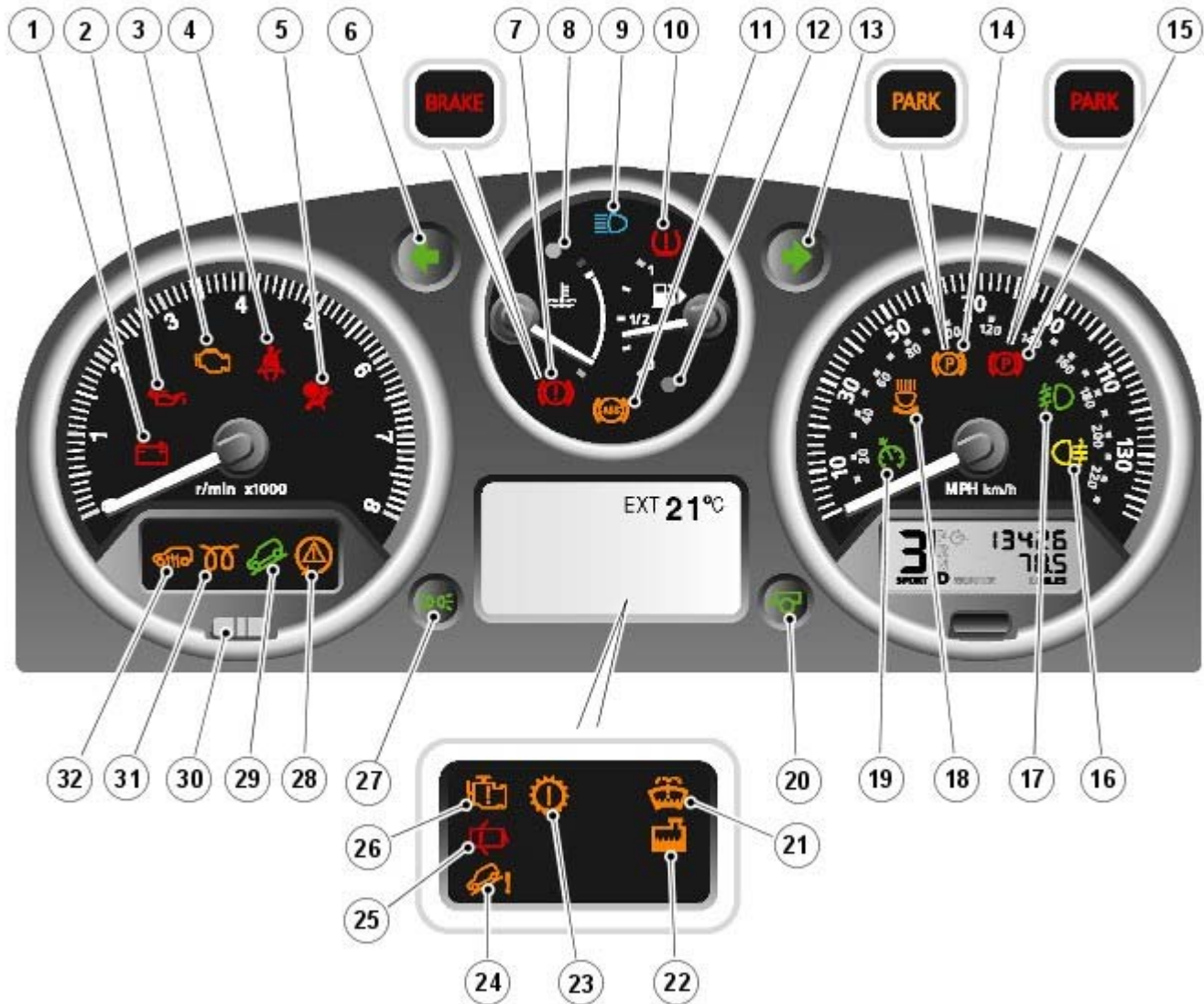
- Major scale mph, minor scale kilometers per hour (kph)
- Major scale kph, minor scale mph
- Major scale kph only.

The speedometer is driven by medium speed CAN bus signals transmitted by the CJB. The vehicle speed signal is provided to the CJB by the Anti-lock Brake System (ABS) module over the high speed CAN bus and is an average of all 4 wheel speed sensor signals.

The speedometer also incorporates the odometer.

For additional information, refer to: [Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

WARNING INDICATORS



E83977

| Item | Description |
|------|--|
| 1 | Ignition/No charge indicator |
| 2 | Low oil pressure warning indicator |
| 3 | Malfunction Indicator Lamp (MIL) (petrol vehicles only) |
| 4 | Safety belt warning indicator |
| 5 | Supplemental Restraint System (SRS) warning indicator |
| 6 | Left Hand (LH) turn signal indicator |
| 7 | Brake warning indicator (low fluid/Emergency Brake Assist (EBA)/Electronic Brake force Distribution (EBD)) |
| 8 | High Engine Coolant Temperature (ECT) warning indicator |
| 9 | Headlamp high beam indicator |
| 10 | Tire Pressure Monitoring System (TPMS) indicator |
| 11 | Anti-lock Brake System (ABS) warning indicator |
| 12 | Low fuel indicator |
| 13 | Right Hand (RH) turn signal indicator |
| 14 | Parking brake indicator - not used |
| 15 | Parking brake indicator |

| | | |
|----|--|--|
| 16 | | Rear fog lamp indicator |
| 17 | | Front fog lamp indicator |
| 18 | | Adaptive Front lighting System (AFS) indicator |
| 19 | | Speed control indicator |
| 20 | | Trailer indicator |
| 21 | | Low washer fluid indicator (low line only) |
| 22 | | Low engine coolant level warning indicator (low line only) |
| 23 | | Transmission warning indicator (low line only) |
| 24 | | Hill Descent Control (HDC) fault indicator (low line only) |
| 25 | | Door open indicator (low line only) |
| 26 | | Engine management system warning indicator (low line only) |
| 27 | | Side lamp indicator |
| 28 | | Dynamic Stability Control (DSC) indicator |
| 29 | | HDC active indicator |
| 30 | | Anti-theft alarm indicator |
| 31 | | Glow plug indicator (diesel vehicles only) |
| 32 | | Fuel fired booster heater indicator (if fitted) |

The low line instrument cluster contains 39 indicators, the high line instrument cluster 27. The indicators in high line instrument clusters are supplemented by messages in the message center.

For additional information, refer to: [Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

The warning indicators can be split into 2 groups; self controlled and externally controlled. Self controlled warning indicators are dependent on software logic within the instrument cluster for activation. Externally controlled indicators are supplied with current from another system controlling module or illuminated by the instrument cluster on receipt of a medium speed CAN bus message from the CJB.

Ignition/No Charge Indicator

The ignition/no charge indicator is controlled by the instrument cluster software and illuminated by medium speed CAN bus signals from the ECM via the CJB. The indicator illuminates in a red color when the vehicle enters power mode 6 and is extinguished when the engine is started.

If the indicator remains illuminated after the engine has started or illuminates when driving, the alternator charge output has failed.

Low Oil Pressure Warning Indicator

The low oil pressure warning indicator is illuminated by the instrument cluster on receipt of a medium speed CAN bus signal from the CJB. The signal originates in the ECM and is generated by the engine oil level sensor on petrol vehicles and the engine oil pressure sensor on diesel vehicles.

The indicator illuminates in a red color when the vehicle enters power mode 6 for a 3 second bulb check. If the bulb subsequently illuminates when the engine is running, the engine should be stopped immediately it is safe to do so.

Malfunction Indicator Lamp

The Malfunction Indicator Lamp (MIL) is illuminated by the instrument cluster on receipt of a medium speed CAN bus signal from the CJB. The signal originates in the ECM and is generated if an On-Board Diagnostic (OBD) fault has been detected which will cause excessive emissions output. This may relate to either an engine management or transmission fault.

The MIL is illuminated in an amber color when the vehicle enters power mode 6 for a 3 second bulb check. The bulb check in this instance is carried out by the ECM via the CJB, not the instrument cluster. If the MIL subsequently illuminates the vehicle should be interrogated using the Land Rover approved diagnostic system at the earliest opportunity.

Safety Belt Warning Indicator

The safety belt warning indicator will illuminate in a red color on receipt of a medium speed CAN bus signal from the CJB. The signal originates in the Restraints Control Module (RCM), which monitors the status of the occupant classification system and switches located in the safety belt buckles.

Three variations of warning are available depending on vehicle configuration:

- Reminder (all vehicles except North American Specification (NAS) vehicles)
- Federal Motor Vehicle Safety Standard (FMVSS) 208 reminder (NAS vehicles only)
- Belt Minder

The conditions for safety belt warning indicator illumination are as follows:

Reminder

- Vehicle in power mode 6
- Drivers safety belt not secured in its buckle
- Large passenger detected in front passenger seat with an unsecured safety belt.

The warning indicator will remain illuminated until either the ignition is switched off or conditions 2 and 3 no longer exist.

FMVSS-208 Reminder

- Vehicle in power mode 6
- Drivers safety belt not secured in its buckle.

The warning indicator will remain illuminated for 65 seconds and will be accompanied by a single 6 second chime from the instrument cluster sounder.

NOTE: The warning indicator and chime will not activate if these conditions arise 75 seconds after the vehicle has entered power mode 6.

The warning indicator will be extinguished and the sounder cancelled if the ignition is switched off or the driver's safety belt is secured in its buckle.

Belt Minder

- Vehicle in power mode 6 (all vehicles except NAS vehicles)
- Vehicle in power mode 6 for 75 seconds (NAS vehicles only)
- Vehicle speed is greater than 6 mph (10 kph)
- Drivers safety belt not secured in its buckle
- Large passenger detected in front passenger seat with an unsecured safety belt.

The warning indicator will flash at a frequency of 2 Hz while accompanied by a chime from the instrument cluster for 10 seconds. This is followed by a 10 second period where the warning indicator is permanently illuminated and the sounder is silent. This 10 second cycle will be repeated for a maximum of 190 seconds or any of the conditions listed above cease to exist.

Supplemental Restraint System Warning Indicator

The Supplemental Restraint System (SRS) warning indicator is illuminated on receipt of a medium speed CAN bus signal from the CJB. The signal originates in the RCM which monitors the condition of the SRS and illuminates the red warning indicator accordingly.

The SRS warning indicator is illuminated by the RCM for a 6 second bulb check when the vehicle first enters power mode 6. If a fault is detected with the indicator, the instrument cluster returns a medium speed CAN bus signal via the CJB to the RCM and a Diagnostic Trouble Code (DTC) is stored in the RCM's memory. The message 'SrS' will also be displayed in the odometer.

For additional information, refer to: [Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

Left and Right Hand Turn Signal Indicators

The green left and right hand turn signal indicators are illuminated on receipt of medium speed CAN bus signals from the CJB. The CJB provides a CAN bus signal with one of the following values:

- 0 - LH steering column multi-function switch in the central position
- 1 - LH steering column multi-function switch in the LH turn position
- 2 - LH steering column multi-function switch in the RH turn position
- 3 - Hazard flashers requested.

If the vehicle is in power mode 6 the instrument cluster will flash the appropriate turn signal indicator if a medium speed CAN bus signal is received with a value of 1 or 2. Medium speed CAN bus signals with a value of 3 will activate both the LH and RH turn signal indicators simultaneously irrespective of power mode.

When activated, the left and right hand turn signal indicators will be accompanied by 'tick tock' chimes from the instrument cluster sounder.

Brake Warning Indicator

EBA and EBD warnings are transmitted to the CJB from the ABS module over the high speed CAN bus. These signals are relayed to the instrument cluster on the medium speed CAN bus and will activate the brake warning indicator when the vehicle is in power mode 6. If an EBA warning is requested, the indicator will illuminate in an amber color. If an EBD warning is requested, the indicator will illuminate in a red color.

Low brake fluid level warnings are also transmitted to the instrument cluster from the CJB on the medium speed CAN bus. The signal originates in the ABS module which receives a hardwired input from the brake fluid level sensor. If a low brake fluid warning is requested, the indicator will illuminate in a red color when the vehicle is in power mode 6.

The brake warning indicator is also subject to a 3 second bulb check when the vehicle first enters power mode 6. The

indicator will illuminate in a amber color for 1.5 seconds then a red color for 1.5 seconds.

High Engine Coolant Temperature Warning Indicator

The red high Engine Coolant Temperature (ECT) warning indicator is controlled by the engine temperature gage software (see above).

Headlamp High Beam Indicator

The blue headlamp high beam indicator is illuminated on receipt of a medium speed CAN bus signal from the CJB. The signal originates in the light switch module and is transmitted to the CJB over the LIN bus. The instrument cluster will only illuminate the headlamp high beam indicator when the vehicle is in power mode 6 and the LH steering column multi-function switch is moved to the high beam position.

Tire Pressure Monitoring System Indicator

The Tire Pressure Monitoring System (TPMS) indicator is controlled by the instrument cluster on receipt of medium speed CAN bus signals from the CJB. The signal originates in the TPMS module. The indicator is illuminated in an amber color for a 3 second bulb check by the TPMS module when the vehicle enters power mode 6. If the indicator remains illuminated or flashes after the engine is started or when driving, the TPMS has developed a fault. The tire pressures should be monitored manually until the fault is rectified.

For additional information, refer to: [Wheels and Tires](#) (204-04 Wheels and Tires, Description and Operation).

Anti-lock Brake System Warning Indicator

The Anti-lock Brake System (ABS) warning indicator is controlled by the ABS module which transmits a high speed CAN bus message to the CJB. The CJB relays the message to the instrument cluster over the medium speed CAN bus. The warning indicator is illuminated in an amber color for 3 seconds for a bulb check by the ABS module when the vehicle enters power mode 6. If the warning indicator remains illuminated or illuminates when driving, an ABS fault has occurred and the ABS function will not be available.

During the bulb check, if the warning indicator comes on for 0.5 second, then goes off for 0.5 second and is then illuminated for the remaining 2 seconds of the bulb check, this indicates that faults are stored in the ABS module memory.

If the warning indicator was illuminated due to a wheel speed sensor fault, the indicator will remain illuminated at the next ignition cycle, even if the fault is rectified. When the vehicle is driven above a speed of 20 km/h (12.5 mph) the indicator will be extinguished. This allows the ABS module to perform a thorough check of the system and to establish that the output from the replaced sensor is correct.

Low Fuel Level Indicator

The low fuel level indicator is controlled by the fuel level gage software (see above). When the vehicle enters power mode 6, the low fuel indicator is illuminated in an amber color for a 3 second bulb check. If the fuel level gage software determines the low fuel indicator should be illuminated, it flashes the indicator at a rate of 2 Hz for 5 seconds. The first flash is accompanied by a chime from the instrument cluster sounder. After the 5 second flashing period the indicator will remain illuminated until fuel is added to the tank or the vehicle ignition is switched off.

Parking Brake Indicator

The red parking brake indicator is illuminated on receipt of a medium speed CAN bus signal from the CJB. The signal originates in the parking brake microswitch, which is hardwired to the CJB. The parking brake indicator will only illuminate if the parking brake is applied and the vehicle is in power mode 6.

Rear Fog Lamp Indicator

The rear fog lamp indicator is illuminated on receipt of a medium speed CAN bus signal from the CJB. The indicator is illuminated in an amber color if the vehicle is in power mode 6 and rear fog lamp operation has been requested.

Front Fog Lamp Indicator

The front fog lamp indicator is illuminated on receipt of a medium speed CAN bus signal from the CJB. The indicator is illuminated in a green color if the vehicle is in power mode 6 and front fog lamp operation has been requested.

Adaptive Front Lighting System Indicator

The Adaptive Front lighting System (AFS) indicator is controlled by the AFS module. The AFS module is hardwired to the CJB, which relays signals to the instrument cluster over the medium speed CAN bus. When the vehicle enters power mode 6, the AFS indicator is illuminated in an amber color for a 3 second bulb check. If during AFS operation a fault is detected, the AFS indicator will flash at a frequency of 2 Hz.

Speed Control Indicator

The speed control indicator is controlled by the ECM, which transmits a speed control active signal to the instrument cluster via the CJB. The indicator will illuminate in an amber color when the vehicle is in power mode 6 and speed control is active.

Trailer Indicator

The trailer indicator is controlled by the instrument cluster on receipt of medium speed CAN bus signals from the CJB. When a trailer is connected to the vehicle electrical system and the turn signal indicator switch is operated, the CJB transmits a signal to the instrument cluster to operate the trailer indicator. The instrument cluster software controls the flash rate of the indicator which flashes in a green color. The trailer indicator flashes slowly, at the same rate as the turn signal indicators.

Low Washer Fluid Indicator

The low washer fluid indicator is illuminated on receipt of a medium speed CAN bus signal from the CJB. The signal originates in the low washer fluid level switch, which is hardwired to the CJB.

The amber low washer fluid indicator is subject to a 3 second bulb check when the vehicle enters power mode 6. If a low washer fluid level is detected for more than 15 seconds when the vehicle is in power mode 6, the instrument cluster will illuminate the indicator.

Low Engine Coolant Level Warning Indicator

The low engine coolant level warning indicator is illuminated on receipt of a medium speed CAN bus signal from the CJB when the vehicle is in power mode 6. The signal originates in the ECM, which transmits the signal to the CJB over the high speed CAN bus.

When the vehicle enters power mode 6, the amber low engine coolant level warning indicator is illuminated for a 3 second bulb check. If the warning indicator remains illuminated after this period, the engine cooling system should be checked for leaks and topped up as necessary.

Transmission Warning Indicator

The transmission warning indicator displays automatic transmission and active-on demand coupling warnings. The warning indicator is illuminated on receipt of medium speed CAN bus signals from the CJB. The signals originate in the Transmission Control Module (TCM) and the active-on demand coupling control module respectively and are transmitted to the CJB over the high speed CAN bus.

The transmission warning indicator is a dual color indicator, which is subject to a 3 second bulb check when the vehicle enters power mode 6. For the first 1.5 seconds of the bulb check the indicator illuminates in an amber color, followed by 1.5 seconds illuminated in a red color.

The table below details warning indicator color against message center message.

| Message Center Message | Warning Indicator Color | |
|--|--|---|
| | Automatic Transmission Related Warning | Active On-demand Coupling Related Warning |
| TRANSMISSION FAULT | Amber | Red |
| TRANSMISSION FAULT AND OVERHEAT | Red | n/a |
| TRANSMISSION FAULT LIMITED GEARS AVAILABLE | Red | n/a |
| TRANSMISSION FAULT TRACTION REDUCED | n/a | Red |
| TRANSMISSION OVERHEAT SLOW DOWN | Amber | Red |

Hill Descent Control Fault Warning Indicator

The amber Hill Descent Control (HDC) warning indicator is illuminated on receipt of medium speed CAN bus signals from the CJB. The signals originate in the ABS module and are transmitted to the CJB over the high speed CAN bus.

When the vehicle enters power mode 6, the HDC warning indicator is subject to a 3 second bulb check. If during HDC operation the HDC warning indicator illuminates it signifies that the 'fade out' strategy has been invoked due to component failure.

If the HDC warning indicator flashes it signifies that the 'fade out' strategy has been invoked due to brake system overheat. In this instance, the first flash is accompanied by a chime from the instrument cluster and the green HDC active indicator will be extinguished.

For additional information, refer to: [Anti-Lock Control - Stability Assist](#) (206-09C Anti-Lock Control - Stability Assist, Description and Operation).

Door Open Indicator

The door open indicator is illuminated on receipt of medium speed CAN bus signals from the CJB. The signals originate in the door modules, which are hardwired to the CJB. The door open indicator will illuminate in a red color if a door open signal is received by the CJB from any door module while the vehicle is in power mode 6.

Engine Management System Warning Indicator

The engine management system warning indicator is illuminated on receipt of medium speed CAN bus signals from the CJB. The signals originate in the ECM and are transmitted to the CJB over the high speed CAN bus.

The amber engine management system warning indicator is illuminated for a 3 second bulb check when the vehicle enters power mode 6. If the indicator subsequently illuminates a DTC will be logged in the ECM which should be interrogated using

the Land Rover approved diagnostic system.

Side Lamp Indicator

The green side light indicator is illuminated on receipt of a medium speed CAN bus signal from the CJB. The signal originates in the light switch module and is transmitted to the CJB over the Local Interconnect Network (LIN) bus. The instrument cluster will only illuminate the side lamp indicator when the vehicle is in power mode 6.

Dynamic Stability Control Indicator

The Dynamic Stability Control (DSC) indicator is illuminated by the instrument cluster on receipt of medium speed CAN bus signals from the CJB. The signal originates in the ABS module. The indicator is illuminated in an amber color for 3 seconds for a bulb check when the vehicle enters power mode 6. If no faults exist, the indicator is extinguished after the bulb check period.

When DSC is active, the indicator flashes to inform the driver that the system is regulating engine output and braking forces. If the indicator remains illuminated after the bulb check period or illuminates when driving, the DSC system has a fault or DSC has been deselected by the driver using the DSC switch on the floor console.

Hill Descent Control Active Indicator

The HDC active indicator is illuminated by the instrument cluster on receipt of medium speed CAN bus signals from the CJB. The signal originates in the ABS module. The indicator is illuminated in a green color when HDC is active and the vehicle speed is below a predetermined threshold. If the vehicle speed is faster than the threshold limit, the HDC indicator will flash until the vehicle speed is reduced. On high line instrument clusters a supporting message will also be displayed in the message center. For additional information, refer to:

[Anti-Lock Control - Stability Assist](#) (206-09C Anti-Lock Control - Stability Assist, Description and Operation),
[Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

If the use of HDC causes the brake discs to exceed their pre-determined temperature, the HDC system initiates a 'fade out'. The HDC indicator flashes during 'fade out' and on high line instrument clusters a supporting message is displayed in the message center. When the brake discs have cooled sufficiently, HDC is reactivated and the HDC indicator is permanently illuminated.

Anti-theft Alarm Indicator

The anti-theft alarm indicator is controlled directly from the CJB via a hardwired connection. There is no software functionality within the instrument cluster to control operation of the anti-theft alarm indicator.

For additional information, refer to: [Anti-Theft - Active](#) (419-01A Anti-Theft - Active, Description and Operation).

Glow Plug Indicator

The glow plug indicator is illuminated on receipt of a medium speed CAN bus signal from the CJB. The signal originates in the diesel ECM and indicates the glow plugs are operational. The indicator will illuminate in an amber color when the vehicle enters power mode 6 and a glow plugs active signal is received from the ECM. When the combustion pre-heat procedure has been carried out, the ECM informs the instrument cluster to extinguish the glow plug indicator.

For additional information, refer to: Electronic Engine Controls - 2.2L Diesel (303-14 Electronic Engine Controls - 2.2L Diesel, Description and Operation).

Overspeed Warning Indicator

The amber overspeed warning indicator is illuminated on receipt of a medium speed CAN bus signal from the CJB when the vehicle is in power mode 6. The vehicle speed signal originates in the ABS module and is the same as that used by the speedometer (see above).

The instrument cluster will flash the overspeed warning indicator at a rate of 2 Hz for 5 seconds if a speed of greater than 75 mph (120 kph) is reached. The first flash of the indicator will be accompanied by a chime from the instrument cluster. If the vehicle stays at this speed, the indicator will remain illuminated after the 5 second flashing period. The instrument cluster will extinguish the indicator if vehicle speed drops below 71 mph (114 kph).

Stop/Start Vehicles - From 2010 MY



E115193

Eco 'Stop/Start' Indicator

The TD4_e introduces the first intelligent 'Stop/Start' system into a Land Rover vehicle. The system automatically shuts down and restarts the vehicle's engine when the appropriate conditions are satisfied. This reduces the amount of time the engine spends idling, thereby improving fuel economy and reducing emissions. The driver will be notified that the engine is shutdown by the 'Eco' icon being illuminated in the instrument cluster. Other warning lights normally associated with an engine shutdown, for example the ignition and low oil pressure indicators are suppressed so will not illuminate during an engine shutdown in a Stop/Start cycle.

For additional information, refer to: [Starting System](#) (303-06C Starting System - TD4 2.2L Diesel, Vehicles Built From: 01-03-2009, Description and Operation).



E115184

Eco Switch

The Stop/Start system is automatically activated each time an ignition cycle occurs. However, the driver can deactivate the system by pressing the 'Eco' switch in the fascia.

For additional information, refer to: [Starting System](#) (303-06C Starting System - TD4 2.2L Diesel, Vehicles Built From: 01-03-2009, Description and Operation).

The Eco switch also operates the Gear Shift Indicator; for additional information refer to Gear Shift Indicator section, below.

CAR CONFIGURATION FILE

The car configuration file contains all relevant data about the specification and market condition of the vehicle, immobilization codes and driver personal settings. The master repository for this information is the CJB, with a back up being held in the instrument cluster. The information is continuously transferred between the 2 components to ensure the data is constantly backed-up.



CAUTION: When a new instrument cluster is to be installed, the Land Rover approved diagnostic system must be connected to the vehicle and the instrument cluster renewal procedure followed. This will ensure that vehicle coding data is correctly installed in the new instrument cluster. The Land Rover approved diagnostic system will also record the current service interval data and restore the settings in the new instrument cluster.

When a new instrument cluster is installed, the Land Rover approved diagnostic system is used to transfer the car configuration file data from the CJB to the replacement instrument cluster. Vehicle coding data such as engine type and market is retrieved and used to update the replacement instrument cluster.

The car configuration file will also need to be updated using the Land Rover approved diagnostic system if the vehicle is modified in service from its original factory specification. This can include fitting non-standard wheels and/or tires, or optional accessory dealer fit components with an electrical interface.

GEAR SHIFT INDICATOR - FROM 2010 MY

OVERVIEW

A Gear Shift Indicator in the instrument cluster illuminates to advise the driver when to select a higher gear to attain better fuel efficiency from the vehicle. If the indicator is obeyed the driver can achieve fuel savings of up to 5%.



Gear shift indicator

Introduced in the manual transmission vehicle as standard, the Gear Shift Indicator is automatically activated each time an ignition cycle occurs. However, the driver can deactivate the indicator by pressing the 'Eco' switch on the fascia.

NOTE: The 'Eco' switch also operates the Stop/Start system.

For additional information, refer to: [Starting System](#) (303-06C Starting System - TD4 2.2L Diesel, Vehicles Built From: 01-03-2009, Description and Operation).



Eco switch

The Gear Shift Indicator illuminates to advise the driver to select a higher gear, the indicator depending on driver action and driving conditions behaves as follows:

- Extinguishes when a higher gear is selected.
- Extinguishes before a higher gear is selected if driver demand or driving conditions change.
- Extinguishes after 12 seconds if the indicator is ignored; either of the two following conditions can reset the indicator:
 - the driver makes a further gear selection,
 - the driver accelerates after exiting a sharp corner.

The Gear Shift Indicator is designed only to assist the driver, gear selection remains the driver's decision based on other driving conditions affecting the vehicle.

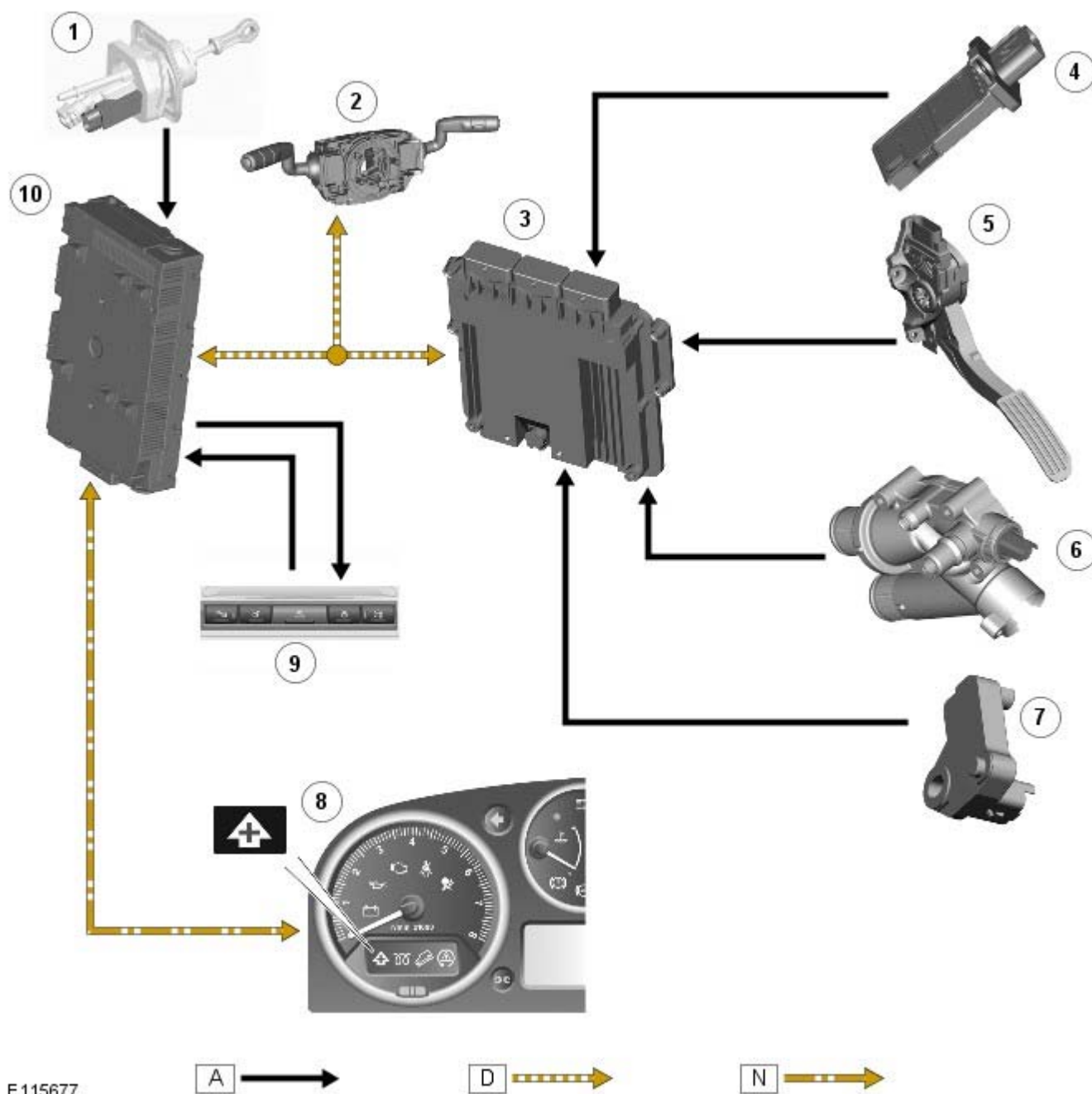
The Gear Shift Indicator:

- Does not advise when to select a lower gear.
- Cannot predict the gradient or curvature of the road ahead.

CONTROL DIAGRAM

Gear Shift Indicator Control Diagram

NOTE: **A** = Hardwired; **D** = High Speed CAN bus; **N** = Medium Speed CAN bus.



| Item | | Description |
|------|--|---|
| 1 | | Linear clutch sensor |
| 2 | | Steering wheel module including steering angle sensor |
| 3 | | Engine control module |
| 4 | | Mass air flow sensor / Intake air temperature sensor |
| 5 | | Accelerator pedal position sensor |
| 6 | | Coolant temperature sensor |
| 7 | | Crankshaft position sensor |
| 8 | | Instrument cluster |
| 9 | | Eco switch |
| 10 | | Central junction box |

PRINCIPLES OF OPERATION

The Gear Shift Indicator takes advantage of the fully mapped engine to continually calculate the engines performance and whether a higher gear would provide improved fuel efficiency. The **ECM (engine control module)** interprets which gear is currently selected from analysis of the following **EEC (electronic engine control)** component inputs:

- Engine load; input from the **MAF (mass air flow)** sensor.
- Driver's accelerator position and demand; input from the **APP (accelerator pedal position)** sensor.

- Engine temperature; input from the coolant temperature sensor.
- Engine speed; input from the [CKP \(crankshaft position\)](#) sensor.
- Vehicle speed; input from the ECM via signals from the [ABS \(anti-lock brake system\)](#) module on the high-speed [CAN \(controller area network\)](#).

Using these inputs the ECM uses an algorithm to monitor the driver's torque and performance demand in the current gear to establish if the same torque and performance could be achieved in the next highest gear to improve fuel efficiency, without introducing engine laboring.

The signal from the Steering Angle Sensor is used to inhibit illumination of the Gear Shift Indicator when the vehicle is traveling round a bend in the road.



E115181

Linear clutch sensor

The linear clutch sensor a component introduced with the Stop/Start system is used to reset the indicator lamp each time a gear change is executed.

For additional information, refer to: [Starting System](#) (303-06C Starting System - TD4 2.2L Diesel, Vehicles Built From: 01-03-2009, Description and Operation).

The two existing clutch position-switches located on the clutch pedal housing and used as inputs for various vehicle systems, are also used by the Gear Shift Indicator system for plausibility checks.

NOTE: The Gear Shift Indicator will not function if there is fault with the Stop/Start system.

For additional information, refer to: [Starting System](#) (303-06C Starting System - TD4 2.2L Diesel, Vehicles Built From: 01-03-2009, Description and Operation).

Instrument Cluster - Instrument Cluster

Diagnosis and Testing

Principles of Operation

For a detailed description of the Instrument Cluster, refer to the relevant Description and Operation section in the workshop manual.

REFER to: [Instrument Cluster](#) (413-01 Instrument Cluster, Description and Operation).

Inspection and Verification



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

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage and system integrity.

Visual Inspection

| Mechanical | Electrical |
|---|--|
| <ul style="list-style-type: none"> ● Fluid levels ● Accessory installations | <ul style="list-style-type: none"> ● Fuse ● Wiring harness ● Electrical connectors ● Instrument cluster ● Central Junction Box (CJB) ● Engine Control Module (ECM) |

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

NOTE: Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).

NOTE: When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

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

NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Instrument Cluster \(IPC\)](#) (100-00 General Information, Description and Operation).

Instrument Cluster - Instrument Cluster

Removal and Installation

Removal

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

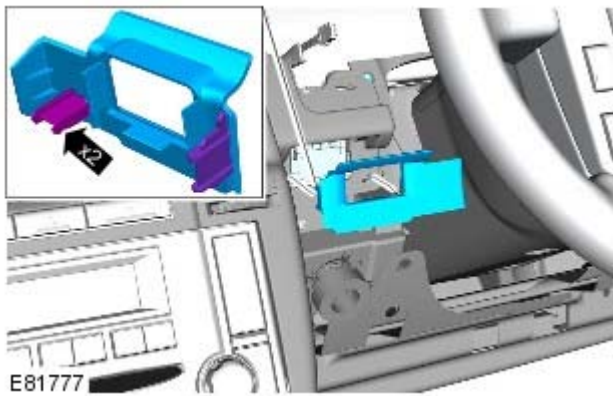
NOTE: Removal steps in this procedure may contain installation details.

1. Make the SRS system safe.

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

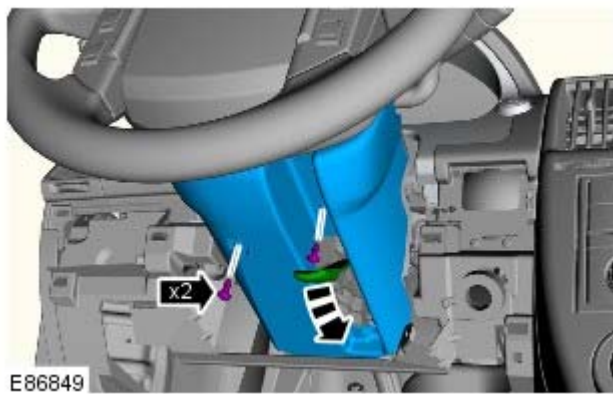
2. Remove the driver lower air bag module.

Refer to: [Driver Lower Air Bag Module](#) (501-20B Supplemental Restraint System, Removal and Installation).



3. **NOTE:** RHD illustration shown, LHD is similar.

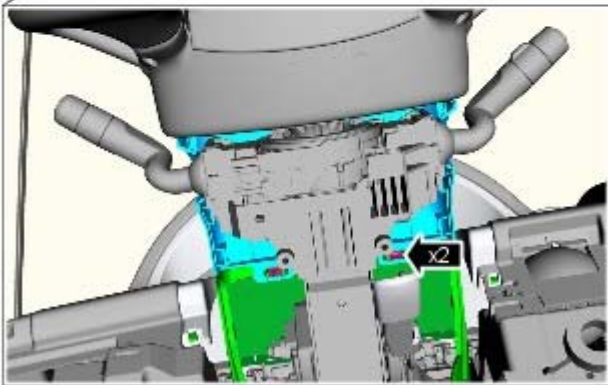
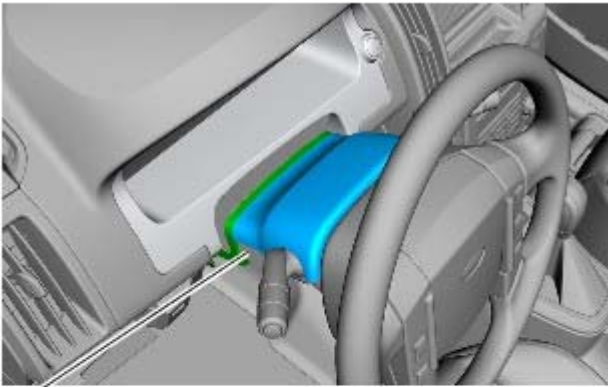
Remove the keyless start control module trim cover.



4. Remove the steering column lower cowl.

5. Adjust the steering column to its lowest position.

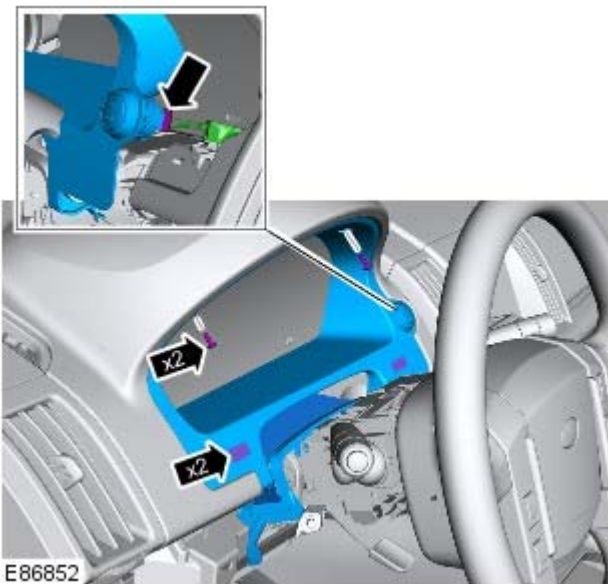
6.



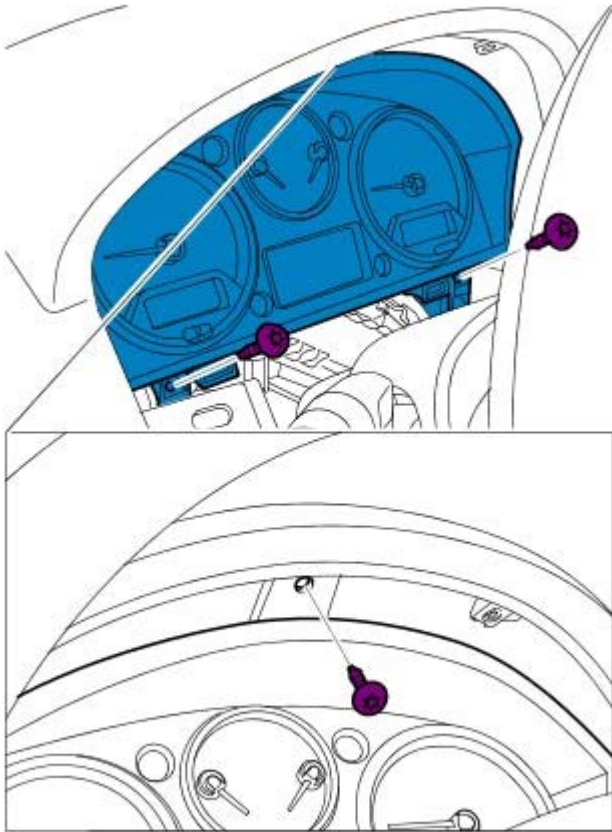
E86851

7. **NOTE:** Take extra care when releasing the clips.

Remove the instrument cluster surround.



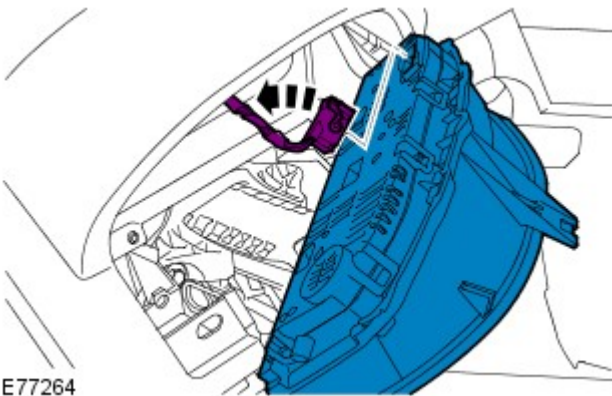
E86852



E77263

8.

- Remove the 3 Torx screws.



E77264

9.

Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Land Rover approved diagnostic equipment.

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Horn -

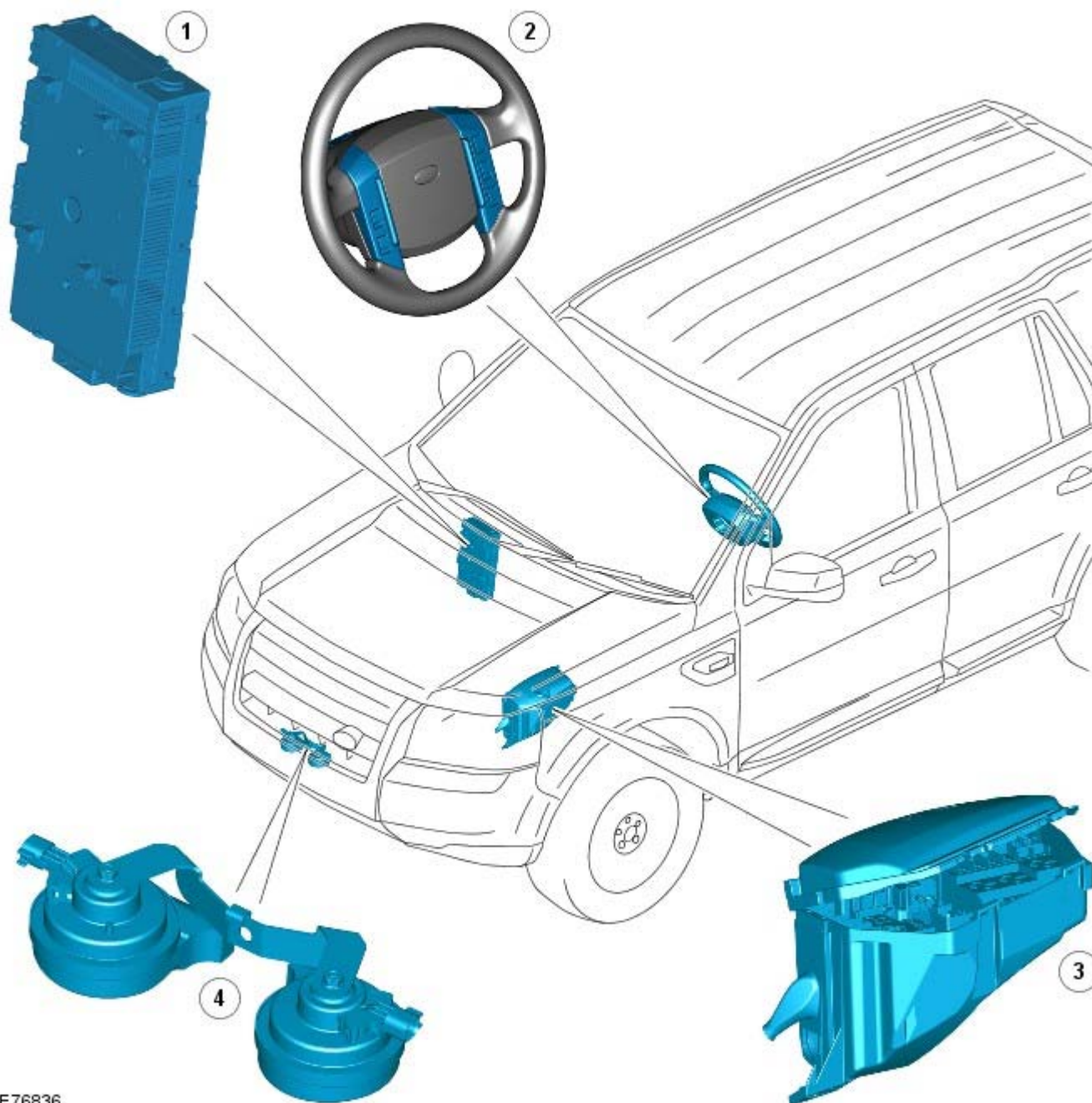
Torque Specifications

| Description | Nm | lb-ft |
|--------------|----|-------|
| Horn bracket | 25 | 18 |
| Horn nut | 10 | 7 |

Horn - Horn

Description and Operation

COMPONENT LOCATION



E76836

| Item | Part Number | Description |
|------|-------------|--|
| 1 | - | Central Junction Box (CJB) |
| 2 | - | Horn switches |
| 3 | - | Relay R10 (Battery Junction Box (BJB)) |
| 4 | - | Horns |

OVERVIEW

The vehicle horns are operated by pressing either of the vertical bars mounted on the steering wheel. Horn switch status is monitored by the CJB via the steering wheel module. When either of the switches is pressed the CJB energizes the horn relay (relay R10), which is located within the BJB. The energized horn relay provides a battery feed to the 2 vehicle horns. Both horns are mounted on brackets and secured to the center of the front cross member, forward of the radiator.

The vehicle horns will also sound if the anti-theft alarm system is activated. If this occurs, operation of the vehicle horns is controlled automatically by the CJB.

For additional information, refer to: [Anti-Theft - Active](#) (419-01A Anti-Theft - Active, Description and Operation).

Horn - Horn

Diagnosis and Testing

Principles of Operation

For a detailed description of the horn system, refer to the relevant Description and Operation section in the workshop manual. REFER to: [Horn](#) (413-06 Horn, Description and Operation).

Inspection and Verification



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

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

| Mechanical | Electrical |
|--|--|
| <ul style="list-style-type: none"> ● Horn switches ● Clock spring/steering angle sensor ● Horns | <ul style="list-style-type: none"> ● Fuses/relays (refer to electrical guide) ● Wiring harness ● Correct engagement of electrical connectors ● Loose or corroded connections ● Central Junction Box (CJB) ● Battery Junction Box (BJB) |

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check CJB for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

NOTE: Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).

NOTE: When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

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


NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

| DTC | Description | Possible Cause | Action |
|---------|--|--|---|
| B1C5512 | Horn Relay Coil Circuit - circuit short to power | <ul style="list-style-type: none"> ● Horn relay control circuit - short to power | Refer to electrical circuit diagrams and check horn relay control circuit for short to power |
| B1C5514 | Horn Relay Coil Circuit- circuit short to ground or open | <ul style="list-style-type: none"> ● Horn relay control circuit - short to ground, open circuit | Refer to electrical circuit diagrams and check horn relay control circuit for short to ground, open circuit |
| U012600 | Lost Communication With Steering Angle Sensor Module | <ul style="list-style-type: none"> ● Lost communication with steering angle sensor | Carry out the associated network test for this DTC using the manufacturer approved diagnostic system |

Horn - Horn

Removal and Installation

Removal

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

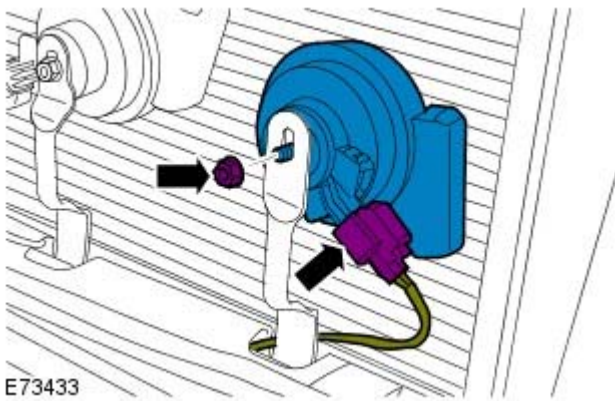
Raise and support the vehicle.

2. Remove the front wheels and tires.

Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

3. Remove the front bumper cover.

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



4.
 - Torque: 10 Nm

Installation

1. To install, reverse the removal procedure.

Horn - Horn Switch

Removal and Installation

Removal

1. Disconnect the battery ground cable.

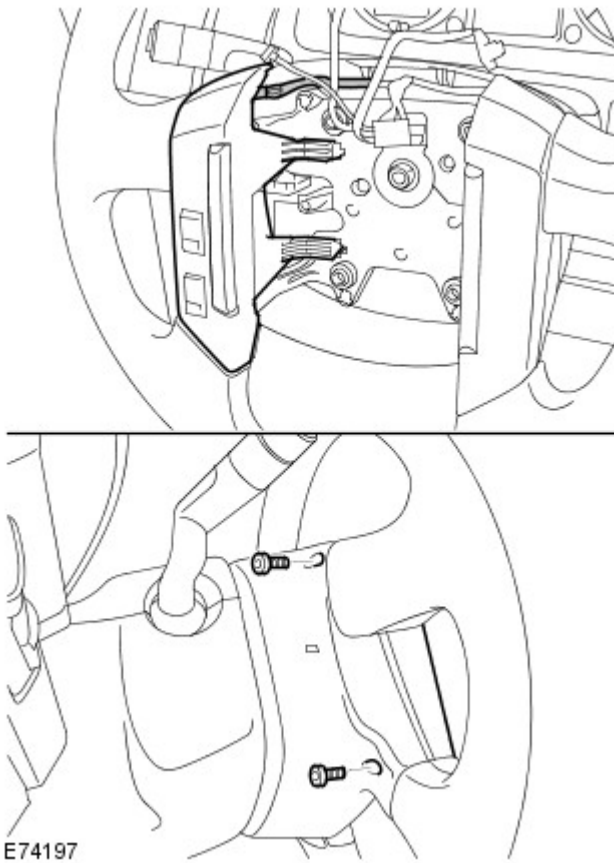
Refer to: [Specifications](#) (414-00 Battery and Charging System - General Information, Specifications).

2. Make the SRS system safe.

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

3. Remove the driver air bag module.

Refer to: [Driver Air Bag Module](#) (501-20B Supplemental Restraint System, Removal and Installation).



- 4.

- Remove the 2 Torx screws.
- Disconnect the electrical connector.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Information and Message Center -

| Item | Specification |
|----------------|--|
| Message centre | Liquid crystal display |
| Location | Centre of instrument cluster (high line vehicles only) |

Information and Message Center - Information and Message Center

Description and Operation

COMPONENT LOCATION



E76933

| Item | Part Number | Description |
|------|-------------|----------------|
| 1 | - | Message center |
| 2 | - | Odometer |

OVERVIEW

The message center is a Liquid Crystal Display (LCD) located in a central position in the instrument cluster. The message center displays system and vehicle status information to the driver.

NOTE: Vehicles before 2010 MY: The message center is fitted to high line instrument clusters only.

NOTE: Vehicles from 2010 MY: the message center is fitted as standard to all vehicles.

The instrument cluster receives message center data from the Central Junction Box (CJB) over the medium speed Controller Area Network (CAN) bus. The CJB generates this data based on medium and high speed CAN bus inputs and hardwired inputs received from various system control modules. Software contained within the instrument cluster converts the data from the

CJB into display messages for the driver.

DISPLAY MODES

The message center has 8 different display modes as shown in the table below.

| Display Mode | Description | Format |
|--------------|------------------------|---|
| 0 | Blank | No display |
| 1 | Pre-check | System pre-check |
| 2 | Normal | Ambient air temperature display only |
| 3 | Trip computer | Ambient air temperature and trip computer display |
| 4 | Warning/Status message | Status and warning information only |
| 5 | Terrain Response | Terrain Response information available in 3 (A, B, and C) formats depending on active functions |
| 6 | Not used | Not used |
| 7 | Diagnostic | Test images displayed to check LCD function |

Display Mode 0

This mode is entered when the ignition is switched off and the CAN bus network is asleep. No characters or symbols are displayed when in this mode. The mode is exited when either power mode 6 (ignition on) is active or the driver enters the customer configuration 'Information' mode.

Display Mode 1

This mode is entered when power mode 6 is first active. The full screen message 'SYSTEM CHECK IN PROGRESS' is displayed for approximately 3 seconds while the instrument cluster carries out an internal diagnostic routine. After the 3 second time period, display mode 2 will become active. If during the 3 second period the ignition is switched off, the message center will revert back to display mode 0.

Display Mode 2

This is the normal operating mode of the message center and will automatically become active after display mode 1.

Display Mode 3

This mode is entered by pressing the trip computer button when the message center is in display mode 2. Trip computer information will be displayed for 20 seconds after which time the display will revert back to display mode 2.

Display Mode 4

This mode is entered automatically if the message center receives warning or status messages from the CJB. The whole screen is used to display warning/status messages, over writing the ambient air temperature (display mode 2) and trip computer (display mode 3) information. Warning messages are displayed for 3 seconds, after which the display will return to the previous display mode (2 or 3). Status messages do not extinguish until the status is rectified, for example screen wash is added to the windshield washer bottle to remove the 'LOW WASHER FLUID' message. If more than 1 status message is present, the screen will scroll through each message at 3 second intervals.

All current warning/status messages are scrolled through at 3 second intervals when the vehicle first enters power mode 6, and when the ignition is switched off. These are displayed in order of priority, the most important message being displayed first.

Display Mode 5

Display mode 5 is entered when Terrain Response is selected. This mode has 3 formats. Format 5A displays the same information as display mode 3 with the addition of a Terrain Response icon in the top left hand (LH) corner of the screen, and a steering wheel direction icon displayed centrally at the top of the screen.

Depending on the Terrain Response CAN message received from the CJB, the screen will enter either display mode 5B or display mode 5C. When in display mode 5B the whole screen will be used to display Terrain Response messages, over writing the information shown in mode 5A.

If the screen adopts display mode 5C the top third of the screen will display all Terrain Response option icons. The lower two thirds of the screen will display Terrain response messages.

The instrument cluster provides a feedback signal to the Terrain Response control module informing it that the relevant Terrain Response information is being displayed. The Terrain Response messages for all 3 display mode 5 formats can be overwritten however if the message center receives a high priority warning/status message. If the message center is unable to display Terrain Response messages due to this occurrence, the instrument cluster changes the feedback signal to the control module from a value of 1 to a value of 0.

Display Mode 7

Display mode 7 is a diagnostic mode and can only be accessed using the Land Rover approved diagnostic system. The

diagnostic routine can be found in '413-00 Instrument Pack and Panel Illumination' under the 'Content Model' menu.

When in display mode 7, 4 different patterns are displayed to check that all areas of the LCD are functional.

MESSAGE PRIORITY

Messages are assigned priorities which are defined by the effect on driving safely and the functional ability of the vehicle. New messages are displayed accompanied by a chime from the instrument cluster sounder. The messages are divided into 3 priority groups.

Priority Group 1

This group of messages have a direct effect on the driving ability and safety of the vehicle, 'ENGINE SYSTEM FAULT' for example. This message would require an immediate reaction from the driver in response to the message. Priority 1 messages will also be accompanied by the appropriate warning indicator flashing and a continuous chime from the instrument cluster. If more than one priority 1 message is present, each message is displayed in turn at 3 second intervals.

Priority Group 2

This group of messages do not directly affect the driving ability or safety of the vehicle, 'CHECK BRAKE PADS' for example. This message must be noted by the driver and the cause rectified as soon as possible. Each of these messages is displayed once when power mode 6 is entered or when the fault occurs for a predetermined time period. These messages can be recalled by the driver by pressing the trip reset button for more than 3 seconds.

Priority Group 3

This group of messages relate to low priority messages, 'LOW WASHER FLUID' for example. Depending on the message, some messages are only shown at the end of a journey to avoid annoyance to the driver. The messages will be accompanied by a chime when the ignition is switched off to alert the driver to their presence.

MESSAGE LIST

Messages are displayed in a language appropriate for the market specification of the vehicle. The language can be changed if required using the Land Rover approved diagnostic system.

NOTE: The list below is shown in alphabetical order.

| Message | Other Warnings | Reason | Action |
|--|---|---|---|
| BONNET OPEN | None | Hood open or not fully closed | Close hood |
| CHECK ALL TYRE PRESSURES | Amber Tire Pressure Monitoring System (TPMS) indicator illuminated | Advisory message. Low pressure warning limit reached in more than 1 wheel in low speed mode or warning limit reached in any running wheel and no location specified by TPMS. For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Description and Operation). | Check all tire pressures and adjust accordingly |
| CHECK ALL TYRE PRESSURES FRONT LEFT LOW | Amber TPMS indicator illuminated | Low pressure warning limit reached in front left tire in low speed mode | Check tire pressure and adjust accordingly |
| CHECK ALL TYRE PRESSURES FRONT RIGHT LOW | Amber TPMS indicator illuminated | Low pressure warning limit reached in front right tire in low speed mode | Check tire pressure and adjust accordingly |
| CHECK ALL TYRE PRESSURES REAR LEFT LOW | Amber TPMS indicator illuminated | Low pressure warning limit reached in rear left tire in low speed mode | Check tire pressure and adjust accordingly |
| CHECK ALL TYRE PRESSURES REAR RIGHT LOW | Amber TPMS indicator illuminated | Low pressure warning limit reached in rear right tire in low speed mode | Check tire pressure and adjust accordingly |
| CHECK SPARE TYRE PRESSURE | Amber TPMS indicator illuminated for 20 seconds and again at subsequent ignition cycles | Low pressure warning limit reached in spare tire | Check tire pressure and adjust accordingly |
| CRANKING WILL COMMENCE AFTER GLOW PERIOD | Glow plug indicator illuminated | Ambient air temperature below 0°C (32°F) | None |
| CRUISE CONTROL NOT PERMITTED | None | Vehicle operating parameters outside threshold for speed control operation | None |
| DPF FULL | Handbook symbol illuminated in message center | Diesel particulate filter requires regenerating | For additional information, refer to: Exhaust System (309-00B Exhaust System - TD4 2.2L Diesel, Description and Operation). |

| Message | Other Warnings | Reason | Action |
|--|--|--|---|
| DPF FULL VISIT DEALER | None | Regeneration of the diesel particulate filter was unsuccessful | Use the Land Rover approved diagnostic system to force regeneration of the diesel particulate filter. |
| DRIVER DOOR OPEN | None | Drivers door open or not fully closed | None |
| DSC SWITCHED OFF | Amber Dynamic Stability Control (DSC) indicator illuminated | System not available due to DSC switched off by driver | Press DSC switch to reactivate system |
| ECO STOP/START FAULT | Tell-tale light in the Eco switch extinguished | Stop/Start not available due to system or sub-system failure | Connect Land Rover approved diagnostic system to diagnose fault |
| ECO STOP/START OFF | Tell-tale light in the Eco switch extinguished | The Eco switch has been pressed | If required, press the Eco switch to reactivate the Stop/Start system |
| ECO STOP/START ON | Tell-tale light in the Eco switch illuminated | The system has been switched off and then later switched on within the same ignition cycle | If required, press the Eco switch to deactivate the Stop/Start system |
| ECO STOP/START UNAVAILABLE | Tell-tale light in the Eco switch extinguished | Either Hill Decent Control (HDC) or Terrain Response (TR) is active | Deselect HDC or TR if terrain conditions permit |
| ENGINE SYSTEM FAULT | Malfunction Indicator Lamp (MIL) illuminated | Engine Control Module (ECM) has detected a fault in the engine management system | Connect Land Rover approved diagnostic system to diagnose fault |
| FRONT LEFT TYRE PRESSURE NOT MONITORED | Amber TPMS indicator flashes for 75 seconds then remains illuminated | No transmission from front left TPMS pressure sensor | Connect Land Rover approved diagnostic system to diagnose fault |
| FRONT PASSENGER DOOR OPEN | None | Front passenger door open or not fully closed | None |
| FRONT RIGHT TYRE PRESSURE NOT MONITORED | Amber TPMS indicator flashes for 75 seconds then remains illuminated | No transmission from front right TPMS pressure sensor | Connect Land Rover approved diagnostic system to diagnose fault |
| FUEL TANK CAP LOOSE OR MISSING | None | North American vehicles only. Diagnostic Monitoring of Tank Leakage (DMTL) pump unable to pressurize the fuel system. For additional information, refer to: Electronic Engine Controls (303-14A Electronic Engine Controls - I6 3.2L Petrol, Description and Operation). | Tighten or replace the fuel tank cap. Check fuel system for leaks. |
| GRASS GRAVEL SNOW | Grass Gravel Snow Terrain Response icon displayed in message center | Advisory message. Terrain Response rotary control has been moved to the Grass Gravel Snow position. Program will become active after 2 seconds | None |
| GRASS GRAVEL SNOW PROGRAM SELECTED | Grass Gravel Snow Terrain Response icon displayed in message center | Advisory message. Terrain Response Grass Gravel Snow special program has been selected for more than 2 seconds and is currently active | None |
| HDC FAULT SYSTEM NOT AVAILABLE | Single chime from instrument cluster sounder | Hill Descent Control (HDC) system fault. Drive with care and do not attempt to descend steep slopes. For additional information, refer to: Anti-Lock Control - Stability Assist (206-09C Anti-Lock Control - Stability Assist, Description and Operation). | Connect Land Rover approved diagnostic system to diagnose fault |
| HDC NOT AVAILABLE IN THIS GEAR | Green HDC active indicator flashes | Incorrect gear selected for HDC to operate. For additional information, refer to: Anti-Lock Control - Stability Assist (206-09C Anti-Lock Control - Stability Assist, Description and Operation). | Select correct gear before attempting descent |
| HDC NOT AVAILABLE SPEED TOO HIGH | Green HDC active indicator flashes | HDC not available as current vehicle speed is above operating threshold. For additional information, refer to: Anti-Lock Control - Stability Assist (206-09C Anti-Lock Control - Stability Assist, Description and Operation). | Reduce speed before attempting descent |
| HDC TEMPORARILY NOT AVAILABLE SYSTEM COOLING | Green HDC active indicator flashes | HDC system switched off while brake system is cooling | Wait until message is extinguished before attempting descent |

| Message | Other Warnings | Reason | Action |
|---------------------------------------|--|--|---|
| HDC SWITCHED OFF | Single chime from instrument cluster sounder | HDC system switched off by driver, Terrain Response system or speed threshold has been exceeded | None |
| HIGH ENGINE SPEED FOR COOLING | None | Idle speed increased to assist engine cooling | None |
| KEY IN IGNITION | Continuous chime from instrument cluster sounder | Advisory message informing the driver that the remote handset has been left in the start control module, the ignition has been switched off, and the drivers door is open | Remove the remote handset from the start control module |
| LEFT REAR DOOR OPEN | None | Left rear door open or not fully closed | None |
| LIGHTS ON | Continuous chime from instrument cluster sounder | Advisory message that the exterior lamps are switched on, the remote handset has been removed from the start control module and the drivers door has been opened | Switch off exterior lamps |
| LOW COOLANT LEVEL | None | Engine coolant level below recommended level | Check engine cooling system for leaks and top up as necessary |
| LOW WASHER FLUID | Single chime from instrument cluster sounder at ignition on (power mode 6) | Washer fluid level below threshold | Add water and additive mixture to windshield washer bottle |
| MEMORY 1 SELECTED | None | Confirmation that memory function has been successfully carried out | None |
| MEMORY 2 SELECTED | None | Confirmation that memory function has been successfully carried out | None |
| MEMORY 3 SELECTED | None | Confirmation that memory function has been successfully carried out | None |
| MEMORY 1 STORED | Single chime from instrument cluster sounder | Confirmation that settings have been stored in the memory | None |
| MEMORY 2 STORED | Single chime from instrument cluster sounder | Confirmation that settings have been stored in the memory | None |
| MEMORY 3 STORED | Single chime from instrument cluster sounder | Confirmation that settings have been stored in the memory | None |
| MUD RUTS | Mud Ruts Terrain Response icon displayed in message center | Advisory message. Terrain Response rotary control has been moved to the Mud Ruts position. Program will become active after 2 seconds | None |
| MUD RUTS PROGRAM SELECTED | Mud Ruts Terrain Response icon displayed in message center | Advisory message. Terrain Response Mud Ruts special program has been selected for more than 2 seconds and is currently active | None |
| OIL SERVICE REQUIRED VISIT DEALER | 'SERVICE' displayed in odometer | Advisory message informing driver that a diesel particulate filter regeneration cycle has caused the engine oil to become diluted. For additional information, refer to: Exhaust System (309-00B Exhaust System - TD4 2.2L Diesel, Description and Operation). | Carry out service and reset Service Interval Indicator (SII) using the Land Rover approved diagnostic system |
| PRESS BRAKE WHEN STARTING | None | Advisory message to allow engine starting. Vehicles with automatic transmission only | None |
| PRESS CLUTCH WHEN STARTING | None | Advisory message to allow engine starting. Vehicles with manual transmission only | None |
| PROGRAM CHANGE IN PROGRESS | Selected Terrain Response icon displayed in message center | Vehicle operating conditions prevent selection of special program. For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation). | If operating conditions change within 60 seconds selected program will be activated. For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation). |
| REAR LEFT TYRE PRESSURE NOT MONITORED | Amber TPMS indicator flashes for 75 seconds then remains illuminated | No transmission from rear left TPMS pressure sensor | Connect Land Rover approved diagnostic system to diagnose fault |

| Message | Other Warnings | Reason | Action |
|--|--|--|--|
| REAR RIGHT TYRE PRESSURE NOT MONITORED | Amber TPMS indicator flashes for 75 seconds then remains illuminated | No transmission from rear right TPMS pressure sensor | Connect Land Rover approved diagnostic system to diagnose fault |
| RECOMMEND COMMAND SHIFT FOR DEEP SOFT SAND | Sand Terrain Response icon displayed center | Advisory message for Terrain Response special program. Only displayed on vehicles with automatic transmission | Select Command Shift if required |
| RECOMMEND STARTING IN 2ND GEAR FOR SLIPPERY CONDITIONS | Grass Gravel Snow Terrain Response icon displayed in message center | Advisory message for Terrain Response special program. Only displayed on vehicles with manual transmission once every ignition cycle | Select 2nd gear if required |
| REDUCED ENGINE PERFORMANCE | None | A fault has occurred that has reduced engine power output | Connect Land Rover approved diagnostic system to diagnose fault |
| RESTART REQUIRED PRESS CLUTCH | None | When an engine restart is required in a Stop/Start cycle but the driver's location is unknown. Either the driver's door or safety belt is unlatched | Depress clutch |
| RIGHT REAR DOOR OPEN | None | Right rear door open or not fully closed | None |
| SAND | Sand Terrain Response icon displayed in message center | Advisory message. Terrain Response rotary control has been moved to the Sand position. Program will become active after 2 seconds | None |
| SAND PROGRAM SELECTED | Sand Terrain Response icon displayed in message center | Advisory message to inform driver that Terrain Response Sand special program has been selected for more than 2 seconds and is currently active | None |
| SELECT NEUTRAL TO RESTART | None | The engine has been shutdown in a Stop/Start cycle and the driver has engaged a gear without depressing the clutch. | Depress clutch and select neutral |
| SELECT PARK OR NEUTRAL TO START ENGINE | None | Advisory message to allow engine starting | None |
| SPECIAL PROGRAMS OFF | Special programs off icon displayed in message center | Advisory message to inform driver that system is in special programs off mode | None |
| SPECIAL PROGRAM TEMPORARILY NOT AVAILABLE | Current Terrain Response program icon displayed in message center | Temporary condition making special programs unavailable. Terrain Response defaults to special programs off mode | Drive off-road with care until temporary condition resolved |
| SYSTEM CHECK IN PROGRESS | None | Instrument cluster internal diagnostic routine | None |
| TAILGATE OPEN | None | Tailgate open or not fully closed | None |
| TERRAIN RESPONSE SPECIAL PROGRAMS NOT AVAILABLE | Single chime from instrument cluster sounder and special programs off icon displayed in message center | Terrain Response special programs not available due to system failure. Drive off-road with care. For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation). | Connect Land Rover approved diagnostic system to diagnose fault |
| TERRAIN RESPONSE SPECIAL PROGRAMS OFF | All 5 Terrain Response icons displayed in message center | Advisory message to inform driver that Terrain Response special programs are off | None |
| TERRAIN RESPONSE SYSTEM FAULTY | Single chime from instrument cluster sounder and special programs off icon displayed in message center | There may be a fault with the Terrain Response system rather than a sub-system fault. For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation). | Drive off-road with care until temporary condition resolved. Connect Land Rover approved diagnostic system to diagnose fault |
| TERRAIN RESPONSE SYSTEM NOT AVAILABLE | Single chime from instrument cluster sounder and special programs off icon displayed in message center | Terrain Response special programs not available due to system failure. | Drive off-road with care until temporary condition resolved. Connect Land Rover approved diagnostic system to diagnose fault |
| TRANSMISSION COMMAND SHIFT SELECTED | None | Advisory message. Movement of the selector lever in + or - positions when selector lever in M/S position | None |

| Message | Other Warnings | Reason | Action |
|--|--|--|---|
| TRANSMISSION FAULT | None | Advisory message to inform driver that the Transmission Control Module (TCM) has detected a fault with the automatic transmission. For additional information, refer to: External Controls (307-05 Automatic Transmission/Transaxle External Controls, Description and Operation). | Connect Land Rover approved diagnostic system to diagnose fault |
| TRANSMISSION FAULT AND OVERHEAT | None | Advisory message to inform driver that the TCM has detected a fault with the automatic transmission and the temperature is too high. For additional information, refer to: External Controls (307-05 Automatic Transmission/Transaxle External Controls, Description and Operation). | Connect Land Rover approved diagnostic system to diagnose fault |
| TRANSMISSION FAULT LIMITED GEARS AVAILABLE | None | Advisory message to inform driver that the TCM has detected a fault with the automatic transmission and performance may be affected. For additional information, refer to: External Controls (307-05 Automatic Transmission/Transaxle External Controls, Description and Operation). | Connect Land Rover approved diagnostic system to diagnose fault |
| TRANSMISSION FAULT TRACTION REDUCED | Single chime from instrument cluster sounder | TCM has stopped transmitting CAN bus messages. Message also displayed if fault detected in active on demand coupling. For additional information, refer to: External Controls (307-05 Automatic Transmission/Transaxle External Controls, Description and Operation), Rear Drive Axle and Differential (205-02 Rear Drive Axle/Differential, Description and Operation). | Connect Land Rover approved diagnostic system to diagnose fault |
| TRANSMISSION OVERHEAT SLOW DOWN | None | Advisory message to inform driver that transmission or active on demand coupling temperature too high. Slow down or stop to assist cooling For additional information, refer to: External Controls (307-05 Automatic Transmission/Transaxle External Controls, Description and Operation), Rear Drive Axle and Differential (205-02 Rear Drive Axle/Differential, Description and Operation). | Check transmission and active on demand coupling for faults |
| TYRE PRESSURE MONITORING SYSTEM FAULT | Amber TPMS indicator flashes for 75 seconds then remains illuminated | TPMS fault, no transmission from more than one pressure sensor, or CAN bus signals missing. For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Description and Operation). | Connect Land Rover approved diagnostic system to diagnose fault |
| TYRE PRESSURES LOW FOR SPEED | Amber TPMS indicator illuminated | Low pressure warning limit reached in high speed mode. For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Description and Operation). | Check all tire pressures and adjust accordingly |
| AUXILIARY HEATER UNAVAILABLE LOW FUEL (vehicles from 2009MY with Fuel Fired Booster Heater (FFBH)) | None | Fuel level in fuel tank is at or below threshold when FFBH 'ON' request is made. | Replenish fuel in fuel tank |
| AUXILIARY HEATER UNAVAILABLE LOW BATTERY (Vehicles from 2009MY with FFBH) | None | Battery voltage is below threshold when FFBH 'ON' request is made. | Investigate reason for low battery voltage. Follow the procedures in the Battery Care Manual to establish the condition of the battery. |

TRIP COMPUTER

Trip computer information is shown in the bottom half of the message center when the screen is in display mode 3.

Trip Meter

A microprocessor in the instrument cluster calculates the trip data based on a wheel speed signal broadcast by the Anti-lock Brake System (ABS) module over the high speed CAN bus. The CJB acts as a gateway and transmits the wheel speed signal to the instrument cluster over the medium speed CAN bus.

The trip meter displays the distance the vehicle has traveled since the last trip meter reset. The trip meter can be reset by pressing and holding the trip computer button for more than 1 second. The trip meter can display up to a distance of 999.9 miles or kilometers. When this figure is exceeded the trip meter starts again from 0 miles or kilometers.

The trip data is stored in the instrument cluster Random Access Memory (RAM) and will be lost if the battery is disconnected.

Average Fuel Consumption

The instrument cluster receives 2 fuel tank level readings on the medium speed CAN bus via the CJB. The instrument cluster calculates an average value of the amount of usable fuel in the tank from the 2 signals. Every 200 meters of vehicle travel the instrument cluster re-calculates this value to determine how much fuel has been used. This value is then averaged over the last 31 miles (50 kilometers) of travel and displayed in the trip computer.

The distance traveled signal originates in the ABS module and is received by the instrument cluster over the medium speed CAN bus via the CJB.

Range

The range value is calculated using the average fuel consumption value (see above) and the fuel tank level value. By dividing the fuel tank level value by the average fuel consumption value the instrument cluster can calculate the distance the vehicle can travel with the current amount of usable fuel in the tank before refilling is necessary.

Average Speed

The average speed signal is calculated using the vehicle speed signal supplied by the CJB over the medium speed CAN bus. This signal originates in the ABS module and is an average of the 4 wheel speed signals. This value is divided by the time since the last trip computer reset to calculate the average vehicle speed.

ODOMETER

The odometer is located in the speedometer and displays the total distance the vehicle has traveled. This is calculated using the same signal as that used for the trip meter.

The odometer display can show 6 characters and distances up to 999,999 miles or kilometers. The value is stored in a protected area of the instrument clusters Electronically Erasable Programmable Read Only Memory (EEPROM) every 1.2 miles (2 kilometers) of vehicle travel. When the ignition is switched off, back up odometer values are also stored in the following modules:

- CJB
- ABS module
- ECM
- Restraints Control Module (RCM)
- Driver door module
- Passenger door module.

The odometer values in these modules are sent to the instrument cluster over the medium speed CAN bus within the first 2 seconds of the vehicle entering power mode 6. If the values received are the same, the cluster determines the odometer value has not been tampered with. If any value is outside of a 186 mile (300 kilometer) window the instrument cluster stores a Diagnostic Trouble Code (DTC) and will display the majority value. The DTC can be retrieved using the Land Rover approved diagnostic system.

Vehicle Operating Modes

The vehicle has 4 operating modes, which allow certain features to be enabled and disabled:

- Normal (nor)
- Factory (fact)
- Transport (transp)
- Crash (crash)

The current vehicle operating mode, shown in parenthesis above, is displayed in the odometer for 5 seconds when the vehicle first enters power mode 6.

NOTE: 'Nor' is only displayed in the Odometer when the vehicle operating mode is changed to normal from any of the other vehicle operating modes. Under all other conditions, 'Nor' is not displayed.

The vehicle operating mode can be changed using the Land Rover approved diagnostic system.

Gear Position

The gear position indicator shows the current automatic transmission selector lever position. During normal operation the display will show P (park), R (reverse), N (neutral) and D (drive). When the transmission is operated in 'CommandShift™' mode, the odometer displays the currently selected manual gear; 1, 2, 3, 4, 5 or 6.

In the event of either a CAN bus failure, or if the TCM detects a transmission overheat situation, the odometer will display the letter 'E' in the same area of the display as the 'CommandShift™' selected gear information.

Supplemental Restrain System Warning Indicator

If the instrument cluster detects the Supplemental Restrain System (SRS) warning indicator has failed, the message 'SrS' will be displayed in the odometer and a DTC stored. The DTC can be retrieved from the instrument cluster using the Land Rover approved diagnostic system.

Service Interval Indicator

The Service Interval Indicator (SII) informs the driver when the next vehicle service is due. The instrument cluster monitors the distance the vehicle has traveled and the time elapsed since the last service.

If vehicle distance is the trigger for the SII, 'SERVICE' will be displayed in the odometer accompanied by a distance qualifier (either 'MILES' or 'KM' depending on the instrument cluster specification). A distance counter will also be displayed in the top Right Hand (RH) corner of the odometer. If the point at which a service is required is passed, the counter will display a negative value. When activated, the SII is displayed for 5 seconds when the vehicle enters power mode 6.

If time is the trigger for the SII, 'SERVICE' will be displayed in the odometer accompanied by a clock symbol. A counter will also be displayed in the top RH corner of the odometer. If the point at which a service is required is passed, the counter will display a negative value. Again, when activated the SII is displayed for 5 seconds when the vehicle enters power mode 6.

If both the distance and time triggers are activated, the SII will display the distance information for 5 seconds, followed by the time information for 5 seconds.

When a service has been carried out, the SII will need to be re-set. This can be done using the Land Rover approved diagnostic system or following a manual re-set procedure. The manual re-set mode is entered by carrying out the following routine:

- Press and hold the trip reset button with the vehicle stationary and in a power mode less than 6.
- While holding the trip reset button, enter the vehicle into power mode 6.
- Release the trip reset button within 10 seconds of entering power mode 6.

If the manual re-set mode has been successfully entered 'dISt' or 'DATE' will be displayed in the odometer, depending on which trigger has been activated.

To clear the 'dISt' trigger press, and hold the trip reset button for more than 5 seconds within 10 seconds of entering the manual re-set mode. If successful, 'RESET' will be displayed in the odometer for 5 seconds. If the date trigger has not been activated 'END' will then be displayed in the odometer.

NOTE: The distance trigger will not reset if the distance the vehicle has traveled is less than 20% of the next service interval value.

If the date trigger has been activated, 'DATE' will be displayed in the odometer. To clear the trigger, press and hold the trip reset button for more than 5 seconds within 10 seconds of 'DATE' being displayed. If successful, 'RESET' will be displayed within the odometer for 5 seconds followed by 'END'. The odometer will now exit re-set mode.

AMBIENT AIR TEMPERATURE

The instrument cluster can display the ambient air temperature reading in either degrees Celsius or Fahrenheit. The ambient air temperature signal originates in the ambient air temperature sensor. The sensor is a Negative Temperature Coefficient (NTC) thermistor, and is mounted in the LH door mirror. A temperature value is calculated by the ECM and broadcast over the high speed CAN bus to the instrument cluster.

If the temperature value falls below 4°C (39°F) the message center will flash the low ambient air temperature icon 5 times. This is accompanied by a chime from the instrument cluster sounder. The low ambient air temperature icon will be repeated if the ambient air temperature rises above 6°C (43°F) then drops below 4°C (39°F) again or a new ignition cycle is started.

Published: 11-May-2011

Warning Devices -

Torque Specifications

| Description | Nm | lb-ft |
|--------------------------------|----|-------|
| Low tire pressure module bolts | 10 | 7 |

Published: 11-May-2011

Warning Devices - Warning Devices

Diagnosis and Testing

Tire pressure monitor system is controlled via the Central Junction Box (CJB), for further information.

REFER to: [Communications Network](#) (418-00 Module Communications Network, Diagnosis and Testing).

Published: 11-May-2011

Parking Aid -

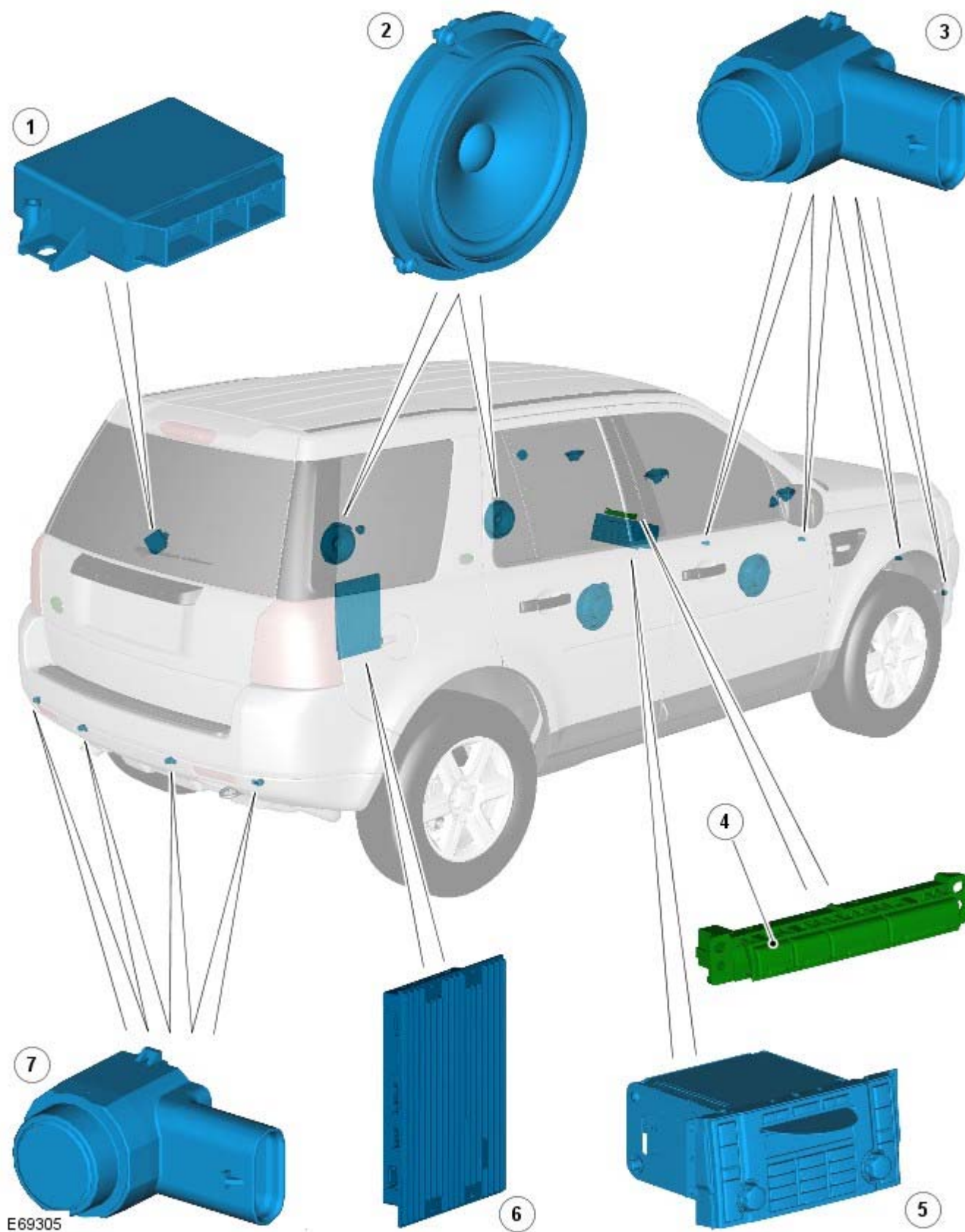
General Specification

| Item | Specification |
|---------------------------|-------------------|
| Detection (Rear): | |
| Center sensors | 1800 mm (70.9 in) |
| Side sensors | 600 mm (23.6 in) |
| Continuous tone | 300 mm (11.8 in) |
| Detection (Front): | |
| Center sensors | 800 mm (31.5 in) |
| Side sensors | 600 mm (23.6 in) |
| Continuous tone | 300 mm (11.8 in) |

Part Number
Parking Aid - Parking Aid
 Description and Operation

Published: 11-May-2011

COMPONENT LOCATION



| Item | Part Number | Description |
|------|-------------|-------------------------------|
| 1 | - | Parking aid module |
| 2 | - | Front and rear audio speakers |

| | | |
|---|--|----------------------------------|
| 3 | | Front parking aid sensor (4 off) |
| 4 | | Parking aid switch |
| 5 | | Integrated Control Module (ICM) |
| 6 | | Power amplifier |
| 7 | | Rear parking aid sensor (4 off) |

OVERVIEW

Two levels of parking aid system can be fitted; a rear only system or a front and rear system.

The parking aid system provides an audible warning to the driver when any obstacles are in the path of the vehicle during forward (if front sensors are fitted) or reverse parking manoeuvres. The system consists of four ultrasonic sensors in each bumper, a parking aid module and a parking aid switch.

At low speeds, the parking aid module uses the ultrasonic sensors to monitor the area around the front and rear bumpers. If an object is detected within a monitored area, the module then outputs a warning using the audio system speakers. The sensors can detect solid objects such as posts, walls and other vehicles and can also detect less solid objects such as a wire mesh fence. Objects very close to the ground may not be detected, but because of their low height may not cause damage to the vehicle.

The parking aid system comprises the following components:

- Parking aid module
- Parking aid switch
- Eight parking aid sensors.

The parking aid module communicates via the medium speed Controller Area Network (CAN) bus with the audio system via the Integrated Control Module (ICM). The audio system then outputs the applicable warning tones from the front or rear speakers when an object is detected. The medium speed CAN bus is also used to collect vehicle data from other vehicle systems.

Parking Aid Module

The parking aid module is located on the Left Hand (LH) side of the luggage compartment, behind the 'C' pillar trim panel.

The parking aid module has three connectors which provide for power, ground and CAN bus connections, front parking aid sensors and rear parking aid sensors.

The medium speed CAN bus connections provide for the receipt of the following information from other systems:

- Anti-lock Brake System (ABS) module - Road speed signal
- Transmission Control Module (TCM) - Reverse gear engaged signal
- Trailer module - Trailer attached to vehicle
- Instrument cluster - Ambient temperature signal.

The module also outputs messages on the medium speed CAN bus which are received by the Integrated Control Module (ICM). The ICM processes these messages and converts them into Media Orientated System Transport (MOST) signals which are passed to the audio system power amplifier. These signals are then used by the power amplifier to emit the applicable warning tones from the front or rear audio speakers when an object is detected by the front or rear parking aid sensors. A warning tone can also be emitted to alert the driver to a fault in the parking aid system.

The parking aid module performs self check routines and when the system is active checks the sensor wiring for short or open circuits. If a fault is detected a code is stored in a memory in the module and if necessary either the front and/or rear sensors can be disabled. The driver is made aware of any fault condition by the parking aid switch Light Emitting Diode (LED) flashing and a continuous warning tone being emitted for 3 seconds, in place of the normal short tones when the system is functioning normally. Fault codes can be read using the Integrated Diagnostic System (IDS) via the diagnostic socket.

Parking Aid Sensors

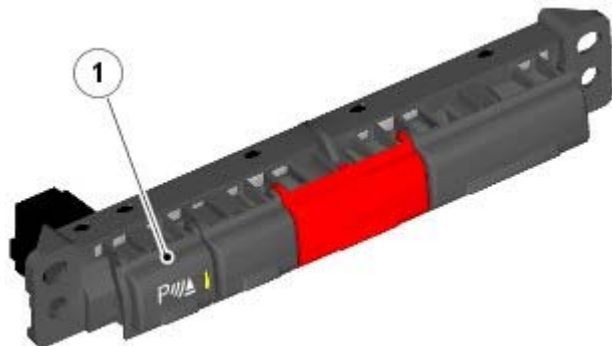
Four ultrasonic sensors are located in the front and rear bumpers. Each sensor comprises a sensor and a bumper insert. The insert ensures that each sensor is correctly orientated in relation to its location in the bumper.

Each sensor has a three pin connector which mates with a bumper harness, which in turn is connected to the main body harness. Three pins provide for power supply, ground and signal lines to and from the parking aid module.

Each sensor comprises a plastic housing which contains a piezo electric disc. The disc resonates at a frequency of 34.8kHz, producing the ultrasonic output. The disc also receives the reflected echo signal from any objects within range.

The parking aid module controls the operation of each sensor using a digital output on the signal line. The module controls the sensor in one of two modes; combined transmitter and receiver mode or receiver mode only.

Parking Aid Switch



E69306

| Item | Description |
|------|--------------------|
| 1 | Parking aid switch |

The parking aid switch is located in the instrument panel switch pack, above the touch screen. The switch is the LH switch with an integral LED.

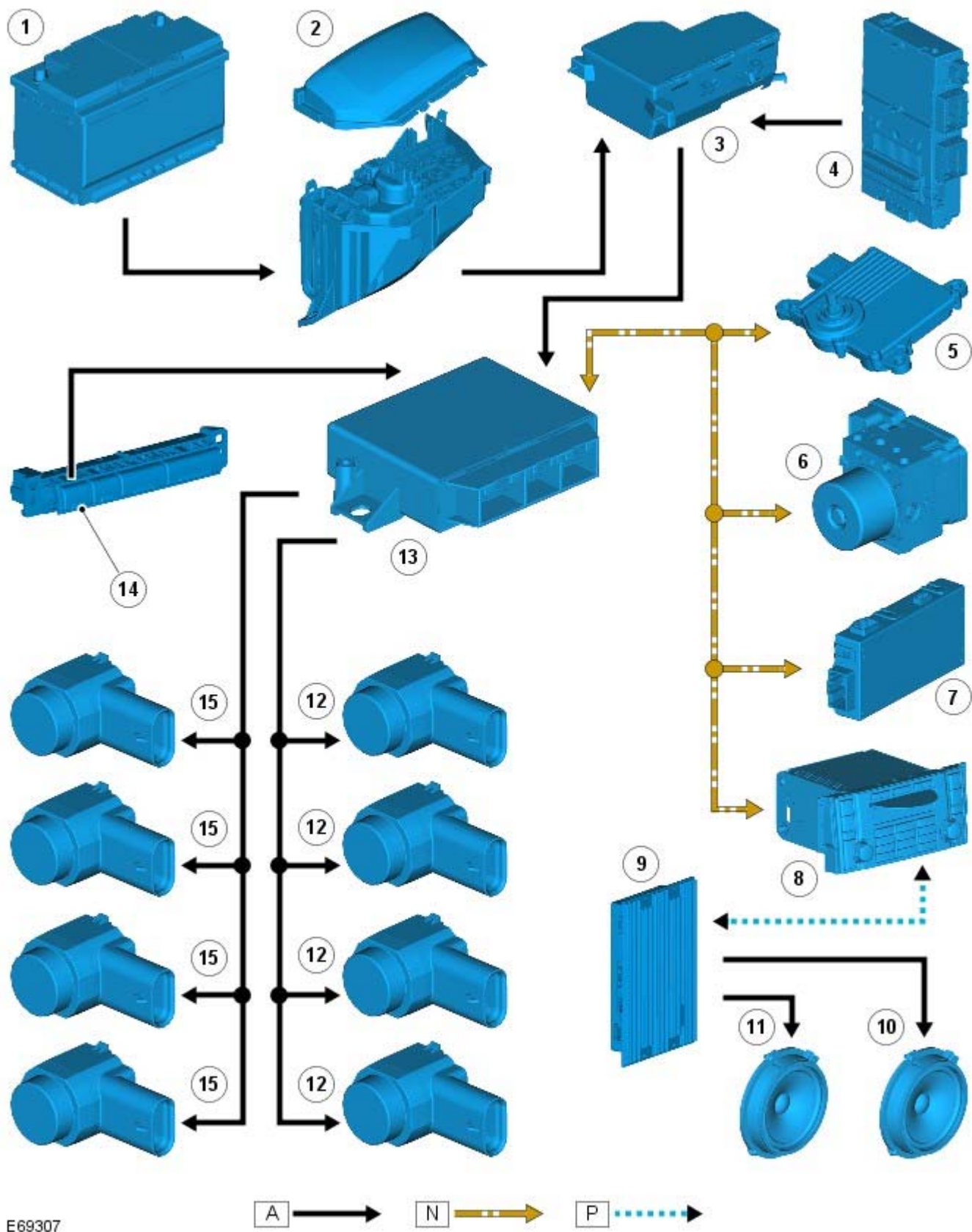
The switch is a non-latching push switch which allows the driver to select the parking aid system on or off. When pressed, the switch momentarily connects a ground to the parking aid module. The LED indicates when the parking aid system is active. The LED is controlled by the parking aid module.

The switch allows the driver to disable the parking aid system when reverse gear is selected or to activate the parking sensors when not in reverse gear.

If a fault exists in the parking aid system, the LED flashes continuously when reverse gear is selected or the driver selects the parking sensors on, using the switch.

CONTROL DIAGRAM

NOTE: **A** = Hardwired; **N** = Medium speed CAN Bus; **P** = Fiber Optic MOST



E69307

| Item | Description |
|------|-------------------------------------|
| 1 | Battery |
| 2 | Power distribution box |
| 3 | Auxiliary junction box |
| 4 | Central Junction Box (CJB) |
| 5 | Transmission Control Module (TCM) |
| 6 | Anit-lock Brake System (ABS) module |
| 7 | Trailer module |

| | | |
|----|--|---------------------------------|
| 8 | | Integrated Control Module (ICM) |
| 9 | | Power amplifier |
| 10 | | Front audio speakers |
| 11 | | Rear audio speakers |
| 12 | | Rear parking aid sensor |
| 13 | | Parking aid module |
| 14 | | Parking aid switch |
| 15 | | Front parking aid sensor |

PRINCIPLES OF OPERATION

When the parking aid module activates the system, the switch LED is illuminated and a single tone is emitted from the front and rear audio speakers to indicate that the system is operating. The parking aid module then processes signals received from the sensors to determine if there is an object with the detection range of the sensors.

In the combined mode, the sensors emit a series of ultrasonic impulses and then switch to receiver mode to receive the echo reflected by an obstacle within the detection range. The received echo signals are amplified and converted from an analogue signal to a digital signal by the sensor. The digital signal is passed to the parking aid module and compared with pre-programmed data stored in an EEPROM within the module. The module receives this data via the signal line from the sensor and calculates the distance from the object using the elapsed time between the transmitted and received impulse. The duration of the impulse duration is determined by the module, with the sensor controlling the frequency of the impulse output.

In receiver mode, the sensor receives impulses that were emitted by adjacent sensors. The module uses this information to precisely determine the position and distance of the object.

If no objects are detected there are no further warning tones. If an object is detected, repeated audible tones are emitted from either the front or rear audio speakers as appropriate. The time delay between the tones decreases as the distance between the object and the vehicle decreases, until at approximately 250 mm (10 inches), the audible tone becomes continuous.

If, after the initial detection of an object, there is no decrease in distance between the object and the vehicle, the audible warning tones remain constant if the object is detected by a central sensor or stops after 3 seconds if the object is detected by a corner sensor.

The audible tones will stop if the vehicle is moved out of reverse gear. The module continues to monitor the distance and will resume the warning tones if a decrease in distance is detected.

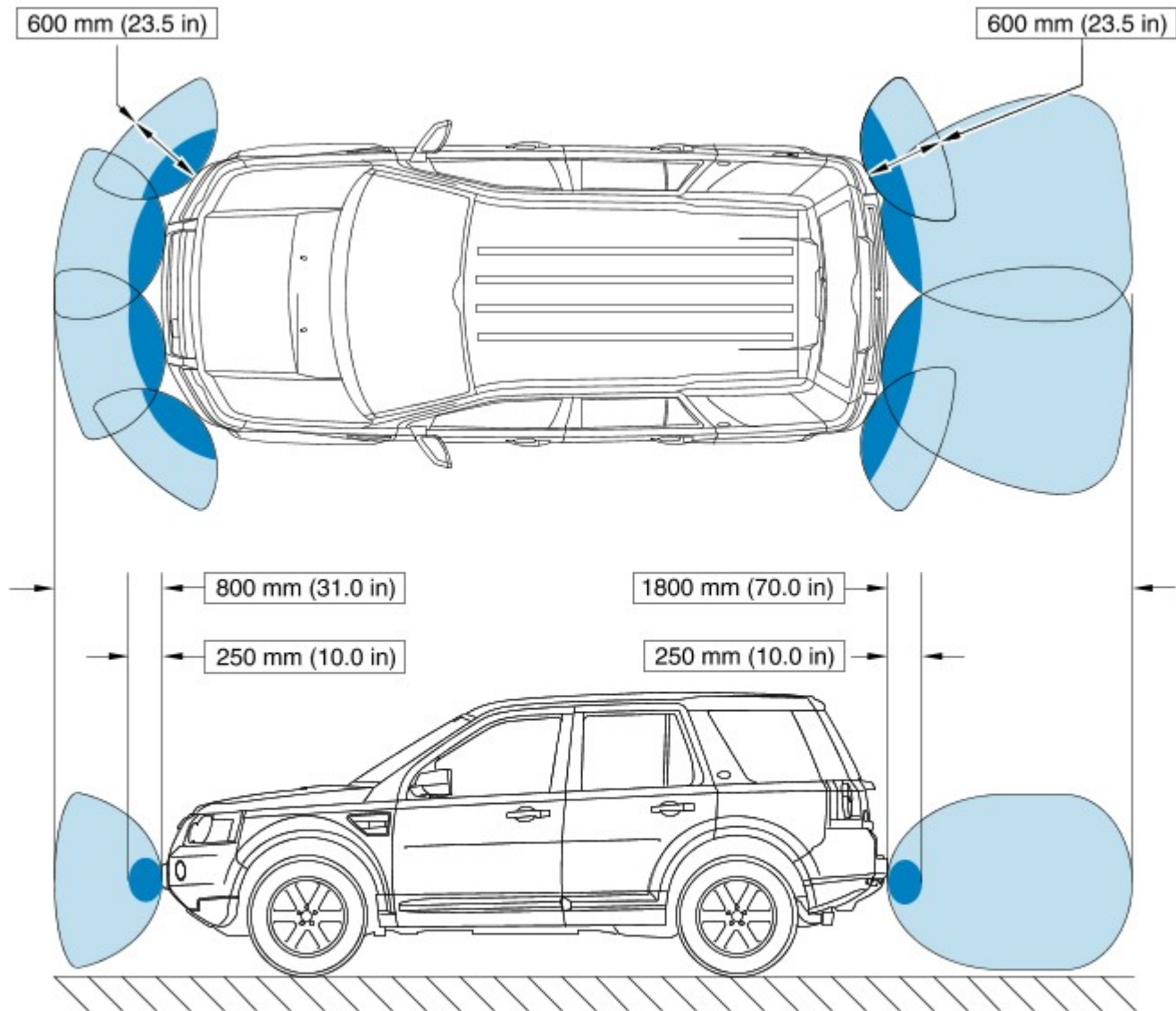
System operation is cancelled when the parking aid switch is pressed or the ignition is switched off. System operation is also cancelled if the vehicle travels more than 50 m (164 ft) or the vehicle forward speed exceeds 30 km/h (19 mph).

The system can detect when a trailer is connected to the vehicle by a message output on the medium speed CAN bus from the trailer module. When the parking aid module detects that a trailer is connected to the vehicle, the rear sensors are disabled to prevent constant warnings due to the close proximity of the trailer.

The parking aid module also incorporates software that compensates for the effects of frost, ice or rain on the sensors. Ice compensation occurs if the ambient temperature, received on a medium speed CAN bus message from the instrument cluster, is less than 6°C (43°F).

Distance Calculation

NOTE: **A** = Intermittent warning tone; **B** = Continuous warning tone



E69308

A ■

B ■

The maximum detection range for the front sensors is 800 mm (31 inches) for the central sensors and 600 mm (23.5 inches) for the corner sensors.

The maximum detection range for the rear sensors is 1800 mm (70 inches) for the central sensors and 600 mm (23.5 inches).

Parking Aid - Parking Aid

Diagnosis and Testing

Principle of Operation

For a detailed description of the parking aid system, refer to the relevant Description and Operation section in the workshop manual.

REFER to: [Parking Aid](#) (413-13 Parking Aid, Description and Operation).

Inspection and Verification



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

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

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

- Check for contamination (e.g. dirt, grime, frosting, ice) around the parking aid sensors, if so refer to the parking aid section in the vehicle handbook.
- Check for the correct installation and alignment of the sensors to the bumper.
- Spurious detection of the ground may occur during front system operation on an up-slope, or down slope.

Visual Inspection

| Electrical |
|---|
| <ul style="list-style-type: none"> ● Fuse(s) ● Relay(s) ● Wiring Harness ● Electrical connector(s) ● Front parking aid sensor(s) and holders ● Rear parking aid sensor(s) and holders ● Audio system. REFER to: Information and Entertainment System (415-01 Information and Entertainment System, Diagnosis and Testing). ● Parking aid switch and LED ● Parking aid module |

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

NOTE: If the control module is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module.

NOTE: Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).

NOTE: When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the DMM leads into account.

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

NOTE: Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.

NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

NOTE: When carrying out repair/diagnosis of the system, on removal of the front or rear bumper inspect the sensor connectors to ensure they were correctly latched and check fly leads for signs of chaffing or trapped wires.


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

REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Parking Aid Module \(PAM\)](#) (100-00 General Information, Description and Operation).

Parking Aid - Front Inner Parking Aid Sensor

Removal and Installation

Removal

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

Raise and support the vehicle.

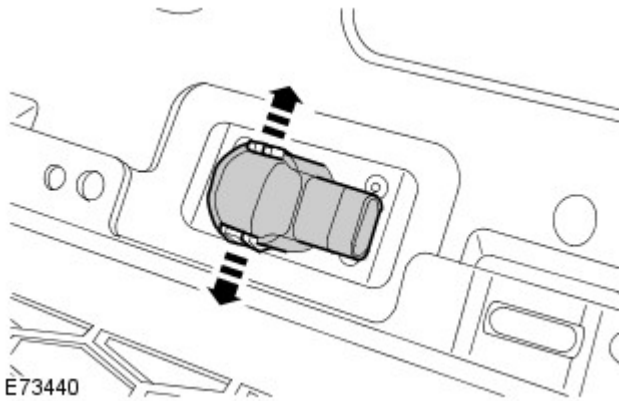
2. Remove the front wheels and tires.

Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

3. Remove the front bumper cover.

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

4.



Installation

1.  **CAUTION:** If a new sensor is installed, only the front face must be painted. Failure to follow this instruction may result in the component malfunctioning.


To install, reverse the removal procedure.

Parking Aid - Front Outer Parking Aid Sensor

Removal and Installation

Removal

NOTE: Removal of the RH front outer parking aid sensor will require the removal of the front bumper cover.

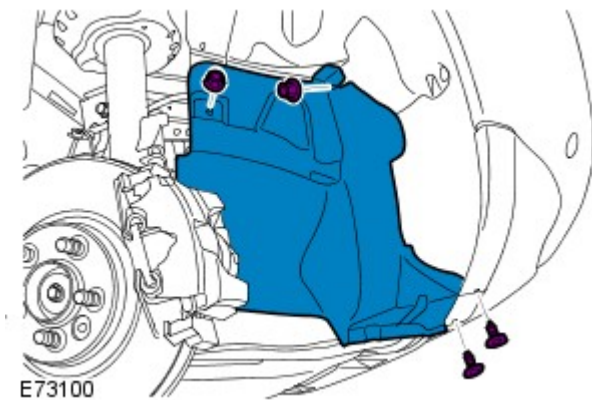
1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

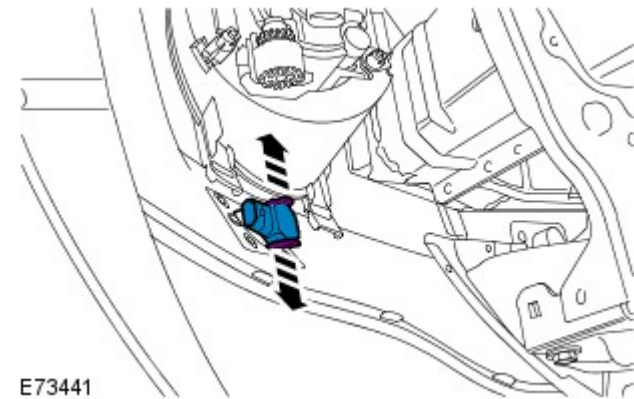
2. Remove the front wheel and tire.

Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

3.



4.



Installation

1.  **CAUTION:** If a new sensor is installed, only the front face must be painted. Failure to follow this instruction may result in the component malfunctioning.

To install, reverse the removal procedure.

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Parking Aid - Parking Aid Module

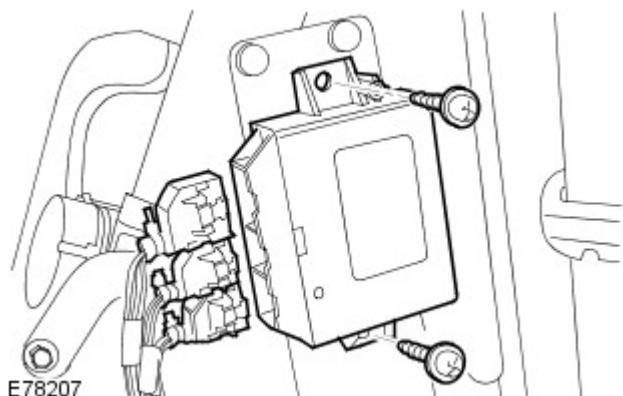
Removal and Installation

Removal

1. Remove the LH rear quarter trim panel.

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

2. Remove the parking aid module.



Installation

1. To install, reverse the removal procedure.
2. If a new component is to be installed, configure using IDS.

Parking Aid - Rear Inner Parking Aid Sensor

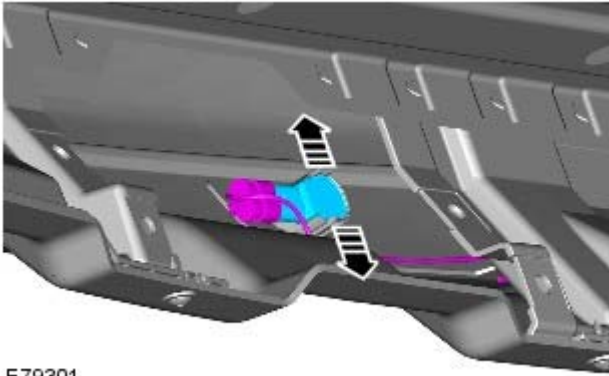
Removal and Installation

Removal

1.  **WARNING:** Make sure to support the vehicle with axle stands.


Raise and support the vehicle.

2.



E79301

Installation

1.  **CAUTION:** If a new sensor is installed, only the front face must be painted. Failure to follow this instruction may result in the component malfunctioning.

To install, reverse the removal procedure.

Parking Aid - Rear Outer Parking Aid Sensor

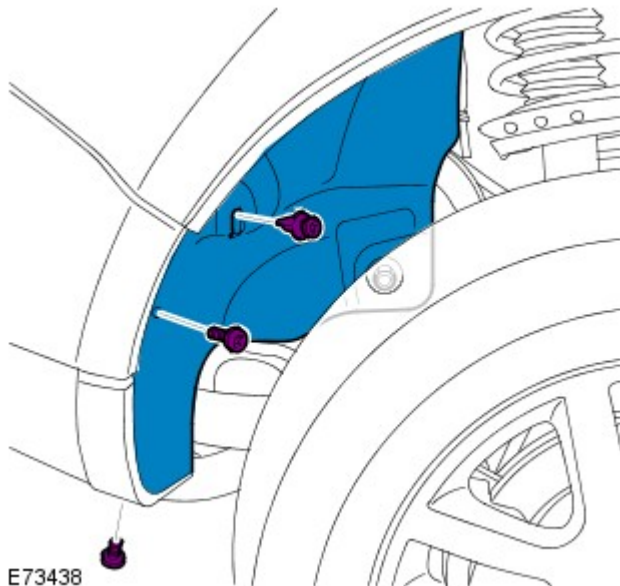
Removal and Installation

Removal

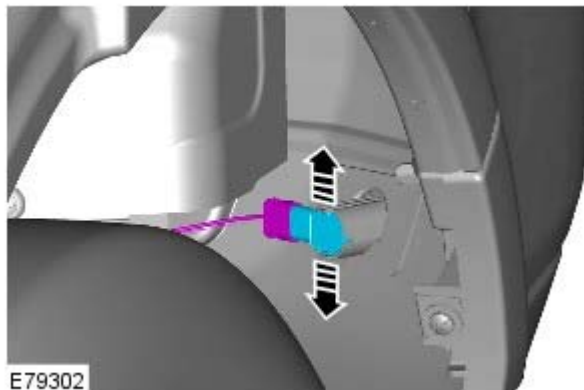
1.  **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Release the fender splash shield.



- 3.



Installation

1.  **CAUTION:** If a new sensor is installed, only the front face must be painted. Failure to follow this instruction may result in the component malfunctioning.

To install, reverse the removal procedure.