

## 204-04 : Wheels and Tires

### Specifications

#### Wheels

Wheel type	Wheel size
Alloy wheel	7J x 17
Alloy wheel	8J x 18
Alloy wheel	8J x 19
Reduced size spare wheel - Steel	5.5J x 19

**CAUTION:** With reduced size spare wheel fitted, do not exceed 80 km/h and replace with standard size wheel at earliest opportunity.

**CAUTION:** Do not use power tools when operating the spare wheel winch, raise and lower winch manually using hand tools only.

#### Tire Sizes - Standard Fit

Wheel size	Tire size	Tire load index
7J x 17 - Alloy	235/70 R17H - All terrain	111
8J x 18 - Alloy	255/60 R18H or V - All terrain	112
8J x 19 - Alloy	255/55 R19H or V - All terrain	111

**CAUTION:** Inner tubes must not be fitted with any of these tires.

#### Tire Sizes - Accessory Fit

Wheel size	Tire size	Tire load index
8J x 19 - Alloy	255/55 R19 - Mud terrain	111
8J x 19 - Alloy	255/55 R19 - Sand	111

**CAUTION:** Inner tubes must not be fitted with any of these tires.

#### Tire Pressures - Not NAS Vehicles

Loading condition	bars	lbf/in <sup>2</sup>	kPa
Normal operating conditions - Up to 4 people:			
Front	2.3	33	230

Rear	2.5	36	250
Vehicle loaded to maximum gross vehicle weight:			
Front	2.3	33	230
Rear	2.9	42	290
Reduced size spare wheel	4.2	60	420
* Standard size spare wheel	2.9	42	290

**CAUTION: \* The standard size spare wheel tire should be inflated to the maximum gross vehicle weight pressure and the pressure for the front or rear wheel locations must be adjusted accordingly if the wheel is to be used under conditions other than with the vehicle loaded to maximum gross vehicle weight.**

#### Tire Pressures - NAS Vehicles

Loading condition	bars	lbf/in <sup>2</sup>	kPa
All conditions - Vehicle loaded up to maximum gross vehicle weight:			
Front	2.3	33	230
Rear	2.9	42	290
Reduced size spare wheel	4.2	60	420
* Standard size spare wheel	2.9	42	290

**CAUTION: \* The standard size spare wheel tire should always be inflated to the highest loading condition pressure which must be adjusted accordingly if the wheel is to be fitted to the front wheel locations.**

#### General Specification

Item	Make	Location
Tire low pressure sensor	Siemens	On inside of wheel rim
Tire pressure sensor initiator:		
Front	Siemens	Attached to the fender splash shield adjacent to the front bumper
Rear	Siemens	Attached to the fender splash shield adjacent to the rear bumper
Module	Siemens	Attached to the roof panel between the sun roofs, on the left hand side of the interior light

#### Recommended Lubricant

Application	Land Rover Part No.
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Wheel hub spigot	RYL 105020
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### Torque Specifications

Description	Nm	lb-ft
* Road wheel nuts	140	103
Tire low pressure sensor	6	4

## Wheels and Tires

### GENERAL

A number of alloy wheel and tire size combinations are available. A Tire Pressure Monitoring System (TPMS) is also available. This system monitors the pressure in each tire and informs the driver if the pressure is outside predetermined thresholds.

### WHEELS



E45548

Item	Part Number	Description
A	-	7JX17
B	-	8JX18 - Style 1
C	-	8JX18 - Style 2
D	-	8JX19
E	-	5.5JX19 - Space saver

There are a number of different alloy wheel styles as follows:

- 7J X 17' - one style
- 8J X 18' - two styles
- 8J X 19' - one style

The spare wheel fitted to all vehicles is a steel space saver wheel. The wheel size is 5.5J X 19 and uses a T175/80R19 tire. The space saver wheel is a standard fitment for all markets except Gulf states. A full size spare is offered as an optional fitment.

## TIRES

Tires are available in a number of sizes and tread patterns dependent on the vehicle usage. Tire sizes are as follows:

- 235/70R17
- 255/60R18
- 255/55R19.

The following tires are available; All Season (AS), All Terrain (AT) and All Terrain - Sport (AT-S).

### NOTE:

Tires should be inflated to the recommended pressures (as given in the owners handbook) only when the tires are cold (ambient temperature). If the tires have been subjected to use or exposed to direct sunlight, move the vehicle into a shaded position and allow the tires to cool before checking and/or adjusting the pressures.

## Specifications

### Air Suspension - General Specification

Item	Specification
Ride height:	
Off road	55 mm above standard
Access - reselectable whilst vehicle is moving	50 mm below standard
Trim height	Configured using T4 plus special tools
Height sensors:	
Location	4 per vehicle - one sensor for each wheel
Height sensor arm colour coding:	
Left hand side, front and rear	WHITE
Right hand side, front and rear	BLACK
Height sensor operating	

voltages:	
Supply voltage	5 volts - supplied by air suspension ECU
Output voltage	Left hand front and right hand rear - Decreases to 0.5 volts with bump travel. Right hand front and left hand rear - Decreases to 4.5 volts with bump travel
Spring/damper modules:	
Type	Guided air spring surrounding twin tube damper
Pressures:	
Normal - Front	800 to 1000 kPa (8.0 to 10.0 bar) (116.0 to 145.0 lbf/in <sup>2</sup> )
Normal - Rear	500 to 800 kPa (5.0 to 8.0 bar) (72.5 to 116.0 lbf/in <sup>2</sup> )
Burst pressure	3500 kPa (35 bar) (507.5 lbf/in <sup>2</sup> )
Maximum spring pressure - Full bump at gross vehicle weight	Approximately 2700 kPa (27 bar) (391.5 lbf/in <sup>2</sup> )
Air compressor:	Supplied with air drier, electrically switched, pilot operated exhaust valve and double temperature sensors
Controlled by	ECU
Maximum pressure	1680 kPa (16.8 bar) (243.6 lbf/in <sup>2</sup> )
Air reservoir:	
Volume	9 litres (0.31 cu.ft)
Working pressure	1750 kPa (17.5 bar) (253.75 lbf/in <sup>2</sup> )
Maximum operating pressure	2300 kPa (23 bar) (333.5 lbf/in <sup>2</sup> )
Reservoir valve block	Incorporates pressure sensor to monitor spring and air reservoir pressures
Valve blocks:	
Front	2 corner valves, 1 cross link valve - all mounted on front bumper armature
Rear	2 corner valves, 1 cross link valve - all mounted on left hand rear spring tower

## Vehicle Dynamic Suspension

### On-Road Mode

This is the normal ride height for the vehicle.

### Off-Road Mode

Off-road mode will only be activated if the vehicle speed is less than 40 km/h. The vehicle will be raised 55 mm higher than the on-road mode to provide additional body clearance and improved approach, departure and breakover angles. If the vehicle speed exceeds 50 km/h, the air suspension control module will automatically lower the vehicle to the on-road mode height. At 40 to 45 km/h a message is displayed in the message

center to warn the driver to slow down or the vehicle will lower.

**NOTE:**

The suspension can be automatically set to off-road mode when some Terrain Response programs and low range are selected.

## **Access Mode**

Access mode lowers the vehicle body height by 50 mm and provides easier entry, exit and loading of the vehicle. Access mode can be pre-selected when the vehicle is moving. The vehicle will partly lower as the vehicle speed decreases, lowering to the full access mode height when the vehicle reaches 8 km/h. If the required road speed is not reached within a predetermined time, the air suspension will return the vehicle to the previously selected height.

Access mode can be selected at any vehicle speed. When access mode is selected, the response of the air suspension system will depend on the vehicle speed:

- If the vehicle speed is more than 20 km/h, the air suspension control module will wait for up to one minute for the vehicle speed to be reduced. The access mode lamp and the lowering lamp will flash while the air suspension control module waits for the vehicle speed to be reduced, the on-road mode lamp will remain illuminated. If the vehicle speed is not reduced sufficiently, the access mode request will be cancelled after 1 minute.
- If the vehicle speed is less than 20 km/h, the air suspension control module will lower the suspension to a part lowered height and will remain at this height for up to one minute. The on-road mode lamp will extinguish as the air suspension control module lowers the suspension to the part lowered height. The access mode lamp and the lowering lamp will illuminate. When part lowered is reached, the 'lower' lower lamp will flash. If the vehicle speed is not reduced to less than 8 km/h in the one minute period, the access mode request will be cancelled.
- If the vehicle speed is less than 8 km/h, the suspension will be lowered to access mode immediately. The access mode lamp and the lowering lamp will illuminate. When the access mode height is reached, the lowering lamp will be extinguished. Access height may be selected up to 40 seconds after the ignition is turned off,

provided

that the driver's door has not been opened within this time.

The suspension will automatically rise from access mode when the vehicle speed exceeds 10 km/h. If access mode was selected directly from off-road mode then the system will return to off-road mode when the vehicle speed exceeds 10 km/h. Otherwise the system will lift the suspension to On-road height.

### **Selecting Access Mode Directly from Off-Road Mode**

When the suspension is in off-road mode height, pressing the air suspension switch once and then a second time before the lowering lamp is extinguished, the control module will lower the suspension to access mode height. The control module will remember to return the suspension to off-road height automatically if the vehicle speed increases above 10 km/h.

## **Crawl (Locked at Access) Mode**

Crawl mode allows the vehicle to be driven at access height. The vehicle is locked in access height and can be selected at a speed of less than 35 km/h and can be driven at low speeds to improve clearance in areas with restricted headroom, i.e. car parks. If the vehicle exceeds 40 km/h, crawl mode will be cancelled and the vehicle will return to on-road height.

Crawl mode allows the vehicle to be driven at low speeds with the suspension locked at the access mode height. This allows the vehicle to be driven in low car parks etc. with increased roof clearance.

Crawl mode can be selected up to 35 km/h with a long press of the switch in the down direction. The access mode lamp and the crawl mode lamp will be illuminated. When the control module is in crawl mode, on-road mode height will be selected automatically if the vehicle speed exceeds 40 km/h. At 30 to 35 km/h a message is displayed in the message center to warn the driver to slow down or the vehicle will raise. Crawl mode can also be manually cancelled by moving the switch in the up direction for 1 second. The access mode lamp and the crawl mode lamp will be extinguished.

## **Automatic Height Change Warnings**

When the suspension is in off-road mode, access mode or crawl mode height, the air suspension control module will change the suspension height automatically when the vehicle speed exceeds a predetermined threshold.

When the suspension is at off-road mode or crawl mode height, the control module issues a warning to advise the driver that the vehicle is approaching the speed threshold. The instrument cluster sounder will emit a chime, a message will be displayed in the message center and the on-road mode lamp and either the raising or lowering lamp will flash.

The off-road mode or crawl mode height speed warning is removed when the vehicle speed is reduced.

## **SPECIAL MODES**

### **Door Open Functionality**

If one or more of the vehicle doors are opened during a height change when the vehicle is stationary, the air suspension control module will restrict further height change. The door open signal is transmitted by the CJB on the high speed CAN bus and received by the air suspension control module. This keeps the vehicle level to the set height when a door opens to allow for changes in loading conditions.

A hardwired door status signal is also transmitted from the CJB to the air suspension control module. This signal provides door status information when the high speed CAN bus is off, i.e.; during periodic re-levelling.

The lamp on the air suspension switch for the target mode height will remain illuminated and the raising or lowering lamp will flash.

If all of the doors are closed within 90 seconds, the height change will resume. If the 90 second period is exceeded and all of the doors are not closed, the height change will be cancelled. The mode lamps showing the previously selected height and the target height will be illuminated. The mode height change can be reselected by operating the switch, however, if the vehicle is driven at speed of more than 5 mph (8 km/h) the control module will continue to raise or lower the vehicle to the target mode height.

### **Extended Mode**

If the vehicle becomes grounded and the traction control becomes operational, the air suspension control module automatically increases the mass of air in the air springs to raise the vehicle clear of the obstruction. Extended mode is activated automatically and cannot be selected manually.

When the air suspension control module has activated the extended mode, the off-road mode lamp will flash if the suspension is above off-road mode height. The off-road mode and on-road mode lamps will flash if the suspension is between off-road mode and on-road mode heights. The on-road mode and access mode lamps will flash if the suspension is between on-road mode and access mode. A message will also be displayed in the message center.

To exit the extended mode, press the air suspension switch briefly in the up or down position or drive the vehicle at a speed of more than 20 km/t.

### **Suspension Prevented From Moving**

If the air suspension control module is attempting to change the suspension height and it detects that the suspension is prevented from moving, the control module will stop all suspension movement. This can be caused by jacking the vehicle, attempting to lower the



vehicle onto an object or raising the vehicle against an obstruction.

The air suspension switch lamps operate as described for extended mode and the same message is displayed in the message center. To start the air suspension system operating, press the air suspension switch briefly in the up or down position or drive the vehicle at a speed of more than 20 km/h.

## Periodic Re-levelling

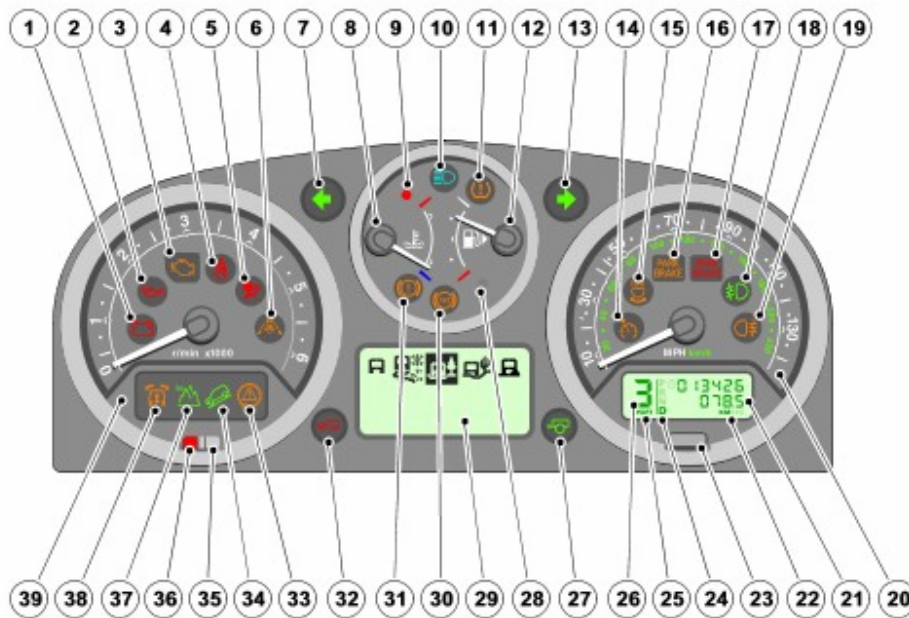
When the vehicle is parked, the air suspension control module 'wakes up' two hours after the ignition was last switched off and then once every six hours. The vehicle height is checked and if the vehicle is not level within a pre-set tolerance, small downwards height adjustments may be made automatically.

## Engine - 2.7L Diesel

### General Specifications

Item	Specification
Type	2.7 litre, 60 degree 'V', common rail direct injection, turbocharged and intercooled diesel, twin overhead camshafts, 4 valves per cylinder
Cylinder arrangement	V6, numbers 1 and 4 cylinders at front of engine when engine is viewed from rear
Cylinder numbering	Number 1 cylinder - right hand bank; Number 4 cylinder - left hand bank
Bore - nominal	81.0 mm (3.188 in)
Stroke	88.0 mm (3.464 in)
Capacity	2720 cm <sup>3</sup> (165.9 in <sup>3</sup> )
Firing order	1 - 4 - 2 - 5 - 3 - 6
Compression ratio	17.3:1
Direction of rotation	Anti-clockwise viewed from rear of engine
Maximum power	147 Kw (200 PS) (197 bhp) @ 4000 rev/min
Maximum torque	440 Nm (324 lb-ft) @ 1900 rev/min

## Instrument Cluster - NAS



E48542

Item	Part Number	Description
1	-	Ignition/No charge warning indicator
2	-	Low oil pressure warning indicator
3	-	Malfunction Indicator Lamp (MIL)
4	-	Seat belt warning indicator
5	-	SRS warning indicator
6	-	Adaptive Cruise Control (ACC) indicator (if fitted)
7	-	Left turn signal indicator
8	-	Coolant temperature gage
9	-	High coolant temperature warning indicator
10	-	High beam indicator
11	-	Tyre pressure monitoring system indicator (if fitted)

12	-	Fuel level gage
13	-	Right turn signal indicator
14	-	Cruise control indicator
15	-	Adaptive front lighting system indicator (if fitted)
16	-	Park brake fault indicator
17	-	Park brake warning indicator
18	-	Front fog lamp indicator
19	-	Rear fog lamp indicator
20	-	Speedometer
21	-	Odometer
22	-	Trip meter display
23	-	Trip reset button
24	-	Selector lever position (automatic transmission only)
25	-	CommandShift™/Sport mode indicator
26	-	CommandShift™ gear position (automatic transmission only)
27	-	Trailer indicator
28	-	Low fuel indicator
29	-	Message center
30	-	ABS indicator
31	-	Brake warning indicator (pad wear/low fluid/EBA/EBD)
32	-	Auxiliary heating
33	-	DSC/traction control indicator
34	-	HDC active indicator
35	-	Ambient light sensor
36	-	Alarm indicator
37	-	Transfer box low range indicator
38	-	Air suspension warning indicator
39	-	Tachometer

## WARNING INDICATORS

The warning indicators are located in various positions in the instrument cluster. The warning indicators can be split into two groups; self controlled and externally controlled.

Self controlled warning indicators are dependent on software logic within the instrument pack for activation. The pack software controls the indicator check illumination at ignition on and all indicators whose operation is controlled by the instrument cluster, the low fuel level warning indicator for example.

Externally controlled indicators are supplied with current from another system controlling module or illuminated by the instrument cluster on receipt of a bus message from another subsystem module.

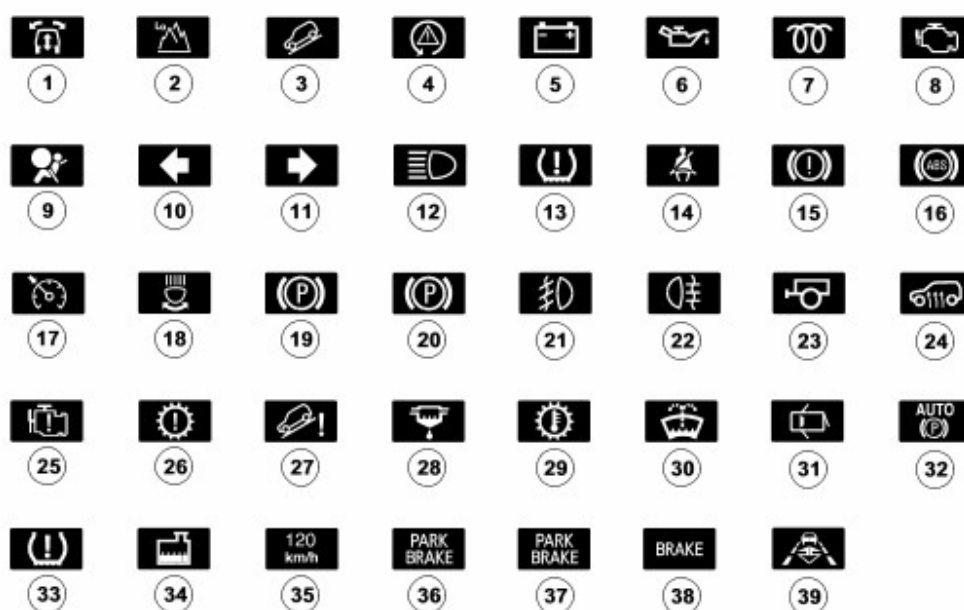
Some indicators are activated by an external subsystem module but the instrument cluster contains the control logic. These indicators are shown in the following table as being both self and externally controlled.

The following table shows the available indicators and indicates if they are subject to an indicator check at ignition on and if they are self or externally controlled.

<b>Indicator</b>	<b>Illumination Color</b>	<b>Bulb Check</b>	<b>Self Controlled (S)/Externally Controlled (E)</b>
Ignition/No charge	Red	No	E
Low oil pressure	Red	No	E
Glow plug active	Amber	* No (will illuminate at ignition on to show glow plugs active)	E
MIL	Amber	* Yes	E
Seat belt	Red	No	E
SRS	Red	* Yes	E
Adaptive cruise control (if fitted)	Amber	No	E
Transfer box low range	Green	No	E
Air suspension	Amber / Red	Yes	E
HDC active	Green	No	E
HDC fault	Amber	Yes	E
DSC / Traction control	Amber	Yes	E
Left turn signal	Green	No	E
Right turn signal	Green	No	E
Trailer	Green	No	E
High engine coolant temperature	RED	Yes	S
High beam	Blue	No	S
ABS failure	Amber	* Yes	E
Low fuel level	Amber	Yes	S
Cruise control	Amber	No	E
Park Brake City mode	Non-functional	-	-
Park brake fault	Amber	Yes	E
Park brake warning	Red	No	E
Front fog lamps	Green	No	E
Rear fog lamps	Amber	No	E
Alarm	Red	No	E
EMS Fault	Amber	Yes	E
Driveline fault	Amber / Red	Yes	E
Driveline overheat	Amber	Yes	E
Low washer fluid	Amber	Yes	E
Door open	Red	No	E
FBH active	Red	Yes	E
Tyre pressure monitoring	Amber	Yes	E

Low coolant level	Amber	No	E
Overspeed	Amber	No	E
Water in fuel	Non-functional	-	-
Tyre pressure warning	Amber	Yes	E
Brake warning	Amber / Red	Yes	E
Adaptive front lighting	Amber	Yes	E
* = Bulb check performed by subsystem module, not instrument cluster			

## Warning Indicator Functionality



E48543

Item	Part Number	Description
1	-	Air suspension
2	-	Transfer box low range
3	-	HDC active
4	-	DSC/Traction control
5	-	Ignition/No charge
6	-	Low oil pressure
7	-	Glow plugs active (diesel models only)
8	-	Malfunction Indicator Lamp (petrol models only)
9	-	SRS warning
10	-	Left turn indicator
11	-	Right turn indicator
12	-	High beam
13	-	Tyre pressure monitoring system

14	-	Seat belt warning
15	-	Brake warning
16	-	ABS
17	-	Cruise control
18	-	Adaptive front lighting system
19	-	Park brake fault (all except NAS)
20	-	Park brake warning (all except NAS)
21	-	Front fog lamps
22	-	Rear fog lamps
23	-	Trailer
24	-	Auxiliary heating
25	-	Engine management system fault
26	-	Driveline fault
27	-	HDC fault
28	-	Water in fuel (non-functional)
29	-	Driveline overheat
30	-	Low washer fluid
31	-	Door open
32	-	Park brake city mode (non-functional)
33	-	Tyre pressure warning
34	-	Low coolant
35	-	Overspeed warning (Gulf only)
36	-	Park brake fault (NAS only)
37	-	Park brake warning (NAS only)
38	-	Brake warning (NAS only)
39	-	Adaptive Cruise Control (ACC) (if fitted)

The functionality for each of the above warning indicators is described below. Some warning indicators are accompanied by a chime from the instrument pack when they are illuminated and also a message in the message center on high line instrument clusters. Some indicators are only available on the low line instrument cluster, with the indicators being replaced with messages on the high line instrument cluster.

### **1. Air Suspension Indicator**

The air suspension indicator is illuminated by the instrument cluster software on receipt of a CAN signal from the air suspension control module. The air suspension control module outputs a number of different signals relating to the air suspension system operation. The instrument cluster interprets the signals and can illuminate the indicator in either an amber or red colour as appropriate. Some signals also include requests for chimes from the instrument cluster to alert the driver.

### **2. Transfer Box Low Range Indicator**

The transfer box low range indicator is illuminated by the instrument cluster software on

receipt of CAN signals from the transfer box control module. When a range change from high to low range is in progress, the low range indicator flashes in an green color. When the range change is complete, the low range indicator remains permanently illuminated until high range is selected.

The transfer box control module also requests a single chime from the instrument cluster to alert the driver that the requested range change is complete. On high line instrument clusters, the range change information is also displayed in the message center.

### **3. Hill Descent Control (HDC) Active Indicator**

The HDC active indicator is illuminated by the instrument cluster software on receipt of CAN signals from 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.

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.

### **4. Dynamic Stability Control (DSC)/Traction Control Indicator**

The DSC/traction control indicator is illuminated by the instrument cluster software on receipt of CAN signals from the ABS module. The indicator is illuminated in an amber color for 3 seconds for a bulb check when the ignition is switched on. 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 fascia.

### **5. Ignition/No Charge Indicator**

The ignition/no charge indicator is controlled by the instrument cluster software and illuminated by CAN signals from the Engine Control Module (ECM). The indicator illuminates in a red color when the ignition is moved to position II 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.

## **6. Low Oil Pressure Indicator**

The low oil pressure indicator is hardwired directly to the instrument cluster. The indicator is illuminated in a red color when the ignition is moved to position II. When the engine is started and the oil pressure increases the low oil pressure indicator should extinguish. If the indicator remains illuminated or illuminates when driving the vehicle should be stopped at the earliest opportunity and the engine switched off until the fault is rectified.

## **7. Glow Plugs Active Indicator (Diesel models only)**

The glow plugs active indicator is illuminated by the instrument cluster software on receipt of a CAN message from the Engine Control Module (ECM). The indicator is located in the same position as the MIL on petrol models. The indicator illuminates in an amber color when the ignition is moved to position II. The indicator illumination period varies with engine temperature and in some cases will not illuminate when the engine temperature is high. The indicator is controlled by CAN signals from the ECM which equate to the time which the glow plugs are energised to pre-heat the combustion chambers. When the glow plug heating time is complete, the indicator is extinguished indicating to the driver that the engine can now be started.

## **8. Malfunction Indicator Lamp (MIL)**

The MIL is controlled by the instrument cluster software on receipt of CAN signals from the ECM. The indicator is illuminated for a bulb check by the ECM when the ignition is moved to position II. The lamp is extinguished when the engine starts.

If the MIL remains illuminated after the engine is started or illuminates while driving, a fault is present and must be investigated at the earliest opportunity. Illumination of the MIL indicates that there is an On-Board Diagnostic (OBD) fault which will cause excessive emissions output. This may relate to either an engine management system fault or a transmission fault.

## **9. Supplementary Restraint System (SRS) Warning Indicator**

The SRS warning indicator is controlled by the restraints control module which transmits CAN signals to the instrument cluster. The warning indicator is illuminated for 6 seconds for a bulb check by the restraints control module when the ignition is moved to position II. If a fault is detected in the SRS the restraints control module illuminates the warning indicator in a red color until the fault is rectified.

The instrument cluster also performs a check of the indicator LED functionality. Failure of the indicator LED is transmitted to the driver in the form of an error message which is displayed in the trip meter display.



## **10 and 11. Left and Right Turn Indicators**

The turn indicators are controlled by the instrument cluster software on receipt of CAN signals on the medium speed CAN bus from the Central Junction Box (CJB). When the turn signal indicator switch is operated, the CJB transmits a signal to the instrument cluster to operate the applicable turn indicator. The instrument cluster software controls the flash rate of the indicator which flashes in a green color. During normal turn signal indicator operation the indicator flashes slowly, accompanied simultaneously by a sound from the instrument cluster sounder. If a fault exists, the instrument cluster responds to a fault message from the CJB and flashes the indicator at double speed.

The hazard warning indicators are also controlled by the CJB and the instrument cluster software and operate in the same manner as the turn signal indicators. The hazard warning indicators can operate with the ignition switched off, therefore, the CAN signal from the CJB to the instrument cluster to operate the left and right hand turn signal indicators will also 'wake-up' the instrument cluster.

## **12. High Beam Indicator**

The high beam indicator is controlled by the instrument cluster software on receipt of CAN signals on the medium speed CAN bus from the Central Junction Box (CJB). When the high beam switch is moved to the high beam or headlight flash position, the CJB transmits a CAN message to the instrument cluster to illuminate the high beam indicator in a blue color.

## **13. Tyre Pressure Monitoring System (TPMS) Indicator**

The Tyre Pressure Monitoring System (TPMS) indicator is controlled by the instrument cluster software on receipt of CAN signals from the TPMS module. The indicator is illuminated in an amber color for a 3 second bulb check by the TPMS module when the ignition is moved to position II. If the indicator remains illuminated after the engine is started or illuminates when driving, the TPMS has developed a fault. The tyre pressures should be monitored manually until the fault is rectified.

## **14. Safety Belt Warning Indicator**

The safety belt warning indicator is controlled by the restraints control module and the instrument cluster software on receipt of CAN signals from the restraints control module.

The indicator is illuminated in a red color when the ignition is moved to position II. The illumination will remain on until the safety belt buckle is latched in position. If the safety belt of an occupied front seat is not fastened, when the vehicle speed exceeds 8 km/h the indicator will flash and repetitive chime will emit for 10 seconds from the instrument cluster. This will be repeated every 30 seconds until the safety belt is fastened, the vehicle speed is reduced below

5 km/h or the ignition switch is moved to the off position. On vehicles with a high line instrument cluster, the indicator warning illumination will be accompanied by a message in the message center.

On NAS vehicles, the indicator will remain permanently illuminated until the safety belt is fastened, the vehicle speed is reduced below 5 km/h or the ignition switch is moved to the off position.

### **15 and 38. Brake Warning Indicator**

This indicator is controlled by CAN signals from the ABS module for Electronic Brake Assist (EBA) and Electronic Brake Distribution (EBD) faults. Brake pad wear or low brake fluid indications are controlled by the instrument cluster with the pad wear sensors and the fluid level sensor hard wired into the instrument cluster.

The indicator can be illuminated in an amber or red colour depending on the fault. The indicator is illuminated for a bulb check when the ignition is switched on. The indicator is illuminated in an amber colour for 1.5 seconds and red colour for a further 1.5 seconds. If no faults exist, the indicator is extinguished after the bulb check period.

The brake warning indicator functions are assigned priority. Fault conditions which require a red illumination have priority over amber illuminated faults.

### **Brake Pad Wear**

- The front left hand inboard brake pad and the rear right hand inboard brake pad are fitted with wear sensors. The pads are wired in series to the instrument cluster which continuously monitors the circuit. When one or both pads wear to their allowed limit (approximately 75% worn) the sensor circuit is broken and is detected by the instrument cluster software. The instrument cluster illuminates the brake warning indicator in a red colour and on high line instrument cluster a

message 'PAD WEAR' is displayed in the message center. When the pad(s) are replaced, the instrument cluster senses the completed circuit and withdraws the indicator illumination and message display (if applicable) when the ignition is switched on to position II.

#### **EBA/EBD Warning**

- If a failure of the EBA or EBD functions occur, the ABS module transmits a CAN signal which is received by the instrument cluster. The instrument cluster software illuminates the brake warning indicator in an amber color for minor EBA/EBD faults and in a red color for major EBA/EBD faults. The indicator will remain illuminated for as long as the fault exists.

#### **Low Brake Fluid**

- The brake fluid reservoir is fitted with a sensor which is connected directly to the instrument cluster. When the ignition is switched on to position II the fluid level is checked. To prevent incorrect warnings when the vehicle is moving, the sensor is monitored once every 25 seconds. If a low fluid situation occurs, the instrument cluster illuminates the brake warning indicator in a red color and on high line instrument clusters also displays the message 'CHECK BRAKE FLUID' in the message center. Illumination of the indicator for low fluid level is also accompanied by a chime from the instrument cluster.

### **16. Anti-lock Brake System (ABS) Indicator**

The ABS indicator is controlled by the ABS module which transmits a CAN signal to the instrument cluster. The indicator is illuminated in an amber color for 3 seconds for a bulb check by the ABS module when the ignition is moved to position II. If the 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 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 indicator was illuminated due to a 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 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.

### **17. Cruise Control Indicator**

The cruise control indicator is controlled by the ECM and the instrument cluster on receipt of CAN signals from the ECM. When the cruise control is selected on, the indicator is illuminated providing that cruise has been resumed and is not within 8 km/h of the set speed or cruise is on and the vehicle speed is within 8 km/h.

## **18. Adaptive Front Lighting System (AFS) Indicator**

The AFS indicator is controlled by the AFS control module and the instrument cluster software on receipt of CAN signals from the control module. The indicator is illuminated in an amber color for a 3 second bulb check when the ignition is moved to position II.

The AFS indicator displays AFS system failures to the driver. If a failure occurs, the indicator will illuminate continuously until the fault is rectified.

## **19 and 36. Park Brake Fault Indicator**

The park brake fault indicator is controlled by the instrument cluster software on receipt of CAN signals from the Electronic Park Brake (EPB) control module. The indicator is illuminated in an amber color for 3 second for a bulb check when the ignition is moved to position II. If a fault occurs in the EPB system occurs, the EPB control module requests illumination of the indicator which remains illuminated until the fault is rectified.

## **20 and 37. Park Brake Warning Indicator**

The park brake warning indicator is controlled by the instrument cluster software on receipt of CAN signals from the Electronic Park Brake (EPB) control module. The indicator is illuminated in a red color when the park brake is applied. If the ignition is moved to the off position, the indicator remains illuminated for 3 minutes. If a fault occurs which prevents park brake application the indicator flashes and the park brake fault indicator is also illuminated.

## **21. Front Fog Lamps Indicator**

The front fog lamp indicator is controlled by the CJB which transmits CAN signals to the instrument cluster. The lamp is illuminated in a green color at all times when the front fog lamps are selected on and the ignition is in position II.

## **22. Rear Fog Lamps Indicator**

The rear fog lamp indicator is controlled by the CJB which transmits CAN signals to the instrument cluster. The lamp is illuminated in an amber color at all times when the rear fog lamps are selected on and the ignition is in position II.

## **23. Trailer Indicator**

The trailer indicator is controlled by the instrument cluster software on receipt of CAN signals on the medium speed CAN bus from the Central Junction Box (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, accompanied simultaneously by a sound from the instrument cluster sounder, at the same rate as the turn signal indicators.

#### **24. Auxiliary Heating Indicator**

The auxiliary heating indicator is controlled by the Automatic Temperature Control (ATC) module and the instrument cluster software. The Fuel Burning Heater (FBH) is controlled by the ATC module and is switched on at a preset time by a driver set time in the instrument cluster software. The indicator is illuminated in an amber color for a 3 seconds bulb check when the ignition is moved to position II. The indicator will remain illuminated at all times when the FBH is active.

#### **25. Engine Management System (EMS) Fault Indicator**

The EMS fault indicator is only available on low line instrument clusters. The indicator is controlled by the ECM and the instrument cluster software on receipt of CAN signals from the ECM. The indicator is illuminated in an amber color for bulb check when the ignition is moved to position II. The lamp is extinguished when the engine starts. Engine management faults which do not affect emissions will permanently illuminate the EMS fault indicator. The indicator will only extinguish when the fault has been rectified. Reduced engine performance or limp home operation is also signalled to the driver by the EMS fault indicator.

#### **26. Driveline Fault Indicator**

The Driveline fault indicator is controlled by transfer box control module, rear differential control module and the transmission control module and the instrument cluster software. The indicator is illuminated by the instrument cluster on receipt of a CAN signal of either of the controlling modules. The instrument cluster interprets the signals and can illuminate the indicator in either an amber or red colour as appropriate for faults relating to either the transfer box, rear differential or the automatic transmission. Amber illumination signifies a minor fault which should be rectified when convenient, Red illumination signifies a major fault which should be rectified at the earliest opportunity.

#### **27. Hill Descent Control (HDC) Fault Indicator**

The HDC fault indicator is only available on low line instrument clusters; on high line instrument cluster fault information is displayed by appropriate messages in the message center. The HDC fault indicator is illuminated by the instrument cluster software on

receipt of CAN signals from the ABS module. The indicator is illuminated in an amber color when a HDC fault is present. The indicator is illuminated in an amber color for a 3 second bulb check when the ignition is moved to position II. If a fault occurs in the HDC system, the amber indicator is illuminated

During the bulb check, if the 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 indicator was illuminated due to a 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 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.

If the use of HDC causes the brake discs to exceed their pre-determined temperature, the HDC system initiates a 'fade out'. The HDC fault indicator flashes during 'fade out'. When the brake discs have cooled sufficiently, HDC is reactivated and the HDC fault indicator is extinguished.

## **28. Water In Fuel Indicator**

This indicator is non-functional.

## **29. Driveline Overheat Indicator**

The driveline overheat indicator is controlled by the instrument cluster software on receipt of CAN signals from the transfer box control module, rear differential control module or the transmission control module for the automatic transmission. The indicator is illuminated in an amber color for a 3 second bulb check when the ignition is moved to position II. When one or more of the control modules sense that the controlled component has reached its over temperature threshold, the applicable control module(s) transmits a CAN signal to the instrument cluster which illuminates the indicator for as long as the over temperature condition exists.

## **30. Low Washer Fluid Indicator**

The low washer fluid indicator is only available on low line instrument clusters; on high line instrument cluster the level information is displayed by appropriate messages in the message center. The low washer fluid indicator is controlled by the instrument cluster. The washer fluid level sensor is hardwired into the instrument cluster which monitors the sensor output. The indicator is illuminated in an amber color for 3 seconds when the ignition is moved to position II. When the fluid in the washer reservoir falls to a predetermined level, the instrument cluster senses the signals from the sensor and illuminates the indicator and emits a single warning chime to alert the driver. The instrument cluster monitors the level sensor signals every 15 seconds to prevent incorrect

warnings occurring due to fluid movement. When the reservoir is replenished the indicator is extinguished.

### **31. Door Open Indicator**

The door open indicator is controlled by the instrument cluster on receipt of CAN signals from the Central Junction Box (CJB). The indicator is illuminated in a red color if any of the front or rear passenger doors, the driver's door, the bonnet or the tail gate are left open with the ignition switch in position II.

### **32. Park Brake City Mode Indicator**

This indicator is non-functional.

### **33. Tyre Pressure Warning Indicator**

The tyre pressure warning indicator is only available on low instrument cluster, high line instrument clusters display warning messages in the message center. The Tyre Pressure Monitoring System (TPMS) indicator is controlled by the instrument cluster software on receipt of CAN signals from the TPMS module. The indicator is illuminated in a red color for a 3 second bulb check by the TPMS module when the ignition is moved to position II.

If the indicator remains illuminated after the engine is started or illuminates when driving, the vehicle should be stopped at the earliest opportunity and the tyre pressures checked.

### **34. Low Coolant Indicator**

The low coolant indicator is controlled by the instrument cluster. The coolant level sensor is hardwired into the instrument cluster which monitors the sensor output. The indicator is illuminated in an amber color for 3 seconds when the ignition is moved to position II. When the coolant in the header tank falls to a predetermined level, the instrument cluster senses the signals from the low coolant sensor. The instrument cluster flashes the indicator for 5 seconds accompanied by an a chime and then illuminates the indicator. The indicator remains illuminated until the coolant level in the header tank is restored to its correct level. The instrument cluster monitors the level sensor signals every 15

seconds to prevent incorrect warnings due to fluid movement.

### **35. Overspeed Warning Indicator**

The overspeed warning indicator is only available on low line instrument clusters; on high line instrument cluster the level information is displayed by appropriate messages in the message center. The overspeed warning indicator is controlled by the instrument cluster and the speed threshold is determined by the default setting. The instrument cluster receives vehicle speed information from the ABS module on the CAN. The instrument cluster software monitors the speed signal data and determines when the speed threshold has been exceeded. When an overspeed condition occurs, the indicator is illuminated permanently for as long as the overspeed condition occurs.

### **39. Adaptive Cruise Control (ACC) Indicator (if fitted)**

The ACC indicator is controlled by the ACC module and the instrument cluster software. The indicator is illuminated when cruise control is active and another vehicle is detected by the radar system in front of the vehicle. The indicator is illuminated in an amber color to alert the driver that the ACC system is active and will automatically control the vehicle speed to maintain a set distance from the vehicle in front.

## **ANALOGUE INSTRUMENTS**

The analogue instruments located in the instrument cluster are as follows:

- Speedometer
- Tachometer
- Fuel level gage
- Engine coolant temperature gage.

The speedometer, tachometer, fuel gauge and engine temperature gauge are each driven by an electronic stepper motor. The characteristics of this type of motor produce damping of the pointer needle. All of the gages return to their respective zero positions when the ignition is switched off.



## **Speedometer**

The speedometer is driven by square wave signals derived from the wheel speed sensors and the ABS module. The wheel speeds are measured by the wheel speed sensors reading the rotational speed of the wheels from toothed targets on the hubs. The wheel speeds are passed from the sensors to the ABS module in the form of pulsed signals. The ABS module converts these signals into a speed output on the high speed CAN to the instrument cluster.

Three versions of the speedometer display are used. The three versions show the speed in kilometres per hour, the speed in miles per hour as the main display and kilometres per hour as a secondary display and Canadian variants show the kilometres per hour as the main display and miles per hours as the secondary display.

## **Tachometer**

The tachometer is driven by an engine speed signal transmitted on the high speed CAN from the ECM. The signal is derived from the Crankshaft Position (CKP) sensor. The signal is received by the instrument cluster microprocessor and the output from the microprocessor drives the tachometer.

Two versions of the tachometer are used for petrol and diesel engine variants. The petrol engine variants use a display which has a maximum engine speed reading of 8000 rev/min. The diesel engine variants use a display which has a maximum engine speed reading of 6000 rev/min.

## **Fuel Level Gage**

The fuel level gage displays the fuel tank contents. When the ignition is off, the pointer returns to the empty position.

The instrument pack is connected to two tank level sensors. One sensor is located at the front of the fuel tank and the other is located at the rear. Each sensor uses a float operated MAgnetic Passive Position Sensor (MAPPS) for measuring the fuel tank contents.

Each sensor is supplied with a reference current from the instrument cluster. The instrument cluster measures the returned output from each sensor which is proportional to the amount of fuel in the tank and the position of the float arm. The inclination of the vehicle, derived from a CAN message from the Electronic Park Brake (EPB) module, is also used to calculate the fuel tank contents. The instrument cluster uses the fuel level sensor signals and the EPB module inclination signals to accurately calculate the volume of fuel in the tank and display this on the fuel level gage. The instrument cluster monitors the signals and updates the fuel level gage pointer position at approximately 20 second intervals. This prevents the pointer moving continually due to fuel movement in the tank due to cornering or braking. When the ignition is off, the pointer needle returns to the

empty position.

A warning lamp is incorporated into the fuel level gage and illuminates when the fuel tank volume is at or below 10 liters on petrol models and 18 liters on diesel models. This is accompanied by a chime from the instrument cluster to alert the driver to the low fuel condition. On vehicles with a high line instrument cluster the low fuel level is also displayed in the message center.

The fuel tank contents is converted into a CAN signal by the instrument cluster and transmitted on the CAN. This is used by the fuel fired booster heater to suspend operation on diesel variants.

The following table shows the fuel tank fuel quantity and the respective pointer positions.

<b>Fuel Tank Quantity (Liters)</b>	<b>Needle Pointer Position</b>
0	Below empty
5	Empty
10	Low fuel (no gage indication)
30	Quarter full
35	Half full
45	Half full
60	Three quarter full
75	Full
80	Above full

## **Engine Coolant Temperature Gage**

The engine coolant temperature gage displays the engine coolant temperature to the driver. When the ignition is off the pointer needle returns to the cold position.

The engine coolant temperature sensor is connected to the ECM which monitors the sensor signals and converts the signals into a value for the engine coolant temperature. This information is transmitted on the high speed CAN for use by the instrument cluster and other systems.

The engine coolant temperature gage is the same on all pack variants. The gage has a blue segment for low temperatures and a red segment for excessively high temperatures. For normal operating temperatures the gage needle pointer is positioned centrally in the gage display zone. The needle pointer position translates to the following approximate temperatures.

<b>Engine Coolant Temperature °C</b>	<b>Needle Pointer Position</b>
Ignition off	Park position
40	Cold (Blue segment)
75 - 115	Normal
120	Start of hot (Red segment)
125	End of hot

## **AMBIENT LIGHT SENSOR**

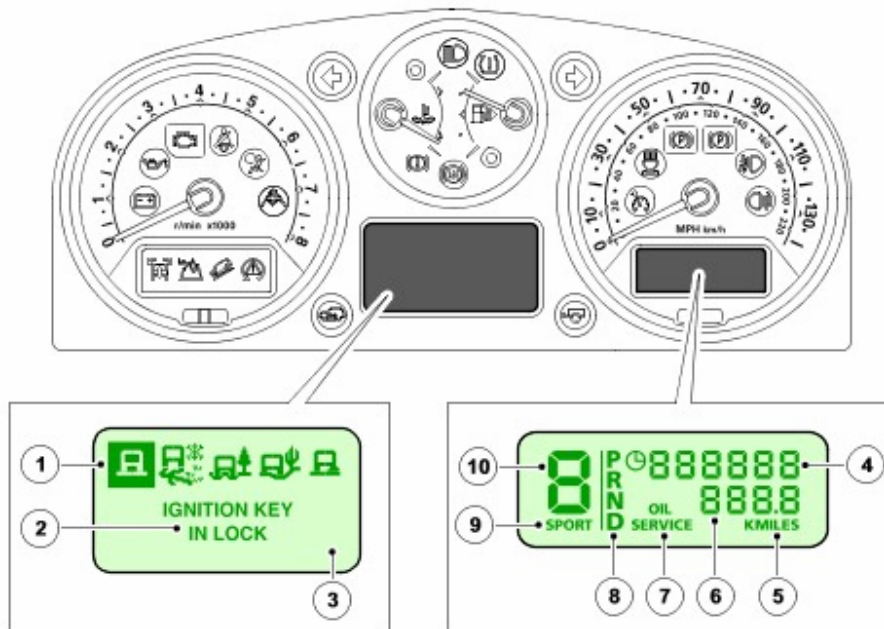
An ambient light sensor is located in the instrument cluster, adjacent to the alarm indicator. The ambient light sensor is a phototransistor which measures the available ambient light.

The phototransistor measures the ambient light (lux) level and passes a signal value for the available light level to the instrument cluster microprocessor. The instrument cluster software adjusts the display brightness of the message center and information display LCD's accordingly to ensure that the displays are clearly visible during day and night time driving.

# Information and Message Center

## GENERAL

### Information and Message Displays



E47674

Item	Part Number	Description
1	-	Terrain Response™ icons (if applicable)
2	-	Message display
3	-	LCD Message center
4	-	Odometer display
5	-	Miles or KM display
6	-	Trip meter display
7	-	LCD Information display
8	-	Gear position display (Automatic transmission only)
9	-	Transmission mode display (Automatic transmission only)
10	-	Selected gear position display (Automatic transmission only)

Two variants of the instrument cluster are used; high line and low line. Both variants also

differ depending on market specification, engine fitments and features fitted to the vehicle.

The instrument cluster is an electronic device which receives digital or analog signals via hardwired or bus systems for instrumentation operation.

The information display, which shows odometer, trip, gear position and mode data, is applicable to both high and low line instrument clusters. The message center is only available on high line instrument clusters.

## **MESSAGE CENTER**

The message center is an Liquid Crystal Display (LCD) located in a central position at the bottom of the instrument cluster. The LCD has a viewable area of 71 mm X 36 mm with a pixel size of 0.54 mm X 0.54 mm. When active, the message center is illuminated as follows:

- At ignition on.
- At ignition off when all current messages are being displayed to the driver.
- At ignition off, each current message is displayed in turn for 3 seconds. The message center will remain active if KEY IN IGNITION or LIGHTS ON is displayed.

When the ignition is switched on and the lights are off, the message center will illuminate at full, normal brightness. If the lights are switched on, the intensity of illumination is reduced to a level determined by the PWM dimmer control located on the lighting control switch.

The majority of messages are generated by the vehicle subsystem modules on receipt of CAN bus message signals. The instrument cluster identifies the signals and displays the appropriate message in the message center.

Most messages are accompanied by a chime or series of chimes which is requested by the module generating the message. The chime is emitted by a sounder located within the instrument cluster.

The driver can view system status messages which are current within the instrument cluster software by cycling through the trip computer functions.

## **Message Center Display Arbitration**

When the ignition is switched on, the message center displays the system check message for 3 seconds. If the ignition is switched off during this period, the display goes off.

After the system check, the message center shows the normal display for a vehicle without Terrain Response™ (display mode 3E, see following section for mode

descriptions). The display shows the ambient temperature, adaptive cruise information (if applicable) and trip computer information. This display format is changed if the driver switches the ignition off or the instrument cluster detects a condition which needs to be relayed to the driver, low washer fluid for example. Driver intervention has the highest priority. If a driver request and a warning condition become active at the same time, the driver request will be displayed first.

If an adaptive cruise set-up message is received, the display will change to display mode 3 D or E (see following section for mode descriptions). This will display for 3 seconds when the display changes back to the normal display.

If a Terrain Response™ message is received, the display will change to a mode 3 display, appropriate for the additional information to be displayed. The instrument cluster reviews the information required to be displayed and shows the appropriate format.

## Display Modes

The message center has four different display modes. Each mode is displayed depending on vehicle operating conditions and driver requests. The display modes are detailed in the following table:

Display Mode	Description	Format
0	Blank	No display in this mode
1	Information	Customer settings display
2	Pre-check	System precheck at ignition on
3	Normal	Seven different formats available (A, B, C, D, E, F or G) depending on vehicle specification and active functions

### Display Mode 0

This mode is entered when the ignition is off and the CAN bus system is 'asleep' and no characters or symbols are displayed. This mode is exited by switching the ignition on or if the driver selects the 'Customer Settings' mode.

### Display Mode 1

This mode displays information to the driver and provides the driver with the option to change certain settings for the vehicle. The display is a full screen format. A number of displays are available to allow the driver to customise various vehicle functions. Refer to 'Customer Settings' in this section for further details.

### Display Mode 2 - System Start-up

When the ignition is switched on, the LCD shows the 'SYSTEM CHECK IN PROGRESS' message. This message is displayed during the indicator lamp test period

for 3 seconds after the ignition on is sensed. When the ignition is switched off, the LCD returns to the display mode 0.

### **Display Mode 3**

Display mode 3 is the normal operating mode for the message center. There are seven different display formats (A to G) which cover all possible display formats and also provides for vehicles with or without the Terrain Response™ system. The seven displays are described below:

- A = Display shows: Terrain Response™ Mode icon; Steering Wheel Direction Icons; Trip computer/Warning Messages
- B = Display shows: Terrain Response™ Modes (Active mode in reverse image); Terrain Response™ description message
- C = Display shows: Active Terrain Response™ Mode icon; Terrain Response™ Description message; Trip Computer/Warning Messages
- D = Display shows: Active Terrain Response™ Mode icon; Ambient Temperature; Text/Information/Advice/Warnings; Adaptive Cruise Control (if applicable)
- E = Display shows: Ambient Temperature; Adaptive Cruise Control (if applicable); Text/Information/Advice/Warnings
- F = Display shows: Ambient Temperature; Warnings/Information
- G = Display shows: Active Terrain Response™ Mode icon; Ambient Temperature; Text/Information/Advice/Warnings

## **Message Priority**

The messages are assigned priorities which are defined by the effect on driving safety and functional ability of the vehicle. New messages are displayed and accompanied by a chime from the sounder. Messages are divided into three priority groups; 1, 2, and 3 as follows:

### **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 at ignition on 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, 'WASHER FLUID LOW' 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	Other Warnings	Reason	Action
SYSTEM CHECK	None	Instrument cluster internal diagnostic routine	None
SYSTEM FAULT	Single chime, general program icon illuminated in message center	Terrain Response special programs not available due to system fault. Drive off-road with care.	Connect T4 to diagnose fault
RECOMMEND	Mud-ruts program icon illuminated in message center	Advisory message for Terrain Response special program displayed once every ignition cycle	Select low range if required
RECOMMEND	Grass Gravel Snow program icon illuminated in message center	Advisory message for Terrain Response special program (Only displayed on vehicles with manual transmission in low range, once every ignition cycle)	Select 2nd gear if required
RECOMMEND	Grass Gravel Snow program icon illuminated in message center	Advisory message for Terrain Response special program (Only displayed on vehicles with manual transmission in low range, once every ignition cycle)	Select 3rd gear if required
RECOMMEND	Mud-ruts program icon illuminated in message center	Advisory message for Terrain Response mud/ruts special program when in high range, displayed once every ignition cycle (Suspension raised automatically when in low range)	Raise suspension manually to off-road height if required
Terrain Response	All five program icons illuminated in message center	Advisory message to inform driver that Terrain Response special programs are off	None
SPECIAL	General program	Advisory message to	None



	icon illuminated in message center	inform driver that current special program has been switched off and general program is active	
CAUTION!	The active special program icon will be illuminated in message center	Only displayed when system would have normally provided off-road height, but driver has manually lowered the suspension (or the suspension system is unable to raise the vehicle)	Raise suspension manually to off-road height if possible and where appropriate
TRAILER	The active special program icon will be illuminated in message center	Advisory message displayed when Terrain Response system would normally have provided off-road height automatically, but system has detected an electrical load on trailer socket	If trailer or light board is connected, manually raise suspension to off-road height if safe to do so
SELECT LOW RANGE	Single chime, rock crawl program icon illuminated in message center	Terrain Response Rock Crawl special program has been requested but transfer box is in high range	Change transfer box to low range
SAND	Sand program icon illuminated in message center	Advisory message. Terrain Response Sand special program has been selected for more than 2 seconds and is currently active	None
ROCK CRAWL	Rock crawl program icon illuminated in message center	Advisory message. Terrain Response Rock Crawl special program has been selected for more than 2 seconds and is currently active	None
GRASS GRAVEL	Grass gravel snow program icon illuminated 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
MUD RUTS	Mud-ruts program	Advisory message.	None

	icon illuminated in message center	Terrain Response Mud/Ruts special program has been selected for more than 2 seconds and is currently active	
GRASS GRAVEL	Grass gravel snow program icon illuminated in message center	Advisory message. Terrain Response rotary control has been moved to the Grass Gravel Snow position. Program will be selected after 2 seconds	None
MUD-RUTS	Mud-ruts program icon illuminated in message center	Advisory message. Terrain Response rotary control has been moved to the Mud/Ruts position. Program will be selected after 2 seconds	None
SAND	Sand program icon illuminated in message center	Advisory message. Terrain Response rotary control has been moved to the Sand position. Program will be selected after 2 seconds	None
ROCK CRAWL	Rock crawl program icon illuminated in message center	Advisory message. Terrain Response rotary control has been moved to the Rock Crawl position. Program will be selected after 2 seconds	None
PROGRAM CHANGE	Selected special program icon illuminated in message center	Vehicle operating conditions prevent selection of program. This may be caused by ABS or DSC activity or electronically controlled differential(s)	If operating conditions change within 60 seconds, selected program will be activated. If message caused by electronically controlled differential(s) overheat, allow differential(s) to cool and attempt to reselect program.
SUSPENSION FAULT	Two chimes, amber indicator permanently illuminated.	A fault has been detected in the air suspension system. Only normal height is available.	Connect T4 to diagnose fault

SUSPENSION FAULT	Two chimes repeated regularly. Red indicator permanently illuminated.	A major fault detected in air suspension system. Height cannot be controlled correctly.	Connect T4 to diagnose fault
SLOW DOWN OR	Two chimes	Vehicle will rise automatically to normal height from crawl (locked access) height if vehicle speed increases.	Ensure the vehicle speed does not exceed 18.6 mph (30 km/h)
SLOW DOWN OR	Two chimes	Vehicle will automatically lower to normal height from off road height if vehicle speed increases.	Ensure the vehicle speed does not exceed 18.6 mph (30 km/h)
SUSPENSION	One chime	Air suspension compressor is cooling. Lifting will resume when compressor has cooled.	None
SUSPENSION	None	Vehicle is lifting slowly because reservoir is empty. Only displayed if lift time exceeds 12 seconds. This is not a system fault	None
SUSPENSION	One chime	Vehicle body has become trapped on an obstacle. Alternates with next message.	None
RESET SUSPENSION	None	Reselect height if door is open or press switch to exit extended mode.	None
SUSPENSION	None	Crawl (locked access) mode selected.	None
SUSPENSION	None	Access height selected.	None
SUSPENSION	None	Normal height selected.	None
SUSPENSION	None	Off road height selected.	None
SUSPENSION	Continuous chime while height is changing.	Air suspension remote control function is being operated.	None
SUSPENSION	One chime	Air suspension height change is prevented because a door is open.	Close all doors
SUSPENSION	One chime	A height change has been requested but is prevented because speed	None

		is too high.	
SUSPENSION FAULT	Two chimes, amber indicator permanently illuminated.	A fault has been detected in the air suspension system. System may still operate normally.	Connect T4
SUSPENSION	One chime	Vehicle height can only be raised with the engine running.	Start engine
KEY BATTERY LOW PLACE IN IGNITION TO CHARGE	None	Handset battery low	Place key in ignition to charge
SUSPENSION FAULT	Amber indicator lamp will be permanently illuminated	ACE system (if fitted) no longer available. Vehicle is still driveable.	Connect T4 to diagnose fault
SUSPENSION FAULT	The red indicator lamp will flash accompanied by a chime	Major component failure, stop vehicle immediately.	Connect T4 to diagnose fault
MEMORY 1	Double chime when selection complete	Memory system - confirmation that selection is completed	None
MEMORY 2	Double chime when selection complete	Memory system - confirmation that selection is completed	None
MEMORY 3	Double chime when selection complete	Memory system - confirmation that selection is completed	None
MEMORY 1	Single chime	Memory system - confirmation that memory has stored driver information	None
MEMORY 2	Single chime	Memory system - confirmation that memory has stored driver information	None
MEMORY 3	Single chime	Memory system - confirmation that memory has stored driver information	None
DOOR MIRROR DIP	Single chime	Memory system - confirmation that memory has stored driver information	None
DSC	Amber indicator	System not available due	To reselect press DSC

	permanently illuminated	to DSC switched off by driver.	switch
HDC FAULT	One chime	System fault, drive with care and do not attempt to descend steep slopes.	Connect T4 to diagnose fault
HDC TEMPORARILY	Green indicator flashing	HDC switched off while brake system is cooling	Wait until message is deleted before attempting descent
HDC	Green indicator flashing	HDC unavailable, speed threshold exceeded (Max HDC operating speed is 31 mph (50 km/h), max speed for HDC selection is 50 mph (80 km/h)).	None
HDC	Green indicator flashing	HDC inoperative because of incorrect gear selection. (HDC operates in 1st and reverse on manual transmissions and CommandShift™ 1st, R and D on automatic transmissions in high range. (In low range, HDC operates in all gears for manual and automatic transmissions).	None
HDC	One chime (if deselected by Terrain Response system or 80 km/h speed threshold exceeded)	HDC switched off by driver, Terrain Response system or speed threshold.	None
FUEL TANK CAP	None	NAS Only - DMTL pump unable to pressurise system	Tighten or replace cap. Check system for leaks
ENGINE SYSTEM	MIL illuminated	ECM has detected a fault in the engine management system	Connect T4 to diagnose fault
HIGH ENGINE	None	Idle speed increased to assist engine cooling	None
TRANSMISSION	None	Advises driver that automatic transmission has a fault and performance may be affected	Connect T4 to diagnose fault
TRANSMISSION	None	Advises driver that	Connect T4 to diagnose

FAULT		automatic transmission has a fault	fault
TRANSMISSION	None	Advises driver that fault has occurred and transmission temperature is too high.	Connect T4 to diagnose fault
TRANSMISSION	None	Advises driver that transmission temperature is too high. slow down or stop to assist cooling.	Check transmission for faults
REVERSE GEAR	None	Advises driver that reverse gear has been selected - Japanese market vehicles only	None
LOW RANGE	One chime. Low range indicator flashes when range change is in progress. Indicator is permanently illuminated when range change is complete	Advises driver that transfer box is in low range.	None
HIGH RANGE	One chime. Low range indicator lamp is extinguished.	Advises driver that transfer box has engaged high range.	None
SPEED TOO HIGH	One chime	Driver has requested range change when vehicle speed is too high.	Reduce speed to 40 km/h on automatic transmission and 20 km/h on manual transmission
SELECT NEUTRAL	One chime	Alerts driver that range change will not occur until neutral is selected on the transmission.	None
PARK LOCK	One chime per second for 3 seconds.	Automatic transmission park lock function ineffective due to transfer box being out of high or low range. Transfer box control module stopped transmitting on the CAN bus or while in neutral mode.	Connect T4 to diagnose fault
TRANSMISSION	One chime	Rear differential temperature has reached	None

		or is approaching the overheat threshold.	
TRANSMISSION	None	Fault has occurred which is preventing transfer box range change	Connect T4 to diagnose fault
TRANSMISSION	One chime	Transfer box control module has stopped transmitting CAN bus messages. Defaults to open center differential.	Connect T4 to diagnose fault
TRANSMISSION	None	Fault has occurred with electronic rear differential. Stop vehicle at earliest opportunity	Connect T4 to diagnose fault
CRUISE CONTROL CANCELLED	None	Driver has disabled the adaptive cruise control system	None
CHECK ALL	None	Advisory message, pressure in a running tire decreased to first warning threshold.	None
TYRE PRESSURES	Chimes emitted for a short time, amber indicator illuminated	Check tyre pressures	Inflate tyres to correct pressure
TYRE PRESSURES	Chimes emitted for a short time, amber indicator illuminated	Check tyre pressures	Inflate tyres to correct pressure
FRONT LEFT	Chimes emitted for a short time, amber indicator illuminated.	Pressure in a running tire decreased to warning threshold.	Inflate tires to correct pressure
FRONT RIGHT	Chimes emitted for a short time, amber indicator illuminated.	Pressure in a running tire decreased to warning threshold.	Inflate tires to correct pressure
REAR LEFT	Chimes emitted for a short time, amber indicator illuminated.	Pressure in a running tire decreased to warning threshold.	Inflate tires to correct pressure
REAR RIGHT	Chimes emitted for a short time, amber indicator illuminated.	Pressure in a running tire decreased to warning threshold.	Inflate tires to correct pressure
FRONT LEFT	None	Pressure in a running tire too high threshold reached.	Inflate tires to correct pressure

FRONT RIGHT	None	Pressure in a running tire too high threshold reached.	Inflate tires to correct pressure
REAR LEFT	None	Pressure in a running tire too high threshold reached.	Inflate tires to correct pressure
REAR RIGHT	None	Pressure in a running tire too high threshold reached.	Inflate tires to correct pressure
TYRE PRESSURE	Chimes emitted for a short time, amber indicator permanently illuminated. Chimes emitted and amber indicator permanently illuminated at subsequent ignition on cycles.	TPMS fault has occurred. Use diagnostics to check for correct system functionality.	Connect T4 to diagnose fault
TYRE PRESSURE	No instrument cluster indicator illumination. TPMS switch status LED illuminated.	TPMS system set by driver for heavy load operation.	None
TYRE PRESSURE	None	Normal setting for TPMS.	None
CHECK	None	Pressure in spare tire decreased to warning threshold.	Inflate tires to correct pressure
FRONT LEFT	Chimes emitted for a short time, amber indicator permanently illuminated. Chimes emitted and amber indicator permanently illuminated at subsequent ignition on cycles.	Possible loss of RF transmission or defective sensor battery.	Connect T4 to diagnose fault
FRONT RIGHT	Chimes emitted for a short time, amber indicator permanently illuminated. Chimes	Possible loss of RF transmission or defective sensor battery.	Connect T4 to diagnose fault



	emitted and amber indicator permanently illuminated at subsequent ignition on cycles.		
REAR LEFT	Chimes emitted for a short time, amber indicator permanently illuminated. Chimes emitted and amber indicator permanently illuminated at subsequent ignition on cycles.	Possible loss of RF transmission or defective sensor battery.	Connect T4 to diagnose fault
REAR RIGHT	Chimes emitted for a short time, amber indicator permanently illuminated. Chimes emitted and amber indicator permanently illuminated at subsequent ignition on cycles.	Possible loss of RF transmission or defective sensor battery.	Connect T4 to diagnose fault
PARK BRAKE	Park brake amber indicator illuminates and red indicator flashes	Loss of CAN or vehicle speed signal is missing	The vehicle cannot be parked by the park brake system in the normal way until the ignition key is removed and a park brake switch apply request is made
PARK BRAKE FAULT	Park brake red indicator flashes	Possible motor fault when driver requested a switch application	Connect T4 to diagnose fault
PARK BRAKE	Park brake red indicator flashes	The park brake bedding cycle has been initiated by the dealer technician	Follow bedding-in procedure in Service Procedures manual
CAUTION!	Park brake red lamp permanently illuminated	The park brake is applied when the vehicle is moving	Do not use the park brake system when the vehicle is moving, except in an emergency
PARK BRAKE	Park brake amber	Possible system	Follow message

FAULT	indicator permanently illuminates	malfunction detected	instruction
PRESS FOOT BRAKE	None	Park brake system release is inhibited until footbrake is pressed	Follow message instruction
PRESS FOOT BRAKE	None	Park brake system release is prevented until foot brake or clutch pedal is pressed	Follow message instruction
PARK BRAKE FAULT	Park brake amber indicator permanently illuminated	Drive away release function is not operating	Use park brake switch and foot brake to release
PARK BRAKE	Park brake red indicator flashes	An emergency release operation has been detected	Pull park brake switch to re-engage emergency release
LOW WASHER FLUID	Single chime at ignition on.	Washer fluid quantity below 1 litre	Add water and additive mixture to washer bottle
HEADLAMP OFF	None	Driver has selected headlamp feature by turning ignition off before turning off headlamps	None
LOW COOLANT	None	Coolant level in header tank below recommended level	Check coolant system for leaks and top up to correct levels
DRIVER'S	None	Driver's door open or not fully closed	None
LEFT REAR	None	Left rear door open or not fully closed	None
FRONT PASSENGER	None	Front passenger door open or not fully closed	None
RIGHT REAR	None	Right rear door open or not fully closed	None
TAILGATE	None	Tailgate open or not fully closed	None
BONNET	None	Bonnet open or not fully closed	None
SETTINGS	None	Driver has accessed the 'Customer Settings menu	Use the steering wheel switches to view and change the settings menus or press the trip computer button to exit the setting menu

INTERIOR LIGHT OFF	None	Driver has selected the interior lamps off	None
AUTOMATIC MODE	None	Driver has enabled the interior lamps	None

## Ambient Temperature

The external ambient air temperature is measured by a sensor located on the right hand side of the bonnet locking platform, behind the front grill. The sensor is connected to the HEVAC module. The HEVAC module outputs temperature messages on the CAN bus which are used by the instrument cluster to display the current ambient temperature.

The message center displays the ambient temperature in the top right hand corner of the LCD display. The temperature is displayed until the message center is required to display system information. When system information has been displayed, the ambient temperature will reappear. The temperature is displayed in °F or °C depending the market configuration of the vehicle. The driver can also change the temperature reading using the 'Customer Settings' function.

### Cold Warning Indication

When the ambient temperature is being displayed, if the temperature falls to 4°C or below, the cold warning symbol will display. The cold warning symbol is in the form of a snow flake and will flash on and off, five times at a frequency of 2Hz. An audible warning will also be emitted by the instrument cluster to alert the driver. After the fifth flash of the symbol, the display will continue to display the snow flake symbol in place of 'EXT' until a temperature of 6°C or higher is measured.

The cold warning will only be displayed once during an ignition cycle. If the ambient temperature rises to 6°C or above and then subsequently falls to 4°C or below during the same ignition cycle, the warning will be repeated.

If the display mode changes to a mode which does not display the ambient temperature during the warning period, the cold warning will be cancelled.

## INFORMATION DISPLAY

The information display is an Liquid Crystal display (LCD) located on the right hand side at the bottom of the instrument cluster. The LCD has a viewable area of 43 mm X 20 mm with a seven segment display. When active, the information display is illuminated as follows:

- Pressing of the Trip button will cause the odometer to illuminate and the odometer and trip distance only will be displayed for a period of 20 seconds
- Ignition on will cause the odometer to illuminate with the full functions displayed

When the ignition is switched on and the lights are off, the information display will illuminate at full, normal brightness, controlled by the ambient light sensor. If the lights are switched on, the intensity of illumination is reduced to a level determined by the PWM dimmer control located on the lighting control switch.

The data shown in the information display is provided to the instrument cluster from other subsystem modules in the form of CAN bus messages. The odometer and trip meter information is derived from the ABS module, the transmission information is supplied from the transmission control module for automatic transmission vehicles or from the transfer box control module for manual transmission.

## **Odometer**

The odometer displays the total distance which the vehicle has travelled. This is calculated by a microprocessor in the instrument cluster using wheel speed messages from the ABS module.

The odometer display can show 6 characters and distances up to 999,999 miles or kilometres. When the ignition is switched off, the odometer reading can be displayed by pressing the trip rest button. The reading will illuminate for a short time before extinguishing.

The total distance travelled is recorded in the instrument cluster Electronically Erasable Programmable Read Only Memory (EEPROM) and the Random Access Memory (RAM). This ensures that the total distance is not lost if the battery is disconnected. The distance is read and stored every 2 kilometres or miles travelled.

## **Trip Meter**

The trip meter displays the total distance which the vehicle has travelled since the last trip meter reset. The trip meter display can show four characters, with a decimal point separating the fourth character which displays 1/10th mile or kilometre. The trip meter can display up kilometres. When this figure is exceeded, the trip display starts again from 000.0 kilometres.

The trip meter can be reset by pressing the trip reset button on the instrument cluster for two seconds. The trip data is stored in the instrument cluster RAM but not in the EEPROM, therefore, if the battery is disconnected, the trip data will be lost and the display will show 000.0 when the battery is reconnected.

## **Gear Position Indicator**

### **Automatic Transmission**

The gear position indicator shows the current selector lever position on vehicles with automatic transmission. During normal operation the display will show 'P' for Park, 'R'

for reverse, 'N' for Neutral and 'D' for Drive.

When the transmission is operated in 'CommandShift™' mode, the display shows the currently selected manual gear; 1, 2, 3, 4, 5 or 6.

The gear position indicator can also display automatic transmission fault information. The following letters are displayed to relay the fault type to the driver:

- 'F' - Transmission Control Module (TCM) has a fault and is using the default limp home mode
- 'H' - TCM has a fault, the default limp home mode is active and the transmission has reached an overheat temperature of more than 137°C
- 'E' - TCM has disabled CAN bus transmission because of a CAN bus failure or because of a transmission overheat temperature of more than 140°C

## **PRND and Sport Display**

The PRND display is only active on vehicles with automatic transmission. The instrument cluster receives CAN bus messages from the TCM for the current selector lever position. This information is used by the instrument cluster to display the current selector lever position.

If the transmission selector lever is moved to the SPORT position, the term 'Sport' is displayed in the LCD. If the selector lever is subsequently moved forward or backwards the transmission operates in 'CommandShift™' mode, the 'Sport' display goes off and the gear position indicator displays the current selected manual gear.

## **Service Interval Indicator (SII)**

The service interval indicator is displayed in the information display. This provides information to the driver warning of an impending service requirement.

The service interval is displayed for 3 seconds when the ignition is switched on. The service interval is reset by the dealer using T4 or a manual reset procedure and, once set, counts down the mileage and time in days to the next service.

The service interval varies depending on market and vehicle engine fitment. In some Eastern European countries, South American countries, Middle East and African countries and some Asia Pacific countries the SII is disabled.

Two levels of service warning are provided; remaining distance and periodic inspection.

### **Remaining Distance**

The remaining distance is calculated by the instrument cluster by using the current odometer value and the last service reset odometer value. The instrument cluster uses these two values to calculate the distance remaining to the next service. The remaining

distance value is used to display the oil service requirement.

The mileage is displayed to the nearest 50 Km. If the service interval passes zero without being reset, the instrument pack will continue counting down and the remaining distance display will show a negative (-) value.

The trigger point for displaying the remaining distance is 2500 Km or less depending on the market configuration of the vehicle and is contained within the Car Configuration File (CCF).

### **Periodic Inspection**

The periodic inspection is calculated by the instrument cluster by using the elapsed days since the last service indicator reset. The periodic inspection value is used to display the inspection service requirement.

The trigger point for displaying the periodic inspection is dependant on the market configuration of the vehicle and is contained within the CCF.

### **Driver Alert**

When an ignition on signal is received by the instrument cluster, the cluster software performs a check to establish if any or both of the driver service alert thresholds have been reached. If a driver alert threshold has been enabled, the applicable service information will be displayed in the information display for 5 seconds. After the 5 second display has elapsed, the information display shows the normal odometer and trip information.

If both the remaining distance and the periodic inspection service thresholds are reached, the oil service and inspection service will be displayed for 2.5 seconds each.

The type of remaining distance service displayed is calculated by the instrument cluster. If the last remaining distance service was an 'oil' service, then the instrument cluster will display that an 'inspection' service is due and visa versa.

### **Reset Procedure**

There are two ways of resetting the service interval indicator. T4 can be connected to the vehicle and diagnostic routine performed or a manual reset procedure can be performed using the trip reset button on the instrument cluster.

#### **Manual Reset Procedure**

- Press and hold the trip reset button.
- Turn the ignition switch on to the ignition position II.
- If the SII function is set in the CCF the information display will flash 'SERVICE' for 5 seconds and then display 'SERVICE' constantly. If the SII function is not set

in the CFF the information display will show the normal odometer and trip information.

- The software will check if remaining distance service is enabled (threshold reached). If the remaining distance service is not enabled the procedure will continue from step K.
- If the trip reset button is released within 10 seconds of entering the reset mode, the information display will show 'OIL'.
- If the trip reset button is not released after 10 seconds, the display will show the next service type and distance/days to next service and the instrument cluster will exit the manual reset procedure.
- If the oil service value reset is not required, press the trip reset button within 10 seconds of releasing it in step E and hold for less than 5 seconds and proceed to step H. This will by-pass the oil service reset procedure.
- If the oil service value is to be reset, press the trip reset button within 10 seconds of releasing it and hold for more than 5 seconds. The information display will show 'RESET' for 5 seconds and then reset the oil service value.
- If reset is not possible, the information display will show 'CANNOT RESET' for 5 seconds.
- The information display will show 'INSPECT'.
- If the inspection service value reset is not required, press the trip reset button within 10 seconds of releasing it in step G and hold for less than 5 seconds and proceed to step K. This will by-pass the inspection service reset procedure.
- If the trip reset button is not pressed after 10 seconds, the display will show the next service type and distance/days to next service and the instrument cluster will exit the manual reset procedure.
- If the inspection service value is to be reset, press the trip reset button within 10 seconds of releasing it and hold for more than 5 seconds. The information display will show 'RESET' for 5 seconds and then reset the inspection service value.
- If reset is not possible, the information display will show 'CANNOT RESET' for 5 seconds.
- The software will check if date service is enabled (threshold reached). If the date service is not enabled the procedure will continue from step O.
- The information display will show 'DATE'.
- If the date service value reset is not required, press the trip reset button within 10 seconds of releasing it in step I and hold for less than 5 seconds and proceed to step O. This will by-pass the date service reset procedure.
- If the trip reset button is not pressed after 10 seconds, the display will show the next service type and distance/days to next service and the instrument cluster will exit the manual reset procedure.
- If the date service value is to be reset, press the trip reset button within 10 seconds of releasing it and hold for more than 5 seconds. The information display will show 'RESET' for 5 seconds and then reset the date service value.
- The information display will show 'END'.
- If the trip reset button is pressed within 10 seconds and pressed for less than 5 seconds the procedure will return to step E.

- If the trip reset button is not pressed after 10 seconds, the display will show the next service type and distance/days to next service and the instrument cluster will exit the manual reset procedure.
- If the trip reset button is pressed within 10 seconds and pressed and held for more than 5 seconds the information display will show the next service type and distance/days to next service and the instrument cluster will exit the manual reset procedure.

## CUSTOMER SETTINGS

The customer settings procedure allows the driver to adjust certain vehicle settings to change the functionality of selected vehicle functions. The customer settings feature is only available on vehicles with a high line instrument cluster.

The vehicle will identify the driver of the vehicle from the vehicle key and restore the functionality to that set by that driver. Each vehicle can have up to three identifiable vehicle keys, so each driver can set their preferences which are recalled when a particular key is used to access the vehicle.

The settings are stored in the instrument cluster EEPROM. Each vehicle has a factory set car configuration file which defines the settings for selected vehicle functions. The factory settings are retained and the system can be changed back to the factory default settings by either the dealer or the driver at any time.

### NOTE:

The factory default settings may differ between market configuration of the vehicle.

The customer settings system is controlled by CAN bus message inputs and outputs from the instrument cluster, the Central Junction Box (CJB), the ABS Module and the Integrated Head Unit (IHU). The following table details the modules and their associated function within the settings system.

Module	Output Information
Central Junction Box (CJB)	Remote handset identity
Ignition key position	
ABS Module	Vehicle moving
Instrument Cluster	Settings Status
Car configuration parameters	
Driver identity	
Integrated Head Unit (IHU)	Scan UP button pressed
Scan DOWN button pressed	
Volume + button pressed	
Volume - button pressed	
Distance unit request	
Consumption unit request	
Language request	



The following systems/functions support the customer settings system.

- HEVAC control module
- Central Junction Box
- Instrument cluster
- Memory control module
- Navigation control module
- Interior lights (CJB function)
- Exterior lights (CJB function)
- Central door locking (CJB function).

## **Customer Settings Functionality**

The customer settings menu is entered by pressing and releasing the trip computer button on the left hand multifunction switch stalk. For reasons of safety, the settings menu will only be displayed if the vehicle is stationary (vehicle speed signal must be below 3 km/h). This is to prevent driver distraction when operating the system. At speeds above 3 km/h the settings screen is not displayed.

Once the instrument cluster has entered the settings mode, the selections can be scrolled through in turn using the ICE radio control switches located on the steering wheel. The radio search up and down buttons |<< >>| allow for selection through the menus. The radio volume switches +/- select the values for the current menu displayed.

When the settings menu is entered, the message center shows the 'SETTINGS' welcome message.

This display allows the driver the option of scrolling through the settings menus or exiting the settings function.

The driver can select the first settings menu by pressing the radio search button >>| or the last settings menu by pressing the radio search button |<<. After a selection is made, the setting will be saved by either proceeding to the next menu or exiting the customer settings menu. Pressing the trip computer button at any time will exit the customer settings system.

If a menu parameter is changed, it will be automatically saved when the next menu is selected or the customer settings menu is exited.

### **NOTE:**

If the vehicle is not fitted with a fuel burning heater, the first available menu will be the Trip distance.

### **Fuel Burning Heater (FBH) Timer (only on TdV6 models with fuel burning heater fitted)**

The FBH timer menu allows the driver adjust the pre-heat time and the pre-heat on time using three separate menu displays. The pre-heat display is the first menu and allows the driver to select a delay period or disable the pre-heat function. If OFF is not selected, the next press of the radio search button >>| displays the pre-heat on time hour menu and a further press of the radio search button >>| displays the pre-heat on time minutes menu.

### **CABIN PRE-HEAT**

The 'CABIN PRE-HEAT' menu allows the driver to select the pre-heat settings:

- OFF (default)
- 30 Mins

If 'OFF' is selected, when the radio search button >>| is pressed, the settings menu will display the next function menu and not the pre-heat start time menus.

### **CABIN PRE-HEAT START TIME**

The 'PRE-HEAT START TIME' menu allows the driver to select the on time hour as shown in the following table:

#### **NOTE:**

The display can be in a 24 Hour or a 12 Hour display which is defined by the clock setting in the Integrated Head Unit (IHU).

<b>24 Hour</b>	<b>12 Hour</b>
00	12 am
01	01 am
02	02 am
03	03 am
04	04 am
05	05 am
06	06 am
07 (default)	07 am (default)
08	08 am
09	09 am
10	10 am
11	11 am
12	12 pm
13	01 pm

14	02 pm
15	03 pm
16	04 pm
17	05 pm
18	06 pm
19	07 pm
20	08 pm
21	09 pm
22	10 pm
23	11 pm

The 'CABIN PRE-HEAT START TIME' menu allows the driver to select the on time minutes which are displayed in increments of 15 minutes between 0 and 60 minutes. The default for the minutes is 0. The value is changed by pressing the + or - buttons on the steering wheel. If the button is pressed and held for more than 4 seconds, the time increments at one hour per second for as long as the button is pressed.

### **CABIN PRE-COOL**

The 'CABIN PRE-COOL' menu allows the driver to select the pre-cool settings:

- OFF (default)
- 30 Mins

If 'OFF' is selected, when the radio search button >>| is pressed, the settings menu will display the next function menu and not the 'Cabin Pre-Cool Start Time' menus.

The Pre-Cool on time hour is as shown in the previous table for Cabin Pre-Heat Start Time. The 'PRE-COOL START TIME' menu allows the driver to select the on time minutes which are displayed in increments of 15 minutes between 0 and 60 minutes. The default for the minutes is 0. The value is changed by pressing the + or - buttons on the steering wheel. If the button is pressed and held for more than 4 seconds, the time increments at one hour per second for as long as the button is pressed.

### **TRIP DISTANCE UNITS**

The 'TRIP DISTANCE UNITS' menu allows the driver to adjust the units in which the trip distance is displayed in the trip computer display. The units can be changed using the steering wheel + or - buttons.

The menu allows the driver to select the following units:

- MILES (mph) (default)
- KM (Km/h)

## **FUEL USAGE UNITS**

The 'FUEL USAGE UNITS' menu allows the driver to change the units in which the fuel consumption is displayed in the trip computer. The units can be changed using the steering wheel + or - buttons.

The menu allows the driver to select the following units:

- MPG (default)
- LITRE/100KM
- KM/LITRE

## **TEMPERATURE DISPLAY UNITS**

The 'TEMP. DISPLAY UNITS' menu allows the driver to change the units in which the external temperature is displayed in the message center. The units can be changed using the steering wheel + or - buttons.

The menu allows the driver to select the following units:

- Degrees C (default)
- Degrees F

## **PROGRAMMABLE OVERSPEED WARNING**

The 'OVERSPEED WARNING' menu allows the driver to set the overspeed warning threshold. The threshold can be changed using the steering wheel + or - buttons.

The menu allows the driver to select the following:

- KM/H - 10 to 250 Km/h in increments of 5 Km/h. The default value is OFF.

If the units are changed from miles to kilometres or visa versa, the overspeed warning value will go to the default OFF value.

## **HEADLAMP TIMER**

The 'HEADLAMP OFF DELAY' menu allows the driver to adjust the delay period for the headlamp delay after the ignition is switched off function. The delay period can be changed using the steering wheel + or - buttons.

The menu allows the driver to select the following delay periods (in seconds):

- 30 (default)
- 60
- 120
- 240

### **DOORS LOCK ON DRIVEAWAY**

The 'DRIVE AWAY DOOR LOCKING' menu allows the driver to disable or enable the door automatic lock function. The feature can be changed to on or off using the steering wheel + or - buttons.

The menu allows the driver to select the following:

- OFF
- ON (default)

### **MIRROR DIP IN REVERSE (if fitted)**

The 'REVERSE MIRROR DIP' menu allows the driver to disable or enable the automatic exterior mirror dip in reverse function. The feature can be changed to on or off using the steering wheel + or - buttons.

The menu allows the driver to select the following:

- OFF
- ON (default)

### **LAZY ENTRY (if memory module fitted)**

The 'LAZY ENTRY' menu allows the driver to disable or enable the lazy entry function which moves the exterior door mirror and the seat position to that set by the driver. The memory positions are stored in the memory module and the individual settings are recognised from the ignition key identification. The feature can be changed to on or off using the steering wheel + or - buttons.

The menu allows the driver to select the following:

- OFF (default)
- ON

## **RESTORE FACTORY SETTINGS**

The 'RESTORE DEFAULT SETTINGS' menu allows the driver to change all customer settings menus to the factory default settings. The settings are programmed into the Car Configuration File (CCF) and cannot be overwritten. The defaults can be reset by selecting 'Yes' using the steering wheel + or - buttons.

The menu allows the driver to select the following:

- YES
- NO (default)

## **AUDIBLE WARNINGS**

The instrument cluster can generate audible warnings to alert the driver to a displayed message and change of vehicle operating condition. The audible warning is generated by a sounder located within the instrument cluster. The audible warnings are categorised into one of three types; warning message indicator lamp alert tones, system status tones and turn signal indicator status tones. The following warning chimes are produced by various vehicle subsystems:

- Lights on warning
- Seat belt warning
- Turn signal indicator/hazard warning indicator warning
- Overspeed warning
- Seat memory warning
- Front parking aid warning
- Alarm system warning
- Key in warning
- Engine coolant over temperature warning
- Air suspension warning
- Tyre pressure monitoring warning
- Adaptive cruise warning
- Electronic park brake warning
- Automatic transmission warning
- Transfer box warning
- Rear differential warning
- Brake pad wear warning
- Low washer fluid warning
- ABS system fault warning
- Brake system fault warning
- Dynamic stability control fault warning
- Hill descent control fault warning
- Hill descent control active warning
- Hill descent control information warning
- Supplementary restraint system warning

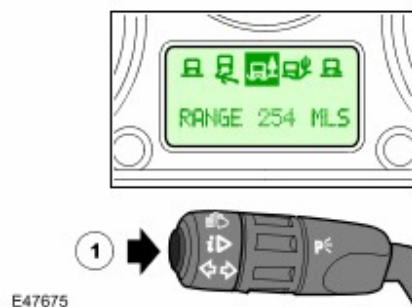
- Engine management system warning
- Low engine oil pressure
- Trip computer overspeed.

The audible warning takes the form of either a single chime, a double chime or a repeating chime. The audible warnings are initiated by a CAN bus message from the requesting subsystem control module or by the instrument cluster software.

## TRIP COMPUTER

### General

The high line instrument cluster contains software which enables the use of an on-board trip computer. The computer allows the driver to access information for current fuel usage, current journey length, average speed and estimated distance on fuel remaining. The information is displayed in the lower part of the message center, providing no other high priority messages are being displayed. If no messages are being displayed or the displayed message is of a low priority, the trip computer will be permitted use of the message center.



E47675

Item	Part Number	Description
1	-	Trip computer button

The driver is able to access the computer and change some parameters which control the information display using the trip computer button on the left hand multifunction switch stalk.

### Trip Computer Functionality

When the engine is started the instrument cluster enters a diagnostic mode and displays a 'System Check in Progress' message in the message center. Once complete, the instrument cluster then displays any warning messages, i.e.; DRIVER'S DOOR OPEN, in priority order.

When any applicable messages have been displayed the message center displays information in mode 3E. Pressing the trip computer button once will display the customer settings menu, if the vehicle is stationary. A second press of the button will exit the

settings menu and the trip information will be displayed. If the vehicle is moving the settings menu display will be ignored and the trip computer information will be displayed in the following order:

- Trip Distance
  - The trip distance since the last reset is displayed.
  - Pressing the trip computer button for more than 2 seconds will reset the trip distance. The display will show dashes for 3 seconds and then change to zeros.
  - Pressing the trip computer button for less than 2 seconds will change the display to the next feature.
- Range
  - The range is displayed showing the distance which can be travelled using the fuel remaining in the fuel tank.
  - Pressing the trip computer button for less than 2 seconds will change the display to the next feature.
- Average Fuel Consumption
  - The average fuel consumption is displayed.
  - Pressing the trip computer button for more than 2 seconds will reset the average fuel consumption. The display will show dashes for 3 seconds and then change to zeros.
  - Pressing the trip computer button for less than 2 seconds will change the display to the next feature.
- Average Speed
  - The average speed is displayed.
  - Pressing the trip computer button for more than 2 seconds will reset the average speed. The display will show dashes for 3 seconds and then change to zeros.
  - Pressing the trip computer button for less than 2 seconds will change the display to the next feature.
- Overspeed Warning
  - The overspeed warning is only displayed if enabled in the customer settings.
  - Pressing the trip computer button for more than 2 seconds will turn the overspeed warning off. A second press of the trip computer button for more than 2 seconds will enable the overspeed warning.
  - Pressing the trip computer button for less than 2 seconds will change the display to the next feature.
- Warning Messages
  - Any warning messages are now displayed. If more than one message is present, each message will be shown for 3 seconds. When all messages have been shown, the display will go blank momentarily, before the display reverts to the mode 3E.



- Pressing the trip computer button for less than 2 seconds during the warning message display will cancel the trip computer and the the message center will display the mode 3E.

## **Parking Aid**

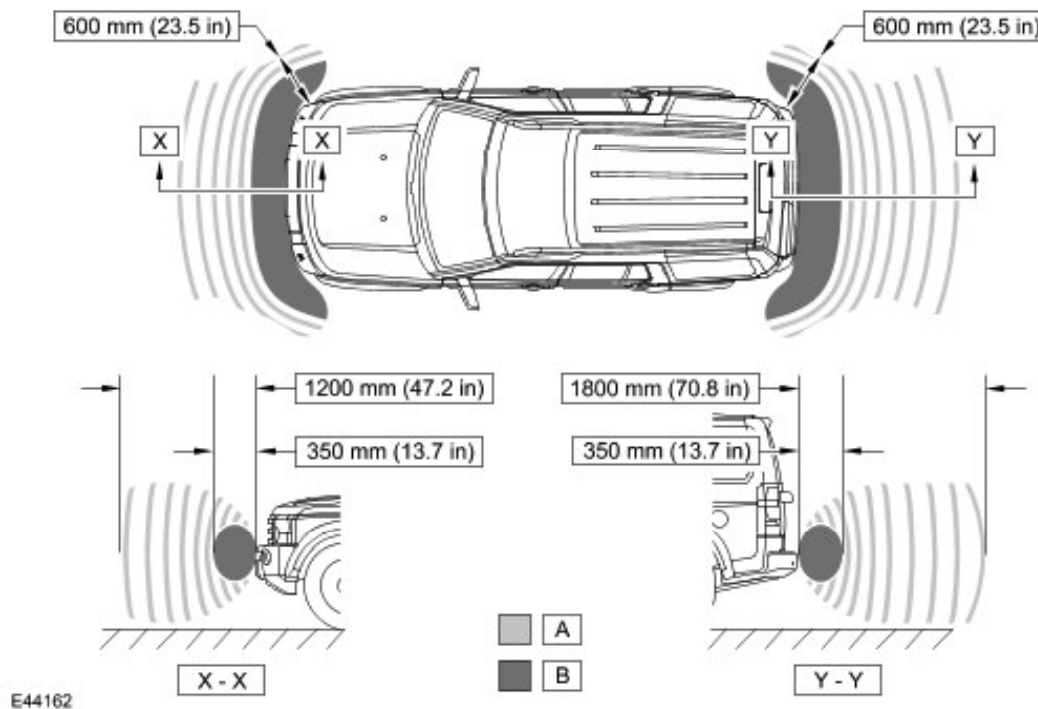
### **Sensor Operation**

The parking aid module processes the distance readings from the ultrasonic sensors to determine if there are any objects within the detection areas. If there are no objects in the detection areas, there are no further audible warnings. If an object is detected, repeated audible warnings are produced on the parking aid sounder.

The maximum detection range is 1800 mm. When an object is detected, the time delay between the audible warning tones decreases as the distance between the detected object and the vehicle decreases until, at approximately 350 mm , the audible warning tone is continuous.

After the initial detection of an object, if there is no decrease in the distance between an object and the central sensors, the time delay between the audible warnings remains constant. If an object is detected by one of the corner sensors only, the audible warnings stop after about 5 seconds if there is no change in the distance between the object and the corner sensor.

### **Detection Area**



## Detection Calculation

When operating in the combined transmitter and receiver mode, the sensor outputs a number ultrasonic pulses and receives the reflected echo signal. The parking aid module amplifies the received echo signals and compares them with a preprogrammed threshold to calculate the distance to the object. This is achieved by determining the elapsed time between the transmission and reception of the ultrasonic signal.

When operating in receiver mode, the sensor receives echo signals transmitted by an adjacent sensor. This mode is used to improve the accuracy of the system.

The detection cycle consists of the parking aid module operating one sensor in the combined transmitter and receiver mode and transmitting a number of ultrasonic pulses. The module then switches the transmitting sensor and the adjacent sensor(s) to receiver mode. After a short time delay, this sequence is repeated using a different sensor to transmit the ultrasonic pulse and continues until all four sensors have output an ultrasonic signal. This sequence is completed in 100ms. The module uses several measurements of the same sensors to remove errors from the calculation.

If the object is directly behind a sensor, the distance is calculated using the time between the transmission and reception of the signal. If the object is positioned

between two sensors, the parking aid module uses both signals to determine the correct distance using triangulation.

To perform the triangulation calculation, the parking aid module must know the distance between the individual sensors in the bumper. This information is stored in the module memory. From the received distance from each sensor and using the known distance between adjacent sensors, the module can calculate the minimum distance from the vehicle to the object.

When approaching several objects, the module recognises the distance from the vehicle to the nearest object.

## **Navigation System**

### **INTRODUCTION TO THE GLOBAL POSITIONING SYSTEM (GPS)**

The system used to calculate the current position of the vehicle is called the GPS (global positioning system). The system utilises satellites which are owned by the United States Department of Defence (DoD). A total of 24 satellites circular orbit the earth every 12 hours at a height of 20,000 km , and between 5 and 11 of these satellites can be seen from a single point at any given time. The orbits are tilted to the earth's equator by 55 degrees to ensure coverage of polar regions. Each satellite transmits radio signals to provide information about the satellite position i.e. latitude, longitude, altitude, almanac data and an accurate time signal generated by an on-board atomic clock. Each satellite contains four atomic clocks.

The vehicle needs to receive data from at least four different satellites to give a three dimensional fix on its current position.

As the vehicle moves, this information is continually being updated. The computer determines which satellites are 'visible' to the system and their current

position and relationship to each other. Using this information the computer can account for positional deviations of the satellites and compensate to enhance the accuracy of the navigation system.

The GPS signal is also known as the Precision positioning signal (PPS). This is now the only GPS signal available, since the Selective positioning signal (a deliberately degraded signal) was turned off on the 2nd May 2000. This ensures that everyone can now use the higher accuracy available with PPS.

SPS predictable accuracy was:

- \* 100 metres horizontal accuracy
- \* 156 metres vertical accuracy
- \* 340 nanoseconds time accuracy.

PPS predictable accuracy is :

- \* 22 metres horizontal accuracy
- \* 27.7 metres vertical accuracy
- \* 200 nanoseconds time accuracy.

Each navigation system provides computer generated audible and visual route guidance information to enable the driver to reach a desired destination. The system allows the driver to choose the desired route using minor or major roads or motorways and the quickest or shortest route. Directions to hospitals, museums, monuments and hotels are also available. The computer uses map information stored on a CD-ROM to determine the best route for the journey and provide the driver with details of directions and approaching junctions.

The system uses almanac data to determine the vehicles position. Almanac data is the current status of the 24 satellites which orbit the earth. The computer determines which satellites are 'visible' to the system and their current position and relationship to each other. Using this information the computer can account for positional deviations of the satellites and compensate to enhance the accuracy of the navigation system. The navigation system requires the almanac data from at least four different satellites to calculate a three dimensional 'fix' on its location. As the vehicle moves the computer continually updates this information so that at all times the computer knows the precise location of the vehicle.

## **Touch Screen Display**

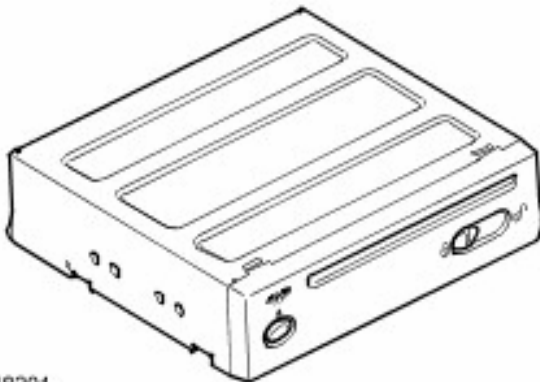


E48202

The Touch Screen Display (TSD) is located in the centre of the instrument panel. The TSD is a touch sensitive 7 inch LCD VGA screen containing 800 x 480 pixels in a 15:9 format. The TSD is connected to the infotainment system on the Media Oriented Systems Transport (MOST) ring. The MOST ring is a fibre optic communications data bus that allows high speed transfer of control instructions and audio around the system.

The TSD processes its own video for system operation but receives the navigation graphics from the navigation computer on a dedicated serial link called GVIF (Gigabit Video Interface)

## Navigation Computer



E48201

The navigation computer is located under the left hand front seat. The computer is the main component in the navigation system and receives inputs from the ABS Unit and the GPS antenna. The navigation computer contains a solid state piezo gyro which measures the motion of the vehicle around its vertical axis. The gyro operates on the principle known as the Coriolis force. The Coriolis force is the force that appears to accelerate a body moving away from its rotational axis against the direction of rotation of the axis. Using the inputs from the ABS unit,

the GPS antenna and the gyro sensor, the computer calculates the vehicle's current position, direction and speed.

The navigation computer also houses the DVD-ROM drive. The drive is used to read map data from region specific DVD's (1 DVD for each of the following regions: EU, US, Japan and Australia). A button, located adjacent to the DVD slot, is provided to eject the DVD from the unit. If ignition is on, or the Entertainment System is in 1-hour mode, one press of the button will eject the DVD.

The GPS receiver receives information from between 1 and 8 satellites at any one time. This information is received from the GPS antenna. The built in GPS receiver is used for calculating the position (i.e. Latitude, longitude and height), direction and speed.

The navigation computer uses non-volatile memory to store settings and configuration information when it is powered down. This process takes place just before the computer turns off.

## **NAVIGATION SYSTEM OPERATION**

The navigation system receives GPS information via the GPS antenna. The GPS signals are used by the navigation computer to calculate the vehicles position. Once the driver has input a desired destination the navigation computer can calculate a route, based on the drivers pre-determined preferences or the default settings in the navigation computer.

The navigation system is accessed by pressing the navigation button at the bottom left hand side of the TSD. The driver will then have the option of on road navigation or off road navigation.

### **On Road Navigation**

On road navigation is initiated by the driver inputting a destination. This can be achieved by:

- \* Typing in an address from the TSD.
- \* Entering a post code.
- \* Choosing a pre-entered address from the address book.
- \* Choosing a point of interest from an area.

The driver is then guided to the destination by a scrolling map display and voice guidance. The display can be varied by scale and display type.

## **Off Road Navigation**

The off road navigation route comprises a series of way points which are followed sequentially. Direct point to point guidance is given to the first way point in the route. When the vehicle arrives at the first way point guidance is given to the second way point in the route. This process continues for subsequent way points until the final way point (destination) is reached.

The routes are stored in the non-volatile memory of the navigation computer.

The routes can be entered on the TSD and comprise way points, Longitude and latitude destination and previously stored routes.

The different route guidance screens give the user the information required for direct point to point direction to the selected destination (guidance mode). The same guidance screens are also available even when guidance is not being given (compass mode). All the destination and guidance information is not shown on the guidance screens when in compass mode. When the system is in compass mode with no guidance being given the route title is 'COMPASS MODE'.

## **4x4 I**

4x4i Gives the driver additional information regarding vehicle systems.

- \* Suspension travel
- \* Gear selected
- \* Range selected
- \* Terrain response
- \* Vehicle heading
- \* Compass heading
- \* Steering wheel angle

The 4x4i System uses inputs from other vehicle systems to display information about suspension and transmission operation along with navigational information.

## **TRAFFIC MESSAGE CHANNEL (TMC) SYSTEM**

The Traffic Message Channel (TMC) is a function of the FM Radio Data System (RDS). The system broadcasts real-time traffic and weather information. Data

messages are received and decoded by the TMC receiver and passed onto the navigation system, which then delivers them via the navigation system interface. TMC messages are filtered by the navigation computer so that only those relevant to the current journey are displayed, allowing the navigation system to offer dynamic route guidance - alerting the driver of a problem on the planned route and calculating an alternative route to avoid the incident.

TMC traffic information systems conform to a global standard that has been adopted by traffic data gatherers, information service providers, broadcasters and vehicle/receiver manufacturers. TMC information is received via the normal FM radio antenna.

All TMC receivers use the same list of event codes, while the location database (on the map disc) contains both a country-specific set of location codes for the strategic European road network

TMC traffic data is currently broadcast in many European countries.

## **CELLULAR PHONE SYSTEM**

The cellular phone system comprises:

- \* Transceiver Module (TM)
- \* Base plate adaptor
- \* Telephone cradle
- \* Microphone
- \* Cellular Phone Antenna

The telephone system fitted to the vehicle allows the driver to dock their own handset to the vehicle hands free telephone system. This is achieved using an adaptor cradle which is telephone specific. This cradle is mated to a standard baseplate which in turn is connected to the TM. The TM is connected to the MOST ring for communication with the rest of the system

## **TELEPHONE SYSTEM OPERATION**



## **Telephone System**

The telephone system can be operated from the IHU or via voice commands. The telephone system has the following functions:

- \* Receive a call
- \* Make a call
- \* Phone book
- \* Text message receive
- \* Telephone phone book download

The telephone system is accessed via the IHU. Once the phone is docked in the cradle it is possible to read/ download the phones own phone book to find a contact or phone number. A phone number can also be dialled into the key pad on the IHU.

Calls can be received or made by pressing the push to talk button on the steering wheel mounted controls.

SMS messages can only be made via the IHU with the handset in the cradle.

## **VOICE RECOGNITION**

The Voice recognition system controls the following systems where fitted:

- \* Telephone
- \* Radio (inc satellite radio)
- \* CD / MP3 Changer
- \* Touch Screen Display (TSD)
- \* Note Pad
- \* Navigation

Voice control will not control Television or climate control system.

On vehicles without navigation system fitted the voice recognition software is held in the Transceiver Module (TM) and the microphone is hardwired directly into the TM. ON vehicles with navigation the voice recognition software is held in the navigation computer and the microphone is wired directly into the navigation computer and the TM. Vehicles with only no navigation system will have a slightly

reduced functionality compared with vehicles that have navigation fitted as well as the phone.

The TM only houses voice recognition software for the telephone system.

Voice control enables the driver to activate important functions of the car telephone and navigation systems without needing to operate any controls manually. This allows the driver to concentrate fully on driving the vehicle. Whenever the driver issues one of the defined voice commands with the system active, the voice control system converts the command into a control signal for the telephone or navigation system. The system recognises which system the command is directed at and routes the direction accordingly. The driver is guided through the dialogues by announcements or questions.

## **Telephone**

The telephone system allows the following to be accessed and controlled by the voice recognition function.

### **Dial Number**

This allows the user to dial a number (up to 20 digits) by digit entry with editing facility and with number as built up and displayed on the instrument pack message centre. The maximum number of recognised digits to be entered in one go is 16.

### **Phonebook**

This allows the user to store inputted phone numbers against inputted nametags. Nametags are user repeatable association names given to identify the numeric destination of the phone call.

This facility will allow 50 nametags with corresponding telephone numbers to be stored within the voice recognition Phonebook. This phonebook should not be confused with the phonebook held within the Sim card or mobile phone. The facility shall allow editing of the nametags and phonebook and also provide audible feedback of the recorded nametag. Where nametags are part of the audible Feedback the corresponding phone number shall be displayed in text form on the instrument pack message centre.

It is also possible to use the add name feature to enter a telephone number onto the IHU and then by voice recognition append a nametag and store this within the voice recognition phonebook.

## **Radio**

The radio system allows the following to be accessed and controlled by the voice recognition function.

### **Radio On**

This allows the user to switch on the radio function. 'Radio On' switches the ICE system to Radio with the last station played.

### **Radio Tune**

This allows the user to tune the radio into the desired frequency and band.

### **Radio Presets**

This allows the user to allocate frequency against a given band preset. The user must be tuned into the desired frequency and band prior to preset allocation. If a preset has already a stored frequency and band against that preset then the new frequency and band shall be allotted.

The Auto store feature instructs the radio to select the six strongest signals and allocate them against the auto store presets.

There shall be nine preset memory locations within each of the following band settings, FM, FMA, AM, AMA, MW, MWA and LW (only nine presets available for LW band therefore no Auto store available).

Voice commands will be available to allow the user to tune the radio to a given preset within the band that is currently tuned.

### **Radio Directory**

This function allows the user to nametag the current frequency and band including satellite radio (SDARS). Nametags are user repeatable association names given to identify the frequency and band information thus allowing the radio to tune into the desired signal. This facility shall allow 20 nametags to be stored within the voice recognition. It shall be possible for the system to replay the whole of the directory with the ability to play or delete the stations announced. It should also be possible to individually delete nametags.

Where nametags are part of the audible Feedback the corresponding Frequency and Band shall be displayed in text form on the instrument pack message centre.

## **CD Changer**

The CD changer system allows the following to be accessed and controlled by the voice recognition function.

The voice commands are standard control features with exception of controls that can be accessed on the steering wheel. Commands shall be available for up to 256 tracks on a CD. Text numeric format shall be 3 numbers i.e. track 6 is displayed as ' 006' . MP3 Format discs have commands for Folder up/down.

## **Display**

This function allows the user to change the TSD display mode by voice command.

## **Voice Recognition Settings**

### **Voice Feedback On / Off**

Allows the user to choose between having audible feedback or not for functions, other than some necessary functions, which must have audible feedback to operate.

### **Replay**

The replay command requests the voice recognition system to repeat it's last dialogue response within a list in both audible and associated text feedback.

### **Notepad**

The notepad function allows the user to record a series of 10 notes for up to 5 min.

The user shall be able to replay or delete the notes in the order that they were recorded. It shall also be possible to delete the whole notepad.

### **TMC**

The TMC system is part of the navigation system and provides real time traffic information to the navigation system. The voice commands are On or Off.

TMC also offers Dynamic route guidance. This is also a voice operated on/off function.

## **BLUETOOTH®**

The TM has Bluetooth® functionality. Bluetooth® allows the user to connect their own mobile phone (Bluetooth® enabled only) to the vehicle telephone system. Once connected the user can use the vehicle hands free functions system. The Bluetooth® system limits the functions available to those that are present in the Bluetooth® hands free profile. The available features include:

- \* Make/receive a call.
- \* Voice calls using the phones own voice tags (where set up).

Bluetooth® will not allow the following to be accessed via the IHU:

- \* SMS
- \* No signal strength indication in the IHU
- \* Phonebook download to the IHU
- \* Missed calls
- \* Last number redial
- \* Calls list

Prior to the Bluetooth® equipped phone being used on the vehicle hands free system the phone must be paired to the TM. The following describes the pairing process.

- \* Switch Bluetooth ' ON' on the handset.
- \* The user initiates a search for other Bluetooth devices from the handset.
- \* The TM acknowledges the existence of the Bluetooth® phone.
- \* Land Rover appears in the handset available device list.
- \* The user selects Land Rover from the device list and the TM will attempt pairing.
- \* TM requests a PIN number from the phone.
- \* The user enters the phone PIN number (this will be supplied by the dealer or will be marked on the side of the TM, use the last four characters of the serial number).
- \* If the PIN number is correct the phone is paired with the TM and its details are stored in the TM EEPROM.

- \* If the PIN number is correct the phone is paired with the TM and the TM details are stored in the handset.

Once paired the TM will periodically check for stored Bluetooth® devices (approximately every 20 seconds). As this occurs the user will see a connection request on the handset and either accepts or declines the request. This request will only happen once per session.

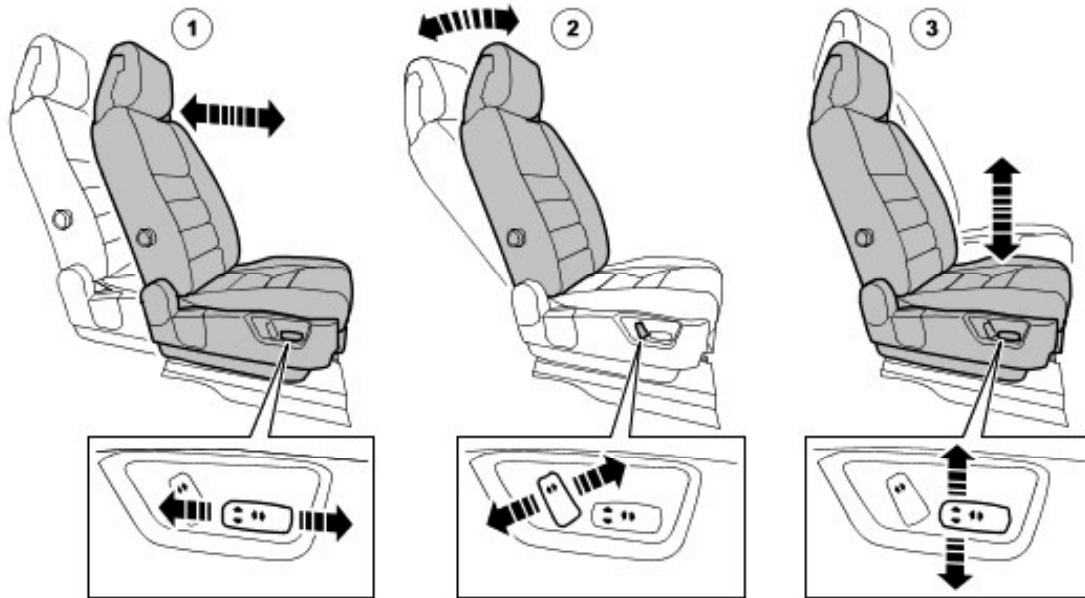
Once the pairing procedure (assigning the mobile phone to the TM) has been completed the mobile handset will automatically connect to the vehicle system once they come into range (approximately 10 metres) and the vehicle ignition is in position II. The word Bluetooth® displays in the IHU to inform the driver that the phone is connected to the TM.

Each time a paired phone and TM come into range the TM will request connection to the phone. The user can accept or decline this request from the handset.

Up to eight Bluetooth® equipped phones can be paired with the TM. Phones can be de-registered/disconnected at any time by the user. Only one phone at a time can be used via the vehicle hands free system. If a phone is connected to the vehicle via the cradle, this phone will cancel out any Bluetooth® phone operation.

If the TM is replaced each phone that is paired with the original TM will have to be re-paired with the new TM.

## **POWER OPERATED FRONT SEATS (NON-MEMORY)**



E48950

- 1 - Forward/Backward adjustment
- 2 - Seat back adjustment
- 3 - Seat cushion height adjustment

### **Forward/Backward adjustment**

Push and hold the switch forwards or backwards to move the seat to the desired position.

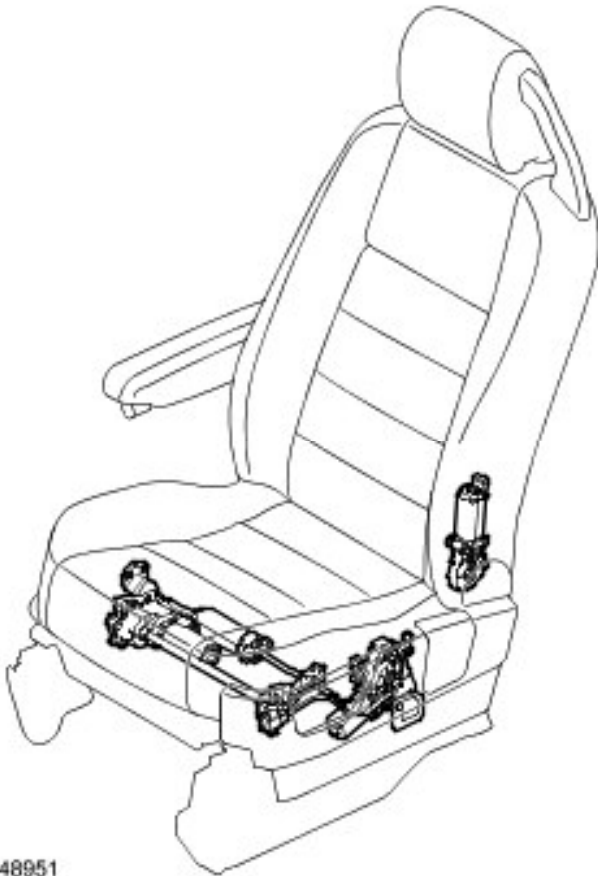
### **Seat back adjustment**

Twist the switch forwards or backwards until the desired seat back angle is achieved.

### **Seat cushion height adjustment**

Push the switch up or down to raise or lower the cushion.

## **Front Seat Motors**

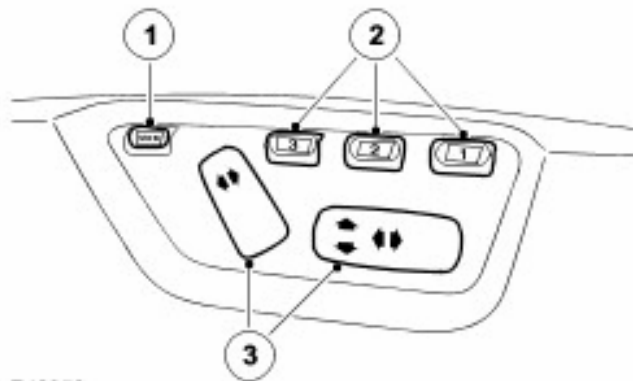


E48951

The seat motors are a permanent magnet motor type coupled to a rack and pinion assembly. Should the motor seize or stick an internal thermal cut-out switch will trip to remove voltage from the motor. Two pins within each of the seat switch packs control the seat motors. Both pins are normally earthed. Operating the switch applies voltage to one of the pins while the other pin remains earthed. Operating the switch in the opposite direction reverses power and earth to the motor allowing the motor to run in the opposite direction.

## **DRIVERS MEMORY SEAT**





E48952

- 1 - Memory store button
- 2 - Memory preset buttons
- 3 - Seat adjustment controls

The memory seat control module can store up to three different driver seating and mirror positions for each key (up to 3 keys). The three-numbered memory and single memory store switches control memory storage and recall operations. Each switch is a momentary action push switch.

All seat adjustments are available whilst the ignition key is in position I or II or for a time period from when either the driver door status is changed or the ignition key status changes from position I to position 0 (key in).

:

This does not include lazy entry where the door is not required to be open, or the ignition key is in position I or II.

The mirror adjustment is only enabled when the ignition key is in position I or II.

## Memory Recall

Memory recall has three memory positions stored for the seats and exterior mirrors. The switches for this function are located on driver's seat outer side trim panel. Pressing the appropriate numbered memory switch allows the seat to start moving to the position appropriate to that memory.

When a memory recall is initiated, to limit the overall current consumption, only two-seat axis will move towards their intended position at any one time. To minimise current load as the motors start, the initiation of each axis is phased with a 10ms delay between each motor starting.

The cushion slide and backrest will move first, followed by the cushion height and tilt. If the vehicle is stationary, the memory recall will operate in a 'one-touch' mode, whereby the switch can be released and the seat will continue to move to the memory position. If, however, the vehicle is in motion when the switch is released, then the system will operate in manual mode. This means that when

the switch is released, the seat will stop moving. In order to reach the intended memory position, the switch must not be released until all movement has stopped. The instrument cluster will emit a double chime to indicate that the recall operation has been successfully completed.

The following procedure will store a memory position:

- \* Ensure the ignition key is in position I or II
- \* Ensure reverse gear is not engaged
- \* Manually adjust the seat to the desired position, using the seat switches
- \* Press and release the 'memory store' switch
- \* Press and release the desired numbered memory switch within 5 seconds

With the ignition key in position II, a single chime will be emitted from the instrument cluster to indicate that the store operation has been successful.

If any of the seat adjustment or memory switches are activated during a 'one touch' memory recall, the recall will be overridden and the seat will begin to move in the direction corresponding to the switch that has been pressed.

Both mirrors move simultaneously about the vertical axis first (left/right), and then, once all vertical axis movements are complete, about the horizontal axis (up/down). To minimise the number of mirror motor's required, a method of sharing is implemented, which dictates that all movement about one axis is complete before movement about the other axis commences.

## **Lazy Entry**

Pressing the unlock button on the remote transmitter will initiate a memory recall. This feature is known as 'lazy entry'. If the seat movement, memory switch or the lock button on the remote transmitter is pressed, then the 'lazy entry' feature will stop immediately.

The memory settings are stored within Electronic Erasable Programmable Read Only Memory (EEPROM) of the memory control module each time the ignition switch is cycled from position II to position I. These are the positional values that a lazy entry request uses when the remote unlock button for that particular key is next pressed.

The lazy entry feature can be activated or deactivated via the customer personalisation feature of the high line instrument cluster. This provides the driver with the option to enable or disable lazy entry as required.

## **Immediate Adjustment**

Pressing one of the manual adjustment switches will initiate the corresponding motor for that axis until the switch is released.

Only two seat motors can be driven at any one time. However, due to the sharing of relays, there are certain combinations of motors that cannot be driven together.

If two axis are being driven and a third axis is requested to move, the third switch request is ignored until either of the two axis switches, already active, are released. The third axis movement may only be initiated providing the switch has been released and re-selected.

Seat adjustment can be initiated simultaneously with any mirror movement.

## **REVERSE GEAR MIRROR POSITION**

To give the driver a clear view of the kerbs when reversing, the exterior door mirror's can be dipped when reverse gear is selected. The level of mirror dipping is set to a predetermined amount when the vehicle leaves the factory but has the ability to be customer programmed.

The following procedure will store a reverse gear mirror position:

- \* Ensure the ignition key is in position I or II
- \* Perform a memory recall procedure
- \* Ensure reverse gear is engaged
- \* Manually adjust the mirrors to the desired position
- \* Press and release the 'memory store' switch
- \* Press and release the desired numbered memory switch
- \* Reverse gear mirror dip setting will be stored for that particular memory setting.

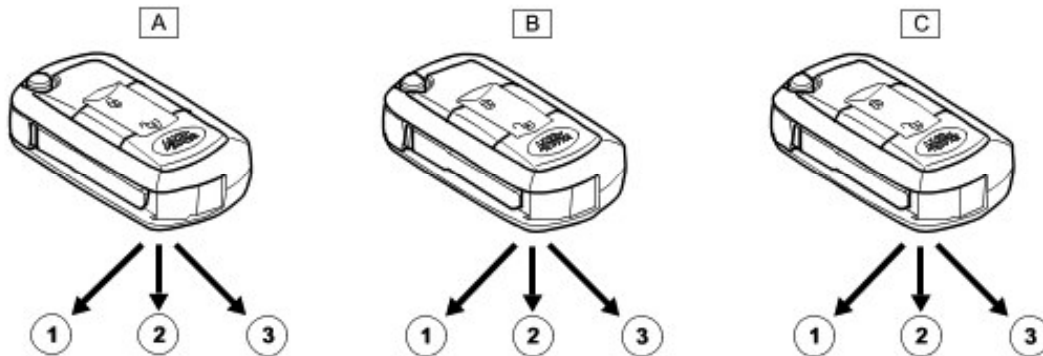
A single chime will be emitted from the instrument cluster to indicate that the store operation has been successful and 'Mirror Dip Stored' message will be displayed in the message centre.

Once this sequence has been completed, the stored mirror position will be the position that the mirrors move to when reverse gear is next selected.

Storing a memory position with reverse gear selected only affects reverse gear mirror positions, the remainder of the memory position's remain unchanged.

To protect against an accidental setting, the mirror position will only be stored if a mirror adjustment has been made since reverse gear was selected. If there is no reverse gear mirror position stored, then a default setting, stored in the memory control module, is adopted.

There are three customer personalisation memory settings per key. For each of these settings there are 3 possible reverse gear mirror position stores. This equates to a possible nine reverse gear mirror position settings. Personalisation memory setting relates to the 3 most recent ignition keys.



E48953

- A - Most recent ignition key
- B - Second most recent ignition key
- C - Third most recent ignition key
- 1 - First reverse gear mirror position store
- 2 - Second reverse gear mirror position store
- 3 - Third reverse gear mirror position store

The reverse gear mirror position feature can be activated or deactivated via the customer personalisation feature of the high line instrument cluster. This provides the driver with the option to enable or disable reverse gear mirror position as required. Information regarding the reverse gear mirror status, for both manual and automatic transmissions, is transmitted as a message on the Local Interconnect Network (LIN) bus

When the reverse gear mirror position feature is toggled 'OFF', all 3 memory settings associated with that personalisation memory will return to the default reverse gear mirror settings.

:

Reverse gear status is only available with the ignition in position II.

When reverse gear is de-selected, the mirror position immediately prior to reverse selection will be resumed, unless a memory recall has been requested whilst reverse has been selected, in which case the mirrors will move to the requested memory position when reverse is de-selected.

On vehicles fitted with the ZF automatic transmission there is a delay of 0.5 second following the selection of reverse gear, prior to the reverse mirror position being recalled. This is to prevent any movement of the mirrors as the gear selector is moved through the reverse position on the way to, and from, the park position.

## **AUDIBLE AND VISUAL CONFIRMATIONS**

An audible confirmation is generated by the instrument cluster to provide confirmation to the driver that the requested operation has been successfully completed. The following operations support an audible confirmation:

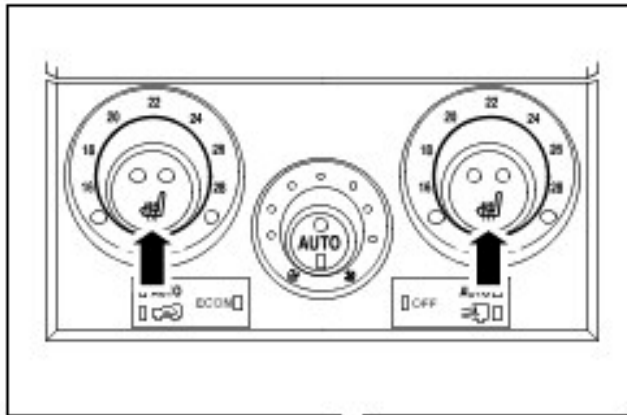
<b>Operation</b>	<b>Audible Confirmation</b>	<b>Conditions</b>
Memory Store	Single Chime	Successful store operation Completed
Memory Recall	Double Chime	Only issued if all axis of movement successfully reach the intended position
Reverse Gear Mirror Position Store	Single Chime	Successful store operation for reverse mirror position completed

In addition to audible confirmation there is also a visual confirmation via the instrument cluster message centre

# SEAT HEATING

## Front Seats

### Front Seat Heater Switches

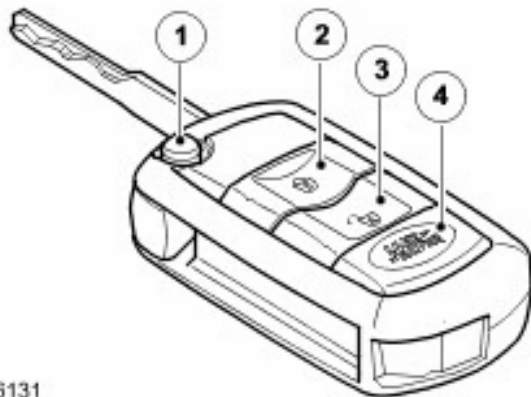


E48956

The heated front seat system is available on both manual and electric seats and is controlled by the Automatic Temperature Control Module (ATCM).

When the front seat heater switch is operated, power is supplied to the heater elements in the seat, causing the seat to heat up. The ATCM senses seat temperature via the sensor in the cushion and regulates voltage to the seat heater elements to maintain a constant temperature

## IGNITION KEY



E46131

- 1 - Key release button
- 2 - Lock button
- 3 - Unlock button
- 4 - Personal button

The ignition key is of the folding blade type, which is released from the stowed position by pushing the key release button on the key head. The key head is a sealed unit that contains a Printed Circuit Board (PCB) and a rechargeable battery. The PCB incorporates the electronics that generate RF signals for remote operation of the CLS and personalized feature. The PCB also incorporates the transponder for engine immobilization.

The battery is non serviceable, and recharges while the engine is running. If the battery charge is low, the remote operating range is reduced. The nominal life of the battery is approximately 14 years.

The key head has three buttons for operation of the CLS and the personalized feature, as follows:

- \* A lock button, for locking and superlocking of the vehicle.
- \* An unlock button, for unlocking the vehicle.
- \* A personal button, for operating the personalized feature, which can be programmed to trigger a panic alarm, operate the headlamp courtesy delay or remotely raise and lower the suspension. Programming the personalized feature with a different function automatically overwrites the previous function. The personalized feature is programmed with the key removed from the ignition switch, as follows:
  - \* Panic alarm. Push and hold the personal button, then push and hold the hazard flasher switch. After a confirmation chime sounds on the instrument cluster speaker, release the personal button and the hazard flasher switch. Push and release the hazard flasher switch again, to cancel the hazard flashers.

- \* Headlamp courtesy delay. Push and hold the personal button, then activate the main beam flash switch (pull switch towards you). After a confirmation chime sounds on the instrument cluster speaker, release the personal button and the main beam flash switch.
  
- Suspension. Push and hold the personal button, then use the air suspension switch to select a different ride height. After a confirmation chime sounds on the instrument cluster speaker, release the personal button and the air suspension switch. Programming the personal button to operate the air suspension must take place within 60 seconds of turning the ignition off. The air suspension switch position is relayed to the CJB on the CAN systems, which power down 60 seconds after the ignition is switched off.

Each ignition key has a unique identification which is determined by the transponder in the key head. Every RF signal from the ignition key contains the identification code and a rolling code. The CJB checks the codes and only responds if the signal is from a valid ignition key. During vehicle production, the identification code of each ignition key supplied with the vehicle is programmed into the CJB, and the rolling codes in the ignition key and the CJB are synchronized. A total of 30 'slots' are available in the CJB software to allow for replacement and additional ignition keys. In service, T4 can be used to communicate with the CJB for the following:

- \* Identify ignition key allocation within the CJB.
- \* Enable new ignition keys.
- \* Disable ignition keys.
- \* Re-enable a previously disabled ignition key.

If the vehicle lockset is replaced, the keys supplied with the new lockset must be enabled and the old keys disabled.

If the rolling code of an ignition key loses synchronisation with the CJB, the remote operating functions will cease to operate. Synchronisation can be restored by starting the engine with the unsynchronized ignition key and allowing the engine to run for a minimum of 6 minutes.

## **CLS OPERATION**

The CLS allows the doors and, where applicable, the fuel filler door, to be centrally locked and unlocked using the remote handset, the CLS switches or the door lock. The CLS has three locking states: internally locked, externally locked and superlocked.



Configurable CLS features include automatic speed locking, automatic relocking and SPE. All vehicles incorporate crash unlocking.

The internally locked state is activated with a single press of the CLS lock switch. The method of activating the externally locked and superlocked states is market dependant:

- \* In all markets except North American Specification (NAS), a single press of the lock button on the remote handset, or a single lock turn of the door lock, activates the superlocked state. A second press of the lock button on the remote handset, or a second lock turn of the door lock, within 2 seconds of the first, changes the CLS to the externally locked state.
- \* In NAS markets, a single press of the lock button on the remote handset, or a single lock turn of the door lock, activates the externally locked state. A second press of the lock button on the remote handset, or a second lock turn of the door lock, within 2 seconds of the first, changes the CLS to the superlocked state.

In the internally locked state:

- \* The exterior door handles are disengaged from the latches, to prevent the doors being opened from outside the vehicle.
- \* The CJB ignores inputs from the tailgate release switch, which prevents the tailgates being opened.
- \* The doors can be opened using the internal door handles.
- \* The vehicle can be unlocked using a single press of the CLS unlock switch, a single press of the unlock button on the remote handset or a single unlock turn of the door lock.

In the externally locked state:

- \* In addition to the conditions adopted for the internally locked state, the CJB also ignores inputs from the CLS lock and unlock switches.
- \* The vehicle can be unlocked using a single press of the unlock button on the remote handset or a single unlock turn of the door lock.

In the superlocked state:

- \* In addition to the conditions adopted for the externally locked state, the CJB activates:
- \* The superlock motors in the door latches, to disengage the interior door handles.
- \* The fuel filler door lock motor (where fitted), to secure the fuel filler door.
- \* The vehicle can be unlocked using a single press of the unlock button on the remote handset or a single unlock turn of the door lock.

When the CLS lock switch is used, the CJB will internally lock the vehicle regardless of the position of the ignition switch, with or without the key in the ignition switch and with or without the engine running.

When the remote handset or the door lock is used, the CJB will only lock or superlock the vehicle provided the ignition key has been removed from the ignition switch.

When the vehicle is externally locked or superlocked, the CJB flashes the turn signal lamps three times, for 500 milliseconds, with a 500 milliseconds pause between flashes. When the vehicle is unlocked using the remote handset or the door lock, the CJB flashes the turn signal lamps once, for 3 seconds.

## **Mislock**

A mislock occurs if the CJB receives an external lock or superlock request when any hinged panel is ajar, an invalid key is in the ignition switch or the repetition blocking limit for the door latches is reached. To indicate a mislock the CJB uses the horns to produce a 100 milliseconds 'chirp' and withholds flashing of the turn signal lamps.

If a mislock occurs because an invalid key is in the ignition switch or a hinged panel is ajar, the CJB still externally locks any doors that are closed. The closed doors are only externally locked, even if the original request was for superlocking.

If a mislock occurs because a hinged panel is ajar, when the hinged panel is subsequently closed the CJB maintains the current locking state until it receives another external lock or superlock request.

## **SPE**

When SPE is enabled, an unlock command from the remote handset or the door lock only unlocks the driver door. To unlock the remaining doors a second unlock command from the remote handset, the door lock or the CLS unlock switch is required.

For each remote handset, SPE can be toggled on and off by pressing and holding the lock and unlock buttons on the remote handset at the same time, for 3 seconds, with the vehicle either locked or unlocked and the key removed from the ignition switch. Confirmation of the change to the SPE setting is provided by the vehicle locking and then unlocking in the selected mode.

## **Speed Dependant Locking**

When speed dependant locking is enabled, the CJB internally locks the doors when the vehicle speed exceeds 8 km/h (5 mph) with the driver door closed and the engine running. If the vehicle slows down or stops, then increases to more than 8 km/h (5 mph) again, the CJB internally locks the doors again only if a door was opened while the vehicle speed was less than 8 km/h (5 mph). When the key is removed from the ignition switch, the CJB returns the vehicle to the previous unlocked state, i.e. unlocks all the doors, or just the driver door if SPE is enabled.

Speed dependant locking can be enabled and disabled in the customer settings menu

## **Crash Unlocking**

When the ignition switch is in position II, if a crash that triggers the air bags occurs the CJB unlocks all of the doors. After 3 seconds, the CJB unlocks the doors again, in case a lock button is pressed during the crash, by flailing limbs for example. The CJB is informed of the crash by a status message from the restraints control module, on the medium speed CAN bus, which changes from 'no crash' to 'crash'. The CLS will also perform crash unlocking if a 'no crash' status message is not received every 500 milliseconds.

The vehicle cannot be centrally locked again until the status message has been reset to 'no crash' by the restraints control module

# Wipers and Washers

## GENERAL

The wiper and washer system is controlled by the Central Junction Box (CJB) on receipt of requests made by the driver or the rain/light sensor unit (if fitted). All wiper functions for the front and rear wipers are controlled from a multi-function wash/wipe switch assembly located on the right hand side of the steering column.

The wiper and washer system comprises:

- \* Front and rear wiper motors
- \* A front wiper linkage
- \* Two front and one rear wiper arms and blades
- \* Two front washer jets and one rear washer jet
- \* A washer reservoir and pump
- \* A wash/wipe control column switch.

The following optional items can be added to enhance the wiper system:

- \* A rain/light sensor for automatic wiper control
- \* Heated front washer jets
- \* Headlamp washers
- \* Low fluid level sensor (fitted to vehicles with headlamp washers).

The wiper system can be optionally equipped with a rain/light sensor. The sensor, located below the interior rear view mirror, detects rain drops on the windscreen and automatically operates the wipers in the intermittent mode. The column stalk switch must be in the intermittent position for rain/light sensor controlled wiper operation.

The front wiper system has five stages of operation and six intermittent delay periods.

The five wiper stages are as follows:

- \* Flick wipe
- \* Off
- \* Intermittent
- \* Normal (slow) speed continuous
- \* Fast speed continuous

## Speed Control Intermittent Mode

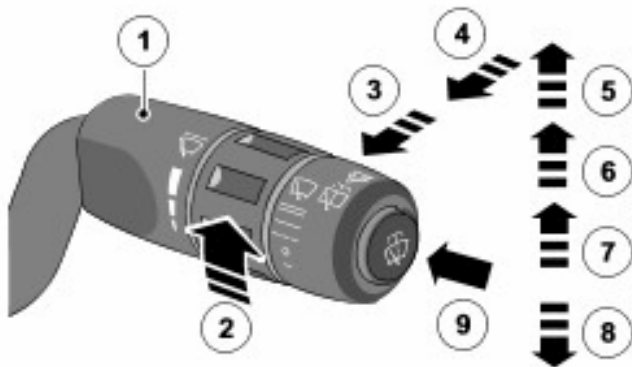
The intermittent, slow and fast speeds are affected by road speed, providing the speed control intermittent wipe mode has been configured. The intermittent wiper delay periods change with the road speed, with the delay decreasing as the road speed increases.

## Speed Dependant Wipe Mode

When the speed dependant wipe mode has been configured, the normal continuous operation changes to intermittent operation when the vehicle is stationary. The fast speed operation changes to normal operation when the vehicle is stationary.

The wiper and washers operate with the ignition switch in positions I or II. Wiper functions are suspended during engine cranking to reduce battery power consumption under high load conditions.

## WIPER CONTROL COLUMN SWITCH



E43327

- 1 Wash/wipe control column switch
- 2 Intermittent variable delay rotary control
- 3 Intermittent/continuous rear wipe
- 4 Rear wash position
- 5 Fast speed wipe position
- 6 Normal speed wipe position
- 7 Intermittent/rain sensor wipe position
- 8 Flick wipe position
- 9 Front windscreen washer control

The wiper control column switch is located on the right hand side of the steering column and controls all front and rear wiper functions.

The switch comprises 8 switch positions and the intermittent rotary control. The switch positions each complete a combination of earth paths to connections on the CJB. The CJB interprets the selected combination of switches and operates the respective function accordingly.

## **Flick Wipe**

Moving the switch down selects the front wiper flick wipe function. The front wipers will operate at fast speed for as long as the flick wipe switch position is operated. Once the switch is released the front wiper motor will revert to a normal (slow) speed operation until a park position has been detected.

## **Intermittent**

Moving the switch up one position from 'OFF', selects intermittent front wiper operation. The rotary potentiometer on the stalk selects one of six delay periods. The delay period is also influenced by vehicle speed (should speed control intermittent wipe mode be configured), using a signal value derived from the ABS control module. The selected delay period decreases with an increase in road speed. When a rain/light sensor is incorporated into the system, the intermittent position also initiates wiper operation controlled by the rain/light sensor. The sensitivity of the rain/light sensor is also adjusted by rotating the rotary switch to one of the six positions.