



ROVER 75 BODY ELECTRICS

Workbook

03-14-RO-W: VER 1

© Rover Group limited 1999

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form, electronic, mechanical, recording or other means without prior written permission from Rover Group.

| | |
|---|-----------|
| Body electrics | 1 |
| Power distribution..... | 1 |
| Networks | 8 |
| CAN-Bus (controller area network) | 11 |
| K-Bus (karosserie)..... | 14 |
| Diagnostic line | 16 |
| GM6 body controller | 17 |
| Window lift system..... | 19 |
| Interior lighting..... | 26 |
| Wiper system..... | 28 |
| Rain sensor functionality | 30 |
| TestBook | 33 |
| History | 33 |
| Rover 75 TestBook..... | 33 |
| TestBook functionality | 34 |
| System diagnostics | 36 |
| ECU replacement..... | 37 |
| Immobilisation | 38 |
| Engine immobilisation EWS-3 | 38 |
| EWS-3 electronic control unit..... | 39 |
| Engine control module (ECM) | 40 |
| GM6..... | 41 |
| Ring antenna and keys..... | 41 |
| Instrument pack..... | 43 |
| Emergency access | 43 |
| Immobilisation ECU and/or key ordering procedure..... | 43 |
| Immobilisation Pin out | 45 |
| Locking and alarm systems | 47 |
| Component layout | 47 |
| Component functionality..... | 48 |
| Anti-theft alarm..... | 51 |
| GM6 pin-out tables | 56 |
| Instrumentation | 59 |
| Instrument panel..... | 59 |
| Bus Connections | 60 |
| Instrument pack gauges | 63 |
| Trip computer | 65 |
| Pin out table | 66 |
| Serviceability and replacing an instrument pack | 67 |
| Diagnostics..... | 69 |
| Instruments circuit diagram | 70 |
| Exterior lighting | 72 |
| Introduction..... | 72 |
| Headlamp assembly..... | 81 |
| Glossary | 87 |
| Glossary | 87 |

Body electrics

Power distribution

Power distribution within the vehicle and the safe delivery of that power, is in the main, carried out by the battery, the alternator, the harness and the fuseboxes. The fuseboxes protect and isolate all systems but there is also additional protection for many individual systems contained within individual circuits and ECU's. For example the smart field effect transistors within the light switch module, these protect individual lighting circuits from voltage surges.

Battery and alternator specification

| Component | KV6 | M47 | K 1.8 |
|-------------------|----------------------|----------------------|--|
| Battery | Yuasa H6 75 Ah | Yuasa H6 75 Ah | Manual Yuasa H5 61 Ah Automatic Yuasa H6 75Ah |
| Alternator | Denso K3B-H 105 A | Valeo A13V+ 105 A | Denso K3B-H 105 A |

ry

All Rover 75 batteries are sealed for life and maintenance free. Located on top of the battery is a battery condition indicator which can indicate three battery states:

1. Green - battery is in good state of charge
2. Dark (turning to black) - battery requires charging
3. Clear (or light yellow) - battery must be replaced

When disconnecting a battery always disarm the alarm and ensure the ignition and all electrical equipment are switched 'off'. When disconnecting the battery always disconnect the negative terminal first, and on reconnection connect the positive terminal first. When a battery has been disconnected from a Rover 75 the audio code will need to be entered to re-enable its functionality.

Fuseboxes

There are two fuseboxes on Rover 75. One is located in the engine compartment and the other is located behind the glovebox in the passenger compartment. The engine compartment fusebox (see Figure 1) contains three types of fuse:

1. Blade type fuse: Conventional pull out male type fuse used to protect circuits between 5 amps and 30 amps
2. J-case fuse: A square shaped pull out female fuse used to protect circuits from 30 amps to 60 amps
3. Bolt down fuse: Sometimes called a fusible link they are used to protect circuits 40 amps to 250 amps



Figure 1

The table 'engine compartment fusebox' contents outlines the fuse ratings and the circuits they protect.

Engine compartment fusebox contents

| Link | Rating | Vehicle | Function |
|------|--------|------------|---|
| FL1 | 150 A | KV6 & K1.8 | Alternator |
| FL2 | 80 A | All | Fuses 13, 14, 15, and 16 of the passenger compartment fuse box |
| FL3 | 50 A | All | Power wash relay, and fuses 1, 2, 3, 4, 5, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, and 42 of the passenger compartment fuse box |
| FL4 | 80 A | All | Cooling fan relay |
| FL5 | 50 A | | Not used |
| FL6 | 100 A | M47R | Glow plug ECU |
| FL7 | 40 A | All | Heated rear window (HRW) relay |
| FL8 | 50 A | All | ABS ECU |
| FL9 | 50 A | All | Light switch module (LSM) |
| FL10 | 40 A | All | Blower motor relay |
| FL11 | 50 A | All | LSM, trailer ECU, trailer fuse |
| FL12 | 50 A | All | Ignition switch |

| Fuse | Rating | Vehicle | Function |
|------|--------|------------|--|
| F1 | 15 A | KV6 | Heated oxygen sensor (HO2S), purge control valve, crankshaft position (CKP) sensor |
| F1 | 15 A | K1.8 | HO2S, purge control valve, CKP sensor |
| F1 | 15 A | M47R | Engine Control Module (ECM) |
| F2 | 20 A | KV6 & K1.8 | Fuel injectors, ignition coils, ECM |
| F2 | 30 A | M47R | ECM |
| F3 | 15 A | KV6 & K1.8 | HO2S, camshaft position (CMP) sensor |
| F4 | 15 A | All | Cooling fan, header 286, compressor clutch relay |
| F5 | 10 A | KV6 & K1.8 | ECM |

Body electrics

| Fuse | Rating | Vehicle | Function |
|------|--------|---------|---------------------------------|
| F6 | 15 A | All | Front fog lamp relay |
| F7 | 30 A | All | ABS ECU |
| F8 | 15 A | M47R | Fuel burning heater (FBH) |
| F9 | 10A | All | Compressor clutch relay |
| F10 | 20 A | All | Windscreen wiper relays 1 and 2 |

The passenger compartment fuse box contains conventional blade type fuses only. The table 'passenger compartment fusebox contents' outlines the fuse ratings and the circuits they protect.

Passenger compartment fusebox contents

| Fuse | Rating | Vehicle | Function |
|------|--------|--------------------|---|
| F1 | 20 A | All | Body Control Unit (BCU) |
| F2 | 30 A | KV6 | Electronic Traction Control (ETC) ECU |
| F3 | 5 A | All | Clock, diagnostic socket, memory seats ECU |
| F4 | 5 A | All | Driver Door Module (DDM), Air Temperature Control (ATC) ECU, fresh/recirculated air motor |
| F5 | 5 A | All | BCU |
| F6 | 5 A | All | Instrument pack |
| F7 | 5 A | All | LSM, clutch pedal position switch, engine immobilisation ECU |
| F8 | 5 A | All | BCU |
| F9 | 10 A | All | Windscreen washer pump |
| F10 | 5 A | All | Instrument pack |
| F11 | 5 A | All | DDM, ATC temperature sensor, header 293, cigar lighter relay, ATC ECU |
| F12 | 10 A | All | Torch socket, Park Distance Control (PDC) ECU, sunblind switch, rain sensor |
| F13 | 10 A | All | BCU |
| F14 | 20 A | All | BCU |
| F15 | 15 A | All | Cigar lighter relay |
| F16 | 20 A | All | Accessory socket relay |
| F17 | 5 A | All | Header 288 |
| F18 | 5 A | All | Airbag ECU |
| F19 | 30 A | All | Memory seat ECU |
| F20 | 20 A | All | Inertia switch, fuel pump relay |
| F21 | 30 A | All | Memory seat ECU, header 293 |
| F22 | 15 A | All | Header 293 |
| F23 | 20 A | All | Sunroof ECU |
| F24 | 30 A | All | BCU |
| F25 | 20 A | All | Ignition switch |
| F26 | 5 A | All | Battery Backed-Up Sounder (BBUS), engine immobilisation ECU |
| F27 | 5 A | All | Instrument pack |
| F28 | 15 A | KV6 & K Series 1.8 | Cruise control switch, rotary coupler, horn switch |
| F28 | 15 A | M47 | Rotary coupler, horn relay |
| F29 | 20 A | | Not used |
| F30 | 30 A | All | Power wash pump |
| F31 | 15 A | All | Alarm sounder |
| F32 | 10 A | K1.8 | ABS ECU |
| F32 | 10 A | KV6 | ABS ECU, ETC switch, ETC ECU |
| F32 | 10 A | M47R | ABS ECU, ETC switch |
| F33 | 5 A | All | ATC ECU, driver seat buckle switch |
| F34 | 10 A | All | Fuel pump relay, ECM |

| Fuse | Rating | Vehicle | Function |
|------|--------|------------|--|
| F35 | 5 A | All | Heated washer jets, mirror switch, passenger side door mirror |
| F36 | 5 A | KV6 & K1.8 | Alternator |
| F36 | 5 A | M47R | Alternator, Oil temperature switch |
| F37 | | | Not used |
| F38 | | | Not used |
| F39 | | | Not used |
| F40 | 5 A | All | LSM |
| F41 | 10 A | All | Cruise control switch, cruise control relay, reverse lamp switch, header 292, reverse lamp relay |
| F42 | 5 A | | Not used |

Notes

Rover 75 harnesses have been designed within CATIA, a computer aided three-dimensional interactive application. This is an electronic design tool enabling the correct routing of the harness to be determined before any vehicles are built. It allows the dimensions and tolerances of the harness to be corrected in relation to other components fitted to the vehicle. Any difficulties which arise can be resolved electronically before any vehicles are built.

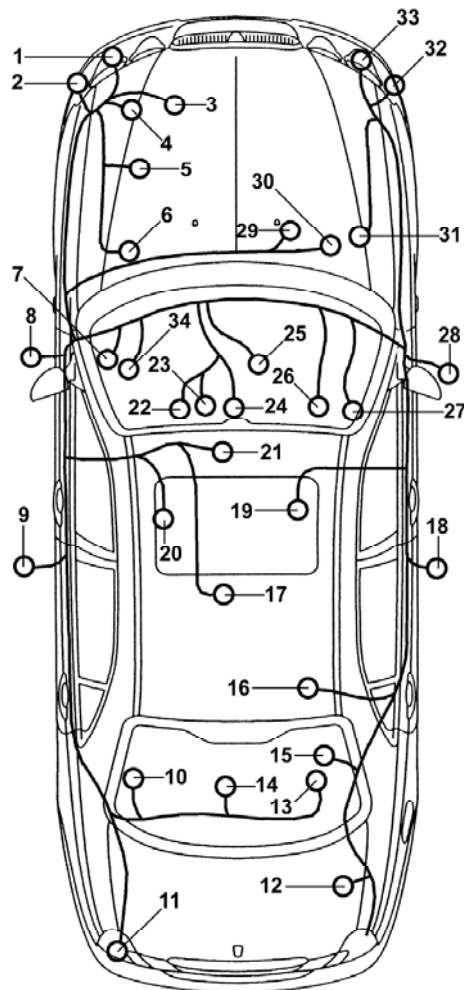
An electrical simulation of the harness, designed using circuit diagrams, is also developed to ensure that volt drops, fuse blow times and current loads are all appropriate and acceptable for the vehicle. Circuit design and simulation is carried out interactively using automated cable-assembly engineering system (ACES). This is done using a number of vehicle variants and specification levels to ensure the design is electrically robust. The capability and effectiveness of the harness is matched to vehicle system requirements.

The Rover 75 harness is often referred to as a single piece harness because it has a large single piece main body harness. In reality the harness system is made up of the following sections:

- Main body harness
- Engine harness
- Door harnesses
- Battery cables
- Roof harness
- Bumper harnesses and front end modular harness (see Figure 3)
- Audio system harness

Many new style connectors are incorporated into the harness. A harness connector remover kit (86-001) will be required to disassemble and reassemble the connectors. The harness repair procedure is carried out by splicing into the harness and replacing the relevant part. The harness can be purchased in individual lengths via the parts supplier and the length which contains the piece of the harness needing repair should be ordered. The required number of solder shrink sleeves will also have to be ordered. A recommended heat tool will be required to shrink the sleeves (for example Master Appliance 'Compact Ultra-Torch').

Integral to the main harness (see Figure 2) are the supplementary restraint system harness, the CAN-Bus twisted wire pairs, the single wire K-Bus data link and the single wire diagnostic line. No part of the SRS harness is repairable.



e: y (RHD)

- | | |
|-----------------------------------|--|
| 1. Front headlamp unit | 25. Audio |
| 2. Link to bumper harness | 26. Instrument pack |
| 3. Gearbox | 27. Steering column |
| 4. Engine compartment fusebox | 28. Link to door harness |
| 5. Link to engine harness/ABS ECU | 29. Brake fluid level |
| 6. ABS ECU | 30. Wiper motor |
| 7. Passenger compartment fusebox | 31. Cruise pump/traction control motor |
| 8. Link to door harness | 32. Front headlamp unit |
| 9. Link to door harness | 33. Link to modular front end harness |
| 10. Reel pretensioner | 34. GM6 body control unit |
| 11. Rear lamp | |
| 12. Park distance control | |
| 13. Reel pretensioner | |
| 14. Reel pretensioner | |
| 15. ABS sensor | |
| 16. Fuel tank | |
| 17. SRS DCU | |
| 18. Link to door harness | |
| 19. Seat | |
| 20. Seat | |
| 21. Switch unit | |
| 22. Centre console | |
| 23. Fascia | |
| 24. Heater | |

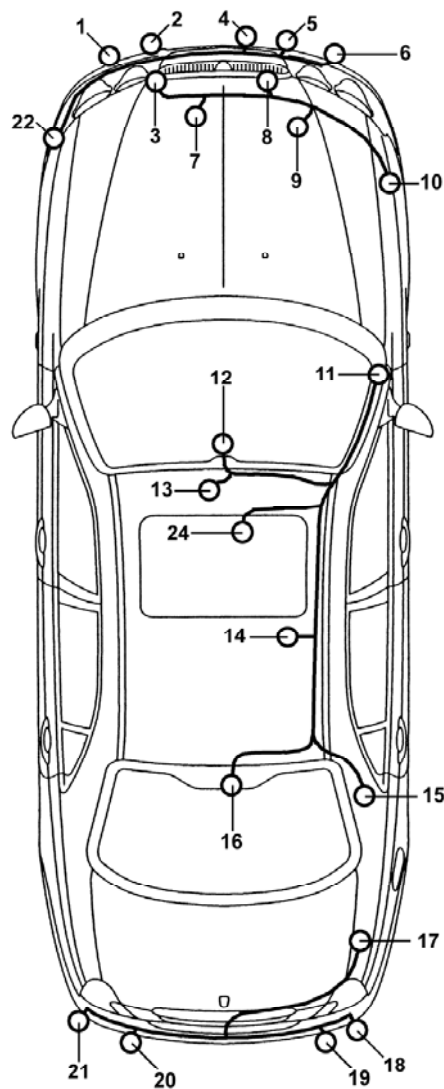
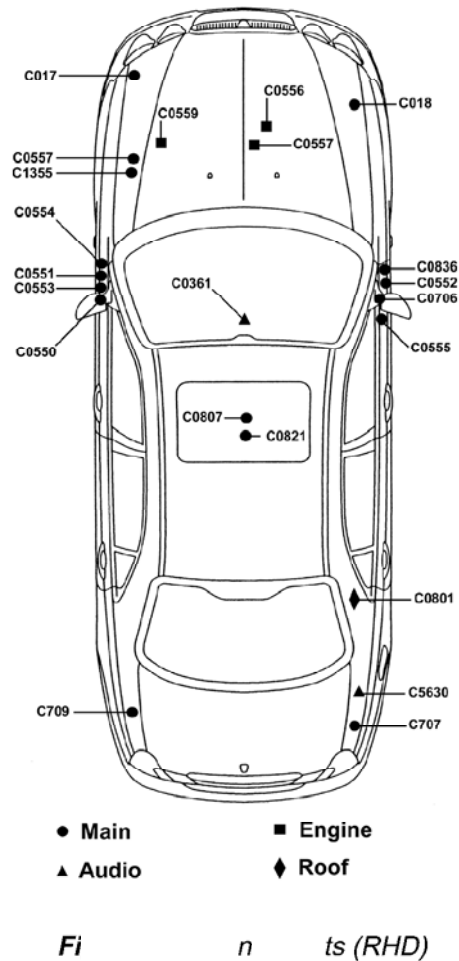


Fig. 6. Reference points

1. Direction indicator
2. Fog lamp
3. Horn
4. Ambient temperature sensor
5. Fog lamp
6. Direction indicator
7. Bonnet switch
8. Horn
9. Ambient temperature sensor fuel burning heater (diesel)
10. Modular front end harness link to main harness
11. Roof harness link to main harness
12. Electrochromatic mirror
13. Interior light module
14. Ultrasonic sensor
15. Earth/ground
16. Centre high mounted stop lamp
17. Parking aid ECU
18. Parking aid sensor
19. Parking aid sensor
20. Parking aid sensor
21. Parking aid sensor
22. Connector to main harness

n s

Ground (earth) points are distributed around the vehicle (see Figure 4).



Wire colour codes

The table 'Wire colour codes' contains the colour code used for Rover 75 harnesses.

Wire colour codes

| Code | Colour |
|------|--------------|
| B | Black |
| G | Green |
| K | Pink |
| LG | Light green |
| N | Brown |
| O | Orange |
| P | Purple |
| R | Red |
| S | Slate (Grey) |
| U | Blue |
| W | White |
| Y | Yellow |

Networks

Technological advancement in vehicle electronics has led to many changes and improvements in vehicle electrical systems. Vehicles are now fitted with systems which, although complex in functionality, are user friendly and very reliable. Electronic control units are used to control and monitor the operation of the systems and Rover 75 has more electronic control units (ECU) controlling systems than any Rover product to date (see Figure 5). An ECU is populated with solid state components, the capacity of which is matched to the complexity of the system it has to control. ECU's receive input signals corresponding to the current state of the system under its control. The signals to the ECU come from various sensors and switches and these inputs dictate the outputs the ECU's send to the actuators of the system.

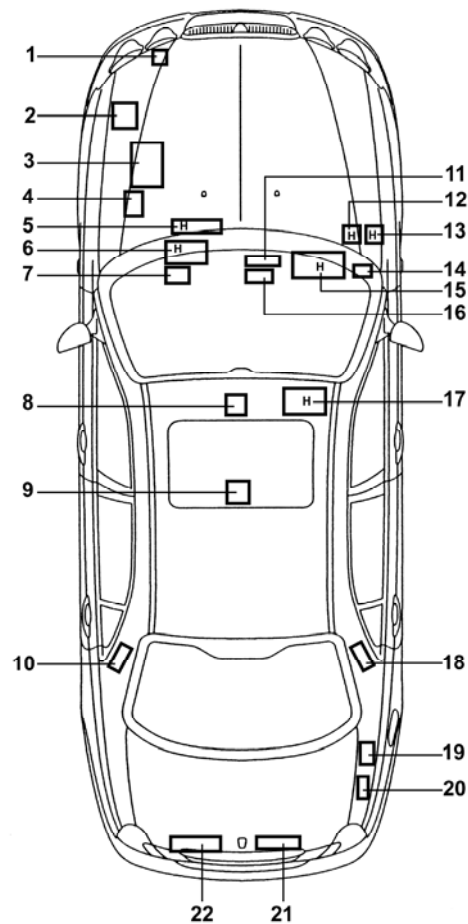


Fig. 1 *pc* *ons*

- 1.Fan pack
 - 2.Engine compartment fuse box
 - 3.Battery
 - 4.ABS ECU
 - 5.Engine control module
 - 6.Passenger comp fusebox, GM6, ATCU, KV6 Traction control ECU, cruise ECU and interface unit
 - 7.CD autochanger
 - 8.Sunroof ECU
 - 9.SRS DCU
 - 10.Aerial amplifier
 - 11.Bordmonitor/ audio head unit
 - 12.Shift interlock
 - 13.Immobilisation ECU (EWS-3)
 - 14.Light switch module
 - 15.Instrument pack
 - 16.ATC ECU
 - 17.Memory seats
 - 18.Audio filter
 - 19.Park distance control
 - 20.Satellite navigation
 - 21.Radio tuner (Only if Highline satellite navigation is fitted)
 - 22.TV module
- H = Handed

The vehicle electrical architecture of Rover 75 has been designed to exploit the full potential of its technological advances. Rather than having an ECU dedicated to its system and unaware of the operation of other systems, the systems around the Rover 75 are all linked together. The ECU's are linked to each other via Bus-systems, allowing communication and exchange of information. Harness bulk and complexity is kept to a minimum using this new method to relay information to and from the different systems. This method used by Rover 75 is called **multiplexing**.

Multiplexing is a technique which uses the same wiring repeatedly for communication between all systems. The systems are all inter-connected, forming a network of communication lines. The information from sensors and switches are converted into digital signals by the system ECU and relayed serially throughout the system network, which is also referred to as a data bus system. A network can be defined as an interconnection of various systems which allows exchange of information. Public telephone systems can be said to be networks within which information can be exchanged. The signal from the sender needs converting on transmission and re-converting at the reception end. The signal ends up in the correct format to be understood by the recipient. There may be a protocol to follow, for example having to wait to re-dial if a line is in use. On Rover 75, system information is prioritised and will find the correct destination through correct coding.

The Rover 75 network system uses a number of interconnected Bus-systems and the gateway for these Bus-systems is the instrument pack. Most ECU's are connected to this system and can transmit and receive messages on the system. All messages that are transmitted on the Bus-systems are made up of binary digits, referred to as bits (BInary digiTS). The bit can be one of two states: 0 and 1. The combination of bits that make up a signal is transmitted in this digital format on the Bus-system. Internal to each ECU is the special equipment required to convert the digital signal back to the value that it represents. Each message will contain information in its code as to where the message starts and ends, and an identifier to ensure the message finds the correct destination. The signal also contains a check function which a receiving ECU uses to check the plausibility of the signal. The ECU that transmits a signal also monitors the return of that signal. This way it can check if the signal is the same as the one transmitted and any faults can be dealt with.

Information from a single sensor can be used to feed many units, saving on harnessing and the number of sensors needed. For example, one of the Anti-lock braking system wheel speed sensors is hard wired to the instrument pack (IPK) for the speedometer. The IPK converts this signal into a K-Bus format and transmits a message on the K-Bus feeding the speed dependent wiper control and the speed dependent radio volume. This means running parallel lines from the sensor to each of the systems is not necessary saving on harness bulk and complexity.

Advantages of multiplexing

- Harnesses are smaller and less complex
- Harnesses are cheaper and lighter
- Improved reliability-reduced wires and connections
- New systems can be added easily 'Plug and Play' (If appropriate wiring is fitted to the existing harness)

The Bus-systems in use on Rover 75 are the CAN-Bus, the K-Bus and the Diagnostic line. These systems make up part of the main harness. The instrument pack acts as the communication gateway, enabling transfer of data from one Bus-system to another. The instrument pack contains a microprocessor which converts and processes all signals into the format required for transmission onto another Bus-system. There are other dedicated Bus-systems in use on Rover 75 such as a window lift Bus and a satellite navigation display Bus.

CAN-Bus (controller area network)

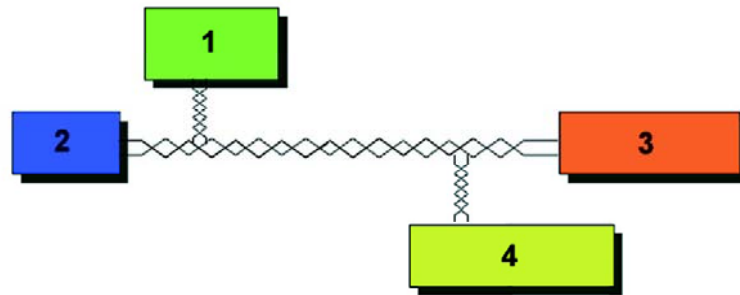


Figure 6

- 1.ABS/ traction control ECU
- 2.Engine control module
- 3.Instrument pack
- 4.Automatic transmission control unit

The CAN-Bus system (see Figure 6) has been developed by Bosch and is becoming the industry standard for Europe. The CAN system is a high speed serial data bus system linked by an unscreened twisted pair of wires: yellow/black and yellow/brown. The wires are twisted to minimise electromagnetic interference from the signal passing down the lines to other systems in the vehicle, such as the radio system. Both wires carry information and for CAN to operate, both signals must be present. The CAN system is the fastest of the Bus-systems used on Rover 75, capable of carrying 500,000 bits of information every second. This speed is recognised as the fastest practical operating speed without a requirement for screened cable. It is used for systems where the speed of exchange of information is vital for their performance; engine management systems, automatic transmission and traction control.

The CAN system uses a linear topology which consists of the main bus length and shorter stubs. The main bus length terminates at the ECM and the IPK and must not be longer than 40 metres. The shorter stubs, for example to the automatic transmission control unit, must be as short as possible and no longer than one metre. Any untwisted portion of the bus will not be longer than four centimetres.

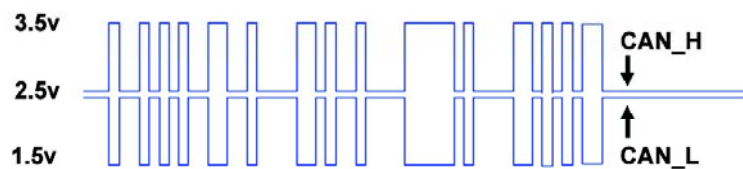


Figure 7

As stated, CAN consists of a twisted pair of wires. One line is called CAN high (CAN_H) and is yellow and black. The other line is called CAN low (CAN_L) and is yellow and brown. CAN_L switches between 2.5 and 1.5 volts. CAN_H switches between 2.5 and 3.5 volts (see Figure 7).

With both CAN_H and CAN_L both at 2.5 volts there is no potential difference (voltage) between them and this is known as the recessive state and is equivalent to logic 1.

With CAN_H switched to 3.5 volts and CAN_L switched to 1.5 volts there is a potential difference of 2 volts between them and this is known as the dominant state and is equivalent to logic 0.

CAN_H and CAN_L always switch together and these two states are the only two possible. When an ECU transmits a signal, it is made up of a series of dominant and recessive states generated by the simultaneous switching of the CAN wires. The signal is a combination of the two possible states, in effect 0 and 1, hence a digital signal.

The structure of a CAN-Bus signal is made up of several parts as shown below:

CAN message structure

| | | | | | | |
|-------|-----------------|---------------|----------------|----------|---------|--------------|
| Start | Identifier/Name | Control Field | Data 0-64 Bits | CRC Test | Confirm | End of Frame |
|-------|-----------------|---------------|----------------|----------|---------|--------------|

The whole message structure can vary from a minimum of 44 bits in length to a maximum of 108 bits.

The message will begin with data to signify the 'start' of the message and will also contain data to signal the message end, 'end of frame'. The 'identifier' part of the signal will determine the content of the signal and the priority of the signal. Arbitration is necessary when a message is transmitted at the same time as another message.

The 'control field' carries information as to the number of bytes to follow and the data field is the actual value of the signal being transmitted.

As an ECU transmits a signal onto CAN it also reads back the identifier on CAN. If it does not recognise the identifier as its own this means it has lost arbitration to another signal transmission and it stops the transmission of its own message. The ECU will wait until the Bus is quiet before transmitting its message again.

Error checking of the signal is performed by the cyclic redundancy check (CRC). All the bits that make up the signal are assembled into an algorithm and this is sent as the CRC part of the signal. The receiver ECU will assemble the signal into the same algorithm and the result should match the CRC part of the signal. If they do not match, an error is recognised and the message is ignored. No acknowledgement (confirm) is given to the erroneous message. Because the ECU which transmits the message is also waiting to receive an acknowledgement, it recognises that the message is faulty and re-transmits the message. Calculations for the amount of error messages which escape these checks have shown an average of 1 error per 10,000,000,000,000 messages manages to get through.

For correct operation of the bus, the bus line must be terminated at both ends (ECM and IPK) with a resistor of nominal value 120 ohms, connected between CAN_H and CAN_L. These terminations ensure that bit errors due to signal reflections are avoided.

Faults

In trying to diagnose and locate a fault on the CAN-Bus or any of its associated components a logical approach should be used. Examples:

- Are the tachometer and coolant gauges working? If either is working, this indicates the CAN link from the ECM to the IPK is operating.
- Does the 'park, reverse, neutral, drive and low (PRNDL) display show the current gear on the IPK? If it does, this indicates that the CAN link from the automatic transmission control unit to the IPK is operating.
- During the start up bulb check, the traction control lamp in the IPK illuminates for four seconds and then goes out. The lamp is held off via the CAN-Bus system. If it does this it is an indication that the CAN link from the ABS/traction control ECU to the IPK is operating.

Not **Be** **mu** **t** **diag** **t** **CAI** **m**. It is a complex interconnected system and TestBook will assist the operator through the diagnostic route.

ECU's are very reliable and ECU failures rare. Wiring faults and poor connections are more common and the symptoms of the fault will vary with the location and severity of the fault. Faults on the system can be diagnosed logically by observing the symptoms and using a process of elimination. TestBook will guide the operator through the process.

If either CAN_H or CAN_L short to ground or short against each other, the CAN-Bus will not function and, therefore, communication will not take place. If a break appears in one of the lines, diagnostic equipment may be used to interrogate each ECU and find out what it is receiving and what it is not. When the CAN system is inoperative, each system ECU will operate independently-some in a default 'limp home' mode.

K-Bus (karosserie)

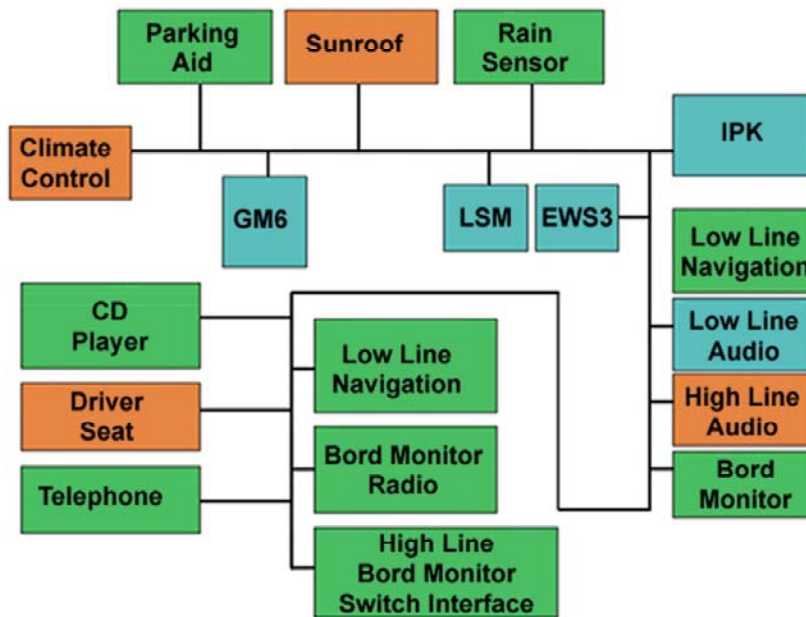


Fig 8 s s

The K-Bus system (see Figure 8) utilised in Rover 75 is the same proven K-Bus serial communication network used by BMW. It uses a single wire coloured white/red/yellow. It is slower than the CAN-Bus system, being capable of carrying 9600 bits of information a second. This is why systems which need fast updates to information tend to use the CAN-Bus system (for example engine and transmission systems). Less critical systems use the K-Bus system. K-Bus is the system which connects all the body electronic systems together and to the IPK.

K-Bus switches between 0–12 volts and has a low impedance, making it resistant to electromagnetic interference. Most users are active on the K-Bus when the ignition is switched to auxiliary position. Some are active with the ignition 'off', such as seat memory, which can operate independently of the ignition.

K-Bus message structure

| | | | | | |
|----------------|--------|------------------|--------------|------|--------|
| Sender address | Length | Receiver address | Command code | Data | CHKSUM |
|----------------|--------|------------------|--------------|------|--------|

The K-Bus message is called a telegram and is made up of several parts. The overall length of a K-Bus message must be between 5 and 37 bytes and if a message does not comply with this it is rejected. Each sender attaches its address to the message and the address for the intended receivers. The 'length' part of the message contains the number of bytes to expect in the message following the length data and the receiver checks that the message complies. The 'command code' informs the receiver to respond where necessary. All ECU's store a list of command codes to which they must respond. The data part of the message is made up of a number of data bytes (0–32) and is the actual data being sent. Each of the ECU's also contain a Bus interface to transmit and receive data to and from the Bus-system. This converts all the sensor information into a digital format and back again. Checksum is a further check the message is put through to help eliminate messages with bit errors.

The K-Bus system is primarily an event-driven system in that messages are sent after a request has been made on one of the systems (for example lights on, sunroof open). As with CAN-Bus there is a priority system. Arbitration on the K-Bus is controlled by the sender of the message. Each sender has a ranking which governs where it stands in the pecking order. The ground module (GM6) has the highest priority on the K-Bus system and messages from the GM6 override any other K-Bus message which has been transmitted simultaneously.

Each of the K-Bus users are continually monitoring the activity on the system. When a user needs to transmit, it waits until there is no activity and then transmits its message. The sender then listens to the system for its own message. If it doesn't receive back its own message this means a user with higher priority has also transmitted. The lower priority user then has to wait until the Bus becomes inactive and then re-transmit. When it receives its own message back this is confirmation of a successful transmission.

As with the CAN-system, logical approaches should be used to determine faults, e.g. with a door open on the vehicle, is the warning displayed in the instrument pack? If the door open warning is displayed this indicates the K-Bus from the GM6 body controller to the instrument pack is functioning correctly.

If the Bus is found to be at zero volts during diagnosis this could mean that the line is shorting to ground. The Bus system will not function if it is shorting to ground. Two pull up resistors, one located in the GM6 and one in the light switch module, pull the Bus voltage high. If the Bus is found to be at zero volts it could be caused by the light switch module (LSM) and the GM6 not being connected or not functioning correctly.

Not *t* *oc* *€* *r* *em.*

Diagnostic line

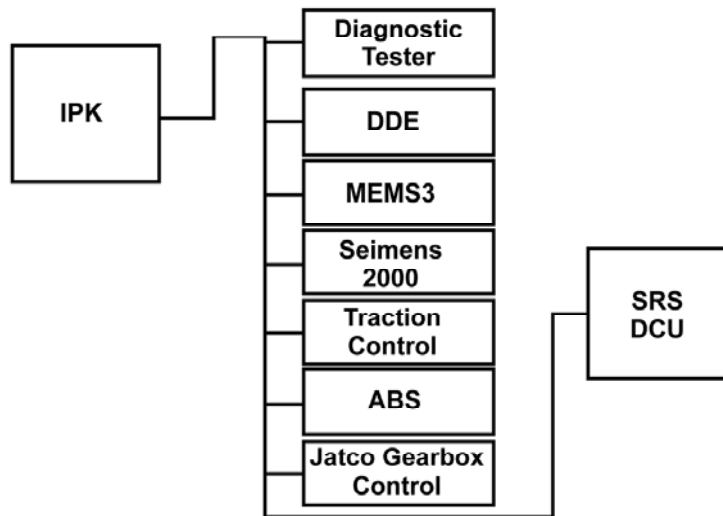


Figure 9

The diagnostic line (see Figure 9) is in fact made up of two separate bus systems which allow TestBook to communicate with the vehicle ECU's via the diagnostic socket:

1. The ISO 9141–2 K-line. This allows communication with the SRS DCU and powertrain related ECU's
2. The Diagnostic DS2 bus. This connects to the ABS ECU and to the instrument pack which enables communication with all the ECU's on the K-Bus system

The diagnostic bus uses a single wire and is capable of carrying 10,400 bits of information a second, although the ECU's on the DS2 bus transmit at 9,600 bits a second. The diagnostic line is used by TestBook to interrogate what each ECU is monitoring on the networks and helps in the fault finding process. It uses a protocol very similar to that of the K-Bus system and is accessed by TestBook via the 16 pin diagnostic connector located in the driver's footwell. The table 'Diagnostic socket pin details' outlines the pin out details of the connector.

Diagnostic socket pin details

| Pin No. | Description | Input/Output |
|---------|----------------------|--------------|
| 1 to 3 | Not used | - |
| 4 | Chassis earth | Output |
| 5 | Signal earth | Output |
| 6 | Not used | - |
| 7 | ISO 9141-2 K line | Input/Output |
| 8 | DS2 | Input/Output |
| 9 to 15 | Not used | - |
| 16 | Battery power supply | Input |

The CAN-system cannot be accessed directly using TestBook. TestBook will assist the operator through a fault finding process which is a logical and manual procedure. During the design and manufacture of CAN-systems, they can be interrogated and monitored using specialist equipment. Rover engineers use a 'Canalyser' to explore and record the functionality of the system. In servicing, this expensive specialist equipment will not be necessary as the CAN-Bus may be diagnosed via the diagnostic line-interrogating each CAN ECU. Problems are more likely to occur with faulty wires or poorly made connections and, in these cases, it will mean the loss of a signal completely. Checks for continuity of a network's wires can be carried out using a multi-meter. Faulty ECU's can be replaced by a new ECU which, if correctly configured, can be plugged directly into the CAN-system.

GM6 body controller

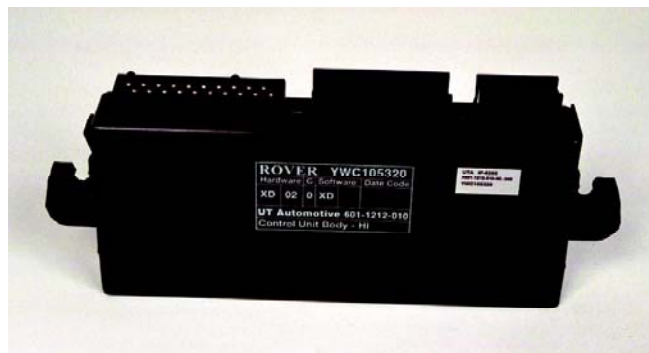


Figure 10

The GM6 (ground module) body controller (see Figure 10) is the body control unit which controls several of the systems on Rover 75. It communicates with other systems fitted to Rover 75 via the K-Bus system. There are two versions of the GM6: a highline and a lowline version. The highline version is black in colour and the lowline is cream coloured. They function in the same way and the only difference is that the highline controls the electric rear window lift system in addition to the other systems that both highline and lowline versions control.

The GM6 is located on the passenger side, behind the glovebox on the cross car protection beam. Access is via the removal of the glovebox. It is secured to two weldnuts on the cross car protection beam using two M6 bolts. The GM6 also has two push-fit mounting ears. The systems controlled by the GM6 are as follows:

- Electrical load management
- Front window lift system
- Rear window lift system (highline version only)
- Alarm and R/F system (not receiver)
- Lowline HEVAC
- Interior lighting system
- Wiper system (including powerwash for the headlamps)
- Heated rear windscreen
- Central door locking
- Fresh air/recirculated air flap (all levels of HEVAC)

n t

Electrical load management is carried out by the GM6. This is designed to reduce battery drain when the vehicle is being transported, stored or not in use for prolonged periods. There are two load management configurations:

1. transit mode
2. normal mode

Transit mode

The vehicle leaves the factory in transit mode and needs to be taken out of transit mode using TestBook. Transit mode is a power saving mode which alters how the vehicle systems operate whilst in transit, preventing battery discharge. Transit mode also limits the number of access points into the vehicle

Areas affected by transit mode:

- Electric windows
- Locking
- Sunroof
- Warnings
- Lights
- Alarm
- Heating
- Television

Electric windows

Front electric windows will remain operable but the one touch open facility will not function. Where fitted rear electric windows will not function and it is necessary to ensure rear windows are closed if it is necessary to program a vehicle into transit mode.

If an anti-trap sensor is fitted to the driver's window the one touch close function will be active for this window.

Locking

Single point entry, lazy locking and superlocking will be active by using the remote handset and by use of the key. The vehicle will go directly to superlock by a single key turn.

f

Sunroof disabled in transit mode.

Ignition warning

The key in ignition warning is active in transit mode. This is a chime which sounds when the key is in the ignition with a door open and the engine not running. In transit mode it is set to a higher frequency than normal making it more audible and harder to ignore.

The overspeed warning is set to 70 mph and a chime sounds when this speed is reached.

Lights

Headlamp timeout feature is disabled. If the battery voltage falls below 12.3 volts the position lamps(sidelights), the parking light and the headlamp levelling function will be disabled.

The interior lights will only illuminate to 50% of their normal intensity and the timeout function will cut out after one minute rather than the normal sixteen minutes.

Alarm

All alarm functions are disabled in transit mode.

Heater

The heated rear window will only operate for one minute with the ignition 'on' and the engine not running.

The heater blower will only operate for one minute with the ignition 'on' and the engine not running.

Television

The television function (if fitted) is disabled in transit mode.

Normal mode

In normal mode all functions will operate as required but the GM6 is constantly monitoring battery voltage. When the battery voltage falls below 12.5 volts the heated rear window is put into power saving mode. The GM6 has a sleep mode as part of its normal function and this helps to reduce battery drain. The sleep mode becomes active if the ignition is 'off' and no change in input is detected for 16 minutes.

During cranking to allow maximum power to be applied to the starter motor the GM6 disables, or powers down, the windscreen wipers, the electric windows, the blower motor and the fresh air/recirculation motor. When cranking is complete and the ignition returned to the 'on' position, the GM6 restores the power to each system in a staggered fashion to prevent simultaneous power demand from the systems.

Window lift system

The GM6 controls all window lift operations. The driver's door switchpack, or module (see Figure 11) , can operate all the windows in the vehicle and communicates with the GM6 using a discrete serial communication Bus (WIN-Bus) with a baud rate of 1200 bits a second. This is a single wire through which all driver demands are sent to the GM6 as digital signals. The GM6 receives these signals, converts them and transmits them as outputs to the relevant motors. The switches controlling the passenger and rear windows are all hard wired to the GM6 and switch to ground. The switches are monitored by the GM6.



Figure 1

Operation of the window lift system is available with the ignition switched to auxiliary position 1 or ignition position 2. There is a time out feature that enables the window lift system to be operated for a predetermined amount of time (40 seconds) after the ignition has been switched off. The timing function is disabled if either of the front doors are opened or if either of the front doors were open when the ignition was switched off.



Figure 2

The individual door switches (see Figure 12) which control the movement of the electric windows are located on the door trim casings on the grab handle. The front passenger and rear passenger window switches are rocker type switches. The rocker switches are momentary action and have three positions:

1. Central position - off
2. Up position - drives window up
3. Down position - drives window down

The driver's door switchpack contains switches for the operation of all the windows. Where rear electric windows are fitted there is a rear window disable switch on the driver's door switchpack. When this switch is operated it will inhibit operation of the rear window switches, leaving control of the rear windows to the driver.

One-shot down

A one-shot down feature is available on all windows. Pressing any of the window switches down for less than 0.4 seconds will drive the window to fully open. Operation of any of the switches for longer than 0.4 seconds activates manual control of the window. In this instance, the window will move in the direction selected for as long as the switch is pressed/operated. This function can be disabled using TestBook.

An rap

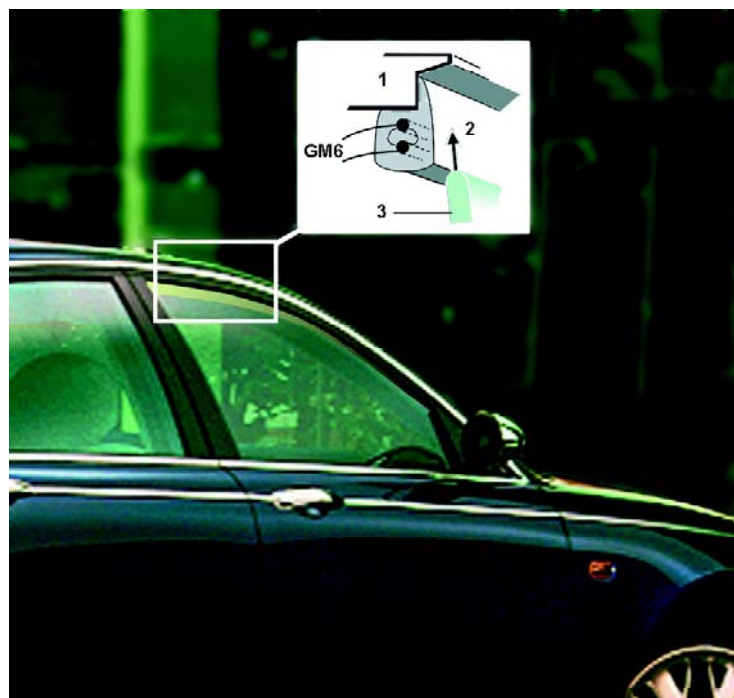


Fig . ti p

- 1.Door frame finisher
- 2.Object
- 3.Glass

The anti-trap feature (see Figure 13) is available on the driver's window on higher trim levels of Rover 75. Where fitted, the added feature of one-shot upwards is available and can be enabled / disabled using TestBook. The anti-trap function is designed to detect when an object is placed between the top edge of the glass and the top of the window frame. The anti-trap system uses a hollow rubber seal with two conductors running through it. One of the conductors is wired to the GM6 and the other is wired to ground. The rubber seal is fixed to the door inner frame finisher using double sided tape. When an object is placed between the top edge of the glass and the top of the window frame, the window will transmit pressure through the object. The pressure from the object will be exerted onto the conductive rubber seal. This pressure will force the conductors to make contact with each other and the GM6 will register a change of resistance between the conductors. The GM6 registers this as an obstruction and drives the window downwards to the fully open position.

The trap sensor has highest priority on the window up movement. If the sensor fails, the GM6 will adopt 'inch mode'. This is a fail-safe procedure which, when an up request is made on a system with a faulty trap seal, will drive the window up for 0.5 seconds. To fully close the window the switch will need to be repeatedly pressed and released until the window is fully home.

libration

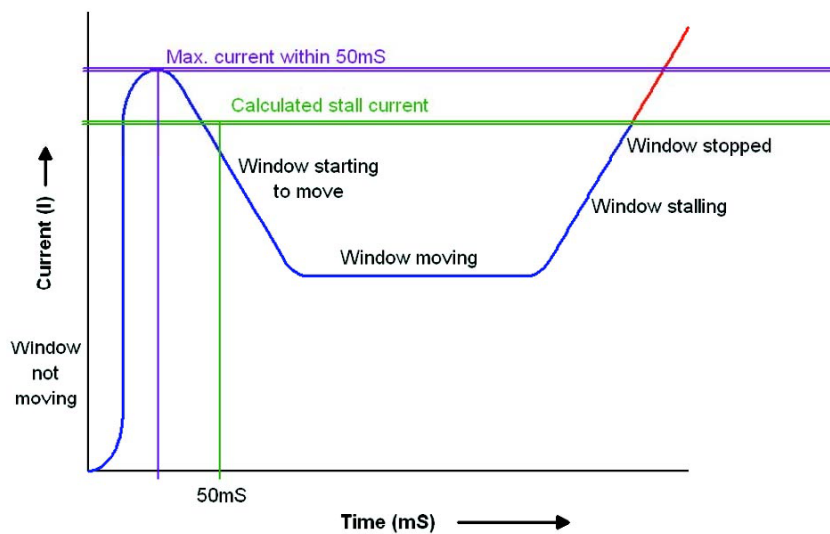


Figure 14

The GM6 monitors the current flowing during a window movement to detect when the window has reached its fully open or fully closed position (see Figure 14). The peak current drawn during a window movement will be at the start of the operation. This is because the window motor must initially overcome the friction between the window contact and the door frame. When the window begins to move there is a current drop. The GM6 will record the current level at the start of the window operation and base its figure for stopping the window motor on this. When the window reaches its full travel, the current builds again as the motor continues attempting to drive the window. When the current reaches the level determined by the GM6 from the start current it switches 'off' the motor.

The GM6 automatically calibrates itself with each window use. It measures the starting current at the beginning of every window operation. It does this because the start current can vary with conditions, particularly changes in temperature. A predetermined current level is not suitable for these reasons. There is an overall current threshold stored in the GM6 to protect the system from high currents caused by stiff or stuck windows. When the current reaches this level, the GM6 automatically switches the motors 'off'. If the motor stalls, for whatever reason, the current will rise until it passes the start current, or overall current threshold, after which the motors will be turned 'off' by the GM6.

witc o. cts

Switch conflicts occur when a local window switch is pressed simultaneously with the corresponding switch in the driver's door module in the opposite direction. When this occurs the window will stop moving. Further operation of the window causing conflict will cause the inch mode to be adopted. This means that if a window switch becomes stuck in the 'on' position it is still possible to 'inch' the window in both directions using the alternative switch.

The GM6 limits the time for which any window motor may operate to seven seconds. If this time limit is reached, the output is switched 'off', regardless of any other condition.

Interior lighting

All interior lighting is controlled by the GM6. The components which make up the interior lighting system include the instrument pack, the inertia switch, the ignition switch, the door harness, the main harness. The other components are distributed around the vehicle (see Figure 17).

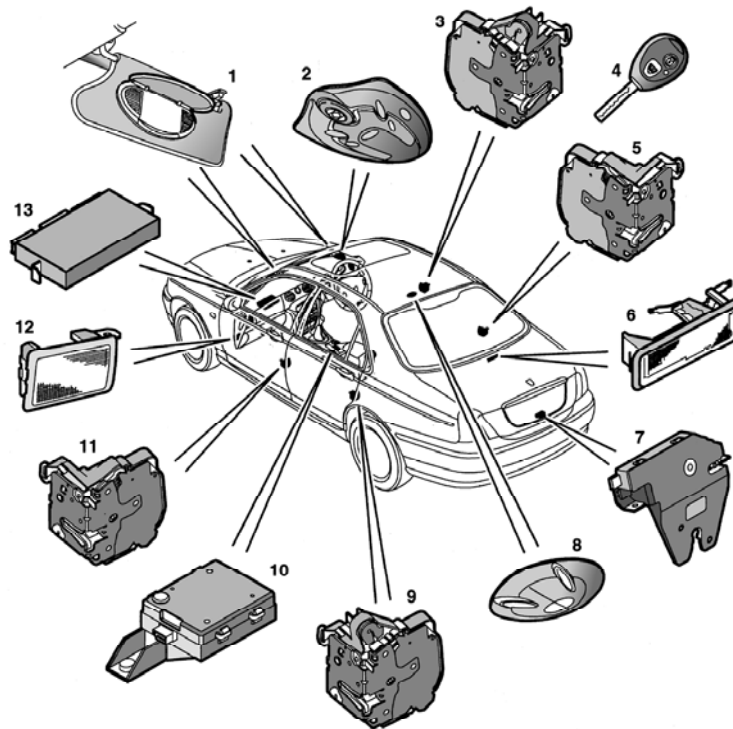


Figure 17. Interior lighting components

1. Vanity mirror units
2. Front interior lamp unit
3. Right hand front door latch
4. Remote handset
5. Right hand rear door latch
6. Boot lamp
7. Boot latch
8. Rear interior lamp unit
9. Left hand rear door latch
10. Radio frequency (RF) transmitter/receiver
11. Left hand front door latch
12. Glove box lamp
13. GM6

The manual interior light switch is located in front of the interior light unit. It is a single momentary push switch and toggles the mode of operation between three selectable modes:

1. Automatic control
2. Permanent 'on'
3. Permanent 'off'

No On permanent off vehicle, interior lighting default automatic mode.

There are front and rear central courtesy lamp units available, both with directional reading lamps.

Auto mode

When in automatic mode, the interior light output ramps up gradually when one or more of the doors are opened, and fades out after a 20 second delay after all the doors are shut, providing the auxiliary ignition position is 'off'. If auxiliary ignition is 'on', the lights will fade out as soon as the doors are shut.

If any door is left open for longer than 16 minutes in automatic mode, the interior light output is switched 'off'. The system resets once the open doors are closed or if a valid 'on/off' signal is received from the interior light switch.

The boot open input has the same affect on the system as a door open input.

In automatic control mode the following inputs will switch the interior light 'on':

- Any open door
- External unlock (Via key or remote handset)
- Inertia switch triggered with alarm disarmed
- Interior light switch operated with interior lights 'off' and alarm disarmed
- Boot open
- Auxiliary ignition position turned from 'on' to 'off' when the sidelights have been 'on' in the previous 32 seconds. In this instance, the light will remain 'on' for 20 seconds.

The interior lights will be switched 'off' in the following conditions:

- All doors and boot shut with auxiliary position 'on' or ignition position 2 'on'. Lights can still be switched 'on' manually in this instance via the interior light switch
- All doors shut with auxiliary position 'off' -delay of 20 seconds. This is dependent on the interior light switch not being switched 'on'
- When auxiliary position is switched from 'on' to 'off' if the sidelights were 'on' during the previous 32 seconds. In this case, there is a 20 delay before lights off
- External lock (via key or remote handset), provided all panels are closed
- When door(s) and/or boot are open for longer than 16 minutes
- Interior light switch is pressed with interior lights 'on'
- Inertia switch reset
- Interior light output on for longer than 16 minutes
- Ignition turned 'on'

on/off

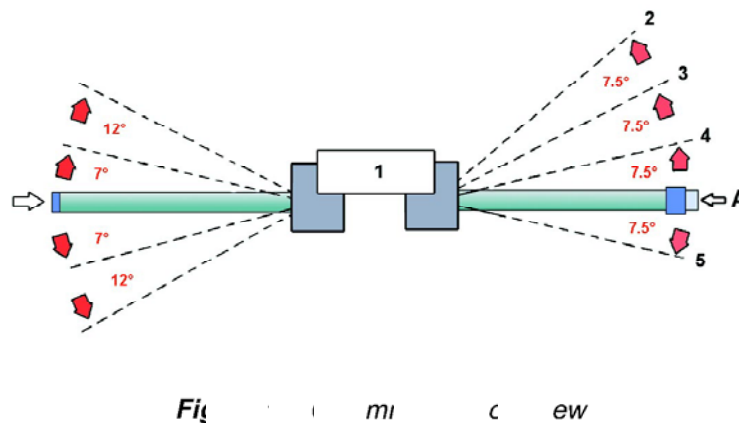
Soft 'on/off', or ramp up and fade out, of the interior lamps is automatic on all interior lamps, except for the manual operation of the interior light switch operations. Metal oxide semi-conducting field effect transistor (MOSFET) transistors are used to pulse width modulate (PWM) the two outputs from the GM6 which feed the lamp circuits. This modulation follows a linear ramp, increasing and decreasing ('on' and 'off') the current supplied to give a smooth and proportional change in light intensity (ramp up and fade out) .

Wiper system

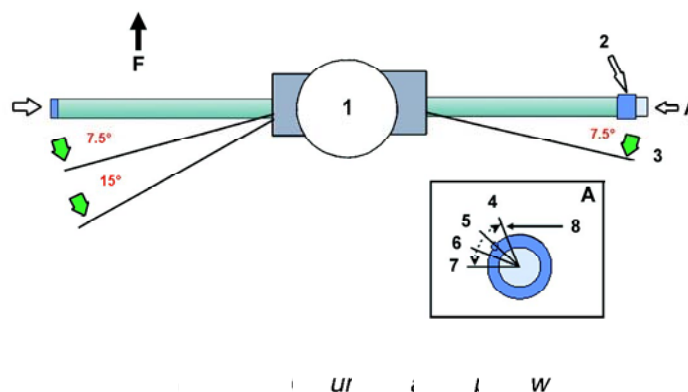
The wiper and wash systems are controlled by the GM6 body controller. The front wiper system is controlled by the right hand column stalk connected to the steering column. There are two wiper speeds and five wiper stalk positions available to the driver:

1. 'Off'
2. Flick wiper
3. Intermittent wiper
4. Continuous slow wiper
5. Continuous fast wiper

The front wipers will only operate with the ignition in position 1 and 2. The wiper function is disabled during engine cranking.



1. Rotary coupler
2. Fast wiper
3. Slow wiper
4. Intermittent wiper
5. Flick wiper



1. Rotary coupler
2. Intermittent wiper control delay
3. Programme wash/wipe
4. End stop
5. Second detent
6. First detent
7. End stop

Slow speed wiper

Initiated by moving the wiper down (see Figure 18). When the stalk is moved down and released one slow speed wipe is performed by the wipers. Holding the stalk down operates the wipers continuously at fast speed. When the stalk is released in this mode, the wipers revert to slow speed until they reach their park position, where they stop.

Intermittent wiper

Moving the stalk switch up one position initiates intermittent wipe. In this position, the wipers will initially perform a wipe at slow speed and then return to their park position. The wipers will remain in the park position for a length of time governed by the vehicle speed and the position of the thumbwheel potentiometer on the stalk (see Figure 19). The thumbwheel potentiometer has four positions, each relating to a different delay time between wipes. When the speed of the vehicle increases, the delay time between each wipe decreases proportionally. The range of delay time can vary between 2 and 26 seconds.

Slow speed wiper

Moving the stalk switch up two positions from the 'off' position initiates slow speed wiper. In this position, the wipers operate at their slow speed continuously. When switched 'off', the wipers continue to operate until they reach their park position. In this mode, if the vehicle slows down to less than 8 Km/h the wipers operate at intermittent wipe. If the vehicle speed subsequently rises above 8 Km/h, the wipers will return to slow speed wiper.

Fast speed wiper

Moving the stalk up three positions from the 'off' position initiates fast speed wiper. In this position, the wipers operate continuously at their fast speed. When switched 'off', the wipers continue to operate at slow speed until they reach their park position. In this mode, if the vehicle slows to less than 8 Km/h the wipers operate at slow speed wiper. If the vehicle speed subsequently rises above 8 Km/h, the wipers will then return to fast speed wiper.

Programmed wiper

Moving the stalk rearwards initiates a programmed wiper. Whilst the stalk is held rearward the washer pump and the wipers will run continuously until the stalk is released. The wipers will start wiping only if the wash has been activated for at least 0.75 seconds. When the stalk is released, the wipers will automatically perform three slow wipes and then return to their park position. If during the programme wiper the stalk position is changed, the programme wiper will cease operation and the newly requested wiper function will be carried out.

There is a washer fluid level switch connected to the instrument pack, which is held open when the fluid level is above a predetermined level. When the washer fluid reaches a predetermined low level, the switch closes. Once the switch has been closed for longer than twenty seconds the warning lamp in the instrument panel will illuminate. A message will be displayed on those instrument packs fitted with a message centre.

Headlamp power wash

The headlamp power wash system is available as an option. When the windscreen washer pump is operated with the ignition 'on', and if the dipped headlamps or main beam are 'on', the headlamp power wash pump is also operated. It will operate on the first operation of the windscreen wash and will then continue to operate on every 5th operation of the windscreen wash.

The windscreen wash has priority and when the washer fluid is below a certain level the power headlamp wash will be inhibited. The GM6 controls the switching of the headlamp power wash via a relay located in the passenger compartment fusebox.

Heated washer jets

Another option available is heated washer jets. There are two heating elements in the tip of the washer jets to prevent the build of ice inhibiting the operation of the jets. These are not controlled by the GM6. They are switched directly from the ignition switch.

Wiper stall protection

The front wiper park switch is used to detect stalling of the wipers. If the wiper run relay is 'on' and the wiper park switch is open circuit, or short circuit, for longer than 18 seconds, then the wiper run relay will be de-activated and the wipers will be stopped and will not park.

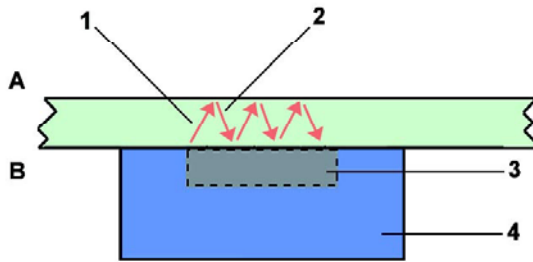
The wiper motor cannot be restarted, after a stall detection, until the ignition auxiliary position is turned 'off', and then back 'on' again, or if the wiper stalk is moved to the 'off' position and then back to any of the 'on' positions.

Rain sensor functionality

The rain sensor consists of four major components:

1. **Infra-red transmitter and receiver:** The transmitter sends infra-red light through the windscreen, via the optical unit (prism). When the infra-red light hits the connection point between the glass and air it is reflected back into the optical unit (prism). The receiver measures the intensity of the incoming infra-red rays. The sensor is calibrated to determine from the reflected infra-red rays the amount of water on the windscreen. From this information the sensor can calculate when to initiate a wipe.
2. **Heating element:** This component ensures the optical element and the windscreen piece it is attached to remain free from condensation and/or ice.
3. **Photoelectric cell:** In poor visibility and dark driving conditions the driver can experience intense dazzle from light shining through water droplets on the windscreen. In these dark and wet conditions the human eye is more sensitive to the headlights of oncoming vehicles. To compensate for this, the rain sensor sensitivity is increased and wipe cycles become more frequent. This helps to prevent dazzle by ensuring water droplets are removed rapidly from the windscreen in wet and dark conditions. A photoelectric cell is used to control the sensitivity of the rain sensor to match the visibility conditions.
4. **Microprocessor:** Located within the sensor, this is where the calculation for the delay between wipes is determined against the given inputs.

inc e of o j tion:



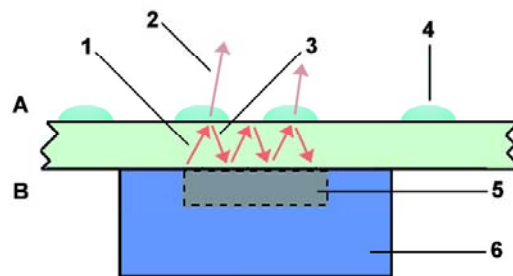
Fi **i** **an w** **een**

- 1.100% light tranLsmitted
- 2.100% light received
- 3.Optical unit (Prism)
- 4.Rain sensor

A = Outside vehicle **B** = Inside vehicle

The rain sensor operation is based on the principles which govern light reflection at bordering layers between materials. Different materials have different refraction indices, which mean that they reflect light in different ways. In clean and dry circumstances, the bordering materials that the rain sensor measures are glass and air. In wet circumstances, the bordering materials are a combination of glass, air, and water.

The transmitter within the rain sensor sends out infra-red light via the optical prism, through the windscreen. The infra-red light is transmitted at a precise angle, which means that when the windscreen is dry and clean 100% of the light transmitted is reflected back into the rain sensor. (although, in reality, some of the light is absorbed by the windscreen). This is called 'total reflection'. In this instance, the amount of light transmitted is equal to the light entering the receiver (see Figure 20).



Fi **e** **i** **en**

- 1.100% light transmitted
- 2.Lost light
- 3.Less than 100% light received
- 4.Raindrop
- 5.Optical unit (prism)
- 6.Rain sensor

When the windscreen is wet over the area monitored by the rain sensor, total reflection does not occur. Some of the light escapes by refraction into the rain droplets and only a percentage of the light is reflected. The proportion of light escaping and light reflecting is determined by the wetness of the windscreen. The wetter the windscreen, the less infra-red light is reflected back into the rain sensor. The sensor can calculate, from the amount of infra-red light being reflected, how wet the windscreen is and when a wipe cycle is required (see Figure 21).

Instructions

If the rain sensor needs replacing, or a windscreen fitted with a rain sensor needs replacing, the sensor can be removed from the screen via two retaining clips. The replacement sensor can then be clipped in its place. If the windscreen is being replaced, the optical element is discarded with the windscreen. The sensor is then fitted to the replacement windscreen which has an optical element pre-fitted.

If the optical element becomes faulty a new screen with an optical element pre-fitted will need to be fitted.

Make sure the rain sensor is set to 'OFF' position or the sensor should be 'OFF'.

TestBook

History

TestBook is a diagnostic information system and was developed by Rover in collaboration with Hewlett Packard. TestBook 1 was launched in February 1993 and world wide roll out was completed by June 1994. TestBook 1 specification is as follows:

- 486SX 25MHz processor
- 4 Mbytes RAM (updated to 20 Mbytes during 1995)
- VGA capacitive touch screen (640 x 480 pixels), 32 grey scale
- 120 Mbytes hard disk
- CD ROM
- MS DOS 5/Windows 3.1 (updated to Win 95 in October 1997)

TestBook 2 was launched in June 1997 and with the following upgraded specification:

- 486DX2 50MHz processor
- 20 Mbytes DRAM
- VGA removable resistive touch screen (640 x 480 pixels), 32 grey scale
- 14 Gbyte hard disk
- 4 x CD ROM
- Windows 95

Additionally TestBook can be used to measure voltage, resistance and current.

Rover 75 TestBook

The launch of Rover 75 introduces a new strategy for TestBook which utilises the extensive Bus technology employed by Rover 75. This makes it possible to read all faults stored throughout the vehicle by pressing a single TestBook button. Existing features of TestBook have been improved and a new feature is the central coding key, which establishes the vehicle configuration.

There is a comprehensive range of diagnostic functions available with Rover 75 TestBook.

Diagnostic functions

- Central coding key
- Vehicle fault diagnostics
- System test
- Sub system test
- Real-time display
- Force outputs
- Vehicle maintenance
- Fault explorer
- Fault code diagnostics

Central coding key

The central coding key is information relating to the ECU's and systems fitted to the vehicle. The central coding key is stored in three ECU's on Rover 75:

1. The engine control module
2. The immobilisation ECU (EWS-3)
3. The instrument pack

TestBook uses this information to establish the ECU's and systems fitted to the vehicle and will only display the relevant system icons appropriate to the vehicle specification. Previously TestBook was programmed to display all systems that could be fitted to the vehicle regardless of whether or not the system was actually fitted to the vehicle.

An additional coding key is stored in the immobilisation ECU only. This information relates to the individualisation of the vehicle configured at the dealership to suit customer preferences, for example the daytime running lights option.

TestBook functionality

The main screen visible when Rover 75 diagnostic system has been accessed using TestBook has four options:

1. Vehicle fault diagnosis
2. System diagnostics
3. Vehicle configuration
4. Vehicle maintenance

Vehicle fault diagnosis

This is a new feature which allows the operator to read all faults stored in all vehicle systems by pressing a single TestBook button. The faults found can be diagnosed by the operator sequentially or non-sequentially as required. Fault explorer can be used to assist fault diagnosis and fault codes can be cleared in vehicle fault diagnostics.

Vehicle maintenance

Vehicle maintenance contains the pre delivery inspection icon which takes the dealer through the process of checks required before handover of the vehicle to the customer. The instrument pack service interval announcement (SIA) display can be reset in vehicle maintenance when necessary, the immobilisation ECU and the engine management ECU can be resynchronised here and transit mode can be selected/deselected (see Figure 22).

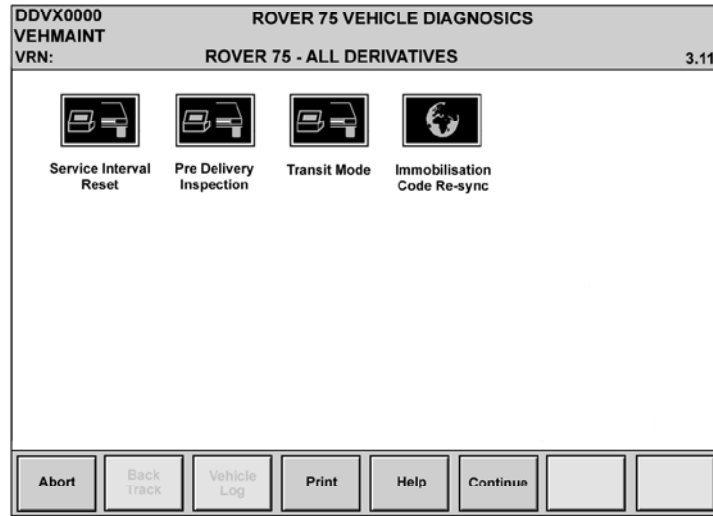


Figure 22: Vehicle Maintenance

Vehicle Configuration

Vehicle configuration contains various options to check and reconfigure ECU's on the vehicle and the ability to set the market configuration. Selecting a market will reconfigure the vehicle to implement the market legislation and the default settings for that particular market. Some market transistions are not permitted because of emissions legislation, for example, changing from a leaded market configuration to an unleaded market configuration (see Figure 23).

Vehicle configuration is where dealer configuration is accessed. This enables the individualisation of the vehicle to suit customer requirements covering options such as the headlamp delay option which the dealer can turn 'on' or 'off' as required.

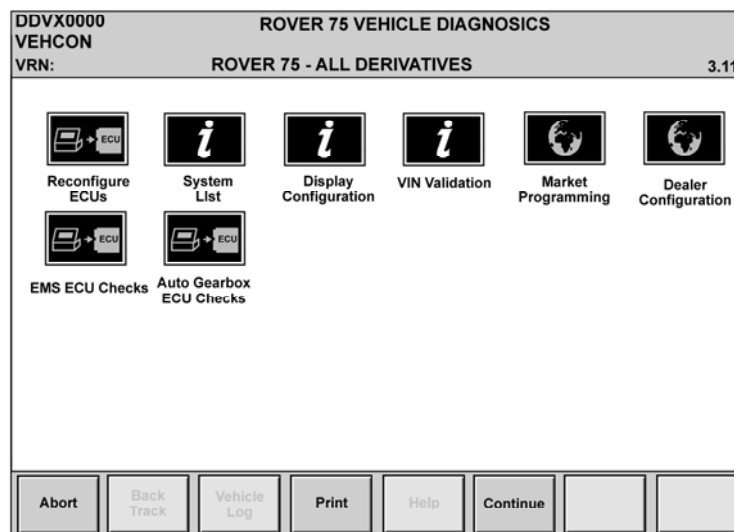
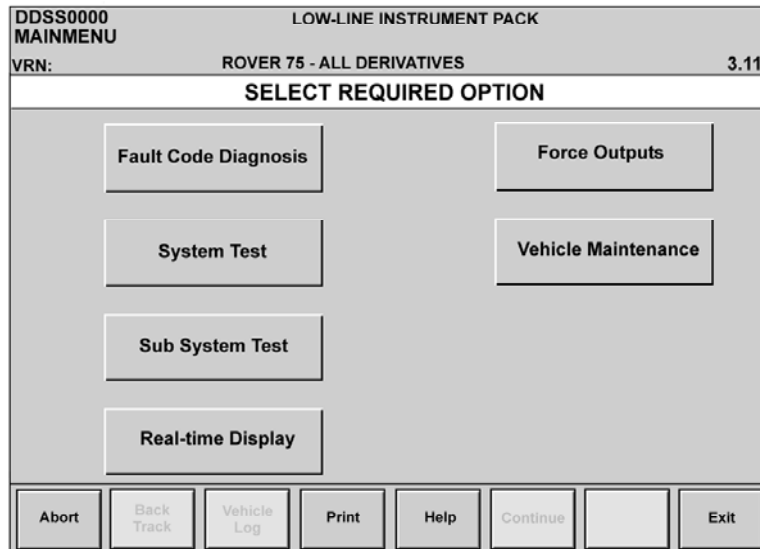


Figure 23: Vehicle Configuration

System diagnostics

System diagnostics covers each of the systems on the vehicle individually, with each system having a separate icon. Entering a system icon enables the functions available with the system to be accessed. The functions are grouped together in a logical fashion (see Figure 24).



€ ç 7 e Lc m t)

Fa code diagnostics

This enables all the fault codes stored in the system ECU to be accessed and if necessary to be explored using fault explorer. When required the fault codes can be cleared.

€ st

This feature is found within each system diagnostic section and covers areas of systems not covered by fault codes. The operator is guided by TestBook screens through a number of operations and must input the results into TestBook. The tests are the complete series of sub-system tests for the system and are undertaken in a sequential manner. All results can be printed for recording purposes and 'fault explorer' can be used to diagnose any faults that are found during the test.

S € st

A sub-system test is one of the tests that make up the overall system test and allows the test to be carried out in isolation. Fault explorer can be used to diagnose any faults that are found during the test.

y

Real time display gives the option of reading live data from the vehicle. An 'overview' icon makes it possible to view a maximum of twenty eight items simultaneously. Individual readings can be enlarged and more detail can be accessed to explain exactly what is being viewed and values expected.

Force outputs

This allows outputs on most of the systems to be driven and correct operation of systems can be confirmed. A maximum of seven items can be viewed simultaneously and more details can be accessed when necessary.

Vehicle maintenance

Vehicle maintenance consists of options set using TestBook that are not part of the diagnostic system. They relate to the updating of the configuration of the vehicle. When the correct system is accessed plip programming is available (security), immobilisation and engine management resynchronisation is available in both systems diagnostics. ECU renewal and programme checks can be carried out in vehicle maintenance.

Fault explorer

Fault explorer lists the possible causes of faults stored in each ECU. Each fault can be explored more detail is available for operators who need it. Items such as fuses and connections which may be the cause of the fault are listed and information on their location can also be accessed.

ECU replacement

The configuration of a Rover 75 is essential to ensure all systems integrate correctly and that TestBook works efficiently. As such whenever an ECU is replaced the vehicle must be reconfigured using TestBook.

It is advised that the ECU to be replaced be left on the vehicle to enable TestBook to establish the configuration. Where available the 'Renew ECU' option located under the 'Vehicle Maintenance' icon of the relevant system diagnostic should be used to configure the vehicle. This will provide the necessary instructions to correctly configure the vehicle when that particular system ECU is renewed. Where this facility is not provided with a particular system diagnostic it is possible to configure the vehicle using 'Reconfigure ECU's' under the main 'Vehicle Configuration' icon.

When renewing powertrain ECU's it is important to replace it with the latest hardware and then download the applicable software. To do this 'ECM checks and renewal' should be used and can be found under 'Vehicle Configuration' and 'Vehicle Maintenance' in the main system diagnostic. The original ECU should be left fitted until requested to change it by TestBook as TestBook indicates suitable hardware numbers for replacement ECU's

In the event of communication failure the faults suggested by 'Fault Explorer' should be investigated. If it is decided that the ECU is faulty, where it is available, 'More Detail' should be selected to ensure the correct procedures are followed. When 'More Detail' is not available it is sufficient to replace the ECU and configure it using 'Renew ECU' in the system specific diagnostic or, if necessary, using 'Reconfigure ECU's' under the main 'Vehicle Configuration' icon.

Immobilisation

Engine immobilisation EWS-3

The immobilisation system used on Rover 75 is referred to as EWS-3 (Elektronische Wegfahrsperre). The main function of the system is to prevent unauthorised starting of the vehicle by creating a secure interface which cannot be copied or bypassed in any way. It also checks systems to ensure that the vehicle is in a safe condition for starting. Immobilisation is carried out by disabling the starter motor and by preventing engine fuelling via the ECM. Although the EWS-3 system uses components in common with the locking and alarm system it is a stand alone system (see Figure 25).

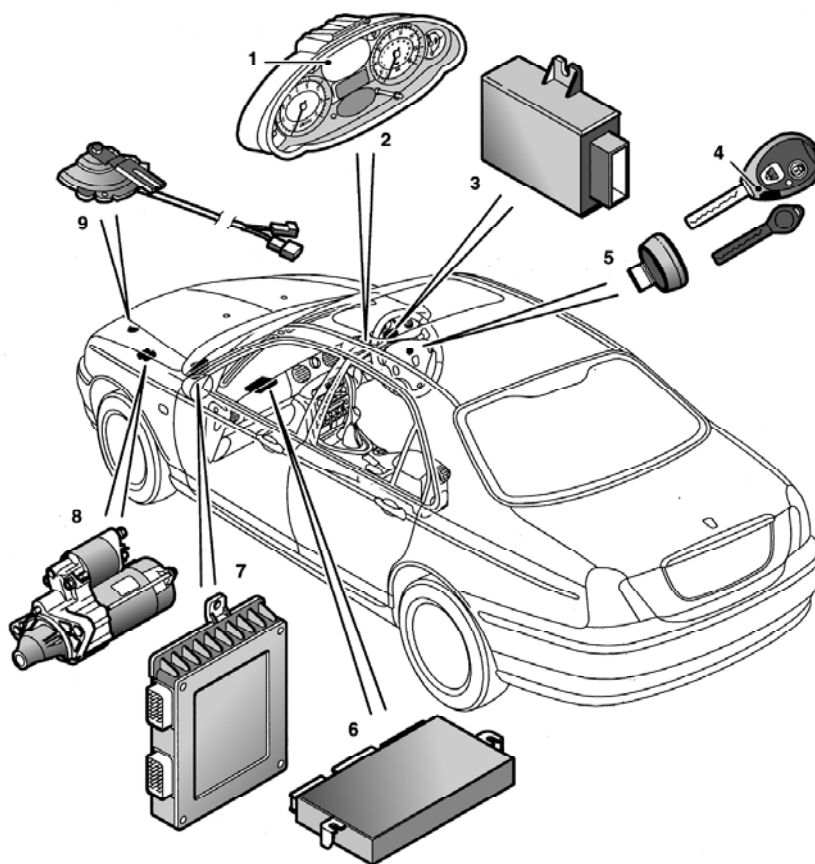


Figure 25. Instrument pack

1. Message centre (hi-line instrument pack only)
2. Instrument pack
3. Immobilisation ECU
4. Key transponder
5. Ring antenna
6. GM6 body control unit
7. Engine control module
8. Starter motor
9. Automatic transmission switch

When a key is inserted in the ignition, a three stage check is carried out. Each key has a unique identification number and this is sent by the key transponder to the EWS-3 ECU. A password unique to the key is used by the EWS-3 ECU to communicate with the transponder. The final stage of the key identification is the confirmation that the rolling code from the transponder matches with the EWS-3 ECU rolling code. Once the EWS-3 has confirmed that a valid key is requesting the starting of the vehicle, it will energise the starter motor relay and inform the ECM that starting has clearance by sending the correct code to the ECM.

The EWS-3 ECU controls the starting of the vehicle by communicating with the ECM via a unidirectional data line. It also uses data sent by the ECM via messages on the CAN-Bus. These messages are converted by the instrument pack into the format compatible with the K-Bus system and sent to the EWS-3 ECU. The EWS-3 also controls the operation of the starter motor via control of a starter motor relay. This relay is internal to the EWS-3 ECU.

EWS-3 electronic control unit



Fi V it

The EWS-3 ECU (see Figure 26) is located on the driver's side A-post and secured by two fixings. The ECU arrives from the supplier as a blank unit and is programmed with a starting code during vehicle manufacture. This code has to be learnt by the ECM and this programming is also carried out during the manufacture of the vehicle. This starting code is then used as a base point for the rolling code by both the EWS-3 and the ECM.

The EWS-3 electronic control unit governs the overall immobilisation and re-mobilisation of the vehicle. Without it receiving a valid signal from a key transponder it will inhibit starting of the vehicle. The starter motor will be disabled and the ECM will not initiate fuelling of the vehicle. Each key has its own identity and the EWS-3 is capable of supporting up to ten keys.

When all the key slots have been used and more keys are required, the EWS-3 must be removed and a new EWS-3 fitted. Therefore, a maximum of 10 keys per vehicle are available at any given time. When new keys are supplied, they arrive ready for use with the vehicle, having been pre-programmed with the relevant coding. This coding relates to a new slot in the EWS-3 ECU. The ECU is capable of recognizing the first use of the new key and initiates the rolling code transfer from then on.

The EWS-3 can communicate with the different types of engine management systems incorporated in the Rover 75 range using the same protocol. The EWS-3 also has a link to the K-Bus system, from which it receives data about the condition of the vehicle (for example engine speed and locking status). From this it can establish if it is safe to start the vehicle. On vehicles fitted with automatic transmission, there is an input from the Park/Neutral switch which must be present before the EWS-3 allows re-mobilisation of the vehicle.

If a fault occurs with the EWS-3 ECU a replacement is available only through a recognized dealership, which will follow a strict process for the replacement of immobilisation components. Here, the relevant information for every EWS-3 ECU is stored against the vehicle identification number in a database. This information cannot be read directly from the EWS-3 ECU using TestBook or any other diagnostic tool. At the appropriate centre this information is accessed and is programmed into the replacement EWS-3 ECU. It will arrive at the dealership ready for fitment to the vehicle. Once the replacement part has been fitted to the vehicle, TestBook will be required to re-synchronise the EWS-3 ECU with the engine control module.

EWS-3 also incorporates a starter motor protection function. When the engine speed exceeds a predetermined value, a starter relay inside the EWS-3 ECU is disabled. This relay is in series with the main starter motor solenoid and therefore when disabled cuts off the power supply to the starter motor. This prevents destruction of the starter motor in the event of a sticking ignition switch.

Engine control module (ECM)

The EWS-3 ECU is capable of working with the three different engine control modules fitted to Rover 75 derivatives. KV6 2.0 and 2.5 litre engines use a Siemens 2000 engine management system (see Figure 27). The K1.8 uses Rover modular engine management system (MEMS 3). The diesel M47 uses the digital diesel electronic (DDE 4.0) engine management system.



Figure 27

Each ECM arrives from the supplier in a blank condition. (i.e. without a starting code base point). During the manufacture of the vehicle, there is a process carried out whereby the ECM learns the starting code from the EWS-3 ECU. This process means that the swapping of the ECM or the EWS-3 ECU from one vehicle to another is not possible because the correct code will not be present in both ECU's. The ECM will allow starting of the vehicle only on reception of a valid code from the EWS-3.

Each ECM can learn only one starting code. For it to learn another it must first be blanked by the supplier. A new ECM will be required in most circumstances and TestBook will be needed to transfer the codes from the EWS-3 ECU to the blank ECM.

There is a window which allows the EWS-3 rolling code to roll ahead of the ECM. If the ECM and the EWS-3 should become out of synchronisation they will need to be re-synchronised using TestBook.

GM6

The function of the GM6 in the immobilisation of the vehicle is to provide the EWS-3 with the locking status of the vehicle. The vehicle will not start in a superlocked state. If, upon receiving a valid key signal, the EWS-3 ECU receives a signal from the GM6 that the vehicle is in the superlocked state, the starting process will be suspended momentarily. The EWS-3 will output, via K-bus, the mobilised status of the vehicle to the GM6. The GM6 will then change the vehicle from the superlocked state to an unlocked state. Starting of the vehicle can then take place. Superlocking of the vehicle is carried out by pressing the remote lock button located on the keyhead. It is possible to inadvertently press this button prior to inserting the key in the ignition. The car would then be in the superlocked state and GM6 intervention is necessary to prevent starting and driving of the vehicle.

The GM6 also prevents external locking of the vehicle if the key is in the ignition, by checking the immobilisation status via K-bus. Only if the EWS-3 has put out via K-bus the message that a valid key is not in the ignition lock will the GM6 allow the vehicle to be locked externally.

Ring antenna and keys

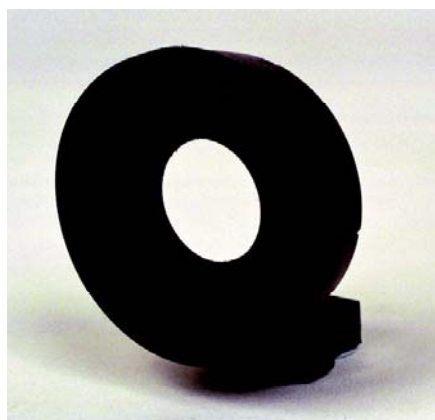


Figure 1.1.1.1

The ring antenna (see Figure 28) is clipped onto the ignition key barrel. When the key is placed in the ignition and switched to auxiliary position, the ring antenna energises the transponder in the key. This is achieved by induction using a 125 KHz frequency power supply from the EWS-3 ECU. This enables transfer of data to take place to and from the transponder in the key.

The wires to the antenna are part of the main harness and should not be more than one metre long to prevent interference to the signal. The transponder has to impart its unique identification number and a valid rolling code. When a valid key signal is read, the vehicle can be started and a new rolling code is written to the transponder for the next operation by the EWS-3 ECU.

The key is made up of a mechanical blade and a transponder. The key blade has an internal mechanical waveform. The code for this waveform is stored on a database in Germany. The transponder chip consists, primarily of a wireless electrical erasable programmable read only memory (EEPROM). This can be written to and read from by the EWS-3 ECU. The range for communication between the ring antenna and the transponder is 2 centimetres. Identification data is programmed into the blank transponder during vehicle manufacture. Each of the transponders is matched with one of the 10 key slots contained in the EWS-3 ECU. Once it is programmed in it cannot be overwritten.

Codes for all 10 slots are programmed randomly into the EWS-ECU during manufacture of the vehicle. Three of these slots are taken up immediately by the three keys which are coded during vehicle manufacture for the vehicle's owner. The data and codes for each of the 10 slots are stored in a database at Dingolfing in Germany. The information on all EWS-3 ECU's, transponder keys and lock sets is not stored by Rover. When a new key or lock set is required it must be processed through a recognised dealership, which will order the new component. The relevant data will need to be accessed from Dingolfing, Germany.

If a key is lost, the slot it is addressed to should be disabled to prevent unauthorised starting of the vehicle. This is carried out using TestBook and requires all available valid keys to complete the process. This way, TestBook can read the identity of all the keys still available and can disarm the slot of the missing key. If the key is subsequently found, the process can be reversed and the slot made valid again.

A valid key is required to be in the ignition to disable/re-enable a key slot and it is not possible to disable the key slot of the key in the ignition. This makes it impossible to accidentally disable all key slots using TestBook which would immobilise the vehicle.

When the ring antenna is not working, care must be taken when carrying out finding a new key system. The voltage and

Instrument pack

The instrument pack is the gateway for all the Bus-systems and it is through this gateway that diagnostic and programming equipment communicates with the EWS-3 system. The EWS-3 communicates with the ECM using a unidirectional link and with the rest of the vehicle via the K-Bus-system.

On highline instrument packs, 'Engine Disabled' will be displayed on the message centre when the ignition is 'on' and either no key or a wrong key is detected. If the transponder in a correct key is faulty, 'Engine Disabled' will be displayed and the vehicle will not start.

Emergency access

There is no Emergency Key Access (EKA) code facility with Rover 75. Any correct key will facilitate entry into the vehicle, even when the CDL system is non functional. Re-mobilisation of the vehicle will be possible only with the correct key in the ignition, with a working transponder and with valid codes. An emergency key is supplied with the vehicle. It contains a relevant coded transponder and is slim enough to fit into a wallet or purse.

Immobilisation ECU and/or key ordering procedure

The immobilisation system is a highly secure system and to maintain security, the supply of spare/replacement keys and immobilisation ECU's is restricted to Rover dealers only. The battery is the only serviceable part of a Rover 75 key and replacement of any other part of the key requires the ordering of a new key. The EWS-3 ECU is non serviceable and failure of any of its internal parts means a replacement EWS-3 ECU has to be ordered. Unlike keys, an ECU identical to the original can be ordered making it possible to use the existing keys, reducing further cost.

Key ECU ordering procedure – All markets (except Japan)

Each dealer must adhere to the following procedure when ordering keys and/or immobilisation ECU's.

1. The dealer receives a request from the customer for a spare/replacement key or a replacement immobilisation ECU and key set.
2. The dealer must request from the customer proof of ownership and Vehicle Identification Number (VIN). This may be in the form of a registration document for example. If proof of ownership cannot be supplied, the dealer must not proceed with ordering keys.
3. The dealer must raise a Vehicle Off Road (VOR) order quoting the VIN and the part number of the part(s) required.
4. The dealer must pass the VOR order to the corporate wholesaler, European distribution centre or importer on the Unipart parts ordering system before 12:45 pm for next day delivery.
5. Unipart will validate the VIN and, if correct, will send an order to BMW GB on the Direct Factory Supplier (DFS) system before 1:00 pm for the same day delivery to Unipart. If Unipart find the VIN to be incorrect, they will contact the dealer to revalidate the VIN.
6. BMW GB record the order and pass it to BMW AG in Dingolfing, Germany who interrogate their database to establish that the VIN is valid. From the database, BMW AG confirm that immobilisation codes remain available.

7. If no codes are available, the order is returned to BMW GB who inform Unipart that all available codes have been used and that a new immobilisation ECU and key set is required. Unipart inform the corporate wholesaler, European distribution centre or importer on a parts information sheet that order has been rejected and reason for rejection. The corporate wholesaler, European distribution centre or importer inform the dealer who will advise the customer that a new immobilisation ECU and key set is required. If customer agrees, then the ordering procedure is repeated from step 3.
8. BMW AG will establish mechanical and electrical key configuration, update the database and create a bar code order form from which the spare/replacement key or immobilisation ECU and key set is made.
9. BMW AG will pass the completed order form to the BMW GB key cutting centre who use the bar code to produce the new keys or new immobilisation ECU and key sets.
10. BMW GB will despatch the part(s) to Unipart at circa 3:30 pm on the same day in order to get the parts on the Unipart overnight VOR delivery.
11. In the UK market, Unipart will despatch the part(s) to the corporate wholesaler overnight to arrive circa 8:30 am next day. The corporate wholesaler will deliver the part(s) to the dealer at circa 12:00 pm on the same day.
12. In ROW markets, Unipart will despatch the part(s) to the European distribution centre or importer next day to arrive by 12:00 pm the following day. The European distribution centre will deliver the part(s) overnight to arrive at the dealer at circa 8:30 am the following day. In importer markets, courier delivery times to the dealer can be typically 5/6 days for South America/Asia and 8/12 days for Australia.
13. A barcode label is attached to the replacement key and must not be removed until the BCU has been programmed with the bar code to enable the remote handset operation. The dealer will programme the replacement key to the BCU and pass the spare/replacement key to customer or install the replacement immobilisation ECU and reconfigure the vehicle electronics accordingly.

Immobilisation Pin out

The pin out table illustrates the connections to the EWS-3 ECU and the harness wire colours.

| Pin No | Connection | Wire colour |
|--------|------------------------------------|-------------|
| 1 | Output to starter motor | WR |
| 2 | Ignition switch (crank) | WR |
| 3 | ignition switch (IPK) | WR |
| 4 | Immobilisation coded signal to ECM | BY |
| 5 | Ring antenna | ON |
| 6 | P/N input from automatic gearbox | BW |
| 7 | not used | |
| 8 | not used | |
| 9 | Logic ground (KL.31) | BS |
| 10 | Logic power (KL.30) | NW |
| 11 | Auxiliary (KL.R) | OLG |
| 12 | Ring antenna | NO |
| 13 | K-Bus link | WRY |

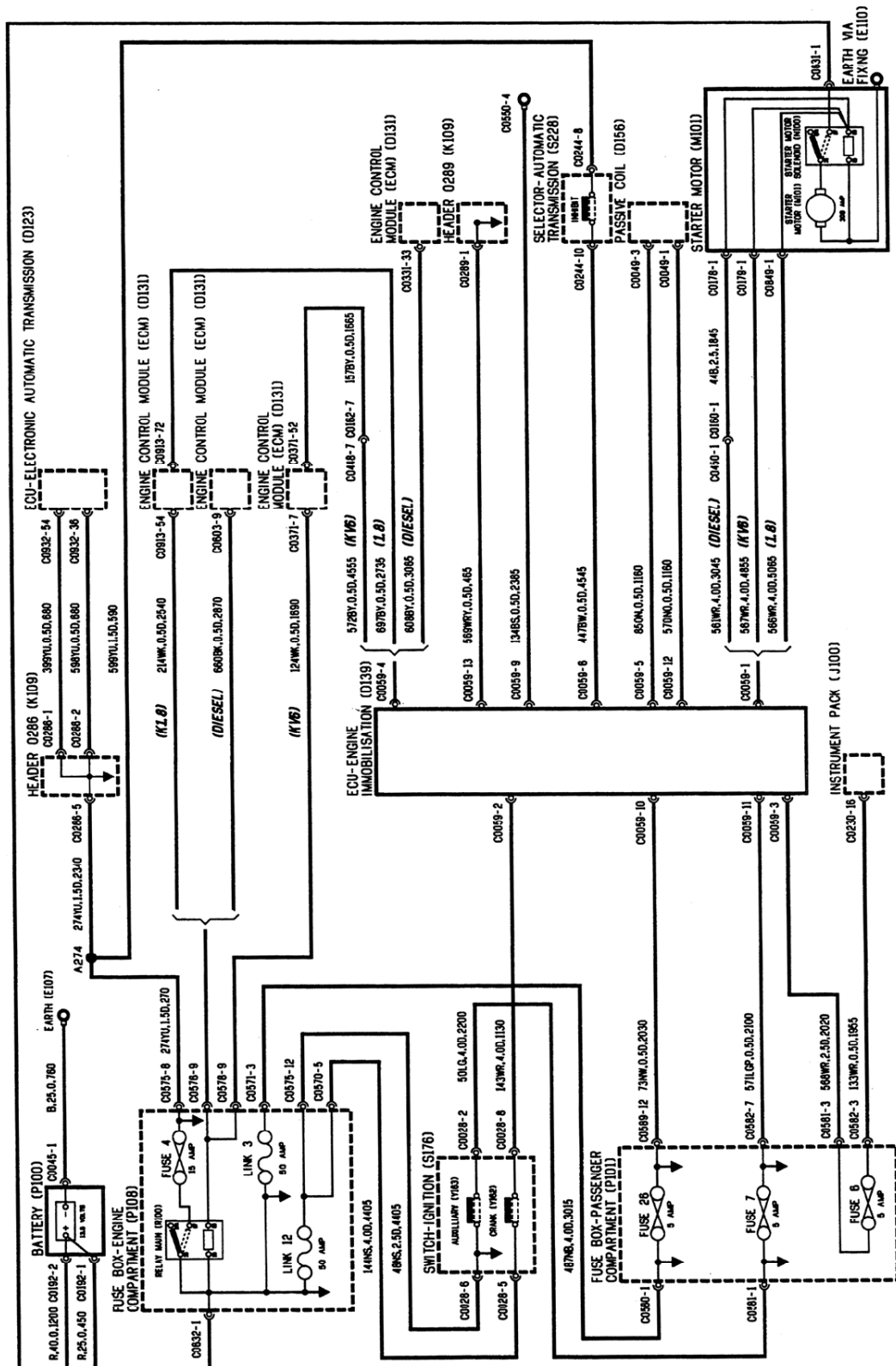


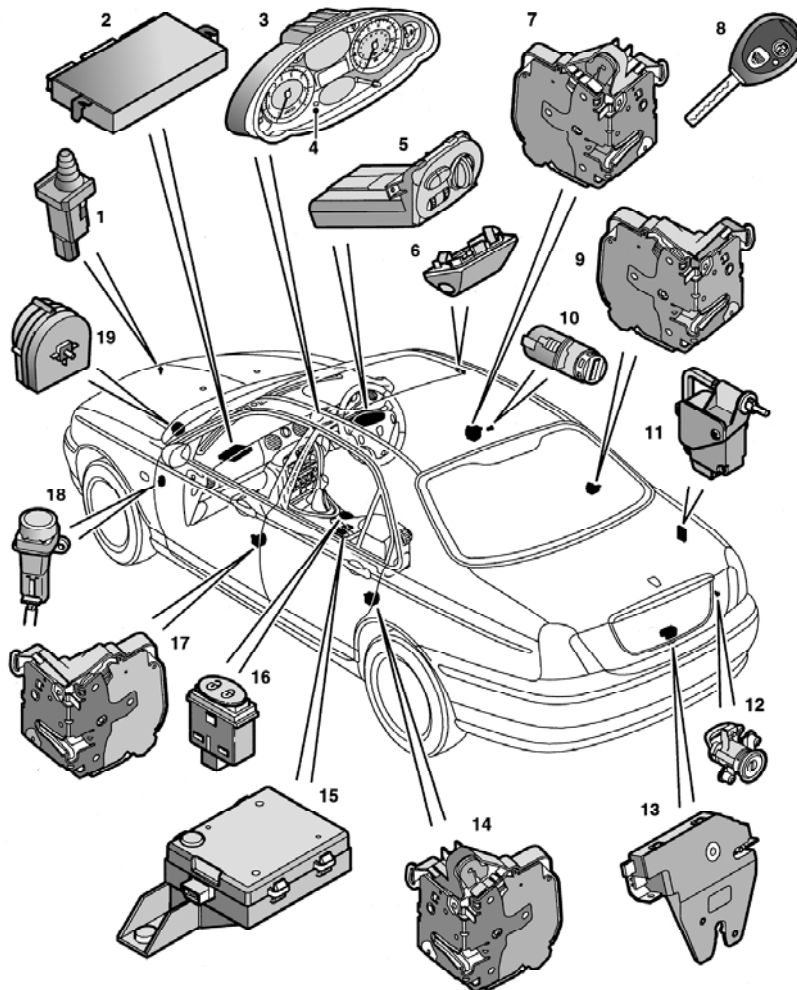
Fig 4

m

Locking and alarm systems

Component layout

The Rover 75 locking and alarm systems are controlled by the GM6 body control unit. All opening panels are monitored by the alarm system and interior protection is provided if volumetric sensing is fitted. The components that make up the locking and alarm systems are distributed around the vehicle (see Figure 30).



F i g u r e 3 0

1. Bonnet open switch: a normally closed sealed microswitch. Short circuit to ground when bonnet is open
2. GM6 body controller
3. Instrument pack
4. Alarm LED
5. Light switch module
6. Volumetric sensor
7. Front right hand door actuator
8. Remote handset
9. Rear right hand door actuator
10. Driver's door key barrel and switch
11. Fuel flap release actuator

12. Boot lid key barrel and switch: a normally open microswitch. Short circuit to ground when the key is turned in the barrel
13. Boot release actuator: Contains the boot open microswitch
14. Rear left hand door actuator
15. RF receiver
16. Master lock/unlock switch
17. Rear front hand door actuator
18. Inertia switch
19. Alarm sounder -BBUS or horn (BBUS shown)

Component functionality

A Rover 75 is supplied with three keys. Two of these keys contain a remote transmitter for locking/unlocking the vehicle and a transponder to re-mobilise the vehicle. The third key is a plastic emergency key which contains a transponder and is thin enough to fit comfortably into a wallet or purse. Both types of key can be used to lock/unlock the vehicle and to arm/disarm the alarm.

The key blade has an internal waveform and the mechanical code for the waveform of a vehicle key blade is kept on a BMW database. The codes are stored against the vehicle identification number on the database run by BMW, in Dingolfing, Germany. Hence a customer can have a new key cut only through a Rover dealer. All the keys contain a transponder used by the immobilisation system of the vehicle and all the transponder data is also stored on this database.

The remote transmitter is an integrated keyhead transmitter with a mechanical key. The transmitter contains two buttons. One for locking and superlocking of the vehicle, and one to unlock the vehicle. The battery inside the handset can be replaced. The correct battery type is CR 20 32. The transmitter sends out a signal which is picked up by the receiver, located next to the handbrake, under the centre console. The signal needs decoding and this is carried out by the GM6.

The receiver has a 12V power supply direct from the BCU. RF signals from the remote handset are received by the receiver which de-modulates the signal before passing it to the BCU on a data output connection. A resistor integral in the BCU pulls the signal output up to 12V. When the remote handset is operated, the signal output line from the receiver to the BCU will oscillate between 0 and 12V at a frequency controlled by the transmitter code.

The transmitter and receiver use a rolling code as part of the lock and unlock signal. Every time the transmitter is pressed the rolling code changes to the next code. The GM6 is synchronised with the transmitter and is aware of the next code to expect. To cater for use of the remote transmitter away from the vehicle (usually inadvertent or idle pressing of the buttons), there is a window allowing 999 forward rolls of the code to be recognised by the system. If the rolling codes do become out of synchronisation, there is a simple process to resynchronise the remote handset with the GM6: To resynchronise the remote transmitter with the vehicle, press either button on the remote handset four times within its operating range ensuring the driver's door is closed and unlocked.

The remote handsets are available in two frequency outputs and are market dependent:

1. 433 MHz
2. 314 MHz

The frequency can be identified by viewing the circuit board inside the key. A small microchip located on the circuit board beneath the battery will be numbered 100 (433 MHz) or 101 (314 MHz).

1.1.1 Inertia switch

The inertia switch is located behind the glovebox on the inner surface of the passenger side 'A'-post. When triggered (with alarm disarmed), the fuel supply is cut 'off', the vehicle centrally unlocks and the hazard lights operate. In this situation, the hazard lights can be switched 'off' only by operating the hazard light switch on the centre console. To reset the inertia switch, the button should be pressed down. If the inertia switch is triggered with the alarm armed, the alarm will be triggered.

Door latches

All door latches share a common ground connection and all except the driver's door latch share a common supply from the GM6. The driver's door latch is a separate supply to enable the single point entry (SPE) facility (see Figure 31).

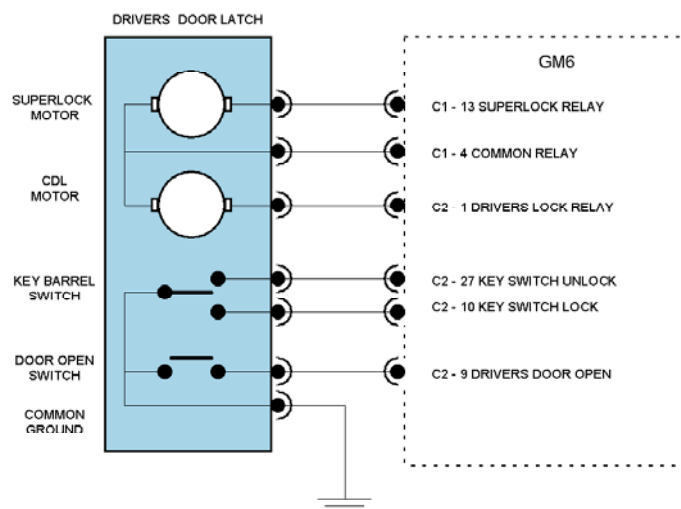


Fig 31 : do h

The driver's door latch comprises of:

- **Door open switch:** A microswitch held open circuit with door closed. Shorted to ground when door opens.
- **Key switch:** Lock. Microswitch held open circuit with the key centred. Shorted to ground when the key is turned to the lock position.
- **Key switch:** Unlock. Microswitch short circuit to ground when the key is in the unlock position. Open circuit in other states.
- **CDL Motor:** Actuator motor. Achieves locking and unlocking condition of latch. Controlled by the GM6.
- **Superlock motor:** Actuator motor. Achieves superlocking/unlocking condition of latch. Controlled by GM6.

The passenger door latches are the same as the driver's door latch but without the Key lock/unlock microswitches (see Figure 32). The door open switches each have an individual input to the GM6. The GM6 has the facility to log the 15 most recent triggers of the alarm. The individual door switch feeds means it is possible to distinguish which latch has triggered the alarm. This can be beneficial in the fault finding process.

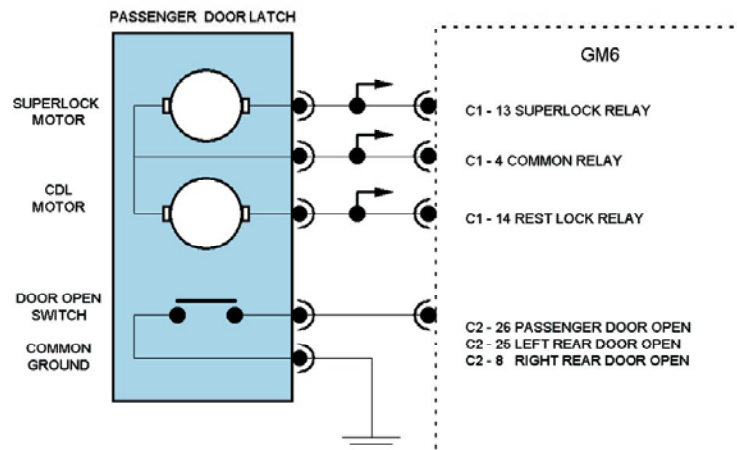


Fig. 1. n do h

Locking states

Electro-mechanical door latches are fitted to Rover 75. All the actuators, switches and electrical systems are integrated into the latch assemblies, improving security. The door latches have three possible mechanical states:

- **Unlocked:** Sill button up. External release handle operational.
- **Central door locking (CDL):** Sill button down (flush and inaccessible). External release handle disabled. Internal release handle operational (requires two pulls to open the door: One to lift the sill button, a second to open the door).
- **Superlocked:** Sill button down. External release handle disabled. Internal release handle disabled.



M h

There is no driver side sill button switch in the latch assembly. Instead, the control input for the system is the master locking switch on the centre console (see Figure 33). The GM6, therefore, receives no feedback as to the position of the latches and every time a lock/unlock request is made from the master locking switch, the GM6 has to drive the latches regardless of their position.

The GM6 monitors the master locking switch and operates a latch motor protection feature. This will allow a limited number of operations over a predetermined period of time, after which operation of the latches will be disabled. This prevents overheating of the latch motors. After this period the latches will only operate after the appropriate amount of time has elapsed in order for the latches to cool. The last operation will always be an unlock operation, making it impossible to be locked in the vehicle as a result of latch motor protection. The alarm sounder (if fitted) will emit a mislock sound when an attempt is made to drive the latches if they are in latch protection mode.

The locking of individual doors can be achieved by pressing the door sill button relevant to the door. Central door locking can only be achieved using the master locking switch on the centre console, by using the driver's key, or by using the remote handset (superlock). The vehicle cannot be centrally locked by operation of any of the individual sill buttons.

Single point entry

The system supports single point entry. This is a security feature which unlocks only the driver's door on receiving an unlock signal from the remote transmitter or the key. To unlock the other doors, the keyholder can either press the remote handset unlock button a second time, turn the key in the lock a second time, or they can enter the car and open the other doors using the master lock switch on the centre console. If, on SPE, the car is unlocked from the superlocked state, the driver's door will unlock and the other doors will change from the superlocked state to CDL locked state. This makes it impossible to drive away with any of the doors in the superlocked state.

Mislock

An audible mislock sound provides information to the driver that an attempt to lock the vehicle has been made with a part of the vehicle open. The sound is generated by the GM6, which momentarily drives the alarm horn, or battery backed-up sounder (BBUS) if fitted.

If a lock, or superlock, is requested whilst the key is in the ignition lock, or when the driver's door is open, a mislock sound will be given. In these cases no locking will take place.

If a lock, or superlock, is requested with the boot or bonnet open then a mislock sound will be given. In this case, the vehicle will superlock.

If a superlock is requested whilst any of the passenger doors is open, a mislock sound will be given. In this case the doors will central lock only.

Anti-theft alarm

The anti-theft alarm is controlled by the GM6. When armed, the GM6 monitors the switches contained in the doors, boot and bonnet. It also monitors the vehicle interior if volumetric protection is provided. When triggered, the alarm initialises both visual and audible warning signals. The hazards will flash and the alarm horn, or BBUS if fitted, will sound. The alarm will trigger its responses a maximum of three times per arming cycle.

Body electrics

The components that make up the anti-theft alarm are located around the vehicle in positions which make access to them difficult in a short period of time. The alarm status (fully armed, partially armed or disarmed) is stored in the GM6 non volatile memory. This means that if power is lost for a period of time, the alarm will recover its correct operating mode when power is restored. If the power, or ground, is removed from the GM6 whilst the alarm is sounding, then, when the power is resumed, the alarm will continue to sound for a maximum of 30 seconds or until it is disarmed.

The alarm can be armed by locking the vehicle using the key or the remote handset. The following table describes the effect on the security system of the various arming actions that can be carried out using the key and the remote handset. It should be noted that, though the vehicle can be locked and unlocked using the master lock switch on the centre console, the alarm cannot be armed or disarmed using this switch.

| Lock request | Perimetric protection | Volumetric protection | CDL locked | Superlock |
|--------------------|-----------------------|-----------------------|------------|-----------|
| Master lock switch | No | No | Yes | No |
| Key lock | Yes | No | Yes | No |
| Remote lock | Yes | Yes | No | Yes |

met protection

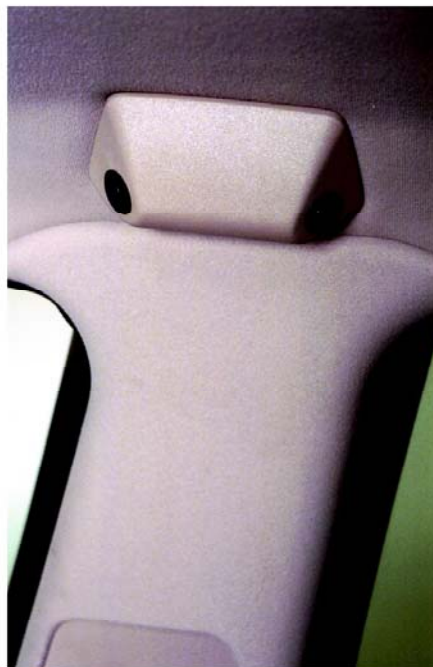


Fig e *€ or*

Volumetric protection: Volumetric protection of the vehicle through ultrasonic sensing is available with certain trim levels on Rover 75. The sensor is located at the top of the driver side 'B'-post (see Figure 34). The ultrasonic sensor is the same as the sensor used in other Rover vehicles. The sensor has a transmitter and receiver located internally. They monitor the vehicle interior and, if an intrusion is detected, they signal to the GM6 to activate the alarm signals. Volumetric protection sensors monitor in two modes:

- **Detection of breaking glass:** The sensor can detect the characteristic high frequency sounds produced by breaking glass.
- **Movement of air:** The sensor can detect movement in the vehicle by the effect of the movement on the ultrasonic signals transmitted by the sensor. The sensor utilises the Doppler principle, monitoring the effect of air movement on the wavelength of the transmitted signal.

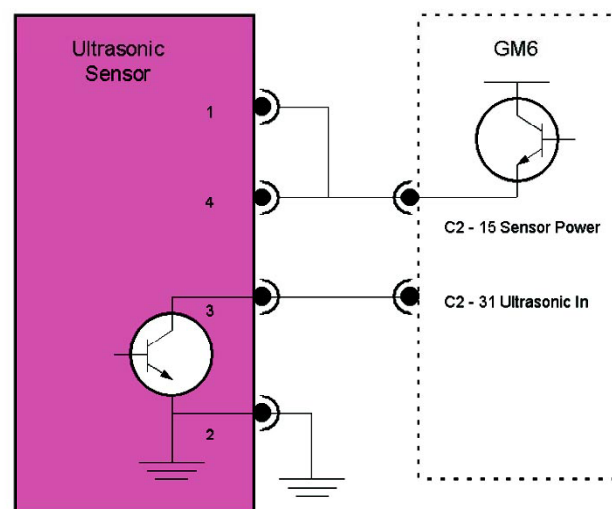


Figure 35

The volumetric sensor has four connections: power (4), earth (2), trigger (3) and a further 12 volt feed for vehicle type configuration (1) (see Figure 35). The trigger line is pulled up to battery voltage by a resistor in the GM6 when the volumetric sensing is active. The alarm is triggered by the sensor switching the trigger line to ground. This signal is picked up by the GM6, which drives the alarm.

When volumetric sensing is activated there is a delay/settle down period of 20 seconds to allow the air movement, caused by the occupants exiting the vehicle, to stabilise. During this period, the volumetric input to GM6 is ignored.

The GM6 will not activate volumetric sensing if the vehicle is locked with any of the electric windows, or the sunroof open. It is not possible for the GM6 to recognise that a manual window left open and this, therefore, will not inhibit the activation of volumetric sensing.

Where volumetric sensing is provided, it is possible to inhibit the volumetric sensing, when necessary, by locking the vehicle with the key via the driver's door lock. In this case, perimeter protection is armed and BBUS is operational, where fitted.

Perimetric protection

The Rover 75 anti-theft alarm provides perimetric protection. This means that if the doors, bonnet or boot are opened when the alarm is armed, the audible and visual warning outputs will be activated. The audible output will be provided by an underbonnet alarm horn or a battery backed-up siren, where fitted. If entry is gained into the car without opening of the boot, bonnet or any of the doors when the alarm is armed (by smashing a window), pressing the boot release switch or the master lock switch will trigger the alarm. As the alarm will still be armed in this type of forced entry the opening of any of the doors, bonnet or boot will trigger the alarm.

Battery back up siren (BBUS)

Another security feature available is the BBUS. It is located under the plenum on the opposite side to the wiper motor. BBUS can distinguish between a slow battery discharge and a fast battery discharge/disconnection. It is active only when the alarm is armed. If the battery is disconnected with the alarm armed, the siren will sound being powered by its back-up Nickel metal hydride (NiMH) battery power supply. A BBUS disconnected with the alarm armed will not sound continuously but will cycle following the alarm programmed pattern. This is on for 25 seconds then off for 10 seconds. The BBUS will sound for up to 10 cycles under its own battery power – depending upon the charge condition of the batteries. When disconnecting a vehicle battery, or BBUS, always ensure the alarm is disarmed to prevent the BBUS from sounding. A vehicle not fitted with BBUS will have an alarm horn fitted in its place, or nothing.

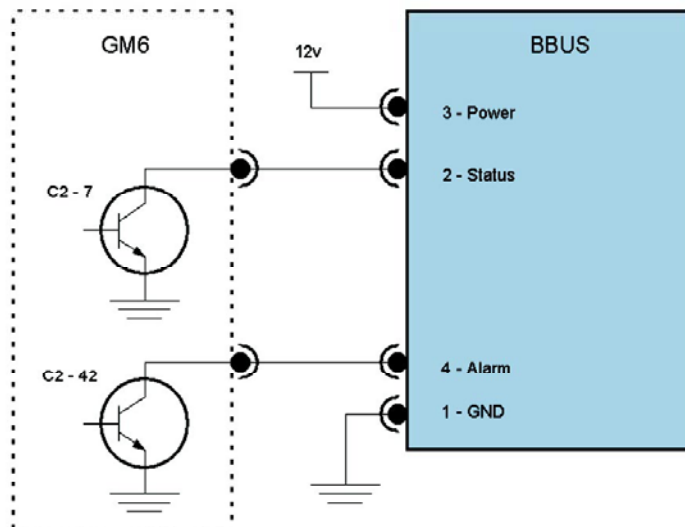


Fig 1.10 BBUS

There are four connections to the BBUS (see Figure 36):

1. **Ground.** This provides the ground path for the battery charging. This line is also protected against tamper and, if disconnected, the sounder will be powered by the batteries.
2. **Status line.** This line controls the arming and disarming of the BBUS. In the disarmed state the line is pulled high by a pull up resistor located inside the BBUS. In the armed state the line is pulled to ground by the GM6. This line is also protected against tamper.
3. **Power.** This is the power feed to the BBUS from the vehicle's battery. When the vehicle is running, this feed is used to charge the NiMH batteries. When the alarm is triggered, this power line is used to power the sounder internal to the BBUS. If, with the alarm armed, power is lost from this line due to tampering, the internal batteries will power the sounder.
4. **Alarm line.** This line causes the siren to sound. In normal circumstances it is held high, at battery voltage, by a pull up resistor inside the BBUS. It is pulled low to sound the alarm by the GM6.

Alarm horn

The alarm horn is fitted to an alarm system where a BBUS is not fitted. It is located in the same secure place as the BBUS and is driven by a relay located in the passenger compartment fusebox controlled by the GM6. It is a single trumpet horn and though it is the same as the low-tone road horn it is used exclusively by the alarm system.

g

Partial arming of the perimeter alarm is also available when one or more of the hinged panels are left open (doors, boot, bonnet). A mislock sound is given but some parts of the system will still be active. If the open panel is subsequently closed, the panel becomes part of the active alarm. Possible partial arming states are:

- **Bonnet open:** Locking and superlocking of the rest of the vehicle is possible. Also, perimeter and volumetric arming of the alarm for the rest of the vehicle is possible.
- **Boot open:** Locking and superlocking of the rest of the vehicle is possible. Perimeter alarm of the rest of the vehicle is possible. Volumetric sensing disabled.
- **Passenger door open:** CDL locking of all panels is possible. Superlocking is disabled. Perimeter protection of other panels is possible. Volumetric sensing disabled.
- **Driver's door open:** It is not possible to lock the vehicle. It is not possible to arm any part of the alarm.

Alarm LED

The deterrent flashing LED is located in the instrument pack and is driven by the GM6. When the vehicle is armed successfully, the LED will flash rapidly for 10 seconds. After this period the LED will slow flash with a 5% duty cycle until the alarm is disarmed.

If the alarm is armed with any of the panels open (partial arming) a mislock sound is given and the LED flashes at a medium rate. After 10 seconds the LED will slow flash with a 5% duty cycle.

If the alarm is triggered, the LED will flash rapidly to indicate to the returning driver that the alarm has been triggered whilst they were away. The LED will go out when the ignition is turned to auxiliary, or after one minute from the unlocking of the vehicle.

GM6 pin-out tables

The pin out tables illustrate the connection details for the three GM6 body control unit connectors defining inputs and outputs. The first table relates to the 54-pin black connector C0660, the second table relates to 20-pin connector C0661 and the final table relates to the 18-pin black connector C0662.

54-pin black connector C0660

| Pin No. | Description | Input/Output |
|---------|--|--------------|
| 1 | Driver's lock motor | Output |
| 2 | Boot release actuator | Output |
| 3 | Right rear window anti-trap | Input |
| 4 | Left rear window anti-trap | Input |
| 5 | Passenger window down | Input |
| 6 | Front wiper slow/fast relay | Input |
| 7 | BBUS arm/disarm | Output |
| 8 | Right rear door open switch | Input |
| 9 | Driver's door open switch | Input |
| 10 | Driver's door key lock switch | Input |
| 11 | Logic earth | Output |
| 12 | Sound alarm | Output |
| 13 | Intermittent wiper delay potentiometer | Input |
| 14 | Heated rear window relay | Output |
| 15 | Alarm RF receiver +12V | Output |
| 16 | Front wiper speed feedback | Output |
| 17 | Master unlock switch | Input |
| 18 | K Bus 1 | Input/Output |
| 19 | Not used | - |
| 20 | Driver's window anti-trap | Input |
| 21 | Passenger window anti-trap | Input |
| 22 | Not used | - |
| 23 | Passenger window up | Input |
| 24 | RF code in | Input |
| 25 | Left rear door open switch | Input |
| 26 | Passenger door open switch | Input |
| 27 | Driver's door key unlock switch | Input |
| 28 | Inertia switch OK signal | Input |
| 29 | Auxiliary sense (Fuse 8) | Input |
| 30 | Front washer pump | Input |
| 31 | Ultrasonics in | Input |
| 32 | Not fitted | - |
| 33 | Driver's window switch bus link | Input |
| 34 | Front wiper run/park relay | Output |
| 35 | Master lock switch | Input |
| 36 | Alarm sensors switched +12V | Output |
| 37 | Left rear window down | Input |
| 38 | Left rear window up | Input |
| 39 | Right rear window down | Input |
| 40 | Right rear window up | Input |
| 441 | Alarm LED | Output |
| 42 | Horn/headlamp power wash | Output |

| Pin No. | Description | Input/Output |
|---------|------------------------------|--------------|
| 43 | Not used | - |
| 44 | Boot release switch | Input |
| 45 | Bonnet open switch | Input |
| 46 | Interior light switch | Input |
| 47 | Boot open switch | Input |
| 48 | Boot key barrel switch | Input |
| 49 | Column switch 2 | Input |
| 50 | Column switch 1 | Input |
| 51 | Not used | - |
| 52 | Not used | - |
| 53 | Front wiper park switch | Input |
| 54 | Logic power (battery supply) | Input |

Black 20-pin connector C0661.

| Pin No. | Description | Input/Output |
|---------|--|--------------|
| 1 | Interior light power VBatt | Input |
| 2 | CDL power VBatt | Input |
| 3 | Power earth | Output |
| 4 | Motor common relay | Output |
| 5 | Front window earth | Output |
| 6 | Passenger window 2 | Output |
| 7 | Front window power VBatt | Input |
| 8 | Rear window earth | Output |
| 9 | Left rear window 1 | Output |
| 10 | Rear window power VBatt | Input |
| 11 | Map reading lamps, glovebox lamp and vanity mirror lamps | Output |
| 12 | Interior lamps | Output |
| 13 | Superlock motor relay | Output |
| 14 | Passenger and rear doors motor relay | Output |
| 15 | Driver's window 2 | Output |
| 16 | Driver's window 1 | Output |
| 17 | Passenger window 1 | Output |
| 18 | Left rear window 2 | Output |
| 19 | right rear window 2 | Output |
| 20 | Right rear window 1 | Output |

Black 18-pin connector C0662.

| Pin No. | Description | Input/Output |
|-----------|---|--------------|
| 1 | Not used | - |
| 2 | Recirculated air | Output |
| 3 | Evaporator temperature thermistor | Input |
| 4 | Air conditioning switch LED | Output |
| 5 | Heated rear window switch LED | Output |
| 6 | Recirculation switch LED | Output |
| 7 | Heated rear window switch | Input |
| 8 | Recirculation switch | Input |
| 9 | Air conditioning switch | Input |
| 10 | Fresh air | Output |
| 11 | Heater blower relay | Output |
| 12 | Pollution sensor | Input |
| 13 | Driver's window down switch (hardwired) | Input |
| 14 | Driver's window up switch (hardwired) | Input |
| 15 | Spare 2 | - |
| 16 | Spare 1 | - |
| 17 | Heater blower motor sense | Input |
| 18 | K Bus 2 | Input/Output |

Instrumentation

Instrument panel

The primary function of the instrument pack (IPK) is to provide the driver with continuously updated information about the vehicle and to indicate faults as they occur, usually by illuminating a warning lamp. The IPK fitted to the Rover 75 is an intelligent unit controlled by a microprocessor and acts as the gateway for the network Bus-systems. The IPK has an EEPROM which stores updated information in this non volatile memory.

The IPK is designed to display information quickly and unambiguously. For this reason, the IPK has a central and prominent position within the driver's field of vision, requiring only the slightest eye adjustment to access the data displayed. The IPK uses a combination of analogue and digital displays combining new technology with proven effective display gauges.

There is a highline and a lowline version of the Rover 75 IPK. Both perform the same function and display the same information, the only difference is in the methods used to display some of the information to the driver. All of the gauges displayed on the highline IPK are identical to the gauges displayed on the lowline IPK. The difference arises with the upper warning lamp array on the lowline IPK being replaced with a 2.5 inch bi-colour display message centre on the highline IPK. The message centre is also used to display lowline navigation and trip computer information (see Figure 37).



Figure 37

The IPK has three main modes controlled by the position of the ignition, and different functions are available with each position:

- Ignition Position 0 (KL.30 or 'Off')
- Ignition Position 1 (KL.R or Auxiliary)
- Ignition Position 2 (KL.15 or Ignition 'On')
- Ignition Position 3 (KL. 50 or Crank)

Ignition Position 0 (KL.30)

In this position, the IPK is in stand by mode and the quiescent current drain is 1mA. In this position the IPK is monitoring the K-Bus because some systems are operative with the ignition 'off' (for example seat memory will operate when the driver's door is opened before the ignition is switched 'on'). If the trip reset button is pressed in this state, the digital odometer will illuminate and display the total mileage, and the fuel gauge will be driven and display the fuel level.

Ignition Position 1 (KL.R or Auxiliary)

In this position, the IPK calculates and displays the ambient temperature. On highline IPK's, the message centre is switched 'on' and after receiving messages from the GM6, via K-Bus, the vehicle map is displayed, indicating the status of the doors. On lowline IPK's, the panel open warning lamp is illuminated to indicate if a door is open. The digital odometer comes 'on' and remains 'on'.

Ignition Position 2 (KL.15 or Ignition)

In the position, all the gauges become active and the CAN-Bus also becomes active. The IPK carries out a bulb check on the low fuel warning lamp, the primary brake system warning lamp and the high coolant temperature warning lamp. These lamps will illuminate for four seconds after switching to ignition position 2 and will extinguish if everything is correct. Other warning lamp bulbs are checked by their own controlling ECU and the bulbs are illuminated for a time which is controlled by that ECU. For example the anti-lock braking system (ABS) and the supplementary restraint system (SRS).

Ignition Position 3 (KL. 50 or Crank)

This position feeds the starter motor to start the vehicle and functions available are as ignition position two. The speedometer is frozen during cranking.

Bus Connections

The instrument pack is the gateway for all the Bus-systems on the vehicle. Many signals generated by sensors on the vehicle need to be transmitted on more than one of the Bus-systems. The Bus-systems use different protocols and work at varying speeds/frequencies. The signals are received from one of the Bus-systems by the IPK and are formatted by the microprocessor in the IPK. This makes the signal compatible for transmission on the other Bus-systems. The Bus-systems connected to the IPK are:

- **CAN-Bus:** Used primarily for communication between the engine management system, the automatic transmission control unit and ABS systems fitted with traction control
- **K-Bus:** Used primarily for communication between body electronic systems (for example the GM6, light switch module and memory seats)
- **Diagnostic Bus/line:** Used by TestBook to communicate with system ECU's
- **Nav-Bus:** A discrete navigation bus to the IPK for displaying navigation communications

Instrument pack Bus communication

Information received by the IPK via K-Bus:

K-Bus inputs

| Input | Source |
|----------------------------------|------------------|
| Immobilisation data | EWS-3 ECU |
| Panel open | GM6 |
| Remote handset battery condition | GM6 |
| Alarm/inertia switch status | GM6 |
| Chime/gong request | GM6/Memory seats |
| Evaporator temperature | HEVAC |
| Condenser fan speed | HEVAC |

| Input | Source |
|------------------------------|--------|
| Air conditioning request | HEVAC |
| Bulb failure | LSM |
| Flasher synchronising | LSM |
| Flasher monitoring | LSM |
| Back-up mileage/service data | LSM |
| Panel illumination | LSM |

Information outputed on to K-Bus via the IPK:

K-Bus outputs

| Output | Recipient |
|-----------------------------|-----------------|
| Ignition switch status | All K-Bus ECU's |
| Washer fluid status | GM6 |
| Wake up signal | All K-Bus ECU's |
| Gear selected | GM6/parking aid |
| Ambient temperature | HEVAC |
| Engine coolant temperature | HEVAC |
| Engine speed/road speed | HEVAC/audio/GM6 |
| Compressor status | HEVAC |
| Master mileage/service data | LSM |

Information received by the IPK via CAN-Bus

CAN-Bus inputs

| Input | Source |
|-----------------------------|---------|
| Traction control | ABS ECU |
| Engine speed | ECM |
| Compressor status | ECM |
| Engine coolant temperature | ECM |
| Engine malfunction (diesel) | DDE 4.0 |
| Fuel consumption | ECM |
| Glow plug lamp | DDE 4.0 |
| Gear selector position | ATCU |
| Gear shift mode | ATCU |
| Emergency drive program | ATCU |
| Diesel engine malfunction | DDE 4.0 |

Information outputed by the IPK on to CAN-Bus

CAN-Bus outputs

| Output | Recipient |
|-------------------------------|-----------|
| Fuel level | ECM |
| Compressor data | ECM |
| Air conditioning ready switch | ECM |
| Fan speed | ECM |
| Ambient temperature | ECM |
| Road speed (back up) | ECM |
| Evaporator temperature | ECM |

Bus diagnosis

Because the IPK is the gateway for the Bus-systems it is useful in fault diagnosis and can help to identify and eliminate suspected faults with the Bus-systems and other systems on the Bus networks. TestBook must always be used for fault diagnosis on the Bus-systems but the following logical approach, using the process of elimination, can assist in isolating the area in which the fault exists.

Can-Bus diagnosis

The IPK displays six messages it receives from CAN. These are:

1. Tachometer
2. Engine temperature
3. PRNDL display (automatics only)
4. Check engine lamp
5. Glowplugs (Diesel only)
6. Traction control

If any of these signals are present at the IPK, it is established that Can-Bus is functioning correctly as a communication link. If all of these signals are absent from the IPK then it is likely that a CAN-Bus fault exists (short to ground, open circuit). If signals one and two are not present, then the ECM is suspect as this transmits these signals onto the CAN-Bus. If an individual signal is missing, it is likely to be a fault with that particular circuit or system, or with this particular connection to the CAN-Bus.

K-Bus fault diagnosis

If the main beam indicator lamp and the direction indicator tell tale lamps operate, this is an indication that the K-Bus link to the IPK is functioning correctly. If the vehicle map operates on the message centre (highline IPK) or a door open indicator lamp (lowline IPK) functions, this indicates the K-Bus link to the GM6 is functioning correctly (see Figure 38).



e

The air conditioning system communicates on both the CAN and K-Bus systems and if it is functioning correctly this indicates the IPK is functioning correctly as the gateway between the two Bus systems.

The air conditioning system can be checked for correct operation by turning the system 'on', opening the bonnet and monitoring the air compressor clutch. If the clutch cycles 'on' and 'off' (pulley rotates and then stops) the system is functioning correctly.

Other logical and systematic fault finding approaches can be used to isolate faults and to determine correctly functioning Bus-systems.

Instrument pack gauges

The major gauges are identical on highline and lowline instrument packs (see Figure 39).



Figure 39 Instrument pack

Speedometer

Located on the right hand side of the instrument panel, the speedometer is one of the major analogue dials. The wheel speed signal is hardwired from the ABS ECU (front right wheel speed sensor) which transmits the signal as a digital square wave (39,000 pulses per mile). The IPK translates/calculates and displays the information on an analogue gauge in mph and km/h: Scale is 0 – 150 mph and 0 – 240 km/h. The IPK then transmits the vehicle road speed on the CAN and K-Bus systems.

Odometer display

The odometer unit is located at the bottom of the centre column in the instrument pack. It is a digital display, driven by the IPK from data received from the road speed signal. The distance travelled is updated in 10 metre increments and stored in the random access memory (RAM) of the IPK. The data is transmitted on K-Bus and stored and updated to the EEPROM inside the IPK every 2 Kilometres. The odometer display is in Km or miles (depending on market requirements) and is a 6 digit figure in a 7 segment LCD display. The total mileage will be displayed continuously in ignition position 1 and 2 and displayed for a predetermined amount of time (30 seconds) if the trip computer button is pressed with the ignition off.

The light switch module is used as a back-up facility to store the odometer reading. The IPK updates the LSM every 100 Km by transmitting the odometer total mileage reading on K-Bus. Every time the ignition is switched to position 2, the IPK and the LSM compare VINs and total mileage reading for plausibility.

With the ignition switch in position 1 or 2 the IPK displays the external temperature continuously in the odometer. It is based on signals received from the ambient temperature located on the front grille. If the IPK is disconnected on reconnection the temperature display will read – 30°C. The speed at which it rises to reach the correct temperature reading is speed dependent and if the car is stationary it is very slow. The IPK can be reset by disconnecting the battery and reconnecting after thirty seconds have elapsed.

The odometer temperature scale can be changed from Centigrade to Fahrenheit and vice versa. On vehicles with automatic temperature control (ATC) the °C/°F switch on the ATC ECU toggles between the scales. Operation of this switch changes both the ATC display and the odometer temperature display. On vehicles without ATC if the trip reset button is held pressed as the ignition is switched from auxiliary to the 'off' position the temperature scale will change from Centigrade to Fahrenheit and vice versa.

ne t erature

Engine coolant temperature is displayed on an analogue gauge located in the left hand side of the IPK. The engine management system transmits this message to the IPK via the CAN-Bus system. When the engine coolant becomes excessively high, a high temperature warning lamp is illuminated in the red segment at the top of the scale.

Fuel gauge

Fuel quantity in the fuel tank is displayed in a minor analogue gauge on the right hand side of the IPK. It is fed by two fuel level senders, each made up of a float and variable resistor. The senders are connected in series and if any fault occurs in this circuit the gauge defaults to zero and the low fuel warning lamp is illuminated. If either of the senders fail during an ignition cycle the fuel gauge is driven by the fuel consumption signal received from the ECM via CAN-Bus. When the ignition is turned 'off' and back 'on' again the low fuel lamp will illuminate and the gauge will default to zero.

The IPK performs complex algorithms on the signals from the senders to ensure the correct fluid level is calculated. As the fuel tank is a saddle tank, fuel will 'slosh' over from one side to the other during vehicle cornering and other manoeuvring. To compensate for this, an anti-slosh algorithm lowers the speed and sensitivity of the gauge based on the amount of slosh in then tank..

There is a low fuel level warning lamp located in the red segment of the fuel gauge.

Tachometer

The engine speed in rev/min is displayed on a major analogue gauge on the left hand side of the IPK. It receives its signal from the engine management system via the CAN-Bus system. Diesel derivatives scale is 0–6000 rev/min. Petrol derivatives scale is 0–8000 rev/min.

n ans i on l es

Vehicles fitted with the Jatco automatic transmission use two 13 segment star display characters to indicate the current gear lever position and the driving mode which has been selected. The message is transmitted by the automatic transmission control unit (ATCU) to the IPK via the CAN-Bus system.

If a fault occurs with the gearbox, the unit ATCU will instigate an emergency program which allows the gearbox to continue to function but in a limited manner. If the fault has led to a default to fourth gear being selected, the IPK will display this fault in the two 13 segment star displays as EP (emergency program).

Service interval announcement/display

The service interval announcement/display (SIA) is used to display the number of miles to the next due vehicle service. The distance is displayed for four seconds after the ignition has been switched to position 2. Service intervals are load dependent and computed from the quantity of fuel used against distance travelled. Three types of vehicle inspection and service are displayed by the SIA display:

1. Distance until oil service due
2. Distance until an inspection due
3. Time service due now

The SIA display must be reset after a service or inspection to allow the SIA to display the next vehicle inspection or service due date. This can be carried out using TestBook or by using special tool number 86 002.

Trip computer

The highline IPK has a trip computer which is active in ignition position 1(KL.R) and position 2(KL.15). It is selected by pressing the trip computer switch located at the end of the left hand column stalk. Selecting the trip computer displays a trip computer function in the message centre. This is scrolled through by pressing 'on' and 'off' the trip computer switch. Continuous pressing of the trip computer switch will not scroll the menu. The current feature selected will be displayed until the trip computer is scrolled to a blank screen or the message centre is required by a higher priority message. A feature is reset by selecting it and holding the trip computer switch for longer than 2 seconds.

If a warning message appears when the trip computer is being used, the warning message has the highest priority. The trip computer will be replaced in the display by the warning message. A further press of the trip computer switch will return the display to the part of the trip computer that was active before the warning message interruption. If the fault continues to exist, the trip computer will time out every 20 seconds and the warning message will be displayed.

The trip computer has priority over the Navigator display.

computer functionality

The trip computer has the following functions:

- **Trip distance-2:** This is the second independent trip distance recorder. The first trip distance recorder is part of the lower digital display unit containing the odometer and service interval data.
- **Average fuel consumption:** The microprocessor in the IPK calculates the average fuel consumption by monitoring the fuel used against distance travelled as a straightforward arithmetical average. The fuel consumption data at a given time is based on fuel injector pulse timing and is supplied to the IPK by the engine control module. This function can be reset by pressing the trip switch for longer than 2 seconds with the function selected. The figure displayed by the average fuel consumption display relates to the distance travelled since the last reset function.

- **Distance till empty:** The IPK computes the distance till empty based on fuel tank contents against fuel consumption. The information displayed is based on the assumption that the average fuel consumption will remain approximately the same until the fuel tank is empty. This figure is based on current driving styles and the figure will, therefore, reflect any changes produced by changes in driving styles. The IPK automatically recomputes the distance till empty figure when fuel is added to the tank.
- **Overspeed warning:** This is a visual and audible warning to the vehicle driver that the vehicle is travelling at a speed in excess of the speed programmed into the trip computer. With the overspeed warning feature selected, the speed limit is set by pressing the trip switch for longer than 1 second. (The scale set in the odometer trip distance 1 governs whether the overspeed is in mph or Km/h) The overspeed function can only be turned off when it is selected by pressing the trip reset button, which toggles the function 'on' and 'off' (except for markets that legally require a pre set overspeed warning).
- **Average speed:** The average speed is displayed in relation to the overall trip distance recorded.

Pin out table

The instrument pack being the focal point for driver information has many inputs from around the vehicle. There are two connectors to the IPK, a white eighteen pin micro quadlock connector (C0230) and a black 12 pin micro quadlock connector (20233).

White connector C0230 pin out table

| Pin number | Type of input | Source | Wire colour |
|------------|---------------------------------------|----------------------------------|-------------|
| 1 | PWM illumination signal | LSM | RW |
| 2 | ABS warning lamp pull up | ABS ECU | YR |
| 3 | 0-12 volt digital | K-Bus | WRY |
| 4 | Battery charge warning lamp pull up | Alternator | NY |
| 5 | Cruise control warning lamp pull up | Cruise ECU or DDE 4.0 | UO |
| 6 | 12 volts | Battery | PG |
| 7 | 12 volts | Ignition on switch KL.15 | WO |
| 8 | 12 volts | ignition auxiliary KL.R | GS |
| 9 | Ground | Ground | BS |
| 10 | Not used | | |
| 11 | Brake failure warning lamp pull up | Brake fluid level switch/ABS ECU | RN |
| 12 | Seat belt warning lamp pull up | Seat belt buckle switch | PR |
| 13 | Not used | | |
| 14 | Low oil pressure warning lamp pull up | Oil pressure switch | WN |
| 15 | Airbag warning lamp pull up | DCU | P |
| 16 | 12 volts | Ignition position 3 KL.50 | WR |
| 17 | Low washer fluid warning lamp pull up | Low washer fluid warning switch | BG |
| 18 | Fuel level analogue input | Fuel sender | BG |

Black connector C0233 pin out table

| Pin Number | Type of input | Source | Wire colour |
|------------|---|----------------------------|-------------|
| 1 | Can H | CAN-Bus | RK |
| 2 | Can L | CAN-Bus | RG |
| 3 | Sensor Ground Not to be used as an accessory ground point | Ground line | BS |
| 4 | External temperature | Ambient temperature sensor | O |
| 5 | Diagnostic line | Diagnostic line | S |
| 6 | Road speed buffered input | ABS ECU | WS |
| 7 | Alarm LED pull up | GM6 | YK |
| 8 | Handbrake warning lamp pull up | Hand brake switch | BY |
| 9 | Trip computer switch input | Trip computer switch | |
| 10 | NAV-Bus | Navigation computer | KB |
| 11 | Reverse gear pull down | Reverse gear switch/relay | GN |
| 12 | Brake pad wear warning lamp pull up | Brake pad wear switch | BW |

Serviceability and replacing an instrument pack

None of the components that make up the IPK are serviceable and failure of one or all components requires a new IPK to be fitted. All warning lamps are driven by light emitting diodes (LED).

IPK's should not be exchanged between vehicles. When a replacement is required a new IPK should be ordered. When a replacement IPK is fitted to the vehicle and configured to the vehicle using TestBook it will communicate with the LSM, via K-Bus, and the stored mileage will be transferred to the IPK. The light switch module periodically communicates with the IPK to update the information it stores for back-up purposes. It stores the vehicle identification number, vehicle total mileage and the SIA data. This data is updated every 100 Km (see Figure 40).

When necessary a IPK with less than 255 Km recorded mileage can be reconfigured to match the vehicle it is being fitted to using TestBook. It will then be able to communicate with the LSM when the ignition is switched 'on'. If the LSM recorded mileage is more than the IPK mileage, this figure will be transferred to the IPK odometer.

If the IPK has more than 255 Km recorded mileage it will not accept the LSM recorded figure after configuration. Instead it will attempt to update the recorded mileage stored in the LSM. If a new LSM has been fitted with zero miles recorded the LSM will accept the figure from the IPK. If the LSM has a valid mileage recorded already, it will not accept a new figure from the IPK which exceeds the recorded mileage by more than 1000 Km. For example if a new value of 6,500 Km was sent to an LSM with a recorded mileage of 5,000 Km the LSM would ignore this new figure.

A working/valid LSM will be updated with new mileage figures every 100 Km via K-Bus. Once it has reached 300,000 Km it ceases to update the mileage. It is therefore conceivable that an IPK, of correct specification, could be fitted to a vehicle outside the correct procedure with incorrect mileage data (without configuring it). There are as yet no visible warnings to inform the driver. Once TestBook is connected to the vehicle problems with the central coding key would occur and communication with the IPK would not be possible - making it clear to the dealer that a problem exists. If an IPK of incorrect configuration and specification is exchanged without configuration by TestBook errors will occur - such as the illumination of various warning lamps- indicating a problem exists.

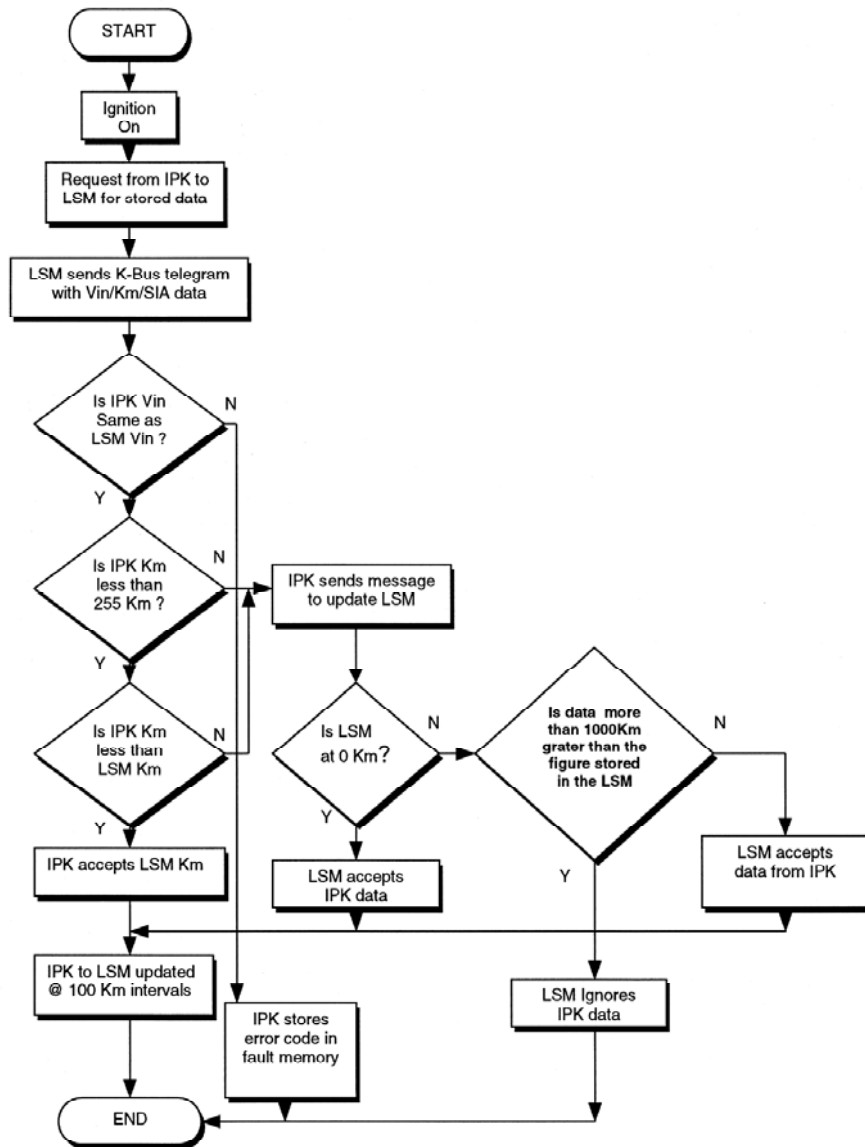


Fig e ll c o d e p t s

If 1 mode

The instrument pack can be put into self test mode via the odometer trip reset button. If this switch is held continuously for longer than five seconds additional information will be displayed. Alternatively the trip if reset button is pressed as the ignition is turned from the 'off' position to auxiliary the self test mode will be selected.

When self test mode is selected initially the number '1' illuminates in the odometer display. To enter test 1 the trip reset button should be released until '1.0' is visible in the display. It is then possible to scroll through the information available in the test , see table 'Self test mode 1'.

Self test mode 1

| Test Number | Display (example) | Definition |
|-------------|-------------------|---|
| 1.0 | - 00124 | Actual VIN number |
| 1.1 | 4812 | Calibration number |
| 3 1.2 | 837235 AA1AF2 | Part number. Coded format |
| 1.3 | 010201 | Diagnosis code-bus index 01-Diag index -02-Coding index 01-Bus index |
| 1.4 | 4298 | Date of manufacture 42 =Week No 98 =Year No |
| 1.5 | 01_800 | 01-Hardware number 800-Software number |
| 3 1.6 | ----- | Not used |
| 1.7 | 00_ _FF_ | 00-CAN index FF-Mod index |

To enter self test 2 it is necessary to enter self test mode but when '1' is displayed rather than waiting for '1.0' to be displayed by the odometer the trip reset button should be pressed again. The number '2' will then be displayed and the reset button should then be released until the odometer displays '2.0'. A further press of the trip reset button puts the IPK into self test mode 2. In this mode all the IPK gauges and warning lamps are driven simultaneously by the IPK and any malfunction within the IPK can be observed.

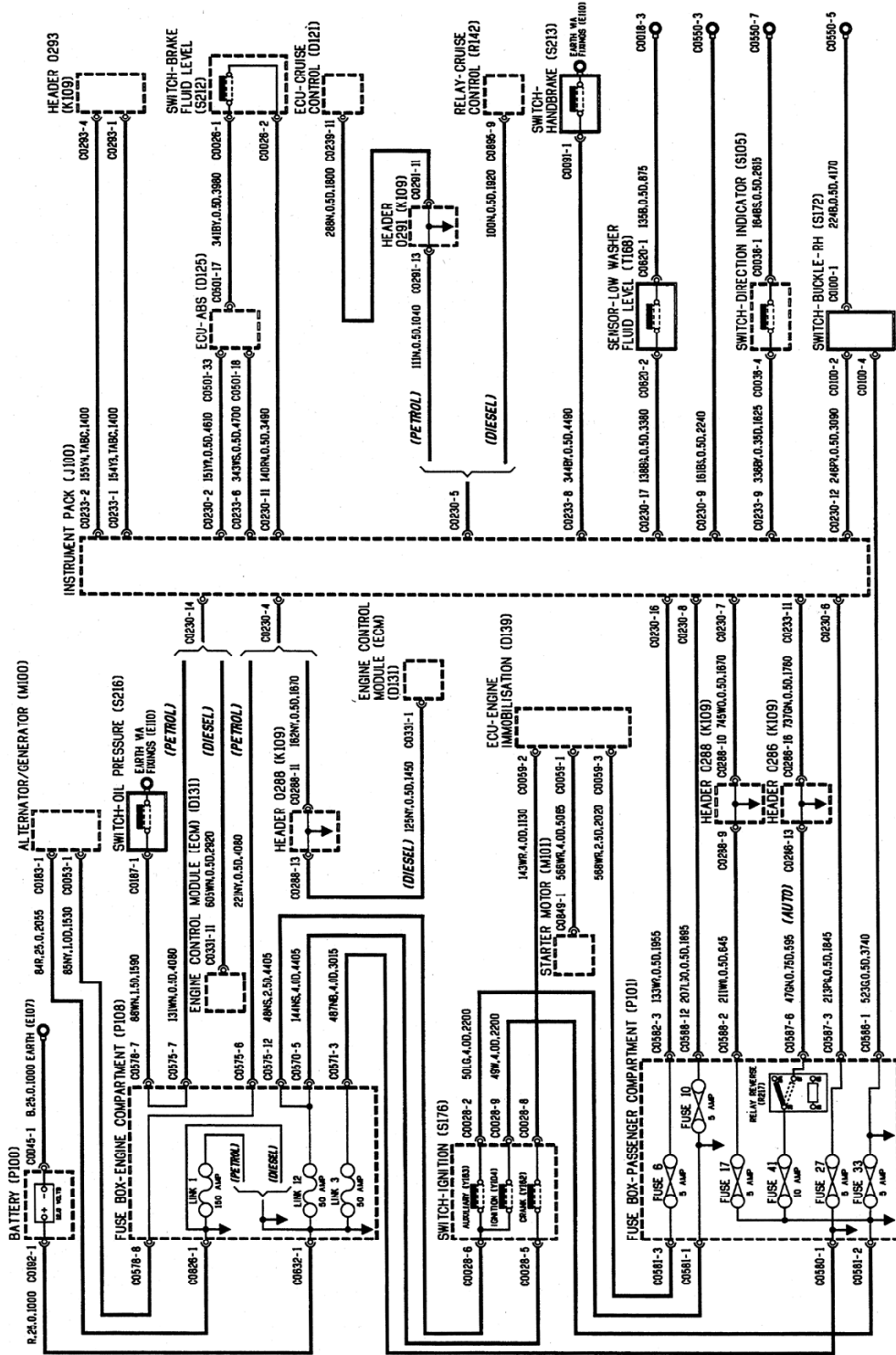
Diagnostics

TestBook is used to access the memory inside the IPK and it can be used to read and clear the stored faults. TestBook can also read inputs to the IPK and drive the warning lamps and gauges (It cannot drive SRS, ABS, seatbelt, low oil pressure, or the battery charge low warning lamps).

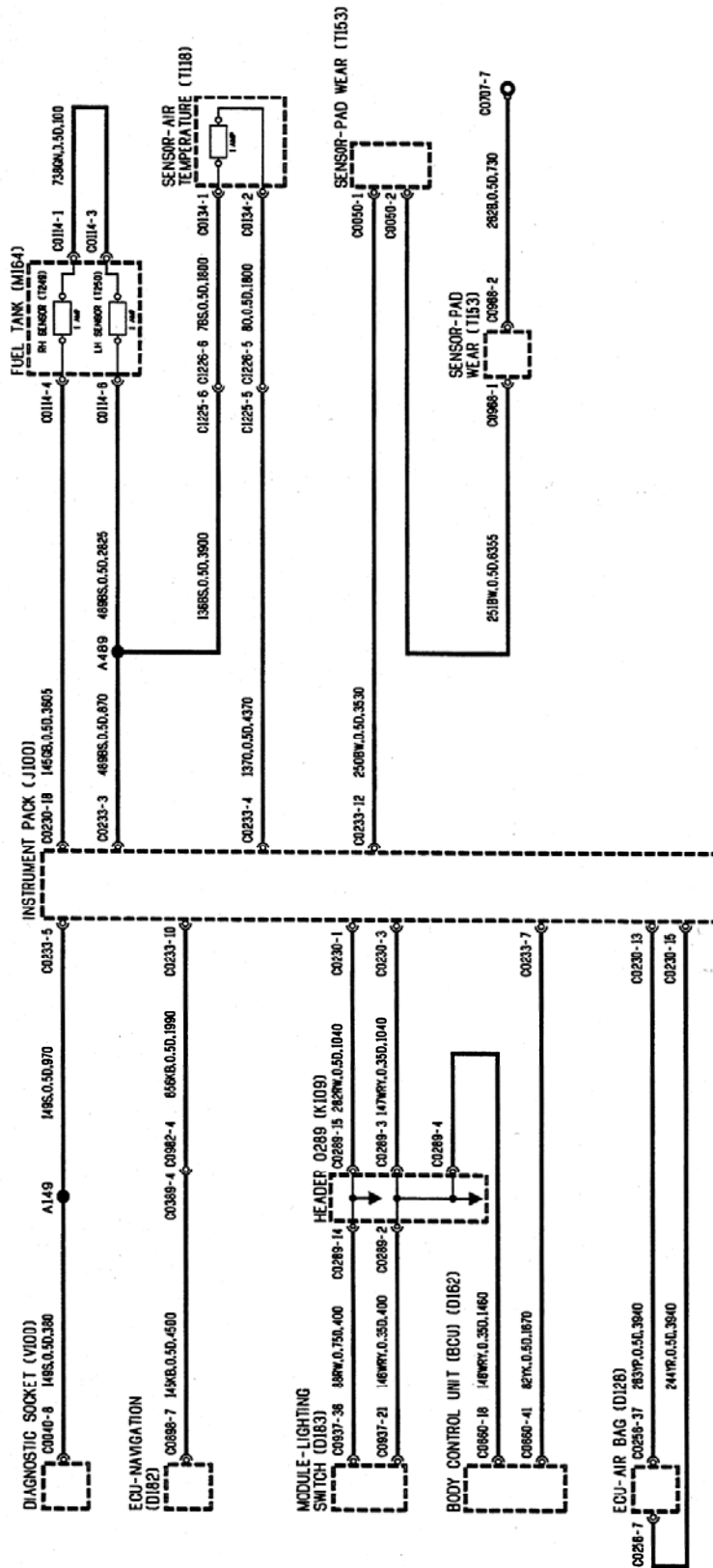
Fault explorer is available to help diagnose the cause of the fault(s) and real time monitor indicates exactly what inputs the IPK is seeing. The sub-system tests check the internal functionality of the IPK. As the IPK is non-serviceable a sub-system failure means a replacement IPK will be required.

Instruments circuit diagram

The circuit diagrams outline inputs and outputs (see Figure 41 and 42).



Fi h e 2)



k e 2)

Exterior lighting

Introduction

The main components of the exterior lighting system are the light switch module, the left hand column stalk switch, the hazard light switch and the exterior lamps around the vehicle (see Figure 43).

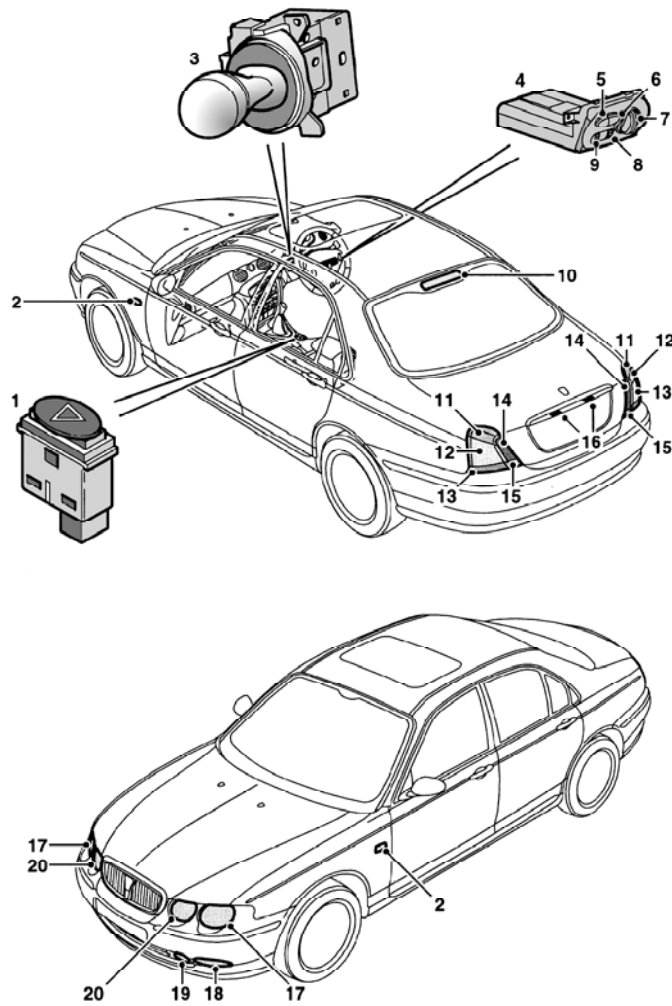


Figure 43

Components

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Hazard warning switch 2. Side repeater (2 off) 3. Direction indicator and main/dip beam column stalk switch 4. Light Switch Module (LSM) 5. Front fog lamp switch (if fitted) 6. Rear fog lamp switch 7. Side lamp/headlamp rotary master switch 8. Headlamp levelling thumbwheel 9. Instrument illumination dimmer thumbwheel 10. Centre High Mounted Stop Lamp (CHMSL) | <ol style="list-style-type: none"> 11. Brake lamp (2 off) 12. Tail lamp (2 off) 13. Rear fog lamp (2 off) 14. Rear direction indicator (2 off) 15. Reverse lamp (2 off) 16. Number plate lamp (2 off) 17. Dipped beam headlamp (2 off) 18. Front direction indicator (2 off) 19. Front fog lamp (2 off - if fitted) 20. Main beam headlamp (2 off) |
|--|--|

The light switch module (LSM) is the control unit which operates all exterior lighting (except reverse lamps), headlamp levelling and instrument panel illumination. The LSM consists of a switch pack and an ECU and is located on the dashboard. Though they are connected together, each can be replaced separately when necessary. The battery supply to the LSM is via two large fuse linked lines. The purpose of these is to provide a method of isolating the LSM, rather than providing overcurrent protection.

The light switch module is secured beneath the lower fascia panel on the driver side by three screws.

Smart field effect transistors (FETs) in the LSM protect the lamp circuits from high voltage surges. These Smart FET's replace standard circuit fuses and react to the heat generated by the excess current flow caused by shorting circuits. Unlike conventional fuses, which need replacing, Smart FETs will continue to operate as normal once the fault has been rectified.

The LSM also functions as the back up for storage of vehicle information used by the instrument pack. The LSM stores VIN, total mileage and service interval data. The process for changing a LSM and its relation to the instrument pack is clearly defined and must be adhered to for correct transfer of vehicle data. This is done using the workshop manual and TestBook. The non volatile memory also stores faults and controller errors and diagnosis is carried out using TestBook.

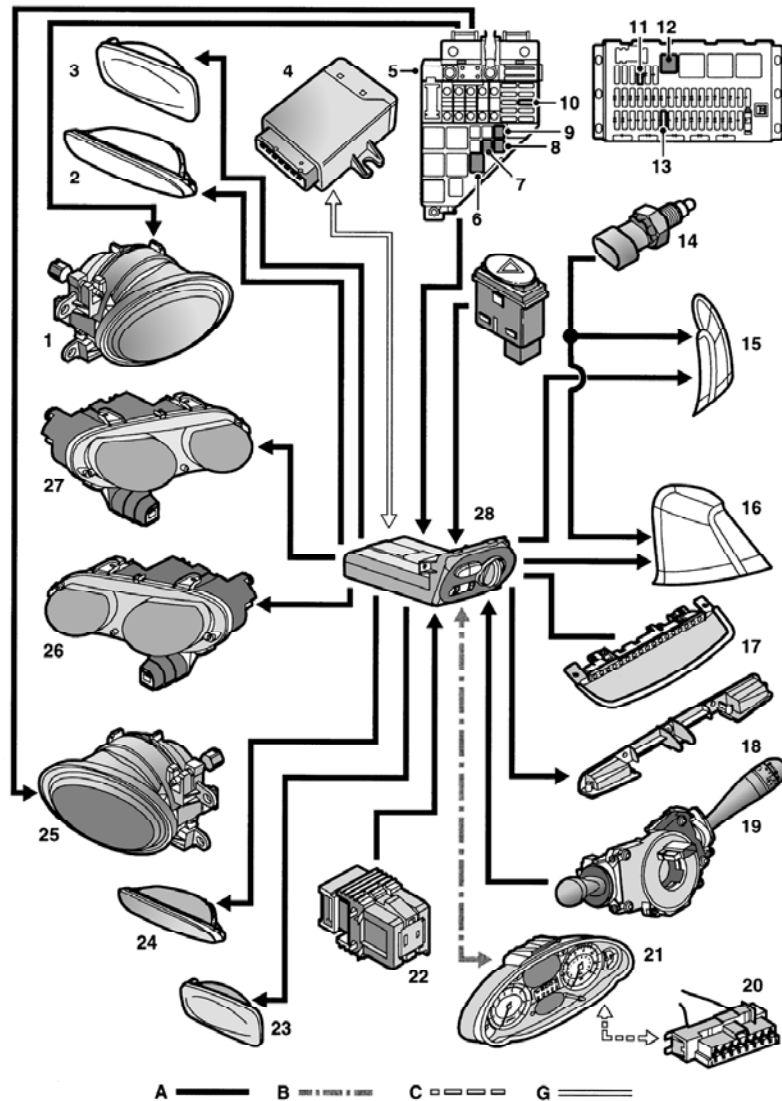


Fig 4 o p t s

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. RH front fog lamp (if fitted) 2. RH front direction indicator lamp 3. RH side repeater lamp 4. Trailer ECU (if fitted) 5. Engine compartment fusebox 6. Front fog lamp relay R6 (if fitted) 7. LSM/trailer ECU fusible link FL11 (50A-if fitted) 8. Ignition switch crank/ignition switch fusible link FL12 (50A) 9. LSM fusible link FL9 (50A) 10. Front fog lamp relay fuse F6 (15A) 11. LSM ignition supply fuse F40 (5A) 12. Reverse lamp relay RL4 (automatic transmission vehicles only) 13. LSM auxiliary supply fuse F7 (5A) 14. Reverse lamp switch (manual transmission | <ul style="list-style-type: none"> switch shown) 15. RH tail lamp assembly 16. LH tail lamp assembly 17. Centre high mount stop lamp (CHMSL) 18. Number plate lamps 19. Direction indicator/dip-main beam switch 20. Diagnostic socket 21. Instrument pack 22. Brake lamp switch 23. LH side repeater lamp 24. LH direction indicator lamp 25. LH front fog lamp (if fitted) 26. LH headlamp assembly 27. RH headlamp assembly 28. Light switch module |
|---|---|

A= Hardwired **B** = K-Bus **C** = Diagnostic line **G** = Trailer Bus

The LSM provides the control for all exterior lighting functionality including bulb monitoring, tail lamp back-up, headlamp timeout facility and the emergency back-up facility (see Figure 44).

Bulb failure warning

Motor vehicle traffic regulations state that a driver should check the operation of the entire vehicle lighting system before beginning a trip. Penalties can be imposed on drivers who drive with a faulty lighting system, even though they may be unaware of a problem. The LSM has the ability to monitor the lighting circuits for continuity and correct operation. This function is operational only with the lighting circuits being switched 'on'. If a long journey is to be undertaken initially in daylight but will continue on into the night and darkness, the correct functioning of the lighting circuits should first be checked. This can be done manually or by switching the lighting circuits 'on' and checking that the bulb failure warning lamp does not illuminate.



Figure 45: Bulb failure warning lamp

Power-MOSFET transistors (metal-oxide semiconductor field effect transistors) are incorporated in the lighting circuits and control bulb monitoring. Power MOSFET transistors are used as switches in much the same way as bi-polar junction transistors. The difference is that the Power-MOSFET transistor uses a voltage as the input signal as opposed to a current. This makes them much more efficient using about one tenth of the power required by a bi-polar junction transistor. Therefore, they generate less heat.

The electronic microprocessor contained within the LSM continually monitors the status of the outputs to each activated lamp. The microprocessor in the LSM feeds the transistor which, in turn, feeds the lamp circuit. A line is also taken from the transistor, which is fed back into the microprocessor. This line will jump from 0 volts to 5 volts when the circuit becomes open circuit, which usually is caused by a bulb failure. On perceiving that the status line is at 5 volts, the LSM communicates to the instrument pack via K-bus. The IPK will indicate the fault to the driver using the message centre (if fitted) (see Figure 45) or by displaying the bulb failure warning lamp.

Once a bulb failure is detected it is stored in the LSM memory. This means that, until the failure is rectified, the instrument pack will illuminate the bulb failure warning lamp when the ignition is switched to position 2. In this instance the bulb failure warning lamp will illuminate whether the lighting circuits are switched on or off. When the bulb failure has been rectified, the lighting circuit must first be switched on before the bulb failure warning lamp will extinguish.

mp ck-up

If a fault is detected with a tail lamp bulb during a bulb monitor check and the bulb is inoperative, the LSM has a back up safety feature: the LSM will illuminate the corresponding brake lamp. The intensity of the brake lamp in normal circumstances is brighter than the intensity of a tail lamp and the LSM compensates for this. The LSM varies the current to the bulb using a MOSFET to modulate the pulse width of the supply to a frequency equal to the luminosity of a tail lamp. The bulb failure warning lamp will still be illuminated in this instance.

Tail lamps and side lights are driven continually by a pulse width modulated output from the LSM to improve bulb service life. This keeps the bulb voltage at 13.5 volts should the supply voltage rises above the 13.5 volt threshold.

Auto i tic i mp i -c (Cou li s)

Another feature controlled by the LSM is the walk home facility or automatic headlamp time-out. This feature is provided to illuminate the area in front of the vehicle for a given amount of time after exiting the vehicle. This function operates when the ignition is switched 'off' before the dipped headlights are switched 'off'. When this occurs, the dipped headlights remain 'on' for the amount of time programmed into the LSM. TestBook can be used to turn this function 'on' and 'off'.

e ncy o ion

In the event of an LSM failure, the lighting system still needs to be driven for safety purposes. Independent hardware is fitted to Rover 75 and is activated in the event of a LSM failure with the ignition in position 2. The emergency operation is held off by a functional LSM which supplies cycling signal to a monoflop which controls the emergency system. The LSM processor provides the cycling signal and it must operate at a minimum of 15Hz to prevent activation of the emergency system. If this signal is not present or falls below 15Hz the monoflop enters its stable state and activates the emergency back up system. When the emergency system is activated, the dipped beam and the tail lamps are switched on regardless of the position of the master light switch. Also, the brake lamps will operate as normal when selected. All other functions controlled by the LSM will not operate.

Emergency operation will also be activated when the vehicle battery terminal voltage is very low (i.e. less than 6V at the LSM) and the ignition is in position 2.

t rd rnin mps

The hazard warning switch is a momentary action switch located on the centre console. When activated, it switches the line from the LSM to ground. The switch latches electronically and the LSM activate all direction indicators and side repeater lamps. The tell tale lamps on the instrument pack and the hazard switch illumination will also flash synchronously with the hazard lamps. The hazards will function regardless of the ignition switch position. When being towed with the hazard lamps on, the direction indicators are still functional and can be selected by operating the LH/RH indicator stalk .

Trailer module

When towing it is necessary to fit a Rover 75 towing electrics kit to separate the load circuit currents of the trailer from the circuits of the towing vehicle. The accessory kits available include a trailer ECU and the relevant harness, which plugs directly into the rear lighting section of the harness. A choice of two towing kits is available:

1. electrics kit with a 12S (7-pin) connector and a 12N (7-pin) connector
2. 13 pin towing kit available covering all towing needs (European standard)

Additionally the towing kit will require two fused feeds from the battery to be located under the dashboard.

Bulb monitoring of trailer lamps is carried out and the trailer ECU communicates the bulb status to the LSM via a discrete bi-directional trailer bus. When a bulb failure is detected the trailer ECU sends a signal to the LSM which in turn transmits a signal on the K-Bus system. The instrument pack receives this signal and will illuminate the trailer bulb failure warning lamp. On lowline IPK's this is a yellow warning lamp with a caravan signal. On highline IPK's the caravan symbol is displayed in the message centre and is accompanied by a text message. After a predetermined length of time the message shrinks down to a small icon without the text message.

When a trailer is connected to a vehicle with park distance control the trailer ECU transmits a message to the LSM which directs the LSM to transmit a message on K-Bus. This message signals the parking aid ECU to disable the function.

Rear fog lamps

Each rear fog lamp bulb is located in the bulb holder behind the tail lamp lens assembly. Each rear fog lamp has a single filament, bayonet type 21 Watt bulb which positively locates in the holder. The bulb protrudes through an aperture in the tail lamp lens to illuminate the rear fog lamp lens section. The bulb holder assembly is accessible by removing the applicable trim panel in each rear corner of the boot and pushing a tab to release the holder from its mounting.

If front fog lamps are not fitted, the rear fog lamps will only operate when the headlamps are 'on' and the ignition switch is in position 2. If the rotary light switch is moved to the side lamp or 'off' position or if the ignition switch is moved to position 1 or 'off' position, the rear fog lamps will be extinguished. The rear fog lamps will not illuminate on the next ignition cycle and must be reselected with the switch on the LSM switch panel.

If front fog lamps are fitted, the rear fog lamps will operate with the side lamps or headlamps 'on' and the front fog lamps selected 'on'. If the rotary light switch is moved to the 'off' position, the front fog lamps are switched 'off' or the ignition switch is moved to position 1 or the 'off' position, the front and rear fog lamps will be extinguished. If the headlamps are 'on' and the front fog lamps are switched 'off', the rear fog lamps will remain 'on'. When the ignition is moved to position 1 or the 'off' position, the rear fog lamps will not illuminate on the next ignition cycle and must be reselected with the switch on the LSM switch panel.

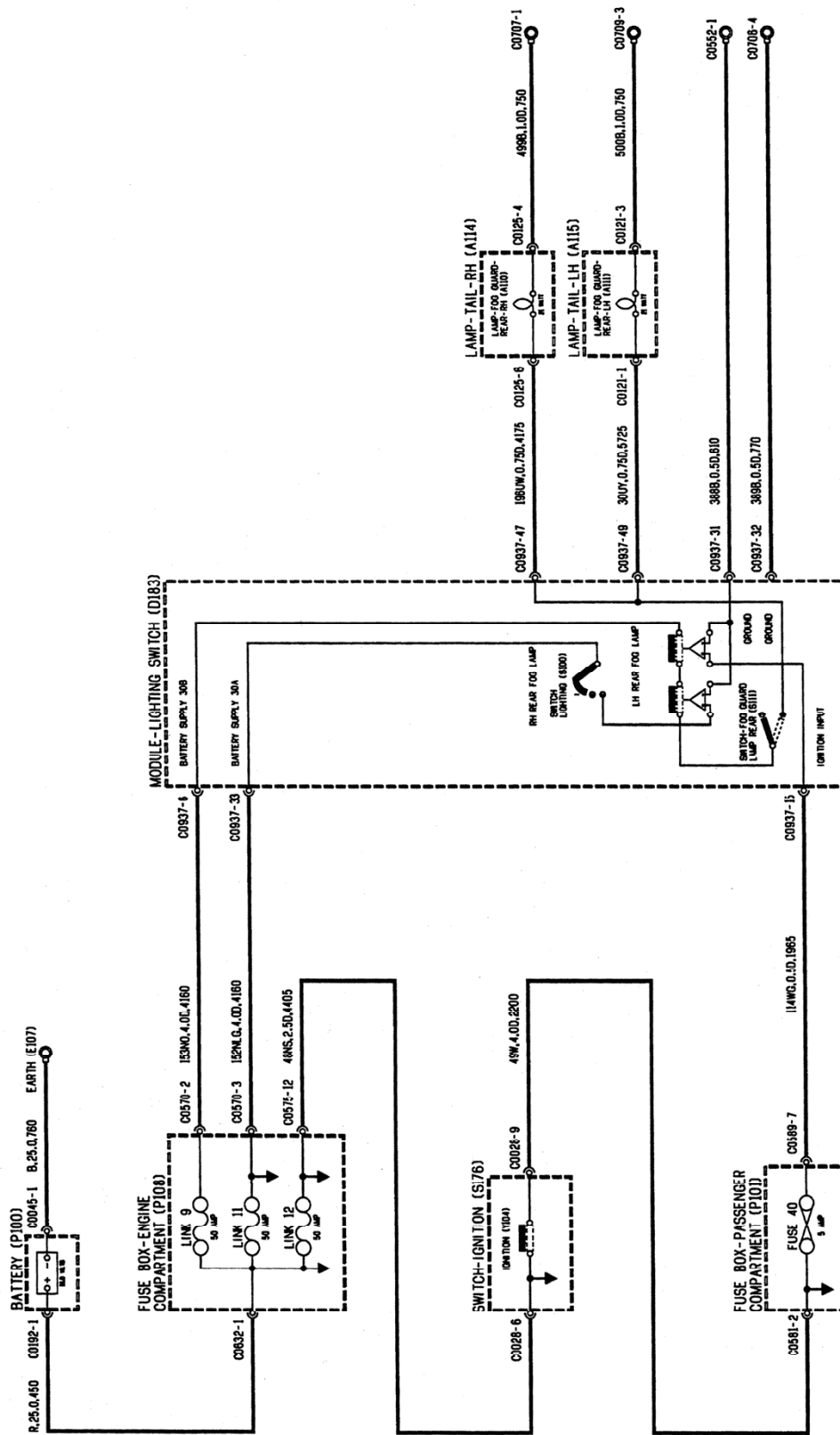


Fig e m

Front fog lamps

On vehicles without front fog lamps, the LSM switch panel does not have a front fog lamp switch. When front fog lamps are fitted, a replacement LSM switch panel is supplied with a front fog lamp switch adjacent to the rear fog lamp switch.

When fitted, the two front fog lamps are located in each outer part of the air intake in the front bumper. Each front fog lamp has a Halogen H1 55 Watt bulb, identical to that used for the dipped beam headlamp. The fog lamps are powered from a relay in the engine compartment fusebox which is energised by the LSM. The fog lamp circuit is protected by a conventional fuse also in the engine compartment fusebox.

The front fog lamps will operate with the side lamps or headlamps 'on' and the ignition switch in position 2. If the rotary light switch is moved to the 'off' position or the ignition switch is moved to position 1 or the 'off' position, the front fog lamps will be extinguished. The front fog lamps will not illuminate on the next ignition cycle and must be reselected with the switch in the LSM switch panel.

When front fogs are fitted as a dealer accessory the installation kit comes complete. It contains full instructions and the kit includes a harness (which plugs directly into main harness), engine fusebox connections and a bezel for bumper section removal.

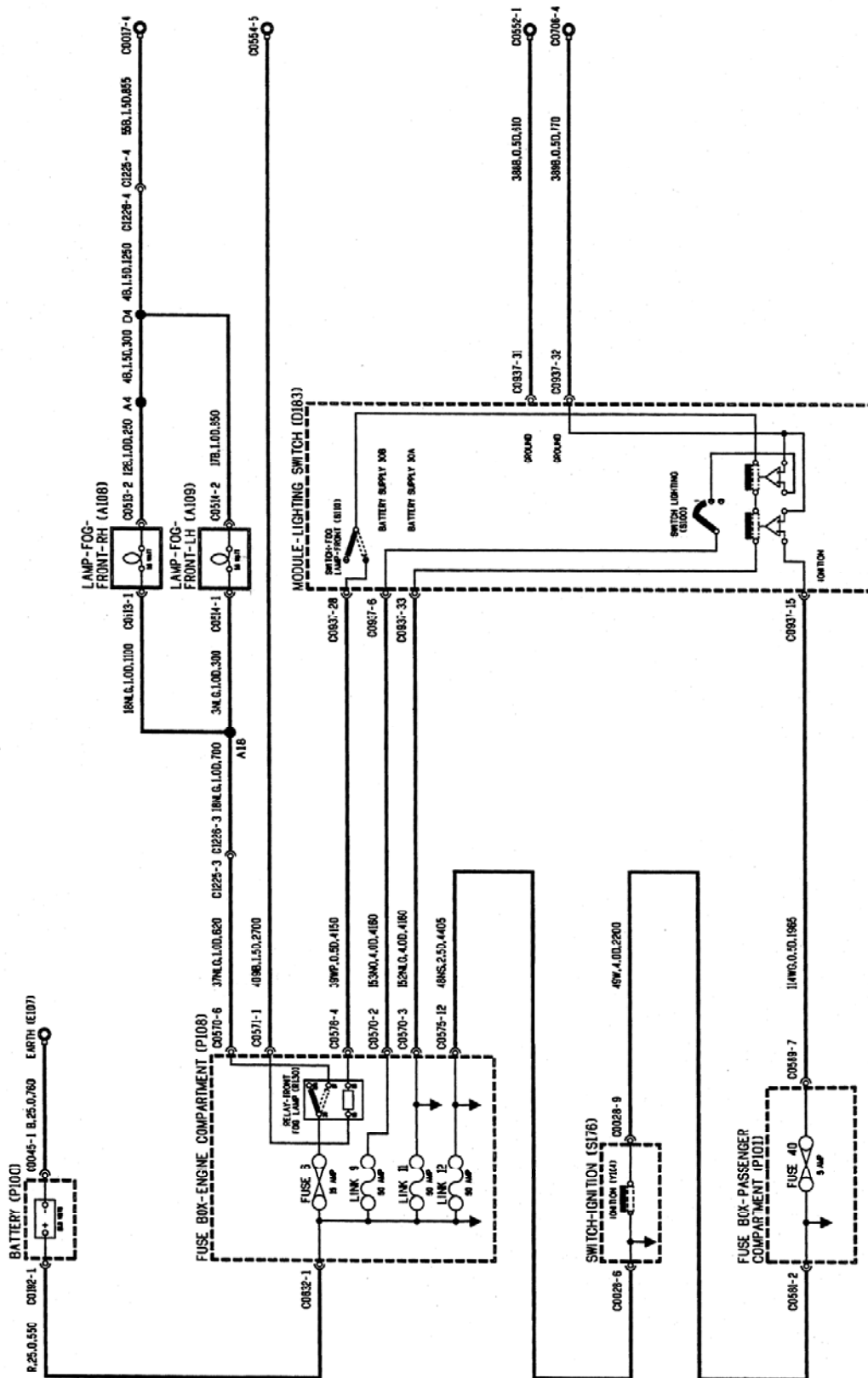


Fig e 4 c f t l m

Brake lamp centre high mount stop lamp and reverse lamp

The brake light switch is a Hall effect proximity sensor monitoring movement of the metallic brake pedal. This means the brake switch works without contact, generates no noise from actuation and allows for simplified adjustment. The output from the Hall sensor holds the brake lamps 'off' when the brakes are not applied. The brake lamp is active in ignition position 1 and 2. If the brake lamp switch is removed or disconnected, the brake lamps will remain 'on' with the ignition in position 1 and 2.

The centre high mounted stop lamp (CHMSL) is composed of fifteen horizontally positioned LED's located at the top of the rear screen and are activated with the brake lamps.

The reverse lamp is not controlled by the LSM. On manual vehicles the reverse lamps are controlled by operation of the reverse gear switch. On automatic variants the reverse lamps are controlled by the reverse lamp relay in the passenger compartment fusebox.

Daytime running lamps

Daytime running lamps are specified for some European markets and are configurable via TestBook. With the LSM configured for daytime running, when the ignition switch is in position 2 and the rotary light switch is 'off', side and tail lamps, dipped beam headlamps and number plate lamps will be illuminated. Instrument panel illumination will remain 'off' until the rotary light switch is moved to the side lamp or headlamp position.

Parking lamp

When the ignition is switched 'off' the parking lamp function is available. In this state, when the direction indicators are operated the corresponding position lamp and tail lamp on that side will be illuminated. Hence, with the right hand direction indicator switch active the right hand position lamp (side light) and the right hand tail lamp are operative, and vice versa. To prevent this function from being initiated accidentally, it is necessary to first return the direction indicator stalk to the 'off' position and then set it as required. A 'P' symbol is etched onto the column stalk to indicate this feature.

Headlamp assembly

Each headlamp unit is a one piece moulded and sealed unit with no serviceable components other than the side lamp, dip and main beam headlamp bulbs. Each unit contains a headlamp levelling motor located inside the headlamp unit.

The headlamp unit is positively located on four mountings and secured with screws to the bonnet locking platform. A single harness multiplug connector provides power and ground connections for the bulbs and headlamp levelling motor.

The headlamp levelling motor is secured in the housing and has a worm drive which is connected to the bottom of the lens. Operation of the motor raises or lowers the lens to achieve the desired vertical adjustment. The LH and RH headlamp levelling motors are controlled by outputs from LSM in response to driver requests using the levelling thumbwheel. Both motors operate together and cannot be operated individually.

Each headlamp unit has two manual adjustment screws on the top surface which are accessible from the engine compartment and can be rotated using an 8 mm Allen key. The outer adjuster controls horizontal adjustment and the inner controls vertical adjustment of the headlamp lens. Using suitable headlamp alignment equipment, the headlamps should be set to 1.0% with the headlamp levelling thumbwheel set to zero and the levelling motors powered to the zero position.

The headlamp unit contains one headlamp lens and reflector. The lens and reflector is divided into two separate inner and outer headlamps. The outer lens and reflector contains a Halogen H1 55 Watt bulb and is used for dipped beam headlamps only. A smaller capless bulb is also located in a push fit holder below the Halogen bulb and is used for side lamp illumination. The inner lens and reflector contains a Halogen H7 55 Watt bulb and is used for main beam only. When main beam is active, the dipped beam bulb remains illuminated. Each Halogen bulb has pegs which ensure that the bulb is installed correctly orientated. The bulbs are secured with wire clips and are covered by sealing rubber covers to prevent the ingress of moisture.

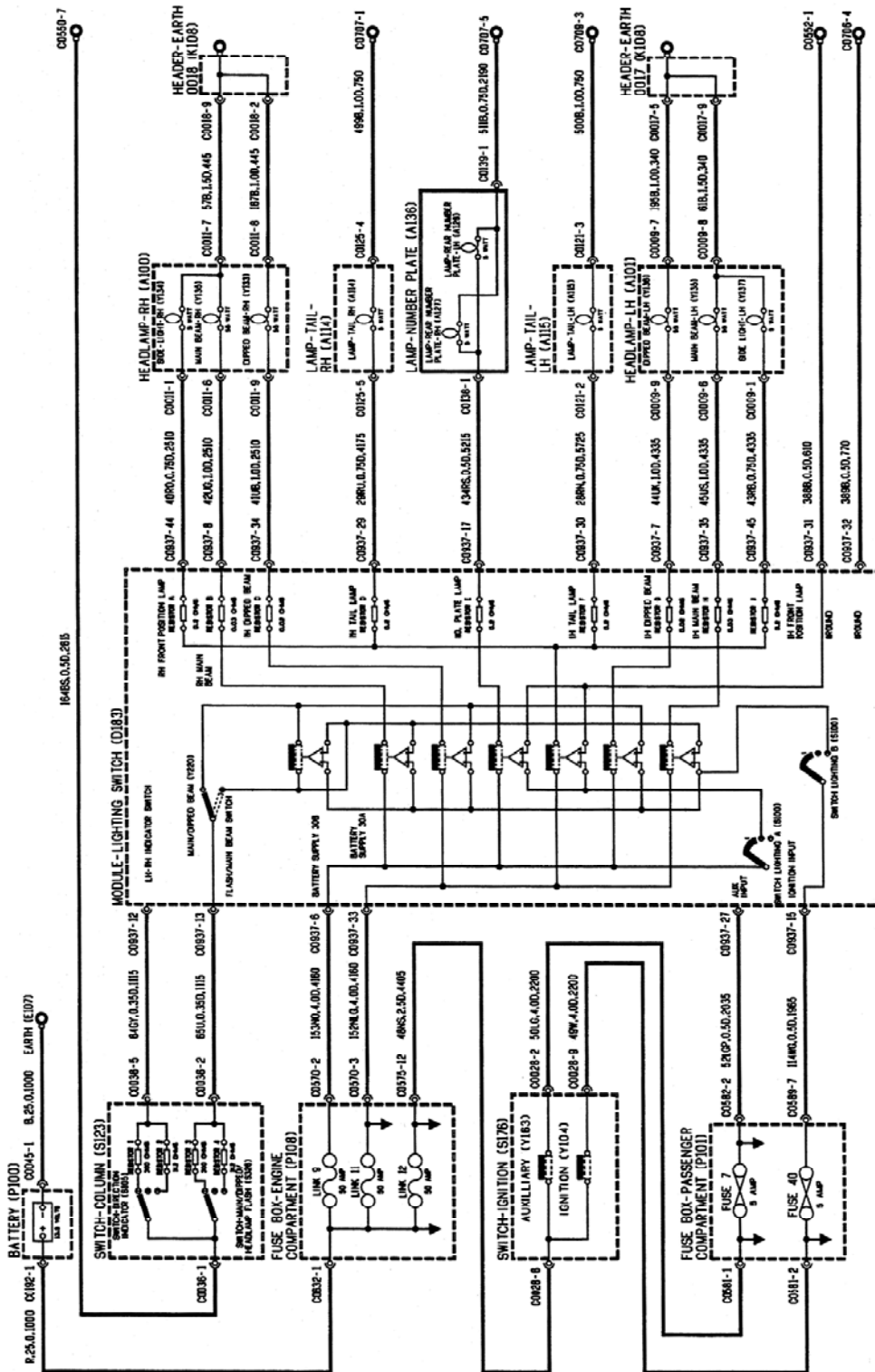


Fig. 1 a s a n c d e l m

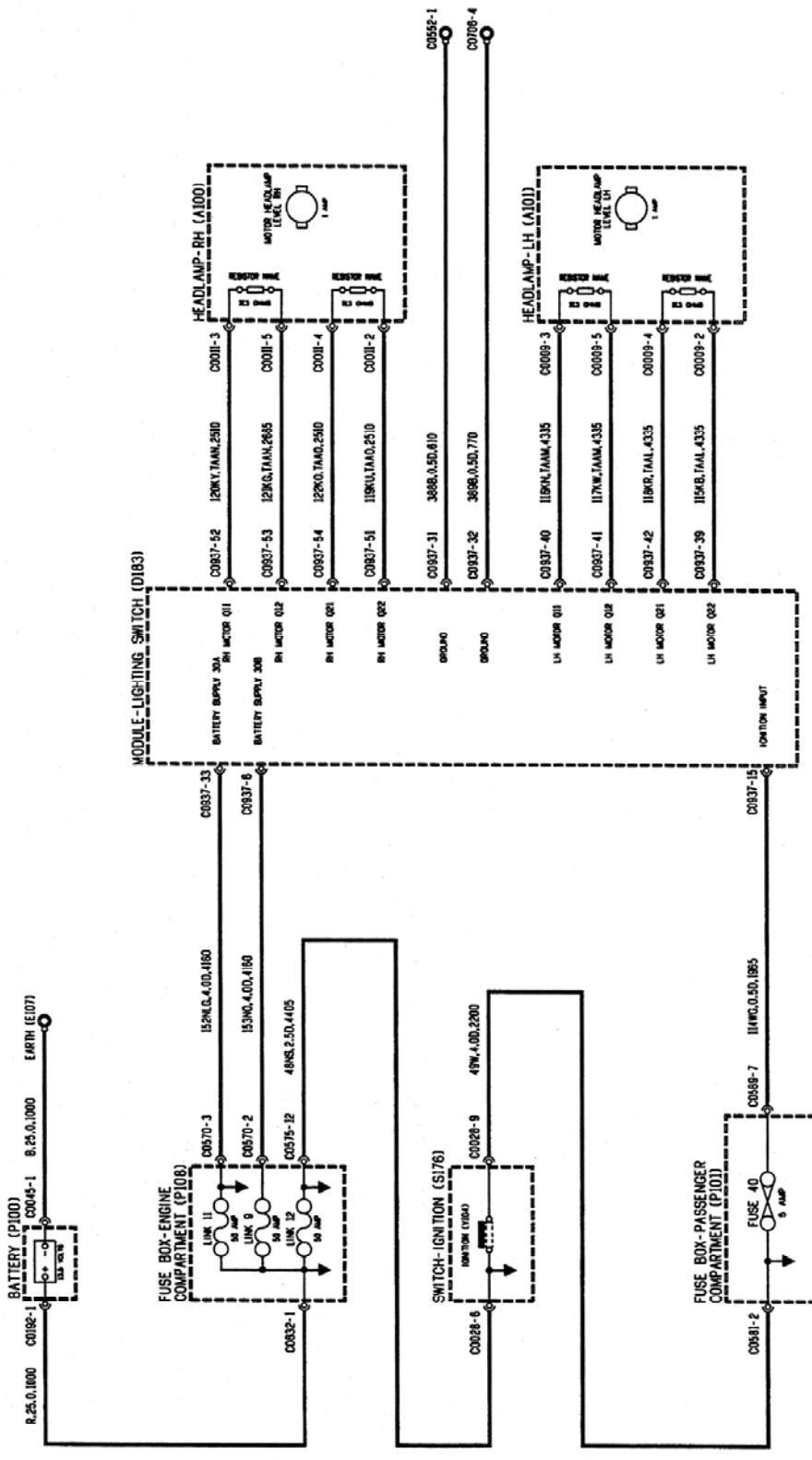
Headlamp levelling system

Headlamp levelling systems are becoming a mandatory requirement in more and more countries and headlamp level adjustment is fitted as standard on Rover 75. The LSM controls the headlamp beam aim adjustment. This system makes it possible to adjust the headlamp aim for varying loads and, therefore, prevent the dazzling of oncoming traffic. It also gives the driver of the vehicle good road lighting at all times. Variation of the headlamp beam aim is carried out by the control of stepper motors contained within the headlamp assembly.

Operation of the headlamp beam aim adjustment is possible only when the LSM receives a message, via the K-Bus link, that the engine is running or when the position lamps (side lights) or the dipped beam lamps are switched on. The system is self synchronising and with every operation of the headlamps the stepper motors will need to find their reference point. The motors are driven up to their full travel, during which time the headlamps will be observed to move downwards and then back to the selected level.

Manual operation is driven by the operation of a knurled thumbwheel on the LSM which adjusts a potentiometer setting. This potentiometer setting has a direct affect on the position of the stepper motors which, in turn, control the headlamp level. There are three settings numbered 0, 1 and 2.

Automatic adjustment of the headlamp beam height is a legal requirement for cars fitted with gas discharge lamps. As with the manual systems linear stepper motors are used to physically adjust the height of the headlamp. Automatic headlamp beam adjustment is not available currently on Rover 75.



Hen nç am

out

The LSM has a single 54 pin connector (C0937) and its connections are outlined in the table 'LSM pin-out table'.

LSM pin-out table

| Pin No. | Description | Input/Output |
|---------|-------------------------------------|--------------|
| 1 | LH rear direction indicator | Output |
| 2 | Not used | - |
| 3 | RH side repeater | Output |
| 4 | Not used | - |
| 5 | LH stop lamp | Output |
| 6 | VBatt 12V supply | Input |
| 7 | LH dipped beam | Output |
| 8 | RH main beam | Output |
| 9 | Trailer bus | Input/Output |
| 10 | RH stop lamp | Output |
| 11 | RH front direction indicator | Output |
| 12 | LH/RH direction indicator switch | Input |
| 13 | Flash/Main beam switch | Input |
| 14 | Not used | - |
| 15 | Ignition switch IGN supply signal | Input |
| 16 | CHMSL | Output |
| 17 | LH/RH number plate lamps | Output |
| 18 | LH side repeater | Output |
| 19 | Not used | - |
| 20 | Not used | - |
| 21 | K Bus | Input/Output |
| 22 | Not used | - |
| 23 | Not used | - |
| 24 | Hazard warning switch | Input |
| 25 | Brake lamp switch | Input |
| 26 | Not used | - |
| 27 | Ignition switch AUX supply signal | Input |
| 28 | Front fog relay | Output |
| 29 | RH tail lamp | Output |
| 30 | LH tail lamp | Output |
| 31 | Earth | Input |
| 32 | Earth | Input |
| 33 | VBatt 12V supply | Input |
| 34 | RH dipped beam | Output |
| 35 | LH main beam | Output |
| 36 | Illumination dimmer | Output |
| 37 | Not used | - |
| 38 | Not used | - |
| 39 | LH headlamp levelling stepper motor | Output |
| 40 | LH headlamp levelling stepper motor | Output |
| 41 | LH headlamp levelling stepper motor | Output |
| 42 | LH headlamp levelling stepper motor | Output |
| 43 | RH rear direction indicator | Output |
| 44 | RH front side lamp | Output |
| 45 | LH front side lamp | Output |

| Pin No. | Description | Input/Output |
|---------|-------------------------------------|--------------|
| 46 | Not used | - |
| 47 | RH rear fog lamp | Output |
| 48 | Hazard warning switch illumination | Output |
| 49 | LH rear fog lamp | Output |
| 50 | LH front direction indicator | Output |
| 51 | RH headlamp levelling stepper motor | Output |
| 52 | RH headlamp levelling stepper motor | Output |
| 53 | RH headlamp levelling stepper motor | Output |
| 54 | RH headlamp levelling stepper motor | Output |

Glossary

The table 'Glossary of terms' explains the abbreviations used in this brochure.

| | |
|---------|--|
| ABS | Anti-lock braking |
| ACES | Automated cable-assembly engineering system |
| ATC | Automatic temperature control |
| ATCU | Automatic transmission control unit |
| AUX. | Auxiliary |
| BBUS | Battery backed-up sounder |
| BCU | Body control unit (GM6) |
| CMP | Camshaft position sensor |
| CAN | Controller area network |
| CATIA | Computer aided three-dimensional interactive application |
| CD | Compact disc |
| CDL | Central door locking |
| CHMSL | Centrally high mounted stop lamp |
| CKP | Crankshaft position sensor |
| CRC | Cyclic redundancy check |
| DB | Data byte |
| DCU | Diagnostic and control unit |
| DDE | Digital diesel electronic |
| DDM | Driver's door module |
| DFS | Direct factory supplier |
| DOS | Disc operating system |
| DS2-Bus | Diagnostic bus |
| ECM | Engine control module |
| ECU | Electronic control unit |
| EEPROM | Electrical erasable programmable read only memory |
| EKA | Emergency key access code |
| EMS | Engine management system |
| EP | Emergency programme |
| ETC | Electronic traction control |
| EWS-3 | Elektronische Wegfahrsperr |
| FBH | Fuel burning heater |
| FET | Field effect transistors |
| FL | Fuse link |
| GM6 | Ground module |
| HEVAC | Heating, ventilation and air-conditioning |
| HRW | Heated rear window |
| HO2S | Heated oxygen sensor |
| Hz | Hertz |
| IPK | Instrument pack |
| ISO | International standards organisation |
| K-Bus | Karosserie-Bus (body) |
| KL | Klemme |
| KV6 | K series engine 'V' configuration 6 cylinder |
| LCD | Liquid crystal display |
| LED | Light emitting diode |
| LH | Left hand |
| LHD | Left hand drive |
| LSM | Light switch module |

| | |
|---------|---|
| MEMS | Modular engine management system |
| MOSFET | Metal-oxide semiconductor field effect transistor |
| NiMH | Nickel metal hydride |
| PDC | Park distance control |
| PDI | Pre delivery inspection |
| PRNDL | Park reverse neutral drive low |
| PWM | Pulse width modulation |
| RAM | Random access memory |
| RF | Radio frequency |
| RH | Right hand |
| RHD | Right hand drive |
| ROM | Read only memory |
| ROW | Rest of the world |
| SIA | Service interval announcement |
| SPE | Single point entry |
| SRS | Supplementary restraint system |
| TV | Television |
| UK | United Kingdom |
| VGA | Video graphics adapter |
| VIN | Vehicle identification number |
| VOR | Vehicle off road |
| WIN-Bus | Window bus |