



Ministry  
of Defence



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Via:  
██████████

11<sup>th</sup> April 2017 Our Ref: FOI2017/04336

Dear ██████████,

Thank you for your email of 4<sup>th</sup> April 2017 requesting the following information:

*AESP 2320-D-122-201*

*I would like to make a Freedom of Information Request for the operating manual for a Land Rover 110.*

I am treating your correspondence as a request for information under the Freedom of Information Act 2000 (FOIA).

A search for the information has now been completed within the Ministry of Defence, and I can confirm that information in scope of your request is held.

Some of the information you have requested falls entirely within the scope of the absolute exemption provided for at section 40 (Personal Data) and qualified exemption provided for at section 26 (Defence) of the FOIA and has been redacted.

Section 40(2) has been applied to some of the information in order to protect personal information as governed by the Data Protection Act 1998. Section 40 is an absolute exemption and there is therefore no requirement to consider the public interest in making a decision to withhold the information.

Section 26 is a qualified exemption and subject to public interest testing which means that the information requested can only be withheld if the public interest in doing so outweighs the public interest in disclosure.

Section 26(1)(b) has been applied to some of the information because it contains details which are operationally sensitive and would prejudice the capability and effectiveness of our armed forces. The document contains information which would allow for the formation of tactics by potential enemies of UK forces to be used against the vehicles taking advantage of limitations inherent in the different systems. The balance of public interest was found to be in favour of withholding the information given that, overall, the public interest is best served in not releasing information that could be used by potential enemies to the detriment of the UK forces and for these reasons I have set the level of prejudice against release of the exempted information at the higher level of "would" rather than "would be likely to".

If you are not satisfied with this response or you wish to complain about any aspect of the handling of your request, then you should contact me in the first instance. If informal resolution is not possible and you are still dissatisfied then you may apply for an independent internal review by contacting the

Information Rights Compliance team, Ground Floor, MOD Main Building, Whitehall, SW1A 2HB (e-mail [CIO-FOI-IR@mod.uk](mailto:CIO-FOI-IR@mod.uk)). Please note that any request for an internal review must be made within 40 working days of the date on which the attempt to reach informal resolution has come to an end.

If you remain dissatisfied following an internal review, you may take your complaint to the Information Commissioner under the provisions of Section 50 of the Freedom of Information Act. Please note that the Information Commissioner will not investigate your case until the MOD internal review process has been completed. Further details of the role and powers of the Information Commissioner can be found on the Commissioner's website, <http://www.ico.org.uk>.

Yours sincerely,

[REDACTED]

[REDACTED]

DES SEC Pol Sec Land Equipment



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**LAND ROVER 90/110/127  
ALL VARIANTS  
(EXCLUDING APV AND SAS  
LAND ROVERS)**

**OPERATING INFORMATION**

This publication contains information covering the requirements of  
Categories 2.0, 3.0, 5.1 & 5.2 at level 1

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## OPERATING INFORMATION

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- CHAPTER 2 - CONTROLS AND INSTRUMENTS**
- CHAPTER 3 - OPERATING INSTRUCTIONS**
- CHAPTER 4 - USER MAINTENANCE**
- CHAPTER 5 - USER SPARES DATA**
- CHAPTER 6 - DESTRUCTION OF EQUIPMENT**

## PREFACE

Sponsor: LSOR 3C

### INTRODUCTION

1. Service Users should forward any comments concerning this publication through the channel prescribed in AESP 0100-P-011-013.
2. The subject matter of this publication may be affected by Defence Council Instructions. If possible, amendments are issued to correct this publication accordingly. When an Instruction contradicts any portion of this publication the Instruction is to be taken as the overriding authority.
3. For periods of servicing and lubricants to be used, reference must be made to the Maintenance Schedule.
4. The contents in this publication cover the following vehicles:
  - Land Rover 110 2.5 diesel 12 V soft top
  - Land Rover 110 2.5 diesel 12 V hard top
  - Land Rover 110 2.5 diesel 12/24 V soft top
  - Land Rover 110 2.5 diesel 12/24 V hard top
  - Land Rover 110 2.5 diesel 12/24 V FFR soft top
  - Land Rover 110 2.5 diesel 12/24 V FFR hard top
  - Land Rover 90 2.5 diesel 12 V soft top
  - Land Rover 90 2.5 diesel 12/24 V hard top
  - Land Rover 90 2.5 diesel 12 V hard top with fixed windows
5. This publication is for the guidance of the user/operator in enabling familiarisation with the Land Rover Truck Utility Light (TUL) and Truck Utility Medium (TUM) vehicles.
6. This publication is broken down into chapters and sub-chapters so as to describe the two vehicle variants. These are the Basic Vehicle and the Fitted For Radio (FFR).
7. Throughout the Chapter the following terms are used to describe locations of the vehicle.

7.1 Right-hand side. The side of the vehicle as viewed from the driver's position.

7.2 Left-hand side. The side of the vehicle as viewed from the driver's position.

**RELATED AND ASSOCIATED PUBLICATIONS**

**Related publications**

8 The Octad for the subject equipment consists of the publications shown below. All references are prefixed with the first eight digits of this publication. The availability of the publications can be checked by reference to the relevant Group Index (see AESP 0100-P-001-013).

<b>CATEGORIES AND INFORMATION LEVELS</b>																		
Category	1		2		3		4		5				6		7		8	
Level	0	0	1	2	0	1	2	1	2	3	4	0	1	1	2	1	2	
<b>1 USER/OPERATOR</b>	101	201	.	.	201	.	.	201	201	.	.	601	.	711	721	.	.	
<b>2 UNIT MAINTENANCE</b>	.	.	.	.	302	.	.	512	502	532	.	.	.	.	.	.	.	
<b>3 FIELD MAINTENANCE</b>	.	.	.	.	.	.	.	512	522	532	.	.	.	.	.	.	.	
<b>4 BASE MAINTENANCE</b>	.	.	.	.	.	.	.	512	524	534	.	.	.	.	.	.	.	

- |                                    |                                 |
|------------------------------------|---------------------------------|
| 1.0 Purpose & Planning Information | 5.3 Inspection Standards        |
| 2.0 Operating Information          | 5.4 Calibration Procedures      |
| 2.1 Special to Arms                | 6.0 Maintenance Schedules       |
| 2.2 Training Aids                  | 6.1 Maintenance Schedules (RAF) |
| 3.0 Technical Description          | 7.1 Illustrated Parts Catalogue |
| 4.1 Installation Instructions      | 7.2 Commercial Parts List       |
| 4.2 Prep for Special Enviroments   | 8.1 Modification Instructions   |
| 5.1 Failure Diagnosis              | 8.2 General Instructions        |
| 5.2 Repair Instructions            |                                 |

• Not published

**Associated publications**

**NOTE**

The following Complete Equipment Schedules have been issued for the undermentioned ASSET CODES at the time of going to print, and will be amended in due course.



<b>CES No</b>	<b>VEHICLE ASSET CODE</b>	<b>VEHICLE TYPE</b>
31750	1705-3100 1705-8100	110
31780	1710-3103	110
31781	1711-3101	110
31782	1714-3101	110
31783	1717-3100 1717-8100	110
31784	1720-3100 1720-8100	110
31787	1620-3101 1620-8100	90
31790	1617-3100 1617-8100	90
31791	1625-3100 1625-8100	90
31792	1150	90

Chapter 1

GENERAL DESCRIPTION

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Para

- 1 INTRODUCTION
- 2 General

Fig

- 1 Truck Utility Light (Cargo)
- 2 Truck Utility Medium (Cargo)
- 3 Truck Utility Light (Fitted For Radio)
- 4 Truck Utility light (Fitted For Radio)

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- 3/4

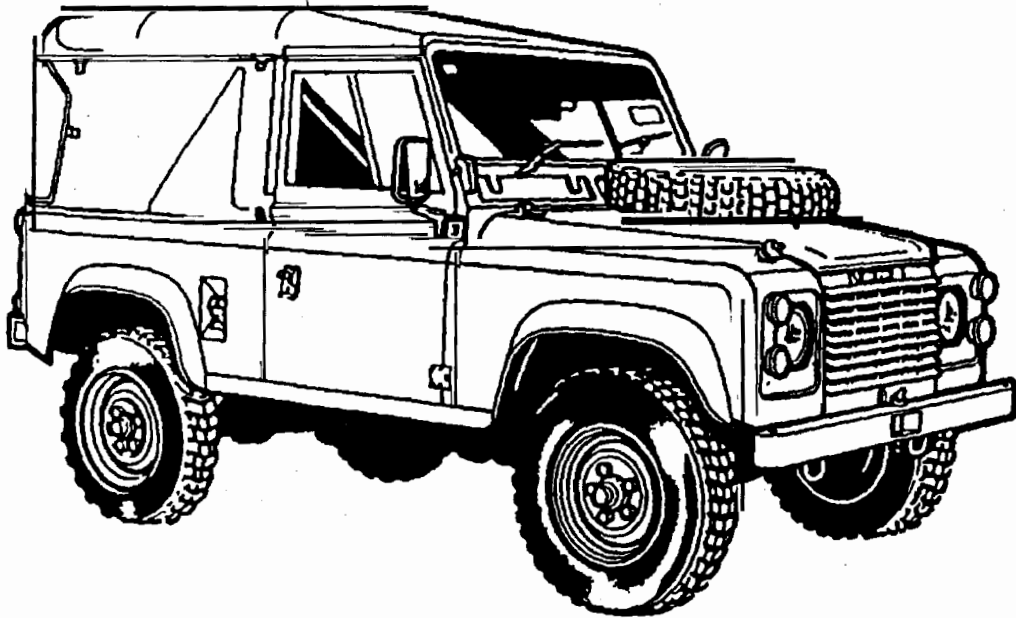
INTRODUCTION

1 This Chapter gives a general description of the Land Rover 90 and 110 variants listed in the following sub-chapters:

- Chapter 1-1 Basic Vehicle
- Chapter 1-2 Fitted For Radio (FFR)

General

2 The information given in this Chapter is applicable to both left and right hand drive vehicles.



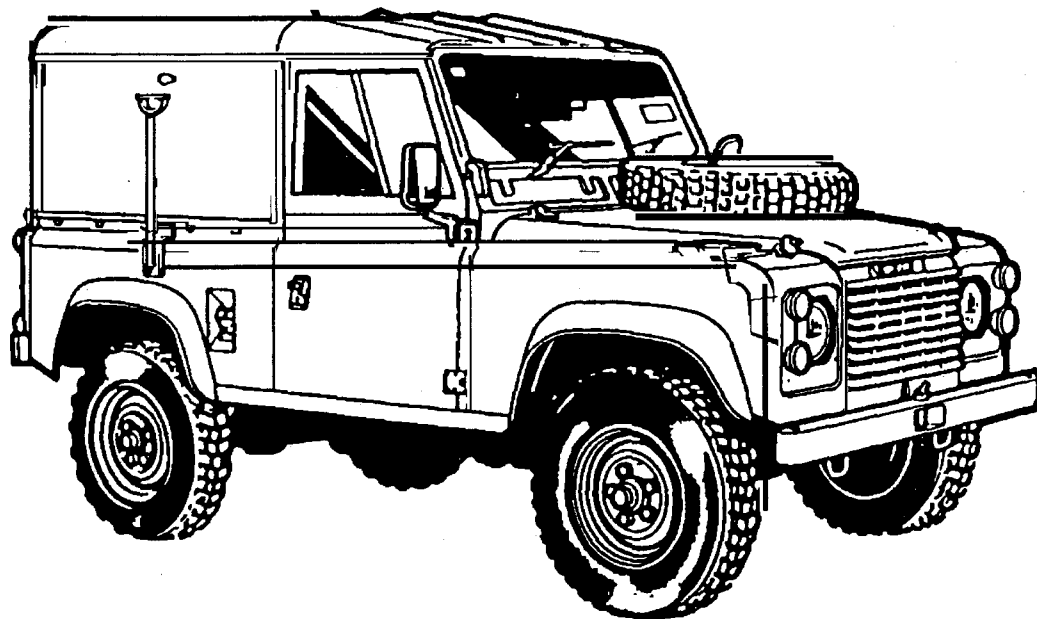
M001

Fig 1 Truck Utility Light (Cargo)



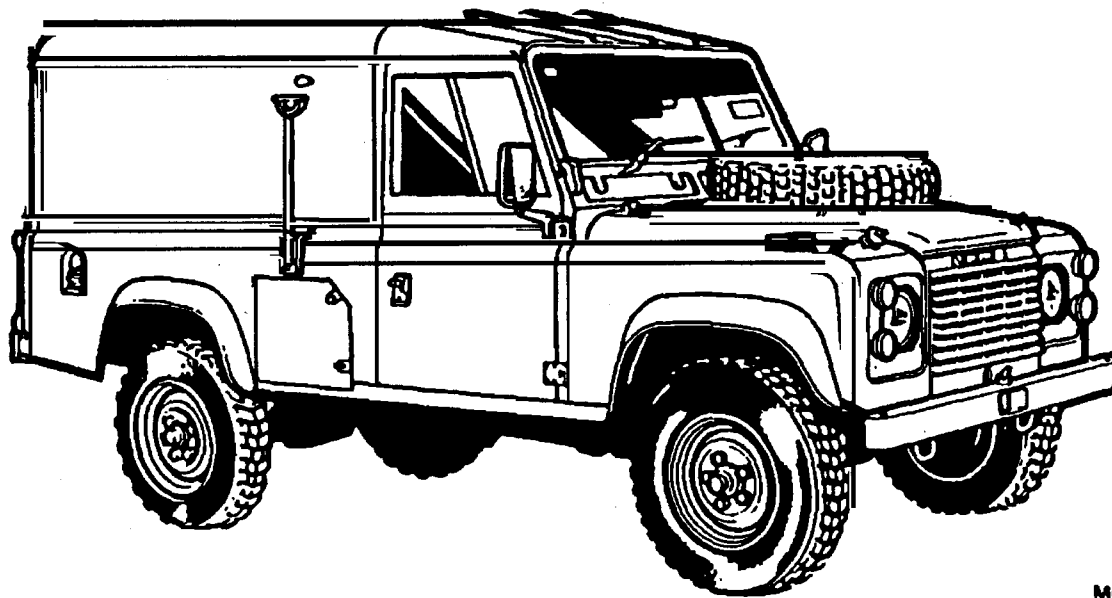
M002

Fig 2 Truck Utility Medium (Cargo)



M003

Fig 3 Truck Utility Light (Fitted For Radio)



M004

Fig 4 Truck Utility Medium (Fitted For Radio)

Chapter 1-1

BASIC VEHICLE

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Para

- 1 INTRODUCTION
- TECHNICAL DATA
- 2 Technical data for TUL
- 3 Technical data for TUM
- 4 LABELS
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  - Brake fluid label
  - Radiator filler plug warning label
  - Anti-freeze label
  - Differential lock warning label
  - Nomenclature label
  - Vehicle identification number plate (VIN)
  - Fuel label
  - Jerry can label
- 5 VEHICLE IDENTIFICATION NUMBER (VIN)
- 6 RUNNING-IN PERIOD
- WARNINGS
- CAUTIONS
- 7 THE VEHICLE
- 8 TRANSMISSION
- 9 CHASSIS
  - Front bumper
  - Front towing pintle
  - Recovery/tie down shackles
  - Rear bumper
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- 11 BRAKES
  - Low fluid level brake circuit
  - Pressure differential warning actuator

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    - Half shafts
    - Hub drive arrangements
    - Steering swivels
    - Axle breathers
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    - Hub driving arrangement
- 13 BODY
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    - Spare wheel stowage
  - Cab doors
    - Door locks
    - Door windows
  - Scuttle
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  - Front wing
  - Bodyside and rear quarters
    - Jerrycan stowage
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  - Floor
- 14 ELECTRICAL SYSTEM
  - Alternator
  - Battery
  - Lights
- 15 FUEL SYSTEM
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  - Fuel filter
- 16 ENGINE COOLING SYSTEM
  - Expansion tank
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INTRODUCTION

1 This Sub-Chapter gives a general description for all common items related to the Land Rover 90 and 110 Truck Utility Light (TUL) and Truck Utility Medium (TUM) vehicles.

TECHNICAL DATA

2 The technical data for the TUL is as follows:

Length..... 3722 mm (146.5 ins)  
Width..... 1790 mm (70.5 ins)  
Height (unladen)..... 2000 mm (78.75 ins)  
Track (front and rear)..... 1486 mm (58.5 ins)  
[REDACTED]  
Fuel capacity..... 54,6 litres (12.0 gals)

3 The technical data for the TUM is as follows:

Length..... 4558 mm (179.4 ins)  
Width..... 1790 mm (70.5 ins)  
Height (unladen)..... 2035 mm (80.1 ins)  
Track (front and rear)..... 1486 mm (58.5 ins)  
[REDACTED]  
Fuel capacity..... 82,0 litres (18.0 gals)

LABELS

4 There are, around the vehicle, labels of various kinds, some for information purposes, others to guard the user when operating the vehicle.

4.1 Asbestos warning label. The label is located under the bonnet, on top of the radiator cowling.

4.2 Brake fluid warning label. The label is located under the bonnet, affixed to the brake servo.

4.3 Radiator filler plug warning label. The label is located to the right of the radiator plug affixed to the inside of the wing.

4.4 Anti-freeze label. There are two labels, one of which is attached to the windscreen and the other can be found under the bonnet, affixed on to the top of the radiator.

4.5 Differential lock warning label. The label is located to the left of the steering wheel, mounted to the right of the auxiliary instrument panel.

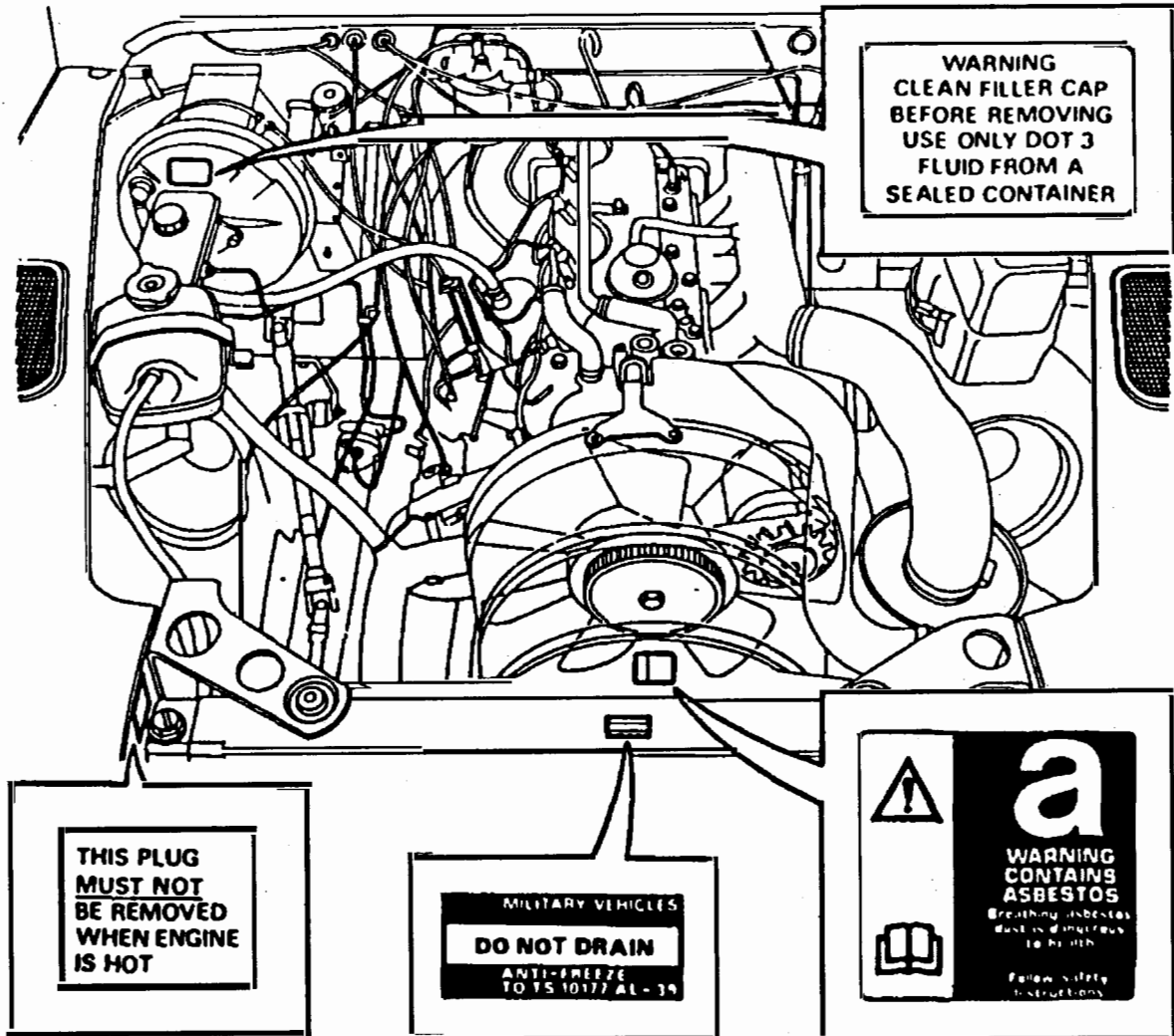
4.6 Nomenclature label. The label is located on side of heel box, drivers side only.

4.7 Vehicle identification number plate (VIN). The label is located under the bonnet on top of the brake pedal box.

4.8 Fuel label. The label is located under filler cap.

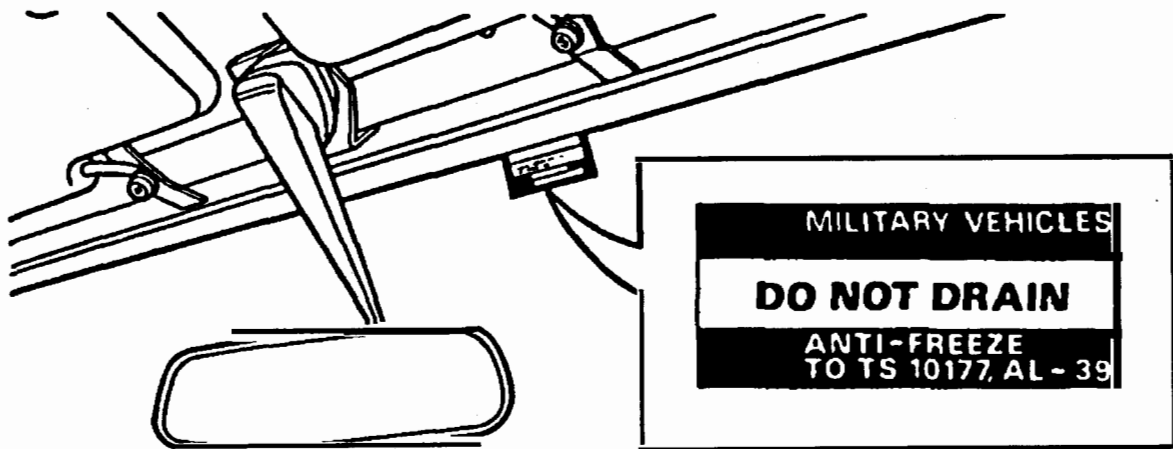
4.9 Jerry can label. The label is located on the inside of the compartment door.





M005

Fig 5 Under bonnet labels



M006

Fig 6 Anti-freeze label on windscreen

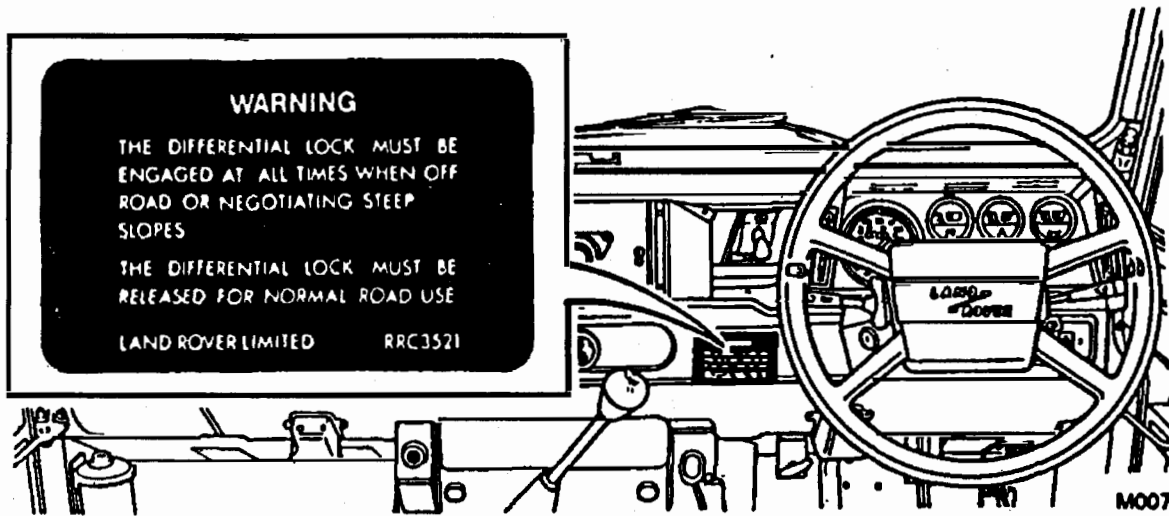


Fig 7 Differential lock warning label

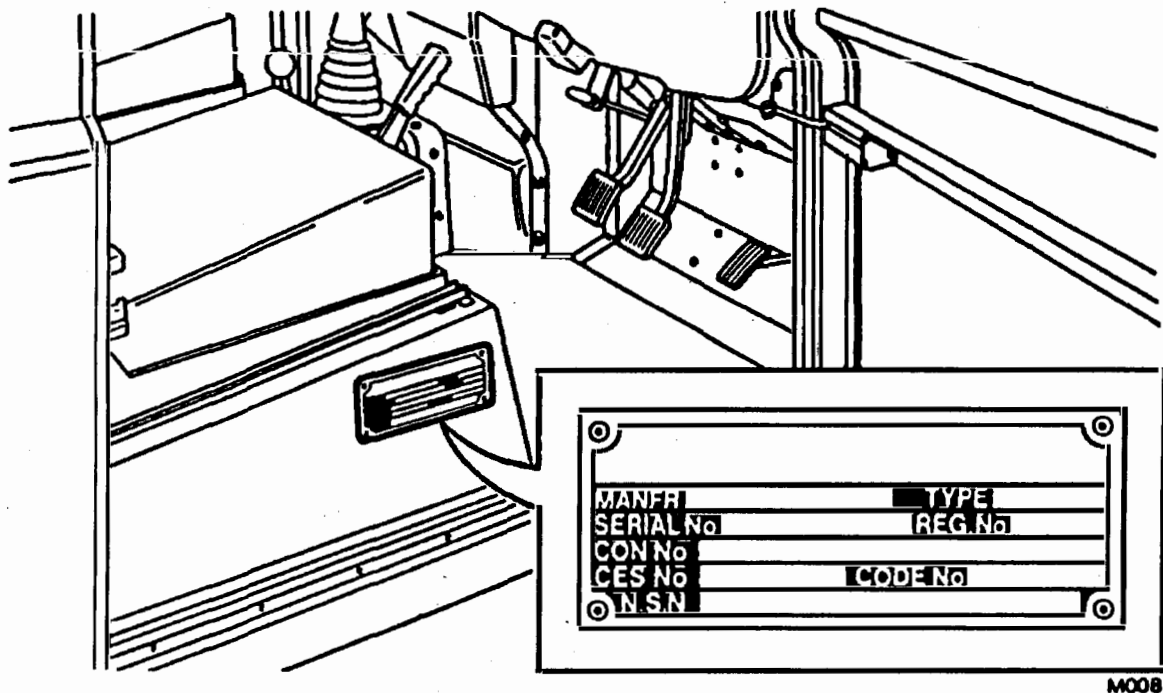


Fig 8 Nomenclature label

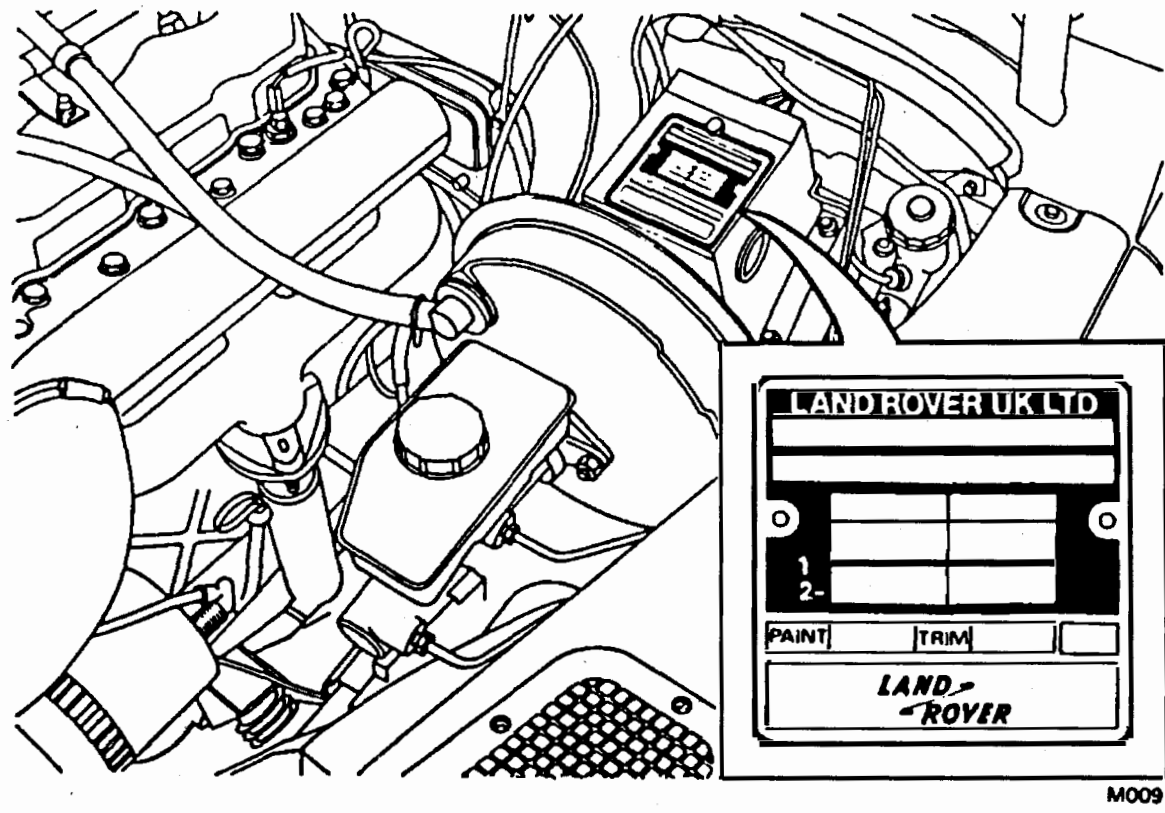


Fig 9 Vehicle identification label

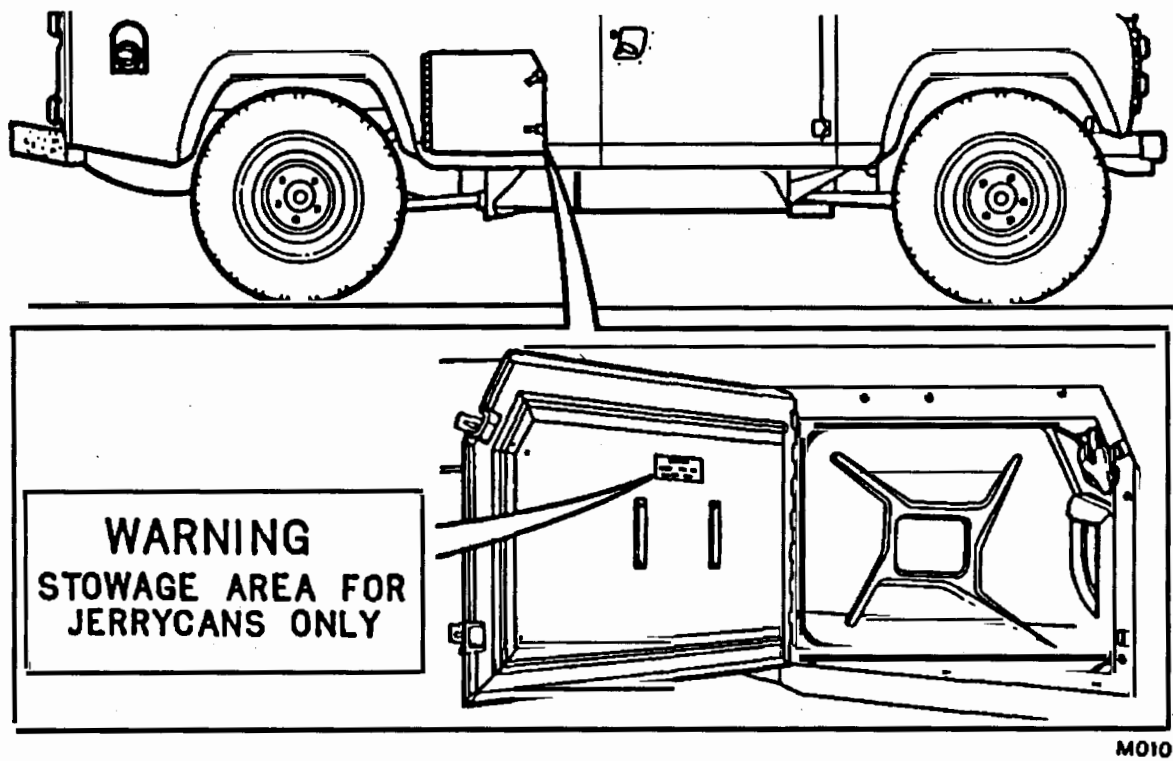
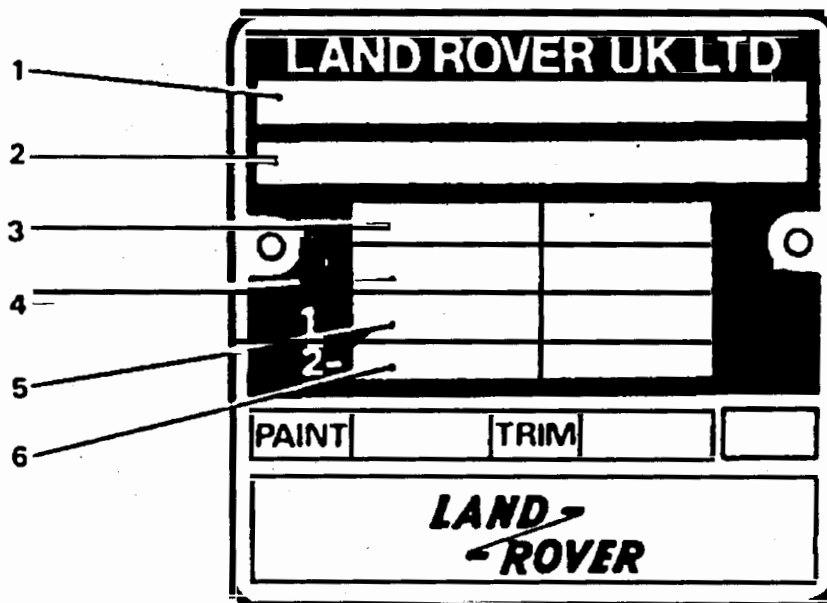


Fig 10 Jerry can label

VEHICLE IDENTIFICATION NUMBER (VIN)

5. The vehicle identification number and the recommended maximum vehicle weights are stamped on a plate and riveted to the top of the brake pedal box in the engine compartment. The number is also stamped on the right-hand side of the chassis forward of the spring mounting turret.



1. Type approval.
2. V.I.N. (minimum of seventeen digits).
3. Maximum permitted laden weight of vehicle.
4. Maximum vehicle and trailer weight.
5. Maximum road weight - front axle.
6. Maximum road weight - rear axle.

Fig 11 Vehicle identification number plate

RUNNING-IN PERIOD

6. Progressive running-in of the vehicle is important and has a direct bearing on reliability and smooth running throughout its life. The most important point is not to hold the vehicle on a large throttle opening for any sustained periods. To start with, the maximum

speed should be limited to 65 to 80 kmh (40 to 50 mph) on a light throttle and this may be progressively increased over the first 2,500km (1550 miles).

WARNINGS ...

- (1) DO NOT MIX CROSS-PLY AND RADIAL-PLY TYRES ON THIS VEHICLE. RECOMMENDED TYRE REPLACEMENTS ARE GIVEN IN THE DATA SECTION.
- (2) DO NOT REMOVE THE EXPANSION TANK FILLER CAP WHEN THE ENGINE IS HOT, BECAUSE THE COOLING SYSTEM IS PRESSURISED AND PERSONAL SCALDING COULD RESULT.
- (3) MANY LIQUIDS AND SUBSTANCES USED IN MOTOR VEHICLES ARE POISONOUS, THEY MUST NOT BE CONSUMED UNDER ANY CIRCUMSTANCES AND MUST BE KEPT AWAY FROM OPEN WOUNDS. THESE SUBSTANCES INCLUDE BRAKE FLUID, FUEL, WINDSCREEN WASHER ADDITIVES, LUBRICANTS, BATTERY CONTENTS, VARIOUS ADHESIVES, COOLING SYSTEM CORROSION INHIBITOR AND POWER ASSISTED STEERING FLUID.
- (4) SOME COMPONENTS ON YOUR VEHICLE, SUCH AS GASKETS AND FRICTION SURFACES (BRAKE PADS OR AUTOMATIC TRANSMISSION BRAKE BANDS), MAY CONTAIN ASBESTOS. BREATHING ASBESTOS DUST IS DANGEROUS TO YOUR HEALTH. YOU ARE THEREFORE ADVISED TO HAVE ANY MAINTENANCE OR REPAIR OPERATIONS ON SUCH COMPONENTS CARRIED OUT BY A RECOGNISED LAND ROVER DEALER. IF, HOWEVER, SERVICE OPERATIONS ARE TO BE UNDERTAKEN ON PARTS CONTAINING ASBESTOS, THE FOLLOWING ESSENTIAL PRECAUTIONS MUST BE OBSERVED:
- (5) WORK OUT OF DOORS OR IN A WELL VENTILATED AREA.
- (6) DUST FOUND ON THE VEHICLE OR PRODUCED DURING WORK ON THE VEHICLE SHOULD BE REMOVED BY EXTRACTION, NOT BY BLOWING.

- (7) DUST WASTE SHOULD BE DAMPENED, PLACED IN A SEALED CONTAINER AND MARKED TO ENSURE SAFE DISPOSAL.
- (8) IF ANY CUTTING, DRILLING ETC., IS ATTEMPTED ON MATERIALS CONTAINING ASBESTOS THE ITEM SHOULD BE DAMPENED AND ONLY HAND TOOLS OR LOW SPEED POWER TOOLS USED.
- (9) FOR YOUR FURTHER GUIDANCE, LAND ROVER REPLACEMENT PARTS WHICH CONTAIN ASBESTOS ARE PROGRESSIVELY BEING IDENTIFIED BY THE ASSOCIATED ILLUSTRATION (FIG 4). IF YOU ARE IN ANY DOUBT, PLEASE CONSULT YOUR DEALER OR DISTRIBUTOR.

CAUTIONS ...

- (1) Regular servicing, as described in (Cat 601) and the MT Drivers handbook (JSP 351) is essential to help provide safe, dependable and economical motoring.
- (2) Always use the safety harness, even for the shortest journeys.
- (3) Before driving, learn the layout and use of all controls, gears and switches.
- (4) Adjust the seat to achieve a comfortable driving position with full control over the vehicle.
- (5) Always start the vehicle and operate the controls from the driving position.
- (6) Ensure that the vehicle speed is low enough for an emergency stop to be made safely under all road and vehicle loading conditions.
- (7) Keep the windscreen and side windows clean to give a clear vision. Use a solvent in the screen washer reservoir.

- (8) Maintain all external lights in good working order and ensure correct setting of headlamp beams.
- (9) Maintain correct tyre pressures. These should be checked as described in (Cat 601).
- (10) Before wading make sure that the timing cover drain plug and the flywheel housing drain plug are in position. If the water is deep, slacken off the fan belt.

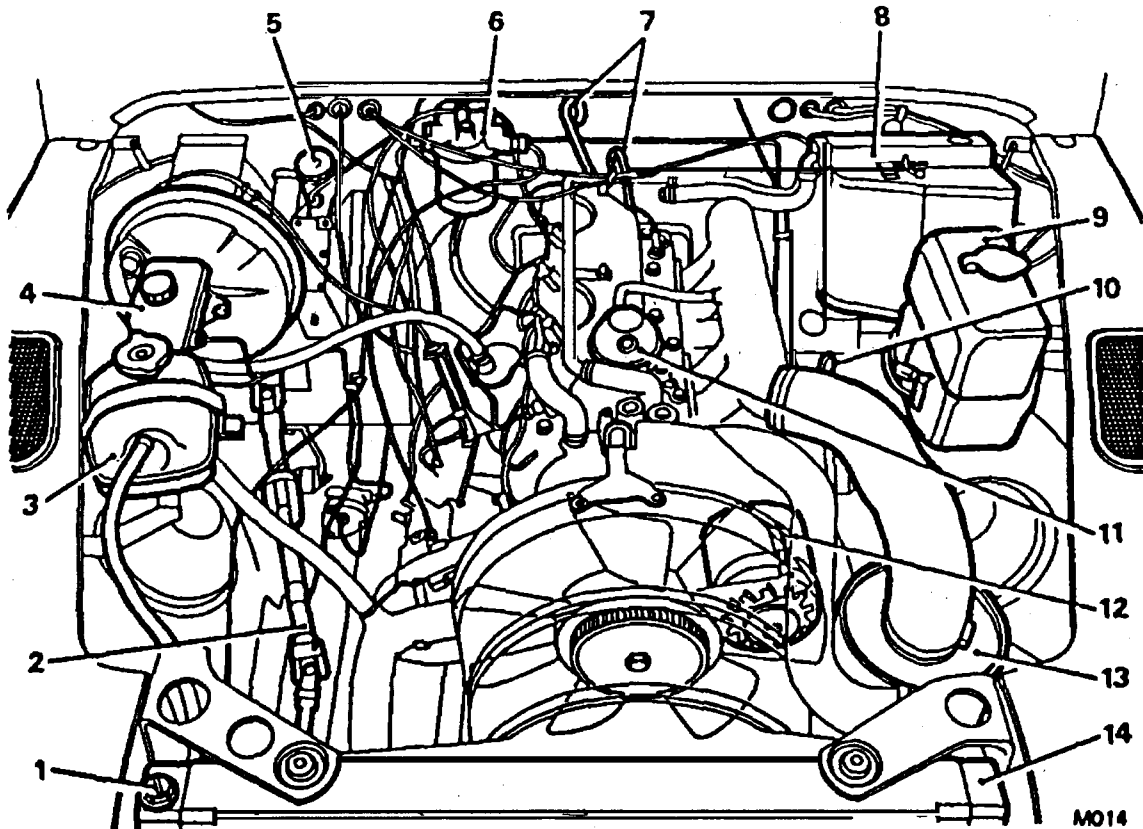
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|----|-------------------------|----|----------------------|
| 1  | Rear fog lights         | 11 | Rotating towing hook |
| 2  | Turn lights             | 12 | Windscreen wipers    |
| 3  | Rear number plate light | 13 | Spare wheel          |
| 4  | Rear side/stop lights   | 14 | Front side lights    |
| 5  | Side mirrors            | 15 | Headlights           |
| 6  | Full length canvas hood | 16 | Turn lights          |
| 7  | Shovel                  | 17 | Front towing pintle  |
| 8  | Helve                   | 18 | Convoy flag holders  |
| 9  | Pick head               | 19 | Door handle          |
| 10 | 12 pin trailer socket   | 20 | Fuel cap             |

Fig 12 Truck Utility Light (Cargo)

- |    |                         |    |                      |
|----|-------------------------|----|----------------------|
| 1  | Rear fog lights         | 11 | Rotating towing hook |
| 2  | Turn lights             | 12 | Windscreen wipers    |
| 3  | Rear number plate light | 13 | Spare wheel          |
| 4  | Rear side/stop lights   | 14 | Front side lights    |
| 5  | Side mirrors            | 15 | Headlights           |
| 6  | Full length canvas hood | 16 | Turn lights          |
| 7  | Shovel                  | 17 | Front towing pintle  |
| 8  | Helve                   | 18 | Convoy flag holders  |
| 9  | Pick head               | 19 | Door handle          |
| 10 | 12 pin trailer socket   | 20 | Jerry can stowage    |

Fig 13 Truck Utility Medium (Cargo)





- |                          |                                   |
|--------------------------|-----------------------------------|
| 1 Radiator filler cap    | 9 Windscreen washer reservoir     |
| 2 Steering mechanism     | 10 Dipstick                       |
| 3 Expansion tank         | 11 Engine oil filler/breather cap |
| 4 Brake fluid reservoir  | 12 12 volt alternator             |
| 5 Clutch fluid reservoir | 13 Air cleaner                    |
| 6 Fuel filter            | 14 Radiator                       |
| 7 Breather pipes         |                                   |
| 8 Heater matrix          |                                   |

Fig 14 Under the bonnet layout

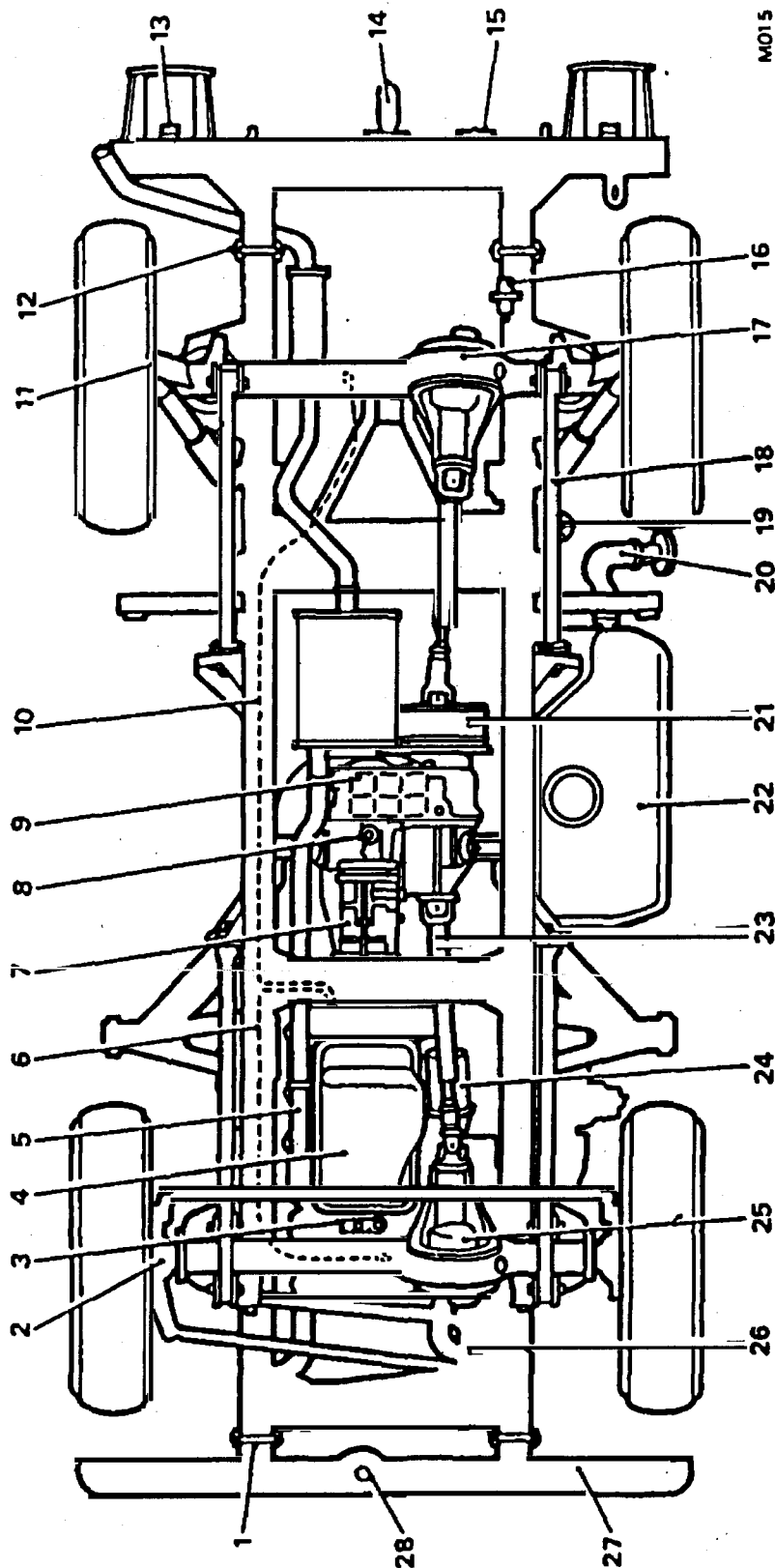


Fig 15 Under the vehicle (TUL)

- 1 Front tie down shackles
- 2 Front brake and swivel pin housing
- 3 Timing cover drain plug
- 4 Engine sump
- 5 Exhaust pipe
- 6 Front axle breather
- 7 Main gearbox
- 8 Main gearbox drain plug and filter
- 9 Transfer gearbox
- 10 Rear axle breather
- 11 Rear brakes
- 12 Rear tie down shackles
- 13 Rear lashing/towing eyes
- 14 Towing hook
- 15 Trailer socket
- 16 Convoy light
- 17 Rear differential axle
- 18 Rear propeller shaft
- 19 Fuel sedimenter
- 20 Fuel filler pipe
- 21 Transmission brake drum
- 22 Fuel tank
- 23 Front propeller shaft
- 24 Engine oil filter
- 25 Front differential axle
- 26 Steering box
- 27 Front bumper
- 28 Front towing pintle

Fig 15 Under the vehicle (TUL)

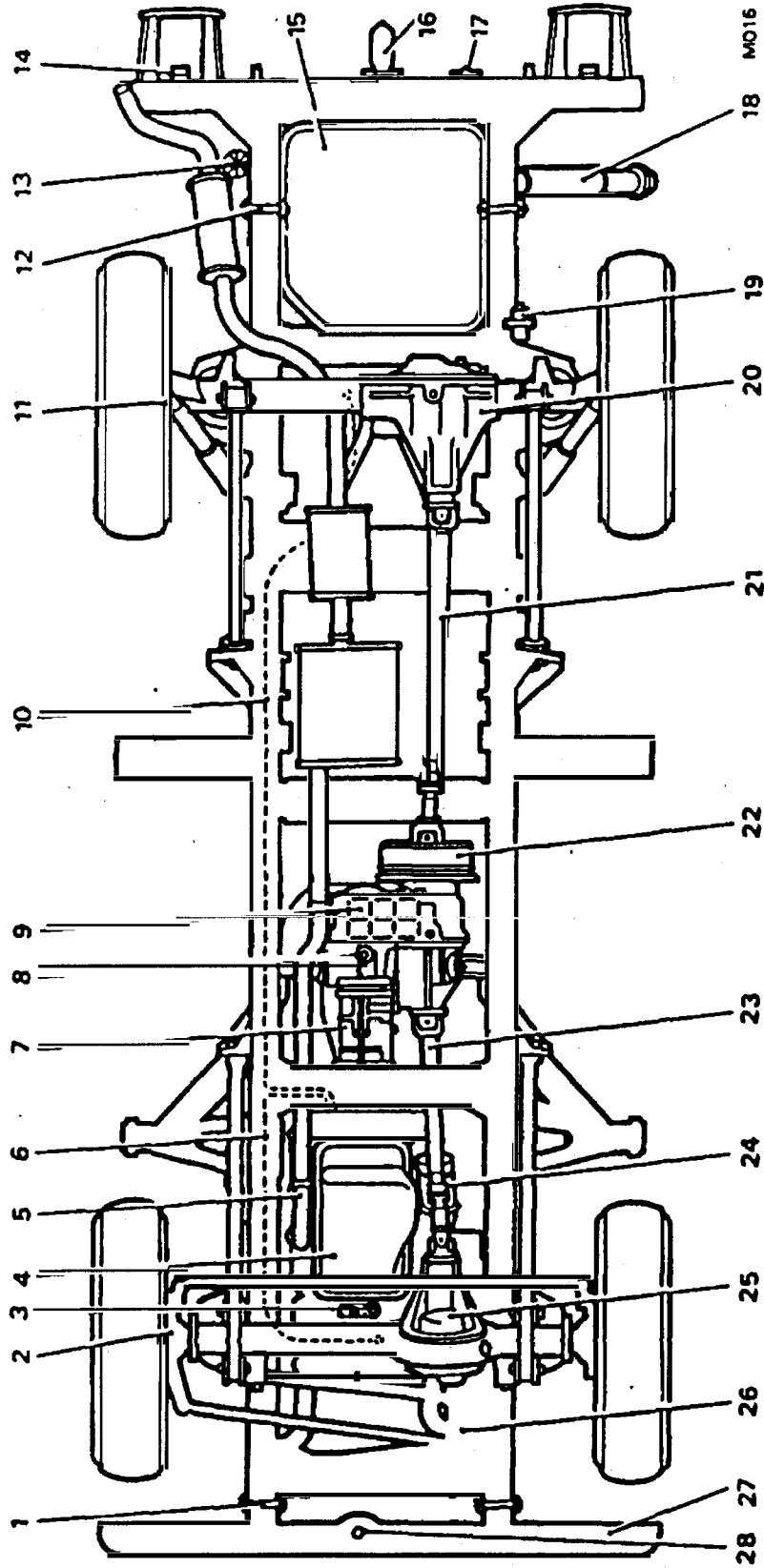


Fig 16 Under the vehicle (TUM)

- 1 Front tie down shackles
- 2 Front brake and swivel pin housing
- 3 Timing cover drain plug
- 4 Engine sump
- 5 Exhaust pipe
- 6 Front axle breather
- 7 Main gearbox
- 8 Main gearbox drain plug and filter
- 9 Transfer gearbox
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- 12 Rear tie down shackles
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- 14 Rear lashing/towing eyes
- 15 Fuel tank
- 16 Towing hook
- 17 Trailer socket
- 18 Fuel filler pipe
- 19 Convoy light
- 20 Rear differential axle
- 21 Rear propeller shaft
- 22 Transmission brake drum
- 23 Front propeller shaft
- 24 Engine oil filter
- 25 Front differential axle
- 26 Steering box
- 27 Front bumper
- 28 Front towing pintle

Fig 16 Under the vehicle (TUM)

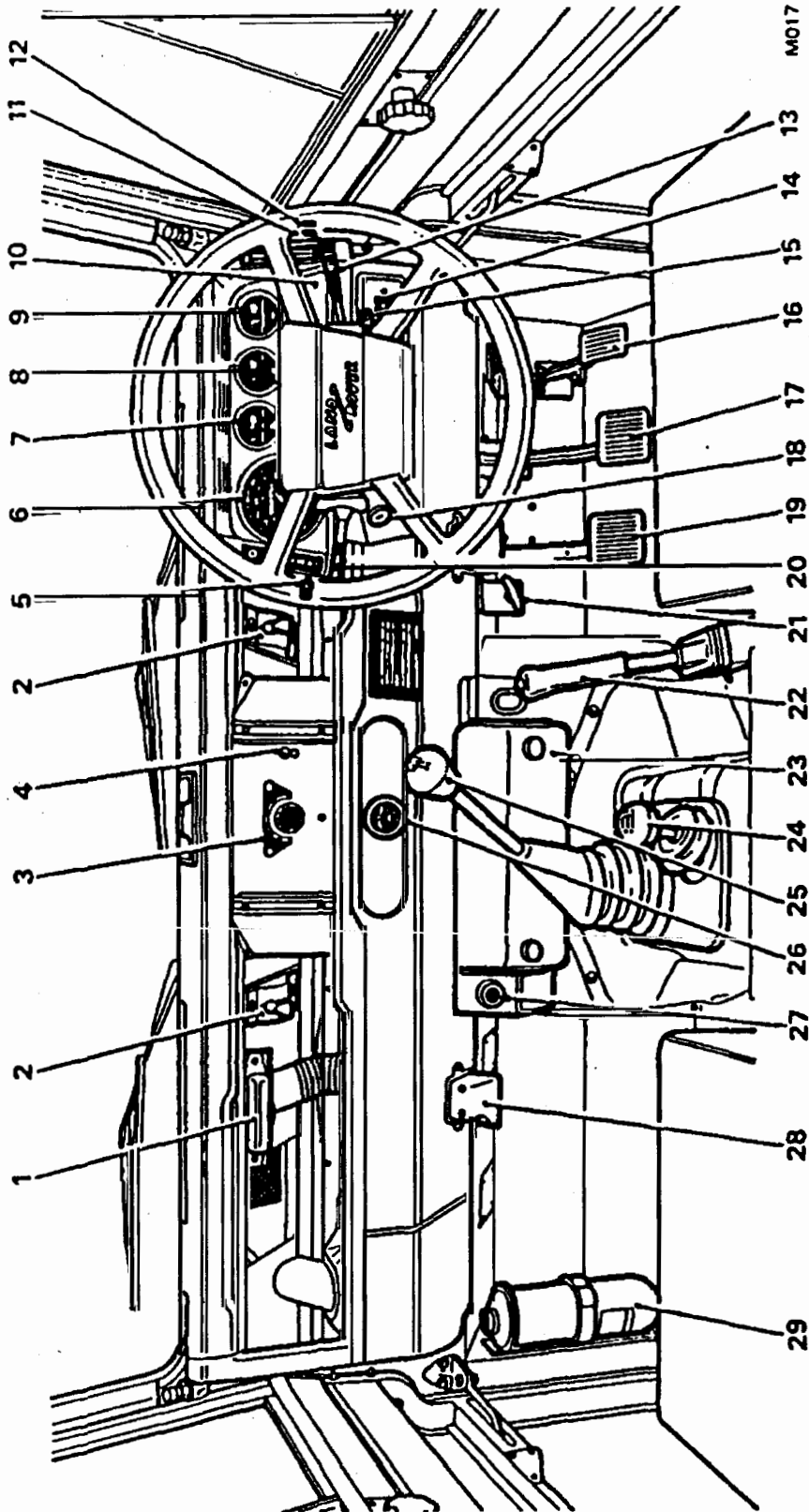
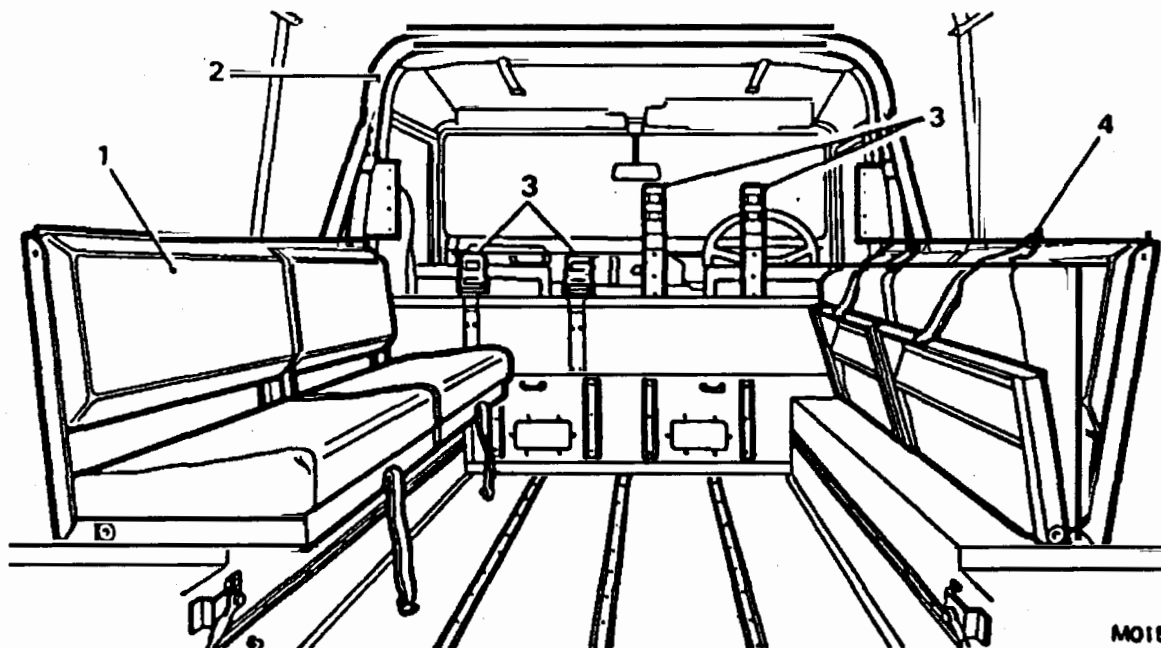


Fig 17 Vehicle dash layout

- 1 Map reading light
- 2 Ventilator control
- 3 Main lighting switch
- 4 Inspection sockets
- 5 Heater fan control
- 6 Speedometer
- 7 Fuel indicator
- 8 Coolant temperature indicator
- 9 Oil temperature indicator (FFR only)
- 10 Warning lights panel
- 11 Temperature control lever
- 12 Distribution control lever
- 13 Windscreen wash/wipe switch
- 14 Hazard warning switch
- 15 Rear fog guard light switch
- 16 Accelerator pedal
- 17 Brake pedal
- 18 Starter switch
- 19 Clutch pedal
- 20 Headlight dip, direction indicators, horn and flasher switch
- 21 Bonnet release handle
- 22 Hand brake
- 23 Fuse box
- 24 Transfer gear/differential lock lever
- 25 Main gear change lever
- 26 Ammeter (FFR only)
- 27 Hand throttle (FFR only)
- 28 Footwell air vents
- 29 Fire Extinguisher

Fig 17 Vehicle dash layout



- |   |                       |   |                       |
|---|-----------------------|---|-----------------------|
| 1 | Fold down bench seats | 3 | Small arms clips      |
| 2 | Roll over bar         | 4 | Seat retaining straps |

Fig 18 Inside the rear of the vehicle

### THE VEHICLE

7 The vehicle is of the four wheeled type, permanently driving through all four wheels and is available in right or left hand drive. It is capable of leaving made up road surfaces and travelling on to unmade ground, also the vehicle is capable of towing when laden the appropriate trailers without undue loss of performance.

### TRANSMISSION

8 The engine is a four cylinder, four stroke compression ignition unit with indirect injection, overhead valve and liquid cooled. The power is transmitted through a single dry plate clutch to a five forward and one reverse speed main gearbox (manual) and a two speed transfer gearbox with an



integral central differential to both front and rear axles. With the combination of transfer gearbox and main gearbox the vehicle in effect has 12 gear ratios, ten forward and two reverse.

### CHASSIS

9 The chassis is made up of two welded box section side members with box, tubular and open channel section cross members, fully welded.

#### Front bumper

9.1 Attached to the front of the chassis is a full width front bumper complete with convoy flag holder facilities at each end.

#### Front towing pintle

9.2 The front towing pintle is built into the centre of the bumper and accepts a 75 mm (2.9 ins) eye.

#### Recovery/tie down shackles

9.3 Four recovery/tie down shackles are fitted to the chassis - Two at the front and two at the rear for aircraft tie down, lifting and recovery functions.

#### Rear bumpers

9.4 The rear bumpers are attached to the rear cross member of the chassis and are of the full quarter types.

### SUSPENSION

10 The suspension is provided by four helical coil springs, one at each wheel station with double acting

hydraulic dampers and rubber buffers.

## BRAKES

11 The brake circuit is divided to provide braking on all four wheels using disc brakes on the front wheels and drum brakes on the rear wheels, with a vacuum servo-assisted hydraulic operation. A mechanically operated transmission parking brake is provided, utilising the drum brake system, mounted on the rear of the transfer gearbox output shaft.

### Low fluid level brake circuit

11.1 The low fluid level brake circuit is fitted only to the TUL vehicles. The low level sensor is situated in the brake reservoir filler cap and connects electrically to the brake warning light inside the vehicle.

### Pressure differential warning actuator (PDWA)

11.2 The PDWA is fitted only to the TUM vehicles. The actuating switch is located underneath the PDWA and connects electrically to the brake warning light inside the vehicle.

## AXLES

12 The axles on the TUL and TUM vehicles are of the rigid construction type with a spiral bevel type differential at the front and a hypoid type differential at the rear.

### Front axle

12.1 The front axle is made up of a two piece pressed casing with offset banjo and spherical housings for universal joints in half shafts.

### Half shafts

12.2 The half shafts are fully floating incorporating a single constant velocity joint.

### Hub drive arrangements

12.3 The hub drive arrangements are driving flanges splined to the half shafts.

### Steering swivels

12.4 The steering swivels are taper roller bearings with asbestos resin upper bearings.

### Axle breathers

12.5 The axle breathers are flexible pipes starting from the axle tubes ending in the engine compartment. There are two breathers, one from each axle.

### Gaiters

12.6 The gaiters are made from leather and are fitted to protect the swivel pin housing.

### Rear axle

12.7 The rear axle is made up of rigid axle tubes pressed into the pinion housing with fully floating half shafts.

### Hub driving arrangement

12.8 The hub driving arrangement consists of driving flanges splined into half shafts with hub bearing taper rollers.

BODY

13 The body is constructed from pressed and folded aluminium alloy panels, spot welded or rivetted. The scuttle, grille, door frames, hinges and other minor items are made from steel.

Windscreen

13.1 The windscreen is made up of a one piece laminated glass. On soft top models only the windscreen can be folded down.

Bonnet

13.2 The bonnet is constructed from aluminium alloy sheet with steel stiffeners fitted with a central retaining device and a safety catch. Mounted on top of the bonnet are two spring loaded claw type safety hooks and spare wheel stowage.

Spare wheel stowage

13.3 The spare wheel stowage is a central spigot located on top of the bonnet; with the facility to lock the spare wheel to the bonnet.

Cab doors

13.4 The cab doors are constructed from aluminium alloy panels with a one piece steel frame and fittings hung on two hinges. The upper door assembly is removeable at waist level.

Door locks

13.5 The doors are fitted with direct action anti-burst door locks complete with a private lock set and adjustable striker plates.

### Door windows

13.6 The door windows are made up of two piece sliding section, of toughened glass, and are lockable in the closed position.

### Scuttle

13.7 The scuttle divides the engine bay from the driving/passenger compartment. It is constructed from mild steel with impact surfaces designed for collapsibility and are padded. The ventilators are pivotted adjustable flaps ducted to face level outlets and are fitted with gauze fly screen.

### Radiator mounting and grille

13.8 The grille panel is a steel structure, rubber mounted to the chassis with a black moulded grille.

### Front wings

13.9 The front wings are made from aluminium alloy sheet with flat tops and steel curved inner wheel valances.

### Bodyside and rear quarters

13.10 The body side and rear quarters are constructed from aluminium alloy with galvanised steel cappings.

### Jerry can stowages

13.11 On TUM vehicles only, jerry can stowages have been built into the bodysides. The stowages are made up of a steel construction with lockabl aluminium alloy doors with a provision for padlocks.

Bulkhead

13.12 The bulkhead separates the driver/passenger compartment from the load compartment of the vehicle. It is constructed from aluminium alloy with galvanised steel cappings and is permanently secured into position.

## Small arms clips

13.13 Mounted on top of the bulkhead are two sets of small arms clips for easy access to the occupiers.

Floor

13.14 The floor is constructed from aluminium alloy sheet panelled, braced underframed and rigidly attached to the chassis frame. Incorporated into the floor are two full length wheel boxes which have full length galvanised steel wearing strips rivetted to them.

ELECTRICAL SYSTEM

14 The electrical system is charged by the vehicle alternator to 12 volts rectified AC negative earth with voltage compensation. The charging control and rectifier are integral with the alternator. The system feeds all the vehicles' electrical requirements.

Alternator

14.1 The alternator is a 12 volt charging system with a 45 Ampere nominal output.

### Battery

14.2 The vehicle battery is of the low maintenance type with special airportable filler caps.

### Lights

14.3 The vehicle lights are of the military type and are controlled by the main lighting switch which governs whether the vehicle is on normal lighting or blackout.

## FUEL SYSTEM

15 The fuel system is made up of the fuel tank feeding through a sedimenter located close to the tank to a fuel filter located on the scuttle to the fuel lift pump to the engine.

### Fuel lift pump

15.1 The engine mounted mechanical fuel lift pump is a self priming unit and does not need any attention. The purpose of the pump is draw fuel up to the engine from the tank.

### Fuel sedimenter

15.2 The fuel sedimenter is to allow excess water to be collected and at periodic intervals drained away to atmosphere.

### Fuel filter

15.3 The fuel filter is a full flow unit and contains a renewable paper element. The filter cleans the fuel and collects any foreign bodies found in the fuel.

ENGINE COOLING SYSTEM

16 The cooling system is located inside the engine compartment and comprises the expansion tank connected to the radiator by way of the engine.

Expansion tank

16.1 The expansion tank is located on the left hand side wing valance and allows the coolant to expand when it gets hot. This prevents the system from being over pressurised.

Radiator

16.2 The radiator is vained so that air can pass through, allowing the heated fluid which has circulated through the engine to cool down.



Chapter 1-2

FITTED FOR RADIO

CONTENTS

Para

- 1 INTRODUCTION
- 2 ELECTRICAL SYSTEM
  - Alternator
- 3 RADIO EQUIPMENT
  - Radio table and battery box
  - Radio equipment rack
  - VHF antenna leads, TUAAM mountings and stowage
  - Antenna mast mountings

Fig

	Page
19 Truck Utility Light (Fitted For Radio)	3/4
20 Truck Utility Medium (Fitted For Radio)	3/4
21 Under the bonnet layout	5
22 Inside the rear of the vehicle	6

INTRODUCTION

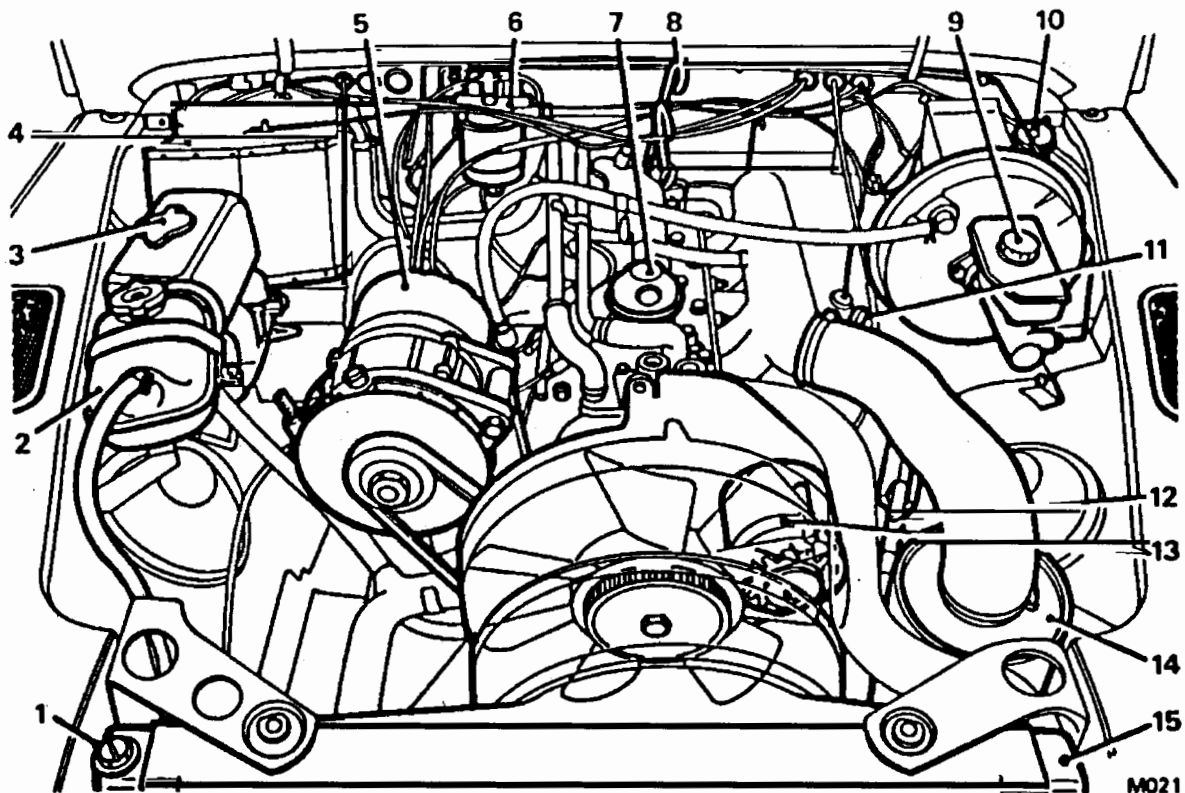
1 This Sub-Chapter describes all the items applicable to the fitted for radio (FFR) TUL and TUM vehicles which have not been covered by Sub-Chapter 1-2.

- |    |                         |    |                      |
|----|-------------------------|----|----------------------|
| 1  | Rear fog lights         | 11 | Rotating towing hook |
| 2  | Turn lights             | 12 | Windscreen wipers    |
| 3  | Rear number plate light | 13 | Spare wheel          |
| 4  | Rear side/stop lights   | 14 | Aerial coaxial 5     |
|    | Radio aerial mounting   |    | stowage              |
|    | base                    | 15 | Front side lights    |
| 6  | Helve                   | 16 | Headlights           |
| 7  | Shovel                  | 17 | Turn lights          |
| 8  | Pick head               | 18 | Oil cooler           |
| 9  | Wing mirrors            | 19 | Front towing pintle  |
| 10 | 12 pin trailer socket   | 20 | Aerial outlet        |
|    |                         | 21 | Door handle          |

Fig 19 Truck Utility Light (Fitted For Radio)

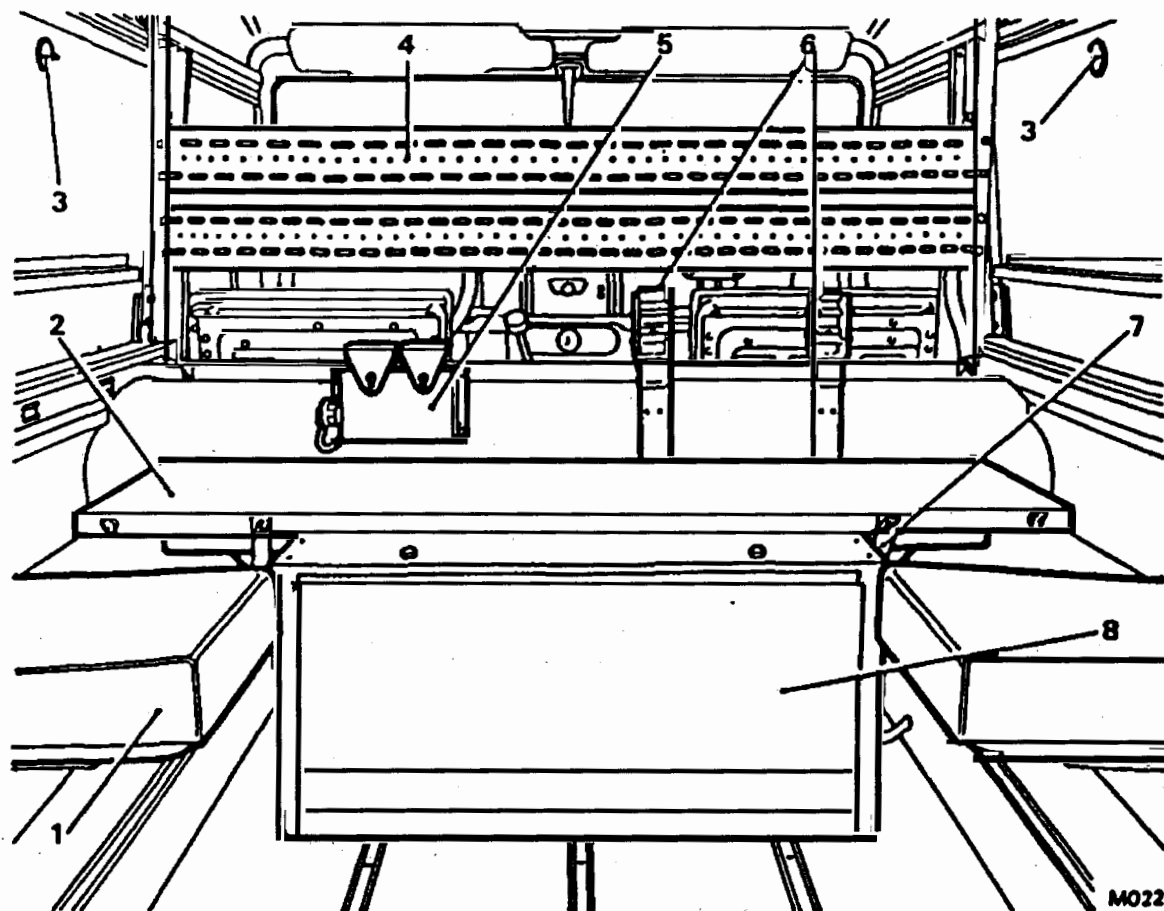
- |    |                         |    |                     |
|----|-------------------------|----|---------------------|
| 1  | Rear fog lights         | 13 | Spare wheel         |
| 2  | Turn lights             | 14 | Aerial coaxial      |
| 3  | Rear number plate light |    | stowage             |
| 4  | Rear side/stop lights   | 15 | Front side lights   |
| 5  | Radio aerial mounting   | 16 | Headlights          |
|    | base                    | 17 | Turn lights         |
| 6  | Helve                   | 18 | Oil cooler          |
| 7  | Shovel                  | 19 | Front towing pintle |
| 8  | Pick head               | 20 | Convoy flag holder  |
| 9  | Wing mirrors            | 21 | Aerial outlet       |
| 10 | 12 pin trailer socket   | 22 | Door handle         |
| 11 | Rotating towing hook    | 23 | Jerry can holder    |
| 12 | Windscreen wipers       | 24 | Fuel cap            |

Fig 20 Truck Utility Medium (Fitted For Radio)



- |                                      |                           |
|--------------------------------------|---------------------------|
| 1 Radiator filler cap                | 8 Breather pipes          |
| 2 Expansion tank                     | 9 Brake fluid reservoir   |
| 3 Windscreen washer reservoir        | 10 Clutch fluid reservoir |
| 4 Heater matrix                      | 11 Dipstick 90 Amp        |
| 5 90 Amp alternator                  | 12 Steering mechanism     |
| 6 Fuel filter                        | 13 45 Amp alternator      |
| 7 Engine oil filler/<br>breather cap | 14 Air cleaner            |
|                                      | 15 Radiator               |

Fig 21 Under the bonnet layout



- |   |                      |   |                     |
|---|----------------------|---|---------------------|
| 1 | Radio seats          | 5 | Terminal box        |
| 2 | Radio table          | 6 | Small arms clips    |
| 3 | Aerial outlets       | 7 | Earthing braids     |
| 4 | Radio equipment rack | 8 | Battery storage box |

Fig 22 Inside the rear of the vehicle

### ELECTRICAL SYSTEM

2 The electrical system is charged by the 24V 90 amp auxiliary alternator to 24 volts connected via an in-line fuse to a terminal/shunt box mounted on the rear of the bulkhead. A 24 volt auxiliary warning light is located in the warning lights panel. The charging control and rectifier are integral with the alternator. The system feeds the vehicles' radio equipment.

Alternator

2.1 The alternator is a 24 volt charging system with a 90 Ampere nominal output.

RADIO EQUIPMENT

3 The radio equipment is made up of the following items:

Radio table and battery box

3.1 A combined radio table and battery box capable of accepting five sets of Clansmen mounting bars, fitted transversely across the vehicle behind the bulkhead. The unit has provision for up to four batteries to be stowed to operate the radio sets.

Radio equipment rack

3.2 The radio equipment rack is made up of two galvanised slotted angle brackets mounted transversely across the vehicle above the bulkhead.

VHF antenna leads, TUUAM mountings and stowage

3.3 Two leads run from the TUUAM mountings and stowage boxes on each wing to the stowage boxes mounted on the front of the bulkhead directly behind the front seats.

Antenna mast mountings

3.4 The two brackets, one on each side of the vehicle, are for the HF antenna mast mountings, which are located on the rear body sides. The brackets can be detached to give a minimum vehicle width for air transportation.

Chapter 2

CONTROLS AND INSTRUMENTS

CONTENTS

Para

- 1 INTRODUCTION
- 2 General

INTRODUCTION

1 This Chapter describes the controls and instruments applicable to the Land Rover 90 and 110 variants listed in the following sub-chapters:

- Chapter 2-1 Basic Vehicle
- Chapter 2-2 Fitted For Radio (FFR)

General

2 The information given in this Chapter is applicable to both left and right hand vehicles.

Chapter 2-1

BASIC VEHICLE

CONTENTS

Para

- 1 INTRODUCTION
- 2 OPERATING THE DOORS
  - To open and close the doors from the outside
  - To open and close the doors from the inside
  - To open and close the doors from the inside  
(Hard top only)
  - Rear door retaining catch (Hard top only)
- 3 TAILGATE
- 4 VEHICLE FASCIA
- 5 DRIVER/PASSENGER SEATS
- 6 SAFETY HARNESS
  - Operating the belt
  - Testing the safety harness (WARNING)
  - Care of belts
  - Harness cleaning
- 7 INSTRUMENT PANEL
  - Coolant temperature indicator
  - Fuel level indicator
  - Speedometer
    - Speedometer trip setting
  - Warning lights panel
    - Oil pressure warning light
    - Ignition warning light
    - Brake circuit warning light
    - Turn light arrows
    - Main beam warning light
    - Fuel level warning light
    - Differential lock warning light
    - Trailer warning light

- Side lights warning light
- Rear fog guard lights warning light
- Diesel cold start warning light
- 8 HAZARD WARNING SWITCH
- 9 STEERING WHEEL CONSOLE
  - The windscreen wash/wipe switch
  - Rear fog guard light switch
  - Headlight dipper, turn lights, horn, and  
headlight flasher
  - Heater plug and starter switch
  - Steering wheel
- 10 DASH VENTILATORS
- 11 MAIN LIGHT SWITCH
- 12 INSPECTION SOCKETS
- 13 MAP READING LIGHT
- 14 FRESH AIR/HEATING CONTROLS
- 15 PEDALS
  - Foot brake pedal
- 16 BONNET RELEASE HANDLE
- 17 FIRE EXTINGUISHER BRACKET
- 18 TRANSMISSION HANDBRAKE
- 19 TRANSFER GEAR/DIFFERENTIAL LOCK LEVER (CAUTION)
- 20 MAIN GEARCHANGE LEVER
- 21 FUSE BOX
- 22 STOWAGE COMPARTMENTS
- 23 BENCH SEATS
- 24 WINDOWS

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23	External door locks	4
24	Internal door locks	5
25	Internal door locks (Hard top only)	6
26	Rear door retaining catch (Hard top only)	7
27	Tailgate locking mechanism	8
28	Seat adjustment	9
29	Seat belt operation	10
30	Coolant temperature indicator	12
31	Fuel level indicator	13
32	Speedometer and trip setting	14
33	Warning lights panel	17



34	Hazard warning switch	19
35	Windscreen wash/wipe switch	20
36	Rear fog guard lights switch	21
37	Headlight dipper, turnlights, horn and headlight flasher	22
38	Heater plug and starter switch	23
39	Dash ventilators	25
40	Main lighting switch	26
41	Inspection sockets	26
42	Map reading light	27
43	Fresh air/heating controls	28
44	Pedal layout	31
45	Bonnet release handle	32
46	Bonnet safety catch	32
47	Fire extinguisher bracket	33
48	Transmission handbrake lever	34
49	Transfer gear/differential lock lever	35
50	Main gearchange lever	36
51	Fuse box location	37
52	Removing the seatbase cover	38
53	Bench seats	39
54	Operating the windows	40

## INTRODUCTION

1 This Sub-Chapter describes all the common items related to the Land Rover 90 and 110 Truck Utility Light (TUL) and Truck Utility Medium (TUM) vehicles.

## OPERATING THE DOORS

2 There are two doors fitted to the soft top vehicles and three doors to the hard top vehicles. The following operations apply to the above mentioned doors and are similar in many of the operations.

### To open and close the doors from the outside

2.1 This affects all three doors fitted to their respective vehicles and operates as follows:

2.1.1 To unlock the door insert the key into the lock (1) and turn it anti-clockwise (a quarter turn), return the key to the vertical position and remove.

2.1.2 To open the door, lift the handle (2).

2.1.3 To lock the door, turn the key clockwise (a quarter turn), return the key to the vertical position and remove.

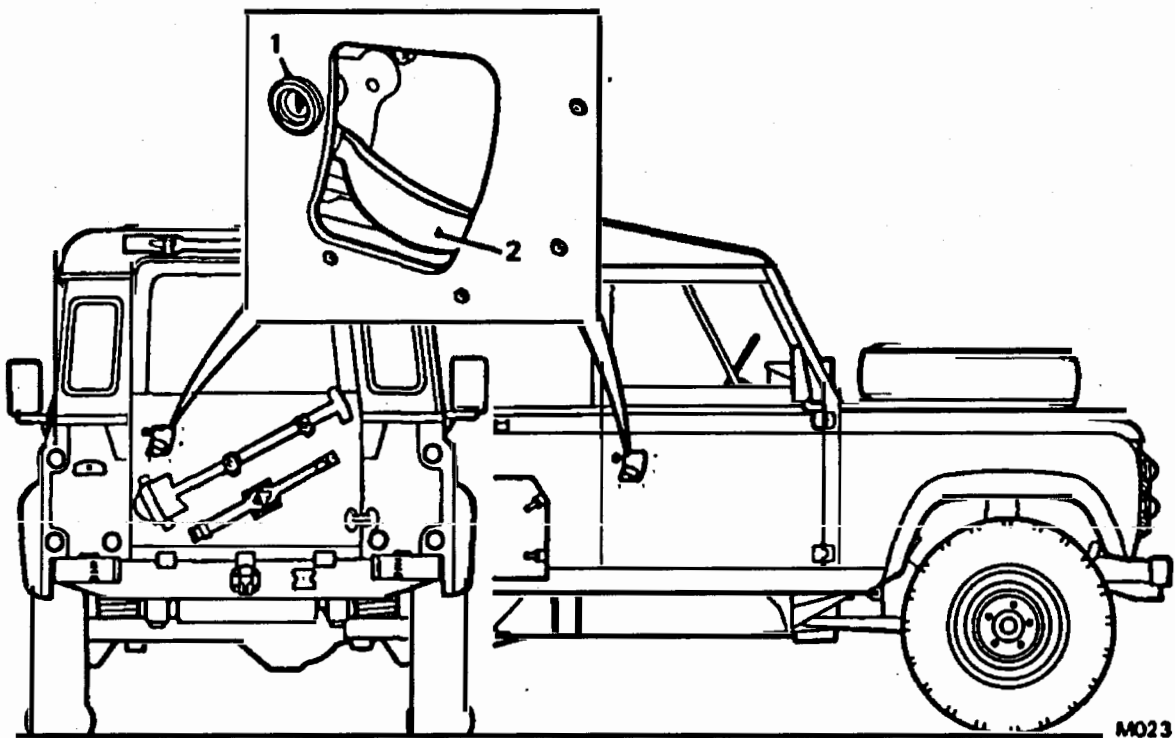


Fig 23 External door locks

To open and close the doors from the inside

2.2 This affects only the driver's door on the vehicles and operates as follows:

2.2.1 To unlock the door, move the knob (2) on the lock case upwards.

2.2.2 Open the door using the inside handle  
(1).

2.2.3 To lock the door, close the door and move  
the knob on the lock case downwards.

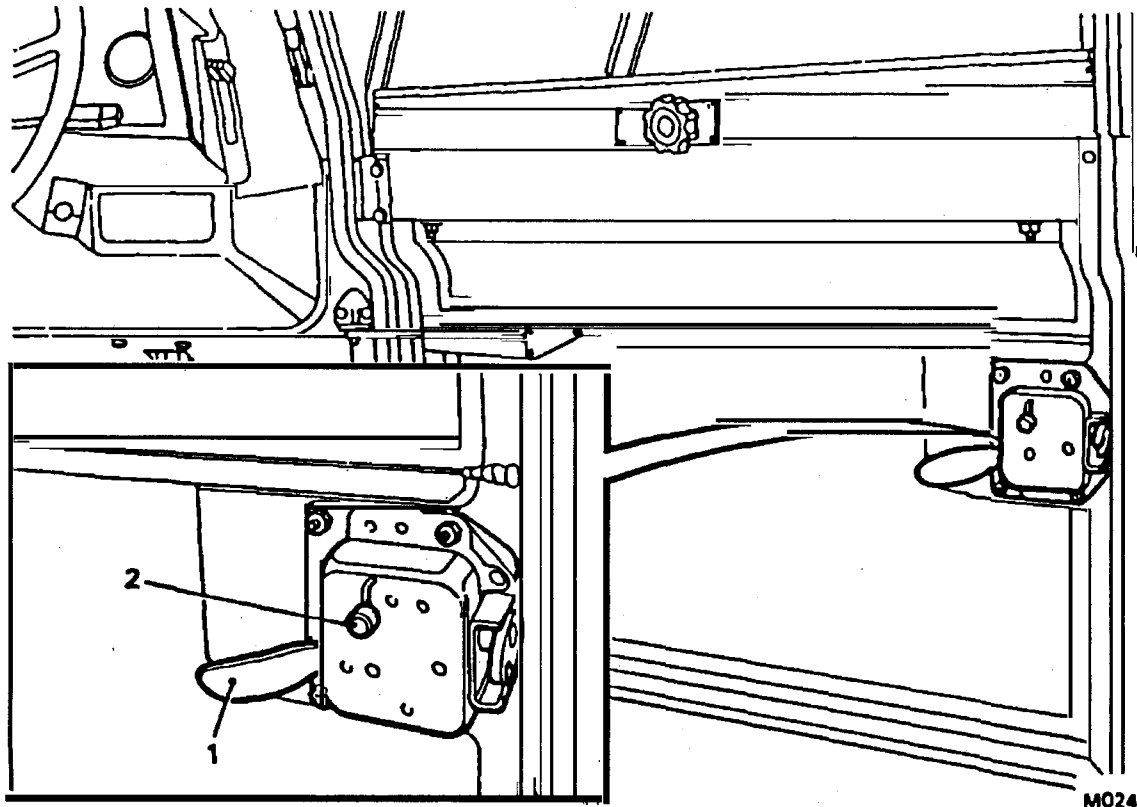


Fig 24 Internal door locks

To open and close the doors from the inside

2.3 This affects the rear (hard tops only) and  
passenger's doors on the vehicles and operates as  
follows:

2.3.1 To unlock the door move the knob (2) on  
the lock case upwards.

2.3.2 Open the door using the inside handle  
(1).

2.3.3 To lock the door move the knob on the lock case downwards before or after closing the door.

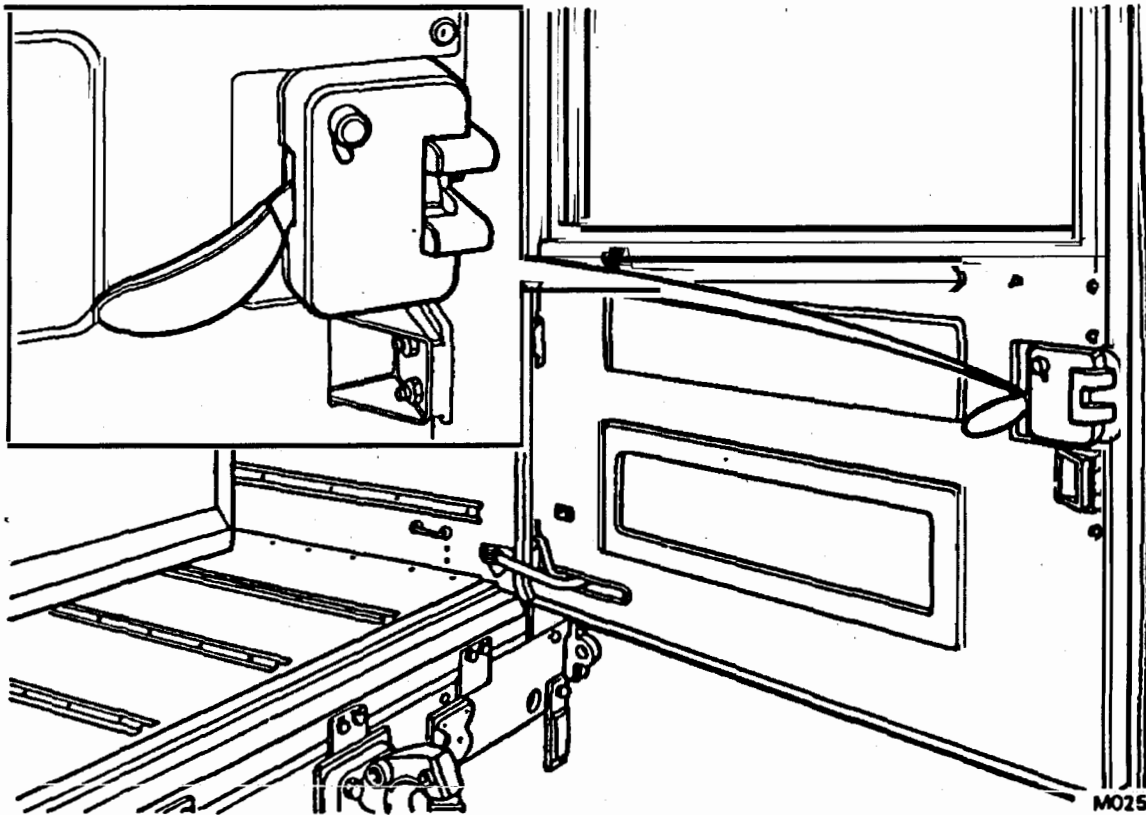


Fig 25 Internal door locks (Hard top only)

Rear door retaining catch (Hard tops only)

2.4 The rear door retaining catch (hard tops only) enables the door to be maintained in the open position. This is to aid in the loading and unloading of the vehicle without interference from the door.

2.4.1 To operate the catch, (2) push the door outwards until the catch locks.

2.4.2 To release the catch, (2) push the lever rearwards and then move the door strap (1) away from the catch.

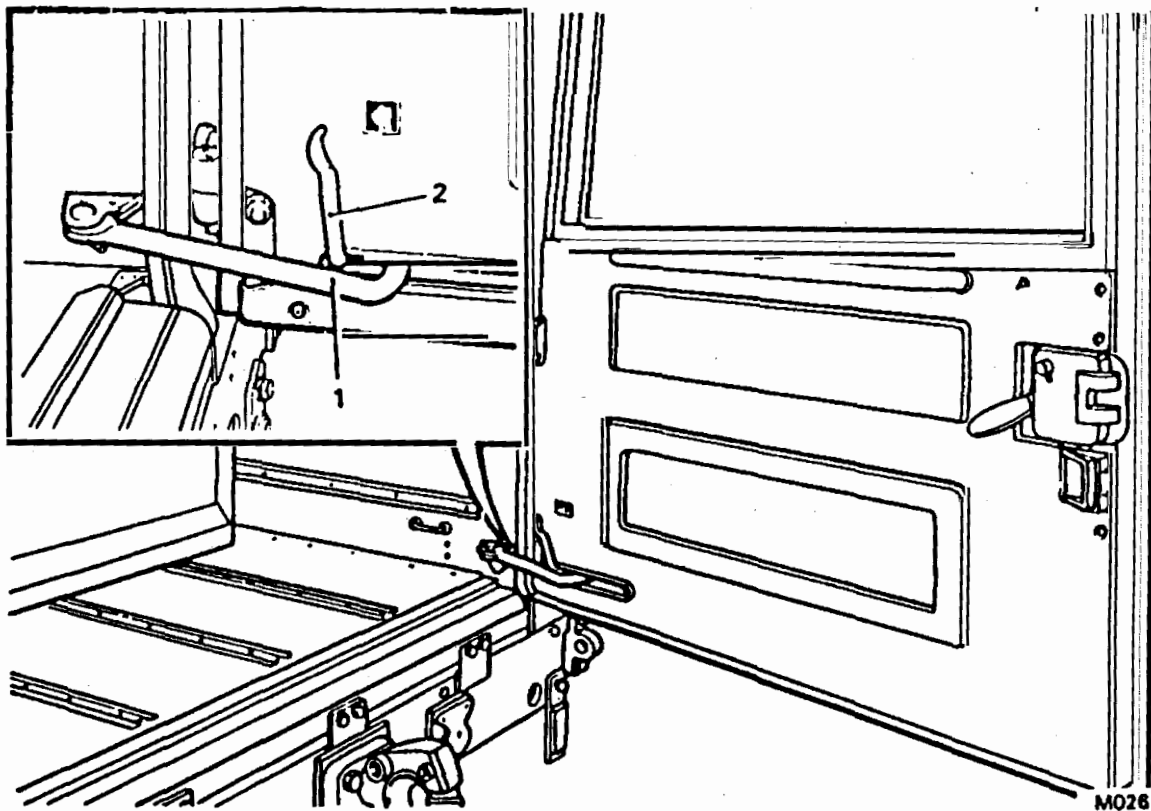


Fig 26 Rear door retaining catch (Hard top only)

TAILGATE (Soft top only)

3 The tailgate applies only to the soft top vehicles and operates thus:

3.1 To release the tailgate, move the catches in an upward direction until they are able to fall into a horizontal position.

3.2 Pull the tailgate downwards until the retaining straps prevent any further travel.

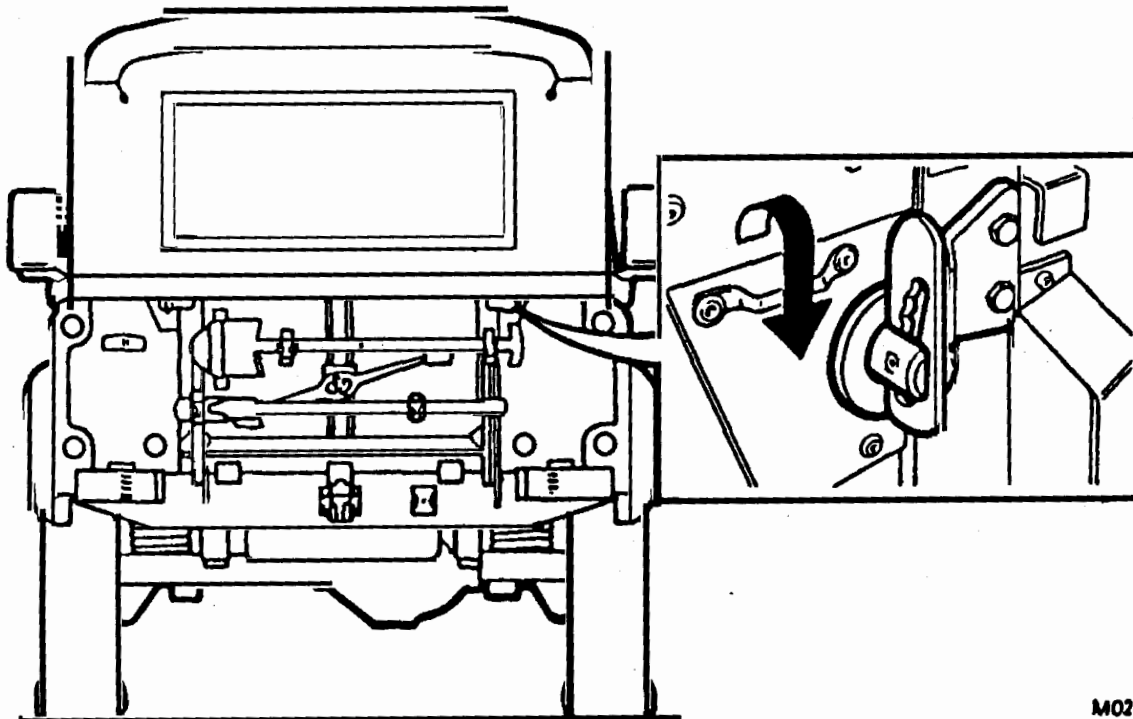


Fig 27 Tailgate locking mechanism

#### VEHICLE FASCIA

4 The vehicle fascia displays the instruments and controls required by the operator when driving the vehicles.

#### DRIVER/PASSENGER SEATS

5 The driver/passenger seats have an adjustable setting for ease of driving and comfort. To adjust the seat, push the lever, (1) located to the front of the seat base, to the left. When the lever is operated, the seat base will move in a forward or backward direction.

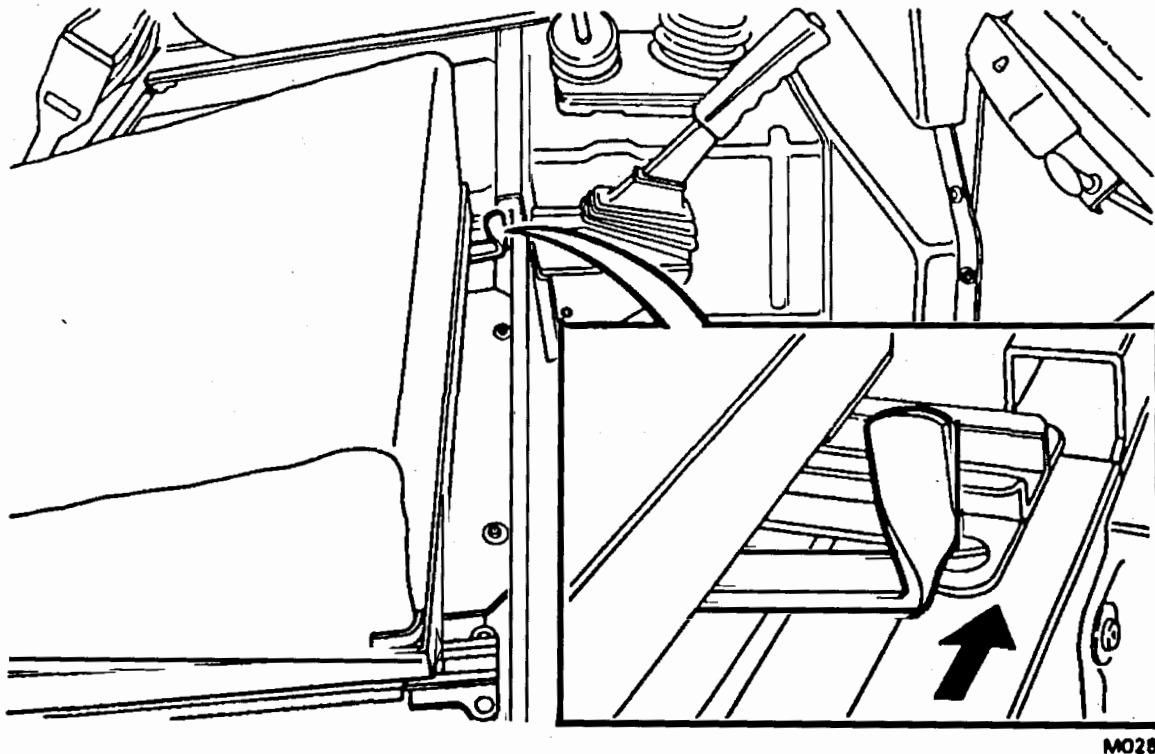


Fig 28 Seat adjustment

### SAFETY HARNESS

6 The safety harness must be fitted to the anchorage points provided. Always use the safety harness provided, even for the shortest of journeys. Alterations and additions must not be made to the harness fitted to the vehicles.

#### Operating the belt

6.1 When operating the belt always ensure that the following points are observed.

6.1.1 Always ensure that the belt is lying flat and is not twisted either on the wearer's body or between the wearer and the anchorage point.

6.1.2 Never attempt to use the seat belt for more than one person.

6.1.3 To fasten, draw the tongue of the belt (1) over the shoulder and across the chest, then push it into the engagement/release slot. A positive click indicates that the belt is locked.

6.1.4 To release, press the release button (2) which will disengage the buckle; this allows the belt to retract. Position the moveable clip as high as possible so that the tongue is accessible when the belt is next required.

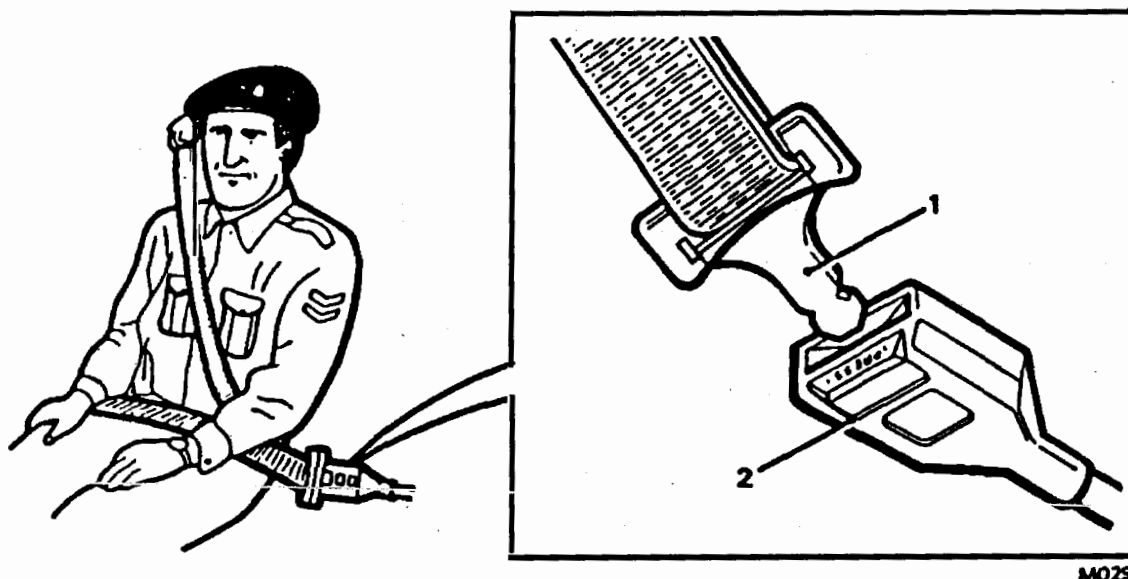


Fig 29 Seat belt operation

### Testing the safety harness

#### WARNING ...

THIS TEST MUST BE CARRIED OUT UNDER SAFE ROAD CONDITIONS, I.E. LEVEL DRY ROAD WITH NO FOLLOWING OR ONCOMING TRAFFIC.

6.2 With the belts in use, drive the vehicle at 8kph (5mph) and brake sharply. The automatic locking device should operate and lock the belt. It is essential that the driver and passenger are



sitting in a normal relaxed position when making the test. The retarding effect of the braking must not be anticipated.

#### Care of the belts

6.3 The safety harnesses fitted to the vehicles are possible life-saving equipment, and should be regarded with the same importance as steering and brake systems. Frequent inspection is advised to ensure continued effectiveness in the event of an accident. Inspect the harness and check as follows:

6.3.1 Inspect the belt webbing periodically for signs of abrasion and wear, paying particular attention to the fixing points.

6.3.2 If worn and correctly stowed on the stowage points provided, deterioration will be kept to a minimum and protection to a maximum.

6.3.3 Seat belt assemblies must be replaced if the vehicle has been involved in an accident, or, if upon inspection, there is evidence of cutting or fraying of the webbing, incorrect buckle or tongue locking function, and/or any damage to the buckle cabling. If any fault is found report it immediately.

#### Harness cleaning

6.4 Do not attempt, when cleaning the harness, to bleach the belt webbing or re-dye it. If the belts become soiled, sponge with warm water using a non-detergent soap and allow them to dry naturally. Do not use caustic soap, chemical cleaners or detergents for cleaning; do not dry with artificial heat or by direct exposure to the sun.

INSTRUMENT PANEL

7 The instrument panel is situated in front of the steering wheel console and consists of the following instruments:

Coolant temperature indicator

7.1 The coolant temperature gauge indicates the running temperature of the engine. Under normal running conditions the temperature indicator needle should register in the black band. If the needle moves to the red band during normal running, the vehicle should be stopped and the cause investigated. The design of the indicator ensures that the needle does not fluctuate, but there is a time lag of a few seconds before registering after the engine has been started, or electrical services, are switched on.

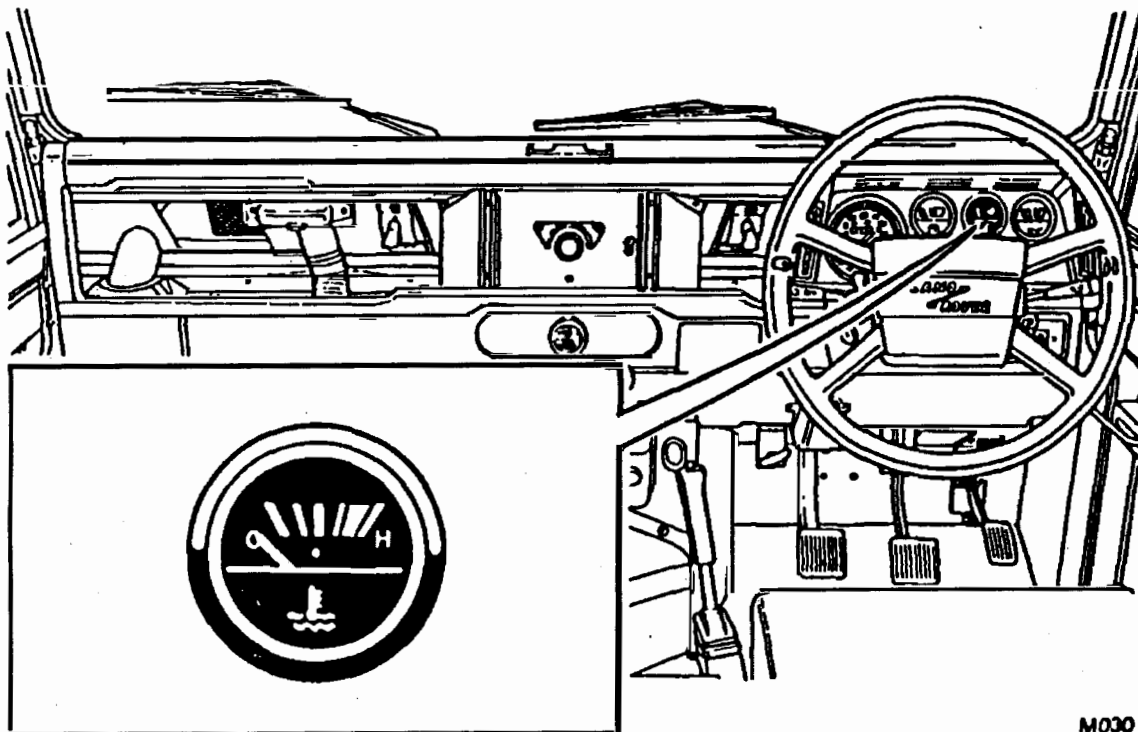


Fig 30 Coolant temperature indicator

### Fuel level indicator

7.2 The fuel level indicator shows the approximate contents of the tank. The design of the indicator ensures that the needle does not fluctuate, but there is a time lag of a few seconds before registering after the engine has been started, or after the electrical services, have been switched on.

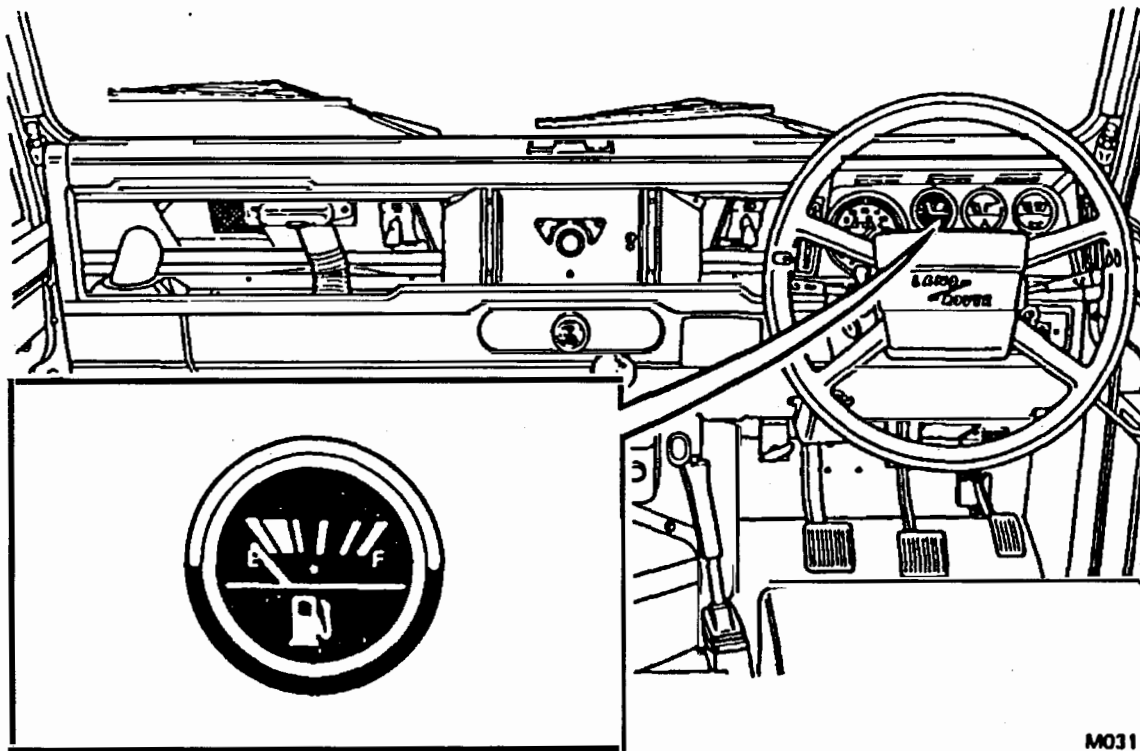


Fig 31 Fuel level indicator

### Speedometer

7.3 The speedometer indicates the speed of the vehicle in kilometers per hour with a miles per hour subscale. The speedometer incorporates a total distance indicator and a trip distance indicator with a trip reset button (1).

### Speedometer trip setting

7.3.1 The speedometer trip setting allows the indicator to be reset to zero by pushing the small black knob (1) on the front of the speedometer.

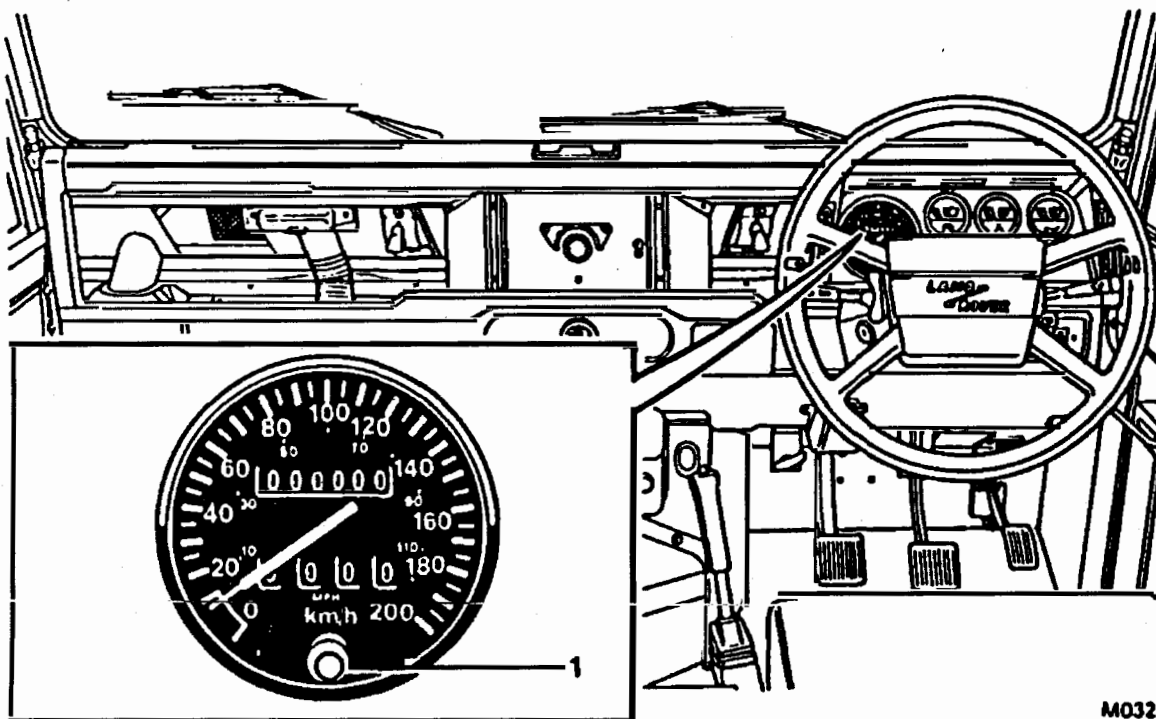


Fig 32 Speedometer and trip setting

### Warning lights panel

7.4 The warning lights panel incorporates all the vehicles warning symbols.

#### Oil Pressure warning light

7.4.1 The red oil pressure warning light (2) will illuminate when the ignition is switched on, also when there is abnormality in the oil pressure.

### Ignition warning light

7.4.2 The red ignition warning light (3) will illuminate when the ignition is switched on.

Note ...

The ignition and oil warning lights should be checked when starting the vehicle from cold; they should light up immediately the ignition is switched on and extinguish when the engine is running. The warning lights may flicker when the engine is running at idling speed but provided they fade out as the engine speed increases, the charging rate and oil pressure are satisfactory. If the oil pressure warning light comes on during normal running, the vehicle should be stopped immediately and the cause investigated. The ignition warning light is connected in series with the alternator field circuit. Bulb failure would prevent the alternator charging properly, therefore the bulb should be checked before suspecting an alternator fault. A failed bulb should be changed with the minimum of delay otherwise the vehicle battery will become discharged.

### Brake circuit check warning light

7.4.3 The red brake circuit check warning light (4) will illuminate if there is a fluid leakage, when the ignition is on or the engine is running, from either the front or rear braking system. If the leakage occurs the light will illuminate when the brakes are applied. The brake circuit warning light will operate momentarily when the starter is actuated. This will confirm that the warning circuit is functioning correctly. If the light comes on

during normal running or braking, the vehicle should be stopped immediately and the cause investigated.

#### Turn light arrows

7.4.4 The green turn light arrows (5) flash in conjunction with the turn lights, when operated by the switch or the steering column. If the turn light arrows do not operate as described, there may be a bulb failure in the warning light panel or in one of the turn lights.

#### Main beam warning light

7.4.5 The blue main beam warning light (6) illuminates when the headlight main beams are operating. The purpose is to remind the operator to dip the headlights when entering brightly lit areas, or when approaching other traffic. The light will also illuminate when the headlight flasher switch is operated.

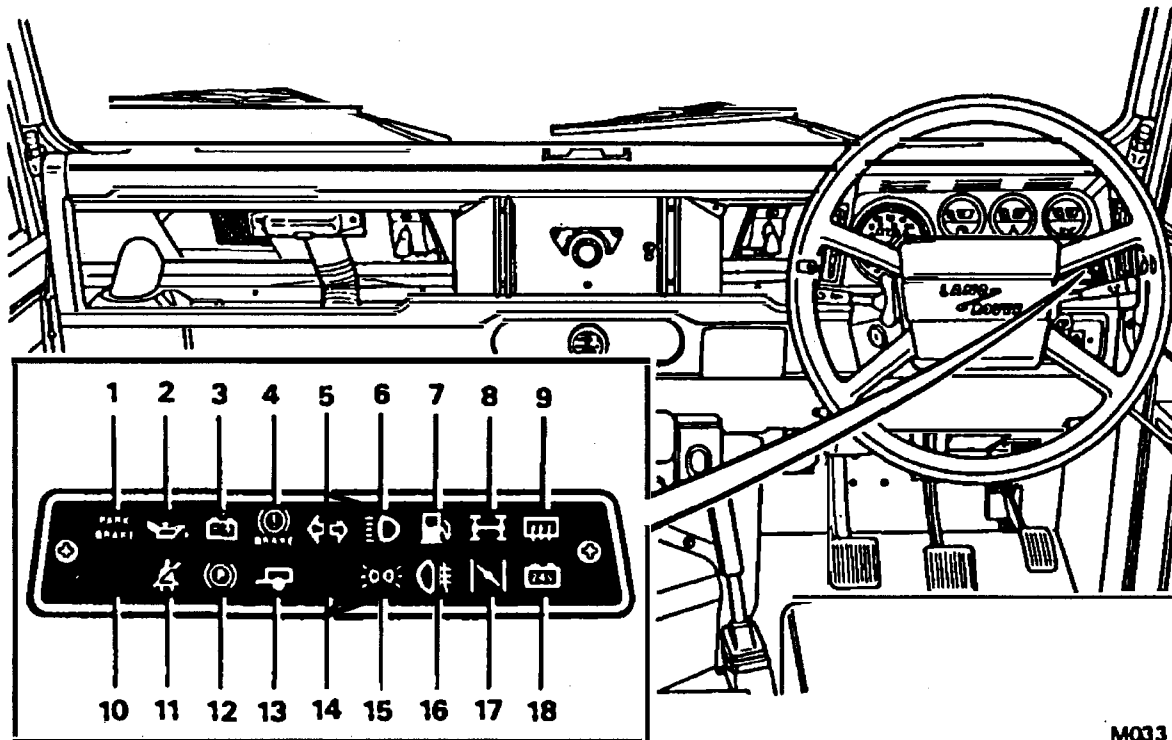
#### Fuel level warning light

7.4.6 The amber fuel level warning light (7) will illuminate when there is approximately 9 litres (2 gallons) left in the fuel tank. The light will remain on until the fuel supply is replenished. Intermittent flashing may occur when cornering, etc, before the fuel level drops below 9 litres (2 gallons).

#### Differential lock warning light

7.4.7 The amber differential lock warning light (8) will illuminate when the gearbox differential lock control knob is engaged. The differential lock should be engaged if traction to one or more wheels is likely to be lost. A

return to the disengaged position should be made as soon as conditions permit.



- |                                     |                            |
|-------------------------------------|----------------------------|
| 1. Park Brake (not used)            | 10. Spare                  |
| 2. Oil Pressure                     | 11. Seat belt (not used)   |
| 3. Ignition (12V)                   | 12. Park brake(not used)   |
| 4. Brake Circuit                    | 13. Trailer                |
| 5. Turn lights                      | 14. Spare                  |
| 6. Main beam                        | 15. Side lights            |
| 7. Low fuel                         | 16. Rear fog               |
| 8. Differential lock                | 17. Cold start             |
| 9. Heated rear window<br>(not used) | 18. Battery charging (24V) |

Fig 33 Warning lights panel

#### Trailer warning light

7.4.8 The green trailer warning light (13) illuminates when a trailer is connected to the vehicle via the twelve pin socket. It will flash in conjunction with the vehicle's turn

lights, thus ensuring that the trailer turn lights are functioning correctly. In the event of a turn light bulb failure on the trailer, the warning light will flash once only and then remain extinguished. Where a trailer is not used or connected, the trailer warning light momentarily flashes every time the turn light switch is operated.

#### Side lights warning light

7.4.9 The green side lights warning light (15) will illuminate when the side lights are switched on.

#### Rear fog guard lights warning light

7.4.10 The amber rear fog guard warning light (16) will illuminate when the rear fog guard switch is switched on.

#### Diesel-cold start warning light

7.4.11 The amber diesel-cold start warning light (17) will illuminate when the engine starter key is turned to the heater plugs "on" position.

### HAZARD WARNING SWITCH

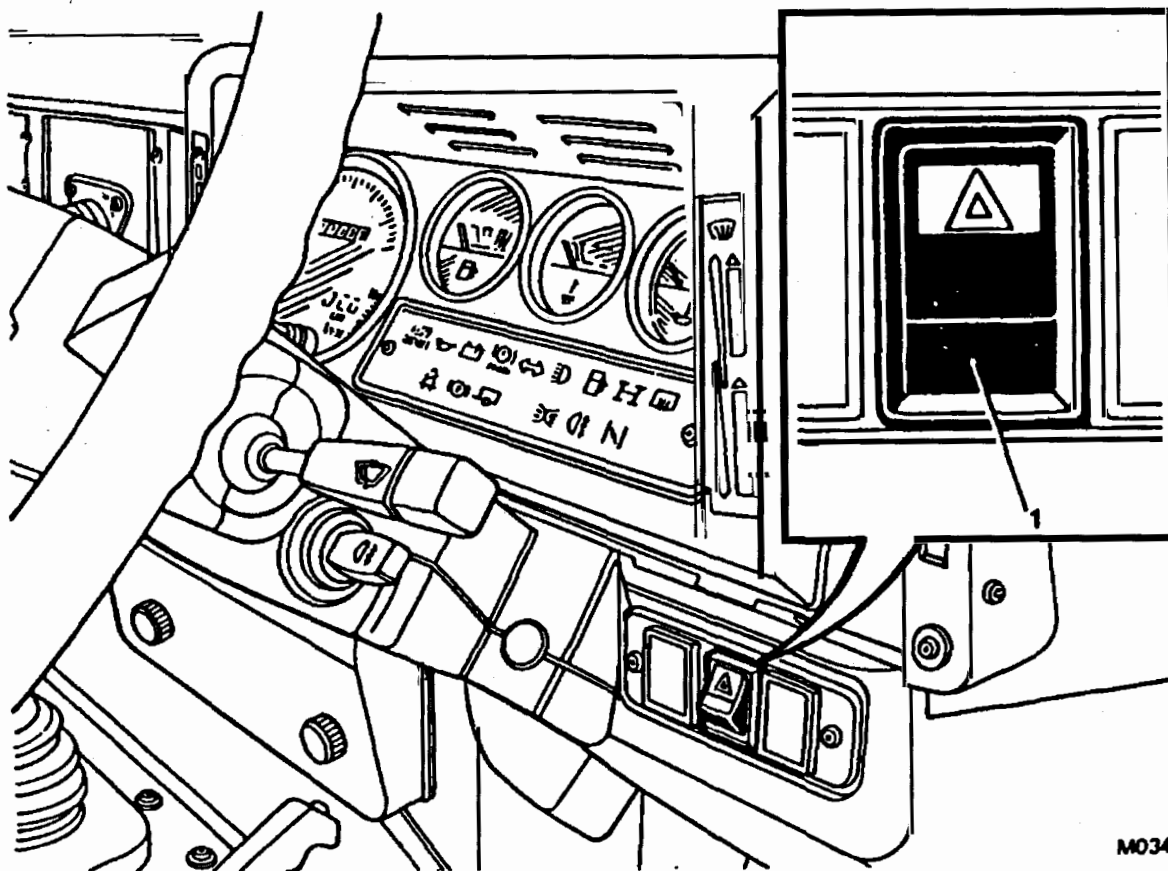
8 The hazard warning switch (1) is located below and to the right of the instrument panel. The switch has a two way rocker action which operates in the following manner:

8.1 Press the upper end of the switch in, the hazard lights are off.

8.2 Press the lower end of the switch in, the hazard warning lights are on. With the switch on,



all four turn lights operate simultaneously. The red warning light (with the triangular symbol) in the switch will flash in conjunction with the exterior turn lights, also the trailer light will flash. The trailer light will flash even when there is no trailer attached. Use the hazard warning system to warn following or oncoming traffic of any hazard, that is, breakdown on fast roads, or an accident to the vehicle or other vehicles.



M034

Fig 34 Hazard warning switch

#### STEERING WHEEL CONSOLE

9 The steering wheel console comprises the following switches and controls:

The windscreen wash/wipe switch.

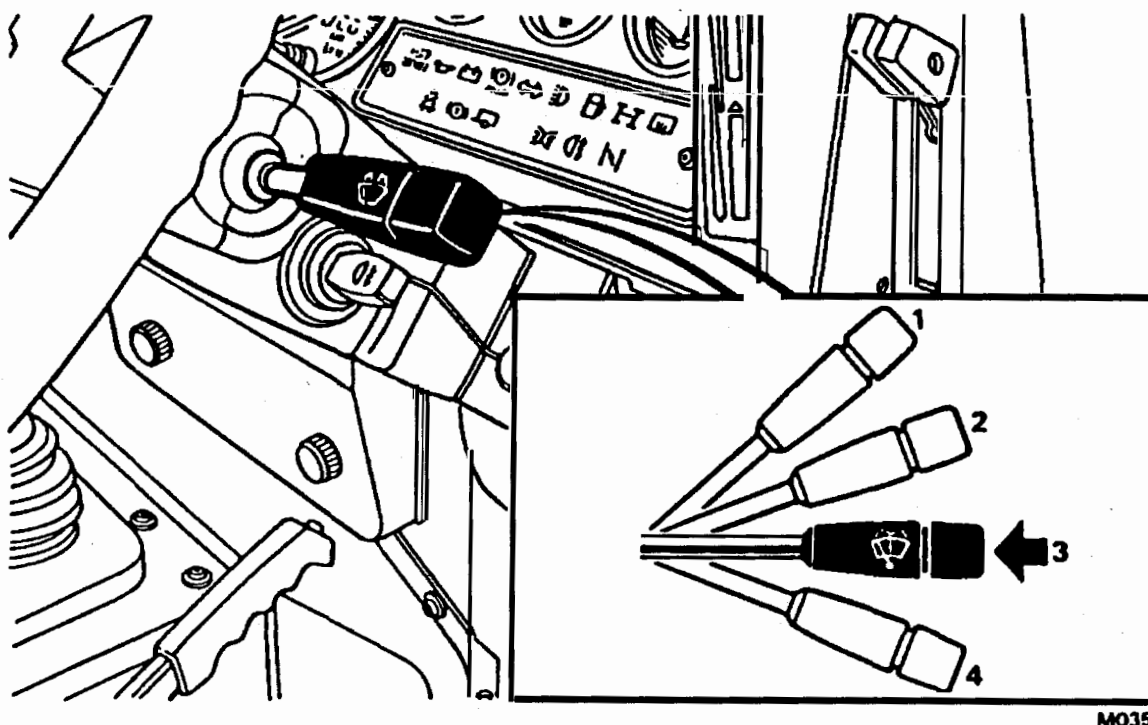
9.1 This is located on the right hand side of the console and is only operative when the ignition is switched on. The switch has five positions.

9.1.1 The switch in the upper position (2) is the fast speed wiper.

9.1.2 The switch in the second position (1) is the slow speed wiper.

9.1.3 The switch in the third position (3) is wipers off.

9.1.4 The switch in the lowest position (4) is the "flick-wipe" position where the wipers will operate at slow speed until the switch is released.



M035

Fig 35 Windscreen wash/wipe switch

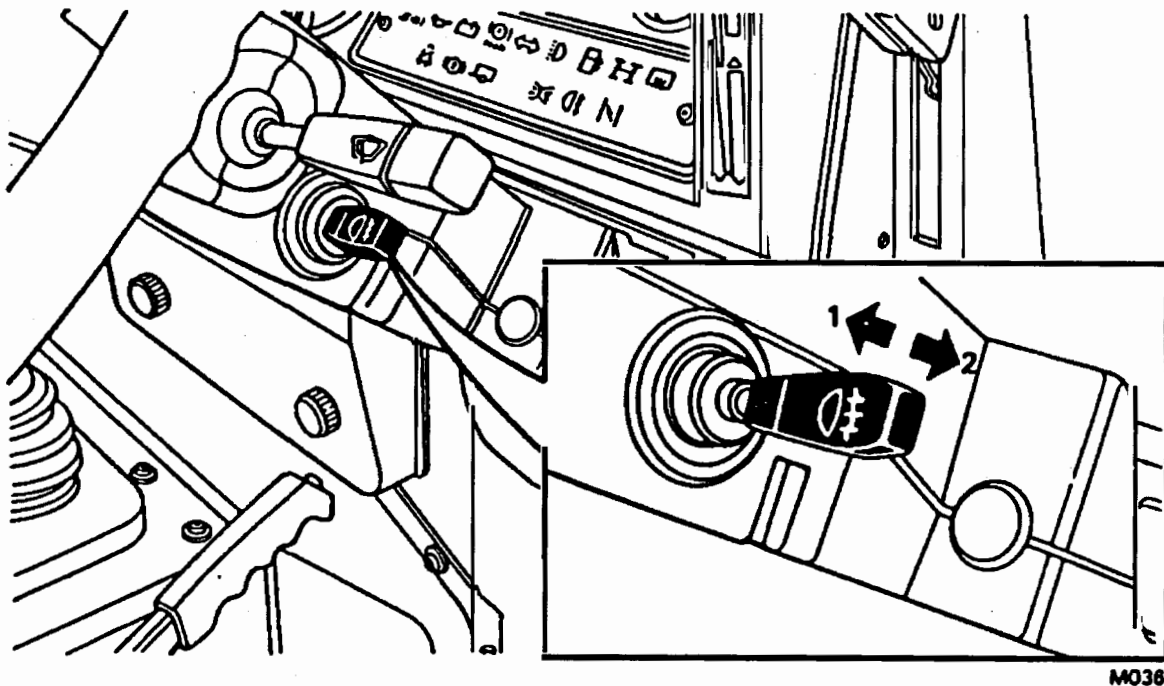
9.1.5 When the switch is pressed in (3) the screen wash position, water is ejected on to the screen. To stop the water, release the switch. This operation can be done with the wiper switch on or off.

### Rear fog guard lights switch

9.2 The rear fog guard lights switch is located on the right-hand side of the console and below the windscreen wiper switch. The switch will only operate with the main lighting switch in the "HST" position. There are two positions.

9.2.1 The switch in the position nearest to the driver, (1) the fog lights are off.

9.2.2 The switch in the position furthest from the driver, (2) the fog lights are on.



M036

Fig 36 Rear fog guard light switch

Headlight dipper, turn lights, horn and headlight  
flasher switch

9.3 The headlight dipper, turn lights, horn and headlight flasher switch is located on the left hand side of the console. The switch has six positions:

9.3.1 The switch in the central position (3) is dipped headlights.

9.3.2 The switch pushed away from the driver (2) is main beam.

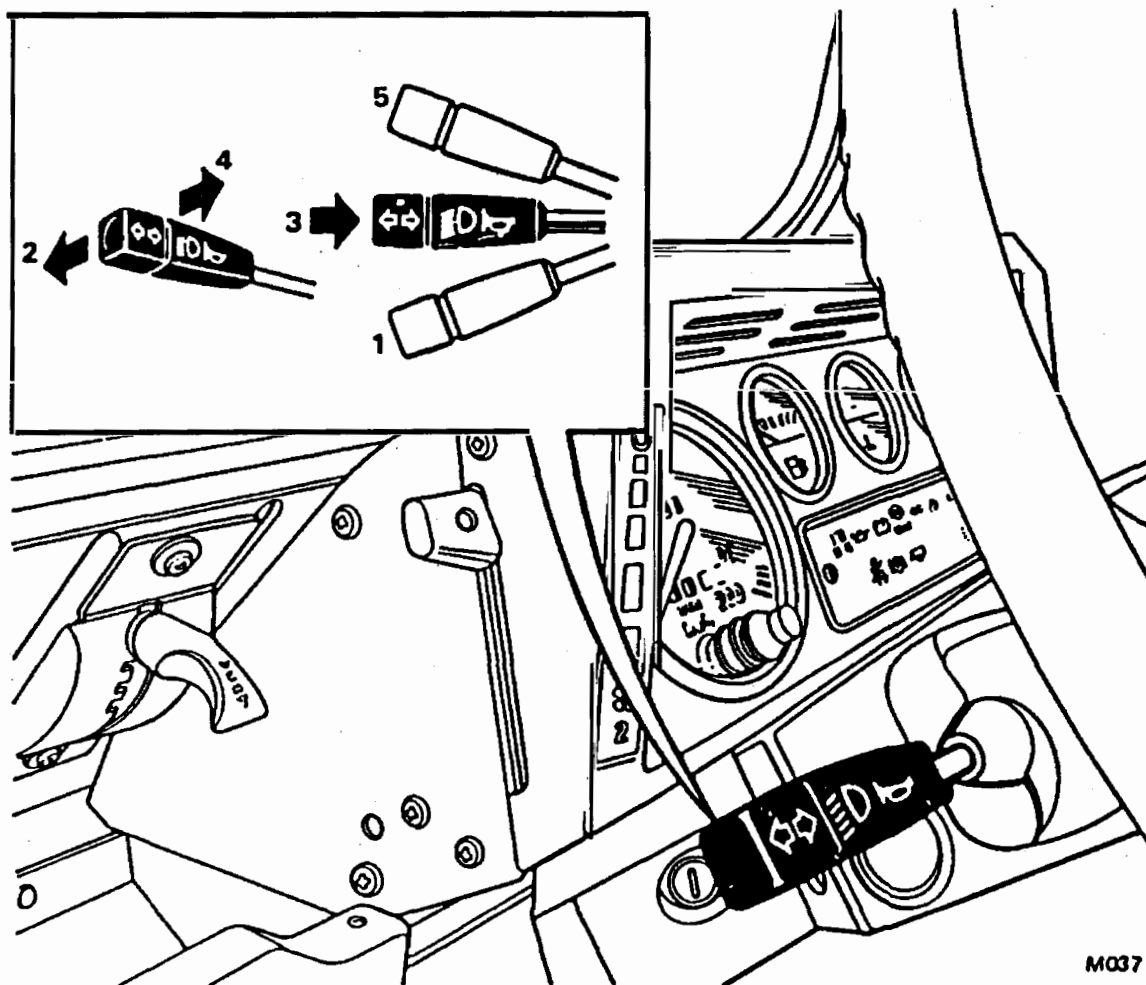


Fig 37 Headlight dipper, turn lights, horn and  
headlight flasher switch

9.3.3 The switch pulled towards the driver (4) is the headlight flash. The headlights can be flashed at anytime, irrespective of other switch positions except when in blackout mode.

9.3.4 Press the switch inwards (3) to operate the horn.

9.3.5 The switch in the upper position (5) operates the right-hand turn light.

9.3.6 The switch in the lower position (1) operates the left-hand turn light.

#### Heater plug and starter switch

9.4 The heater plug and starter switch is located to the left-hand side of the console and below the headlight dipper switch. The switch has four positions.

9.4.1 The key in the upright position (1) the switch is off.

9.4.2 The key turned to the first position (2) allows the heater blower and accessories to be used.

9.4.3 Turn the key further against spring pressure, (3) the heater plugs are on and the amber warning light will illuminate.

9.4.4 Turn the key further against spring pressure (4) to operate the starter motor. When the engine has started release the key and it will automatically return to the first position. The key in this position is the "run" mode with the oil and charge lights and accessories all operable.

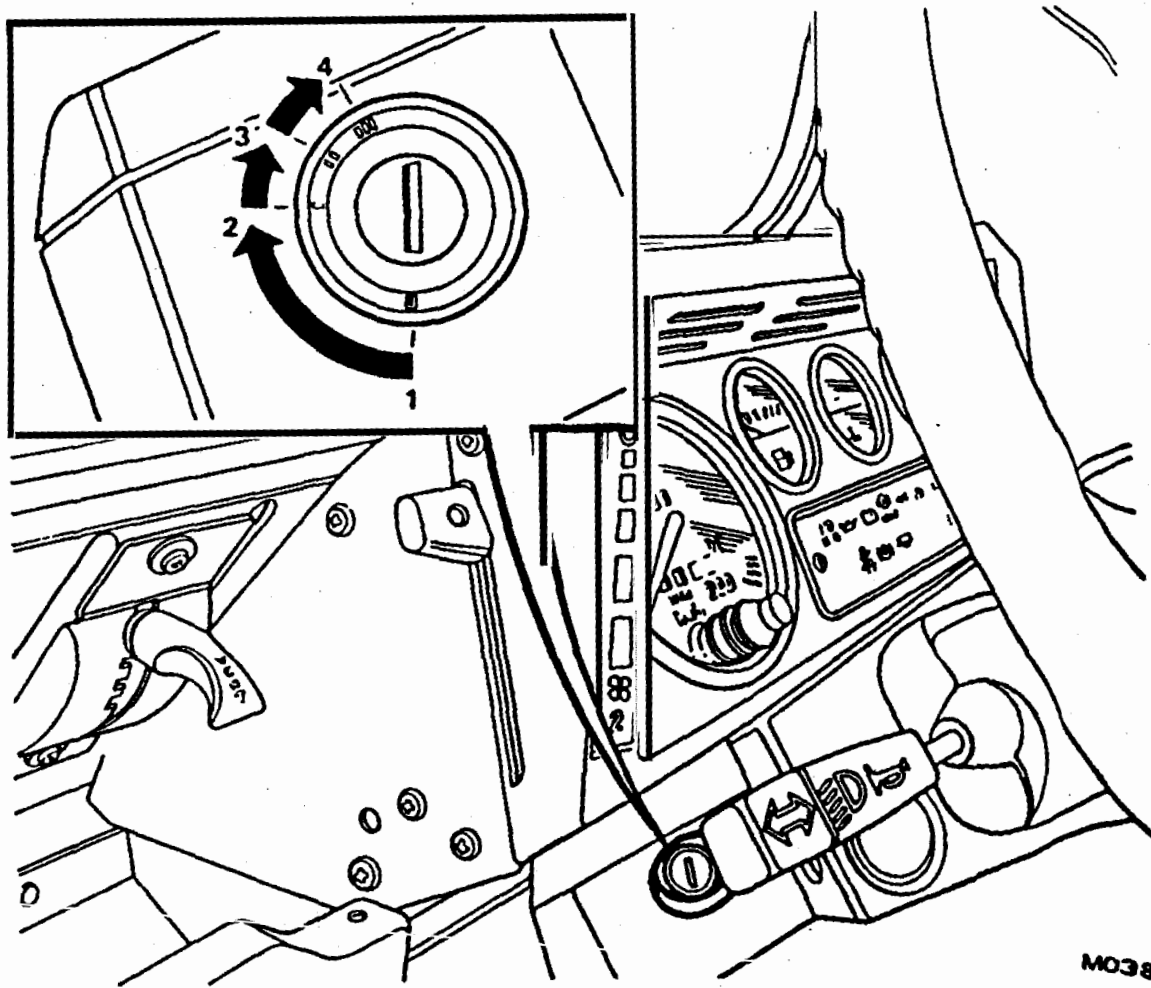


Fig 38 Heater plug and starter switch

### Steering wheel

9.5 The steering wheel is connected to the front wheels by a series of columns and rods via a steering box. To change from hard right to hard left requires the steering wheel to be turned four and one half times.

### DASH VENTILATORS

10 The two dash ventilators are mounted in the scuttle and open to the atmosphere. The dash ventilators may be opened separately by pushing the

lever (1) downwards until the desired position is obtained. Use of the ventilators will be found advantageous when traversing dusty roads, as dust sucked into the vehicle from the rear is greatly reduced.

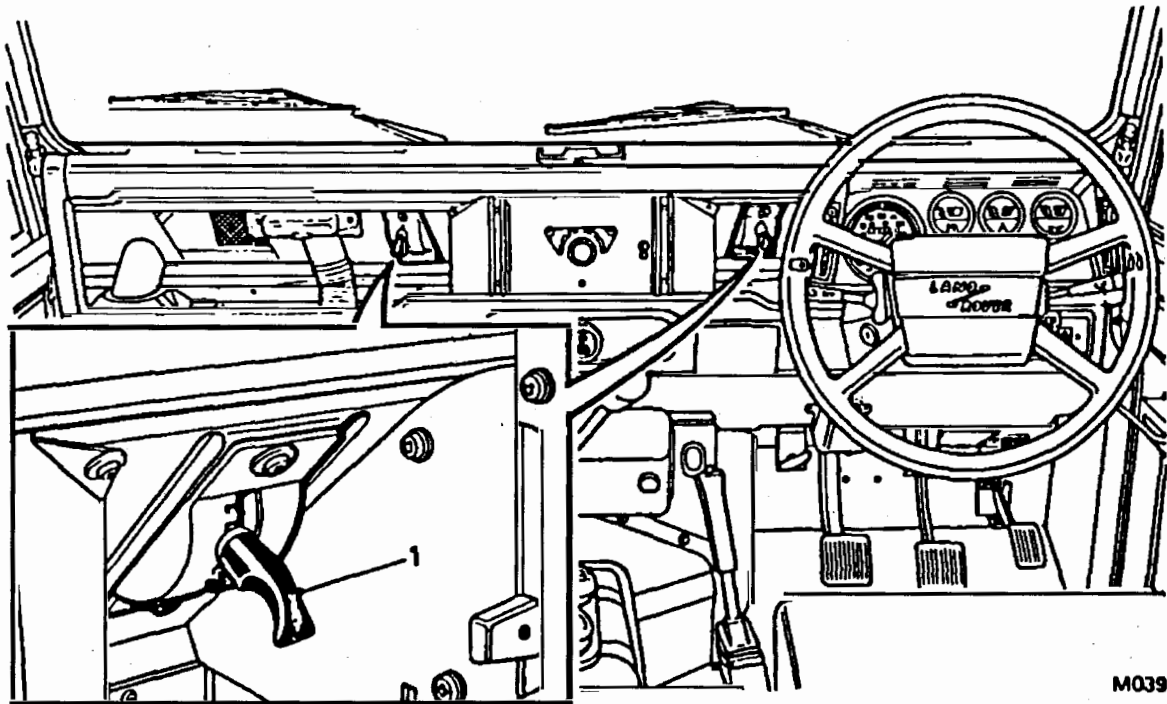


Fig 39 Dash ventilators

### MAIN LIGHTING SWITCH

11 The main lighting switch (1) is situated in the centre of the fascia and has six positions. Fitted over the top of the switch is an indicator panel plate (2) which shows the individual positions as follows:

- 11.1 OFF - All lights are off
- 11.2 CONV - Convoy light only
- 11.3 SCONV - Convoy and side lights
- 11.4 T - Tail and rear number plate lights

- 11.5 ST - Side, tail and rear number plate lights
- 11.6 HST - Head, side, tail and rear number plate lights

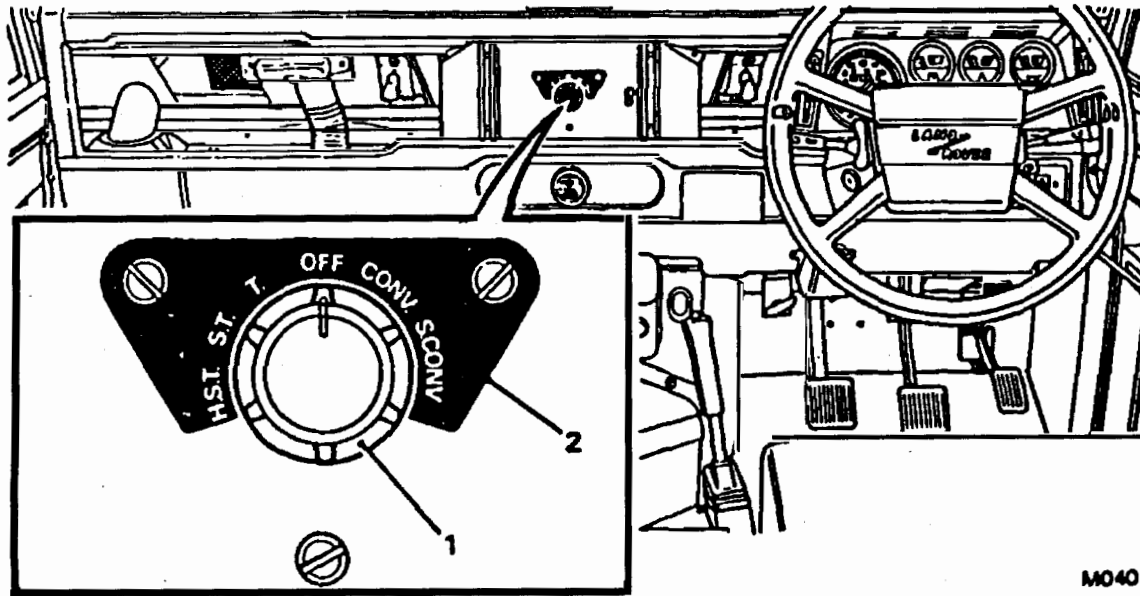


Fig 40 Main lighting switch

INSPECTION SOCKETS

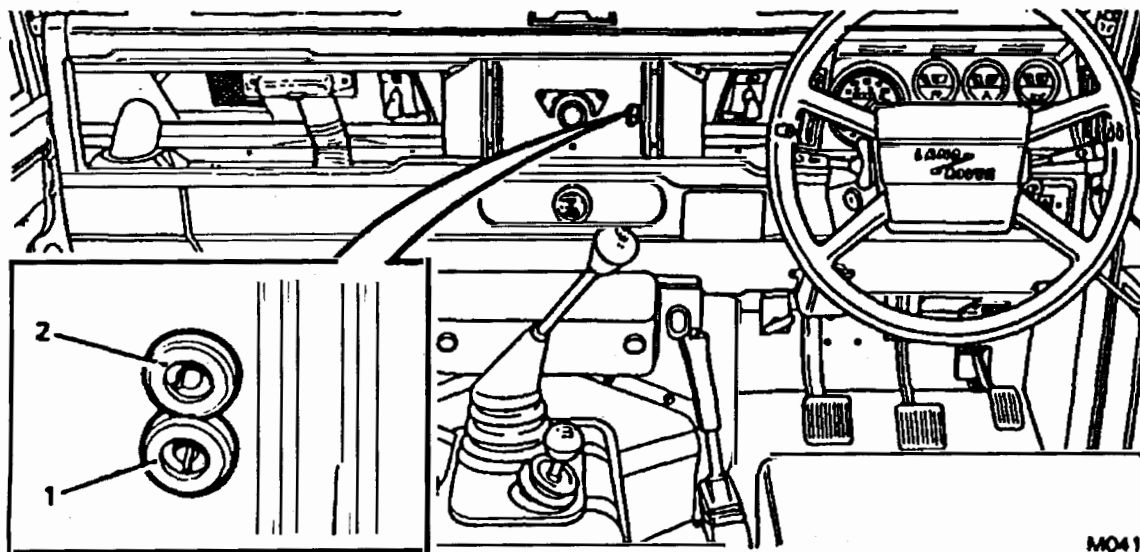


Fig 41 Inspection sockets



12 The inspection sockets are located to the right of the main lighting switch and are for the purpose of an inspection lamp. The red socket (2) is live and the black socket (1) is to earth.

#### MAP READING LIGHT

13 The map reading light (1) is located to the left of the main lighting switch in front of the passenger seat. The facility is for being able to see documents while driving at night. To operate the light:

13.1 Rotate the centre flap (2) upwards and the light illuminates automatically.

13.2 To extinguish the light, rotate the centre flap downwards.

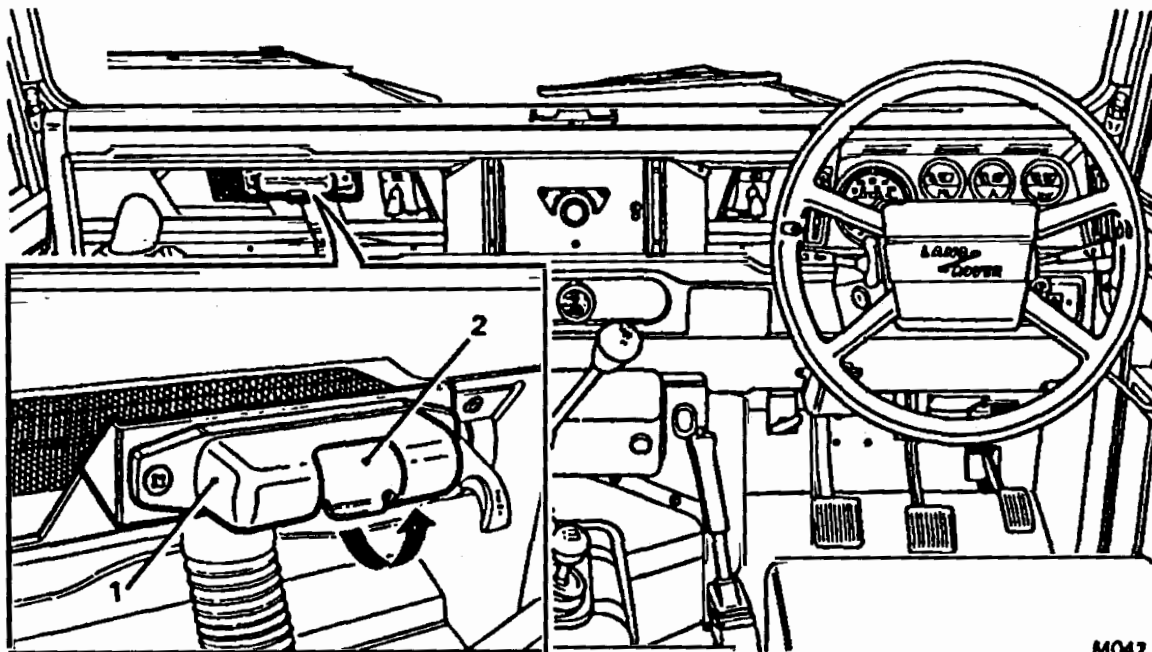


Fig 42 Map reading light

#### FRESH AIR/HEATING CONTROLS

14 The fresh air/heating controls are located to either side of the instrument panel, the distribution

(3) and temperature control (2) levers being on the right and the blower motor lever (1) on the left, for the right hand drive vehicles. The heating system delivers fresh air to the windscreen for demisting and to the driving cab interior in variable temperature proportions, between cold and hot according to the setting of the controls. Warm or hot air will be available once the engine has attained normal working temperatures. The heater has three controls:

Note ...

On left hand drive vehicles the distribution and temperature control levers are on the left hand side and the blower motor lever is on the right hand side.

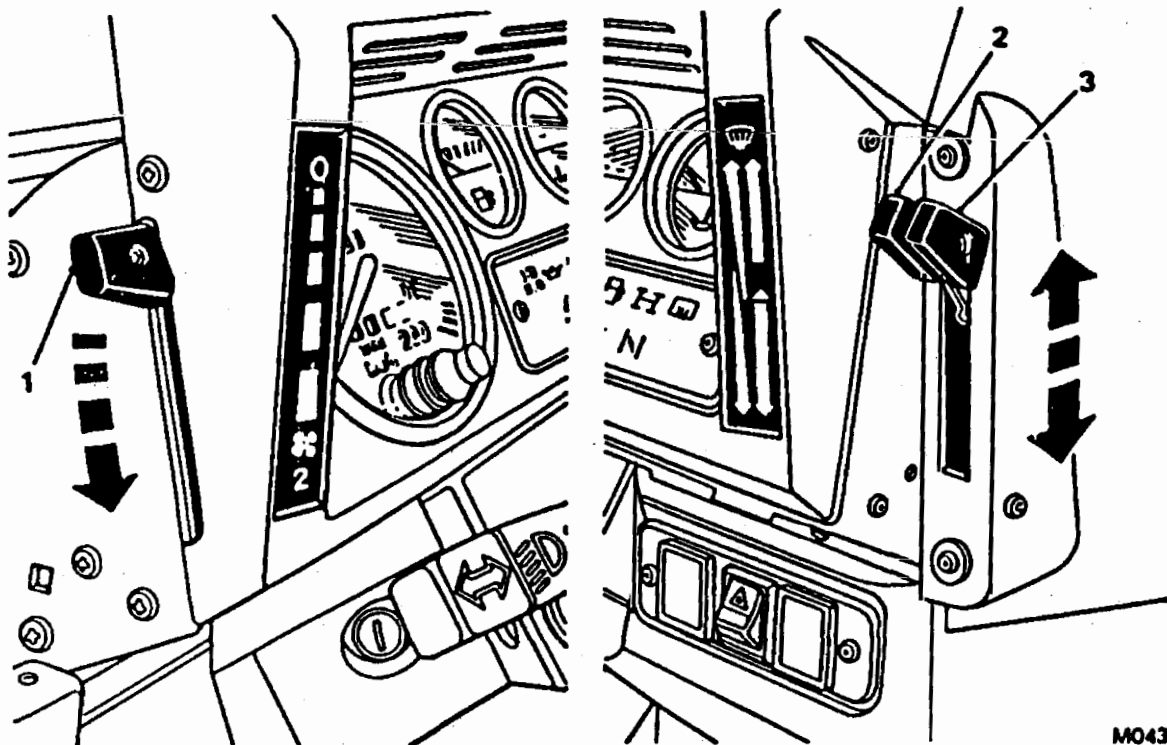


Fig 43 Fresh air/heating controls

14.1 Air distribution control. The lever (1) controls the direction of air flow, it has three positions:

14.1.1 With the lever fully up, all the air is directed onto the screen through the demister vents.

14.1.2 With the lever mid-way, air is directed to the foot level vents and to the screen.

14.1.3 With the lever fully down, air is directed to the foot level vents, although a certain amount will continue to pass through the demister vents.

14.2 Temperature control lever. The lever (2) controls the temperature of the air from the heater unit, it has three positions:

14.2.1 To increase the temperature move the lever in the direction of the red arrow.

14.2.2 To decrease the temperature move the lever in the direction of the blue arrow.

14.2.3 Action between the maximum temperature and the minimum temperature is progressive.

14.3 Blower motor lever. The motor will only operate with the starter key turned to the first position or with the engine running. The lever (3) has four positions:

14.3.1 With the lever fully up the heating and ventilation system is inoperative.

14.3.2 Move the lever in a downward motion until a positive click is felt, this is the "ram" position. In this position the air is

forced into the vehicle by its forward movement, and then routed and heated as determined by the position of the distribution and temperature controls. When the vehicle is stationary, the system is inoperative.

14.3.3 Move the lever to the second position and this will give a slow blower motor speed.

14.3.4 Move the lever down to the last position and this will give a fast blower motor speed to boost the airflow into the vehicle. Air is routed and heated as determined by the position of the distribution and temperature controls.

## PEDALS

15 The brake (2), clutch (1) and accelerator (3) pedals are located in the well of the driver's compartment, below the steering wheel console. The pedals are of the pendant type with the brake and clutch operated hydraulically. The brakes are servo assisted for ease of operation. The accelerator pedal has a mechanical linkage operating a control cable. To operate, depress the appropriate pedal.

### Foot brake pedal

15.1 To check the foot brake (2) for correct operation proceed as follows:

15.1.1 Check that the brake pedal travel is not excessive and maintains a satisfactory pressure under normal working load.

15.1.2 Excessive pedal travel could be caused by badly worn rear brake linings.

15.1.3 If the brakes **feel** spongy this may be caused by air in the **hydraulic** system, it must be removed by bleeding **the** system at each wheel cylinder (Cat 501).

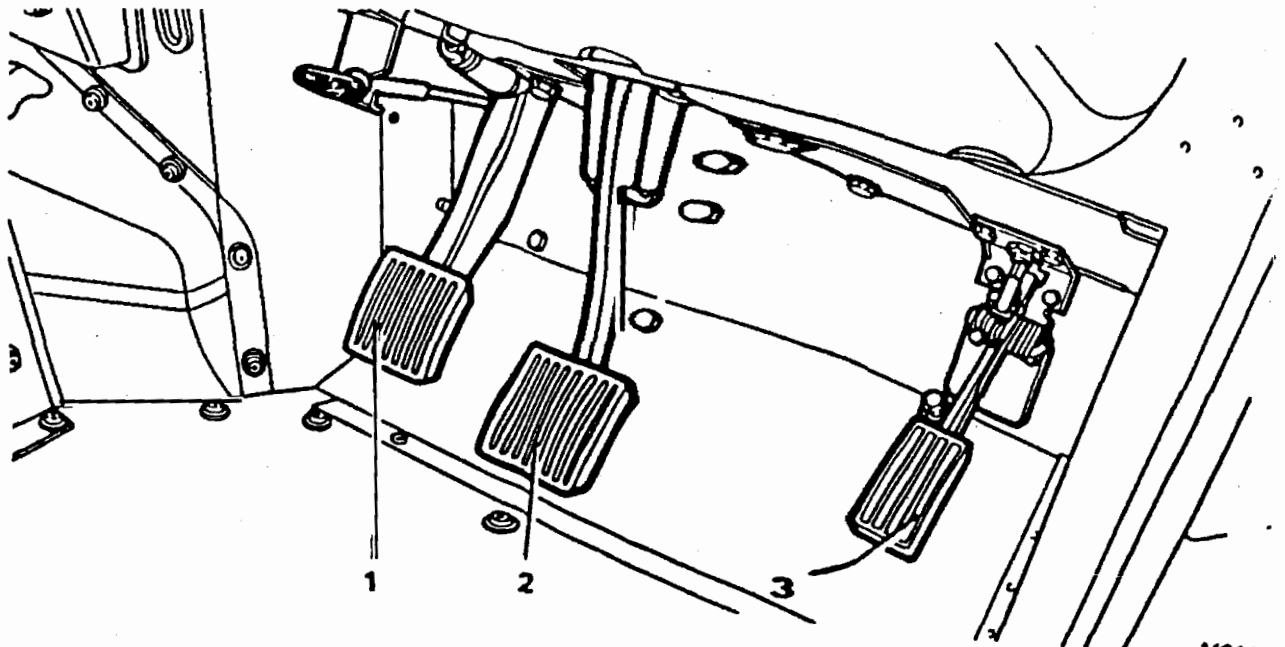


Fig 44 Pedal layout

#### BONNET RELEASE HANDLE

16 The bonnet release handle (1) is located to the right of the gearbox tunnel within the well of the driver's compartment. This opens the bonnet as follows:

16.1 Pull the handle, this disengages the locking plate and allows the bonnet to spring open to the limits of the safety catch.

16.2 To open, insert the hand under the bonnet and locate the safety catch on the left hand side of the vehicle, press upwards, this releases the safety catch and lifts the bonnet clear.

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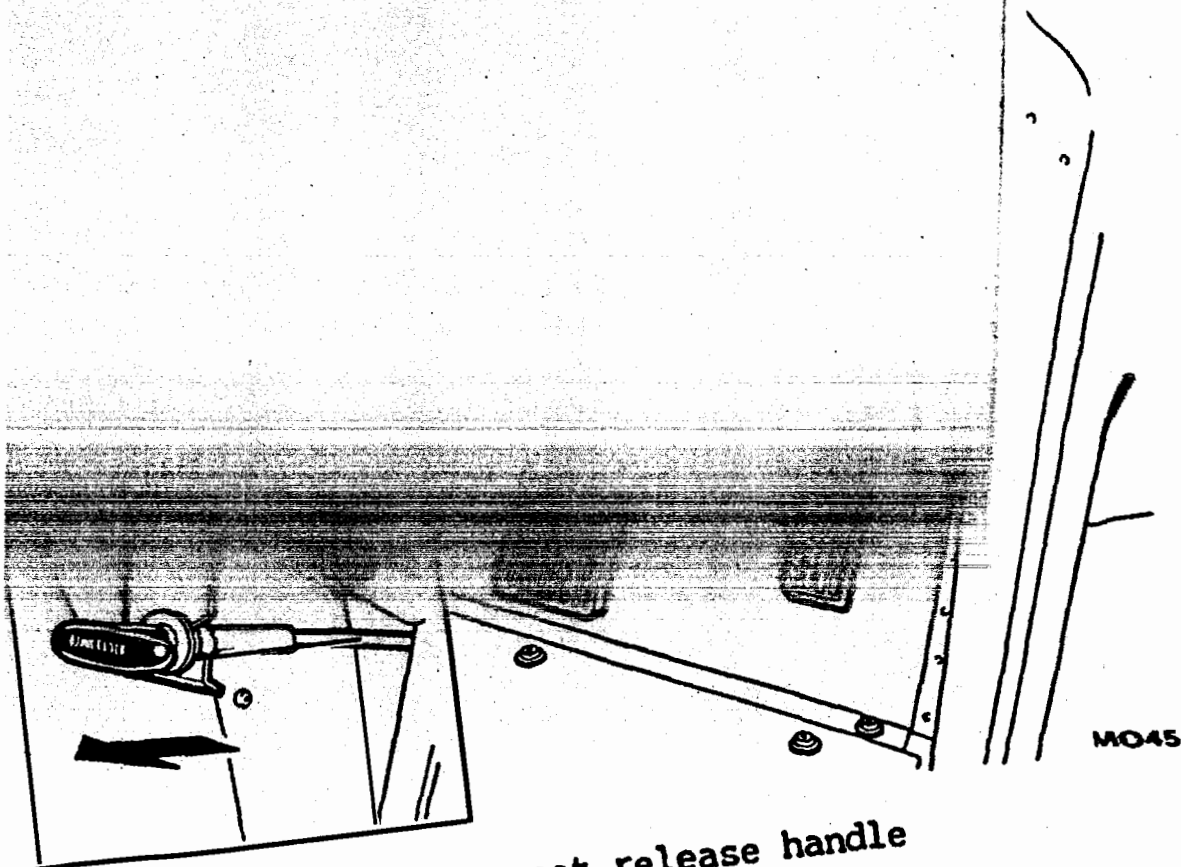


Fig 45 Bonnet release handle

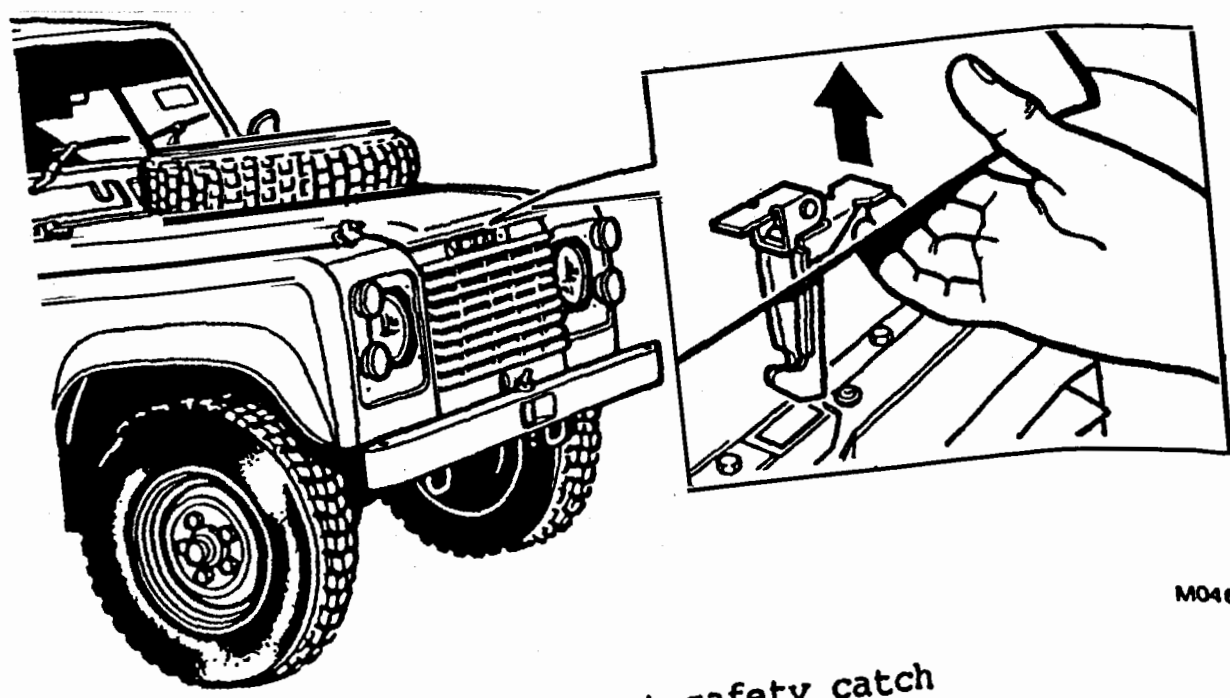


Fig 46 Bonnet safety catch

16.3 To close, lower the bonnet into position and apply pressure downwards until the locking mechanism locates in its housing. The bonnet release handle automatically resets itself.

Note ...

On left hand drive vehicles, the bonnet release handle is located on the passenger side.

### FIRE EXTINGUISHER BRACKET

17 The fire extinguisher bracket is situated forward of the passenger door, in the well. All personnel should be familiar with the mechanism for releasing the extinguisher. The procedure for releasing the extinguisher is as follows:

17.1 Pull the strap (1) which releases the retaining bracket.

17.2 The extinguisher (2) may now be removed.

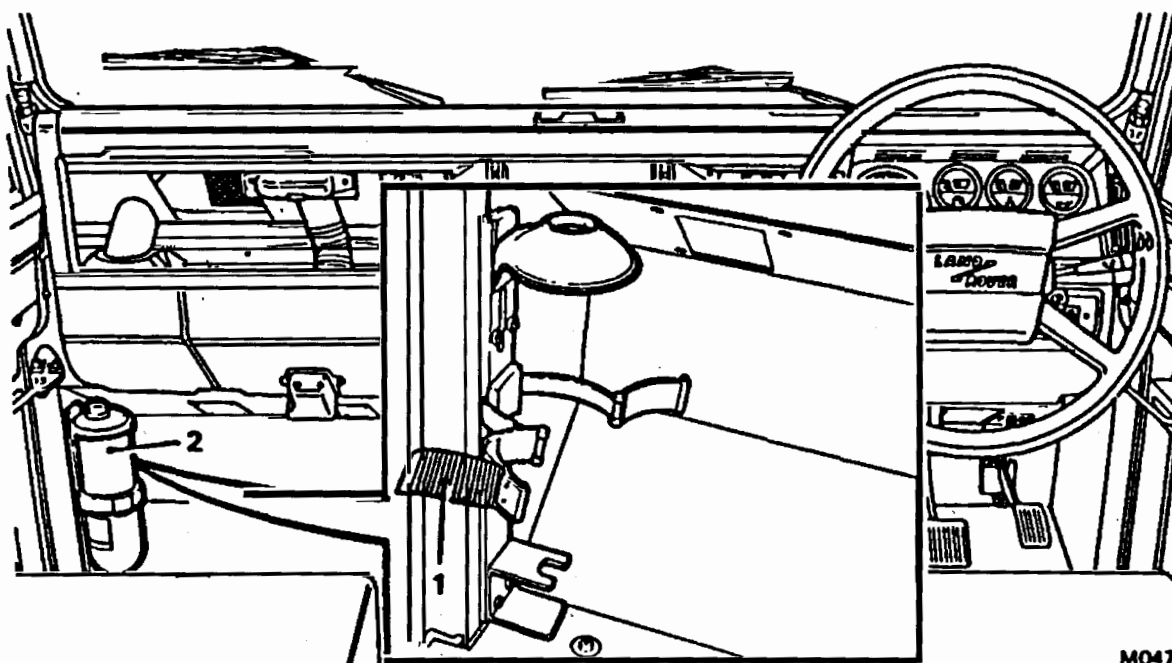
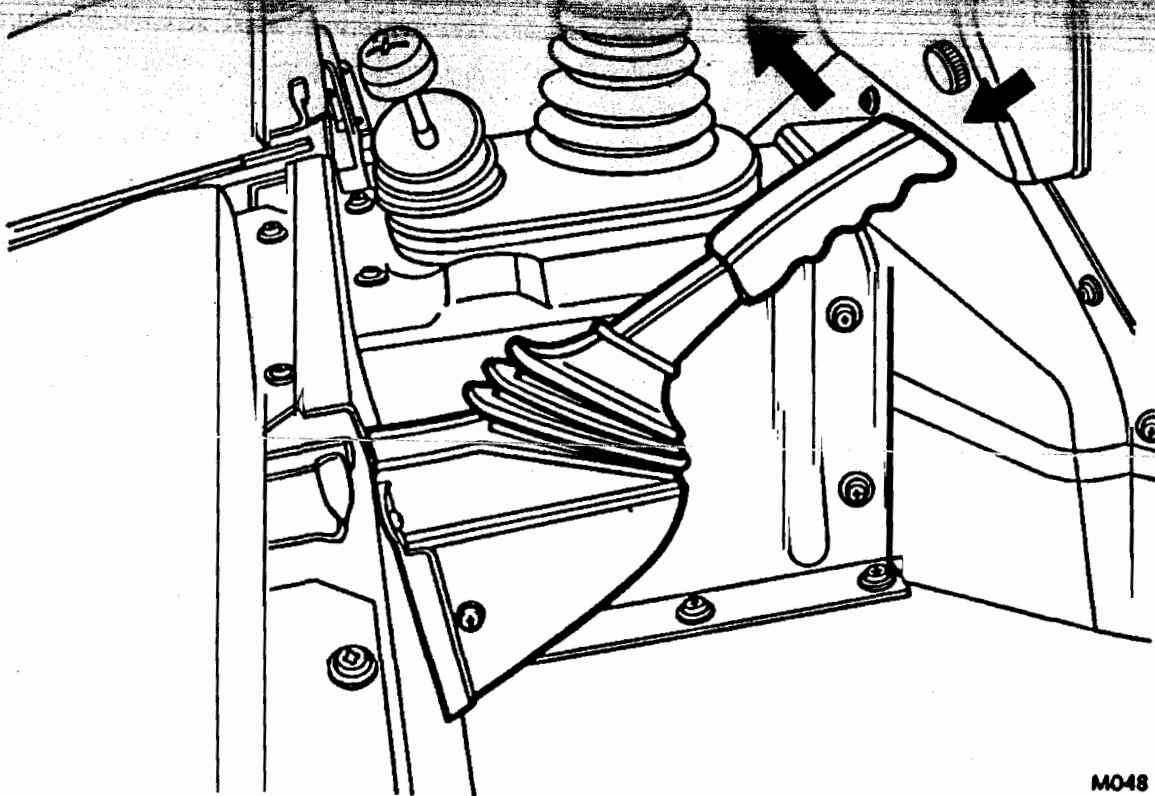


Fig 47 Fire extinguisher bracket



M048

Fig 48 Transmission handbrake lever

TRANSFER GEAR/DIFFERENTIAL LOCK LEVER

CAUTIONS ...

- (1) The vehicle must be stationary when moving the transfer gears from high "H" to low "L".



- (2) Engagement of the lock with one or more wheels slipping will cause damage to the transmission.

19 The transfer gear/differential lock lever is located on the gear box tunnel adjacent to the handbrake lever. The lever controls the selection of the high and low gear ratios and the engagement of the differential lock. The transfer gear/differential lock lever has the six following positions:

19.1 Fully rearwards right. The transfer gearbox is in high ratio with the differential unlocked. This position is used for normal road work.

19.2 Fully rearwards left. The transfer gearbox is in high ratio with the differential locked. The differential lock warning light should be illuminated.

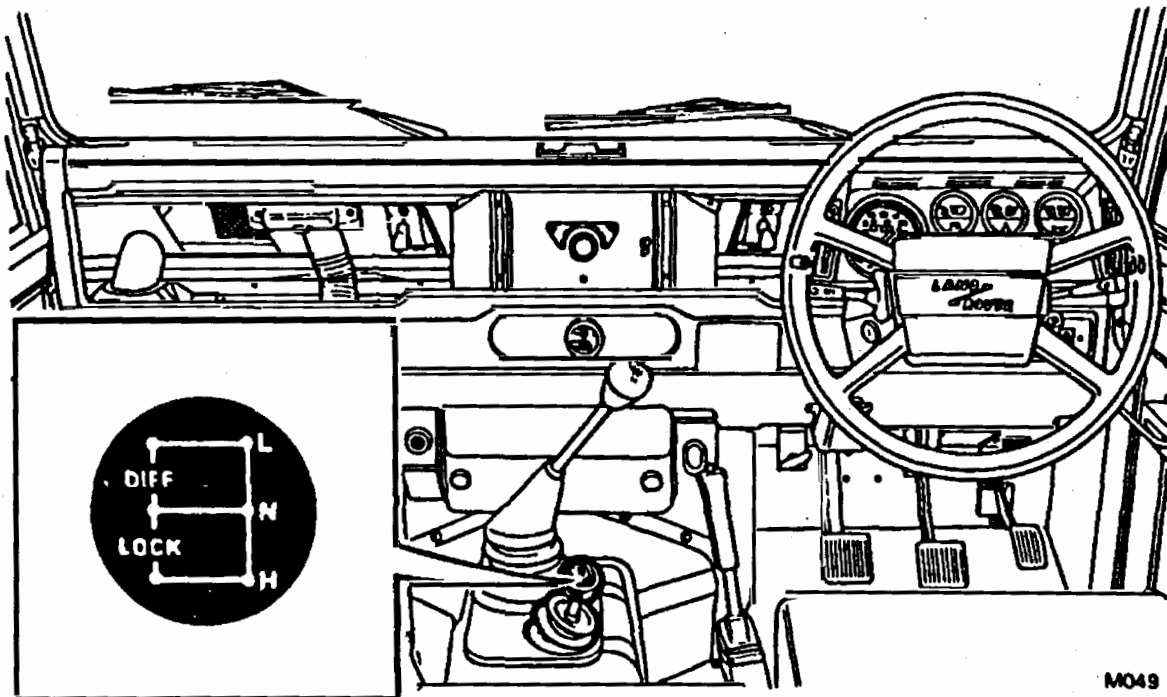
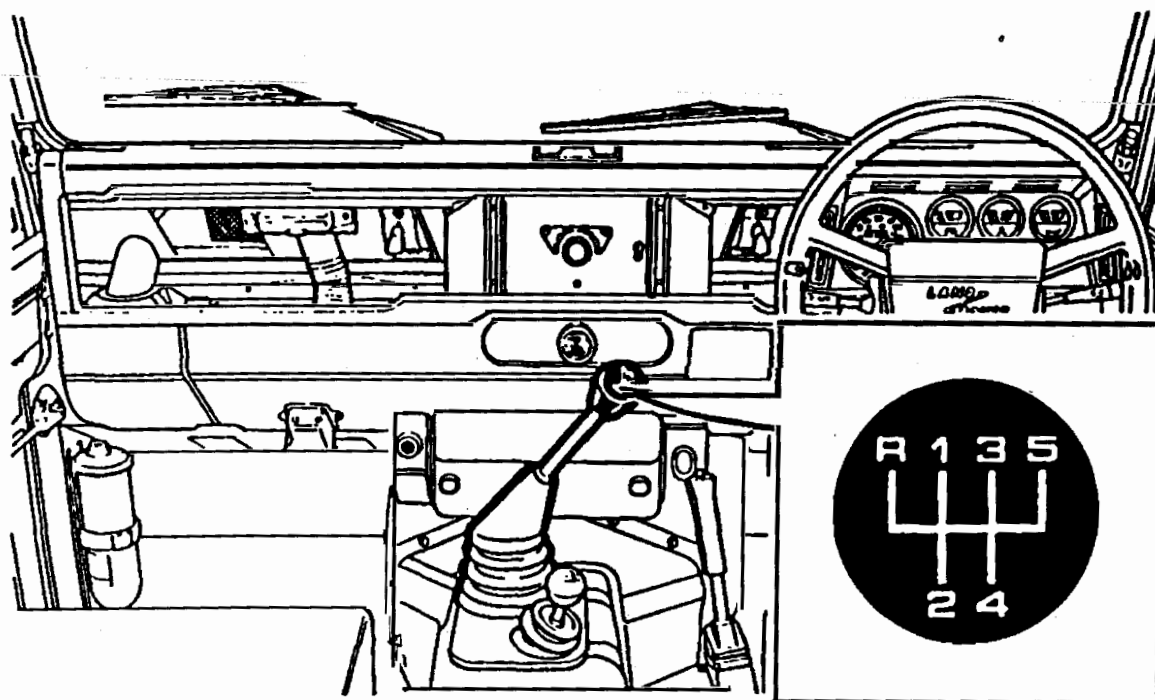


Fig 49 Transfer gear/differential lock lever

19.3 Centre left. The transfer gearbox is in neutral "N" with the differential locked. The

19.6 Fully forward left. The transfer gearbox is in low ratio with the differential locked. The differential lock warning light should be illuminated.

MAIN GEARCHANGE LEVER



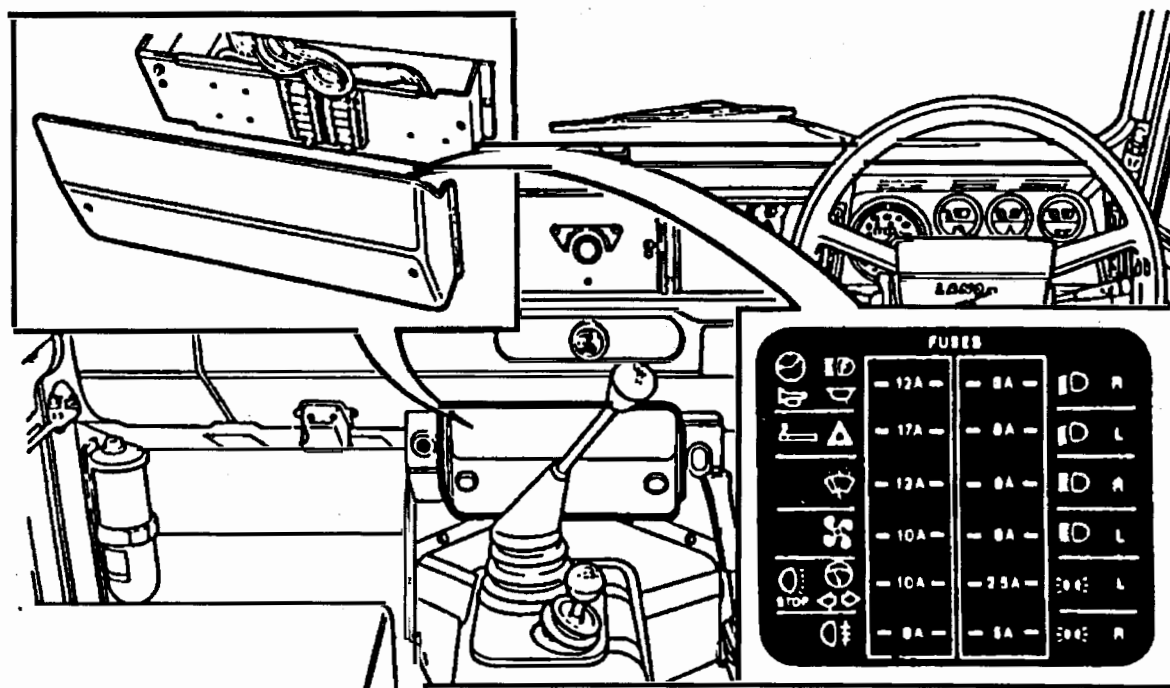
M050

Fig 50 Main gearchange lever

20 The main gearchange lever is located on the gearbox tunnel adjacent to the transfer gear/differential lock lever. The gear positions are indicated on the lever knob. In the neutral position, spring pressure holds the lever opposite the third and fourth speed gear positions so that slight pressure is required on the lever when selecting the first, second or fifth speed gears. When changing from fifth speed, move the lever into the neutral position and allow the spring pressure to align the lever; it can then be moved back into fourth or forward into third gear. To engage reverse, move the lever to the left as far as possible and forwards to engage the gear.

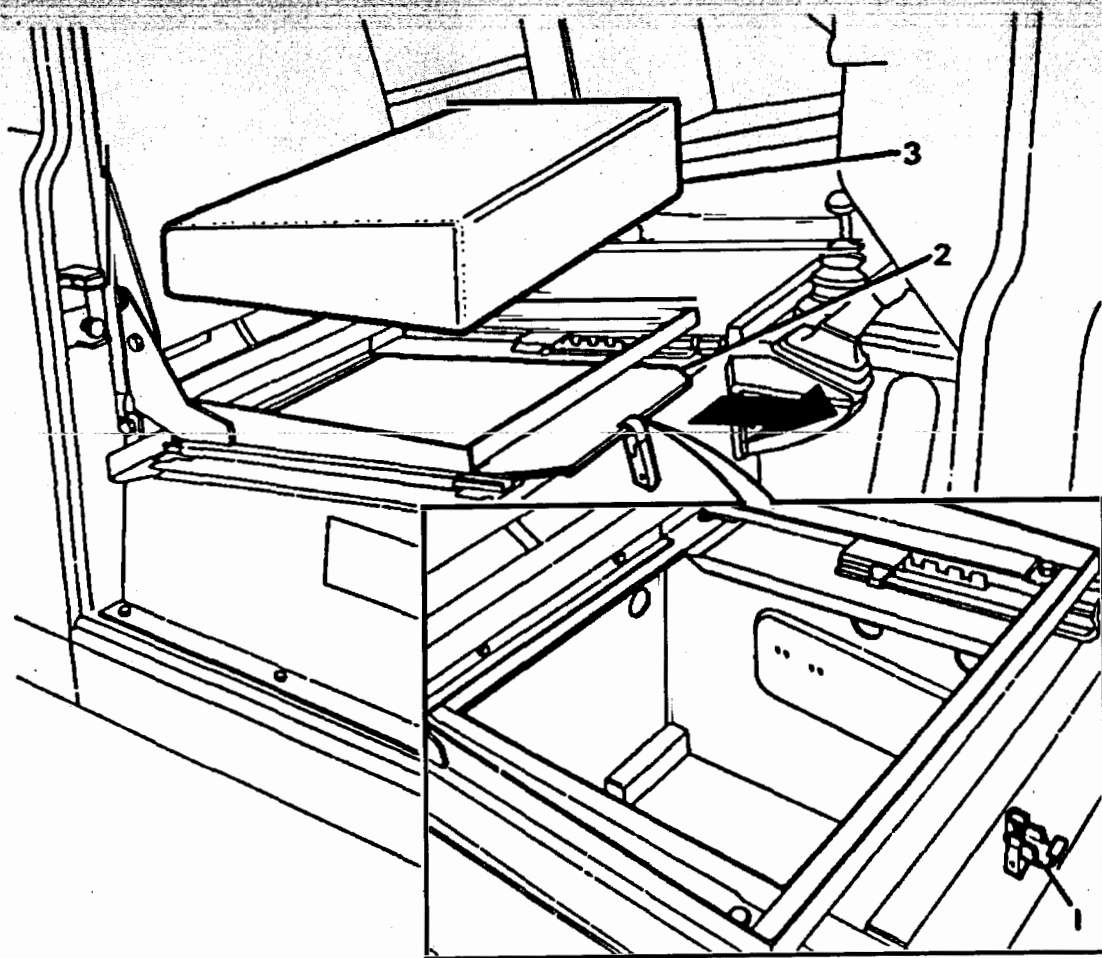
FUSE BOX

21 The fuse box is located in the centre and below the fascia, directly in front of the main gear change lever. The box contains twelve fuses of the following values: 2.5, 5, 8, 10 and 12 amperes.



M051

Fig 51 Fuse box location



M052

Fig 52 Removing the seatbase cover

22.1 To obtain access to either compartment  
proceed as follows:

22.1.1 Lift off the seat cushion (3).

22.1.2 Undo the overcentre catch (1) and slide the cover plate (2) from the seat base.

22.1.3 The stowage compartment is accessible.

22.1.4 Slide the cover back into place and secure using the overcentre catch.

22.5 Replace the seat cushion.

### BENCH SEATS

23 There are two (2 seater) bench type seats located in the rear of the TUL vehicles and there are four (2 seater) bench type seats located in the rear of the TUM vehicles.

23.1 The seat cushions (1) can be stowed in an upright position by means of a strap with a metal hook (2) which fastens to the rear of the seat.

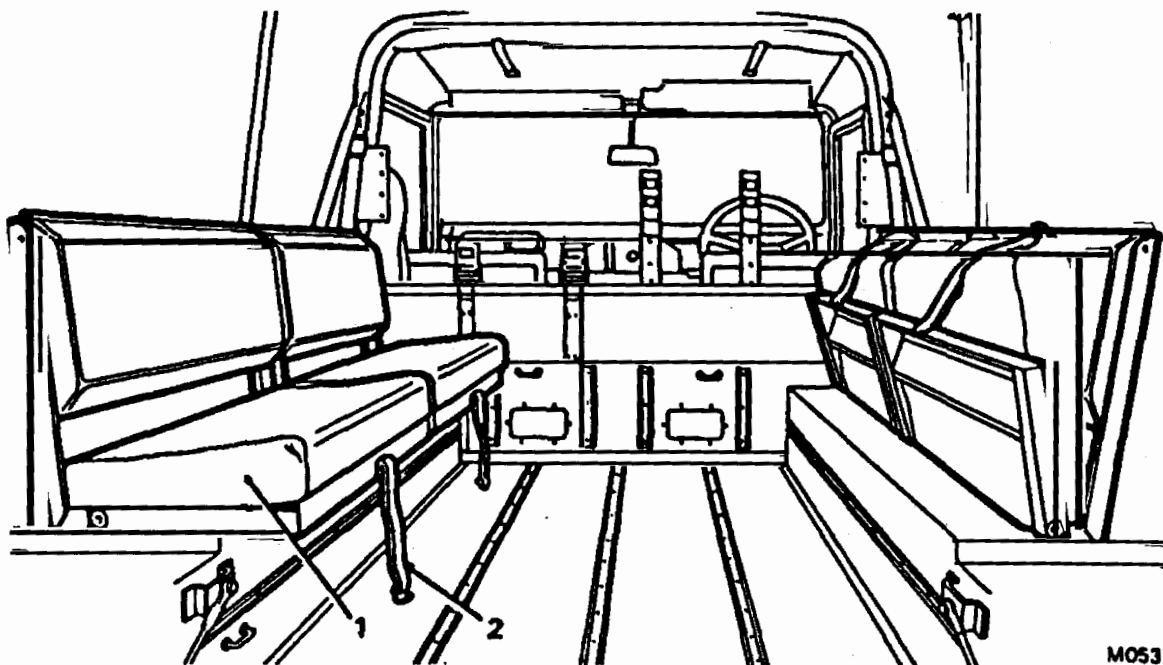


Fig 53 Bench seats

24.2 Move the front part of the window assembly will then allow you to move the rear part of the window forward.

24.3 To lock the window close each part of the window and turn the window lock control in a clockwise direction.

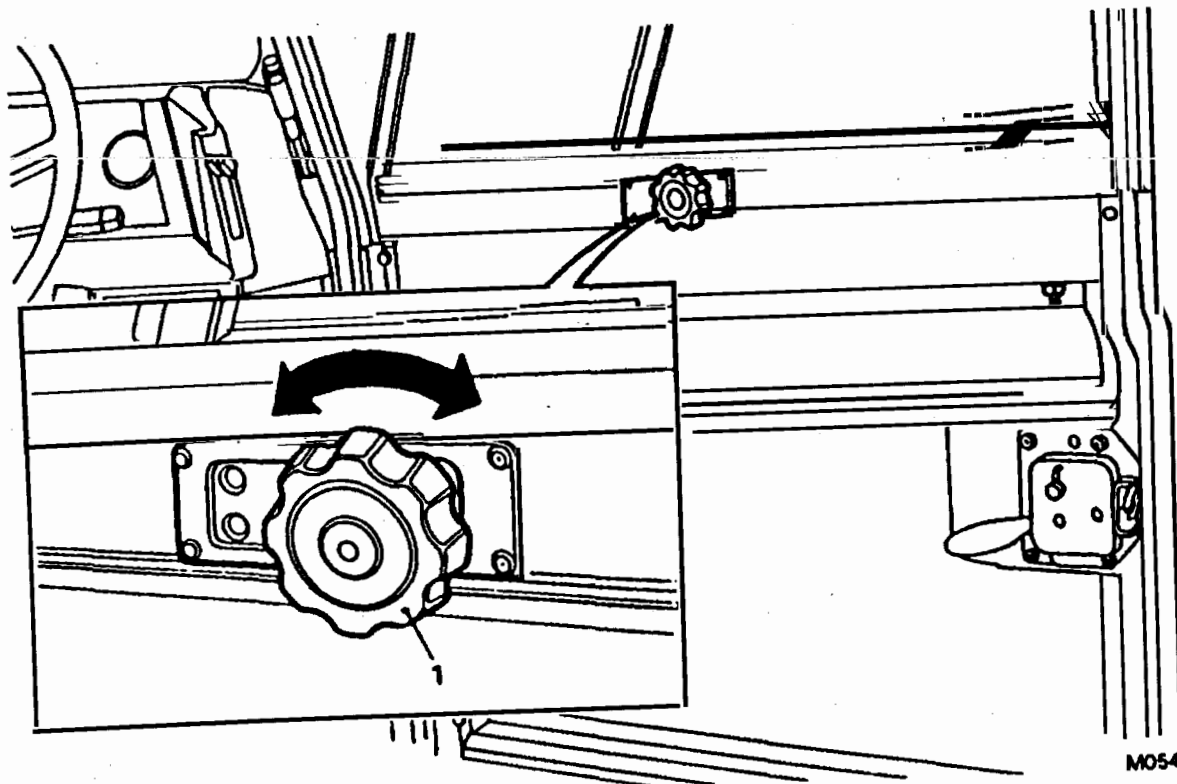


Fig 54 Operating the windows

Chapter 2-2

FITTED FOR RADIO (FFR)

CONTENTS

Para

- 1 INTRODUCTION
- 2 INSTRUMENT PANEL
  - Oil temperature indicator
  - Warning lights panel
  - Battery charging warning light
- 3 AMMETER
- 4 ENGINE HAND THROTTLE
- 5 AUXILIARY TERMINALS
- 6 FAST FUSE
- 7 RADIO AERIAL COAXIAL STOWAGE
- 8 RADIO OPERATOR SEATS
- 9 RADIO TABLE
- 10 RADIO BATTERY STOWAGE BOX

Fig

- 55 Oil temperature indicator
- 56 Ammeter location
- 57 Engine hand throttle
- 58 Auxiliary terminals
- 59 Fast fuse location
- 60 Radio aerial coaxial stowage box
- 61 Radio table and battery stowage box

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- 7

INTRODUCTION

1 This Sub-Chapter describes all the items applicable to the fitted for radio (FFR) TUL and TUM vehicles which have not been covered by Sub-Chapter 2-1.



INSTRUMENT PANEL

2 The instrument panel is covered by Sub-Chapter 2-1 except for the following items:

Oil temperature indicator

2.1 The oil temperature indicator provides a continuous indication of oil temperature. When the engine oil reaches its normal operating temperature, the gauge indicator needle should register in the mid-way area. Should the needle travel to the "H" (hot) block during normal running, the vehicle must be stopped and the cause investigated.

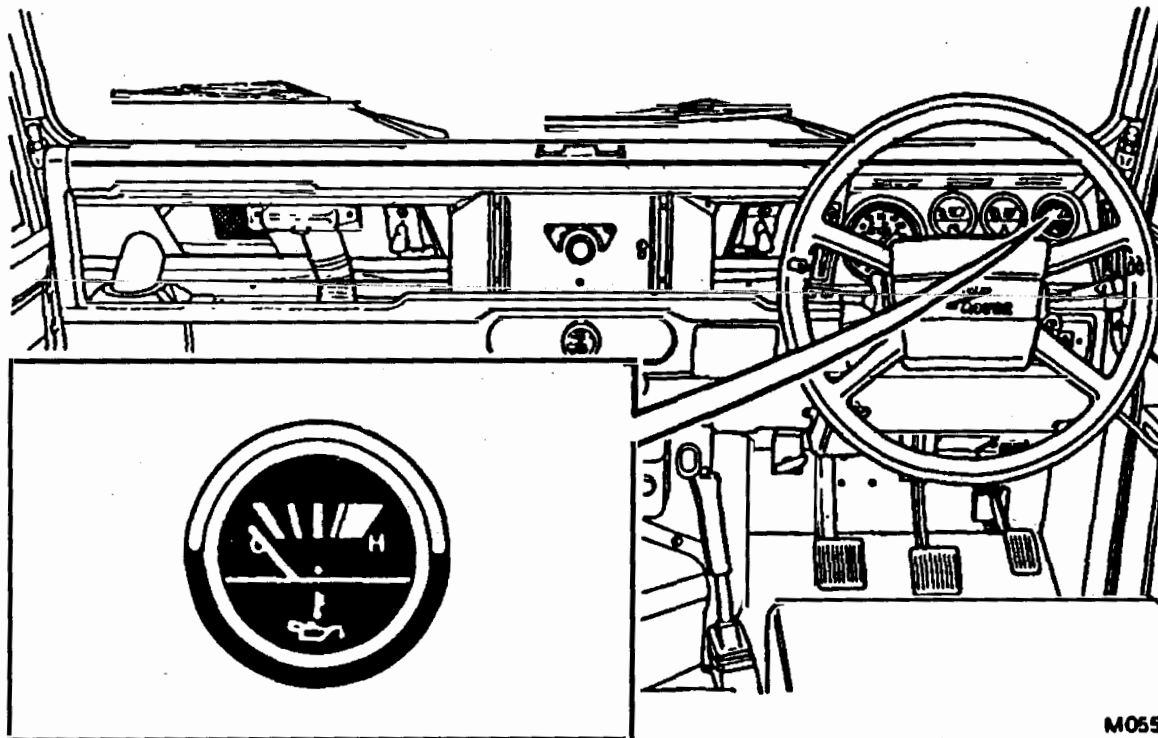


Fig 55 Temperature indicator

Warning lights panel

2.2 The warning lights panel is covered by Sub-Chapter 2-1 except for the following item:

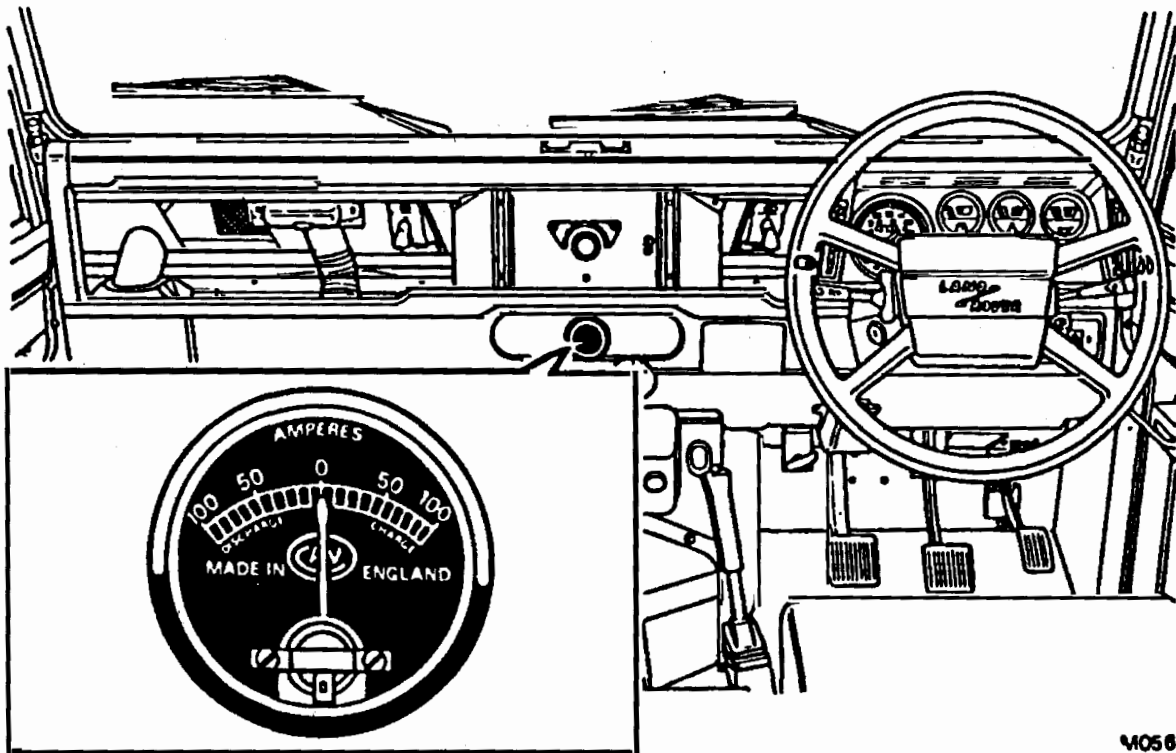


### Battery charging warning light (24V)

2.2.1 The amber battery charging warning light (18) will illuminate when the ninety ampere alternator is not charging the radio batteries. When this occurs stop vehicle and investigate the cause.

### AMMETER

3 The ammeter is located in the centre of the ancillary panel, below the main lighting switch panel. The gauge is graduated and indicates the charge and discharge rates of the radio system batteries.



4056

Fig 56 Ammeter location

### ENGINE HAND THROTTLE

4 The engine hand throttle is located to the left and adjacent to the fuse box. The purpose of the throttle is to over-ride the accelerator pedal linkage when the

vehicle is stationary. To set the throttle, pull out to the required speed and twist to lock into place. Before normal road driving is contemplated, check and ensure that the hand throttle is pushed fully down to the closed position. Do not use the hand throttle while driving the vehicle normally.

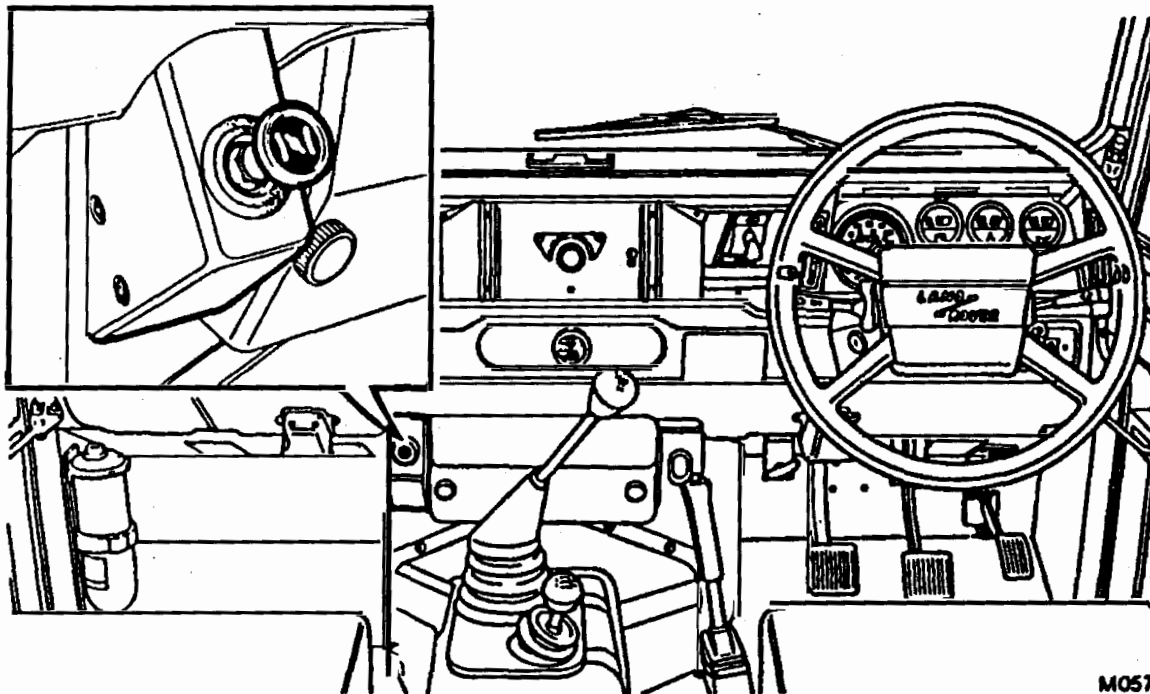


Fig 57 Engine hand throttle

### AUXILIARY TERMINALS

5 The terminal box is attached to the panel behind the left hand seat. Auxiliary terminals are provided for operating 24V equipment while the engine is running. The socket on the left hand side is an alternative to the terminals for carrying a charge to the radio from the batteries stored under the table. It is also used for charging additional radio batteries which are housed in the battery stowage box.

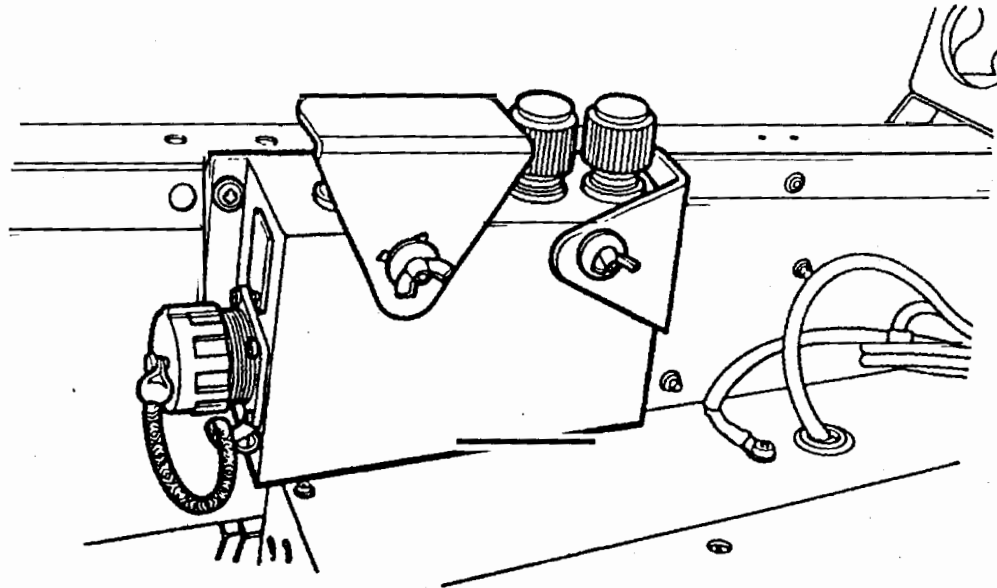


Fig 58 Auxiliary terminals

M058

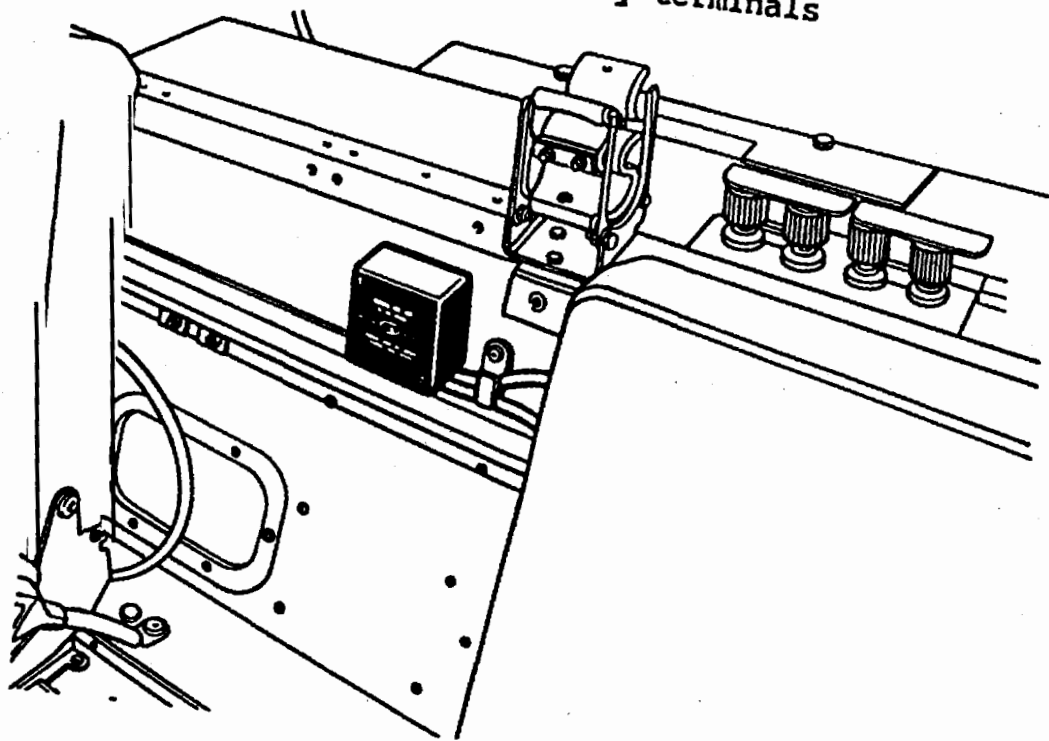


Fig 59 Fast fuse location

M059

Aug 88

FAST FUSE

6 The fast fuse is located to the bulkhead behind the front seats. The fuse protects the generator circuit using a 50 ampere replaceable link. A spare link is also contained within the box. To replace the fuse link see (Chapter 4-2 paragraph 3).

RADIO AERIAL COAXIAL STOWAGE

7 The two radio aerial coaxial stowage compartments are located on the bulkhead behind the seats. They provide a safe and compact storage for the aerial leads (1) when they are not in use.

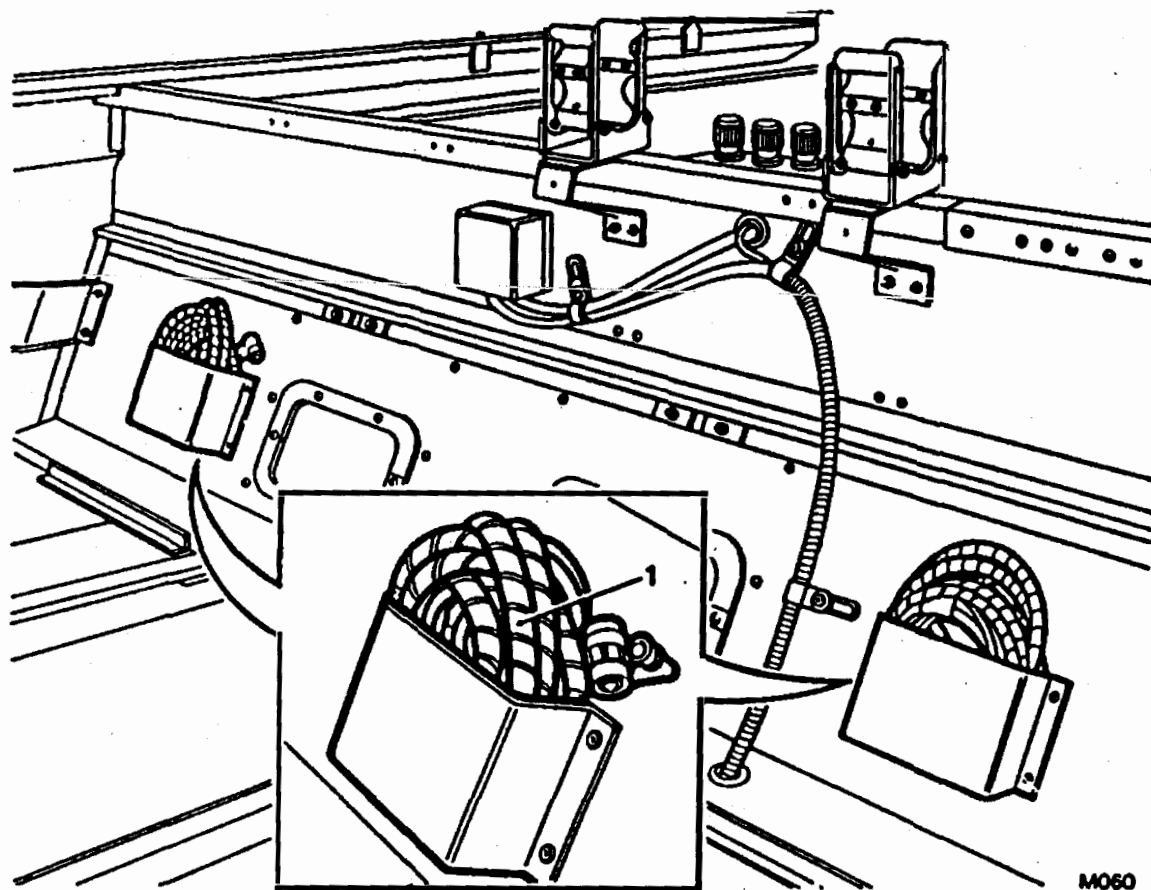


Fig 60 Radio aerial coaxial stowage

RADIO OPERATORS SEATS

8 The two radio operators seats are located into cleats attached to the vehicle. These are situated adjacent to the radio table, therefore giving easy access to the radio.

8.1 To relocate the seat proceed as follows:

8.1.1 Remove the seat from the retaining cleats mounted on the side of the vehicle.

8.1.2 Re-position the seat in either of the five other positions by locating the lugs at the rear of the seat into the cleats.

RADIO TABLE

9 The radio table (1) is located immediately in front of the vehicle bulkhead and supports one or two radio sets. It is supported by and bolted to the radio battery stowage. The table top is earthed by copper braids, (2) bolted to the sides of the vehicle.

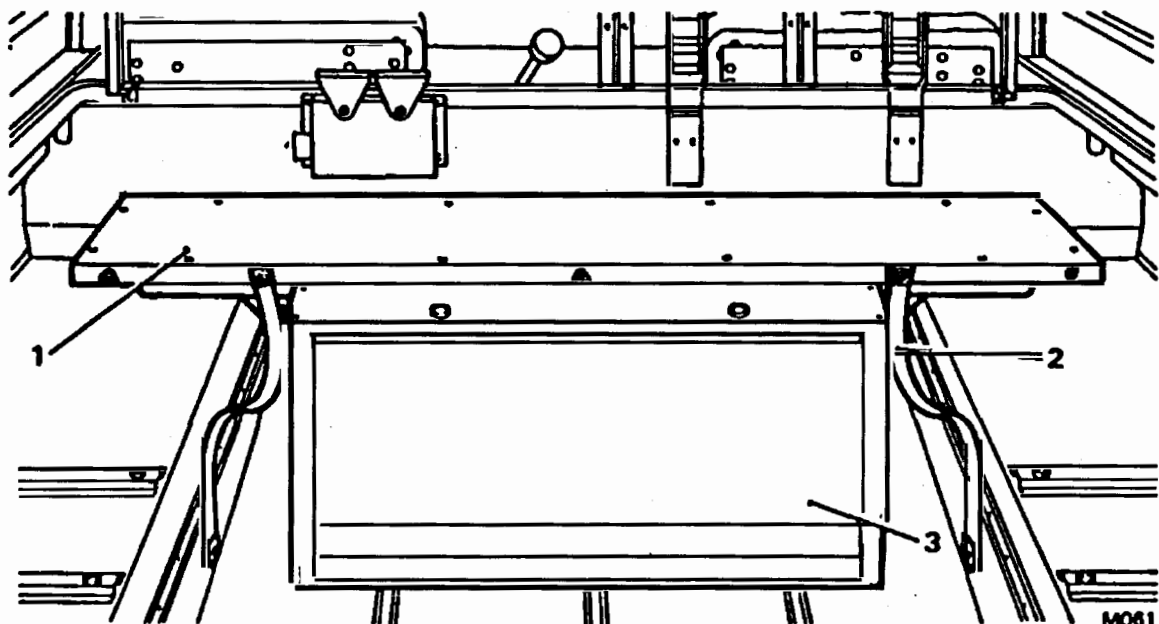


Fig 61 Radio tabl and battery stowage box

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ARMY EQUIPMENT  
SUPPORT PUBLICATION

RADIO BATTERY STOWAGE BOX

10 The battery stowage box (3) is located directly underneath the radio table and contains two battery trays. The trays have the capability of holding two 12 volt 100 amp hour radio batteries each.

Chapter 3

OPERATING INSTRUCTIONS

CONTENTS

Para

- 1 INTRODUCTION
- 2 General

INTRODUCTION

1 This Chapter describes the operating instructions applicable to the Land Rover 90 and 110 variants listed in the following sub-chapters:

- Chapter 3-1 Basic Vehicle
- Chapter 3-2 Fitted For Radio (FFR)

General

2 The information given in this Chapter is applicable to both left and right hand drive vehicles.

Chapter 3-1

BASIC VEHICLE

CONTENTS

Para

- 1 INTRODUCTION
- 2 General
- 3 PRE-START CHECKS
- 4 STARING THE ENGINE
  - Starting a cold engine
  - Starting a warm engine
- 5 TRANSFER GEAR/DIFFERENTIAL LOCK LEVER
  - Operating the transfer/differential lock lever
- 6 FOLDING STAY
- 7 BATTERY (CAUTIONS)
- 8 INSTRUMENTS
- 9 LIGHTS
- 10 ENGINE OIL
- 11 ENGINE COOLING SYSTEM
- 12 WHEELS
  - Tyre wear (WARNING)
  - Tyre pressures
- 13 FUEL
  - Fuel cap (Early models only)
  - Fuel cap (Later models only)
- 14 EXTENDED FILLER NECK
- 15 FLYWHEEL HOUSING WADING PLUG
- 16 JERRY CAN STOWAGE BOX (TUM only)
- 17 FRONT TOWING PINTLE
- 18 CONVOY FLAG HOLDER
- 19 LIFTING/TOWING RINGS
- 20 12-PIN TRAILER SOCKET
- 21 ROTATING TOWING HOOK (WARNING)(CAUTION)



- 22 PICK AND SHOVEL
  - Hard top
  - Soft top
- 23 WINDSCREEN DROP DOWN (Soft top only)
- 24 VEHICLE RECOVERY
  - Towing the vehicle on four wheels
  - Suspended tow on two wheels
- 25 RECOVERING WHEEL GRIP
- 26 TOWING
- 27 TRANSPORTING THE VEHICLE
- 28 DRIVING TECHNIQUES
  - Gear ranges
  - Transfer gear changing (CAUTION)
  - Match engine speed to the gear selected
  - Riding the clutch
  - Braking
  - Engine braking
  - Rough rocky tracks (WARNING)
  - Wading
    - After being in water (CAUTION)
    - Driving on soft sand
    - Descending steep slopes
    - Ground clearance
    - Rutted and existing wheel tracks
    - Ice and snow
    - Negotiating a "V" shaped gully
    - Crossing ridges and ditches
      - Crossing over a ridge
      - Crossing a ditch
    - Traversing slopes
    - Climbing steep slopes
    - Driving in soft dry sand

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## INTRODUCTION

1 This Sub-Chapter gives a general description for all common items related to the Land Rover 90 and 110 Truck Utility Light (TUL) and Truck Utility Medium (TUM) vehicles.

### General

2 Before operating the vehicle, the operator must be acquainted with the operating instructions given in the subsequent paragraphs.

### PRE-START CHECKS

3 Before starting the vehicle check the vehicle as described in the MT Driver's Handbook (JSP 351 Part 1) (Cat 601 table 4) and paragraphs 8,9,10,11,12 and 13 in this Sub-Chapter.

STARTING THE ENGINECAUTION ...

The use of ether in any form must not be used to start the engine, as the very high cylinder pressures that are developed under these conditions can lead to serious and expensive mechanical failure.

4 When starting the engine, do not operate the accelerator pedal during the engine starting procedure. The vehicle diesel engine will start satisfactorily, with the proper use of the heater plugs down to temperatures of  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) even with the battery at only 70% charged, provided that the correct grade of oil has been used. Use the heater plug position when starting from cold, for example, with a cold engine and an air temperature of  $0^{\circ}\text{C}$  ( $32^{\circ}\text{F}$ ) the key should be held in the heater plug position for 10 to 15 seconds. The time required for any set of circumstances will be found with experience. An amber warning light will illuminate when the engine starter key is turned to the "heater plug" position.

Starting a cold engine

4.1 When starting a cold engine do not operate the accelerator pedal during the engine starting procedure. Turn the starter key and hold it in the heater plug position for 10 to 15 seconds, then turn the key further against spring pressure to start the engine, then release the key immediately the engine starts.

Starting a warm engine

4.2 When starting a warm engine do not operate the accelerator pedal during the engine starting

procedure. Turn the key to the engine start position and release immediately the engine starts.

### TRANSFER GEAR/DIFFERENTIAL LOCK LEVER

5 The transfer gear/differential lock lever is positioned forward of the main gear change lever. The correct method of operating the transfer gearbox is as follows:

#### Operating the transfer/differential lock lever

5.1 The correct method of transfer gear changing is described as follows:

5.1.1 Depress the clutch pedal and push the lever fully forward, release the clutch.

5.1.2 Should there be any problem in changing gear do not force the lever.

5.1.3 With the engine running, engage a main gear and release the clutch momentarily, then return the main gear lever to neutral and try the transfer gear lever again.

5.1.4 Changes from low "L" to high "H" can easily be made without stopping the vehicle as follows:

5.1.4.1 Depress the clutch pedal and release the accelerator pedal as for normal gear change.

5.1.4.2 Release the clutch pedal for three seconds then depress the clutch again and move the transfer lever firmly into the high "H" position.

5.1.4.3 Move the main gear lever to second gear and release the clutch pedal while depressing the accelerator to take up the drive smoothly.

5.1.4.4 As the vehicle accelerates, change gear in the main gearbox in the normal way.

Note ...

This operation can be carried out smoothly and quickly after a little practice.

5.2 The correct method of differential lock gear changing is described as follows:

5.2.1 The vehicle has a permanent four-wheel drive and a third differential fitted in the transfer gearbox between the drives to front and rear axles.

5.2.2 The third differential allows a high degree of mobility in off road use.

5.2.3 In conditions requiring maximum traction to both axles, the gearbox differential unit can be locked so that both output shafts rotate at the same speed.

5.2.4 The differential is controlled through the combined transfer/differential lock lever described earlier.

5.2.5 The control can be operated while the vehicle is travelling without wheel slip and in a straight line, or while it is stationary. The differential should be locked for slippery or doubtful surface conditions.

5.2.6 If the warning light remains on, this indicates that the transmission is "wound-up". The vehicle must be stopped and reversed for a few metres to "unwind" the transmission; the warning light will then be extinguished and the vehicle can proceed.

5.2.7 Under certain conditions a slight delay may be experienced before the differential becomes locked, with subsequent warning light illumination.

Notes ...

- (1) This delay is a built-in safety precaution and ensures that gears are correctly aligned before differential locking commences.
- (2) To avoid unnecessary wear and possible damage to the transmission and final drive, it is important that wide throttle openings are not used when the vehicle is operating in first and second gear low range with the differential locked. A return to the unlocked position must be made as soon as traction is regained.
- (3) The differential lock is a spring engage/disengage action. The warning light sensor is fitted in the gearbox. Some delay may occur whilst the vehicle is stationary.

### FOLDING STAY

6 The folding support stay (1) is located to the right hand side of the engine compartment. To open the bonnet refer to Bonnet release handle (Chapter 2-1 paragraph 16).

6.1 To retain the bonnet in the upright position proceed as follows:

6.1.1' Release the safety catch (2) then lift the bonnet up and pull the support stay forward.

6.1.2 Ensure that the support is properly locked before releasing the bonnet.

6.2 To close the bonnet proceed as follows:

6.2.1 Hold the bonnet open and push the support back and gently lower the bonnet.

6.2.2 Finally, push the bonnet down firmly until it locks. Do not allow the bonnet to drop from the fully open position.

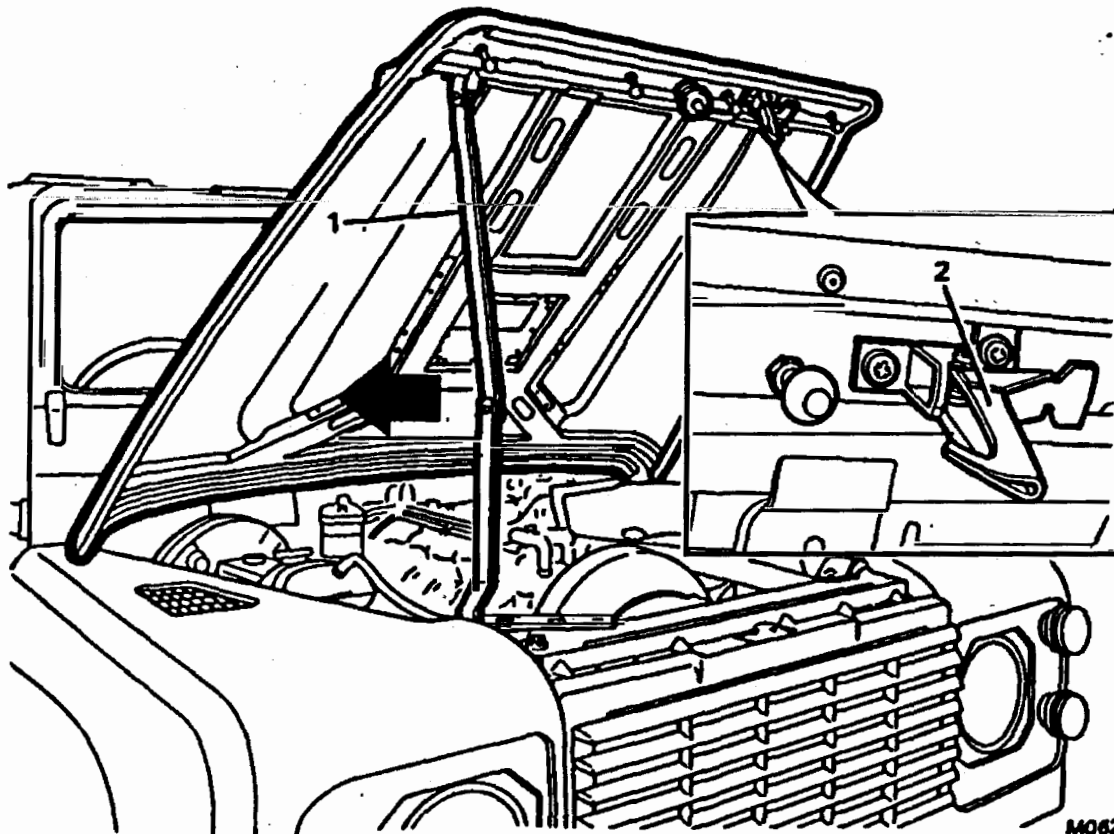


Fig 62 Folding stay operation

BATTERY

CAUTIONS ...

- (1) Do not let the engine run with the battery disconnected.
- (2) Do not use a high-speed battery charger as a starting aid. When using a charger to charge the battery, it must be disconnected from the rest of the vehicle's electrical system.
- (3) When installing, ensure that the battery is connected in correct polarity.
- (4) The battery must be disconnected before carrying out any electrical welding on the vehicle.
- (5) If a new battery is fitted to the vehicle, it should be the same type as the original battery. Alternatives may vary in size and terminal positions and this could lead to a possible fire hazard if the terminals or leads come in contact with the battery clamp assembly. When fitting a new battery ensure that the terminals and leads are well clear of the battery clamp assembly.

7 The air portable battery is located in a covered well underneath the left-hand seat. It is of a low maintenance type requiring levels to be checked dependant on the climatic conditions. The electrolyte level should be checked from one year (hot climates) to three years (temperate climates). To check if maintenance is required refer to (Chapter 4-1 paragraph 16).

INSTRUMENTS

8 When the engine is running check that the following instruments and warning lights operate correctly.



- 8.1 Oil pressure warning light is extinguished.
- 8.2 Cold start warning light is extinguished.
- 8.3 Engine start warning light is extinguished.
- 8.4 Fuel level indicator is operating.
- 8.5 Coolant temperature indicator is operating.
- 8.6 All relevant warning lights are operable, that is, the side lights, turn lights, main beam, rear fog lights and differential lock.

#### LIGHTS

9 Check the operation of all exterior lights and renew any that are defective before taking the vehicle on to the road (Chapter 4-1 paragraph 2).

#### ENGINE OIL

10 Check the engine oil level using the dipstick. The dipstick is located to the left-hand side of the engine. Top up as described (Chapter 4-1 paragraph 11) with the specified oil (Cat 601 Table 2).

#### ENGINE COOLING SYSTEM

11 Check the engine cooling system as described in Chapter 4-1 paragraph 23) and top up as necessary.

#### WHEELS

12 Check the tyres for correct pressures (Cat 601 Table 3), also for wear, chafing and imbedded foreign bodies.

Tyre wear

WARNING ...

**DO NOT USE TYRES WITH EXCESSIVELY WORN TREADS. TYRE WEAR SHOULD BE CHECKED AT EVERY MAINTENANCE INSPECTION (STANDING ORDERS FOR DRIVERS, JSP 341 PART IV, SECTION 3 CHAP 10 ANNEX A)**

**12.1 Check tyres for tread depth and visually for external cuts in the fabric, exposure of ply or cord structure.**

**12.1.1 Most tyres fitted to the vehicle are fitted as original equipment which include wear indicators in their tread pattern. When the tread has worn to a remaining depth of 1.6 mm (0.06 in.) the indicators appear at the surface as bars which connect the tread pattern across the full width of the tyre.**

**12.1.2 When the indicators appear in two or more adjacent grooves, at three locations around the tyre, a new tyre should be fitted.**

**12.1.3 If the tyres do not have wear indicators, the tread should be measured daily (Standing Orders for Drivers, JSP 341 Part IV, Section 3 Chap 10 Annex A) if the tread has worn to a depth of 1.6 mm (0.06 in.), new tyres should be fitted. Do not continue to use tyres that have worn to the recommended limit or the safety of the vehicle could be affected and legal regulations governing tread depth may be broken.**

Tyre pressures

**12.2 Tyre pressure should be checked daily, (Standing Orders for Drivers, JSP 341 Part IV, Section 3 Chap 10 Annex A). To check the tyre pressures proceed as follows:**

12.2.1 Whenever possible check with the tyres cold as the pressure is about 0.14 bar (1.42 lbf/in<sup>2</sup>) higher at running temperature.

12.2.1 Always replace the valve caps as they form a positive seal on the valves.

12.2.3 Any unusual pressure loss in excess of 0.21 bar (2.84 lbf/in<sup>2</sup>) per week should be investigated and corrected.

12.2.4 Always check the spare wheel so that it is ready for use at anytime.

12.2.5 At the same time remove embedded flints, etc from the tyre treads with the aid of a penknife or similar tool and check that the tyres have no breaks in the fabric or cuts to sidewall, etc. Clean off any oil or grease on the tyres using white spirit sparingly.

12.2.6 Check that there are no lumps or bulges in the tyres or exposure of the ply or cord structure.

12.2.7 'Butyl' synthetic inner tubes must be fitted to ensure inflation integrity at all times and all repairs must be vulcanised.

12.2.8 Maximum tyre life and performance will only be obtained if the tyres are maintained at the correct pressure.

## FUEL

13 Check the fuel level using the fuel level indicator and if low, refill with the correct fuel. The fuel cap is located on the right hand side of the vehicle.

Fuel cap (Early models only)

13.1 The fuel cap is secured by a clasp and padlock on the TUM vehicles (early models) only. To release the cap proceed as follows:

13.1.1 Unlock the padlock (1) and remove from the clasp.

13.1.2 Lift back the two parts of the clasp (2) which will allow access to the fuel cap.

13.1.3 Turn the cap (3) in an anti-clockwise direction to release.

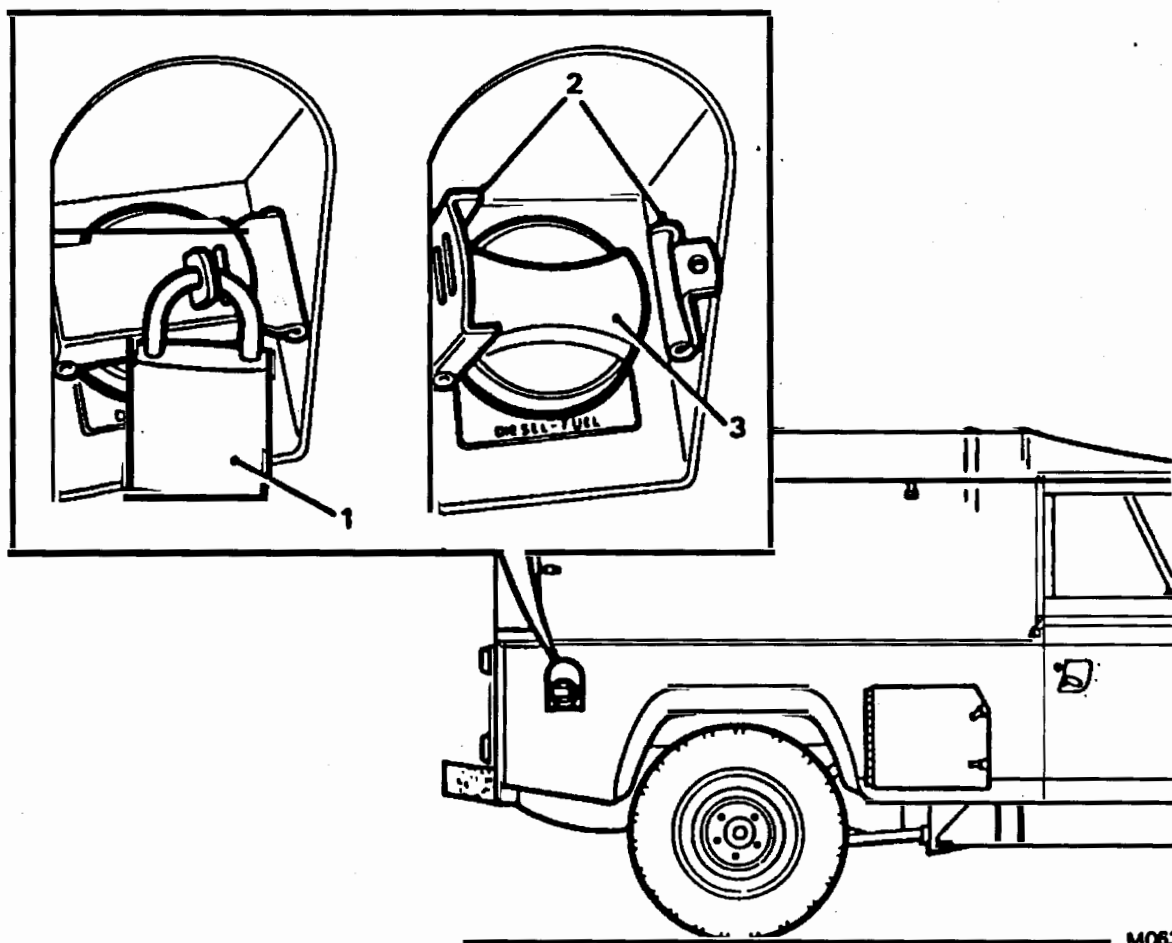


Fig 63 Fuel cap (Early models)

Fuel cap (Later models only)

13.2 The fuel cap is secured by a lock located in the centre of the filler cap on both TUL and TUM vehicles (later models). To release the cap proceed as follows:

13.2.1 Insert the key into the lock (1) and turn in an anti-clockwise direction.

13.2.2 Turn the cap (2) in an anti-clockwise direction and remove.

13.2.3 To replace the fuel cap, turn in a clockwise direction.

13.2.4 To lock the cap, insert the key into the lock and turn in a clockwise direction.

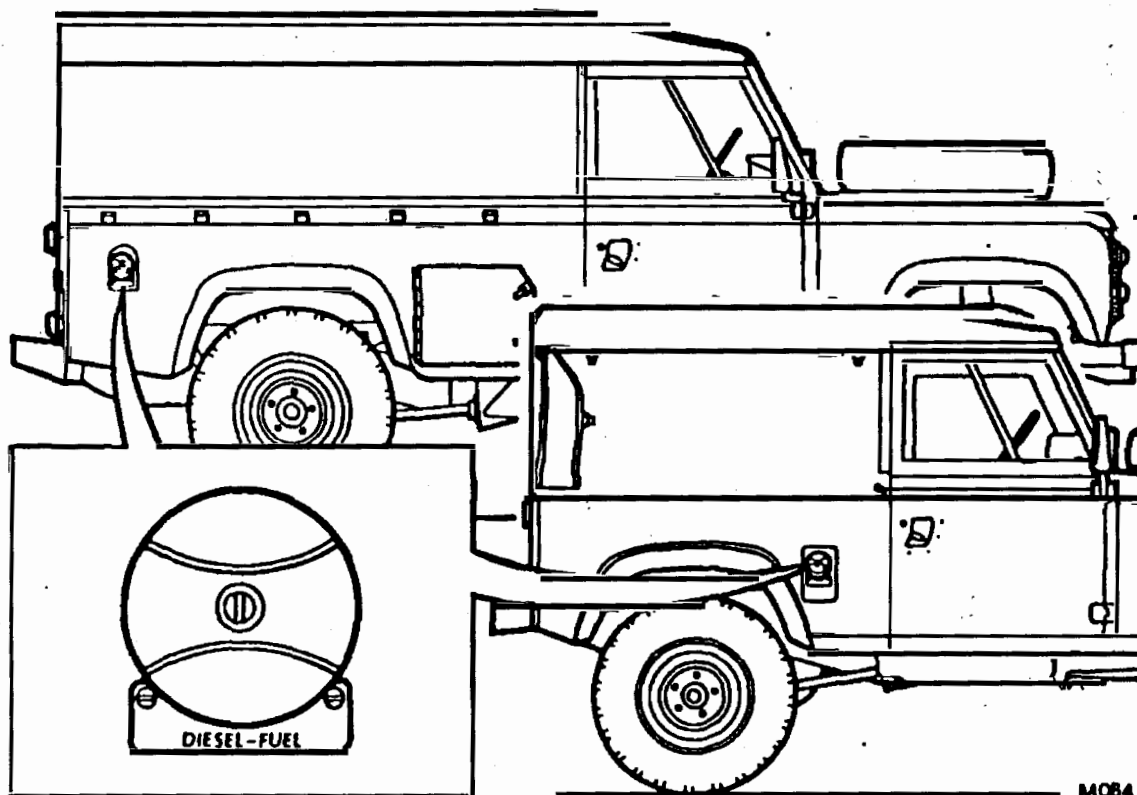


Fig 64 Fuel cap (Later models)

EXTENDED FILLER NECK

14 The vehicle is fitted with an extended filler neck for ease of filling when using a jerry can. To use the filler neck proceed as follows:

14.1 Open the filler cap as described in paragraphs (13.1) and (13.2) to gain access to the filler neck.

14.2 Pull the inner filler neck outwards to its fullest extent and rotate slightly, this locks the neck in place.

14.3 To remove the filler neck for cleaning purposes pull the neck out, rotate and then pull again, this releases the filler neck.

14.4 Clean the filter gauze at the base of the filler neck; once clean replace the filler neck into the main neck of the fuel tank.

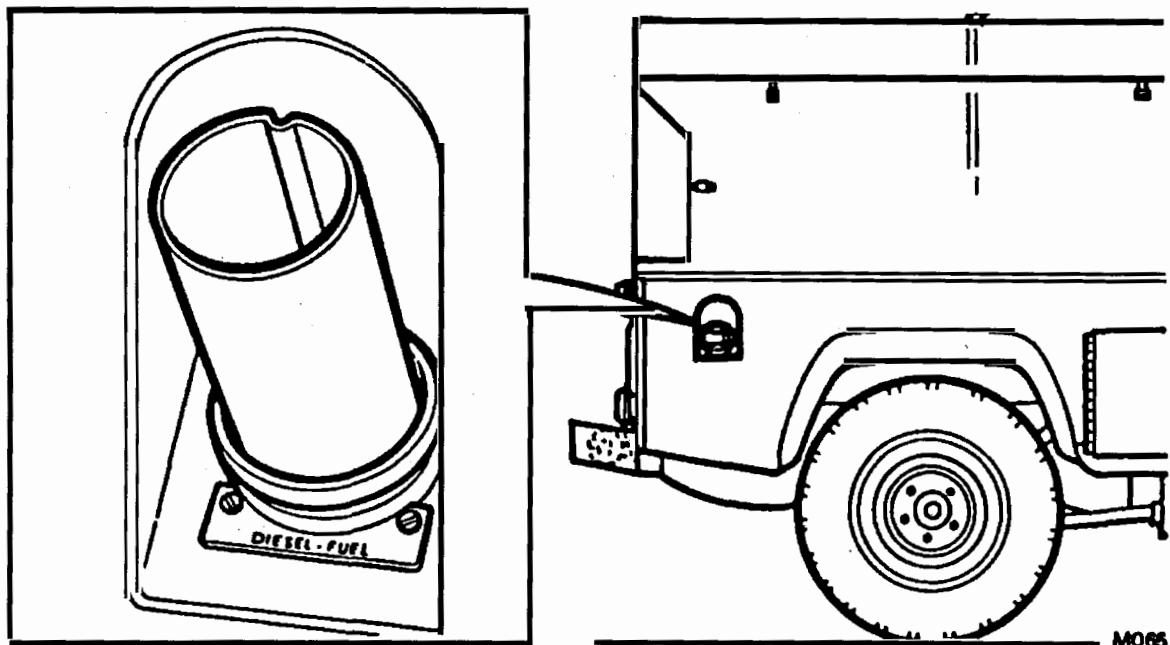


Fig 65 Extended filler neck

FLYWHEEL HOUSING WADING PLUG

15 By fitting a plug in the drain hole at the bottom of the housing, the flywheel housing can be completely sealed to prevent the ingress of mud and water when in wading conditions.

15.1 The plug (1) should only be fitted when the vehicle is expected to do wading or very muddy work.

15.2 When the plug is in use it must be removed periodically and all oil allowed to drain out before it is replaced.

15.3 When the plug is not in use it should be stowed away.

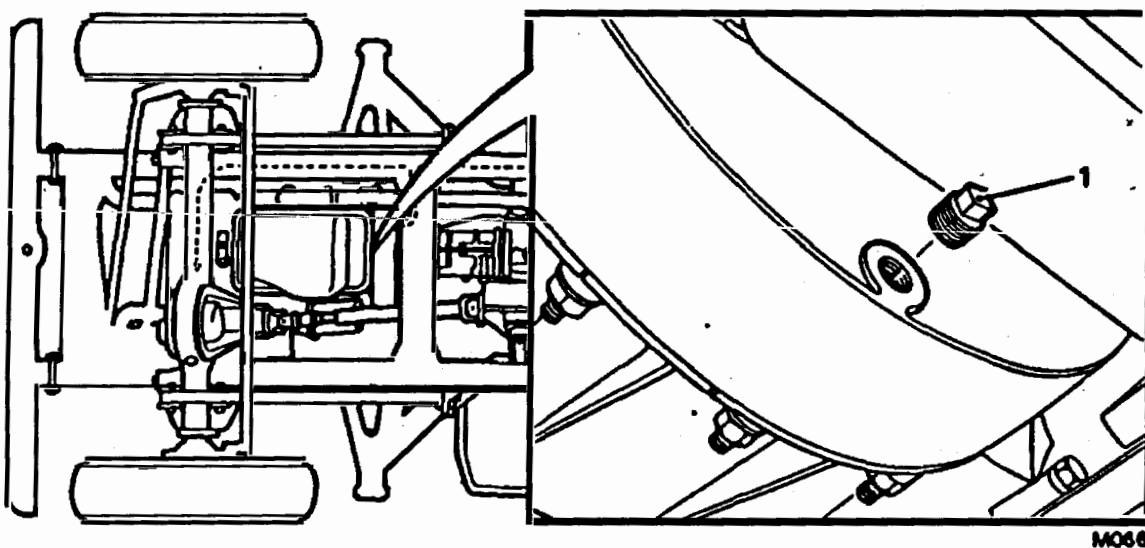


Fig 66 Flywheel housing wading plug

JERRY CAN STOWAGE (TUM only)

16 There are two stowage facilities, (1) one on either side of the vehicle. These are provided for the stowage of two jerry cans on each side.

16.1 Access is gained by releasing the two over-centre catches (2) securing the compartment door. A padlock facility is provided for security.

16.2 A warning label is fixed to the inside of the right hand compartment door to inform personnel that the compartment is for jerry cans only.

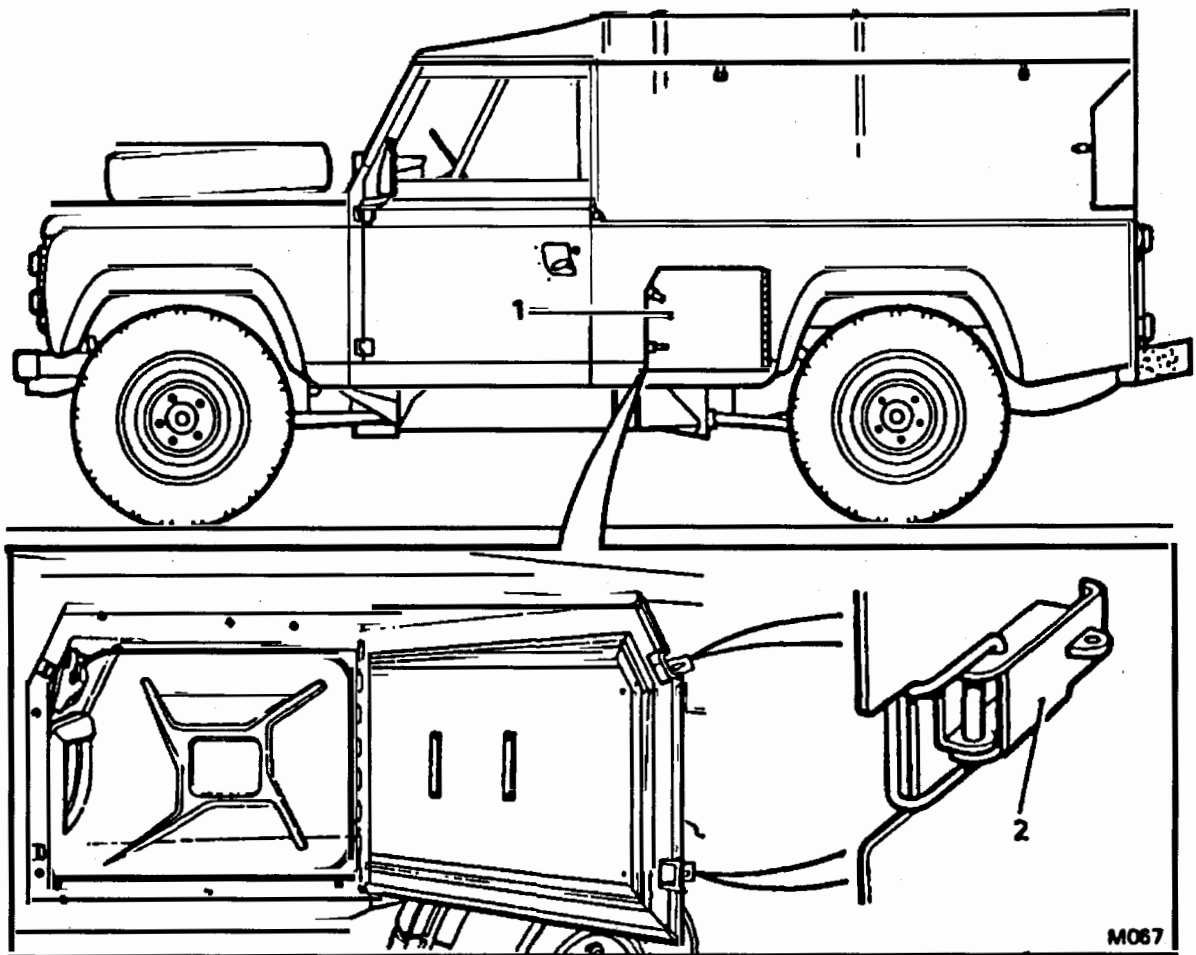


Fig 67 Jerry can stowage

### FRONT TOWING PINTLE

17 The front towing pintle is integral with the front bumper.

17.1 To use the towing pintle proceed as follows:



17.1.1 Remove the circular retaining pin (2) to release the pintle.

17.1.2 Lift the pintle (1) to provide access to the recess in the bumper.

17.1.3 Replace the pintle and then fit the retaining pin to lock it into position.

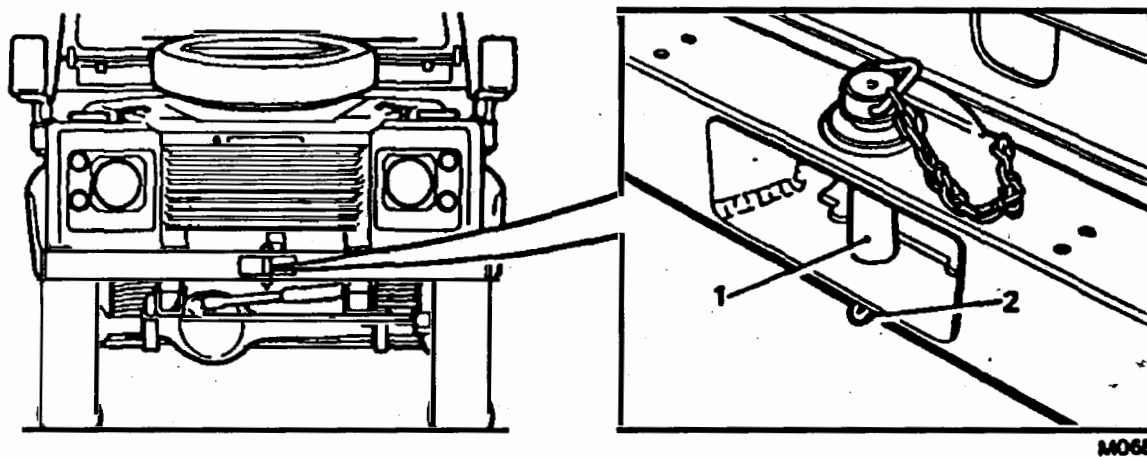


Fig 68 Front towing pintle

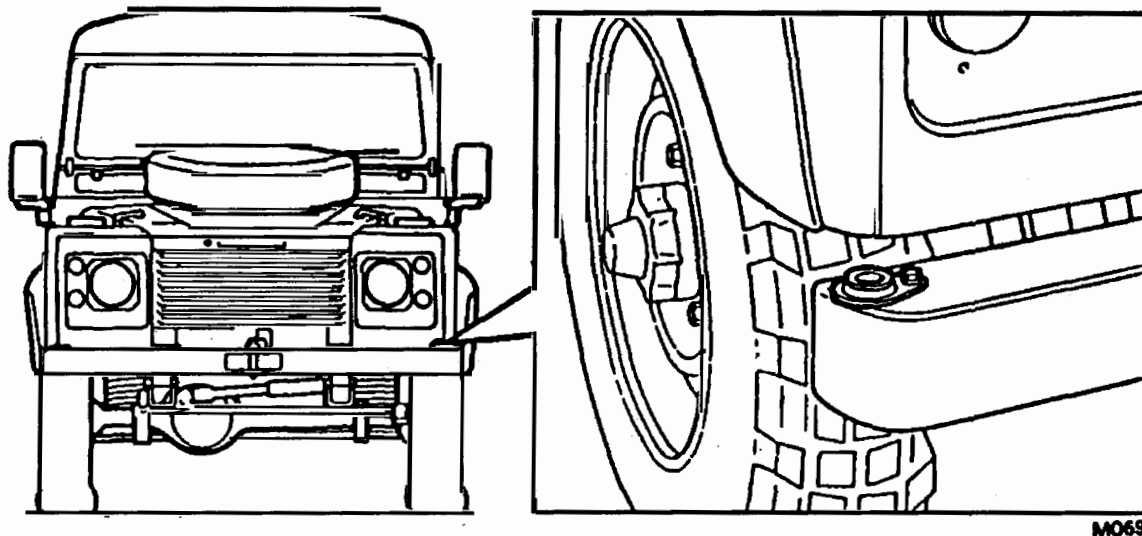


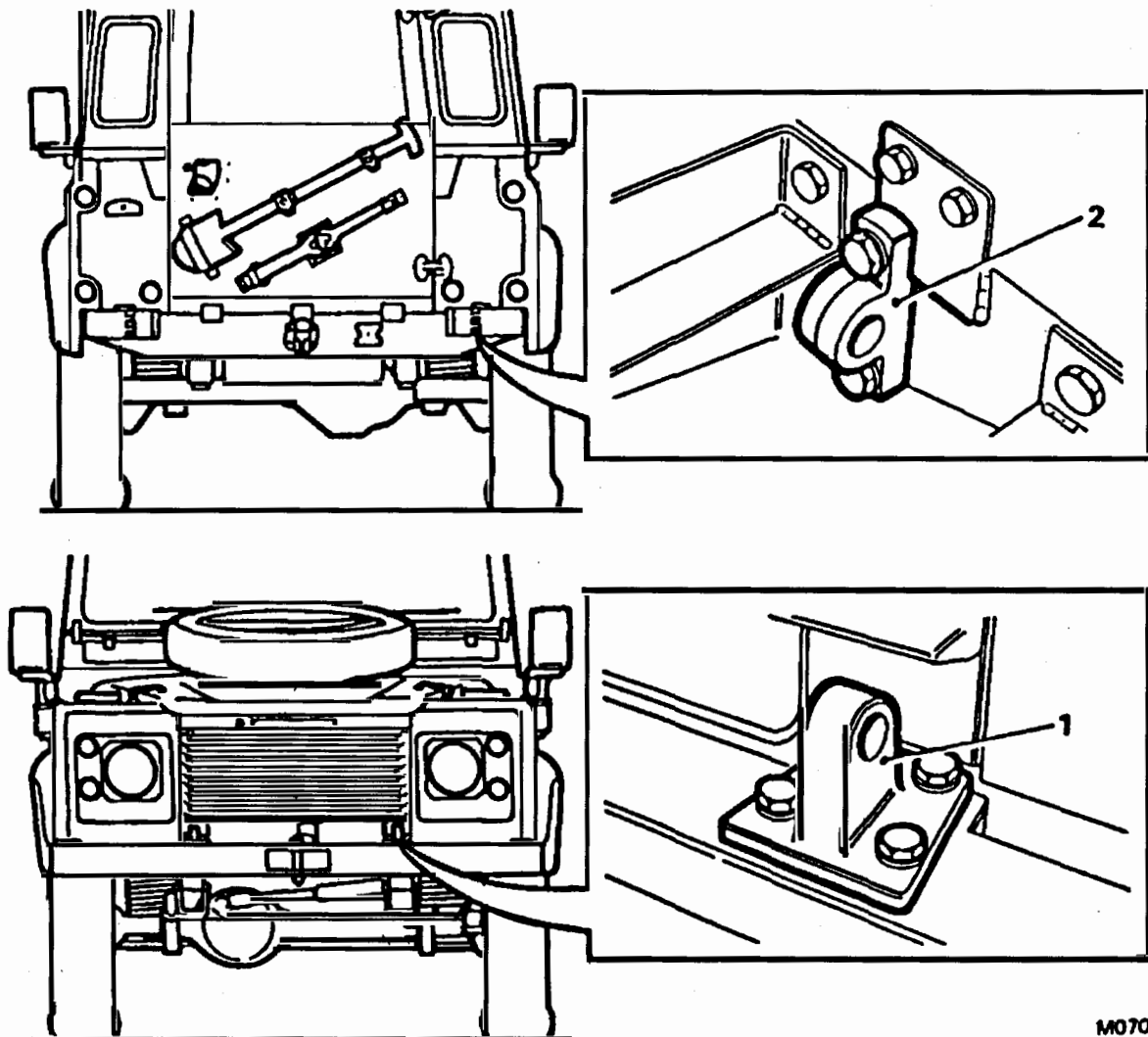
Fig 69 Convoy flag holder

CONVOY FLAG HOLDER

18 This is located to the driver's side of the front bumper for the purpose of holding a flag. This may be repositioned to the passenger's side when required.

LIFTING/TOWING RINGS

19 The lifting/towing rings are located on top of the front bumper (1) and are bolted to the chassis members, also on the inside of the rear bumperettes, (2) fixed to the rear chassis frame.



M070

Fig 70 Lifting/towing rings

12-PIN TRAILER SOCKET

20 The trailer socket is located to the right of the rotating towing hook at the rear of the vehicle. When not in use, this socket is protected by a spring loaded cover.

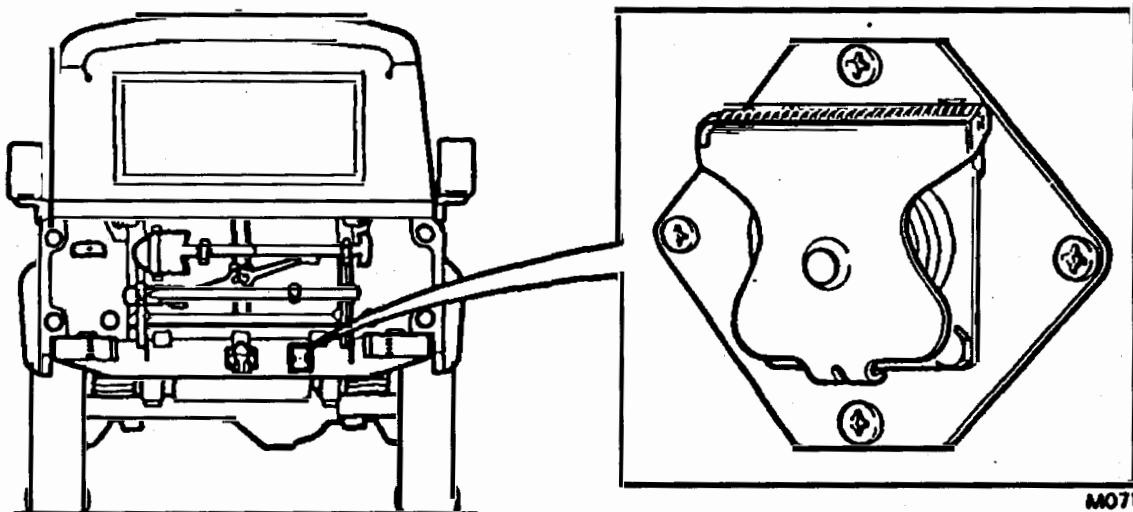


Fig 71 Trailer socket location

20.1 To use the socket, lift the cover (1) and insert the trailer plug pushing it fully home and the lip of the cover locates in the slot in the plug case.

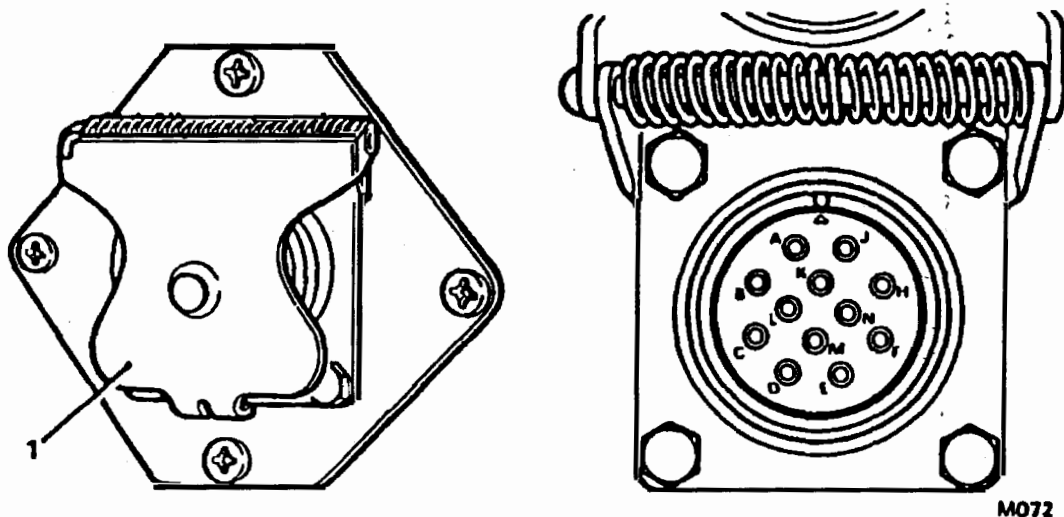


Fig 72 Trailer socket operation

ROTATING TOWING HOOK

WARNING ...

WHEN THE TOWING HOOK IS IN USE, THE JAW MUST ALWAYS BE LOCKED TO PREVENT THE RING OF THE TOWING BAR OR CHAIN FROM JUMPING OUT WHEN TRAVERSING ROUGH TERRAIN OR ENCOUNTERING SUDDEN DIPS IN THE ROAD.

CAUTION ...

Before use check that the towing pintle is clean, well lubricated and in good condition.

21 The towing hook is located on the rear cross member.

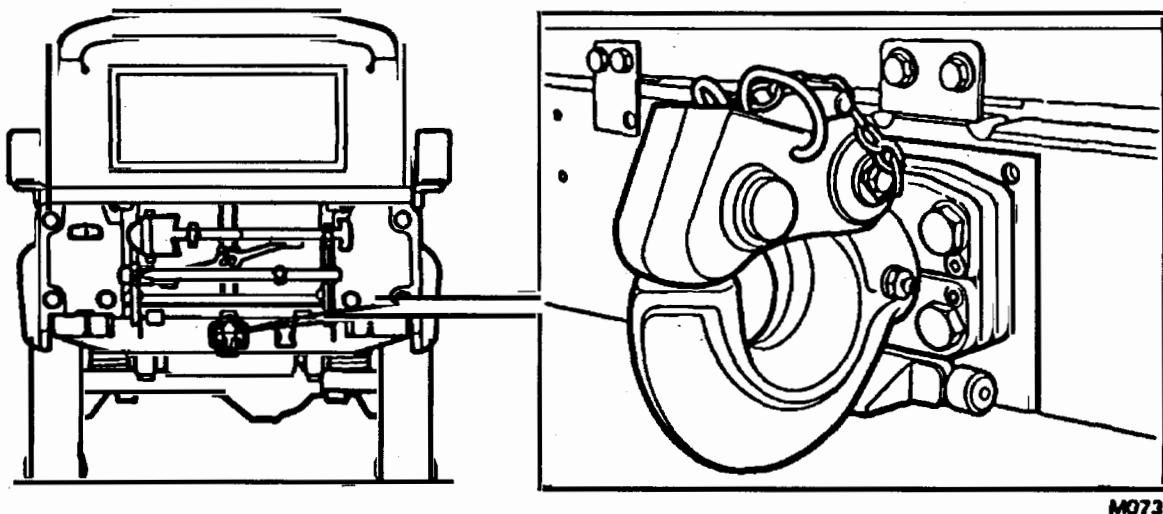


Fig 73 Rotating towing hook location

21.1 To use the towing hook proceed as follows:

21.1.1 Remove the locking pin (2) securing the jaw (1).

21.1.2 Withdraw the pin and then lift the jaw to open the hook (5).

21.1.3 To secure the jaw insert the locking pin.

21.1.4 To rotate the jaw, remove the spring clip (6) retaining the anti-rotation pin (4).

21.1.5 Withdraw the pin and lower the locking plate, (7) the jaw will now rotate to the left or right.

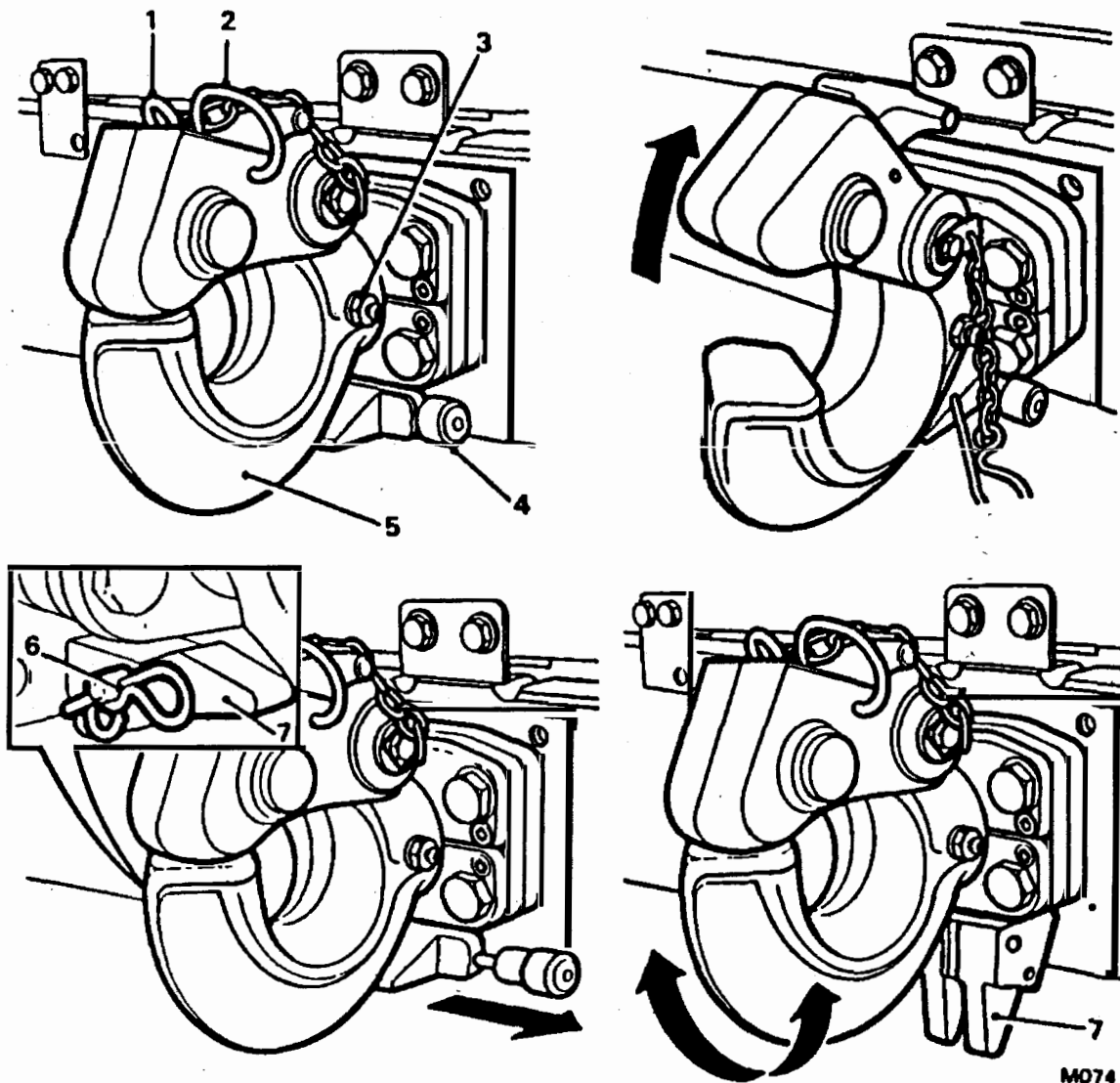


Fig 74 Rotating towing hook operation

21.1.6 To lock the jaw, place the locking plate into position and insert the anti-rotation pin and secure with the spring clip.

21.1.7 Always after use, especially when the hook has been used in extreme conditions, clean and oil all moving parts internally and externally.

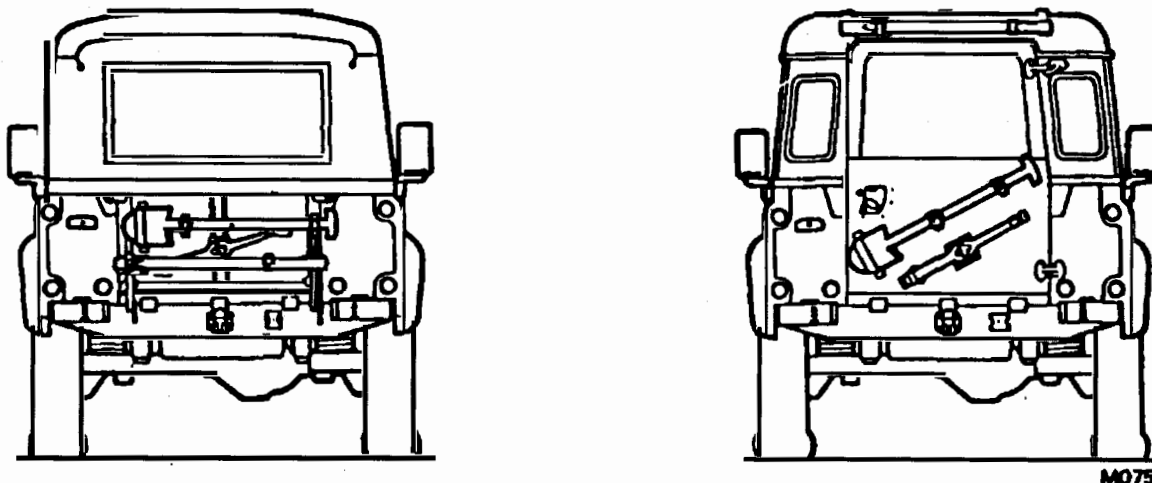
21.1.8 Lubricate the towing hook using the specified grease (Cat 601 table 5) through the grease nipple (3).

### PICK AND SHOVEL STOWAGE

22 The pick and shovel stowage is located at the rear of the vehicle.

#### 22.1 Hard top only

22.1.1 Mounted on the outside of the vehicle above and on the door, webbing straps which provide for the stowage of a pick head and shovel. The pick handle is stowed above the rear door retained by two straps. The stowage arrangement is as shown in Fig 75.



M075

Fig 75 Pick and shovel stowage

## 22.2 Soft top only

22.2.1 Mounted on the outside of the tailgate are webbing straps which provide for the stowage of a pick head, handle and shovel. The stowage arrangement is as shown in Fig 75.

## WINDSCREEN (Soft top only)

23 The windscreen can be lowered by means of a special operation.

23.1 To lower the windscreen proceed as follows:

23.1.1 Remove the front of the canvas hood from the top of the windscreen.

23.1.2 Locate one of the two locking bolts on the side of the windscreen.

23.1.3 Undo the top nut (1) and remove.

23.1.4 Loosen the bottom lock nut (2) until clear of the bracket.

23.1.5 Lower the locking bolt away from the bracket.

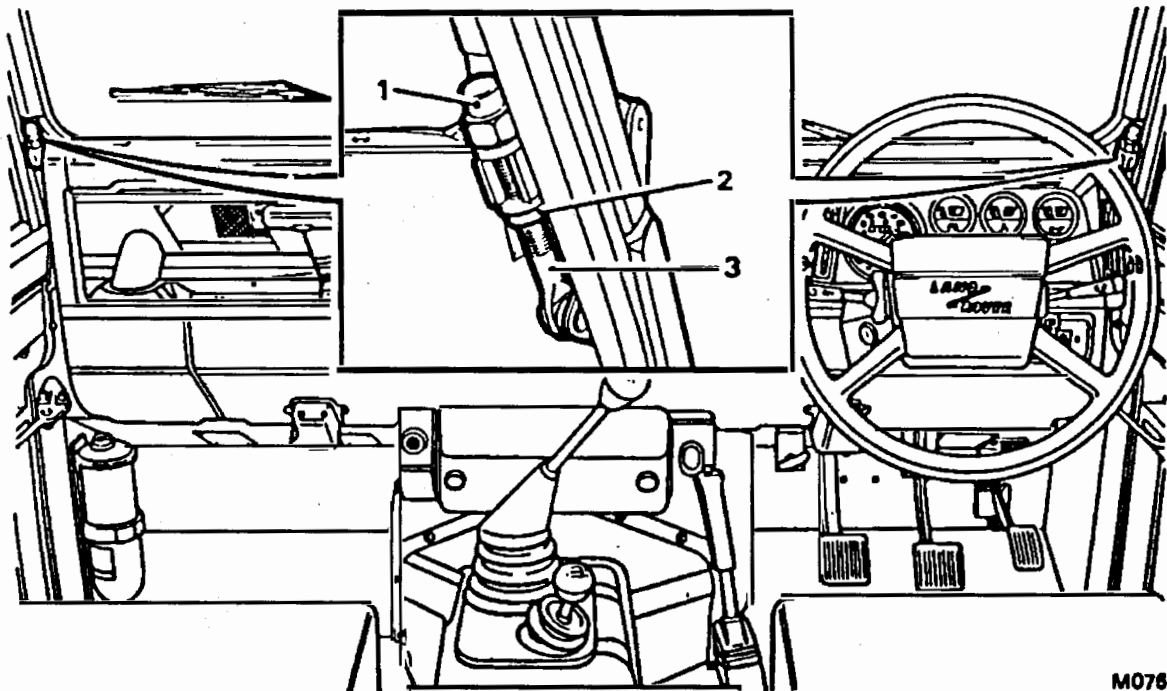
23.1.6 Repeat for the other locking bolt positioned on the other side of the windscreen.

23.1.7 The windscreen can now be lowered.

Notes ...

(1) Care should be taken when lowering the windscreen.

(2) The windscreen should not be lowered with the spare wheel mounted on the bonnet.



M076

Fig 76 Windscreen lowering operation

### VEHICLE RECOVERY

24 If the vehicle should suffer a breakdown or accident damage and it becomes necessary to make a recovery, it is essential to adhere to one of the following procedures, depending on the type of recovery to be undertaken. This is because the vehicles have permanent four-wheel drive.

#### 24.1 Towing the vehicle on four wheels

24.1.1 Set the main gearbox in neutral.

24.1.2 Set the transfer box in neutral.

24.1.3 Ensure the differential lock is in the normal "unlocked" position.



24.1.4 Secure the towing attachment to the vehicle.

24.1.5 Release the handbrake.

Note ...

Unless the engine is running, brake servo cannot be maintained. This will result in a considerable increase in pedal pressure being required to apply the brakes.

## 24.2 Suspended tow on two wheels

CAUTION ...

Where a front propeller shaft is to be removed check whether the four rear end fixing bolts in the gearbox flange are entered from the gearbox side. In this event they cannot readily be withdrawn. However, since the flange will revolve as soon as the vehicle is towed the four loose bolts must be tightly secured with nuts or suitably wired to prevent damage to the gearbox end casing.

24.2.1 Disconnect the propeller shaft from the axle to be trailed.

24.2.2 The steering wheel and/or linkage must be secured in a straight ahead position. The vehicle can then be attached to the breakdown vehicle and raised.

## RECOVERING WHEEL GRIP

25 Should the vehicle become immobile due to loss of wheel grip, the following points could be of value:

25.1 Avoid prolonged wheel spin; this will only make matters worse.

25.2 Try to remove obstacles rather than force the vehicle to cross them.

25.3 If the ground is very soft, reduce tyre pressures if this has not been previously done.

25.4 Clear clogged tyre treads.

25.5 Reverse as far as possible, then the momentum reached in going forward again may get the vehicle over the obstacle.

25.6 Brushwood, sacking, or any similar "mat" material placed in front of the tyres will help in producing tyre grip.

25.7 If possible, jack up the vehicle and place material under the wheels. Great care must be taken when doing this to avoid personal injury.

### TOWING

26 The weight of the trailer plus load depends upon several factors when towing.

26.1 Towing stability.

26.2 Weight of the vehicle contents including passengers.

Note ...

When part of the weight is transferable, loading the towing vehicle will generally improve the stability of the combination.

26.3 Engine performance is progressively reduced above altitudes of 300 meters (985 feet).

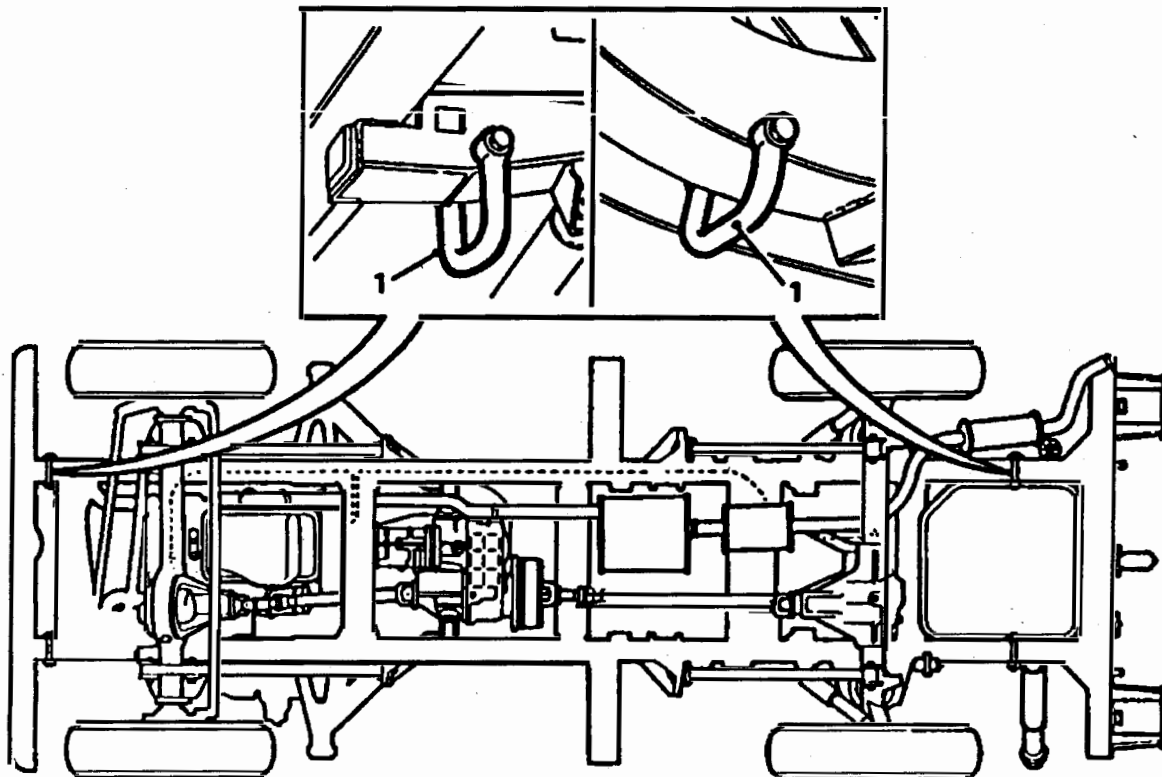
26.4 For trailer stability (2 wheel trailers) the maximum load imposed on the vehicle tow bar (nose weight) should be 75 kg (165 lbs).

Note ...

It is the driver's responsibility to ensure that all regulations with regard to towing are complied with as stated in the MT Drivers Handbook (JSP 351 Part 2 section H).

#### TRANSPORTING THE VEHICLE

27 Lashing rings (1) are available on the front and rear chassis members to facilitate the securing, lifting and recovering of the vehicle where necessary.



M077

Fig 77 Lashing rings

DRIVING TECHNIQUES

28 The following notes are to give a guide to the operator on how to drive the vehicle over all types of terrain.

Gear ranges

28.1 Use "High" ratio for all normal driving on good roads and surfaces. The "Low" ratio can be used for cross-country and rough terrain driving, moving heavy loads or ascending steep slopes. The two ranges may be used progressively when changing up, as conditions demand.

28.2 As an example of how the full progressive ranges of the gearbox may be used, consider a vehicle which is heavily laden or towing a heavy trailer and which is required to pull away from a standing start up a steep gradient. With the transfer gear in "Low" position, the vehicle will pull away in first gear and the gear changes for the first four gears can be made in the normal way with the main gear lever. When road conditions are suitable for "High" range they may be brought into operation without stopping the vehicle as follows:

28.2.1 Depress the clutch pedal and return the main gear lever to the neutral position.

28.2.2 Move the transfer gear lever to the neutral position and then release the clutch momentarily.

28.2.3 Depress the clutch and move the transfer lever in to "High" position.

28.2.4 Select second or third gear, depending on road conditions and release the clutch, then continue to change up in the normal way.

28.2.5 This operation can be carried out smoothly and quickly after a little practice. By making use of the full range of the gearbox in this manner, the clutch life will not be shortened by having to compensate for the selection of an unsuitable gear ratio.

### Transfer gear changing

28.3 To change from "High" (H) to "Low" (L), move the transfer gear lever from fully rearward to fully forward as follows.

### CAUTION ...

This should only be attempted when the vehicle is stationary.

28.3.1 Depress the clutch pedal and push the transfer gear lever fully forward and release the clutch.

### Note ...

Should there be any hesitation in the gear engaging, do not force the lever. With the engine running, engage a gear with the main gear lever and release the clutch momentarily; then return the main gear lever to neutral and try the transfer gear lever again.

Match engine speed to the gear selected

28.4 Before traversing a difficult section, select low range differential, locked and a suitable gear, which for most purposes, second or third is satisfactory.

28.5 Remain in this gear whilst driving and use care when applying the accelerator pedal since a sudden power surge may cause loss of traction.

28.6 Unlock the differential as soon as practicable.

Riding the clutch

28.7 Keep the foot away from the clutch pedal. The practice of resting the foot on the clutch pedal should be avoided. Apart from premature clutch wear, a sudden bump could cause the pedal to be pressed too far, disengaging the drive, and causing the vehicle to go out of control.

Braking

28.8 Keep the application of the brake pedal to a minimum. Braking on wet or muddy slopes can induce sliding and loss of control.

Engine braking

28.9 Before descending steep slopes, first gear low range with differential locked should be selected and the engine should be allowed to provide the braking. Failure to adopt this procedure may result in loss of control.

Rough rocky tracksWARNING ...

DO NOT HOLD THE STEERING WHEEL WITH THE FINGERS AND THUMBS INSIDE THE WHEEL. A SUDDEN VIOLENT KICK OF THE WHEEL COULD DAMAGE OR EVEN BREAK THE FINGERS. GRIP THE WHEEL ON THE OUTSIDE OF THE RIM WHEN TRAVELLING ACROSS COUNTRY (FIG 78).

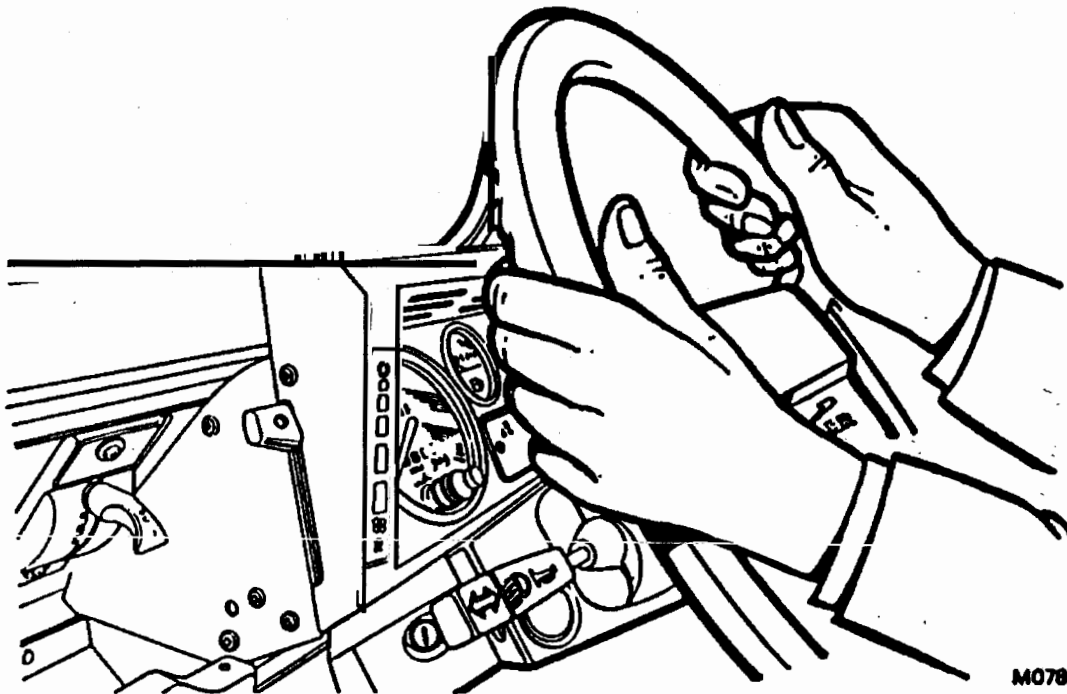


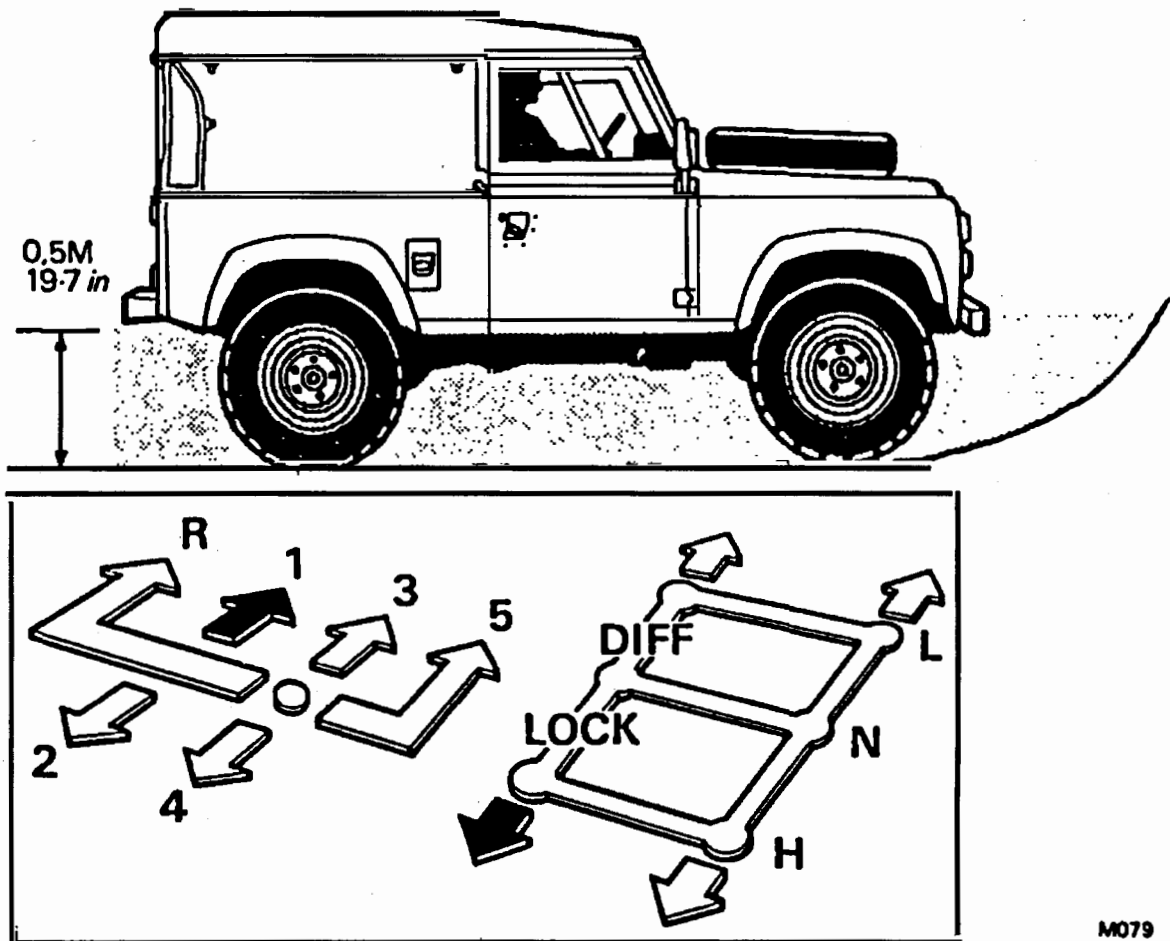
Fig 78 Holding the steering wheel

28.10 Although beaten rough tracks can be negotiated in normal drive, it is advisable to lock the differential if there is excessive suspension movement likely to induce loss of traction.

28.11 As the track becomes rougher and more rocky, low range may be necessary to avoid slipping the clutch and to make the vehicle easier to control.

Wading

28.12 The maximum advisable depth is 0,5 metres (19.7 ins). Before wading make sure that the timing cover drain plug and the flywheel housing drain plug are in position. If the water is deep, slacken off the fan belt.



M079

Fig 79 Wading

28.13 To prevent saturation of the electrical system and air intake, avoid excessive engine speed. A low gear with the differential locked is desirable and sufficient throttle should be maintained to avoid stalling if the exhaust pipe is under water.



After being in waterCAUTION ...

Do not rely on the handbrake to hold the vehicle once the transmission brake has been subjected to mud and water; leave the vehicle parked in gear.

28.14 Make sure that the brakes are dried out immediately so that they are fully effective when needed again. This can be accomplished by driving a short distance with the footbrake applied.

28.15 Re-tighten and adjust the fan belt, remove the flywheel housing drain plug and the timing cover drain plug.

Driving on soft ground

28.16 Where conditions are soft, such as marsh ground or sand, reduced tyre pressures will increase the contact area of the tyres with the ground. This will help to improve traction and reduce the tendency to sink. Tyre pressures should be reinflated to the standard pressures (Cat 601 Table 3) when firm ground is reached.

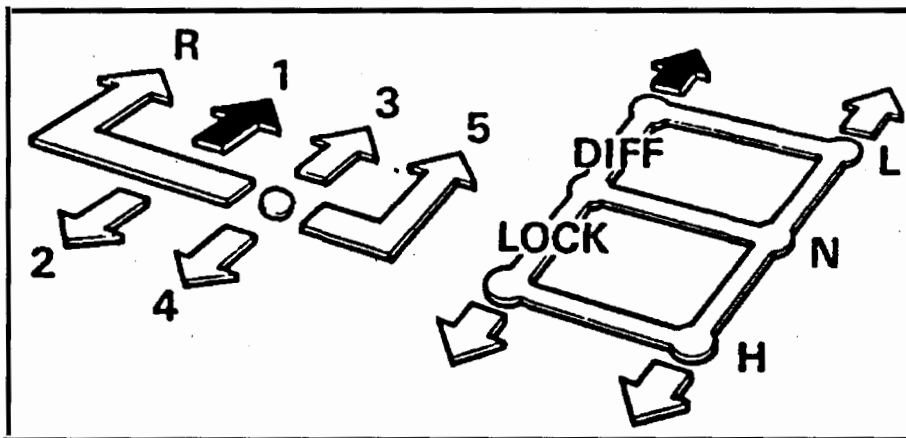
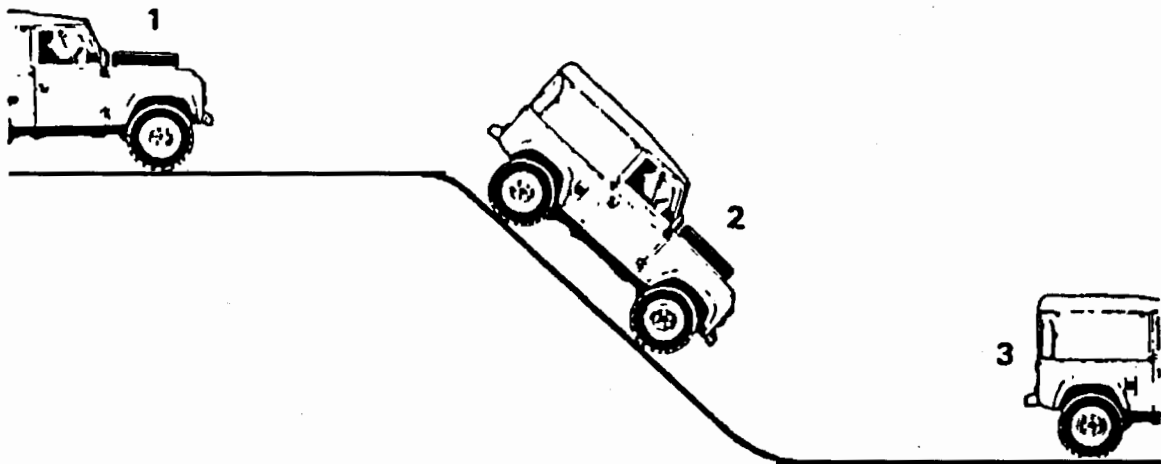
Descending steep slopes

28.17 Stop the vehicle at least a vehicle length before the slope and engage first gear, low range with differential locked. Check gear engagement before moving off. Do not touch the brake or clutch during the descent, the engine will limit the speed, and the vehicle will maintain control while the front wheels are turning. If the vehicle begins to slide, accelerate to maintain directional stability.

28.17.1 Stop at least a vehicle length (1) before the slope. Select first gear, low range with differential locked.

28.17.2 Descend (2) using engine retardation.

28.17.3 When back on level ground (3) unlock the differential then change into second gear.



MO80

Fig 80 Descending a steep slope

Ground clearance

28.18 Be aware of the need to maintain ground clearance under the chassis and a clear approach and departure angle. Avoid existing deep wheel ruts, sudden changes in slopes and obstacles which could interfere with the chassis.

Rutted and existing wheel tracks

28.19 Generally the tendency is to over-steer the vehicle under these circumstances, resulting in the vehicle being driven on left or right-hand lock in ruts. This should be avoided as it produces drag at the road wheels and can be dangerous, causing the vehicle to veer off the track the moment the front wheels reach level ground or find traction.

Ice and snow

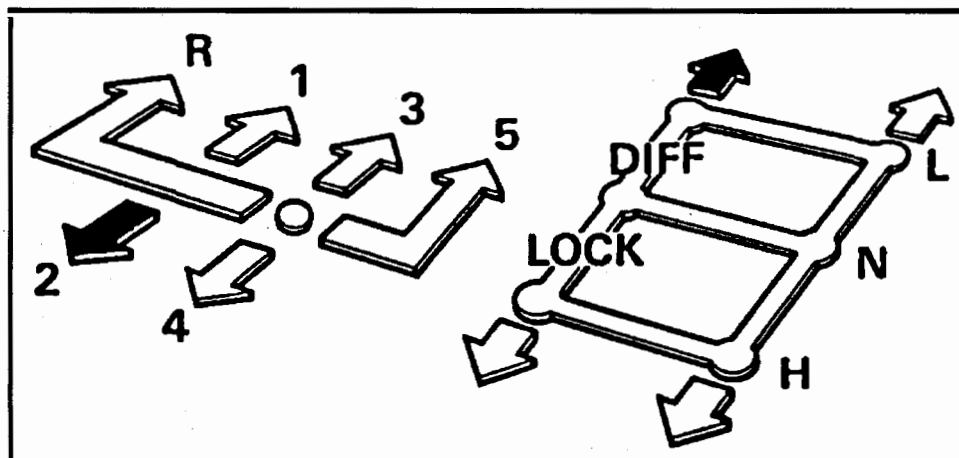
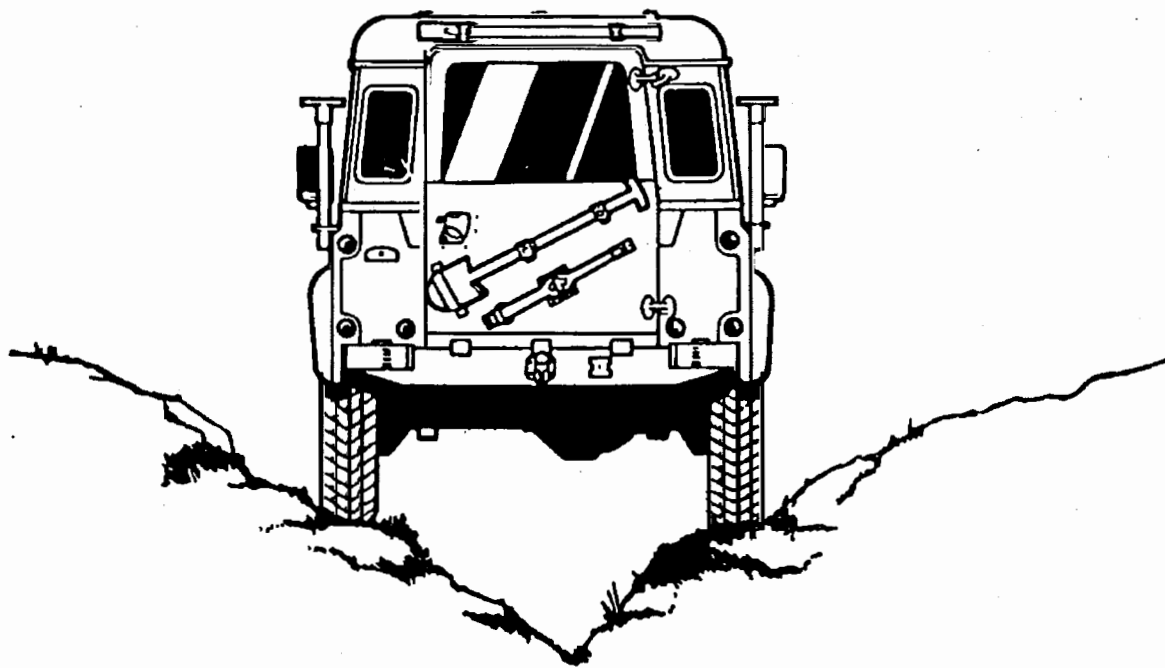
28.20 The vehicles are, of course, used extensively in snow and icy conditions. The driving techniques are generally the same as driving on mud or wet grass. Select the highest gear possible with the differential locked and use only sufficient engine revolutions to just move the vehicle forward without labouring. Avoid violent movements of the steering wheel and use the brakes, with care, only if necessary.

## Note ...

The differential lock can be engaged or disengaged at any speed providing the road wheels are rotating at the same speed. For example, in slippery conditions if one wheel is spinning, ease off the accelerator before engagement.

Negotiating a "V" shaped gully

28.21 This should be tackled with caution since steering up or down the gully walls could lead to the vehicle becoming trapped on the bank or an obstacle such as a tree or rock.



M081

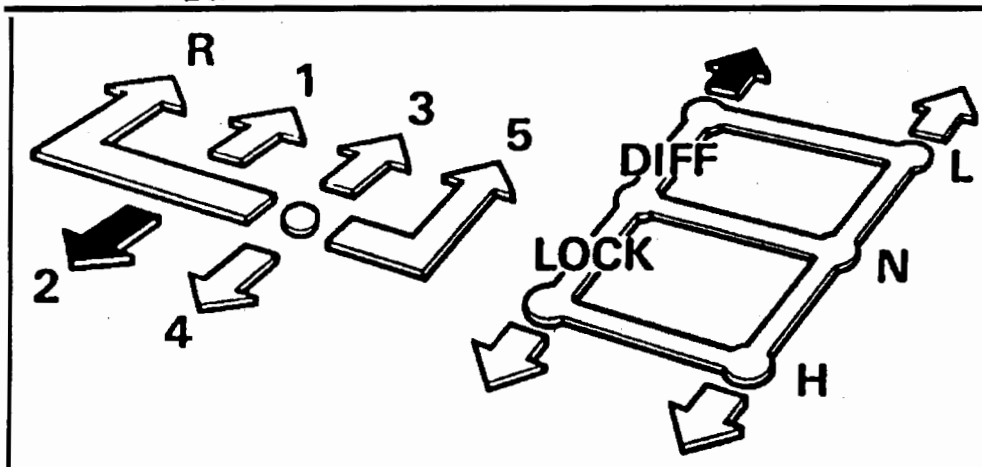
Fig 81 Negotiating a "V" shaped gully

Crossing ridges and ditches

28.22 Bearing in mind the ramp break-over angle and the action of the differential, select a path so that the condition under each wheel is similar to that under the opposite wheel of the same axl . This principle should be applied both in avoiding dissimilar ground surfaces under opposite wheels and in assessing the correct angle of approach to an obstacle so as to avoid the wheels being lifted off of the ground.

Crossing over a ridge

28.22.1 Approach a ridge at right angles so that both front wheels go over together. If approached at any angle traction can be completely lost through diagonally opposite wheels leaving the ground.

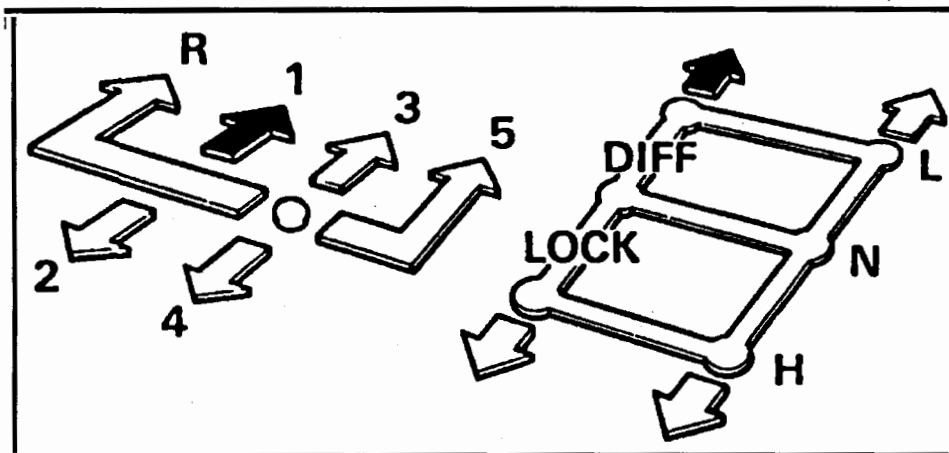
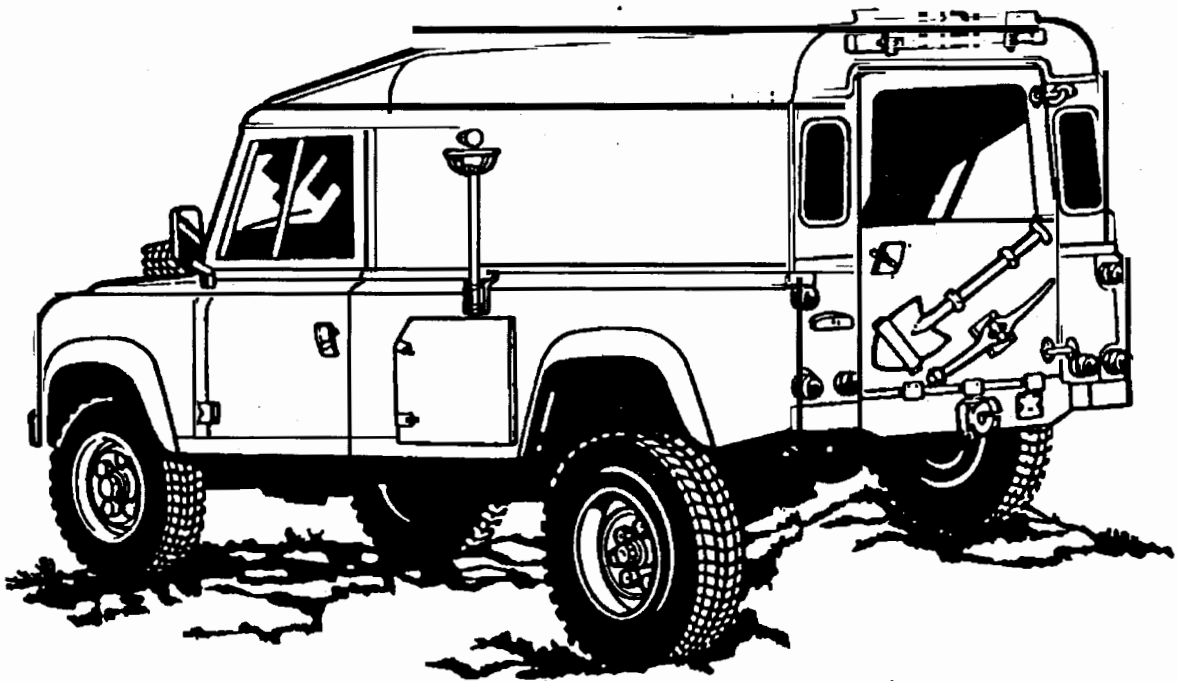


M082

Fig 82 Crossing over a ridge

Crossing a ditch

28.22.2 Here the opposite to Fig 82 applies. Ditches should be crossed at an angle so that three wheels are kept in contact with the ground. If approached at right angles the two front wheels will drop into the ditch, effectively preventing forward or reverse motion.

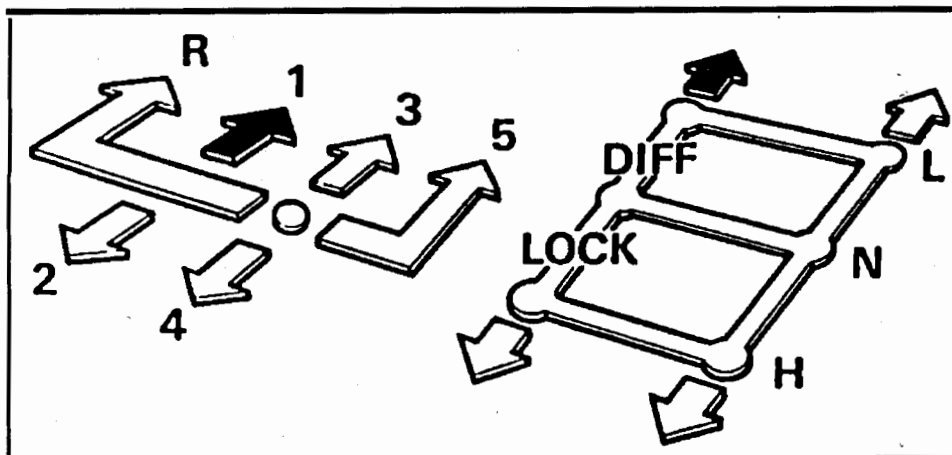


M083

Fig 83 Crossing a ditch

Traversing slopes

28.23 Traversing a slope should be undertaken in the following way. Check that the ground is firm under the wheels and that it is not soft under the downhill side wheels. Also avoid the uppermost wheels climbing over a rock or tree root, both of these situations could result in the vehicle rolling onto its side.



M084

Fig 84 Traversing slopes

Climbing steep slopes

22.24 This will usually require the use of low range second or third gear with differential locked. Should the slope be slippery, use the highest gear that the engine can manage without labouring and stalling.

28.25 If the vehicle fails to climb a slope but does not stall, the following procedure should be carried out:

28.25.1 Hold the vehicle on the footbrake and engage reverse gear as quickly as possible.

28.25.2 Release the brakes and allow vehicle to reverse down the slope whilst ensuring that both feet are clear of the brake and clutch pedals. If the vehicle stalls on a slope, hold the vehicle on the footbrake, engage reverse gear and remove the feet from both clutch and brake pedals.

28.25.3 Start the engine whilst in gear and allow the vehicle to reverse down the slope, using only the retardation effect of the engine for braking.

28.25.4 When back on level ground, or where forward traction can be regained, then a possible faster approach will overcome the inertia and the extra momentum will often enable the slope to be climbed.

Driving in soft, dry sand

28.26 When conditions are soft, reduced tyre pressures will increase the contact area, improve traction and reduce the tendency to sink. Select a gear, lock the differential and stay in it.



2320-D-122-201

ARMY EQUIPMENT  
SUPPORT PUBLICATION

28.27 Because of the drag of the sand, the instant the clutch is disengaged the vehicle will stop. If a standing start in sand or on the side of dunes is necessary, exercise care in applying the accelerator pedal, as sudden power will induce loss of traction and cause the vehicle to dig itself into trouble.

Chapter 3-2

FITTED FOR RADIO

CONTENTS

Para

- 1 INTRODUCTION
- 2 PROP ROD
- 3 AUXILIARY TERMINALS
- 4 AERIAL COAXIAL STOWAGE
- 5 RADIO AERIAL MOUNTING BASE
- 6 AERIAL OUTLET

Fig

- 85 Prop rod
- 86 Auxiliary terminal operation
- 87 Aerial coaxial stowage
- 88 Radio aerial mounting base and outlet

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- 3
- 4
- 5/6

INTRODUCTION

1 This Sub-Chapter describes all the items applicable to the fitted for radio (FFR) TUL and TUM vehicles which have not been covered by Sub-Chapter 3-1.

PROP ROD

WARNING ...

THE SPARE WHEEL IS FITTED TO THE BONNET; IT WILL BE HEAVY TO LIFT. DO NOT ALLOW IT TO DROP.

2 The prop rod is located underneath and clipped to the bonnet. To open the bonnet refer to Bonnet release

handle (Chapter 2-1 paragraph 16).

2.1 To retain the bonnet in the upright position proceed as follows:

2.1.1 Release the bonnet safety catch, (3) lift the bonnet up and pull the prop rod (2) from the stowage clip (1).

2.1.2 Locate the lower end of the prop rod in the hole (4) in the top of the radiator grille panel.

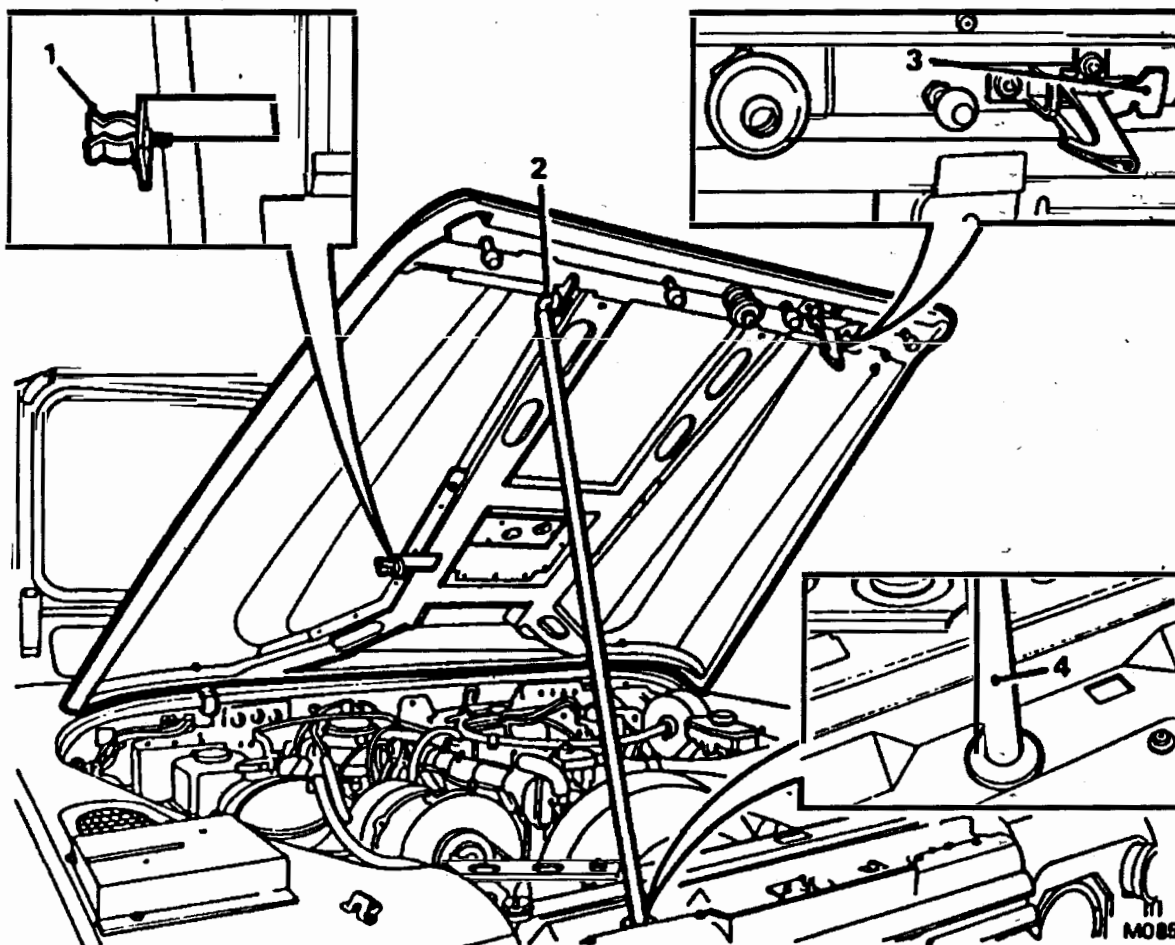


Fig 85 Prop rod operation

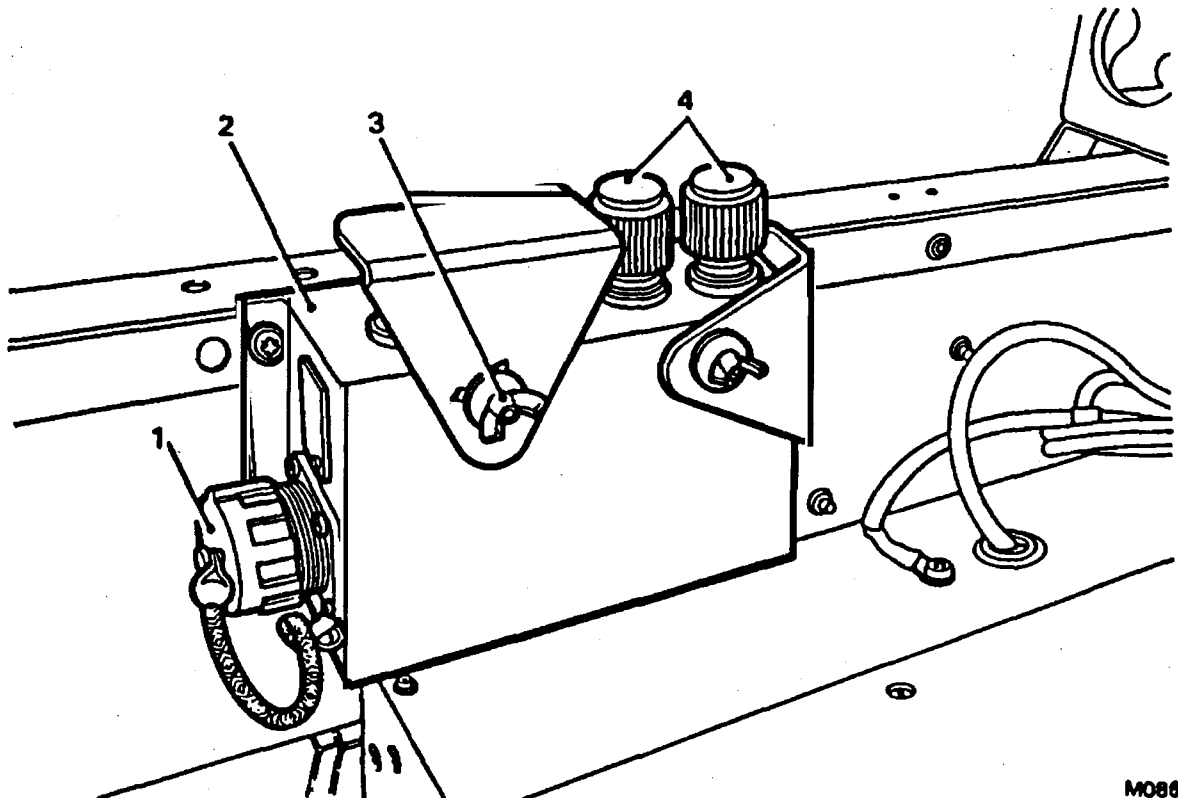
2.2 To close the bonnet proceed as follows:

2.2.1 Hold the bonnet open, lift the prop rod from the grille panel and locate it into the stowage clip.

2.2.2 Push the bonnet down firmly until it locks. Do not allow the bonnet to drop from the fully open position.

### AUXILIARY TERMINALS

2 The terminal box (2) is attached to the panel behind the left hand seat. The terminals on the top of the box are for carrying a charge to the radio from the batteries stored under the table. The socket (1) on the side can also carry to the radio as an alternative.



M086

Fig 86 Auxiliary terminal operation

2.1 To use the terminals proceed as follows:

2.1.1 Slacken the wing nuts (3) securing the keeper plate.

2.1.2 Connect the leads to the terminals (4) ensuring the correct polarity is observed, i.e. red positive and black negative.

2.1.3 Re-position the keeper plate to cover the terminals and tighten the wing nuts.

### AERIAL COAXIAL STOWAGE

3 Two stowage compartments, (1) one on each wing top, are provided for the stowage of coaxial cable (2) for VHF radio installations.

3.1 To gain access, locate the cover (3) to the side of the stowage box and pull, this will release the cover.

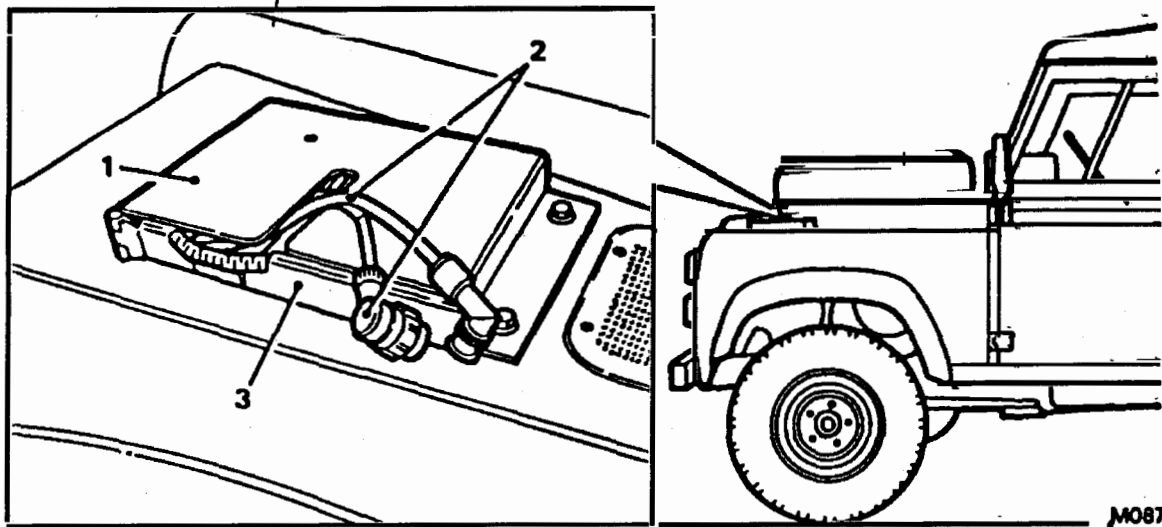


Fig 87 Aerial coaxial stowage

3.2 Pull the coaxial aerials out and position them through the opening in the top of the stowage box cover and close. This allows the stowage to be completely closed while still using the aerial tuning units.

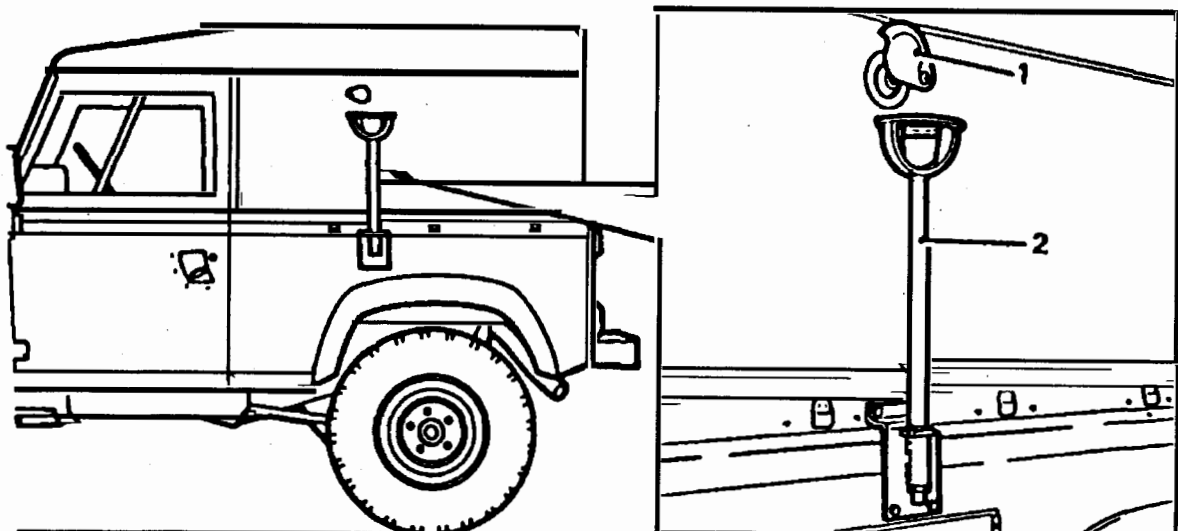
#### RADIO AERIAL MOUNTING BASE

4 The radio aerial mounting base (2) is located on the side of the vehicles and is used for mounting the radio aerials.

4.1 Both radio aerial mounting bases on either side of the vehicle body can be removed by undoing the elongated captive hexagonal headed bolt and lifting the mounting from its aerial mounting bracket socket. A hole in the head of the bolt is provided to accept a tommy bar.

#### AERIAL OUTLET

5 The aerial outlet is covered by a swivel plate (1) when not in use. Its purpose is to connect the external aerial with the radio pack inside the vehicle.



M088

Fig 88 Radio aerial mounting base and outlet

Chapter 4

USER MAINTENANCE

CONTENTS

Para

- 1 INTRODUCTION
- 2 General

INTRODUCTION

1 This Chapter describes the user maintenance applicable to the Land Rover 90 and 110 variants listed in the following sub-chapters.

Chapter 4-1 Basic Vehicle

Chapter 4-2 Fitted For Radio (FFR)

General

2 The information given in this chapter is applicable to both left and right hand drive vehicles.

Chapter 4-1

BASIC VEHICLE

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- 2 General
- 3 BULBS
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  - Warning lights
  - Instrument panel
  - Hazard warning light
  - Convoy light
  - Side, tail/stop, turn and rear fog lights
  - Rear number plate light
  - Headlights
  - Side repeater lights
- 4 FUSES
  - To change a fuse
- 5 AIR CLEANER
  - To check the dump valve
  - To renew the air cleaner element
  - To clean the air cleaner element (WARNING)  
(CAUTIONS)
    - Washing in water
    - After washing inspection (CAUTION)
- 6 FUEL FILTER
  - To drain the filter
  - To renew the filter
- 7 FUEL SEDIMENTER
  - To drain the sedimenter
  - To clean the element
- 8 BRAKE FLUID RESERVOIRS (CAUTION)
  - TUL brake reservoir



Low fluid/brake circuit warning light test  
(WARNING)

- TUM brake reservoir (CAUTION)
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- 10 STEERING BOX
- 11 ENGINE (WARNINGS)(CAUTION)
  - To check the engine oil level
  - Engine oil change
- 12 GEARBOX
  - To check/top up the gearbox
  - To change the gearbox oil
- 13 TRANSFER GEARBOX
  - To check/top up the transfer gearbox
  - To change the transfer gearbox oil
- 14 FRONT AND REAR DIFFERENTIAL AXLE
  - To check/top up the differential axle
  - To change the differential axle oil
- 15 SWIVEL PIN HOUSINGS
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  - To change the swivel pin housing oil
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  - Propeller shafts (Later models)
  - Lubricating the propeller shafts
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- 19 ENGINE FRONT TIMING COVER
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- 20 WINDSCREEN WIPER BLADES
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- 22 SPARE WHEEL (WARNING)
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  - To replace the wheel
- 23 ENGINE COOLING SYSTEM (WARNING)(CAUTIONS)
  - Expansion tank
  - Cooling system protection
  - Flushing the engine cooling system
- 24 ENGINE OIL FILLER/BREATHING CAP
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27	DRIVE BELT	
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## INTRODUCTION

1 This Sub-Chapter describes all the user maintenance related to the Land Rover 90 and 110 Truck Utility Light (TUL) and Truck Utility Medium (TUM) vehicles.

### General

2 All the service intervals for the subsequent paragraphs are to be found in the following documents: MT Driver's Handbook (JSP 351 Part 1 Para 5) and (Cat 601 Tables 4 and 5). For the most efficient use of the vehicles, the service intervals should be adhered to.

### BULBS

### CAUTION

All the bulbs incorporated in the vehicle are of the 12 volt type and should be changed immediately they have failed. Failure to do so will result in

the vehicle operating in an unreliable condition  
e.g. warning lights not indicating failure  
especially with the brakes, vehicle charging and 24  
volt charging circuits.

3 The bulbs are either the push or the bayonet types. The appropriate bulb ratings are to be found in the User Spares Data Chapter 5. The following paragraphs describe how to replace all the bulbs on the vehicle.

#### Map reading light

3.1 The map reading light is situated to the left of the main lighting switch, in front of the passenger seat.

3.1.1 Disconnect the negative earth lead from the battery.

3.1.2 Ease the light cover (3) from its holder.

3.1.3 Pull out the rubber mounted bulb holder (2).

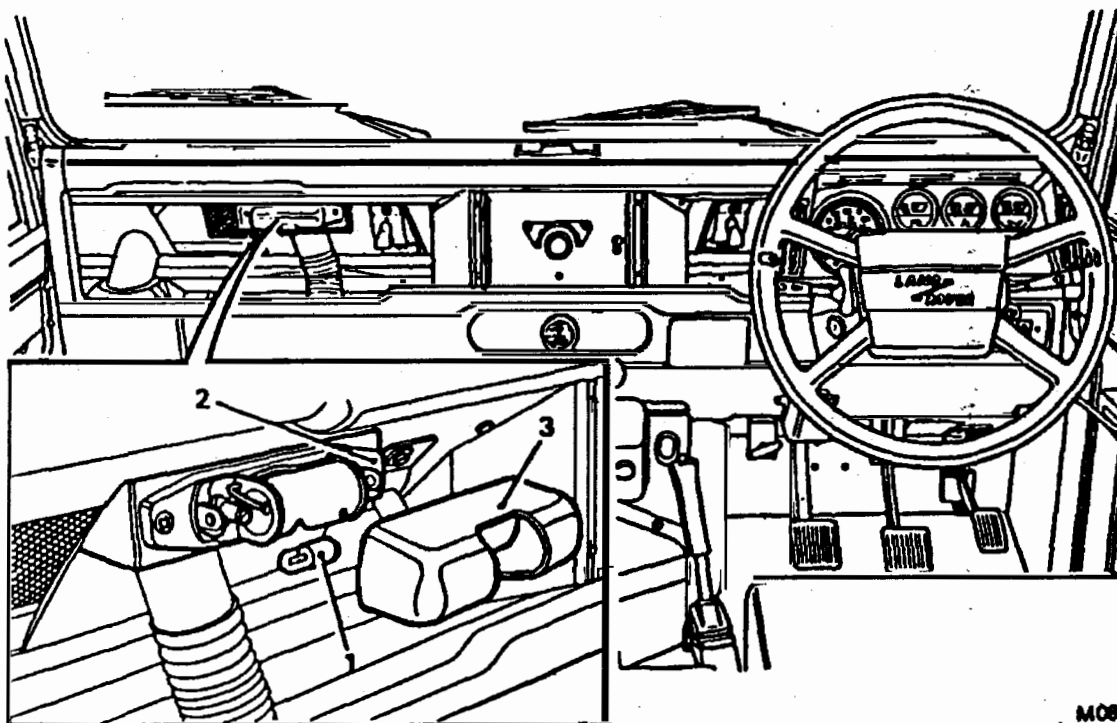
3.1.4 Twist, remove the bulb (1) and discard.

3.1.5 Insert a new bulb and twist to lock into place.

3.1.6 Refit the bulb holder ensuring the rubber grommet is properly in position.

3.1.7 Refit the light cover on to its holder.

3.1.8 Reconnect the negative earth lead to the battery.



M089

Fig 89 Map reading light

### Warning lights

3.2 The warning lights panel is an integral part of the instrument panel which is situated in front of the steering wheel console and contains eleven bulbs.

3.2.1 Disconnect the negative earth lead from the battery.

3.2.2 Remove the two screws (1) retaining the warning lights panel and ease the panel forward to gain access to the bulbs.

3.2.3 Remove the appropriate plug connector (2) from the rear of the warning lights panel.

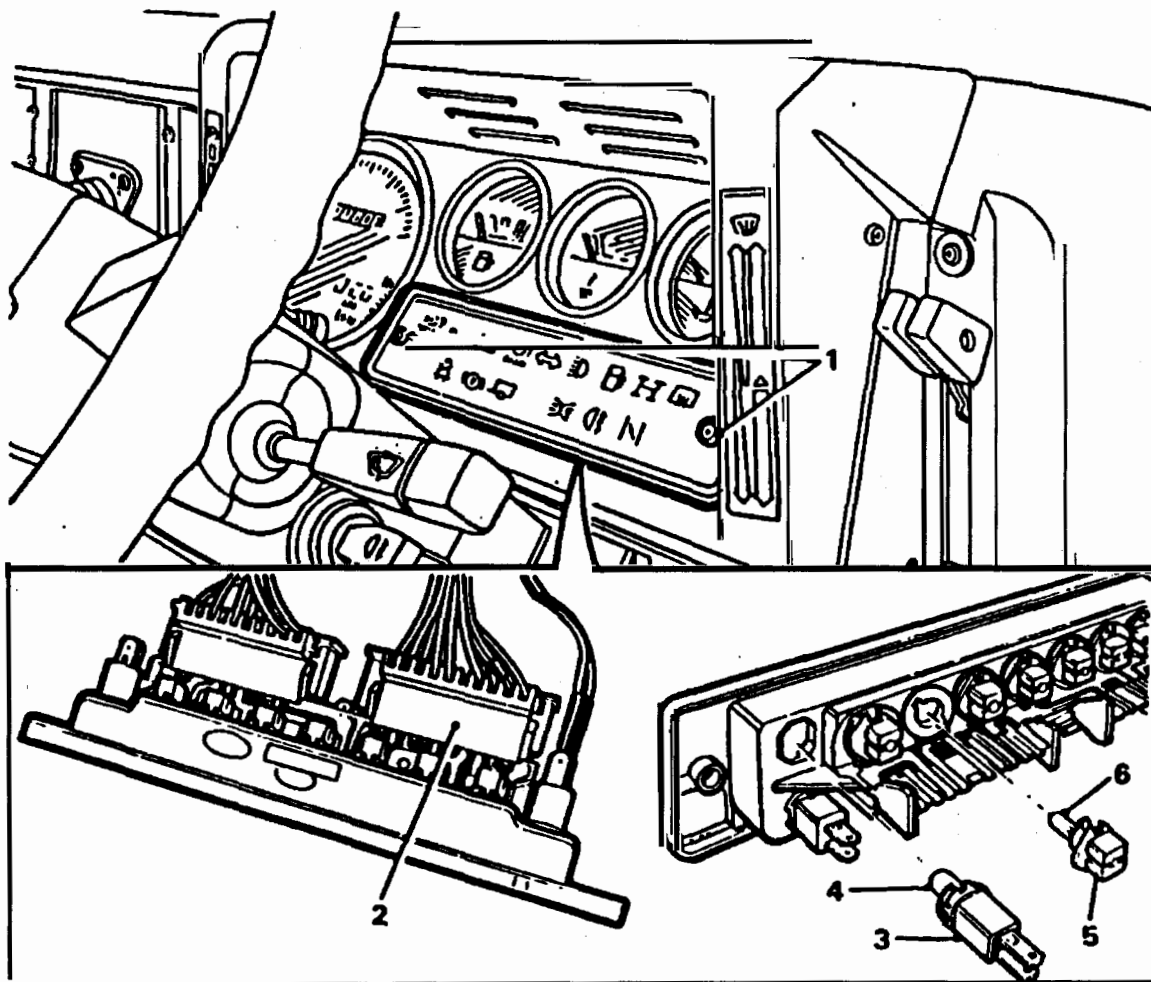
3.2.4 Twist the bulb holder (3)(5) and pull it from its socket.

3.2.5 Pull the bulb (4)(6) from its holder and discard.

3.2.6 Fit a new bulb and replace the holder into its socket.

3.2.7 Replace the plug connector and carefully fit the warning lights panel.

3.2.8 Secure with the two screws to the instrument panel.



M090

Fig 90 warning lights

Instrument panel

3.3 The instrument panel is situated in front of the steering wheel console and contains three bulbs.

3.3.1 Disconnect the negative earth lead from the battery.

3.3.2 Remove the four screws (1) retaining the instrument panel and ease the panel forward to gain access to the bulbs.

Note ...

If required remove the drive cable from the speedometer to make access easier.

3.3.3 Twist and pull the bulb holder (2) from its socket.

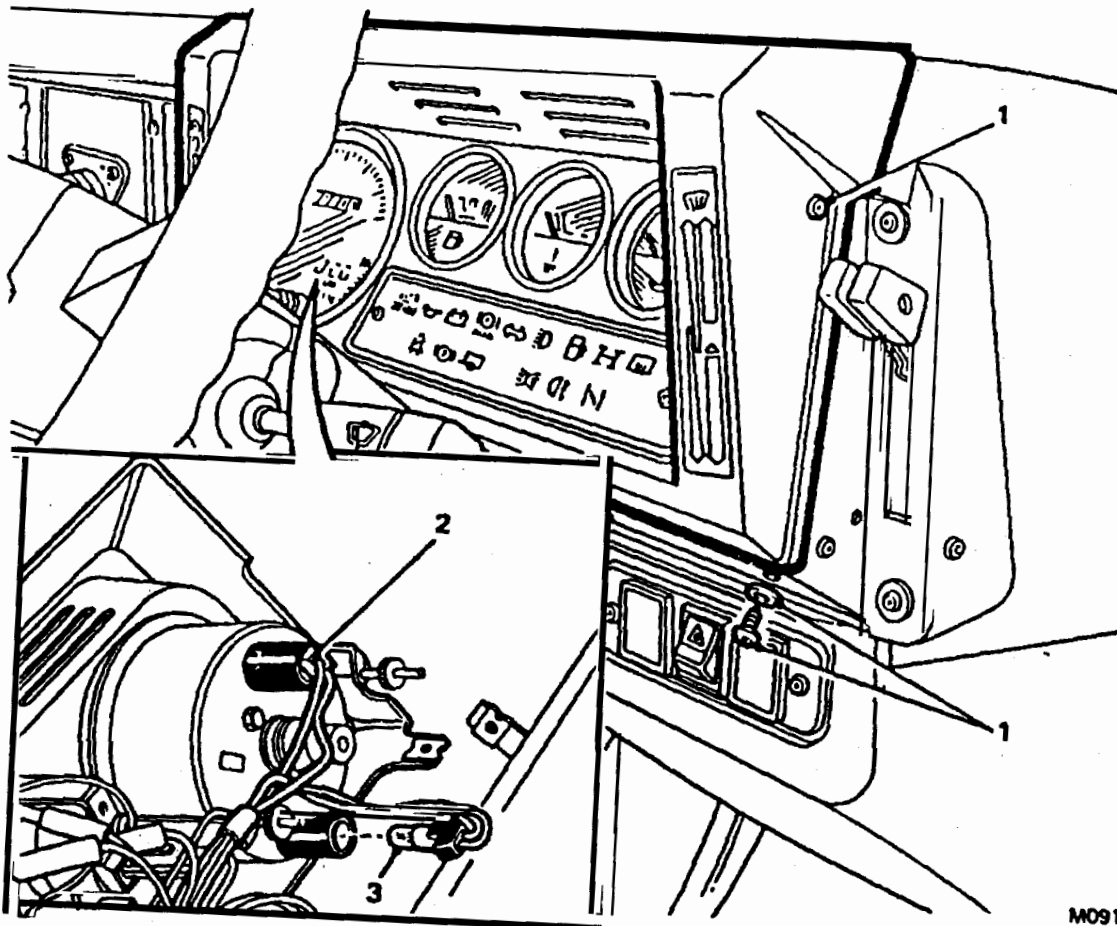
3.3.4 Pull the bulb (3) from its holder and discard.

3.3.5 Fit a new bulb and replace the holder into its socket.

3.3.6 Reconnect the speedometer drive cable if removed, then replace the instrument panel carefully so as not to twist or damage the wiring at the rear.

3.3.7 Secure the panel with the four screws.

3.3.8 Reconnect the negative earth lead to the battery.



M091

Fig 91 Instrument lights

Hazard warning light

3.4 The hazard warning switch is located below and to the right of the instrument panel.

3.4.1 Disconnect the negative earth lead from the battery.

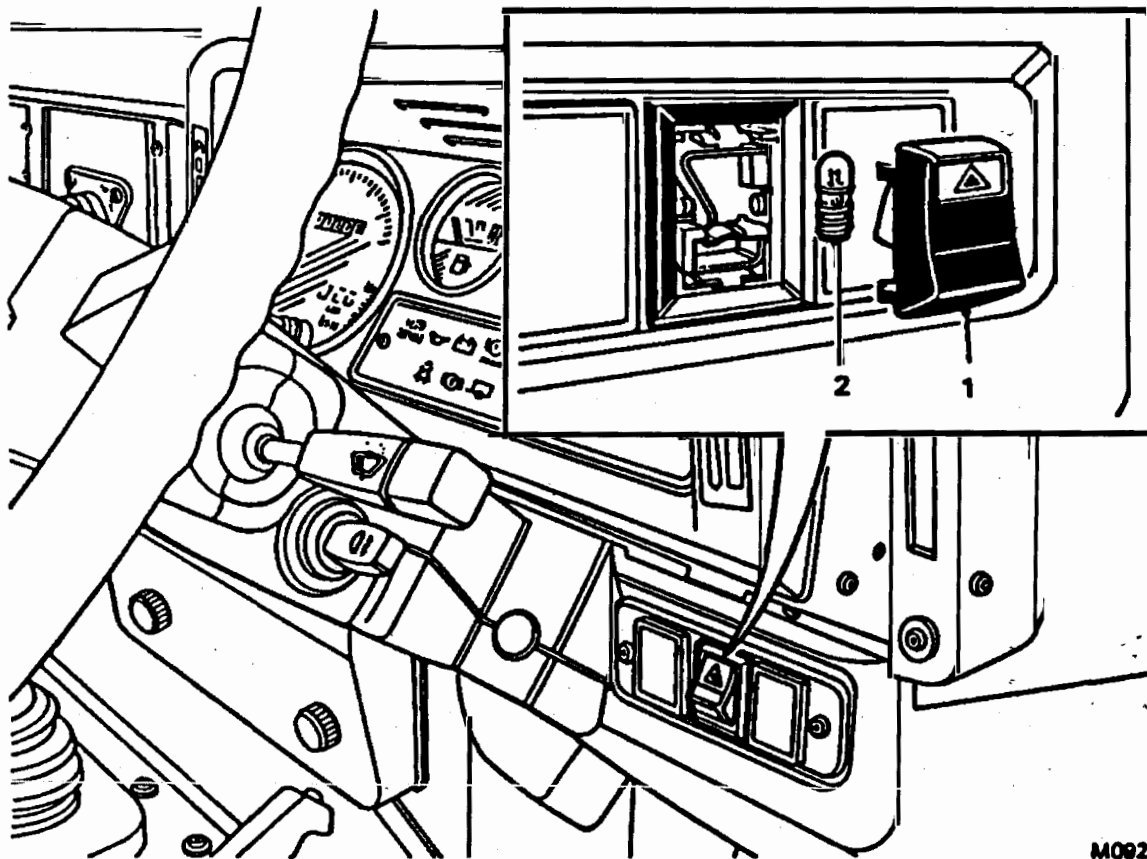
3.4.2 Ease the hazard switch cover (1) off.

3.4.3 Ease the bulb (2) from its holder within the switch and discard.

3.4.4 Fit a new bulb into its housing and refit the cover.



3.4.5 Reconnect the negative earth lead to the battery.



M092

Fig 92 Hazard warning switch

### Convoy light

3.5 The convoy light is situated underneath and to the rear of the vehicle. It is located on the right hand chassis member.

3.5.1 Disconnect the negative earth lead from the battery.

3.5.2 Clean the exterior of the light (1) if dirty so access can be made more easily.

3.5.3 Unscrew the retaining cap (3) and remove the bulbholder from the convoy light.

3.5.4 Press and twist to release the bulb (2) from the holder and discard.

3.5.5 Fit a new bulb into the holder.

3.5.6 Refit the bulb holder and secure by tightening the retaining cap.

3.5.7 Reconnect the negative earth lead to the battery.

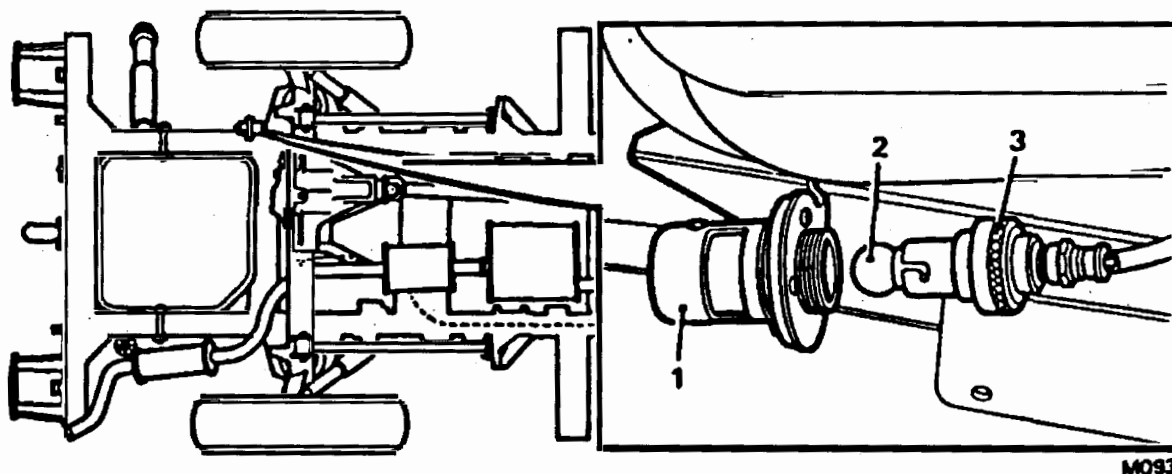


Fig 93 Convoy light

Side, tail/stop, turn and rear fog lights

3.6 The side, tail/stop, turn and rear fog lights are all of the same type and therefore the following instructions are the same for all the lights.

3.6.1 Disconnect the negative earth lead from the battery.

3.6.2 Clean the exterior of the lamp if dirty so access can be made more easily.

- 3.6.3 Unscrew the lens cap (1) and remove.
- 3.6.4 Press the bulb inwards and turn to remove the bulb, (2) then discard.
- 3.6.5 Fit a new bulb into the holder.
- 3.6.6 Fit the lens cap and tighten securely.
- 3.6.7 Reconnect the negative earth lead to the battery.

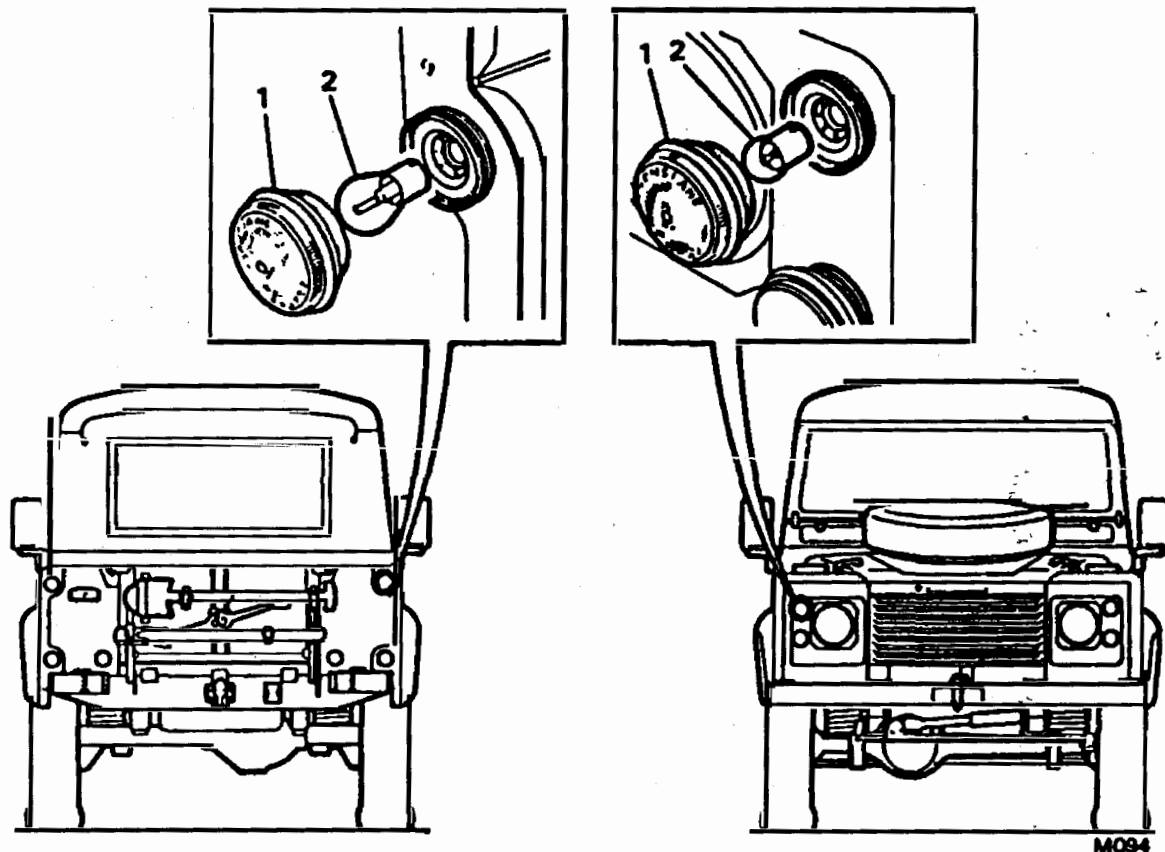


Fig 94 Side, tail/stop and rear fog lights

Rear number plate light

3.7 The rear number plate light has two bulbs, check that the correct bulb is replaced to ensure full working capacity.

3.7.1 Disconnect the negative earth lead from the battery.

3.7.2 Slacken the securing screw (3) and remove the cover from the light body (1).

3.7.3 Pull out the appropriate bulb (2) and discard.

3.7.4 Fit a new bulb into the holder.

3.7.5 Fit the cover and secure with the screw.

3.7.6 Reconnect the negative earth lead to the battery.

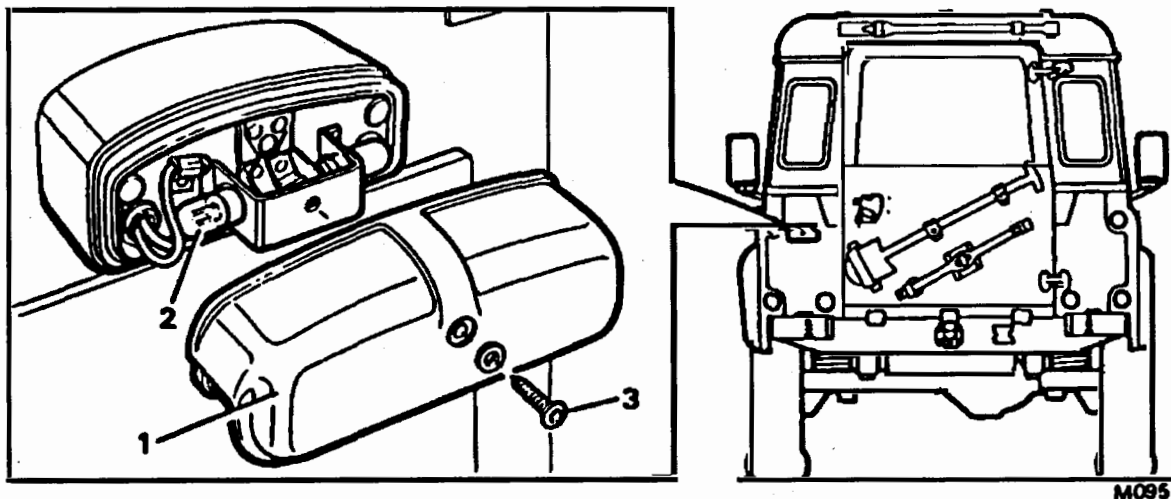


Fig 95 Rear number plate light

### Headlights

3.8 The headlights can be adjusted by the means of two screws so that the correct alignment can be maintained.

3.8.1 Disconnect the negative earth lead from the battery.

3.8.2 Press the light unit (1) inwards and turn anti-clockwise to release the from the vehicle body.

3.8.3 To release the headlight disconnect from the rubber socket (2).

3.8.4 Remove the rubber shroud (3) and release the bulb (4) from the headlight.

3.8.5 Remove the bulb and discard.

3.8.6 Fit a new bulb and secure into place using the spring clip.

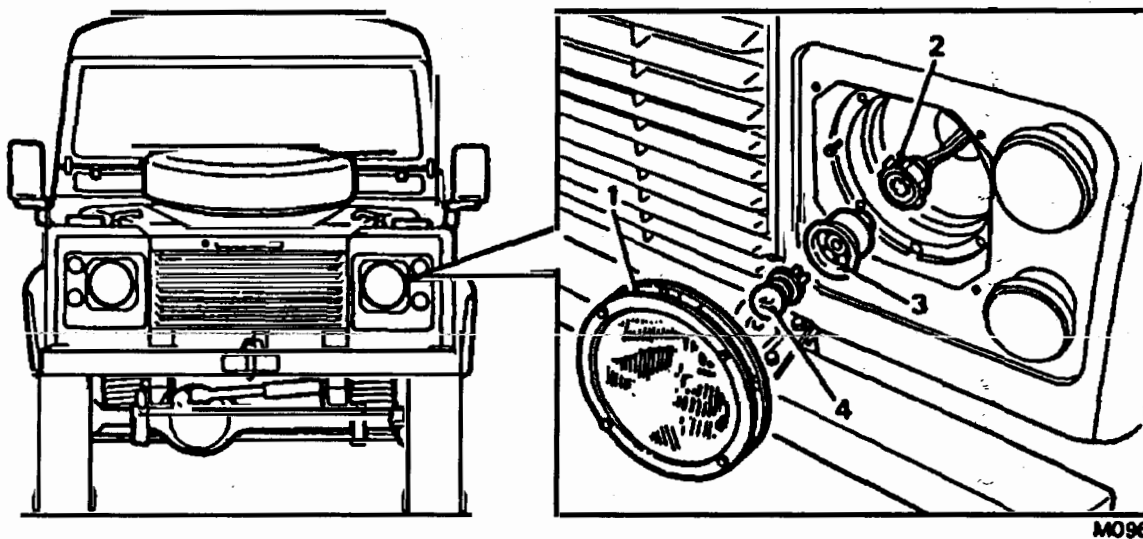


Fig 96 Headlights

3.8.7 Replace the rubber shroud and reconnect to the rubber socket.

3.8.8 Press the light unit inwards ensuring that the lugs are located in place and turn clockwise to secure.

3.8.9 Reconnect the negative earth lead to the battery.

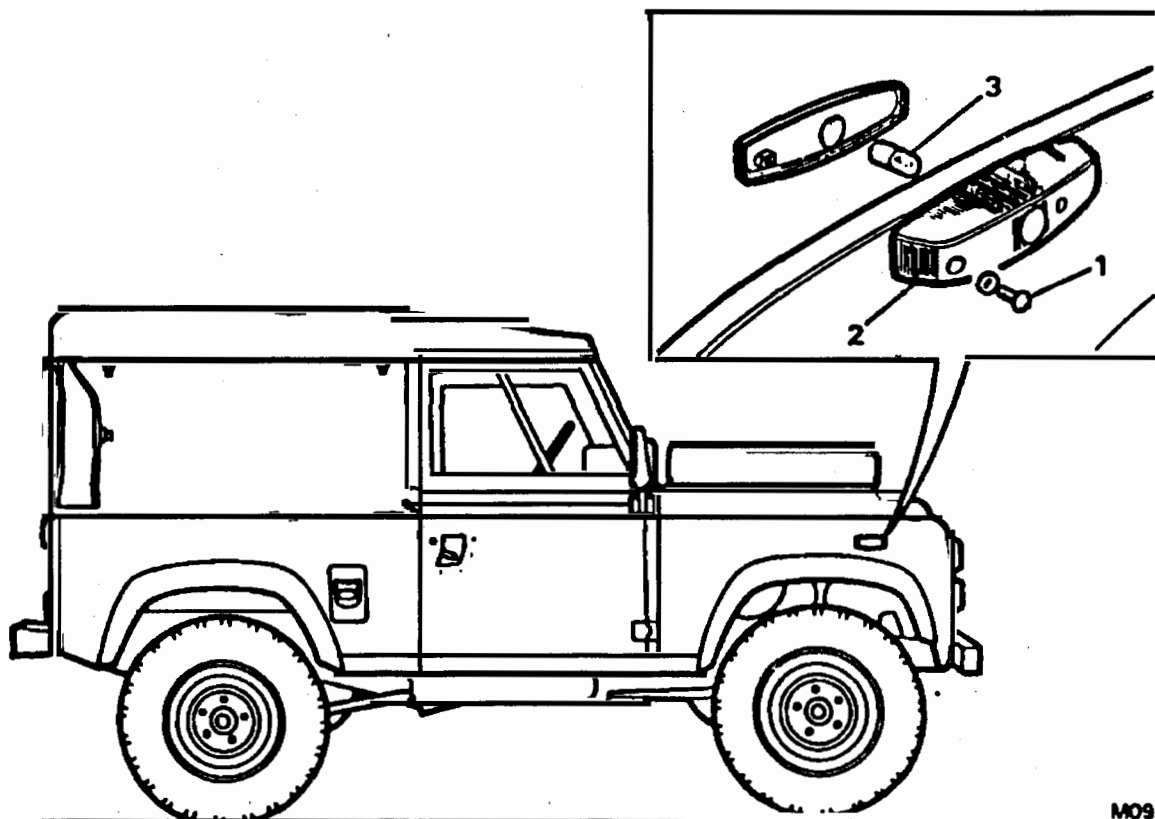
Note ...

The lights should be checked using the specialised headlight alignment equipment available.

• Side repeater lights

3.9 The side repeater lights are located on either side of the vehicle wings mounted towards the front.

3.9.1 Disconnect the negative earth lead from the battery.



M097

Fig 97 Side repeater lights

- 3.9.2 Remove the retaining screw (1) from the front of the lens.
- 3.9.3 Slide the lens (2) forward to disengage it from the light base and remove the gasket along with it.
- 3.9.4 Press the bulb inwards and turn to remove the bulb, (3) then discard.
- 3.9.5 Fit a new bulb into the holder.
- 3.9.6 Slide the lens back on to the light base and secure with the screw.
- 3.9.7 Reconnect the negative earth lead to the battery.

## FUSES

4 The fuse box containing all the vehicles fuses is located in the centre and below the fascia, directly in front of the main gear change lever.

### To change a fuse

- 4.1 Disconnect the negative earth lead from the battery.
- 4.2 Undo the two serrated fuse box knobs (1) and remove the fuse box cover (2).
- 4.3 Replace the failed fuse, (3) ensuring the correctly rated one is fitted. (Check the fuse label inside the cover for the correct rating).
- 4.4 Fit the fuse cover and secure with the two screws.

4.5 Reconnect the negative earth lead to the battery.

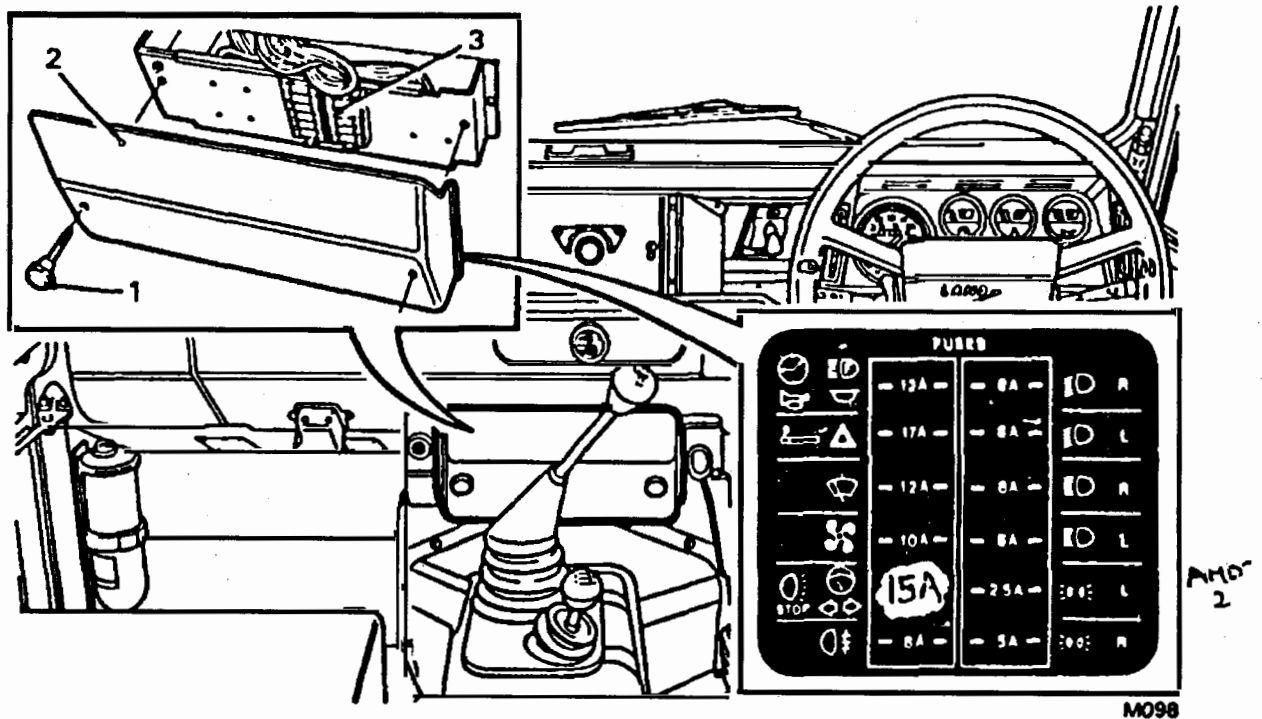


Fig 98 Fuses

### AIR CLEANER

5 The air cleaner is situated in the engine compartment on the left hand side.

#### To check the dump valve

5.1 The dump valve provides an automatic drain for the air cleaner, and is fitted to the base of the air cleaner.

5.1.1 Squeeze open the dump valve (1) and check that the interior is clean.

5.1.2 Check that the rubber is flexible and in good condition.



5.1.3 If necessary, remove the dump valve to clean the interior.

5.1.4 Fit a new valve if the original one is in poor condition.

5.1.5 Under heavy conditions such as dusty, deep wading or field, attention must be more frequent.

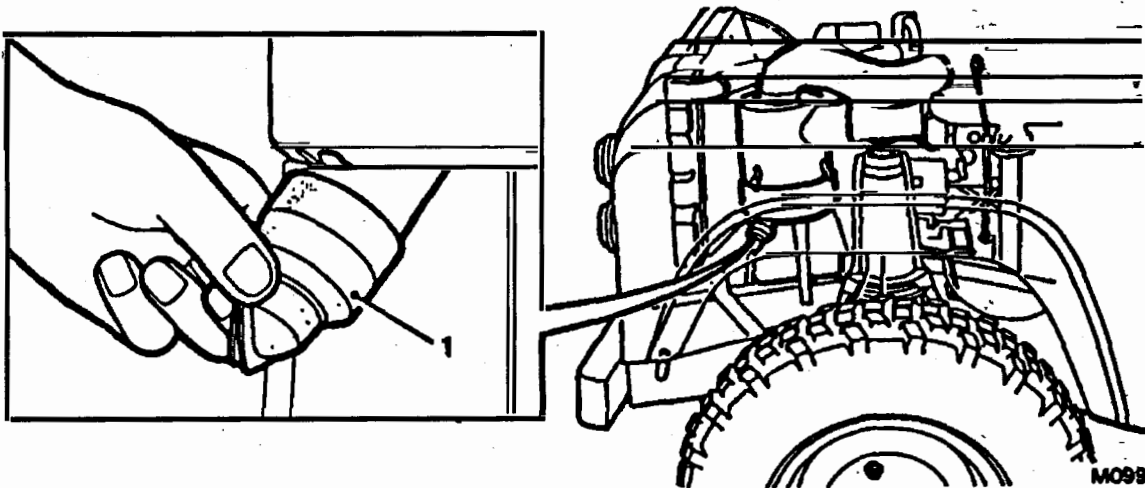


Fig 99 To check the dump valve

To renew the air cleaner element

5.2 In emergencies the filter element can be cleaned and used again. Once back at base then renew the air cleaner element.

5.2.1 Undo the pipe clip (1) at the top of the air cleaner and remove.

5.2.2 Pull up three clips (3) and remove the air cleaner canister.

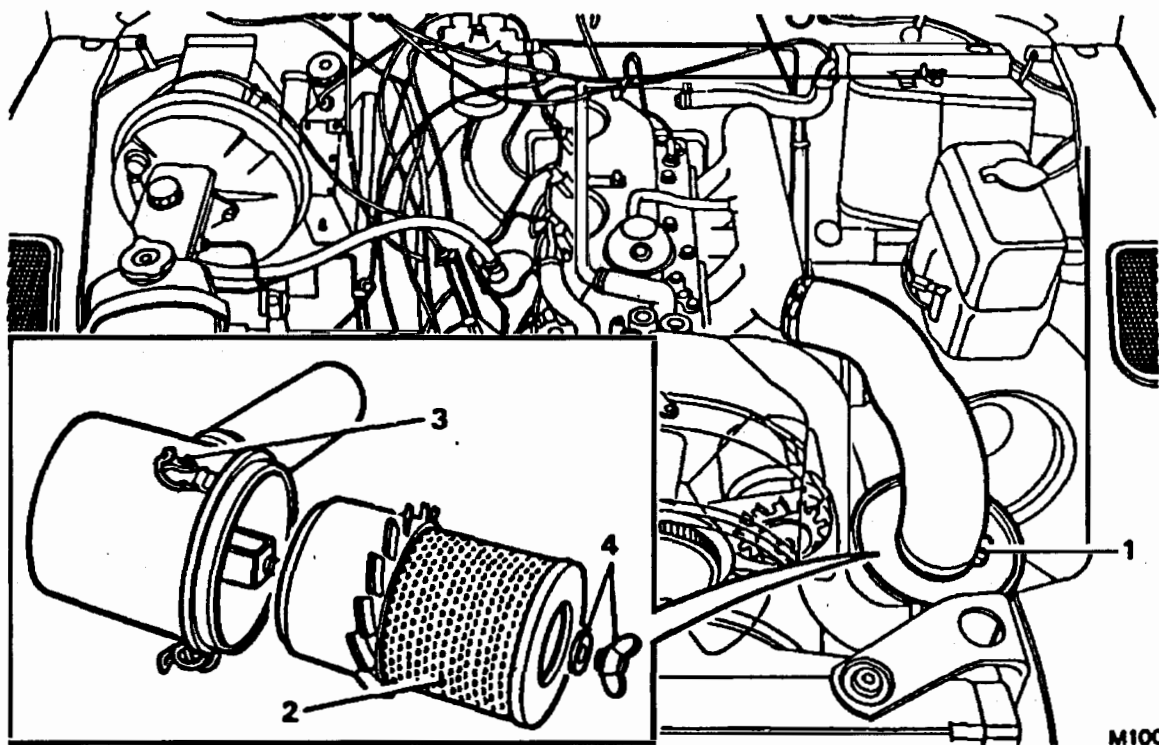
5.2.3 Undo the element wing nut (4) and remove the washer along with it.

5.2.4 Remove the element (2) and discard.

5.2.5 Fit a new element and secure with the washer and wing nut.

5.2.6 Fit the air cleaner cannister and secure with the three clips.

5.2.7 Refit the air cleaner hose.



M100

Fig 100 To renew the air cleaner

To clean the air cleaner element

WARNING ...

DURING THE CLEANING OF THE ELEMENT BY COMPRESSED AIR, SAFETY GOGGLES AND BREATHING MASK SHOULD BE WORN TO PREVENT THE INHALATION OF DUST.

CAUTION ...

If the element is contaminated with oil or carbon deposits then it should not be cleaned.

5.3 When a replacement element is not available, the element may be cleaned in the following ways:

5.3.1 Compressed air. This is the better of the two methods. Direct air through the element in the direction opposite to the normal air flow, moving the nozzle up and down while rotating the element. Keep the nozzle at least 25,0 mm (1.0 inch) from the pleated paper. The maximum air pressure must be no more than 5,6 kg cm<sup>2</sup> (80.0 lbf in<sup>2</sup>) to avoid damage to the element.

CAUTIONS ...

- (1) If an element is replaced wet it will collapse under engine suction, which could result in engine damage.
- (2) The use of any fluid (especially solvents) or detergent powder other than those specified may damage the element.

5.3.2 Washing in water. Soak the element for fifteen to sixty minutes in water with a detergent powder. The detergent should be of a synthetic, bio-degradable, non-sudsing type (Pn9-10.5). Brands such as Persil or Omo are suitable. Rinse the element until the water is clear using a maximum water pressure of 1,7 kg cm<sup>2</sup> (25.0 lbf in<sup>2</sup>) to prevent damage to the element. Leave the element to dry naturally, but can be assisted to a maximum temperature of 71° C (160° F). Do not use compressed air or light bulbs for drying.

5.3.3 After washing inspection. Place a bright light inside the element and rotate the element slowly. If any rupture, hole, thin spot or damaged gasket is discovered, replace as

previously described in paragraph (5.2). After inspection, mark the end of the cap to show the number of times the element has been serviced and the date of service. Elements should be replaced after a maximum of six cleanings, or annually whichever occurs first.

CAUTION ...

When cleaning elements by the previously described methods, care must be taken to prevent dirt which has been removed recontaminating the clean side of the element.

Note ...

The previous cleaning instructions apply to the elements supplied by Land Rover only.

FUEL FILTER

6 The fuel filter is mounted at the rear of the engine compartment.

To drain the filter

6.1 Slacken the drain plug (1) at the bottom of the filter (2) to allow the water to run out.

6.2 When pure diesel fuel is emitted, tighten the drain plug and wipe any excess away.

6.3 Check for any seepage around the drain.

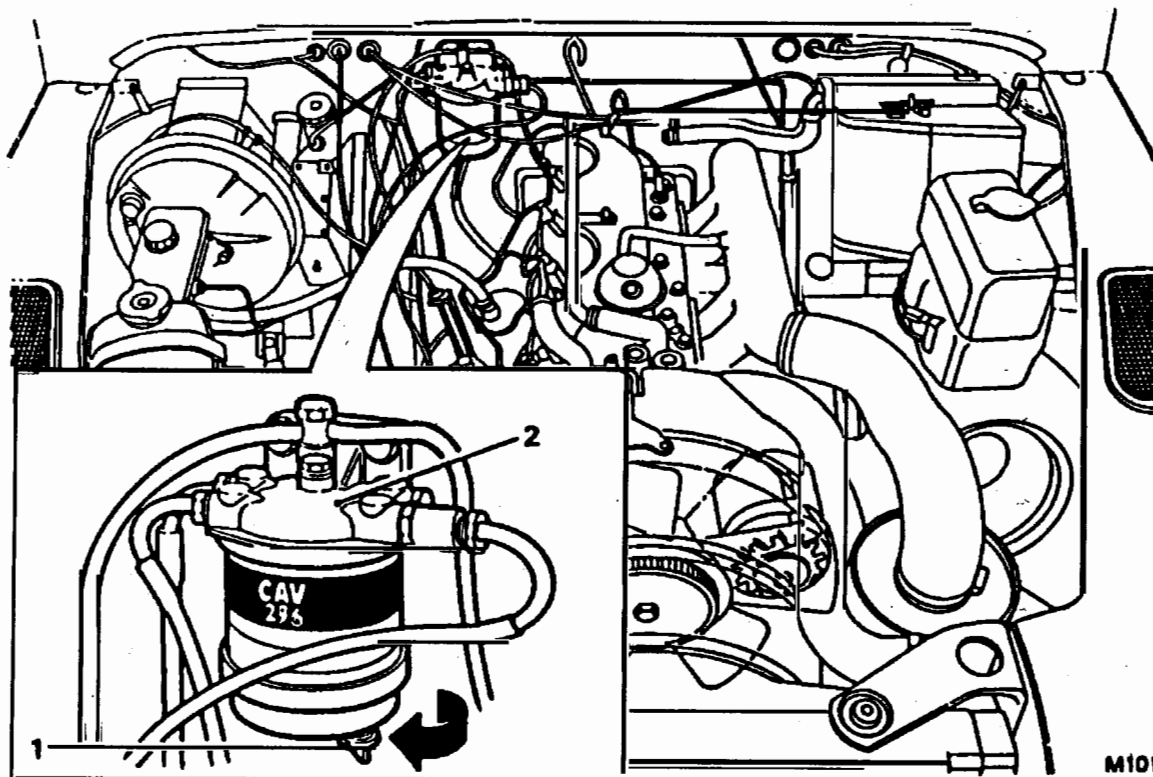


Fig 101 To drain the filter

To renew the filter

6.4 Supporting the element holder, (1) unscrew the bolt (2) on the top of the filter.

6.5 Remove the element holder.

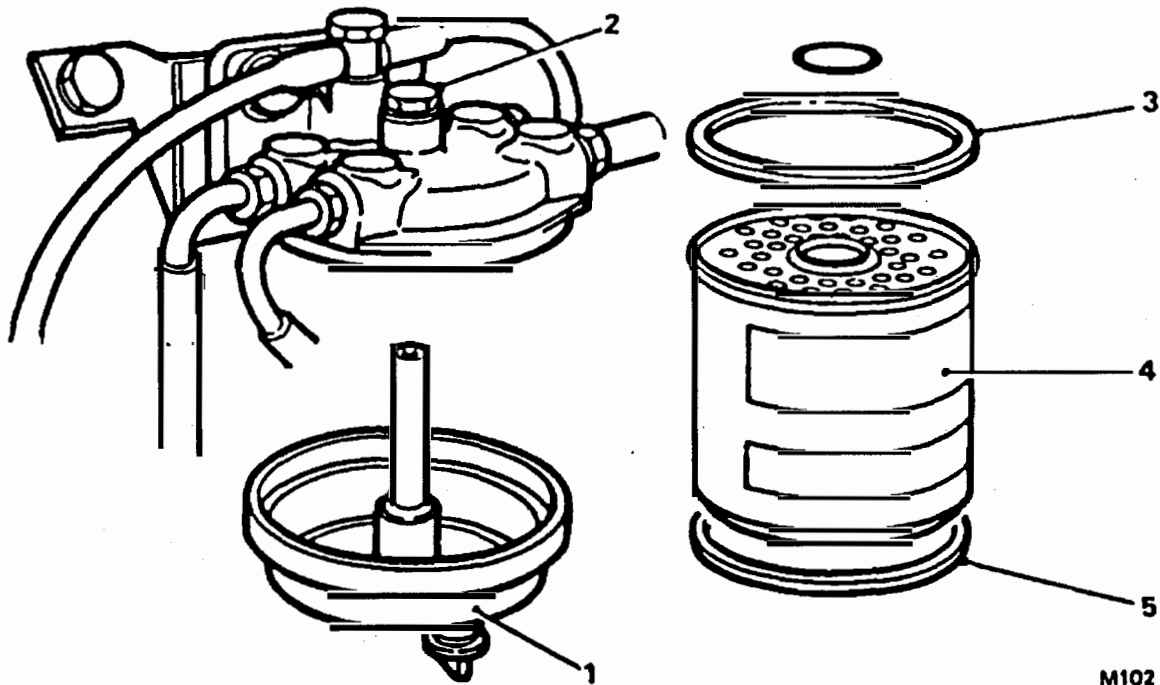
6.6 Remove the element (4) and discard.

6.7 Check and renew the large and small rubber washers (3) in the filter top, also the large rubber washer (5) in the element holder if necessary.

6.8 Wash the element holder in petrol, fluid oil or equivalent.

6.9 Fit the new element onto the filter top spigot with the holes of the element facing to the top.

6.10 Fit the element holder and secure with the bolt on the top of the filter.



M102

Fig 102 To renew the filter

### FUEL SEDIMENTER

7 The sedimenter is positioned in a different location for the TUL as against the TUM. On the TUL the sedimenter is attached to the chassis frame, on the right-hand side in front of the rear wheel. On the TUM the sedimenter is attached to the chassis frame, on the left-hand side behind the rear wheel.

#### To drain the sedimenter

7.1 Locate the drain tap (1) at the bottom of the sedimenter and slacken off until pure diesel fuel is emitted then close tap.

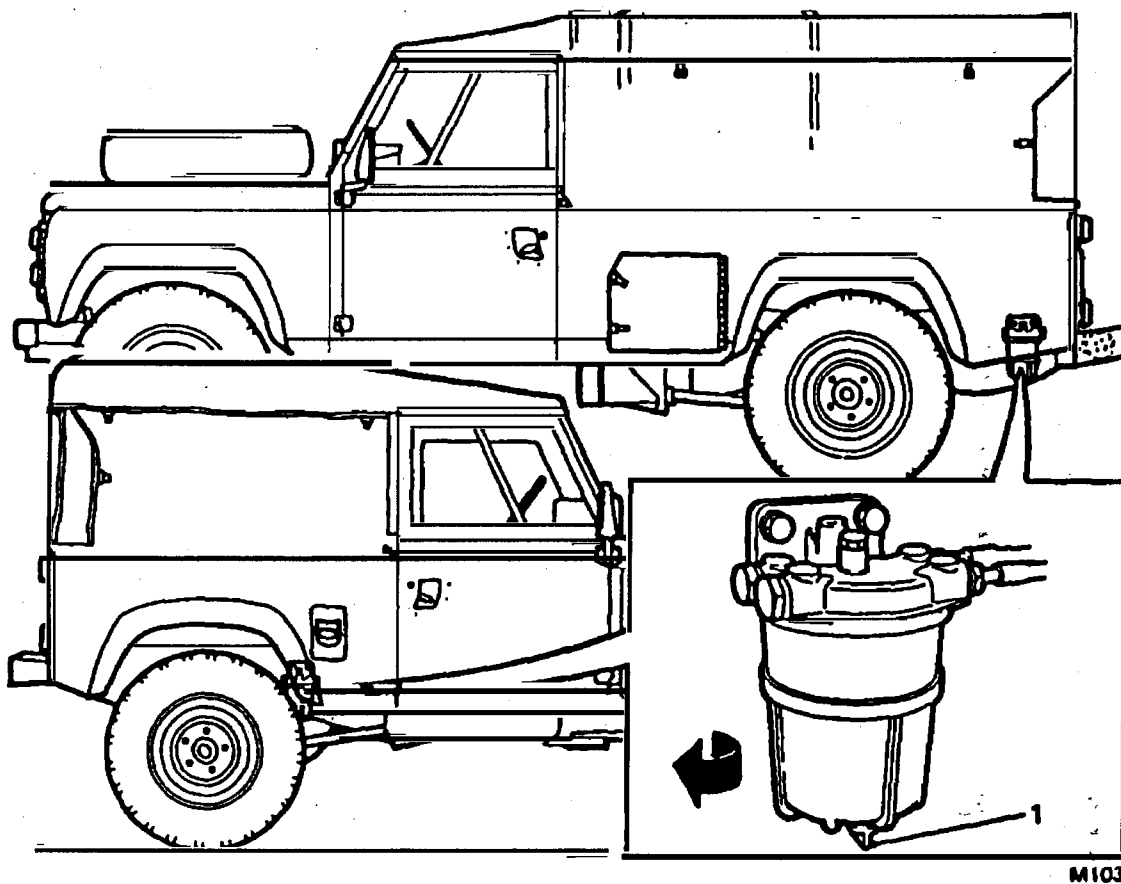


Fig 103 To drain the sedimenter

To clean the element

7.2 Disconnect the fuel inlet pipe from the sedimenter and raise the pipe above the level of the fuel tank supporting it in this position to prevent fuel draining from the tank.

7.2.1 Support the bowl (1) and unscrew the bolt (4) on top of the unit and remove.

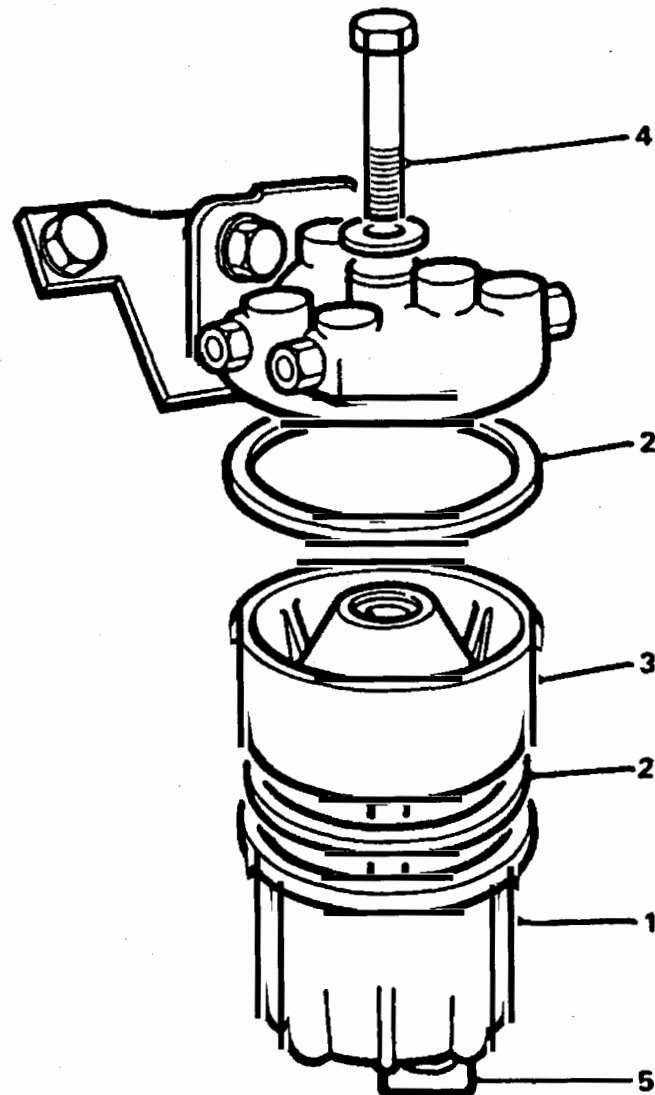
7.2.2 Remove the bowl, element (3) and seals (2).

7.2.3 Discard the seals and clean all the other parts in kerosene or an equivalent fluid.

7.2.4 Reassemble the sedimenter fitting new seals.

7.2.5 Slacken off the drain tap (5) until pure diesel fuel is emitted then close tap.

7.2.6 Start the engine and check the sedimenter for leaks.



M104

Fig 104 To clean the element



BRAKE FLUID RESERVOIRSCAUTION ...

When topping-up a reservoir, care must be taken to ensure that fluid does not come in contact with any paintwork on the vehicle.

8 The tandem brake fluid reservoir is integral with the servo unit and the master cylinder. There are two types of reservoir fitted, and are located in the engine compartments of the relevant vehicle.

TUL brake reservoir

8.1 The reservoir cap has a fluid level sensor built into it, this informs the driver via the warning light when the brake fluid is low. To top up with fluid proceed as follows:

8.1.1 Hold the centre terminal block (3) stationary and undo the reservoir cap.

8.1.2 Check the fluid level in the reservoir. The level is indicated on the translucent reservoir body (1).

8.1.3 Top up to the "max" mark (4) with the specified fluid (Cat 601 Table 2).

8.1.4 Replace the filler cap and secure.

Note ...

If significant topping-up is required, check the master cylinder, wheel cylinders and brake pipes for leakages; any leakage must be reported immediately for rectification.

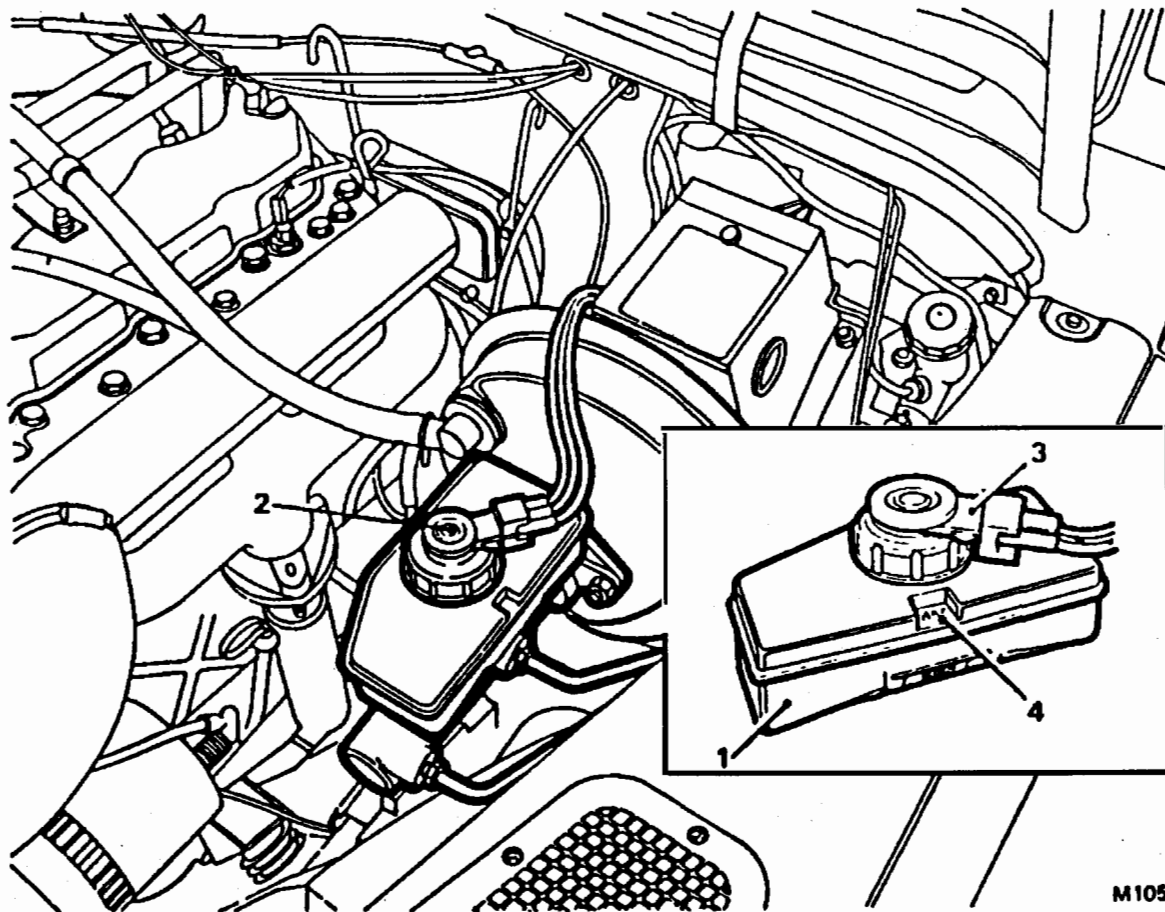


Fig 105 TUL brake reservoir

Low fluid/brake circuit warning light test

WARNING ...

AS THIS TEST REQUIRES THE RELEASE OF THE  
HANDBRAKE, ENSURE THAT THE VEHICLE IS ON LEVEL  
GROUND.

8.2 Under normal conditions the warning light remains off, however to check that the circuit is operative proceed as follows:

8.2.1 Switch on the ignition and release the handbrake

8.2.2 Press the flexible contact (2) located in the filler cap.

8.2.3 The red warning light on the instrument panel should illuminate, but if the warning light fails to illuminate and the bulb is operating correctly, the fault should be reported immediately.

### TUM brake reservoir

#### CAUTION ...

When topping-up a reservoir, care must be taken to ensure that fluid does not come in contact with any paintwork on the vehicle.

8.3 The brake reservoir cap has no fluid level sensor built into it and this is common to all the TUM vehicles. To top up with the fluid proceed as follows:

8.3.1 Undo the reservoir cap (3).

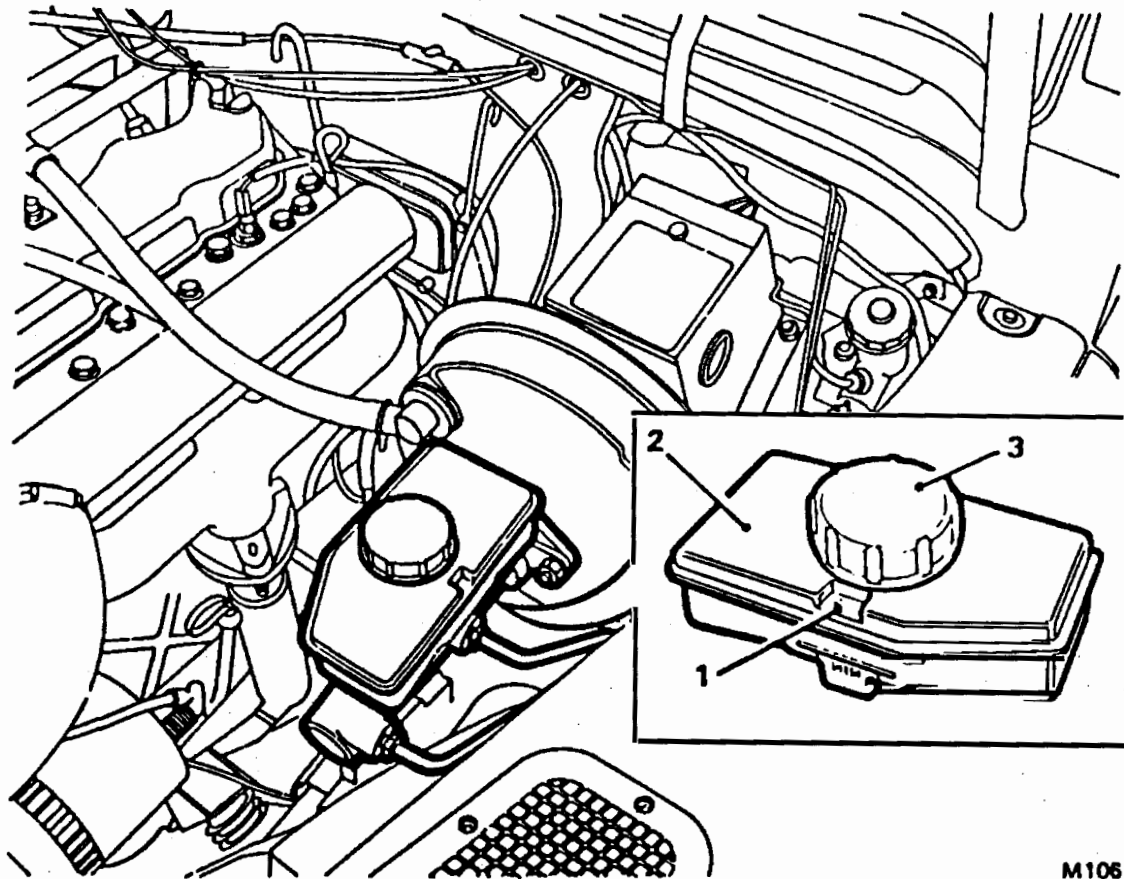
8.3.2 Check the fluid level in the reservoir. The level is indicated on the translucent reservoir body (2).

8.3.3 Top up to the "max" mark (1) with the specified fluid (Cat 601 Table 2).

8.3.4 Replace the filler cap and secure.

#### Note ...

If significant topping-up is required, check the master cylinder, wheel cylinders and brake pipes for leakages; any leakage must be reported immediately for rectification.



M106

Fig 106 TUM brake reservoir

### CLUTCH

9 The clutch is mounted on the left-hand side of the brake fluid reservoir within the engine compartment. To top up proceed as follows:

- 9.1 Remove the cap (1) and check the level.
- 9.2 If low, top-up with the specified fluid (Cat 601 Table 2) to the bottom of the filler neck (2).
- 9.3 If significant topping-up is required, check for leaks at the master cylinder, slave cylinder and connecting pipes.
- 9.4 Replace the filler cap and secure.

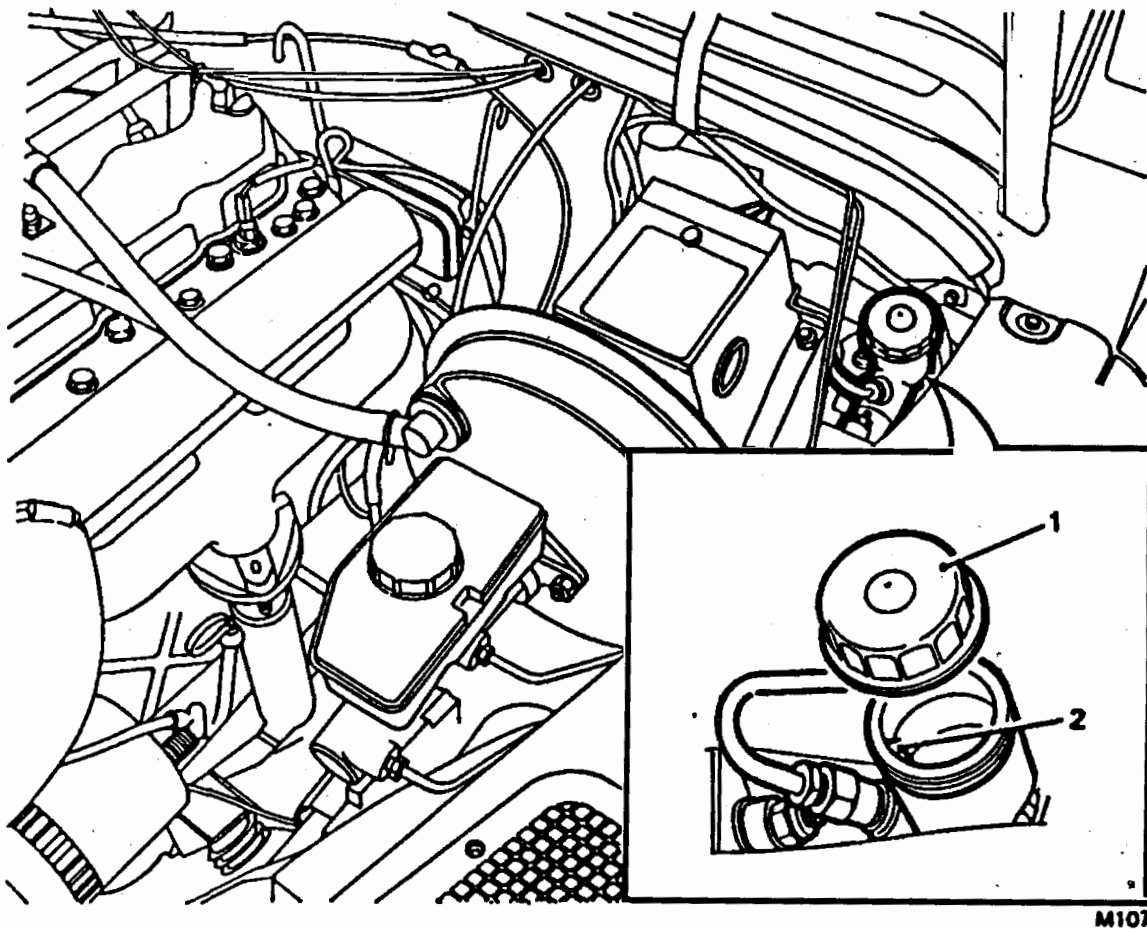


Fig 107 Clutch reservoir

### STEERING BOX

10 The manual steering box is located on the chassis frame member. To top up proceed as follows:

- 10.1 Remove the oil filler plug (1) and check the level which should be 25mm (1.00 in) below the top of the filler hole.
- 10.2 If low, top up to the correct level with the specified oil (Cat 601 Table 2).
- 10.3 Refit the filler plug and clean any surplus oil away.

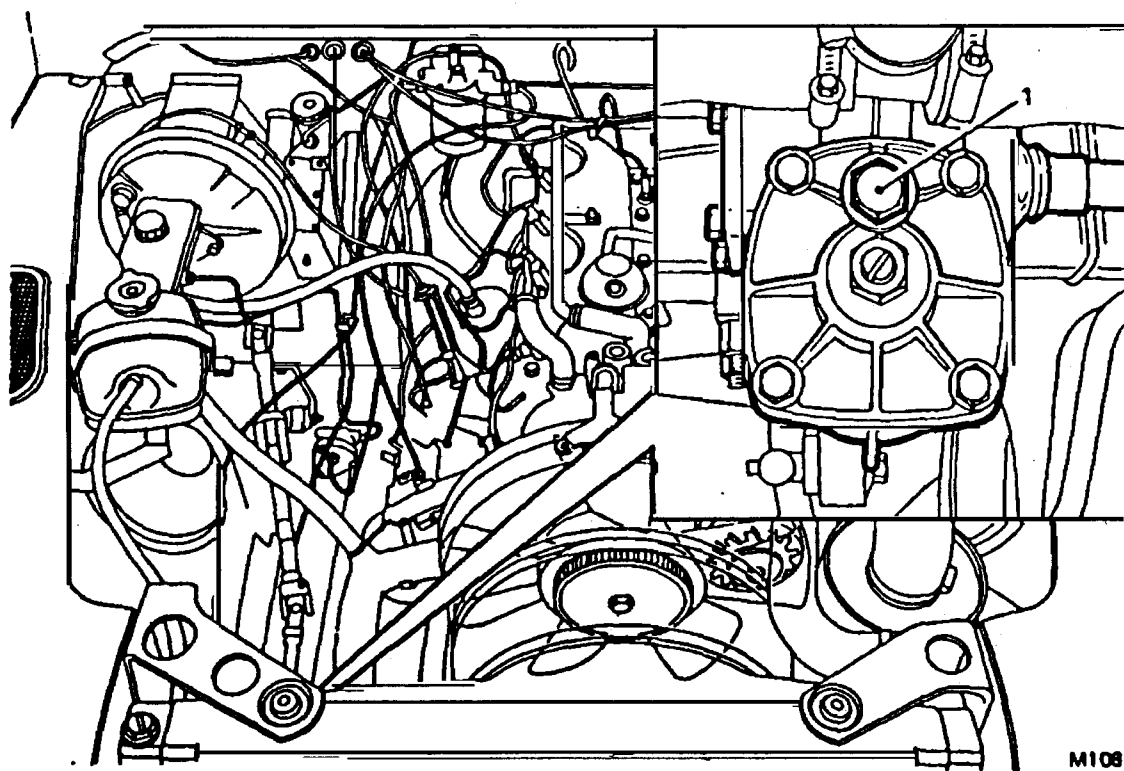


Fig 108 Steering box

ENGINE

WARNINGS ...

- (1) PROLONGED AND REPEATED CONTACT WITH USED ENGINE OILS MAY CAUSE SERIOUS SKIN DISORDERS, INCLUDING DERMATITIS AND CANCER.
- (2) AVOID EXCESSIVE CONTACT, WASH THOROUGHLY AFTER CONTACT.

CAUTION ...

The oil level must never be above the "H" mark as engine damage may be caused.

11 The engine oil is checked by using the dipstick which is located on the left-hand side of the engine.

Note ...

Whenever possible the oil level should be checked with the engine hot.

To check the engine oil level

11.1 To check the oil level when the engine is hot proceed as follows:

11.1.1 The vehicle must be sited on level ground.

11.1.2 Wait at least five minutes after the engine has stopped.

11.1.3 Withdraw the dipstick, (1) wipe clean and re-insert into its tube, ensuring it is pushed fully home.

11.1.4 Withdraw the dipstick and take note of the oil level (2).

11.1.5 If the oil level is between the "N" and "H" (middle and upper notches) add no oil.

11.1.6 If the oil level is between the "L" and "N" (lower and middle notches) add 1,00 litre (1.76 pts) only through the engine oil filler/breather cap (3) on the rocker cover with the specified oil in (Cat 601 Table 2).

11.1.7 If the oil level is below the "L" (lower notch) add 2,00 litres (3.52 pts) and re-check the level after five minutes.

11.2 To check the oil level when the engine is cold proceed as follows:

11.2.1 The vehicle must be sited on level ground.

11.2.2 DO NOT START THE ENGINE

11.2.3 Proceed to check the oil level as in paragraphs 11.1.3 to 11.1.6

11.2.4 If it is necessary to recheck the oil, or if the engine has been started without being thoroughly warmed up, wait at least thirty minutes to confirm that the oil level is correct.

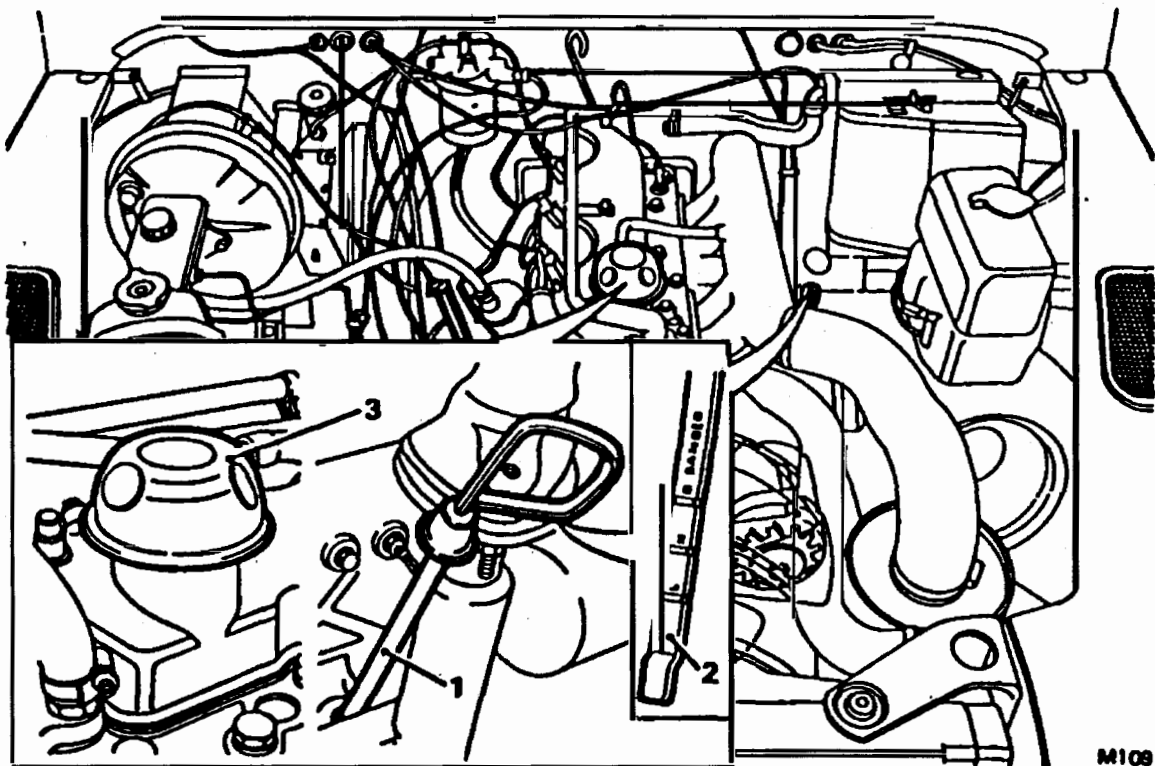


Fig 109 Checking the engine oil level

### Engine oil change

11.3 When changing the engine oil, the engine oil filter should be changed at the same time (Cat 601 Table 5). To change the oil and filter proceed as



follows:

11.3.1 Run the engine, to warm up the oil, and then disconnect the negative earth lead from the battery.

11.3.2 Place a suitable container under the engine sump (1).

11.3.3 Remove the drain plug (2) in the right-hand side of the sump and allow the oil to drain away completely then replace the plug.

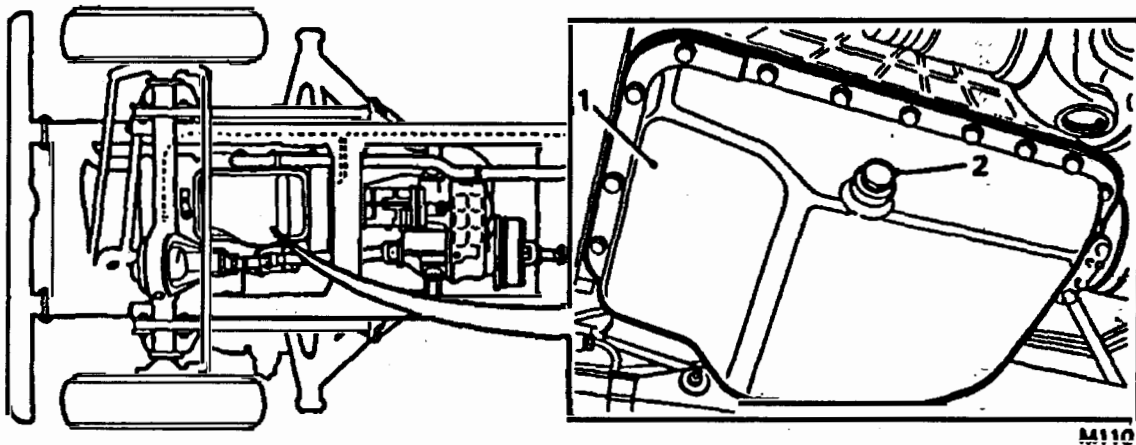


Fig 110 Draining the sump

11.3.4 Remove the filter Fig 111 (1) using a strap spanner.

11.3.5 Place the new rubber washer (2) on to the filter and fit the new filter on to the adapter.

11.3.6 Remove the engine oil filler/breather cap Fig 112 (1) located on top of the rocker box.

11.3.7 Fill the engine with the correct quantity of the specified oil (Cat 601 Table 2) through the top of the rocker box cover.

11.3.8 Replace the engine oil filler/breather cap.

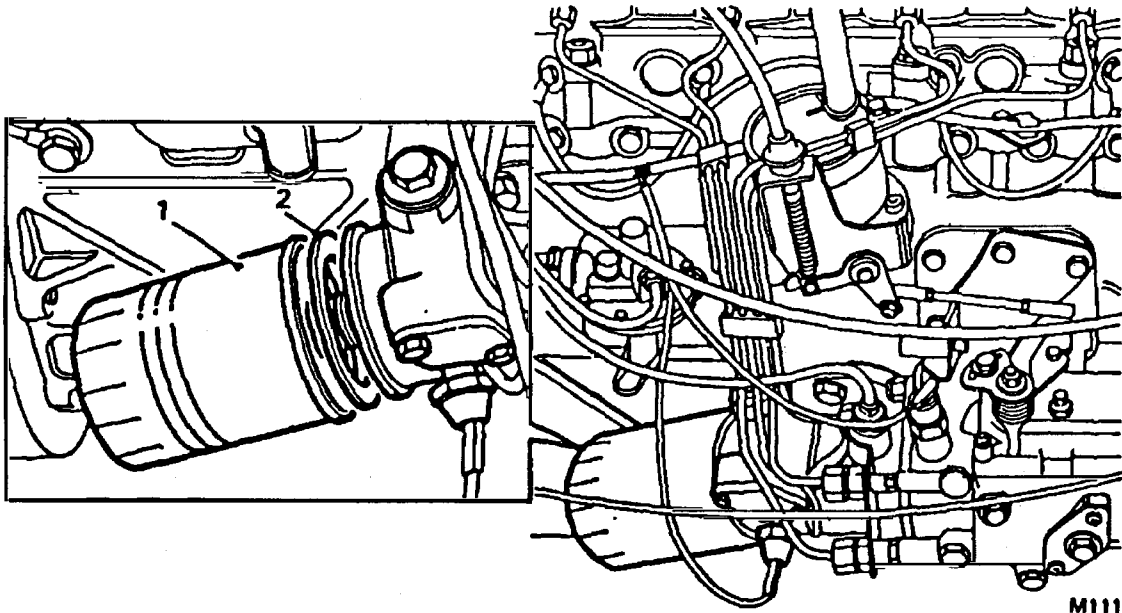


Fig 111 Engine oil filter

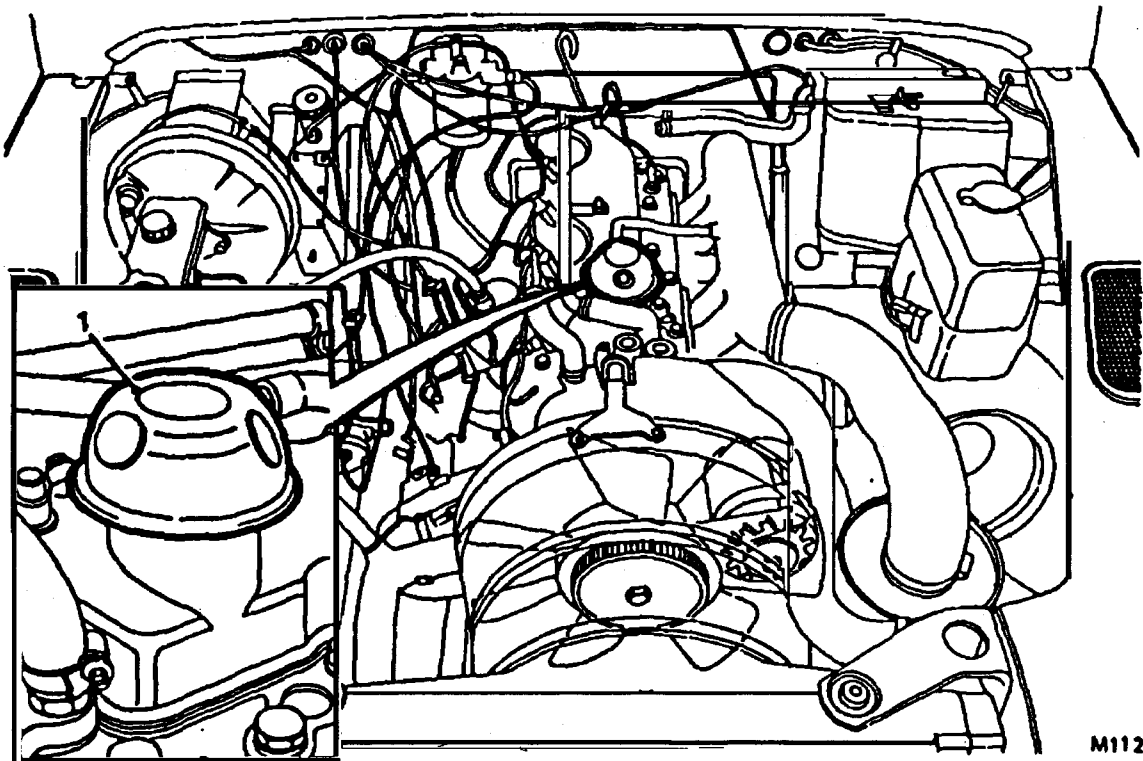


Fig 112 Engine oil filler/breather cap

11.3.9 Reconnect the negative earth lead to the battery, then run the engine checking for leakages at the filter joint and the sump drain plug.

## GEARBOX

12 The gearbox drain and filler plugs are situated under the vehicle.

### To check/top up the gearbox

12.1 Locate the filler plug (1) on the right-hand side of the gearbox and undo.

12.2 Top up with the specified oil (Cat 601 Table 2) until it begins to run out of the filler/level hole.

12.3 Fit and tighten the gearbox filler/level plug and clean any surplus oil away.

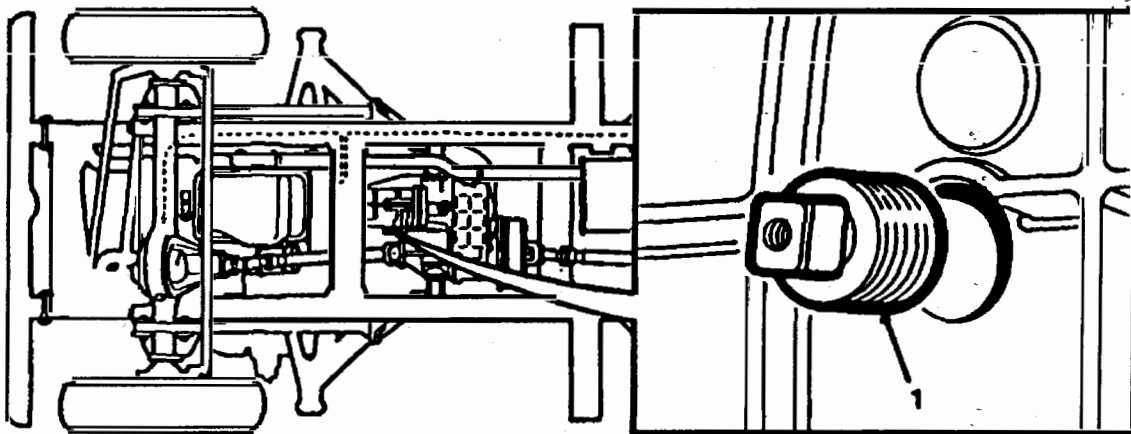


Fig 113 Gearbox filler plug

### To change the gearbox oil

12.4 Place a suitable container under the gearbox drain plug.

12.5 Remove the gearbox and extension case drain plugs (1)(4) and allow the oil to drain completely.

12.6 Remove the filter (3) from the extension case and wash in kerosene or equivalent.

12.7 Refit the filter to the extension case and using two new washers, (2) fit the two drain plugs ensuring they are secure.

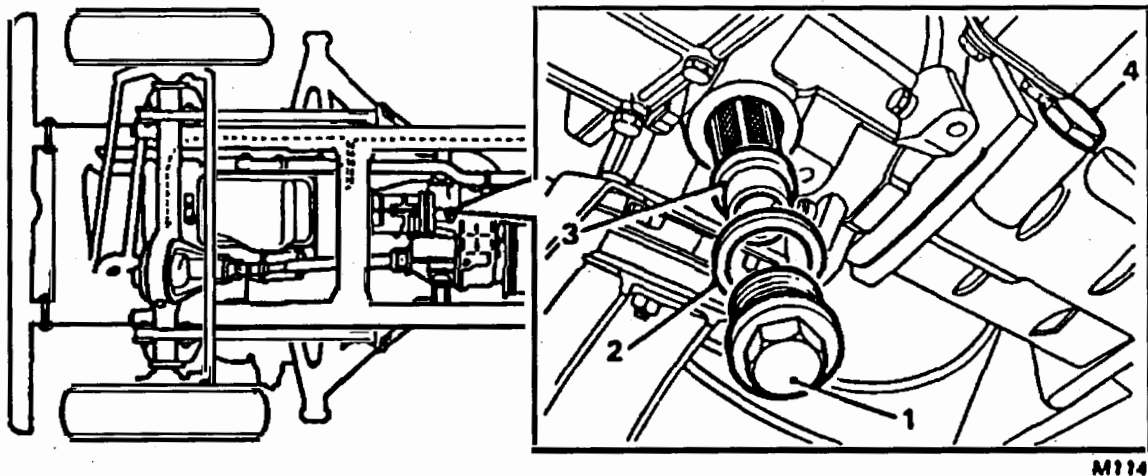


Fig 114 Gearbox drain plugs

12.8 Fill the gearbox with the specified oil (Cat 601 Table 2) until the oil begins to run out of the filler/level hole Fig 113 (1).

12.9 Fit and tighten the gearbox filler/level plug and clean any surplus oil away.

### TRANSFER GEARBOX

13 The transfer gearbox is situated to the rear of the gearbox, under the vehicle.

#### To check/top up the transfer gearbox

13.1 Locate the filler/level plug (1) at the back of the transfer gearbox and undo.

13.2 Top up with the specified oil (Cat 601 Table 2) until the oil begins to run out of the filler/level hole.

13.3 Fit and tighten the transfer gearbox filler/level plug and clean any surplus oil away.

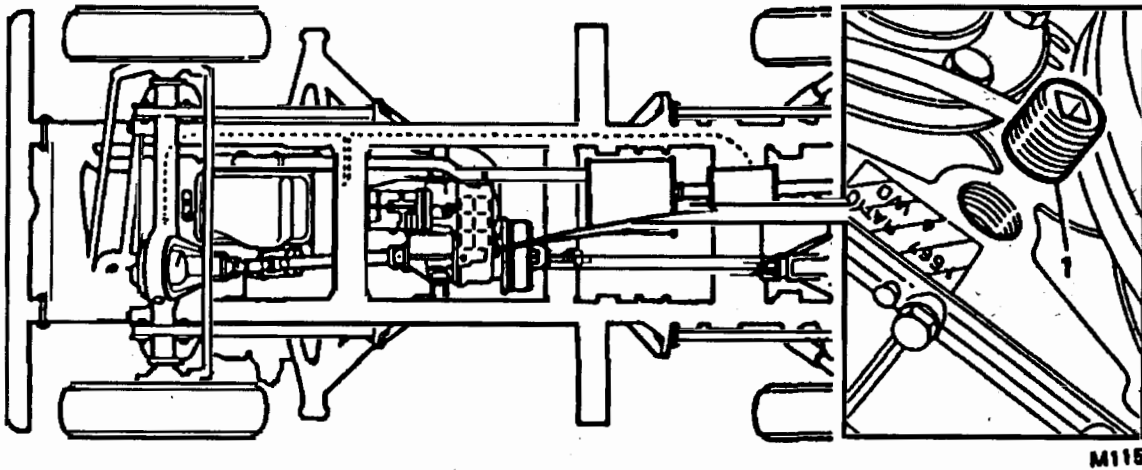


Fig 115 Transfer gearbox filler plug

To change the transfer gearbox oil

13.4 Place a suitable container under the transfer gearbox drainplug.

13.5 Remove the drain plug (1) and allow the oil to drain completely.

13.6 Fit the drain plug with a new washer (1) and tighten.

13.7 Remove the filler/level plug (2) and fill the transfer gearbox with the specified oil (Cat 601 Table 2) until it begins to run out of the filler/level hole.

13.8 Fit and tighten the transfer gearbox filler/level plug and clean any surplus oil away.

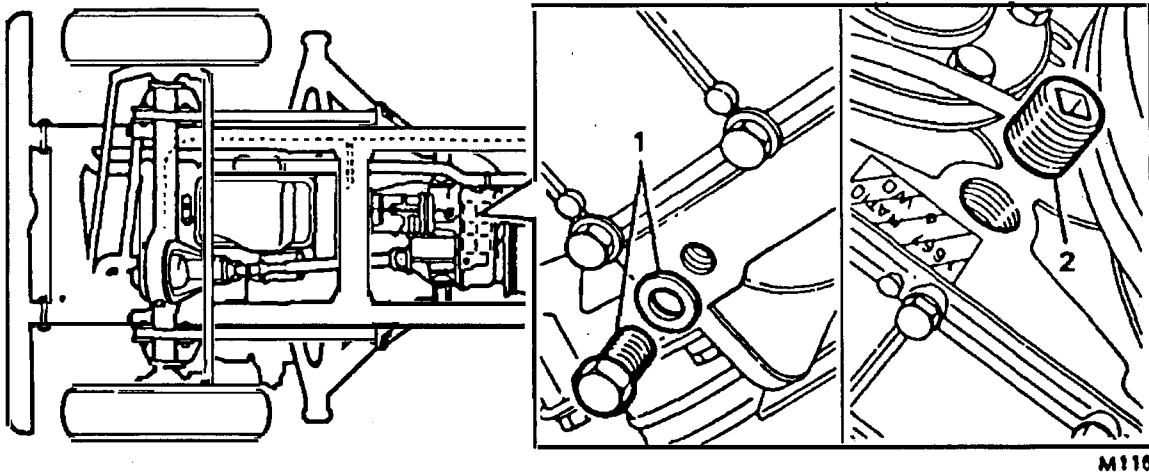


Fig 116 Transfer gearbox filler/drain plug

FRONT AND REAR DIFFERENTIAL AXLES

14 On the TUL vehicle the front and rear differential axles and the front differential axle of the TUM vehicle are of the "Rover" type. The rear differential axle of the TUM vehicle is of the "Salisbury" type.

To check/top up the differential axle

14.1 Locate and undo the filler/level plug (2) on the differential axle.

14.2 Top up with the specified oil (Cat 601 Table 2) until it begins to run out of the filler/level hole.

14.3 Fit and tighten the differential axle filler/level plug and clean any surplus oil away.

To change the differential axle oil

14.4 Immediately after a run, when the oil is warm drain the differential axle by removing the drain plug (1) located at the bottom of the axle casing.

14.5 Fit the drain plug and tighten.

14.6 Remove the filler/level plug (2) and fill the differential axle with the specified oil (Cat 601 Table 2) until it begins to run out of the filler/level hole.

14.7 Fit and tighten the differential axle filler/level plug and clean any surplus oil away.

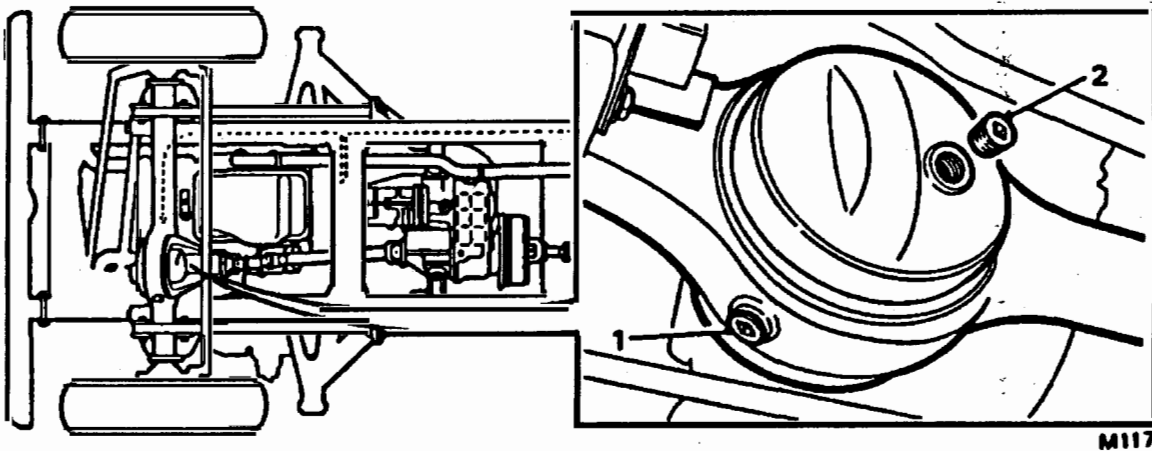


Fig 117 Rover differential axle filler/drain plug

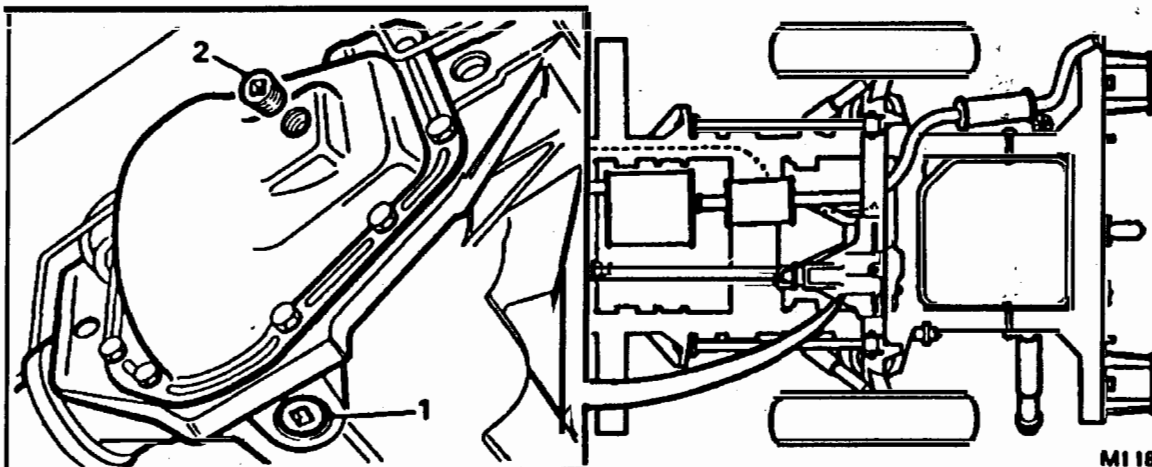


Fig 118 Salisbury differential axle filler/drain plug

#### SWIVEL PIN HOUSING

15 The swivel pin housings are located at the end of the front axle and lubricate the universal joints,

swivel pins and front hubs.

To top up the swivel pin housing

15.1 Locate and undo the filler/level plug (2) on the side of the swivel pin housing.

15.2 Top up with the specified oil (Cat 601 Table 2) until it begins to run out of the filler/level hole.

15.3 Fit and tighten the swivel pin housing filler/level plug and clean any surplus oil away.

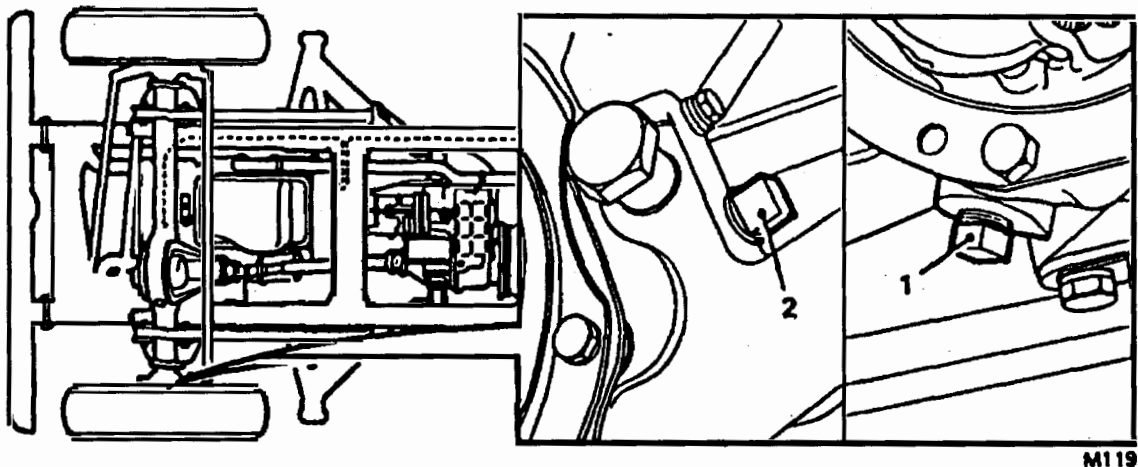


Fig 119 Swivel pin housing filler/drain plugs

To change the swivel pin housing oil

15.4 Drain the oil by removing the drain plug (1) at the bottom of the swivel pin housing.

15.5 Fit and tighten the drain plug.

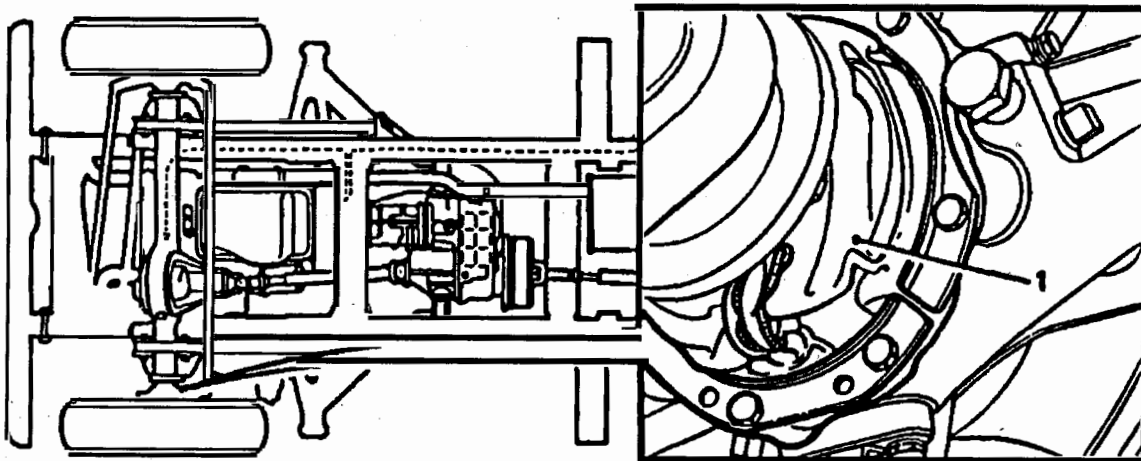
15.6 Remove the filler/level plug (2) and fill the swivel pin housing with the specified oil (Cat 601 Table 2) until it begins to run out of the filler/level hole.



15.7 Fit and tighten the swivel pin housing filler/level plug and clean any surplus oil away.

Note ...

Ensure the swivel pin housing gaiters (1) are not interfering with the topping up or refilling operations, also check the gaiters for wear and replace as described (Cat 522 Chapter 6 para 14).



M120

Fig 120 Swivel pin housing gaiter

### BATTERY

16 The battery is located underneath the left hand seat. To check the battery proceed as follows:

16.1 Lift off the left hand seat cushion (3).

16.2 Undo the overcentre catch (1) and slide the cover (2) from the seat base.

16.3 Disconnect the negative earth lead from the battery.

16.4 Gently prise off the vent cover (4) and inspect the electrolyte level of the centre cell. If low top up with distilled water to a maximum of

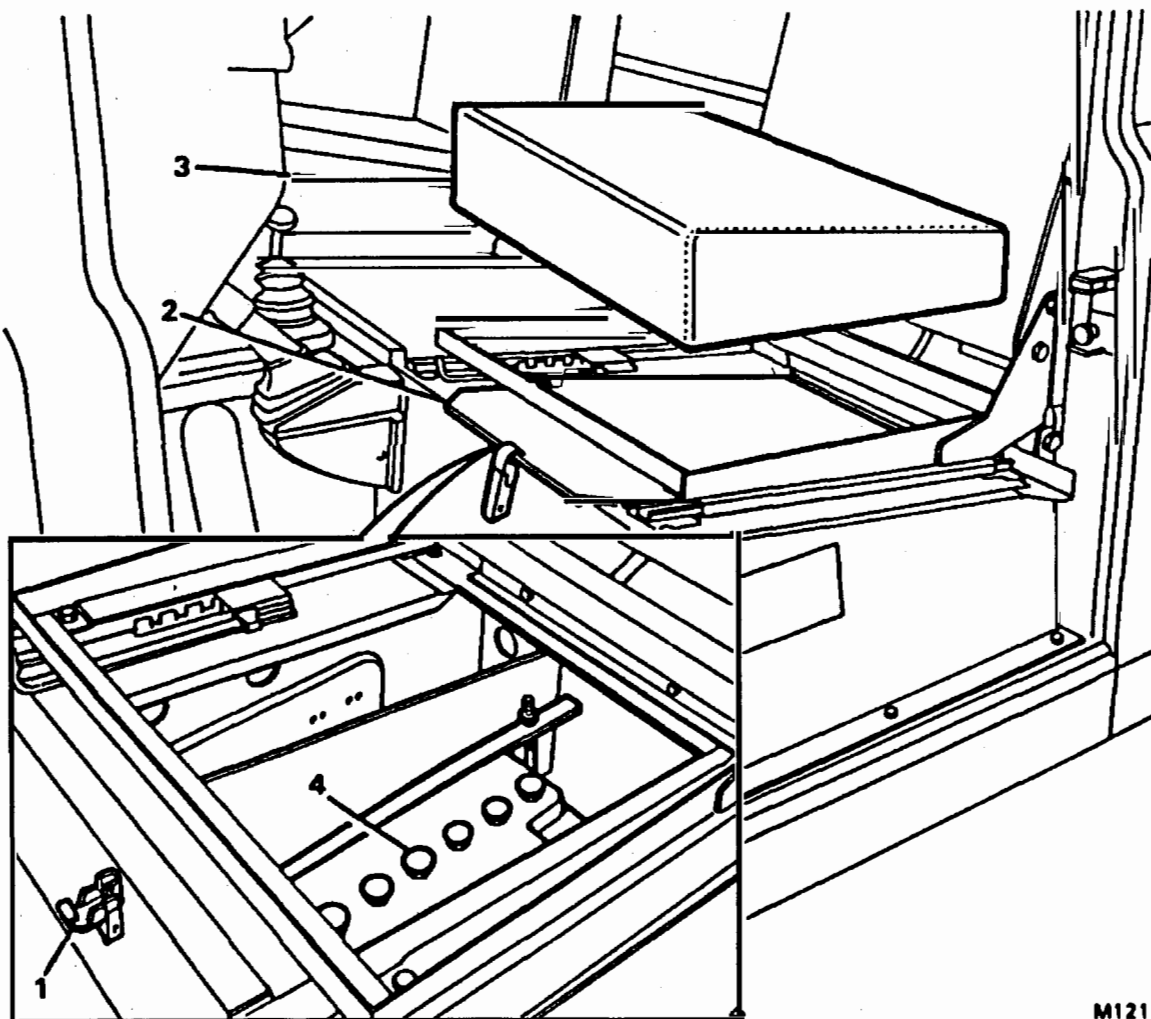
3mm (0.12 in) above the plates.

16.5 Replace the vent cover, also clean and grease the battery terminals with the specified grease (Cat 601 Table 5).

16.6 Reconnect the negative earth lead to the battery.

16.7 Slide the cover back into place and secure using the overcentre catch.

16.8 Replace the seat cushion.



M121

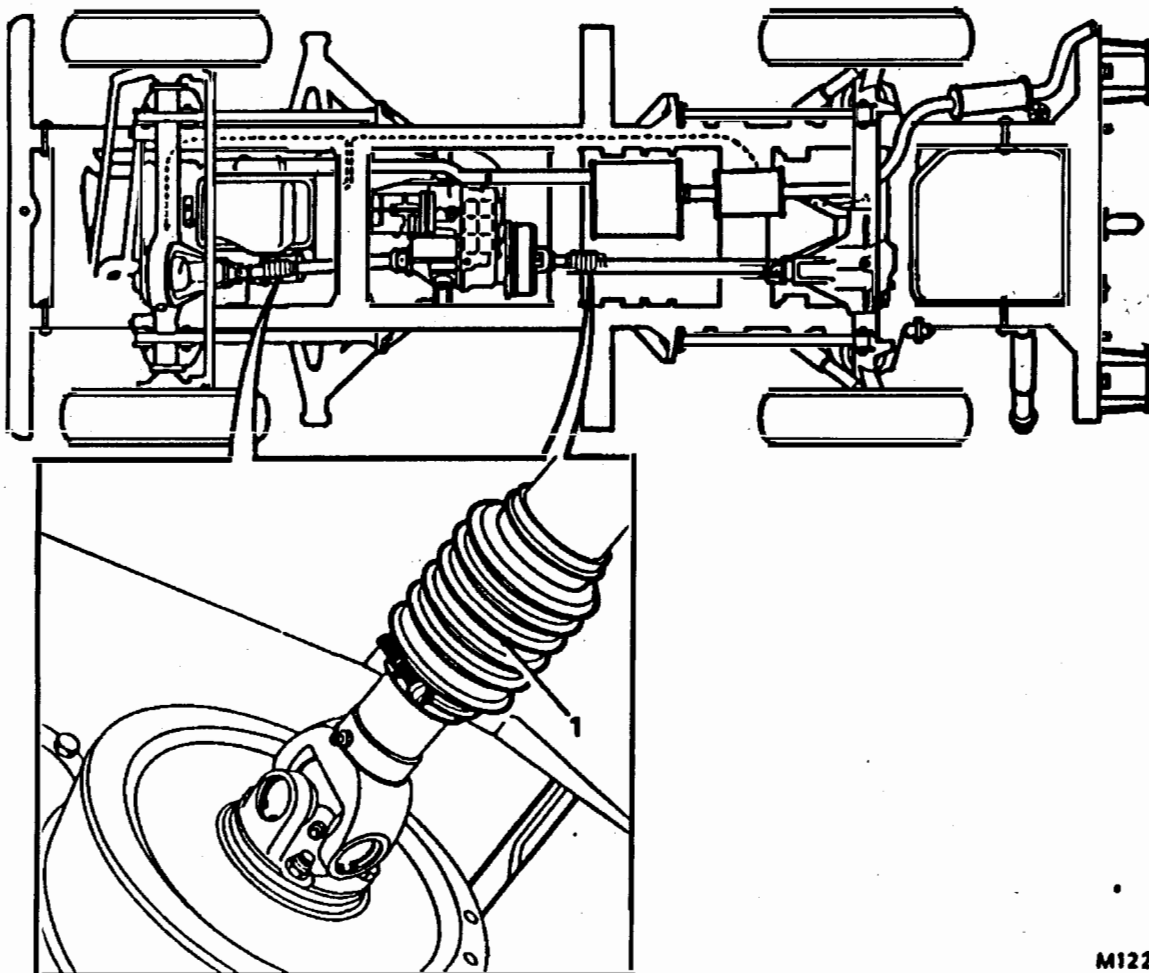
Fig 121 Battery

PROPELLER SHAFTS

17 The propeller shafts are located underneath the vehicle and connect the transfer box to the front and rear differential axles.

Propeller Shafts (Early Models)

17.1 The propeller shafts on TUM vehicles (early models) only have rubber gaiters (1) fitted over the sliding joints.



M122

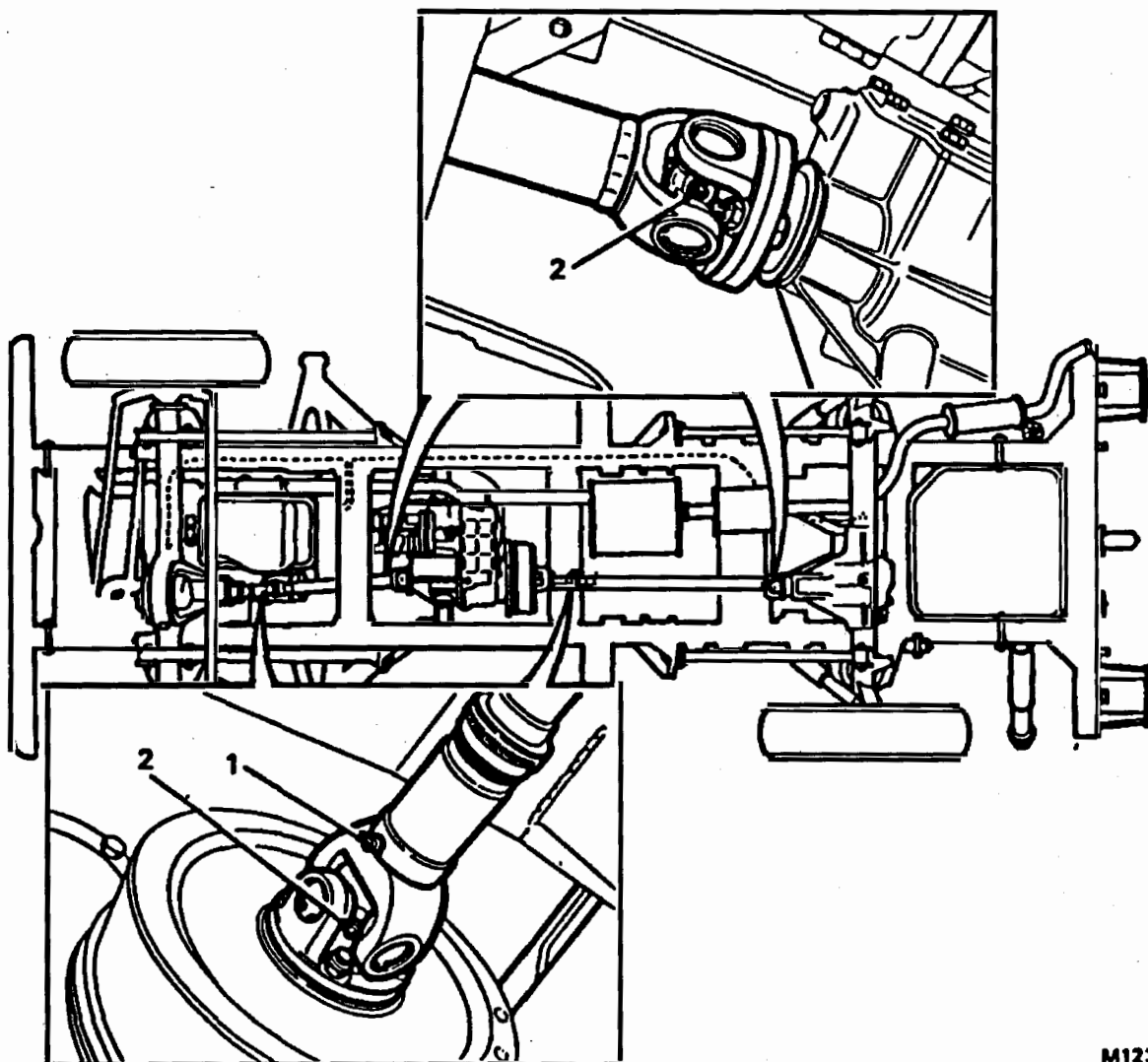
Fig 122 Propeller shaft (Early models)

Note ...

Whilst the gaiters do not affect the lubrication, they should be regularly examined and renewed if split or damaged.

Propeller Shafts (Later Models)

17.2 The propeller shafts on all the later models do not have rubber gaiters fitted over the sliding joints.



M123

Fig 123 Propeller shafts (Later models)

Note ...

Due to the type of sliding joint used on these shafts, only light greasing is required.

### Lubricating the propeller shafts

17.3 Apply the recommended grease (Cat 601 Table 2) to the grease nipples (1) at the sliding ends of each shaft, also to the grease nipples (2) inside each of the universal joints.

### AXLE BREATHING SYSTEM

18 There are two axle breather pipes, (3) one from each axle tube, which terminate inside the engine compartment.

### CAUTION ...

Blocked breather pipes may cause damage to the axles, so ensure that regular servicing (Cat 601 Table 5) is carried out. When the vehicle has undergone rugged and difficult conditions more frequent servicing may be required.

### Cleaning the axle breather pipes

18.1 Check that both pipes are clear of mud, debris and are not kinked, split or damaged.

18.2 If a pipe (3) is blocked, undo the nut (2) and release the banjo (1) on the appropriate axle tube and remove the pipe.

18.3 Carefully clean the pipe until all blockages have been removed.

18.4 Replace the pipe and secure to the axle tube with the banjo bolt.

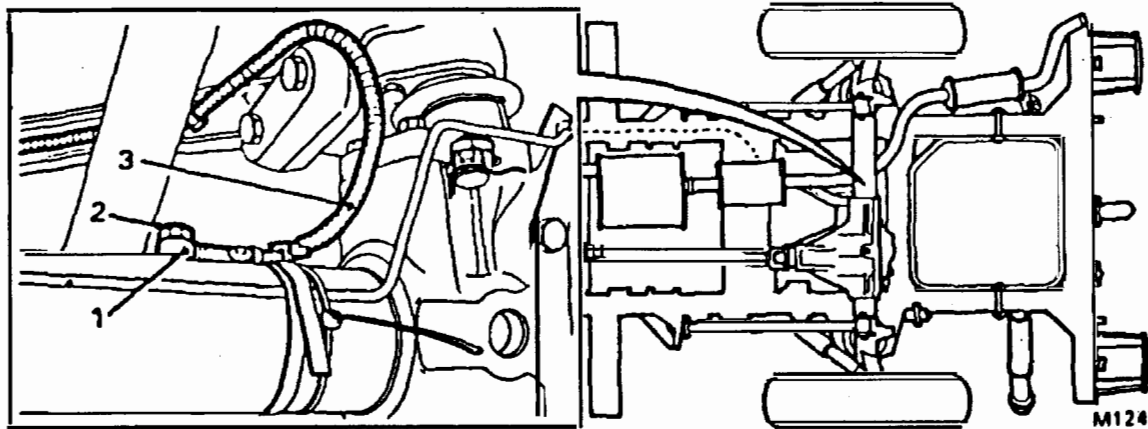


Fig 124 Axle breathing system

ENGINE FRONT TIMING COVER

19 At the bottom of the engine front timing cover is located a gauze filter which must be removed and cleaned at regular intervals (Cat 601 Table 5).

Cleaning the filter

19.1 Locate the filter housing at the bottom of the timing cover.

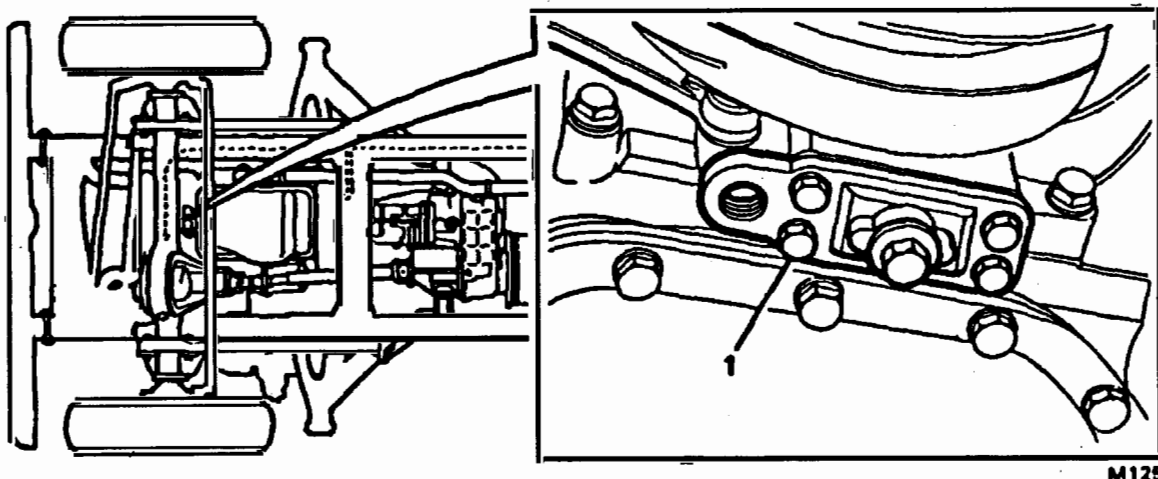


Fig 125 Engine front timing cover location

19.2 Undo the four bolts (1) and remove the washers, plate Fig 126 (3), gauze (2) and gasket (1).

19.3 Wash the gauze in kerosene or equivalent cleaning agent, brushing off any stubborn mud or debris collected.

Note ...

Before fitting the gauze, ensure that it is clean.

19.4 Inspect the gasket, if damaged, fit a new one.

19.5 Fit the gasket, gauze and plate, securing them with the washers and four bolts.

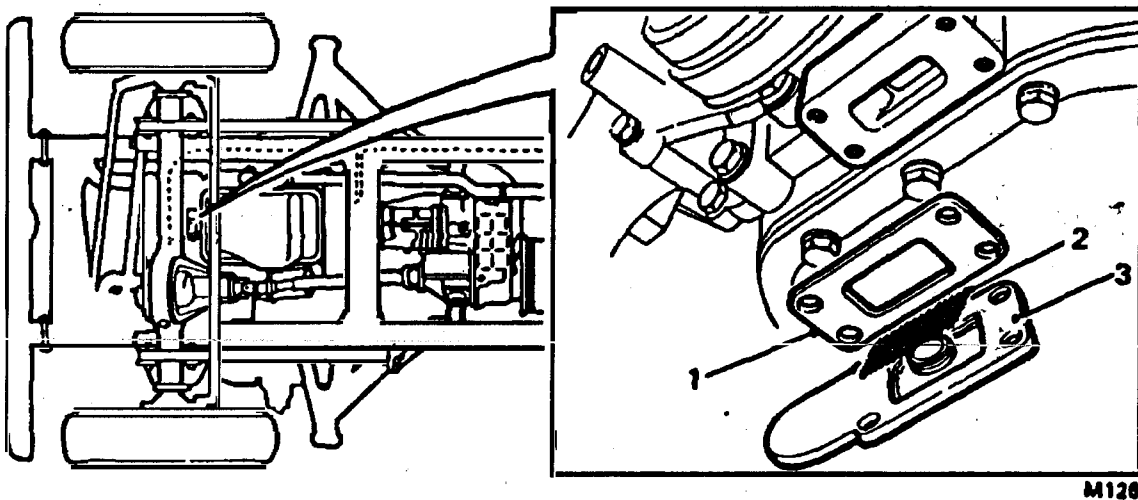


Fig 126 Engine front timing cover renewal

#### WINDSCREEN WIPER BLADES

20 Check the windscreen wiper blades and if necessary, renew using the following procedure:

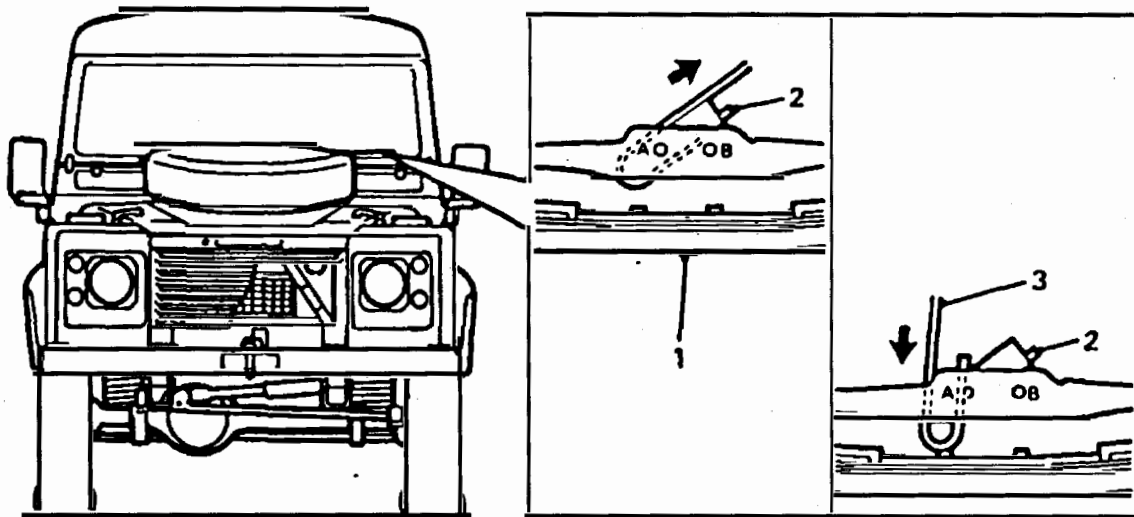
20.1 Lift the wiper arm away from the windscreen.

20.2 Squeeze the spring clip (2) and push the blade towards the windscreen.

20.3 To free the blade (1), unhook from the wiper arm (3).

20.4 To fit, push the new blade over the wiper arm.

20.5 Hook the arm into the swivel bracket (3) on the blade ensuring that the retaining clip (2) is engaged.



U5943/4

Fig 127 Windscreen wiper blade

## WHEEL CHANGING

21 When changing any of the wheels on the vehicle use the wheelbrace as supplied. Wheels should be chocked in all circumstances Fig 128. To replace a wheel proceed as follows:

## WARNINGS

**(1) IF THE VEHICLE IS COUPLED TO A TRAILER DISCONNECT THE TRAILER FROM THE VEHICLE BEFORE COMMENCING JACKING. THIS IS TO PREVENT THE TRAILER PULLING THE VEHICLE OFF THE JACK AND CAUSING PERSONAL INJURY.**

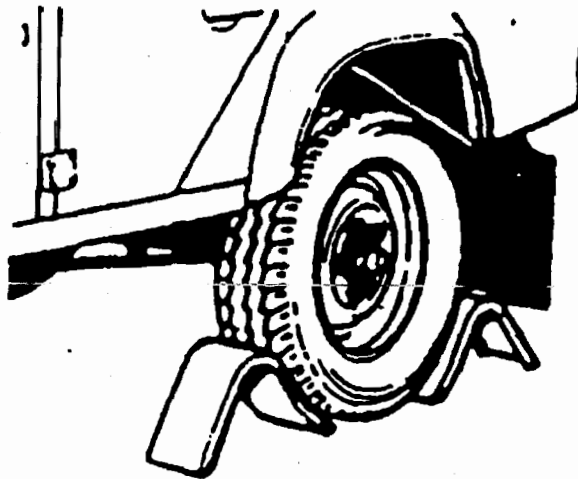


**WARNINGS (continued)**

**(2) IT IS UNSAFE TO WORK UNDER THE VEHICLE USING ONLY THE JACK TO SUPPORT IT. ALWAYS USE STANDS OR OTHER SUITABLE SUPPORTS TO PROVIDE ADEQUATE SAFETY. WHEELS SHOULD BE CHOCKED IN ALL CIRCUMSTANCES.**

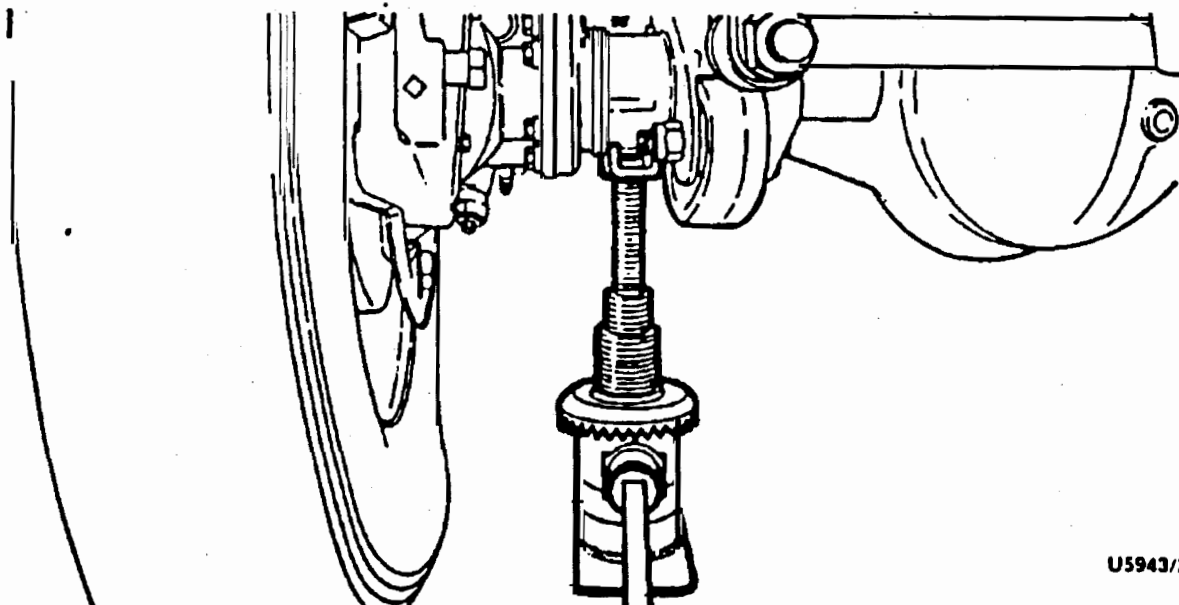
**NOTE**

The jack should be used on level and firm ground. Always engage the differential lock before jacking. The differential lock is only engaged if the warning light is illuminated with the Ignition/Starter switch switched on. No person should remain in a vehicle being jacked. Apply the parking brake. Engage first gear in the main gearbox. Engage low gear in the transfer gearbox. Turn off the Ignition/Starter switch and remove the key.



U5943/1

**Fig 28 Wheel chocked**

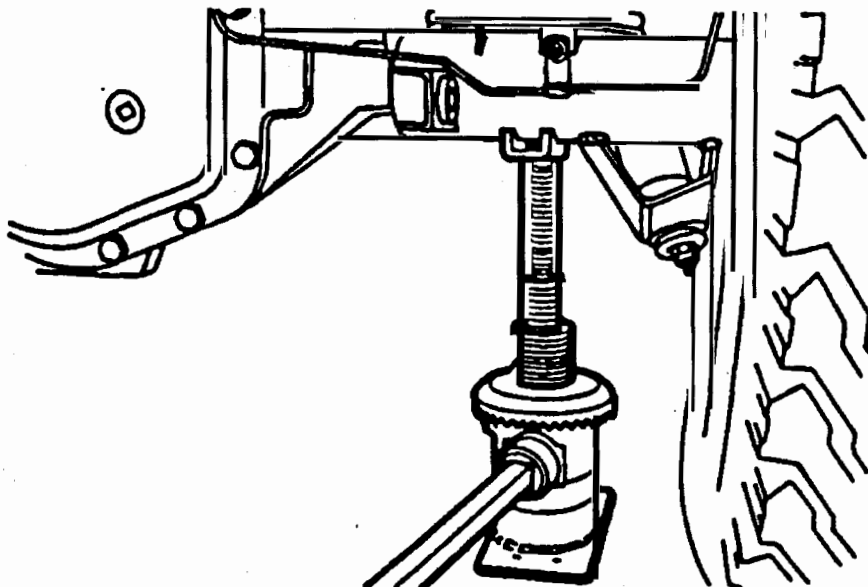


U5943/2

Fig 128A Jacking up a front wheel

**NOTE**

Jack up the corner of the vehicle by positioning the jack so that when raised, it will engage with the front axle casing immediately below the coil spring where it will be located between the flange at the end of the axle casing and a large bracket to which front suspension members are mounted.



U5943/3

Fig 128B Jacking up a rear wheel

**NOTE**

Jack up the corner of the vehicle by positioning the jack so that when raised, it will engage with the rear axle casing immediately below the coil spring and as close to the shock absorber mounting bracket as possible.

21.1 Using the wheelbrace, initially slacken the nuts on the wheel to be removed before jacking the vehicle.

21.2 Remove the spare wheel from the bonnet (Chapter 4-1 Para 22).

21.3 Jack up the relevant corner of the vehicle sufficiently to allow a wheel, with a fully inflated tyre, to be fitted.

21.4 When the wheel is clear of the ground, remove the wheel nuts and lift off the wheel.

21.5 Place a drop of oil or grease on the wheel studs to assist in the replacement, if available.

21.6 Fit the spare wheel, refit the nuts and tighten as much as possible.

21.7 Lower the vehicle to the ground and tighten to the specified torque (Cat 601 Table 3).

#### NOTES

(1) Where possible a torque spanner should be used to ensure that the correct figures are reached.

(2) When a torque spanner cannot be used tighten as far as possible and report the wheel change immediately (JSP 351 Part 1 Para 8).

#### SPARE WHEEL

22 The spare wheel is located on the bonnet and retained by the wheel clamp.

#### WARNING

**THE SPARE WHEEL IS HEAVY TO LIFT, TAKE CARE WHEN LIFTING IT ON AND OFF THE BONNET.**

To remove the wheel

22.1 Undo and remove the two retaining bolts and washers (2).

22.2 Remove the circular retaining plate (3).

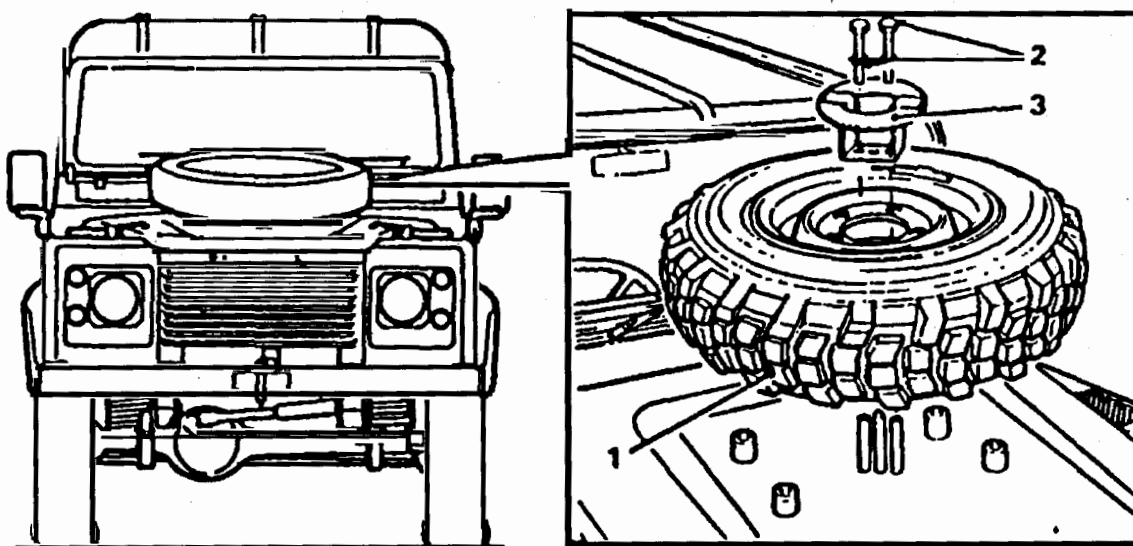
22.3 Remove the spare wheel (1) from its location on the bonnet.

To replace the wheel

22.4 Place the spare wheel on to its location on the bonnet.

22.5 Position the circular retaining plate over the wheel, ensuring that it has located on to the studs.

22.6 Fit the two washers and bolts and secure.



U5943/5

Fig 128C Removing the spare wheel

ENGINE COOLING SYSTEMWARNING ...

DO NOT REMOVE THE EXPANSION CAP WHEN THE ENGINE IS HOT BECAUSE THE COOLING SYSTEM IS PRESSURISED AND PERSONAL SCALDING COULD RESULT.

CAUTIONS ...

- (1) Failure to tighten the expansion cap may result in coolant loss with possible damage to the engine through overheating.
- (2) Never run the engine without coolant, not even for a very brief period, otherwise the injectors may be seriously damaged. This is due to the very high rate of heat transfer in the region of the injector nozzles.
- (3) As a precaution against corrosion, the cooling system should be drained and flushed out as specified (Cat 601 Table 2).

23 The cooling system is located inside the engine compartment and comprises of the expansion tank connected to the radiator by way of the engine. The engine coolant is a mixture of two fluids (Cat 601 Table 2) and is an aid to protecting the engine from overheating.

Expansion tank

23.1 The expansion tank (1) is located on the right hand wing valance.

23.1.1 When removing the filler cap (2) proceed as follows:

23.1.2 Turn the cap anti-clockwise a quarter of a turn and allow the pressure to escape, before turning further in the same direction to lift it off.

23.1.3 When replacing the expansion tank cap, it is important that it is tightened down fully, not just to the first stop.

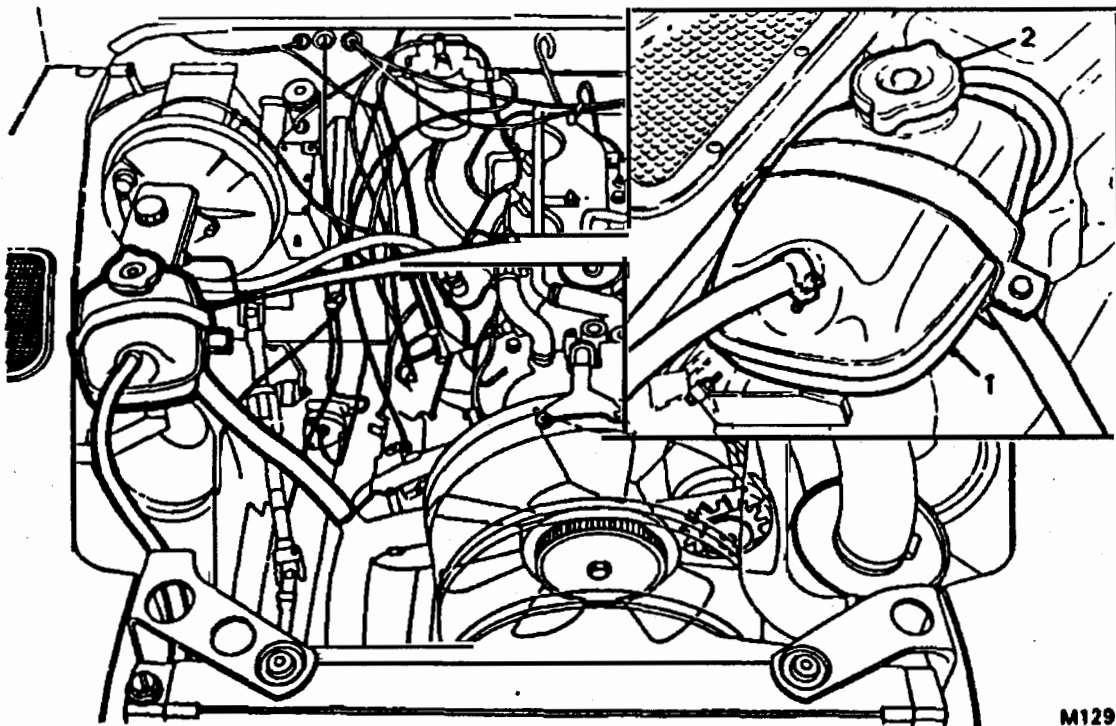


Fig 129 Expansion tank

23.1.4 Check the coolant as specified (Cat 601 Table 2) depending upon the operating conditions.

### Cooling system protection

23.2 The cooling system should be protected as follows:

23.2.1 In cold climates against frost and corrosion by using the anti-freeze as specified (Cat 601 Table 2).

23.2.2 In warm climates where frost is not a problem a corrosion inhibitor should be used as specified (Cat 601 Table 2).

23.2.3 It is essential therefore if the cooling system is drained or topped-up at any time either in winter or summer, to refill with a solution of water and the correct type of anti-freeze or water inhibitor where frost precautions are not necessary, otherwise damage to the engine will result.

### Flushing the engine cooling system

23.3 To flush the system proceed as follows:

23.3.1 Remove the expansion tank cap Fig 130 (1) and radiator filler plug (4).

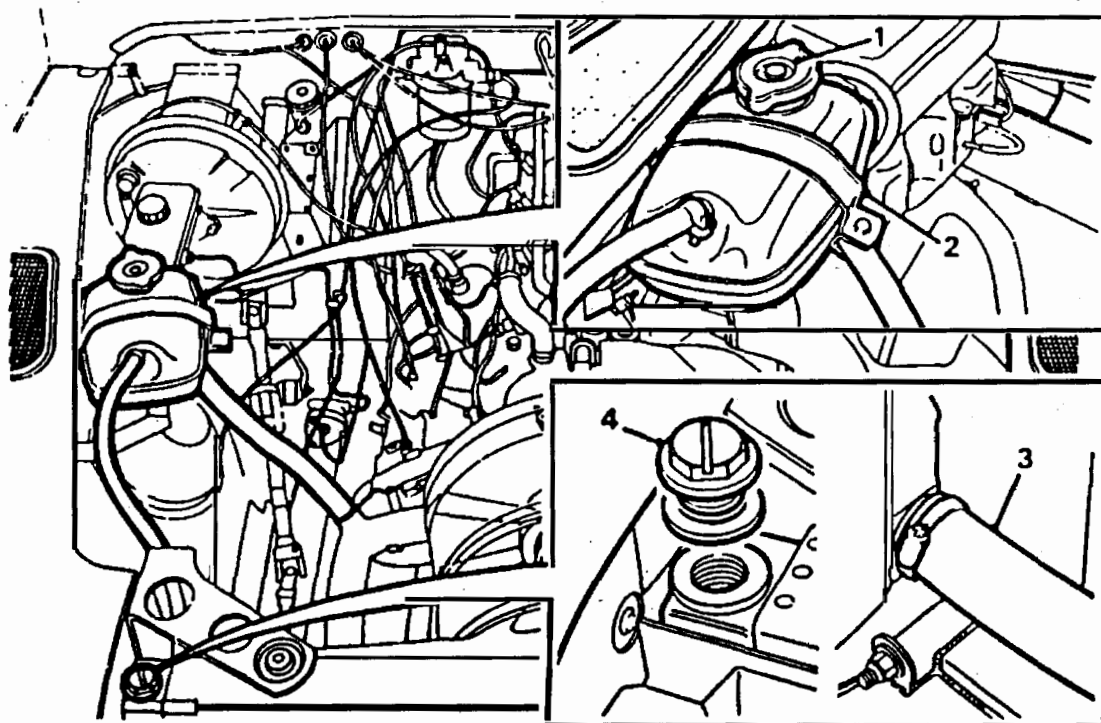
23.3.2 Remove radiator bottom hose (3).

23.3.3 Remove the cylinder block drain plug Fig 131 (1) which is on the left hand side of the engine.

23.3.4 To drain the expansion tank, disconnect the hose from the tank to the water pump Fig 130 (2).

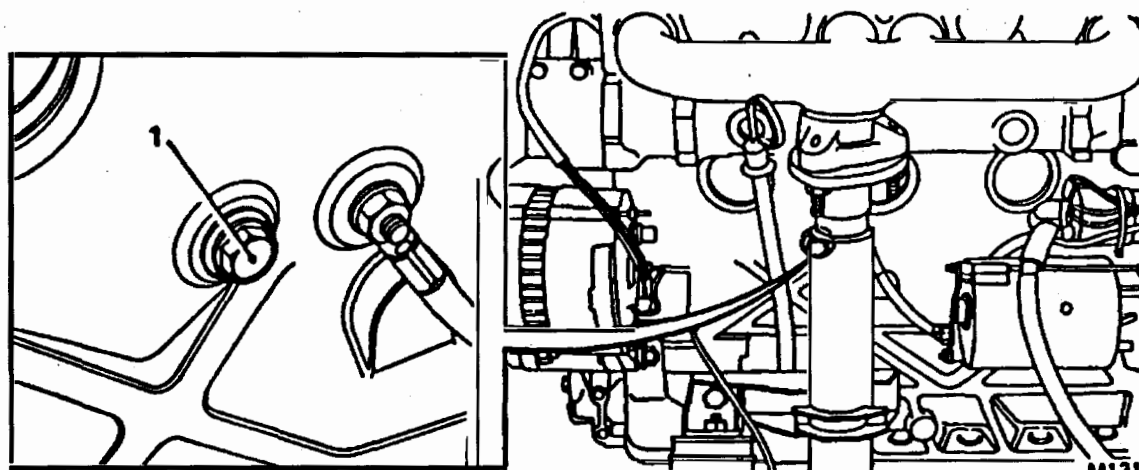
23.3.5 Flush the system thoroughly.

23.3.6 Fit the pipe, engine drain plug and radiator drain plug/bottom hose.



M130

Fig 130 Radiator and expansion tank



M131

Fig 131 Cylinder block drain plug

23.3.7 Fill the system with the correct solution of water and anti-freeze or inhibitor dependent on operating conditions through the expansion tank until half full.



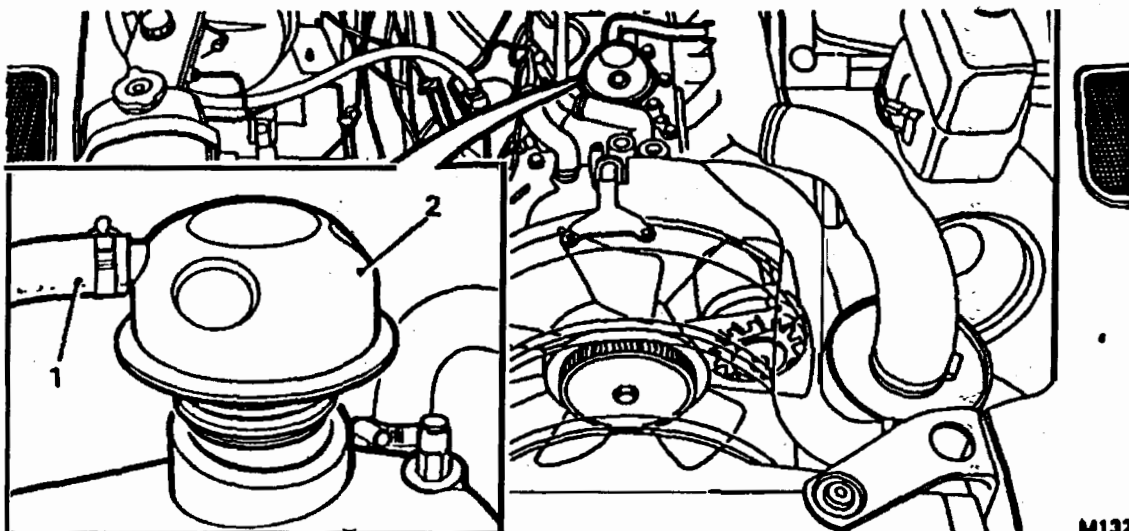
23.3.8 Fit the expansion tank cap and radiator filler plug, run the engine until the operating temperature has been achieved, allow to cool and check level, top up if necessary.

Notes ...

- (1) Never use salt water with anti-freeze or an inhibitor, otherwise corrosion will occur.
- (2) In certain territories where the only available water supply may have some salt content, use only clean rainwater or distilled water.
- (3) After draining, flushing and refilling the system, the engine must be run for 5 minutes to ensure elimination of any air locks from within the cooling system.

#### ENGINE FILLER/BREATHER CAP

24 The engine filler/breather cap is fitted to the top of the rocker cover which is located on the engine.



M132

Fig 132 Engine oil filler/breather cap

To clean the filter

24.1 Disconnect the hose Fig 132 (1) from the filler/breather cap.

24.2 Pull the filler/breather cap (2) off the rocker cover.

24.3 Wash the gauze filter encapsulated within the cap in clean fuel or equivalent.

24.5 Refit the filler/breather on to the rocker cover and then fit the hose.

WINDSCREEN WASHER RESERVOIR

25 The reservoir is located on the wing valance and has provision for one pump to feed the front wash/wipe system.

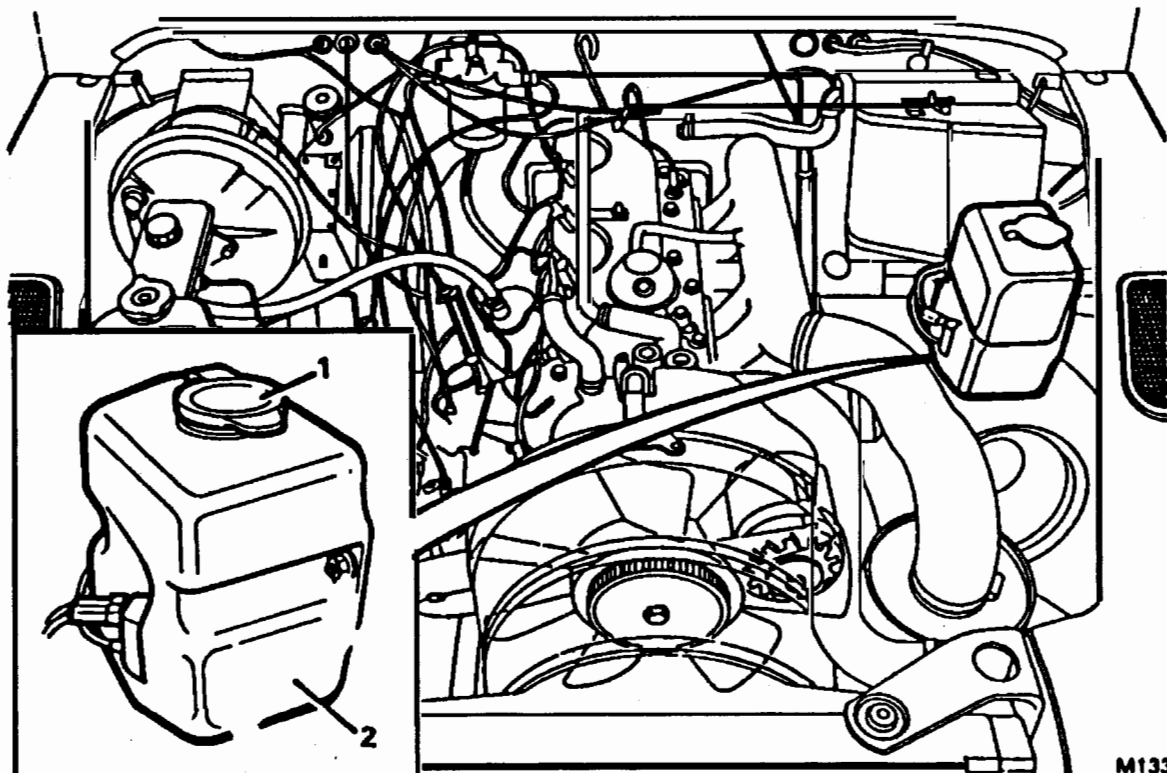


Fig 133 Windscreen washer reservoir (Early models)

25.1 To top up the reservoir (2) proceed as follows:

25.1.1 Remove reservoir cap (1).

25.1.2 Top-up to within approximately 25 mm (1.0 in) below the bottom of the filler neck.

25.1.3 Use a screen washer solvent in the container, it will assist in removing mud, flies and road film from the windscreen.

25.1.4 Keep the washer bottle filled with clean water and solvent.

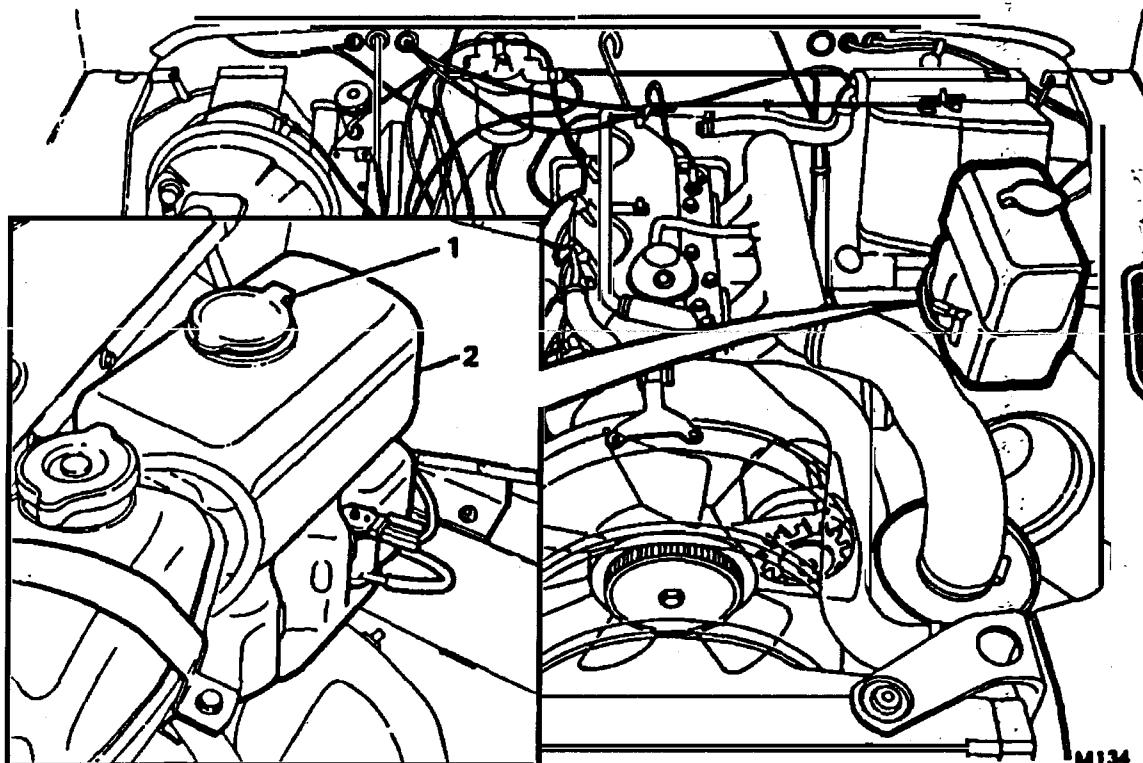


Fig 134 Windscreen washer reservoir (Later models)

#### TAPPET ADJUSTMENT

26 Tappet adjustment may be required to improve the engine's performance. This operation can easily be

carried out by the user.

Note ...

The tappets can be adjusted hot or cold.

26.1 To adjust the tappets proceed as follows:

26.1.1 Undo the retaining nuts (1) and remove the rocker cover (2).

26.1.2 Rotate the engine in the running direction until the valve receiving attention is fully open.

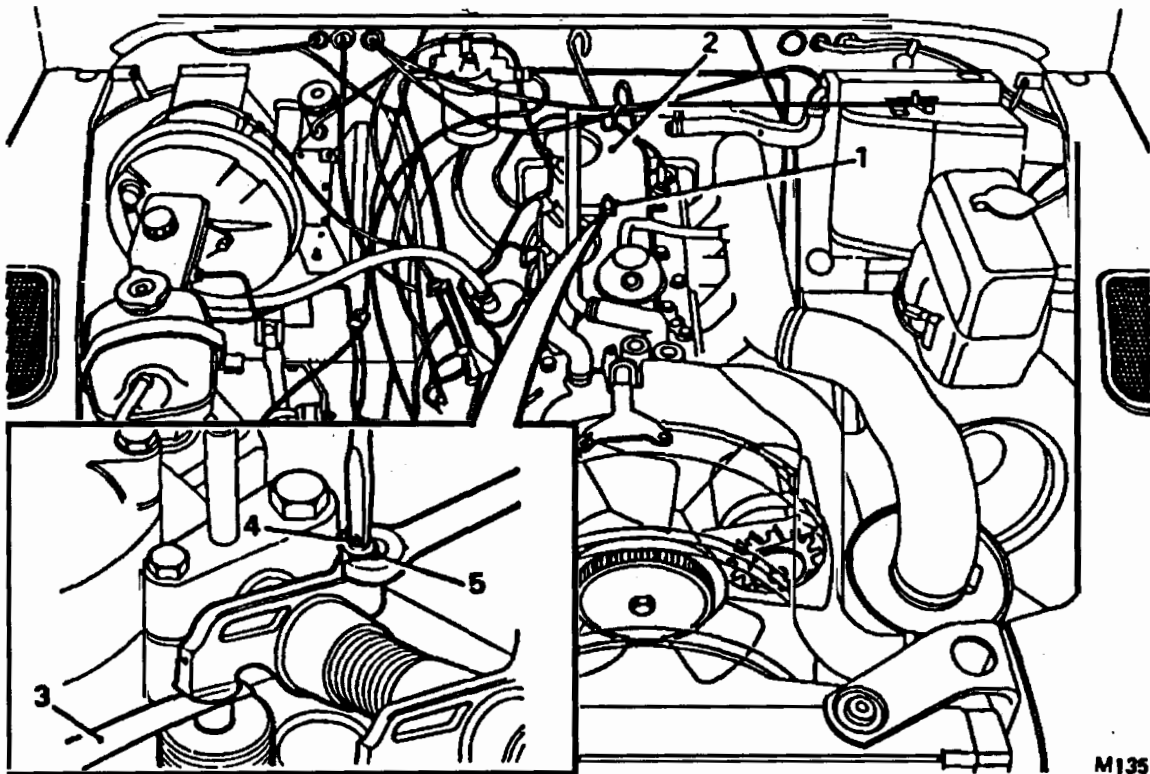


Fig 135 Tappet adjustment

26.1.3 Rotate the engine one complete turn, to bring the tappet onto the back of the cam.

26.1.4 Check the tappet clearance (Cat 601 Table 3) with the appropriate feeler gauge (3).

26.1.5 If adjustment is required, slacken the locknut (5) and rotate the tappet adjusting screw (4) until the clearance is correct, then re-tighten locknut.

26.1.6 Repeat for the other valves in turn.

### DRIVE BELTS

27 Examine the pulley for damage and check that there are no pebbles or grit trapped in the V-grooves that could damage or reduce the life of the drive belt.

27.1 The vehicle operates on a normal 12V electrical system. The alternator is driven from the engine crankshaft pulley via a belt (1) and is permanent whilst the engine is operating. The 12V alternator charges a single 12V battery fitted beneath the left-hand seat within the vehicle cab.

#### Alternator drive belt

27.2 To check the alternator drive belt (1) apply finger pressure between the alternator pulley (5) and fan pulley (2). See Cat 601 Table 3 for belt deflection. To renew/adjust the drive belt proceed as follows:

27.2.1 Slacken the bolts (7) securing the alternator to the mounting bracket.

27.2.2 Slacken the fixings at the top (4) and bottom (3) of the adjustment link.

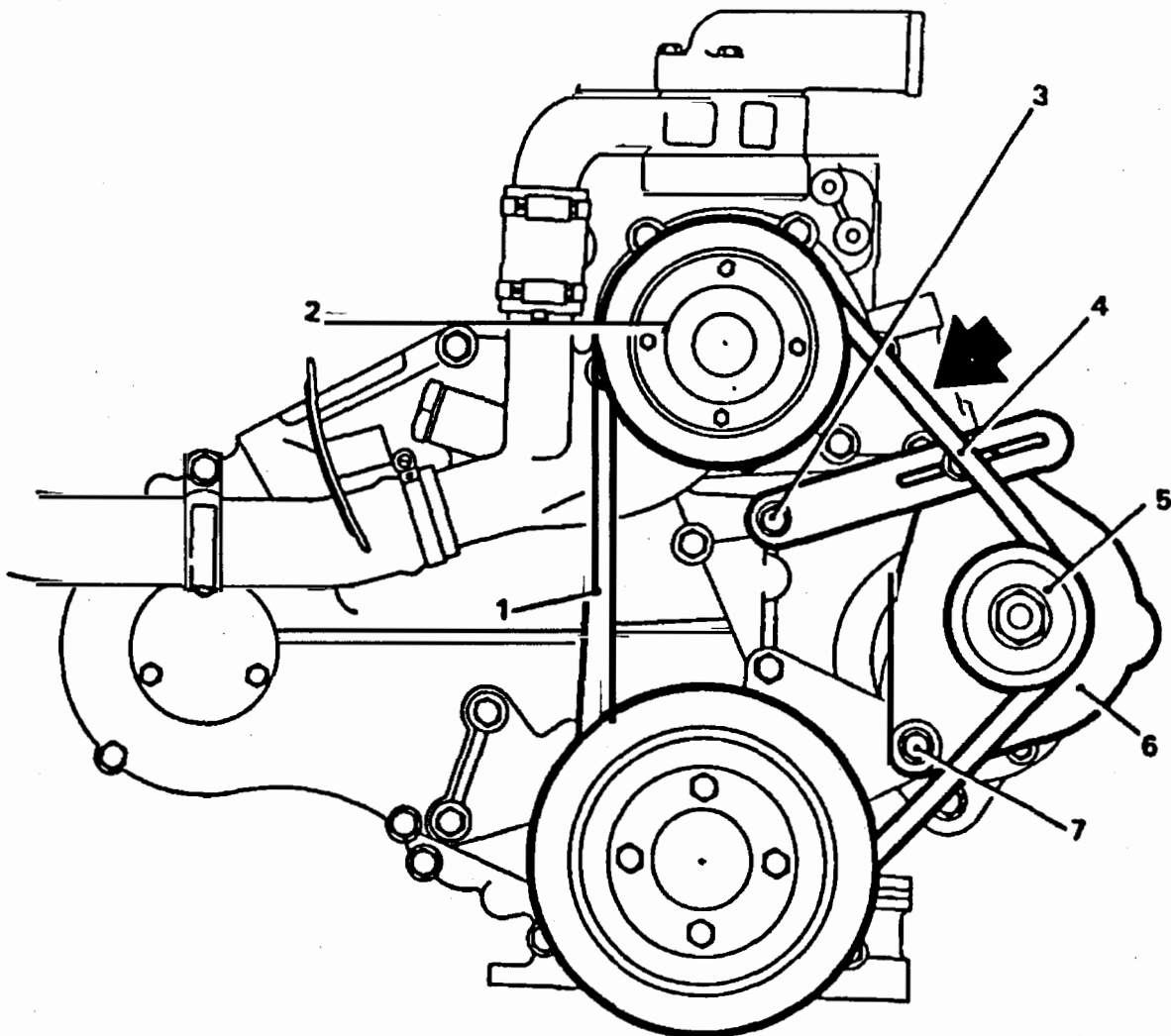
27.2.3 Pivot the alternator (6) until the required tension is obtained and then tighten the bolt (4) at the top of the adjustment link.

27.2.4 Tighten the nut securing the bottom of the adjustment link (3).

27.2.5 Tighten the two bolts (7) securing the alternator to the mounting bracket.

. Note ...

Check that the belt tension has been maintained during the tightening sequence.



M136

Fig 136 Alternator drive belt

Chapter 4-2

FITTED FOR RADIO (FFR)

CONTENTS

Para

- 1 INTRODUCTION
- 2 BULBS
  - Oil temperature indicator
  - Ammeter
- 3 FAST FUSE
- 4 DRIVE BELTS
  - Alternator drive belt
- 5 RADIO BATTERIES

Fig

- 137 Ammeter
- 138 Fast fuse
- 139 Alternator drive belt
- 140 Radio batteries
- 141 Battery configurations

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- 8

INTRODUCTION

1 This Sub-Chapter described all the items applicable to the fitted for radio (FFR) TUL and TUM vehicles which have not been covered by Sub-Chapter 4-1.

BULBS

2 The bulb replacement for the basic vehicles which are covered in Sub-Chapter 4-1 except for the following items:

### Oil temperature indicator

2.1 The oil temperature indicator is located in the instrument panel which is situated in front of the steering wheel console.

2.1.1 The bulb replacement for the oil temperature indicator is the same as the "Instrument panel" (Chapter 4-1 paragraph 3.3)

### Ammeter

2.2 The ammeter is situated in the centre of the auxiliary panel, below the main lighting panel.

2.2.1 Disconnect the negative earth lead from the battery.

2.2.2 Undo the four screws (1) retaining the main lighting switch panel (2).

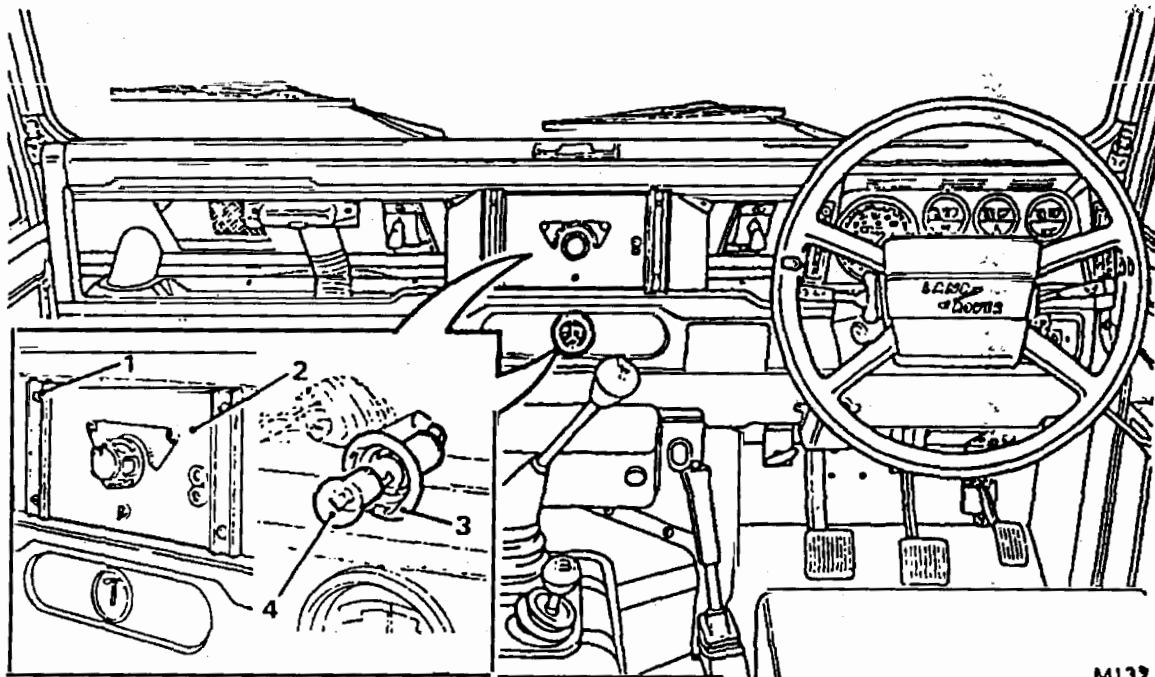


Fig 137 Ammeter



2.2.3 Ease the panel forward as far as possible to gain access to the bulb holder (3).

2.2.4 Remove the defective bulb (4) and discard.

2.2.5 Fit a new bulb and refit the main lighting switch panel securing it with the four screws.

2.2.6 Reconnect the negative earth lead to the battery.

### FAST FUSE

3 The fast fuse is located behind the front seats attached to the bulkhead. To replace the fuse proceed as follows:

3.1 Disconnect the negative earth lead from the battery.

3.2 Undo the two retaining screws (1) and remove the cover (2).

3.3 Replace the defective fuse (3) with the spare also attached inside the box.

Note ...

If the spare is used report it as soon as possible so that another replacement fuse may be fitted.

3.4 Fit the cover and secure with the two screws.

3.5 Reconnect the negative earth lead to the battery.

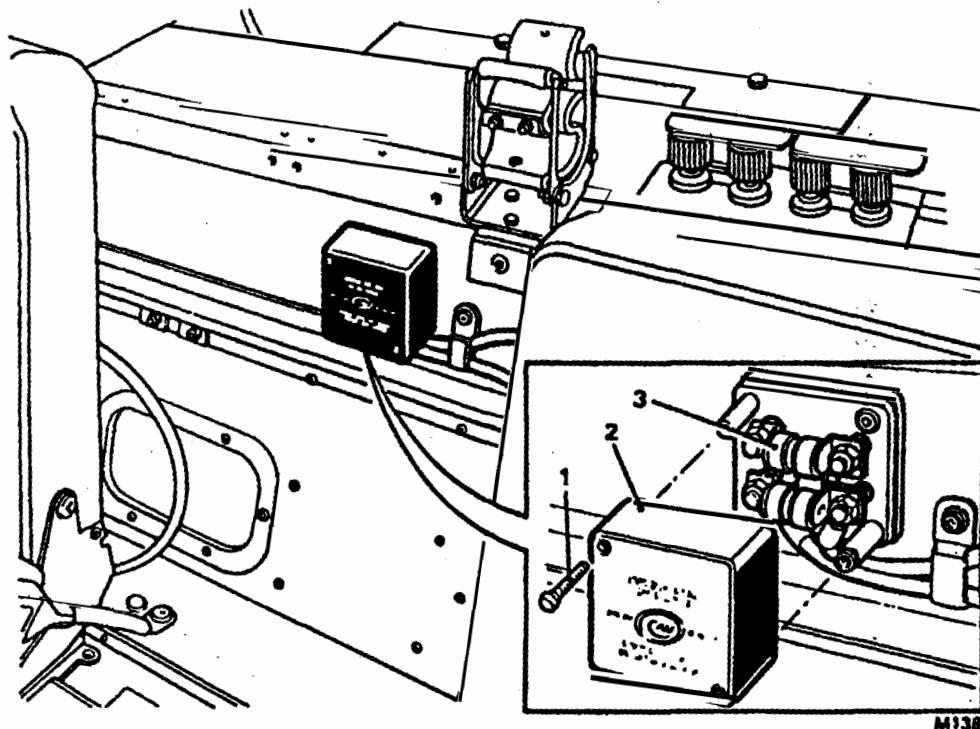


Fig 138 Fast fuse

DRIVE BELTS

4 Examine all pulleys for damage and check that there are no pebbles or grit trapped in the V-grooves that could damage or reduce the life of the drive belts. The radio batteries operate off a 24V supply.

4.1 The alternator is driven by a separate belt from the engine crankshaft pulley and the drive is permanent whilst the engine is operating. The 24V alternator charges two 12V batteries that are connected in series to produce 24V.

Alternator drive belt

4.2 To check the alternator drive belt apply finger pressure between the alternator pulley (6)

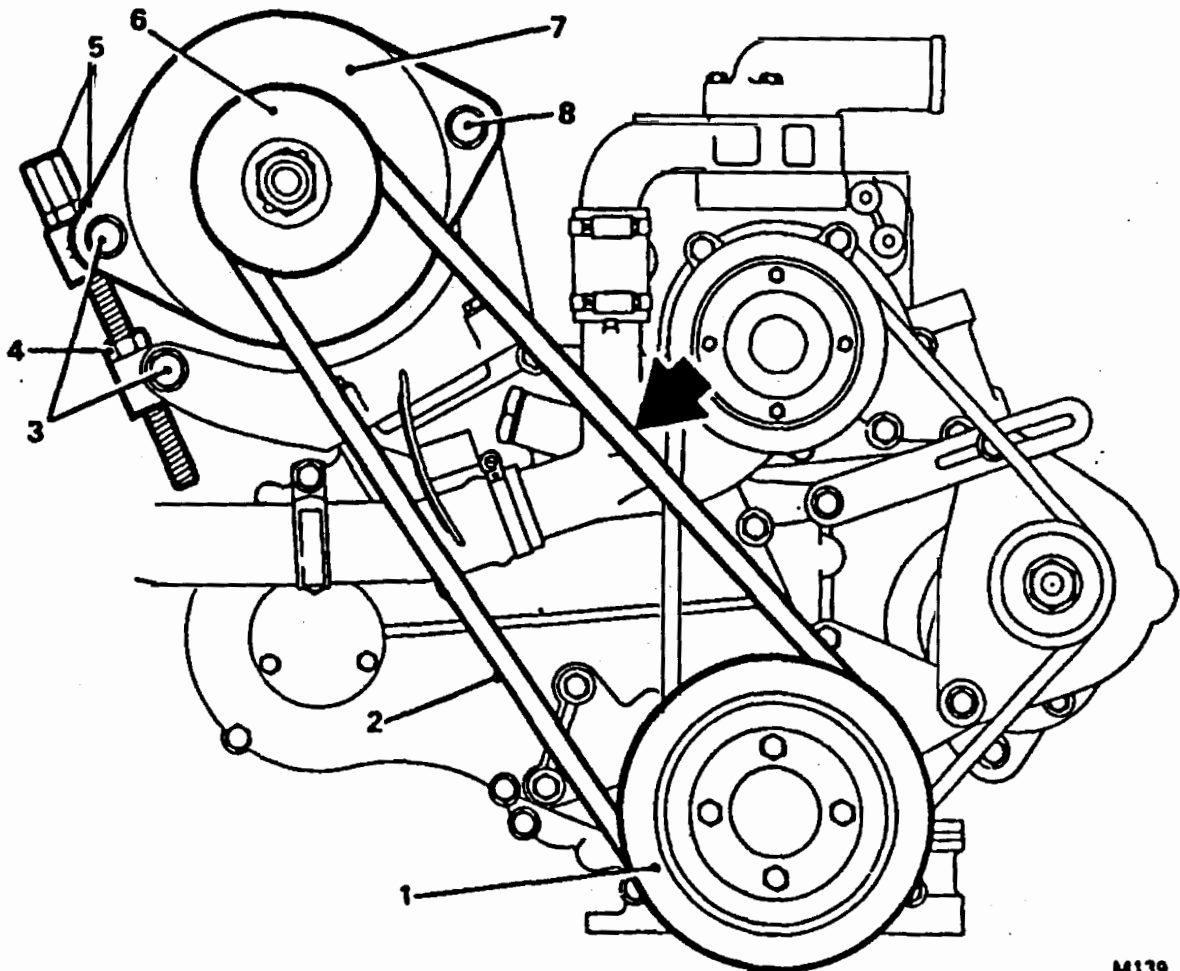
and crankshaft pulley (1). See Cat 601 Table 3 for belt deflection. To renew/adjust the drive belt proceed as follows:

4.2.1 Slacken the bolts (8) securing the alternator to the mounting bracket.

4.2.2 Slacken the adjustment strut pivot bolts (3).

4.2.3 Slacken the upper nuts (5) on the adjustment strut.

4.2.4 Adjust the belt (2) to the correct tension by tightening or slackening the lower adjustment nut (4).



M139

Fig 139 Alternator drive belt

4.2.5 Tighten the upper nut (5) on the adjustment strut.

4.2.6 Tighten the bolts (8) securing the alternator (7) to the mounting bracket.

4.2.7 Tighten the adjustment strut pivot bolt (3).

Note ...

Check that the belt tension has been maintained during the tightening sequence.

### RADIO BATTERY

5 The radio batteries are stowed inside the battery storage box directly under the radio table in the rear of the vehicle.

5.1 To change the batteries proceed as follows:

5.1.1 Isolate the radio batteries from the alternator.

5.1.2 Remove the leads from the batteries.

5.1.3 Undo the two retaining screws (4) located on top of the box.

5.1.4 Ease the front cover forward then lift out.

5.1.5 Pull the battery tray (1) out by its handle.

5.1.6 Undo the two wing nuts (2) which release the battery clamp plate (3).

5.1.7 Move the "J" bolts away and remove the plate, the batteries can now be changed.

( Fig 141 shows battery configuration for (A) vehicles up to 1988 and (B) 1988 onwards.

5.1.8 When the batteries have been replaced reconnect the leads.

5.1.9 Reconnect the alternator to the batteries.

5.1.10 Replace the front cover and secure with the two retaining screws.

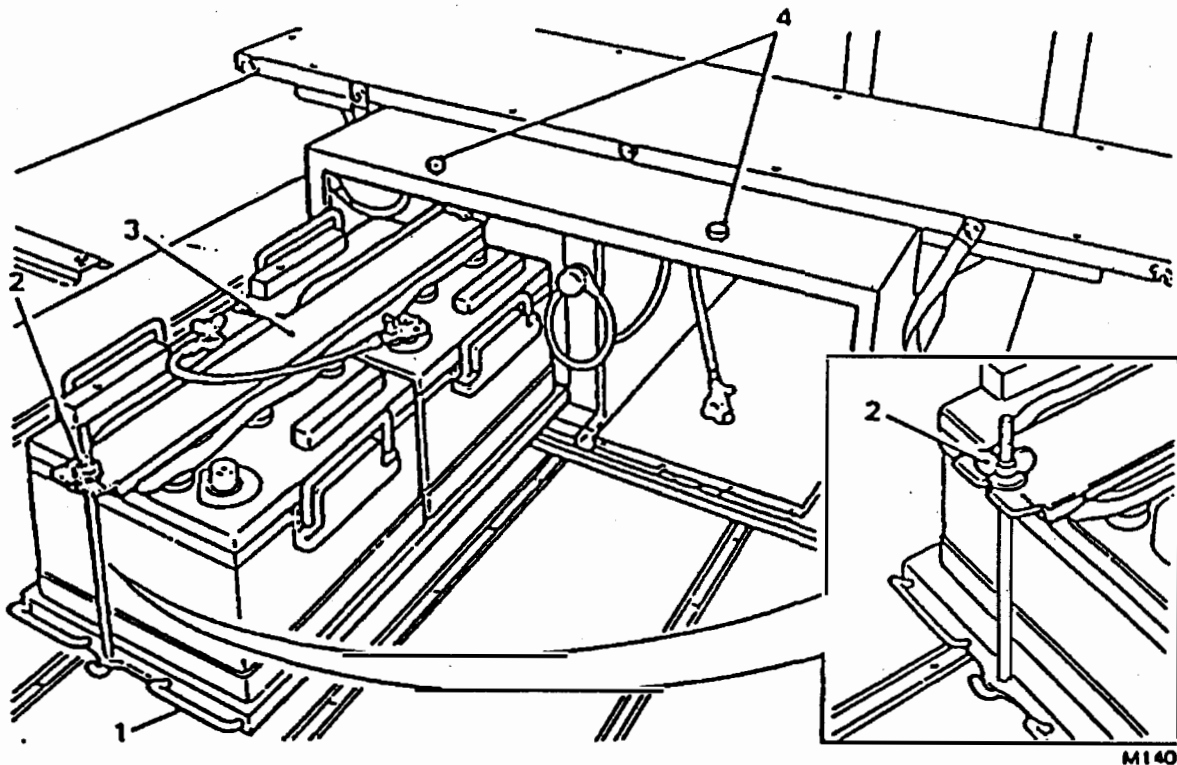
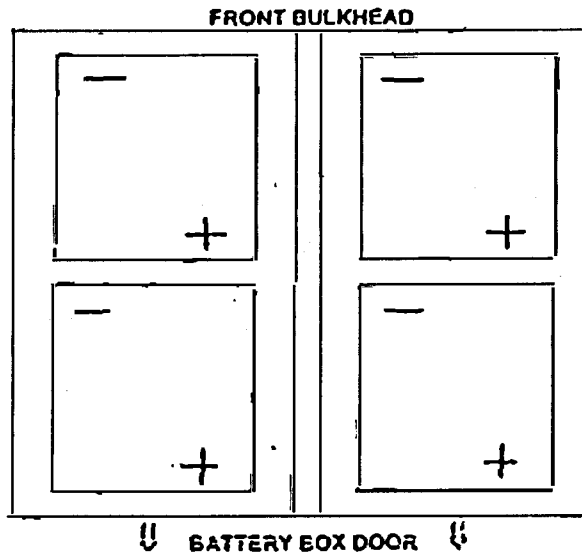


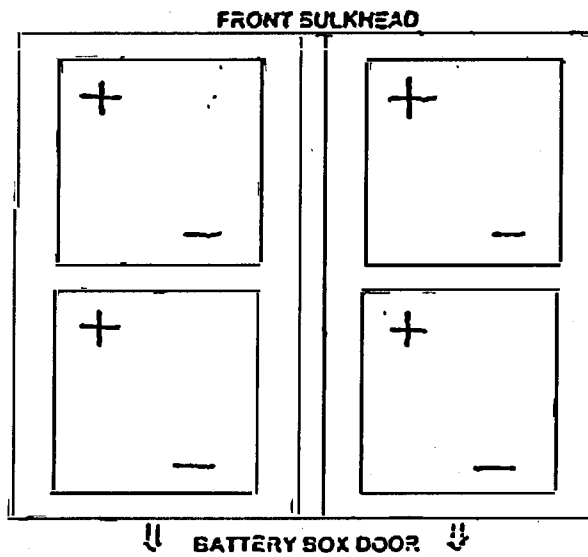
Fig 140 Radio batteries

RADIO BATTERIES (POS [+]  
FIRST)



for (A) vehicles up to 1988

RADIO BATTERIES (NEG [-]  
FIRST)



(B) 1988 onwards.

Fig 141 shows battery configuration

Chapter 5

USER SPARES DATA

CONTENTS

Para

- 1 INTRODUCTION
- 2 General
- 3 BULBS
- 4 FUSES
- 5 OTHER ITEMS

Table

- 1 Bulbs
- 2 Fuses
- 3 Other items

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INTRODUCTION

1 This Chapter gives all the user spares for carrying out all operations mentioned in this publication.

General

2 The information given in this Chapter is applicable to both the Basic Vehicle and the Fitted For Radio (FFR) TUL and TUM vehicles. Where any information is applicable to (FFR) only it will be identified as such.

BULBS

3 The following table consists of the bulb ratings for the lights located around the vehicles. For the location of the bulbs and replacement instructions see

(Chapter 4-1 paragraph 3).

TABLE 1 BULBS

Bulb identification	Rating
Headlights Right/Left hand drive	12V 45W/40W
Side lights	12V 5W
Side repeater lights	12V 4W
Turn lights	12V 5W
Stop/tail lights	12V 21W/5W
Rear fog guard lights	12V 21W
Number plate light (2 bulbs)	12V 4W
Convoy light	12V 7W
Warning lights panel	12V 1.2W
Ignition warning light (24V)	24V 1.2W
Instrument panel	12V 3W
Hazard warning light	12V 0.6W
Map reading light	12V 2W
Ammeter light (FFR only)	12V 3W

FUSES

4 The following table consists of the fuse ratings and the items they protect. For location of the fuse and fast fuse (FFR only) boxes (Chapter 2-1 paragraph 21) and (Chapter 2-2 paragraph 6) also for instructions on replacing the fuses (Chapter 4-1 paragraph 4) and (Chapter 4-2 paragraph 3).

TABLE 2 FUSES

Fuse Rating	Circuits protected	Colour
10 Amp	Auxiliary feed, Horn Headlight flash, Map light	Blue/Yellow (continued)



TABLE 2 FUSES (continued)

Fuse Rating	Circuits protected	Colour
10 Amp	Hazard warning switch	Blue/Yellow
12 Amp	Side lights, instruments and wash/wipe	Pink
10 Amp	Heater matrix	Blue/Yellow
15 Amp	Reverse, stop and turn lights	Blue/Yellow
8 Amp	Rear fog guard light	Light Brown
8 Amp	Right headlight dipped	Light Brown
8 Amp	Left headlight dipped	Light Brown
8 Amp	Right headlight	Light Brown
8 Amp	Left headlight	Light Brown
2.5 Amp	Turn lights front	Red
5 Amp	Turn lights rear	Pale Blue
150 Amp	90 amp circuit (FFR only)	-

OTHER ITEMS

3 The following table covers all the other items on the vehicles which have not been mentioned in the previous two tables.

TABLE 3 OTHER ITEMS

Item	Description	Part No
Vehicle battery	Chloride with air portable caps	PRC 5637
Radio batteries (FFR only)	Lucas No. 4 Mk 3 (UK 6TN)	575449
Oil filter	Fram paper unit	ETC 6599

(continued)

TABLE 3 OTHER ITEMS (continued)

Item	Description	Part No.
Air cleaner	Coopers paper unit	NRC 9238
12V drive belt	Goodyear	ERC 6886
24V drive belt (FFR)	Goodyear	532002
Fuel filter	CAV paper unit	RTC 3182
Tyres	Michelin XZL 16 x 7.50	
Wiper blades	Trico	PRC 4278

Chapter 6

DESTRUCTION OF EQUIPMENT TO PREVENT ENEMY USE

CONTENTS

Para

- 1 MANDATORY DIRECTIVE  
Degree of damage  
Spare parts
- 2 MEANS AND PROCEDURES  
Mechanical  
Burning (WARNING)  
Gunfire (WARNING)
- 3 PRIORITIES

Table

- 1 Priorities for destruction

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5/6

MANDATORY DIRECTIVE

1 Destruction of the equipment when subject to capture by the enemy, will be undertaken by the user arm, ONLY WHEN, in the judgement of the unit commander concerned, such action is necessary in accordance with orders of, policy established by the army or Divisional Commanders.

1.1 The reporting of the destruction of the equipment is to be done through command channels.

Degree of damage

1.2 The degree of damage inflicted, to prevent the equipment being used by an enemy, shall be as

follows:

1.2.1 Methods of destruction should achieve such damage to equipment and essential spare parts, that it will not be possible to restore the equipment to a usable condition in the combat zone either by repair or by cannibilization.

1.2.2 Classified equipment must be destroyed in such degree as to prevent, whenever possible, duplication, or determination of operation or function by the enemy.

1.2.3 Any classified documents, notes, instructions or other written material pertaining to function, operation, maintenance or employment, including drawings or parts lists, must be destroyed in a manner to render them useless to the enemy.

1.2.4 In general, destruction of essential parts, followed by burning will usually be sufficient to render the equipment useless. However, selection of the particular method of destruction requires imagination and resourcefulness in utilization of the facilities at hand under the existing conditions. Time is usually critical.

### Spare parts

1.3 The same priority for destruction of component parts of a major item necessary to render the item inoperable, must be given to the destruction of similar components in spare parts storage areas.

MEANS AND PROCEDURES

2 If destruction is ordered, due consideration should be given to:

2.1 Selection of a point of destruction that will cause greatest obstruction to enemy movement and also prevent hazard to friendly troops from fragments or ricocheting projectiles which may occur incidental to the destruction by gunfire.

2.2 Observance of appropriate safety precautions.

2.3 The following information is for guidance only. Of the several means of destruction, those most generally applicable are as follows:

Mechanical

2.4 This requires an axe, pick, crowbar or similar implement. The equipment should be destroyed in accordance with the priorities given in (Table 1 Priorities).

Burning

WARNING ...

DUE CONSIDERATION SHOULD BE GIVEN TO THE HIGHLY  
FLAMMABLE NATURE OF GASOLINE AND ITS VAPOUR.  
CARELESSNESS IN ITS USE MAY RESULT IN PAINFUL  
BURNS.

2.5 This requires gasoline, oil or other flammables.

2.5.1 Remove and empty the portable fire extinguishers.

2.5.2 If quantities of combustibles are limited, smash all vital elements, such as switches, instruments and control levers.

2.5.3 Place ammunition and charges in and about the equipment so that the greatest damage will result from the explosion.

2.5.4 Pour gasoline and oil over the equipment. Ignite by means of an incendiary grenade fired from a safe distance, by a burst from a flame thrower, by a combustible train of suitable length or appropriate means. Take cover immediately.

### Gunfire

#### WARNING ...

FIRING ARTILLERY AT RANGES OF 457 METERS (500 YARDS) OR LESS, AND FIRING GRENADES OR ANTI-TANK ROCKETS SHOULD BE FROM COVER.

2.6 When destroying the equipment by gunfire, proceed as follows:

2.6.1 Remove and empty the portable fire extinguishers.

2.6.2 Smash all vital elements as outlined in (sub-paragraph 2.5.2).

2.6.3 Destroy the equipment by gunfire, using tank guns, self propelled guns, artillery, rifles using rifle grenades or launchers using anti-tank rockets.

PRIORITIES

3 The priorities for destruction should be considered as follows:

3.1 The priority must be given to the destruction of classified equipment and associated documents.

3.2 When lack of time and/or means prevents complete destruction of essential parts, and the same parts are to be destroyed on all like equipment.

3.3 A guide to priorities for destruction of the equipment is shown in (Table 1 Priorities).

TABLE 1 PRIORITIES FOR DESTRUCTION

Item	Priority
Engine	1
Tyres	2
Hydraulic brake system	3
Gearbox	4
Differentials	5
Frame	6

ARMY EQUIPMENT  
SUPPORT PUBLICATION

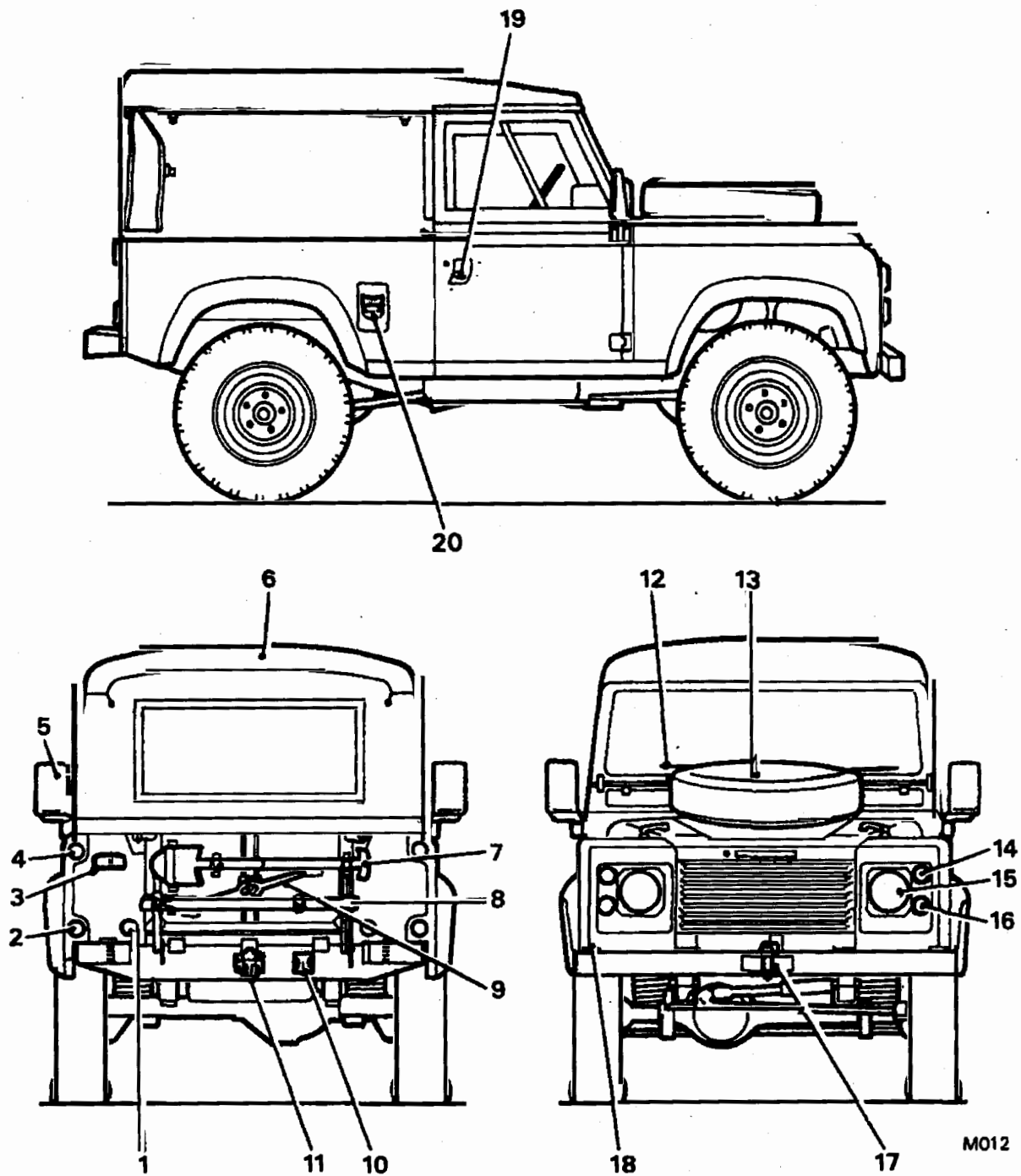


Fig 12 Truck Utility Light (Cargo)



ARMY EQUIPMENT  
SUPPORT PUBLICATION

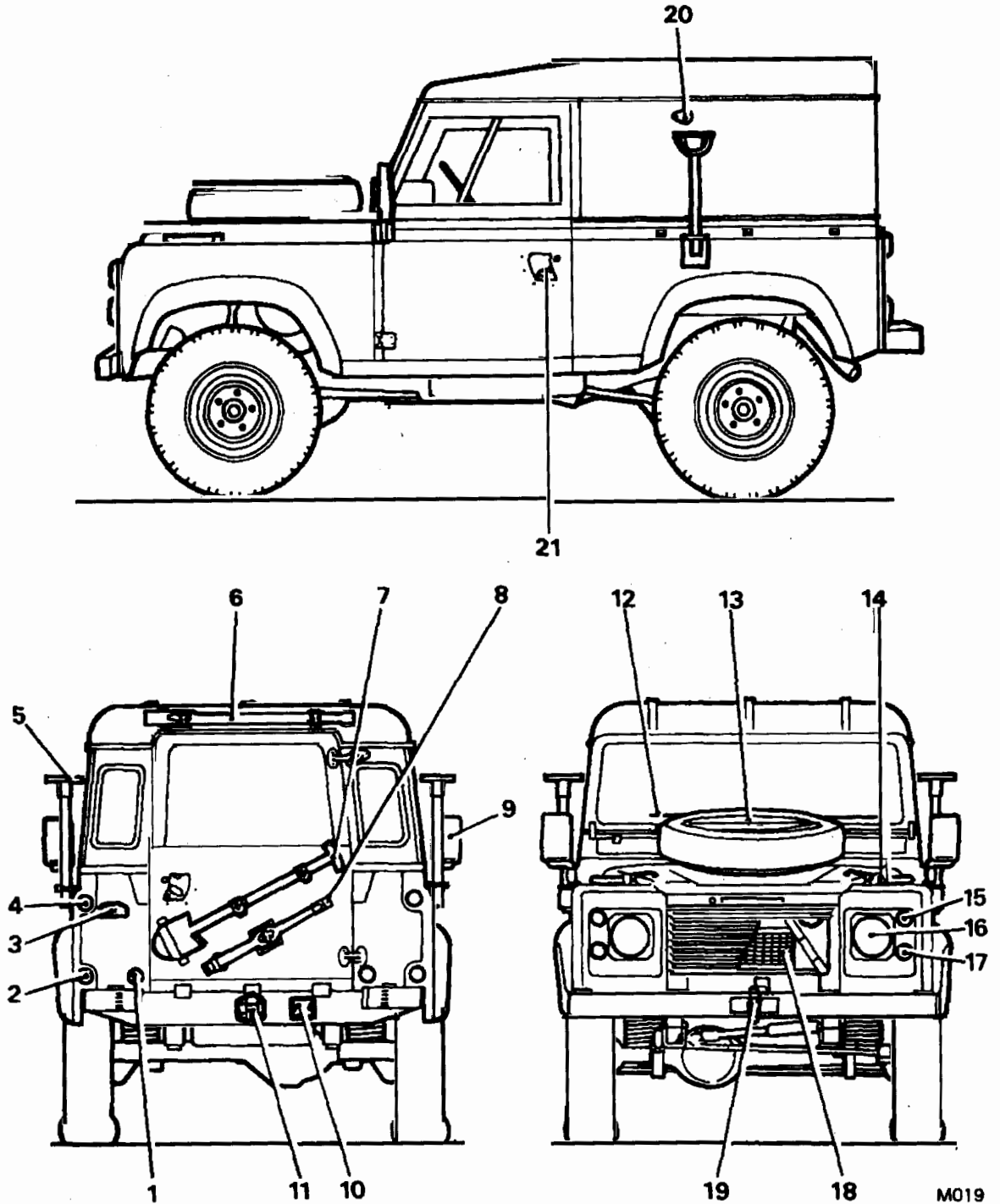


Fig 19 Truck Utility Light (Fitted For Radio)