Ministry of Defence

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Email: DES SEC-PolSec LE-JSC-WPNS@mod.uk

[redacted]

email: [redacted]

Our Reference:
FOI2022/11621
Date:
10 November 2022

Dear [redacted]

Thank you for your email of 11 October 2022, requesting the following information:

> *Under the Freedom Of Information act, please provide a PDF copy of Bedford MJR2 manuals*
>
> *2320-H-102-201 - Operating Instruction*
> *2320-H-102-302 - Technical Description*
> *2320-H-102-512 - Failure Diagnosis*
> *2320-H-102-522 - Repair Instructions*
> *2320-H-102-523 - Repair Instruction*
> *2320-H-102-532 - Inspection Standards 1*
> *2320-H-102-533 - Inspection Standards 2*
> *2320-H-102-601 - Maintenance schedule*

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

A search for the information has now been completed within the Ministry of Defence (MOD), and I can confirm that information in scope of your request is held. This is attached, as follows:

- Annex A – AESP 2320-H-100-201 (redacted)
- Annex B – AESP 2320-H-100-302 (redacted)
- Annex C – AESP 2320-H-100-512 (redacted)
- Annex D – AESP 2320-H-100-522 (redacted)
- Annex E – AESP 2320-H-100-523 (redacted)
- Annex F – AESP 2320-H-100-532 (redacted)
- Annex G – AESP 2320-H-100-533 (redacted)
- Annex H – AESP 2320-H-100-601 (redacted)

It has proved necessary to withhold some information in accordance with qualified exemptions of the FOI Act. Some of the Technical Description (Annex A) and Repair Instructions (Annex D) Parts List related to classified equipment or upgrades and tactics,

techniques and procedures has been redacted in accordance with Sections 26(1) (a) and (b) (Defence) and Section 38(1) (a) and (b) (Health and Safety). Section 26 applies to information that if disclosed would or would likely; prejudice the defence of the British Islands or any colony; and/or the capability, effectiveness or security of the Armed Forces of the Crown or any forces cooperating with them. Section 38 applies to information that if disclosed would or would likely; endanger the physical or mental health of any individual; or endanger the safety of any individual.

I must also advise you that some of the information within each Annex falls entirely within the scope of the absolute exemption provided for at Section 40 (Personal Information) of the Freedom of Information Act and has been redacted. Section 40(2) has been applied to protect personal information as governed by the General Data Protection Regulations (GDPR). Section 40 is an absolute exemption and there is no requirement to consider the public interest in deciding to withhold the information

If you have any queries regarding the content of this letter, please contact this office in the first instance. If you wish to complain about the handling of your request, or the content of this response, you can request 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.gov.uk). Please note that any request for an internal review should be made within 40 working days of the date of this response.

If you remain dissatisfied following an internal review, you may raise your complaint directly to the Information Commissioner under the provisions of Section 50 of the Freedom of Information Act. Please note that the Information Commissioner will not normally investigate your case until the MOD internal review process has been completed. The Information Commissioner can be contacted at: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF. Further details of the role and powers of the Information Commissioner can be found on the Commissioner's website at https://ico.org.uk/.

Yours sincerely,

DES SEC Pol Sec

Ministry of Defence

TRUCK, 4 TONNE, 4x4, BEDFORD MJ, ALL VARIANTS

OPERATING INFORMATION

2320-H-100-201

Issue No. 2
Amendment No. 000
May 2015

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D1832

Publications Authority: DESLEOSP-OSVP-CVS-PLS-Mgr1
Operational Support Vehicles Programme (OSVP)
Spruce 3C# 1309
DE&S, Abbey Wood
Bristol
BS34 8JH

Users should forward any comments on this publication using the form attached inside

AMENDMENT RECORD

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PRELIMINARY MATERIAL

OPERATING INFORMATION

Chapter

PREFACE

Sponsor:	Operational Support Vehicle Programme
Project No.	
File Ref:	OSVP
Publication Authority:	DES LE OSP-OSVP-CVS-PLS-Mgr1

INTRODUCTION

1. Service users should forward any comments on this publication through the channels prescribed in AESP 0100-P-011-013. An AESP Form 10 is included at the end of the preliminary pages. It should be photocopied and used for forwarding comments on this AESP.

2. The Form 10 in this publication is Unclassified. Where comments made are of a classified nature, the completed form is to be annotated with the appropriate Protective Marking. Security procedures are to be observed in accordance with JSP 440.

3. This procedure is only to be used for the purpose of commenting on the content of an individual AESP and must not be used In place of the equipment defect reporting procedure as outlined in The Defence Supply Chain Manual JSP 336.

4. Where AESPs specify action to be taken, the AESP will be itself sufficient authority for such action and also for the demand of the necessary stores, subject to provisions of Para 5.

5. The subject matter of this publication may be affected by Defence Instructions and Notices (DINs), Standard Operating Procedures (SOPs) or local regulations. When any such Instruction, Order or regulation contradicts any portion of this publication, it is to be taken as the overriding authority.

AMENDMENTS

6. New or amended material will be indicated by vertical margin lines to show the extent of the amendment in accordance with AESP 0100-P-009-013.

RELATED AND ASSOCIATED PUBLICATIONS

Related publications

7. 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-A-001-013).

Publication information

8. Any communication regarding this publication should be made to the controlling publication authority.

Publication authority

9. The publication authority for this AESP is as follows:

DES LE OSP-OSVP-CVS-PLS-Mgr1

Associated publications

10. There are no associated publications.

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	101	*	*
	1	Equipment Support Policy Directives	111	111	111	*
2	0	Operating Information	201	*	*	*
	1	Aide-Memoire	*	*	*	*
	2	Training Aids	*	*	*	*
3	0	Technical Description	*	*	*	*
4	1	Installation Instructions	201	*	*	*
	2	Preparation for Special Environments	*	522	522	*
5	1	Failure Diagnosis	*	*	*	*
	2	Maintenance Instructions	201	*	*	*
	3	Inspection Standards	*	*	*	*
	4	Calibration Procedures	*	*	*	*
6	0	Maintenance Schedules	*	*	*	*
7	1	Illustrated Parts Catalogues	201	201	*	*
	2	Commercial Parts Lists	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	*	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	*	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

*Category / sub-category not published

WARNINGS

11. None

CAUTIONS

12. None

LIST OF ABBREVIATIONS

13. The following abbreviations are those used within this publication together with those used in related and associated publications:

Abbreviation	Definition
AESP	Army Equipment Support Publication
AP	Air Publication
BFPO	British Forces Post Office
C	Celcius
Chap	Chapter
cm	centimetre
deg	degree
DIN	Defence Instructions and Notices
EMER	Electrical and Mechanical Engineering Regulations
Fig	Figure
FRACAS	Failure Reporting Analysis and Corrective Action System
in.	inch
JSP	Joint Service Publication
km	kilometre
lbf ft	pounds force feet
lbf $in.^2$	pounds force per square inch
Lflt	Leaflet
LOLER	Lifting Operations and Lifting Equipment Regulations
LSV	Load Sensing Valve
mm	millimetre
MoD	Ministry of Defence
MT	Mechanical Transport
NCO	Non-Commissioned Officer
Nm	Newton metres
OSVPT	Operational Support Vehicle Project Team
Para	Paragraph
QT	Qualified Tradesman
RAF	Royal Air Force
REME	Royal Electrical and Mechanical Engineers
rev/min	revolutions per minute

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EQUIPMENT DESIGNATION

RECOVERY VEHICLE, Wh Lt, 4t, 4x4, w/turbo charged engine, Bedford MJP2BMO
Vehicle Asset Code B27 1310-3100 and 1311-3100 (Winterised)
NSN 2320 -99-893-6140

TRUCK, CARGO, 4t, 4x4, w/hyd tail lift, w/turbo charged engine, Bedford MJP2BMO
Vehicle Asset Code B36 2022-3101
NSN 2320-99-893-6144

TRUCK, CARGO, 4t, 4x4, w/turbo charged engine, Bedford MJP2BMO Vehicle Asset Code B36 2025-3100
NSN 2320-99-893-5954

TRUCK, CARGO, 4t, 4x4, LHD, w/turbo charged engine, Bedford MJP2BMO
Vehicle Asset Code B36 2025-8100
NSN 2320-99-893-6142

TRUCK, CARGO, w/3t crane, 4t, 4x4, Armament Support, w/turbo charged engine, Bedford MJP2
Vehicle Asset Code B36 2038-3100
NSN 2320-99-893-6146

TRUCK, CARGO, w/3t crane, 4t, 4x4, Armament Support, LHD, w/turbo charged engine, Bedford MJP2BMO
Vehicle Asset Code B36 2038-8100
NSN 2320-99-893-6147

TRUCK, CARGO, w/3t crane, 4t, 4x4, APFC, w/turbo charged engine, Bedford MJP2BMO
Vehicle Asset Code B36 2039-3100
NSN 2320-99-893-6148

TRUCK, CARGO, w/winch, 4t, 4x4, w/turbo charged engine, Bedford MJP2WMO
Vehicle Asset Code B36 2050-3100
NSN 2320-99-893-6141

TRUCK, CARGO, w/winch, 4t, 4x4, LHD, w/turbo charged engine, Bedford

MJP2WMO
Vehicle Asset Code B36 2050-8100
NSN 2320-99-893-6143

TRUCK, FLAT PLATFORM, 4t, 4x4, w/turbo charged engine. Bedford MJP2BMO
Vehicle Asset Code B36 2091-3100
NSN 2320-99-893-6137

TRUCK, FLAT PLATFORM, 4t, 4x4, LHD, w/turbo charged engine, Bedford MJP2BMO
Vehicle Asset Code B36 2091-8100
NSN 2320-99-893-6138

TRUCK, FUEL SERVICING AIRCRAFT, 4t, 4x4, 4500 litres, w/turbo charged engine, Bedford MJP2BMO
Vehicle Asset Code B36 2165-3100
NSN 2320-99-893-6139

TRUCK, FUEL SERVICING, AIRCRAFT, 4t, 4x4, 1000 gal, D/P, Tactical Air-portable, Mk 5. LHD, w/turbo charged engine, Bedford MJP2BMO Vehicle Asset Code M36 2165-8100
NSN 2320-99-893-6145

CHAPTER 1-1

GENERAL DESCRIPTION

TRUCK, CARGO 4 TONNE 4 X 4 AND W/WINCH

1. The 4 tonne cargo vehicle is an all wheel drive logistic vehicle with a 4 tonne payload and is designed to carry 6 Unit Load Containers or pallets. The vehicle is based on proved commercial components with special military features incorporated. It can be supplied with or without a 6.5 tonne capacity winch. It is to provide the Army's main logistic lift at 1st, 2nd and 3rd Line.

2. The six-cylinder engine is of the in-line, turbocharged, four-stroke, direct injection type, with combustion chambers formed in the piston crowns. The overhead valves are push rod operated. The turbocharger, mounted in the centre of the exhaust manifold, is driven by the engine exhaust gas. Lubrication of the engine is by a high pressure gear-type pump, oil being filtered by an AC full-flow filter.

3. Drive to the front wheels is transmitted through hypoid gears, the differential and pinion assembly being similar to that used in the rear axle, apart from changes necessary to bring the pinion above the centre of the axle. The drive from the differential assembly to the road wheel hubs is by 'Tracta' universal joints.

4. The rear axle drive is also by hypoid gears, the drive being transmitted to the road wheel by fully-floating axle shafts.

5. Steering of the vehicle is effected through steering gear of the semi-irreversible worm and sector type.

6. Suspension consists of semi-elliptic springs and double-acting telescopic shock absorbers.

7. A single, dry-plate clutch, with a spring-loaded centre, transmits the power to the

8. The gearbox has four forward speeds and one reverse, with synchromesh operation on Top, 3rd and 2nd gears.

9. All four wheels of vehicle can be driven. The drive to the front wheels is engaged or disengaged by means of the transfer box lever situated centrally in the driver's cab.

10. A transfer box, mounted beneath the third intermediate chassis frame crossmember, transmits the drive to either the rear axle (high ratio only), or to both front and rear axles, in either high or low ratio as required. It also provides a power take-off.

11. The footbrake operates through an air-hydraulic system and acts on all four wheels. The horizontal pull-up type handbrake operates a drum type independent transmission brake. The system incorporates 3-line connections for trailer brake operation. Air supply is by an engine driven compressor.

12. Vehicles with a Date Into Service (DIS) on or after 1st April 1989, are fitted with Self Sealing Trailer Air Brake Connections (Palm Couplings). Vehicles with a DIS before 1st April 1989 have manual trailer brake couplings. Vehicles with Manual Couplings will need the air supply to the trailer selected on before driving off. On vehicles with self seal couplings, connecting the brake couplings automatically turns on the air supply.

13. On standard vehicles the electrical system is 24 volt negative chassis ground. On vehicles without a standard electrical system a 24 volt insulated negative return is fitted, providing an insulated ground return for all vehicle electrical components. Both systems are suppressed. The batteries are secured in a carrier attached to the frame sidemember on standard vehicles whereas on vehicles equipped with an insulated negative return system the batteries are located behind the driver in the rear parcel shelf.

14. The winch (where fitted) is power operated and its maximum pull is governed by the engine torque. The drive to the winch is controlled by the transfer box and power take-off levers, when the first speed of the main gearbox is engaged.

15. All vehicles have a Vehicle Weight Specification plate which carries the vehicle identification details. The plate is riveted to the cab right-hand door pillar.

16. All models also have a Service Parts Identification plate which carries the chassis number and all the code numbers for the particular vehicle. When ordering replacement parts, all details on this plate, together with the engine number where applicable, should be quoted to ensure correct replacement parts being obtained. The plate is attached to the cab left-hand door pillar.

17. The engine number is stamped on a machined pad on the lower right- hand side of the crankcase.

CHAPTER 1-2

GENERAL DESCRIPTION

TRUCK, CARGO 4 TONNE 4X4 W/CRANE

NOTE

This Chapter to be read in conjunction with Chapter 1-1

18. The 4 tonne cargo with crane is an all wheel drive logistic vehicle with 4 tonne payload, designed to carry 6 Unit Load Containers or pallets. The vehicle is based on proven commercial components with special military features incorporated, including a 3 tonne capacity crane. It is to provide the Army's main logistic lift at 1st, 2nd and 3rd Line.

2. The crane is hydraulically driven by a pump taking its drive from the transfer box. Operating controls are behind the cab and are accessible through the cab roof observation hatch.

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CONTROLS AND INSTRUMENTS

TRUCK CARGO 4-TONNE 4 X 4 AND W/WINCH CONTENTS

CONTENTS

continued

CONTENTS (Contd)

BATTERY CUT-OUT SWITCH

CAUTION

Always stop the engine before switching off the cut-out switch.

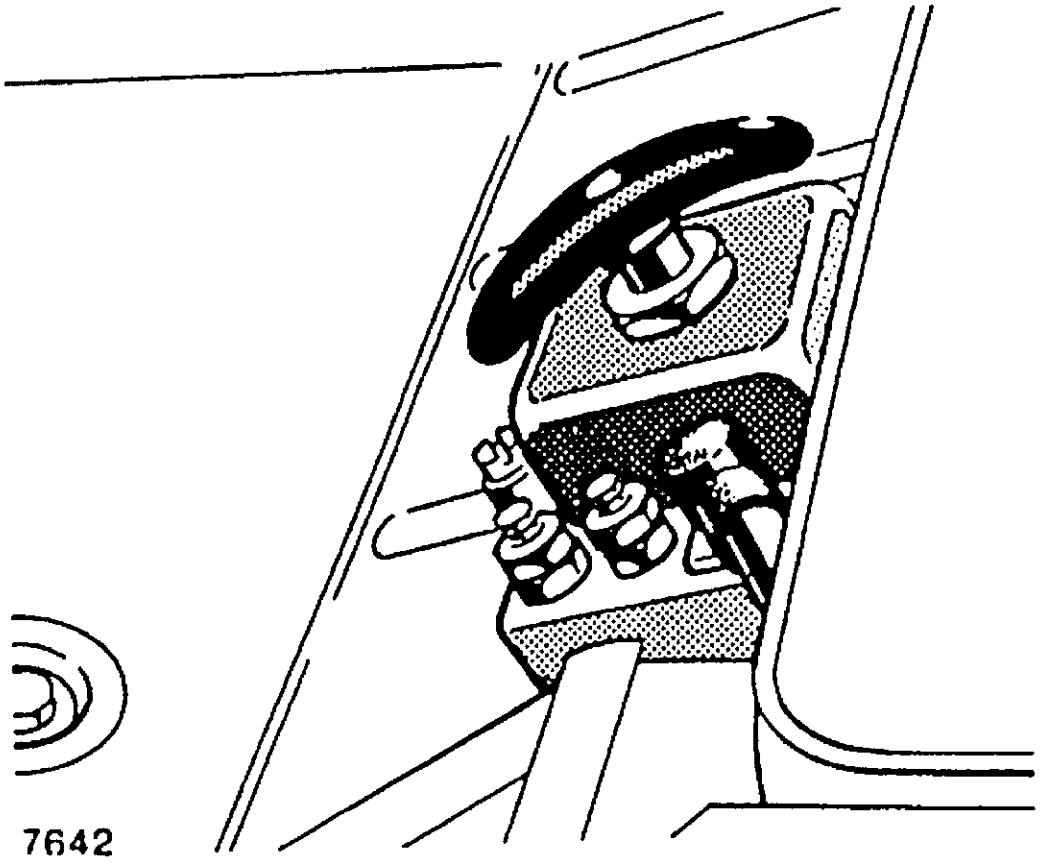


Fig 1 Battery master switch

1. This switch (Fig 1) is positioned beneath the right-hand seat in the cab. When the switch is in the 'OFF' position, the battery is completely isolated from the rest of the vehicle. The switch positions are marked on the switch top cover.

COMBINED MAIN KEY-START SWITCH

2. This switch (Fig 2(39)) is located on the engine compartment top panel, adjacent to the driver's seat. It is operated by a key and the first movement of the switch turns on the main circuits. Further rotation of the switch against the pressure of a spring operates the starter. When the switch is released it returns automatically to the running position.

NOTE

Turning the key-start switch to the 'OFF' position does not stop the engine. See paragraph 3 for use of engine 'stop' control

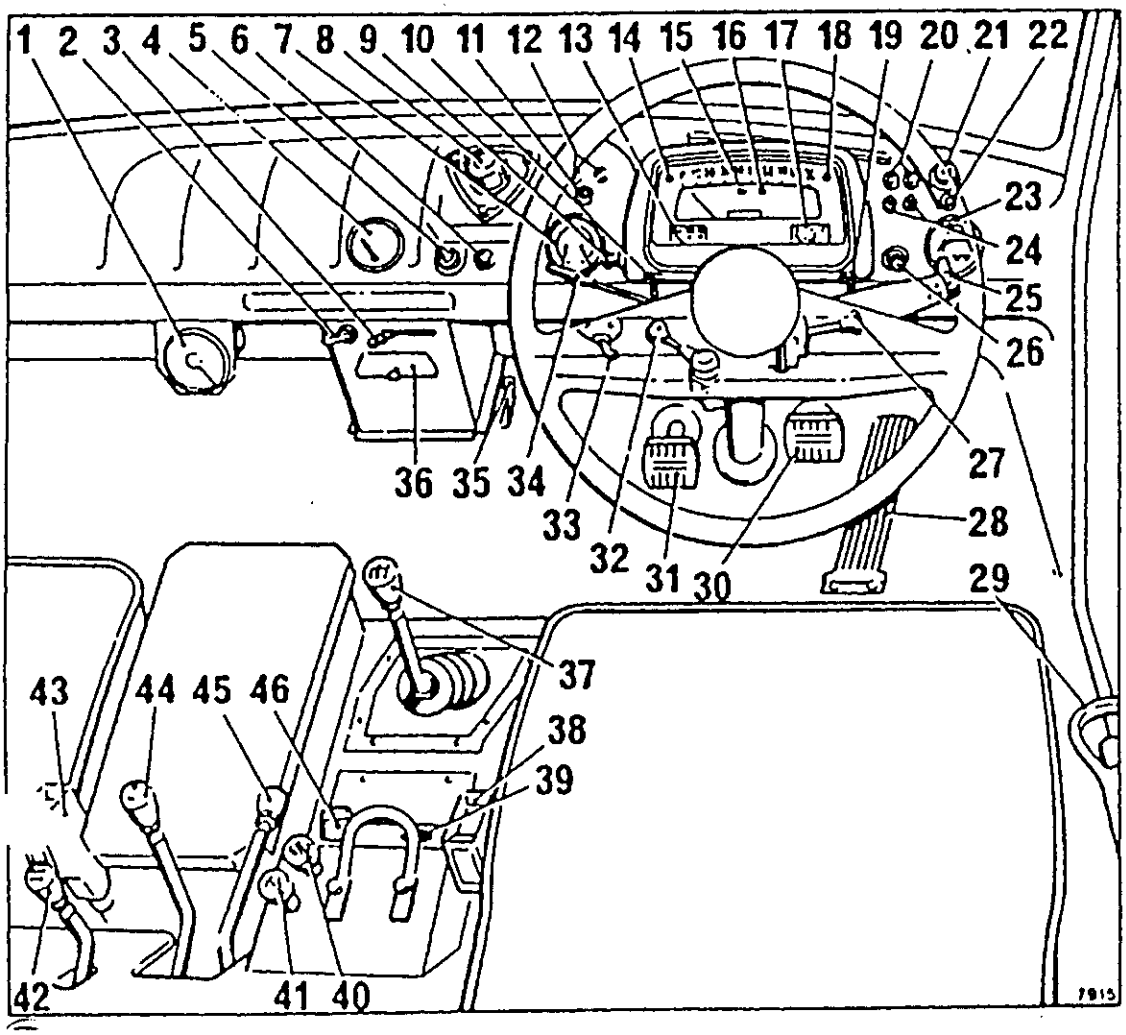


Fig 2 Instruments and controls

1 Tachometer
2 Heater fan switch
3 Heater temperature control lever
4 Temperature gauge*
5 [redacted]
6 Warning lamp - trailer turn light or interior light switch*
7 Dual air pressure gauge
8 Main driving light switch
9 Rear fog guard light
10 Panel light switch
11 Low air pressure warning
12 Inspection light sockets
13 Temperature gauge (Chassis ground return only)
14 Alternator warning light
15 Turn signal warning
16 Main beam warning light
37 Gear lever
17 Fuel gauge (Chassis ground return only)
18 Oil pressure warning
19 Windscreen wiper switch
20 Circuit leak check warning lights*
21 Hazard warning light switch
22 Warning light-trailer turn light*
23 Battery condition indicator
24 Circuit leak check switches*
25 Combined headlight dipper control and horn push
26 Windscreen wash control button
27 Hill holder
28 Accelerator pedal
29 Parking brake lever
30 Brake pedal
31 Clutch pedal
32 Winch brake
33 Trailer brake emergency control valve
34 Turn signal switch lever
35 Air control lever
36 Air flap
37 Gear lever
38 Driver's seat belt lock
39 Key-start switch
40 Engine stop conrol
41 Engine idle control
42 Power take-off lever
43 Passenger seat belt lock
44 Transfer box ratio control lever
45 Transfer box two/four wheel drive lever
46 Cold start control knob

ENGINE STOP CONTROL

3. The knob (40) is positioned on the engine compartment top panel adjacent to the main switch. To operate the control, pull the knob outward and hold it there until the engine stops.

ENGINE IDLE CONTROL

4. The idling control knob (41) is mounted on the engine compartment top panel and is appropriately marked.

5. To increase idling speed, screw the knob anti-clockwise. To decrease idling speed, screw the knob clockwise.

6. The control can be used to best advantage to prevent the engine stalling whilst it is warming up.

LIGHTING SWITCH

7. The driving light switch (8) is adjacent to the centre of the instrument panel and the switch has six positions including the 'OFF'. Turning the switchknob anti-clockwise from the 'OFF' to the 'T' position operates the tail and number plate lights. Rotation to the 'ST' position operates the sidelights in addition to the tail and number plate lights. Further rotation to the 'HST' position operates the headlights also. The stoplight and turn signal circuits are energised with the switch at 'OFF' or any of the anti-clockwise positions. Turning the switch knob clockwise from the 'OFF' to the 'C' position operates the convoy light and breaks the stoplight and turn signal circuits. Further rotation to the 'CS' position brings the sidelights also into circuit.

COMBINED HEADLIGHT BEAM CONTROL AND HORN PUSH SWITCH

10. The headlights beam control (25) is located on the right-hand side of the steering column. The switch is a two-position switch, the clockwise position being dipped beam and the anti-clockwise position being main beam. A blue warning light (16) in the speedometer is illuminated when the headlights are on main beam.

11. The headlight beam switch also operates the horn by depressing the switch knob.

TURN AND LANE CHANGE SIGNAL LIGHT CONTROL SWITCH

12. The switch (34) is on the left-hand side of the steering column. Anti-clockwise movement of the lever switches on the left-hand turn signal, signalling a left-hand turn. Clockwise movement of the lever correspondingly indicates a right-hand turn.

13. Whenever the turn signals are in use, a small green light (15) in the instrument cluster panel is illuminated.

14. When a trailer is in use, the flasher circuit provides for the turn signal switch to operate the trailer turn signals simultaneously with those of the prime mover, through the 12-point trailer socket. There is a separate green warning light (6 or 22) on the instrument panel for the trailer turn signals.

HAZARD WARNING DEVICE

15. The switch (21) for the device is located on the right-hand side of the instrument panel, just above the battery condition indicator (23). To bring the hazard warning system into operation, depress the switch button. The flashing turn-signals on both sides of the vehicle, and on the trailer if in use, will then come into operation. The switch incorporates a red light which flashes on and off in conjunction with the turn signals on the vehicle. To switch the hazard warning system off, depress the switch button.

REAR FOG GUARD LIGHT SWITCH

16. The switch (9) is mounted on the left-hand side of the instrument surround panel. When lights are switched on, indication is given by lamp illumination in the switch itself.

17. The lights can only be illuminated with headlights in the dipped beam position. If fog guard lights are switched on and the headlights are changed to main beam or side lights only, the rear fog lights are automatically extinguished.

CAB ROOF LIGHT SWITCH

18. The switch for the roof light is incorporated in the light itself on vehicles with a negative chassis ground electrical system. On vehicles equipped with an insulated negative return electrical system, the switch (6) is mounted in the dash panel.

INSTRUMENT PANEL LIGHTING

19. Illumination of the instrument panel is provided by concealed lights, mounted behind the instruments. They are controlled by a small switch (10) located on the left-hand side of the instrument panel. The panel lights cannot be switched on until the side and tail lights are also switched on.

CIRCUIT LEAK CHECK SWITCHES

20. On vehicles equipped with an insulated negative return electrical system a circuit leak check is incorporated which indicates if there is an electrical leak to the chassis.

21. The switches (24) are mounted directly below the warning lights (20) to the right of the instrument panel. If when depressing the switches independently, the warning lights illuminate, it indicates that there is an electrical leak to the chassis, and should be reported.

22. In the event of lamp failure in the warning lights, no indication of a leak would be given, therefore to overcome this situation, a lamp illumination, check should be carried out first. To check lamp illumination, depress both switches simultaneously. If lamps do not illuminate, this indicates a lamp or line fuse failure and should be reported.

BATTERY CONDITION INDICATOR AND ALTERNATOR WARNING LIGHT

23. The condition of the vehicle's batteries can be checked by turning key-start switch to the 'ON' position and noting the reading on the battery condition indicator (23) which is located to the right of the instrument cluster. With a well charged battery the needle should rest between 24 and 26. A reading below 24 shows that the battery requires attention. It is necessary to wait a few seconds for the battery voltage to stabilize before taking a reading.

24. A red warning light (14) in the instrument cluster panel is illuminated when the key-start switch is turned to the 'ON' position. With the engine running it should go out as soon as the alternator commences to charge the battery. The light acts as a warning if, for any reason, the alternator ceases to charge the battery.

25. When the engine is running at above idling speed the needle should indicate between 26 and 30 on the indicator (23). If the needle rests near the 30 mark the charging voltage is satisfactory. Should the needle stay near the 26 mark the charging voltage is low. This position may also be indicated when the headlights and other electrical equipment are in use. When the needle rests consistently on or above the 30 mark, it indicates a charging problem. Disregard readings shown when the engine is idling.

COLD START AID

26. The cold start aid knob (46) is located on the engine compartment top cover and is basically a push-type switch which controls two electrically-operated igniters in the inlet manifold to assist the starting of the engine from cold. See Chap 3-1, para 2 for engine starting procedure.

TEMPERATURE GAUGE

27. The temperature gauge (13) or (4) shows whether the engine is operating at the correct temperature. Under normal conditions the needle should lie around the 80 mark. If the needle rises significantly higher than normal, the cause should be investigated. Due allowance however, should be made for travelling in extremely hilly country, or in hot weather with a following wind. Should the temperature gauge show that the cooling system is consistently operating at too low a temperature, the efficiency of the thermostat should be checked.

WARNING

WHEN THE ENGINE IS AT NORMAL OPERATING TEMPERATURE OR ABOVE, THE INTERNAL PRESSURE BUILT UP IN THE COOLING SYSTEM WILL BLOW OUT SCALDING FLUD AND VAPOUR IF THE RADIATOR CAP IS SUDDENLY REMOVED. TO PREVENT LOSS OF COOLANT AND TO AVOID THE DANGER OF BEING SCALDED, THE COOLANT LEVEL SHOULD BE CHECKED OR COOLANT ADDED ONLY WHEN THE ENGINE IS COOL. IF THE CAP MUST BE REMOVED WHEN THE ENGINE IS HOT, PLACE A CLOTH OVER THE CAP AND ROTATE THE CAP SLOWLY ANTI- CLOCKWISE TO THE FIRST STOP AND ALLOW PRESSURE TO ESCAPE COMPLETELY.

THEN TURN THE CAP SLOWLY ANTI-CLOCKWISE TO REMOVE IT. MAKE SURE THAT THE CAP IS TURNED FULLY CLOCKWISE WHEN IT IS INSTALLED.

FUEL GAUGE

28. On vehicles with a negative chassis ground electrical system the fuel gauge (17) is electrically operated and functions only when the main starter switch is turned to the 'ON' position. Vehicles which have insulated negative return electrical systems have a mechanical fuel gauge positioned in the side of the fuel tank.

ACCELERATOR PEDAL

29. The accelerator pedal (28) is on the extreme right-hand side of the driver's footwell.

CLUTCH PEDAL

30. The clutch pedal (31) is on the extreme left-hand side of the driver's footwell.

BRAKE CONTROLS

31. The footbrake pedal (30) is between the clutch and accelerator pedals. It operates the brake shoes on all four wheels on the prime mover and also on the trailer when towing through an air pressure/hydraulic system. The parking brake lever (29) positioned at the outer side of the driver's seat, is of the horizontal pull-up type and it operates an independent drum-type transmission brake, which is mounted on the rear axle pinion shaft.

VEHICLE AND TRAILER EMERGENCY BRAKE HOLD (HILL HOLDER)

32. The hand control lever (27) is mounted on the right of the steering column and when applied in an anti-clockwise direction and held against spring pressure, enables the vehicle and trailer brakes to be applied. This can be used to assist the driver, when holding vehicle and trailer on, or pulling away on, a steep incline. For operating instructions refer to Chap 3-1, paras 41-43 inclusive.

TRAILER BRAKE EMERGENCY HAND CONTROL VALVE

33. The trailer brake emergency hand control valve (33) mounted to the instrument panel allows the driver to leave the vehicle and trailer safely parked to enable him to leave the vehicle and apply the manual parking brake. For operating instructions refer to Chap 3-1, paras 44 and 45.

BRAKE WARNING DEVICES

34. On all models there is a dual air pressure gauge (7) located in the instrument panel to register the air pressure in the reservoirs. The brake system also incorporates a tow air pressure alarm buzzer and an amber warning light (11).

35. The vehicle must not be driven until the amber warning light goes out and the buzzer ceases to operate. If the buzzer sounds and the amber light comes on during vehicle operation, an immediate stop should be made and the cause of the air loss determined.

OIL PRESSURE WARNING LIGHT AND BUZZER

36. An amber warning light (18) in the instrument cluster panel will illuminate and an audible buzzer will sound when the ignition is switched on. The light should go out and providing there is sufficient air in the braking system, the buzzer will cease to sound when the engine is started. The light and buzzer are operated through a switch in the engine lubrication system and will, therefore, operate as soon as the oil pressure falls below the safety limit.

ALTERNATOR WARNING LIGHT

37. An alternator warning light (14) in the instrument cluster glows when the main switch is turned to the 'ON' position. It should go out as soon as the alternator commences to charge the battery. The light also serves as a warning not to leave the combined main and key-start switch on when the engine is not running. The light acts as warning if for any reason the alternator ceases to charge the battery.

MAIN GEARBOX CHANGE-SPEED LEVER

38. The main gearbox change-speed lever (37) is positioned centrally in the cab. There are four forward speeds and one reverse, with synchromesh operation on top, third and second speeds.

TRANSFER BOX RATIO CONTROL LEVER

39. The transfer box ratio lever (44) is centrally positioned in the cab, on the engine top compartment panel. The knob is marked 'H-N-L'.

TRANSFER BOX TWO/FOUR WHEEL DRIVE CONTROL LEVER

40. The transfer box two/four-wheel drive control lever (45) is located on the engine compartment top panel, to the left of the transfer box ratio control lever, and it is marked '4WD, 2WD'.

POWER TAKE-OFF LEVER (WHERE FITTED)

41. The power take-off lever (42) is centrally positioned on the engine compartment top panel, to the left of the transfer box levers. Move back to engage the power take-off.

WINCH CONTROLS (WHERE FITTED)

42. An air-operated winch brake lever (32), painted white, is attached to the steering column.

43. The winch cable drum clutch and cable tensioning device is controlled by a hand lever on the frame side-member.

44. On all vehicles equipped with a winch, a modified engine idling control is fitted. This provides adequate control of the engine during winching operations. To increase the engine speed, unscrew the knob.

TACHOMETER (WHERE FITTED)

45. The engine-driven tachometer (1) is attached to a bracket on the lower edge of the instrument panel, just to the left of the heater and the figures on the dial indicate hundreds of revolutions - ie when the needle points to 15, the engine is running at 1500 rev/min.

WINDSCREEN WIPERS

46. Dual, parallel action, two-speed windscreen wipers are operated by a heavy-duty electric motor. The switch (19) is on the right-hand lower edge of the instrument cluster panel.

WINDSCREEN WASH

47. The knob for operating the screen-wash (26) is at the right of the instrument panel. To clean the screen, push the knob in and two jets of water will be directed on to the area of the screen swept by the wiper blades. The reservoir for the screen-wash is located under the instrument panel.

SEAT ADJUSTMENT

CAUTION

Do not adjust driver's seat while the vehicle is moving - the seat could move unexpectedly, causing loss of control.

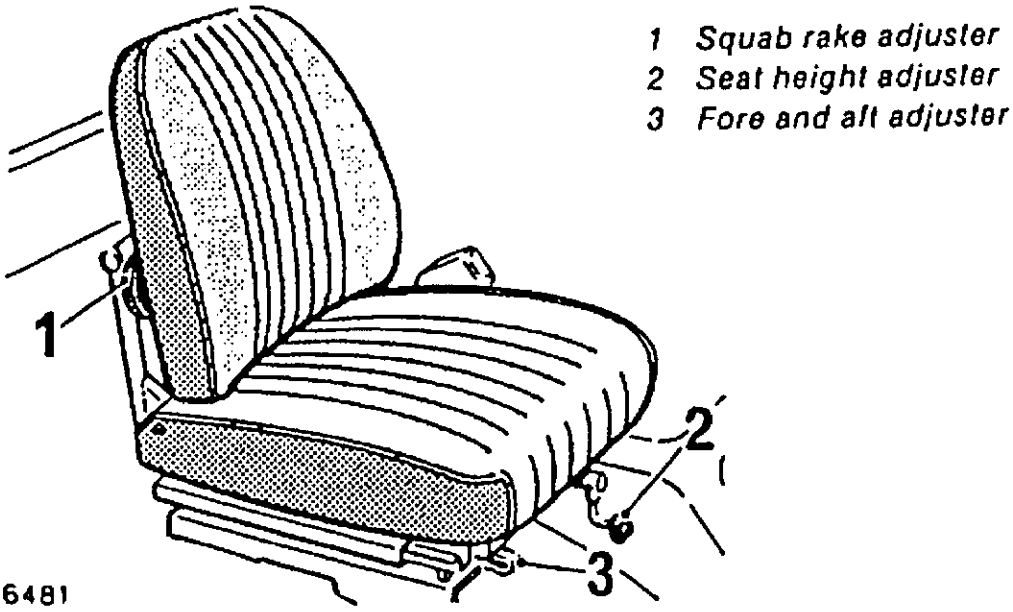


Fig 3 Seat adjustment controls

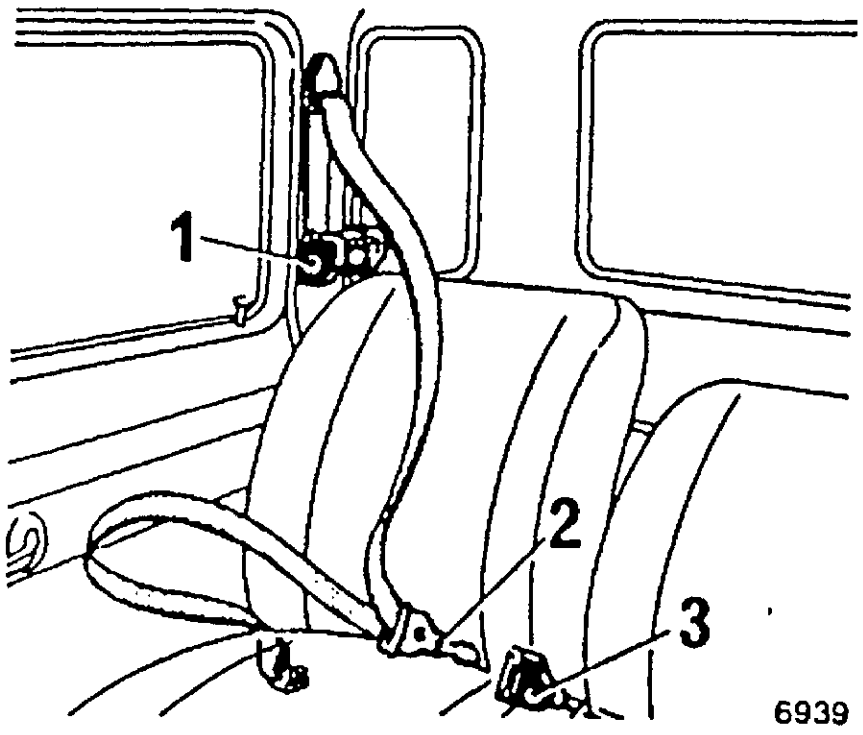
48. The driver's seat has provision for 50 mm (2 inch) height adjustment, forward and rearward adjustment of 127 mm (5 inch) and squab rake of 17 degrees.

49. To raise the seat assembly when in the sitting position, turn the handle (Fig 3 (2)) at the front of the seat to the left. To lower the seat assembly turn the

handle to the right. This operation is easier if the body weight is not resting on the seat cushion.

50. Fore and aft adjustment is carried out by releasing the lever (3) at the front of the seat. When the seat is in the required position, release lever and rock seat to ensure catch has engaged.

51. To adjust the squab rake turn the large knurled knob (1) situated on the right-hand side of seat squab, either clockwise or anti-clockwise for the desired angle.



1 Inertia reel 2 Tongue 3 Coupling buckle

Fig 4 Seat belt layout

SEAT BELTS

52. The seat belts (Fig 4) are of the lap diagonal type with single-handed operation.

53. This type of seat belt stores the belt neatly away when not in use, provides automatic adjustment and gives the wearer complete freedom of movement under normal driving conditions.

To fasten the belt

54. To fasten the belt, grasp the tongue and slowly pull the webbing through the top attachment point. The belt should pass over the right shoulder on the right-hand seat and over the left shoulder on the left-hand seat. With the lap portion of the belt positioned as low on the hips as possible, push the tongue into the coupling buckle (Fig 5). A positive click will signal that the tongue is securely locked in the buckle.

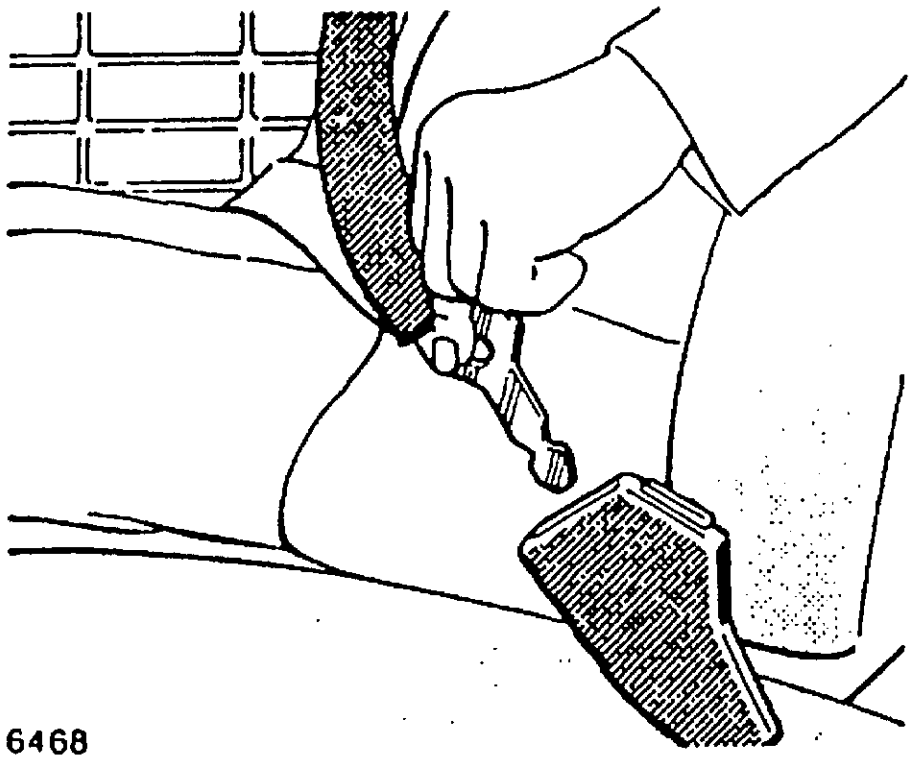


Fig 5 Seat belt fasten

To release the belt

55. Simply depress the release button (Fig 6) on the coupling buckle which is marked 'PRESS', and return the tongue to its stowed position near the top attachment point.

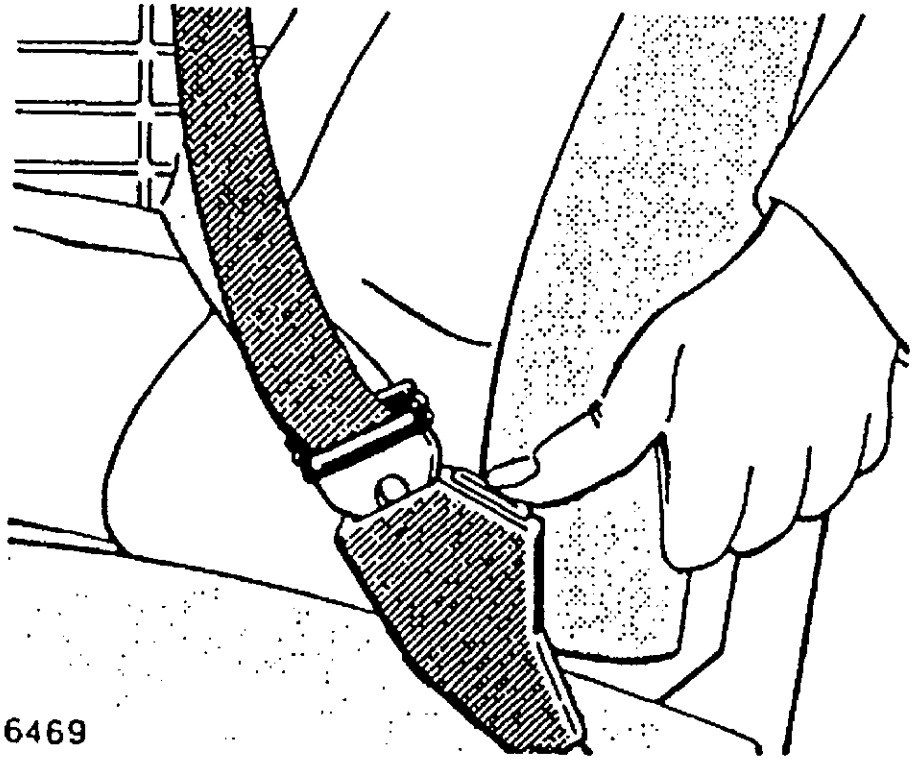
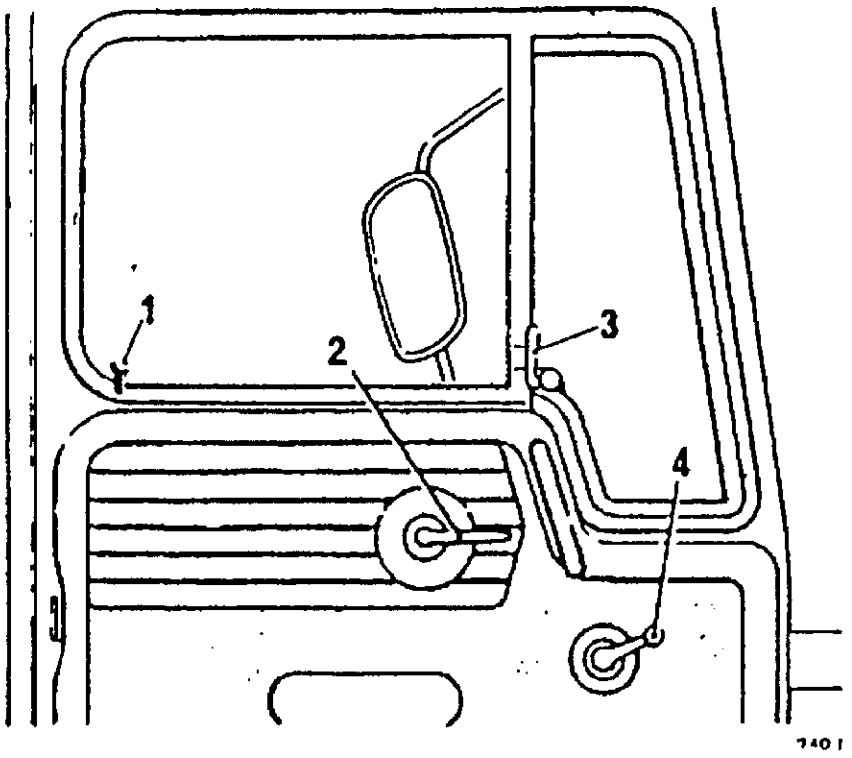


Fig 6 Seat belt release

CAB DOOR LOCKS

56. The passenger's door can be locked by depressing plunger knob (Fig 7 (1)). Similarly, the driver's door can be locked from the inside in this manner. The driver's door can be locked from the outside using the main switch key.

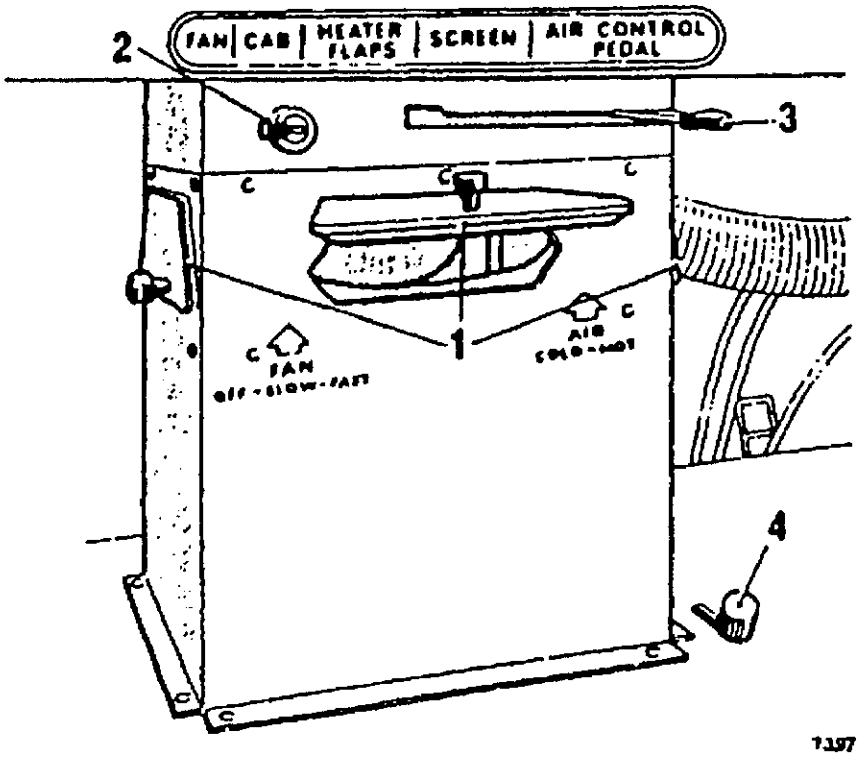


1 Internal locking knob
2 Door release lever
3 No-draught ventilation catch
4 Window winder control

Fig 7 Door controls

WINDOW CONTROLS

57. No-draught ventilator windows are incorporated in the front portion of each door. They are retained in the closed position by a small catch (3) on the bottom of the window frame. To open a window, turn the catch forward and push the rear of the window outward. This allows air to circulate without draughts. The rear portion of each front door has a window which can be raised or lowered by turning the handle (4) on the door inside panel.



1 Air flaps
2 Air booster switch
3 Heater control lever
4 Ventilation control lever

Fig 8 Heating and ventilation controls

VENTILATION AND HEATING

58. The heater is designed to operate in conjunction, with the cab fresh air ventilation system. In addition to heating the cab interior, the heater is also used for demisting and de-icing the windscreen, air being diverted for this purpose through a duct at each side. Air flaps (Fig 8 (1)), and a ventilation flap controlled by lever (4), direct air through the system. The temperature of the air is controlled by lever (3) and to boost air flow an electrically-operated fan, controlled by switch (2), is provided. Whenever the vehicle is parked, the air intake control lever (4), must be moved to the rearward (closed) position, to prevent the ingress of insects etc. The system is operated as follows:

No ventilation or heating

59. Move the floor mounted air control lever to its rearward position. Heat control lever to the left. Close the three air flaps on the sides and front of the heater.

Cab cooling

60. Heat control lever to the left. Move the floor mounted air control lever to its forward position. Open air flaps on both sides and front of heater. Air flow can be increased by operating the heater fan, fast or slow as required.

Cold air demisting

61. Heat control lever to the left. Open floor ventilation flap by moving the control lever to its forward position. Close air flaps on both sides and front of heater. Air flow can be increased by operating the heater fan.

Cab heating

62. Heat control lever to the right. Open floor ventilation flap by moving the control lever to its forward position. Open air flaps on both sides and front of heater. Air flow can be increased by operating the heater fan.

Hot air demisting and de-icing

63. Heat control lever to the right. Open floor ventilation by moving the control lever to its forward position. Close all air flaps on both sides and front of the heater. Air flow can be increased by operating the heater fan.

ENGINE ACCESS PANELS

64. Hinged panels, beneath the quarter lights on each side of the cab, are fitted with slam-type locks, with outside handles. Self-locking stays retain them in the open position.

OBSERVATION HATCH

65. The observation hatch is situated in the centre of the roof panel and the fire resistant cover is secured by three stretch rings located over pegs in between hip ring padding.

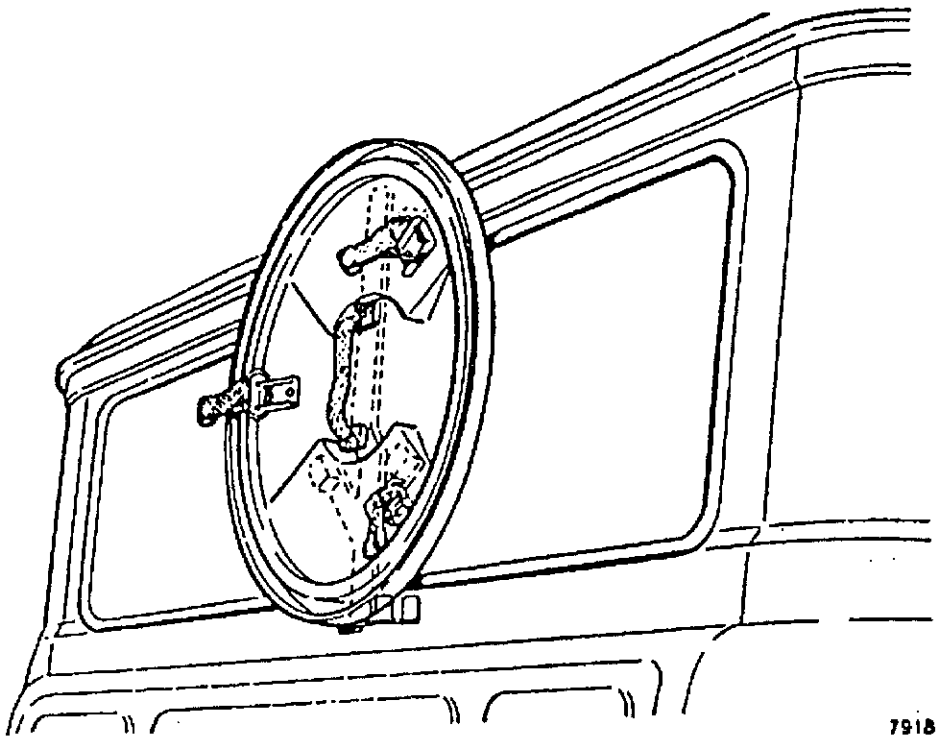


Fig 9 Observation hatch stowage

66. A bracket positioned on the centre of the cab back panel (Fig 9) is provided for hatch cover stowage when removed.

REAR VISION EXTERIOR MIRRORS

67. Two rear view exterior convex mirrors incorporating a ball joint tensioning device are installed.

68. The tensioning screws may need some adjustment from time to time.

69. Access to the ball joint tensioning screws is gained after temporarily removing the mirror attachment bracket, which is secured to the mirror housing by two screws.

70. When setting the ball joint clamping load, tighten four screws (Fig 10 arrowed) carefully and evenly until the required mirror head tension is attained.

71. Adjust the convex mirror until the side of the vehicle is visible in the portion of the mirror closest to the vehicle. This type of mirror is designed to give a much wider view in the rear, especially of the lane next to your vehicle. This may be helpful when changing lanes, or when reversing the vehicle. However, cars and other objects seen in a convex mirror will LOOK smaller and further away than when seen in a flat mirror. Therefore, use care when judging the size or distance of a car or object seen in this convex mirror. Use the interior mirror or glance rearward to determine the size and distance of objects seen in the convex mirror.

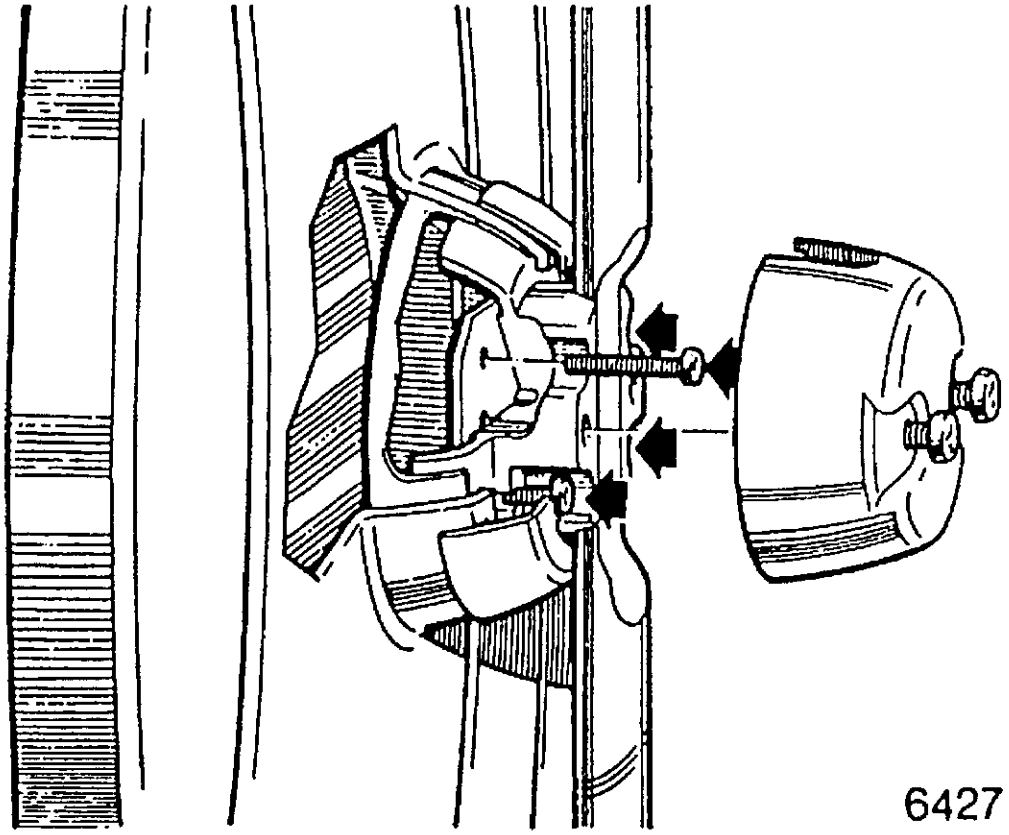


Fig 10 Rear vision mirror

CHAPTER 2-2

CONTROLS AND INSTRUMENTS

TRUCK CARGO 4 TONNE 4 X 4 W/CRANE CONTENTS

CONTENTS

Para

Fig Page

NOTE

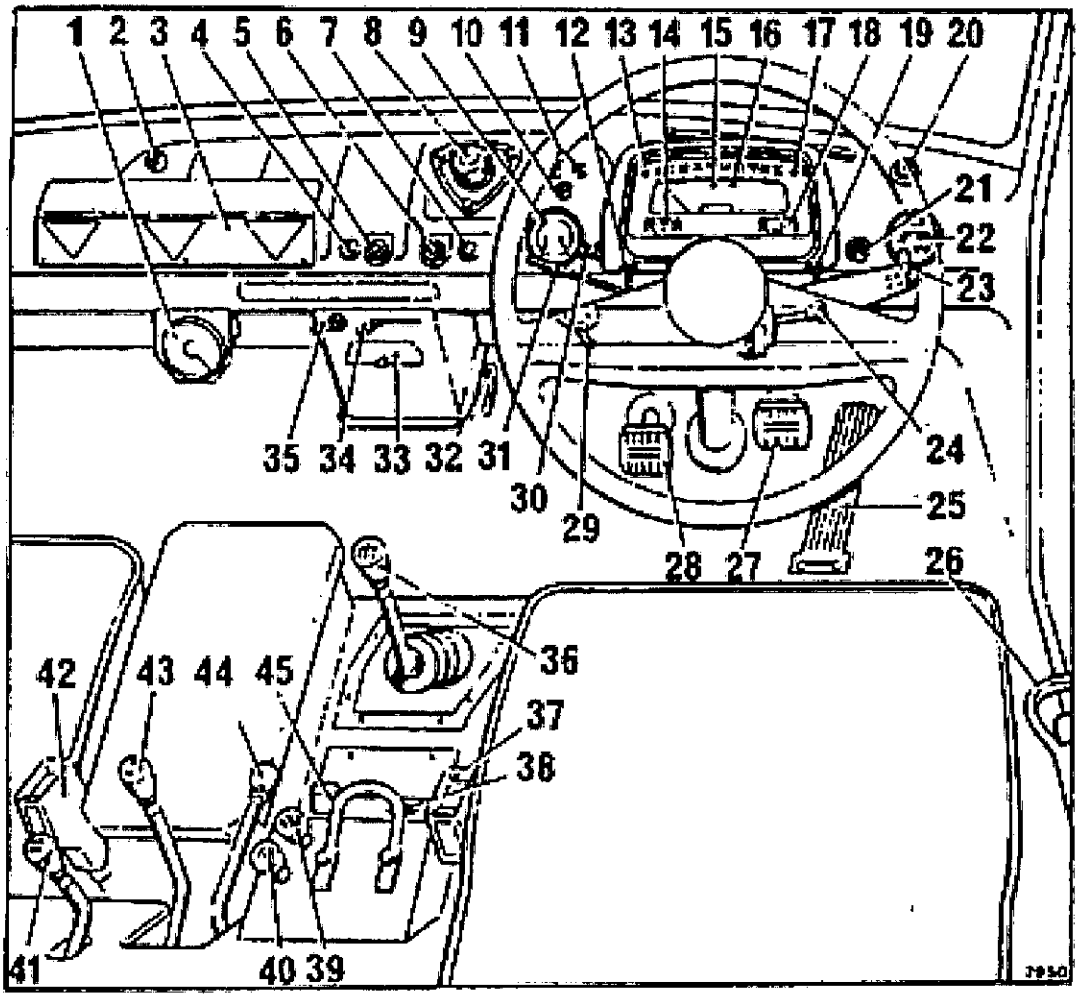
This Chapter to be read in conjunction with Chap 2-1

GEARBOX POWER TAKE-OFF LEVER

1. The gearbox power take-off lever (Fig 1(40)) is positioned on the cab back panel adjacent to the transfer box two/four-wheel drive and ratio control levers. When this is engaged a warning lamp (2) in the dash panel will illuminate.

CAB ROOF FLOODLIGHT SWITCH AND WARNING LIGHT

2. The lights can be illuminated by switches on the lights or by a switch (5) in the dash panel. Adjacent to switch is a warning light (4), which indicates when illuminated, the floodlights are on. The switch mounted in the dash panel can also extinguish the floodlights even though they have been illuminated by the independent switch on the light



Key to Fig 1

1 Tachometer
2 Power take-off engagement warning light
3 Crane warning labels
4 Roof floodlights sockets illumination warning light
5 Roof floodlight switch
6 [redacted]
7 Warning light-trailer turn light
8 Main driving light switch
9 Dual air pressure gauge
10 Low air pressure warning light
11 Inspection light
12 Panel light switch
13 Alternator warning light
14 Temperature gauge
15 Turn signal warning light
16 Main beam warning light

Continued

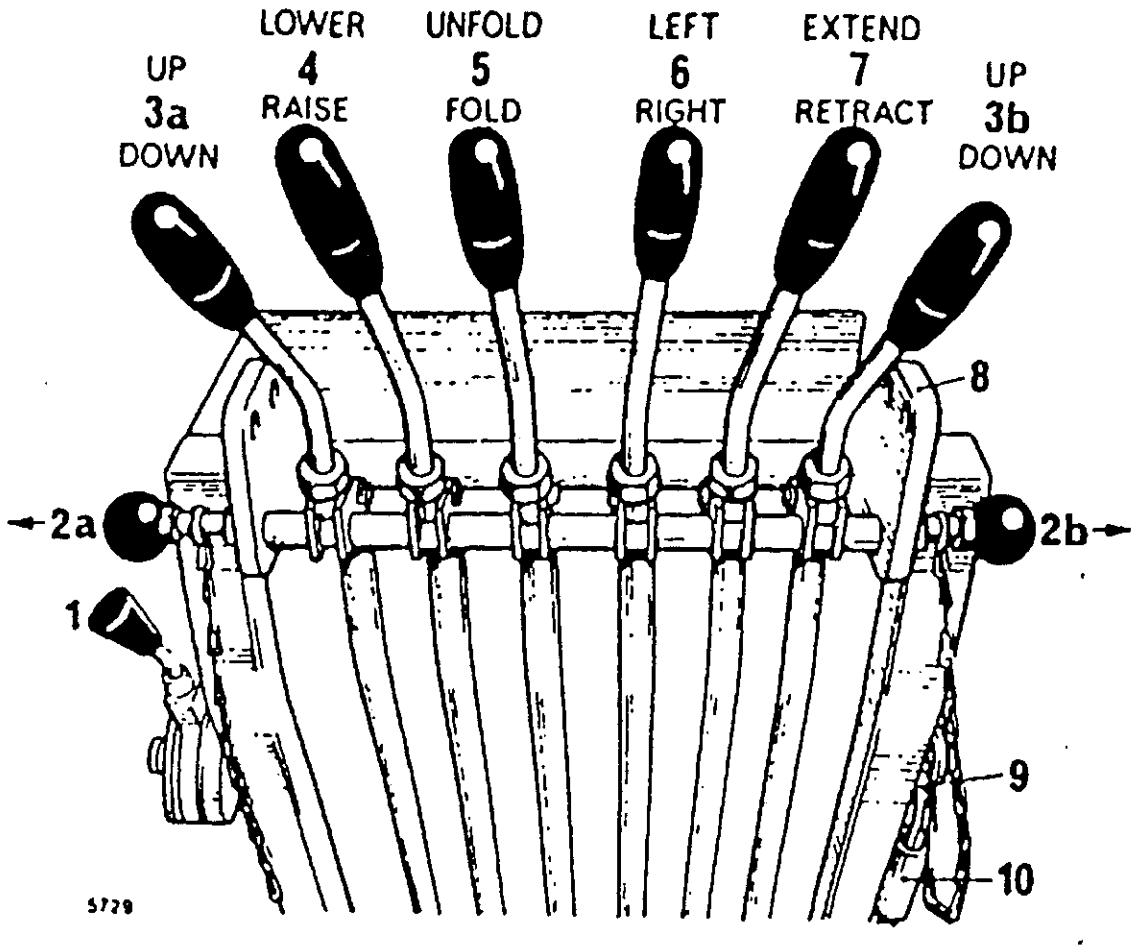
Key to Fig 1 (contd)

17 Oil pressure warning lever light
18 Fuel gauge
19 Windscreen wiper switch
20 Hazard warning light switch
21 Windscreen wash control button
22 Battery condition indicator control
23 Combined headlamp dipper control and horn push lever
24 Hill holder
25 Accelerator pedal
26 Parking brake lever
27 Brake pedal
28 Accelerator pedal
29 Trailer brake hand control lever valve
30 Rear fog guard light switch
31 Turn signal switch
32 Air control lever
33 Air flap
34 Heater temperature control lever
35 Heater fan switch
36 Gear lever
37 Driver's seat belt lock
38 Key-start switch
39 Engine stop
40 Engine idle control
41 Power take-off
42 Passenger seat belt lock
43 Transfer box ratio control lever
44 Transfer box two/four wheel drive
45 Cold start

Fig 1 Instrument gauges and controls

CRANE LEVER CONTROLS

3. The crane lever controls (Fig 2) are positioned behind the cab at roof level and are accessible after removing observation hatch cover. Lever control directions are marked on frame directly in front of levers.



1 Throttle control
2a & 2b Stabilizer control safety mechanism
3a & 3b L/H & R/H Stabilizer control
4 Boom control
5 Jib control
6 Stew control
7 Jib extension control
8 Control bracket
9 Safety stirrup
10 Stirrup stowage bracket

Fig 2 Crane lever controls

OPERATING INSTRUCTIONS

TRUCK CARGO 4 TONNE 4 X 4 CARGO AND W/WINCH

CONTENTS

BEFORE STARTING THE ENGINE

1. Check the fuel, oil and coolant levels and top-up as necessary. Use the correct anti-freeze for the cooling system when authorised. See that the battery master switch is turned on (see current instructions). Where applicable turn the fuel tank tap to the 'ON' position and operate the circuit leak check switches as detailed in Chap 2-1, para 19a.

2. If the engine has not been run for one month or more, it will be necessary to oil prime the turbocharger. To prime turbocharger 50 cm (2 fl oz) of clean engine oil should be added via the turbocharger oil adaptor plug (Fig 1).

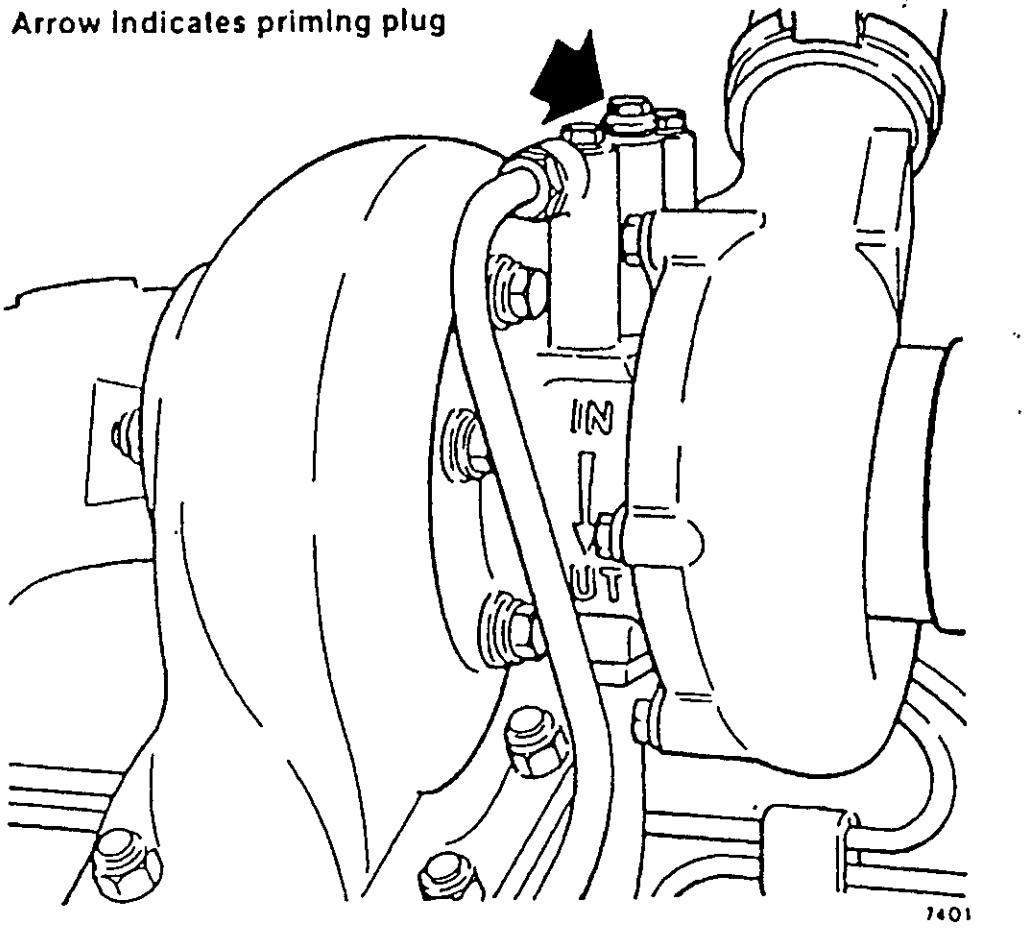


Fig 1 Turbocharger

STARTING THE ENGINE

CAUTION

When starting a turbocharged engine from cold it is important that the engine idling speed does not exceed 1000 rev/min for one minute in ambient temperatures above +10 degrees C and for three minutes in ambient temperatures below 10 degrees C. This period should be strictly adhered to as this allows the turbocharger shaft, seals and bearings to be well lubricated before high engine speeds are required, thus prolonging the service life of the turbocharger.

NOTE

An engine idling control is used to vary the engine idling speed. It can be used to advantage to prevent stalling of the engine during the warming-up period. The idling speed should be returned to normal when the engine is warm.

3. The method of starting the engine is dependent on the prevailing temperature and the driver should make sure that he is thoroughly familiar with the appropriate procedure.

With temperature above +10 degrees C

4. See that main gearbox gear shift lever is in neutral and the parking brake control is applied.

5. Turn key-start switch to 'ON' position.

6. Check that manual stop control is in 'run' position.

7. Fully depress accelerator pedal and hold down.

8. Fully depress clutch pedal and hold down.

9. Turn key-start switch to engage starter.

10. Ehen engine fires evenly release key-start switch and release clutch pedal.

11. When engine fires evenly, gradually release accelerator pedal to maintain 1000 rev/min for 1 minute.

12. Return to idle.

CAUTION

If engine does not start alter 10 seconds cranking, turn key-start to OFF position, operate stop control and use procedures as for below +10 degrees C.

With temperature below +10 degrees C to -32 degrees C

13. See that main gearbox gear shift lever is in neutral and the parking brake control is applied.

14. Turn key-start switch to 'ON' position.

15. Check that manual stop control is in 'run' position.

16. Depress cold start device control knob and hold down.

17. After 15 seconds fully depress clutch and accelerator pedals and turn key-start switch to engage starter.

18. When engine fires evenly release key-start switch and release clutch pedal.

19. When engine is running evenly, release cold start control knob and gradually release accelerator pedal to maintain 1000 rev/min for 3 mins.

20. Return to idle.

CAUTION

If engine does not start after 10 seconds cranking, turn key-start to OFF position, operate stop control and repeat procedure as from para 13.

NOTE

The cold start device holds 3 minutes of fuel. If the device is operated for more than 3 minutes, refill by hand priming for 200 strokes and repeat starting procedure as from para 13.

STARTING A WARM ENGINE

21. When engine is warm it can be started by turning key-start switch to engage the starter. When engine fires evenly, release key-start switch.

TO STOP THE ENGINE

CAUTION

The method of stopping a turbocharged engine is dependent upon the conditions under which the engine has been operating. For normal running and moderate engine speeds it is only necessary to pull the engine stop control and turn the key-start switch to the OFF position. If the engine has had a long run sustaining high engine speeds, it is important, before engine shutdown, to idle engine for three minutes including any low speed manoeuvring time, to allow lubricating oils to carry heat away from the turbocharger shaft, bearing and seals.

22. Pull the engine stop control knob and hold out until the engine stops. See that the control goes fully home when released after the engine has stopped. Turn off the key-start switch.

SENSIBLE DRIVING

23. Extensive testing has shown that the formal running-in schedule with specified speed restrictions for a given mileage is now unnecessary. However, during the early life of the vehicle a certain amount of restraint and the observance of a few simple precautions will ensure, smoother engine life, better performance, lower oil consumption and a greater all-round mechanical silence.

24. The following driving techniques are to be observed:

24.1 Drive with restraint for the first 1500 km (1000 miles). Thereafter, progressively take advantage of the capabilities of the vehicle.

24.2 Avoid full-throttle operation and high engine speeds, particularly in the low range of gears.

24.3 Use the gearbox freely to avoid letting the engine labour or 'over-rev'.

24.4 Unnecessary heavy braking should be avoided during this initial period as it may reduce future brake efficiency and life.

24.5 Drive at moderate speeds until the engine has completely warmed up.

GEAR CHANGING

CAUTION

To avoid damage to the transfer box, the P.T.O. lever must only be operated when the vehicle is stationary.

25. The main gearbox has four forward speeds and one reverse, with synchromesh operation on top. 3rd and 2nd gears. The gear shift lever positions shown in Fig 2 are also marked upon the knob on the top of the gear shift lever.

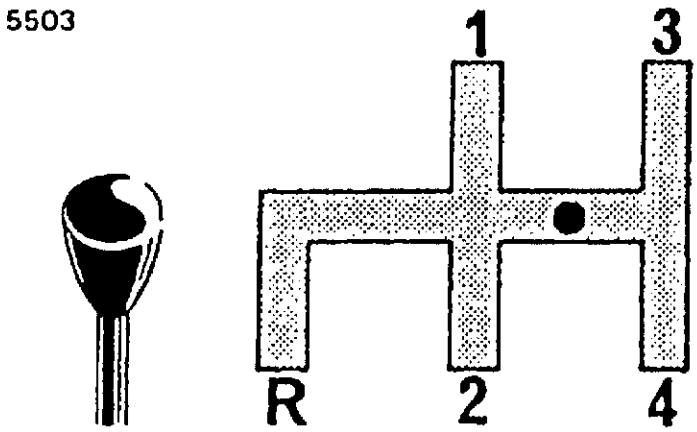


Fig 2 Gear change diagram - main gearbox

26. To prevent any risk of reverse gear being accidentally engaged while the vehicle is moving forward, the resistance of a stiff spring must be overcome before the gear can be engaged.

27. Except when changing into 1st gear, gear changes can be made either up or down, by merely depressing the clutch pedal and moving the gear shift lever firmly into the required position. It is necessary to double-declutch when changing down to 1st gear.

28. The transfer box provides three alternative drives: a straight through drive to the rear axle, a straight through drive to all four wheels and a 2:1 reduction for four-wheel drive. The control levers are mounted in the cab adjacent to the driver and high or low ratio must be engaged before the vehicle can be driven.

29. The transfer box operation is controlled by two levers and the operating positions are marked on the appropriate lever knobs (Fig 3).

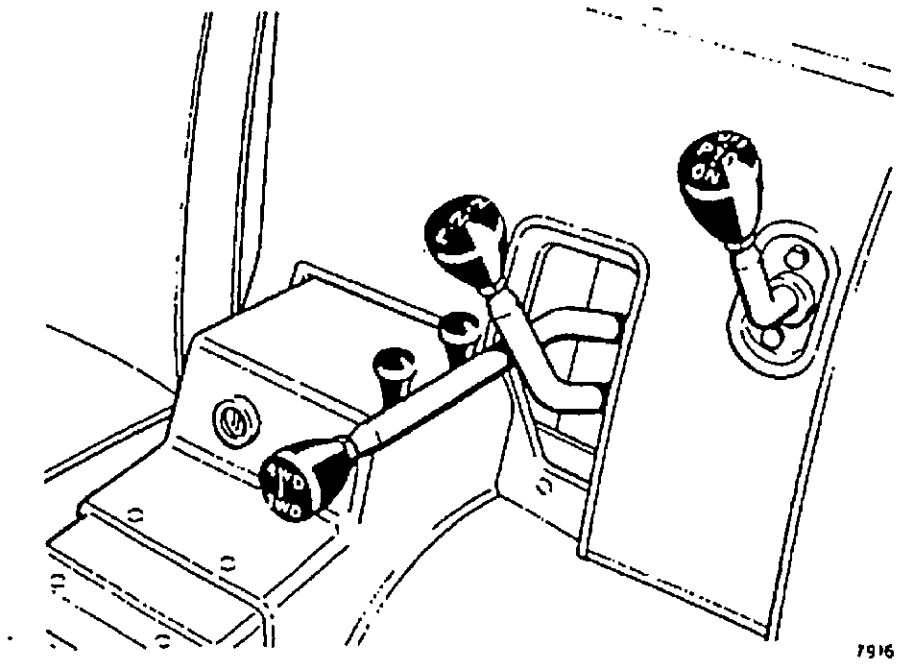


Fig 3 Transfer box controls

30. The right-hand lever controls the drive. In the fully down position normal two-wheel drive is engaged, in the fully-up position four-wheel drive is engaged.

31. The left-hand lever controls the selection of either high or low ratio. The fully-up position engages the high ratio, the central position neutral, and the fully downward position engages low ratio.

31.1 High ratio can be used when the drive lever is in either two or four wheel drive

31.2 Low ratio can be used only in four-wheel drive.

32. The arrangement of the inter-lock linkage between the two levers is such that should the driver inadvertently attempt to change from four-wheel drive to two-wheel drive while the ratio lever is in low, the ratio lever will automatically be moved to the neutral position.

33. Changes from two-wheel drive to four-wheel drive are made by depressing the clutch and simultaneously moving the drive lever upwards. These changes should only be made in anticipation of heavy going and at low vehicle speeds. Four-wheel drive should not be used on normal prepared road surfaces.

34. Changes from four-wheel drive high to four-wheel drive low - or vice versa - are made by depressing the clutch pedal and simultaneously moving the ratio lever to the appropriate position.

35. hanges from low four-wheel drive to two-wheel drive necessitates a combination change in the following sequence. Depress the clutch pedal and simultaneously move the ratio lever from low to high and then move the drive lever to the two-wheel drive position. This change sequence should be carried out as quickly as possible to reduce the loss of road speed to a minimum.

NOTE

Two-wheel drive cannot be operated with the transfer box in low ratio (See Para 31).

36. The change from four-wheel drive high to two-wheel drive is made bymoving the drive lever downwards, not depressing the clutch but getting the drive line in a no-torque position by use of the throttle.

37. If difficulty is experienced in accomplishing the operation given in the previous paragraph this will be due to the presence of transmission wind-up. It will then be necessary to use one of the following methods to release the wind-up and allow the drive lever to be moved.

37.1 Reverse the vehicle while keeping firm hand pressure on the drive lever.

37.2 Position one or more wheels on a soft or loose surface.

37.3 Raise one wheel clear of the ground, after applying the usual safety precautions.

NOTE

Do not use four-wheel drive on roads or firm surfaces. For normal road work the 'high' two-wheel drive must be used. The four-wheel drive should only be engaged when conditions render its use essential ie for temporary use over rough ground. The two-wheel drive must be re-engaged at the earliest opportunity. The four-wheel drive low-ratio is not to be regarded as providing a specially low series of gear ratios for hill climbing on hard road surfaces.

ENGAGING THE POWER TAKE-OFF (WHERE FITTED)

38. Start the engine as detailed at the beginning of this section. Depress the engine clutch pedal. Engage first gear in the main gearbox and, with the transfer box gear lever in the neutral position, engage the power take-off by moving the control lever downwards. Take up the drive by allowing the clutch pedal to return slowly to its normal position.

NOTE

It is not possible to engage power take-off unless the transfer box is in the neutral position.

USE OF CLUTCH

39. Avoid 'riding the clutch' - ie resting the left foot on the pedal while driving as it may result in wear of the clutch linings and withdrawal bearing. The pedal should have 25 mm (1 inch) of 'free travel' ie the amount of travel before pressure of the clutch springs is felt.

USE OF BRAKES

40. On all models there is a dual air pressure gauge located in the instrument panel to register the air pressure in the reservoirs. The brake system also incorporates a low air pressure alarm buzzer and an amber warning light.

41. The vehicle must not be driven until the amber warning light goes out and the buzzer ceases to operate. If the buzzer sounds and the amber light comes on during vehicle operation an immediate stop should be made and the cause of the air loss determined.

VEHICLE AND TRAILER EMERGENCY BRAKE HOLD (HILL HOLDER)

WARNING

THE VEHICLE AND TRAILER EMERGENCY BRAKE HAND CONTROL LEVER OPERATES AGAINST SPRING PRESSURE AND MUST BE HELD IN THE APPLIED POSITION DURING THE TIME VEHICLE AND TRAILER IS HELD ON AN INCLINE.

42. A brake hand control lever mounted on the right of the steering column enables the vehicle and trailer brakes to be applied to assist the driver, when holding vehicle and trailer on, or pulling away on, a steep incline.

43. When stopping vehicle and trailer on a steep incline use foot brake in normal manner and apply hand control lever against spring pressure in an anti- clockwise direction and hold. When moving vehicle and trailer on an incline slowly release hand control lever whilst driving away using normal driving techniques.

44. In the unlikely event of failure of the footbrake the brake hand control valve can be used to apply the vehicle and trailer brakes. The lever should be moved slowly so that a gradual application of the brakes is obtained.

TRAILER BRAKE EMERGENCY HAND CONTROL VALVE

WARNING

ON NO ACCOUNT SHOULD THE TRAILER BE LEFT PARKED ON AIR PRESSURE BRAKING ONLY. ALWAYS USE THE TRAILER MANUAL PARKING BRAKE.

NOTE

The following procedure must be used when parking a trailer.

45. The trailer brake emergency hand control valve fitted to the instrument panel operates the trailer brakes. This allows the driver, after applying vehicle hand brake and trailer brake emergency control valve, to leave the vehicle and apply the trailer manual parking brake. It is also recommended that the wheels should be chocked as a safety measure.

46. When control valve is in the ON position, trailer brakes applied, an audible buzzer will sound.

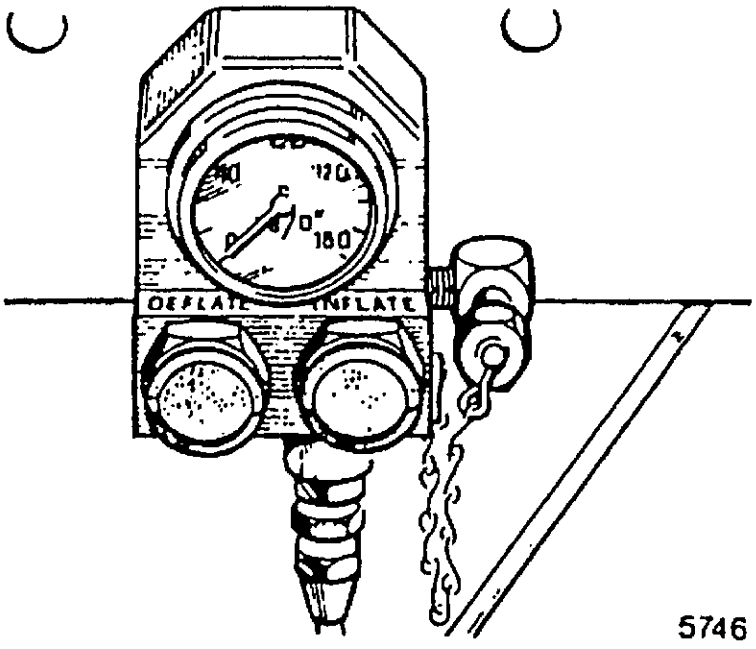


Fig 4 Tyre Inflator

TYRE INFLATOR

47. A tyre inflator assembly (Fig 4) is attached to the outside of the left-hand frame sidemember and it includes a manually operated valve for inflation and deflation of the tyres, a pressure gauge and a connection for the hose. To use the tyre inflator proceed as follows:

47.1 Start the engine and see that full pressure is indicated on the air pressure gauges in the cab. Keep the engine running at a fast idling speed whilst the tyres are being inflated.

47.2 Remove the dust cap from the inflator outlet.

47.3 Connect the hose and before connecting the other end of the hose to the tyre valve, press the 'INFLATE' button for a few seconds to clear any foreign matter from the hose.

47.4 To check the pressure in the tyre, connect the hose to the tyre to be checked, and read off the pressure from the gauge.

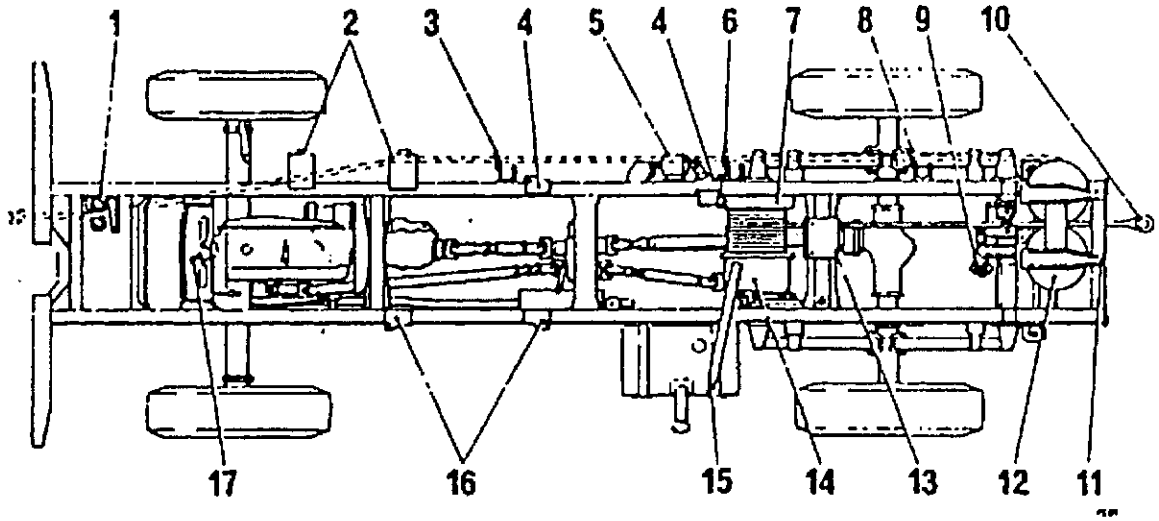
47.5 To inflate or deflate a tyre just press the respective button marked 'INFLATE' or 'DEFLATE'.

47.6 When the operations are completed, disconnect the hose and replace the dust cap to the inflator outlet. Stow the hose carefully and ensure that it is not kinked or in contact with oil or battery acid.

PREPARING FOR WINCHING

48. A tachometer is provided which should be used in conjunction with the hand throttle to set the engine to run at 1600 rev/min prior to a winching operation. A warning buzzer will operate if the load on the winching cable approaches the maximum. If the load is not reduced the engine will stop automatically.

49. The normal procedure when preparing to use the winch is to scotch the vehicle, thread cable through the fairleads, pay out the cable (unwind the cable from the drum) and attach the cable to the load. The method of doing each of these operations is as follows:



1 Front fairlead rollers
2 Side fairlead rollers
3 Cable guide
4 Anchor brackets
5 Winch brake air cylinder
6 Cable guide
7 Cable drum brake band
8 Cable guide
9 Cable tensioner air cylinder
lever
10 Cable eye
11 Rear fairlead rollers
12 Rear fairlead sheaves
13 Cable pay-on guide
14 Winch worm reduction gear
15 Winch clutch and cable tensioner lever
16 Anchor brackets
17 Winch brake

Fig 5 Winch cable threading diagram

55.1 **To scotch the vehicle.** Two wheel scotches and two hawsers are provided for anchoring the vehicle. When hauling from the rear, place one under each front wheel. When hauling from the front, place one under each rear wheel. When hawsers are in use, they must be attached to the anchor brackets (Fig 5(4 and 16)).

55.2 **To thread the cable.** According to whether it is intended to haul from the front or rear of the vehicle, thread the cable as shown in Fig 5. It should be noted however, that when hauling from the front of the vehicle, the cable is threaded through guides attached to the right-hand side-member.

55.3 **To pay out the cable.** Disengage the winch clutch by moving the clutch and cable tensioner lever (15) towards the front of the vehicle and then release the cable drum brake. The cable may then be unwound from the drum by pulling on the end. When the red mark on the cable shows at the rear fairleads do not pay out any more cable.

55.4 **Attaching the load.** Attach the cable to the load so that a direct strain only is put on the cable when winding in. Never wrap or tie the winch cable round any object for securing purposes. Use the tow rope provided.

BEFORE DRIVING THE WINCH

50. Make sure that the main gearbox gear shift lever, the left-hand transfer box lever and the power take-off are in neutral. Release the cable drum brake and engage the dog-clutch by moving the winch clutch lever toward the front of the vehicle. Start the engine in the usual manner.

DRIVING THE WINCH

WARNING

PERSONAL INJURY. TO AVOID THE RISK OF PERSONAL INJURY, ALL PERSONNEL NOT DIRECTLY INVOLVED IN THE OPERATION OF THE WINCH ARE TO STAY OUTSIDE THE WINCH OPERATING ENVELOPE WHEN THE WINCH IS IN USE.

51. Depress the engine clutch pedal. Move the gear shift lever into first on the main transmission and, with the left-hand transfer box gear lever in the neutral position, engage the power take-off moving the control lever downwards. Take up the drive by allowing the clutch pedal to return slowly to its normal position.

52. The air-operated winch brake control, painted white, is located on the steering column under the wheel. As the brake is applied, the driver should declutch. If it is intended to hold the load for any length of time, disengage the power take-off.

WINDING IN THE CABLE

CAUTION

When winching operations are completed it is important to ensure that the winch clutch is disengaged and the winch brake is applied.

53. Never haul in slack cable. Keep the cable taut when winding in so that coiling will be firm and even.

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CHAPTER 3-2 OPERATING INSTRUCTIONS

TRUCK CARGO 4 TONNE 4 X 4 W/CRANE

CONTENTS

NOTE

This Chapter to be read in conjunction with Chap 3-1.

PREPARATION FOR USING CRANE

WARNINGS

(1) THE CRANE OPERATOR MUST BE CONVERSANT WITH ALL ACCIDENT PREVENTION REGULATIONS AND OPERATING INSTRUCTIONS.

(2) IT IS PROHIBITED TO OPERATE THE CRANE ON BOARD SHIPS.

(3) THE USE OF THE CALM FOR LIFTING TASKS ASSOCIATED WITH AIRCRAFT REQUIRES THE AIRFRAME TO BE EARTH BONDED IMMEDIATELY BEFORE AND DURING THE USE OF THE CALM.

(4) THE USE OF JIB EXTENSIONS IS PROHIBITED.

(5) THE CRANE HYDRAULIC OPERATING PRESSURE MUST NOT BE INCREASED OR MODIFIED IN ANY WAY.

(6) ENSURE THAT THE HYDRAULIC STABILISERS (OUTRIGGERS) ARE CORRECTLY DEPLOYED AND LOCKED IN POSITION BEFORE ATTEMPTING TO OPERATE THE CRANE.

(7) ENSURE THAT THE HANDBRAKE IS APPLIED AND THAT CHOCKS ARE POSITIONED BENEATH THE ROAD WHEELS BEFORE ATTEMPTING TO DEPLOY/OPERATE THE CRANE.

(8) WHERE POSSIBLE, PARK THE VEHICLE ON FIRM LEVEL GROUND BEFORE DEPLOYING/OPERATING THE CRANE.

(9) WHEN THE GROUND SURFACE IS SOFT AND THERE IS A POSSIBILITY OF THE HYDRAULIC STABILISER FEET PENETRATING THE GROUND SURFACE, PLACE RIGID PANELS OF SUFFICIENT STRENGTH BENEATH EACH STABILISER FOOT.

(10) RANGE OR UNDER SUSPENDED LOADS.

(11) (DO NOT SHUT DOWN THE CRANE WITH A SUSPENDED LOAD.

(12) DO NOT ATTEMPT TO MOVE THE VEHICLE WITH A SUSPENDED LOAD.

(13) (DO NOT COMMENCE SLEWING UNLESS THE CENTRAL COLUMN IS UPRIGHT.

(14) DO NOT COMMENCE SLEWING UNTIL THE LOAD IS SUSPENDED AND IT IS SAFE TO DO SO.

(15) DO NOT EXCEED THE LOAD CAPACITY STATED IN THE LOAD CAPACITY CHART. THE LOAD CAPACITY STATED REFERS TO THE CRANE IN A HORIZONTAL POSITION; THIS CAPACITY WILL BE REDUCED WHEN THE CRANE IS OPERATED AT AN ANGLE.

(16) ENSURE THAT A MINIMUM SAFE WORKING DISTANCE OF 5 METRES IS OBSERVED WHEN WORKING IN THE VICINITY OF OVERHEAD CABLES.

(17) WHILST OPERATING THE CRANE, OPERATORS NEED TO BE AWARE OF ANY OVERHEAD OBSTRUCTIONS, AND THAT A FULLY EXTENDED CRANE IN THE EXTENDED VERTICAL POSITION CAN REACH A HEIGHT OF 10.5 METRES FROM GROUND LEVEL.

(18) ENSURE THAT THE POWER TAKE-OFF UNIT IS DISENGAGED BEFORE ATTEMPTING TO DRIVE THE VEHICLE.

(19) ENSURE THAT THE HAND THROTTLE LEVER IS RETURNED TO THE ENGINE IDLING POSITION BEFORE ATTEMPTING THE DRIVE HE VEHICLE.

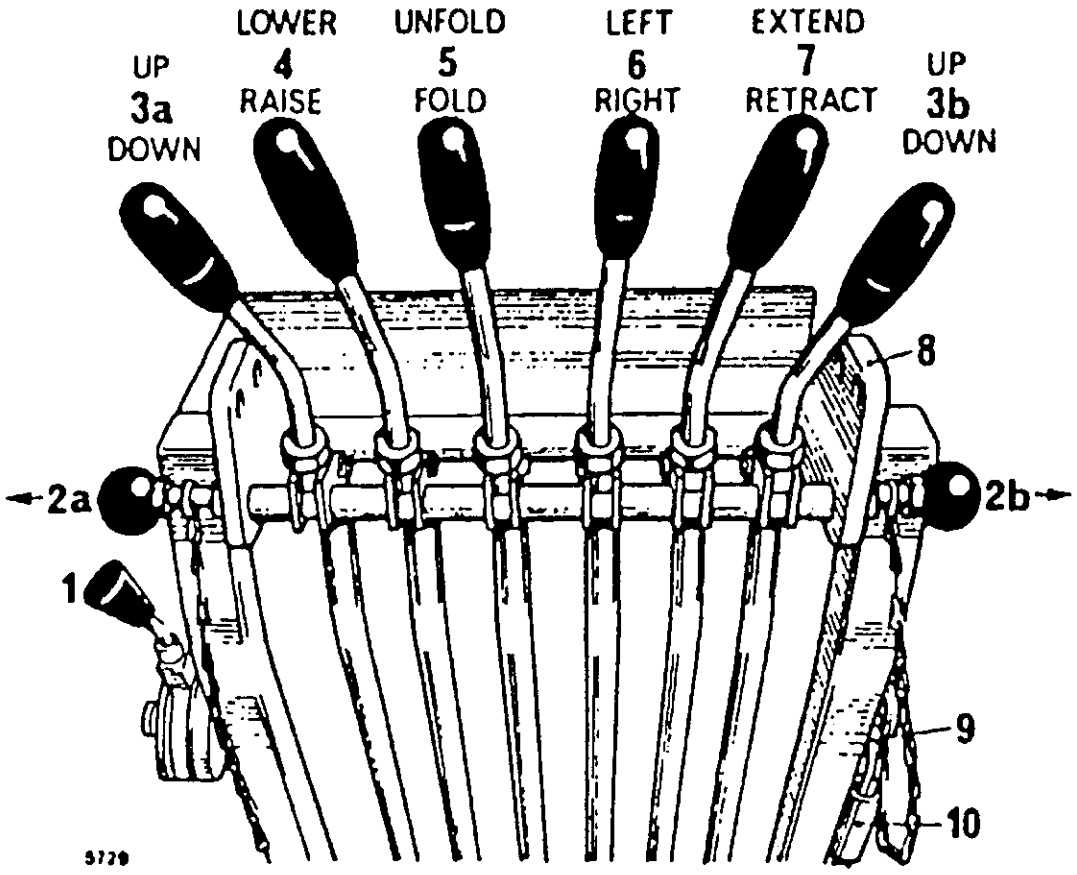
(20) (ENSURE THAT BOTH HYDRAULIC ISOLATION VALVES ARE IN THE FULLY CLOSED POSITION WHILST THE OUTRIGGERS ARE EITHER IN THE DEPLOYED OR FULLY RETRACTED POSITIONS.

CAUTIONS

(1) When the column folding ram attains its fully stowed or erected position, ensure that the control lever is continued to be operated for an additional 5 seconds to ensure that the column folding hydraulic system is fully pressurised.

(2) To prevent accidental damage to the vehicle or crane, ensure that particular care is taken whilst the crane boom is being manouvered into its deployed or transit positions and whenever the crane is operated within close proximity of the vehicle headboard or body.

(3) The design of this crane prohibits a straight vertical lift. Crane operators will need to operate the inner and outer booms alternately to obtain a staged vertical lift (all).



1	Throttle control	6	Slew control
2	Stabilizer control safety mechanism	7	Jib extension control
3	L/H & R/H stabilizer control	8	Control bracket
4	Boom control	9	Safety stirrup
5	Jib control	10	Stirrup stowage bracket

Fig 1 Crane lever controls

1. A sequence of operations must be followed when crane is being used. These are summarized as follows:

1.1. Where possible ensure vehicle is on firm level ground, stationary with parking brake control applied.

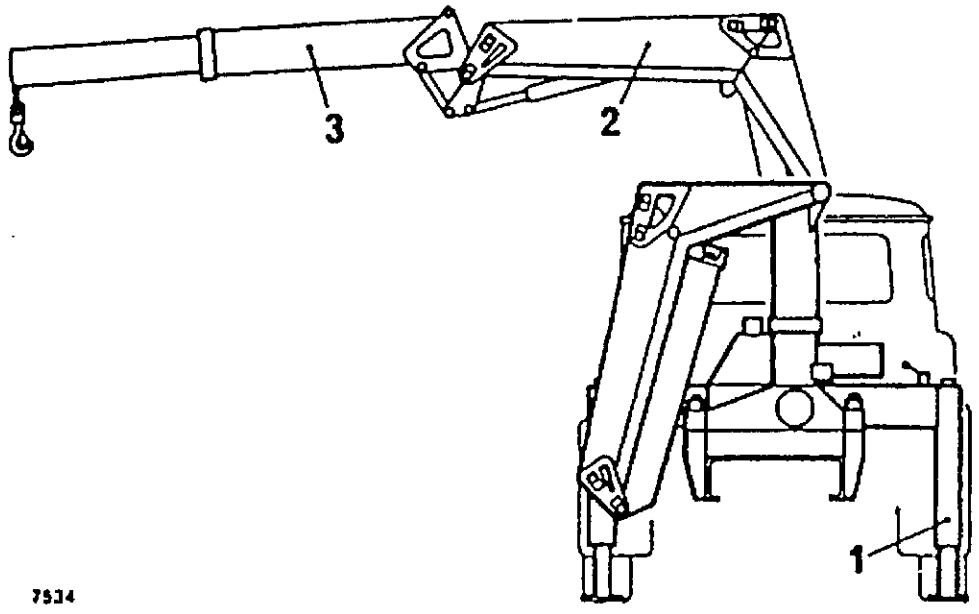
1.2. Check hydraulic oil level. An indication sight glass is situated in the side of the oil reservoir.

1.3. Start engine. Depress clutch pedal and engage appropriate gear, and with transfer box gearshift lever in neutral, engage P.T.O. Take up the drive by allowing the clutch pedal to return slowly to its normal position.

NOTE

Appropriate gears are Vehicles prior to chassis number KT 210342, engage second gear. Vehicles after this chassis number, engage third gear, (an instruction plate stating this is attached to the underside of the crane controls cover).

1.4. Open hand throttle (Fig 1(1)) to achieve fast idle (approx 1000 rev/min).



1 Hydraulic stabilizer 2 Boom 3 Telescopic jib

Fig 2 Hydraulic Crane

1.5. Remove safety stirrup (9) from control bracket (8) and locate in stowage bracket (10).

1.6. Pull out stabilizer safety pin (2a) extend stabilizer (3a) and release safety pin. Repeat same for (2b and 3b).

1.7. To move the loading crane into working position, lift the boom (Fig 2(2)) until the safety hook disconnects the jib (3). Working instructions for the crane are self explanatory by referring to the appropriate illustrations.

1.8. If fast craning is required open hand throttle further.

1.9. When craning operations are completed, ensure crane assembly has been stowed correctly and the safety stirrup (Fig 1(9)) has been replaced in control bracket (8). Close hand throttle, depress clutch pedal and disengage hydraulic pump drive.

CRANE LIFTING CAPABILITIES

2. The crane lifting capacities relating to reach are as shown (Fig 3).

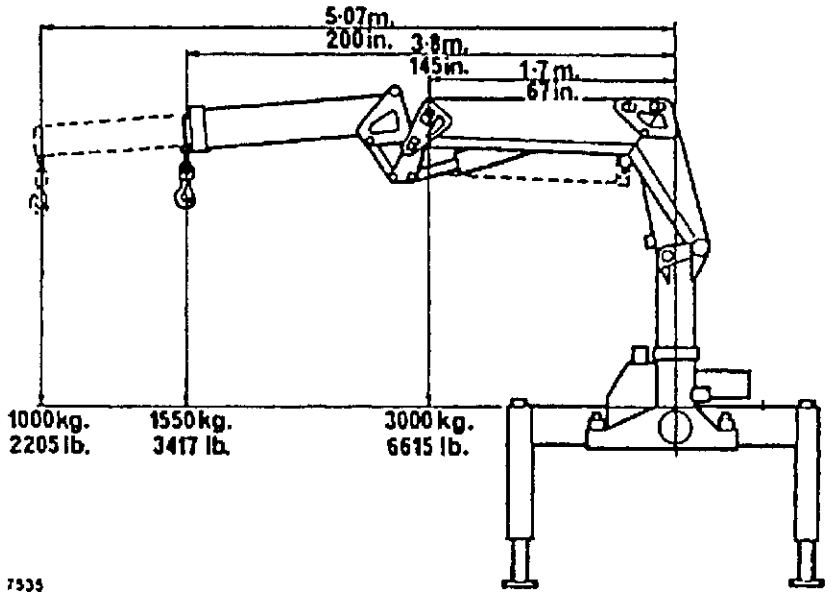


Fig 3 Crane loading chart

CHAPTER 4

SPECIAL INSTRUCTIONS

CONTENTS

BRAKE AIR COMPRESSOR ANTI-FREEZER

1. The brake air compressor anti-freezer prevents freezing of any moisture in the air which is being drawn into the compressor when the vehicle is operating under low ambient temperature conditions.

2. The anti-freezer consists of a reservoir and a cover fitted with an air filter, filler plug and check valve. The reservoir is positioned behind the cab and is accessible after raising the left-hand maintenance inspection cover.

3. When topping up use only a methyl-alcohol solution.

4. The level of fluid can be checked visually through the translucent reservoir and should, during periods of low ambient temperature, be kept topped-up.

FIRE PRECAUTIONS

5. Two BCF type (bromochlorodifluoromethane) fire extinguishers are provided one being located in the cab, the other being attached to the exterior of

the cab. Fire precautions should be strictly observed in accordance with current standing orders.

6. Before commencing to tow, the driver of the towing vehicle and the officer in charge must refer to the User Handbook/Maintenance Schedule for the towed equipment or plant in order to familiarise themselves with:

6.1 Special checks that may be required before starting and during the journey.

6.2 Speed restriction and bridge classification imposed by the nature of the towed equipment or plant.

NOTE

When a vehicle tows any equipment or plant, except in the case of a standard train where the dual classification is usually given, the classification of the train should normally be taken as the SUM of the separate classifications of the prime mover and the towed equipment or plant.

GENERAL TOWING INFORMATION

7. The rear couplings for the Service and Emergency air lines are of the 'palm' type, colour coded yellow and red for Service and Emergency lines respectively.

NOTES

(1) Drivers will need to be aware that two different types of trailer brake couplings may be encountered on Bedford vehicles, Manual Couplings and self sealing Couplings.

(2) Vehicles with Self Seal Couplings only require the trailer brake hoses to be connected; these vehicles will have an information label located in the cab and also next to the towing hook to show that self sealing couplings are fitted

(3) Vehicles with Manual Couplings will need the air supply to the trailer turned on before driving off, as per normal routine.

7.2 To connect the hose to a coupling head, the two parts of the coupling are placed together at right angles so that the spigot engages correctly, then the hose part is turned until they are in line and locked together.

7.3 When both couplings are connected, open the shut-off cocks at each coupling head (turn the cock handles until they are in line with pipe).

7.4 Before disconnecting the hoses, close the shut-off cocks (handles at right angles to the pipeline) and after disconnection refit the dummy couplings to exclude dirt.

8. Provision is made to enable trailers with three-line braking to be coupled to towing vehicle. A secondary park connecting hose is attached to the secondary line coupling which can be disconnected and coupled to the towed vehicle.

9. Interconnection of the electrical system between the towing and towed vehicle is provided by a 12-point socket situated on rear crossmember.

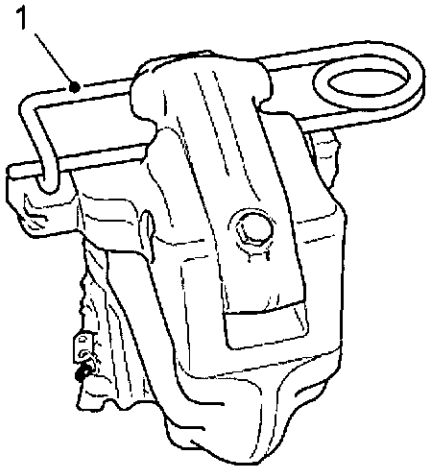
9.1 An air warning 2-pin plug is installed adjacent to the 12-point plug. This must be connected up when towing and indicates, by the air gauge on the instrument panel in the cab, when air pressure falls below minimum requirement on the towed vehicle.

TOWING HOOK

10. The vehicle is installed with a towing hook at the front and rear. The hook may be used either as a rigid or swivelling coupling according to the type of tow bar installed to the trailer. It should be locked rigid when coupled to a swivelling-type tow bar and unlocked when coupled to a solid tow bar. As a swivelling coupling the hook is free to rotate about a horizontal axis which allows the trailer front axle to tilt on uneven ground. To change to a rigid coupling, swing the swivel lock up to engage the bottom of the hook.

11. The eye of the trailer tow bar is prevented from jumping out of the hook by the hook jaw. To open this, pull out the release pin and lift the jaw. The jaw can be retained in this position by the catch and can be released in a similar manner.

12. When a trailer towing eye is connected to the towing hook (Fig 1), **the top jaw must be locked in the closed position**. This is achieved by inserting a suitable positive locking pin (1) (refer to Cat 711) of the correct dimensions.



1 Locking pin

FIG 1 TOWING HOOK AND LOCKING PIN

SHALLOW FORDING

13. The vehicle is capable of shallow fording to a depth of 762 mm (2.5 ft) without special protection. The breather on each axle vents through a tube which has its outlet raised well clear of the axle case.

CHAPTER 5-1

USER MAINTENANCE TRUCK CARGO 4 TONNE 4 X 4 AND W/WINCH

CONTENTS

continued

CONTENTS (cont)

continued

CONTENTS (cont)

TOP-UP ENGINE OIL

1. When checking the oil level of the engine., ensure the vehicle is standing on level ground. The dip-stick is accessible after raising the right-hand engine access panel and the filler is located on the valve rocker cover. Wipe the dip- stick then check the level. Replenish, if necessary with the correct grade of oil up to the 'FULL' mark on the dip-stick, The amount of oil required to bring the level on the dip-stick from the 'ADD OIL' to 'FULL' mark is 3.1 litres (5.5 UK pt). When adding oil to the engine, time must be allowed for the oil to flow down inside the engine to the oil pan before a further check is made on the oil level. It is important to ensure the oil has reached the oil pan before making this check otherwise overfilling of the oil pan may result.

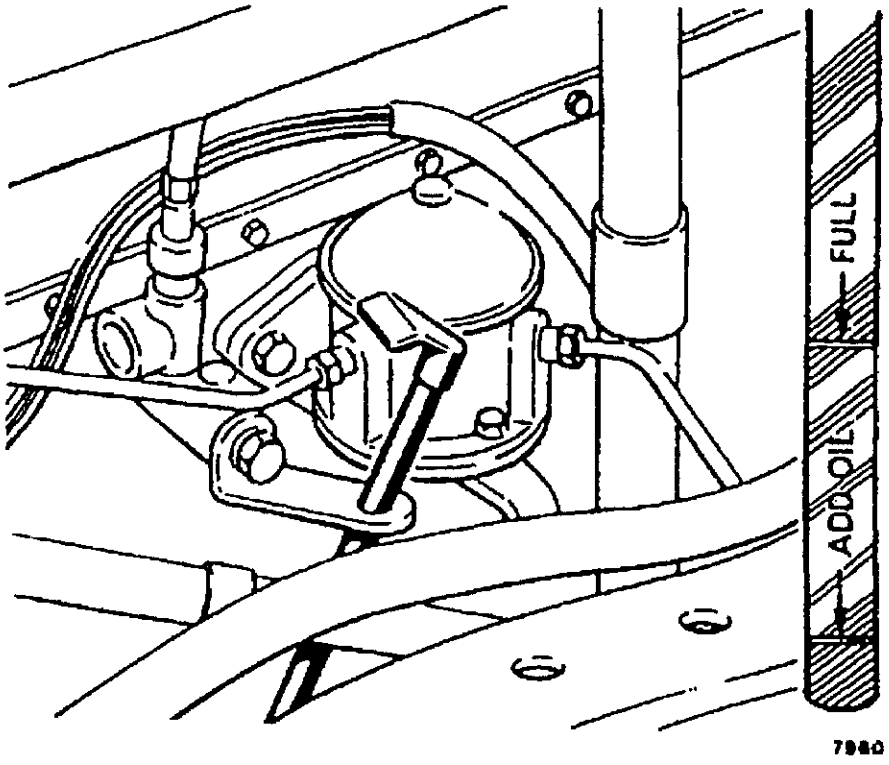
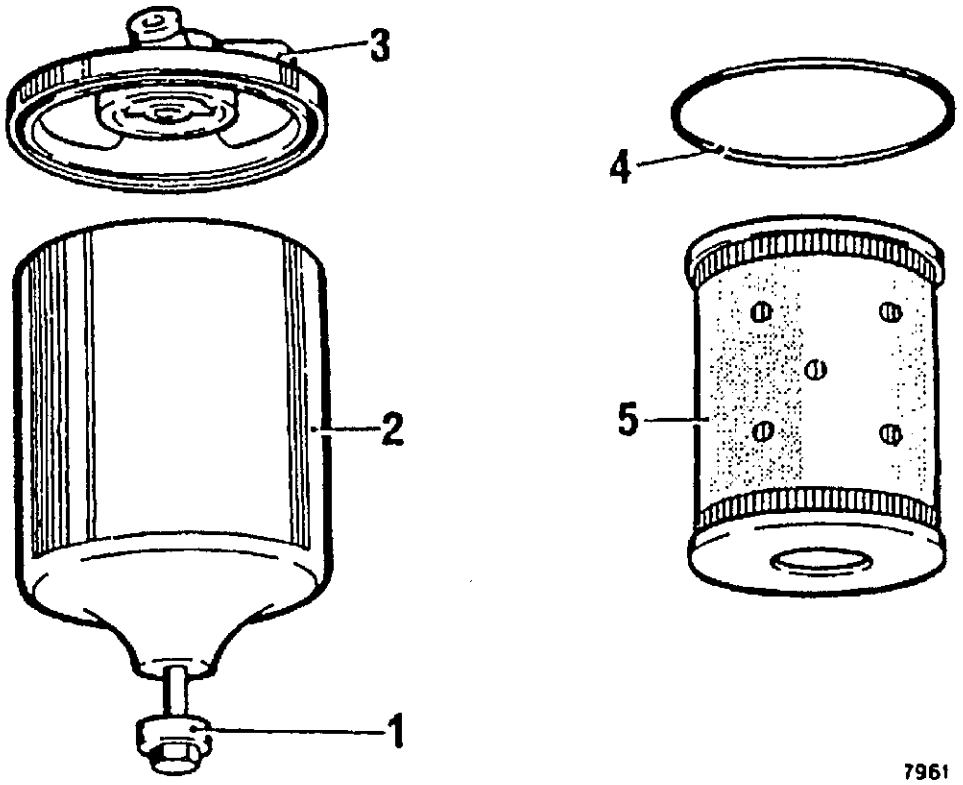


Fig 1 Engine dipstick

2. The drain plug is in the bottom of the engine oil pan. It possible, drain after the vehicle has been running when the oil is warm and will flow freely. When warm, the impurities will be in suspension and will be drained out with the oil. After replacing the drain plug, refill with fresh oil through the filler hole.



1 Fixing bolt
2 Filter casing
3 Filter head
4 Sealing gasket
5 Element

Fig 2 Oil filter - exploded view

CHANGE OIL FILTER ELEMENT

3. Unscrew filter casing centre bolt (Fig 2(1)) and withdraw the casing (2) and element assembly (5) from the filter housing (3), taking care when removing the filter casing as some oil will run out as soon as the casing separates from the filter housing. Lift out the element and discard it. Remove sealing washer (4) from the groove in filter housing. Thoroughly clean the inside of filter head and casing to remove any sludge deposits.

4. Install new sealing washer ensuring that it locates correctly and is free from kinks. Position new element in casing and carefully locate casing into the groove in filter head and tighten centre bolt. It is important not to overtighten the bolt as this can distort the casing, causing it to leak. Replenish the oil pan with new oil and run the engine for two to three minutes to allow the oil to circulate. Stop the engine, allow time for the oil to drain back into the oil pan and then recheck the level. Check for leaks and top-up as necessary.

TOP-UP COOLING SYSTEM LEVEL

WARNING

WHEN THE ENGINE IS AT NORMAL TEMPERATURE OR ABOVE, THE INTERNAL PRESSURE BUILT UP IN THE COOLING SYSTEM WILL BLOW OUT SCALDING FLUID AND VAPOUR IF THE RADIATOR CAP IS SUDDENLY REMOVED. TO PREVENT LOSS OF COOLANT AND TO AVOID THE DANGER OF BEING SCALDED, THE COOLANT LEVEL SHOULD BE CHECKED OR COOLANT ADDED, ONLY WHEN THE ENGINE IS COOL. IF THE CAP MUST BE REMOVED WHEN THE ENGINE IS HOT, PLACE A CLOTH OVER THE CAP AND ROTATE THE CAP SLOWLY ANTI- CLOCKWISE TO THE FIRST STOP AND ALLOW PRESSURE TO ESCAPE COMPLETELY. THEN TURN THE CAP AGAIN SLOWLY ANTI-CLOCKWISE TO REMOVE IT. MAKE SURE THAT THE CAP IS TURNED FULLY CLOCKWISE WHEN IT IS INSTALLED.

5. Check the level in the system after removing the bayonet-type filler cap (Fig 3 (arrowed)) from the header tank which is accessible after raising the engine left-hand side access panel. If necessary, add coolant until the level is up to the bottom of the filler neck.

6. If the engine is allowed to run short of coolant and overheats, use hot coolant for replenishing or wait until the engine is cool.

7. If the cooling system contains anti-freeze, the coolant level should only be topped-up with anti-freeze solution of the correct strength if dilution of the solution already in the cooling system is to be avoided. Since the use of plain water will dilute the anti-freeze solution in the cooling system and reduce the degree of frost protection provided a check on the strength of the anti-freeze solution is incorporated in the maintenance services.

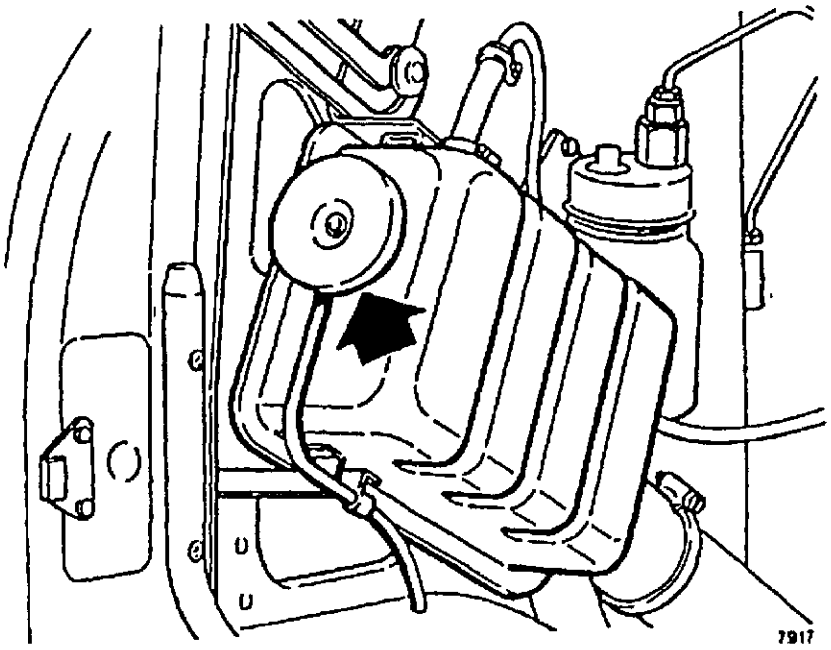


Fig 3 Cooling system header tank

CHECK TIGHTNESS OF INJECTOR PIPE CLIPS

8. The injector pipe clips must be secure on the pipes and prevent vibration of the pipes which could lead to eventual fracture or chafing of the pipe

CHANGE MAIN FUEL FILTER ELEMENT

WARNING

COMPRESSED AIR. DO NOT DIRECT COMPRESSED AIR AGAINST THE SKIN

9. Clean all dirt from and around the filter. To remove the filter element, unscrew the centre bolt at the filter head and detach the sediment trap and element, gaskets and sealing rings. Clean the filter head and the sediment trap to remove any foreign matter and then blow dry with compressed air. Do not use cloth for this purpose. Install new sealing rings and gaskets (Fig 4) to the filter head and sediment trap, ensuring that they are correctly located and not kinked or twisted. Position new filter element so that it locates over the sealing ring, reassemble bottom and refit and tighten centre bolt to bottom cover.

NOTE

As air will have entered the fuel system it will be necessary to air vent the system.

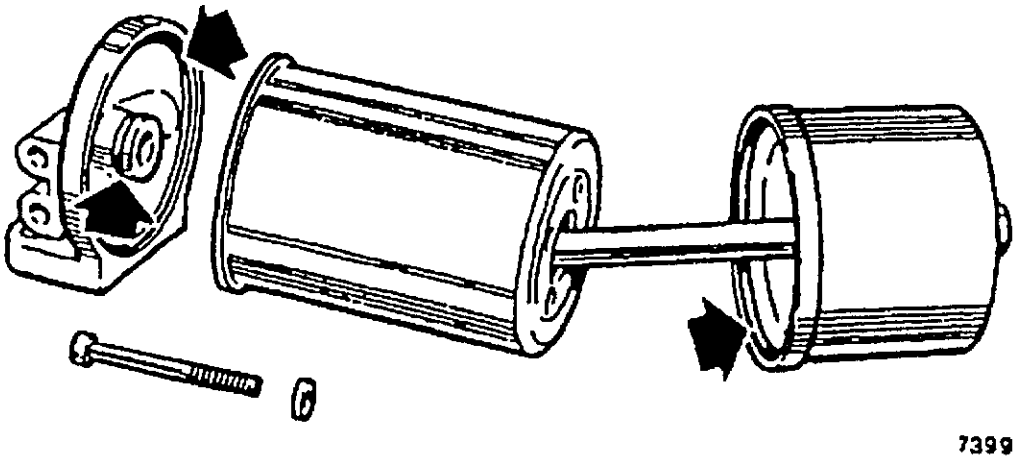


Fig 4 Renewing fuel filter element. Arrows indicate sealing rings and gaskets

AIR VENTING FUEL SYSTEM

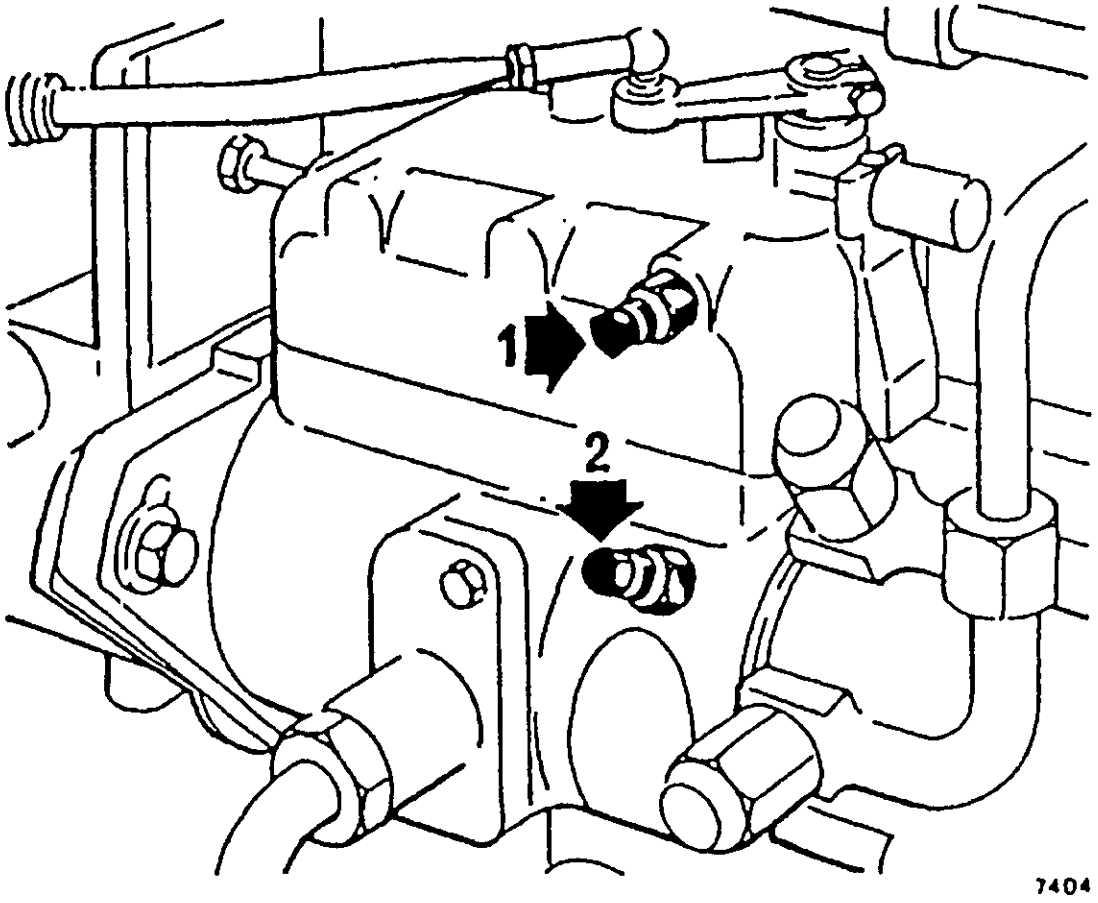
10. Slacken plug in unused outlet of fuel filter and vent screws on pump body (Fig 5 (2)) and governor housing (1). Operate priming lever of fuel lift pump until air-free fuel flows from outlet on filter and tighten plug while operating lever. Continue priming until air-free fuel flows from vent screw on pump body then tighten screw.

11. Slacken two injection pipe unions, operate starter and as soon as engine runs, tighten injection pipe unions and vent screw on governor housing.

NOTE

Do not pump fuel by cranking engine with starter as this may lead to overheating of the starter.

12. The fuel sedimentor (Fig 6) is located towards the rear on the lower right-hand side of the engine crankcase.



1 Governor housing vent screw 2 Pump body vent screw

Fig 5 Fuel injection pump

13. Before draining, clean dirt from and around plug in base of sedimentor bowl. Remove the plug to expel trapped water and sediment. Check drain plug sealing ring for condition and renew if necessary. Re-install seal and plug after draining.

DRAIN MAIN FUEL FILTER TRAP

14. Wipe the base of the sediment trap (Fig 7) to remove any dirt and then unscrew the drain plug. After allowing any moisture to drain away, replace the plug.

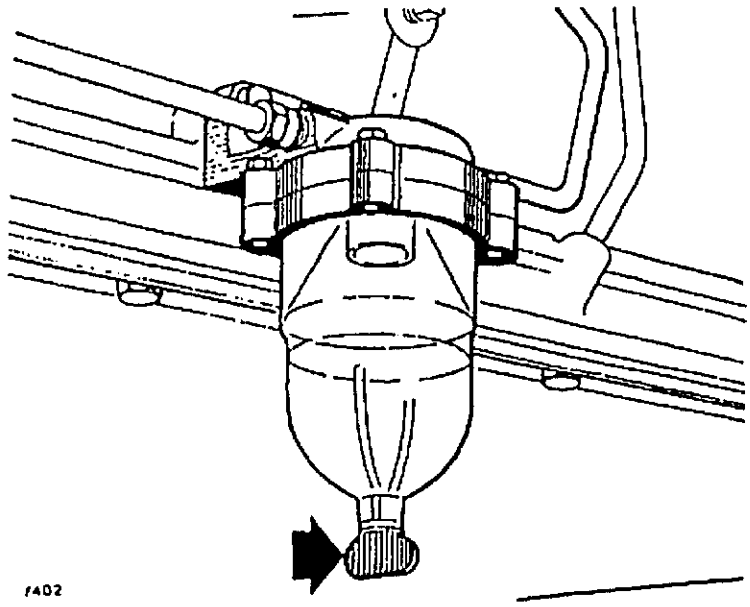


Fig 6 Fuel sedimentor

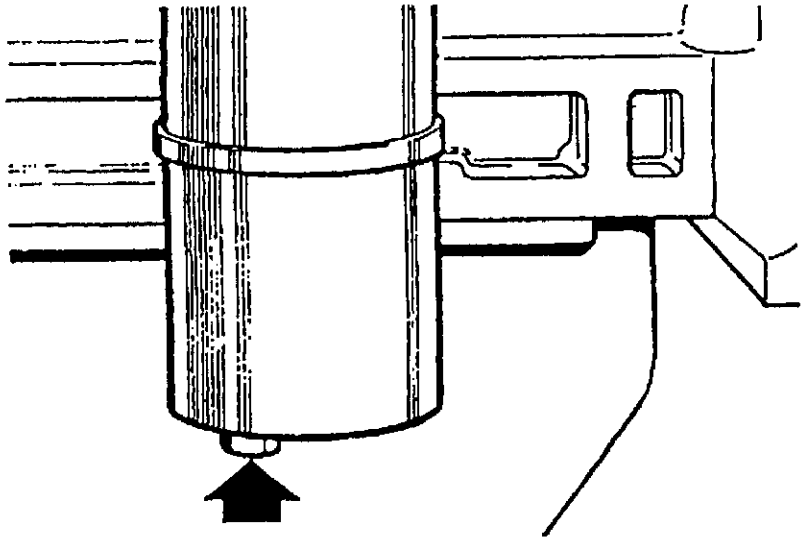


Fig 7 Main fuel filter sediment trap

BATTERY ELECTROLYTE LEVEL

WARNING

NEVER EXPOSE THE BATTERY TO AN OPEN FLAME OR ELECTRIC SPARK - CHEMICAL ACTION IN THE BATTERY GENERATES HYDROGEN GAS WHICH IS FLAMMABLE AND EXPLOSIVE. DO NOT ALLOW BATTERY ELECTROLYTE (FLUID) TO CONTACT EYES, SKIN, FABRICS, OR PAINTED SURFACES. FLUID IS A SULPHURIC ACID SOLUTION WHICH COULD CAUSE SERIOUS PERSONAL INJURY OR PROPERTY DAMAGE. FLUSH ANY CONTACTED AREA WITH WATER IMMEDIATELY AND THOROUGHLY. IF CONTACT HAS BEEN MADE WITH EYES OR SKIN, AFTER FIRST AID TREATMENT SEEK MEDICAL ATTENTION. WEAR EYE PROTECTION WHEN WORKING ON OR NEAR BATTERY. REMOVE RINGS, METAL WATCHBANDS AND OTHER METAL JEWELLERY BEFORE WORKING ON OR AROUND A BATTERY. BE CAREFUL IN USING METAL TOOLS AND EQUIPMENT. IF SUCH METAL SHOULD CONTACT THE POSITIVE BATTERY TERMINAL (OR METAL IN CONTACT WITH IT) AND ANY OTHER METAL ON THE VEHICLE, A SHORT CIRCUIT MAY OCCUR WHICH COULD CAUSE PERSONAL INJURY. BATTERIES AND BATTERY ACID SHOULD ALWAYS BE KEPT OUT OF THE REACH OF CHILDREN.

15. To check the level of the electrolyte in the cells, remove the battery cover (Fig 8) which is retained by two wing nuts and carefully remove the plastic covers from the top of each battery. Top-up, if necessary, each cell with colourless, odourless, drinking water until the level of electrolyte is just over the separator guard. Replace the plastic covers.

16. See that the batteries are dry on top and secure in their mountings. Also see that the terminals are tight, free from corrosion and coated with petroleum jelly.

FAN DRIVE BELT ADJUSTMENT

17. With the engine switched off, it should be possible to depress the slackest drive belt 8 mm (0.3 in) when firm thumb pressure is applied. The correct position to check the amount of belt deflection is midway between alternator and water pump pulleys (Fig 9). The fan drive belts should be neither too tight nor too loose. Too tight a belt imposes an undue load on the fan assembly and shortens the life of the belts. Too loose a belt allows slippage and lowers the fan speed, causing excessive belt wear and overheating of the cooling system.

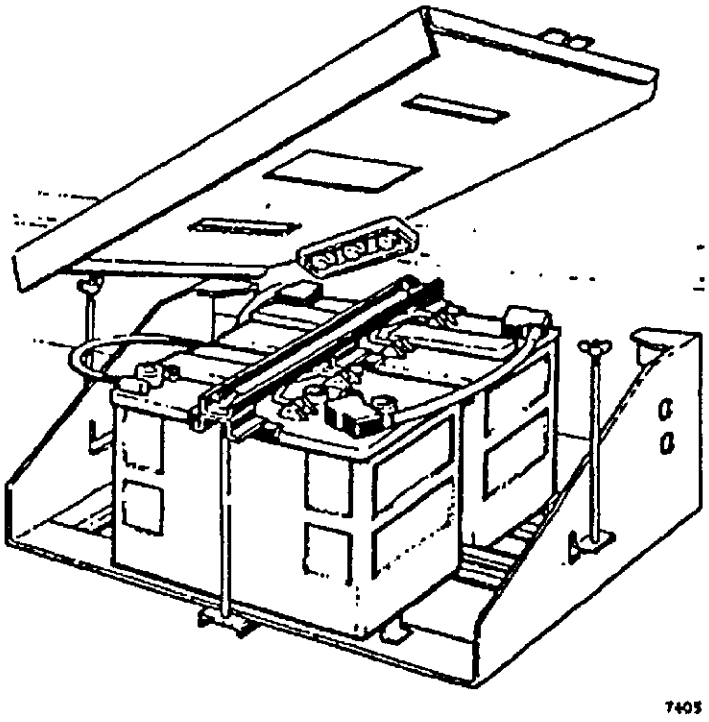


Fig 8 Checking battery electrolyte level

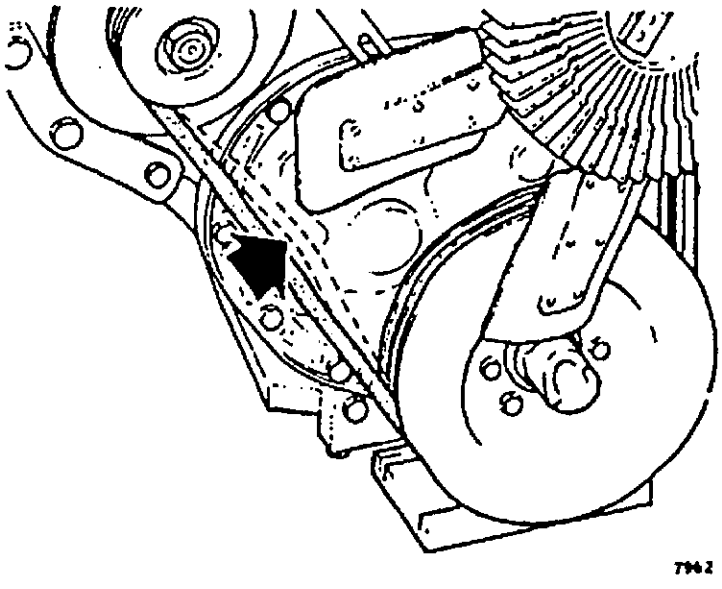


Fig 9 Fan belt slack

The dotted outline shows where the fan belt must be depressed to determine if the belt requires adjustment.

Adjustment

18. To adjust the belts, slacken the nuts on the two mounting bolts and then slacken the two bolts securing the slotted brace (Fig 10).

19. Pivot the alternator away from the engine to tighten the belts. If a lever is used to move the alternator, it is essential that leverage is applied to the drive end shield and never against the stator or rear end shield.

20. When the tension is correct it is important that the bolts and nuts are tightened in the following order; the front mounting bolt nut, the slotted brace to alternator bolt; the rear mounting bolt nut; the bolt securing the brace to the engine.

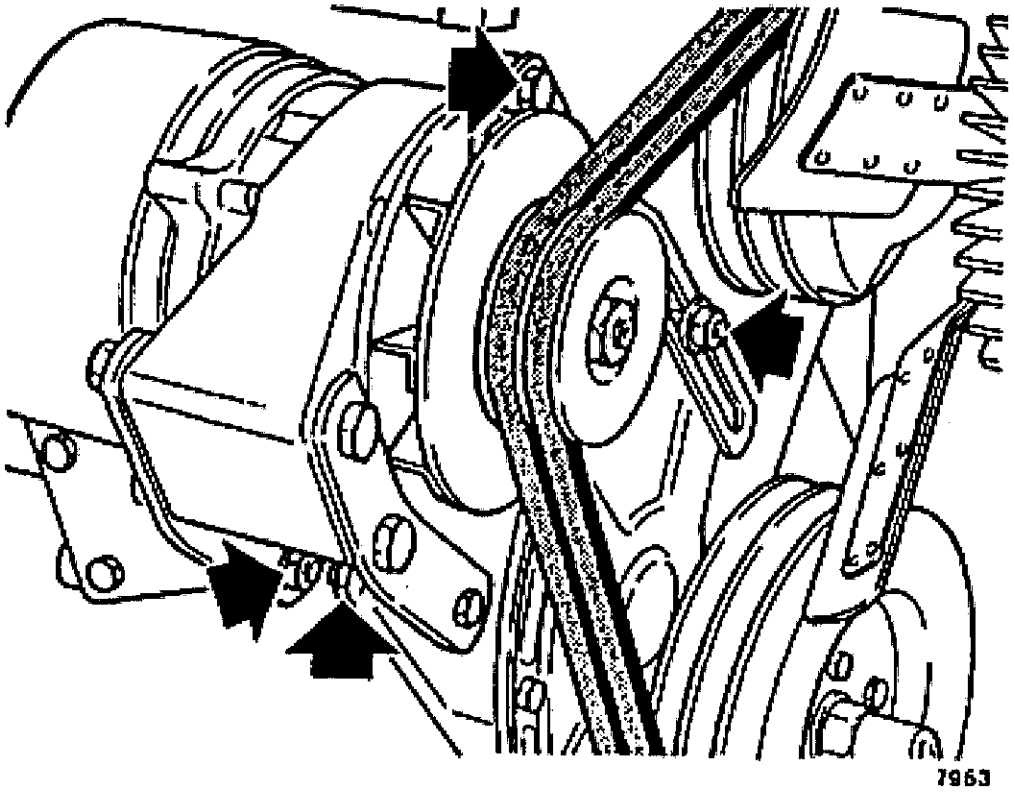


Fig 10 Fan belt adjustment details

GEARBOX

21. When checking the oil level of the gearbox ensure that the vehicle is standing on level ground. The oil filler/level plug (Fig 11(1)), located in the rear vertical face and the drain plug (2), located at the lowest point of the casing are both accessible from beneath the vehicle. The oil level should be up to the bottom of the filler/level plug hole.

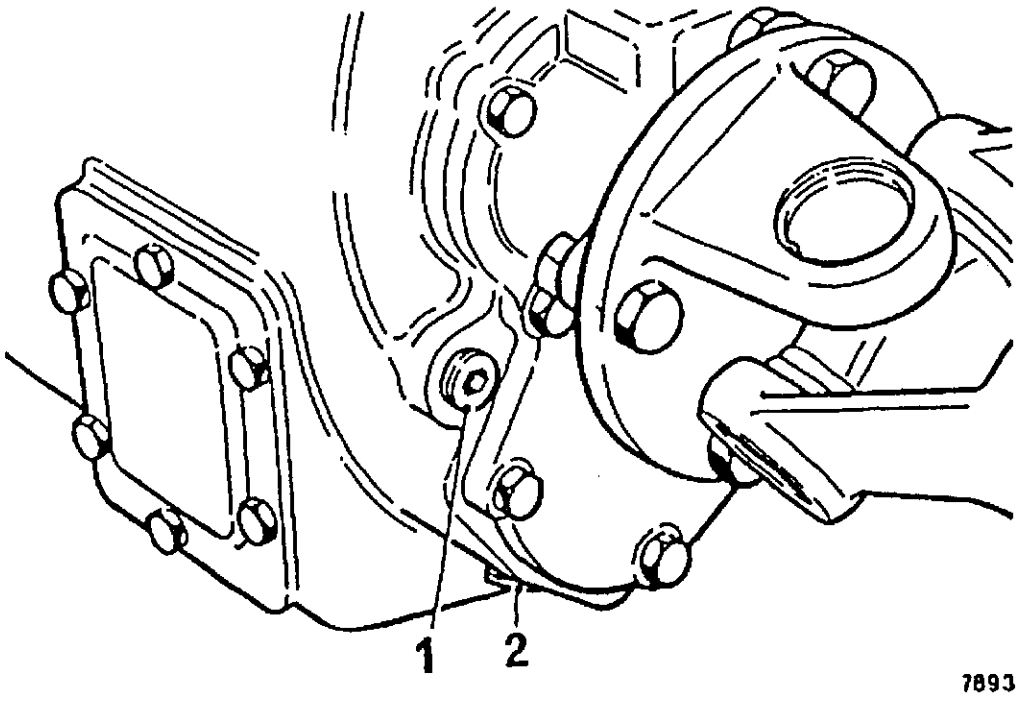


Fig 11 Main gearbox oil filler and drain plugs

TRANSFER BOX

22. The oil filler/level plug (Fig 12) is situated in the front face of the transfer box. The level of oil should be up to the bottom of the filler/level plug hole with the vehicle standing on level ground. The oil drain plug (Fig 13) is located at the lowest point of the casing and faces the rear of the vehicle.

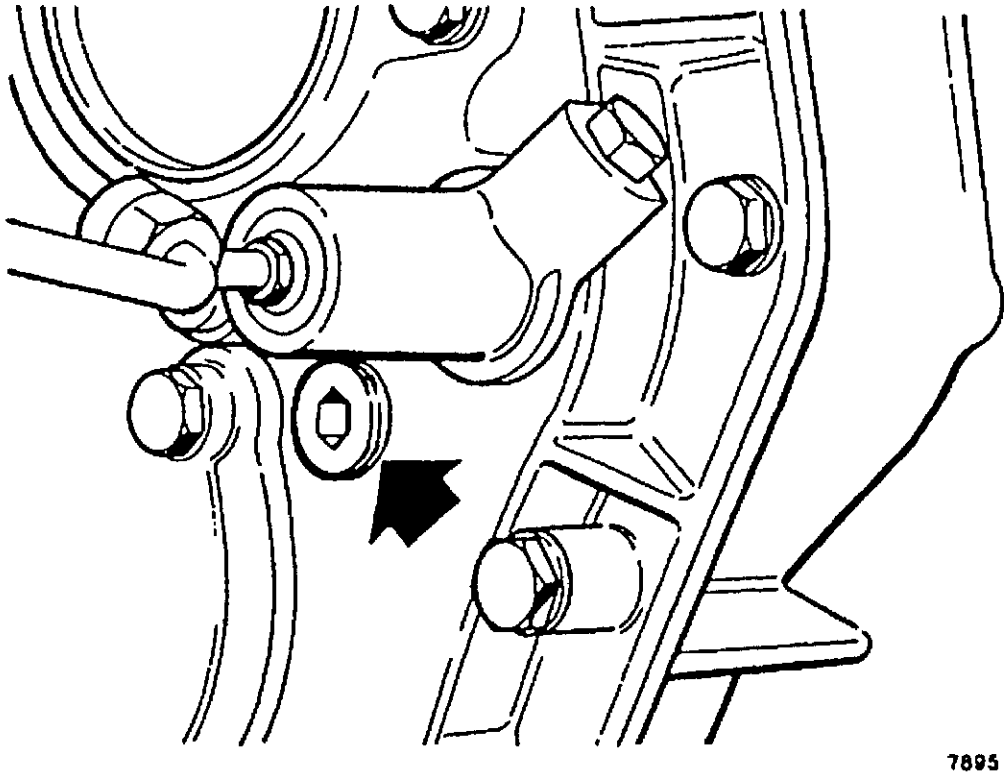


Fig 12 Transfer box oil filler/level plug

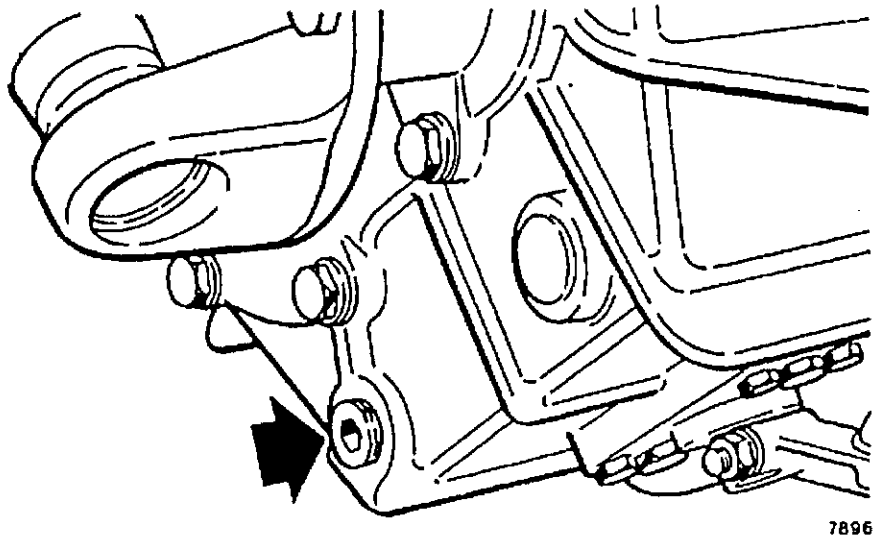


Fig 13 Transfer box oil drain plug

FRONT AND REAR AXLES

23. The oil filler/level plug (Fig 14) is situated in the axle housing cover and the oil level should be up to the bottom of the filler plug hole with the vehicle, standing on level ground. To drain oil remove the axle housing cover.

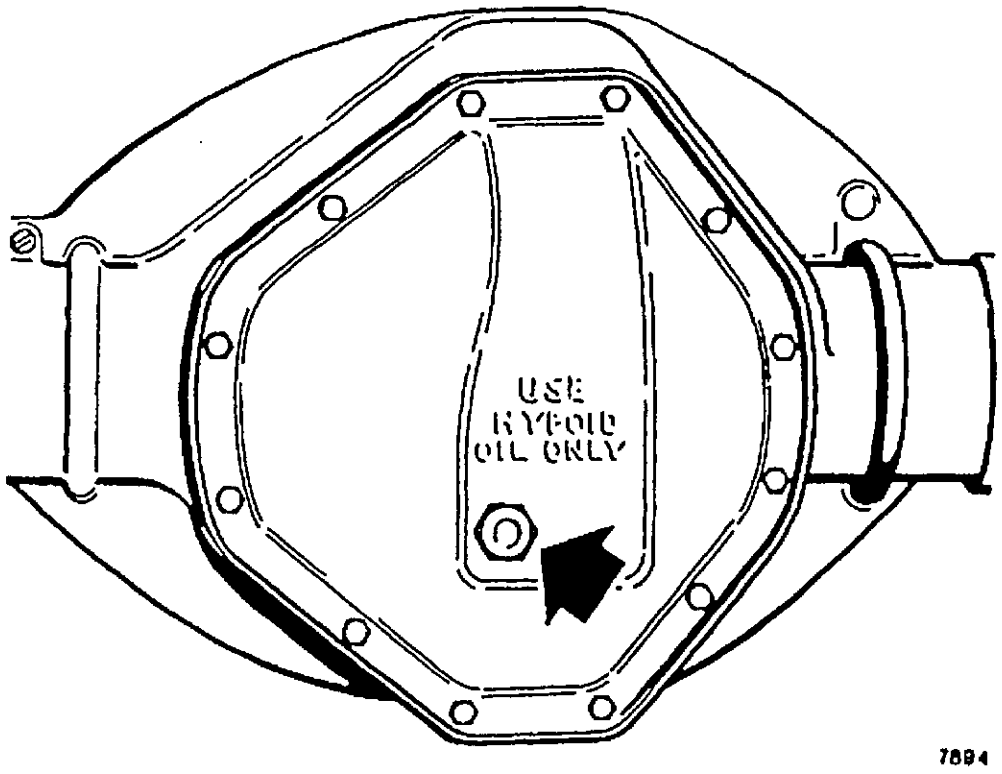
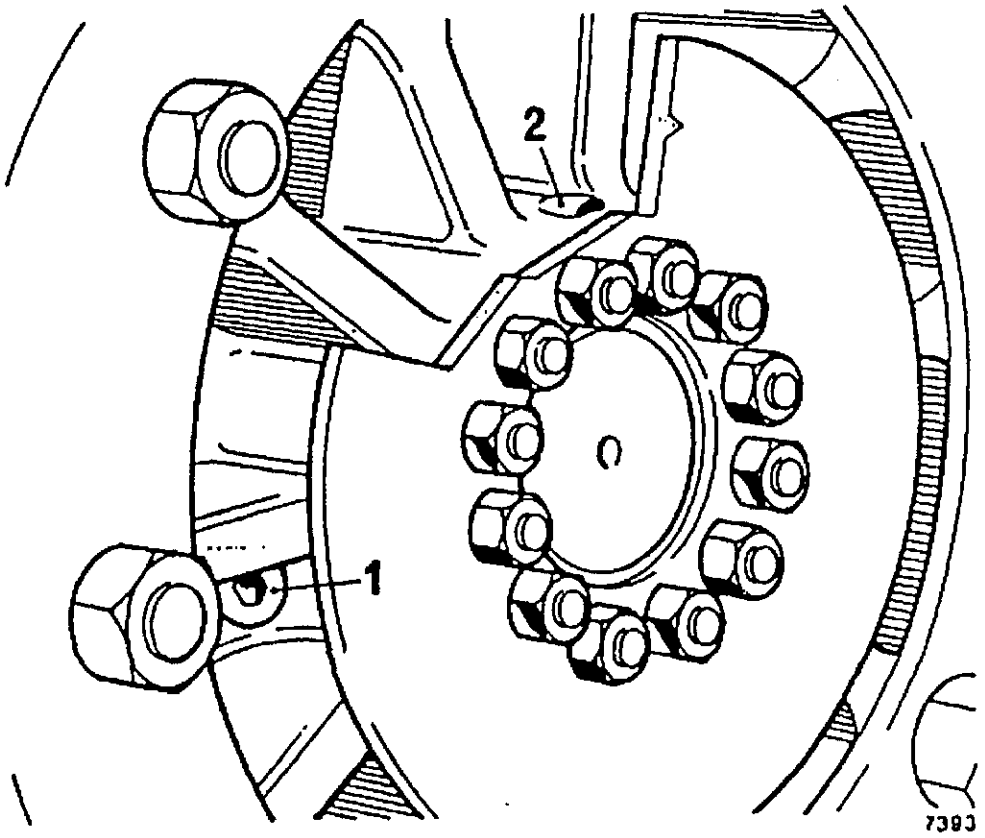


Fig 14 Front and rear axle oil filler/level plug

REAR AXLE HUBS

24. Check oil level in rear axle hubs by rotating hub until boss (Fig 15(2)) is in uppermost position. Remove filler/level plug (1) and check level, topping-up if necessary, to the bottom of filler/level plug hole.



1 Filler/level plug *2 Boss on hub*

Fig 15 Checking rear hub oil level

STEERING BOX

25. To top-up steering box apply oil gun to nipple (Fig 16(2)) on the box until oil begins to ooze from the hole in the casing at the top of the box.

26. To drain and refill steering box, remove nipple (2) and plug (1) from base of the box and allow all the oil to drain away. Replace plug and refill with correct oil to the level of the lubrication nipple hole. Finally replace the nipple and apply oil gun to the nipple until oil begins to ooze from hole in casing at the top of box.

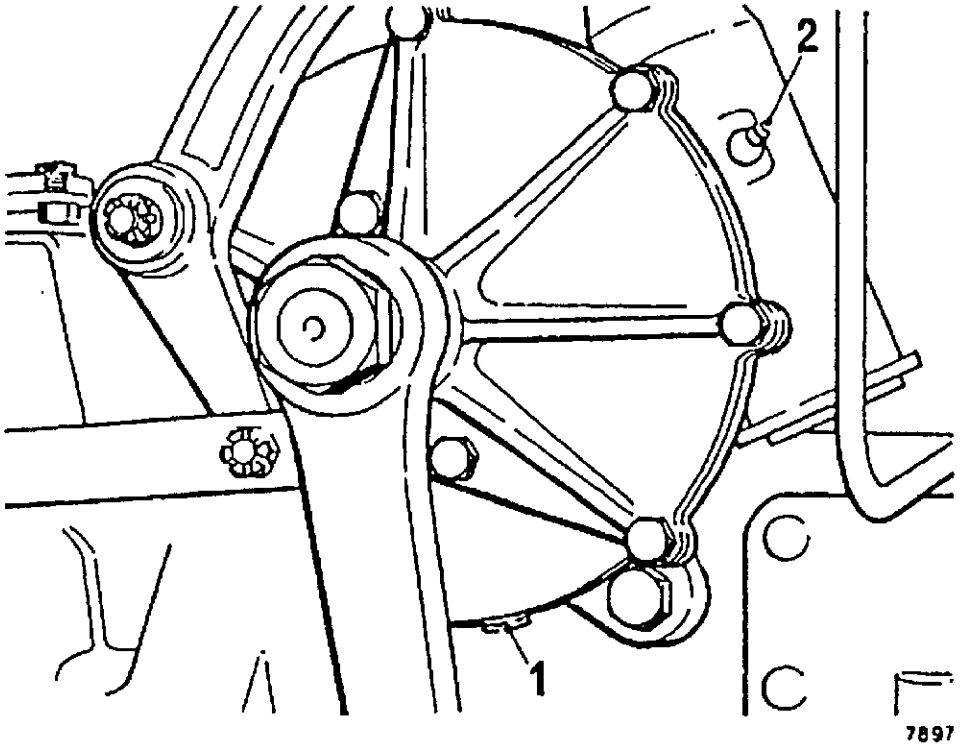


Fig 16 Steering box lubrication points

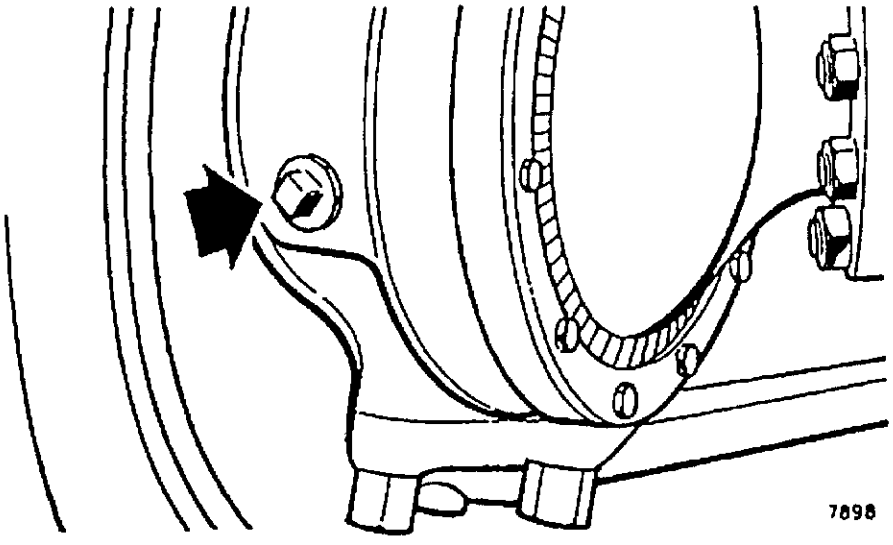


Fig 17 Steering knuckle oil filler/level plug

TRACTA JOINT HOUSINGS

27. A combined oil filler/level plug (Fig 17) is fitted to each steering knuckle. The level of the oil should be to the bottom of the filler/level plug hole.

INSPECT AIR CLEANER RESTRICTION INDICATOR

28. An air cleaner restriction indicator (Fig 18), attached to the air inlet pipe from air cleaner to turbocharger, indicates the need for filter servicing.

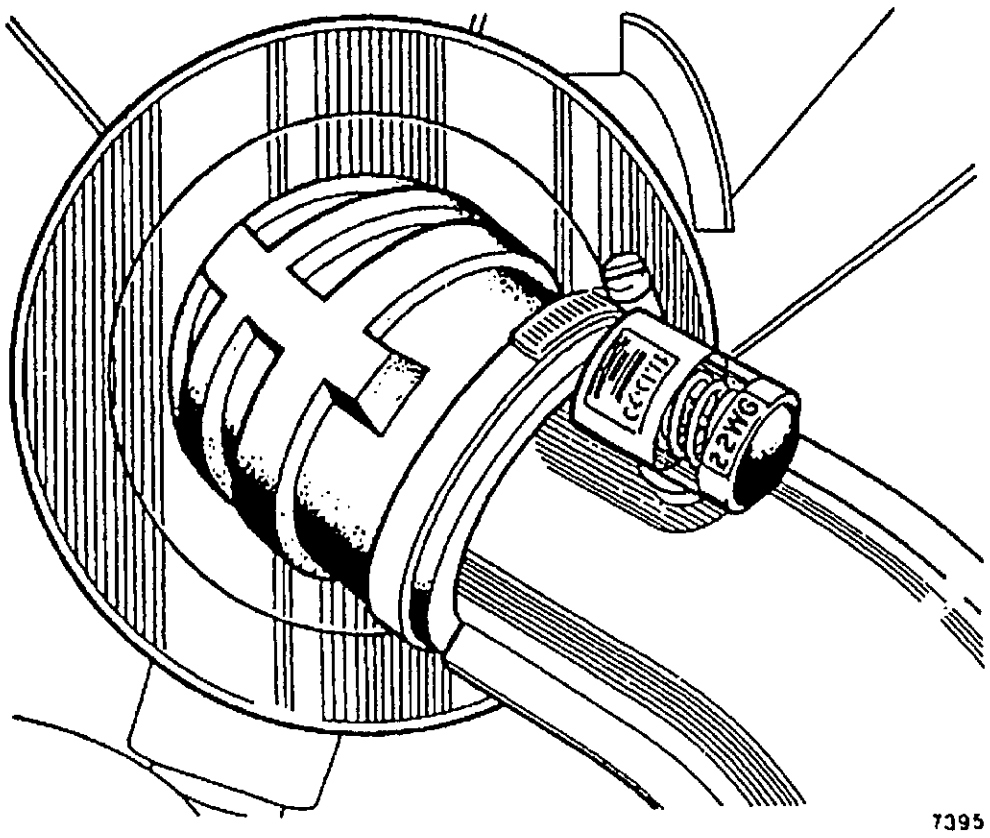


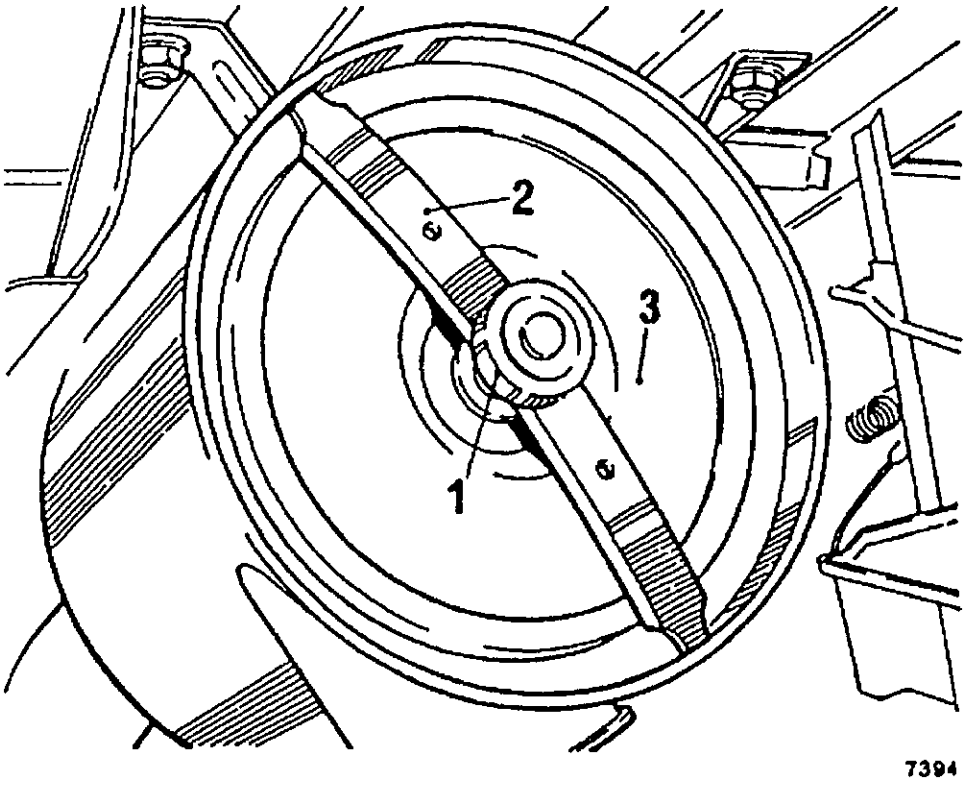
Fig 18 Air cleaner restriction indicator

29. If a red signal is visible, it is a warning that the air cleaner element is blocked with dirt, etc and needs replacing.

30. The cleaner restriction indicator can be reset by depressing rubber button.

CHANGE AIR CLEANER ELEMENT

31. To remove air cleaner element, slacken knurled knob (Fig 19(1)) and withdraw retaining clamp (2) and filter element (3). Clean inside of filter casing, including rubber water drain valve in base of casing, install new element and retain with clamp.



1 Knurled knob *2 Retaining clamp* *3 Filter element*

Fig 19 Air cleaner

BRAKE HYDRAULIC FLUID LEVEL

32. There are two separate transparent reservoirs (Fig 20) with screw-on caps. Both reservoirs have to be inspected and topped-up to the maximum fluid level indicator line marked on the reservoirs.

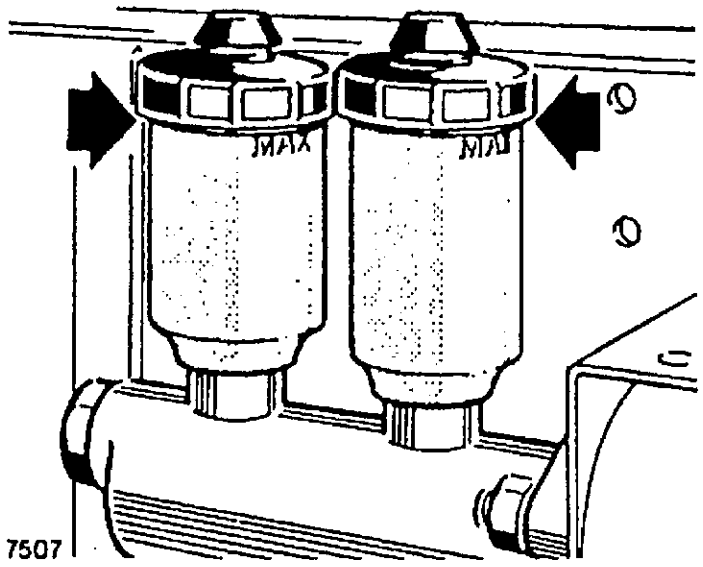


Fig 20 Brake hydraulic fluid levels

DRAIN AIR RESERVOIRS

33. Slacken the plug at the bottom of each reservoir (Fig 21) so that moisture can be drained away. Securely tighten plug when air only is being emitted. Finally run engine to fully charge air supply.

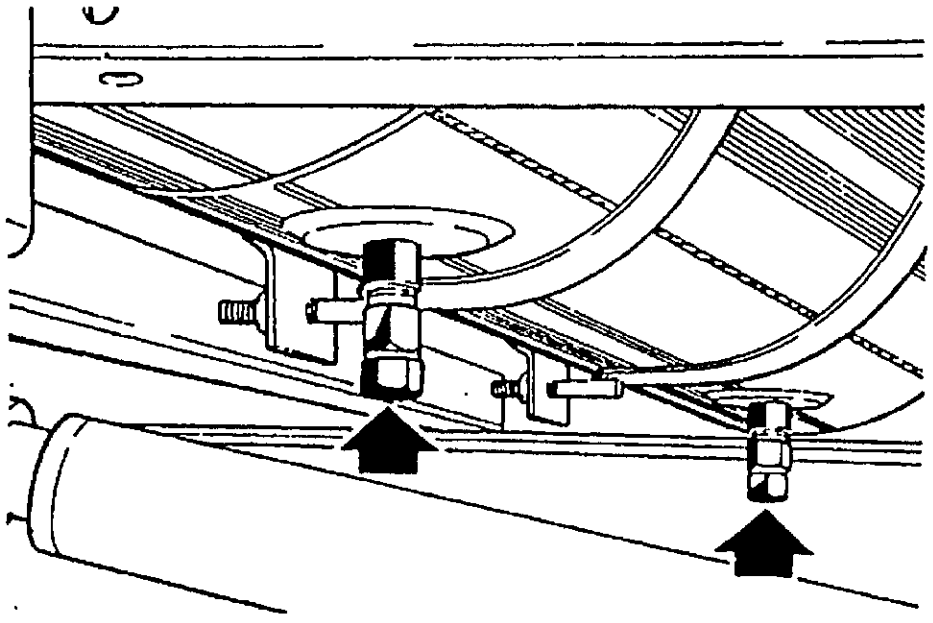
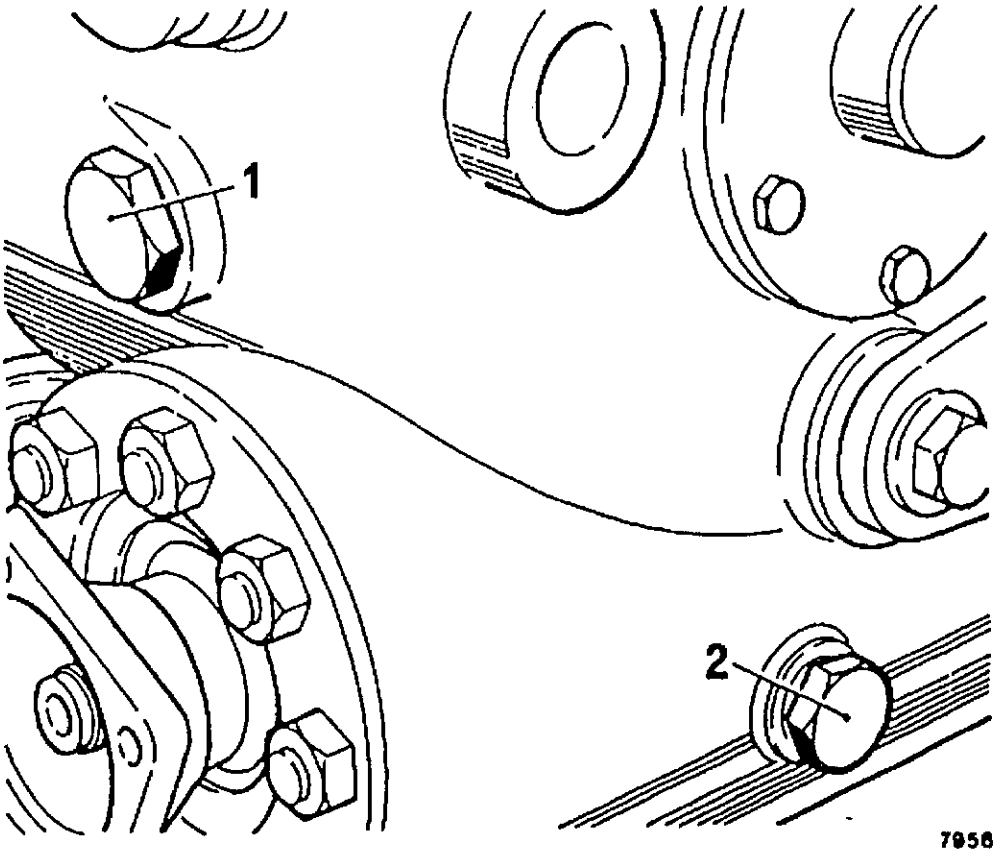


Fig 21 Brake air reservoir drain plugs



1 Level/filler plug 2 Drain plug

Fig 22 Winch oil filler/level and drain plugs

WINCH OIL LEVEL

34. Ensure vehicle is on level ground and remove filler/level plug (Fig 22(1)) and check that oil is level with bottom of hole.

35. To renew oil, drain from plug (2) and refill using correct grade of oil.

36. When necessary, clean winch breather (Fig 23) by removing breather (arrowed) from large hexagon, clean thoroughly and refit.

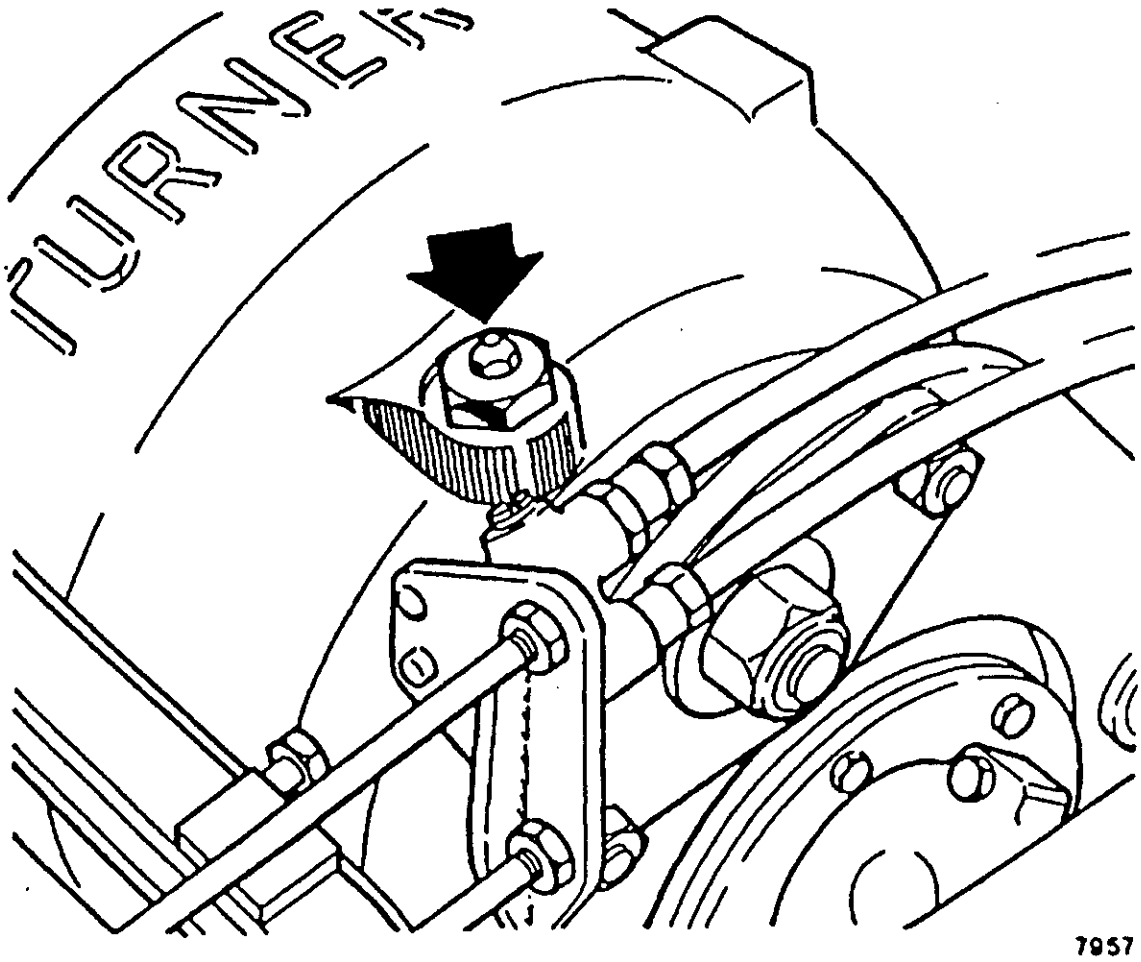
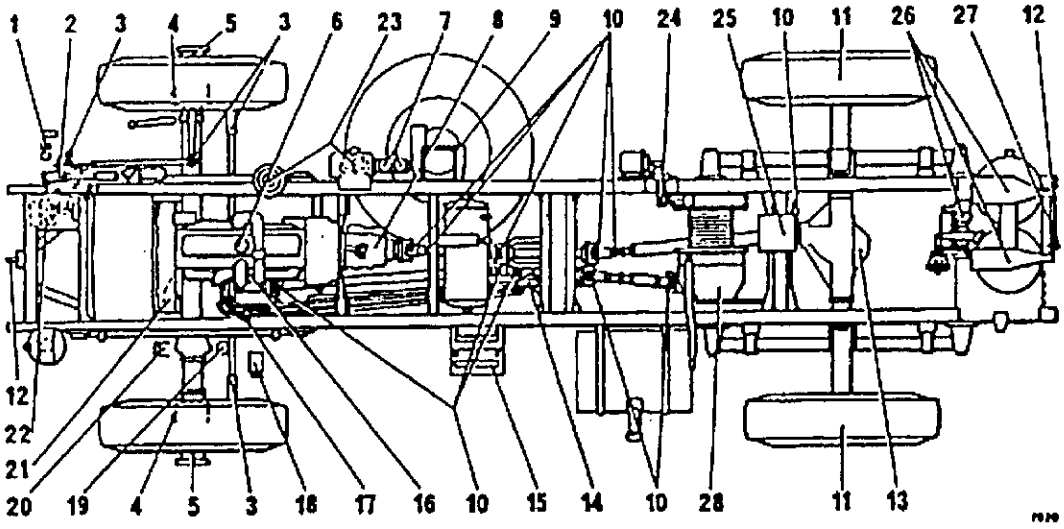


Fig 23 Winch breather



1 Lubricate accelerator brake clutch control linkage
2 Top-up steering gear oil box level
3 Lubricate steering connecting system rod and tie rod ball joints
4 Top-up tracta joint oil levels
5 Lubricate hub bearings
6 Top-up engine oil level
7 Top-up brake fluid level
8 Top-up gearbox oil level
9 Lubricate spare wheel carrier mechanism
10 Lubricate propeller shaft sliding couplings and brake universal joints
11 Top-up hub bearing oil level
12 Lubricate towing hook
13 Top-up rear axle oil level
14 Top-up transfer box oil level
15 Top-up battery electro-lyte level
16 Oil prime turbocharger and (when applicable)
17 Lubricate transfer control linkages
18 Top-up cooling level
19 Top-up air compressor anti-freeze level
20 Top-up windshield wash
21 Top-up front axle oil level
22 Lubricate front fairlead rollers
23 Lubricate side fairlead rollers
24 Lubricate winch linkage
25 Lubricate winch cable pay-on gear
26 Lubricate cable tensioner assembly
27 Lubricate rear fairlead rollers
28 Top-up winch oil level

Fig 24 Lubrication and levels chart

HEADLIGHTS

37. To renew a headlight lamp press the complete light unit inwards and turn anti-clockwise. With the light unit held in the palm of the hand, press in and turn the lamp holder anti-clockwise to release and withdraw lamp from light unit.

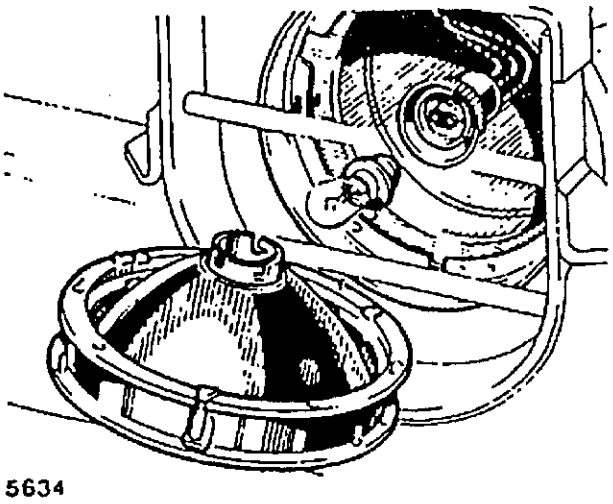


Fig 25 Headlight lamp renewal

SIDE LIGHT

38. Unscrew threaded lens for lamp access (Fig 26). The lamp can then be removed by pushing in and turning anti-clockwise.

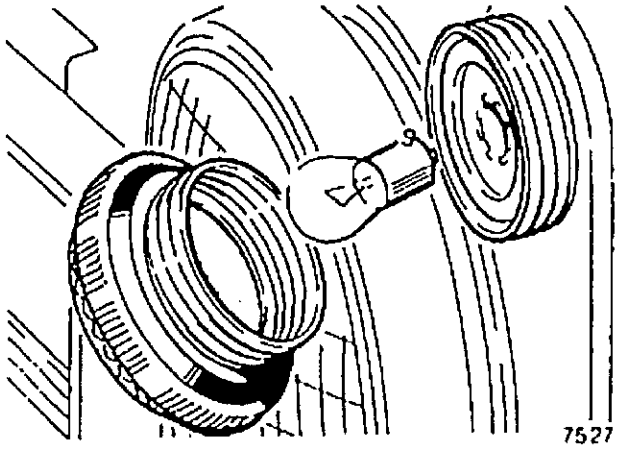


Fig 26 Side light lamp renewal

STOP/TAIL AND REAR TURN SIGNAL LIGHTS

39. Access to either lamp is achieved after unscrewing lens anti-clockwise (Fig 27).

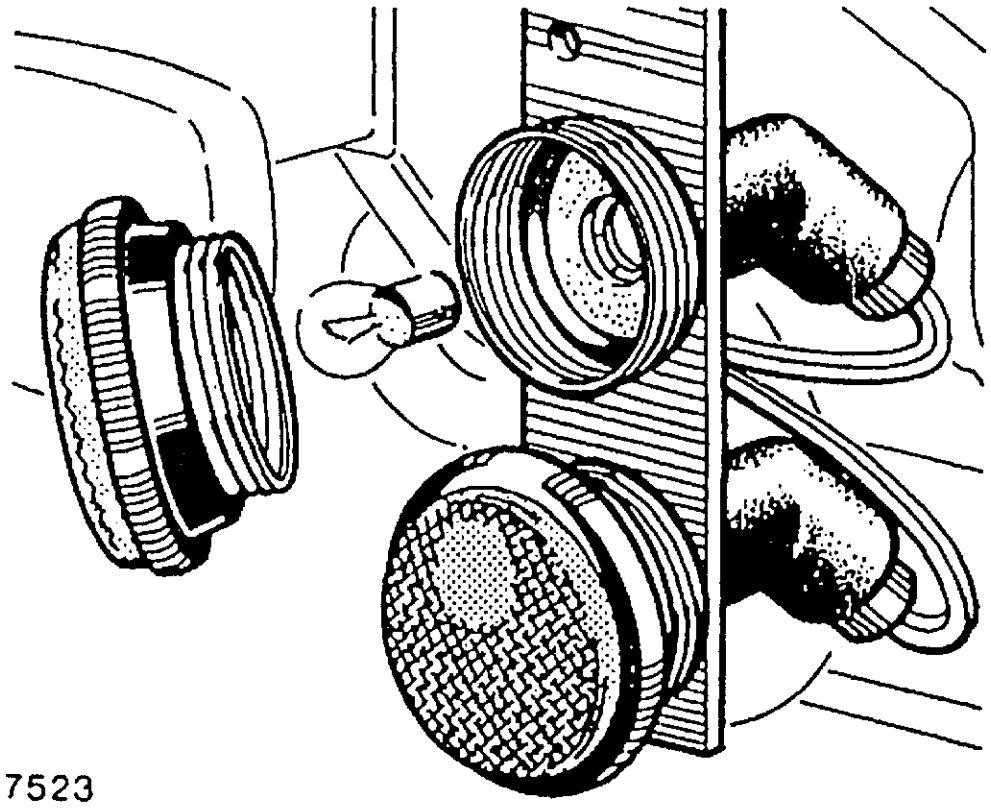


Fig 27 Stop, tail and rear turn signal lamp renewal

REAR GUARD FOG LIGHT

40. Unscrew threaded lens for lamp access as shown in Fig 27. The lamp can be removed by pushing in and turning anti-clockwise.

HAZARD WARNING LIGHT

41. The lamps utilize the front and rear turn signal lamps.

REAR NUMBER PLATE LIGHT

42. Access to the lamp is gained after removing lens and cover (Fig 29) secured by three screws.

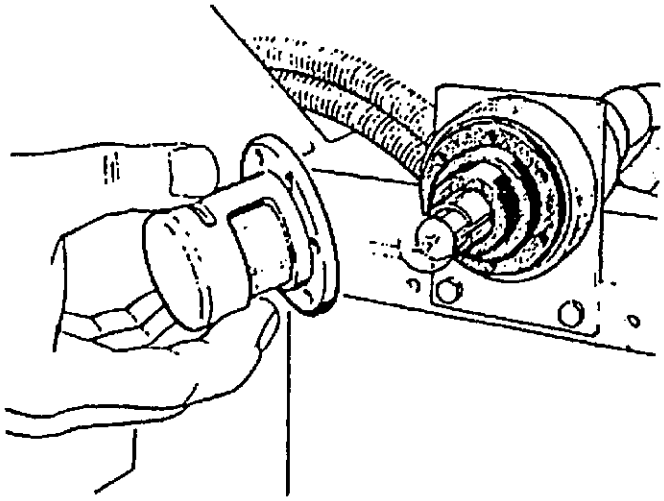


Fig 28 Rear number plate light

CAB INTERIOR LIGHT

43. To gain access to the roof light lamp (Fig 30), remove the lens by carefully squeezing top and bottom sides together and pulling downwards.

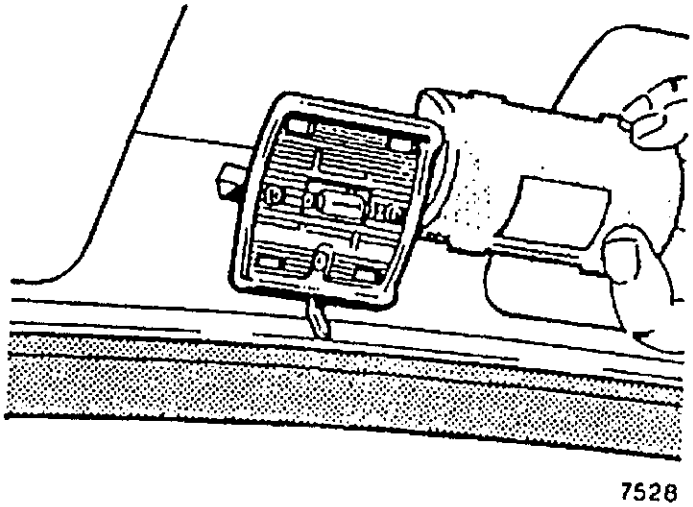


Fig 29 Cab interior light

FRONT TURN SIGNAL LIGHT

44. Lamp access is gained after removing the rim securing screw and easing the rim away from lens (Fig 31). Remove lens by easing it away from the light body and sideways out of rim.

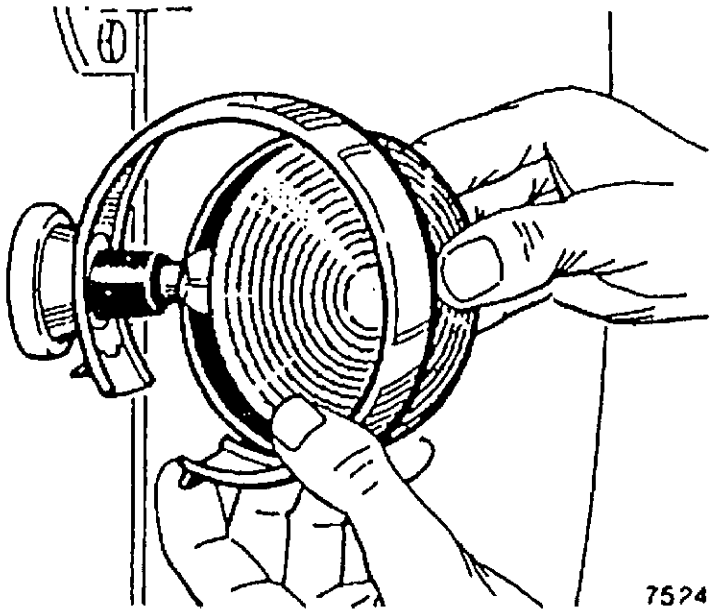


Fig 30 Front turn signal light

CONVOY LIGHT

45. Access to lamp is gained after removing lens and cover secured by three screws, as number plate light (Fig 29).

AIR PRESSURE GAUGE ILLUMINATION

46. To gain access to lamp, remove instrument panel, disconnect speedometer cable and place instrument assembly to one side. Using instrument aperture in dash panel, the lamp holder can be pulled from rear of air pressure gauge.

HAZARD WARNING SWITCH LAMP

47. The lamp is incorporated in the hazard warning switch, to renew lamp, unscrew the top cover of switch.

LOW AIR PRESSURE WARNING LIGHT/TRAILER TURN SIGNAL WARNING LIGHT

48. Access to lamp is gained alter prising warning light from dash panel and separating lens from lamp holder. Turn lamp anti-clockwise for removal.

TACHOMETER ILLUMINATION LAMP

49. Access to lamp is gained after prising lamp holder from rear of instrument. Turn bulb anti-clockwise for removal.

MAIN INSTRUMENT LAMPS

50. All lamps contained within the main instrument are accessible when the instrument is withdrawn from dash panel. These lamps are as follows:

Alternator Warning Lamps
Oil Pressure Warning Lamp
Turn Signal Warning Lamp
Main Beam Warning Lamp
Panel Lamps

BATTERY CONDITION INDICATOR LAMP

51. The battery condition indicator lamp is mounted in rear of instrument. Access is gained to lamp after removing indicator from dash panel. To facilitate removal of indicator, remove fuse box mounting panel from beneath right-hand side of dash panel, release knurled nut and clamping bracket retaining indicator and withdraw indicator.

REAR GUARD FOG LAMP SWITCH LAMP

52. Lamp access is gained after unscrewing switch knob and shaft from holder and unscrewing knob from shaft.

FUSES

53. A 4-way fuse box is mounted beneath the instrument panel adjacent to the steering column. Access to fuses is gained after removing knurled nut and cover.

COMBINED TURN SIGNAL AND HAZARD WARNING FLASHING UNIT

54. The unit is positioned beneath the dash panel, to the right of steering column and screwed to the fuse box mounting panel. To gain access to unit, remove two bolts supporting the fuse box panel and pull clear of dash.

SPARE WHEEL

55. The spare wheel is carried in a winch-type carrier (Fig 32) located on the right-hand chassis sidemember.

56. Before attempting to remove spare wheel from its carrier ensure that the cable of carrier is fully wound up. Hook the short length of chain into one of the wheel fixing holes. This will ensure that when the wheel reaches the ground it will be in a vertical position and easier to handle.

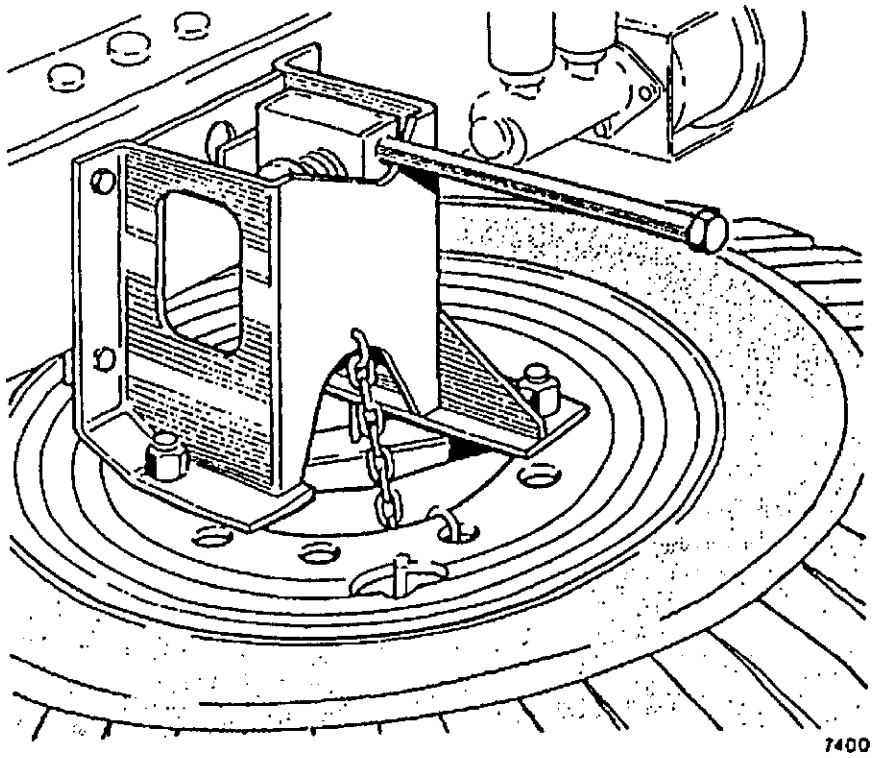


Fig 31 Spare wheel carrier

57. Using the wheel nut wrench remove the two nuts holding the wheel to the carrier. Again using the wheel nut wrench, turn the winch bar screw anti-clockwise to lower the spare wheel to the ground. When installing a wheel to the carrier turn the winch bar clockwise until the wheel support bar studs engage the carrier and the nuts can be started on the studs. Securely tighten nuts.

JACKING INSTRUCTIONS

58. To raise a wheel clear of the ground place the jack under the axle tube adjacent to the wheel which is to be raised.

PREPARATIONS

WARNING

FOLLOW JACKING PREPARATION AND INSTRUCTIONS IN ORDER TO REDUCE THE POSSIBILITY OF SERIOUS PERSONAL INJURY. THE JACK IS DESIGNED FOR USE ONLY WHEN CHANGING WHEELS. STAND CLEAR OF AND NEVER GET BENEATH THE VEHICLE WHEN IT IS SUPPORTED ONLY BY A JACK. DO NOT START OR RUN THE ENGINE WHILE THE VEHICLE IS ON THE JACK.

59. Park on a firm level surface and apply the parking brake. Activate the hazard warning system. Block both the front and back of the wheel diagonally opposite the jack position.

TO REMOVE WHEELS

60. Slacken the wheel nuts about a half turn (left-hand thread on left-hand side of the vehicle, right-hand thread on the right-hand side). Then jack up the vehicle, remove the wheel nuts and lift the wheel clear of the studs.

61. Before the wheel nuts are replaced, wheel stud threads should be cleaned and oiled. Take care when replacing the wheel to locate the conical seats of the nuts against the wheel. The torque 544 Nm (400 lbft) of the wheel nuts should be checked after the jack has been lowered.

62. Whenever a wheel has been removed and replaced it is advisable to re-check the torque of the wheel nuts after a further 1500 km (1000 miles) have been covered. Also it is sound 'safety practice' to occasionally check the torque of all the wheel nuts.

TIGHTENING WHEEL NUTS WITHOUT A TORQUE WRENCH

63. Tighten the wheel nuts as tight as possible using the issued wheel brace without the use of extension tubes etc. Drive the vehicle for 2 - 3 miles, stop and re-check wheel nut tightness. Recheck tightness of the wheel nuts using a torque wrench set to 544Nm (400lb ft) as soon as possible.

FITTING AND REMOVAL OF PASSENGER SEATING

64. Refer to AESP 2320-G-300 Cat 411 for fitting and removal instructions of troop carrying vehicle enhanced seating.

CHAPTER 5-2

USER MAINTENANCE

TRUCK 4 TONNE 4 X 4 W/CRANE

CONTENTS

NOTE

This Chapter to be read in conjunction with Chap 5-1.

TOP-UP CRANE HYDRAULIC OIL RESERVOIR

CAUTION

Cleanliness is of extreme importance where hydraulic circuits and components are concerned. It is, therefore, most important to exercise care as the ingress of dirt or foreign matter in the oil will result in rapid wear of the pump and valves.

1. When checking the oil level of the reservoir ensure the vehicle is standing on level ground and all rams are retracted. The oil level is visible through an inspection glass in the side of the reservoir.

2. When it becomes necessary to top-up oil level the following procedure should be carried out:

2.1 Remove cover (Fig 1) from top of filter.

2.2 With all rams retracted top-up oil level to the middle of the sight glass.

2.3 Re-install filter top cover.

CLEAN/CHANGE CRANE HYDRAULIC OIL FILTER

CAUTION

Cleanliness is of extreme importance where hydraulic circuits and components are concerned. It is, therefore, most important to exercise care as the ingress of dirt or foreign matter in the oil will result in rapid wear of the pump and valves.

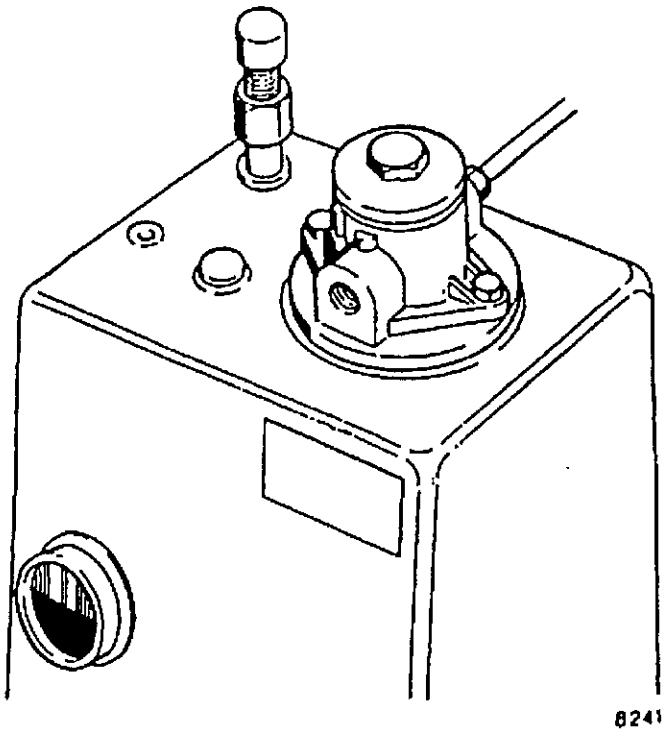
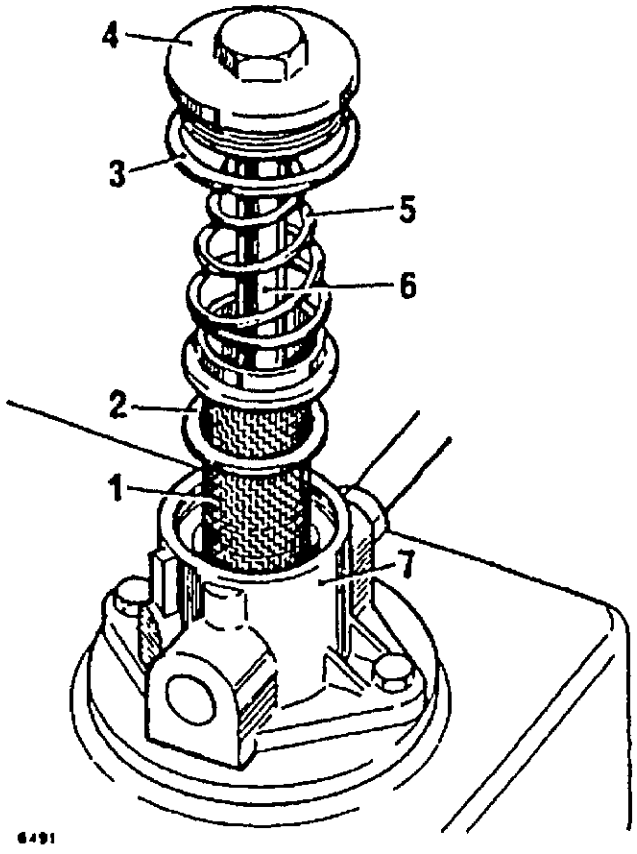


Fig 1 Crane hydraulic reservoir

Removal

3. Unscrew and remove filter cover (Fig 2(4)) together with gasket (3) and compression spring (5). Clean magnetic rod (6) with a clean fluff-free cloth.

3.1 Withdraw filter element (1) and gasket (2) from filter housing 7. Clean filter element in diesel fuel. If element is too heavily contaminated it must be renewed.



1 Element
2 Gasket
3 Cover gasket
4 Cover
5 Compression spring
6 Magnetic rod
7 Filter housing

Fig 2 Crane hydraulic oil filter

Installation

4. Install filter element and gasket to filter housing. With rams in the fully retracted position, check level of hydraulic oil in sight glass on reservoir and if necessary top-up.

3.1 Replace compression spring, gasket and filter cover.

CHANGE CRANE HYDRAULIC OIL

CAUTION

Cleanliness is of extreme importance where hydraulic circuits and components are concerned. It is, therefore, most important to exercise care as the ingress of dirt or foreign matter in the oil will result in rapid wear of the pump and valves.

5. Drain oil from reservoir using drain plug or the outlet pipe connection.

5.1 Refill reservoir up to the middle of the oil inspection sight glass.

5.2 Extend stabilizer rams.

5.3 Fully extend lifting ram at slow pump speed.

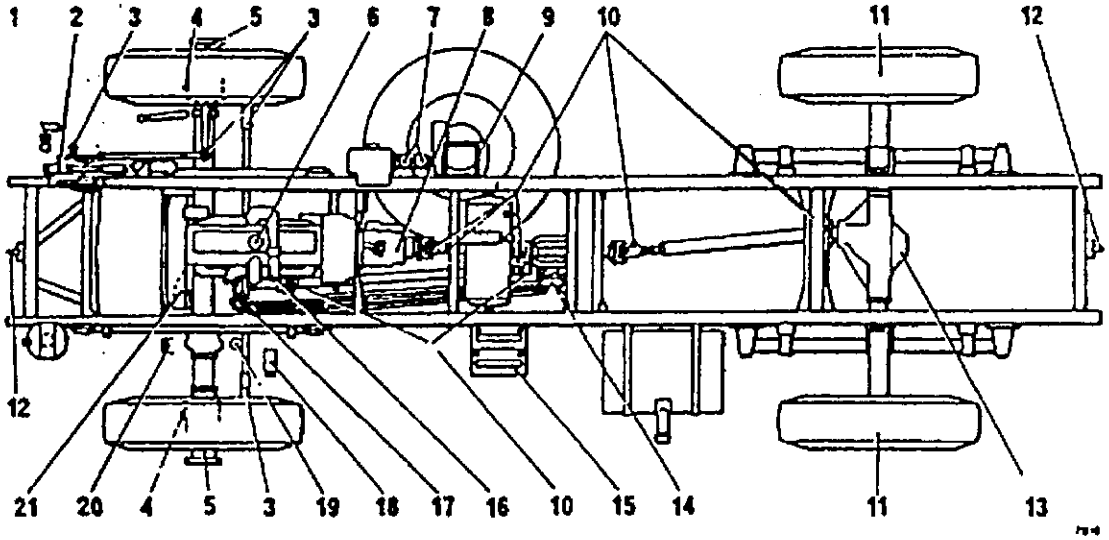
5.4 Fully extend jib ram and jib extension ram.

5.5 Retract all rams in reverse order.

5.6 Replenish oil up to the middle of sight glass and replace filter cover.

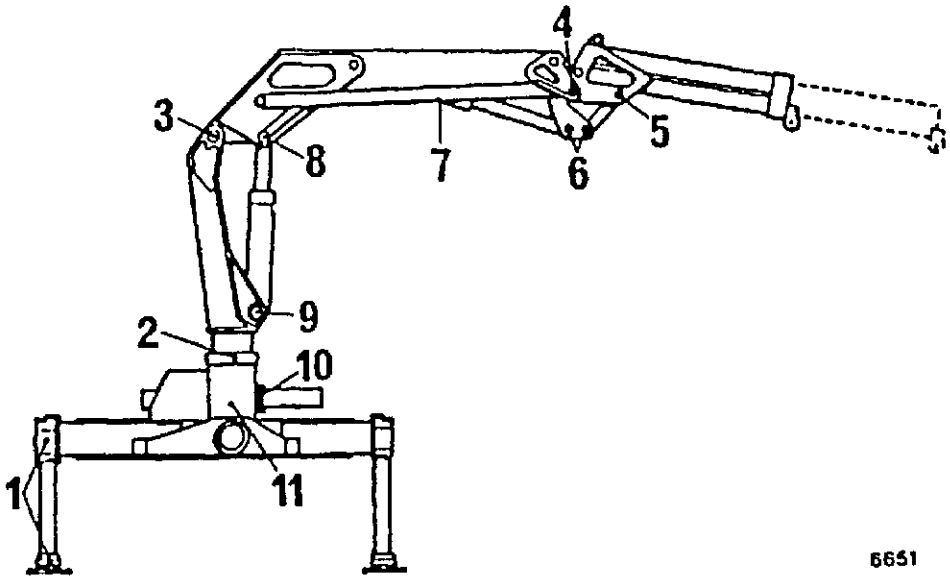
NOTE

It is recommended that all oil pipes be pressure tested after filling by actuating the control valve to bring each ram to its final position, where it should be held for several seconds under pressure, whilst a visual check is made of all joints for leakage.



1 Lubricate accelerator brake clutch control linkage
2 Top-up steering gear oil level
3 Lubricate steering connecting rod and tie rod ball joints
4 Top-up tracta joint oil levels
5 Lubricate hub bearings
6 Top-up engine oil level
7 Top-up brake fluid level
8 Top-up gearbox oil level
9 Lubricate spare wheel carrier mechanism
10 Lubricate propeller shaft couplings and universal joints
11 Top-up hub bearing oil level
12 Lubricate towing hook and
13 Top-up rear axle oil level
14 Top-up transfer box oil level
15 Top-up battery electrolyte level
16 Oil prime turbocharger (when applicable)
17 Lubricate transfer box control linkages
18 Top-up cooling system level
19 Top-up air compressor anti-freeze level sliding
20 Top-up windshield wash
21 Top-up front axle oil level

Fig 3 Lubrication and levels chart



1 Lubricate stabilizer rams and supports ram
2 Lubricate upper trestle
3 Lubricate centre column ram to boom pivot
4 Lubricate boom to jib pivot
5 Lubricate jib lifting ram to upper pivot
6 Lubricate boom and jib reservoir linkage pivots
7 Lubricate jib lifting ram
8 Lubricate boom lifting top pivot
9 Lubricate boom lifting bottom pivot
10 Lubricate slewing ram
11 Lubricate centre column pendulum frame
12 Top-up crane

Fig 4 Crane lubrication chart

CHAPTER 6

USER SPARES DATA

CONTENTS

Light	Volts	Watts	Type
Head	26	50/50	Pre-focus, vertical dip
Side and Number			
Plate	26	6	Small centre contact
Convoy	26	21	Small centre contact
Tail/Stop	24	7/30	Small bayonet cap (offset pins)
Turn Signal/ Hazard Warning	24	24	Small centre contact
Interior Roof	6	24	Festoon
Instrument illumination & warning	24	3	Wedge base capless
Hazard Warning Switch	24	3	Peanut
Trailer Turn Signal and Winch Warning	24	2	Peanut
Speedometer Illumination	24	2.8	Miniature centre contact
Tachometer Illumination	24	4	Miniature Edison screw
Brake Air Pressure Gauge illumination	24	2.8	Miniature Edison screw
Rear Fog	24	21	Small centre contact

TABLE 2 FUSE DATA

Fuse No	Circuits Protected
1	Windscreen wipers, alternator and oil pressure warning lights, heater fan motor, temperature gauge, fuel gauge, winch torque limiter (where applicable). Air pressure warning buzzer and light and two-pin trailer socket.
2	Instrument illumination light, rear tail light and number plate.
3	Hazard warning circuit, convoy light and turn signals.
4	Horn, interior light, inspection light sockets and battery feed for trailer sockets.

TABLE 3 MISCELLANEOUS DATA

Part No	Description
	Engine oil filter element Fan drive belts Fuel filter element Air cleaner element Engine oil Gearbox oil Transfer box oil Axle oil Hub oil

CHAPTER 7

DESTRUCTION OF VEHICLE TO PREVENT ENEMY USE

CONTENTS

GENERAL

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

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

DEGREE OF DAMAGE

3. The degree of damage inflicted, to prevent the equipment being used by an enemy, shall be as follows:

3.1 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 cannibalization.

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

3.3 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.

PRIORITIES FOR DESTRUCTION

4. The priorities for destruction should be considered as follows:

Priority	Parts
1	Fuel pump and injectors
2	Engine block and cooling system
3	Tyres and suspensions
4	Air and Hydraulic systems
5	Differentials
6	Frame

4.1 Priority must be given to the destruction of classified equipment and associated documents.

4.2 When lack of time and/or means prevents complete destruction of equipment, priority is to be given to the destruction of essential parts, and the same parts are to be destroyed on all like equipment.

4.3 A guide to priorities for destruction of the equipment is shown in the Table.

SPARE PARTS

5. 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.

METHODS OF DESTRUCTION

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

Mechanical

7. This requires an axe, pick, crowbar or similar implement. The equipment should be destroyed in accordance with the priorities given in the Table.

Burning

8. This requires gasoline, oil or other flammables.

8.1 Remove and empty the portable fire extinguishers.

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

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

8.4 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 other appropriate means. Take cover immediately.

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.

Gunfire

9. When destroying the equipment by gunfire proceed as follows:

9.1 Remove and empty the portable fire extinguishers.

9.2 Smash all vital elements as outlined in sub-para 8.2.

[redacted]

9.3 Destroy the equipment by gunfire, using tank guns, self-propelled guns, artillery, rifles using rifle grenades or launchers using anti-tank rockets.

10. 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.

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

11.1 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.

11.2 Observance of appropriate safety precautions.

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*AESP/EMER NUMBER:		*IS THIS SAFETY RELATED?	Yes ☐	No ☐

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TRUCK, 4 t, 4x4, BEDFORD MJ ALL VARIANTS

FAULT DIAGNOSIS

This publication contains information covering the requirements of Sub-Category 5-1 at information levels 2, 3 and 4

BY COMMAND OF THE DEFENCE COUNCIL

[redacted]

MINISTRY OF DEFENCE

Sponsor:
DGEME (A) EME7b
File ref: D/DGEME/125/8/16

Publications Authority:
Vehicles & Weapons Branch REME
Project No: 7b1067 (187)
File ref: 7b1067/AESP/B

AMENDMENT RECORD

Amdt	Incorporated by	Date
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CONTENTS

PREFACE

AMENDMENT IDENTIFICATION

4 Except for manuscript entries, amendments are identified by marginal side lining. Manuscript amendments are identified by Amdt No in outside margin in line with the amendment.

COMMENTS ON THIS PUBLICATION

5 Comments on this publication are to be forwarded in accordance with AESP 0100-P-011-013 to Vehicles and Weapons Branch REME, Chobham Lane, Chertsey, Surrey KT16 OEE.

ASSOCIATED PUBLICATIONS

AESP 2815-K-062-512 Engine Diesel 6 Cyl Bedford 5.4 Litre Turbocharged

WARNINGS/CAUTIONS

6 Before driving this vehicle or operating any fitted equipment, personnel are to read and understand the Warnings, Cautions and Operating Instructions detailed in Cat 201 of this AESP.

Chapter 10

AIR PRESSURE AND BRAKING SYSTEM

CONTENTS

GENERAL INFORMATION

1 When diagnosing braking system faults it must first be ascertained whether the fault is caused by a mechanical, hydraulic or air system fault.

2 The mechanical system comprises the brake drums, shoes and linings, adjusters, and parking brake lever and cables.

3 The hydraulic system comprises the dual master cylinder, wheel cylinders and load sensing valve.

4 If the fault is caused by an air orientated failure it must be determined in which part of the air system the failure lies. Air pressure test points located on the master cylinder actuator and air reservoir can be of assistance when deciding this. The air pressure gauges located in the cab can also be of assistance.

The air system can be divided into the following categories:

4.1 The charging system which includes the compressor, governer valve, condensing tank and drain valve, system protection valve and reservoirs.

4.2 The service brake system which includes the footbrake valve, dual air pressure gauge, dual relay valve, changeover valve, and master cylinder actuator.

4.3 The hill holder brake system which includes the hill holder control valve and change over valve.

4.4 The trailer park brake system which includes the trailer park control valve and change over valve.

4.5 The auxiliary equipment system which includes a pressure loss limiting valve and tyre inflator.

TABLE 1 - BRAKING SYSTEM FAULT DIAGNOSIS

Fault	Possible Causes	Remedy
Service brakes release too slowly	Faulty footbrake valve	Check operation of valve and linkage
	Defective brake shoe return springs	Check for springs which are broken or have become detached from shoes
Brakes binding on	Incorrect brake adjustment	Check brake adjustment
	Defective brake shoe return springs	Check for springs which are broken or have become detached from shoes
	Parking brake mechanism faulty	Check operation of lever cables and expanders
Brakes pull to one side	Incorrect brake adjustment	Check brake adjustment
	Faulty wheel cylinder	Check for fluid leaks from cylinder
	Brake linings contaminated	Check brake linings, replace if necessary
Slow or insufficient air pressure build up	Leaks from air lines and components in charging system or in a particular system as indicated by cab gauges	Check for leaks either audible or visual (using a soap solution)
	Compressor faulty	Check compressor output
	Governor valve incorrectly adjusted	Check and if necessary adjust governor
	Air pressure gauge faulty	Replace air pressure gauge
Excessive air pressure	Governor valve faulty or incorrectly adjusted	Check governor valve
	Air pressure gauge faulty	Replace air pressure gauge
	Compressor unloader valves not operating	Check unloader valves
Brakes apply but performance inadquate	Low pressure in Service 1 or 11 brake systems	Check for air leaks in Service 1 and 11 systems
	Footbrake valve faulty	Carry out footbrake valve operating test
	Master cylinder faulty	Check for fluid leaks and operation
	Master cylinder actuator faulty	Check actuator for leaks and examine seals

(continued)

TABLE 1 - BRAKING SYSTEM FAULT DIAGNOSIS (continued)

Fault	Possible Causes	Remedy
	Load sensing valve linkage incorrectly adjusted or valve faulty	Check linkage setting and carry out valve operating test
	Excessive brake lining to drum clearance	Check brake adjustment
	Contaminated or glazed brake linings	Inspect brake shoe linings

Chapter 13

ELECTRICAL SYSTEM

CONTENTS

CAV AC5R/24 ALTERNATOR GENERAL INFORMATION

1 Before commencing a test, it is essential that the cautions given under the heading 'CAV AC5R/24 ALTERNATOR' in Level 2, Chap 13 are strictly adhered to.

2 Before investigating suspected faults in the charging system, it is essential that the battery installed in the vehicle to be checked is known to be in good condition and fully charged.

Using the chart

3 Trouble diagnosis is simple if the sequence of operations detailed on the 'tree' of the chart is correctly used. For example, if when the key-start switch is in the ON position the warning lamp does not light, follow the procedure detailed in Operation 12 and thereafter as shown in the 'tree'. Make no attempt to work from Operation 1 onwards in numerical sequence unless it happens that the fault in the charging system entails this.

CAV CA45F STARTER - GENERAL INFORMATION

4 Before carrying out any tests on the starting system, check that the vehicle gearbox is in neutral with parking brake applied.

Operations

1. Check Alternator drive belts for tension and condition.
2. Connect an ammeter in series with alternator positive output wire.
3. Remove rear cover from alternator. Reconnect wiring. Remove green wire (field) from brush box 'F' terminal and bridge terminal to ground (negative terminal on insulated return alternator). With ammeter connected in series with alternator positive output wire, adjust engine speed to produce maximum output.
4. Renew or repair alternator.
5. Switch off and stop engine. Remove wiring from rear of alternator. Switch on but do not start engine.
6. Check for short circuit in wire between alternator indicator terminal and warning lamp bulb.
7. Connect voltmeter between battery positive and negative terminals, increase engine speed to 1500 rev/min. Voltmeter should read 26-28 volts, ammeter reading 13 amp maximum. Higher amperage, which would probably give lower voltage reading, could indicate need to recharge battery before continuing with test.
8. If alternator drive belts tension and condition are satisfactory, a faulty battery or overloaded system is indicated. Comparison should be made between electrical loading and alternator output: 35 amp.
9. Switch off and stop engine. Remove rear cover from alternator. Reconnect wiring. Restart engine and increase engine speed to 1500 rev/min. With voltmeter negative connected to ground (negative terminal on insulated return alternator), and positive connected to 'A' terminal on brush box, meter should read 26-28 volts.
10. Check battery terminals and wiring between battery and alternator for poor connection and resistive circuits.
11. Install new regulator.
12. Remove connector from alternator and bridge 'IND' wire (brown/yellow) in connector to ground (negative terminal on insulated return alternator).
13. Remove rear cover and reconnect wiring. Check for loose or corroded connections between alternator, regulator and brush box.
14. Remove auxiliary diode wire (yellow) from brush box terminal leaving auxiliary diode feed wire (yellow with red sleeve) to regulator in position (see Fig 12 and 13, Chap 13, Level 3). Observe warning lamp.
15. Connect slave wire between brush box 'A' terminal and ground (negative terminal on insulated return alternator).
16. Disconnect slave wire from 'A' terminal and connect between 'F' terminal and ground (negative terminal on insulated ground return alternator).
17. Check continuity between alternator 'IND' terminal and brush box 'A' terminal. This circuit includes warning lamp wire (yellow), regulator and auxiliary diode feed (yellow with red sleeve).
18. Check warning lamp bulb. Check bulb-holder for loose connection. Check wire (brown/yellow) between alternator indicator terminal, warning lamp bulb and key-start switch for continuity. Note: warning lamp bulb must be 24 volt 3 watt.
19. Check that charging system operates satisfactorily by connecting voltmeter across battery terminals and ammeter in series with alternator output circuit. Impose approximately 35 amp load on battery, start engine and increase engine speed until ammeter reads maximum charge (35 amp). Remove load from battery. Ammeter should then drop slowly back to show trickle charge. Voltmeter should show 26-28 volts.

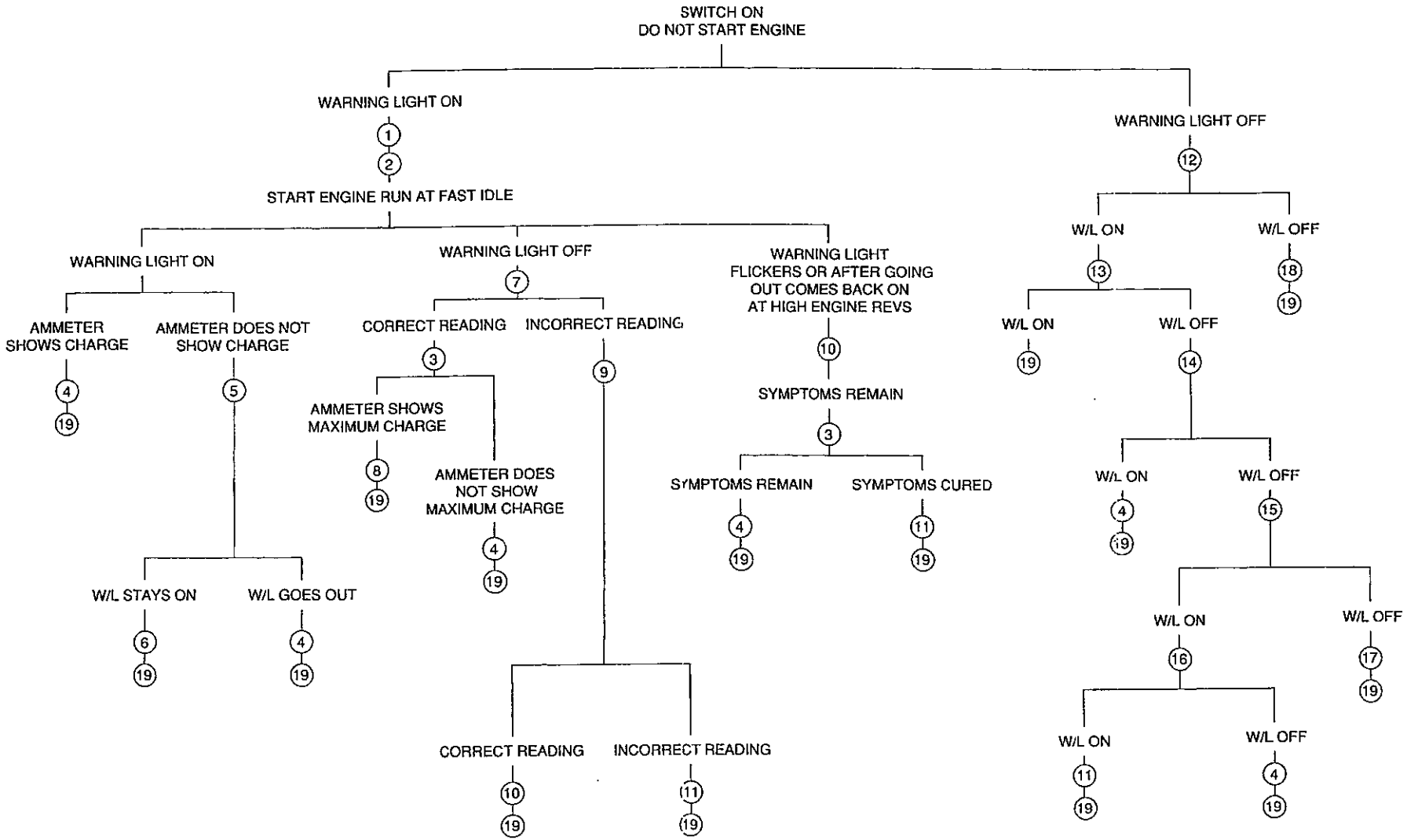

CHART 1 – CAV AC5R/24 ALTERNATOR FAULT DIAGNOSIS

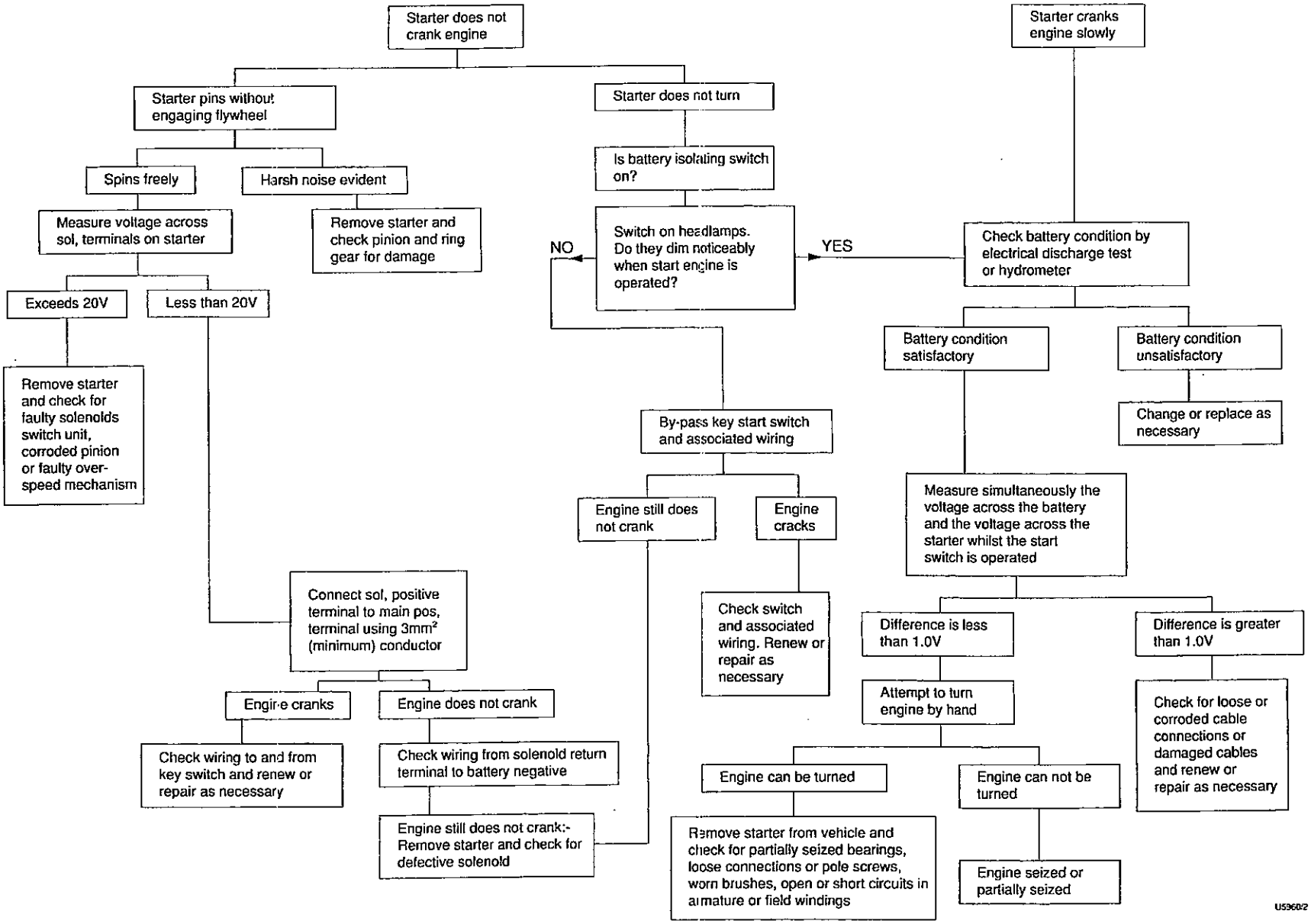

CHART 2 – CAV CA45F STARTER FAULT DIAGNOSIS

Chapter 18

CRANE

CONTENTS

TABLE 1 - CRANE FAULT DIAGNOSIS

Fault	Possible Causes	Remedy
Crane does not operate at all	No fluid supply	Ensure that PTO is engaged and supply shut off valve is open
	Main system relief valve not operating	Check adjustment of main relief valve
	Faulty hydraulic pump	Install gauge to gauging point and check operating pressure
Slewing operation faulty	Column bearing seized	Check for adequate lubrication of centre column bearing
	Relief valves faulty	Check adjustment of slewing relief valves
	Slewing restrictors blocked	Renew slew adaptors
	Faulty slewing ram seals	Renew rams
Hydraulic pump noisy	Pump faulty	Renew power takeoff/ hydraulic pump assembly
	Hydraulic filter blocked	Thoroughly clean filter
	Leak in suction line (foam in reservoir)	Check that all joints and pipes are sound
Boom dropping	Main lifting ram relief valve pressure too low	Check operating pressures and main lifting ram relief valves
	Main lifting ram load holding valve faulty	Renew load holding valve
	Main lifting ram seals faulty	Renew main lifting ram
Jib dropping	See possible causes and remedies for boom dropping	

(continued)

TABLE 1 - CRANE FAULT DIAGNOSIS (continued)

Fault	Possible Causes	Remedy
Hydraulic oil over heating	Restriction in hydraulic system	Check that filter is not blocked. Ensure pipes have no kinks or flat spots. If necessary remove pipes and blow through with dry compressed air
	Main system relief valve faulty	Check adjustment of main system relief valve
	Air entering suction line	Check that all joints and pipes are sound
	Wrong type of oil	Ensure that oil used is OM 33
	Mechanical restriction	Ensure that all pins in boom and jib are free and adequately lubricated
Movements too slow	Hydraulic pump faulty	Install gauge to gauging point and check operating pressures
	Air entering suction line	Check that all joints and pipes are sound
	System relief valves faulty	Check adjustment of system relief valves
	Valve spool does not move into position (levers seized)	Free off clevis pin, pivot rod and quadrant

ARMY EQUIPMENT
SUPPORT PUBLICATION

2320-H-100-302
OCTOBER 1984

003840

TRUCK, 4t, 4x4, BEDFORD MJ ALL VARIANTS

TECHNICAL DESCRIPTION

REPRINTED INCORPORATING AMDT No. 1

BY COMMAND OF THE DEFENCE COUNCIL

[redacted]

Ministry of Defence

Issued by

**DIRECTOR GENERAL SAFETY AND ENGINEERING
TECHNICAL INFORMATION GROUP**

AMENDMENT RECORD

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PREFACE

Sponsor : DGEME(A)EME 7(b)

INTRODUCTION

1. Service users should forward any comments on this publication through the channels prescribed in AESP 0100-P-011-013.

2. The subject matter of this publication may be affected by Defence Council Instructions (DCIs), Standard Operating Procedures (SOPs) or by Local Regulations. When any such Instruction, Order or Regulation contradicts any portion of this publication they are 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.

RELATED AND ASSOCIATED PUBLICATIONS

Related Publications

4. The Octad for the subject equipment consists of the publications shown. All references are prefixed with the first eight digits of this publication.

CATEGORIES AND INFORMATION LEVELS															
Category	1	2	3	4		5				6	7			8	
Level				1	2	1	2	3	4		1	2	4	1	2
1 USER/OPERATOR	101	201	201	*	*	201	201	*	*	601	711	721	741	*	*
2 UNIT MAINTENANCE	*	*	302	*	*	512	522	532	*	*	*	*	*	*	*
3 FIELD MAINTENANCE	*	*	302	*	*	512	523	533	*	*	*	*	*	*	*
4 BASE MAINTENANCE	*	*	303	*	*	512	523	533	*	*	*	*	*	*	*

1.0 Purpose & Planning Information
2.0 Operating Information
3.0 Technical Description
4.1 Installation Instructions
4.2 Prep for Special Environments
5.1 Failure Diagnosis
5.2 Repair Instructions
5.3 Inspection Standards
5.4 Calibration Procedures
6.0 Maintenance Schedules
7.1 Illustrated Parts Catalogue
7.2 Commercial Parts List
7.4 Complete Equipment Schedule
8.1 Modification Instructions
8.2 General Instructions

* Not published

Reference to AESP 0100-A-001-001 must be made to ensure the availability of the listed publications.

Associated Publications

5. Code No	Type	Title
A 028	EMER Test and Measurement	
J 330	EMER Power	Lead Acid Battery Maintenance
N 111	EMER Workshop	Preservation Identification and Package of Assemblies
N 345	EMER Workshop	Assembly Techniques, split shell Bearings using Plastigage method
C 011	EMER Workshop	BS Symbols used in Diagrams for Hydraulic and Pneumatic Systems
2815-K-062-302	AESP	Engine, Diesel 6 cyl. 5.4 litre Bedford

Chapter 1

ENGINE

CONTENTS

ENGINE

GENERAL DESCRIPTION

1. The Bedford six-cylinder direct injection diesel engine has a capacity of 5.4 litre (330 in^3) a nominal bore of 103.20 mm (4.063 in) and a nominal stroke of 107.95 mm (4.25 in).

2. For Technical Description of the engine refer to AESP 2815-K-062-302.

ENGINE MOUNTINGS

3. The engine front/mounting (Fig 1) is a bonded rubber single insulator, located between a bracket on the timing case and the engine front crossmember.

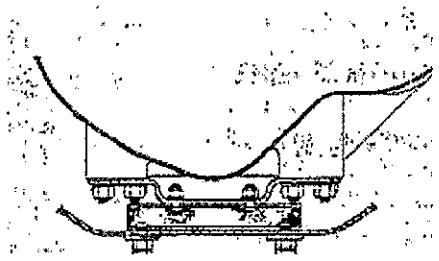


Fig 1 Front engine mounting

4. Tow rear mountings (Fig 2) of the shackle type are attached to a hanger, mounted in the engine rear cross member and to a lug on the flywheel housing. The flywheel housing and hanger eyes incorporate rubber bushes with an inner sleeve.

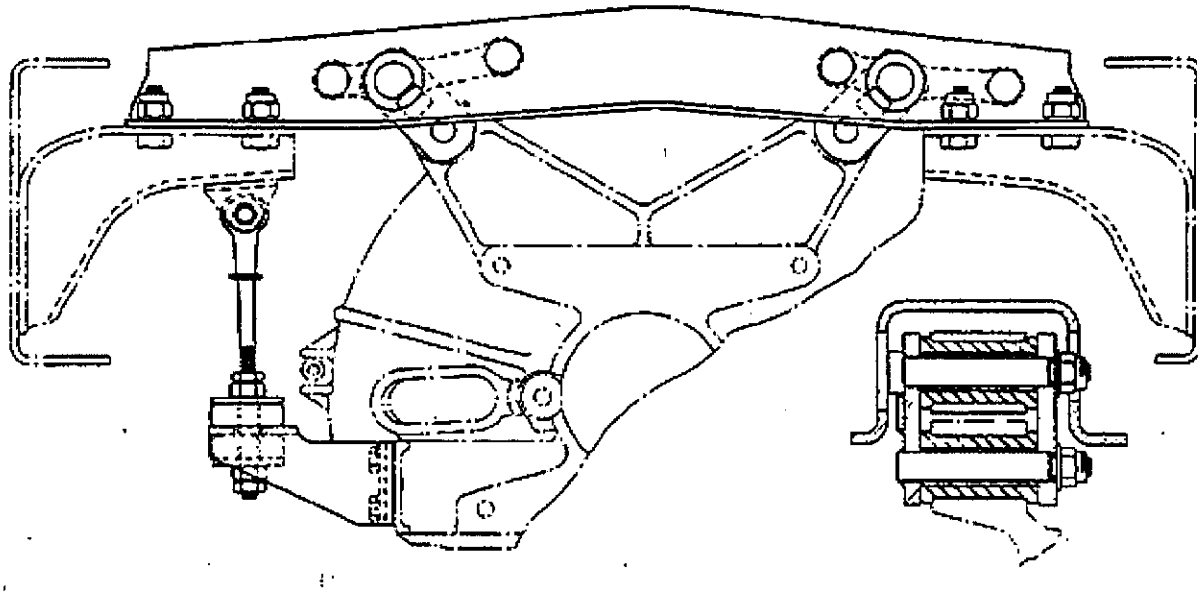


Fig 2 Rear engine mounting

5. An adjustable torque reaction rod is connected between the flywheel housing and the engine rear support crossmember bracket.

Chapter 2

CLUTCH

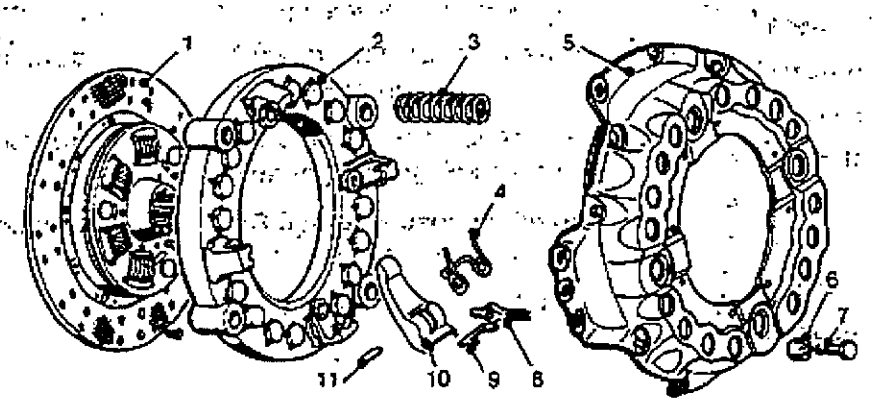
CONTENTS

CLUTCH

GENERAL DESCRIPTION

1. The 330 mm (13 in) diameter clutch (Fig 1) incorporates four release levers (10) and sixteen thrust springs (3). Drive is transmitted via four drive straps riveted to the cover (5) and bolted to the pressure plate (2).

1 Friction disc
2 Pressure plate
3 Thrust spring
4 Anti rattle spring
5. Cover
6 Furrule
7 Drive strap bolt
8 Eye bolt
9 Release lever strut
10 Release lever
11 Pivot pin



T5394/6 **Fig 1 Clutch assembly, exploded view**

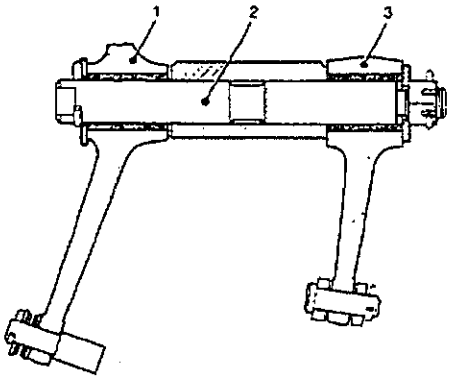
CLUTCH PILOT BEARING

2. Clutch pilot bearing is shielded on both sides and can be installed in the flywheel either way round.

CLUTCH FORK AND RELEASE BEARING

3. The clutch fork pivots on a ball support mounted in the clutch housing. Two pins incorporated in the fork jaw engage a grooved sleeve if the release bearing which slides on the tubular extension of the transmission front cover. The bearing is of the single-row ball type and is packed with lubricant and sealed during manufacture.

4. The clutch pedal (Fig 2 (1)) and brake pedal (3) on right hand drive vehicles are bushed and pivot on a shaft (2) mounted in the steering gear case.

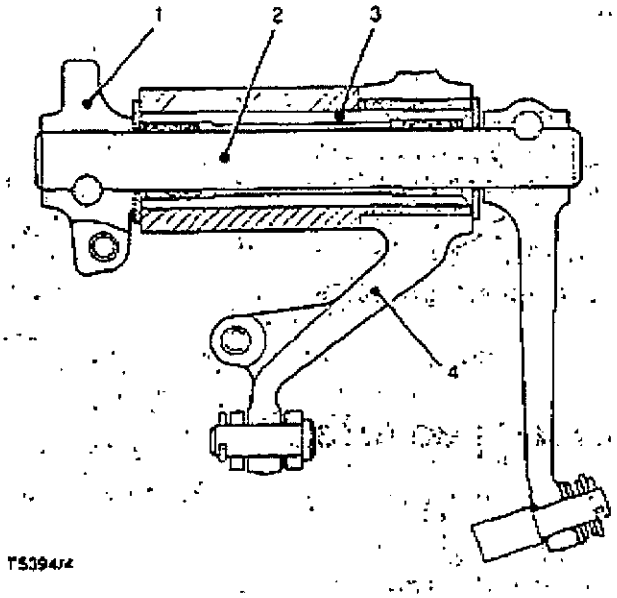


1 Clutch pedal
2 Pivot shaft
3 Brake pedal

T5394/3 **Fig 2 - Clutch pedal and shaft assembly, right-hand drive**

5. On left-hand drive vehicles the clutch pedal (Fig 3 (1)) is clamped to a shaft (2) which passes through a bushed bracket (3) in the steering gear casing. A lever on the other end of the shaft operates the clutch push rod. The brake pedal (4) pivots on a bush on the outside of the sleeve.

6. An adjustable stop is provided for adjusting the pedal setting.



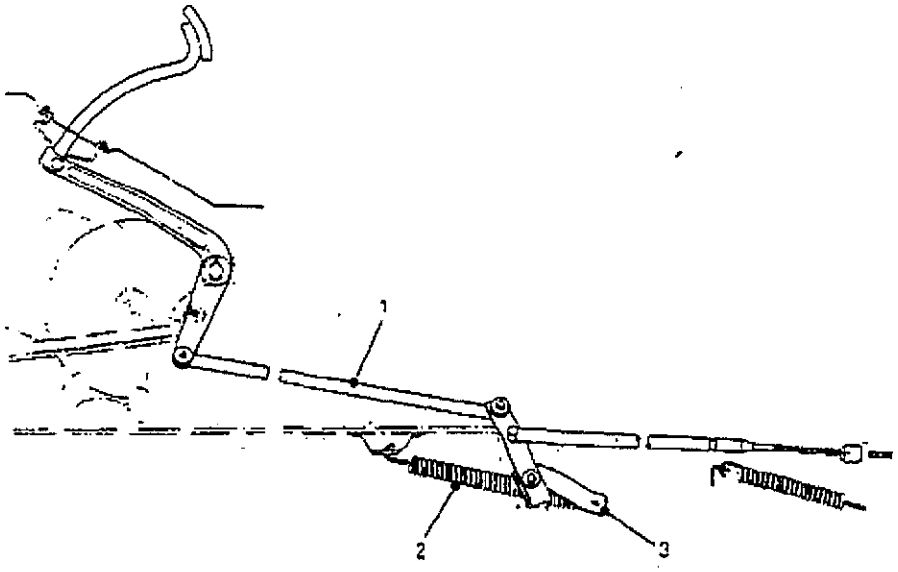
1 Clutch pedal
2 Pivot shaft
3 Bushed bracket
4 Brake pedal

Fig 3 Clutch pedal and shaft assembly left-hand drive

CLUTCH LINKAGE

7. The linkage (Fig 4) from the pedal to the clutch fork consists of push rods interconnected by a relay lever mounted on the chassis frame.

8. Adjustment is provided at the clutch fork end of the linkage.



1 Front push rod
2 Spring
3 Toggle lever

Fig 4 Clutch Linkage T5394/5

9. The push rod lever incorporates a toggle lever (3) and spring (2) designed to assist clutch pedal operation. The spring is anchored to the front spring bump stop bracket.

10. Forward push rod (1) is connected to the upper hole in relay lever, with split pin towards the engine.

Chapter 3

GEARBOX

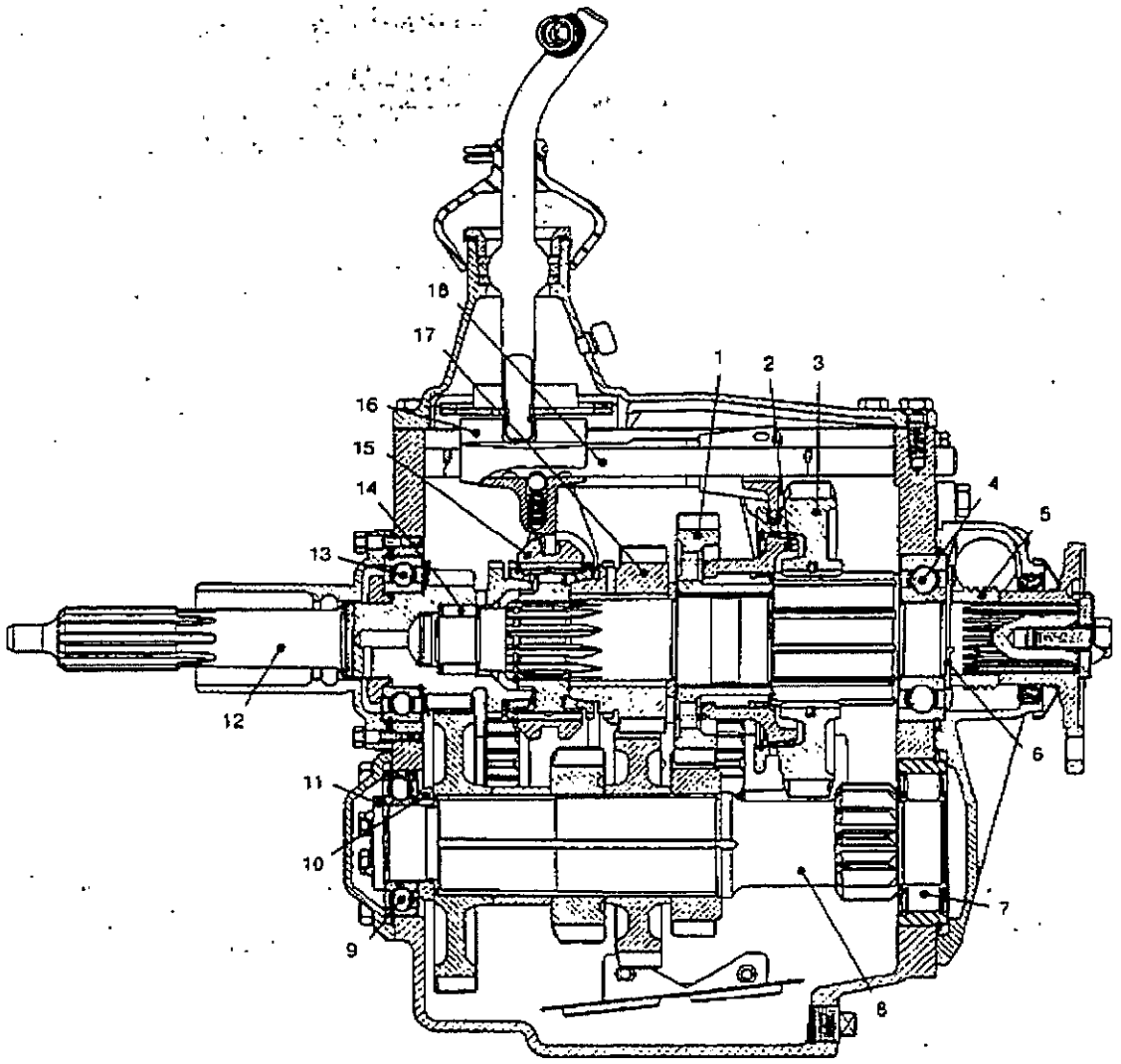
CONTENTS

GEARBOX

GENERAL DESCRIPTION

1. The Bedford four-speed gearbox (Fig 1) incorporates synchromesh engagement on second, third, and fourth speeds.

2. The rear of the main drive pinion is supported by a ball bearing (13) in the transmission casing, and a spigot at the front end of the pinion (12) engages a bearing in the crankshaft.



1	Second speed gear	7	Roller bearing	13	Ball bearing
2	Insert	8	Layshaft	14	Needle rollers
3	First and reverse gear	9	Ball bearing	15	Third and fourth speed clutch
4	Ball bearing	10	Spacer	16	Striking forks
5	Speedometer driving gear	11	Washer	17	Third speed gear
6	Oil thrower	12	Pinion	18	Shift rods

Fig 1 Gearbox

3. The mainshaft is supported at the front, by needle rollers (14) in the main drive pinion counterbore and by a ball bearing (4) in the rear of the gearbox casing.

4. The third and fourth speed synchromesh mechanism (15) incorporates a clutch and a hub which is splined to the mainshaft.

5. The second speed synchromesh mechanism is incorporated in the front of the first and reverse gear (3). The gear houses an insert (2) and a cone with two driving lugs for synchronizing second speed engagement. The bore of the gear is grooved to accommodate a spring damper ring and a rubber compression strip.

6. The second speed gear (1) is bushed but the third speed gear (17) operates on a sleeve pressed on the mainshaft.

7. The layshaft assembly (8) is supported in the front of the gearbox casing by a ball bearing (9) and at the rear by a roller bearing (7).

8. Endwise location of the layshaft is controlled by the front bearing inner race which is clamped between a spacer (10) on the shaft spigot and a thick washer (11) secured by bolts.

9. The first speed gear is integral with the layshaft, the others being keyed and pressed on the shaft.

10. The reverse idler pinion is bushed and operates on a fixed shaft pressed into the casing and secured by a spring pin.

11. Striking forks (16) and reverse lever head operate on fixed shift rods (18) in the top of the casing. Spring-loaded balls, housed in the fork and reverse lever head bosses, enter detent slots when gears are engaged or disengaged.

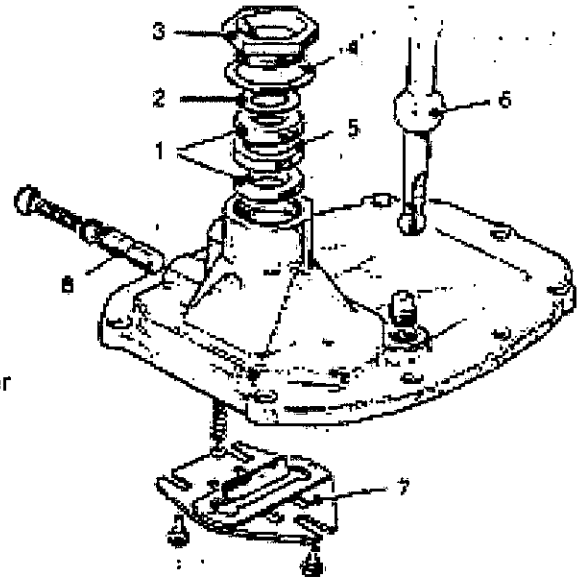
12. Jaws in the reverse lever head engage the top of a reverse striking lever which pivots on an eccentric adjuster bolt in the side of the casing. The lower end of the lever engages the reverse idler pinion.

GEARBOX TOP COVER

13. The gearbox top cover (Fig 2) incorporates two ball seatings (1), a spacer (5) and washer (2).

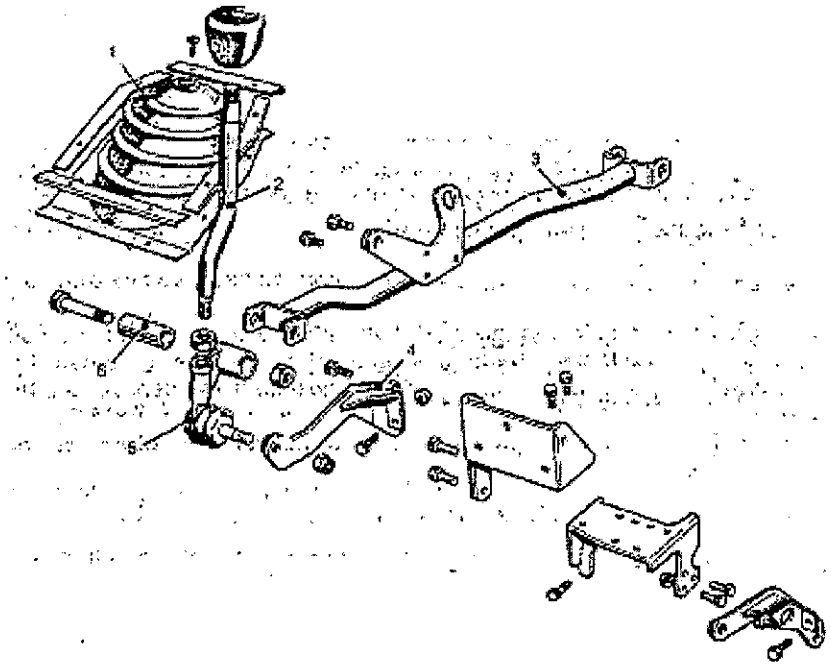
14. The change speed lever (6) is retained by a nut (3) which is locked by a tab washer (4).

15. Individual gear selection is provided by a slotted interlock plate (7) which engages the striking forks. A spring loaded plunger (8) prevents engagement of reverse when a forward speed is selected.



1	Ball seatings	5	Spacer
2	Washer	6	Change speed lever
3	Retaining nut	7	Interlock plate
4	Table washer	8	Plunger

Fig 2 Gearbox top cover



1 Gear shift lever grommet
2 Gear shift lever
3 Gear shift relay rod
4 Mounting bracket
5 Ball joint assembly
6 Bush

Fig 3 Gear shift lever and linkage

GEAR SHIFT LEVER AND LINKAGE

16. The gear shift lever (Fig 3 (2)) is screwed into a ball joint assembly (5) which is mounted on a bracket (4) secured to the engine cylinder head

17. The non-adjustable tubular rod (3) incorporates a yoke at each end and is insulated from vibration by two bushes (6) which are mounted in plastic inserts.

Chapter 4

TRANSFER BOX

CONTENTS

TRANSFER BOX

GENERAL DESCRIPTION

1. The transfer box (Fig 1) is manually controlled by two levers in the cab and provides a direct drive to the rear axle for two wheel drive, or a direct drive to both axles i.e. four wheel drive high, or a two to one reduction to both axles (four wheel drive low). On some vehicles, the transfer box incorporates a power take-off which is controlled by a separate lever.

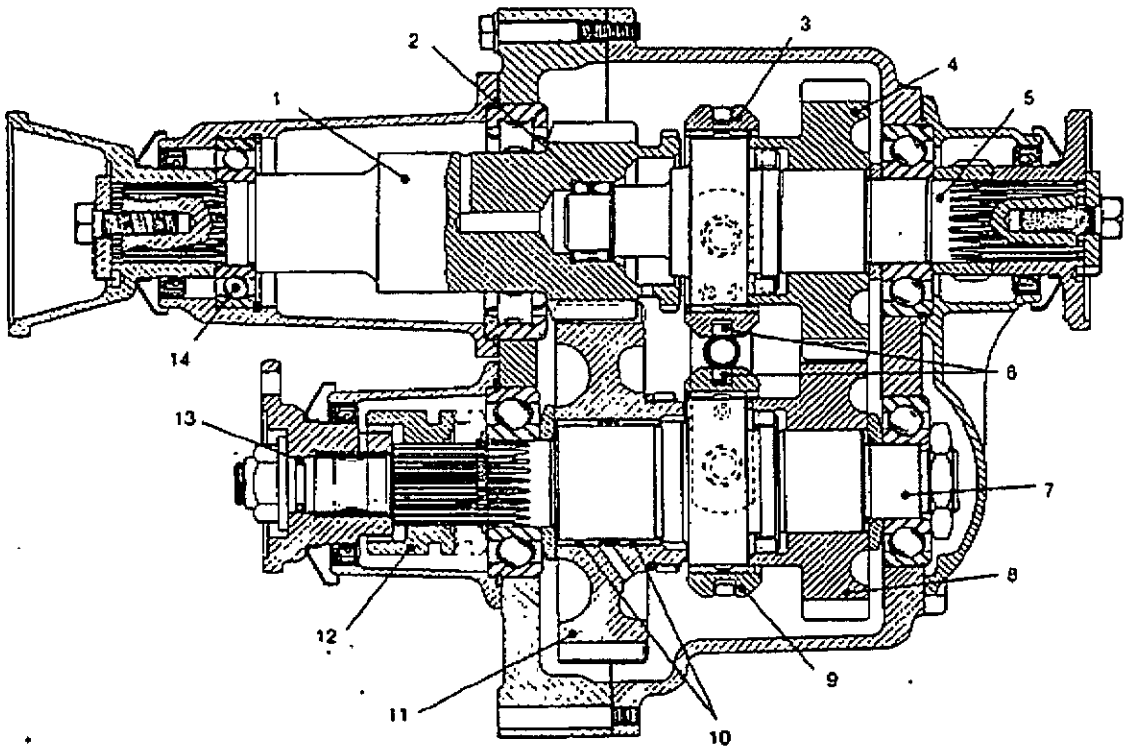
2. The input pinion (1) is supported at its forward end by a ball bearing (14).

3. The rear end of the mainshaft (5) and the front and rear ends of the layshaft (7) are supported by ball bearings and the front of the mainshaft is carried by a roller bearing (2) in a counterbore in the input pinion. Gears dogged to the mainshaft and layshaft are in constant mesh.

4. The layshaft driven gear (11) is carried on needle rollers (10) and is in constant mesh with the input pinion.

5. The front end of the layshaft is splined to engage a front wheel drive clutch (12). Internal teeth on the clutch engage external teeth on the coupling flange when in four wheel drive.

6. A drive for the speedometer is provided at the rear of the transfer box.



1 Input pinion	6 Clutch striking forks	11 Layshaft driven gear
2 Roller bearing	7 Layshaft	12 Front wheel drive clutch
3 Mainshaft clutch sleeve	8 Layshaft direct drive gear	13 O-ring seal
4 Mainshaft gear	9 Layshaft clutch sleeve	14 Ball bearing
5 Mainshaft	10 Needle rollers	

Fig 1 Sectional view of transfer box

Chapter 5

REAR AXLE

CONTENTS

REAR AXLE

GENERAL DESCRIPTION

1. The rear axle (Fig 1) is of the single speed hypoid fully-floating type.

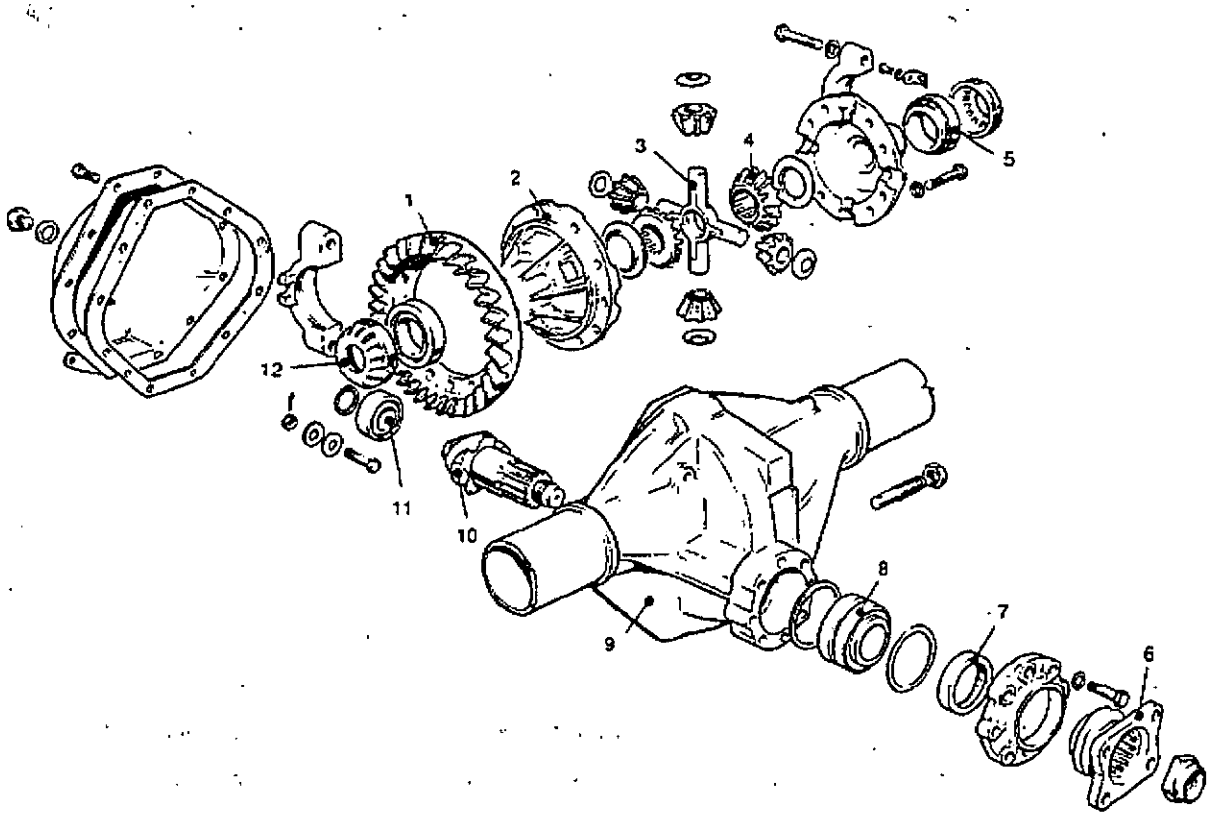
2. The hypoid pinion (10) is straddle mounted between a double row taper roller bearing (8) at the front and a double row parallel roller bearing (11) at the rear.

3. The differential and hypoid gear, and the hubs, are carried on taper roller bearings.

4. Pinion front bearing pre-load is controlled by a graded spacer located between the inner races, and pinion meshing is achieved by shims in the bearing housing.

5. Differential side bearing pre-load, and the lateral location of the differential and hypoid gear, is controlled by adjusting nuts (12).

6. A thrust screw in the axle housing limits deflection of the hypoid gear under heavy load conditions.



1	Hypoid gear	5	Side bearings	9	Axle housing
2	Differential casing	6	Pinion flange	10	Pinion
3	Trunnion	7	Pinion shaft seal	11	Pinion rear bearing
4	Side gears	8	Roller bearing	12	Adjusting nut

Fig 1 Rear axle assembly

Chapter 6

FRONT AXLE

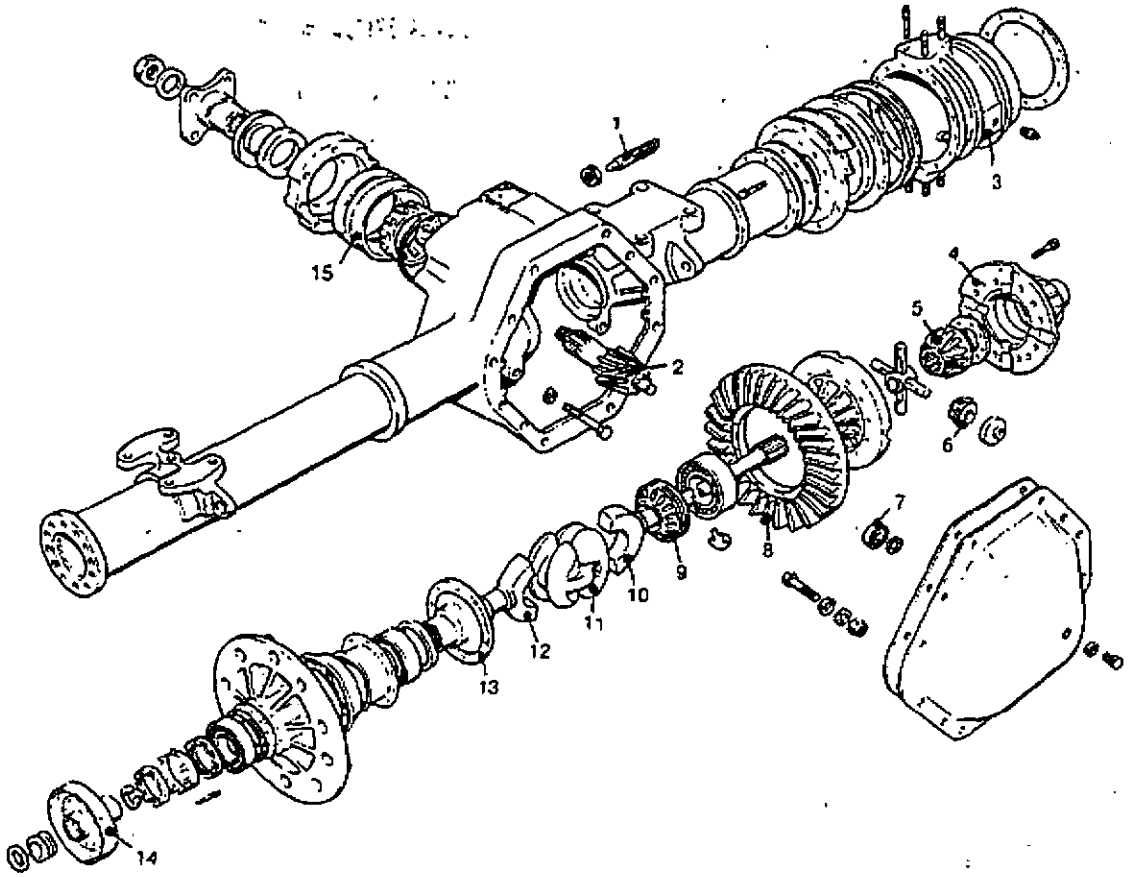
CONTENTS

FRONT AXLE

GENERAL DESCRIPTION

1. The front axle (Fig 1) is of the fully floating type incorporating a hypoid final drive in which the pinion (2) is located above the axis of the hypoid gear (8). Sling plates are provided at the outer end of the axle.

2. The axle housing consists of a differential carrier and pinion housing with extensions accommodating pressed-in tubes, the outer end of the tubes being flanged for attachment of spherical tube ends. The housing is ventilated by a drilling through one of the axle tube dowels, the breather is extended by a pipe attached to the chassis frame.



1	Thrust screw	6	Differential pinions	11	Constant velocity joint
2	Pinion	7	Roller bearing	12	Hub drive shaft fork
3	Tracta joint housing	8	Hypoid gear	13	Drive shaft housing
4	Differential casing	9	Adjusting nut	14	Drive sleeve
5	Side gears	10	Axle shaft fork	15	Roller bearing

Fig 1 Front axle assembly

3. The differential casing (4) to which the hypoid gear is bolted, is mounted on taper roller bearings.

4. Adjusting nuts (9) are used to position the gear transversely for meshing with the pinion.

5. A four pinion differential is used and thrust washers are assembled to the differential pinions (6) and side gears (5).

6. A thrust screw (1) in the right-hand side of the axle housing controls deflection of the hypoid gear under heavy load conditions.

7. The pinion is straddle mounted between a double row roller bearing (7) at its spigot end and a double row taper roller bearing (15) at its outer end.

8. The drive is transmitted through tracta constant-velocity universal joints (11). The outer end of the axle shaft incorporates a fork (10) which engages the spigot joint to the tracta joint. The shaft is supported in the axle tube end by a phosphor bronze bush.

9. The tracta joint comprises a spigot joint, which is assembled to the axle shaft fork, and a slotted joint, which is assembled to the hub drive shaft fork (12).

10. The inner end of the hub drive shaft is supported by a phosphor bronze bush and the outer end is splined for engagement with the hub driven sleeve (14).

11. The steering knuckle comprises a hub drive shaft housing (13), the inner end of which is bolted to a tracta joint housing (3). An oil seal is attached to the inner face of the tracta joint housing.

12. The tracta joint housing and hub drive shaft housing are carried by two pivots located in taper roller bearings in the axle tube end. On the drivers side of the vehicle the upper pivot is integral with the steering third arm. The lower pivots are integral with the steering arms.

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Chapter 7

STEERING

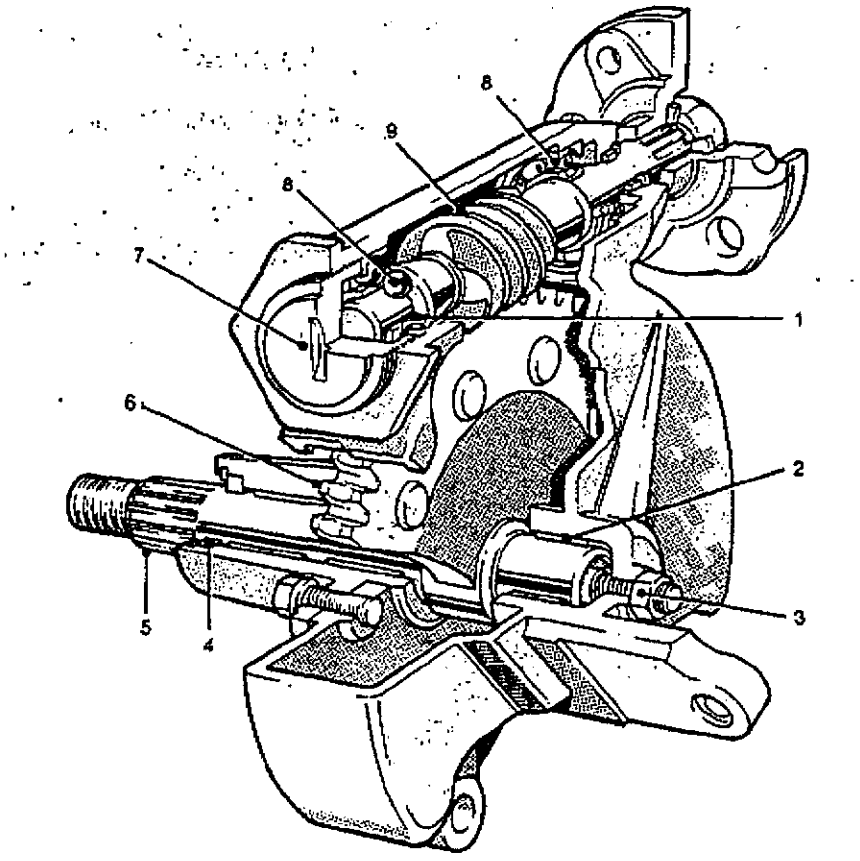
CONTENTS

STEERING GEAR

GENERAL DESCRIPTION

1. The steering gear is of the worm and sector type. An integral worm and shaft (Fig 1 (9)) is located in the steering gear by ball thrust bearings (8), one at each end of worm.

2. The upper bearing is located against a shoulder in the gear, whilst the lower bearing forms an abutment for an adjuster (7) in the lower end of the case. An oil seal (4) is located above the bearing.



1	Oil seal	4	Oil seal	7	Adjuster
2	Bushes	5	Drop arm shaft	8	Bearings
3	Adjusting screw	6	Sector	9	Worm and shaft

Fig 1 Steering gear

3. The sector (6) is riveted to a flange formed on the inner end of the drop arm shaft (5), which is supported in two lead-bronze steel backed bushes (2). An oil seal (4) is located at the outer end of the shaft. The engagement of the sector teeth with the worm is maintained by an adjusting screw (3).

STEERING WHEEL SHAFT AND COLUMN

4. The steering wheel is attached to the steering shaft by a nut and a plain washer. The mating surfaces of the wheel are serrated and tapered. The shaft nut is concealed by a plastic cover which is a push fit in the wheel boss. (Fig 2).

5. The steering shaft is enclosed by a column bolted to the cab toe panel and supported by a bracket on the instrument panel. The shaft rotates in a plain bearing in the top of the column. The headlamp beam and signal switches and hill holder control valve are also attached to the top of the column.

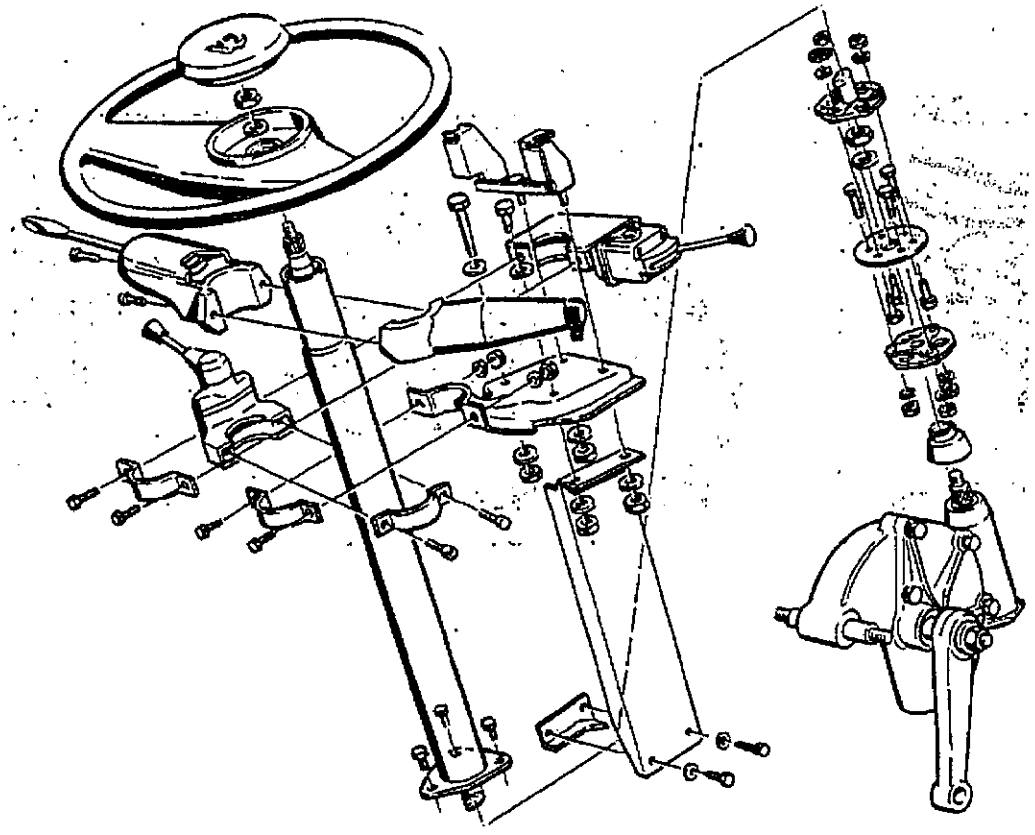
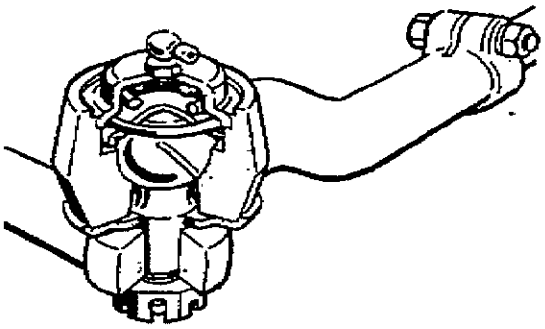


Fig 2 Steering wheel, shaft and column

6. The steering shaft is connected to the steering gear by a flexible coupling which consists of a fabric disc interposed between two flanges. One secured to the worm shaft and the other to the steering shaft.

STEERING TIE ROD AND CONNECTING ROD

7. The tie rod is provided with spring-loaded ball joints (Fig 3), threaded right and left hand for adjustment. It is possible to move the socket in line with the ball stud against compression of the spring when a load is applied on the socket end plate.



TS394/18 **Fig 3 Tie rod ball joint**

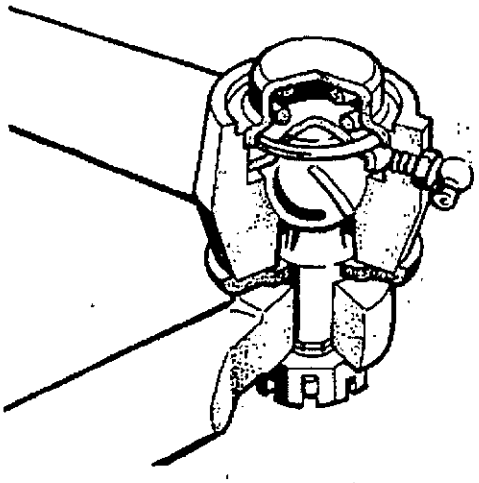


Fig 4 Connecting rod ball joint

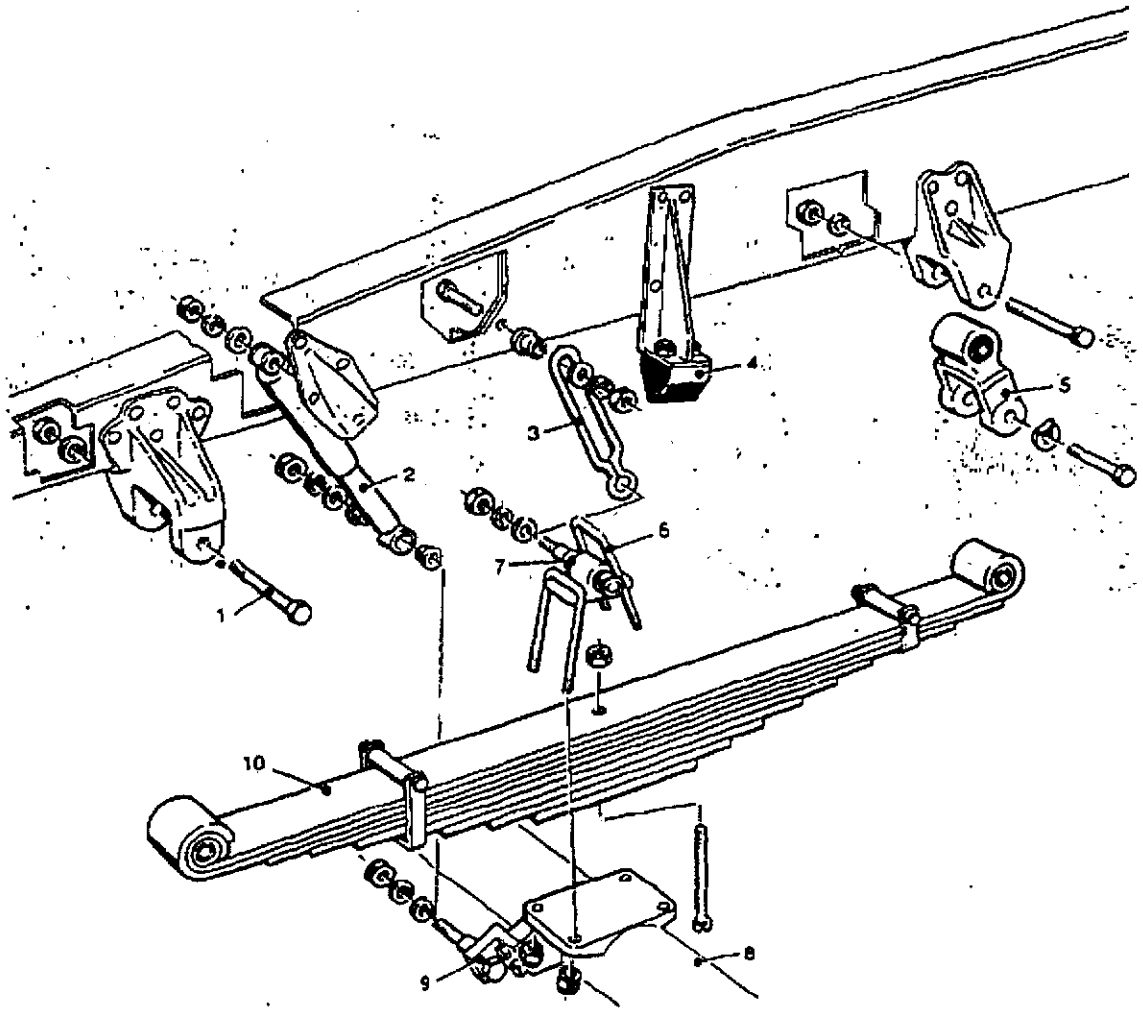
8. The connecting rod also incorporates spring-loaded ball joints (Fig 4), but it not adjustable for length.

9. If there is any free play in the joint which can be felt without applying pressure, the joint must be renewed.

Chapter 8

SUSPENSION

CONTENTS



1	Bolt	6	U-bolt
2	Shock absorber	7	Spacer
3	Rebound link	8	Axle
4	Rubber bumper	9	Shock absorber mounting bracket
5	Shackle	10	Spring

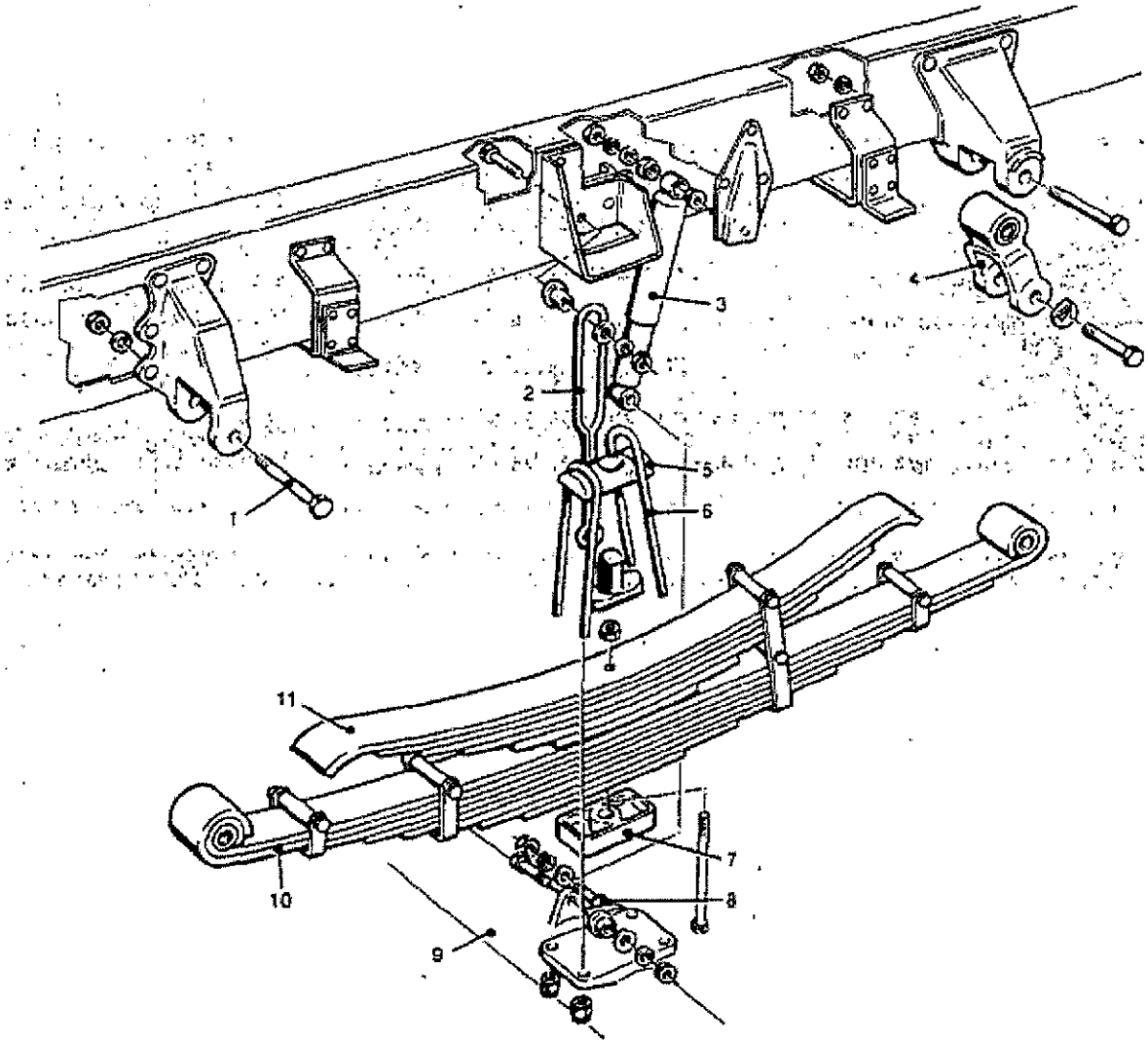
Fig 1 Front Suspension

SUSPENSION

GENERAL DESCRIPTION

1. The front and rear suspension (Figs 1 and 2) consists of semi-elliptical taper leaf springs and double acting hydraulic shock absorbers.

2. The rear suspension springs have eight leaves and a helper spring whereas the front suspension springs have nine leaves. The eyes of the spring main leaves and the shackels incorporate rubber bushes. The spring second leaf is extended around the eye of the main leaf to prevent excessive movement of the axle in the event of failure of the main leaf. The spring leaves are held together by a centre bolt and clips. All springs are equipped with rubber bumpers and rebound links.



1	Bolt	4	Shackle	7	Spacer	10	Spring
2	Rebound link	5	Spacer	8	Shock absorber mounting bolt	11	Helper spring
3	Shock absorber	6	U-bolt	9	Axle		

Fig 2 Rear suspension

3. The shackles, which are fitted at th . of the springs are attached to the hang bolts, lockwashers and nuts.

4. The rear of the spring is attached shackle by a bolt and tab washer.

5. Axles are secured to the springs bolts. Location of the axle is controlled b bolt spacer mounted on top of the spring.

6. The shock absorbers all have eye mountings.

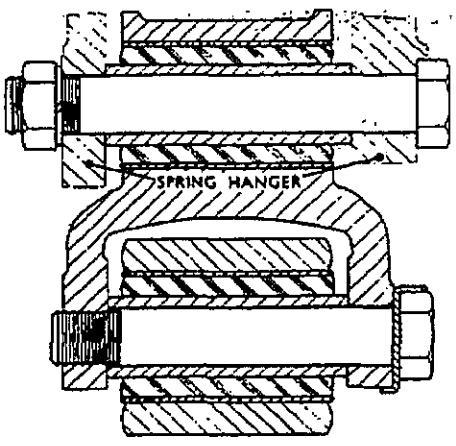


Fig 3 Spring and shackle bushes

Chapter 9

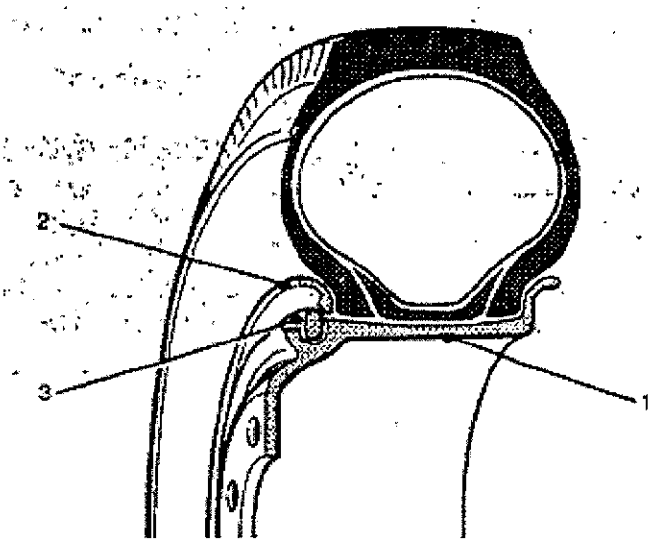
ROAD WHEELS AND TYRES

CONTENTS

ROAD WHEELS AND TYRES

GENERAL DESCRIPTION

1. The road wheels (Fig 1) are the heavy duty type with wide base rims and consist of three pieces, the rim base (1), and loose flange (2) and locking ring (3). Wheel size is B80 x 20.



1 Rim base

2 Loose flange

3 Locking ring

Fig 1 Road wheel

3. The wheels are standard ten stud fixing on 7/8 dia studs and the threads are left-handed on the left side of the vehicle.

3. Non directional cross counting pattern tyres are used on all wheels and the size is 12.00 - 20 x PR14. The tyres are tubed with flaps.

Chapter 10

AIR PRESSURE AND BRAKING SYSTEM

CONTENTS

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Fig *Page*

AIR PRESSURE AND BRAKING SYSTEM

GENERAL DESCRIPTION

1. The vehicle is equipped with an air operated, hydraulic actuated system (Fig 1) air pressure being supplied by a single cylinder compressor. The air intake is taken from the inlet manifold. A condensing reservoir with automatic drain valve is connected between the compressor and the dual air reservoir to eject moisture from the system.

2. The service and secondary circuits of the air system are fed with air through a triple pressure protection valve, which incorporates integral non-return valves for system isolation and supplies air to the dual air reservoir. The additional element of the triple pressure protection valve supplies the trailer brake system, which is two line braking.

3. Pressure in the storage system is controlled by a governor valve which signals the compressor accordingly. A dual air pressure gauge registers the pressure in the service and secondary reservoirs. Low pressure warning lamps and warning buzzer are also fitted.

4. All wheels are fitted with drum brakes of the leading and trailing shoe type, which are actuated by hydraulic double acting brake cylinders on the front and hydraulic transverse brake cylinders on the rear.

5. Service braking is controlled by the footbrake pedal via a dual footbrake valve which delivers air to a master cylinder actuator. The hydraulic tandem master cylinder operates the front and rear brakes independently. A load sensing valve is incorporated in the rear axle circuit to proportion the degree of braking accordingly to the axle load, thus ensuring optimum braking under all load conditions.

6. The footbrake also applies to trailer via a dual relay valve, when required.

7. The hill holder hand control valve applies the vehicle service brakes and trailer brakes via a change over valve.

8. The master cylinder actuator has a service and secondary means of air supply which are, independent of each other and controlled by the footbrake valve. In the event of a failure of the service system the secondary system is automatically brought into action to provide reduced but positive braking.

9. The hill holder hand control valve can also be used to apply the vehicle brakes in the event of a failure of the footbrake valve.

10 The parking brake is of the drum type transmission, fitted to the rear axle and operated by a hand lever and cables.

11. Vehicles are equipped with a two line braking system for towing a trailer. Air from the footbrake valve signals the dual relay valve, which then delivers air to the trailer control line (service), identified by a yellow coupling. The trailer emergency line is fed direct from the supply side of dual relay valve and is identified by a red coupling.

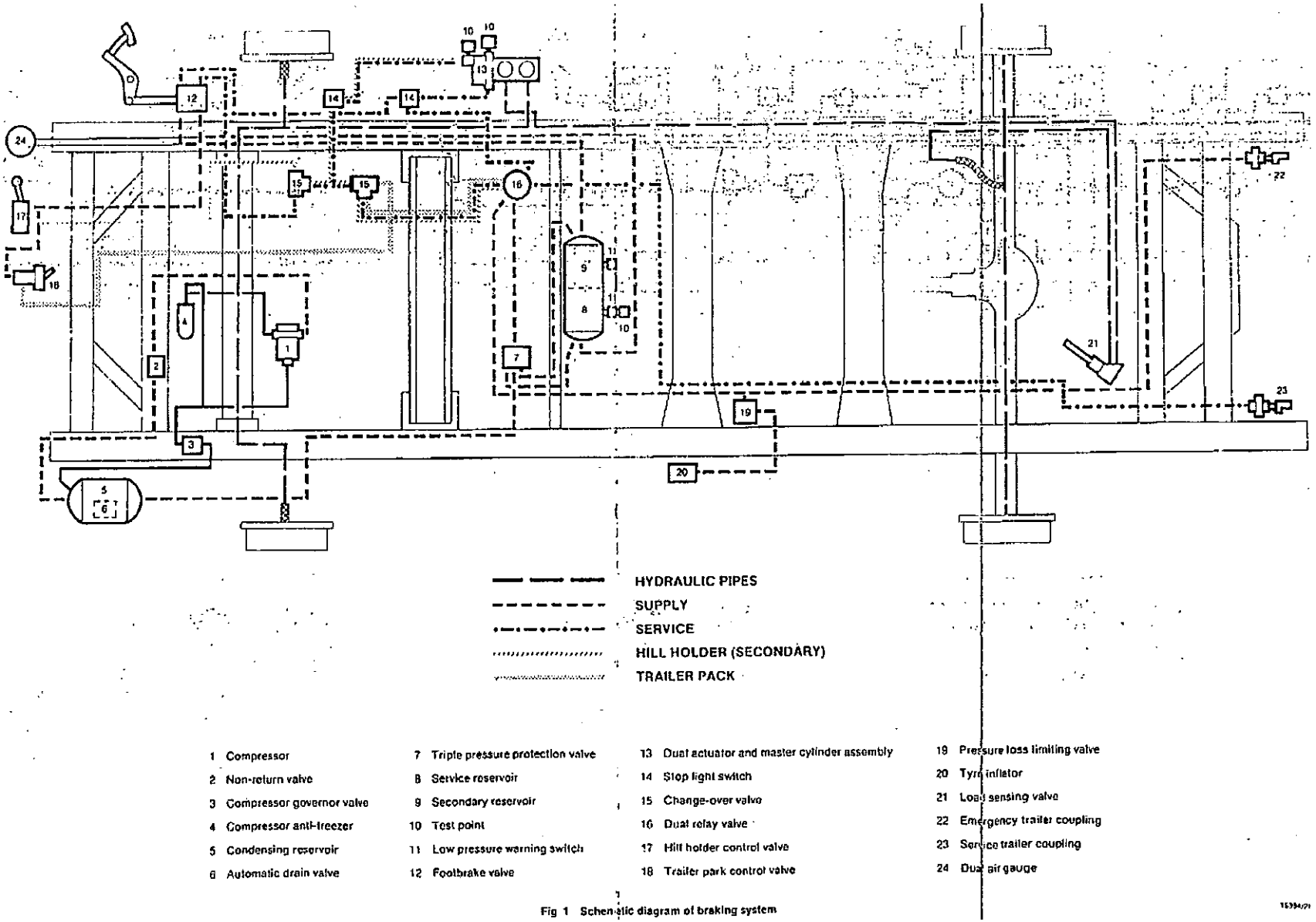
12. The trailer may also be parked by the trailer park control valve which applies the trailer service brakes whilst the trailer manual brake is applied.

13. The majority of the air pipes in the braking system are of the coloured flexible type, with red being the supply circuit, yellow the service brakes circuit, orange the parking circuit and blue the hill holder control circuit.

14. The brake lines shown in black represent:

14.1 Hydraulic fluid pipes from the master cylinder to the slave cylinders and load sensing valve.

14.2 Nylon pipes being used in the area of the governor valve, anti-freezer and supply pipes to air pressure gauges.



1 Compressor	7 Triple pressure protection valve	13 Dual actuator and master cylinder assembly	19 Pressure loss limiting valve
2 Non-return valve	8 Service reservoir	14 Stop light switch	20 Tyre inflator
3 Compressor governor valve	9 Secondary reservoir	15 Change-over valve	21 Load sensing valve
4 Compressor anti-freezer	10 Test point	16 Dual relay valve	22 Emergency trailer coupling
5 Condensing reservoir	11 Low pressure warning switch	17 Hill holder control valve	23 Service trailer coupling
6 Automatic drain valve	12 Footbrake valve	18 Trailer park control valve	24 Dual air gauge

Fig 1 Schematic diagram of braking system

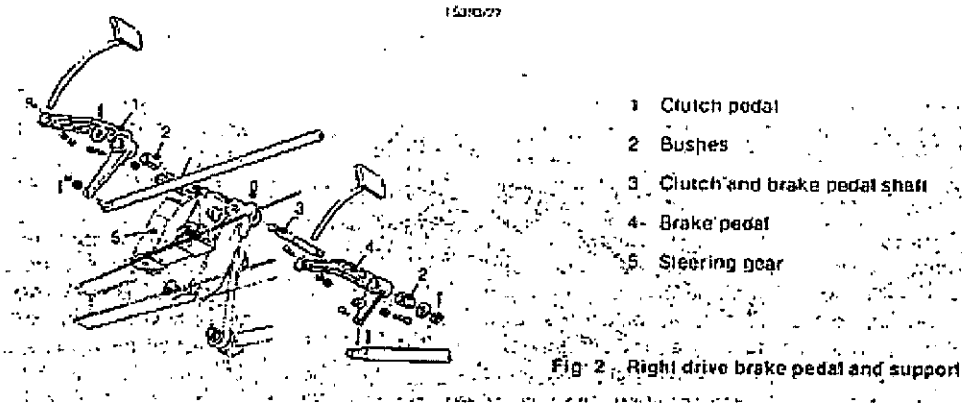
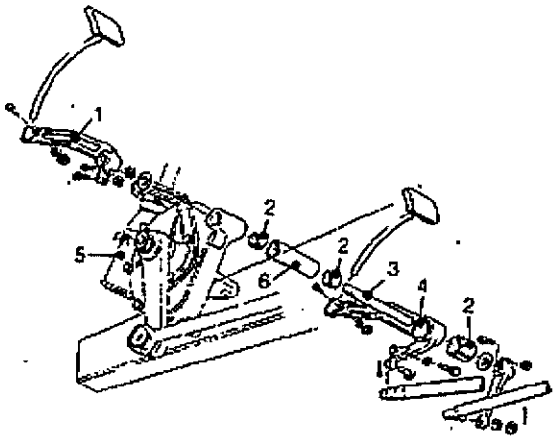


Fig 2 Right drive brake pedal and support

BRAKE PEDAL AND SUPPORT

15. The brake pedal pivots on a shaft mounted on the steering gear. On right drive vehicles (Fig 2) the shaft (3) also carries the clutch pedal (1).



T5394/23

Fig 3 Left drive brake pedal and support

16. On left drive vehicles (Fig 3) the shaft (6) is hollow and bushed to support a separate clutch pedal shaft (3).

1 Clutch pedal
2 Bushes
3 Clutch pedal shaft
4 Brake pedal
5 Steering gear
6 Brake pedal shaft

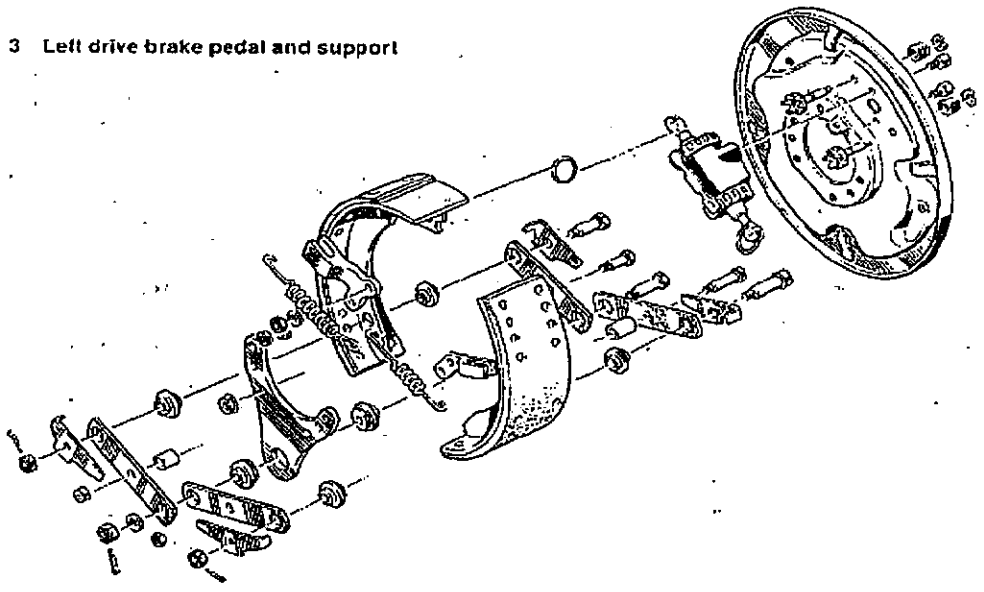


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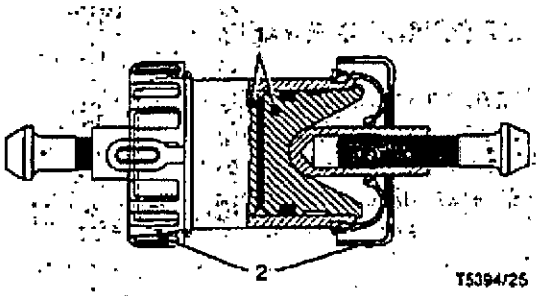
Fig 4 Rear brake assembly

FRONT AND REAR BRAKE ASSEMBLY

17. The front and rear brakes (Fig 4) are of the leading and tailing shoe type operated by hydraulic, brake cylinders. The shoes are held against the flange plate by spring-loaded retainers and provided with individual return springs. Anchor springs secure shoes to the brake cylinder push rods. The leading shoes have a show support. The brake cylinders bolted to the flange plate and fitted with drum type adjusters are activated from outside the flange plates.

BRAKE CYLINDERS

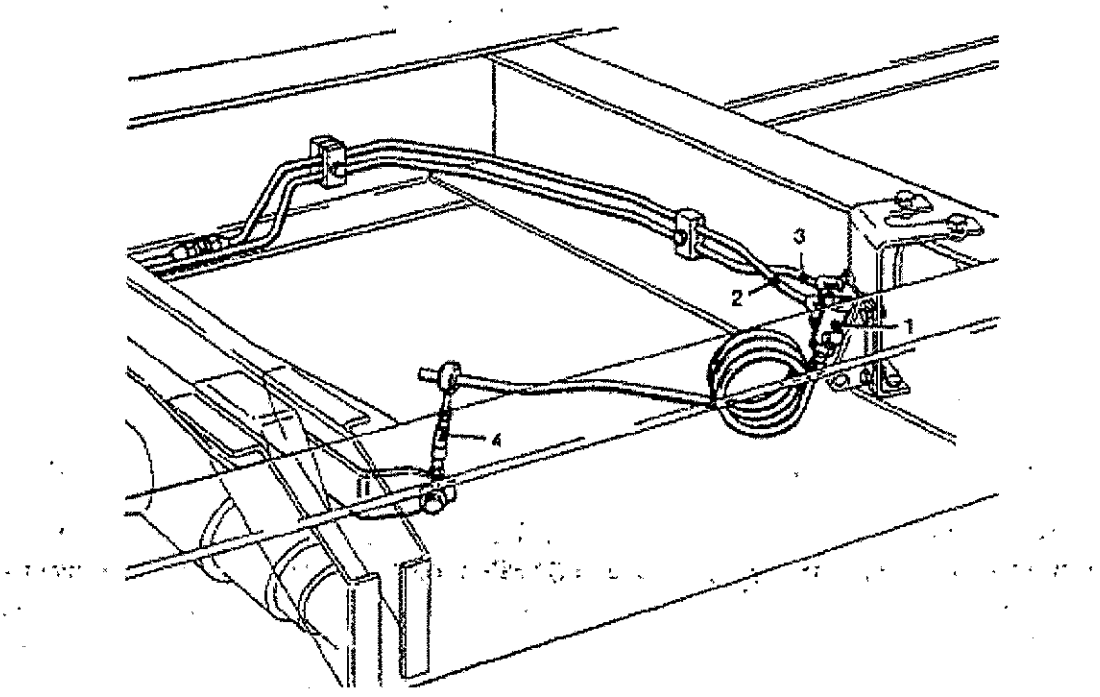
18. The front and rear brake cylinders are attached to the inside face of the brake flange plates and contain two opposed pistons (Fig 5(1)). They are fitted with drum type adjusters (2) actuated from the outside of the flange plate.



1 Pistons
2 Adjusters

LOAD SENSING VALVE

19. A load sensing valve (Fig 6(1)) is installed in the hydraulic line to the rear brakes which allows the degree of braking at the rear wheels to be increased or decreased according to variation in load on the rear axle.



1 Load sensing valve
2 Hydraulic supply from tandem master cylinder
3 Hydraulic delivery to rear brakes
4 Link to rear axle

Fig 6 Load sensing valve installation

20. The valve is mounted on the rear chassis crossmember and operated by a pair of sensing springs connecting the valve operating lever to an adjustable link (4) attached to the rear axle.

21. A load sensing valve data plate (Fig 7) provides details for setting load sensing valve with vehicle in an unladen condition.

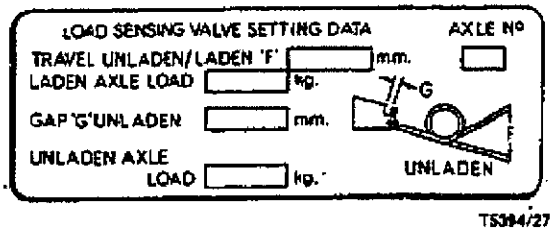


Fig 7 Load sensing valve setting data plate

22. The plate is attached to the door aperture (Fig 8).

23. With an unladen vehicle initial pressure on the footbrake valve causes brake fluid to flow through the valve intake port ((Fig 9(4)) pas the ball valve (6) and out of the outlet port (5) to the rear brake cylinders

24. As pressure in the rear brakes increases, it loads the valve piston (7) until pressure is sufficient to overcome the combined loads from internal spring (1) and sensing spring (2). The piston then moves down allowing the ball valve to close, thus preventing further pressure to the rear brakes.

25. When the brakes are released the reducing pressure in the lower chamber allows the piston to be pushed downwards and this movement opens the ball valve which allows the piston to return to its original position.

26. Should braking be increased after initial application, the extra pressure from the master cylinder in the lower chamber forces the piston upwards, which opens the ball valve allowing fluid to pass until pressure at the rear brakes is sufficient to force the piston down again and close the ball valve. These rapid controlling movements are repeated as long as pressure at the master cylinder continues to rise.

27.When the vehicle is laden the sensing spring applies an upward force to the piston in proportion to the weight and fluid pressure to the brakes has to be proportionally higher before the piston can be moved downwards to close the valve. Eventually the force on the piston is such that maximum braking pressure is insufficient to move it and the valve remains open. In this condition the valve is inoperative and offers no restriction to the fluid.

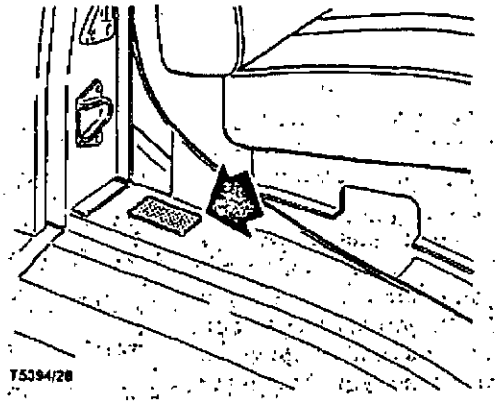
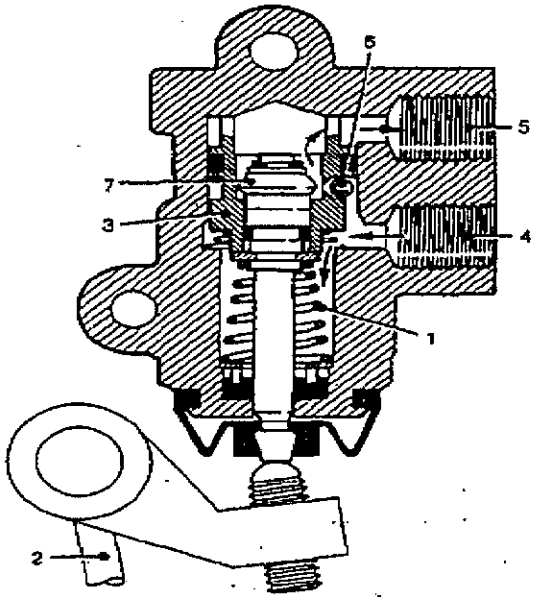


Fig 8 Load sensing valve data plate position



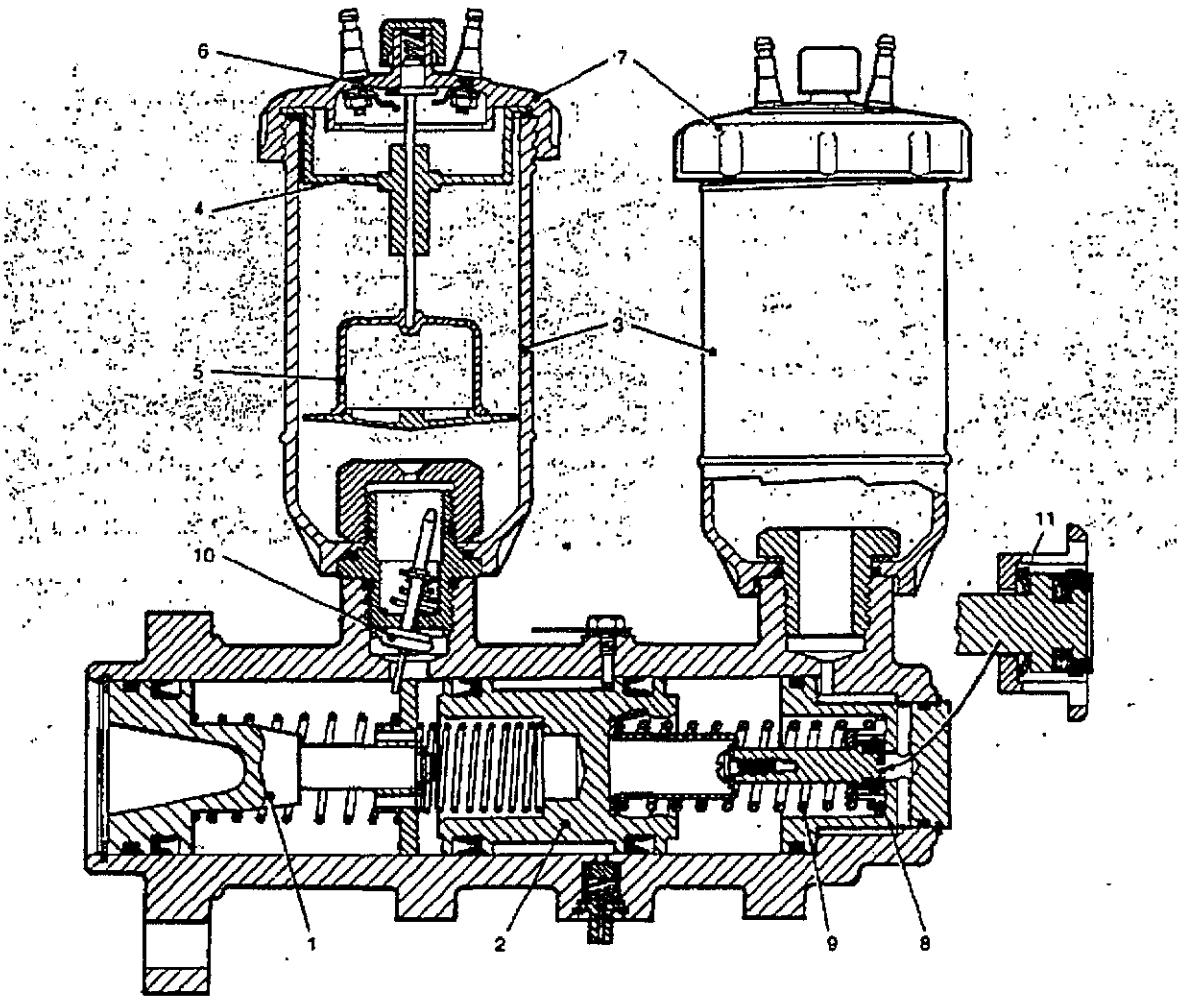
1 Spring
2 Sensing spring
3 Sleeve
4 Intake port
5 Outlet port
6 Ball valve
7 Valve piston

T5394/29 Fig 9 Load sensing valve

BRAKE MASTER CYLINDER

28. The cylinder (Fig 10) contains two spring-loaded pistons (1 and 2) each fitted with rubber seals. Two detachable plastic reservoirs (3) each contain a filter (4) and a float assembly (5). The floats operate the low level warning switches (6) and are incorporated in the reservoir caps (7).

29.The reservoir adjacent to the master cylinder actuator has a self-contained recuperating valve which is screwed into a tapped boss in the cylinder so that the valve spindle projects into the cylinder bore. The valve is held open by the piston flange when the brakes are off and closes under the action of its spring as the piston moves when the brakes are applied.



1	Piston	4	Filter	7	Reservoir cap	10	Recuperating valve
2	Piston	5	Float	8	Recuperating valve	11	Wave washer
3	Reservoir	6	Low pressure warning switch	9	Spring		

Fig 10 Section of master cylinder T5394/30

30. The recuperating valve (8) for the other reservoir is incorporated in piston assembly (2) and held open by spring (9) when the brakes are off. When the brakes are applied the movement of piston (2) compresses spring (9) and the recuperating valve is then closed by wave washer (11).

31. Two adaptors screwed into tapped bosses in the side of the cylinder retain spring-loaded check valves and provide attachment for the front and rear hydraulic pipes. The check valves are provided with by-pass holes.

Master cylinder vent

32. A vent (Fig 11) is incorporated in the base of the master cylinder (arrowed). Brake fluid visible from this vent indicates a faulty secondary or primary piston. Slight dampness around the vent is acceptable due to brake fluid presence on cylinder bores to lubricate piston seals.

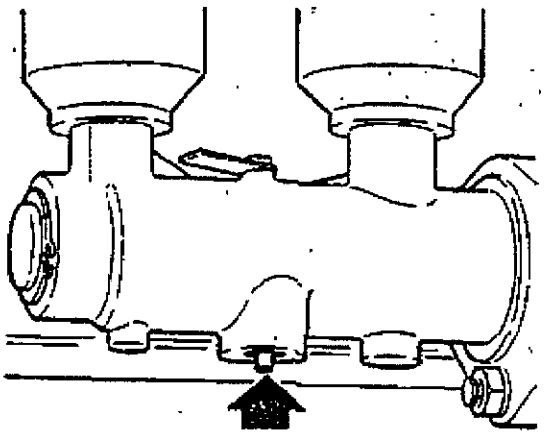


Fig 11 Master cylinder vent T5394/31

Master Cylinder Actuator

33. The master cylinder actuator (Fig 12) which is mounted, together with the hydraulic tandem master cylinder, on the chassis sidemaster.

34. The actuator (Fig 13) consists of a circular body (1) clamped between two cylinders (2) each, containing a piston (3). A push rod (4) which is held towards the rear of the actuator by a return spring (5) passes through the centre of one piston and abuts the centre of the other. Movement of either piston is transmitted by the push rod to the master cylinder primary piston.

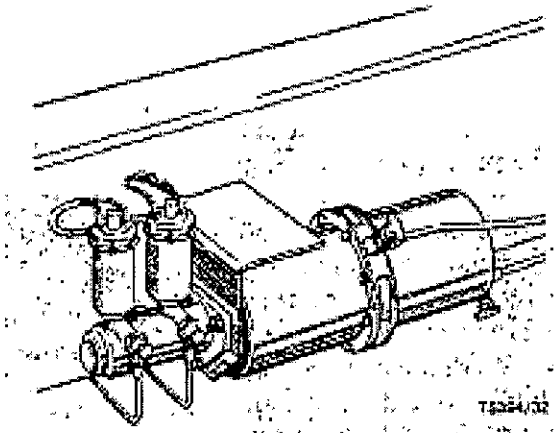
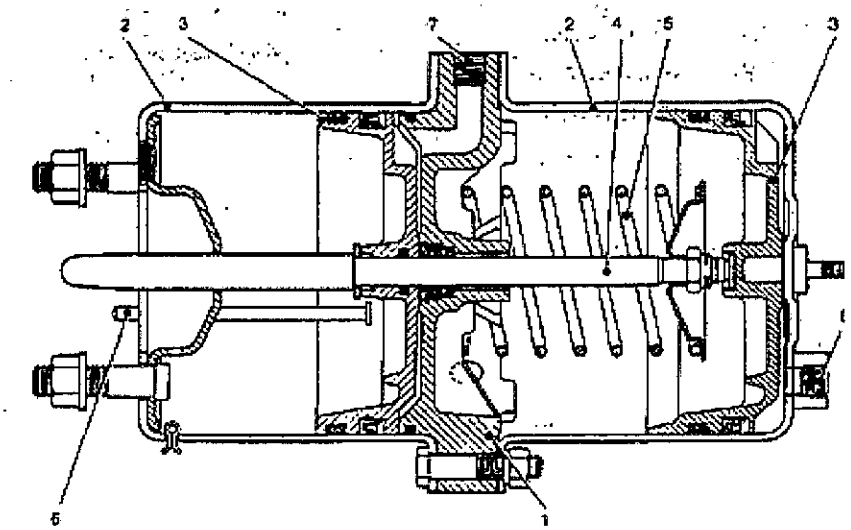


Fig 12 Master cylinder and actuator assembly



1 Body 3 Piston 5 Return spring 7 Supply port
2 Cylinder 4 Push rod 6 Indicator rod 8 Supply port

Fig 13 Master cylinder actuator

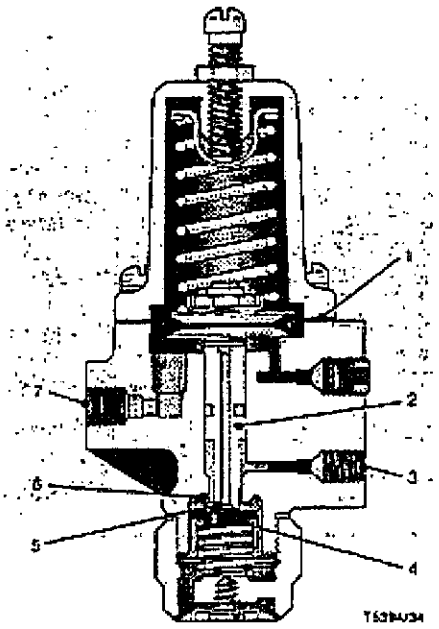
35. An indicator rod (6) which provides a visual indication of brake shoe travel is incorporated in the cylinder adjacent to the master cylinder.

36. When the footbrake is applied, compressed air enters the supply ports (7 and 8) of both cylinders behind the pistons. This causes the pistons to move along the cylinders and operate the master cylinder by means of the push rod.

COMPRESSOR GOVERNOR VALVE

37. The output of the compressor is controlled by a diaphragm type governor valve (Fig 14) mounted on the chassis sidemember.

38. The valve comprises a body and cover containing a spring, a diaphragm assembly and a spring-loaded inlet/exhaust valve. The diaphragm assembly consists of a diaphragm (1) and a hollow plunger (2) which contacts the inlet/exhaust valve (4). A nut, fitted with an exhaust diaphragm retains the inlet/exhaust valve and spring in position in the body.



1 Diaphragm
2 Plunger
3 Delivery port
4 Inlet/Exhaust valve
5 Inlet valve seat
6 Exhaust valve seat
7 Supply port

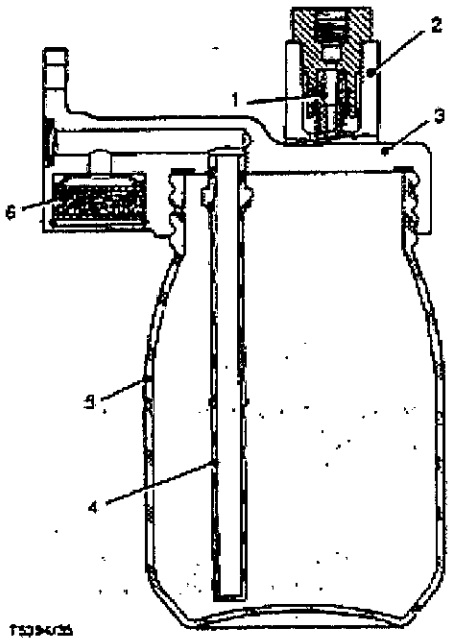
Fig 14 Compressor governor valve

39. Compressed air from the reservoir enters the supply port (7) beneath the diaphragm. When the air pressure is sufficient to overcome the spring pressure the diaphragm assembly lifts and the spring-loaded inlet/exhaust valve contacts the exhaust valve seat (6) in the body. Further movement of the diaphragm assembly causes the inlet valve seat (5) to move away from the inlet/exhaust valve and air passes through the hollow plunger and delivery port (3) to operate the compressor unloader valve.

40. As the air pressure in the reservoir decreases, the spring depresses the diaphragm assembly. When this occurs the plunger closes the inlet valve and opens the exhaust valve allowing the air pressure in the compressor unloader valve to exhaust through the exhaust nut to atmosphere and normal operation of the compressor is resumed.

COMPRESSOR ANTI-FREEZER

41. To prevent freezing of the moisture in the air drawn into the compressor when the vehicle is operating under low ambient temperature conditions an anti-freezer is incorporated in the air system. The anti-freezer (Fig 15) consists of a reservoir (5) and a cover (3) fitted with an air filter (6), filter plug and check valve (2). Under conditions of low ambient temperature the reservoir is filled with methyl alcohol solution. When the compressor is operating a partial vacuum is present in the compressor manifold and above the methyl alcohol in the anti-freezer reservoir. This causes air to pass through the air filter and tube (4) to the bottom of the reservoir. The air them mixes with the alcohol and the vapour is drawn into the compressor inlet.

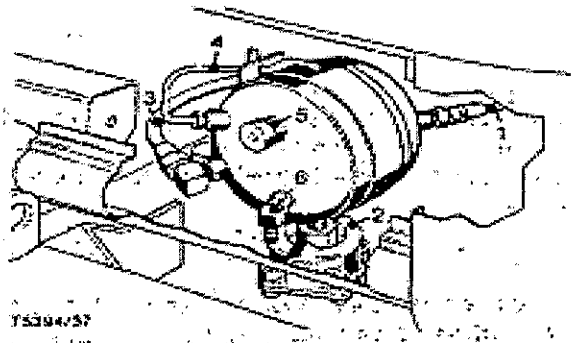


1 Check valve plunger
2 Check valve
3 Cover
4 Tube
5 Reservoir
6 Air filter

Fig 15 Compressor anti-freezer

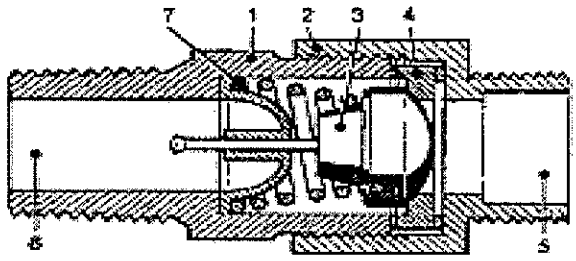
42. When the compressor is unloaded, air from the governor valve causes the plunger (1) in the check valve to close the anti-freezer outlet port and prevent alcohol being supplied to the compressor intake.

43. The compressor anti-freezer is mounted on the rear of the left hand side of the cab.



1 Supply to triple pressure protection valve
2 Automatic drain valve
3 Supply from compressor
4 Signal to governor valve
5 Safety valve
6 Schrader valve

Fig 16 Condensing reservoir



1 Valve body
2 Screw cap
3 Valve
4 Valve seat
5 Supply port
6 Delivery port
7 Return spring

Fig 17 Section of non-return valve

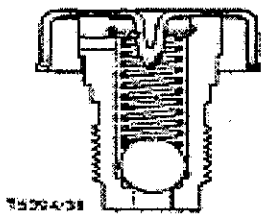


Fig 18 Section of a safety valve

CONDENSING RESERVOIR

44. A condensing reservoir (Fig 16) fed by air from the compressor via a non-return valve, is mounted on the chassis sidemember at the front.

45. It is fitted with an automatic drain valve (2) and a non adjustable ball type safety valve (5). Airline (3) is the condensing reservoir feed from the compressor. Airlines (1 and 4) supply the triple pressure protection valve and governor valve respectively.

46. A schrader valve (6) is also fitted so the air system can be charged from an outside source if the engine is inoperative.

Non-return valve

47. A non-return valve (Fig 17) is located in the supply connection to the condensing reservoir. The valve consists of a body (1) and screw cap (2) containing a half round rubber valve (3) spring-loaded against a valve seat (4).

48. Compressed air from the compressor enters the supply port (5) and pushes valve (3) off its seat depressing spring (7). Air now flows past the valve and out of delivery port (6).

49. When pressure at supply port is reduced the valve is forced back onto its seat by the spring and any reverse flow of air from the delivery port to supply port is prevented.

Safety Valve

50. A safety valve (Fig 18) located in the servo reservoir, protects the all system against excessive air pressure in the event of governor valve failure. The valve is non adjustable and consists of a body containing a spring-loaded ball valve retained by a washer and circlip. A dust cover is fitted over the valve body.

Automatic Drain Valve

51. The automatic drain valve (Fig 19), located in the lowest part of the condensing reservoir comprises a body and cover containing an inlet/exhaust valve (1) and a nylon valve guide (3).

52. The inlet and exhaust valves are normally in contact with their seats (2 and 4) but air and condensate from the reservoir pass into the valve body by flexing the inlet valve away from the seat. The air pressure inside the valve is, therefore, the same as the reservoir pressure.

53. When the reservoir pressure is reduced, the air pressure in the valve body causes the inlet/exhaust valve to lift and open the exhaust valve, allowing condensate and air to exhaust through the cover.

54. After this operation is complete, reservoir pressure above inlet/exhaust valve is greater than pressure below the valve, and exhaust valve again closes.

TRIPLE PRESSURE SYSTEM PROTECTION VALVE

55. A triple pressure system protection valve (Fig 20) is installed in the braking system to prevent total loss of air supplied to individual reservoirs, should a leak develop in any one circuit.

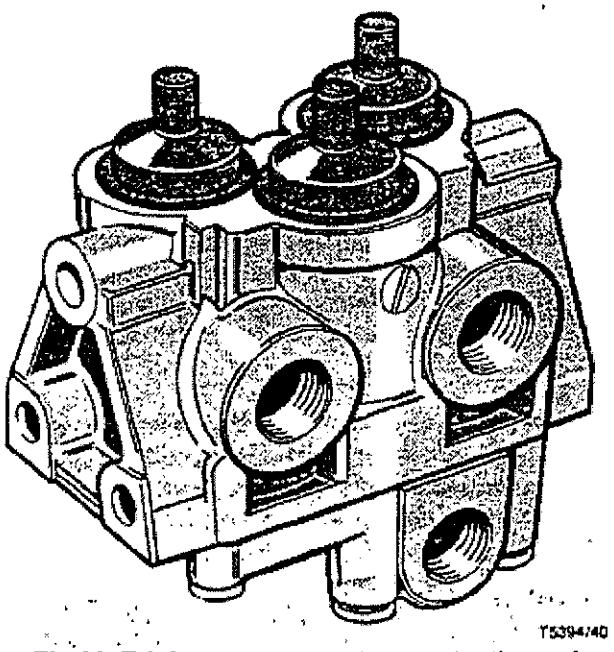
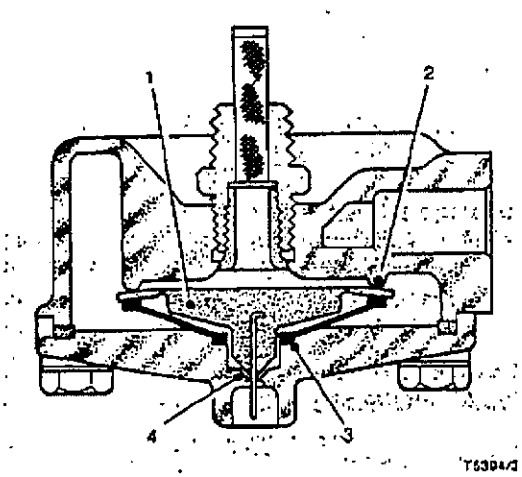


Fig 20 Triple pressure system protection valve

58. When compressed air from the condensing unit reaches initial valve opening pressure, the piston (Fig 22(9)) rises slightly and allows air to pass by the non-return (14) valve to the reservoir. As the air pressure in the reservoir builds up, it acts on the piston lower face and further compresses the control spring (7) until the piston is fully raised. In normal condition, pressure in the reservoir holds the piston up whilst the non-return valve permits recharging and prevents pressure feed back.

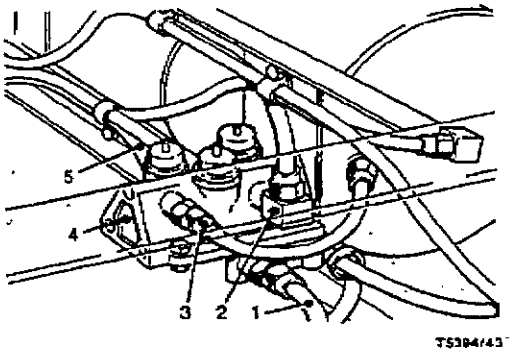


1 Inlet/exhaust valve
2 Inlet valve seat
3 Nylon valve guide
4 Exhaust valve seat

Fig 19 Section of automatic drain valve

56. The valve is installed in the supply line to the service and secondary reservoirs and the trailer brakes supply line (Fig 21).

57. Integral non-return valves prevent feed back from the reservoirs.



1 Supply feed from condensing reservoir
2 Supply to Secondary reservoir
3 Supply to Service reservoir
4 Triple pressure protection valve
5 Supply to trailer brakes relay valve

Fig 21 Air pipe connections at triple pressure system protection valve

59. Should a leak occur in the circuit, the control spring will, when the reservoir pressure drops below the valve closing pressure, return the piston and hold the non-return valve on its seat.

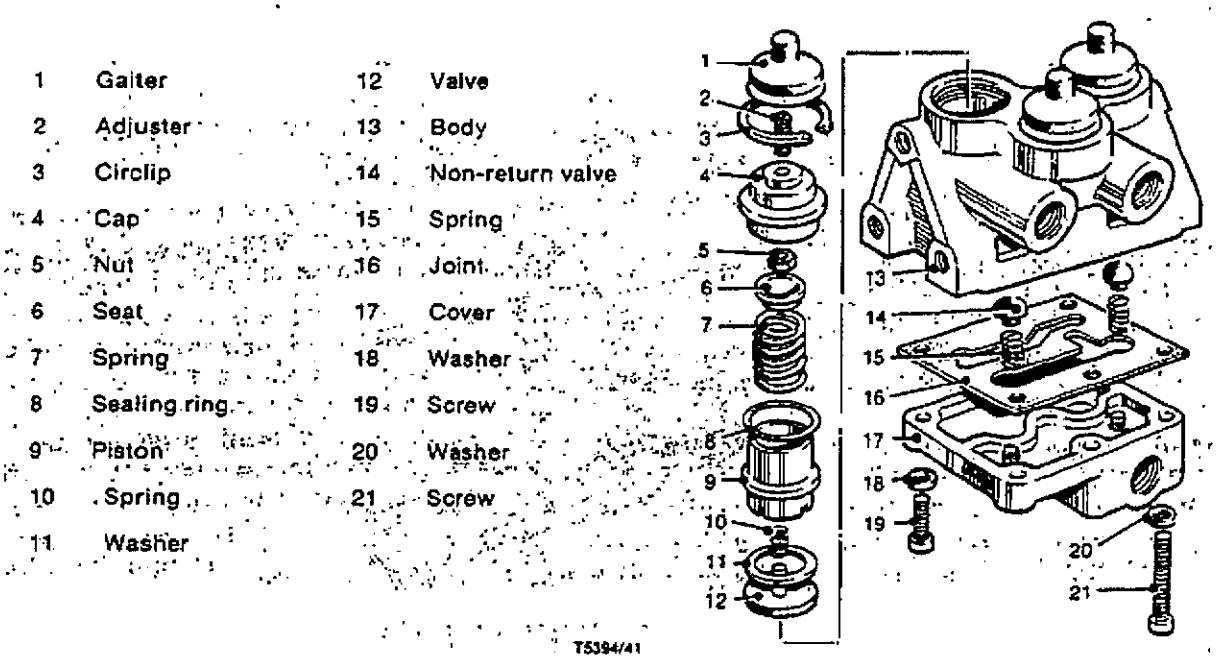
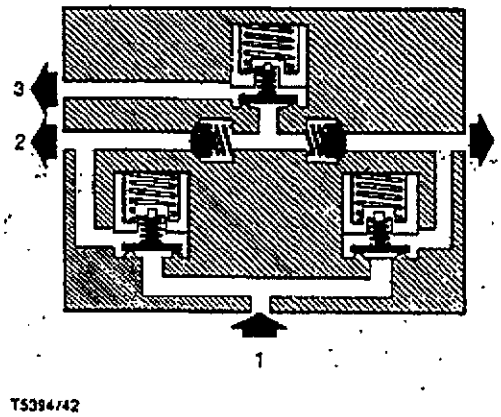


Fig 22 Exploded view of triple system protection valve

60. This allows all other reservoirs to be charged to an efficient operating level as the valve supplying the faulty circuit will not open until the specified initial opening pressure of the valve has been reached in the remainder of the circuit.

61. The valve initial opening pressure differs from valve closing pressure because to initially open the valve, spring pressure must be overcome by air pressure acting on a small surface area, whereas when the valve is open, reservoir back pressure acting on the lower face of the piston, a relatively larger surface area, prevents the spring from closing the valve until reservoir pressure drops below the specified valve closing pressure.



1 Inlet port

2 Service supply port

3 Trailer supply port

4 Secondary supply port

Fig 23 Schematic diagram of triple pressure system protection valve

62. The valve comprises three single elements in one body (Fig 23). Air enters through port (1) supplying the Service and Secondary reservoirs through ports (2) and (4) respectively before supplying the trailer circuit through port (3). Two additional non-return valves prevent cross leakage of the interconnected ports leading to the trailer circuit element, should air loss in either the Service or Secondary circuits occur.

LOW PRESSURE WARNING SWITCHES

63. Low air pressure warning switches (Fig 24) are incorporated in the Service and Secondary reservoirs. The switches, which actuate a buzzer and warning lamp in the vehicle if the pressure in either reservoir falls below the minimum required, are sealed units and consist of a body, spring-loaded diaphragm and contacts.

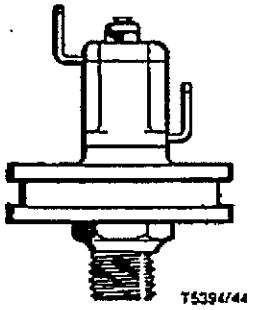
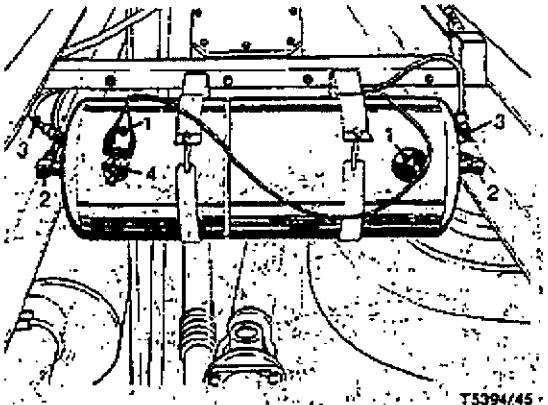


Fig 24 Low pressure warning switch



1 Low pressure warning switch
2 Supply to footbrake valve
3 Supply from triple pressure system protection valve
4 Test point

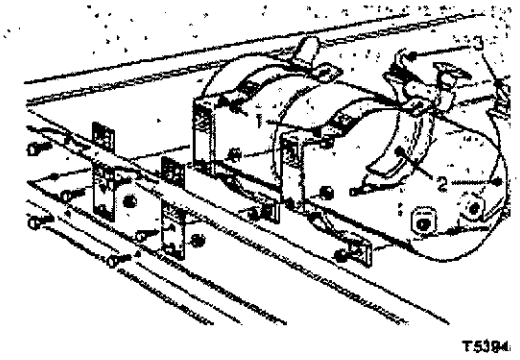
Fig 25 Dual air reservoir

66. The dual air reservoir is supported by brackets (Fig 26 (1)) attached to the rear of the spare wheel crossmember. The reservoir is clamped to the brackets by straps (3) with insulators (2) installed between strap and reservoir.

DUAL AIR RESERVOIR

64. Dry air from the condensing reservoir passes through the triple pressure protection valve to the dual reservoir (Fig 25). This is a Service and Secondary reservoir combined in one assembly. The reservoirs incorporate drain plugs, a test point (4) and low pressure warning switches (1).

65. Air lines (2) from each reservoir supply air to the footbrake valve whilst lines (3) are the feed from the triple pressure protection valve.

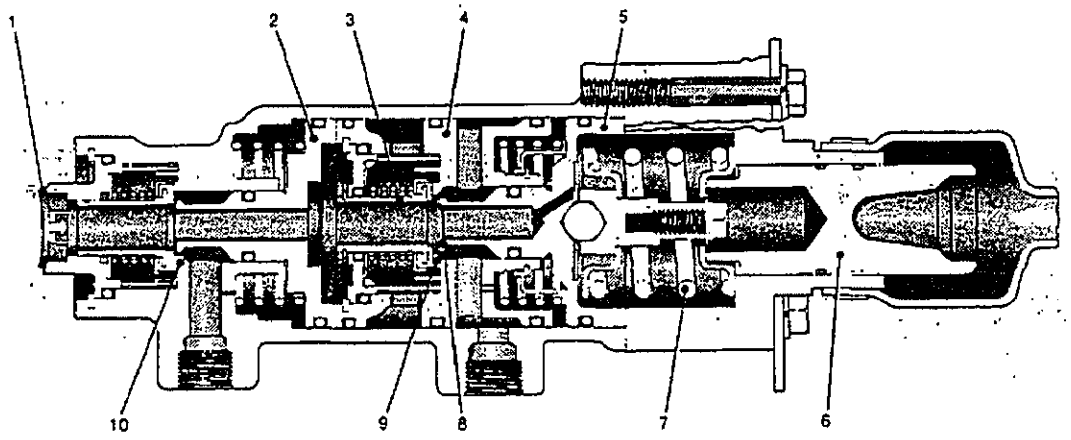


1 Brackets 2 Insulators 3 Strap

Fig 26 Attachment of air reservoir

FOOTBRAKE VALVE

67. The dual footbrake valve (Fig 27) which is operated by the brake pedal, is mounted on the chassis sidemember at the front of the vehicle on the drivers side.



1 Exhaust diaphragm
2 Rear piston
3 Inlet/exhaust valve
4 Valve carrier
5 Front piston
6 Plunger
7 Buffer spring
8 Exhaust valve seat
9 Inlet valve seat
10 Inlet valve seat

Fig 27. Footbrake valve

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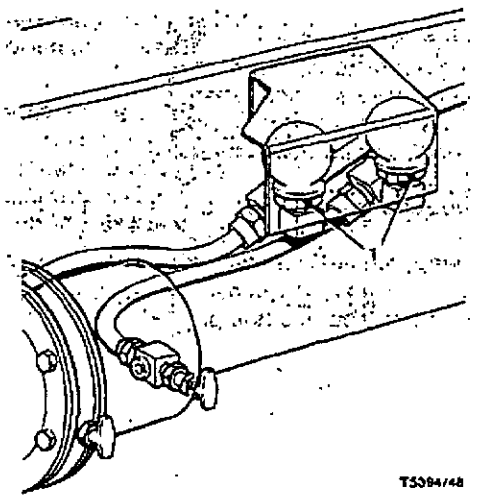
68. When the brake pedal is depressed, force is applied via the plunger (6) and buffer spring (7) to the front piston (5), causing the exhaust valve seat (8) on the piston to close on the inlet/exhaust valve (3). The force is also transmitted via the valve carrier (4) to the rear piston (2), causing the exhaust valve seat on the piston to close on the inlet/exhaust valve. Further pressure on the brake pedal causes the pistons to lift the inlet valves from the seat (10) in the body and seat (9) in the carrier, allowing compressed air from the reservoirs to pass through the valve to the brake actuators, load sensing valve and relay valves.

69. The air pressure delivered by both halves of the valve is proportional to the effort applied to the brake pedal and the valve imparts a reaction relative to the movement of the brake pedal so that the driver can sense the degree of brake application.

70. When the brake pedal is released, the pistons and valve carrier return under the action of spring and air pressure. This movement closes the inlet valves and unseats the exhaust valves to release the pressure in the brake lines through the exhaust diaphragm.



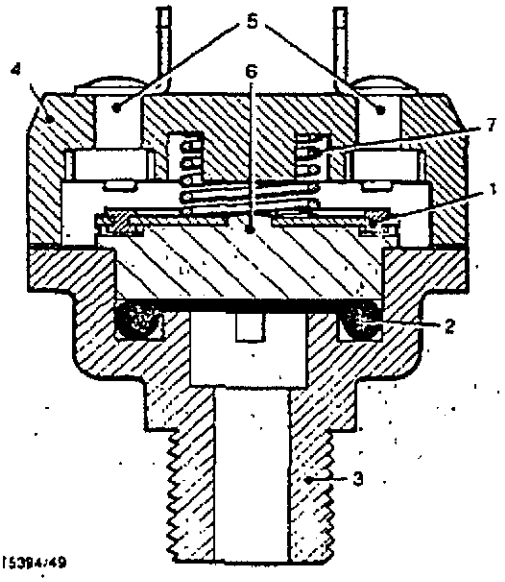
1 Stop lamp switch

Fig 28 Stop lamp switches location

STOP LAMP SWITCH

71. A stop lamps switch (Fig 28 (11)) is incorporated in the airline, between the footbrake valve and master cylinder actuator and the airline from the change over valve to the master cylinder actuator. The switches are located on the outside of the chassis right hand sidemember.

72. Each switch consists of a body (Fig 29 (3)) and cover (4) containing two terminals (5), an electrical contact strip (1) piston (6) piston return spring (7) and diaphragm (2).



1 Contact strip
2 Diaphragm
3 Body
4 Cover
5 Terminals
6 Piston
7 Piston return spring

Fig 29 Stop lamp switch section

CHANGE-OVER VALVE

73. Two change-over valves (Fig 30) are incorporated in the braking system to prevent the compound application of the brakes by more than one of the following control valves.

73.1 Footbrake valve

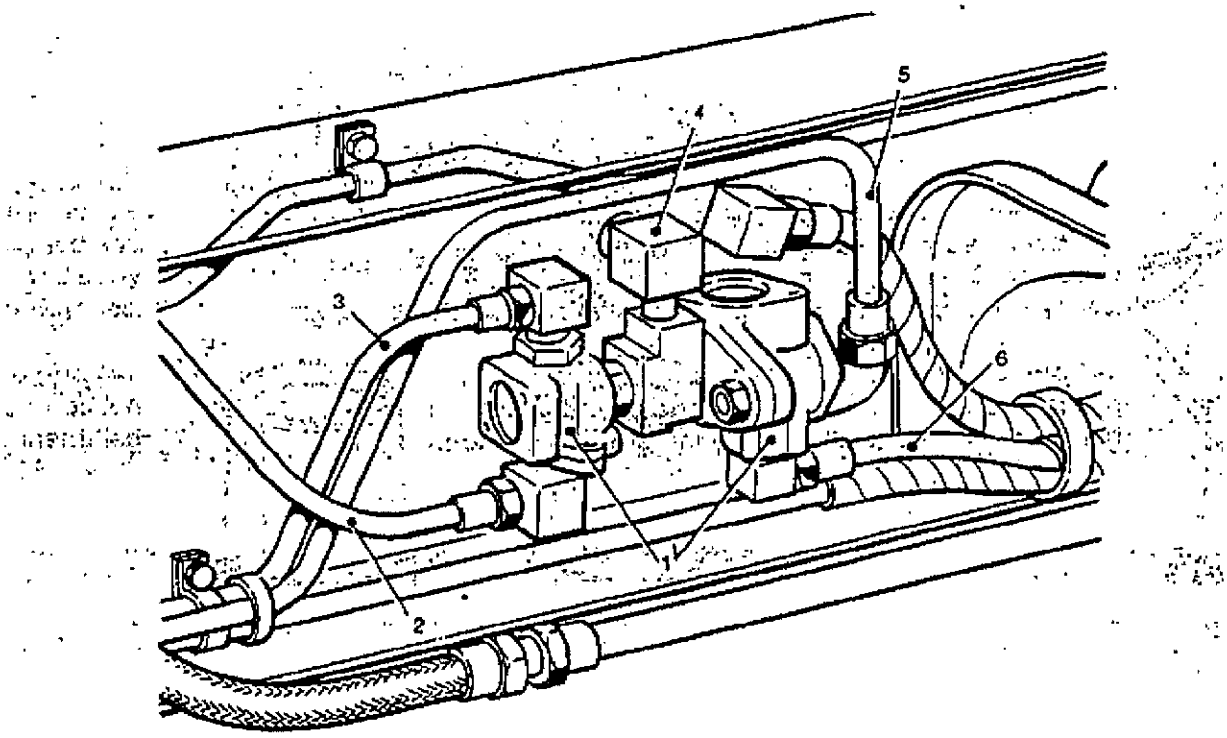
73.2 Hill holder control valve

73.3 Trailer park control valve

74. The change over valves are located on the inside of the right hand sidemember.

75. Each valve (Fig 31) consists of a body which has two supply ports and one delivery port. The body contains a shuttle valve which is free to move along its guide.

76. When air enters port (1) the shuttle valve moves to the opposite end to seal the other supply port (2). This allows air to pass through the delivery port (3) and prevents leakage through the supply port.



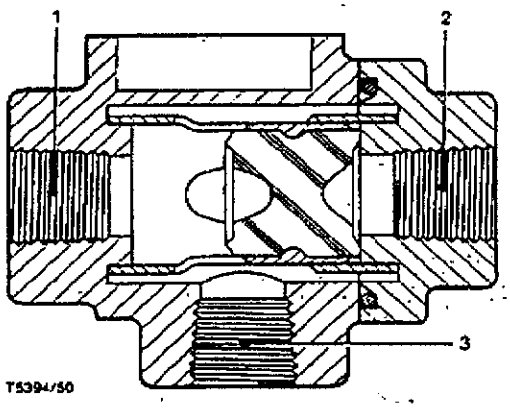
1 Change-over valves
2 Supply from footbrake valve
3 Supply from hill holder valve
4 Supply to stop lamp switch and master cylinder actuator
5 Supply from trailer park control valve
6 Signal line pressure to dual relay valve

Fig 30 Airline connections to change-over valves

77. Should the supply through port (1) fail, or a greater supply enter through port (2) the shuttle valve will move along its bore and allow air to pass through delivery port (3).

HILL HOLDER CONTROL VALVE

78. The hill holder control valve (Fig 32) is mounted on the right hand side of the steering column and supplied with air from the service reservoir.



1 Supply port 2 Supply port
3 Delivery port

Fig 31 Change-over valve

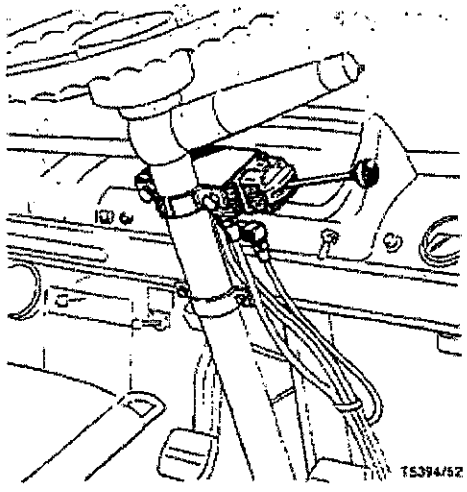


Fig 32 Hill holder control valve

79. When the control valve lever is in the 'BRAKES ON' position, compressed air is delivered to the vehicle braking and trailer system via a change-over valve. When the control valve lever is released it returns to 'BRAKES OFF' position under spring pressure and exhausts the air in the system, thus releasing vehicle and trailer brakes.

80. The valve (Fig 33) consists of a body containing a lever assembly which operates a plunger (2) by means of a spring-loaded cam (3). As the operating lever is moved towards the 'BRAKES-ON' position, the cam depresses plunger (2) and causes exhaust seat (4) to close on inlet/exhaust valve (5).

81. Further movement of the lever causes the inlet/exhaust valve to move away from the inlet seat (6) and allows air to pass to the braking system.

1	Lever assembly	4	Exhaust seat
2	Plunger	5	Inlet/exhaust valve
3	Cam	6	Inlet valve seat

82. The air pressure delivered by the valve is proportional to the effort applied to the lever and the valve imparts a reaction relative to the movement of the lever so that the driver can sense the degree of braking.

83. When the control lever is returned to the 'BRAKES OFF' position, the inlet valve closes and the exhaust valve opens to allow the air to exhaust.

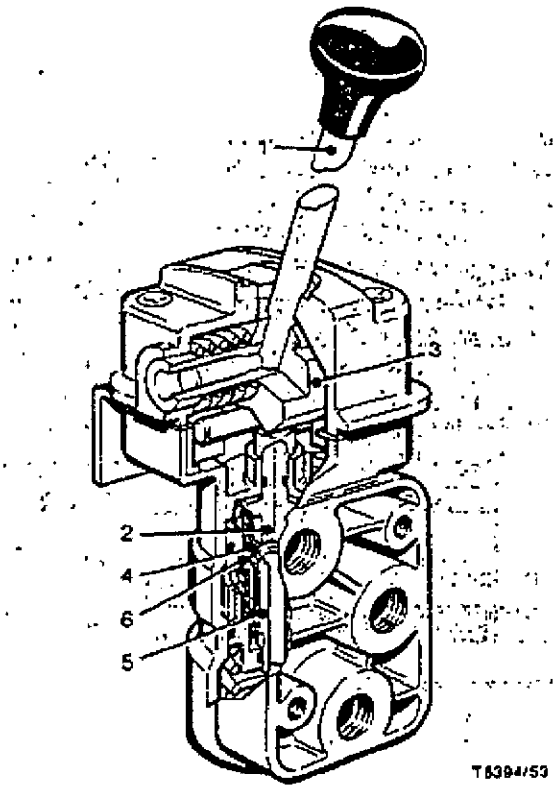
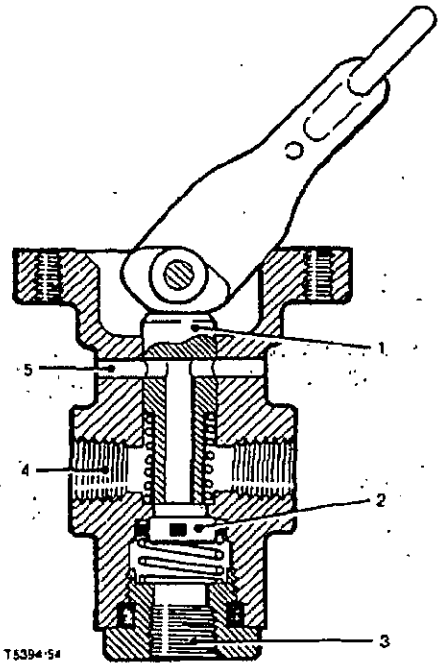


Fig 33 Section of hill holder control valve

TRAILER PARK CONTROL VALVE

84. The trailer park control valve (Fig 34) is mounted on the dashboard beneath the instrument panel and is supplied with air from the service reservoir.

85. Movement of the control lever causes plunger (1) to move the inlet valve (2) off its seat allowing air from the service reservoir to pass through inlet port (3) to the trailer park control change-over valve via port (4). When lever is returned delivery valve closes and air is exhausted through exhaust port (5).



1 Plunger
2 Inlet valve
3 Inlet port
4 Outlet port
5 Exhaust port

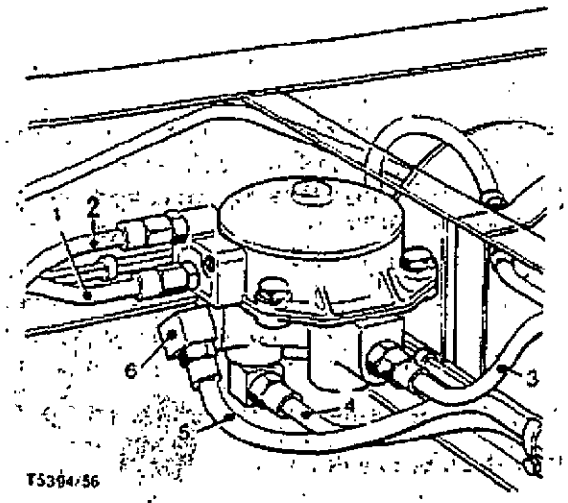
Fig 34 Section of the trailer park control valve

DUAL RELAY VALVE

86. To eliminate time lag during application and release a dual relay valve is incorporated in the trailer service brake circuit (Fig 35). It is mounted on the right-hand side of the spare wheel crossmember.

87. The valve (Fig 36) consists of a body and cover containing three pistons and an inlet exhaust valve assembly.

88. The control air pressures enter the top of the valve through the signal ports (1) causing the pistons (2) to move downwards until the exhaust valve seat (3) contacts the inlet valve (4). Further increase in this air pressure causes the inlet valve to move off its seat allowing air direct from the triple pressure protection valve to enter the valve through the supply port (5) and exit from the delivery port (6).



1 Signal from change-over valve
2 Signal from footbrake valve
3 Supply to service trailer coupling
4 Supply from triple pressure protection valve
5 Supply to pressure limiting valve
6 Restrictor

Fig 35 Airline connection to dual relay valve

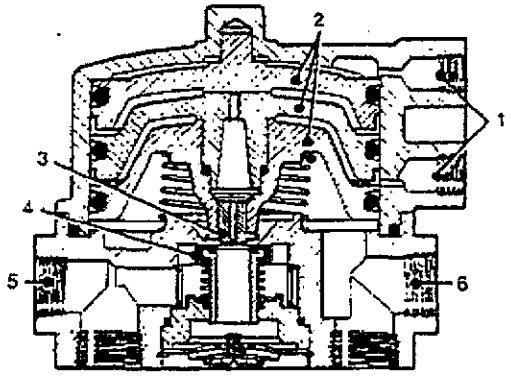
89. The pressure of the air passing through the valve acts on the underside of the lower piston causing the pistons to rise and close the inlet valve when the pressure below the piston is equal to that above, so bringing the valve into a balanced condition.

90. Any further increase in control pressure will cause the piston to move down and open the inlet valve increasing delivery pressure from the valve, until balance is once again achieved.

91. A decrease in the control pressure will cause the piston to rise and the exhaust valve to open allowing the delivered air to exhaust through the centre of the inlet valve and out through the exhaust diaphragm, until balance is once again achieved.

92. When no control pressure is being supplied the pistons are in the fully raised position with the exhaust valve open and the inlet valve closed.

93. The two signal ports enable both the Service and Secondary air pressures delivered from the footbrake valve to control the dual relay valve independently should a failure in one or other occur.



1 Signal ports
2 Pistons
3 Exhaust valve seat
4 Inlet valve
5 Supply port
6 Delivery port

Fig 36 Section of a dual relay valve

PRESSURE LOSS LIMITING VALVE

94. A pressure loss limiting valve (Fig 37) is incorporated in the trailer emergency line to prevent total loss of air through the tyre inflator or winch and controls.

95. The valve is located midway along the inside of the left hand chassis sidemember.

96. The valve (Fig 38) consists of a body and cover containing a spring adjusting screw, diaphragm, valve and valve seat.

97. Compressed air from the triple pressure protection valve via the trailer service relay valve enters the pressure loss limiting valve beneath the diaphragm (7) and valve (6) assembly. When air pressure is sufficient to over come the spring (2) pressure the valve opens to allow air to pass to the tyre inflator and winch controls via delivery port (3).

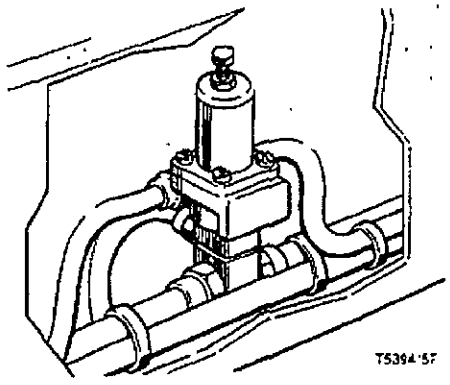


Fig 37 Pressure loss limiting valve

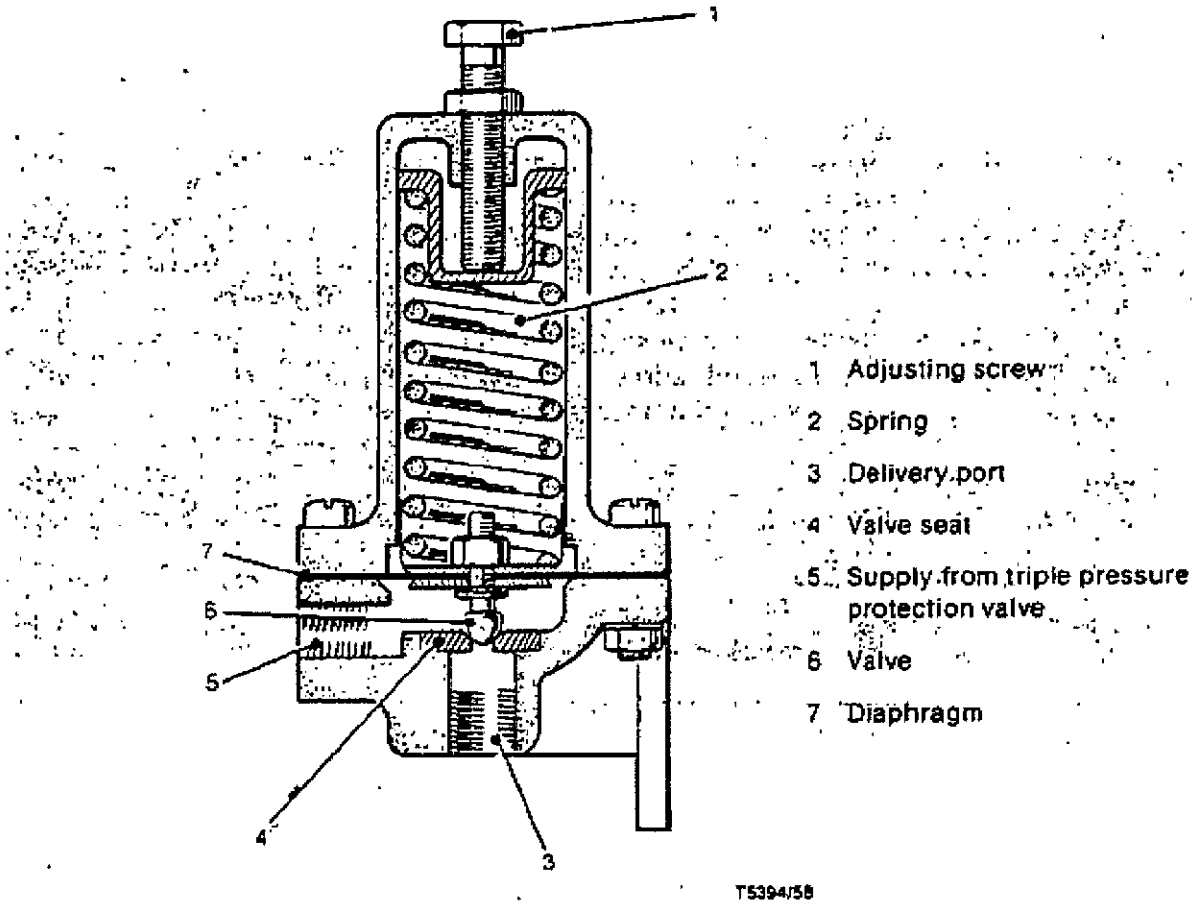


Fig 38 Pressure loss limiting valve section

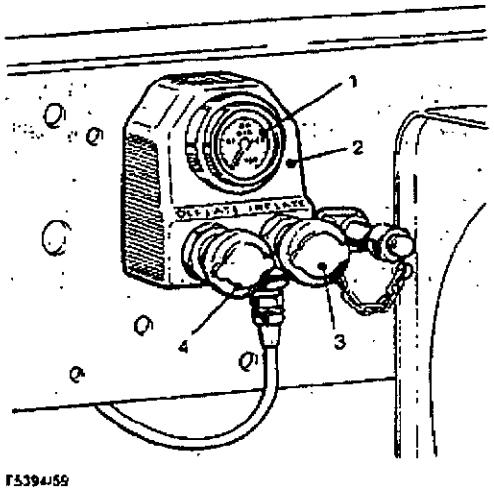
TYRE INFLATOR

98. A tyre inflator is incorporated into the air pressure braking system to provide the vehicle with a ready and simple method of inflating tyres. When it is necessary to adjust the pressure in any tyre the inflator is connected to the tyre valve by a rubber hose connector.

99. Before using the tyre inflator ensure that the vehicle air pressure system is fully charged and that the parking brake is applied.

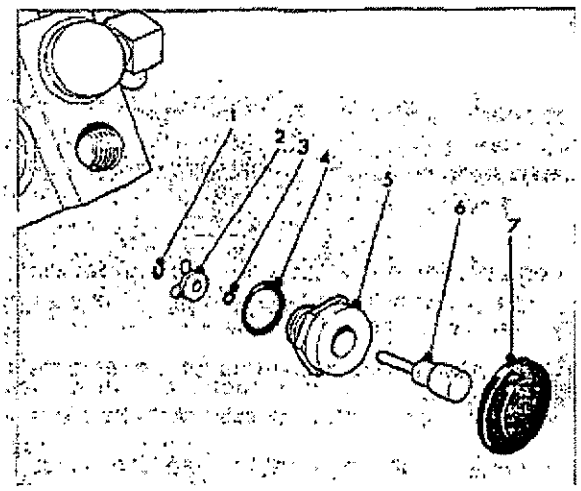
100 With the hose connected to the tyre valve and inflator observe the gauge reading and check whether inflation or deflation is required. The operation is similar in either case. Assuming inflation is required, the inlet valve is unseated when the INFLATE button is depressed, allowing compressed air to enter the tyre. Releasing the button instantly shuts off the compressed air allowing a gauge check to be made. If too much air pressure has been delivered to the tyre, the DEFLATED button can be depressed and surplus air exhausted at the rubber flap in the body.

101. The unit (Fig 39), which is located adjacent to the spare wheel, comprises a body (2), gauge (1), deflate button (4) and inflate button (3).



1 Gauge 3 Inflate button
2 Body 4 Deflate button

Fig 39 Tyre inflator



102. The deflate and inflate buttons (Fig 40) comprise a push rod guide (5), with a push rod/operating button (6) which is retained by a circlip (1). A bridge-type O-ring retainer (2) holds O-ring (3) in position on push rod/operating button. Water ingress is prevented by gaiter (7) and push rod guide O-ring (4).

1 Circlip
2 Seal retainer
3 Push rod seal
4 Push rod guide seal
5 Push rod guide
6 Push rod/operating button
7 Gaiter

Fig 40 Exploded view of inflate/deflate button

103. The valve components (Fig 41) located below the push rod/operating button guide assembly, comprise a valve seat (5), valve (3), valve guide (2) and return spring (1). To prevent air leakage O-ring (4) locates in groove of valve seat.

1 Return spring
2 Valve guide
3 Valve
4 O-ring
5 Valve seat

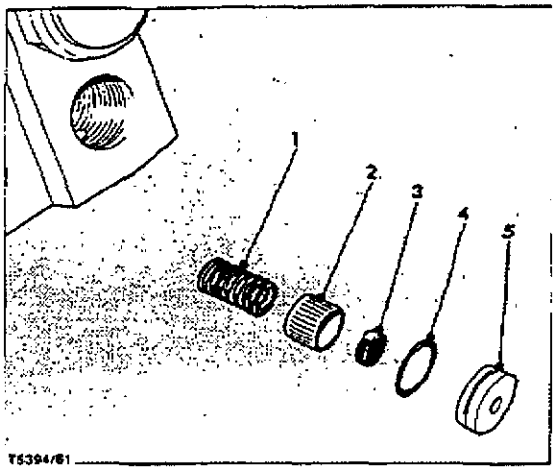
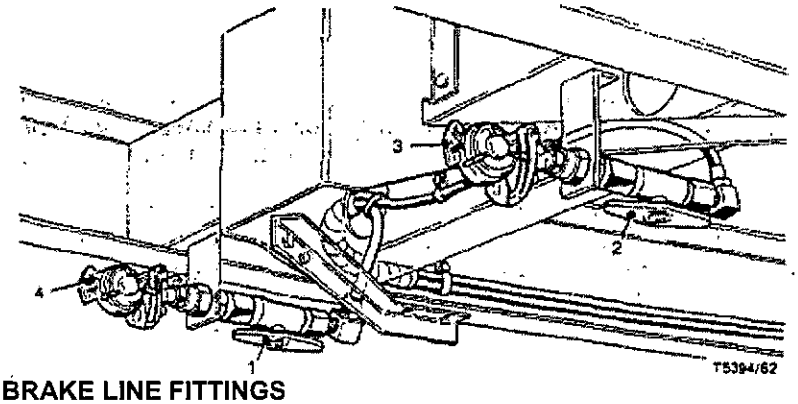


Fig 41 Valve components



1 Service line shut-off valve
2 Emergency line shut-off valve
3 Emergency line palm coupling
4 Service line palm

Fig 42 Rear air couplings

BRAKE LINE FITTINGS

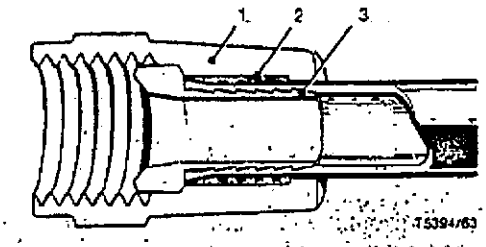
Rear air couplings

104. The rear couplings (Fig 42) for the Service and Emergency airlines are of the palm type. The couplings are such that when connected with another coupling of the same type, pressure is put onto the rubber facing gaskets to make air tight seal. This joint can easily be connected or disconnected by hand. The couplings are colour coded yellow and red for Service and Emergency lines respectively.

105. When not in use, integral dummy couplings prevent the intrusion of moisture or foreign matter. The couplings are provided with shut off valves. The valves are adjacent to each coupling.

BRAKE PIPES

106. The majority if the brake pipes on the vehicle are of the nylon type and have specially designed end fittings (Fig 43) comprising a nut (1), shell (2) and body (3) which cannot be transferred from old to new pipes.



1 Nut 2 Shell 3 Body

Fig 43 Brake pipe end fittings

107. Only imperial diameter pipe is installed (Fig 44), this being used with either imperial or metric threaded nuts. An imperial threaded nut (A) can be identified from a metric threaded nut (B) by its tapered body.

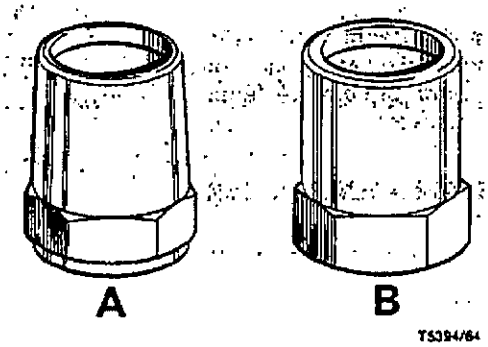
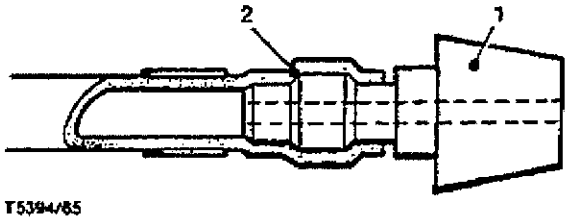


Fig 44 Brake pipe nut identification

NYLON GAUGE PIPES

108. The nylon pipes between the footbrake valve and instrument panel have nipple end fittings (Fig 45) which cannot be transferred from old to new pipes.

109. New nipple end fittings must be installed using correct tool.



1 Nipple end fitting

2 Gauge pipe

Fig 45 Gauge pipe nipple end fitting

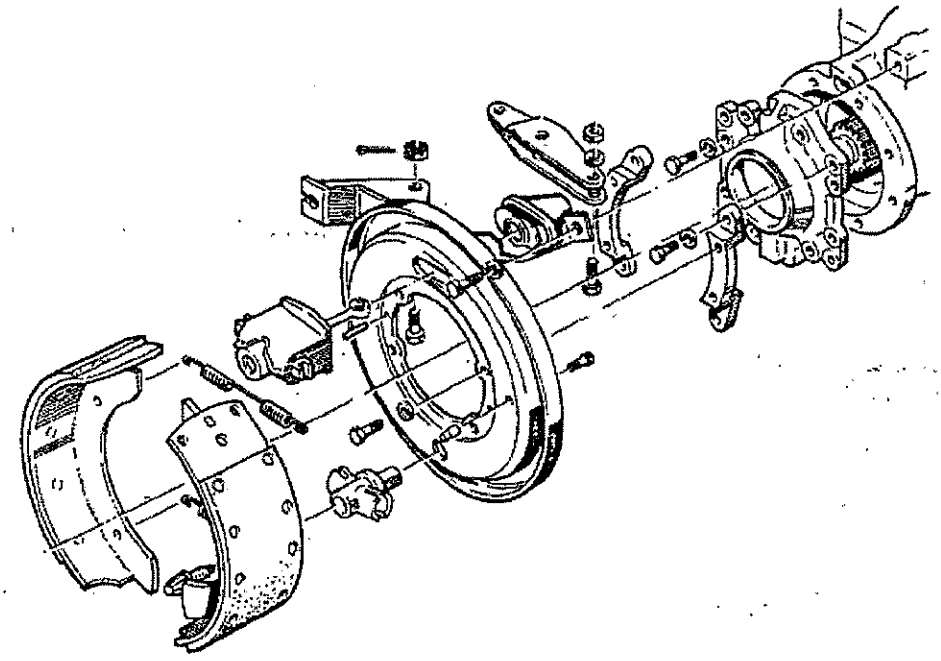


Fig 46 Transmission brake assembly

PARKING BRAKE

110. The parking brake lever is mounted on the drivers seat platform and operates a drum-type transmission brake (Fig 46) through a cross-shaft and cable.

111. The brake shoes are operated by a lever and two expanding tappets, and shoe adjustment is effected by a wedge type adjuster.

112. The drum locates on the bolts of the pinion shaft flange and is secured by two screws.

Chapter 11

FUEL SYSTEM AND EXHAUST SYSTEM

CONTENTS

FUEL SYSTEM AND EXHAUST SYSTEM

GENERAL DESCRIPTION

1. The fuel system includes a sedimenter a diaphragm type fuel feed pump, a cartridge type main fuel filter and a mechanically governed distributor type fuel injection pump. The fuel injectors, which are located in renewable sleeves in the cylinder head, project into combustion chambers in the piston crowns.

2. The cold start aid consists of two igniters mounted in the air intake manifold and a fuel supply tank. Fuel delivery to igniters is controlled by a solenoid operated spool valve.

3. Air filtration is by a paper type element air cleaner. An air restriction indicator is incorporated in the filtered side of the air intake system.

4. Exhaust is via a three piece manifold, a turbo-charger and through a down pipe to the silencer.

FUEL SYSTEM

Sedimenter

5. A fuel system sedimenter (Fig 1) with drain tap (arrowed) mounted on the engine crankcase, is connected between fuel tank and feed pump.

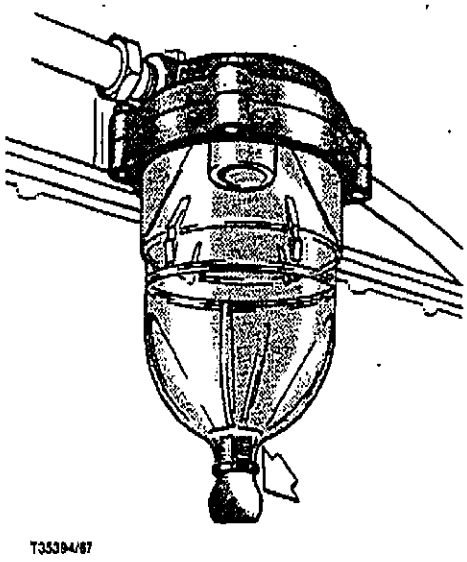
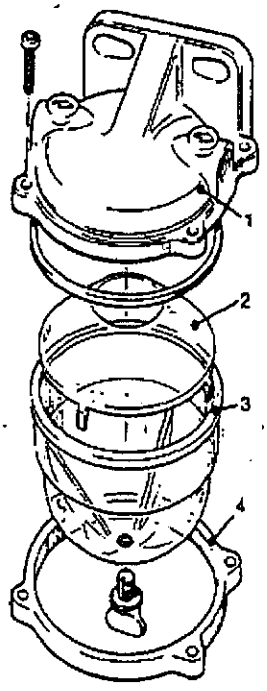


Fig 1 Fuel sedimenter



1 Sedimenter head

2 Filter element

3 Bowl

4 Bowl clamp plate

Fig 2 Exploded view of sedimenter

6. The sedimenter comprises a metal head (Fig 2 (1)) a transparent plastic bowl (3) incorporated a conical element (2) and a bowl clamp plate (4) which is secured to the head by four screws. The bowl drain plug has a vertical slot in its threads to permit draining when plug is loosened. The function for the sedimenter is to remove water and solid particles from fuel before entering the lift pump.

7. Fuel passes first into the head of sedimenter and then, via an annular gap between base of the element and wall of the bowl, into lower chamber. The gap is sufficiently narrow to distribute the flow evenly around case of the cone. The fuel then passes over the effective area and out via the annulus at centre of element. Air entering sedimenter will exit through the by-pass bleed drilling in the outlet passage.

Fuel feed pump

8. The spring-loaded diaphragm-type fuel feed pump (Fig 3) is mounted on the right-hand side of the crankcase and is operated by an eccentric on the camshaft. The pump incorporates a gauze filter screen (3) and is provided with a hand priming lever.

9. When the pump supplies fuel surplus to requirements of engine, pressure builds up in the pump and holds the pumping diaphragm (6) down against spring pressure, allowing the rocker arm (13) to idle without operating the pump.

1 Filter cover	6 Diaphragm	10 Spring
2 Gasket	7 Spring	11 Pin
3 Gauze filter	8 Retainer	12 Link
4 Pump cover	9 Pump body	13 Rocker arm
5 Valves		

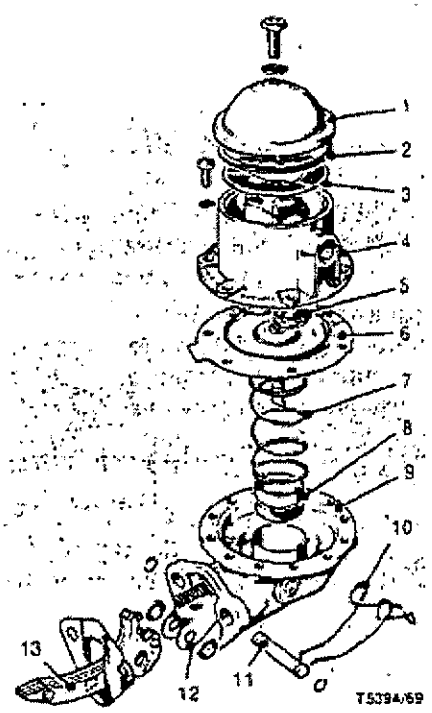


Fig 3 Exploded view of fuel pump

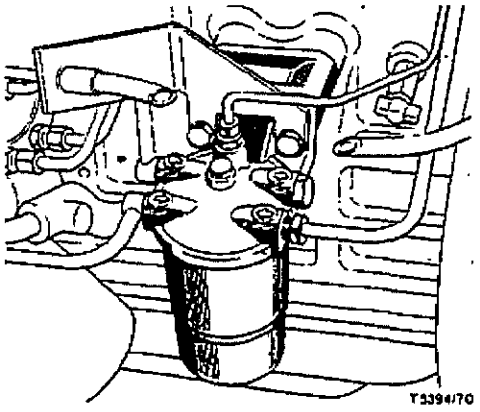


Fig 4 Main fuel filter

Main fuel filter

10. A main field filter (Fig 4), bolted to crankcase, is connected between the fuel feed and injection pumps.

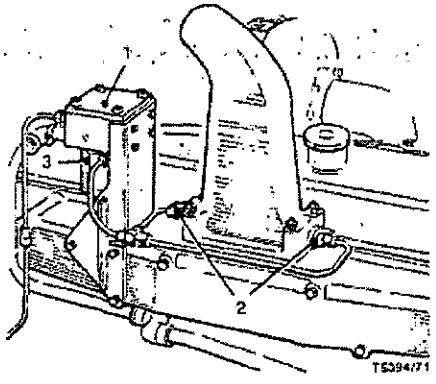
11. The filter incorporates a disposable paper type element contained within a steel canister. The canister is clamped between the cover and case to form an integral part of the filter. Inlet and outlet pipe connections are provided in the head which also contains an air vent connection.

Cold starting aid

12. The cold starting aid (Fig 5) comprises electrically operated igniters (2) in the intake manifold.

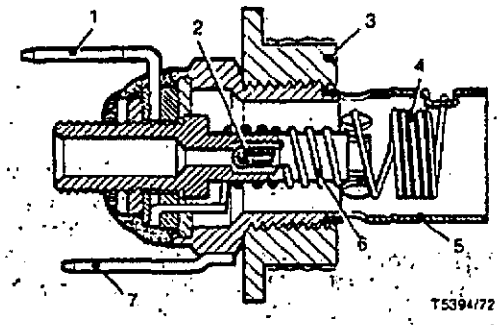
13. An igniter supply tank (1) incorporates a spool valve operated by a solenoid (3). The spool valve allows the inlet manifold pressure to act upon the fuel in the supply tank, when the igniter is energized.

14. This allows the fuel from the supply tank to flow to the igniters when the cold starting switch is depressed.



1 Supply tank 2 Igniters
3 Solenoid

Fig 5 Cold starting aid

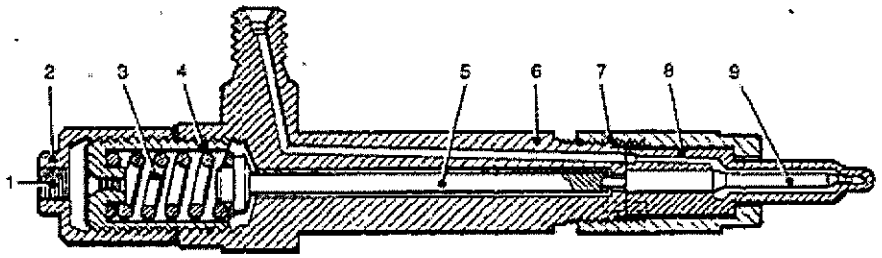


1 Positive terminal
2 Ball valve
3 Insulating bush
4 Igniter coil
5 Igniter shield
6 Heater coil
7 Negative terminal

Fig 6 Igniter

15. The igniters (Fig 6) are operated by a switch mounted on the cab instrument panel. When the switch is depressed, heater coil (6) in the igniter is energised. This heats the valve body causing it to expand thus opening the ball valve (2) permitting the entry of gravity feed fuel. The fuel is vapourised by heat of the body, the vapour is then ignited by coil (4). When the engine is cranked the burning fuel heats the intake air of engine to a level which in addition to the compression temperature, is sufficient to ensure that the intake charge has reached a temperature to ignite the engine fuel when injected.

16. On vehicles installed with insulated ground return wiring, igniters are installed as shown with insulating bush (3) and negative terminal (7), whereas on vehicles with normal application these two items are deleted.



1 Leak-off connection
2 Nozzle holder cap
3 Spring
4 Spring cap
5 Valve spindle
6 Nozzle holder casting
7 Nozzle nut
8 Nozzle body
9 Needle valve

Fig 7 Injector

Injectors

17. The injectors (Fig 7) are of the multi-hole type. Their operation is by fuel which is delivered under pressure from injection pump. The fuel lifts the spring-loaded needle valve (9) from its seat and emerges as on atomized spray through spray holes in the nozzle tip. A slight leakage of fuel past the needle valve stem, returns via valve spindle bore in nozzle holder casting (6) to the leak off connection (1) and through return pipes to fuel tank. This fuel leakage provides lubrication for valve stem which is a selective fit in the nozzle body (8).

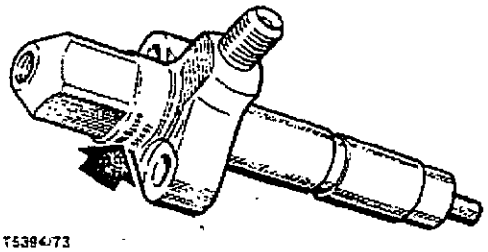


Fig 8 Injector identification number

18. The injectors (Fig 8) are identified by despatch number (arrowed) stamped on nozzle holder casting.

Fuel injection pump

19. The CAV fuel injection pump (Fig 9) is a mechanically governed distributor-type, flange mounted on a carrier attached to the air compressor. The rear end of the carrier is supported by a bracket bolted to the cylinder block.

20. The drive shaft coupling is keyed and clamped by a bolt and nut to the compressor shaft and is splined at the rear end for engagement with the pump shaft splines. A masterspline ensures correct timing relationship between the pump and coupling.

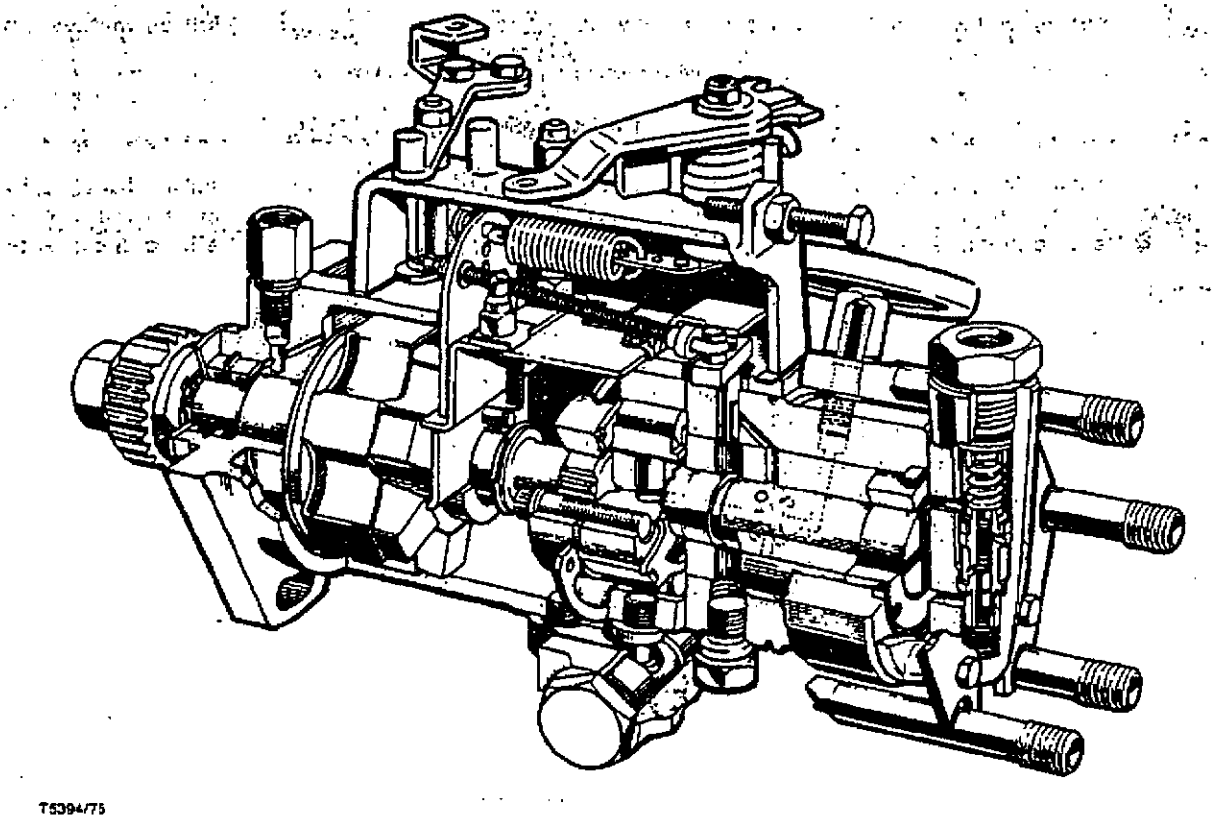


Fig 9 Fuel injection pump

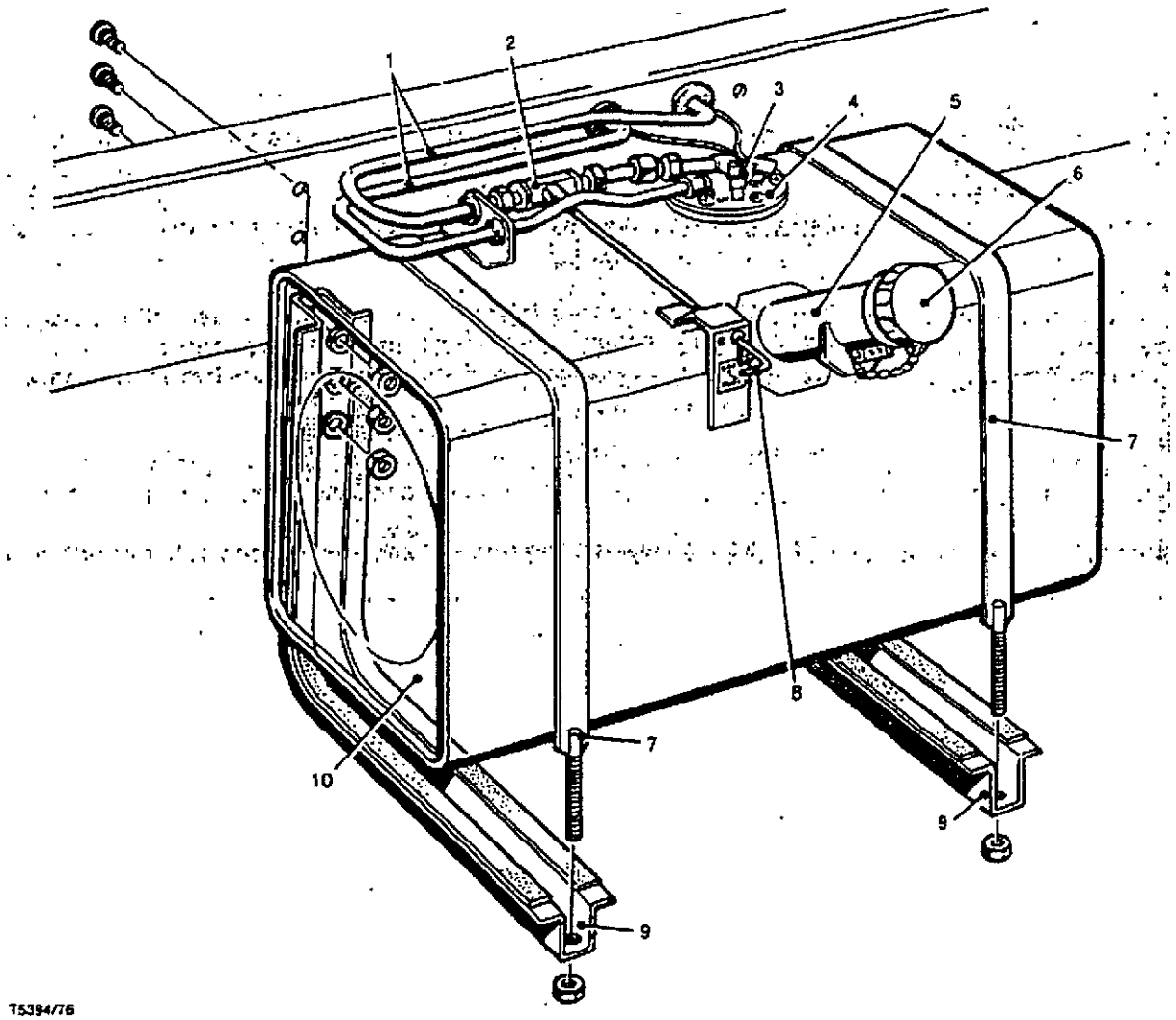
21. The carrier enclosed the pump coupling which is lubricated by engine oil supplied fro the rear of the compressor.

22. Two opposed seals in the drive end of the pump retain the engine oil in the carrier and the fuel oil in the pump. A drilling in the housing from between the seals to the pump exterior provides evidence of oil leakage in the event of seal failure.

23. The fuel leak-off connection is on the pump inspection cover.

Fuel tank

24. The fuel tank (Fig 10) is constructed from Tinterne sheet steel with welded seams. Two inner baffles are spot welded to both sides and top of tank. A gap is provided between the baffles and bottom of tank to allow fuel flow. Flanges are soldered to the tank for mounting fuel pipe connections, telescopic filler neck (5) and, on vehicles with insulated ground return wiring, the fuel gauge. The tank is secured by two metal straps (7) to 'L' shaped brackets (9) which are attached to the chassis sidemember by nuts and bolts.



1 Fuel pipes	4 Fuel tank unit	8 Handle, shut off value
2 Shut off value	5 Telescopic filler neck	9 Tank mounting brackets
3 Fuel gauge connections	6 Filler cap	10 Fuel tank
	7 Tank securing straps	

Fig 10 Fuel tank

25. A fuel tank unit (4) with gauge connections (3) also has two fuel pipe connections. The fuel pipes (1) incorporate a manually operated shut-off valve (2) controlled by lever (8) in the delivery pipe. The other pipe is for fuel return. The filler neck (5) is equipped with an anti-spill type safety cap (6), incorporating controlled ventilation.

26. In vehicles installed with insulated ground return wiring a mechanically operated fuel gauge with a direct acting float is installed. The face of the gauge is divided into ¼-½-¾-F (Full) capacity markings.

EXHAUST SYSTEM

27. The exhaust system comprises a front pipe, silencer and tail pipe which is supported by a bracket and insulator bolted to the chassis sidemember. The front pipe is sealed by a packing ring to an elbow secured to the turbo-charger by studs and nuts.

28. On vehicles with insulated ground return wiring a revised exhaust system is used with the silencer mounted at the front of the vehicle beneath the toe panel.

Chapter 12

COOLING SYSTEM

CONTENTS

COOLING SYSTEM

GENERAL DESCRIPTION

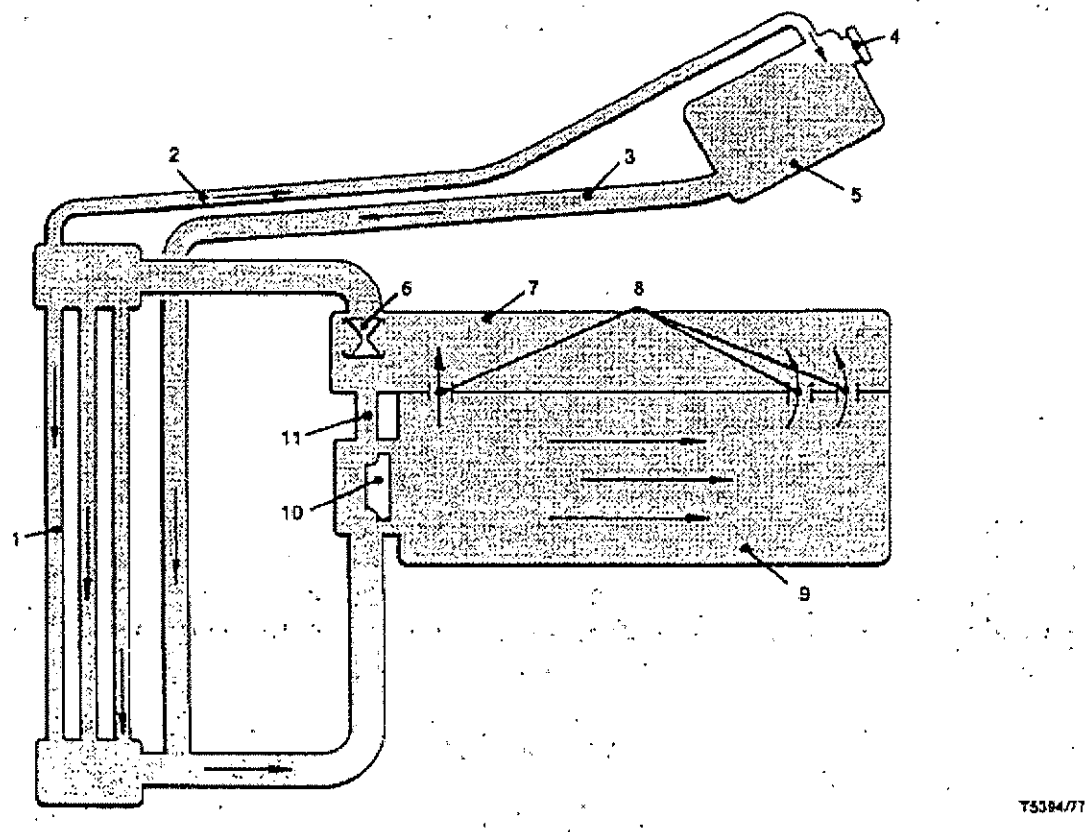
1. The pressurized cooling system (Fig 1) includes a tube and centre radiator (1), a belt driven pump (10), a single blocking thermostat (6) and a five blade thermosensing viscous fan.

2. The header tank (5) has a vent line (2) from the radiator top tank to ensure air is expelled when filling the cooling system.

3. A safety valve is incorporated in the filler cap (4). Coolant which enters the pump rotor chamber from the radiator bottom tank is discharged through the engine opens the thermostat housed at the front of the cylinder head and passes into the radiator top tank where it then passes down through the cooling elements.

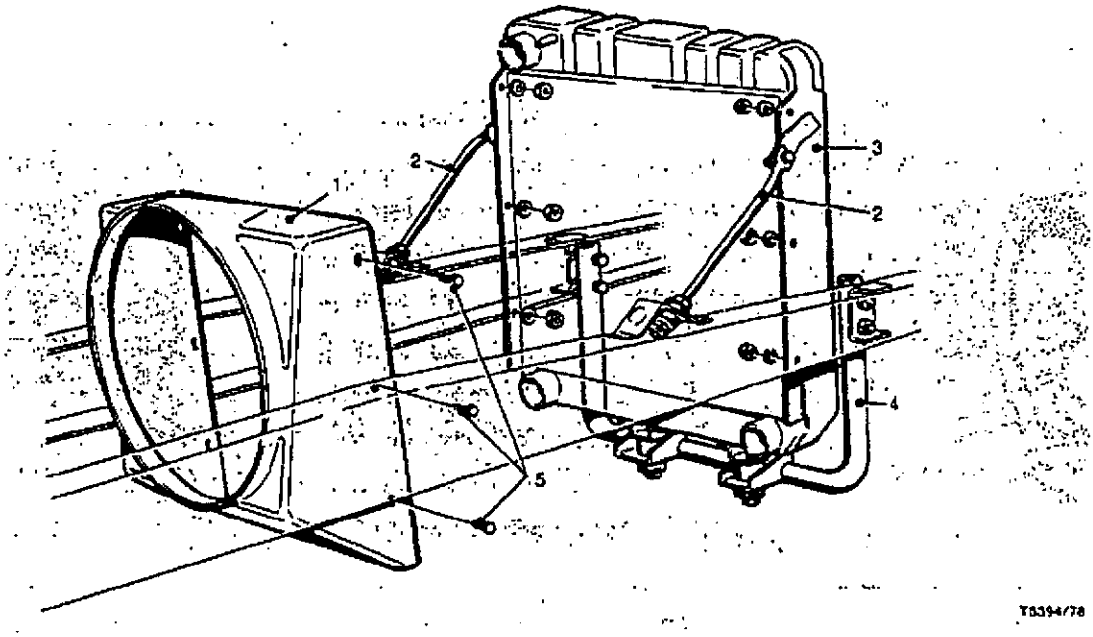
4. When the engine is cold, circulation through the radiator is prevented by the thermostat being closed, coolant returning direct to the pump via the by-pass hose (11).

5. There are two drain taps, one in the radiator bottom tank and the other at the rear of the cylinder block on the left hand side.



1	Radiator	6	Thermostat
2	Radiator vent line	7	Cylinder head
3	Coolant fill line	8	Coolant transfer ports
4	Filler cap	9	Cylinder block
5	Header tank	10	Water pump
		11	By-pass hose

Fig 1 Schematic diagram of cooling system



1 Cowl
2 Tie rods
3 Radiator
4 Mounting frame
5 Bolts, cowl mounting

Fig 2 Radiator, cowl and mountings

RADIATOR AND HEADER TANK

6. The tube and center radiator (Fig 2 (3)) is rubber mounted on a 'U' shaped frame (4) between chassis side members. The radiator is supported by tie rods (2) rubber mounted to brackets riveted to the chassis longitudinal members.

7. A cowl (1) is attached to the radiator by bolts (5). The holes in the cowl are elongated to permit cowl positioning relative to fan. The drain tap is located in the radiator bottom tank.

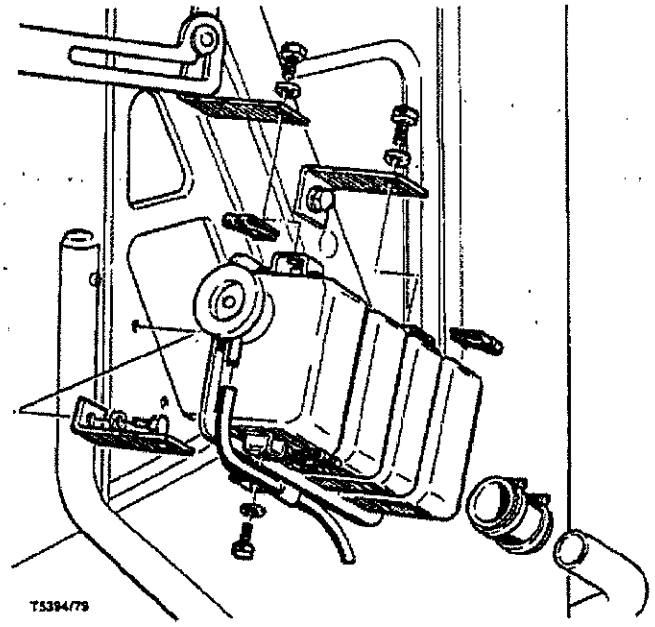
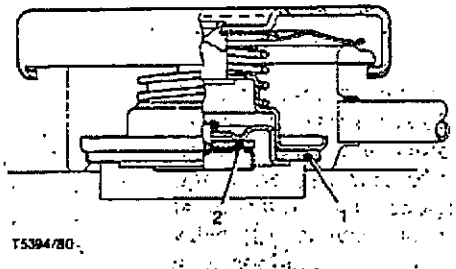


Fig 3 Header tank and mountings

8. The header tank (Fig 3) is attached to the cab rear panel and connections to the engine and radiator are via metal pipes and rubber hoses.

Radiator filler cap

9. The radiator filler (Fig 4) cap incorporates a safety valve to protect the cooling system. The safety valve (1), which seats in the header tank neck maintains a nominal operating pressure of 0.5 bar (7 lbf/in^2) at which the temperature of the coolant can rise to 100°C. The vacuum valve (2) relieves the depression in the system as the engine cools.



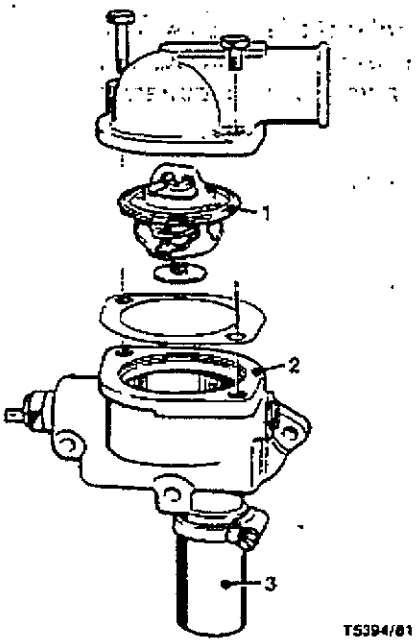
1 Safety valve 2 Vacuum valve

Fig 4 Filler cap

THERMOSTAT

10. A single blocking thermostat (Fig 5) of either AC-Delco or Western-Thompson manufacture is installed in a housing (2) bolted to the front of the cylinder head.

11. Coolant circulation is directed from the thermostat housing to the water pump via a by-pass hose (3). As the engine temperature rises the thermostat (1) gradually opens to allow an increasing flow of coolant to circulate through the radiator.



1 Thermostat

2 Thermostat hou

3 By-pass hose

Fig 5 Thermostat and housings

WATER PUMP

12. The water pump (Fig 6) driven by twin belts, is of the centrifugal type with a phenolic face rotor seal running against a ceramitic desk, a spring-loaded lip-type seal is used for protection against water penetration into the bearing and shaft assembly.

13. The pump has no backing plate but is attached direct to the front of the cylinder block. The rotor and pulley are supported by a bearing and shaft assembly which is retained in the pump body by a circlip.

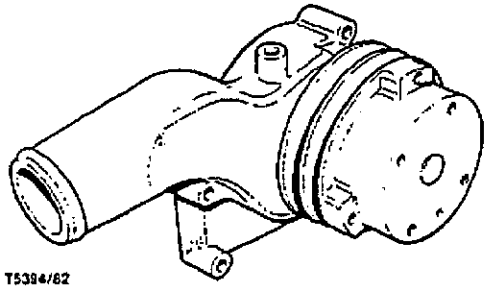


Fig 6 Water pump

FAN AND VISCOUS DRIVE

14. The five bladed metal fan (Fig 7) is driven by a viscous drive unit. The viscous drive unit, mounted on the water pump pulley is of the air temperature sensing type, which, operating as a shear type fluid coupling, controls the fan speed by transmitting drive through a film of silicone fluid.

15. In operation, the fan speed increases with engine speed, though at a lower rate, until the limit of the torque capacity of the drive is reached. The fan at this point is revolving at its maximum attainable speed which will not be exceeded when engine speed increases further.

16. The fan drive incorporates a temperature sensing device which changes the degree of drive to the fan relative to the temperature of the air stream through the radiator. When the temperature is low, drive transmission is reduced and the maximum attainable fan speed is decreased. As the air stream temperature rises the drive transmission progressively increases until the maximum drive is transmitted.

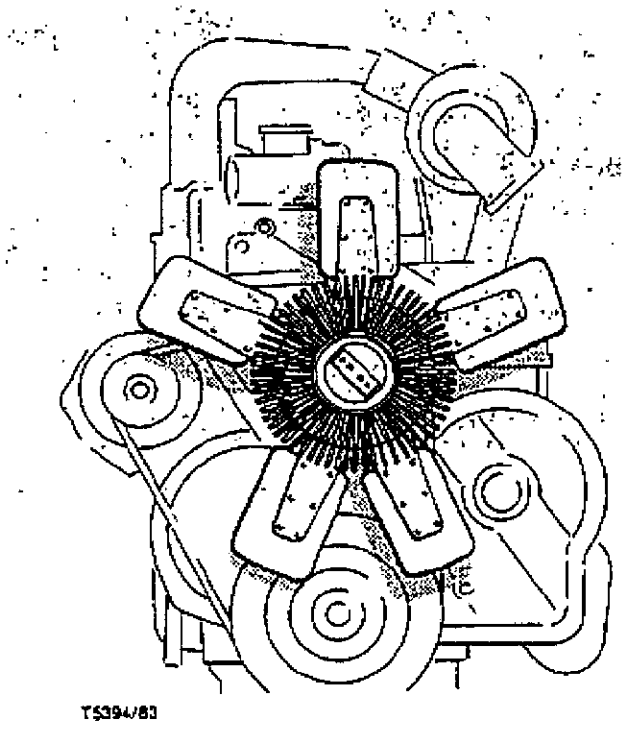


Fig 7 Fan assembly

FAN BELTS

17. The V type fan belts which also drive the alternator, consists of polyester cords set in polychloroprene. The belts are supplied in matched pairs to ensure even tension on both belts. If one belt should fail it is essential that both belts are renewed and the remaining belt discarded.

18. Fan belt adjustment is achieved by pivoting the alternator on its mountings.

Chapter 13

ELECTRICAL SYSTEM

CONTENTS

CONTENTS (Contd)

ELECTRICAL SYSTEM

GENERAL DESCRIPTION

1. The standard chassis ground return wiring system comprises of the main chassis and cab harnesses and subsidiary harnesses. Protection is provided by four 35 Amp fuses. In addition, standard two-point and twelve-point trailer wiring sockets are incorporated at the rear of the vehicle.

2. The insulated ground return wiring system differs from the standard wiring system by providing an insulated ground return for all vehicle electrical components. All cables located externally are housed in rust-proof seamless flexible conduit.

3. A master battery cut-out switch is situated in the cab, attached to the floor panel beneath the driver's seat. Bulk fuel carrying vehicles have an additional master cut-out switch located on the chassis sidemember adjacent to the battery carrier. With either switch in the 'OFF' position, the complete electrical circuit is disconnected.

4. Two 12 V 128 Ah batteries connected in series are charged by a 35 A engine driven alternator. Output is controlled by a transistorised voltage regulator. As the alternator is self-limiting in its current output, the regulator has only to control voltage.

5. The starter motor is a co-axial type and incorporates a two-stage solenoid switch unit mounted internally around the armature shaft.

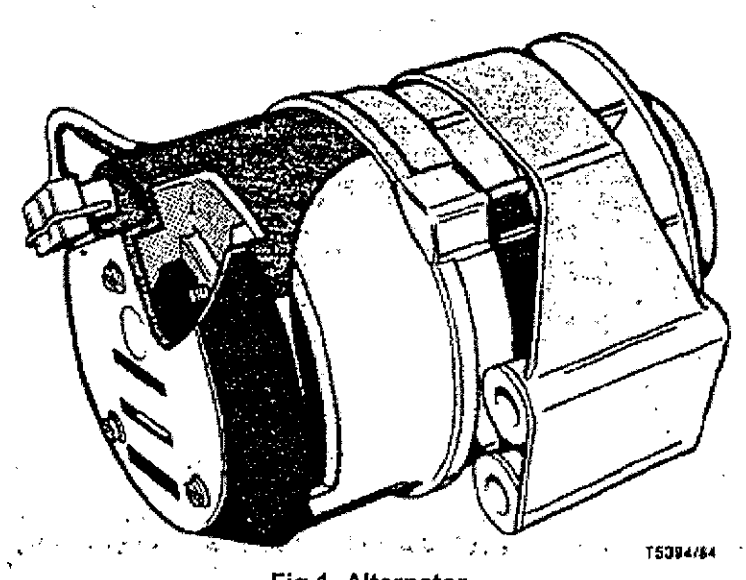


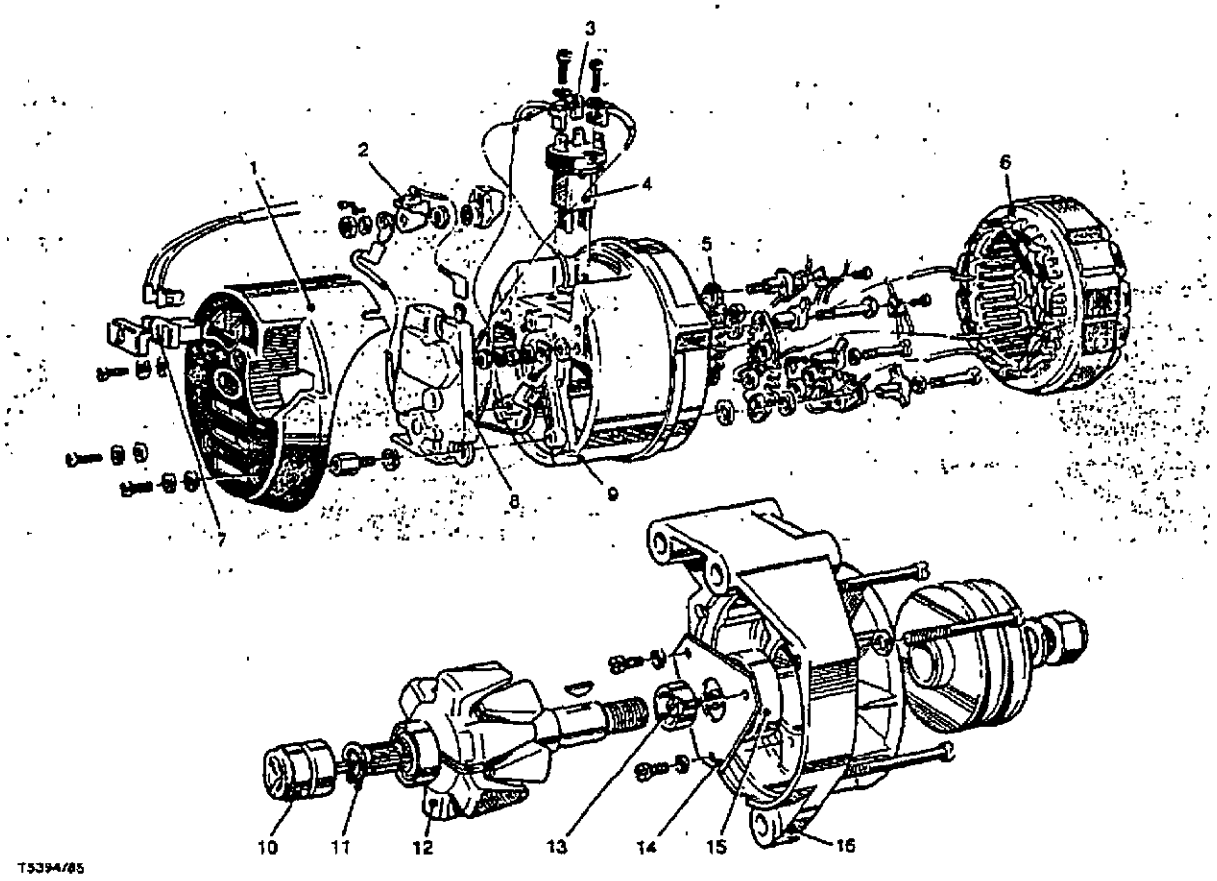
Fig 1 Alternator

ALTERNATOR

6. The CAV AC5R/24 alternator (Fig 1), which is self-limiting in current output, incorporates a three phase star connected stator excited by a wound field rotor.

7. Rectification of the output from a.c. to d.c. is effected by six silicon diodes connected in a three-phase bridge circuit between the stator (Fig 2 (6)) and the output connection and ground. A second rectifier bridge is formed by using three auxiliary diodes in conjunction with the three main negatives diodes and this provides rectified current for the field winding via the slip rings (10) and brushes (4), the current then passing through the regulator (8) to ground.

8. The rotor (12) and stator are located between the drive end (16) and slip ring end bracket (9) which house the ball bearings supporting the rotor shaft. The rectifying diodes are located in hear sinks (5) secured to the inside of the slip ring end bracket.



1	End cover	5	Heat sink	9	Slip ring end bracket	13	Bearing spacer
2	Terminal block	6	Stator	10	Slip ring assembly	14	Clamp plate
3	'A' terminal wire	7	Multi-plug	11	Circlip	15	Bearing
4	Brush gear	8	Regulator	12	Rotor	16	Drive end bracket

Fig 2 Exploded view of alternator (Chassis ground return)

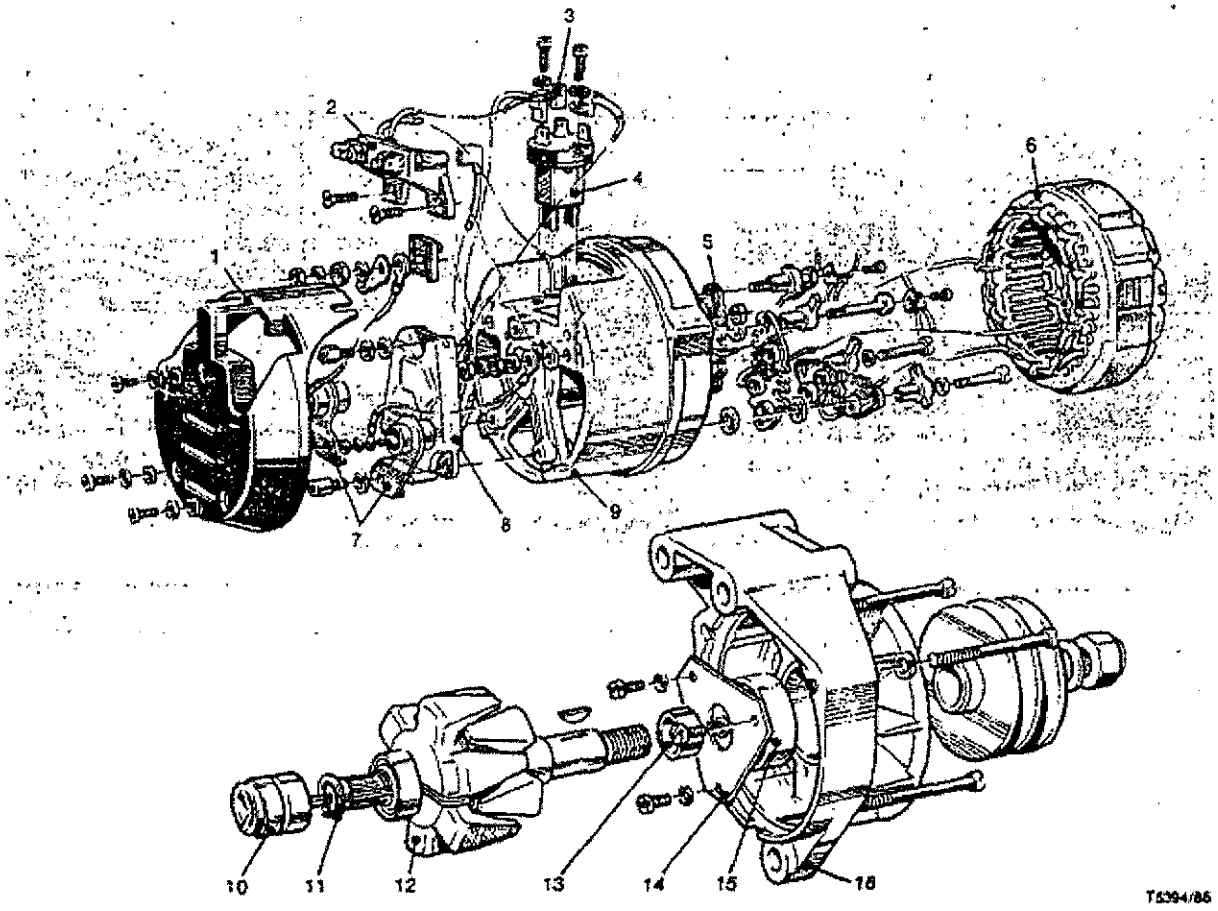
9. The machine-sensed voltage regulator is non-adjustable and is mounted on the slip ring end bracket inside the moulded end cover (1).

10. The insulated ground return alternator (Fig 3) differs from the standard alternator by providing insulated output connections housed in a terminal block (2). Radio suppression is provided by two, internally mounted, uF capacitors (7)

STARTER

11. The starter (Fig 4) is a co-axial type and incorporates a two-stage solenoid switch unit (7) mounted internally around the armature shaft (32). The brush gear (3) is carried in the commutator end shield (2) which, together with a drive end shield (11) are secured to the yoke (4) by through bolts (8).

12. The starter is so designed that pinion (25) engagement occurs under reduced power and full power is only applied when the pinion is fully engaged. The pinion locks in the fully engaged position to prevent premature disengagement.



1	End cover	5	Heat sink	9	Slip ring end bracket	13	Bearing spacer
2	Terminal block	6	Stator	10	Slip ring assembly	14	Clamp plate
3	'A' terminal wire	7	Capacitors	11	Circlip	15	Bearing
4	Brush gear	8	Regulator	12	Rotor	16	Drive end bracket

Fig 3 Exploded view of alternator (insulated ground return)

13 An overspeed device comprising steel balls housed in the pinion sleeve and a locking collar (26) prevents the armature from being driven at excessively high speeds by the engine.

14. The starter is wired for insulated return.

15. The main terminal (16) is permanently connected to the battery supply, operation of the starter being controlled by the application of battery power to the solenoid terminals (17).

16. When the starter solenoid is energised, its plunger moves towards engagement. Four spring-loaded steel segments (9) in the plunger bear against a shoulder on the pinion sleeve and move the pinion sleeve and integral pinion to its first position. At the same time, the first stage contacts close and current is applied to the starter windings via a built-in resistor (6). The armature rotates under reduced power and the pinion is driven into engagement by means of the armature shaft helix.

17. When the pinion is almost fully engaged, the second stage contacts close, shorting out the resistor and applying full battery power to the starter windings. When the pinion sleeve is fully engaged it is locked in position by six balls (30) located in the sleeve which drop into recesses in the armature shaft. The spring-loaded locking collar slides over the balls to keep them in position.

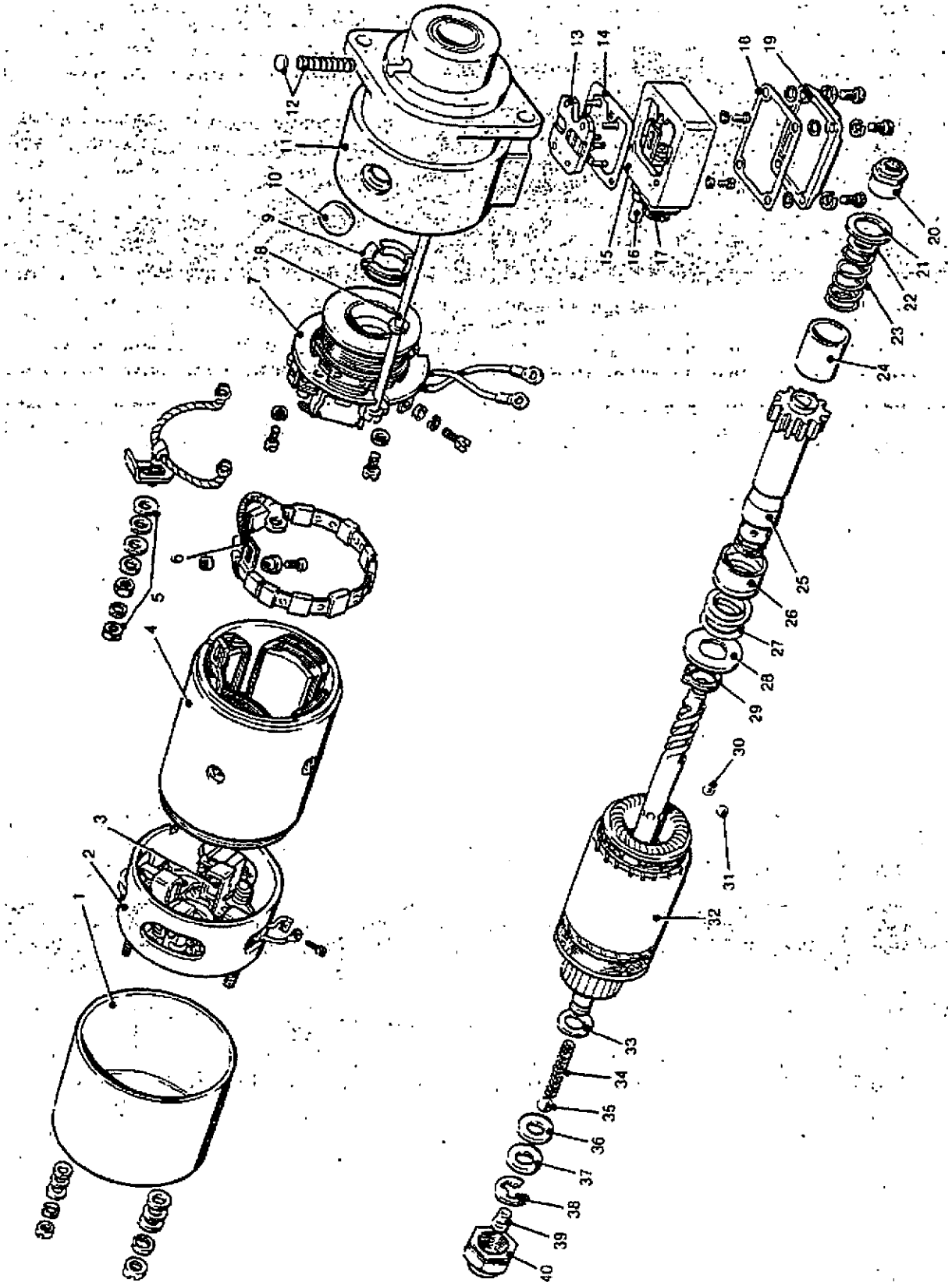


Fig 4 Exploded view of starter

1 Commutator end shield cover
2 Commutator end shield
3 Brushgear
4 Yoke
5 Terminal assembly
6 Resistor
7 Solenoid
8 Through bolts
9 Segment and garter spring
10 Core plug
11 Drive end shield
12 Core plug and spring, lubricator wick
13 Terminal block
14 Gasket
15 Terminal box
16 Main terminal
17 Solenoid terminals
18 Gasket
19 Terminal box cover
20 Pinion spot nut
21 Thrust washer
22 Shim
23 Spring, pinion return
24 Helix shroud
25 Pinion
26 Lock collar
27 Locking spring
28 Trip collar
29 Circlip
30 Locking balls
31 Overspeed release balls
32 Armature
33 Shims, armature end float
34 Recoil spring
35 Recoil ball
36 Shim
37 Thrust washer
38 Circlip
39 Thrust pad
40 End cap

Key to Fig 4

18. As the pinion sleeve moves into full engagement, a ramp on the sleeve forces the four spring-loaded segments outwards where they are held in position by the magnetic field of the solenoid.

19. Should the engine start to drive the armature at a speed in excess of the permitted maximum, then the overspeed device will operate. This consists of four additional steel balls (31) housed in the pinion sleeve. At speed above 9000 rev/min they move outwards under centrifugal force against a ramp on the locking collar. The locking collar is forced back against its spring thus releasing the six locking balls from the recesses in the armature shaft. The pinion is now driven back along the helix to its original position the shoulder passing through the four steel segments which are being held out by magnetic force. The starter will continue to run unloaded until switched off.

20. If the starter is switched off before the overspeed device has operated, the solenoid plunger, in moving back, pushes the locking collar backwards and releases the locking balls thus enabling the pinion sleeve to return to its original position.

BATTEREIS

21. The two 12 V batteries are of the lead acid type and are connected in series. They are retained in a carrier bracket mounted to the chassis sidemember end enclosed by sheet metal protection panels. On bulk fuel carrying vehicles, the batteries are enclosed in a fire-proof fibre-glass cover.

22. Petroleum tanker vehicles have the batteries mounted inside the cab on the rear shelf platform directly behind the driver.

23. The capacity of the batteries is 128 Ah at 20 hour rate. Provided they are properly maintained the batteries will function satisfactorily throughout a wide temperature range.

24. If batteries are to be taken from storage, charging should be carried out in accordance with the manufacturer's instructions. To ease handling of batteries, carrying handles are incorporated in battery cases.

FUSES

25. A 4-way fuse box is mounted beneath the dash panel adjacent to the steering column. The value of each fuse is 35A.

26. A 50 A inline fuse is located in the feed to the winch load limiter control switch.

WINDSHEILD WIPER EQUIPMENT

27. The windshield wipers are operated by a two-speed electric motor. The motor, links and pivot housings are assembled to a mounting bracket as a complete unit (Fig 5).

Wiper arms and blades

28. The blades are secured to the arms by a projecting pip on the arm which is held in engagement with a hole in the blade attachment by a leaf spring.

29. The arms are secured to the serrated driving shaft by a domed nut.

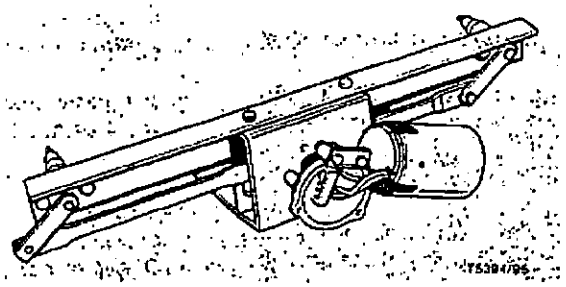
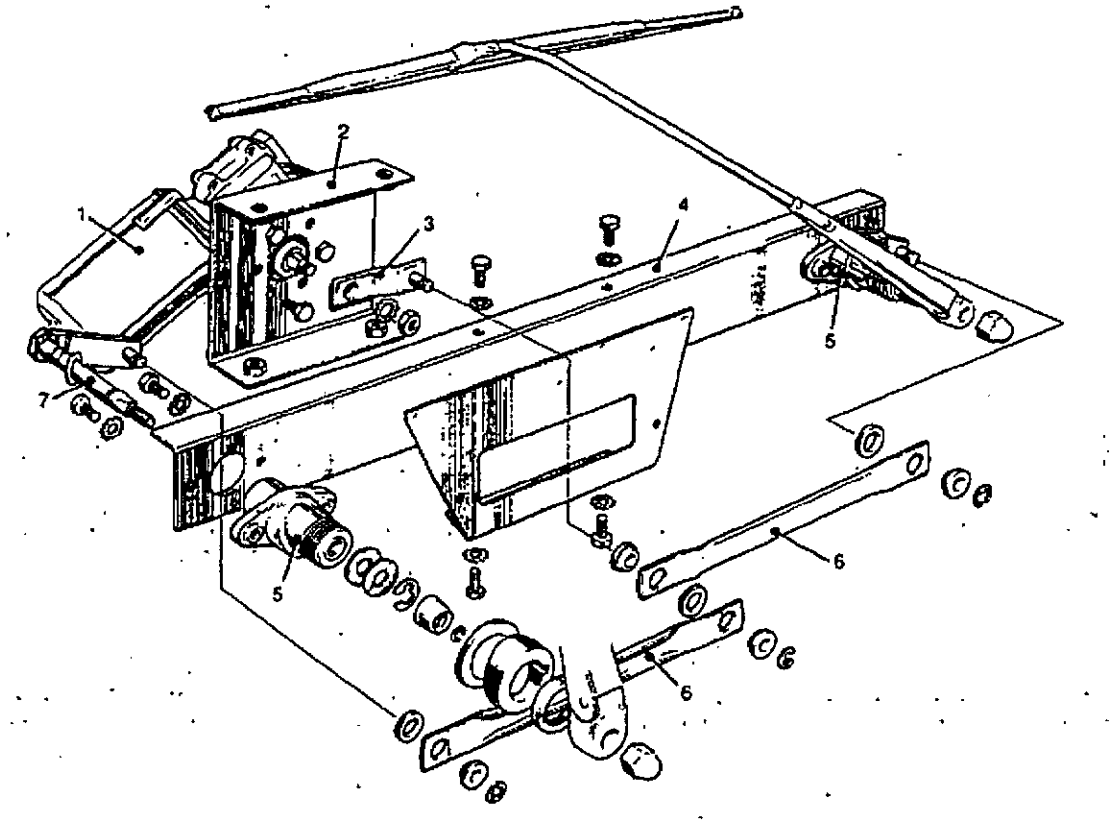


Fig 5 Wiper motor, links, pivot housings and mounting bracket

Wiper unit

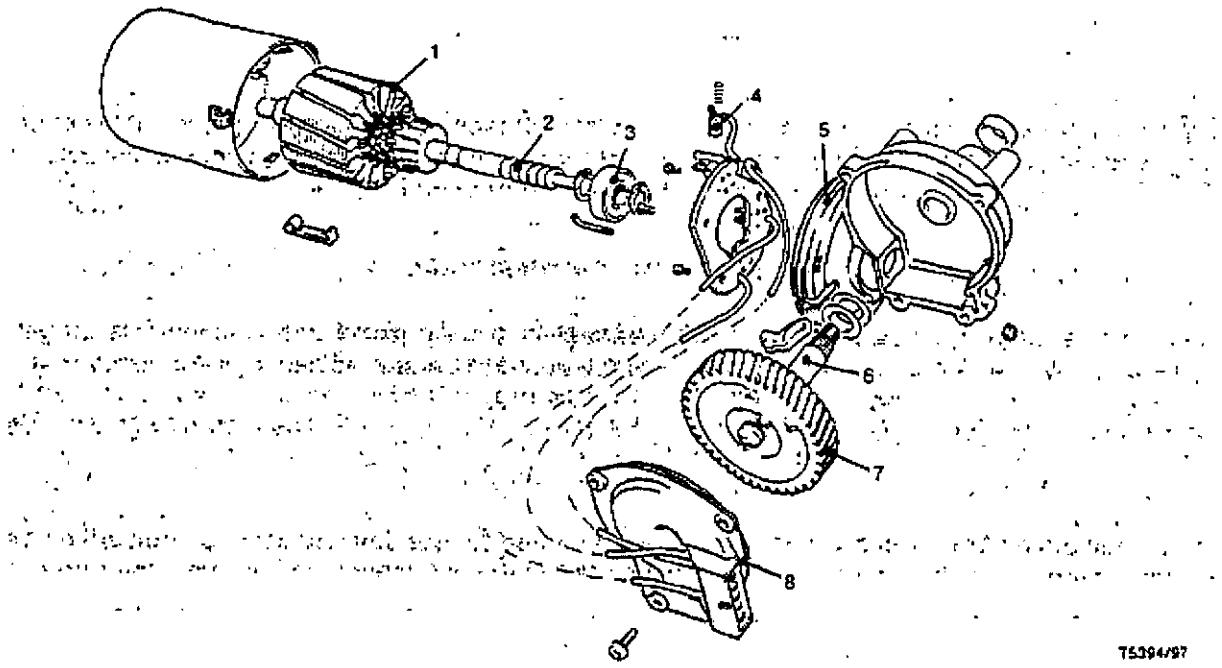
30. The wiper unit end comprises a mounting bracket (Fig 6 (4)) with a pivot housing (5) bolted to each end and a motor (1) secured to a centre plate (2) by three bolts. The centre plate is bolted to the mounting bracket and another flanged plate which forms a box section. Two links (5) connecting the pivot (7) and motor cranks (3) are bushed at each end.



1 Wiper motor
2 Centre plate
3 Motor crank
4 Mounting bracket
5 Pivot housing
6 Links
7 Pivot

Fig 6 Wiper unit

31. The two speed wiper motor (Fig 7) is a two-pole permanent-magnet type incorporating a non-adjustable self-parking.



1 *Armature*	3 *Ball bearing*	5 *Gear housing*	7 Gear
2 Worm gear	4 Brush	6 Cross-shaft	8 Terminal block

Fig 7 Wiper motor

32. The supply to the motor is taken through the key-start switch via No. 1 fuse and the wiper switch mounted in the bottom of the instrument assembly.

33. A worm gear (2), integral with the armature shaft engages a gear (7) splined to a cross-shaft (6).

34. The armature (1) is supported in the frame by a spherical, sintered metal bush and in the gear housing (5) by a sealed ball bearing (3) and a needle roller bearing. Armature end thrust is accommodated by the ball bearing.

35. The ball bearing outer race is a push fit in the gear housing and is held in position by an L-shaped retainer. The threaded portion of the retainer passes through the housing, and is secured by a nut on the outside of the housing.

36. Cross-shaft end float is non adjustable and is controlled by a hemispherical plastic button in the inner end of the cross-shaft. The button contacts the centre of the gear housing cover.

37. The housing cover incorporates a terminal block (8). Wires from this block feed the three motor brushes (4). Copper conductors soldered to the two remaining terminals pass through the cover and contact the self-parking switch plate in the cross-shaft gear wheel. A third conductor is soldered to the ground terminal and also contacts the self-parking switch plate.

38. The terminals (Fig 8) are numbered to correspond to a standard European wiring system, as follows:

31 b	Black	Motor ground and ground for self-parking switch.
53	Red	Motor low speed.
53 b	Blue	Motor high speed.
53 a	No visible wire	Feed for self-parking switch.
53 e	No visible wire	Current reversal feed for self-parking switch.

39. A thermotrip (Fig 9), designed to protect the motor from overload, is inserted in the black ground wire and is mounted on the brush plate inside the end frame.

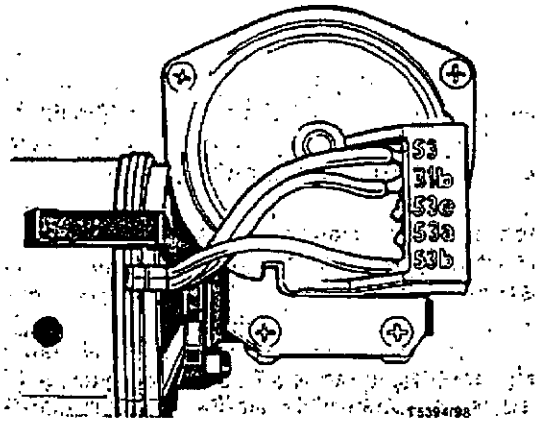


Fig 8 Wiring connections

Windshield Wash

40. The wash system is operated by an electric pump which is controlled by a push button mounted in the dash panel to the right of the instrument assembly.

41. Two spherical-type jets mounted in the windshield lower panel can be adjusted by inserting a pin in the jet orifice and moving to the required angle.

INSTRUMENTS

42. On vehicles with standard chassis ground return wiring, the instrument assembly incorporates a speedometer, fuel and water temperature gauges, and instrument, indicator and warning lights which receive their electrical supply from a printed circuit attached to the rear face of the instrument casing, through a multi-socket connector on the wiring harness.

43. The speedometer mask has slit windows in front of the headlight main beam and vehicle turn signal indicator lights. A dial in front of the instruments has red and amber lens on either side fir the alternator and oil warning lights, and windows for the speedometer, fuel and water temperature gauges.

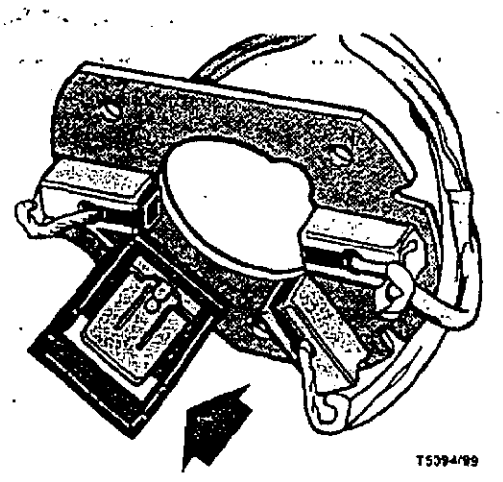


Fig 9 Overload thermotrip

44. Vehicles with insulated ground return wiring have an identical instrument assembly except for the field and water temperature gauges, which are not incorporated within the instrument. The temperature gauge is mounted in the dash panel and the fuel gauge is in the side of the fuel tank.

45. The instrument indicator and warning light holders have a bakelite body with metal contacts for connection the appropriate printed circuit strips. The lamps are of the wedge-base capless type.

46. The acrylic bezel is secured to the instrument casing by metal tabs. The instrument assembly also houses the panel light switch, windshield wiper switch and rear dog guard light switch.

Water temperature gauge

47. On vehicles with standard chassis ground return wiring, the electrically operated temperature gauge comprises two units, one housed in the instrument assembly and an engine unit screwed into the cooling system thermostat housing.

48. Vehicles with insulated ground return wiring have a dial type gauge mounted in the centre of the dash panel which is operated by a capillary tube routed through the cab from the cooling system thermostat housing.

Fuel gauge

49. On vehicles with standard chassis ground return wiring, the electrically-operated fuel gauge comprises two units, a gauge housed in the instrument assembly and a fuel tank unit.

50. Vehicles with insulated ground return wiring have a mechanically operated fuel gauge of the direct-acting float-type, mounted in the side of the fuel tank.

Speedometer and Techometer

51. The magnetic type speedometer is cable driven from the transfer box.

52. On vehicles equipped with a winch or crane, a magnetic-type tachometer is attached to the instrument panel lower flange on the passenger side. The tachometer drive is by a cable which is driven from an extension drive coupled to the oil pump driving gear in the crankcase.

Air pressure gauge

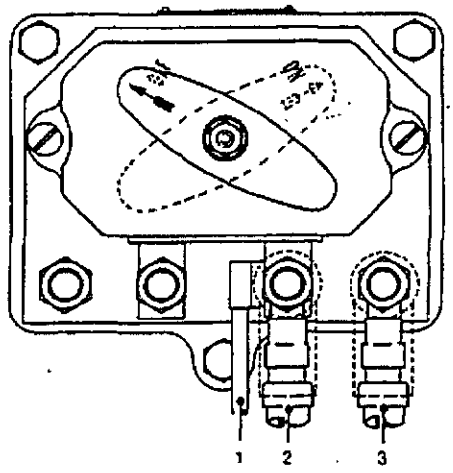
53. A dual air pressure gauge located in the dash panel indicates pressure in the Service and Secondary systems.

CONTROLS

Battery isolating switch

54. The battery isolating switch (Fig 10) is situated in the cab, attached to the floor panel beneath the drivers' seat. Bulk fuel carrying vehicles have an additional battery isolating switch mounted on the chassis sidemember adjacent to the battery carrier.

55. The isolating switch is activated by turning to 'OFF' or 'ON' position, this being clearly indicated on the switch.



1 Part of ignition harness
2 To starter
3 To battery

Fig 10 Battery isolating switch

Oil pressure switch

56. The oil pressure switch is a diaphragm-operated sealed unit which is screwed into the main oil gallery. The switch is located on the left-hand side of the engine adjacent to the fuel filter.

Key-start switch

57. The key-start switch is a three-position type which controls the ignition or warning lights and starter circuit. The switch is secured by a locking ring to the engine compartment top panel, adjacent to the drivers' seat.

58. The switch is operated by a key which can be inserted and withdrawn in the 'OFF' position.

58.1 'OFF – With the key in this position, no circuits are energised.

58.2 'ON' – With the key in this position, the warning lights are on and depending on air supply, a brake warning buzzer may sound and warning light illuminate.

58.3 'START' – Turning the key clockwise against the pressure of a spring will operate the starter motor. When the engine starts and the key is released it will return automatically to the 'ON' position.

Winch warning switch and light

59. On winching, if pull exceeds maximum, a warning horn is activated by a torque limit switch on the winch. If winching is still to be carried out the horn can be isolated by a switch located in the tachometer mounting bracket. Also mounted in the tachometer bracket is a warning light which illuminates when the warning horn has been isolated.

Lighting switch

60. The six-position switch (Fig 11) is mounted on the centre of the dash panel.

61. Turning the switch knob anti-clockwise from the 'OFF' to the 'T' position operates the tail and number plate lights. Rotation to the 'ST' position operates the sidelights in addition to the tail and number plate lights. Further rotation to the 'HST' position operates the head lights also.

62. Headlight high and low beam control switch (Fig 12) is situated to right of steering wheel utilizing the horn push.

63. The stop-light and turn signal circuits are energized with the switch at 'OFF' or any of the anti-clockwise positions. Turning the switch knob clockwise from the 'OFF' to the 'C' position operates the convoy light and breaks the stop-light and turn signal circuits. Further rotation to the 'CS' position brings the sidelight also into circuit.

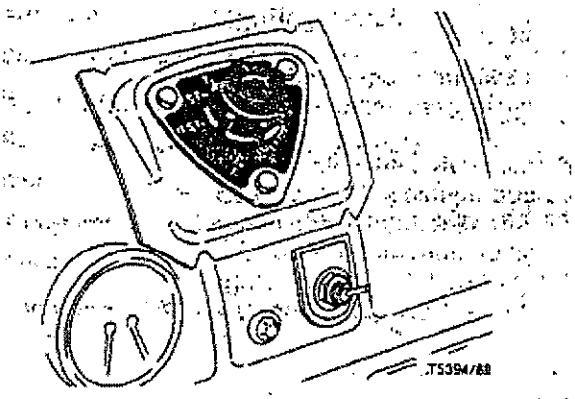


Fig 11 Lighting switch

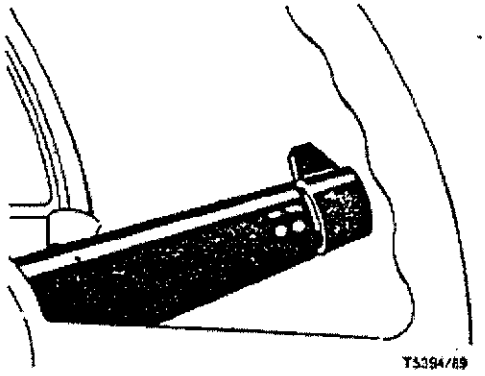


Fig 12 Headlight beam control switch

Turn signal and hazard warning system

64. The same lights operate as turn signal or hazard warning through a transistorised turn signal/hazard warning unit (Fig 13) having a capacity to operate six 21 watt lamps simultaneously.

65. The front lights are mounted on the cab and incorporate two amber lenses facing front and rear.

66. The rear lights are similar to the stop/tail lights but have an amber lens. The lights are provided with single-filament centre contact lamp.

67. Lights on the trailer are connected to the vehicle circuit through the 'M' and 'N' terminals of the trailer socket.

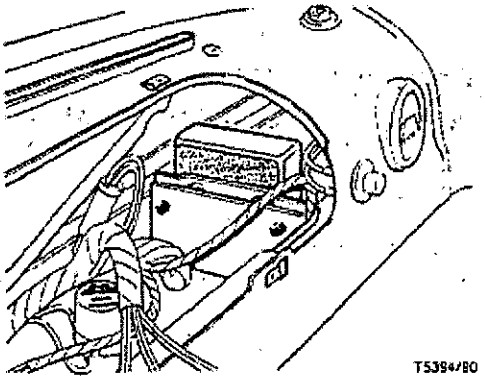


Fig 13 Turn signal and hazard warning unit

68. The turn signal circuit is fed from No. 6 terminal of the lighting switch, the lights being controlled by a three-position switch, housed in a casing which provides a clamp for the horn and dip switch assembly on the steering column. The switch consists of a contact operated by a lever. The self-cancelling device comprises a flanged action plate assembled between the lever and switch, which is held against the metal hum of a rubber wheel by a spring on the inner end of lever. The hub locates in an indentation in the action plate flange when the switch is 'OFF'. The rubber wheel contacts the hub of the steering wheel. Projections on the action plate located the lever in the 'ON' position.

69. Green indicator lights in the instrument assembly and on the dash panel indicate that lights are flashing on vehicle and trailer respectively.

70. The hazard warning switch is mounted in the dash panel to the right of the main instrument assembly.

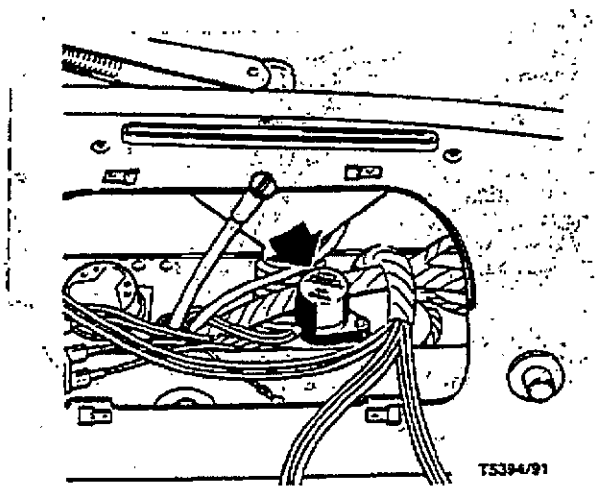


Fig 14 Air pressure warning buzzer

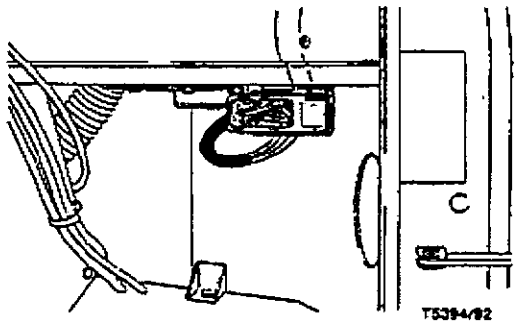


Fig 15 Turn signal relay isolating unit

Warning buzzer

71. The warning buzzer (Fig 14) is a circular red plastic sealed unit which is screwed on the dash panel reinforcement rail directly behind instrument panel. In addition to giving a warning of low air pressure in the braking system, the buzzer also gives and audible warning of when the brake fluid level in the reservoir is low.

Turn signal relay isolating unit

72. The unit (Fig 15) is positioned beneath the dash panel, to the right of the steering column and screwed to the fuse box mounting panel. The unit isolates the turn signal when convoy lights are illuminated.

Turn signal and hazard warning unit

73. All variants are equipped with an electronic type flasher unit (Fig 13) which also incorporates provision for hazard warning operation.

Horn

74.Single horns are mounted on the left and right hand step support brackets directly behind the headlights. They are of the vibrator type, one being a high note the other a low note. Winch variants have an additional high note horn used as an audible warning before winch reaches its maximum pull.

LIGHTING EQUIPMENT

Headlights

75. The headlights are mounted in the cab front panel and incorporate a semi-sealed light unit secured to the light body by spring-loaded beam trim screws.

76. The light rim incorporates a fairing to allow fitment of a standard blackout or an infra-red filter.

77. The double filament pre-focus lights are of the vertical dip type, the beams are controlled by a switch combined with the horn push and mounted on a bracket on the steering column

Sidelights

78. The sidelights, mounted adjacent to the headlights, consist of a rubber body and a white translucent lens screwed into a metal retainer, and are fitted with a single filament centre contact light.

79. The lens seals against the body to prevent the entry of water to the interior of the light.

Tail and stop-lights

80. The combined tail and stop-lights are similar to the sidelights but are fitted with a red lens and a twin-filament lamp.

81. The stop-light switches are located on the outside of the chassis right-hand sidemember. One is incorporated in the airline between the footbrake valve and master cylinder actuator, the other in the airline to the change-over valve.

Number plate and convoy lights

82. The cylindrical number plate and convoy lights are identical and incorporate a detachable holder for a single-filament centre contact lamp. A cover on the light can be rotated to black out the light if required.

Fog rear guard lights

83. The fog rear guard lights, which are mounted on the number plate bracket, are the same type of light as the tail-light and are operated by a switch mounted in the side of the instrument panel.

Cab interior light

84. The interior light is screwed to the front windscreen upper rail, carrying a festoon-type lamp, a switch and a clip-in lens. Vehicles equipped with insulated ground return wiring have an independent interior light switch mounted in the dash panel.

Chapter 14

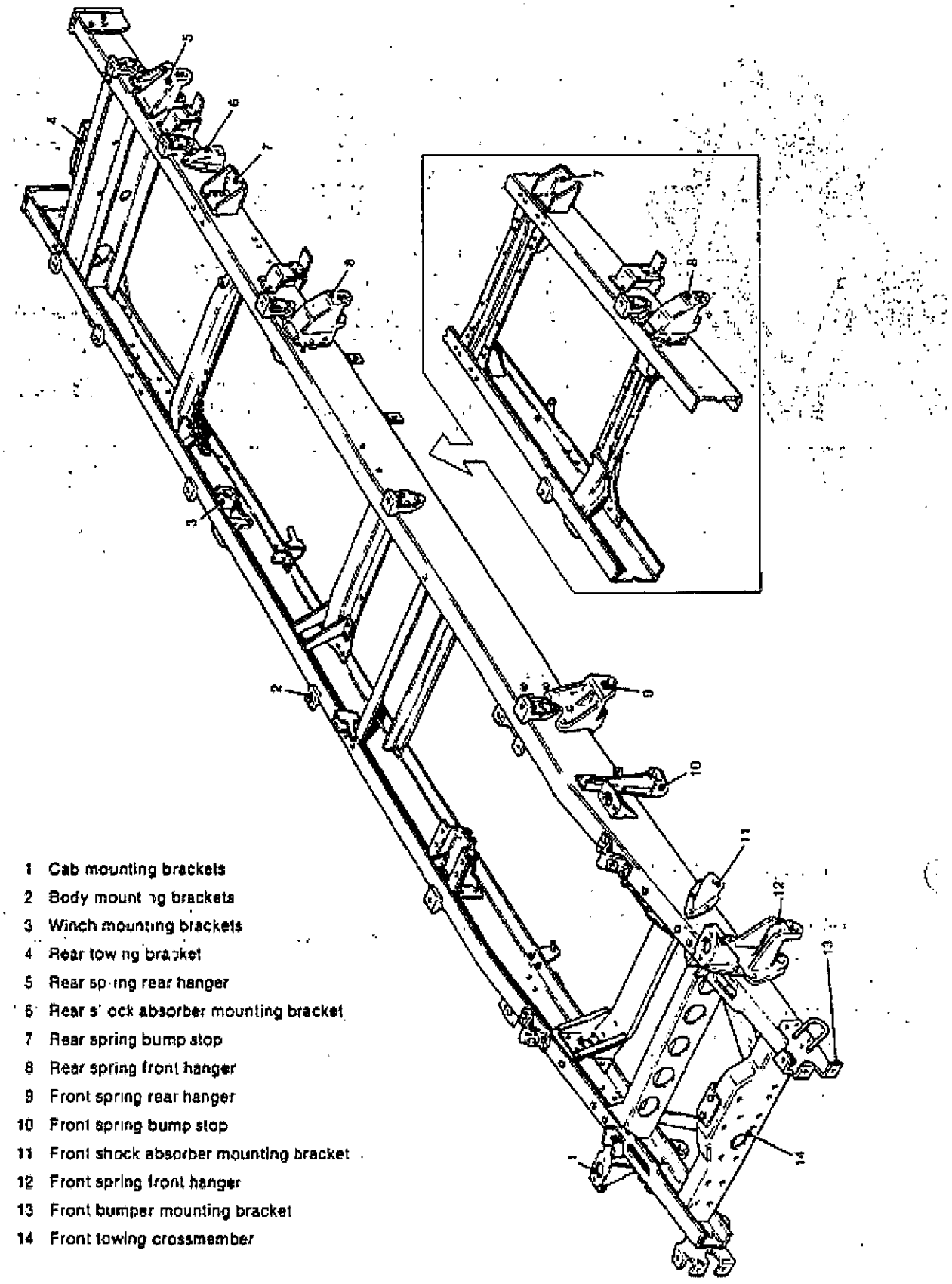
HYDRAULIC SYSTEM

Not applicable to this vehicle

Chapter 15

CHASSIS FRAME AND FITTINGS

CONTENTS



1 Cab mounting brackets
2 Body mount ng brackets
3 Winch mounting brackets
4 Rear tow ng bracket
5 Rear sp ring rear hanger
6 Rear s' ock absorber mounting bracket
7 Rear spring bump stop
8 Rear spring front hanger
9 Front spring rear hanger
10 Front spring bump stop
11 Front shock absorber mounting bracket
12 Front spring front hanger
13 Front bumper mounting bracket
14 Front towing crossmember

Fig 1 Chassis frame

CHASSIS FRAME AND FITTINGS

GENERAL DESCRIPTION

1. The chassis frame (Fig 1) is a flat ladder-type unit with 241 mm (9.5 in) deep channel sidemembers bracked by six crossmembers, two of which are of alligator jaw design.

2. The frame assembly is held together by cold squeezed rivets which enables the frame to flex without distortion or loosening cab or body mounts.

3. A heavy-duty bumper incorporating headlight guards and a towing hook is bolted to the front crossmember with additional brackets to the chassis sidemember.

4. Two lifting eyes are incorporated in the front bumper and lashing eyes are fitted at the front and rear of the chassis frame.

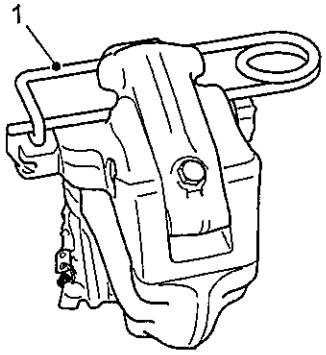
5. The chassis frame is basically the same on all variants, the only difference being the location of two crossmembers for crane and winch mounting. The part view Fig 1 shows location of crossmembers for crane variants.

TOWING HOOKS

6. The towing hooks may be used either as a rigid or swivelling coupling according to the type of tow bar being used.

7. The hook comprises of a rigid bottom jaw and a moveable top jaw which is held in position by a locking pin. The locking pin ensures that the top jaw, should towing hook be revolved, cannot release.

8. To use the towing hook (Fig 2), remove the locking pin (1) and open the top jaw. When a trailer towing eye is connected to the towing hook **the top jaw must be locked in the closed position.** This is achieved by inserting a suitable positive locking pin (refer to Cat 711) of the correct dimensions through the drilled hole located through the latch and upper jaw.



1 Towing hook

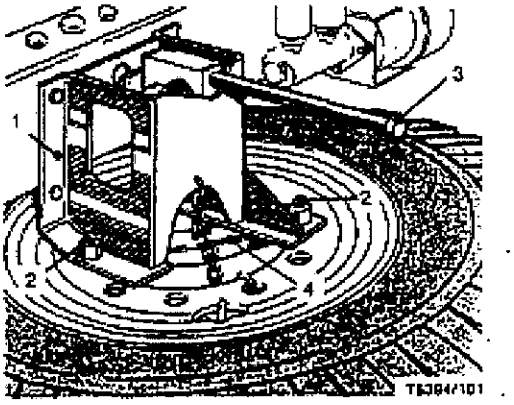
Fig 2 Towing hook and locking pin

REAR TRAILER COUPLINGS

9. Twelve and two pin trailer sockets are mounted to the rear of the vehicle with air pressure trailer couplings. The twelve pin socket provides interconnection of electrical system between the towing and towed vehicle or trailer. The two pin socket indicates, by air gauges on the instrument panel, when air pressure falls below minimum requirement on vehicle being towed. Both sockets are equipped with a waterproof screw on cap.

10. Air pressure couplings are of the palm type. When towing ensure couplings are clean before being connected, turn dummy coupling and place trailer coupling in position. The sleeve must be turned so that notch and peg align. Having installed trailer connections turn appropriate shut-off valves to 'ON' position.

10.1 Vehicles first used after 1st April 1989 will have self sealing air couplings fitted with no shut-off valves. Details of this fit can be found in Cat 811 Mod Instruction No. 30.



1 Winch mounting bracket

2 Winch bar studs

3 Winch bar screw

4 Winch bar

Fig 3 Spare wheel winch

SPARE WHEEL WINCH

11. A spare wheel winch (Fig 3) is mounted on the side of chassis sidemember on the left hand side of vehicle.

12. The spare wheel is attached to winch mounting bracket (1) by a winch bar (4). The winch bar is attached to winch by a cable. To raise wheel place winch bar inside wheel hub utilising wheel stud holes and raise wheel by turning winch bar screw (3), raise wheel until winch bar studs (2) protrude through bracket and secure with nuts

Chapter 16

CAB AND FITTINGS

CONTENTS

CAB AND FITTINGS

GENERAL DESCRIPTION

1. The cab (Fig 1) is of all steel welded construction incorporating a box section subframe and is so arranged that the rear centre section is raised to form a compartment for the engine and radiator.

2. Infra red reflection pain is used for both exterior and interior panel protection.

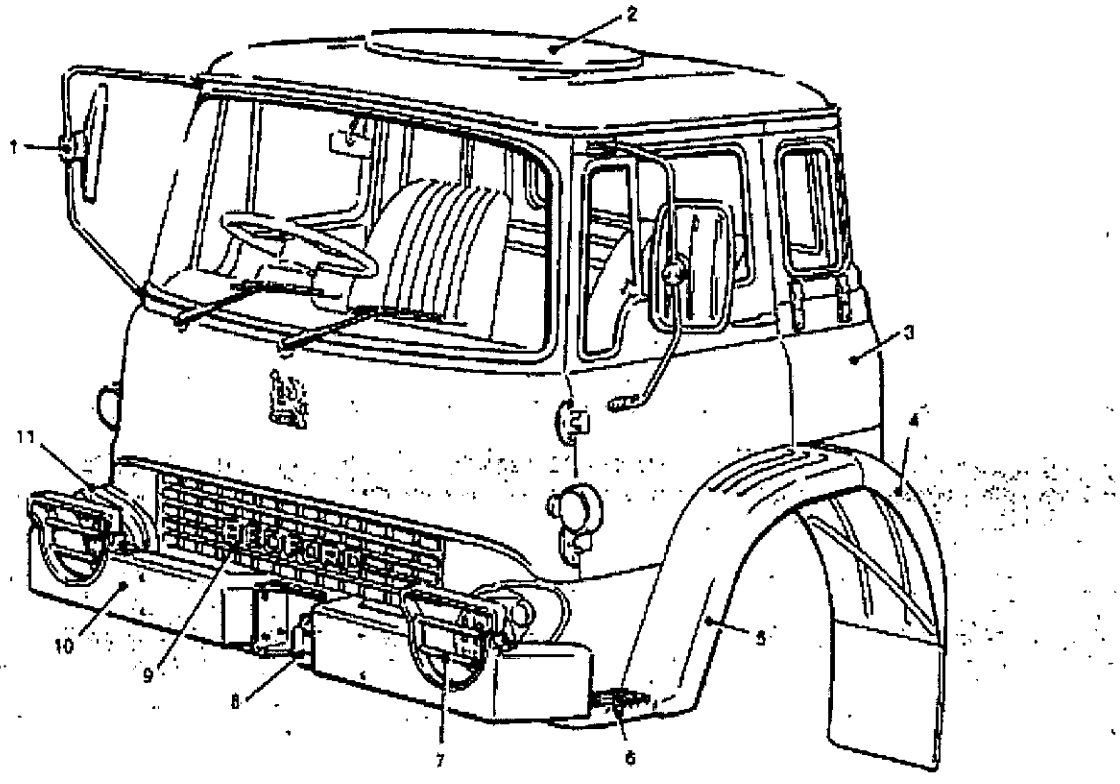
3. Observation hatches are provided on most variants, and a fibreglass cover (2) with waterproof seal is held in position by three stretch rings over pegs. A cover stowage bracket is located on cab back panel.

4. Gun clips are positioned on both sides of the dash panel by the front door pillars.

5. Two fire extinguishers are provided, one in the cab, the other on the cab outer back panel. Grab handles are installed on both vertical door pillars to assist cab entry.

6. A laminated windscreen is secured to cab front panel by a locking strip type glazing channel and sun visors are installed to cab inner roof rail.

7. The front wings (5) and extension panels (4) are secured to the cab by bolts, screws and nuts. The wings are also attached to the step (6) by a bolt and spacer. Each panel can be removed separately. A silencer strip is clamped between the wing and the cab and two rubber buffers are installed at the rear, these contacting the lower section of the engine inspection cover (3) when closed.



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1	Door mirror	5	Front wing	9	Grille panel
2	Observation hatch cover	6	Step	10	Bumper
3	Engine inspection cover	7	Headlight guard	11	Headlight mounting panel
4	Front wing extension	8	Towing hook		

Fig 1 Cab assembly

8. Each extension panel is supported at the top by a tubular bracket which is secured by cross recess screws and countersunk lock washers to the cab lock pillar. A stay supports the bottom of the panel. Mud flaps located at the lower and inner edges of the panel are secured by retainers, screws and speed nuts. Rubber silencer strips are installed between the panel and the cab.

9. The headlight mounting panel (11) bolts to the lower edge front wing panel, with screw fixings at the door aperture tread plate. Additional bolts fixings are behind front grille panel (9).

CAB DOOR ASSEMBLY

10. The cab door (Fig 2) is of steel construction consisting of inner and outer panels and supported by two external hinges attached to the front panel. The door is held in the fully open position by a check link (10) which is riveted to a bracket in the door panel.

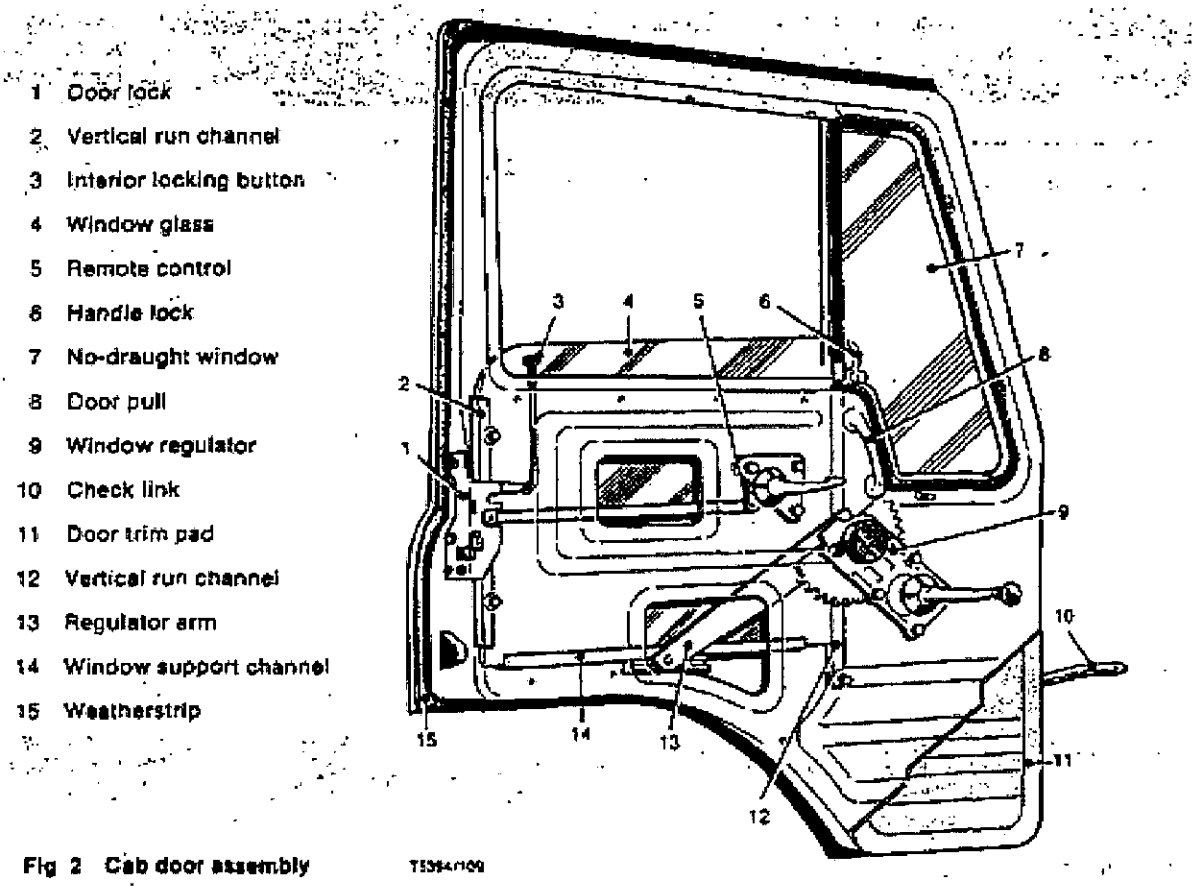


Fig 2 Cab door assembly

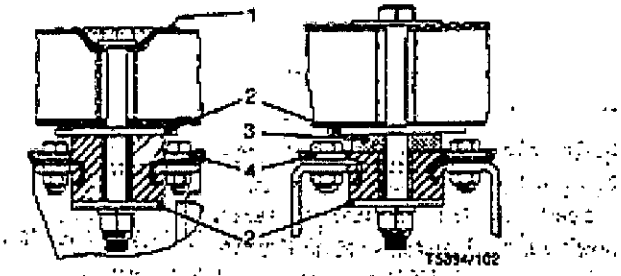
11. The door weatherstrip (15) is made from sponge rubber which is moulded to suit the contour of the door and secured by adhesive. A pivoting n-draught window (7) with a handle lock (6) forms a vertical run channel (12) for the door window glass. The window glass (4) is surrounded by run channels located within the stationary frame. A lower horizontal weatherstrip is secured to the inner panel by spring clips.

12.Door window is adjusted by a regulator (9) which is operated by an internal handle. A rubber buffer is fixed to the bottom of door to cushion the window glass in its lowest position. A door pull (8) is screwed to the inner panel.

13. The door lock (1) is bolted to the door shut face and incorporates the remote control (5) and interior locking button (3). The fork of the lock engages a striker attached to the cab lock pillar. The door outside handle is bolted to the door outer panel and has a plunger type release button.

CAB MOUNTINGS

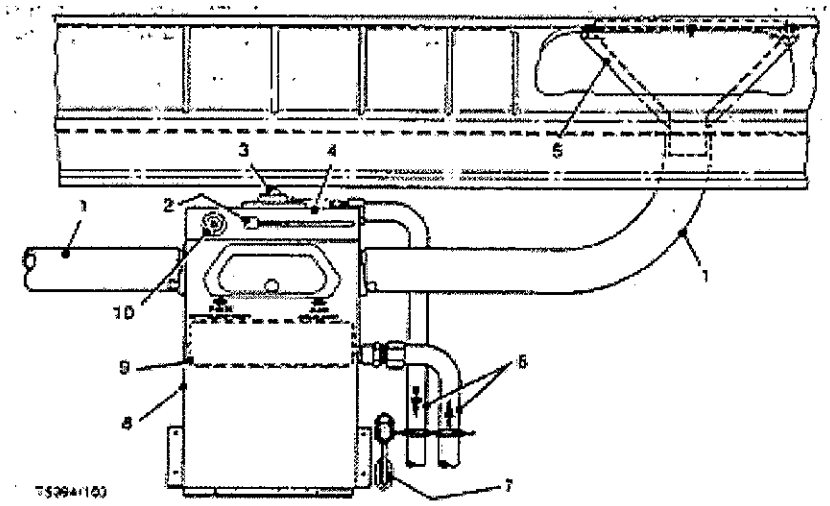
14. The cab is mounted on rubber insulated mountings (Fig 3) two at the front and two at the rear. The mounting on the left is used at the front only. The mounting on the right, together with distance washer (3), is used at the rear. Each mounting is secured to the chassis frame bracket by two bolts, self-locking nuts and internal-toothed lock washers. A reinforcement plate (4) is assembled on the flange of the mounting and a plain washer (2) at the top and bottom. Reinforcements (1) are clamped in the recesses in the cab floor by the front mounting bolts.



1 Floor panel reinforcement
2 Plain washer
3 Distance washer
4 Reinforcement plate

Fig 3 Arrangement of cab mountings

CAB VENTILATION AND HEATING



1 Flexible hose
2 Water valve control lever
3 Electric motor
4 Water valve
5 Demist outlet
6 Metal pipes
7 Flap operating lever
8 Heater
9 Radiator element
10 Fan motor switch

Fig 4 Ventilation and heating system

15. Cab ventilation and heating (Fig 4) is provided by an intake in the floor panel. Air flow is controlled by a flap valve operated by a lever (7) protruding through the floor. When cab heating is specified, a heater (8) containing a radiator element (9), manually operated water valve (4) and electric motor (3) with fan, is mounted immediately above the ventilator. Metal pipes (6) and rubber hoses connect the heater to the engine cooling system. The water valve control lever (2) and fan motor switch (10) are mounted on the heater casing which also admits air into the cab via three hinged doors and a duct each side. Each duct is connected to a demist outlet (5) by a flexible hose (1).

1 Water valve
2 Water valve sealing ring
3 Motor mounting plate
4 Fan
5 Cut-off plate
6 Radiator
7 Casing
8 Casing closing panel

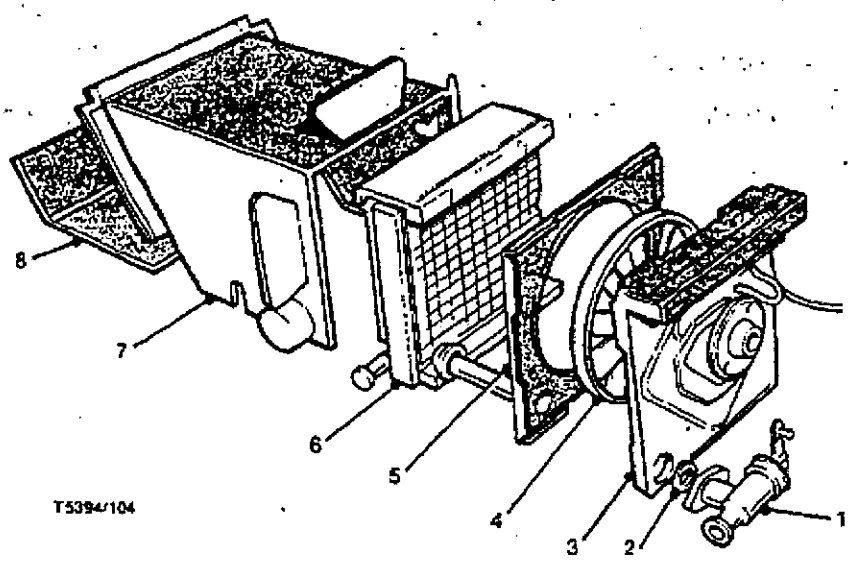


Fig 5 Heater assembly

16. The heater assembly (Fig 5) consists of a casing (7) which houses a radiator (6), fan (4), motor and mounting plate (3) and the water valve (1).

17. The heater assembly as viewed from above (Fig 6) has a control lever (1) riveted to the motor mounting plate and a link rod (2) connects the lever to the water valve lever (3).

1 Control lever
2 Link rod
3 Water valve lever

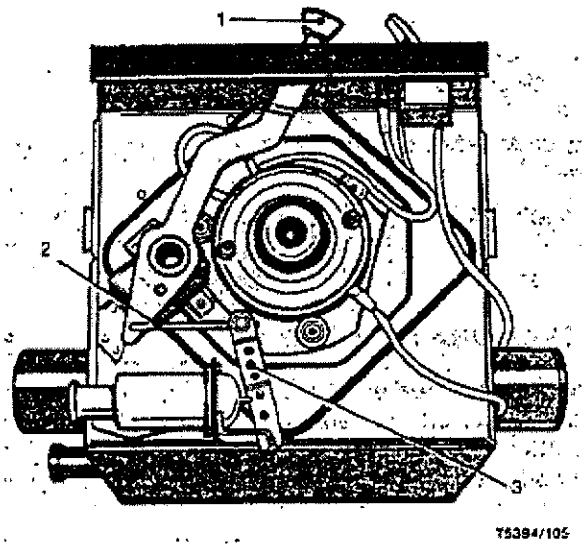
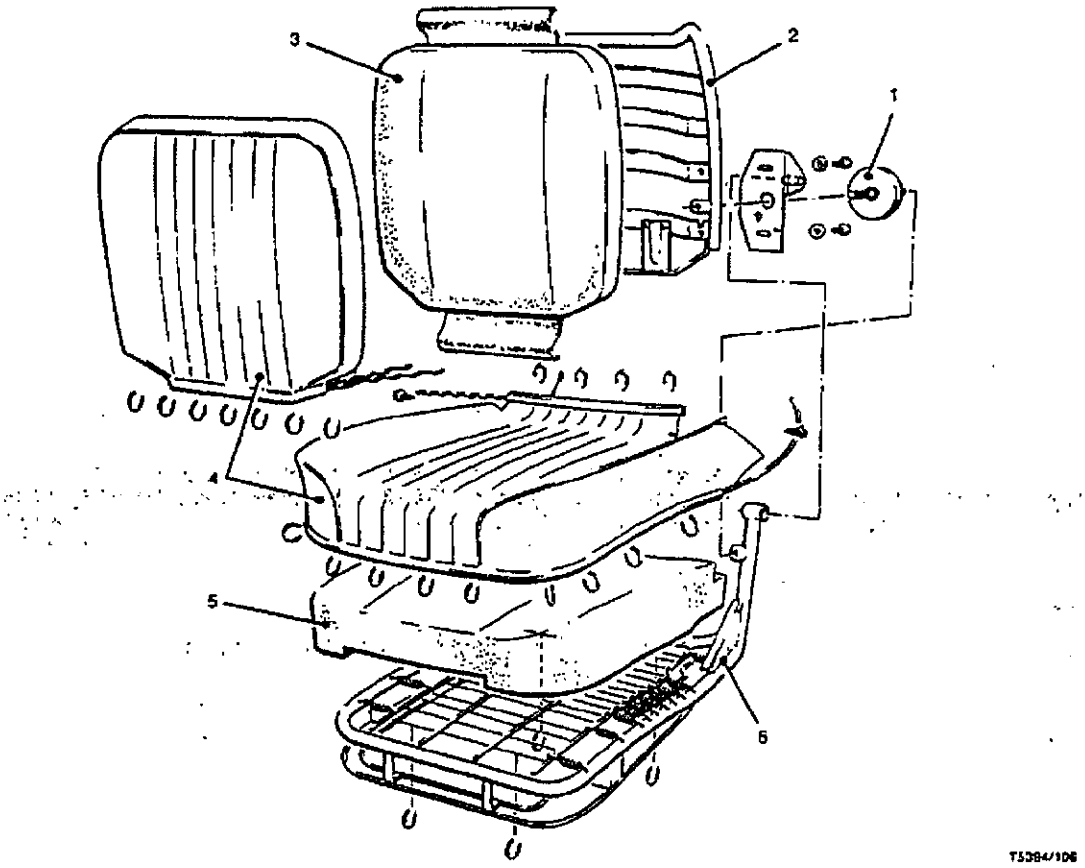


Fig 6 Heater assembly as viewed from above

CAB TRIM AND HARDWARE

18. The roof lining panel is a one-piece type shaped to the contour of the roof and secured around the edges with plastic rivets. On most variants the observation hip ring gives additional support to centre of roof lining.

19. Driver and passenger seats (Fig 7) are identical but only drivers seat has full adjustment.



1 Adjuster wheel
2 Squab frame
3 Foam padding
4 Covers
5 Foam padding
6 Spring assembly

Fig 7 Seat assembly

20. The seats comprise a frame and spring assembly (6), squab frame (2), foam padding (3 and 5), and covers (4). The rake of the squab can be varied by means of an adjuster wheel (1) and threaded shaft positioned on the outer side of the seat.

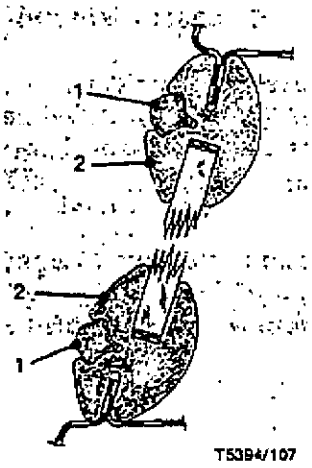
21. The driver's seat is attached to an adjuster frame which provides both height and fore and aft adjustment. The adjuster frame is mounted on a tubular seat support. The passenger seat also mounts to a tubular seat support.

Windshield glass

22. The laminated glass windshield is mounted in its aperture by a rubber weatherstrip (Fig 8 (2)) which is slotted for attachment to the cab. A filler strip (1) inserted in the forward side tightens the weatherstrip against the glass.

Rear and quarter window glass

23. Both the rear window and quarter windows are of toughened glass mounted in rubber weatherstrips, of the same type as the windshield weatherstrip.



1 Filler strip
2 Rubber weatherstrip

Fig 8 Windshield weatherstrip

Chapter 17

WINCH

CONTENTS

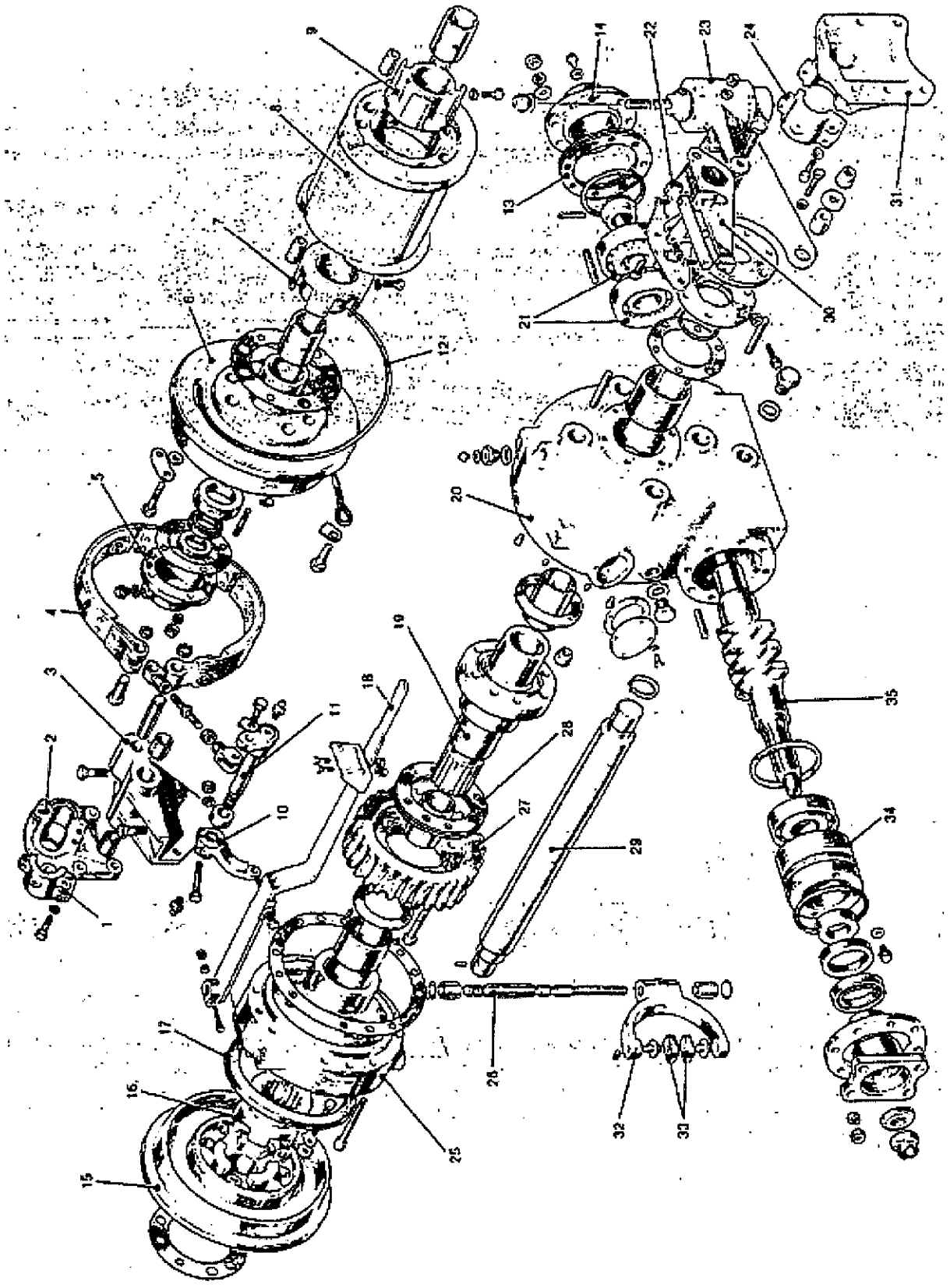


Fig 1 Exploded view of winch

1 Mounting bracket cap right-hand
2 Mounting bracket right-hand
3 Brake bracket
4 Brake band
5 End cover and oil seal housing
6 Flange - brake end
7 Oil collector
8 Cable drum
9 Oil collector
10 Brake lever
11 Brake shaft
12 Cable
13 Shims
14 End cover
15 Flange - clutch end
16 Clutch dog
17 Oil seal
18 Clutch lever
19 Wormwheel hub
20 Wormcase
21 Bearings
22 Tensioner control valve
23 Torque bracket and load limiter
24 Mounting bracket cap left-hand
25 Clutch housing
26 Clutch shaft
27 Wormwheel
28 Shims
29 Mainshaft
30 Tensioner control valve bracket
31 Mounting bracket left-hand
32 Clutch fork
33 Clutch fork slippers
34 Oil seal and bearing housing
35 Wormshaft

Key to Fig 1

WINCH

GENERAL DESCRIPTION

1. The winch (Fig 1) comprises a worm and wheel drive housed in one-piece casing (20). Drive end of wormshaft (35) is supported by a parallel roller bearing in a housing (34) which also incorporates two lip-type oil seals. Other end of wormshaft is supported on two taper roller bearings (21) in the wormcase which also control wormshaft end float. End float is adjusted by shims (13) between end cover (14) and wormcase.

2. The wormwheel (27) is bolted to a hub (19) with shims (28) interposed between wheel and hub flange to provide a means of adjusting tooth contact. The wormwheel hub is supported on the mainshaft (29) and in the wormcase and clutch housing (25) by a steel backed, lead-bronze bearings. End float of hub is controlled by two thrust washers, one between the hub and clutch housing and the other between hub and wormcase. The thrust washers are each located by two dowel pints.

3. Clutch end of wormwheel hub is splined to accommodate a sliding clutch dog (16) operated by a fork (32) and shaft (26) in the clutch housing. The sliding clutch engages with dogs on the cable drum flange (15) to transmit drive from the wormwheel hub to the drum. Drum is supported on the mainshaft by two steel-backed, lead-bronze bearings with endwise location of drum controlled by a bronze washer and circlip.

4. Oil sealing of drum to wormcase is accomplished by a lip-type oil seal (17) between drum and clutch housing cover. Sealing of drum to mainshaft is achieved by two, lip-type oil seals positioned in a housing bolted to drum brake end of drum. End of cable is secured to drum by an eye-bolt and locked with a tab washer.

5. Two trunnion and mounting bracket assemblies, one on each end of the mainshaft are used to attach winch assembly to the chassis sidemember. Torsional location of winch is controlled by the torque reaction bracket and load limiter assembly (23).

6. Drive to the winch assembly is transmitted by a propeller shaft from the power take-off flange on the transfer box to the wormshaft flange on winch.

7. A spring-loaded breather is installed to top of wormcase.

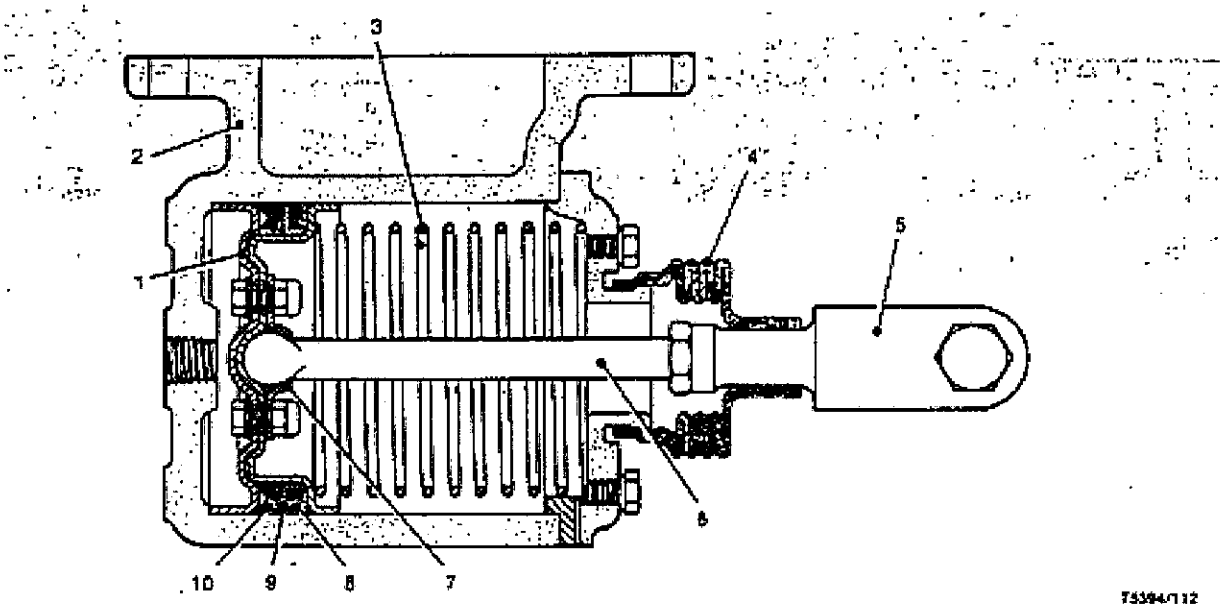
WINCH CLUTCH

8. The drum type dog clutch is oil immersed and sealed to prevent ingress of water or dirt.

9. Clutch engagement is achieved by a lever mounted on the winch assembly.

WINCH BRAKE OPERATING CYLINDER

10. The winch brake operating cylinder (Fig 2) is attached to the right-hand chassis sidemember and is connected to a lever and shaft mounted in a bracket on top of sidemember. The other end of shaft is connected to the winch brake band.



1 Piston seal retainer	4 Gaiter	7 Piston rod retainer
2 Cylinder	5 Piston rod clevis	8 Lubrication felt
3 Piston return spring	6 Piston rod	9 Lubrication felt retainer
		10 Piston seal

Fig 2 Sectional view of winch brake operating cylinder

11. The operating cylinder consists of a composite piston which comprises a piston seal retainer (1), piston seal (10), lubrication felt (8), lubrication felt retainer (9) and a piston rod retainer (7). A piston return spring (3) is incorporated between the piston and end cover.

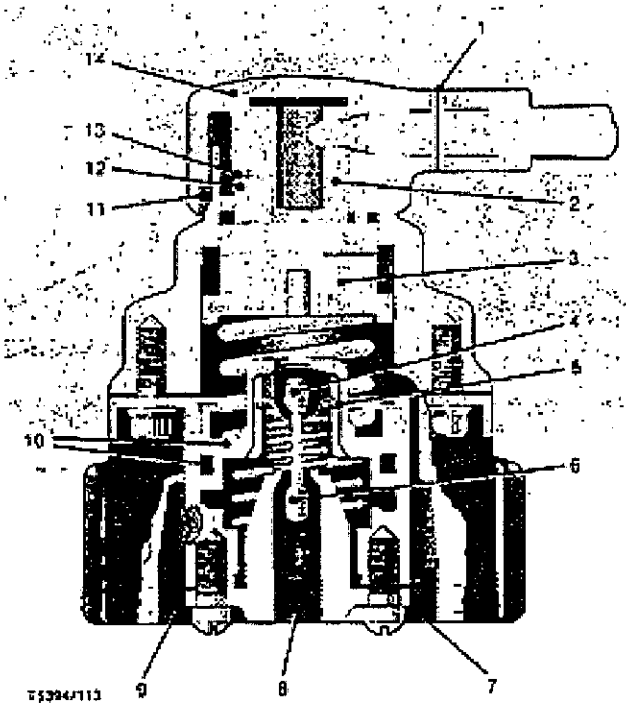
12. An external air filter is incorporated in the breather port.

WINCH BRAKE HAND CONTROL VALVE

13. The winch brake hand control valve (Fig 3) is mounted on the steering column and consists of a body and cover containing a hand-operated inlet valve (6) and exhaust valve (4) assembly. The handle and head (14) are secured to a cam follower (2) located in the cover. The inlet/exhaust valve assembly is fitted below the piston (10) and comprises an inlet valve seat (8) rubber valve, spring and spring guide (5).

14. When the handle is moved in a clockwise direction from the released position, force is exerted on the pressure graduating spring through the action of the cam (3) and cam follower. The force of the spring on the piston causes it to move downwards. The exhaust seat in the centre of the piston contacts the exhaust valve and closes the exhaust passage in the piston. Continued downward movement of the piston unseats the inlet valve, permitting compressed air from the secondary reservoir to flow through the

valve to the secondary line change-over valve and secondary relay valve. Thus graduation takes place during application and release of the secondary brake system, pressure in the brake line being proportional to the degree of movement of the control valve handle.

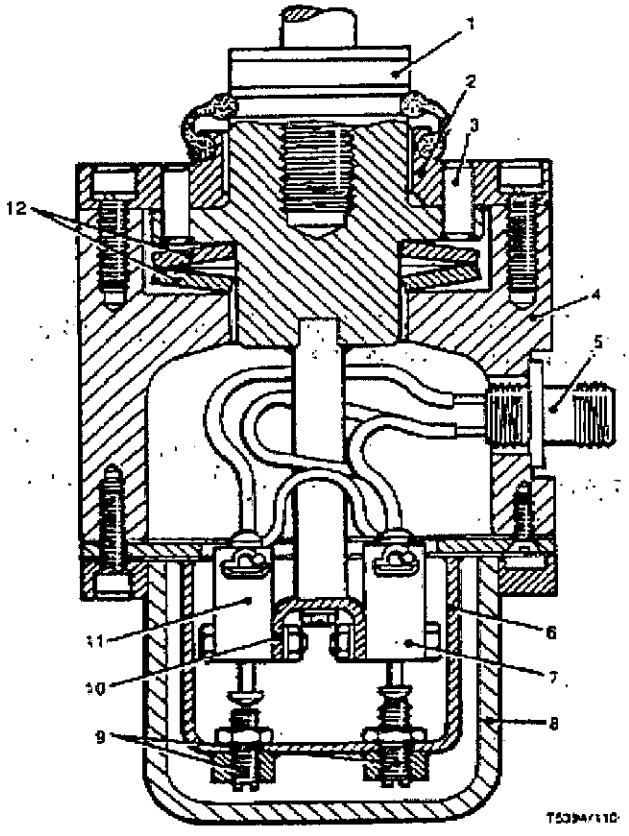


1 Spring pin
2 Cam follower
3 Cam
4 Exhaust valve
5 Exhaust valve guide and spring
6 Inlet valve
7 Exhaust port
8 Inlet port and inlet valve seat
9 Delivery port
10 Piston and seat
11 Head sealing ring
12 Adjusting ring
13 Lockwasher
14 Valve head

Fig 3 Brake hand control valve

WINCH LOAD LIMITER

15. The winch load limiter (Fig 4) is incorporated in the torque reaction bracket and includes a disc type spring (12) and two switches (7 and 11). The switches are activated by a control switch mounted on the power take-off control lever bracket.



1 Seating dome
2 Cover plate
3 Dowel
4 Spring housing
5 Connecting socket
6 Adjusting screw bracket
7 Warning horn/light switch
8 Switch cover
9 Adjusting screws
10 Switch bracket
11 Engine cut-off solenoid switch
12 Spring discs

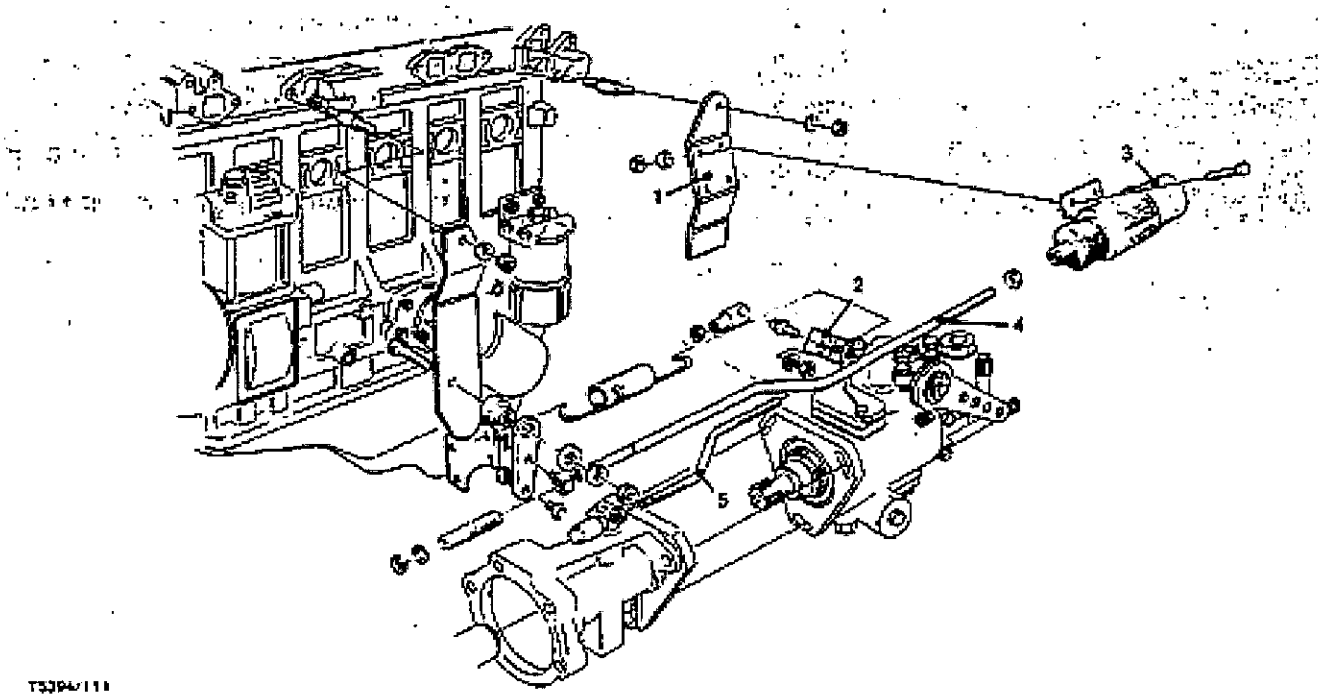
Fig 4 Sectional view of winch load limiter

16. Switch (7) operates a warning horn and light when the winch reaches a nominal rated load. A toggle switch mounted on the tachometer bracket, enables the warning horn to be isolated. Switch (11) activates an engine cut-off solenoid connected to the engine fuel injection pump stop control lever when the winch load reaches the maximum permitted safety load.

17. To re-start engine the winch must be relieved from the overload condition.

Engine cut-off solenoid

18. The engine cut-off solenoid (Fig 5 (3)) is connected to the fuel injection pump stop control lever (2) by rods (4 and 5).



1 Solenoid mounting bracket
2 Stop control lever
3 Solenoid
4 Rod
5 Rod

Fig 5 Exploded view of engine cut-off solenoid linkage

19. When load on which reaches its maximum permitted safety limit, winch load limiter activates solenoid which pulls rod and stop control lever rearwards thus stopping the engine.

20. A spring inside the solenoid returns the solenoid and linkage the 'engine run' position. The engine will not start if the load on the winch is not relieved.

PAY-ON GEAR

21. The pay-on gear (Fig 6) is attached to its own chassis crossmember situated between the winch and rear fairleads. The pay-on gear consists of a trolley (7) which is allowed to run freely on a curved track (2) under the influence of the cable. The trolley is supported on eight balls which run directly in the track and are secured by adjustable retainers. Four rollers (3) support the trolley against the underneath of the curved track. The cable is guided by a pulley (6).

22. Travel of the trolley is restricted by adjustable stop bolts (1) situated at each end of the track.

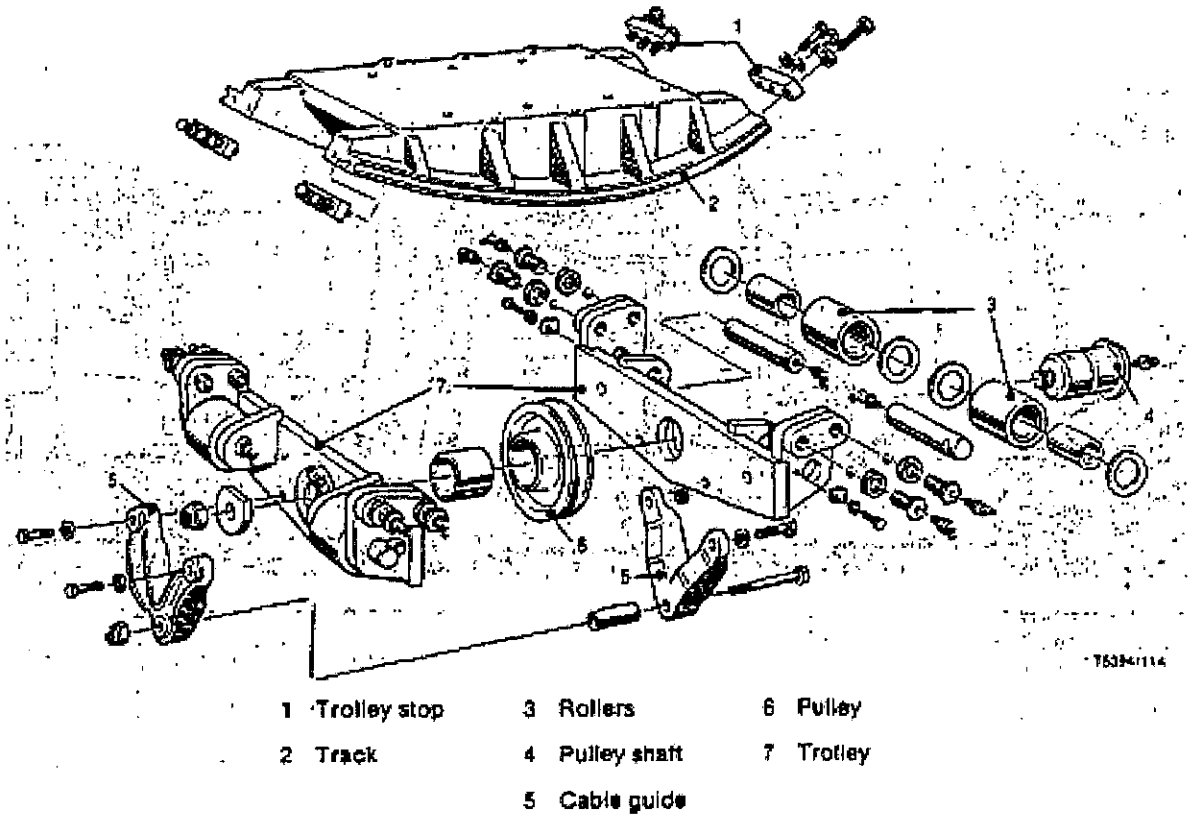


Fig 6 Exploded view of pay-on gear

REAR FAIRLEADS AND CABLE TENSIONER

23. The rear fairleads and cable tensioner (Fig 7) are mounted on a common base plate attached to the rear of the chassis. The fairleads consist of two horizontal pulleys (16) retained by brackets (1) which are extended rearwards to provide support for a horizontal roller (2). A second roller (5) located parallel with and beneath the first, is supported by two brackets (6) bolted to the rear apron.

24. The cable tensioner comprises two pulleys, one (14) fixed to rear fairlead base plate, while the other (8) is attached to a swinging lever arm (13) pivoting on base plate. The movable pulley (8) is operated by an operating cylinder (9) which is actuated by compressed air through a control valve, operated in conjunction with the winch clutch lever.

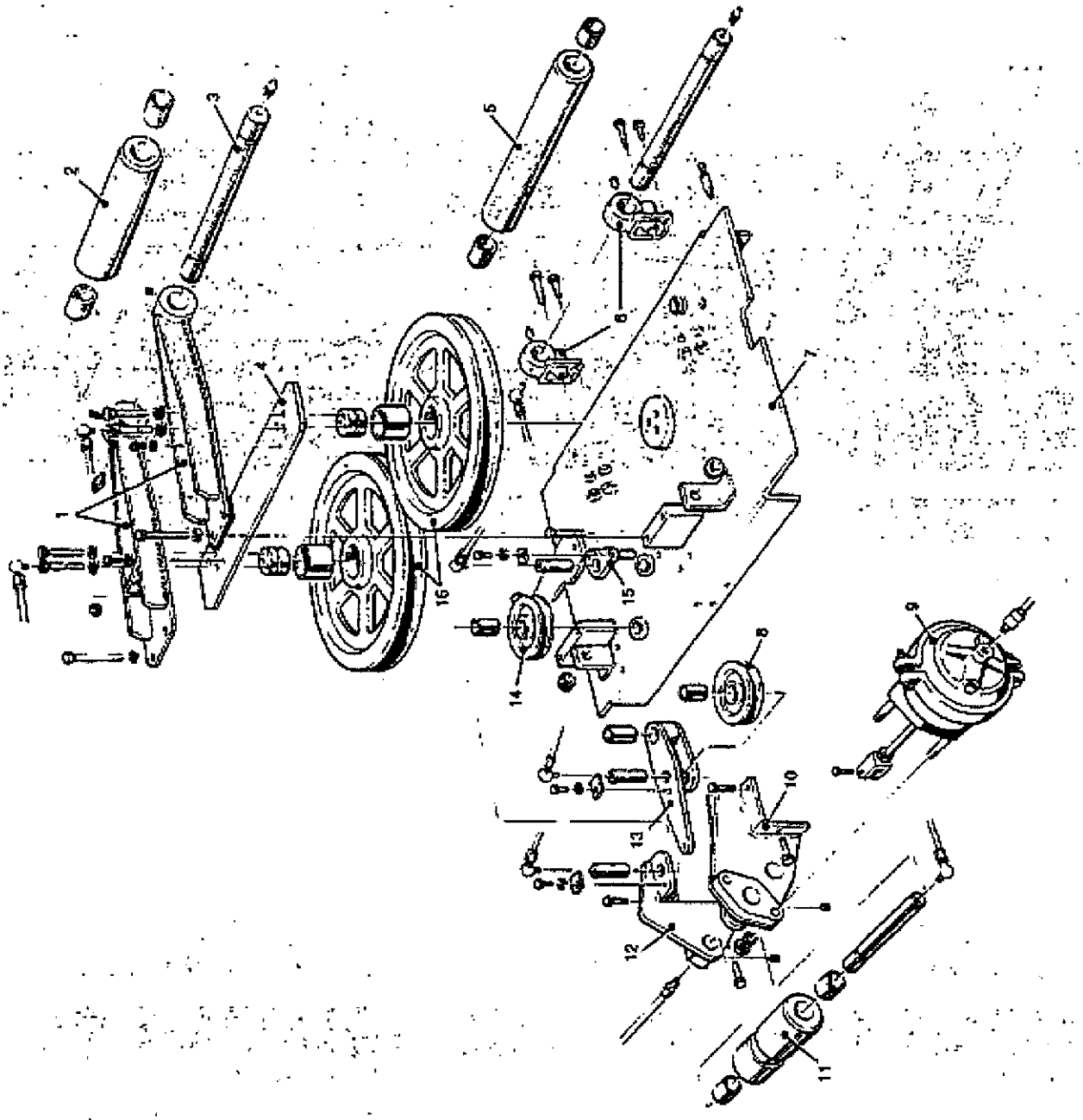
25. When the winch clutch engagement lever is placed in 'payout' position, air is supplied to the tensioner operating cylinder which moves lever arm and pulley rearward, thereby relieving tension on cable. When the winch clutch engagement lever is placed in engaged position, air is exhausted from actuator allowing it to move lever arm and pulley forwards and exerting correct tension on cable.

26. A roller (11) is incorporated in front of the tensioner pulleys mounted on a bracket attached to front apron.

FRONT FAIRLEADS

27. The front fairleads (Fig 8) consists of two vertical rollers (6), an upper horizontal roller (1) mounted on a common bracket (5) situated under the front of the vehicle chassis frame.

28. The fairleads are so designed that they permit winching from varying angles.



1 Roller brackets
2 Upper roller
3 Roller shaft
4 Support plate
5 Lower roller
6 Lower roller brackets
7 Base plate
8 Tensioner pulley
9 Cable tensioner operating cylinder
10 Roller and cylinder mounting bracket
11 Roller
12 Roller bracket
13 Tensioner lever
14 Tensioner pulley
15 Pivot bracket
16 Main pulleys

Fig 7 Rear fairleads and cable tensioner

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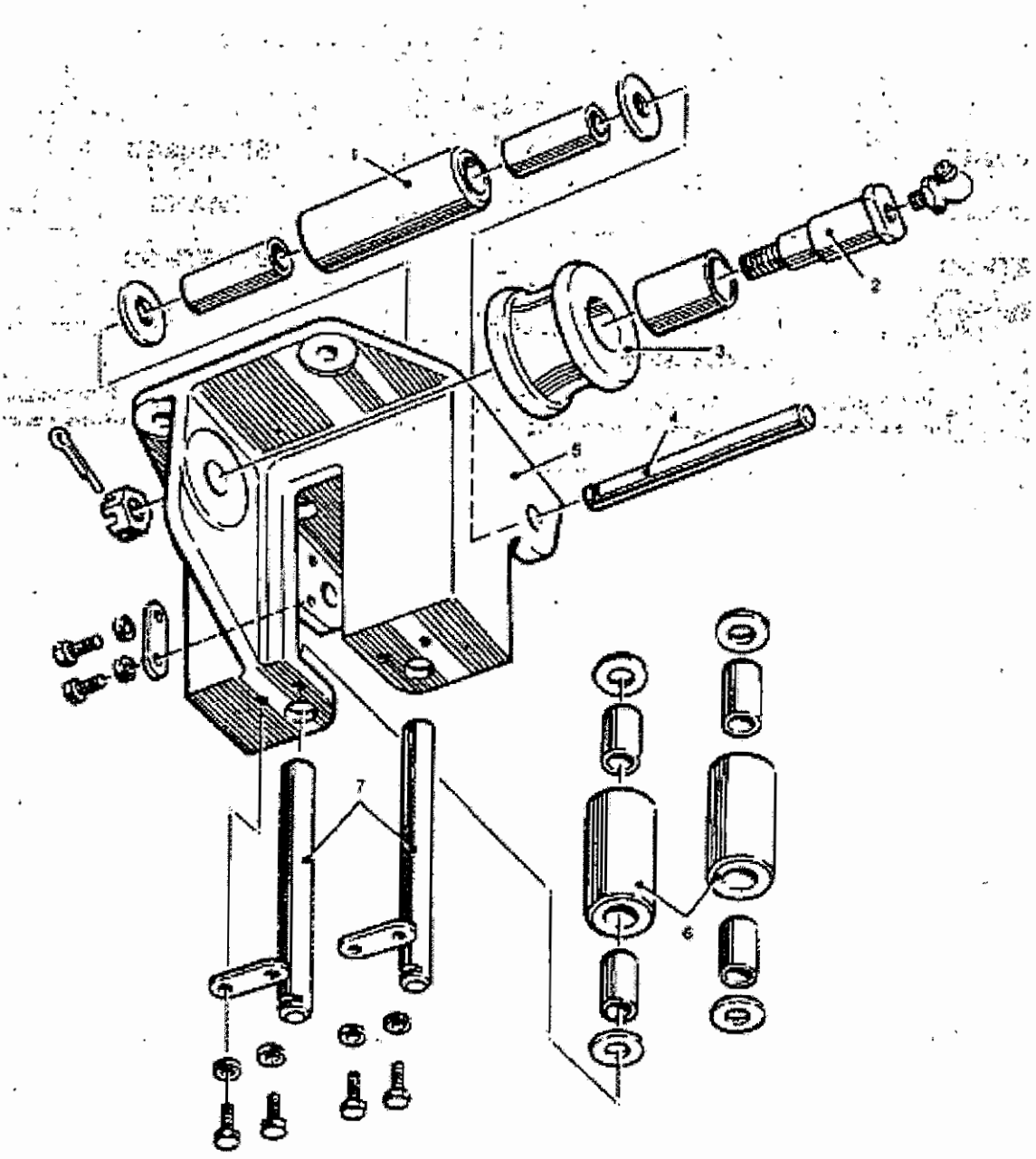


1 Horizontal roller
2 Pulley pin
3 Pulley
4 Horizontal roller shaft
5 Fairleads bracket
6 Vertical rollers
7 Vertical roler shafts

Fig 8 Exploded view of front fairleads

Chapter 18

CRANE

CONTENTS

CRANE

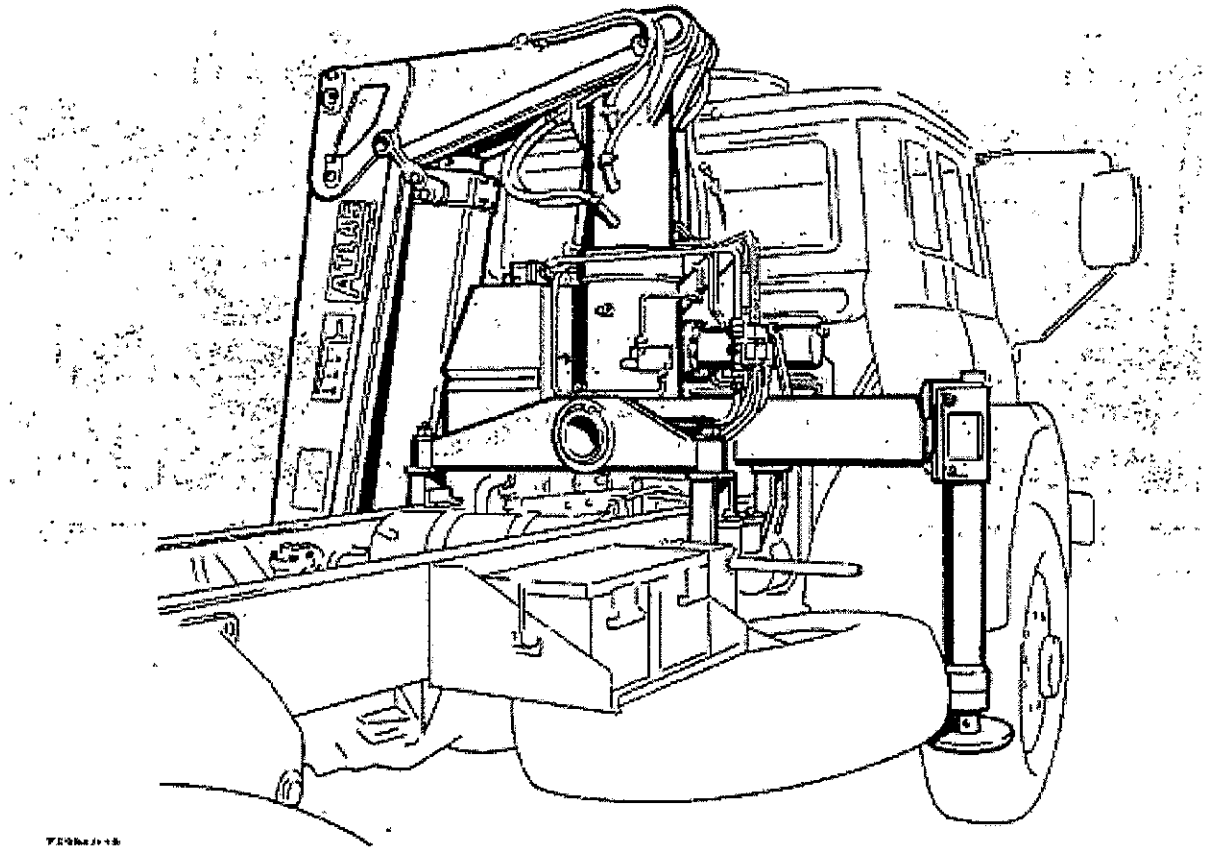


Fig 1 Crane assembly mounted on vehicle

GENERAL DESCRIPTION

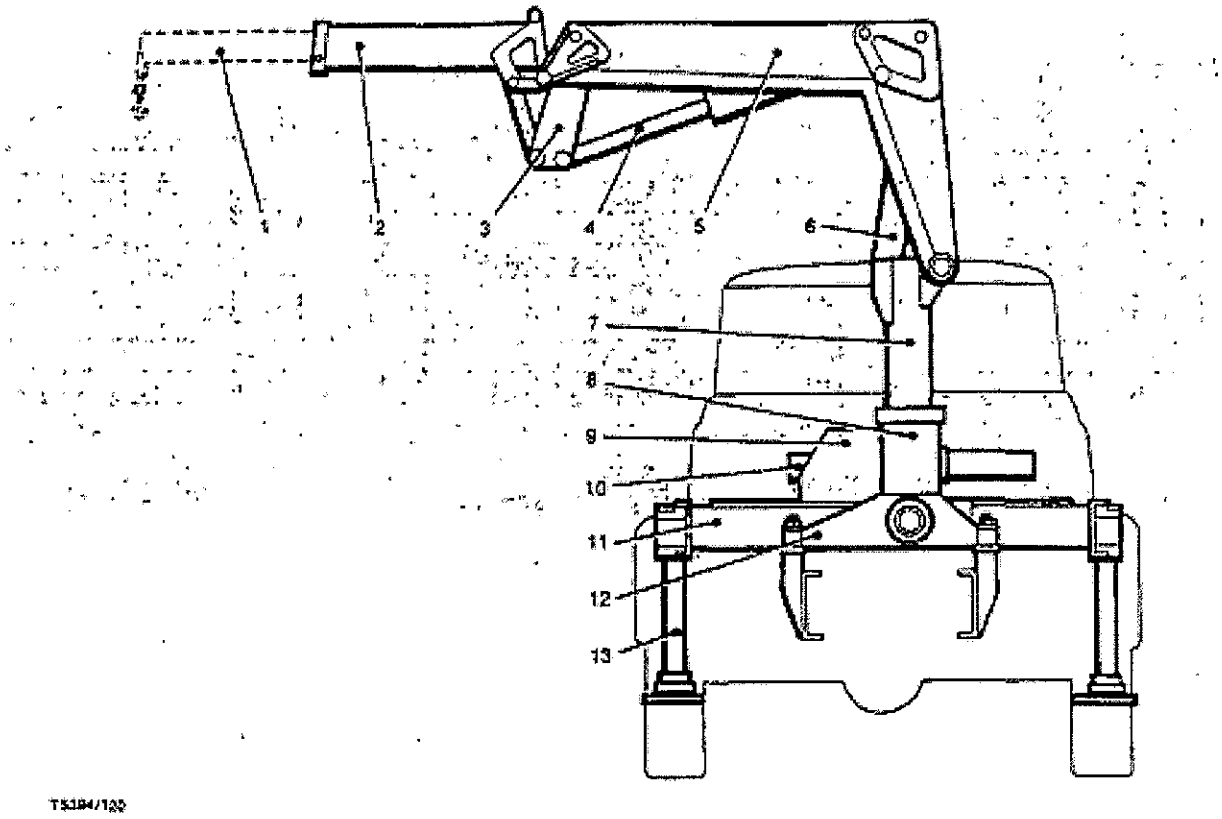
1. The crane assembly (Fig 1) is a fully hydraulically controlled unit with folding boom and jib. It is folded completely hydraulically to the stowed position. All working motions, including control of the stabilizers, are effected by control valves operated view control rods and linkages from roof of cab. Hydraulic relief and safety valves are incorporated to protect crane components against overloading. In addition, load holding valves are used in order to prevent any load from suddenly falling to the ground due to a pipe or hose failure.

2. The crane trestle (Fig 2(11)) is of welded construction incorporating both the column mountings (8) and slewing rams (10). The pendulum beam (12), pivoted to crane trestle, is a rotatable or movable type of crane attachment which allows chassis to twist and distort during normal vehicle operation.

3. Two hydraulic stabilizer legs (13) are symmetrically bolted to the near and off-sides of the crane trestle. The rams are double-acting with chromium-plated piston rods. The rams relieve vehicle chassis frame of undue strain during loading and off-loading operations and prevent tipping.

4. The rotatable centre column (7) with column trunnion and pinion is supported in compact plastic material. Attached to the box-shaped upper section of centre column is the folding boom (5), jib (2) and lifting ram (6). The hydraulic hoses are routed inside centre column for protection.

5. Slewing through an angle of 193° is effected by the slew rams, the rack of which rotates the centre column. The cylinder tubes are flanged to column mounting and a plastic block acts as a guide to the rack within cylinders.



1	Jib extension tube	5	Boom	9	Oil reservoir
2	Jib	6	Lifting ram	10	Slewing rams
3	Jib ram linkage	7	Centre column	11	Trestle
4	Jib ram	8	Centre column base	12	Pendulum beam
				13	Stabilizer

Fig 2 Components of crane assembly

6. The folding boom, which is raised and lowered by the lifting ram, incorporates jib ram (4) and linkage (3). The jib extension tube (1) is supported on plastic guide blocks and is hydraulically operated by a ram positioned inside jib.

7. All rams are double-acting and have chromium-plated piston rods together with wear resistant compact packings.

DRIVE UNIT/HYDRAULIC PUMP ASSEMBLY

8. The nine-cylinder swash plate pump (Fig 3) is bolted to a hanger bracket welded to the chassis and driven by a drive shaft from the power take-off mounted on the vehicle gearbox.

9. Drilled in the pump body are nine cylinders, set in a circle, equi-distant from and parallel to each other. The inlet (4) and outlet (1) unions of the pump are connected by drillings to the inlet and outlet of each cylinder which are controlled by valves. A spring-loaded plunger (8) is fitted into each cylinder bore. The plungers are hollow and drillings below the head allow the inflow of oil. A thrust race (9) mounted on the wobble shaft (10) is set at an angle to the axis of the shaft against the enlarged inclined surface of the swash plate.

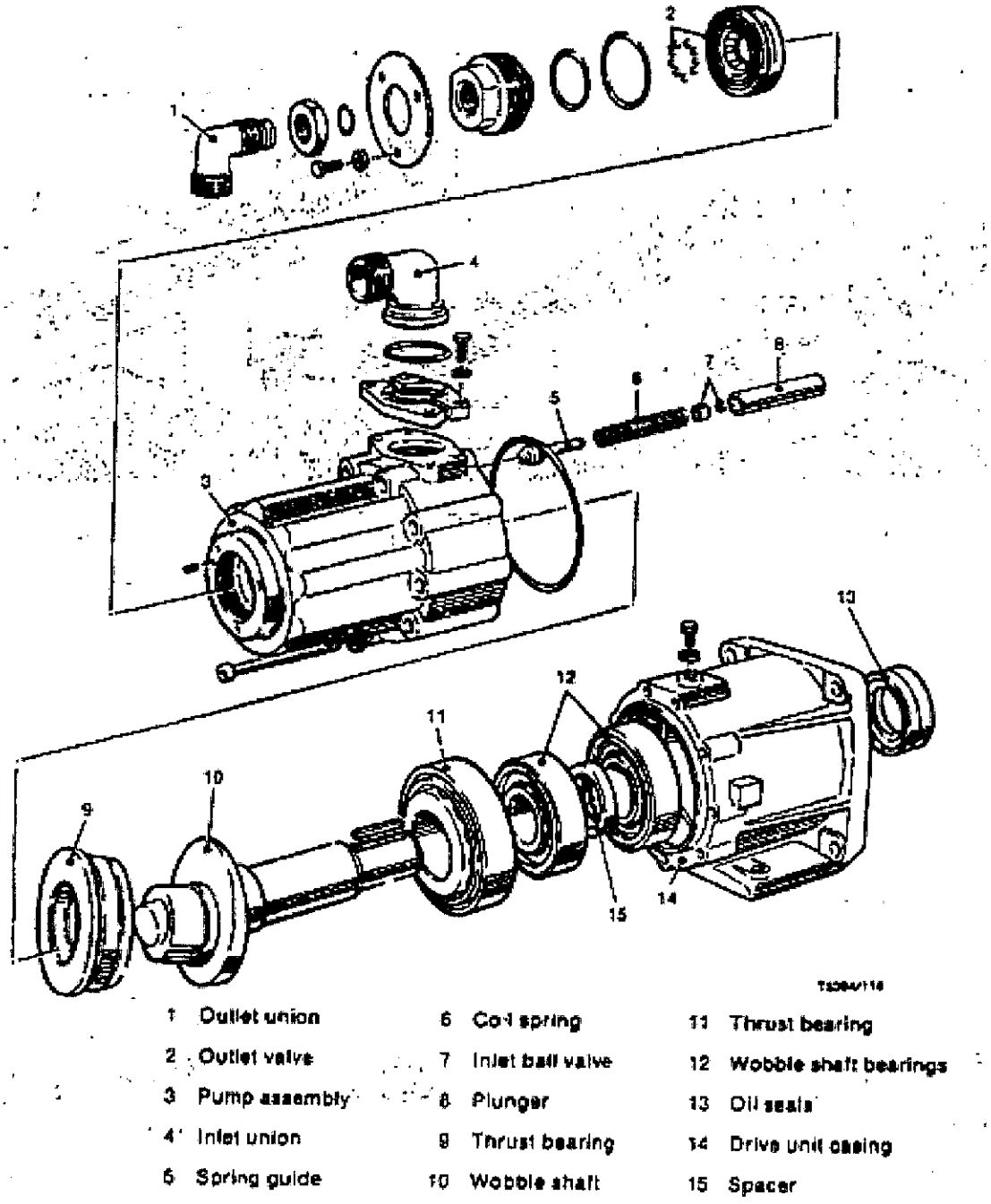
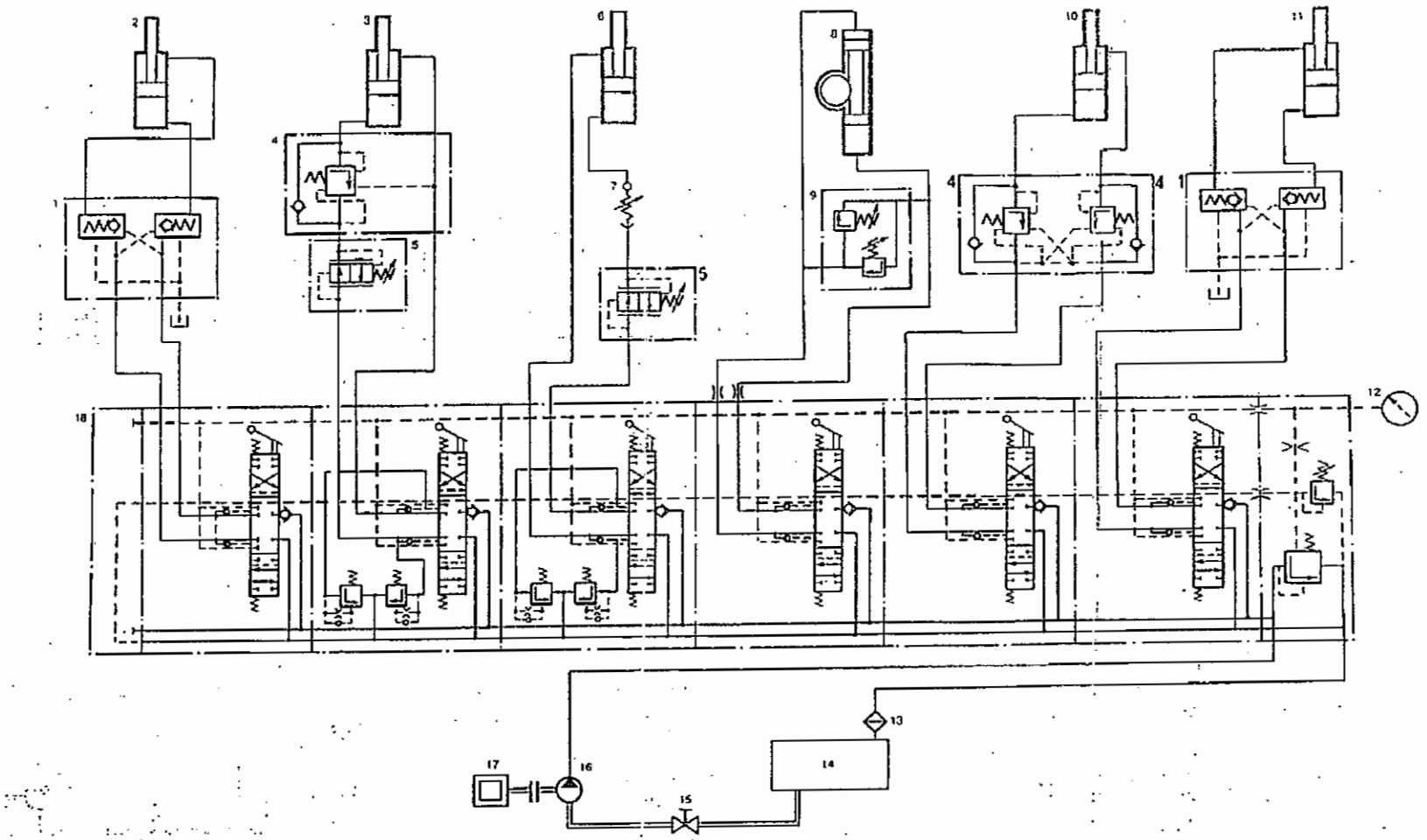


Fig 3 Exploded view of drive unit/hydraulic pump assembly

10. The plungers are maintained in contact with the wobble shaft thrust race at all times by the pressure of the coil springs (6) so that the plungers are continually in recessive stages of the inlet of outlet strokes. As the wobble shaft rotates and the face of the thrust race moves away from each cylinder in succession, the coil spring forces the plunger outward creating a depression in the cylinder. The inlet ball valve (7) is drawn off its seating and oil flows into the cylinder. Further rotation of the wobble shaft causes the thrust race to force the plungers back into the cylinder. The pressure of oil closes the inlet valve, opens the outlet valve (2) and the oil is forced out to the pump outlet union.

11. A diagrammatic layout of the hydraulic circuit is shown in Fig 4.



1	Double non-return valve	7	Emergency safety valve	13	Oil filter
2	Left-hand stabilizer	8	Slewing ram	14	Oil reservoir
3	Main lifting ram	9	Double relief valve	15	Shut-off valve
4	Load holding valve	10	Jib extension ram	16	Oil pump
5	Lowering brake valve	11	Right-hand stabilizer	17	Power take-off
6	Jib ram	12	Pressure gauge connection	18	Control valve block

Fig 4 Hydraulic circuit diagram

2320-H-100-522
June 1983

TRUCK, 4t, 4x4, BEDFORD MJ, ALL VARIANTS

REPAIR INSTRUCTIONS

REPRINTED INCORPORATING **AMDTS Nos 1 to 10**

BY COMMAND OF THE DEFENCE COUNCIL

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CONTENTS

PREFACE

AMENDMENT IDENTIFICATION

1 Except for manuscript entries, amendments are identified by marginal side lining. Manuscript amendments are identified by Amdt No in outside margin in line with the amendment.

COMMENTS ON THIS PUBLICATION

2 Comments on this publication are to be forwarded in accordance with AESP 0100-P-011-013 to Vehicles and Weapons Branch REME, Chobham Lane, Chertsey, Surrey KT16 OEE.

ASSOCIATED PUBLICATIONS

AESP	2320-H-100-101	Purpose and Planning Information
AESP	2320-H-100-201	Operating Instructions
AESP	2320-H-100-302	Technical Description
AESP	2320-H-100-601	Maintenance Schedule
AESP	2320-H-100-711	Illustrated Parts Catalogue
AESP	2320-H-100-721	Commercial Parts List
AESP	2320-H-100-741	Complete Equipment Schedule
AESP	2815-K-062-512	Engine Diesel 6 Cyl Bedford 5.4 Litre Turbo-charged

WARNINGS/CAUTIONS

3 Before driving this vehicle or operating any fitted equipment, personnel are to read and understand the Warnings, Cautions and Operating Instructions detailed in Cat 201 of this AESP.

Chapter 1

ENGINE

CONTENTS

ENGINE FRONT MOUNTING

CAUTION ...

Do not let fan jam against engine cowl.

Removal

1 Remove nuts and washers securing the mounting to the engine support and chassis crossmember brackets.

2 Raise front of engine as far as fan cowl will allow and slacken bolts securing the mounting bracket to the chassis crossmember sufficiently to enable mounting to be removed.

Installation

3 Install the thick plain washer under the nuts securing the mounting to the chassis crossmember bracket.

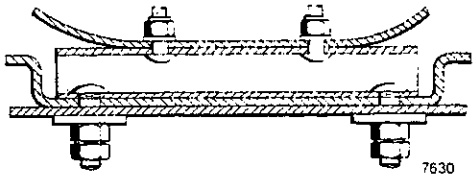


Fig 1 - Engine front mounting

ENGINE REAR MOUNTING

Removal

4 Support engine with jack under transmission and remove bolts attaching the support crossmember to the brackets on chassis frame.

5 Remove two nuts, one each side, securing the shackle pins to the mounting bracket in the crossmember, and drive out the pins. Slacken the nuts securing the shackles to the clutch housing bosses and lift away the support crossmember.

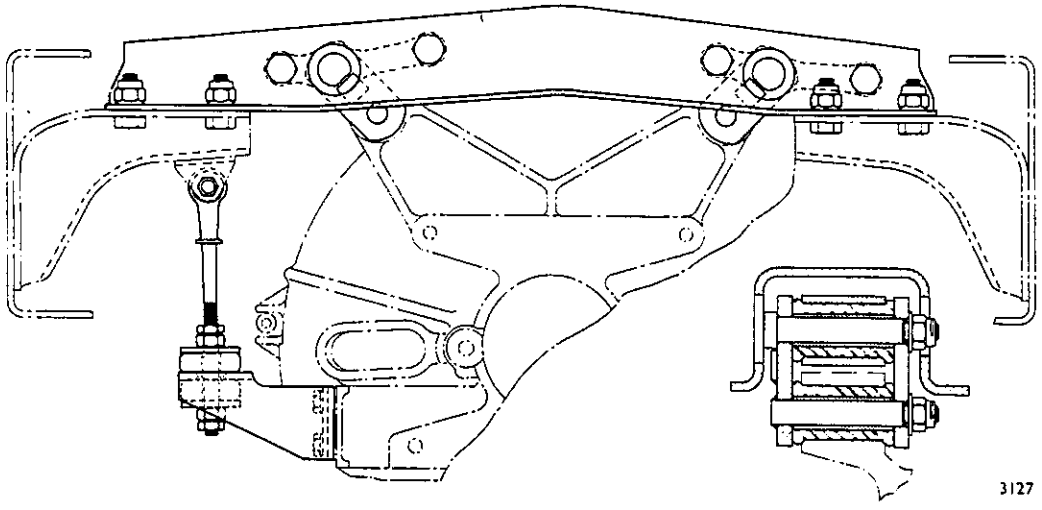


Fig 2 - Engine rear mounting

Installation

6 Smear new bush with liquid soap and use a draw bolt to install into clutch housing or shackle bracket.

7 Check that rubber bushes of the torque reaction rod are adjusted firmly against the clutch housing bracket.

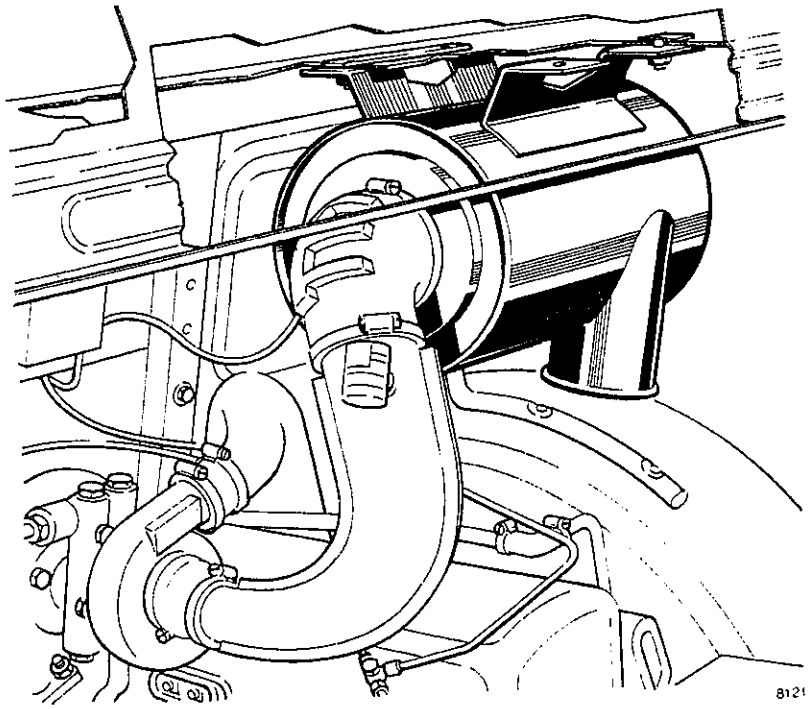


Fig 3 - Air cleaner removal

ENGINE AIR CLEANER, HOSES AND TRUNKING

8 The engine air cleaner, hoses and trunking may be removed by slackening jubilee clips on hose connectors and removing four nuts and washers clamping air cleaner assembly to underside of parcel shelf. Remove two nuts and bolts from support bracket and lift away complete assembly.

ENGINE ASSEMBLY

Removal

9 To facilitate engine removal, remove cab as described in Chapter 16, Level 3.

10 Remove radiator and all associated pipes and hoses.

11 Disconnect clutch push rod, fuel pipes, engine wiring harness, throttle controls, parking brake and front end of main propeller shaft.

12 When lifting engine out of chassis frame, ensure oil pan clears front axle before withdrawing unit forward.

Installation

13 On installation of a new or overhauled engine add 225 ml (8 UK fl oz) of zinc dithio-phosphate additive as a running-in compound to engine oil.

14 It is essential that the additive is used only throughout the 800 km (500 mile) running-in period and, should the oil be changed before 800 km (500 miles) have been accomplished, additive should be added to fresh oil.

15 Accelerator pedal linkage should be installed and fuel system vented as described in AESP 2815-K-062-512, para 199.

16 On installation adjust torque reaction rod by tightening upper and lower adjusting nuts finger tight until rubbers contact bracket. Using a wrench, tighten adjusting nuts by equal amounts to ensure that rubbers are equally stressed. Secure adjusting nuts in position with the lock nuts.

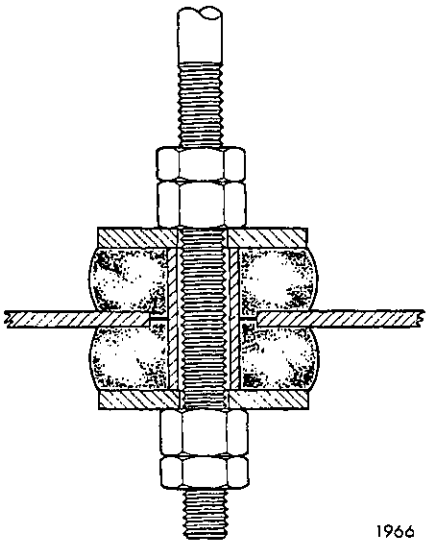


Fig 4 - Torque reaction rod installation

Chapter 2

CLUTCH

CONTENTS

CLUTCH PEDAL, SHAFT AND LINKAGE

Removal and Reconditioning

1 The clutch pedal on right-hand drive models may be withdrawn after removing split pin and washer.

2 The pedal shaft is retained in the steering gear by a spring pin (arrowed) which may be driven out from the underside.

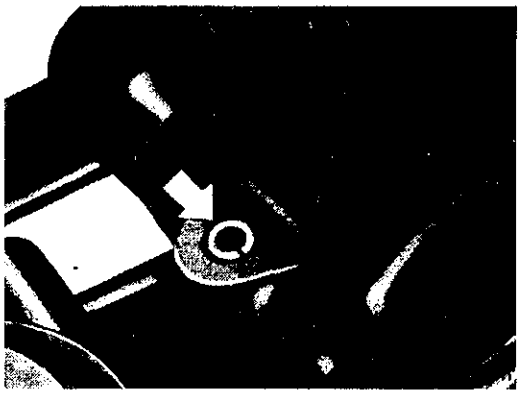


Fig 1 Pedal shaft spring pin

3 Clutch pedal bush must be pressed in until flush with outer face of pedal boss.

4 On left drive models the steering gear must be removed or lowered for access to pedal shaft sleeve.

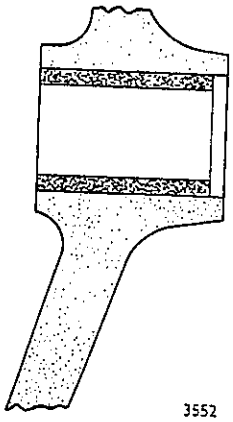


Fig 2 Pedal bush installation

5 Install replacement bushes in pedal shaft sleeve so that dimension 'A' is 1.52 mm (0.060 in.).

6 Should it be necessary to renew pedal shaft sleeve, press sleeve into steering gear case until flush with clutch pedal side.

7 Replacement clutch pedal and shaft bushes are pre-finished and do not require reaming on assembly.

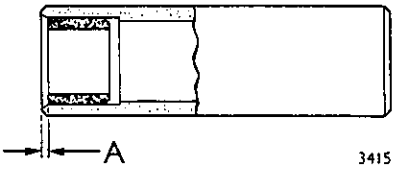


Fig 3 Pedal shaft sleeve bush

Installation and Pedal Setting

8 Clutch pedal and shaft bushes must be liberally smeared with XG 279 Grease on installation.

9 Excessive clutch and brake pedal side clearance on right drive models, can be reduced by loosening the spring pin, retaining shaft in steering gear, and tightening slotted nut.

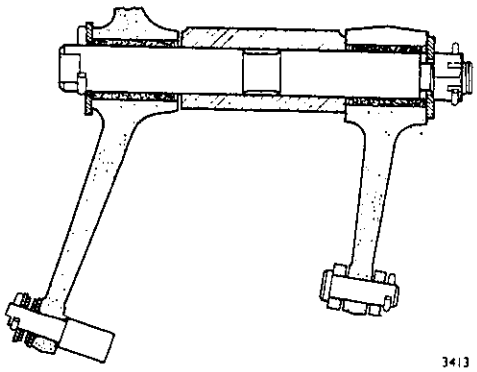


Fig 4 Pedal assembly

10 Clutch pedal stop bolt must be adjusted so that dimension 'A' (from upper face of clutch pedal to underside of floor panel) is 25 mm (1.00 in.).

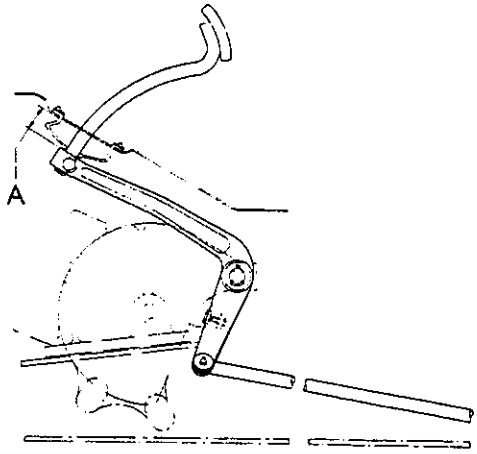


Fig 5 Clutch pedal setting dimension

11 Adjustment for clutch linkage is provided at clutch fork end.

CLUTCH PEDAL FREE TRAVEL

12 Before adjusting clutch pedal free travel, check clutch pedal setting as previously described in para 10.

13 Pedal free travel is adjusted by rotating push rod adjusting nut until specified clearance of 25 mm (1.00 in.) is obtained.

CLUTCH FORK AND RELEASE BEARING

Removal and Installation

14 Remove gearbox as described in Chapter 3, level 2.

15 To remove clutch fork, knock back locking tab from head of clutch fork ball support. Hold ball hexagon with a wrench and unscrew ball from support.

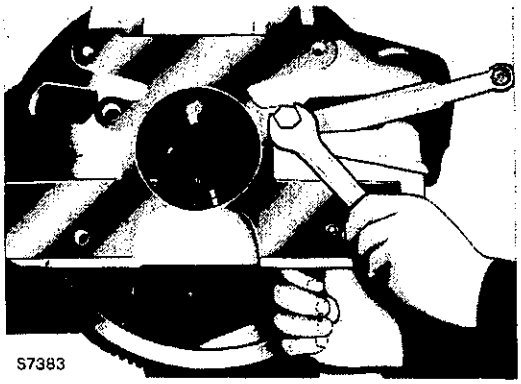


Fig 6 Removing clutch fork

16 To release clutch fork (1) from ball (2), ease out snap ring (3) from groove in fork and remove retainer (4) from ball.

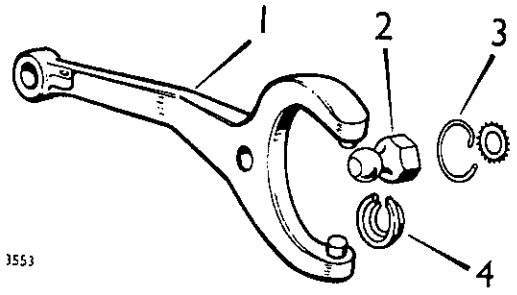
17 Before installing clutch fork, pack recess in fork, and ball retainer with XG 264 grease.

18 When installing clutch fork support through rear face of clutch housing, assemble support to ball pivot screwing it on approximately two threads.

19 Tighten support, and holding support in position with a wrench, complete tightening of ball pivot. Secure support in position with tabwasher.

20 The release bearing has recesses machined in the bore which should be lubricated with XG 264 prior to installation.

21 Adjust clutch pedal free travel as described in para 13.



1. Clutch fork
2. Support
3. Snap ring
4. Retainer

Fig 7 Clutch fork assembly

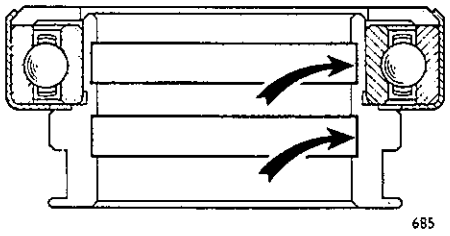


Fig 8 Release bearing grooves

CLUTCH

Removal and Installation

22 Remove gearbox as described in Chapter 3, level 2.

23 Remove flywheel underpan. Unscrew the clutch cover attaching bolts evenly and withdraw the clutch and disc.

24 Install clutch disc with marked face towards flywheel. If marking is illegible, install disc with hub spring retainer away from flywheel.

25 Tighten clutch to flywheel bolts to 31 Nm (24 lbf ft).

26 The gearbox front cover sleeve and main drive pinion splines must be lightly smeared with XG 264 grease on installation.

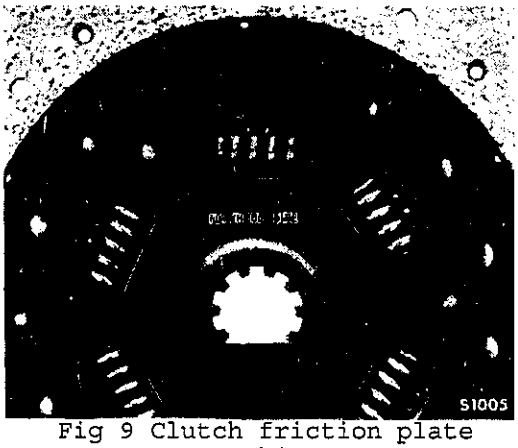


Fig 9 Clutch friction plate marking

CHAPTER 3

GEARBOX

CONTENTS

Para

Table

Fig

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Tool No (where applicable)	NSN/Part No (where applicable)	Designation
VR 2043		Rear seal remover

GEAR SHIFT LEVER AND LINKAGE

Removal

1 Release the gear shift lever grommet (secured by 8 screws) from the cab floor.

2 Slacken the locknut and unscrew the gear shift lever from the ball joint.

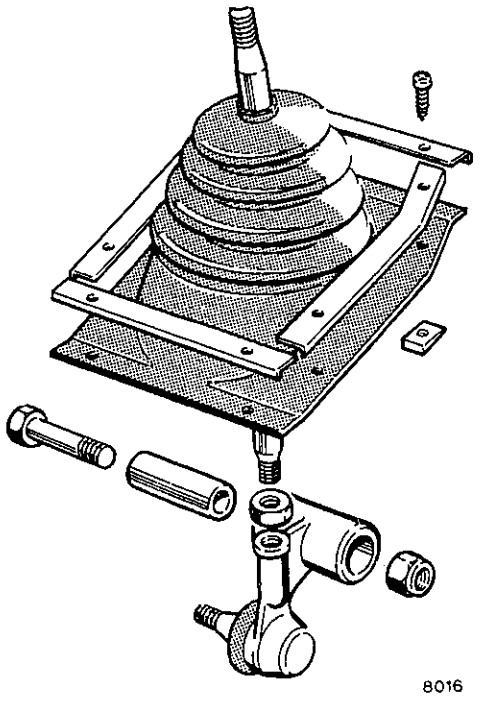


Fig 1. Gear shift lever assembly

3 Disconnect the coupling rod from the gear shift lever ball joint and gearbox change speed lever (Fig 2) and withdraw the inner tubes.

4 Remove the ball joint from the bracket on the cylinder head by utilizing a ball joint remover.

5 If renewal of the change speed lever bushes is required proceed as follows:

5.1 Slide the change speed lever rubber grommet up the lever.

5.2 Knock back the locking tab, remove the seating nut and withdraw the change speed lever and upper seating.

5.3 Remove the spacer and lower seating.

5.4 Do not remove the rubber grommet from the lever unless renewal is necessary.

6 When renewing bushes (1) in ball joint boss and change speed lever, ream to obtain clearance of 0.02/0.12 mm (0.001/0.004 in.) for coupling inner tube (2). Diameter of inner tube is 13.28/13.32 mm (0.523/0.524 in.).

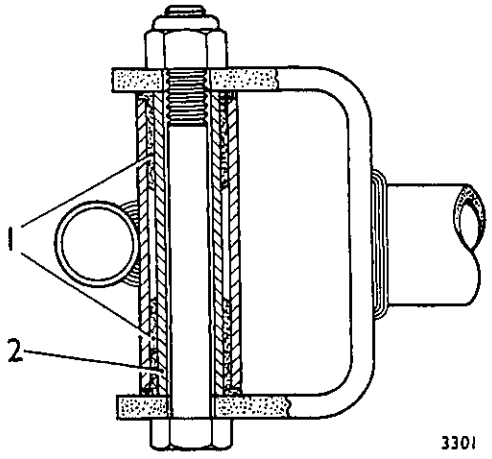


Fig 2. Renewing bushes in gear shift linkage

Installation

7 Installation is a reversal of removal, bearing in mind the following points:

7.1 Check that the bolts securing the gear shift lever bracket to the cylinder head are tight.

7.2 Before assembling the inner tube to the gear shift lever ball joint boss and change speed lever, smear the outer surface of the tubes with grease.

TOP COVER

Removal

8 Disconnect the coupling rod from the gearbox change speed lever and withdraw the inner tube.

9 Remove the top cover and install a temporary cover.

Installation

10 Use a new gasket and tighten evenly the special chamfered bolts.

11 Before re-connecting the coupling rod to the change speed lever, smear the outer surface of the inner tube with grease.

REAR SEAL

Removal

12 Disconnect the front end of the main propeller shaft and support the shaft.

13 Remove the bolt, tabwasher and plain washer, and withdraw the universal joint flange from the gearbox mainshaft.

14 To withdraw seal without removing rear cover, proceed as follows:

With coupling flange bolt installed as a distance piece, screw threaded body of Remover VR2043 firmly into seal and then tighten thrust screw.

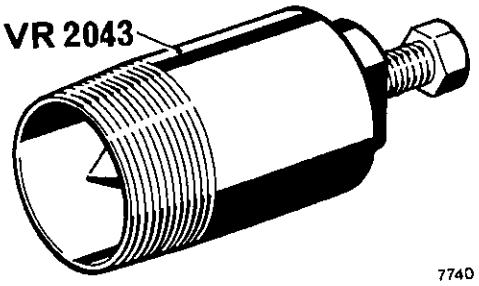


Fig 3. Rear seal remover

15 If Remover VR2043 is not available, remove seal as follows:

15.1 Drain the gearbox.

15.2 Remove the rear cover.

15.3 Drive the seal squarely out of the cover.

Installation

16 Press in the seal, lip facing inwards, until the seal casing is flush with the cover end face (arrowed)

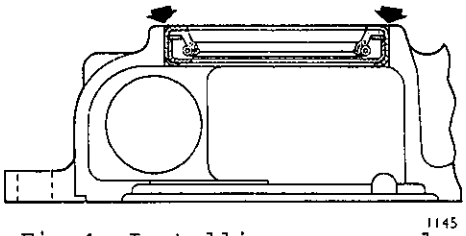


Fig 4. Installing rear seal

17 Lubricate the seal lip with Rocol anti-scuffing paste.

18 Loctite 510 (Flange Sealant) is used to form a gasket joint between rear cover and gearbox. Coat rear cover bolts with jointing compound prior to installation.

19 Tighten the universal joint flange attaching bolt to 104 Nm (77 lbf) ft) and secure it with the lock tab.

20 Tighten the propeller shaft bolts to 108 Nm (80 lbf ft).

21 Refill the gearbox with oil, meeting specification MIL-L-2105 (SAE 90 above 0°C, SAE 80 below 0°C).

GEARBOX

Removal

22 Drain the gearbox.

23 Disconnect the coupling rod from the gearbox change speed lever and withdraw the inner tube.

24 Disconnect the front end of the main propeller shaft and support the shaft.

25 Remove the clutch housing underpan.

26 Remove the bolts, nut and lockwasher, securing the gearbox to the clutch housing, and withdraw the gearbox. Note that the assembly weighs approximately 66 Kg (145 lb) and the use of a cradle is advised.

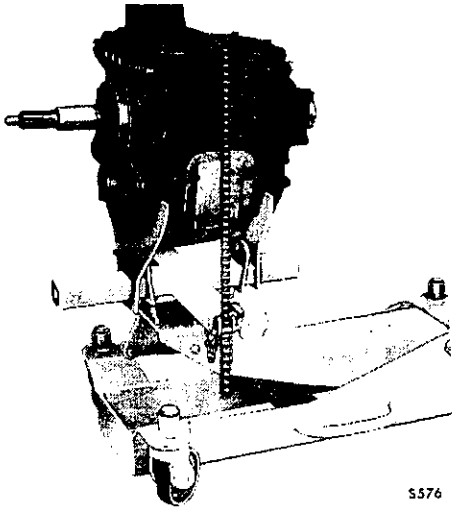


Fig 5. Withdrawing gearbox

Installation

27 Gearbox installation is the reverse procedure of removal, however, prior to installation lubricate front cover sleeve and main drive pinion splines sparingly.

28 Tighten the propeller shaft bolts to 108 Nm (80 lbf ft).

29 Fill gearbox to correct level with oil, meeting specification MIL-L-2105 (SAE 90 above 0°C, SAE 80 below 0°C).

CHAPTER 4

TRANSFER BOX

CONTENTS

TRANSFER BOX ASSEMBLY

Removal

1 Drain the oil.

2 Disconnect and support the propeller shafts.

3 Disconnect the control rod from the power take-off striking fork rod.

4 Disconnect the control rod from the striking levers on the transfer box controls support bracket.

5 Disconnect the speedometer cable.

6 Slacken the bolts securing the transfer box to the chassis frame and mounting bracket.

7 Support the transfer box, weight approximately 75 kg (165 lb), and remove the bolts securing it to the mounting bracket and chassis frame.

8 Lower the transfer box and withdraw it clear of the vehicle.

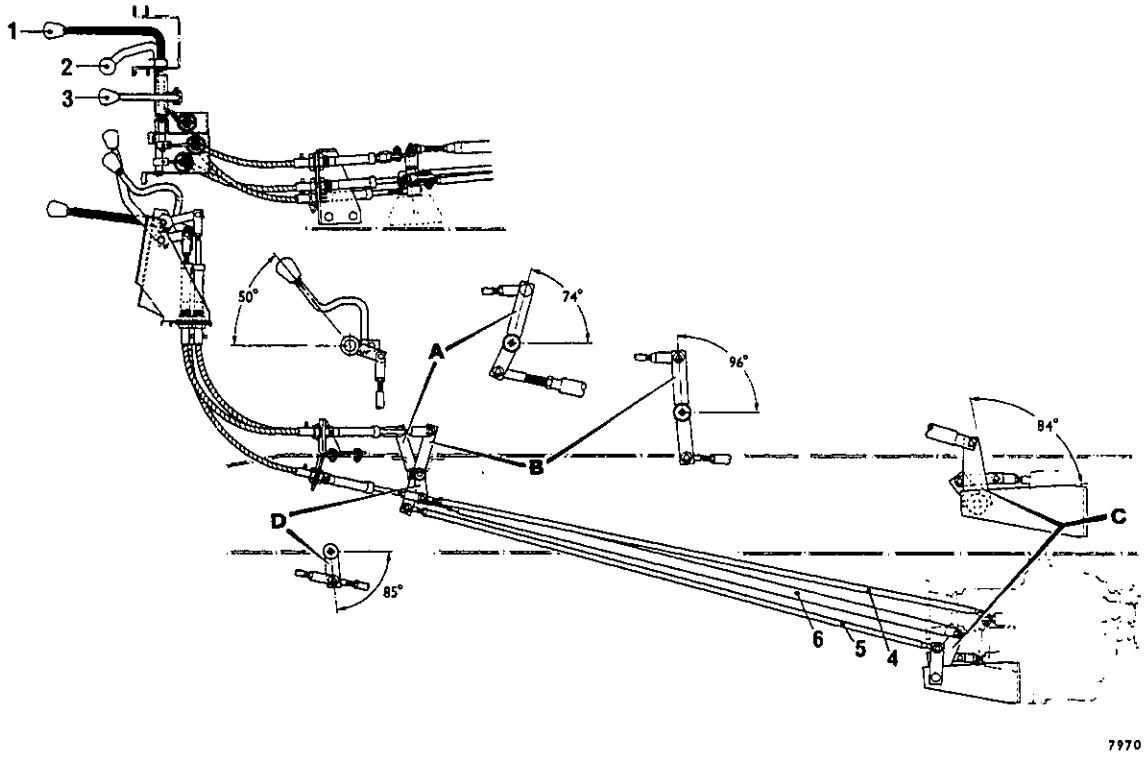
Installation

9 Installation of transfer box is the reverse procedure of removal.

10 Tighten the propeller shaft bolt nuts to 74 Nm (55 lbf ft) for 7/16 in. dia bolts and 108 Nm (80 lbf ft) for 1/2 in. dia bolts.

11 Refill the transfer box with MIL-L-2105, SAE 90 above 0°C, SAE 80 below 0°C.

TRANSFER BOX CONTROL LINKAGE



1. 2/4-wheel drive control lever
2. Ratio control lever
3. Power take-off control lever
4. Power take-off control rod
5. Ratio control rod
6. 2/4-wheel drive control rod

Fig 1. Control linkage

Adjustments

12 Disconnect the control rods and cables from the relay levers 'A', 'B' and 'D'.

2/4-Wheel Drive Control Linkage

13 Pull the 2/4-wheel drive control rod forward to engage four-wheel drive and check that the angle of lever 'C' is as shown in Fig 1. If necessary, adjust the transfer box striking rod link.

14 Set relay lever 'A' to the angle shown in Fig 1. Adjust the length of the 2/4-wheel drive control rod so that the rod end is aligned with the lower hole in the relay lever and reconnect the rod to the lever.

15 Set the transfer box ratio control lever in the 'low' (downward) position and the 2/4-wheel drive control lever in the four-wheel drive (upward) position.

16 Hold the levers so that the flats on the lever interlock cams are in contact as shown, then adjust the clevis at the lower or upper end of the control cable so that the hole in the lower clevis is aligned with the hole in the relay lever. Reconnect the clevis to the lever.

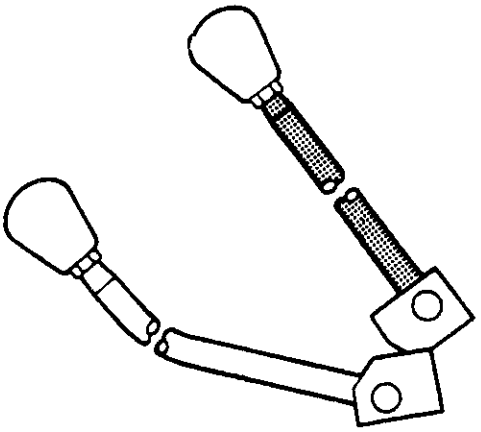


Fig 2. Interlock cams

Transfer Box Ratio Control linkage

17 Push the transfer box ratio control rod rearwards to engage low rear ratio.

18 Set relay lever 'B' to the angle shown in Fig 1. Adjust the length of the rod so that the rod end is aligned with the lower hole in the relay lever and reconnect the rod to the lever.

19 Set and hold the control levers, adjust and reconnect the clevis as described under '2/4-Wheel Drive Control Linkage'.

Power Take-off Control Linkage

20 Push the power take-off control rod rearwards to disengage the power takeoff.

21 Set relay lever 'D' to the angle shown in Fig 1. Adjust the length of the rod so that the rod end is aligned with the hole in the relay lever.

22 Set the power take off control lever to the 'OFF' position and to an angle of approximately 50° as shown in Fig 1.

23 Adjust the clevis at the lower or upper end of the control cable so that the hole in the lower clevis is aligned with the hole in the relay lever. Reconnect the clevis and rod end to the lever.

Disassembly

24 Disconnect the control rods from the transfer box striking levers and relay levers.

25 Disconnect the transfer box striking rod connecting link from the cross-shaft tube lever.

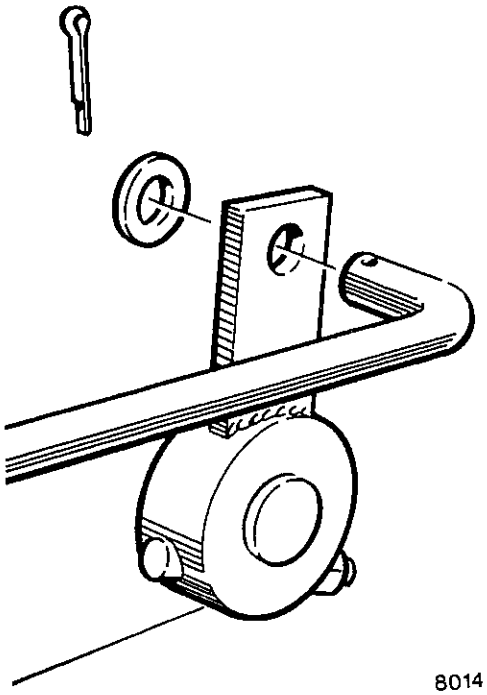


Fig 3. Striking rod connecting link

26 Remove the cotter from the cross-shaft lever. Remove the lever and withdraw the shaft, then remove the cross-shaft tube from the support bracket.

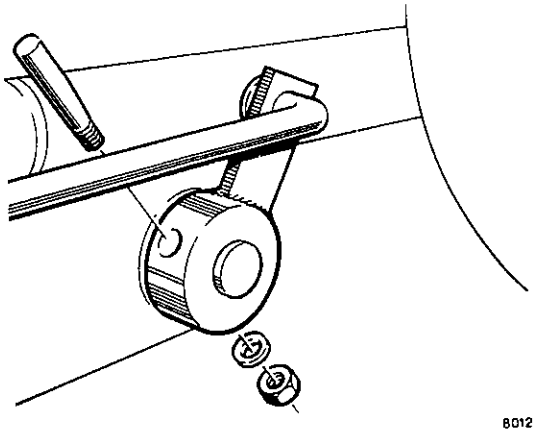


Fig 4. Cross-shaft lever

27 Remove the support bracket from the transfer box.

28 Remove the clevis pins from the ends of the control cables. Remove the clevises and locknuts and release the cables from the support bracket on the chassis frame and cab.

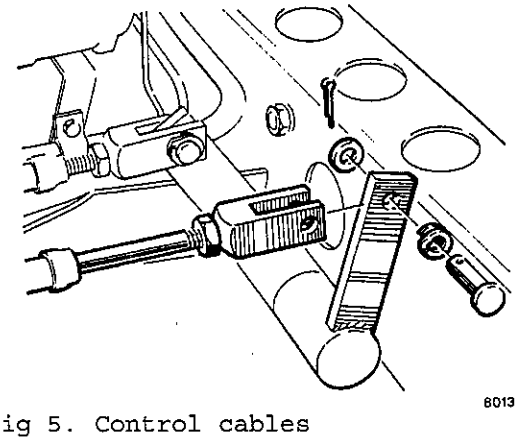


Fig 5. Control cables

29 Remove the split pin and washer from the relay lever support bracket pin and withdraw the levers.

30 Remove the clamp bolt securing the power take-off control lever and withdraw the lever.

31 Remove the cotters securing the operating levers to the control lever shafts.

32 Remove the control lever support bracket from the cab, and at the same time, ease the operating levers off the control lever shafts.

33 Remove the split pin, plain washer and thackray washer from the 2/4-wheel drive control lever shaft and withdraw the power take-off operating lever and tube assembly.

34 Unscrew the bearings retaining the control levers to the cab bracket and withdraw the levers.

35 Lubricate the control cables, bearings and friction surfaces of the linkage with grease.

36 When assembling the control levers, position the 2/4-wheel drive control lever shaft in the upper hole in the cab bracket. Place an internal toothed washer over the screwed bearings before assembling and tightening the bearings.

37 Assemble the power take-off operating lever and tube (arrowed), thackray washer and plain washer over the shaft of the 2/4-wheel drive control lever shaft and secure with a split pin.

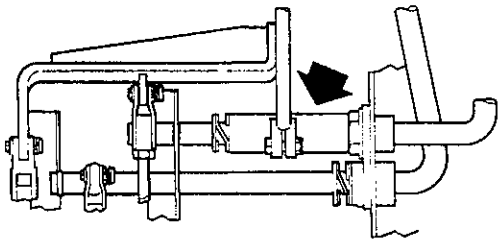


Fig 6. Power take-off operating levers

38 When installing the control lever support bracket, assemble the longer operating lever to the 2/4-wheel drive control lever (upper) shaft and the shorter operating lever to the shaft of the remaining lever. Each lever should be located so that the flat on the edge of the lever boss faces downwards, to enable the cotter pin to be inserted from the top of the boss.

39 The power take-off control cable is longer than the other two cables and must be assembled to the inner hole in the control lever support bracket and to the lower flange of the bracket on the chassis frame.

40 When installing the relay levers, first locate the power take-off lever ('D', Fig 1) with the longer side of its boss towards the support bracket. Assemble lever 'B' (Fig 1) with the shorter side of its boss first, and lever 'A' (Fig 1) with the longer side of its boss first.

41 Place new seals between the ends of the transfer box striking lever cross-shaft tube and the support bracket.

42 Place a new seal over the striking lever cross-shaft and assemble the shaft from the right-hand side of the vehicle.

43 Place a new seal over the end of the striking lever cross-shaft and assemble the lever with the cotter hole in the lever boss away from the support bracket. The cotter must be installed with the washer and nut against the flat of the lever boss.

44 Assemble the 2/4 wheel drive control rod to lever 'C' (Fig 1) but before installing the clevis pin, place a thackray washer between the striking lever and the inner side of the rod end. Connect the forward end of the rod to the lower hole in relay lever 'A' (Fig 1).

45 The transfer box ratio control rod is shorter than the power take-off rod and must be connected to the right-hand striking lever and to the lower hole in relay lever 'B' (Fig 1).

46 Before finally installing the clevis pins, adjust the transfer box striking rod link, control rod ends and cable clevises as previously described.

INPUT PINION OIL SEAL

Removal

47 Disconnect and support the rear end of the main propeller shaft.

48 Remove the bolt, tabwasher and plain washer, and withdraw the propeller shaft flange.

49 Cut through the flange of the seal casing with a small chisel, and collapse the casing by inserting a wedge between the seal and the cover bore, adjacent to the severed flange. Take care not to damage the bore.

Installation

50 Ensure that the cover bore is clean and free from burrs.

51 Smear the seal lip with Rocol Anti-scuffing Paste.

52 Install the seal in the cover with the lip facing inwards. The seal casing must be flush with the front of the cover.

53 Tighten the propeller shaft flange attaching bolt to 87 Nm (64 lbf ft) and secure it with the lock tab.

54 Tighten the propeller shaft bolts to 108 Nm (80 lbf ft).

55 Top up the transfer box with MIL-L-2105 (SAE 90 oil for temperatures above 0°C or SAE 80 oil for temperatures below 0°C).

MAINSHAFT, LAYSHAFT AND POWER TAKE-OFF SHAFT OIL SEALS

Removal

56 Drain the oil, except when renewing the power take-off shaft oil seal.

57 Disconnect and support the appropriate propeller shaft.

58 Remove the flange bolt, tab washer and plain washer (mainshaft and power take-off shaft flanges), or knock back the staking and remove the nut (lay-shaft flange), and withdraw the flange.

59 Before removing the layshaft front cover, disconnect the striking fork rod connecting link and remove the striking rod link and locknut from the threaded end of the striking fork rod. Unscrew the striking fork rod locking ball spring retainer from the cover and withdraw the spring and ball.

60 Before removing the transfer box rear cover, disconnect the speedometer cable, and withdraw the driven gear and housing from the cover.

61 Remove the appropriate cover.

62 Drive the oil seal squarely out of the cover.

Installation

63 Smear the seal lip with Rocol Anti-scuffing Paste.

64 Press in the new seal with the lip facing inwards. The seal casing must be flush with the cover.

65 Use jointing compound when installing the cover bolts.

66 Before installing the layshaft universal joint flange, place a new 'O' ring seal in the groove of the layshaft, and smear the seal with gear oil.

67 Tighten the propeller shaft flange attaching bolt (mainshaft and power take-off shafts) to 74 Nm (55 lbf ft) for 7/16 dia bolts and 108 Nm (80 lbf ft) for 1/2 in. dia bolts, and secure with the lock tab.

68 Assemble the washer over the end of the layshaft, tighten the nut and secure by staking it into the slot in the shaft.

69 Tighten the propeller shaft bolt nuts to 108 Nm (80 lbf ft).

70 Install the speedometer driven gear housing.

71 Refill the transfer box with MIL-L-2105 (SAE 90 oil for temperatures above 0°C or SAE 80 oil for temperatures below 0°C).

72 Before installing the clevis pin in the striking rod connecting link, adjust the striking rod link as described under 'Transfer Box Control Linkage'.

PROPELLER SHAFTS

Removal

73 Remove the nuts and bolts from the universal joint flanges and withdraw the shaft.

Disassembly

74 Identify the alignment arrows or marks on the sliding coupling and shaft. If none exist mark the coupling and shaft to ensure correct alignment on reassembly.

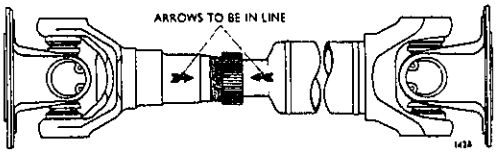


Fig 7. Alignment arrows on coupling and shaft

75 Unscrew the dust cap from the sliding coupling and slide the coupling off the shaft.

76 Remove the seal and washer from the dust cap.

Universal Joint Renewal

77 Remove the lubrication nipple from the trunnion and clean away paint from the bearing snap rings.

78 Tap the end of one of the bearing races with a brass drift to relieve end thrust on the snap ring, and remove the ring. Remove the remaining snap rings in a similar manner.

79 Support the flange yoke on the jaws of a vice so the lubrication nipple boss in the trunnion is facing downwards. Lightly tap the radius of the sliding coupling yoke with a copper hammer, until the bearing race protrudes. Do not tap the sliding yoke too far as the trunnion will foul the inner end of the yoke bore.

80 Grip the bearing race in a vice, and lightly tap the sliding coupling yoke upwards to remove the race. Remove the opposite bearing by the same method.

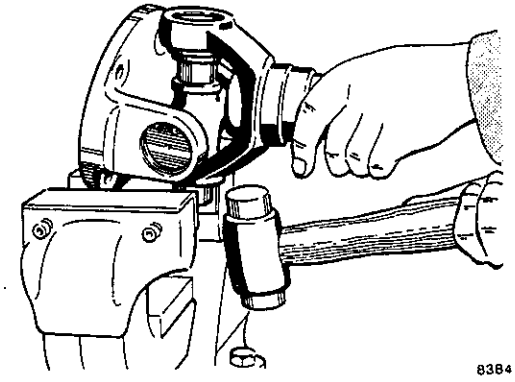


Fig 8. Removing bearing race from yoke

81 Support the exposed bearing journals of the trunnion on hardwood blocks with the lubrication nipple toss facing downwards, and remove the top race. Invert the assembly and remove the remaining bearing race.

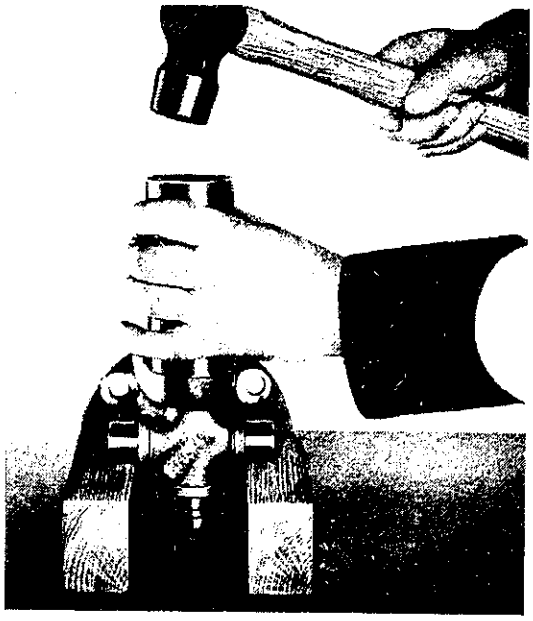


Fig 9. Driving bearing race from flange yoke

82 Install the new trunnion and bearing race by reversing the foregoing operations, using a flat-ended drift slightly smaller in diameter than the bearing bore of the yoke when tapping in the bearings. If necessary, coat the needle rollers with grease to retain them in the races, and ensure that the relief valve of the trunnion is facing towards the flange.

83 Install the lubrication nipple and charge the universal joint with grease.

Reassembly

84 Lubricate the shaft splines with grease.

85 Align the arrows or marks on the coupling and shaft. Failure to observe this precaution may result in transmission vibration due to misalignment of the front and rear universal joint yokes.

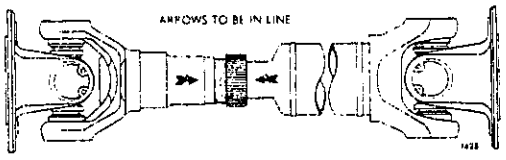


Fig 10. Alignment arrows on coupling and shaft

86 Tighten the dust cover hand tight only.

87 Before tightening the clamp screws round the gaiter on the front axle propeller shaft, make sure that the sliding coupling is fully extended, and the screws are positioned diametrically opposite.

Installation

88 Install the front shaft with the sliding joint to the transmission and the remaining shafts with the sliding joint to the transfer box.

89 Tighten the attaching nuts to 108 Nm (80 lbf ft).

90 Lubricate the joints and sliding coupling with grease.

Chapter 5

REAR AXLE

CONTENTS

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Ser	Tool No (where applicable)	NSN/Part No (where applicable)	Designation
(1)	(2)	(3)	(4)
	Z8079A D1137 KM2033 KM2035 KM2070	7BD/5120-99-833-4158 6MT2 4910-99-795-7444	Hub nut wrench Thread restorer Hub seal installer Pinion seal installer Holding bar Slide hammer

AXLE SHAFTS

Removal

1 With hub positioned with oil filler plug at bottom, remove plug and drain oil from hub.

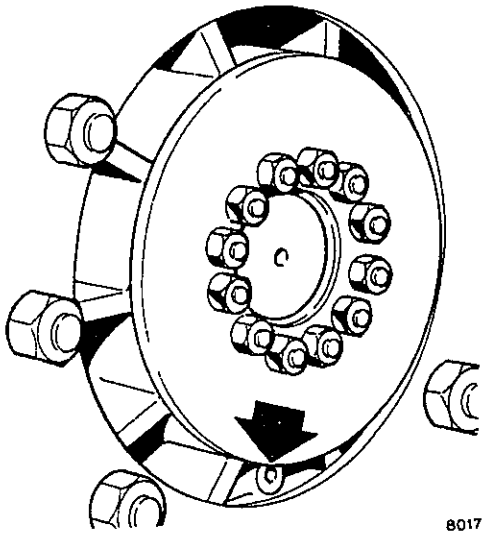


Fig 1 Draining oil from hub

2 Remove the axle shaft flange nuts and sling plate, and withdraw the shaft. A drift may be used to break the flange joint with the hub.

Installation

3 Before installing axle shaft check studs for security in hub. Loose studs should be removed, and re-installed using Loctite 270 (Studlock) and tightened to 34Nm (25 lbf ft).

4 Smear jointing compound on the mating faces of the hub and axle shaft and lock the axle shaft nuts with Loctite 270 (Studlock).

5 If excessive slackness of the hub bearings is suspected, adjust hub bearings as follows:

5.1 Remove axle shaft, bearing locknut (use Wrench Z8079A), and tabwasher.

5.2 While rotating hub, tighten hub nut to 54 Nm (40 lbf ft) using Wrench Z8079A, slacken off nut two slots. Tighten locknut to 270 Nm (200 lbf ft) and lock in position with tabwasher.

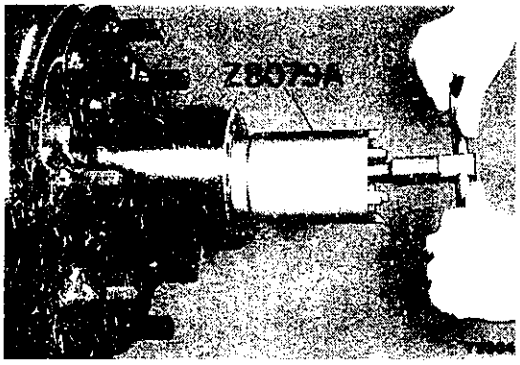


Fig 2. Removing bearing locknut

REAR HUBS

Removal

6 Scotch the front wheels and raise and support the rear of the vehicle.

7 Drain oil from hub and remove axle shaft as described in para 1 of this chapter.

8 Use Wrench Z8079A to remove bearing locknut and adjusting nut. Note that the nuts are locked by a tabwasher.

9 With the aid of an assistant remove hub.

Disassembly

10 Remove oil seal and withdraw inner bearing. Withdraw spacer located between inner bearing race and outer bearing race retaining ring, drive outer race outwards, away from bearing retaining ring, and remove ring.

11 Remove three equally spaced axle shaft studs, insert a drift through the stud holes and drive out the bearing outer race, complete with inner race and rollers.

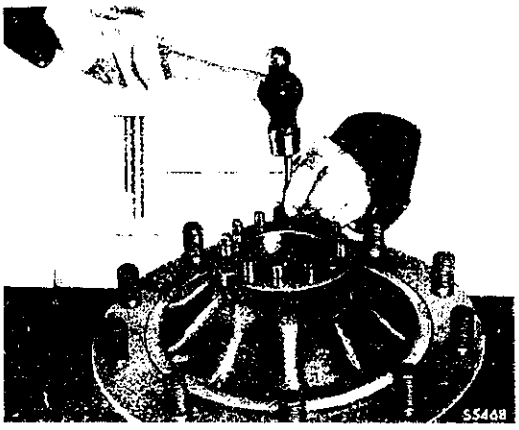


Fig 3. Driving out bearing

12 When renewing wheel bolts, ensure that bolts stamped 'L' are installed in the l.h. hub. Lockpins and nuts should be secured by staking.

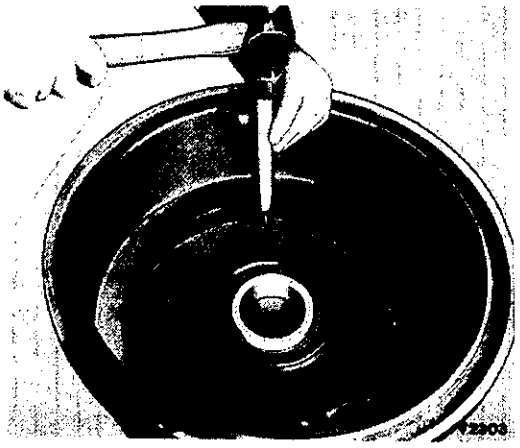


Fig 4. Staking wheel bolts

13 To restore the shape of damaged threads or the axle tube, use Die D1137. Assemble the die to the inner threads of the tube and tighten the handles to clamp the two halves together before unscrewing the die from the tube.

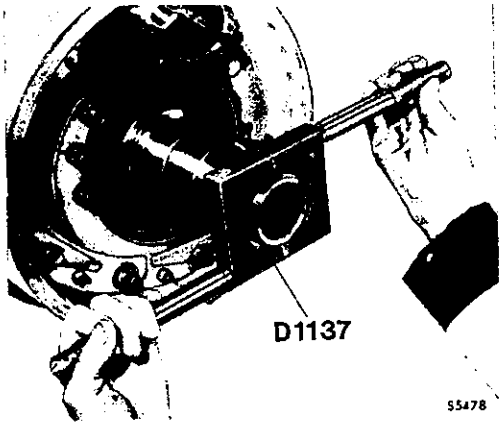


Fig 5. Restoring threads on axle tubes

Reassembly

14 Outer bearing must be installed with the thin end of the outer race towards the axle shaft flange. After installing outer tearing retaining ring, tap bearing outer race into contact with ring.

15 Insert spacer into hub so that smaller diameter end of spacer is seated in retaining ring.

16 Install inner bearing into hub.

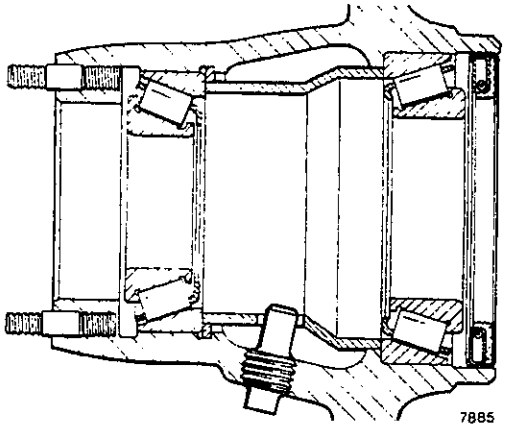


Fig 6. Installing spacer

17 Lightly oil lip of hub oil seal with clean axle oil and ease seal on to radiused end of installer sleeve KM2033 with open end of seal towards step on installer. Coat outer face of seal with Loctite 221 (screwlock) and located installer sleeve and seal into inner bearing so step on sleeve locates in hub bearing.

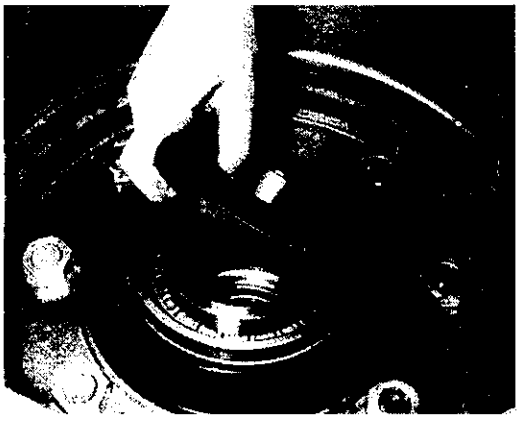


Fig 7. Locating hub oil seal

18 Place body of Installer KM2003 onto seal and press seal into place.

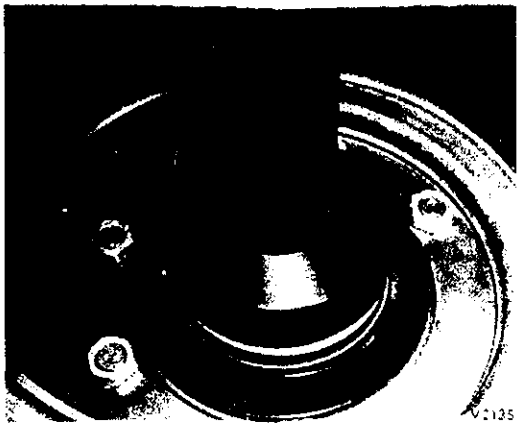
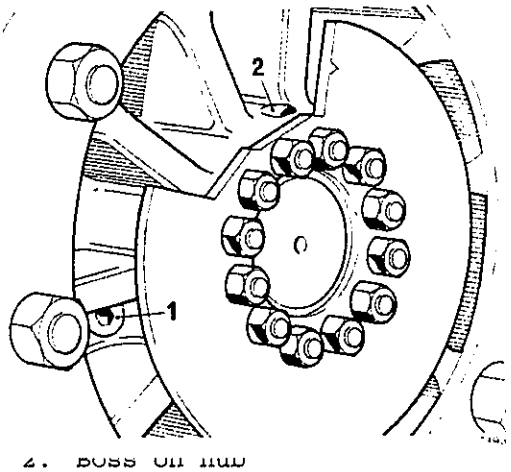


Fig 8. Installing hub oil seal

19 Install rubber 'O' ring to axle and install hub.

20 While rotating hub, tighten hub nut to 54 Nm (40 lbf ft), slacken off nut two slots and lock in position.

21 Position hub with mark 2 to the top which will position hub filler plug (1) approximately 14° below centre line and fill hub with clean axle oil.



2. Boss on hub

Fig 9. Checking rear hub oil level

PINION OIL SEAL

Removal

22 Disconnect and support the rear end of the propeller shaft.

23 Detach the transmission brake drum from the pinion flange. Cover the brake shoes to prevent contamination of the facings.

24 Remove the flange nut and washer. To prevent rotation of the pinion whilst undoing the nut use Holding Bar KM2070.

25 Remove flange.

26 Remove retaining bolts and withdraw pinion housing.

27 Remove the seal from the pinion housing.

28 Lightly oil lip of seal with clean axle oil and ease seal onto Installer KM2033 with flange on seal facing shoulder on installer.

29 Locate seal and installer in pinion cover and press seal into place. Seal is located correctly when installer butts against cover.

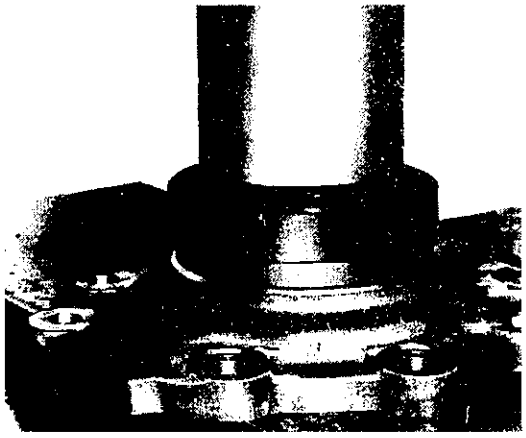


Fig 10. Pressing seal into pinion housing cover

30 Smear the pinion bearing shims (arrowed) with grease to retain them in position. It is essential to install shims of the same total thickness as originally installed. The spacer located in the pinion housing cover can be selected by subtracting the amount of bearing protrusion (A) above the axle housing plus 0.12 mm (0.005 in.) from the depth of the machined shoulder (B) in the pinion housing cover.

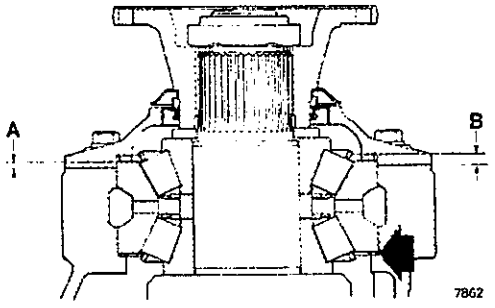


Fig 11. Pinion assembly

31 The pinion housing to axle housing joint is sealed using Loctite Sealant 510 (flange sealant).

32 Installation is a reversal of removal, pinion flange nut is tightened to 745 Nm (550 lbf ft).

REAR COVER

Removal

33 Drain the axle by removing the cover.

Installation

34 Refit the axle housing cover, using a new gasket. Assemble the reinforcement to the two bottom bolts.

THRUST SCREW

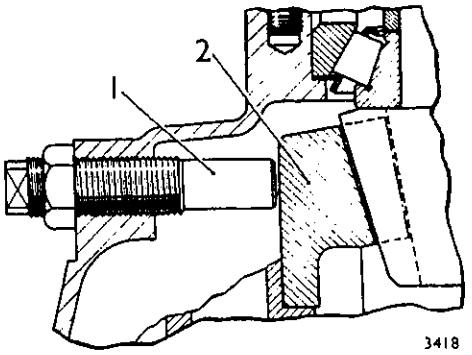
Removal

35 Slacken the locknut and unscrew the gear thrust screw.

Installation

36 Install the hypoid gear thrust screw and locknut.

37 Adjust by screwing thrust screw lightly into contact with the gear (2) and backing off an eighth of a turn before tightening locknut.



1. Thrust screw
2. Gear

Fig 12. Adjusting thrust screw

CHAPTER 6

FRONT AXLE

CONTENTS

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Tool No (where applicable)	NSN/Part No (where applicable)	Designation
Z8079A	7BD/5120-99-833-4158	Hub wrench
KM2070		Holding bat

PINION OIL SEAL

1 Removal and installation of pinion oil seal is similar to that described in Chap 5, Level 2, para 22 for rear axle.

HOUSING COVER

Removal

2 Drain the axle by removing the cover.

Installation

3 Refit the axle housing cover, using a new gasket. Assemble the re-inforcement to the two bottom bolts.

Removal

4 Clean the tracta joint housing around the oil seal.

5 Remove the oil seal retaining bolts and withdraw the seal cover plate, seal spring and seal.

6 Cut and remove the old seal.

Installation

7 Cut the new seal at an angle and in a position which permits the seal to be assembled with the cut uppermost.

8 Ensure that all parts are clean and smear the spherical face of the axle tube end with gear oil.

9 Assemble the new seal to the seal spring and seal cover plate, and install the assembly in the tracta joint housing, ensuring that the cut in the seal is located at the top.

10 Top up the tracta joint housing with OEP 220 for temperatures above -15°C or OEP 38 for temperatures below -15°C.

BEARING ADJUSTMENT

11 Remove hub drive sleeve retaining nuts and withdraw sleeve.

12 Using Hub Wrench Z8079A and an extension bar, tighten the adjusting nut, using moderate hand pressure; at the same time, rotate hub to settle the bearings. Slacken the nut and using the wrench, retighten as far as possible by hand. Then slacken nut a sixth of a turn.

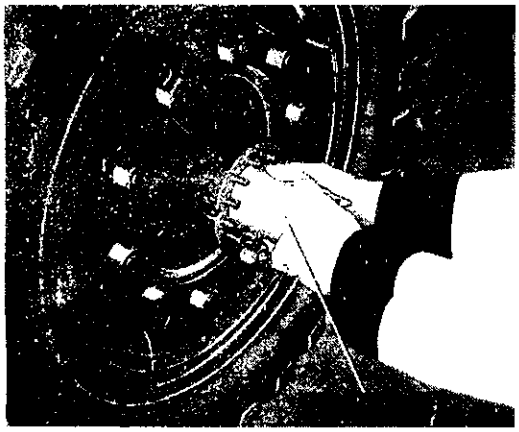


Fig 1. Adjusting hub bearing

13 Fit a new tabwasher with the right angled tabs pointing outwards, and turn back one of the short tabs into one of the slots in the adjusting nut. If necessary, alter the position of the nut to bring the slot into alignment with the tab.

14 Refit the locknut and tighten with Wrench Z8079A. If the end float of the hub is within the specified limits of 0.05/0.30 mm (0.002/0.012 in.) secure the locknut with a tab.

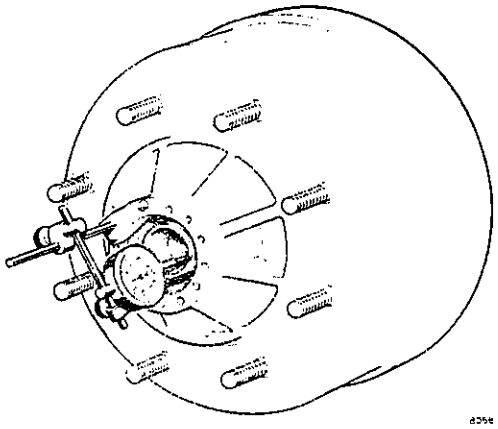


Fig 2. Hub end float

15 Install the hub drive sleeve, using a new gasket, and lock the nuts with Loctite 270 (studlock).

16 Install the oil seal retainer using a new seal.

FRONT HUBS

Removal

17 Scotch the rear wheels and raise and support the front of the vehicle. Remove the road wheel. The wheel nuts on the l.h. side have l.h. threads.

18 Remove bolt from centre of hub and withdraw oil seal retainer and oil seal.

19 Remove nuts securing hub drive sleeve to hub and withdraw sleeve.

20 Knock back the lock tab, and using Wrench Z8079A unscrew the locknut and remove the tabwasher and bearing adjusting nut.

21 Withdraw the hub and brake drum from the hub drive shaft housing. If necessary, back off the brake shoe adjustment.

Disassembly

22 Remove the screws securing the brake drum to the hub, and separate the two components.

23 Drive out the inner bearing and oil seal, using a soft metal drift against the bearing outer race.

24 Tap the outer bearing outer race towards the outer end of the hub, and remove the bearing retaining ring.

25 Remove three equally spaced hub drive sleeve studs from the hub, insert a drift through the stud holes and drive out the outer bearing outer race, complete with inner race and rollers.

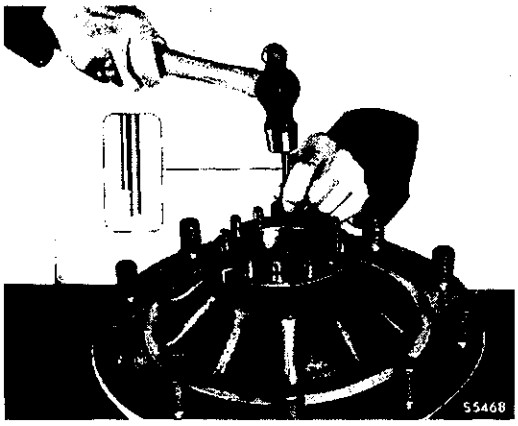


Fig 3. Driving out bearing

Reassembly

26 The hub bolts are a press fit in the hub and do not require staking or peening. New bolts should be engaged with the serrations in the hub before being pressed in. Note that replacement bolts for l.h. side hubs have l.h. threads and are stamped with a letter 'L'.

27 Lubricate the outer bearing with recommended grease, and insert the complete bearing, thin end of the outer race first, through the inner end of the hub, and tap the cuter race squarely into the hub until it is clear of the retaining ring groove. Assemble the retaining ring in the hub groove, ensuring that it is correctly seated. Insert the drift used for disassembly through the stud holes in the outer end of the hub, and tap the bearing outer race into contact with the retaining ring.

28 Locate the outer race of the inner bearing in the hub, thick end first, and tap home squarely against the hub recess shoulder. Pack the inner race and rollers with Lithium based grease with approximately 7% soap, and assemble to the hub.

29 Lubricate the seal and refit with the lip towards the hub. Press in until the face of the seal is flush with the hub.

30 Clean the contact faces of the brake drum and hub and assemble the drum to the hub.

31 Smear the threads of the three drive sleeve studs with Loctite 270 (studlock) and install the studs in the hub.

32 Assemble the hub bearing adjusting (larger) nut with the slots facing outwards.

33 Adjust bearing as described in para 11.

THRUST SCREW

34 Removal and installation of the thrust screw is the same as that described in Chap 5, Level 2, para 35.

CHAPTER 7

STEERING

CONTENTS

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Tool No (where applicable)	NSN/Part No (where applicable)	Designation
814		Ball joint remover
Z8470		Steering drop arm remover
Z8512	7BD/5120-99-833-4168	Steering wheel remover
KM2021		Steering wheel remover adaptor
Z8508		Thread protector

STEERING GEOMETRY

1 All steering geometry checks and front wheel alignment checks must be carried out with the vehicle unladen and standing on a level base.

2 Before checking steering geometry ensure that tyre pressures and front hub bearings are correctly adjusted, and that tie rod ball joints and steering pivots are in good condition.

Front wheel alignment (toe-in)

3 With front wheels in the straight ahead position, check wheel alignment between wheel rims at height of wheel centres. The measurement should be taken at point indicated in Fig 1 and be 1.5 to 4.6 mm (0.06 to 0.18 in.)

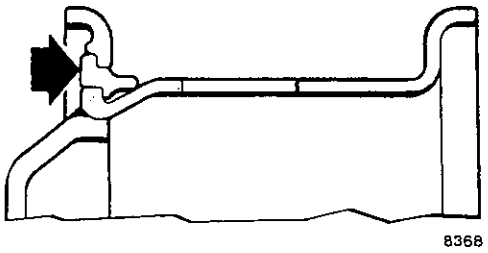


Fig 1 - Position for checking wheel alignment

Camber angle and steering pivot inclination

4 When carrying out this check, it is also necessary to consider the included angle, which is the sum of the camber angle and the steering pivot inclination. If the included angle is correct but the camber angle and steering pivot inclination are incorrect, the axle housing is bent or twisted. If, however, the steering pivot inclination is correct and the camber angle incorrect, a bent hub drive shaft housing is indicated. The camber angle should be 1/2° pos to 1° pos and the steering pivot inclination should be 6° to 7°.

Castor angle

5 The castor angle should be 1° pos to 2° pos with the vehicle unladen. Incorrect castor angle can be caused by the following:

5.1 Weak or broken front spring.

5.2 A distorted chassis frame.

5.3 A distorted axle housing or hub drive shaft housing.

Toe-out on turns

6 The toe-out on turns is controlled by the angle of the steering arms.

7 The inside wheel should be at 21.3/4° to 23.3/4° when the outside wheel is at 20°. Should the readings not be within these limits, check the arms against the appropriate dimensions given in Chap 6, level 3, para 53.

TIE ROD

8 The tie rod ball joints are the spring-loaded type and it is possible to move the socket in line with the stud against the compression of the spring when a load is applied.

9 If there is any free play in the joint which can be felt without applying firm pressure, the joint must be renewed.

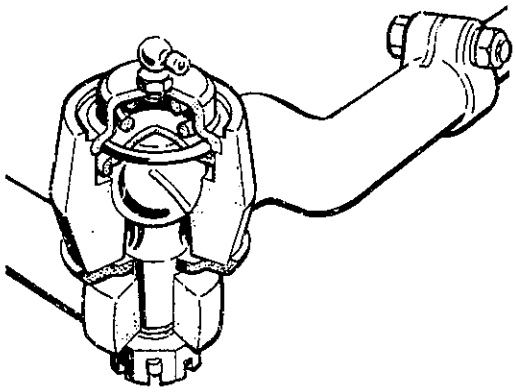


Fig 2 - Tie rod ball joint

Removal

10 Raise and support the front of the vehicle and disconnect the ball joints from steering arms using Remover 814.

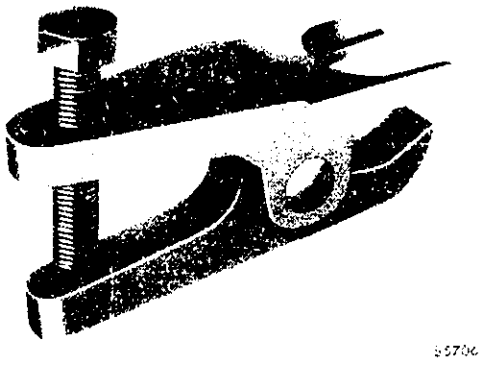


Fig 3 - Remover 814

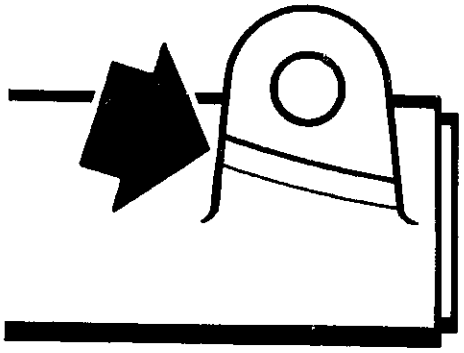
Inspection

11 Slacken the tie rod clamp bolts and check for slackness of the threads.

12 The tie rod may be straightened if only distorted, but do not heat the rod when straightening.

Installation

13 The tie rod ball joints have left and right-hand threads, for left and right sides respectively. For identification, the left side has a recess as arrowed in Fig 4.



8367

Fig 4 - Left side ball joint identification

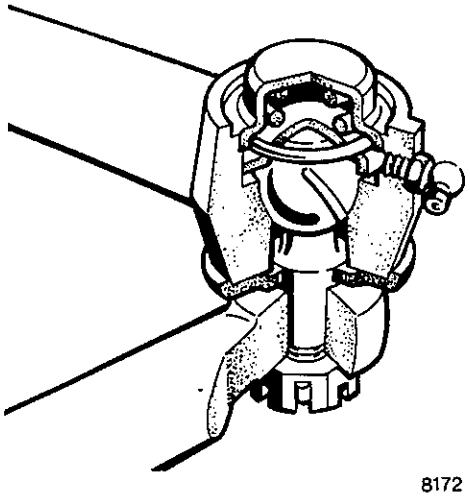
14 Before securing the tie rod in position, check that ball joints are screwed on to the rod an equal amount. Ensure that all mating tapers are clean and free from oil and grease. Tighten ball joint nuts to a torque of 176 Nm (130 lbf ft).

15 Adjust the tie rod to give correct toe-in as described in para 3 of this chapter. After adjustment, check that the ball joints are aligned with each other before tightening the clamp bolts.

CONNECTING ROD

16 The connecting rod ball joints are the spring-loaded type and it is possible to move the socket in line with the stud against the compression of the spring when a load is applied.

17 If there is any free play in the joint which can be felt without applying pressure the joint must be renewed.



8172

Fig 5 - Connecting rod ball joint

Removal

18 Raise and support the front of the vehicle and disconnect the ball joints securing the connecting rod to the steering third arm and drop arm using Remover 814.

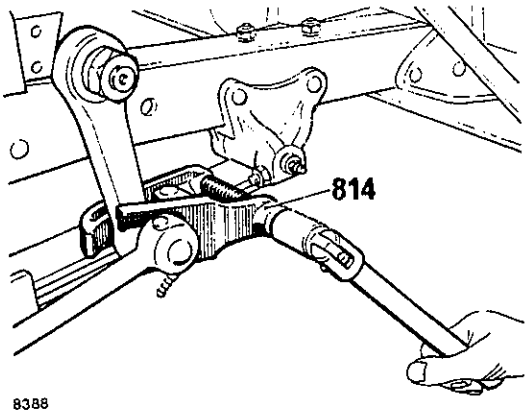


Fig 6 - Disconnecting ball joint joint from drop arm using Remover 814

Installation

19 Tighten connecting rod ball joint nuts to a torque of 176 Nm (130 lbf ft).

DROP ARM

Removal

20 Raise and support the front of the vehicle and disconnect the connecting rod from drop arm as described in para 18 of this chapter.

21 Withdraw the drop arm from the steering gear using Remover Z8470.

Note . . .

Removal of the drop arm is no longer a supported activity. Any repairs required on the steering box necessitating this action are to be dealt with by replacing the steering box which comes complete with drop arm.

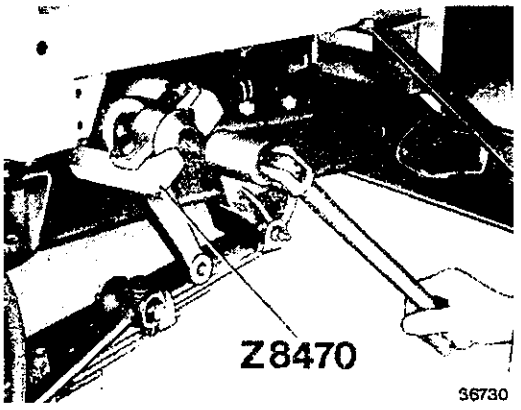
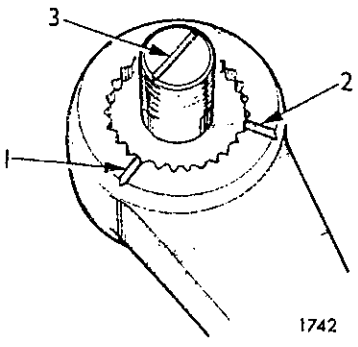


Fig 7 - Withdrawing drop arm from steering gear

Installation

22 To enable drop arm to be correctly located on drop arm shaft, outer face of arm is marked with notches (1) and (2) and drop arm shaft is similarly marked with one notch. On right drive, notch (1) must coincide with notch on shaft. On left drive arm must be located so that notch (2) is aligned with notch on shaft. Tighten drop arm retaining nut to a torque of 170 Nm (125 lbf ft).



1. Right drive location notch
2. Left drive location notch
3. Notch on drop arm shaft

Fig 8 - Drop arm location mark

STEERING WHEEL

Removal

23 Prise out the cover (1) from the centre of steering wheel, and remove nut (2) and plain washer (3) from steering shaft.

24 Remove signal switch and headlamp control switch from steering column.

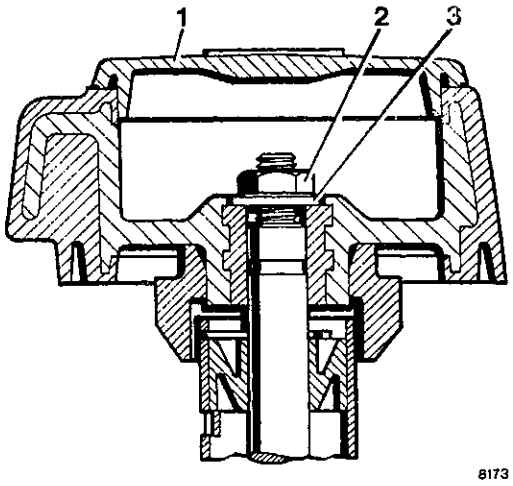


Fig 9 - Steering wheel boss section

25 Install thread protector Z8508 and withdraw the steering wheel using Remover Z8512 and adaptor KM2021.

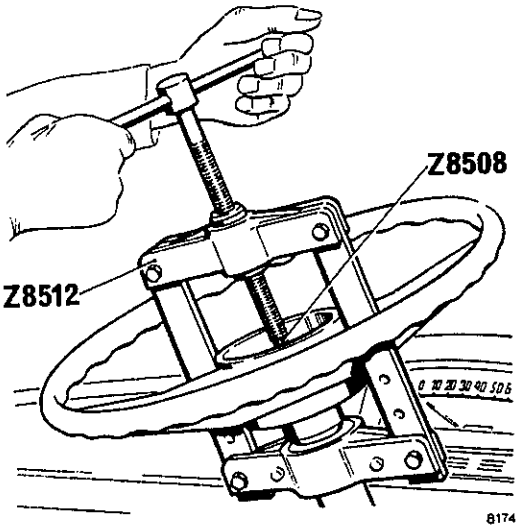


Fig 10 - Removing steering wheel

Installation

26 When installing steering wheel, check that the road wheels are in the straight ahead position and locate wheel so that spokes lie in a horizontal plane.

27 Tighten steering wheel nut to a torque of 47 Nm (35 lbf ft).

STEERING SHAFT AND COLUMN

Removal

28 Remove steering wheel as described in para 23 of this chapter.

29 Remove hill holder valve and winch control valve from steering column.

30 Detach radiator grille.

31 Remove flexible coupling flange bolts and steering gear attaching bolts to allow steering gear to be moved to one side.

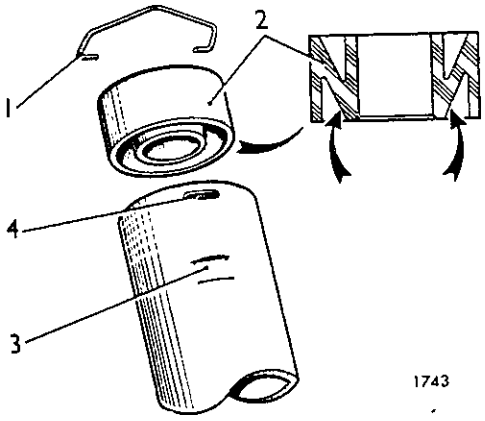
32 Release steering column from instrument panel and toe panel.

33 Withdraw steering shaft from below.

34 Withdraw steering column.

Disassembly

35 Remove bearing retainer (1) and push bearing (2) out of column.



2. Bearing
3. Steering column indent
4. Retainer locating slot

Fig 11 - Steering shaft bearing

Reassembly

36 Bearing must be installed so that chamfered boss (arrowed Fig 11) on end of bearing is towards the inside of column. Bearing should be pressed in contact with indents (3) in column to allow retainer (1) to seat correctly in slots (4) in column. Bore of bearing should be smeared with grease meeting specification GM4733-M before inserting steering shaft.

Installation

37 When assembling flexible coupling to steering shaft ensure that bolts are installed with heads against coupling.

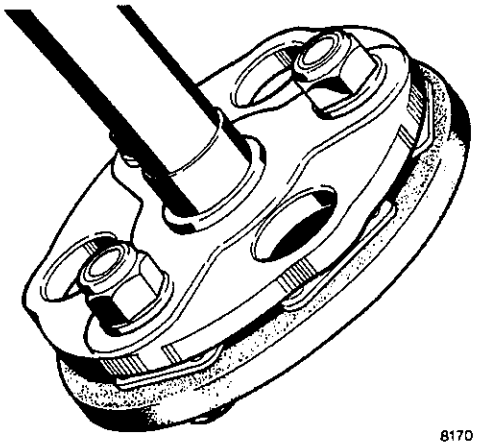


Fig 12 - Flexible coupling assy to steering shaft

38 Installation of the steering is the opposite of removal ensuring the following:

38.1 When assembling steering shaft and coupling to steering gear flange, ensure that bolts are installed with heads against coupling.

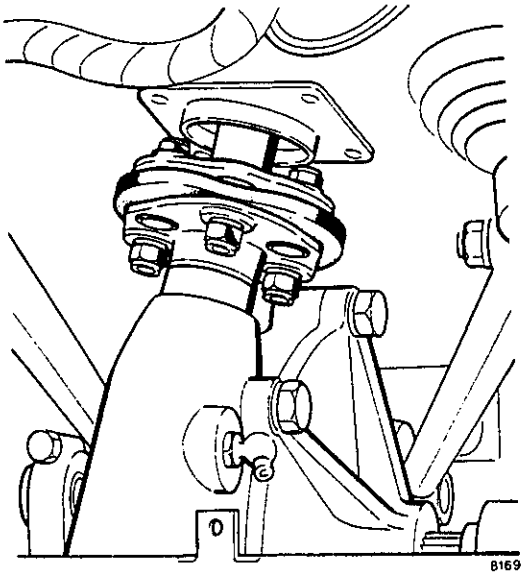


Fig 13 - Steering shaft and coupling assembled to steering gear flange

38.2 Tighten steering gear attaching bolts to torque given in para 42.2 of this chapter.

38.3 Install steering wheel as described in para 28 of this chapter.

STEERING GEAR

Removal

39 Remove radiator grille and detach flexible coupling from steering gear flange.

40 Withdraw drop arm from steering gear as described in para 21 of this chapter.

41 Release brake and clutch pedals from pedal shaft, remove steering gear retaining bolts and withdraw gear.

Installation

42 Installation of the steering gear is the opposite to removal ensuring the following:

42.1 When reconnecting steering gear flange to flexible coupling ensure that each bolt is installed with its head against coupling.

42.2 Steering gear bolts must be tightened to a torque of 102 Nm (75 lbf ft)

42.3 For the installation of the drop arm refer to para 22 of this chapter.

42.4 Top up steering gear case with oil to specifications GM4734-M, GM4735-M or AP1-GL5, or MIL-L-2105B or MIL-L-2105C, until oil escapes from breather hole and can be seen to trickle down casing.

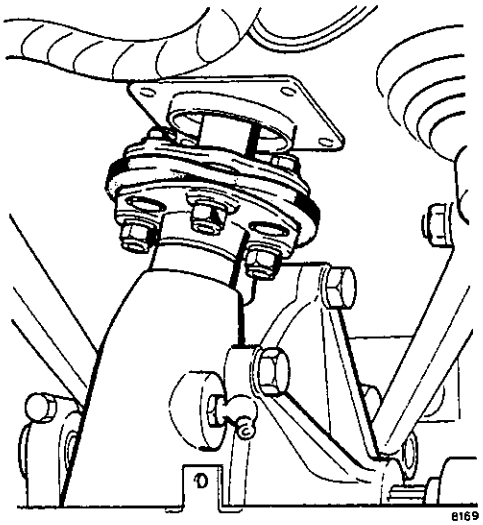


Fig 14 - Flexible coupling assembled to steering gear

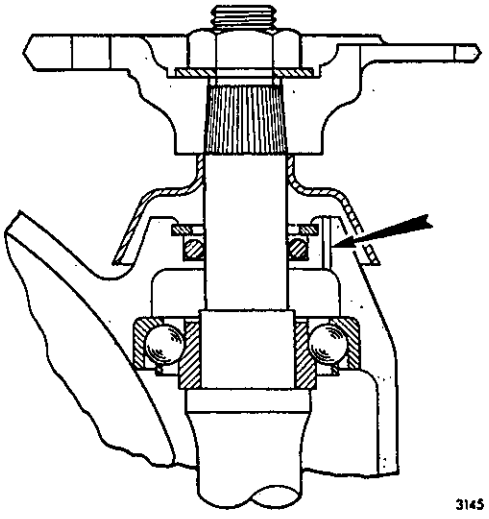


Fig 15 - Steering case breather hole

CHAPTER 8

SUSPENSION

CONTENTS

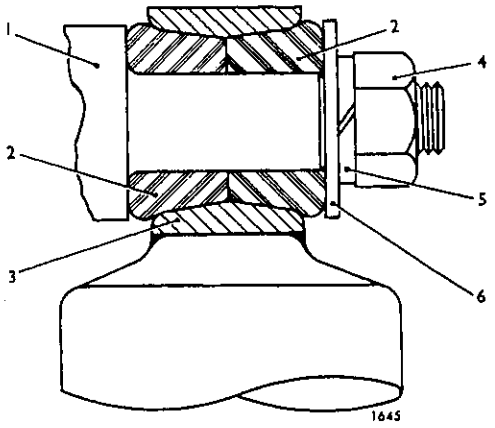
SHOCK ABSORBERS

Removal

1 The shock absorbers can be withdrawn from the mounting pins after removing the retaining nuts and washers.

Installation

2 When installing shock absorbers assemble attaching parts as shown in Fig 1.



1. Mounting pin
2. Rubber bush
3. Shock absorber eye
4. Securing nut
5. Lockwasher
6. Plain washer

Fig 1 - Shock absorber mounting

3 Install the front shock absorber lower mounting with the bolt head against the bracket.

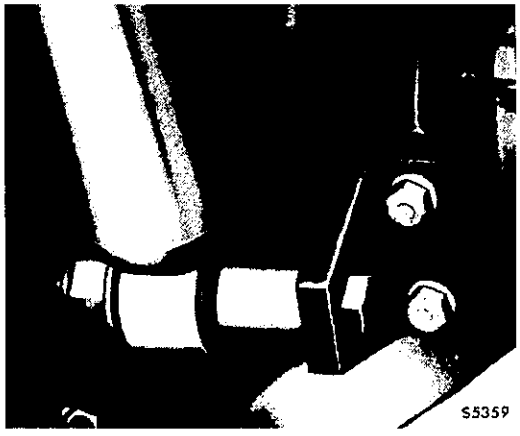


Fig 2 - Front shock absorber lower mounting

SPRINGS AND SHACKLES

Removal

CAUTION ...

Do not, when lowering axle, allow any strain to be exerted on hydraulic fluid pipes.

4 Support the chassis frame and remove the road wheel.

5 Remove U-bolts and lower axle.

6 Remove hanger bolts and withdraw the spring from the spring hangers.

Disassembly

7 Remove the spring shackle.

8 Clean up the peened ends of the spring leaf clip bolts and remove bolts and spacers.

9 Clamp the leaves together adjacent to the centre bolt and tighten nut sufficiently to enable the peened end to be cleaned up.

10 Remove the nut and release clamp to separate the spring leaves.

Inspection and reconditioning

11 When renewing the spring eye bushes, position the bush in the spring eye so that the bush protrudes an equal amount each side.

12 Examine the helper spring brackets and ensure they are riveted securely to the chassis.

Reassembly

13 The leaves of the springs should be assembled so that the tapped holes in the clips are all on the same side. The centre bolt holes in the front spring leaves are unequally spaced between the ends of the leaves. When assembling the spring ensure that the shorter length of the leaves are all on the same side of the centre bolt.

14 When assembling a rear spring, note that the upswept end of the second leaf must be towards the front of the vehicle and the double clip towards the rear of the vehicle when the spring is installed.

15 Smear the shackle bolt with grease and assemble the shackle to the end opposite to that with the upswept second leaf, ensuring the head of the bolt is towards the outside of the vehicle when the spring is installed. Do not tighten the bolt at this stage.

Installation

16 Smear the spring hanger nuts and bolts with grease and install the spring with the shackle to the rear.

17 On the rear springs install the packing block between the spring and axle.

18 Tighten the U-bolt nuts and the spring and shackle bolts to the torque specified below with the weight of the vehicle on the springs.

Spring hanger and shackle bolts and nuts

Front springs	170 Nm	(125 lbf ft)
Rear springs	258 Nm	(190 lbf ft)

Spring U-bolt nuts

Front springs	129 Nm	(95 lbf ft)
Rear springs	190 Nm	(140 lbf ft)

19 Ensure the U-bolt nuts are tightened progressively to ensure correct seating of the spring. Re-check rear spring U-bolt torque with the vehicle fully laden.

Chapter 9

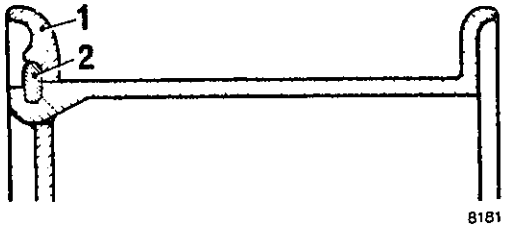
WHEELS AND TYRES

CONTENTS

WHEELS AND TYRES

Wheels

1 The disc-type road wheels have wide base rims and are of the three-piece type incorporating a loose flange (1) and a split lock ring (2).



1 Loose flange 2 Split lock ring

Fig 1 Section through road wheel

2 When the lock ring is correctly seated, gap between ends of ring, dimension 'A' should be 12.5/19.0mm (0.50/0.75in). Wheels made by STEEL STAMPINGS UK should have a gap of 6.0/14.0mm (0.236/0.55in).

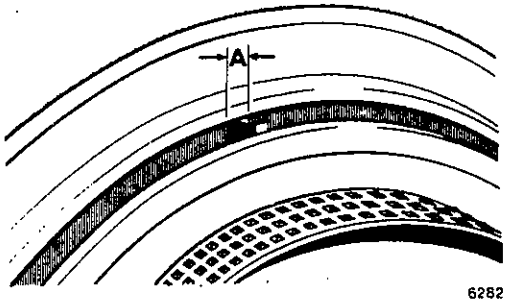


Fig 2 Checking split lock ring installation

3 Before checking wheel run-out, tyre must be removed from wheel. Run-out cannot be measured satisfactorily at the edge of the wheel rim or loose flange.

4 Check wheels at point 'B' for radial run-out and point 'C' for lateral run-out. Wheel run-out must be within the following limits:

Radial: 1.5mm (0.06in) max
Lateral: 3.1mm (0.12in) max

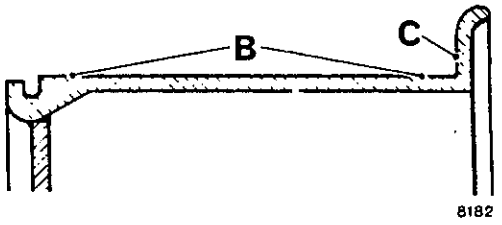


Fig 3 Checking wheel run-out

5 The wheels are attached to the hubs by ten conical-seated nuts. The nuts on the left-hand side of the vehicle have left-hand threads.

6 When installing a wheel, ensure that the mating surfaces of wheel and hub are clean. Smear conical seating of wheel nuts with grease and tighten nuts to 540Nm (400 lbf ft).

Tyres

7 Standard tyres installed are 12.00 x 20 - 14p cross-ply tyres and are of the non-directional type.

Spare wheel

8 The spare wheel is raised and lowered by a winch incorporated in the carrier at the right-hand side of the chassis frame.

9 A chain between the carrier and the wheel tilts the wheel from the horizontal as it is lowered, thus reducing the effort required to manhandle the wheel into position.

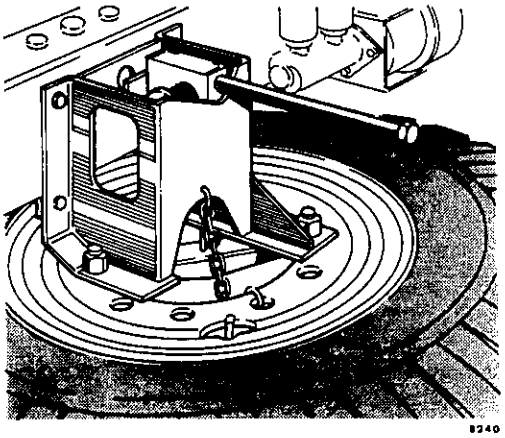


Fig 4 Spare wheel carrier

CHAPTER 10

AIR PRESSURE AND BRAKING SYSTEM

CONTENTS

(continued)

CONTENTS (continued)

(continued)

CONTENTS (continued)

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Tool No (where applicable)	NSN/Part No (where applicable)	Designation
D1142		Reservoir retaining nut removing wrench
VR2096	7BD/5120-99-816-8181	Master cylinder actuator shim gauge
KM2053	6MT2/4910-99-795-7445	Master cylinder actuator shim gauge (vehicles with vented master cylinder)
E690T	6MT2/5120-99-834-0355	Flexible brake pipes, end fitting assembly tool
KM2050	6MT2/4910-99-777-1780	Nipple end installer

BRAKE PEDAL AND SUPPORT

1 The brake pedal pivots on a shaft mounted on the steering gear.

2 On right hand drive vehicles the shaft also carried the clutch pedal. On left drive vehicles, the shaft is hollow and bushed to support a separate clutch pedal shaft. To gain access remove the radiator grille.

Removal and reconditioning

3 On right drive vehicles, clutch pedal and shaft must be removed from steering gear to withdraw brake pedal. Footbrake valve and clutch push rods may be left in position after removing push rod yoke clevis pins.

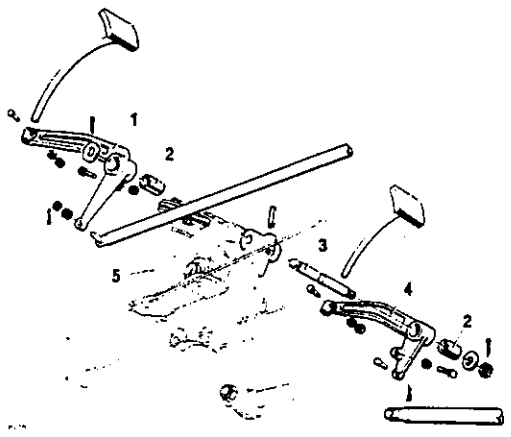


Fig 1 - Right drive brake pedal assembly

4 For removal of left drive vehicle brake pedal refer to Chap 11 level 3.

5 Brake pedal bush on right drive vehicles should be pressed in until flush with pedal outer face.

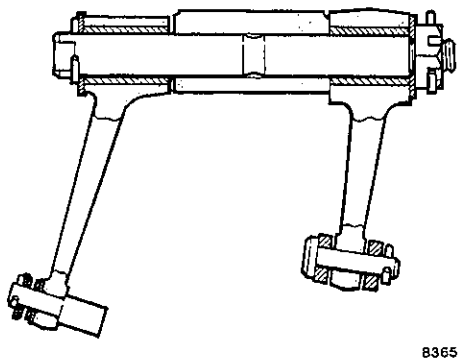


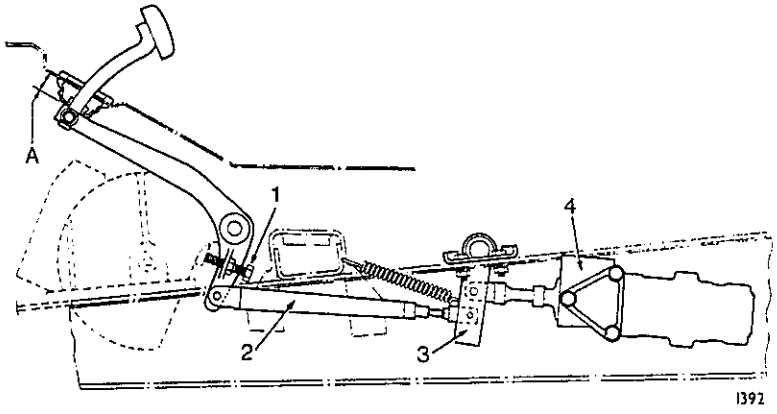
Fig 2 - Right drive brake pedal section

6 The replacement brake pedal bushes are of the prefinished type that do not require reaming on assembly.

Installation and pedal setting

7 Brake pedal bushes should be liberally lubricated with XG 264 grease.

8 Pedal setting is controlled by the combination of the pedal stop bolt (1) and the footbrake valve push rod (2). Adjust pedal stop bolt until dimension 'A' (Fig 5) is 25 mm (10 in.). Detach pedal return spring from push rod relay lever (3) and push rod from brake pedal. With the brake pedal against its stop and the footbrake valve in the off position, adjust the push rod clevis to align with the brake pedal and reassemble. Back off pedal stop bolt half a turn to provide pedal free travel.



1. Pedal stop bolt
2. Push rod
3. Relay lever
4. Footbrake valve

Fig 3 - Brake pedal and linkage

FOOTBRAKE ADJUSTMENT

WARNING ...

(1) PRIOR TO RELEASING PARKING BRAKE, CHOCK ROAD WHEELS.

(2) AVOID INHALING BRAKE DUST AS IT CONTAINS ASBESTOS WHICH MAY SERIOUSLY INJURE HEALTH.

9 Indication that brakes need adjusting is given, if the red band on the indicator rod incorporated in the rear of the master cylinder actuator is showing.

10 Before adjusting the brakes, ensure that air pressure system is fully charged. Check the hub bearings for slackness. If necessary adjust the bearings as described in Chap 5 for rear axles and Chap 6 for front axles. Check also for excessive wear of the shoe facings. These can be examined through the inspection holes in each flange plate.

11 To adjust brakes, back off shoe adjusters (Fig 6) until shoes are clear of drum. Then rotate the front adjuster clockwise until shoe is hard against drum. Centralize shoe by applying heavy pressure to brake pedal, and then back off adjuster until shoe is just clear of the drum. Repeat this for the rear adjuster. When all brakes have been adjusted push indicator rod fully home.

Fig 4 - Brake adjusters

BLEEDING THE HYDRAULIC SYSTEM

12 Before bleeding the hydraulic system adjust the brakes as described in paragraphs 10 and 11 of this chapter. Fully charge the air system and release parking brake. Remove the filler caps from the master cylinder and if necessary top up the fluid level. Use brake fluid to specification GM4653-M or FMVSS DOT3 or SAE J1703F.

13 Bleed each brake in turn in sequence left-hand rear, right-hand rear, left-hand front and right-hand front. It is not necessary to fully depress brake pedal during this operation. To ensure master cylinder pistons fully return after each stroke of brake pedal, the exhaust diaphragm should be removed from rear of footbrake valve during bleeding operation.

14 After bleeding system, push indicator rod into master cylinder actuator until it contacts piston and apply heavy pressure to brake pedal. Check that indicator rod does not emerge sufficiently to reveal its red band, as this indicates that further investigation of the brake system is necessary.

15 It is important that the exhaust diaphragm is correctly replaced after bleeding operation is complete.

BRAKE DRUMS

16 The front and rear brake drums locate on the wheel attaching bolts and are secured to the hubs by countersunk screws. On vehicles with single rear wheels, the rear brake drums are bolted to the hub flanges.

Removal

17 Follow the procedure for hub and drum removal given in Chap 5 for rear hubs or Chap 6 for front hubs.

Installation

18 Follow the procedure given in Chap 5 (rear drums) or Chap 6 (front drums).

19 Fully charge air system and check brake adjustment as described in para 11 of this chapter.

BRAKE SHOES

Removal

20 Remove brake drums as described in para 17 of this chapter.

21 Disconnect the shoe return springs and push rod anchor springs (Fig 7) and secure the brake cylinder pistons with wire to prevent displacement while shoes are removed.

22 Remove the shoe retainers and nuts securing the brake anchor plate.

23 Disengage the leading shoe from the shoe support and withdraw the brake shoes and anchor plate assembly. Remove the links from brake shoe and anchor plate.

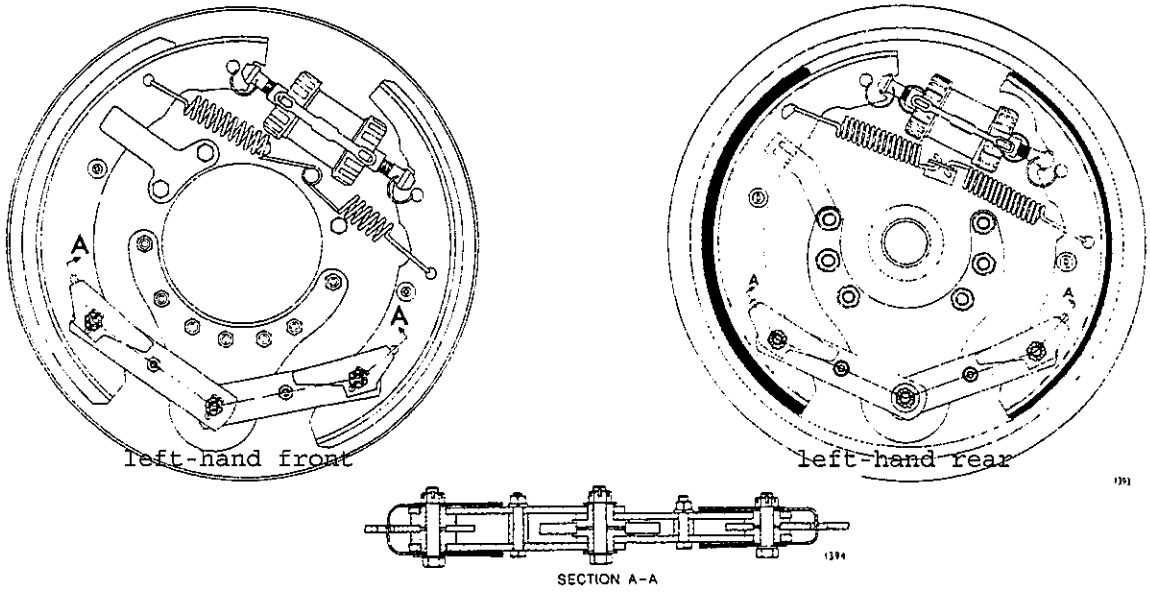


Fig 5 - Brake assemblies

Inspection

24 Inspect facing for wear and contamination by oil or grease.

Reassembly

25 When assembling links to shoes, ensure heads of bolts will be adjacent to flange plate when brakes are installed on vehicle.

26 After assembling links to shoes check tension of friction springs with a spring balance. If friction load is less than 5.4 kg (12 lb), renew springs.

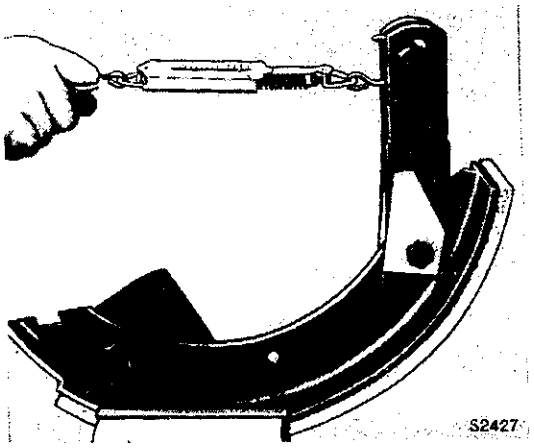


Fig 6 - Checking tension of friction springs

Installation

27 Before installing shoes smear pivots, guide plates and shoe supports with recommended grease (XG 279) ensuring that no lubricant is allowed between friction springs and shoes or links.

28 Installation of brake shoes is reversal of removal. Ensure that pull-off springs are assembled with squared end attached to shoes - ref Fig 7. After installing brake drums adjust brakes as described in paras 10 and 11 of this chapter.

BRAKE CYLINDERS

29 The front and rear brake cylinders, butted to the inside face of the brake flange plates, contain two opposed pistons fitted with drum-type adjusters actuated from outside the flange plate.

Removal

30 Remove hub and drum assembly as described in para 17 of this chapter.

31 Disconnect brake shoe return springs, push rod anchor springs and the hydraulic pipe from the back of the cylinder. Remove securing bolts and withdraw cylinder.

Disassembly and inspection

32 Withdraw pistons after removing adjusters, spring clips and rubber boots.

33 Examine the cylinder bore and pistons for scores and ridges and replace components as necessary. The rubber seals should be renewed whenever the cylinder is disassembled.

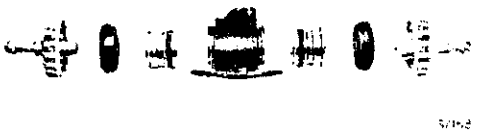


Fig 7 - Brake cylinder disassembly

Reassembly and installation

34 Ensure open side of piston seals face towards the flat end of piston (Fig 10) and before assembly smear the seals and cylinder bore with brake fluid.

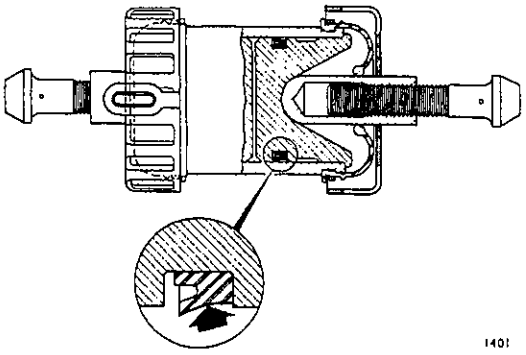


Fig 8 - Section of brake cylinder showing piston seal installation

35 Installation of wheel cylinders is a reversal of removal. After installation, bleed the hydraulic system as described in para 12 of this chapter.

LOAD SENSING VALVE

36 The load sensing valve, which is installed in the hydraulic line to the rear brakes, is mounted on the rear chassis crossmember and operated by a pair of sensing springs connecting the valve operating lever to an adjustable link attached to the rear axle.

Operating and leakage test

37 Stand the vehicle unladen on a flat level surface and fully charge brake system to governor cut-out pressure.

37.1 Disconnect the link from the differential housing bracket.

37.2 Examine the valve and associated brake pipes for fluid leaks. Lift the dust cover on the valve. The area revealed may be moist but should not be excessively wet.

37.3 Have the brake applied fairly hard and the piston stem should move downwards about 1.5 mm (0.06 in.) and stop. This movement is quite rapid and positive. (Fig 11).

37.4 Hold the brake on for 10-15 seconds, with no reduction of pedal effort, and there should be no further movement of the piston stem.

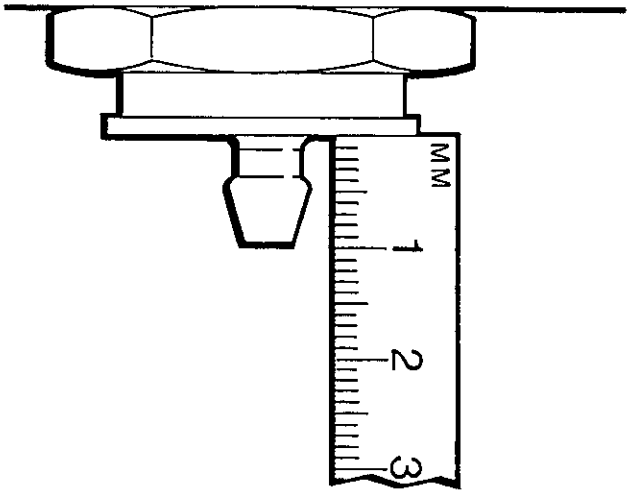


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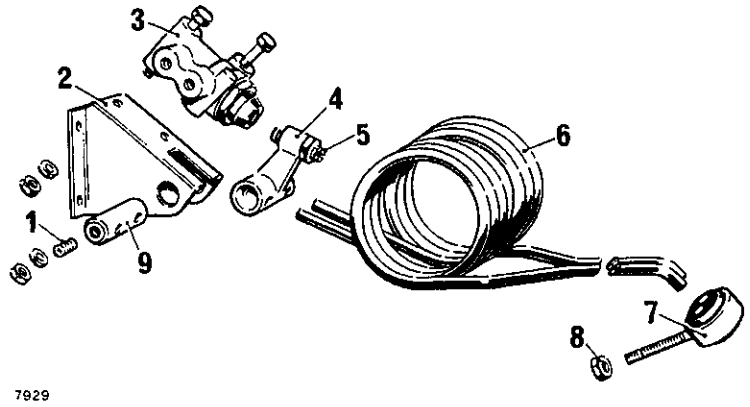
Fig 9 - Measuring piston stem movement

37.5 On release of the brakes the piston stem should again move downwards momentarily and then move back to its original position.

37.6 If, when the brake is applied, the piston stem does not move at all, or moves considerably more than 1.5 mm (0.06 in.) a new valve should be fitted.

37.7 During the 10-15 second leakage test the piston stem should not move further than its first rapid movement. If further movement does occur, the valve is faulty and should be replaced. Slow 'creep' of the piston stem after the 10-15 second test is permissible.

Removal



1. Grub screw
2. Mounting bracket
3. Load sensing valve
4. Lever
5. Adjusting screw
   (This is correctly set at the production factory and must not be disturbed)
6. Spring
7. Adjuster eye and ferrule assy
8. Locknut
9. Bearing pin

Fig 10 - Load sensing valve and spring assembly

38 To remove load sensing valve, disconnect hydraulic pipes, remove valve securing bolts and withdraw valve.

39 To remove valve springs (6) and lever (4), disconnect axle link, loosen grub screw (1) and press out bearing pin (9).

40 All parts, including the load sensing valve are only serviceable by exchange.

Installation and adjustment

41 Installation is the reversal of removal. After installing, bleed the hydraulic system as described in para 12 of this chapter and adjust load sensing valve linkage as follows:

41.1 Ascertain load on rear axle.

41.2 Measure gap at point 'G' on load sensing valve.

41.3 Using chart below check whether gap is correct.

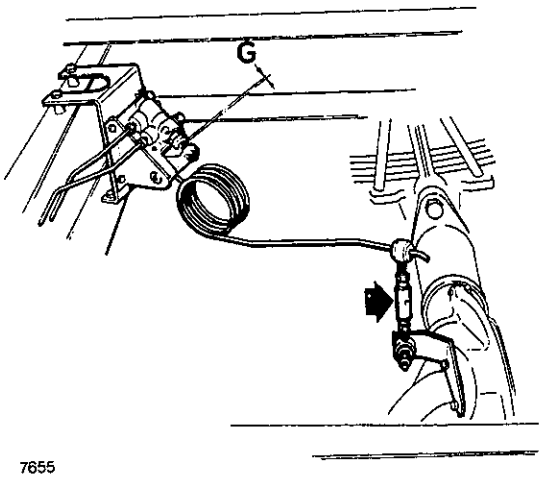


Fig 11 - Load sensing valve adjustment

MODEL	CODE	AXLE LOAD (kg (lb)					SETTING GAP mm (in.)
		1600 (3528)	1800 (3969)	2000 (4410)	2200 (4851)	2400 (5292)	
MOP2WMO	183	-	-	1.38 (0.054)	0.86 (0.034)	0.34 (0.013)	
MOP2BMO	183	2.08 (0.082)	1.59 (0.063)	1.10 (0.043)	0.61 (0.024)	0.16 (0.006)	
MOP2WMO	-	2.08 (0.082)	1.59 (0.063)	1.10 (0.043)	0.61 (0.024)	0.16 (0.006)	
MOP2BMO	-	1.79 (0.070)	1.25 (0.049)	0.75 (0.030)	0.24 (0.009)	-	

41.4 If gap is not correct adjust linkage (arrowed) between axle and valve lever.

MASTER CYLINDER

Leakage test

42 Brake fluid visible from the vent in the base of the master cylinder indicates a faulty seal on either the primary or secondary piston.

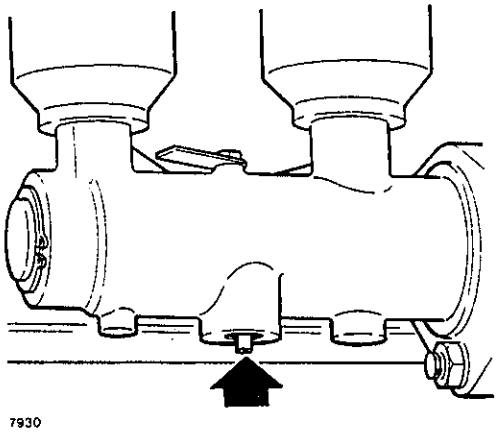


Fig 12 - Master cylinder vent

Removal

43 To remove master cylinder, it is necessary to remove actuator and master cylinder assembly from vehicle.

44 When separating master cylinder from actuator, note number of shims between attaching faces. Shims control clearance between actuator push rod and master cylinder primary piston.

Disassembly

45 Remove reservoir floats and filters.

46 Use Wrench D1142 to remove reservoir retaining nuts.

47 Withdraw the recuperating valve (1) installed beneath the reservoir (2) at the push rod end of the master cylinder.

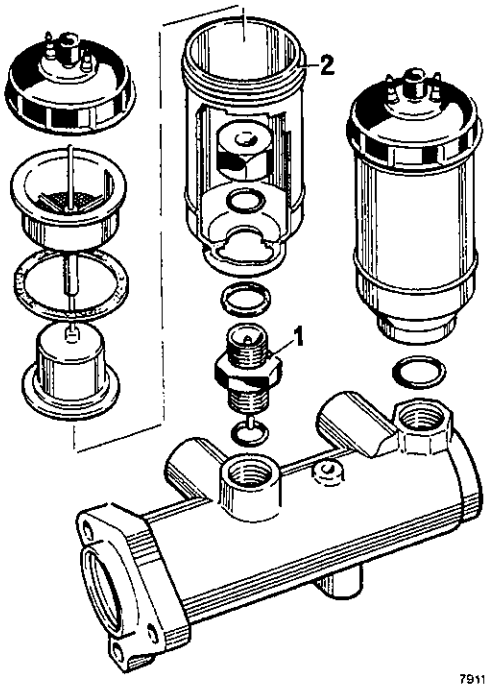


Fig 13 - Master cylinder reservoirs

48 Do not disassemble valve unnecessarily. If required, valve may be disassembled by removing spring retainer.

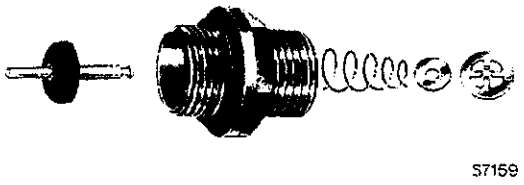


Fig 14 - Recuperating valve disassembly

49 Remove secondary piston stop bolt (1), and the vent (2), seals (3), and spring (4).

50 Pistons may be withdrawn after removal of the circlips.

51 Use a thin feeler gauge to assist seals in passing over the circlip groove.

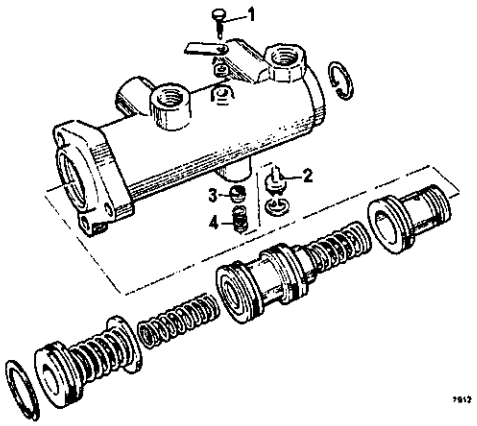


Fig 15 - Master cylinder

52 Remove hydraulic pipe connection adaptors and withdraw check valves.

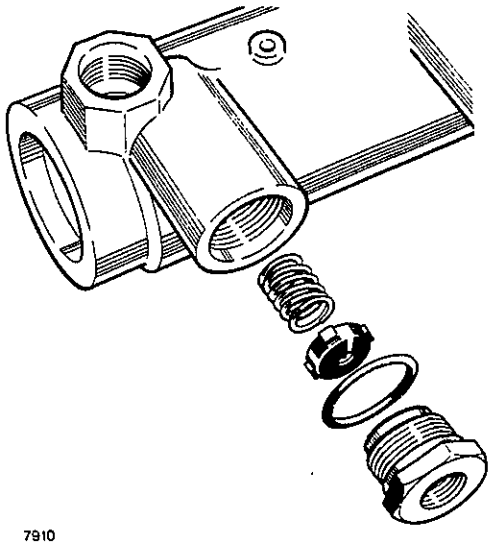


Fig 16 - Master cylinder check valves

Reassembly and installation

53 Lips of the seal on the primary piston face away from push rod end of piston.

54 Lips of seals on secondary piston face away from each other.

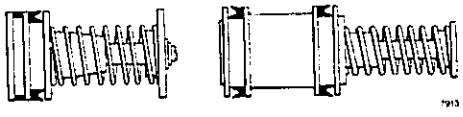


Fig 17 - Primary and secondary piston seals

55 When installing recuperating valve and piston stop, hold pistons depressed and check that movement of primary piston actuates valve.

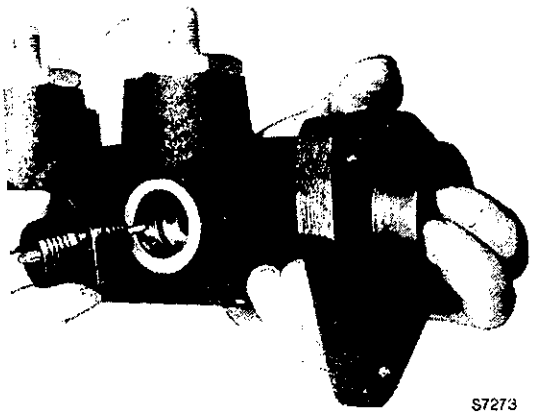
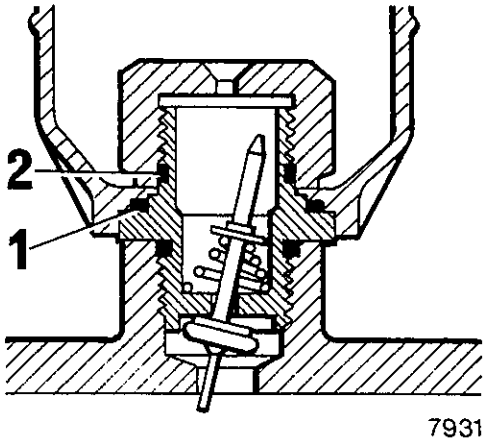


Fig 18 - Installing recuperating valve

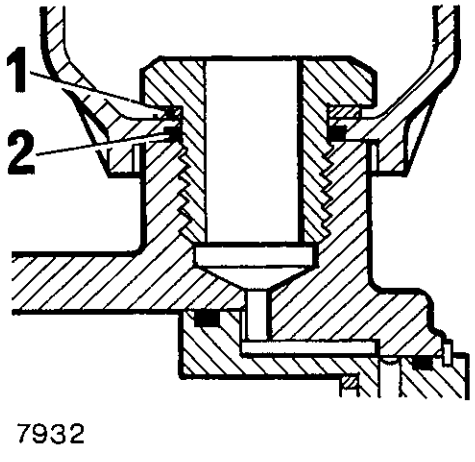
56 Before installing reservoir nearest the push rod end, position rubber O-ring (1) on recuperating valve and copper washer (2) under reservoir retaining nut.



1. Rubber O-ring
2. Copper washer

Fig 19 - Sealing washers primary reservoir

57 Before installing the other reservoir, position copper washer (1) between retaining union and inside of reservoir, and O-ring on the union outside the reservoir.



1. Copper washer
2. Rubber O-ring

Fig 20 - Sealing washers secondary reservoir

58 Determine the number of shims required between the master cylinder and actuator before installing cylinder. This may be achieved as described in para 79 of this chapter.

59 When installing cylinder on vehicle tighten adapter xxx(nuts?) to specified torque of 24-34 Nm (18-25 lbf ft).

60 Bleed hydraulic system as described in para 12 of this chapter.

MASTER CYLINDER ACTUATOR

Removal and disassembly

61 Release the pressure from the air system and remove air lines from the actuator and hydraulic pipes from the master cylinder

62 When removing actuator, note number of shims between master cylinder and support as they control clearance between actuator push rod and master cylinder primary piston.

63 Mark position of cylinders in relation to body before disassembly.

64 Piston may be withdrawn from front cylinder by applying low air pressure to supply port.

65 Indicator rod may be withdrawn from rear cylinder after removing friction disc.

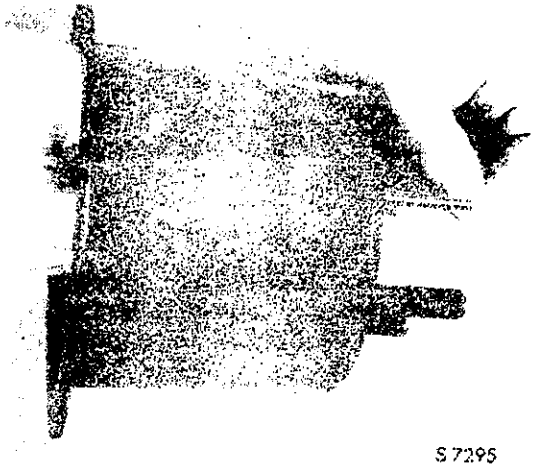


Fig 21 - Withdrawing indicator rod

66 Push rod and piston may be separated from body after removing push rod lock nut. Spring tension can be overcome by hand pressure.

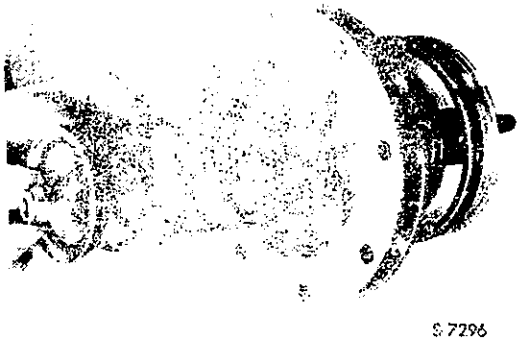


Fig 22 - Withdrawing push rod and piston

PUBLICATIONS

67 Felt ring and seal are retained in body by a circlip. Filter in body should not be removed unnecessarily.

68 Discard all components which will be renewed from a repair kit.

Inspection

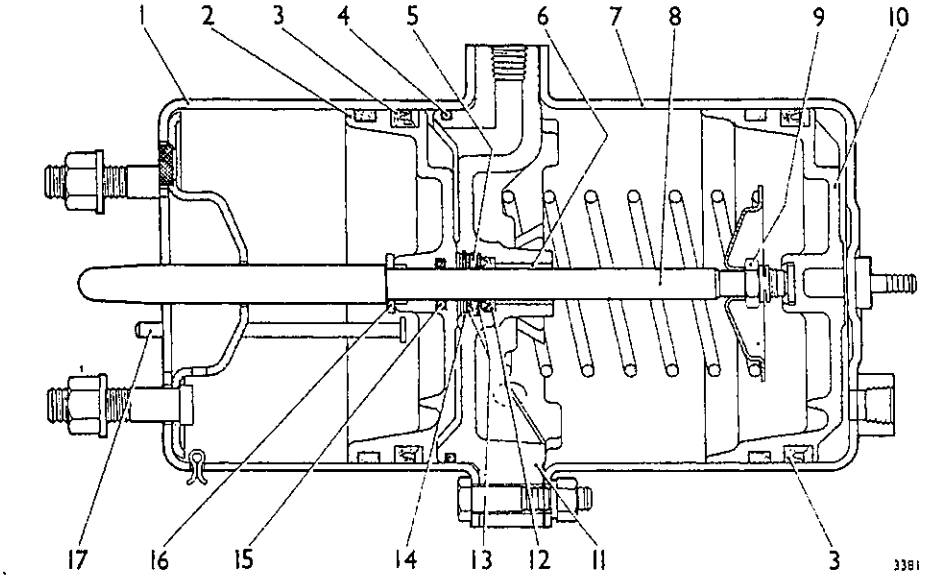
69 Examine sliding surface of push rod for scores and bush in body for wear. Rod should be a close sliding fit in bush.

70 Inspect cylinders for dents or signs of scoring and corrosion. Slight corrosion may be removed with fine emery cloth.

Reassembly

71 Before reassembly, liberally smear seals, sealing rings, push rod, bush and sliding surfaces of cylinders, pistons and indicator rod with Rocol E1A grease.

72 Soak felt ring and piston lubricator felts in Clayton Dewandre Power Cylinder Oil.



1. Rear cylinder
2. Rear piston
3. Piston seals
4. Sealing ring groove
5. Felt ring
6. Bush
7. Front cylinder
8. Push rod
9. Push rod lock nut
10. Front piston
11. Body
12. Seal
13. Washer
14. Circlip
15. Sealing ring
16. Thrust washer
17. Indicator rod

Fig 23 - Master cylinder actuator assembly

73 Press seal (12) into body (11) with plain side towards bush (6) and insert a washer (13) on each side of felt ring (5) before installing circlip (14).

74 Assemble seals (3) to groove nearest closed ends of piston (2 and 10) with plain side of seals towards lubricator felt grooves. Locate sealing ring (15) in rear piston push rod bore.

75 Before assembling piston and body to push rod (8), place thrust washer (16) against abutment on rod. Care should be taken to avoid damaging seal in body, and sealing ring groove (4) on outside of body should be adjacent to piston. Fully tighten push rod lock nut (9).

76 Insert front piston, closed end first, into cylinder (7} incorporating air supply port. Before installing rear cylinder (1), retain indicator rod (17) with friction disc.

77 Tighten cylinder retaining bolts to a torque of 24 Nm (18 lbf ft).

Installation

78 Before installing actuator, determine thickness of shims required between master cylinder and support to provide correct clearance between actuator push rod and master cylinder primary.

79 To determine thickness of shims, locate actuator in support and assemble shims removed and Gauge VR2096. Add or remove sufficient shims until push rod is flush with, or not more than 0.13 mm (0.005 in.) below gauge. As a final check, shims should be compressed by securing gauge with three nuts.

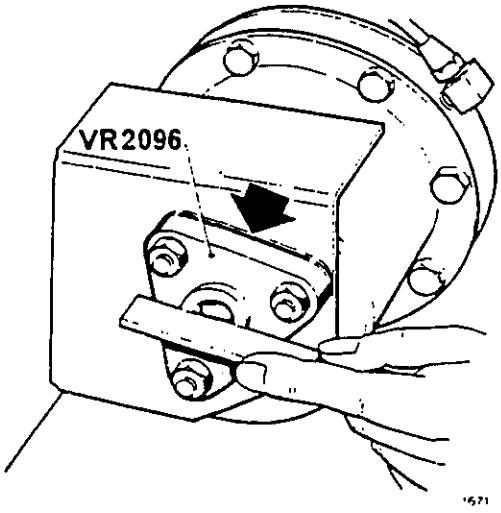


Fig 24 - Checking shim thickness

Note...

When assessing the number of shims required to provide the correct clearance between the actuator push rod and master cylinder primary piston on Trucks with a vented master cylinder, Actuator Push Rod Gauge KM2053 must be used.

80 Bleed the hydraulic brake system as described in para 13 of this chapter.

81 Check air and hydraulic pipe connections for leakage.

COMPRESSOR GOVERNOR VALVE

82 The output of the compressor is controlled by a piston-type governor valve mounted on the left hand side of the frame, inside front face.

Operating test

83 Check operation of governor valve by charging system until valve cuts out and further compression of air ceases. If pressure indicated on vehicle gauge is not within specified limits, slacken locknut and rotate adjusting screw clockwise to increase pressure or anti-clockwise to reduce pressure. Pressures should be:
Cut-out 7.1 to 7.4 bar (103 to 107 Ibf/in.^{2})
Cut-in 6.1 bar (88 lbf/in.^{2}).

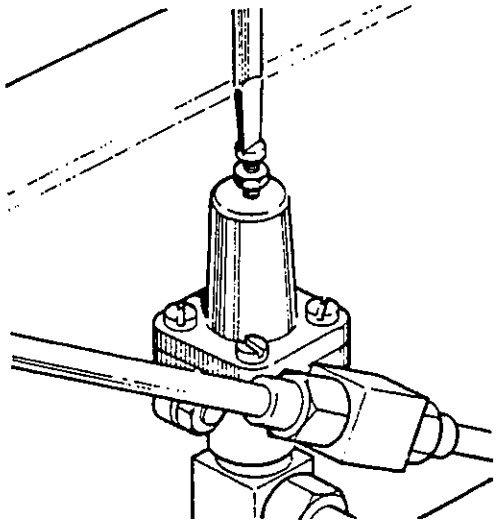


Fig 25 - Adjusting governor valve cut-out pressure

Leakage test

84 Charge the system to just below the governor valve cut-out pressure and smear soap solution over the valve body and cover. Leakage from the exhaust diaphragm indicates a faulty inlet valve, inlet valve seat or plunger sealing ring.

85 Leakage from vent hole in cover indicates a faulty main diaphragm.

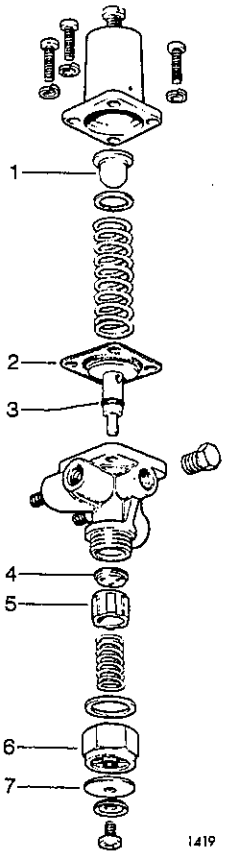
86 Fully charge system and again check for leakage from exhaust diaphragm. Leakage indicates a faulty exhaust valve or seat.

Removal

87 Release the pressure from the system, disconnect air lines and remove securing nuts.

Disassembly and inspection

88 Back off the adjusting screw and progressively remove the cover screws. Lift off the cover and withdraw the spring, washer and spring seat. Withdraw the main diaphragm assembly and remove plunger sealing ring. Insert a length of 3 mm (0.125 in.) diameter rod through the hole in the diaphragm plunger and remove the nut. Unscrew exhaust diaphragm retaining screw and remove the plate and diaphragm.



1. Spring seat
2. Main diaphragm
3. Plunger sealing ring
4. Inlet/exhaust valve
5. Spring retainer
6. Exhaust nut
7. Exhaust diaphragm

Fig 26 - Governor valve disassembly

89 Inlet/exhaust valve, spring may be removed after unscrewing exhaust nut. Exhaust diaphragm is secured by screw and plate.

90 Check that the passages in the body and vent in the cover are not obstructed. The face of the inlet/exhaust valve should be flat and smooth. Replace components as necessary.

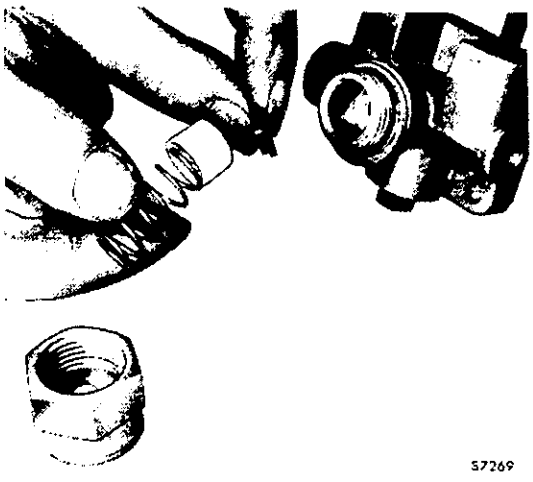


Fig 27 - Inlet/exhaust valve disassembly

Reassembly and installation

91 When assembling diaphragm and plunger, locate fabric washer (arrowed) between diaphragm plate and shoulder of plunger.

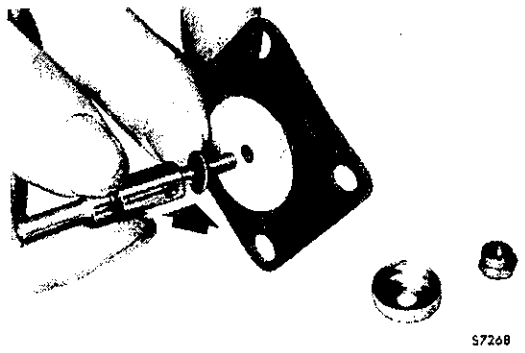


Fig 28 - Diaphragm and plunger reassembly

92 Ensure bevel edged diaphragm plate is located below diaphragm with bevel edge towards diaphragm.

93 Smear plunger with Rocol E1A grease before installation.

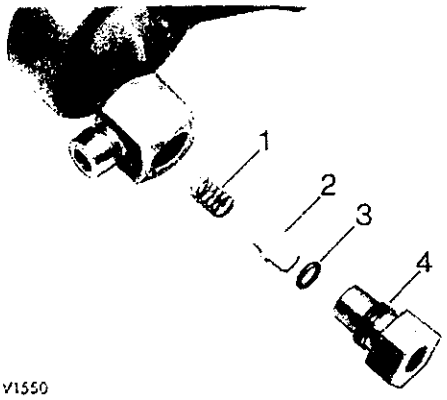
94 After installing governor valve, carry out operating and leakage tests as described in paras 83 and 84 of this chapter.

COMPRESSOR ANTI-FREEZER

95 The compressor anti-freezer is located on the rear of the left-hand side of the cab.

Disassembly and inspection

96 Disassemble check valve by unscrewing hexagonal plunger guide (4) and removing spring (1), plunger (2) and seal (3).



1. Spring
2. Plunger
3. Seal
4. Plunger guide

Fig 29 - Compressor anti-freezer check valve

97 Remove circlip and withdraw perforated discs, filter and stepped washer.

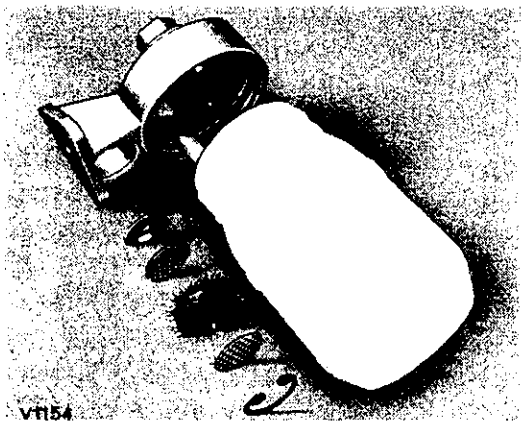


Fig 30 - Compressor anti-freezer filter

98 Ensure air passages in cover and vent tube are not obstructed. Inspect plunger and cover sealing rings for deterioration. Clean all filter components.

Reassembly and installation

99 Reassembly is a reversal of disassembly. Connect air line from governor valve to top port of check valve and air line from compressor to check valve side port.

NON-RETURN VALVE

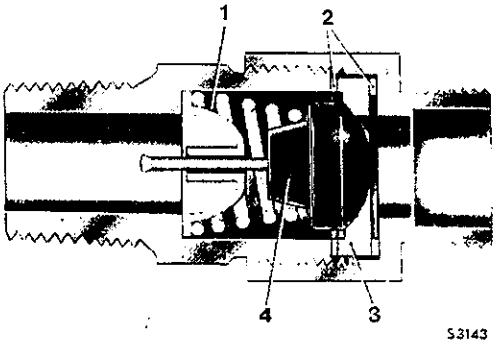
100A non-return valve is located in the supply connection to the condensing reservoir. The valve consists of a body and screw cap containing a half-round rubber valve, spring-loaded against a valve seat.

Leakage test

101Check non-return valve for leakage by fully charging air system. With engine stopped and supply pipe disconnected, smear open end of valve with a soap solution. Leakage should not exceed a 25 mm (1.0 in.) bubble in one second.

Reassembly and installation

102When reassembling the non-return valve, install a sealing washer (2) on each side of the valve seat (3). Install valve assembly (1) so that rubber valve (4) is in contact with its seat.



1. [illegible]
2. Sealing washer
3. Valve seat
4. Rubber valve

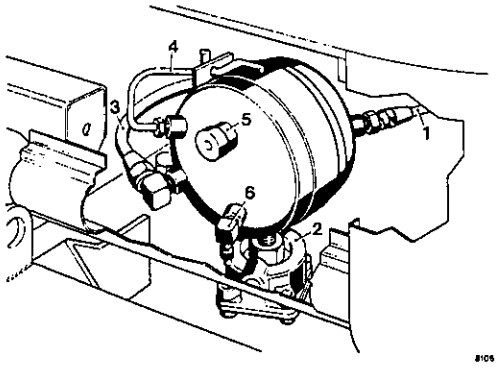
Fig 31 - Non-return valve

103When installing the non-return valve, ensure arrow on body points in the direction of condensing reservoir. Carry out leakage test as described in para 101 of this chapter.

CONDENSING RESERVOIR

104The condensing reservoir is mounted on the chassis side member at the front of the vehicle. It is fitted with an automatic water drain valve (2) and a non-adjustable ball type safety valve (5).

105Air line (3) is the condensing reservoir feed from the compressor via a non-return valve. Air lines (1 and 4) supply the triple pressure protection valve and governor valve respectively.



1. Supply line to triple pressure protection valve
2. Automatic water drain valve
3. Supply from compressor
4. Signal line to governor valve
5. Safety valve

Fig 32 - Condensing reservoir

SAFETY VALVE

106A safety valve, located in the condensing reservoir, protects the air system against excessive air pressure in the event of governor valve failure. The valve is non-adjustable and consists of a body containing a spring-loaded ball check-valve retained by a washer and circlip. A dust cover is fitted over the valve body.

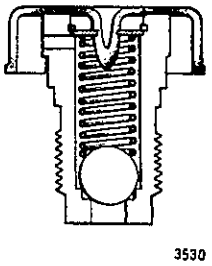


Fig 33 - Safety valve

107Operation of safety valve may be checked by disconnecting the air line to governor valve at condensing reservoir and installing a plug in reservoir connection. Charge system and check that valve operates between 9.6-11.0 bar (140/160 lbf/In^2). If valve fails release air at specified pressure, remove and clean valve. If valve still fails to operate renew valve.

Leakage test

108Check the safety valve for leakage by fully charging system and smearing valve with a soap solution. If leakage exceeds a 25 mm (1.0 in.) soap bubble in five seconds renew valve.

AUTOMATIC DRAIN VALVE

109The automatic drain valve is located on the lowest part of the condensing reservoir.

Operating test

110With air system fully charged, decrease pressure by applying and releasing brakes and check that drain valve exhausts air and/or condensate. If valve fails to operate, carefully depress wire in exhaust port. If air is not exhausted remove valve for cleaning.

Leakage test

111With air system fully charged, smear valve body and cover with soap solution. Leakage from exhaust port indicates a faulty exhaust valve and/or seat. Leakage from body indicates a faulty sealing ring.

112Note that slight leakage at exhaust port may be caused by excessive leakage in other parts of air brake system.

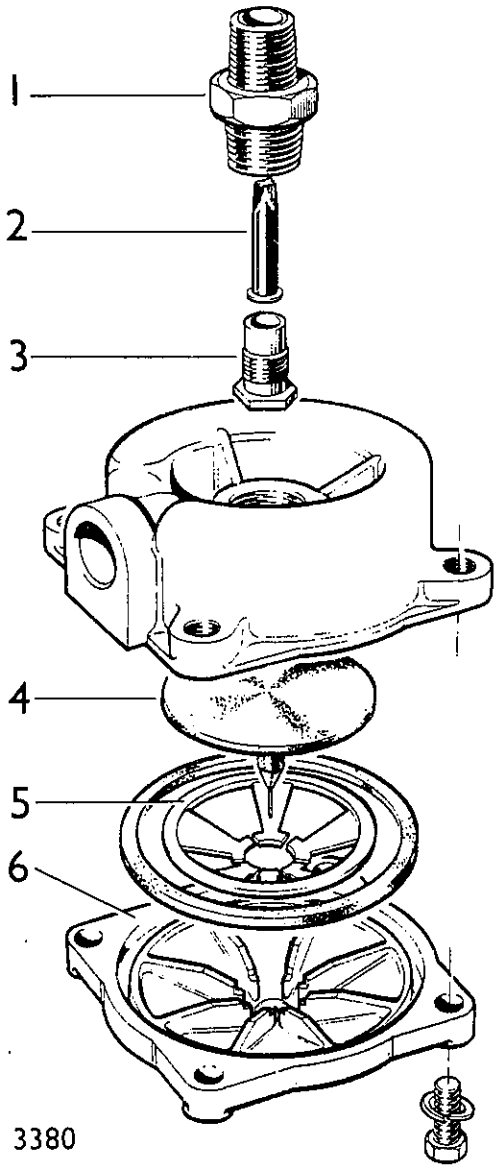
Removal and disassembly

113Release the pressure from the system and unscrew the valve from reservoir.

114Filter (2) may be withdrawn after removing adaptor (1) and unscrewing filter retaining sleeve (3).

115Valve guide (5) and inlet/exhaust valve (4) may be withdrawn after removing cover (6).

116Wipe inlet/exhaust with a clean dry cloth and examine for wear and deterioration.



1.Adaptor
2.Filter
3.Retaining sleeve
4. Inlet/exhaust valve
5. Valve guide
6. Valve cover

Fig 34 - Automatic drain valve

Reassembly and installation

117Reassemble valve in the reverse order of disassembly, ensuring a thin film of Rocol E1A grease is applied to the inlet valve seat.

118Install the unit to the condensing reservoir and carry out the operating and leakage tests as described in paras 110 and 111 of this chapter.

TRIPLE PRESSURE SYSTEM PROTECTION VALVE

119A triple element system protection is installed in the supply line to the Service I and Service II reservoirs, and the trailer brakes circuit to prevent total loss of air supplied to individual reservoirs, should a leak develop in any one circuit.

120The valve is mounted to the left-hand side of the spare wheel carrier.

Operating test

121Drain air from circuit of valve/element which is to be checked by removing reservoir drain plug or supply pipe.

122Lower pressure in remainder of system to approximately 2.8 bar (40 lbf/in^2).

123Charge system and when air escapes to atmosphere from open circuit, note pressures, on gauges in cab, of remainder of system. This will indicate the opening pressure of valve/element being checked.

124The specified opening pressures are as follows:

Service I supply	6.7 bar (97 lbf/in^2)
Service II supply	6.7 bar (97 lbf/in^2)
Trailer Emergency supply	5.0 bar (72 lbf/in^2)

125If pressure is not within specified limits, valve must be removed and adjusted. Connect a variable air supply, incorporating a pressure gauge, to protection valve inlet port. Remove rubber cover and turn adjusting screw until valve just opens at specified pressure. Plug outlet ports of each element except for the one that is to be adjusted.

Leakage test

126Check valves for leakage by charging system to governor cut out pressure, removing supply connection and smearing soap solution over inlet port and rubber cover. Leakage from rubber cover must be less than a 5 mm (0.2 in.) soap bubble in ten seconds. Leakage from inlet port in excess of a 10 mm (0.4 in.) soap bubble in six seconds indicates a faulty non-return valve.

127To check for leaks from the two additional non-return valves, charge system to governor cut-out pressure, remove valve outlet connection to Service I reservoir and smear soap solution over valve outlet port. Leakage in excess of a 10 mm (0.4 in.) soap bubble in six seconds indicates a faulty non-return valve.

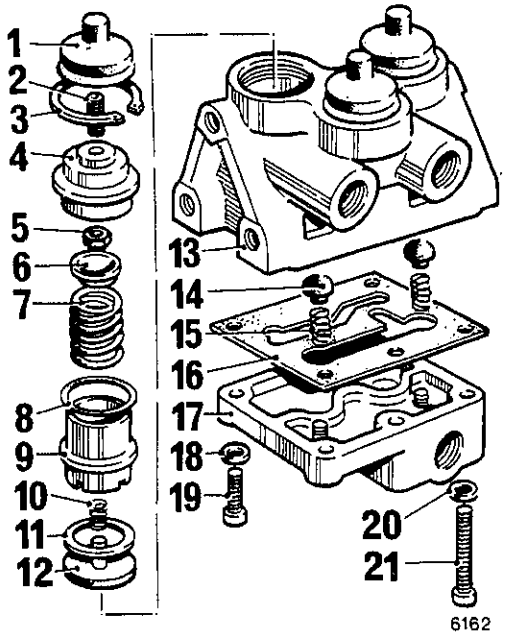
128Repeat procedure on valve outlet connection to Service II reservoir, first ensuring that system is fully charged to governor cut-out pressure.

Disassembly and inspection

129Remove rubber gaiters (1) and circlips (3). Withdraw the valve cap (4), adjusting screw (2), spring (7), piston (9) and non-return valves (12).

130Remove lower cover (17) which is secured by six screws (21) to gain access to the additional non-return valves (14).

131Ensure valve body (13) and pistons (9) are free from scores, and seals and springs have not deteriorated. Renew parts as necessary.



1. Gaiter
2. Adjusting screw
3. Circlip
4. Cap
5. Nut
6. Seat
7. Spring
8. Sealing ring
9. Piston
10. Spring
11. Washer
12. Non-return valve
13. Valve body
14. Non-return valve
15. Spring
16. Gasket
17. Lower cover
18. Washer
19. Screw
20. Washer
21. Screw

Fig 35 - Triple system protection valve disassembly

Reassembly and installation

132Before reassembly smear pistons with Rocol E1A grease. After installing system protection valves carry out operating and leakage test as described in paras 121 and 126 of this chapter.

Low pressure warning switches

133Low air pressure warning switches are incorporated in the Service I and Service II reservoirs. The switches, which actuate a buzzer and warning lamp in the vehicle if the pressure in either reservoir falls below the minimum required, are sealed units and consist of a body, spring-loaded diaphragm and contacts.

Operating test

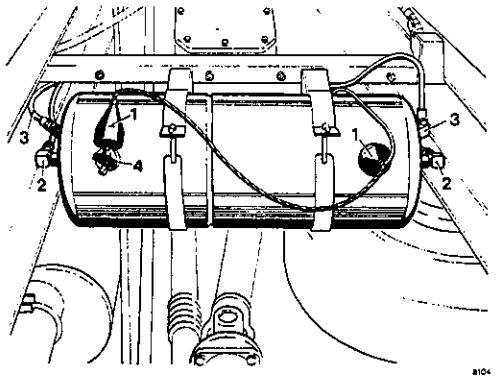
134With system fully charged and engine stopped, disconnect wire from switch not being tested and turn key start switch to running position. Release pressure by applying and releasing footbrake and note pressure indicated on dual air gauge at which buzzer and warning lamp operate. If switch fails to operate between 4.5/5.1 bar (65/75 lbf/in^2) it must be renewed.

Leakage test

135Check switches for leakage by fully charging air system and smearing switch with soap solution.

DUAL AIR RESERVOIR

136A dual air reservoir comprising a Service I and Service II reservoir combined in one assembly is mounted on the rear of the spare wheel carrier cross member. The reservoirs incorporate low pressure warning switches (1) and are provided with drain plugs. An air line from each reservoir supplies air to the footbrake valve.

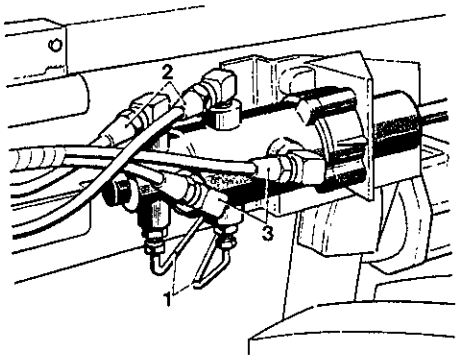


1. Low pressure warning switches
2. Supply to footbrake valve
3. Feed from triple pressure protection valve
4. Test point

Fig 36 - Dual air reservoir

FOOTBRAKE VALVE

137The dual footbrake valve, which is operated by the brake pedal, is mounted on the outside of the chassis side member at the front of the vehicle on the driver's side.

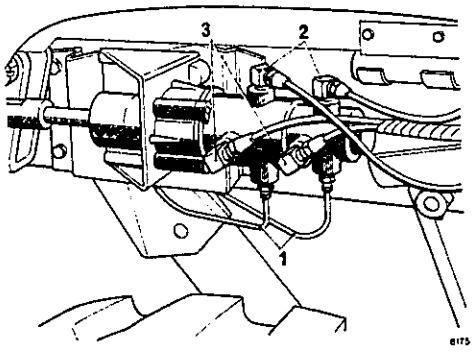


1. Air line to vehicle air pressure gauge
2. Air line from reservoirs
3. Delivery air lines from footbrake valve

Fig 37 - Footbrake valve and air lines - right drive

Operating test

138Check operation of foot-brake valve by disconnecting delivery air lines (3) from footbrake valve and connecting an air pressure test gauge to each port. Do not disturb air lines (2) from reservoirs or air lines (1) to vehicle air pressure gauge.



1. Air line to vehicle air pressure gauge
2. Air line from reservoirs
3. Delivery air lines from footbrake valve

Fig 38 - Footbrake valve and air lines - left drive

139With air system fully charged, fully apply footbrake and check that pressures registered on test gauges are approximately the same as registered on vehicle gauge.

140Release brake pedal and check that pressures fall immediately to zero on test gauges.

141Recharge system and gradually apply footbrake. Pressures registered on test gauges should be within 0.3 bar (5 lbf/in^2) of each other and should increase with brake pedal effort until they are approximately the same as registered on vehicle gauge. Check pressures again while slowly releasing brake pedal.

Leakage test

142Check footbrake valve for leakage by fully charging system and smearing exhaust diaphragm and dust cover with a soap solution. Leakage indicates faulty valve carrier sealing rings or inlet valves and/or seats. Leakage from exhaust diaphragm in excess of a 25 mm (1.0 in.) soap bubble in five seconds with brake pedal fully applied indicates faulty exhaust valves and/or seats, or piston sealing rings, or valve carrier rear sealing ring.

143With system fully charged gradually apply footbrake valve until delivered pressure rises to 6.2 bar (90 lbf/in^2) and smear exhaust diaphragm and dust cover with soap solution.

144Fully apply brake pedal and gradually release until delivered pressure falls to 6.2 bar (90 lbf/in^2) and repeat leakage test. Leakage in either condition is not permissible.

Removal

145To prevent the ingress of dirt into the valve body, do not attempt to disassemble to valve without first removing it from the vehicle. Disconnect all air lines after identifying them in relation to their respective ports. Remove the three retaining bolts and washers and withdraw the valve assembly.

146Mark the position of plunger housing in relation to valve body before disassembly.

Disassembly

147Remove circlip, withdraw valve guide spring, inlet/exhaust valve and filter from rear of body.

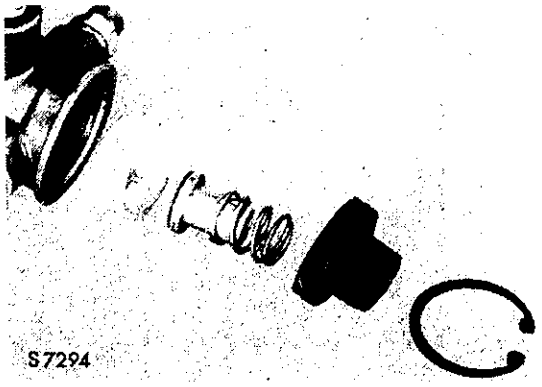


Fig 39 - Disassembling rear of footbrake valve

148Remove mounting bracket and withdraw plunger housing, buffer spring, retainers and ball housing. If necessary disassemble buffer spring by removing lock-type bolt.

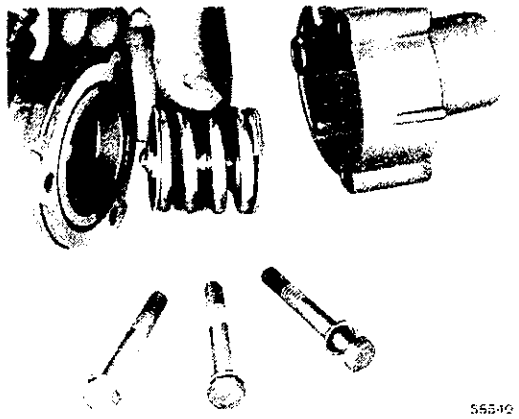


Fig 40 - Disassembling front of footbrake valve

149Push front piston, valve carrier and rear piston out of bore with a wooden rod inserted through rear of body. Care must be taken to avoid damaging exhaust valve seat on rear piston. Remove spring and retainer from spigotted end of carrier by unwinding ring.

150Remove valve guide spring filter and inlet/exhaust valve from rear of carrier after releasing circlip.

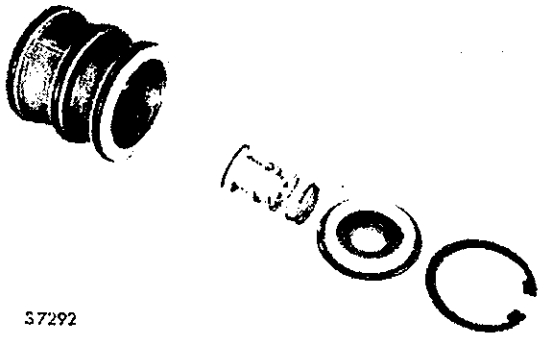


Fig 41 - Disassembling valve carrier

Inspection

151Clean all parts and inspect valve seat in body and carrier, and exhaust valve seats on pistons for damage. If necessary reface exhaust valve seats on a surface plate with fine emery cloth. Check seals for deterioration. Renew parts as necessary.

152Ensure breather hole in front piston and bleed hole in valve carrier and body are not obstructed. Ends of buffer spring must be flat and parallel.

Reassembly

153Prior to reassembly, liberally smear all moving parts, including seals with Rocol E1A grease.

154Before installing rear piston, position spring in end of valve bore.

155When installing filter, inlet/ exhaust valve, spring and valve guide in carrier, depress guide only as far as necessary to locate circlip. If guide is pushed too far into bore, outer sealing ring may be displaced when guide returns against circlip causing air leakage. Inner sealing ring is located by a retainer.

Fig 42 - Assembling valve carrier

156After assembling front piston spring and retainer to carrier, insert carrier into valve body with valve guide towards rear piston.

Fig 43 - Installing valve carrier to valve body

157When assembling buffer spring and ball housing ensure front retainer is not trapped between housing, and bolt washer. Place assembly on piston so that ball is located in recess in centre of piston.

158Before installing filter, inlet/ exhaust valve and spring in rear of body, place seal retainer on valve guide.

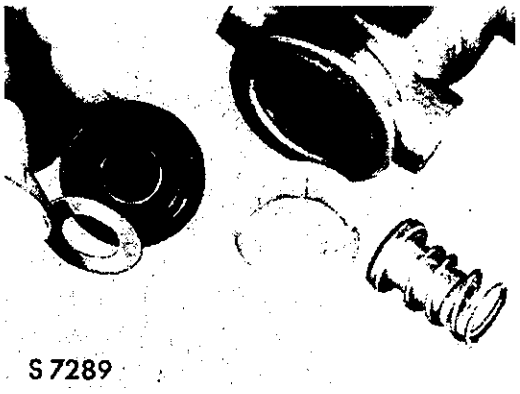


Fig 44 - Assembling rear of footbrake valve

Installation

159Install valve to vehicle. Check and if necessary adjust brake pedal setting as described in para 8 of this chapter. Carry out operating and air leakage tests as described in paras 138 and 142 of this chapter.

STOP LAMP SWITCHES

160A stop lamp switch is incorporated in the air line between the footbrake valve and master cylinder actuator, and the air line to the changeover valve. The switches are located on the outside of the chassis right-hand sidemember and consist of a body and cover containing two terminals, an electrical contact strip, piston, diaphragm and piston return spring.

Leakage test

161Check stop lamp switches for leakage by fully charging air system and smearing switch with a soap solution. With footbrake applied, leakage at cover indicates a faulty diaphragm.

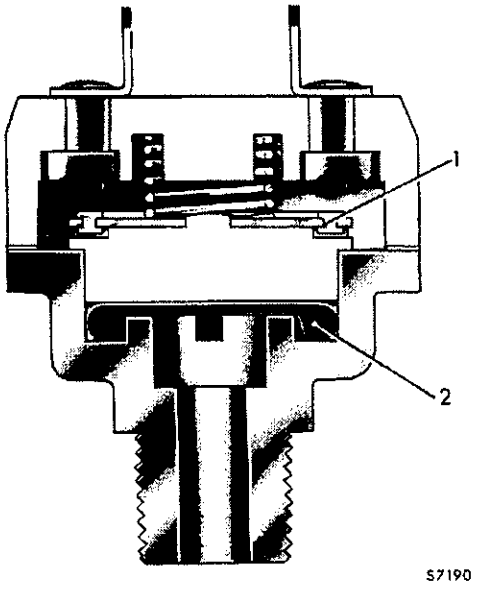
Disassembly and inspection

162Switch is disassembled by removing cover screws.

163If switch contacts are only slightly pitted they may be cleaned with a fine cut file. If contacts are badly burnt or pitted, switch cover should be renewed together with contact strip (1).

Reassembly

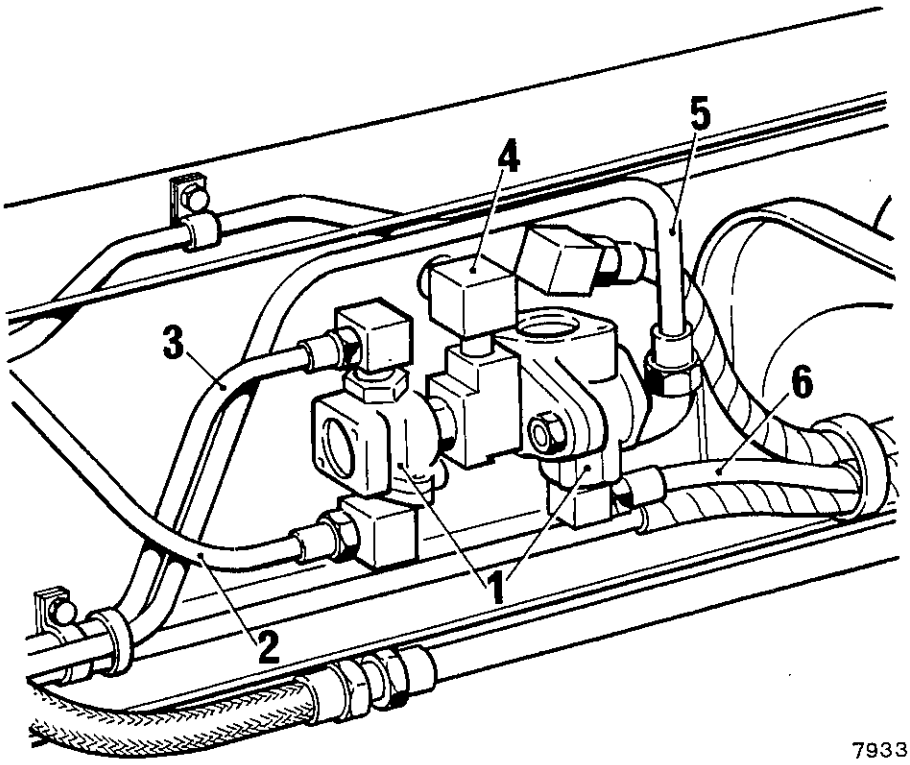
164Lightly smear diaphragm bore with Rocol E1A grease before installing diaphragm (2) with plain side towards switch cover. When installing contact strip, ensure larger diameter contact heads are towards switch cover.



1. Contact strip 2. Diaphragm
Fig 45 - Stop lamp switch

CHANGE-OVER VALVES

165Two changeover valves are incorporated in the braking system. The valves are located on the inside of the right-hand sidemember.



1. Changeover valves
2. Supply from footbrake valve
3. Supply from hill holder valve
4. Supply to stop lamp switch and master cylinder actuator
5. Supply from trailer park control valve
6. Signal pressure to dual relay valve

Fig 46 - Air line connections to changeover valves

Leakage test

166On the changeover valve incorporated in the footbrake valve and hill-holder delivery lines. Fully charge system to governor valve cut-out pressure, disconnect supply line from footbrake at changeover valve and smear inlet port with a soap solution.

166.1 Leakage in excess of a 13 mm (0.5 in.) bubble in five seconds with the hill holder applied indicates a faulty shuttle valve.

166.2 Reconnect supply line from footbrake valve, disconnect supply line from hill holder valve and smear inlet port with a soap solution.

166.3 Leakage in excess of a 13 mm (0.5 in.) bubble in five seconds with footbrake indicates a faulty shuttle valve.

167Leakage test on the changeover valve incorporated in the trailer park control valve and master cylinder actuator supply lines. Fully charge system to governor cut-out pressure, disconnect supply line to the changeover valve from trailer park control valve and smear inlet port with a soap solution.

167.1 Leakage in excess of a 13 mm bubble (0.5 in.) in five seconds with the footbrake applied indicates a faulty shuttle valve.

167.2 Reconnect supply line from trailer park control valve, disconnect supply line (1) from stop lamp switch to master cylinder actuator at stop lamp switch and smear port with a soap solution.

167.3 Leakage in excess of a 13 mm (0.5 in.) bubble in five seconds with the trailer park control valve applied indicates a faulty shuttle valve.

167.4 Ensure that the hill holder control valve and footbrake valve are not applied.

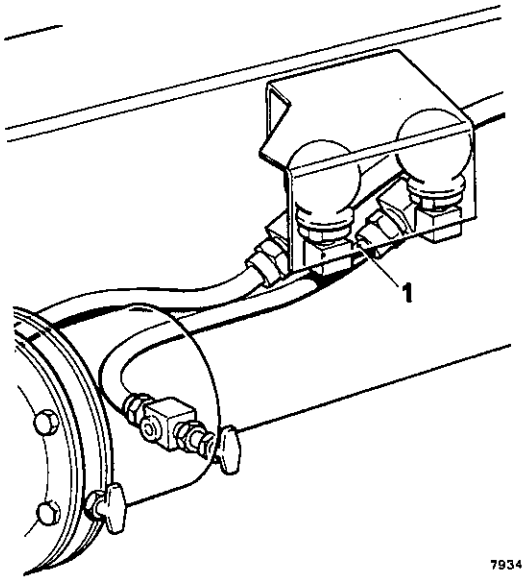


Fig 47 - Air line connections to master cylinder actuator

Reassembly

168Before reassembly, smear shuttle valve sleeve and inner surface of guide with recommended grease.

HILL HOLDER CONTROL VALVE

169The hill holder control valve is mounted on the right-hand side of the steering column.

Operating test

Ensure that valve handle torsion springs are effective and hold the handle in the 'BRAKES OFF' position.

170To check operation of the hill holder control valve disconnect delivery pipe from valve and install a pressure gauge in the port.

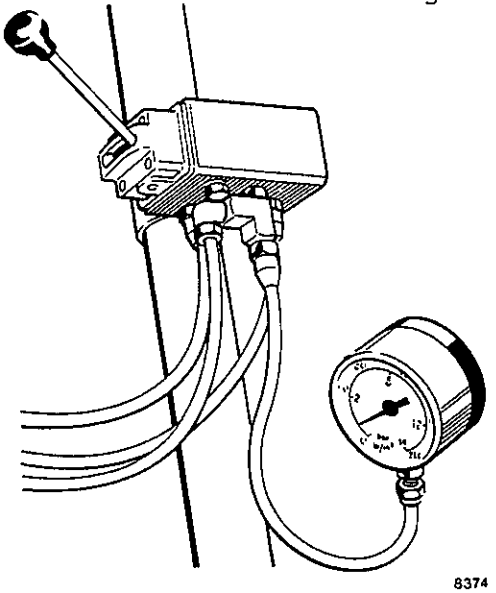


Fig 48 - Checking operation of valve

171Charge air system to governor cut-out pressure.

172With lever in 'BRAKES OFF' the pressure gauge should register zero. Slowly move lever to the 'BRAKES ON' position. Pressure registered on the gauge should rise in proportion to handle movement. At the 'BRAKES ON' position gauge should register the same as the Service II pressure gauge.

173If the gauge pressures are not the same, the valve can be adjusted as follows:

173.1 Remove locking plate and retaining screw. Re-install screw to castellated pressure adjusting plug.

173.2 Ensure air system is charged to governor cut-out pressure.

173.3 Hold the valve control lever in the 'BRAKES ON' position and adjust the delivery pressure of the valve by rotating the pressure adjusting plug.

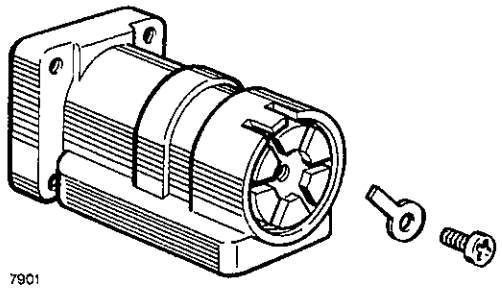


Fig 49 - Locking plate, retaining screw and pressure adjusting plug

173.4 When specified delivery pressure has been achieved remove locking plate retaining screw and install locking plate. If it is necessary to alter position of pressure adjusting plug to facilitate locking plate installation, plug must only be rotated clockwise.

Leakage test

174Charge system to governor cut-out pressure and apply a soap solution to valve body and exhaust port.

175There must be no leakage when valve lever is at either end of its operating cycle.

Removal

176Release air pipes from valve ensuring that pipes are identified in relation to valve ports to aid installation.

177Remove valve and bracket assembly securing bolts and withdraw assembly from steering column. Separate valve from support bracket.

178Release lever housing securing screws and separate lever housing from valve body.

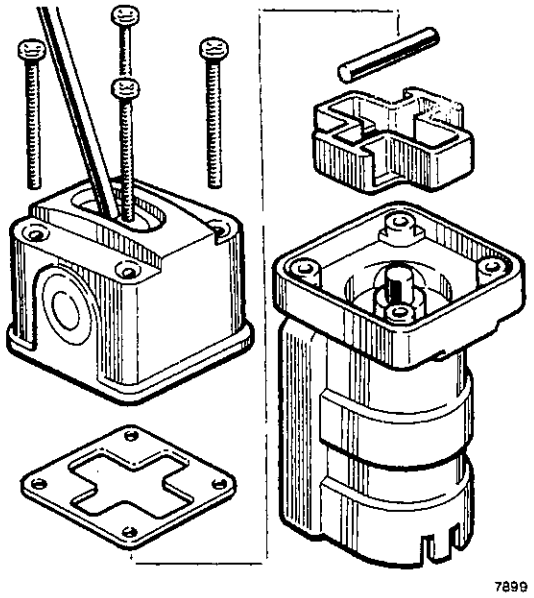
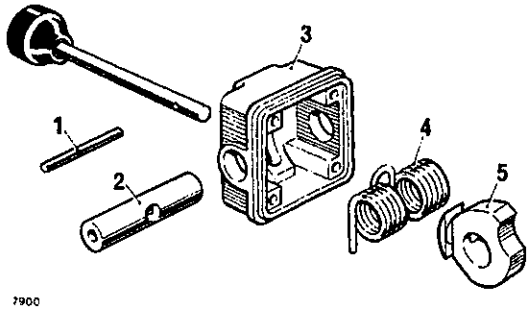


Fig 50 - Lever housing securing screws

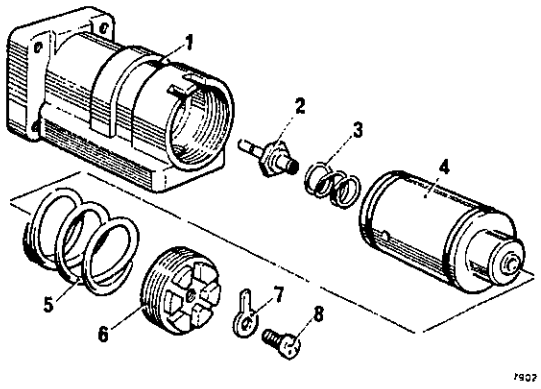
179To disassemble valve lever, cam, and lever return spring from lever housing, use a thin rod to tap shaft (1) from the centre of valve cam pivot shaft (2). Push out pivot shaft from lever housing (3) and withdraw lever return spring (4) and cam (5).



1. Shaft
2. Cam pivot shaft
3. Lever housing
4. Return spring
5. Cam

Fig 51 - Lever housing disassembly

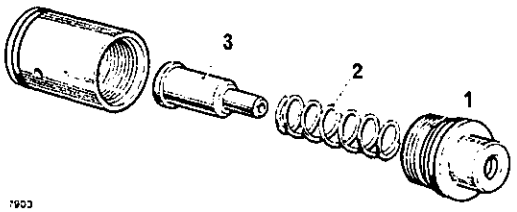
180Remove screw (8) and locking plate (7) from base of valve body (1). Unscrew castellated pressure adjusting plug (6) and withdraw graduating spring (5) valve carrier (4), plunger spring (3) and plunger (2).



1. Valve body
2. Plunger
3. Plunger spring
4. Valve carrier
5. Graduating spring
6. Pressure adjusting plug
7. Locking plate
8. Locking screw

Fig 52 - Valve carrier and plunger removal

181Unscrew lower part of valve carrier body (1) and withdraw piston spring (2) and piston (3). Remove the two O-rings from the bore of the lower part of valve carrier body.



1. Valve carrier body
2. Piston spring
3. Piston

Fig 53 - Valve carrier body

Inspection

182Examine sliding surfaces of valve body and pistons for excessive wear or scoring. Inspect operating cam in lever housing for wear or burrs.

183Renew all O-rings.

Reassembly and installation

184Reassembly and installation of valve is a reversal of removal and disassembly with particular attention being paid to the following:

184.1 During reassembly, liberally smear working surfaces of operating cams, valve carrier, sealing rings and springs with Rocol E1A grease.

184.2 Screw castellated pressure adjusting plug into base of valve body two or three revolutions and install locking plate retaining screw but not locking plates.

184.3 Adjust delivery pressure of valve as described in para 173 of this chapter.

184.4 Carry out leakage test as described in para 174 of this chapter.

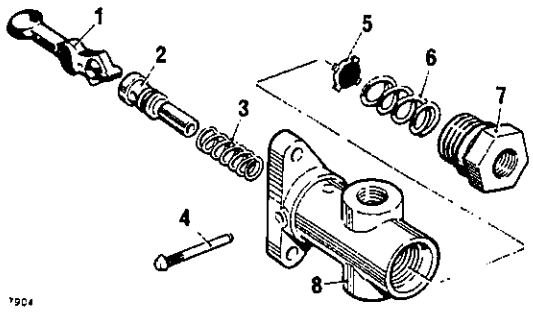
TRAILER PARK CONTROL VALVE

185The trailer park control valve mounted on the dash beneath the instrument panel.

Disassembly

186Disc valve (5) and spring (6) may be withdrawn from rear of valve after removal of plug (7).

187Lever (1), plunger (2) and spring (3) may be withdrawn from valve body (8) after driving out lever pivot pin (4).



1. Lever
2. Plunger
3. Spring
4. Lever pivot pin
5. Disc valve
6. Spring
7. Plug
8. Body

Fig 54 - Trailer park control valve disassembly

Inspection and reassembly

188Inspect plunger and plug sealing rings, and disc valve for signs of deterioration and indentation.

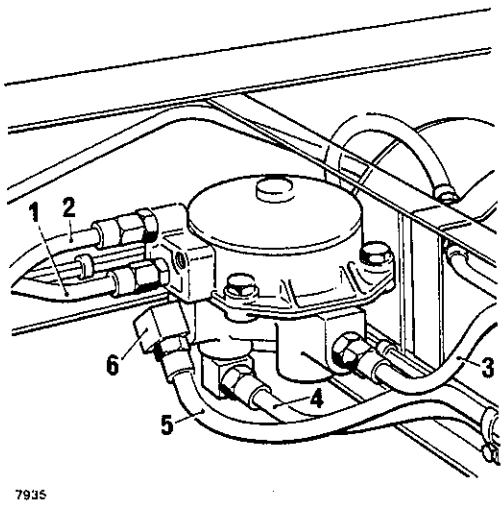
189Smear sliding surfaces of lever, plunger and pivot pin with Rocol E1A grease before reassembly.

190Place disc valve squarely in body before installing larger spring and plug.

191Smaller spring locates over plunger.

DUAL RELAY VALVE

192The dual relay valve is incorporated in the trailer service brake circuit and is mounted on the right-hand side of the spare wheel crossmember.



1. Signal from changeover valve
2. Signal from footbrake valve
3. Supply to service trailer coupling
4. Supply from triple pressure protection valve
5. Supply to pressure limiting valve
6. Restrictor

Fig 55 - Air line connections to dual relay valve

Operating and leakage test

193Apply parking brake. Disconnect one of the signal input lines and plug the port. Install an accurate air pressure gauge on tee piece to allow air flow in the other signal input line. Install a gauge in the service delivery port.

193.1 Fully charge the air system to governor cut-out pressure. Operate footbrake, slowly applying air to the relay valve, pausing at several places between the off and maximum application positions. Check that signal gauge and delivery gauge move simultaneously and that the readings are approximately equal. Release air pressure in stages checking gauge readings as before. With valve in balanced condition, check for leaks with a soap solution. No leakage is permissible.

193.2 Disconnect gauge from first signal port tested, and plug the port. Reconnect gauge with the first pipe disconnected and repeat the test as described in para 193.1.

Disassembly

194Removal of four bolts securing relay valve top cover provides access to pistons, which may be withdrawn by carefully applying air pressure to upper signal port.

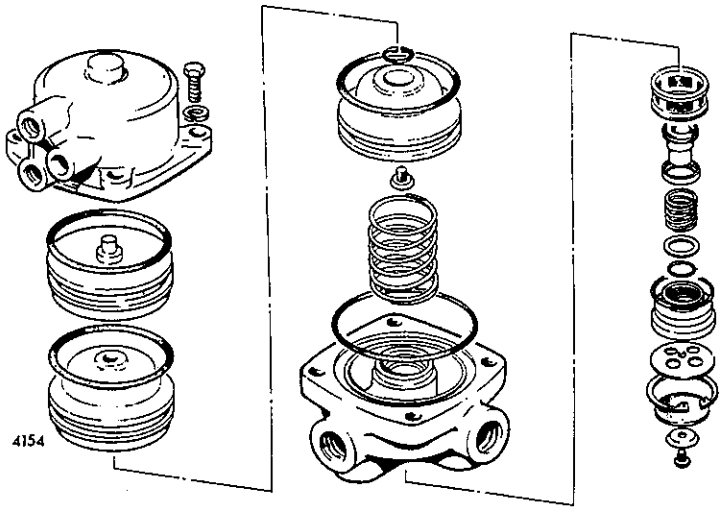


Fig 56 - Dual relay valve disassembly

195Remove circlip and withdraw exhaust diaphragm guide assembly, filter spring, inlet/exhaust valve and valve retainer from valve body.

Inspection and reassembly

196Inspect sliding surfaces of pistons and cover for wear and scores, and seals for deterioration. Renew parts as necessary.

197On reassembly, liberally smear all sliding surfaces and seals with Rocol E1A grease.

198Assemble retainer to inlet/exhaust valve and position in valve body.

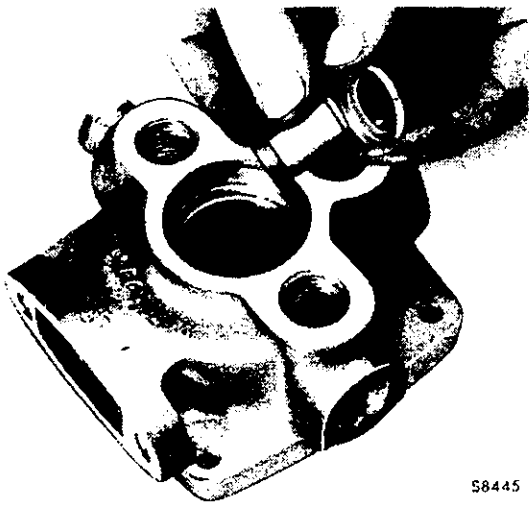


Fig 57 Inlet/exhaust valve retainer assembly

199Assemble O-ring and retainer to inlet/exhaust valve guide before installing guide in valve body.

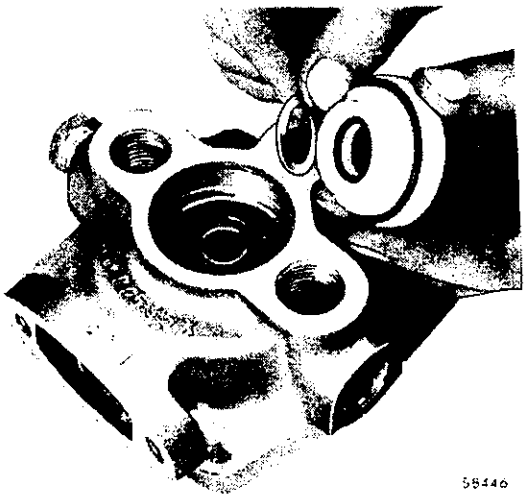


Fig 58 - Inlet/exhaust valve guide assembly

Installation

200Before assembling pistons to top cover of the valve, install O-ring (arrowed) to centre piston stem.

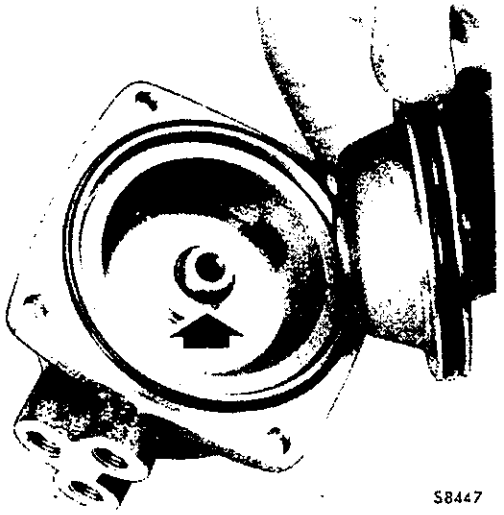


Fig 59 - Installation of O-ring to centre of piston stem

201After installing valve, carry out operating and leakage tests as described in para 193 of this chapter.

PRESSURE LOSS LIMITING VALVE

202The pressure loss limiting valve is located midway along the chassis left-hand sidemember.

Operating and leakage test

203To check the operation of the pressure loss limiting valve, connect an air pressure gauge to the supply line and disconnect the delivery line. Charge air system and note the pressure at which air begins to escape from the delivery port.

204If the operating pressure is not 4.5-4.8 bar (65-70 lbf/in^2) adjust valve spring tension by means of the screw in cover.

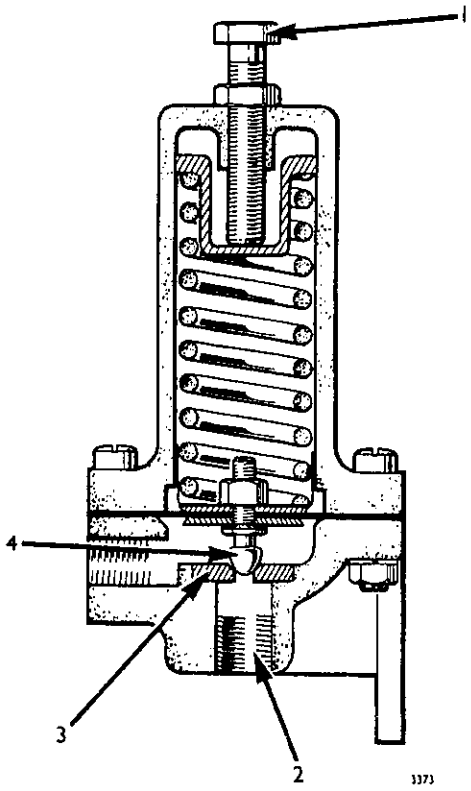
205Valve may be checked for leakage by fully charging air system and smearing body and cover with soap solution. Leakage from cover indicates a faulty diaphragm.

Disassembly

206When disassembling valve, back off adjusting screw (1) before progressively slackening cover bolts.

207Valve seat (3) may be removed by inserting a drift through delivery port (2).

208Diaphragm and valve assembly (4) together with valve seat are contained in repair kit.



1. Adjusting screw
2. Delivery port
3. Valve seat
4. Valve

Fig 60 - Pressure loss limiting valve assembly

Reassembly

209After pressing valve seat into body, lightly tap a 8 mm (0.312 in.) diameter steel ball on to seat to form an air tight seating for valve.

210Install the pressure limiting valve on the vehicle and carry out the operating and leakage tests as described in para 203 of this chapter.

TYRE INFLATOR

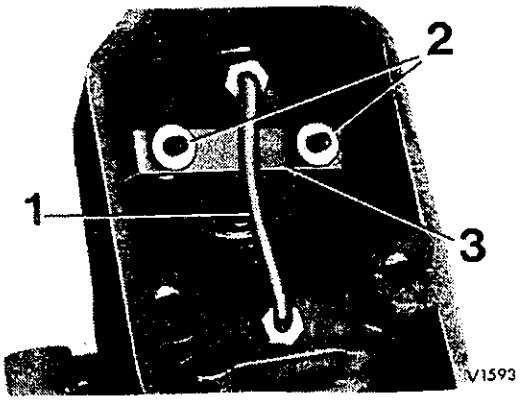
211The tyre inflator is located midway along the left-hand chassis sidemember.

Removal

212Disconnect air supply pipe and remove the two bolts securing inflator to mounting bracket.

Disassembly

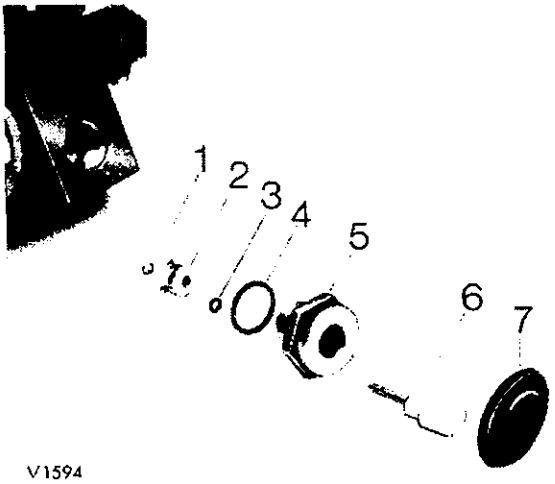
213Remove air pressure gauge after disconnecting pipe (1) and removing clamp nuts (2) and bracket (3).



1. Pipe 2. Clamp nuts
3. Bracket

Fig 61 - Removing air pressure gauge

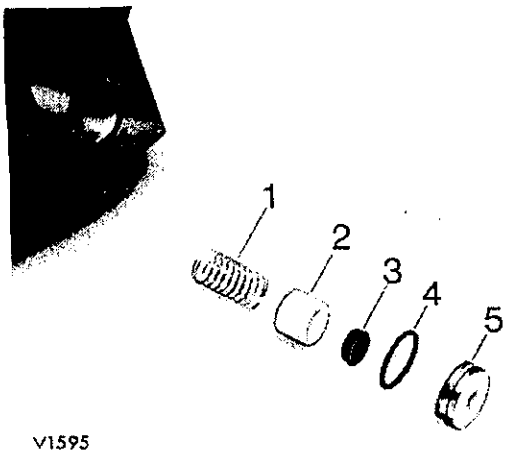
214Remove gaiter (7) from the 'DEFLATE' button and unscrew the push rod/operating button and guide assembly. Remove push rod guide O-ring (4) and circlip (1) and bridge type O-ring retainer noting the way it is fitted. Press the push rod/ operating button (6) from the guide (5) and remove the push rod O-ring (3).



1. Circlip
2. O-ring retainer
3. Push rod O-ring
4. Push rod guide O-ring
5. Push rod guide
6. Push rod/operating button
7. Gaiter

Fig 62 - Disassembly of push rod/ operating button and guide

215Carefully apply air pressure to valve inlet port to remove valve seat (5) and O-ring (4), valve (3), guide (2) and return spring (1).



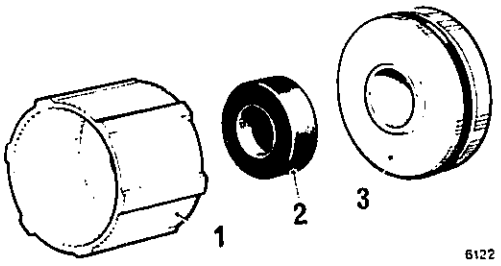
1. Spring
2. Guide
3. Valve
4. O-ring
5. Valve seat

Fig 63 - Removal of valve seat

Repeat the procedure for the 'INFLATE' button

Reassembly

216Reassembly is a reversal of disassembly. Lubricate all bores, moving parts and sealing rings with Rocol E1A grease. Valves must be installed so that recessed side of valve (2) is towards the guide (1). Install the valve seat (3) into the bore so that raised seat portion is towards valve.



1. Valve guide
2. Valve
3. Valve seat

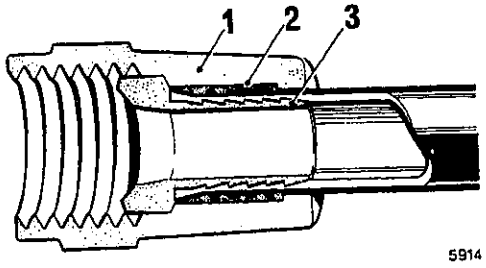
Fig 64 - Valve and valve seat installation

Installation

217Install inflator to vehicle and check for leaks.

BRAKE PIPES

218The majority of the brake pipes on the vehicle are of the nylon type and have specially designed end fittings comprising a nut (1), shell (2) and body (3) which cannot be transferred from old to new pipes.



1. Nut 2. Shell 3. Body

Fig 65 - Brake pipe and fittings

219Only imperial diameter pipe is installed, this being used with either imperial or metric threaded nuts. An imperial threaded nut (A) can be identified from a metric threaded nut (B) by its tapered body.

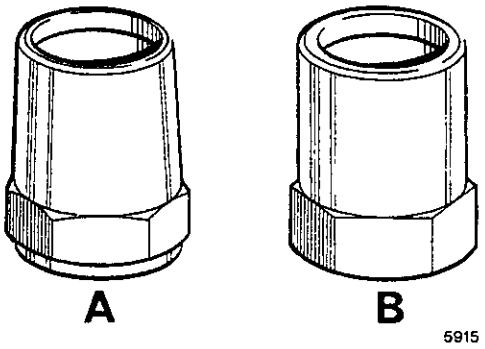


Fig 66 - Brake pipe nut identification

End fittings installation

220Select mandrel suitable for pipe being renewed and install it to hand tool E690T followed by appropriate threaded adaptor to suit pipe size and thread of nut to be installed.

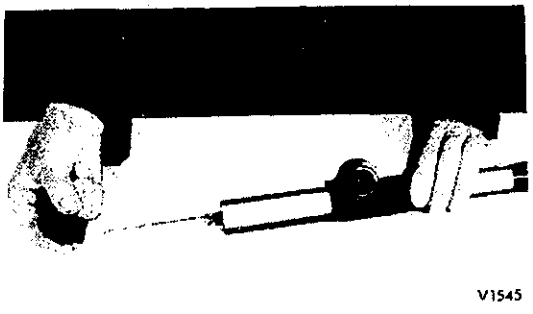
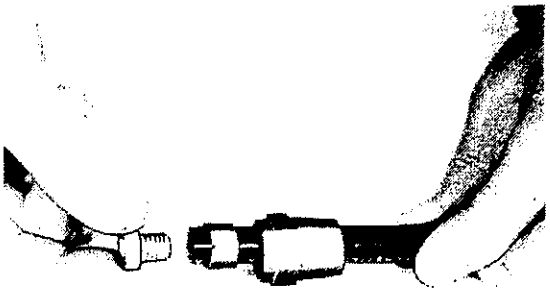


Fig 67 - Assembling brake pipe end fitting tool

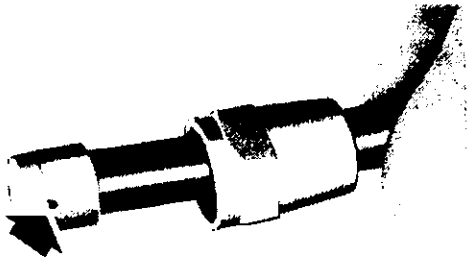
220.1 Ensure that end of pipe is cut clean and square. Slide the shell and nut over the pipe and press the body firmly into the bore of the pipe until the pipe rests firmly on the shoulder of the body.



V1546

Fig 68 - Assembling end fittings to pipe

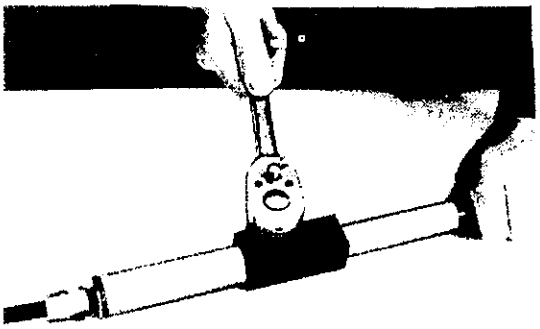
220.2 Slide the shell down the pipe to meet the body shoulder and check, through notch in shell, that the pipe is still firmly against the shoulder.



V1547

Fig 69 - Checking for correct assembly

220.3 Screw the nut on to the adaptor on hand tool E690T and using a socket wrench force the mandrel through the bore of the fitting until the wrench will not rotate any more. Withdraw mandrel, release pipe from tool and repeat procedure for other end of pipe.



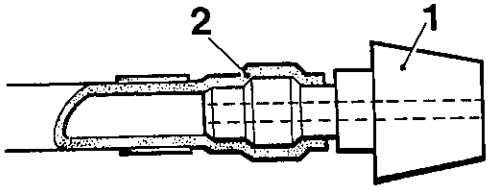
V1548

Fig 70 - Completing pipe and fitting installation

NYLON GAUGE PIPES

221The nylon pipes between the footbrake valve and instrument panel have nipple end fittings which cannot be transferred from old to new pipes.

222New nipple end fittings must be installed using tool No KM2050.



1. Nipple end fitting
2. Gauge pipe

Fig 71 - Gauge pipe nipple end fitting

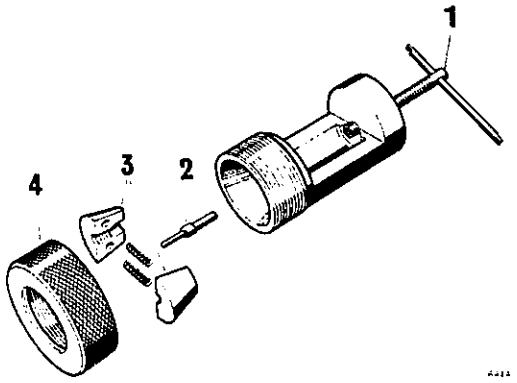
Nipple end fittings installation

223Install nut to pipe prior to installation of end fittings.

223.1 Fully retract ram (1) and insert nipple retaining pin (2) into end of ram.

223.2 Place nipple on to retaining pin with serrated end of nipple away from ram.

223.3 Install correct cotters (3) and springs for size of pipe and install retaining collar (4).



1. Ram
2. Nipple retaining pin
3. Cotters
4. Retaining collar

Fig 72 - Nipple installer tool No KM2050

223.4 Ensure end of pipe is cut clean and square. Insert pipe through cotters so that end of pipe is level with inner face of cotters, tighten retaining collar until cotters securely clamp pipe.

223.5 Screw in ram until nipple is fully engaged in pipe. Loosen retaining collar and withdraw pipe.

Parking brake adjustment

WARNINGS ...

(1) PRIOR TO JACKING UP REAR ROAD WHEELS, CHOCK FRONT ROAD WHEELS

(2) AVOID INHALING BRAKE DUST AS IT CONTAINS ASBESTOS WHICH MAY SERIOUSLY INJURE HEALTH.

(3) PRIOR TO RELEASING PARKING BRAKE, CHOCK ROAD WHEELS.

224Jack up rear road wheels and to centralize brake shoes, fully apply parking brake and then release the lever to the 'off' position.

225Turn shoe adjuster clockwise until shoes are hard in contact with drum, then back off until shoes are just clear of drum.

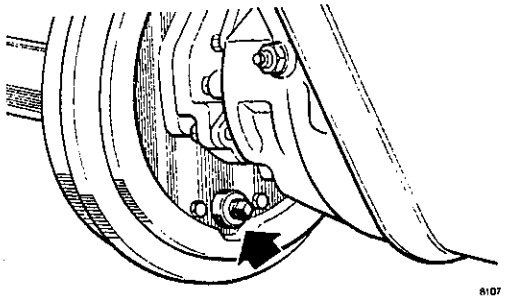


Fig 73 - Parking brake adjuster

226If, after adjusting shoes, there is still excessive travel on the parking brake lever, adjust the parking brake cables as described in para 262 of this chapter.

PARKING BRAKE DRUM

227The parking brake drum locates over the rear axle pinion shaft flange bolts and is secured to the flange by two countersunk head screws.

Removal

228Disconnect and support the rear end of the propeller shaft. Remove brake drum securing screws, release parking brake lever and withdraw drum. If necessary, back off shoe adjuster.

Installation

229Locate brake drum over pinion shaft flange bolts. Use a new gasket between the drum and pinion shaft flange.

230Install drum retaining screws, refit propeller shaft and tighten propeller shaft nut to 108 Nm (80 lbf ft).

231Adjust brake as described in para 224.

PARKING BRAKE SHOES

Removal

232Remove brake drum as described in para 228.

233Prise the shoes off the expander tappets and detach the return spring.

234Prise the shoes off the adjuster tappets, remove the second return spring and lift away the shoes. Note the difference in the shape of the ends of the shoes.

Inspection

235Inspect facings for wear and contamination by oil or grease.

Installation

236Lightly smear the ends of shoes and steady posts on the back plate with XG 279 grease, assemble shoes and return springs as shown in Fig 74.

237Install brake drum as described in para 226 of this chapter.

238Adjust the brake shoe steady posts as follows:

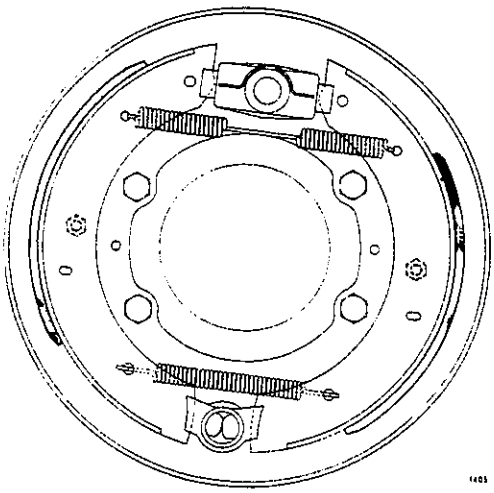


Fig 74 - Parking brake assembly

238.1 Slacken the locknuts and back off both steady posts two turns anti-clockwise.

238.2 Apply the brake hard several times to centralize the expander and then lock up the shoes in the drum by turning the adjuster clockwise.

238.3 Screw in the steady posts until they are in light contact with the shoe webs, then tighten the locknuts.

238.4 Back off the adjuster to free the brake.

PARKING BRAKE SHOE EXPANDER

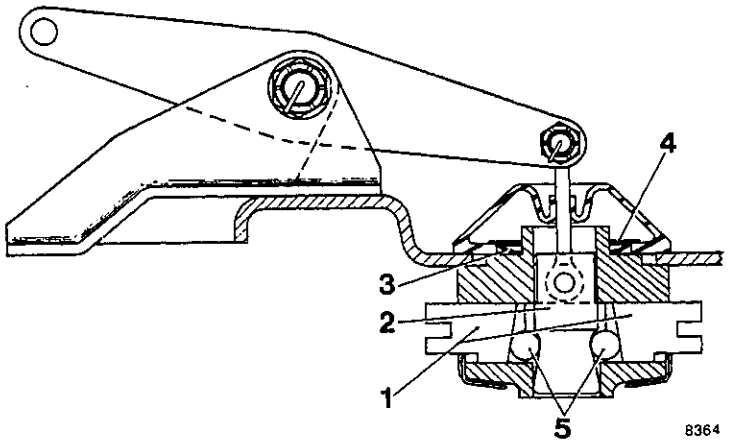
239Remove brake drum and brake shoes as described in paras 228 and 232 of this chapter.

240Disconnect the expander draw link from the lever.

241Detach the rubber dust cover from the back plate and withdraw the draw link and plunger (2).

242Remove the spring clip and withdraw the tappets (1) and rollers (5).

243Withdraw the retaining spring (3) and locking plate (4) from the groove in the expander housing and remove housing.



1. Tappets
2. Plunger
3. Retaining spring
4. Locking plate
5. Rollers

Fig 75 - Parking brake expander

Installation

244Lubricate the tappets, rollers, plunger and link pin with XG 279 grease.

245Installation of the parking brake shoe expander is a reversal of removal. Ensure tappets are assembled with the tapered end positioned as shown in Fig 75.

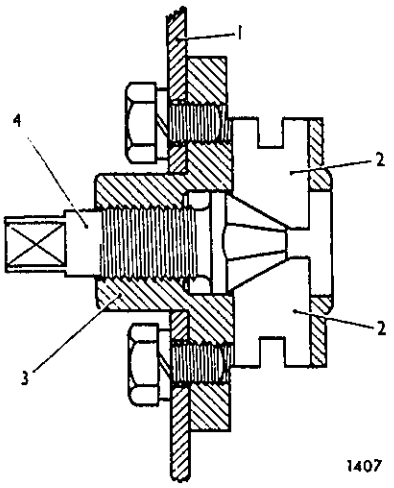
246Install parking brake drum and shoes as described in para 229 and 236 of this chapter.

PARKING BRAKE SHOE ADJUSTER

Removal

247Remove brake drum and shoes as described in paras 228 and 232 of this chapter.

248Remove adjuster securing bolts and withdraw adjuster.



1. Brake flange plate
2. Tappet
3. Housing
4. Adjuster

Fig 76 - Parking brake shoe adjuster

Disassembly and reassembly

249Withdraw the tappets and unscrew the adjuster clockwise as viewed from the square end.

250When reassembling, lubricate the adjuster and tappets with XG 279 grease, ensure that the tapered ends of the tappets are related as shown in Fig 77.

251Tighten the bolts to 30 Nm (22 lbf ft).

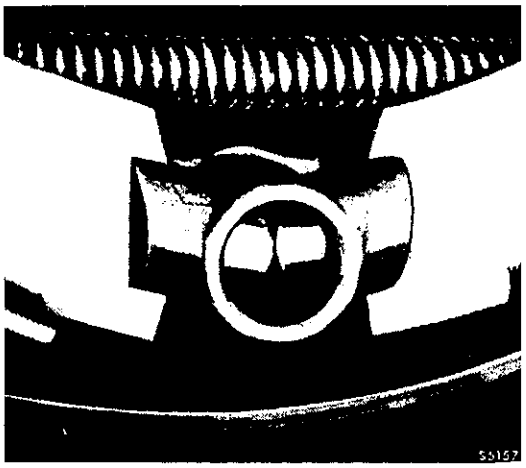


Fig 77 - Brake adjuster tappets installation

Installation

252Install brake drum and shoes as described in paras 229 and 236 of this chapter.

PARKING BRAKE CABLES

253Disconnect the rear cable from the lever on the brake back plate.

254Slacken the locknut and unscrew the adjusting sleeve connecting the front and rear cables.

255Release the spring clip and withdraw the rear cable outer casing from the brackets on the brake back plate and chassis frame.

256Slacken the locknut and unscrew the front cable adjusting sleeve from the clevis.

257Detach the front cable clip from the engine support crossmember.

258Release the spring clips and withdraw the front cable outer casing from the brackets on the cab and chassis frame.

Installation

259Adjust brake shoes as described in para 221.

260Installation of cables is a reversal of removal. Ensure that the threaded sleeves are engaged by an approximately equal amount.

261Adjust the cables as follows:

261.1 Pull on the brake lever three notches and adjust the cables until the brake shoes are just contacting the drum. Both threaded sleeves should be used for this adjustment to avoid the possibility of insufficient thread engagement in one of the sleeves.

261.2 Release the brake lever and check the drum for free rotation.

PARKING BRAKE LEVER

Removal

262From inside the engine compartment, remove the clamp bolt and withdraw the lever from the brake cross-shaft.

263Remove the three bolts securing the lever support bracket to the mounting bracket and withdraw the lever and shaft. Do not lose the two spacers from the front of the sector.

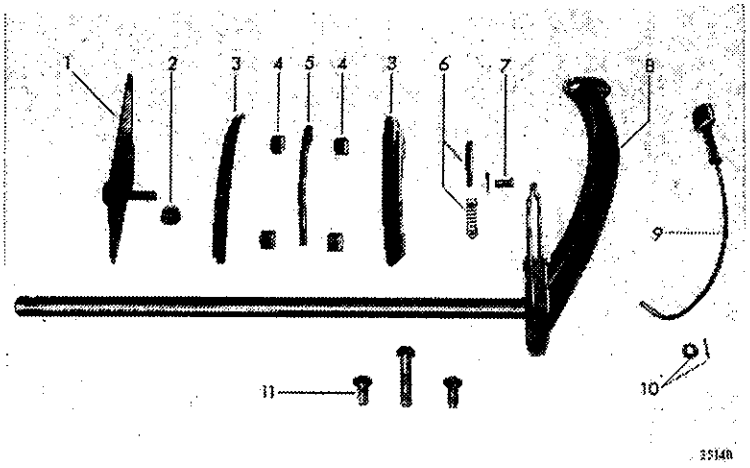
Disassembly and inspection

264Remove the nut and plain washer securing the lever guard and sector to the support bracket, and lift away the guard sector and spacers.

265Detach the rod from the pawl, remove the securing pin and lift away the pawl and spring.

266Withdraw the rod, spring and spring seat from the lever.

267Check the condition of the cross shaft seal and grommet located under the cab wheel arch.



1. Support bracket
2. Nut and washer
3. Guard
4. Spacer
5. Sector
6. Pawl and spring
7. Pawl retaining pin
8. Lever and shaft
9. Pawl rod and button
10. Pawl rod washer and pin
11. Support bracket bolts

Fig 78 - Parking brake lever assembly

Reassembly.

268Reassembly is a reversal of disassembly. Ensure that the spacers are located either side of the sector as shown in Fig 78 and soak a new felt seal in engine oil before installing.

Installation

269Installation is a reversal of removal. Adjust parking brake cables as described in para 261 of this chapter.

Chapter 11

FUEL SYSTEM AND EXHAUST SYSTEM

CONTENTS

ACCELERATOR PEDAL LINKAGE

Adjustment

1 The accelerator pedal linkage should be adjusted so that the injection pump control lever is in maximum speed position when accelerator pedal is 20 mm (0.8 in.) above toe panel (dimension 'A').

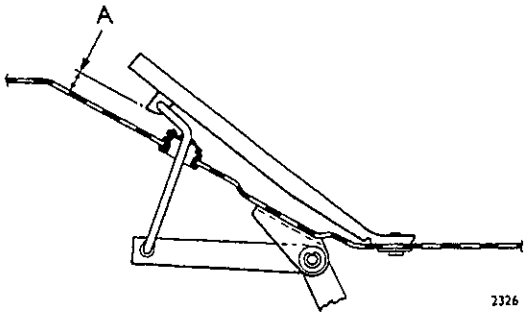


Fig 1 - Accelerator pedal linkage adjustment

2 Adjustment is carried out by varying the length of the throttle control rod through the rod swivel of the relay lever located on the chassis sidemember.

3 Prior to carrying out adjustment, ensure that idling control wire is screwed in and that nipple on the control wire will allow the pump lever to return to the idling position.

4 Adjust nipple on the idling control wire to allow approximately 1.5 mm (0.06 in.) free play.

Chapter 12

COOLING

CONTENTS

RADIATOR HEADER TANK

Removal and Installation

1 Slacken the clip securing the filler pipe hose to the tank. Detach the vent pipe.

2 Remove the bolts securing the tank, and release the tank from the filler pipe hose.

3 After installing the tank, top up the cooling system.

RADIATOR

CAUTION ...

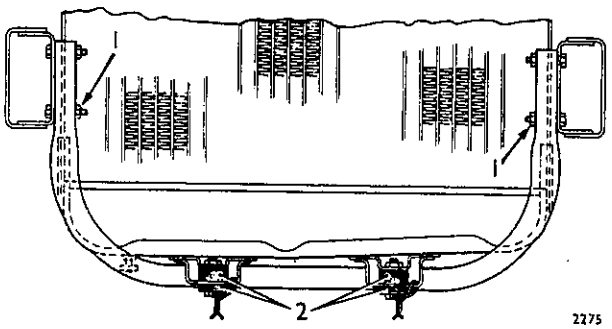
> If during vehicle repair the radiator is left empty and allowed to dry out, any sediment or deposits will harden and cause obstruction in the element water passages. Where a radiator is temporarily out of service, seal the inlet and outlet pipes with suitable plugs and fill with water.

Removal

4 Drain the cooling system and disconnect hoses and vent pipe from radiator.

5 Remove cowl securing screws and position cowl rearwards over fan.

6 Remove the two lower bolts (1) and lower support insulators (2). The tubular support frame can be swung forward to allow radiator to be withdrawn downwards.



2. Lower support insulators

Fig 1 Radiator mountings

Installations

7 When installing radiator, ensure that the thicker insulators are inserted above support, and secure bolts with locking wire.

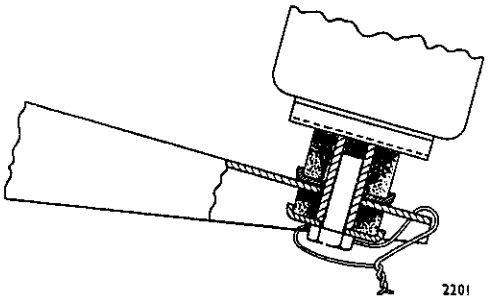


Fig 2 Installing locking wire

8 When installing radiator cowl, ensure that it clears fan at all points.

FAN AND VISCOUS DRIVE

Removal

9 To gain access to fan and viscous drive remove radiator and cowl as described in para 4.

WATER PUMP

Removal

10 To gain access for removal of water pump, radiator and fan must be removed as described in paras 1 to 6 and slacken clip on by-pass hose.

Chapter 13

ELECTRICAL

CONTENTS

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Ser	Tool No (where applicable)	NSN/Part No (where applicable)	Designation
(1)	(2)	(3)	(4)
1	VR 2180A		Wiper housing wrench

GENERAL

CAUTION ...

Before disconnecting any wire in the electrical system ensure a battery terminal is disconnected.

CAV AC5R/24 ALTERNATOR

CAUTION ...

(1) Negative polarity must be observed. Reversed battery connections, however brief, may result in the destruction of the rectifying diodes and possible damage to the charging system wiring harness.

(2) Before disconnecting any wire in the charging system, ensure that a battery terminal is disconnected.

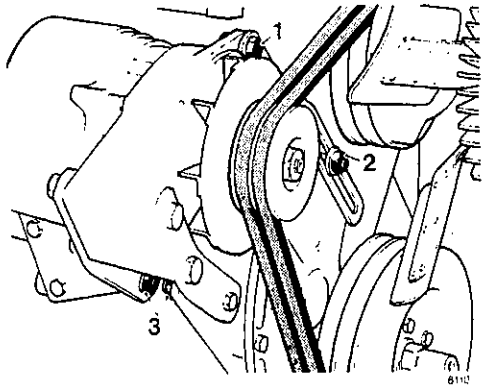
(3) The alternator must never be run with the output wire disconnected.

(4) Do not boost-charge a battery when it is connected to the vehicle's electrical system. If the engine is started during boost-charging, the semi-conductor devices in the regulator may be damaged.

(5) If using electric welding to repair a vehicle, it is essential that the battery cut-out switch is turned to the 'OFF' position and the alternator output wires are first disconnected.

Removal

1 Remove drive belts after slackening nuts on the two mounting bolts (3), bolt (1) and nut (2) securing alternator adjuster brace and withdraw drive belt. Remove alternator after disconnecting wiring and removing brace bolts (1) and mounting bolts (3).



1. Alternator to brace bolt
2. Adjuster brace securing nut
3. Alternator mounting bolts and nut

Fig 1 - Removing alternator

Installation

2 When installing alternator, adjust drive belts as described in AESP 2320-H-100-201, Chap 5 - 1 User Maintenance.

CAV AC5R/24 ALTERNATOR BRUSH GEAR

Removal

3 Access to brush gear is achieved after alternator and removing moulded end cover disconnecting wiring from rear of secured by three screws.

4 Remove brush gear after disconnecting three wires and removing two screws securing brush gear to alternator.

5 Servicing of brushes is confined to checking that brush protrusion is no less than 7 mm (0.28 in.) and brushes move freely in holder. If brush movement is sluggish, lightly polish sides of brush with a smooth file.

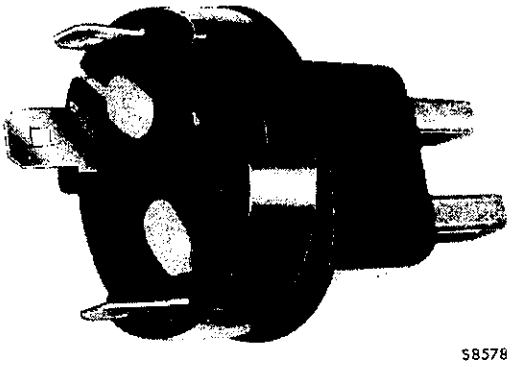
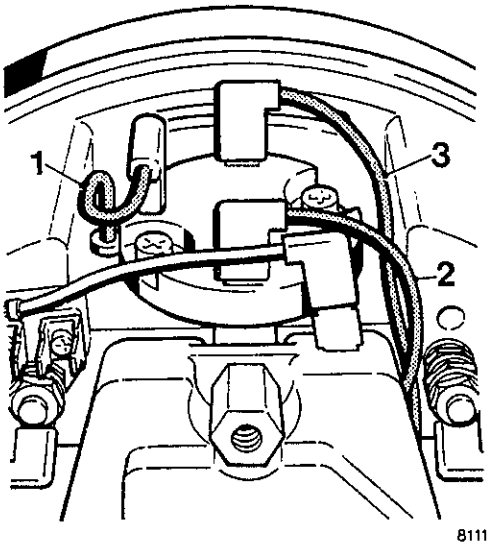
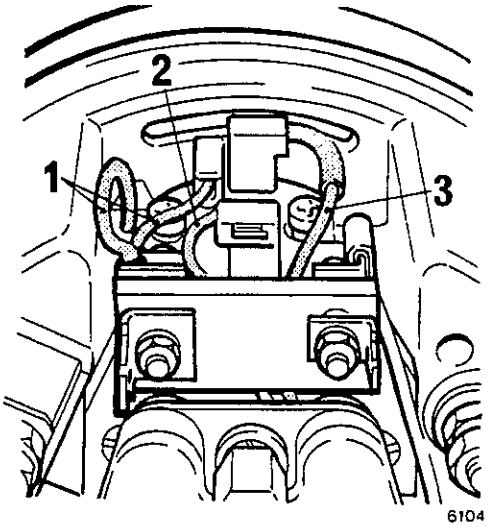


Fig 2 - Brush gear removed from alternator

Installation

6 After installing brush gear, reconnect wiring as follows: 1 - yellow, 2 - green, 3 - yellow with red sleeve.





Chassis ground return Insulated ground return

1 Yellow 2 Green 3 Yellow with red sleeve

Fig 3 - Wiring connections to brush gear

CAV CA45F STARTER

Solenoid supply check

7 The supply to solenoid may be checked through the loop wire connector which is located in the starter switch wiring loom approximately 126 mm (4.0 in.) from the main terminal box on the starter. Disconnect the single red/white wire from connector, connect voltmeter positive to wire and negative to ground terminal on front of starter.

8 Operate key-start switch. If battery voltage is obtained this indicates a fault in solenoid and/or starter.

9 Should reading not be obtained on voltmeter, check wiring and key-start switch.

Removal

10 Withdraw main cable from terminal box after slackening the clamp.

11 Disconnect switch wiring loom from terminal box by unscrewing knurled ring of waterproof connection and withdraw plug.

12 Remove three securing bolts and withdraw starter motor.

Installation

13 After installing starter, ensure knurled ring and cable clamp are fully tightened.

HEAD LAMPS

Removal

14 Disconnect the wires from main harness behind the radiator grille, accessible from underneath and release harness from clips.

15 Remove light unit by pressing it firmly inwards and turning anti-clockwise. Release bulb cap by turning anti-clockwise and withdraw light unit.

16 Head lamp body and seals can be removed after releasing four fixing screws.

Installation

17 Clip lamp harness to rear of bumper and secure with screws. Ensure harness connections are secure and waterproof coverings are positioned.

Head lamp aligning

18 Before commencing adjustment, the trim screws (arrowed) must be screwed right in.

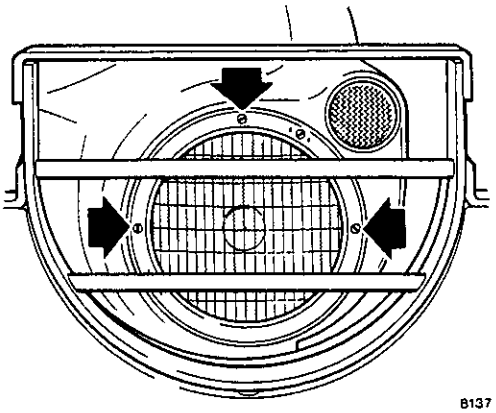


Fig 4 - Head lamp trim screws

19 Ensure that vehicle is unladen and standing on a level surface with tyres inflated to correct pressure. If beam equipment is not available, check the beam alignment by placing the vehicle on a level surface 7.6 metres (25 feet) away from a blank wall, with the front of vehicle parallel to wall. When correctly set, the centre of light spots from main filaments will be 102 mm (4 in.) below the centre of headlights and parallel with vehicle centre lines.

SIDE LAMPS

Removal

20 Unscrew threaded lens, disconnect lamp wiring from main harness behind the radiator grille, accessible from underneath. Release wires from retaining clips.

21 Release lamp body from its retainer by depressing the three locating pips on the body.

22 Lamp retainer can now be removed from panel.

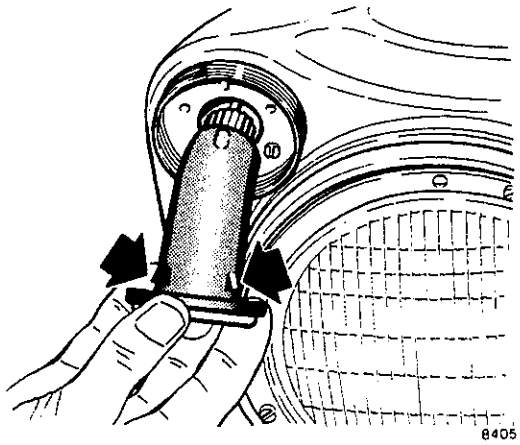


Fig 5 - Side lamp locating pips

Installation

23 Attach lamp retainer to front panel with fixing screws.

24 Feed lamp body into position ensuring pips are located behind mounting panel and reconnect wiring.

FRONT TURN SIGNAL LAMP/HAZARD WARNING

Removal

25 Remove the cab front quarter trim panel from inside cab and disconnect lamp wiring from main harness.

26 Remove nut and spacer and remove lamp.

Installation

27 Ensure tapered spacer is correctly located and secure lamp with nut.

28 Locate lamp wire behind panel spacer before connecting to main harness.

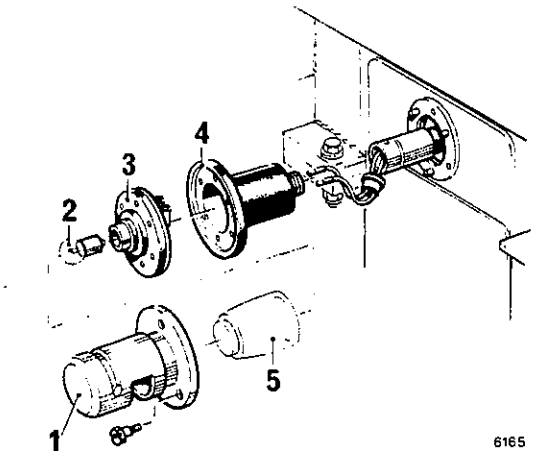
REAR TURN SIGNAL LAMP/HAZARD WARNING/STOP AND TAIL LAMP

29 Removal is same as front side lamp, for details see para 20.

REAR NUMBER PLATE/CONVOY LAMP

Removal

30 Remove lamp cover (1) and glass (5) after removing three securing screws. Lamp housing (4) can be released after unscrewing knurled nut. Ease bulb holder (3) through lamp housing enough to enable removal of wiring.



1. Lamp cover
2. Bulb
3. Detachable holder
4. Housing
5. Glass

Fig 6 - Rear number plate/convoy lamp

TURN SIGNAL AND HAZARD WARNING UNIT

31 The unit is secured to a bracket mounted beneath the dash panel, to the right of the steering column.

32 The unit is sealed and servicing is by replacement only.

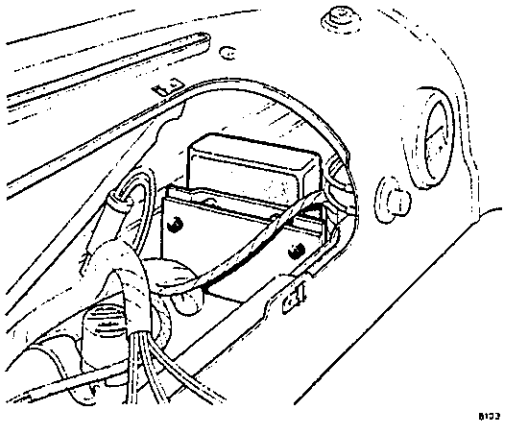


Fig 7 - Turn signal and hazard warning unit

TURN SIGNAL RELAY ISOLATING UNIT

Removal

33 The unit is positioned beneath the dash panel, to the right of steering column and screwed to the fuse box mounting panel

34 To gain access to unit, remove two bolts supporting the fuse box panel and draw clear of dash.

35 The unit is sealed and servicing is by replacement only.

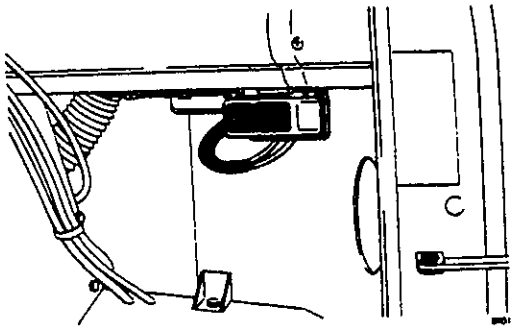


Fig 8 - Turn signal relay isolating unit

Installation

36 The relay terminals are clearly marked and the wiring should be reconnected as follows:

Terminal No	Colour
C1	Yellow/Purple
C2	Yellow/Purple
W1	Green
W2	Black

AIR PRESSURE WARNING BUZZER

37 The warning buzzer is a circular red plastic sealed unit which is screwed on the dash panel reinforcement rail directly behind instrument assembly. Removal of instrument assembly is detailed in para 66.

38 In addition to giving a warning of low air pressure in the braking system, the buzzer also gives an audible warning when the brake fluid level in the reservoir is low.

39 The buzzer is a sealed unit and servicing is by replacement only.

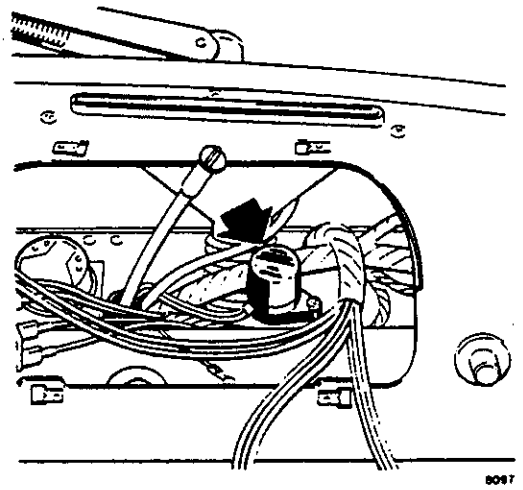


Fig 9 - Air pressure warning buzzer

Installation

40 Connect green wire to positive terminal and green/yellow wire to negative terminal.

TRAILER PARK WARNING BUZZER

41 The warning buzzer is a circular white plastic unit which is secured to dash panel strengthening brace directly behind instrument assembly. Removal of instrument assembly is detailed in para 66.

42 The buzzer is a sealed unit and servicing is by replacement only.

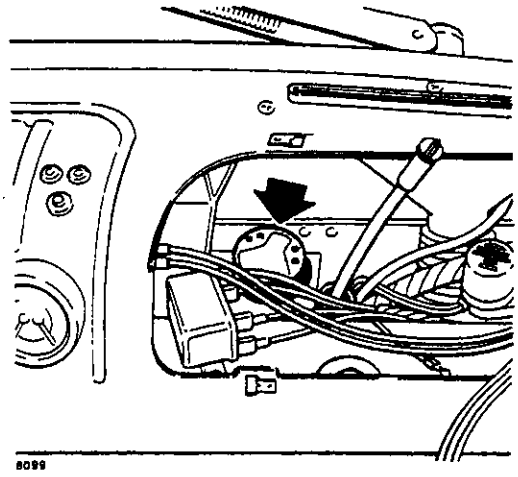


Fig 10 - Trailer park warning buzzer

HORN

43 Single horns are mounted on the left and right-hand step support brackets directly behind the headlamps.

44 Horn tone adjustment can be made by rotating bolt (arrowed) anti-clockwise until there is no note from the horn, then rotate screw clockwise until horn is audible. Finally, rotate screw an additional quarter turn clockwise.

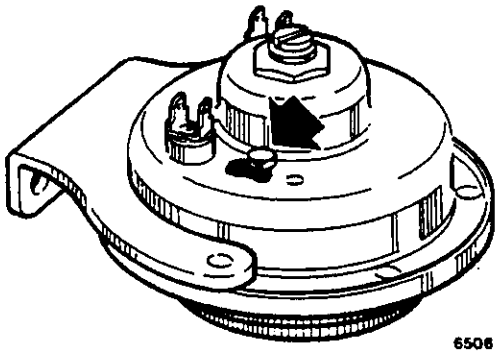


Fig 11 - Horn adjuster

INTERIOR LAMP

45 The lamp is secured to the windshield top rail by two screws and distance pieces.

46 The lamp lens is secured to the lamp base by four projections on the edge of the lens which engage slots in the base.

Removal

47 Remove lens by squeezing together the longer sides of the lens.

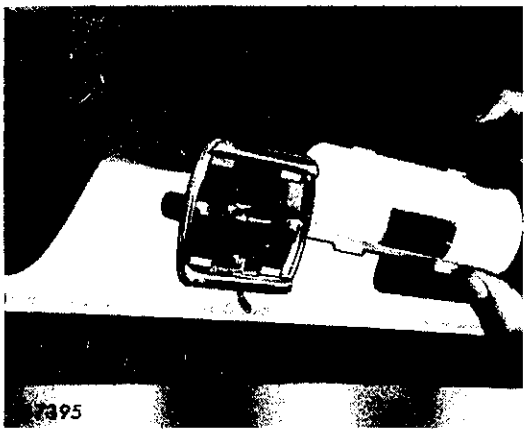


Fig 12 - Interior lamp lens removal

48 Remove securing screws, disconnect wiring and withdraw lamp taking care not to lose distance pieces.

INTERIOR LAMP SWITCH

49 The switch is incorporated in the lamp assembly except on vehicles equipped with insulated ground return wiring.

50 On these vehicles the switch is situated in the dash panel [redacted]

LIGHTING SWITCH Removal

51 Remove main instrument from dash panel as detailed in para 66.

52 Remove switch knob by depressing spring-loaded retainer through hole in side of knob.

53 Remove escutcheon retaining bolts, disconnect wiring and withdraw switch through instrument aperture.

Installation

54 Connect wiring to switch terminals as follows:

Terminal No	Colour
1	Brown/White
2	Red/Green
3	Brown/Blue
4	Red/Blue
5	Red
6	Yellow/Purple

[redacted]

FOG REAR GUARD LAMP SWITCH

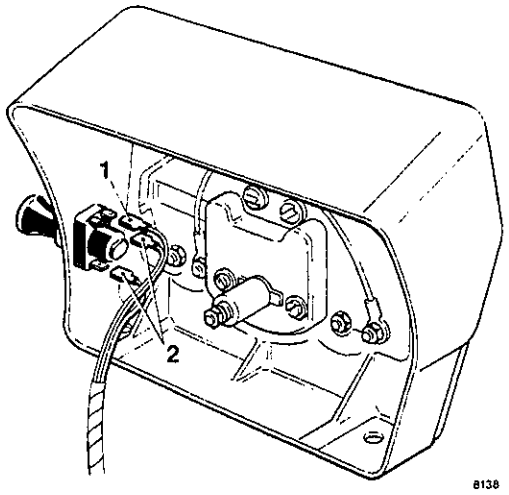
Removal

56 Remove instrument assembly from dash panel as detailed in para 66.

57 Unscrew knob and shaft from switch and withdraw switch after removing switch locking ring.

Installation

58 Reconnect wiring to switch as illustrated.



1. Black wire
2. Red/pink wire

Fig 13 - Fog rear guard lamp switch connection

FOG REAR GUARD RELAY

59 The relay is screwed to the dash panel bottom rail behind the instrument panel. For details of instrument assembly removal see para 66.

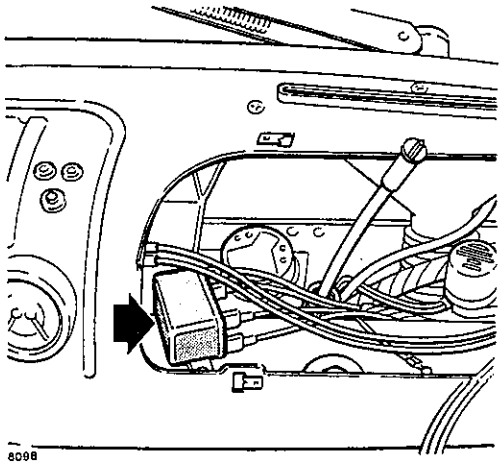


Fig 14 - Fog rear guard relay

Installation

60 Connect wiring to relay terminals as follows:

Terminal No	Colour
C1	Red/Purple
C2	Red/Pink
W1	Blue/Red
W2	Black

61 Black ground wire is positioned beneath relay retaining screw.

HAZARD WARNING SWITCH

Removal

62 Withdraw instrument assembly from dash panel as described in para 66 and disconnect main harness wiring connector from switch.

63 Depress the two integral catches (screwed) that secure the switch in the instrument panel and withdraw switch.

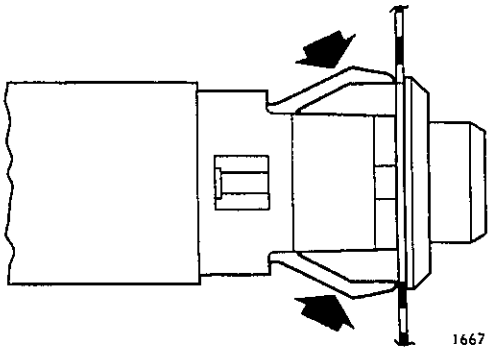


Fig 15 - Switch integral catches

Installation

64 The switch is located radially by a key engaging a cutaway in the instrument panel.

65 When connecting main wiring harness connector to the switch, align the key with the keyway (arrowed) in the switch.

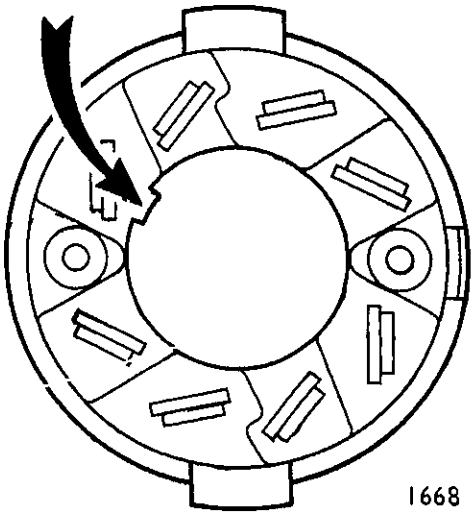


Fig 16 - Harness connector key-way

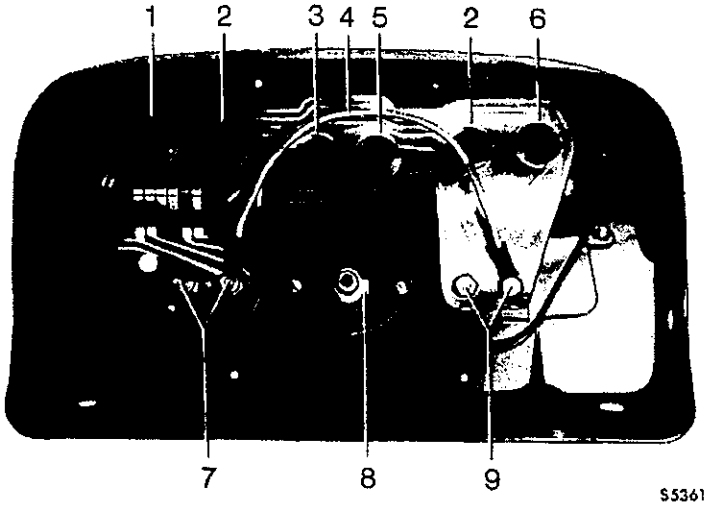
INSTRUMENT ASSEMBLY

Removal

66 Remove the four retaining screws and withdraw instrument assembly from dash panel and disconnect speedometer cable.

67 The multi-socket connector can be withdrawn after squeezing together the integral catches at each end of the connector.

68 Disconnect wires from instrument lamp switch, windshield wiper switch and brake air pressure warning lamp at their connectors with the main harness.



1. Oil warning lamp
2. Instrument lamps
3. Main beam indicator lamp
4. Connecting strip
5. Turn signal indicator lamp
6. Alternator warning lamp
7. Fuel gauge
8. Speedometer
9. Water temperature gauge

Fig 17 - Rear view of instrument assembly

FUEL AND WATER TEMPERATURE GAUGES

Fuel and water temperature gauge tests - chassis ground return only

69 The fuel and water temperature gauges can be checked without removing them from the assembly by withdrawing the assembly from the instrument panel, removing the wiring harness multi-socket connector and substituting a test socket with test wires connected to terminals (4), (8), (11) and (12) as shown in Figs 18 and 19.

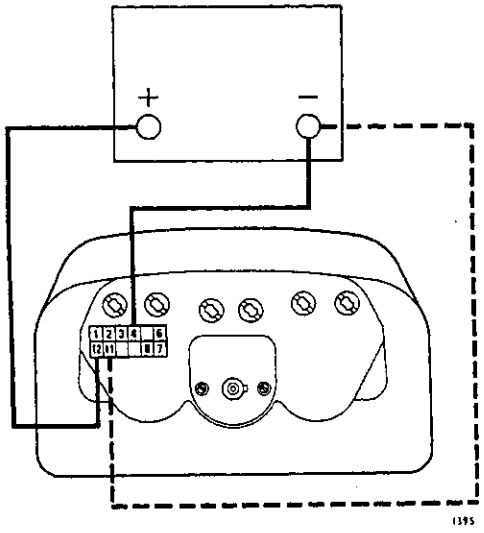


Fig 18 - Fuel gauge test

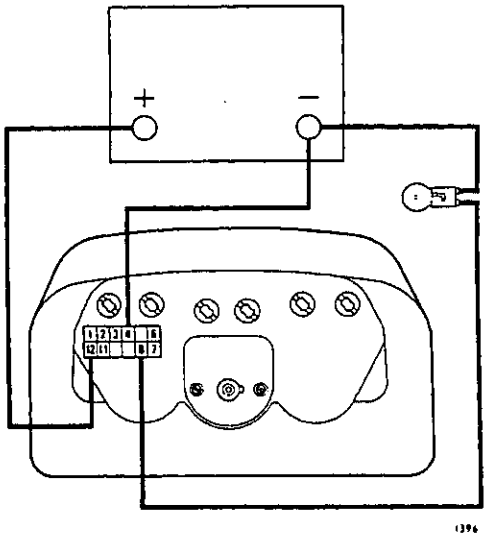


Fig 19 - Water temperature gauge test

70 To test the fuel gauge, connect terminal (12) to the supply positive and terminal (4) to negative (Fig 18). The gauge pointer should move to the 'F' position. With the test wires still connected, connect terminal (11) to the supply negative, when the gauge pointer should move to the 'E' position.

71 To test the water temperature gauge, connect terminal (4) to the supply negative terminal (12) to positive and terminal (8) via a 6 watt test lamp to the supply negative (Fig 19). The gauge pointer should register at the 130 end of the scale

72 Similar tests on the fuel and water temperature gauges can be carried out when the gauges are removed from the instrument assembly by connecting the fuel gauge to the supply as shown in Fig 20, and for the water temperature gauge to the supply as shown in Fig 21.

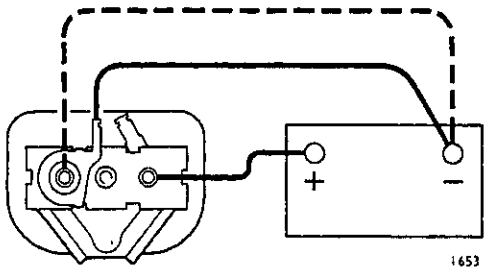


Fig 20 - Fuel gauge test, gauge removed from assembly

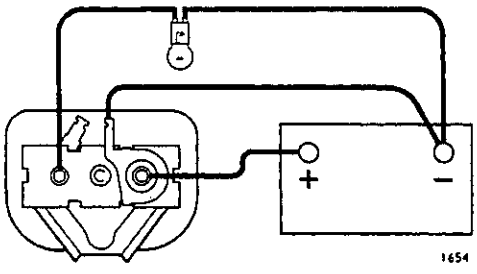


Fig 21 - Water temperature gauge test, gauge removed from assembly

Dismantling

Note ...

Removal of the instrument assembly is detailed in para 66.

73 Withdraw bulb holders by rotating anti-clockwise.

74 Ease spring clips off the bezel spigots and remove bezel and dial from case.

75 Remove two screws securing the speedometer to the case and lift out speedometer and mast assembly. If necessary remove the mask by removing the two securing screws.

CAUTION ...

When withdrawing the gauges hold down the printed circuit ground tag to prevent it jamming on the gauge stud.

76 Withdraw the fuel and water temperature gauges after removing the securing nuts, lock washers, plain washers and connecting strip bridging battery connections on the units.

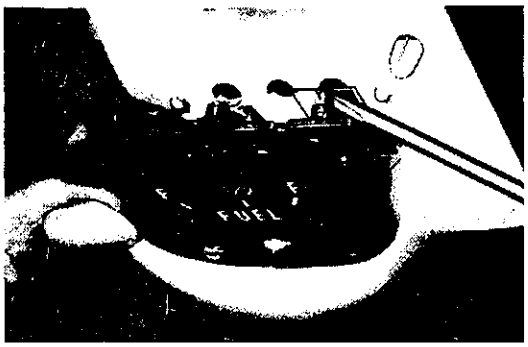


Fig 22 - Easing the printed circuit ground tab off the gauge stud

77 After tapping out the retaining button 'A', the printed circuit can be withdrawn. The circuit is located by dowel 'B'.

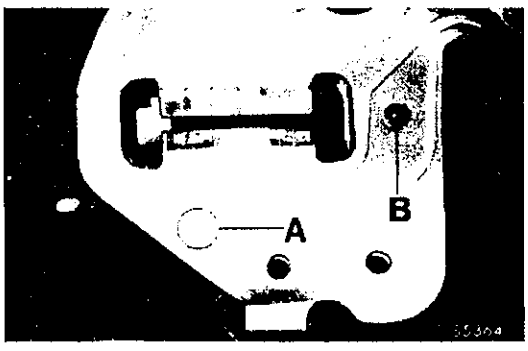


Fig 23 - Printed circuit location and retention

Reassembly

78 When installing the gauges, locate the water temperature gauge on the left. The connecting strip bridges the battery connections. The gauges are secured in the case by brass washers lock-washers and nuts.

79 Ensure the printed circuit ground tab engages the gauge stud.

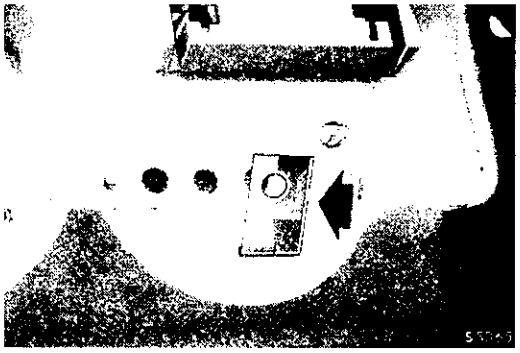


Fig 24 - Installing gauge to printed circuit ground tab

80 Ensure that the bezel is held tightly in position with the retaining clips assembled to the four lower bezel spigots. The clip tabs must coincide with the flats on the spigots.

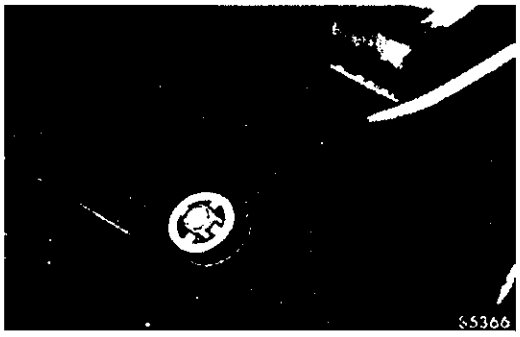


Fig 25 - Instrument assembly bezel retention

Installation

81 The end flanges of the multi-socket connector differ in width to suit the end slots in the instrument housing and ensure that it is correctly installed in the printed circuit.

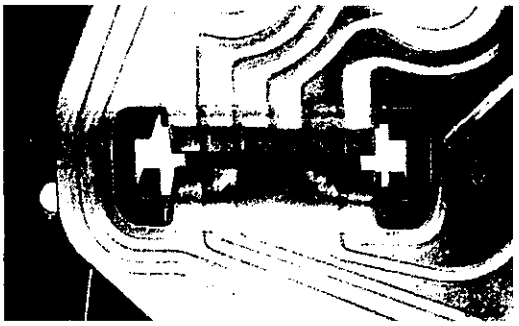


Fig 26 - Multi-socket connector location

82 When connecting the brake air pressure warning lamp, connect the green wires together and the green/yellow wire to the green/brown wire.

FUEL AND WATER TEMPERATURE GAUGES - Insulated ground return

83 On vehicles equipped with insulated ground return wiring, a mechanical fuel gauge is installed in the fuel tank.

84 An independent temperature gauge is mounted in the dash panel to the left of the main lighting switch.

FUEL GAUGE TANK UNIT - Chassis ground return only

Removal

85 Disconnect wire from terminal, remove securing screws and withdraw unit from tank.

Inspection

86 Check arm for free movement. It should fall under its own weight.

87 Remove contact cover and examine the contact shoe and resistor for signs of overheating or fracture. Ensure that full contact of the shoe has been maintained over the whole length of the resistor. Replace contact housing. If tabs have broken away during removal solder the cover to the plate.

88 Check the operation of the unit by connecting one wire of an ohmmeter to the terminal of unit and one wire to unit housing. Move float up and down, when readings between 1 and 30 ohms should be registered.

Installation

89 Use a new gasket between fuel tank unit and tank, position float towards rear of tank.

WATER TEMPERATURE GAUGE ENGINE UNIT

Removal

90 Remove radiator filler cap and drain the engine cooling system as described in AESP 2320-H-100-201.

91 Disconnect wire from connector on engine unit and unscrew unit from thermostat housing.

Installation

92 Before installing the unit coat threads with jointing compound.

SPEEDOMETER AND TACHOMETER CABLES

Removal

Note .. .

Removal of instrument assembly is detailed in para 66.

93 Unscrew knurled nut securing cable assembly to speedometer or tachometer and ease the assembly and grommet through toe panel.

94 Unscrew knurled nut securing cable assembly to driven gear housing on the transfer box or tachometer drive housing on the engine.

95 Detach cable from clips on the floor panel and chassis frame.

96 Withdraw the cable assembly and remove cable from casing.

Inspection

97 Examine casing for kinks or fractures and cable for broken strands.

Installation

98 Lubricate the lower two-thirds of the cable with a lithium based grease with approx 7% soap before assembling it to the casing. Do not over-lubricate as this may lead to contamination and failure of the instrument.

99 Assemble end of speedometer cable incorporating the collar to the instrument.

100The keyed end of tachometer cable is assembled to the drive housing on the engine.

INSTRUMENT AND WARNING LAMP BULBS

Removal

101To gain access to bulbs, remove main instrument assembly as described in para 66.

102Remove bulb holders by rotating anti-clockwise to line up the holder lugs with the slots in the casing. The bulbs are of the pull-out type.

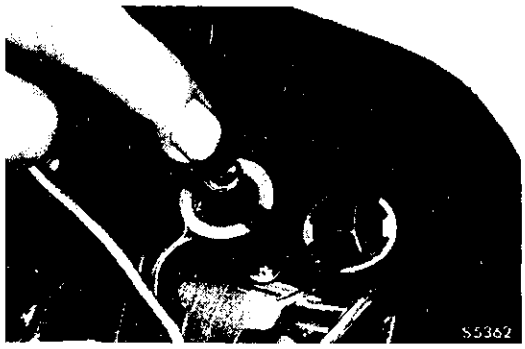


Fig 27 - Bulb holder removal

KEY-START SWITCH

Removal

103Remove switch locking ring and withdraw the switch from beneath the engine compartment top panel. Retain washer between switch and panel.

Dismantling

104Drill through the thin section (arrowed) to gain access to the lock barrel release plunger.

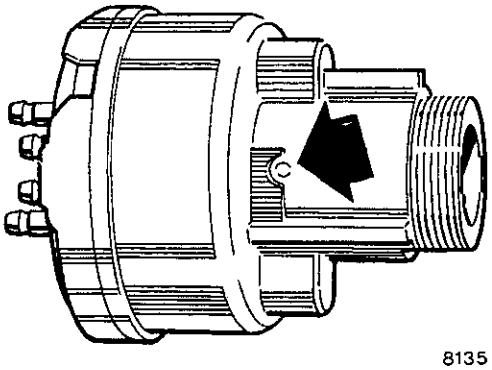


Fig 28 - Barrel release plunger location

105With the switch in the locked position, insert a wire through the hole in the switch body, depress the lock barrel spring plunger and withdraw the barrel.

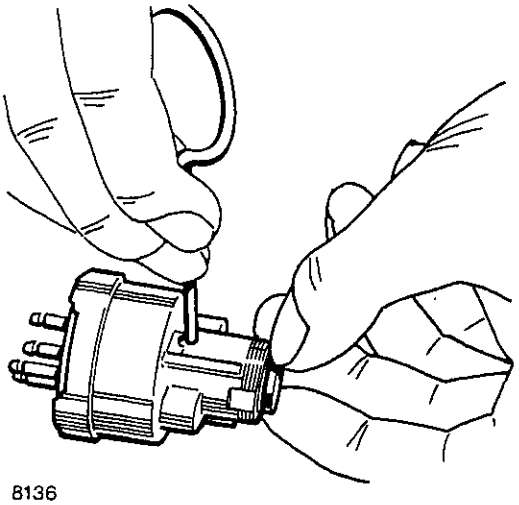


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Fig 29 - Withdrawing the key start switch barrel

Reassembly

106Align lock barrel plunger with hole in switch body, and push the barrel home until plunger engages locating hole in switch rotor. Seal the drilled hole in housing with wax.

Installation

107The switch is located by flats on the switch body panel.

HEAD LAMP DIP SWITCH AND HORN PUSH

Dip switch test

108Disconnect switch harness at multi-socket plug behind dash panel.

109Switch on headlamps.

110Connect blue wire socket of connector to the blue/white wire socket and the blue/red wire socket in turn. If the bulbs illuminate on main and dip filaments in turn, the circuits are satisfactory and the fault is in the dip switch.

Horn push test

111Connect the purple wire socket in connector to the purple/black wire socket. If the horn operates, the circuit is satisfactory and the fault is in the horn push.

Removal and Installation

112Disconnect the wiring harness at the multi-socket plug behind dash panel and unclip the harness from steering column.

113Remove switch which is secured by two screws to the turn signal switch.

114When installing, locate the assembly on the steering column as indicated in Fig 30.

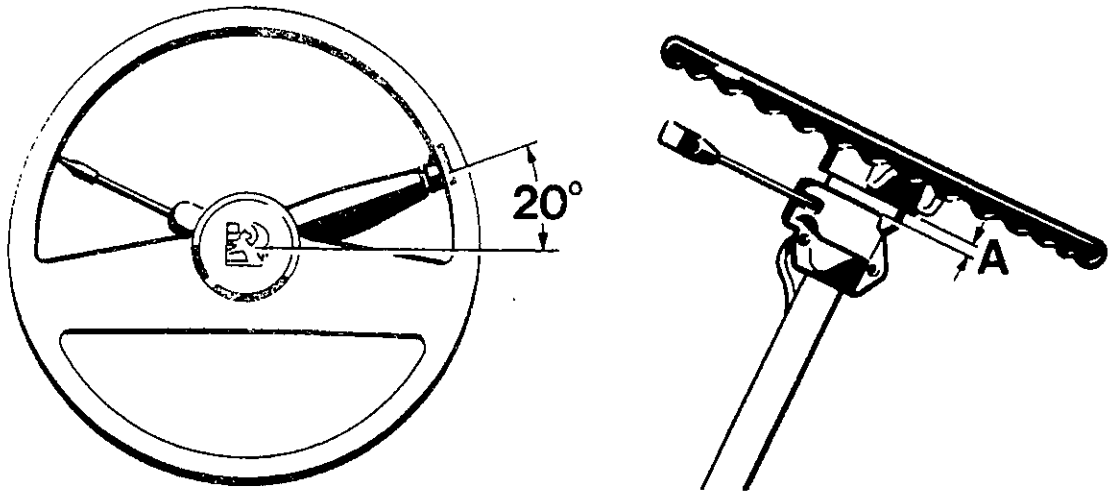


Fig 30 - Location of turn signal switch, dipswitch and horn push
Dimension 'A' is 4.5 mm (0.18 in.)

TURN SIGNAL SWITCH

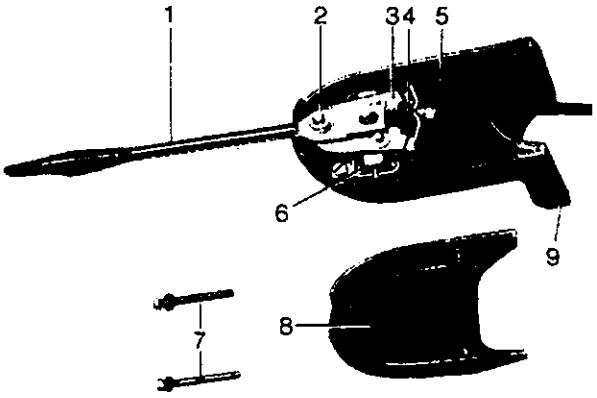
Switch tests

115Substitution by plugging in a replacement switch and harness assembly to the turn signal system and checking operation of the system with the key-start switch in the 'On' position, will indicate whether the existing assembly is faulty. Alternatively, a continuity check can be carried out on the existing switch and harness by disconnecting switch wires from main harness, tripping the switch lever to the right turn position and checking for continuity across the green/brown and green/white wires. With the switch lever tripped to the left turn position, continuity should be checked across the green/brown and green/red wires.

Removal

116Disconnect switch wires from main harness and remove the two screws securing the switch to the horn push and dipswitch assembly.

Dismantling



1 Lever
2 Spring clip
3 Action plate
4 Action plate spring
5 Rubber wheel
6 Switch
7 Upper casing attaching screws
8 Upper casing
9 Lower casing

Fig 31 - Turn signal switch details

117Remove switch upper casing (8) and withdraw switch lever (1) after removing spring retainer clip (2) with pliers. Remove action plate (3), rubber wheel (5), brass shims if fitted, and steel washer. Withdraw switch (6) from lower casing (9) after removing two attaching screws (7).

118When renewing harness, connect wires as shown in Fig 32.

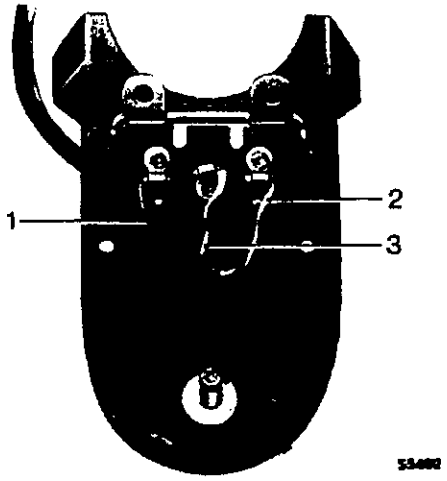


Fig 32 - Turn signal switch wiring connections

Reassembly

119When installing rubber wheel, place the steel washer on wheel spindle followed by any brass shims removed during disassembly.

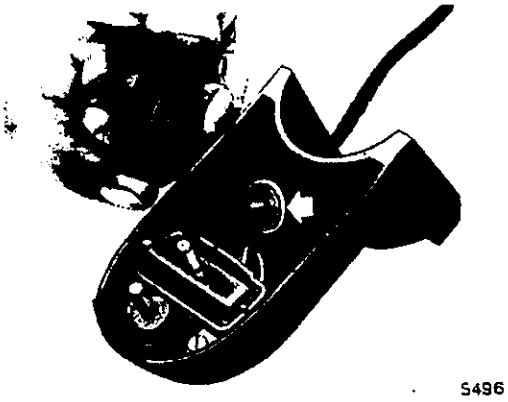


Fig 33 - Assembling rubber wheel to turn signal switch

Installation

120Locate switch on steering column as shown in Fig 30. The rubber wheel in the switch must contact the steering wheel boss.

121 Connect the wires to the corresponding wires in the main harness.

COLD STARTING AID SWITCH

122The switch is secured to the cab engine cover by a slotted locking ring.

123To gain access to locking ring, remove knob whilst depressing spring plunger in switch shaft through hole in switch knob. Switch can be withdrawn from beneath cab.

COLD START IGNITERS

124For removal and installation details refer to AESP 2815-K-062- series.

IGNITER SOLENOID SWITCH

125Mounted on the intake manifold below the igniter supply tank, servicing is by replacement only.

Installation

126Connect brown/red wire on connector nearest the engine rocker cover and the black wire on outer connector.

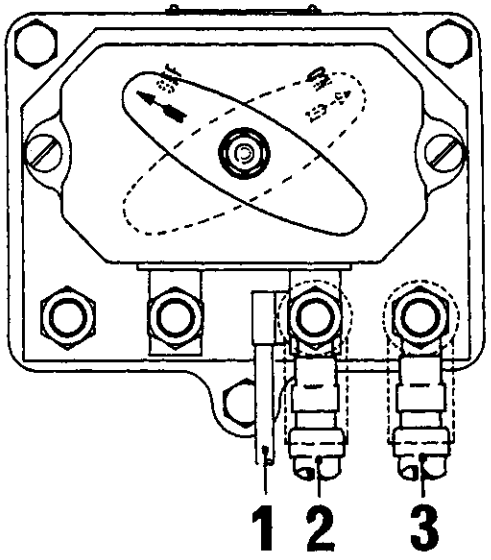
BATTERY ISOLATION SWITCH

127The switch is bolted to the floor panel beneath the driver's seat.

128Petroleum tanker vehicles have an additional- switch mounted on the battery carrier.

Installation

129Connect cables to switch as illustrated.

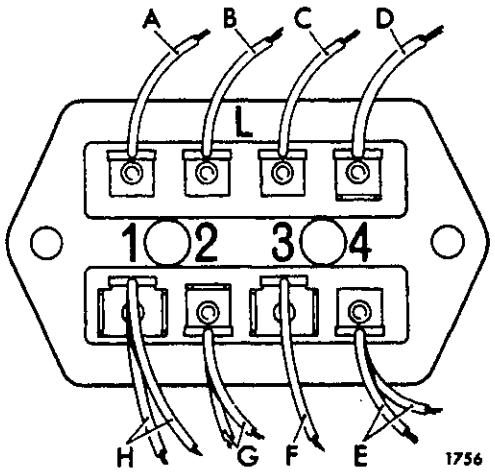


1 Ignition harness 2 To Starter
3 To battery

Fig 34 - Battery isolating switch

FUSE BOX

130The fuse box is secured by two screws to a bracket beneath the dash panel to the right of the steering column. Fuse box wiring connections are shown in Fig 35.



A - White
B - Red
C - Brown/White
D - Brown
E - Purple
F - Brown/Purple
G - Red/Purple Brown
H - Green

Fig 35 - Fuse box wiring connections

WIPER ARMS AND BLADES

131Ineffective wiping of the windshield can be attributed to two causes: deterioration or wear of the rubber portion of the blade, which can be determined by visual examination, or loss of pressure by the wiper arm.

132The blade is secured to the arm by a projecting pip on the arm held in engagement with a hole in the blade attachment by a leaf spring. To renew blade insert a thin screwdriver between outer side of arm and blade to release the pip from hole in blade attachment.

Renewal

133The pressure applied by the wiper arm should be 3.9 - 5.0 N (14 - 18 oz). This can be checked with a spring balance with the arms in a vertical position. If the tension is incorrect, renew the complete arm assembly as follows:

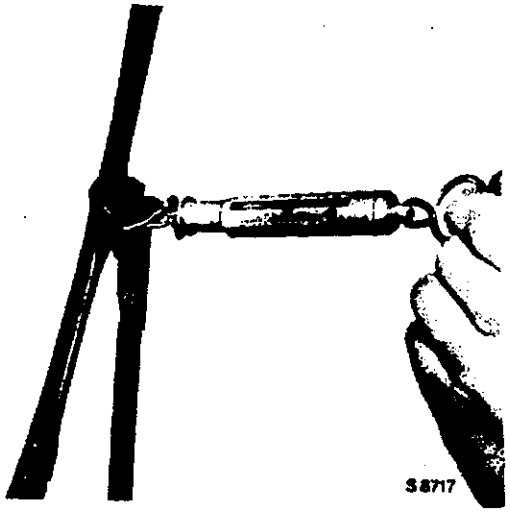


Fig 35a - Wiper arm spring retention

134Remove domed nut and prise arm from serrated driver.

135Install new arm on pivot so that dimension 'A' is 51 mm (2 in.) and dimension 'B' is 38 mm (1.5 in.) from the end of wiper blade to windshield weatherstrip as shown in Fig 36.

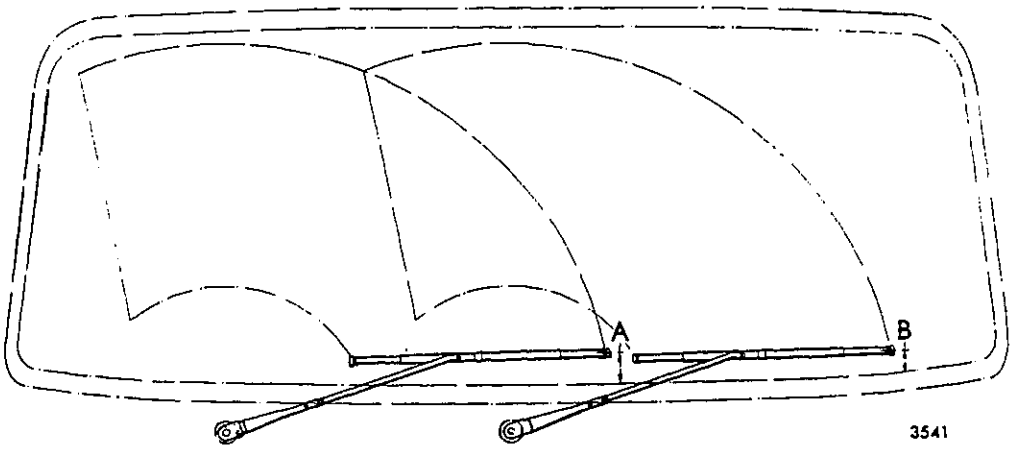


Fig 36 - Arrangement of windshield wipers. The arms and blades are shown in the parking position

136Should trouble be experienced with wiper blade judder, and it occurs in both directions of wipe this could be due to a defective or worn blade.

137If judder occurs in one direction of wipe only, this can be rectified by resetting the plane of the wiper arm. Should judder occur when blade is moving in direction of large arrow, arm should be twisted in the direction indicated by small arrow. Conversely, if judder occurs when blade is moving in opposite direction, twist arm in opposite direction.

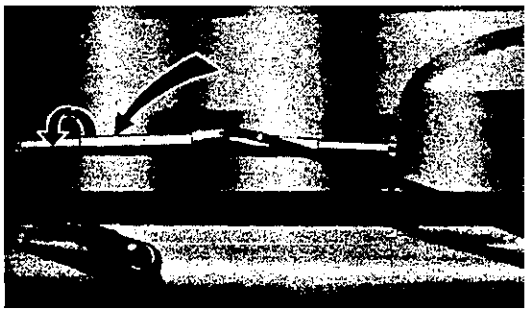
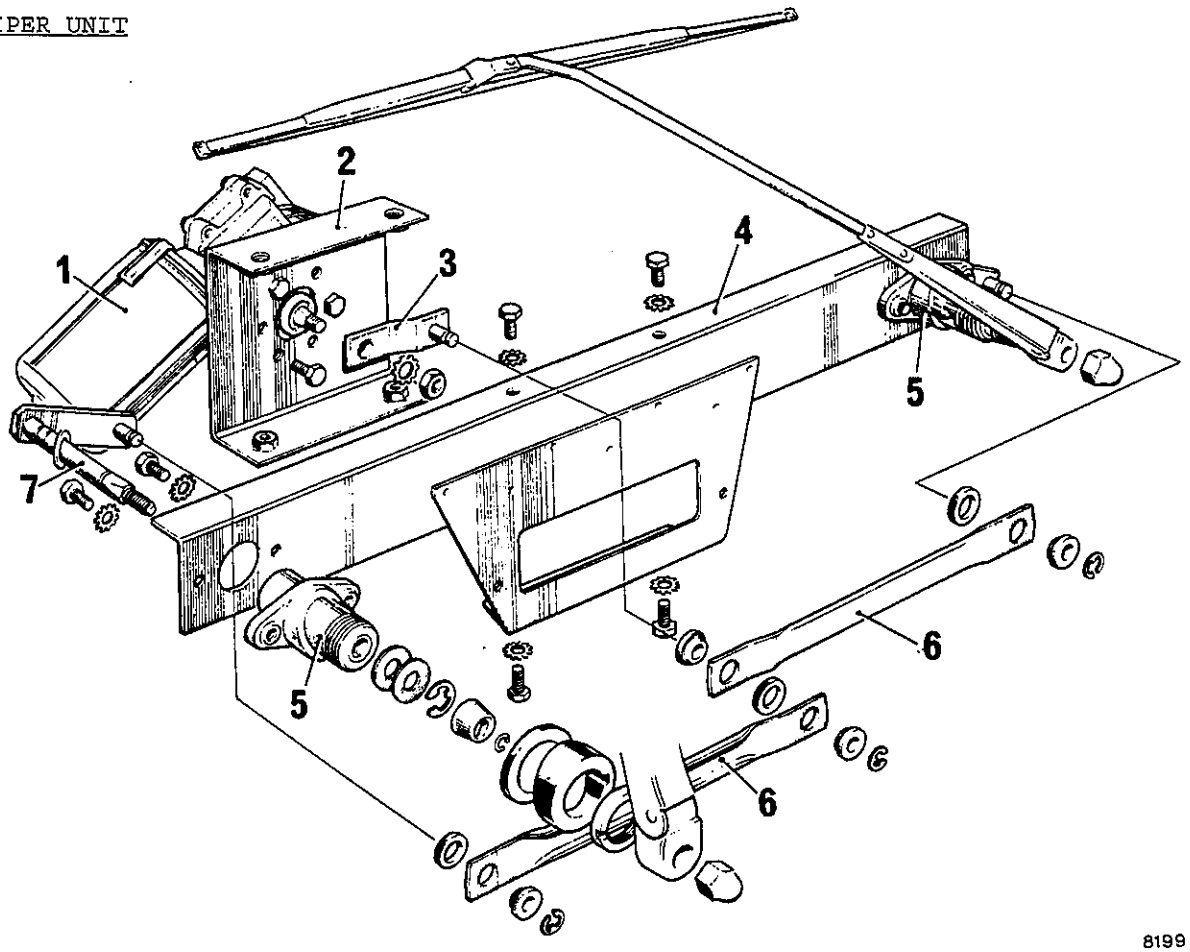


Fig 37 - Wiper arm resetting

138Resetting of arm should be carried out gradually until wiper blade operation is normal when checked on a wet windshield.

WIPER UNIT



1. Wiper motor
2. Centre plate
3. Motor crank
4. Mounting bracket
5. Pivot housings
6. Links
7. Pivot

Fig 38 - Wiper unit

139The wiper unit comprises a mounting bracket (4) with a pivot housing (5) bolted to each end and a motor (1) secured to a centre plate (2) by three bolts. The centre plate is bolted to the mounting bracket (4) and another flanged plate which forms a box section. Two links (6) connecting the pivot (7) and motor cranks (3) are bushed at each end.

140The mounting bracket and the motor are the same for right and left drive vehicles but the mounting angle of the motor is different, this being determined by selection of either of the two sets of mounting bolt holes in the centre plate.

141The unit is secured to the scuttle by ring nuts on the pivot housings and the base of the centre plate is bolted to a bracket under the instrument panel.

Removal

142After withdrawing wiper arms and blades, remove nuts and escutcheons from pivot housings using wiper housing wrench VR2180A. Detach instrument carrier panel and remove both demist hoses and driver's demist duct.

143After removing multi-socket connector from wiper motor, detach support bracket from instrument panel and wiper mounting bracket and withdraw wiper unit over heater and from passenger side of instrument panel.

Dismantling

144After prising E-clip from pivot crank and removing bolts, pivot housing can be withdrawn from mounting bracket.

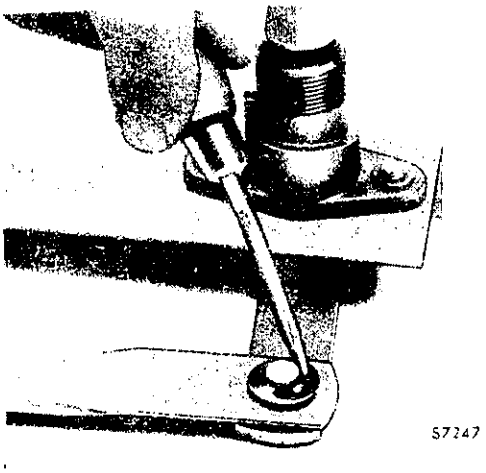


Fig 39 - Removing E-clip from pivot crank

145Serrated driver can be prised off tapered flats on pivot spindle after removing circlip.

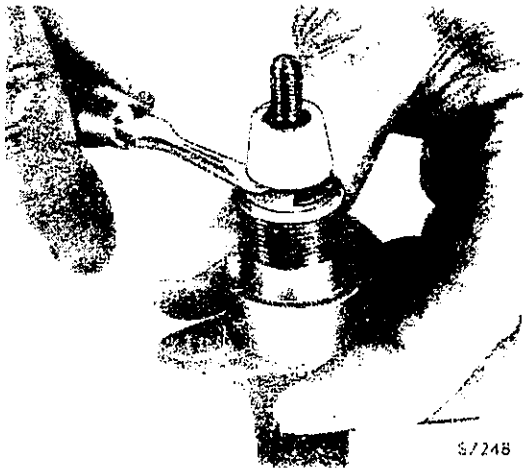


Fig 40 - Serrated driver removal

146Spindle and crank can be withdrawn from housing after prising off E-clip. Take care of shims at outer end of shaft and washer at inner ends.

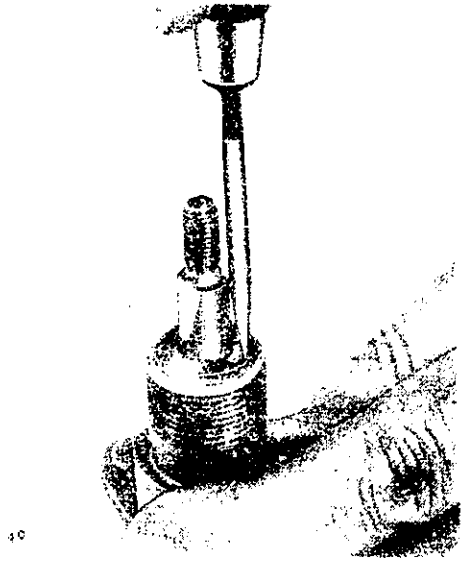


Fig 41 - Prising of E-clip

Reassembly

147When reassembling, inject XG 279 grease into annular space between pivot bearings then select shims to provide specified end float on spindle.

148Serrated driver must be located on spindle so that identification groove (arrowed) is away from pivot crank (ie towards top of mounting bracket when pivot is installed).

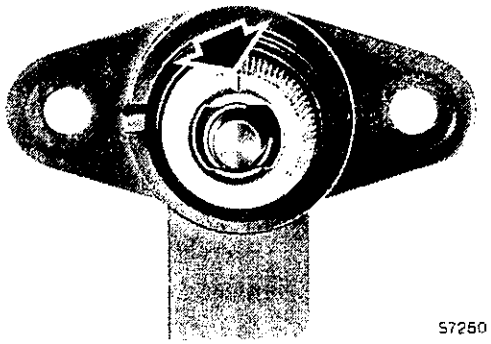


Fig 42 - Serrated driver location

149Pivot housings are not interchangeable side for side and are marked RH and LH for right and left hand respectively. The housings must be assembled to mounting bracket so that narrow section of shoulder is towards top of mounting bracket.

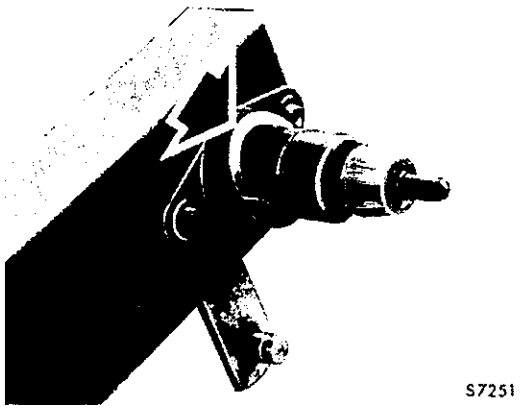


Fig 43 - Pivot housing location

150The wiper link bushes can be renewed by pressing out the original bushes and pressing in new. Ensure that bushes are pressed in the correct way round The motor crank bushes 'A' are pressed in the same way round whilst those for the pivot cranks 'B' are installed in the opposite direction.

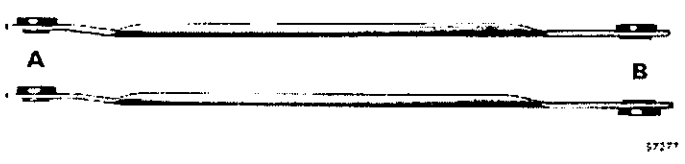


Fig 44 - Motor crank bush installation

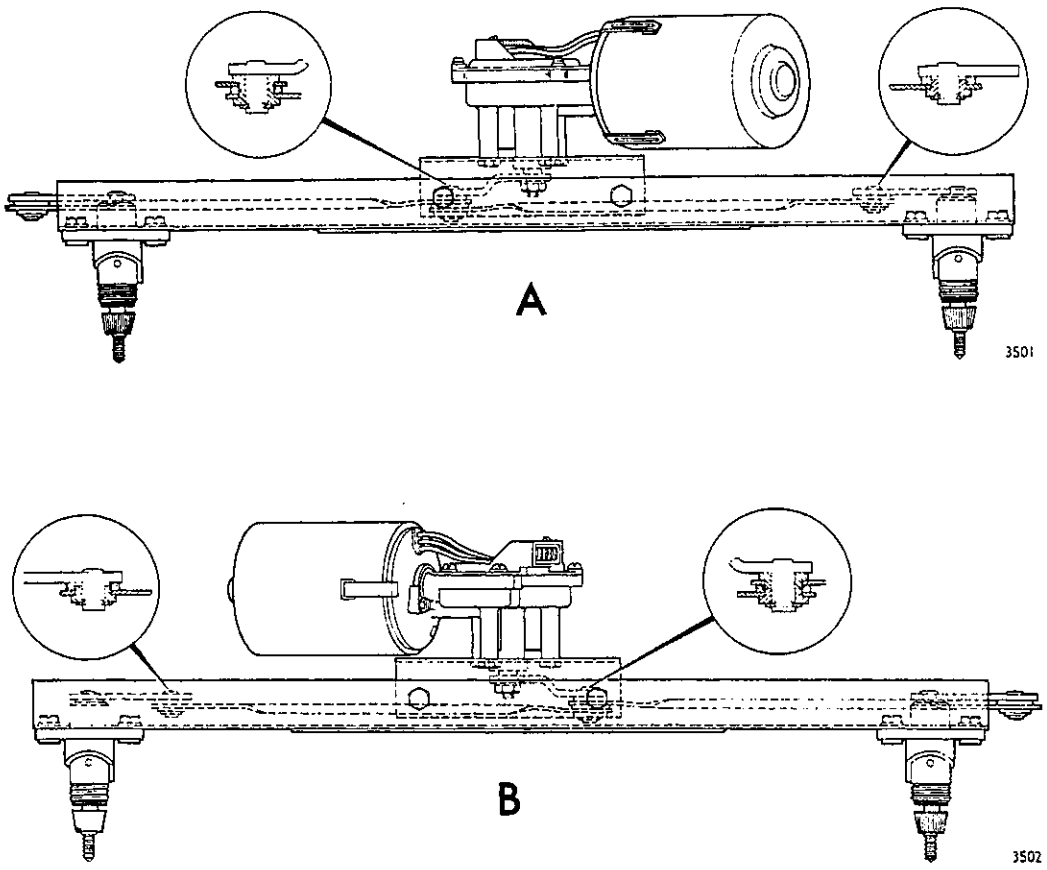


Fig 45 - Right and left drive mounting locations

151The mounting location for the motor, and assembly of the links for right drive models is shown at 'A' and for left drive models at 'B'.

WIPER MOTOR

152Wiper motor can be detached from mounting bracket after removing wiper unit from vehicle and detaching motor crank from cross-shaft.

153To release end frame from gear housing, prise out clips from slots in frame.

154End frame can then be withdrawn from gear housing, leaving armature assembled to housing.

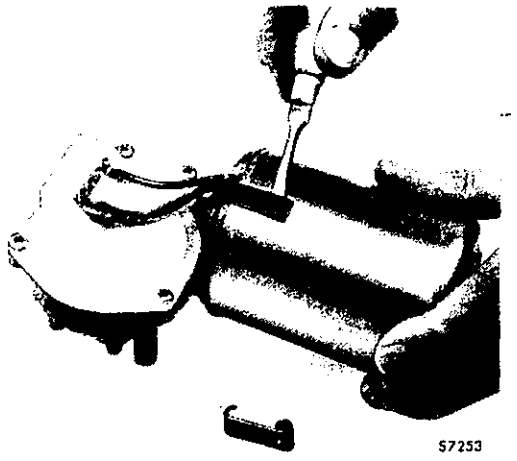


Fig 46 - Releasing end frame from gear housing

155After removing gear housing cover, secured by four screws, main gear and cross-shaft can be withdrawn.

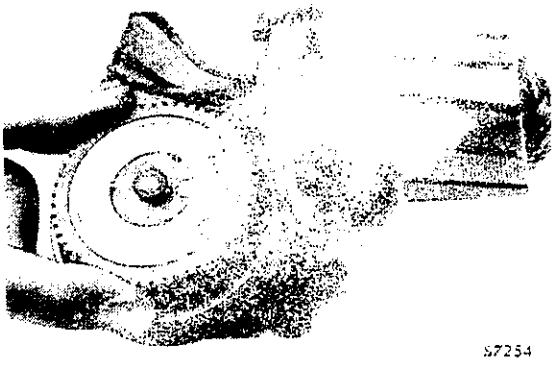


Fig 47 - Main gear and cross-shaft withdrawal

156Brush leads should be hooked over tags on brush holders, maintaining them in a retracted position, to facilitate removal of armature.

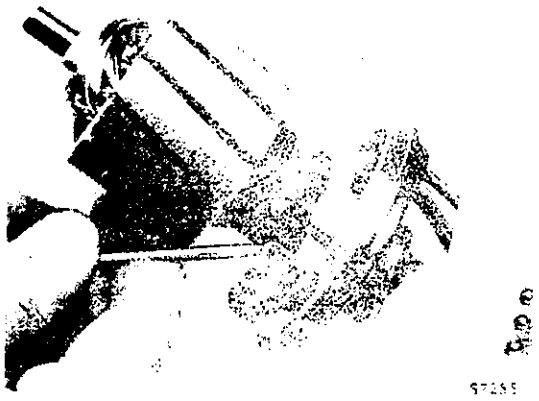


Fig 48 - Retracting brush holders

157Armature and bearing can be withdrawn after slackening bearing retainer nut.

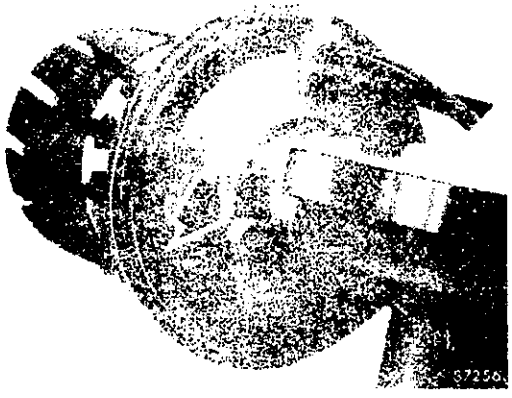


Fig 49 - Armature and bearing withdrawal

158Finally, brush plate may be withdrawn, together with brushes, leads and gear housing cover. Take care that thermotrip blade (arrowed) is not distorted by rough handling, as this will render it unserviceable.

Fig 50 - Brush plate withdrawal

Note ...

The gear housing and armature shaft and cross-shaft bushes are not serviced. The armature and the gear and cross-shaft assembly are available as individual items and the remainder of the motor components are serviced in three kits as follows:
End frame kit, gear cover and brush kit and hardware kit.

159Check brushes for wear, if length of brushes are below 6 mm (0.24 in.) install new gear cover and brush assembly.

Reassembly

160Before installing cross-shaft, pack space between bushes and repack housing approximately half full with XG 279.

161Thrust button at inner end of cross-shaft and bearing surface in gear housing cover, should also be smeared with Rocol Anti-scuffing compound, aerosol can H1 9150-99-224-8709.

162Brushes should be retraced before armature is inserted into gear housing. Brush leads must be unhooked, to return brushes to normal position, before end frame is replaced.

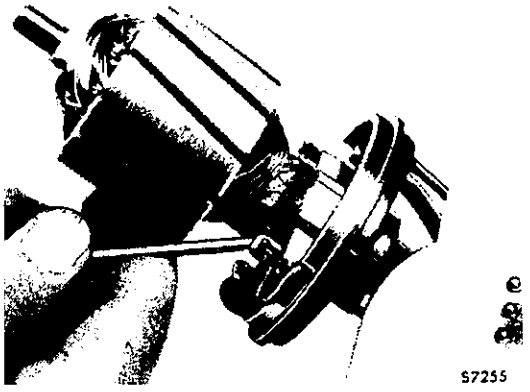


Fig 51 - Retraction of brushes

163Ensure that L-shaped bearing retainer is positioned on bearing outer race before tightening nut.

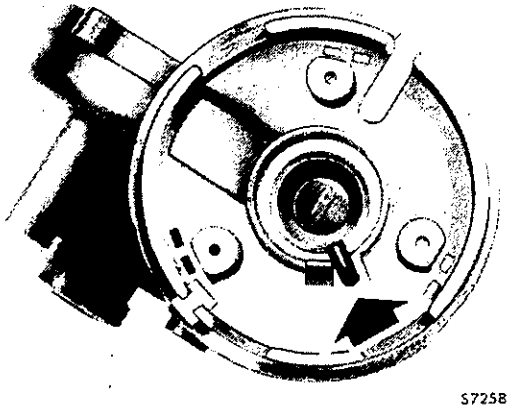


Fig 52 - Bearing retainer positioning

164To test motor, connect in circuit with a 24 volt supply, and an ammeter. Connect supply negative lead to terminal '31b' and supply positive to terminal '53' for low-speed operation, or to terminal '53b' for high speed operation. Current consumption should be 2.0 amp at high speed and 1.2 amp at low speed after running light for 5 to 10 minutes.

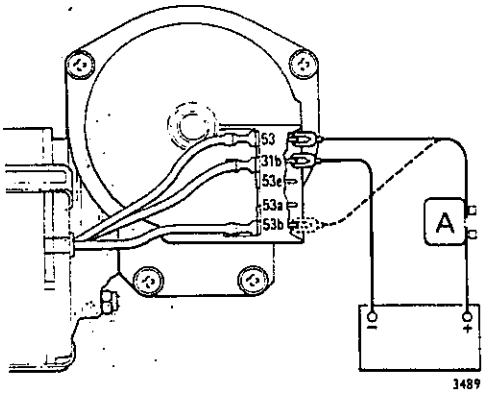


Fig 53 - Motor test connections

165To check self parking, connect supply negative to terminal '31b' and positive to '53a'. Link terminal '53' to '53e' when shaft should rotate a maximum of one revolution before stopping.

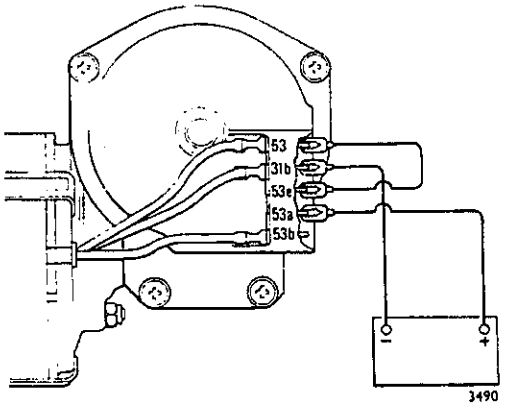


Fig 54 - Self-parking check

166Assemble motor to centre plate of mounting bracket in the appropriate position for a right or left drive unit as shown in following illustrations. Ensure that motor cross-shaft is in the parked position.

167On right drive units install crank so that arrow on crank is in line with arrow marked 'R' on centre plate.

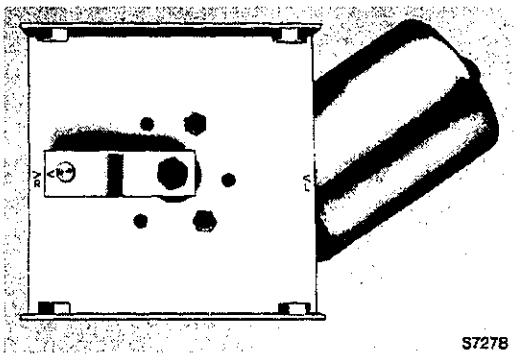


Fig 55 - Right drive crank installation

168On left drive units install crank so that arrow on crank is in line with arrow marked 'L' on centre plate.

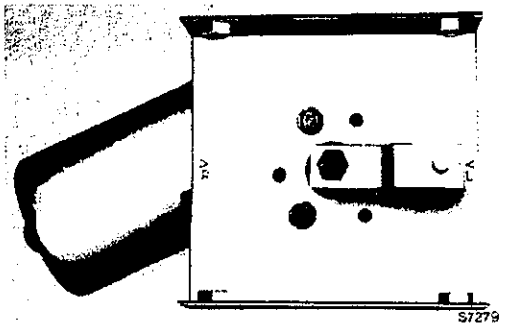


Fig 56 - Left drive crank installation

169It is important that motor crank is held securely in a vice whilst tightening nut, otherwise cross-shaft gear will be damaged.

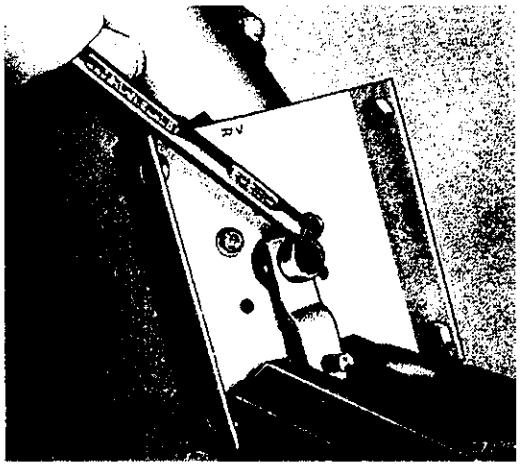


Fig 57 - Motor crank tightening

WINDSHIELD WASH

170The windshield wash system is operated by an electric pump which is controlled from the push-type switch mounted on the dash panel to the right of instrument panel.

171The pump is mounted to the cab front panel reinforcement under the dash panel, at the passenger side.

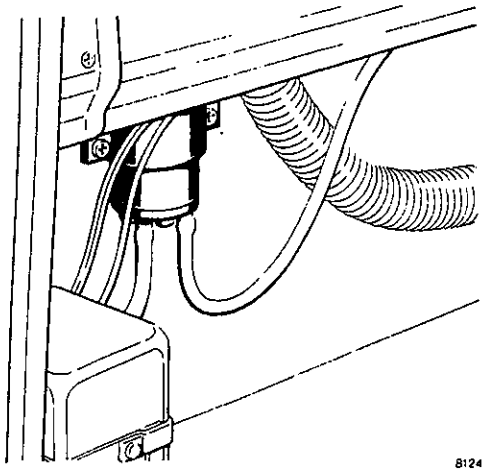


Fig 58 - Windshield wash pump location

172The outlet nozzle is identified by the arrow pointing upwards with the pump positioned as illustrated. Pump motor terminals are marked + (positive) and - (negative).

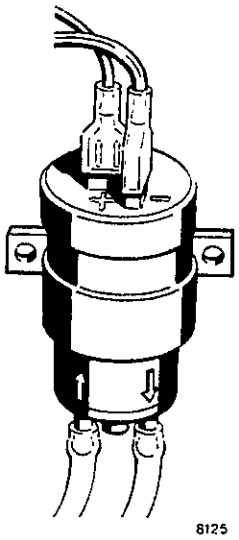
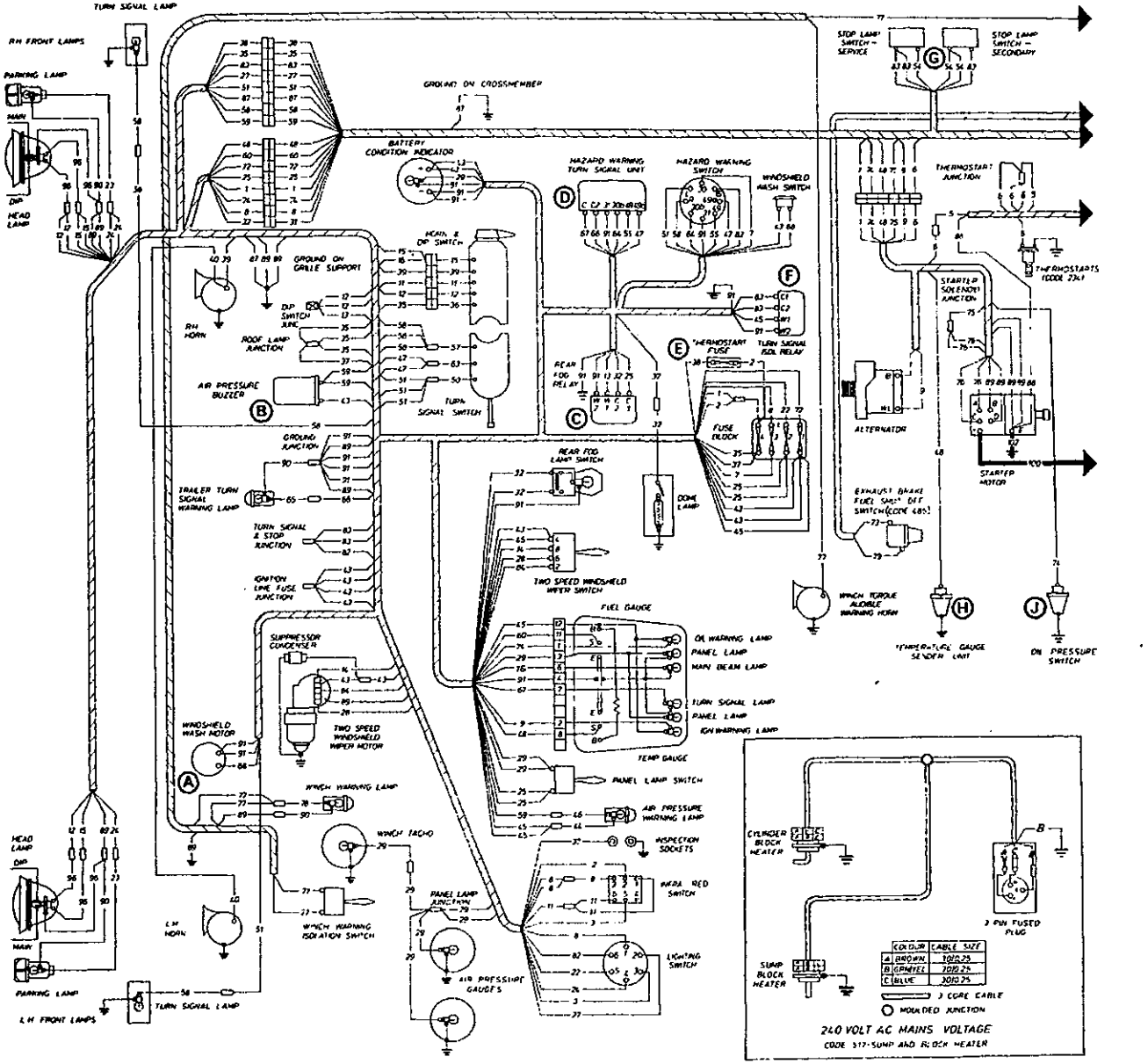


Fig 59 - Wash pump connections

TABLE 2 - WIRING DIAGRAMS - COMPONENT LOCATION

Ref	Item	Location
(1)	(2)	(3)
A	Windshield wash motor	Beneath dash panel on passenger's side
B	Air pressure buzzer	Behind instrument assembly
C	Rear fog relay	Behind instrument assembly
D	Hazard warning turn signal unit	Behind instrument assembly
E	Thermostat fuse	Adjacent to main fuse box, beneath dash panel
F	Turn signal isolating relay	Beneath dash panel, driver's side
G	Stop lamp switches	On outside of chassis right-hand sidemember between front wheel and brake master cylinder
H	Temperature gauge sender unit	In thermostat housing
J	Oil pressure switch	In oil filter housing
K	Brake fluid level switches	Mounted in top of master cylinder reservoir caps
L	Thermostart circuit breaker	Beneath cab, mounted on cab back panel
M	Ballast resistor	Beneath cab, mounted on cab back panel
N	Thermostart relay	Beneath cab, mounted on back panel
P	Limiter switch	Beneath cab on P.T.O. linkage
R	Line fuse	Taken off feed to winch load limiter switch beneath cab at P.T.O linkage area
S	Engine shut-off solenoid	Adjacent to fuel pump
T	Low brake pressure switch	Mounted in the service reservoir midway along chassis
U	Low brake pressure switch	Mounted in the secondary reservoir midway along chassis



8455A

Fig 60(A)

Fig 60(A)

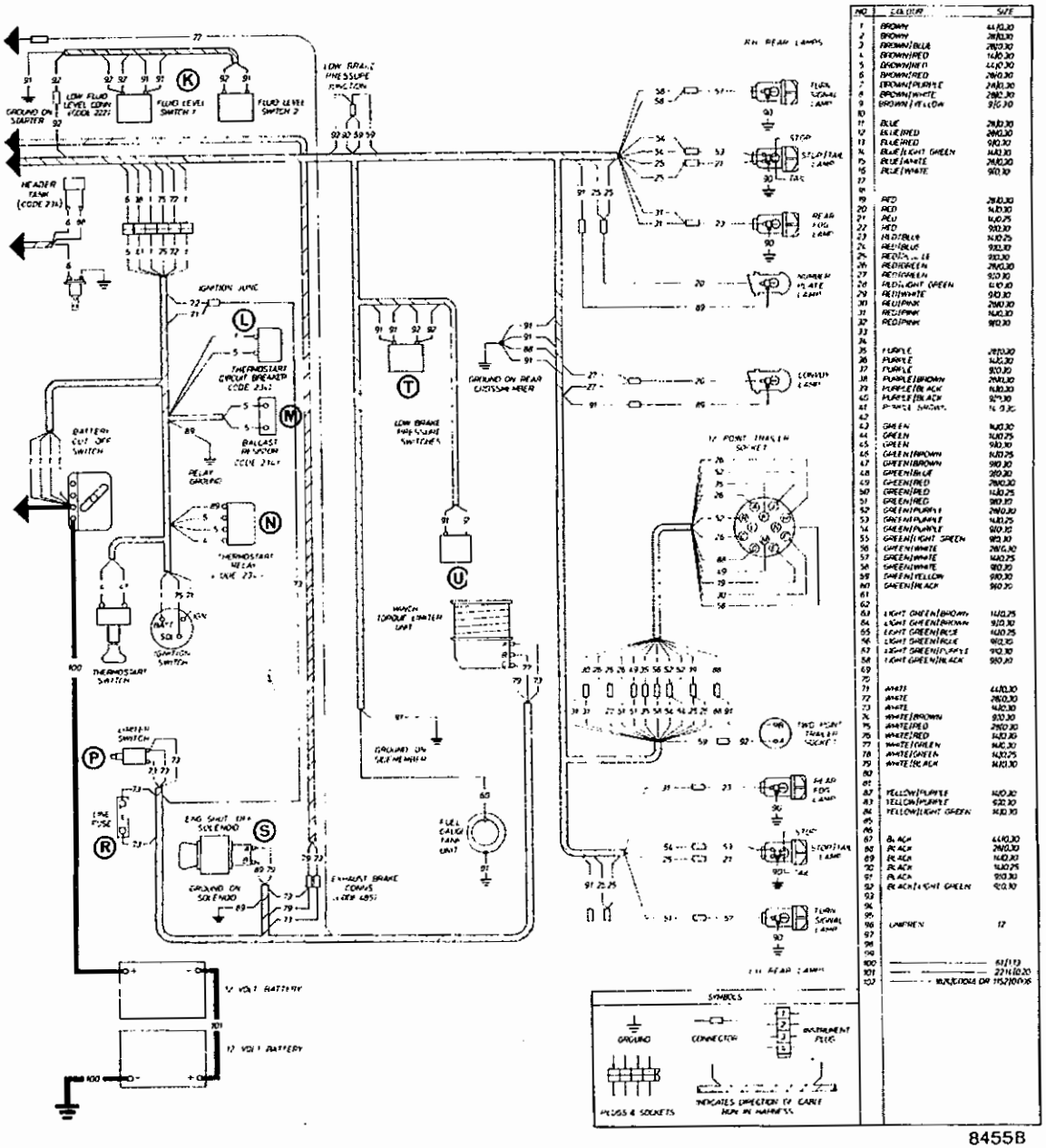


Fig 60(B)

Wiring diagram 24 volt alternator system chassis ground return rhd shown lhd similar

Fig 60(B)

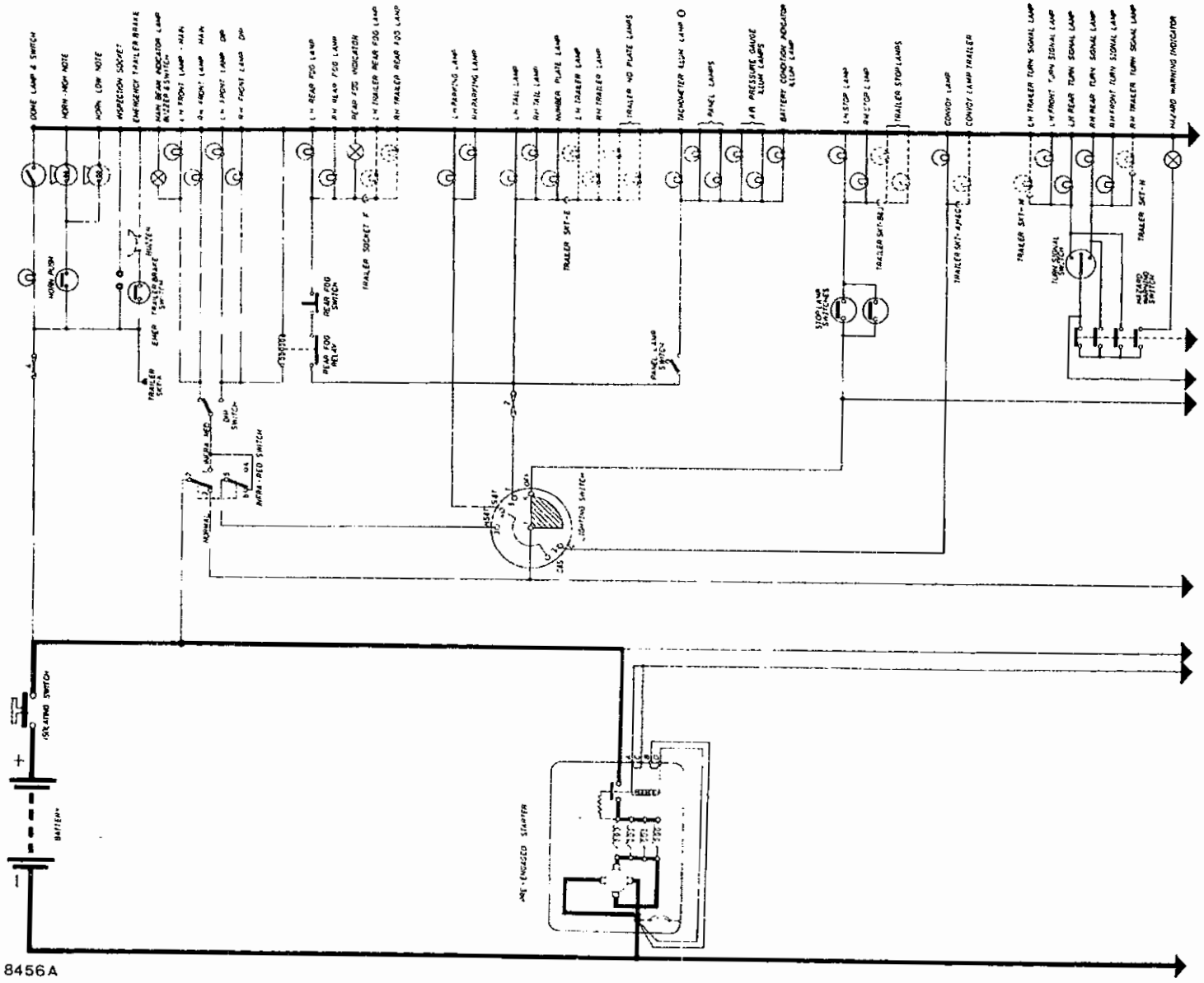


Fig 61(A)

Circuit wiring diagram 24 volt alternator system chassis ground return rhd shown lhd similar

Fig 61(A)

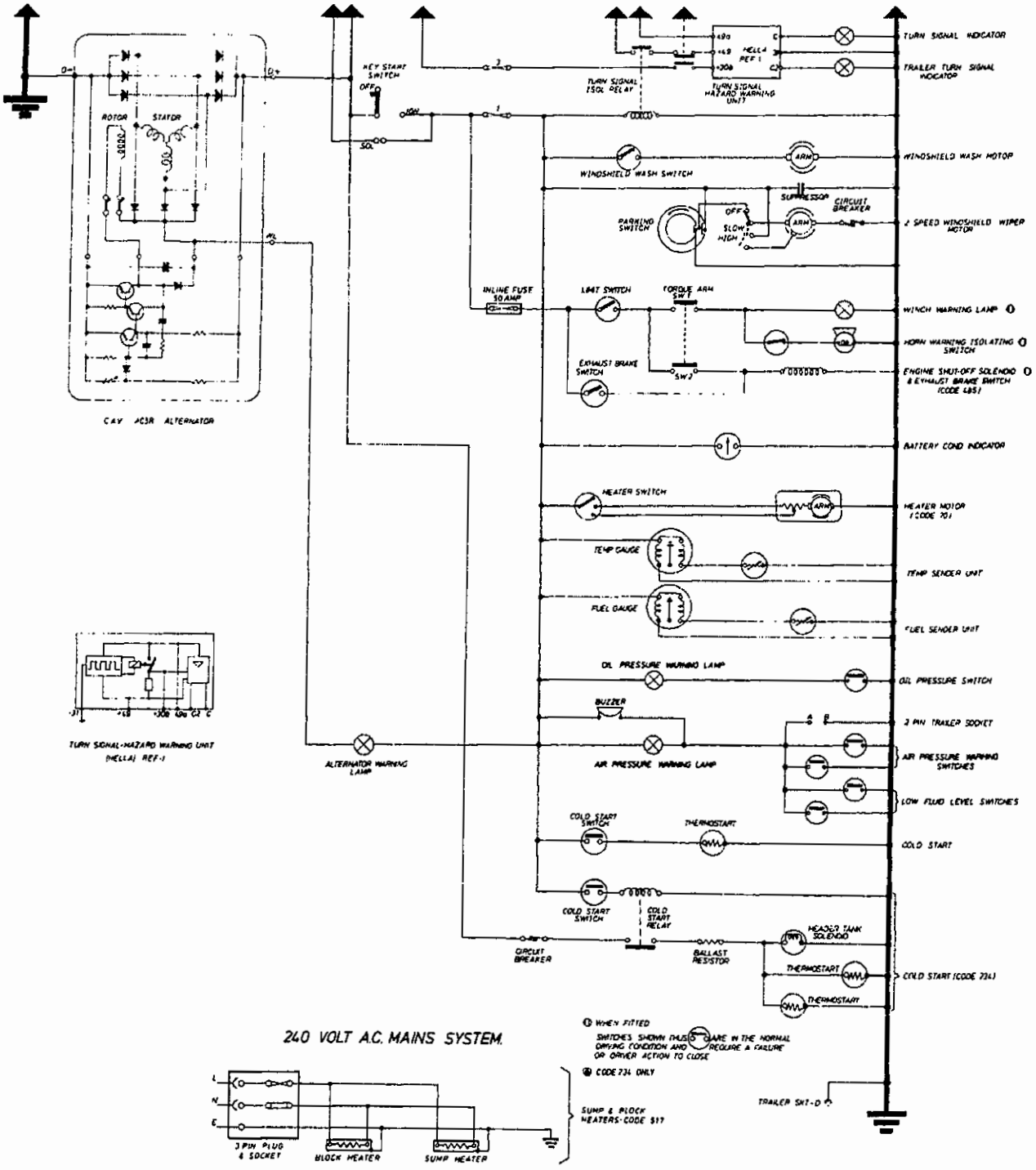
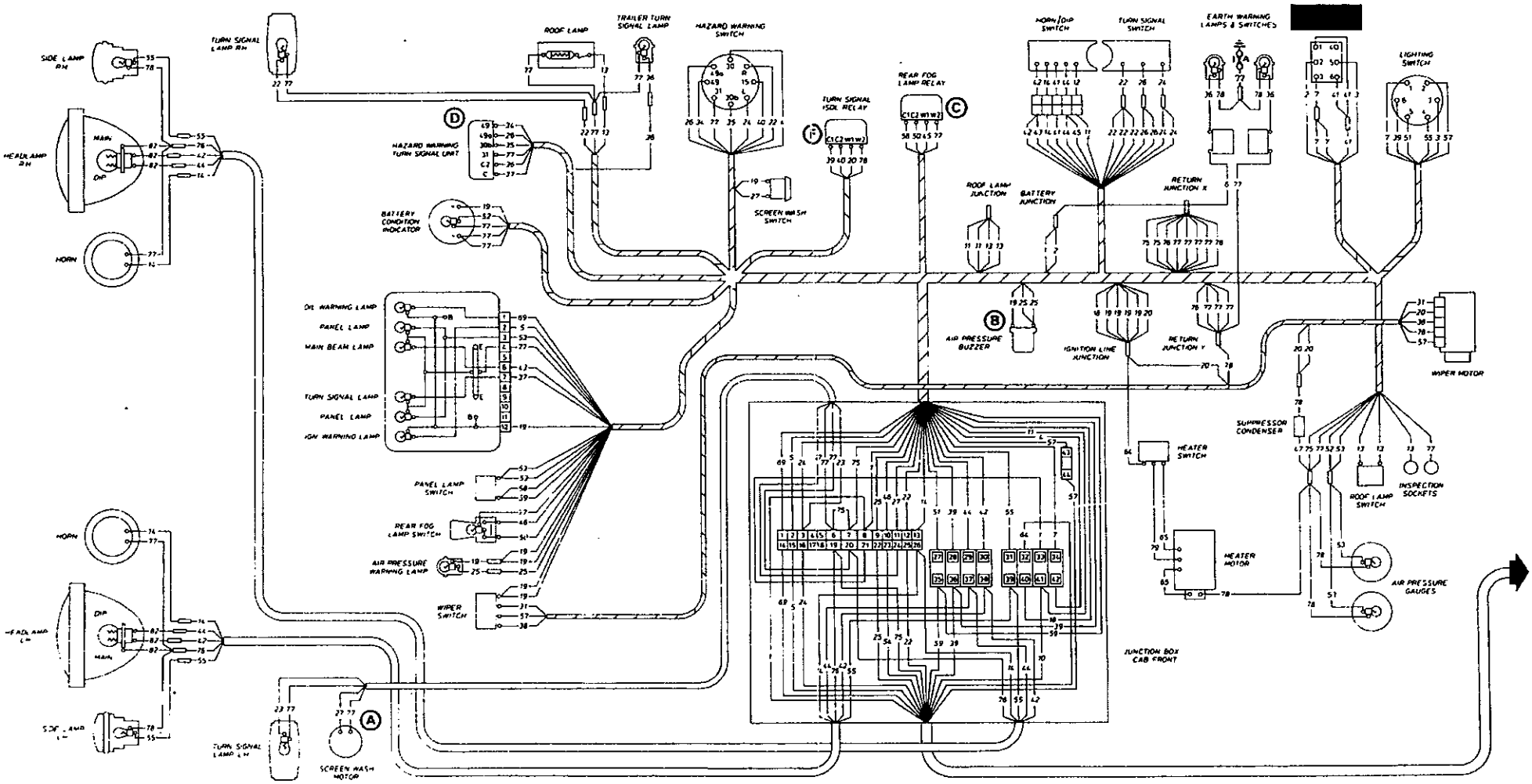


Fig 61(B) Circuit wiring diagram 24 volt alternator system chassis ground return r.h.d shown, l.h.d similar

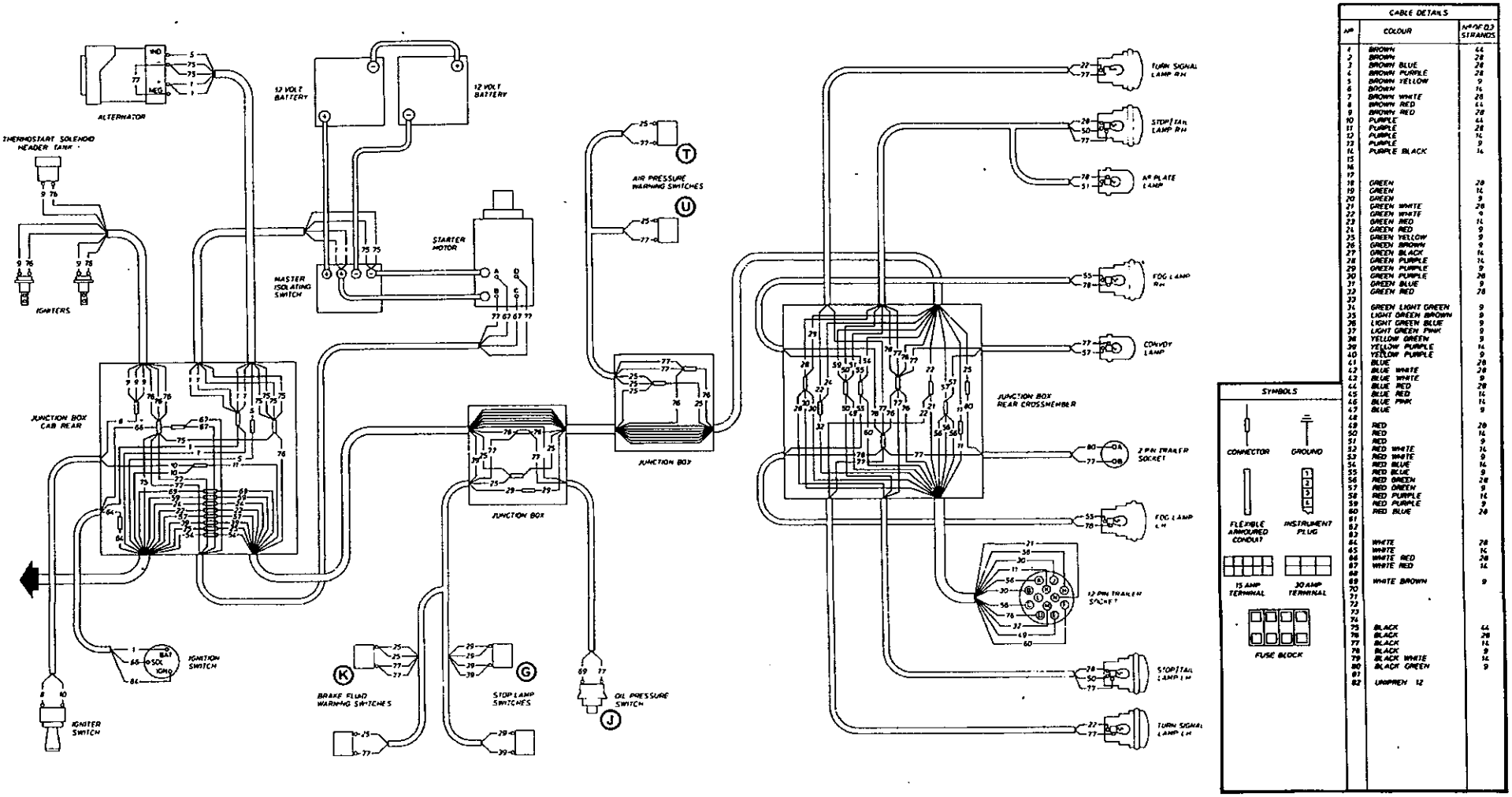


8602(A)

Fig 62(A)

Wiring diagram 24 V chassis insulated return

Fig 62(A)



8602(B)

Fig 62(B)

Wiring diagram 24 volt chassis insulated return

Fig 62(B)

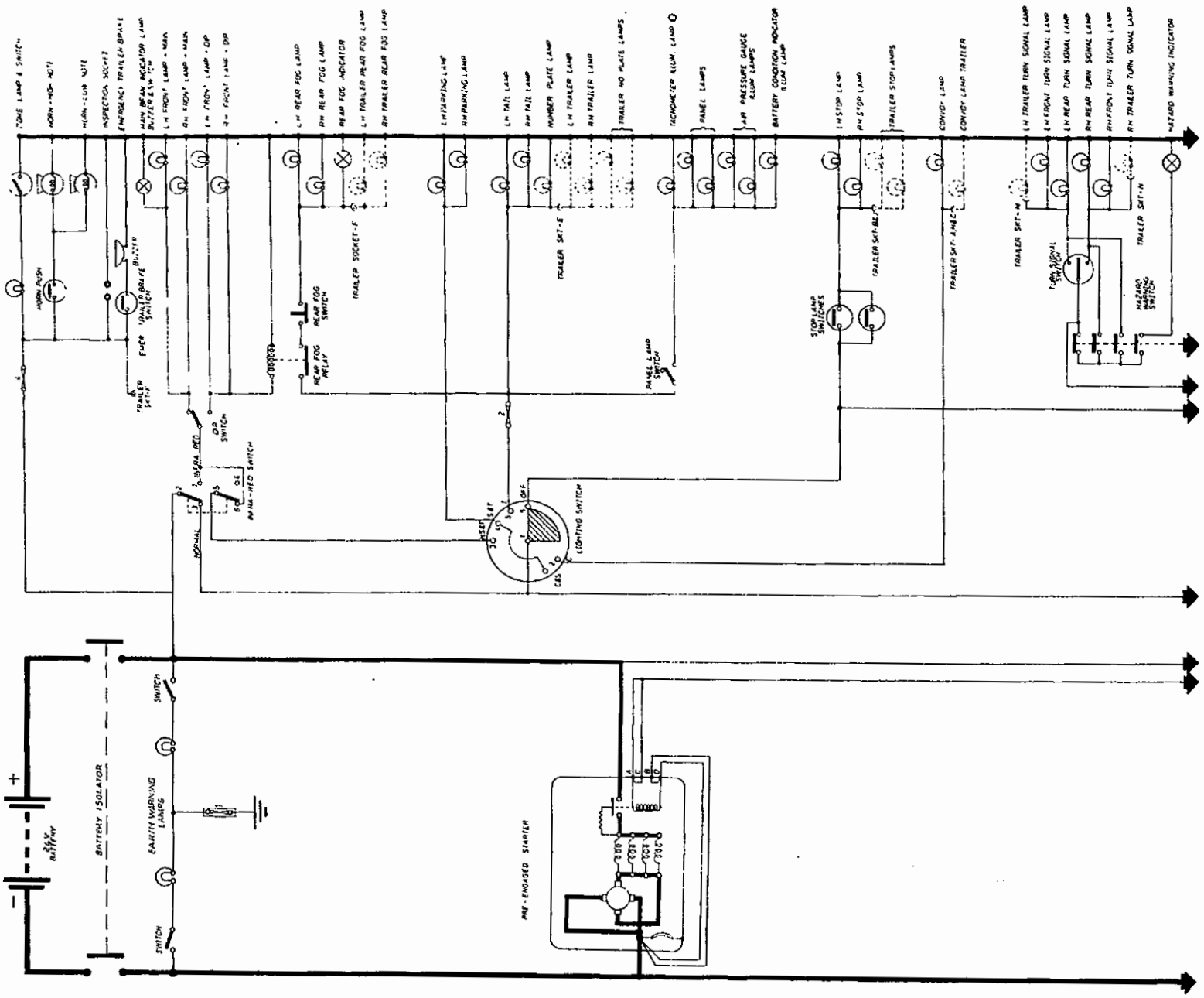


Fig 63(A)

8612(A)

Fig 63(A)

Circuit wiring diagram 24V chassis insulated return

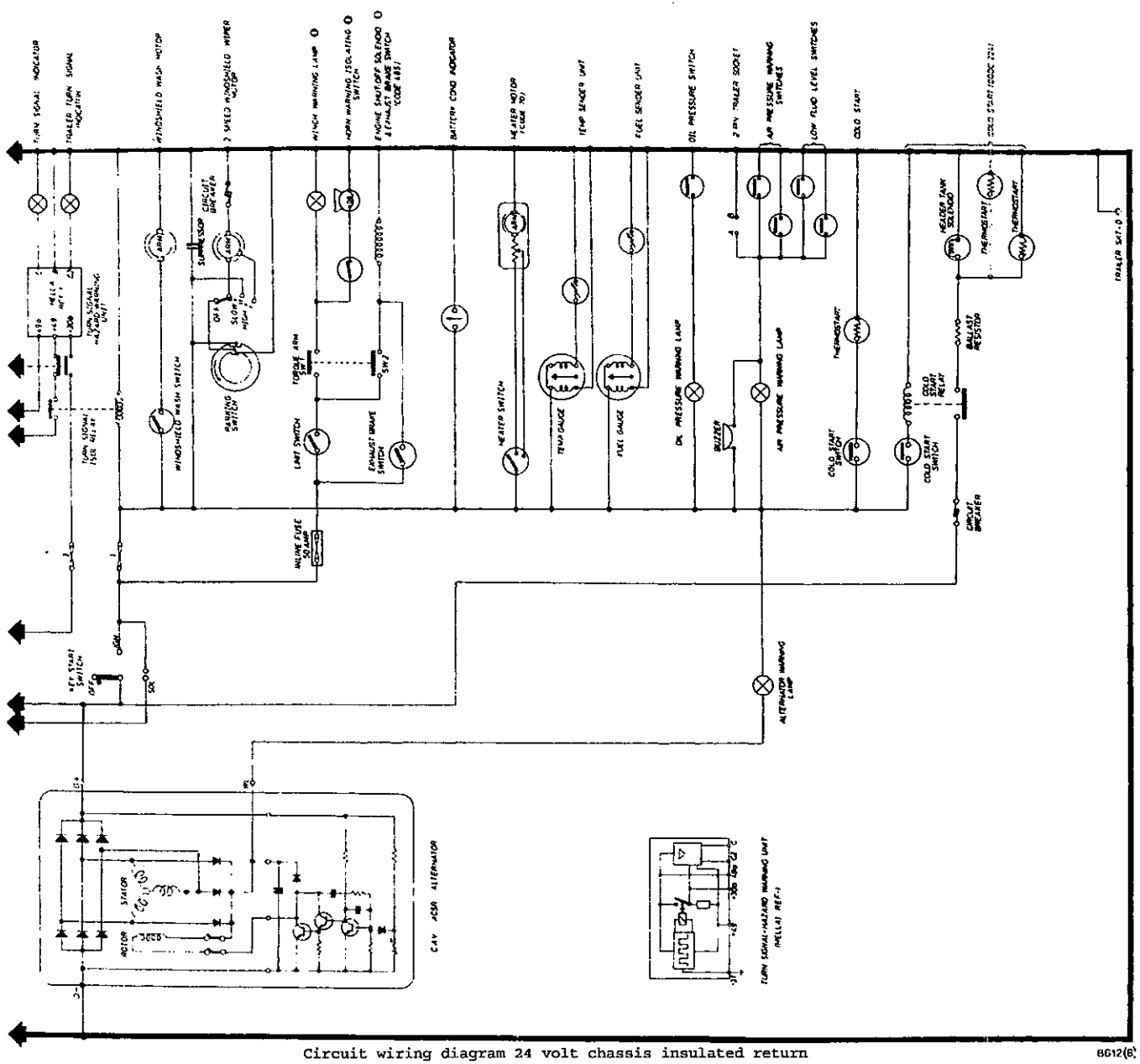


Fig 63(B)

Circuit wiring diagram 24 volt chassis insulated return

8612(B)

Fig 63(B)

FITTED FOR RADIO (FFR) VEHICLES

173FFR vehicles are fitted with a Lucas CAV AB 172R (16 Mk 1) alternator. The following paragraphs detail the removal and installation procedures for these alternators.

Removal

174Disconnect a battery terminal.

175Remove the double passenger seat assembly by withdrawing the two screws securing the back of the seat to the cab back panel, withdrawing the two bolts securing the seat frame to the seat riser panel and withdrawing the two clamps retaining the seat frame to the engine cover panel.

176Remove the gearshift gaiter from the engine cover panel, disconnect the harness from the rear of the ignition switch, and disconnect the idle control cable from the fuel injection pump.

177Remove the bolts securing the engine cover panel to the cab floor panel and withdraw the engine cover panel.

178Loosen the alternator pivot mounting bolt and the alternator adjuster pivot lock nut. Wind the alternator adjuster pivot until the fan belts can be removed.

179Remove the fan belts.

180Remove the electrical connections from the rear of the alternator taking note of the relative positions to assist in reassembly.

181Remove the split pin securing the alternator adjuster clevis pin and withdraw the clevis pin from the alternator mounting bracket.

182Support the weight of the alternator and withdraw the alternator pivot mounting bolt.

183Withdraw the alternator assembly from the engine compartment.

184Remove the nut holding the adjuster rod to the alternator adjuster pivot and withdraw the rod.

185Remove the nut, lockwasher and plain washer securing the adjuster pivot to the alternator and drift the adjuster pivot out of the lug in the alternator complete with its bush.

Installation

186Installation is a reversal of removal.

Chapter 16

CAB AND FITTINGS

CONTENTS

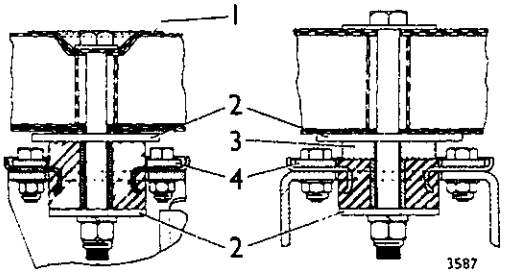
CONTENTS (continued)

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Tool No (where applicable)	NSN/Part No (where applicable)	Designation
D 1021		Window regulator handle remover
UM9		Hog ring pliers
28321		Filler strip installer

CAB MOUNTINGS

1 The cab is mounted on rubber insulated mountings, two at the front and two at the rear. The mounting on the left is used at the front only. The mounting on the right, together with distance washer (3), is used at the rear. Each mounting is secured to the chassis frame bracket by two bolts, self-locking nuts and internal toothed lock washers. A reinforcement plate (4) is assembled on the flange of the mounting and a plain washer (2) at the top and bottom. Reinforcements (1) are clamped in the recesses in the cab floor by the front mounting bolts.



1. Reinforcements 2. Plain washer
3. Distance washer 4. Reinforcement plate

Fig 1 Arrangement of cab mountings

Removal

2 To remove a mounting, cab must be raised to enable mounting to be lifted out of mounting bracket. Ensure that all components, including steering shaft coupling, which will prevent cab being raised sufficiently, are disconnected or removed.

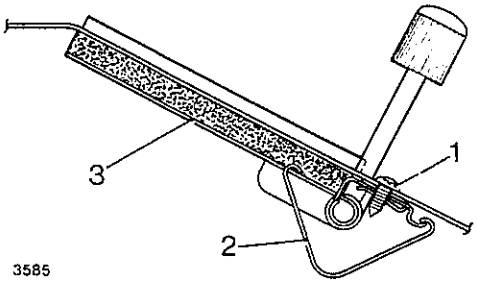
Installation

3 Install the mountings, reinforcing plate, bolts and washers as shown in Fig 1.

4 Re-connect the steering shaft coupling so that the steering wheel is correctly aligned with road wheels. Install bolts with their heads uppermost and tighten the nuts until four threads project through.

CAB VENTILATOR

5 The ventilator is secured to the cab floor by three screws (1) and speed nuts. A spring plate (2) retains the flap valve (3) in the closed and open positions.



plate

Fig 2 Cab floor ventilator

Removal

6 Ventilator attaching screws are enclosed by the heater casing and to gain access to screws, heater must be removed.

7 Ventilator can then be removed after pulling rubber pad from operating lever, removing attaching screws and lowering ventilator while easing lever through grommet in floor panel.

HEATER WATER VALVE

WARNING ...

CARE MUST BE TAKEN WHEN DRAINING THE COOLING SYSTEM AS THE WATER CAN BE HOT ENOUGH TO CAUSE BURNS, THEREFORE SUITABLE PRECAUTIONS MUST BE TAKEN.

8 The water valve is mounted over the heater radiator outlet pipe and secured to the heater by two nuts. The valve operating lever is connected to the control lever by a link rod and nipple.

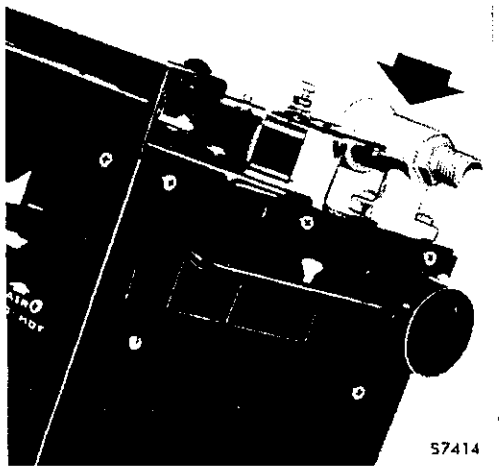


Fig 3 Heater water valve location

Removal

9 Before removing valve attaching nuts set control lever in 'HOT' (right hand) position and drain engine cooling system.

10 To prevent distortion of heater casing, hold water valve with a wrench before loosening pipe union nut.

11 After disconnecting link rod, remove nipple from valve operating lever and withdraw valve and sealing ring.

12 The water valve is a sealed unit and is serviced only as an assembly.

Installation

13 Before installing water valve, place a new sealing ring over radiator outlet pipe.

14 Before tightening screw in nipple to secure link rod, set control lever in 'COLD' position and valve operating lever in the closed position (towards valve).

15 When refilling engine cooling system, set water valve control lever in the 'HOT' position.

16 Run engine at a fast idling speed for five minutes to ensure full circulation of coolant through heater radiator before topping-up cooling system.

HEATER MOTOR SWITCH

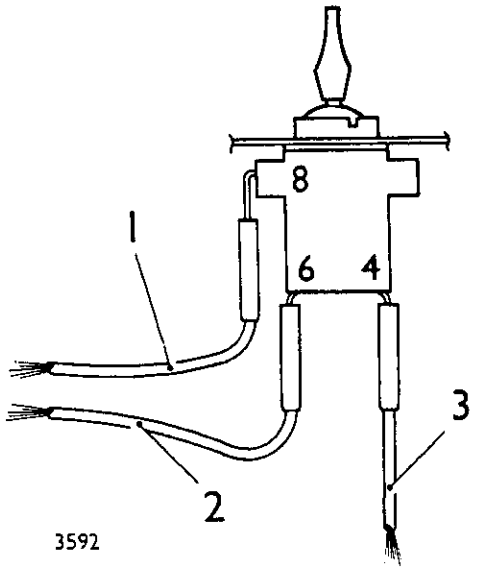
Removal

17 Unscrew switch retaining nut then ease switch clear of heater and detach wires from switch terminals.

Installation

18 Switch terminals are marked '4', '6' and '8'. White feed wire (3) must be connected to terminal '4', black white wire (2) to terminal '6' and white wire (1) to terminal '8'.

19 Before installing switch, place a wave washer over switch spigot.



1. White wire
2. Black/white wire
3. White feed wire

Fig 4 Heater motor switch

HEATER ASSEMBLY

WARNING ...

CARE MUST BE TAKEN WHEN DRAINING THE COOLING SYSTEM AS THE WATER CAN BE HOT ENOUGH TO CAUSE BURNS, THEREFORE SUITABLE PRECAUTIONS MUST BE TAKEN.

Removal

20 Before removing heater, set water valve control lever in 'HOT' (right-hand) position and drain engine cooling system.

21 Heater can be removed as an assembly after disconnecting white freed wire from heater switch, water pipes and demist hoses from heater and removing screws from holes (arrowed) in base of casing.

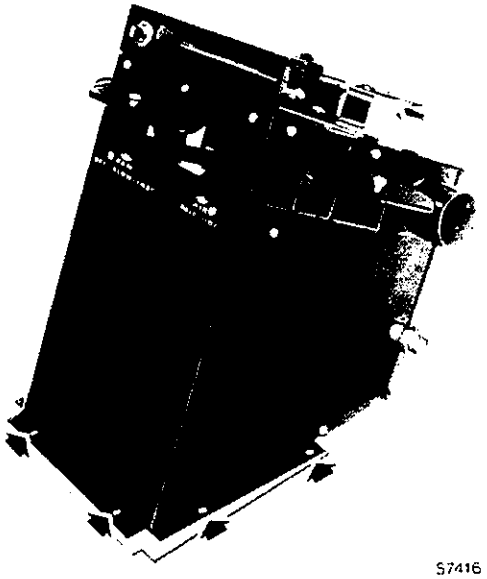


Fig 5 Heater assembly

CAUTION ...

When releasing or tightening water pipe union nuts, water valve and heater radiator inlet pipe adaptor should be held with a wrench to prevent distortion of the casing or pipe.

Installation

22 Ensure that seal is correctly positioned on base of heater casing. If a new seal is required, it should be cemented to casing.

23 Refill engine cooling system, as described in para 15.

HEATER FAN MOTOR

24 The heater motor is riveted to a mounting plate which is attached to the casing by screws.

Removal

25 To gain access to screws, heater must be removed as described in para 20.

26 Before motor mounting plate can be withdrawn, water valve and sealing ring must be removed, and black ground wire disconnected from casing.

27 To remove fan, ease spring collar from fan boss and pull fan off motor spindle.

28 When removing rivets securing motor to mounting plate, do not damage spacers surrounding rivet stems. Before motor can be removed motor wire must be unsoldered from resistor.

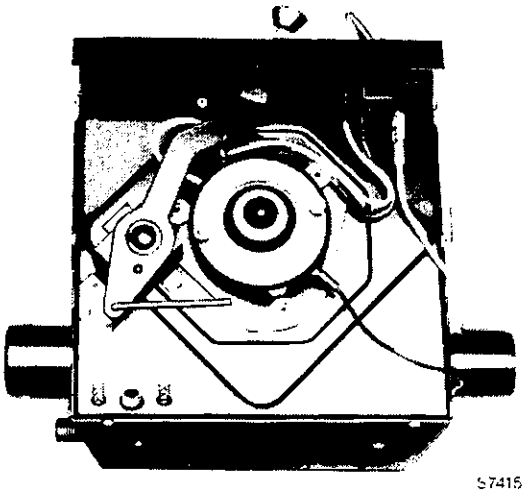


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Fig 6 Heater motor location

Installation

29 If motor is to be renewed, spacers and rubber bushes should be removed from flange of motor.

30 When installing motor, position it so that white motor wire is adjacent to grommet in mounting plate. A plain washer must be placed over each rubber bush and spacer before setting rivet to secure motor.

31 White motor wire should be soldered, together with white switch wire, to resistor terminal.

32 With spring collar in position on fan boss, push fan on to motor spindle until dimension 'A' (from end of spindle to end face of fan boss), is 4.57 mm (0.18 in.)

Fig 7 Fan to spindle dimension

33 After assembling mounting plate in heater case, remove closing panel (1) and check clearance between rim of fan (3) and raised inner edge of cut-off plate (2). If clearance is less than 0.64 mm (0.025 in.) or more than 1.90 mm (0.075 in.) fan must be repositioned accordingly on motor spindle.

34 Assemble water valve and install heater as previously described in para 22.

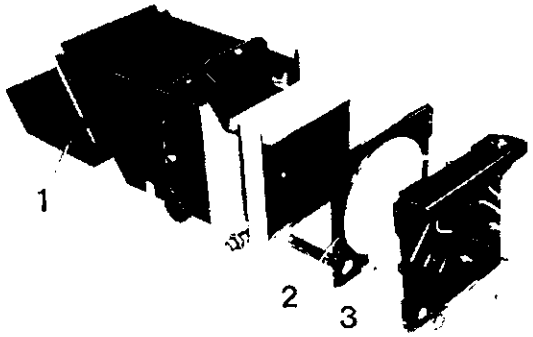


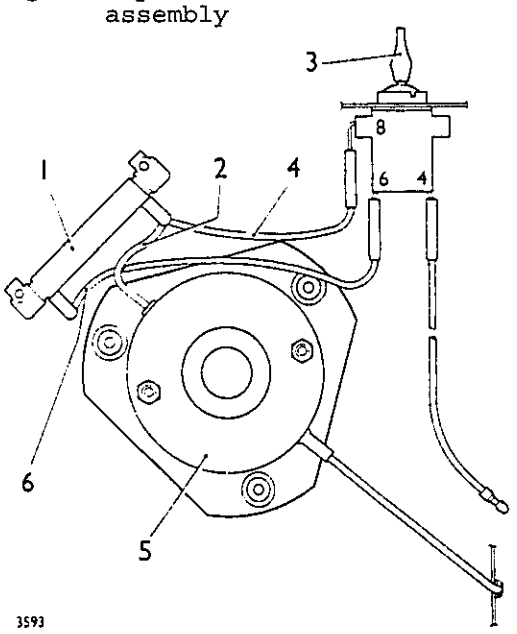
Fig 8 Exploded view of heater assembly

HEATER MOTOR RESISTOR

35 The resistor (1) is attached to the underside of the motor mounting plate by pop rivets, and is connected to the heater motor (5) and two-way switch (3).

36 When installing resistor, ensure that terminal tags are towards motor. Black white wire (6) must be soldered to terminal tag furthest from switch, and white wire (2) from motor together with white wire (4) from switch to second tag.

37 Assemble motor mounting plate and water valve, and install heater as previously described in para 22.



1. Resistor
2. White wire
3. Two-way switch
4. White wire
5. Heater motor
6. Black/white wire

Fig 9 Heater resistor connections

HEATER RADIATOR

38 The heater radiator can be withdrawn from casing after removing heater and withdrawing motor mounting plate, cut-off plate and closing panel from casing.

39 The efficiency of the radiator can be checked by comparing the water flow through it with that of a new radiator. Reduced flow may be rectified by reverse flushing or the use of chemical cleaners.

40 If new sealing strips are required, they should be cemented around edges of radiator.

41 Before installing radiator, place new sponge sealing rings over radiator inlet and outlet pipes.

42 Assemble motor mounting plate and water valve, and install heater as previously described in para 22.

DOOR TRIM PADS AND INSIDE HANDLES

43 The door trim pad is attached to the door inner panel by plastic fasteners which are located in slotted holes in the trim panel.

Removal

44 Trim pad can be removed by releasing fasteners from inner panel with a thin blade, after removing door pull, window regulator handle and door lock handle.

45 To remove door regulator handle, insert Remover D1021 between handle and wearing disc in line with arm of handle and push remover to disengage retainer spring from recess in handle spindle.

46 The door water deflector and trim insert is secured to the inner panel by adhesive.

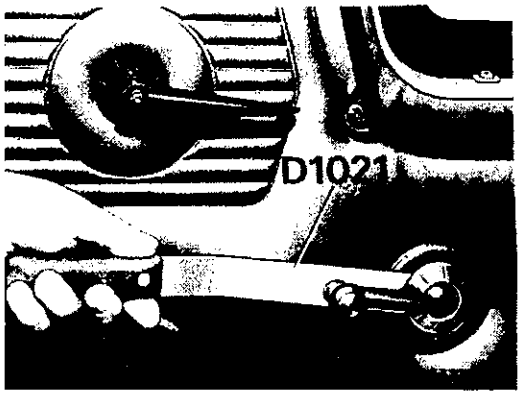


Fig 10 Regulator handle removal

Installation

47 When installing, apply adhesive to mating surfaces of water deflector or insert and inner panel and press firmly into position when adhesive has become tacky.

48 After installing trim pad, place a wearing disc over boss of each inside handle. Ensure that regulator handle retainer spring is seating correctly in handle boss then, with window closed and handle positioned with its arm facing downwards, press handle firmly on to spindle.

49 Door lock remote control handle should be installed with its arm facing forward.

50 Door pull should be installed with its straighter side facing forward.

DOOR WINDOW GLASS REGULATORS

51 Before releasing regulator from door inner panel, lower window to its fully open position.

Removal

52 Remove regulator fixing bolts and slide regulator arm off guide of window lift channel. Raise window glass and wedge it in the closed position.

53 With regulator lowered to bottom of door, push arm of regulator upwards until it is clear of no draught ventilator channel then guide the arm between ventilator channel and door outer panel and withdraw regulator through door inner panel lower aperture.

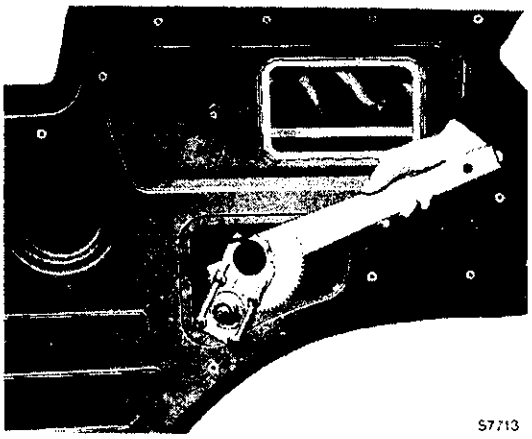


Fig 11 Window regulator removal

Installation

54 Before installing, smear bearing surfaces of regulator and window lift guide channel with high melting point grease.

DOOR LOCKS, STRIKERS AND OUTSIDE HANDLES

55 The door lock is bolted to the door shut face and incorporates the remote control and interior locking button. The fork of the lock engages a striker attached to the cab lock pillar.

56 The door outside handle is bolted to the door outer panel and has a plunger type release button.

57 Before releasing door lock, remove window glass regulator as described in para 52 and wedge glass in the closed position.

Removal

58 After removing water deflector from main aperture in inner panel, remove two screws (arrowed) and withdraw window glass rear run channel retainer.

Fig 12 Rear run channel fixings

59 Door outside handle is secured by two nuts and washers. After removing these, withdraw handle. Door lock and remote control can then be withdrawn through main aperture in door panel.

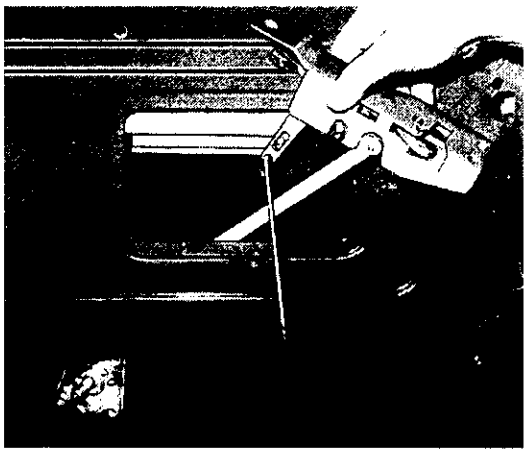


Fig 13 Door lock and remote control removal

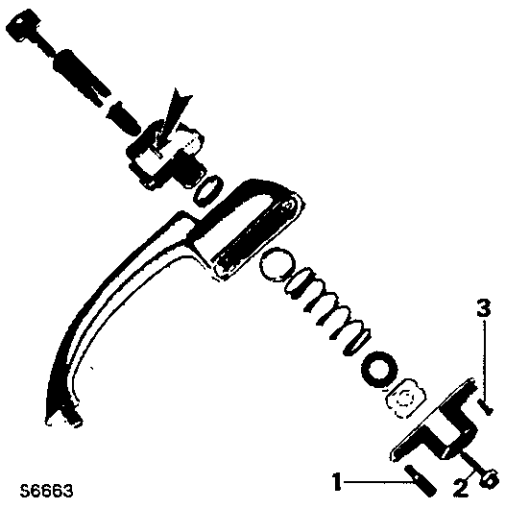
Installation

CAUTION ...

> When installing lock barrel, lubricate internal surfaces of barrel wards with a non-greasy lubricant or dry graphite. The use of machine oil could result in damage to lock caused by grit or fluff adhering to the lock wards.

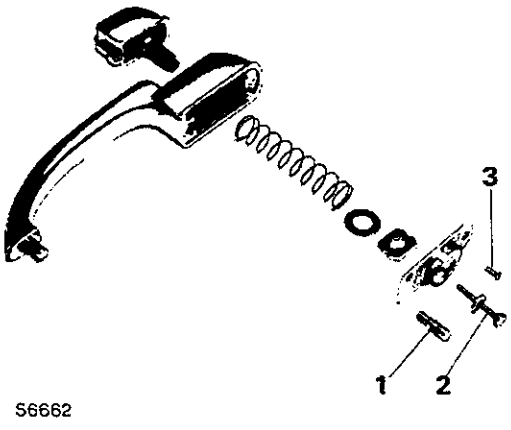
60 Before installing door lock, smear bearing surfaces of lock and remote control with high melting point grease.

61 Before tightening remote control screws adjust control to minimize amount of slackness between control and lock levers.



1. Stud 2. Bolt 3. Screw

Fig 14 Drivers door handle



1. Stud 2. Bolt 3. Screw

Fig 15 Passenger door handle

62 Both the left-hand and right-hand door outside handles incorporate a push button but only the handle on the driver's side (left) has a lock barrel, which is situated in the button. To release push button from handle, remove stud (1), bolt (2) and screw (3). Lock barrel can then be withdrawn from push button after removing pin (arrowed).

63 Before installing door outside handle, ensure that dimension 'A' (from mounting face of handle to end of push button bolt) is 22.86 mm (0.90 in.) on handle with a lock barrel (left) or handle without a lock barrel (right).

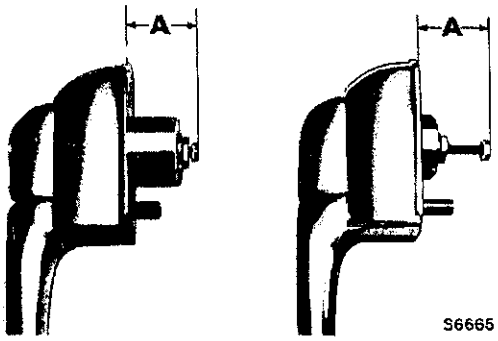


Fig 16 Push button bolt dimension

64 The door lock striker and dovetail reception bracket can be adjusted up and down or sideways by slackening the attaching screws and moving the bracket or striker to the required position. The striker can also be adjusted forwards or backwards by varying the number of adjusting plates assembled behind the striker.

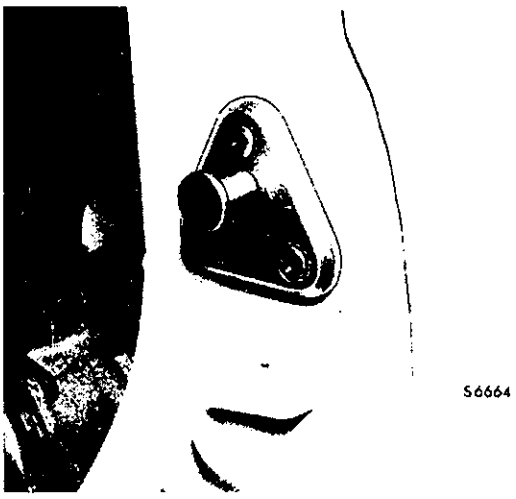


Fig 17 Door lock striker

DOOR VENTILATORS

65 Each door incorporates a pivoting no-draught window. The power pivot has an adjustable friction control which maintains the window in any set position. A handle locks the window when closed.

66 The door lower inner draught strip is attached to the door inner panel by spring clips. Clips can be released from panel after removing window surround moulding.

67 To allow division channel to be withdrawn, window regulator must first be removed and glass lowered to bottom of door.

Removal

68 After removing screws (arrowed) push ventilator inwards at the top and then pull upwards to withdraw.

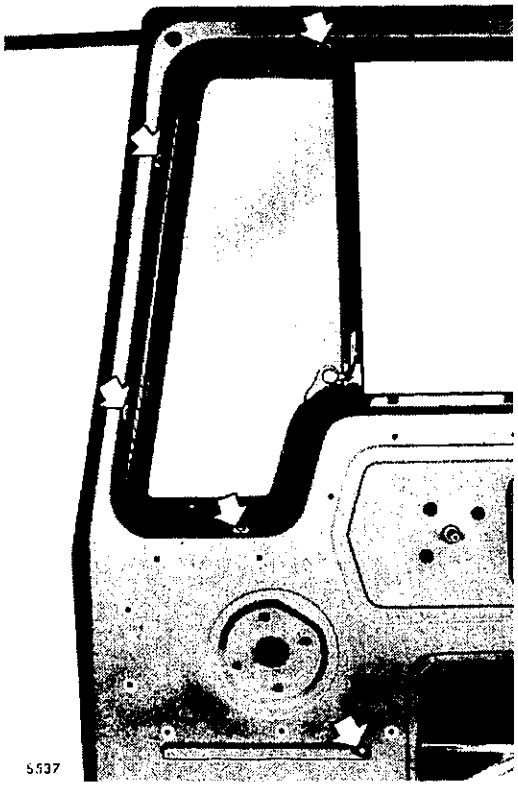


Fig 18 No-draught ventilator fixing screws

Disassembly

69 To remove glass assembly from ventilator frame, release friction control and remove the mounting bracket, then push glass assembly downwards while easing upper pivot clear of ventilator frame.

70 Ventilator locking handle can be removed after driving out retaining pin. Note that one end of pin is splined and it should be driven out from plain end.

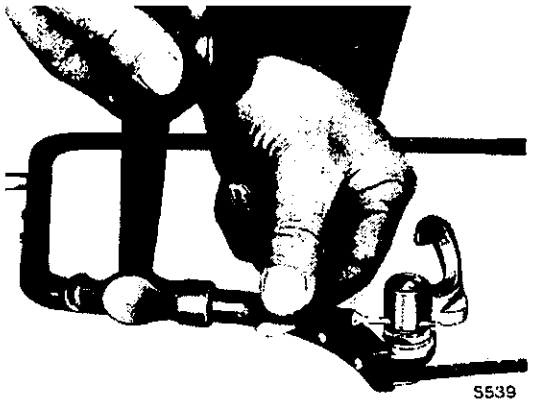


Fig 19 Locking handle removal

71 The ventilator glass channel is in two sections held together by screws. The rear section can be withdrawn after removing two screws and the locking handle stud.

72 To remove front section, gently prise ends of channel outwards and withdraw glass and filler strip.

73 The ventilator division channel weatherstrip is secured to the channel by rivets which can be drilled out after removing the glass run channel and retaining clips from the division channel.

74 The ventilator frame weatherstrip is a push-fit and can be released by easing it away from the frame once the division channel weatherstrip has been removed.

Reassembly and Installation

75 The ventilator frame weatherstrip is moulded to the shape of the frame. When installing, ensure that holes in weatherstrip are in alignment with hole at top and bottom of frame.

76 When installing division channel weatherstrip ensure that heads of rivets are towards inner face of channel.

77 Before installing glass run channel, assemble retaining clips to channel then press this channel into division channel.

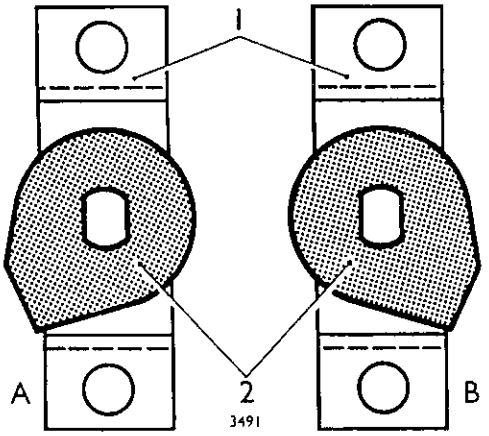
78 When assembling ventilator glass to channel, rest polished edge of glass on a flat protected surface and place filler strip over glass before tapping channel into position.

79 Before installing locking handle stud, cut two holes in filler strip using channel rear section bracket as a guide. Stud must be positioned so that its flat side is in line with adjacent edge of channel.

80 After trimming off surplus filler strip projecting above edges of channel, seal ends of channel with sealing compound.

81 When installing locking handle, smear bearing surfaces of handle and stud with high melting point grease and drive in retaining pin plain end first.

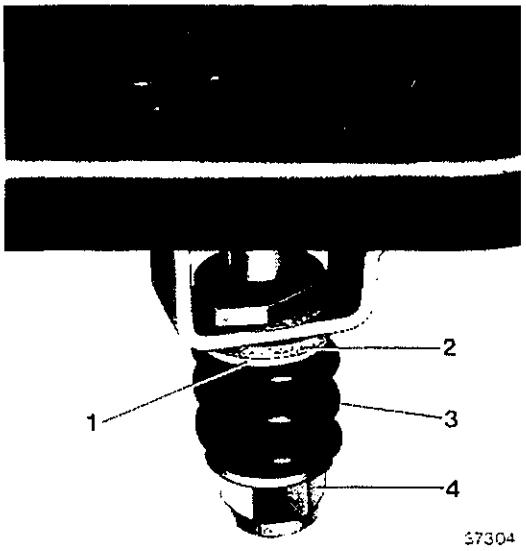
82 Before installing ventilator lower stop bracket (1) place ventilator stop (2) and a friction washer over pivot spindle. Stop must be positioned so that its highest point on left hand 'A' or right hand 'B' ventilator is towards the rear and outer side of ventilator.



1. Lower stop bracket
2. Ventilator stop

Fig 20 Lower stop positioning

83 To complete assembly of ventilator friction control, assemble friction washer (2), plain washer (1), spring (3), plain washer and nut (4). These parts should not be lubricated, but the nut should be tightened sufficiently to prevent ventilator closing by wind pressure when vehicle is in motion.



1. Plain washer
2. Friction washer
3. Spring
4. Nut

Fig 21 Ventilator friction control

84 When installing ventilator, lower division channel into door working from inner side of door and position ventilator division channel on door window glass, then push ventilator into position using an awl to lift lip of ventilator frame weatherstrip over flange of door frame.

85 Before finally tightening division channel lower attaching screw, adjust channel forwards or rearwards to give free operation of window glass without excessive side movement.

Removal

86 Door window glass can be withdrawn after removing door ventilator.

87 When removing a window lift channel carefully tap off channel by sliding a hammer along glass and against edge of channel. If glass is to be used again ensure that hammer is free from burrs otherwise glass may be scratched.

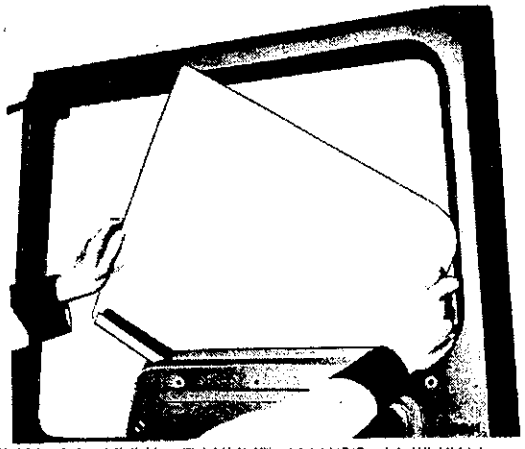


Fig 22 Door window glass removal

88 Where a broken glass is being renewed, ensure that all glass fragments are removed from inside the door otherwise drain slot (arrowed) may become obstructed.

Fig 23 Door drain slot

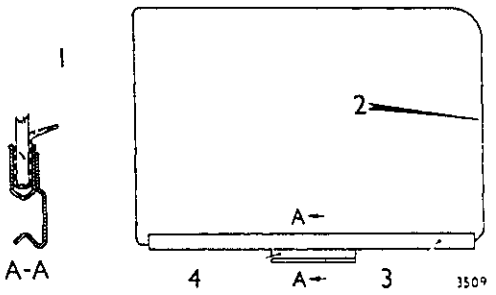
Installation

89 Window lift channel (3) must be installed on unpolished edge of glass so that open side of guide channel (4) is towards inner face of glass. Rear of glass (2) can be identified by its chamfered and curved corners. Section A-A indicates assembly of right-hand window.

90 Window lift channel weatherstrip must be positioned with its lip (1) towards outer face of glass.

91 If any surplus rubber is protruding on inner side of channel, this should be cut away at edge of channel.

92 Before installing window glass, smear guide channel with high melting point grease.



1. Weatherstrip lip
2. Rear of glass
3. Lift channel
4. Guide channel

Fig 24 Window lift channel installation

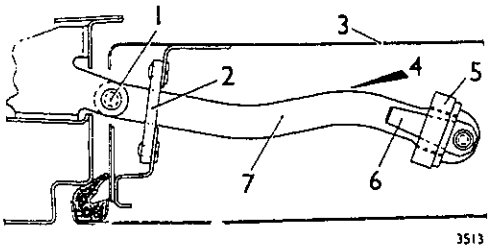
DOOR CHECK LINKS

Removal

93 Check link can be withdrawn through -door inner panel lower aperture after removing rivet securing check link to hinge pillar.

Installation

94 Before installing check link (7) ensure that insulator (5) is in position. When installed, set (4) in link must be nearest to door inner panel (3). Before setting rivet (1) check that spring plates (6) override hold-open clip (2) with door in open position.



2. Hold-open clip
3. Door inner panel
4. Set
5. Insulator
6. Spring plates
7. Check link

Fig 25 Door check link

DOOR WEATHERSTRIPS

Removal

95 Weatherstrip can be released from door by easing it away with a broad-bladed knife, but before weatherstrip can be removed from forward edge of door, check link attaching rivet must be removed.

Installation

96 When installing weatherstrip, coat mating surfaces of weatherstrip and door channel with adhesive and allow adhesive to become tacky, then install weatherstrip, starting at each corner in turn.

97 Ensure that weatherstrip is correctly positioned above drain slot (arrowed) at bottom of door inner panel.

98 After installing a weather-strip, if undue force is required to close the door, adjust lock striker as described in para 64.

Fig 26 Door drain slot

DOORS AND HINGES

99 The door can be removed after disconnecting door check link from cab pillar and driving out hinge pins.

100To prevent check link falling into door, a spare bolt should be placed in eye of link.

101Hinge pins should be smeared with high melting point grease and installed with their heads uppermost.

102Adjustment of the door in the up or down, and forward or rearward positions is provided by clearance holes in the cab panel, and the use of caged anchor plates at the hinge attaching points in the hinge pillar. To realign, loosen bolts securing hinges to hinge pillar and move door as required.

103When checking alignment of door, first loosen dovetail reception bracket attaching screws and push bracket towards inside edge of cab pillar to allow door to hang freely on its hinges.

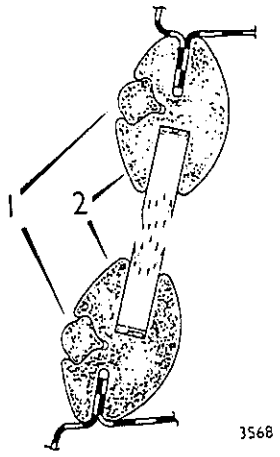
When re-positioning dovetail reception bracket and lock striker, refer to para 64.

WINDSHIELD GLASS

WARNING ...

DO NOT BUMP OR USE UNDUE FORCE IF THE GLASS IS TO BE USED AGAIN AS THIS COULD RESULT IN THE GLASS BECOMING FRACTURED.

104The glass is mounted in its aperture by a rubber weatherstrip (2) which is slotted for attachment to the cab. A filler strip (1) inserted in the forward side tightens the weatherstrip against the glass.



1. Filler strip
2. Rubber weatherstrip

Fig 27 Windshield weatherstrip

Removal

105Remove the windshield wiper arms and blades.

106Ease inside lip of glazing channel over aperture flange along top and sides of windshield (this can be achieved using a broad blade tool and placing a finger on the glass to cushion the tool should it slip).

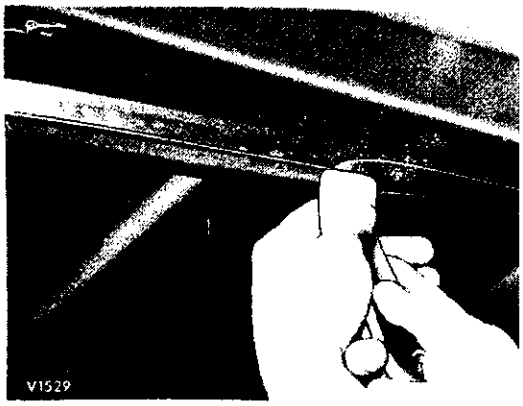


Fig 28 Windshield glass removal

107Support windshield on the outside and with even hand pressure, carefully push windshield out from inside the cab. If the windshield is difficult to remove, it is recommended the outer lip of the weatherstrip in contact with the glass, is cut sufficiently to allow the glass to be withdrawn.

108Where glass is removed in order to correct water leaks or for replacement due to breakage, it is important to check windshield aperture for distortion or damage.

108.1 For the purpose of inspection, the glass can be used as a template by supporting glass in aperture on short sections cut from a discarded weatherstrip (Fig 29). The spacing between edge of glass and aperture rebate must be uniform and the contour of aperture flange must compare favourably with that of the glass.

108.2 If necessary aperture and/or rebate must be re-formed to suit.

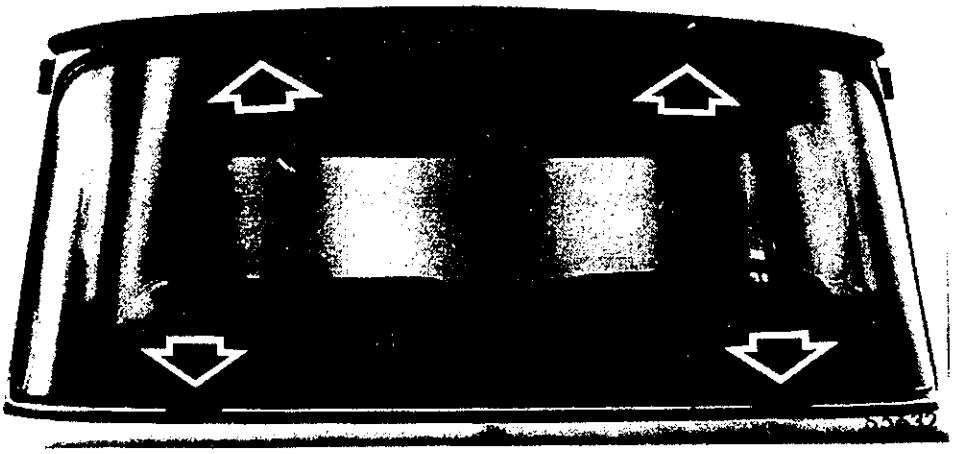


Fig 29 Windshield aperture check

Installation

109The weatherstrip should be installed on aperture flange with its groove facing forward after applying a bead of windshield sealing compound around aperture rebate at front of pinch-weld flange.

110The weatherstrip has four integral sections shaped to conform to the contour of the aperture.

111Ensure that these sections are correctly positioned at the corners.

112Before placing glass in position on weatherstrip, brush soap solution in filler strip groove of weatherstrip.

113Use a flat blunt tool to ease lip of weatherstrip over edge of glass starting at each lower corner and working towards centre of glass.

114When lower edge of glass is seated in groove of weatherstrip, ensure that glass is in centre of aperture before easing remainder of weatherstrip lip over sides and top of glass. To ensure that glass is centralized and settled, push the outside of the glass firmly with the palm of the hand, suitably protected by a glove.

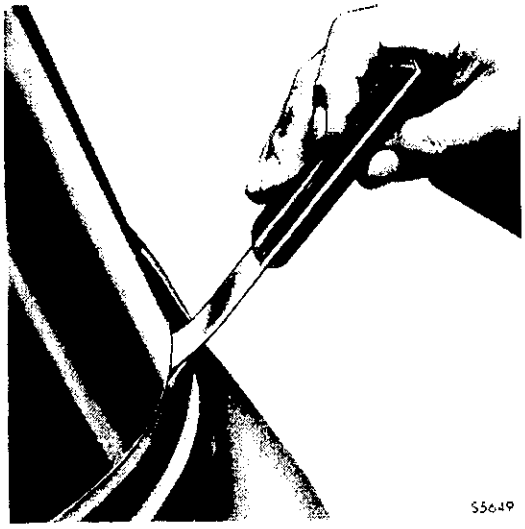


Fig 30 Windshield installation.

115A sealing gun should be used to inject windshield sealing compound between forward face of glass and weatherstrip (arrowed).

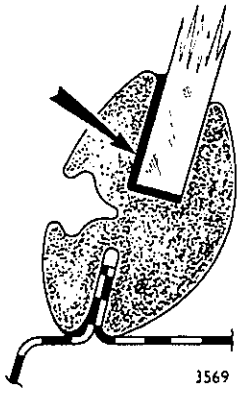


Fig 31 Sealing compound location

116To install a filler strip, thread one end through the eye of Installer Z8321 with curved side of filler towards handle of tool. Starting in centre at top of glass, push filler into groove of weatherstrip, then cut off surplus filler.

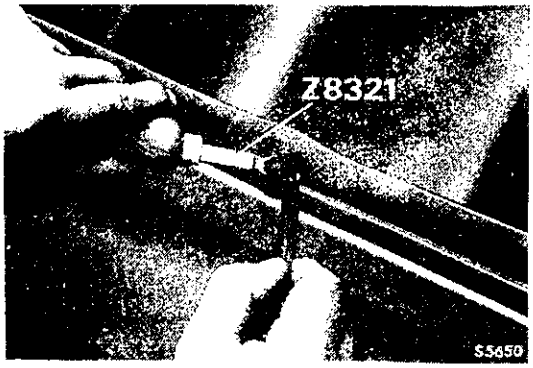


Fig 32 Filler strip installation

117When installing a rubber type filler strip, do not stretch it by pulling it along weatherstrip.

118When installing windshield wiper arms and blades, ensure that outer end of blade on passenger side is 38.1 mm (1.50 in.) from edge of weatherstrip in the extreme downward position and blade on driver's side is 50.8 mm (2.00 in.).

REAR AND QUARTER WINDOW GLASSES

119Both the rear window and quarter windows are of toughened glass mounted in rubber weatherstrips.

120Glass can be removed after removing filler strip from groove in weather-strip and pushing glass out from inside cab.

121The procedure for inspection and installation of the glasses is similar to that for the windshield except for the sealing operations which are not necessary.

SEATS

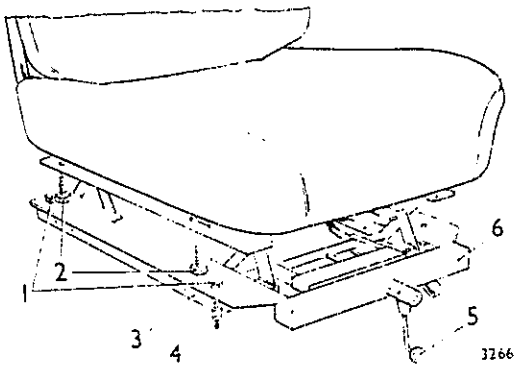
Removal

122The driver's seat or single passenger seat can be removed with or without seat adjuster frame (6). If the seat is to be released from the frame, rotate handle (5) to raise the mechanism and remove bolts (2).

123To release adjuster from seat slides (3), remove bolts (1).

124The seat slides are attached to the cab seat support by two nuts and studs (4) and two nuts and bolts at the rear.

125The passenger seat can be removed from support frame by releasing four fixing bolts.



1. Slide bolts
2. Cushion fixing bolts
3. Slide
4. Seat support bolts
5. Height adjuster
6. Adjuster frame

Fig 33 Drivers seat

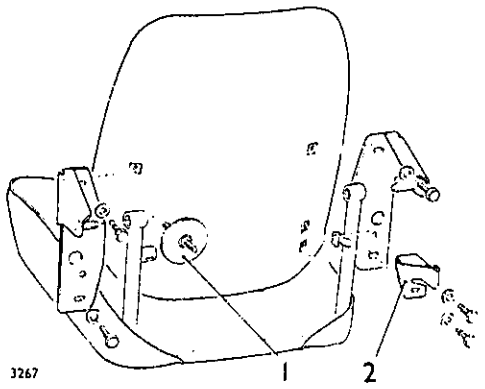
Installation

126When installing seat slides, smear a little grease on bearing surfaces of slides and ensure that they move freely. Wipe off excess lubricant and assemble slide and handle assembly on the left-hand side.

127Before installing seat adjuster, smear screwed shaft with high melting point grease and lubricate remaining friction surfaces with oil.

128To replace seat covers or padding, seats should be removed and the squab separated from the cushion.

129The squab of the driver's seat or single passenger seat can be removed from seat frame after removing stop bracket (2) and rotating squab rake adjusting wheel (1) until its screwed shaft is disengaged, and removing remaining bolts from mounting brackets.



1. Rake adjusting wheel
2. Stop bracket

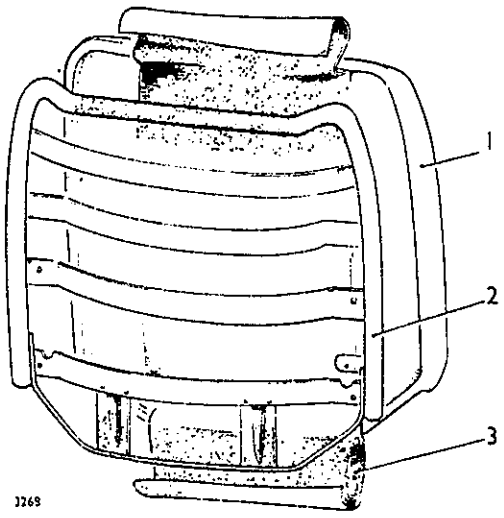
Fig 34 Driver's seat squab

130The squab padding (1) is shaped for location over the squab frame (2) and has two flaps (3) for attachment to the frame.

Installation

131When installing padding, attach it to the squab frame after applying trim adhesive over the shaded areas of the flaps and frame.

132Before installing squab cover, place a polythene envelope over upper end of squab padding to prevent padding being dragged out of position.



1. Padding
2. Squab frame
3. Attaching flaps

Fig 35 Squab padding

133Ease cover into position, then insert a trim rod into each trim pocket and secure the pockets together with seven hog rings with Pliers UM9 or similar.

134If a new squab cover has been installed, cut a 19 mm (0.76 in.) square hole in cover around each of the five squab fixing bolt holes.

135When installing squab rake adjusting wheel, ensure the left-hand threaded end of the shaft is screwed into the seat frame and that both ends of the shaft are stated simultaneously.

136The coil springs connecting the seat platform to the frame are of three different tensions. Each spring is coloured for identification and installed as follows: Orange (1), white (2) and grey (3).

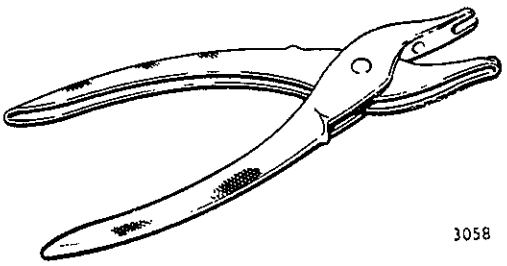
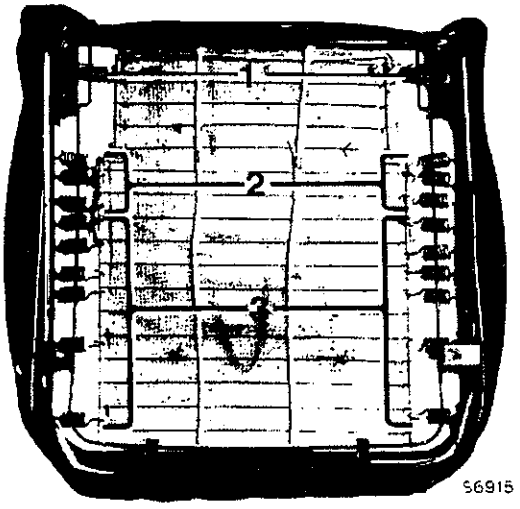


Fig 36 Hog ring pliers



1. Orange spring
2. White spring
3. Grey spring

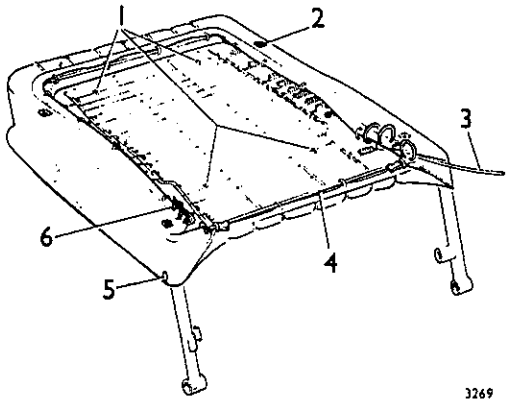
Fig 37 Seat platform

137When installing driver's seat or single passenger seat cushion padding, attach the hessian-covered side to spring unit with four hog rings (1).

138After placing cushion cover in position over padding, insert a trim rod in pocket and rear of cushion and secure to rear rail (4) with hog rings, using Pliers UM9. The seaming cord (3) should then be pulled taut and the front and side edges of cover secured to inner rail with hog rings. Ends of seaming cord should be folded back and secured with one hog ring (6) each side.

139The cover side panels should be secured to seat frame by a screw and washer (5) each side.

140If a new cushion cover has been installed cut a 19 mm (0.76 in.) square hole (2) in cover around each of the four seat fixing bolt holes.



1. Hog rings
2. Square hole
3. Seaming cord
4. Rear rail
5. Screw and washer
6. Hog ring

Fig 38 Seat cushion

CAB ROOF LINING

141The roof lining panel is a one-piece type shaped to the contour of the roof and secured by plastic rivets.

Removal

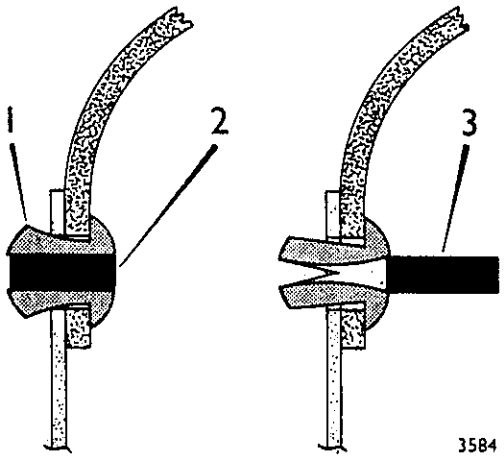
142Remove plastic rivets (1) by punching central pin (2) through rivet so that prongs of rivet can close up to allow rivet to be removed.

143After releasing rivet centre pin, use a thin blade inserted behind roof lining panel to prise out rivet.

Installation

144Position headlining to roof panel and align rivet retaining holes.

145When installing new rivet, the pin (Fig 39(3)) is an integral part of rivet and to facilitate installation, place on a solid base and lightly strike pin to force it a short way into rivet.



1. Rivet
2. Central pin
3. Pin

Fig 39 Headlining retaining rivet

Chapter 17

WINCH

CONTENTS

WARNINGS ...

(1) INDUSTRIAL GLOVES ARE TO BE WORN WHEN HANDLING THE WINCH ROPE. KEEP HANDS AND CLOTHING CLEAR OF THE WINCH AND FAIRLEADS WHEN THE WINCH IS IN OPERATION.

(2) ALL PERSONNEL NOT DIRECTLY INVOLVED IN THE WINCH TEST ARE TO REMAIN OUTSIDE THE WINCH TEST AREA.

WINCH TESTING

1 Before commencing test, check the following:

1.1 Free rotation of all fairleads, pulleys and rollers.

1.2 Winch brake operation and drum free spool after brake release.

1.3 Presence of rope run-out safety mark.

1.4 Check in cab the operation of the winch maximum torque warning light and the winch horn on/off switch.

2 Prepare the vehicle for testing as follows:

2.1 Position test vehicle, for rear pull, in a designated winch test area and secure vehicle by using the front tow eye and straight bar to a suitable anchor point.

2.2 With winch drive clutch disengaged, pull rope out to bottom layer, with red safety mark on rope showing at rear fairlead.

2.3 With engine speed at 1000 rev/min, engage winch and carry out a rope recovery pull, maintaining a light load on the rope, ensure rope pays onto winch drum correctly. Stop winch when rope is on sixth layer.

2.4 With rope midway on sixth layer attach winch rope, via a strain gauge, to a load vehicle (an MJP at GWV or similar weight vehicle is suitable) and locate read out instrumentation in load vehicle.

Note ...

The use of a fixed anchor point is not recommended as mechanical winches tend to "snatch" and difficulty will be experienced in obtaining reliable readings. Using a load vehicle and controlling the winch load being applied, by use of the load vehicles brakes, gives greater control and reduces the possibility of excessive force being applied above the winch and rope safe working load limits.

3 To verify the load at which the winch horn operates, proceed as follows:

3.1 With winch test vehicle engine speed set at 1000 rev/min engage winch and commence a pull.

3.2 Progressively apply a load to the winch applied through the brakes on the load vehicle, until a load of 34.9 to 41.8 kN is attained. The winch horn should operate.

3.3 Should the winch horn fail to operate within these settings care must be taken not to exceed a load of 51 kN.

3.4 Should adjustments be necessary then the above test must be repeated to ensure final setting is correct.

4 To verify the load at which the engine cut out operates, proceed as follows:

4.1 With test vehicle engine speed still set at 1000 rev/min engage winch and commence pull. Carefully apply load until a load of 42.8 to 51.8 kN is attained. The engine cutout should operate.

4.2 Care must be taken to ensure that the maximum setting is not exceeded should the cut out fail to operate.

4.3 Should adjustments be necessary then the above test must be repeated to ensure final setting is correct.

4.4 Remove winch rope and strain gauge equipment from load vehicle. 4.5 Release vehicle from anchor point.

5 Initial setting of switches is given in Para 11. If during the winch test, the warning horn and lamp, or engine cut-off, operates at a lower load than specified, adjusting screws must be turned anti-clockwise after first removing switch cover. Should the load to operate the switches be too high, turn adjusting screws clockwise. Ensure that adjusting screw locknuts are tightened before installing switch cover.

WINCH LOAD LIMITER CONTROL SWITCH (Fig 1)

CAUTION ...

At no time should the switch be located so plunger is fully depressed, otherwise switch and bracket can be damaged or it can prevent power take-off gear being fully engaged.

Adjustment

6 Slacken both switch bracket attaching screws. With the power take-off control lever in the disengaged position, adjust position of switch so contacts have parted.

Removal

7 Move power take-off control lever into engaged position. Disconnect both wires from switch terminals and remove both switch bracket attaching screws.

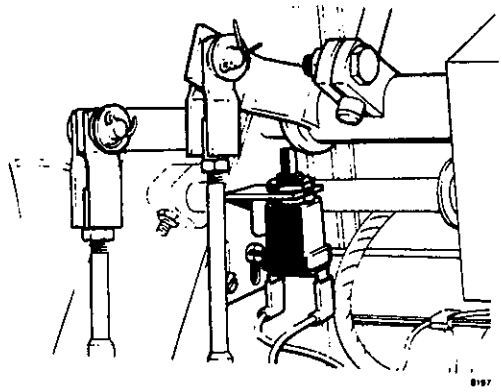


Fig 1 Winch load limiter control switch

Installation

8 After installing switch on transfer box control bracket, carry out adjustment procedure as described in Para 6. Both Wires are coloured white and can be connected to either terminal.

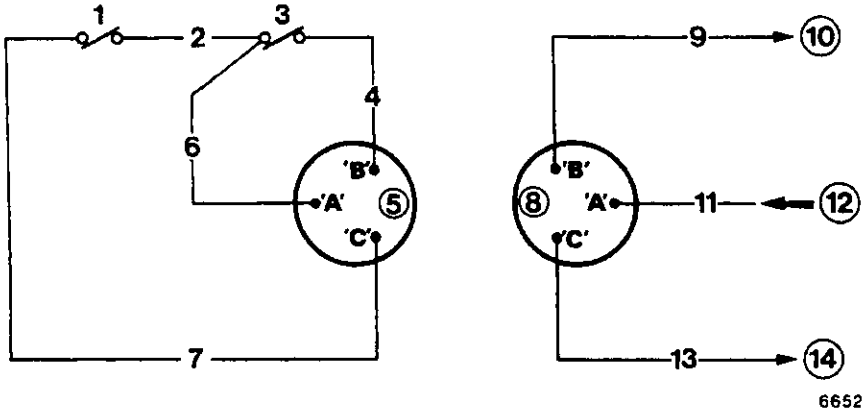
WINCH LOAD LIMITER

Removal

9 Remove four screws and detach switch cover.

10 Remove screws and nuts attaching switch to bracket, disconnect wires from switch terminals and withdraw switch.

Installation and initial setting



1	Engine cut-off switch	7	White/black	12	From power take-off engagement warning switch
2	White	8	Socket		
3	Warning horn/lamp switch	9	White/black		
4	White/green	10	To warning horn/lamp	13	White/green
5	Plug	11	White/blue	14	To engine cut-off solenoid
6	White				

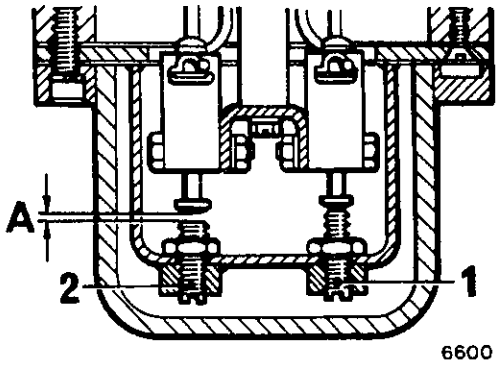
Fig 2 Wiring connections to winch load limiter

11 Connect wires to switches as shown above and carry out an initial switch setting as follows:

11.1 Release engine cut-off switch adjusting screw (2) locknut and turn screw to obtain a clearance of 0.56 mm (0.22 in.) dimension 'A'.

11.2 Release warning horn and lamp adjusting screw (1) locknut and turn screw until it just contacts switch plunger. A further half turn of screw clockwise will give the initial setting.

12 Carry out a practical test as detailed in Para 1 to obtain accurate load settings.



1 Warning horn/lamp switch adjusting screw
2 Engine cut-off switch adjusting screw

Fig 3 Initially setting load limiter switches

WINCH LOAD LIMITER WARNING HORN

13 For information on the winch load limiter warning horn, refer to horn in Chap 13.

WINCH LOAD LIMITER WARNING HORN ISOLATING SWITCH

Removal and Installation

14 Remove the push-on connectors from switch terminals.

15 Remove the switch retaining ring and withdraw switch from the rear of the tachometer bracket.

16 When installing the switch the wires can be connected to either terminal.

WINCH LOAD LIMITER WARNING LAMP

Removal and Installation

17 Disconnect the wires from harness.

18 The lamp, which is a push fit in the tachometer bracket, can be withdrawn from the front.

19 When installing the lamp, connect the wires to the corresponding wires in the harness.

20 To renew the bulb, spring the lens off the body. The bulb has a bayonet-type fixing.

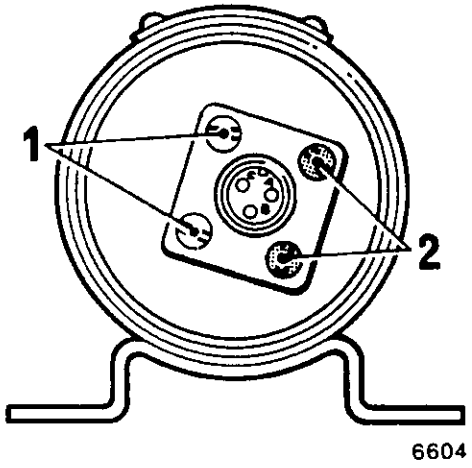
ENGINE CUT-OFF SOLENOID

Removal

21 Disconnect operating rod from relay lever, disconnect wiring socket, remove attaching bolts and withdraw solenoid.

Installation

22 Before installing solenoid, detach end cover by removing two screws (1) nearest to centre of solenoid. The other two screws (2) retain the wiring socket and not the cover.



1 End cover securing screws
2 Wiring socket securing screws

Fig 4 Removing engine cut-off solenoid end cover

WINCH BRAKE ADJUSTMENT

23 Turn the winch brake control lever (white) to the 'OFF' position.

24 Disengage the winch clutch by moving the clutch lever forward.

25 Slacken locknut and rotate adjusting stud until brake band is tight. Slacken adjusting stud one complete revolution and tighten locknut. Check that only slight resistance is felt when rotating winch drum by hand.

WINCH BRAKE OPERATING CYLINDER

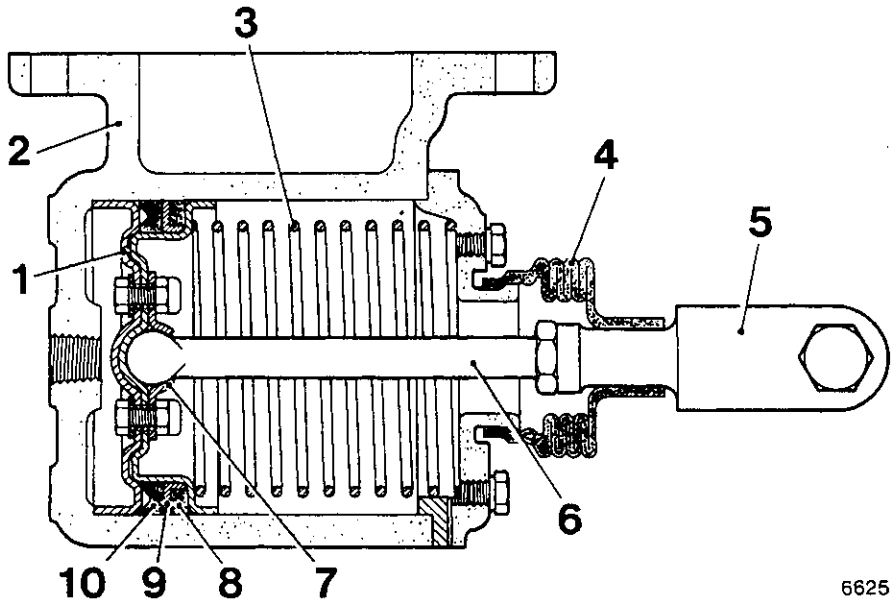
Removal

26 Turn the winch brake control lever (white) to the 'OFF' position (anti-clockwise).

27 Disconnect air pressure supply pipe.

28 Disconnect the brake lever clevis.

29 Remove the bolts securing the cylinder to the chassis frame.



1. Piston seal retainer
2. Cylinder
3. Piston return spring
4. Gaiter
5. Piston rod clevis
6. Piston rod
7. Piston rod retainer
8. Lubrication felt
9. Lubrication felt retainer
10. Piston seal

Fig 6 Sectional view of winch brake operating cylinder

Disassembly and Reassembly

30 Detach gaiter (4) from cover and pull back to allow clevis locknut to be slackened. Unscrew clevis (5) from piston rod (6) and remove gaiter.

31 Carefully remove end cover bolts while simultaneously pressing down on cover to overcome pressure exerted by the piston return spring (3). Remove spring and piston assembly from cylinder (2).

32 Remove nuts and bolts securing piston assembly and withdraw seal retainer (1), piston felt retainer (9) and lubrication felt (8).

33 On reassembly ensure that lip of seal is facing away from piston rod.

34 Before inserting piston assembly into cylinder, ensure that felt has been saturated with Clayton Dewandre power cylinder oil.

35 Ensure that external air filter is clean.

Installation

36 When installing the brake lever clevis pin, position spring washer on the outside of lever.

WINCH BRAKE CONTROL VALVE

Operating test

37 Connect pressure gauge to delivery port of hand control valve.

38 Charge the system to operating pressure.

39 Slowly move hand control to fully 'ON' position. The pressure registered on the test gauge should increase until it is the same as registered on secondary reservoir pressure gauge. If gauge pressures are not the same, the valve should be adjusted as follows:

39.1 Remove valve head (Fig 7(3)) and adjusting ring lock washer (4).

39.2 Rotate adjusting ring (5) clockwise to increase pressure or anti-clockwise to reduce pressure.

40 Turning the adjusting ring one notch will alter pressure by 0.3 bar (5 lbf/in^2).

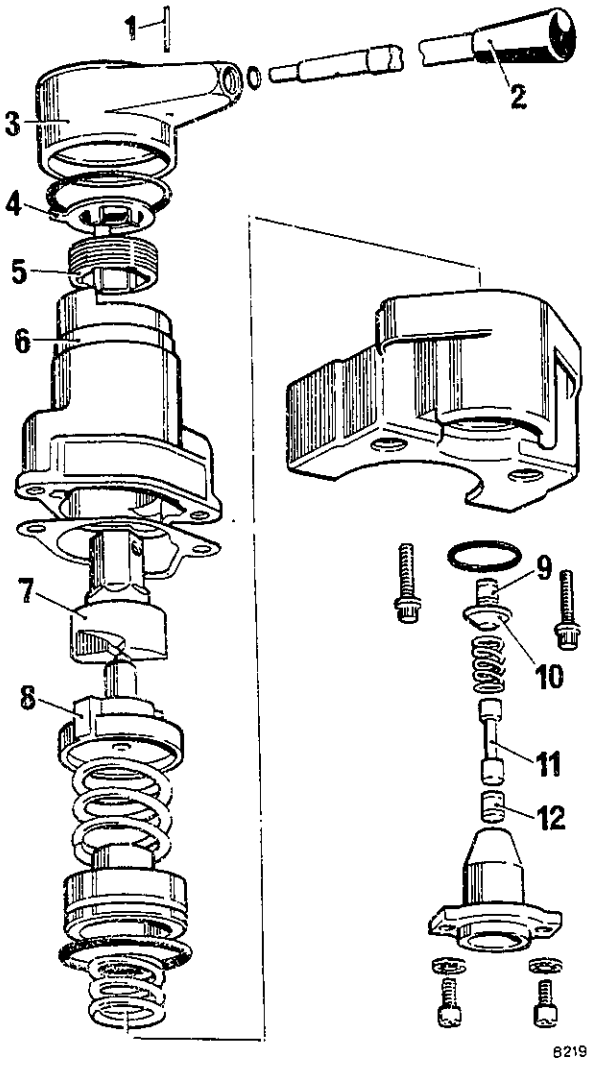
41 If after adjusting the valve, the required pressure is not obtainable, the valve is faulty.

Leakage test

42 Disconnect exhaust air line from exhaust port and charge system to operating pressure.

43 With control lever in the 'OFF' position, smear exhaust port with soap solution. Evidence of leakage at this point indicates defective inlet valve or seat.

44 With control lever in fully 'ON' position, again check for leakage from exhaust port. Air leakage in excess of a 25 mm (1.0 in.) soap bubble in five seconds will indicate a defective exhaust valve or seat, or a faulty piston sealing ring.



1. Spring pin
2. Control lever
3. Valve head
4. Adjusting ring lock washer
5. Adjusting ring
6. Cover
7. Cam follower
8. Cam
9. Exhaust valve
10. Exhaust valve guide
11. Valve stem
12. Inlet valve

Fig 7 Hand control valve

Removal

45 Release pressure from system and disconnect air lines from supply, delivery and exhaust ports on the valve.

46 Unscrew clamp bolts and withdraw valve.

Disassembly

47 Drive out spring pin (1) from the valve head and withdraw the control lever (2). Lift off valve head (3) and remove adjusting ring lock washer (4).

48 Remove the cover (6) from the body and withdraw cam follower (7). Unscrew adjusting ring (5).

49 Remove inlet/exhaust valve assembly from body.

50 Insert a rod into the inlet port to hold inlet valve (12) on its seat. Depress the exhaust valve guide (10) and remove rubber exhaust valve (9). Withdraw the stem from inlet valve seat and remove inlet valve.

Reassembly and Installation

51 Smear bore in body with recommended grease and screw adjusting ring into cover until the top of the ring is flush with top of threaded part of cover.

52 Lubricate cover bore, cam and follower with recommended grease.

53 Do not fit spring pin in control lever until valve has been adjusted.

54 Install control valve in the vehicle and carry out operating and leakage tests.

CABLE TENSIONER CONTROL VALVE

Removal

55 Release the pressure from air system condensing reservoir and disengage winch clutch by moving lever forward.

56 Disconnect air pressure supply pipes.

57 Remove screws and detach control valve from mounting bracket.

Installation

58 Following installation of control valve, check adjustment of clutch lever stop screw as follows:

58.1 The stop screw should be adjusted to contact clutch lever when in the engaged position.

CABLE TENSIONER OPERATING CYLINDER

Leakage test

59 Check cylinder for leakage by fully charging air system and with winch clutch lever in the payout position, smearing soap solution over vents in body.

60 Leakage indicates a faulty diaphragm.

Removal

61 Release pressure from air system condensing reservoir and disengage winch clutch by moving lever forward.

62 Disconnect air pressure supply pipe.

63 Disconnect tensioner pulley lever clevis.

64 Remove nuts securing cylinder sufficiently to unscrew clevis, then detach the cylinder from mounting bracket.

Disassembly and Inspection

65 Before removing clamp, mark position of body and cover in relation to clamp to ensure correct reassembly. Remove clamp and withdraw cover, diaphragm, bush plate and rod assembly and spring.

66 Inspect diaphragm for deterioration and spring for cracks and general condition.

Reassembly

67 Before assembling diaphragm, ensure bead and mating cover faces are clean and free from oil or grease.

68 Tighten clamp bolts evenly and recheck after diaphragm has been allowed to settle.

Installation

69 Install cylinder and adjust clevis so that dimension 'A' between cylinder rod and roller arm is 3 mm (0.125 in.)

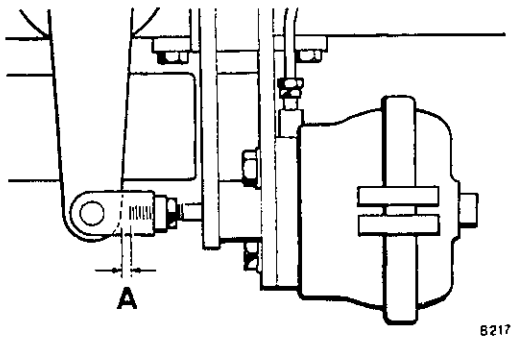


Fig 8 Cable tensioner setting

PAY ON GEAR

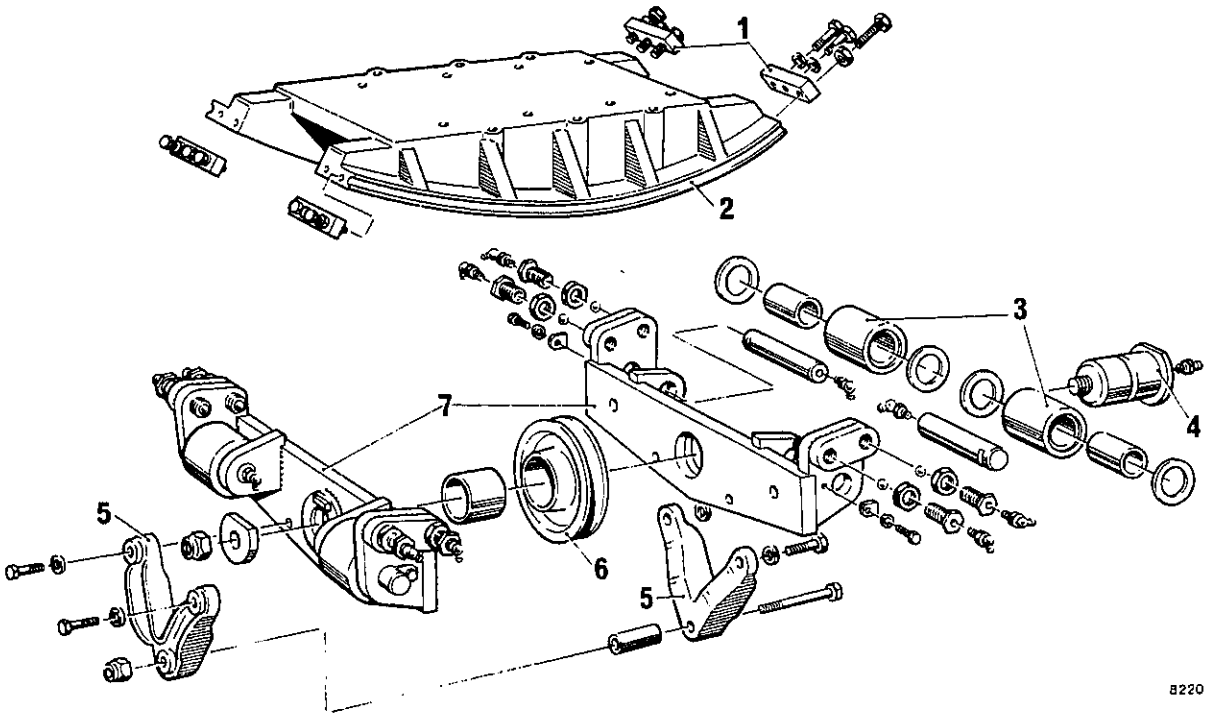
Adjustment

70 Adjust the trolley stop bolts so that centre of pulley groove is approximately 25 mm (1 in.) from the inside edge of drum flanges.

71 Pay out the cable until only a few coils remain on winch drum.

72 Keeping cable under tension, operate the winch.

73 During winding, the cable should automatically lay itself in between the two outer coils. If the cable builds up at drum flanges, adjust trolley stop bolts until it moves across drum. This adjustment must be carried out at both ends of drum.



1. Trolley stop
2. Track
3. Rollers
4. Pulley shaft
5. Cable guide
6. Pulley
7. Trolley

Fig 9 Pay-on gear

Removal

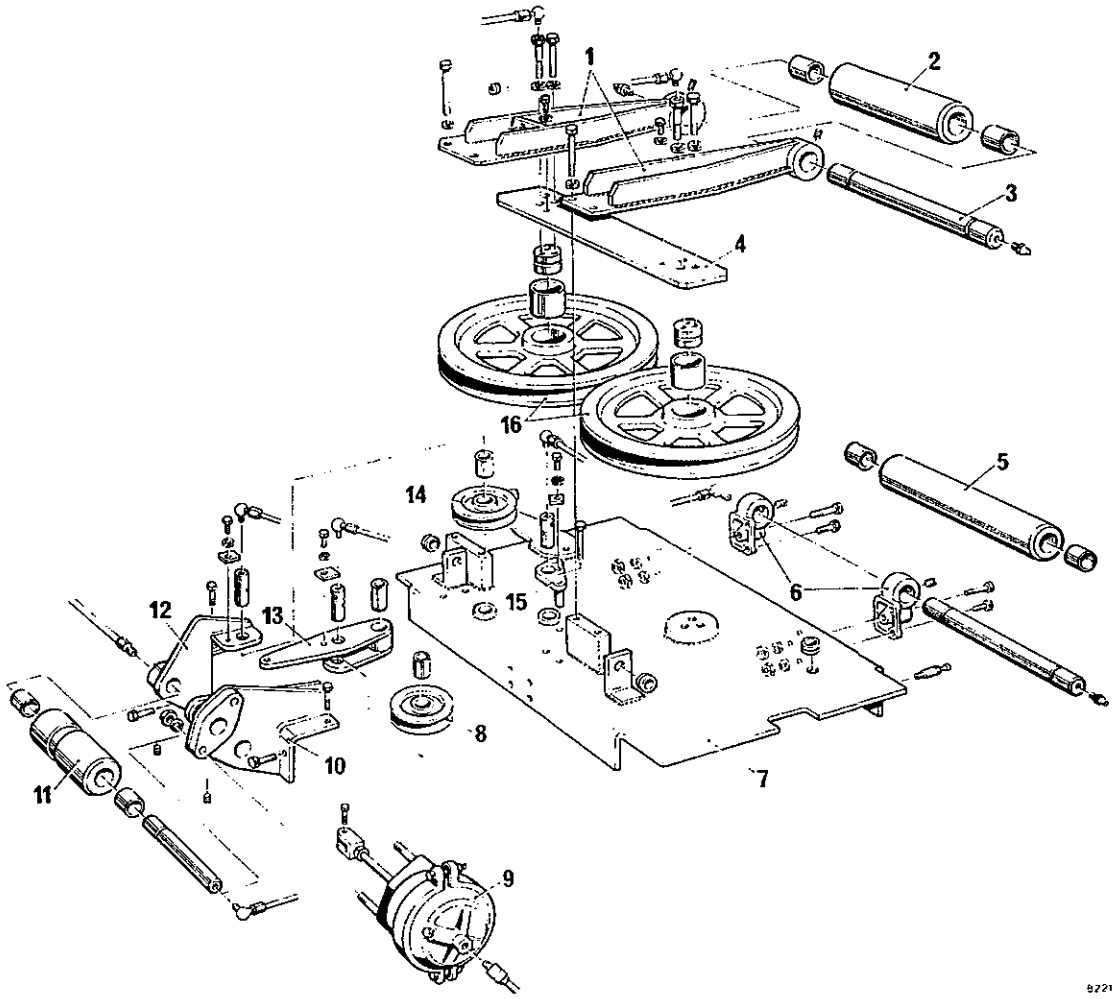
74 Release locknuts and unscrew ball retainers on each side of trolley (7), then lift assembly away from track (2). Take care not to lose the steel balls.

Disassembly and Reassembly

75 Remove locking plates, pulley shafts (4) and rollers (3).

76 Remove cable guide (5) and spacer.

77 On reassembly ensure spacer is located between cable guide.



1. Roller brackets
2. Upper roller
3. Roller shaft
4. Support plate
5. Lower roller
6. Lower roller brackets
7. Baseplate
8. Tensioner pulley
9. Cable tensioner operating cylinder
10. Roller and cylinder mounting bracket
11. Roller
12. Roller bracket
13. Tensioner lever
14. Tensioner pulley
15. Pivot bracket
16. Main pulleys

Installation

78 Ball retainers should be adjusted so that trolley moves freely with minimum side play.

79 If trolley stops (1) have been disturbed, they must be reset so that trolley is not able to travel the full width of the drum, but is stopped on either side with pulley groove centre approximately 25 mm (1.0 in.) from inside edge of drum flanges. If the cable tends to build up at the flanges this dimension must be increased.

REAR FAIRLEADS AND CABLE TENSIONER

Removal

80 Remove the body and remove all lubrication unions and pipes. Disconnect air supply pipe to cable tensioner cylinder.

81 Remove bolts securing upper roller brackets (Fig 10(1)) to baseplate (7).

82 Remove bolts from each main pulley (16) centre, lift off brackets and withdraw pulleys and pulley centres. Remove upper roller (2) from its supports.

83 Remove bolts passing through baseplate apron and withdraw lower roller (5) and brackets (6).

84 Remove bolts holding tensioner pulley shaft locating plates, and tap out pulley shafts, then withdraw pulleys.

85 Remove clevis pin and detach cable tensioner lever (13).

86 Remove front roller bracket securing bolt and detach brackets (10 and 12).

87 Remove baseplate to frame attachment bolts and lift away baseplate.

Installation

88 Installation is a reversal of removal. However, when installing the upper roller brackets ensure that the brackets are square with each other to prevent seizure of the top roller. The same applies to the baseplate aprons and rollers.

89 The main pulley centre bolts tapped to receive lubrication pipes, must be installed in the front hole of the pulley centres.

90 Adjust cable tensioner as described in para 69.

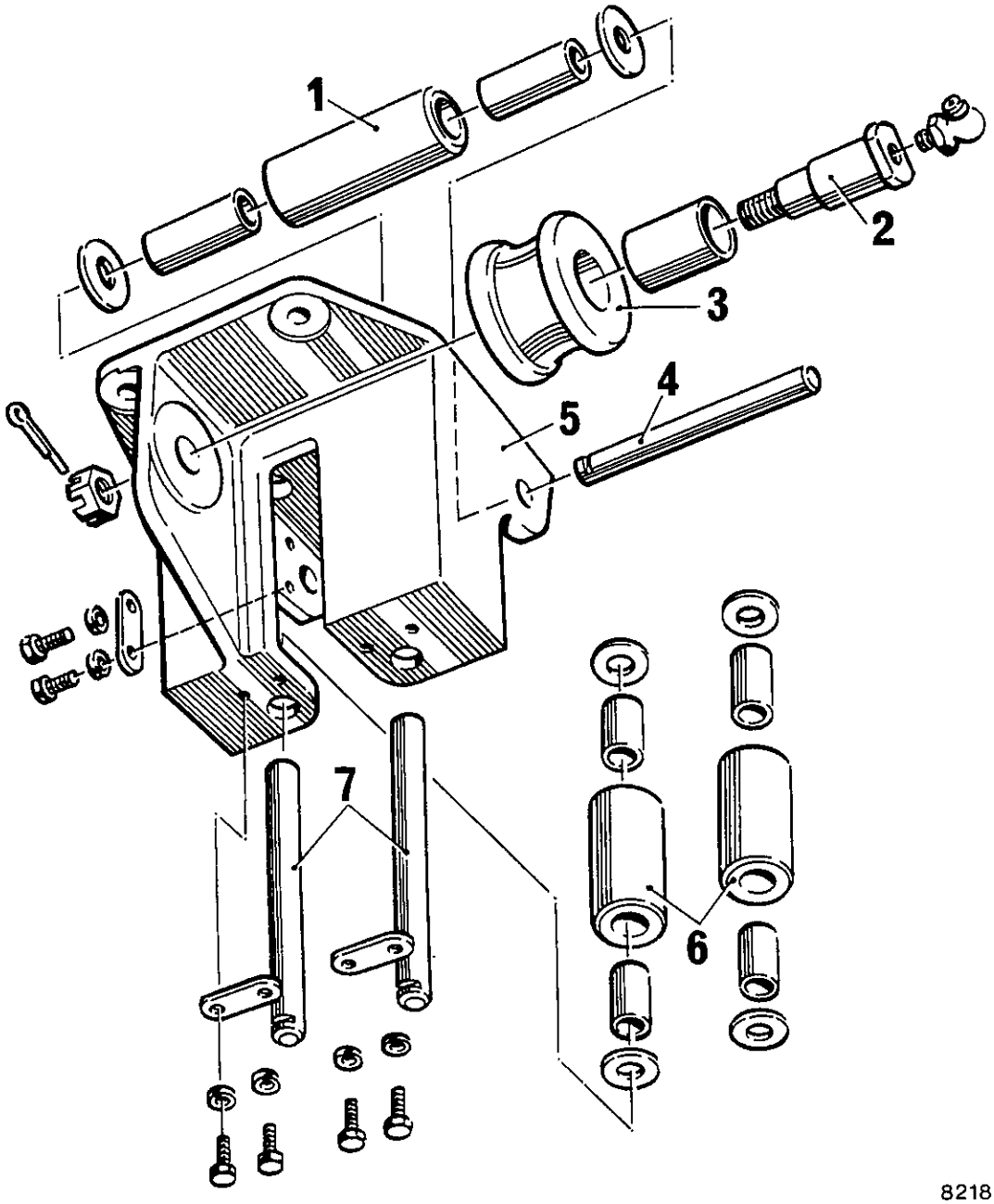
FRONT FAIRLEADS

Removal

91 Remove bolts attaching fairleads to mounting bracket.

Disassembly and Reassembly

92 Remove split pin and nuts and withdraw pulley pin (Fig 11(2)) and pulley(3).



1. Horizontal roller
2. Pulley pin
3. Pulley
4. Horizontal roller shaft
5. Fairleads bracket
6. Vertical rollers
7. Vertical roller shafts

Fig 11 Front fairleads

93 Remove locking plates and drive out horizontal and vertical roller shafts (4 and 7) and withdraw rollers.

94 On reassembly, lubricate rollers with grease and ensure that a spacer is placed at each end of rollers.

WINCH CABLE

95 Raise the rear of body by approximately 50 mm (2.0 in.).

96 Disengage winch clutch by moving lever forward.

97 Release winch brake by turning control lever (white) to the 'OFF' position (anti-clockwise).

98 Pay-out cable, knock back locktab and remove pin securing the cable to winch drum. Withdraw cable from winch.

99 Remove cable guide follower under pay-on gear and detach cable.

100Disconnect lubrication pipes, remove bolt and retainer plate from cable tensioner fixed pulley. Push out pulley centre from underneath and remove pulley.

101Disconnect lubrication pipes, remove bolts securing two main pulleys and upper roller brackets. Remove one pulley to allow withdrawal of the cable loop.

Installation

102Installation is a reversal of removal. However, the main pulley centre bolts, tapped to receive lubrication pipes, must be installed in the front hole of the pulley centres.

103Renew locktab under pin securing the cable eye to the winch drum.

CHAPTER 18

CRANE

CONTENTS

RESERVOIR

WARNINGS ...

(1) FUNCTIONAL TESTING OF THE CRANE MUST ONLY BE CARRIED OUT BY AUTHORIZED PERSONNEL. THOSE NOT FAMILIAR WITH CRANING OPERATIONS SHOULD REFER TO 'OPERATING THE CRANE' IN OPERATING INFORMATION AESP 2320-H-100-201.

(2) ENSURE CRANE IS SAFE BEFORE REMOVING ANY PARTS. THIS IS PARTICULARLY APPLICABLE IF THE CRANE IS IN AN OPENED POSITION WHEN PIPES/HOSES ARE DISCONNECTED.

CAUTION ...

Cleanliness is of the utmost importance where hydraulic systems are concerned. It is most important to exercise extreme care because the ingress of dirt or foreign matter will cause rapid wear of hydraulic components.

Removal

1 Drain the oil from the reservoir into a clean container. Disconnect and cap the oil return and oil feed pipes. Remove the three bracket bolts supporting the reservoir and withdraw the reservoir from the vehicle.

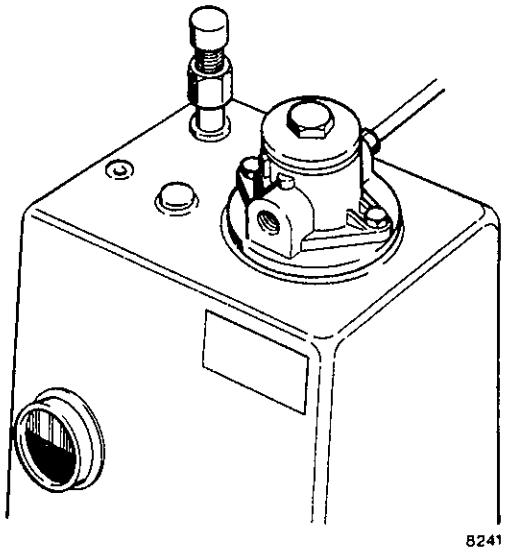


Fig 1 Crane hydraulic reservoir

Installation

2 Installation of reservoir is a reversal of removal.

The procedure for filling the reservoir is given in Operation Information AESP 2320-H-100-201, Chap 5-2, para 1.

DRIVE UNIT/HYDRAULIC PUMP ASSEMBLY

WARNING ...

FUNCTIONAL TESTING OF THE CRANE MUST ONLY BE CARRIED OUT BY AUTHORIZED PERSONNEL. THOSE NOT FAMILIAR WITH CRANING OPERATIONS SHOULD REFER TO 'OPERATING THE CRANE' IN OPERATING INFORMATION ASEP 2320-H-100-201.

CAUTION ...

Cleanliness is of the utmost importance where hydraulic systems are concerned. It is most important to exercise extreme care because the ingress of dirt or foreign matter will cause rapid wear of hydraulic components.

Removal

3 Close stop valve in low pressure pipe from reservoir to hydraulic pump.

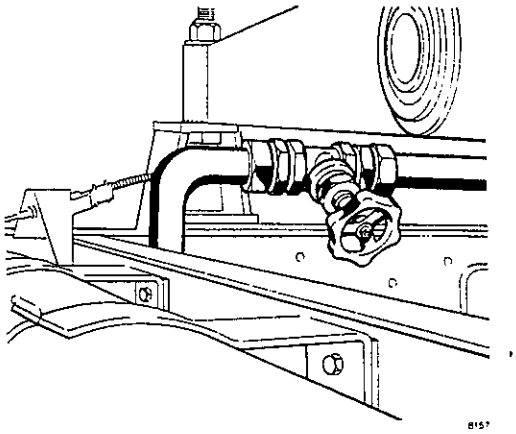
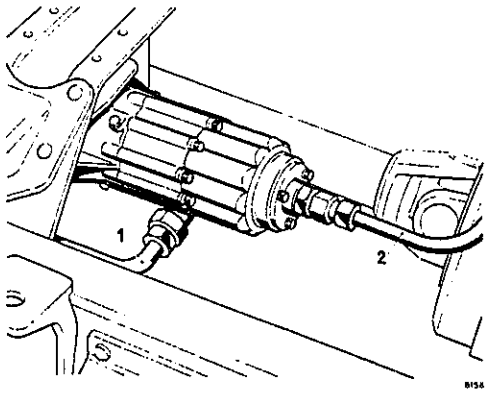


Fig 2 Low pressure pipe and stop valve

4 Disconnect low pressure pipe (1) and high pressure pipe (2) from pump and cap pipe ends and union connections at pump. Drain oil from pump and pressure pipes.

5 Remove bolt from drive shaft coupling to pump shaft.

6 Remove pump retaining bolts and withdraw pump from hanger bracket and drive shaft coupling.



1. Low pressure pipe 2. High pressure pipe

Fig 3 Hydraulic pipe identification at pump

Installation

7 Installation of pump is a reversal of removal. BLEEDING THE PUMP

8 If for any reason it is necessary to remove air from the system (air in the system will cause a jerky operation), following maintenance or dismantling of pump or pipes the pump should be bled as follows:

8.1 Place a clean receptacle beneath pump unit.

8.2 Remove bleed screw (arrowed) from top of drive unit casing.

8.3 Oil containing air bubbles will issue from the open port. When the bubbles cease and a steady stream of oil flows from the port, replace the bleed screw.

8.4 Top up oil reservoir as described in Operating Information AESP 2320-H-100-201.

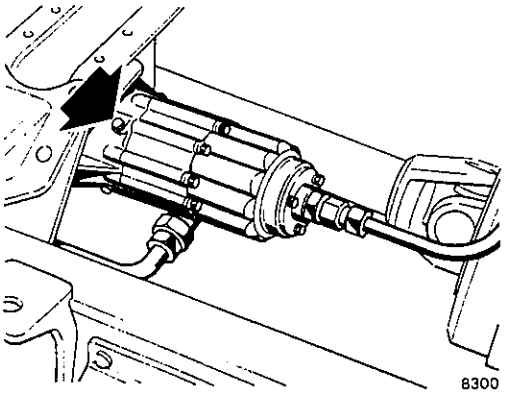


Fig 4 Hydraulic pump bleed screw

ADJUSTMENT OF RELIEF VALVES

WARNINGS ...

(1) FUNCTIONAL TESTING OF THE CRANE MUST ONLY BE CARRIED OUT BY AUTHORIZED PERSONNEL. THOSE NOT FAMILIAR WITH CRANING OPERATIONS SHOULD REFER TO 'OPERATING THE CRANE' IN OPERATING INFORMATION AESP 2320-H-100-201.

(2) ENSURE CRANE IS SAFE BEFORE REMOVING ANY PARTS. THIS IS PARTICULARLY APPLICABLE IF THE CRANE IS IN AN OPENED POSITION WHEN PIPES/HOSES ARE REMOVED.

CAUTION ...

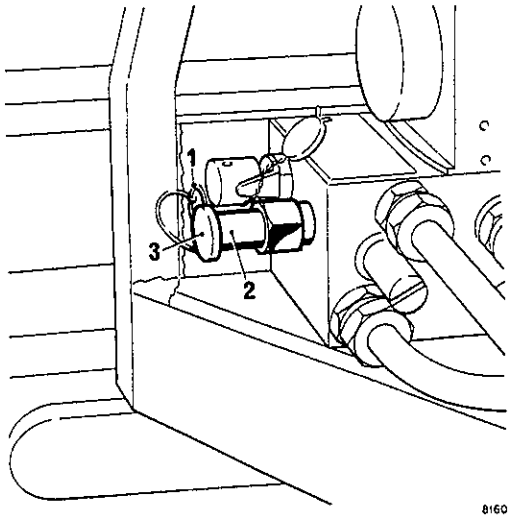
Cleanliness is of the utmost importance where hydraulic systems are concerned. It is most important to exercise extreme care because the ingress of dirt or foreign matter will cause rapid wear of hydraulic components.

9 Ensure there is no leakage from rams, valve blocks or any connections.

10 Remove retaining clip (1) and withdraw plug (3). Install test gauge to body (2).

11 With parking brake applied, engine running and gearbox in neutral, depress the clutch and engage the power take off.

12 Operate and hold the stabilizer legs in the fully up position until the main relief valve operates. Note the pressure on the gauge which should read 150 bar (2178 lbf/in^2).



1. Retaining clip 2. Body 3. Plug
Fig 5 Test gauge connection point

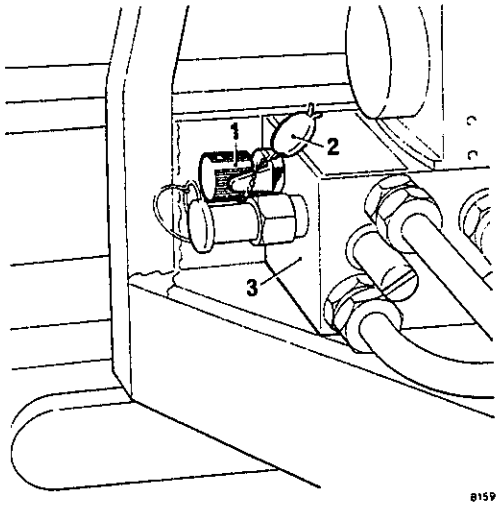
13 Break seal (2) and with stabilizer legs still held in the fully up position, turn main relief valve adjusting knob (1) until pressure on gauge reads 50 bar (3630 lbf/in^2).

14 Return stabilizer control to neutral position and prepare crane for work.

15 Operate boom control lever until main lifting cylinder is fully extended and with lever held in this position note pressure on gauge. This should be 170 bar (2468 lbf/in^2).

16 Fully retract main lifting cylinder (boom) and with control lever held in fully retracted position note pressure on gauge. This should be 60 bar (871 lbf/in^2).

17 If pressures are incorrect, place boom and jib in a safe position where they will not drop (eg resting on body) and stop engine.

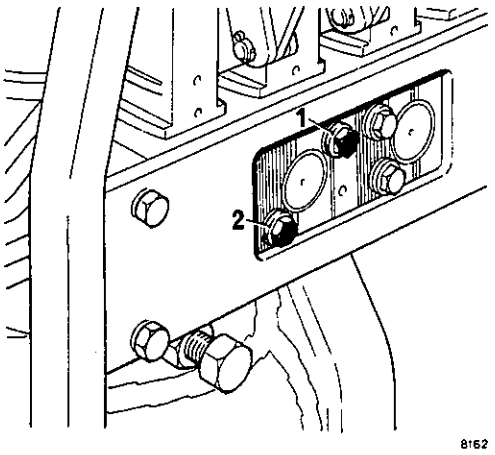


1. Adjusting knob 2. Seal
3. Control valve block

Fig 6 Main relief valve adjusting knob

18 Place a clean container beneath control valve block and depending on which valve is to be adjusted, remove either the lifting circuit relief valve plug (1) or the retracting circuit relief valve plug (2).

19 Take care when removing the plug not to lose any of the associated items. Note the order in which they are removed to ensure that they are re-installed correctly.

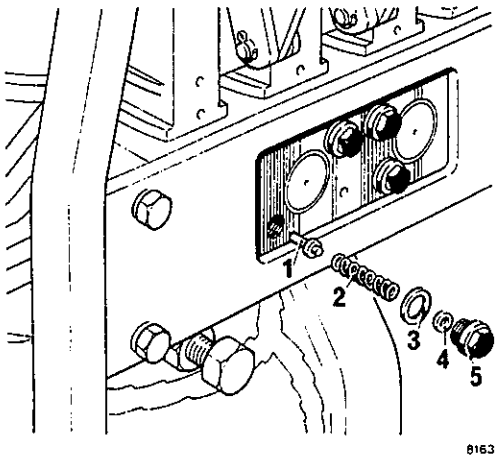


1. Boom lifting circuit relief valve
2. Boom retracting circuit relief valve

Fig 7 Relief valve identification

20 To adjust pressure it is necessary to increase or decrease the thickness of shim (4) beneath the plug (5). Shims are serviced in thicknesses of 0.3 mm, 0.5 mm and 1.0 mm. Increasing the thickness of shims increases the pressure and decreasing the thickness of shims decreases pressure.

21 Do not, under any circumstances, mix the compression spring (2) or the valve cone (1) from one relief valve to another.



1. Valve cone
2. Compression spring
3. Copper washer
4. Shim
5. Plug

Fig 8 Exploded view of relief valve

TRUCK, 4 TONNE, 4x4, BEDFORD MJ, ALL VARIANTS

REPAIR INSTRUCTIONS

REPRINTED AUG 1993 INCORPORATING AMDT Nos 1 to 3

This publication contains information covering the requirements of Sub-Category 5.2 at information levels 3 and 4

BY COMMAND OF THE DEFENCE COUNCIL

[redacted]

Ministry of Defence

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AMENDMENT RECORD

Amdt	Incorporated by	Date
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CONTENTS

PREFACE

Amendment identification

1 Except for manuscript entries, amendments are to be identified by marginal side lining. Manuscript amendments are identified by Amdt No in outside margin in line with the amendment.

Comments on this publication

2 Comments on this publication are to be forwarded in accordance with AESP 000-P-011-013 to Vehicles and Weapons Branch REME, Chobham Lane, Chertsey, Surrey KT16 OEE.

ASSOCIATED PUBLICATIONS

AESP 2320-H-100-101	Purpose and planning information
AESP 2320-H-100-201	Operating instructions
AESP 2320-H-100-302	Technical description
AESP 2320-H-100-601	Maintenance Schedule
AESP 2320-H-100-711	Illustrated Parts Catalogue
AESP 2320-H-100-721	Commercial Parts List
AESP 2320-H-100-741	Complete Equipment Schedule
AESP 2815-K-062-512	Engine Diesel 6 cyl Bedford 5.4 Litre Turbocharged
AESP 2610-A-409-301	Pneumatic Tyres and Tubes Associated, Road Wheels
EMER Test & Measurement	A 028
EMER Power J 330	Lead Acid Battery Maintenance
EMER Workshop N 111	Preservation, Identification and Packaging of Assemblies
EMER Workshop N 345	Assembly Techniques, Split Shell Bearings using Plastigage Method
EMER Workshop C 010	Hydraulic Equipment Introduction to A, B and C Vehicle Hydraulic Systems
EMER Workshop C 011	BS Symbols used in Diagrams for Hydraulic and Pneumatic Systems
EMER Workshop C 171	Plessey Hydraulic Pumps, Beta and Gamma Range

WARNINGS/CAUTIONS

3 Before driving this vehicle or operating any fitted equipment, personnel are to read and understand the Warnings, Cautions and Operating Instructions detailed in Cat 201 of this AESP.

CHAPTER 2

CLUTCH

CONTENTS

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Ser	Tool No (where applicable)	NSN/Part No (where applicable)	Designation
(1)	(2)	(3)	(4)
1	99A		Churchill Clutch Fixture
2	99M		Churchill Clutch Fixture Adaptor
2	Z8527	7BD/5120-99-873-9362	Clutch Pilot Bearing Remover

CLUTCH

Disassembly

1 Remove friction disc and pressure plate as described in Chap 2, level 2, para 23.

2 Secure clutch cover assembly to Clutch Fixture 99A and Adaptor 99M and compress thrust springs before removing eye bolt nuts, and drive strap bolts and ferrules.

3 Before separating clutch cover from pressure plate, mark them for alignment on reassembly.

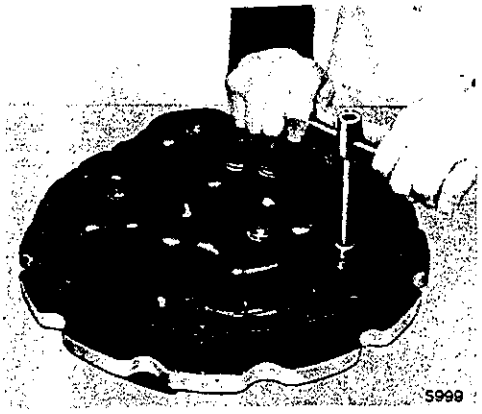


Fig 1 - Removing drive strap bolts

Inspection and Reconditioning

4 When renewing clutch disc friction facings, drill rivets sufficiently to allow them to be punched out. Do not shear rivets with a chisel as this may distort disc segments or elongate rivet holes.

5 Install rivets with the heads against the facing material. To avoid damage to the facing material do not overtighten the rivets.

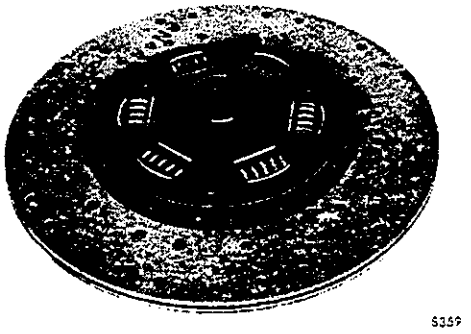


Fig 2 - Installing facing rivets

6 Scores on friction surface of pressure plate can be removed by grinding, providing plate thickness (dimension 'A') after machining is not less than 18.67 mm (0.735 in.). Thickness must be checked at several points around plate.

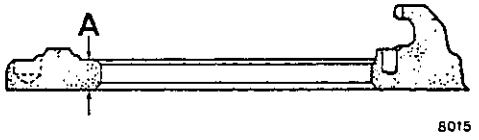


Fig 3 - Thickness of pressure plate

7 The heads of the drive strap ferrules are recessed to act as a lock for the bolt heads. Whenever the bolts are disturbed both these and the ferrules must be renewed. Bolts and ferrules are serviced as a kit.

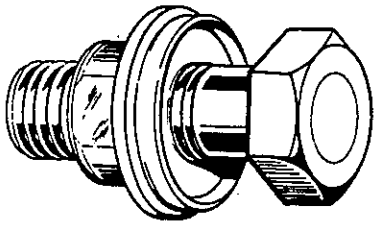
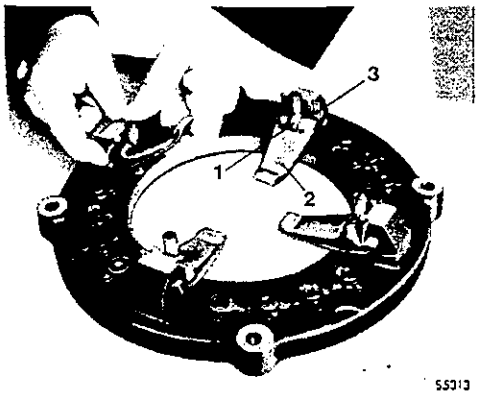


Fig 4 - Drive strap ferrule and bolt

Reassembly

8 On reassembly apply a smear of XG 279 grease to bearing surfaces of release levers, eye bolts, pins and struts.



1. Eye bolt 2. Release lever
3. Lever strut

Fig 5 - Installing release levers

9 Install anti-rattle springs with spring ends (arrowed) towards centre of cover.

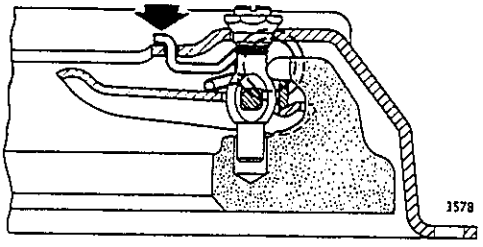


Fig 6 - Installing anti-rattle springs

10 When reassembling original cover and pressure plate, ensure that marks made during disassembly are in alignment.

11 Before finally tightening bolts securing clutch cover to jig, check that strap slots are aligned with pressure plate bolt holes then assemble ferrules in drive strap slots and loosely assemble strap attaching bolts.

12 Adjust release levers to 56.51/57.78 mm (2.225/2.275 in.) using gauge plate 0.33 in. thick by turning eye bolt nuts.

Fig 7 - Adjusting release lever heights

13 Before locking eye bolt nuts, operate release levers several times and recheck adjustment.

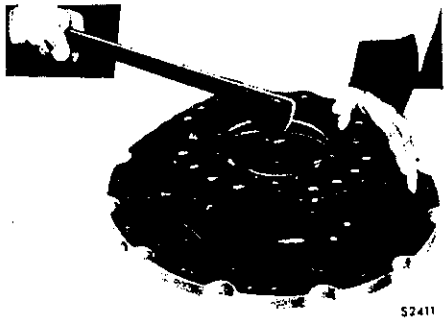


Fig 8 - Operating release levers

14 Before releasing clutch from jig, lock each eye bolt nut by staking nut into slot of bolt.

15 Tighten drive strap bolts to a torque of 24 Nm (18 lbf ft) and stake edge of ferrule on to bolt head.

16 Install clutch as described in Chap 2, level 2, para 24.

CLUTCH PILOT BEARING

17 To renew clutch pilot bearing in crankshaft flange, remove clutch assembly and withdraw bearing with Remover Z8527.

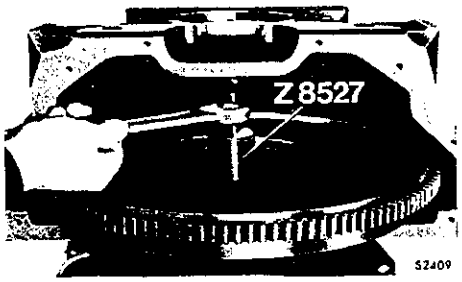


Fig 9 Removing clutch pilot bearing

18 On installation, drive bearing against shouldered face of crankshaft.

CHAPTER 3

GEARBOX

CONTENTS

(continued)

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Ser	Tool No (where applicable)	NSN/Part No (where applicable)	Designation
(1)	(2)	(3)	(4)
1	D1123		Wrench-pinion nut
2	Z8524	7BD/5120-99-825-5881	Bridge piece
3	Z8523	7BD/5120-99-833-4151	Drag
4	Z8283		Drift
5	D1141		Installer-bearing

TOP COVER

Removal

1 Disconnect the coupling rod from the gearbox gearshift lever and withdraw the inner tube.

2 Remove the top cover and install a temporary cover.

Disassembly

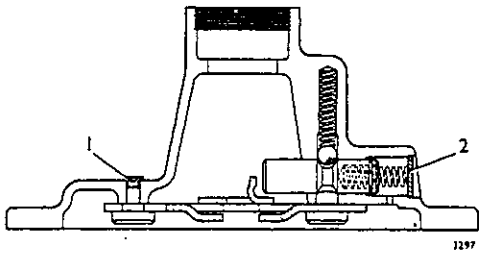
3 Slide the gearshift lever rubber grommet up the lever.

4 Knock back the locking tab, remove the seating nut and withdraw the gearshift lever and upper seating.

5 Remove the spacer and lower seating.

6 Do not remove the rubber grommet from the lever unless renewal is necessary.

7 To remove interlock plate, chisel off ends of rivets (1). Reverse stop plunger and spring can be withdrawn after removing expansion plug (2).



1. Retaining rivets
2. Reverse stop plunger

Fig 1 - Interlock plate removal

Reassembly

8 Insert locking ball and spring in cover before installing reverse stop plunger. Use a short tapered rod to depress locking ball and spring while inserting plunger. Ensure circlip (arrowed) is located on plunger before installing a new expansion plug.

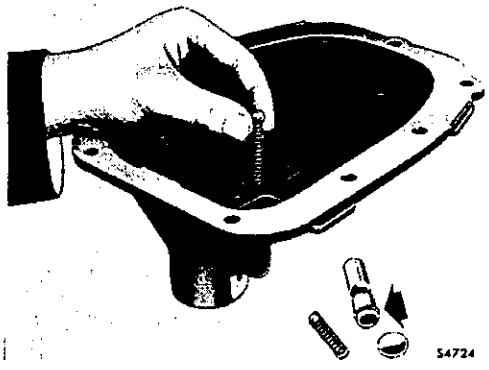


Fig 2 - Installing locking ball and spring

9 Special service replacement rivets and guides are used to secure interlock plate to top cover. After riveting plate to cover, ensure that plate slides freely on guides.

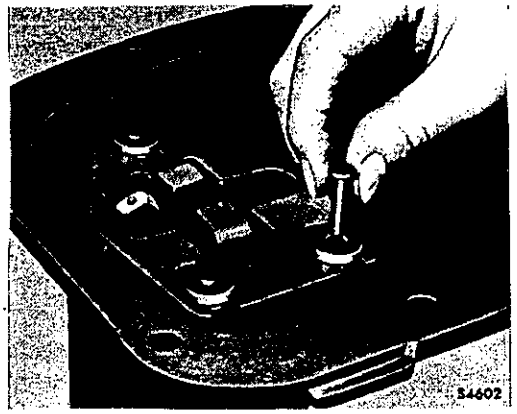


Fig 3 - Installing interlock plate

10 Before installing gearshift lever, ensure lower seating is located in cover turret.

11 After locating lever, spacer, upper seating and washer in turret, tighten retaining nut just sufficiently to eliminate lever slackness and secure nut with tab washer.

Installation

12 Use a new gasket and tighten evenly the special chamfered bolts.

13 Before reconnecting the coupling rod to the gearshift lever, smear the outer surface of the inner tube with grease.

GEARBOX

Removal

14 As described in Chap 3, level 2, para 22.

Installation

15 As described in Chap 3, level 2, para 27.

Disassembly

16 To facilitate disassembly and reassembly of gearbox, bolt two supports to casing lower attaching lugs.

17 After engaging top and reverse gears, remove coupling flange bolt.

18 Striking fork rods are located in gearbox casing by a retainer bolted to rear of casing.

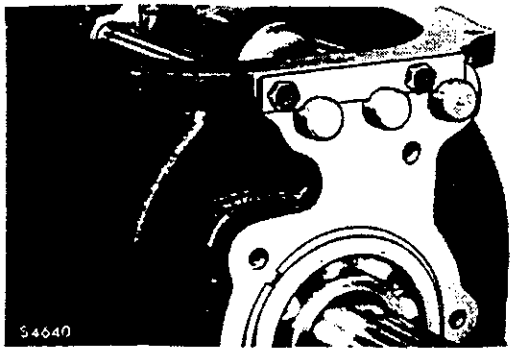


Fig 4 - Striking fork rod retainer

19 Fork rods must be driven out from front of casing. Take care not to lose locking balls as forks become detached.

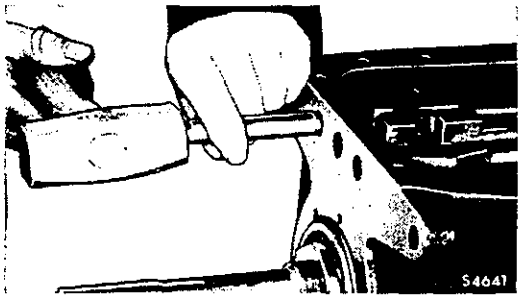


Fig 5 - Removing fork rods

20 To facilitate removal of pinion left-hand threaded nut, and layshaft bearing retainer bolts, engage second and third gears. Use Wrench D1123 to unscrew pinion nut.

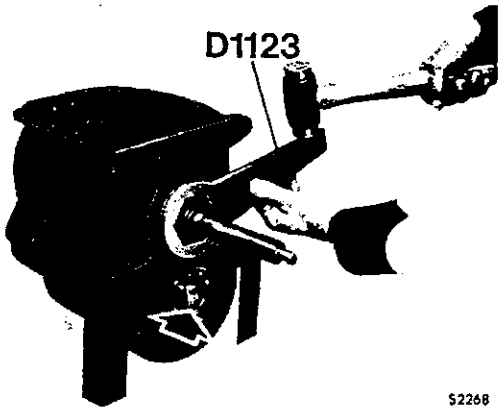


Fig 6 - Removing pinion nut

21 Remove the bolt, tabwasher and plain washer, and withdraw the universal joint flange from the mainshaft.

22 To remove main drive pinion bearing, remove locating ring from outer race and assemble Adaptor Z8524 to bearing. Use Remover Z8523 to withdraw bearing off shaft and out of casing. Ensure bridge piece (arrowed) is interposed between remover screw and casing to relieve main drive pinion of end thrust.

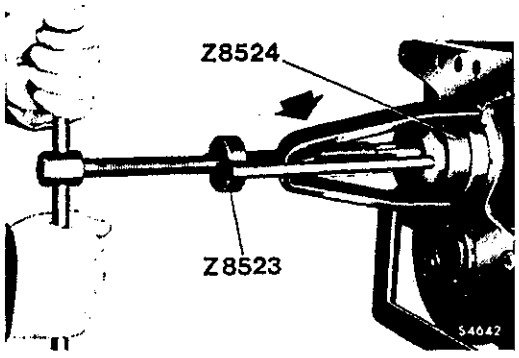


Fig 7 - Removing main drive pinion bearing

23 After removing bearing, withdraw oil thrower to prevent damaging it during removal of mainshaft.

24 Remove the rear cover.

25 After removing speedometer driving gear and oil thrower, mainshaft bearing can be removed in a similar manner to main drive pinion bearing, using Adaptor Z8524 and Remover Z8523 together with a distance piece (arrowed) and a plug supplied with the remover.

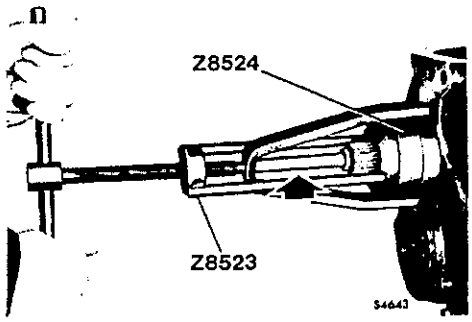


Fig 8 - Removing mainshaft bearing

26 To facilitate removal of mainshaft, slide first and reverse gear forward on mainshaft to engage second gear. Slide third and fourth clutch rearwards on clutch hub to engage third gear. Lay gearbox on its side, and with main drive pinion located as far forward as possible through casing bore, withdraw mainshaft assembly through top of casing.

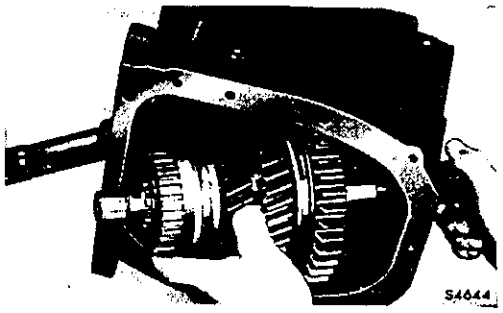


Fig 9 - Lifting out mainshaft assy

27 Use Adaptor Z8524 and Remover Z8523 to remove layshaft rear bearing.

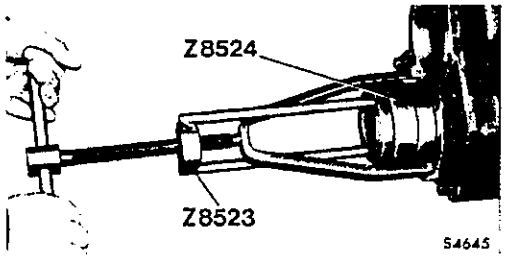


Fig 10 - Removing layshaft bearing

28 Reverse pinion shaft is retained in casing by a spring pin (arrowed). Pin must be driven in as far as possible so that it is contained within pinion shaft.

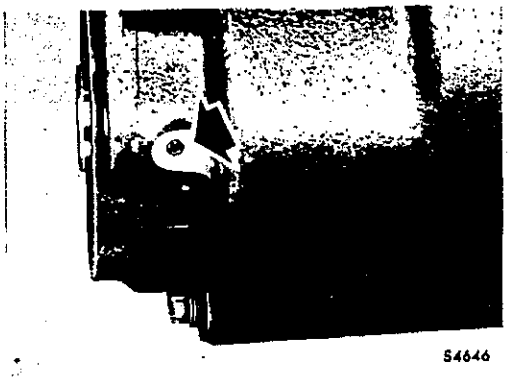


Fig 11 - Reverse pinion shaft retaining pin

29 When pressing reverse pinion shaft out of casing, support rear of casing on a sleeve.

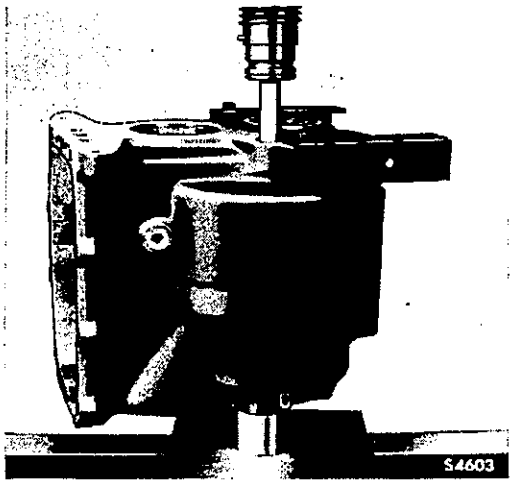


Fig 12 - Pressing out reverse pinion shaft

30 Layshaft gear can be pressed out of front bearing and assembly lifted out of casing. Front bearing can then be tapped out from inside casing.

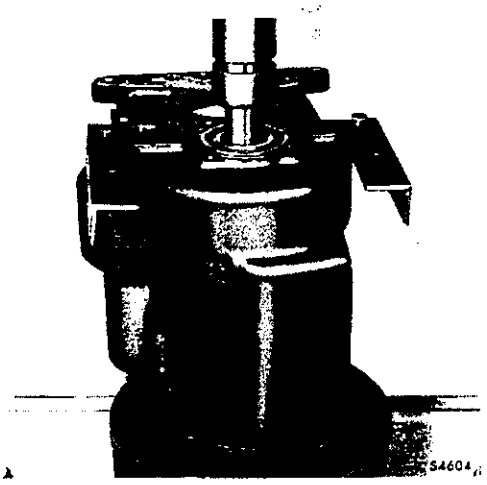


Fig 13 - Pressing out layshaft gear

31 Before disassembling mainshaft, mark with a spot of paint the radial position of third and fourth speed clutch relative to its hub. In addition mark position of first and reverse gears splines in relation to mating splines on mainshaft. This will ensure that components are reassembled in the same relationship as before.

32 First and reverse gear can be withdrawn off mainshaft after removing synchronizing cone retainer (arrowed).

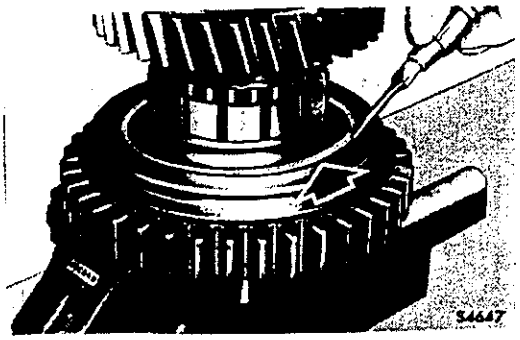


Fig 14 - Removing synchronizing cone retainer

33 Third and fourth speed clutch hub is retained on front end of mainshaft by a retaining ring.

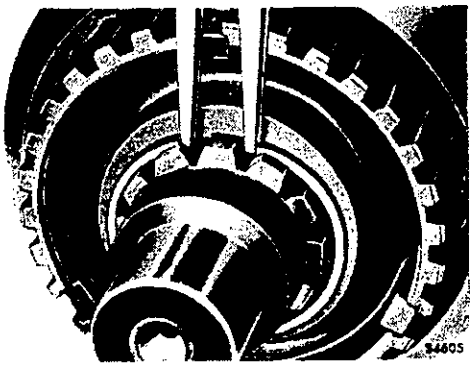


Fig 15 - Removing third and fourth speed clutch hub retaining ring

34 To press clutch hub and third speed gear sleeve off mainshaft, support second gear on press making sure that synchronizing springs are clear of press.

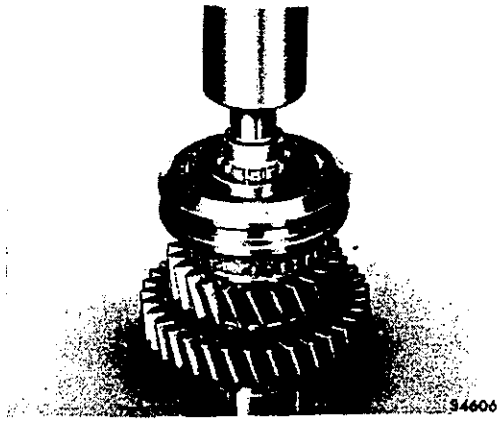


Fig 16 - Pressing clutch hub and third speed gear sleeve off mainshaft.

35 Discard damper ring and compression strip of first and reverse gear.

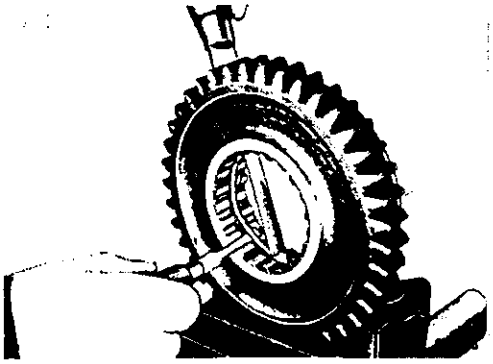


Fig 17 - First and reverse gear damper ring

36 Layshaft first speed gear is integral with layshaft. Remaining gears are pressed and keyed to layshaft. Support rear face of second gear on press when pressing layshaft out of gears. Discard keys after removing gears.

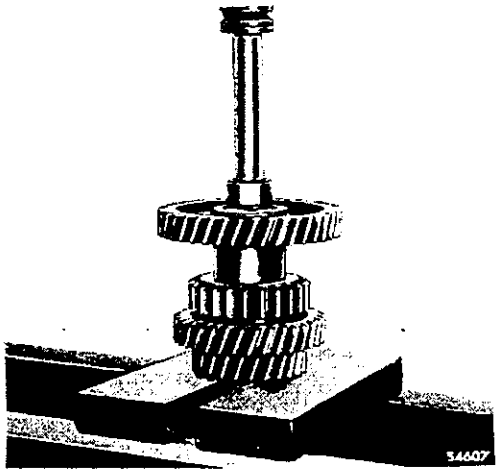


Fig 18 - Pressing gears off layshaft

Reassembly

37 Before assembling gears to layshaft, locate new keys on shaft so that each key projects halfway above ends of keyways. Retain keys in this position with stiff grease.

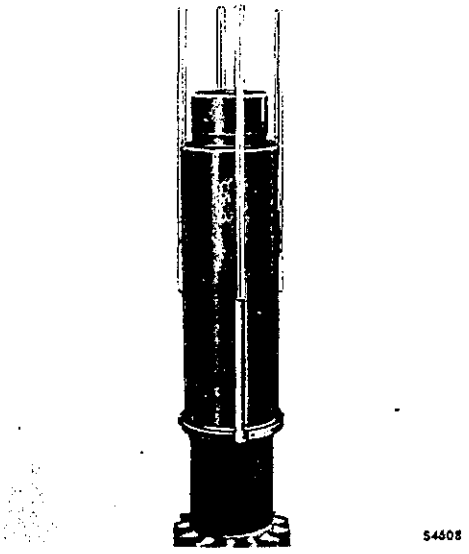


Fig 19 - Assembling keys to layshaft

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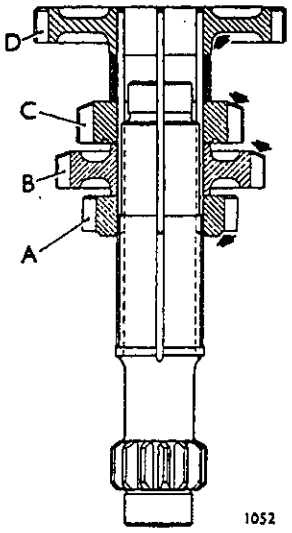
38 Layshaft gears must be assembled to layshaft as follows: 'A' - second gear, with boss to rear of shaft; 'B' - third gear and 'C' - reverse gear, with chamfers on end of teeth to front of layshaft; 'D' - driven gear, with boss to rear of shaft. Ensure that spacer, between driven gear and reverse gear, is concentric with boss of driven gear.

Before pressing gears on to shaft, keys must be flush with driven gear end face.



A Second gear
B Third gear
C Reverse gear
D Driven gear

Fig 20 - Assembling layshaft gears

39 When pressing gears on to shaft, use a sleeve to contact driven gear end face and ends of keys. Gears must be pressed on to shaft until second gear contacts layshaft shoulder. During this operation take care that keys do not jam in bottom ends of shaft keyways. Gears and spacer must be in firm contact with each other and keys must be tapped below end face of driven gear after gears are finally assembled.

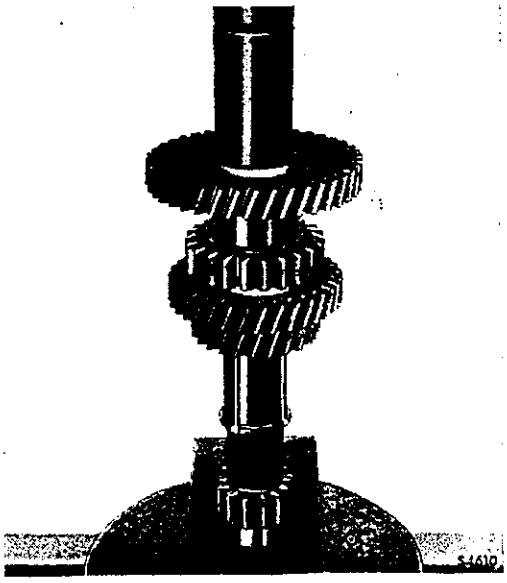


Fig 21 - Pressing gears on to layshaft

Note ...

Third and fourth speed clutch and hub, also first and reverse gear and mainshaft are matched assemblies, therefore components of each assembly must not be renewed individually.

40 Use long end of Remover Z8283 when pressing bush out of mainshaft second speed gear.

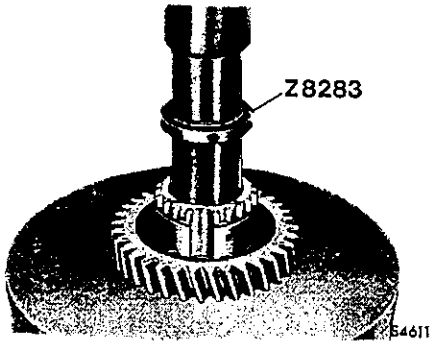


Fig 22 - Second speed bush removal

41 New bush must be located so that oil holes are aligned with holes in gear bore.

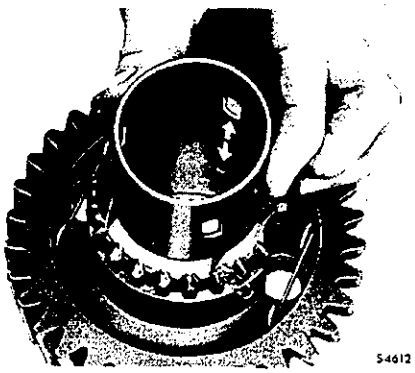


Fig 23 - Installing bush in second speed gear

42 Use short end of Installer Z8283 and press bush into gear until collar on drift contacts gear. Replacement bushes are pre-finished to size.

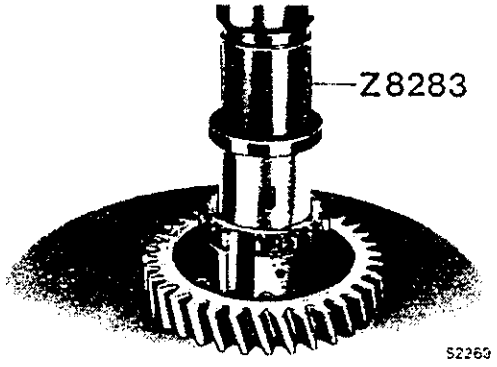


Fig 24 - Pressing bush into gear

43 After installing, bush must be staked into oil grooves in front end face of gear.

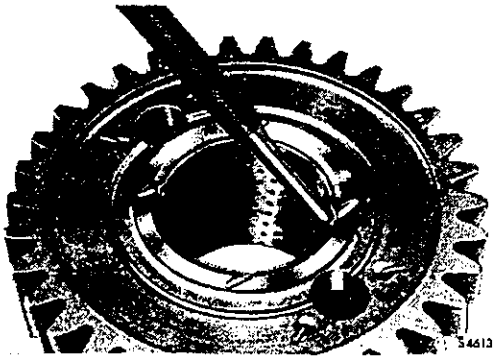


Fig 25 - Staking bush into gear

44 Synchronizing springs can be removed by straightening ends of springs. In order that lugs of first and reverse gear cone can engage holes in second gear, new synchronizing springs must be installed so that straight section of spring (arrowed) is offset outwards from centres of holes in gear.

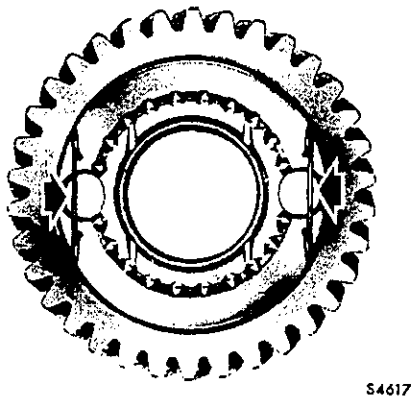


Fig 26 - Replacing synchronizing springs

45 To secure springs in gear, support spring eyes on wood blocks and bend over ends of springs. Ensure each spring is secure in gear and with no end float.

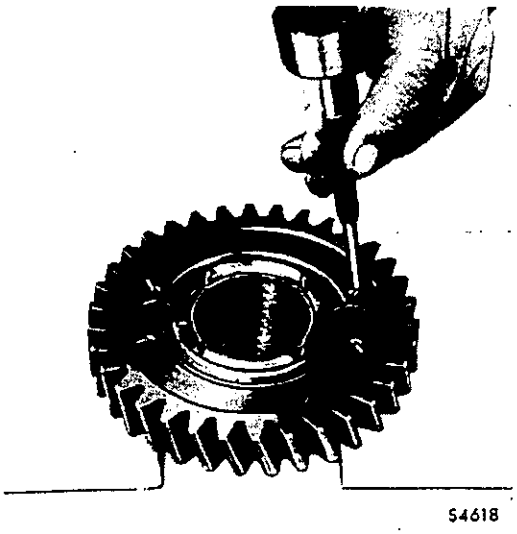


Fig 27 - Securing springs in gear

46 When installing compression strip in bore of first and reverse gear, ensure strip is not twisted. Top speed hub retainer can be used to roll strip into groove.

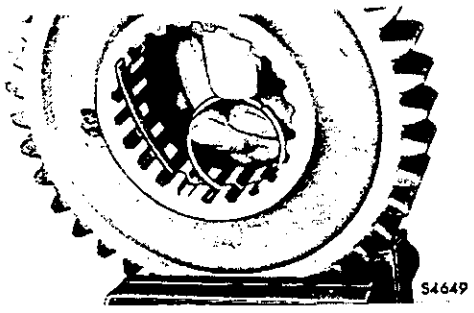


Fig 28 - Installing compression strip in first and reverse gear

47 After installing compression strip, damper ring must be located in groove so that centre lugs (arrowed) on ring are aligned with high splines in gear.

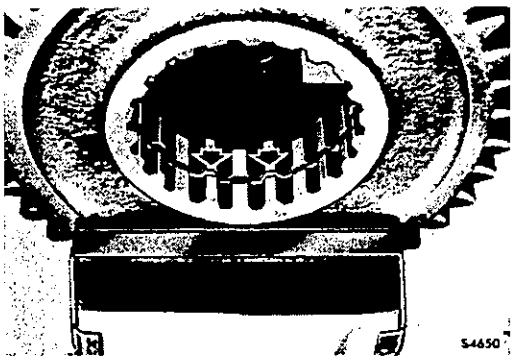


Fig 29 - Installing damper ring in first and reverse gear

48 When installing first and reverse gear on mainshaft, marked spline of gear and shaft must be re-aligned. Ensure lugs of damper ring engage splines of shaft, and tap gear on to shaft.

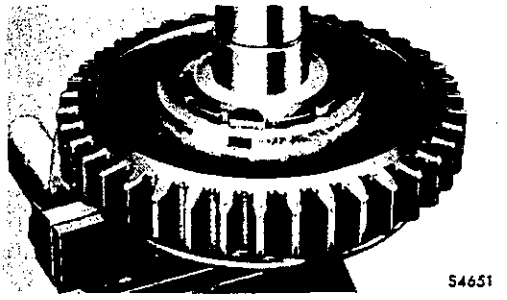


Fig 30 - Installing first and reverse gear on mainshaft

49 After installing gear on shaft, synchronizing cone must be assembled to gear and secured with retainer (arrowed).

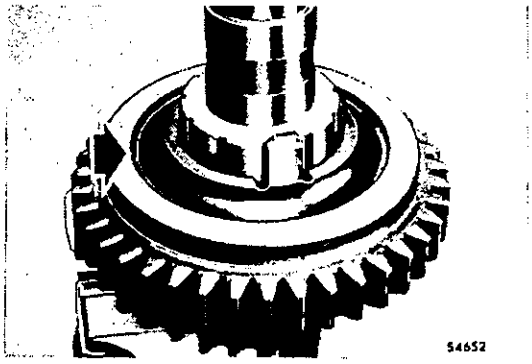


Fig 31 - Assembling synchronizer to gear

50 After assembling second gear on mainshaft, locate a new thrust washer, with chamfered end of bore first, against shoulder on mainshaft and check that gear end float is within 0.23/0.35 mm (0.009/0.014 in.).

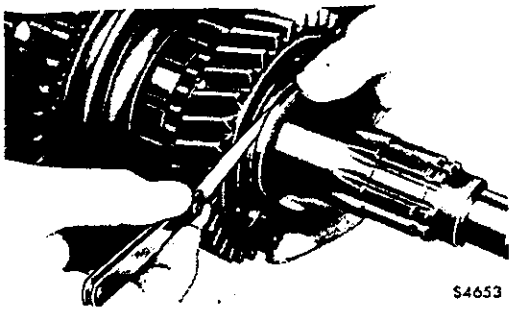


Fig 32 - Installing second gear thrust washer

51 When pressing third gear mainshaft sleeve on to shaft, avoid excessive pressure when sleeve contacts thrust washer as this may dostort sleeve. After installing, ensure gear rotates freely on sleeve.

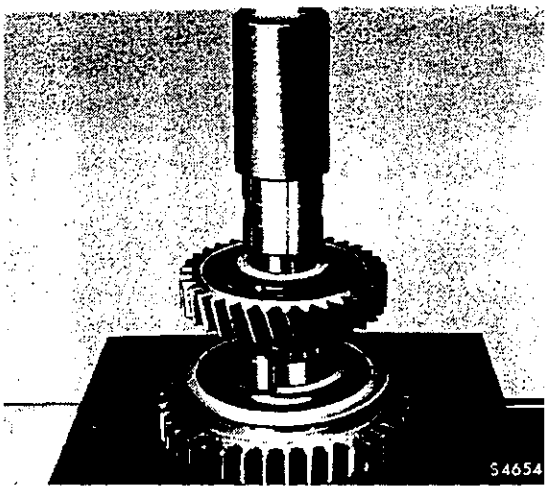


Fig 33 - Pressing third gear sleeve on to mainshaft

52 When assembling clutch key springs to third and fourth speed clutch hub, springs must be located on keys so that ends of both springs are on same keys. Spring ends must also be clear of curved surface of clutch hub.

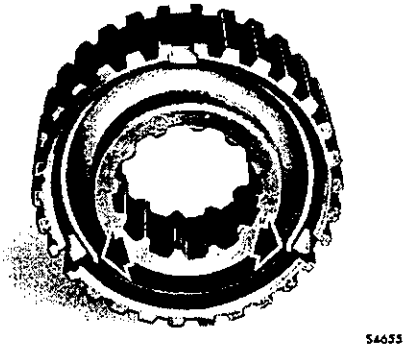


Fig 34 - Assembling clutch hub

53 Third and fourth speed clutch hub must be located on mainshaft so that longer boss of hub is towards spigoted end of shaft. Align slots (arrowed) in synchronizing ring with keys while pressing hub on to shaft. Avoid excessive pressure when hub contacts third gear sleeve as this may distort sleeve and result in insufficient clearance for gear.

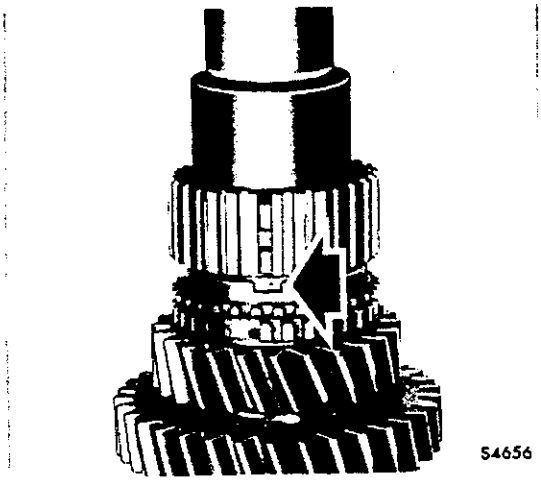


Fig 35 - Installing clutch hub to mainshaft

54 After installing third and fourth speed clutch hub, check that third gear end float is within 0.23/0.35 mm (0.009/0.014 in.) and that gear rotates freely. Clutch must be assembled to hub with its groove adjacent to the third speed gear.

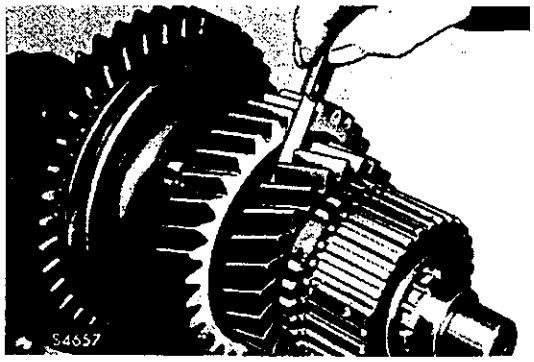


Fig 36 - Third gear end float

55 Third and fourth speed clutch hub retaining ring is serviced in four thicknesses. Select a new ring which will give minimum clearance between ring and clutch hub; clearance must not exceed specified maximum.

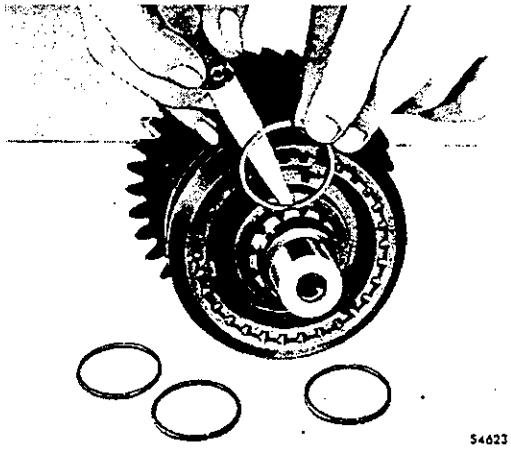


Fig 37 - Retaining ring selection

56 Layshaft front bearing must be pressed into casing until bearing locating ring contacts front face of casing.

57 Layshaft front bearing spacer must be assembled, bore chamfer first, to layshaft front spigot. Smear spacer with petroleum jelly to retain it on spigot while installing layshaft gear assembly.

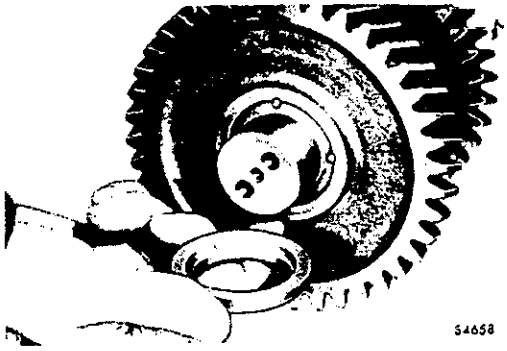


Fig 38 - Installing layshaft front bearing spacer

58 To in stall layshaft gear assembly, up-end casing so that layshaft front bearing rests on press. After aligning spigot on front end of layshaft with bearing, press in layshaft to fully engage spigot in bearing.

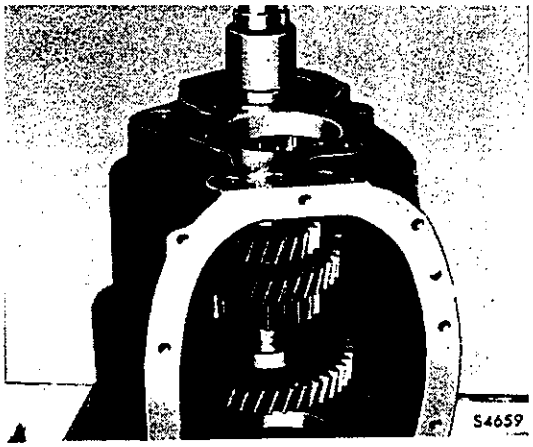


Fig 39 - Installing layshaft gear assembly

59 Layshaft rear bearing must be installed so that bearing locating ring contacts rear face of casing.

60 Before pressing in reverse pinion shaft ensure that retaining pin hole in rear end of shaft is aligned with hole in casing. Shaft must be secured by a pin driven in flush with casing.

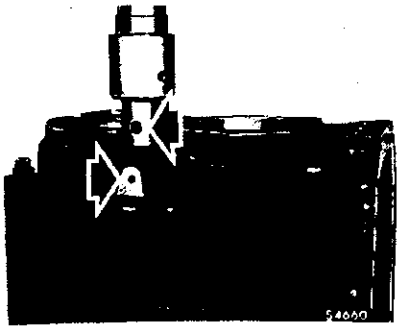


Fig 40 - Installing reverse pinion shaft

61 Front end of mainshaft is supported in main drive pinion counterbore by 18 bearing rollers.

62 Smear rollers with grease when assembling to pinion bore and locate keep ring (arrowed) midway along rollers to retain them in position prior to engaging mainshaft spigot.

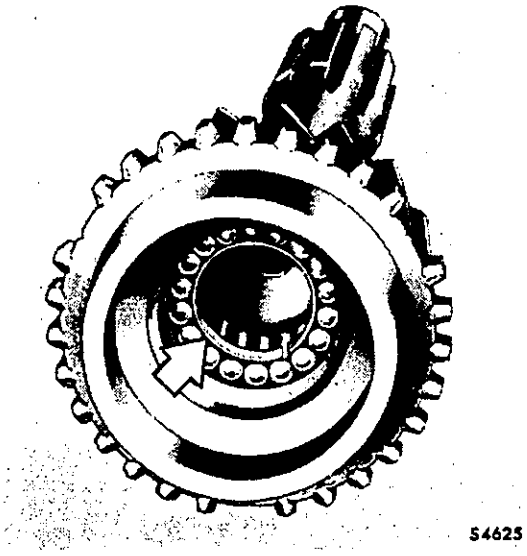


Fig 41 - Installing pinion roller bearings

63 To facilitate installation of mainshaft, lay gearbox casing on its side. Assemble a synchronizing ring to main drive pinion cone and insert pinion shaft as far as possible through casing bore. Slide first and reverse gear forward on mainshaft to engage second gear. Slide third and fourth clutch rearwards on clutch hub to engage third gear, and place mainshaft assembly in casing so that rear of shaft is as far as possible through casing bore.

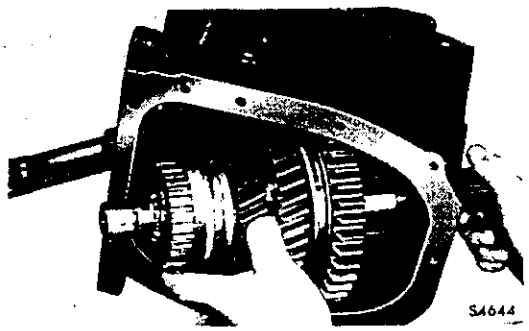


Fig 42 - Installing mainshaft

64 Mainshaft rear bearing must be located on shaft so that bearing retaining ring is to rear of shaft. Use Installer D1141 to drive bearing into contact with shaft splined hub.

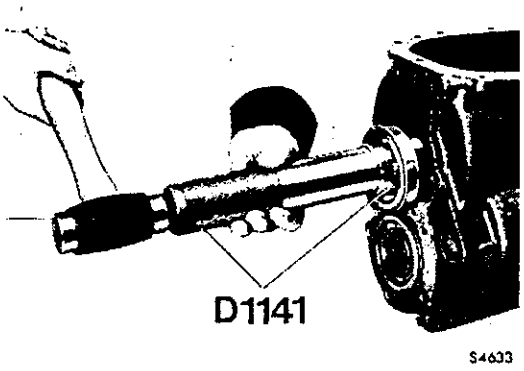


Fig 43 - Locating mainshaft rear bearing

65 When assembling main drive pinion to mainshaft spigot, ensure that synchronizing ring slots (arrowed) are aligned with clutch keys.

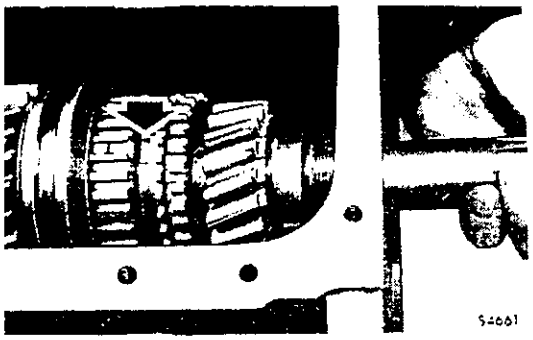


Fig 44 - Installing main drive pinion

66 To prevent third and fourth speed clutch contacting layshaft third gear when installing mainshaft rear bearing in casing, clutch must be located in the neutral position. Use Installer D1141 to drive bearing in until bearing retaining ring contacts rear face of casing.

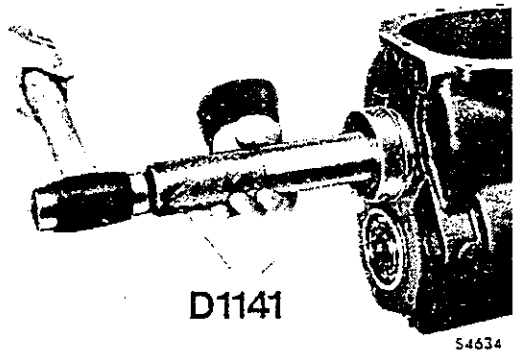


Fig 45 - Installing mainshaft rear bearing

67 Oil thrower is located on main drive pinion with concave side to pinion teeth, and concentric with pinion shoulder. Use stiff grease to retain oil thrower in position during subsequent installation of bearing.

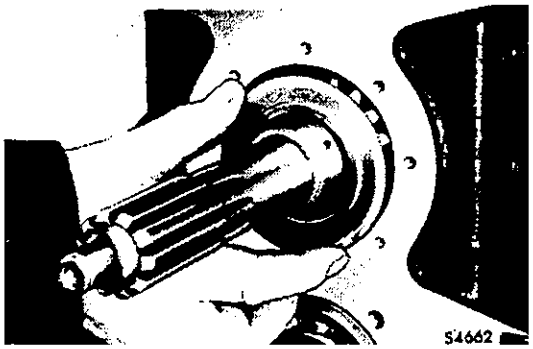


Fig 46 - Installing oil thrower

68 To ensure pinion bearing is located squarely on shaft and in casing bore, hold bearing on nut spigot and screw nut on to shaft until finger tight.

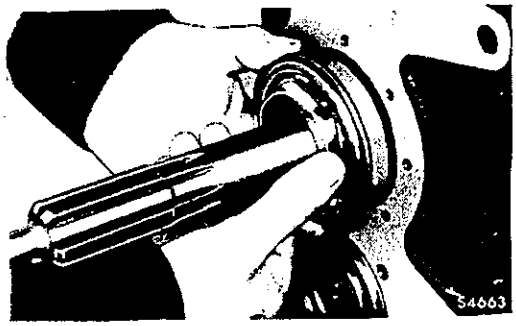


Fig 47 - Locating pinion bearing

69 After engaging both second and reverse gears, use Wrench D1123 to tighten nut approximately three turns, then carefully tap bearing into casing with Installer D1141. Repate this procedure until bearing retaining ring contacts casing. During this operation, ensure fourth speed synchronizing ring is not forced into contact with gear cone otherwise synchronizing ring will be damaged. Ensure main drive pinion oil thrower remains in position.

70 After tightening pinion nut, secure it by staking into hole provided in main drive pinion.

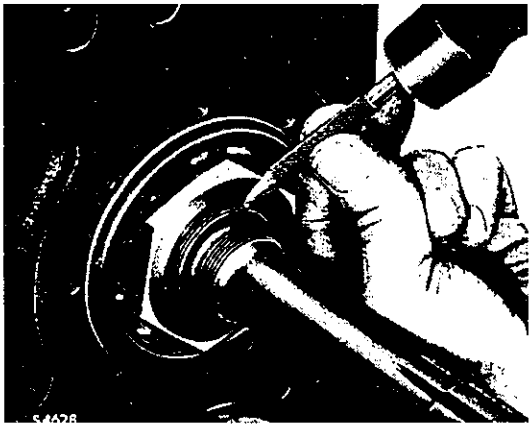


Fig 48 - Staking pinion nut

71 When assembling retainer to front spigot of layshaft, ensure bolts are secured by locking plate.

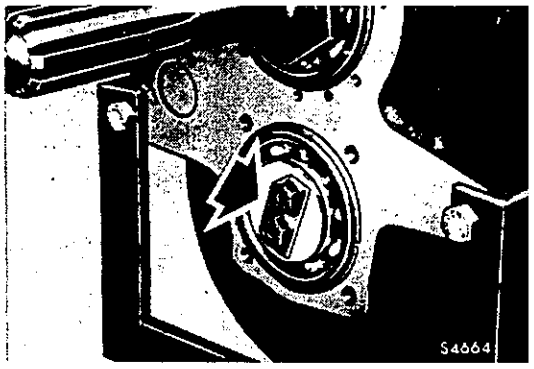


Fig 49 - Installing layshaft spigot bearing retainer

72 When assembling layshaft front cover apply Loctite 510 (sealant) to transmission face and smear bolts with jointing compound.

73 Install oil thrower to mainshaft so that paddles are away from bearing and install speedometer driving gear so that shoulder is towards oil thrower.

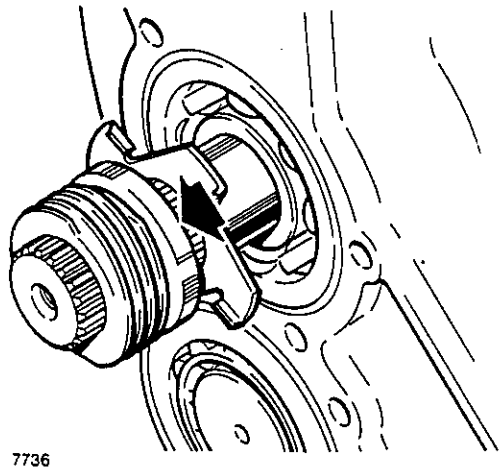


Fig 50 - Installing oil thrower and speedometer driving gear

74 When installing rear cover apply Loctite 510 (sealant) to transmission face and smear bolts with jointing compound. With both top and reverse gears engaged, tighten coupling flange bolt to specified torque.

75 When installing reverse striking lever, lower end of lever must be fully engaged in reverse idler gear groove in all positions when operated. Do not secure nut of lever eccentric bolt at this stage.

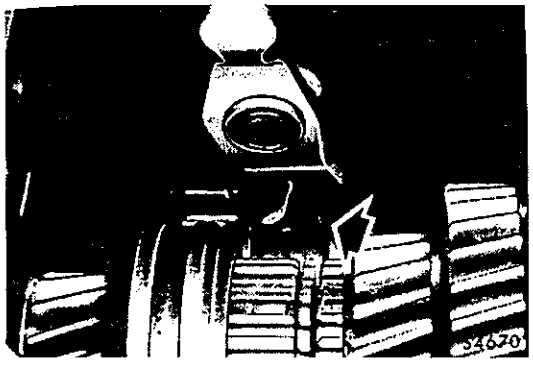


Fig 51 - Installing reverse striking lever

76 Striking fork rods are identified by location and number of locking slots. 'A' - reverse, has two locking slots at front of rod. 'B' - first and second, has three locking slots at rear of rod. 'C' - third and fourth, has three locking slots at front of rod.

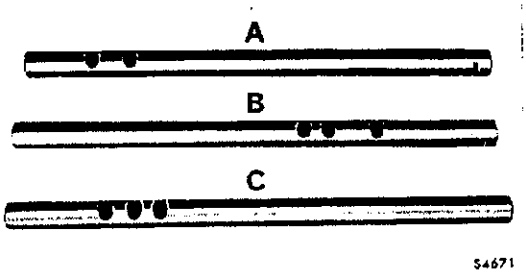


Fig 52 - Striking fork rod identification

77 To facilitate assembly of striking forks to rods, use pilot rods (arrowed) to retain locking ball and spring in forks and reverse lever head, installing rods will push pilots clear.

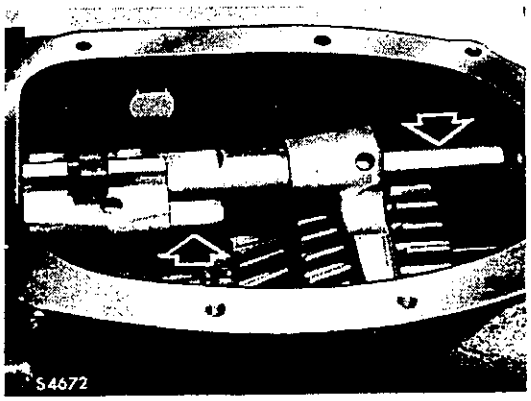


Fig 53 - Assembly of striking forks

78 Before driving striking fork rods into casing, engage top and second gear. Position retainer in rod locating grooves so that chamfered edge of retainer is to the bottom of casing and to rear of rods. Tempoarily install guide bolts to align retainer holes with tapped holes in casing. Apply a small amount of Loctite 290 (adhesive) to ends of selector rods and drive rods into casing. Remove guide bolts, apply Hylomar PL 32/M jointing compound to threads and replace and tighten bolts.

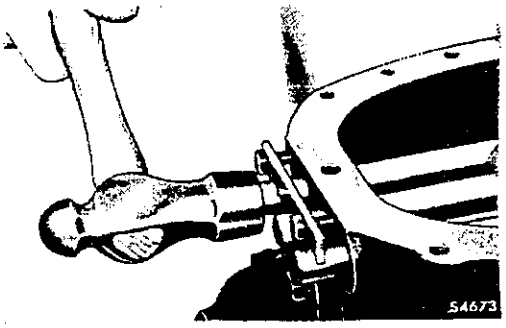


Fig 54 - Installing striking fork rods

79 Use new sealing washers on main drive pinion cover bolts, and ensure washers do not project beyond cover flange.

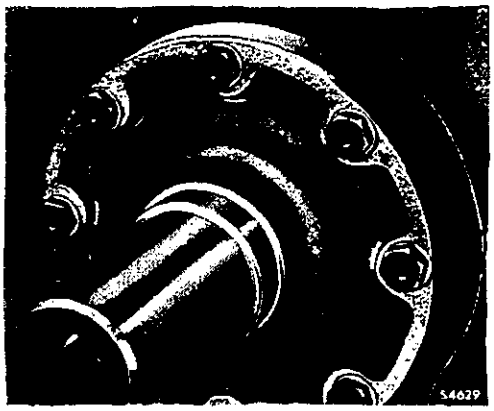


Fig 55 - Installing main drive pinion cover

80 To ensure reverse idler gear fully engages mainshaft first and reverse gear when in reverse, striking lever can be adjusted by means of an eccentric pivot bolt. High side of eccentric is indicated by punch marks (arrowed).

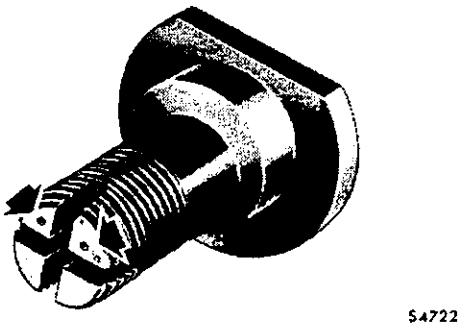


Fig 56 - Reverse idler gear pivot bolt

81 To adjust reverse striking lever, select reverse gear and rotate eccentric pivot bolt until clearance between reverse gear and layshaft third speed gear is 1.3/1.5 mm (0.05/0.06 in.).

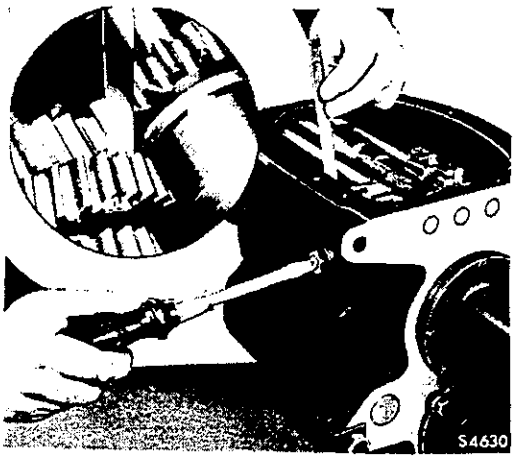


Fig 57 - Adjusting reverse striking lever

82 After setting reverse striking lever, do not disturb pivot bolt when tightening nut. Secure nut by staking it into each end of pivot bolt slots.

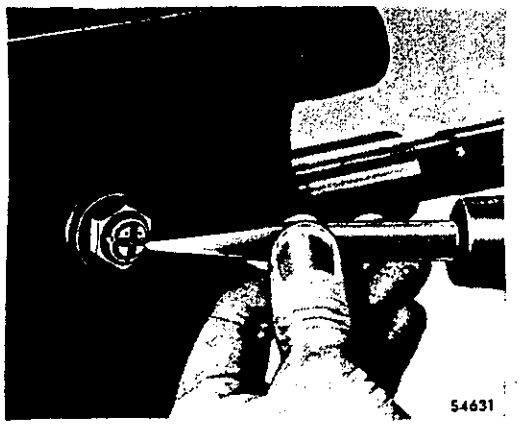


Fig 58 - Staking pivot bolt nut

83 Ensure chip collector is installed in bottom of casing before assembling cover to power take-off aperture.

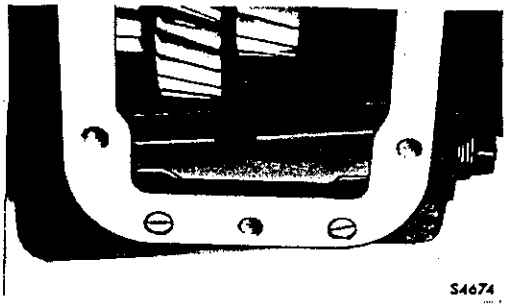


Fig 59 - Installing chip collector

84 Before installing gearbox, lubricate front cover sleeve and main drive pinion splines sparingly with grease.

CHAPTER 4

TRANSFER BOX

CONTENTS

SPEEDOMETER GEARS

Removal

1 Drain the oil from the transfer box.

2 Disconnect and support the front end of the rear propeller shaft.

3 Disconnect the speedometer cable and remove the driven gear and housing from the transfer box rear cover.

4 Remove the bolt, tabwasher and plain washer and withdraw the flange from the mainshaft.

5 Remove the transfer box rear cover.

6 Withdraw the speedometer driving gear.

Installation

7 Install the driving gear with its spigot towards the mainshaft bearing.

8 Tighten the propeller shaft flange attaching bolt to 87Nm (64 lbf ft), and secure it with the lock tab.

9 Lubricate the speedometer driven gear and shaft with gear oil.

10 Locate the driven gear housing as shown in Fig 1.

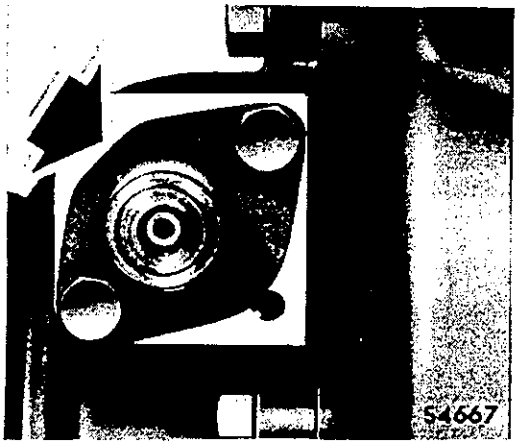


Fig 1 - Speedometer housing location

11 Tighten the propeller shaft bolts to 108 Nm (80 lbf ft).

12 Refit the transfer box with oil meeting specification MIL-L-2105 (SAE 90 oil for temperatures above 0°C or SAE 80 for temperatures below 0°C).

TRANSFER BOX ASSEMBLY

Removal

13 Drain the oil.

14 Disconnect and support the propeller shafts.

15 Disconnect the control rod from the power take-off striking fork rod.

16 Disconnect the control rod from the striking levers on the transfer box controls support bracket.

17 Disconnect the speedometer cable.

18 Slacken the bolts securing the transfer box to the chassis frame and mounting bracket.

19 Support the transfer box weight approximately 75 kg (165 lb), and remove the bolts securing it to the mounting bracket and chassis frame.

20 Lower the transfer box and withdraw it clear of the vehicle.

Installation

21 Installation of transfer box is the reverse procedure of removal.

22 Tighten universal joint flange bolts to 75 Nm (55 lbf ft) for 7/16 in. dia bolts and 108 Nm (80 lbf ft) for 1/2 in. dia.

23 Refill transfer box to correct level with oil meeting specification MIL-L-2105 SAE 90 for temperatures above 0°C or SAE 80 for temperatures below 0°C.

Disassembly

24 Disconnect the short control rod from the transfer box striking fork outer lever.

25 Disconnect the striking fork rod connecting link from the striking rod link. Remove the link and locknut from the rod.

26 Remove the transfer box controls support bracket.

27 Remove the mainshaft and the power take-off flanges.

28 Knock back the staking, remove the nut securing the layshaft flange and withdraw the flange.

29 Unscrew the retainer and withdraw the striking fork locking ball spring and ball from the layshaft and power take-off front covers.

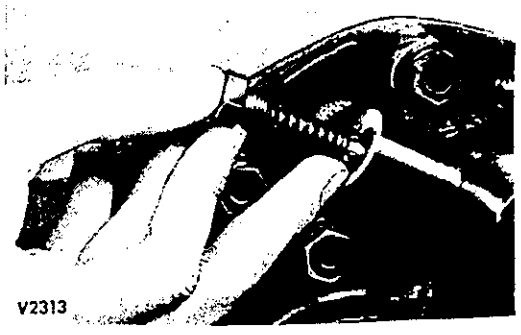


Fig 2 - Striking fork locking ball

30 Remove the eye bolt and locknut from the power take-off striking fork rod and remove the bolts securing the power take-off front cover, withdraw cover.

31 Remove the layshaft front cover. Withdraw the front wheel drive clutch and striking fork.

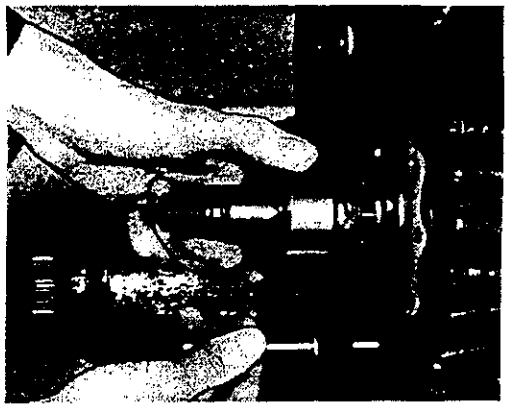


Fig 3 - Front wheel drive clutch removal

32 Remove the circlip and retaining ring locating the layshaft front bearing on the shaft.

33 Remove the locating ring from the layshaft front bearing outer race, and withdraw the bearing using Remover Z8523 and Adaptor Z8524.

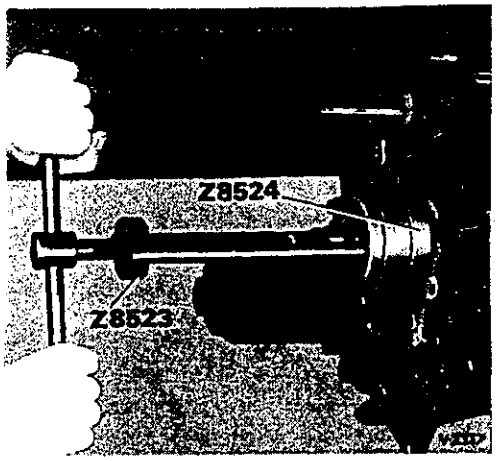


Fig 4 - Layshaft front bearing removal

34 Using Remover Z8523, Adaptor Z8524 and a distance piece installed between the Remover and power take-off shaft withdraw the power take-off front bearing.

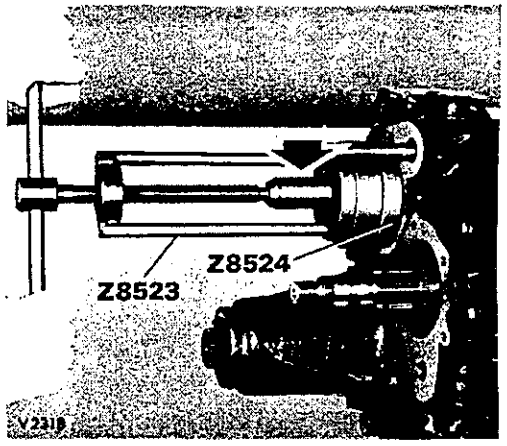


Fig 5 - Power take-off front bearing removal

35 Remove the bolts securing the transfer box front cover, and withdraw the cover squarely off the two dowels. A flat (arrowed) is machined on the input pinion dogs to clear the layshaft driven gear teeth.

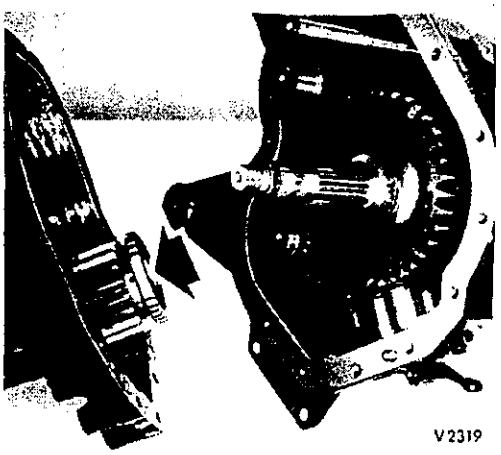


Fig 6 - Front cover removal

36 Carefully withdraw the layshaft driven gear and spacer. Remove the rollers and the roller spacer.

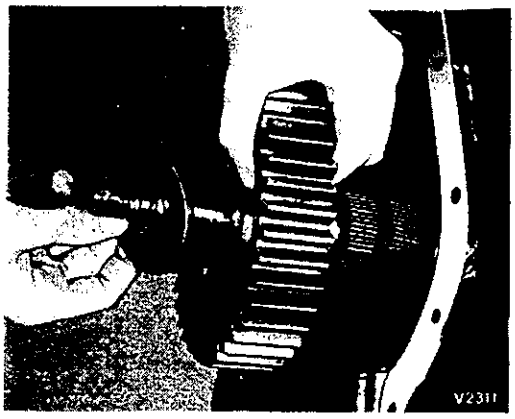


Fig 7 - Layshaft driven gear removal

37 Withdraw power take-off gear and spacer together with the striking fork and rod.

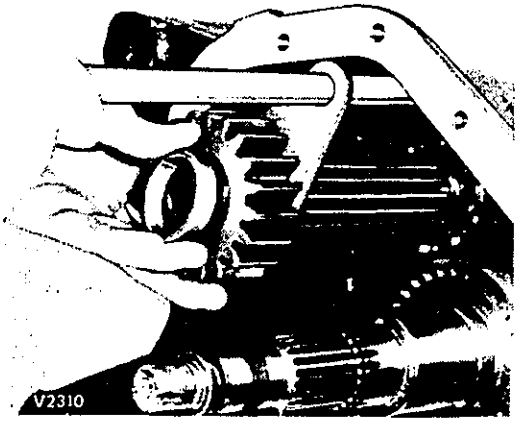


Fig 8 - Power take-off gear removal

38 Remove the speedometer driven gear and housing from the transfer box rear cover.

39 Remove the transfer box and power take-off rear covers. Withdraw the speedometer gear from the mainshaft.

40 Remove the cotter from the transfer box outer lever, and withdraw the lever, circlip and washer from the shaft.

41 Unscrew the retainers and extract the locking plunger springs from the striking fork lever housing. Remove the housing, taking care not to lose the two locking plungers. Withdraw the oil seal from the housing.

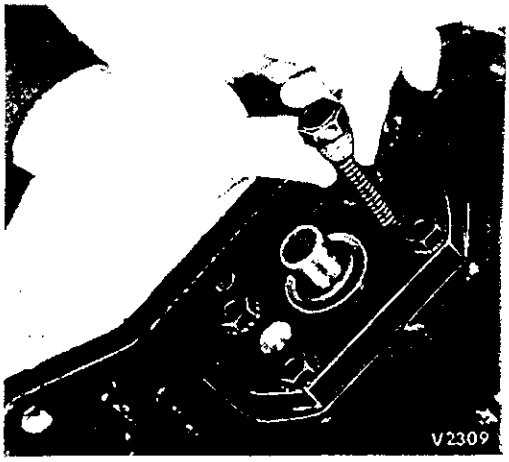


Fig 9 - Withdrawing locking plunger and springs

42 Lift the striking fork lever and shaft to enable the striking forks to be disengaged from the clutch sleeves, and withdraw the assembly through the open end of the casing.

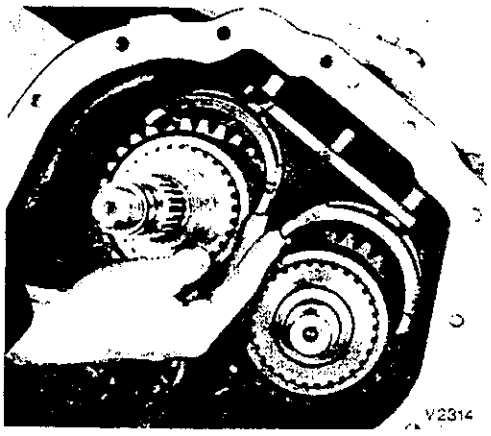


Fig 10 - Striking fork withdrawal

43 Support the front end of the layshaft, and drive the rear bearing out of the casing by tapping the rear end of the layshaft.

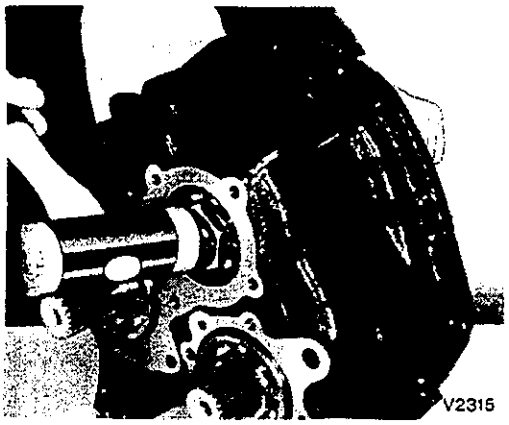


Fig 11 - Layshaft removal

44 Remove the locating ring from the mainshaft rear bearing outer race. Support the mainshaft and using a soft mallet against the rear end of the shaft, drive the bearing out of the casing.

45 Remove the locating ring from the power take-off rear bearing outer race. Support the shaft, and using a soft mallet against the rear end of the shaft, drive the bearing out of the casing.

46 Disassemble the mainshaft assembly as follows:

46.1 Slide the sleeve off the clutch hub.

46.2 Support the mainshaft gear on the bed of a press and press the rear end of the mainshaft through the bearing spacer and gear.

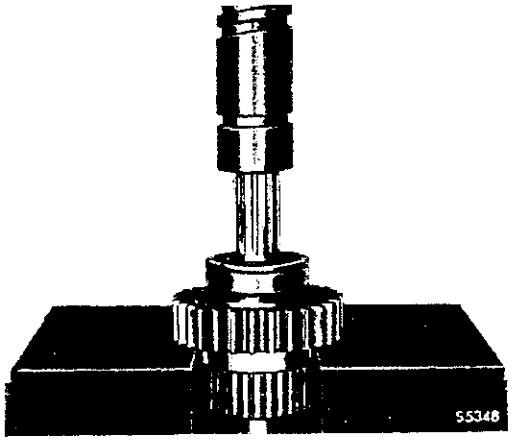


Fig 12 - Mainshaft disassembly

47 Disassemble the layshaft assembly as follows:

47.1 Slide the sleeve off the layshaft clutch hub.

47.2 Grip the splined end of the layshaft in a soft jawed vice and remove the bearing left hand threaded retaining nut.

47.3 Support the layshaft direct drive gear on the bed of a press and, using a suitable drift, press the shaft through the rear bearing, spacer and gear.

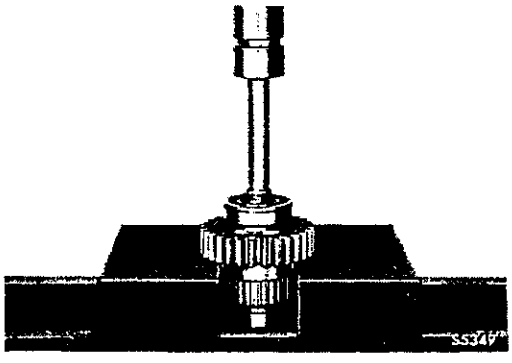


Fig 13 - Layshaft disassembly

48 Disassemble the input pinion and cover as follows:

48.1 Remove the roller bearing from the pinion counterbore.

48.2 Remove the input pinion flange and tap the shaft rearwards out of the pinion and transfer box front covers.

48.3 Remove the pinion cover from the transfer box front cover.

48.4 Remove the roller bearing from the transfer box cover.

48.5 From inside the pinion cover, remove the outer bearing retaining ring, and with the cover supported and a drift contacting the bearing inner race, press the bearing out of the cover.

49 Support the power take-off bearing spacer on the bed of a press, and press the shaft through the bearing and spacer.

Inspection and reconditioning

50 Remove all burrs from the gear teeth and splines with a fine grade carborundum stone and afterwards wash the components thoroughly to remove all traces of carborundum. Gears must be renewed only in pairs, not individually.

51 To renew the striking fork rod oil seal in the power take-off or layshaft front cover, prise out the retainer from the boss of the cover and withdraw the seal. Smear the new seal with Rocol anti-scuffing paste and fit a new retainer.

52 When renewing a main oil seal, smear the seal lip with Rocol anti-scuffing paste and ensure that the lip faces inwards before pressing in the seal. The seal casing must be flush with the cover.

53 The layshaft universal joint flange and bush is serviced only as an assembly. When renewing the flange mud sling, it should be pressed on to the shoulder of the flange.

Reassembly

54 Reassemble the main shaft assembly as follows:

54.1 Rest the rear face of the mainshaft gear on the bed of a press. Locate the mainshaft squarely in the gear bore, rotating the gear if necessary to bring the internal teeth into alignment with the corresponding dog teeth of the mainshaft. Press the shaft down until it is right home against the clutch hub.

54.2 Locate the spacer, bore chamfer first, against the gear and, with the front face of the clutch hub supported on a press, assemble the mainshaft bearing with the locating ring groove away from the gear, and press the bearing on to the shaft until it contacts the spacer.

54.3 Assemble the sleeve to the clutch hub, ensuring that it slides freely on the hub splines.

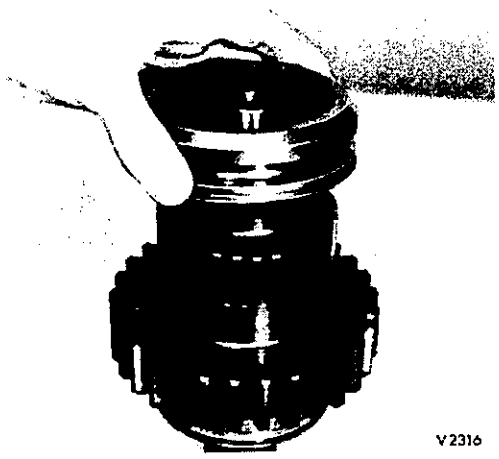


Fig 14 - Clutch hub assembly

55 Reassemble the layshaft assembly as follows:

55.1 Rest the rear face of the layshaft direct drive gear on the bed of a press. Locate the layshaft squarely in the gear bore, rotating the gear if necessary to bring the internal teeth into alignment with the corresponding dog teeth of the layshaft. Press the shaft down until it is right home against the clutch hub.

55.2 Locate the spacer, bore chamfer first, against the gear and, with the front face of the clutch hub supported on a press, assemble the layshaft bearing with the locating ring groove away from the gear, and press the bearing on to the shaft until it contacts the spacer.

55.3 Grip the splined end of the layshaft in a soft jawed vice and refit the bearing left hand threaded retaining nut. Secure the nut by staking it into the groove in the shaft.

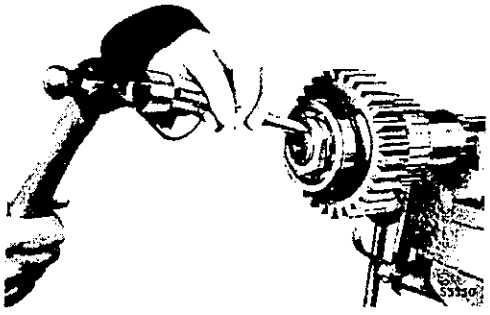


Fig 15 - Staking layshaft nut

55.4 Assemble the sleeve to the clutch hub, ensuring that it slides freely on the hub splines.

56 Assemble the spacing washer to the rear end of the power take-off shaft, and press the bearing, with the locating ring groove away from the spacer washer, right home on the shaft.

57 Install the layshaft assembly as follows:

57.1 Rest the rear face of the transfer box on the bench with the mounting bosses away from the operator.

57.2 Locate the layshaft in the casing so that the bearing is entered squarely in the casing bore nearest the operator.

57.3 Tap the front end of the layshaft to drive in the bearing, until the groove in the outer race can just be seen at the rear of the casing. A locating ring is not used on this bearing.

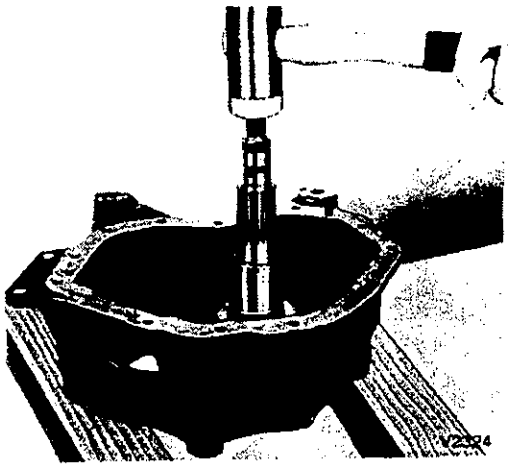


Fig 16 - Layshaft installation

58 Install the mainshaft assembly as follows:

58.1 Position the rear end of the mainshaft through the bearing bore. Hold the mainshaft assembly so that the bearing remains square to the bore, and drive the bearing into the casing by tapping the front of the mainshaft. If necessary, rotate the shaft to engage the teeth on the mainshaft gear with the teeth on the layshaft gear.

58.2 Assemble the locating ring to the bearing outer race and tap the rear end of the shaft until the ring contacts the casing.

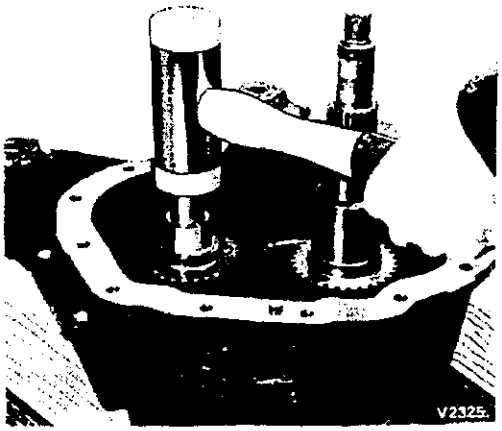


Fig 17 - Mainshaft installation

59 Assemble the power take-off shaft as follows:

59.1 Locate the rear end of the shaft in the bearing bore so that the bearing is square to the bore, and drive the bearing into the casing.

59.2 Assemble the locating ring to the bearing outer race and tap the rear end of the shaft until the ring contacts the casing.

59.3 Assemble the striking fork to the gear and position the gear (flanged side first) over the shaft, at the same time entering the striking fork rod in the bore of the casing.

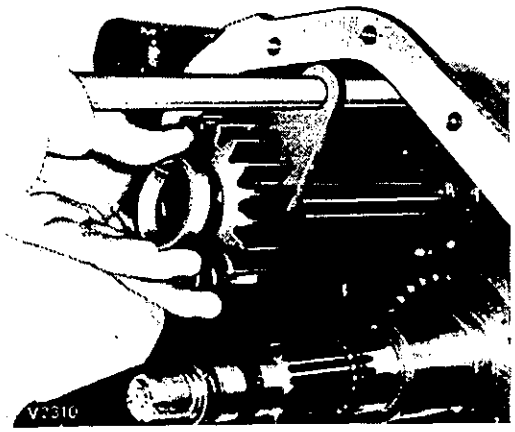


Fig 18 - Power take-off gear and striking fork installation

60 Assemble the selector mechanism as follows:

60.1 From the open end of the casing, position the shaft of the striking fork lever with the flat on the end of the shaft away from the layshaft, and insert the assembly through the aperture in the top of the casing. Hold the shaft and assemble the forks to the bushes of the striking lever; power the assembly and engage the forks in the grooves in the main-shaft and layshaft clutch sleeves.

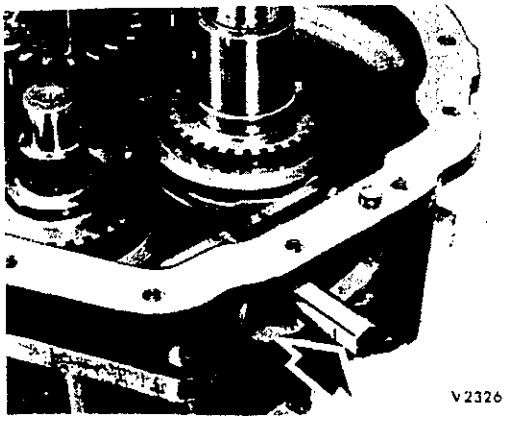


Fig 19 - Striking fork lever

60.2 Using a new gasket reassemble the striking fork lever housing. Smear the attaching bolt threads with jointing compound and tighten evenly. Do not overtighten.

60.3 Place a new oil seal in the housing recess, and refit the washer and circlip. Position the clutch sleeves in neutral, and install the locking plungers, springs, and retainers. Assemble the outer lever to the shaft and fit the cotter with the threaded portion towards the casing flange.

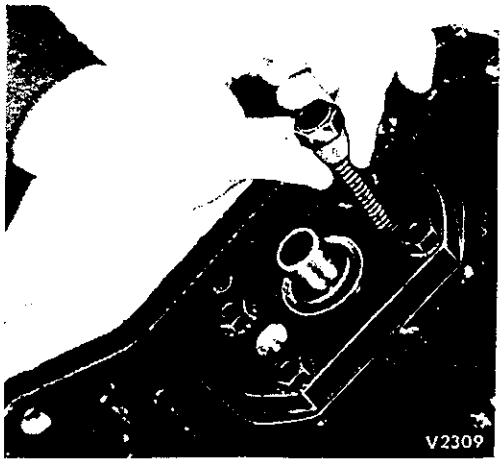


Fig 20 - Installing locking plunge and springs

61 Assemble the layshaft driven gear to the shaft as follows:

61.1 Smear grease on the layshaft journal and assemble 116 rollers to the journal, with the spacer between the two rows of rollers.

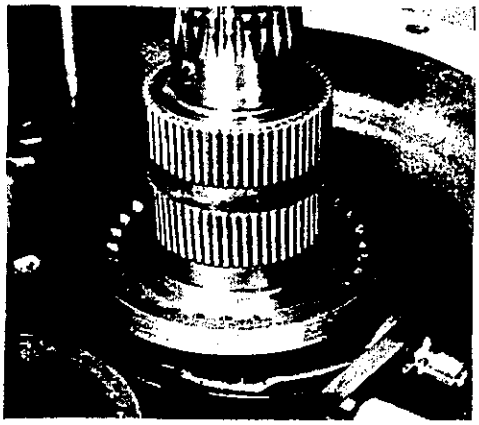


Fig 21 - Roller installation

61.2 Check that the oil feed holes in the layshaft driven gear are free from obstruction, and that the circlip (arrowed) is secure in the gear groove. With the oil feed holes towards the box, assemble the gear over the rollers, taking care not to displace any of the rollers.

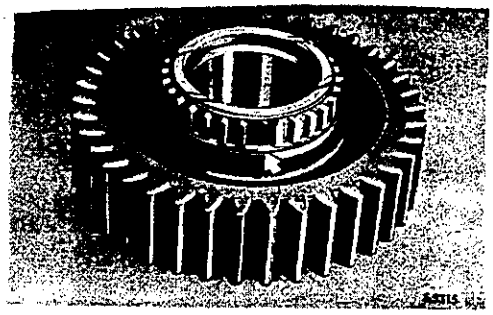


Fig 22 - Layshaft driven gear

61.3 Fit a new spacer, bore chamfer first, to the layshaft shoulder and check that the end float of the layshaft driven gear is 0.23/0.35 mm (0.009/0.014 in.).

62 Using jointing compound, assemble a new gasket to the attaching face on the transfer box casing. Assemble the cover squarely on to the dowels and fit the bolts after smearing them with jointing compound. Tighten the bolts evenly.

63 Using a tubular drift, install the layshaft front bearing in the transfer box front cover. The bearing locating ring must be in contact with the face of the cover. Position the washer on the front of the layshaft against the bearing inner race and install the circlip.

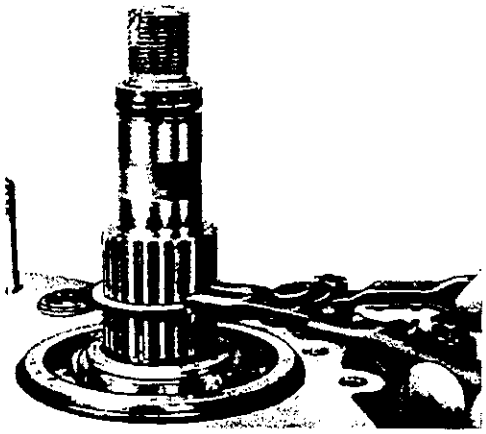


Fig 23 - Layshaft front bearing installation

64 Assemble the front wheel drive clutch to the layshaft, with the selector fork groove in the clutch to the rear.

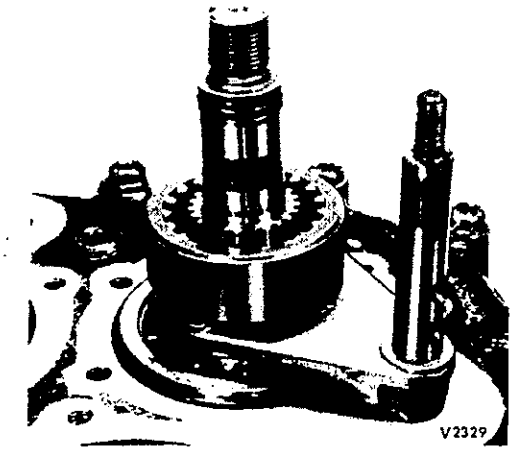


Fig 24 - Front wheel drive clutch installation

65 Engage the striking fork rod with the groove in the clutch, at the same time entering the rear end of the rod in the bore in the front cover.

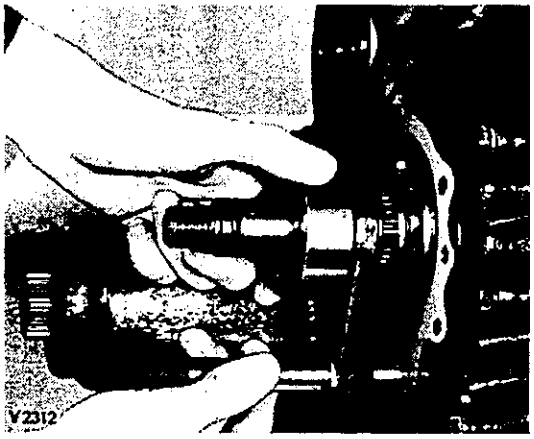


Fig 25 - Striking fork rod installation

66 Smear the layshaft cover oil seal with Rocol anti-scuffing paste and assemble the cover to the transfer box, using a new gasket. Install the striking fork and locking ball, spring and retainer.

67 Before installing the layshaft universal joint flange, place a new O-ring seal in the groove of the layshaft and smear the seal with gear oil.

68 Assemble the washer over the end of the layshaft, tighten the nut and secure by staking it into the slot in the shaft.

69 Assemble the locknut and striking rod link to the threaded end of the 2/4 wheel drive clutch striking fork rod but do not tighten the locknut at this stage.

70 Using a hammer and drift through the rear end of the input pinion cover, tap the outer bearing squarely in to the cover bore until it locates against the shoulder. Install the bearing retaining ring in the groove.

71 Assemble the input pinion and cover as follows:

71.1 Lubricate the mainshaft spigot bearing and place it in the counterbore of the input shaft pinion.

71.2 Align the flat on the input pinion dogs to clear the layshaft driven gear, put the pinion into mesh with the layshaft, and carefully feed the pinion on to the mainshaft spigot. Enter the roller bearing squarely in the cover and gently tap the bearing into the cover. The bearing locating ring must be in contact with the cover.

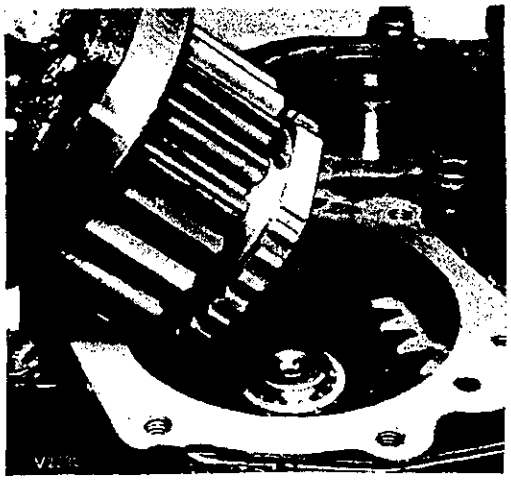


Fig 26 - Input pinion installation

71.3 Attach a new pinion cover gasket to the transfer box front cover. Place the pinion cover over the input pinion shaft and assemble the coupling flange to the shaft. Refit the washer, tabwasher and attaching bolt.

71.4 Tighten the flange attaching bolt sufficiently to enable the pinion cover bolts to be installed.

71.5 Install the cover bolts, after smearing the threads with jointing compound, but do not tighten them. Tighten the coupling flange bolt to 104 Nm (77 lbf ft) and secure with the lock tab.

71.6 Tighten the cover bolts evenly and check that the mud sling does not foul the cover.

72 Refit the speedometer driving gear with the spigot towards the mainshaft bearing and assemble the transfer box rear cover, using a new gasket. Smear the bolt threads with jointing compound and tighten evenly.

73 Assemble the flange to the mainshaft, tighten the bolt to 104 Nm (77 lbf ft) and secure with the lock tab.

74 Lubricate the speedometer driven gear and shaft with gear oil. Insert the gear into the gear housing, and fit the gear and housing to the transfer box rear cover. Locate the housing as shown under 'Speedometer Gears'.

75 Refit the power take off rear cover, using a new gasket. Smear the attaching bolt threads with jointing compound and tighten evenly. Assemble the flange to the shaft, tighten the bolt to 104 Nm (77 lbf ft) and secure with the lock tab.

76 Assemble the split collar against the splines on the front end of the power take off shaft and replace the front bearing, using a tubular drift. The bearing must be in contact with the collar.

77 Using a new gasket, fit the power take off front cover and striking fork rod. Smear the bolt threads with jointing compound and tighten evenly. Refit the eye bolt and locknut to the striking fork rod and tighten the nut. Check the operation of the rod, which must slide freely.

78 With the power take-off gear disengaged, install the striking fork rod locking ball, spring and retainer.

79 Assemble the transfer box controls support bracket and reconnect the short control rod to the transfer box outer lever and to the outer lever on the bracket.

80 Install the transfer box as described in Chap 4, level 2, para 9.

CHAPTER 5

REAR AXLE

CONTENTS

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Ser	Tool No (where applicable)	NSN/Part No (where applicable)	Designation
(1)	(2)	(3)	(4)
1	Z8457	7BD/5120-99-828-6750	)
2	Z8458	7BD/5120-99-828-6751	) Pinion bearing removers
3	Z8428		) Two legged drag
4	1500	6MT2/5120-99-401-3589	Ram
5	Z8455	7BD/5120-99-804-5825	Remover
6	Z8456	7BD/5120-99-804-5827	Collets

REAR AXLE ASSEMBLY

Removal

1 Scotch the front wheels and raise and support the rear of the vehicle.

2 Remove the road wheels. The wheel nuts on the left-hand side have left-hand threads.

3 Disconnect and support the rear end of the propeller shaft.

4 Disconnect the brake hose, and the axle breather tube.

5 Disconnect the parking brake cable.

6 Remove the rear spring retaining bolts and disconnect the shock absorbers from the axle.

7 Lower the axle to disengage the springs and remove the axle.

Installation

8 Rear axle installation is a reversal of removal with particular attention being paid to the following points:

8.1 Install spring hanger and shackle bolts and tighten to a torque of 257 Nm (190 lbf ft).

8.2 Install propeller shaft and tighten nuts to a torque of 108 Nm (80 lbf ft).

8.3 Check oil level in axle centre and in each hub.

8.4 Recheck the spring retaining bolt tightness with the vehicle fully laden.

8.5 Bleed and adjust the brakes.

DIFFERENTIAL ASSEMBLY

Removal

9 Drain the axle by removing the cover.

10 With hubs positioned with oil filler plugs at bottom, remove plugs and drain oil from hubs.

11 Remove the axle shaft flange nuts and sling plate, and withdraw the shaft. A drift may be used to break the flange joint with the hub.

12 Slacken the locknut and unscrew the gear thrust screw.

13 Remove the lockplates from the differential side bearing caps.

14 Mark the bearing caps to ensure they are not inter-changed during reassembly.

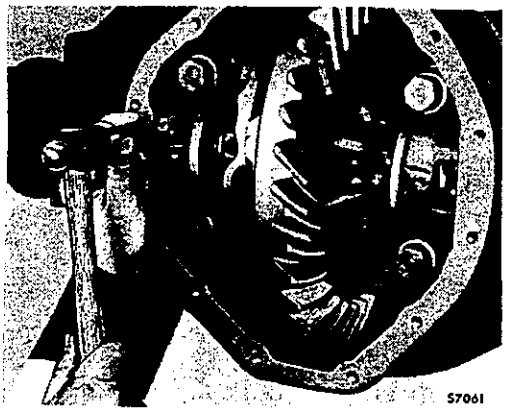


Fig 1 - Marking bearing caps

15 Remove the bearing caps together with the adjusting nuts and bearing outer races.

16 Withdraw differential and hypoid gear keeping side bearing outer races with their respective bearings. Do not remove side bearings from differential unless renewal is necessary.

Disassembly

17 Remove differential assembly from axle housing as previously described.

18 Disassemble the hypoid gear and differential as follows:

18.1 Remove the bolts securing the hypoid gear and cover to the differential case, and lift away the cover. Remove the differential spider, pinions and thrust washers. Ensure that all pinions and side gears are kept to their respective thrust washers for correct reassembly.

18.2 The side bearing inner race and rollers should only be removed if they are to be renewed.

18.3 Remove the hypoid gear using a soft metal hammer to tap the gear from the differential case register.

19 To remove a bearing, split cage and remove cage and rollers. Install a plug (arrowed) in differential case spigot, and assemble Remover Z8455 and Collets Z8456 to bearing inner race. Locking ring must be unscrewed from body of remover as far as possible to ensure collets fully engage bearing race collar. Use a No 1500 Hydraulic Ram to withdraw race.

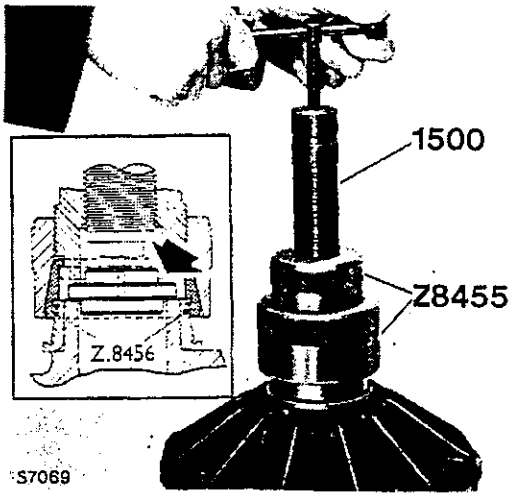


Fig 2 - Removing side bearing inner race

Reassembly

20 Press the new bearing inner race and rollers on to the differential case spigot, making sure that it is right home against the spigot shoulder.

21 Reassemble the differential as follows:

21.1 Prior to assembly, lubricate all parts with oil.

21.2 Place a side gear and thrust washer into the differential case cover.

21.3 Assemble the four differential pinions and thrust washers to the spider. Install the spider in the cover ensuring that the pinions mesh with the side gear.

21.4 Place the second side gear in mesh with the pinions and assemble the thrust washer to the gear.

21.5 Differential case and cover must be assembled with pairing numbers in line.

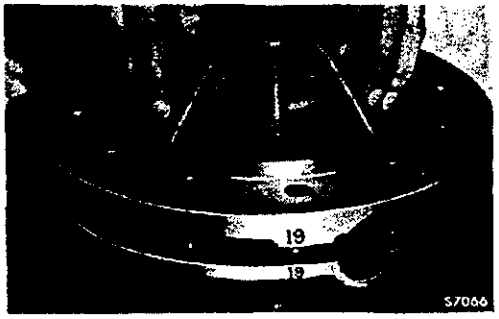


Fig 3 - Assembling differential

21.6 Place the hypoid gear on the differential case register and using new lockwashers, tighten the bolts evenly to 156 Nm (115 lbf ft). Three guide studs, each 51 mm (2.0 in.) long and slotted at one end for a screw-driver, can be made from spare attaching bolts and screwed into the gear to facilitate assembly.

21.7 The hypoid gear may be an interference fit on the register. If this is so, warm the gear, avoiding local heating, then place in position on the case register.

PINION BEARING

Removal

22 Remove pinion as described in Chap 5, level 2, para 22.

23 To inspect front bearing, press outer race and front inner race and rollers off pinion shaft, leaving rear inner race and rollers in position. Ensure that races and rollers are kept to their respective ends of the bearing.

24 Front bearing rear inner race and rollers, and pinion rear bearing, need not be disturbed unless renewal is necessary.

25 To remove rear half of pinion front bearing, support assembly on Removal Plate Z8457 (5-tooth pinion), Z8458 (6-tooth pinion) or Z8459 (7-tooth pinion).

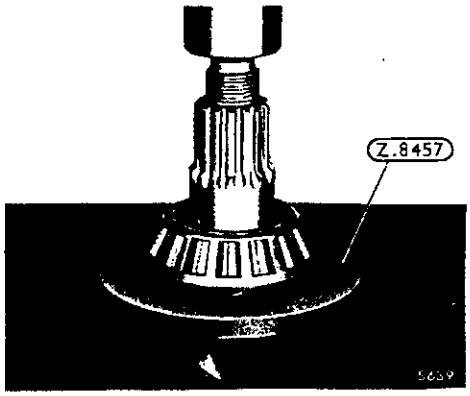


Fig 4 - Removing pinion front bearing

26 Use Remover Z8428 with a No 1500 Ram to remove pinion rear bearing inner race. Note that race is secured to pinion shaft by a circlip.

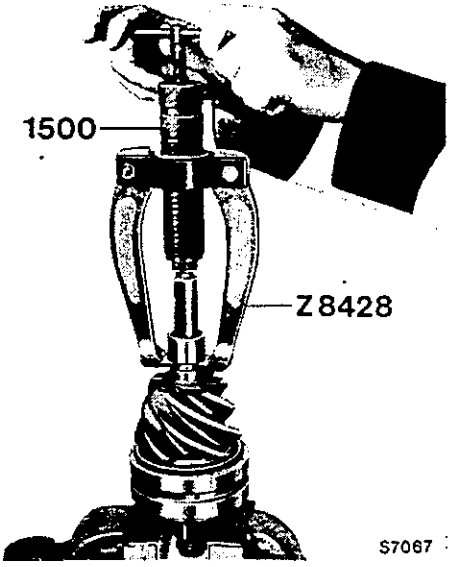


Fig 5 - Removing pinion rear bearing inner race

DIFFERENTIAL AND PINION

Installation

27 Before installing pinion rear bearing outer race, smear periphery with Loctite 270 (studlock).

28 To ensure clearance with the hypoid gear, install pinion bearing race retaining bolt from front of boss.

29 Before installing hypoid pinion and bearings, assemble the differential and hypoid gear to the axle housing as follows:

29.1 Ensure the side bearing outer races and caps are refitted in their original positions and check that the adjusting nuts correctly engage the threads of the carrier and bearing caps. Tighten the cap bolts sufficiently to hold the caps firmly but allow the bearing adjusting nuts to be turned.

29.2 Tighten the adjusting nuts with a lever until the bearing outer faces are firmly in contact with the rollers. Back off one of the adjusting nuts, then retighten and note when the bearing outer races come into contact with the rollers, the point at which firm contact occurs will be felt quite distinctly. From this point, tighten the nut further by not less than one slot, or not more than two, to pre-load the bearings. Note that the ultimate fitment of the adjusting nut lockplates must be kept in mind and the slots of the nuts lined up accordingly. Do not finally tighten the bearing cap bolts or install the lockplates at this stage.

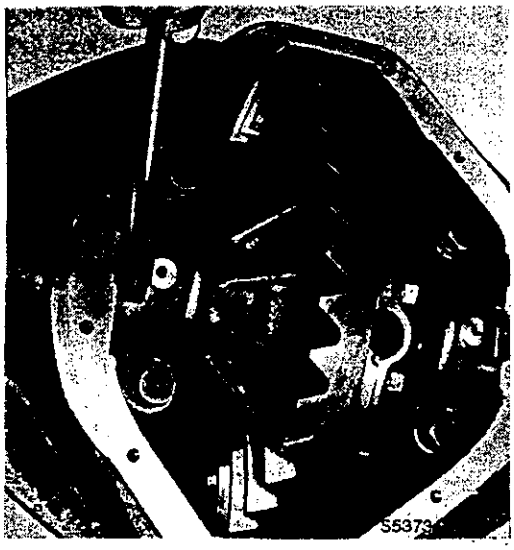


Fig 6 - Pre-loading differential side bearing

30 After adjusting bearing pre-load, check the run-out on the rear face of the hypoid gear. If run-out exceeds 0.13 mm (0.005 in.), gear must be removed and a check made for burrs or foreign matter on the mating faces, or a check made for run-out of the differential case flange.

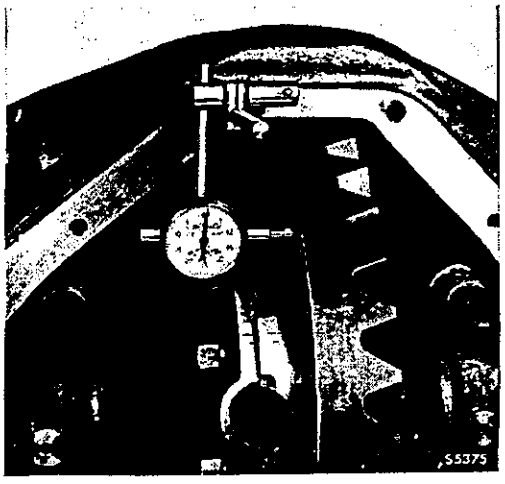


Fig 7 - Hypoid gear run-out

31 When assembling front bearing to hypoid pinion, ensure that spacer supplied with bearing is used. Spacer (arrowed) is graded for thickness and must not be interchanged indiscriminately.

32 Ensure that the end of the pinion rear bearing inner race with the larger internal radius is towards pinion teeth.

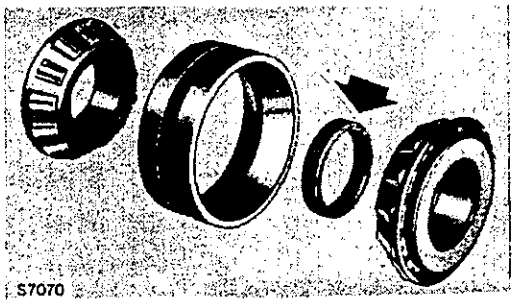


Fig 8 - Front bearing spacer

33 Smear the pinion bearing shims (arrowed) with grease to retain them in position. It is essential to install shims of the same total thickness as originally installed. The spacer located in the pinion housing cover can be selected by subtracting the amount of bearing protrusion (A) above the axle housing plus 0.12 mm (0.005 in.) from the depth of the machined shoulder, (B) in the pinion housing cover.

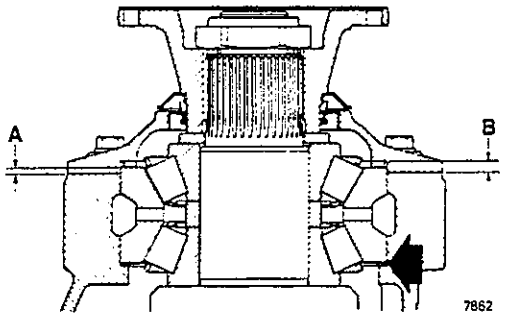


Fig 9 - Pinion assembly

34 Tighten flange nut to 745 Nm (550 lbf ft) at the same time rotating front bearing to ensure it does not bind in one position.

35 Tighten cover bolts evenly, at the same time checking that pinion does not bind against hypoid gear. If necessary, move gear away from pinion by backing off left-hand adjusting nut and tightening right-hand nut by the same amount. This is essential to maintain correct pre-load. Again keep in mind the ultimate fitting of the lockplates.

36 Backlash must be checked at heel of tooth. If backlash is outside specified limit 0.18-0.28 mm (0.007-0.011 in.), move gear in appropriate direction as described above. Check backlash at several points around hypoid gear, to ensure there are no tight spots.

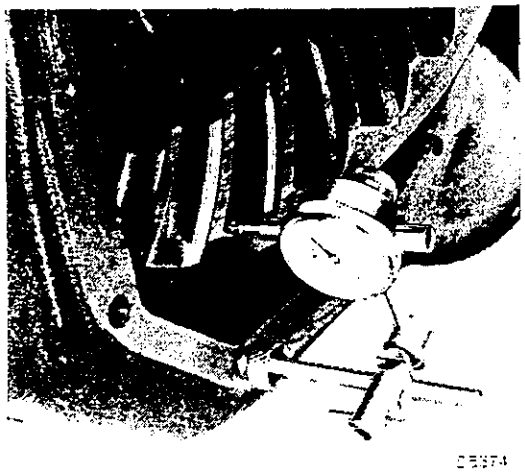


Fig 10 - Checking backlash

37 Having obtained correct backlash, tighten bearing cap bolts to 196 Nm (145 lbf ft) check that bearing cap abutment pads are in contact with axle housing and carry out a tooth marking check. Use a wrench on one of the hypoid gear attaching bolts to rotate gear backwards and forwards.

38 Correct meshing should produce marking 'A' on drive (convex) side of hypoid gear teeth. Marking 'B' indicates that pinion is too far in, and pinion shim thickness is insufficient. If marking is as at 'C', shim thickness must be decreased.

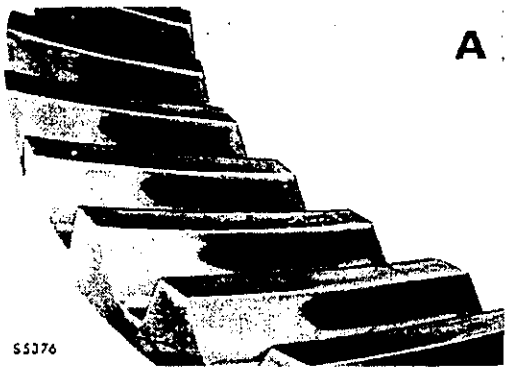


Fig 11 - Tooth markings

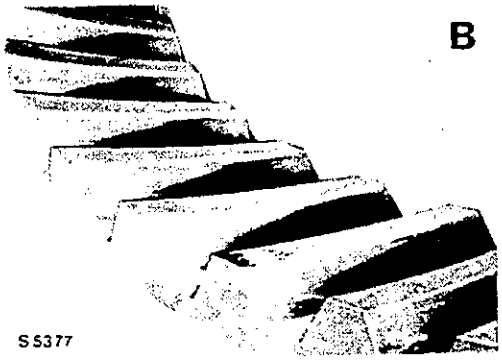


Fig 12 - Tooth markings

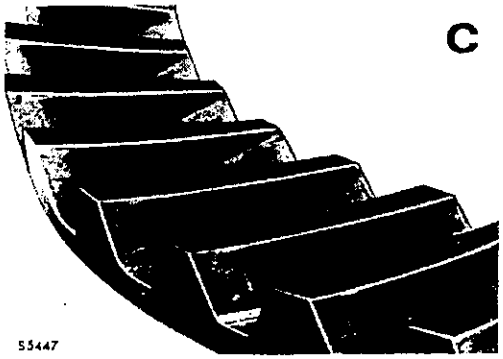


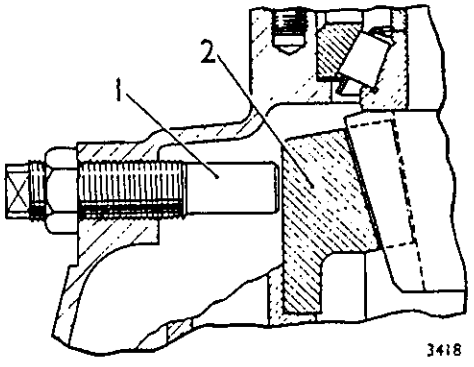
Fig 13 - Tooth markings

39 Whenever a change is made to the setting shims, the spacer located in the pinion housing must be re-calculated as stated previously.

40 After refitting the pinion assembly it is essential to re-adjust the hypoid gear and pinion backlash, as previously explained, before re-checking the tooth marking. Readjustment of side bearing pre-load may be omitted provided care is taken to rotate both adjusting nuts an equal number of slots.

41 Having obtained correct meshing of the hypoid gear and pinion, remove the three lower pinion housing cover bolts and re-install after smearing threads with pipe sealer.

42 Install hypoid gear thrust screw (1) and adjust by screwing it lightly into contact with the gear (2) and backing off an eighth of a turn before tightening locknut.



1. Thrust screw 2. Gear

Fig 14 - Adjusting thrust screw

43 When installing axle housing cover, assemble reinforcement to the two lower bolts.

44 On installation of axle shafts, smear mating faces of shaft and hub with jointing compound.

45 Fill axle and hubs with clean axle oil as described in Chap 5, level 2, para 2.

OIL DEFLECTOR

Renewal

46 When renewing an oil deflector, position it squarely on axle tube.

CHAPTER 6

FRONT AXLE

CONTENTS

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Ser	Tool No (where applicable)	NSN/Part No (where applicable)	Designation
(1)	(2)	(3)	(4)
1	814		Remover
2	1500	6MT2/5120-99-401-3589	Ram
3	Z8455	7BD/5120-99-804-5826	Remover
4	Z8456	7BD/5120-99-804-5827	Collets

FRONT AXLE ASSEMBLY

Removal

1 Scotch the rear wheels and raise and support the front of the vehicle. Remove the road wheel. The wheel nuts on the left hand side have left hand threads.

2 Disconnect the hoses at the front brake cylinders.

3 Disconnect the connecting rod from the steering third arm, using Remover 814.

4 Disconnect the shock absorbers from the axle.

5 Disconnect the propeller shaft from the pinion shaft flange and support the shaft.

6 Disconnect the breather pipe from the axle housing.

7 Jack up the axle, and remove the spring retaining bolts.

8 Withdraw the axle from the front of the vehicle. Note that the assembly weighs approximately 417 kg (920 lb).

Installation

9 Installation of axle to vehicle is a reversal of removal with particular attention being paid to the following:

9.1 Tighten the spring hanger and shackle bolts and nuts to 169 Nm (125 lbf ft).

9.2 Install propeller shaft and tighten nuts to a torque of 108 Nm (80 lbf ft).

9.3 Fill the tracta joint housings and axle housing with oil.

9.4 Ensure there is adequate clearance between the road wheels and springs on full lock. Adjust lock stops if necessary.

9.5 Bleed and adjust the brakes.

9.6 Adjust the front wheel toe-in.

DIFFERENTIAL ASSEMBLY

Removal

10 Scotch the rear wheels and raise and support the front of the vehicle. Remove the road wheel. The wheel nuts on the left hand side have left hand threads.

11 Drain the axle by removing the cover.

12 Remove the hubs and brake drums as described in Chap 6, level 2, para 17.

13 Disconnect the brake shoe return springs and remove the brake flange plates and drive shaft housings.

14 Withdraw the hub drive shafts and tracta joints.

15 Disconnect the connecting rod from the steering third arm, and the tie rod from the steering arms, using Remover 814.

16 Mark the flanges of the axle tube ends and axle housing, to ensure correct assembly.

17 Knock back the lock tabs on the nuts securing the axle tube ends. Support the tube ends and remove the nuts and bolts, then withdraw the tube ends complete with axle shafts.

18 Slacken the locknut and unscrew the gear thrust screw.

19 Remove the lockplates from the differential side bearing caps.

20 Mark the caps and ensure that the bearing adjusting nuts are kept to their respective sides for correct reassembly.

21 Remove the bearing caps together with the adjusting nuts and bearing outer races, then withdraw differential assembly.

22 Disassembly and reassembly of the differential is the same as that described in Chap 5, level 3, para 17.

Installation

23 Installation of the differential assembly is similar to that described in Chap 5, level 3, para 27 apart from the following points:

23.1 When installing the axle tube end, use a new gasket, and ensure that the mark across the tube end and housing flanges is in alignment. Use new tab washers under the tube end attaching nuts.

23.2 To ensure that the axle shaft bush is seating correctly in the tube end, drive the bush and shaft assembly home using a block of wood as a drift inserted in the fork of the shaft.

23.3 Assemble the tracta spigot joint to the axle shaft fork, followed by the slotted joint and hub drive shaft.

23.4 Fit a new gasket between the hub drive shaft housing and tracta joint housing after smearing the gasket and the threads of the attaching bolts and studs with jointing compound. Tighten the bolts and nuts to 57 Nm (42 lbf ft) after assembling the brake flange plate.

23.5 Install the hub and adjust the hub bearings as described in Chap 6, level 2, para 11.

23.6 When installing the steering tie rod ensure that the left-hand threaded end if connected to the left-hand steering arm. Tighten the tie rod and connecting rod ball joint nuts to 190 Nm (140 lbf ft).

23.7 Refill the axle housing and tracta joint housings with oil.

23.8 Bleed and adjust the brakes.

23.9 Adjust the front wheel toe-in.

PINION BEARING

24 Removal and installation of pinion bearing is similar to that described in Chap 5, level 3, para 31.

DRIVE SHAFTS AND TRACTA JOINTS

Removal

25 Before removing the hub drive shaft and tracta joint, check for end float as follows:

25.1 Scotch the rear wheels and raise and support the front of the vehicle. Remove the road wheel. The wheel nuts on the left-hand side have left-hand threads.

25.2 Remove the bolt securing the oil seal retainer to the hub drive shaft, and withdraw the retainer and seal assembly.

25.3 Rotate the road wheel until the line marked on the end of the hub drive shaft is at 90° to the steering pivot axis.

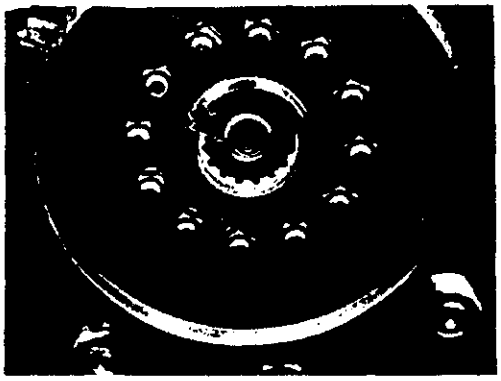


Fig 1 - Hub drive shaft alignment

25.4 Turn the road wheel to full lock, tap the hub drive shaft inwards as far as possible, and measure the distance between the end of the shaft and the oil seal retainer abutment, dimension 'A'. The dimensions must be between 3.0 and 7.1 mm (0.12 and 0.28 in.). If the dimension exceeds the top limit it is probable that wear has taken place in the tracta joint or thrust face of the axle shaft bush. If the dimension is less than the bottom limit the inference is that the axle shaft bush is not fully home in the axle tube end.

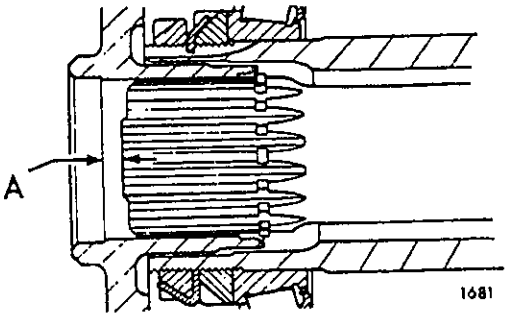


Fig 2 - Hub drive shaft end float

26 Remove the front hub and brake drums as described in Chap 6, level 2, para 17.

27 Disconnect the tie rod and connecting rod ball joints using Remover 814.

28 Clean the axle around the tracta joint housing oil seal.

29 Remove the bolts attaching the oil seal assembly to the housing, and withdraw the seal cover plate, seal spring and seal.

30 Disconnect the hose from the front brake cylinder.

31 Disconnect the brake shoe return springs and remove the nuts and bolts securing the brake back plate and hub drive shaft housing to the tracta joint housing.

32 Lift away the brake back plate, and withdraw the hub drive shaft housing from the tracta joint housing.

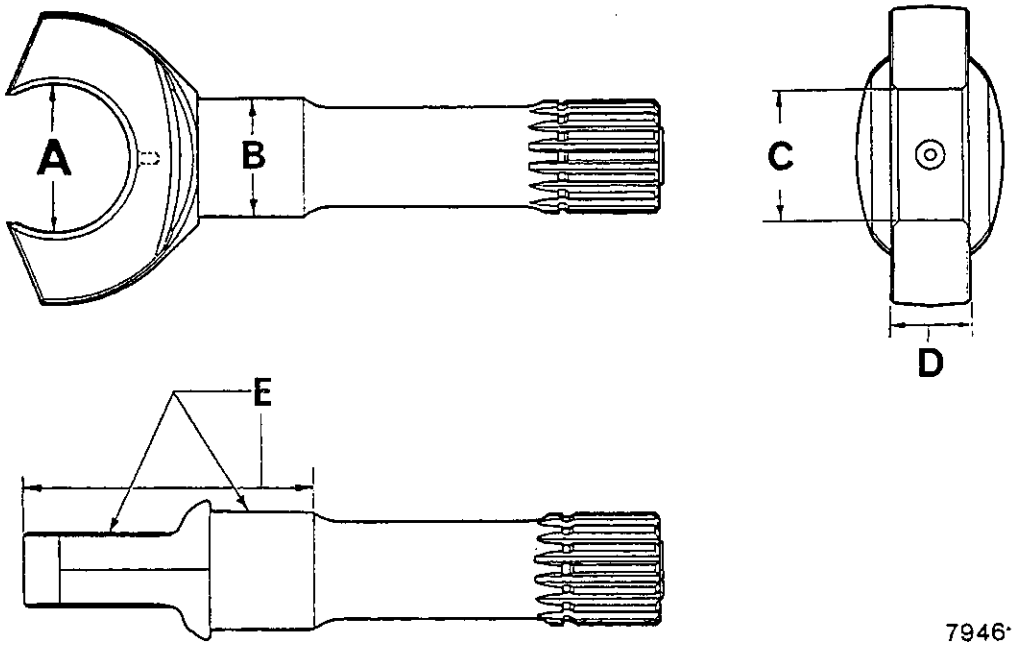
33 Withdraw the hub drive shaft and tracta joint.

34 Mark the flanges of the axle tube end and the axle housing to ensure correct reassembly.

35 Knock back the lock tabs on the nuts securing the axle tube end, remove the nuts and bolts, and withdraw the tube end complete with the axle shaft.

36 Drive the axle shaft and bush out of the axle tube end, using a soft hammer on the inner end of the shaft.

37 Should misalignment of the axle shaft or hub drive shaft be suspected, check the shafts alignment against the dimensions given below.



A - 60.04/60.12 mm (2.364/2.367 in.)
B - (Axle shaft 46.012/46.042 mm (1.8115/1.8127 in.)
(Hub drive shaft 47.60/47.62 mm (1.874/1.875 in.)
C - 52.12/52.37 mm (2.052/2.062 in.)
D - 29.94/29.97 mm (1.179/1.180 in.)
E - These faces to be parallel within 0.05 mm (0.002 in.) for this length

Fig 3 - Drive shaft alignment

38 To renew the axle shaft bush, proceed as follows:

38.1 Carefully split the collar and remove from the shaft.

38.2 Remove the old bush and place the new bush in position with the flanged end towards the tracta joint fork.

38.3 Heat a new collar to dark blue colour and place it quickly in position on the shaft. To ensure that the end float of the bush is within the specified limits, insert a 0.38 mm (0.015 in.) feeler strip between the end of the bush and the shoulder of the shaft to prevent the collar being pushed on too far.

39 To renew the hub drive shaft bush, press the old bush out of the hub drive shaft housing from the outer end, and press the new bush home against the shoulder from the inner end of the housing.

40 Slight scoring of the tracta joint spigot and slotted joints may be removed by using a fine grade carborundum stone dipped in thin oil.

41 The joints are graded and serviced as selected assemblies. For identification, each component is etched with the type number 120 and the grading number 1, 2, 3 or 4. Whilst spigots and slotted joints having different grading numbers must not be assembled together, complete joint assemblies are interchangeable and can be assembled to any pair of shafts.

42 After assembly, the end float of the bush should be within 0.25/0.50 mm (0.010/0.020 in.).

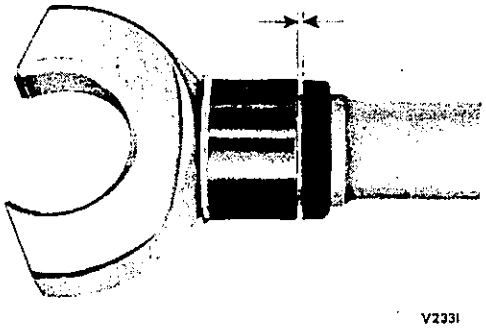


Fig 4 - Bush end float

Installation

43 When installing the axle tube end, use a new gasket, and ensure that the mark across the tube end and housing flanges is in alignment. Use new tab-washers under the axle tube end attaching nuts.

44 Feed the axle shaft splines into the differential side gear until the bush enters the bore of the axle tube end. Drive the bush and shaft assembly home using a block of wood as a drift inserted in the tracta joint fork.

45 Assemble the tracta spigot joint to the axle shaft fork, followed by the slotted joint and hub drive shaft.

46 Coat the mating faces of the hub drive shaft housing, tracta joint housing and hub with Loctite 575 (sealant) prior to assembly. Smear threads of attaching bolts with jointing compound and tighten the bolts and nuts to 57 Nm (42 lbf ft).

47 Adjust the hub bearings as described in Chap 6, level 2, para 11.

48 Check the tracta joint end float.

49 Tighten the tie rod ball joint nut to 190 Nm (140 lbf ft).

50 Fill the tracta joint housing with oil.

51 Bleed the brakes.

52 Adjust the front wheel toe-in.

STEERING ARMS

CAUTION ...

> Do not remove the steering third arm and steering arm on the same side of the vehicle simultaneously otherwise difficulty will be experienced in supporting the tracta joint housing and hub, and aligning the pivot bearings on reassembly.

Removal

53 Scotch the rear wheels and raise and support the front of the vehicle. Remove the road wheel. The wheel nuts on the left-hand side have left-hand threads.

54 When removing the steering third arm, support the tracta joint housing and hub and drum assembly by placing a jack under the lower pivot. When removing the steering arm, support the assembly by placing a jack under the hub drive sleeve flange.

55 Clean the axle around the tracta joint housing oil seal. Slacken the seal attaching bolts.

56 Detach the tie rod or connecting rod ball joints using Remover 814.

57 Remove the nuts and withdraw the arm by screwing 3/8 in. - 24 UNF bolts evenly into the tapped holes provided in the flange. Take care of the shim assembled between the flange and the tracta joint housing.

Inspection

58 Check the arm for distortion against the dimensions given below. No attempt should be made to reset a distorted arm.

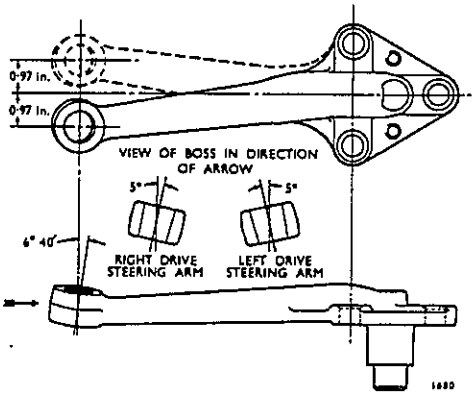


Fig 5 - Steering arm - right and left hand

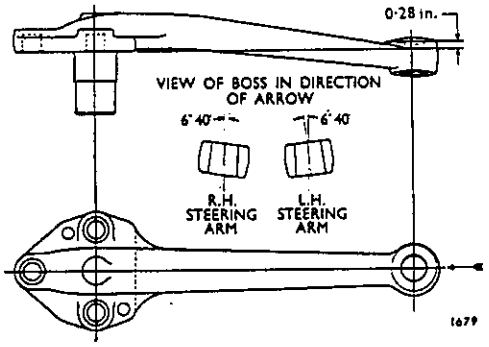


Fig 6 - Steering third arm - right-drive. Left drive is shown chain dotted

Installation

Note the following:

59 Before refitting the steering arm ensure that the faces of the arm flange and tracta joint housing are clean and free from burrs.

60 Check that the tracta joint housing pivots freely without slackness in the bearings. If necessary, adjust as described in para 11.

61 Tighten the steering arm and ball joint nuts to 318 Nm (235 lbf ft) and 190 Nm (140 lbf ft) respectively.

62 Refill the tracta joint housing.

63 Adjust the front wheel toe-in.

STEERING PIVOT BEARINGS

Bearing adjustment

64 Raise and support the front of the vehicle.

65 Remove the road wheel. The wheel nuts on the left-hand side have left-hand threads.

66 Disconnect the connecting rod ball joint using Remover 814.

67 Clean the axle around the tracta joint housing oil seal. Slacken the seal attaching bolts.

68 Support the tracta joint housing and hub.

69 Remove the securing nuts from the steering third arm or upper pivot flange.

70 Screw 3/8 in. - 24 UNF bolts evenly into the tapped holes in the steering third arm or pivot flange and withdraw the pivot and shim.

71 Unscrew the bolts from the flange and remove any burrs from the faces of the flange and tracta joint housing.

72 Replace the pivot installing a shim 0.13 mm (0.005 in.) thinner than the original.

73 Tighten the securing nuts to 244 Nm (180 lbf ft).

74 Check for slackness in the bearings and for free swivelling of the tracta joint housing by applying a force of 13 lbf to the steering arm utilizing a spring balance.

75 If necessary, repeat the previous operations, varying the shim thickness until the correct adjustment is obtained.

76 Tighten the tracta joint housing oil seal bolts and top up with oil.

77 Reconnect the connecting rod and tighten the ball joint to 190 Nm (140 lbf ft).

Removal

78 Remove the front hub and brake drum.

79 Disconnect the tie rod and connecting rod ball joints using Remover 814.

80 Clean the axle around the tracta joint housing oil seal.

81 Remove the bolts attaching the oil seal assembly to the housing, and withdraw the seal cover plate, seal spring and seal.

82 Disconnect the hose from the front brake cylinder.

83 Disconnect the brake shoe return springs and remove the nuts and bolts securing the brake back plate and hub drive shaft housing to the tracta joint housing.

84 Lift away the brake back plate, and withdraw the hub drive shaft housing from the tracta joint housing.

85 Withdraw the hub drive shaft and tracta joint.

86 Remove the nuts securing the steering arm and pivot to the bottom of the tracta joint housing, screw 3/8 in. - 24 UNF bolts evenly into the tapped holes provided in the pivot flange, and withdraw the pivot.

87 Remove the nuts securing the steering third arm and pivot on steering pivot flange. Withdraw the pivot and lift away the tracta joint housing. Take care of the shim assembled between the pivot flange and the tracta joint housing.

88 Lift the inner race and rollers out of the upper bearing, and drive the upper and lower bearing outer races out of the axle tube end.

Installation

89 If the original pivot bearings are refitted, use the original shim when installing the upper pivot.

90 If new bearings are being fitted temporarily, replace the upper pivot without a shim, and lightly tighten the nuts to eliminate clearance in the bearings. Measure the clearance between the pivot and housing faces. Select a shim 0.30/0.45 mm (0.012/0.018 in.) thinner than the measurement obtained to pre-load the bearings.

91 Tighten the nuts securing the steering arm and pivot, and steering pivot flange to 244 Nm (180 lb ft). Check that the tracta joint housing has free rotation without slackness. If necessary, re-adjust as previously described.

92 Coat the mating faces of the hub drive shaft housing, tracta joint housing and hub with Loctite 575 (sealant) prior to assembly. Smear threads of attaching bolts with jointing compound and tighten the bolts and nuts to 57 Nm (42 lbf ft).

93 Adjust the hub bearings as described in Chap 6, level 2, para 11.

94 Fill the tracta joint housing with oil.

95 Bleed the brakes.

CHAPTER 7

STEERING

CONTENTS

Para

Fig

STEERING GEAR

1 Remove steering gear as described in Chap 7, level 2, para 39.

2 Secure gear in vice with coupling flange uppermost.

3 Remove nut and washer from the end of worm shaft and withdraw coupling flange and steering gear shield.

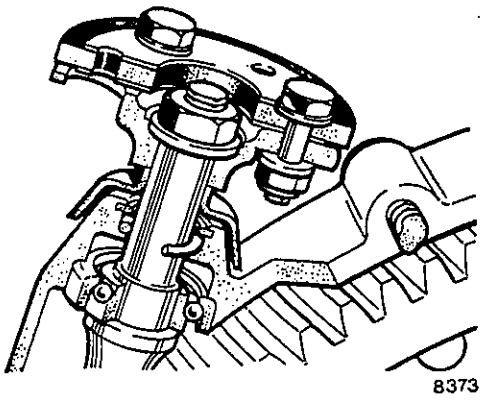
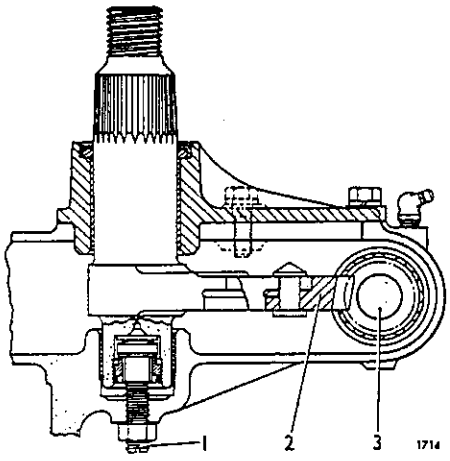


Fig 1 - Steering gear coupling flange and shield

4 Reposition the steering gear in the vice so that the cover bolts are uppermost and the gear lash adjusting screw (1) is accessible. Remove the lash adjusting screw locknut (4) and turn the screw clockwise several times to ensure clearance between the teeth of sector (2) and worm (3).

5 Remove cover retaining bolts and detach cover. Drain oil from steering gear and remove drop arm shaft and sector. Rotating lash adjusting screw clockwise will assist in releasing shaft from case.

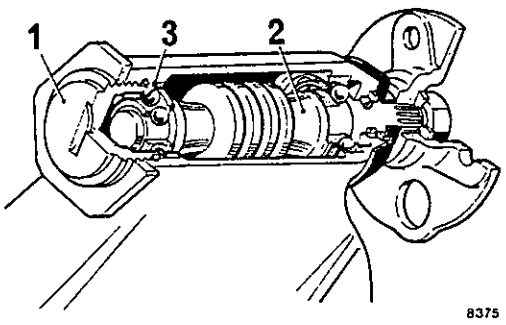


1. Gear lash adjusting screw
2. Sector
3. Worm shaft
4. Locknut

Fig 2 - Steering gear showing the gear lash adjustment details

6 Remove worm bearing adjuster (1) from casing and withdraw wormshaft (2) together with lower bearing (3).

7 Worm shaft upper bearing outer face can be driven out after removing oil seal retainer and seal from upper end of casing.



1. Worm bearing adjuster
2. Wormshaft
3. Lower bearing

Fig 3 - Steering worm shaft assy

Inspection and reconditioning:

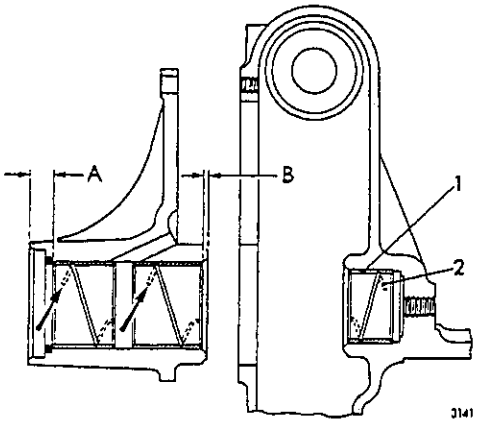
8 Renew the drop arm shaft bushes as follows:

8.1 With the cover supported, press out the bush. To remove the bush from the case, screw a 1 in. standard pipe tap into the bush and push out the tap and bush using a 7/16 - 20 UNF x 1.50 in. bolt screwed into the lash adjusting screw hole.

8.2 Drop arm shaft bush must be installed in case cover so that closed ends of oil grooves are towards the outer side of cover.

8.3 Dimension 'A' (from end of bush to end face of cover) should be 10.6 mm (0.42 in.).

8.4 Bush (1) must be pressed into gear case, with closed end of oil groove (2) first, until it contacts shoulder in case.



1. Bush 2. Closed end of oil groove

Fig 4 - Drop arm shaft bush Installation

8.5 Bolt the case and cover together and machine bushes to:

Outer bush bore	38.12-38.17 mm	(1.50-1.503 in.)
Inner bush bore	31.77-31.82 mm	(1.251-1.253 in.)

9 Worm shaft bearings must be pressed on worm shaft so that open end of each bearing is towards worm.

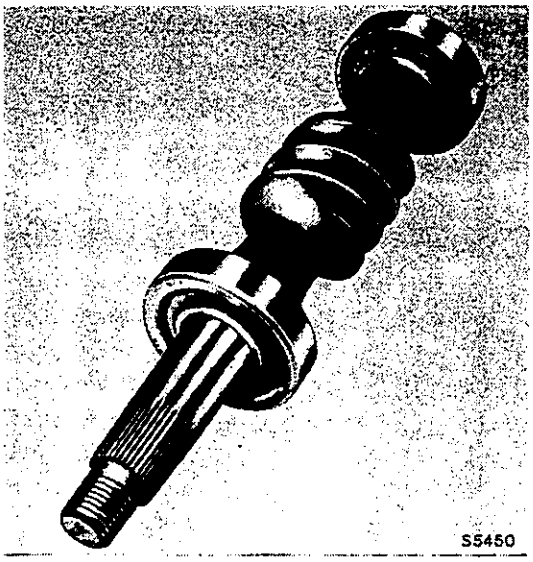


Fig 5 - Worm shaft and bearing assembly

Reassembly

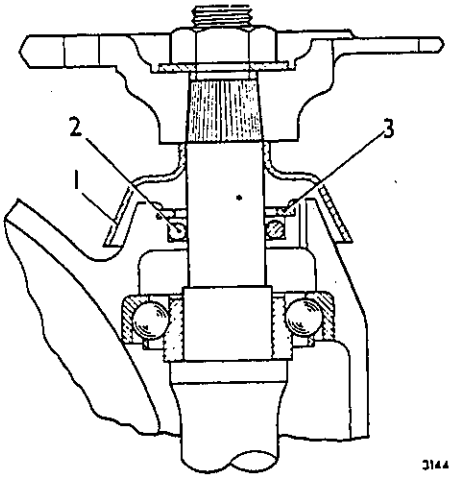
10 Before installing worm bearing adjuster, smear threads of adjuster with jointing compound. Adjust worm bearings so that there is no perceptible end float or binding of shaft.

11 Worm shaft O-ring (2) should be smeared with oil before assembly.

12 To secure retainer (3), stake end face of gear case in four places.

13 Before assembling coupling flange, place shield (1) over worm shaft but do not press shield on to shaft, as final position of shield will be determined by coupling flange.

14 Coupling flange nut should be tightened to 64 Nm (47 lbf ft) after installing drop arm shaft and sector.



1. Shield 2. O-ring
3. Retainer

Fig 6 - Installation of worm shaft seal and coupling flange

15 Before assembling drop arm shaft to steering gear case, smear threads of gear lash adjusting screw 1 with jointing compound.

16 Before finally assembling side cover fill steering gear with oil to specifications GM4734-M, GM4735-M, or API GL5 or MIL-L-2105B or MIL-L-2105C.

17 Gear lash adjusting screw must be adjusted to ensure adequate clearance between sector teeth and worm before tightening cover bolts.

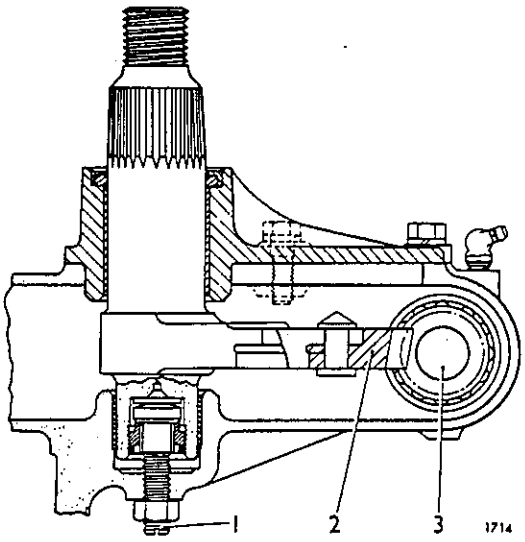


Fig 7 - Steering gear assembly

18 Gear lash adjusting screw must be finally adjusted until steering gear operates smoothly with no perceptible backlash or binding between sector teeth and worm with sector in midway position, i.e. when notch on end of drop arm shaft is at right angles to worm shaft axis. Tighten adjusting screw locknut to 38 Nm (28 lbf ft) torque.

19 Install steering gear as described in Chap 7, level 2, para 42.

CHAPTER 10

AIR PRESSURE AND BRAKING SYSTEM

CONTENTS

BRAKE PEDAL AND SUPPORT - LEFT DRIVE VEHICLES

Removal and reconditioning

1 On left drive vehicles, steering gear assembly must be removed from vehicle to withdraw brake pedal. Refer to Chap 7, level 3. Footbrake valve and clutch push-rods may be left in position after removing push rod yoke clevis pin.

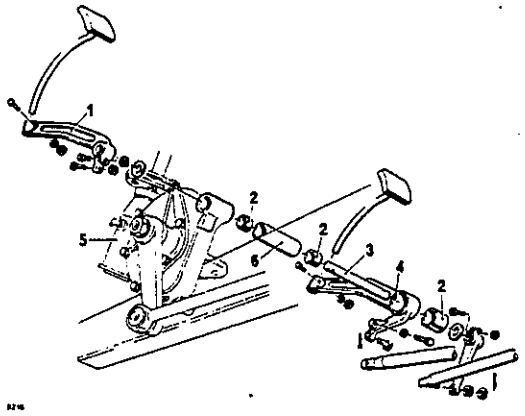


Fig 1 - Left drive brake pedal assy

2 Brake pedal bush should be pressed in until flush with the pedal outer face.

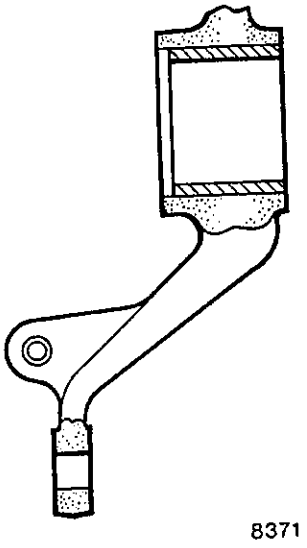


Fig 2 - Brake pedal section

3 Press the bushes into the pedal shaft bore so that dimension 'A' (Fig 3) is 1.5 mm (0.06 in.). Press shaft into steering gear until flush with clutch pedal side of gear.

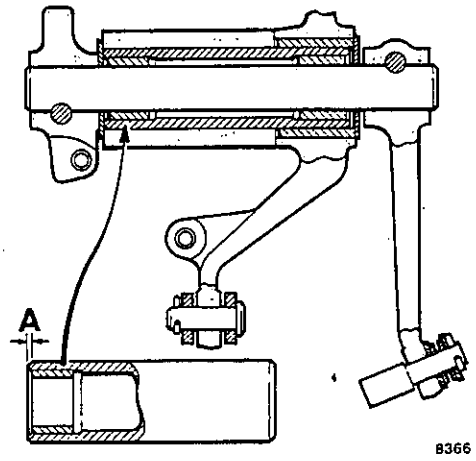


Fig 3 - Brake and clutch pedal assembly section

4 The replacement brake pedal bushes are of the prefinished type that do not require reaming on assembly.

Installation and pedal setting

5 For installation and pedal setting refer to para 7, Chap 10, level 3.

BRAKE DRUMS

Machining

6 Excessive scoring or ovality of the drum braking surface may be rectified by machining, providing the internal diameter 'A' and run-out after machining do not exceed the following dimensions:

6.1 Maximum diameter after surface refacing:

411.15 mm (16.187 in.)

6.2 Maximum run-out of braking surface:

0.25 mm (0.010 in.)

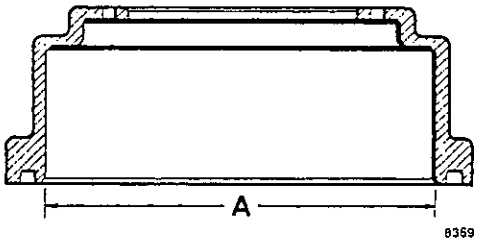


Fig 4 - Maximum diameter after refacing

PARKING BRAKE DRUM

7 Slight ovality or scoring of the parking brake drum braking surface may be rectified by machining provided the internal diameter 'B' and run-out after machining do not exceed the following dimensions:

7.1 Maximum diameter after surface refacing:

306.37 mm (12.062 in.)

7.2 Maximum run-out of braking surface:

0.15 mm (0.006 in.)

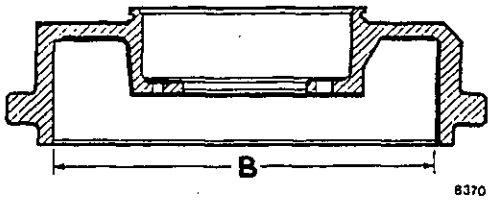


Fig 5 - Maximum diameter after refacing

7.3 To ensure a true surface the machining operation must be carried out with the drum mounted on the pinion shaft flange.

CHAPTER 13

ELECTRICAL

CONTENTS

(continued)

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Ser	Tool No (where applicable)	NSN/Part No (where applicable)	Designation
(1)	(2)	(3)	(4)
1	CAV 5693-266		Drive end shield bush extractor
2	CAV 5693-222		Armature end float checking gauge
3	CAV 5693-240		Commutator end shield bush installer
4	CAV 5693-267		Drive end shield bush plug gauge
5	CAV 5693-275		Commutator end shield bush plug gauge
6	CAV 6244-6		Drive end shield seal protector

CAV AC5R/24 ALTERNATOR

CAUTIONS ...

(1) Negative polarity must be observed. Reversed battery connections, however brief, may result in the destruction of the rectifying diodes and possible damage to the charging system wiring harness.

(2) Before disconnecting any wire in the charging system, ensure that a battery. terminal is disconnected.

(3) The alternator must never be run with the output wire disconnected.

(4) Do not boost-charge a battery when it is connected to the vehicle's electrical system. If the engine is started during boost-charging, the semi-conductor devices in the regulator may be damaged.

(5) If using electric welding to repair a vehicle, it is essential that the battery cut-out switch is turned to the 'off' position and the alternator output wires are first disconnected.

Disassembly

1 Remove alternator as detailed in AESP 2320-H-100-522, Chap 13, para 1.

1.1 Remove pulley and fan.

2 Remove moulded cover from slip ring end bracket. Disconnect the three wires from bush holder, remove retaining screws and withdraw brush holder assembly and gasket.

3 Remove the three regulator securing bolts, disconnect remaining connections and withdraw regulator. The green and yellow regulator wires will pass through terminal mounting block after removing the plastic terminal covers.

4 Remove through bolts securing drive end and slip ring end brackets to stator. Mark end brackets relative to stator for correct location on reassembly.

5 Withdraw drive end bracket and rotor from stator and slip ring end bracket. If necessary use a hide-faced mallet to tap drive end bracket away from stator.

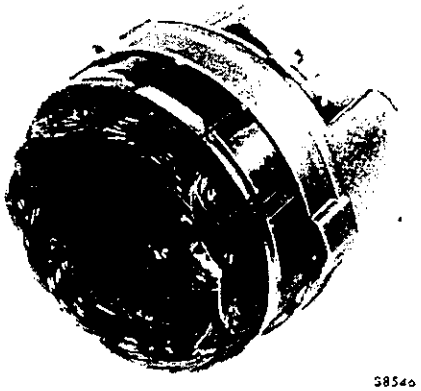


Fig 1 - Withdrawing drive end bracket

6 Drive end bracket and rotor need not be separated unless drive end bearing requires examination or rotor needs renewing. In this case remove key, and with drive end bracket supported, press rotor out of bracket.

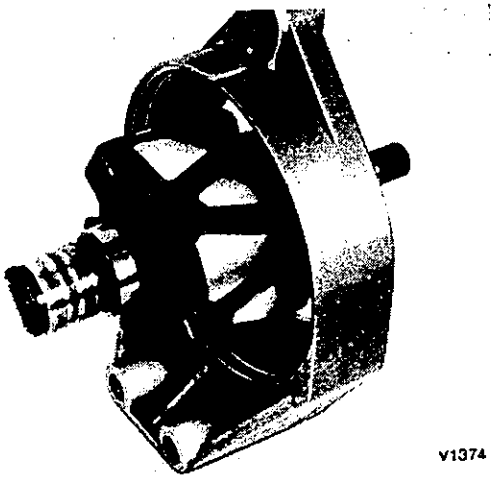


Fig 2 - Drive end bracket and rotor

7 Remove O-ring from slip ring end bracket with a sharp pointed probe. Take care not to damage O-ring groove.

Inspection and reconditioning

8 Servicing of brushes is confined to checking that brush protrusion is no less than 7 mm (0.28 in.) and brushes move freely in holder. If brush movement is sluggish, lightly polish sides of brush with a smooth file.

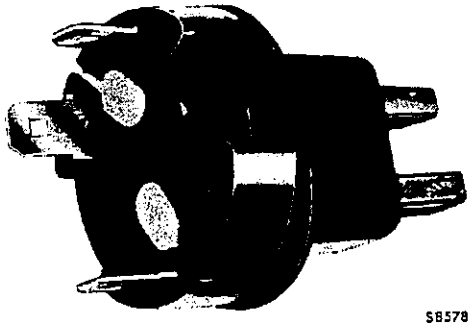


Fig 3 - Servicing brushes

Slip rings

9 The surfaces of the slip rings should be smooth, clean and dry. If they require cleaning, use a cloth moistened with white spirit and polish with a very fine emery cloth. Burned or scored ring may be skimmed in a lathe, removing the least amount of material necessary, and polished to produce a smooth surface. Minimum diameter and maximum eccentricity should be 28.85 mm (1.136 in.), and 0.05 mm (0.002 in.), respectively.

Rotor

10 Rotor windings may be checked by connecting an ohmmeter across slip rings. If reading is lower than 9.6 ohms, this indicates a short circuit between coils; a high reading indicates surfaces of slip rings need cleaning; an infinity reading indicates an open circuit in field windings.

11 Insulation between slip rings and rotor poles is checked by connecting test circuit as shown using a 50 volt AC mains supply and a 2.4 watt test lamp. The mains supply should be sourced from a mains isolating transformer with a screened primary winding. If lamp lights, coil is grounding and a replacement rotor is required.

CAUTION ...

No attempt should be made to machine rotor poles or straighten a distorted shaft.

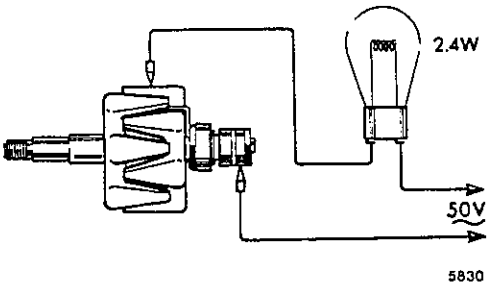


Fig 4 - Checking insulation between slip rings and rotor poles

Stator

12 Stator windings may be checked as follows:

12.1 Unsolder the three stator wires from the heat sink tags.

12.2 Do not disturb tag attachment to heat sink nor flex stator wires unduly.

12.3 Remove stator from slip ring end bracket. If necessary employ a hide-faced mallet to effect separation. Stator and slip ring end bracket should be marked to assist during assembly.

12.4 Connect a test circuit as shown, using a 24 volt, 20 amp DC supply; position probes in the following sequence 1-2, 2-3 and 1-2. Check that voltage drops in each case to 8.3 - 8.5 volts. If voltage reading is outside these limits, renew stator.

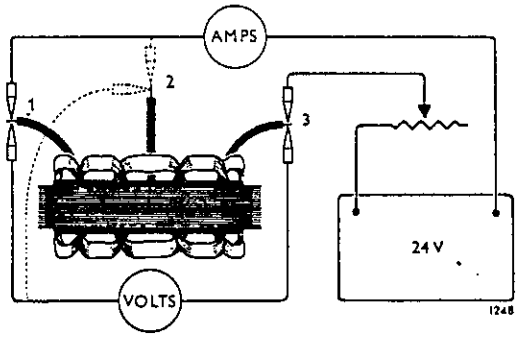


Fig 5 - Checking stator windings

13 Insulation between stator coils and core is checked by connecting test circuit as shown using a 50 volt AC mains supply and a 2.4 watt test lamp. The mains supply should be sourced from a mains isolating transformer with a screened primary winding. Connect test probes between any one of the three wire ends and stator core. If lamp lights, stator coils are grounding and a replacement stator is required. Before resoldering stator wires, check diodes for serviceability.

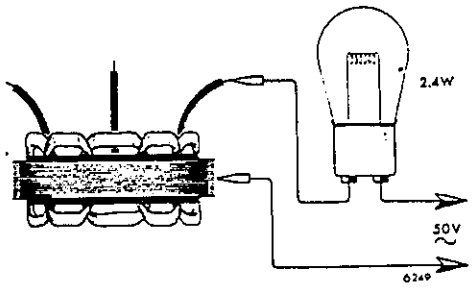


Fig 6 - Checking insulation between stator coils and core

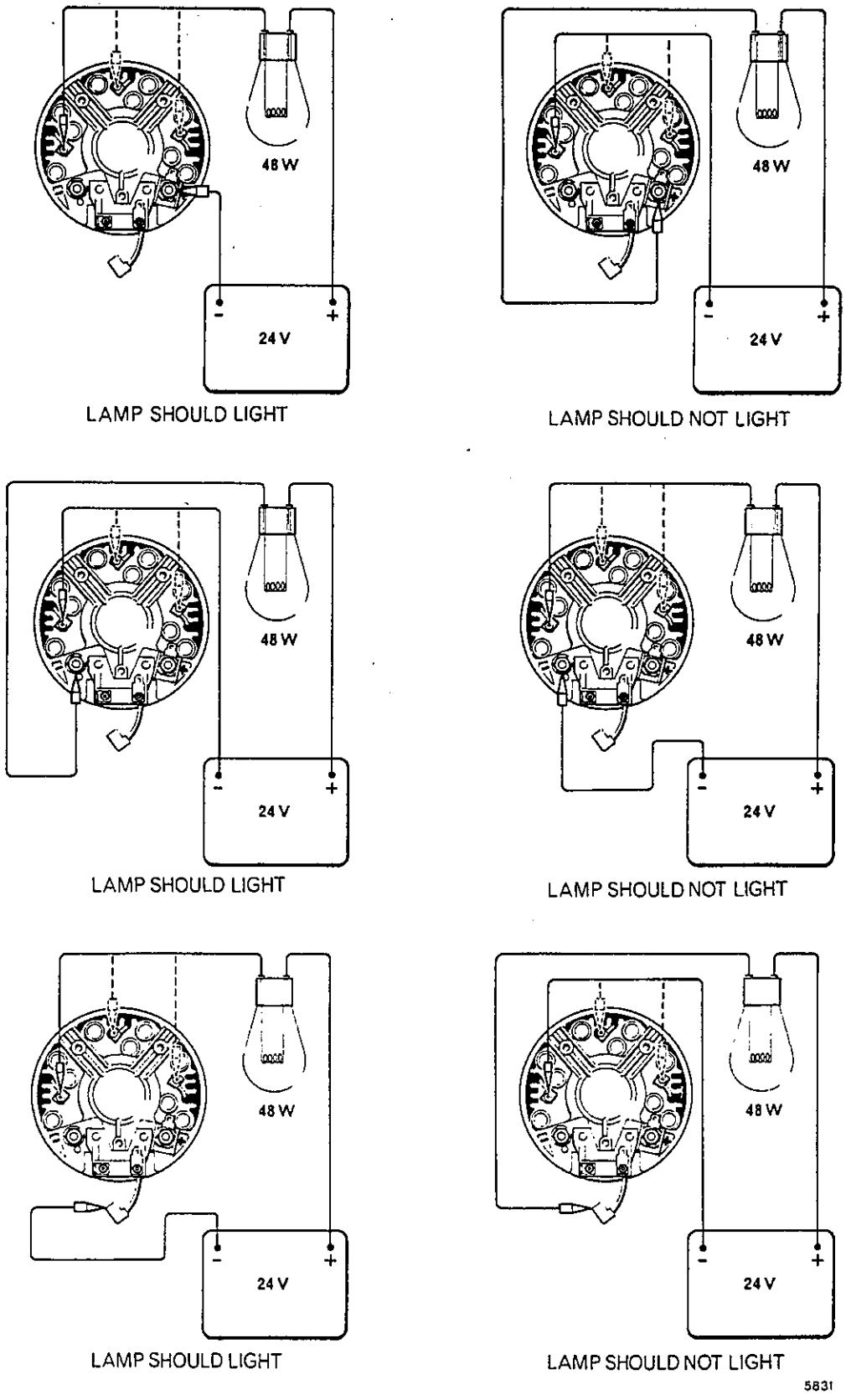


Fig 7 - Checking diodes

Heat sinks and diodes

14 Diodes may be checked as follows:

14.1 Connect a test circuit as shown in Fig 7, using a 24 volt supply and a 48 watt test lamp. Test probe should contact each heat sink in turn, following sequence indicated. If test gives opposite result, this indicates a faulty diode. This procedure is adequate for service purposes.

14.2 Should a battery ohmmeter be used to check the diodes, a serviceable diode will indicate infinity in one direction and a much lower reading in the other.

CAUTION ...

Hand-driven generator-type ohmmeter must never be used for checking diodes.

15 Diodes are not individually replaceable, but are supplied for service purposes already pressed into appropriate heat sink. When renewing a heat sink, proceed as follows:

15.1 Withdraw 'A' terminal wire complete with spade terminal and grommet through hole in end bracket after disconnecting from terminal block.

15.2 Remove positive and negative terminal nuts, washers, terminal block and blades (capacitors and positive terminal blade, insulated ground return only), noting disposition of same for reassembly. Remove heat sink retaining screws and washers from slip ring end bracket and withdraw complete heat sink assembly.

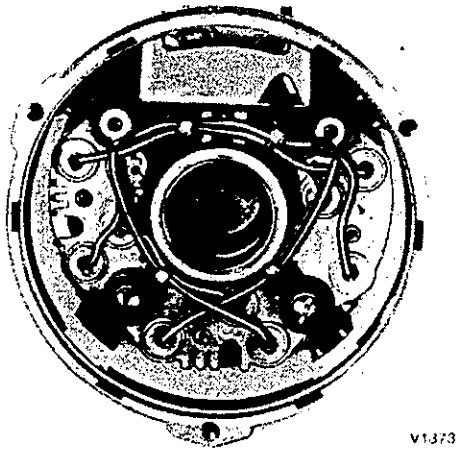


Fig 8 - Removing heat sinks

15.3 Replacement heat sinks are supplied with wires attached which must be cut to correct length. When it is necessary to solder a wire to a diode post use a pair of long-nose pliers to act as a thermal shunt and solder joint as quickly as possible. Great care must be taken to avoid overheating diodes or bending diode posts. After soldering connections, check diode for correct operation.

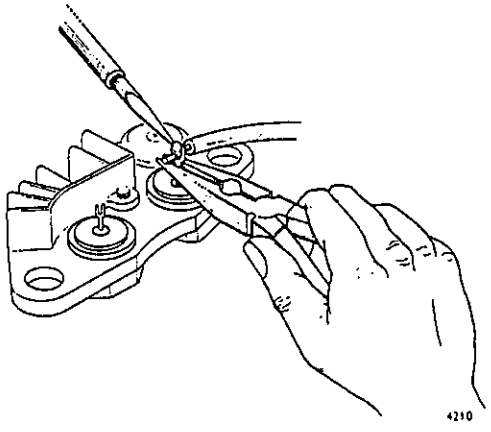


Fig 9 - Soldering wire to diode post

15.4 When assembling heat sinks, ensure nylon insulation washers are interposed between adjacent heat sinks and between heat sinks and end bracket. Check tightness of tag attachment to terminal bolt heads.

Bearings

16 Bearings are of the fully shieleded type which are pre-packed with lubricant and sealed for life.

17 Access to bearing in drive end bracket is obtained by removing clamp plate and pressing bearing out of bracket. Care must be taken during removal and installation of bearing to ensure that end bracket is supported on bearing housing, so that no undue strain is placed upon support webs.

18 To renew slip ring end bracket bearing, proceed as follows:

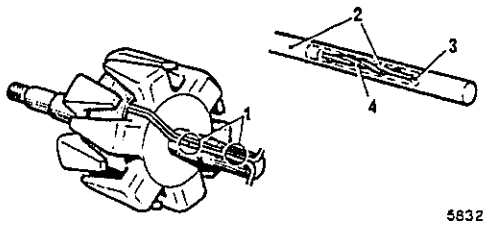
18.1 Unsolder ends of field wires from slip ring, taking care not to break wires. Withdraw slip ring assembly from rotor. Removal of slip ring assembly will render it unserviceable and a new one must be installed.

18.2 Remove bearing circlip and withdraw bearing and bearing spacer.

18.3 Before installing a new bearing, check that field wires are serviceable and of sufficient length.

18.4 Should a wire break when re-soldering it to a slip ring terminal, it will be necessary to remove slip ring assembly, rendering it unserviceable. If new wires are required they should be installed as follows:

18.4.1 If both wires require renewal, joints should be staggered as shown at (1). Trim back sleeving and lightly twist length of 23 SWG copper wire to existing wire (4) and solder. Remove any excess wire. Apply coating of shellac and slide short length of 2 mm sleeving (3) over joint to fit inside existing sleeve. Apply further coating of shellac and slide a new length of 3 mm sleeving (2) to abut original sleeve. Apply final coat of shellac to sleeve exterior.



1. Staggered joints
2. 3 mm sleeving
3. 2 mm sleeving
4. Existing wire

Fig 10 - Renewing field wires

18.4.2 Install bearing spacer with groove adjacent to field wires. Press new bearing on to shaft and install circlip. Plug with ICI Silcoset 151 any gap where wires enter spacer, and between spacer and rotor poles. Pass field wires through bore of new slip ring. Locate slip ring on shaft so that terminal posts are positioned at 90° relative to shaft slot. Press slip ring assembly on to rotor shaft using length of 16 mm (5/8 in.) diameter bar. An incline should be made on bar to provide passage for field wires. Slip ring assembly must be installed with its centre sleeve flush with end of rotor shaft. Re-solder field wires to terminal posts.

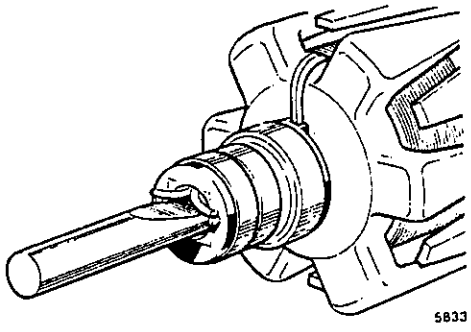


Fig 11 - Pressing slip ring assembly on to rotor

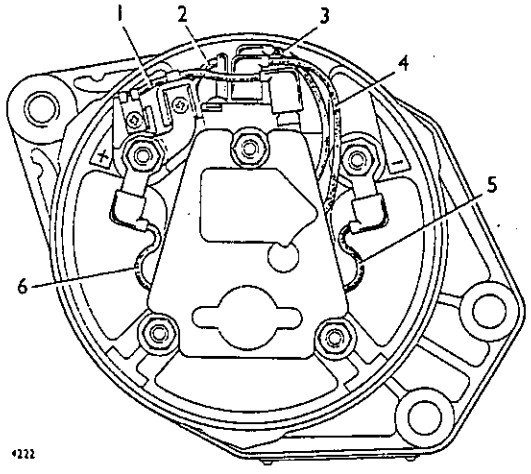
18.4.3 After assembly, lightly skim slip rings to ensure they are concentric with slip ring end bearing. Do not reduce ring diameter below 28.85 mm (1.136 in.). Polish to produce a smooth surface.

Reassembly

19 When assembling stator to slip ring end bracket, ensure that wide space in finning of each heat sink coincides with a stator wire and that locating marks made during disassembly are in alignment.

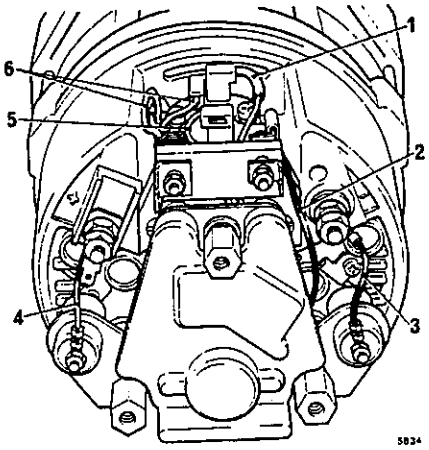
20 Alternator ground is via machine body. Assemble alternator through bolts clean and dry to ensure ground continuity between end brackets (except insulated ground return).

21 Tighten through bolts to a torque of 7.4 Nm (65 lbf in.) and pulley nut to a torque of 61 Nm (45 lbf ft). When the alternator is completely assembled, check that rotor can be turned freely by hand. It should turn noiselessly.



1. Warning lamp (yellow)
2. Auxiliary diodes (yellow)
3. Auxiliary diode feed (yellow with red sleeve)
4. Field (green)
5. Ground (black)
6. B + sensing (red)

Fig 12 - Wiring connections (chassis ground return)



1. Auxiliary diode feed (yellow with red sleeve)
2. Negative (black)
3. Capacitor (black)
4. Capacitor (red)
5. Field (green)
6. Auxiliary diodes (yellow)

Fig 13 - Wiring connections (insulated ground return)

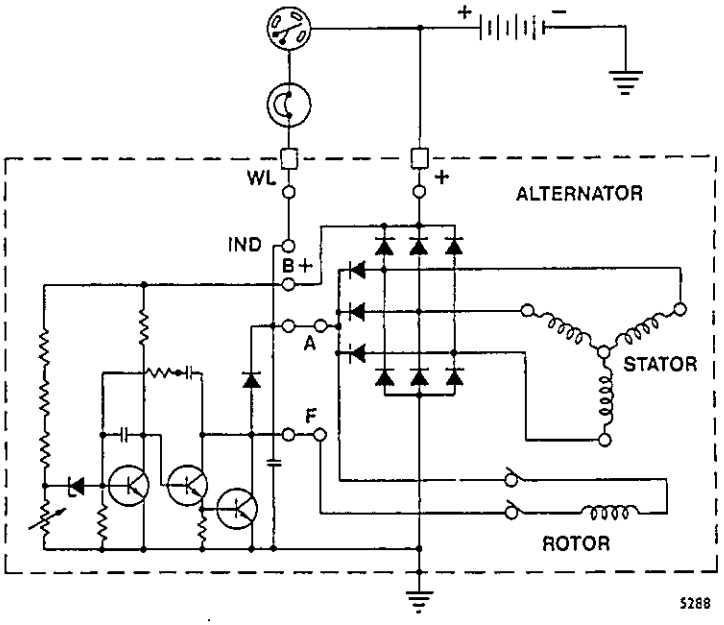


Fig 14 - Circuit diagram (chassis ground return)

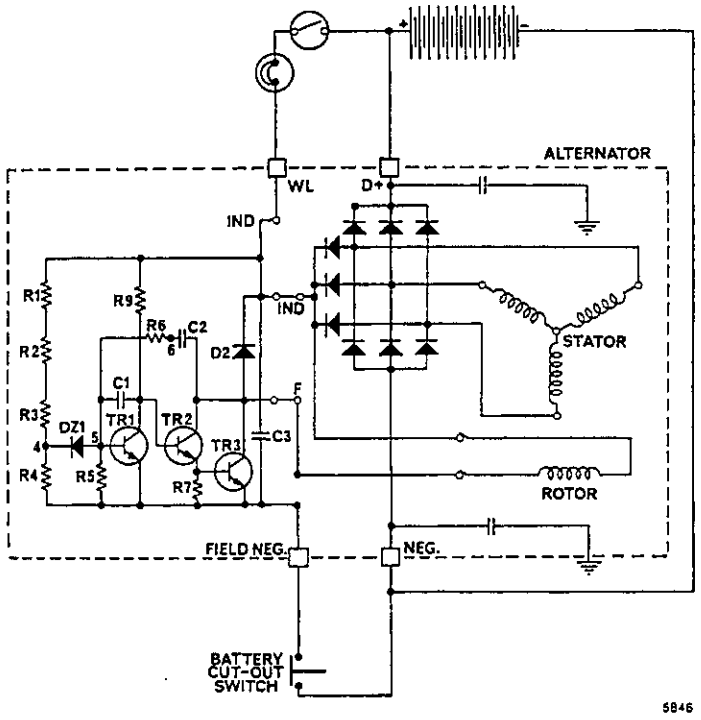


Fig 15 - Circuit diagram (insulated ground return)

CAV CA45F STARTER

WARNING ...

UNDER NO CIRCUMSTANCES SHOULD ANY ATTEMPT BE MADE TO PULL THE PINION OUTWARDS WHILE THE MAIN TERMINALS ARE CONNECTED TO THE POWER SUPPLY. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SERIOUS INJURIES BEING SUSTAINED.

GENERAL

CAUTION ...

Before disconnecting any wire in the electrical system ensure a battery terminal is disconnected.

Disassembly

22 Remove terminal box cover and gasket, secured by four screws which are held in cover by rubber O-rings.

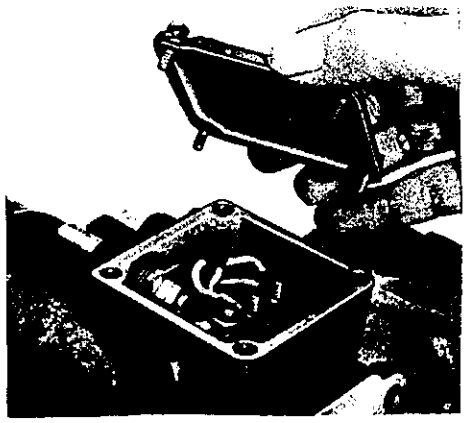


Fig 16 - Removing terminal box cover

23 Unlock and remove nuts and plain washer securing main terminal connecting bar to post. Remove nuts and lock washers from solenoid terminals and lift off wires.

24 Remove three screws and lock washers securing terminal box to starter. Withdraw terminal box and gasket complete with main terminal connection bar and switch wiring plugs.

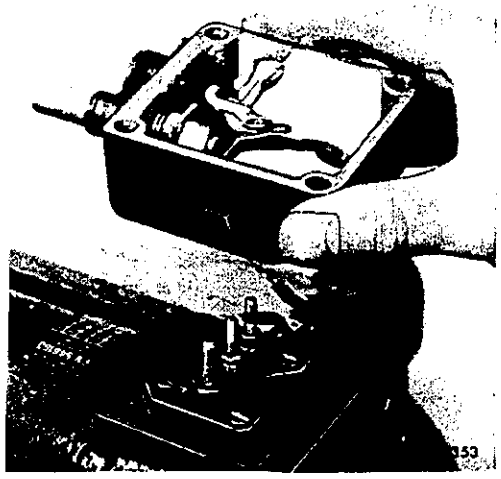


Fig 17 - Removing terminal box

25 Withdraw terminal block after removing nut together with lock and plain washer from the main terminal post and four screws securing block to starter.

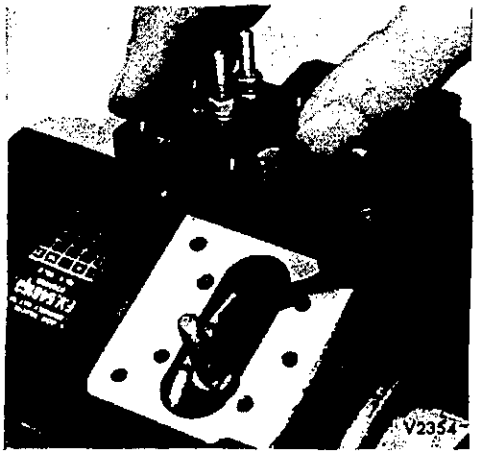


Fig 18 - Removing terminal block

26 Prise the two core plugs from drive end shield after piercing them with a pointed tool. Remove pinion bearing lubrication wick spring.

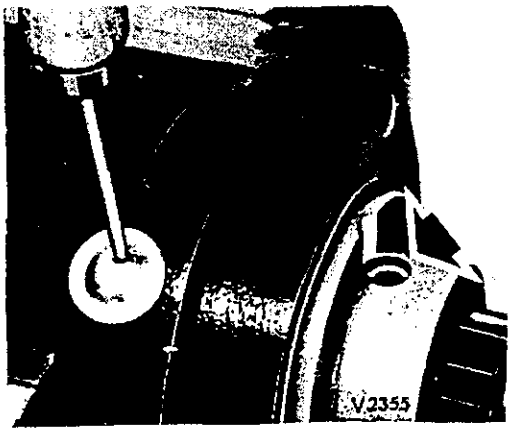


Fig 19 - Prising out core plugs from drive end shield

27 Remove the two screws, together with lock and plain washers, securing the field terminal to the fixed contacts.

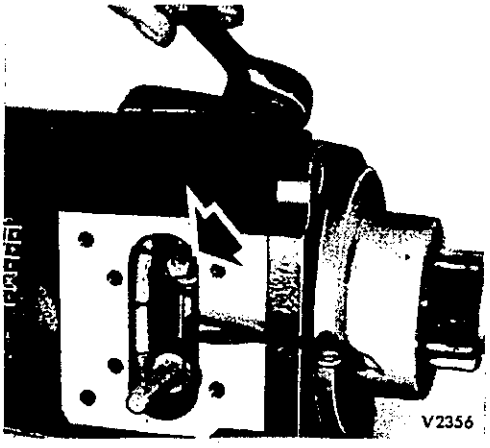


Fig 20 - Removing field terminal screws

28 Remove commutator end shield cover after removing nuts, washer and insulation from main negative and thermal switch terminals. Remove and discard sealing ring.

29 Disconnect brush leads and field coil connections from brush holders. Lift brush springs and withdraw brushes. Each brush should be marked in relation to its holder, unless the brushes are to be renewed.

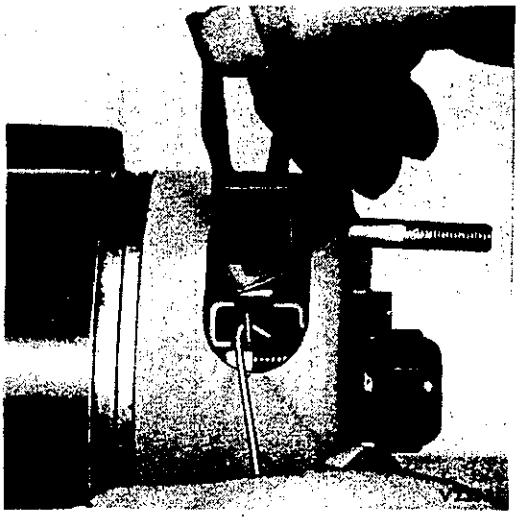


Fig 21 - Withdrawing brushes from holders

30 Remove hexagon end cap, thrust pad and steel ball from commutator end shield. Remove recoil spring located in end of armature shaft.

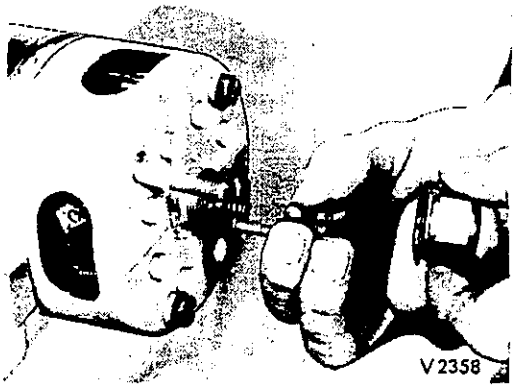


Fig 22 - Removing hexagon end cap

31 Remove circlip, thrust washer and shims from armature shaft, noting number fitted.

32 After removing two through bolts and lock washers, withdraw commutator end shield. Remove shims from armature shaft, noting number fitted.

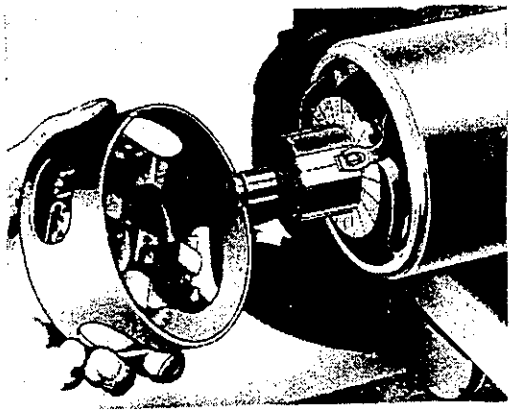


Fig 23 - Removing commutator end shield

33 Tap drive end shield away from yoke with a soft mallet, then withdraw it complete with armature from yoke. Support armature to avoid damaging windings and commutator.

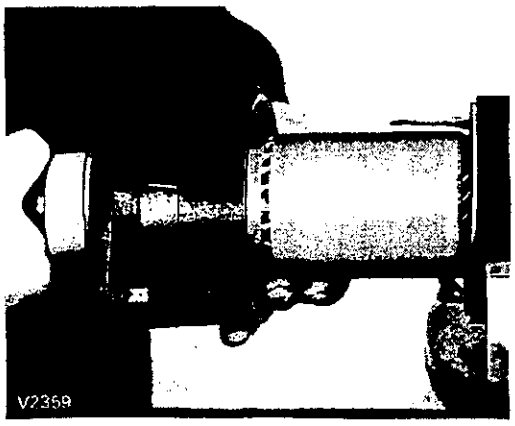


Fig 24 - Removing drive end shield from yoke

34 Mount armature in an armature clamp and unscrew pinion stop nut in direction of starter rotation. Remove thrust washer, shim, spring and helix shroud.

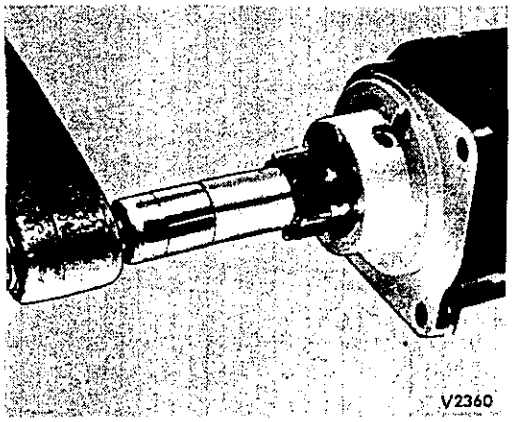


Fig 25 - Unscrewing pinion stop nut

35 Release ball lock by pushing end shield towards armature. With end shield held in this position, rotate pinion anti-clockwise until the helix disengages. Slide pinion together with drive end shield off armature shaft. Retrieve any of the six locking and four overspeed balls which may fall through to inside of the pinion sleeve.

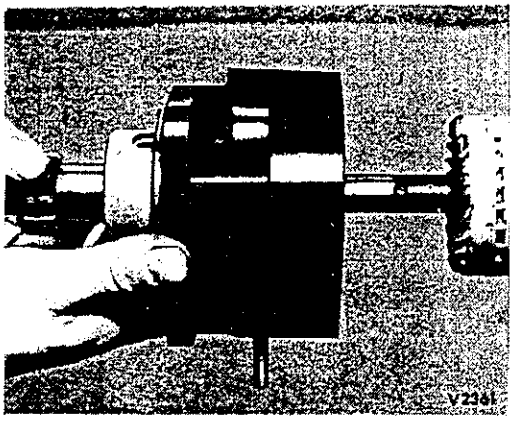


Fig 26 - Withdrawing drive end shield from armature

36 Remove and discard circlip from end of pinion sleeve and withdraw trip collar, lock collar and spring.

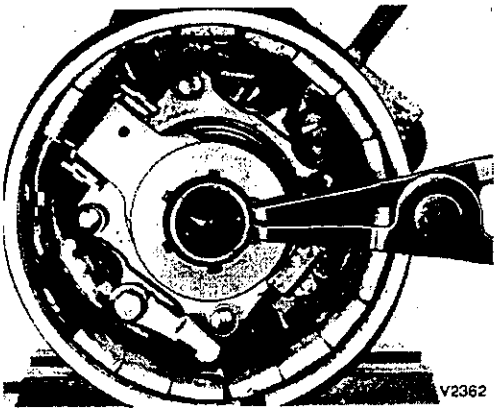


Fig 27 - Removing circlip from pinion sleeve

37 Withdraw pinion from drive end shield. Carefully remove any burrs on pinion with a stone before withdrawing the pinion.

38 Detach the resistor flexible lead from moving contact plate and drive out rivet securing resistor to drive end shield. Remove resistor, bush and spacer.

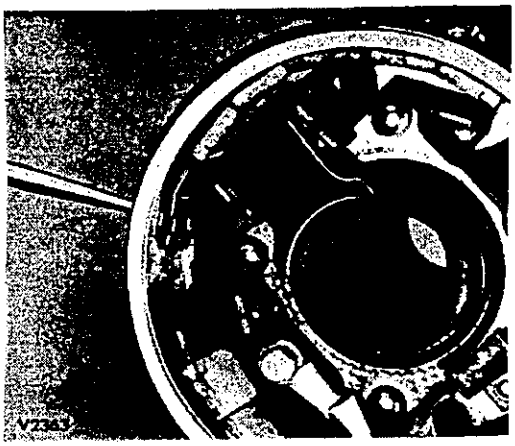


Fig 28 - Removing resistor

39 Remove main terminal post screw and lock washer and withdraw post.

40 Withdraw solenoid assembly after removing two screws (arrowed) and lock washers.

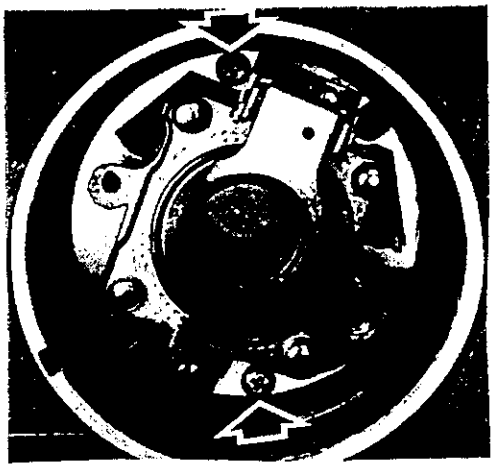


Fig 29 - Solenoid securing screws

Inspection and Reconditioning

Armature

41 Check armature windings visually and with a 'growler'.

42 Commutator can be cleaned with very fine grade glass paper. Do not use emery or carborundum paper. If necessary, commutator can be skimmed using a diamond tipped tool, providing diameter is not reduced below 39.2 mm (1.56 in.). The radius at the junction of the risers and commutator must not exceed 1.0 mm (0.04 in.). Do not skim the risers.

43 Examine armature shaft for damage or wear, particularly the pinion helices. Burrs caused by the steel locking and overspeed ball can be carefully removed using a carborundum stone.

Field Coils

44 Test the windings for grounding to the yoke and poles with a 100 volt 'megger'. There is no easy way of checking for internal shorts in the coils as their resistance is low. New coils should be substituted if the existing ones are suspect.

45 To renew the coils or re-insulate, proceed as follows:

45.1 Check that pole shoes and yoke are numbered to ensure correct relationship on reassembly.

45.2 Remove field coils and pole shoes from yoke, using a pole screwdriver.

45.3 To re-insulate the coils, use 12.7 mm (0.50 in.) wide linen tape.

45.4 Where necessary, fit new tags to coil leads.

45.5 Assemble shoes to coils so that, when installed in yoke, the field leads will be in line with their appropriate terminals and the numbers on end of pole shoes line up with corresponding numbers on ends of yoke.

45.6 Locate coil and pole shoe assembly in yoke so that numbers on shoes and yoke correspond. Smear screws with jointing compound, insert and tighten to 38 Nm (28 lbf ft) with a pole shoe screwdriver. Ensure shoes are aligned and no space exists between them and the yoke.

Brushgear

46 Check for sticking of brushes in their holders and for excessive brush wear. Do not renew brushes individually, fit a complete set.

47 To free sticking brushes, clean off all deposits from brush and holder. If necessary ease brushes by polishing sides of each brush with a fine cut file.

48 Bed-in new brushes as follows:

48.1 Mount the armature in an armature clamp and wrap a strip of fine grade glass paper (not emery cloth or carborundum paper) around the commutator.

48.2 Assemble the commutator end shield to the armature. Fit the brushes to the holders and retain with the brush springs.

48.3 Rotate the end shield in the direction opposite to normal rotation of the armature until the brushes are bedded over a minimum of 80% of their contact area.

48.4 Remove the glass paper and all traces of dust and abrasive.

49 Check the tension of the brush springs with a spring balance. Correct spring tension is between 27-34 N (6-7.5 lbf).

Drive end shield and pinion

50 Prise out and discard the bearing bush oil seal. Check bush using CAV Plug Gauge 5693-267.

51 If necessary renew bush as follows:

51.1 Ensure that the oiler sealing plug and spring have been removed, then extract bush with CAV Tool No 5693-266 and discard the rectangular shaped felt wick.

51.2 Install a new felt wick into oil reservoir groove in drive end shield, so that the ends meet 180° from oiler hole, then cut off surplus.

51.3 The new bush must be fine bored to correct size after it has been pressed in. To prevent swarf getting into felt wick the cut-out in the bush must be sealed in the following manner before the bush is installed.

51.3.1 Place bush on a suitable mandrel held horizontally in a vice. Place a piece of thin letheroid over the bush aperture and tap all round the edge of the hole with a small hammer. The leatheroid will be cut exactly to size and will fit snugly in the aperture.

51.4 Press bush, chamfered end first, fully into end shield bore, ensuring that cut-out in bush aligns with oiler hole in end shield.

51.5 Fine bore the bush to 28.63/28.65 mm (1.127/1.134 in.) diameter so that it is concentric with the oil seal recess.

51.6 Remove leatheroid pad from cut-out in bush and press in a new oil seal with lip facing outwards.

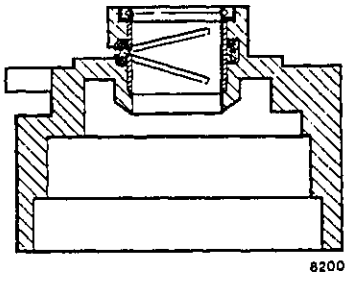


Fig 30 - Installing new oil seal to drive end shield

Note ...

If a new end shield assembly is being installed, the leatheroid pad must be removed from the bearing bush before starter is assembled.

52 Examine bearing surfaces of pinion sleeve and also pinion teeth for excessive wear or damage. Grease internal surfaces of pinion sleeve before assembly with XG 279.

53 Where necessary the complete pinion sleeve must be renewed. This is serviced with oil seal installed.

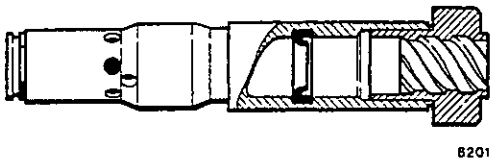


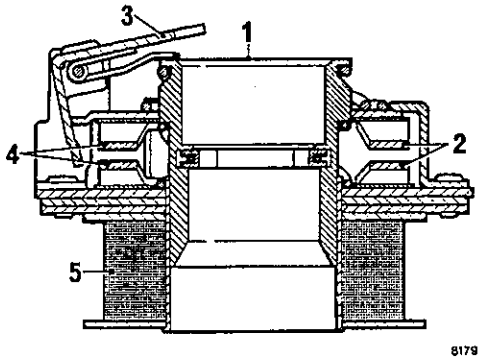
Fig 31 - Pinion sleeve

Solenoid switch unit

54 After checking the unit for wear or damage, check coils for short or open circuits by measuring current consumption as follows:

54.1 With an ammeter in supply circuit, apply 24 volts to black and green leads, current consumption should be approximately 19 amps.

55 To check solenoid switch for correct operation, position switch coil (5) on a flat surface. Apply downward pressure to the top of plunger (1) and check that first stage contacts (2) close. Whilst still maintaining pressure, depress trigger (3) and the second stage contacts (4) should now close.



1. Top of plunger
2. First stage contacts
3. Trigger
4. Second stage contacts
5. Coil

Fig 32 - Checking solenoid switch for correct operation

56 If necessary clean both first and second stage contacts with very fine carborundum paper then wipe them over with white spirit. Should they be excessively burnt or pitted, the solenoid and switch assembly must be renewed.

57 Check the first stage contact gap, it should be 2.1 mm (0.083 in.), with a bottom limit of 1.93 mm (0.076 in.), and a maximum of 2.5 mm (0.098 in.).

Commutator and shield bearing

58 Check that the bearing bush is tight in the commutator end shield housing. Check bearing for wear using CAV Plug Gauge 5693-275.

59 If necessary renew bearing as follows:

59.1 Remove bearing and install new bearing using CAV Tool No 5693-240.

59.2 When installing new bearing lubricate bore of commutator end shield housing with a light oil. The bearing is pre-finished and should not be machined.

Reassembly

60 When installing pinion, use CAV Split Collar 6244-6 to protect seal in end of drive end shield.

61 Assemble garter spring and segments to solenoid switch plunger with a smear of grease as follows:

61.1 Locate the four segments in garter spring so that the spring engages grooves in the segments and holds them together end to end in a circle.

61.2 Push garter spring and segments assembly into bore of solenoid plunger from coil end of switch until it engages the recess. Engaging one segment in recess first and edging the others into position will simplify installation.

62 Lightly smear solenoid trigger with grease.

63 Insert solenoid switch into drive end shield so that the extensions (arrowed) on switch locate in recesses in the shield.

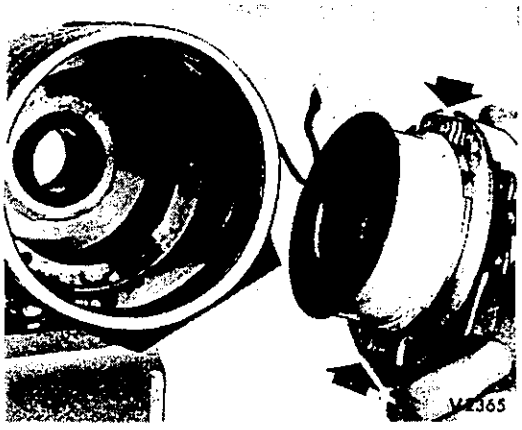


Fig 33 - Installing solenoid assembly

64 Before tightening main terminal post securing screw, position terminal block on end shield to ensure correct post location.

65 Secure resistor to drive end shield with insulation spacer and rivet (arrowed). Connect flexible lead to solenoid.

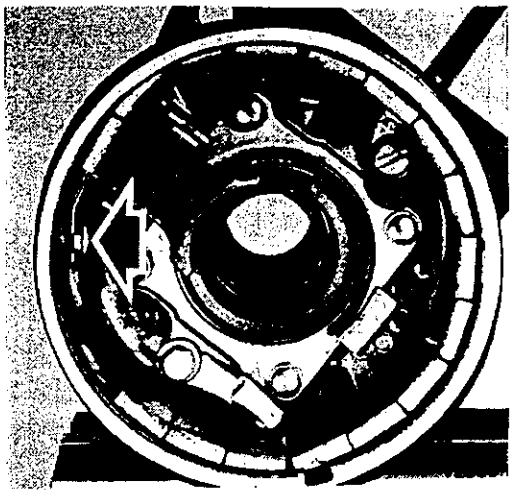


Fig 34 - Installing resistor to drive end shield

66 Insert locking and overspeed release balls into pinion sleeve holes from inside bore, using a spot of grease XG 279 to hold them in position.

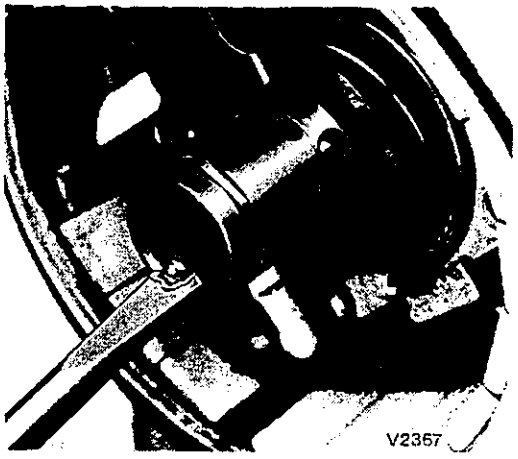


Fig 35 - Inserting locking and overspeed release balls

67 Assemble lock collar (inside chamfer toward solenoid), spring and trip collar to pinion sleeve and secure with a new circlip.

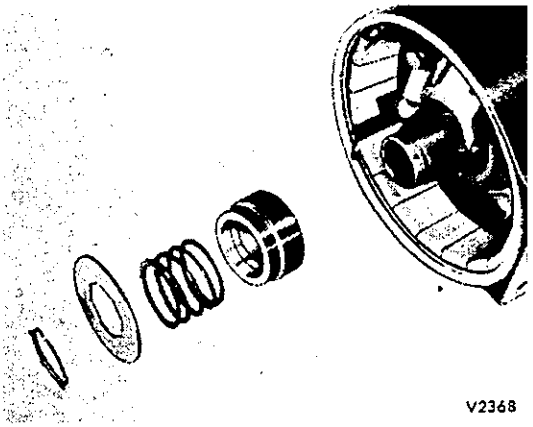


Fig 36 Installing locking and trip mechanism to pinion sleeve

68 Mount armature in an armature clamp and smear helix and bearing surfaces with grease. Pull pinion out as far as possible from drive end shield, slide pinion and end shield on to the armature shaft, engage pinion with shaft helix and then release pinion. Screw pinion on to shaft and check that the pinion locking mechanism engages.

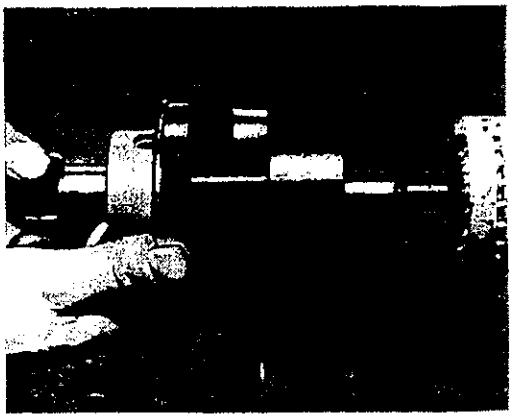


Fig 37 - Sliding pinion and drive end shield on to armature

69 Support weight of drive end shield and rotate pinion first in one direction and then in the other to ensure that pinion is free on shaft and locking mechanism functions correctly. The locking mechanism can be released by pulling the lock collar back against its spring.

70 Assemble helix shroud, pinion return spring, shim and thrust washers to armature shaft. Smear shaft thread with Loctite 290 (Penetrating Adhesive). Tighten pinion stop nut to 61 Nm (45 lbf ft).

Fig 38 - Installing pinion return assembly

71 Assemble armature and drive end shield to yoke, ensuring dowel (arrowed) in yoke engages end shield slot. Seal joint with jointing compound.

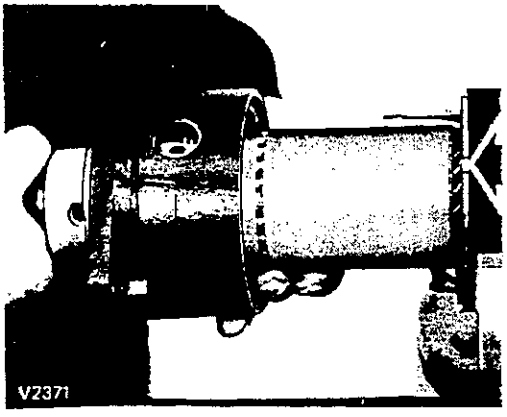


Fig 39 - Installing armature and end shield to yoke

72 Check that all the shims have been removed from armature shaft, assemble commutator end shield to yoke ensuring that slot and dowel engage and secure with through bolts.

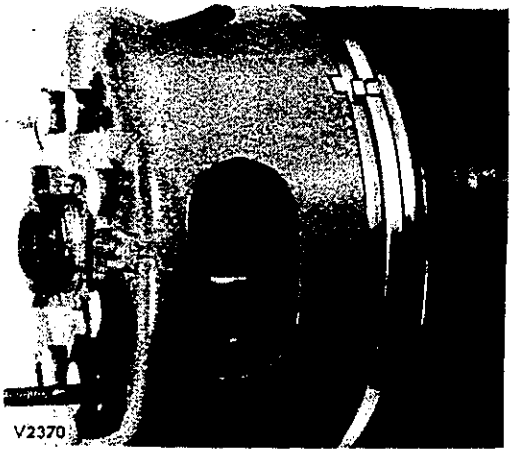


Fig 40 - Installing commutator end shield

73 Assemble thrust washer and circlip, but no shims, to armature shaft. The circlip must be located in relation to shaft key as shown in Fig 41.

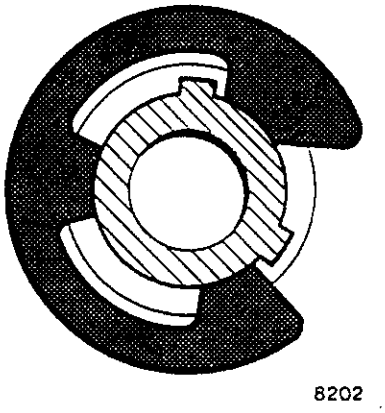
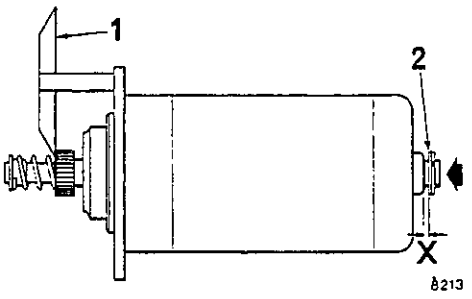


Fig 41 - Commutator end circlip location on shaft

74 Adjust armature end float using CAV Gauge 5693-222 as follows:

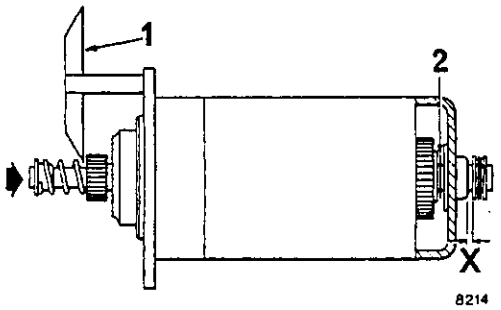
74.1 With gauge (1) held firmly against drive end shield lightly push against commutator end of armature until pinion contacts gauge. Measure gap 'X' between thrust washer (2) and commutator end shield. Shims equivalent to the gap measurement should then be fitted between the thrust washer and circlip. Shims should be well greased before use and are available in two thicknesses 0.20 and 0.10 mm (0.008 and 0.004 in.)



1. Checking gauge
2. Thrust washer

Fig 42 - Measuring pinion location

74.2 To check armature shaft end float, firmly push shaft toward commutator end shield and again measure gap 'X'.



1. Checking gauge
2. Armature end float shims

Fig 43 - Measuring armature end float

74.3 Correct shaft end float is 2.0/2.5 mm (0.08/0.10 in.). If gap is in excess of this, remove comm commutator end shield and install shims (2), equivalent to the excess, to the armature shaft.

74.4 Reinstall commutator end shield, thrust washer, shims and circlip, then re-check end float. Seal joint between yoke and end shield with jointing compound.

74.5 Smear the armature shaft recoil spring and ball with grease and insert them into the bore of shaft. Insert the thrust pad into end cap using grease to retain it in position. With starter held vertically screw cap on to commutator end shield. Lock in position by punching two thin corners of hexagon into slots in bearing collar.

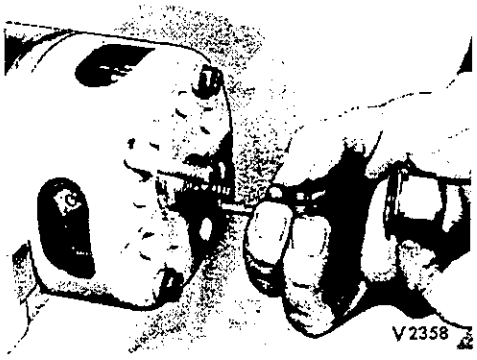


Fig 44 - Installing armature recoil mechanism

74.6 Check that any variation in the relationship of pinion position to the checking gauge is within the limits of plus 0.08 mm (0.003 in.) or minus 0.05 mm (0.002 in.).

75 Fill reservoir in drive end shield with oil OM-13. Insert spring and secure with a new core plug.

76 Connect field winding leads to the solenoid switch lugs, ensure that leads are located on outside of lugs. Install a new core plug in the drive end shield.

77 Install brushes to their respective holders. Connect brush and field winding leads to brush gear.

78 Assemble terminal block and box with a new gasket to drive end shield. Secure main terminal post to block.

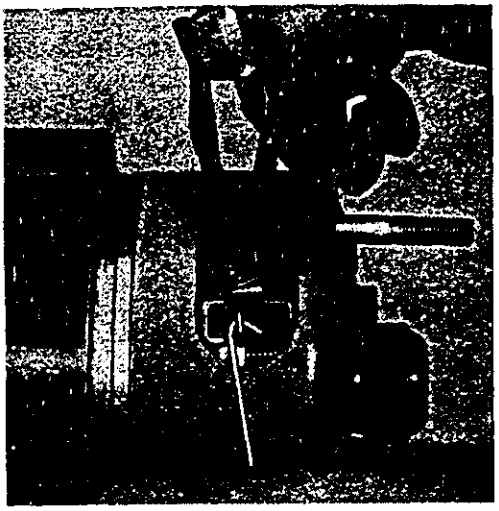
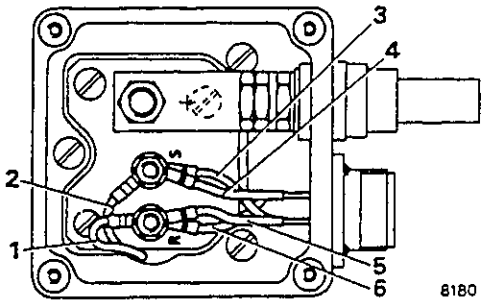


Fig 45 - Installing brushes to holders

79 Connect solenoid green wire and switch wires 'B' and 'D' to 'R' terminal post. Connect solenoid black wire and switch wires 'A' and 'C' to 'S' terminal post.



1. Green
2. Black
3. 'C' wire
4. 'A' wire
5. 'D' wire
6. 'B' wire

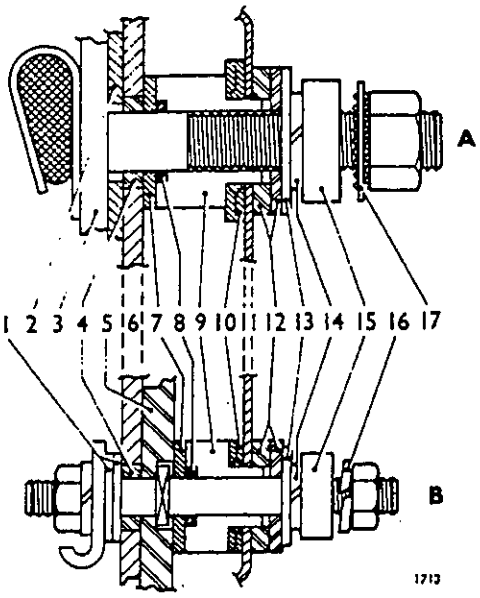
Fig 46 - Connections in terminal base

80 Secure main terminal connecting bar to terminal post. Install cover with a new gasket to terminal box.

81 Install a new commutator end cover sealing ring into groove in yoke.

82 Assemble insulating washer and bushes to main negative terminal 'A' and thermal switch terminal 'B' as shown in Fig 47.

83 Install commutator end cover (11), place two insulating washers (12) on each terminal and secure with flat washers (13), lock washer (14) and screwed collars (15).



1. Insulating washers
2. Brush holder
3. Terminal post
4. Insulating bushes
5. Insulator
6. Commutator end shield
7. Insulating washers
8. Sealing rings
9. Bushes
10. Shakeproof washers
11. Commutator end cover
12. Insulating washers
13. Flat washers
14. Lock washers
15. Screwed collars
16. Spring washer
17. Shakeproof washer

Fig 47 - Commutator end cover terminal installation

Solenoid engagement mechanism tests

WARNING ...

WHEN TESTING SOLENOID ENGAGEMENT MECHANISM UNDER NO CIRCUMSTANCES SHOULD BOTH MAIN TERMINALS BE CONNECTED TO THE SUPPLY, OTHERWISE THE PINION WILL ROTATE AT HIGH SPEED WHEN PULLED FORWARD, CAUSING SERIOUS INJURY TO THE OPERATOR.

84 Pull the pinion forward by hand approximately 1.6 mm (0.06 in.) and release. The pinion should return to its original position.

85 Energise the solenoid by means of a 24 volt supply connected between solenoid terminals 'R' and 'S'. When the solenoid has been energised, the pinion should move forward for a distance of 6.3 mm (0.24 in.) minimum.

86 With the solenoid still energised, pull the pinion forward by hand. The locking mechanism should now come into operation, locking the pinion in the forward position.

87 Disconnect the supply to the solenoid. The pinion must return to its disengaged position in one sharp movement.

88 Check the recoil spring action by applying a compression spring balance to the driving end of the armature shaft. The force required before backward movement of the shaft occurs should be 133/168 N (30/38 lbf).

STARTER PERFORMANCE TESTS

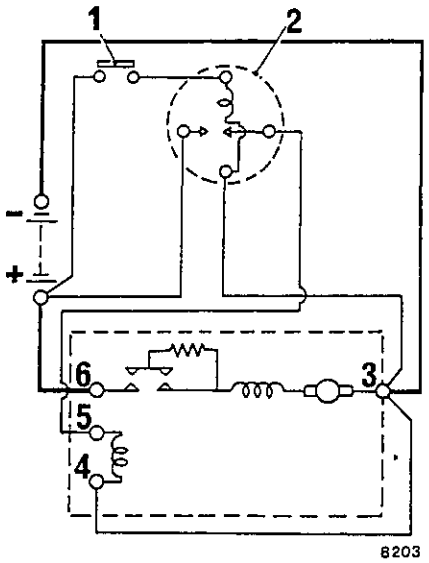
CAUTION ...

> If the starter is allowed to run without engagement with a flywheel, the pinion will not be restrained from rotation in the initial stages, and thus will not complete the forward movement necessary to trip the second stage contacts. Under these conditions, the resistor will remain in circuit and may be damaged by overheating. Moreover, prolonged running on first stage contacts may cause grooving of the solenoid trip mechanism. For these reasons, the starter should always be run in conjunction with a flywheel, but if this is not possible, the running period must not exceed five seconds.

89 For these tests the brushes must bed for at least 80% of their contact area.

90 Mount the starter on the starter test bench, with a 3.18 mm (0.125 in.) in clearance between the face of the pinion and the face of the test bench flywheel.

91 Connect starter terminals as shown in test circuit Fig 48 to fully charged 24 volt battery with a capacity not less than that shown in the Test Data Table 2.



1. Switch
2. ST relay
3. Starter ground terminal
4. Solenoid 'R' terminal
5. Solenoid 'S' terminal
6. Starter main terminal

Fig 48 - Test circuit

92 Complete ten engagements into a partly locked flywheel to ensure that the engaging mechanism is operating satisfactorily. Non-engagement may be caused by a tight drive end bearing or by the pinion binding on the armature shaft.

93 Disconnect the separate supply to the solenoid, and connect the machine for normal operation. Then check the lock torque (LT) the running torque (RT) and the light running (LR) of the starter against that given in Table 2.

TABLE 2 - TEST DATA

Ser	Type of Test	Minimum battery capacity	Torque figures	Current ampere	Terminal voltage	Speed rev/ min
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	LT	78 Ah	51 Nm (38.0 lbf ft)	910 max	9.2	-
2	RT	78 Ah	23 Nm (17.0 lbf ft)	555 max	15.2	1550 min
3	LT	78 Ah	NIL	60 100	24.0	7000

Note ...

It is important that the battery is adequately charged, in good condition and of the minimum capacity specified. A partly charged battery or one in poor condition will not provide current sufficient to reach the specified torque figures.

Chapter 16

CAB AND FITTINGS

CONTENTS

CAB ASSEMBLY

Removal

CAUTIONS ...

(1) Turn battery cut-out switch to the 'OFF' position.

(2) Do not attempt to lift cap using a rope or wire sling without a beam, otherwise the cab structure may be damaged.

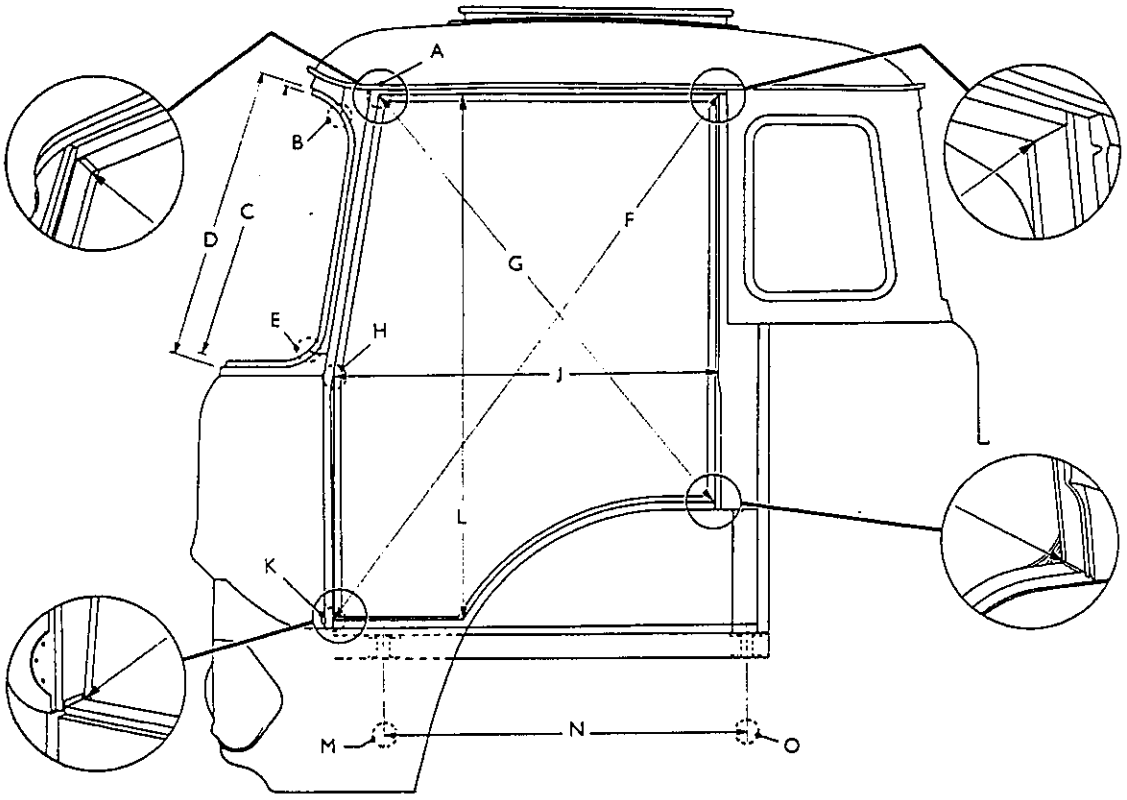
94 Drain cooling system.

95 Disconnect all electrical connections, pipes and cables from cab to chassis.

96 Disconnect steering shaft flange from flexible coupling and remove the brake and clutch pedal stems.

97 Remove cab mounting bolts.

98 Raise cab by means of a flat beam inserted through the door apertures (not window apertures) with the lifting slings attached to ends of beam. so that they are clear of cab. Ensure that all wiring and controls are clear before commencing to lift.



A -	1465 mm	(57.70 in.)	Across cab at pinchweld flanges
B -	1470 mm	(57.90 in.)	Across cab at weld in pinchweld flanges
C -	648 mm	(25.50 in.)	Centre of front end panel aperture
D -	670 mm	(26.40 in.)	Centre of front end panel on edge of rebate
E -	1679 mm	(66.10 in.)	Across cab at weld in pinchweld flanges
F -	1478 mm	(58.20 in.)	From top of lock pillar to bottom of hinge pillar
G -	1204 mm	(47.40 in.)	From top of hinge pillar to bottom of lock pillar
H -	1618 mm	(63.70 in.)	Across cab at pinchweld flanges
J -	879 mm	(34.60 in.)	From hinge pillar at upper hinge to cab lock pillar
K -	1742 mm	(68.60 in.)	Across cab at pinchweld flanges
L -	1201 mm	(47.30 in.)	From roof side rail to sill upper panel
M -	991 mm	(39.00 in.)	Between centres of front and rear mounting points
N -	810 mm	(31.90 in.)	Between centres of front and rear mounting points
O -	991 mm	(39.00 in.)	Between centres of rear cab mounting points

Fig 1 - Cab nominal dimensions 7b/1067

CHAPTER 17

WINCH

CONTENTS

Para

Table

Fig

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Ser	Tool No (where applicable)	NSN/Part No (where applicable)	Designation
(1)	(2)	(3)	(4)
1	SP152400		Hydraulic puller
2	SP152800		Hydraulic puller

WINCH ASSEMBLY

Removal

1 Remove vehicle body and drain oil from wormcase.

2 Remove cable from drum as follows:

2.1 Disengage the winch clutch by moving lever forward.

2.2 Release winch brake by turning the control lever (white) to the 'OFF' position (anti-clockwise).

2.3 Pay out cable, knock back the lock tab and remove pin securing cable eye to winch drum. Withdraw cable from winch.

3 Remove the clutch operating lever.

4 Release air pressure from air system condensing reservoir.

5 Disconnect the linkage to winch brake cylinder and remove circlips from the brake shaft and brake band link pin. Remove securing bolts from the brake bracket and the brake clevis pin from the brake shaft jaw. Lift brake bracket complete with shaft, distance piece and lever, away from the chassis frame.

6 Remove the brake band from drum. Withdraw brake shaft from its bracket, after removing the brake lever and pinch bolt.

7 Disconnect the pipes from the tensioner control valve located on the torque bracket making note of pipe location for ease of replacement.

8 Disconnect wiring socket from load limiter switch.

9 Remove the two nuts and one eye bolt securing the torque arm to the winch casing and remove dowels.

10 Loosen the nut securing torque bracket to the crossmember and swing torque bracket towards chassis frame.

11 Disconnect propeller shaft from winch flange and support to one side.

12 Remove caps from winch mounting brackets and lift winch assembly clear of brackets.

13 Move assembly forward until winch is clear of torque brackets.

14 Turn winch assembly anti-clockwise until sufficient clearance is obtained to lift it past the chassis crossmembers.

Disassembly

15 Remove both clevis pins from clutch lever, withdraw clutch engagement rod and spring assembly, remove three bolts and withdraw torque reaction bracket and limiter assembly complete with clutch actuator.

16 Use two of the four securing bolts as draw bolts (arrowed) to withdraw oil seal housing from drum.

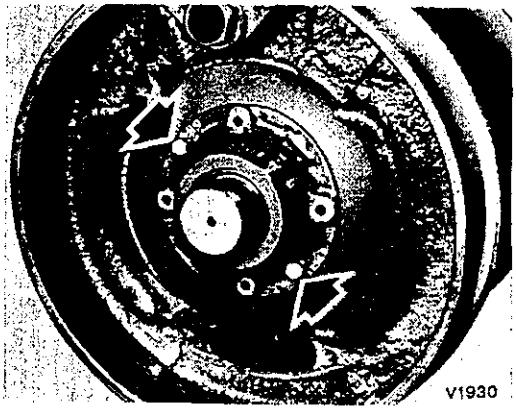


Fig 1 - Removing oil seal housing from drum

17 Position winch assembly on wormcase side so that drum is upermost. Remove circlip bronze locating washer and key from mainshaft.

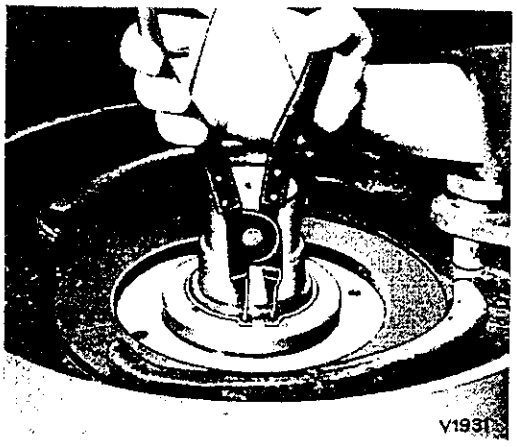


Fig 2 - Removing circlip and bronze locating washer

18 With the aid of a chain hoist and a pair of lifting brackets secured to existing bolt holes, withdraw drum from wormcase and mainshaft

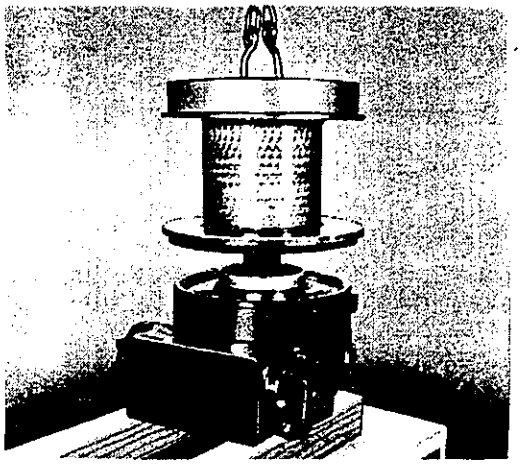


Fig 3 - Removing drum

19 Remove circlip from wormwheel end of mainshaft, remove six bolts and withdraw end plate and O-ring housing. Withdraw mainshaft

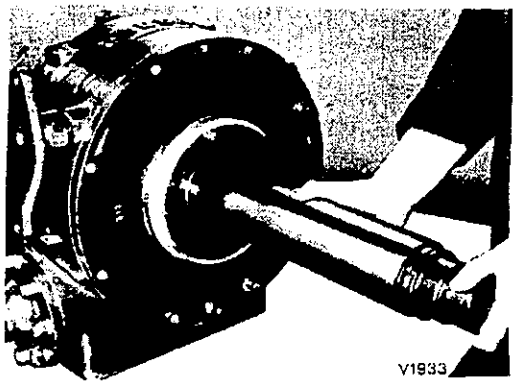


Fig 4 - Removing mainshaft

20 Remove the eight clutch housing securing bolts and use two of these bolts as draw bolts to withdraw cover from clutch housing.

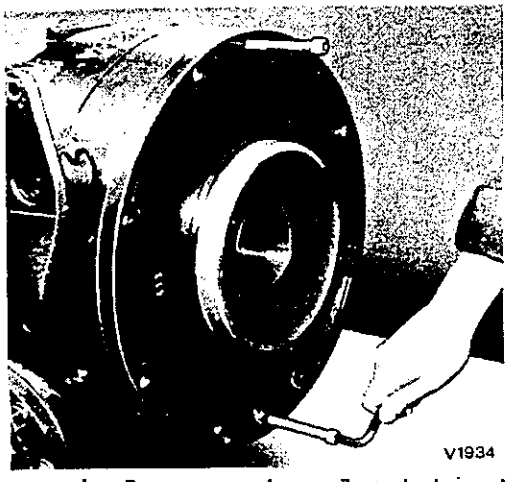


Fig 5 - Removing clutch housing cover

21 Rotate clutch shaft and remove sliding clutch from wormwheel hub. Remove slippers from fork.

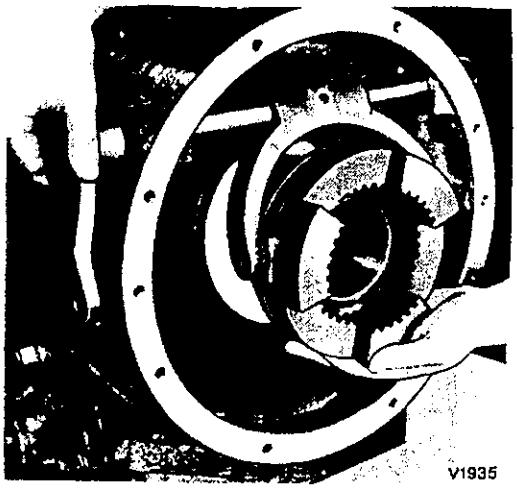


Fig 6 - Removing sliding clutch

22 Lightly tap clutch housing to release it from dowels and withdraw clutch housing from worm-case complete with clutch shaft and fork. Withdraw thrust washer from clutch housing. If required, remove grub screw and withdraw clutch shaft and fork.

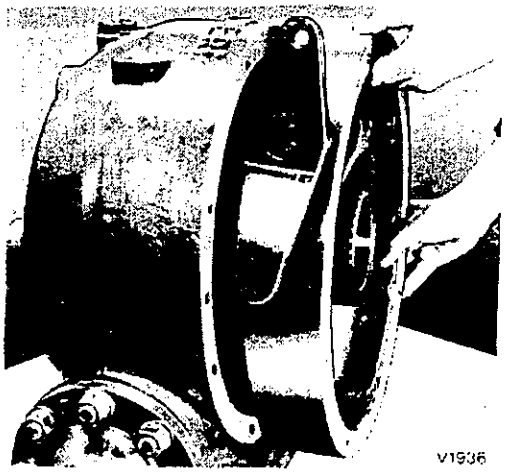


Fig 7 - Removing clutch housing

23 Remove universal joint flange securing nut and withdraw flange from wormshaft using a two legged puller. In the example shown opposite, hydraulic puller No SP152400 is used together with a 100 mm (4 in.) extension (arrowed).

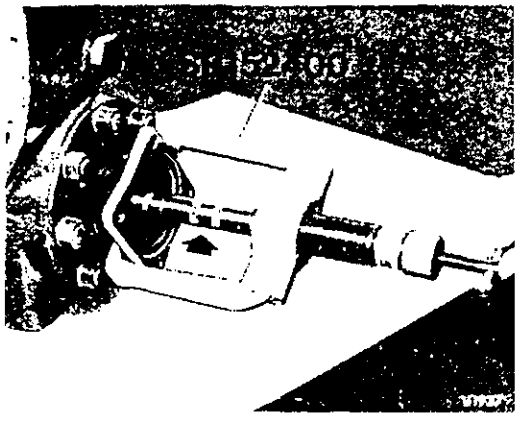


Fig 8 - Removing universal joint flange

24 Remove eight nuts and spring washers and withdraw oil seal and bearing housing retaining plate. With the aid of two draw bolts and a steel bar resting against end of wormshaft, withdraw oil seal and bearing housing assembly followed by shim and bearing spacer.

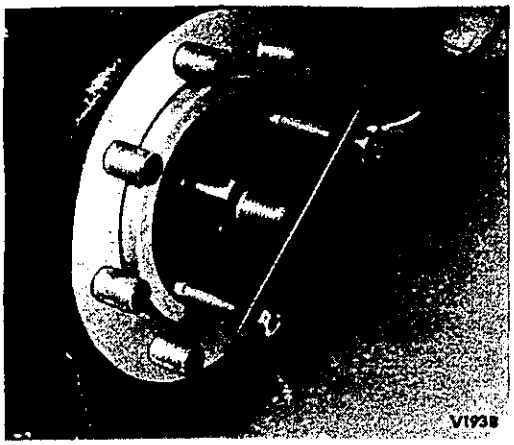


Fig 9 - Removing oil seal and bearing housing assy

25 Remove eight nuts, spring washers and flat washers and withdraw wormshaft end cover, O-ring and shims. Keep shims in safe place for reassembly. Temporarily install oil seal and bearing housing retaining plate to wormcase and force wormshaft towards taper roller bearings so as to push outer bearing outer race from case. In the example shown opposite, hydraulic puller No SP152800 is used together with a 150 mm (6 in.) spacer (arrowed) with legs of puller positioned behind retaining plate and centre of puller acting on end of wormshaft. This will enable wormshaft to drop out of mesh with wormwheel.

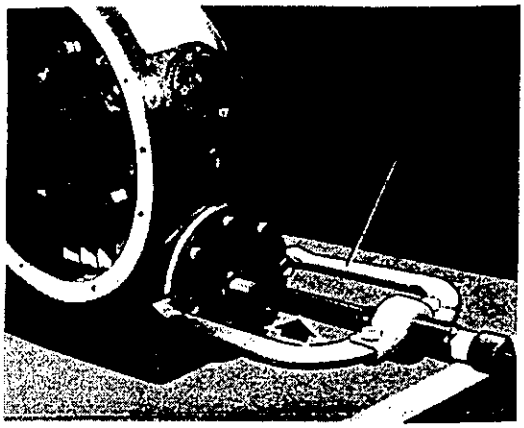


Fig 10 - Removing wormshaft outer taper roller bearing outer race

26 Withdraw wormwheel and hub assembly from case and remove thrust washer.

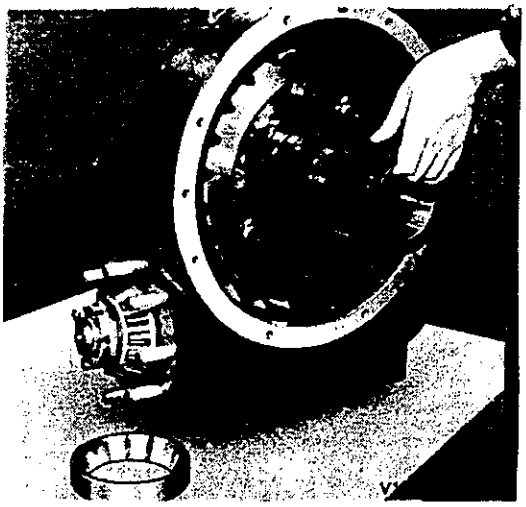


Fig 11 - Removing wormwheel and hub assembly

27 Support wormshaft and tap out remaining taper roller bearing outer race from wormcase and withdraw wormshaft. If bearings are in need of renewal, remove split pin and slotted nut and press bearings from shaft. Press off remaining wormshaft bearing from other end of shaft.

28 If wormwheel or hub are in need of renewal, remove bolts and press hub out of wheel. Keep shims in safe place for reassembly.

Inspection and Reconditioning

29 Examine mainshaft and wormwheel hub bushes for scores and wear and renew if necessary.

30 Inspect wormwheel hub thrust washers for scores and wear and renew if necessary.

31 Examine all oil seals and O-rings and renew as required.

Reassembly

32 Reassembly is the reverse procedure of disassembly provided the following points are noted.

33 Ensure inner bearing outer race is installed over end of wormshaft before pressing taper roller bearings on to shaft. Tighten nut to 142 Nm (105 lbf ft) and continue tightening nut until hole in shaft is aligned with the next nearest slot in nut and secure with split pin.

34 Assemble wormwheel to hub using shims removed during disassembly between wheel and hub flange. Tighten bolts to 142 Nm (105 lbf ft).

35 Before installing wormwheel and hub assembly, install thrust washer to wormcase using grease to retain washer in position. Apply a coating of marking blue to worm teeth on wheel and install wormwheel and hub assembly ensuring wormshaft is positioned as far out of mesh with wheel as possible.

36 Gently tap outer taper roller bearing outer race into wormcase and install end cover with shims (removed during disassembly) situated between cover and case. Tighten nuts to 61 Nm (45 lbf ft).

37 Install shim to bore of wormcase prior to installation of oil seal and bearing housing.

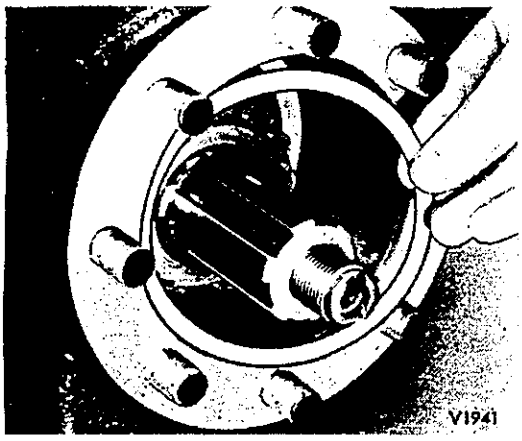


Fig 12 - Installing shim to bore of wormcase

38 Similarly, install spacer to wormshaft with chamfer towards bearing, fill cavity between oil seals with recommended grease. Install oil seal and bearing housing to wormcase, install retaining plate and tighten nuts to 61 Nm (45 lbf ft).

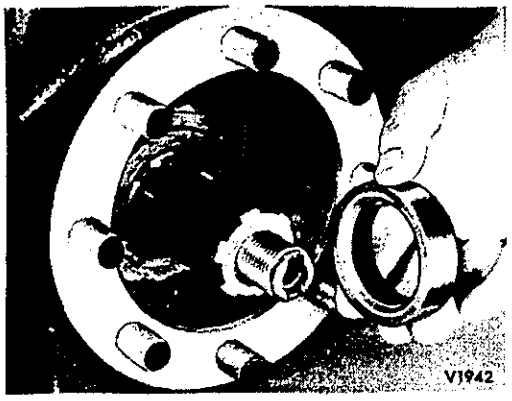


Fig 13 - Installing spacer to wormshaft

39 The procedure for checking end float of wormshaft is as follows:

39.1 Tap driving end of wormshaft to spread taper roller bearing outer races. Install dial gauge so that plunger of gauge contact driving end of wormshaft and adjust gauge to register zero. Remove plug from centre of end cover and replace it with a bolt approximately 38 mm (1.5 in.) long.

39.2 Screw in bolt until all end float of wormshaft is taken up and note reading on gauge. Correct end float is 0.05/0.13 mm (0.002/0.005 in.). End float can be adjusted by altering thickness of shims between end cover and wormcase. Removing shims will reduce end float, adding shims will increase it.

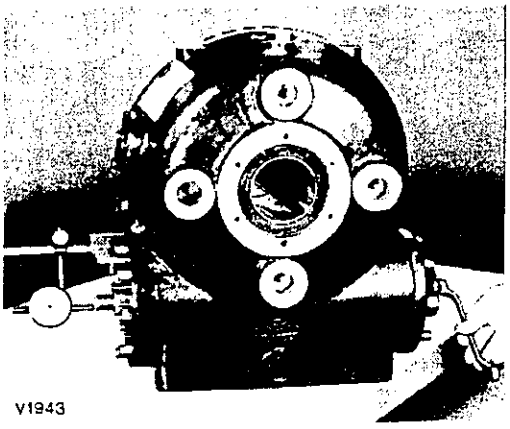


Fig 14 - Checking wormshaft end float

40 Assemble universal joint flange to wormshaft followed by washer and nut. Tighten nut to 142 Nm (105 lbf ft) and stake to shaft.

41 Before installing clutch housing, install thrust washer to housing using grease to retain washer in position. Smear gasket with jointing compound. After installing cover, tighten clutch housing bolts to 41 Nm (30 lbf ft).

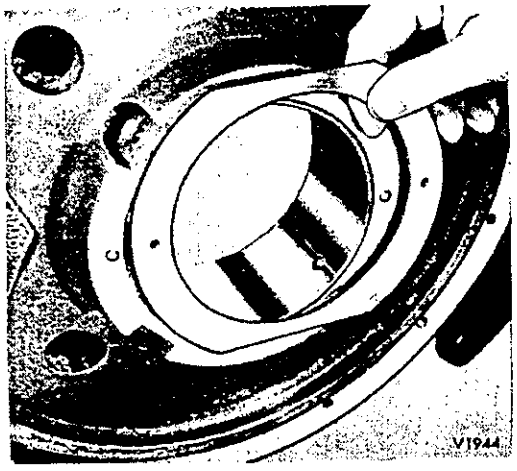
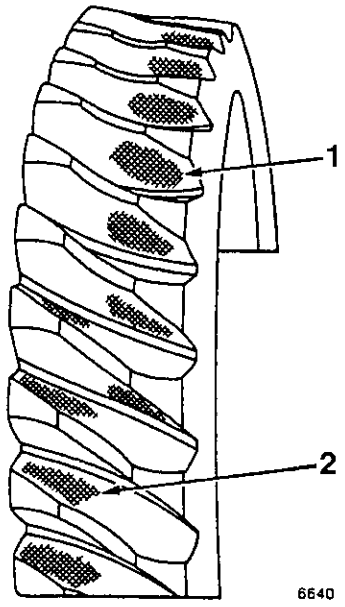


Fig 15 - Installing thrust washer to clutch housing

42 Rotate wormshaft in both directions to obtain a tooth marking on wormwheel. Remove inspection cover and examine the results. Reference to illustration will indicate type of contact required and if necessary adjustment obtained by varying number of shims located between wormwheel and wormwheel hub. Note that some backlash must exist between the worm and wheel, otherwise it-will prove impossible to revolve wormshaft by hand. The wormshaft will have to be lowered in the wormcase as previously described to enable wormwheel assembly to be removed each time an adjustment is made.



1. Anti-clockwise wormshaft rotation
2. Clockwise wormshaft rotation

Fig 16 - Correct contact area on wormwheel teeth

43 After installing mainshaft O-ring housing and end plate, tighten bolts to 41 Nm (30 lbf ft).

44 Before installing oil seal housing to drum, pack cavity between oil seals with recommended grease. Tighten bolts to 45 Nm (33 lbf ft).

Installation

45 The torque bracket must be assembled loosely to crossmember before installing the winch.

46 Installation of winch is the reverse procedure of removal.

47 Adjust cable tensioner control valve as detailed in para 58 level 2.

48 Refill winch with recommended oil to correct level and recheck after initial running.

CHAPTER 18

CRANE

CONTENTS

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Ser	Tool No (where applicable)	NSN/Part No (where applicable)	Designation
(1)	(2)	(3)	(4)
1	JT 1483		Jig fixture, power take-off/hydraulic pump disassembly

DRIVE UNIT/HYDRAULIC PUMP ASSEMBLY

CAUTION ...

Cleanliness is of the utmost importance where hydraulic systems are concerned. It is most important to exercise extreme care because the ingress of dirt or foreign matter will cause rapid wear of hydraulic components.

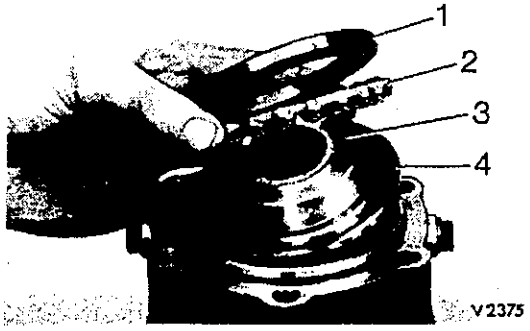
Disassembly

1 When assembling or disassembling the hydraulic pump from drive unit, it is necessary to use Jig Fixture JT 1483.

2 To install Jig Fixture JT 1483 remove three of the pump securing bolts. Adjust centre screw of jig fixture to hold pump unit against spring pressure whilst removing remaining securing bolts. Carefully release centre screw until spring pressure is relieved and remove jig fixture.

3 Separate hydraulic pump from drive unit, taking care not to displace any of the plungers or springs.

4 Remove outer thrust race (1) and bearings (2) from wobble shaft (3). Inner thrust race (4) on wobble shaft must only be removed if bearing assembly is to be renewed.



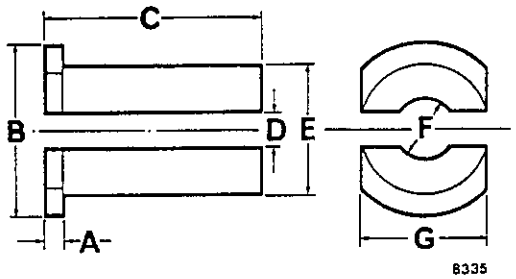
1. Outer thrust race
2. Bearings
3. Wobble shaft
4. Inner thrust race

Fig 1 - Removing wobble shaft bearing

5 Remove Woodruff key and press wobble shaft out through the two bearings and spacer.

6 If the two bearings and spacer remain in housing extract the bearings as follows:

6.1 Working from the wobble plate end of the housing, insert the two halves of the locally manufactured bearing extractor (Fig 2) so that the flanges locate between the seals and bearing inner track.



A. 3.18 mm (0.125 in.)
B. 37.29 mm (1.468 in.) dia
C. 53.98 mm (2.125 in.)
D. 5.52 mm (0.218 in.)
E. 30.94 mm (1.218 in.) dia
F. 11.10 mm (0.437 in.) dia
G. 30.94 mm (1.218 in.)

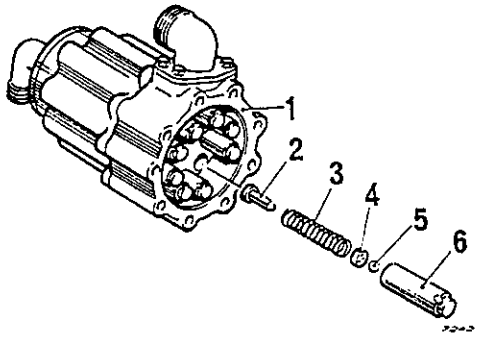
Fig 2 - Bearing extractor tool local manufacture (Material: Mild steel)

6.2 Slide a 11.10 mm (0.437 in.) x 76.6 mm (3.00 in.) bolt through centre of extractor, keeping the extractor halves in contact with the flanges lipped behind the bearing inner track.

6.3 Place the housing complete with extractor under press and push out the two bearings and spacer.

7 Remove the two oil seals from housing.

8 Remove plunger (6), ball valve (5), grid (4), spring (3) and spring guide (2) from pump (1). Repeat procedure for remaining plungers.



1. Pump
2. Spring guide
3. Spring
4. Grid
5. Ball valve
6. Plunger

Fig 3 - Disassembling pump plungers

9 Remove angled connector from pump head plug. Remove end plate securing bolts (arrowed) and withdraw plate from pump.

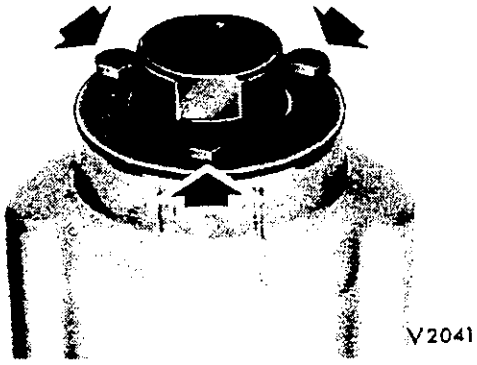
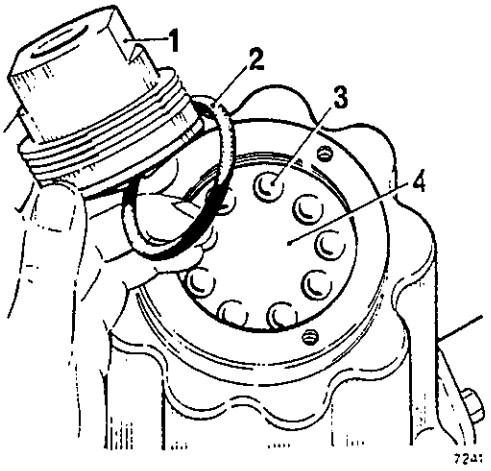


Fig 4 - End plate securing bolts

10 Unscrew and remove pump head plug (1) and O-ring (2). Remove the ball valves (3) from outlet valve block (4).



1. Pump head plug
2. O-ring
3. Ball valves
4. Outlet valve block

Fig 5 - Removing pump head plug

11 Using a thin rod lightly tap out (through hole in open end of pump) the outlet valve block. Ensure that the two locating dowels (arrowed) are not displaced from valve block.

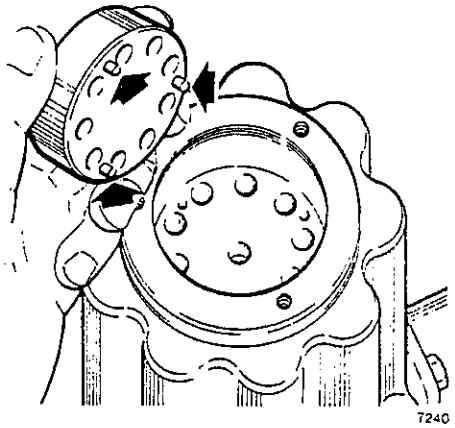


Fig 6 - Outlet valve block locating dowels

Inspection

12 Inspect the following items for wear, cracking, chipping and scoring.

12.1 Wobble shaft, bearings and thrust races.

12.2 Plunger bores. Light scoring of plunger bores can be removed by lapping, the resultant loss in efficiency being negligible

12.3 Plunger springs. Check springs for length and wear against a new component. Renew springs if necessary.

12.4 Plunger balls and grids.

12.5 Plunger ball valve seat. A simple test is to place the ball on its seat and blow down the plunger. This will indicate whether or not the ball and seat are serviceable.

12.6 Pump head plug.

12.7 Outlet valve block (mind ball valves and seats).

12.8 Inlet and outlet union threads.

Reassembly

13 Install oil seals to housing with open sides of seals facing away from each other.

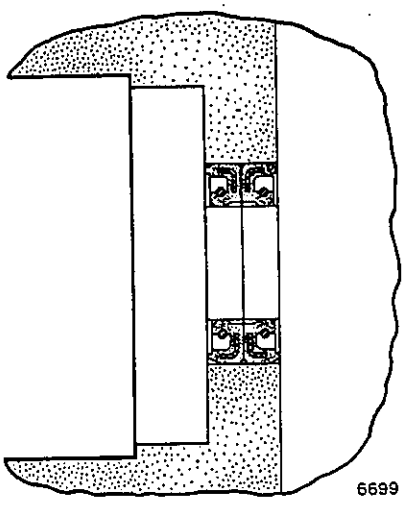


Fig 7 - Correct oil seal installation

14 Press wobble shaft bearing, with spacer into housing. The extractor tool, reversed, will ensure alignment of bearings and spacer.

15 Assemble thrust bearing to wobble shaft. Liberally lubricate the shaft and oil seals. Insert and press the shaft into the housing taking care not to damage the oil seal lips.

16 Support and secure housing with wobble plate uppermost and assemble thrust bearing on to wobble plate face.

17 Install outlet valve block to pump ensuring that dowels (arrowed) engage in locating holes in casing. Assemble ball valves to valve block. Install O-ring, pump head plug and end plate to pump.

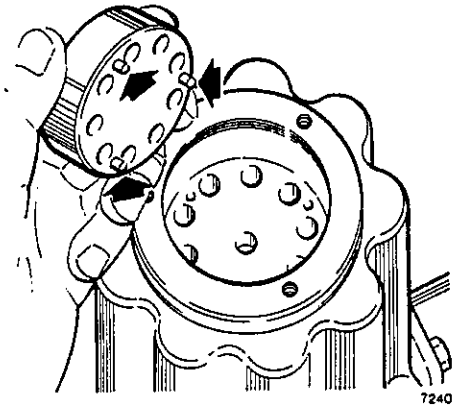


Fig 8 - Installing valve block to casing

18 Install ball valve to plunger followed by grid, spring and spring guide. Install plunger assembly to pump ensuring that plunger moves freely in bore. Repeat this procedure for the remaining plungers.

19 Carefully assemble pump to drive unit taking care not to dislodge the plungers from their bores. Pull both casings together using Jig Fixture (JT 1483) and install and tighten securing bolts.

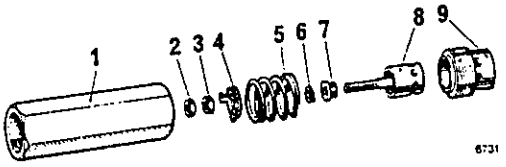
LOWERING BRAKE VALVES

CAUTION ...

Cleanliness is of the utmost importance where hydraulic systems are concerned. It is most important to exercise extreme care because the ingress of dirt or foreign matter will cause rapid wear of hydraulic components.

Disassembly

20 Unscrew bush (9) and withdraw piston and spring assembly from housing (1). Disassemble spring (5) and spring cage (4) from piston (8).



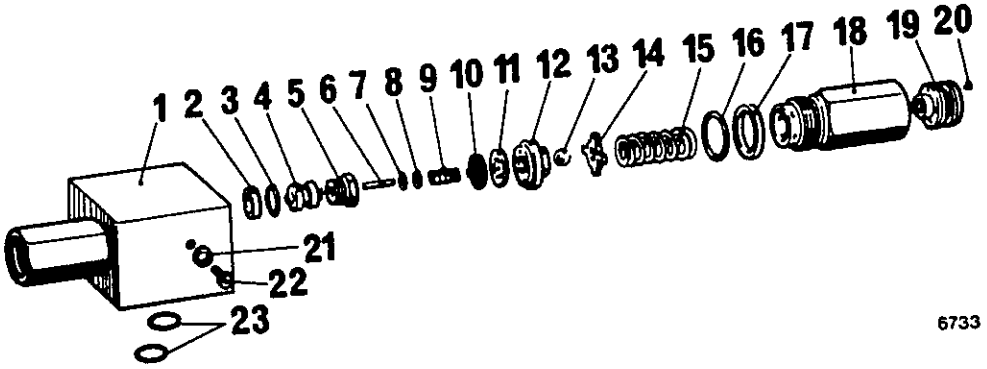
1. Housing
2. Nut
3. Nut
4. Spring cage
5. Spring
6. Circlip
7. Bush
8. Piston
9. Bush

Fig 9 - Exploded view of lowering brake valve

Reassembly

21 Reassemble valve in reverse order. Pressure testing and setting of valve must be carried out on the component test bench. Do not install valve to vehicle unless the pressure setting is correct.

LOAD HOLDING VALVES



1 Valve block	9 Compression ring	16 O-ring
2 Gasket	10 Filter	17 Thrust ring
3 O-ring	11 Valve plate	18 Spring housing
4 Piston	12 Valve seat	19 Threaded disc
5 Guide	13 Ball	20 Threaded pin
6 Push rod	14 Washer	21 Copper washer
7 Copper washer	15 Compression spring	22 Bolt
8 Ring		23 O-ring

Fig 10 - Exploded view of load holding valve

Disassembly

22 Unscrew spring housing (18) from valve block (1), and withdraw spring (15), washer (14) and ball (13), followed by valve seat (12), valve plate (11), filter (10) and spring (9).

Reassembly

23 Reassemble valve in reverse order. Pressure testing and setting of valve must be carried out on the component test bench. Do not install valve to vehicle unless the pressure setting is correct.

CONTROL VALVE BLOCK

WARNINGS ...

(1) FUNCTIONAL TESTING OF THE CRANE MUST ONLY BE CARRIED OUT BY AUTHORISED PERSONNEL. THOSE NOT FAMILIAR WITH CRANING OPERATIONS SHOULD REFER TO 'OPERATING THE CRANE' IN OPERATING INFORMATION AESP 2320-H-100-201.

(2) ENSURE CRANE IS SAFE BEFORE REMOVING ANY PARTS. THIS IS PARTICULARLY APPLICABLE IF THE CRANE IS IN AN OPENED POSITION WHEN PIPES/HOSES ARE DISCONNECTED.

Removal

24 Remove clevis pins securing control rods to control levers.

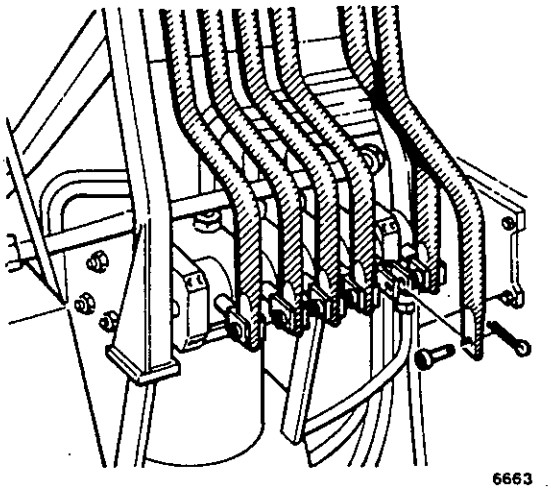
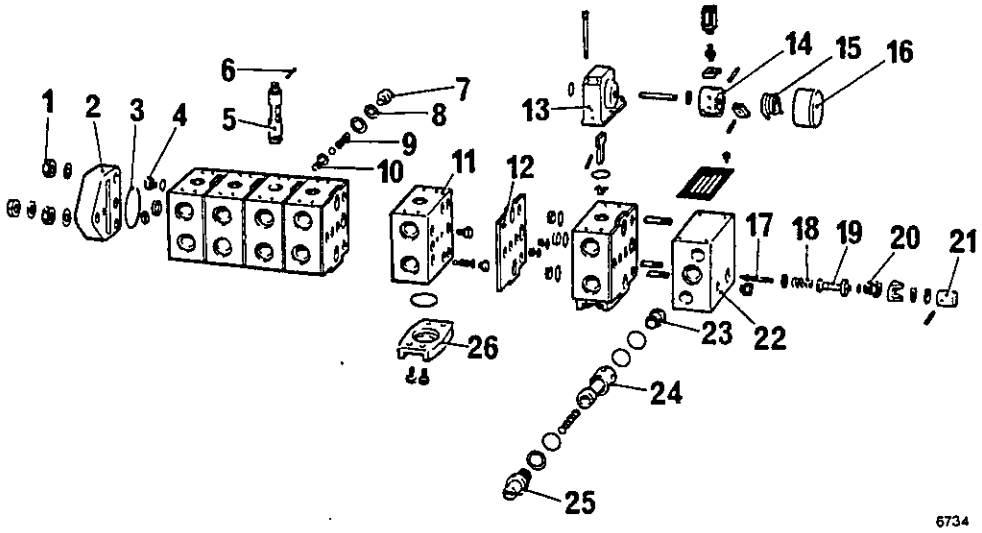


Fig 11 - Disconnecting control rods at control valve block

25 Disconnect hydraulic oil pipes to and from control valve block and cap all union connections in valve block and pipe ends. If in doubt as to pipe locations for refitting, mark and identify pipes before disconnecting.

26 Remove the four retaining screws securing valve block to support bracket and withdraw valve block complete.

Disassembly

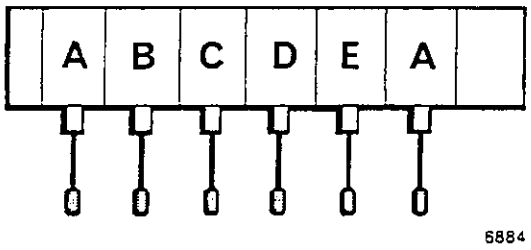


1. Retaining nut
2. End plate
3. O-ring
4. Plug
5. Spool valve
6. Pin
7. Relief valve plug
8. Relief valve shim
9. Relief valve spring
10. Relief valve cone
11. Valve section
12. Intermediate plate
13. Lever housing
14. Lever hub
15. Lever spring
16. Hood
17. Relief valve cone
18. Relief valve spring
19. Adjusting screw
20. Guide bush
21. Regulating knob
22. Connecting block
23. Bush
24. Piston with bush
25. Plug
26. Cover plate

Fig 12 - Exploded view of control valve block

27 Remove the valve section retaining nuts (1) and slide end plate (2) and valve sections as an assembly from the tie rods.

28 Carefully separate the sections keeping them in the order in which they are removed. Each valve section should be disassembled and reassembled separately to avoid the mixing of any parts.



A Stabilizer rams valve sections
B Main lifting ram valve section
C Jib ram valve section
D Slewing rams valve section
E Jib extension ram valve section

Fig 13 - Identification of control valve block sections

Inspection

29 Clean off all components with white spirit and dry with a lint free cloth or use compressed air.

29.1 Ensure that each section of the valve block is free from damage on the machined faces, particularly the locations for the O-ring seals.

29.2 Check that tie rods are not bent and do not have damaged threads.

29.3 Inspect lever housing and associated parts for wear or damage.

STABILIZER RAMS

WARNING ...

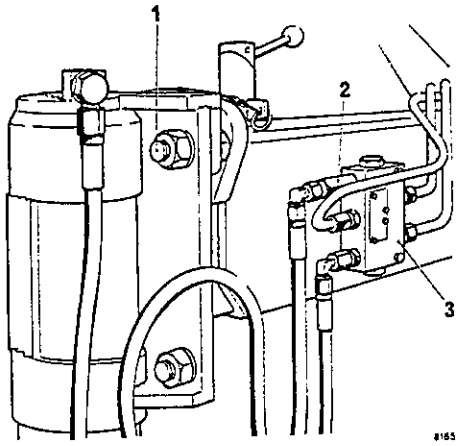
FUNCTIONAL TESTING OF THE CRANE MUST ONLY BE CARRIED OUT BY AUTHORIZED PERSONNEL. THOSE NOT FAMILIAR WITH CRANING OPERATIONS SHOULD REFER TO OPERATING THE CRANE IN OPERATING INFORMATION AESP 2320-H-100-201.

CAUTION ...

Cleanliness is of the utmost importance where hydraulic systems are concerned. It is most important to exercise extreme care because the ingress of dirt or foreign matter will cause rapid wear of hydraulic components.

Removal

30 Disconnect and cap pipe ends adjacent to restricted non-return valve (2) and double non-return valve (3). Remove bolts (1) securing stabilizer ram to support.



1. Bolt
2. Restricted non-return valve
3. Double non-return valve

Fig 14 - Stabilizer removal

Installation

31 Installation of stabilizer rams is a reversal of removal. After making pipe connections, operate stabilizer two or three times to fill rams with oil.

32 Check and if necessary top-up level of hydraulic fluid as described in Operating Information.

Leakage test

33 Pressure test all pipes/hoses to the stabilizer by actuating stabilizer control valve to bring rams into their final positions where they should be held whilst a visual check is made of all joints for leakage.

CRANE SECTIONS

WARNINGS ...

(1) FUNCTIONAL TESTING OF THE CRANE MUST ONLY BE CARRIED OUT BY AUTHORIZED PERSONNEL. THOSE NOT FAMILIAR WITH CRANING OPERATIONS REFER TO 'OPERATING THE CRANE' IN OPERATING INFORMATION AESP 2320-H-100-201.

(2) ENSURE CRANE IS SAFE BEFORE REMOVING ANY PARTS. THIS IS PARTICULARLY APPLICABLE IF THE CRANE IS IN AN OPENED POSITION WHEN PIPES/HOSES ARE DISCONNECTED.

34 The method of removing crane sections and/or hydraulic rams depends largely on the repairs necessary. In Fig 15 the crane has been opened and stowed in the fore and aft position with jib and boom sections over the platform body. From this position, with boom supported and hydraulic pressure relieved, the following units can be removed:

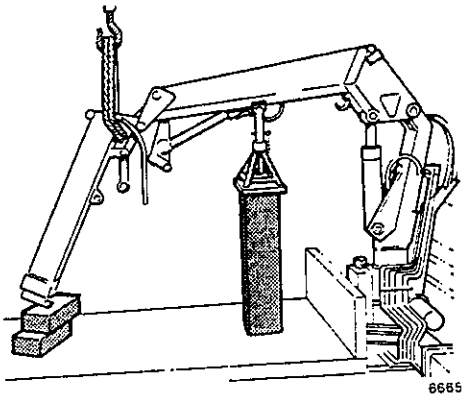


Fig 15 - Positioning crane for dismantling

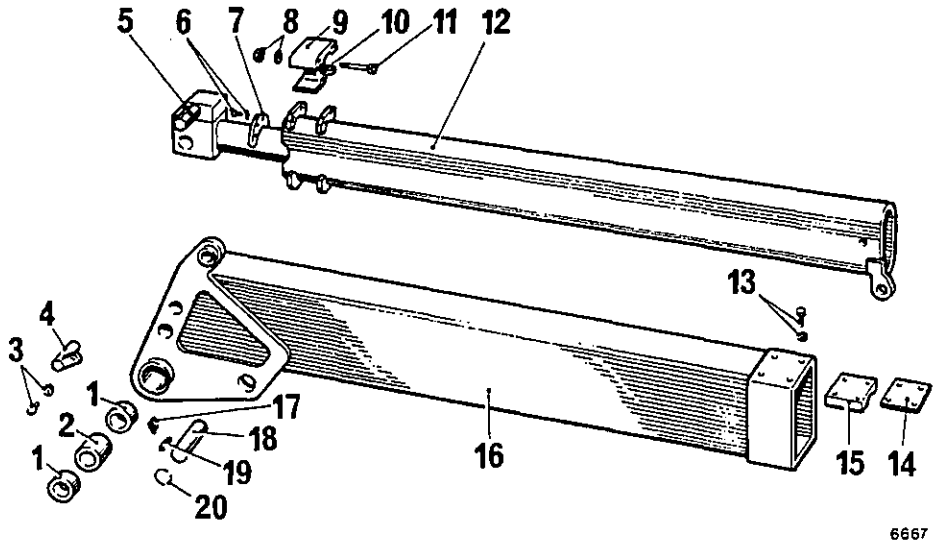
34.1 Jib, jib extension and hydraulic ram.

34.2 Boom to jib ram.

34.3 Main lifting ram (centre column to boom).

34.4 Boom.

35 The crane sections and rams are secured with steel pins which are retained either by circlip, split pin or bolt. Where it is necessary to remove a number of pins they must be marked for identification to aid reassembly. Similarly, mark and identify all hydraulic hoses/pipes. All open hose/pipe ends and connectors must be capped to prevent the ingress of dirt or foreign matter.



1. Bush
2. Spacer
3. Retaining bolt and washer
4. Securing pin
5. Load holding valve
6. Retaining bolt
7. Mounting plate
8. Nut and washer
9. Guide plate
10. Spacer
11. Bolt
12. Extension arm
13. Retaining bolt and washer
14. Spacer
15. Guide plate
16. Jib
17. Grease nipple
18. Anchor pin
19. Key
20. Circlip

Fig 16 - Removing jib extension/hydraulic ram from jib

36 To remove jib extension and hydraulic ram from jib proceed as follows:

36.1 Disconnect and remove rotary banjos from jib.

36.2 Remove retaining bolt and washer (3) and drive out securing pin (4).

36.3 Remove bolts and washers (13) securing guide plate (15) and spacer (14) to jib. Jib extension and hydraulic ram can now be withdrawn from jib.

36.4 To release hydraulic ram from jib extension, remove bolts and washers (6) securing mounting plate (7) to jib extension.

37 Reassembly of hydraulic ram to jib extension and jib extension to jib is a reversal of removal. If, however, excessive movement exists between jib and extension, shims must be installed between guide plate (15) and interior face of jib.

Installation

38 Installation of crane sections and lifting rams is a reversal of removal.

39 Top-up or refill the hydraulic oil reservoir as described in Operating Information AESP 2320-H-100-201.

Leakage Test

40 Pressure test all pipes/hoses by actuating the control valve to bring each ram to its final position where it should be held whilst a visual check is made of all joints for leakage.

CRANE ASSEMBLY

WARNING ...

FUNCTIONAL TESTING OF THE CRANE MUST ONLY BE CARRIED OUT BY AUTHORIZED PERSONNEL. THOSE NOT FAMILIAR WITH CRANING OPERATIONS, SHOULD REFER TO 'OPERATING THE CRANE' IN OPERATING INFORMATION AESP 2320-H-100-201.

Removal

41 Removal of the crane assembly must only be carried out with the boom and jib in the stowed/travelling position.

42 Close stop valve in low pressure pipe from reservoir to pump. Disconnect pipe at pump side of stop valve and cap all open connections.

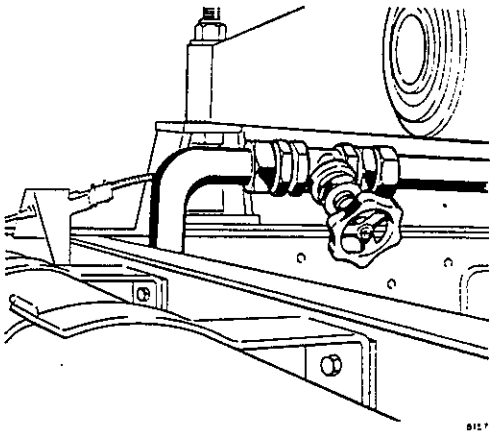


Fig 17 - Low pressure pipe and stop valve

43 Disconnect high pressure pipe at union (arrowed) and cap all open connections.

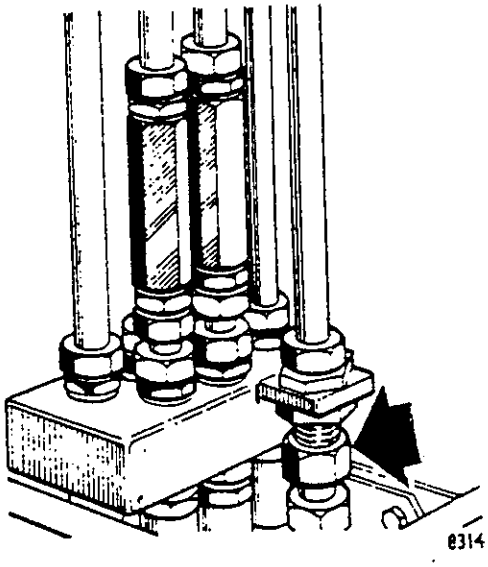
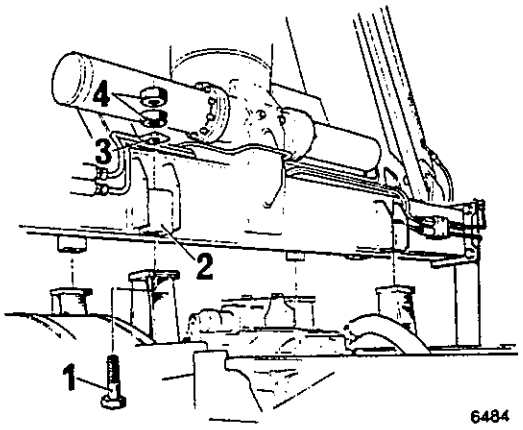


Fig 18 - High pressure pipe union

44 Remove the retaining nuts (4) and bolts (1) from the four crane mounting points (2).



1. Mounting bolt
2. Mounting point
3. Washer
4. Retaining nuts

Fig 19 - Crane mounting points

WARNING ...

THE CRANE ASSEMBLY WEIGHS APPROXIMATELY 1100 kg (2424 lb). THEREFORE IT IS IMPORTANT TO ENSURE THAT THE EQUIPMENT BEING USED TO LIFT THE ASSEMBLY IS CAPABLE OF DOING SO AND ALSO THAT PARTICULAR ATTENTION IS PAID TO THE METHOD OF SLINGING.

45 The crane must be slung for removal as shown.

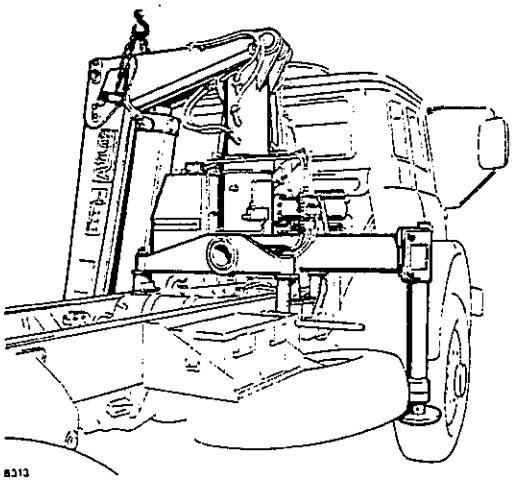


Fig 20 - Lifting crane from vehicle

46 If, when removing the assembly, there is not enough height available to enable the stabilizers to clear the chassis then they must be removed as described in para 30.

Installation

47 Crane installation is a reversal of removal with particular attention being paid to the following points.

47.1 If stabilizers have been removed, install as described in para 31.

47.2 Retaining nuts and bolts must be tightened to a torque of 1633 Nm (1205 lbf ft).

48 Top-up or refill the hydraulic oil reservoir as described in Operating Information AESP 2320-H-100-201.

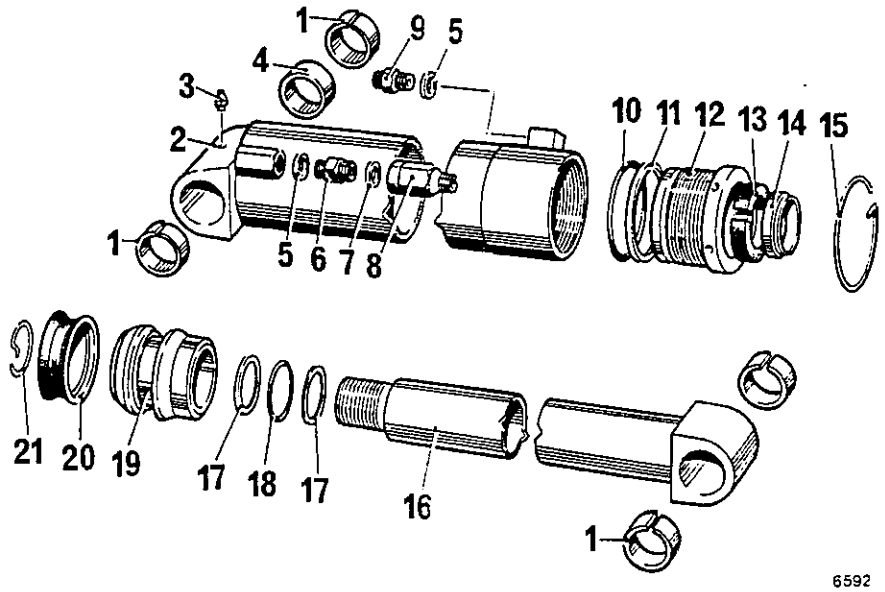
Leakage test

49 Pressure test all pipes/hoses by actuating the control valve to bring each ram to its final position where it should be held whilst a visual check is made of all joints for leakage.

CRANE RAMS

CAUTION ...

Cleanliness is of the utmost importance where hydraulic systems are concerned. It is most important to exercise extreme care because the ingress of dirt of foreign matter will cause rapid wear of hydraulic components.



1. Split bush
2. Cylinder
3. Grease nipple
4. Spacer
5. Copper washer
6. Coupling
7. Copper washer
8. Emergency safety valve
9. Coupling
10. O-ring
11. Back-up ring
12. Cylinder nut
13. U-ring
14. Wiper seal
15. Spring ring
16. Piston rod
17. Back-up ring
18. O-ring
19. Piston
20. Compact piston pack
21. Spring ring

Fig 21 - Jib ram

50 Remove spring ring (15) from cylinder nut (12). Install a well fitting pin to cylinder assembly eye. With cylinder supported and pin gripped in a vice, unscrew cylinder nut (12) and withdraw piston rod assembly from cylinder (2). Keep piston rod (16) parallel to cylinder during removal and withdraw carefully to prevent damage of piston rod or associated parts against threaded end of cylinder.

51 With piston rod assembly resting on wooden V blocks remove spring ring (21) from end of piston rod.

52 Unscrew piston (19) and remove back-up rings (17) together with O-ring (18). Remove compact piston pack (20) from piston.

53 Slide cylinder nut (12) off piston rod and remove wiper seal (14), U-ring (13), O-ring (10) and back-up ring (11).

54 Emergency safety valve (8) may be removed but must not, under any circumstances, be disassembled.

Inspection

55 Clean all components in white spirit and dry with a lint free cloth or with compressed air. Ensure that:

55.1 Cylinder is free from deep scoring and that the threads for the cylinder nut are serviceable.

55.2 Bushes are not excessively worn.

55.3 Piston rod is free from scoring and the chrome is intact.

55.4 All seals, O-rings and U-rings are renewed.

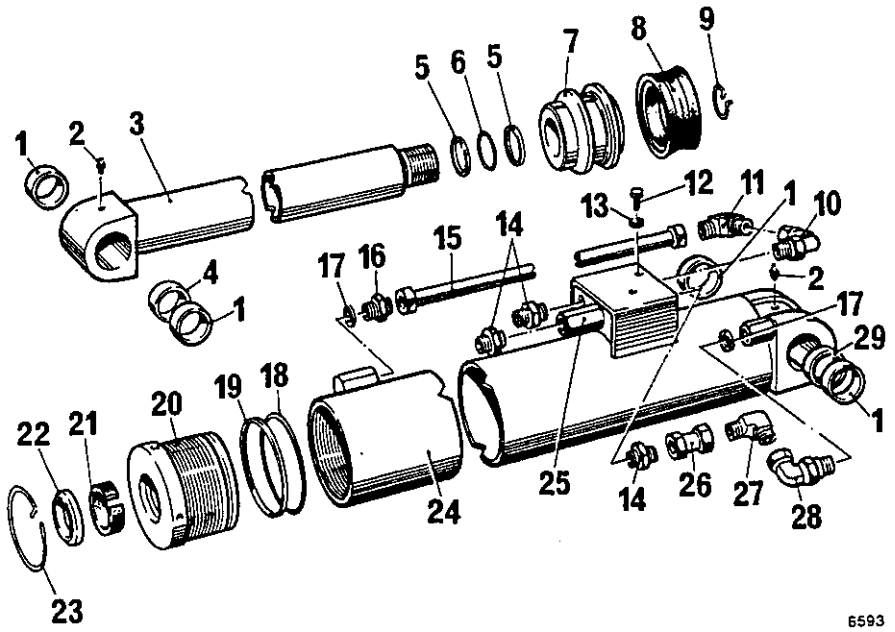
Reassembly

56 Reassembly of jib ram is a reversal of disassembly with special attention being paid to the following:

56.1 When installing piston rod assembly to cylinder take care not to damage compact piston pack on threads in end of cylinder.

56.2 When installing cylinder nut, hold cylinder in vice, as described in para 50, and tighten securely.

Main lifting ram

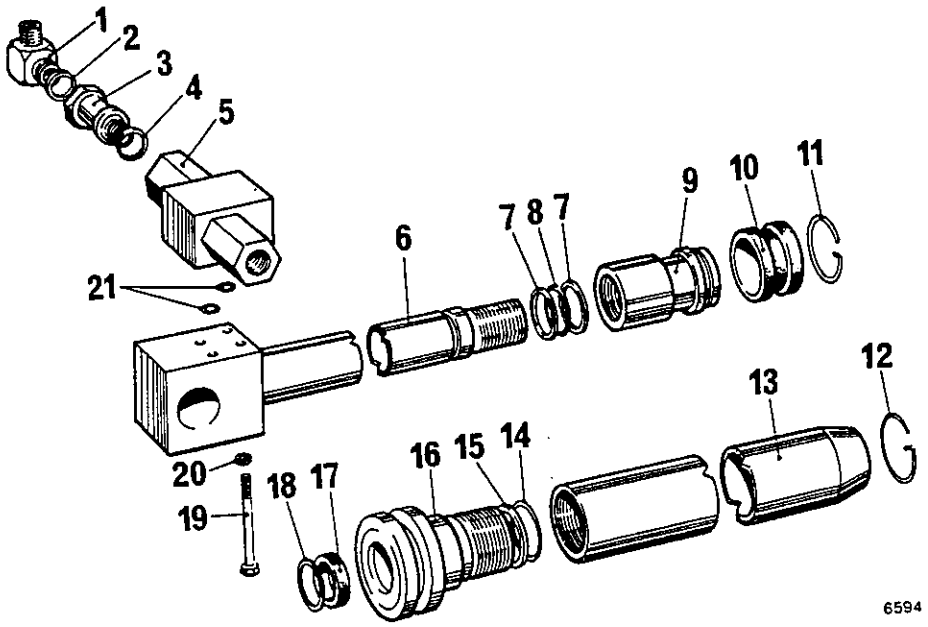


1. Bush
2. Grease nipple
3. Piston rod
4. Spacer
5. Back-up ring
6. O-ring
7. Piston
8. Compact piston pack
9. Spring ring
10. Coupling
11. Coupling
12. Bolt
13. Spring washer
14. Coupling
15. Oil pipe
16. Coupling
17. Copper washer
18. O-ring
19. Back-up ring
20. Cylinder nut
21. U-ring
22. Wiper seal
23. Spring ring
24. Cylinder
25. Load holding valve
26. Oil pipe
27. Coupling
28. Coupling
29. Spacer

Fig 22 - Main lifting ram

57 Disassembly, inspection and reassembly of the main lifting ram are as described in para 50 for the jib ram.

Jib extension ram



1. Rotary banjo
2. Copper washer
3. Rotary banjo connector
4. Copper washer
5. Load holding valve
6. Piston rod
7. Back-up ring
8. O-ring
9. Piston
10. Compact piston pack
11. Spring ring
12. Spring ring
13. Cylinder
14. O-ring
15. Back-up ring
16. Cylinder nut
17. U-ring
18. Wiper seal
19. Bolt
20. Spring washer

Fig 23 - Jib extension ram

Disassembly

58 Support cylinder assembly as described in para 50. Remove rotary banjo (1) and load holding valve (5) from piston rod (6).

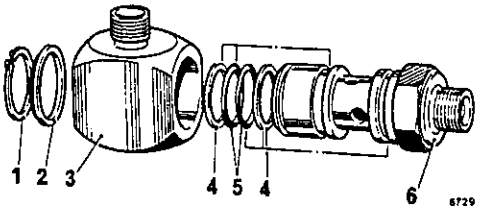
59 Unscrew cylinder nut (16) and carefully withdraw piston rod from cylinder (13)

60 With piston rod assembly resting on wooden V-blocks, remove spring ring (11) from end of piston rod.

61 Unscrew piston (9) and remove back-up rings (7) together with O-ring (8). Remove compact piston pack (10) from piston.

62 Remove cylinder nut from piston rod and withdraw wiper seal (18) and U-ring (17) from nut. Remove back-up ring (15) and O-ring (14) from cylinder.

63 If rotary banjo is disassembled ensure it is reassembled as shown.



1. Circlip
2. Washer
3. Body
4. Back-up ring
5. O-ring
6. Adaptor

Fig 24 - Rotary banjo

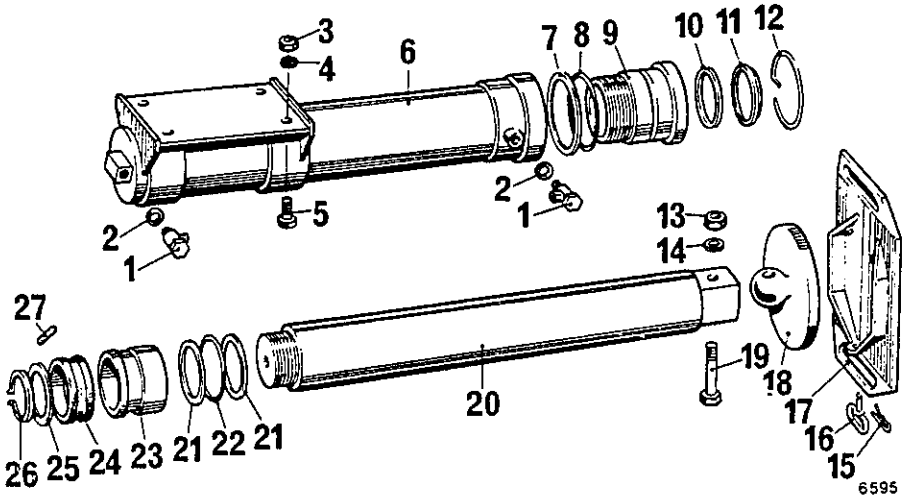
Inspection

64 Inspect components as described in para 55. Renew all O-rings and U-rings.

Reassembly

65 Reassembly is a reversal of disassembly taking care, when installing piston rod assembly to cylinder not to damage U-rings against threads in end of cylinder.

Stabilizer rams - Disassembly



1. Coupling
2. Copper washer
3. Nut
4. Spring washer
5. Bolt
6. Cylinder
7. O-ring
8. Back-up ring
9. Cylinder nut
10. U-ring
11. Wiper seal
12. Spring ring
13. Nut
14. Spring washer
15. Retaining clip
16. Retaining pin
17. Support plate
18. Stabilizer foot
19. Bolt
20. Piston rod
21. Back-up ring
22. O-ring
23. Piston
24. Compact piston pack
25. Washer
26. Circlip
27. Dowelpin

Fig 25 - Stabilizer ram

66 Remove spring ring (12) from cylinder nut (9). Unscrew cylinder nut and. withdraw piston rod assembly from cylinder (6) taking care not to damage piston rod or associated parts against threaded end of cylinder.

67 With piston rod assembly resting on wooden V blocks remove circlip (26) from end of piston rod (20). Tilt piston rod and extract dowel (27). Unscrew piston (23) from piston rod and remove compact piston pack (24). Remove back-up rings (21) and O-ring (22).

68 Slide cylinder nut from piston rod and remove wiper seal (11) and U-ring (10).

Inspection

69 Inspect components as described in para 55. Renew all seals.

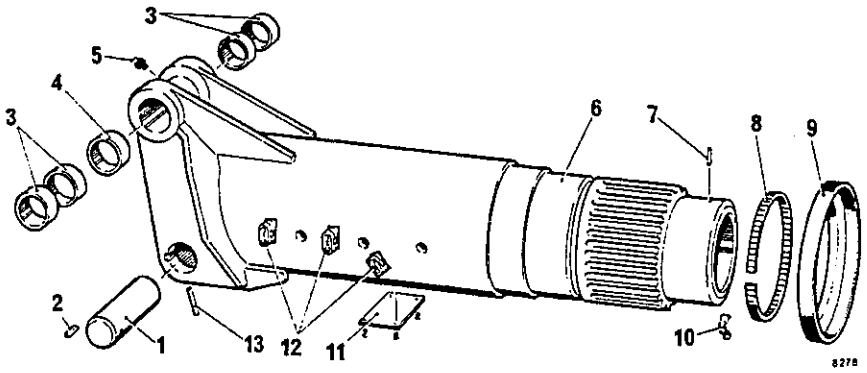
Reassembly

70 Reassembly is a reversal of disassembly taking care, when installing piston rod assembly to cylinder, not to damage piston rod or components against threads in end of cylinder.

CRANE CENTRE COLUMN

CAUTION ...

The dowel bolts are screwed into both the crane base and foot bearing. If bolts are removed there is a possibility of crane bearing becoming displaced when centre column is removed.



1. Pin
2. Key
3. Bush
4. Spacer
5. Grease nipple
6. Crane centre column
7. Dowel pin
8. Clamping band
9. Rubber collar
10. Clamp
11. Name plate
12. Clip
13. Cylindrical pin

Fig 26 - Crane centre column

Removal

71 Remove jib and boom as described in para 34, with the jib and boom in the true fore and aft positions. This will ensure that slew pistons are in the central position when the centre column is removed.

72 Mark and identify flexible hoses which are routed through centre column and secured at connection block. It is essential that these hoses are marked otherwise errors may occur when reassembling.

73 Partially unscrew dowel bolts (Fig 28 (15)) sufficiently for dowel end of bolts (which fit into a peripheral groove at base of centre column) to clear groove.

74 Mark position of centre column relative to crane base. Sling and lift centre column clear of base.

Installation

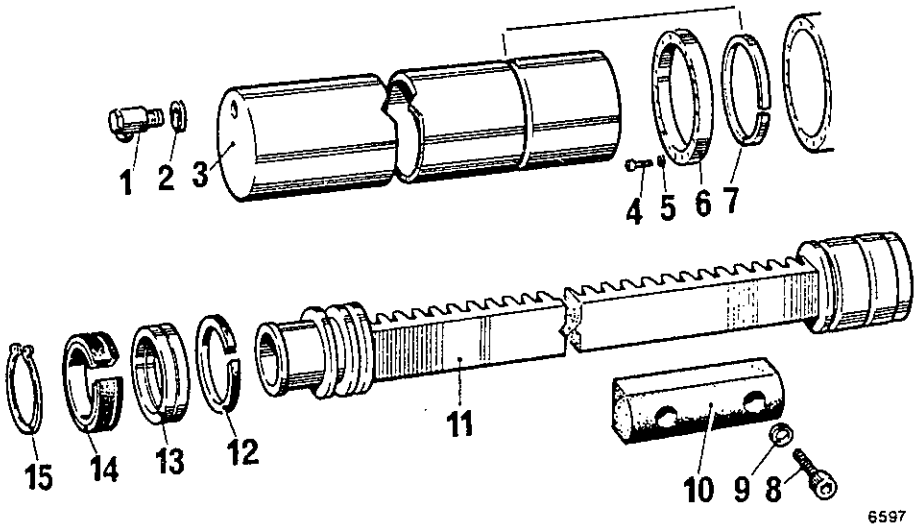
75 Installation of centre column to crane base is a reversal of removal paying particular attention to the following:

75.1 Slew pistons must be in the central position.

75.2 When installing centre column, identification marks made prior to removal must be correctly aligned.

75.3 Align clamping band (Fig 26 (8)) in crane base to allow dowel pin (7) on centre column to locate in clamping band.

SLEWING RAMS



1. Coupling
2. Copper washer
3. Cylinder
4. Allen screw
5. Spring washer
6. Flange ring
7. Holding ring
8. Allen screw
9. Spring washer
10. Guide block
11. Slew rack
12. Wiper seal
13. Piston guide ring
14. U-ring
15. Circlip

Fig 27 - Slewing rams

Disassembly

76 Slew piston seals can be renewed without removing slew rack (11) from crane base.

77 Disconnect and cap pipe connections at banjo coupling (1). Remove coupling from cylinder.

78 Remove socket headed bolts (4) securing flange ring (6) to crane base. Release fastening ring (7) and withdraw cylinder tube (3) to expose piston head and components.

79 Release circlip (15) and remove U-ring (14), guide piece (13), and wiper seal (12), noting which way round they are installed.

80 If removal of slew rack is required, it is necessary to first remove centre column as described in para 71-73.

81 Prior to removal of slew rack measure and record the distance that piston head protrudes from flange face of crane base so that rack can be repositioned correctly on installation.

82 Remove screws (8) and carefully withdraw slew rack and guide block (10).

Reassembly

83 Reassembly of slewing rams is a reversal of disassembly with particular attention being paid to the following:

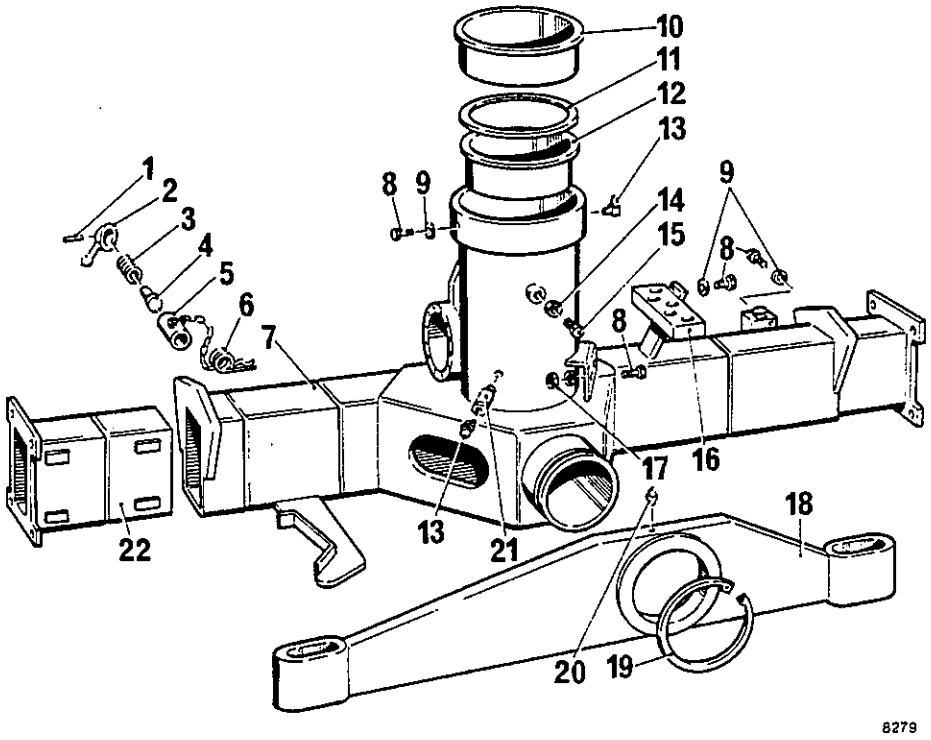
83.1 When installing rack to crane base and cylinder to crane base, care is taken not to damage seals.

83.2 The slew rack must be placed in crane base in the same position as it was before removal.

83.3 Ensure that after cylinder installation the hydraulic oil reservoir is topped up as described in Operating Information.

83.4 The slew ram control valve is operated and the slewing rams exercised a few times to fill them with oil.

CRANE BASE



1. Adaptor sleeve
2. Lever
3. Compression spring
4. Pin
5. Housing
6. Spring pin
7. Crane base
8. Belt
9. Spring washer
10. Neck bearing
11. Thrust washer
12. Foot bearing
13. Grease nipple
14. Nut
15. Dowel bolt
16. Duct block
17. Nut
18. Bearer
19. Circlip
20. Grease nipple
21. Grease nipple extension
22. Extension box

Fig 28 - Crane base

84 Access to upper bearing in crane base can only be gained after removal of crane centre column as described in para 71.

85 Access to lower bearing in crane base can only be gained after removal of slewing rams as described in para 76.

86 Upper bearing is retained by dowel bolts (15) which are locked in position by nuts (14). Lower bearing is similarly retained.

87 When installing new bearings it is necessary to proceed as follows:

87.1 Install lower bearing in crane base and drill and tap bearing to accept dowel bolts. It is most important to note that upper and lower bearings are manufactured from 'Tufnol'. To prevent swelling of bearing during drilling or tapping only sharp drills and taps must be used.

87.2 Repeat procedure for upper bearing.

88 Crane base bearer (18) can be removed from crane base after releasing circlip (19).

2320-H-100-601
3rd Edition January 2000
(Superseding edition dated Feb 95)

TRUCK, 4 TONNE, 4 X 4, BEDFORD MJ (ALL VARIANTS)

MAINTENANCE SCHEDULE (JOINT SERVICE)

This publication contains information covering the requirements of Category 6-0 at information levels 1 and 2.

BY COMMAND OF THE DEFENCE COUNCIL

[redacted]

Issued by
Ministry of Defence
DIRECTOR GENERAL SAFETY AND ENGINEERING-TECHNICAL INFORMATION GROUP

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
1	[redacted]	May 04
2	[redacted]	Mar 05
3	[redacted]	Jun 05
4	INCORPORATED	
5	INCORPORATED	
6	INCORPORATED	Apr 08
7	INCORPORATED	Jun 08
8	INCORPORATED	Oct 08
9	INCORPORATED	Apr 09
10	INCORPORATED	Oct 09
11	INCORPORATED	May 11
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PREFACE

Sponsor:
GSV PT
File ref: GSV/5065

Publication Agency:
DGS&E TIG

INTRODUCTION

1 Service users should forward any comments on this publication through the channels prescribed in AESP 0100-P-011-013. An AESP Form 10 is provided at the end of this publication; it should be photocopied and used for forwarding comments on this AESP.

2 AESPs are issued under Defence Council authority and where AESPs specify action to be taken, the AESP will of itself be sufficient authority for such action and also for the demanding of the necessary stores.

RELATED AND ASSOCIATED PUBLICATIONS

Related Publications

3 The Octad for the subject equipment consists of the publications shown opposite. 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-A-001-013).

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directives	*	*	*	*
2	0	Operating Information	201	201	201	201
	1	Aide-Memoire	*	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	*	302	302	302
4	1	Installation Instructions	411	411	*	*
	2	Preparation for Special Environments	421	421	*	*
5	1	Failure Diagnosis	*	512	512	512
	2	Repair Instructions	*	522	523	523
	3	Inspection Standards	*	532	533	533
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedules	601	601	*	*
7	1	Illustrated Parts Catalogues	711	711	711	711
	2	Commercial Parts Lists	*	721	721	721
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	741	741	741
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	811	811	811	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	821	821	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

*Category/Sub-category not published

Associated Publications

4	Reference	Title
	JSP 800 Vol 5	Joint Service Road Transport Regulations
	AP 3260 Book 1	Mechanical Transport Maintenance Regulations for the Royal Air Force
	AP 3260 Book 3	Mechanical Transport – General Orders
	AGAI Vol 4	Equipment and Stores – Periodic REME Examination
	EMER Test and Measurement A 028 Chap 650	Inspection and Testing of Lifting Equipment
	AC 60503 (PAM 2)	Material Regulations for the Army Vol 2 Equipment Support Pamphlet No. 2
	AC 61418	Truck Fuel Servicing Tactical Mk 5, 5A and 5B - Specialist
	AD 8288/B5	Daily Servicing for Truck Fuel Servicing
	AD 8269/c10	Servicing Schedule for Vehicles with Winterising Equipment
	AP 4545L Volume 2	Mechanical Transport - General Orders and Modifications - Mobile Cranes

AESP 2300-A-050-013	B Vehicle Test, Inspection and Certification
AESP 2300-A-300-532	B Vehicle Cab Corrosion Inspection Standards
AESP 2320-A-100-Octad	Degassing, Cleaning, Examination and Repair of Truck Fuel Servicing and Bulk Fuelling Equipment
AESP 2320-L-100-Octad	Refueller 1000 Gallon Tactical Mk 5, 5A and 5B
AESP 2320-A-310-201	B Vehicle Corrosion Prevention
AESP 25.10-G-100-Octad	Hydraulic Tail Lift Truck Mounted Ratcliff (All Variants)
AESP 2510-E-400-Octad	Body Tanker Ground Fuel 5000 Litre Roberts
AESP 2510-E-400-Octad	Body Tanker Ground fuel 800 Gallons Roberts
AESP 2530-D-051-Octad	B Vehicle Air Brake Inspection Policy
AESP 4930-C-100-Octad	Tank and Pump Unit Liquid Dispensing Truck Mounting
AESP 4910-E-300-Octad	Analyser Diesel Exhaust Model DX 210 (VL Churchill)
AESP 2540-A-100-201	Pintle Towing Rotatable

MAINTENANCE SCHEDULE

INTRODUCTION

1 This Maintenance Schedule is the authority for carrying out all scheduled maintenance tasks on the subject equipment and takes precedence over any other conflicting publication.

2 The person on a unit or formation with delegated responsibility for the specified equipment, who is also competent and experienced in that role, is responsible for ensuring that the operations detailed in this Maintenance Schedule are properly carried out. The operations are only to be carried out by personnel who, through either professional trade training or an equipment specific formal training course, are appropriately qualified. The aforementioned responsible person may also order any operation to be carried out more frequently than specified, if conditions under which the equipment operated render it necessary.

3 Scheduled Maintenance is to be recorded in the appropriate equipment document in accordance with single service regulations.

4 Serial numbers left blank in the tables may be taken up by amendment action at a later date.

DEFINITIONS

5 As far as this document is concerned, the following definitions apply:

5.1 Examine. Carry out a survey of the condition of an item without dismantling, **unless** specifically instructed to do so in the relevant task requirement. The condition of an item may be impaired by the following:

5.1.1 Insecurity of attachment.

5.1.2 Cracks or fractures.

5.1.3 Corrosion, contamination or deterioration.

5.1.4 Distortion.

5.1.5 Loose or missing fasteners.

5.1.6 Chafing, fraying, scoring or wear.

5.1.7 Faulty or broken locking devices.

5.1.8 Loose clips or packing, obstruction of, or leakage from pipelines.

5.1.9 Discolouration due to overheating or leakage of fluids.

5.1.10 Damage due to external sources.

5.2 Check. Make a comparison of measurement of time, pressure, temperature, resistance, dimension or other quantity, with known figure.

5.3 Operate. As far as possible, ascertain that the component or system functions correctly without the use of test equipment or reference to measurement.

5.4 Replenish. Refill a container to a predetermined level, pressure or quantity. This includes any necessary cleaning of orifices, examination of caps, covers, gaskets and washers, renewal of locking devices and cleaning of vents.

5.5 Replace. Remove an item and then fit a new or reconditioned item.

WARNINGS, CAUTIONS AND MAINTENANCE NOTES

6 Before any maintenance task is carried out the WARNINGS, CAUTIONS and Maintenance Notes preceding the appropriate table must be read and understood.

MAINTENANCE INTERVALS AND AREAS OF RESPONSIBILITY

NOTE

The information contained in the tables is equipment specific and should reflect the manufacturer's recommendations and equipment usage.

7 Table 4 – Action on Receipt. The maintenance detailed in Table 4 covers the action taken when the equipment arrives on a unit. These operations will normally be of a once only nature, eg the recording of lifting equipment with the appropriate test authority, actions that are necessary to be undertaken before the equipment is put into service or actions that are only required during the running in period. The maintenance detailed in Table 4 maintenance must be carried out by appropriate trained personnel, as described in Para 2.

8 Table 5 – Out of Phase Maintenance. The maintenance tasks detailed in Table 5 covers tasks that do not fall into line with the time/usage interval requirements of Table 6 or 7. The maintenance detailed in Table 5 maintenance must be carried out by appropriately trained personnel, as described in Para 2.

9 Table 6 – Driver/Operator Maintenance. The maintenance tasks detailed in Table 6, Maintenance Intervals A, B, C and D are to be carried out by appropriately trained personnel, as described in Para 2, as follows:

9.1 A – Daily before use (only on days used).

9.2 B – Daily after use (after the equipment has been operated).

9.3 C – Weekly, whether the equipment is used or not.

9.4 D – Not Applicable.

10 Table 7 – Time/Usage Maintenance. The maintenance detailed in Table 7, Maintenance Interval 1st, A, B, C and D must be carried out by a appropriately trained personnel, as detailed in Para 2, at the following intervals:

10.1 1st – After the first 500 miles (800 km)

10.2 A – Every 6,000 miles (10,000 km) or 6 months, whichever occurs first.

10.3 B – Every 12,000 miles (20,000 km) or 12 months, whichever occurs first.

10.4 C – Every 24,000 miles (40,000 km) or 24 months, whichever occurs first.

10.5 D – RAF use only, REF: 2300-A-050-013.

11 Table 8 – Out of use Maintenance. The Out of Use Maintenance in Table 8 is to be carried out in accordance with single service regulations.

TABLE 1 EQUIPMENT APPLICABILITY

Serial (1)	Equipment Asset Code (2)	Designation (3)	Contract Numbers (4)
1	2025-3100	Truck Cargo, 4 Tonne, 4 x 4, with Turbo Charged Engine.	FVE22A/246 FVE22A/295 FVE21B/234
2	2025-8100	Truck Cargo, 4 Tonne, 4 x 4, LHD with Turbo Charged Engine, Bedford MJP2BMO.	FVE22A/246
3	2025-8101	Truck Cargo, 4 Tonne, 4 x 4, LHD Automatic Gearbox with Turbo Charged Engine, Bedford MJP2BMO.	
4	2026-3100	Truck Cargo (Winterised), 4 Tonne, 4 x 4 with Turbo Charged Engine, Bedford MJP2MBO.	FVE22A/414
5	2037-3102	Truck Cargo with 3 Tonne Crane, 4 Tonne, 4 x 4 with Turbo Charged Engine, Bedford MJP2MBO.	FVE22A/414
6	2037-8100	Truck Cargo, 4 Tonne Bedford, with 3 Tonne Crane	
7	2038-3100	Truck Cargo, 4 Tonne Bedford, with 3 Tonne Crane Armament Support	
8	2038-8100	Truck Cargo with 3 Tonne Crane, 4 Tonne, 4 x 4 Armament Support LHD with Turbo Charged Engine, Bedford MJP2MBO.	FVE22A/246
9	2039-3100	Truck Cargo with 3 Tonne Crane, 4 Tonne, 4 x 4 APFC with Turbo Charged Engine, Bedford MJP2MBO.	
10	2043-3101	Truck Cargo 4 Tonne with 3 Tonne Crane (Winterised) Bedford MJP2MBO	
11	2050-3100	Truck Cargo, W/Winch, 4 Tonne, 4 x 4 with Turbo Charged Engine, Bedford MJP2MBO.	FVE22A/246
12	2050-8100	Truck Cargo, W/Winch, 4 Tonne, 4 x 4 LHD with Turbo Charged Engine, Bedford MJP2MBO.	FVE22A/246 FVE22A/328
13	2053-3100	Truck Cargo, W/Winch (Winterised), 4 Tonne, 4 x 4 with Turbo Charged Engine, Bedford MJP2MBO.	FVE22A/410
14	2091-3105	Truck Flat Platform, 4 Tonne, Ptarmigan, Bedford MJP2BMO	
15	2091-3106	Truck Flat Platform, 4 Tonne, Ptarmigan, Bedford MJP2BMO	
16	2091-3100	Truck Flat Platform, 4 Tonne, 4 x 4 with Turbo Charged Engine, Bedford MJP2BMO.	FVE22A/246
17	2091-8100	Truck Flat Platform, 4 Tonne, Bedford MJP2BMO	
18	2091-8101	Truck Flat Platform, 4 Tonne, AWD Bedford MJP2BMO	
19	2091-8105	Truck Flat Platform, 4 Tonne, Ptarmigan, Bedford MJP2BMO	
20	2091-8106	Truck Flat Platform, 4 Tonne, Ptarmigan, LHD Bedford MJP2BMO	
21	2091-8107	Truck Flat Platform, 4 Tonne, Ptarmigan PV, Bedford MJP2BMO	

(continued)

TABLE 1 EQUIPMENT APPLICABILITY (continued)

Serial (1)	Equipment Asset Code (2)	Designation (3)	Contract Numbers (4)
22	2092-3100	Truck Flat Platform (Winterised), 4 Tonne, 4 x 4 with Turbo Charged Engine, Bedford MJP2BMO.	
23	2092-3103	Truck Flat Platform, 4 Tonne, Ptarmigan, Bedford MJP2BMO	
24	2094-3100	Truck Flat Platform with 3 Tonne Crane, 4 Tonne, 4 x 4 with Turbo Charged Engine, MJP2BMO.	
25	2094-8100	Truck Flat Platform with 3 Tonne Crane, 4 Tonne, 4 x 4 with Turbo Charged Engine, MJP2BMO.	
26	2095-3101	Truck Flat Platform, 4 Tonne, Bedford, W/Winch	
27	2095-8101	Truck Flat Platform, 4 Tonne, Bedford, W/Winch	
28	2096-4100	Truck Flat Platform, 4 Tonne, Bedford, FFR W/Winch	
29	2096-8100	Truck Flat Platform, 4 Tonne, Bedford, FFR W/Winch	
30	2205-3101	Truck Cargo, Bulk Fuel (Winterised), 4 Tonne, 4 x 4 with Turbo Charged Engine, Bedford MJP3BMO.	
31	8022-8101	Truck Cargo, 4 Tonne Bedford, with Hydraulic Tail Lift	
32	8025-8102	Truck Cargo, 4 Tonne, 4 x 4, Bedford MJP2BMO	

TABLE 2 FUELS, LUBRICANTS AND ASSOCIATED PRODUCTS

NOTES

(1) The products listed below are to be used on this equipment. Alternative products must not be used without the approval of an appropriate equipment support manager.

(2) Oil changes at the –15 deg C point shall only be made in the advice of the responsible person identified at Para 2.

(3) The capacities listed are to be used as a guide only. A physical check is to be carried out to ensure that all fluid levels are correct. This check should be carried out with the equipment unladen and standing on level ground whenever possible.

Serial	Assembly	Product		Capacity	
		Above –15 deg C	Below –15 deg C	Litres	Pints
(1)	(2)	(3)	(4)	(5)	(6)
1	Engine (inc filters).	OMD 90	OMD 55	12.0	21.0
2	Main gearbox (manual).	OEP 220	OEP 38	3.7	6.6
3	Main gearbox (automatic).	OMD 90	OMD 55	11.0	19.0
4	Transfer gearbox.	OEP 220	OEP 38	3.0	5.5
5	Front axle differential.	OEP 220	OEP 38	3.7	6.5
6	Front axle hubs (per hub).	OEP 220	OEP 38	0.4	0.7
7	Rear axle differential.	OEP 220	OEP 38	3.4	6.0
8	Rear axle hubs (per hub).	OEP 220	OEP 38	0.6	1.0
9	Steering box.	OEP 220	OEP 38	1.2	2.2
10	Power steering unit.	OMD 90	OMD 90	4.5	7.9
11	Brake hydraulic reservoir.	OX 8	OX 8	-	-
12	Compressor anti-freezer.	AL 14	AL 14	-	-
13	Coolant capacity.	AL39/water mix		24.0	42.0
14	Fuel capacity.	Diesel		150	33 gal
15	Windscreen washer reservoir.	AL11/washer		-	-
16	Battery.	De-min water			
17	Battery terminals.	PX 7	PX 7	-	-
18	General greasing.	XG 279	XG 279	-	-
19	General lubrication.	OMD 90	OMD 90	-	-
20	Winch gearbox.	OC 600	OEP 220	9.0	15.8
21	Winch rope (34D 8030-99-549-0384) (For RAF AP 3260, Bk 3, Chap 10-1, Inst 2 refers).	RD 205	RD 205		
22	Winch rope (Army only).	XG 279	XG 279		
23	Crane hydraulic reservoir.	OM 33	OM 33	-	-
24	Tail lift reservoir.	OM 33	OM 18	-	-
25	CALM greasing.	XG 276	XG 276	-	-

TABLE 3 EQUIPMENT DATA

Serial (1)	Item (2)	Detail (3)	
	ADJUSTMENTS		
1	Valve clearances (hot).	Inlet: 0.3 mm Exhaust: 0.3 mm	(0.012 in.) (0.012 in.)
2	Water pump/alternator drive belts.	13 mm (0.5 in.) at centre of longest run.	
3	Clutch pedal free play.	25.4 mm	(1 in.)
4	Clutch and brake pedal height settings (top of pedal arms to under side of toe panel).	25.4 mm	(1 in.)
5	Front wheel alignment.	1.6 to 4.8 mm (1/16 to 3/16 in.) Toe-in	
6	Engine idling speed.	500 to 550 rev/min	
7			
8			
	TORQUE SETTINGS		
9	Steering drop arm nuts.	170 Nm	(126 lbf ft)
10	Steering power cylinder.	54 Nm	(40 lbf ft)
11	Hydraulic pump bolts.	58 Nm	(43 lbf ft)
12	Wheel nuts.	544 Nm	(405 lbf ft)
13	Rocker shaft bolts.	58 Nm	(43 lbf ft)
14	Propeller shaft flange bolts.	7/16 in. bolts 75 Nm	(56 lbf ft)
15	Cylinder head bolts.	1/2 in. bolts 260 Nm (192 lbf ft) with lightly oiled threads	
16	Road spring U-bolts.	Front: 129 Nm Rear: 189 Nm	(95 lbf ft) (140 lbf ft)
17			
18			
	TYRES		
19	Manufacturer.	Various	Goodyear
20	Type.	Crossply	Radial (G188/388)
21	Size.	12.00 x 20 14 ply	12.00 R 20
22	Pressures (road):		
	22.1 Front.	3.1 bar (45 lbf/in.^{2})	4 bar (58 lbf/in.^{2})
	22.2 Rear and spare.	6.2 bar (91 lbf/in.^{2})	6 bar (87 lbf/in.^{2})
23	Pressures (cross country):		
	23.1 Front.	2.8 bar (41 lbf/in.^{2})	3 bar (44 lbf/in.^{2})
	23.2 Rear and spare.	5.5 bar (80 lbf/in.^{2})	4.5 bar (65 lbf/in.^{2})
24			
25			

(continued)

TABLE 3 EQUIPMENT DATA (continued)

Serial (1)	Item (2)	Detail (3)
	AIR BRAKING SYSTEM	
26	Operating pressures:	
	26.1 Governor/Unloader cut-out.	7.1 to 7.4 bar (103 to 107 lbf/in.^{2})
	26.2 Low-pressure warning.	5 bar ± 0.34 (73 lbf/in.^{2} ± 5 lbf/in.^{2})
	26.3 Pressure protection.	6.7 bar (97 lbf/in.^{2})
27	Load sensing valve (LSV).	See vehicle mounted LSV data plate or LSV setting chart at AESP 2320-H-100-522, Chap 10, Page 9, Para 36.
28		
29		
	DIMENSIONS	
30		
31	Length.	Refer to vehicle data plate.
32	Width.	Refer to vehicle data plate.
33	Height.	Refer to vehicle data plate.
34		
	WEIGHT	
35		
36	Unladen weight.	Refer to vehicle data plate.
37	Gross vehicle weight.	Refer to vehicle data plate.

TABLE 4 ACTION ON RECEIPT

Serial (1)	Action (2)
1	RAF units are to inform their parent lifting machine test centre of any change in the holdings of lifting machines. Such notification is to include the EAC, description, registration mark, certificates available and date of last proof load test or safe working load test.
2	On receipt of Crane or Winch variants, Army units are to inform their parent REME workshop, who will take relevant action in accordance with EMER T&M A 028, Chap 650.

TABLE 5 OUT OF PHASE MAINTENANCE

Serial (1)	Action (2)	Interval (3)
1	Coolant: Check condition and specific gravity. (For RAF AP 3260 Book 3, Chap 1-1, Inst No. 2 refers).	Before winter: (Adjust to local conditions).
2	Check the torque loading of the wheel nuts.	After fitting or changing a road wheel at approx, 20 miles (32 kms), or after 30 mins driving.
3	For crane or platform (if fitted). A full functional test of the platform and its emergency systems, is to be carried out by a competent person.	Every 6 months.
4	Adjust crown wheel thrust pads.	48,000 miles (80,000 kms).
5	Replace brake fluid reservoirs (hot tropical climates).	Every 36 months.
6	Engine sump, drain, replace filter element, replenish	Every 36 months or 36,000 miles (60,000 km)
7	Coolant, drain and replenish	Every 5 years

TABLE 6 DRIVER/OPERATOR MAINTENANCE

Before driving this vehicle or operating any fitted equipment, personnel are to read and understand the Warnings, Cautions and Operating Instructions detailed in category 201 of this AESP.

The following WARNINGS/CAUTIONS and Maintenance Notes must be read and understood before commencing these maintenance tasks.

WARNINGS

(1) PERSONAL INJURY. FUELS, OILS, LUBRICANTS AND ASSOCIATED PRODUCTS ARE HARMFUL TO SKIN AND BODY. ALL PERSONNEL ARE TO CONSULT THEIR CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH (COSHH) BEFORE CARRYING OUT ANY MAINTENANCE OR REPLENISHMENT ACTIVITY ON THIS VEHICLE. TO MINIMISE RISKS OF EXPOSURE, WEAR APPROPRIATE PROTECTIVE CLOTHING, USE BARRIER CREAMS AND PAY ATTENTION TO PERSONAL HYGIENE. THE MINIMUM TREATMENT AFTER SKIN CONTACT IS TO WASH THE AFFECTED AREA WITH SOAP AND WATER. SEEK MEDICAL ATTENTION IF ANY OF THESE PRODUCTS ARE INGESTED.

(2) PERSONAL INJURY. ON VEHICLES FITTED WITH POWER TAKE OFF (PTO) FOR DRIVING SPECIALIST EQUIPMENT, ENSURE THAT THE PTO IS OUT OF GEAR AND THAT THE ENGINE IS STOPPED BEFORE WORKING ON OR CHANGING COMPONENTS.

(3) PERSONAL INJURY. OPERATORS ARE TO ENSURE THAT THERE ARE NO PERSONNEL OR EQUIPMENT WITHIN THE LIFTING AND MOVEMENT AREAS OF THE CRANE.

(4) PERSONAL INJURY. BARE HAND CONTACT OF STEEL WIRE ROPES IS TO BE AVOIDED AT ALL TIMES.

(5) PERSONAL INJURY NEVER HANDLE A WIRE ROPE WHEN ANYONE ELSE IS AT THE CONTROLS.

CAUTIONS

(1) EQUIPMENT DAMAGE. If the vehicle has not been run for one month or longer, prime the turbo charger bearings with 50 cm^3 (2 fl oz) of clean OMD 90 before starting the engine. To be carried out by an MT Mech/MT Tech, or VM only.

(2) EQUIPMENT DAMAGE. Before stopping the engine after a long hard run at sustained high speed, it is important to allow the engine to idle for a minimum of one minute to assist in heat dissipation from the turbo charger and exhaust manifold.

(3) EQUIPMENT DAMAGE. When winching, set parking brake and chock wheels.

(4) EQUIPMENT DAMAGE. The wire rope is to always spool off the bottom of the drum.

(5) EQUIPMENT DAMAGE. Do not winch with less than 5 wraps of wire rope around the drum.

(6) EQUIPMENT DAMAGE. Always fully deploy and lock the crane outrigger legs before operating the crane boom arm.

(7) EQUIPMENT DAMAGE. Before slewing the crane arm, ensure that it has been sufficiently raised to clear the payload.

(8) EQUIPMENT DAMAGE. Whilst operating the crane, ensure that the vertical column does not collide with any part of the payload.

(continued)

TABLE 6 DRIVER/OPERATOR MAINTENANCE (continued)

(9) EQUIPMENT DAMAGE. Do not attempt to fill or top up a hot engine with cold coolant.

(10) EQUIPMENT DAMAGE. The batteries must never be disconnected when the engine is running.

(11) EQUIPMENT DAMAGE. This vehicle is fitted with rh and lh threaded wheel studs.

MAINTENANCE NOTES

(1) Should the brake fluid reservoirs need constant replenishing the vehicle is to be placed unserviceable and checked for brake fluid leaks.

(2) If the brake air reservoir automatic drain valve fails to operate the vehicle is to be placed unserviceable maintenance to be carried out by appropriately trained personnel.

(3) The hydraulic oil level must be checked before crane operation is started. This is to be carried out with the crane folded and the vehicle on level ground. The correct level lies between the two holes in the sight glass of the crane oil tank. This level does not remain constant during crane operations.

(4) The tail lift is to be maintained in accordance with AESP 2510-G-100-Octad.

(5) The towing pintle is to be maintained in accordance with AESP 2540-A-100-201.

Serial	Task	Fig/ Item No.	Product	Maintenance Interval			
				A	B	C	D
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Examine vehicle for obvious signs of damage.			X		X	
2	Ensure that the vehicle has sufficient fuel, oil, and coolant for the journey or task. Replenish as necessary.			X		X	
3	Windscreen and windows: Examine for clarity and damage.			X			
4	Rear view mirrors: Examine for cracks and deterioration of reflective surfaces.			X			
5	Seat belts and attachments: Examine for serviceability, damage and security of attachment.			X			
6	Instruments and gauges: Check function of all instruments and gauges.			X			
7	Tyre pressures (including spare wheel): Check.			X		X	
8	Tyres (including spare wheel): Examine for cuts, damage and uneven wear. Check tread depth.			X		X	
9	Wheel nuts: Check tightness of all wheel nuts to the recommended torque loading. (See Table 5 Serial 2)					X	
10	Spare Wheel: Examine for security of attachment.			X			
11	Air cleaner restriction indicator: Examine (if this shows red, the air cleaner is to be serviced).					X	

(continued)

TABLE 6 DRIVER/OPERATOR MAINTENANCE (continued)

Serial	Task	Fig/ Item No.	Product	Maintenance Interval			
				A	B	C	D
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
12	Windscreen washer reservoir: Check fluid level and replenish as necessary.			X		X	
13	Fire extinguishers: Ensure vehicle is fitted with serviceable fire extinguishers.			X			
14	Towing hitches: Examine and ensure that locking latch is free, locking pins are in place and attached by securing chains.			X		X	
15	Low air pressure warning devices: Operate.			X		X	
16	Brake line anti-freezer: Check level and replenish as necessary.		AL 14	X		X	
17	Batteries: Examine and replenish level as necessary.		De-min water			X	
18	Fan belts: Examine, ensure correct tension.					X	
19	Brake hydraulic reservoirs: Check level. (See Maintenance Note 1)		OX 8			X	
20	Brake adjustment indicator rod: Check to see if the groove (painted red) on the indicator rod is visible. If visible, the vehicle is to be placed unserviceable.					X	
21	Brake air reservoir automatic drain valve: Operate. (See Maintenance Note 2)					X	
22	Examine the vehicle for signs of fluid or air leaks.					X	
23	Winch: Operate to disperse oil.				X		
24	Winch ropes: Ensure the following:						
	24.1 The rope reeve (eye) is undamaged.			X			
	24.2 The rope is free from fraying.			X			
	24.3 The rope is not kinked.			X			
	24.4 The rope is not excessively corroded.			X			
	24.5 The rope is laid evenly on the drum.			X			
25	CALM: Examine and ensure correct stowage.			X	X	X	
26	CALM stabilising legs: Examine for damage and hydraulic oil leaks.			X		X	
27	CALM hydraulic system: Examine, particularly for hydraulic oil leaks.					X	
28	CALM hydraulic oil reservoir: Check level and replenish as necessary. (See Maintenance Note 3)		OM 33			X	
29	CALM: Operate throughout its range and ensure controls return to neutral when released.					X	

(continued)

TABLE 6 DRIVER/OPERATOR MAINTENANCE (continued)

Serial	Task	Fig/ Item No.	Product	Maintenance Interval			
				A	B	C	D
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
30	Hydraulic tail lift: Maintain in accordance with AESP 2150-G-100-601. (See Maintenance Note 4)					X	
31	Enhanced Seating (if fitted)						
	31.1 Seat Belts: Examine, check security of mountings and ensure correct operation. Check for chafing, fraying, scoring or wear. Replace if necessary.			X			
	32.2 Ratchet Straps: Examine, ensure correct operation. Check for chafing, fraying, scoring or wear. Replace if necessary.			X			
	31.3 Luggage Netting: Examine, check for chafing, fraying; scoring or wear. Replace if necessary.			X			
	31.4 Luggage Netting clips and turnbuckles: Examine and check general condition and operation of turnbuckle, checking for corrosion, damage to threads.			X			
	31.5 Latch Mechanism: Examine and check general condition and operation of mechanism.			X			
	31.6 Sword Pins: Examine and check general condition and operation of pin and chain, checking for corrosion.			X			
	31.7 Seat Back and Bases: Examine seats and check for cracks, damaged to mounting points. Replace if necessary.			X			
	31.8 Seat Belt Anchorages: Examine and specifically check for damage to the anchorage bars and welds including cracks, corrosion and being out of form.			X			
	31.9 Frame Assembly: Examine for any damaged paintwork or corrosion.			X			
	31.10 Record completion of above actions in Unit Inspection/Servicing register. See Annex A to Installation Inst No. 7.			X			
32							
33							
34							

(continued)

TABLE 6 DRIVER/OPERATOR MAINTENANCE (continued)

Serial (1)	Task (2)	Fig/ Item No. (3)	Product (4)	Maintenance Interval			
				A (5)	B (6)	C (7)	D (8)
35	ADP658/FMT658A/FMT1001/FMT1001A (Duty Movement Authorisation/Driver Tasking Sheet) as appropriate: Sign.			X			
36	CES equipment: Examine for serviceability and correct stowage.					X	
37	Static functional test: Carry out to confirm the serviceability of all functions and particularly door locks, windows, seat adjusters, seat-belts and obligatory lights.					X	
38	Mobile functional test: Carry out a short mobile test to confirm the serviceability of all functions of starting, driving through the gears and stopping the vehicle.					X	
39	Make relevant entries into equipment documents FMT1004 or JAMES					X	

TABLE 7 TIME/USAGE MAINTENANCE

The following WARNINGS, CAUTIONS and Maintenance Notes must be read and understood before commencing these maintenance tasks.

WARNINGS

(1) PERSONAL INJURY. ALL PERSONNEL ARE TO CONSULT THEIR CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH (COSHH) REGULATIONS BEFORE CARRYING OUT ANY MAINTENANCE OR REPLENISHMENT ACTIVITY ON THIS VEHICLE AND WEAR THE APPROPRIATE PROTECTIVE CLOTHING/BARRIER CREAM.

(2) PERSONAL INJURY. BRAKE/CLUTCH LININGS COULD CONTAIN ASBESTOS. DO NOT BLOW, DUST OR USE A BRUSH TO REMOVE DUST FROM BRAKE AND CLUTCH LININGS. USE CLEAN WET RAGS TO REMOVE DUST AND DEPOSIT WET RAGS INTO A PLASTIC WASTE BAG FOR DISPOSAL. DO NOT GRIND, DRILL OR FILE BRAKE/CLUTCH LININGS UNLESS WORKING IN A VENTILATED BOOTH OR WITH ADEQUATE FILTERED EXTRACTORS.

(3) PERSONAL INJURY. SPRING BRAKE ACTUATORS ARE NOT TO BE DISMANTLED.

(4) PERSONAL INJURY. ON VEHICLES FITTED WITH POWER TAKE OFF (PTO) FOR DRIVING SPECIALIST EQUIPMENT, ENSURE THAT THE PTO IS OUT OF GEAR AND THAT THE ENGINE IS STOPPED BEFORE WORKING ON OR CHANGING COMPONENTS.

(5) PERSONAL INJURY. BARE HAND CONTACT OF STEEL WIRE ROPES IS TO BE AVOIDED AT ALL TIMES.

(6) PERSONAL INJURY. NEVER HANDLE A WIRE ROPE WHEN ANYONE ELSE IS AT THE CONTROLS.

CAUTIONS

(1) EQUIPMENT DAMAGE. If the vehicle has not been run for one month or longer, prime the turbo charger bearings with 50 cm^3 (2 fl oz) of clean OMD 90 before starting the engine. To be carried out by an MT Mech/MT Tech, or VM only.

(2) EQUIPMENT DAMAGE. Before stopping the engine after a long hard run at sustained high speed, it is important to allow the engine to idle for a minimum of one minute to assist in heat dissipation from the turbo charger and exhaust manifold.

(3) EQUIPMENT DAMAGE. When winching, set parking brake and chock wheels.

(4) EQUIPMENT DAMAGE. The wire rope is to always spool off the bottom of the drum

(5) EQUIPMENT DAMAGE. Do not winch with less than five wraps of wire rope around the drum.

(6) EQUIPMENT DAMAGE. Always fully deploy and lock the crane outrigger legs before operating the crane boom arm.

(7) EQUIPMENT DAMAGE. Before slewing the crane arm, ensure that it has been sufficiently raised to clear the payload

(8) CRANE OPERATION. Whilst operating the crane, ensure that the vertical column does not collide with any part of the payload.

TABLE 7 TIME/USAGE MAINTENANCE (continued)

MAINTENANCE NOTES

(1) The filler/drain plug on the rear hubs should be positioned at 3 o'clock when checking and filling.

(2) When checking axle tracta housings it is necessary to turn the road wheels to a full lock position to clear the filler hole.

(3) Release air pressure by lifting top wheel of the safety valve prior to draining and replenishing the hydraulic braking system.

(4) Hydraulic jacks are to be left at maximum height under maximum load for five minutes, then checked for creep.

(5) A SAFE WORKING LOAD TEST is to be carried out after any operation involving dismantling or repair to the hydraulic system. (For RAF AP 3260 Book 3 Chap 10-1 Gen Inst No. 3 refers) (For Army EMER T & M A028 refers).

(6) Wire ropes are to be examined by a competent SNCO (EMER T&M A 028 Chap 650 refers).

(7) For RAF lubricate wire ropes in accordance with AP 3260 Book 3 Chap 10-1 Inst No. 3 - RAF only.

(8) The tail lift is to be maintained in accordance with AESP 2510-G-100-Octad.

(9) The hydraulic oil level must be checked before crane operation is started. This is to be carried out with the crane folded and the vehicle on level ground. The correct level lies between the two holes in the sight glass of the crane oil tank. This level does not remain constant during crane operations.

(10) With the hydraulic tank correctly filled and all rams in the closed position, inflate the tank air pressure to 0.8 bar (12 lbf/in.^{2}).

(11) The towing pintle is to be maintained in accordance with 2540-A-100-201.

Serial (1)	Task (2)	Fig/ Item No. (3)	Product (4)	Maintenance Interval				
				1st (5)	A (6)	B (7)	C (8)	D (9)
	ENGINE							
1	Engine assembly: Examine, check for oil/water leaks.			X	X	X	X	1
2	Engine oil: Drain and replenish, renew oil filter. Refer to Table 5, Serial 6.	8	OMD 90	X				1
3								
4	Valve clearances: Check adjustment. (VM)			X		X	X	1
5	Fuel filter element: Replace.			X			X	1
6	Engine idle speed: Check and adjust. (VM)			X		X	X	1
7	Fan belts: Examine, check tension and adjust if necessary. (VM)			X	X	X	X	1
8	Air cleaner: Check restriction indicator.			X	X	X		1
9	Air cleaner: Clean, renew element.						X	1
10	Engine controls: Examine, and lubricate.		OMD 90	X	X	X	X	1

(continued)

TABLE 7 TIME/USAGE MAINTENANCE (continued)

Serial (1)	Task (2)	Fig/ Item No. (3)	Product (4)	Maintenance Interval 1st (5)	A (6)	B (7)	C (8)	D (9)
11	Exhaust system: Examine.			X		X	X	1
12	Turbocharger: Examine. (VM)			X		X	X	1
13	Inlet and exhaust manifolds: Examine.			X		X	X	1
14	Cooling system: Check level and replenish as necessary (See Table 5 Serial 1).		AL 39 water/mix	X		X	X	1
15	Radiator, pipes and hoses: Examine for leaks and security of attachment.			X		X	X	1
16	Engine mountings: Examine and check security of mounting bolts. (VM)			X		X	X	1
17	Fuel tank, pipes and hoses: Examine particularly for security of attachment, leaks and chafing.			X		X	X	1
18	Fuel lift pump: Examine.			X		X	X	1
19	Fuel lift pump: Clean gauze filter.			X		X	X	1
20	Injection pump: Examine.			X		X	X	1
21	Cold start device: Examine and operate.			X		X	X	1
22	Fuel sediment bowl: Drain, clean and examine.			X	X	X	X	1
23	Injectors: Examine. (VM)					X	X	1
24	Exhaust emissions: Check using smoke emission meter.			X		X	X	1
25	Cooling system: Renew engine coolant (VM) (Refer to Table 5 Serial 7)		AL 39/ water mix					X
26								
27	**STEERING AND SUSPENSION**							
28	Steering box: Examine, and check adjustment. (VM)			X		X	X	2
29	Steering box: Check oil level and replenish as necessary.	2	OEP 220	X	X	X	X	2
30	Front wheel alignment: Check adjustment as necessary. (VM)			X		X	X	2
31	Steering drop arm: Check torque. (VM)			X	X	X	X	2
32	Steering column: Examine.			X		X	X	2
33	Steering arms, linkages and ball joints: Examine, ensure that all locking devices are serviceable and in place.			X		X	X	2
34	Steering drag link ball joints: Lubricate (two points).	3-6	XG 279	X	X	X	X	2

(continued)

TABLE 7 TIME/USAGE MAINTENANCE (continued)

Serial (1)	Task (2)	Fig/ Item No. (3)	Product (4)	Maintenance Interval 1st (5)	A (6)	B (7)	C (8)	D (9)
35	Steering track rod ball joints: Lubricate (two points).	7-27	XG 279	X	X	X	X	2
36	Road springs: Examine.			X		X	X	2
37	Front and rear spring U-bolt nuts: Examine and check torque loading. (VM)			X		X	X	2
38	Shock absorbers: Examine.			X		X	X	2
39	Rebound pads: Examine.			X		X	X	2
40	Road wheels (including spare): Examine for damage.			X		X	X	2
41	Road wheel nuts: Check torque loading.			X	X	X	X	2
42	Tyres (including spare): Examine for cuts, other damage, tread depth, uneven wear and tyre pressures.			X	X	X	X	2
43								
44								
45								
	TRANSMISSION							
46	Front axle: Examine and check oil level, replenish as necessary.	30	OEP 220		X	X		3
47	Front axle: Examine, drain oil and replenish.	30	OEP 220	X			X	3
48	Rear axle oil: Examine check oil level and replenish as necessary.	15	OEP 220		X	X		3
49	Rear axle: Examine, drain oil and replenish.	15	OEP 220	X			X	3
50	Rear axle hubs: Check oil level and replenish as necessary. (See Maintenance Note 1)	16-19	OEP 220		X	X		3
51	Rear axle hubs: Drain and replenish (See Maintenance Note 1)	16-19	OEP 220	X			X	3
52	Front and rear axle breathers: Clean.					X	X	3
53	Rear wheel bearings: Check for correct adjustment. (VM)			X		X		3
54	Rear wheel bearings: Remove, clean, examine, lubricate and adjust. (VM)	16-19	XG-279				X	3
55	Front axle tracta joint housings: Check oil level and replenish as necessary. (See Maintenance Note 2)	4-29	OEP 220		X	X		3
56	Front axle tracta joint housings: Drain, replenish (See Maintenance Note 2).	4-29	OEP 220	X			X	3

(continued)

TABLE 7 TIME/USAGE MAINTENANCE (continued)

Serial (1)	Task (2)	Fig/ Item No. (3)	Product (4)	Maintenance Interval 1st (5)	A (6)	B (7)	C (8)	D (9)
57	Front wheel bearings: Check for correct adjustment. (VM)			X		X		3
58	Front wheel bearings: Remove, clean, examine, lubricate and adjust. (VM)	5-28	XG 279				X	3
59	Clutch pedal linkage: Check free play and adjust as necessary. (VM)			X	X	X	X	3
60	Clutch linkage: Lubricate.		OMD 90	X	X	X	X	3
61	Gearbox: Examine.			X		X	X	3
62	Gearbox oil: Check oil level and replenish as necessary.	24	OEP 220		X	X		3
63	Gearbox oil: Drain and replenish.	24	OEP 220	X			X	3
64	Gearbox breather: Clean.					X	X	3
65	Propeller shafts: Examine, check for security, lubricate universal joints and splines (nine points).	11-20-22-23-26	XG 279	X	X	X	X	3
66	Transfer gearbox and mountings: Examine. (VM)			X		X	X	3
67	Transfer gearbox oil: Check oil level and replenish as necessary.	13	OEP 220		X	X		3
68	Transfer gearbox oil: Drain and replenish.	13	OEP 220	X			X	3
69	Transfer gearbox linkage: Examine and lubricate (four points).	25	XG 279	X	X	X	X	3
70								
71								
72	**BRAKES**							
73	Air braking system: Examine and ensure correct operation in accordance with AESP 2330-A-050-013 Chap 4 Annex A (VM) (See Table 3 for equipment data).				X	X	X	4
74	Air brake components: Examine.			X	X	X	X	4
75	Air reservoirs: Examine and drain. Check for condensate. (See Maintenance Note 3)			X	X	X	X	4
76	Front and rear brake shoes: Examine through back plates and adjust as necessary.			X	X	X		4
77	Front and rear brake linings, drums and cylinders: Strip, clean, examine, reassemble and adjust. (VM)						X	4

(continued)

TABLE 7 TIME/USAGE MAINTENANCE (continued)

Serial (1)	Task (2)	Fig/ Item No. (3)	Product (4)	Maintenance Interval 1st (5)	A (6)	B (7)	C (8)	D (9)
78	Trailer connections: Examine and ensure correct operation.			X	X	X	X	4
79	Brake load sense valve: Examine. Check valve setting. (VM)			X			X	4
80	Brake master cylinder: Examine.	10		X	X	X	X	4
81	Brake fluid reservoirs: Examine, replenish as necessary. (See Table 5 Serial 5)	10	OX 8	X	X	X	X	4
82	Brake fluid: Renew. (VM)	10	OX 8				X	4
83	Transmission brake: Examine, adjust brake shoes. (VM)			X		X		4
84	Transmission brake: Examine. Check brake shoes for wear, adjust. (VM)						X	4
85	Transmission brake: Examine, adjust brake cables if required. (VM)			X		X	X	4
86	Brake pedal linkage and hand controls: Examine, ensure free movement and correct operation.			X		X	X	4
87	Tyre inflator: Examine, ensure correct operation.			X		X	X	4
88	Compressor anti-freezer: Examine, replenish as required.		AL 14	X	X	X	X	4
89	Brake system: Carry out a roller brake test or decelerometer test (For RAF in accordance with AP 3260 Book 3 Chap 4-1 Gen inst No. 1). AESP 2300-A-050-013 (VM)(Army Refers).			X	X	X	X	4
90								
91								
92								
	ELECTRICS							
93	Batteries: Examine. Clean terminals and smear with protective grease. Check electrolyte level, replenish as necessary.		PX-7 De-min water	X	X	X	X	5
94	Battery stowage area: Examine, restore surface finish as necessary.			X	X	X	X	5
95	Starter motor: Examine.			X		X	X	5
96	Alternator: Examine. Check output voltage. (VMNE)			X		X	X	5
97	Electrical wiring, junction boxes and conduits: Examine for signs of burning, chafing or other damage and for security of attachment.			X	X	X	X	5

(continued)

TABLE 7 TIME/USAGE MAINTENANCE (continued)

Serial (1)	Task (2)	Fig/ Item No. (3)	Product (4)	Maintenance Interval 1st (5)	A (6)	B (7)	C (8)	D (9)
98	Lamps, horn, windscreen wipers and washers, direction indicators and hazard flashers: Examine. Ensure correct operation.			X	X	X	X	5
99	Instruments, gauges and transmitters: Examine. Ensure correct operation.			X	X	X	X	5
100	Heaters and demisters: Examine and operate.			X	X	X	X	5
101	Reflectors: Examine.			X	X	X	X	5
102	Switches and warning devices: Examine and operate.			X	X	X	X	5
103	Relays and electrical accessories: Examine and operate.			X		X	X	5
104	Master switch: Examine and operate.			X	X	X	X	5
105	Fuses: Examine. Ensure correct rating.			X	X	X	X	5
106	Fuse holders: Examine.			X	X	X	X	5
107	Cold start device: Examine and operate.			X	X	X	X	5
108	Headlight alignment check and adjust: (For RAF in accordance with AP 3620 Bk 3 Chap 5-1, Gen Inst 1)(VM/VE).			X		X	X	5
109								
110								
111								
	CAB, BODY AND CHASSIS							
112	Chassis and cab: Thoroughly clean exterior, examine for any damaged paintwork or corrosion, rectify as necessary, in accordance with AESP 2300-A-310-201.	X		X			X	6
113	Cab door hinges: Lubricate (four points).		XG 279	X	X	X	X	6
114	Cab doors, pillars, floor, steps, wings bumpers, registration marker and legal plates: Examine.			X	X		X	6
115	Seat belts: Examine, check security of mounting bolts and ensure correct operation.			X		X	X	6
116	Seats, slides and adjusters: Examine and lubricate.		OMD 90	X		X	X	6
117	Windscreen and windows: Examine.			X	X	X	X	6
118	Mirrors and pivot arms: Examine.			X	X	X	X	6
119	Wiper arms and blades: Examine.			X	X	X	X	6

(continued)

TABLE 7 TIME/USAGE MAINTENANCE (continued)

Serial (1)	Task (2)	Fig/ Item No. (3)	Product (4)	Maintenance Interval 1st (5)	A (6)	B (7)	C (8)	D (9)
120	Lubrication: General lubrication of all controls, levers, linkages, pivots, pins, locks, catches and hinges.		XG 279 OMD 90	X	X	X	X	6
121	Spare wheel carrier: Examine, operate and lubricate.		XG 279	X	X	X	X	6
122	Body side boards and tail gate: Examine. Ensure locking devices are serviceable and securely attached by chain. Lubricate.		OMD 90	X	X	X	X	6
123	Front and rear towing pintle: Carry out inspection and functional tests in accordance with AESP 2540-A-100-201. Examine and ensure locking catch is free, locking pins are in position and attached with securing chains. Lubricate pintle to shaft housing as required	17-31	XG 279 OMD 90	X	X	X	X	6
124	Gaiters and protective covers: Examine.			X		X	X	6
125	Vehicle jack: Operate throughout its range on the vehicle for which it is issued. (See Maintenance Note 4)			X		X	X	6
126	Carry out a veh inspection report in accordance with AESP 2300-A-300-532. (VM) (Not RAF vehicles).					X		6
127								
128								
129								
	WINCH							
130	Winch mountings: Examine.			X		X	X	6
131	Winch mechanism: Examine.			X		X	X	6
132	Winch gearbox oil: Check level and replenish as necessary. (See Table 2)	21	OC 600		X	X		6
133	Winch gearbox oil: Drain and replenish. (See Table 2).	21	OC 600	X			X	6
134	Winch rope: Maintain as per the following. (See Maintenance Notes 6 and 7)							6
	134.1 Examine the rope throughout its working length for fraying, signs of corrosion and kinks.			X	X	X	X	6
	134.2 Ensure that the rope anchorage is secure and not excessively worn.			X	X	X	X	6
	134.3 Examine the guides and rollers for damage and free rotation.			X	X	X	X	6
	134.4 Ensure that the rope is laid evenly on the drum.			X	X	X	X	6
	134.5 Examine the rope reeve (eye) for damage.			X	X	X	X	6

(continued)

TABLE 7 TIME/USAGE MAINTENANCE (continued)

Serial	Task	Fig/ Item No.	Product	Maintenance Interval				
				1st	A	B	C	D
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	134.6 Ensure that the safe working load tag is fitted to the rope.			X	X	X	X	6
	134.7 Winch rope: Lubricate. (See Maintenance Note 7)			X	X	X	X	6
135	Winch: Operate.			X		X	X	6
136	Winch rollers, pay on gear and pulleys: Lubricate.	1-9-12-14-18	XG 279	X	X	X	X	6
137	Winch mechanism: Check adjustments. (VM)			X		X	X	6
138	Winch load limiter warning lamp, horn and engine cut off wiring: Examine.			X		X	X	6
139	Winch brake: Ensure the winch brake operating air valve breather is free of any mud, road dirt.				X	X	X	6
140								
141								
	CALM							
142	Crane assembly: Examine. (See Maintenance Notes 5)			X		X	X	6
143	Crane stabilising legs: Operate and examine.			X		X	x	6
144	Crane hydraulic rams: Examine.			X		X	X	6
145	Crane hydraulic reservoir: Check oil level and replenish as necessary. (See Maintenance Notes 5, 9 and 10)		OM 33		X	X		6
146	Crane hydraulic reservoir: Drain, clean filter element, clean magnetic rod and replenish. (See Maintenance Notes 5, 9 and 10)		OM 33	X			X	6
147	Crane hydraulic pipes/hoses: Examine. (VM)			X		X	X	6
148	Crane hydraulic valves and controls: Examine.			X		X	X	6
149	Crane PTO/hydraulic pump: Examine.			X		X	X	6
150	Crane: Lubricate.	40 to 53	XG 276 OMD 90	X	X	X	X	6
151	CALM: Operate all modes.			X		X	X	6
152								
153								

(continued)

TABLE 7 TIME/USAGE MAINTENANCE (continued)

Serial (1)	Task (2)	Fig/ Item No. (3)	Product (4)	Maintenance Interval				
				1st (5)	A (6)	B (7)	C (8)	D (9)
	TAIL LIFT							
154	Tail lift: Examine tail lift ropes and anchorages in accordance with EMER Wksp B 017. (See Maintenance Notes 5, 6, 7 and 8)					X	X	6
155								
156	Tail lift: Maintain in accordance with AESP 2510-G-100-Octad.			X	X	X	X	6
157								
158								
159	**ENHANCED SEATING SYSTEM**							
	159.1 Seat Belts: Examine, check for chafing, fraying, scoring or wear, security of mountings and ensure correct operation. Replace if necessary.				X	X	X	6
	159.2 Ratchet Straps: Examine, ensure correct operation. Check for chafing, fraying, scoring or wear. Replace if necessary.				X	X	X	6
	159.3 Luggage Netting: Examine, check for chafing, fraying, scoring or wear. Replace if necessary.				X	X	X	6
	159.4 Luggage Netting clips and turnbuckle: Examine and check general condition and operation of turnbuckle, checking for corrosion, damage to threads. Lubricate.		OMD 90		X	X	X	6
	159.5 Latch Mechanism: Examine and check general condition and operation of mechanism. Lubricate latch thread, pivot pin and internals of mechanism		XG 279		X	X	X	6
	159.6 Sword Pins: Examine and check general condition and operation of pin and chain, checking for corrosion.		OMD 90		X	X	X	6
	159.7 Seat Back and Bases: Examine seats and check for cracks, damaged to mounting points. Replace if necessary.				X	X	X	6
	159.8 Seat Belt Anchorages: Examine and specifically check for damage to the anchorage bars and welds including cracks, corrosion and being out of form.				X	X	X	6

(continued)

TABLE 7 TIME/USAGE MAINTENANCE (continued)

Serial (1)	Task (2)	Fig/ Item No. (3)	Product (4)	Maintenance Interval				
				1st (5)	A (6)	B (7)	C (8)	D (9)
	159.9 Frame Assembly: Examine for any damaged paintwork or corrosion, rectify as necessary in accordance with AESP 2300-A-310-201.				X	X	X	X
	159.10 Record completion of above actions in Unit Inspection/Servicing register. See Annex A to Installation Inst No. 2, 2330-G-300-411.				X			
160	MOD 1084A (Worksheet) or STAMA Worksheet (Tradesman and countersigning NCO): Sign. (RAF only)			X	X	X	X	All
161								
162	Road test (NCO MT Technician only): Carry out. (VM)			X	X	X	X	All
163	MOD 1084A (Worksheet) or STAMA Worksheet: Insert co-ordinating signature. (RAF only)			X	X	X	X	All
164	Record action in FMT 1004 (Army only).			X	X	X	X	All
165	Carry out Safety Inspection (AFG 932(b) Part 1 in accordance with AESP 2300-A-050-013 (Army only).				X			
166	Carry out Mandatory Inspection AFG 932 (b) Part 1 and 2 in accordance with AESP 2300 A-050-013 (Army only).					X	X	

TABLE 8 OUT OF USE MAINTENANCE

WARNINGS, CAUTIONS and Maintenance Notes preceding Tables 5, 6 and 7 must be read and understood before commencing these maintenance tasks.

Serial (1)	Operation (2)	Fig/ Item No (3)	Product (4)
	Prior to vehicle entering storage:		
1	Carry out Table 6, Columns A, B and C maintenance, check coolant specific gravity and patch paint.		
2	Carry out next maintenance due if it falls during out of use period.		
3	Rectify all faults affecting road/task worthiness.		
4	Fill fuel tanks.		
5	Isolate batteries by master switch or disconnect earth lead.		
	Monthly whilst vehicle in storage:		
6	Drain pre-mix tank, flush tank, pump and pipe work with clean water.		
7	Carry out Table 6, Columns A and B maintenance.		
8	Operate equipment and all systems.		
9	Carry out road test over 8 km (5 miles) if possible.		
10	Update FMT1004 or JAMES.		
	Action necessary to return equipment into use:		
11	Carry out Table 6, columns A, B and C maintenance.		

Key to Fig 1

Key No.	Description
1	Winch rollers
2	Steering box
3	Steering drag link ball joints
4	Front tracta housing
5	Front hubs
6	Steering drag link ball joints
7	Steering track rod ball joints
8	Engine oil filler cap
9	Winch rollers
10	Brake master cylinder
11	Propeller shaft universal joints and splines
12	Winch rollers
13	Transfer box
14	Winch pay on gear
15	Rear axle
16	Rear hubs
17	Rear towing pintle
18	Winch pulleys
19	Rear hubs
20	Propeller shaft universal joints and splines
21	Winch assembly
22	Propeller shaft universal joints and splines
23	Propeller shaft universal joints and splines
24	Gearbox assembly
25	Transfer box control linkages
26	Propeller shaft universal joints and splines
27	Steering track rod ball joints
28	Front hubs
29	Front tracta housing
30	Front axle assembly
31	Front towing pintle

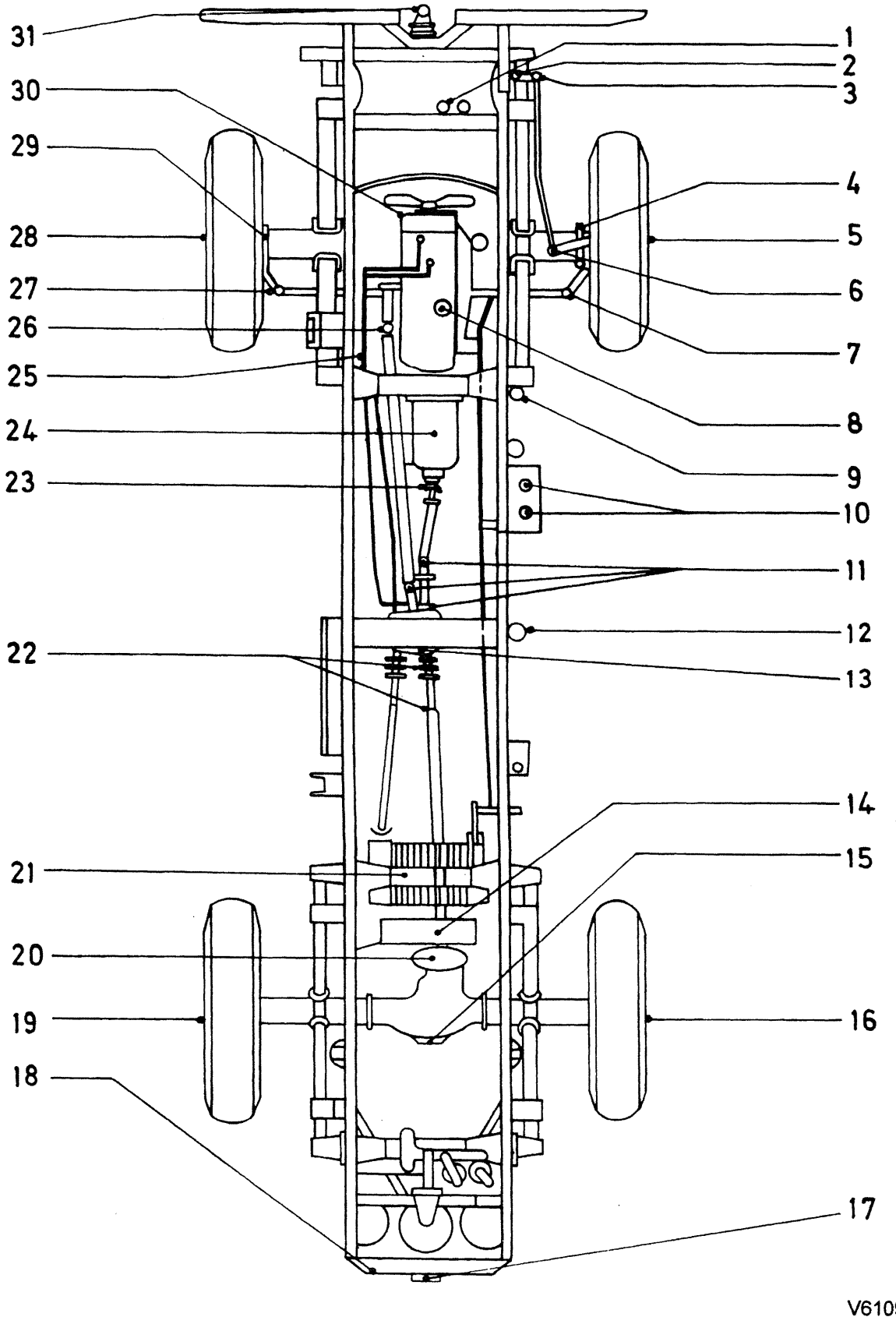
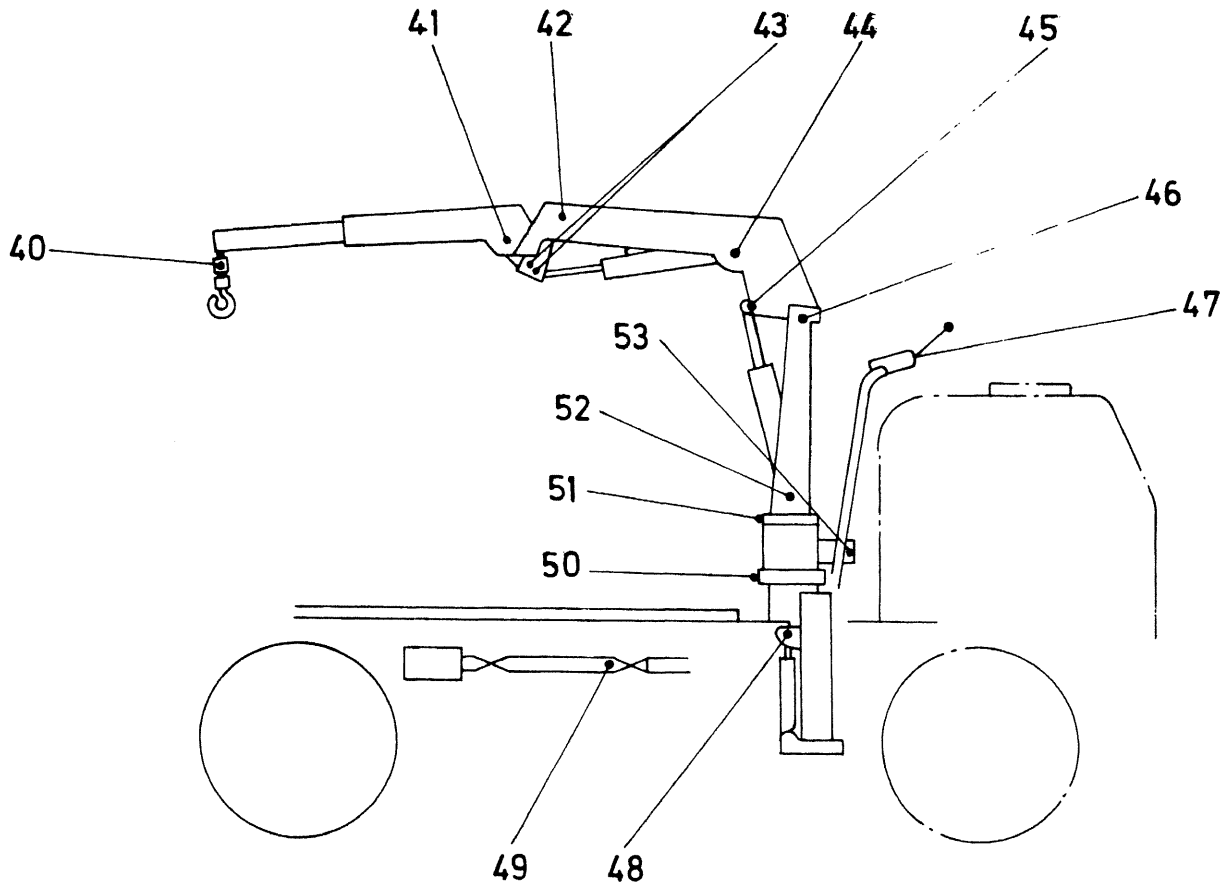


Fig 1 Lubrication diagram - vehicle chassis



NOTE

Items 40 to 53 are greasing points

V6172/2

Fig 2 Lubrication diagram - crane

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AESP Form 10 (Issue 5.0 dated Dec 01)

TRUCK, 4 TONNE, 4x4, BEDFORD MJ - ALL VARIANTS

INSPECTION STANDARD PART 1

COMPLETE EQUIPMENT

REPRINTED INCORPORATING AMDTS 1-3

This publication contains information covering the requirements of Sub-Category 5-3 at information levels 2 and 3

BY COMMAND OF THE DEFENCE COUNCIL

[redacted]

Ministry of Defence

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4			10		
5			11		
6			12		

INSPECTION STANDARD PART 1

EQUIPMENT IDENTITY

1 The equipments included are:

1.1 MJP2BMO vehicles all variants with turbo-charged 330 cu in. (5.4 litre) engine.

INTRODUCTION

2 Except for manuscript entries, amendments are identified by marginal side lining. Manuscript amendments are identified by Amdt No in outside margin in line with the amendment.

3 Comments on this publication are to be forwarded in accordance with AESP 0100-P-011-013 to Vehicles and Weapons Branch REME, Chobham Lane, Chertsey, Surrey KT16 OEE.

4 This publication details the Acceptable Quality Levels (AQL) for the complete equipment to meet the quality standard at levels 2 and 3.

5 It is to be applied in conjunction with the general principles contained in Chapter 150 of EMER T & M A 028.

6 The following abbreviations are used: H = High L = Low

INDEX TO SCHEDULES

7 Main breakdown of inspection and testing of complete equipment is as follows:

7c 1147(212) D2-1-22-11

SCHEDULE

8 This schedule gives the AQL, for inspection and testing of complete equipment at levels 2 and 3.

Ser	Detail	Acceptable Quality Level (AQL)		Remarks
		Level 2	Level 3	
(1)	(2)	(3)	(4)	(5)
1	ENGINE			
	1.1 Compression pressure at starter cranking speed, normal operating temperature, all injectors removed.	H. 33.8 bar (490 lbf/in²) L. 23.4 bar (340 lbf/in²)	L. 26.2 bar (380 lbf/in²)	
	1.2 Maximum variation between cylinders:	2.07 bar (30 lbf/in²)		
	1.3 Fan belt adjustment remaining (belt at correct tension):	H.89 mm (3½ in.) L. 12.5 mm (1/2 in.)	L. 25 mm (1 in.)	Measured at slot of alternator bracket
	1.4 Rock at tip of fan blades:	H. 3.2 mm (1/8 in.)	H. 0.8 mm (1/32 in.) L. 0.000	
	1.5 Lubricating oil pressure (hot) at 2000 rev/min.	See remarks	H. 3.4 bar (50 lbf/in²) L. 2.0 bar (30 lbf/in²)	Oil warning light to be out at idling speed
	1.6 Engine, hot, to idle smoothly at:	500/550 rev/min		
	1.7 Coolant temperature (maximum):	95°C		
	1.8 Maximum governed speed at full load (rev/min).	2700		Maximum eng no load speed 2970 rev/min.
2	CLUTCH			
	2.1 Clutch pedal free travel:	25 mm (1 in.)		

(continued)

SCHEDULE (continued)

(1)	(2)	(3)	(4)	(5)
3	GEARBOX			
	3.1 Backlash measured at rim of output flange:	H 16 mm (5/8 in.)	H 9.5 mm (3/8 in.)	
		L 6 mm (1/4 in.)		
	3.2 Lift at output flange:	H 2.4 mm (3/32 in.)	H 1.6 mm (1/16 in.)	
		L ZERO		
4	TRANSFER BOX			
	4.1 Backlash measured at rim of output flanges to front and rear axle:	H 16 mm (5/8 in.)	H 9.5 mm (3/8 in.)	
		L 6 mm (1/4 in.)		
	4.2 Lift at output flange:	H 2.4 mm (3/32 in.)	H 1.6 mm (1/16 in.)	
		L ZERO		
	4.3 Backlash measured at rim of input flange:	H 16 mm (5/8 in.)	H 9.5 mm (3/8 in.)	
		L 6 mm (1/4 in.)		
	4.4 Lift at input flange:	H 2.4 mm (3/32 in.)	H 1.6 mm (1/16 in.)	
		L ZERO		
5	REAR AXLE			
	5.1 Lift at input flange:	H 2.4 mm (3/32 in.)	H 1.6 mm (1/16 in.)	
		L ZERO		
	5.2 Backlash measured at rim of wheel (input held):	H 63.5 mm (2½ in.)	H 50.8 mm (2 in.)	
		L 16 mm (5/8 in.)		
6	FRONT AXLE			
	6.1 Lift at input flange:	H 2.4 mm (3/32 in.)	H 1.6 mm (1/16 in.)	
		L ZERO		
	6.2 Backlash measured at rim of wheel (input held):	H 63.5 mm (2½ in.)	H 50.8 mm (2 in.)	
		L 16 mm (5/8 in.)		
	6.3 Wheel hub rim rock (no perceptible clearance in swivel pin)	H 4.8 mm (3/16 in.)	H 2.4 mm (3/32 in.)	
		L 1.6 mm (1/16 in.)		

(continued)

SCHEDULE (continued)

(1)	(2)	(3)	(4)	(5)
7	Steering			
	7.1 Toe in measured at wheel rim:	1.52 mm to 4.57 mm (1/16 in. to 3/16 in.)		
	7.2 Free play measured at steering wheel rim:	H 101.6 mm (4 in.)	H 63.5 mm (2 1/2 in.)	
		L 12.7 mm (1/2 in.)		
	7.3 Turning circle	18.01 m (60 ft)		
8	SUSPENSION			
	8.1 Camber of semi-elliptic springs			
	Front:	H 25.4 (1 in.)		
		L 12.7mm (1/2 in.)	L 16mm (5/8 in.)	
	Rear:	H 49.8 mm (2 in.)		
		L 19 mm (3/4 in.)	L 25.4 mm (1 in.)	
	8.2 Lift at shackle pins	H 2.4 mm (3/32 in.)	H 1.6 mm (1/16 in.)	
		L 0.8 mm (1/32 in.)		
9	BRAKES			
	9.1 Free movement at top of brake pedal:	25.4 mm (1 in.)		
	9.2 Thickness of brake linings, front and rear:			
	Leading:	H 12.3 mm (1/2 in.)	L 8.0 mm (5/16 in.)	
	Trailing:	H 6.7 mm (17/64 in.)	L 4.8 mm (3/16 in.)	
	9.3 Compressor governor valve settings:			
	Cut-out pressure:	7.4 Bar (107 lbf/in^2)		
	Cut-in pressure:	6.1 Bar (88 lbf/in^2) (Min)		

(continued)

SCHEDULE (continued)

(1)	(2)	(3)	(4)	(5)
	9.4 Condensing tank safety valve setting:	9.6 Bar-10 Bar (140 lbf/in^2 - 150 lbf/in^2)		
	9.5 Brake system warning switch			
	Makes contact:	5.34 Bar-4.66 Bar (78 lbf/in^2)-(68 lbf/in^2)		
	Breaks contact:	4.66 Bar-5.34 Bar (68 lbf/in^2)-(78 lbf/in^2)		
	9.6 Air pressure stop lamp switch			
	Cut-in pressure:	0.4 Bar (6 lbf/in^2)		
	9.7 Permissible leakage rate			
	With all brakes released (handbrake on):	0.35 Bar (5 lbf/in^2) in 5 min	0.35 Bar (5 lbf/in^2) in 10 min	
	With all brakes applied (handbrake on):	0.7 Bar (10 lbf/in^2) in 5 min	0.7 Bar (10 lbf/in^2) in 10 min	
10	ROAD TEST 10.1 Oil consumption	370 Km/L (130 mile/pt)	425 Km/L (150 mile/pt)	Cargo vehicle unladen with full tank of fuel.
	10.2 Time to accelerate from 20 to 40 mile/h in top gear:	H 30 sec	H 25 sec	
		L 15 sec		
	10.3 Braking efficiency minimum requirement must be achieved:	50% (Min)		
	10.4 Distance to pull up on dry level surface from 20 mile/h given minimum braking efficiency:	7.62 m (25 ft) (Max)		
	10.5 Handbrake to hold on a gradient of:	1 : 4		
	10.6 Hill holder brake (not lockable) to hold vehicle on a gradient of:	1 : 4		

SCHEDULE (continued)

(1)	(2)	(3)	(4)	(5)
11	CRANE			
	11.1 Working pressure system relief valve set to:	RAF VEHICLES 150 BAR (2175 lbf/in^2) nominal ARMY VEHICLES 200 BAR (2900 lbf/in^2) nominal		Check with engine at 1200 rev/min
	11.2 Ram creep limit (total creep of lifting and jib rams)	75 mm max over 5 min period		
	11.3 Stablilizer ram creep:	zero		Stabilizer ram shut off valve to be in closed position
	11.4 SWL Test	To just lift SWL		In accordance with para 10
	11.5 Proof load test	No distortion, cracks flaking paint or hydraulic fluid leaks		In accordance with para 12

HYDRAULIC CRANE TESTS

WARNINGS ...

(1) TESTING OF THE CRANE IS TO BE CARRIED OUT BY AUTHORIZED PERSONNEL.

(2) TESTS ARE TO BE CARRIED OUT IN A NOMINATED CRANE TESTING AREA CLEARED OF PERSONNEL AND OBSTRUCTIONS.

CAUTIONS

(1) The Overload Test Kit which is the subject of this instruction must not be used on cranes fitted with remote control facility.

(2) Cranes fitted to Army vehicles operate with a system pressure of 200 bar. RAF vehicles 150 bar.

9 PREPARATION

9.1 To prepare the crane for craning operations refer to 'operating the crane' in operating information AESP 2320-H-100-201 Chapter 3.2.

PROOF LOAD TEST

CAUTION ...

Before carrying out the Proof Load Test ensure that system pressure relief valve is set to lift the Safe Working Load (SWL)

10

10.1 Check the system pressure in accordance with AESP 2320-H-100-522 Chap 18 para 10-12 using 9AHY/6685-99-826-8090 Gauge Pressure c/w connection.

10.2 Reduce system pressure to 130 bar (1885 lbf/in^2) (RAF) 180 bar (2610 lbf/in^2) Army.

10.3 Using the figures on the crane duty plate jib out to the maximum radius shown and attempt to lift the associated load.

10.4 Increase the system pressure by degrees to a maximum of 160 bar (RAF) 210 bar (Army) until the load is lifted.

10.5 If with the system relief valve set to 160 bar (RAF) 210 (Army) the load is not lifted, check the operating pressures of the jib and boom relief valves in accordance with AESP 2320-H-100-522 Chap 18 paras 13-22 for RAF or EMER Eng & Misc U 124/3 Chap 2 for Army vehicles.

11 The proof load is 1.25 x SWL and the extra lift capability is achieved hydraulically by the introduction of an Overload Test Kit (Fig 1) into the return line from the control valve to the hydraulic reservoir.

CAUTIONS ...

(1) Before use, ensure that the test kit PRV is set to operate at 80 bar by connecting the test kit to a hand driven hydraulic pump fitted with a suitable gauge.

(2) Ensure that the hand pump is clean and that it is charged with the same hydraulic oil as the crane being tested.

(3) Ensure, when fitting the test kit to the crane hydraulic system that the outlet union from the test kit PRV is connected to the fluid line to the crane system reservoir.

12

12.1 Remove the hydaulic pipe from the control valve to the hydraulic reservoir.

12.2 Fit the test kit, using the flexible hoses provided, between the control valve and the reservoir. Ensure the outlet hose from the test kit pressure relief valve goes to the reservoir.

12.3 Ensure that the shut-off valve (Fig 1 item 3) in the test kit circuit is open.

CAUTION ...

Ensure load is correct for chosen radius.

12.4 Using the figures on the crane duty plate jib out to the maximum radius shown and close the shut-off valve in the test kit.

12.5 Add weights to increase the Safe Working Load (SWL) at that radius by 25%.

12.6 Lift the load and slew the crane through its full range of travel.

12.7 Lower the load and remove the test weight.

12.8 Closely examine the crane structure and hydraulic system for deformities, cracking or flaking paintwork and hydraulic leaks.

12.9 Jib in to the intermediate radius of the crane stated on the duty table.

12.10 Using a test weight 25% in excess of that stated for SWL, lift the load and slew the crane through its full range of travel.

12.11 Lower the load and remove test weight and again closely examine the crane structure for deformities, cracks or flaking paint and the hydraulic system for leaks.

12.12 Jib in to minimum radius of the crane stated on the duty table.

12.13 Using a test weight 25% in excess of that stated for SWL lift the load and slew the crane through its full range of travel.

12.14 Lower the load and remove test weight and check crane for faults as in para 12.11.

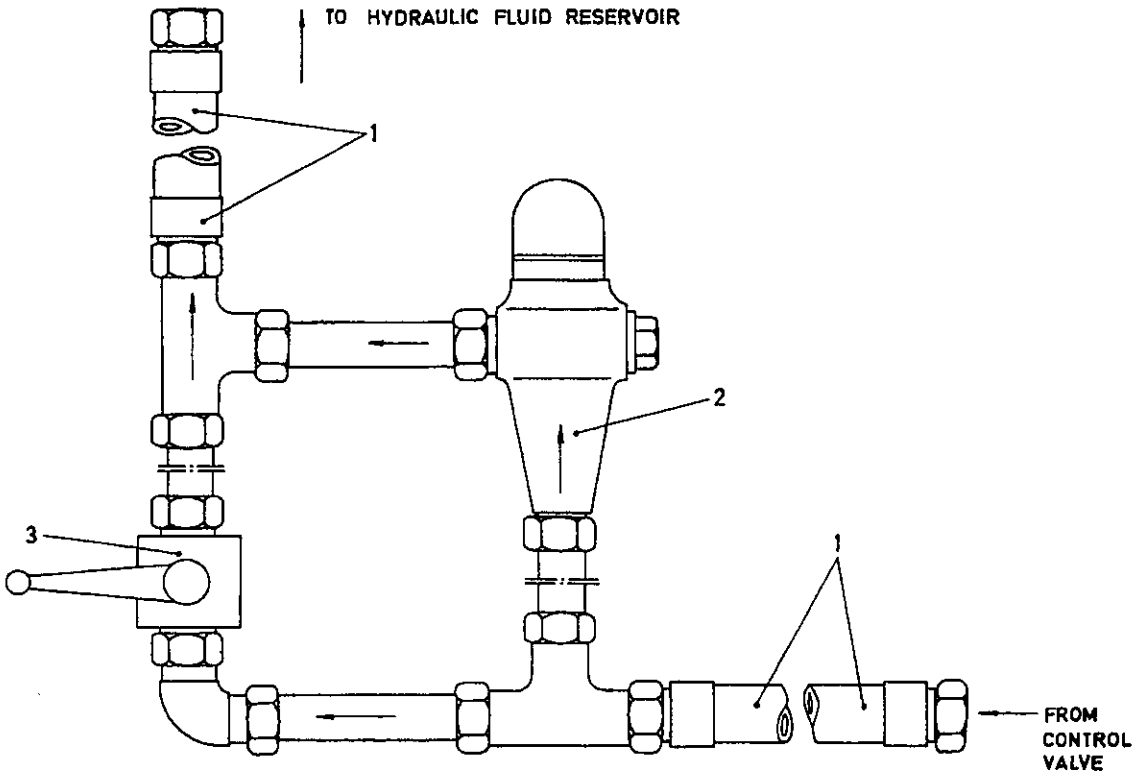
12.15 Open the shut-off valve on the test kit.

12.16 Remove the test kit and re-connect hydraulic pipe from the control valve to the reservoir.

13 Before returning the crane to the user, re-check the SWL in accordance with para 10 and include in the check, the load decelerating valves, which can be proved as follows:

13.1 Whilst lowering the SWL at full speed arrest the load suddenly, this will check the functioning of the load decelerating valves.

13.2 Again examine the crane for any faults as at para 12.11.



V6976/1

1. Hose NW 16 X 1000 mm
2. Pressure Relief Valve (To be set to 80 bar)
3. Shut-off cock

Fig 1 - Overload Test Kit (Atlas)
(Atlas Part No 306.24.69)
(NATO Code NYA)

TRUCK, 4 TONNE, 4x4, BEDFORD MJ - ALL VARIANTS

INSPECTION STANDARD PART 2

EXAMINATION AND TESTING OF COMPONENTS AND ASSEMBLIES

This publication contains information covering the requirements of Sub-Category 5-3 at information levels 3 and 4

BY COMMAND OF THE DEFENCE COUNCIL

[redacted]

Ministry of Defence

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1			7		
2			8		
3			9		
4			10		
5			11		
6			12		

INSPECTION STANDARD PART 2

EQUIPMENT IDENTITY

1 The equipments included are:

1.1 MJP2BM0 vehicles all variants with turbo-charged 330 cu in. (5.4 litre) engine.

INTRODUCTION

2 Except for manuscript entries, amendments are identified by marginal side lining. Manuscript amendments are identified by Amdt No in outside margin in line with the amendment.

3 Comments on this publication are to be forwarded in accordance with AESP 0100-P-011-013 to Vehicles & Weapons Branch REME, Chobham Lane, Chertsey, Surrey KT16 0EE.

SCHEDULES

4 For Inspection Standard Part 2 details of engine, refer to AESP 2815-K-062-533. For details of other assemblies, reference should be made to manufacturers' limits and tolerances specified in AESP 2320-H-100-522 and AESP 2320-H-100-523.