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

REPAIR INSTRUCTIONS

REPRINTED INCORPORATING AMDTS Nos 1 to 10

BY COMMAND OF THE DEFENCE COUNCIL

Alvin Whitmore.

Ministry of Defence

Sponsor:

DGEME (A) EME7b(1)
File ref: D/DGEME/125/8/16

Publications Authority:

Vehs & Wpns Br REME
Project No: 7b 1067 (97)
File ref: 7b1067 AESP

AMENDMENT RECORD

Amdt	Incorporated by	Date
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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 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

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4	Engine rear mounting
8	Engine air cleaner, hoses and trunking
9	Engine assembly

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ENGINE FRONT MOUNTINGCAUTION ...

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.

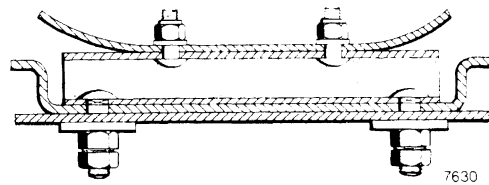


Fig 1 - Engine front mounting

ENGINE REAR MOUNTINGRemoval

- 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.

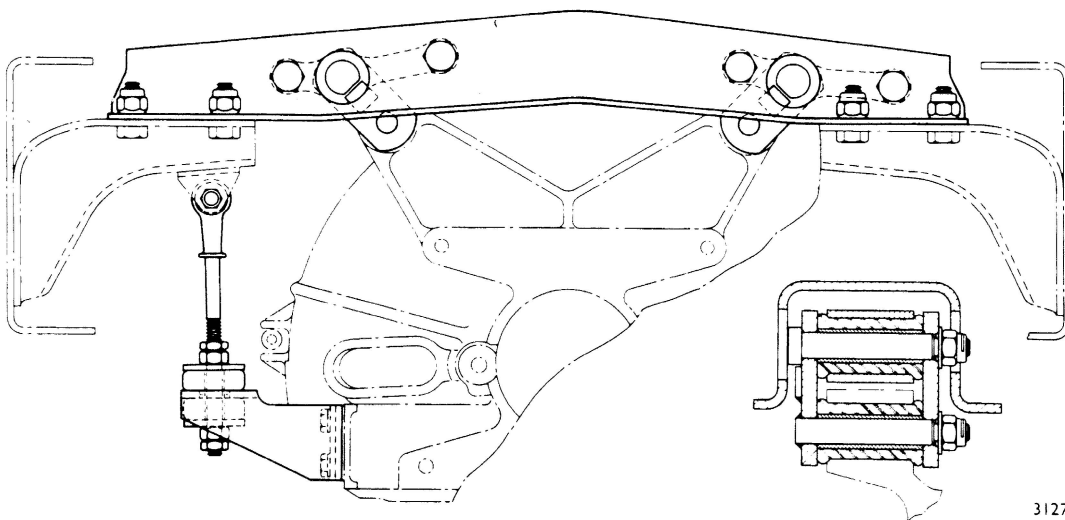


Fig 2 - Engine rear mounting

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.

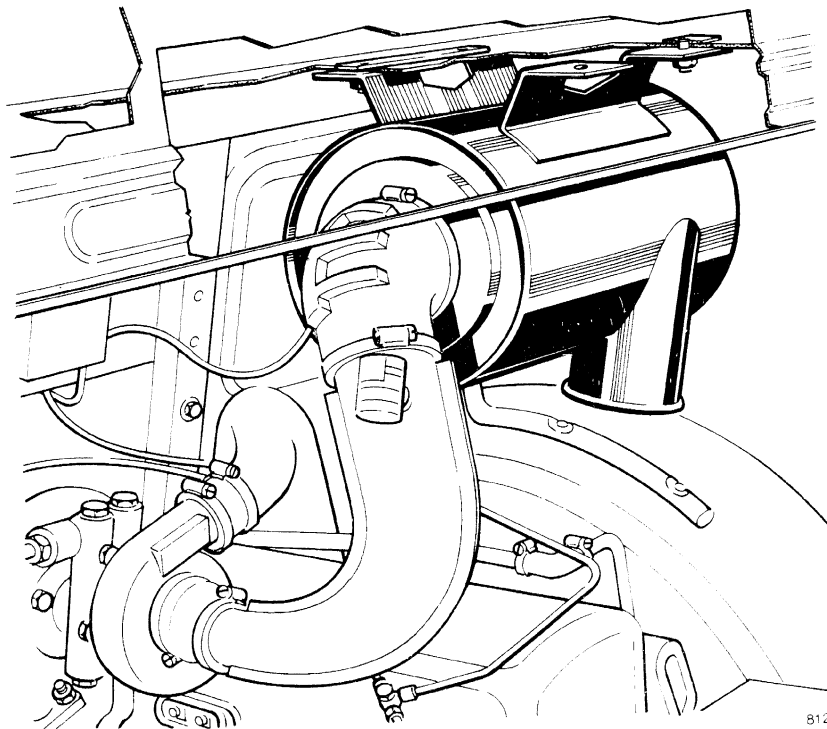


Fig 3 - Air cleaner removal

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.

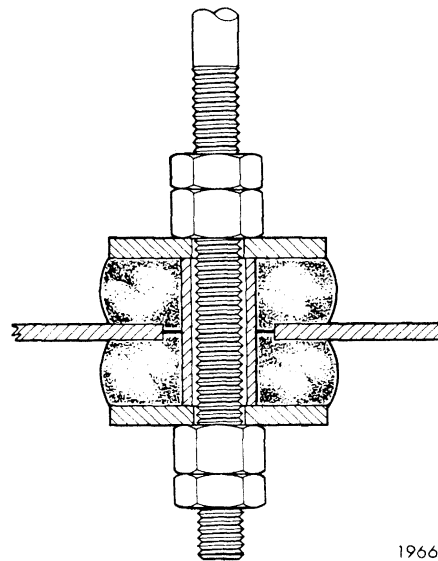


Fig 4 - Torque reaction rod
installation

Chapter 2

CLUTCH

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12	Clutch pedal free travel
14	Clutch fork and release bearing
22	Clutch

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2	Pedal bush installation
3	Pedal shaft sleeve bush
4	Pedal assembly
5	Clutch pedal setting dimension
6	Removing clutch fork
7	Clutch fork assembly
8	Release bearing grooves
9	Clutch friction plate marking

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CLUTCH PEDAL, SHAFT AND LINKAGERemoval 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.

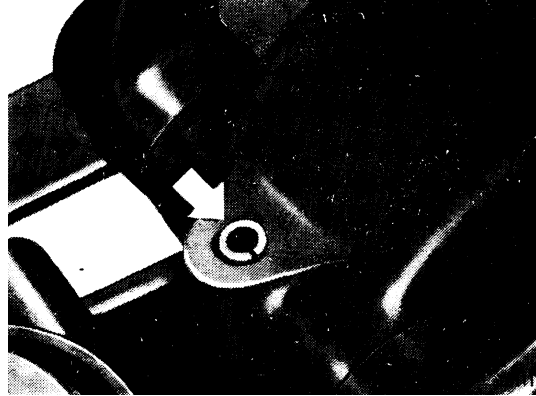


Fig 1 Pedal shaft spring pin

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.

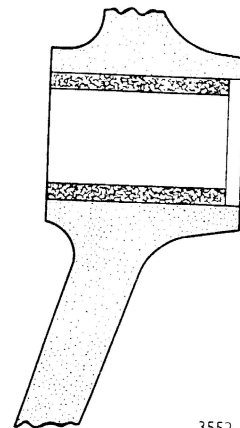


Fig 2 Pedal bush installation

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.

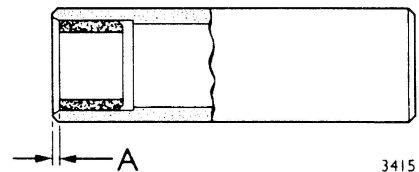
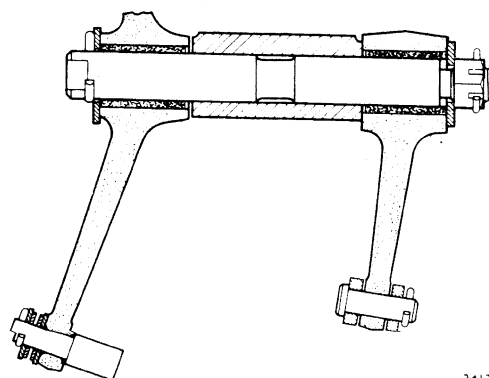


Fig 3 Pedal shaft sleeve bush

Installation and Pedal Setting

8 Clutch pedal and shaft bushes must be liberally smeared with XG 279 Grease on installation.

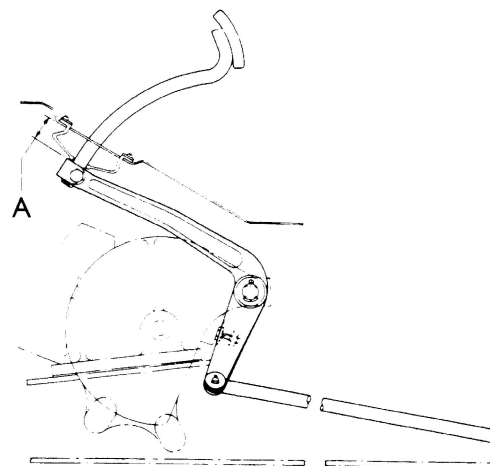
9 Excessive clutch and brake pedal side clearance on right drive models, can be reduced by loosening the spring pin, retaining shaft in steering gear, and tightening slotted nut.



3413

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.).



2297

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 BEARINGRemoval 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.

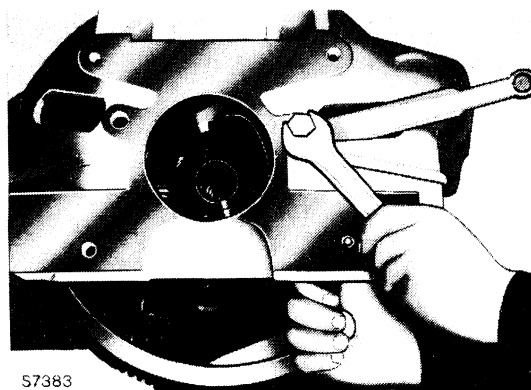


Fig 6 Removing clutch fork

16 To release clutch fork (1) from ball (2), ease out snap ring (3) from groove in fork and remove retainer (4) from ball.

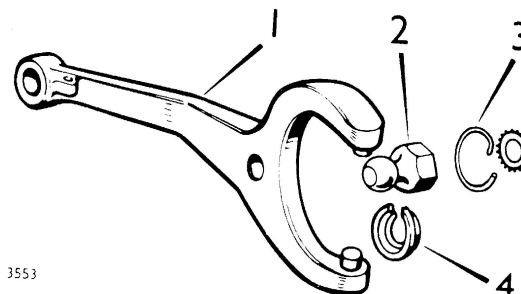
17 Before installing clutch fork, pack recess in fork, and ball retainer with XG 264 grease.

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 3. Snap ring
2. Support 4. Retainer

Fig 7 Clutch fork assembly

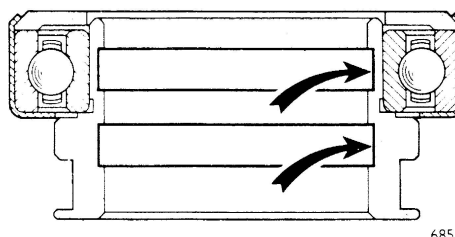


Fig 8 Release bearing grooves

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.

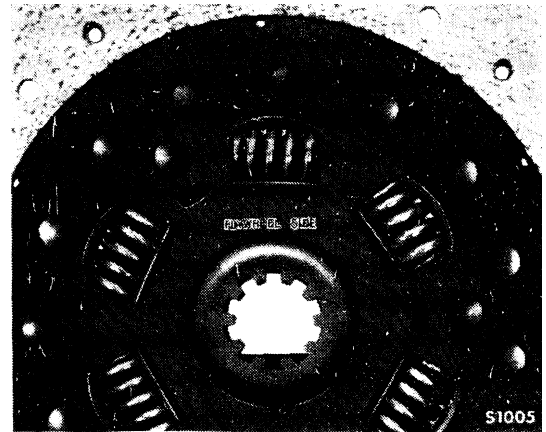


Fig 9 Clutch friction plate marking

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CHAPTER 3

GEARBOX

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2	Renewing bushes in gear shift linkage
3	Rear seal remover
4	Installing rear seal
5	Withdrawing gearbox

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TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

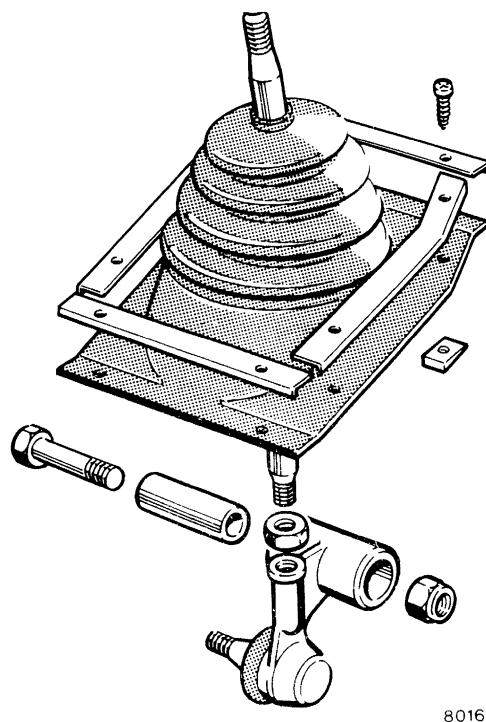
Tool No (where applicable)	NSN/Part No (where applicable)	Designation
VR 2043		Rear seal remover

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.



8016

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.).

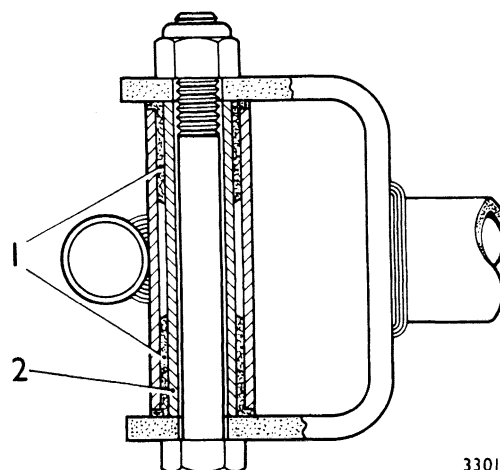


Fig 2. Renewing bushes in gear shift linkage

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.

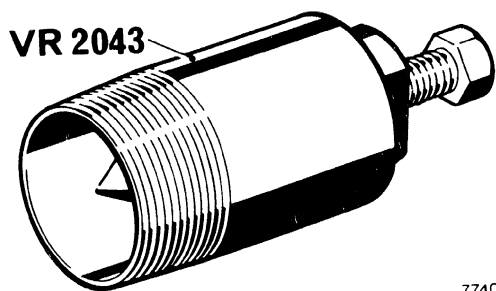
11 Before re-connecting the coupling rod to the change speed lever, smear the outer surface of the inner tube with grease.

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.



7740

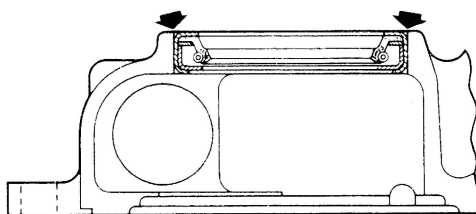
Fig 3. Rear seal remover

- 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 seal¹¹⁴⁵

- 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.

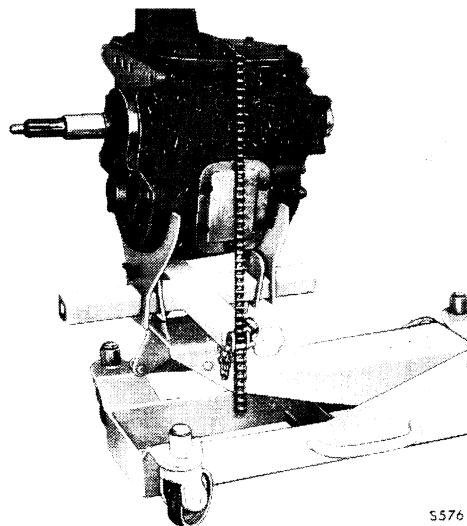


Fig 5. Withdrawing gearbox

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

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TRANSFER BOX ASSEMBLY

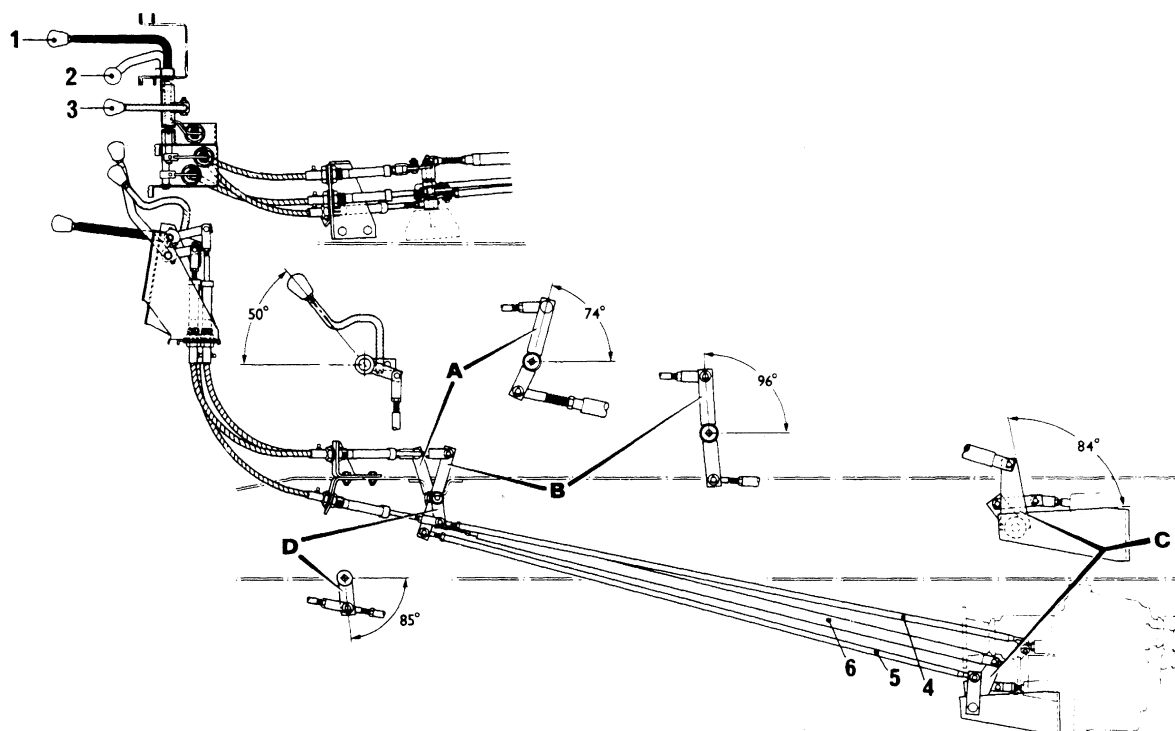
Removal

- 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



7970

- | | |
|----------------------------------|--------------------------------|
| 1. 2/4-wheel drive control lever | 4. Power take-off control rod |
| 2. Ratio control lever | 5. Ratio control rod |
| 3. Power take-off control lever | 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.

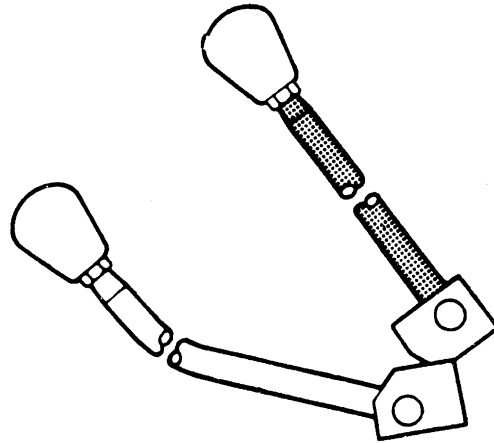


Fig 2. Interlock cams

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.

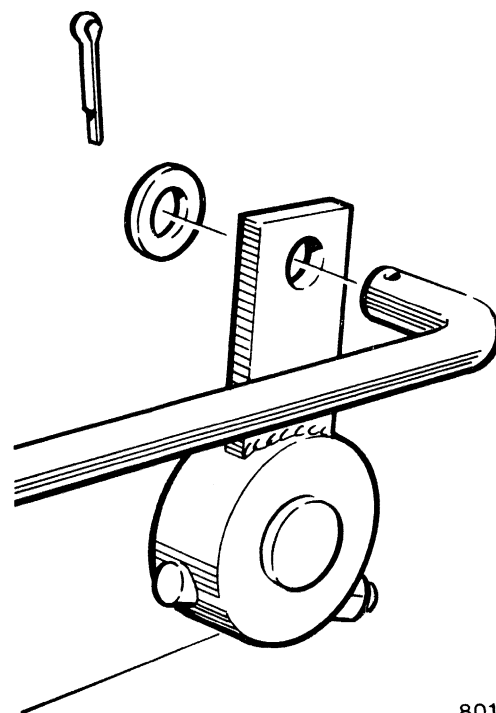
22 Set the power take off control lever to the 'OFF' position and to an angle of approximately 50° as shown in Fig 1.

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.

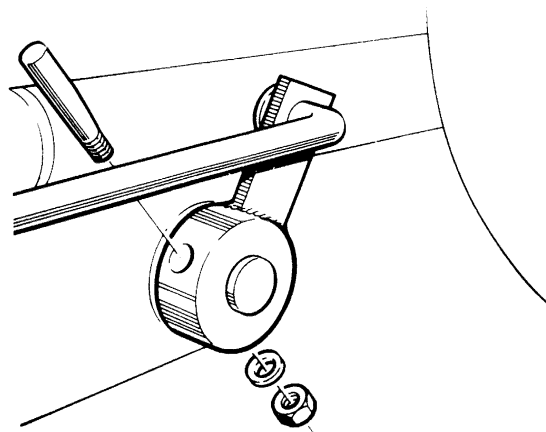
25 Disconnect the transfer box striking rod connecting link from the cross-shaft tube lever.



8014

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.

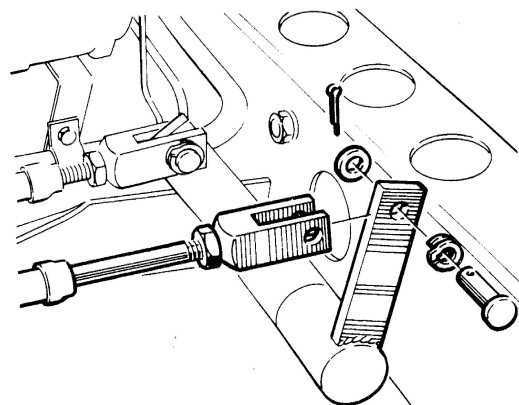


8012

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.



8013

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.

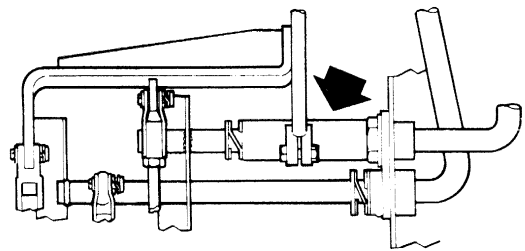
33 Remove the split pin, plain washer and thackray washer from the 2/4-wheel drive control lever shaft and withdraw the power take-off operating lever and tube assembly.

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.



8011

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.

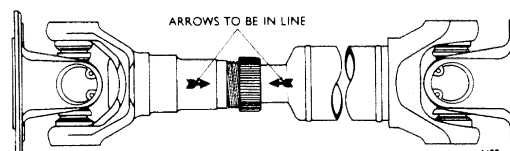


Fig 7. Alignment arrows on coupling and shaft

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.

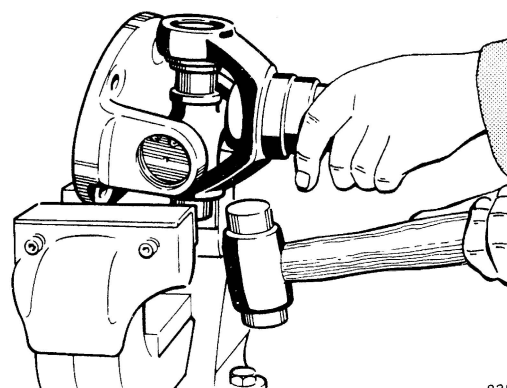


Fig 8. Removing bearing race from yoke

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.

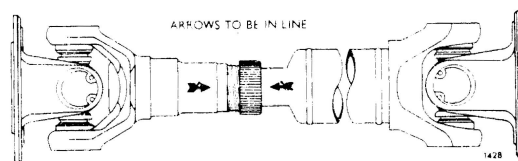


Fig 10. Alignment arrows on coupling and shaft

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

Para

- 1 Axle shafts
- 5 Bearing adjustment
- 6 Rear hubs
- 22 Pinion oil seal
- 33 Rear cover
- 35 Thrust screw

Table

- 1 Special test equipment and tools

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Fig

- 1 Draining oil from hub
- 2 Removing bearing locknut
- 3 Driving out bearing
- 4 Staking wheel bolts
- 5 Restoring threads on axle tubes
- 6 Installing spacer
- 7 Locating hub oil seal
- 8 Installing hub oil seal
- 9 Checking rear hub oil level
- 10 Pressing seal into pinion housing cover
- 11 Pinion assembly
- 12 Adjusting thrust screw

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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.

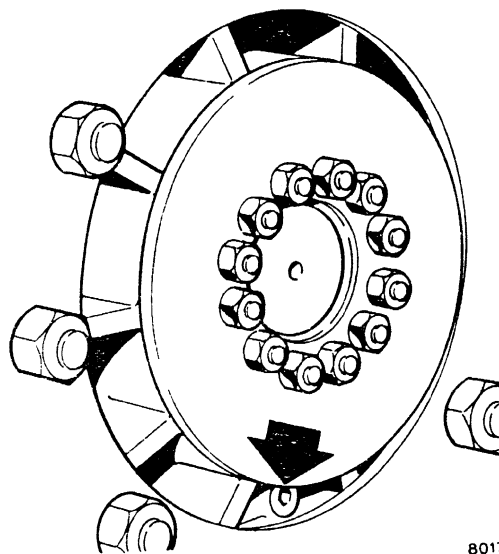


Fig 1 Draining oil from hub

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.

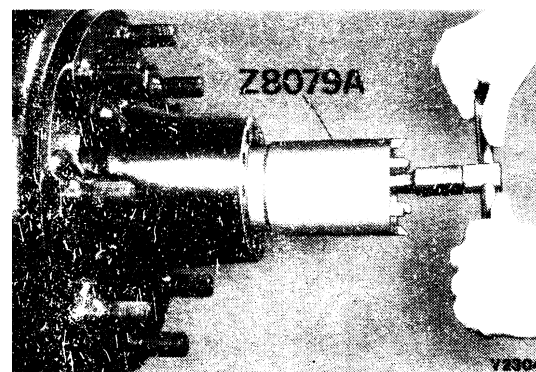


Fig 2. Removing bearing locknut

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.

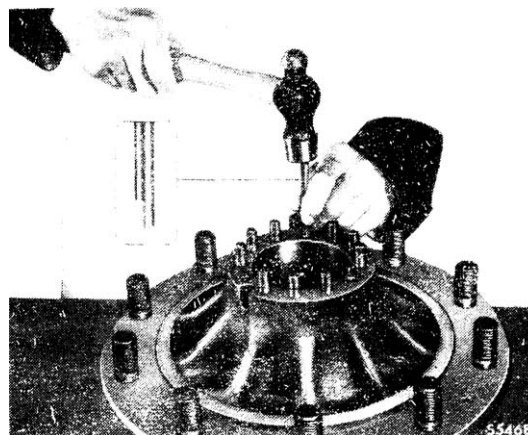


Fig 3. Driving out bearing

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.

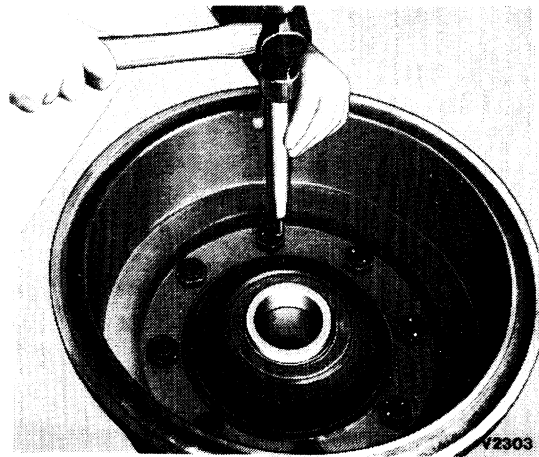


Fig 4. Staking wheel bolts

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.

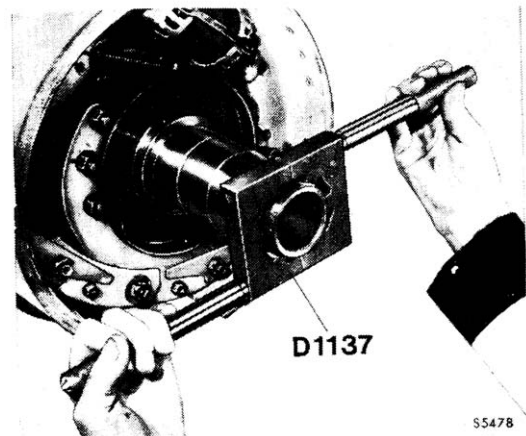


Fig 5. Restoring threads on axle tubes

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.

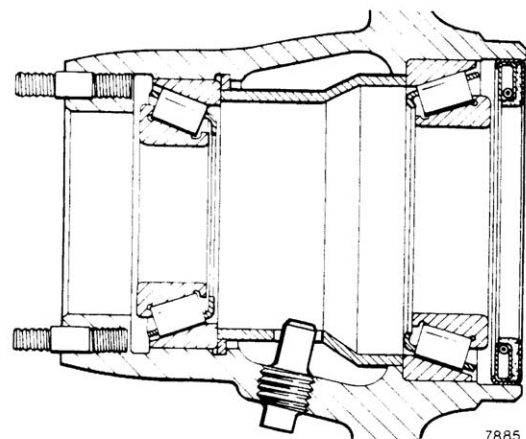


Fig 6. Installing spacer

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.

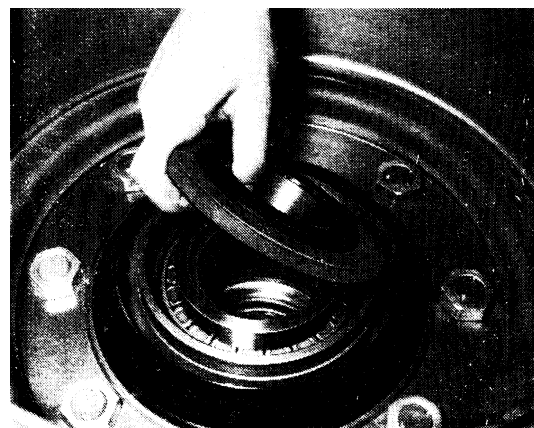


Fig 7. Locating hub oil seal

18 Place body of Installer KM2003 onto seal and press seal into place.

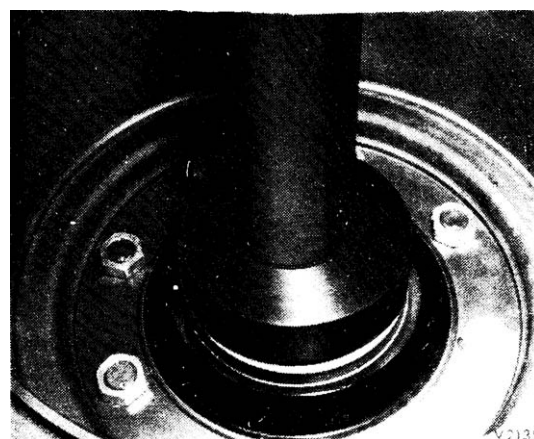
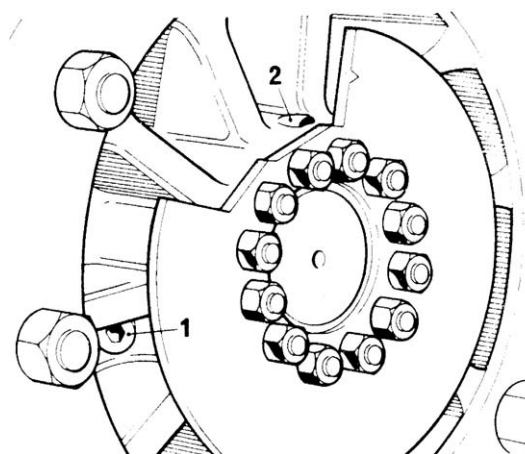


Fig 8. Installing hub oil seal

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.

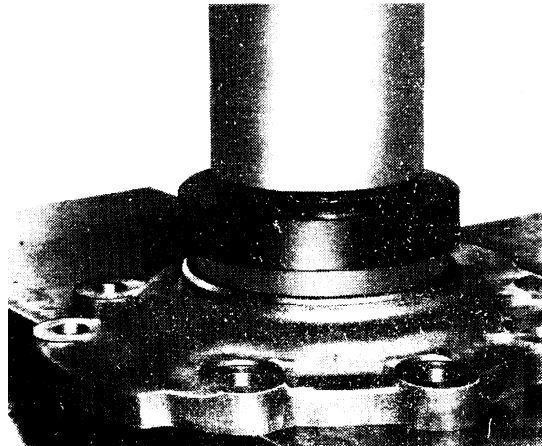


Fig 10. Pressing seal into pinion housing cover

- 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.

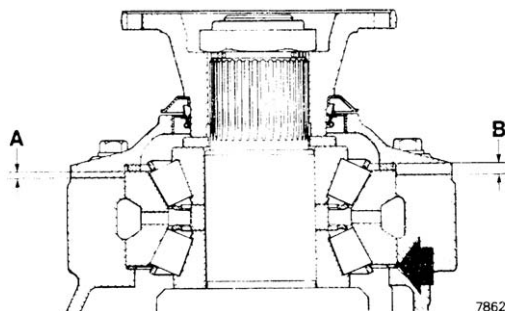


Fig 11. Pinion assembly

- 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

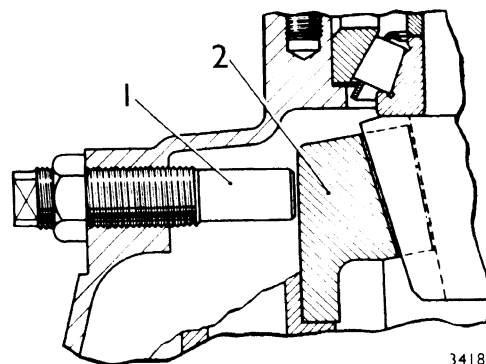
Removal

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

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1	Pinion oil seal
2	Housing cover
4	Tracta joint housing oil seals
11	Bearing adjustment
17	Front hubs
34	Thrust screw

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1	Adjusting hub bearing
2	Hub end float
3	Driving out bearing

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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.

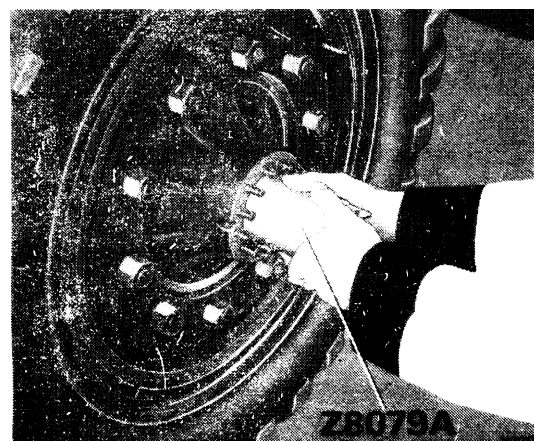


Fig 1. Adjusting hub bearing

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.

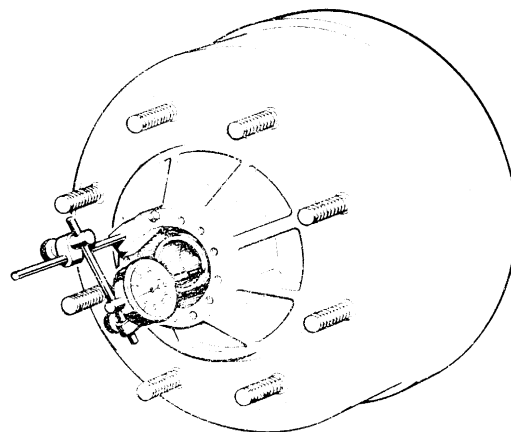


Fig 2. Hub end float

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.

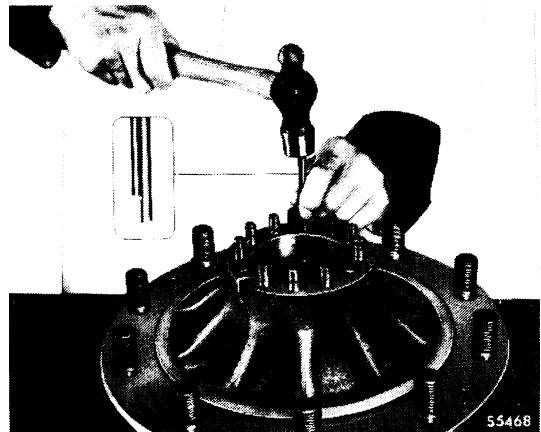


Fig 3. Driving out bearing

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 outer 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

Para

1	Steering geometry
8	Tie rod
16	Connecting rod
20	Drop arm
23	Steering wheel
28	Steering shaft and column
39	Steering gear

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3	Remover 814	3
4	Left side ball joint identification	4
5	Connecting rod ball joint	4
6	Disconnecting ball joint from drop arm using remover 814	5
7	Withdrawing drop arm from steering gear	5
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11	Steering shaft bearing	7
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14	Flexible coupling assembled to steering gear	9/10
15	Steering case breather hole	9/10

TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Tool No (where applicable)	NSN/Part No (where applicable)	Designation
814 Z8470 Z8512 KM2021 Z8508	7BD/5120-99-833-4168	Ball joint remover Steering drop arm remover Steering wheel remover Steering wheel remover adaptor Thread protector

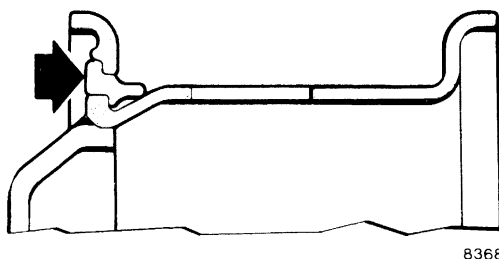
STEERING GEOMETRY

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.)



8368

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 $1/2^\circ$ 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

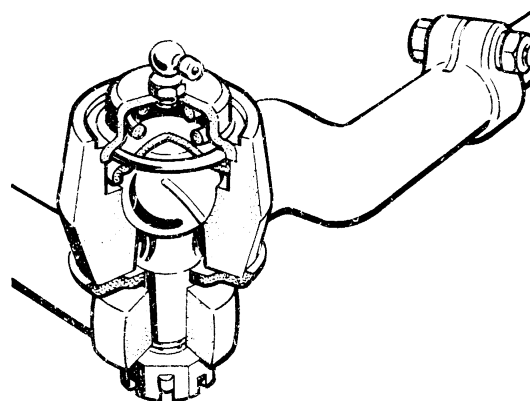
6 The toe-out on turns is controlled by the angle of the steering arms.

7 The inside wheel should be at $21.3/4^{\circ}$ to $23.3/4^{\circ}$ 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.

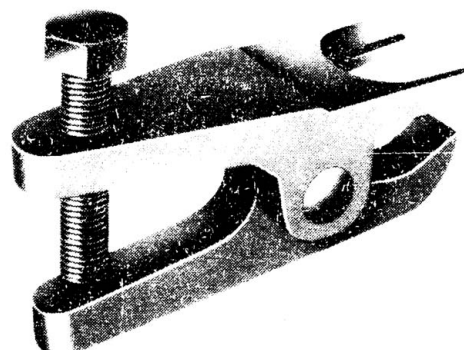


8171

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.



55796

Fig 3 - Remover 814

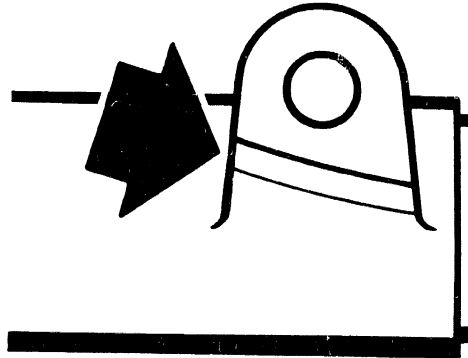
Inspection

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

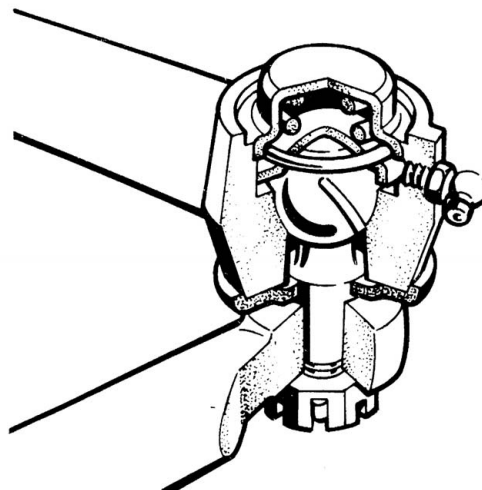
14 Before securing the tie rod in position, check that ball joints are screwed on to the rod an equal amount. Ensure that all mating tapers are clean and free from oil and grease. Tighten ball joint nuts to a torque of 176 Nm (130 lbf ft).

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.

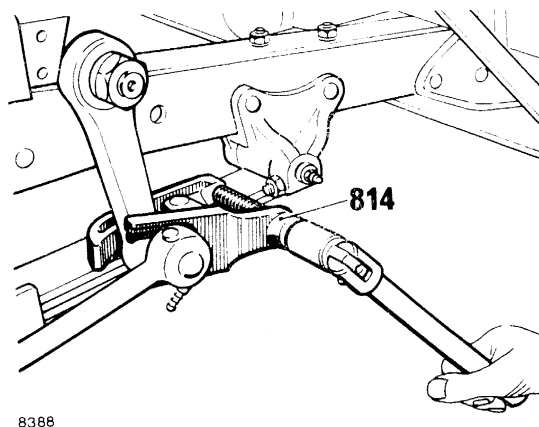


Fig 6 - Disconnecting ball joint from drop arm using Remover 814

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.

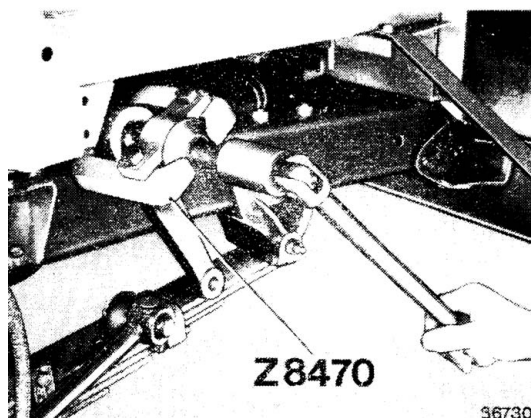
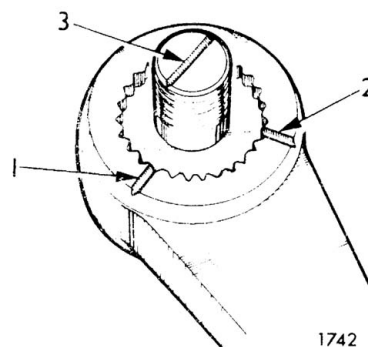


Fig 7 - Withdrawing drop arm from steering gear

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).



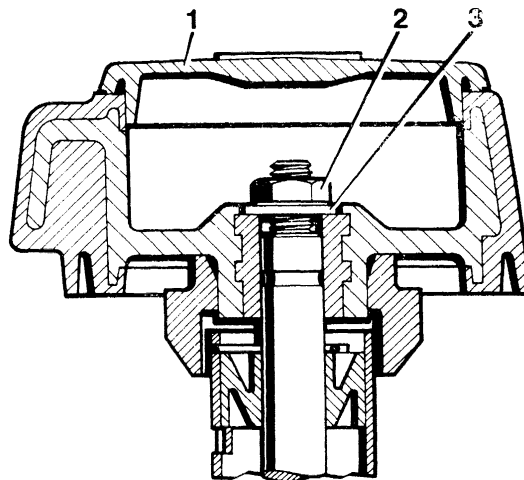
1. Right drive location notch
2. Left drive location notch
3. Notch on drop arm shaft

Fig 8 - Drop arm location mark

STEERING WHEELRemoval

23 Prise out the cover (1) from the centre of steering wheel, and remove nut (2) and plain washer (3) from steering shaft.

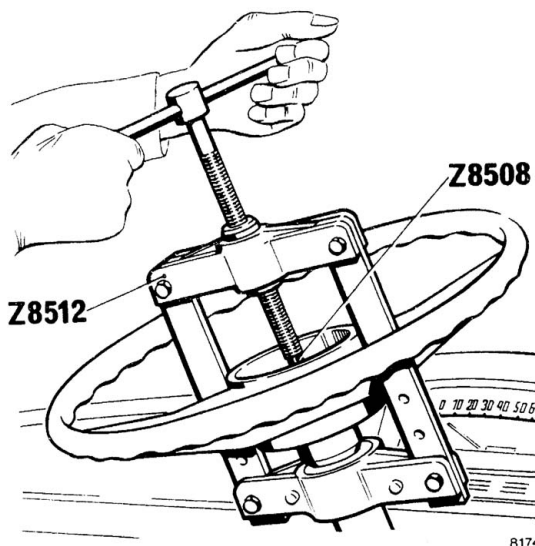
24 Remove signal switch and head-lamp control switch from steering column.



8173

Fig 9 - Steering wheel boss section

25 Install thread protector Z8508 and withdraw the steering wheel using Remover Z8512 and adaptor KM2021.



8174

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 COLUMNRemoval

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.

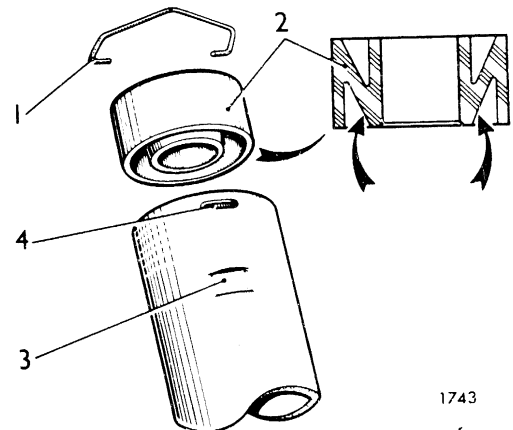
32 Release steering column from instrument panel and toe panel.

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

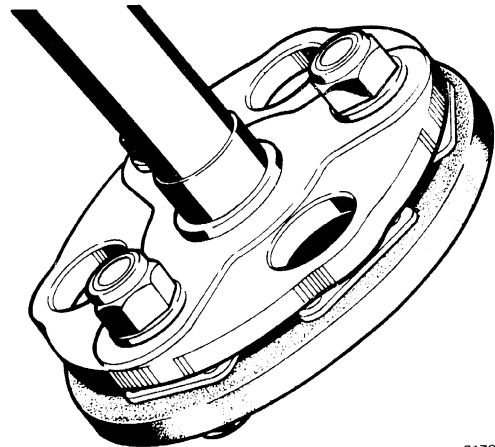
Fig 11 - Steering shaft bearing

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.

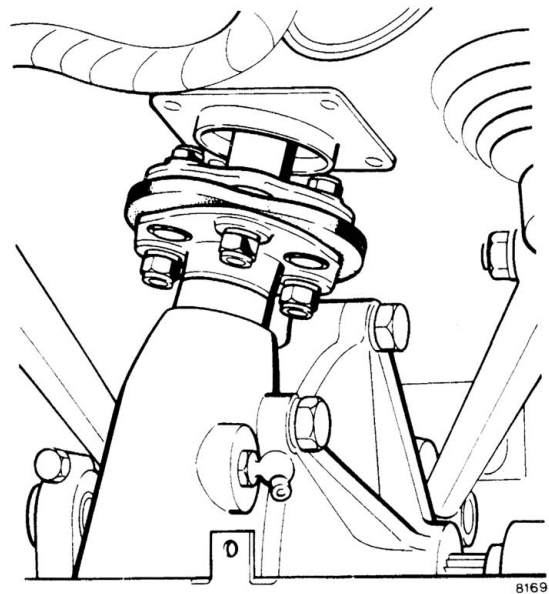


8170

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.



8169

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 (75lbf 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.

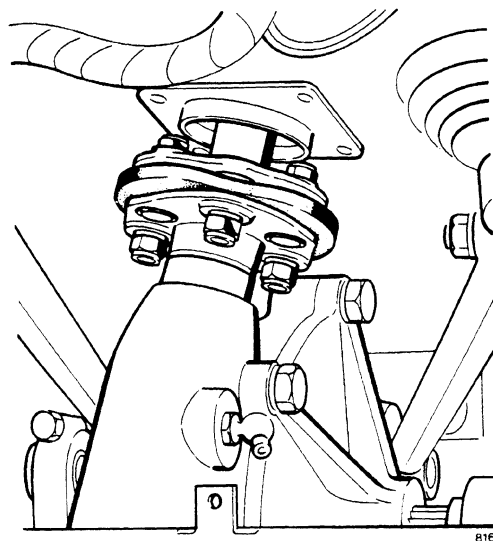


Fig 14 - Flexible coupling assembled to steering gear

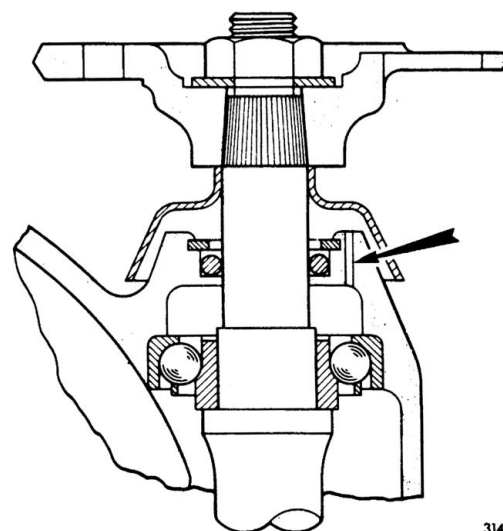


Fig 15 - Steering case breather hole

CHAPTER 8

SUSPENSION

CONTENTS

Para

- 1 Shock absorbers
- 4 Springs and shackles (Caution)

Fig

Page

- 1 Shock absorber mounting
- 2 Front shock absorber lower mounting

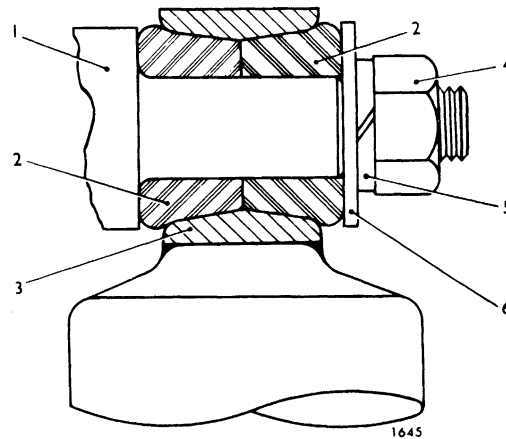
2
2

SHOCK ABSORBERSRemoval

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.

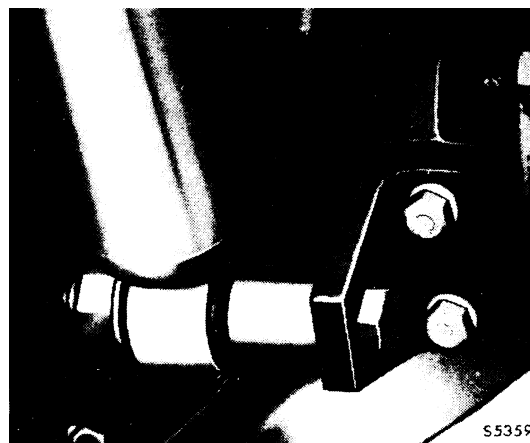


Fig 2 - Front shock absorber lower mounting

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

Para

- 1 Wheels
- 7 Tyres
- 8 Spare wheel

Fig

- 1 Section through road wheel
- 2 Checking split lock ring installation
- 3 Checking wheel run-out
- 4 Spare wheel and carrier

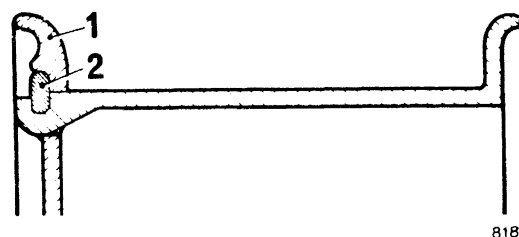
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- 3

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).

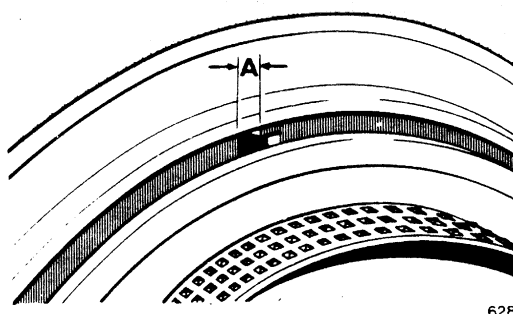


Fig 2 Checking split lock ring installation

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

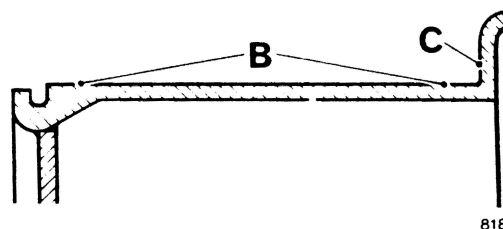


Fig 3 Checking wheel run-out

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.

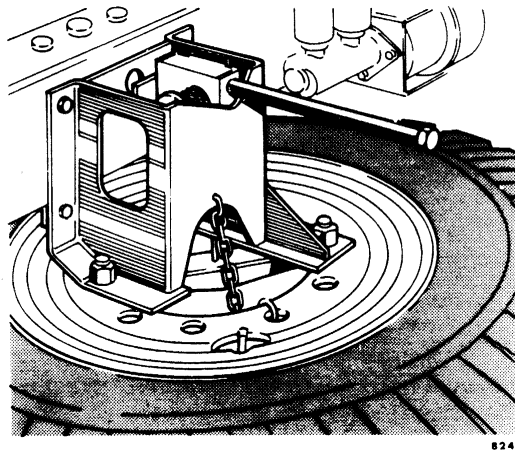


Fig 4 Spare wheel carrier

CHAPTER 10

AIR PRESSURE AND BRAKING SYSTEM

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9	Footbrake adjustment (WARNING)
12	Bleeding the hydraulic system
16	Brake drums
20	Brake shoes
29	Brake cylinders
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61	Master cylinder actuator
82	Compressor governor valve
95	Compressor anti-freezer
100	Non-return valve
104	Condensing reservoir
106	Safety valve
109	Automatic drain valve
119	Triple pressure system protection valve
133	Low pressure warning switches
136	Dual air reservoir
137	Footbrake valve
160	Stop lamp switches
165	Changeover valves
169	Hill holder control valve
185	Trailer park control valve
192	Dual relay valve
202	Pressure loss limiting valve
211	Tyre inflator
218	Brake pipes
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2	Right drive brake pedal section
3	Brake pedal and linkage
4	Brake adjusters
5	Brake assemblies

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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.

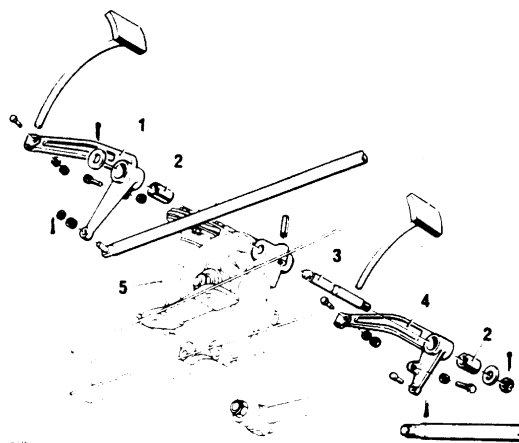


Fig 1 - Right drive brake pedal assembly

- 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.

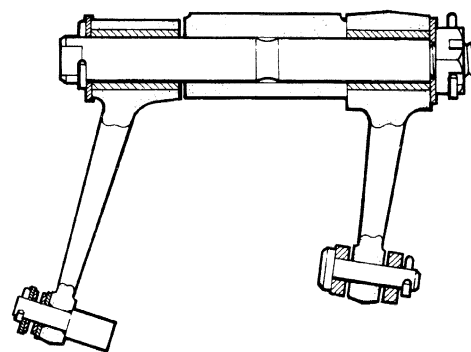


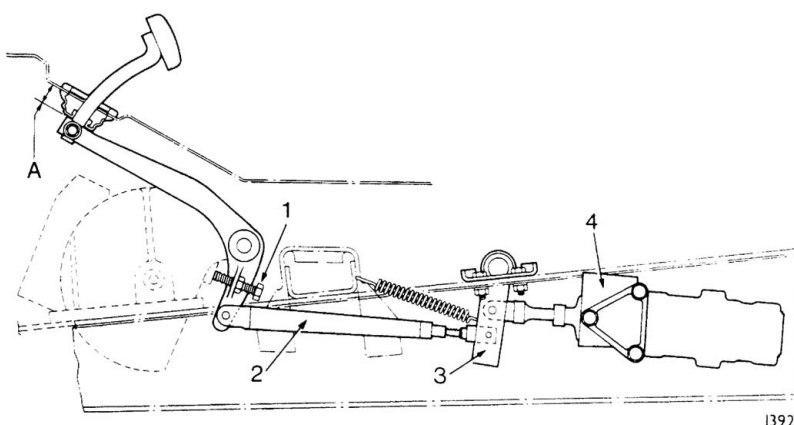
Fig 2 - Right drive brake pedal section

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 | 3. Relay lever |
| 2. Push rod | 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.

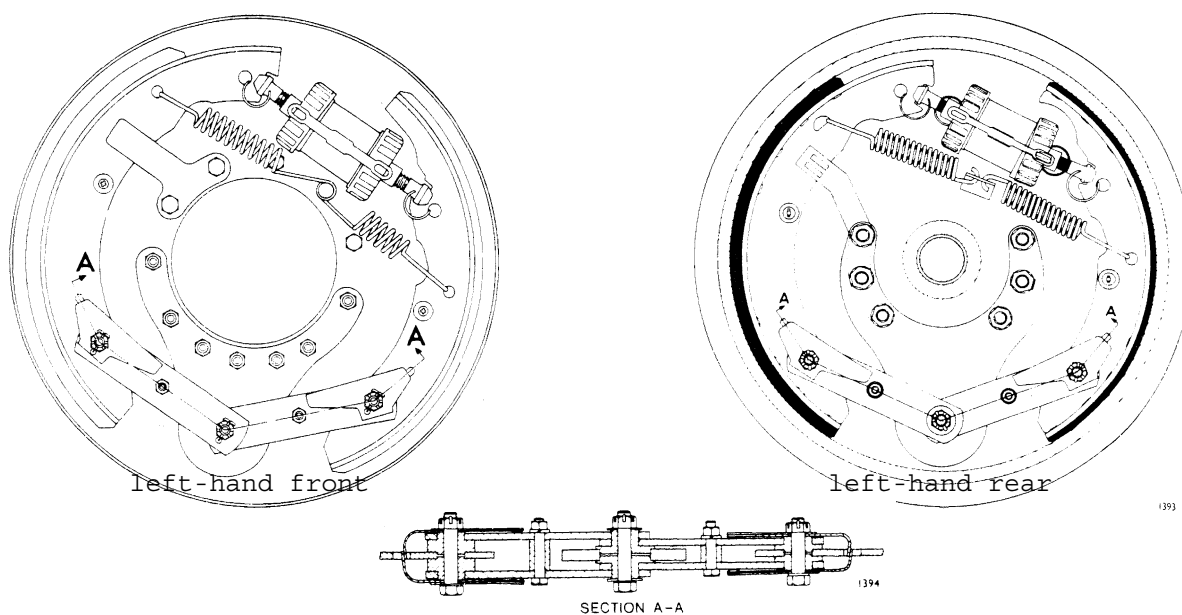


Fig 5 - Brake assemblies

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.

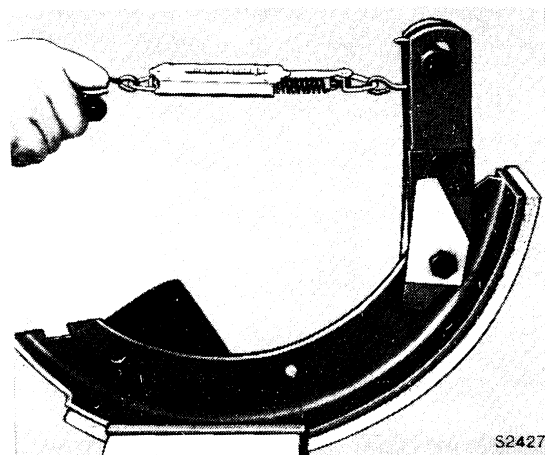


Fig 6 - Checking tension of friction springs

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.

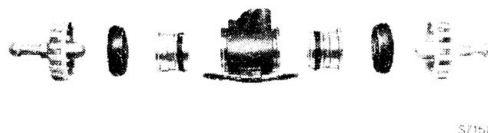


Fig 7 - Brake cylinder disassembly

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.

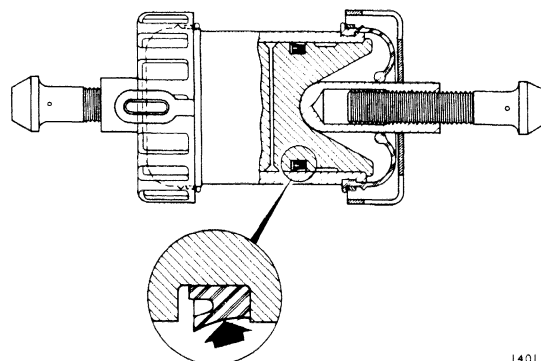


Fig 8 - Section of brake cylinder showing piston seal installation

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

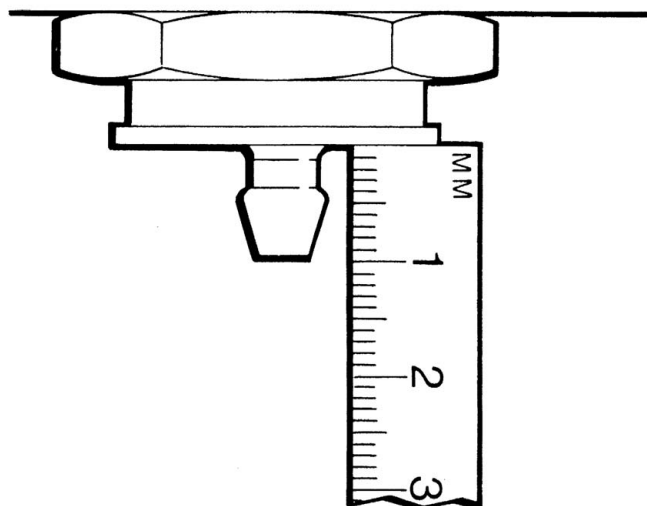
37 Stand the vehicle unladen on a flat level surface and fully charge brake system to governor cut-out pressure.

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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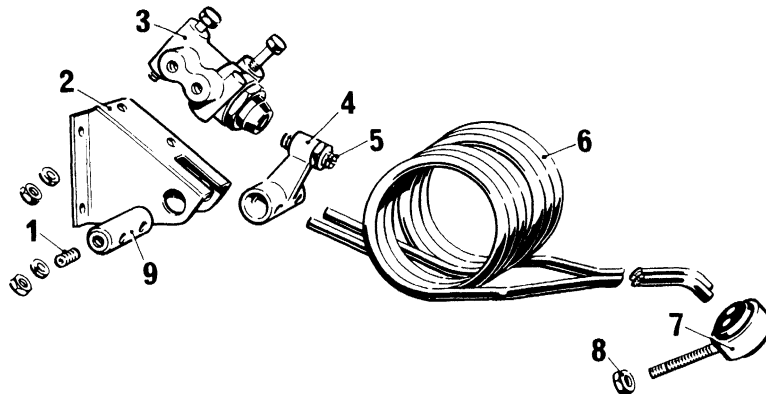
Fig 9 - Measuring piston stem movement

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



7929

- | | |
|---|----------------------------------|
| 1. Grub screw | 6. Spring |
| 2. Mounting bracket | 7. Adjuster eye and ferrule assy |
| 3. Load sensing valve | 8. Locknut |
| 4. Lever | 9. Bearing pin |
| 5. Adjusting screw | |
| (This is correctly set at the production factory and must not be disturbed) | |

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.

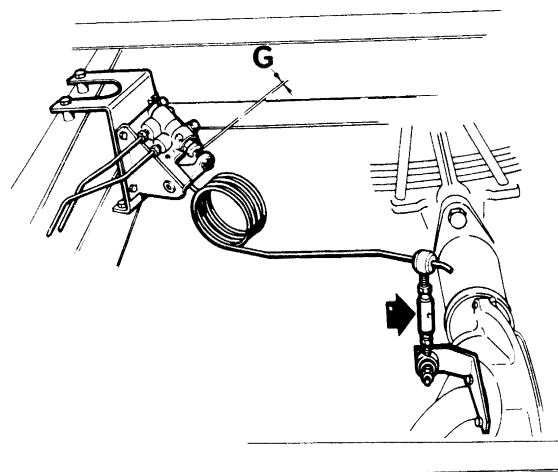
Installation and adjustment

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.



7655

Fig 11 - Load sensing valve adjustment

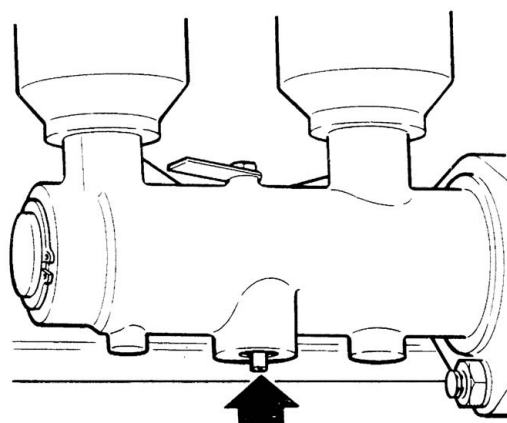
MODEL	CODE	AXLE LOAD (kg (lb))					SETTING GAP mm (in.)
		1600 (3528)	1800 (3969)	2000 (4410)	2200 (4851)	2400 (5292)	
MOP2WMO	183	-	-	1.38 (0.054)	0.86 (0.034)	0.34 (0.013)	
MOP2BMO	183	2.08 (0.082)	1.59 (0.063)	1.10 (0.043)	0.61 (0.024)	0.16 (0.006)	
MOP2WMO	-	2.08 (0.082)	1.59 (0.063)	1.10 (0.043)	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.



7930

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.

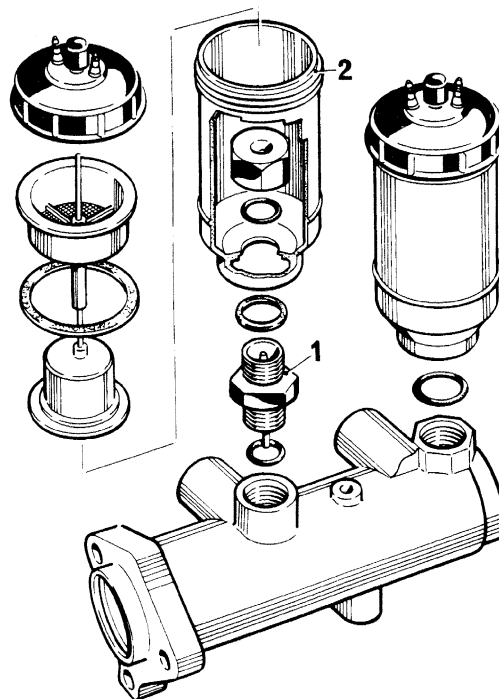


Fig 13 - Master cylinder reservoirs

48 Do not disassemble valve unnecessarily. If required, valve may be disassembled by removing spring retainer.

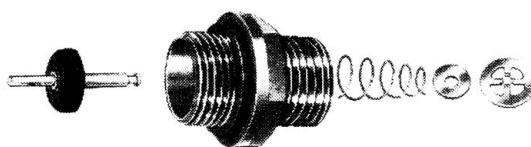


Fig 14 - Recuperating valve disassembly

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.

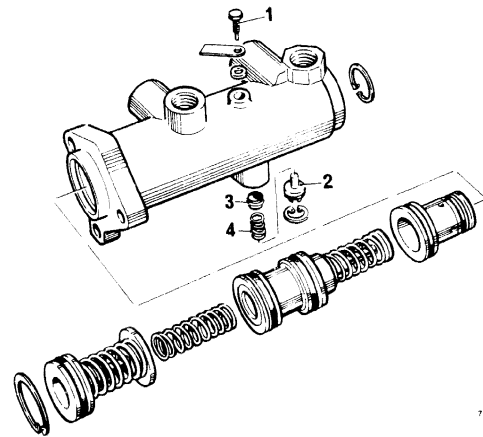


Fig 15 - Master cylinder

52 Remove hydraulic pipe connection adaptors and withdraw check valves.

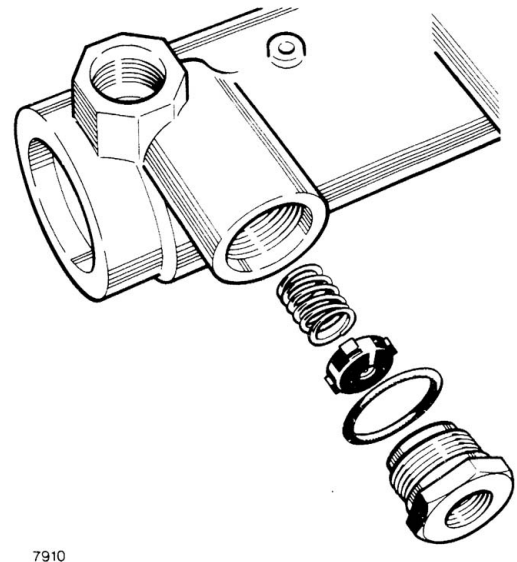


Fig 16 - Master cylinder check valves

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.

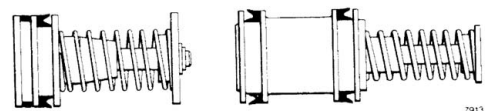
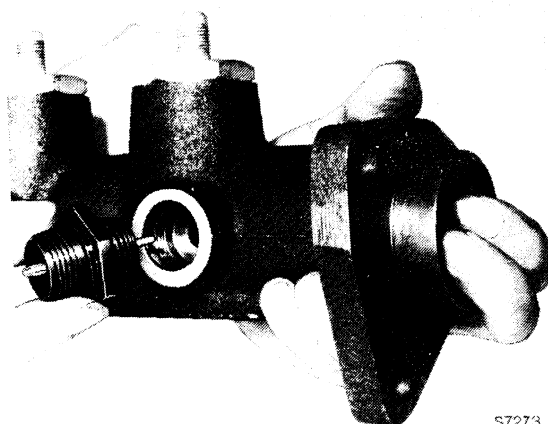


Fig 17 - Primary and secondary piston seals

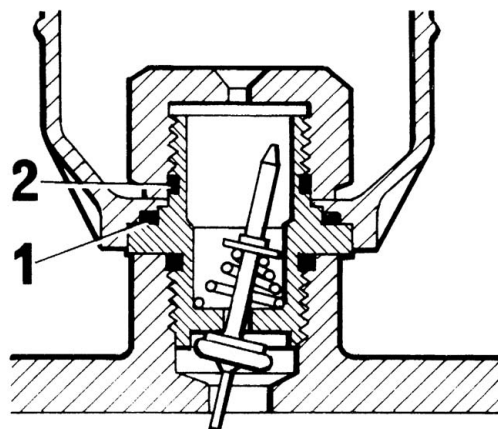
55 When installing recuperating valve and piston stop, hold pistons depressed and check that movement of primary piston actuates valve.



57273

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.

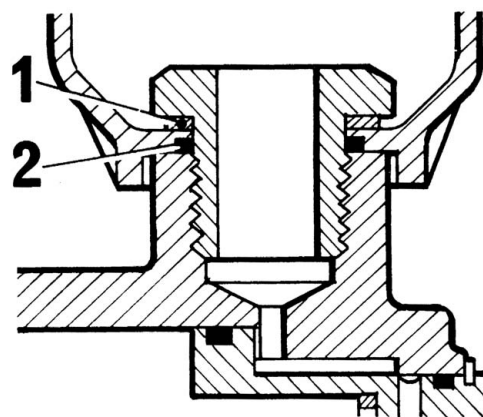


7931

- 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.



7932

- 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.

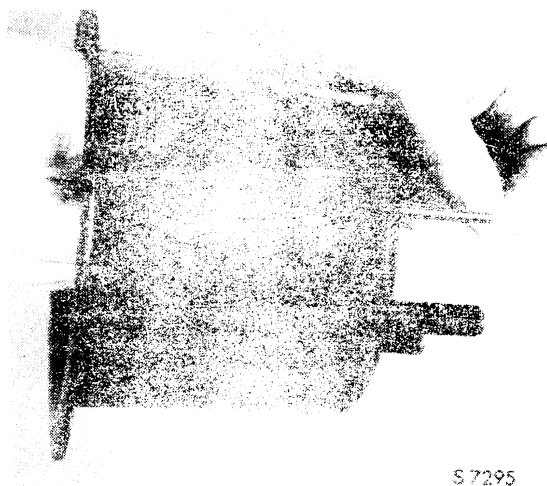


Fig 21 - Withdrawing indicator rod

66 Push rod and piston may be separated from body after removing push rod lock nut. Spring tension can be overcome by hand pressure.

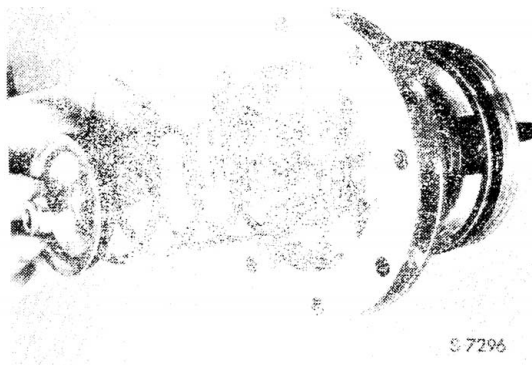


Fig 22 - Withdrawing push rod and piston

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

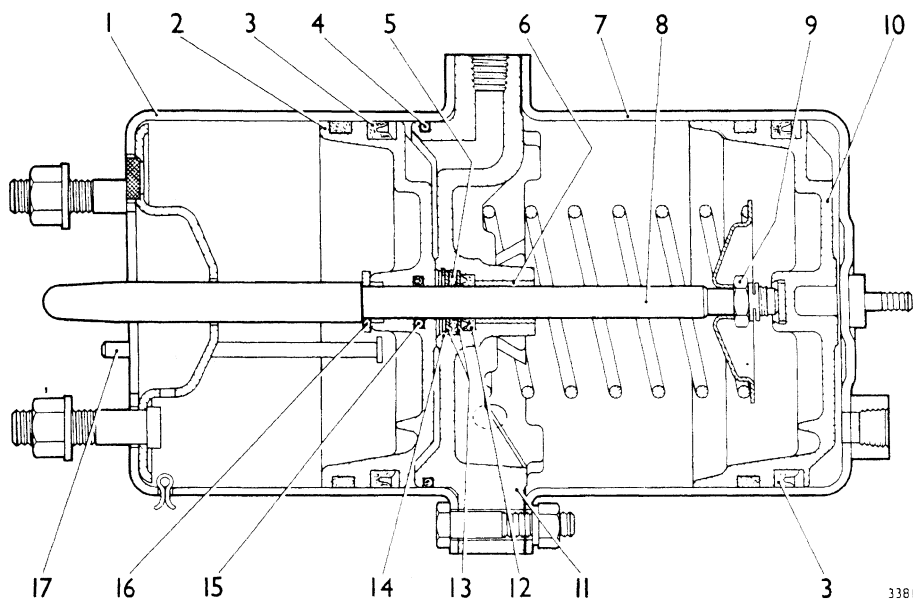
69 Examine sliding surface of push rod for scores and bush in body for wear. Rod should be a close sliding fit in bush.

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 | 10. Front piston |
| 2. Rear piston | 11. Body |
| 3. Piston seals | 12. Seal |
| 4. Sealing ring groove | 13. Washer |
| 5. Felt ring | 14. Circlip |
| 6. Bush | 15. Sealing ring |
| 7. Front cylinder | 16. Thrust washer |
| 8. Push rod | 17. Indicator rod |
| 9. Push rod lock nut | |

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.

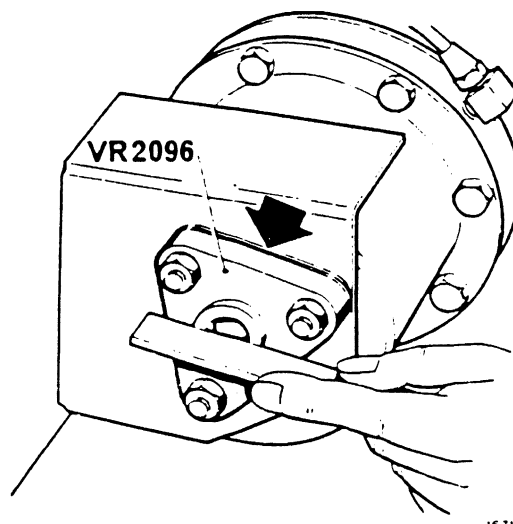


Fig 24 - Checking shim thickness

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 lbf/in.²)

Cut-in 6.1 bar (88 lbf/in.²).

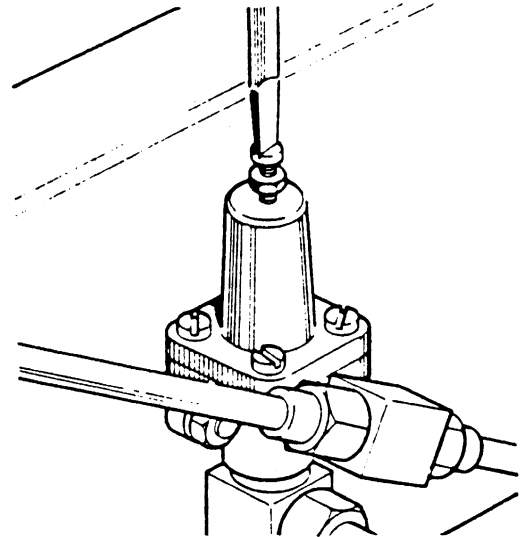


Fig 25 - Adjusting governor
valve cut-out pressure

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.

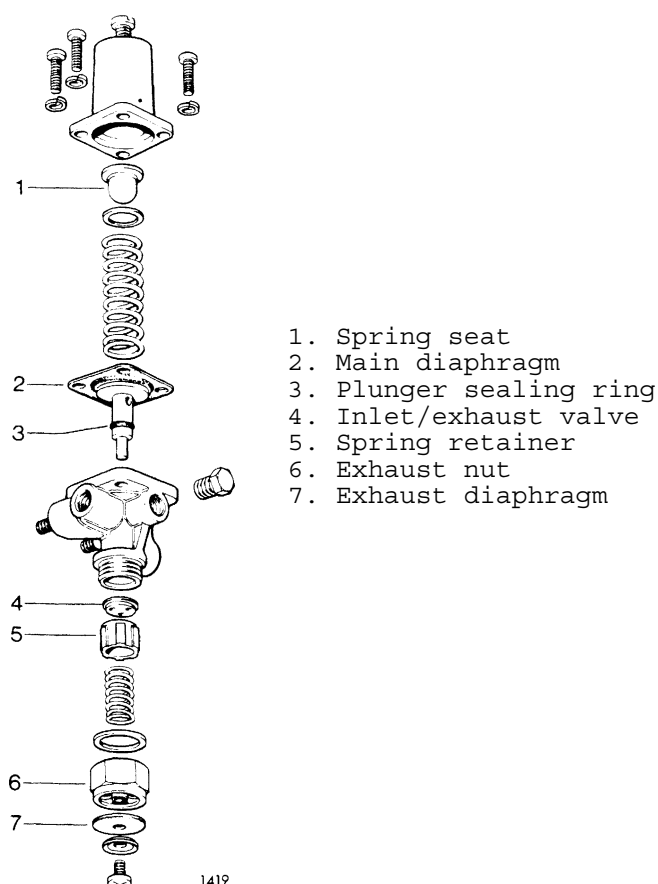


Fig 26 - Governor valve disassembly

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.

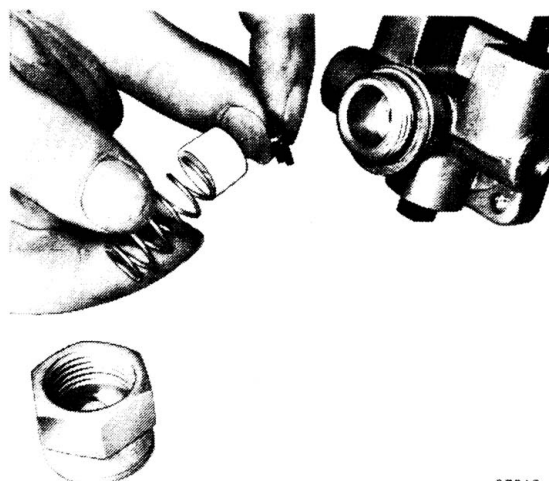


Fig 27 - Inlet/exhaust valve disassembly

Reassembly and installation

91 When assembling diaphragm and plunger, locate fabric washer (arrowed) between diaphragm plate and shoulder of plunger.

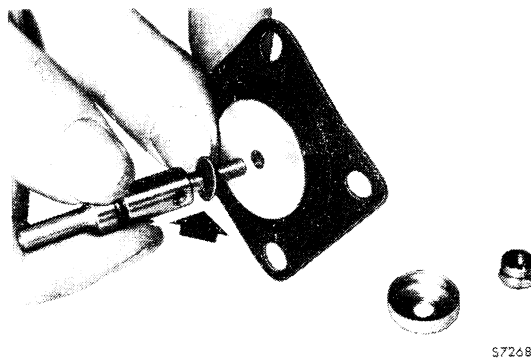


Fig 28 - Diaphragm and plunger
reassembly

92 Ensure bevel edged diaphragm plate is located below diaphragm with bevel edge towards diaphragm.

93 Smear plunger with Rocol E1A grease before installation.

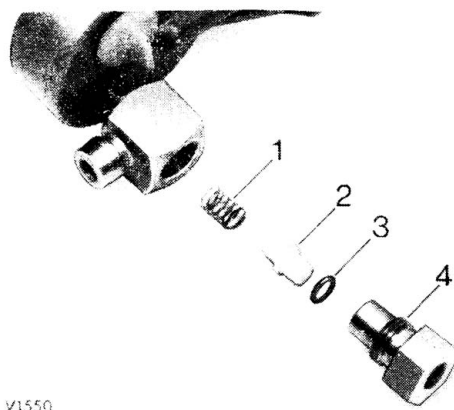
94 After installing governor valve, carry out operating and leakage tests as described in paras 83 and 84 of this chapter.

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 | 3. Seal |
| 2. Plunger | 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

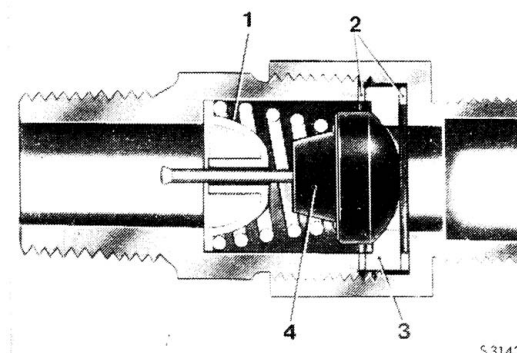
100A non-return valve is located in the supply connection to the condensing reservoir. The valve consists of a body and screw cap containing a half-round rubber valve, spring-loaded against a valve seat.

Leakage test

101 Check 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

102 When 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.



- 2. Sealing washer
- 3. Valve seat
- 4. Rubber valve

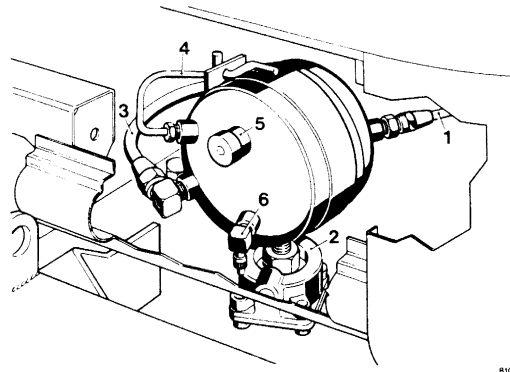
Fig 31 - Non-return valve

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.

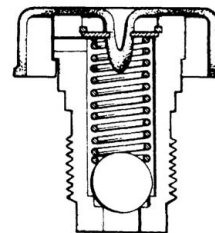


Fig 33 - Safety valve

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/in²). 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

110 With 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

111 With 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.

112 Note that slight leakage at exhaust port may be caused by excessive leakage in other parts of air brake system.

Removal and disassembly

113 Release the pressure from the system and unscrew the valve from reservoir.

114 Filter (2) may be withdrawn after removing adaptor (1) and unscrewing filter retaining sleeve (3).

115 Valve guide (5) and inlet/exhaust valve (4) may be withdrawn after removing cover (6).

116 Wipe inlet/exhaust with a clean dry cloth and examine for wear and deterioration.

- | | |
|---------------------|------------------------|
| 1. Adaptor | 4. Inlet/exhaust valve |
| 2. Filter | 5. Valve guide |
| 3. Retaining sleeve | 6. Valve cover |

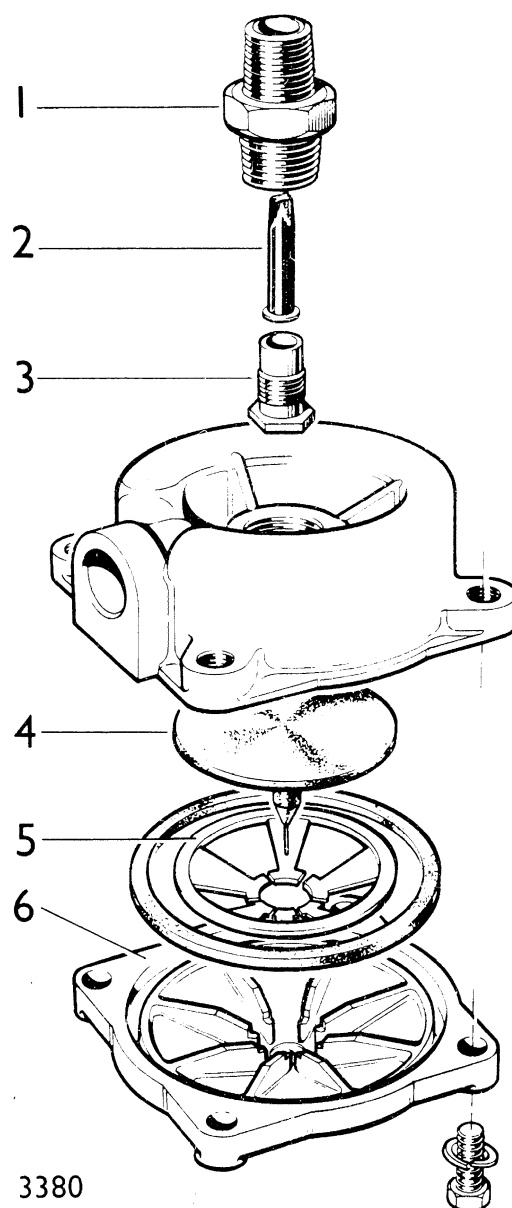


Fig 34 - Automatic drain valve

Reassembly and installation

117 Reassemble valve in the reverse order of disassembly, ensuring a thin film of Rocol E1A grease is applied to the inlet valve seat.

118 Install 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

119 A 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.

120 The valve is mounted to the left-hand side of the spare wheel carrier.

Operating test

121 Drain air from circuit of valve/element which is to be checked by removing reservoir drain plug or supply pipe.

122 Lower pressure in remainder of system to approximately 2.8 bar (40 lbf/in²).

123 Charge 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.

124 The 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)

125 If 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

126 Check 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.

127 To 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.

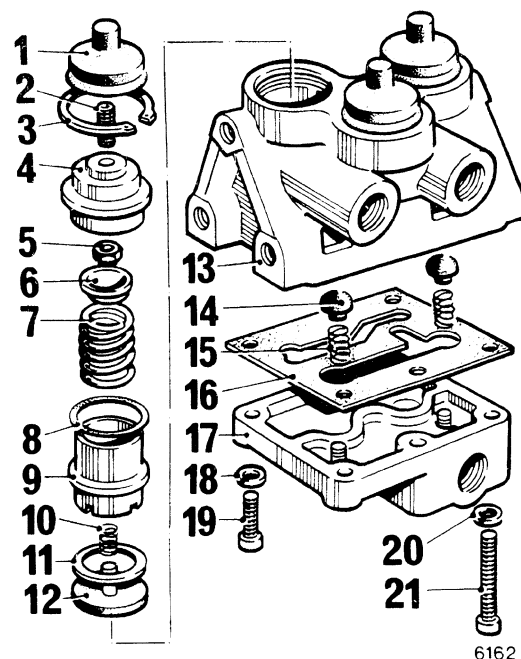
128 Repeat procedure on valve outlet connection to Service II reservoir, first ensuring that system is fully charged to governor cut-out pressure.

Disassembly and inspection

129 Remove rubber gaiters (1) and circlips (3). Withdraw the valve cap (4), adjusting screw (2), spring (7), piston (9) and non-return valves (12).

130 Remove lower cover (17) which is secured by six screws (21) to gain access to the additional non-return valves (14).

131 Ensure valve body (13) and pistons (9) are free from scores, and seals and springs have not deteriorated. Renew parts as necessary.



- | | |
|--------------------|----------------------|
| 1. Gaiter | 12. Non-return valve |
| 2. Adjusting screw | 13. Valve body |
| 3. Circlip | 14. Non-return valve |
| 4. Cap | 15. Spring |
| 5. Nut | 16. Gasket |
| 6. Seat | 17. Lower cover |
| 7. Spring | 18. Washer |
| 8. Sealing ring | 19. Screw |
| 9. Piston | 20. Washer |
| 10. Spring | 21. Screw |
| 11. Washer | |

Fig 35 - Triple system protection valve
disassembly

Reassembly and installation

132 Before 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

133 Low 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

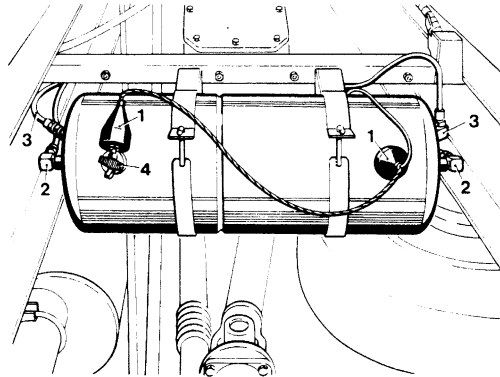
134 With system fully charged and engine stopped, disconnect wire from switch not being tested and turn key start switch to running position. Release pressure by applying and releasing footbrake and note pressure indicated on dual air gauge at which buzzer and warning lamp operate. If switch fails to operate between 4.5/5.1 bar (65/75 lbf/in²) it must be renewed.

Leakage test

135 Check switches for leakage by fully charging air system and smearing switch with soap solution.

DUAL AIR RESERVOIR

136 A 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.

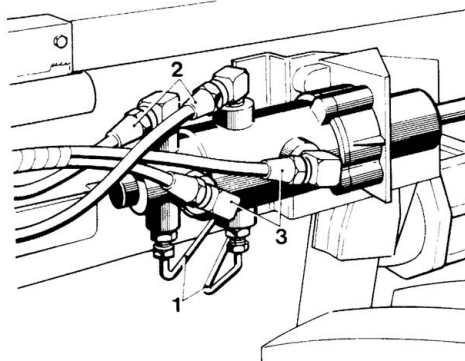


1. Low pressure warning switches
2. Supply to footbrake valve
3. Feed from triple pressure protection valve
4. Test point

Fig 36 - Dual air reservoir

FOOTBRAKE VALVE

137 The 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.

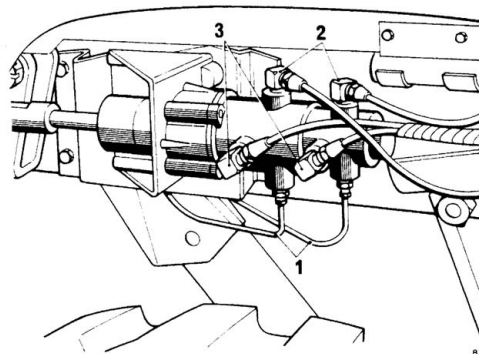


1. Air line to vehicle air pressure gauge
2. Air line from reservoirs
3. Delivery air lines from footbrake valve

Fig 37 - Footbrake valve and air lines - right drive

Operating test

138 Check operation of footbrake 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

139 With air system fully charged, fully apply footbrake and check that pressures registered on test gauges are approximately the same as registered on vehicle gauge.

140 Release brake pedal and check that pressures fall immediately to zero on test gauges.

141 Recharge system and gradually apply footbrake. Pressures registered on test gauges should be within 0.3 bar (5 lbf/in²) 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

142 Check 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.

143 With system fully charged gradually apply footbrake valve until delivered pressure rises to 6.2 bar (90 lbf/in²) and smear exhaust diaphragm and dust cover with soap solution.

144 Fully apply brake pedal and gradually release until delivered pressure falls to 6.2 bar (90 lbf/in²) and repeat leakage test. Leakage in either condition is not permissible.

Removal

145 To 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.

146 Mark the position of plunger housing in relation to valve body before disassembly.

Disassembly

147 Remove circlip, withdraw valve guide spring, inlet/exhaust valve and filter from rear of body.

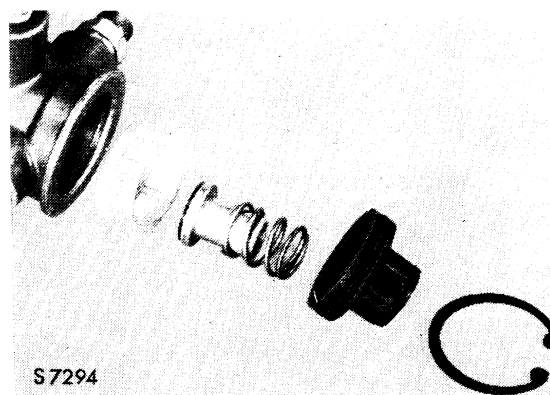


Fig 39 - Disassembling rear of footbrake valve

148 Remove mounting bracket and withdraw plunger housing, buffer spring, retainers and ball housing. If necessary disassemble buffer spring by removing lock-type bolt.

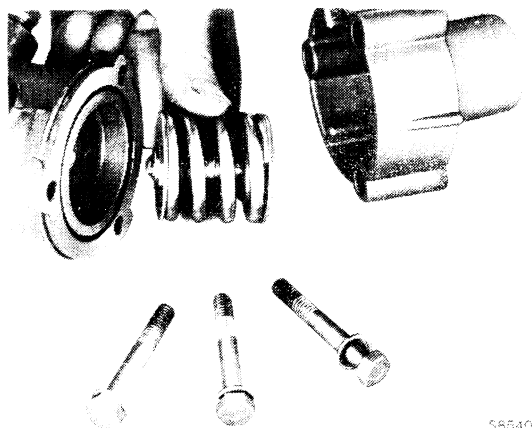


Fig 40 - Disassembling front of footbrake valve

149 Push 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.

150 Remove valve guide spring filter and inlet/exhaust valve from rear of carrier after releasing circlip.

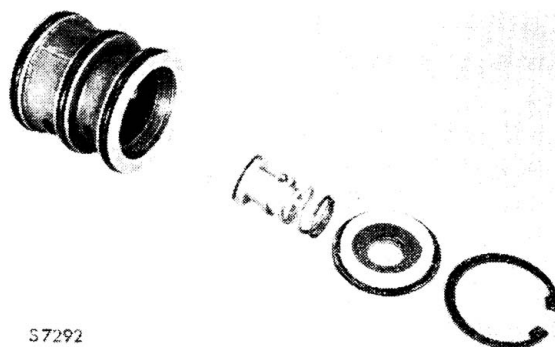


Fig 41 - Disassembling valve carrier

Inspection

151 Clean 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.

152 Ensure 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

153 Prior to reassembly, liberally smear all moving parts, including seals with Rocol E1A grease.

154 Before 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.

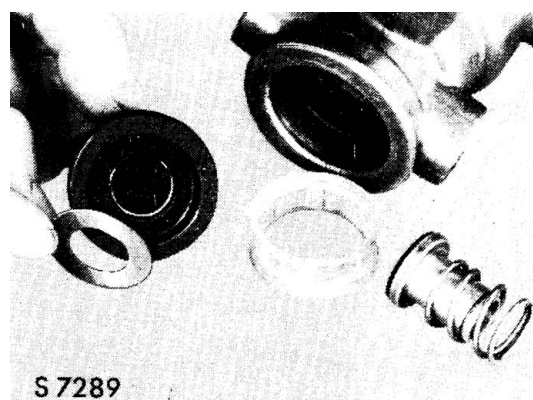


Fig 44 - Assembling rear of footbrake valve

Installation

159 Install 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

160 A 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

161 Check 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.

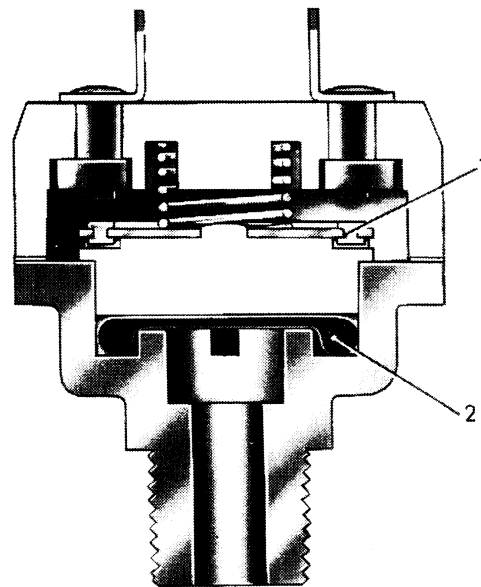
Disassembly and inspection

162 Switch is disassembled by removing cover screws.

163 If 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

164 Lightly 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.

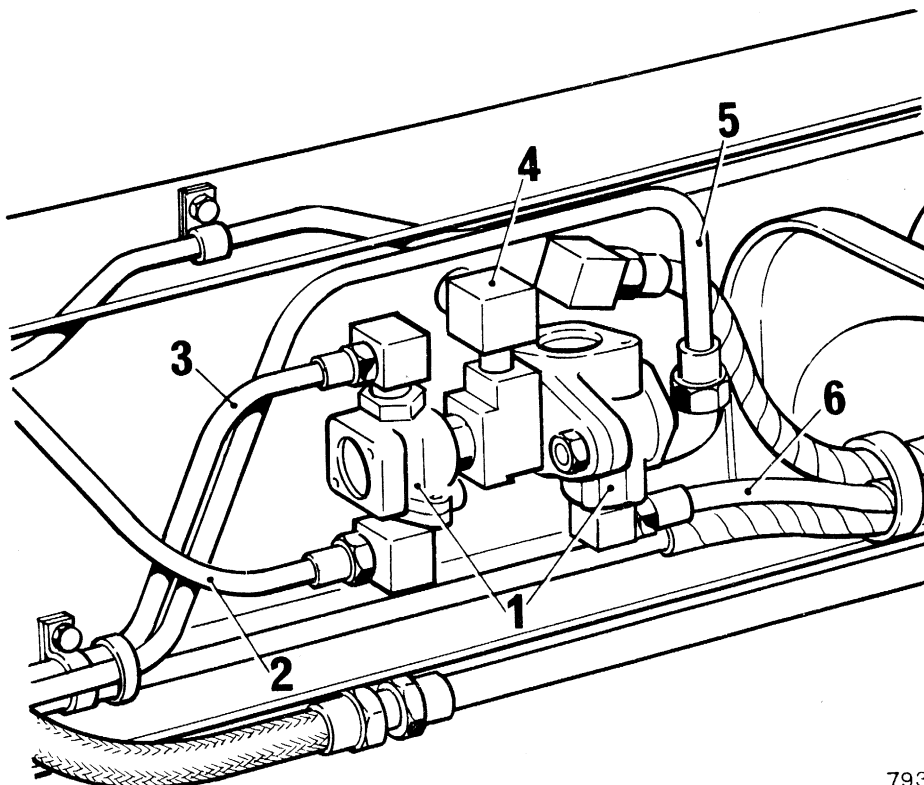


57190

1. Contact strip 2. Diaphragm
Fig 45 - Stop lamp switch

CHANGE-OVER VALVES

165 Two changeover valves are incorporated in the braking system. The valves are located on the inside of the right-hand sidemember.



7933

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

166 On 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.

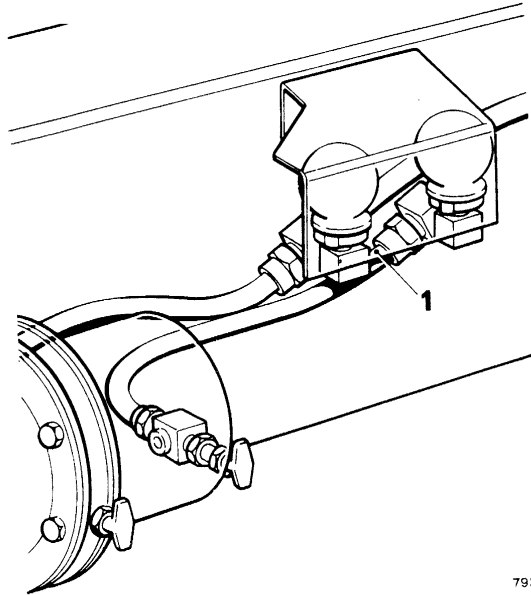
167 Leakage test on the changeover valve incorporated in the trailer park control valve and master cylinder actuator supply lines. Fully charge system to governor cut-out pressure, disconnect supply line to the changeover valve from trailer park control valve and smear inlet port with a soap solution.

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.



7934

Fig 47 - Air line connections to master cylinder actuator

Reassembly

168 Before reassembly, smear shuttle valve sleeve and inner surface of guide with recommended grease.

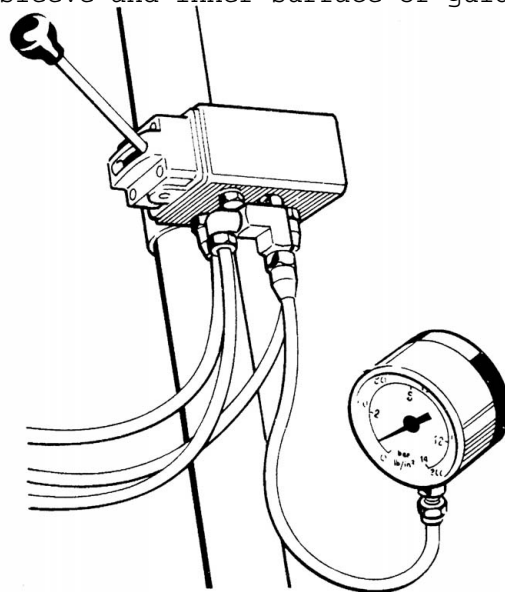
HILL HOLDER CONTROL VALVE

169 The 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.

170 To check operation of the hill holder control valve disconnect delivery pipe from valve and install a pressure gauge in the port.



8374

Fig 48 - Checking operation of valve

171 Charge air system to governor cut-out pressure.

172 With 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.

173 If 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.

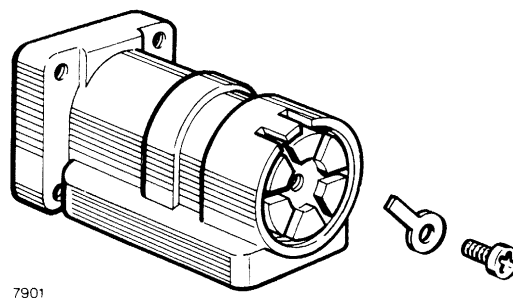


Fig 49 - Locking plate, retaining screw and pressure adjusting plug

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

174 Charge system to governor cut-out pressure and apply a soap solution to valve body and exhaust port.

175 There must be no leakage when valve lever is at either end of its operating cycle.

Removal

176 Release air pipes from valve ensuring that pipes are identified in relation to valve ports to aid installation.

177 Remove valve and bracket assembly securing bolts and withdraw assembly from steering column. Separate valve from support bracket.

178 Release lever housing securing screws and separate lever housing from valve body.

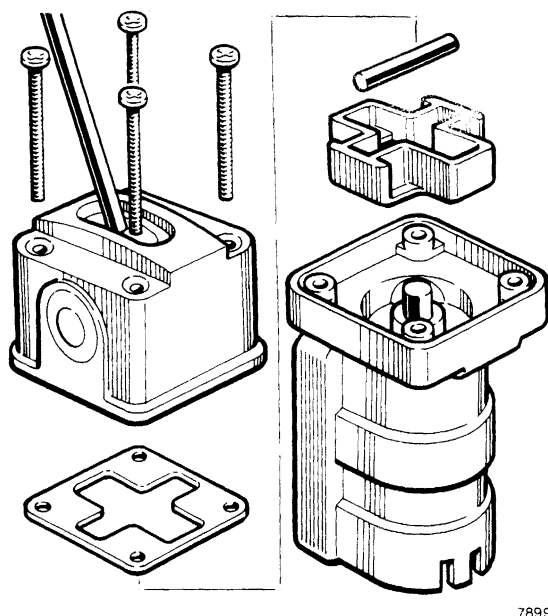
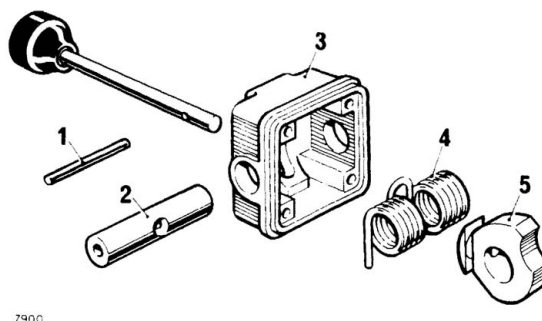


Fig 50 - Lever housing securing screws

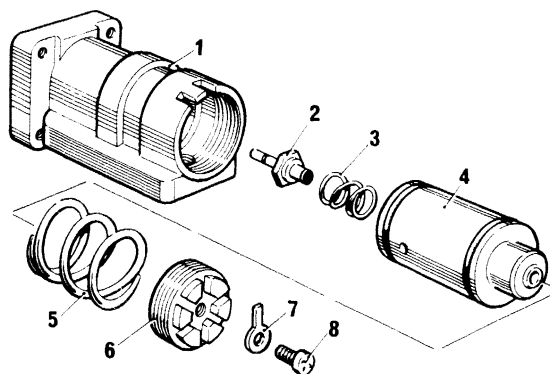
179 To disassemble valve lever, cam, and lever return spring from lever housing, use a thin rod to tap shaft (1) from the centre of valve cam pivot shaft (2). Push out pivot shaft from lever housing (3) and withdraw lever return spring (4) and cam (5).



- | | |
|--------------------|------------------|
| 1. Shaft | 4. Return spring |
| 2. Cam pivot shaft | 5. Cam |
| 3. Lever housing | |

Fig 51 - Lever housing disassembly

180 Remove 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).

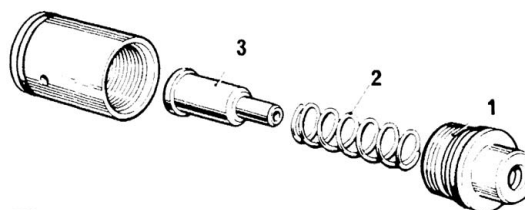


7902

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

181 Unscrew 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.



7903

1. Valve carrier body
2. Piston spring
3. Piston

Fig 53 - Valve carrier body

Inspection

182 Examine sliding surfaces of valve body and pistons for excessive wear or scoring. Inspect operating cam in lever housing for wear or burrs.

183 Renew all O-rings.

Reassembly and installation

184 Reassembly 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.

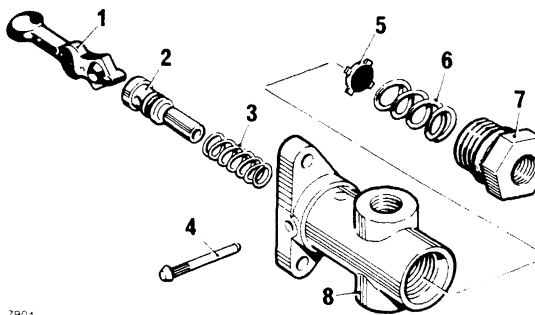
TRAILER PARK CONTROL VALVE

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 | 5. Disc valve |
| 2. Plunger | 6. Spring |
| 3. Spring | 7. Plug |
| 4. Lever pivot pin | 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.

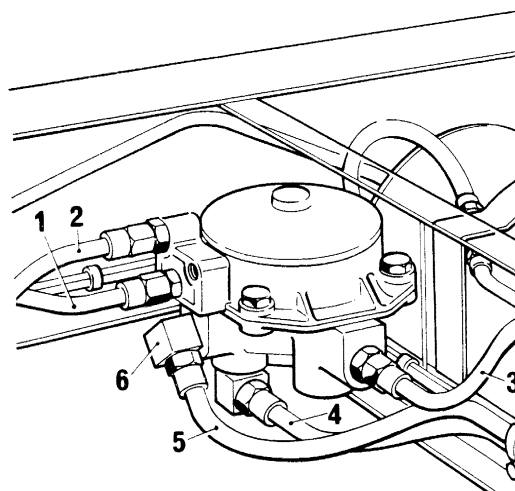
189Smear sliding surfaces of lever, plunger and pivot pin with Rocol E1A grease before reassembly.

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.



7935

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

194 Removal 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.

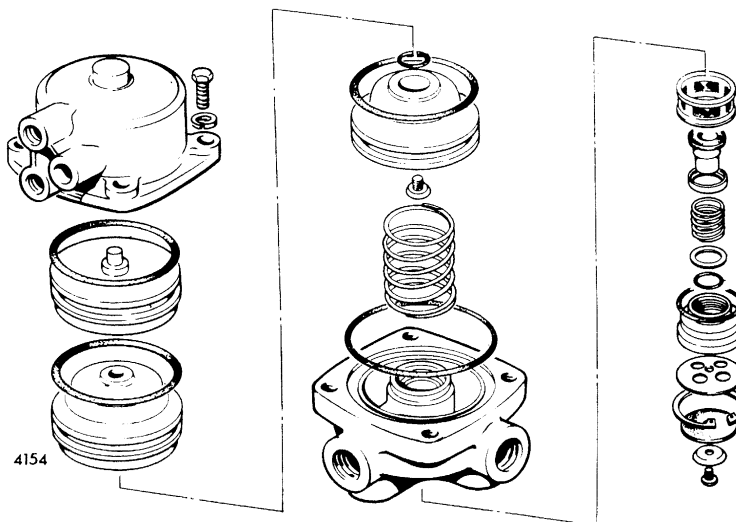


Fig 56 - Dual relay valve disassembly

195 Remove circlip and withdraw exhaust diaphragm guide assembly, filter spring, inlet/exhaust valve and valve retainer from valve body.

Inspection and reassembly

196 Inspect sliding surfaces of pistons and cover for wear and scores, and seals for deterioration. Renew parts as necessary.

197 On reassembly, liberally smear all sliding surfaces and seals with Rocol E1A grease.

198 Assemble retainer to inlet/exhaust valve and position in valve body.



S8445

Fig 57 Inlet/exhaust valve retainer
assembly

199 Assemble O-ring and retainer to inlet/exhaust valve guide before installing guide in valve body.



Fig 58 - Inlet/exhaust valve guide assembly

Installation

200 Before assembling pistons to top cover of the valve, install O-ring (arrowed) to centre piston stem.

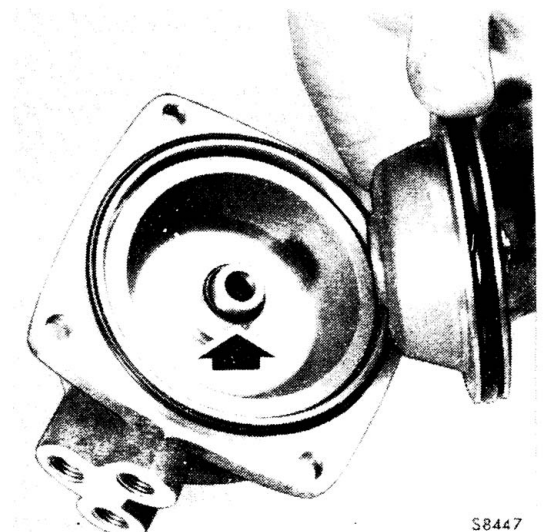


Fig 59 - Installation of O-ring to centre of piston stem

201 After installing valve, carry out operating and leakage tests as described in para 193 of this chapter.

PRESSURE LOSS LIMITING VALVE

202 The pressure loss limiting valve is located midway along the chassis left-hand sidemember.

Operating and leakage test

203 To 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.

204 If the operating pressure is not 4.5-4.8 bar (65-70 lbf/in²) adjust valve spring tension by means of the screw in cover.

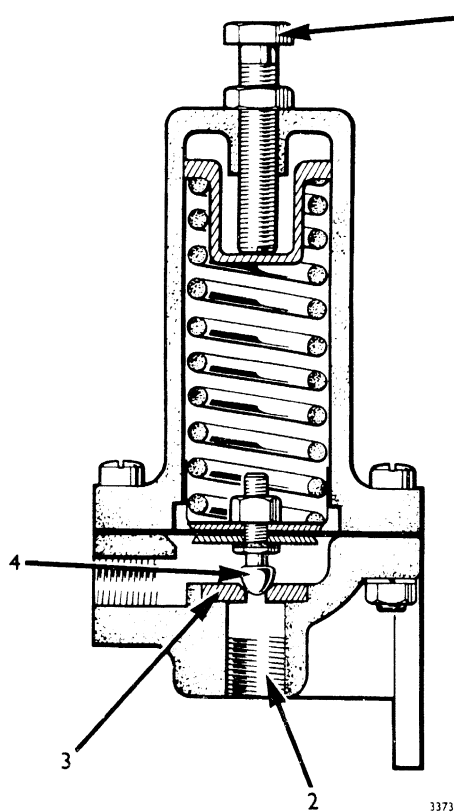
205 Valve may be checked for leakage by fully charging air system and smearing body and cover with soap solution. Leakage from cover indicates a faulty diaphragm.

Disassembly

206 When disassembling valve, back off adjusting screw (1) before progressively slackening cover bolts.

207 Valve seat (3) may be removed by inserting a drift through delivery port (2).

208 Diaphragm and valve assembly (4) together with valve seat are contained in repair kit.



- | | |
|--------------------|---------------|
| 1. Adjusting screw | 3. Valve seat |
| 2. Delivery port | 4. Valve |

Fig 60 - Pressure loss limiting valve assembly

Reassembly

209 After 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.

210 Install 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

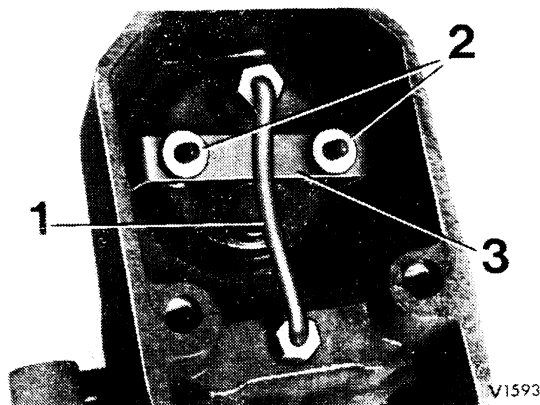
211 The tyre inflator is located midway along the left-hand chassis sidemember.

Removal

212 Disconnect air supply pipe and remove the two bolts securing inflator to mounting bracket.

Disassembly

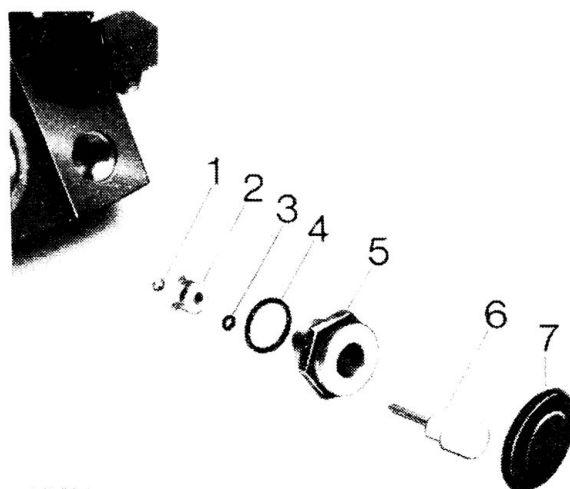
213 Remove air pressure gauge after disconnecting pipe (1) and removing clamp nuts (2) and bracket (3).



1. Pipe 2. Clamp nuts
3. Bracket

Fig 61 - Removing air pressure gauge

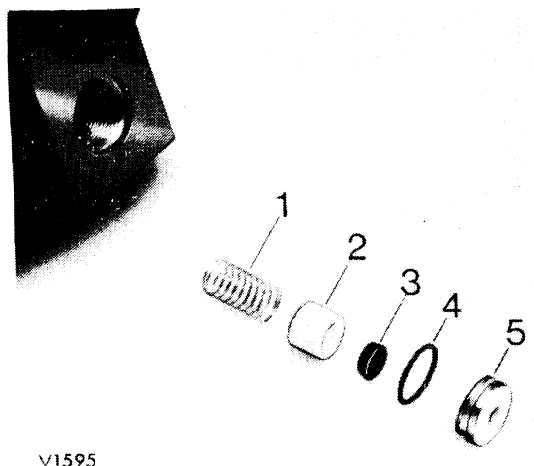
214 Remove gaiter (7) from the 'DEFLATE' button and unscrew the push rod/operating button and guide assembly. Remove push rod guide O-ring (4) and circlip (1) and bridge type O-ring retainer noting the way it is fitted. Press the push rod/operating button (6) from the guide (5) and remove the push rod 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

215 Carefully apply air pressure to valve inlet port to remove valve seat (5) and O-ring (4), valve (3), guide (2) and return spring (1).



V1595

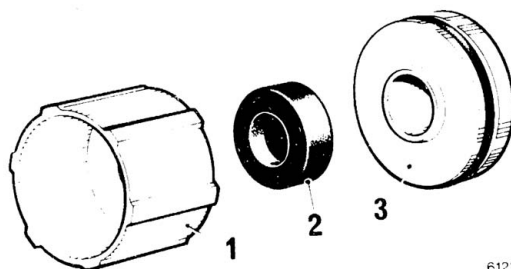
- | | |
|-----------|---------------|
| 1. Spring | 4. O-ring |
| 2. Guide | 5. Valve seat |
| 3. Valve | |

Fig 63 - Removal of valve seat

Repeat the procedure for the 'INFLATE' button

Reassembly

216 Reassembly 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.



6122

- | | |
|----------------|----------|
| 1. Valve guide | 2. Valve |
| 3. Valve seat | |

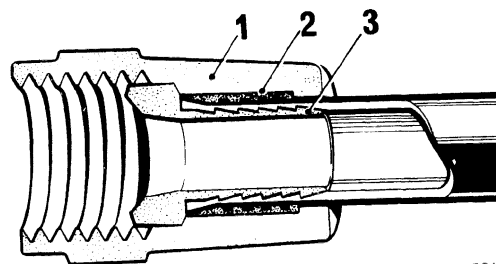
Fig 64 - Valve and valve seat installation

Installation

217 Install 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.

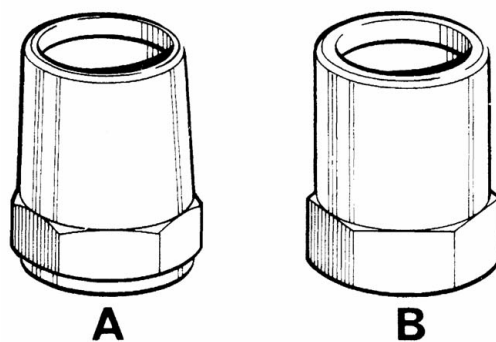


5914

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.

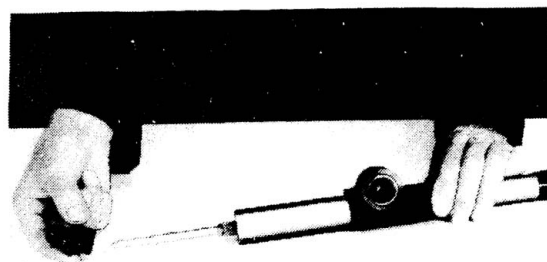


5915

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.



V1545

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.

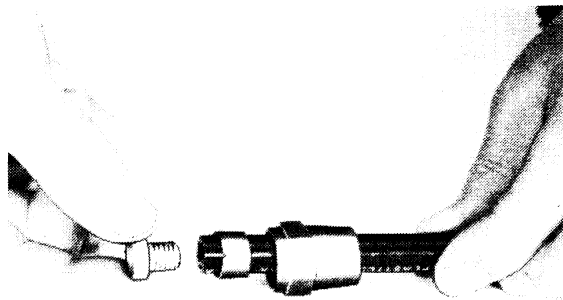


Fig 68 - Assembling end fittings^{V1546}
to pipe

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.

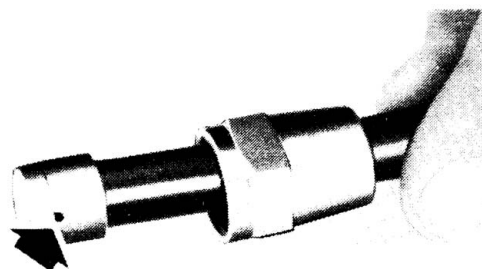


Fig 69 - Checking for correct^{V1547}
assembly

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.

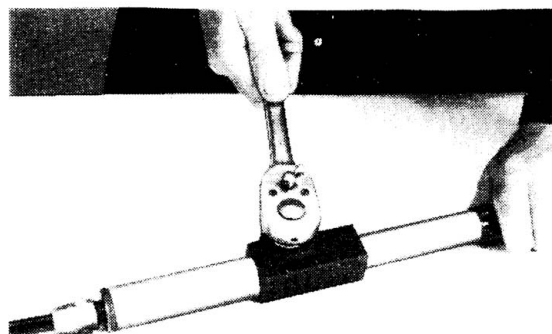
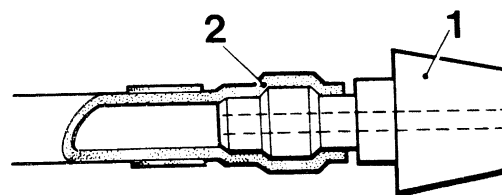


Fig 70 - Completing pipe and^{V1548}
fitting installation

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.



8108

- 1. Nipple end fitting
- 2. Gauge pipe

Fig 71 - Gauge pipe nipple end fitting

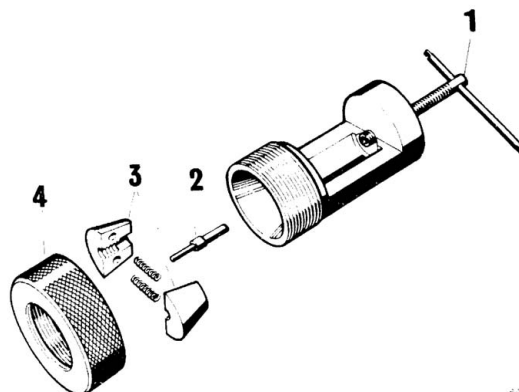
Nipple end fittings installation

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 adjustmentWARNINGS ...

- (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.

224 Jack up rear road wheels and to centralize brake shoes, fully apply parking brake and then release the lever to the 'off' position.

225 Turn shoe adjuster clockwise until shoes are hard in contact with drum, then back off until shoes are just clear of drum.

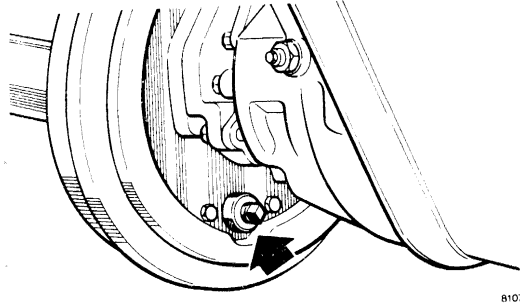


Fig 73 - Parking brake adjuster

226 If, 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

227 The parking brake drum locates over the rear axle pinion shaft flange bolts and is secured to the flange by two countersunk head screws.

Removal

228 Disconnect 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

229 Locate brake drum over pinion shaft flange bolts. Use a new gasket between the drum and pinion shaft flange.

230 Install drum retaining screws, refit propeller shaft and tighten propeller shaft nut to 108 Nm (80 lbf ft).

231 Adjust brake as described in para 224.

PARKING BRAKE SHOESRemoval

232 Remove brake drum as described in para 228.

233 Prise 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:

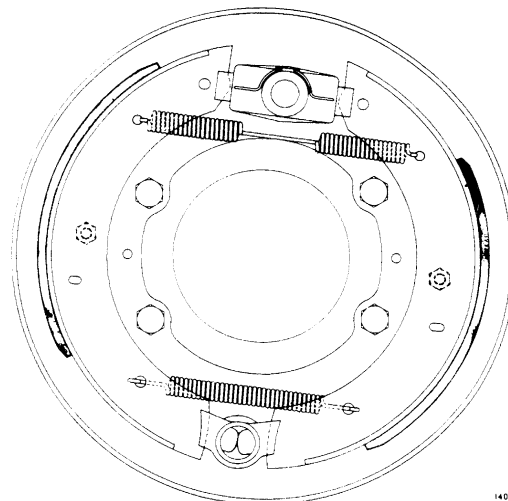


Fig 74 - Parking brake assembly

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

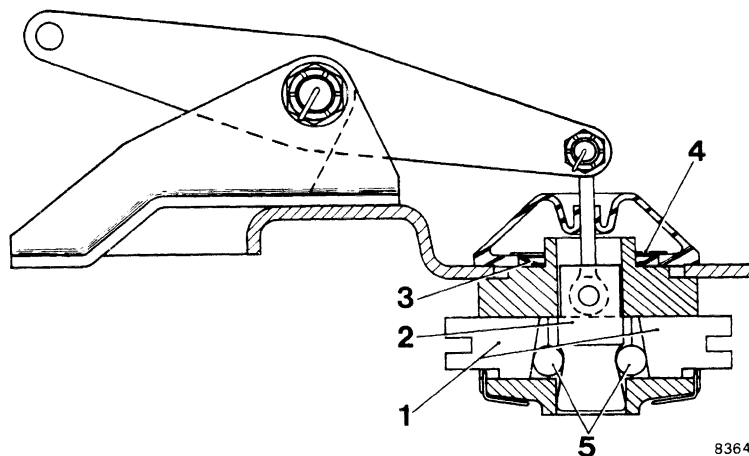
239Remove brake drum and brake shoes as described in paras 228 and 232 of this chapter.

240 Disconnect the expander draw link from the lever.

241 Detach the rubber dust cover from the back plate and withdraw the draw link and plunger (2).

242 Remove the spring clip and withdraw the tappets (1) and rollers (5).

243 Withdraw the retaining spring (3) and locking plate (4) from the groove in the expander housing and remove housing.



- | | |
|------------|---------------------|
| 1. Tappets | 3. Retaining spring |
| 2. Plunger | 4. Locking plate |
| 5. Rollers | |

Fig 75 - Parking brake expander

Installation

244 Lubricate the tappets, rollers, plunger and link pin with XG 279 grease.

245 Installation 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.

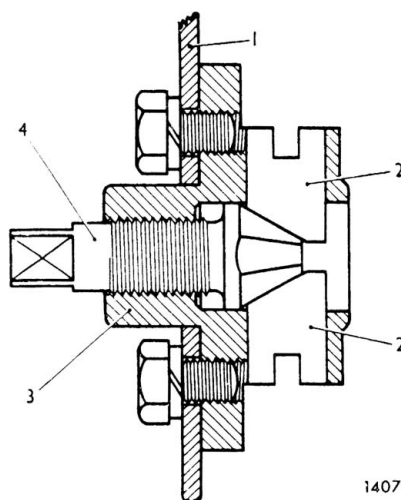
246 Install parking brake drum and shoes as described in para 229 and 236 of this chapter.

PARKING BRAKE SHOE ADJUSTER

Removal

247 Remove brake drum and shoes as described in paras 228 and 232 of this chapter.

248 Remove 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

249 Withdraw the tappets and unscrew the adjuster clockwise as viewed from the square end.

250 When 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.

251 Tighten the bolts to 30 Nm (22 lbf ft).

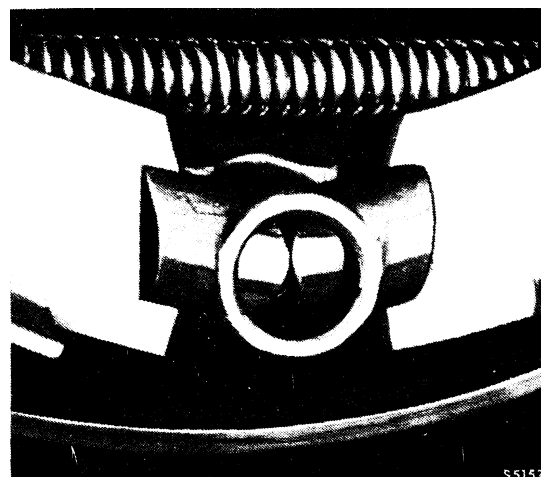


Fig 77 - Brake adjuster tappets installation

Installation

252 Install brake drum and shoes as described in paras 229 and 236 of this chapter.

PARKING BRAKE CABLES

253 Disconnect the rear cable from the lever on the brake back plate.

254 Slacken the locknut and unscrew the adjusting sleeve connecting the front and rear cables.

255 Release the spring clip and withdraw the rear cable outer casing from the brackets on the brake back plate and chassis frame.

256 Slacken the locknut and unscrew the front cable adjusting sleeve from the clevis.

257 Detach the front cable clip from the engine support crossmember.

258 Release the spring clips and withdraw the front cable outer casing from the brackets on the cab and chassis frame.

Installation

259 Adjust brake shoes as described in para 221.

260 Installation of cables is a reversal of removal. Ensure that the threaded sleeves are engaged by an approximately equal amount.

261 Adjust 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 LEVERRemoval

262 From inside the engine compartment, remove the clamp bolt and withdraw the lever from the brake cross-shaft.

263 Remove 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.

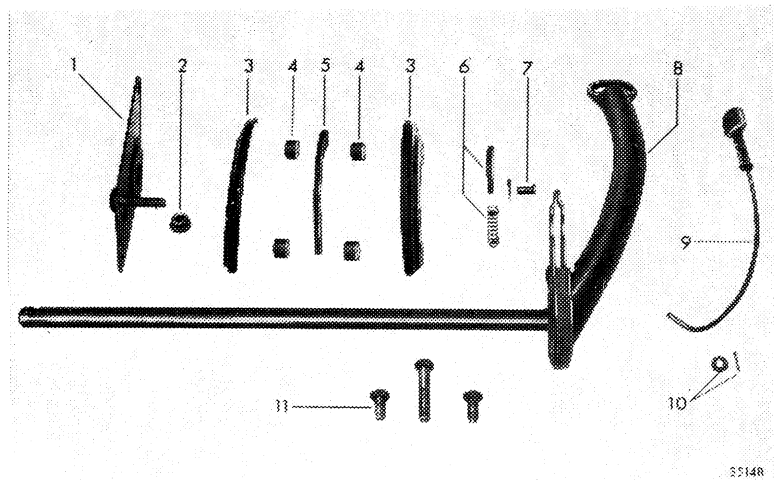
Disassembly and inspection

264 Remove the nut and plain washer securing the lever guard and sector to the support bracket, and lift away the guard sector and spacers.

265 Detach the rod from the pawl, remove the securing pin and lift away the pawl and spring.

266 Withdraw the rod, spring and spring seat from the lever.

267 Check 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.

268 Reassembly 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

269 Installation 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

Para

- 1 Accelerator pedal linkage

Fig

- 1 Accelerator pedal linkage adjustment

Page

2

ACCELERATOR PEDAL LINKAGEAdjustment

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').

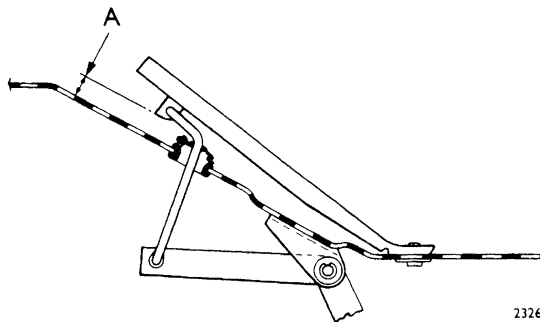


Fig 1 - Accelerator pedal linkage adjustment

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

Para

1	Radiator header tank
4	Radiator
9	Fan and viscous drive
10	Water pump

Fig

1	Radiator mountings
2	Installing locking wire

Page

2
2

RADIATOR HEADER TANKRemoval and Installation

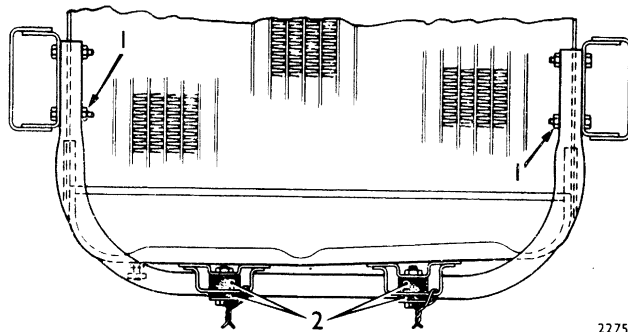
- 1 Slacken the clip securing the filler pipe hose to the tank. Detach the vent pipe.
- 2 Remove the bolts securing the tank, and release the tank from the filler pipe hose.
- 3 After installing the tank, top up the cooling system.

RADIATORCAUTION ...

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.



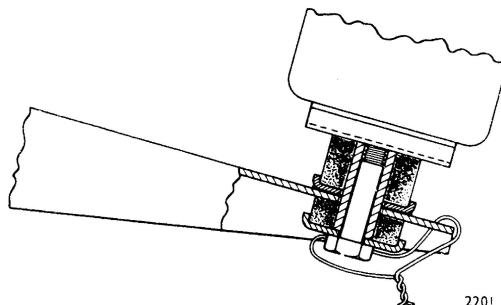
2275

2. Lower support insulators
Radiator mountings

Fig 1

Installations

- 7 When installing radiator, ensure that the thicker insulators are inserted above support, and secure bolts with locking wire.



2201

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

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3	CAV AC5R/24 alternator brush gear	A6
7	CAV CA45F starter	A7
14	Head lamps	A8
18	Head lamp aligning	A8
20	Side lamps	A9
25	Front turn signal lamp/hazard warning	A9
29	Rear turn signal lamp/hazard warning/stop and tail lamp	A10
30	Rear number plate/convoy lamp	A10
31	Turn signal and hazard warning unit	A10
33	Turn signal relay isolating unit	A11
37	Oil/air pressure warning buzzer	A11
41	Trailer park warning buzzer	A12
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93	Speedometer and tachometer cables	B6
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6	Rear number plate/convoy lamp	A10
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12	Interior lamp lens removal	A13
13	Fog rear guard lamp switch connections	A14
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41	Prising off E-clip	C2
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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

GENERALCAUTION ...

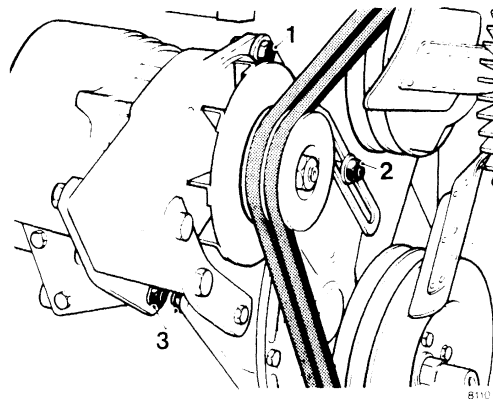
Before disconnecting any wire in the electrical system ensure a battery terminal is disconnected.

CAV AC5R/24 ALTERNATORCAUTION ...

- (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

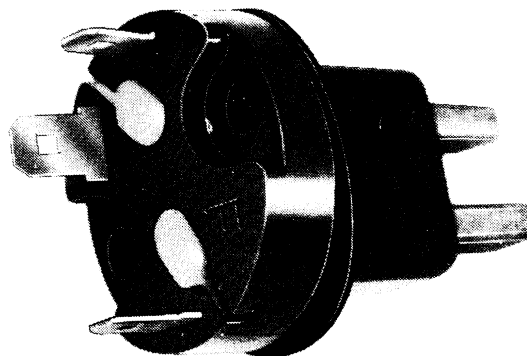
2 When installing alternator, adjust drive belts as described in AESP 2320-H-100-201, Chap 5 - 1 User Maintenance.

CAV AC5R/24 ALTERNATOR BRUSH GEARRemoval

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.

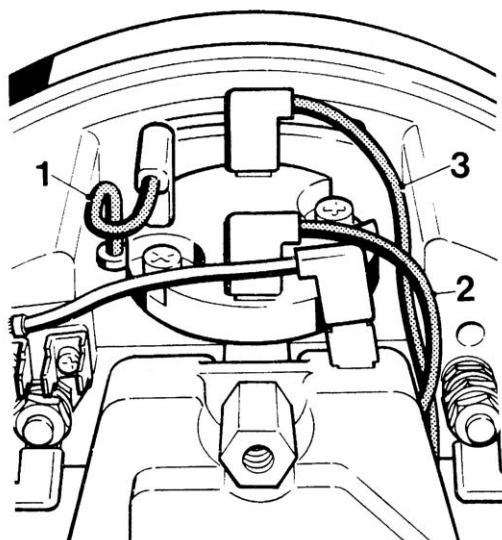


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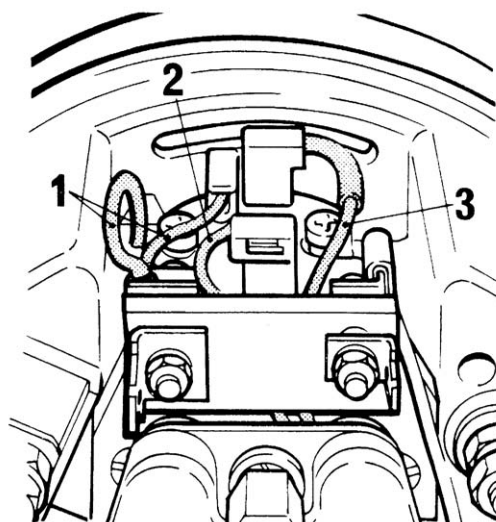
Fig 2 - Brush gear removed from alternator

Installation

6 After installing brush gear, reconnect wiring as follows: 1 - yellow, 2 - green, 3 - yellow with red sleeve.



8111



6104

Chassis ground return

1 Yellow

2 Green

Insulated ground return

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.

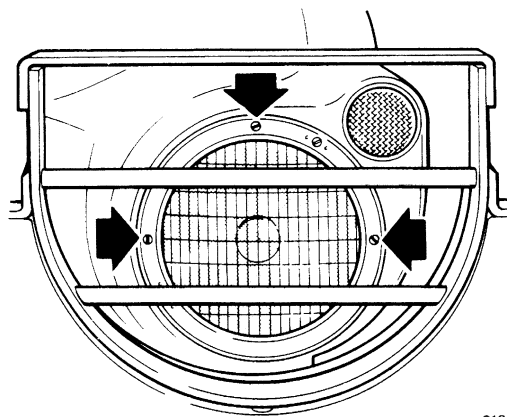
16 Head lamp body and seals can be removed after releasing four fixing screws.

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.



8137

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.

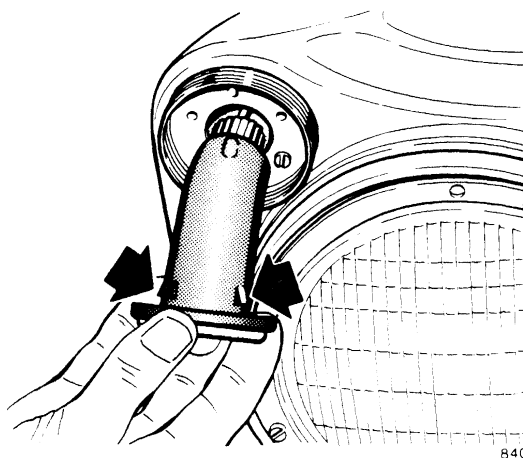


Fig 5 - Side lamp locating pips

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.

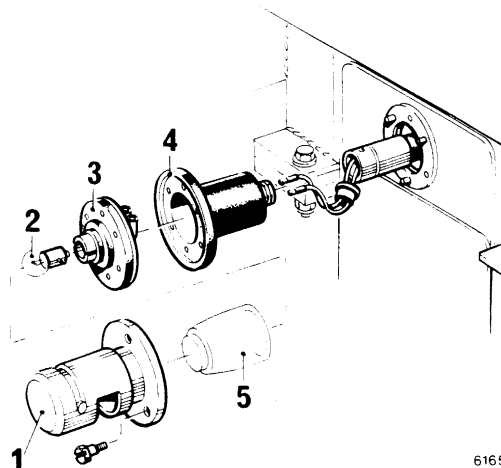
28 Locate lamp wire behind panel spacer before connecting to main harness.

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 LAMPRemoval

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.



6165

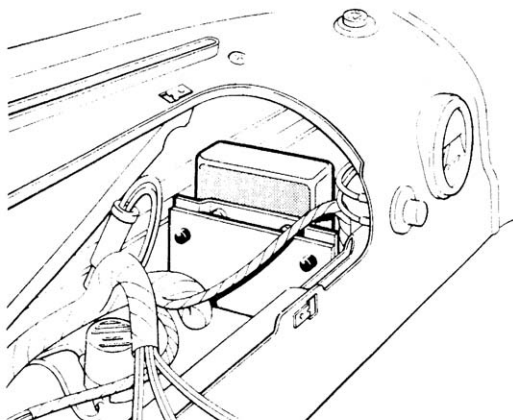
- | | |
|----------------------|------------|
| 1. Lamp cover | 4. Housing |
| 2. Bulb | 5. Glass |
| 3. Detachable holder | |

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.



8103

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.

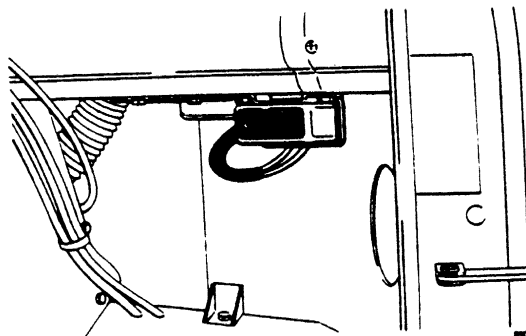


Fig 8 - Turn signal relay isolating unit

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.

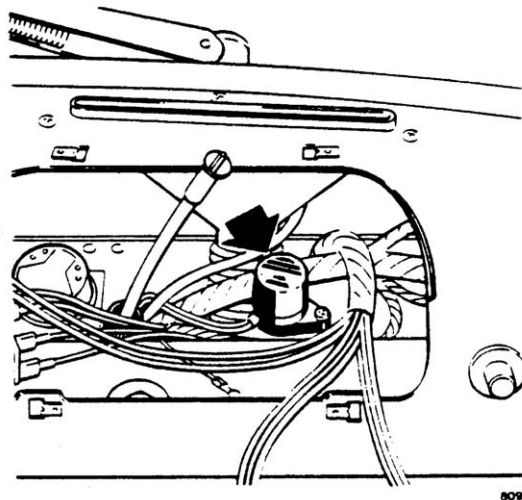


Fig 9 - Air pressure warning buzzer

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.

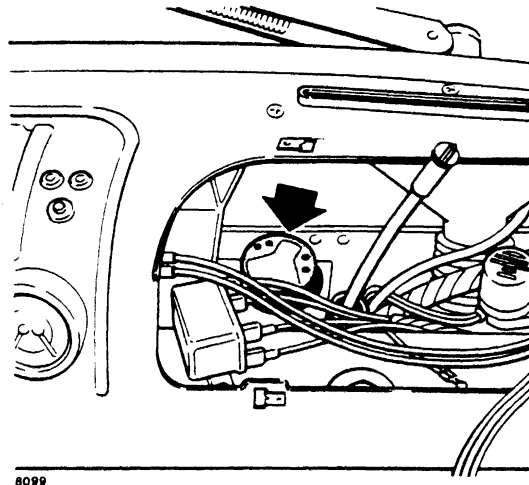


Fig 10 - Trailer park warning buzzer

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.

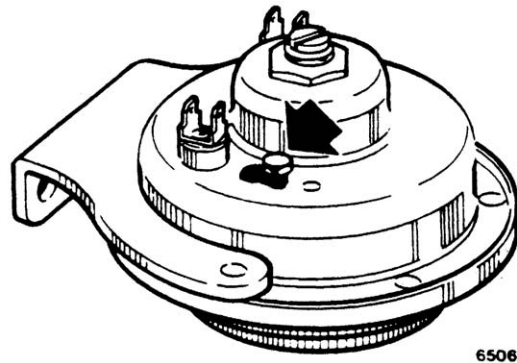


Fig 11 - Horn adjuster

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.

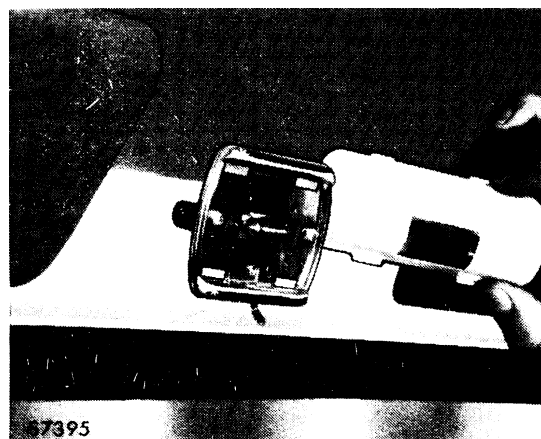


Fig 12 - Interior lamp lens removal

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 adjacent to the infra-red lighting switch. See para 55 for location and removal of infra-red lighting switch.

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

INFRA-RED LIGHTING SWITCHRemoval

55 Remove locknut and withdraw switch from behind dash panel and disconnect wiring.

55.1 Installation

Connect wiring to relay terminals as follows:

Terminal No	Colour
1	Blue
2	Brown
3	Brown/White
5	Brown/Blue
6	Blue

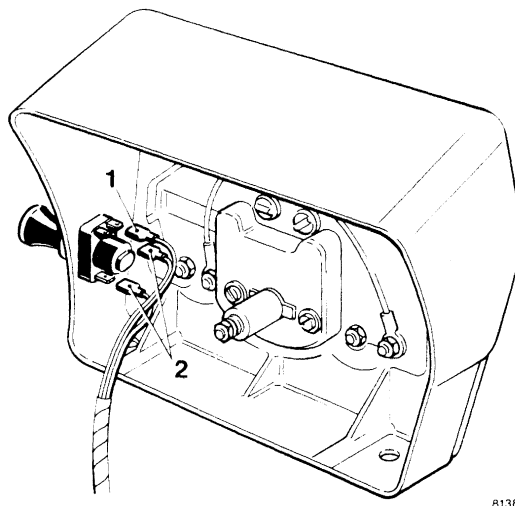
FOG REAR GUARD LAMP SWITCHRemoval

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.



8138

- 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.

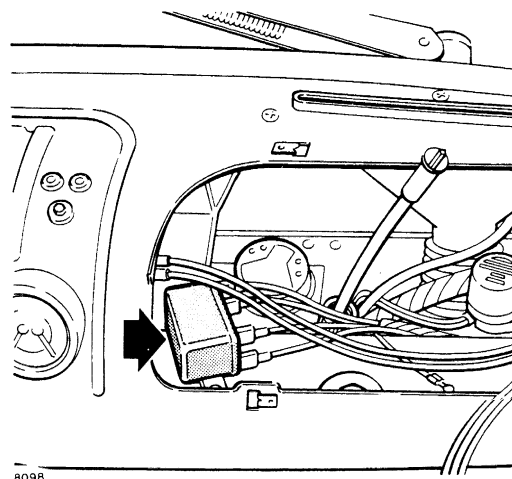


Fig 14 - Fog rear guard relay

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.

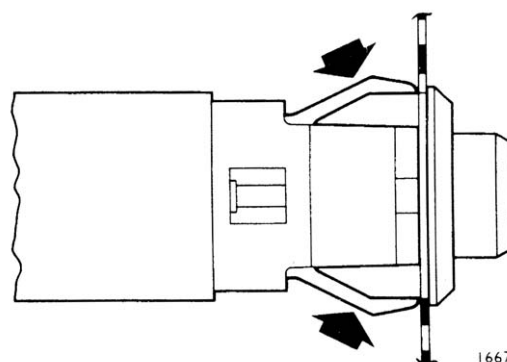


Fig 15 - Switch integral catches

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.

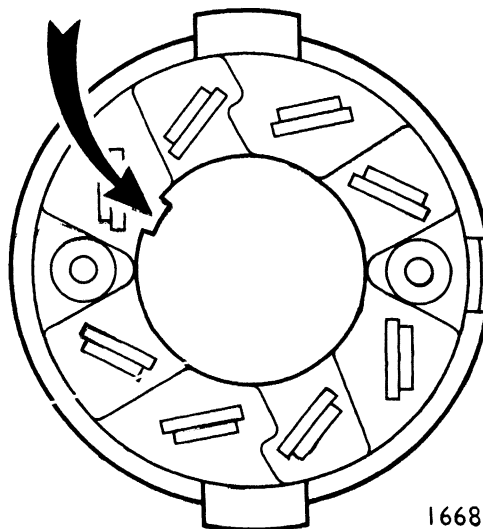


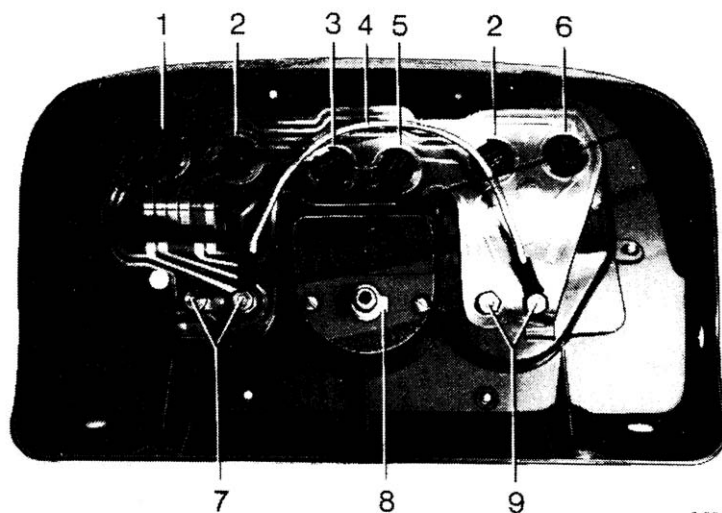
Fig 16 - Harness connector
key-way

INSTRUMENT ASSEMBLYRemoval

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 | 4. Connecting strip | 7. Fuel gauge |
| 2. Instrument lamps | 5. Turn signal indicator lamp | 8. Speedometer |
| 3. Main beam indicator lamp | 6. Alternator warning lamp | 9. Water temperature gauge |

S5361

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.

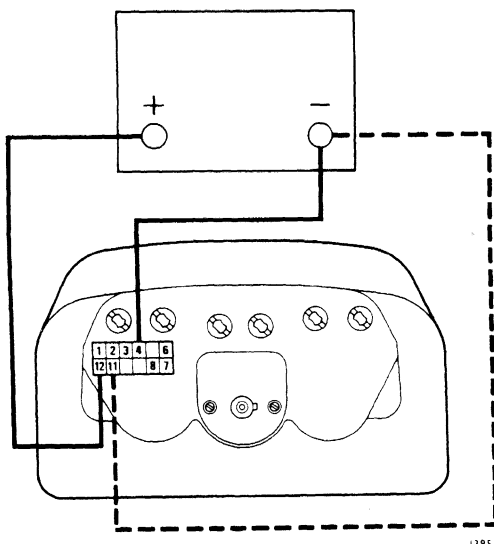


Fig 18 - Fuel gauge test

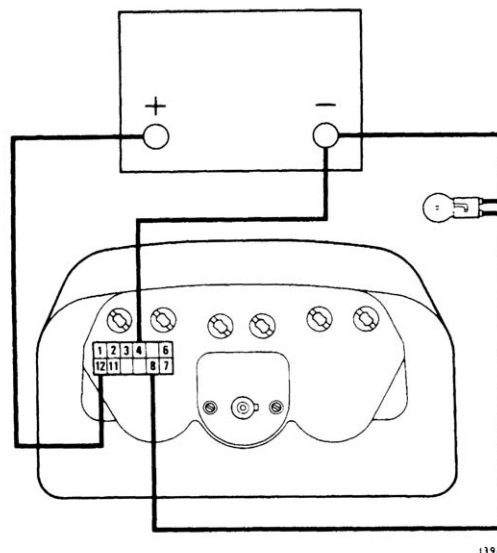


Fig 19 - Water temperature gauge test

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.

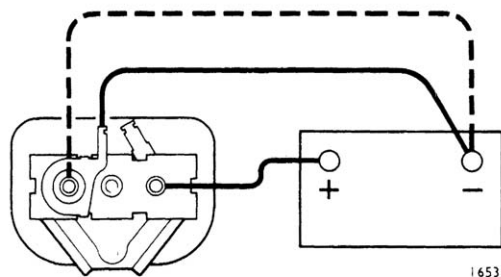


Fig 20 - Fuel gauge test, gauge removed from assembly

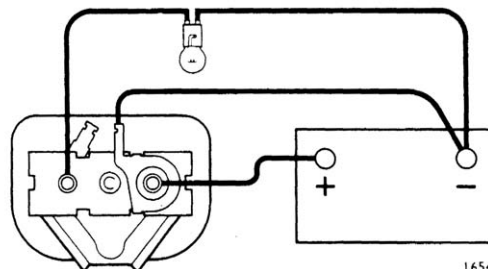


Fig 21 - Water temperature gauge test, gauge removed from assembly

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.

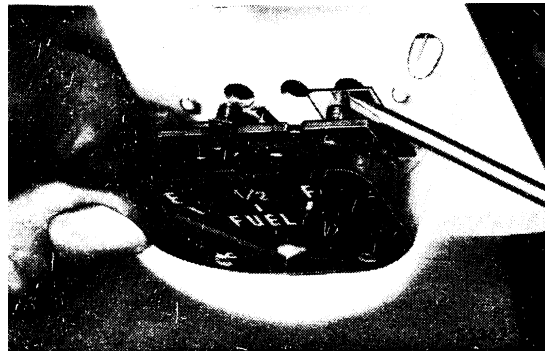


Fig 22 - Easing the printed circuit ground tab off the gauge stud

77 After tapping out the retaining button 'A', the printed circuit can be withdrawn. The circuit is located by dowel 'B'.

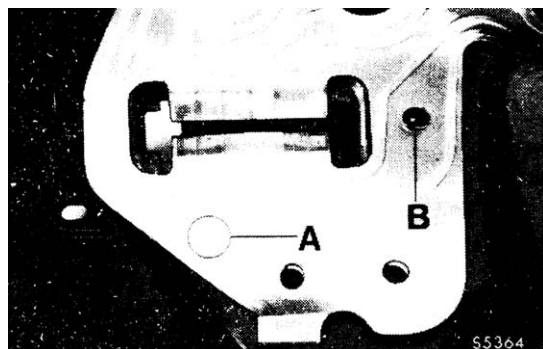


Fig 23 - Printed circuit location and retention

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.

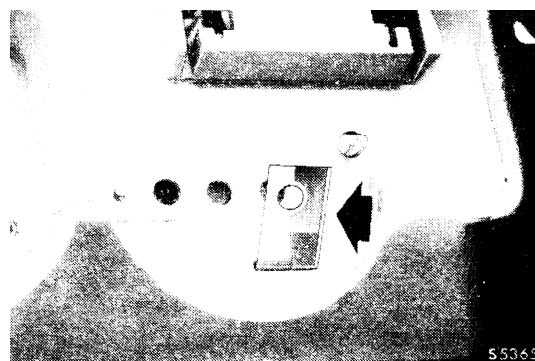


Fig 24 - Installing gauge to printed circuit ground tab

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.

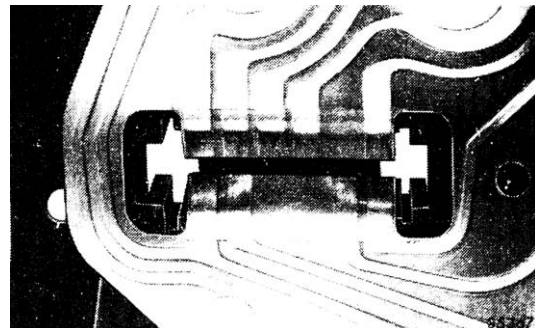


Fig 26 - Multi-socket connector location

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 onlyRemoval

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 UNITRemoval

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 CABLESRemoval

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.

100 The keyed end of tachometer cable is assembled to the drive housing on the engine.

INSTRUMENT AND WARNING LAMP BULBS

Removal

101 To gain access to bulbs, remove main instrument assembly as described in para 66.

102 Remove 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

103 Remove switch locking ring and withdraw the switch from beneath the engine compartment top panel. Retain washer between switch and panel.

Dismantling

104 Drill through the thin section (arrowed) to gain access to the lock barrel release plunger.

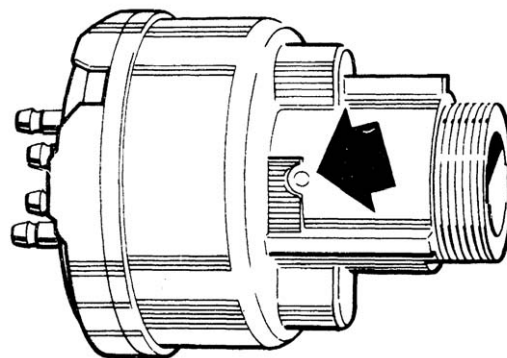
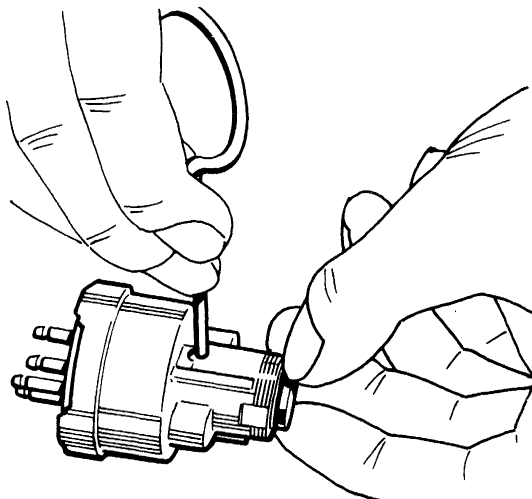


Fig 28 - Barrel release plunger location

105 With 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.



8136

Fig 29 - Withdrawing the key start switch barrel

Reassembly

106 Align 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

107 The switch is located by flats on the switch body panel.

HEAD LAMP DIP SWITCH AND HORN PUSH

Dip switch test

108 Disconnect switch harness at multi-socket plug behind dash panel.

109 Switch on headlamps.

110 Connect 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

111 Connect 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

112 Disconnect the wiring harness at the multi-socket plug behind dash panel and unclip the harness from steering column.

113 Remove 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.

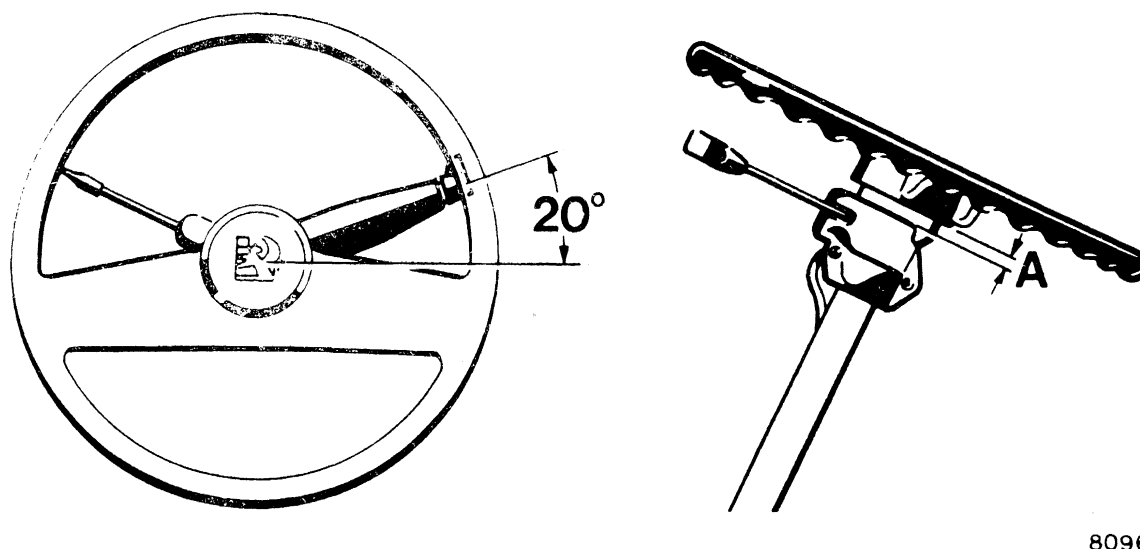


Fig 30 - Location of turn signal switch, dipswitch and horn push
Dimension 'A' is 4.5 mm (0.18 in.)

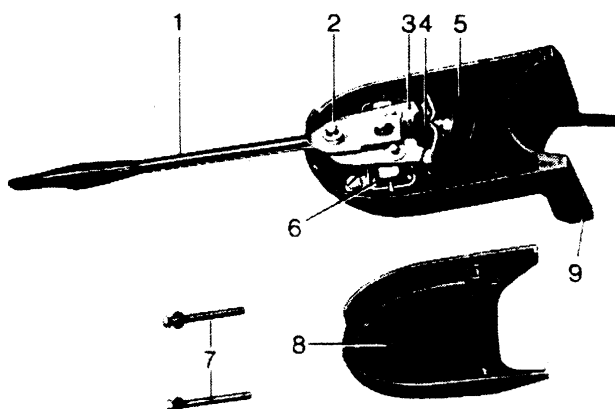
TURN SIGNAL SWITCH

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

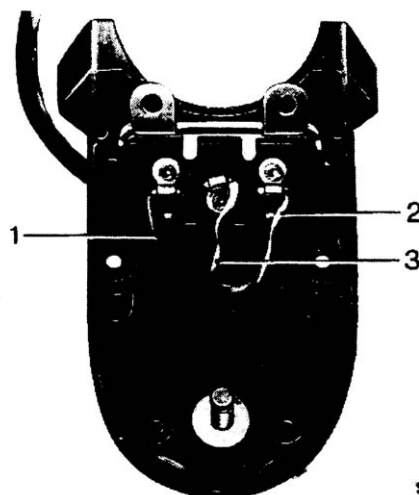
- 1 Lever
- 2 Spring clip
- 3 Action plate
- 4 Action plate spring
- 5 Rubber wheel
- 6 Switch
- 7 Upper casing attaching screws
- 8 Upper casing
- 9 Lower casing

Fig 31 - Turn signal switch details

S493

117 Remove 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).

118 When renewing harness, connect wires as shown in Fig 32.



S5402

Fig 32 - Turn signal switch wiring connections

Reassembly

119 When installing rubber wheel, place the steel washer on wheel spindle followed by any brass shims removed during disassembly.



S496

Fig 33 - Assembling rubber wheel to turn signal switch

Installation

120 Locate 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

122 The switch is secured to the cab engine cover by a slotted locking ring.

123 To 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

124 For removal and installation details refer to AESP 2815-K-062- series.

IGNITER SOLENOID SWITCH

125 Mounted on the intake manifold below the igniter supply tank, servicing is by replacement only.

Installation

126 Connect brown/red wire on connector nearest the engine rocker cover and the black wire on outer connector.

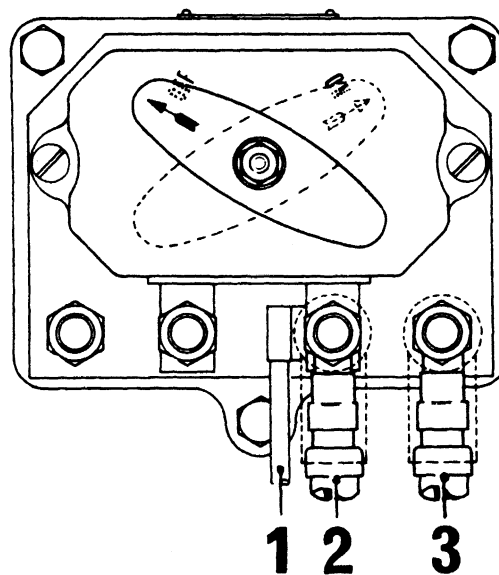
BATTERY ISOLATION SWITCH

127 The switch is bolted to the floor panel beneath the driver's seat.

128 Petroleum tanker vehicles have an additional- switch mounted on the battery carrier.

Installation

129 Connect cables to switch as illustrated.



8198

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.

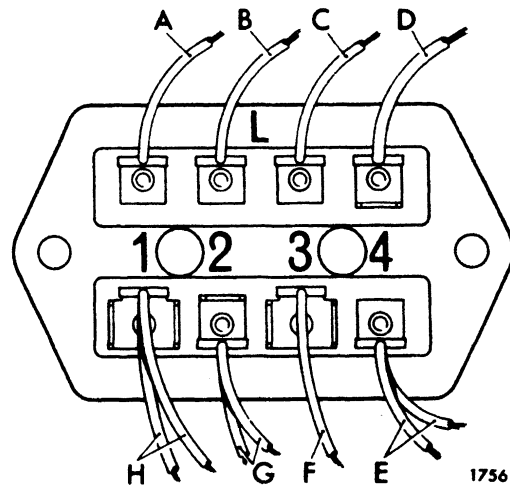


Fig 35 - Fuse box wiring connections

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:

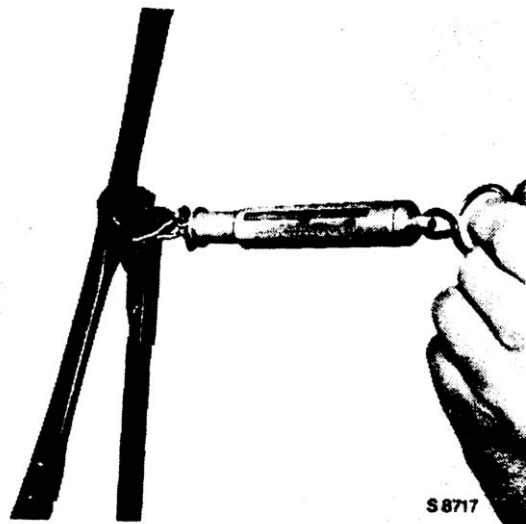


Fig 35a - Wiper arm spring retention

134Remove domed nut and prise arm from serrated driver.

135 Install 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.

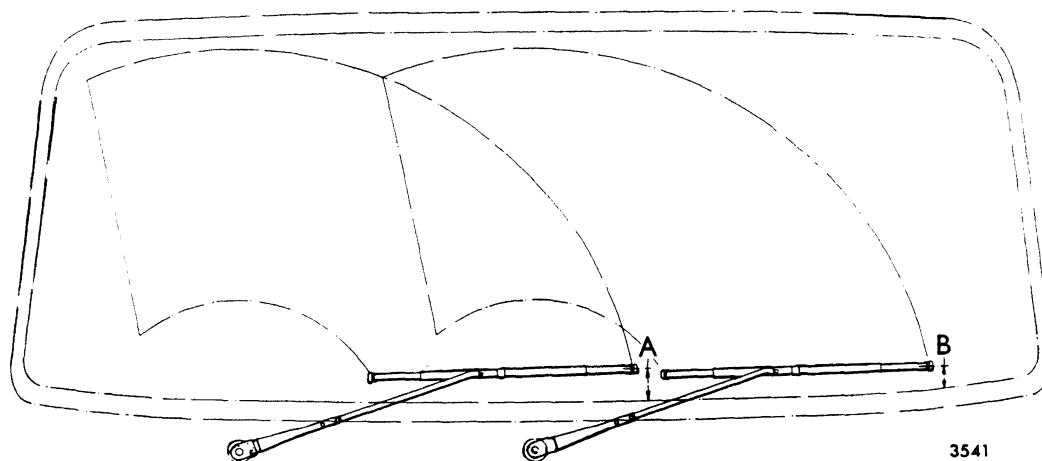


Fig 36 - Arrangement of windshield wipers. The arms and blades are shown in the parking position

136 Should 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.

137 If 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.

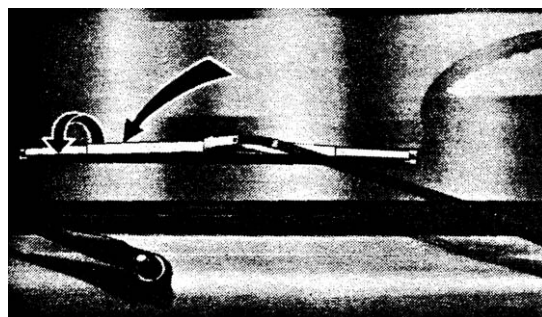
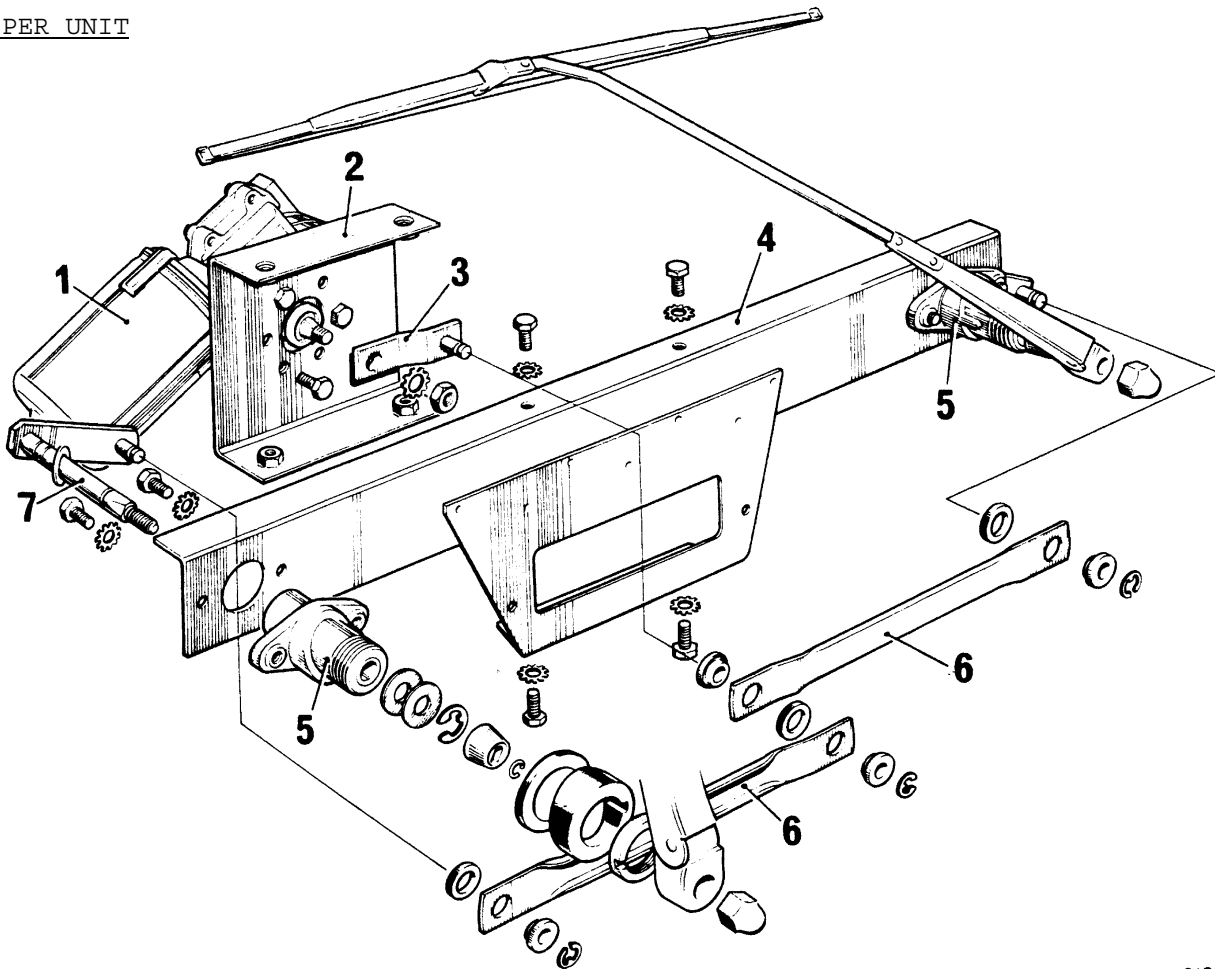


Fig 37 - Wiper arm resetting

138 Resetting of arm should be carried out gradually until wiper blade operation is normal when checked on a wet windshield.

WIPER UNIT

8199

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

144 After prising E-clip from pivot crank and removing bolts, pivot housing can be withdrawn from mounting bracket.

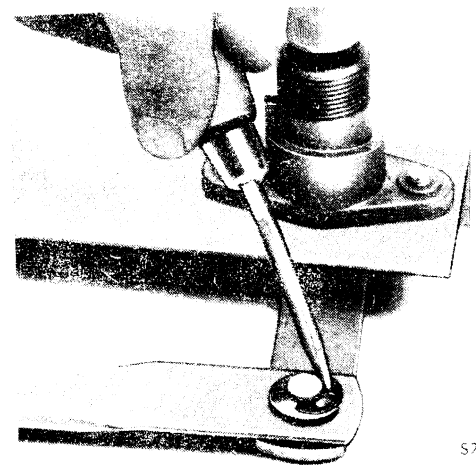


Fig 39 - Removing E-clip from pivot crank

145 Serrated driver can be prised off tapered flats on pivot spindle after removing circlip.

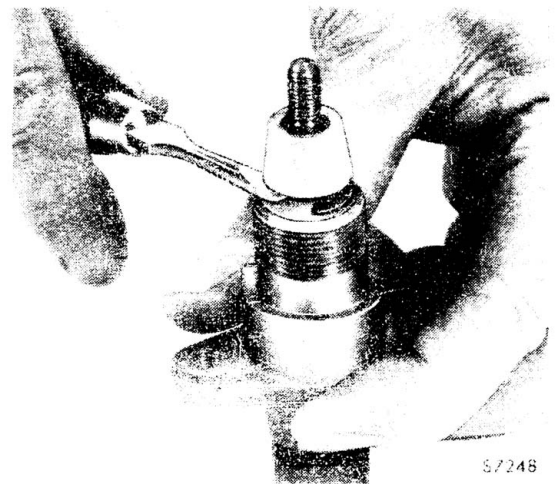


Fig 40 - Serrated driver removal

146 Spindle 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.

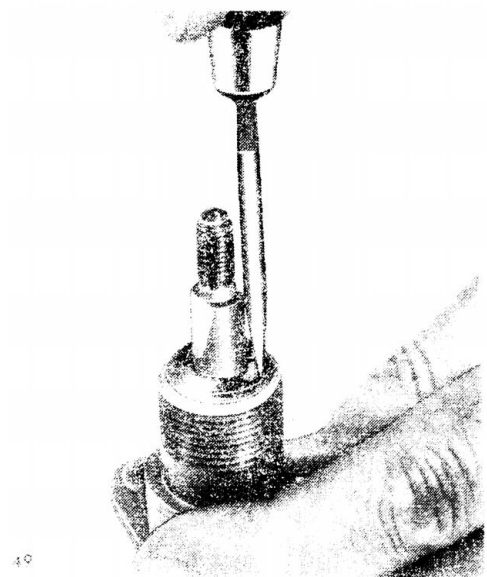
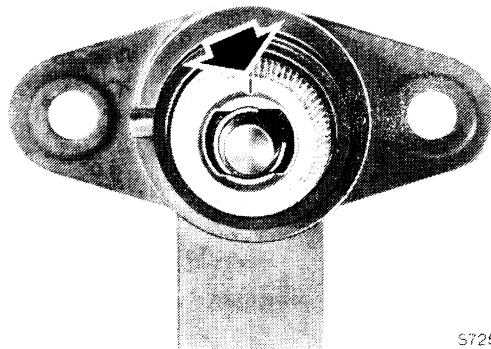


Fig 41 - Prising of E-clip

Reassembly

147When reassembling, inject XG 279 grease into annular space between pivot bearings then select shims to provide specified end float on spindle.

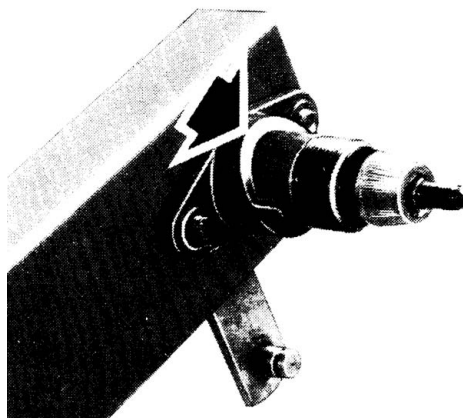
148Serrated driver must be located on spindle so that identification groove (arrowed) is away from pivot crank (ie towards top of mounting bracket when pivot is installed).



S7250

Fig 42 - Serrated driver location

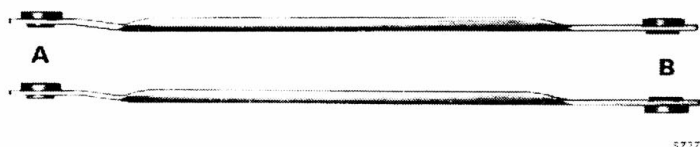
149Pivot housings are not interchangeable side for side and are marked RH and LH for right and left hand respectively. The housings must be assembled to mounting bracket so that narrow section of shoulder is towards top of mounting bracket.



S7251

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.



S7277

Fig 44 - Motor crank bush
installation

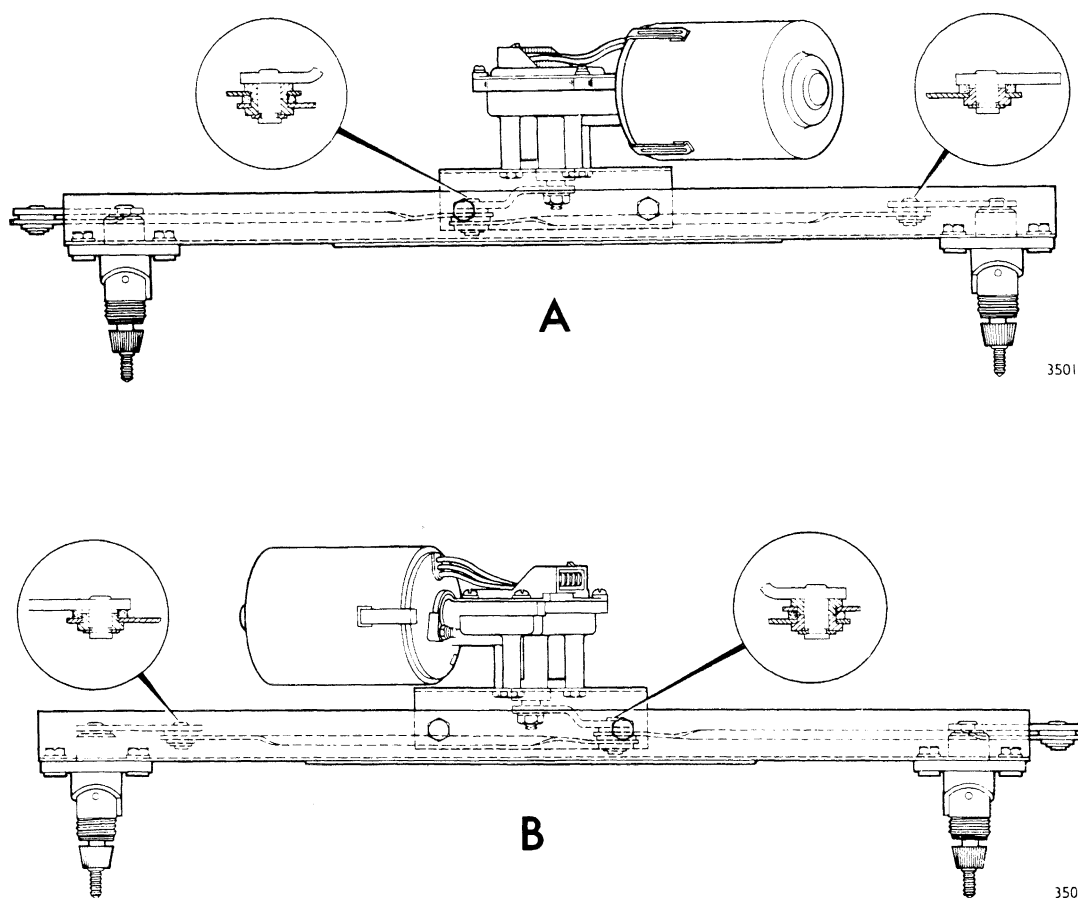


Fig 45 - Right and left drive mounting locations

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.

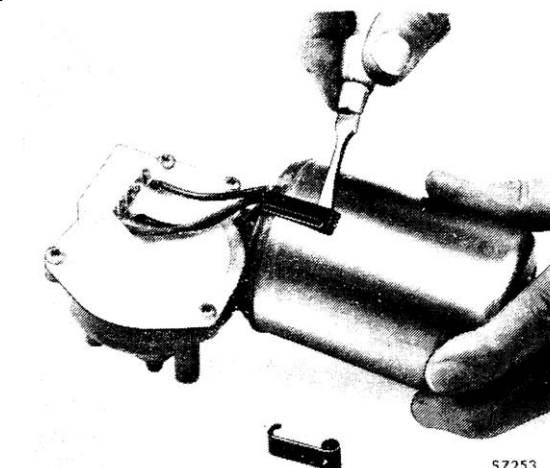
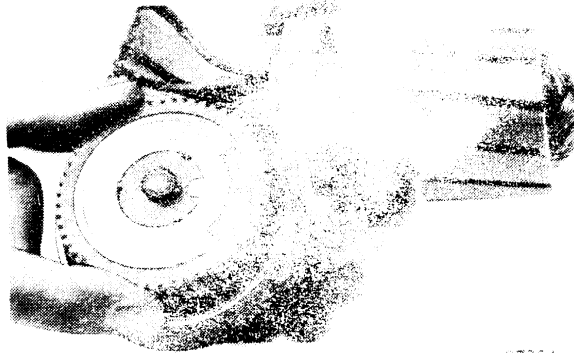


Fig 46 - Releasing end frame from gear housing

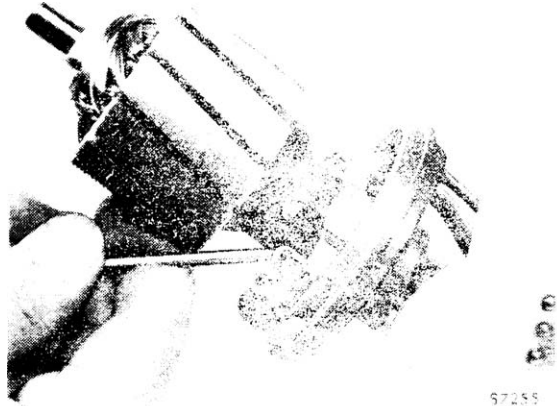
155After removing gear housing cover, secured by four screws, main gear and cross-shaft can be withdrawn.



S7254

Fig 47 - Main gear and cross-shaft withdrawal

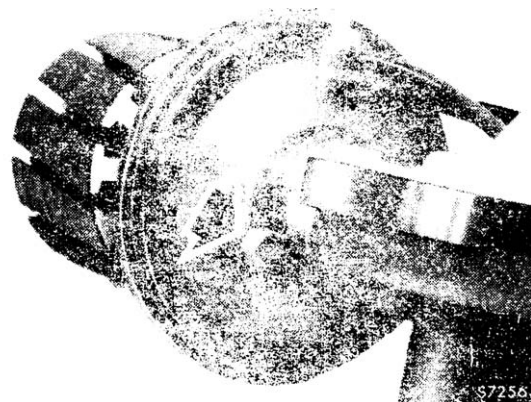
156Brush leads should be hooked over tags on brush holders, maintaining them in a retracted position, to facilitate removal of armature.



S7255

Fig 48 - Retracting brush holders

157Armature and bearing can be withdrawn after slackening bearing retainer nut.



S7256

Fig 49 - Armature and bearing withdrawal

158 Finally, 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.



V1876

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.

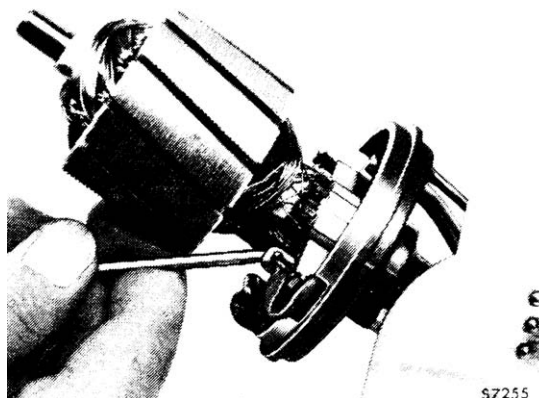
159 Check brushes for wear, if length of brushes are below 6 mm (0.24 in.) install new gear cover and brush assembly.

Reassembly

160 Before installing cross-shaft, pack space between bushes and repack housing approximately half full with XG 279.

161 Thrust 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.

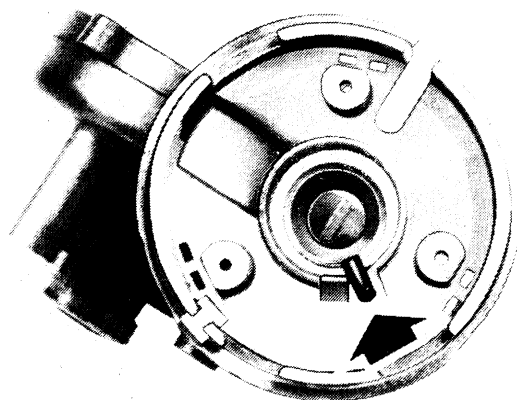
162 Brushes should be retraced before armature is inserted into gear housing. Brush leads must be unhooked, to return brushes to normal position, before end frame is replaced.



S7255

Fig 51 - Retraction of brushes

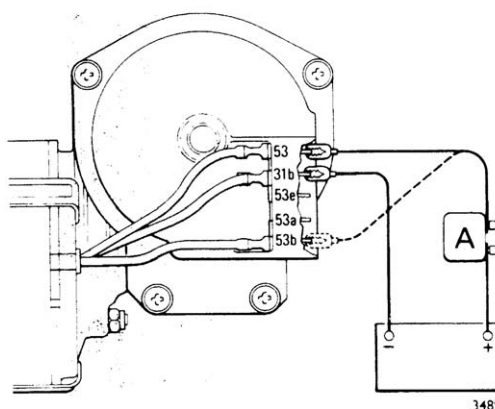
163 Ensure that L-shaped bearing retainer is positioned on bearing outer race before tightening nut.



S7258

Fig 52 - Bearing retainer positioning

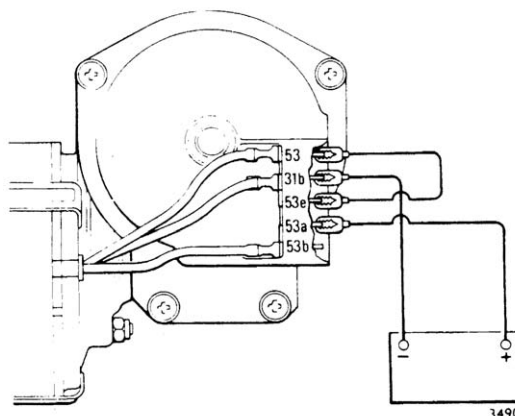
164 To test motor, connect in circuit with a 24 volt supply, and an ammeter. Connect supply negative lead to terminal '31b' and supply positive to terminal '53' for low-speed operation, or to terminal '53b' for high speed operation. Current consumption should be 2.0 amp at high speed and 1.2 amp at low speed after running light for 5 to 10 minutes.



3489

Fig 53 - Motor test connections

165 To 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.



3490

Fig 54 - Self-parking check

166 Assemble 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.

167 On right drive units install crank so that arrow on crank is in line with arrow marked 'R' on centre plate.

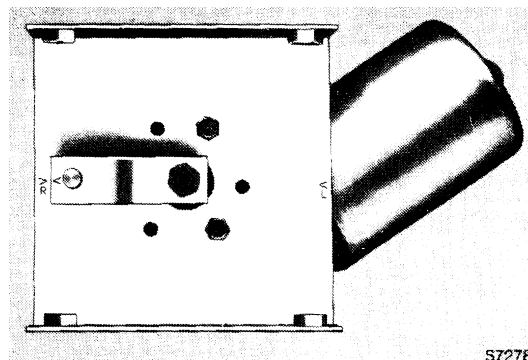


Fig 55 - Right drive crank installation

168 On left drive units install crank so that arrow on crank is in line with arrow marked 'L' on centre plate.

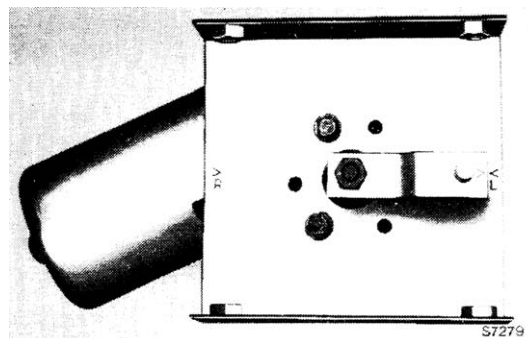


Fig 56 - Left drive crank installation

169 It is important that motor crank is held securely in a vice whilst tightening nut, otherwise cross-shaft gear will be damaged.

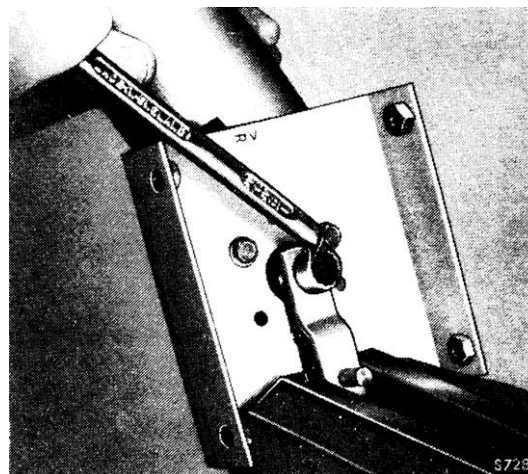


Fig 57 - Motor crank tightening

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.

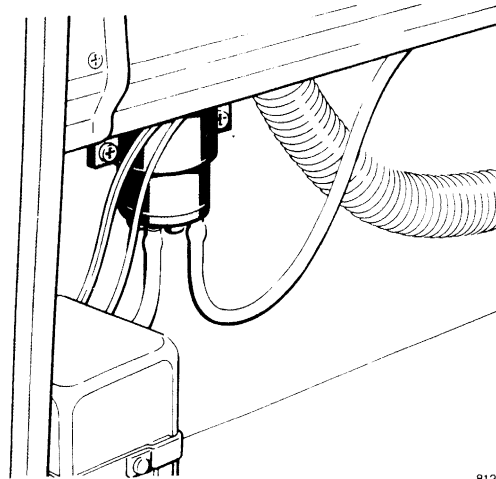


Fig 58 - Windshield wash pump location

172The outlet nozzle is identified by the arrow pointing upwards with the pump positioned as illustrated. Pump motor terminals are marked + (positive) and - (negative).

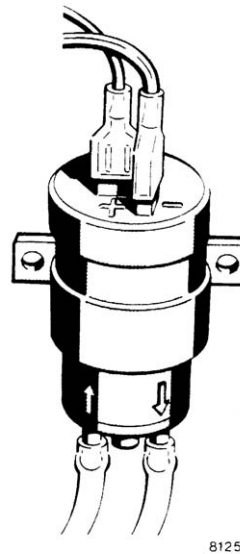


Fig 59 - Wash pump connections

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

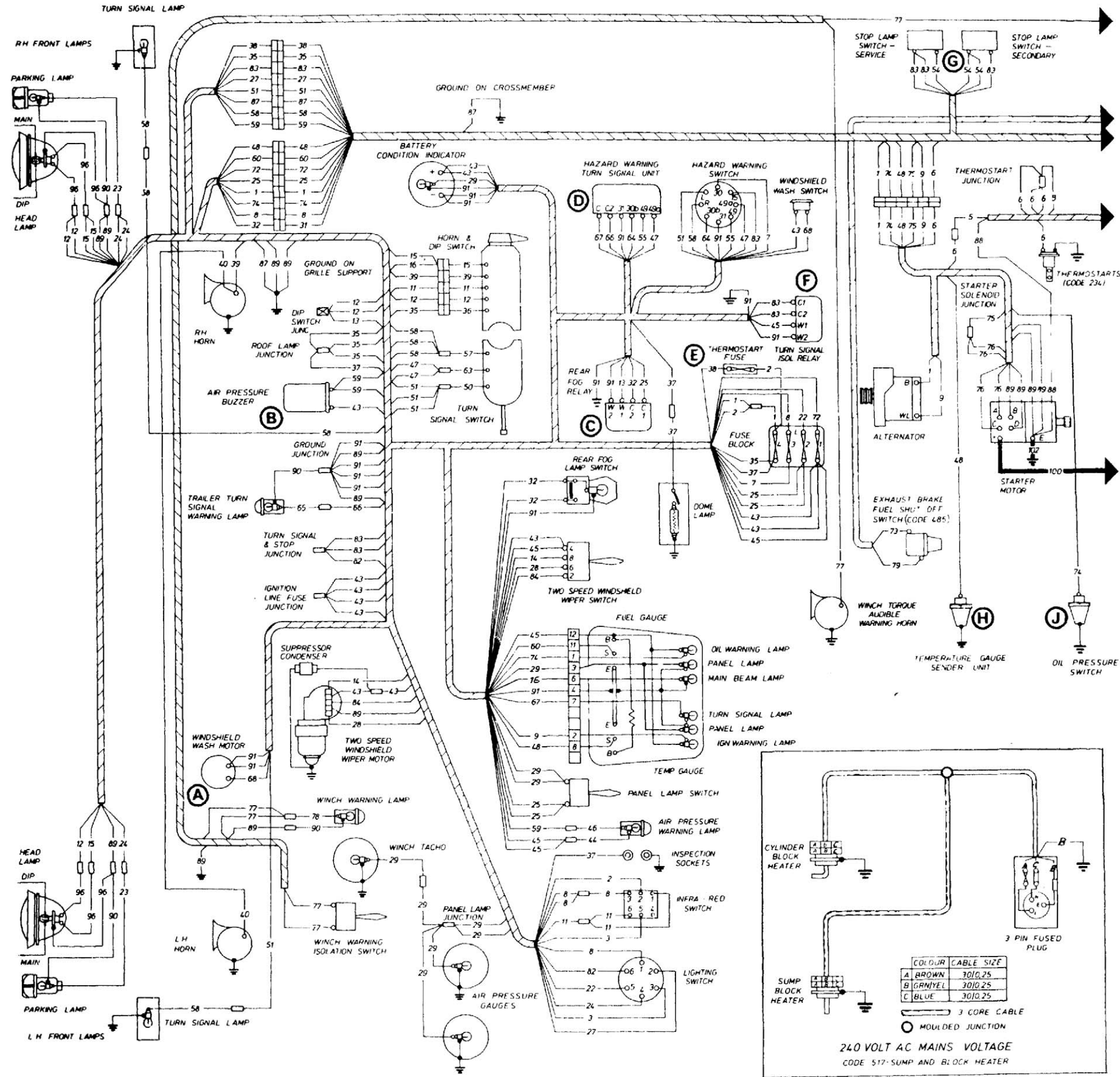


Fig 60(A)

8455A

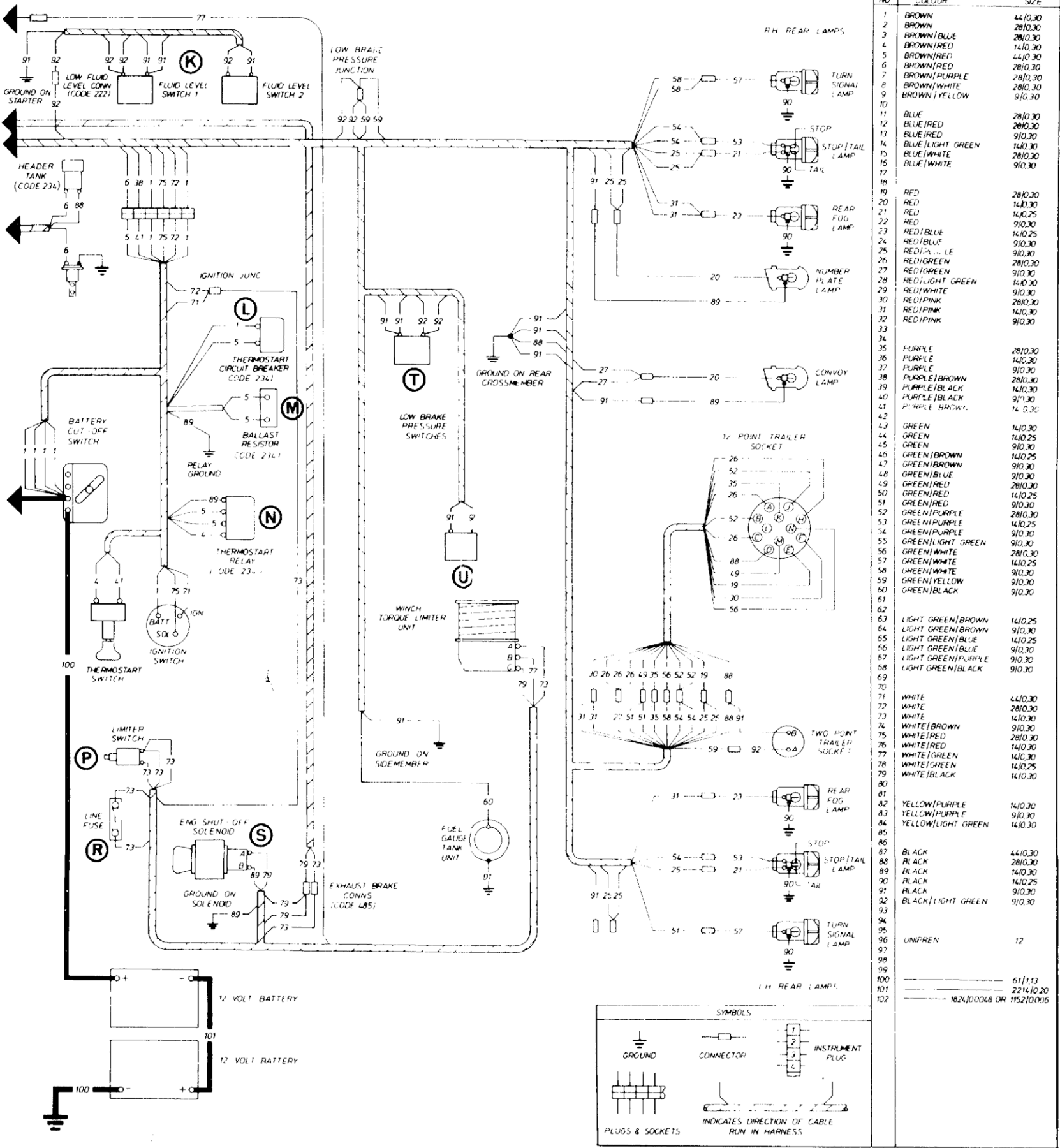


Fig 60(B)

Wiring diagram 24 volt alternator system chassis ground return rhd shown lhd similar

8455B

Fig 60(B)

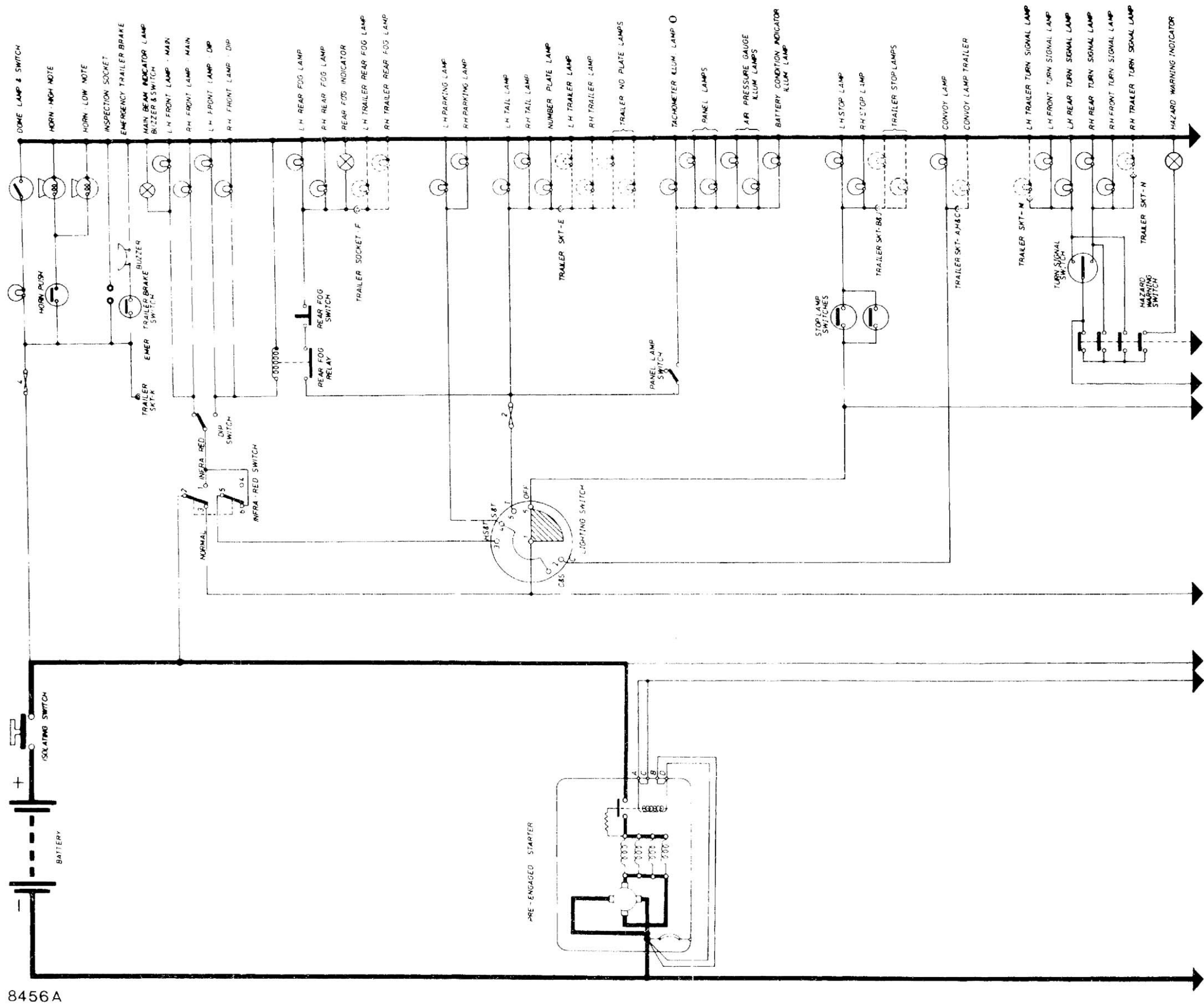
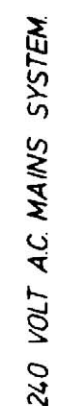


Fig 61(A)

Circuit wiring diagram 24 volt alternator system chassis ground return rhd shown lhd similar

Fig 61(A)



Circuit wiring diagram 24 volt alternator system chassis ground return r.h.d shown, l.h.d similar

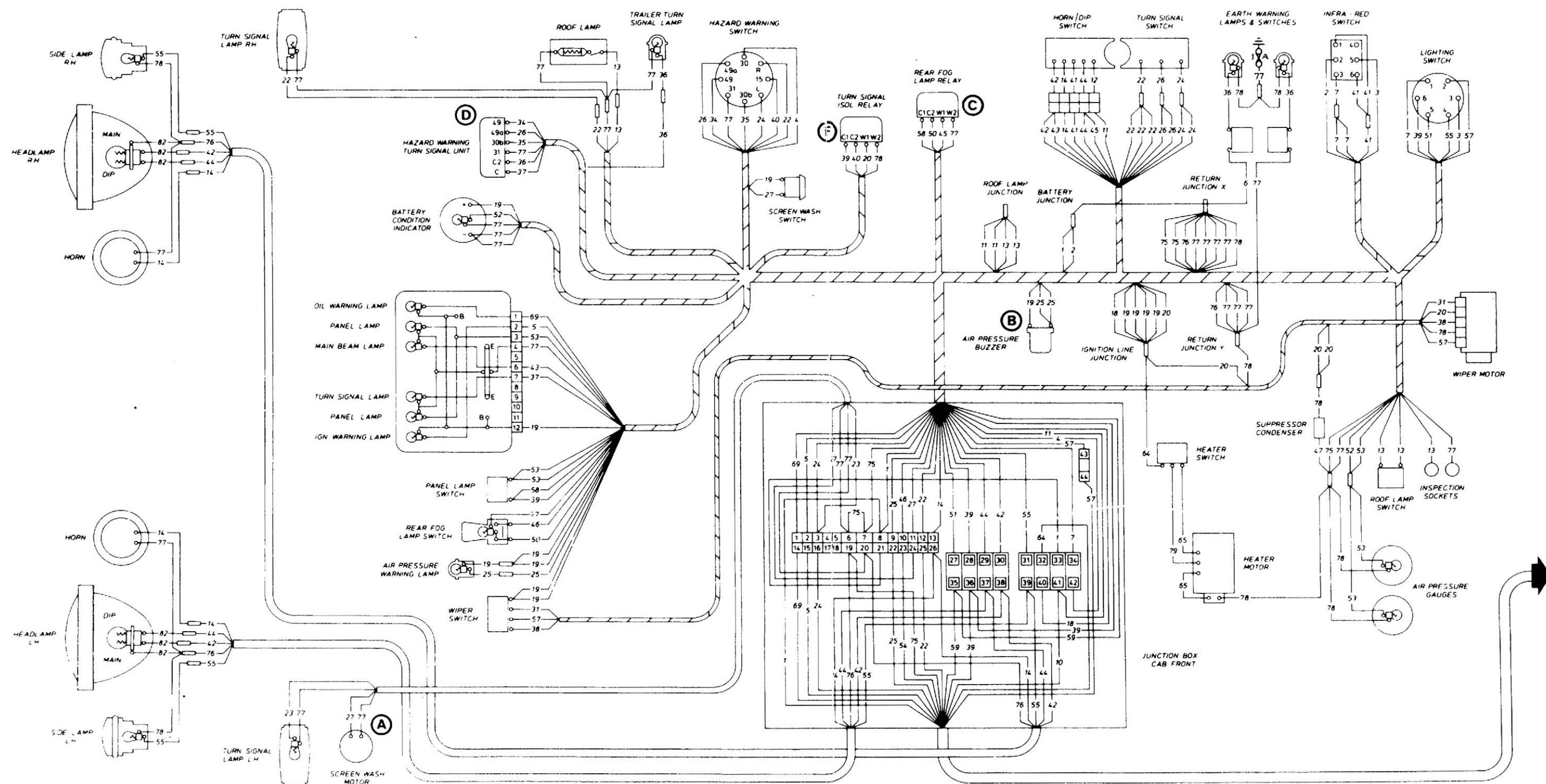


Fig 62 (A)

Wiring diagram 24 V chassis insulated return

8602(A)

Fig 62 (A)

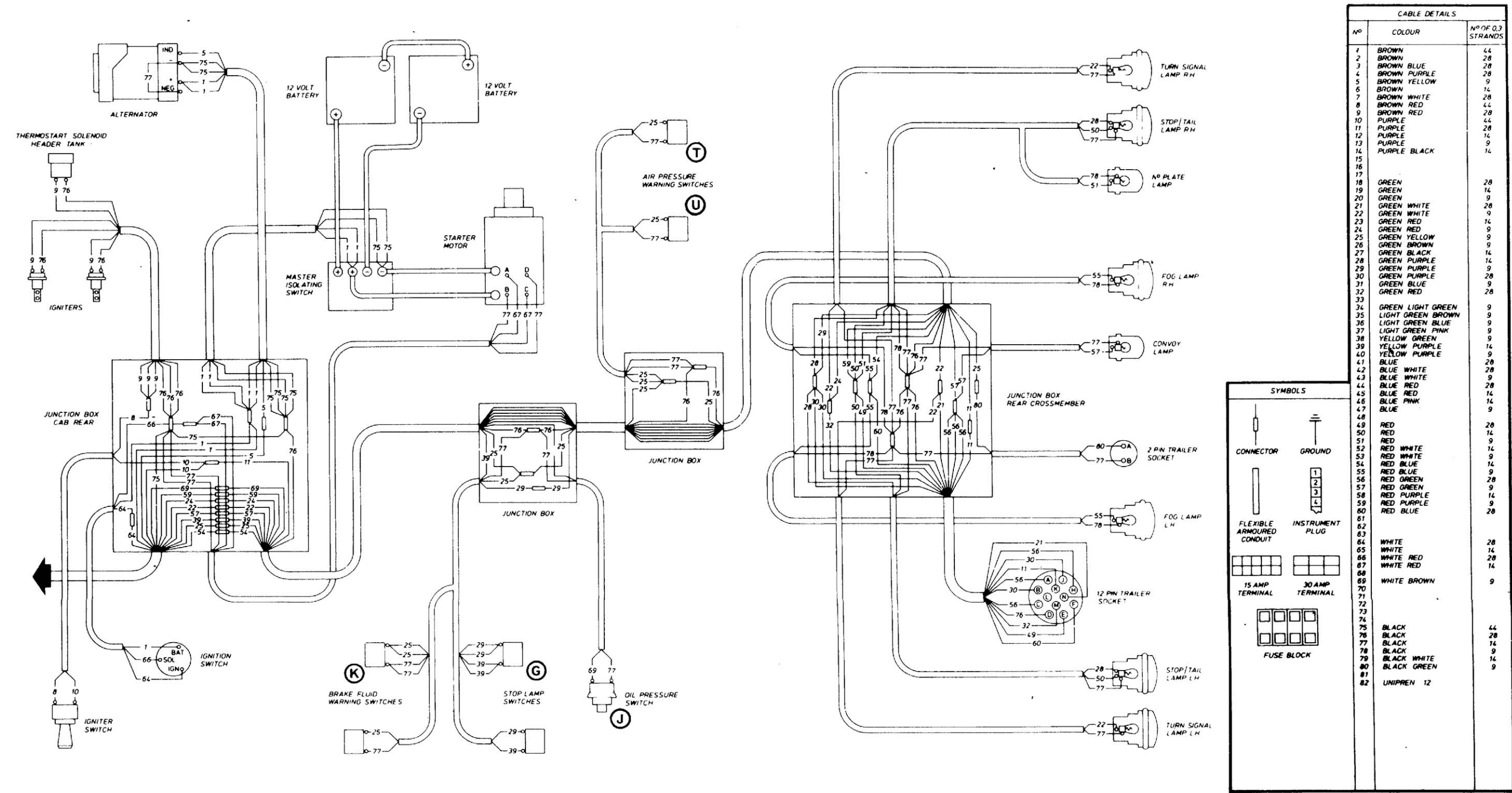
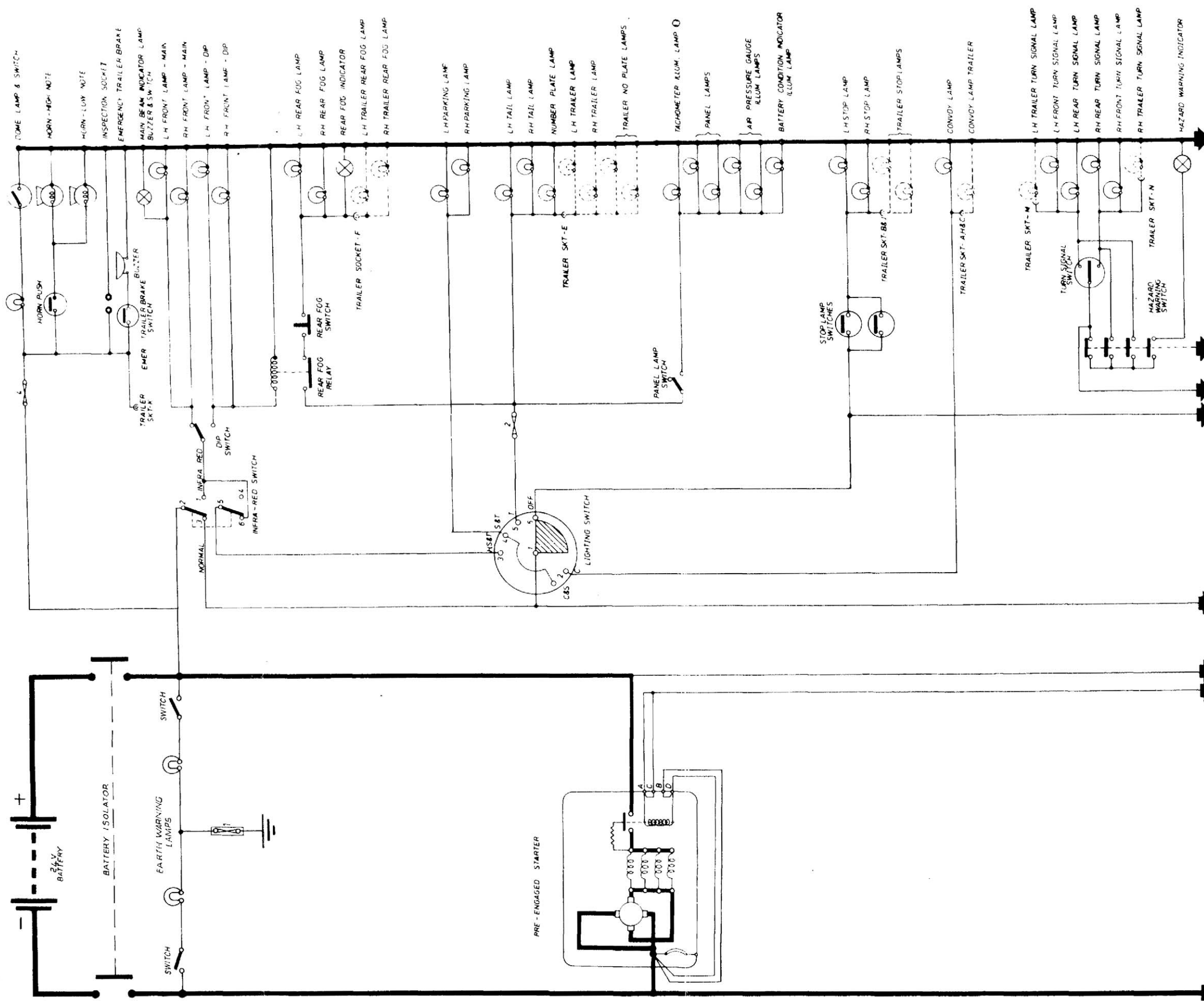


Fig 62(B)

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

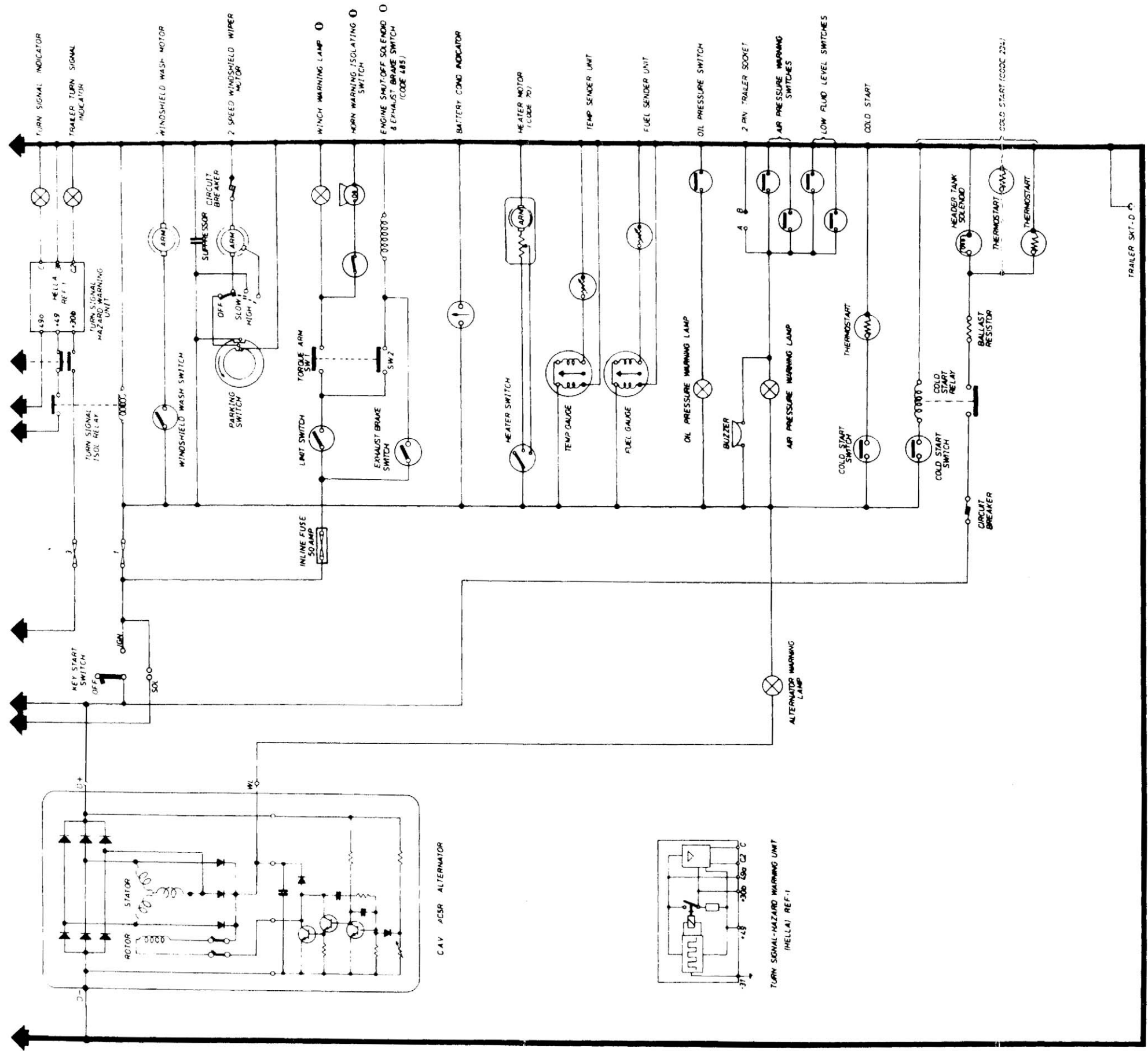


Fig 63(B)

Fig 63(B)

Circuit wiring diagram 24 volt chassis insulated return

8612(B)

FITTED FOR RADIO (FFR) VEHICLES

173 FFR 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

174 Disconnect a battery terminal.

175 Remove 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.

176 Remove 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.

177 Remove the bolts securing the engine cover panel to the cab floor panel and withdraw the engine cover panel.

178 Loosen the alternator pivot mounting bolt and the alternator adjuster pivot lock nut. Wind the alternator adjuster pivot until the fan belts can be removed.

179 Remove the fan belts.

180 Remove the electrical connections from the rear of the alternator taking note of the relative positions to assist in reassembly.

181 Remove the split pin securing the alternator adjuster clevis pin and withdraw the clevis pin from the alternator mounting bracket.

182 Support the weight of the alternator and withdraw the alternator pivot mounting bolt.

183 Withdraw the alternator assembly from the engine compartment.

184 Remove the nut holding the adjuster rod to the alternator adjuster pivot and withdraw the rod.

185 Remove 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

186 Installation is a reversal of removal.

Chapter 16

CAB AND FITTINGS

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5	Cab ventilator
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17	Heater motor switch
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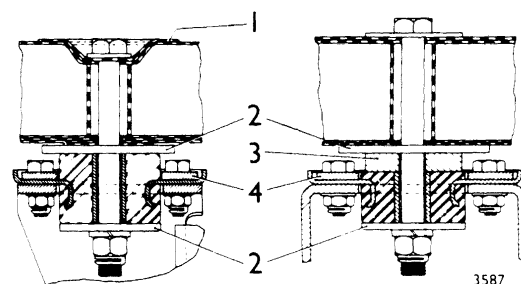
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TABLE 1 - SPECIAL TEST EQUIPMENT AND TOOLS

Tool No (where applicable)	NSN/Part No (where applicable)	Designation
D 1021		Window regulator handle remover
UM9 28321		Hog ring pliers 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.

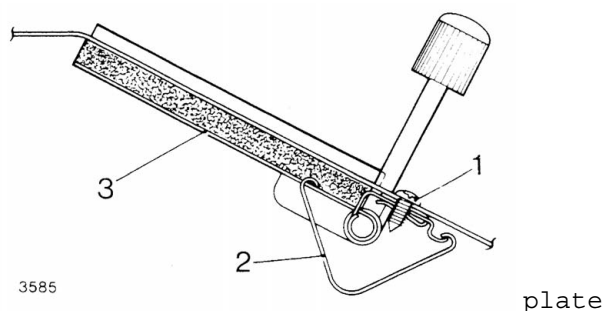


Fig 2 Cab floor ventilator

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.

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.

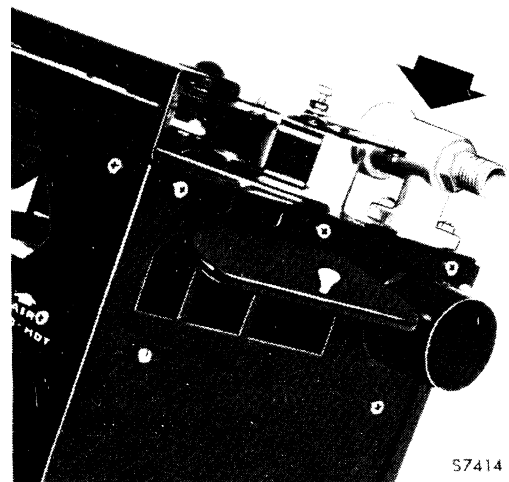


Fig 3 Heater water valve location

HEATER MOTOR SWITCH

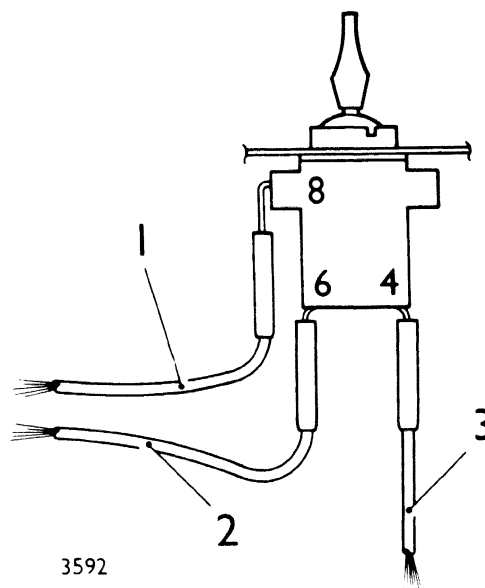
Removal

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

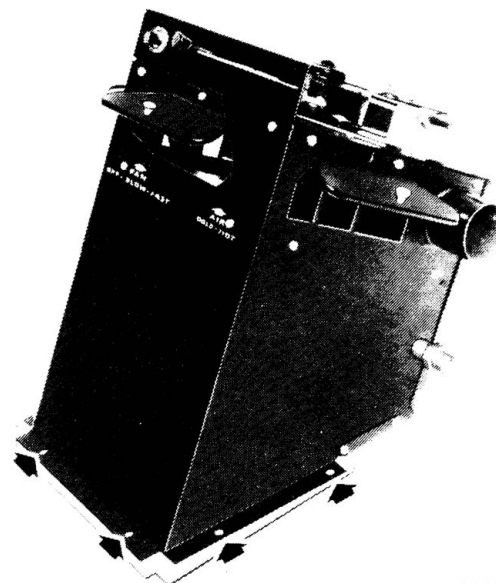
WARNING ...

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 feed wire from heater switch, water pipes and demist hoses from heater and removing screws from holes (arrowed) in base of casing.



S7416

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.

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.

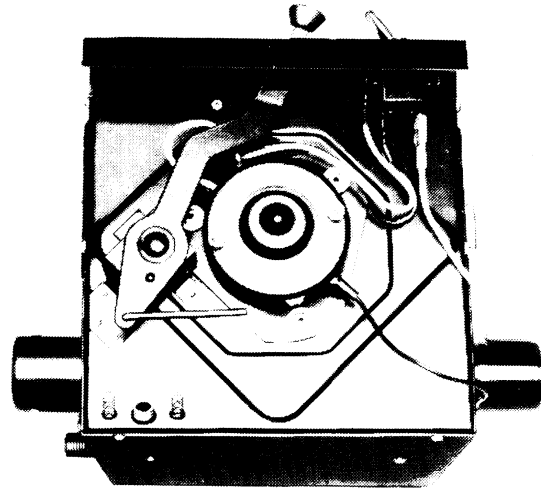


Fig 6 Heater motor location

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.)

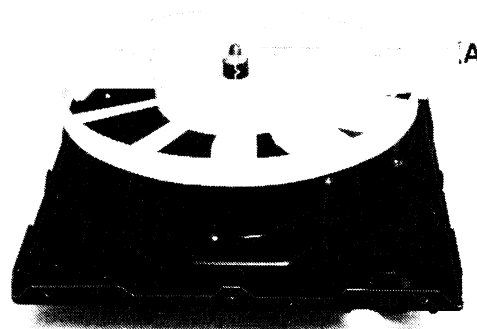


Fig 7 Fan to spindle dimension

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.

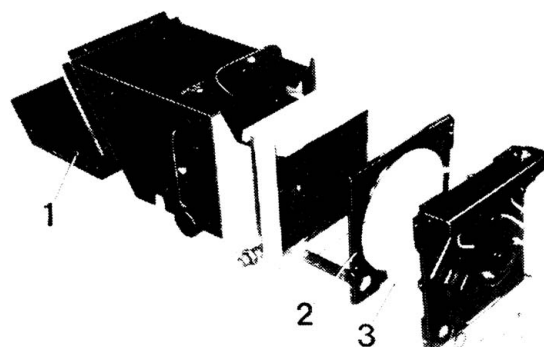


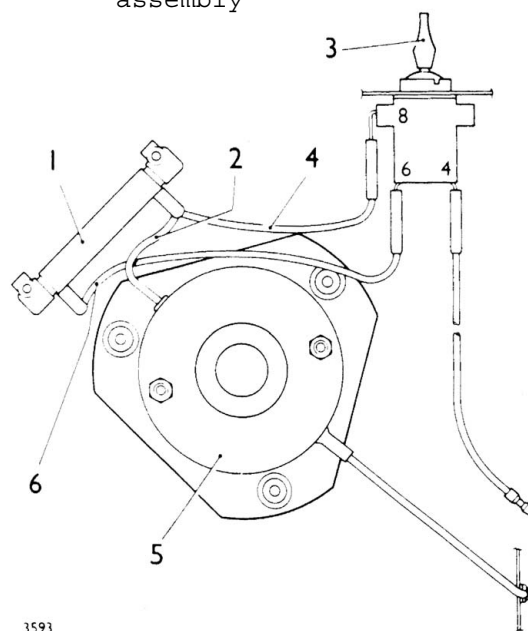
Fig 8 Exploded view of heater assembly

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.



3593

- | | |
|-------------------|---------------------|
| 1. Resistor | 4. White wire |
| 2. White wire | 5. Heater motor |
| 3. Two-way switch | 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.

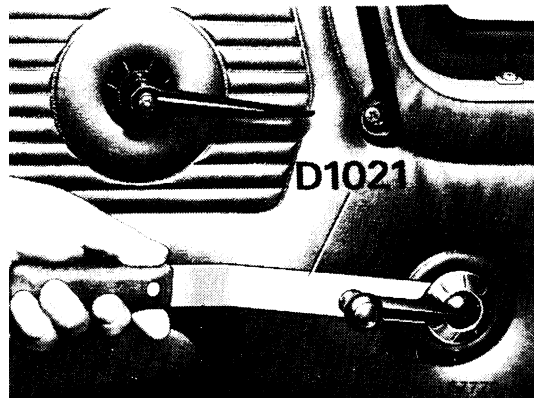


Fig 10 Regulator handle removal

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.

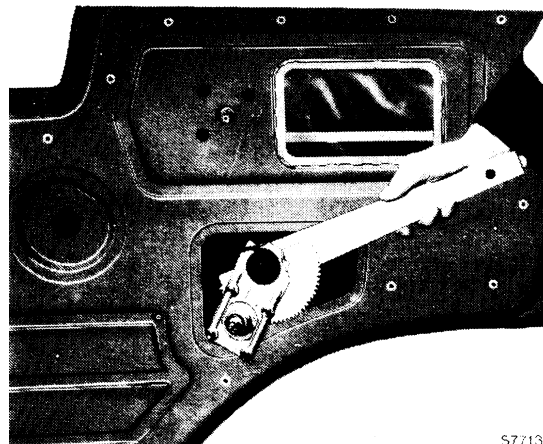
DOOR WINDOW GLASS REGULATORS

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.



S7713

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.



S6669

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.

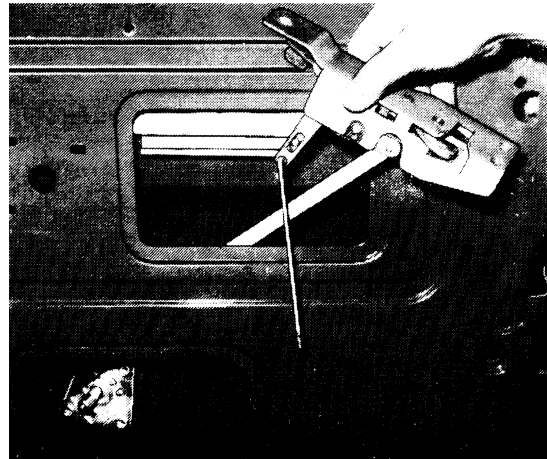


Fig 13 Door lock and remote control removal

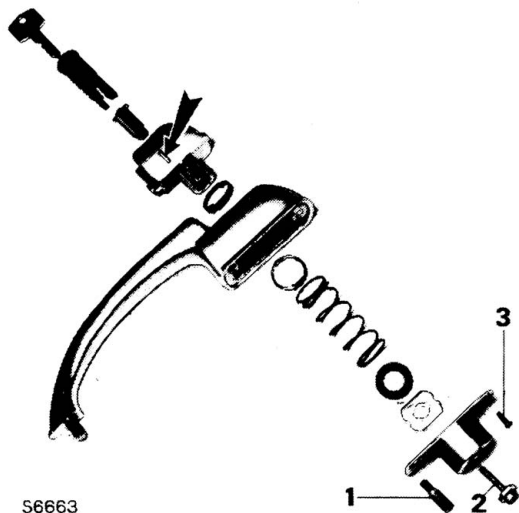
Installation

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.

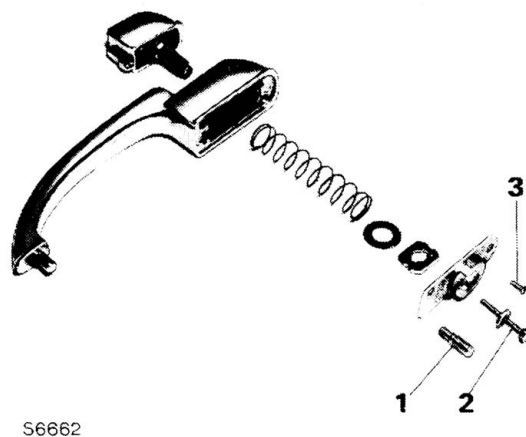
60 Before installing door lock, smear bearing surfaces of lock and remote control with high melting point grease.

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).

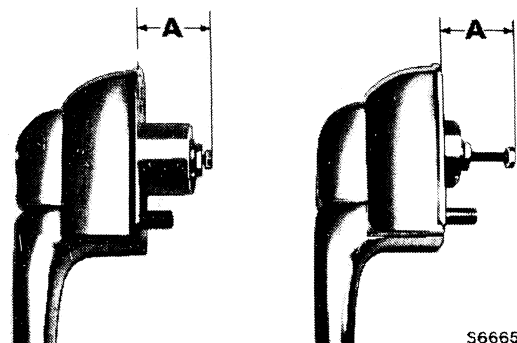


Fig 16 Push button bolt dimension

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.

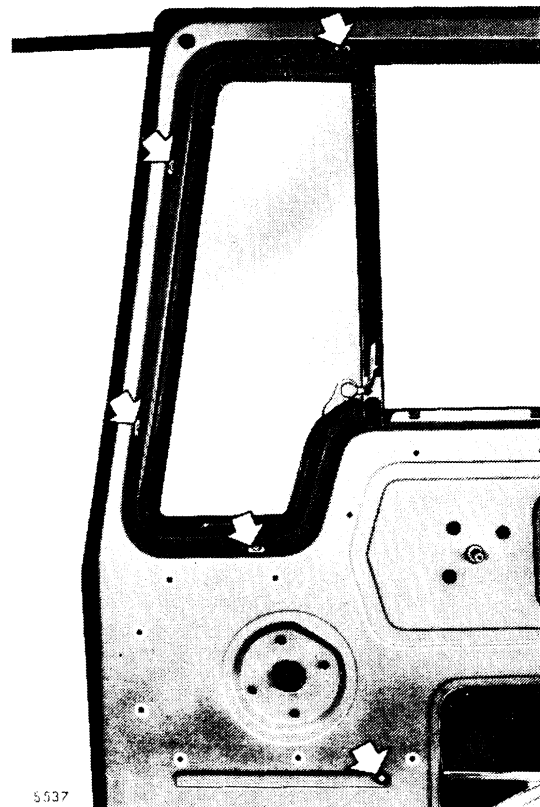


Fig 18 No-draught ventilator
fixing screws

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.

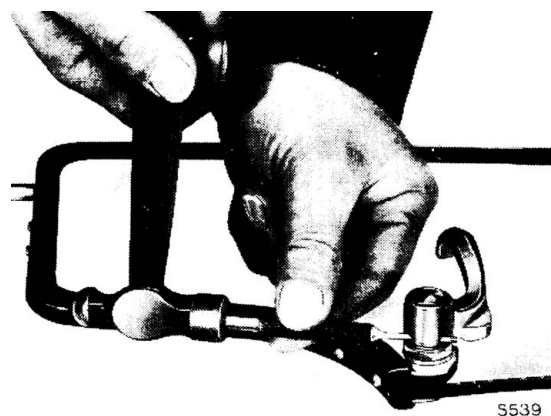


Fig 19 Locking handle removal

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.

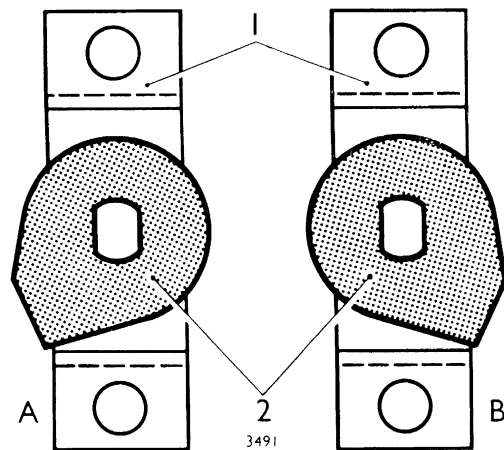
78 When assembling ventilator glass to channel, rest polished edge of glass on a flat protected surface and place filler strip over glass before tapping channel into position.

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.

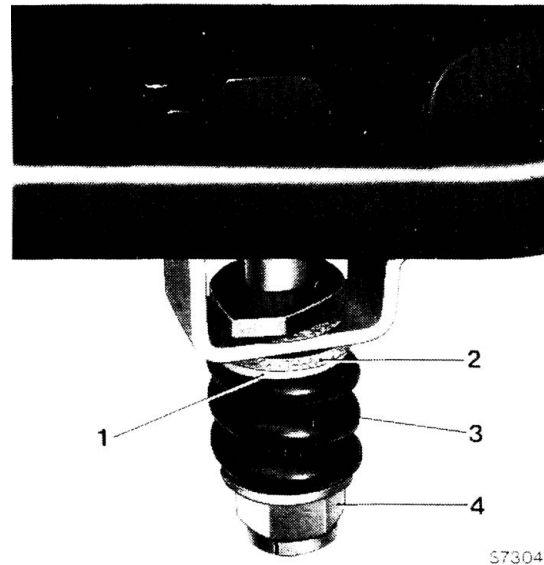
82 Before installing ventilator lower stop bracket (1) place ventilator stop (2) and a friction washer over pivot spindle. Stop must be positioned so that its highest point on left hand 'A' or right hand 'B' ventilator is towards the rear and outer side of ventilator.



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.

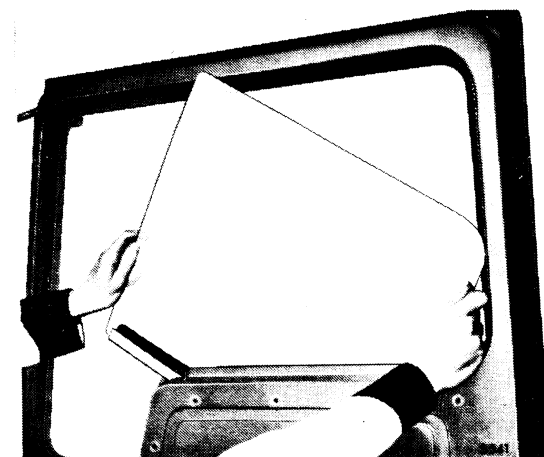
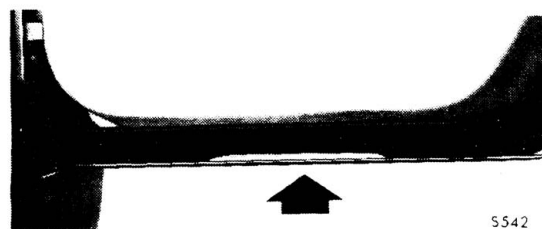


Fig 22 Door window glass removal

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.



5542

Fig 23 Door drain slot

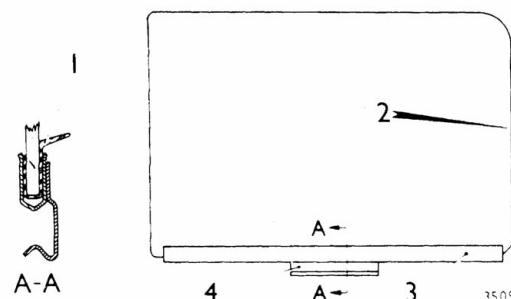
Installation

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

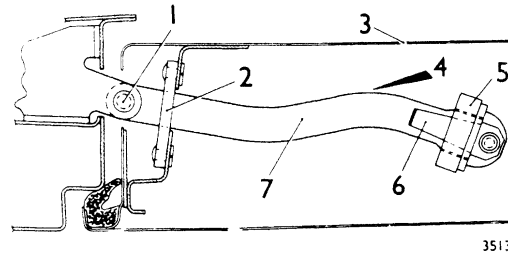
Fig 24 Window lift channel installation

DOOR CHECK LINKSRemoval

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 WEATHERSTRIPSRemoval

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 weatherstrip, 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.

100 To prevent check link falling into door, a spare bolt should be placed in eye of link.

101 Hinge pins should be smeared with high melting point grease and installed with their heads uppermost.

102 Adjustment 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.

103 When 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.

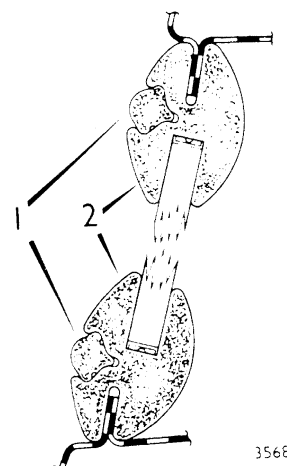
When re-positioning dovetail reception bracket and lock striker, refer to para 64.

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.

104 The 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

105 Remove the windshield wiper arms and blades.

106 Ease 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).

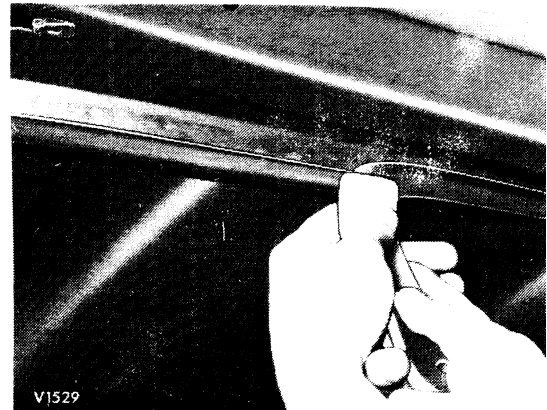


Fig 28 Windshield glass removal

107 Support 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.

108 Where 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.

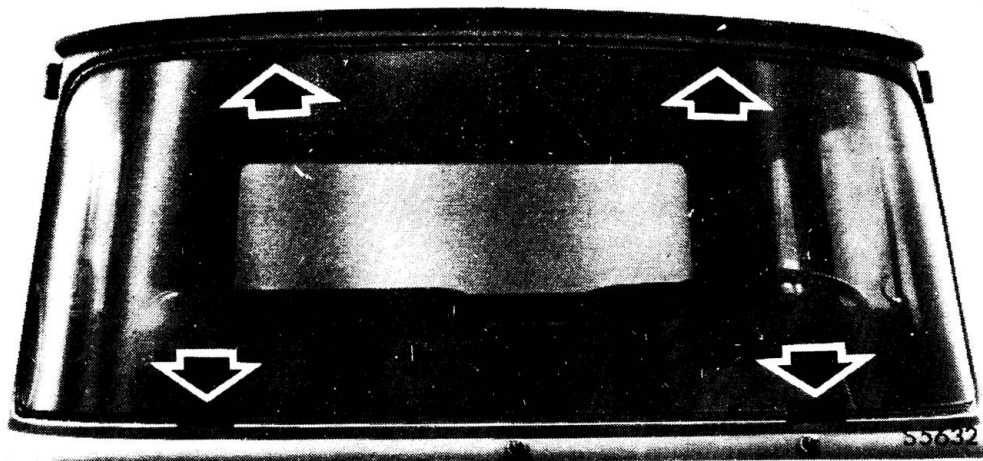


Fig 29 Windshield aperture check

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.

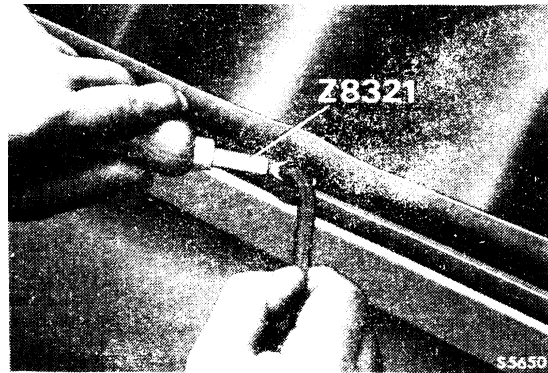


Fig 32 Filler strip installation

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

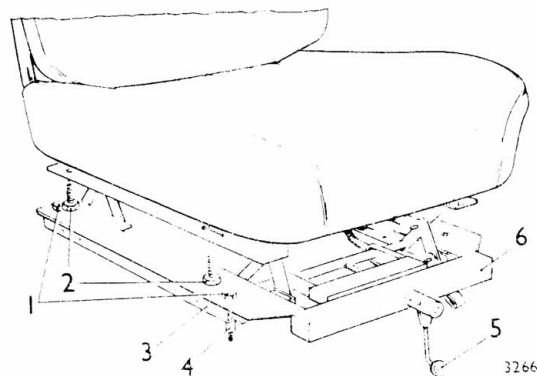
Removal

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

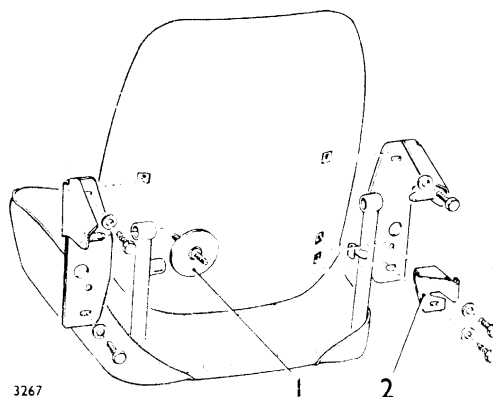
Installation

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

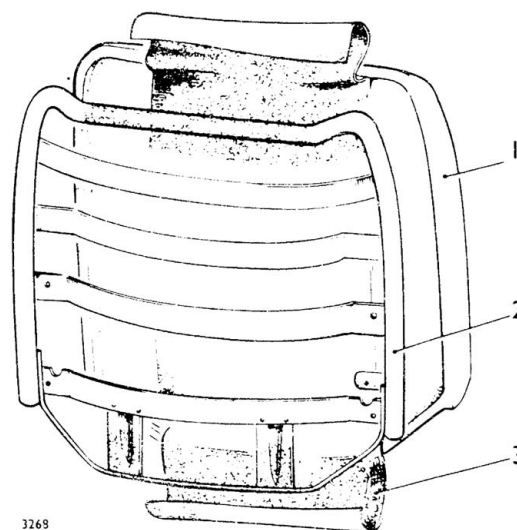
Fig 34 Driver's seat squab

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).

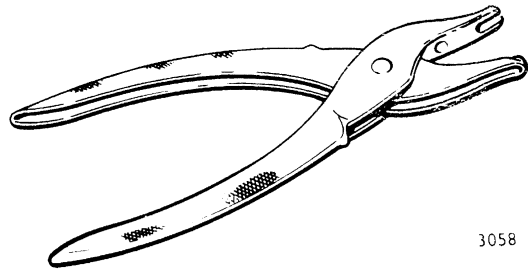
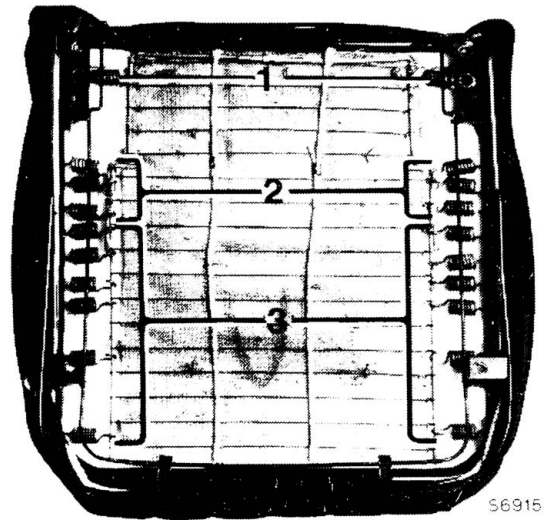


Fig 36 Hog ring pliers



1. Orange spring
2. White spring
3. Grey spring

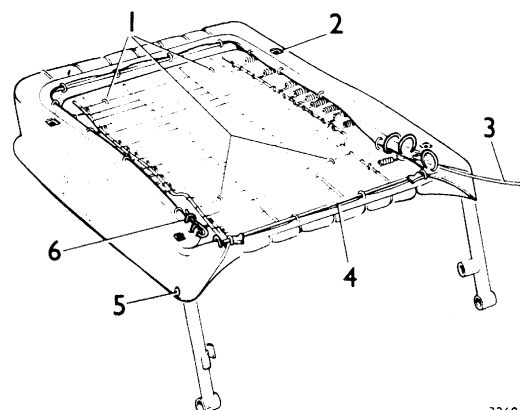
Fig 37 Seat platform

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.



3269

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

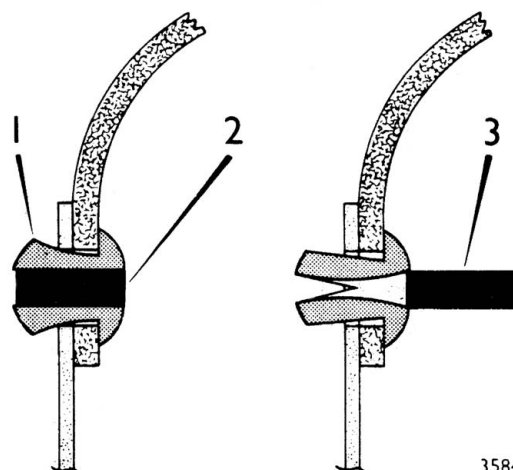
142Remove plastic rivets (1) by punching central pin (2) through rivet so that prongs of rivet can close up to allow rivet to be removed.

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.



3584

1. Rivet
2. Central pin
3. Pin

Fig 39 Headlining retaining rivet

Chapter 17

WINCH

CONTENTS

Para

WARNINGS

- 1 Winch testing
- 6 Winch load limiter control switch (Caution)
- 9 Winch load limiter
- 13 Winch load limiter warning horn
- 14 Winch load limiter warning horn isolation switch
- 17 Winch load limiter warning lamp
- 21 Engine cut-off solenoid
- 23 Winch brake adjustment
- 26 Winch brake operating cylinder
- 37 Winch brake control valve
- 55 Cable tensioner control valve
- 59 Cable tensioner operating cylinder
- 70 Pay-on gear
- 80 Rear fairleads and cable tensioner
- 91 Front fairleads
- 95 Winch cable

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| 2 | Wiring connections to winch load limiter | 3 |
| 3 | Initially setting load limiter switches | 3 |
| 4 | Removing engine cut-off solenoid end cover | 4 |
| 5 | Not allocated | |
| 6 | Sectional view of winch brake operating cylinder | 5 |
| 7 | Hand control valve | 7 |
| 8 | Cable tensioner setting | 9 |
| 9 | Pay-on gear | 10 |
| 10 | Rear fairleads | 11 |
| 11 | Front fairleads | 13 |

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.

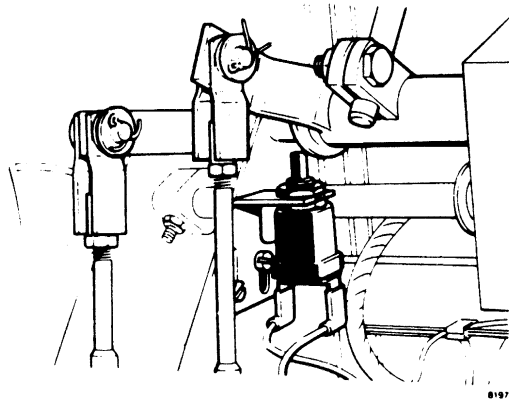


Fig 1 Winch load limiter control switch

Installation

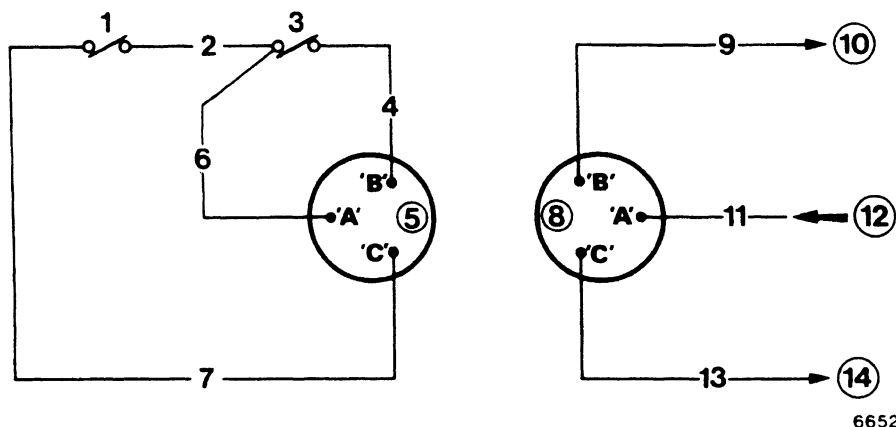
8 After installing switch on transfer box control bracket, carry out adjustment procedure as described in Para 6. Both Wires are coloured white and can be connected to either terminal.

WINCH LOAD LIMITERRemoval

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 | 13 White/green |
| 3 Warning horn/lamp switch | 9 White/black | 14 To engine cut-off solenoid |
| 4 White/green | 10 To warning horn/lamp | |
| 5 Plug | 11 White/blue | |
| 6 White | | |

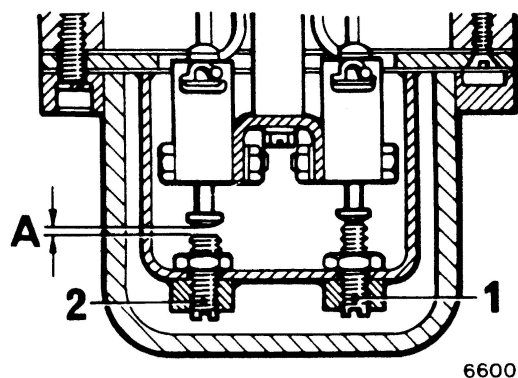
Fig 2 Wiring connections to winch load limiter

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 SWITCHRemoval 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 LAMPRemoval 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.

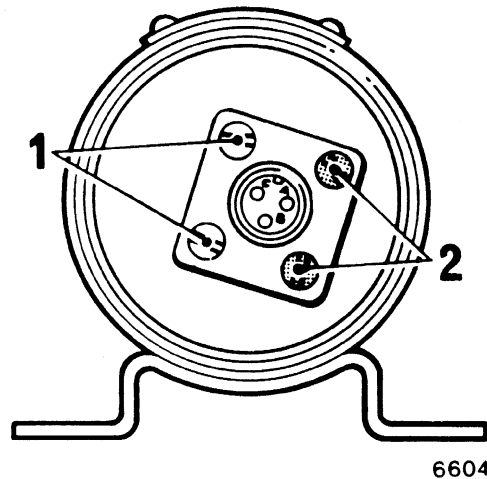
20 To renew the bulb, spring the lens off the body. The bulb has a bayonet-type fixing.

ENGINE CUT-OFF SOLENOIDRemoval

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.



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- 1 End cover securing screws
- 2 Wiring socket securing screws

Fig 4 Removing engine cut-off solenoid end cover

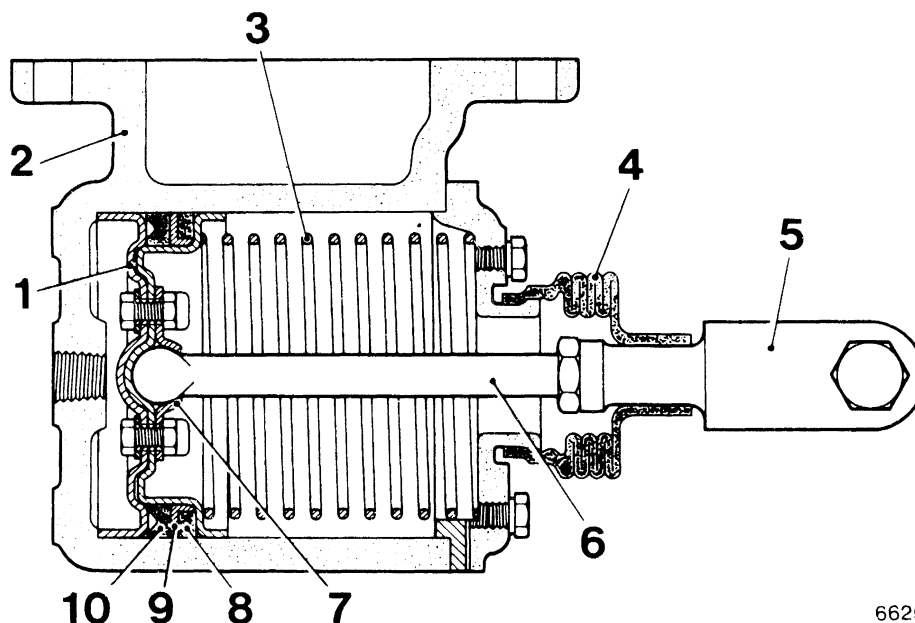
WINCH BRAKE ADJUSTMENT

- 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.



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- | | |
|-------------------------|------------------------------|
| 1. Piston seal retainer | 6. Piston rod |
| 2. Cylinder | 7. Piston rod retainer |
| 3. Piston return spring | 8. Lubrication felt |
| 4. Gaiter | 9. Lubrication felt retainer |
| 5. Piston rod clevis | 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 VALVEOperating 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/in²).

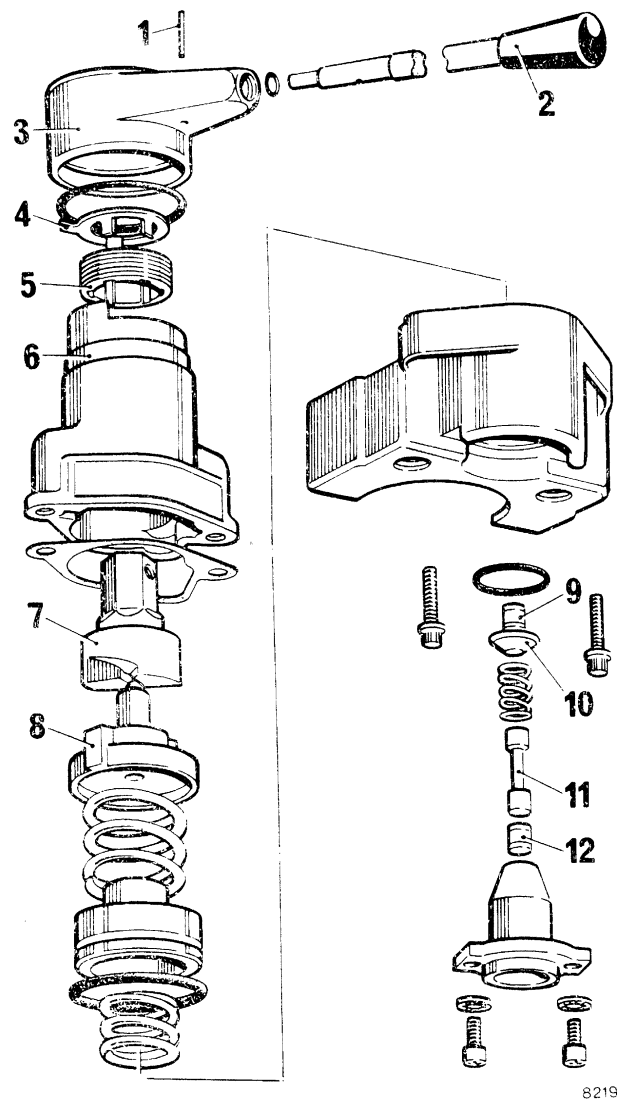
41 If after adjusting the valve, the required pressure is not obtainable, the valve is faulty.

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.



8219

- | | |
|-------------------------------|-------------------------|
| 1. Spring pin | 7. Cam follower |
| 2. Control lever | 8. Cam |
| 3. Valve head | 9. Exhaust valve |
| 4. Adjusting ring lock washer | 10. Exhaust valve guide |
| 5. Adjusting ring | 11. Valve stem |
| 6. Cover | 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 VALVERemoval

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 CYLINDERLeakage 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.)

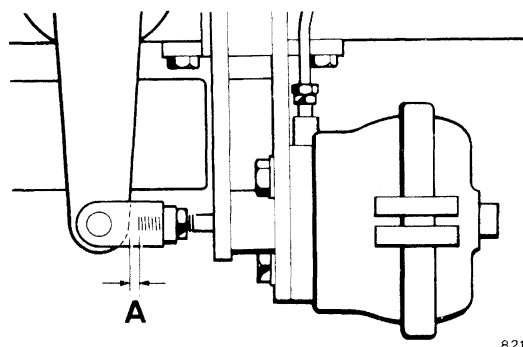


Fig 8 Cable tensioner setting

PAY ON GEAR

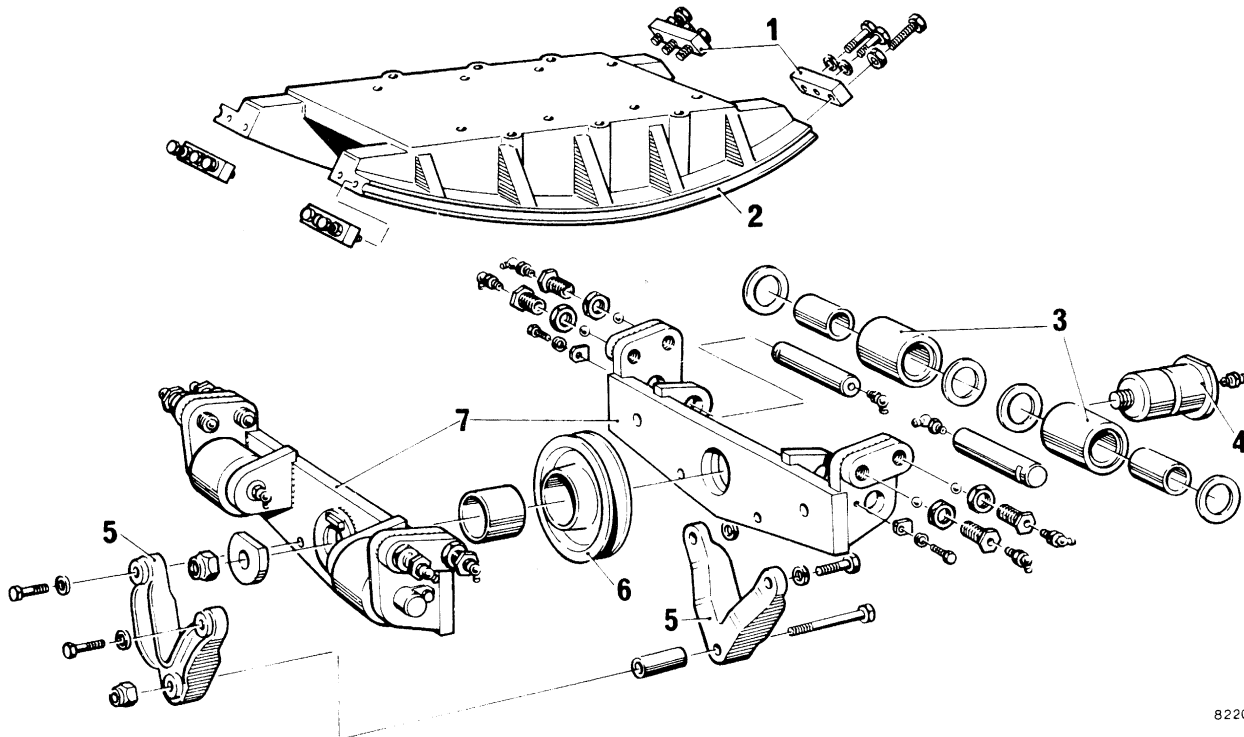
Adjustment

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

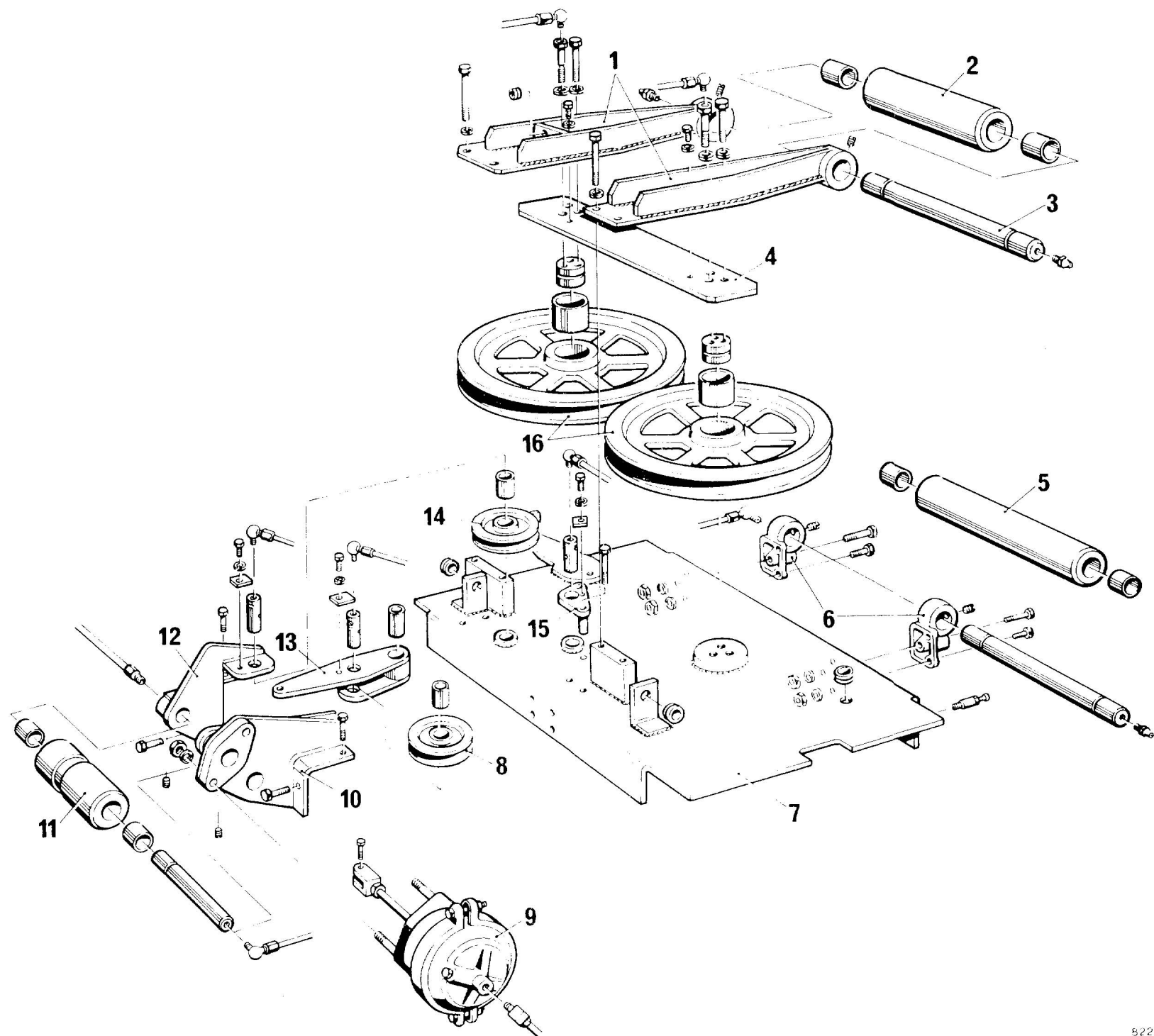
74 Release locknuts and unscrew ball retainers on each side of trolley (7), then lift assembly away from track (2). Take care not to lose the steel balls.

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

8221

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 TENSIONERRemoval

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.

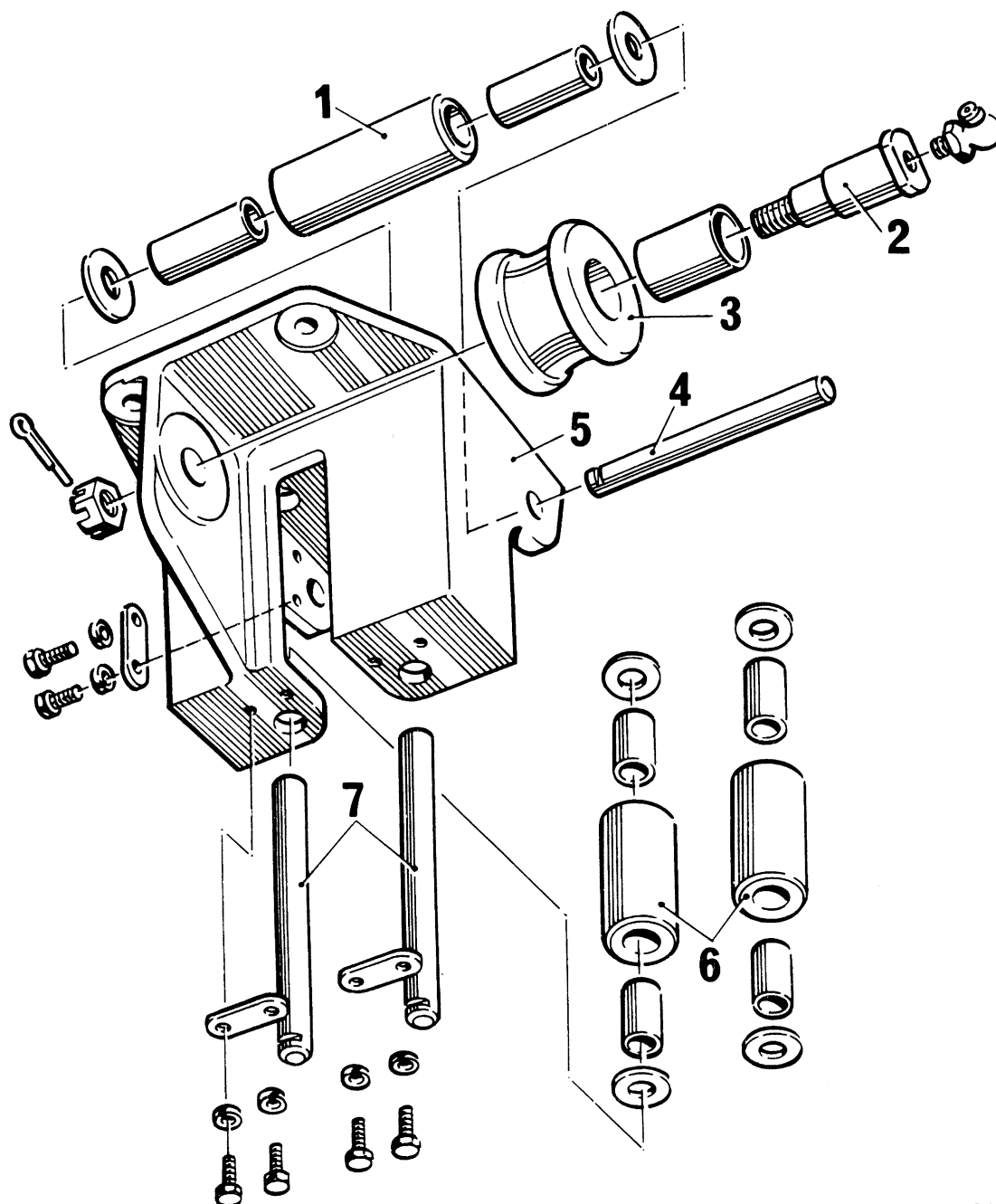
90 Adjust cable tensioner as described in para 69.

FRONT FAIRLEADSRemoval

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).



8218

- | | |
|----------------------------|---------------------------|
| 1. Horizontal roller | 5. Fairleads bracket |
| 2. Pulley pin | 6. Vertical rollers |
| 3. Pulley | 7. Vertical roller shafts |
| 4. Horizontal roller shaft | |

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.

100 Disconnect lubrication pipes, remove bolt and retainer plate from cable tensioner fixed pulley. Push out pulley centre from underneath and remove pulley.

101 Disconnect lubrication pipes, remove bolts securing two main pulleys and upper roller brackets. Remove one pulley to allow withdrawal of the cable loop.

Installation

102 Installation 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.

103 Renew locktab under pin securing the cable eye to the winch drum.

CHAPTER 18

CRANE

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- 3 Drive unit/hydraulic pump assembly (WARNING/Caution)
- 8 Bleeding the pump
- 9 Adjustment of relief valves (WARNING/Caution)
- 10 Lowering brake valves (WARNING/Caution)
- 29 Load holding valves (WARNING/Caution)

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| 2 Low pressure pipe and stop valve | 3 |
| 3 Hydraulic pipe identification at pump | 3 |
| 4 Hydraulic pump bleed screw | 4 |
| 5 Test gauge connection point | 5 |
| 6 Main relief valve adjusting knob | 5 |
| 7 Relief valve identification | 6 |
| 8 Exploded view of relief valve | 6 |
| 9 Jib ram relief valves | 7 |
| 10 Slewing ram relief valves | 7 |
| 11 Exploded view of slew circuit relief valve | 7 |
| 12 Lowering brake valves | 8 |
| 13 Main lifting ram load holding valve | 9 |
| 14 Jib extension ram load holding valves | 9 |

RESERVOIRWARNINGS ...

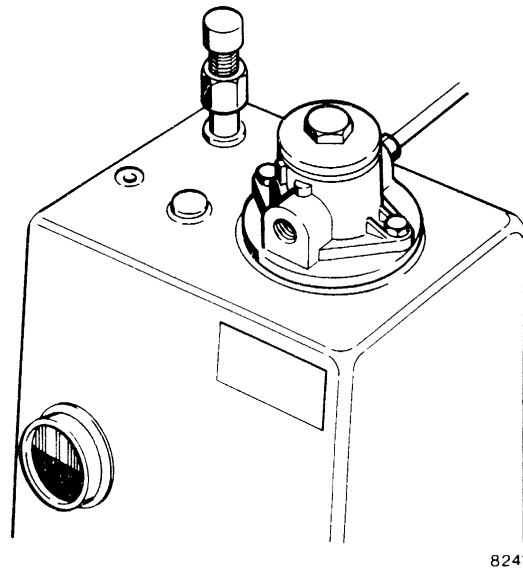
- (1) FUNCTIONAL TESTING OF THE CRANE MUST ONLY BE CARRIED OUT BY AUTHORIZED PERSONNEL. THOSE NOT FAMILIAR WITH CRANING OPERATIONS SHOULD REFER TO 'OPERATING THE CRANE' IN OPERATING INFORMATION AESP 2320-H-100-201.
- (2) ENSURE CRANE IS SAFE BEFORE REMOVING ANY PARTS. THIS IS PARTICULARLY APPLICABLE 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.



8241

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 ...

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Removal

3 Close stop valve in low pressure pipe from reservoir to hydraulic pump.

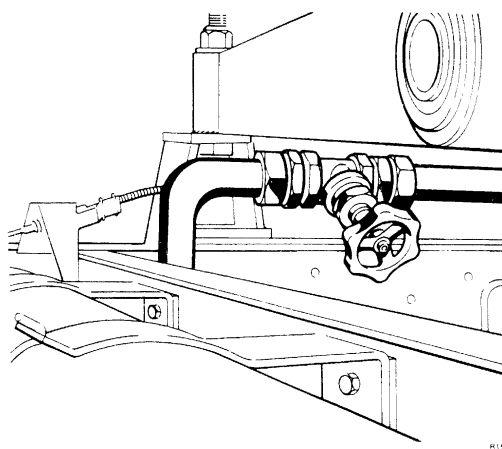
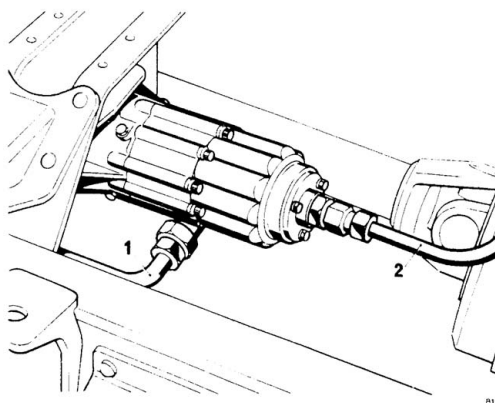


Fig 2 Low pressure pipe and stop valve

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.

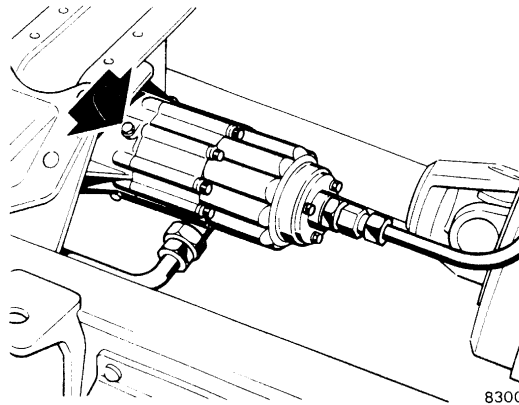


Fig 4 Hydraulic pump bleed screw

ADJUSTMENT OF RELIEF VALVES

WARNINGS ...

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- (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 ...

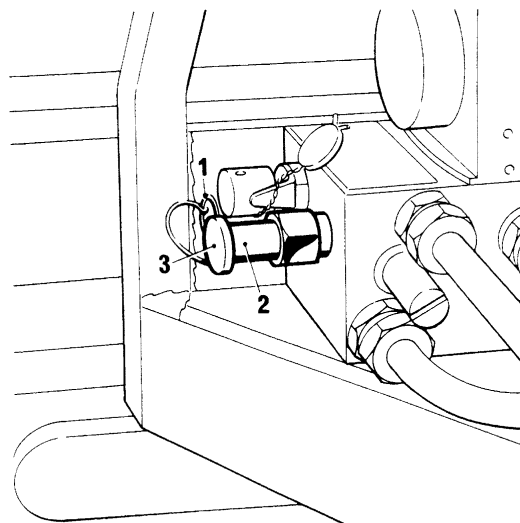
Cleanliness is of the utmost importance where hydraulic systems are concerned. It is most important to exercise extreme care because the ingress of dirt or foreign matter will cause rapid wear of hydraulic components.

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/in²).



1. Retaining clip 2. Body 3. Plug
Fig 5 Test gauge connection point

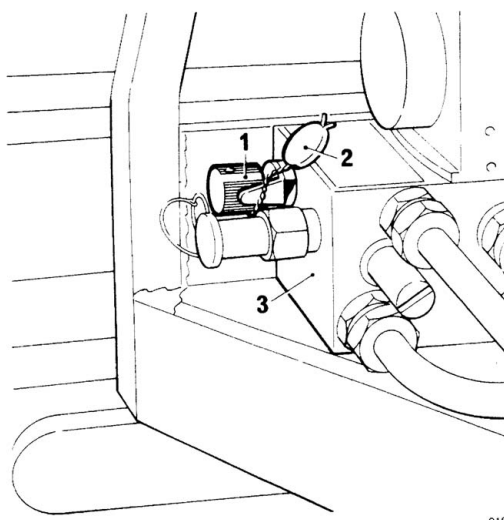
13 Break seal (2) and with stabilizer legs still held in the fully up position, turn main relief valve adjusting knob (1) until pressure on gauge reads 50 bar (3630 lbf/in²).

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/in²).

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/in²).

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.

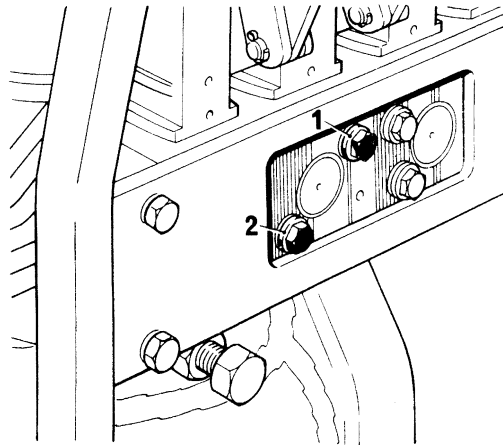


1. Adjusting knob 2. Seal
3. Control valve block

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.



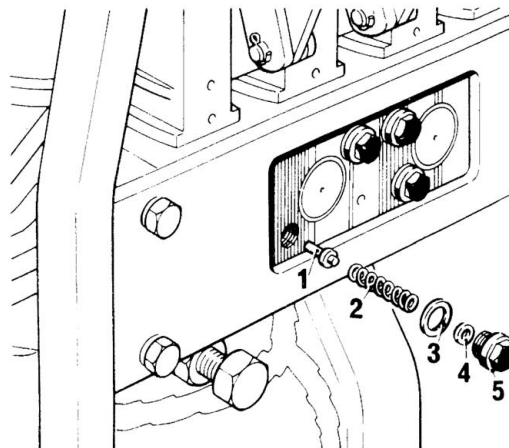
8162

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.

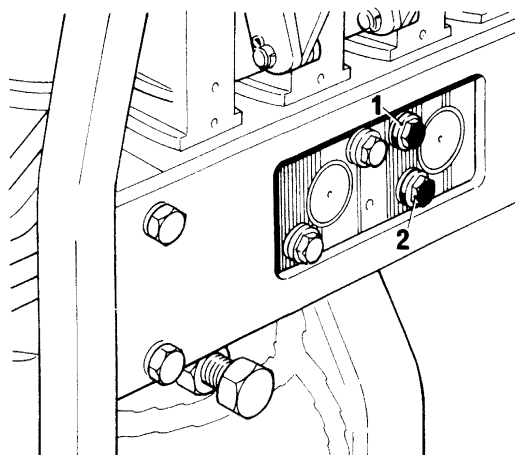


8163

- | | |
|-----------------------|---------|
| 1. Valve cone | 4. Shim |
| 2. Compression spring | 5. Plug |
| 3. Copper washer | |

Fig 8 Exploded view of relief valve

22 Carry out a similar test and, where necessary, adjustment procedure for the jib ram, noting that the relief valve operating pressure for the jib ram, when held fully extended or fully retracted, is 170 bar (2468 lbf/in²).



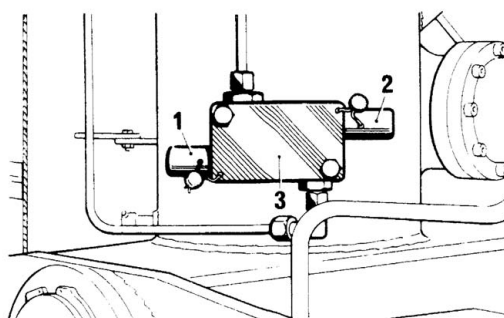
8164

1. Lifting circuit relief valve
2. Retracting circuit relief valve

Fig 9 Jib ram relief valves

23 Slewing ram relief valve pressures are checked in a similar manner to that previously given but the method of adjustment is different. The correct relief valve pressure, when the crane is held fully slewed to the left or right is 200 bar (2904 lbf/in²).

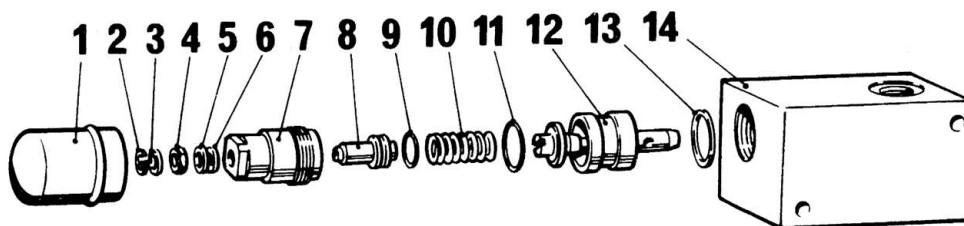
24 If pressures are incorrect, depending on which relief valve is to be adjusted, remove either the left hand slew circuit domed cap (2) or the right hand slew circuit domed cap (1).



8161

1. Right-hand slew circuit relief valve
2. Left-hand slew circuit relief valve
3. Valve block

Fig 10 Slewing ram relief valves



6730

- | | | | |
|--------------|--------------------|----------------|-------------------|
| 1. Domed cap | 5. Washer | 9. 'O' ring | 13. Washer |
| 2. Circlip | 6. Washer | 10. Spring | 14. Valve housing |
| 3. Washer | 7. Adaptor | 11. 'O' ring | |
| 4. Nut | 8. Adjusting screw | 12. Valve seal | |

Fig 11 Exploded view of slew circuit relief valve

25 Hold setscrew (8) and slacken locknut (4). With slew control held in its maximum operating position rotate screw (8) until relief pressure is as specified. With setscrew held in this position tighten locknut. Re-check relief pressure setting before installing domed cap.

26 Fully extend jib extension and check relief valve pressure. This should be 235 bar (3412 lbf/in²); if pressure is incorrect the load holding valves shown in Fig 14 should be renewed. These valves are pre-set to the correct relief pressure.

27 When all relief valve pressures have been checked and are correct, operate and hold stabilizer legs in the fully up position until the main relief valve operates, then adjust main relief valve to 150 bar (2178 lbf/in²). Install lock wire to control knob and seal in position. Finally re-check pressure at which main relief valve operates.

WARNINGS ...

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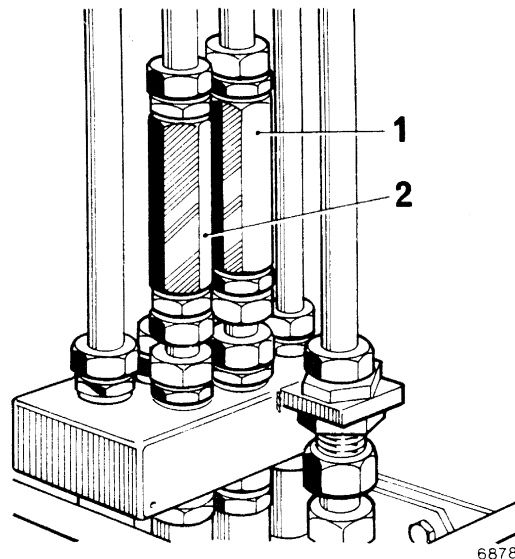
CAUTION ...

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.

28 Two lowering brake valves are installed, one in the main lifting ram circuit (2), the other in the jib ram circuit (1).

Removal

29 Removal of a valve is straightforward, but to aid installation, mark which way round the valve is installed in relation to the circuit.



1. Jib ram lowering brake valve
2. Main lifting ram lowering brake valve

Fig 12 Lowering brake valves

LOAD HOLDING VALVES

WARNINGS ...

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- (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 ...

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30 Three load holding valves are installed, one (arrowed) in the main lifting ram circuit and two mounted at the base of the jib extension ram.

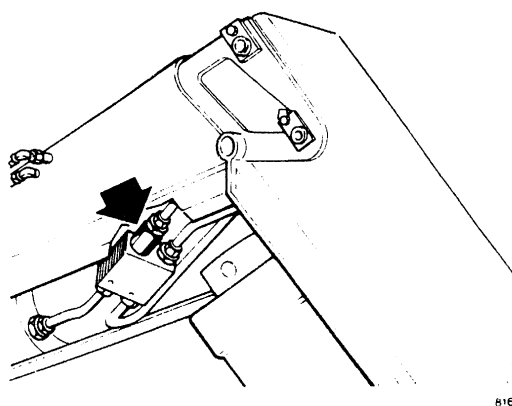


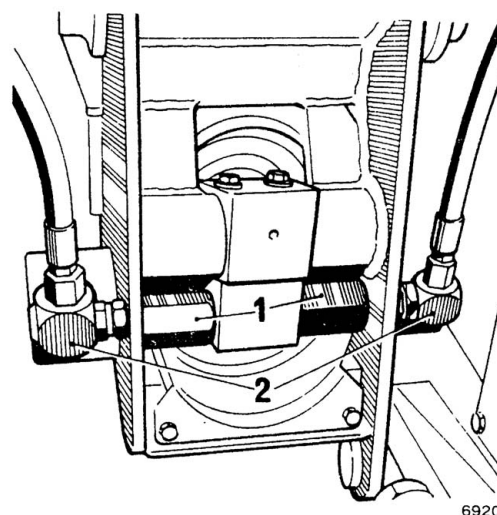
Fig 13 Main lifting ram load holding valve

Removal

31 Removal of valves is straightforward. When removing valves (1) from jib extension ram it is first necessary to disconnect rotary banjos (2).

Installation

32 Only install a load holding valve to main lifting ram or jib extension ram circuits when it is known that valve pressure setting is correct.



1. Load holding valve 2. Rotary banjo

Fig 14 Jib extension ram load holding valve

