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FV430 SERIES, VEHICLES ALL MARKS

REPAIR INSTRUCTIONS

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PRELIMINARY MATERIAL

REPAIR INSTRUCTIONS

PREFACE

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INTRODUCTION

1 Service users should forward any comments concerning this Publication through the channels prescribed in AESP 0100-P-011-013. An AESP Form 10 is provided at the end of this document; it should be photocopied and used for forwarding comments on this AESP.

2 AESPs are issued under Defence Council authority and where AESPs specify action to be taken, the AESP will of itself be sufficient authority for such action and also for the demanding of the necessary stores, subject to the provision of Para 3 below.

3 The subject matter of this publication may be affected by Defence Council Instructions (DCIs), Standard Operating Procedures (SOPs) or by local regulations. When any such instruction, order or regulation contradicts any portion of this publication it is to be taken as the overriding authority.

RELATED AND ASSOCIATED PUBLICATIONS

Related Publications

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

5 This publication has been produced in both hard copy and microfiche formats. Each page therefore carries a page number and a frame number.

Category/Sub-category			Information level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	*	*	*	*
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5	1	Failure Diagnosis	*	*		*
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8	1	Modification Instructions	*	*	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

* Categories/Sub-categories not published

Associated publications

6 A comprehensive list of associated publications will be found in AESP 2350-T-250-522. The following publications are additional to that list.

Reference	Title
AESP 1015-C-100-Octad	Mortar 81 mm
Army Code 14660	Illustrated parts catalogue
CAV Test plan NNL6H90/289	Hydraulic governor RHG 140
EMER Pwr S 567/2 Instr 1-7	Power pack, engine, Rolls Royce k60 technical handbook – Modification Instructions
EMER Pwr S 568/1 Pt 2	Engine, Rolls Royce, type K60 technical handbook – Inspection standard part 2 components and assemblies
EMER Pwr S 569/1 Instr 1-5, 7-15	Engine, Rolls Royce K60, multi-fuel technical handbook - Miscellaneous Instructions
EMER Pwr S 569/2 Instr 1-7	Power pack, K60 Engine, Mk 4F and 6F technical handbook – Miscellaneous Instructions

ABBREVIATIONS

7 Throughout this Publication, any reference to right or left is seen as from the rear of the vehicle looking forward, unless otherwise stated. Where non-standard abbreviations are used, the full meaning is written out the first time the subject is mentioned in text followed by the abbreviation in brackets.

WARNINGS

(1) PERSONNEL HAZARD. ENSURE THAT ALL LOCAL STANDING OPERATING PROCEDURES AND ALL CURRENT HEALTH AND SAFETY REGULATIONS ARE COMPLIED WITH, WHEN CARRYING OUT ANY OF THE PROCEDURES DETAILED WITHIN THIS PUBLICATION.

(2) PERSONNEL HAZARD. BEFORE COMMENCING ANY REPAIR TO A VEHICLE, ENSURE THAT BATTERY MASTER SWITCHES AND FUEL COCK ARE TURNED TO OFF POSITION. ALSO, ENSURE THAT THE VEHICLE IS SECURELY CHOCKED TO PREVENT MOVEMENT.

(3) FIRE HAZARD. DANGER OF FIRE ALWAYS EXISTS WHEN WORKING ON FUEL SYSTEM WITHIN VEHICLE. BATTERY MASTER SWITCHES AND FUEL COCK MUST BE TURNED OFF; DOORS AND HATCHES MUST BE OPENED TO DISPERSE FUMES THAT MAY ARISE; FIRE EXTINGUISHING EQUIPMENT MUST BE TO HAND. WHEN REFUELLING OR DRAINING, THE WARNING GIVEN IN THE USER HANDBOOK, MUST BE OBSERVED.

(4) FIRE HAZARD. DUE TO THE EXTREME HEAT FROM EXHAUST MANIFOLD AND CONSEQUENT FIRE RISK, IT IS ESSENTIAL, WHEN HYDRAULIC CONNECTIONS ARE BROKEN TO REMOVE PIPES OR COMPONENTS, THAT OIL SPILLAGE IS KEPT TO A MINIMUM. ANY SPILLED OIL MUST BE CLEANED UP IMMEDIATELY AND NOT ALLOWED TO ACCUMULATE ON OR AROUND THE ENGINE.

(5) ELECTRIC SHOCK. VOLTAGES USED ON SOME EQUIPMENT, EG RADIOS, CAN BE LETHAL. DO NOT ATTEMPT ANY REPAIR OR ADJUSTMENT TO THESE EQUIPMENTS UNLESS ALL BATTERY MASTER SWITCHES ARE OFF. IF A POWER TOOL IS USED FROM THE SOCKET, EARTHING PROCEDURE AND PRECAUTIONS DETAILED IN USER HANDBOOK MUST BE FOLLOWED.

(6) HEAVY WEIGHT. THE POWER PACK WEIGHS 1816 kg (4000 lb). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS WHEN MOVING THIS EQUIPMENT.

(7) HEAVY WEIGHT. THE SUPERSTRUCTURE WEIGHS 408 kg (900 lb). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS WHEN MOVING THIS EQUIPMENT.

(8) PERSONNEL HAZARD. OIL WILL BE EXTREMELY HOT, REMOVE DRAIN PLUG AND FILTER WITH CARE.

(9) PERSONNEL HAZARD. OIL WILL BE EXTREMELY HOT. ENSURE ALL OIL IS DRAINED BEFORE ATTEMPTING TO REPLACE DRAIN PLUG.

(10) ASBESTOS HEALTH HAZARD. THIS EQUIPMENT CONTAINS ASBESTOS COMPONENTS. NO ATTEMPT IS TO BE MADE TO WORK WITH ASBESTOS MATERIALS WITHOUT CONFORMING TO APPROPRIATE DEPARTMENTAL /UNIT INSTRUCTIONS.

(11) FIRE HAZARD. FLASH POINT OF WATER DISPLACING FLUID (PX-10 (TABLE 2, SER 7)) IS 38 deg C (100 deg F) APPROXIMATELY AND THE FOLLOWING PRECAUTIONS MUST BE OBSERVED TO ELIMINATE FIRE HAZARD.

(12) FIRE HAZARD. FLUID MUST NOT BE LEFT STANDING OR STORED IN OPEN CONTAINERS.

(13) FIRE HAZARD. SMOKING OR USE OF NAKED LIGHTS IS PROHIBITED WHERE WATER DISPLACING FLUID IS BEING USED.

(14) FIRE HAZARD. DISPOSE OF USED WATER DISPLACING FLUID IN ACCORDANCE WITH LOCAL STANDING ORDERS.

(15) SAFETY HAZARD. BEFORE ANY REPAIR IS CARRIED OUT TO A FUEL TANK, OBSERVE SAFETY PRECAUTIONS DETAILED IN EMER GEN 0 331.

(16) PERSONAL HAZARD. AFTER ANY REPAIRS OR REPLACEMENTS TO HEAT EXCHANGER, COOLANT SIDE OF ASSEMBLY MUST BE PRESSURE TESTED. WHEN THE OIL COOLER HAS BEEN REPAIRED, THE OIL COOLER IS ALSO TO BE PRESSURE TESTED.

(17) PHYSICAL INJURY. WHEN CARRYING OUT A CONVERTOR STALL TEST, VEHICLE MUST BE POSITIVELY PREVENTED FROM MOVING.

(18) PHYSICAL INJURY. APPLY BOTH STEERING BRAKE LEVERS AND ENGAGE PARKING CONTROLS; 'CHOCK' VEHICLE TO PREVENT MOVEMENT FORWARD OR IN REVERSE.

(19) PERSONNEL INJURY. THE SPRING FORCE WITHIN FRICTION TYPE SHOCK ABSORBER CAUSES THE SHOES TO EXERT CONSIDERABLE RADIAL PRESSURE. WHEN ASSEMBLY IS BEING DISMANTLED OR ASSEMBLED, SPECIAL TOOL FV559632 MUST BE USED. ANY ATTEMPT TO DISMANTLE BY OTHER MEANS MAY RESULT IN INJURY TO PERSONNEL, AS THE SHOES WILL TEND TO FLY OUTWARDS AS THEY CLEAR THE CYLINDER.

(20) PERSONAL INJURY. DURING THIS OPERATION, SHOES MUST NOT PROTRUDE PAST OPEN END OF CYLINDER, AS TOOL RETAINING SLEEVE IS NOT BEING USED.

(21) COSHH HAZARD. HARDENER SHOULD NOT BE ALLOWED TO TOUCH SKIN. PERSONNEL PREPARING MIXTURE SHOULD APPLY INDUSTRIAL PROPHYLACTIC OINTMENT TO HANDS AND WEAR RUBBER GLOVES. ANY TRACE OF HARDENER ON SKIN SHOULD BE REMOVED IMMEDIATELY WITH WARM SOAPY WATER.

(22) PERSONNEL HAZARD. BEFORE USING ANY HAZARDOUS SUBSTANCE OR MATERIAL, ENSURE THAT YOU KNOW THE SAFETY AND FIRST AID INSTRUCTIONS:

(22.1) ON THE LABEL OF THE CONTAINER IT WAS SUPPIED IN.

(22.2) ON THE MATERIAL SAFETY DATA SHEEET.

(22.3) IN THE LOCAL SAFETY ORDERS AND REGULATIONS.

(23) HEAVY WEIGHT. THE TRANSFER GEARBOX WEIGHS 70 kg (154 lb). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS WHEN MOVING THIS EQUIPMENT.

(24) HEAVY WEIGHT. THE FINAL DRIVE WEIGHS 136.2 kg (300 lb). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS WHEN MOVING THIS EQUIPMENT.

CAUTIONS

(1) EQUIPMENT DAMAGE. A vehicle with a disabled engine should not be towed without first removing or disconnecting the gearbox coupling connecting the main gearbox to the steering unit. Unless this is done, moving parts of the main gearbox will be running at high speed with only a limited supply of oil from the rear oil pump (front oil pump will be inoperative). In these conditions, there is a definite risk of the gearbox overheating and seizing. In an emergency, vehicle may be towed FORWARD, for up to half a mile, without serious risk of damage, but in no circumstances must vehicle be towed in reverse. This is because the rear oil pump operation is non- reversible and only operates when the vehicle moves forward.

(2) EQUIPMENT DAMAGE. If steering unit trouble occurs and it is necessary to tow the vehicle, the drive shafts between the steering unit and final drives must be disconnected. In the event of a final drive failure, tracks must be removed.

(3) EQUIPMENT DAMAGE. An A-frame towing bar should be used and towing speed should not exceed 10 mph.

(4) EQUIPMENT DAMAGE. Oil temperature must not exceed 66 deg C (150 deg F) during scavenge operation. If an oil temperature gauge is not fitted the 'stalled' condition must not be maintained longer than thirty seconds due to rapid heating of gearbox oil.

(5) EQUIPMENT DAMAGE. Engine oil tank and pipes and heat exchangers (AESP 2350-T-251-522) must be cleaned before fitting replacement engine.

(6) EQUIPMENT DAMAGE. It is imperative that water is not allowed to penetrate the oil side of the heat exchanger and extra care should be taken during this test.

(7) EQUIPMENT DAMAGE. It is very important that all traces of detergent solution are completely removed, otherwise aerating will occur in the oil.

(8) EQUIPMENT DAMAGE. Do not probe tubes to remove obstruction as this may render heat exchanger unserviceable.

(9) EQUIPMENT DAMAGE. Do not tap control plate seat on end of cylinder barrel. This seat is a lapped fit to control plate and care must be taken, while removing and subsequently during overhaul, to avoid damage to either component.

(10) EQUIPMENT DAMAGE. Do not use a centre punch or other similar tool that will distort the components.

(11) EQUIPMENT DAMAGE. Retaining plate, which secures pistons to rear face of carrier, must not, in any circumstances, be subjected to impact. Bearings should not be fitted to shaft while retaining plate and piston carrier is held rigidly.

(12) EQUIPMENT DAMAGE. Do not remove bush unless necessary, as damage may occur during removal, necessitating renewal of the bush.

(13) EQUIPMENT DAMAGE. Transfer tubes will be damaged if transfer gearbox is not supported until casing clears tubes.

(14) EQUIPMENT DAMAGE. Oil remaining in gearbox will be a mixture of preservative oil and engine oil. Temperature must not be allowed to exceed 66 deg C (150 deg F) during scavenging operations described in Para 71. Stalled condition must not be maintained in excess of twenty seconds, otherwise over heating of gearbox will occur.

(15) EQUIPMENT DAMAGE. Do not maintain stalled condition for longer than thirty seconds due to rapid heating of gearbox.

(16) EQUIPMENT DAMAGE. With gearbox in neutral, run engine at 1200 to 1500 rev/min for two minutes to cool oil between tests.

(17) EQUIPMENT DAMAGE. Do not allow gearbox oil temperature to exceed 108 deg C (225 deg F).

(18) EQUIPMENT DAMAGE. Keep a close check to prevent engine-cooling system from over-heating.

(19) EQUIPMENT DAMAGE. Maximum figure of 108 deg C (225 deg F) for this test is given as a safety factor due to rapid rise in oil temperature. Maximum oil temperature during road test should not exceed 108 deg C (250 deg F gauge reading).

(20) EQUIPMENT DAMAGE. Maximum engine coolant temperature should not exceed 105 deg C (220 deg F).

(21) EQUIPMENT DAMAGE. Maximum gearbox oil temperature during road test should not exceed 122 deg C (250 deg F).

(22) EQUIPMENT DAMAGE. During test, engine and brakes will be under severe load.

(23) EQUIPMENT DAMAGE. Steering unit must be re-aligned to final drives when a replacement assembly is fitted. It is important that steering unit output shafts are aligned to within 0.38 mm (0.015 in.) in both horizontal and vertical planes and that angular displacement is within 0.76 mm (0.030 in.). When checking alignment, mounting bolts must be fully tightened.

(24) EQUIPMENT DAMAGE. If these shims are omitted, steering drift or damage to sprocket labyrinth will occur, due to misalignment of sprocket hub.

(25) EQUIPMENT DAMAGE. Do not use cleaning solvents to remove grease or dirt from torsion bars with the rubber/tape protection, as these may damage covering.

(26) EQUIPMENT DAMAGE. Semi-conducting devices and capacitors, having a comparatively low dc working voltage, are included in some of the assemblies. When carrying out insulation tests with a test set, megger, both ends of interconnecting harnesses or cables must be disconnected, and any semi-conducting device or capacitor, which is included in the circuit of an assembly, must be isolated.

(27) EQUIPMENT DAMAGE. If the ventilation batteries are disconnected or removed, the positive lead must be secured to the insulated terminal post located on the left hand hull wall adjacent to the batteries. This will avoid the danger of a short circuit occurring between the disconnected positive lead and earth should the engine be run.

(28) EQUIPMENT DAMAGE. The bearings in this motor are pre-packed and sealed. Any cleaning involving the use of solvents in which lubricants may be dissolved, must be avoided.

(29) EQUIPMENT DAMAGE. Ensure that controller knob is set to position 1DC before closing single pole switch.

(30) EQUIPMENT DAMAGE. Fan unit of ventilation and Environmental Control System must NOT be run unless the paper element has been fitted to the filter unit, otherwise dust particles in the incoming air can erode fan blades and reduce the efficiency of the equipment.

(31) EQUIPMENT DAMAGE. All sealing throughout vehicle MUST be maintained in a serviceable condition at all times, this is important, as efficient operation of Environmental Control System depends on good and sound sealing of the vehicle. Hull sealing should be inspected at frequent intervals.

CHAPTER 1-0

POWER PACK ASSEMBLY – LIST OF CHAPTERS

CONTENTS

LIST OF CHAPTERS

1 This chapter is further sub-divided as follows:

CHAPTER 1-1

POWER PACK

CONTENTS

GENERAL

WARNING

HEAVY WEIGHT. THE POWER PACK WEIGHS 1816 kg (4000 lb). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS WHEN MOVING THIS EQUIPMENT.

1 Unit repairs: Removing, adjusting and refitting of sub-assemblies and components of the power pack are described in AESP 2350-T-250-522.

2 Field repairs: Breakdown of power pack for removing and refitting major assemblies is described in relevant chapters of this publication.

2.1 Chap 1-2 - Engine

2.2 Chap 1-5 - Transmission

CAUTIONS

(1) EQUIPMENT DAMAGE. A vehicle with a disabled engine should not be towed without first removing or disconnecting the gearbox coupling connecting the main gearbox to the steering unit. Unless this is done, moving parts of the main gearbox will be running at high speed with only a limited supply of oil from the rear oil pump (front oil pump will be inoperative). In these conditions, there is a definite risk of the gearbox overheating and seizing. In an emergency, vehicle may be towed FORWARD, for up to half a mile, without serious risk of damage, but in no circumstances must vehicle be towed in reverse. This is because the rear oil pump operation is non- reversible and only operates when the vehicle moves forward.

(2) EQUIPMENT DAMAGE. If steering unit trouble occurs and it is necessary to tow the vehicle, the drive shafts between the steering unit and final drives must be disconnected. In the event of a final drive failure, tracks must be removed.

(3) EQUIPMENT DAMAGE. An A-frame towing bar should be used and towing speed should not exceed 10 mph.

WORKSHOP SPECIAL TOOLS

3 Table 1 lists the special tools required to carry out the operations detailed in this Sub chapter.

TABLE 1 WORKSHOP SPECIAL TOOLS

Ser (1)	NSN (2)	Designation (3)	FV No. (4)
1	TBA	Sling lifting power pack	559907
2	9ACR 4910-99-802-3190	Beam lifting power pack universal	586352

4 Table 2 lists the adhesives, sealants and lubricants required to carry out the operations detailed in this sub chapter.

TABLE 2 ADHESIVES, SEALANTS AND LUBRICANTS

Ser (1)	NSN (2)	Mfr ID (3)	Description (4)
1	8030-99-225-2053	PX 4	Preservative oil

POWER PACK

Removing and refitting

5 The procedure for removing and refitting power pack is described in AESP 2350-T-250-522, Chap 1-1.

Test running

6 Test run the power pack as follows:

6.1 Position the power pack in front of the vehicle and connect up to the vehicle electrics, fuel supply and gearbox 'neutral start' cable described in AESP 2350-T-250-522, Chap 1-1.

6.2 Start the engine and run at 1000 rev/min. Check that the engine and main gearbox oil systems are functioning using the 'press-to-test' oil pressure switch. Ensure that the hydraulic fan drive system is operating, AESP 2350-T-250-522, Chap 1-4 refers.

6.3 When fully satisfied that all systems are functioning correctly, increase the engine speed to 2000 rev/min and continue running until temperature of outlet coolant reaches 66 deg C (150 deg F).

6.4 Operate the gearbox by moving the gear range lever through all gears to energize clutches and charge system until the oil temperature reaches 66 deg C (150 deg F).

6.5 Stop the engine. Drain the gearbox by removing the drain plug and oil filter element.

WARNING

PERSONNEL HAZARD. OIL WILL BE EXTREMELY HOT, REMOVE THE DRAIN PLUG AND FILTER WITH CARE.

6.6 Ensure the fuel supply and master switch are off. Disconnect the power pack from the vehicle and install the power pack in vehicle, AESP 2350-T-250-522, Chap 1-1 refers.

6.7 Remove the gearbox access plug from the hull bottom plate and position a suitable container to collect oil.

6.8 Apply both steering brake levers and engage the parking controls.

NOTE

The operation detailed in Para 6.9 is carried out to scavenge transmission oil contaminated with preservative oil. (Table 2, Ser 1) from gearbox converter.

CAUTION

EQUIPMENT DAMAGE. Oil temperature must not exceed 66 deg C (150 deg F) during scavenge operation. If an oil temperature gauge is not fitted the 'stalled' condition must not be maintained longer than thirty seconds due to rapid heating of gearbox oil.

6.9 Start the engine. Engage the transmission by selecting 3-6 gear range. Increase engine speed to 1000 rev/min to 'stall' the torque converter. Maintain engine speed for 20 seconds approximately whilst the oil is scavenged from converter.

WARNING

PERSONNEL HAZARD. OIL WILL BE EXTREMELY HOT. ENSURE ALL OIL IS DRAINED BEFORE ATTEMPTING TO REPLACE THE DRAIN PLUG.

6.10 Refit the drain plug and fit a new oil filter element to the gearbox. AESP 2350-T-250-522 Chap 1-5 details renewing of the element.

6.11 Fill the gearbox to correct working level AESP 2350-T-250-601 refers.

Failure diagnosis

7 Refer to AESP 2350-T-250-522, Chap1-4, Table 4 for failure diagnosis of hydraulic fan drive.

8 Refer to AESP 2530-T-250-522, Chap 1-5, Table 4 for failure diagnosis of main gearbox.

SUPERSTRUCTURE

General

9 The superstructure complete with sub-assemblies/components can be removed from power pack sub-frame as one assembly. Use blanking plugs or seal all apertures, pipe ends and unions with masking tape when dismantling.

Removing

WARNING

HEAVY WEIGHT. THE SUPERSTRUCTURE WEIGHS 408 kg (900 lb). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS WHEN MOVING THIS EQUIPMENT.

10 Remove the power pack as detailed in AESP 2350-T-250-522 Chap 1-1 and proceed as follows:

10.1 Drain the coolant and hydraulic oil systems.

10.2 Release the worm drive hose clip from coolant hose at top of the coolant pump. Release the coolant by-pass at the union on the coolant pump and release the worm drive hose clip from the flexible coolant hose at thermostat.

10.3 Unscrew the union nuts.

10.3.1 Fuel Injection Pump (FIP) leak-off at the T-junction above the pump.

10.3.2 Fuel supply pipe to the FIP.

10.3.3 Injector leak-off pipe at the union to the flexible pipe.

10.4 Disconnect the firewire union adjacent to No.1 injector.

10.5 Remove the exhaust branch pipe from both manifolds.

10.6 Disconnect the engine oil tank to heat exchanger oil pipe at the tank union. Remove the engine oil tank breather from the oil tank and from the flexible hose connection underneath the radiator.

10.7 Disconnect all cables from the rectifier top plate, engine oil tank.

10.8 Remove the cable harness (thorn connector) from the front generator.

10.9 Disconnect the surplus air pipe from the engine air casing.

10.10 Disconnect the oil pipe fitted between the bottom cover (sump) and heat exchanger at the flexible connection below the air cleaner.

10.11 Disconnect the firewire union below the starter motor. Remove cables from the starter motor.

10.12 Disconnect the inlet and outlet pipes, the hydraulic pump and the pump leak-off pipe.

10.13 Disconnect the inlet and outlet pipes on the engine oil filters. Release the worm drive hose clip on the engine gear case breather at the filter.

10.14 Disconnect the main gearbox to heat exchanger oil pipes at the heat exchanger. Remove the sender unit from the main gearbox oil pipe.

10.15 Remove the cable harness (thorn connector) from the rear generator and the cable clip from the superstructure. Remove all clips securing cables to the engine casing. Remove the thorn connector from the engine junction box.

10.16 Disconnect the air cleaner to blower (supercharger) trunking, and blank off the blower, AESP 2350-T-251-522, Chap 1-3 refers.

10.17 Unscrew the securing bolts and remove the lower section of the rear part of the superstructure, the lower part consisting of two legs and a cross member.

10.18 Attach the lifting sling/beam to the superstructure. If the universal lifting beam (Table 1 Ser 2) is used, adjust the sling legs to counteract the predominance of weight on LH side. If the lifting sling (Table 1 Ser 1) is used, fit a 'check' rope to the air cleaner brackets. Take the weight of the superstructure and sub-assemblies and remove the six bolts securing the superstructure to the base frame.

WARNING

HEAVY WEIGHT. THE POWER PACK WEIGHS 1816 kg (4000 lb). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS WHEN MOVING THIS EQUIPMENT.

10.19 Lift the superstructure assembly carefully, ensuring a balanced lift. Most of the weight is on air cleaner side. Ease the assembly clear of the engine and gearbox and free any pipes or cables as the lifting progresses.

10.20 Refit the lower section of rear part of the superstructure, then place the superstructure on suitable wooden blocks. Pack up as necessary to allow for uneven length of superstructure legs. Ensure the assembly is secure before releasing the weight and removing the lifting sling or beam.

10.21 Mask or seal off pipe openings, apertures and opened connections as necessary.

Refitting

11 Refitting the superstructure is a reversal of Para 10

PRESERVATION

12 Temporary preservation of repairable power packs is to be carried out in REME workshops, prior to back loading, as follows:

12.1 AESP 0200-A-220-013 is a general guide when preserving power pack assemblies.

12.2 As the power pack will have recently been taken out of service, internal parts of major assemblies and hydraulic fan drive components will be covered with a film of oil acting as a preservative. It is still necessary to introduce a suitable preservative into the engine cylinders, as corrosive residues of combustion may be present. Carry out the procedure detailed in AESP 0200-A-220-013.

12.3 Drain the cooling system, the main gearbox, the engine, and hydraulic oil tanks. Affix a label stating 'COOLING SYSTEM AND ALL LUBRICATING SYSTEMS ARE DRAINED'.

DE-PRESERVATION

NOTE

For long-term preservation of power pack (but not necessarily as assemblies/components) the main gearbox, hydraulic fan system and FIP governor are left filled with the correct oil.

13 De-preservation is to be carried out as follows:

13.1 Remove the replacement assembly from the packing case. Local instructions regarding the return of case and other parts to be followed.

13.2 Remove all blanking plates, masking and securing tape from apertures, breathers and connections.

13.3 Clean off all external preserving grease with a suitable cleaning agent (TBA) and wipe dry with clean lint-free cloth.

13.4 Lift the power pack sufficiently to remove the drain plug from the engine oil tank and drain off any residue of preservative oil. (Table 2, Ser 1) Replace the drain plug and lower the pack.

13.5 Fill to their correct levels:

13.5.1 The cooling system
13.5.2 The engine oil tank
} AESP 2350-T-250-601 refers.

13.6 Remove the drain plug from the cam chest (base) of the fuel injection pump and drain off any preservative oil (Table 2, Ser 1). Fill the base of pump until oil reaches the level of the drain return, AESP 2350-T-250-601 refers.

13.7 Prime the fuel filter.

13.8 Check and top up if necessary the following oil levels, AESP 2350-T-250-601 refers.

13.8.1 The main gearbox.

13.8.2 The hydraulic oil tank.

13.8.3 The FIP governor.

13.9 All apertures, ports, breathers and pipe/hose ends must be sealed, using materials recommended in AESP 0200-A-220-013.

14 Dismantled power packs should be assembled and all external pipes and hoses refitted. Prior to assembling, ensure all internal parts are sprayed with preservative oil. (Table 2, Ser 1), since these parts may not have a covering of oil.

REPAIR TO FRAME

15 The superstructure and sub-frame form a fabricated structure consisting of channel and box sections arc welded to the required design of an Mk 2 power pack. The superstructure for both types is bolted to a sub-frame for ease of dismantling.

16 Welded joints are to be examined, particularly for cracks and cavities, and must be repaired as detailed in AESP 0200-A-201-013.

PAINTING OF FRAME

17 Painting of the superstructure and sub-frame is to be carried out in accordance with AESP 0200-A-221-013.

CHAPTER 1-2

ENGINE

CONTENTS

WORKSHOP SPECIAL TOOLS

1 Table 1 lists the special tools required to carry out the operations detailed in this sub chapter.

TABLE 1 WORKSHOP SPECIAL TOOLS

Ser (1)	NSN (2)	Designation (3)
1	4910-99-800-8918	Engine lifting sling
2	5306-99-865-4905	Eye bolts
3	3940-99-800-7984	Scavenge blower lifting tackle
4	TBA	Stand, Maintenance, Automotive Engine

ADHESIVES, SEALANTS AND LUBRICANTS

2 Table 2 lists the special tools required to carry out the operations detailed in this sub chapter.

TABLE 2 ADHESIVES, SEALANTS AND LUBRICANTS

Ser (1)	NSN (2)	Mfr ID (3)	Description (4)
1	9150-99-991-1124	OMD 90	Lubricating Oil
2	8038-99-224-0759	Wellseal	Sealing compound
3	8010-99-224-8909		Paint priming
4	8010-99-224-8910		Paint priming
5	8010-99-943-4732		Paint aluminium
6	8030-99-225-2053	PX 4	Preservative composition
7	6850-99-224-4966	PX 10	Water displacing fluid
8	8135-99-943-2408		Mouldable wax wrapping
9	8135-99-943-2410		Mouldable wax wrapping
10	(Loctite product)	Ultra copper 5920	Sealing compound
11	(Loctite product)	Ultra black 5910	Sealing compound

GENERAL

3 Power unit for Mk 2 and 2/1 vehicle is a Rolls Royce, K60, No. 4, Mk 4F and 6F. Field repairs to this engine are detailed in Para 16 to Para 32.

4 UNF screw threads are used throughout on the K60 engine. Some metric threads are used on the fuel injection equipment.

5 When any external pipes are disconnected, blanking plugs or caps must be fitted to unions or open ends. If plugs/caps are not available, tape adhesive fabric should be used. Drip trays should be placed underneath power pack or engine when oil pipes are disconnected. Dimensions of oil pipe unions measured across flats are 15/16 in., 1 5/16 in., 1 5/8 in., 1 11/16 in.

6 If any sub-assembly or component is removed to expose an open part of the engine, normal precautions regarding covering and protecting must be observed. In the case of the K60 engine, if air cleaner or scavenge blower assembly is removed it is essential that a blanking plate or cover be used over open apertures. Similarly, if an exhaust manifold is removed, ensure ports are 'blocked off' to prevent entry of foreign material.

7 A new type of sealing arrangement is employed on some flange faces of certain components fitted to K60 engine, and consists of sealing compound with a silk thread laid around face joint.

Replacement assemblies

CAUTION

EQUIPMENT DAMAGE. Engine oil tank pipes and heat exchangers must be cleaned before fitting replacement engine, AESP 2350-T-250-522 refers.

ENGINE ASSEMBLY

WARNING

ASBESTOS HEALTH HAZARD. THIS EQUIPMENT CONTAINS ASBESTOS COMPONENTS. NO ATTEMPT IS TO BE MADE TO WORK WITH ASBESTOS MATERIALS WITHOUT CONFORMING TO APPROPRIATE DEPARTMENTAL/UNIT INSTRUCTIONS.

Removing

8 Remove power pack AESP 2350-T-250-522, Chap 1-1 refers and proceed as follows:

8.1 Drain all systems.

8.2 Remove the superstructure Chap 1-1 refers.

8.3 Remove the main gearbox Chap 1-5 refers.

8.4 Remove the Metalastik coupling Para 36 refers.

8.5 Remove the mechanical drive casing Chap 1-5 refers.

8.6 Remove the RH firewire complete with securing bracket.

8.7 Remove the coolant drainpipe clip from the RH front of sub-frame.

8.8 Disconnect and remove the earthing strip from the LH side of sub-frame.

8.9 Remove the exhaust heat shield from front engine mounting.

WARNING

HEAVY WEIGHT. THE ENGINE WEIGHS 758 kg (1670 lb). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS WHEN MOVING THIS EQUIPMENT.

8.10 Screw the two eyebolts, (Table 1, Ser 2), into the tapped holes in the top of the rear of the engine casing. Fit the lifting sling (Table 1, Ser 1) and take the weight of engine.

8.11 Remove the nuts on the engine front support. Lift and move the engine to the rear until the bottom damper is clear of the frame. Lift the engine clear of the sub-frame.

Preparation

9 Prior to refitting original engine or fitting a new reconditioned engine, carry out the following operations:

9.1 Inspect the sub-frame for distortion and any signs of cracks in the welds.

9.2 Clean all external oil pipes and the engine oil tank.

9.3 Clean the engine oil filter case and fit a new element(s).

9.4 Clean and service the air cleaners.

9.5 Clean the fuel filter.

9.6 Clean and flush out the radiator. Clean the radiator externally, if possible with steam cleaning equipment. Ensure the matrix is not damaged. Renew all coolant hoses.

9.7 Clean and flush coolant and oil sections of the heat exchanger, AESP 2350-T-250-522 Chap1-4 refers.

9.8 Inspect the exhaust system. Renew any damaged or unserviceable part.

9.9 Inspect the mounting pads, replace as necessary.

De-preservation

10 Carry out the following de-preservation and servicing checks on new or reconditioned engines.

10.1 Carefully remove the engine from the packing case and inspect the assembly and accessories for damage in transit.

10.2 Remove all external forms of preservative wrapping from all sealed orifices and fuel injection equipment. Clean off all external preserving grease with suitable cleaning agent and wipe dry.

10.3 Check all accessible nuts and unions for tightness and correctly locate coolant hose clips to ensure accessibility should it be necessary to rectify any coolant leaks when the power pack is assembled.

Refitting or replacing engine

NOTE

Ensure all hose and pipe connections are thoroughly tightened and lock-wired as necessary, particularly those where access is difficult when power pack assembling is completed.

11 To refit or replace the engine proceed as follows:

11.1 The engine flywheel and Metalastik coupling must be removed from a new or reconditioned engine in order to fit the flywheel housing (mechanical drive casing) to the engine wheel case. For details of refitting coupling and flywheel see Para 44 and Para 49.

11.2 After lowering the engine onto the sub-frame, pack up underneath the engine rear bearers, and then secure the engine front mounting to the U-frame of sub-frame. Providing the rear of the engine is adequately supported, the weight may be released until both rear support brackets are fitted.

11.3 Ensure oil transfer sleeves with seals are correctly located between the flange faces or wheel case and mechanical drive casing (see Chap 1-5 for correct setting of stud before assembling the flywheel to the engine).

11.4 Refit or replace the main and/or transfer gearboxes Chap1-5 refers.

Tests and adjustments

12 When the power pack has been assembled with a new or repaired engine, refill all systems AESP 2350-T-250-601 refers for capacities and special servicing instructions. Before test run, carry out the following tests and adjustments.

12.1 Adjust the gearbox throttle valve controls, AESP 2350-T-250-522 Chap 3 refers.

12.2 Ensure the fuel injection pump governor oil reservoir is correctly filled, AESP 2350-T-250-601 refers.

12.3 Pressure test the cooling system, AESP 2350-T-250-522 refers.

Test run

13 Commence test-running the power pack, AESP 2350-T-250-523 Chap 1-1 refers.

14 Functionally test the hydraulic fan drive, AESP 2350-T-250-522 Chap 1-4 refers.

15 Test the main gearbox, AESP 2350-T-250-522 Chap 1-5 refers.

ENGINE REPAIRS

16 If equipment is available and extent of repairs justify the extra work involved, mount the engine on stand, maintenance, automotive engine (Table 1, Ser 4), and proceed as follows:

16.1 Remove the tacho-generator unit.

NOTE

Mask or cover exhaust ports when the manifold is removed.

16.2 Remove the LH exhaust manifold.

16.3 Remove the oil pressure switch (sender unit).

16.4 Remove the injectors 'Leak-off' pipes.

16.5 Screw the eyebolts (Table 1, Ser 2) fully home into the tapped holes at the top rear of the engine casing. Sling using engine lift sling (Table 1, Ser1) and lift the engine into position; slide the brackets in position and secure to the engine casing. Fully tighten bolts; ensuring each bracket inner face is tightened against the engine casing.

Oil pressure relief valve

17 The main oil pressure relief valve is located in a housing in pressure pump cover plate. Remove as follows:

17.1 Remove the power pack, AESP 2350-T-250-522 refers.

17.2 Remove the elbow connection from the engine bottom cover (sump) to pump cover plate.

17.3 Remove the circlip; withdraw the spring guide, spring and valve.

17.4 Renew the two O-rings fitted to the spring guide body, and the large O-ring fitted to the elbow connections. The free length of the spring is 79.4 mm (3.126 in); the spring should compress to 54.6 mm (2.150 in) under load of high 16.2 kg (35.6 lb), low 14.3 kg (31.5 lb). Renew the spring if not within these limits; do not use washers to pack up behind a weak spring. Assemble and refit the pressure relief valve in reverse order to removing.

Main oil pumps

18 There are two scavenge and one pressure pump fitted, all being gear driven off the lower crankshaft, and housed inside engine casing. Removing and dismantling oil pumps is not to be carried out at field level.

Scavenge blower assembly

19 The scavenge blower assembly is driven from the upper crankshaft via an intermediate gear. The drive shaft extends through the centre of the top rotor and is spur gear connected at its front end (in relation to engine) to bottom rotor. The rotors are of a three lobed involute format, dynamically balanced on double ball and single roller bearings. A flexible coupling located by Woodruff key to gear end of drive shaft provides drive to engine coolant pump. Lubrication for assembly is by pressure feed from engine oil gallery. A small scavenge pump driven by a dog coupling from geared end of lower rotor shaft returns oil through hollow dowel to wheel case. Field repairs to scavenge blower are to consist of removing and refitting assembly and replacement of oil seals. Clearance between rotors and casing are detailed in EMER Power S 568/1, Pt 2 Section 6 as a guide to field units when considering if wear is sufficient to justify replacement.

Removing

20 To remove the scavenge blower assembly proceed as follows:

20.1 Remove the power pack, AESP 2350-T-250-522 Chap 1-1 refers.

20.2 Drain the coolant system.

20.3 Remove the air cleaner assembly, AESP 2350-T-250-522 Chap 1-3 refers.

20.4 Disconnect and remove the oil pipe from the engine bottom cover to the union of the flexible pipe to the heat exchanger. Remove the oil drainpipe from the lower front of the scavenge blower casing. Use a suitable tray for oil spillage and cap off the pipe ends.

20.5 Remove the setscrews securing the tacho-generator gear housing to the drive housing and the screws securing the drive housing to the wheel case.

20.6 Remove the LH threaded nut securing the drive gear to the drive shaft (wheel case end).

20.7 Disconnect the drive shaft assembly scavenge blower to the coolant pump and remove the pump AESP 2350-T-250-522 Chap 1-4 refers.

20.8 Fit the sling (Table 1, Ser 3) to the scavenge blower assembly and take the weight.

20.9 Remove the screws securing the scavenge blower housing flange to the wheel case, and the screws securing the mounting bracket to the air chest; lift and ease the assembly to the front of the engine to disengage drive, swing the assembly clear of the engine casing. Collect the preformed packing fitted between the base of scavenge blower and the air chest, as soon as possible, fit suitable a cover over aperture in the air chest.

Maintenance

21 Excessive wear of rotor bearings will result in noisy drive gear and intermeshing of rotors.

22 Inspect rotors and inlet/outlet casing for scores or burrs. Small blemishes may be carefully stoned to restore profile, but if heavy scoring is apparent, assembly should be back-loaded to base for complete dismantling. The drive shaft absorbs torsional fluctuations of rotor assembly and should be carefully inspected to ensure it is free from 'nicks' or burrs.

Reassembling

23 To reassemble the scavenge blower assembly proceed as follows:

23.1 Position the new seal flush with outer face of drive cover, with the lip facing inwards (toward rotors). Lubricate the seal lip with oil (Table 2, Ser 1).

23.2 Carefully expand the new O-ring over the cover.

23.3 Refit the cover and flexible coupling, ensuring the oil hole in the cover is adjacent to the oil hole in the gear casing.

23.4 Strike number '2' from the modification record plate on the blower.

Alternator drive and casing

24 To remove the alternator drive and casing, AESP 2350-T-250-522 Chap 1-2 refers.

25 Inspect the following, AESP 2350-T-250-522 Chap 1-2 refers.

25.1 Front cover and rear housing for distortion; ensure flange faces are clean and free of burrs.

25.2 Gear teeth for excessive wear. On assembly, backlash between the gears should be between 0.051 mm to 0.127 mm (0.002in to 0.005in).

25.3 Renew oil seals on transfer sleeve.

NOTES

(1) The thrust/tensioning arrangement, in the counter bore of drive shaft gear, consists of discs (or separating washers) spring loaded and located by a circlip. This should not be dismantled unless obviously necessary; when assembling, ensure 'cut-away' parts of disc are aligned.

(2) Bearing bushes for the drive and intermediate gears are shrunk-fitted and line bored. They are not to be renewed at field level.

26 Refit the assembly in reverse order to removing, ensuring that:

26.1 The thrust washer is fitted on the boss of the drive wheel with the relief grooves outwards.

26.2 The transfers sleeve is fitted between the rear housing and the front cover.

Top and bottom covers

27 These are secured to the top and bottom of the engine casing and, when removed, provide access to the upper (air) and lower (exhaust) crankshafts. In addition, the bottom cover functions as a sump or reservoir for drained oil as it is scavenged back to the engine oil tank.

Removing and refitting

28 To remove the top and bottom covers proceed as follows:

28.1 Remove the engine, (Para 8 refers).

28.2 Remove the harness clips and engine junction box (top cover only) before removing the screws securing the covers to the engine casing.

28.3 If the engine is mounted in stand or on packing, position a jack as a support when lowering the bottom cover. Remove pipe connecting the bottom cover to the pressure pump housing cover plate and ensure the cover is lowered evenly.

28.4 To remove air baffle assembly with strainers fitted to bottom cover, open tab washers of baffle assembly and remove screws. When refitting baffle assembly new tab washers are to be used.

28.5 Clean baffle assembly, strainers and covers before refitting.

28.6 Using sealing compound (either Table 2, Ser 10 or Ser 11), use two or three guide studs to position top/bottom cover exactly in position. Tighten screws evenly.

Removing the wheel case

29 To remove the wheel case proceed as follows:

29.1 Remove the power pack, AESP 2350-T-250-522 Chap 1-2 refers.

29.2 Remove the engine AESP, 2350-T-250-522 Chap 1-2 refers.

29.3 Remove the alternator drive and casing, AESP 2350-T-250-522 Chap 1-2 refers.

29.4 Remove all pipes and electrical leads (harness) connected between the wheel case and the engine casing.

NOTE

At this stage it is advisable to mount the engine in a stand or pack up underneath the engine bearers with suitable packing. This is necessary as both the top and bottom covers have to be removed.

29.5 Remove the centre setscrews from each of the intermediate (idling) gears; i.e. two crankshaft intermediates and one scavenge blower intermediate gears.

NOTE

These setscrews are externally positioned centrally to the end covers and locate and secure the tapered split bush fitted over end of the respective wheel boss support.

29.6 Remove the top and bottom covers. Note that the rear end of each cover forms a mated joint with the angled face (top and bottom) of the wheel case.

29.7 Remove setscrews securing flange of wheel case to engine casing.

29.8 Remove the wheel case. If necessary tap with a mallet to break joint. The wheel case can be manhandled free; weight 36.3 kg (80 lb approx).

NOTE

The wheel case can be removed complete with output shaft and gear, but it must be remembered that train of gears between the upper and lower crankshafts will now be disconnected (see phasing of crankshafts Para 30).

29.9 Unscrew the flange setscrews and remove the output shaft and housing. The housing is split horizontally to permit removal of the output shaft with gear.

Refitting the wheel case (including phasing crankshafts)

NOTE

The wheel case must be refitted with the output shaft removed, so that the crankshafts can be rotated independently for phasing.

30 To refit the wheel case proceed as follows:

30.1 Coat the mating faces with sealing compound (Table 2, Ser 10 or Ser 11) and offer up the wheel case to the engine casing. Secure with two or three setscrews.

30.2 Rotate the crankshafts until the timing mark on each crankshaft is in line with the respective timing mark on the wheel case. The timing marks are grooved lines machined on the flange face of the wheel case adjacent to each crankshaft; the lower crankshaft marks are in the vertical centre position and the upper crankshaft marks are 11 degrees to the right of vertical centre line, lower part of bore.

30.3 With both crankshafts aligned, fit the output shaft and housing. Ensure that:

30.3.1 Meshing of the output gear does not disturb the crankshaft settings.

30.3.2 The relief grooves of the split thrust washer face against the gear wheel.

30.4 Continue refitting in reverse order to removing.

Removing the fuel injection pump drive

31 To remove the fuel injection pump drive, proceed as follows:

31.1 Remove the engine Para 8 refers.

31.2 Mount the engine in stand, or pack up underneath the engine bearers so that the bottom cover can be removed.

31.3 Remove the alternators, alternator drive and housing, AESP 2350-T-250-522 refers.

31.4 Remove the top and bottom covers Para 28 refers.

31.5 Remove the wheel case Para 29 refers.

31.6 Remove the upper crankshaft intermediate (idler) gear, loosen and move aside the upper oil spray pipe.

31.7 Remove the fuel injection pump drive shaft.

31.8 Remove the fuel injection pump.

31.9 Remove the fuel injection pump coupling (flexible drive) as follows:

31.9.1 Remove the setscrews securing the front plate of the drive.

31.9.2 Remove the setscrews securing the back plate to the flexible drive.

31.9.3 Unscrew the slotted nut securing the drive dog to the drive shaft.

31.9.4 Remove the drive dog, flexible plate and back plate.

31.10 Remove the setscrews securing the fuel injection pump drive housing to the adaptor plate. Remove the drive housing complete.

31.11 Remove the setscrews securing the adaptor plate to the engine casing. Note that a large O-ring is fitted in centre of the adaptor plate and two small O-rings form a seal on either side of the oil delivery tube (hollow dowel) fitted between the engine casing, adaptor plate and fuel injection pump drive housing.

Refitting the fuel injection pump drive

32 To refit the fuel injection pump drive proceed as follows:

32.1 Thoroughly clean all surfaces.

32.2 Apply sealing compound (Table 2, Ser 2) to the inner face of the adaptor plate and locate one of the small O-rings in the recess. Refit the adaptor plate to the engine casing.

32.3 Apply sealing compound (Table 2, Ser 2) to the outer face of the adaptor plate and fit the second (small) O-ring.

32.4 Fig the large O-ring to the fuel injection pump drive housing and refit the housing to the adaptor plate.

32.5 Refit the fuel injection pump coupling including the flexible drive plate.

32.6 Align the upper (inlet) crankshaft to timing mark on the upper crankshaft damper (40 deg before inner dead centre) and the pointer on engine casing.

32.7 Refit the fuel injection pump so that the pointer on the pump aligns with the timing mark on the coupling.

32.8 Maintain the conditions in Para 32.6 and 32.7, and carefully fit the fuel injection pump shaft in the wheel case; mesh the gears without disturbing the coupling timing or the crankshaft timing.

32.9 Turn the engine over; using the upper crankshaft damper, one complete revolution and recheck the fuel injection pump timing.

32.10 Refit and tighten the oil spray pipe; fit the upper crankshaft intermediate gear.

32.11 Refit the wheel case as detailed in Para 30.

32.12 Refit the alternator drive and housing,

FUEL INJECTION EQUIPMENT

33 For repairs to the fuel injection pump and governor, refer to the following publications.

33.1 EMER Pwr M 106 Fuel Injection Equipment, Technical Handbook - Preferred repair scheme.

33.2 EMER Pwr M 112/3 Fuel Injection Equipment, CAV, Fuel Injector Pumps, types N and NN Technical handbook – Technical Description.

33.3 EMER Pwr M 114/3 CAV Fuel Injection Pumps, Types N and NN Technical Handbook - Field and Base repairs.

33.4 EMER Pwr M 132 Fuel Injection Equipment CAV Governors and Stop Assemblies Technical Handbook – Technical Description.

33.5 EMER Pwr M 134 Fuel Injection Equipment CAV Governors and Stop Assemblies Technical Handbook – Field and Base Repairs.

33.6 CAV Test plan NNL6H90/289 with hydraulic governor RHG 140.

NOTE

Test plan is supplied with fuel injection test bench.

ENGINE COUPLING

Removing

NOTES

(1) The flywheel, Metalastik coupling and flywheel buffer stops are identical items on Mk 2 and Mk 2/1 vehicles.

(2) Fig 2 shows a sectioned elevation of Metalastik coupling.

34 Remove the power pack and superstructure Chap 1-1 refers).

35 Remove the transfer gearbox assembly from the mechanical drive casing Chap 1-5 refers.

36 Remove the Metalastik coupling from the engine flywheel, as follows.

36.1 Release the tabs of the locking washers and remove the outer ring of screws securing the coupling to the flywheel.

36.2 Grasp the hollow driving hub and pull the coupling away from the flywheel. If necessary, pull sideways on the hub to break the seal formed by the rubber buffer stops fitted to the engine flywheel.

Dismantling

37 To dismantle the stop plate and driving hub from the coupling plate, proceed as follows.

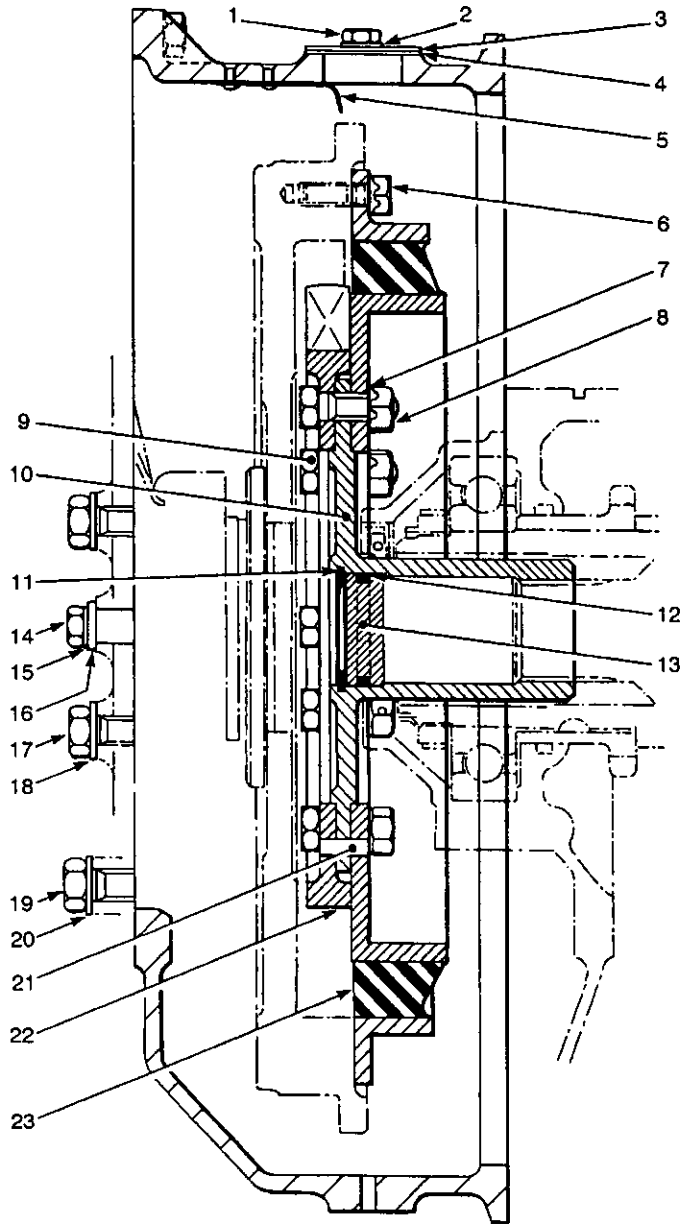
37.1 Release the tabs of the locking washers (Fig 1(7)) and remove the inner ring of nuts (8) and bolts (9) securing the stop plate (22) and driving hub (10) to coupling plate (23).

37.2 Remove the stop plate (22) and driving hub (10). Note that the stop plate and driving hub are located by a roll pin (dowel).

37.3 Remove the circlip (11) retaining the driving hub end plug (13). Withdraw the end plug, complete with O-ring (12).

Maintenance

38 Inspect the bonded rubber ring of the coupling plate for signs of breaking away from the metal. If this is apparent, renew the complete coupling.



432/245

1	Setscrew	13	End plug
2	Washer	14	Bolt
3	Timing cover	15	Washer
4	Gasket	16	Dowel
5	Timing pointer	17	Bolt
6	Bolt	18	Washer
7	Lock washer	19	Bolt
8	Nut	20	Washer
9	Bolt	21	Roll pin (dowel)
10	Driving hub	22	Stop plate
11	Circlip	23	Metalastik coupling
12	'O' ring		

Fig 1 Metalastik coupling, Mk 2 and 2/1 vehicles

39 Renew O-ring on the end plug.

40 Renew all locking washers; examine and renew circlip if necessary.

41 Inspect threads of all nuts and bolts and renew as necessary.

42 Inspect hub internal splines for wear and damage.

43 Three extraction holes have been drilled in the coupling shaft, to facilitate its removal from the flywheel. An example of the location of the holes can be seen in Fig 2.

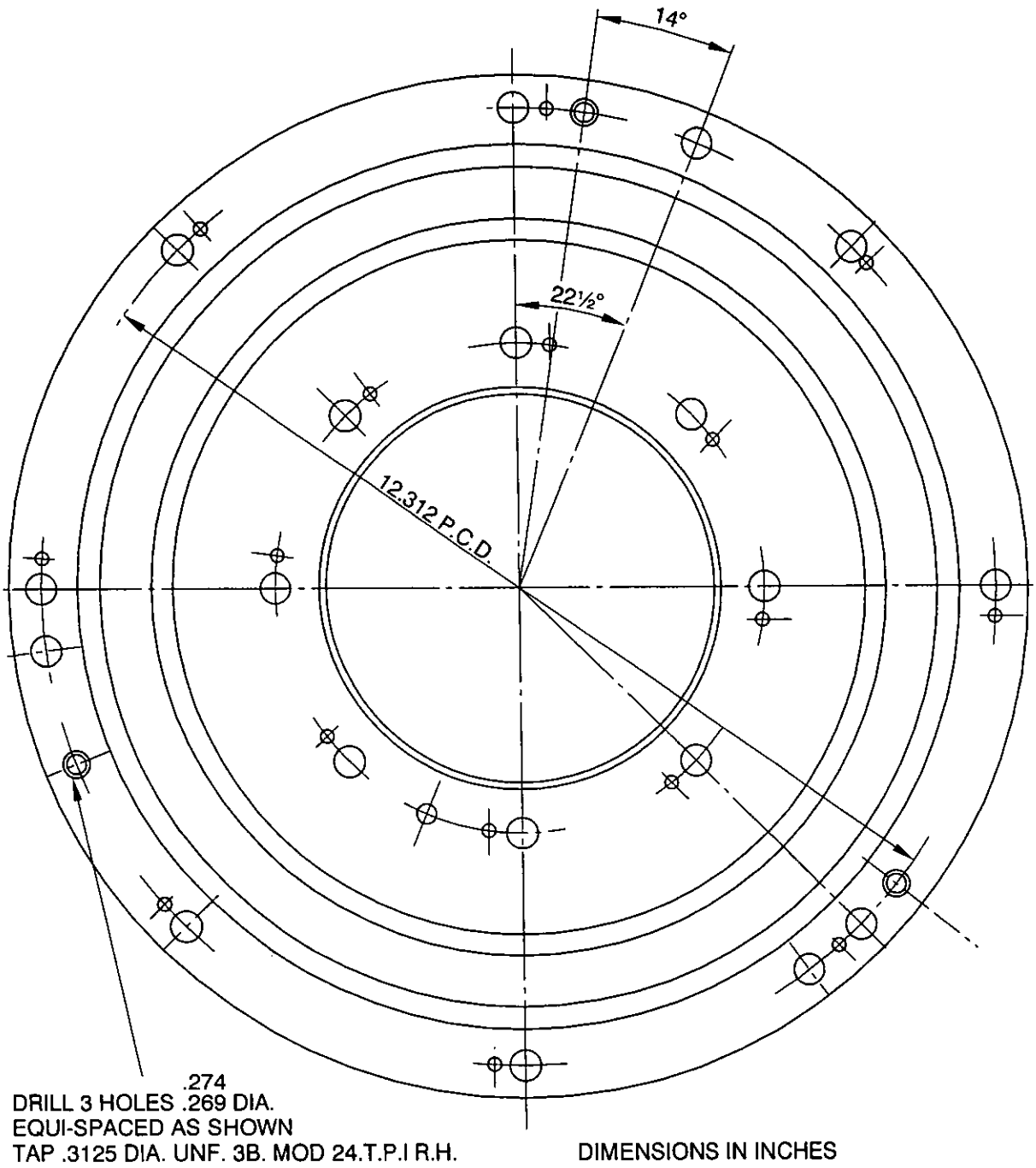


Fig 2 Drilling detail - coupling shaft flexible

Assembling and refitting

44 Assemble and refit the Metalastik coupling in the reverse order ensuring that.

44.1 The coupling is located to the flywheel by three roll pins (dowels).

44.2 Nuts and bolts securing the driving hub and stop plate to the coupling are tightened to 49 Nm (36 lbf ft).

44.3 Bolts securing coupling to flywheel are tightened to 28.4 Nm (21 lbf ft).

FLYWHEEL AND STARTER RING

Removing

45 The procedure to remove the flywheel and starter ring is as follows:

45.1 Remove the Metalastik coupling.

45.2 Remove the ring nuts from the centre of flywheel.

45.3 Remove the flywheel and starter ring assembly (weight – 18.6 kg (41 lb)).

NOTE

A new flywheel is issued without the three roll pins for locating the Metalastik coupling. When demanding a new flywheel, a set of three new roll pins must also be demanded. Roll pins from unserviceable flywheel must not be extracted and fitted to the new flywheel.(NSN LV10/5315-99-204-7772 - Pin, Spring, Flex Coupling to Flywheel).

Maintenance

46 Inspect the bonded rubber pads on each of the four buffer stops, for excessive wear or signs of breaking away from the metal. Renew the stops if the rubber pads are unserviceable.

47 When replacing the buffer stops, tighten the nuts and bolts securing each stop to the flywheel to 28.4 Nm (21 lbf ft).

48 To remove the starter ring, remove the bolts securing the starter ring to the flywheel and remove the ring.

Refitting

49 Assemble the flywheel to the crankshaft flange, noting that correct location of the flywheel is ensured by an offset hole.

50 The nuts securing the flywheel to the crankshaft are to be tightened to 48.8 Nm (36 lbf ft) (set bolts for K60 engine). Should the 3/8 in. UNF bolts securing the flywheel to the output gear on a K60 engine exceed 7/8 in. length, they are to be reduced to prevent 'bottoming' AESP 2350-T-250-821 Gen Instr No 1/Misc Instr No.6 refers.

OIL TANK AND EXTERNAL OIL PIPES

Engine oil tank

51 The engine oil tank is manufactured from No. 16 SWG terne plate consisting of mild steel sheet with internal surfaces protected with coating of 20% tin and 80% lead. Cleaning of the tank is described in AESP 2350-T-250-522.

Pressure testing

WARNINGS

(1) FIRE HAZARD. FLASH POINT OF WATER DISPLACING FLUID (PX-10 (TABLE 2, SER 7)) IS 38 deg C (100 deg F) APPROXIMATELY AND THE FOLLOWING PRECAUTIONS MUST BE OBSERVED TO ELIMINATE FIRE HAZARD.

(2) FIRE HAZARD. FLUID MUST NOT BE LEFT STANDING OR STORED IN OPEN CONTAINERS.

(3) FIRE HAZARD. SMOKING OR USE OF NAKED LIGHTS IS PROHIBITED WHERE WATER DISPLACING FLUID IS BEING USED.

(4) FIRE HAZARD. DISPOSE OF USED WATER DISPLACING FLUID IN ACCORDANCE WITH LOCAL STANDING ORDERS.

52 Before replacing a new or repaired tank, carry out the pressure test as follows:

52.1 Wash out the tank with clean running water, then rinse in hot 1% washing soda solution followed by further rinses in clean running water.

52.2 Thoroughly dry, particularly seams and joints. Blank off all apertures and outlet connections. Whiten the outside on all seams and joints, and support tank so that joint can be inspected.

52.3 Pour into the tank, sufficient water displacing fluid (See Table 2, Ser 7) to fill at least 10% of tank capacity. Manipulate the tank to ensure that all internal surfaces are wet.

52.4 Air pressurizes the tank to 172 mbar (2-1/2 lb/sq in). for a further half an hour. Maintain this pressure for half an hour, and then reduce to 69 mbar (1 lb/sq in) for a further half an hour.

52.5 Examine the seams for leaks, indicated by discolouration of whitening.

52.6 When all leaks have been rectified, retest as detailed in Sub-para 52.4.

52.7 Drain off the water displacing fluid, but leave the tank sealed until required for installation.

53 Preservation of oil tanks for temporary storage is to be carried out as follows:

53.1 Pour water-displacing fluid into the tank so that at least 10% of tank is filled. Manipulate tank to ensure that all internal surfaces are wet. Drain off water displacing fluid.

53.2 Repeat using a composition, preservative (Table 2, Ser 6). After draining, refit the drain plug.

53.3 Seal off all apertures using wax wrapping, (Table 2, Ser 8 and 9) and adhesive tape.

Painting

54 The following paints are to be used when painting external surfaces of oil tank.

54.1 Paint, priming. (Table 2, Ser 3 and 4).

54.2 Paint, aluminium, fire resisting. (Table 2, Ser 5).

54.3 For painting engine and engine components, AESP 0200-A-221-013 refers.

Cleaning external oil pipes

55 To clean external oil pipes proceed as follows.

55.1 Oil pipes and hoses must be cleaned by blowing through them with dry compressed air until all traces of sludge has been removed.

55.2 Visually inspect and renew any hose showing signs of deterioration.

55.3 Pump oil (Table 2, Ser 1) through pipes/hoses to remove any trace of moisture that may be present.

55.4 Fit blanking caps over ends of pipe until required for use.

CHAPTER 1-3

FUEL SYSTEM

CONTENTS

ADHESIVES, SEALANTS AND LUBRICANTS

1 Table 1 lists the adhesives, sealants and lubricants required to carry out the operations detailed in this sub chapter.

TABLE 1 ADHESIVES, SEALANTS AND LUBRICANTS

Ser (1)	NSN (2)	Mfr ID (3)	Description (4)
1	3439-99-910-5037		Solder, Tin alloy
2	8030-99-225-2053	PX4	Preservative, composition
3	6850-99-224-4966	PX10	Water displacing fluid
4	8135-99-943-2408		Mouldable wrapping, waxed

FUEL TANKS

General

2 Fuel tanks fitted to a FV430 series vehicle are manufactured from No.16 SWG terne plate. Basic metal is mild steel plate and internal surfaces are protected with a coating of terne (composition 20% tin, 80% lead).

Removing and refitting

3 Procedure for removing and refitting fuel tanks can be found in AESP 2350-T-250-522 Chap 1-3.

Repairs to fuel tanks

WARNING

SAFETY HAZARD. BEFORE ANY REPAIR IS CARRIED OUT TO A FUEL TANK, OBSERVE SAFETY PRECAUTIONS DETAILED IN EMER GEN 0 331.

General

4 When a damaged tank can economically be made structurally sound by the addition of small patches, the tank may be repaired. Severely damaged or corroded tanks are to be reduced to salvage.

Preparation

5 Remove all components, which can easily be dismantled, i.e. filler housing, blanking plates, sender unit and float assembly.

6 Degas, clean and inspect tank as detailed in EMER Gen 0 331.

7 If on inspection it is found that sludge and gummy residue are still present, the tank should be immersed in hot 5% caustic soda solution as detailed in EMER Wksp G 300.

De-rusting

8 Small areas of rust may be removed using de-rusting fluid as detailed in Wksp G 300.

Corroded tanks

9 Where internal surfaces have small areas of corrosion, the areas may be tinned, using solder (Table 1, Ser 1), after cleaning and de-rusting.

Damaged tanks

10 Where it is decided that economic reclamation of a damaged tank is possible by the addition of patch plates. The plates must be of terne plate or mild steel tinned on all surfaces.

10.1 Plates must be of the same gauge as the tank and must overlap the extremities of the damage by at least 19 mm (0.75 in.). Repair plates must not exceed 152 mm (6 in.) square. They are to be secured with self-tapping screws spaced at no more than 25 mm (1 in.) pitch, and the joint sealed by soldering over joint edges and screw heads.

11 Where inspection holes have been cut in the tank, these are to be closed by patch plates using the method detailed in Sub-Para 10.1.

12 After repairs have been completed, the tank is to be tested for leaks by whitening all joints and seams, then carefully pouring kerosene into tank, agitating tank to ensure that kerosene wets all internal surfaces. Examine all whitened joints for signs of leakage.

13 If leakage is apparent, the tank must be degassed as detailed in Para 6 before rectification.

Painting

14 Exterior of fuel tanks are to be painted in accordance with AESP 0200-A-221-013 to produce a finished colour to match tank position, i.e. aluminium for internally mounted tanks, green bronze for externally mounted tanks.

Temporary preservation

15 Preservation of fuel tanks is to be carried out as follows using materials detailed in AESP 0200-A-221-013.

15.1 Pour into tank sufficient water displacing fluid (Table 1, Ser 3) to occupy at least 10% tank capacity. Manipulate tank to ensure that all internal surfaces are wet. Drain off surplus fluid.

15.2 Repeat procedure detailed in Sub-Para 15.1 using preservative. (Table 1, Ser 2)

15.3 Seal off all apertures with mouldable wax wrapping (Table 1, Ser 4) and secure with adhesive tape.

CHAPTER 1-4

COOLING SYSTEM

CONTENTS

(continued)

CONTENTS (continued)

WORKSHOP SPECIAL TOOLS

1 Table 1 lists the special tools required to carry out the procedures detailed in this sub-chapter.

TABLE 1 WORKSHOP SPECIAL TOOLS

Ser (1)	NSN (2)	Designation (3)	
1	5120-99-808-9465	Puller mechanical No.4 c/w 2 legs	
2	TBA	Puller attachment	
3	W2/6685-99-942-0443	Gauge, pressure 0-60 lbf in²	x 1
4	6MT6/4720-99-805-7790	Hose, rubber, 1.75 in. id x 2.25 in. od	x 2
5	6MT1/4730-99-801-1057	Clip, hose, worm drive, 2 in. to 2.67 in.	x 4
6	9ACR/2930-99-801-3553	Head, cooler, coolant outlet	x 1
7	9ACR/2930-99-867-4613	Tank end fluid cooler	x 1
8	9ACR/2990-99-867-4600	Gasket	x 4
9	9ACR/5310-99-867-4599	Nut, plain cap	x 2
10	6MT1/5330-99-942-8542	Washer, seal	x 2

LOCALLY MANUFACTURED TOOLS

2 Table 2 lists the locally manufactured tools required to carry out the procedures detailed in this Sub-chapter.

NOTE

Drawings if required may be obtained from LASS IPT, DLO Andover, Portway, Monxton Road, Andover, Hants, SP11 8HT

TABLE 2 LOCALLY MANUFACTURED TOOLS

Ser (1)	Drawing No. (2)	Designation (3)
1	V7122/3	Slave bolts for dismantling control unit
2	V7122/4	Jig for drilling seal removal holes, control unit

ADHESIVES, SEALANTS AND LUBRICANTS

3 Table 3 lists the adhesives, sealants and lubricants required to carry out the procedures detailed in this Sub-chapter.

TABLE 3 ADHESIVES, SEALANTS AND LUBRICANTS

Ser (1)	NSN (2)	Mfr ID (3)	Description (4)
1	7930-99-220-4958		Detergent (GP)
2	6505-99-210-2450		Citric Acid
3	6850-99-220-2661		Cleaning compound
4	8030-99-220-2370	Hylomar	Jointing compound
5	8030-99-225-0248	242	Loctite
6	6850-99-224-4966	PX10	Water displacing fluid
7	TBA		Kerosene

COOLANT PUMP

4 Removing, dismantling, reassembling and refitting the coolant pump fitted to K60 engine is described in AESP 2350-T-250-522 Chap 1-4.

RADIATOR

5 Removing, refitting and pressure testing of the radiator and pressure relief valve and vacuum relief valve are described in AESP 2350-T-250-522 Chap 1-4.

6 If a partial or complete clogging of the radiator is suspected, clean in accordance with the procedures described in Para 8 to 10.

7 The cleaning methods and agents described are a means of ensuring cleanliness in the system. Other approved methods may be adopted at the discretion of the formation Equipment Support Branch REME.

Cleaning

Reverse flushing

8 Fit blanking plugs to the two pipe connections on the header tank.

9 Remove sediment and other loose residue from the radiator by directing a stream of water under moderate pressure into the outlet pipe orifice at lower tank until no evidence of foreign material is visible in the discharged water.

Chemical cleaning

10 If water flow indicates that an internal obstruction is still present after carrying out reverse flushing procedure, clean radiator as follows:

10.1 Prepare a solution of detergent and water in accordance with instructions on container (Table 3, Ser 1). Heat solution to 83 deg C (180 deg F).

10.2 Fit blanking plugs to all orifices, remove the filler cap and pour heated solution into the radiator and allow to stand for ten minutes.

10.3 Drain off solution and allow the radiator to cool for 15 minutes.

10.4 Prepare a solution of citric acid and water (Table 3, Ser 2) 113 gm (4 ounces) of citric acid to each 4.5 litre (1 gal) of water. Heat the solution to 83 deg C (180 deg F).

10.5 Pour heated solution into the radiator and allow to stand for ten minutes.

10.6 Drain off solution and allow the radiator to cool for 15 minutes.

10.7 Thoroughly flush out the radiator with cold water. Ensure that all trace of cleaning agents has been removed.

10.8 If water flow still indicates that internal obstruction has not been cleared, repeat the operations detailed in Sub-Para 10.2 to 10.6.

10.9 If still unsatisfactory back load for contract repair under local arrangements.

HEAT EXCHANGER

CAUTION

EQUIPMENT DAMAGE. It is very important that all traces of detergent solution are completely removed, otherwise aerating will occur in the oil.

11 Removal and refitting of the heat exchanger and replacement of individual oil and coolant sections are described in AESP 2350-T-250-522 Chap 1-4

12 The cleaning method and agents described are a means of ensuring cleanliness in the system. Other approved methods may be adopted at the discretion of the local Quality Assurance personnel with assistance from formation Equipment Support Branch REME.

Cleaning

13 Whenever a new or rebuilt engine, gearbox or steering unit is fitted, the heat exchanger must be thoroughly cleaned and flushed out. This also applies where serious contamination of hydraulic fan drive system or lubrication system of an assembly has occurred, or if the linings of the steering unit brake bands have broken up, and also after repairs to heat exchanger. Neglecting to do so may result in premature failure of an assembly due to the presence of foreign particles.

Dismantling and assembling

NOTE

The heat exchanger should only require dismantling if internal leaks are apparent and/or internal leaks or a blocked system is suspected. When fault finding in cases of overheating, heavy oil sludge deposits in the particular sections of the heat exchanger should be considered. General overheating of all systems may be due to partly blocked coolant matrix in one or more sections. Partial or complete dismantling of the heat exchanger will be dependent on these circumstances.

14 Before removing the nuts and through bolts, mark the flanges of each section to ensure correct replacement.

15 If sections are difficult to part, tap the flanges with a block of hardwood to free them. Use a knife blade or similar in the joint of each section to part, taking care not to damage the flange faces. The joint washers fitted between each section are circular in plan.

16 Points to note when assembling are:

16.1 Ensure all parts are thoroughly cleaned.

16.2 Use a new joint washer for each section removed. Ensure the flange faces are correctly mated and tighten the nuts evenly and securely before wire locking.

16.3 The relief valves are non-adjustable. If they have been dismantled for checking and cleaning, ensure the unions and valve caps are wire-locked.

Cleaning coolant matrix

17 To clean the coolant matrix proceed as follows:

17.1 Plug oil inlet and outlet orifices of each oil cooler section, plug coolant inlet and outlet orifices.

17.2 Clean the exchanger externally by immersion in a kerosene bath. Agitate fluid to ensure thorough cleaning.

17.3 Remove the heat exchanger from bath and allow to drain.

17.4 Remove the plugs from coolant orifices.

17.5 To clean and flush matrix tubes, carry out the operations described for radiator cleaning, Para 8 to Para 10 refers.

Cleaning oil cooler sections

NOTES

(1) When cleaning internal oil passages of each oil cooler, use reverse flushing procedure.

(2) Use only kerosene (Table 3, Ser 7) for cleaning.

18 To clean the oil cooler sections proceed as follows:

18.1 Before cleaning engine or GM-Allison gearbox oil coolers, dismantle and remove the pressure relief valve from the valve body by removing the locking wire, end cap and washer and then withdraw the spring and ball from valve body. Refit the end cap and sealing washer.

18.2 Oil cooler(s) to be cleaned must be filled with kerosene and allowed to stand for 30 minutes.

18.3 Drain off the kerosene.

18.4 Force flush cooler(s) with kerosene, heated to a temperature of 50 deg C to 60 deg C (122 deg F to 140 deg F), for a period of 30 minutes approximately. Ensure that the flushing operation is first of all carried out in reverse direction of normal oil flow (outlet to inlet).

18.5 Secure a 100 mesh gauze filter across neck of outlet orifice. Repeat flushing for a further 30 minutes in normal direction of oil flow (inlet to outlet).

18.6 If foreign particles or sludge are found in the filter, repeat reverse flush described in Para 8.

18.7 Drain off the kerosene (Table 3, Ser 7) by inverting oil cooler and allowing cleaning fluid to drain from inlet and outlet orifices.

18.8 Rinse by immersing cooler in a bath of cold water containing 1% detergent (Table 3, Ser 1) for ten minutes, emptying and filling at least twice during this period.

18.9 Thoroughly flush out cooler with cold water for one hour or until clear of detergent solution.

18.10 Dry off before reassembly.

18.11 Clean pressure relief valve spring and ball with kerosene. Dry off and reassemble relief valve-to-valve body, fitting a new washer to end cap; after assembling the valve, wire lock the end cap with No. 20 SWG steel wire.

Repairs

19 Repairs should be confined to replacement of damaged or faulty oil coolers and coolant chambers, faulty pressure relief valve components, sealing off leaking matrix tubes, repairing leaks in solder between matrix tubes and fitting new gaskets and washers.

20 After repairs have been carried out, clean and flush (Para 11 to 15), assemble the heat exchanger and subject coolant side of assembly to an internal air pressure test under water (Para 27 to 30).

Inspection

21 To determine a faulty section, prior to dismantling heat exchanger for repair, pressure test the assembly and note from which section(s) air is escaping. Para 30 refers.

22 When the heat exchanger has been dismantled, apply the following procedure throughout to individual items.

22.1 Pressure test the faulty section and note where air is leaking. Para 30 refers.

22.2 Inspect metal components for cleanliness, distortion, cracking, denting, corrosion, and serviceability of threads and security of brazing.

22.3 Inspect the ball and ball seating of the pressure valve for freedom from burrs or other irregularities preventing correct seating of the ball.

22.4 Inspect the pressure relief valve spring for distortion and loss of resiliency. Check spring free length and loading as detailed in Table 4.

TABLE 4 SPRING LOADING

Ser (1)	Description (2)	Vehicle mark (3)	Free length mm (in.) (4)	Load (lbf) (5)	Compressed length mm (in.) (6)	Spring rate (lbf/in.) (7)
1	Engine oil cooler PRV spring	2 and 2/1	53.3 to 60.3 (2.10 to 2.375)	3.9 ± 0.25 39.2 ± 2.5	44.4 (1.75) 35.6 (1.40)	11.1 40.2
2	Gearbox oil cooler PRV spring	2 and 2/1	50.8 to 57.1 (2.00 to 2.25)	5.0 ± 0.50 4.5 ± 0.25	44.4 (1.75) 44.4 (1.75)	20.0 9.0

CAUTION

EQUIPMENT DAMAGE. Do not probe tubes to remove obstruction as this may render heat exchanger unserviceable.

22.5 Inspect the matrix tubes for freedom from obstruction. Check the matrix tubes for security. Check solder for leaks between the matrix tubes.

Sealing leaking matrix tubes

23 If leaks from the matrix tubes are evident during pressure test of the coolant side of the heat exchanger, up to a maximum of five tubes may be plugged and sealed off. Leakage from the tubes in excess of this number renders the heat exchanger unserviceable. If excessive leakage is confined to tubes in an individual oil cooler, replace the faulty cooler. Unserviceable assemblies or oil cooler sections are to be returned for base repair.

24 To seal off leaking tube, solder a disc to each end of tube.

25 If leaks are occurring in the solder between the tubes, affect a repair by soldering with a fine oxy-acetylene flame, using a small nozzle, as follows.

25.1 Clean the area of the leak with wire brush.

25.2 Immerse the bottom of the element in shallow bath of water to prevent overheating during repair.

25.3 Fuse a prepared thin stick of solder (approx 0.09 in. section) and soldering fluid, into the damaged area.

25.4 After soldering is completed, ensure tubes are clear.

26 Pressure test the repaired oil cooler section (Para 31 and 32 refer). Assemble the heat exchanger and pressure test the assembly for leaks (Para 30 refers).

Assembling

27 Ensure correct positioning of the oil inlet and outlet orifices when fitting oil cooler sections together, otherwise a reverse oil flow will occur.

27.1 Ensure that the collector plate strips (centre ribs) are aligned when fitting oil cooler sections together, otherwise coolant flow will be impeded.

27.2 Ensure coolant end tanks are correctly aligned or it will not be possible to connect the heat exchanger coolant connections to radiator and coolant pump.

27.3 Renew all gaskets and washers. Wire lock pressure relief valve end caps.

Pressure relief valves (PRV)

28 Spring loadings are shown in Table 4.

Testing pressure relief valves

29 To test the pressure relief valves proceed as follows:

29.1 Blank off the oil outlet orifice on the oil cooler section carrying the pressure relief to be tested. Connect the P.R.V. inlet to the oil cooler inlet (the outlet end is repositioned to avoid oil cooler body). Connect the inlet side to a suitable air supply line incorporating a regulating valve and a 0 to 60 lbf in^2 pressure gauge.

29.2 Apply air pressure and check that the ball becomes unseated at a pressure of:

29.2.1 Engine cooler PRV 3.45 bars (50 lbf in^2).

29.2.2 Gearbox cooler PRV 1.05 bars (15 lbf in^2).

29.3 If the required valve opening pressure is not obtained, fit a new spring and retest. Valves are not adjustable.

29.4 Disconnect the air supply rig. Wire-lock the end cap with No. 20 SWG steel wire on completion of testing.

Pressure testing

WARNING

PERSONAL HAZARD. AFTER ANY REPAIRS OR REPLACEMENTS TO HEAT EXCHANGER, COOLANT SIDE OF ASSEMBLY MUST BE PRESSURE TESTED. WHEN THE OIL COOLER HAS BEEN REPAIRED, THE OIL COOLER IS ALSO TO BE PRESSURE TESTED.

Preparation

30 To carry out pressure testing of oil cooler sections or heat exchanger assembly, the items detailed in Table 1, Ser's 3-10 will be required.

31 Steel or brass spacing rings, 5.25 in. o.d. x 4.5 in. i.d. x 0.375 in. thick. Gaskets and rings are fitted between coolant covers and oil cooler section. The rings are necessary due to location dowels.

32 Four x 3/8in. dia. steel rods of varying lengths 2.778 in. (70.5mm), 1.575 in. (40mm), 1.214 in. (30.8mm) and 1.1in. (27.9mm). Each rod is to be threaded 1in. at each end to receive nut, plain cap and washer. The rods are required to secure the coolant end covers to the appropriate oil cooler section being tested.

Testing heat exchanger assembly

CAUTION

EQUIPMENT DAMAGE. It is imperative that water is not allowed to penetrate the oil side of the heat exchanger and extra care should be taken during this test.

NOTES

(1) This test is applied to determine a faulty section before repair and is also applied after assembling heat exchanger, following repair.

(2) Water in test tank is to be at room temperature.

33 To test the heat exchanger assembly proceed as follows:

33.1 Fit blanking plugs to all inlet and outlet orifices of the oil cooler sections.

33.2 Connect the plain plug with the attached gauge to the coolant outlet orifice and the plain plug with the attached Schrader valve to the coolant inlet orifice, by means of rubber hoses and hose clips.

33.3 Immerse the heat exchanger assembly in a tank of clean water. Connect to a suitable air supply and charge through Schrader valve to a pressure of 3.45 bar (50 lbf in^2).

33.4 Maintain this pressure for at least 15 minutes during which period there should be no signs of leaks as indicated by presence of air bubbles in water. When testing an assembly to determine a faulty section(s), prior to repair, note from which section(s) air is escaping.

33.5 On completion of pressure test, slowly release the air pressure, remove the assembly from the test tank and disconnect the air supply. Remove plugs from coolant orifices.

33.6 Allow the water to drain and finally dry off.

Testing oil cooler section for external leaks

34 To test the oil cooler section for external leaks proceed as follows:

34.1 Connect the appropriate threaded plug with attached pressure gauge to the outlet orifice of the oil cooler section and the appropriate threaded plug with attached Schrader valve to the inlet orifice. See Fig 1(1).

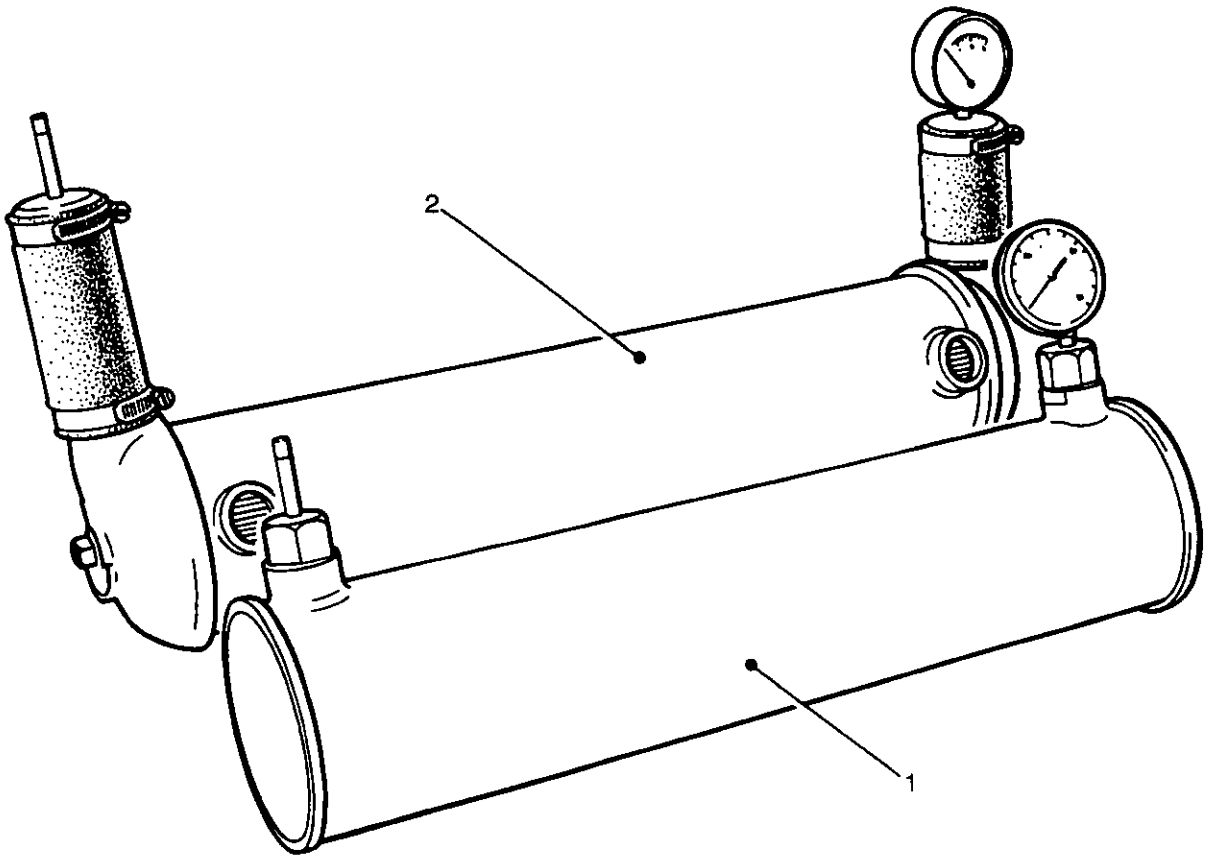
NOTE

If adaptor and/or PRV fitted, use appropriate female unions.

34.2 Immerse the oil cooler system in a tank of clean water. Connect to a suitable air supply and charge through the Schrader valve to a pressure of 3.45 bar (50 lbf in^2); note where air is leaking.

34.3 Release the air pressure, remove the cooler from the tank, remove the plugs and repair the faulty cooler as detailed in Para 20 to 23.

34.4 After repair, allow the section to cool down, then reconnect plugs and pressure test to 3.45 bar (50 lbf in²) with oil cooler section immersed in a tank of clean water for a period of 30 minutes. Ensure that there are no leaks or pressure drop.



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1 Prepared for external leak test 2 Prepared for internal leak test

Fig 1 Oil cooler section of heat exchanger prepared for testing

Testing oil cooler section for internal leaks

35 To test the oil cooler section for internal leaks proceed as follows:

35.1 Fit the inlet and outlet coolant heads to oil cooler section using the appropriate gaskets, spacing rings, securing rod and nuts.

35.2 Connect the plain plug with attached pressure gauge to coolant outlet orifice and the plain plug with attached Schrader valve to coolant inlet orifice, by means of rubber hoses and hose clips, see Fig 1(2).

35.3 Immerse the oil cooler section in a bath of warm oil (oil that is normally used in that particular section). Connect to a suitable air supply and charge through the Schrader valve to a pressure of 3.45 bar (50 lbf in²) for a period of 30 minutes. Ensure that there are no leaks or pressure drop.

35.4 After repair, clean and flush as detailed in Para 14 and 15. Assemble the heat exchanger, and pressure test the assembly as detailed in Para 27 to 30.

Temporary preservation

36 If the heat exchanger is not required for immediate fitting to the power pack, carry out the following temporary preservation instructions and store the unit until required for use.

36.1 Fill the coolant side with water displacing fluid (Table 3, Ser 6) and allow to stand for five minutes. Drain the fluid and leave the coolant orifices exposed for three hours and then seal off orifices.

36.2 Flush each oil cooler section with warm oil as normally used in the relevant lubricating system.

NOTE

If cold oil is used, it will be necessary to withdraw the ball and spring from pressure relief valves.

36.3 Individual oil coolers not fitted to an assembly, must have the matrix tubes protected by fitting thick corrugated cardboard covers or blanking boards.

Failure diagnosis

37 Failures that may be caused by malfunctioning of heat exchanger are listed in Table 5.

TABLE 5 FAILURE DIAGNOSIS, HEAT EXCHANGER

Ser No. (1)	Symptoms (2)	Probable causes (3)	Action (4)
1	Leaks at oil inlet or outlet connections	Loose connectors or oil pipe unions	Tighten
		Faulty washers	Renew
2	Leaks at pressure relief valve end caps	Faulty washers	Renew
3	Coolant leaks at oil cooler flange joints	Faulty joint gaskets	Renew
4	Leaks from matrix tubes indicated by coolant mixing with oil	Corroded or damaged tubes	Repair tubes or replace assembly, see Para 16 to 24
5	Low oil flow	Heavy sludge in oil cooler(s) or restricted orifices	Clean and flush oil cooler(s), see Para 14 and 15
6	High oil flow	Faulty pressure relief valve	Fit new pressure relief valve components or assembly
7	Individual lubrication system over-heating	Oil pipes restricted	Clean or renew pipes
		Heavy sludge in oil cooler	Clean and flush oil cooler, see Para 10
8	General over-heating of all systems, in excess of normal	Restricted coolant flow	Clean and flush coolant matrix, see Para 14
9	Hydraulic fan speed low	Restricted oil flow	Clean and flush oil cooler, see Para 10

HYDRAULIC FAN DRIVE

General

38 Repair of components used in the hydraulic fan drive system should be carried out in as clean a condition as possible. AESP 2300-A-201 for general information applicable to theory, repair and maintenance of hydraulic systems in vehicles refers.

HYDRAULIC MOTOR

Dismantling

CAUTIONS

(1) EQUIPMENT DAMAGE. Do not tap control plate seat on end of cylinder barrel. This seat is a lapped fit to control plate and care must be taken, while removing and subsequently during overhaul, to avoid damage to either component.

(2) EQUIPMENT DAMAGE. Do not use a centre punch or other similar tool that will distort the components.

39 To dismantle the hydraulic motor proceed as follows:

39.1 Remove the hydraulic motor from the power pack as detailed in AESP 2350-T-250-522 Chap 1-4 and drain the oil from the motor body.

39.2 Remove the Woodruff key from the drive shaft.

39.3 Grip the motor body between soft metal clams in a vice.

39.4 Remove the circlip from the drive shaft end of the motor casing.

39.5 Make alignment marks on the control plate flange and motor body with a file or scriber to ensure refitting in the exact position on reassembly. It is important that these marks are accurate, thus avoiding lengthy adjustment of central plate.

39.6 Turn back the lock washers on the four bolts securing the control plate to the motor body. Remove the bolts and withdraw the control plate (ensure that the cylinder barrel is retained in the casing as the control plate is removed).

39.7 Apply hand pressure to the cylinder barrel at the same time pulling gently forward on the drive shaft to ease the bearing housing through the O-ring. Withdraw the complete internal assembly from the motor casing, ensuring that the pistons are not withdrawn from the cylinder barrel.

39.8 Mark the piston rod carrier and the exterior of the cylinder barrel with a scratch or file mark to ensure that the pistons are mated to the correct cylinder bore on reassembly.

39.9 Withdraw the cylinder barrel off the pistons and centre spindle. Retrieve the spring as the barrel is removed.

39.10 Ease the bearing housing off the drive shaft side of the assembly.

39.11 If it is necessary only to replace the oil seal, the old seal may be removed from bearing housing without further dismantling of the bearing assembly as follows:

39.11.1 Using a hardwood dolly, approximately 28.6 mm (1.125 in) in diameter, punch or press out the oil seal from the bearing housing. Retrieve the backing plate.

39.11.2 Remove the O-rings from the motor body and control plate respectively.

36.11.3 Refit the oil seal as detailed in Para 37.

39.12 If bearing replacement is necessary, continue the dismantling of the assembly as follows.

39.13 Using the bearing puller attachment (Table 1, Ser 2) with push puller No. 4 and two 4 5 in. legs (Table 1 Ser 1), draw off the thrust bearing together with the front bearing and distance piece.

39.14 Mount the puller assembly behind the rear bearing and withdraw from the shaft, complete with the distance piece.

Assembling

Oil seal

40 Locate the steel backing ring in the bearing housing and, using a hardwood dolly, 40.38 mm (1 6 in) dia x 152.4 mm (6 in). long, drive the oil seal into the recess in the bearing housing.

Bearings

41 Bearings should be tapped on with the piston carrier and drive shaft assembly held in hand. Ensure that the thrust race is not overloaded and can rotate freely.

CAUTION

EQUIPMENT DAMAGE. The retaining plate, which secures the pistons to the rear face of the carrier, must not, in any circumstances, be subjected to impact. Bearings should not be fitted to the shaft while the retaining plate and piston carrier is held rigidly.

42 When fully located on the shaft, lubricate bearings and fit the bearing housing over the shaft and bearing assembly.

Cylinder barrel

43 Locate the spring on the centre spindle.

44 Lubricate the pistons and bores of the cylinder barrel. Enter the pistons into the cylinder bores, ensuring that the alignment marks made on dismantling coincide, and that the peg on centre spindle engages in the slot of the cylinder barrel.

Motor body

45 Fit the O-ring to the groove in the motor body and lightly coat the O-ring (when fitted) and the exterior of the bearing housing with the oil normally used in the hydraulic system.

46 Grip the flange of the body between clams in a vice with the angled end furthest away from the operator.

47 Enter the cylinder barrel end of the drive shaft and piston assembly into the straight section of the body (nearest operator), ensuring that slight pressure is maintained on the cylinder barrel to prevent disengagement with the pistons and drive peg. When the bevelled edge of the bearing housing contacts the O-ring, increased resistance will be felt. At this stage, maintain support on the cylinder barrel whilst applying light pressure to the bearing housing with a rotating movement. This will facilitate passage of the bearing housing through the O-ring and ensure that the O-ring is compressed without damage. Continue the procedure until the circlip can be fitted to the groove in the motor body.

Control plate

48 Relocate the pump assembly in a vice with the angled end uppermost.

49 Fit the O-ring to the underside of the control plate flange.

50 Lubricate the control plate and fit to the motor, ensuring that the bush locates over the end of the centre spindle and that the marks made on dismantling are accurately aligned. Tighten the securing bolts and turn the lockwasher tabs against the heads of the bolts.

51 Refit the Woodruff key in the drive shaft and refit the motor to the power pack.

HYDRAULIC PUMP

Removing and refitting oil seal

52 The procedure to remove and refit the hydraulic pump oil seal is as follows:

52.1 Remove the hydraulic pump from the power pack as detailed in AESP 2350-T-250-522 Chap 1-4 and drain the oil from the pump body.

52.2 Using soft metal clams between jaws of a vice, grip the pump assembly at the mounting bracket flange with the drive shaft toward the operator.

52.3 Turn back the lockwasher tab and remove the drive coupling retaining bolt. Withdraw the drive coupling and remove the key from the drive shaft.

52.4 Remove the socket head setscrews and withdraw the seal housing complete with oil seal.

52.5 Using a hardwood dolly approximately 36.6 mm (1.44in.) in diameter, punch or press out the oil seal. Retrieve the steel backing ring.

52.6 Refit the backing rings in the seal housing and press in a new oil seal using a hardwood dolly 45.2 mm (1.75in.) in diameter.

52.7 Apply a coating of jointing compound (Table 3, Ser 4) to the joint face of the seal housing and pump body.

52.8 Reassemble the seal housing, drive shaft key and coupling in reverse order to dismantling, ensuring that the bolt is fully tightened and secured with the locking washer.

NOTE

O-ring and running bush should not be dismantled from drive shaft unless running bush has become loose on shaft, in which case the complete pump must be dismantled.

Bearings

Dismantling

53 Remove the oil seal from the pump as detailed in Para 49 and then proceed as follows:

53.1 Using soft metal clamps between the jaws of a vice, grip the pump assembly at the mounting bracket flange with the drive shaft toward the operator.

53.2 Make alignment marks on the mounting bracket and the flange of pump body to ensure correct positioning of the pump unions when the unit is refitted to power pack. Remove the three bolts and nuts securing the mounting bracket to the pump body and withdraw the pump from the bracket.

53.3 Grip pump body in the vice at mounting flange (using soft metal clams between jaws of vice and positioning drive shaft toward operator).

53.4 Make alignment marks on the control plate flange and the pump casing with a file or scriber, to ensure refitting to an exact position on reassembly. It is important that these marks are accurate, thus avoiding length adjustment of control plate. Turn back the lockwasher tabs on the bolts securing the control plate, slacken the bolts but do not remove at this stage.

53.5 Make alignment marks across the two centre flanges of the pump body and remove the socket head setscrews. Ease the piston end of the pump body off the bearing housing, placing one hand under the centre section of the compete assembly to locate and retain the cylinder barrel on the pistons, as the casing is withdrawn.

53.6 Continue holding the cylinder barrel and slacken the vice sufficiently to withdraw the assembly from the jaws, supporting the bearing housing with whilst removing.

53.7 Turn the assembly to the vertical with the drive shaft pointing down and, still holding cylinder barrel to keep the pistons located, tap the drive shaft down on to the bench or a piece of softwood to free the bearings from the pump body. Lift the drive shaft and cylinder barrel assembly away from the pump body and place down flat on a clean bench. Ensure that the distance piece is retained with the pump body to which it was initially fitted as this component is machined within precise limits for correct positioning of the drive assembly.

53.8 Mark the piston rod carrier and the exterior of cylinder barrel to ensure that the pistons are mated to the correct bores on assembly. Withdraw the cylinder barrel and collect the spring.

53.9 Using the tools (Table 1, Ser 2), remove the bearing, spacer and thrust bearing, locating the bearing puller behind the inner track of the thrust bearing.

53.10 Remove the circlip and then draw off the large journal bearing with the inner track using the bearing puller attachments (Table 1, Ser 2).

CAUTION

EQUIPMENT DAMAGE. Do not remove the bush unless necessary, as damage may occur during removal, necessitating renewal of the bush.

53.11 If loose on the shaft, withdraw the running bush.

53.12 Remove the bolts and withdraw the control plate from the piston end of the pump body.

Assembling

54 To assemble the bearings proceed as follows:

54.1 If removed, fit the O-ring to the groove in the drive shaft.

54.2 Fit the running bush, tap into position with a hollow drift. Ensure that the bush abuts the shoulder of the drive shaft.

CAUTION

EQUIPMENT DAMAGE. The retaining plate, which secures the pistons to the rear face of the carrier, must not, in any circumstances, be subjected to impact. Bearings should not be fitted to the shaft with the retaining plate and piston carrier held rigidly.

54.3 Fit the large journal bearing complete with inner track to the drive shaft, ensuring that the inner lips are located correctly. Normally, the bearings can be fitted with the piston assembly held in the hand, tapping the bearing into position.

54.4 Fit the circlip followed by the thrust bearing, spacer and outer journal bearing. Ensure that the outer journal bearing does not overload the thrust bearing, which must be able to rotate freely.

54.5 Insert the shaft and bearing assembly into the pump body, pushing in until the outer bearing contacts the shoulder in the pump body.

54.6 Fit the spacer against the large journal bearing by passing the spacer over the piston assembly.

54.7 Locate the spring on the centre spindle and lubricate the pistons and cylinder bores. Refit the pistons to the cylinder barrel, ensuring that the alignment marks made on dismantling are located correctly and that the peg on the centre spindle engages in the slot in the cylinder barrel.

54.8 Fit a gasket to the joint face and locate the piston end of the pump body over the cylinder barrel assembly, aligning the marks made across the two flanges on dismantling. Threads of the socket head setscrews securing the two halves of the pump body together must be coated with adhesive (Table 3, Ser 5) and the spring washers originally fitted under the heads replaced with plain washers. Tighten the screws to 39.5 Nm (29 lbf ft).

54.9 Lubricate the control plate and bolt to the end of pump body, aligning marks made on dismantling and ensuring that lockwasher tabs are turned over against the heads of the retaining bolts.

54.10 Fit the oil seal housing and coupling to the pump as detailed in Para 49.

CONTROL UNIT

Dismantling

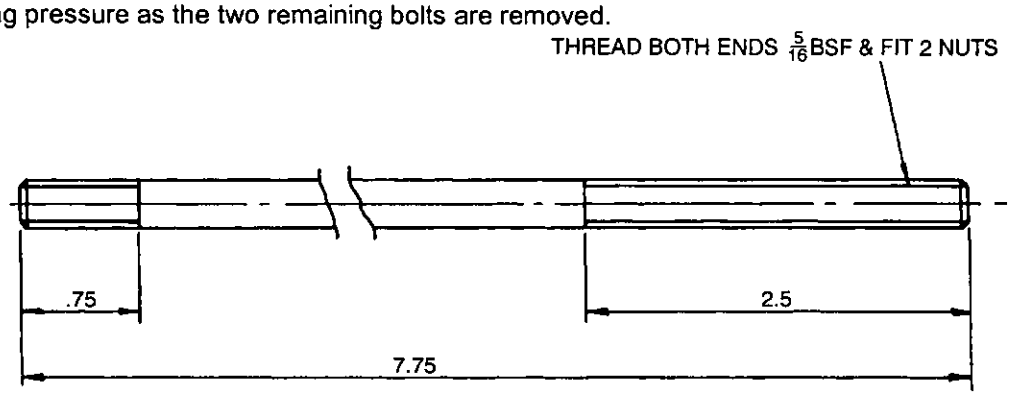
55 To dismantle the control unit proceed as follows:

55.1 Remove the control unit from the power pack and, if necessary, dismantle the thermostat element detailed in AESP 2350-T-250-522 Chap 1-4.

55.2 Remove the split pin and withdraw the fulcrum pin, control lever and control lever spring.

55.3 Remove the two screws and withdraw the control lever mounting bracket.

55.4 Remove two of the four tie bolts at diagonally opposite locations and replace with two locally manufactured slave bolts (see Fig 2) with plain washer under the nuts. Slave bolts will contain the spring pressure as the two remaining bolts are removed.



MATL : STEEL Ø8 mm
BS 970 PT1 070 M20
G2/9510-99-964-7036

432/250

Dimensions in inches unless otherwise stated

Fig 2 Slave bolts for dismantling control unit

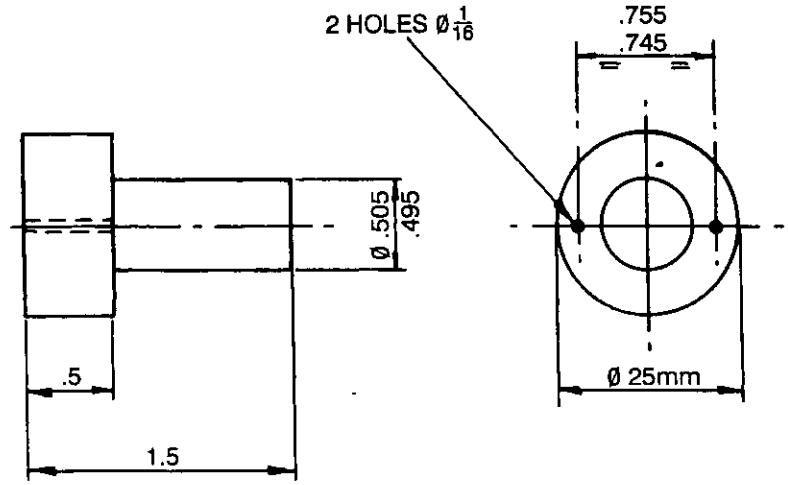
55.5 Having removed the two remaining tie bolts, slacken the nuts on each of the two slave bolts an equal amount at a time until all spring pressure is relieved. Withdraw the slave bolts and the top plate of the controller and the piston and relief valve springs respectively.

55.6 Turn the controller over and remove the two countersunk screws. Separate the bottom plate from the controller body.

55.7 Withdraw the piston and relief valve. Do not disturb the O-rings on the relief valve unless it is intended to replace.

55.8 If necessary, remove the oil seal by drilling two 1.6 mm (0.0625 in) diameter holes through the bottom plate, using locally manufactured jig shown in Fig 3 and as shown in Fig 4, punching out from the underside of plate.

55.9 The piston sleeve is shrunk into the control valve body and must not be removed. Should this sleeve be worn or damaged, a complete control valve body must be fitted. The piston is not a mated component with the sleeve and can be replaced as necessary.



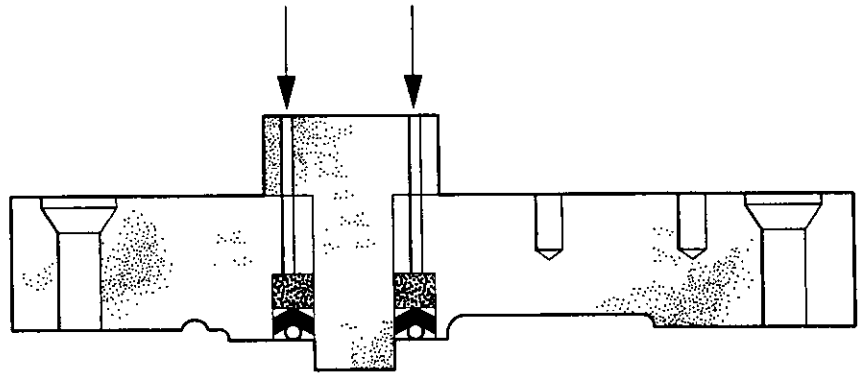
MATL : STEEL Ø 25mm
BS 970 PT1 070 M20
G2/9510-99-964-7041

432/251

Dimensions in inches unless otherwise stated

Fig 3 Jig for drilling seal removal holes, control unit

(1) INVERT BOTTOM PLATE OF CONTROLLER
(2) INSERT JIG
(3) DRILL 2- Ø 1/16 HOLES AS SHOWN
(4) PUNCH OUT OIL SEALS



432/252

Fig 4 Removing oil seal from bottom plate of control unit

Inspection

56 Inspect the relief valve seating and the piston and sleeve for signs of wear. The relief valve seating is the item most likely to wear and, if suspect, the complete relief valve must be renewed. No attempt should be made to reclaim suspect parts.

57 Replace all O-rings and gaskets on reassembly.

Assembling

58 To reassemble the control unit proceed as follows:

58.1 Fit the oil seal to the bottom plate, using a hardwood dolly approximately 21.4 mm (0.81 in) diameter.

58.2 Fit the two O-rings to the relief valve body.

58.3 Lubricate the stem and fit the relief valve plunger into the body of the relief valve. Lubricate external surface of the O-rings and relief valve bore in the control unit body. Insert the valve assembly into the bore from the top, twisting the valve slightly to assist the O-rings to slip over the chamfered edge of the bore.

58.4 Lubricate the piston lands and the stem of piston and insert from the bottom of the control valve body.

58.5 Fit a new gasket to the underside of the control valve body, retaining in position with a smear of grease.

NOTE

Ensure that when fitting the gasket, holes are punched to relieve pressure from the back of the relief valve to the piston.

58.6 Fit the bottom plate over the piston stem and secure to the body with the two countersunk screws.

58.7 Fit the gasket to the underside of the top plate retaining in position with a smear of grease.

58.8 Locate the piston spring on top of the piston and push the relief valve spring onto the locating screw in the top plate. Position the top cover above the body, ensuring that the piston spring is located in the spring recess. Insert two slave bolts, positioning the control lever mounting bracket over the slave bolt occupying the mounting bracket location. Tighten the slave bolts down evenly until the springs are compressed and the cover is seated on the body.

58.9 Fit two tie bolts positioning the lever mounting bracket to coincide with one of the bolts as necessary, and tighten fully.

58.10 Remove the slave bolts and replace with the two remaining tie bolts. Tighten all four bolts evenly.

58.11 Fit the control lever, control lever spring and fulcrum pin.

58.12 Refit the thermostat housing.

58.13 After refitting to power pack and testing as detailed in AESP 2350-T-250-522 Chap 1-1, the over-ride screw must be wire locked and sealed.

TANK UNIT

Dismantling and cleaning

59 Where serious contamination of the hydraulic system has occurred, the tank unit (which is in two compartments) must be separated and thoroughly cleaned out. Proceed as follows:

59.1 Drain the oil and remove the tank unit from the power pack, ensuring that any of the Tungum piping which has to be taken off is treated with care to avoid twisting or buckling when removing connections.

CAUTION

EQUIPMENT DAMAGE. Ensure that magnetic filters do not come into contact with steel or iron and that they are always stood on end.

59.2 Remove the magnetic filter and clean as detailed in AESP 2350-T-250-522 Chap 1-4.

59.3 Remove the upper tank cover plate by removing the ring of nuts.

59.4 Detach the upper tank from the lower tank by removing the nuts from the tank flanges.

59.5 Thoroughly clean out the tank, removing any moisture or sediment from crevices.

59.6 Reassemble the tank unit in reverse order to dismantling, ensuring that all gaskets and sealing washers are renewed.

59.7 Before refitting the tank to the power pack, disconnect all pipe lines at the unions into the pump, motors, control unit, heat exchanger, and leakage and pressure testing fixtures and allow to drain. If necessary, remove, dismantle and clean out the pump, motors and control unit.

FIELD TESTING

60 Field testing of the hydraulic fan drive system is carried out as detailed in AESP 2350-T-250-522, Chap 1-4.

Noise adjustment

61 Where undue noise emanates from within the pump or motors, check alignment of the control plate markings. Slight adjustment can be made as follows:

61.1 Turn back the lock-washers and slacken the bolts securing the control plate to the pump or motor body and rotate the control plate a small amount. Retighten the control plate and retest. Rotate the control plate in the opposite direction if this procedure does not lessen the noise.

NOTE

It is not normally necessary to adjust the control plate away from the alignment marks. Amount of rotation for test purposes must be kept to a minimum. Where the procedure detailed does not have any effect on noise level, the pump or motor must be renewed as fault will lay elsewhere in unit and further adjustment is likely to cause damage.

61.2 Ensure that the control plate securing bolts are tightened and the lockwasher tabs turned over against the bolt heads on completion of tests.

Leakage rates

62 Standard acceptance test for new or reconditioned pumps and motors, i.e. reconditioned pumps or motors having new piston and cylinder barrel assemblies fitted during base repair.

62.1 Pumps. A leakage rate of 325 cc per minute at 1480 rev min and 96.9 bar (1400 lb sq in) at 50 deg C (122 deg F) using oil normally used in hydraulic system AESP 2350-T-250-601 refers.

62.2 Motors. A leakage rate of 250 cc per minute at 2550 rev min and 96.9 bar (1400 lb sq in) at 50 deg C (122 deg F) using oil normally used in hydraulic system AESP 2350-T251-601 refers.

62.3 Condemnation limits for pumps and motors EMER T&M A028 Chap 056-062 refers.

CHAPTER 1- 5

TRANSMISSION

CONTENTS

(continued)

CONTENTS (continued)

WORKSHOP SPECIAL TOOLS

1 Table 1 lists the workshop special tools required to carry out the operations detailed in this sub-chapter.

TABLE 1 WORKSHOP SPECIAL TOOLS

Ser (1)	NSN (2)	Designation (3)	FV No./ Mnfr No. (4)
1	5120-99-866-9594	Spanner transfer gearbox nuts	FV559559
2	2530-99-866-9588	Lifting adaptor, steering unit	FV538313
3	5120-99-866-9586	Mandrel, steering unit alignment (2 off)	FV524611
4	5120-99-866-9587	Sliding flange, steering unit alignment (2 off)	FV524612

(continued)

TABLE 1 WORKSHOP SPECIAL TOOLS (continued)

Ser (1)	NSN (2)	Designation (3)	FV No./ Mnfr No. (4)
5	5120-99-867-5184	Assembly and extractor tool, sprocket hug	FV559631
6	5120-99-867-5185	Extractor sprocket	FV586277
7	5120-99-802-2487	Assembly and extractor tool, sprocket hub	FV586607
8	5120-99-866-9584	Removal tool final drive	FV485641
9	5120-99-808-9465	Puller mechanical, No.4 c/w 2 legs	140/8B7548
10	5120-99-808-9464	Puller mechanical	140/8B7554
11	5120-99-867-0383	Wrench, crowfoot, 1 1/8 in A/F, bi-hex, 1/2 in sq drive	
12	5120-01-348-9451	Crowfoot, attachment, Socket Wrench	

LOCALLY MANUFACTURED TOOLS

2 Table 2 lists the locally manufactured tools required to carry out the operations detailed in this sub chapter.

NOTE

Drawings if required may be obtained from LASS IPT, DLO Andover, Portway, Monxton Road, Andover, Hants. SP11 8HT.

TABLE 2 LOCALLY MANUFACTURED TOOLS

Ser (1)	Drawing No. (2)	Designation (3)
1	V7022/1	Eyebolt
2	V7022/2	Support studs
3	V7022/3	Lifting tool, gearbox
4	V7022/4	Lifting bracket, gearbox
5	V7022/5	Engine support bracket
6	V7022/6	Peg spanner
7	V7022/7	Pillar legs
8	**TBA**	Dolly

ADHESIVES, SEALANTS AND LUBRICANTS

3 Table 3 lists the adhesives, sealants and adhesives required to carry out the operations detailed in this sub chapter.

TABLE 3 ADHESIVES, SEALANTS AND LUBRICANTS

Ser (1)	NSN (2)	Mfr ID (3)	Description (4)
1	8030-99-220-2370	Hylomar PL32M	Sealing compound
2	9150-99-220-2418	XG 279	Grease, automotive and artillery, 3 kg
3	8030-99-225-2053	PX 4	Preservative oil
4	8030-99-224-1999		Primer locking sealant
5	8040-99-225-1152	Loctite 641	Adhesive
6	9150-99-910-0510	XG 271	Grease GP
7	8135-99-943-2408		Mouldable wrapping waxed

GENERAL

4 Drip trays should be used to catch oil spillage whenever oil pipes are disconnected. Blanking caps or plugs must be fitted to pipe ends and adaptors whenever unions are disconnected. If blanking caps/plugs are not available, mask all pipe ends or apertures with sealing tape.

Weights

5 The following are approximate weights for the assemblies and sub-assemblies.

5.1	Transfer gearbox - Mk 2 and 2/1 vehicle	70 kg	(154 lb)
5.2	GM Allison (main) gearbox	231.5 kg	(510 lb)
5.3	Air cleaner assembly with frame	39.9 kg	(88 lb)
5.4	Steering unit	312.3 kg	(688 lb)
5.5	Sprocket hub	86.3 kg	(190 lb)
5.6	Final drive	136.2 kg	(300 lb)
5.7	Main casing, final drive	43.1 kg	(95 lb)
5.8	Rear casing, final drive	32.2 kg	(71 lb)
5.9	Output shaft and drive gear, final drive	42.7 kg	(94 lb)

TRANSFER GEARBOX

Removing

6 To remove the transfer gearbox proceed as follows:

6.1 Remove the power pack, AESP 2350-T-250-522, Chap 1-1 refers.

6.2 Remove the plug connector from the rear generator and the cable clip from the superstructure.

6.3 Remove the lower part of the rear end of the superstructure.

6.4 Remove the bearing cover of the transfer gearbox to obtain access to the drive shaft to the main gearbox. An aid to giving an indication of which oil seal is leaking is the drilling of a second hole in the cover plate. Release the locking attachment on the gearbox drive shaft nut and remove the nut.

6.5 Unscrew the three oil pipes from the transfer gearbox. Unscrew the union nuts of the engine oil pipes at the bracket above the transfer gearbox. Remove the four flange bolts securing the engine oil pipes to the bracket. Remove the bracket; pipes and screws securing the transfer gearbox to the mechanical drive housing.

CAUTION

EQUIPMENT DAMAGE. The transfer tubes will be damaged if the transfer gearbox is not supported until the casing clears the tubes.

6.6 Screw in four support studs (Table 2, Ser 2).

WARNING

HEAVY WEIGHT. THE TRANSFER GEARBOX WEIGHS 70kg (154lb). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS WHEN MOVING THIS EQUIPMENT.

6.7 Using 3/8in. UNF x 2 1/2in. long screws as jacking screws ease the transfer gearbox from the mechanical drive housing and lift clear.

Refitting

7 Before refitting the transfer gearbox, in reverse order to removing, carry out the following:

7.1 Inspect the mating faces of the intermediate casing; flywheel, and mechanical drive housing. This is a metal-to-metal joint and sealing compound is not required.

7.2 Machine 0.127 mm to 0.254 mm (0.005 in. to 0.010 in.) from the reverse face of the gearbox drive shaft locknut to allow new locking indentations when securing the locknut.

7.3 Check the position of the oil transfer tube (Fig 1).

8 Lock the gearbox drive shaft nut into slots provided.

NOTE

Total amount of protrusion of reverse face of locknut is 0.635 mm (0.025 in.). Permissible amount to be machined must not exceed 0.508 mm (0.020 in.); otherwise the nut must be scrapped.

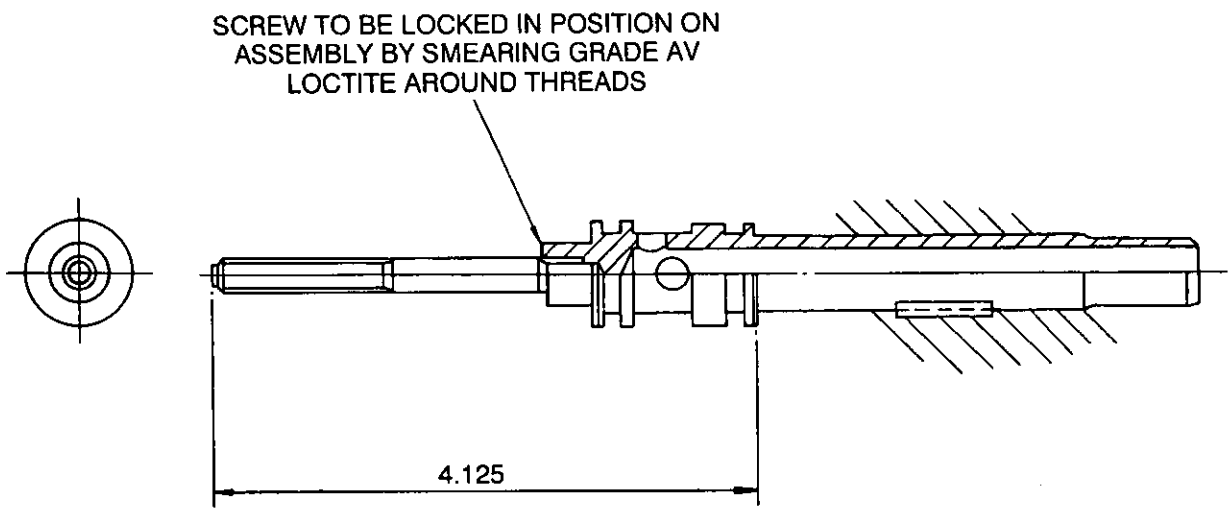


Fig 1 Assembly oil transfer tube, flywheel housing to transfer gearbox

Maintenance

9 If refitting the original transfer gearbox, inspect the following and renew as necessary:

9.1 Oil seals and bearing cover plates for signs of oil leaks.

9.2 Threads of all bolts for damage, burrs or stretch.

9.3 Dowel pins for burrs or looseness.

9.4 Threads or gearbox coupling/shaft and locknut for damage.

9.5 Check Metalastik coupling and flexplate for security.

9.6 Check oil seal surfaces of driving hub and gearbox coupling shaft for burrs and scoring.

10 If fitting a new or reconditioned transfer gearbox, remove all forms of external preservation and drain off surplus preservative oil (Table 3, Ser 3).

Bearing cover plates

11 All bearing cover plates fitted to the front and reverse faces of the transfer gearbox are metal to metal joints; use sealing compound (Table 3, Ser 1) on both faces.

12 If oil leaks are apparent, remove the relevant cover plate(s) and remove all trace of old sealing compound from the gearbox casing and cover plates.

13 Check the cover plate for distortion.

14 Refit the cover plate, applying sealing compound (Table 3, Ser 1) to both jointing faces. Tighten the bolts evenly.

Oil seals

15 Oil seals are located on reverse face of the transfer gearbox and are fitted to the engine and gearbox coupling shafts. To renew the oil seals fitted to the engine and gearbox shafts, the transfer gearbox must be removed from the power pack, Para 6 refers and proceed as follows:

15.1 Remove the oil seal and bearing housing(s) and press out the unserviceable oil seal, using a hardwood dolly or disc.

15.2 Remove all trace of old sealing compound from the faces of gearbox casing and bearing housing.

15.3 Fit the replacement oil seal in the housing, with the lip of the seal facing inwards (towards the bearing). Use a suitable disc to enter the seal squarely in the housing. Press the seal into the housing until it is flush with the outer face in the housing.

15.4 Inspect the oil seal surface on the respective shafts. Dress the surface if lightly burred or scored. Renew the shaft if badly scored; Para 17 refers.

15.5 Refit the seal housing, applying sealing compound (Table 3, Ser 1) to both jointing faces. Tighten the bolts evenly.

Driving hub (input)

16 To replace a worn driving hub, Chap 1-2 of this publication refers.

Refitting gearbox coupling shaft

17 To refit a gearbox coupling shaft proceed as follows:

17.1 Remove the transfer gearbox, see Para 6.

17.2 Remove the nuts securing the flexplate to the torque converter pump cover. Remove the flexplate complete with the gearbox-coupling shaft, Chap 1-2 refers.

17.3 From the reverse face of the flexplate, remove the bolts securing the shaft to the plate. Secure the clamping rings.

17.4 Refit in reverse order to removing, noting that the hole set at 12 o'clock in shaft flange is offset two degrees. Tighten the bolts securing the shaft and the nuts securing the flexplate to 49 Nm (36 lbf ft) torque.

Reclamation

18 Should the first two threads on the end of the coupling shaft have been damaged when removing the locknut, reclaim by machining off the damaged threads and re-cutting the two locking grooves.

19 The grooves are diametrically opposite and dimensions are:

19.1 Length 3.175 mm (0.125 in).

19.2 Width 4.76 mm (0.1875 in).

19.3 Chamfered at 45 deg.

Replacing rear generator drive shaft

20 It is not necessary to remove the transfer gearbox to fit a new generator drive shaft, proceed as follows:

20.1 Remove the drive tube to the rear generator.

20.2 Remove the oil seal housing from the reverse face of the intermediate casing of the transfer gearbox. Remove the bearing cover plate from the outer casing to gain access to the circlip retaining the drive shaft.

20.3 Remove the circlip and withdraw the drive shaft through the rear of the assembly.

20.4 Should it be necessary to renew the O-ring on the sleeved bush, tap out the bush through the front of the assembly.

20.5 Refit the sleeved bush and fit a new drive shaft in reverse order to removing, fitting a new oil seal and O-rings. Apply sealing compound (Table 3, Ser 1) to the faces of the oil sealing housing and bearing cover plate.

Use of adhesive, bearing fit on transfer gearbox

21 A number of cases have been reported of excessive noise and vibration in the transfer gearbox, one of the causes being attributed to outer races of main gear train support bearings rotating in their housings.

22 Where noise and vibration from the transfer gearbox is reported, check the bearing to bearing housing fit and providing the clearance does not exceed 0.102 mm (0.004 in.), reclamation of worn housings can be effected by using adhesive compound (Table 3, Ser 5). Assemblies exceeding this limit should be back loaded for base repair.

Application of adhesive compound.

23 Ensure that the outer race of the bearing and surfaces of the bearing housing are clean and free from oil and grease. Primer locking sealant (Table 3, Ser 4) can be used to assist degreasing. Spray on the primer, wipe clean and allow to dry.

24 Apply sealing compound (Table 3, Ser 5) sparingly and evenly to both surfaces of the outer race and bearing housing. Being fairly viscous the sealing compound will not run off the surfaces rapidly but it is not advisable to apply the sealing compound to the components too long before assembly.

NOTE

For diameters above 101.6 mm (4 in.), and where clearances are greater than 0.076 mm (0.003 in.), sealing compound (Table 3, Ser 5) should be applied to both surfaces.

25 After sealing compound (Table 3, Ser 5) has been applied the components are assembled in the usual way. Curing takes place automatically after assembly. A run of sealing compound (Table 3, Ser 5) can be applied to the joint line after assembly to ensure complete filling.

Removal of bearings fitted with adhesive compound

26 On smooth surfaces such as those in general bearing practice, sealing compound (Table 3, Ser 5) will have a shear strength of approximately 84.75 Nm (750 lbf in.) The push-out force required to dislodge a bearing fitted with sealing compound (Table 3, Ser 5) can be estimated by the shear strength x contact area i.e. 750 x 11d x width.

27 Adhesive compound (Table 3, Ser 5) is size sensitive and its shear strength falls off as the contact area increases. For areas greater than 127 mm² (5in.²), multiply the push-out force by the size factor from the Table 4.

TABLE 4 BEARING FIT SIZE FACTORS

BEARING FIT SIZE FACTORS					
Area mm (sq in.)	127 (5)	254 (10)	508 (20)	762 (30)	1016 (40)
Size factor	0.9	0.8	0.7	0.5	0.4

Dismantling the transfer gearbox

28 To ensure that the surfaces of bearings and housings are properly clean and dry and that the adhesive compound is correctly applied, it will be necessary to partly dismantle the transfer gearbox. These instructions should be used as a guide and adapted to suit the bearing(s) to be reclaimed.

28.1 From the outer casing, remove the bearing cover plate, to expose the locknut retaining the ball bearing of the generator drive gear.

28.2 Remove the split pin and fulcrum pin connecting the dis-connector lever (to the operating shaft).

28.3 Remove the bolts securing the outer casing to intermediate casing. Using two jacking bolts, withdraw the outer casing away from the locating dowels and lift off.

28.4 Remove the bearing access covers from the outer casing and press out the outer races of the roller bearing. Clean the race and housing, apply adhesive compound (Table 3, Ser 5) referring to Para 26 and 27 and fit the output gear assembly to the casing, using a dolly or hide hammer.

Intermediate gears

29 Remove the circlip, retaining the ball bearing, from the appropriate intermediate gear assembly. Lift out the intermediate gear assembly.

29.1 Clean the outer race of the bearing and housing, apply adhesive compound (Table 3, Ser 5) and fit the intermediate gear assembly to the casing, using dolly or hide hammer.

Output gear

30 Remove the circlip retaining ball bearing, from the output gear assembly.

30.1 Screw the four pillar legs (Table 2, Ser 7) to the intermediate casing and reverse casing to stand on the supporting legs.

30.2 Remove the output gear assembly with the aid of the dolly (Table 2, Ser 8).

30.3 Clean the outer race of the bearing and housing, apply adhesive compound (Table 3, Ser 5) fit the output gear assembly to the casing, using a dolly or hide hammer.

Input gear

31 Screw the four pillar legs (Table 2, Ser 7) to the intermediate casing and reverse the casing to stand on the supporting legs.

31.1 Remove the bolts securing the input shaft oil seal and bearing housing to the rear of the intermediate casing. Remove the housing.

31.2 Clean the outer race of the bearing and housing, apply adhesive compound (Table 3, Ser 5).

31.3 Apply sealing compound (Table 3, Ser 1) to the joint face of the oil seal and bearing housing. Fit the bearing housing, ensuring that the oil drillings are aligned between the housing and the casing. Press home using a block of hardwood. Tighten the securing bolts.

MECHANICAL DRIVE CASING

32 The mechanical drive casing houses the engine flywheel, engine coupling, flexplate and torque convertor pump cover. Bolted to the casing are the three main assemblies of the power pack, i.e. the engine, transfer gearbox and GM Allison gearbox.

Removing, Method 1

33 Proceed as follows:

33.1 Remove the power pack, AESP 2350-T-250-522, Chap 1-1 refers.

33.2 Remove the transfer gearbox, Para 6 refers.

33.3 Disconnect (at the hydraulic pump end) the flexible hose from the hydraulic pump to fan motors. Cap off the pipe end and pump union.

33.4 Remove the lower rear part of superstructure.

33.5 Using suitable wood blocks, pack up under the engine and under the main gearbox to support the weight of these assemblies when operation in Sub-Para 6.5 is carried out.

33.6 Remove the Metalastik coupling and engine flywheel, Chap 1-2.

33.7 Remove the nuts, and then unscrew the studs securing the LH support bracket to the mechanical drive casing. Remove the support bracket.

33.8 Remove all setscrews securing the flange face of the mechanical driving casing to the engine and main gearbox; remove the mechanical drive casing.

Removing, Method 2

34 This method is based on removing the main gearbox complete with mechanical drive casing; Para 37 refers.

Refitting

35 Refit in reverse order to removing depending on which method has been used, Para 37 or 38 refer.

MAIN GEARBOX (GM-ALLISON TX200)

36 There are alternative methods for removing the main gearbox, dependent on the extent of repairs required. If it is necessary to remove the main gearbox only, Method 1 may be employed. If, however, requirement is removal of major assemblies preparatory to removing the engine, Method 2 can be used to eliminate some operations by removing gearbox complete with mechanical drive casing.

Removing, Method 1

NOTE

It will be necessary to support the power pack on wooden blocks so that access to two of the setscrews, securing the gearbox flange to the mechanical drive casing, can be obtained from under the power pack.

37 To remove the main gearbox only proceed as follows:

37.1 Remove the power pack, AESP 2350-T-250-522, Chap 1-1 refers and drain the main gearbox.

37.2 Remove the engine oil feed pipe at the union adjacent to the engine bottom cover.

37.3 Remove the engine oil tank filler neck.

37.4 Remove the two bolts securing the firewire bracket to the main gearbox.

37.5 Remove the small-bore pipe fitted between the fuel injection pump governor and the gearbox throttle valve control.

37.6 Remove the flexible oil pipes (gearbox heat exchanger) from the main gearbox.

37.7 Remove the oil return pipe from the alternator drive casing.

37.8 Remove the rear three injection pipes; remove the cable clip from the gearbox.

37.9 Disconnect the harness from the front alternator.

37.10 Support the mechanical drive casing with suitable wood blocks.

37.11 Open the inspection plate on the mechanical drive casing and remove the nuts securing the flexible drive plate to the torque convertor drive.

37.12 Remove the studs from the gearbox support bracket and remove the bracket from the base frame.

WARNING

HEAVY WEIGHT. THE MAIN GEARBOX WEIGHS 231.5 kg (510 lb). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS WHEN MOVING THIS EQUIPMENT.

37.13 Fit locally manufactured lifting bracket, (Table 2, Ser 4), Fig 2 refers, and take the weight of gearbox.

37.14 Remove all setscrews securing the gearbox flange to the mechanical drive casing.

37.15 Carefully lift the gearbox and ease clear. During this operation, ensure that the drive bolts in the convertor drive do not bend or distort the flexible drive plate. Providing a balanced lift is obtained and care exercised in easing the gearbox clear, the drive bolts will clear the flexible drive plate.

37.16 Lower the gearbox on to a suitable stand or blocks.

37.17 Plug all exposed apertures on the gearbox and power pack to prevent the ingress of dirt.

37.18 If the power pack is to stand for any length of time with the main gearbox removed, fit a locally manufactured supporting bracket (Table 2, Ser 5).

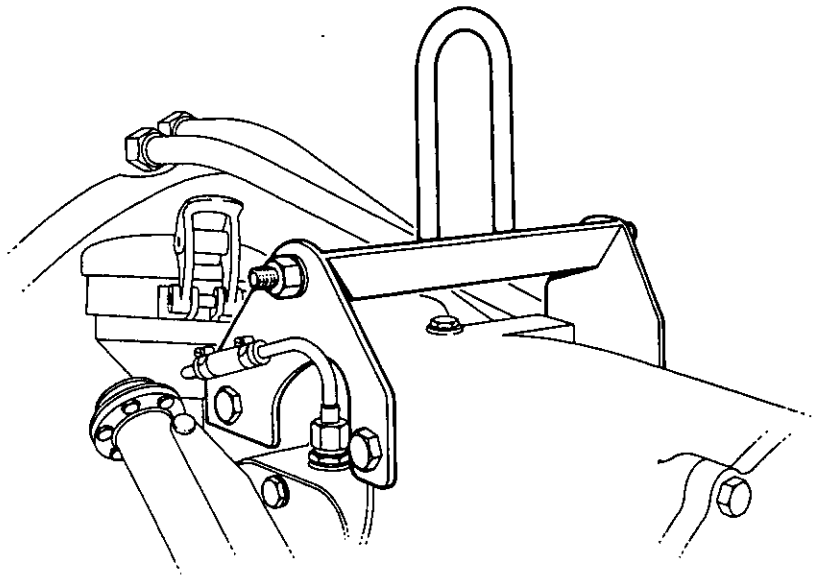


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Fig 2 Lifting bracket

Removing, Method 2

38 To remove the gearbox complete with the mechanical drive casing proceed as follows:

38.1 Remove the power pack, AESP 2350-T-250-522, Chap 1-1 refers, and drain the main gearbox.

38.2 Remove the transfer gearbox, Para 6 refers.

38.3 Remove the two bolts securing the firewire bracket to the main gearbox.

38.4 Remove the throttle valve control pipe fitted between the fuel injection pump governor and the throttle valve control.

38.5 Remove the flexible oil pipes (gearbox/heat exchanger) from the main gearbox.

38.6 Remove the starter motor.

38.7 Remove the Metalastik coupling from the flywheel. Note (for fitting purposes) the location of the dowel tubes in relation to the securing bolts. This is to ensure that the coupling can only be refitted one way.

38.8 Remove the engine flywheel. The securing bolts are not equi-spaced and the flywheel can only be located in one position when refitting.

38.9 Remove the oil pipe fitted inside the mechanical drive casing, secured behind the flywheel.

38.10 Support with suitable wood blocks:

38.10.1 The rear end of engine, Fig 3 refers.

38.10.2 The engine side of the mechanical drive casing.

38.11 Remove the bolts securing the mechanical drive casing to the engine casing.

38.12 Fit locally manufactured lifting brackets (Table 2, Ser 4) and take the weight of the gearbox.

38.13 Remove the nuts and studs securing the gearbox and mechanical drive casing support brackets. Remove both support brackets.

38.14 Move gearbox complete with mechanical drive casing to rear of engine until dowels fitted between engine casing and mechanical drive casing are clear. Note that a bobbin (oil transfer sleeve) is fitted between the faces of engine and mechanical drive casings.

38.15 Lift gearbox clear of power pack and position on suitable support.

38.16 Remove mechanical drive casing from gearbox.

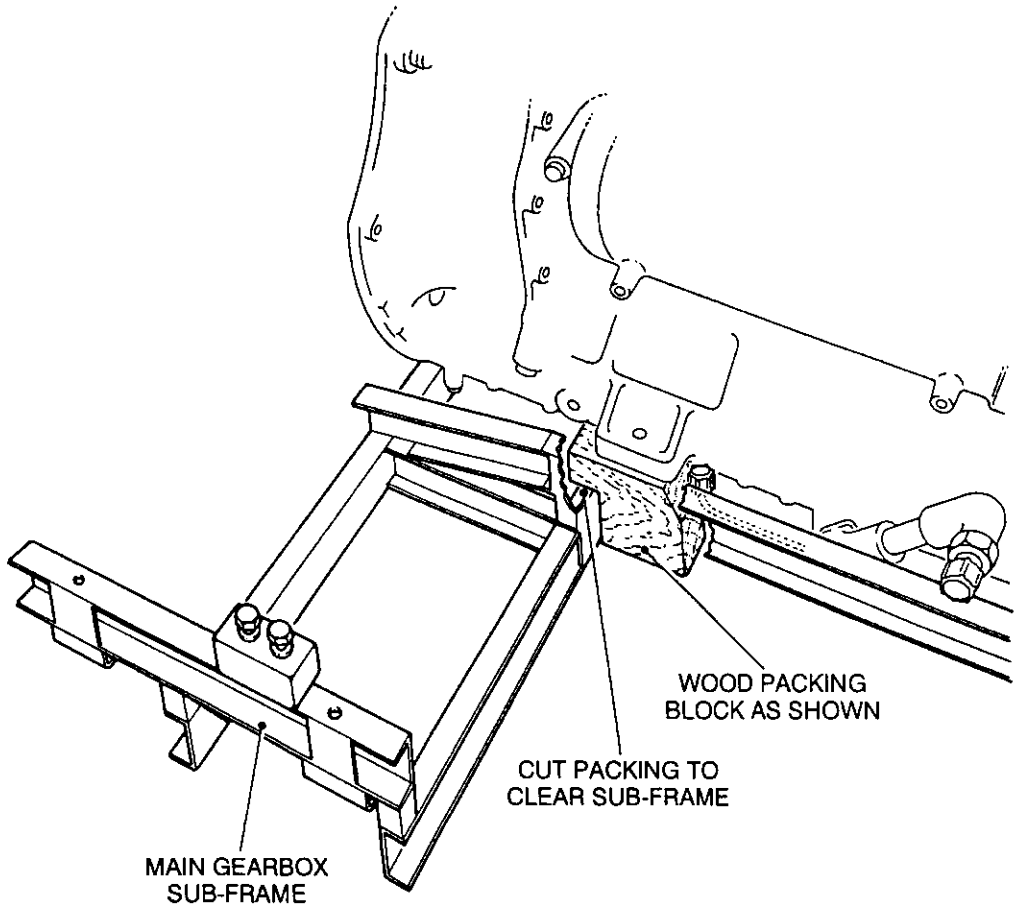


Fig 3 Method of supporting engine prior to removing gearbox and mechanical drive casing

Refitting, Method 1

39 If the main gearbox only has been removed, as detailed in Method 1, refit in reverse order to removing ensuring that the aligning procedure is observed, as follows:

39.1 With a slipstone remove any small burrs from the male spigot of the convertor and the female spigot of the input shaft.

39.2 With the gearbox slung, connect the harness to the rear generator before fitting the gearbox o the mechanical drive casing. This will allow ease of access to the generator harness socket.

39.3 Ensure the mating faces of the gearbox and the mechanical drive casing are parallel and square before offering the two faces together. Ensure also that the six drive studs on the torque convertor enter corresponding holes in the flexible drive plate.

39.4 Fit and finger tighten the gearbox-securing bolts.

39.5 To ensure the male and female spigots are correctly located, disengage the engine output to transfer gearbox and rotate the flexible drive plate. Should excessive pressure be required to rotate the flexible drive plate, remove and refit the gearbox.

39.6 Tighten the gearbox-securing bolts to 33.9 Nm to 37.9 Nm (25 lb/ft to 28 lb/ft).

39.7 Fit and tighten the six flexible drive plate nuts to 55.6 Nm to 66.4 Nm (41 lbf ft to 49 lbf ft) recheck free rotation of the flexible drive plate.

39.8 Fill the main gearbox and engine oil tank to correct working level with correct grades of oil, AESP 2350-T-250-601 refers.

39.9 Check and adjust, if necessary, the engine and gearbox throttle valve control linkage, as detailed in AESP 2350-T-250-522, Chap 3.

39.10 Position the power pack in front of the vehicle and connect up for test run, as detailed in AESP 2350-T-250-522, Chap 1-1. Test run the power pack and check for oil and coolant leaks and correct functioning. Select all gears in turn to ensure full circulation of oil within the gearbox. Recheck oil levels and top up as necessary in accordance with AESP 2350-T-250-601.

39.11 After completion of the test run, refit the gearbox coupling to output flange of gearbox. Tighten the nuts and bolts to 47.5 Nm (35 lbf ft) torque.

Refitting, Method 2

40 If the main gearbox has been removed as detailed in Para 38, refit in the reverse order to removing observing the following points:

40.1 Before fitting the locknut to the gearbox-coupling shaft, machine 0.127 mm to 0.254 mm (0.005 in.to 0.010 in.) from the reverse face of the nut to allow a new locking position to be made, Para 7 refers.

40.2 Fit the mechanical drive casing to the main gearbox before positioning the assembly to the engine casing. Flange faces of the casing and the torque convertor housing must be clean and free from burrs; apply sealing compound (Table 3, Ser 1) to the flange faces and tighten the securing bolt to 33.9 Nm to 38.0 Nm (25 lbf ft to 28 lbf ft).

40.3 Inspect and renew if necessary the two small O-rings fitted to the oil transfer sleeve; ensure the sleeve is located in the engine casing before fitting the gearbox with the mechanical drive casing. (Refer to Fig 4 for correct setting of the oil feed tube stud, which ensures the tube bobbin, is maintained in its correct location)

40.4 For details of engine coupling and flywheel replacement, Chap 1-2 refers.

Maintenance

41 Prior to fitting a new or reconditioned gearbox assembly, remove the following parts from the defective assembly and refit on the replacement assembly:

41.1 The gearbox oil filler and breather/overflow pipe.

41.2 The gearbox external oil pipes (to and from heat exchanger) and clips.

41.3 The range and gear selector levers.

41.4 The throttle valve control and mounting plate.

NOTES

(1) Refer to AESP 2350-T-250-522, Chap 3 for correct positioning and adjustment of range and gear selector levers.

(2) Clean external oil pipes as detailed in Para 80.

(3) Clean and flush the gearbox oil cooler section of the heat exchanger, Chap 1-4 refers.

(4) Inspect the resilient mounting pads and all securing nuts, bolts and studs.

De-preservation instructions (Task 1)

42 Proceed with de-preservation instructions (Task 1) as follows:

42.1 Remove the new or reconditioned gearbox from its packing case.

42.2 Clean off all external preserving grease with a suitable cleaning agent and wipe dry with clean lint free cloth.

42.3 Remove all blanking plates, masking and securing tape.

42.4 Remove from the old gearbox and replace on new gearbox those parts detailed in Para 41.

42.5 Fit the gearbox assembly to the power pack, Para 39 or 40 refers.

42.6 Fill the gearbox with oil, to correct level, AESP 2350-T-250-601 refers.

De-preservation instructions (Task 2)

43 Proceed with de-preservation instructions (Task 2) as follows:

43.1 Position and connect the power pack to the vehicle electrical and fuel supplies as detailed in AESP 2350-T-250-522, Chap 1-1, preparatory to test running. Ensure that the gear selector 'neutral start' cable is connected.

43.2 Check that all lubricating and hydraulic systems are correctly filled as detailed in the Servicing Schedule. Check that the cooling system is correctly filled.

43.3 Start and run up the engine to normal rated speed until the temperature of outlet coolant reaches 66 deg C (150 deg F).

43.4 Operate the gearbox by moving the gear range lever through all gears to energize all clutches and charge the system, until the gearbox oil temperature reaches 66 deg C (150 deg F). Stop the engine.

43.5 Drain the gearbox by removing the drain plug and oil filter element.

De-preservation instructions (Task 3)

44 Proceed with de-preservation instructions (Task 3) as follows:

44.1 Ensure the battery master switch and the fuel supply are off. Disconnect the power pack and (with the gearbox drain plug and gearbox oil filter element removed) install in the vehicle as detailed in AESP 2350-T-250-522 Chap 1-1.

44.2 Remove the gearbox access plug from the hull bottom plate and position a suitable container to collect oil.

44.3 Apply both steering brake levers and engage the parking controls. Chock the vehicle to prevent movement forward or in reverse.

44.4 Switch 'ON' the battery master switch and fuel supply. Start the engine.

CAUTION

EQUIPMENT DAMAGE. Oil remaining in gearbox will be a mixture of preservative oil and engine oil. The temperature must not be allowed to exceed 66 deg C (150 deg F) during scavenging operations described in Para 44.5. The stalled condition must not be maintained in excess of twenty seconds, otherwise over heating of gearbox will occur.

44.5 Engage transmission by selecting the 3-6 gear range. Increase engine speed to 1000 rev/min to stall the torque convertor, maintaining this speed for twenty seconds approximately (this will scavenge the oil from the convertor).

44.6 Refit the drain plug and fit a new oil filter element to the gearbox, AESP 2350-T-250-522, Chap 1-5 refers.

44.7 Refill the gearbox to correct working level with oil, AESP 2350-T-250-601 refers.

Oil seal, gearbox output flange

45 In the event of a heavy oil leak from the gearbox output shaft. Refer to AESP 2350-T-250-522, Chap 1-5 for details of removing the oil seal and flange bolt sealing ring.

TESTS

Road test

46 When road testing the vehicle, check operation of the gearbox as detailed in AESP 2350-T-250-522, Chap 1-5. Before faulting the gearbox, ensure that the oil level in gearbox is correct and that engine is properly tuned and functioning correctly. Refer to Table 5 for failure diagnosis.

Torque convertor stall test

WARNINGS

(1) PHYSICAL INJURY. WHEN CARRYING OUT A TORQUE CONVERTOR STALL TEST, THE VEHICLE MUST BE POSITIVELY PREVENTED FROM MOVING.

(2) PHYSICAL INJURY. APPLY BOTH STEERING BRAKE LEVERS AND ENGAGE PARKING CONTROLS; 'CHOCK' THE VEHICLE TO PREVENT MOVEMENT FORWARD OR IN REVERSE.

CAUTIONS

(1) EQUIPMENT DAMAGE. Do not maintain the stalled condition for longer than thirty seconds due to rapid heating of the gearbox.

(2) EQUIPMENT DAMAGE. With the gearbox in neutral, run the engine at 1200 to 1500 rev/min for two minutes to cool oil between tests.

(3) EQUIPMENT DAMAGE. Do not allow the gearbox oil temperature to exceed 108 deg C (225 deg F).

(4) EQUIPMENT DAMAGE. Keep a close check to prevent the engine cooling system from over-heating.

(5) EQUIPMENT DAMAGE. Maximum figure of 108 deg C (225 deg F) for this test is given as a safety factor due to the rapid rise in oil temperature. Maximum oil temperature during the road test should not exceed 108 deg C (250 deg F gauge reading).

(6) EQUIPMENT DAMAGE. Maximum engine coolant temperature should not exceed 105 deg C (220 deg F).

(7) EQUIPMENT DAMAGE. Maximum gearbox oil temperature during the road test should not exceed 122 deg C (250 deg F).

47 To road test the vehicle proceed as follows:

47.1 Apply both steering brake levers and engage the parking controls to lock the gearbox output; select any forward gear range (except 1-2 range), accelerate engine to full throttle and note maximum rev/min.

47.2 Compare this figure with figure specified as normal for those conditions (2400 to 2600 rev/min). An engine speed above or below this range may indicate a fault in the engine or gearbox.

NOTE

Engine power will decrease when operating at high altitudes, becoming more pronounced as the altitude increases.

47.3 After making allowances for altitude, a low engine speed may indicate the engine is not delivering full power.

47.4 If low engine speed persists after the engine has been tuned and proved to be functioning correctly, an internal fault in the gearbox is indicated. Refer to Table 3 for failure diagnosis.

47.5 If high engine speed is noted, check the gearbox oil level. High engine speed can occur if the oil level is LOW in the gearbox.

47.6 If high engine speed persists after the gearbox oil has been corrected, an internal fault in gearbox is indicated. See Table 3 for failure diagnosis.

47.7 Convertor stall tests may be made in 3-4, 3-5 and 3-6 gear ranges. The low-splitter and intermediate range clutches will be the only clutches tested, regardless of which three ranges are used. Carry out a clutch slippage check' to isolate the fault.

Clutch slippage check

48 The clutch slippage check tests operation of all clutches under full load conditions on the road. If correct engine speed (rev/min) is exceeded in the test conditions outlined below, one or more of the clutches are slipping.

49 Clutch slippage check in lockup gears is carried out at full load and full throttle and is carried out as follows:

49.1 Stop the vehicle and apply both steering brakes firmly. Position the gear control lever in 1-2 gear range. With the brakes still applied, accelerate the engine to full throttle. Release the steering brakes gradually, so that the vehicle gains road speed slowly.

49.2 At 2600 rev/min approximately, the lockup clutch should engage. The gearbox will then be operating in first gear lockup at full throttle. Continue to adjust steering brake application so that the engine speed and road speed increase slowly. For details of clutches applied in first gear refer to Para 50.

49.3 To observe first gear lockup operation for a period longer than is normal under heavy load acceleration, fully depress the accelerator rapidly after engine speed is above 2800 rev/min. This will prevent a change up into second gear and a lockup-to-convertor change.

CAUTIONS

(1) EQUIPMENT DAMAGE. During test, the engine and brakes will be under severe load.

(2) EQUIPMENT DAMAGE. Keep a close check on the engine, brakes and gearbox to prevent overheating.

(3) EQUIPMENT DAMAGE. Do not allow the gearbox oil temperature to exceed 108 deg C (225 deg F).

(4) EQUIPMENT DAMAGE. The maximum figure of 108 deg C (225 deg F) for this test is given as a safety factor due to the rapid rise in oil temperature. Maximum oil temperature during road test should not exceed 108 deg C (250 deg F) gauge reading.

(5) EQUIPMENT DAMAGE. The maximum engine coolant temperature should not exceed 105 deg C (220 deg F).

(6) EQUIPMENT DAMAGE. The maximum gearbox oil temperature during the road test should not exceed 122 deg C (250 deg F).

49.4 If slippage is encountered, release the accelerator pedal immediately to prevent further damage. To determine which clutch is slipping, try another gear.

49.5 Second gear lockup can be tested after first gear lockup, merely by releasing the brakes enough to let the engine speed approach the governed speed. The gearbox should change up into second gear just below governed speed, i.e. 3500 to 3700 rev/min. For details of clutches applied in second gear refer to Para 50.

49.6 The procedure described for 1-2 gear range can be used for 3-4 and 3-6 ranges to test third, fourth, fifth and sixth gear operations at full throttle in lockup.

49.7 If clutch slippage occurs, refer to Table 3 for failure diagnosis.

NOTE

It is possible that the low range clutch may slip in first gear but not in second gear. This is because in first gear, the engine torque, which is working at the low range clutch, has been multiplied by the splitter planetary gear. In second gear, the splitter planetary is locked up and therefore the engine torque working at low range clutch is not multiplied. The same torque multiplication conditions apply to intermediate range and high range clutches when the splitter planetary is in reduction and direct drive. Thus, a greater torque is working at the intermediate range clutch in third gear than it is in fourth gear, although the engine torque may be the same in both gears.

50 Clutches applied and under test in lockup gears are as follows:

	Gear	Clutches
50.1	1	Lockup, low splitter, low range
50.2	2	Lockup, high splitter, low range
50.3	3	Lockup, low splitter, intermediate range
50.4	4	Lockup, high splitter, intermediate range
50.5	5	Lockup, low splitter, high range
50.6	6	Lockup, high splitter, high range

STEERING UNIT, TYPE S1F6

Removing

NOTES

(1) The following operations are grouped for convenience, assuming two men are working on vehicle.

(2) Difficulty will be experienced in disconnecting and tightening external oil pipe unions at the rear of the steering unit, unless the flare nut adaptors (Table 1, Ser 13 and 14) are used. In the event of the adaptors not being available, it may be advantageous to remove the power pack, prior to removing the steering unit, so that access is obtained to the pipe unions.

51 Remove the steering unit as follows:

51.1 Position the vehicle on level ground. Chock the road wheels to prevent movement of the vehicle.

51.2 Position a container under front of hull and drain the oil from the steering unit oil tank.

51.3 Open the steering unit access plate by releasing the six quick-release bolts, turning the flat plates under bolt heads to release the locking wedges on the underside of the access plate. Do not allow the access plate to swing under the hull and become trapped between the hull and the ground.

51.4 Through steering unit access plate. Disconnect the steering brake band operating levers from the long (vertical) rods by removing the split pins and clevis pins.

51.5 Disconnect and remove the breather pipe assembly from the steering unit and oil tank.

51.6 Disconnect both coupling rings (muff couplings) of the LH half-shaft and remove the LH halfshaft, AESP 2350-T-250-522, Chap 1-5 refers.

51.7 Slacken and unscrew the steering unit front mounting bolts.

NOTE

The front mounting bolts cannot be removed from the steering unit mounting eyes unless the brake band operating levers are loosened and moved along the shaft.

51.8 Inside vehicle. Loosen and turn the four centre clamps on the access cover plates between the driver and the power pack compartments; remove the upper and lower sections of the cover plates (these are secured by quick-release bolts).

51.9 Remove the driver's screen washer container.

51.10 Disconnect the 'neutral start' cable secured to the inside of the bulkhead between the driver and the power pack compartments. Remove the driver's gear selector lever assembly with the attached linkage.

51.11 Turn the engine oil filler locking ring to release the filler pipe from the partition sill, remove the engine oil filler pipe from the engine oil tank.

51.12 Remove the upper forward section of the driver/power pack partition; disconnect the accelerator linkage from the governor arm and from the lower cross-shaft.

51.13 Remove the bolts securing the gearbox coupling to the steering unit, at the steering unit end.

51.14 Disconnect the accelerator linkage at the pedal connection. Remove the driver's footplate between the driver's seat and the RH half-shaft cowling. Remove the two halves of the cowling covering RH half-shaft with the accelerator pedal assembly.

51.15 Remove the steering unit sealing panel (front panel) from the longitudinal bulkhead.

51.16 Disconnect the inner coupling ring connecting the RH half-shaft to the steering unit.

NOTE

When refitting the steering unit, both half-shafts must be removed to check the steering unit alignment.

51.17 Remove the steering unit rear mounting bolts.

51.18 External oil pipes. Disconnect the oil feed pipe, oil tank to steering unit, at the adaptor on the rear of the steering unit casing.

51.19 Disconnect the oil return pipe, steering unit to heat exchanger, at the adaptor on the rear of the steering unit casing; also disconnect the rigid section of pipe from the flexible section and remove the rigid section.

NOTE

Blank off the ends of oil pipes and adaptors to prevent ingress of dirt.

51.20 Lifting out steering unit. Assemble the lifting adaptor (Table 1, Ser 2) to the lifting eyes on the steering unit casing.

NOTE

The short leg of lifting adaptor must be connected to rear lifting eye.

51.21 Lift the steering unit sufficiently to allow removal of the alignment shims, located between the three mounting eyes and mounting brackets secure the shims to their respective mounting eyes. Lift out and remove the steering unit assembly through the access aperture in the front glacis plate.

Maintenance

52 If refitting original assembly, carry out following checks and renew as necessary.

52.1 Inspect for oil leaks at the input and output shafts, sump plate, brake band cover plates and brake band operating pins. Renew oil seals, O-rings and gaskets as necessary.

52.2 Replace sealing washers, as necessary, at the external oil pipe adaptors. Replace damaged or doubtful oil hoses.

52.3 Inspect the threads of the mounting bolts for damage, burrs or stretch.

53 If fitting a new or reconditioned assembly, carry out following maintenance operations.

53.1 Fit O-rings (provided with replacement assembly) and split rings to the output driving flange gears. Fit the original rear-mounting bracket to casing, ensuring that the securing nuts are tightened to a torque of 81 Nm - 88 Nm (60 lbf ft - 65 lbf ft).

53.2 If the assembly is received without front mounting bolts, scribe datum line across the ends of the brake operating levers and shafts, remove the levers and fit two mounting bolts, spring and flat washers; refit the levers, ensuring that they are correctly aligned.

53.3 Clean external oil pipes, refer to Para 80.

53.4 Clean and flush the steering unit oil cooler section of the heat exchanger, refer to Chap 1-4.

53.5 Clean out the steering unit oil tank, refer to Para 73.

Refitting

54 Refit the steering unit as follows:

54.1 Assemble the lifting adaptor (Table 1, Ser 2); lift and lower the steering unit into position and refit the original shims irrespective of whether the steering unit is the original or a replacement assembly and tighten with three 1 1/8in. x 4in. bolts to 366 Nm (270 lbf ft). Ensure that the ends of the bolts do not 'bottom' in brackets before finally tightening.

54.2 With both half-shafts removed, check the steering unit alignment, as detailed in Para 56. The alignment procedure need only be implemented when fitting a replacement assembly.

54.3 When the steering unit has been correctly aligned, refitting of assembly is the reverse of that of removing. Ensuring the following:

54.3.1 The oil pipe unions are tight and not leaking.

54.3.2 Refit the half-shafts in accordance with AESP 2350-T-250-522, Chap 1-5.

54.3.3 The gearbox coupling bolts must be tightened to 47.5 Nm (35 lbf ft). Tighten the nuts securing the rear-mounting bracket to the steering unit case to 81.4 Nm to 88.1 Nm (60 lbf ft to 65 lbf ft).

54.4 Refill the system with steering unit oil. AESP 2350-T-250-601 refers.

54.5 Adjust the steering brake bands in accordance with AESP 2350-T-250-522, Chap 1-5.

Steering unit alignment

CAUTION

EQUIPMENT DAMAGE. The steering unit must be re-aligned to the final drives when a replacement assembly is fitted. It is important that the steering unit output shafts are aligned to within 0.38 mm (0.015 in.) in both horizontal and vertical planes and that the angular displacement is within 0.76 mm (0.030 in.). When checking alignment the mounting bolts must be fully tightened.

55 Assemble steering unit alignment tools, as follows:

55.1 Remove the half-shaft coupling retaining plate from the driving flange of the final drive input shafts.

55.2 Secure each mandrel, steering unit alignment tool (Table 1, Ser 3) as modified by AESP 2350-T-250-811 Mod Instr No.1/18) to input shaft of LH and RH final drives, Fig 4 refers.

55.3 Slide each sliding flange (Table 1, Ser 4) up to the steering unit output shaft flange.

56 Check the steering unit alignment as follows:

56.1 Check the steering unit for alignment in the horizontal and vertical planes. Fully revolve both sliding flanges of the alignment tool and check that the machined boss on each sliding flange does not bind on inside edges of the steering unit driving flange recess.

56.2 Check the steering unit for angular displacement, using feeler gauges inserted at diametrically opposite points between the faces of the steering unit output shaft flanges and the sliding flanges of the alignment tool.

56.3 When carrying out above checks, rotate the steering unit input shaft to equalize angular errors on each side.

56.4 When all three points have been checked for alignment, lift the steering unit and shim as necessary, refer to Para 57 to 59. Refit the steering unit, tighten the mounting bolts and recheck for alignment.

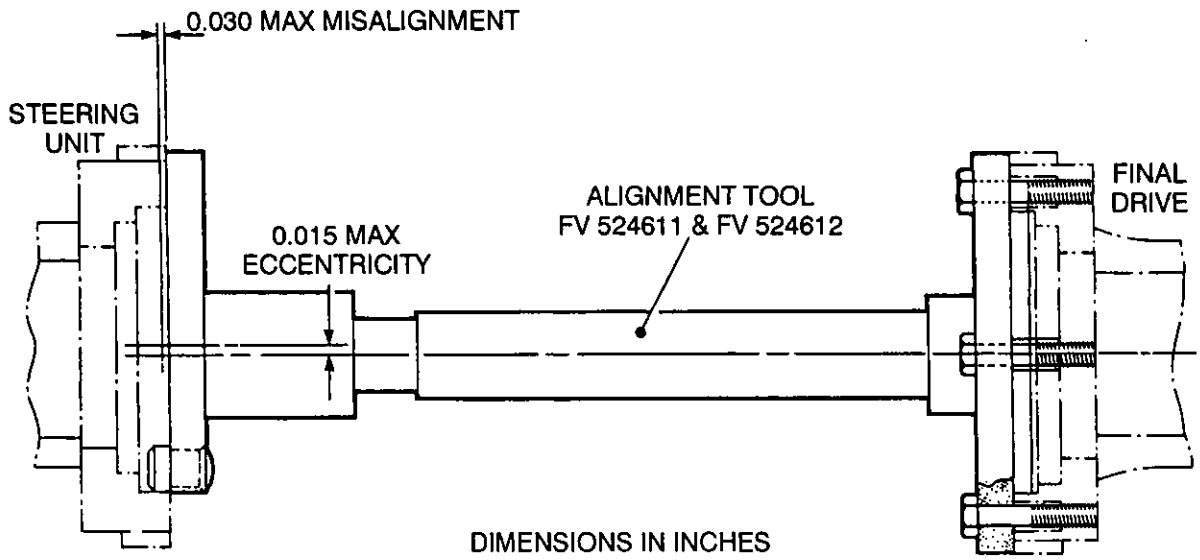


Fig 4 Alignment of steering unit to final drive

Adjustment, steering unit alignment

NOTE

Shims are provided in sizes of No. 10 SWG 3.25 mm (0.128 in.) and No. 20 SWG 0.89 mm (0.036 in.). If shims of other sizes are required to attain correct alignment, they are to be locally manufactured.

57 Removing or inserting shims between the steering unit front mounting brackets and the hull support brackets rectifies horizontal displacement. This allows the assembly to be moved forward or backwards.

58 Vertical displacement is rectified by removing or inserting shims at all three mounting points, between the steering unit front mounting eyes and the front mounting brackets and between the rear mounting bracket and the hull mounting boss. This allows the assembly to be raised or lowered.

59 Angular displacement is rectified by removing or inserting shims (from one side only), between the steering unit front mounting eyes and the front mounting brackets. This allows rectification if the assembly is tilted.

Renewing oil seal, general

60 Oil seals can be renewed with the steering unit installed in the vehicle, but difficulty will be experienced in removing the split pin, which locks the castellated nut securing the driving flange to the output shaft. It will be advantageous, therefore, to carry out renewal of the output shaft seals when the steering unit has been removed from vehicle.

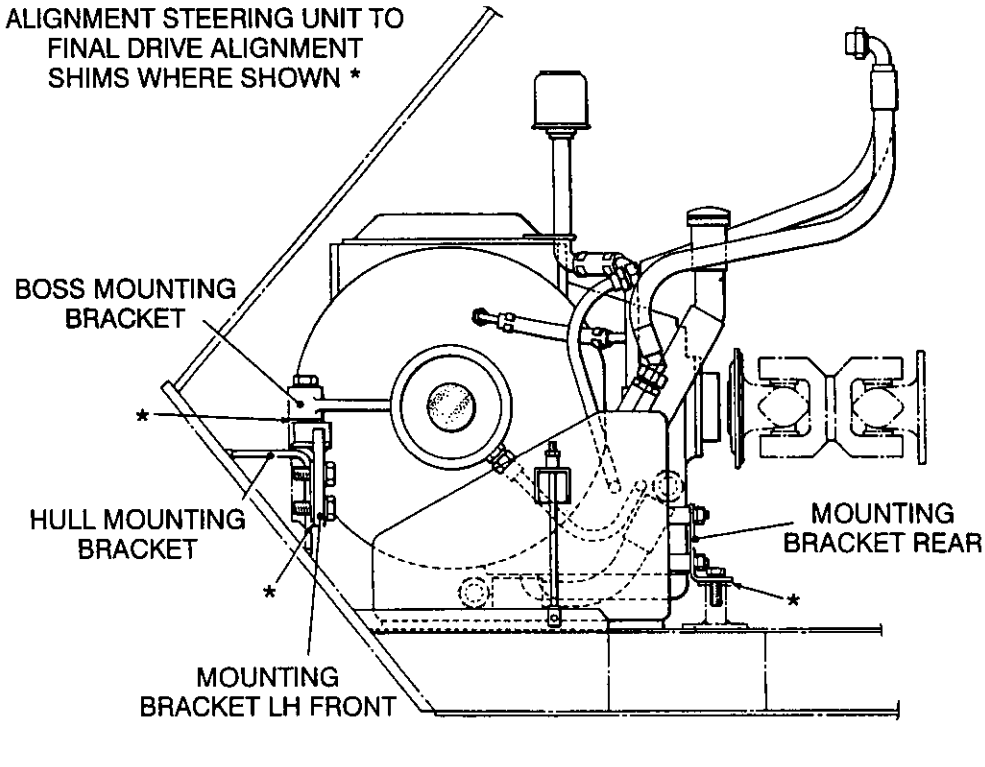


Fig 5 Location of steering unit alignment shims

Oil seal, bevel pinion input shaft

Preparation

61 Remove the engine rear and front sealing panels as follows:

61.1 Lower the backrest of the driver's seat.

61.2 Remove the two flexible hoses from the air ducting above the rear engine cover Remove the engine rear-sealing panel from the longitudinal bulkhead by releasing the quick release bolts and lifting out the panel (weight 25.9 kg (57 lb)).

61.3 Disconnect the oil filler hose from the engine oil tank.

61.4 Unscrew the hand throttle control rod and remove.

61.5 Disconnect the gear range selector linkage at the gearbox control rod by removing the pivot bolt from the threaded yoke.

61.6 Disconnect the gearbox interlock (neutral start) switch cable at the plug on the longitudinal bulkhead.

61.7 Remove the gearbox range selector assembly (complete with lever, pivot and linkage, and its mounting bracket) from the outer face of the engine front sealing panel (centre panel) by removing nuts and bolts.

61.8 Remove the plastic container from the driver's screen washer.

61.9 Remove the engine front sealing panel from the longitudinal bulkhead, together with the oil filler caps and hoses of the engine and steering unit oil tanks (weight 20 kg (44 lb)). Mask the filler tubes of both oil tanks with mouldable wax wrapping and secure with adhesive tape to prevent ingress of dirt.

Renewal

62 To renew proceed as follows:

62.1 Disconnect the gearbox coupling from the gearbox and steering unit drive flanges. Lift out the coupling.

62.2 Remove the input flanged driving shaft by withdrawing it from the bevel pinion hollow shaft.

62.3 Remove the ring of bolts around the oil seal housing. Remove the seal-housing, tap lightly with a hide hammer to loosen.

62.4 Press out the oil seal from the housing using a suitable disc. Remove O-ring from driving shaft.

62.5 Remove all trace of old sealing compound from the jointing faces of housing and casing.

62.6 Fit new oil seal into the housing with the lip of the seal facing inward (towards bearing). Use a suitable disc to the enter seal squarely in housing.

62.7 Ensure that there are no nicks or burrs on the seal facing on the shaft.

62.8 Carefully dress any imperfections.

62.9 Refit the seal housing, applying sealing compound (Table 3, Ser 1) to both jointing faces. Tighten the bolts evenly.

62.10 Fit the O-ring to the groove in the driving shaft. Lightly coat the O-ring with oil normally used in the steering unit. Insert the driving shaft into the hollow shaft and press home.

62.11 Refit the gearbox coupling and tighten the nuts and bolts to 47.5 Nm (35 lb ft) torque.

62.12 Refit the engine front and rear sealing panels in reverse order to removing.

Oil seal, output shaft

63 When the renewing oil seal of the LH output shaft, open the steering unit access cover plate and remove the LH half shaft. Refer to Para 67.

64 When renewing the oil seal of the RH output shaft, remove the half-shaft cowling and steering unit-sealing panel and then remove the RH half-shaft. Refer to Para 65.

65 To remove half shaft cowling and sealing panels proceed as follows:

65.1 Remove the engine front sealing panel from the longitudinal bulkhead, together with the oil filler caps and hoses of the engine and steering unit oil tanks (weight 19.9 kg (44 lb)). Mask the filler tubes of both oil tanks with mouldable wax wrapping and secure with adhesive tape to prevent the ingress of dirt.

65.2 Disconnect the accelerator linkage at the pedal connection. Remove the driver's footplate between the driver's seat and half shaft cowling.

65.3 Remove the nuts and bolts securing the two halves of metal cowling surrounding the RH half shaft. Lift off the cowling together with the accelerator assembly.

65.4 Remove the steering unit sealing panel (front panel) from the longitudinal bulkhead.

65.5 Disconnect the inner coupling ring, connecting the RH half shaft to the output shaft of the steering unit, refer to AESP 2350-T-250-522, Chap 1-5.

NOTE

When refitting the steering unit, both half shafts must be removed to check steering unit alignment.

Removing

66 Remove the oil seal, output shaft as follows:

66.1 Remove the split pin from the castellated nut, which secures the driving flange to the output shaft.

66.2 Hold the driving flange with local manufactured peg spanner (Table 2, Ser 6), remove the castellated nut and bevelled washer. Withdraw the driving flange from the output shaft.

66.3 Remove the ring of bolts around the oil seal housing. With the aid of two jacking bolts, remove the seal housing.

66.4 Press out the oil seal from the housing, using a suitable disc. Remove all trace of old sealing compound from the jointing faces of the seal and bearing housing.

Replacing

67 Ensure that there are no nicks or burrs on seal facing of driving flange. Carefully dress any imperfections and proceed as follows:

67.1 Refit the seal housing, applying sealing compound (Table 3, Ser 1) to both jointing faces. At this stage, do not tighten bolts.

NOTE

Before fitting the drive flange to the output shaft, ensure that the O-ring, spring clip and retaining plates of the half shaft coupling are fitted to the driving flange gear.

67.2 Fit the driving flange to the output shaft and, centralizing the oil seal, tighten bolts evenly around the seal housing.

67.3 Refit the bevelled washer and castellated nut. Tighten nut to 271 Nm (200 lb ft) and fit a new split pin. Refit the half shaft.

67.4 Refit the sealing panel and cowling or access cover plate, depending on which seal has been renewed.

STEERING BRAKE BAND ASSEMBLY

Removing and refitting the operating pin assembly oil seals

68 To remove and refit the operating pin assembly oil seals proceed as follows:

68.1 Disconnect the steering brake band-operating lever from the long (vertical) rod by removing the split pin and clevis pin.

68.2 Remove the nuts and flat washers securing the assembly to the steering unit casing. Withdraw the operating pin housing complete with pin casing.

68.3 Before refitting the assembly, fit a new oil seal to the operating pin housing and ensure that the oil drillings in housing are clear.

68.4 Clean off the sealing compound from the jointing faces and apply sealing compound (Table 3, Ser 1).

68.5 Refit the assembly and reconnect the brake band controls. Check the steering brake band adjustment, AESP 2350-T-250-522, Chap 1-5 refers.

NOTE

Should operating lever be removed from operating cross-shaft, scribe a datum line across lever and shaft to ensure correct alignment of operating lever when refitting.

Adjusting screw assembly

69 To renew the adjusting screw housing screw assembly, back off the adjusting screw, remove the nuts and flat washers securing the housing to the steering unit casing and withdraw the housing complete with pin.

70 Clean off the old sealing compound from jointing faces, apply sealing compound (Table 3, Ser 1) and fit the new assembly. Adjust the steering brake bands, AESP 2350-T-251-522, Chap 1-5 refers.

SUMP, STEERING UNIT

71 To rectify an oil leak from sump plate, proceed as follows:

71.1 Remove the steering unit from the vehicle; refer to Para 51. Drain the oil from the steering unit casing into a suitable container.

71.2 Position and prop up the steering unit assembly so as to give access to the sump plate.

71.3 Remove the nuts and flat washers securing the sump plate to the casing, remove the sump plate, and lightly tap with a hide hammer to loosen.

71.4 Remove the lower sump joint (between the sump plate and the gauze strainer).

71.5 Remove the bolts securing the gauze strainer. Remove the strainer and the upper sump joint (between the strainer and the casing), using a sharp bladed knife.

71.6 Clean the joint faces, clean or remove the gauze strainer, as necessary. Refit the two new joints and refit the parts in reverse order to removing.

STEERING UNIT OIL TANK

72 The oil tank is manufactured from No.16 SWG terne plate, being of mild steel sheet with internal surfaces protected with a covering of terne coating (20% tin, 80% lead).

Cleaning

73 Normal cleaning of oil tank is described in AESP 2350-T-250-522, Chap 1-5.

Pressure testing

74 To pressure test oil tank, carry out operations detailed for engine oil tank, Chap 1-2 refers.

Temporary preservation

75 Preservation of oil tanks for temporary storage is to be carried out as detailed for engine oil tank, Chap 1-2 refers.

Painting

76 Paints used for painting external surfaces of oil tank are to be the same as detailed for the engine oil tank; Chap 1-2 refers.

PRESERVATION OF REPAIRABLE TRANSMISSION ASSEMBLIES

77 Temporary preservation of repairable transmission assemblies, i.e. transfer gearbox, GM-Allison gearbox, steering unit and final drives, is to be carried out in REME workshops prior to back loading for repair.

Preservation

78 Preservation is to be carried out as follows:

78.1 Drain the oil from the assembly and affix a label to this effect.

78.2 As the assembly will have recently been taken out of service, internal parts will be covered with a film of oil, which will act as an adequate preservative.

78.3 Preserve all unpainted surfaces with grease (Table 3, Ser 6).

78.4 All apertures must be sealed with mouldable wax wrapping (Table 3, Ser 7) and secured with adhesive tape.

Dismantled assemblies

79 Dismantled assemblies should be reassembled. Prior to reassembly, all internal parts should be sprayed with preservative (Table 3, Ser 3)

External oil pipes

80 Preserve external oil pipes as follows:

80.1 Oil pipes and hoses must be cleaned until all traces of sludge and old oil have been removed.

80.2 Visually inspect pipes and hoses. Repair or replace damaged oil pipes. Replace rubber hoses where there are signs of deterioration.

80.3 Pump clean oil (of the type that is normally used in the system) through pipes to remove any trace of moisture that may be present after cleaning.

80.4 Fit blanking caps to both ends of each pipe until required for use.

Assembling transfer gearbox

81 To assemble a transfer gearbox proceed as follows:

81.1 Fit the scavenge pump to the intermediate casing, ensuring that both dowel pins are correctly located. Tighten the securing bolts.

81.2 Apply sealing compound (Table 3, Ser 1) to joint faces and fit the outer casing to the intermediate casing. Tighten the securing bolts, ensuring that the dowel pins are correctly located.

FAILURE DIAGNOSIS

82 Table 4 contains failure diagnosis information for locating and correcting transmission faults which may occur. Corrective action detailed is within the scope of field repairs. Table 5 contains failure diagnosis information for the steering unit.

83 Field workshops are not to dismantle GM-Allison TX200 gearbox or steering unit, but are to fit replacement assemblies.

Gearbox, GM Allison TX 200

84 Use failure diagnosis chart Table 5 for gearbox in conjunction with tests described in Para 46 to 50 inclusive, and adjustments to engine and gearbox throttle valve control linkage described in AESP 2350-T-250-522, Chap 3. Several faults can be corrected by external checks and adjustments. Accurate diagnosis can assist in eliminating unnecessary gearbox removal and replacement.

85 To carry out effective fault diagnosis, personnel should have a wide knowledge of the construction and operating characteristics of Type TX200 gearbox. For technical description of gearbox, see AESP 2350-T-250-302.

86 Table 5 lists the diagnosis information for the Allison gearbox detailed in this sub chapter.

TABLE 5 FAILURE DIAGNOSIS, GEARBOX GM-ALLISON TX200

Ser (1)	Symptoms (2)	Probable cause (3)	Action (4)
1	Engine operating effectively, but no drive with range selector in any position	Oil level low	Fill to correct level
		Oil filter choked	Replace filter element
		Range selector linkage out of adjustment	Adjust linkage
		Throttle valve control linkage out of adjustment	Adjust control linkage
		Internal failure, gearbox	Replace gearbox
		Defective transmission	Check, isolate and rectify
		Engine dis-connector mechanism disengaged	Engage dis-connector mechanism
2	Engine operating effectively, but vehicle loses power or fails to develop full power with range selector in any position	Incorrect grade of oil	Change to correct grade
		Incorrect adjustment of steering brake	Adjust brakes
		Range selector linkage out of adjustment	Adjust linkage
		Throttle valve control linkage out of adjustment	Adjust control linkage
		Oil level low	Fill to correct level
		Internal failure, gearbox	Replace gearbox
3	No drive in any range	Engine dis-connector mechanism disengaged	Engage dis-connector mechanism
		Oil level low	Fill to correct level
		Oil filter choked	Replace filter element
		Range selector linkage out of adjustment	Adjust linkage
		Throttle valve control linkage out of adjustment	Adjust control linkage
		Splitter clutch failure	Replace gearbox
		Defective clutch piston seals	Replace gearbox
4	Vehicle moves forward in neutral	Range selector linkage out of adjustment	Adjust linkage
		Range clutch failure	Replace gearbox
		Insufficient range clutch clearance	Replace gearbox

(continued)

TABLE 5 FAILURE DIAGNOSIS, GEARBOX GM-ALLISON TX200 (continued)

Ser (1)	Symptoms (2)	Probable Cause (3)	Action (4)
5	Vehicle moves backward in neutral	Range selector linkage out of adjustment	Adjust linkage
		Reverse range clutch failure	Replace gearbox
6	Excessive creep in any range except neutral	Engine idling speed too high	Adjust to correct idling speed
7	Engine over-speeds on full throttle gear change	Defective down-shift timing valve	Replace gearbox
		Defective piston seals, intermediate range clutch	Replace gearbox
8	All gear change points too low at full throttle	Throttle valve control linkage out of adjustment	Adjust control linkage
		Defective throttle valve	Replace gearbox
		Main pressure leaking into governor circuit	Replace gearbox
9	All gear change points too high except lockup and 1-2 range at part throttle	Rear pitot tube loose	Tighten rear pitot tube mounting bolts
		Defective rear governor and/or damaged rear pitot	Replace gearbox
10	No change to 2nd gear and lockup gear change points high	Defective front governor and/or front pitot tube	Replace gearbox
		Front governor circuit leakage	Replace gearbox
		Defective lockup valve or cut-off valve	Replace gearbox
		Loose anchor bolts high range clutch diaphragm	Replace gearbox
		Oil level low, causing low oil pressure	Fill to correct level
		Oil filter choked, causing low oil pressure	Replace filter element
11	1-2 gear range and all lockup gear change points high	Defective front governor and/or front pitot tube	Replace gearbox
		Front governor circuit leakage	Replace gearbox
		Loose anchor bolts high range clutch diaphragm	Replace gearbox
		Oil level low, causing low oil pressure	Fill to correct level
		Oil filter choked, causing low oil pressure	Replace filter element

(continued)

TABLE 5 FAILURE DIAGNOSIS, GEARBOX GM-ALLISON TX200 (continued)

Ser (1)	Symptoms (2)	Probable Cause (3)	Action (4)
12	Erratic gear changes	Range selector linkage out of adjustment	Adjust linkage
		Throttle valve control linkage out of adjustment	Adjust control linkage
		Internal valves sticking	Replace gearbox
13	Down change to low misses 2nd gear	Defective front governor	Replace gearbox
		Defective splitter relay valve	Replace gearbox
		Drive changes manually at too low vehicle speed	Correct driving practice
14	Gear change misses 4th gear	Rear pitot tube loose	Tighten rear pitot tube mounting bolts
		Defective rear governor and/or pitot tube	Replace gearbox
		Defective rear pump	Replace gearbox
		Defective rear pitot splitter plug	Replace gearbox
15	Lockup clutch fails to engage	Defective front governor	Replace gearbox
		Defective lockup valve or cut-off valve	Replace gearbox
		Excessive internal leakage	Replace gearbox
		Leaking turbine shaft seals	Replace gearbox
		Clutch plate failure	Replace gearbox
16	Clutch slippage in all gears	Oil level low	Fill to correct level
		Oil filter choked, causing low clutch pressure	Replace oil filter element
		Throttle valve control linkage out of adjustment	Adjust control linkage
		Lockup clutch slipping	Replace gearbox
		Low clutch pressure	Replace gearbox if control linkage and filter element are satisfactory
17	Slippage in reverse gear lockup	Defective reverse clutch	Replace gearbox
		Leaking clutch piston seals	Replace gearbox
18	Slippage in 3rd and 4th gear lockup	Leaking clutch piston seals	Replace gearbox
		Defective intermediate range clutch	Replace gearbox
19	Slippage in 5th and 6th gear lockup	Leaking clutch piston seals	Replace gearbox
		Defective high range clutch	Replace gearbox
20	Slippage or chatter in 1st and 2nd gear lockup	Leaking clutch piston seals	Replace gearbox
		Defective low range clutch	Replace gearbox

(continued)

TABLE 5 FAILURE DIAGNOSIS, GEARBOX GM-ALLISON TX200 (continued)

Ser (1)	Symptoms (2)	Probable Cause (3)	Action (4)
21	Slippage or chatter in 1st, 3rd and 5th gear lockup	Leaking clutch piston seals Loose anchor bolts, high range clutch diaphragm Defective low splitter clutch	Replace gearbox
22	Slippage or chatter in 2nd, 4th and 6th gear lockup	Leaking clutch piston seals Loose anchor bolts, high range clutch diaphragm Defective high splitter clutch	Replace gearbox
23	Intermittent buzzing noise	Oil filter choked Oil level low Leaking oil transfer tubes or oil pan seals	Replace filter element Fill to correct level Replace gearbox
24	Oil leak at output shaft	Output flange seal or flange retaining bolt sealing ring leaking	Replace oil seal or sealing ring (see AESP 2350-T-250-522)
25	Oil leak at rear bearing retainer	Loose bearing retainer bolts Leaking bearing retainer gasket	Tighten down bolts evenly Replace gearbox
26	Oil thrown from gearbox filler tube	Dipstick loose Oil level too high Breather pipe blocked or disconnected Clutch failure	Secure or replace as necessary Drain to correct level Connect, clean or replace pipe Replace gearbox
27	Gearbox overheating in all ranges	Oil level low Oil level too high Defective temperature sending unit Power pack air flow restricted Defective engine cooling system Oil pipes to and from heat exchanger restricted or disconnected Oil cooler section of heat exchanger Incorrect driving practice Defective stators, torque convertor Defective ground sleeve bushing, torque convertor	Fill to correct level Drain to correct level Replace sending unit Clear restriction Check and rectify Connect, clean or replace pipes Clean or replace oil cooler section Do not slip transmission on incline Replace gearbox Replace gearbox

(continued)

TABLE 5 FAILURE DIAGNOSIS, GEARBOX GM-ALLISON TX200 (continued)

Ser (1)	Symptoms (2)	Probable Cause (3)	Action (4)
28	Dirty oil	Failure to change at specified interval	Change oil and replace oil filter element
		Oil filter element faulty	Change oil and replace oil filter element
		Clutch failure	Replace gearbox
		Gearbox overheating	See Ser 27
29	Vehicle will not tow start (also see Ser 1 and 3)	Defective engine	Check and rectify
		Defective transmission	Check, isolate and rectify
		Oil level low, gearbox	Fill to correct level
		Rear oil pump failure or clutch slippage	Replace gearbox
30	High stall speed-torque convertor	Oil level low	Fill to correct level
		Oil filter choke	Replace oil filter element
		Throttle valve control linkage out of adjustment	Adjust control linkage
		Low clutch pressure	Replace gearbox
		Low convertor pressure	Replace gearbox
		Failure or range clutches and low splitter clutch	Replace gearbox (check stall speed in each range)
31	Low stall speed-torque convertor	Engine not operating effectively	Check and rectify (may be attributed to high altitude)
		Incorrect functioning or convertor stators	

NOTES

(1) Ser 27. These faults can also result in excessive fuel consumption.

(2) Ser 30. Clutch slippage may be recognized by alternate racing and loading of the engine, which is at times accompanied by a violent chatter.

Steering unit

87 Table 6 lists the diagnosis information for the steering unit detailed in this sub-chapter.

TABLE 6 FAILURE DIAGNOSIS, STEERING UNIT

Ser (1)	Symptoms (2)	Probable cause (3)	Action (4)
1	Engine and gearbox operating effectively but vehicle fails to move with range selector in any position	Defective steering unit	Replace steering unit
		Defective half-shaft	Repair or replace shaft
		Defective final drive	Repair of replace final drive
		Broken or thrown track	Replace track

(continued)

TABLE 6 FAILURE DIAGNOSIS, STEERING UNIT

Ser (1)	Symptoms (2)	Probable cause (3)	Action (4)
2	Vehicle difficult to steer	Steering unit brake bands out of adjustment	Adjust brake bands
		Brake linings worn beyond adjustable limits	Replace brake bands and adjust
3	One or both steering brakes grab	Steering unit brake bands out of adjustment	Adjust brake bands
		Defective brake drum	Replace steering unit
4	Vehicle hard to stop or brakes fail to hold when applied	Steering unit brake bands out of adjustment	Adjust brake bands
		Brake linings worn beyond adjustable limits	Replace brake bands and adjust
5	Steering unit overheating	Oil level low	Fill to correct level
		External oil pipes restricted or leaking	Connect, clean, repair or replace pipes
		Oil cooler section of heat exchanger restricted	Clean or replace oil cooler section
		Steering unit brake bands binding or seized	Adjust or replace brake bands and check steering linkage
		Steering unit oil tank outlet blocked	Remove and clean outlet gauze strainer. Clean out tank, if necessary
		Oil pressure pump inoperative	Replace steering unit
6	Oil leaking from steering unit	Loose or broken oil pipes	Connect or repair pipes or replace as necessary
		Leaking oil tank	Repair or replace tank
		Defective output shaft oil seal	Replace seal
		Defective input shaft oil seal	Replace seal
		Defective base (sump) plate gasket	Replace gasket

CHAPTER 2-0

FINAL DRIVE, SUSPENSION AND TRACKS – LIST OF CHAPTERS

CONTENTS

LIST OF CHAPTERS

1 This chapter is further sub-divided as follows:

CHAPTER 2-1

FINAL DRIVE

CONTENTS

WORKSHOP SPECIAL TOOLS

1 Table 1 lists the special tools required to carry out the operations detailed in this sub chapter.

TABLE 1 WORKSHOP SPECIAL TOOLS

Ser (1)	NSN (2)	Designation (3)	FV No./Mfr No. (4)
1	9ACR/5120-99-867-5184	Assembly and extractor tool, sprocket hug	FV559631
2	9ACR/5120-99-867-5185	Adaptor	FV586277
3	9ACR/5120-99-802-2487	Assembly and extractor tool, sprocket hub	FV586607
4	9ACR/5120-99-866-9584	Removal tool final drive	FV485641
5	8RECP/5120-99-808-9465	Puller mechanical, No. 4 c/w 2 legs	140/8B7548
6	8RECP/5120-99-806-7470	Puller, attachment	140/8B7551
7	8RECP/5307-99-808-9469	Stud extension	140/8B7553
8	8RECP/5120-99-808-9464	Puller mechanical	140/8B7554
9	9ACR/5120-99-823-3286	Spanner, main drive shaft	FV650235
10	9ACR/5120-99-823-9296	Wrench main drive shaft	TBA

LOCALLY MANUFACTURED TOOLS

2 Table 2 lists the locally manufactured tools required to carry out the operations detailed in this sub chapter.

NOTE

Drawings may be demanded from LASS IPT, DLO Andover, Portway, Monxton Road, Andover, Hants, SP11 8HT.

TABLE 2 LOCALLY MANUFACTURED TOOLS

Ser (1)	Illustration No. (2)	Designation (3)
1	V 7022/6	Peg spanner, Strg unit & final drive driving flange
2	V 7023/1	Removal tool, gearbox output flange
3	V 7023/2	Extractor for gearbox output flange seal
4	V 7023/5	Gauge checking pin protrusion steering brake adjustment

ADHESIVES, SEALANTS AND LUBRICANTS

3 Table 3 lists the adhesives, sealants and lubricants required to carry out the operations detailed in this sub chapter.

TABLE 3 ADHESIVES, SEALANTS AND LUBRICANTS

Ser (1)	NSN/FV (2)	Mfr ID (3)	Description (4)
1	9150-99-220-2418	XG 279	Grease, automotive and artillery, 3 kg
2	8030-99-220-2370	Hylomar	Jointing compound, 10 g tube
3	9150-99-220-1477	OEP 220	Lubricating oil

FINAL DRIVE

4 Table 4 details the information for use during fault diagnosis of the final drive

TABLE 4 FAILURE DIAGNOSIS - FINAL DRIVE

Ser (1)	Symptoms (2)	Probable cause (3)	Action (4)
1	Final drive noisy or overheating	Defective final drive	Repair or replace final drive
2	Oil leaking from final drive	Defective input shaft oil seal	Replace seal
		Defective output shaft oil seal	Replace seal
3	Water in final drive	Defective output shaft oil seal	Replace seal

Preliminary operations

5 Position the vehicle on firm level ground. Apply the steering brake opposite to that from which the final drive is to be removed and secure with the parking control. Chock the road wheels to prevent movement of the vehicle and proceed as follows:

5.1 Drain oil from the final drive into a clean container (capacity of each unit is 4.3 litres (7.5 pt)). Refit the drain plug and joint washer after draining.

5.2 Remove the front track shield and forward section of the track guard. Slacken the track tension and break the track AESP 2350-T-251-201 refers. Pull the top run of track rearwards until clear of the sprocket. Keep the track in check to prevent running off or jamming.

5.3 When removing the LH final drive, open the steering unit access cover plate as follows:

5.3.1 Open the steering unit access plate by releasing the six quick-release bolts, turning the flat plates under the bolt heads to release the locking wedges on the underside of the access plate. Do not allow the access plate to swing under the hull and become trapped between the hull and the ground.

5.4 When removing the RH final drive, disconnect the control rod at the accelerator pedal, remove the driver's floor plate, disconnect the half-shaft cowling and then remove the cowling complete with the accelerator pedal.

Removing

6 To remove the final drive assembly proceed as follows:

6.1 Remove the locking wire, two bolts and locking plate securing the sprocket hub locknut. Using the wrench (Table 1, Ser 9), remove the sprocket hub locknut. Secure the two shims fitted between the hub and the taper roller bearing.

NOTES

(1) For final drives with serrated output shaft and sprocket hubs, use wrench main drive shaft (Table 1, Ser 10).

(2) Removal procedure is similar for either LH or RH unit.

6.2 Lightly centre punch the output shaft and sprocket hub to ensure correct reassembly of the mating splines when refitting the hub. Withdraw the sprocket hub from the output shaft, using the extractor tool. Sprocket hubs and extractor tools are identified as follows:

6.2.1 Splined hub without two withdrawal holes - use extractor tool (Table 1, Ser 1) and adaptor (Table 1, Ser 2).

6.2.2 Splined hub having two 1/2 in. UNC withdrawal holes at 117.5 mm (4.625 in.) pitch circle diameter - use extractor tool (Table 1, Ser 1). Splined output shafts are fitted to final drives.

6.2.3 Serrated hub having two 1/2 in UNC withdrawal holes - use extractor tool (Table 1, Ser 3). Serrated output shafts of increased diameter are fitted to final drive.

6.3 Disconnect the coupling ring securing the half-shaft to the final drive input shaft by knocking up the tab washers and removing the bolts and retaining plates securing the coupling, i.e. towards the centre and half shaft. Slide the coupling rings off driving gear towards the shaft centre. Secure the spring clip O- ring.

6.4 When removing the RH final drive, disconnect the speedometer drive from the adaptor located at the base of the rear casing of the final drive.

6.5 Slacken the bracket clamping bolt and remove the front shock absorber from the anchor plate brackets on the final drive casing. Swing the shock absorber clear and secure to an adjacent hull bracket.

6.6 Remove the outer plate of the shock absorber anchor plate bracket from the final drive casing by removing the bolts and levering away from the two locating dowels.

6.7 With the exception of the two bolts (which should be located above the horizontal centre line) remove the bolts securing the final drive to the hull side plate.

6.8 Assemble the final drive removal tool (Table 1, Ser 4) by bolting the plate bracket to the top of the final drive casing, using two bolts 7/16 in. UNC x 25 mm (1 in.) long. Insert the lifting tube through the hole in the plate bracket and guide the tube over the boss located on the hull side plate above the final drive. Secure the tube to the hull boss by means of the attached split pin and then support the end of the tube on a suitable wood block or a portable jib crane.

6.9 Remove the remaining two bolts. The removal tool and two locating dowels now support the assembly.

6.10 Using three jacking bolts 5/8 in. UNC x 57 mm (2.25 in.) long, jack the final drive away from the hull side plate, until the two locating dowels clear the hull plate.

WARNING

HEAVY WEIGHT. THE FINAL DRIVE WEIGHS 136.2 kg (300 lb). DUE CONSIDERATION MUST BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS WHEN MOVING THIS EQUIPMENT.

6.11 Slide the assembly carefully along the lifting tube until it reaches the retaining collar on the end of the tube. Lower the assembly to the ground and remove the lifting tool.

Dismantling

7 Support the final drive assembly on wood blocks with the input shaft uppermost and proceed as follows:

7.1 Remove the split pin, castellated nut and flat washer securing the driving flange to the input shaft. Hold the driving flange with peg spanner (Table 2, Ser 1) and remove the castellated nut with a 1 7/8 in. A/F socket spanner.

7.2 Withdraw the driving flange from the input shaft.

7.3 If the assembly is RH, remove the speedometer drive housing from the rear casing.

7.4 Remove the countersunk screws securing the rear casing to the main casing.

NOTE

Countersunk screws are secured by peening the flange over the screw heads.

7.5 Using three jacking bolts, 7/16 in. UNC, jack the rear casing away from the main casing. Drive out the two locating dowels, which are secured by peening the case flange over the dowel head.

7.6 Remove the rear casing from the main casing of the assembly, exposing the drive gears and their supporting bearings.

7.7 Tilt the input pinion away from the output shaft gear wheel and lift out the output shaft complete with gear wheels; lift out the input shaft.

7.8 Turn the rear and main casings over and remove the input and output oil seal housings; secure the shim fitted between the seal housings and the assembly casing.

NOTE

Taper roller bearings are adjusted by means of these shims to allow permitted end-float to their respective shafts.

Inspection

8 To inspect proceed as follows:

8.1 Inspect the roller bearings in accordance with T&M A 028 Chap 060.

8.2 Inspect all tapped holes for damaged threads and screw threads for distortion and damage. Check the casing dowels for correct fit.

8.3 Inspect the splines for distortion, damage and wear.

8.4 Inspect bearing housings for 'fretting' or slackness. If either the rear or main casings are damaged beyond local repair, the complete sub-assembly should be renewed to ensure a matched casing.

8.5 Check that the pressure relief valve is clear and not damaged.

8.6 Inspect the gear teeth for excessive wear, damage, pitting, flaking, cracking or scuffing. The pinion and wheel are not supplied in mated pairs and may be renewed individually.

8.7 Renew all oil seals. Inspect the seal facings on the sprocket hub sleeve and the input driving flange for scoring; renew if badly scored.

8.8 Inspect the sprocket rings for worn teeth.

8.9 Renew the joint washers at the speedometer drive housing or blanking plate, depending on whether the assembly is RH or LH.

8.10 Renew the filler and drain plug joint washers. Check the lubricating nipple on the sprocket hub and renew if necessary.

8.11 Inspect the bolts securing the driving gear to the output shaft flange for wear or looseness.

8.12 Remove the speedometer driving gear from the output shaft.

Renewing bearings

9 To renew the bearings proceed as follows:

9.1 Remove the speedometer driving gear from the output shaft. Using the puller complete with attachment (Table 1, Ser 5 and 6) draw off the taper roller bearings from the input and output shafts.

9.2 To remove the outer races of the roller bearings from the bearing housings in the rear and main casing, using the puller (Table 1, Ser 8), stud extension (Table 1, Ser 7) and puller (Table 1, Ser 5), withdraw the outer races from their housings.

9.3 The outer race of the input shaft inner roller bearing can be removed by unscrewing the two grub-screws from the main casing, and then jacking out the race, using two bolts, 5/16in. UNC x 45 mm (1 75 in) long.

9.4 Fit new roller bearings to the shafts, using a suitable press (if available) or a non-ferrous alloy tubular drift of correct diameter to bear against the inner race of bearing. Ensure that the bearings are pressed fully home against the shoulders on the shaft. First fit the outer bearings (large) and then the inner bearing to the output shaft.

NOTE

Before fitting the outer race of the input shaft inner bearing, fit the two grub-screws smeared with sealing compound (Table 3, Ser 2) to the main casing, but do not screw down or peen over until after the bearings have been adjusted for correct end float.

9.5 Fit the outer races to the bearing housings, using a suitable press or a non-ferrous alloy drift or hide hammer.

Renewing oil seals

10 Renew all oil seals. For detailed fitting instructions see AESP 2350-T-250-522, Chap 1-5.

Renewing gear wheel (output shaft)

11 To renew the gear wheel (output shaft) proceed as follows:

11.1 Open the locking portions of the fitted bolts from the slotted nuts.

11.2 Remove the slotted nuts and drive out the fitted bolts securing the gear wheel to the shaft flange. Remove the gear wheel (weight 14 kg (31 5 lb)).

11.3 When fitting a new gear wheel, renew all fitted bolts and nuts. Should the bolt holes in the shaft flange be worn, renew complete wheel and shaft assembly.

NOTE

Clearance between machined surfaces of the fitted bolt (LV9/ACR 5305-99-865-6338) and the bolt holes in the shaft flange and the wheel is 0.05 mm (0.002 in.) to 0.1 mm (0.004 in.) when new. Renew if worn beyond design limits.

11.4 Assemble the gear wheel to the shaft flange, draw the bolts fully home and ensure that the bolt heads abut against the locking ridge around the shaft flange. Ensure the chamfer is face down when fitting the gear wheel.

11.5 Tighten the slotted nuts to 217 Nm (160 lbf ft). Lock the nuts by peening the bolts into slots in two diametrically opposite positions.

End-float, input and output shafts

12 To adjust the end-float of the input and output shafts proceed as follows:

NOTES

(1) Correct end-float for both the input and output shafts is between 0.1 mm (0.004 in.) and 0.15 mm (0.006 in.).

(2) Shims are supplied in sizes 0.13 mm (0.005 in.) and 0.18 mm (0.007 in.) for the input shaft and in sizes 0.13 mm (0.005 in.), 0.18 mm (0.007 in.) and 0.51 mm (0.020 in.) for the output shaft.

12.1 To adjust the taper roller bearings for correct end-float of the input shaft, assemble the input shaft to the main casing and fit the rear casing to the main casing; tighten the three countersunk screws. Fit the oil seal housing to the casing assembly.

12.2 Use a dial test indicator (or locally manufactured tools detailed in Table 2, Ser 3,4 and 5) to check the input shaft end float. Fit shims between the oil seal housing and the casing to attain the correct end float. After adjusting for the correct end float, check that the bearings are free and not binding.

12.3 Remove the rear casing and input shaft, assemble the output shaft assembly; refit the rear casing and tighten the countersunk screws. Fit the output shaft oil seal housing.

12.4 To adjust the taper roller bearings for correct end-float of the output shaft, carry out instructions detailed in Sub-Para 12.1 to 12.3 but for 'input' read 'output'.

12.5 After completing the end-float adjustments, do not remove oil seal housings and shims from rear and main casings.

Backlash, driving gears

13 To adjust the backlash of the driving gears proceed as follows:

13.1 Assemble and mesh the input and output gears in the final drive main casing. Measure the amount of backlash between the gears, using a dial test indicator or feeler gauges.

13.2 Press down on the pinion shaft and hold it stationary, rock the wheel gently and record the amount of backlash. Check the backlash at several points around the wheel to obtain variation in the backlash. The backlash with new gears should be between 0.23 mm to 0.51 mm (0.009 in. to 0.020 in) if output gear (stamped FV500040 sheet 1) is fitted, and between 0.18 mm to 0.38 mm (0.007 in. to 0.015 in.) if output gear (stamped FV500040 sheet 2) is fitted. Variation in backlash should not exceed 0.05 mm (0.002 in.).

NOTE

These gears are interchangeable but note alteration to backlash dimensions.

Speedometer drive gears and shaft bushes

14 To replace the speedometer driving gear, remove the locking wire and bolts securing the gear to the inner end of the output shaft. Refit the new gear and wire lock the securing bolts.

15 To renew the two bushes in the housing of the speedometer driven gear, drive out the driven gear and shaft, then remove the bearing sleeve from the housing. Press out the old bushes and press in two new bushes. Assemble the driven gear and shaft to the housing; then press the sleeve onto shaft. Refit the adaptor with a new joint.

Assembling final drive

16 To assemble the final drive proceed as follows:

16.1 Clean off the old sealing compound from the joint faces of the rear and main casing. Support the main casing on wooden blocks.

16.2 Lightly oil the taper roller bearings and driving gears with clean oil (Table 3, Ser 3).

16.3 Assemble the input and output gears to the main casing. Smear the joint faces of both casings with sealing compound (Table 3, Ser 2), fit the rear casing to the main casing, tighten the countersunk screws and secure by peening the flange over the screw heads.

16.4 Ensure that the two dowels are secured to the main casing by peening the flange over the dowel heads.

16.5 Manufacture an indicator plate by brazing a short length of mild steel plate to the worm drive clip and fit the worm drive clip to the input shaft. Secure the output shaft and with a dial test indicator bearing against the indicator plate, recheck the backlash of driving gears (see Para 13). Recheck the input and output shaft end-float 0.1 mm to 0.15 mm (0.004 in. to 0.006 in.). Check that the driving gears rotate freely.

16.6 After the end-float has been rechecked, screw the two grub screws into the main casing until the screws lightly touch the outer race of the inner bearing on the input shaft. Peen over to secure the screws.

16.7 Ensure that the O-ring spring clip and retaining plates are fitted to the driving flange gear before fitting the driving flange to the input shaft.

16.8 Fit the driving flange to the input shaft, together with the flat washer and castellated nut. Tighten the nut to a torque of 271 Nm (200 lbf ft) and secure with a new split pin.

16.9 Fit the speedometer drive and housing to the rear casing of the RH unit, ensuring that a new joint is fitted. If assembling the LH unit, fit the blanking plate and a new joint.

16.10 Fit new washers to both the filler and drain plugs.

Refitting

17 Clean off the old sealing compound from the hull side plate and the final drive casing.

18 Assemble removal tool (Table 1, Ser 4), sling and lift the final drive to the required height for fitting to the hull.

19 Smear the joint faces of the hull plate and the final drive casing with sealing compound (Table 3, Ser 2).

20 Refitting the final drive assembly is the reverse of that for removing particularly noting the following points:

20.1 Inspect bolts and spring washers and replace any that are damaged or in anyway doubtful.

20.2 Ensure that the pressure relief valve is not damaged by the hull side plate when replacing the final drive.

20.3 Smear the bolts which secure the final drive to the hull and outer plate of shock absorber anchor bracket to the final drive casing with sealing compound (Table 3, Ser 2). Tighten these bolts to 190-203 Nm (140-150 lbf ft).

CAUTION

EQUIPMENT DAMAGE. If these shims are omitted, steering drift or damage to sprocket labyrinth will occur, due to misalignment of sprocket hub.

20.4 Ensure that the two shims No.12 and 18 SWG are fitted prior to refitting sprocket hub.

20.5 Refill the final drive with oil, AESP 2350-T-250-601 refers. Grease the sprocket hub labyrinth (Table 3, Ser 1).

20.6 Refit the track and adjust to the correct tension in accordance with AESP 2350-T-250-201.

CHAPTER 2-2

SUSPENSION AND TRACKS

CONTENTS

WORKSHOP SPECIAL TOOLS

1 Table 1 lists the workshop special tools required to carry out the operations detailed in this sub chapter.

TABLE 1 WORKSHOP SPECIAL TOOLS

Serial (1)	Part No. (2)	Designation (3)	FV No. (4)
1	9ACR/5120-99-986-7037	Tool, dismantling shock absorber	FV559632

NOTE

See AESP 2350-T-250-522, Chap 2-2 for additional list of special tools for suspension unit.

LOCALLY MANUFACTURED TOOLS

NOTE

Drawings may be demanded from LASS IPT, DLO Andover, Portway, Monxton Road, Andover, Hants, SP11 8HT.

2 Table 2 lists the locally manufactured tools required to carry out the operations detailed in this sub chapter.

TABLE 2 LOCALLY MANUFACTURED TOOLS

Serial (1)	Drawing No. (2)	Designation (3)
1	V6760/2	Guide, studs, track adjuster brackets
2	V6760/4	Tool supporting inner bush removal/insertion
3	V6760/5	Tool inserting outer bush and seal
4	V6760/6	Mandrel removal and inserting inner bush
5	V6760/7	Sleeve retaining inner bush insertion
6	V6760/8	Screw and nut assembly tool

ADHESIVES, SEALANTS AND LUBRICANTS

3 Table 3 lists the adhesives, sealants and lubricants required to carry out the operations detailed in this sub chapter.

TABLE 3 ADHESIVES, SEALANTS AND LUBRICANTS

Serial (1)	NSN/FV (2)	Mfr ID (3)	Description (4)
1	8030-99-224-9248	ZX 38	Antisieze compound, 100 g tube
2	8030-99-220-2370	Hylomar PL32M	Sealing compound
3	9150-99-220-2418	XG 279	Grease, automotive and artillery, 3 kg
4	8040-99-224-2588	Araldite AV100	Adhesive, 1 kg
5	8040-99-224-2665	Araldite HV100	Hardener, adhesive, 1 kg

SHOCK ABSORBERS

Removal and refitting

4 Removing and refitting shock absorber assemblies and 'Silentbloc' bushes are described in AESP 2350-T-250-522, Chap 2-2.

Dismantling

WARNING

PERSONNEL INJURY. THE SPRING FORCE WITHIN FRICTION TYPE SHOCK ABSORBER CAUSES THE SHOES TO EXERT CONSIDERABLE RADIAL PRESSURE. WHEN ASSEMBLY IS BEING DISMANTLED OR ASSEMBLED, SPECIAL TOOL FV559632 MUST BE USED. ANY ATTEMPT TO DISMANTLE BY OTHER MEANS MAY RESULT IN INJURY TO PERSONNEL, AS THE SHOES WILL TEND TO FLY OUTWARDS AS THEY CLEAR THE CYLINDER.

5 To dismantle shock a absorber assembly proceed as follows:

5.1 Grip the cylindrical end of the special tool (Table 1, Ser 1) in a vice between soft metal clamps. Support the opposite end of tool with a suitable wood block.

5.2 Turn the extractor nut anticlockwise and screw the fork end forward until the short pin is 3 mm (0.125 in.) approximately from the end slot. Remove both the long and short pins from the tool.

5.3 Check the position of the shoes (Fig 1 (5))within the shock absorber cylinder (1). If the edge of the shoes are not within 13 mm (0.5 in.) of the open end of the cylinder, proceed as follows:

WARNING

PERSONAL INJURY. DURING THIS OPERATION, SHOES MUST NOT PROTRUDE PAST OPEN END OF CYLINDER, AS TOOL RETAINING SLEEVE IS NOT BEING USED.

5.3.1 Assemble the shock absorber to the special tool, without the tool retaining sleeve. Fit the open end of the shock absorber cylinder into the recess in the tool. Anchor the top end of the shock absorber by screwing the long pin into the intermediate mounting hole, through the bush of the shock absorber.

5.3.2 Align the holes of the fork end with the lower bush of the shock absorber and insert the pin, turning through 90 deg after insertion, to lock the pin in the slot.

5.3.3 Turn the extractor nut clockwise and screw the fork end back to extract the shoe assembly until the edge of the shoes reach the open end of the shock absorber cylinder. Observe movement of the shoe assembly through the elongated slot in the tool.

5.3.4 Remove both the long and short pins and lift out shock absorber. Insert the short pin and turn the extractor nut anti-clockwise to screw the fork end forward until the short pin is 3 mm (0.125 in.) approximately from end of the slot. Remove the short pin from the tool.

5.4 Fit the retaining sleeve into the recess of the tool and fit the open end of the shock absorber cylinder into the recess of the retaining sleeve. Anchor the top end of shock absorber by screwing the long pin into the first mounting hole, through the bush of the shock absorber.

5.5 Align the holes of the fork end with the lower bush of the shock absorber and insert the short pin, turning through 90° after insertion, to lock the pin in the slot.

5.6 Turn the extractor nut clockwise and screw the fork end back to the limit of travel to extract the shoe assembly from the shock absorber cylinder, into the retaining sleeve of the tool. The cylinder will be free to move on the axis of the long pin when the shoes are completely inside the retaining sleeve.

5.7 Remove the long pin and shock absorber cylinder. The shoes are held in compression by the retaining sleeve and the spring tensioning nut (3) is now exposed.

NOTE

Later type shock absorbers have a larger diameter threaded portion of rod increased from 22 mm to 29 mm diameter (0.875 in. to 1 125 in.). The small recessed washer has been dispensed with and split pin replaced by a ring.

5.8 Remove split pin (2)and ring retaining (if fitted) from the tensioning nut and unscrew the nut, using a socket spanner, to relieve the spring tension. Remove the nut and slide the retaining sleeve away from the shoe assembly. Secure the shoe segments.

5.9 Remove the short pin from the tool and lift out the shock absorber rod complete with components. Remove the remaining components from rod (6), including the small recessed washer (4)(if fitted), the shoe actuators (10), the large flat washer (9), the compression spring (8) and the large recessed washer (7).

5.10 The shock absorber is now completely dismantled.

Inspection

6 Inspect the shock absorber assembly as follows:

6.1 Inspect interior of the cylinder for deep scoring and rusting.

6.2 Check the cylinder mounting eye weld for security.

6.3 Inspect the rod for signs of break-up at the shouldered portions, and for damage to the threaded portion.

6.4 Inspect the compression spring for signs of break-up or weakness. The free length of a new spring is 164 mm (6.45 in.) (spring rate 359 Nm (265 lbf ft.) + 8% or - 6%).

6.5 Inspect the friction linings of each shoe segment for wear or damage. The friction linings are bonded to the shoes and new lining thickness is 4.75 mm (0.187 in.). Replace all three shoe segments if one or more are unserviceable. Linings less than 2.4 mm (0.0935 in.) thick should not be refitted.

6.6 Inspect the spring tensioning nut for damaged threads.

6.7 Inspect the 'Silentbloc' bushes in each mounting eye for wear or damage. Inspect the mounting bolts for wear or damage. Bearing surfaces of the mounting bolts are chrome plated to a thickness of 0.008 mm to 0.018 mm (0.0003 in. to 0.0007 in.).

NOTE

Shoe actuators and contact faces of shoes are casehardened to a depth of 0.38 mm to 0.76 mm (0.015 in to 0.030 in.).

Assembling

7 To assemble the shock absorber proceed as follows:

7.1 Prior to assembling, smear the cone faces of the shoe actuators and of the friction shoes with grease (Table 3, Serial 1). Remaining components must be assembled clean and dry

7.2 Assemble the large recessed washer (Fig 1 (7)), compression spring (8), large flat washer (9), shoe actuators (10) and small recessed washer (4) if fitted, to the shock absorber rod in that order. Screw the tensioning nut on by two or three threads.

7.3 Assemble the friction shoes (5) around the shoe actuators (10) and fit the retaining sleeve of the special tool (Table 1, Ser 1) over the shoe assembly, the tensioning nut facing the recessed end of the sleeve.

7.4 Turn the extractor nut of the special tool clockwise and screw the fork end back to the limit of travel. Assemble the shoe assembly and retaining sleeve to the special tool. Align the holes of the fork end with the lower bush of shock absorber and insert the short pin, turning through 90 deg after insertion, to lock the pin in the slot.

7.5 With the friction shoes held in position by the tool retaining sleeve, preload the compression spring by screwing down the tensioning nut, until the measurement between the lower edge of the shoes and the flat face of the large recessed washer is 111 mm (4 375 in.) (see Fig 1). Measurement can be checked through the elongated slot in the tool, using inside callipers and a six-inch rule.

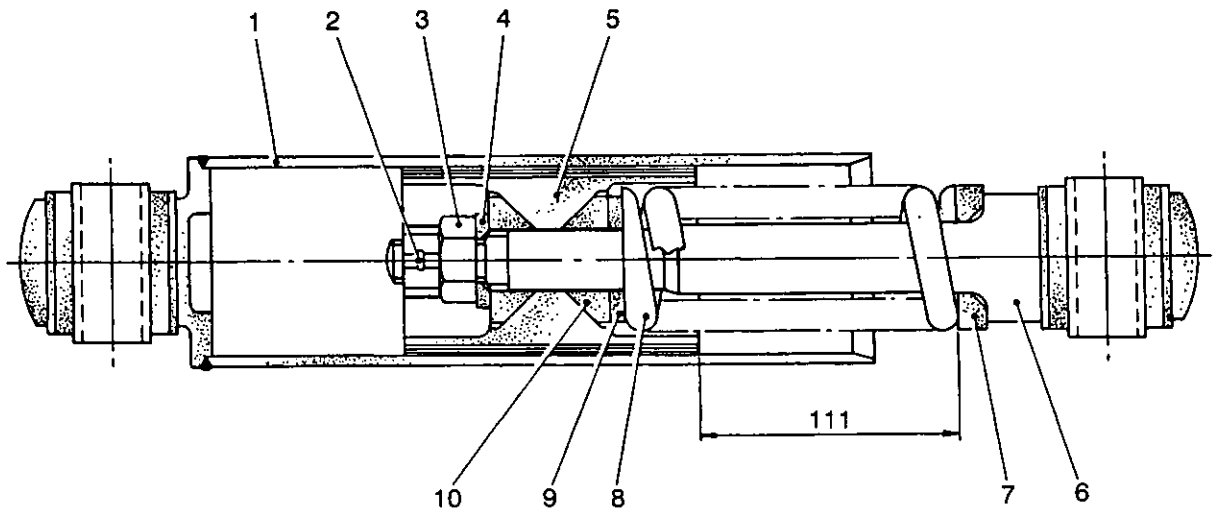
7.6 After correctly preloading the spring, fit a new split pin (2), turning over the ends to lock the nut securely, or secure with the ring retaining.

7.7 Fit the open end of the shock absorber cylinder into the recess of the retaining sleeve. Anchor the top end of the cylinder by screwing the long pin into the first mounting hole of the tool, through the bush of the shock absorber.

7.8 Turn the extractor nut of the tool counter clockwise and screw the fork end forward until the short pin is 3 mm (0.125 in.) approximately from the end of the slot. This will push the shoe assembly into the open cylinder of the shock absorber

7.9 Slacken extractor nut slightly and remove the long and short pins from the tool. Remove the shock absorber and retaining sleeve from the tool. Remove the retaining sleeve from the shock absorber.

7.10 The retaining sleeve will not be required for operations detailed in Para 8.



1	Cylinder	6	Rod
2	Split pin	7	Washer, recessed (large)
3	Tensioning nut	8	Compression spring
4	Washer, recessed (small)	9	Flat washer
5	Friction shoe segment	10	Actuator, friction shoe

Dimensions in mm

Fig 1 Arrangement of shock absorber

Adjusting mounting eye centres

8 To adjust the mounting eye centres proceed ass follows:

8.1 Turn extractor nut of the tool clockwise and screw the fork end back to the limit of travel. Assemble the shock absorber to the tool, without the retaining sleeve, fitting the open end of the cylinder into the recess of the tool. Anchor the top end of the shock absorber by screwing the long pin into the intermediate mounting hole, through the hole of the shock absorber.

8.2 Align the holes of the fork end with the lower bush of the shock absorber and insert the short pin, turning through 90 deg after insertion to lock the pin in the slot.

8.3 Turn the extractor nut anticlockwise and screw the fork end forward, pushing the shoes further into the cylinder of the shock absorber. Continue screwing the fork end forward until required distance of 450 mm (18 in.) approximately between the centres of the shock absorber mounting eyes is attained.

8.4 Slacken the extractor nut slightly and remove both mounting pins. Remove the shock absorber from the tool.

8.5 The shock absorber is now ready for fitting to the vehicle.

TRACK ADJUSTER, HYDRAULIC

Removing bracket assembly

9 Prior to removing the track adjuster bracket from the hull side plate, chock the road wheels; break the track and remove the tensioner wheels, securing the distance pieces fitted between the wheel disc. Remove the wheel hub, AESP 2350-T-250-522, Chap 2-2 refers.

10 Remove the split pin and nut from the idler arm retaining washer. Remove the retaining washer, complete with O-ring, secure the shims mounted beneath the washer.

11 Slide the idler arm away from end of the hydraulic ram and remove the idler arm from the pivot axle. Secure the inner O-ring on the pivot arm.

12 Remove the track adjuster bracket complete with hydraulic adjuster as follows:

12.1 Position a wooden block under the idler arm axle to support the weight of the track adjuster bracket when removing the bracket from the hull side plate.

12.2 With the exception of two bolts, unscrew and remove bolts securing the bracket to the hull.

NOTE

Four captive nuts and two tapped holes are fitted to the interior wall of the hull side plate.

12.3 Slacken the two remaining bolts. Break the seal binding the bracket to the hull side plate. Remove the bolts and lift the bracket away from the side plate, taking care not to damage adhesive facing and paper gasket.

13 To remove the hydraulic adjuster from the bracket, unscrew the two bolts securing the trunnion plate, remove the trunnion plate and lift the adjuster unit away from the bracket.

NOTE

Information on repairs to the hydraulic adjuster is in AESP 2350-T-250-522, Chap 2-2. A technical description is given in AESP 2350-T-250-302, Chap 4.

Refitting bracket assembly

14 Before refitting the track adjuster bracket to the hull side plate, check that the Araldite facing and paper gasket are not damaged and that the hull surface is flat.

15 Refit the track adjuster assembly as follows:

15.1 Smear the threads of the bracket mounting bolts with sealing compound (Table 3, Ser 2). Offer up the bracket to the hull side plate and fit the mounting bolts. Tighten the bolts down evenly, working diagonally across the face of the bracket.

15.2 If the hydraulic adjuster has been removed, refit the adjuster to the bracket, fit the trunnion plate and secure with two bolts.

15.3 Refit the idler arm to the pivot axle, renewing O-rings and smearing bearing surfaces with grease (Table 3, Ser 3). Fit the shims, retaining washer, nut and split pin, ensuring that there is 0.6mm (0.025 in.) clearance between the face of washer and the idler arm.

15.4 Assemble the wheel hub and track tensioner wheels as described in AESP 2350-T-250-522, Chap 2-2, ensure that distance pieces are fitted between the tensioner wheel discs. Rejoin the track and adjust the track tension 25 mm to 38 mm (1 in. to 1 5 in.) sag between guide rollers. Refit the track guard.

Joint facing

16 Joint facings between the track adjuster bracket and the hull are prepared with an adhesive base (Table 3, Ser 4) and hardener (Table 3, Ser 5) to form a smooth flat surface for mounting the brackets. A paper gasket is interposed between the adhesive (Table 3, Ser 4) and bracket to prevent adhesion of latter. Normally it should not be necessary to remove brackets unless they are damaged. If removal is necessary, see Para 9 to 13.

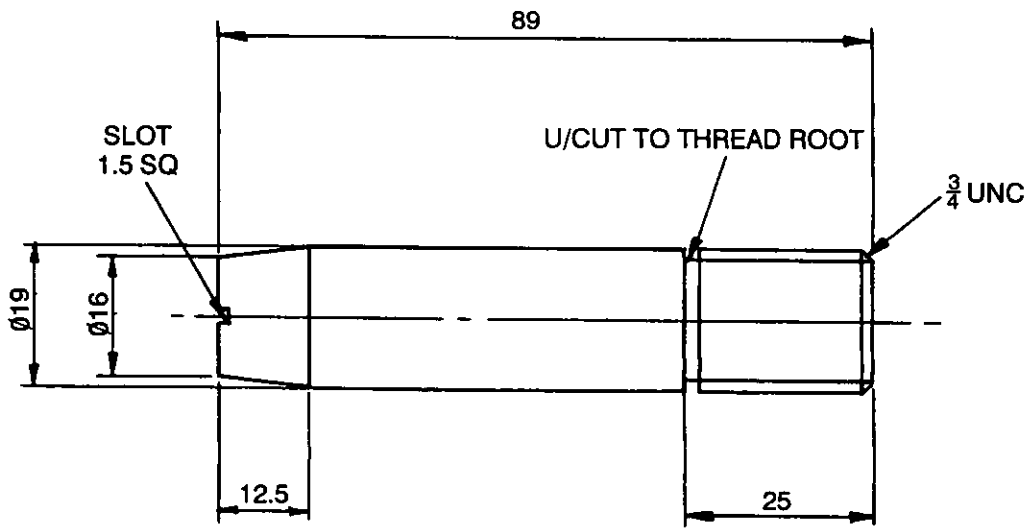
17 Where the joint has cracked or deteriorated, prepare a new facing as follows:

17.1 Remove the existing joint by chipping and use of wire brush. It is essential that surface is free from oil, grease and paint.

17.2 Locally manufacture twelve guide studs 3/4 in. dia UNC x 89 mm (3 5in.) long (taper off plain ends and cut screwdriver slots), see Fig 2.

17.3 Locally manufacture a pressure plate using a track adjuster bracket as pattern. Apart from drilling securing holes, do not remove any other metal from the pressure plate.

17.4 Manufacture a gasket to pattern from non-absorbent paper.



Tolerance ± 0.5 mm
Material - Steel bar 0.20 to BS970 Pt 1 070M 20 (G2/9510-99-964-7040)

Dimension in mm

Fig 2 Guide studs, track adjuster brackets

NOTE

Mixture remains usable for about one hour at normal room temperature 16 deg C (60 deg F).

17.5 Mix required quantity of adhesive and hardener (Table 3, Ser 4 and 5) in equal proportions.

WARNING

HEALTH AND SAFETY HAZARD. HARDENER SHOULD NOT BE ALLOWED TO TOUCH SKIN. PERSONNEL PREPARING THE MIXTURE MUST APPLY INDUSTRIAL PROPHYLACTIC OINTMENT TO HANDS AND WEAR RUBBER GLOVES. ANY TRACE OF HARDENER ON SKIN MUST BE REMOVED IMMEDIATELY WITH WARM SOAPY WATER.

17.6 It is essential to prevent the Araldite from entering bolt holes and coating internal threads. To achieve this, fit twelve guide studs to the mounting holes in the hull side plate.

NOTE

In an emergency, grease may be used in place of guide studs, ensuring that internal threads are liberally coated.

17.7 Apply an even layer of combined adhesive and hardener (Table 3, Ser 4 and 5) over the surface area of the hull, to a depth of 1.5 mm (0.0625in.) approximately.

17.8 Carefully fit the paper gasket over the guide studs and smooth it onto adhesive facing.

17.9 Offer up the pressure plate to the hull and guide it over the studs. Replace each stud, in turn, with a mounting bolt. Do not tighten bolts until they have all been fitted.

17.10 Carefully draw the pressure plate on to the adhesive facing, tightening the mounting bolts evenly until fully tightened. Trim surplus adhesive from the edges of the surface area.

17.11 Allow to set for 24 hours.

17.12 After the adhesive has set hard, remove the pressure plate, taking care not to damage the facing and paper gasket.

17.13 Refit the track adjuster assembly to the hull side plate, refer to Para 14 and 15.

TRACKS

Cleaning

18 Remove embedded stones, oil or grease from rubber pads. Remove stones, dirt and mud from tracks and suspension units. Do not allow the rubber pads and bushes to contact oil or cleaning solvents. Accumulation of stones and mud will reduce track effective length and increase tension, thereby reducing track life.

Inspection

NOTE

Specifications given in this paragraph are manufacturer's limits on new parts.

Rubber pads

19 Inspect the rubber pads for security, damage and wear. If badly damaged or when worn down sufficiently to allow link to contact ground, renew the pads. Check the securing bolt, nut and spring washer for wear or damage. If the securing bolt is loose, worn or damaged, renew the rubber pad. When fitting a rubber pad, ensure the securing nut is tightened to 95 Nm (70 lbf ft) dry.

Track pins

20 Check track pins for wear and bends. Track pins must be straight for full length, with 0.2 mm (0.008 in.) total indicator reading. Dimensions of a new pin, measured across the flats, should be 15.8mm to 15.9 mm (0.622 in. to 0.626 in.). Renew worn or broken circlips (if fitted), or check tightness of nuts (136 Nm (100 lbf ft) dry).

Track links

21 Inspect the track links for fractures, cracks and wear. If the guide horn is worn thin to point that breakage can occur in service, discard link and fit a new one. Inside dimension a new bush, measured across the flats should be 15.9 mm to 16 mm (0.626 in. to 0.631 in.).

21.1 If the bushes are worn, indicated by loose or twisted pins, fit a new link. The two leading bushes are fitted 10 deg off-set to the three trailing bushes and a special jig and fitting tool will be required to fit and correctly align the bushes. Re-bushing will only be undertaken if so directed by Senior REME officer where shortage of track replacements is experienced.

21.2 If track links are wearing more on one end of the link, change the tracks to opposite sides of the vehicle to extend service life.

22 If one track on the vehicle has completed its useful life, both tracks and sprocket rings must be replaced. Driving with new tracks on worn sprockets will shorten life of tracks. Driving with one old track and one new will throw vehicle out of balance and affect steering.

23 Tracks must be fitted so that spud face of each link is trailing as links pass over sprockets.

24 When new tracks are fitted, the rubber pads 'bed down'. It is necessary, therefore, that during first 80 km (50 miles) running of a new track or fitting a new pad, nuts securing the pads are checked frequently for tightness 95 Nm (70 lbf ft dry).

NOTE

A support washer, FV599537, is fitted under the track tread pad to improve pad support.

Track length adjustment

25 When tracks are new they are the same length. Thus the pitch of the links, or the distance between pin centres, is identical, but the rate of wear (stretch) in each track may be different. Consequently, the pitch of one track may gradually become greater than that of the other. If this occurs vehicle will no longer steer straight, but will tend to turn to side with shortest pitched track.

26 To compare the pitch of two tracks containing the same number of links, lay both tracks on ground and stretch taut. The longer track has longest pitch.

27 To prolong track life, the track can be balanced by breaking into sections, and changing over alternate sections, so that when joined up, each track is equal in length with same number of links and same average pitch.

28 Worn tracks containing the minimum (88) track links are to be sentenced BLR or BER in accordance with instructions detailed in AESP 2350-T-250-522, Chap 2-2.

AXLE ARM BRACKET

29 To assist vehicle maintenance, two pre-sized bearing bushes (in which the axle arm tube pivots) are fitted to each axle arm bracket. There is no need to machine bushes after fitting to the bracket.

29.1 Dimensions of the new bushes, axle arm bracket, are as follows:

29.1.1 Outer bush ID 85.88 to 85.93 mm (3.3810 to 3.3830 in.)
OD 90.48 to 90.50 mm (3.5620 to 3.5630 in.)

29.1.2 Inner bush ID 73.01 to 73.06 mm (2.8745 to 2.8765 in.)
OD 77.01 to 77.04 mm)3.0320 to 3.0330 in.)

29.2 Axle arm tube to bush clearances, when new, are as follows:

29.2.1 Tube to outer bush 0.08 to 0.15 mm (0.0030 to 0.0060 in.)

29.2.2 Tube to inner bush 0.09 to 0.17 mm (0.0035 to 0.0065 in.)

Removing bushes and seals

30 Slacken the track, remove the road wheels, wheel hub and axle arm, and torsion bar (see AESP 2350-T-251-522, Chap 2-2).

31 To gain access to the inner bush and seal, remove the inspection cover plate from the torsion bar housing, from within the hull. Various assemblies and components, with exception of RH plate of No. 3 torsion bar housing, conceal the inspection cover plates. Depending on which particular bushes and seals are being renewed, it will be necessary first to remove certain assemblies or components. Table 4 details those assemblies and components.

TABLE 4 ACCESS TO INNER BUSH AND SEAL

Ser (1)	Axle arm bracket (2)	Assembly/component to be removed (3)
1	No. 1 LH station	Power pack and oil tank of steering unit (see AESP 2350-T-251-522, Chap 1-1 and 1-5).
2	No. 1 RH station	Driver's seat, radio batteries and container, driver's floor plate, steering lever assembly (see AESP 2350-T-251-522, Chap 3)
3	No. 2 LH station	Power pack (see AESP 2350-T-251-522, Chap 3)
4	No. 2 RH station	Driver's seat, radio batteries and container
5	No. 3 LH station	Power pack (see AESP 2350-T-251-522, Chap 1-1)
6	No. 3 RH station	Commander's seat
7	No. 4 LH and RH stations	Ventilation system batteries and container, forward section of hull floor plate
8	No. 5 LH and RH stations	Rear section of hull floor plate

32 Remove the outer seal and bush.

33 Fit tool (Table 2, Ser 2) to mandrel (Table 2, Ser 4) and locate it in the outer bush housing. Locate the mandrel in the inner bush and drive the inner bush and seal inwards from the housing.

Fitting new bushes and seals

34 To fit new bushes and seals proceed as follows:

34.1 Remove any burrs or sharp edges from the bore of the axle arm bracket.

34.2 Assemble the inner bush using the mandrel (Table 2, Ser 4) in conjunction with the supporting tool (Table 2, Ser 2) and retaining sleeve (Table 2, Ser 5). Fit the supporting tool to the mandrel and locate in the outer bush housing. Fit the inner bush to the mandrel and retain using the sleeve. Align the mandrel complete with the bush and sleeve to the inner bush housing. Drift in the assembly until correctly located in the housing. Check that the lubricating holes are aligned and remove any sharp edges or burrs.

34.3 Using the screw and nut assembly (Table 2, Ser 6), install the inner seal from the inside of the vehicle.

34.4 Using tool (Table 2, Ser 6) assemble the outer bush. Fit the bush to the tool and drift in to correctly locate the bush in housing. Remove the tool and check for correct alignment of the lubricating holes and remove any sharp edges or burrs.

34.5 Fit the outer seal to the insertion tool and drift in the seal until correctly located in the housing.

NOTE

Inner and outer seals are fitted with lips facing outwards (back-to-back) to act as excluders. Ensure the seals are located squarely in the housings.

34.6 Smear the inside of bushes with grease (Table 3, Ser 3). Ensure that there are no nicks or burrs on the seal and bearing surfaces of the axle arm tube. Carefully dress any axle arm tube imperfections with a carborundum slip.

34.7 Refit the axle arm, torsion bar and wheel hub, check the torsion bar setting and the axle arm end-float AESP 2350-T-250-522, Chap 2-2 refers.

34.8 Refit the road wheels and adjust the track tension, noting that torque tightness of road wheel nuts must not exceed 163 Nm (120 lbf ft), use correct tools, see AESP 2350-T-250-522, Chap 2-2. Track tension is correct with 25mm to 38 mm (1 in. to 1 5 in.) sag midway between the guide idlers.

34.9 Refit the inspection cover plate to the torsion bar housing. Refit the assembly and/or components which were removed to uncover inspection plate, Para 31 refers.

34.10 Lubricate the axle arm bushes with grease (Table 3, Ser 3), AESP 2350-T-250-601 refers.

Repairs to bracket

35 When any work is carried out on the suspension system, welds securing brackets to hull must be inspected for cracks. If cracking is discovered, a repair is to be carried out in accordance with EMER Wksp 0 360, (Repair of armour plate).

TORSION BARS

CAUTION

EQUIPMENT DAMAGE. Do not use cleaning solvents to remove grease or dirt from torsion bars with the rubber/tape protection, as these will damage the covering.

36 After removing torsion bar AESP 2350-T-250-522 refers, examine the protective coating for damage.

37 The method of preserving bars has been changed on new bars from synthetic rubber, tape wrapped, to an epoxy resin in paint system, which gives a hard black gloss finish.

Renewing protective coating

38 Renew the protective coating as follows:

38.1 Clean off the old preservative and chemically clean bar.

NOTE

Minor damage to epoxy painted surfaces may be feathered down and patch painted.

38.2 Examine the surface for corrosion, particularly on the plain area of the bar. Renew the bar if corrosion is deeper than 0.4 mm (0.015 in.).

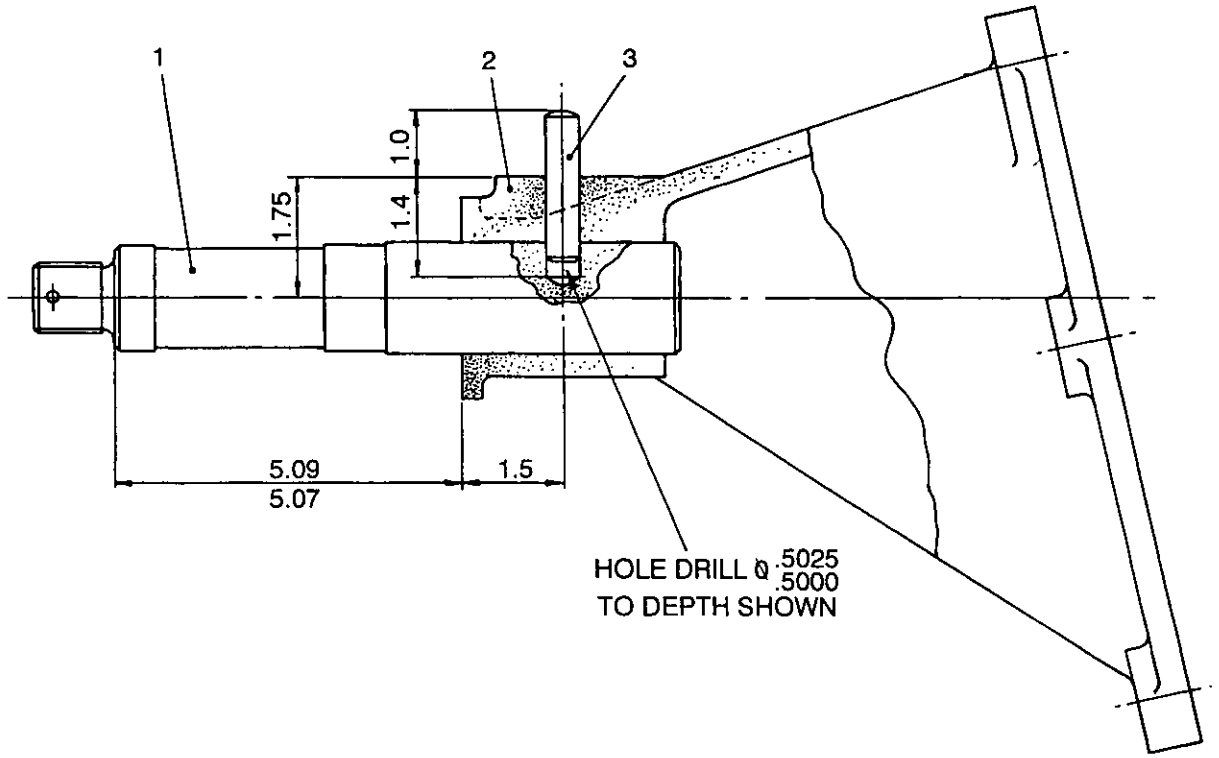
38.3 Paint the bar with epoxy type paint as detailed in AESP 0200-A-221-013.

GUIDE ROLLER BRACKET

Fitting stub axle to bracket

39 New stub axles (Fig 3 (1)) and brackets (2) are issued without holes for Mills pin (3). To drill the hole proceed as follows:

39.1 Press the stub axle into the bore of the bracket until the face of the axle shaft, at the outer bearing end, protrudes 128.8mm to 129.3 mm (5.07in to 5.09 in.) from the outer face of the bracket. Mark off 38 mm (1.5 in.) from the outer face of bracket and drill a 12.7 mm (1/2 in. (- 0.000 in. to + 0.0025in.)) hole to a depth of 6.4 mm (0.25 in.) through top of the bracket into the shaft. Fit a new Mills pin ensuring it is a drive fit and protrudes 25 mm (1 in.) above the top of the bracket.



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1 Stub axle
2 Mounting bracket
3 Mills pin

Dimension in inches

Fig 3 Stub axle and bracket assembly, guide roller

CHAPTER 3

HULL AND CONTROLS

CONTENTS

ADHESIVES, SEALANTS AND LUBRICANTS

1 Table 1 lists the adhesives, sealants and lubricants required to carry out the operations detailed in this sub chapter.

TABLE 1 ADHESIVES, SEALANTS AND LUBRICANTS

Ser (1)	NSN (2)	Mfr ID (3)	Description (4)
1	9150-99-220-2418	XG 279	Grease, automotive and artillery, 3 kg

GENERAL

2 It is important to maintain all hull sealing in a serviceable condition at all times. Efficient operation of the environmental control equipment and power pack cooling is dependent upon efficient sealing, see AESP 2350-T-250-522, Chap 3 for repairs to sealing.

Repairs to armour plate

3 Repairs and welding of armour plate is to be carried out in accordance with techniques and precautions detailed in EMER Wksp 0 360 Chap 9.

4 Replacing of studs, secured to the hull by welding techniques is to be carried out in accordance with EMER Wksp 0 360 Chap 4.

CONTROLS

General

5 The procedure for removing, refitting and adjusting the following controls is described in AESP 2350-T-250-522, Chap 3.

5.1 Gear range selector.

5.2 Engine and gearbox throttle controls.

5.3 Accelerator pedal and linkage.

5.4 Steering levers.

Steering and brake cross-shaft

Removing

6 The procedure to remove to the cross-shaft is as follows:

6.1 Remove the steering unit, Chap 1-5 refers.

6.2 Remove the steering unit oil tank, refer to AESP 2350-T-250-522, Chap 5 (ignore NOTE on power pack removal).

6.3 Remove the steering levers, refer to AESP 2350-T-250-522, Chap 3.

6.4 Remove the lubricating pipe to the LH bearing housing by disconnecting the pipe at the bearing housing and double adaptor then remove the metal clip securing the pipe to the hull front plate.

6.5 Disconnect the lubricating pipe at the RH bearing housing and remove the pipe.

6.6 Remove the clevis pins connecting the vertical control rods to the horizontal remote control levers and remove the control rods.

6.7 Remove the sealing plate and rubber gasket from the lower part of the longitudinal bulkhead, where the cross-shaft protrudes through the bulkhead.

6.8 Remove the nuts and bolts securing the LH and RH bearing housings to the hull mounting brackets. Lift the cross-shaft sufficiently to slide the bearing housings, complete with spherical bearings, from the cross-shaft spigots.

6.9 From within the driving compartment slacken and remove the clamping nut and bolt. Remove the RH remote control lever from the splined end of the cross-shaft. Mark the lever and shaft, prior to removing, to ensure correct positioning of lever on assembling.

6.10 Through the steering unit access aperture, grasp the cross-shaft and slide it under the support plate of the steering unit oil tank, towards the hull LH side plate.

6.11 From within the driving compartment, grasp the LH remote control lever, welded to the hollow shaft, and levering the shaft upwards, remove the shaft with levers through the aperture in the lower part of the longitudinal bulkhead. The short hollow shaft is now parted from cross-shaft.

6.12 Slide the cross-shaft towards the longitudinal bulkhead until it clears the support plate of the steering unit oil tank then slide the cross-shaft back over the oil tank support plate. Remove the cross-shaft through the steering unit access aperture.

Stripping and assembling

7 The procedure for stripping and assembling the cross-shaft is as follows:

7.1 Remove the spherical bearings from the bearing housings and the bushes from the hollow shaft of the remote control lever assembly.

7.2 All parts must be scrupulously clean before fitting new bearings and bushes.

7.3 Fit new spherical bearings using a suitable disc to enter them squarely in their housings. Ensure that the bearings are pressed home against the abutment shoulder so that the outer face of the bearing is flush with the outside face of the housing. There should be a diametrical clearance of 0.025mm to 0.051 mm (0.001in to 0.002 in.) between the bearings and the cross-shaft spigot.

7.4 Fit new bushes, ensuring that the outer edge of the bush is flush with the outside edge of the hollow shaft. There should be a diametrical clearance of 0.127mm to 0.203 mm (0.005in to 0.008 in.) between the bushes and the cross-shaft.

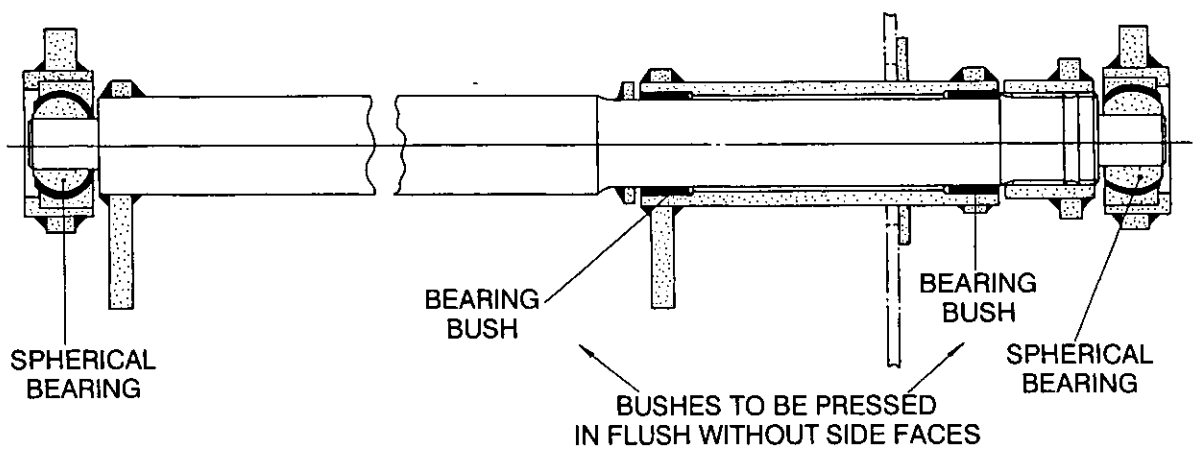


Fig 1 Arrangement of bearings and bushes for cross-shaft and remote control lever assembly

Refitting

8 The procedure to refit the cross-shaft, is as follows::

8.1 Prior to refitting the cross-shaft assembly, renew all unserviceable nuts, bolts, washers and split pins. Renew the rubber gasket if unserviceable. Check the lubricating pipes and nipples for serviceability and ensure that they are not blocked with hard grease. If fitting new remote control levers, ream out the holes to fit clevis pins.

8.2 Smear the bearing surfaces and splines of the cross-shaft with grease (Table 1, Ser 1).

8.3 Slide the splined end of the cross-shaft through the aperture in the lower part of the longitudinal bulkhead, until clear of the steering unit oil tank support plate. Slide the cross-shaft back towards the hull LH side plate and under the oil tank support plate.

8.4 Fit the sealing plate and rubber gasket over the remote control lever and hollow shaft assembly.

8.5 From within the driving compartment, insert the remote control lever and hollow shaft assembly through the aperture in the lower part of the longitudinal bulkhead and fit to the main cross-shaft.

8.6 Slide the cross-shaft assembly towards the longitudinal bulkhead until clear of the oil tank support and the assembly lies between the hull mounting brackets.

8.7 With the cross-shaft remote control levers set in the horizontal plane and the LH remote control lever to the splined end of the cross-shaft. Ensure that both vertical remote control levers are correctly aligned; this can be checked by inserting a 12.7 mm (0.5 in.) round bar x 76.2 mm (3 in.) long through the clevis pin holes in the levers.

8.8 Fit the clamping nut and bolt and tighten to secure the RH remote control lever to the cross-shaft.

8.9 Fit the RH bearing housing to the spigot of the cross-shaft; then fit the LH bearing housing to the spigot at the opposite end of the cross-shaft.

8.10 Insert the nuts and bolts and secure both bearing housings to the hull mounting brackets.

8.11 Fit the sealing plate and rubber gasket to the lower part of the longitudinal bulkhead.

8.12 Refit both vertical control rods to the horizontal remote control levers inserting clevis pins, washers and new split pins.

8.13 Connect the lubricating pipe to the RH bearing housing. Connect the lubricating pipe to the LH bearing housing and to the double adaptor; secure the pipe to the hull front plate with the metal clip.

8.14 Charge the bearings and bushes with grease (Table 1, Ser 1).

8.15 Replace the following assemblies:

8.15.1 The steering levers, AESP 2350-T-250-522, Chap 3 refers.

8.15.2 The steering unit oil tank, AESP 2350-T-250-522, Chap 1-5 refers.

8.15.3 The steering unit, Chap 5 refers.

8.16 Adjust the steering brake bands and control linkage in accordance with Para 15 to 17.

Accelerator linkage bearings

Removing and refitting

9 The procedure to remove and refit the accelerator linkage bearings is as follows:

9.1 the accelerator linkage cross-shaft is located under the driver's floor plate, between the radio battery and the base of steering levers; it is mounted on two spherical bearings, the bearings being located on the RH side of the hull and longitudinal bulkhead plate.

9.2 To renew the bearings, remove the driver's floor plate, disconnect the accelerator pedal linkage, remove the screws securing the bearing housings and lift out the cross-shaft and housing.

9.3 Press out the unserviceable bearings and press in new bearings. Refit the cross-shaft in reverse order to removing.

Steering brake controls

Adjusting

10 Adjust the steering brake controls as follows:

10.1 With the steering unit operating levers, in the 'OFF' position, the lower rods, between the cross-shaft levers and the steering levers should be adjusted to ensure that the steering levers are against the stop on the brackets.

NOTE

Angular movement of the steering unit operating levers from 'ON' to 'OFF' is 4 degrees (maximum movement 15 degrees) so that the operating levers in 'OFF' position are set at 64 degrees to the vertical.

10.2 Adjust the steering brake bands in accordance with AESP 2350-T-250-522, Chap 1-5.

10.3 Recheck the angle of the steering unit operating levers and if necessary, readjust the control rods.

Gearbox throttle valve actuator

11 The procedure for removing, refitting and adjusting the gearbox throttle valve actuator and linkage is described in AESP 2350-T-250-522, Chap 3.

Dismantling

12 The procedure to dismantle the gearbox throttle valve actuator is as follows:

12.1 Clamp the actuator valve assembly in a vice fitted with soft metal clamps.

12.2 Slacken the locknut, and unscrew the connecting link fork end from the lower piston rod. Remove the rubber boot.

12.3 Slacken the adaptor locknut and unscrew the adaptor from the valve body releasing the spring tension. Remove the lower piston and compression spring from the valve body. Shake out the 3 mm (0.25 in.) steel ball bearing from the orifice in the piston head.

12.4 Remove the six nuts, washers and bolts securing the valve head to the valve body and remove the valve head. Remove the upper piston and diaphragm from the valve body. Tap out the piston stop from the valve body.

12.5 To remove the diaphragm from the piston head, remove the centre bolt and clamping washer.

Replacing bushes

13 The procedure for replacing the bushes is as follows:

13.1 Bushes will only be replaced if they are worn or damaged, condemn if clearance of the piston head to the upper bush and piston rod to lower bush exceeds 0.25 mm (0.010in.).

13.2 Dimensions of the fitted bushes are as follows:

13.2.1	Upper bush	ID	17.50 mm (0.689in.)
		OD	19.89 mm (0.783in.)
13.2.2	Lower bush	ID	12.75 mm (0.502in.)
		OD	15.09 mm (0.594in.)

13.3 Locally manufacture stepped drifts to drive out and fit the bushes, refer to Para 13.2.1 and13.2.2 for dimensions.

13.4 Remove the upper bush from the valve body by driving it out towards the flanged end. Remove the lower bush from the threaded adaptor by driving it out, away from the threaded end.

13.5 Fit new bushes ensuring that they abut against the shallow shoulder in both the valve body and adaptor. Bushes are an interference fit and will be reamed out after fitting to give a clearance between the bush and piston of 0.076mm to 0.102 mm (0.003in to 0.004 in.).

Inspection

14 The procedure for inspecting the gearbox throttle valve actuator is as follows:

14.1 Inspect all threads for damage or stretch.

14.2 Inspect the plating on the pistons for deterioration and scoring; check the security of brazing.

14.3 Fit a new diaphragm, rubber boot and pipe union sealing washer.

14.4 Examine the bushes and replace only if worn or damaged, Para 13 refers.

14.5 Inspect the valve body and head for cracks, warping or damage.

14.6 Check the compression spring loading as follows:

14.6.1 Free length 141 mm (5.575 in.) (approx).

14.6.2 Load to compress to 4.2 mm (3/18 in.) 5.9 kg ± 180 g (13 lb ± 6 5oz).

14.6.3 Spring rate 0.6 Nm (5.31 lb in.).

Assembling

15 Clamp the valve body in a vice fitted with soft metal clamps and assemble in reverse order to dismantling, ensuring the following:

15.1 When fitting the diaphragm to the upper piston, ensure that the fabric side of the diaphragm is in contact with the piston. The diaphragm is secured between flanges of the valve body and head by semi-circular holes machined on the periphery of the diaphragm. When assembling, ensure the holes are located by through bolts and the diaphragm is secured correctly between the flanges.

15.2 Carry out the functional tests and adjust spring tension if necessary, sub-para 16 1 refers.

Functional tests

16 As well as carrying out these tests after overhauling the actuator valve, the tests can also be used to avoid unnecessary dismantling of the assembly.

16.1 Adjusting the spring tension. Adjust the spring tension as follows:

16.1.1 Connect the actuator valve assembly to an hydraulically operated hand pump having a 0-7 bar (0-100 lb sq in) pressure gauge in circuit. The feed pipe from the pump will be connected to the pipe union in the valve head.

16.1.2 Apply hydraulic pressure to the head of the upper piston and observe the pressure indicated on the gauge when the lower piston rod commences to move outwards from the bottom valve body. With the spring tension correctly adjusted, pressure must be 1.6 bar ± 137 mbar (23 ± 2 lb sq in.).

16.1.3 Continue applying hydraulic pressure and observe pressure indicated on the gauge when the lower piston stops moving outwards. A minimum pressure of 2 bar (29 lb sq in.) should be obtained.

16.1.4 Spring tension is adjusted by screwing the adaptor into the valve body until pressures quoted in sub-sub-para 16.1.2 and sub-sub-para 16.1.3 are obtained. When spring tension has been correctly adjusted, tighten adaptor locknut.

16.2 Diaphragm leakage. Apply hydraulic pressure to the head of the upper piston until 345 bar (50 lb/sq in.) is indicated on the gauge. If the pressure drop exceeds 345 mbar (5 lb/sq in) in one minute, the diaphragm must be replaced.

CHAPTER 4

VENTILATION SYSTEM

CONTENTS

INTRODUCTION

1. This chapter describes field repairs to those parts of the ventilation system, which are peculiar to Mk 2 and 2/1 vehicles.

SEALANTS, SOLVENTS AND LUBRICANTS

2 Table 1 lists the sealants, solvents and lubricants required to carry out the procedures described within this chapter.

TABLE 1 SEALANTS, SOLVENTS AND LUBRICANTS

Ser (1)	NSN/FV No. (2)	Designation (3)
1	H1/8030-99-220-2370	Sealing compound

SPECIAL TOOLS AND TEST EQUIPMENT

3 Table 2 lists the special tools and test equipment required to carry out the procedures described within this chapter.

TABLE 2 SPECIAL TOOLS AND TEST EQUIPMENT

Ser (1)	NSN/FV No. (2)	Designation (3)
1	Z4/6625-99-102-5387	500V Megohometer
2	Z4/6625-99-252-3606	Multimeter set, general purpose, hand held

GENERAL

CAUTION

EQUIPMENT DAMAGE. Semi-conducting devices and capacitors, having a comparatively low dc working voltage, are included in some of the assemblies. When carrying out insulation tests with a test set, megger, both ends of interconnecting harnesses or cables must be disconnected, and any semi-conducting device or capacitor, which is included in the circuit of an assembly, must be isolated.

4 The electrical system contains voltage sensitive elements (semi-conductors, diodes, and capacitors) and the following instructions must therefore be strictly observed when conducting megohmeter tests.

4.1 Assemblies. Capacitors and semi-conductors in an assembly circuit must be isolated before testing. Where a specified voltage megohmeter is detailed for a particular assembly, on no account must a higher voltage be used.

4.2 Harnesses. Both ends of inter-connecting harnesses must be disconnected.

Insulation resistance testing

5 The 'cold' insulation resistance of all assemblies, other than rotating machines, are not to be less than 5MΩ when measured with a 500V megohmmeter (subject to the conditions detailed in Para 4).

6 The 'cold' resistance of all rotating machines must be tested with a 500V megohmeter and are not to be less than 1MΩ when all windings are paralleled (subject to the conditions detailed in Para 4).

Electrical testing

7 Before commencing any of the electrical tests detailed in this chapter, carry out the following:

7.1 Inspect for mechanical damage.

7.2 Ensure that all connections are clean and tight.

7.3 On successful completion of electrical testing all electrical connections must be remade.

CAUTION

EQUIPMENT DAMAGE. If the ventilation batteries are disconnected or removed, the positive lead must be secured to the insulated terminal post located on the left hand hull wall adjacent to the batteries. This will avoid the danger of a short circuit occurring between the disconnected positive lead and earth should the engine be run.

8 All continuity and resistance tests should be with the systems made 'dead' by switching 'OFF' battery master switches. Multimeter set (Table 2, Ser 2), must be used for these tests and set to the resistance range, unless the megohmeter is specifically detailed for a test.

9 Where a test details a voltage measurement, the multimeter must be used and set to a suitable dc or ac voltage range, as appropriate.

Initial conditions

10 When carrying out failure diagnosis, the following initial conditions are assumed to be met:

10.1 All user maintenance, Level 2 fault finding has been successfully carried out.

10.2 No Circuit Breaker (CB) is tripped and all fuses are serviceable.

10.3 Diagnostic equipment is serviceable and correctly calibrated.

MK 2 VEHICLES

VENTILATION SYSTEM

11 Field repairs to the fan pressurizing unit No 1 Mk 1 are permitted only when test equipment is to hand or when a serviceable vehicle is available to test the repaired unit in the vehicle.

Fan pressurizing unit No 1 Mk 1

Dismantling

12 The procedure to dismantle a Fan pressurizing unit No 1 Mk 1 is as follows:

12.1 Remove the inlet mounting plate (Fig 1 (1)), inlet flare (2), and casing (3).

12.2 Remove the impeller securing nut (4), withdraw the impeller (5) and key (6).

12.3 Remove the spinner (7) and the motor mounting plate (8).

CAUTION

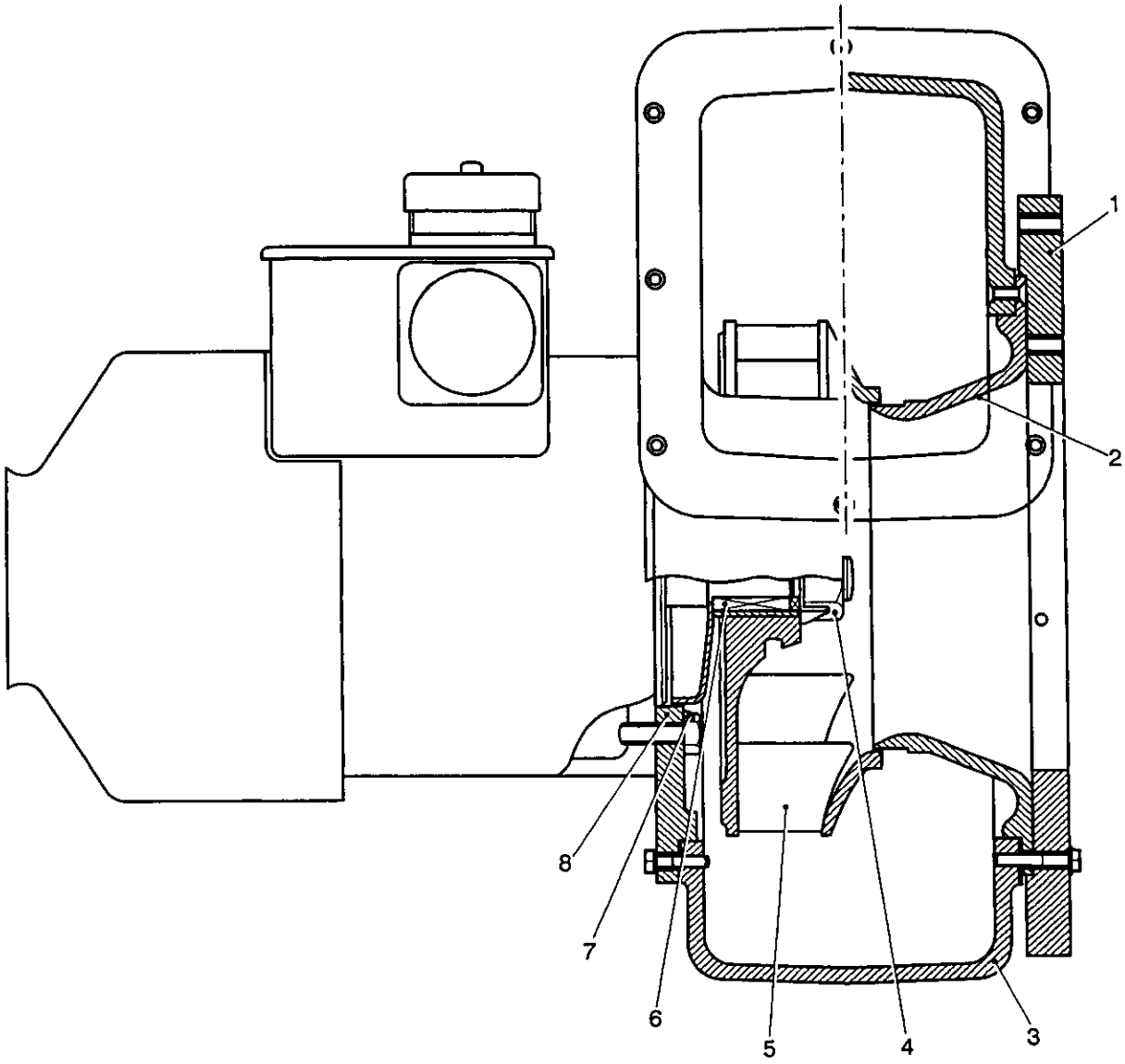
EQUIPMENT DAMAGE. The bearings in this motor are pre-packed and sealed. Any cleaning involving the use of solvents in which lubricants may be dissolved, must be avoided.

12.4 Remove the fan cover (Fig 2 (3)).

12.5 Remove the fan nut (1), with the lock washer (2), extract the fan (4) and spacer (19) then refit the nut to protect the armature shaft thread.

12.6 Remove the commutator cover pin, remove the fan cover mounting posts (15) and ease the commutator cover (5) clear of the CE bracket assembly (6).

12.7 For ease of correct reassembly, mark each brush to its brush holder. Remove the four brush springs and backplate assemblies (7). Disconnect the flexible leads and remove the brushes (16).



1	Inlet mounting plate	5	Impeller
2	Inlet flare	6	Key
3	Casing	7	Spinner
4	Impeller securing nut	8	Mounting plate

Fig 1 Fan sub-assembly

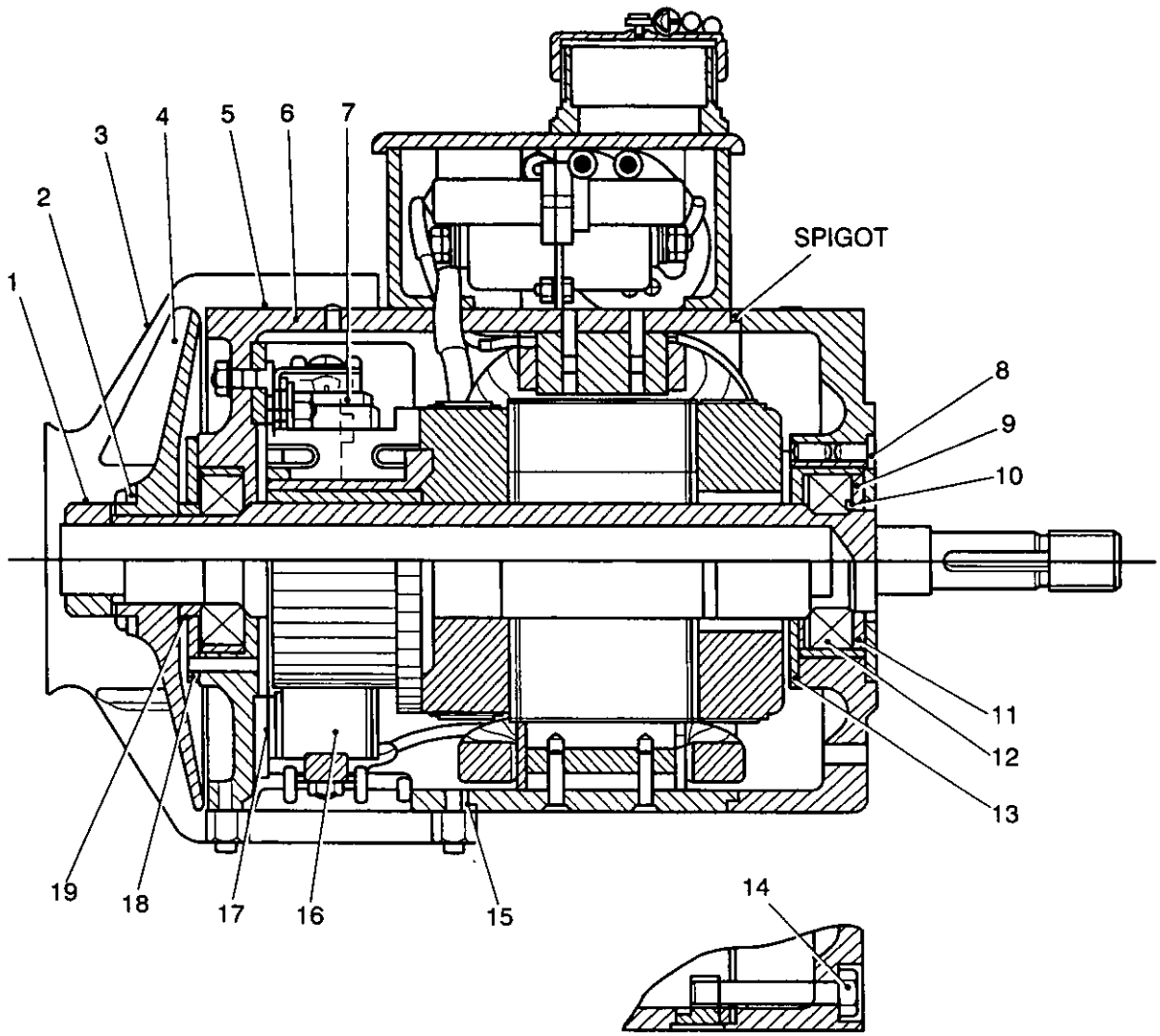
12.8 Remove the two stay bolt nuts (14) and washers, using a hide hammer, strike fan end of armature shaft (protected by fan nut) to free the armature and DE bracket from yoke.

NOTE

The fan nut must be temporarily removed to allow the shaft to clear the CE bearing.

12.9 Noting number of bearing shims (11) fitted, remove the outer DE bearing cap assembly (8), preloading spring (9) and bearing shims. Remove the circlip (10) and withdraw the armature from the DE bracket, ensuring that locating lip on periphery of bracket is not damaged. Remove the DE bearing cap (13) and withdraw the bearing (12).

12.10 Disconnect the four shield leads from the brush boxes and remove the CE bracket assembly. Remove the brush gear assembly (17) and the CE bearing cap (18), then withdraw the bearing from the bracket.



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1	Fan nut	11	Bearing shims
2	Lockwasher	12	Bearing (2 off)
3	Fan cover	13	DE bearing cap, inner
4	Fan	14	Stay bolt nuts (2 off)
5	Commutator cover	15	Fan cover mounting post (8 off)
6	CE bracket assembly	16	Brush (4 off)
7	Backplate assembly (4 off)	17	Brush gear assembly
8	DE bearing cap, outer	18	CE bearing cap
9	Preloading spring	19	Fan spacer
10	Circlip		

Fig 2 Motor sub-assembly

Testing with motor dismantled

13 With the motor dismantled and with reference to Fig 3, carry out the following tests:

13.1 Using the multimeter (Table 2, Ser 2) test the following:

13.1.1 Continuity of fields and armature.

13.1.2 Resistance of shunt field across leads B and G, which must be 6.8 ohms.

13.2 With the megohmmeter (Table 2, Ser 1) set to 100V, ensure that the resistance between live and earthed parts is not less than two megohms.

13.3 Measure the length of brushes (L) and renew those less than 0.250 in.

13.4 Using a suitable spring balance. Check the force exerted (P) by all the brush springs, this should be 625g (22oz) tension in each instance.

13.5 Ensure that the commutator is clean and has a minimum diameter (D) of 2.750 in, also that mica inserts are undercut (maximum depth 0.025 in.).

13.6 Ensure that the terminations of the armature windings are securely soldered to commutator risers.

13.7 Check the bearings in accordance with EMER T & M A028 Chap 060.

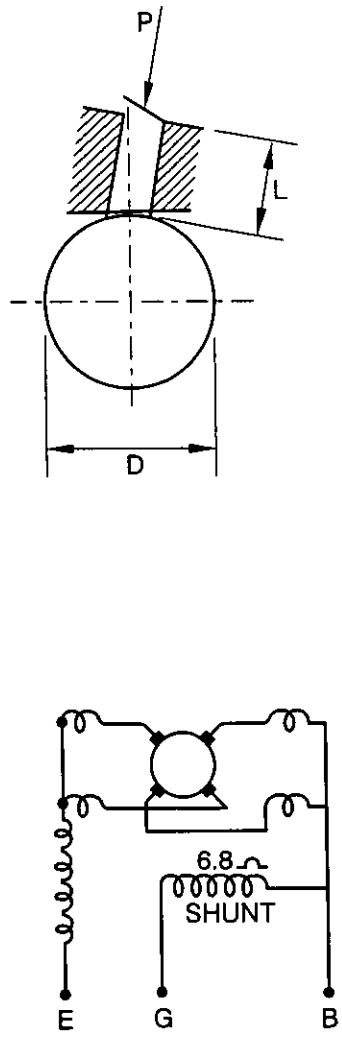

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Fig 3 Details of commutator brush and motor wiring diagram

Assembling

14 Assemble the fan pressurizing unit No 1 Mk1 in the reverse order to dismantling, ensuring the following:

14.1 The DE bracket must be located on the yoke with the armature assembly positioned before the DE bearing is fitted.

14.2 Carbon brushes must be fitted correctly to their respective holders.

14.3 Before securing the outer DE. bearing cap, the pre-loading spring must be tested by applying a load of between 3.6 and 4.6kg (8 and 10lb) to the cap. This should compress the spring so that the cap is flush with the DE bracket. Adjust as necessary by adding or removing shims behind the spring.

14.4 Fan sub-assembly. Mounting surfaces of casing and mounting surfaces of inlet flare and motor mounting plate must be coated with sealing compound (Table 1, Ser 1).

Terminal box sub-assembly removal and refitting

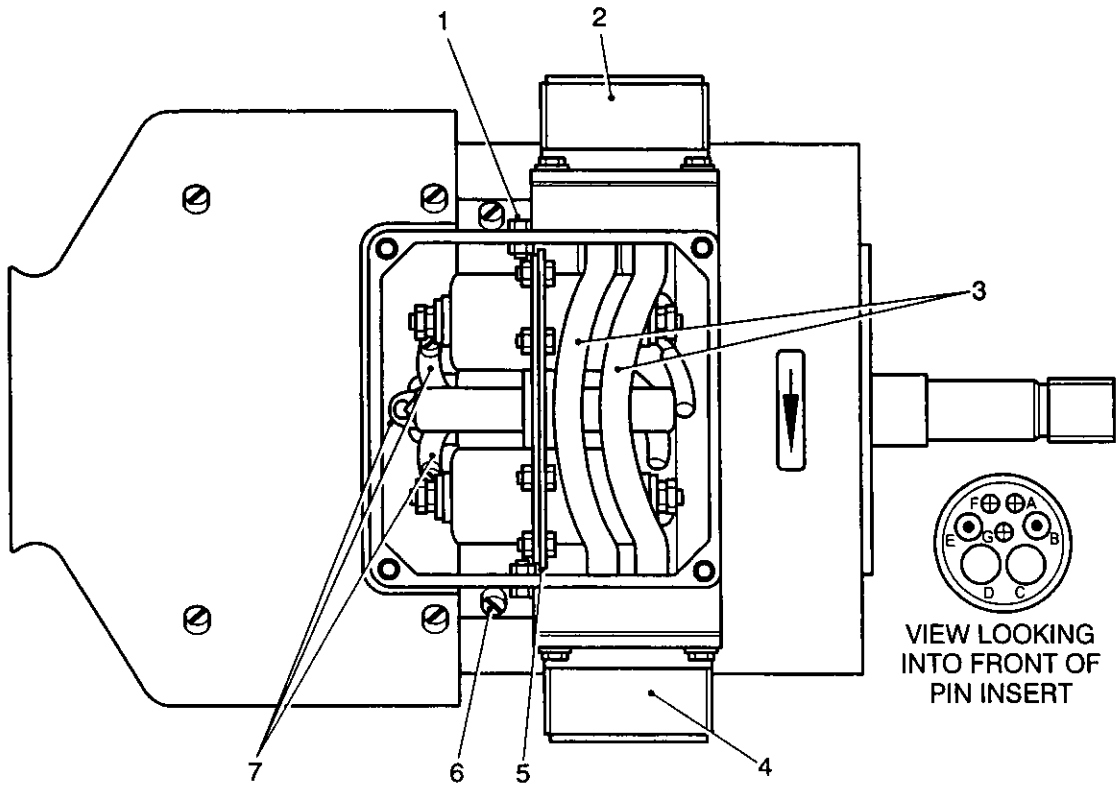
15 The procedure to remove a terminal box sub-assembly is as follows:

15.1 Remove the terminal box cover.

15.2 Disconnect the three leads (Fig 4 (7)) connecting the suppressors to the motor.

15.3 Unscrew the four screws (6) securing the terminal box to the yoke of the motor and remove the terminal box.

15.4 Refitting is the reverse of the procedure detailed for removal.



1	Suppressor mounting plate securing screws (4 off)	4	Plug
2	Socket	5	Suppressor mounting plate
3	Through leads (2 off)	6	Terminal box securing screws (4 off)
		7	Suppressor connecting leads (3 off)

Fig 4 Terminal box sub-assembly

Suppressor removal and refitting

16 The procedure to remove a suppressor is as follows:

16.1 Remove the terminal box cover.

16.2 Lift through the leads (Fig 4 (3)) and also, if fitted, the lead interconnecting pin F and insert F as far as possible, without disconnecting.

16.3 Remove the four screws (1) securing the suppressor mounting plate (5) and tilt to enable the suppressors to be disconnected or removed.

16.4 Refitting is the reverse of the procedure detailed for removal.

Testing of assembled fan unit

17 If a calibration duct is available, test as follows:

17.1 Mount the fan unit with the aid of V-blocks, on the platform of an electrical test bench and clamp down securely. Ensure that the fan unit is so positioned that the calibrating duct can be fitted to allow an unobstructed airflow.

17.2 Connect the flange of the calibration duct to the air outlet flange of the unit (Fig 5 refers). The four small outlet ports, situated on each side of the duct, 18 in. from the flange, must be sealed.

17.3 Ensure the 24V dc supply has sufficient capacity to complete the test (43 amps for 1 hour).

17.4 Connect motor to test circuit (Fig 6 refers) using a fan controller No1 Mk 2, as a variable resistor.

CAUTION

EQUIPMENT DAMAGE. Ensure that controller knob is set to position 1DC before closing single pole switch.

17.5 Rotate the fan controller knob to position 1DC and close the single pole switch (1). Slowly increase fan controller knob to position 4DC.

17.6 Continue the test for one hour and periodically check that current consumption is not more than 43 amps and using a suitable instrument for accurate speed measurement, check that the speed is not in excess of 7150 rev/min.

17.7 Immediately following this test, reduce the field resistance to minimum, which in the case of the fan controller is position 1DC. Current should now be 17 amps and speed not in excess of 4500 rev/min.

17.8 On completion of the test stop the motor by switching the single pole switch to 'OFF' whilst the fan controller switch is at position 1DC.

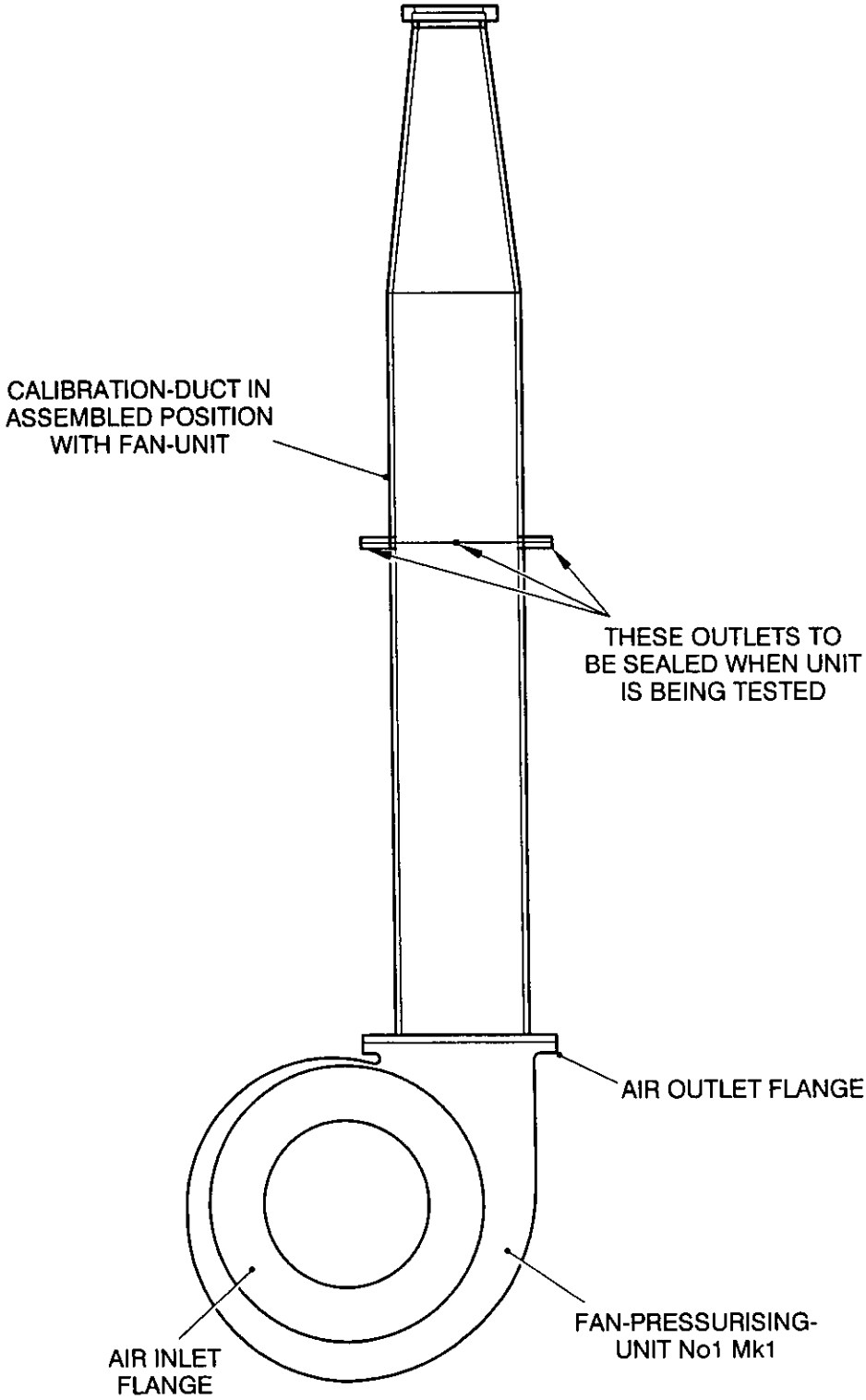
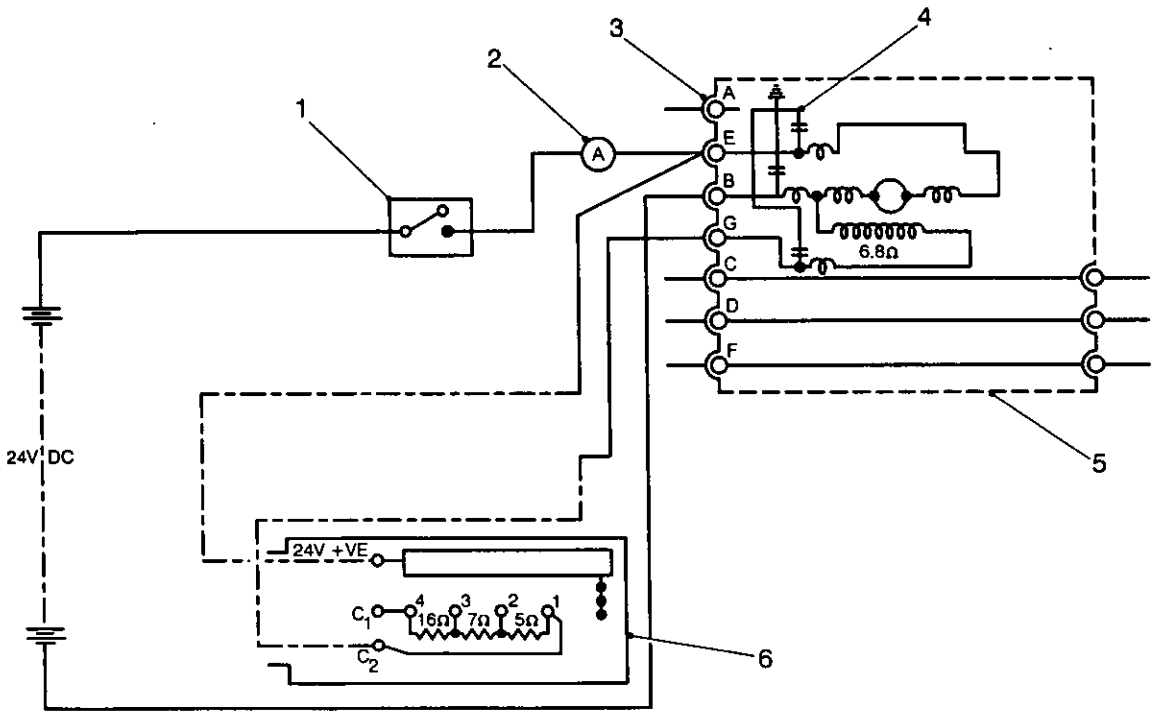


Fig 5 Assembly of the unit calibration duct with the fan pressurizing unit



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1	Single pole switch	4	Suppression circuit
2	Ammeter	5	Fan motor
3	Connector socket	6	Fan controller No 1 Mk 2

Fig 6 Test circuit, fan unit

18 If a calibration duct is not available, test as follows:

18.1 Fit fan unit to a serviceable vehicle, AESP 2350-T-251-522 Chap 4 refers.

18.2 Fit a new paper filter element to filter unit.

18.3 Close all doors, hatches, etc.

18.4 Start the vehicle engine and adjust its speed sufficiently high for a charging rate to be indicated on the front generator ammeter.

NOTE

If the ventilating batteries are well charged it is not essential to run the engine for the duration of the test.

18.5 Switch the fan switch located in the accessories control box to ON. This box is situated on the roof of the vehicle to the right of the driver's position.

18.6 Set the fan controller to position 4DC and run the motor for one hour with controller at this position. Note that the pressure relief valve, situated in the roof of the vehicle, operates when the pressure inside the vehicle, as indicated by the positive scale of the clock gauge, reaches 3in. standard water gauge.

18.7 On completion of this test run, return controller to 'OFF' open fan switch and stop engine, if running.

19 On completion of the test detailed in Para 15 and 16, with the motor still hot and disconnected from the supply, carry out an insulation test using megohmeter (Table 2, Ser 1) set to 100V in the following manner:

19.1 Pin B of motor plug to earth.

19.2 Pin E of motor plug to earth.

19.3 Pin G of motor plug to earth.

19.4 If a reading of less than 1 megohm is noted, renew the motor.

Testing complete ventilation system (7 in. fan)

20 The procedure to test the complete ventilation system is as follows:

CAUTION

EQUIPMENT DAMAGE. Fan unit of ventilation and NBC system must NOT be run unless the paper element has been fitted to the filter unit, otherwise dust particles in the incoming air can erode fan blades and reduce the efficiency of the equipment.

20.1 Note type of filter elements fitted in filter compartment (filter particulate FV 616497 or FV594639, filter anti-vapour FV594540 or substitute filter, anti-vapour FV482426).

CAUTION

EQUIPMENT DAMAGE. All sealing throughout vehicle MUST be maintained in a serviceable condition at all times, this is important, as efficient operation of NBC equipment depends on good and sound sealing of the vehicle. Hull sealing should be inspected at frequent intervals.

20.2 Check that all hatch and door seals are serviceable, replace as necessary.

20.3 With the vehicle completely equipped but un-pressurized, zero the pressure/suction gauge by removing plug from face of gauge to allow access to zeroing screw.

20.4 Close all hatches and doors and check that the commander's cupola is clamped in the non-rotating position.

20.5 Start the engine and set to run at 750 to 1000 rev min.

20.6 Start the fan, vehicle pressurizing FV481818 and allow to run for a minimum warm-up period of 15 minutes.

20.7 During this period, ensure that all the ball diffusers, are turned to the JET position and are located centrally in their housings.

20.8 Ensure that a minimum of 28V dc is available at the ventilation battery terminals. If necessary, adjust engine speed.

20.9 If adjustment of engine speed within the specified range fails to produce 28Vdc at the battery terminals, proceed as follows:

20.9.1 Carry out controlled dc voltage check, AESP 2350-T-250-522 refers.

20.9.2 Adjust control panel as required, AESP 2350-T-250-522 refers.

20.10 Ensure that the valve, vehicle pressure relief, is free by operating with the fingers.

20.11 Table 3 details figures of vehicle pressure at the four fan speeds are to be regarded as the minimum.

TABLE 3 VEHICLE AIR PRESSURE 7 INCH FAN, MK 2 VEHICLE

Fan speed controller position	Vehicle pressure indicator on gauge pressure/suction	
	With filter, anti-vapour FV594540 in. water gauge	With substitute filter, anti-vapour FV482426 in. water gauge
1	2.2	2.8
2	3.0	3.3
3	3.3	3.6
4	3.6	4.2

21 If test in Para 20 is unsatisfactory, the following points should be checked:

21.1 Door, hatch or bulkhead seals insufficiently compressed.

21.2 Re-inspect all door, hatch or bulkhead seals for damage.

21.3 Incorrectly adjusted valve, vehicle pressure relief, AESP 2350-T-250-522 Chap 4 refers.

21.4 Damaged valve, vehicle pressure relief.

21.5 Insufficient voltage.

21.6 Unacceptable restrictions to air flow in ventilation system.

21.7 Inadequate performance of fan pressurizing unit.

21.8 Incorrect resistance in fan controller No. 1 Mk 2.

MK 2/1 VEHICLES

VENTILATION CONTROL SYSTEM

22 Fan units fitted to vehicle may be either:

22.1 Fan, pressurizing No. 1 Mk 2 (7 in.) FV564270 used with controller fan, No. 1, Mk 2.

22.2 Fan, pressurizing No. 4 Mk 1 (5.1 in.) FV482416 used with controller fan, No. 2, Mk 1.

22.3 Refer to Para 1 for details of dismantling and reassembly

23 Both fans are used with an internal type filter box.

Testing complete ventilation system (7 in. Fan)

24 The procedure to test the complete ventilation system is as follows;

24.1 Proceed as detailed in Sub-Para 20.1 to 20.5 inclusive.

24.2 Start the pressurizing fan No 1 Mk 2 FV564270 and allow to run for a minimum warm up period of 15 minutes.

24.3 Continue as detailed in Sub-Para 20.6 to 20.10 inclusive.

24.4 Table 4 details figures of vehicle pressure at the four fan speeds are to be regarded the minimum.

TABLE 4 VEHICLE AIR PRESSURE 7 INCH FAN, MK 2/1 VEHICLE

Fan speed controller position	Vehicle pressure indicator on gauge pressure/suction	
	With filter, anti-vapour FV481851 in. water gauge	With substitute filter, anti-vapour FV481939 in. water gauge
1	2.2	2.8
2	3.0	3.3
3	3.3	3.6
4	3.6	4.2

25 If test in Para 24 is unsatisfactory, proceed as detailed in Para 21.

Testing complete ventilation system (5.1 in. fan)

26 The procedure to test the complete ventilation system is as follows;

26.1 Note type of filter elements fitted in filter compartment.

26.2 Proceed as detailed in Sub-Para 20.2 to 20.5 inclusive.

26.3 Start the pressurizing fan No 4 Mk 1 FV482416 and allow to run to a minimum warm up period of 15 minutes.

26.4 Continue as detailed in Sub-Para 20.6 to 20.10 inclusive.

26.5 Table 5 details figures of vehicle pressure at the six fan speeds are to be regarded as the minimum.

TABLE 5 VEHICLE AIR PRESSURE 5.1 INCH FAN, MK 2/1 VEHICLE

Controller fan, No. 2 Mk 1 speed position	Vehicle pressure indicator on gauge pressure/suction FV481819	
	With filter, anti-vapour FV594540 in. water gauge	With substitute filter, anti-vapour FV482426 in. water gauge
MIN	2.1	3.4
2	3.1	3.4
4	3.2	3.5
5(H)	3.3	3.6
8	3.5	3.9
MAX	3.6	4.2

27 If test in Para 26 is unsatisfactory, proceed as detailed in Para 21.

CHAPTER 5

ELECTRICAL SYSTEM

CONTENTS

INTRODUCTION

1 This chapter describes field repairs to those parts of the electrical system, which are peculiar to Mk 2 and 2/1 vehicles. Field repairs to common assemblies listed below are described in the relevant EMER.

1	Pump fuel pressurizing, No. 2, Mk 1	Pwr P 424/1
2	Starter, No. 3, Mk 1 and 2	Pwr P 324/11
3	Rectifier unit, No. 1, Mk 1	Pwr P 124/2
4	Firewire control box, No. 1, Mk 1	Pwr P 454/4
5	Distribution panel, No. 6, Mk 1	Pwr P 154/11

SEALANTS, SOLVENTS AND LUBRICANTS

2 Table 1 lists the sealants, solvents and lubricants required to carry out the procedures described within this chapter.

TABLE 1 SEALANTS, SOLVENTS AND LUBRICANTS

Ser (1)	NSN/FV No. (2)	Designation (3)
1	6850-99-535-7277	Silicon grease

SPECIAL TOOLS AND TEST EQUIPMENT

3 Table 2 lists the special tools and test equipment required to carry out the procedures described within this chapter.

TABLE 2 SPECIAL TOOLS AND TEST EQUIPMENT

Ser (1)	NSN/FV No. (2)	Designation (3)
1	6625-99-102-5387	500V Megohmmeter
2	6625-99-252-3606	Multimeter set, general purpose, hand held
3	4440-99-966-7873	Dehumidifier, desiccant, electric

GENERAL

CAUTION

EQUIPMENT DAMAGE. Semi-conducting devices and capacitors, having a comparatively low dc working voltage, are included in some of the assemblies. When carrying out insulation tests with a test set, megger, both ends of interconnecting harnesses or cables must be disconnected, and any semi-conducting device or capacitor, which is included in the circuit of an assembly, must be isolated.

4 The electrical system contains voltage sensitive elements (semi-conductors, diodes, and capacitors) and the following instructions must therefore be strictly observed when conducting megohmmeter tests.

4.1 Assemblies. Capacitors and semi-conductors in an assembly circuit must be isolated before testing. Where a specified voltage megohmeter is detailed for a particular assembly, on no account must a higher voltage be used.

4.2 Harnesses. Both ends of inter-connecting harnesses must be disconnected.

Insulation resistance testing

5 The 'cold' insulation resistance of all assemblies, other than rotating machines, are not to be less than 5MΩ when measured with a 500V megohmmeter (subject to the conditions detailed in Para 4).

6 The 'cold' resistance of all rotating machines must be tested with a 500V megohmeter and are not to be less than 1MΩ when all windings are paralleled (subject to the conditions detailed in Para 4).

Electrical testing

7 Before commencing any of the electrical tests detailed in this chapter, carry out the following:

7.1 Inspect for mechanical damage.

7.2 Ensure that all connections are clean and tight.

7.3 On successful completion of electrical testing all electrical connections must be remade.

8 All continuity and resistance tests should be with the systems made 'dead' by switching 'OFF' battery master switches. Multimeter set (Table 2, Ser 2), must be used for these tests and set to the resistance range, unless the megohmeter is specifically detailed for a test.

9 Where a test details a voltage measurement, the multimeter must be used and set to a suitable dc or ac voltage range, as appropriate.

Initial conditions

10 When carrying out failure diagnosis, the following initial conditions are assumed to be met:

10.1 All user maintenance and fault finding has been successfully carried out.

10.2 No Circuit Breaker (CB) is tripped and all fuses are serviceable

10.3 Diagnostic equipment is serviceable and correctly calibrated.

RADIO DISTRIBUTION BOX NO. 1 MK 3

Dismantling

11 The procedure to dismantle a radio distribution box No. 1 Mk 3 (Fig 1) is as follows:

11.1 Open the top cover panel and move to full extent of securing straps for maximum access.

11.2 Disconnect cables MR, SW, RI, 9B and 6D at the terminal block, mounted on the relay mountings:

11.3 Disconnect the heavy blue cable 6A from its connection on top of the relay.

11.4 Disconnect and remove the busbar fitted between switch S1 and the top of relay.

11.5 Disconnect and remove the heavy blue cable, switch S1 to fuse connection.

11.6 Remove the cable from the fuse connection to the base of the terminal block.

11.7 Note the position for correct reassembly, then disconnect and remove the busbar RDP 1 to switch S1

11.8 Disconnect the busbar at RDP 7. Release the connection at switch S1. Move busbar to clear RDP 7 during removal.

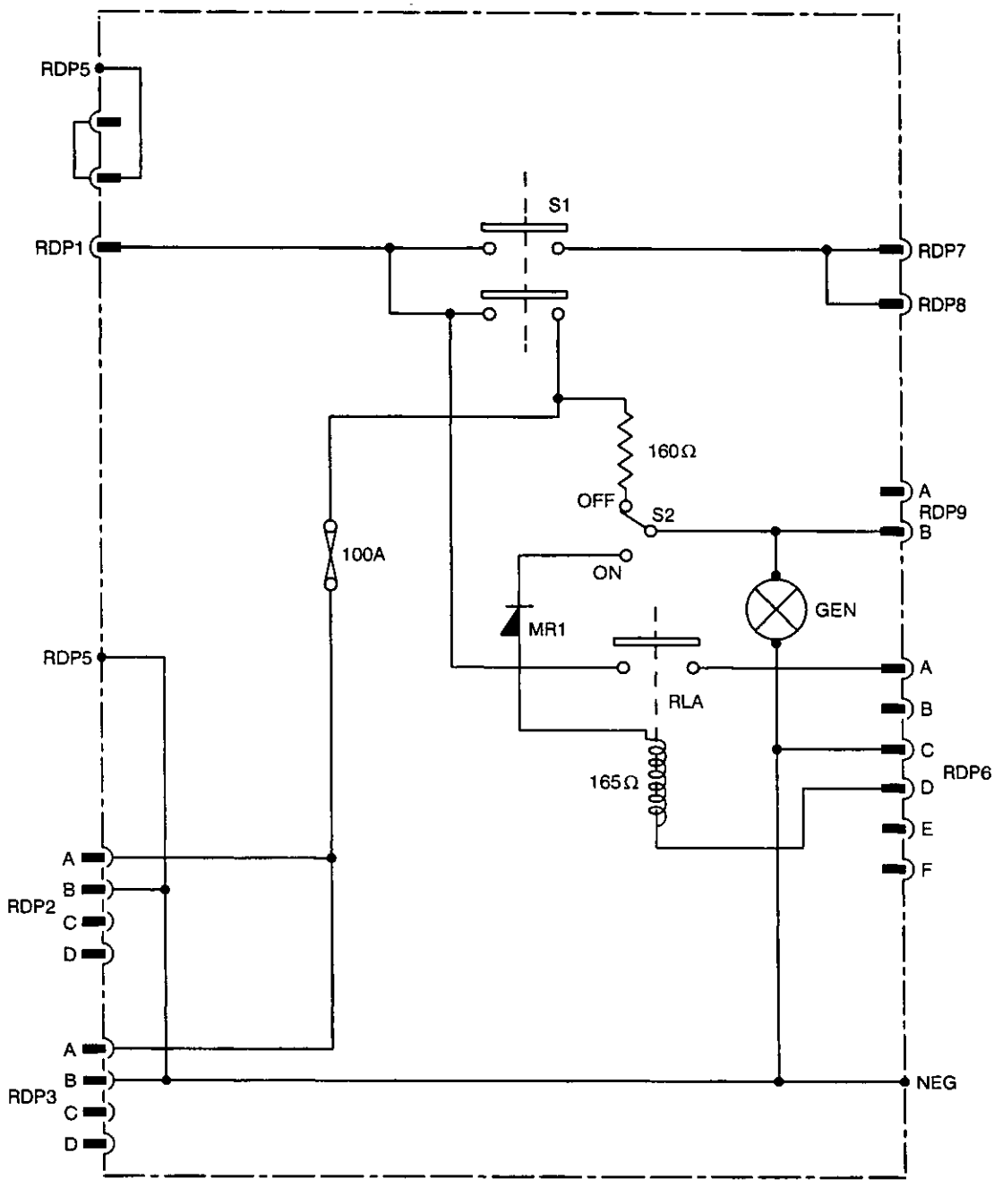


Fig 1 Radio distribution box No 1 Mk 3

11.9 Disconnect the earth lead at the case, note cable route for correct reassembly and withdraw the cable clear of the relay

11.10 Remove the four nuts retaining the common base of relay and S1 and withdraw from the outer case.

11.11 Remove the four nuts retaining the relay to the base, disconnect the coil connections and remove the relay.

11.12 Undo the four screws retaining the switch to the base and remove the switch.

Reassembling

12 Reassemble in reverse order to dismantling.

Tests and adjustments

13 Test the assembled radio distribution box as detailed in AESP 2350-T-250-522, Chap 5.

14 Test the relay when removed from its assembly, as follows:

14.1 The armature is quite free in its bearings, the minimum permitted clearance between armature and yoke limbs is 0.05 mm (0.002 in).

14.2 Contact separation with the relay normal is between 2.03 mm and 2.29 mm (0.080 in and 0.090 in). If necessary, adjust by varying height of fixed contacts.

14.3 Fixed contacts are in alignment (A and B) within 0.38 mm (0.015 in) (Fig 2 refers).

14.4 Coil resistance measured between terminals X1 and X2 is 165Ω ± 5%.

14.5 The relay operates fully when a voltage between the range of 16V to 29V dc is applied to the coil across terminals X1 and X2.

15 With contacts thus closed:

15.1 Neither contact must open when a force of 250gms (8.75 oz) is applied to the centre of the bridge against the direction of contact pressure.

15.2 Clearance between the contact spring and ceramic stud is not less than 0.20 mm (0.008 in). If necessary, adjust by varying height of fixed contacts.

15.3 The relay must release fully at a voltage not less than 3V dc and not exceeding 12V dc when the coil voltage is reduced from 24V dc.

15.4 Insulation resistance, between all live parts not normally in contact with one another (operated and non operated positions to be considered) and between all parts collectively and frame, is not less than 5 megohms when measured with a dc voltage, not less than 100V and not greater than 500V, applied for sufficient time to allow needle of megohmeter (Table 2, Ser 1) to become stationary.

15.5 If any of the preceding tests are unsatisfactory and the faults cannot be rectified by minor adjustments, change the relay.

16 If any doubt exists with respect to relay or switch contacts and circuits, a millivolt drop test may be applied.

16.1 Arrange circuits as shown in following Table 4 to carry currents indicated in third column. With these currents flowing, measure volt drop across terminations of circuit and check that volt drop fall within limits specified in fourth column.

NOTE

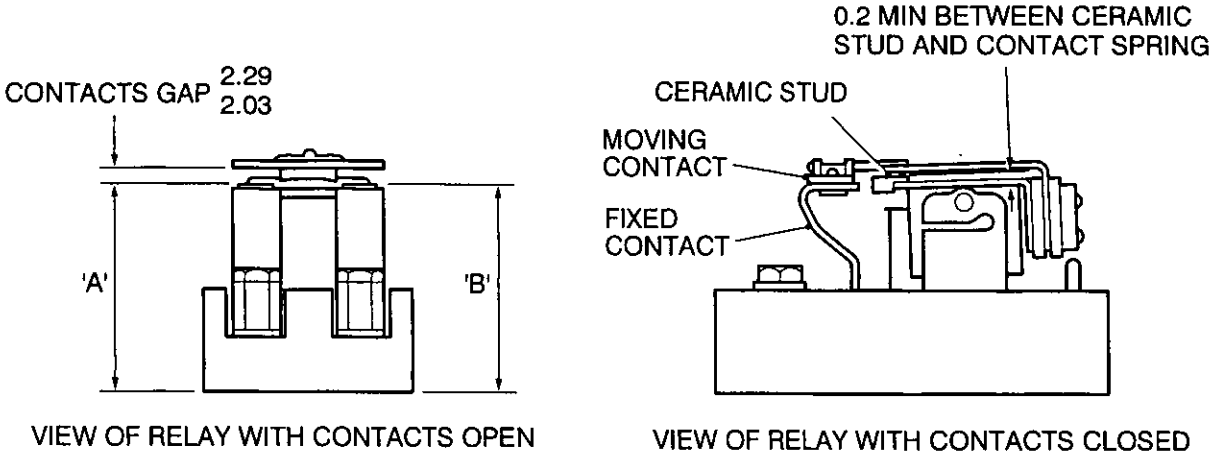
During test 10 of Table 3, relay must be energized by applying 24V dc (positive to 6D, negative to 9B with S2 on).

16.2 Switch on S2, apply 24V dc (negative to 6D, positive to 9B) and check that relay does not operated.

16.3 Check that 160Σ appears between 2A and 9B with S2 closed, and between 1 and 9B when both S1 and S2 are closed.

TABLE 3 MILLIVOLT DROP TEST

Test No. (1)	Circuit (2)	Current amp (3)	Volt drop millivolts (4)
1	4 to free link	100	270 to 290
2	5 to negative	100	135 to 145
3	5 to 6C	100	170 to 180
4	1 to 7 with S1 closed	100	140 to 150
5	1 to 8 with S1 closed	100	140 to 150
6	1 to 2A with S1 closed	60	140 to 150
7	1 to 3A with S1 closed	60	140 to 150
8	5 to 3B	60	85 to 95
9	5 to 2B	60	75 to 85
10	1 to 6A	40	140 to 150



NOTE: DIMENSIONS 'A' AND 'B' TO BE IDENTICAL WITHIN 0.38
DIMENSIONS IN MILLIMETRES

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Fig 2 Setting details for relay BO/IDM/28/60

REV/MIN SENDER UNIT NO. 1 MK 1

Dismantling

21 The procedure to dismantle a rev/min sender unit No. 1 Mk 1 is as follows:

21.1 Tap out the retaining pin and remove the driver gear.

21.2 Remove the three screws and lift off the cap and washer.

21.3 Remove the ring tension spring.

21.4 Withdraw the rotating magnets complete with drive shaft.

21.5 Remove the two screws securing terminal block and withdraw block.

21.6 Unsolder the leads from the terminal block and withdraw the coil.

Reassembling

22 Reassemble in reverse order to dismantling.

Testing

23 Check the insulation resistance between terminals and case. This must not be less than 5 megohms when tested at 100V dc.

24 Mount rev min sender unit on a suitable test stand. Run unit at 1000 rev min and check that voltage output is between 9.5V and 10.5V using the multimeter (Table 2, Ser 2).

PERISCOPE WIPER MOTOR

Removal

25 The procedure to remove a periscope wiper motor from its gearbox is as follows:

25.1 Remove the six screws securing the motor to its gearbox.

25.2 Remove the terminal board cover plate (secured by four screws).

25.3 Disconnect the two leads at No. 1 and 2 on the terminal board and remove motor from the gearbox.

Refitting

26 The procedure to refit a periscope wiper motor from its gearbox is the reverse of the procedure detailed for removal.

Dismantling

27 The procedure to dismantle a periscope wiper motor is as follows:

27.1 Remove the cover assembly (Fig 4 (9)).

27.2 Remove the brush holder cap (4) and brushes (5).

27.3 Remove the two yoke bolts and withdraw the armature (10).

27.4 Remove the leads to the brush holders.

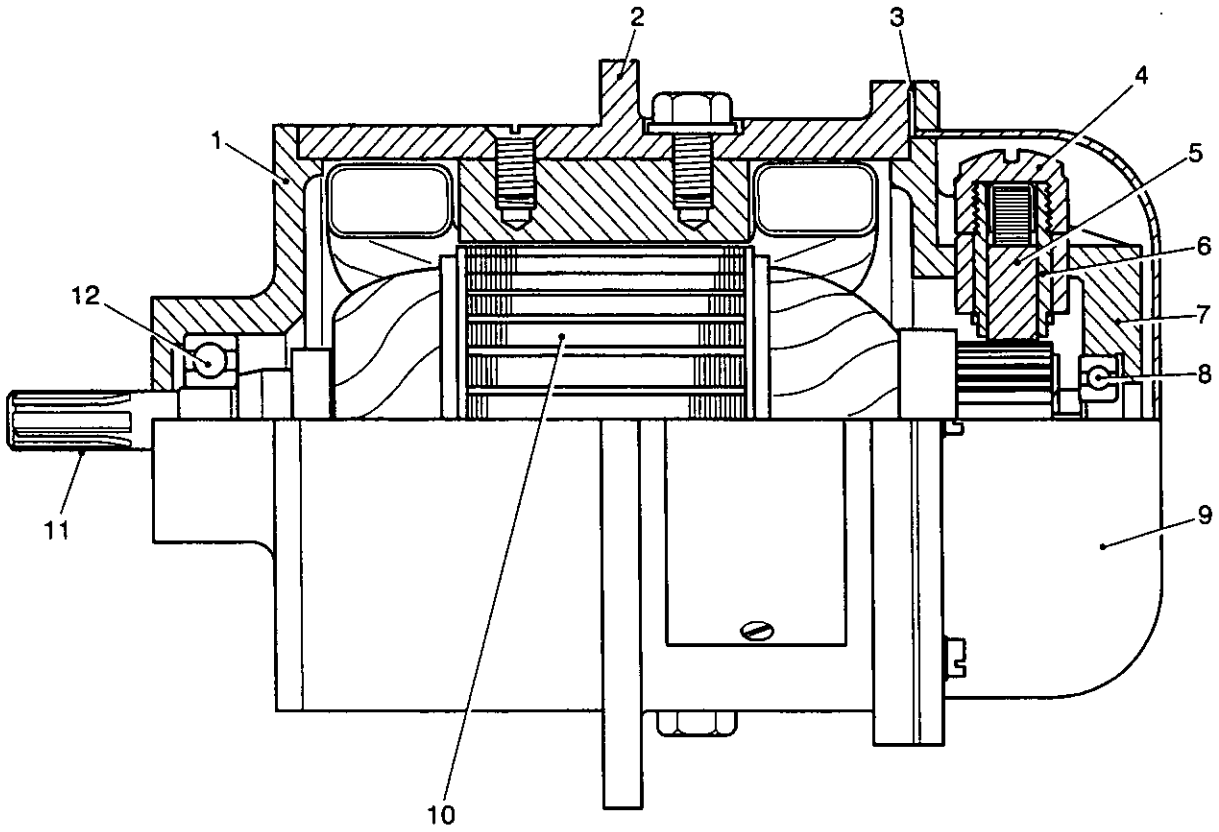
27.5 Remove the commutator end plate (7).

27.6 Press the brush holders (6) from the commutator end plate (if necessary).

27.7 Part the drive end plate (1) from the armature.

27.8 Remove the circlip and press the bearing (12) from the drive end plate.

27.9 Withdraw the bearing (8) from the armature using locally manufactured extractor (See Fig 5 for manufacturing details).



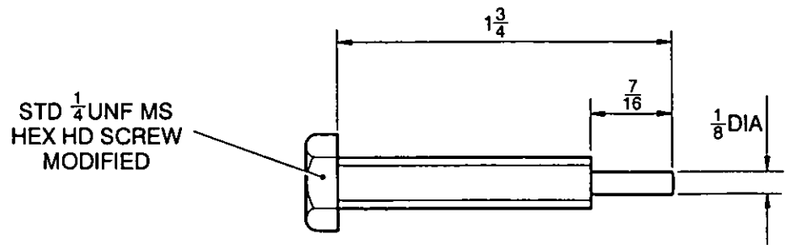
1	Drive end plate	7	Commutator end plate
2	Body assembly motor	8	Bearing, ball
3	Gasket end cover	9	Cover assembly
4	Brush holder cap	10	Armature motor
5	Brush complete with spring	11	Drive splines to gearbox
6	Brush holder	12	Bearing, ball

Fig 3 Periscope wiper motor

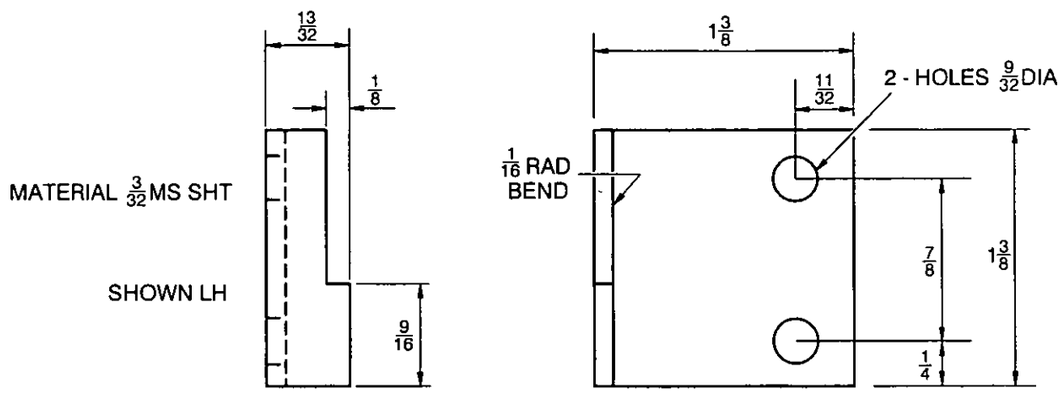
Reassembling

28 Assemble in reverse order to dismantling, ensuring the following:

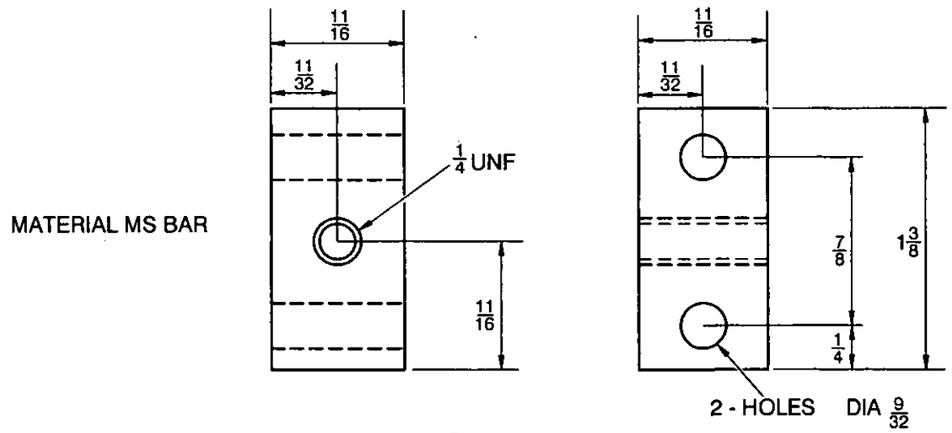
28.1 Grease (Table 1, Ser 1) is to be applied to all gaskets prior to installation.



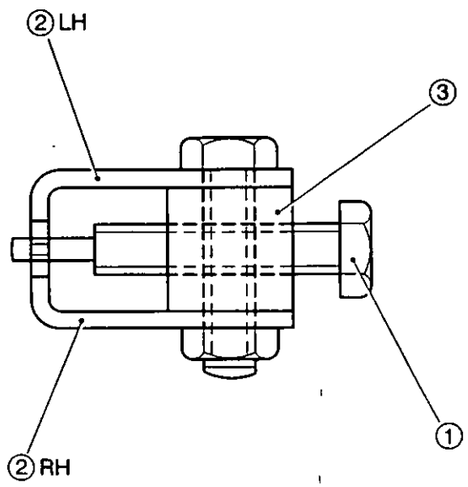
① 1-OFF PER SET



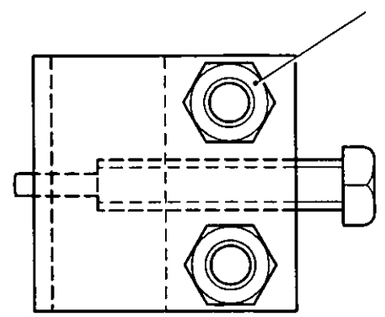
② 1-LH 1-RH PER SET



③ 1-OFF PER SET



SUPPLY 2 - $\frac{1}{4}$UNF x $1\frac{1}{4}$ LG
MS HEX HD SCREWS
WITH NUTS



ASSEMBLY

DIMENSIONS IN INCHES

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Fig 4 Manufacturing details, ball race extractor

Periscope wiper motor switch removal

29 The procedure to dismantle a periscope wiper motor switch is as follows:

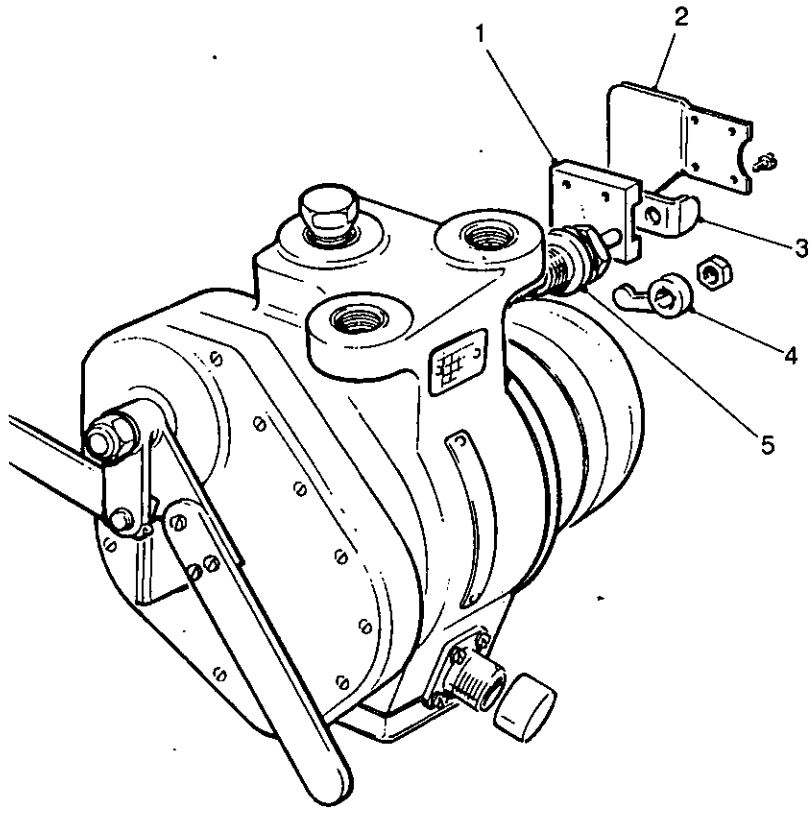
29.1 Remove the plate (Fig 6(2)).

29.2 Lift off the switch lever arm (3).

29.3 Lift off the switch lever slide (1).

29.4 Disconnect leads 1 and 3 at the terminal block.

29.5 Remove switch securing nut and lift out switch (5).



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1 Switch lever slide
2 Switch lever plate
3 Switch lever arm
4 Parking lever
5 Switch complete with leads

Fig 5 Periscope wiper switch

Periscope wiper motor switch refitting

30 The procedure to refit a periscope wiper motor switch is the reverse of the procedure detailed for removal.

Periscope wiper motor gearbox dismantling and reassembly

31 Periscope wiper motor gearbox repair is by replacement only. Separate the gearbox from the motor as detailed in Para 25, carry out the tests detailed in Para 32 and back load for overhaul if the gearbox fails those tests.

31.1 Before assembling the gearbox to the motor, smear the gasket with grease silicon (Table 1, Ser 1).

Testing

32 The procedure to test a periscope wiper motor assembly is as follows:

32.1 Check that the insulation resistance when tested at 100V dc is not less than 5 megohms.

32.2 Supply motor with 28.5V dc, and run for 30 minutes to reach working temperature. Check that the no load speed does not exceed 3550 rev min.

32.3 Fit a temporary cover (see Fig 7 for manufacturing details) to the drive end flange of motor, with rubber gasket, smeared with grease silicon (Table 1,Ser 1) inserted between flange and cover. Immerse motor in water to a depth of 3ft for one hour. No water should have entered the motor.

32.4 Remove cover and refit to a serviceable gearbox. Supply motor at 22V dc and check that speed is 2000 rev min minimum (using stroboscope). Commutation must be sparkless during this test.

32.5 Increase supply voltage to 30V and check that speed does not exceed 3100 rev/min. Commutation must be sparkless during this test.

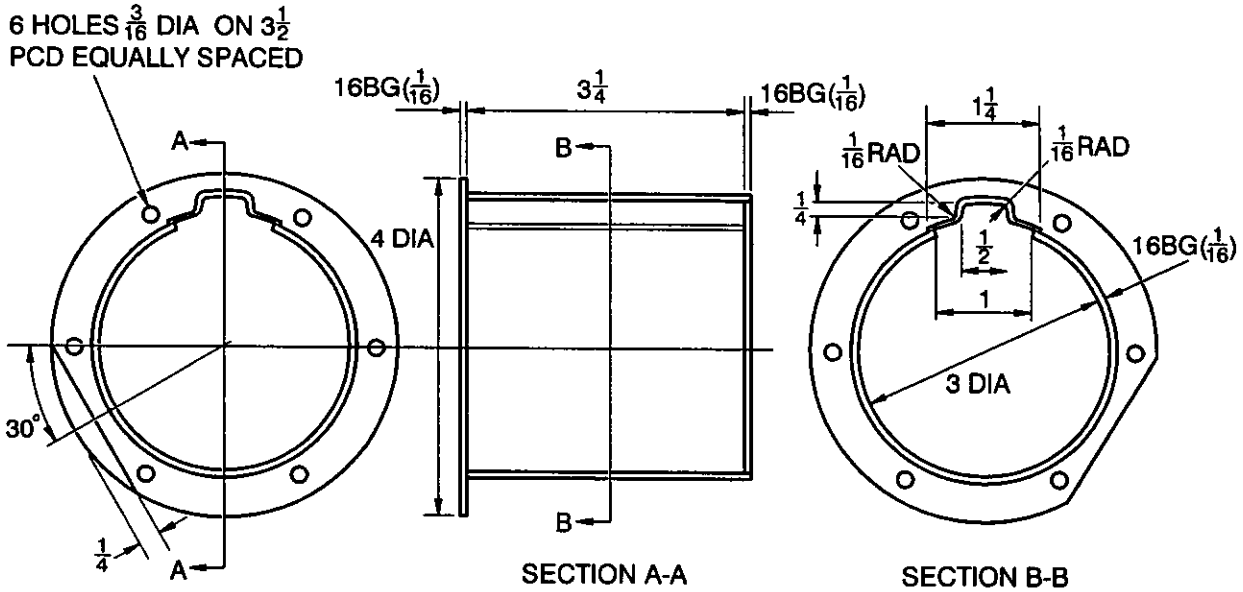

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Fig 6 Manufacturing details, temporary cover

CONNECTOR ANALOGUE NO 1 MK 1

Testing

33 Place the connector analogue No 1 Mk 1 in dehumidifier (Table 2, Ser 3) with three leads of Y3/6145-99-910-0175, wire electrical equipment, type 2 14/0076 red or similar, connected to terminals A, B and C and fed through the upper left hand corner of dehumidifier door for connection to two multimeters (Table 2, Ser 2) as shown in Fig 8.

34 Check that:

Multimeter 1 indicates a closed circuit.
Multimeter 2 indicates an open circuit.

35 Switch the dehumidifier ON and check that multimeter 1 indicates a closed circuit up to 37.7 deg C (100 deg F) and an open circuit before 43.3 deg C (110 deg F) is reached. Switch the oven OFF and check multimeter 1 indicates a closed circuit when temperature has dropped 9 deg F (5 deg C) from temperature at which an open circuit was indicated.

36 Switch the oven ON and check that multimeter 2 indicates an open circuit up to 115 deg F (46.1 deg C) and a closed circuit before 125 deg F (51.6 deg C) is reached. Switch the oven OFF and ensure that multimeter 2 indicates an open circuit when temperature has dropped 9 deg F (5 deg C) from temperature at which a closed circuit was indicated.

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