



Ministry
of Defence

Defence Equipment and Support
Secretariat
#2043 Maple 0a
Ministry of Defence
Abbey Wood
Bristol BS34 8JH



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

██████

██████████

Our Reference:
FOI2022/11393
Date:
30 November 2022

Dear ██████,

Thank you for your email of 6 October 2022, requesting the following information:

I was wondering if you still had documents such as technical handbooks for the CVR(T) Jaguar J60 engines and TN15 Transmission units

Your request has been handled in accordance with the Freedom of Information (FOI) Act 2000.

A search of Ministry of Defence (MOD) records has been completed and we can confirm that we hold information which falls within the scope of your request. This is enclosed as follows:

Army Equipment Support Publication (AESP) 2350-T-220-522 – COMBAT VEHICLE RECONNAISSANCE, FULL-TRACKED, CVR(T)(D) COMMON ITEMS – Maintenance Instructions

Army Equipment Support Publication (AESP) 2350-T-220-523 – COMBAT VEHICLE RECONNAISSANCE, FULL-TRACKED, CVR(T)(D) COMMON ITEMS – Maintenance Instructions

Army Equipment Support Publication (AESP) 2350-T-220-601 – COMBAT VEHICLE RECONNAISSANCE, FULL-TRACKED, CVR(T)(D) COMMON ITEMS – Maintenance Instructions

Please note that these documents have not been released in their entirety; as your request was concerned specifically with the engine and transmission of CVR(T)(D), we have only released information relating to those components.

Some of the information you have requested falls within the scope of the absolute exemption provided for in Section 40 (personal data) and qualified exemptions Section 26 (Defence), Section 27 (International Relations), Section 38 (Health and Safety) of the FOI Act and has been withheld.

Section 40(2) has been applied to personal information as governed by the General Data Protection Regulations (GDPR). Section 40 is an absolute exemption and there is therefore no requirement to consider the public interest in making a decision to withhold the information.

Sections 26, 27 and 38 are qualified exemptions and subject to public interest testing which means that the information requested can only be withheld if the public interest in doing so outweighs the public interest in disclosure.

Defence Equipment & Support

Section 26(1)(b), Section 27(1) and Section 38(1) have been applied to some of the information because it contains details which are operationally sensitive and would prejudice the capability and effectiveness of the Armed Forces, prejudice the relations between the United Kingdom and another state, and compromise the health and safety of Armed Forces personnel.

The balance of public interest was found to be in favour of withholding the information under these exemptions. Therefore, I have set the level of prejudice against release of the exempted information at the higher level of 'would' rather than 'would be likely to'.

If you have any queries regarding the content of this letter, please contact this office in the first instance. If you wish to complain about the handling of your request, or the content of this response, you can request an independent internal review by contacting the Information Rights Compliance team, Ground Floor, MOD Main Building, Whitehall, SW1A 2HB (e-mail CIO-FOI-IR@mod.gov.uk). Please note that any request for an internal review should be made within 40 working days of the date of this response.

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

Yours sincerely,

DE&S Secretariat



CONDITIONS OF RELEASE

- 1 This information is released by the UK Government for Defence purposes only.
- 2 This information must be afforded the same degree of protection as that afforded to information of an equivalent security marking originated by the recipient Government or as required by the recipient Government's security regulations.
- 3 This information may be disclosed only within the Defence Department of the recipient Government, except as otherwise authorized by the Ministry of Defence (Army).
- 4 This information may be subject to privately owned rights.

**COMBAT VEHICLE, RECONNAISSANCE,
FULL TRACKED, CVR(T) (D) – COMMON ITEMS
MAINTENANCE INSTRUCTIONS**

~~THIS DOCUMENT IS THE PROPERTY OF HER BRITANNIC MAJESTY'S GOVERNMENT, and is issued for the information of such persons only as need to know its contents in the course of their official duties. Any person finding this document should hand it to a British forces unit or to a police station for its safe return to the MINISTRY OF DEFENCE (Dcy (Pol)), MAIN BUILDING, WHITEHALL, LONDON SW1A 2HB with particulars of how and where found. THE UNAUTHORIZED RETENTION OR DESTRUCTION OF THIS DOCUMENT MAY BE AN OFFENCE UNDER THE OFFICIAL SECRETS ACTS OF 1911-1989. (When released to persons outside Government service, this document is issued on a personal basis and the recipient to whom it may be entrusted in confidence, within the provision of the Official Secrets Acts 1911-1989, is personally responsible for its safe custody and for seeing that its contents are disclosed only to authorized persons).~~

Sponsored for use in the
UNITED KINGDOM MINISTRY OF DEFENCE AND ARMED FORCES

by

[REDACTED]

~~OFFICIAL-SENSITIVE~~

~~OFFICIAL-SENSITIVE~~

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
1	INCORPORATED	01/05
2	INCORPORATED	03/06
3	INCORPORATED	10/06
4	INCORPORATED	04/07
5	INCORPORATED	09/07
6	INCORPORATED	10/07
7	INCORPORATED	07/08
8	INCORPORATED	11/08
9	INCORPORATED	11/10
10	INCORPORATED	06/12
11	INCORPORATED	03/13
12	INCORPORATED	05/13
13	INCORPORATED	10/13
14	INCORPORATED	07/14
15	INCORPORATED	09/14
16	INCORPORATED	05/15
17	INCORPORATED	07/15
18	INCORPORATED	03/16
19	INCORPORATED	10/16
20	INCORPORATED	01/17
21	INCORPORATED	03/17
22	INCORPORATED	06/17
23	INCORPORATED	07/17
24	INCORPORATED	01/18
25	INCORPORATED	02/19
26	INCORPORATED	07/19
27	INCORPORATED	01/20
28	INCORPORATED	03/20
29	INCORPORATED	09/21
30	INCORPORATED	12/21
31		

Amdt No.	Incorporated By (Signature)	Date
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		
62		

UK RESTRICTED

SECRET

SECRET

SECRET

SECRET

UK RESTRICTED

CONTENTS

PRELIMINARY MATERIAL	Page
Front cover (title page).....	(i)/(ii)
Amendment record	(iii)/(iv)
Contents (this list)	(v)
PREFACE	(vi)
Introduction	(vi)
Related and associated publications	(vii)
Related publications.....	(vii)
Associated publications	(vii)
Reference organizations and addresses	(viii)
Table 1 Reference organizations and addresses	(viii)
Warnings.....	(viii)
Cautions.....	(xii)

MAINTENANCE INSTRUCTIONS

Chapter

- 1 Engine assembly
- 2 Fuel system
- 3 Cooling system
- 4 Transmission
- 5 Driver's controls
- 6 Suspension and tracks
- 7 Hull and fittings
- 8 Electrical system
- 9 Hydraulic system
- 10 Battle damage

PREFACE

Sponsor: Refer to Table 1, Serial 1
File ref: Pubs 2285
Publication Authority: Refer to Table 1, Serial 1

INTRODUCTION

1 Users should forward any comments on this publication using the AESP Form 10 and the accompanying guidance which can be accessed and downloaded from the Joint Asset Management and Engineering Solutions (JAMES) Portal (via Hot Topics – Forms) or from Technical Documentation Online (TDOL) Viewer (Search: FORM10).

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 Para 3 below.

3 The subject matter of this publication may be affected by Defence Instructions and Notices (DINs), Standing 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

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

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directives	111	*	*	*
2	0	Operating Information	201	*	*	*
	1	Aide-Memoire	211	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	201	302	*	*
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	*	*	*
	2	Maintenance Instructions	201	522	523	524
	3	Inspection Standards	*	532	532	532
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedules	601	601	*	*
7	1	Illustrated Parts Catalogues	711	711	*	*
	2	Commercial Parts Lists	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	*	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions				

*Category/Sub-category not published

Associated publications

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

(continued)

Associated publications (continued)

<u>Reference</u>	<u>Title</u>
AESP 0200-A-283-013	Guide to Stress Corrosion Cracking and Related Defects in Medium/High Strength Aluminium Alloys
AESP 6140-A-100-013	Batteries - All Types
AESP 2815-K-101-Series	Engine
EMER Eng Misc D 322/1	Cooking Vessel No.1 Mk 2
EMER Power O 322/4	CAV Starters
EMER Power P322/16	Starter, Electric, No 4 Mk 2
EMER Power P 134/30	Generator Panel No.12
EMER Power W 001	Vehicles fitted with alternators
EMER Power W 104/23	Generator No.12
EMER Wksp C 010	Introduction to hydraulic systems of A, B and C vehicles
EMER Wksp C 011	British Standard symbols used in diagrams for hydraulic and pneumatic systems

REFERENCE ORGANIZATIONS AND ADDRESSES

7 The organizations listed in Table 1 are referred to throughout this AESP.

TABLE 1 REFERENCE ORGANIZATIONS AND ADDRESSES

Serial (1)	Organization (2)	Address (3)
1	[REDACTED]	[REDACTED]

WARNINGS

- (1) FIRE RISK. DANGER OF FIRE ALWAYS EXISTS WHEN WORKING ON FUEL SYSTEM WITHIN VEHICLE. MASTER SWITCH MUST BE OFF, HATCHES MUST BE OPEN TO DISPERSE FUMES. IF IN DOUBT USE EXPLOSIMETER.
- (2) FIRE RISK. FIRE EXTINGUISHING EQUIPMENT MUST BE AVAILABLE AT ALL TIMES.
- (3) PERSONNEL SAFETY. HYDROFLUOROCARBON (HFC) GAS EXTINGUISHING AGENTS MAY DECOMPOSE UNDER CERTAIN FIRE CONDITIONS, PRODUCING CONSIDERABLE QUANTITIES OF HYDROGEN FLUORIDE (HF) [REDACTED] XTINGUISHING AGENTS, IMMEDIATELY EVACUATE TO AN AREA WITH FRESH AIR, AND INFORM MEDICAL SERVICES OF SUSPECTED EXPOSURE TO HF.
- (4) STATIC ELECTRICITY. VEHICLES FITTED WITH RUBBER PADDED TRACKS MAY BE CHARGED WITH STATIC ELECTRICITY. BEFORE REPAIRS TO FUEL SYSTEM, OR WHEN REFUELLING, THE VEHICLE MUST BE EARTHED.
- (5) FIRE RISK. WHEN USING A VOLTMETER OR TEST LAMP CARE MUST BE TAKEN NOT TO CAUSE A SPARK. IN NO CIRCUMSTANCES 'FLASH' THE FEED WIRE TO EARTH.
- (6) EYE PROTECTION. COOLANT SOLUTION AL39 WILL BE EJECTED UNDER PRESSURE DURING BLEEDING OPERATION - PROTECT EYES WITH GOGGLES.

(continued)

WARNINGS (continued)

- (7) **TOXIC AND HAZARDOUS SUBSTANCE.** FLUID AL39 IS BOTH TOXIC AND HAZARDOUS. REFER TO LOCAL UNIT PRECAUTIONS FOR FULL SAFETY PROCEDURES. MINIMUM PRECAUTION AFTER USE IS TO WASH THE AFFECTED SKIN AREAS WITH SOAP AND WATER.
- (8) **DANGER FROM SCALDING.** DO NOT RELEASE THE COOLANT PRESSURE/FILLER CAP WHILE THE ENGINE IS RUNNING OR BEFORE SUFFICIENT TIME HAS BEEN ALLOWED FOR THE COOLANT TEMPERATURE TO COOL, OTHERWISE SEVERE SCALDING CAN RESULT.
- (9) **TOXIC SUBSTANCE.** HYDRAULIC OIL IS BOTH TOXIC AND HAZARDOUS. AVOID SKIN CONTACT WITH OIL. APPLY BARRIER CREAM TO HANDS BEFORE COMMENCING WORK ON THE HYDRAULIC SYSTEM.
- (10) **PERSONAL INJURY.** SPRING MAY STILL BE UNDER COMPRESSION WHEN NUT IS REMOVED.
- (11) **RISK TO LIFE AND LIMB.** DO NOT TAKE RISKS WITH THE JACKING STRUT COLLAPSE CAN CAUSE SERIOUS INJURY.
- (12) **CORROSIVE SUBSTANCE.** GOGGLES AND GLOVES MUST BE WORN WHEN APPLYING REMOVER. IF REMOVER COMES INTO CONTACT WITH SKIN OR EYES, WASH OFF IMMEDIATELY WITH CLEAN WATER AND SEEK MEDICAL ATTENTION.
- (13) **ASBESTOS HEALTH HAZARD - ASBESTOS.** INSULATING MATERIAL USED ON THIS EQUIPMENT MAY CONTAIN ASBESTOS. NO ATTEMPT IS TO BE MADE TO WORK WITH ASBESTOS MATERIALS WITHOUT CONFORMING TO APPROPRIATE DEPARTMENTAL/UNIT INSTRUCTIONS.
- (14) **DANGER TO LIFE AND LIMB.** DUE TO HULL PLATE TOLERANCING, IT IS NOT ADVISABLE TO INTERCHANGE LIFTING EYES ON OR BETWEEN VEHICLES. IF IT IS FOUND NECESSARY TO INTERCHANGE, RE-ADJUSTMENT MUST BE CARRIED OUT AS DETAILED BELOW.
- (15) **DANGER TO LIFE OR LIMB.** DO NOT ATTEMPT ANY REPAIRS UNTIL PROJECTILES HAVE BEEN DECLARED SAFE.
- (16) **DANGER FROM SCALDING.** TO AVOID SCALDING FROM HOT COOLANT, PROTECTIVE GLOVES MUST BE WORN WHEN REMOVING THE COOLANT DRAIN PLUG.
- (17) **DANGER FROM SCALDING.** COOLING SYSTEM IS PRESSURISED. EXERCISE EXTREME CARE WHEN REMOVING THE FILLER CAP TO AVOID SCALDING.
- (18) **DANGER TO LIFE AND LIMB.** MAKE SURE THE ENGINE FUEL CUT OFF LEVER IS FULLY IN THE 'STOP' POSITION BEFORE ATTEMPTING TO ROTATE THE ENGINE MANUALLY.
- (19) **COMPRESSED AIR.** ENSURE THAT WHEN USING COMPRESSED AIR EMITTING TOOLS, THE NOZZLE DOES NOT COME INTO DIRECT CONTACT WITH THE SKIN, AIR INJECTED INTO THE BLOODSTREAM CAN CAUSE POSSIBLE DEATH.
- (20) **RISK TO HEALTH.** DIESEL FUEL IS CARCINOGENIC. USE BARRIER CREAM AND WEAR PROTECTIVE CLOTHING WHEN THERE IS A POTENTIAL RISK OF CONTACT WITH DIESEL FUEL.
- (21) **DANGER TO LIFE AND LIMB.** DRIVERS COMPARTMENT MUST BE MANNED THROUGHOUT THE ENGINE RUN PERIOD.

(continued)

WARNINGS (continued)

(22) DANGER OF HEARING DAMAGE. ALL PERSONNEL IN IMMEDIATE VICINITY MUST WEAR EAR PROTECTORS WHEN ENGINE IS RUNNING.

(23) DANGER TO LIFE AND LIMB. ALL TOOLS AND EQUIPMENT USED DURING MAINTENANCE MUST BE REMOVED FROM THE ENGINE AND GEARBOX COMPARTMENTS PRIOR TO STARTING.

(24) DANGER TO LIFE AND LIMB. BEFORE PERSONNEL ARE ALLOWED UNDER THE VEHICLE, THE PARKING BRAKE MUST BE FULLY APPLIED AND THE VEHICLE SECURED AGAINST MOVEMENT.

(25) DANGER FROM SCALDING FROM HOT OIL. PROTECTIVE GLOVES MUST BE WORN WHEN REMOVING THE GEARBOX OIL DRAIN PLUG.

(26) ASBESTOS HAZARD. THE BRAKE PADS MAY CONTAIN ASBESTOS. ENSURE THAT ADEQUATE PRECAUTIONS ARE TAKEN TO PREVENT POSSIBLE INHALATION OF ANY DUST.

(27) ASBESTOS HAZARD. THE CLUTCH LININGS MAY CONTAIN ASBESTOS. ENSURE THAT ADEQUATE PRECAUTIONS ARE TAKEN TO PREVENT POSSIBLE INHALATION OF ANY DUST.

(28) PERSONNEL INJURY. DUE TO THE RESTRICTED WORKING AREA AND WEIGHT OF THE INDIVIDUAL COMPONENTS, IT IS RECOMMENDED THAT THE REMOVAL OF THE LOUVRES BE CONDUCTED BY A MINIMUM OF TWO PERSONNEL.

(29) PERSONNEL INJURY. DUE TO THE UNEVEN SURFACE AND THE RESTRICTED WORKING AREA CAUTION MUST BE EXERCISED IN THE PLACEMENT OF LIMBS.

(30) RISK OF BURNS. BEFORE DISMANTLING THE EXHAUST SYSTEM ENSURE THAT THE COMPONENTS HAVE COOLED SUFFICIENTLY TO BE HANDLED.

(31) CADMIUM PLATING. THE EQUIPMENT COVERED BY THIS PUBLICATION CONTAINS COMPONENTS INCORPORATING CADMIUM PLATED MATERIAL WHICH IS A POTENTIAL SAFETY HAZARD. THIS MATERIAL, IN ITSELF, IS SAFE EXCEPT IN CIRCUMSTANCES WHEN IT IS HEATED, CORRODED OR WORKED. POTENTIAL HAZARDS ARISE WHEN:

(31.1) CADMIUM PLATING MATERIAL OR COMPONENTS ARE FILED AND THE RESULTING DUST IS INHALED.

(31.2) TOXIC FUMES ARE INHALED WHEN CADMIUM IS HEATED.

(31.3) CADMIUM SALTS FORMING AS A RESULT OF CORROSION ARE ABSORBED INTO THE BODY TISSUES THROUGH SKIN, MOUTH, OR WOUND.

REFER TO JSP 515 FOR THE RELEVANT MSDS AND CONDUCT A RISK ASSESSMENT I.A.W. JSP 375, VOL 2, LEAFLET 5 OR AESP 0200-A-093-013 PRIOR TO ACTIVITIES.

[REDACTED]

[REDACTED]

(continued)

WARNINGS (continued)



(35) PERSONNEL INJURY. CARE MUST BE TAKEN WHILST MOVING THE VEHICLE WITH THE ANTENNAS FITTED. TOUCHING OF OVERHEAD CABLES MAY INDUCE HIGH VOLTAGES INTO THE VEHICLE CAUSING POSSIBLE ELECTROCUTION OF CREW MEMBERS.

(36) PERSONNEL INJURY. WHEN CARRYING OUT ANY TYPE OF WORK ON A CVR(T) (BOWMAN) VEHICLE, ATTENTION MUST BE MADE TO THE VARIOUS SAFETY NOTICES WHICH ARE POSITIONED THROUGHOUT THE VEHICLE.

(37) RISK OF CRUSH INJURY. DO NOT WORK UNDER VEHICLE SUPPORTED ONLY BY JACKING STRUTS. VEHICLE MUST BE SECURELY SUPPORTED BY HULL STANDS OR APPROVED SKIDDING.

(38) RISK OF CRUSH INJURY. VEHICLE MUST NOT BE SUPPORTED BY JACKING STRUTS FOR PROLONGED PERIODS. FAILURE OF TORSION BARS CAN OCCUR SUDDENLY, WHICH WILL SIGNIFICANTLY REDUCE GROUND CLEARANCE OR CAUSE VEHICLE MOVEMENT. THIS RISK IS INCREASED ON UP-ARMoured VEHICLES.

(39) RISK OF CRUSH INJURY. WHEN AXLE ARMS ARE RAISED BY MEANS OF JACKING STRUT OR ADAPTOR, THE VEHICLE MUST BE SECURED TO PREVENT MOVEMENT USING APPROVED CHOCKS.

(40) PERSONAL INJURY. WHEN CARRYING OUT REPAIRS AND MAINTENANCE, THERE MAY BE A RISK OF SHARP EDGES OR SPLINTERS, ENSURE WHEN CARRYING OUT THESE TASKS THAT CARE IS TAKEN, AND ADEQUATE PROTECTIVE EQUIPMENT IS USED.

(41) SILICA. TOXIC SUBSTANCE. ANY ACCUMULATED SAND ON THE VEHICLE MAY CONTAIN SILICA DUST WHICH MUST BE REGARDED AS HAZARDOUS TO HEALTH. PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN TO PREVENT INHALATION OF DUST WHEN CLEANING OR WORKING ON THE VEHICLE. REMOVE ANY SAND AND DUST DEPOSITS FROM THE VEHICLE BEFORE COMMENCING WORK. ALL PERSONAL PROTECTIVE EQUIPMENT MUST BE CLEANED AFTER EACH USE IN A DESIGNATED AREA TO PREVENT THE RISK OF DUST INHALATION BY UNPROTECTED PERSONNEL.

(42) DANGER OF DEATH OR INJURY. IF A VEHICLE IS INVOLVED IN A ROAD TRAFFIC ACCIDENT (RTA) OR A HEAVY IMPACT TO THE FRONT OF THE VEHICLE (HULL, TRACKS OR FINAL DRIVES) IT IS POSSIBLE THAT DAMAGE HAS OCCURRED TO COMPONENTS INSIDE THE FINAL DRIVE THAT CAN RESULT IN A LOSS OF CONTROL OF THE VEHICLE. THE VEHICLE MUST BE RECOVERED AND BOTH FINAL DRIVES MUST BE REPLACED. THE REMOVED DRIVES MUST BE RETURNED TO THE REPAIR AGENCY. REPORT TO REME. THE SEFIT AND PLATFORM TEAMS MUST BE INFORMED.

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

- (a) ON THE LABEL OF THE CONTAINER IT WAS SUPPLIED IN.
- (b) ON THE MATERIAL SAFETY DATA SHEET.
- (c) IN THE LOCAL SAFETY ORDERS AND REGULATIONS.

(continued)

WARNINGS (continued)

(44) **EARTH BONDING.** IT IS IMPERATIVE, FOR CORRECT AND SAFE VEHICLE OPERATION, THAT IF AN ELECTRICAL COMPONENT IS RENEWED OR REFITTED THAT THE CORRECT EARTHING STRAP/BONDING LEAD (WHERE DETAILED IN THE APPROPRIATE CAT 711) IS FITTED AND CONNECTED. ALL CONTACT SURFACES MUST BE SCRUPULOUSLY CLEAN AND FREE FROM PAINT.

(45) **ELECTRIC SHOCK. VOLTAGE/CURRENT PRODUCED BY THE GENERATOR CAN RESULT IN ELECTRIC SHOCK. WHERE PRACTICABLE, LIVE WORKING SHOULD BE AVOIDED AND THE CIRCUITS/BATTERIES ISOLATED.**

(46) **HEAVY WEIGHT.** DUE CONSIDERATION SHOULD BE GIVEN TO THE REGULATIONS GOVERNING THE LIFTING OF HEAVY WEIGHTS. USE MECHANICAL HANDLING EQUIPMENT WHERE PRACTICAL. GET ASSISTANCE IF REQUIRED AND PLAN YOUR ROUTE AND WHERE YOU ARE GOING TO PUT THINGS DOWN.

(47) **ELECTRIC SHOCK.** WHEN DISCONNECTING BATTERIES, REMOVE ALL THE TERMINALS FROM THE EARTH (NEGATIVE) (-) TERMINAL POSTS BEFORE REMOVING THE SUPPLY (POSITIVE) (+) TERMINALS. REPLACE IN THE REVERSE ORDER (POSITIVE TERMINALS FIRST).

(48) **ENTANGLEMENT.** ENSURE ALL ITEMS OF LOOSE CLOTHING ETC ARE KEPT CLEAR OF ROTATING OBJECTS AT ALL TIMES.

(49) **TOXIC AND HAZARDOUS SUBSTANCE - CERABOARD ALUMINOSILICATE FIBRES.** ALL VARIANT (EXCEPT SCIMITAR) ENGINE COMPARTMENT BULKHEAD INSULATION MAY CONTAIN ALUMINOSILICATE FIBRES WHICH ARE HARMFUL WHEN INHALED AND AN IRRITANT TO THE SKIN AND EYES. USE APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN CLEANING THE COMPARTMENT TO PREVENT INHALATION AND CONTACT WITH SKIN AND EYES.

CAUTIONS

(1) **EQUIPMENT DAMAGE.** All electrical components are hermetically sealed in an inert helium gas atmosphere located in the outlet compartment, and are thus immune to climatic changes and must not be tampered with.

(2) **EQUIPMENT DAMAGE.** The outlet valve and buffer spring are mounted within the plunger and must not be extracted for inspection, as damage may be done to the highly finished plunger bore. The outside of the plunger is also highly finished and must be treated with great care.

(3) **EQUIPMENT DAMAGE.** Do not run engine with radiator in raised position.

(4) **EQUIPMENT DAMAGE.** Some gearboxes (early production) are secured in their packing crates by bolts, which screw directly into the gearbox end casings. If a new assembly is being installed, ensure that the correct screws, with dowty sealing washers, are fitted in place of the packing bolts.

(5) **EQUIPMENT DAMAGE.** No adhesive should be used with this method.

(6) **EQUIPMENT DAMAGE.** Dye penetrants are not to be used for crack detection.

(7) **ABRASIVE TYPE LIMITATION.** Dressing of plate surfaces must be carried out using power driven aluminium oxide (alumina) abrasive discs. Silicon carbide discs (carborundum) must not be used.

(8) **TORQUE LIMITATION.** Do not overtighten nut on bolt, such that dishing of the repair plate occurs.

(continued)

CAUTIONS (continued)

- (9) **PLATE DISTORTION LIMITATION.** Do not attempt to correct any plate distortion as cold setting will result in high residual stress and the use of heat would be detrimental to the ballistic properties of the plate.
- (10) **EQUIPMENT DAMAGE.** Do not rapidly increase and decrease the engine revolutions immediately after starting.
- (11) **EQUIPMENT DAMAGE.** To avoid damage to the engine, allow the engine to idle for 3-4 minutes to allow the turbocharger to slow and cool before stopping the engine. Only under operationally essential and circumstances of safety may the engine be switched off immediately prior to turbocharger run down and cool.
- (12) **EQUIPMENT DAMAGE.** Take care when lifting engine that coolant outlet elbow does not contact the coolant header tank.
- (13) **EQUIPMENT DAMAGE.** The engine idling speed is never to exceed 750 rpm otherwise the clutch may become engaged.
- (14) **EQUIPMENT DAMAGE.** Ensure timing pin is disengaged from camshaft drive gear before turning engine.
- (15) **EQUIPMENT DAMAGE.** Do not use tools when fitting the filter canister. Over tightening will damage the canister or the filter head by distorting the screw threads.
- (16) **EQUIPMENT DAMAGE.** If the air inlet louvres are open, no air is drawn through the radiator or charge air cooler. Therefore, only limited running of the engine in this condition is possible. The engine must be stopped before high coolant temperatures occur.
- (17) **EQUIPMENT DAMAGE.** Extreme care is required when removing the air inlet louvres to prevent damage to the radiator and charge air cooler matrices.
- (18) **EQUIPMENT DAMAGE.** When placing the driver's hatch support plate on the ground, ensure that the plate is well supported to ensure that no damage occurs to any of the attached components.
- (19) **EQUIPMENT DAMAGE.** Guide studs must be used to support the input coupling during removal to prevent damage to oil pump drive shaft and woodruff key.
- (20) **LOOSE ITEMS.** The replacement clutch assembly must be placed on a clean surface, with the freewheel assembly uppermost, before removing the freewheel retainers.
- (21) **EQUIPMENT DAMAGE.** The clutch assembly must be supported during removal to prevent damage to oil pump drive shaft and woodruff key.
- (22) **EQUIPMENT DAMAGE.** ZX 38 (Table 2, Serial 4) must be used on the torsion bar locating pin for installation to prevent seizing over time.
- (23) **EQUIPMENT DAMAGE.** DO NOT use a hammer to install the torsion bar locating pin as this will cause damage to the pin and the thread.
- (24) **EQUIPMENT DAMAGE.** DO NOT overtighten the grub screw as it may cause damage to the torsion bar locating pin.
- (25) **EQUIPMENT DAMAGE.** Do not over tighten the filter bowl. It will cause damage to the filter bowl and the strainer within it.

~~OFFICIAL SENSITIVE~~

~~OFFICIAL SENSITIVE~~

CHAPTER 4

TRANSMISSION

CONTENTS

Para	
1	Introduction (WARNINGS)
	Gearbox
2	General
5	Failure diagnosis and pressure testing of gearbox
9	Test procedure (WARNINGS) (CAUTIONS)
10	Gearbox mounting bolts
11	Removing (WARNINGS)
12	Refitting
	Steering brakes
13	Removing brake pads (WARNING)
14	Fitting brake pads
15	Removing brake caliper assembly (WARNING)
16	Dismantling (WARNING)
17	Reassembling
18	Refitting
	Steering brake disc
19	Removing (WARNING)
20	Refitting
	Output coupling and oil seal
21	Removing
22	Refitting
	Centrifugal clutch
23	Checking for lining wear (WARNING)
	Clutch replacement
24	Removing (WARNING) (CAUTIONS)
25	Refitting
26	Final drives (WARNING)
27	Removing
28	Refitting
29	Sprocket hub bearings - adjusting
	Seal, final drive input shaft
30	Replacing
	Main brake disc repair procedure
31	Removal
32	Refitting
	Main drive coupling
33	Removal - engine and gearbox installed
34	Examination
35	Refitting
	Dipstick tube
36	Removing (WARNING)
37	Refitting (CAUTION)

(continued)

CONTENTS (continued)

Para		
	Gear selector pawl spring renewal	
38	Removing	
39	Refitting	
	Gearbox by-pass oil strainer (TN15E, non-BATUS only)	
40	Removal	
41	Refitting	
	Gearbox by-pass oil strainer (TN15E, BATUS only)	
42	Removal	
43	Refitting (CAUTION)	

Table		Page
1	Tools and test equipment.....	3
2	Materials.....	3
3	Failure diagnosis	9

Fig		
1	Adapter to gearbox controller.....	7
2	Flow diagram.....	8
3	Adapter to fit gauge (TN15D).....	10
4	Pressure test point (TN15D)	10
5	Gearbox, external view (TN15E, non-BATUS only).....	11
6	Gearbox, external view (TN15E, BATUS only).....	12
7	Gearbox test sequence (TN15D)	13
8	Gearbox test sequence (TN15E)	14
9	Gear selector control valve	16
10	Arrangement of final drive assembly.....	17
11	Gearbox rear mounting components.....	18
12	Gearbox alignment check	19
13	Gearbox output.....	23
14	Clutch wear gauge	24
15	Location of centrifugal clutch holding strap.....	25
16	Location of input hub guide bolts	26
17	Location of freewheel retainers	27
18	Final drive removal	30
19	Guide stud	31
20	Main drive coupling	33
21	Gear selector pawl spring renewal.....	35
22	By-pass oil strainer assembly (TN15E, non-BATUS only).....	37

PROPRIETARY INFORMATION

This publication contains information proprietary to David Brown Engineering Limited. It is released to the United Kingdom Ministry of Defence (MOD) under the agreement that it is to be used solely for the repair and overhaul by MOD staff working in MOD facilities on TN15D and TN15E gearboxes for MOD vehicles. This information, wholly or in part, may not be used for any other purpose and may not be passed on to non MOD staff without prior written permission from David Brown Engineering Limited.

TABLE 1 TOOLS AND TEST EQUIPMENT

Serial (1)	NSN (2)	Part No (3)	Designation (4)	Qty (5)
1	9CVT 6685-99-942-0501	-	Gauge, pressure dial, 0-800 lbf/in ²	1
2	LV1SC/5120-99-819-1790	-	Spanner, wrench	1
3	LV1SC/5120-99-819-1792	FV719113	Puller, mechanical	1
4	LV1SC/5120-99-819-2156	-	Mandrel, oil seal	1
5	LV1SC/5120-99-500-3983	ST200042	Spanner, wrench	1
6	LV9CVT/5120-99-819-1777	FV770062	Tube assembly final drive	1
7	LV9CVT/4910-99-837-5201	-	Sling, final drive	1
8	LV9CVT/5120-99-819-1776	-	Spanner, wrench	1
9	TBA	TBA	Lifting sling	1
10	Local Manufacture	-	Clutch lining wear gauge	1
11	Local Manufacture	-	Final drive guide studs	1
12	NIV	-	Pipe assembly, comprising:	1
13	G2-4710-99-960-9645	-	. Piping, copper, 1/4 in. o.d. x 0.048 in. wall thickness x 5 ft lg	1
14	6MT1-4730-99-400-1169	-	. Nut, 1/4 BSP	2
15	6MT1-4730-99-804-7954	-	. Ferrule	2
16	6MT9/4720-99-825-5353	-	Hose	1
	NOTE Serial 16 can be used in lieu of Serial 12			
17	9CVT/4730-99-958-5904	AS37967	Adapter, gearbox, pressure point (TN15D only)	1
	NOTE Manufactured from G2/9510-99-960-5953	-	Steel bar, carbon, hexagon, 3/4 in. AF x 3 in. - See Fig 1	
18	NIV (see Fig 3)	AS37968	Adapter gauge (TN15D only)	1
	NOTE Manufactured from G2/9530-99-960-9041	-	Brass rod, hexagon, 1 in. AF x 22 in. lg - see Fig 3	
19	LV1SC/5120-99-819-2150	FV719120	Puller, mechanical	1
20	-	170676ST	Centrifugal clutch holding strap	1
21	-	170677ST	Input hub guide bolt	2
22	9CVTEM/5120-99-725-3957	FV2304831	Crowsfoot spanner, 27mm	1
23	9MVCV 4910-99-747-8553	OE5058	Test Kit Hydraulic	1

TABLE 2 MATERIALS

Serial (1)	NSN (2)	Part No (3)	Designation (4)	Qty (5)
1	H1/8040-99-224-8996	-	Sealing compound grade AV	A/R
2	9150-99-991-1124	-	OMD 90	A/R
3	8030-99-220-2495	-	Compound JC5A	A/R
4	H1/8020-99-220-2370	-	Jointing compound	A/R
5	H1/8030-99-225-1152	-	Loctite 641	A/R
6	H1/8030-99-224-8992	-	Loctite 241	A/R
7	H1/8030-99-225-3058	-	Loctite 574	A/R

(continued)

TABLE 2 MATERIALS (continued)

Serial (1)	NSN (2)	Part No (3)	Designation (4)	Qty (5)
8	H1ATS/8030-99-225-0248	-	Loctite 242	A/R
9	H1ATS/8030-99-762-3278	AS64068	Loctite 222E, Screwlock	A/R
10	POLPEP 9150-99-220-2418	-	Grease XG 279	A/R
11	H1ATS/8040-99-701-8040	-	Loctite 518	A/R

INTRODUCTION

1 This chapter details failure diagnosis and unit repairs to items of the transmission system, which are common to the CVR(T) Diesel vehicles.

WARNINGS

(1) **CADMIUM PLATING. THIS EQUIPMENT CONTAINS CADMIUM PLATED MATERIAL. REFER TO WARNING No. 31 IN THE PRELIMINARY PAGES, CADMIUM PLATING.**

(2) **PERSONAL INJURY. WHEN CARRYING OUT REPAIRS AND MAINTENANCE, THERE MAY BE A RISK OF SHARP EDGES AND METAL SPLINTERS, ENSURE WHEN CARRYING OUT THESE TASKS THAT CARE IS TAKEN, AND ADEQUATE PROTECTIVE EQUIPMENT IS USED.**

(3) **SILICA - TOXIC SUBSTANCE. BEFORE WORKING ON THE VEHICLE, REFER TO THE SILICA WARNING IN THE PRELIMINARY PAGES.**

GEARBOX**General**

2 The gearbox fitted to the vehicle may be either a TN15D or an uprated version, designated TN15E. The gearboxes are colour coded for identification; the TN15D gearbox has the top cover painted yellow and the TN15E top cover is painted blue. The TN15E gearbox is the preferred fit.

3 The TN15E has uprated internal components, ie. third generation brake bands, non-metallic bushes, pump drive shaft, bevel pinion locking and high range clutch. Brake band oil pressures have also been increased. Externally, an additional bypass oil strainer assembly with oil pressure test point and a gearbox usage monitor have been added. TN15E gearboxes fitted to vehicles held by BATUS only may have a repositioned bypass oil strainer assembly and replacement breather. The centrifugal clutch assembly is the same as that fitted to the TN15D. The operation of the TN15E gearbox is fundamentally the same as TN15D.

4 Failure diagnosis is to be carried out prior to repairs. Unit repairs to the TN15D and TN15E gearboxes consist of:

- 4.1 Removing and refitting the complete assembly.
- 4.2 Repair to steering brakes.
- 4.3 Replacing output seals.
- 4.4 Removing and refitting centrifugal clutch.

Failure diagnosis and pressure testing of gearbox

5 The following procedures will assist in locating/isolating faults in the transmission and detect hydraulic faults within the gearbox before extensive damage is caused. The pressure testing of the gearbox should be carried out whenever gearbox performance is suspect.

6 For initial fault diagnosis, when driver reports slip or loss of drive, consult flow diagram, refer to Fig 2, and Failure Diagnosis, Table 3.

7 To carry out pressure testing of the TN15D gearbox, the stores listed in Table 1, Serials 12 to 18 will be required.

8 The oil pressure testing procedure for the TN15E is the same as for the TN15D, but using a connection hose to connect the gauge to the test point (Fig 5 (3)) located on the by-pass oil strainer housing (4). The test point on TN15E gearboxes which may be fitted to vehicles held by BATUS only is located on the strainer manifold assembly (Fig 6 (1)) at the opposite side to the strainer bowl (2). Refer to Fig 8 for TN15E gearbox hydraulic oil pressures.

Test procedure

9 Carry out pressure test, as follows:

WARNINGS

(1) **DANGER TO LIFE AND LIMB. DRIVER'S COMPARTMENT MUST BE MANNED THROUGHOUT THE ENGINE RUN PERIOD.**

(2) **DANGER OF HEARING DAMAGE. ALL PERSONNEL IN IMMEDIATE VICINITY MUST WEAR EAR PROTECTORS WHEN ENGINE IS RUNNING.**

(3) **DANGER TO LIFE AND LIMB. ALL TOOLS AND EQUIPMENT USED DURING MAINTENANCE MUST BE REMOVED FROM THE ENGINE AND GEARBOX COMPARTMENTS PRIOR TO STARTING.**

9.1 Position vehicle on level ground, parking brake on.

9.2 Select neutral and run engine for ten minutes at 2000 rev/min.

9.3 Stop engine. Exhaust hydraulic pressure system by selecting a gear. Re-select neutral.

WARNING

ASBESTOS HAZARD. THE CLUTCH LININGS MAY CONTAIN ASBESTOS. ENSURE THAT ADEQUATE PRECAUTIONS ARE TAKEN TO PREVENT POSSIBLE INHALATION OF ANY DUST.

9.4 Open and secure transmission louvres and raise radiator.

9.5 Check oil level in accordance with Maintenance Schedule.

9.6 Connect pressure gauge (either Table 1, Serial 1 or Serial 23) to pressure test point:

9.6.1 TN15D. Remove pressure test point blanking screw (see Fig 4) and fit pressure gauge with hose and adapters (Table 1, Serial 12 or Serial 16).

9.6.2 TN15E (non-BATUS only). Remove protection cap from pressure test point blanking located on the by-pass oil strainer housing (see Fig 5) and fit pressure gauge with hose and adapters.

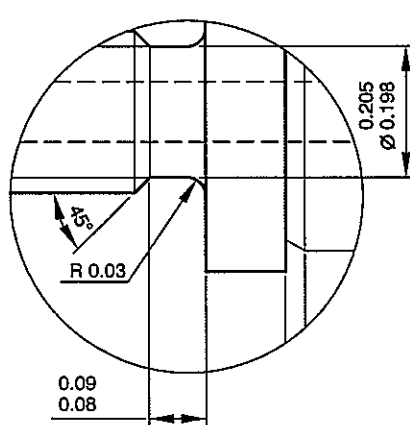
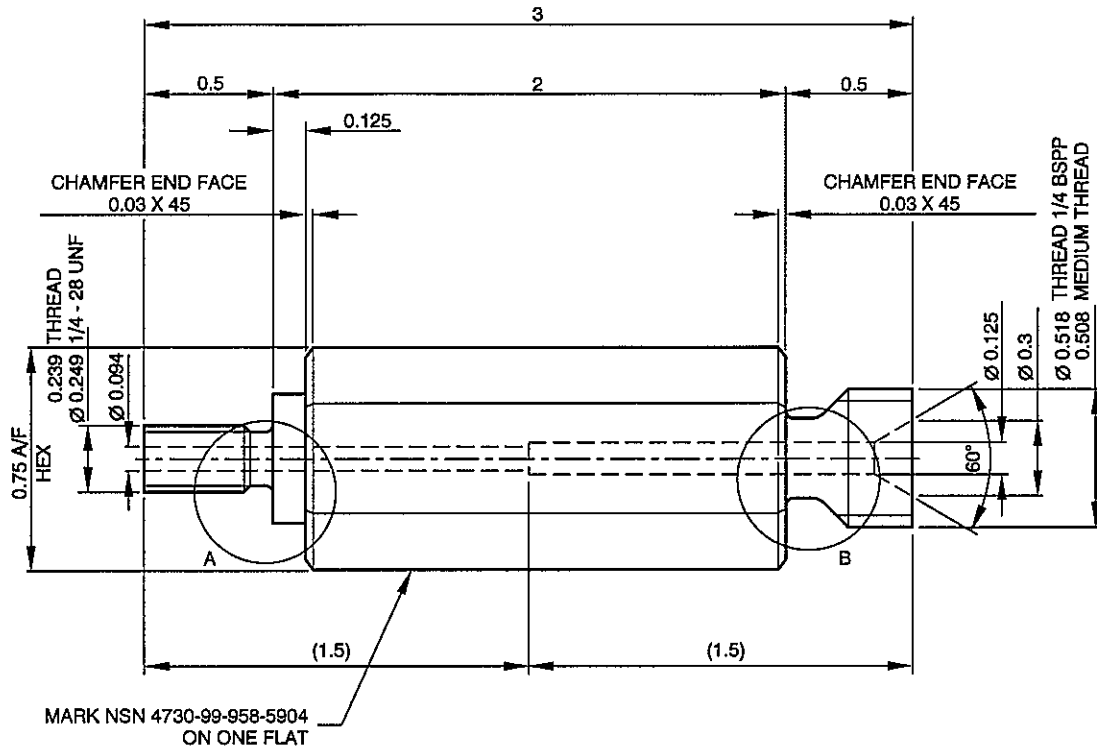
9.6.3 TN15E (BATUS only). Remove protection cap from pressure test point blanking located on the strainer manifold assembly (see Fig 6) and fit pressure gauge with hose and adapters.

- 9.6.4 Rest gauge on drivers hatch support plate such that it can be seen from the driver's seat.

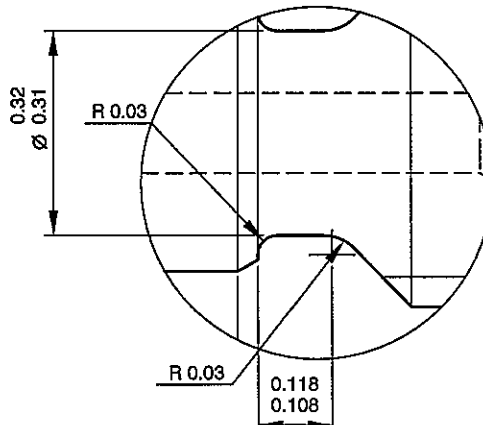
CAUTION

EQUIPMENT DAMAGE. If the air inlet louvres are open, no air is drawn through the radiator or charge air cooler. Therefore, only limited running of the engine in this condition is possible. The engine must be stopped before high coolant temperatures occur.

- 9.7 Lower radiator.
- 9.8 Select neutral on forward/reverse control.
- 9.9 Start engine and run at idling speed. Slacken adapter closest to gauge to allow air to bleed from pipe. Tighten adapter and check for leaks.
- 9.10 Run engine at 2000 rev/min and proceed with tests as detailed in Fig 7 (TN15D) or Fig 8 (TN15E).
- 9.11 Stop engine; exhaust hydraulic system pressure by selecting a gear. Reselect neutral and raise radiator. Remove test equipment; refit blanking screw (TN15D) or pressure test point protection cap (TN15E) and lower the radiator.
- 9.12 Start engine and check for leaks. Lower and secure transmission louvres.



DETAIL A



DETAIL B

MAT:- STEEL BS 970 070M20

DIMENSIONS IN INCHES

CVR50004

Fig 1 Adapter to gearbox controller

INFORMATION PROPRIETARY TO DAVID BROWN ENGINEERING LTD
See declaration on page 2

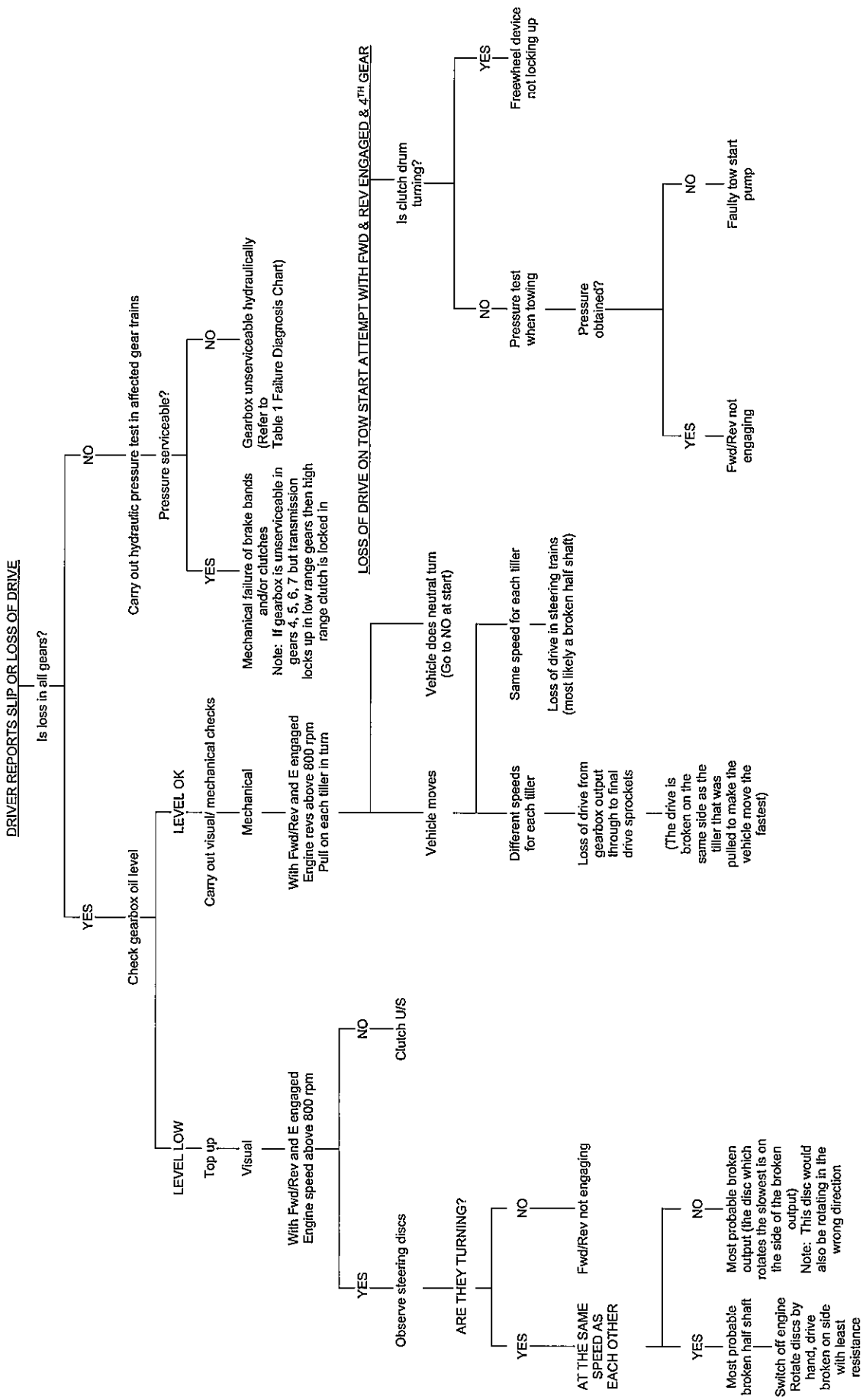


Fig 2 Flow diagram

INFORMATION PROPRIETARY TO DAVID BROWN ENGINEERING LTD

See declaration on page 2

TABLE 3 FAILURE DIAGNOSIS

Serial (1)	Failure (2)	Possible Cause (3)
1	No drive in any gear but neutral turn possible.	1.1 Low oil level (no pressure). 1.2 No oil pressure (pump drive shaft).
2	No drive in any gear and no neutral turn. (Centrifugal clutch serviceable)	2.1 Forward/reverse selector defective. 2.2 Mechanical failure of a half-shaft. 2.3 Final drive defective, or a broken gearbox output shaft.
3	No drive in E or 4 but operates normally in other positions.	3.1 E/4 brake defective.
4	No drive in 2 or 5 but operates normally in other positions.	4.1 2/5 brake defective.
5	No drive in 3 or 6 but operates normally in other positions.	5.1 3/6 brake defective.
6	Centrifugal clutch rotating - no drive in E, 2 and 3 but operates normally in other positions.	6.1 Low range brake defective.
7	Centrifugal clutch not rotating - no drive in E, 2 and 3 but operates normally in other positions.	7.1 High range clutch failure.
8	No drive in 4, 5, 6 and 7 but operates normally in other positions.	8.1 High range clutch defective.
9	Drive in all positions except 7.	9.1 7 speed clutch defective.
10	Vehicle slows down rapidly on changing gear.	10.1 Two gears engaged at the same time.
11	Continuous gear slip.	11.1 Low oil pressure or worn brake bands/clutches.
12	Tow start impossible (engine not turning).	12.1 Tow start pump defective.
13	No tow start and no engine braking on over-run.	13.1 Clutch free wheel device defective.
14	Stiff gear change.	14.1 Usually rotor mechanism.

NOTES

- Serial 1 Determine the oil pressure by carrying out the oil pressure test.
- 2 Failure diagnosis must be carried out paying particular attention to the following:
- 2.1 Look for failure of the bell-crank pin, cracks at the selector fork housing and, if the fork shaft moves normally, suspect that the fork locking screw has failed.
- 2.2 With a broken half-shaft, the steering discs will rotate in their normal direction, but much faster than normal, when an attempt is made to drive the vehicle.
- 2.3 If the gearbox output shaft or the final drive has failed, the steering-brake disc on the unaffected side will rotate in its normal direction to normal but slower. The unaffected side disc will rotate faster than normal.
- 2.4 If the final drive input shaft is turning when an attempt is made to drive the vehicle, the fault is within the final drive. If not, then the fault is in the gearbox output. The disc movements will only take place when an attempt is made to drive the vehicle.
- 10 Most likely cause is a defective gasket (TN15D only) on the blanking plate fitted when the old type modulator block is removed.
- 11 As the band linings wear there is no external indicator. If the oil pressures are within the limits the band ends are touching, and the linings worn out. A common cause of clutch failure is swarf build-up inside the clutches.
- 12 Tow-start pump pressure can be checked by towing the vehicle in 4th gear, with a gauge fitted to the gearbox. The gauge should register pressure up to 3.5 kgf/cm² (50 lb/in²).
- 14 To make a gear change, when oil pressure is normal, the load required to move the controller lever is normally about 13.4 kgf (35 lbf). If a check of the complete linkage shows that it is not fouling anywhere, measure the force required to make a gear change at the controller lever.

NOTE

This can be measured with a spring balance attached to the hole at the end of the controller lever. Measurement must be recorded while pulling the spring balance perpendicular to the controller lever.

If the recorded load is excessive the controller should be replaced. A suggested figure for 'excessive' is anything in excess of 24.5 kgf (55 lbf).

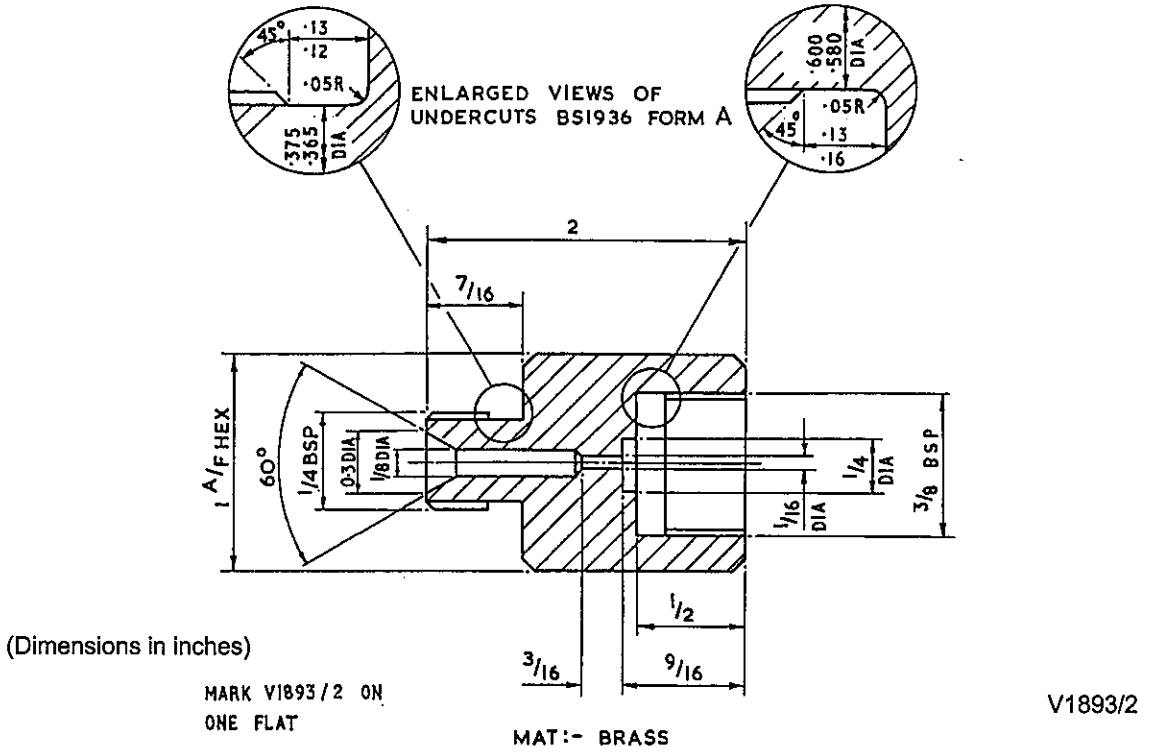


Fig 3 Adapter to fit gauge (TN15D)

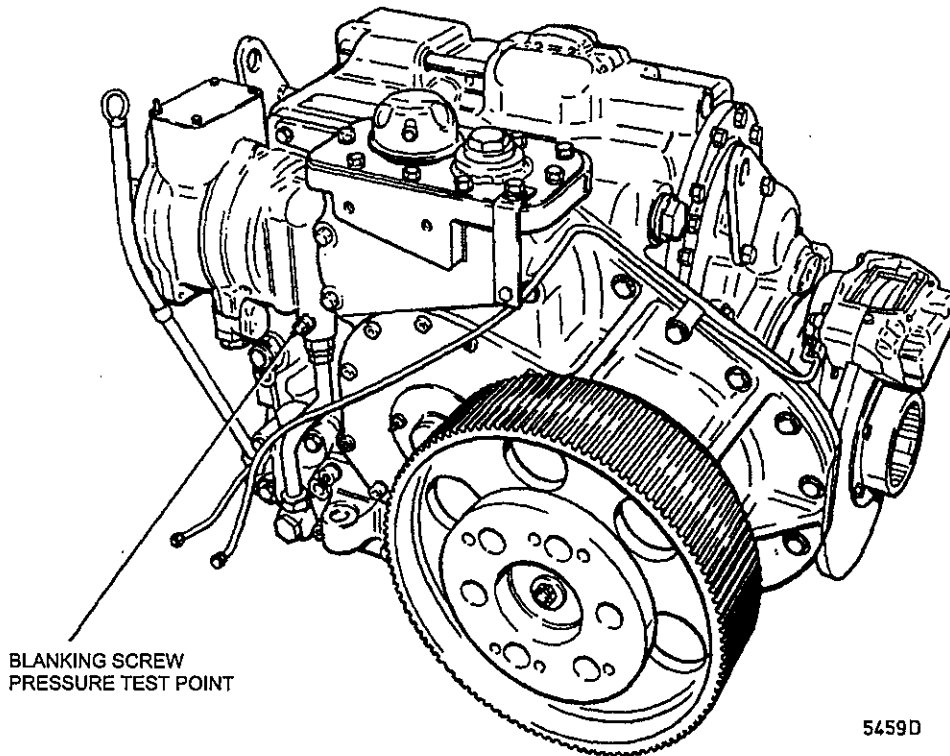
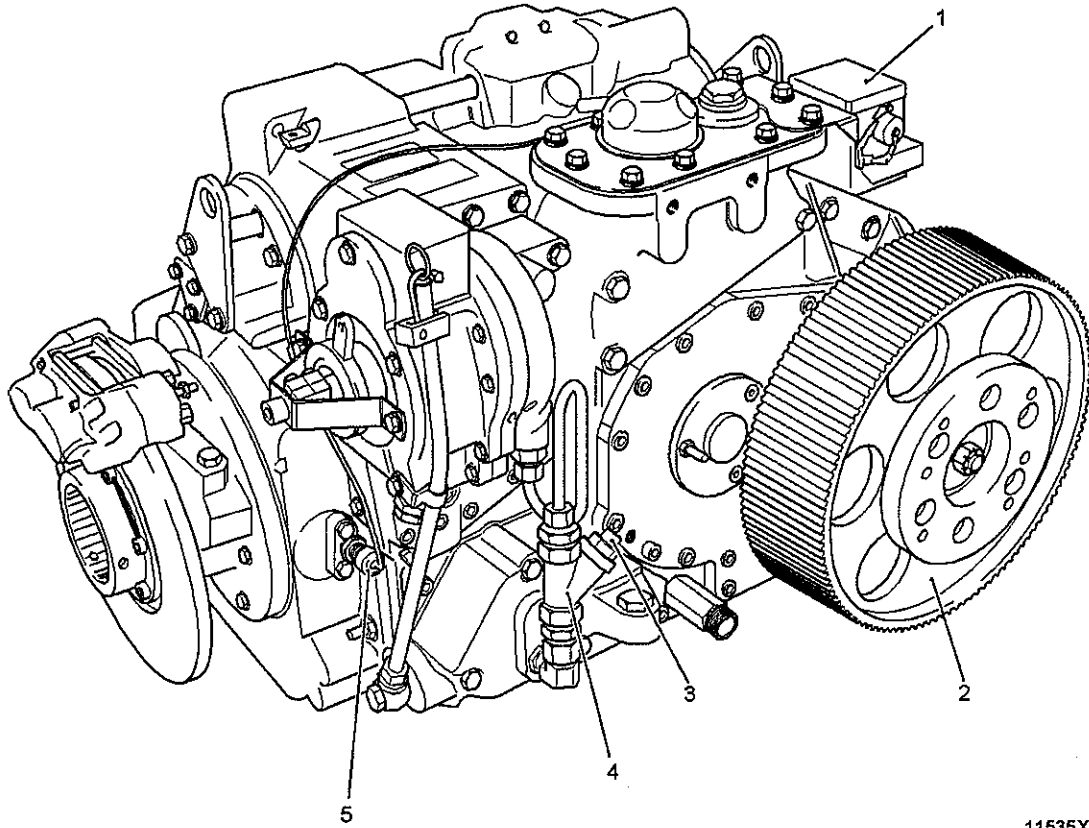


Fig 4 Pressure test point (TN15D)

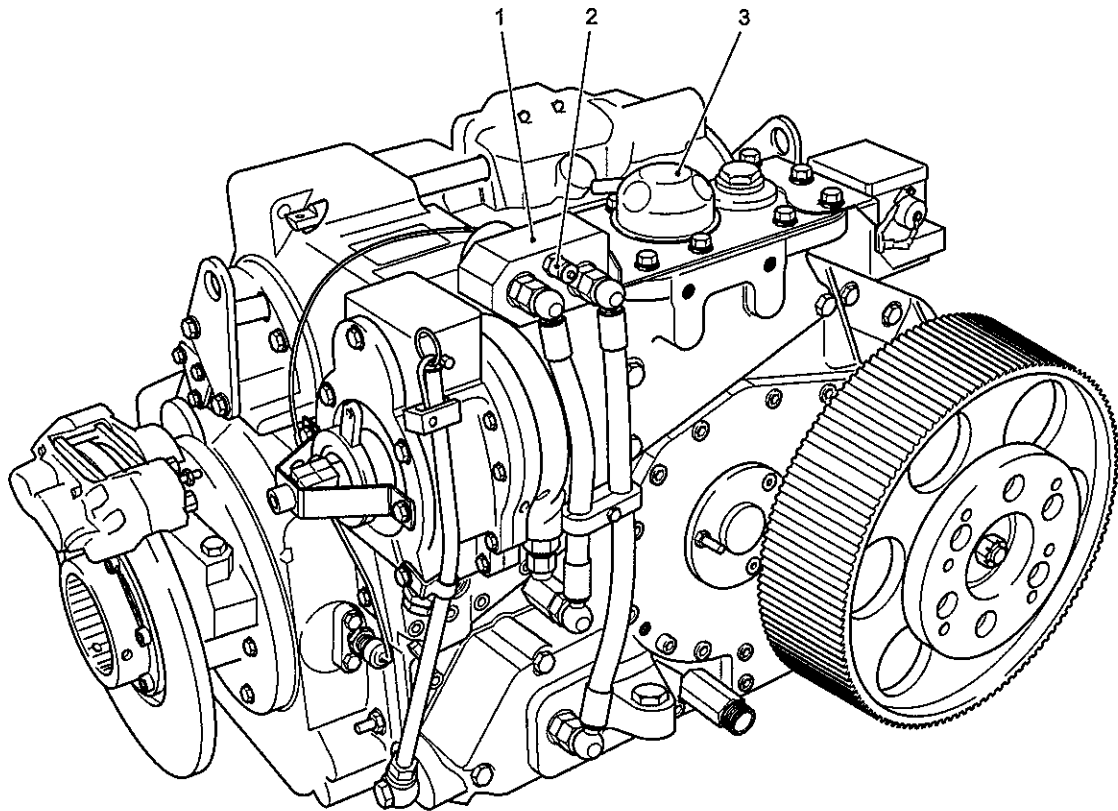
INFORMATION PROPRIETARY TO DAVID BROWN ENGINEERING LTD
See declaration on page 2



11535X

- | | | | |
|---|--------------------------|---|------------------------------|
| 1 | Gearbox usage monitor | 4 | By-pass oil strainer housing |
| 2 | Cooling fan drive pulley | 5 | Sender unit |
| 3 | Oil pressure test point | | |

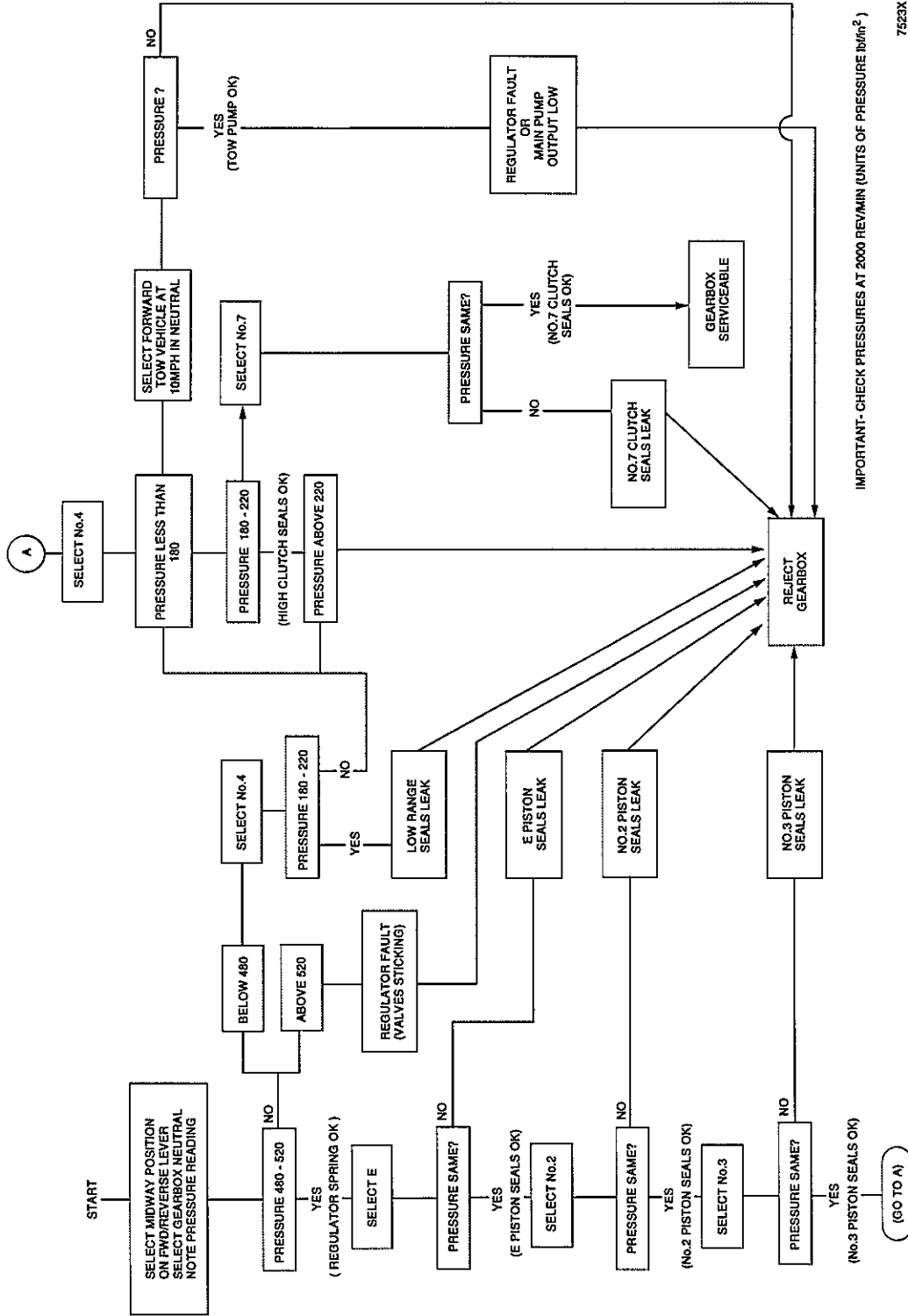
Fig 5 Gearbox, external view (TN15E, non-BATUS only)



11606X

- 1 Strainer manifold assembly
- 2 Oil pressure test point
- 3 Breather

Fig 6 Gearbox, external view (TN15E, BATUS only)



IMPORTANT- CHECK PRESSURES AT 2000 REV/MIN (UNITS OF PRESSURE lb/in²)

7523X

Fig 7 Gearbox test sequence (TN15D)

INFORMATION PROPRIETARY TO DAVID BROWN ENGINEERING LTD
See declaration on page 2

OFFICIAL-SENSITIVE

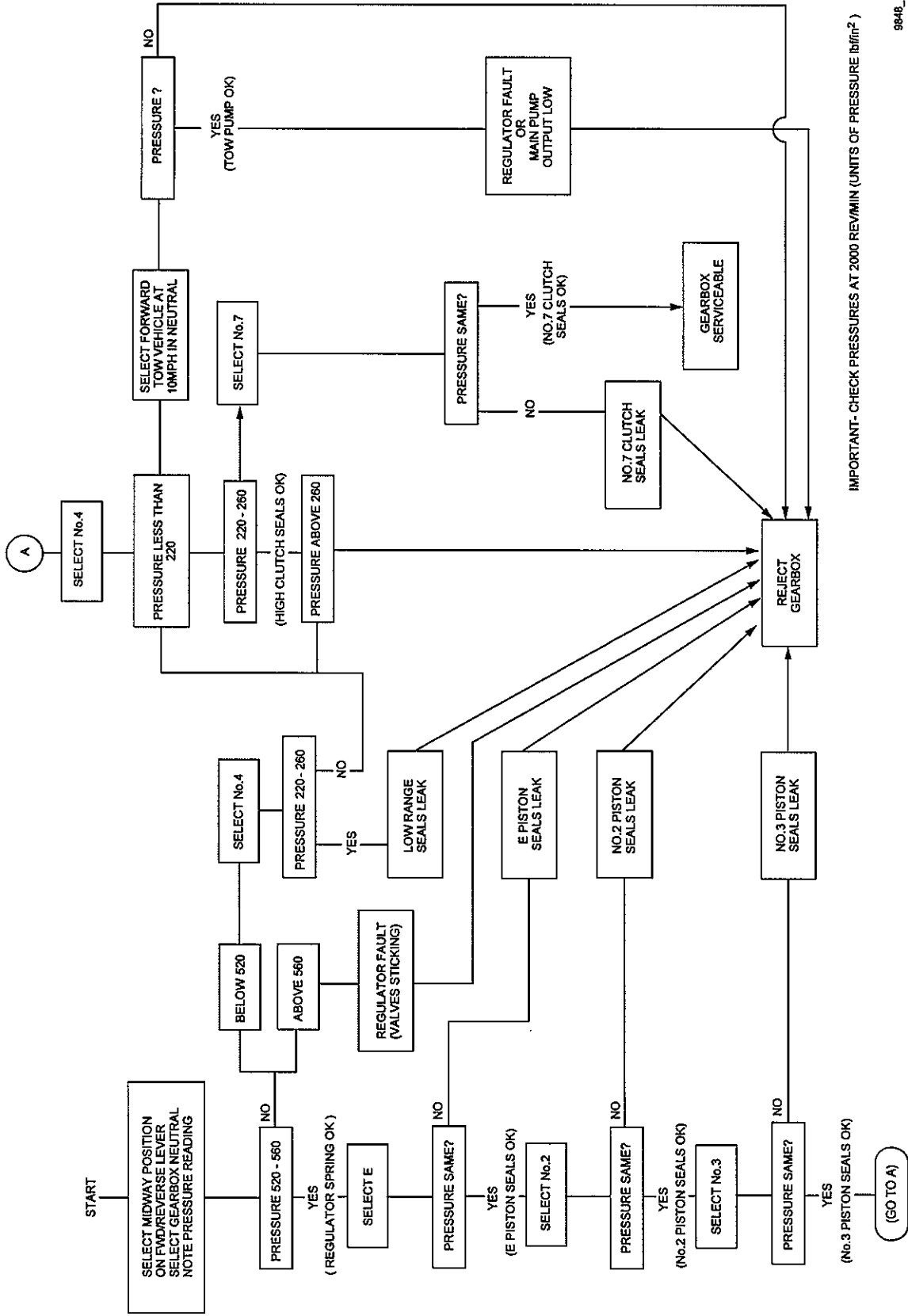


Fig 8 Gearbox test sequence (TN15E)

IMPORTANT- CHECK PRESSURES AT 2000 REV/MIN (UNITS OF PRESSURE lbf/in²)

9848_1X

INFORMATION PROPRIETARY TO DAVID BROWN ENGINEERING LTD
See declaration on page 2

Gearbox mounting bolts

10 The gearbox is located on two cradle mounting blocks welded to the hull, each having a gearbox mounting clamp fitted on top with two bolts. These are located each side of the gearbox, inboard of the steering calipers. The gearbox mounting clamps are not interchangeable. The rear of the gearbox is supported on shims on a boss to the left of the centre line, retained by a single bolt. When fitting new mounting bolts ensure that the shims at the rear mounting are correctly placed to ensure correct alignment of the gearbox. Refer to Sub-para 12.1.2 and Fig 11.

Removing

11 To remove the gearbox, proceed as follows:

WARNINGS

(1) DANGER TO LIFE AND LIMB. BEFORE PERSONNEL ARE ALLOWED UNDER THE VEHICLE, THE PARKING BRAKE MUST BE FULLY APPLIED AND THE VEHICLE SECURED AGAINST MOVEMENT.

(2) DANGER FROM SCALDING FROM HOT OIL. PROTECTIVE GLOVES MUST BE WORN WHEN REMOVING THE GEARBOX OIL DRAIN PLUG.

11.1 Position the vehicle on firm level ground, apply the parking brake, chock the road wheels and turn the hull battery master switch to **OFF**.

11.2 Position a container with a capacity greater than 18 litres under the vehicle, remove the access plate from the underside of the vehicle and remove gearbox drain plug. Drain the gearbox oil. Operate the hull drain valve-actuating knob.

11.3 Remove the engine and transmission louvred access covers.

11.4 Remove driver's hatch support plate as detailed in Chap 7.

11.5 Remove driver's seat as detailed in Chap 7.

11.6 Remove radiator as detailed in Chap 3.

11.7 Disconnect gear selector rod from gearbox and inside drivers compartment. Disconnect the forward/reverse control rod.

11.8 Disconnect starter motor inhibitor cable (Fig 9 (2)) from the gear selector control valve and the gear position indicator drive cable from the gear selector control valve spindle. Unclip the hull drain valve cable from the 'P' clip on top of the gear selector control valve.

11.9 Disconnect and remove oil sensor switch.

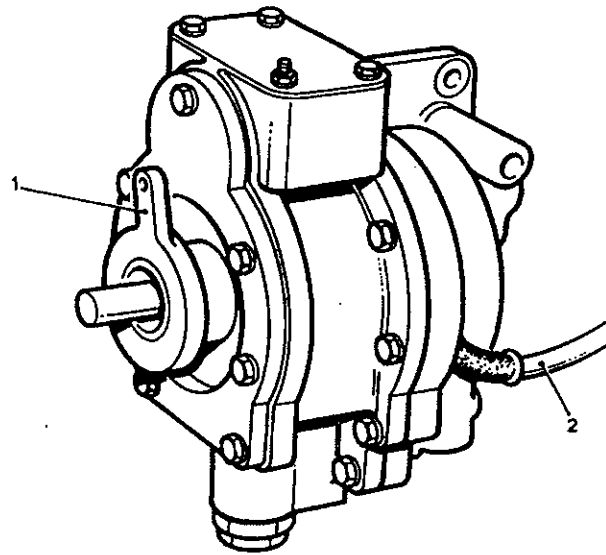
11.10 Disconnect and fit plugs to oil hoses.

11.11 Blank off the air vent hole on the steering brake hydraulic reservoir cap with adhesive tape to prevent loss of fluid. Disconnect the hydraulic pipes serving the steering brake callipers by unscrewing the pipe unions on the transmission side of the driver/transmission compartment bulkhead. Plug the unions to prevent the entry of foreign matter.

11.12 Remove the engine/transmission compartment bulkhead assembly as detailed in Chap 7. Remove hydraulic reservoirs' bracket securing bolts. It is not necessary to disconnect hydraulic pipes.

11.13 Disconnect the pipes at the oil filter inlet and outlet. Remove the bracket securing the oil pipe to the selector block and lay the pipe over gearbox.

11.14 Remove drive coupling lower shield.



54580

1 Selector lever

2 Starter motor inhibitor cable

Fig 9 Gear selector control valve

11.15 Remove the driver/transmission compartment bulkhead securing bolts to leave gearbox heat exchanger keep plate in place on hull, and lift out bulkhead using two lifting eyes screwed into the bulkhead top and a suitable sling.

11.16 Remove the main drive coupling and adaptor assembly as detailed in Para 33.

11.17 Disconnect the final drive input shaft(s) as follows:

11.17.1 Remove the end cap cover from the centre of the final drive hub.

11.17.2 At the gearbox output coupling, depress the spring loaded locating plunger and pull the shaft out of the coupling.

11.18 Remove four bolts from the gearbox clamps and remove clamps and anti vibration liners.

NOTE

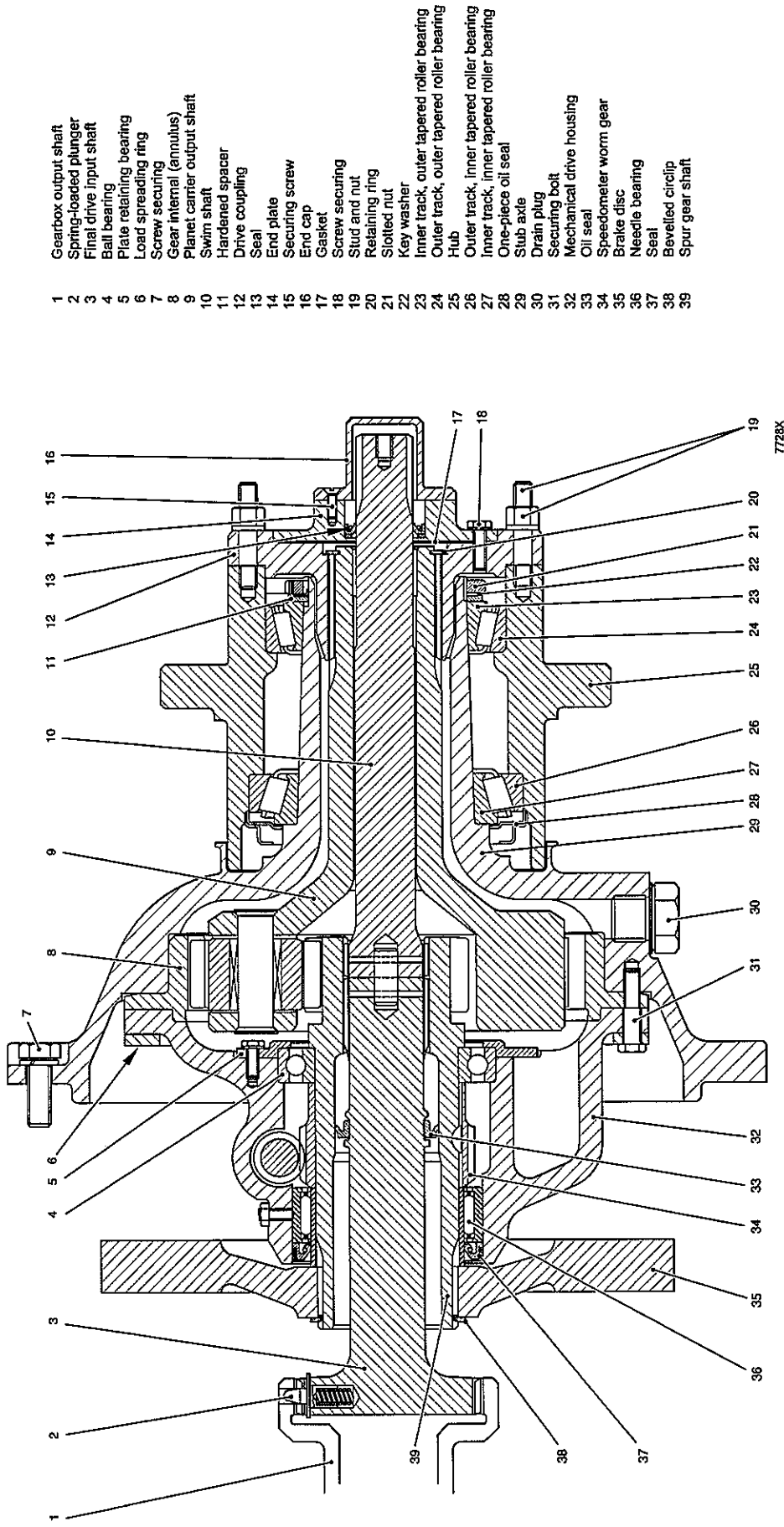
The clamps are stamped with the hull number of the vehicle to which they are machined during production. It is therefore essential to ensure that these clamps are not divorced from their parent vehicle, as they are not interchangeable with different hulls.

11.19 Remove the bolt from the mounting on the left-hand rear of the gearbox. Packing is fitted below this mounting to align fan belt drive. Collect and retain shims, washer, seating ring and pad.

NOTE

The approximate weight of the gearbox is 430 kg (950 lb).

11.20 Remove the gearbox, using lifting sling (Table 1, Serial 9).

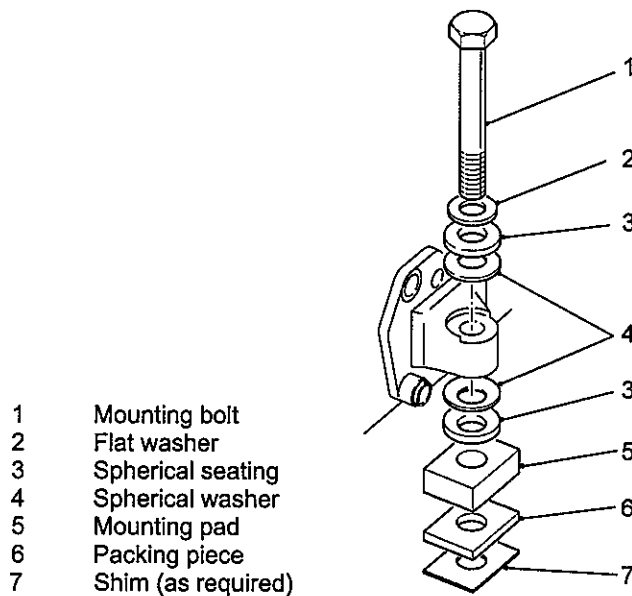


- 1 Gearbox output shaft
- 2 Spring-loaded plunger
- 3 Final drive input shaft
- 4 Ball bearing
- 5 Plate retaining bearing
- 6 Load spreading ring
- 7 Screw securing
- 8 Gear internal (annulus)
- 9 Planet carrier output shaft
- 10 Swim shaft
- 11 Hardened spacer
- 12 Drive coupling
- 13 Seal
- 14 End plate
- 15 Securing screw
- 16 End cap
- 17 Gasket
- 18 Screw securing
- 19 Stud and nut
- 20 Retaining ring
- 21 Slotted nut
- 22 Key washer
- 23 Inner track, outer tapered roller bearing
- 24 Outer track, outer tapered roller bearing
- 25 Hub
- 26 Outer track, inner tapered roller bearing
- 27 Inner track, inner tapered roller bearing
- 28 One-piece oil seal
- 29 Stub axle
- 30 Drain plug
- 31 Securing bolt
- 32 Mechanical drive housing
- 33 Oil seal
- 34 Spectrometer worm gear
- 35 Brake disc
- 36 Needle bearing
- 37 Seal
- 38 Bevelled circlip
- 39 Spur gear shaft

Fig 10 Arrangement of final drive assembly

INFORMATION PROPRIETARY TO DAVID BROWN ENGINEERING LTD
See declaration on page 2

OFFICIAL-SENSITIVE



9885_1X

Fig 11 Gearbox rear mounting components

Refitting

12 To refit the gearbox, proceed as follows:

12.1 Refit gearbox in reverse order to removing, ensuring that the gearbox is correctly seated in its mountings:

12.1.1 The hexagon adapters (inlet from filter and outlet to oil heat exchanger) are tightened to 205 Nm before connecting the lubrication oil pipes.

12.1.2 The original packing comprising, washers, spherical seating, packing piece, shims and mounting pad are refitted below rear mounting in the correct order, see Fig 11.

NOTE

The mounting pad (5) (with packing piece (6) and shim (7) (as required) underneath) should be mounted against the rear gearbox mount welded to the torsion bar cover, with any additional steel shims placed underneath the packing piece. If it is not assembled in this configuration, wear of the mounting pad occurs, causing the rear gearbox mounting to become misaligned.

12.1.3 The rear mounting bolt (1) is tightened to a torque of 135 Nm (100 lbf ft).

12.1.4 The gearbox clamp anti-vibration fibre liners are fitted correctly and the bolts are tightened to a torque of 84 Nm (62 lbf ft).

12.1.5 Fan drive toothed belt must be fitted around the clutch drum before the drive coupling is fitted. Ensure that indicator arrows are pointing in the direction of rotation.

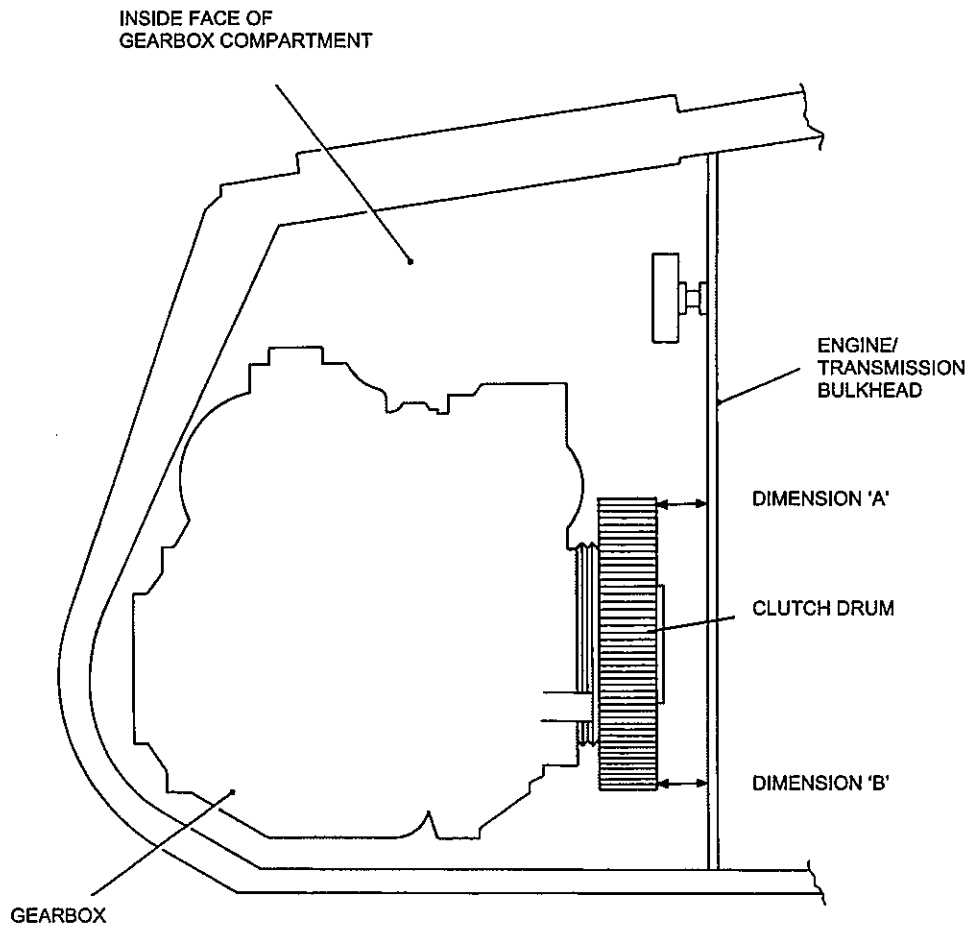
12.1.6 Steering disc securing screws are wire locked.

12.2 Check and adjust shimming to ensure correct gearbox alignment as follows:

12.2.1 Place a straightedge across the top and bottom inside vertical faces of the clutch drum to the right side of the gearbox compartment, see Fig 12.

12.2.2 Mark the side plate of the compartment and measure the distance from each mark back to the gearbox/engine bulkhead (dimensions 'A' and 'B').

INFORMATION PROPRIETARY TO DAVID BROWN ENGINEERING LTD
See declaration on page 2



7524X

Fig 12 Gearbox alignment check

12.2.3 If dimension 'A' is less than 'B' add packing. If dimension 'A' is greater than 'B' remove packing. N.B. Any packing removed from below the bottom surface of the gearbox rear mounting is to be replaced by a washer of equivalent thickness under the bolt head. Once the gearbox mounting has been set with the bulkhead, the packing should not be disturbed.

NOTE

The gearbox will pivot around its front clamps therefore this will not affect alignment with final drives.

12.2.4 Refer to Cat 522, Chap 1 and use engine-to-gearbox alignment tool to accurately check the alignment. Adjust shimming at the engine mountings as necessary.

12.3 Refit the engine to gearbox drive coupling and adaptor assembly, ensuring that the following points are embodied:

12.3.1 Clean the fixing bolts and apply screwlock (Table 2, Serial 9).

12.3.2 The bolts are tightened to 88 Nm (65 lbf. ft).

12.4 Refit and adjust alternator drive belt.

- 12.5 Refit and bleed steering brake pipework and carry out a functional test of the system as detailed in Cat 201, Chap 12.
- 12.6 Reconnect all oil pipework, ensuring unions are oil tight.
- 12.7 Renew gearbox oil filter element and strainer element (TN15E only) as detailed in Cat 201, Chap 7.
- 12.8 Refill gearbox with oil, as specified in the Maintenance Schedule.
- 12.9 Remove the adhesive tape from the air vent hole on the steering brake hydraulic reservoir cap, top up and bleed the system.
- 12.10 Refill engine cooling system as detailed in Chap 2.
- 12.11 After final assembly, check that fan drive belt runs in the centre of the pulleys when the engine is running.

STEERING BRAKES**Removing brake pads**

- 13 To remove the brake pads, proceed as follows:
 - 13.1 Lift transmission cover louvres.
 - 13.2 Raise radiator to upright position.

WARNING

ASBESTOS HAZARD. THE BRAKE PADS MAY CONTAIN ASBESTOS. ENSURE THAT ADEQUATE PRECAUTIONS ARE TAKEN TO PREVENT POSSIBLE INHALATION OF ANY DUST.

- 13.3 Remove spring pins from pad locating pins and remove locating pins.
- 13.4 Retract brake pad to establish full travel.
- 13.5 Remove brake pads.

Fitting brake pads

- 14 To fit the steering-brake pads, proceed as follows:
 - 14.1 Push piston back into calipers. Do not use a sharp instrument as damage to pistons may occur.
 - 14.2 Slide in brake pads, refit locating pins, ensuring that the head of the locating pin is outboard of the gearbox, and refit spring pins.
 - 14.3 Apply steering-brakes to set pistons in correct position and check hydraulic fluid level.
 - 14.4 Lower radiator and refit transmission cover louvres.

Removing brake caliper assembly

- 15 To remove the brake caliper assembly, proceed as follows:
 - 15.1 Remove transmission cover louvres.
 - 15.2 Raise radiator to upright position.

WARNING

ASBESTOS HAZARD. THE BRAKE PADS MAY CONTAIN ASBESTOS. ENSURE THAT ADEQUATE PRECAUTIONS ARE TAKEN TO PREVENT POSSIBLE INHALATION OF ANY DUST.

- 15.3 Disconnect hydraulic brake pipe at caliper and drain fluid into clean container.
- 15.4 Remove screws securing caliper mounting bar to gearbox and lift caliper assembly from vehicle.

Dismantling

16 To dismantle the brake caliper assembly, proceed as follows:

WARNING

ASBESTOS HAZARD. THE BRAKE PADS MAY CONTAIN ASBESTOS. ENSURE THAT ADEQUATE PRECAUTIONS ARE TAKEN TO PREVENT POSSIBLE INHALATION OF ANY DUST.

- 16.1 Remove screws securing caliper to caliper mounting bar.
- 16.2 Clean exterior of caliper.
- 16.3 Remove brake pads.
- 16.4 Using fingers only, ease dust excluders from pistons.
- 16.5 Remove pistons. If difficulty is encountered fit a lubricating nipple into oil feed inlet tapped hole and using a lubricating gun, pump in hydraulic fluid to free pistons. Do not use a sharp instrument to prise out pistons.
- 16.6 Remove dust excluders from cylinders.
- 16.7 Thoroughly clean pistons and cylinders and inspect for signs of scoring and general wear. Renew where necessary. Replace all seals and dust excluders.

Reassembling

17 To reassemble brake caliper assembly, proceed as follows:

- 17.1 Ensure that pistons and cylinders are free from dirt or traces of lint and cleaning rag. Moisten both with clean brake fluid.
- 17.2 Remount caliper assembly to mounting bar and tighten screw to 75 - 81 Nm (55-60 lbf ft).

Refitting

18 To refit brake caliper assembly, proceed as follows:

- 18.1 Ensure pistons are pushed fully into cylinders.
- 18.2 Fit caliper unit and mounting bracket to gearbox, tighten screws to 115 Nm (85 lbf ft).
- 18.3 Fit brake pads, refit locating pins, ensuring that the head of the locating pin is outboard of the gearbox, refit spring clips and connect hydraulic pipes.
- 18.4 Fill reservoir with hydraulic fluid and bleed system. Check for leaks.

Steering brake discRemoving

19 To remove the steering-brake disc, proceed as follows:

19.1 Remove gearbox (see Para 11).

WARNING

ASBESTOS HAZARD. THE BRAKE PADS MAY CONTAIN ASBESTOS. ENSURE THAT ADEQUATE PRECAUTIONS ARE TAKEN TO PREVENT POSSIBLE INHALATION OF ANY DUST.

19.2 Remove caliper assembly (see Para 15).

19.3 Remove locking wire from socket head securing screws and remove screws, also load spreading rings.

19.4 Remove disc.

Refitting

20 To refit the steering-brake disc, proceed as follows:

20.1 When refitting disc ensure that load spreading rings if fitted (see Sub-Para 19.3 above) are refitted in reverse order to removal. Tighten screws to 54 Nm (40 lbf ft) and ensure they are wire locked.

20.2 If load spreading rings are not fitted, refit disc in reverse order to removal. Tighten screws to 48 Nm (35 lbf ft) and ensure they are wire locked.

Output coupling and oil sealRemoving

21 To remove the output coupling and oil seal, refer to Fig 13 and proceed as follows:

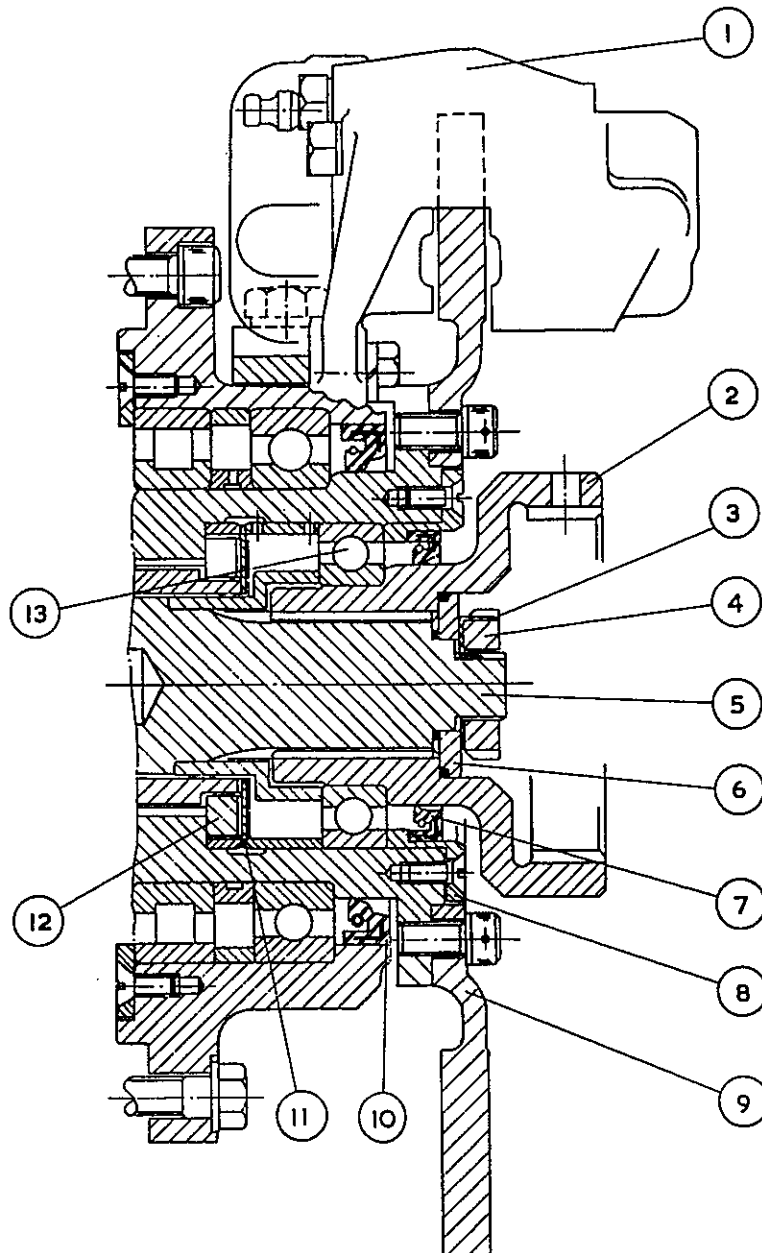
21.1 Access to the output coupling can be gained by either removal of the gearbox or the appropriate final drive assembly.

21.2 Release locking tab (3) and remove slotted nut (4) using spanner (Table 1, Serial 2).

21.3 Remove washer (6) and withdraw coupling (2) using puller (Table 1, Serial 3).

21.4 Remove countersunk screws securing oil seal housing (8) and remove housing.

21.5 Remove oil seal (7) from housing.



v8/49

- | | | | |
|---|-------------------|----|------------------|
| 1 | Steering caliper | 8 | Oil seal housing |
| 2 | Output coupling | 9 | Disc |
| 3 | Locking tab | 10 | Oil seal |
| 4 | Slotted nut | 11 | Locking washer |
| 5 | Output shaft | 12 | Ring nut |
| 6 | Washer | 13 | Ball bearing |
| 7 | Coupling oil seal | | |

Fig 13 Gearbox output

INFORMATION PROPRIETARY TO DAVID BROWN ENGINEERING LTD
See declaration on page 2

Refitting

22 To refit the output coupling (2) and oil seal (7), proceed as follows:

- 22.1 Refit seal to housing using tool (Table 1, Serial 4).
- 22.2 Refit coupling to gearbox in reverse order to removing.
- 22.3 Refit gearbox or final drive assembly as applicable.

CENTRIFUGAL CLUTCH**Checking for lining wear**

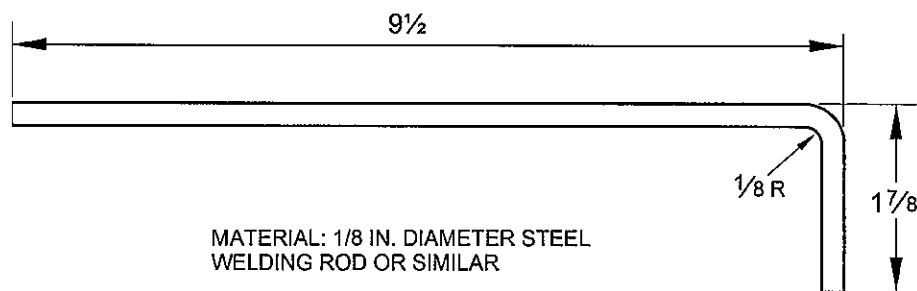
23 To check clutch lining for wear, proceed as follows:

- 23.1 Manufacture gauge detailed in Fig 14.
- 23.2 Remove transmission compartment louvres.

WARNING

ASBESTOS HAZARD. THE CLUTCH LININGS MAY CONTAIN ASBESTOS. ENSURE THAT ADEQUATE PRECAUTIONS ARE TAKEN TO PREVENT POSSIBLE INHALATION OF ANY DUST.

23.3 Offer up gauge to clutch; if gauge pin enters between linings and clutch drum, clutch assembly should be replaced.



9716_1X

Fig 14 Clutch wear gauge

Clutch replacement

Removing

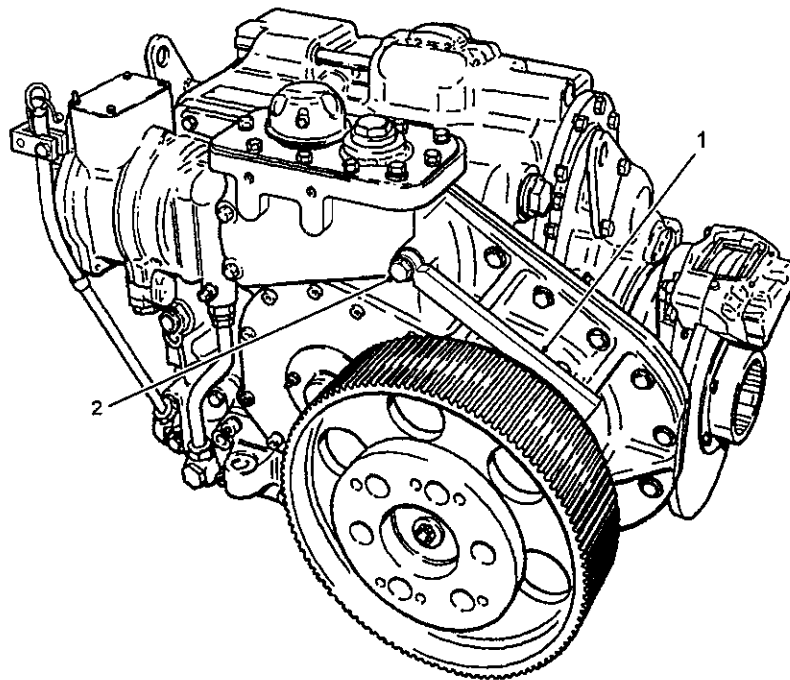
24 The centrifugal clutch is to be replaced as a complete assembly (supplied as Replacement Kit, Centrifugal Clutch, 9CVT 2520-99-507-3102). To remove the centrifugal clutch assembly, proceed as follows:

WARNING

ASBESTOS HAZARD. THE CLUTCH LININGS MAY CONTAIN ASBESTOS. ENSURE THAT ADEQUATE PRECAUTIONS ARE TAKEN TO PREVENT POSSIBLE INHALATION OF ANY DUST.

24.1 The clutch assembly can be removed with the gearbox installed. Prepare as for removal of gearbox as detailed at Sub-paras 11.1 – 11.16 to gain access to clutch.

24.2 Attach centrifugal clutch holding strap (Table 1, Serial 20), to gearbox casing securing bolt (Fig 15 (2)) and engage free end in clutch outer member, to prevent clutch outer member rotating.



9220X

- 1 Centrifugal clutch holding strap 2 Gearbox casing securing bolt

Fig 15 Location of centrifugal clutch holding strap

24.3 Remove split pin (Fig 16 (9)) castellated nut (3) and special washer (8) from oil pump drive shaft (6).

24.4 Remove six hexagon head bolts (1) and spring washers (2) securing input hub (4) and toothed belt drive pulley (5) to clutch inner member.

CAUTION

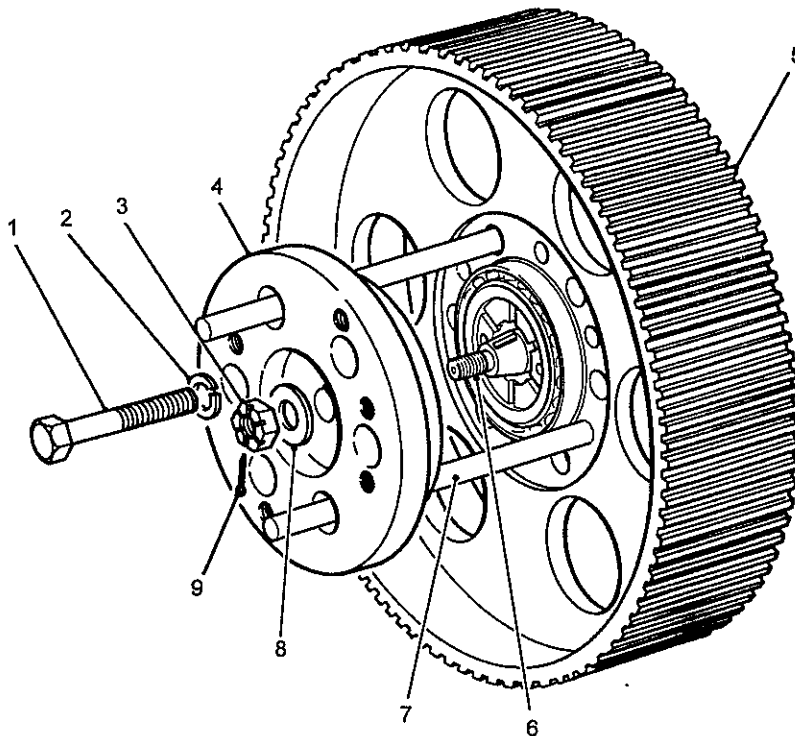
EQUIPMENT DAMAGE. Guide studs must be used to support the input coupling during removal to prevent damage to oil pump drive shaft and woodruff key.

24.5 Fit two input hub guide bolts (7) (Table 1, Serial 21) through the input hub fixing holes and screw into the clutch inner member.

24.6 Using two of the bolts (1) as jacking screws, remove the input hub (4) from the oil pump drive shaft (6).

24.7 Remove toothed belt drive pulley (5).

24.8 Unscrew and remove the two input hub guide bolts (7) from the clutch inner member.



9221X

1	Hexagon head bolt	6	Oil pump drive shaft
2	Spring washer	7	Input hub guide bolt
3	Castellated nut	8	Special washer
4	Input hub	9	Split pin
5	Toothed belt drive pulley		

Fig 16 Location of input hub guide bolts

INFORMATION PROPRIETARY TO DAVID BROWN ENGINEERING LTD
See declaration on page 2

CAUTION

LOOSE ITEMS. The replacement clutch assembly must be placed on a clean surface, with the freewheel assembly uppermost, before removing the freewheel retainers.

24.9 Remove the two freewheel retainers (Fig 17 (7)) and hexagon head screws (6) from the replacement centrifugal clutch assembly (supplied fitted).

24.10 Fit the two freewheel retainers (7) and hexagon head screws (6) to the clutch inner member on the vehicle to retain the freewheel assembly in the clutch.

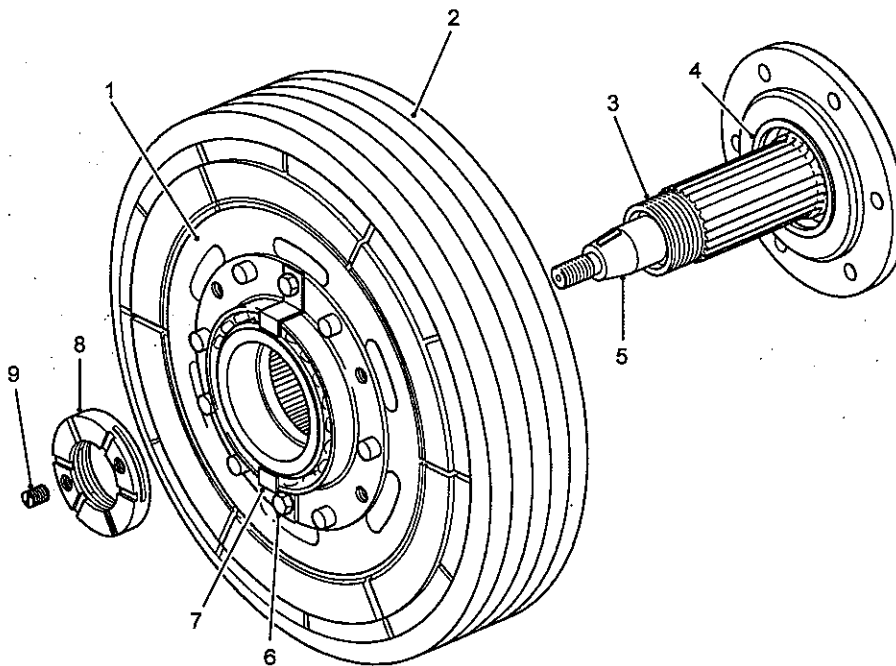
24.11 Slacken the two grub screws (9), which lock the slotted ring nut (8).

24.12 Using spanner (Table 1, Serial 5) remove slotted ring nut (8).

CAUTION

EQUIPMENT DAMAGE. The clutch assembly must be supported during removal to prevent damage to oil pump drive shaft and woodruff key.

24.13 Using lifting equipment, support weight of clutch assembly and carefully remove from the gearbox input shaft (3).



9222X

- | | | | |
|---|----------------------|---|------------------------------------|
| 1 | Clutch inner member | 6 | Hexagon head screw (two positions) |
| 2 | Clutch outer member | 7 | Freewheel retainer (two positions) |
| 3 | Gearbox input shaft | 8 | Slotted ring nut |
| 4 | Oil seal | 9 | Grub screw |
| 5 | Oil pump drive shaft | | |

Fig 17 Location of freewheel retainers

Refitting

25 To refit the centrifugal clutch assembly, proceed as follows:

- 25.1 Check the gearbox input bearing oil seal (Fig 17 (4)). Renew if signs of damage, wear or excessive oil leakage are evident.
- 25.2 Clean the input shaft (3) and apply light coating of grease (Table 2, Serial 10) to the splines.
- 25.3 Rotate the oil pump drive shaft (5) to locate the woodruff key in the top centre position. Check the condition of the woodruff key and renew if damaged or worn.
- 25.4 Transfer the two freewheel retainers (7) and hexagon head screws (6) from the original clutch to the replacement clutch assembly to retain the freewheel assembly in position.
- 25.5 Using lifting sling to support weight, fit clutch assembly to the input shaft (3). Ensure locking tool is engaged to prevent rotation of clutch outer member.
- 25.6 Remove the two grub screws (9) from the slotted ring nut (8), degrease the nut and grub screws. Apply locking compound (Table 2, Serial 8) to threads of grub screws (9) and refit to slotted nut (8).
- 25.7 Fit slotted ring nut (8) to input shaft (3) and using special spanner (Table 1, Serial 5), torque tighten to 270 Nm (200 lbf ft).
- 25.8 Check that the clutch inner member rotates clockwise without turning the outer member after the slotted ring nut (8) has been tightened.
- 25.9 Torque tighten the two grub screws (9) in the slotted ring nut (8) to 7.5 Nm.
- 25.10 Remove the two freewheel retainers (7) and hexagon head screws (6).

NOTE

The two freewheel retainers (7) and hexagon head screws (6) are to be refitted to the clutch assembly removed from the vehicle.

- 25.11 Fit two input hub guide bolts (Fig 16 (7)) (Table 1, Serial 21) to two diametrically opposite input hub fixing holes in clutch inner member.
- 25.12 Fit toothed belt drive pulley (5) onto dowels in clutch inner member.
- 25.13 Mark the position of the keyway on the outer flange of the input hub (4), to facilitate correct engagement on the pump drive shaft (6).
- 25.14 Apply a light coat of grease (Table 2, Serial 10) to the inner bearing interface of the input hub (4).
- 25.15 Rotate the oil pump drive shaft (6) as necessary to locate the woodruff key in the top centre position.
- 25.16 Align the input hub keyway with the woodruff key on the oil pump drive shaft and engage on the two guide studs.
- 25.17 Slide the input hub fully home and fit four securing bolts (1) and new spring washers (2) finger tight.
- 25.18 Fit new special washer (8) and castellated nut (3) to pump drive shaft. Torque tighten to 81 Nm (60 lbf ft).
- 25.19 Fit split cotter pin (9) to castellated nut (3). Further tighten castellated nut (3) if necessary to align next available slot.

25.20 Remove the two input hub guide bolts (7) and fit the two remaining securing bolts (1) and new spring washers (2). Torque tighten the six securing bolts (1) to 61-65 Nm (45-48 lbf ft). in sequence.

25.21 Remove centrifugal clutch holding strap (Fig 15 (1)) (Table 1, Serial 20) and refit gearbox casing securing bolt (2) using new sealing washer supplied with clutch replacement kit.

25.22 Refit items removed for access.

FINAL DRIVES

WARNING

DANGER OF DEATH OR INJURY. IF A VEHICLE IS INVOLVED IN A ROAD TRAFFIC ACCIDENT (RTA) OR A HEAVY IMPACT TO THE FRONT OF THE VEHICLE (HULL, TRACKS OR FINAL DRIVES) IT IS POSSIBLE THAT DAMAGE HAS OCCURRED TO COMPONENTS INSIDE THE FINAL DRIVE THAT CAN RESULT IN A LOSS OF CONTROL OF THE VEHICLE. THE VEHICLE MUST BE RECOVERED AND BOTH FINAL DRIVES MUST BE REPLACED. THE REMOVED DRIVES MUST BE RETURNED TO THE REPAIR AGENCY. REPORT TO REME. THE SEFIT AND PLATFORM TEAMS MUST BE INFORMED.

[REDACTED]

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

NOTE

If the gearbox has been removed for any purpose, the input shaft/swim shaft can be withdrawn without removing the final drive.

MAIN BRAKE DISC REPAIR PROCEDURE

Removal

- 31 To remove the main brake disc, proceed as follows:
 - 31.1 Remove final drive assembly as detailed at Para 27.
 - 31.2 Remove input shaft and swim shaft as an assembly by withdrawing it from the input end.
 - 31.3 Remove bevelled circlip locating the main brake disc on the spur gearshaft. Remove main brake disc.

[REDACTED]

Refitting

32 To repair and refit the main brake disc, proceed as follows:

32.1 Clean and dry main brake disc and spur gearshaft splines, apply sealing compound (Table 2, Serial 5) to main brake disc splines and spur gearshaft splines before fitting both items together. To ensure the sealing compound cures properly the vehicle must not be moved or driven for 6 hours.

32.2 Refit main brake disc and secure with bevelled circlip.

32.3 Refit input shaft and swim shaft assembly.

32.4 Refit final drive assembly as detailed at Para 28.

NOTE

Only when disc achieves excessive rim rock does the assembly require repair as above.

MAIN DRIVE COUPLING

Removal – engine and gearbox installed

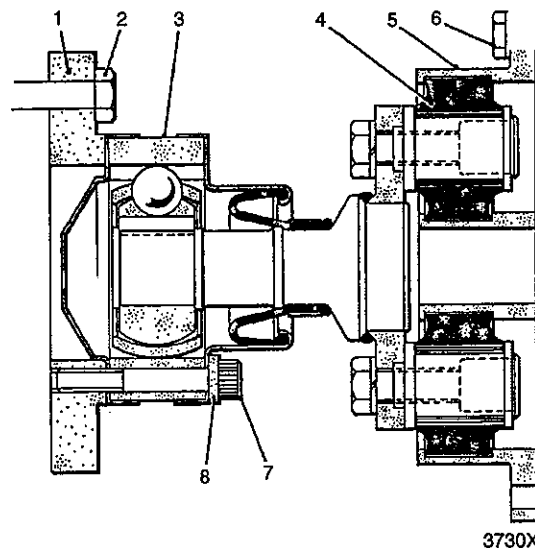
NOTE

To remove the main drive coupling with the engine and gearbox installed, the louvres and the engine/transmission compartment bulkhead must be removed.

33 To remove the main drive coupling with engine and gearbox installed, proceed as follows:

33.1 Remove the louvres and driver's hatch support plate (Chap 7).

33.2 Remove the engine/transmission compartment bulkhead (Chap 7).



- | | | | |
|---|--------------------------|---|---------------------------------------|
| 1 | Coupling/gearbox adapter | 5 | Engine flywheel coupling |
| 2 | Adapter/gearbox bolts | 6 | Coupling/flywheel bolts |
| 3 | Constant velocity joint | 7 | Cap head screws (coupling to adapter) |
| 4 | Flexible coupling | 8 | Locking plate |

Fig 20 Main drive coupling

INFORMATION PROPRIETARY TO DAVID BROWN ENGINEERING LTD
See declaration on page 2

33.3 Remove the six bolts (Fig 20 (6)) securing the main drive coupling and adaptor assembly to the flywheel.

33.4 Remove the four bolts (2) securing the main drive coupling adapter to the gearbox and remove the main drive coupling and adapter assembly.

33.5 Remove the six cap head screws (7) and three locking plates (8) securing the main drive coupling to the gearbox adaptor (1).

Examination

34 To carry out an examination of the main drive coupling, proceed as follows:

34.1 Thoroughly clean all components. Examine the main drive coupling for damage, wear and serviceability. It must be renewed if any of the following conditions are found:

34.1.1 Radial play (as opposed to backlash) can be felt in the constant velocity (CV) joint.

34.1.2 Rubber boot is damaged.

34.1.3 Grease is escaping from joint.

34.1.4 Signs of bolt slackness or block deterioration in flexible coupling (4). The difference between cracks and creases may prove difficult to differentiate and as a result the coupling may be condemned prematurely because of wrong assumption.

34.1.5 Creases similar to folds in human skin are normal. Cracks which penetrate body of rubber may cause damage to coupling. Probe any suspected crack with blunt tool (e.g. small screwdriver to ascertain extent of flaw. Cracks which penetrate below surface of rubber indicate that the coupling should be replaced.

Refitting

35 Refitting the main drive coupling is a reversal of the removal procedure. Clean the cap head screws (7), apply screwlock (Table 2, Serial 9), fit and torque tighten to 137 Nm (101 lbf ft). Clean the adapter/gearbox bolts (2) and the coupling/flywheel bolts (6), apply screwlock (Table 2, Serial 9) and torque tighten to 88 Nm (65 lbf ft).

DIPSTICK TUBE

Removing

WARNING

DANGER OF SCALDING FROM HOT OIL. PROTECTIVE GLOVES MUST BE WORN WHEN REMOVING THE GEARBOX OIL DRAIN PLUG.

36 To remove dipstick tube:

36.1 Open and secure transmission access louvres. Raise radiator.

36.2 Drain gearbox oil into a container having a capacity greater than 18 litres.

36.3 Remove dipstick and loosen nut-retaining clip near top of dipstick.

36.4 Loosen banjo bolt at bottom of dipstick.

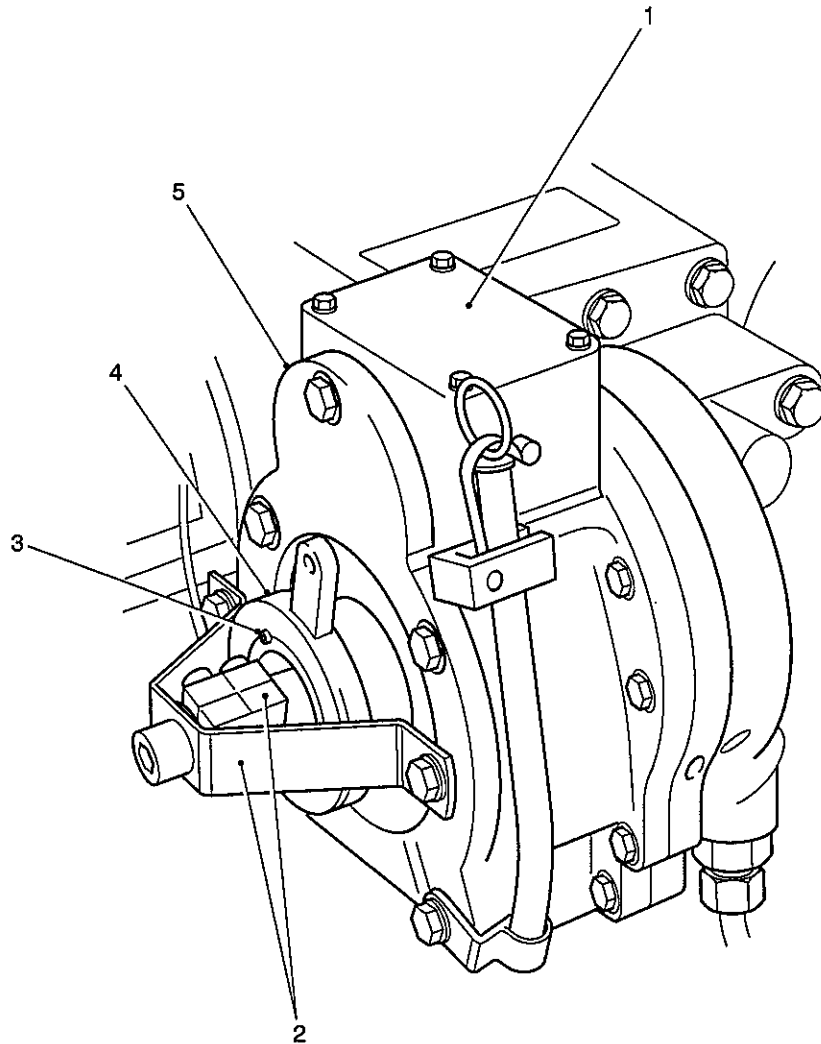
36.5 Remove nut and washer at top of dipstick and banjo bolt at bottom of tube.

36.6 Collect banjo sealing washer and remove dipstick tube. Remove banjo from tube.

Refitting

37 To refit dipstick tube, proceed as follows:

- 37.1 Refit banjo loosely to bottom of dipstick tube.
- 37.2 Insert banjo bolt with new sealing washers into banjo.
- 37.3 Position dipstick tube top clip over stud, secure banjo bolt and fit nut and washer to stud.
- 37.4 Tighten all fittings and refit dipstick.
- 37.5 Refill gearbox with oil to correct level.



CVR50003

- | | | | |
|---|-------------------------|---|-----------------|
| 1 | Top cover | 4 | Actuation lever |
| 2 | Bracket and pinch block | 5 | Front cover |
| 3 | Grub screw | | |

Fig 21 Gear selector pawl spring renewal

INFORMATION PROPRIETARY TO DAVID BROWN ENGINEERING LTD
See declaration on page 2

CAUTION

EQUIPMENT DAMAGE. The engine must not be run with the radiator in the raised position.

37.6 Check level as detailed in Cat 201, Chap 4 again after running the engine and selecting all gears in turn.

37.7 Lower radiator. Lower and secure transmission access louvres.

GEAR SELECTOR PAWL SPRING RENEWAL**Removing**

38 To renew the gear selector pawl spring, proceed as follows:

38.1 Remove top cover (Fig 21 (1)).

38.2 If all parts of the damaged spring have been retrieved, fit new spring ensuring it is located correctly. Smear spring with grease XG279 (Table 2, Serial 10).

38.3 If all parts of the damaged spring cannot be retrieved, remove gear selector cable bracket and pinch block (2).

38.4 Remove grub screw (3) from gear actuation lever (4).

38.5 Remove gear actuation lever (4) ensuring woodruff key does not drop out.

38.6 Remove selector housing front cover (5) and recover ALL the damaged spring parts.

Refitting

39 To refit gear selector pawl spring, proceed as follows:

39.1 Fit new spring ensuring it is located correctly. Smear spring with grease XG279 (Table 2, Serial 10).

39.2 Refit selector housing front cover applying Loctite 518 (Table 2, Serial 11) to fixing screws.

39.3 Refit top cover applying Loctite 518 (Table 2, Serial 11) to fixing screws.

39.4 Refit lever ensuring woodruff key is located correctly, secure with grub screw using Loctite 242 (Table 2, Serial 8).

39.5 Refit gear selector cable bracket and pinch block.

GEARBOX BY-PASS OIL STRAINER (TN15E, NON-BATUS ONLY)**Removal**

40 The by-pass oil strainer (Fig 22) is a metal mesh type filter fitted in a housing in the by-pass oil pipe, located adjacent to the input module and below the gear selector housing. A gearbox oil pressure test point is also incorporated into the housing. Remove the by-pass oil strainer element as follows:

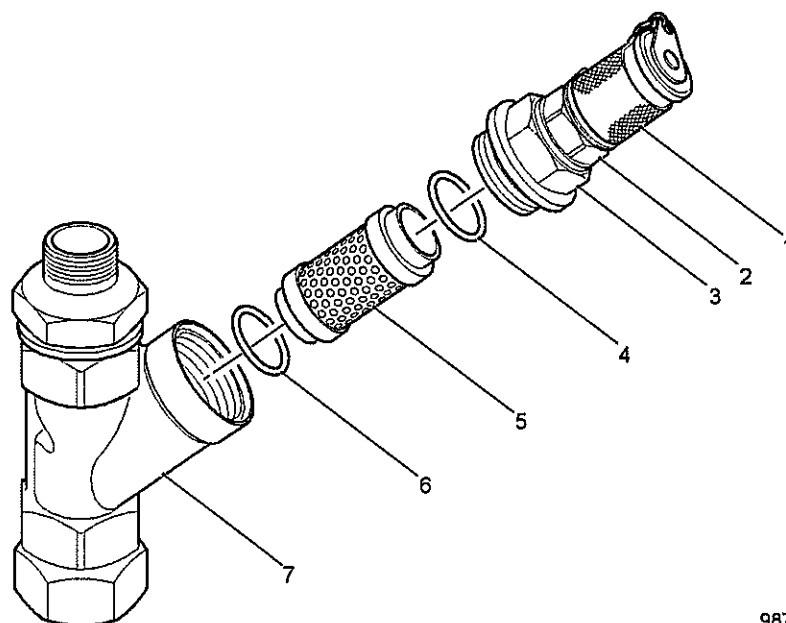
40.1 Position the vehicle on firm level ground.

40.2 Stop the engine and set all battery master switches to OFF. Apply the parking brake.

40.3 Position the main armament clear of the transmission louvres (Scimitar).

40.4 Release, raise and secure the transmission louvres.

40.5 Raise and secure the radiator.



9879X

- | | | | |
|---|-------------------------------|---|------------------------------|
| 1 | Protection cap | 5 | Strainer element |
| 2 | Pressure test point connector | 6 | O-ring |
| 3 | Flanged adaptor | 7 | By-pass oil strainer housing |
| 4 | O-ring | | |

Fig 22 By-pass oil strainer assembly (TN15E, non-BATUS only)

- 40.6 Operate the gear selector lever several times to release gearbox hydraulic pressure.
- 40.7 Disconnect the oil feed pipe from the main gearbox oil filter. Raise the disconnected end of pipe to prevent drainage and protect the open connections to prevent ingress of contamination.
- 40.8 Remove the cooling fan tensioner assembly from the gearbox.
- 40.9 Clean the by-pass oil strainer housing (7) externally.
- 40.10 Using a 27 mm crowfoot spanner (Table 1, Serial 22) and extension, unscrew the flanged adaptor (3) on the strainer and pressure test point assembly. Remove the complete assembly from the strainer housing (7), noting the position of the O-ring on the flanged adaptor.
- 40.11 Remove the strainer element (5) and O-rings (4 and 6) from the assembly and discard, noting the position of the O-rings on each end of the strainer element. Recover the lower O-ring (6) if it has remained in the strainer housing (7).
- 40.12 Replace the strainer element (5) using new O-rings (4 and 6).

Refitting

- 41 Refit the oil by-pass strainer element (5) as follows:
- 41.1 Check the condition of the O-rings (4 and 6) on the flanged adaptor (3). Renew the O-ring if necessary.
- 41.2 Install (push fit) the strainer element (5) into the flanged adaptor (3), ensuring both O-rings (4 and 6) are correctly positioned.

- 41.3 Refit the strainer element and pressure test point assembly to the strainer housing (7) and tighten the flanged adaptor (3) using the 27 mm crowsfoot spanner (Table 1, Serial 22) and extension. Torque tighten the flanged adaptor to 55 Nm (41 lbf ft).
- 41.4 Refit the cooling fan belt tensioner assembly to the gearbox.
- 41.5 Adjust the cooling fan drive belt tension. Refer to Cat 522, Chap 3.
- 41.6 Remove protection and reconnect the oil feed pipe to the main gearbox oil filter.
- 41.7 Check the gearbox oil level (cold). Top-up as necessary, refer to Cat 601, Maintenance Schedule.
- 41.8 Run the engine and carry out gearbox hot oil check.
- 41.9 Lower the radiator.
- 41.10 Release and lower the transmission louvres.

GEARBOX BY-PASS OIL STRAINER (TN15E, BATUS ONLY)

Removal

42 The by-pass oil strainer is a metal mesh type filter fitted in the filter bowl in the strainer manifold assembly. A gearbox oil pressure test point is also incorporated in the strainer manifold assembly. The strainer element is to be changed at the periodicities declared for the gearbox strainer in AESP 2350-T-220-601. This aligns with the replacement of the main gearbox oil filter. Remove the by-pass oil strainer element as follows:

- 42.1 Position the vehicle on firm level ground.
- 42.2 Stop the engine and set all battery master switches to OFF. Apply the parking brake.
- 42.3 Position the main armament clear of the transmission louvres (Scimitar).
- 42.4 Release, raise and secure the transmission louvres.
- 42.5 Raise and secure the radiator.
- 42.6 Use a suitable strap wrench to remove the filter bowl from the strainer manifold assembly. Retain the filter bowl.
- 42.7 Remove and discard the strainer element.
- 42.8 Remove and discard the 'O' ring seal from the filter bowl.

Refitting

- 43 Refit the oil by-pass strainer element as follows:
- 43.1 Install a small 'O' ring seal inside a new strainer element.
 - 43.2 Install a large 'O' ring on the filter bowl.
 - 43.3 Install the strainer element on the manifold.

CAUTION

EQUIPMENT DAMAGE. Do not over tighten the filter bowl. It will cause damage to the filter bowl and the strainer within it.

- 43.4 Install the filter bowl on the strainer manifold assembly. Hand tighten the filter bowl and then use a suitable strap wrench to fully tighten.

- 43.5 Lower the radiator.
- 43.6 Release and lower the transmission louvres.

~~OFFICIAL SENSITIVE~~

1

~~OFFICIAL SENSITIVE~~



CONDITIONS OF RELEASE

- 1 This information is released by the UK Government for Defence purposes only.
- 2 This information must be afforded the same degree of protection as that afforded to information of an equivalent security marking originated by the recipient Government or as required by the recipient Government's security regulations.
- 3 This information may be disclosed only within the Defence Department of the recipient Government, except as otherwise authorized by the Ministry of Defence (Army).
- 4 This information may be subject to privately owned rights.

**~~COMBAT VEHICLE, RECONNAISSANCE,
FULL TRACKED, CVR(T) (D) – COMMON ITEMS
MAINTENANCE INSTRUCTIONS~~**

~~THIS DOCUMENT IS THE PROPERTY OF HER BRITANNIC MAJESTY'S GOVERNMENT, and is issued for the information of such persons only as need to know its contents in the course of their official duties. Any person finding this document should hand it to a British forces unit or to a police station for its safe return to the MINISTRY OF DEFENCE (Dey (Pol)), MAIN BUILDING, WHITEHALL, LONDON SW1A 2HB with particulars of how and where found. THE UNAUTHORIZED RETENTION OR DESTRUCTION OF THIS DOCUMENT MAY BE AN OFFENCE UNDER THE OFFICIAL SECRETS ACTS OF 1911-1989. (When released to persons outside Government service, this document is issued on a personal basis and the recipient to whom it may be entrusted in confidence, within the provision of the Official Secrets Acts 1911-1989, is personally responsible for its safe custody and for seeing that its contents are disclosed only to authorized persons).~~

Sponsored for use in the
UNITED KINGDOM MINISTRY OF DEFENCE AND ARMED FORCES
by



~~OFFICIAL-SENSITIVE~~

~~OFFICIAL-SENSITIVE~~

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
1	INCORPORATED	01/05
2	INCORPORATED	10/06
3	INCORPORATED	04/07
4	INCORPORATED	10/07
5	INCORPORATED	07/08
6	INCORPORATED	11/08
7	INCORPORATED	11/10
8	INCORPORATED	06/12
9	INCORPORATED	05/13
10	INCORPORATED	10/13
11	INCORPORATED	07/14
12	INCORPORATED	09/14
13	INCORPORATED	05/15
14	INCORPORATED	07/15
15	INCORPORATED	03/16
16	INCORPORATED	07/17
17	INCORPORATED	01/18
18	INCORPORATED	07/19
19	INCORPORATED	03/20
20	INCORPORATED	12/21
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		

Amdt No.	Incorporated By (Signature)	Date
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		
62		

UK RESTRICTED

UK RESTRICTED

CONTENTS

PRELIMINARY MATERIAL	Page
Front cover (title page).....	(i)/(ii)
Amendment record	(iii)/(iv)
Contents (this list)	(v)
PREFACE	(vi)
Introduction	(vi)
Related and associated publications	(vii)
Related publications.....	(vii)
Associated publications	(viii)
Reference organizations and addresses	(viii)
Table 1 Reference organizations and addresses	(viii)
Warnings	(ix)
Caution.....	(x)

MAINTENANCE INSTRUCTIONS

Chapter

- 1 Engine
- 2 Fuel system
- 3 Cooling system
- 4 Transmission
- 5 Driver's controls
- 6 Suspension and tracks
- 7 Hull and fittings
- 8 Electrical system
- 9 Hydraulic system
- 10 Battle damage

PREFACE

Sponsor: Armoured Refer to Table 1, Serial 1
File ref: Pubs 2285
Publication Authority: Refer to Table 1, Serial 1

INTRODUCTION

1 Users should forward any comments on this publication using the AESP Form 10 and the accompanying guidance which can be accessed and downloaded from the Joint Asset Management and Engineering Solutions (JAMES) Portal (via Hot Topics – Forms) or from Technical Documentation Online (TDOL) Viewer (Search: FORM10).

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 Para 3 below.

3 The subject matter of this publication may be affected by Defence Instructions and Notices (DINs), Standing 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.

4 

RELATED AND ASSOCIATED PUBLICATIONS

Related publications

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

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directives	111	*	*	*
2	0	Operating Information	201	*	*	*
	1	Aide-Memoire	211	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	201	302	*	*
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	*	*	*
	2	Maintenance Instructions	201	522	523	524
	3	Inspection Standards	*	532	532	532
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedules	601	601	*	*
7	1	Illustrated Parts Catalogues	711	711	*	*
	2	Commercial Parts Lists	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	*	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

*Category/Sub-category not published

Associated publications

[REDACTED]

REFERENCE ORGANIZATIONS AND ADDRESSES

7 The organizations listed in Table 1 are referred to throughout this AESP.

TABLE 1 REFERENCE ORGANIZATIONS AND ADDRESSES

Serial (1)	Organization (2)	Address (3)
[REDACTED]	[REDACTED]	[REDACTED]

WARNINGS

- (1) **TOXIC SUBSTANCE. GOGGLES AND GLOVES MUST BE WORN WHEN APPLYING PAINT REMOVER. IF REMOVER COMES INTO CONTACT WITH SKIN OR EYES, WASH OFF IMMEDIATELY WITH CLEAN WATER AND SEEK MEDICAL ATTENTION.**
- (2) **DANGER TO LIFE AND LIMB. PERSONNEL ARE NOT TO REMAIN INSIDE OF VEHICLE DURING PRESSURISATION TEST WITH PRESSURE RELIEF VALVE SEALED.**
- (3) **DANGER TO PERSONNEL. DO NOT ENTER VEHICLE TO CARRY OUT REPAIRS/FAULT RECTIFICATION UNTIL ALL SMOKE HAS BEEN EXPELLED.**
- (4) **ASBESTOS HAZARD. CLUTCH LININGS AND BRAKE PADS MAY CONTAIN ASBESTOS. ENSURE THAT ADEQUATE PRECAUTIONS ARE TAKEN TO PREVENT POSSIBLE INHALATION OF ANY DUST.**
- (5) **CADMIUM PLATING. THE EQUIPMENT COVERED BY THIS PUBLICATION CONTAINS COMPONENTS INCORPORATING CADMIUM PLATED MATERIAL WHICH IS A POTENTIAL SAFETY HAZARD. THIS MATERIAL, IN ITSELF, IS SAFE EXCEPT IN CIRCUMSTANCES WHEN IT IS HEATED, CORRODED, OR WORKED. POTENTIAL HAZARDS ARISE WHEN:**
 - (5.1) **CADMIUM PLATING MATERIAL OR COMPONENTS ARE FILED AND THE RESULTING DUST IS INHALED.**
 - (5.2) **TOXIC FUMES ARE INHALED WHEN CADMIUM IS HEATED.**
 - (5.3) **CADMIUM SALTS FORMING AS A RESULT OF CORROSION ARE ABSORBED INTO THE BODY TISSUES THROUGH SKIN, MOUTH, OR WOUND.**

REFER TO JSP 515 FOR THE RELEVANT MSDS AND CONDUCT A RISK ASSESSMENT I.A.W. JSP 375, VOL 2, LEAFLET 5 OR AESP 0200-A-093-013 PRIOR TO ACTIVITIES.

- (6) **LETHAL VOLTAGES. DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT. WHEN CARRYING OUT WORK ON ANY BOWMAN RADIO EQUIPMENT DURING FAILURE DIAGNOSTICS, REFER TO BOWMAN CIETP, DAESP 5895-G-200-SERIES.**
- (7) **FIRE HAZARD. BOWMAN EQUIPMENT MAY CAUSE FLAMMABLE SUBSTANCES TO IGNITE AT REFUELLING POINT. BOWMAN SYSTEM MUST BE TURNED TO STANDBY DURING REFUELLING.**
- (8) **PERSONNEL INJURY. BOWMAN ANTENNAS MAY TRANSMIT AT ANY TIME. SHOULD A CREW MEMBER GRAB AN ANTENNA WHILST TRANSMITTING THEY MAY SUFFER RF BURNS. UNDER NO CIRCUMSTANCES MUST AN ANTENNA BE TOUCHED WHEN FITTED TO THE VEHICLE UNLESS EQUIPMENT IS TURNED TO STANDBY.**
- (9) **PERSONNEL INJURY. CARE MUST BE TAKEN WHILST MOVING THE VEHICLE WITH THE ANTENNAS FITTED. TOUCHING OF OVERHEAD CABLES MAY INDUCE HIGH VOLTAGES INTO THE VEHICLE CAUSING POSSIBLE ELECTROCUTION OF CREW MEMBERS.**
- (10) **PERSONNEL INJURY. WHEN CARRYING OUT ANY TYPE OF WORK ON A CVR(T) (BOWMAN) VEHICLE, ATTENTION MUST BE MADE TO THE VARIOUS SAFETY NOTICES WHICH ARE POSITIONED THROUGHOUT THE VEHICLE.**
- (11) **PERSONAL INJURY. WHEN CARRYING OUT REPAIRS AND MAINTENANCE, THERE MAY BE A RISK OF SHARP EDGES AND METAL SPLINTERS, ENSURE WHEN CARRYING OUT THESE TASKS THAT CARE IS TAKEN, AND ADEQUATE PROTECTIVE EQUIPMENT IS USED.**

(continued)

WARNINGS (continued)

(12) SILICA. TOXIC SUBSTANCE. ANY ACCUMULATED SAND ON THE VEHICLE MAY CONTAIN SILICA DUST WHICH MUST BE REGARDED AS HAZARDOUS TO HEALTH. PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN TO PREVENT INHALATION OF DUST WHEN CLEANING OR WORKING ON THE VEHICLE. REMOVE ANY SAND AND DUST DEPOSITS FROM THE VEHICLE BEFORE COMMENCING WORK. ALL PERSONAL PROTECTIVE EQUIPMENT MUST BE CLEANED AFTER EACH USE IN A DESIGNATED AREA TO PREVENT THE RISK OF DUST INHALATION BY UNPROTECTED PERSONNEL.

CAUTION

EQUIPMENT DAMAGE. Dye penetrants are not to be used for crack detection.



CONDITIONS OF RELEASE

- 1 This information is released by the UK Government for Defence purposes only.
- 2 This information must be afforded the same degree of protection as that afforded to information of an equivalent security marking originated by the recipient Government or as required by the recipient Government's security regulations.
- 3 This information may be disclosed only within the Defence Department of the recipient Government, except as otherwise authorized by the Ministry of Defence (Army).
- 4 This information may be subject to privately owned rights.

**COMBAT VEHICLE RECONNAISSANCE
FULL TRACKED (CVR(T))
(DIESEL VARIANTS)
MAINTENANCE SCHEDULE**

~~THIS DOCUMENT IS THE PROPERTY OF HER BRITANNIC MAJESTY'S GOVERNMENT, and is issued for the information of such persons only as need to know its contents in the course of their official duties. Any person finding this document should hand it to a British forces unit or to a police station for its safe return to the MINISTRY OF DEFENCE (Dey (Pol)), MAIN BUILDING, WHITEHALL, LONDON SW1A 2HB with particulars of how and where found. THE UNAUTHORIZED RETENTION OR DESTRUCTION OF THIS DOCUMENT MAY BE AN OFFENCE UNDER THE OFFICIAL SECRETS ACTS OF 1911-1989. (When released to persons outside Government service, this document is issued on a personal basis and the recipient to whom it may be entrusted in confidence, within the provision of the Official Secrets Acts 1911-1989, is personally responsible for its safe custody and for seeing that its contents are disclosed only to authorized persons).~~

Sponsored for use in the

UNITED KINGDOM MINISTRY OF DEFENCE AND ARMED FORCES

by



OFFICIAL-SENSITIVE

OFFICIAL-SENSITIVE

AMENDMENT RECORD

Amdt No.	Incorporated By (Signature)	Date
1	INCORPORATED	03/13
2	INCORPORATED	05/13
3	INCORPORATED	07/14
4	INCORPORATED	09/14
5	INCORPORATED	05/15
6	INCORPORATED	07/15
7	INCORPORATED	10/16
8	INCORPORATED	12/16
9	INCORPORATED	07/17
10	INCORPORATED	01/18
11	INCORPORATED	07/18
12	INCORPORATED	02/19
13	INCORPORATED	09/19
14	INCORPORATED	09/19
15	INCORPORATED	03/20
16	INCORPORATED	09/21
17	INCORPORATED	12/21
18	INCORPORATED	01/22
19	INCORPORATED	02/22
20	INCORPORATED	04/22
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		

Amdt No.	Incorporated By (Signature)	Date
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		
62		

UK RESTRICTED

UK RESTRICTED

CONTENTS

PRELIMINARY MATERIAL

	Page
Front cover (title page).....	(i)/(ii)
Amendment record	(iii)/(iv)
Contents (this list).....	(v)/(vi)
Preface	(vii)
Introduction	(vii)
Authority	(vii)
Responsibilities	(vii)
Recording	(vii)
Related and associated publications	(viii)
Related publications.....	(viii)
Associated publications.....	(ix)
Warnings.....	(x)
Cautions.....	(xiv)
Table 1 Lubricants and associated products.	(xv)
Table 2 Capacities.	(xvii)
Table 3 AL11/water/concentrate dilution.....	(xix)
Table 4 Torque wrench settings	(xx)
Reference organizations and addresses	(xx)
Table 5 Reference organizations and addresses	(xx)
Chap	
1 Automotive maintenance	
2 Armament maintenance	
3 NBC equipment maintenance	
4 Out of use (OOU) maintenance	

~~OFFICIAL-SENSITIVE~~

~~OFFICIAL-SENSITIVE~~

PREFACE

Sponsor: Refer to Table 5, Serial 1

Publication Agency: Refer to Table 5, Serial 1

INTRODUCTION

1 Users should forward any comments on this publication using the AESP Form 10 and the accompanying guidance which can be accessed and downloaded from the Joint Asset Management and Engineering Solutions (JAMES) Portal (via Hot Topics – Forms) or from Technical Documentation Online (TDOL) Viewer (Search: FORM10).

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.

Authority

3 This maintenance schedule is authoritative. If the instructions contained in this publication differ from those in other publications, the instructions in the Schedule are to be followed.

Responsibilities

4 The Unit Commander is responsible for the proper application of instructions in this schedule. He may order any operations to be carried out more frequently if conditions under which his vehicles are operating render it necessary. He should seek the advice of his REME adviser before making such changes. Where any maintenance task is specifically nominated (REME task), it is the responsibility of the vehicle commander to ensure that the task is carried out.

5 Days on which distance/time maintenance is carried out may be adjusted to suit activities of the Unit. As a guide, variations of plus or minus 10 percent are acceptable.

6 Vehicle Commander and crew maintenance responsibilities are detailed in Standing Orders for the Safety of Crews of AFVs (Army Code No. 71276).

Recording

7 Scheduled maintenance (except before use, during use and after use checks) must be recorded in Vehicle Record Book AB 413, this includes Armament Maintenance.

RELATED AND ASSOCIATED PUBLICATIONS**Related publications**

8 The Octad for the subject equipment consists of the publications shown overleaf. 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 (AESP 0100-A-001-013).

Category/Sub-category			Information Level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	*	*	*
	1	Equipment Support Policy Directives	111	*	*	*
2	0	Operating Information	201	*	*	*
	1	Aide-Memoire	211	*	*	*
	2	Training Aids	*	*	*	*
3		Technical Description	201	302	*	*
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	*	*	*
	2	Maintenance Instructions	201	522	523	524
	3	Inspection Standards	*	532	532	532
	4	Calibration Procedures	*	*	*	*
6		Maintenance Schedules	601	601	*	*
7	1	Illustrated Parts Catalogues	711	711	*	*
	2	Commercial Parts Lists	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	*	*	*
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	*	*	*	*
	2	General Instructions, Special Technical Instructions and Servicing Instructions	*	*	*	*
	3	Service Engineered Modification Instructions	*	*	*	*

* Category/Sub-category not published

[REDACTED]

Associated publications

<u>Reference</u>	<u>Title</u>
AESP 2350-T-210-812	Combat Vehicle Reconnaissance Tracked (CVR(T)) All Variants - Modification Instructions and Index.
AESP 2350-T-210-821	Combat Vehicle Reconnaissance Tracked (CVR(T)) All Variants - General Instructions and Index.
Defence Standard 01-5	Fuels, Lubricants and Associated Products.

WARNINGS

(1) **PERSONAL INJURY. VEHICLES FITTED WITH RUBBER PADDED TRACKS MAY BE CHARGED WITH STATIC ELECTRICITY AND THEREFORE MUST BE EARTHED BEFORE REFUELLING.**

(2) **PERSONAL INJURY. REFUELLING MUST NOT TAKE PLACE NEAR RADAR EQUIPMENT. SAFE DISTANCE WILL VARY BETWEEN 25 AND 175 METRES DEPENDING ON RADAR EQUIPMENT. VEHICLE CREWS ARE TO CHECK WITH RADAR OPERATORS BEFORE REFUELLING.**

(3) **PERSONAL INJURY. FLUID AL11 IS HIGHLY INFLAMMABLE. THE PREPARATION OF THE FLUID FOR WINDSCREEN WASHERS IS TO BE CARRIED OUT IN THE OPEN AND AWAY FROM NAKED FLAME. MINIMUM PRECAUTION AFTER USE IS TO WASH THE AFFECTED SKIN AREAS WITH SOAP AND WATER.**

(4) **PERSONAL INJURY. FLUID AL39 IS BOTH TOXIC AND HAZARDOUS. REFER TO LOCAL UNIT PRECAUTIONS OR DINS FOR FULL SAFETY PROCEDURES. MINIMUM PRECAUTION AFTER USE IS TO WASH THE AFFECTED SKIN AREAS WITH SOAP AND WATER.**

(5) **PERSONAL INJURY. ELECTROLYTE IS BOTH TOXIC AND HAZARDOUS. DO NOT REMOVE BATTERY FILLER CAPS, IF FITTED, WHILE BATTERIES ARE CHARGING.**

(continued)

WARNINGS (continued)

(6) **PERSONAL INJURY. DO NOT REMOVE THE COOLANT FILLER CAP IF THE TEMPERATURE OF THE HEADER TANK IS ABOVE HAND HOT.**

(7) **PERSONAL INJURY. A FALSE NEUTRAL (UNINTENDED TURN) CAN RESULT FROM 'STICKING' OF A MASTER CYLINDER PISTON DUE TO CORROSION OR FREEZING OF A PISTON DURING COLD WEATHER.**

(8) **PERSONAL INJURY. CLEANING COMPOUND (DISPEC) IS INFLAMMABLE AND IS NOT TO BE USED NEAR NAKED FLAMES.**

(9) **PERSONAL INJURY. (DISPEC) CAN CAUSE DERMATITIS. HANDS ARE TO BE PROTECTED BY A BARRIER CREAM AT ALL TIMES WHEN USING THIS CLEANING AGENT.**

(10) **PERSONAL INJURY. DO NOT ENTER OR LEAVE THE DRIVER'S COMPARTMENT OR SIT IN THE DRIVER'S SEAT WITH HEAD ABOVE HULL LEVEL, UNLESS THE DRIVER'S HATCH IS LOCKED FULLY OPEN.**

(11) **PERSONAL INJURY. HIGH PRESSURE AIR IS DANGEROUS. DO NOT BREAK OR ADJUST COUPLINGS, OR ATTEMPT TO STOP LEAKS BY TIGHTENING UNIONS, NUTS OR FITTINGS WHILST THE SYSTEM IS PRESSURISED. (RECUPERATOR) (SCIMITAR).**

(12) **AIR CONDITIONING SYSTEMS. ONLY PERSONNEL WITH SPECIALIST KNOWLEDGE ON AIR CONDITIONING SYSTEMS ARE PERMITTED TO WORK ON THE VEHICLE CREW TEMPERATURE CONTROL SYSTEM. (SAMARITAN).**

(13) **PERSONAL INJURY. GOGGLES AND GLOVES ARE TO BE WORN WHEN WORKING ON PIPEWORK ASSEMBLIES, WHICH MAY CONTAIN REFRIGERANT AND WHEN HANDLING REFRIGERANT CONTAINERS. IF REFRIGERANT SHOULD COME INTO CONTACT WITH THE EYES, DO NOT RUB EYES. SPLASH EYES WITH COLD WATER AND SEEK IMMEDIATE MEDICAL ATTENTION. (SAMARITAN).**

(14) **PERSONAL INJURY. WHEN A LEAK OCCURS, OR IS SUSPECTED FROM A REFRIGERANT SYSTEM, IT IS TO BE INVESTIGATED BY REME AS SOON AS POSSIBLE. BEFORE INVESTIGATION THE SYSTEM IS TO BE SWITCHED OFF AND THE AREA WELL VENTILATED. (SAMARITAN).**

WARNINGS (continued)

(15) PERSONAL INJURY. PERSONNEL ARE TO WEAR GOGGLES AND GLOVES WHEN WORKING WITH IMPACT TOOLS THAT CAUSE METAL TO METAL CONTACT OR FRAGMENTATION, IN ORDER TO PROTECT EYES AND HANDS AGAINST METAL FRAGMENTS AND FLYING PARTICLES.

(16) PERSONAL INJURY. NO PART OF THE BODY OR ITEM OF CLOTHING IS PERMITTED TO ENCROACH OUTSIDE THE TURN-TABLE AREA (SCIMITAR).

(17) PERSONAL INJURY. ENSURE ALL SMOKE GRENADE BARRELS ARE UNLOADED BEFORE CARRYING OUT MAINTENANCE TASKS.

(18) PERSONAL INJURY. RUNNING ENGINES CAN DAMAGE HEARING. EAR DEFENDERS ARE TO BE WORN BY ALL PERSONNEL WORKING ON OR NEAR THE VEHICLE WHILST THE ENGINE IS RUNNING.

(19) ASPHYXIATION HAZARD. IF FLUOROKETONE (NOVEC 1230) EXTINGUISHERS HAVE BEEN USED INSIDE THE VEHICLE, PERSONNEL MUST NOT RE-ENTER UNTIL ALL FUMES HAVE DISPERSED.

(20) PERSONNEL SAFETY. FLUOROKETONE EXTINGUISHING AGENTS MAY DECOMPOSE UNDER CERTAIN FIRE CONDITIONS, PRODUCING CONSIDERABLE QUANTITIES OF FLUOROKETONE GAS. EXPOSURE TO LARGE DOSES OF FLUOROKETONE MAY BE HARMFUL IF INHALED. IF A CREW MEMBER SHOWS SYMPTOMS OF INHALATION, IMMEDIATELY EVACUATE TO AN AREA WITH FRESH AIR, AND INFORM MEDICAL SERVICES OF SUSPECTED EXPOSURE TO FLUOROKETONE.

(21) PERSONNEL SAFETY. HYDROFLUOROCARBON (HFC) GAS EXTINGUISHING AGENTS MAY DECOMPOSE UNDER CERTAIN FIRE CONDITIONS, PRODUCING CONSIDERABLE QUANTITIES OF HYDROGEN FLUORIDE (HF) GAS. EXPOSURE TO LARGE DOSES OF HF CAN LEAD TO POTENTIALLY LETHAL RESPIRATORY FAILURE. IF A CREW MEMBER IS IN CLOSE PROXIMITY TO A FIRE TACKLED BY EXTINGUISHING AGENTS, IMMEDIATELY EVACUATE TO AN AREA WITH FRESH AIR, AND INFORM MEDICAL SERVICES OF SUSPECTED EXPOSURE TO HF.

(continued)

WARNINGS (continued)

(22) **PERSONAL INJURY. BEFORE RENEWING TRACK LINKS CHECK THE AB 413 TO ENSURE TRACK CONDEMNATION LIMIT WILL NOT BE EXCEEDED.**

(23) **PERSONAL INJURY. DO NOT RUN THE NBC SYSTEM WHEN PAINTING OR CLEANING SOLVENTS ARE BEING USED IN THE VICINITY.**

(24) **PERSONAL INJURY. TO REDUCE THE RISK OF INHALING PX 36 VAPOUR, ORDNANCE CLEANING BRUSHES AND SLEEVES SHOULD BE SPRAY LOADED WITH PX 36 OUTSIDE THE TURRET.**

(25) **RISK TO HEALTH. DIESEL FUEL IS CARCINOGENIC. USE BARRIER CREAM AND WEAR PROTECTIVE CLOTHING WHEN THERE IS A POTENTIAL RISK OF CONTACT WITH DIESEL FUEL.**

(26) **PERSONAL INJURY. FAILURE TO MAINTAIN THE CORRECT OIL LEVEL WILL RESULT IN FINAL DRIVE FAILURE AND CONSEQUENTLY LOSS OF VEHICLE CONTROL.**

(27) **PERSONAL INJURY. WHEN CARRYING OUT REPAIRS AND MAINTENANCE, THERE MAY BE A RISK OF SHARP EDGES AND METAL SPLINTERS, ENSURE WHEN CARRYING OUT THESE TASKS THAT CARE IS TAKEN AND ADEQUATE PROTECTIVE EQUIPMENT IS USED.**

(28) **SILICA. TOXIC SUBSTANCE. ANY ACCUMULATED SAND ON THE VEHICLE MAY CONTAIN SILICA DUST WHICH MUST BE REGARDED AS HAZARDOUS TO HEALTH. PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN TO PREVENT INHALATION OF DUST WHEN CLEANING OR WORKING ON THE VEHICLE. REMOVE ANY SAND AND DUST DEPOSITS FROM THE VEHICLE BEFORE COMMENCING WORK. ALL PERSONAL PROTECTIVE EQUIPMENT MUST BE CLEANED AFTER EACH USE IN A DESIGNATED AREA TO PREVENT THE RISK OF DUST INHALATION BY UNPROTECTED PERSONNEL.**

(29) **TOXIC AND HAZARDOUS SUBSTANCE - CERABOARD ALUMINOSILICATE FIBRES. ALL VARIANT (EXCEPT SCIMITAR) ENGINE COMPARTMENT BULKHEAD INSULATION MAY CONTAIN ALUMINOSILICATE FIBRES WHICH ARE HARMFUL WHEN INHALED AND AN IRRITANT TO THE SKIN AND EYES. USE APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN CLEANING THE COMPARTMENT TO PREVENT INHALATION AND CONTACT WITH SKIN AND EYES.**

CAUTIONS

- (1) **EQUIPMENT DAMAGE.** Do not traverse or elevate the armament without first ensuring it is safe to do so and that the outside area is clear.
- (2) **EQUIPMENT DAMAGE.** Do not open sight cowl doors without first checking outside area is clear.
- (3) **EQUIPMENT DAMAGE.** Do not move the vehicle if any warning light is illuminated.
- (4) **EQUIPMENT DAMAGE.** It is recommended that fuel tanks be filled to maximum to reduce contamination by condensation.
- (5) **EQUIPMENT DAMAGE.** If the vehicle is parked in the open in inclement weather or overnight, ensure louvre waterproof covers are fitted.
- (6) **EQUIPMENT DAMAGE.** Where a vehicle has been in contact with salt water it is to be washed as soon as possible with fresh water.
- (7) **EQUIPMENT DAMAGE.** The vehicle power should only be augmented via slave lead assistance if it is unable to start on its own.
- (8) **EQUIPMENT DAMAGE.** PX 36 must not be used to clean or lubricate the breech or any breech components.

NOTES

- (1) Details of user maintenance are not to be recorded when carried out as part of another maintenance task.
- (2) Maintenance (except 'before use', 'during' and 'after use' checks) must be recorded in Vehicle Record Book AB 413, this includes Armament maintenance.

TABLE 1 - LUBRICANTS AND ASSOCIATED PRODUCTS

NOTES

- (1) Only products listed below are to be used on this equipment unless special authority is obtained from the Ministry of Defence or Theatre HQ.
- (2) Oil changes at the -15 deg C (5 deg F) point are only to be made on the advice of the local REME advisor. Changes of grade will normally be recommended when the ambient temperature is expected to be below -15 deg C (5 deg F) for more than five hours per day. Special instructions will apply if the engine has been winterised.
- (3) Buffer oil. Below temperatures of -7 deg C (20 deg F) buffer oil (OM 15) is to be drained and refilled with two parts OM 15 and one part white spirit. It is essential that buffer oil is returned to its normal operating equivalent as soon as possible to prevent damage to seals. Drain and flush with OM 15 and then fill with new 'filtered' OM 15.
- (4) If temperatures of -35 deg C (-31 deg F) and below are expected use Kero B (NATO code F-58) in place of PX 24 on 30 mm gun.
- (5) Materiel Regulations Vol 5, Pam 1, Sect 15, Para 1506. Standard mix for all vehicles down to -35 deg C (-31 deg F) is: 50 parts AL39 to 50 parts water: A mixture of 60 parts AL39 to 40 parts water gives the maximum protection possible.
- (6) FROST PRECAUTIONS. Table 3 is to be used to determine the ratio of AL11/water/concentrate required in the system to give frost protection.

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

(continued)

TABLE 1 - LUBRICANTS AND ASSOCIATED PRODUCTS (continued)

1	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
3	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
4	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
5	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
6	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
7	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
8	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
9	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
10	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
11	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
12	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
13	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
14	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
15	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
16	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
17	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
18	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
19	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
20	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
21	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
22	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
23	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
24	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
25	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
26	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
27	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
28	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
29	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
30	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

(continued)

TABLE 2 - CAPACITIES (continued)

Serial (1)	System (2)	Capacity		Product (5)
		Metric (litres) (3)	Imperial (4)	
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED]

[REDACTED]		[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

[REDACTED]

TABLE 4 - TORQUE WRENCH SETTINGS

Serial	Component	Torque Nm (lbf ft)
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
10	Gearbox filter bowl	50 (37)

REFERENCE ORGANIZATIONS AND ADDRESSES

10 The organizations listed in Table 5 are referred to throughout this AESP.

TABLE 5 REFERENCE ORGANIZATIONS AND ADDRESSES

Serial (1)	Organization (2)	Address (3)
[REDACTED]	[REDACTED]	[REDACTED]

CHAPTER 1
AUTOMOTIVE MAINTENANCE
CONTENTS

NOTES

(1) This combined maintenance schedule covers the maintenance necessary for the following CVR(T) variants fitted with diesel engines:

FV 103 Spartan, FV 104 Samaritan, FV 105 Sultan,
FV 106 Samson, FV 107 Scimitar

(2) Maintenance (except 'before use', 'during use' and 'after use' checks), must be recorded in the Vehicle Record Book (AB 413), this includes Armament Maintenance.

Para

Maintenance terms

1	Before use, during use and after use maintenance - Tables 1, 2 and 3 Time/Usage based maintenance - Tables 3A, 4, 5, 6, 7, 8, 9, 10 and 11
2	Aim
3	Scope
4	Completion
5	Personnel
6	Documentation
7	1000 mile (1600 km) maintenance - Table 3A
8	3000 mile (4800 km) maintenance - Table 4
9	5000 mile (8000 km) maintenance - Table 5
10	Monthly maintenance - Table 6
11	Two monthly maintenance - Table 7
12	Six monthly maintenance - Table 8
13	Twelve monthly maintenance - Table 9
14	Twenty four monthly maintenance - Table 10
15	Examination 200 winch operating hours (Samson only) - Table 11
16	Track examination 500 miles (800 km) - Table 12
17	Deep wading - Table 13
18	Receipt maintenance - Table 14
19	Initial - Table 15
20	Out of use maintenance (Chap 4)

(continued)

CONTENTS (continued)

Table		Page
1	Before use maintenance	6
2	During use maintenance	12
3	After use maintenance	13
3A	1000 mile (1600 km) maintenance.....	16
4	3000 mile (4800 km) maintenance.....	17
5	5000 mile (8000 km) maintenance.....	18
6	Monthly maintenance.....	18
7	Two monthly maintenance	19
8	Six monthly maintenance.....	21
9	Twelve monthly maintenance	21
10	Twenty four monthly maintenance	22
11	Examination 200 winch operating hours (Samson only).....	23
12	Track examination (500 miles) (800 km).....	23
13	Deep wading.....	25
14	Receipt maintenance	26
15	Initial maintenance	26

MAINTENANCE TERMS**Before use, during use and after use maintenance - Tables 1, 2 and 3**

1 Maintenance is to be carried out daily when the vehicle is in use.

1.1 Table 1 - Before use maintenance. This maintenance **must** be carried out before the vehicle is used.

NOTE

When an 'After use maintenance' has been carried out within the previous six hours it is acceptable to use the vehicle without carrying out 'Before use maintenance' with the exception of Serial 9 of Table 1.

1.2 Table 2 - During use maintenance. This maintenance is to be carried out at suitable intervals throughout the day, i.e. during halts on the march or during lulls in firing.

1.3 Table 3 - After use maintenance. This maintenance **must** be carried out every day that the vehicle has been used.

Time/Usage based maintenance - Tables 3A, 4, 5, 6, 7, 8, 9, 10 and 11

2 Aim. The aim of the Time/Usage based maintenance is to check that the correct level of preventative maintenance is being carried out on the equipment and to ensure that any faults are identified and rectified as early as possible, thereby preventing any safety hazards or subsequent damage to equipment occurring.

3 Scope. The Time/Usage maintenance tables cover the following:

3.1 Safety. A check of the condition and serviceability of those systems and devices that could, if defective, constitute a danger to life.

3.2 Operational. A check of the condition and serviceability of those systems which are vital to the operational role of the equipment.

3.3 Wear and tear. A check of the general condition of all components in order to ascertain whether normal performance can be expected or that observation or repair will be required.

3.4 Appearance. A check of the general appearance of the equipment to ascertain whether or not it reflects its age and usage.

3.5 Road test. A road test is defined as exercising the equipment and systems at the correct operating temperatures in order to confirm serviceability. This should be achieved between 3 to 5 miles. The test route should include suitable gradients to check the full range of engine and transmission performance.

4 Completion. Time/Usage maintenance tasks detailed in Tables 3A to 14 need to be carried out by appropriately trained personnel at the intervals listed.

5 Personnel. Maintenance should be supervised by the vehicle commander or suitably qualified personnel as directed by the sub unit commander. Technical advice and assistance should be requested from REME as required.

6 Documentation. Whenever time/usage maintenance is completed the date and details are to be recorded in Section 3 of the AB 413. Any faults that require REME action must be reported immediately.

1000 mile (1600 km) maintenance - Table 3A

7 This maintenance is to be carried out at the specified frequency.

3000 mile (4800 km) maintenance - Table 4

8 This maintenance is to be carried out at the specified frequency.

5000 mile (8000 km) maintenance - Table 5

9 This maintenance is to be carried out at the specified frequency.

Monthly maintenance - Table 6

10 This maintenance is to be carried out at the specified frequency.

Two monthly maintenance - Table 7

11 This maintenance is to be carried out at the specified frequency.

Six monthly maintenance - Table 8

12 This maintenance is to be carried out at the specified frequency.

Twelve monthly maintenance - Table 9

13 This maintenance is to be carried out at the specified frequency.

Twenty four monthly maintenance - Table 10

14 This maintenance is to be carried out at the specified frequency.

Examination 200 winch operating hours (Samson only) - Table 11

15 This maintenance is to be carried out at the specified frequency.

Track examination 500 miles (800 km) - Table 12

16 This maintenance is to be carried out with the track off the vehicle. It is to be carried out when fitting new track and at 500 mile (800 km) intervals thereafter, until track is condemned.

Deep wading - Table 13

17 This maintenance is to be carried out on orders of the local commander before and after deep wading.

NOTE

Deep wading is defined as the vehicle being immersed in water up to a maximum of 1.07 m, (42 in.) for a period of not less than 5 minutes.

Receipt maintenance - Table 14

18 This maintenance is to be carried out on receipt of a new or overhauled vehicle.

Initial maintenance - Table 15

19 This maintenance is to be carried out when the vehicle, or new/overhauled assembly, has completed running in period.

Out of use maintenance (Chap 4)

NOTE

Out of use maintenance applies to vehicle stored within unit lines/vehicle depots for periods between 4 (four) and 12 (twelve) months only.

20 These checks are carried out:

20.1 Table 1 - Preparation. This maintenance is to be carried out whenever the vehicle is to be placed into out of use storage.

20.2 Table 2 - During. This maintenance is to be carried out whenever the vehicle is in 'out of use' storage at the recommended weekly, monthly or 6 monthly intervals.

20.3 Table 3 - Reactivation. This maintenance is to be carried out whenever the vehicle is to be taken out from out of use storage.

TABLE 1 - BEFORE USE MAINTENANCE

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
NOTE			
When an 'After use maintenance' has been carried out within the previous six hours it is acceptable to use the vehicle without carrying out 'Before use maintenance' with the exception of Serial 9 of Table 1.			
1	<p>GENERAL:</p> <p>Check:</p> <p>1.1 All fire extinguishers for security and serviceability.</p> <p>1.2 All portable fire extinguishers are fully charged.</p>	-	-
2	<p>EXTERNAL:</p> <p>Check:</p> <p>2.1 Running gear (dampers, hubs and road wheels) for condition and security of components.</p> <p>2.2 All road wheels, idlers and axle arms visually for signs of oil leakage and top up if necessary.</p> <p>2.3 Both tracks condition and tension (adjust if necessary).</p> <p>2.4 All winter tracks for stud condition.</p> <p>2.5 Both rear idlers for visibility of wear indicators (new six spoke type only), security and signs of cracking.</p>	-	<p>Ensure that the pressure gauge needle is in the green zone. If the pressure needle is in the red zone, the extinguisher must be replaced.</p> <p>Visual check.</p> <p>Visual check.</p> <p>Visual check.</p> <p>Visual check (if applicable).</p> <p>Visual check.</p>

(continued)

TABLE 1 - BEFORE USE MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
	2.6 Front sprockets for visibility of wear indicators.	-	Visual check, indented wear indicators.
	2.7 Security of all stowage and fittings, particularly those external to the vehicle.	-	Prior to stowage use.
	2.8 Operation of all wash/wipe systems.	-	
	2.9 Operation and serviceability of all seat restraints and harnesses.	-	
	2.10 Seatbelt cutters are fitted to the seats and:	-	
	2.10.1 The blade is not rusted or corroded.		
	2.10.2 The plastic body is free from cracks.		
	2.10.3 The blade is free from debris that could impair the operation of the cutter.		
	2.10.4 There is no damage to the pouch.		
	2.11 All hatch retaining arrangements for security and serviceability.	-	
	2.12 All louvre retainers for security and serviceability.	-	
	2.13 Operation of internal communications system.	-	
	2.14 Horn, mirrors and vehicle lights.	-	

(continued)

TABLE 1 - BEFORE USE MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
	2.15 Final drives for oil leaks. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]	OMD 90 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]	Top up as necessary. Report to REME. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
4	TRANSMISSION COMPARTMENT: Check: 4.1 Gearbox oil level and for signs of leakage and top up if necessary. 4.2 Radiator and charge air cooler for damage or blockage (restricted air flow). 4.3 Cooling fan arrangements. 4.4 Condition of main brake discs, bands and pads.	OMD 90 - - -	Visual check. Visual check. Visual check. Minimum pad thickness 3 mm (1/8 in.).

(continued)

TABLE 1 - BEFORE USE MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
	4.5 Condition of main brake pad retaining plates.	-	Visual check. Ensure that the correct bolts and shakeproof washers are fitted and secure.
	4.6 Condition of steering discs and pads.	-	Visual check. Minimum pad thickness 3 mm (1/8 in.). No cracks on discs.
5	DRIVER'S COMPARTMENT: Check:		
	5.1 Main brake and steering brake reservoir oil levels and top-up if necessary.	OM 11	Ensure steering levers are fully forward.
	[REDACTED]	•	[REDACTED]
	[REDACTED]	•	[REDACTED]
	[REDACTED]	•	[REDACTED]
	[REDACTED]	•	[REDACTED]
	[REDACTED]	•	[REDACTED]
	[REDACTED]	•	[REDACTED]
	[REDACTED]	•	[REDACTED]
	[REDACTED]	•	[REDACTED]

(continued)

TABLE 1 - BEFORE USE MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	
●	[REDACTED]	●	[REDACTED]
●	[REDACTED]	●	[REDACTED]
●	[REDACTED]	●	[REDACTED]
●	[REDACTED]	●	[REDACTED]
●	[REDACTED]	●	[REDACTED]
●	[REDACTED]	●	[REDACTED]

(continued)

TABLE 1 - BEFORE USE MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
█	█ █ █ █ █ █ █ █ █ █ █	█ █ █ █ █ █ █ █ █ █ █	
10	<p>BEFORE MOVING OFF</p> <p>Check:</p> <p>10.1 Operation of steering and all brakes.</p>	-	<p>█ █ █ █ █ █ █ █</p> <p>Main, steering and parking. If fault found, switch engine off and report to REME.</p>

TABLE 2 - DURING USE MAINTENANCE

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
1	<p>GENERAL:</p> <p>Check:</p> <p>1.1 All portable fire extinguishers are fully charged.</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>2.2 Report if clutch engages before 750 rpm or does not engage before 900 rpm.</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	<p>Novec 1230</p> <p>[REDACTED]</p> <p>-</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	<p>Ensure that the pressure gauge needle is in the green zone. If the pressure needle is in the red zone, the extinguisher must be replaced.</p> <p>[REDACTED]</p> <p>Report to REME.</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>

(continued)

TABLE 3 - AFTER USE MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
	[REDACTED]		
	[REDACTED]		
	[REDACTED]		
	2.1 Operation of steering and all brakes.	-	Main, steering and parking.
	[REDACTED]		[REDACTED]
	[REDACTED]		
	[REDACTED]		
	[REDACTED]		
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]
	[REDACTED]		[REDACTED]

(continued)

TABLE 3 - AFTER USE MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
4	<p>DRIVER'S COMPARTMENT</p> <p>Check:</p> <p>4.1 Main brake and steering brake reservoir levels and top up if necessary.</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	<p>OM 11</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>	<p>Ensure steering levers are fully forward.</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>
6	<p>TRANSMISSION COMPARTMENT</p> <p>Check:</p> <p>6.1 Gearbox oil level and for signs of leakage and top-up if necessary.</p> <p>6.2 Condition of gearbox breather.</p>	<p>OMD 90</p> <p>-</p>	<p>Clean gearbox compartment if necessary.</p> <p>Visual check.</p>

(continued)

TABLE 3 - AFTER USE MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
	6.3 Condition of main brake discs, bands and pads.	-	Visual check. Minimum pad thickness 3 mm ($\frac{1}{8}$ in.).
	6.4 Condition of main brake pad retaining plates.	-	Visual check. Ensure that the correct bolts and shakeproof washers are fitted and secure.
	6.5 Condition of steering discs and pads.	-	Visual check. Minimum pad thickness 3 mm ($\frac{1}{8}$ in.). No cracks on discs.
	6.6 Cooling fan drive belt.	-	Visual check. 14 mm deflection.
	6.7 Alternator drive belt.	-	Visual check. Approximately 13 mm (0.5 in) deflection.
	[REDACTED]	-	
	[REDACTED]	-	
	[REDACTED]	-	

TABLE 3A - 1000 MILE (1600 KM) MAINTENANCE

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
1	Replace gearbox by-pass oil strainer element and O-rings.	-	Or 24 monthly whichever occurs first. (See Table 10).

TABLE 4 - 3000 MILE (4800 KM) MAINTENANCE

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
1	Drain and refill gearbox oil and fit new gearbox oil filter.	OMD 90	Or 24 monthly whichever occurs first. (See Table 10).
●	[REDACTED]	●	
●	[REDACTED]	[REDACTED]	[REDACTED]
●	[REDACTED]	[REDACTED]	[REDACTED]
●	[REDACTED]	[REDACTED]	[REDACTED]
●	[REDACTED]	●	
●	[REDACTED]	●	[REDACTED]
●	[REDACTED]	●	[REDACTED]
●	[REDACTED]	●	[REDACTED]
●	[REDACTED]	●	[REDACTED]
●	[REDACTED]	●	[REDACTED]

TABLE 5 - 5000 MILE (8000 KM) MAINTENANCE

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

TABLE 6 - MONTHLY MAINTENANCE

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
1	Drain water from fuel/water separator.	-	
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

(continued)

TABLE 6 - MONTHLY MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
█	[REDACTED]	█	
	[REDACTED]	█	[REDACTED]
█	[REDACTED]	█	[REDACTED]
█	[REDACTED]	█	

TABLE 7 - TWO MONTHLY MAINTENANCE

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
█	[REDACTED]	[REDACTED]	
2	Clean, check and lubricate as necessary:		
	2.1 Gear change linkage.	OMD 90	
	2.2 Accelerator linkage.	OMD 90	Cat 201, Chap 6.
	2.3 Stop lever linkage.	OMD 90	Cat 201, Chap 6.
	2.4 Steering interlock, bell cranks, lever and brake pedal pivots.	OMD 90	
	2.5 Parking brake mechanism.	OMD 90	
	2.6 Driver's seat mechanism.	OMD 90	Cat 201, Chap 3.
	2.7 Forward/reverse gear linkage.	OMD 90	

(continued)

TABLE 7 - TWO MONTHLY MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
■	[REDACTED]	■	
■	[REDACTED]	-	
5	Condition of main brake pad retaining plates.	-	Visual check. Ensure that the correct bolts and shakeproof washers are fitted and secure.
■	[REDACTED]	[REDACTED]	

(continued)

TABLE 7 - TWO MONTHLY MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
	[REDACTED]	[REDACTED]	
	[REDACTED]	[REDACTED]	
	[REDACTED]	[REDACTED]	
	[REDACTED]	[REDACTED]	
	[REDACTED]	[REDACTED]	
	[REDACTED]	[REDACTED]	[REDACTED]

TABLE 8 - SIX MONTHLY MAINTENANCE

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
	[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]	[REDACTED]

TABLE 9 - TWELVE MONTHLY MAINTENANCE

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
	[REDACTED]	[REDACTED]	
	[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]	[REDACTED]

(continued)

TABLE 9 - TWELVE MONTHLY MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
■	[REDACTED]	[REDACTED]	[REDACTED]
■	[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	.	[REDACTED]
	[REDACTED]	.	[REDACTED]
	[REDACTED]	[REDACTED]	[REDACTED]

TABLE 10 - TWENTY FOUR MONTHLY MAINTENANCE

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
■	[REDACTED]	[REDACTED]	[REDACTED]
2	Drain and refill gearbox oil and fit new gearbox oil filter.	OMD 90	Oil to be changed at 3,000 miles or two years whichever occurs first. (See also Table 4).

(continued)

TABLE 10 - TWENTY FOUR MONTHLY MAINTENANCE (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
3	Replace gearbox by-pass oil strainer element and O-rings.	-	Or 1,000 miles whichever occurs first. (See Table 3A).

**TABLE 11 - EXAMINATION 200 WINCH OPERATING HOURS
 (Samson only)**

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
█	██████████	█	█
█	████████████████████	██████████	██████████
█	████████████████████	██████████	██████████
█	████████████████████	██████████	██████████
█	████████████████████	█	██████████

TABLE 12 - TRACK EXAMINATION (500 MILES) (800 KM)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
█	████████████████████	█	████████████████████

(continued)

TABLE 12 - TRACK EXAMINATION (500 MILES) (800 KM) (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
■	[REDACTED]		[REDACTED]
	[REDACTED]	●	
	[REDACTED]	●	
	[REDACTED]	●	[REDACTED]
	[REDACTED]	●	
	[REDACTED]	●	
	[REDACTED]	●	
	[REDACTED]	●	
	[REDACTED]	●	
	[REDACTED]	●	
	[REDACTED]	●	[REDACTED]
	[REDACTED]	●	[REDACTED]
	[REDACTED]	●	[REDACTED]
	[REDACTED]	●	[REDACTED]

(continued)

TABLE 12 - TRACK EXAMINATION (500 MILES) (800 KM) (continued)

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
3	Refit track and tension.	-	Repeat procedure with other track.
4	Record details in AB 413 (2C).	-	

TABLE 13 - DEEP WADING

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
NOTE			
Before deep wading Serials 1 to 3 are to be completed.			
1	Ensure all hull access plates and additional hull drain plugs are in place.		
2	Drive shaft end caps (top hats) are fitted.		
3	Variants with rear doors must check the door seals and the door clamps are engaged prior to wading.		
NOTE			
After deep wading Serials 4 to 7 are to be completed.			
4	Check for hull contamination (drain if necessary using additional drain holes).	-	See Caution No. 6.
5	Check road wheel hubs, idler hubs and final drive oils for contamination (drain, flush and refill if necessary).	OMD 90	
6	Lubricate track idler wheel axle arms.	ZX 38	
7	Lubricate the messier damper lower link arm bush if the double ball joint link arm is not fitted.	XG 279	
8	Check brakes and steering.		

TABLE 14 - RECEIPT MAINTENANCE

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
1	Carry out Before Use Maintenance (Table 1).	-	
2	Enter maintenance details (receipt) in AB 413 and report faults.	-	

TABLE 15 - INITIAL MAINTENANCE

To be carried out when the vehicle (or new/overhauled assembly) has completed 500 miles (800 km).

Serial (1)	Maintenance task (2)	Product (3)	Remarks (4)
1	Renew: 1.1 Engine oil filter and seals. 1.2 Gearbox oil filter and seals.	- - -	Torque tighten gearbox filter bowl. See Table 4 of preliminary pages.
2	Drain and refill: 2.1 Engine sump. 2.2 Gearbox. 2.3 Final drives.	OX 90 OMD 90 OMD 90	See Warning No. 26.
3	Renew engine and system fuel filter/water separator.	-	
4	Clean: 4.1 Gearbox breather filter. 4.2 Electric fuel pump priming filter.	- -	
5	Check idle speed is 700 to 750 rpm, adjust as necessary.	-	REME.
6	Enter maintenance details (initial) in AB 413 and report faults.		