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CARRIER MAINTENANCE FULL TRACKED FV 434 MK 1 AND 1/1 (BOWMAN)

MAINTENANCE INSTRUCTIONS

BY COMMAND OF THE DEFENCE COUNCIL

Ministry of Defence
Issued by

DEFENCE LOGISTICS ORGANISATION

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1			32		
2			33		
3			34		
4			35		
5			36		
6			37		
7			38		
8			39		
9			40		
10			41		
11			42		
12			43		
13			44		
14			45		
15			46		
16			47		
17			48		
18			49		
19			50		
20			51		
21			52		
22			53		
23			54		
24			55		
25			56		
26			57		
27			58		
28			59		
29			60		
30			61		
31			62		

CONTENTS

PRELIMINARY MATERIAL

REPAIR INSTRUCTIONS

Chapter

PREFACE

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INTRODUCTION

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

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

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

RELATED AND ASSOCIATED PUBLICATIONS

Related Publications

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

5 This publication has been produced in both hard copy and microfiche formats.

Category/Sub-category			Information level			
			1 User/ Operator	2 Unit Maintenance	3 Field Maintenance	4 Base Maintenance
1	0	Purpose and Planning Information	101	101	101	101
	1	Equipment Support Policy Directives	*	*	*	*
2	0	Operating Information	*	*	*	*
	1	Aide Memoire	*	*	*	*
	2	Training Aids	221	*	*	*
3		Technical Description	201	302	302	302
4	1	Installation Instructions	*	*	*	*
	2	Preparation for Special Environments	*	*	*	*
5	1	Failure Diagnosis	201	522	522	522
	2	Maintenance Instructions	201	522	523	524
	3	Inspection Standards	*	*	*	*
	4	Calibration Standards	*	*	*	*
6		Maintenance Schedules	601	601	601	601
7	1	Illustrated Parts Catalogues	711	711	711	711
	2	Commercial Parts Lists	*	*	*	*
	3	Complete Equipment Schedule, Production	*	*	*	*
	4	Complete Equipment Schedule, Service Edition (Simple Equipment)	741	741	741	741
	5	Complete Equipment Schedule, Service Edition (Complex Equipment)	*	*	*	*
8	1	Modification Instructions	811	811	811	811
	2	General Instructions, Special Technical Instructions and Servicing Instructions	821	821	821	821
	3	Service Engineered Modification Instructions (RAF only)	*	*	*	*

* Categories/Sub-categories not published

Associated Publications

Reference	Title
AESP 2300-A-100-201	Introduction to A, B and C vehicle hydraulic systems
AESP 2350-T-250	Carrier, Full Tracked FV430 Series
AESP 2350-T-250-741	Complete Equipment Schedule
AESP 2350-T-252-Octad	Carrier Full Tracked FV434 Series
AESP 5800-H-204-741	CCCI (C3I) FV434
AESP 6140-A-100-013	Secondary batteries, lead-acid
AESP 6920-D-100-101	Direct fire weapon effect simulator family (DFWES)
AESP 6920-D-102-201	Target weapon effects simulator (TAGWES)
AESP 6920-D-210-211	TAGWES on fighting vehicle FV432 and fighting vehicle FV434
Army Code 45268	IKEE CLANSMAN Basic Harness for FV434
Army Code 45317	MODIFICATION KIT, Electronic Equipment, Radio Station UK/VRC 353 for FV434
EMER Comms Inst H225	CCCI (C3I)Installation in Carrier, Maintenance, Full Tracked FV434, Technical Handbook – Installation instructions
EMER GEN 0331	Preparation for the repair of Vehicle fuel tanks and other metal containers for flammable liquid
EMER Power S 562/1	Engine, K60, No. 4, Mk 4G, Technical Handbook - Technical description
EMER Pwr P424/1	Pump, Fuel pressurising, No 2, Mk 1, (FV342593) Technical Handbook – Field and Base repairs.

ABBREVIATIONS

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

WARNINGS AND CAUTIONS

WARNINGS

(1) PERSONNEL HAZARD. WHERE A CROSS REFERENCE EXISTS TO ANOTHER PUBLICATION TO CARRY OUT A REPAIR, DUE ATTENTION MUST BE PAID TO THE WARNINGS CONTAINED WITHIN THAT PUBLICATION.

(2) PERSONNEL HAZARD. TESTING OF THE CRANE IS TO BE CARRIED OUT ONLY BY AUTHORIZED PERSONNEL.

(3) PERSONNEL HAZARD. TESTS ARE TO BE CARRIED OUT IN A NOMINATED CRANE TESTING AREA CLEARED OF PERSONNEL AND OBSTRUCTIONS.

(4) PERSONNEL HAZARD. DO NOT EXCEED PROOF TEST LOADS STATED AT SPECIFIC RADII.

(5) PERSONNEL DANGER. DO NOT WORK UNDER A SUSPENDED LOAD, COMPLY WITH ALL CURRENT LIFTING REGULATIONS.

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

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

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

(7.2) ON THE MATERIAL SAFETY DATA SHEEET.

(7.3) IN THE LOCAL SAFETY ORDERS AND REGULATIONS.

(8) PERSONNEL HAZARD. BEFORE ANY REPAIR IS CARRIED OUT TO A FUEL TANK, SAFETY PRECAUTIONS AS DETAILED IN EMER GEN 0 331 MUST BE OBSERVED.

(9) LETHAL VOLTAGES. DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT. WHEN CARRYING OUT WORK ON ANY BOWMAN RADIO EQUIPMENT DURING FAILURE DIAGNOSTICS, REFER TO EMER MGMT S-262

(10) FIRE HAZARD. BOWMAN EQUIPMENT MAY CAUSE FLAMMABLE SUBSTANCES TO IGNITE AT REFUELLING POINT. BOWMAN SYSTEM MUST BE TURNED TO STANDBY DURING REFUELLING

(11) 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.

(12) 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.

(13) PERSONNEL INJURY. WHEN CARRYING OUT ANY TYPE WORK ON THE FV432 (BOWMAN) VEHICLE ATTENTION MUST BE MADE TO THE VARIOUS SAFETY NOTICES WHICH ARE POSITIONED THROUGHOUT THE VEHICLE.

(14) PERSONAL INJURY. ALL USERS AND MAINTAINERS MUST PAY ATTENTION TO THE BOWMAN SAFETY NOTICES AS ISSUED BY BOWMAN LAND DIGITIZATION (BLD) TO UNITS.

CAUTION

EQUIPMENT DAMAGE. Where a cross reference exists to another publication to carry out a repair, due attention must be paid to the CAUTIONS contained within that publication.

CHAPTER 1-0

POWER PACK ASSEMBLY – LIST OF CHAPTERS

CONTENTS

LIST OF CHAPTERS

1 This chapter is further sub-divided as follows:

Chap

1-1 Power pack
1-2 Engine
1-3 Fuel system
1-4 Cooling system
1-5 Transmission

CHAPTER 1-1

POWER PACK

CONTENTS

GENERAL

1 The power pack for the Carrier Maintenance Full Tracked FV434 MK 1 and 1/1 is similar to that used on the Carrier Personnel Full Tracked FV432 MK 2 & 2/1, except in this role, an additional power take off and hydraulic pump are fitted to supply power to the crane AESP 2350-T-252-522 Chap 1-1 refers. The repair instructions for all other assemblies are detailed in AESP 2350-T-251-523 Chap 1-1.

CHAPTER 1-2

ENGINE

CONTENTS

GENERAL

1 The Rolls Royce K 60, No 4 Mk 4F or 6F engines fitted to the Carrier Maintenance Full Tracked FV434 MK 1 and 1/1 are similar to that used on the Carrier Personnel Full Tracked FV432 MK 2 & 2/1. The repair instructions are detailed in AESP 2350-T-251-523 Chap 1-2.

CHAPTER 1-3

FUEL SYSTEM

CONTENTS

GENERAL

1 Field repairs to the fuel system are to be carried out on the fuel injection equipment, fuel pressurizing pump and fuel tank.

2 As fuel injection equipment is so closely associated with the engine, field repairs to these sub-assemblies/components are detailed in AESP 2350 T-251-523 Chap 1-3.

3 Field repairs to the fuel pressurizing pump No 2 Mk 1 are detailed in EMER Pwr P 424/1.

FUEL TANK

WARNING

PERSONNEL HAZARD. BEFORE ANY REPAIR IS CARRIED OUT TO A FUEL TANK, SAFETY PRECAUTIONS AS DETAILED IN EMER GEN 0 331 MUST BE OBSERVED.

4 Removal/refitting fuel tank is detailed in AESP 2350-T-251-522, Chap 1-3.

5 Field repairs to fuel tank are detailed in AESP 2350-T-251-523, Chap 1-3.

CHAPTER 1-4

COOLING SYSTEM

CONTENTS

GENERAL

1 The cooling system fitted to the Carrier Maintenance Full Tracked FV434 MK 1 and 1/1 is similar to that used on the Carrier Personnel Full Tracked FV432 MK 2 & 2/1. The repair instructions are detailed in AESP 2350-T-251-523 Chap 1-4.

CHAPTER 1-5

TRANSMISSION

CONTENTS

GENERAL

1 All transmission assemblies fitted to the Carrier Maintenance Full Tracked FV434 MK 1 and 1/1 are similar to those fitted on the Carrier Personnel Full Tracked FV432 MK 2 & 2/1. The differences are detailed in AESP 2350-T-252-522 Chap 1-5.

2 Repair procedures to all other transmission assemblies are as detailed in AESP 2350-T-251-523 Chap 1-5.

CHAPTER 2-0

FINAL DRIVES, SUSPENSION AND TRACKS – LIST OF CHAPTERS

CONTENTS

LIST OF CHAPTERS

1 This chapter is further sub-divided as follows:

Chap

2-1 Final drives
2-2 Suspension and tracks

CHAPTER 2-1

FINAL DRIVES

CONTENTS

GENERAL

1 The final drives fitted to the Carrier Maintenance Full Tracked FV434 MK 1 and 1/1 are similar to those used on the Carrier Personnel Full Tracked FV432 MK 2 & 2/1, except the final drive ratio is lower, because of the extra payload. The repair procedures are detailed in AESP 2350-T-251-523 Chap 2-1.

CHAPTER 2-2

SUSPENSION AND TRACKS

CONTENTS

GENERAL

1 The suspension of the Carrier Maintenance Full Tracked FV434 MK 1 and 1/1 is similar to that fitted on the Carrier Personnel Full Tracked FV432 MK 2 & 2/1, except that hydraulic shock absorbers, capable of being locked as solid struts, are fitted to the front and rear stations, instead of friction type shock absorbers and the torsion bars, although similar to those fitted to the Carrier Personnel Full Tracked FV432 MK 2 & 2/1, they require different initial settings as per AESP 2350-T-252-522 Chap 2-2 refers.

2 Field repairs to hydraulic shock absorbers/lock out struts are confined to assembly replacement and bleeding as detailed in AESP 2350-T-252-522 Chap 2-2.

3 Field repairs to all other suspension assemblies are detailed in AESP 2350-T-251-523 Chap 2-2.

CHAPTER 3

HULL, FITTINGS AND CONTROLS

CONTENTS

GENERAL

1 The hull, fittings and controls of the Carrier Maintenance Full Track FV434 MK 1 and 1/1 is similar to those on the Carrier Personnel Full Tracked FV432 MK 2 & 2/1, except that the load carrying compartment of FV434 is constructed of mild steel sheet, welded to armoured front and bottom sections of vehicle.

2 Field repairs to armoured sections, including weld joint of mild steel to armour are detailed in AESP 2350-T-251-523 Chap 3.

3 Hull details relevant to the crane are detailed in Chap 6 of this publication.

CHAPTER 4

VENTILATION SYSTEM

CONTENTS

Para

Table

Page

GENERAL

1 This chapter describes field repairs to those parts of the environmental control system, which are specific to the Carrier Maintenance Full Tracked FV434 MK 1 and 1/1. The ventilation system is equipped with a fan, pressurizing No. 4 Mk 1 (FV 482416) and a controller, fan No. 2 Mk 1 (FV 546143). Repairs to common assemblies and details of dismantling, assembling and testing fan units and controllers are contained in AESP 2350-T-251-523.

TESTING THE COMPLETE VENTILATION SYSTEM

2 The procedure to test the complete ventilation system is as follows;

2.1 Ensure that the pressurizing fan and fan controller are serviceable.

2.2 Ensure that the filter particulate, No. 2 Mk 1 (FV 594639) is in place with preferably filter anti-vapour, No. 2 Mk 1 (FV 594540) or substitute filter anti-vapour, No. 2 Mk 1 (FV 482426) are in place.

2.3 Check that all hatch and door seals are serviceable, replace as necessary.

2.4 With the vehicle completely equipped but un-pressurized, zero the pressure/suction gauge by removing plug from face of gauge to allow access to zeroing screw.

2.5 Close all hatches and doors and check that the commander's cupola is clamped in the non-rotating position.

2.6 Start the engine and set to run at 750 to 1000 rev min.

2.7 Start the fan, vehicle pressurizing, set the controller to position 5(H) and allow to run for a minimum warm-up period of 15 minutes.

2.8 During this period, ensure that all the ball diffusers, are turned to the JET position and are located centrally in their housings.

2.9 Ensure that a minimum of 28V dc is available at the radio battery terminals. If necessary, adjust engine speed.

2.10 Ensure that the valve, vehicle pressure relief, is free by operating with the fingers.

2.11 Table 1 details figures of vehicle pressure at the six fan speeds are to be regarded as the minimum.

TABLE 1 VEHICLE AIR PRESSURE

Ser (1)	Controller fan, No. 2 Mk 1 speed position (2)	Vehicle pressure indicator on gauge pressure/suction FV481819	
		With filter, anti-vapour FV594540 in. water gauge (3)	With substitute filter, anti-vapour FV482426 in. water gauge (4)
1	MIN	1.5	3.0
2	2	1.9	3.2
3	4	2.5	3.6
4	5(H)	2.7	3.8
5	8	3.0	4.5
6	MAX	3.3	4.7

3 If the test is unsatisfactory, the following points should be checked:

3.1 Door, hatch or bulkhead seals insufficiently compressed.

3.2 Re-inspect all door, hatch or bulkhead seals for damage.

3.3 Incorrectly adjusted valve, vehicle pressure relief, AESP 2350-T-251-522 Chap 4 refers.

3.4 Damaged valve, vehicle pressure relief.

3.5 Insufficient voltage AESP 2350-T-251-522 Chap 5 refers.

3.6 Unacceptable restrictions to air flow in ventilation system.

3.7 Inadequate performance of fan pressurizing unit.

3.8 Incorrect resistance in fan controller No. 1 Mk 2.

CHAPTER 5

ELECTRICAL SYSTEM

CONTENTS

GENERAL

1 There is currently no information relating to the specific electrical system for Carrier Maintenance Full Tracked FV434 MK 1 and 1/1.

2 The components of the electrical system fitted to the Carrier Maintenance Full Tracked FV434 MK 1 and 1/1 are similar to those fitted on the Carrier Personnel Full Tracked FV432 MK 2 & 2/1. The repair instructions for these components are detailed in AESP 2350-T-251-523 Chap 5.

CHAPTER 6

HYDRAULIC CRANE AND LOCKOUT SYSTEM

CONTENTS

(continued)

CONTENTS (continued)

(continued)

CONTENTS (continued)

GENERAL

1 The original Main Control Valve (MCV) (FV649488) is no longer supported by spares, thus on failure it is replaced by the introduction of (AESP 2350-T-252-811 Mod Instr No 1 (EMER TV 107/4 Instr No 23)) a new MCV (FV847574). This MCV is also not supported via spares.

SPECIAL TOOLS AND TEST EQUIPMENT

2 Table 1 lists the REME special tools and test equipment used in carrying out the repair procedures detailed in this chapter.

TABLE 1 SPECIAL TOOLS AND TEST EQUIPMENT

Serial (1)	Drawing No. (2)	Description (3)
1	REME 002003	Spanner, inner boom
2	REME 002004	Tool, distance piece manifold
3	REME 002007	Tool, adaptor removal, manifold
4	REME 002011	Adaptor for pressure gauge test points
5	REME 002092	Extractor upper bush slewing body and details
6	REME 002100	Tool removing blanking and details
7	REME 002103	Extractor plate (lower bush)
8	REME 002104	Three-way block
9	REME 002105	Bridge piece
10	REME 002106	Male adaptor
11	REME 002107	Gauge, rack setting
12	REME 002108	Cap blanking
13	REME 002109	Lifting plate

3 Table 2 lists the general test equipment used in carrying out test procedures detailed in this chapter.

TABLE 2 TEST EQUIPMENT, HOSE FAILURE AND PILOT OPERATED CHECK VALVES

Serial (1)	Part No. (2)	Item (3)	Qty (4)
1	LV6/MT1/3920-99-202-7513	Quick acting unloading valve	1
2	LV8/REGC/2590-99-804-5002	Hose, high pressure, oil	2
3	LV6/MT1/4730-99-801-1938	Union, pipe 7/8in. UNF male	2
4	LV6/MT1/5330-99-881-4515	Washer, seal, flat 7/8in.	3
5	Special tools Serial No. 4	Three-way block	1
6	Special tools Serial No. 6	Adaptors 1/2in. BSP male to 7/8in. UNF	2
7	TBA	Washer, seal, flat 1/2in. BSP	2

OILS, LUBRICANTS AND SOLVENTS

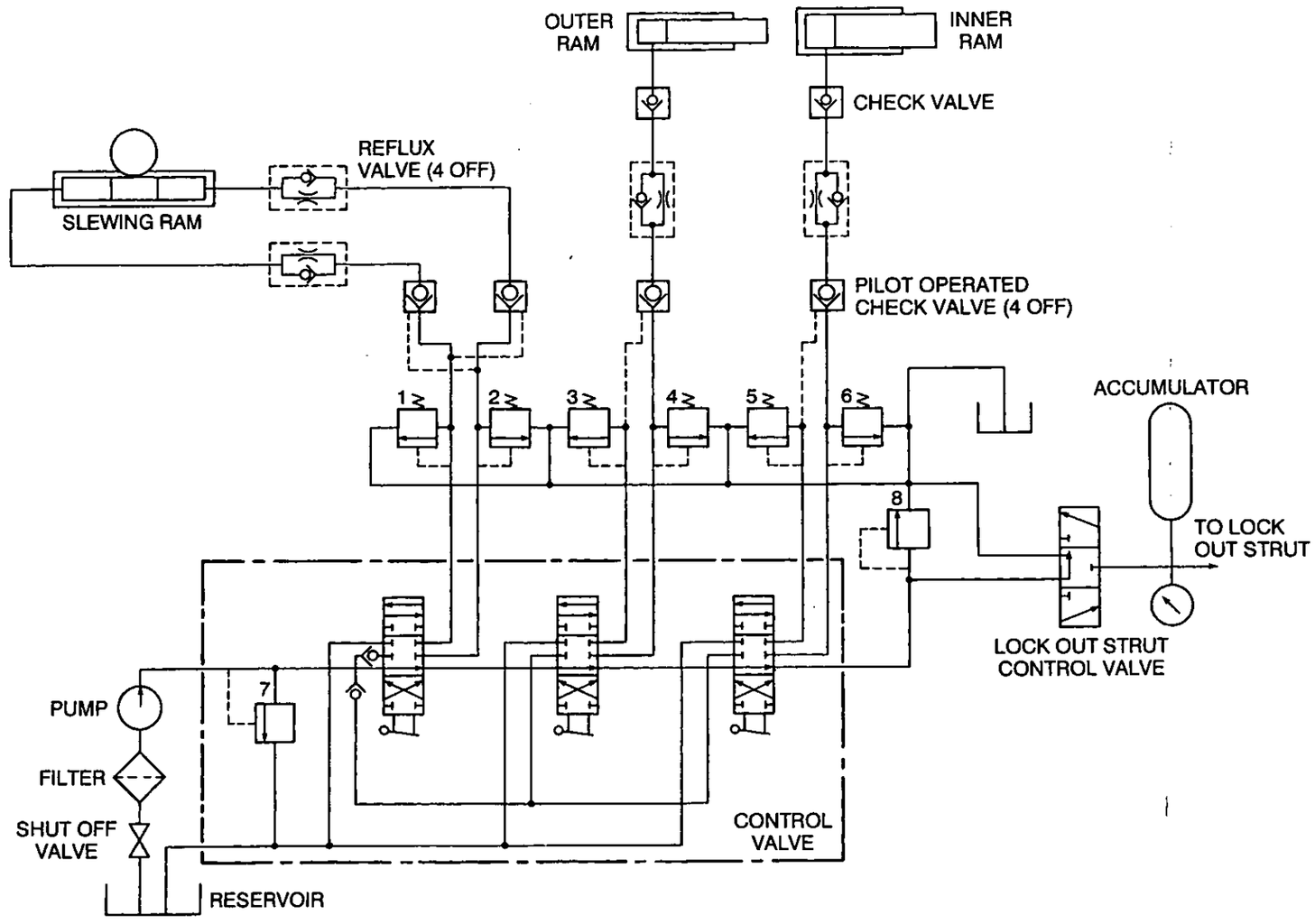
4 Table 3 details the oils, lubricants and solvents used in the repair procedures detailed in this chapter.

TABLE 3 OILS, LUBRICANTS AND SOLVENTS

Serial (1)	Part No. (2)	Description (3)
1	TBA	White spirit
2	TBA	Grinding compound
3	XG 279	Grease

HYDRAULIC CIRCUIT

5 Fig 1 details the hydraulic circuit diagram for the old MCV – FV649488 and is included for reference only.



434/153

Fig 1 Hydraulic circuit diagram – FV649488

SLEWING BODY

Removal

NOTE

If the slewing rack is to be removed it must be withdrawn after removal of the slewing body, see Para 13.

6 The procedure for the removal of the slewing body is as follows:

6.1 Fold the outer boom (Fig 2(14)) back on the inner boom and ensure that it is held securely by the safety catch (9).

6.2 Fit a sling around the two sections of the boom and support on suitable lifting equipment.

6.3 Remove the inner and outer boom cylinders as detailed in Para 41 and 45.

6.4 Remove the bolts clamping the hull aperture cover to the slewing body and withdraw the cover.

6.5 Remove the two bolts securing the boom pivot lock plate (2), remove the plate, drive out the pivot pin (1) and lift the boom assembly away from the vehicle. Lower the assembly to the ground and rest across wooden blocks.

6.6 Remove the two bolts (25) securing the pinion thrust blocks, Fig 4(15), at each side of the pinion housing, lift the pinion cover (Fig 2(26)) and withdraw the thrust block from the housing.

6.7 Fit the lifting plate (Table 1, Serial 13) between the boom pivot plates. Secure in position by locating the inner boom cylinder inner pivot pin (30) through the lower hole. Secure pin in position with the lock plate (29) and fasten a suitable shackle through the top (lifting) hole. Lift the slewing body (19) off the king post using suitable lifting equipment, lower and arrange the assembly across wooden blocks so that the pinion is clear of ground.

6.8 Check that the thrust washer (17) is still on top of the king post, or alternatively, remove from the interior of the slewing body.

6.9 Remove the upper and lower king post bushes. (These are normally a slack fit on the king post and in the slewing body, but if seized in slewing body, remove as detailed in Para 9).

Inspection

7 Inspect the slewing body and ensure that:

7.1 The pinion teeth are free from cracks and excessive wear.

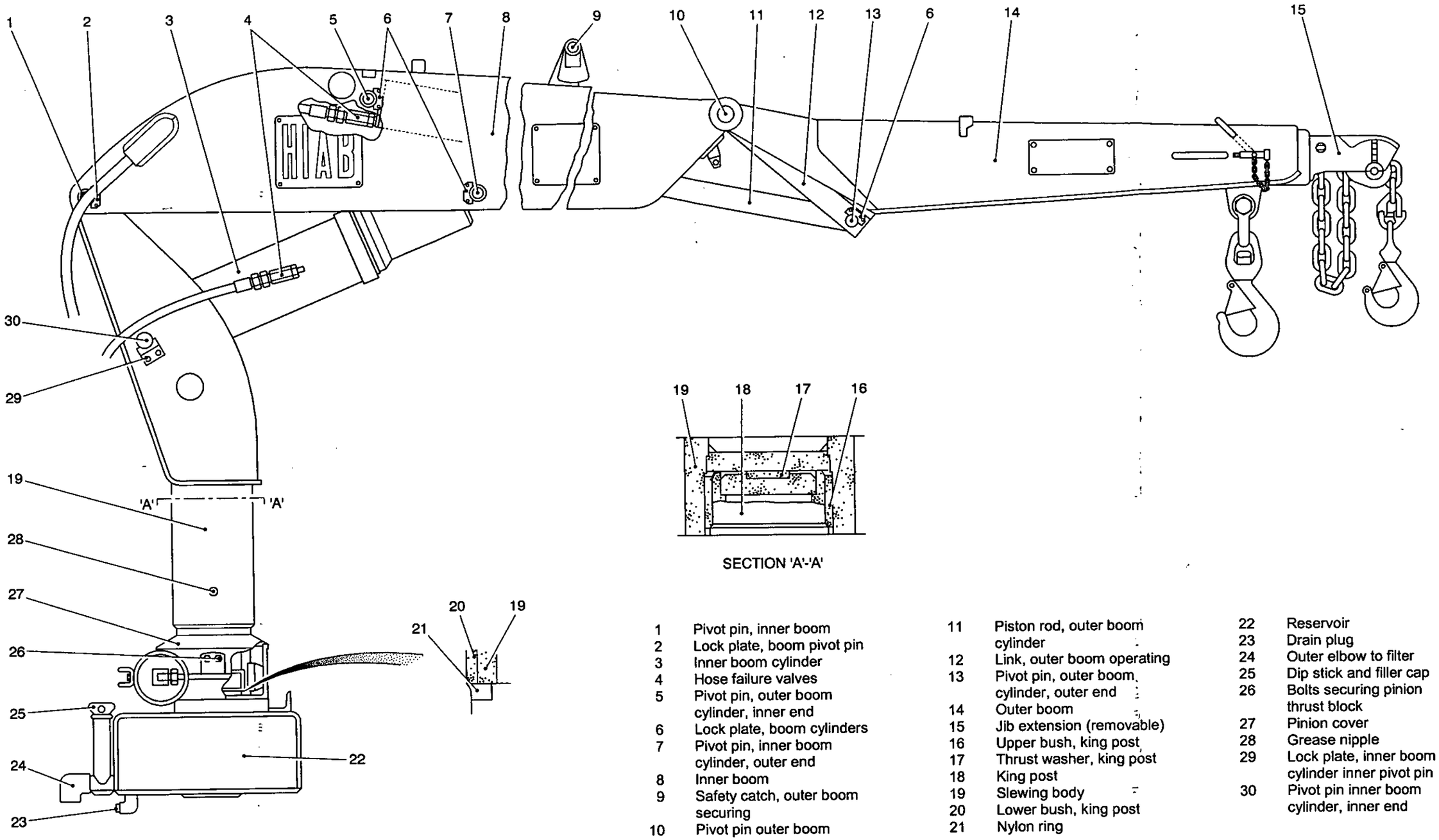
7.2 The pinion is not split, examine the end face and root diameter of the teeth for hair line cracks.

7.3 The pinion is locked on the slewing body with the six taper pins. The taper pins are tight and staked securely in position.

7.4 The king post bushes are within the fitting tolerances specified in Table 4. Inner and outer diameters of the bushes are free from scoring and signs of seizure.

7.5 The king post is free from abrasion or deep scoring. Dress any surface irregularities with a smooth grade stone.

7.6 The thrust washer, located on top of the king post, is not unduly worn. Signs of severe scoring on top of the king post or on the interior thrust face in the slewing body, indicate that the thrust washer or the king post bushes are faulty.



SECTION 'A'-'A'

1	Pivot pin, inner boom	11	Piston rod, outer boom cylinder	22	Reservoir
2	Lock plate, boom pivot pin	12	Link, outer boom operating	23	Drain plug
3	Inner boom cylinder	13	Pivot pin, outer boom cylinder, outer end	24	Outer elbow to filter
4	Hose failure valves	14	Outer boom	25	Dip stick and filler cap
5	Pivot pin, outer boom cylinder, inner end	15	Jib extension (removable)	26	Bolts securing pinion thrust block
6	Lock plate, boom cylinders	16	Upper bush, king post	27	Pinion cover
7	Pivot pin, inner boom cylinder, outer end	17	Thrust washer, king post	28	Grease nipple
8	Inner boom	18	King post	29	Lock plate, inner boom cylinder inner pivot pin
9	Safety catch, outer boom securing	19	Slewing body	30	Pivot pin inner boom cylinder, inner end
10	Pivot pin outer boom	20	Lower bush, king post		
		21	Nylon ring		

Fig 2 General arrangement of crane

7.7 The nylon ring in the base of the pinion housing is free from severe scuffing, damage or excessive wear.

7.8 The pinion cover and the hull aperture sealing rings are in serviceable condition.

TABLE 4 KING POST BUSH CLEARANCES

Serial (1)	Detail (2)	Design (3)		Renew when clearance exceeds (4)	
		mm	inches	mm	inches
1	**UPPER BUSH** (1) Clearance between bush and slewing body	High 0.346 Low 0.000	0.0135 0.0000	0.600	0.023
2	(2) Clearance between bush and king post	High 0.266 Low 0.000	0.0105 0.0000	0.508	0.020
3	**LOWER BUSH** (1) Clearance between bush and slewing body	High 0.249 Low 0.000	0.010 0.000	0.508	0.020
4	(2) Clearance between bush and king post	High 0.266 Low 0.000	0.0105 0.0000	0.508	0.020

Dismantling the pinion

8 Dismantle the pinion as follows:

8.1 Split the pinion at the root diameter of the teeth and drive off the end of the slewing body. It will be necessary to fit a new pinion on assembling and, for this reason, the pinion must only be removed when necessitated by damage for excessive wear.

8.2 Remove the pinion cover and the hull aperture sealing ring from the slewing body.

Dismantling the bushes

9 Dismantle the bushes as follows:

9.1 If the upper bush has become seized in the slewing body, remove using locally manufactured tool (Table 1, Serial 5). Arrange the extractor plate to fit into the recess in the centre of the internal diameter of the bush.

9.2 The lower bush may be removed from the slewing body using locally manufactured bridge piece, and extractor plate (Table 1, Serial 7) in conjunction with bolt, precision, UNF - 2A 'S' steel (1 x 12in) 'S' steel, G1 5310-99-941-6754 and nut, UNF (1in) 'S' steel G1 5310-99-136-1523. The bolt will require thread to be extended to suit application.

Assembling the pinion

10 Assemble the pinion as follows:

10.1 Remove all rust and scale and remains of taper pins from the area of the slewing body to be occupied by the pinion. If necessary, dress the pinion fitting area with a fine file to facilitate location of the pinion.

10.2 Fit the hull to aperture seal.

10.3 Heat the pinion until black and fit onto the bottom of the slewing body. Allow to cool and contract onto the slewing body (do not quench).

10.4 When the pinion is cool and tight on slewing body, drill the gear and the slewing body at equi-angular positions to accept new taper pins. Drive the taper pins in and stake in position.

10.5 If necessary, clean up the lower face of the pinion and slewing body with fine file or stone (any protrusion or abrasion will damage the nylon seal in the pinion housing).

10.6 Fit the pinion cover over the pinion, the plastic type material will stretch sufficiently to permit location over the periphery of the gear teeth.

Assembling the king post bushes

11 Bushes should be not more than an easy push fit into bore of slewing body. Where possible fit, bushes by selective assembly to attain a free fit within the tolerances specified in Table 4.

Refitting

12 The procedure for refitting the slewing body is as follows:

12.1 Clean out the pinion housing and, if necessary, fit a new nylon ring (Fig 2(21)).

12.2 Grease (Table 3, Serial 3) the thrust washer (17) and place in position on top of the king post. Apply a light coat of grease (Table 3, Serial 3) to the king post and locate the lower and upper bushes on the king post in their respective positions. (If the slewing body bushes will stay in place with a coat of thick grease it is preferable to fit them to the slewing body. In most cases however, the bushes will be a slack fit and drop out as the assembly is raised to the vertical position).

12.3 Apply light coat of grease (Table 3, Serial 3) to interior of slewing body, particularly at bush locating areas. Using the lifting plate (Table 1, Serial 13) lift the slewing body on suitable lifting equipment and lower the king post until the pinion is just above the slewing housing.

12.4 Remove the hydraulic supply pipe and the elbow from LH slewing cylinder.

12.5 Refer to Fig 3 and insert the locally manufactured gauge (Table 1, Serial 11) through the fluid port in the LH slewing cylinder until it touches the centre of the slew position. Adjust the slewing rack to left or right, until the mark on the gauge aligns with the machined outer face of the fluid port. Withdraw the gauge.

12.6 Rotate the slewing body until the grease nipple (28) is above the centre line of slewing rack housing. Lower the slewing body until the pinion engages with the rack teeth and is located on the nylon ring in the pinion housing.

12.7 Insert the gauge through the fluid port and locate against the centre of the slew piston. Check that the mark on the gauge is still aligned with the outer face of the fluid port in the slewing cylinder when the grease nipple or centre of the slewing body is directly over the centre line of the slewing rack housing. An error of one tooth will account for a difference of one inch (approx) either side of the mark on the gauge (tooth pitch 25.13mm). If necessary, lift the slewing body and adjust the rack to the correct position. Incorrect mesh of the pinion with the slew rack will result in longer and shorter traverse, each side of the centre of normal slewing arc, according to the position of the rack.

NOTE

The pinion and rack are marked to indicate correct meshing position, but when crane is assembled to a vehicle, it is difficult to align these marks precisely.

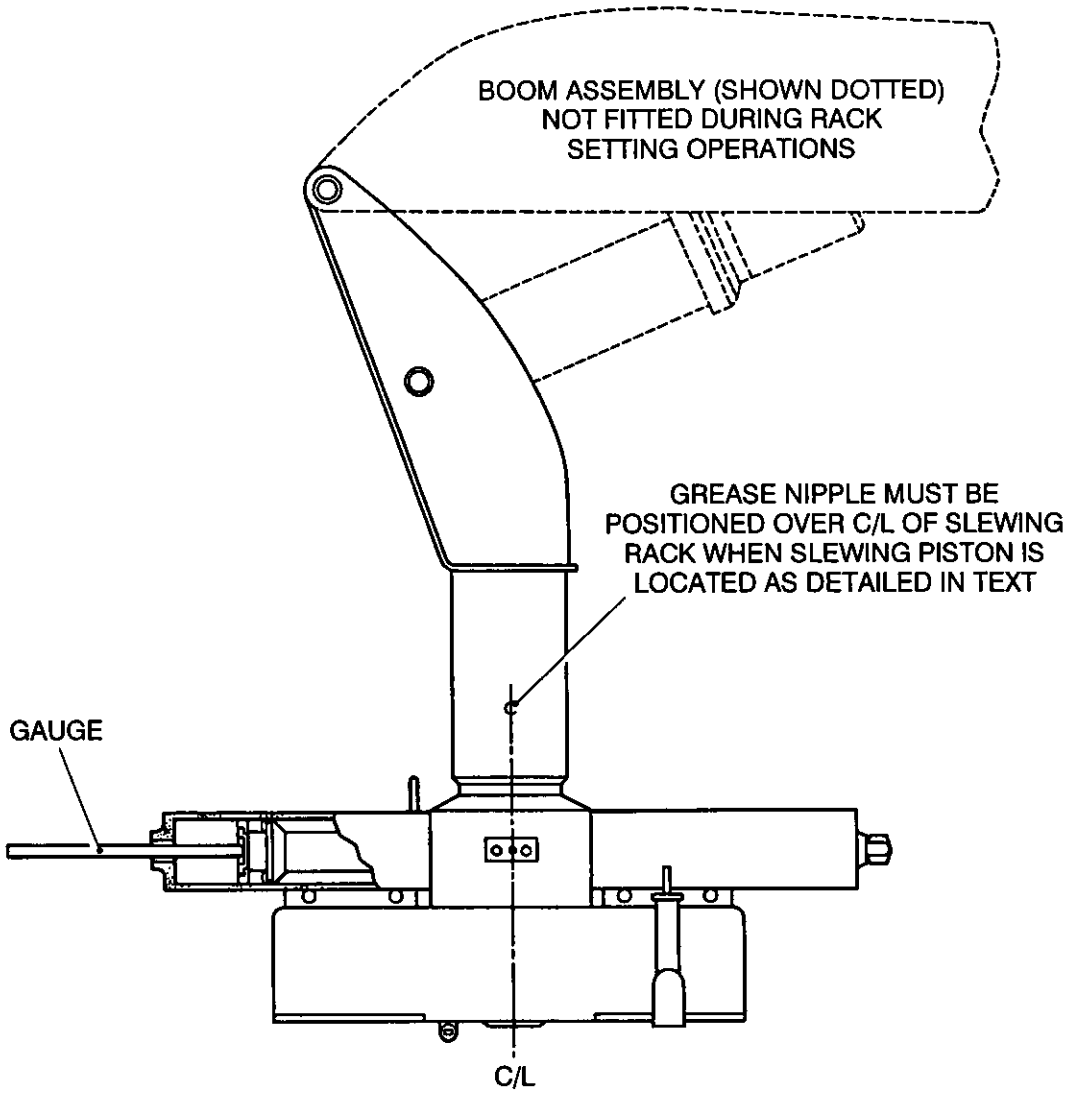


Fig 3 Alignment of slewing body for correct meshing of slewing rack

12.8 Lift the edge of the pinion cover and apply coat of grease (Table 3, Serial 3)to the upper face of the pinion.

12.9 Insert the thrust blocks (Fig 4(15)) and secure to the housing with bolts and washers (Fig 2(26)).

12.10 Refit the elbow to the fluid port on the LH slewing cylinder and connect the hydraulic supply line.

12.11 Refit the boom assembly and the boom cylinders in the reverse order to removal. Bleed the system as detailed in AESP 2350-T-252-522 Chap 6.

SLEWING RACK

Removal

13 The procedure to remove the slewing rack is as follows:

13.1 Remove the slewing body as detailed in Para 6.

13.2 Disconnect the hydraulic pipes from the LH and RH slewing cylinders, remove each cylinder from the reservoir assembly and seals from the slewing pistons, as detailed in AESP 2350-T-252-522 Chap 6.

13.3 Remove the locating bolts (Fig 4(2)) and the grease nipple (7) (or the grease nipple adaptor bolt) and withdraw the bracket (3).

13.4 Move the slewing rack to the LH or RH side of the pinion housing. The slewing rack guide bearing (5) will be dislodged from the centre of the housing as the rack is moved. Rotate the rack through 90 deg (approx) until the heads of the four guide pins (4) are at the lowest point and fall into the cavity beneath the slewing rack. Withdraw the guide bearing from the housing. The slewing rack can then be removed through the slewing cylinder aperture complete with guide bearing. Collect the guide pins from the housing.

Refitting

14 The procedure to refit the slewing rack is as follows:

14.1 Insert the slewing rack and the guide bearing together through the slewing cylinder aperture. Engage the guide bearing in the housing at 180 deg to the position normally occupied (with the outer circumference of the bearing towards the king post). Leave the guide pin holes clear of the housing.

14.2 Adjust the slewing rack teeth to face outward (away from the normal engagement position with the pinion teeth).

14.3 Apply grease (Table 3, Serial 3) to the underside of the heads of the rack guide pins and insert through the guide bearing until in contact with the rib on back of the slewing rack.

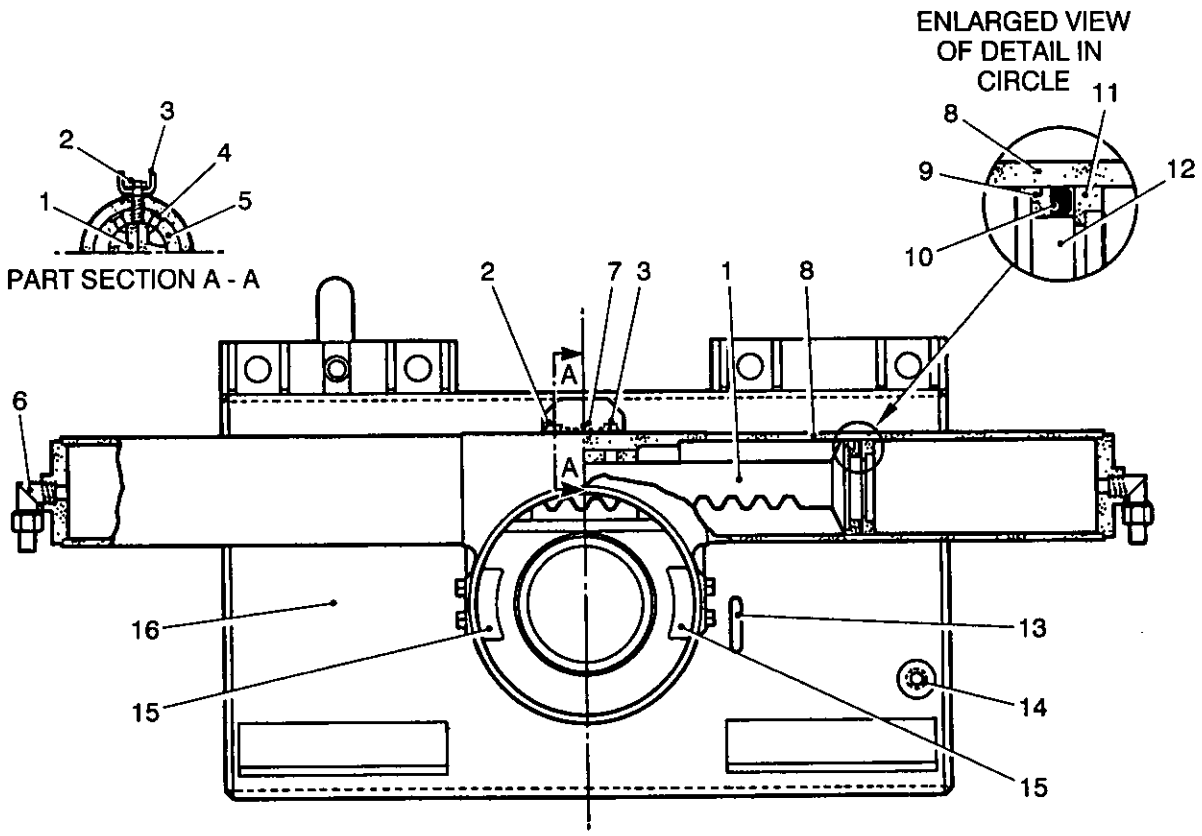
14.4 Rotate the slewing rack and guide through 180 deg until the rack teeth are in the normal engagement position. Ensure that the guide pins remain in position.

14.5 Push the slewing rack through the housing until the underside of the piston head butts against the guide bearing. Then, gently push and pull the rack against the end of the guide housing until the locating bolt holes align with the holes in the housing. It is essential that during engagement of the guide bearing with the housing, the heads of the guide pins are kept below the outer surface of the bearing.

14.6 Secure the guide bearing in position with the locating bolts (2) and fit the grease nipple (7) and/or the adaptor through the bracket (3) into the housing.

14.7 Fit the seals in the slewing pistons and the slewing cylinders to the housing, as detailed in AESP 2350-T-252-522 Chap 6.

14.8 Refit the slewing body as detailed in Para 12, and service all grease points using grease (Table 3, Serial 3).



1	Slewing rack	9	Support rings, slewing piston seal
2	Locating bolt	10	Seal slewing piston
3	Bracket	11	Collar
4	Guide pins	12	Slewing piston
5	Slewing rack guide bearing	13	Breather pipe
6	Elbow, slewing cylinder hydraulic connection	14	Return line connection on reservoir
7	Grease nipple	15	Pinion thrust blocks
8	Slewing cylinder	16	Reservoir

Fig 4 General arrangement of slewing rack

RESERVOIR AND PINION HOUSING

Removal

NOTE

Removing reservoir and king post assembly is easier when power pack is removed, the assembly being withdrawn through engine compartment hatches. If time is not available for removing power pack the following procedure (the majority of which is also applicable, when removing through engine compartment hatches) should be adopted.

15 The procedure to remove the reservoir and pinion housing is as follows:

15.1 Remove the slewing body as detailed in Para 6.

15.2 Remove the slewing rack as detailed in Para 13.

15.3 Drain the hydraulic fluid from the reservoir as follows:

15.3.1 Shut the stop cock in the fluid supply line (located between the reservoir and filter).

15.3.2 Place a clean container under the filter and remove the drain plug from the base of the filter bowl.

15.3.3 Turn on the stop cock and collect the hydraulic fluid in the container under the filter head. Use the stop cock to control and also shut off the flow when necessary to empty or substitute further containers.

15.3.4 When the flow through the filter head ceases, remove the plug from the elbow at the base of the reservoir and allow the residue to drain.

15.4 Disconnect main feed pipe at union above stop cock.

15.5 Remove the pipe between the oil pressure gauge connection in the hull roof and the junction with the lock out supply line at floor level.

15.6 Disconnect the return pipe at the top forward end of the reservoir and at the union protruding through the hull roof. The pipe cannot be removed and must be left in position until the reservoir is removed from the vehicle.

15.7 From the interior of the hull, remove:

15.7.1 The padding from the front of the reservoir.

15.7.2 The operator's and commander's seats from the gangway.

15.7.3 The periscope stowage tray from the rear bulkhead (above the RH slewing cylinder).

15.7.4 The operator's head rest and the head set rest from the roof of the hull (in front of the king post).

15.7.5 The heater control from the centre bulkhead.

15.7.6 The switchboard, engine No. 3 Mk 2 from the rear bulkhead (remove one clip from the cable and support the switch assembly with a piece of cord nearer to hull wall).

15.7.7 The guide rollers and bracket for the engine speed control rod from the rear bulkhead. Withdraw the clevis pin securing the control rod to control lever and the hinge rod away from the crane location.

15.7.8 The two struts for the water carrier stowage (from the access gangway).

15.7.9 The junction boxes and the base of radio set carrier (leave the radio set carrier brackets in position).

15.7.10 The NBC filter from the rear edge of the cupola aperture.

15.7.11 The rubberised padding from trunking at the rear edge of the cupola hatch.

15.8 Remove the cupola from the top of the hull.

15.9 Remove the eight bolts and nuts securing the reservoir mountings at the base (front) and the hull wall (rear). Rear mountings have packing pieces between the bracket and the hull.

15.10 Place wooden blocks (approx 760 mm (2ft 6in.) long) across the gangway behind the engine to same height as the base of the reservoir.

15.11 Pull the reservoir towards the centre of the hull and then lift the leading edge so that the king post is tilted toward the RH side of vehicle.

15.12 Gradually pull out the reservoir from the hull mounting position on to the wooden blocks until the king post is completely inside the hull. A rope located around the king post and passed up through the king post aperture to an assistant above, will help control the overhanging weight of the king post.

WARNING

PERSONNEL DANGER. DO NOT WORK UNDER A SUSPENDED LOAD, COMPLY WITH ALL CURRENT LIFTING REGULATIONS.

15.13 Having moved the reservoir onto wooden blocks, insert a sling through the slew rack bore and lift centrally on suitable lifting equipment. Allow the king post to pass beneath the cut away section of the central bulkhead, as the reservoir is moved along the gangway as far as possible.

15.14 When the sling fouls the side of operators hatch, lower the equipment and allow the reservoir to rest on the shelf at the LH of gangway and remove sling from lifting equipment hook. Relocate on hook through the cupola aperture.

15.15 Lift the reservoir and move forward as far as possible until the king post is central between the brackets of the radio carrier.

15.16 Attach a sling and shackle to the inner bolt hole at the front and rear mountings of the reservoir; pass the sling up and attach to the lifting equipment hook. Raise so that the king post can be guided up between the radio carrier brackets and be located in the cupola aperture.

15.17 Attach a second sling and shackle to the forward hull wall mounting bracket of the reservoir and attach to the lifting equipment hook. Lift the reservoir until it protrudes end on through the cupola aperture.

15.18 Locate the reservoir so that the forward end and the king post protrude through the cupola aperture with the rear end of the reservoir positioned under the radio location. Manoeuvre the reservoir through the cupola aperture until the lifting equipment can lift it clear of, and away from, the hull. Lower the reservoir onto a pair of suitable wooden blocks.

Testing

16 Test the reservoir as follows:

16.1 Plug all orifices and install a Schrader valve (in suitable threaded cap) in either the filler plug and dipstick location or the return pipe connection.

16.2 Pressurize with compressed air to 1.38 bar (20 lbf/in²) (a tyre pressure gauge can be used to check pressure). Immerse in a tank filled with water to check for leaks).

16.3 If leaking, steam clean interior of the reservoir and repair by welding.

Refitting

17 The procedure to refit the reservoir and pinion housing is as follows:

17.1 Ensure that the pipe between the union protruding through the hull roof and the forward end of the reservoir (return line) is in position behind the king post location.

NOTE

This pipe cannot be fitted after reservoir is located on hull mountings.

17.2 Fit shackles and slings to the inner holes of the forward hull wall and the base mounting brackets of the reservoir (shackles will foul cupola aperture if fitted to outer pair of holes). Lift the reservoir and king post assembly using suitable lifting equipment. Lower through the cupola aperture so that the rear end of the reservoir is located under the radio location. It will be necessary to support or wedge the reservoir, whilst one of the shackles is removed, to permit the corner of the reservoir to be lowered through the aperture.

17.3 With the reservoir inside the hull:

17.3.1 Support the reservoir temporarily and remove the sling and shackle from the mounting bracket hole.

17.3.2 Refit the sling through the slewing rack bore and lift the reservoir until clear of the hull fitments.

17.3.3 Manoeuvre the reservoir until it is lengthways along the gangway with the king post at 90 degrees to the vertical and located under, or to side of the radio location.

17.3.4 Rearrange the sling through the operator's hatch aperture when movement is limited by the sling fouling the cupola aperture.

17.4 Move the reservoir along the gangway, checking that the king post clears the cut away section of the central bulkhead. Allow the reservoir to rest on wooden blocks (which are placed behind the engine and on the corner of the tray at engine side of the gangway). Loop a sling about the king post and pass it up through the king post aperture to an assistant on top of the hull roof. Pull the king post upward on this sling, levering the reservoir until the king post is entered through the hull aperture centrally with the mounting brackets aligned.

17.5 Refit all components in the reverse order to removal, ensuring that:

17.5.1 Packing pieces are located between the reservoir mounting bracket and the hull wall.

17.5.2 The thrust disc on top of the king post is located in position prior to fitting the slewing body.

ROTARY VALVE, LOCK OUT CYLINDER CONTROL

18 No repairs are carried out on the lock out cylinder control rotary valve, its removal and refitting are detailed in AESP 2350-T-252-522 Chap 6.

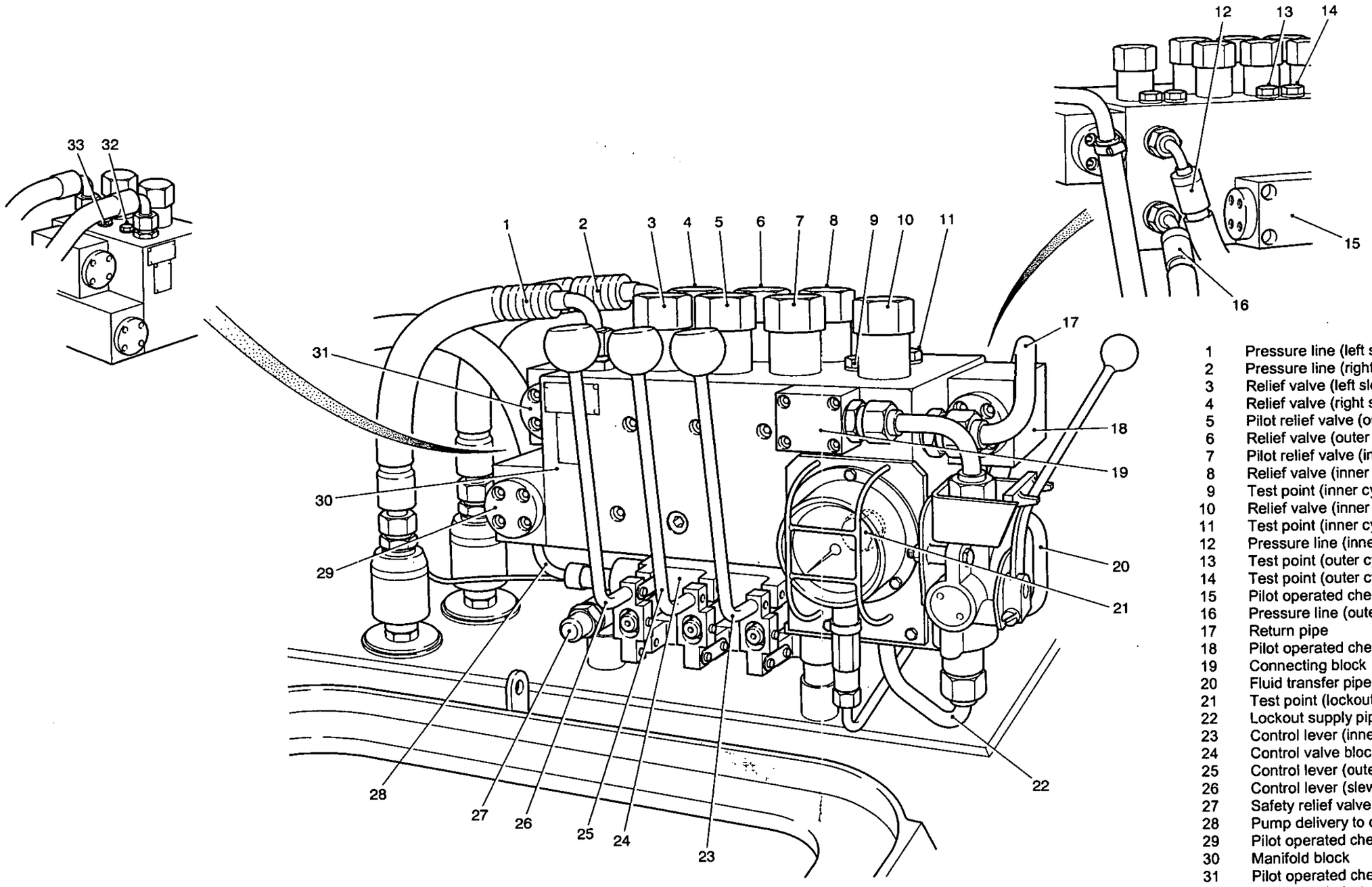
MAIN CONTROL VALVE

Introduction

19 There are two types of Main Control Valve (MRV) that can be fitted to FV434. The original MCV (FV649488) Fig 5, and the new MCV (FV847574) Fig 6. Neither of these MCVs' are repairable, as they are not supported by spares. There are two courses of action to take, as follows:

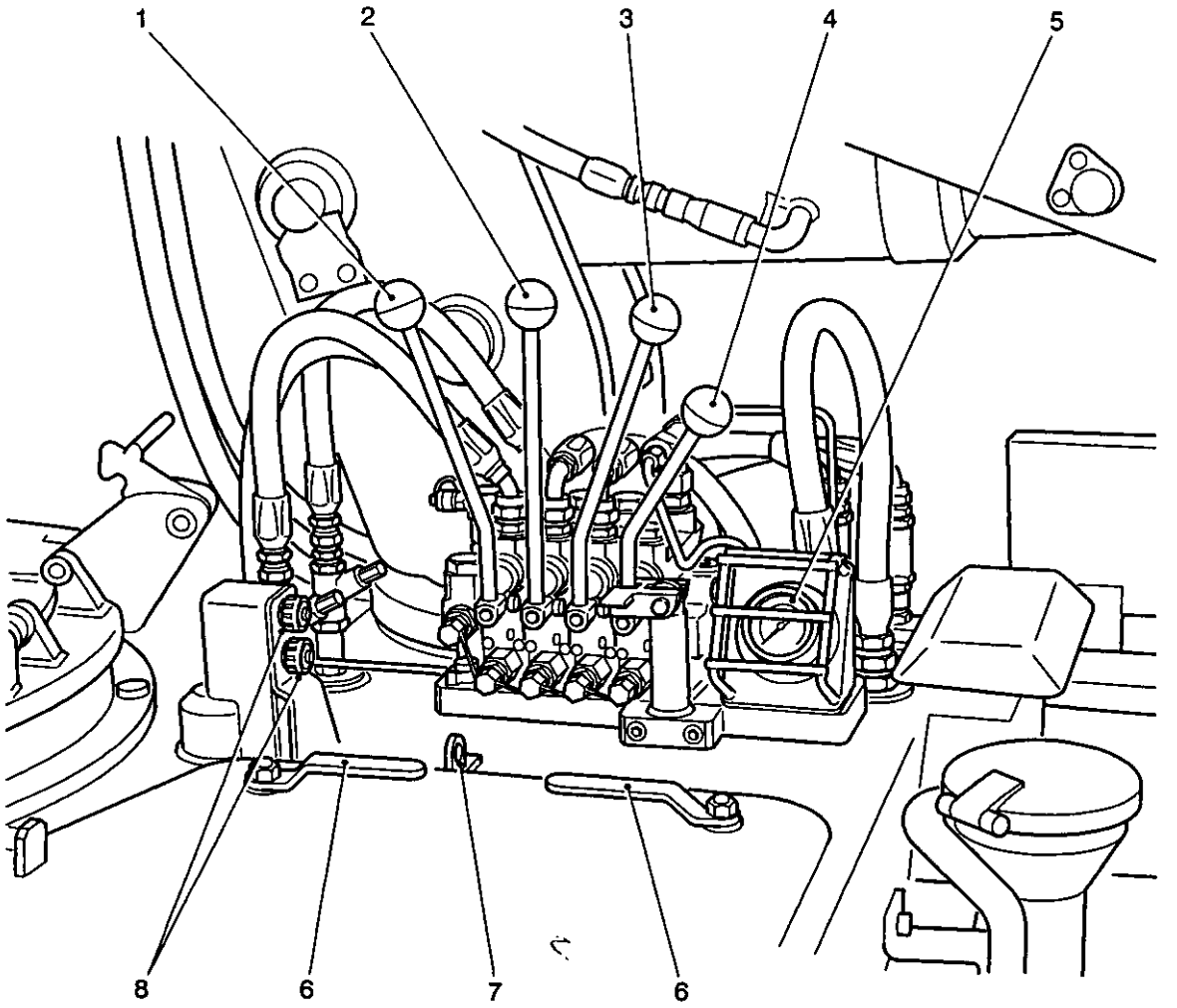
19.1 On failure of the original MCV (FV649488), remove MCV as per Para 20 and refer to AESP 2350-T-252-811 Modification Instruction No. 1, EMER Modification Instruction No. 23 "Crane Hydraulic Control".

19.2 On failure of new MCV (FV847574), remove and refit as per Para's 20 and 21.



1 Pressure line (left slew cylinder)
2 Pressure line (right slew cylinder)
3 Relief valve (left slew cylinder)
4 Relief valve (right slew cylinder)
5 Pilot relief valve (outer cylinder)
6 Relief valve (outer cylinder)
7 Pilot relief valve (inner cylinder)
8 Relief valve (inner cylinder)
9 Test point (inner cylinder pilot)
10 Relief valve (inner cylinder)
11 Test point (inner cylinder)
12 Pressure line (inner cylinder)
13 Test point (outer cylinder)
14 Test point (outer cylinder pilot)
15 Pilot operated check valve (outer cylinder)
16 Pressure line (outer cylinder)
17 Return pipe
18 Pilot operated check valve (inner cylinder)
19 Connecting block
20 Fluid transfer pipe
21 Test point (lockout system)
22 Lockout supply pipe
23 Control lever (inner cylinder)
24 Control valve block
25 Control lever (outer cylinder)
26 Control lever (slewing)
27 Safety relief valve
28 Pump delivery to control valve
29 Pilot operated check valve (left slew cylinder)
30 Manifold block
31 Pilot operated check valve (right slew cylinder)
32 Test point (left slew cylinder
33 Test point (right slew cylinder)

Fig 5 Main control valve – FV649488



434/014

1 Slewing lever
2 Outer ram lever
3 Inner ram lever
4 Lockout lever
5 Lockout pressure gauge
6 Operators door padlock hasp
7 Operators door locking handle
8 Light sockets

Fig 6 Main control valve – FV847574

Removal

20 The procedure to remove main control valve is as follows:

20.1 Disconnect the feed hoses to the LH and RH slew cylinders, at the top LH end of the manifold block.

20.2 Disconnect the delivery hose from the pump at the LH end of the main control valve, (below the manifold block).

20.3 Disconnect the feed hoses to the inner and outer boom cylinders at the rear of the manifold block.

20.4 Disconnect the steel pipe (return line to reservoir) at the RH end of the manifold block above the rotary control valve for the lock out circuit.

20.5 Disconnect the steel feed pipe to the lock out cylinders at the rear of the rotary control valve.

20.6 Cap off all connections on the control valve and manifold. Remove the three nuts and washers securing the manifold and control valve assembly to the top of the hull. If available, use suitable lifting equipment to remove the assembly from the hull.

Refitting

21 To refit new MVC (FV847574) (Fig 6) refer to AESP 2350-T-252-811 Modification Instruction No. 1, EMER Modification Instruction No. 23 "Crane Hydraulic Control" and proceed as detailed in Para 9 onwards.

PILOT OPERATED CHECK VALVE

Removal and dismantling

22 Remove and dismantle the pilot operated check valves as follows:

22.1 Remove the two setscrews holding the valve body to the manifold block and withdraw the valve and sealing ring.

22.2 Remove the four socket head setscrews securing each end cap to the valve assembly and withdraw the spring (Fig 7(1)), ball (2) and valve cage (3) from one end of the housing and the pilot spool from the opposite end. Collect any sealing washers fitted beneath the end caps.

Inspection

23 Wash all parts in white spirit (Table 3, Serial 1) and examine:

23.1 The seat on the exterior of the valve cage (3) and the mating seat in the valve housing (5).

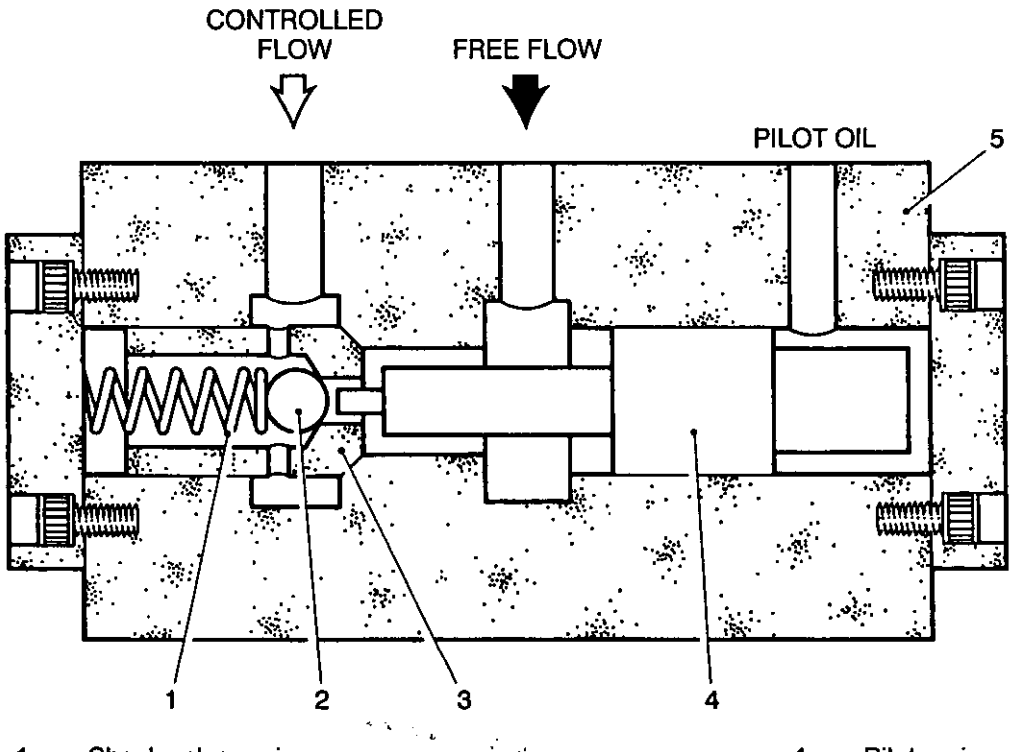
23.2 The ball seating inside the valve cage and condition of the ball.

23.3 The spring for breakage or deformation.

23.4 The valve cage maybe lapped to housing.

23.5 The ball seat may be lapped by brazing the ball to piece of 3/16in. diameter rod (or similar) and using fine grinding compound (Table 3, Serial 2). Remove all traces of grinding compound and fit a new ball on assembling.

23.6 Refit the valve on the manifold block using new seals if necessary.



1	Check valve spring	4	Pilot spring
2	Ball	5	Housing
3	Valve cage		

Fig 7 Pilot operated check valve

Adjustment

24 Check and adjust the manifold pilot relief valve setting as follows:

24.1 Fit a suitable gauge (capable of reading up to 3000 lbf/in^2) to the test point for the valve to be adjusted.

24.2 Arrange for a load of 1248 kg (2750 lbs) to be lifted at 3.95 m (13ft) radius using the extension jib.

24.3 Run the pump to circulate fluid through control valve and the engage lock out cylinders. Lift the load approximately half way between the ground and the maximum height of lift.

24.4 Operate the control lever to lower the load on the boom cylinder connected to the pilot relief valve under adjustment. Observe the pressure registered on the gauge as load begins to descend. This should be 2500 lbf/in².

24.5 To adjust the pressure, remove the cap, slacken the lock nut and turn the adjusting screw clockwise to increase, or anti-clockwise to reduce the pressure. Ensure the lock nut is tightened before proceeding further.

24.6 When the correct pilot relief setting is obtained, remove the gauge and adaptor. Refit blanking caps to gauge test point and relief valve adjusting screw.

24.7 Functional testing of pilot operated check valves is detailed in Para 54 to 60.

SYSTEM RELIEF VALVE

25 This valve does not require maintenance or adjustment. Should the fluid become severely contaminated by dirt however, it is possible that foreign matter may become lodged under the ball valve. This would result in the ball being held off its seat with a consequent loss of pressure in the entire system.

Removal

26 Remove the system relief valve as follows:

26.1 Remove the acorn nut (Fig 8(10)), slacken the lock nut (9), but not the adjusting screw (8) at this stage.

26.2 Unscrew the housing (7) and withdraw complete with spring (5) and washer (6). Withdraw also, the ball retainer (4) from the control valve. Loosen the lock nut and unscrew the adjusting screw from the housing (7).

26.3 The steel ball (3) will remain in the control valve. Apply a small quantity of thick grease to the unsharpened end of a pencil and push onto the ball. The ball should now remain attached to pencil as it is withdrawn.

26.4 Unscrew and remove the relief ball seating (2) from the control valve.

26.5 Remove the nylon ball (1) in same manner as detailed for the steel ball at Sub-Para 26.3.

Inspection

27 Clean off all parts in white spirit (Table 3, Serial 1) and check:

27.1 The steel ball and seat for serviceability and that they are free from ridging and pitting.

27.2 The nylon ball is free from ridging or flats, renew if necessary.

27.3 Condition of the O-ring fitted to the underside of the ball seating (2).

27.4 The steel ball and seat may be lapped in by brazing ball it to piece of 3/16in. diameter rod and using fine grinding compound (Table 3, Serial 2). Remove all traces of grinding compound before refitting.

Refitting

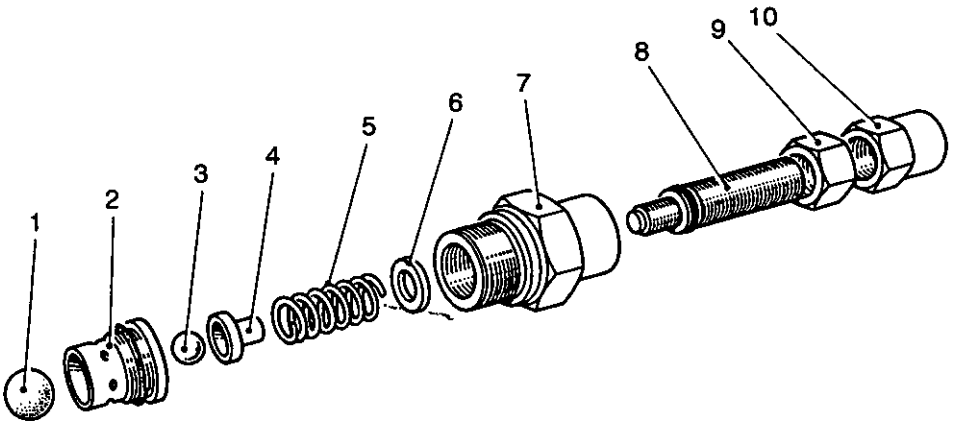
28 Refit the system relief valve as follows:

28.1 Locate the O-ring in position on the underside of the ball seat flange and using a small quantity of clean thick grease, stick the nylon ball (Fig 8(1)) on the underside of the ball seating (2).

28.2 Place the steel ball in position in front of the seat (the ball retainer (4) will automatically located it when fitted).

28.3 Insert the washer (6), spring (5) and ball retainer (4) into the housing (7) and fit.

28.4 Fit the adjusting screw (8) complete with lock nut (9) into housing and screw in until the lock nut is located in position occupied prior to removal. Do not fit the acorn nut (10) until relief valve adjustment is completed.



434/163

1	Nylon ball	6	Washer, spring seat
2	Ball seating	7	Housing relief valve
3	Steel ball	8	Adjusting screw
4	Ball retainer	9	Lock nut
5	Relief valve spring	10	Acorn nut

Fig 8 System relief valve

Adjustment

29 Adjust the system relief valve as follows:

29.1 Fit a 0 – 204 atm (0-3000 lbf/in²) gauge (Para 30 refers) and locally manufactured adaptor (Table 1, Serial 4) to the outer boom cylinder circuit gauge test point on the manifold block (see Fig 13).

29.2 Remove the cap, slacken the lock nut and screw down the adjusting screw of the outer boom cylinder manifold relief valve several turns, thereby increasing the pressure at which the valve will open.

29.3 Run the pump to circulate fluid through the control valve. Operate the control valve lever to raise the outer boom until the piston is fully extended. Hold the lever in this position and observe the maximum pressure registered on the gauge. With full pump flow the system relief valve should open at 190 atm (2800 lbf/in²).

29.4 To adjust the pressure, slacken the lock nut and turn the adjusting screw clockwise to increase or anticlockwise to decrease the pressure. Ensure the lock nut is tightened before proceeding further.

29.5 When the correct system relief valve setting of 190 atm (2800 lbf/in²) is attained fit the acorn nut to the relief valve adjusting screw.

29.6 Reset the outer boom cylinder manifold relief valve by slackening the adjusting screw and resetting as detailed at Para 63.

REFLUX VALVES

Removal

30 Remove a reflux valve as follows:

30.1 Disconnect the hose at the input (upper) end of valve.

30.2 Unscrew the valve from the junction block (boom cylinder valves) or the hull roof unions (slew cylinder valves). The outer end of the inner body (Fig 9(1)) has slots for suitable peg spanner. If a reflux valve is faulty all four reflux valves must be replaced with flow control valves (Para 38 refers).

Dismantling

31 Dismantle a reflux valve as follows:

31.1 Remove the seal (if fitted).

31.2 Remove the external circlip (6) from the tapered end of the valve.

31.3 Make note of the position of the lock nut on the threaded inner body then the slacken lock nut and unscrew the inner body from the outer body (5) complete with the O-rings (7).

31.4 If necessary to dismantle the check valve, remove the internal circlip (10) and withdraw the spacer (9), spring (8) and valve spool (3) from the inner body.

Inspecting

32 Wash all parts in white spirit (Table 3, Serial 1) and examine:

32.1 The valve seat (4) and seat inner body (1), rectify slight imperfections by lapping, otherwise renew the valve spool (3).

32.2 The spring for breakage or deformation.

32.3 The adjustment threads for damage.

Assembling

33 Assembly is in the reverse order to dismantling. Ensure that the internal circlip (10) is located securely in the groove and new O-rings (7) are fitted. Lubricate the internal surface of the outer body and clean hydraulic fluid before fitting inner and outer bodies together.

<u>O-ring seal test</u>

34 Carry out a test of the O-ring seal as follows:

34.1 Connect a suitable hand pump to the free flow port and fit a suitable threaded plug to controlled flow port.

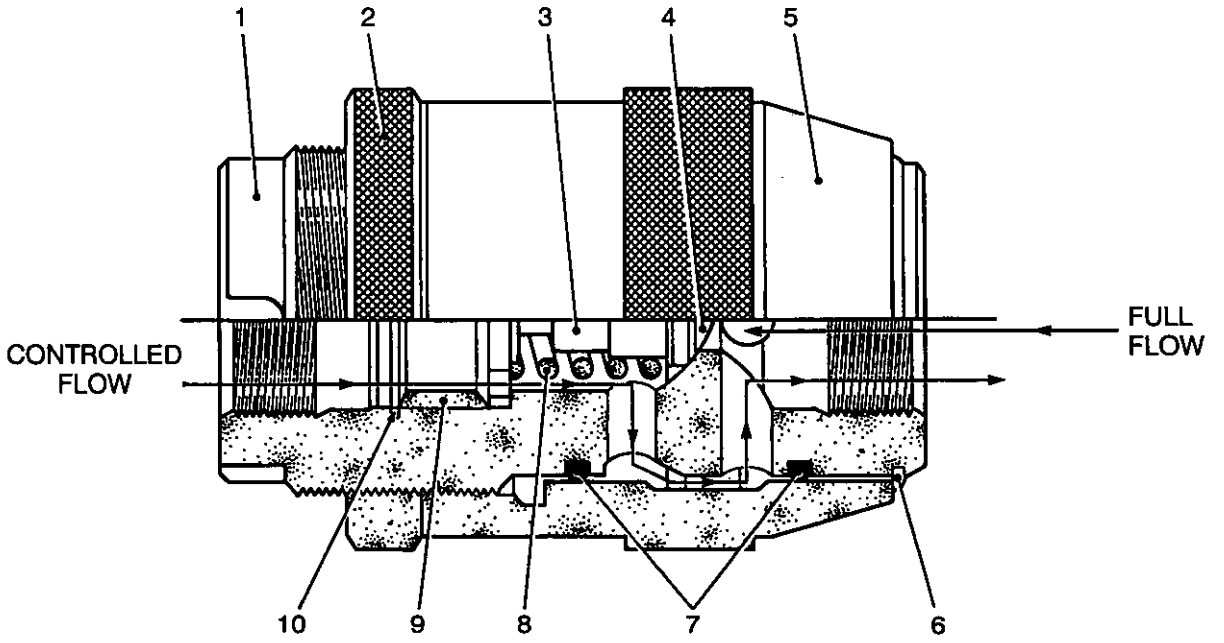
34.2 With the reflux valve adjusted to the fully open position apply pressure of 170 atm (2500 lbf/in^2) to the free flow port. There must not be any leakage between the inner and outer body sections.

Refitting

35 Refitting is the reverse of the procedure detailed for removal, ensuring the following:

35.1 The boom cylinder valves are fitted with the controlled flow port connected to the boom cylinder hose and the free flow port to the junction block on hull.

35.2 The slewing cylinder valves are fitted with the free flow port connected to the manifold delivery hoses and the controlled flow port to pipe adaptors on the hull roof.



1	Inner body	6	Circlip
2	Lock nut	7	O-rings
3	Check valve spool	8	Spring
4	Check valve seat	9	Spacer
5	Outer body	10	Circlip

Fig 9 Reflux valve

Adjustment

36 Ensure the valve is adjusted to the position noted on dismantling. Where this precaution has been omitted (or valve was already out of adjustment), the valve must be adjusted to give precise throttled control of slew cylinders, in both directions and throughout arc of travel. Adjustment for boom cylinder reflux valve should allow crane to descend at a slow enough speed for precise control (with full rated load at maximum and minimum radius).

37 To adjust the valve, slacken the lock nut (Fig 9(2)) and screw the outer body (5) along the inner body (1), towards the flat end of valve assembly (controlled flow port) to decrease flow, or away from, to increase flow.

FLOW CONTROL VALVE

38 Flow control valves are fitted as a set of four whenever a reflux valve fails.

Removal

CAUTION

EQUIPMENT DAMAGE. Flow control valves have an arrow marked on the body of the valve, indicating direction of free flow, take note of the direction of flow before removing a flow control valve to ensure correct refitting.

39 Remove a flow control valve as follows:

39.1 Note, for ease of correct refitting, direction of flow of the valve.

39.2 Disconnect the hose at the input (upper) end of valve.

39.3 Unscrew the valve from the junction block (boom cylinder valves) or the hull roof unions (slew cylinder valves).

Refitting

40 Refitting is the reverse of the procedure detailed for removal, ensuring the following:

40.1 The direction of flow arrow on the valve body is pointing in the correct direction.

INNER BOOM RAM CYLINDER

Removal

41 Remove the inner boom ram cylinder as follows:

41.1 Use suitable lifting equipment or the vehicle's hydraulic system plus manual assistance, to raise the boom over the cargo compartment. The boom should be in a convenient position for being supported by a wooden block. The control valve should be operated for each function (even if hydraulic system is inoperative) to relieve any hydrostatic lock. Lower the boom onto wooden blocks ensuring the weight is supported safely. If no pilot pressure is available to operate check valve, slacken hose failure valve to ram cylinder (but, not hydraulic hose) to bleed off fluid and therefore lower the boom.

41.2 Remove the hydraulic hose from the port on the ram cylinder (if not already removed to permit blocking of boom).

41.3 Remove the two bolts and lock plate from the pivot pin at the outer end of the ram. Withdraw the pin and lower the ram cylinder downwards.

41.4 If the ram cylinder is to be dismantled, using spanner (Table 1, Serial 1) slacken the ring nut retaining the piston assembly within the cylinder. (The cylinder should be held securely by king post). Do not remove the ring nut, slacken sufficiently to permit easy removal on bench.

41.5 Remove the two bolts and lock plate from the pivot pin at the inner end of the ram cylinder. Tap out the pin and withdraw the ram cylinder assembly as the pin is driven clear.

Dismantling

42 Dismantle the inner boom ram cylinder as follows:

42.1 Place the cylinder assembly on a suitable bench, unscrew the previously slackened ring nut (Fig 10(1)) and withdraw the ram piston assembly.

42.2 Using a strap wrench, unscrew and remove the yoke end of the piston and slide off the ring nut.

42.3 Extract the O-ring (2) and backing rings (3) from the exterior of the ring nut, remove the O-ring (4), backing rings (5) and wiper seal (6) from interior of the ring nut.

42.4 Remove the hose failure valve and dismantle it by unscrewing the spring cap from the body and withdrawing the spring and ball.

Inspection

43 Clean all parts and examine:

43.1 The ram piston and cylinder for damage, scoring or wear. Slight scoring may be rectified by stoning, deep scoring will necessitate renewal of component.

43.2 The pivot bushes (at each end of the cylinder) for wear.

43.3 The pivot pins for wear or damage caused during removal.

43.4 The ball and ball seat in the hose failure valve for ridging and damaged seat and the ball spring for breakage or distortion.

Assembling

44 Assembling is the reverse of the procedure detailed for dismantling, ensuring the following:

44.1 All components are clean and lubricated with hydraulic fluid (as used in vehicle system) for assembling.

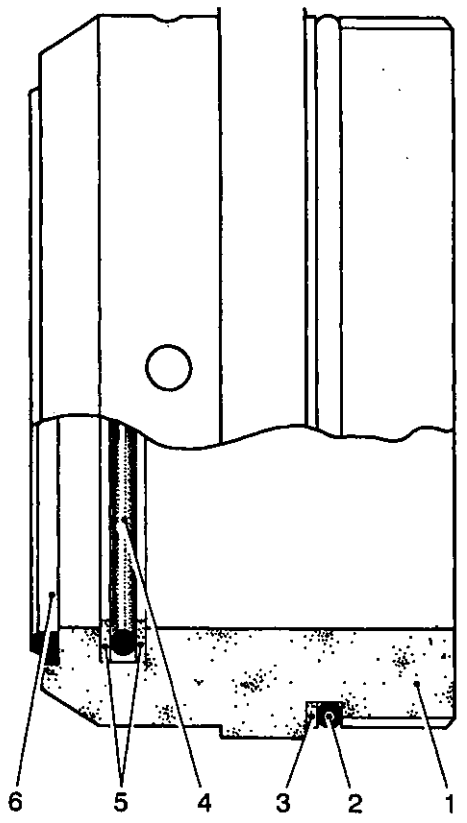
44.2 O-rings, backing rings and seals are renewed and fitted in position without distortion.

44.3 The pivot pin lock plates are fitted and secure.

44.4 The hose failure valve spring is fitted with tapered end into the valve body.

44.5 New copper washers are fitted to pipe connections.

44.6 The crane is functionally tested under maximum rated load at minimum radius condition (see Fig 15). Inspect for oil leaks at cylinder and hose connections.



434/165

1 Ring nut
2 External O-ring
3 External backing ring
4 Internal O-ring
5 Internal backing ring
6 Wiper seal

Fig 10 Ring nut, inner boom cylinder

OUTER BOOM RAM CYLINDER

Removal and dismantling

45 Removal and dismantling of the outer boom ram cylinder is as follows:

45.1 From the travelling position, swing the outer section of boom up and over onto main boom. Ensure that catch engages and locks outer section securely in stowed position. Raise the boom as detailed at Para 41.1, and position timber support under boom in such a position as to allow easy access to the cylinder pivot pins.

45.2 Remove the two bolts and lock plate from the piston rod connecting pin. Withdraw the pin. Lower the cylinder to a convenient position and tie thrust link clear of operator with piece of strong cord.

45.3 Slacken the cylinder end cap lock ring (Fig 11 (8)) and unscrew end cap (7) one full turn (do not remove end cap from cylinder at this stage).

45.4 Remove plate from hose entry into boom.

45.5 Remove the two socket head screws and the lock plate from the inner end of cylinder. Tap out the pin and lower the ram cylinder assembly as the pin is driven clear. Pull the hydraulic hose through the boom sufficiently to gain access for removal.

45.6 Remove the hydraulic hose from the connection on the hose failure valve and withdraw the ram cylinder, leaving the hose in position in the boom.

45.7 Remove the end cap and withdraw the piston rod assembly.

45.8 Remove the backing rings (4) and O-ring (11) from the piston head (12).

45.9 To dismantle the piston head from the piston rod (only necessary if the piston head or rod is damaged) remove the circlip (3) and withdraw the two halves of the split collar (2) from the groove in the piston rod. Detach the piston head from the rod by applying sharp tap to the end of the piston rod with soft faced hammer to free the piston head from the O-ring (10).

45.10 For maintenance and inspection information refer to Para 43.

Assembling and refitting

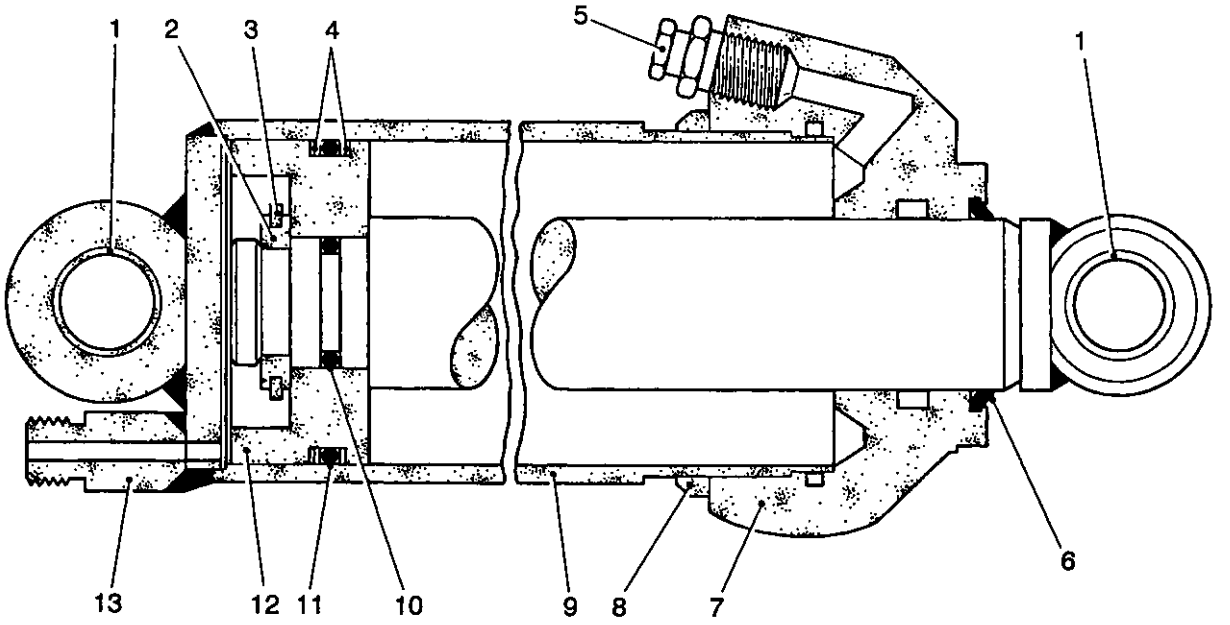
46 Assembling and refitting is the reverse of the procedure detailed for removal and dismantling, ensuring the following:

46.1 If the piston head has been removed, a new O-ring (10) must be fitted.

46.2 A new wiper seal (6) is fitted to the cylinder end cap.

46.3 The hydraulic hose is fitted to the hose failure valve/cylinder port prior to locating the inner pivot pin.

46.4 Details for assembling the inner boom cylinder at Para 44 are observed, being applicable also to the outer boom cylinder.



434/166

1	Bush	8	Lock ring
2	Split collar	9	Cylinder
3	Circlip	10	O-ring piston rod seal
4	Backing rings, piston head seal	11	O-ring piston head seal
5	Bleed screw	12	Piston head
6	Wiper seal	13	Fluid port
7	Cylinder end cap		

Fig 11 Piston head, outer boom cylinder

FUNCTIONAL TESTING OF HOSE FAILURE VALVES

Test equipment

47 Functional testing of hose failure and pilot operated check valves is to be carried out at three monthly intervals. Testing is also to be carried out if valves have been removed and refitted. For testing, the test equipment listed in Table 2 is required.

Outer boom hose failure valve test procedure

Connecting test equipment

48 Connect the test equipment to the outer boom hose failure valve as follows:

48.1 Lower inner and outer boom to the fully retracted position.

48.2 Disconnect the outer boom hose (at the reflux or flow control valve and screw on the three-way block. Use a 7/8in. sealing washer between the reflux valve and block. Ensure that the block is located with the straight through passage in the vertical position Fig 12). Fit a 7/8in. UNF male union and sealing washer to each of the remaining ports in this block. Reconnect the outer boom hose to the upper port in block.

48.3 Fit 7/8in. to 1/2in. BSP male adaptors and sealing washers to the ports on each side of the unloading valve.

48.4 Connect one of the test hoses between the union of the three-way block and the port marked 'L' on the unloading valve. The hose should be 90 deg to the reflux valve/outer boom hose flow path.

48.5 Connect the remaining test circuit hose to the port marked 'U' on the unloading valve. Locate the end of hose into a clean empty 23 litre (5 gallon) container.

48.6 Check that the unloading valve is in the closed position. Operate the hydraulic system to expel any air introduced into system whilst connecting the test equipment. Open the unloading valve momentarily during this procedure to ensure that air is expelled from the discharge hose.

Static test

49 Carry out a static test as follows:

49.1 Lift a test load 2034 Kg (2 tons) on the crane, ensuring that the outer boom is not raised to the maximum height

NOTE

It will be impossible to lower the load if the outer boom is fully extended. It is necessary to raise the boom, to effect release of the hose failure valve.

49.2 Suspend the load at 610 mm (2ft) above the ground.

49.3 Return the outer boom control lever to the central position.

49.4 Turn the unloading valve to unloading position, quickly, to simulate a burst hose. The load should remain suspended, if it does not, the hose failure valve is not operating and must be removed for examination.

49.5 To release the hose failure valve, close the unloading valve and operate the boom control valve to raise load further, then lower in the normal manner.

Raising test

50 Carry out a raising test as follows:

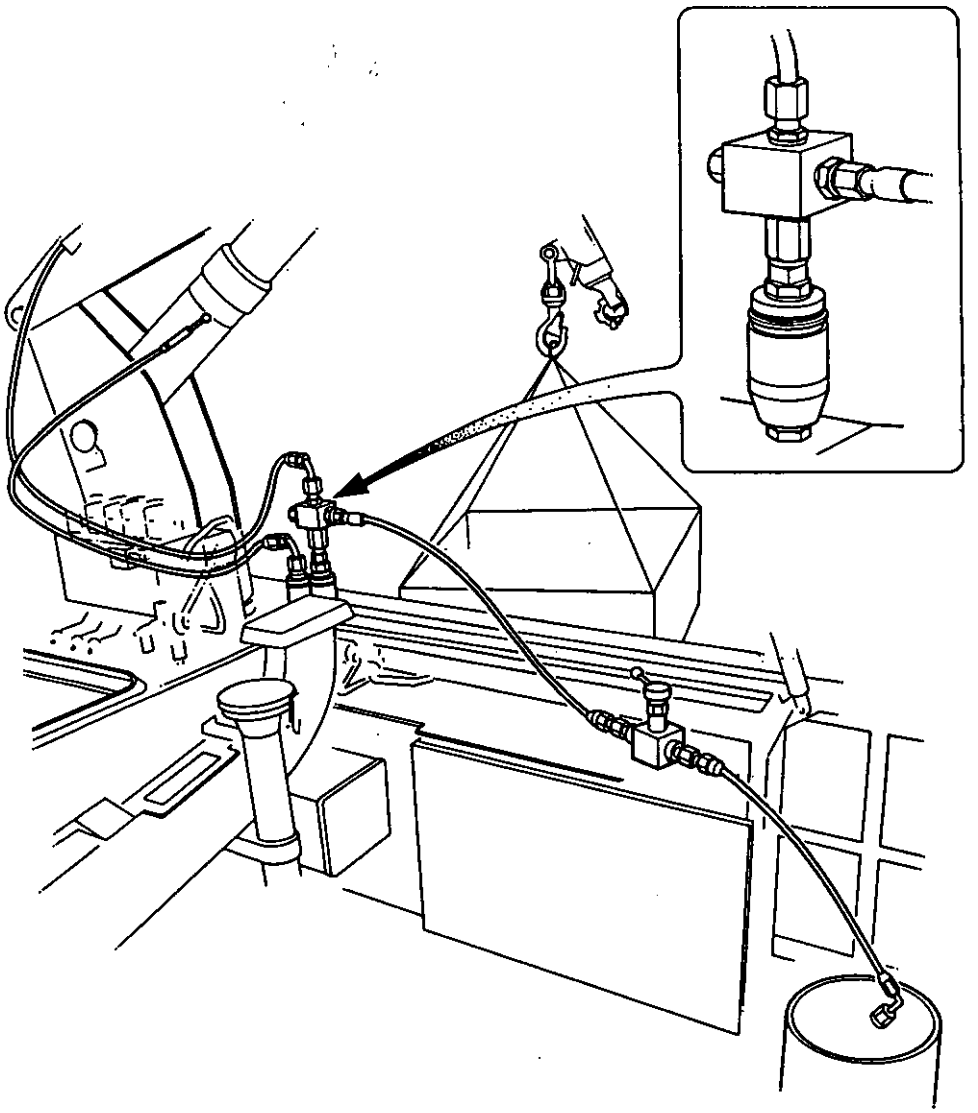
50.1 Operate the outer boom control valve to raise the load, and with the aid of an assistant, open the unloading valve whilst the load is still raised. If hose failure valve is operating correctly the load will drop a few inches, then hold, this is due to displacement from the pump having to be overcome by displacement from the boom cylinder.

NOTE

Under conditions of complete burst the action of the hose failure valve would be instantaneous.

50.2 Should the load fall, the hose failure valve is faulty and must be removed for examination.

50.3 To release the hose failure valve, close the unloading valve and operate boom control valve to raise load, then lower in normal manner.



434/167

Fig 12 Test circuit outer boom hose failure valve

Lowering test

51 Carry out a lowering test as follows:

51.1 Operate the control valve to raise the load to maximum height then position the valve to lower the load. With the aid of an assistant, open the unloading valve while the load is descending. If hose failure valve is operating, the load will stop descending.

51.2 If the load continues descending the hose failure valve is not operating and must be removed for examination.

51.3 To release hose failure valve, close unloading valve and operate control valve to raise load, then lower load in normal manner.

51.4 Ensure that:

51.4.1 The unloading valve is always operated with a firm and positive motion to prevent damage to the valve seals. It is a two position valve which must not be used in the mid position.

51.4.2 The level in the container (see Sub-Para 48.5) is observed if tests are carried out more than once on a faulty hose failure valve.

51.5 When the unloading valve is operated, on static and raising tests, do not the fully extend the boom, otherwise a hydrostatic lock could occur causing difficulty in releasing the hose failure valve.

Inner boom hose failure valve

52 On completion of tests on hose failure valve for outer boom cylinder, remove test circuit and reconnect outer boom hose to reflux valve. Inner boom hose failure valve is tested using the same procedures as outer boom hose failure valve. The test circuit for inner boom hose failure valve is connected between the inner boom hose and reflux valve.

EXAMINATION OF HOSE FAILURE VALVES

53 If functioning of a hose failure valve is suspected or definitely faulty, hose failure valve must be removed from vehicle and dismantled. The spring should then be examined (Table 5 refers) and the lighter gauge spring must be fitted. Other possible causes of failure include; damaged ball or seat, or foreign matter trapped under ball valve. All new hose failure valves received from RAOC should be dismantled and the spring examined prior to fitting to a vehicle. Modified valves must be stamped 'B' on the valve body.

TABLE 5 DETAILS OF OLD AND NEW SPRINGS

Serial (1)	Detail (2)	Old type spring (3)	New type spring (4)
1	Spring gauge	1.4 mm	1.0 mm
2	Closed length	18.2 mm	13.0 mm

FUNCTIONAL TESTING OF PILOT OPERATED CHECK VALVES

Location of pilot operated check valves

54 The pilot operated check valves are mounted on the control valve manifold block. The valves and their relevant circuits are located as follows (also refer to AESP 2350-T-252-522 Chap 6, Fig 2):

54.1 Slewing LH rotation, LH cylinder: Front, (forward) side of manifold.

54.2 Slewing RH rotation, RH cylinder: RH side of manifold nearest front of vehicle.

54.3 Outer ram: RH side of manifold nearest rear of vehicle.

54.4 Inner ram: Rear side of valve block adjacent to rotary valve for lockout struts.

Test equipment

55 Functional testing of the pilot operated check valves is to be carried out if valves have been removed and refitted. For testing, the test equipment listed in Table 2 is required.

Connecting test equipment

56 Connect the test equipment as follows:

56.1 Disconnect the flexible hose in the main pump delivery line to the valve block at the union on top of the hull (between the two reflux valves controlling the slewing cylinders).

56.2 Connect the test equipment direct to the hull union. The pump line flexible hose should be connected to the uppermost port of the three-way block in similar manner to that detailed for testing hose failure valves

56.3 Arrange hose connected to port marked 'U' on unloading valve to discharge into a container.

Static test

57 Carry out a static test as follows:

57.1 Lift a test load of 2034 Kg (2 tons) on the crane. Use both the inner and outer booms to give a clearance of approximately 1220 mm (4ft) under load.

57.2 With the crane control valve in the neutral position, turn unloading valve quickly to unloading position to simulate burst hose. If check valves are operating correctly load will remain suspended. If load falls, a check valve is not working and must be removed for repair or replacement. Under these circumstances the check valve for either the inner or the outer boom could be at fault. Therefore further checks to find out which is defective are to be carried out.

Inner boom check valve test

58 Carry out a inner boom check valve test as follows:

58.1 Operate inner boom control lever to raise the load. With the aid of an assistant, open the unloading valve while the load is being raised. If check valve is operating correctly load will be held almost immediately. If load falls the check valve must be removed for repair or replacement.

Outer boom check valve test

59 Carry out a outer boom check valve test as follows:

59.1 Repeat the operations detailed for inner boom tests (Para 57 and 58) using outer boom control lever. The same conditions apply that the load must be held.

Slewing ram check valve tests

60 Carry out a slewing ram check valve test as follows:

60.1 With load lifting clear of ground, operate slewing control lever to rotate jib to either the left or right. Open unloading valve with jib in motion. Jib should stop immediately.

60.2 Repeat test in opposite direction of rotation (separate pilot operated check valves control left hand and right hand rotation).

60.3 If jib does not hold immediately in either direction, the appropriate pilot operated valve(s) must be removed for repair or replacement.

CRANE PROOF LOAD TEST FOR OLD TYPE MAIN CONTROL VALVE - FV649488

WARNINGS

(1) PERSONNEL HAZARD. TESTING OF THE CRANE IS CARRIED OUT ONLY BY AUTHORIZED PERSONNEL.

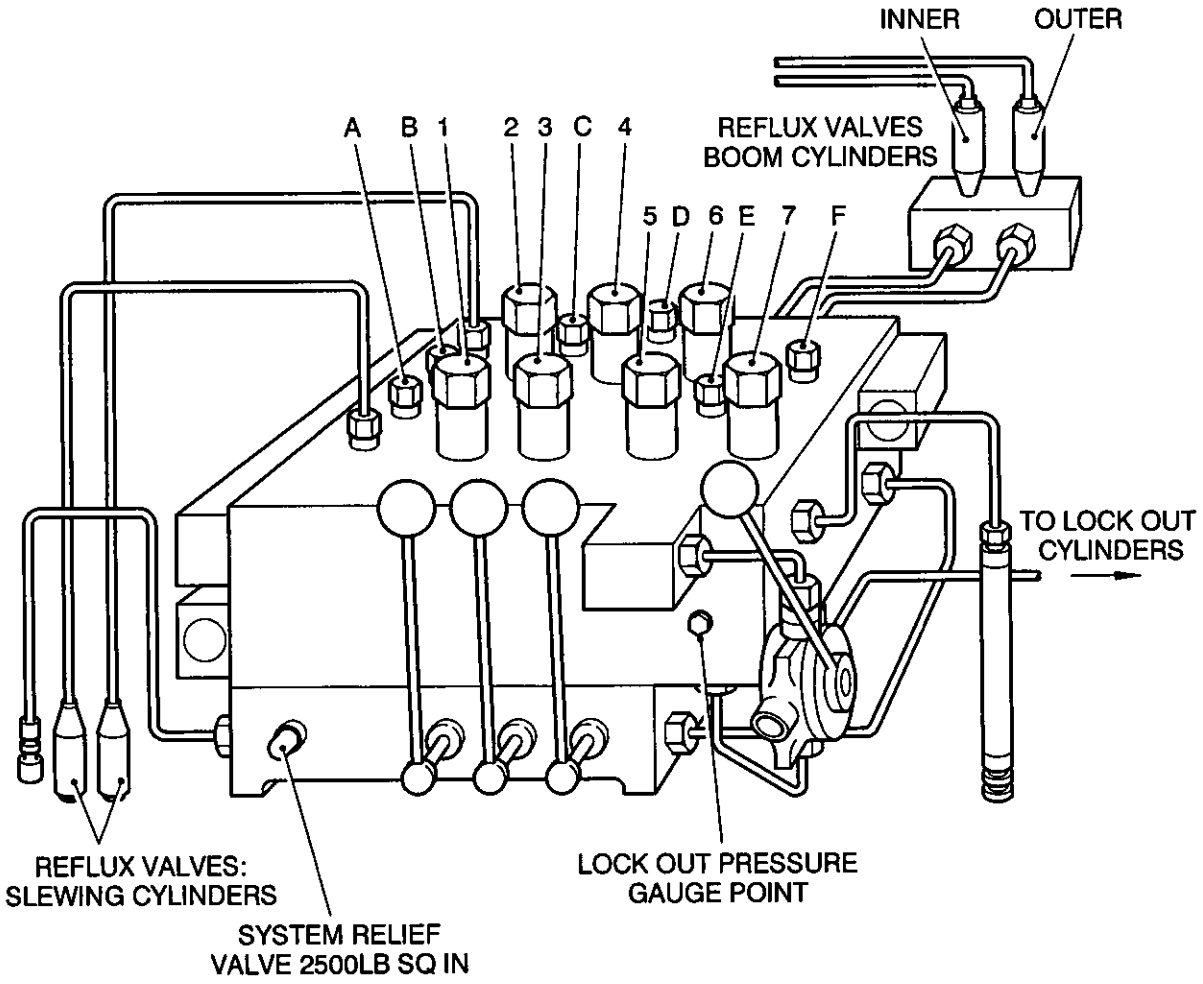
(2) PERSONNEL HAZARD. TESTS ARE TO BE CARRIED OUT IN A NOMINATED CRANE TESTING AREA CLEARED OF PERSONNEL AND OBSTRUCTIONS.

(3) PERSONNEL HAZARD. DO NOT EXCEED PROOF TEST LOADS STATED AT SPECIFIC RADII.

Adjustment

61 To adjust relief valves refer to Para 63 to 66.

62 Remove the blanking plug. Insert a suitable pressure gauge (capable of reading up to 3000 lbf/in^2), attached to a locally manufactured adaptor (Table 1, Serial 4) into the pressure gauge test point on manifold block (specific to the valve being adjusted, see Fig 13).



Relief valves

1	LH slew relief valve, 2000 lbf/sq in.
2	RH slew relief valve, 2000 lbf/sq in.
3	Outer boom pilot relief valve, 2500 lbf/sq in.
4	Outer boom relief valve, 2500 lbf/sq in.
5	Inner boom, pilot relief valve, 2500 lbf/sq in.
6	Inner boom relief valve, 2500 lbf/sq in.
7	Lock out relief valve, 2500 lbf/sq in.

Pressure gauge test points

A	LH slew
B	RH slew
C	Outer boom cylinder pilot
D	Outer boom cylinder
E	Inner boom cylinder pilot
F	Inner boom cylinder

Fig 13 Control valve and manifold block assembly – FV649488

Slewing relief valves

63 Adjust the slewing relief valves as follows:

63.1 Run the pump to circulate fluid through the control valve. Operate the slewing control to slew the crane through arc of travel (in direction, depending on which valve is to be set) until the crane comes against slewing stop. Hold the control lever open and observe the maximum pressure registered on gauge. This should be 136 atm (2000 lbf/in^2).

63.2 To adjust the pressure, remove the cap (2) and the slacken lock nut (1). Turn clockwise to increase or anti-clockwise to reduce the pressure. Ensure the lock nut is tightened before proceeding further.

63.3 Hold the control lever open as detailed at Sub-Para 63.1 and again check max pressure on gauge.

63.4 When correct relief setting of 136 atm (2000 lbf/in²) is attained, shut down the pump. Remove the gauge and adaptor, refit the blanking plug to gauge test point and the cap to relief valve adjusting screw.

Outer and inner boom ram cylinder relief valves

64 Adjust the outer and inner boom ram cylinder relief valves as follows:

64.1 Fit the gauge (Para 62) to the test point for the valve to be adjusted.

64.2 Run the pump to circulate fluid through the control valve. Operate the control valve lever to raise the boom under adjustment until the boom cylinder piston is fully extended. Hold the control lever open and observe maximum pressure registered on gauge, which should be 2500 lbf/in².

64.3 To adjust the pressure, proceed in a similar manner as detailed for slewing relief valves. When correct setting of 170 atm (2500 lbf/in²) is attained, shut down the pump. Remove the gauge and adaptor, refit the caps to gauge test point and relief valve adjusting screw.

Outer and inner pilot relief valves

65 Adjust the outer and inner pilot relief valves as follows:

65.1 Fit the gauge (Para 62) to the test point for the valve to be adjusted.

65.2 Arrange for a load of 1248 kg (2750 lbs) to be lifted at 3.95 m (13ft) radius using the extension jib.

65.3 Run the pump to circulate fluid through the control valve. Engage the lock out cylinders and lift the load approximately half way between the ground and the maximum height of lift.

65.4 Operate the control lever to lower the load on the boom cylinder connected to the pilot relief valve under adjustment. Observe pressure registered on gauge as the load begins to descend. This should be 170 atm (2500 lbf/in²).

65.5 To adjust the pressure, proceed in similar manner as detailed for slewing relief valves.

65.6 When the correct pilot relief setting is attained, remove the gauge and adaptor. Refit the blanking caps to the gauge test point and relief valve adjusting screw.

Lock out circuit-relief valve

66 Adjust the lock out circuit-relief valve as follows:

66.1 Check the air pressure in the accumulator and if necessary, charge to 1000 lbf/in² (as detailed in AESP 2350-T-252-522 Chap 6).

66.2 Run the pump to circulate fluid through the control valve. Engage the lock out cylinders by turning the rotary valve to 'lock out engaged' position. Observe the maximum pressure registered on the gauge fitted to the lock out circuit on the vehicle, while the rotary valve is in the engaged position. This should be 102 atm (1500 lbf/in²).

66.3 To adjust the pressure, remove the cap and slacken the lock nut. Turn clockwise to increase or anti-clockwise to reduce the pressure. Ensure the lock nut is tightened before proceeding further.

66.4 If the gauge fitted to the vehicle is unserviceable or suspect, disconnect and remove the gauge from the lock out supply line, capping the exposed union with a blanking plug. Fit the pressure gauge (Para 62) to the lock out test gauge point on manifold block. The lock out test gauge point located as shown in Fig 8 is accessible after removal of the vehicle gauge. Check the maximum pressure in lock out circuit, as detailed in Para 66.2. If necessary, adjust as detailed in Para 66.3.

66.5 When the correct setting of 102 atm (1500 lbf/in^2) is attained remove the gauge and adaptor. Refit plugs to the gauge test point and relief valve adjusting screw. Refit the vehicle gauge to supply line as determined by the method employed.

Flow control valve

NOTES

(1) The rate of slew and jib raise/lower can be adjusted at the flow control valves.

(2) Regulated flow can be increased or decreased, free flow is not adjustable.

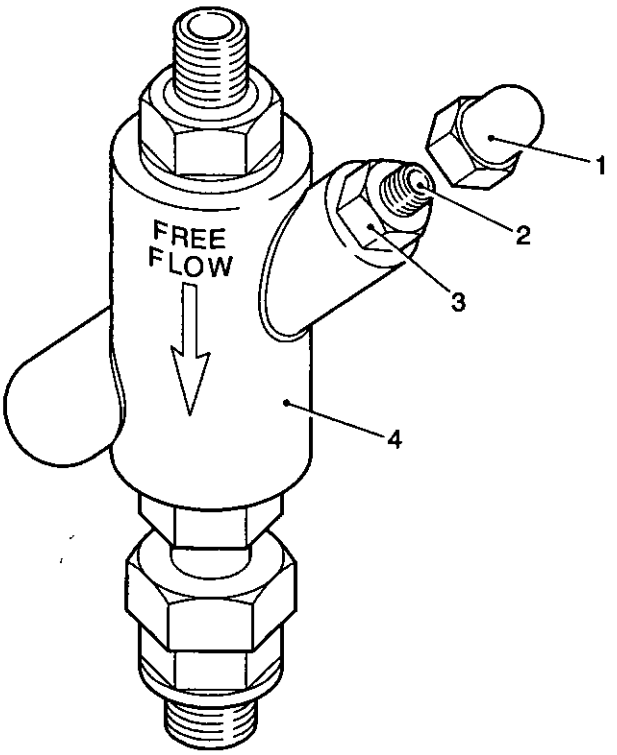
(3) Regulated flow is used to limit the maximum rate at which each function can be controlled; normal control is effected by the metering spools in the main control valve.

67 To adjust the flow control valve(Fig 14(4)) proceed as follows:

67.1 Remove the domed nut (1), slacken the locknut (3), increase or decrease the regulated flow by screwing the adjuster (2) in or out.

67.2 When correctly adjusted the slew cylinder valves must give précis throttled control in both directions and throughout arc of travel.

67.3 When correctly adjusted the boom cylinder valves must allow the crane to descend at a slow enough speed for precise control with the full rated load at maximum and minimum radii.



434/169

1	Domed nut	3	Locknut
2	Adjuster	4	Flow control valve

Fig 14 Flow control valve

Test procedure

68 Carry out a crane proof load test as follows:

68.1 This test must be carried out after manufacture, after repair, at four yearly intervals or as requested by a qualified inspector.

68.2 Before carrying out the proof load test ensure that the system pressure relief valve is set to lift the Safe Working Load (SWL). Ensure crane is capable of lifting the SWL at radii given in Fig 15. Operating instructions for the crane is detailed in AESP 2350-T-252-201 Chap 3-1.

68.3 The proof load test is 1.25 x SWL for each of the given radii in Fig 15. To enable the crane to lift the increased loads, the system pressure relief valve and the manifold block relief valve settings have to be increased.

68.4 Valve settings to be increased as follows:

68.4.1 The system pressure relief valve is set at a maximum of 170 atm (2500 lbf/in²) to lift a Safe Working Load and the setting is increased to 212.5 atm (3125 lbf/in²) to lift the proof load.

68.4.2 The manifold block relief valve settings are increased (1.25 x pressure to lift SWL) as detailed in Table 6.

TABLE 6 MANIFOLD BLOCK RELIEF VALVE SETTINGS FOR CRANE PROOF LOAD TEST

RELIEF VALVE	SETTINGS
Relief valve lock out increased to	127 atm (1875 lbf/in²)
Relief valve slew cylinders increased to	170 atm (2500 lbf/in²)
Pilot relief valve outer cylinder increased to	212 atm (3125 lbf/in²)
Relief valve outer cylinder increased to	212 atm (3125 lbf/in²)
Relief valve inner cylinder increased to	212 atm (3125 lbf/in²)
Pilot relief valve inner cylinder increased to	212 atm (3125 lbf/in²)
Reflux valves lift rams increased to	170 atm (2500 lbf/in²)
Reflux valves slew rams increased to	170 atm (2500 lbf/in²)

68.4.3 Relief valves are adjusted ,as detailed within this chapter, to lift the following proof loads (1.25 x SWL).

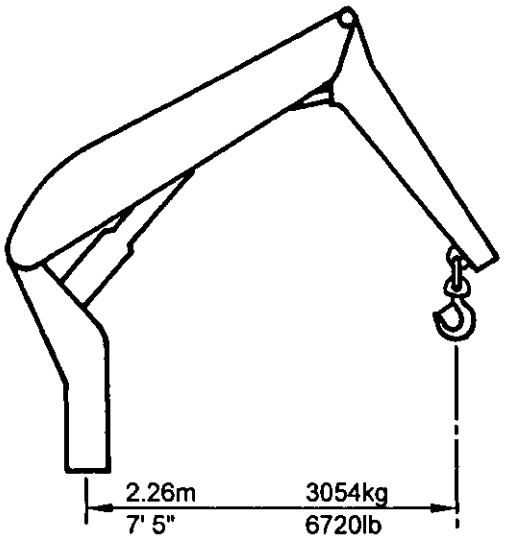
68.4.3.1 571 atm (8400 lbf/in²) at 2260 mm (7ft 5in.) Radius.

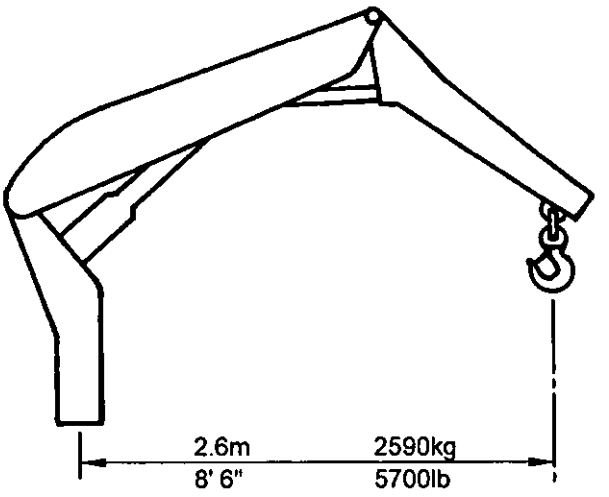
68.4.2.1 234 atm (3438 lbf/in²) at 3962 mm (13ft) Radius.

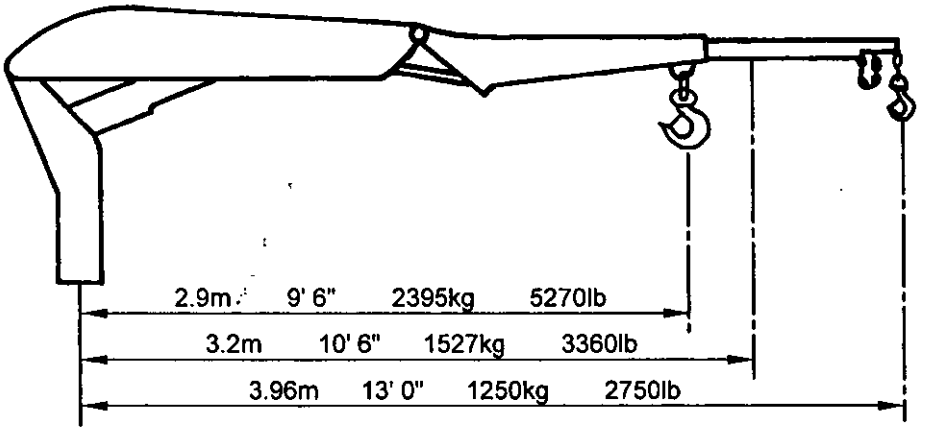
68.5 Jib out to maximum radius given in Fig 15. Add weights until proof load is reached. Lift the load and slew the crane through arc of travel. Lower the load, then closely examine the crane structure for cracks, deformities or flaking paint and the hydraulic system for leaks.

68.6 Repeat operation for the other stated radii.

68.7 Reset to orignal pressures on successful completion.







434/168

Fig 15 Max safe load and boom radii

CRANE PROOF LOAD TEST FOR LATEST TYPE MAIN CONTROL VALVE FV847574

NOTE

The following 125% x Safe working Load Test Procedure is to be carried out after the completion of AESP 2350-T-252-811 Modification Instruction No.1, EMER Modification Instruction No. 23. This instruction supersedes Para 61 to 68 for the adjustment of the valve block assembly FV847575 only.

69 Reference documents:

69.1 FVRDE Spec 9339.

69.2 EMER Tk Veh E 108 Serial 36e and 58c.

69.3 Drawings FV847573, FV847574 and FV874575.

TABLE 7 TEST EQUIPMENT REQUIRED

NOTE

The tools listed below are applicable to FV434s with Mod instruction 23 incorporated.

Ser (1)	Description (2)		
1	Test Set 9 MCV 4910-99-747-8553 comprising:		
	1.1	Gauge, pressure	0 to 400 bar
	1.2	Test hose	4 metres lg
	1.3	Hydratest fitting	HSP 476

WARNINGS

(1) PERSONAL INJURY. TESTING OF THE CRANE IS TO BE CARRIED OUT BY AUTHORIZED PERSONNEL.

(2) PERSONAL INJURY. TESTS ARE TO BE CARRIED OUT IN A NOMINATED CRANE TESTING AREA CLEARED OF PERSONNEL AND OBSTRUCTIONS.

CAUTION

EQUIPMENT DAMAGE. Do not exceed proof test loads stated at specific radii.

Test procedure

70 This test must be carried out after manufacture, after repair, at four yearly intervals or as requested by a qualified inspector.

71 Before carrying out the proof load test ensure that the system pressure relief valve is set to lift the Safe Working Load (SWL). Ensure the crane is capable of lifting the SWL at radii given in Fig 15. Operating instructions for the crane are detailed in AESP2350-T-252-201 Chap 3-1.

72 The proof load test is 125% x SWL for each of the given radii in Fig 15. To enable the crane to lift the increased loads, the outer jib service relief valve, the inner jib service port relief valve and the main system relief valve settings have to be increased as detailed in table 8. There is no requirement to alter the hydraulic lockout valve or the slew rate settings.

TABLE 8 RELIEF VALVE SETTINGS FOR PROOF LOAD TEST

RELIEF VALVE	SETTINGS
Main system relief valve increased to	241 bar (3500 lbf/in.^{2})
Outer jib service port relief valve increased to	215 bar (3120 lbf/in.^{2})
Inner jib service port relief valve increased to	215 bar (3120 lbf/in.^{2})
Outer jib pilot port relief valve increased to	172.5 bar (2500 lbf/in.^{2})
Inner jib pilot port relief valve increased to	172.5 bar (2500 lbf/in.^{2})

73 To obtain the valve settings proceed as follows:

NOTES

(1) All pre-test adjustments to relief valves are to be made with no load applied to the crane.

(2) The adjustments to the main system relief valve adjustment screw and the service port relief valves adjustment screws are to be made with the relevant operating lever in the 'raise' position and the jib fully extended to its stop.

(3) The adjustments to the pilot port relief valves adjustments screw are to be made with the relevant operating lever in the 'lower' position and the jib in motion.

(4) The proof pressures stated in this procedure are approximate and it may be necessary to increase them by 5 to 10% when conducting the crane proof test with the appropriate load.

73.1 Pressure test set (Table 7, item 1) is to be attached to the minimess connection point on the main valve block prior to engaging the PTO and starting the vehicle engine.

73.2 Engage the crane pump drive PTO. Start vehicle engine and set to run at a speed of between 1000 and 1200 rev/in, the pressure test gauge should register 193 bar (2800 lbf/in.^{2}).

73.3 Before commencement of the crane overload test, operate the crane jib and note the pressure gauge readings of the inner jib and the outer jib for all positions.

73.4 Remove and retain the adjustment cover nuts from the main system relief valve, inner – outer jib pilot relief valve and inner – outer jib service port relief valve adjustment screws. Slacken off each adjustment screw lockout.

73.5 Measure and record the thread extension of the outer jib service port relief valve adjustment screw, then fully screw in the adjustment screw.

73.6 Fully deploy the jib, and with the outer jib service port relief valve operating lever held in the 'fully raised' position, note the pressure at which the main system relief valve operates.

73.7 Screw in the adjustment screw of the main system relief valve to raise the valve pressure setting to 241 bar (3500 lbf/in.^{2}). Temporarily lock the adjusting screw using the locknut.

73.8 Unscrew the outer jib service port relief valve adjusting screw to its approximate position noted at Sub-Para 73.5.

73.9 With the outer jib service port relief valve operating lever in the 'raise' position, screw in the adjustment screw until the pressure setting of 215 bar (3120 lbf/in.^{2}) is indicated on the gauge. Temporarily lock the adjusting screw using the locknut.

73.10 Repeat the above procedure using the inner jib operating lever.

73.11 With the outer jib pilot port operating lever in the 'lower' position, screw in the adjustment screw until the pressure setting of 172.5 bar (2500 lbf/in.^{2}) is indicated on the pressure gauge. Temporarily lock the adjusting screw using the locknut.

73.12 Repeat the above procedure with the inner jib pilot operating ever.

74 Commence the 125% crane proof load test as laid down in EMER Tkd Veh 108 Part 1 Serial 58c. Further adjustment of the relief valves may be required in order to attain the proof load test.

75 On satisfactory completion of the proof load test, return the main system, outer and inner jib relief valves to their original settings as follows.

NOTE

It is necessary to temporarily maintain the pressure setting of the outer jib service port relief valve above that of the main system relief valve in order to achieve the main system relief valve setting verification.

75.1 Fully screw in the outer jib service port relief valve adjustment screw.

75.2 Reset the main system relief valve by unscrewing the adjustment screw to provide a pressure of approximately 180 bar (2600 lbf/in.^{2}) then screw in the adjustment screw to set a pressure of 193 bar (2800 lbf/in.^{2}). Retighten the adjustment screw locknut, refit cover nut retained in Sub-Para 73.4.

75.3 With the outer jib service port relief valve operating lever in the 'raise' position, screw out the adjustment screw until an approximate pressure setting of 120 bar (1740 lbf/in.^{2}) is obtained. Screw in the adjustment screw to set to set a pressure of 138 bar (2000 lbf/in.^{2}). Retighten the adjustment screw locknut, refit cover nut retained in Sub-Para 73.4.

75.4 Repeat the above procedure with the inner jib service port relief valve operating lever.

75.5 With the outer jib service port relief valve operating lever in the 'raise' position, screw out the adjusting screw until an approximate pressure setting of 150 bar (2175 lbf/in.^{2}) is indicated on the pressure gauge. Screw in the adjustment screw to set a pressure of 138 bar (200 lbf/in.^{2}). Retighten the adjustment screw locknut, refit cover nut retained in Sub-Para 73.4.

75.6 Repeat the above procedure with the inner jib pilot port relief valve operating lever.

75.7 Retest the crane to ensure the crane is capable of lifting SWL at radii given in Fig 15 with the reset valve block pressures.

75.8 Unlock the vehicle dampers, stop the vehicle engine and disengage the hydraulic pump dog clutch. Remove the pressure test gauge from the minimess connection on the valve block and replace the blanking plug.

76 Fully inspect the craneand the hydraulic system for leaks and/or damage.

77 Rectify any leaks/damage found. The vehicle is then fit for service.

Relief valve settings for safe working load

78 The relief valve pressure settings for valve bock FV847574 are factory set as follows:

NOTE

These figures can vary to as much as 10% from vehicle to vehicle once the SWL test has been completed, so they are only to be used as a primary setting guide.

78.1	Main system relief valve	193 bar	(2800 lbf/in.^{2})
78.2	Outer jib service port relief valve	172 bar	(2500 lbf/in.^{2})
78.3	Inner jib service port relief valve	172 bar	(2500 lbf/in.^{2})
78.4	Outer jib pilot port relief valve	138 bar	(2000lbf/in.^{2})
78.5	Inner jib pilot port relief valve	138 bar	(2000 lbf/in.^{2})
78.6	Slew left, slew right	138 bar	(2000 lbf/in.^{2})
78.7	Suspension lockout	103 bar	(1500 lbf/in.^{2})

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