AP 105D-1307-1

HUNTER

JACK

FAIREY HYDRAULICS LTD.

PART No. AH30227

GENERAL AND TECHNICAL INFORMATION

BY COMMAND OF THE DEFENCE COUNCIL

Frank Cooper.

Ministry of Defence

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the channel prescribed for that purpose in :
AP(N)140 Chap. 1 Annex A (RN)
AP 100B–01, Order 0504 (RAF)

CAUTIONARY NOTICE

Acid damage

The cleaning fluid for many hydraulic components is trichloroethane or some other form of chlorinated solvent. If traces of solvent are left in components they can combine with minute amounts of water, present in operational hydraulic systems, to form hydrochloric acid. It is essential that when hydraulic components are cleaned with a chlorinated solvent all traces of the solvent must be removed from internal surfaces and passages, before assembly, using the air blast method or other effective means.

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MODIFICATION RECORD

The following record confirms that this publication is technically up-to-date in respect of the modifications listed below. Information on modification titles, classification categories and mark applicabilities is given in the associated Modification Leaflets publication.

MODIFICATIONS

FHB 130L

FHB 156

Leading Particulars

Jack AH 30227	Ref. No. 27KF/
Fluid OM–15, DTD 585	Ref. No. 34B/9100572
Working pressure	3000 lb in^2
Stroke –	
Maximum	2.858 in
Minimum	2.790 in
Overall dimensions (approx) –	
Length (retracted)	19.6 in
Width	2.2 in
Height	3.2 in
Weight (approx)	3.2 lb

◀ WARNING: THE LIFE OF THIS JACK IS 2000 FLYING HOURS. THIS CAN BE INCREASED TO 3000 HOURS SUBJECT TO THE EXTENSION END PART NO. BH 18011 BEING RENEWED BETWEEN 1000 AND 2000 HOURS. THE P.F.C.U. RECORD CARD IS TO BE SUITABLY ANOTATED. ▶

INTRODUCTION

1. The jack is designed for power operation of the elevators in accurate response to movements of the control column. The jack responds to a supply of pressure fluid directed by a servo valve, mounted on the jack body. Provision is made for automatic change-over to manual control in the event of a hydraulic failure; this is achieved by the automatic unseating of a pressure-held by-pass valve in the jack. The jack retains the notched ram of the earlier type jack, anchorage to the aircraft structure being achieved by 'gagging' the release unit in the locked position with a special locking bolt.

DESCRIPTION

2. The jack body contains a piston, the head of which has two grooves, each carrying two split piston rings backed by an inner sealing ring. The piston ram passes out through a seal fitted into a groove in the jack body, early issues of body having two seal grooves at this point carry a seal in the outer groove only (fig. 1). The end of the ram is notched to accept the release unit pawl.

3. The piston chamber is closed by an extension end which screws into the jack body, a seal prevents fluid leakage between the extension end and the body. The extension end is located by a dowel which is attached to the identification plate and passes through the body wall into that of the extension end, later bodies have a second hole at 180 deg from the original to facilitate dowel repositioning. The extension end is further locked by a screwed collar and this is locked by a locking washer peened into slots in the collar and the jack body. Seals fitted into the grooves within the extension end bore prevent fluid leakage between the extension end and the ram and a vent hole in the extension end serves to prevent the accumulation of fluid should there be seepage past these seals. The extension end terminates in an eye fitted with a bearing which is retained by circlips.

4. Each end of the piston chamber is connected to one of the jack platform connecting piece orifices by an internal duct formed by interconnecting drillings. At the ram end of the body the two ducts inter-connect through the by-pass valve housing but, in normal operation, are sealed one from the other by a pressure-held by-pass valve. The valve housing, which is threaded to accept a special banjo connection, is secured to the jack body by two banjo bolts; sealing washers under the bolt heads and between the housing and the jack body prevent fluid leakage. The two connecting pieces, each of which carries two seals, serve to make the fluid connection to the servo valve.

OPERATION

5. The operation of this jack is the same as that of the typical jack described in A.P.105D–0002–1.

SERVICING

SPECIAL TOOLS

6. The following special tools and test equipment are required when servicing the jack:–

Description	Part No.	Ref. No.
Seal manipulating tools (set of 3)	FHQ 100	27KF/683
Connection block	FHQ 102	27KF/697
Manipulating tool	FHQ 164	27KF/688
Hook spanner	FHQ 759	27KF/1
Extension end spanner	FHQ 760	27KF/2748
Setting jig	FHQ 761	27KF/2747
Vice blocks	FHQ 762	27KF/6
Seal expansion mandrel	FHQ 794	27KF/107
Re-seating washer	FHQ 2284	27KF/3230

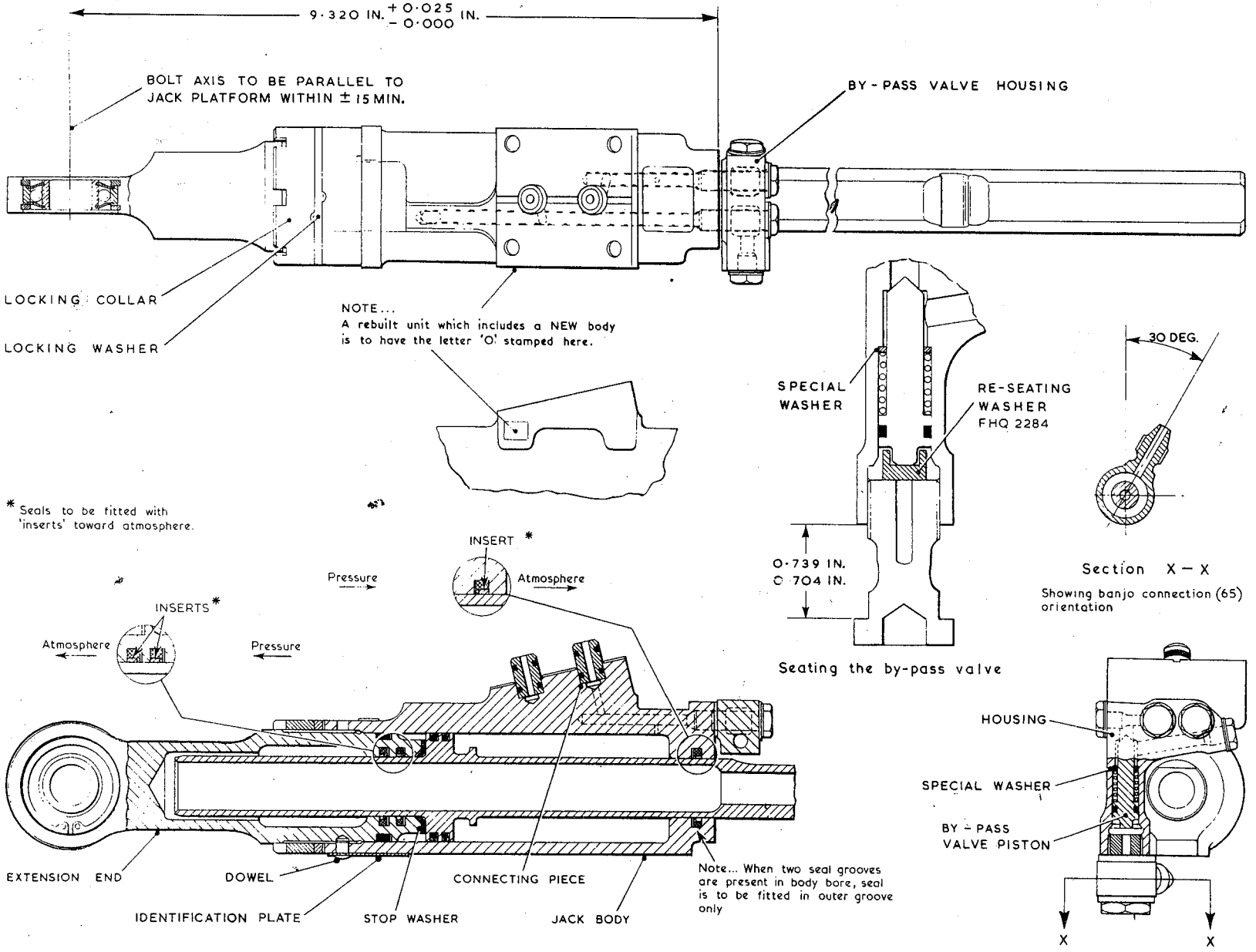

Fig. 1 Jack AH 30227

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SEALS FOR HUNTER JACK AH30227

HYDRAULIC BAY - MWS - TSD **Bin pick list** 07/12/95

Sect/Ref	Part no.	Description	Qty Per Jack	Qty in stock	Location	Balance
27KF- - -4542699	FHS1482-21	SEAL	1	2	DF5	
27KF- - -4542701	FHS1483-4	SEAL	1	2	DE4	
27KF- - -4542702	DH26343	SEAL	2	2	DE4	
27KF- - -4542711	DH23395	SEAL PTFE	4	0	DD3	
27QA- - -4535127	GD2496-27	SEAL	3	6	WK1	

DISMANTLING

7. Support the jack between vice blocks FHQ 762 and dismantle as follows:–

(1) Remove the two blanking plugs from the by-pass valve housing.

(2) Unscrew the two banjo bolts securing the housing to the jack body and remove the housing.

(3) Remove the special banjo connection from the valve housing and withdraw the valve piston, spring and special washer.

(4) Release the identification plate retaining strip and remove the plate complete with dowel.

(5) Slacken the locking collar, using spanner FHQ 759, and unscrew and remove the extension end, using spanner FHQ 760.

(6) Remove the locking washer and unscrew the locking collar from the extension end.

Note...

It should not be necessary to remove the bearing from the extension end eye, unless it is defective.

(7) Withdraw the ram from the jack body. The stop washer is a tight push fit on the ram and unless the ram is to be re-chromed, removal of the washer should not be necessary.

(8) Remove the platform protective cover plate and orifice protection plugs.

(9) Remove the seals from the extension end, piston, jack body, connecting pieces and by-pass valve piston, using manipulating tool FHQ 100.

EXAMINING

8. Wash all parts, except the extension end pre-packed bearing, in an approved cleaning fluid, and examine them in accordance with the instructions given in A.P.105D–1307–6.

SEATING THE BY-PASS VALVE

9. On assembly of new parts or at any time when the by-pass valve seating is suspect, the valve piston should be seated as follows:–

(1) Ensure that the valve and seat are clean and free from visual defects.

(2) Position the special washer in the by-pass valve housing bore and insert the valve piston complete with piston seal and spring.

(3) Position the re-seating washer FHQ 2284 on the head of the valve piston and insert the banjo bolt; with the bolt screwed down finger tight only, check the clearance between the valve housing and the underside of the banjo bolt head. If the clearance is within the limits given (fig. 1), then proceed in accordance with operation (4) of this paragraph. Should the clearance not be within these limits then the procedure given in A.P.105D–1307–6 is to be adopted.

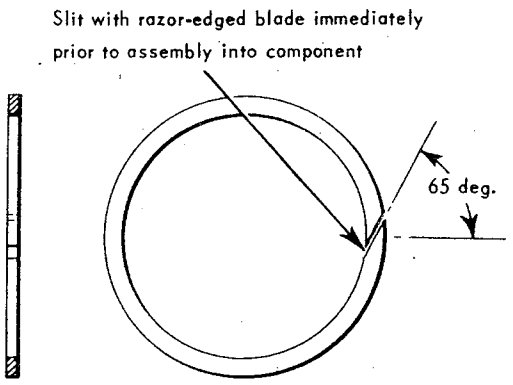

Fig. 2 Piston head sealing ring

(4) Continue to tighten the banjo bolt but not more than is necessary to achieve satisfactory seating of the valve. In doing this, the clearance between housing and bolt head must not be reduced by more than 0.010 in, and the torque loading of the bolt must not exceed 100 lb. in.

(5) Remove the banjo bolt and the re-seating washer; withdraw the valve piston, spring and special washer from the housing in preparation for final assembly (para. 12).

ASSEMBLING

New extension end

10. If the extension end being fitted is new it will not be drilled to receive the locating dowel, therefore, before proceeding with assembly, it will be necessary to position, align, and drill the new end. Without any seals fitted proceed as follows:–

(1) Screw the locking collar on to the extension end and position the locking washer.

(2) Slide the ram into the jack body and screw in the extension end.

(3) With the aid of setting jig FHQ 761 or the dimensions given (fig. 1), set the position of the extension end and align its eye end. Using hook spanner FHQ 759 tighten the

SEE NOTE PAGE 4

locking collar but do not peen the locking washer.

Note...

The extension end setting dimension for this jack is less by 0.080 in than for the jack for which jig FHQ 761 was originally made; when using the jig an 0.080 in thick slip gauge is to be inserted between the ram end of the jack body and the jig block.

(4) Remove the jack from the jig and ensure that the ram will stroke and rotate freely at all positions of the stroke.

(5) Drill into the extension end through the existing hole in the jack body; drill 3/16 in dia, 0.23 in deep measured from the surface of the jack body.

(6) Dismantle the jack in preparation for final assembly.

SEE TI/HUNTER/3729 10.

New jack body

11. A new jack body will have its dowel hole already drilled but, when the original extension end is assembled, correctly positioned and aligned, the hole may not exactly match with that of the extension end. Without any seals fitted, proceed as follows:–

(1) Proceed as detailed in para. 10, operations (1) to (4) inclusive.

(2) Check the alignment of the jack body and extension end dowel holes. If the holes are correctly aligned, dismantle the unit in preparation for final assembly. Where the holes are not aligned, then dependent on the extent of mis-alignment, (a) the existing holes will have to be enlarged and an oversize dowel fitted or, (b) a new hole will have to be drilled. Later issues of body are provided with an additional hole for this purpose, but this will still have to be extended into the extension end. Whichever course is adopted, (a) or (b), ensure that the depth of hole does not exceed 0.23 in measured from the surface of the jack body, and make the repair in accordance with the instructions contained in A.P. 105D–1307–6.

(3) Dismantle the jack in preparation for final assembly.

Complete component

12. During final assembly, fit new seals throughout, ensure that each part is scrupulously clean and smear both the parts and new seals with clean hydraulic fluid immediately before assembly. Where bonded seals are used, ensure that the torque loading figures are not exceeded. Support the jack body between vice blocks FHQ 762 and proceed as follows:–

(1) Check that the stop washer is in position on the piston ram, or if removed, carefully press it over the ram, flat leading, to the position shown in figure 1.

(2) Fit a new backing seal and two new sealing rings to each of the piston head grooves. Slit each ring as shown in figure 2 immediately prior to fitting. When fitting, space the first pair of rings with the slits 180 deg. apart and similarly space the second pair with the slits at 90 deg. to those of the first pair.

(3) Well moisten three new ram seals with hydraulic fluid and carefully fit one into the jack body (if body has two grooves, fit seal to outer groove only) and two into the grooves of the extension end bore. Ensure that these seals are fitted so that their white inserts are toward atmosphere when the jack is assembled, as illustrated in figure 1.

Note...

If the rubber/fabric (pre Mod. FHB 156) type ram seals are still being used, then only two are fitted one in the jack body and one in the extension end. These seals are fitted in each case with the rounded rubber face to pressure and the fabric face to atmosphere (fig. 1).

(4) Smear mandrel FHQ 794 with clean fluid and expand the ram seal into the jack body groove by carefully inserting the mandrel. Remove the mandrel and check that the seal is satisfactorily positioned in the groove and its insert correctly located. Repeat this operation immediately prior to inserting the piston ram.

(5) Carefully insert the piston into the body.

(6) Screw the locking collar on to the extension end and position a new locking washer. Fit a seal into the external groove of the extension end.

(7) Expand and check the fitting of the ram seals in the extension end bore in a manner similar to that given for the body seal (operation (4)).

(8) Slide the extension end over the ram and screw it into the jack body until the locating dowel holes coincide. Hold the extension end with spanner FHQ 760 and tighten the locking collar, using spanner FHQ 759. Check that distance from ram end of body to extension eye is within the limits given (fig. 1).

(9) Fit a new seal to the by-pass valve piston. Position the special washer in the by-pass housing and insert the piston and spring.

(10) Assemble the banjo connection to the by-pass valve housing, using a new sealing washer each side of the banjo body; fit a protection cap, with seal, to the fluid connection.

(11) Insert the two housing-securing banjo bolts, through the housing and into the end of the jack body, using four new sealing washers, one under the head of each bolt and one encircling each bolt between the housing and the jack body. Tighten the bolts to 50 to 60 lb in torque load.

(12) Position a new sealing washer on each of the housing blanking plugs; insert and tighten the plugs to 25 to 30 lb in torque load.

(13) Fit the connecting piece seals and insert the two connecting pieces into the jack platform; position the protective cover plate and secure it with ¼ in dia B.S.F. screws and washers.

(14) Test the jack in accordance with para. 13.

TESTING

13. The test rig used must include in the pressure line a filter capable of 5–micron filtration, and the tests should be carried out at normal room temperature (50 to 68°F), using the fluid specified in 'Leading Particulars'. Remove the cover plate and position and secure the connecting block FHQ 102 on the jack platform. Ensure that all air is expelled from the jack and test in accordance with Table 1. Fault diagnosis is given in Table 2.

BY-PASS VALVE ALTERNATIVE WASHERS AND SPRINGS

14. When the by-pass valve operating pressure requirements given in Table 1, cannot be met using a standard special washer and valve spring, a selective assembly may be made from the following parts:–

Alternative by-pass valve special washers

Part No.	Thickness
DH 32179	0.055/0.060 in (thin)
DH 22607	0.085/0.090 in (standard)
DH 32181	0.115/0.120 in (thick)

Alternative by-pass valve springs

Part No.	Effort when compressed to 0.45 in
DH 23207	10 ± lb (standard)
DH 32197	13.5 ± lb (alternative)

Although tree selection of the parts is permissible, spring effort should always be checked prior to the introduction of a thick washer, as the washer is to compensate for adverse tolerances or repair in the valve or seat, and not to bolster a weak spring. A thick washer used with a weak spring could in fact result in an over-packed spring preventing satisfactory valve seating and consequent excessive seepage across the valve seat.

AFTER TESTING

15. When the tests have been satisfactorily completed:–

(1) Fully retract the jack, disconnect the test rig pipelines and leaving the jack full of fluid fit a protection cap, with seal, to the by-pass housing fluid connection.

(2) Remove the connecting blocks from the jack platform and remove the connecting pieces, using tool FHQ 164. Fit the protection plugs in the fluid orifices and secure the protective cover plate.

(3) Lock the extension end locking collar by peening the locking washer into the slots in the collar and the jack body.

(4) Wire-lock each of the by-pass housing securing banjo bolts and its adjacent housing blanking plug together.

(5) Fit the identification plate and locking dowel assembly in accordance with the instructions given in A.P.105D–0002–1.

Note...

If the hole for the locking dowel has been repositioned under an authorised repair (i.e. is not at 180 deg. to the jack body platform), then the dowel is to be removed from the identification plate, and the extension end is to be locked and the plate secured in its original position by the use of a dowel and strip assembly, details of which are given in the appropriate chapter of A.P.105D–1307–6.

(6) Lightly coat the exposed portion of the jack ram with grease XG–275.

(7) Seal the connecting pieces in a polythene bag containing fluid OM–15, and attach the bag to the jack.

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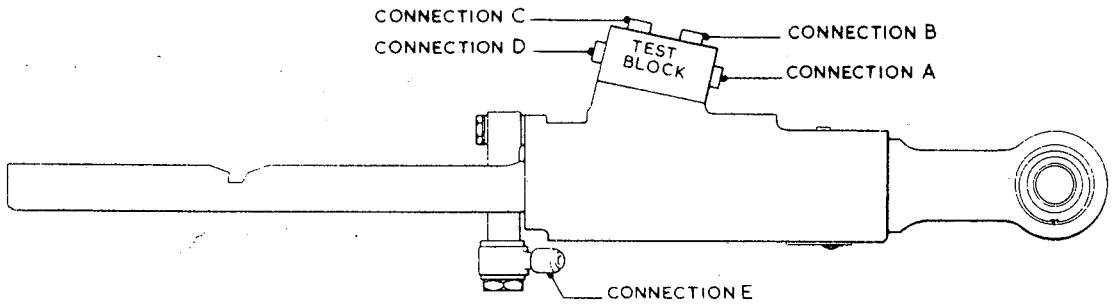

Fig.3 Test connections

◀ (Position of identification plate corrected) ▶

TABLE 1 Test schedule

Test No	Minimum and maximum pressures in lb/in² at connections A or B	C or D	E	Procedure	Requirements
1	3850 4150	Reservoir	3850 4150	Maintain pressure for 3 minutes	No external seepage
2	1 10	Reservoir	3850 4150	Maintain pressure for 3 minutes	No external seepage
3	Reservoir	3850 4150	3850 4150	Maintain pressure for 3 minutes	No external seepage
4	Reservoir	1 10	3850 4150	Maintain pressure for 3 minutes	No external seepage
5	2880 3120	Atmosphere	2880 3120	Maintain pressure for 4 minutes; during the fourth minute measure the seepage from connection 'C' or 'D'	No external seepage, other than a maximum of 65 c.c. at connection 'C' or 'D'

TABLE 1 Test schedule (continued)

Test No.	Minimum and maximum pressures in lb/in² at connections A or B	C or D	E	Procedure	Requirements
6	Atmosphere	2880 3120	2880 3120	Maintain pressure for 4 minutes; during the fourth minute measure the seepage from connection 'A' or 'B'	No external seepage, other than a maximum of 65 c.c. at connection 'A' or 'B'
7	As required Reservoir	Reservoir As required	2880 3120	Measure jack stroke	See 'Leading Particulars'
8	Reservoir	Reservoir	Atmosphere	Exercise jack by manually stroking the ram in and out 20 to 25 times, then check the load required to manually stroke the ram in each direction	Maximum: 29 lb
9	As required	Atmosphere	As for connection 'A' or 'B'	To check the by-pass valve operating pressure, connect connections 'A' or 'B' and connection 'E' in a common pressure line, then:-	
				(a) Gradually raise pressure and observe flow at connection 'C' or 'D' and note pressure when this flow falls to normal seepage rate	(a) Maximum: 500 lb/in²
				(b) Increase pressure to 2880/3120 lb/in² and then gradually decrease pressure and note pressure when flow re-commences	(b) Minimum: 200 lb/in²
10	Atmosphere	As required	As for connection 'C' or 'D'	Repeat as at Test No. 9, but connect connections 'C' or 'D' and 'E' in common pressure line and observe flow at connection 'A' or 'B'	As for Test No 9(a) and (b)

TABLE 2 Fault diagnosis

Fault	Diagnosis
1 Leakage between extension end and jack body	1 Defective extension end outer seal
2 Leakage from extension end vent hole	2 Defective extension end bore seals
3 Leakage between ram and jack body	3 Defective body bore seal
4 Excessive seepage from open connection during Table 1, Test No. 5	4 (1) Defective piston seal or incorrectly spaced sealing rings (2) Excessive wear or damage in cylinder bore (3) Fouled or defective by-pass valve seating (4) Defective by-pass valve piston seal (5) Coil-binding in by-pass valve spring (para 14)
5 Excessive seepage from open connection during Table 1, Test No. 6	5 As for diagnosis No. 5(1), (2), (3) and (5)
6 Pressure excessive when flow falls to normal seepage at Table 1, Tests No. 9 and 10	6 Over-thick by-pass valve special washer or over-strong spring (para. 14)
7 Pressure insufficient when flow re-commences at Table 1, Tests No. 9 and 10	7 Under-strength by-pass valve spring or too thin a washer (para. 14)

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