AP 105D-1303-1

HUNTER.

JACK

FAIREY HYDRAULICS LTD.

PART No. AH33523

GENERAL AND TECHNICAL INFORMATION

BY COMMAND OF THE DEFENCE COUNCIL

Frank Cooper.

Ministry of Defence

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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.

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 90

FHB 117

FHB 157

FHB 165

Leading Particulars

Jack AH 33523	Ref. No. 27KF/ –
Fluid OM–15, D.T.D. 585	Ref. No. 34B/9100572
Maximum working pressure	3,000 lb /in.²
Stroke –	
Maximum	3.155 in
Minimum	3.090 in
Overall dimensions (approx.) –	
Length (retracted)	19.6 in
Width	3.0 in
Height	2.5 in
Weight (approx.)	2.5 lb

WARNING: THE FINITE LIFE OF THESE JACKS IS 2000 FLYING HOURS AS DEFINED BY THE LIFE OF THE JACK BODY PART No. AH 33203.

INTRODUCTION

1. The jack is designed for power operation of the ailerons in accurate response to movement 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 pressure failure, this being 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.

2. Jack AH 33523 has an increase in body wall thickness in the region of the duct blanking plug (Figure 1), compared with the earlier type jack AH 23505.

DESCRIPTION

3. 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 the seals fitted into the jack body and the end is notched to accept the release unit pawl.

4. The piston chamber is closed by an extension end which screws into the jack body, a seal preventing fluid leakage between the extension end and the body. The extension end is located by a dowel attached to the identification plate and is locked by a screwed collar, the collar being locked by a locking washer peened into slots in the collar and the jack body. Seals fitted to the grooves within the extension end bore prevent fluid leakage between the extension end and the ram; a vent hole in the extension end also serves to prevent the accumulation of fluid should there be seepage past the seals. The extension end terminates in an eye, fitted with a bearing and two flanged ferrules, the ferrules are pressed one from each side into the bearing inner race.

5. Each end of the piston chamber is connected to one of the jack platform connecting piece orifices by an internal duct formed by intercommunicating drillings, blanking plugs being used where necessary. The inner ends of the two ducts are in inter-communication with each other 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 banjo connection, is bolted to the side of the jack platform. A seal in the jack body counterbore, located by a special washer, prevents fluid leakage between body and valve housing. The two connecting pieces, each of which carries two seals, serve to make the fluid connections to the servo valve.

OPERATION

6. The operation of the jack is the same as that of the typical jack described in AP.105D–0002–1.

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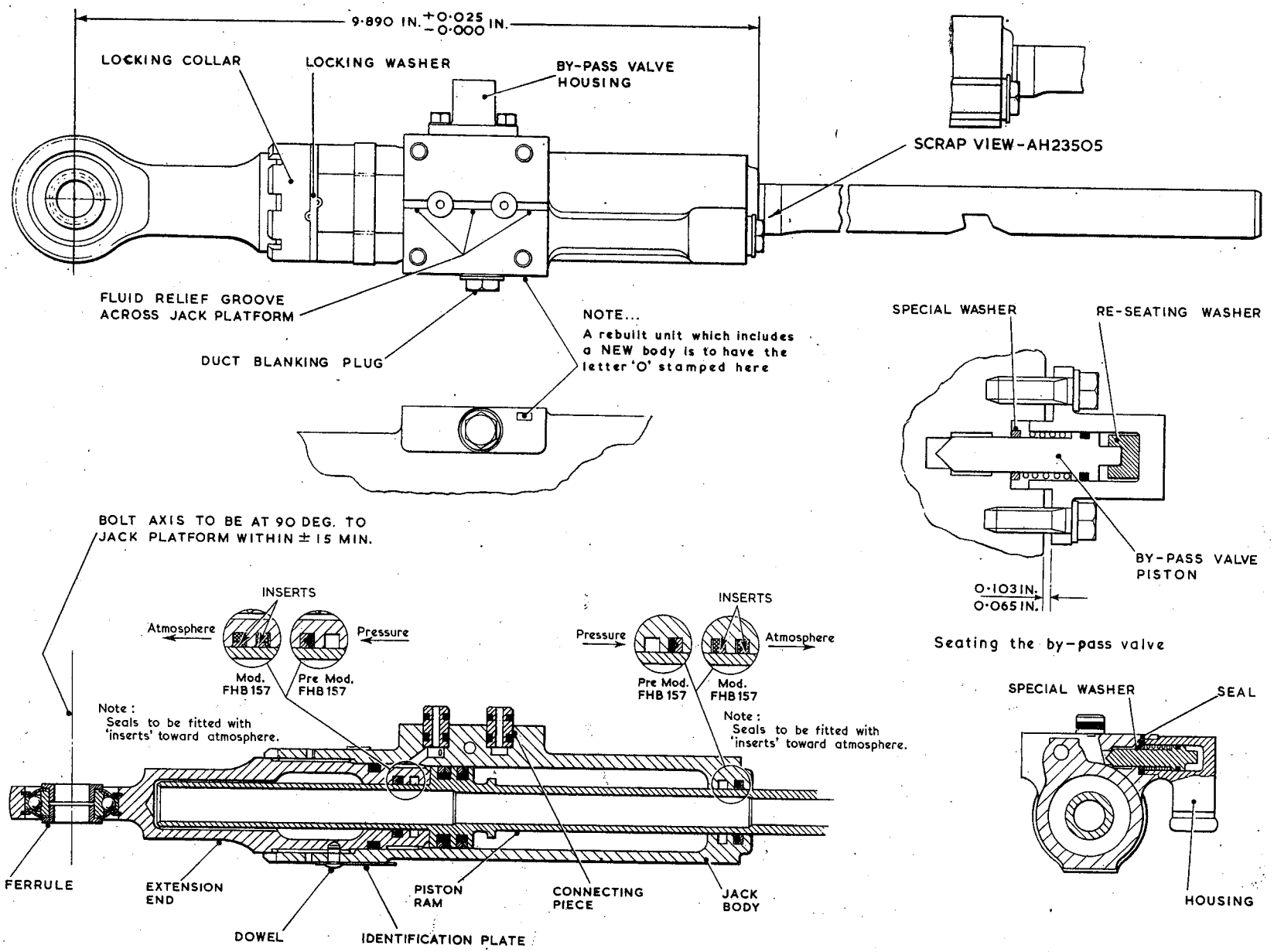

Fig 1 Jack assembly

(Position of identification plate corrected

SERVICING

SPECIAL TOOLS AND EQUIPMENT

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

Description	Part No.	Ref. No.
Seal manipulating tool	FHQ 100	27KF/683
Connecting block	FHQ 102	27KF/697
Hook spanner	RS/181/16	27Y/2374
Manipulating tool	FHQ 164	27KF/688
Peg spanner	FHQ 270	27KF/1250
Vice blocks	FHQ 271	27KF/1244
Setting jig	FHQ 272	27KF/1247
Seal expansion mandrel	FHQ 793	27KF/1063
Re-seating washer	FHQ 2284	27KF/3230

DISMANTLING

8. To dismantle the jack proceed as follows:–

(1) Remove the two securing bolts and withdraw the by-pass valve housing, remove the valve piston and spring from the housing and the special washer and seal from the jack body.

(2) Support the jack between vice blocks FHQ 271, release the identification plate retaining strip and remove the plate, complete with dowel.

(3) Slacken the locking collar, using hook spanner RS/181/16, and unscrew and remove the extension end, using peg spanner FHQ 270.

(4) Remove the locking washer and unscrew the locking collar from the extension end, and remove the ferrules from the bearing.

Note . . .

The extension end bearing is retained by special washers, which are pressed into position and are not to be disturbed unless the bearing is defective.

(5) Withdraw the ram from the jack body.

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

(7) Remove the duct blanking plugs from the jack body.

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

EXAMINING

9. Wash all parts, except the extension end pre-packed bearing, in an approved cleaning fluid, and examine them for serviceability. Repairs and schedule of fits and clearances appear in A.P.105D–1303–6.

SEATING THE BY-PASS VALVE

10. 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 piston and seat are clean and free from visual defects.

(2) Position the re-seating washer FHQ 2284 in the valve housing (Fig. 1), and insert the valve, complete with seal and spring, into the housing.

(3) Position the special washer in the jack body counterbore, assemble the valve and housing to the jack, and with the securing bolts screwed down finger tight only, check the clearance between the housing and the jack body. 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–1303–6 is to be adopted.

(4) Continue to tighten the bolts evenly but not more than is necessary to achieve a satisfactory seating. In doing this, the clearance between housing and body must not be reduced by more than 0.010 in., and the torque loading of the bolts must not exceed 20 lb. in.

(5) Dismantle the valve and housing and remove the re-seating washer in preparation for final assembly (para. 13).

ASSEMBLING

New extension end

11. If the extension end being fitted is new it will not be drilled to receive the locating dowel, therefore, before proceeding with the 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 272 or the dimensions given (Fig. 1), set the position of the extension end and align its eye end. Using hook spanner RS/181/16 tighten the locking collar but do not peen the locking washer.

(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 $\frac{3}{16}$ in. dia. 0.23 in. deep, measured from the surface of the jack body.

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

New jack body

12. 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 seals fitted, proceed as follows:–

(1) Proceed as detailed in para. 11, 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.

Whichever course is adopted, (a) or (b), ensure that the depth of the 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–1303–6.

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

Final assembly

13. During final assembly, fit new seals throughout, ensure that each part is scrupulously clean, and smear both the parts and the new seals with clean hydraulic fluid immediately before assembly. Support the jack body between vice blocks FHQ 271 and proceed as follows:–

(1) 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.

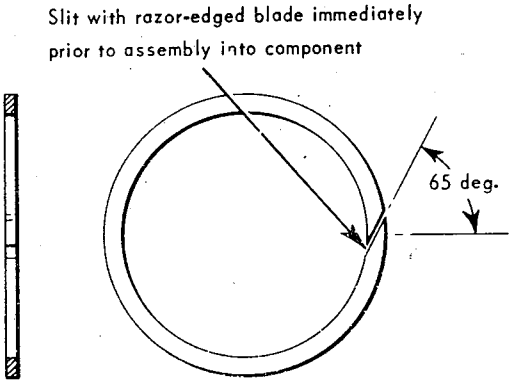

Fig. 2. Piston head sealing ring

(2) Well moisten four new ram seals with hydraulic fluid and carefully fit two into the jack body 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 157) 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 flat fabric face to atmosphere (fig. 1).

(3) Smear mandrel FHQ 793 with clean fluid and expand the ram seals into the jack body grooves by carefully inserting the mandrel. Remove the mandrel and check that the seals are satisfactorily positioned in the grooves and their inserts correctly located. Repeat this operation immediately prior to inserting the piston ram.

(4) Carefully insert the piston into the body.

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

(6) Expand and check the fitting of the ram seals in the extension end bore in a manner similar to that given for the body seals (operation (3)).

(7) Slide the extension end over the ram and screw it into the jack body until the locating dowel holes coincide. Holding the extension end with peg spanner FHQ 270, tighten the locking collar, using hook spanner RS/181/16.

(8) Screw the duct blanking plugs, complete with new sealing washers, into the jack body. Ensure when tightening the plugs that the figures given in connection with the torque loading of bonded seals (A.P. 105D–0002–1), are not exceeded.

(9) Remove the jack from the vice and insert the seal and special washer into the by-pass valve counterbore in the jack body.

(10) Fit the seal to the by-pass valve piston and insert the valve and spring into the valve housing.

(11) Assemble the housing complete with valve and spring to the jack body; insert and tighten the securing bolts and fit a protection plug, with seal, to the housing fluid connection.

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

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

TESTING

14. 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 deg. 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. Ensuring that all air is expelled from the jack, test in accordance with Table 1. Fault diagnosis is given in Table 2.

BY-PASS VALVE ALTERNATIVE WASHERS AND SPRINGS

15. 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 ± 1 lb. (standard)
DH 32197	13.5 ± 1 lb. (alternative)

Although free 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

16. When the tests have been satisfactorily completed:–

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

(2) Remove the connecting block 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 the duct blanking plugs to the jack body.

(5) Wire-lock the two by-pass valve housing securing bolts together.

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

(7) Lightly coat the mating faces with yellow chromate jointing compound and press the two ferrules, one into each side of the extension end bearing.

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

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

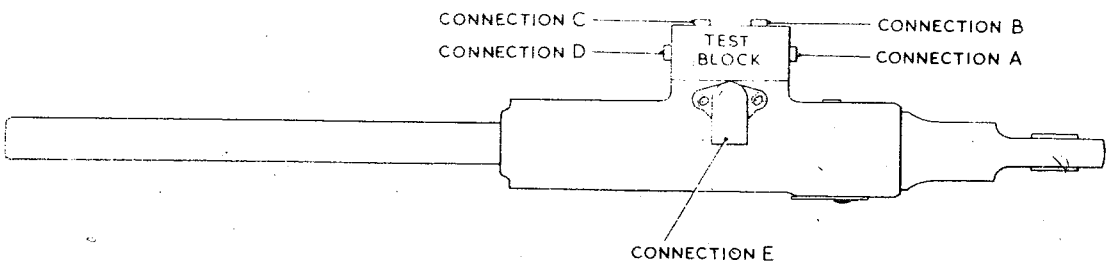

Fig. 3 Test connections

◀ (Position of identification plate corrected) ▶

TABLE 1 Test schedule

Test No.	Minimum and maximum pressures in lb./in.² 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'
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 the 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: 27 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 (b) Increase pressure to 2880/3120 lb/in.² and then gradually decrease pressure and note pressure when flow re-commences	(a) Maximum: 500 lb/in.² (b) Minimum: 200 lb/in.²
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)

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TABLE 2 Fault diagnosis

Fault	Diagnosis
1. Leakage between the extension end and the jack body	1. Defective extension end outer seal
2. Leakage from the extension end vent hole	2. Defective extension end bore seals
3. Leakage between ram and jack body	3. Defective body bore seals
4. Leakage between jack body and by-pass valve housing	4. Defective seal in jack body counterbore
5. Excessive seepage from open connection during Test 5 of Table 1	5. (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) Coil-binding in by-pass valve spring (para. 15)
6. Excessive seepage from open connection during Test 6 of Table 1	6. (1) As for diagnosis No. 5(1), (2), (3) and (4) (2) Defective by-pass valve piston seal
7. Pressure excessive when flow falls to normal seepage at Table 1, Tests No. 9 and 10	7. Over-thick by-pass valve special washer or over-strong spring (para. 15)
8. Pressure insufficient when flow re-commences at Table 1, Tests No. 9 and 10	8. Under-strength by-pass valve spring or too thin a washer (para. 15)

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