AP 105D-1301-16C

HUNTER

POWERED FLYING CONTROL UNITS

FAIREY HYDRAULICS LTD.

PART No. AH 950, AH 1891 and AH 1892

GENERAL AND TECHNICAL INFORMATION

FITS, CLEARANCES AND REPAIR TOLERANCES

BY COMMAND OF THE DEFENCE COUNCIL

Frank Cooper

Ministry of Defence

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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 90*
FHB 117
FHB 129·
FHB 130L
FHB 131·
FHB 162
FHB 165

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.

Leading Particulars

Control unit AH 950	Ref. No. 27KF/2972
Control unit AH 1891	Ref. No. 27KF/3567
Control unit AH 1892	Ref. No. 27KF/3568
Fluid OM–15, D.T.D. 585	Ref. No. 34B/9100572
Maximum working pressure	3,000 lb /in ^{2}
Jack stroke –	
Maximum	3.155 in
Minimum	3.090 in
Overall dimensions (approx.)	
Length (retracted)	19.6 in
Width	4.0 in
Height	4.9 in
Weight	6.2 lb

WARNING: THE LIFE OF THESE CONTROL UNITS IS 2000 FLYING HOURS. THIS CAN BE EXTENDED TO 3000 HOURS SUBJECT TO THE JACK PART NO. AH 23505 OR AH 33523 BEING RENEWED BETWEEN 1000 AND 2000 HOURS. THE SERIAL NO. OF THE REPLACEMENT JACK IS TO BE RECORDED ON THE CONTROL UNIT LOG CARD.

DESCRIPTION

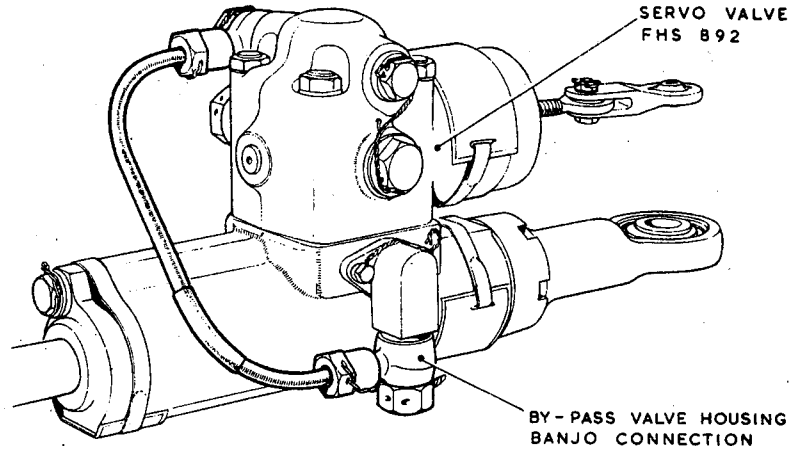
1. The purpose of each control unit is to move an aircraft aileron surface in accurate relationship to the movement of the control column. Each unit consists mainly of a jack assembly, a valve assembly and a locked release unit. The various combinations of these assemblies and their related publications are given in Table 1. The additional items that complete the unit assembly are:- the by-pass valve housing banjo connection with sealing washers, an external pipe and a valve spindle eye end and fork link assembly.

2. The unit incorporates a means of manual reversion which operates on the by-pass principle, fully described in A.P. 105D–0002–1 The release unit is retained solely as an anchorage for the jack ram and is locked so that the release pawl is permanently engaged with the ram notch.

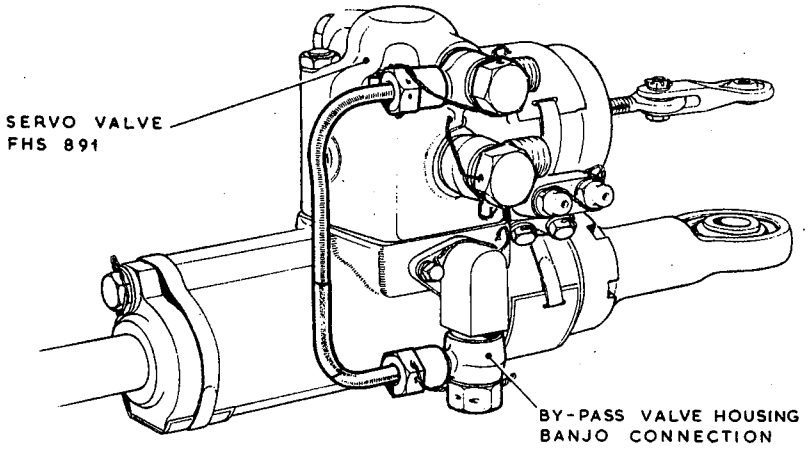
3. On units with valve FHS 891 fitted, the fluid connections and bleed points are on the same side of the unit as the by-pass valve housing; consequently a slightly shorter external pipe is fitted. Control units AH 1891 and AH 1892 are fitted with a strengthened jack body. Apart from this and the handing difference of the valves, the units are identical.

Table 1 – Breakdown of control units

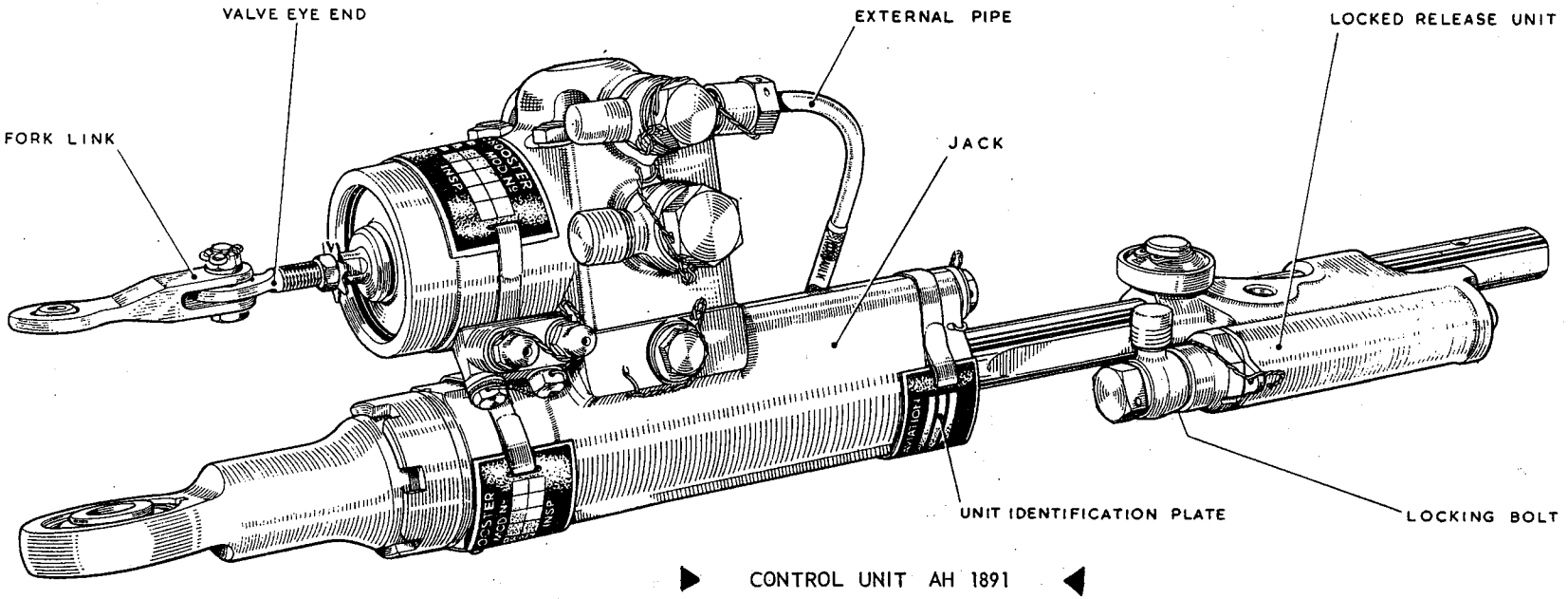
Control unit	Jack assembly A.P.105D–1303–1	Valve assembly A.P.105D–1302–1	Release unit A.P.105D–1304–1
AH 950	AH 23505	FHS 891	CH 23521
AH 1891	AH 33523	FHS 892	CH 23521
AH 1892	AH 33523	FHS 891	CH 23521



▶ CONTROL UNIT AH 1891 ◀



CONTROL UNIT AH 950 and AH 1892



▶ CONTROL UNIT AH 1891 ◀

Fig.1 – Control unit

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SERVICING

SPECIAL TOOLS

4. The following special tools are required to service the control unit:–

Description	Part No.	Ref. No.
Seal manipulating tools (set of 3)	FHQ 100	27KF/683
Manipulating tool	FHQ 164	27KF/688

DISMANTLING (Fig. 1)

5. To dismantle the unit proceed as follows:–

(1) Unscrew the release unit locking bolt until the pawl is clear of the ram notch; slide the unit off the ram and screw in the locking bolt sufficiently to ensure that it is retained.

(2) Remove the split pin, nut and washer, withdraw the bolt and remove the fork link from the valve eye end.

(3) Slacken the locknut and remove the valve eye end.

(4) Remove the external pipe.

(5) Remove the banjo bolt and union from the by-pass valve housing, fit a protection plug to the housing and a protection cap to the banjo connection on the valve.

(6) Unscrew the four valve attachment bolts evenly, and lift the valve from the jack platform ensuring that the bottom platen remains in the valve body; remove the connecting pieces, using tool FHQ 164, place them in a protective bag and attach the bag to the jack.

(7) Fit protection plugs to the fluid orifices in the valve bottom platen; position the valve base cover plate and secure it, using the four valve attachment bolts and ¼ in. B.S.F. nuts.

(8) Fit protection plugs to the jack platform fluid orifices; position the cover plate and secure it with ¼ in. dia. B.S.F. screws and washers.

(9) Remove the unit identification plate.

6. Instructions for dismantling the jack, valve and release unit will be found in the relevant publications (Table 1).

EXAMINING

7. Instructions for examining the jack, valve and release unit will be found in the relevant publications. Clean all other parts in approved cleaning fluid and examine them for serviceability. Fits and clearances appear in Table 2.

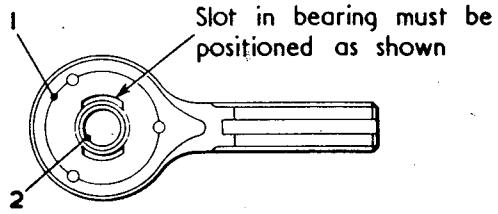

Figure 2 – Key diagram

Table 2 – Fits, clearances and repair tolerances

Ref. No. on Key diagram	Parts and Description		Dimension New	Permissible Worn Dimension		Clearance New	Permissible Worn Clearance	Remarks
				Inter-changeable Assembly	Selective Assembly			
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)
1	BEARING IN EYE END							
	Eye end	i/d	0.5622	0.5622	–	0.0004 −0.0005	0.0004	
	Bearing	o/d	0.5622 0.5618	0.5618	–			
2	BEARING	i/d	0.1900 0.1896	0.1900	–	–	–	

ASSEMBLING

8. Ensure that the jack, valve and release unit have been tested and are serviceable. Smear the connecting pieces, seals and sealing washers with clean hydraulic fluid immediately before fitting and where bonded sealing washers are used, ensure the torque loading figures (A.P. 105D–0002–1) are not exceeded. Maintain scrupulous cleanliness throughout and assemble the unit as follows:–

(1) Remove the cover plate and protection plugs from the jack platform and fit the connecting pieces complete with new seals into the fluid orifices.

(2) Remove the cover plate from the valve base and withdraw the protection plugs from the bottom platen.

(3) Place the valve squarely over the connecting pieces and press it firmly on to the jack platform. Engage the four attachment bolts complete with new tabwashers, tighten the bolts evenly but do not lock the tabwashers until after fluid testing.

(4) Remove the protecting plug and loosely assemble the banjo and bolt to the by-pass valve housing, using new sealing washers, one each side of the banjo body.

(5) Remove the protection cap from the two-way banjo on the valve and position the external pipe; tighten the by-pass housing banjo bolt and the pipe adapters.

(6) Screw the eye end, complete with locknut and new tabwasher, into the valve spindle and tighten the locknut but do not lock the tabwasher.

(7) Test the jack and valve assembly in accordance with para. 9. The fitting of the release unit is included in para. 10.

TESTING

9. 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. Test the unit in accordance with the tests scheduled in Table 3. Fault diagnosis is given in Table 4.

Note ...

When testing units embodying ram seals introduced by Mod. FHB 117 (pre Mod. FHB 157), it must be remembered that with this type of rubber/fabric seal a dampness of the jack ram during operation can be accepted as inherent. Slight leakage may occur after prolonged periods of standing, this, except in isolated cases will disappear when the unit is exercised. If doubt exists as to the seal serviceability, wipe the unit dry, operate the ram through 6 reversals at normal system pressure (2880/3120 lb/in^2), release pressure and again dry the unit, re-pressurize and repeat through a further 6 reversals. If no evidence of seepage is now apparent, the unit seals can be considered serviceable. Seepage past the ram seals into the extension end must be assessed in the knowledge of this note, but, in general, slight seepage from the extension end bleed hole after prolonged standing may be ignored, provided that it does not persist.

AFTER TESTING

10. When the tests have been satisfactorily completed:–

(1) Fully retract the ram, disconnect the rig pipe lines and, leaving the unit filled with fluid, fit protection caps, with seals, to the valve fluid connections.

(2) Lock the valve securing bolts by bending over the tabwashers.

(3) Wire-lock the valve bleed nipples together.

(4) Wire-lock each of the external pipe adapters and its adjacent banjo bolt together.

(5) Check that the data on the identification plate is correct and attach the plate to the unit in accordance with A.P.105D–0002–1– 'Fitting identification and locking dowel plate assemblies'. If the plate is new, indent the plate into the dimple in the jack body.

(6) Unscrew the release unit locking bolt to allow movement of the pawl and slide the unit on to the jack ram.

(7) Screw in the locking bolt and ensure that the pawl wedges cleanly in the ram notch; (see relevant aircraft publication for bolt torque loading and locking when unit is installed).

(8) Liberally coat the ram notch and release unit pawl with grease, XG–275.

(9) Assemble the fork link to the valve spindle eye end, with bolt, washer, nut and split pin.

Note ...

To prevent damage to the valve spindle and eye end, the eye end and fork link complete should be removed from the spindle and tied to the unit until required at installation.

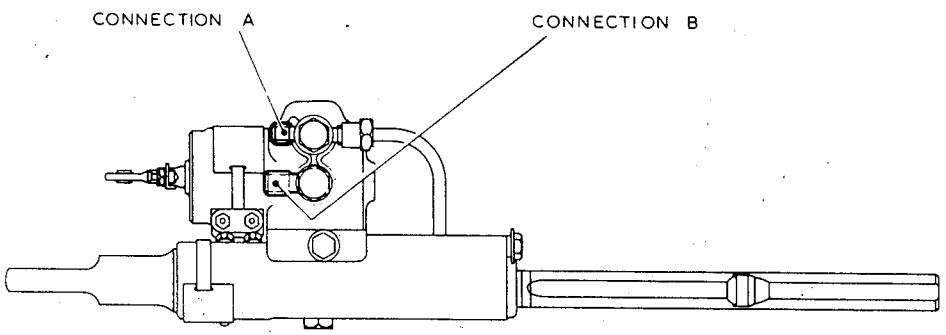

Fig.3 – Test connections

Table 3 – Test schedule

Test No.	Minimum and maximum pressures in lb./in.^{2} at connections A	B	Valve selection	Procedure	Requirements
Note.	*Before commencing the tests below, bleed the valve damper chamber (A.P.105D–1302–1) and expel all air from the unit.*				
1	3850 4150	Reservoir	In	Maintain pressure for 3 minutes	No external seepage
2.	1 10	Blank	In	Maintain pressure for 2 minutes	No external seepage
3.	3850 4150	Reservoir	Out	Maintain pressure for 3 minutes	No external seepage
4.	1 10	Blank	Out	Maintain pressure for 2 minutes	No external seepage
5.	2880 3120	Atmosphere	Out	Maintain pressure for 4 minutes with pump 'ON'. Check seepage in the fourth minute	Not to exceed 100 c.c. in the fourth minute
6	2880 3120	Atmosphere	In	As for Test No. 5	As for Test No. 5
7.	1920 2080	960 1040	Neutral	Maintain pressure for 2 minutes	No external seepage

Table 3 – Test schedule (continued)

Test No.	Minimum and maximum pressures in lb./in.^{2} at connections A	B	Valve selection	Procedure	Requirements
8.	1920 2080	1 10	Neutral	Maintain pressure for 2 minutes	No external seepage
9.	2880 3120	Reservoir	Alternate	Move the control valve fully in and out then:- (1) Measure the operating load at which the valve spindle starts to move irrespective of the speed of movement. Repeat over all parts of the stroke (2) Adjust the valve spindle until the ram is stationary and clear of its stops. Then measure the operating load on the valve spindle necessary to cause the ram to move (3) Repeat (2) for movement of the ram in the opposite direction	(1) Maximum: 6 lb., matched to within 2½ lb. (2) Maximum: 2½ lb. (3) Maximum: 2½ lb.
10.	2880 3120	Reservoir	Neutral	Maintain pressure for 5 minutes with the rig pump ' ON. After this period measure the operating load at which the valve spindle starts to move, irrespective of the speed of movement. Repeat for second 5 minute period and measure the load in the opposite direction	Maximum: 10 lb.
11.	As required	Atmosphere	0·03 in. In	(1) Gradually raise pressure at connection A and observe flow at connection B. When flow falls to normal seepage rate, note pressure at connection A (2) Increase pressure to 2880/3120 lb/in.^{2} then gradually decrease and note pressure when flow re-commences	(1) Maximum: 500 lb/in.^{2} (2) Minimum: 200 lb/in.^{2}
12.	As required	Atmosphere	0·03 in. Out	As for Test No. 11	As for Test No. 11

Note ...

(1) To select the valve operating spindle to neutral, adjust its position until the jack ram is stationary at some intermediate point in its stroke.

(2) Test 9 (2) and (3). This load is known as the 'operating load off-centre'. The initial movement of the valve spindle to its extreme of travel are essential to off-set possible 'valve stiction'.

(3) Test 10. The measured load is the operating load which will be required to make an initial movement of the operating spindle after the valve has been standing with pressure applied. This increased operating load is termed 'valve stiction'.

Table 4 – Fault diagnosis

Fault	Diagnosis
1. Excessive seepage from connection B when valve is neutral	1. See valve fault diagnosis (A.P.105D–1302–1)
2. Excessive seepage from connection B when valve is selected and jack ram is at extreme of travel	2. (1) Defective jack piston head seals (2) Excessive jack cylinder bore wear (3) Leakage past by-pass valve
3. External leakage from valve	3. See valve fault diagnosis (A.P.105D–1302–1)
4. External leakage from jack	4. See jack fault diagnosis (A.P.105D–1303–1)
5. Leakage between valve and jack platform	5. (1) Defective valve bottom platen seal (2) Defective connecting piece seal
6. Valve tends to select without assistance	6. (1) Foreign matter between the faces of the valve bottom platen and the jack platform (2) Foreign matter between the faces of the valve platen spacer and the top platen
7. Jack 'creeps' when the valve is neutral	7. Foreign matter between the faces of the valve outer sleeve and the bottom platen
8. Incorrect by-pass valve operating pressures at Table 1, Tests No. 11 and 12.	8. See jack fault diagnosis (A.P.105D–1303–1)

Note ... Any rectification must be followed by re-testing.

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