Formerly AP4601A
Vol 4 Pt 6

AP 105D-1309-5F

Issued July 1974

BAY SERVICING SCHEDULE

POWERED FLYING CONTROLS
SERVO VALVE
SERIES FHS 722
(FAIREY HYDRAULICS)

BY COMMAND OF THE DEFENCE COUNCIL

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(Ministry of Defence)

FOR USE IN THE
ROYAL AIR FORCE

AMENDMENT RECORD CERTIFICATE

1. This certificate is for Ministry of Defence (Air) ALs only
2. Amendments are to be inserted in numerical sequence except where Non-Availability slips for particular A.L.s are issued.

A.L. No	A.L. MONTH AND YEAR OF ISSUE	AMENDMENT INCORPORATED SIGNATURE	DATE OF INCORPORATION
1			
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E0450 (1) Issued July 1974

POWERED FLYING CONTROLS
SERVO VALVE
SUPPLEMENTARY SERVICING

ITEM No	ITEM	OPERATION

POWERED FLYING CONTROLS
SERVO VALVE

REF NO.	EQUIPMENT AND TOOLS	QTY
	Kit Tool, Airframe Fitter to Scale A/ AP830 Vol 3 Pt A	1
27KF/683	Tool, Seal Manipulating Pt No. FHQ100	1
27KF/695	Fixture, Universal Testing Pt No. FHQ103	1
27KF/696	Rig, Backlash Checking Pt No. FHQ163	1
27KF/692	Tool, Platen Pt No. FHQ165	1
27KF/976	Blocks, Vice Pt No. FHQ264	1
27KF/693	Extractor, End Cap Pt No. FHQ231	1
27KF/3102	Fixture, Stroke Centring	1
1B/9100089	Indicator, Dial Test, Set.	1

SPARES

Refer to AP4515P Vol 3 Pt 1 Sect 2 Chap 1

	MATERIALS	NATO CODE NO.	As required
34B/91000572	Oil, OM-15	H-515	
30A/3055	Wire, Locking 22 SWG	"	"

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SERVICING NOTES

1. AP105D-0001-5F is to be complied with throughout the work detailed in this schedule.

2. Unless otherwise stated parts are to be cleaned using oil, OM-15.

3. The following parts are matched assemblies and are only to be renewed in their groups:

(a) Top platen and inner sleeve.

(b) Bottom platen and outer sleeve.

(c) Piston, operating ring and balancing spindle.

4. To ensure the correct relative assembly of the bottom platen, outer sleeve, operating ring, and end cap is accurately maintained, it is important to ascertain their positions relative to the valve body before dismantling. Indication marks in the form of a letter 'S' on the bottom platen and outer sleeve and a centre pop on the operating ring will be found on parts supplied as spares. These marks are to be towards the piston when the parts are assembled.

5. The type of body, spindle stroke and piston orifice of a particular valve are indicated in the part number of the valve, which consists of the basic part number, and three suffix numbers, eg.

FHS 722/3/140/0

FHS 722	Basic part number.
/3	Valve body number (Fig 1, Table 1, refers).
/140	Spindle stroke in thousandths of an inch.
/0	Diameter of orifice in orifice screw, in thousandths of an inch (Fig 2 refers).

Spindle stroke is to be within the limits PLUS 0.020 in. and MINUS 0.000 in. and be matched either side of the indicated centre to within 0.010 in.

6. Unless otherwise stated component parts are to be lubricated with oil, OM-15 immediately before assembling.

7. Bonded seals are to be torque loaded as detailed in AP105D-0002-1.

P.F.6.

ITEM No	ITEM	OPERATION
1.	Preparation	
1.1	Servicing Notes.	Read.
2.	Dismantling	
2.1	Blanking plugs.	(i) Remove. (ii) Discard bonded seals.
2.2	Bleed screws.	(i) Remove. (ii) Discard gaskets.
2.3	Hydraulic connexion protection plugs.	Remove.
2.4	Servo valve.	Support in vice using vice blocks.
2.5	Servo valve attachment bolts.	(i) Remove. (ii) Discard tab washers.
2.6	Protection cover.	Remove.
2.7	Platen retaining washers.	Remove and discard.
2.8	Bottom platen protection plugs.	Remove.
2.9	Bottom platen.	Note relative position, (Servicing Notes 3 and 4 refer), and remove using platen tool.
2.10 2.11	Inner sleeve.) Outer sleeve.)	(i) Note relative position and remove. (ii) Separate and remove spring.
2.12	Inner sleeve seal.	Remove and discard.
2.13	Operating ring.	Remove.
2.14	Balancing spindle.	(i) Remove. (ii) Discard seal.
2.15	End cap.	(i) Remove circlip. (ii) Note relative position and remove using end cap extractor. (iii) Discard seals.
2.16	Piston.	(i) Remove. Note: Do not remove ball valve, orifice screws or stop collars. (ii) Discard seal.

Continued overleaf

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ITEM No	ITEM	OPERATION
2.17	Platen spacer.	Remove.
2.18	Top platen.	Note relative position and remove using platen tool.
2.19	Servo valve body.	Remove from vice and vice blocks.
3.	Examination	
3.1	Valve body.	(i) Clean.
3.2	End cap.	(ii) Examine.
3.3	Piston.	
3.4	Top platen.	
3.5	Bottom platen.	
3.6	Operating ring.	
3.7	Platen spacer.	
3.8	Balancing spindle.	
3.9	Inner sleeve.	
3.10	Sleeve spring.	
3.11	Outer sleeve.	
3.12	Circlip.	
3.13	Bleed screws.	
3.14	Blanking plugs.	
3.15	Servo valve attachment bolts.	
4.	Backlash Check	
4.1	Outer sleeve.	(i) Assemble dry in correct relative positions.
4.2	Operating ring.	
4.3	Piston.	(ii) Fit to backlash test rig. (iii) Check backlash does not exceed 0.001 in. (iv) Remove from backlash test rig.
5.	Piston Stroke and Concentricity Check	
5.1	Balancing spindle seal.	Fit new item to valve body.
5.2	End cap spindle seal.	Fit new item.
5.3	Piston.	Fit to valve body in correct relative positions.
5.4	Balancing spindle.	
5.5	Operating ring.	
5.6	End cap.	
5.7	Circlip.	Fit.
5.8	Servo valve.	Fit to stroke centring fixture.
5.9	Eye end.	(i) Fit locknut. (ii) Fit to piston spindle. (iii) Fit spring balance.

Continued

ITEM No	ITEM	OPERATION
5.	Piston Stroke and Concentricity Check (Contd)	
5.10	Servo valve.	(i) Check load required to slowly stroke piston does not exceed 1 lbf. (ii) Rotate piston. (iii) Repeat Operation (i).
5.11	Eye end.	(i) Remove spring balance. (ii) Remove.
5.12	Servo valve.	Fit appropriate end pad to operating spindle.
5.13	Dial test indicator. (DTI).	Fit to bear on end pad.
5.14	Stroke centring mandrel.	Fit.
5.15	DTI.	Set to zero.
5.16	Stroke centring mandrel.	Remove.
5.17	Piston spindle.	(i) Stroke. (ii) Check DTI indication is within limits (Servicing Note 5 refers).
5.18	DTI.)	
5.19	End pad.)	
5.20	Piston.)	
5.21	Balancing spindle.)	Remove.
5.22	Operating ring.)	
5.23	End cap.)	
5.24	Circlip.)	
6.	Assembling	
6.1	Blanking plugs.	(i) Fit bonded seals. (ii) Fit.
6.2	Hydraulic connexion protection plugs.	Fit.
6.3	Top platen.	(i) Fit new seal. (ii) Fit to valve body in correct relative position.

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Continued overleaf

ITEM No	ITEM	OPERATION
6.4	Platen spacer.	(i) Fit, smaller inner diameter hole leading. (ii) Align smaller holes with balancing spindle and piston openings in body.
6.5	Piston.	(i) Fit new seal. (ii) Fit, complete with stop collars.
6.6	End cap.	(i) Fit new outer seal. (ii) Ensure spindle seal has not been damaged or disturbed. (iii) Fit, ensuring one slot aligns with bleed screw holes.
6.7	Circlip.	Fit.
6.8	Balancing spindle.	Fit, grooved end first.
6.9	Operating ring.	Fit, ensuring correct relative position, and engaging slots in ring with piston and balancing spindle.
6.10	Inner sleeve.	(i) Fit new seal. (ii) Position spring in bore.
6.11	Outer sleeve.	Press over inner sleeve.
6.12	Inner and outer sleeve assembly.	Fit, ensuring correct relative assembly, inner sleeve leading.
6.13	Bottom platen.	(i) Fit new seal. (ii) Fit, ensuring correct relative assembly, using platen tool.
7.	Priming Damper Chamber	
7.1	Servo valve.	Immerse in clean oil, OM-15, bleed screw orifices uppermost.
7.2	Piston spindle.	Stroke, until all air is expelled.
7.3	Servo valve.	(i) Remove from oil. (ii) Dry thoroughly.
7.4	Bleed screws.	(i) Fit gaskets. (ii) Fit.
8.	Establishing Valve Neutral	
8.1	Eye end.	Fit.
8.2	Connecting pieces.	(i) Fit seals. (ii) Fit to test fixture platform.

Continued

ITEM No	ITEM	OPERATION
8.	Establishing Valve Neutral (Contd)	
8.3	Servo valve.	Fit to test fixture platform.
8.4	Servo valve attachment bolts.	(i) Fit new tab washers. (ii) Fit.
8.5	Eye end.	Fit to test fixture.
8.6	Connexions A and C (Fig 2 refers).	Fit to hydraulic test rig supply.
8.7	Connexion B.	Fit to test rig return.
8.8	DTI.	Fit to bear on end of balancing spindle, plunger slightly depressed.
8.9	Hydraulic test rig.	Apply pressure of 2000 lbf/in2.
8.10	Piston spindle.	(i) Select to move test fixture pistons D and E alternately in and out. (ii) Select sufficient to cause piston E to begin retracting. Disregard piston D. Note DTI indication. (iii) Select sufficient to cause piston D to begin extending. Disregard piston E. Note DTI indication.
8.11	DTI.	Set to neutral by halving the difference of indication obtained in Sub-item 8.10.
9.	Testing	
9.1	Piston spindle.	Select out.
9.2	Hydraulic test rig.	(i) Apply pressure of between 3840 and 4160 lbf/in2. (ii) Maintain for 3 minutes.
9.3	Assembly.	Ensure no external seepage.
9.4	Piston spindle.	(i) Select in. (ii) Repeat Sub-item 9.2. (iii) Release pressure.
9.5	Connexion B.	Disconnect from hydraulic test rig return.
9.6	Piston spindle.	Select neutral.

Continued overleaf

ITEM No	ITEM	OPERATION
9.7	Hydraulic test rig.	(i) Apply pressure of between 2880 and 3120 lbf/in2. (ii) Maintain for 4 minutes with pump on.
9.8	Assembly.	During fourth minute check seepage at connexion B does not exceed 35 cm3.
9.9	Piston spindle.	Select in.
9.10	Connexions A and C.	Repeat Sub-items 9.7 and 9.8.
9.11	Piston spindle.	Select out.
9.12	Connexions A and C.	(i) Repeat Sub-item 9.7 and 9.8. (ii) Release pressure.
9.13	Connexion B.	Connect to hydraulic test rig supply.
9.14	Piston spindle.	Select neutral.
9.15	Hydraulic test rig.	(i) Apply pressure of between 1920 and 2080 lbf/in2 at connexions A and C. (ii) Apply pressure of between 380 and 420 lbf/in2 at connexion B. (iii) Maintain pressure for 3 minutes.
9.16	Assembly.	Ensure no external seepage.
9.17	Hydraulic test rig.	Release pressure.
9.18	Connexions A and C.	(i) Disconnect from hydraulic test rig. (ii) Fit blanks.
9.19	Piston spindle.	Select either in or out.
9.20	Hydraulic test rig.	(i) Apply pressure of between 1 and 10 lbf/in2 to connexion B. (ii) Maintain for 6 hours.
9.21	Assembly.	Ensure no external seepage.
9.22	Hydraulic test rig.	Release pressure.
9.23	Bleed screws.	Remove.
9.24	Connexions A and C.	Remove blanks.
9.25	Connexion B.	Remove from hydraulic test rig.
9.26	Piston spindle.	Stroke in both directions to expel oil from damper chamber and check stroke is within limits. (Servicing Note 5 refers).
9.27	Eye end.	(i) Disconnect from test fixture. (ii) Fit spring balance.

Continued

ITEM No	ITEM	OPERATION
9.	Testing (Contd)	
9.28	Piston spindle.	Stroke slowly in both directions. Ensure load does not exceed 7 lbf.
9.29	Servo valve.	(i) Refill damper chamber with oil, OM-15. (ii) Bleed.
9.30	Bleed screws.	Refit.
9.31	Connexion B.	Connect to hydraulic test rig return.
9.32	Connexions A and C.	Connect to hydraulic test rig supply.
9.33	Hydraulic test rig.	Apply pressure of between 2880 and 3120 lbf/in2 to connexions A and C.
9.34	Piston spindle.	(i) Select out and in alternately. (ii) Check operating load does not exceed 6 lbf in either direction. All indications are to be within 2.5 lbf of each other. (iii) Select neutral. (iv) Ensure initial load required to move spindle from neutral in both directions does not exceed 2.5 lbs.
9.35	Hydraulic test rig.	Release pressure.
9.36	Connexion B.	(i) Disconnect from hydraulic test rig return. (ii) Connect to hydraulic test rig supply.
9.37	Hydraulic test rig.	(i) Apply pressure of between 380 and 420 lbf/in2 to connexion B. (ii) Apply pressure of between 2880 and 3120 lbf/in2 to connexions A and C.
9.38	Piston spindle.	(i) Select neutral. (ii) Ensure initial load required to move spindle from neutral in both directions does not exceed 3.5 lbf.
9.39	Hydraulic test rig.	Release pressure.
9.40	Eye end.	(i) Remove spring balance. (ii) Connect to test fixture.

Continued overleaf

ITEM No	ITEM	OPERATION
9.41	Connexion B.	Connect to hydraulic test rig return.
9.42	Hydraulic test rig.	Apply pressure of between 960 and 1040 lbf/in2 to connexions A and C.
9.43	Piston spindle.	(i) Select neutral with pistons D and E in mid-position. (ii) Move until either piston just begins to extend.
9.44	DTI.	Set to zero.
9.45	Piston spindle.	Move in opposite direction until other piston just begins to extend.
9.46	DTI.	Note indication. This is to be between 0.001 and 0.006 in.
9.47	Piston spindle.	(i) Select neutral. (ii) Move until piston E just begins to retract.
9.48	DTI.	Set to zero.
9.49	Piston spindle.	Move until piston D just begins to retract.
9.50	DTI.	Note indication. This is to be between 0.002 and 0.006 in.
9.51	Piston spindle.	(i) Select neutral. (ii) Move until piston E just begins to extend.
9.52	DTI.	Set to zero.
9.53	Piston spindle.	Move until piston D just begins to retract.
9.54	DTI.	Note indication. This is not to exceed 0.003 in.
9.55	Piston spindle.	(i) Select neutral. (ii) Move until piston D just begins to extend.
9.56	DTI.	Set to zero.
9.57	Piston spindle.	Move until piston E just begins to retract.
9.58	DTI.	Note indication. This is not to exceed 0.003 in.
9.59	Hydraulic test rig.	Release pressure.

Continued

ITEM No	ITEM	OPERATION
9.	Testing (Contd)	
9.60	Eye end.	(i) Disconnect from test fixture. (ii) Fit spring balance.
9.61	Piston spindle.	Select neutral.
9.62	Hydraulic test rig.	Apply pressure of between 2880 and 3120 lbf/in2 to connexions A and C and maintain for 5 minutes with pump on.
9.63	Piston spindle.	(i) Ensure load required to move in does not exceed 10 lbf. (ii) Select neutral.
9.64	Hydraulic test rig.	Maintain pressure for further 5 minutes with pump on.
9.65	Piston spindle.	Ensure load required to move out does not exceed 10 lbf.
9.66	Hydraulic test rig.	Release pressure.
9.67	Servo valve.	(i) Disconnect from hydraulic test rig. (ii) Remove from test fixture.
10.	Completion	
10.1	Servo valve.	Ensure full of fluid.
10.2	Bottom platen protection plugs.	Fit.
10.3	Platen retaining washers.	Fit, cone leading.
10.4	Protection cover.	Fit, using 1/4 in. BSF nuts.
10.5	Hydraulic connexion protection plugs.	Fit.
10.6	Eye end.	Remove.
10.7 10.8	Bleed screws. Blanking plugs.	Lock with wire 22 SWG.
10.9	Servicing forms.	Sign.

Continued overleaf

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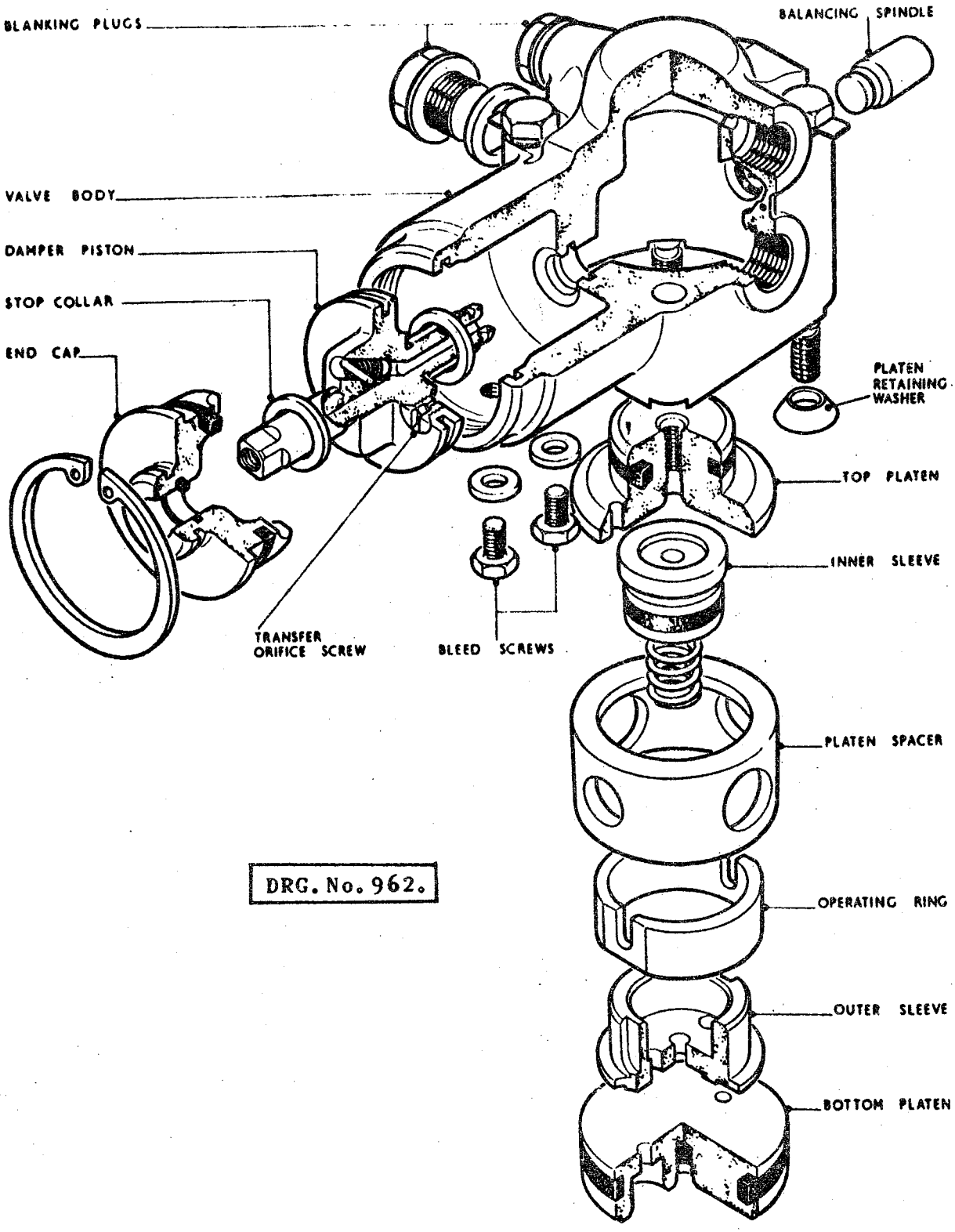
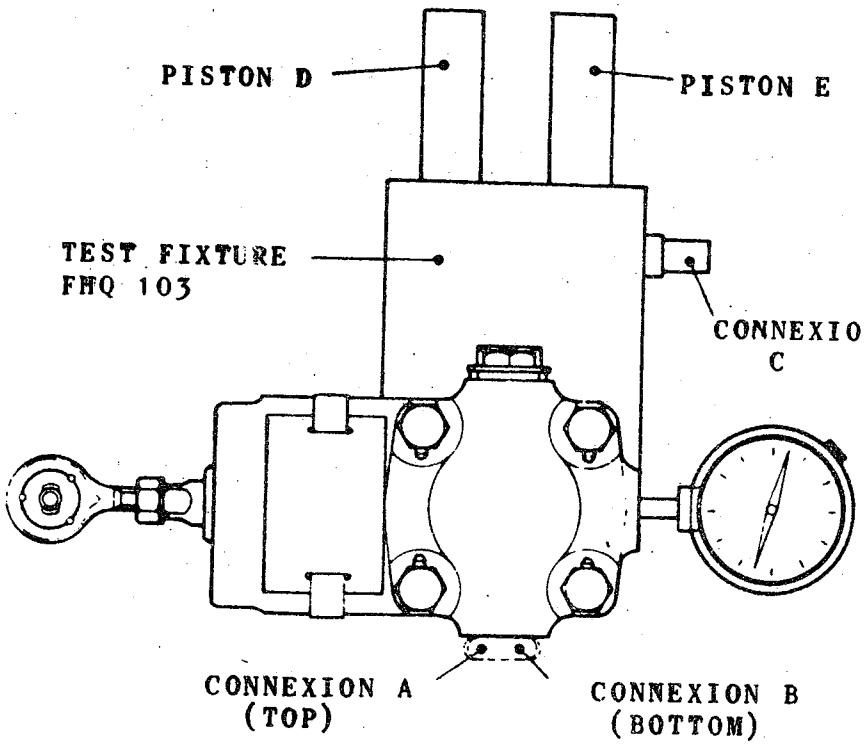
POWERED FLYING CONTROLS
SERVO VALVE



Exploded view of valve FHS 722



TEST CONNEXIONS DRG No. 961.

FIG 2

P.F.6.