Appendix 1

STANDARD SERVICEABILITY TEST FOR HEIGHT LOCK TRANSDUCER, TYPE B

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Introduction

1. This appendix describes the serviceability tests to be applied to the height lock transducer ,Type B (Ref. No. 6TD/812) prior to installation in an aircraft and at any time when the serviceability is suspect. The tolerances specified must not be exceeded. Fault diagnosis for the transducer is given in App. 2, the adjustments and tests in addition to the S.S.T. in App. 3, and component removal and replacement in App. 4. The abbreviations used for test equipment components are listed in Table 1.

TABLE 1

Test equipment abbreviations

Components	Abbreviation
Power control unit	PCU
Power supply test panel	PSTP
Height lock transducer, Type B test panel	HLTP
System distribution panel	SDP
ON/OFF supply switch (PSTP)	S1
ON/OFF—SUPPLY switch (HLTP)	S1
OPERATING MODE switch	S2
RADIO HEIGHT SIMULATOR switches — FEET	S3
RADIO HEIGHT SIMULATOR switches — INCREASE / DECREASE	S4
Pitot-static test set, Mk. 3	Mk. 3 PS
Air data test set, Type B	ADTS

Test equipment

2. The following test equipment is required:—

(1) Height lock transducer, Type B test panel (Ref. No. 6C/4531) fitted into the test set, Type 9B (Ref. No. 6C/2868) as shown in fig. 3.

(2) Mk. 3 pitot-static test set (Ref. No. 6C/2106) fitted into the test set, Type 9B as shown in fig. 3, or the air data test set, Type B (Ref. No. 6C/3720).

(3) Bellows control unit (Ref. No. 6C/1698).

(4) Precision aneroid barometer (Ref. No. 6C/2154).

(5) Multimeter, Type 12889 (Ref. No. 5QP/17447).

(6) Valve voltmeter, range 0 to 5V, calibrated to an accuracy of 0·5%.

(7) Oscilloscope, Type CT414, Ref. No. 6625-99-943-1632.

(8) Portable pressure/vacuum test set (Ref. No. 6C/3154).

(9) Stop watch, G.S., 1/5th second (Ref. No. 6B/9101001).

(10) Vibrator, 115V, producing 3,200 c/s (Ref. No. 6A/7041), described in A.P.1275A, Vol. 1, Sect. 22, Chap. 17.

Power supplies

3. The following power supplies are required:—

(1) 115V ± 3V, 400 c/s ± 20 c/s, 3-phase, phase rotation A-B-C with B phase earthed.

(2) 28V ± 1·5V d.c.

Pneumatic supplies

4. Pressure/vacuum supplies capable of simulating −1200 ft to + 52000 ft standard conditions, obtainable from the portable pressure/vacuum test set used in conjunction with the Mk. 3 PS, or from the ADTS.

Servicing methods

5. (1) All operations are to be carried out in the sequence listed. The operation is to be read through completely before it is carried out.

(2) When tests are completed, a blanking cover is always to be fitted to the static input of the transducer.

(3) Unless otherwise stated, all tests of the height lock transducer are to be carried out with the base of the transducer level.

(4) No adjustments are permitted on the transducer.

(5) Allow 15 min. warm-up period before proceeding with height lock tests.

TEST PROCEDURE

Preparation for tests

Test set, Type 9B setting and testing power supplies

6. (1) Check the test set panel interconnections at the rear of the test set and the test set power supply connection to the INPUT plug on the PCU. A test set interconnection diagram is given in A.P.4685T, Vol. 1, Sect. 2, Chap. 19A.

(2) Set switches and controls as follows:—

MAINS switch (PCU) to the off position.

AC INCREASE control and DC INCREASE control (PCU) fully clockwise.

S1 (PSTP) to OFF.

S1 (HLTP) to OFF.

(3) Ensure that no equipment is connected to the test set at the SDP and check that the protective cap is fitted to the auxiliary power input plug on the front panel of the PSTP.

(4) Set MAINS switch (PCU) to ON.

(5) Ensure that the phase sequence lamp (PCU) and the four lamps of the rotation indicator (PSTP) are lit and indicating the correct phase rotation.

(6) Check that the frequency indicated on the meter (PCU) is 400 c/s ± 20 c/s.

(7) Adjust the AC INCREASE control (PCU) until a.c. voltmeter on PCU reads 115V. Adjust DC INCREASE control (PCU) until d.c. voltmeter on PCU reads 28V.

(8) Set VOLTAGE SELECTOR switch (PCU) to all three phase positions in turn. Check that in each position the indicated a.c. voltage is between 113V and 117V, and that the phase sequence lamp remains lit. Set the selector switch to A-B.

(9) Set S1 (HLTP) to ON.

(10) Using a multimeter set to the 0 to 100V d.c. range, check the availability of the voltages between pin V of socket HL1 (HLTP) and the pins listed in Table 2, for the appropriate positions of S2 (HLTP) as shown in Table 2.

(11) Using a multimeter on the 0 to 250V a.c. range, check the availability of the 115V 3-phase supply between pin A and pin B (phase A), and pin C and pin B (phase C) of socket HL1 (HLTP).

(12) Set the test set switches as follows:—

S1 (HLTP) to OFF
MAINS switch (PCU) to the off position.

Note . . .

If the serviceability of the HLTP is suspect, the panel is to be tested in accordance with the check calibration described in A.P.4685T, Vol. 1, Sect. 2, Chap. 19E, App. 1.

TABLE 2

Voltage outputs—transducer relay supplies

S2 position		HL1 pins		
		X	Y	W
SERVO		0V	0V	0V
BAROMETRIC		0V	0V	+28V
RADIO HL	LOW	0V	+28V	+28V
	HIGH	+28V	+28V	+28V

Preliminary examination

7. Examine the transducer for damage and clean externally using clean dry cloth (Ref. No. 32B/242).

Height lock transducer

8. Connect the height lock transducer to HL1 (HLTP) using cable assembly CA1, as shown in fig. 3.

Leak test

Pitot-static test set, Mk. 3

9. (1) Prepare the Mk. 3 PS for use as described in A.P.1275T, Vol. 1, Sect. 3, Chap. 38 and fit into test set, Type 9B as shown in fig. 3.

(2) Blank off static outlet (S) and pitot outlet (P)

(3) Set selector switch A to EXTERNAL SUCTION and selector switch B to STATIC INPUT. Slowly open STATIC control valve to reduce the pressure to 300 mb, close STATIC control valve.

(4) Note any change on the static presentation after 5 min.

(5) If excessive leaks are indicated in sub-para. (4) rectify in accordance with the instructions given in A.P.1275T, Vol. 1, Sect. 3, Chap. 38.

(6) Set selector switch B to STATIC VENT and slowly open STATIC control valve to increase the pressure to ambient.

(7) Connect the height lock transducer STATIC adapter to the Mk. 3 PS static outlet (S) using a flexible hose of $\frac{3}{8}$ in. internal diameter not exceeding 5 ft in length (fig. 3). Secure the ends of the hose with hose clips.

(8) Set the test set switches as follows:—

MAINS switch (PCU) to ON
S1 (PSTP) to OFF
S2 (HLTP) to SERVO
S3 (HLTP) to 0 FEET
S4 (HLTP) to INCREASE
S1 (HLTP) to OFF

(9) Set selector switch B to STATIC INPUT. Slowly open STATIC control valve to reduce the pressure to 300 mb, close STATIC control valve.

(10) Note any change on the static presentation after 5 min. This is not to exceed 5 mb more than that observed in sub-para. (4).

(11) Set selector switch B to STATIC VENT and slowly open static control valve to increase the pressure to ambient.

(12) Disconnect the flexible hose from the STATIC input to the transducer.

Air data test set, Type B

10. (1) Prepare the ADTS for use as described in A.P.1275T, Vol. 1, Sect. 3, Chap. 42.

(2) Connect the height lock transducer to the ALT outlet on the ADTS distribution panel using a flexible hose not exceeding 5 ft in length, and a shut-off valve (fig. 3). Secure the ends of the hose with hose clips.

(3) Close the shut-off valve.

(4) Set the vernier slide of the absolute manometer to 300 mb.

(5) Set the CONTROLLED PRESSURE selector and the SERVO switch of the absolute controller to ON. Allow the NULL INDICATOR to return to zero.

(6) Set the SERVO switch to OFF.

(7) After 5 min. set the changeover switch on the photo scanner so that the rear of the tube is illuminated. Position the vernier slide so that the upper edge of the slot is above the mercury meniscus, then lower the slide very slowly until the light is just cut off at the centre of the meniscus, as seen through the slot in the right-hand side of the scanner tube.

Note . . .

Always tap the bench before taking a reading to overcome surface tension and to form the correct meniscus shape.

(8) Reset the changeover switch to re-illuminate the scale and note the scale reading.

(9) Set the SERVO switch to ON and allow the NULL INDICATOR to return to zero.

(10) Set the vernier slide of the absolute manometer to the prevailing atmospheric pressure and allow the NULL INDICATOR to return to zero.

(11) Open the shut-off valve.

(12) Set the test set switches as in para. 9, sub-para. (8).

(13) Set the vernier slide of the absolute manometer to 300 mb.

(14) When the NULL INDICATOR reads zero, set the SERVO switch to OFF.

(15) Repeat sub-para. (7) and (8).

(16) The second reading obtained is not to exceed the first by more than 5 mb.

(17) Set the SERVO switch to ON and allow the NULL INDICATOR to return to zero.

(18) Set the vernier slide of the absolute manometer to the prevailing atmospheric pressure.

(19) Set the SERVO switch to OFF and the absolute pressure gauge to approximately 30 in. Hg.

(20) Set the absolute CONTROLLED PRESSURE selector to VENT.

(21) Disconnect the flexible hose from the STATIC input adapter on the transducer.

Barometric height lock tests

11. (1) Connect the height lock transducer for test as shown in fig. 1. Set the pressure on the STATIC input on the transducer to 1013·5 mb. Strap vibrator to transducer and switch on vibrator.

(2) Check that the test set switches are still set as in para. 9, sub-para. (8). Set S1 (HLTP) to ON.

(3) Set S2 (HLTP) to BAROMETRIC. The reading on the valve voltmeter connected between terminals TE2 (SIG.E) and TE3 (TRANSDUCER o/p) on the HLTP must not be greater than 0·3V r.m.s.

(4) With a multimeter set to the 2·5V d.c. range, measure the height lock output at terminals TE2(SIG.E) and TE4 (DEMODULATED, TRANSDUCER o/p) on the HLTP. The output must not be greater than 50mV d.c.

(5) Using the bellows control unit, decrease the static input pressure to the transducer from 1013·5 mb to 1009·5 mb, recording the readings obtained on the valve voltmeter for every 0·5 mb.

(6) Check that in the range 1013·5 mb to 1009·5 mb the phase of the voltage on the valve voltmeter is in phase, to within $\pm 20°$, with the reference voltage on an oscilloscope connected across terminals TE3 (TRANSDUCER o/p), TE1(REF.) and TE2(SIG.E) on the HLTP

(7) Ensure that the signal continues to increase in the correct sense when the pressure is decreased below 1009·5 mb to 1007·5 mb and that saturation does not occur before an output of 3·5V r.m.s. is obtained.

(8) Slowly return the static pressure to 1013·5 mb.

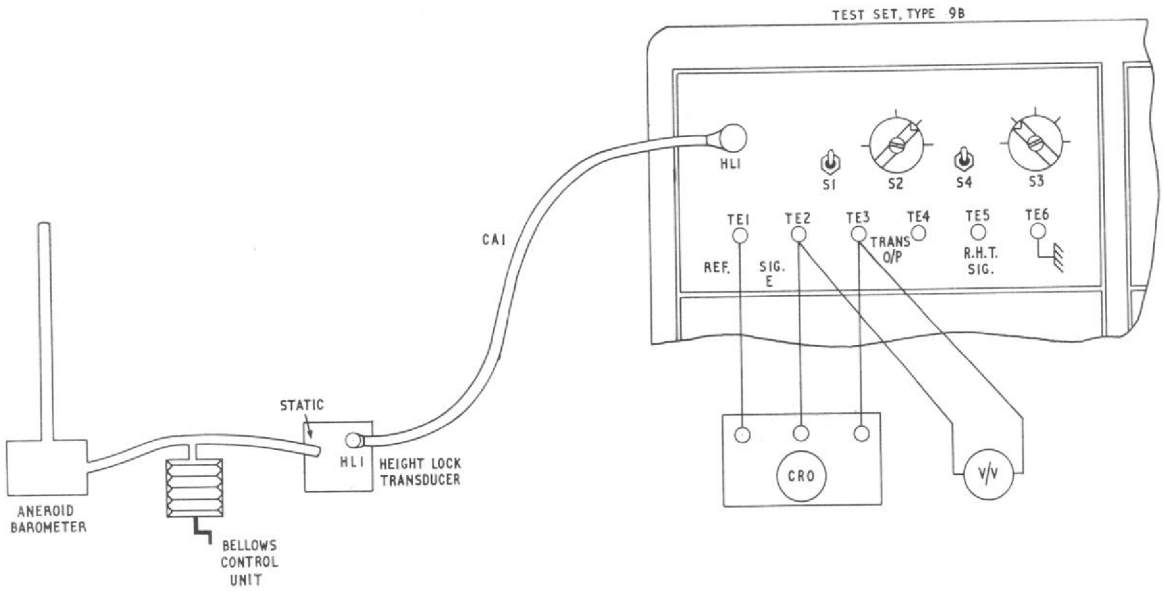

Fig. 1. Transducer connected for test using bellows and barometer

(9) Set S2(HLTP) to SERVO. Allow transducer servomechanism to settle then return S2 to the BAROMETRIC position.

(10) Increase the static pressure to the transducer from 1013·5 mb to 1017·5 mb, recording the readings obtained on the valve voltmeter for every 0·5 mb.

(11) Ensure that the signal continues to increase in the correct sense when the static pressure is increased beyond 1017·5 mb to 1019 mb and that saturation does not occur before an output voltage of 3·5V is obtained.

(12) Plot the outputs recorded in sub-para. (5) and (10) on a graph as in fig. 2. The positive and negative slopes must be within 5% of each other. The output must be 2·72V r.m.s. ± 5%, at 1009·5 mb and 1017·5 mb.

(13) Return the pressure on the static input of the transducer to the prevailing atmospheric pressure.

(14) Set S2 (HLTP) to SERVO.

(15) Disconnect the hose from the STATIC input adapter on the transducer.

Position attitude tests

12. (1) Connect the transducer to the HLTP as in fig. 3, but with the static connection open to atmosphere.

(2) Check that the test set switches are still as set in para. 11, sub-para. (2).

(3) Strap the vibrator to the transducer and switch on vibrator.

(4) Set S2 (HLTP) to BAROMETRIC and take the reading on the valve voltmeter connected between terminals TE3 (TRANSDUCER o/p) and TE3 (SIG.E) on the HLTP.

(5) Turn the transducer on to its top and take a second reading of the valve voltmeter.

(6) Repeat with transducer on each side, and front and rear. The change in height lock output from one direction to the other in any one plane must be less than 0·125V r.m.s.

(7) Set S2(HLTP) back to SERVO.

(8) Set S1 (HLTP) to OFF.

(9) Switch off vibrator and unstrap from transducer.

Servo follow-up tests

13. (1) Remove cover from transducer (App. 4).

(2) Place the transducer on to its top and connect for test as shown in fig. 3.

(3) Set the test set switches as in para. 11,

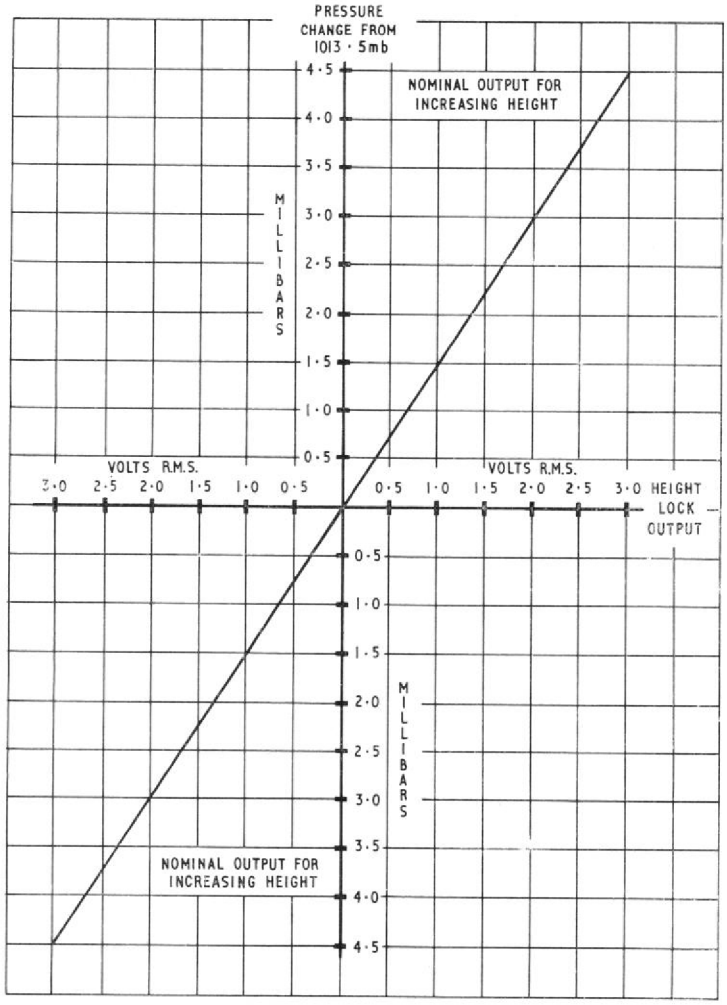

Fig. 2. Nominal height lock outputs

sub-para. (2) and the switches and controls of the Mk. 3 PS, or the ADTS, to the operating positions as detailed in A.P.1275T, Vol. 1, Sect. 3, Chap. 38, or Chap. 42 respectively.

(4) Strap the vibrator to the transducer and switch on vibrator.

(5) Using the Mk. 3 PS, or the ADTS, slowly reduce the pressure on the STATIC input to the transducer to 696·5 mb.

(6) Set S1(HLTP) to OFF.

(7) Slowly increase the applied pressure to 1013·5 mb.

(8) Place S1 (HLTP) to ON and record the time taken for the servomechanism to come to rest. This must be less than 35 seconds.

(9) Slowly reduce the pressure to approximately 1006 mb.

(10) Set S1(HLTP) to OFF.

(11) Slowly return applied pressure to 1013·5 mb.

(12) Place S1(HLTP) to ON and check that the servomechanism comes to rest with only one overshoot and one undershoot.

Range test

14. (1) With the transducer set for test as in para. 13, sub-para. (1) to (4), slowly reduce the pressure on the transducer to simulate approximately the following heights:—

20,000 ft — 465·5 mb

40,000 ft — 187·5 mb

Check that the servomechanism stabilizes at both heights.

(2) Slowly increase the pressure to 1013·5 mb and check that the servomechanism stabilizes.

(3) Slowly increase the pressure further to

1050·5 mb. Check that the servomechanism stabilizes.

(4) Slowly reduce the pressure to 1013·5 mb.

Microswitch operation test

15. (1) Connect the transducer for test as in para. 13, sub-para. (1) to (4).

(2) Slowly increase the pressure on the input to the transducer until microswitch MSW1 operates and causes the servomechanism to reverse direction. Note the pressure reading on the Mk. 3 PS, or the ADTS.

(3) Slowly adjust the pressure towards 1013·5 mb until the gear train becomes steady and again note the pressure reading on the Mk. 3 PS, or the ADTS.

(4) The readings obtained in sub-para. (2) and (3) must be within the range 1058 mb to 1050·5 mb.

(5) Slowly reduce the pressure to 1013·5 mb and then further until microswitch MSW2 operates and causes the servomechanism to reverse direction. Note the pressure reading on the Mk. 3 PS, or the ADTS.

(6) Slowly adjust the pressure towards 1013·5 mb until the gear train becomes steady and again note the pressure reading on the Mk. 3 PS, or ADTS.

(7) The readings obtained in sub-para. (5) and (6) must be within the range 116mb to 105·5mb.

(8) Slowly increase the pressure to the prevailing atmospheric pressure and disconnect the flexible hose from the STATIC input adapter on the transducer.

(9) Close down the Mk. 3 PS, or the ADTS, as detailed in A.P.1275T, Vol. 1, Sect. 3, Chap. 38, or Chap. 42.

(10) Set S1 (HLTP) to OFF.

(11) Switch off vibrator and unstrap from transducer.

(12) Refit transducer cover (App. 4).

Hysteresis test

16. (1) Connect the transducer for test as shown in fig. 1, with the pressure on the static input to the transducer at 1013·3 mb.

(2) Set the test set switches as in para. 11, sub-para. (2).

(3) Strap the vibrator to the transducer and switch on vibrator.

(4) Set S2 (HLTP) to BAROMETRIC and slowly actuate the bellows control unit several times over the range 1011 mb to 1014 mb, to exercise the capsule unit. Return the pressure to 1013·3 mb.

(5) Set S2(HLTP) to SERVO. Allow transducer servomechanism time to settle then place S2 back to BAROMETRIC.

(6) Slowly decrease the pressure to 1011·1 mb and then increase the pressure towards ambient to 1012·6 mb, taking care not to overshoot. Note the valve voltmeter reading.

(7) Slowly increase the pressure through ambient to 1014 mb and then slowly decrease the pressure through ambient to 1012·6 mb, taking care not to overshoot. Again note the valve voltmeter reading.

(8) The difference between the two recorded readings must be less than 200mV r.m.s.

(9) Slowly return the pressure to 1013·3 mb.

Discrimination test

17. (1) Connect the transducer for test as in para. 16, sub-para. (1) to (3).

(2) Set S2 (HLTP) to barometric.

(3) Slowly decrease the pressure to 1011·8 mb and note valve voltmeter reading.

(4) Further decrease the pressure by 0·1 mb to 1011·7 mb and again note the valve voltmeter reading.

(5) The difference between the recorded values must not be less than 0·02V r.m.s.

(6) Slowly increase the pressure on the static input to the prevailing atmospheric pressure.

(7) Set S2 (HLTP) to SERVO.

(8) Switch off vibrator and remove the flexible hose from the STATIC input adapter on the transducer.

Radio height lock modes

Preparation

18. (1) Connect the transducer for test as shown

in fig. 1, but with the static connection open to atmosphere.

(2) Set the test set switches as follows:—

MAINS switch (PCU) to ON

S1 (PSTP) to OFF

S2 (HLTP) to SERVO

S3 (HLTP) to 0 FEET

S4 (HLTP) to INCREASE

S1 (HLTP) to ON

(3) Connect a valve voltmeter to terminals TE3(TRANSDUCER O/P) and TE2(SIG.E) on the HLTP, and a multimeter, set to the 2·5V d.c. range, to terminals TE4(DEMODULATED TRANSDUCER O/P) and TE2 (SIG.E) on the HLTP.

(4) Switch on vibrator and set S2(HLTP) to BAROMETRIC.

(5) The readings obtained on the valve voltmeter must not be greater than 0·3V r.m.s. The d.c. output as measured on the multimeter must be less than 50mV.

(6) Disconnect the multimeter.

Low range

19. (1) Set S3(HLTP) to 100 FEET.

(2) To exercise servomechanism prior to testing, turn S2(HLTP) to LOW and observe the reading on the valve voltmeter. When this reaches 3V turn S2 back to SERVO.

(3) Set S2(HLTP) to LOW and observe the pointer on the valve voltmeter. When this reaches 1V start stop watch and measure the time taken for the pointer to reach 3V. Set S2 back to SERVO. The recorded time must be 8 seconds ±20%.

(4) Repeat sub-para. (3) for each position of S3(HLTP). The recorded times must be as follows:—

75 FEET	$10\frac{3}{5}$ seconds ± 20%
50 FEET	16 seconds ± 20%
25 FEET	32 seconds ± 20%

(5) Set S4(HLTP) to DECREASE and S3 (HLTP) to 100 FEET. Repeat sub-para. (2).

(6) Repeat sub-para. (3) and (4) for decreasing heights.

High range

20. Repeat all operations detailed in para. 19, but with switch S2(HLTP) in the HIGH position where previously set to LOW.

Switching off and disconnecting test equipment

21. (1) Set the test switches as follows:—

S1(HLTP) to OFF

MAINS switch (PCU) to the off position

(2) Disconnect cable assembly CA1 from the transducer and the HLTP.

(3) Lightly smear the threads of HL1 on the transducer with silicone compound MS4.

(4) Fit Viscap to transducer static connection.

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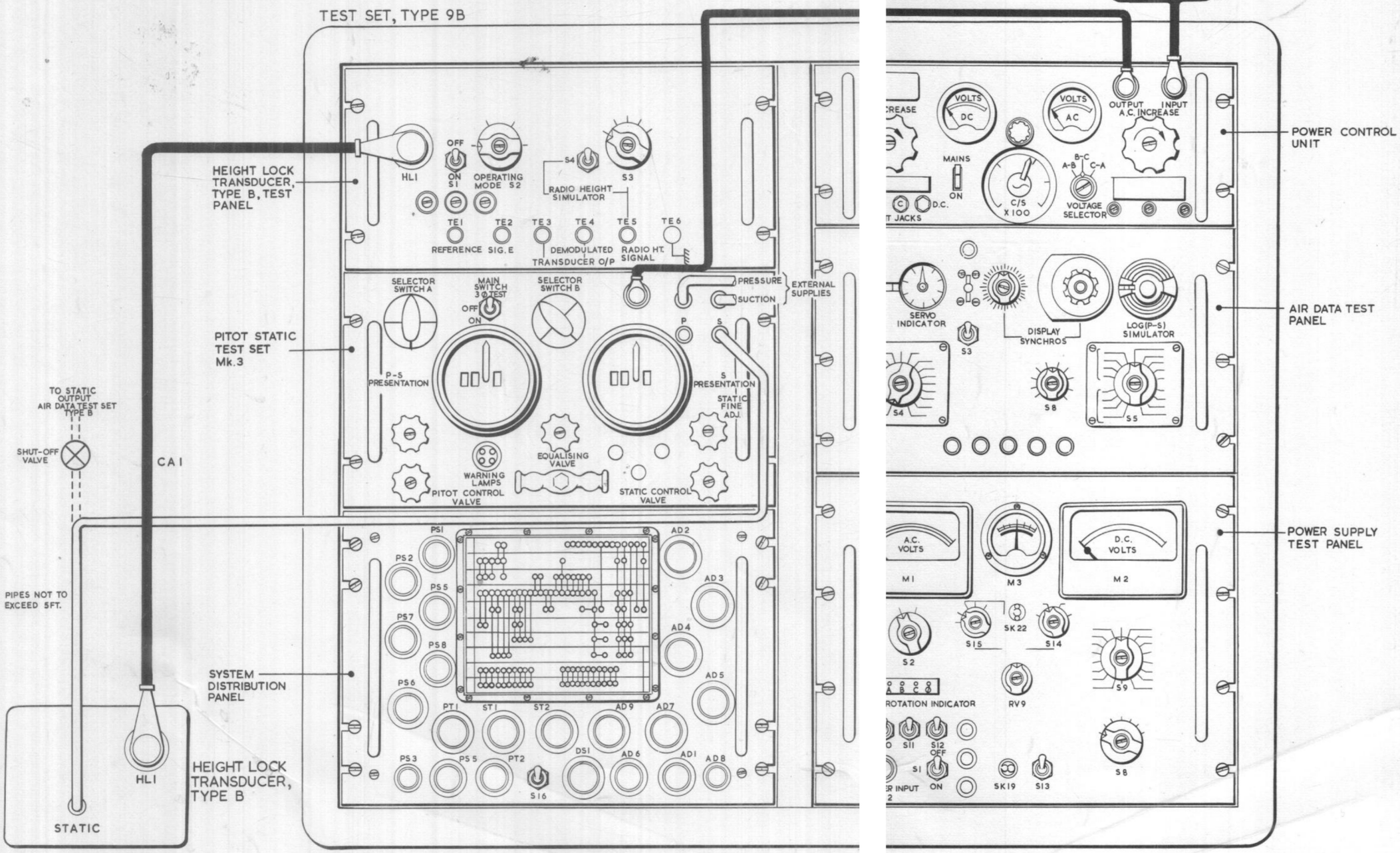

Fig. 3 Height lock transducer, Type B, connected to test equipment Fig. 3

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