Appendix 3

HEIGHT LOCK TRANSDUCER, TYPE A, Ref. No. 6A/5935

(Including Modification ADS/135)

SERVICING

TESTS AND ADJUSTMENTS

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Introduction

1. This appendix describes the tests and adjustments for the height lock transducer, Type A, Ref. No. 6A/5935, and has been written to a standard of second line servicing only. The tests are in addition to the S.S.T. (App. 1) and provide special checks on individual components or sections of the transducer which are suspected of being faulty. The adjustments are those to be made when setting-up a transducer after component replacement, or to bring the transducer within the tolerances specified in the serviceability tests. After completing a test or the adjustments the transducer cover must be refitted and the transducer subjected to the complete S.S.T. detailed in App. 1. The procedures for removal of components from the transducer are detailed in App. 4.

Caution . . .

Should the servomechanism tend to run away, the power supplies to the transducer must be switched off and a check carried out on the servo amplifier as detailed in para. 6.

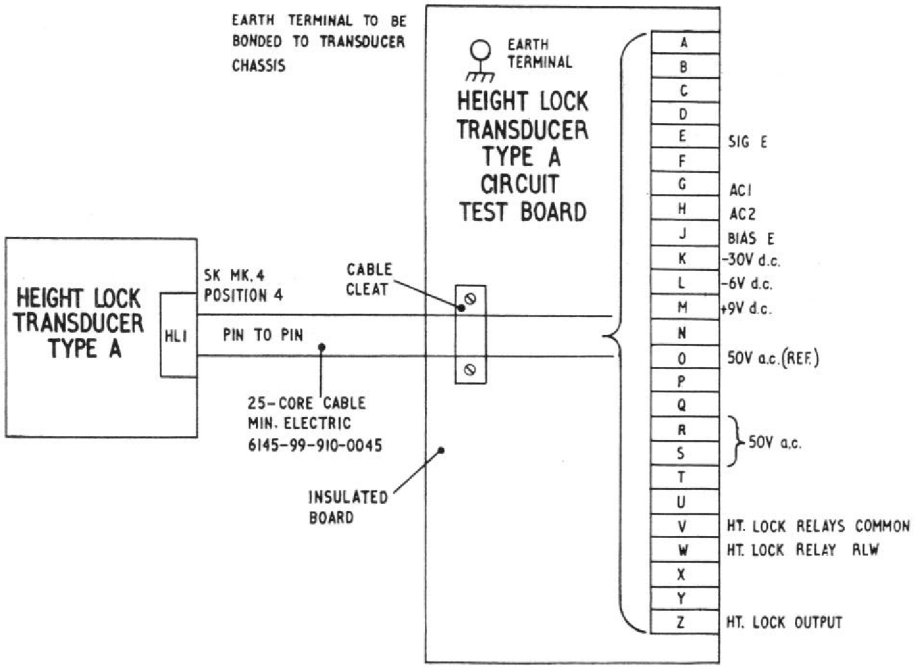

Fig. 1. Transducer connected to circuit test board

Test equipment

2. The following test equipment is required:—

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

(2) Sylphon bellows (Ref. No. 6C/474).

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

(4) Valve voltmeter, Type CT343 or valve voltmeter of similar range and accuracy.

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

(6) Insulation resistance tester, Type C (Ref. No. 5G/152).

(7) Transformer, variac, Type 60 (Ref. No. 6C/1969).

(8) Gramme gauges, Ref. No. 1H/57 and Ref. No. 1H/59.

(9) Locally manufactured height lock transducer test set (see App. 1, Test equipment).

(10) Power supply unit, Type B (Ref. No. 6A/6822) or Type C (Ref. No. 6A/8548).

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.

Servicing methods

4. (1) Unless otherwise stated all tests and adjustments will be carried out with the transducer mounted in the normal position.

(2) When connecting the variac transformer ensure correct phase connection of the 50V a.c. output. Incorrect phasing will result in the servomechanism oscillating about the null point instead of settling at a steady null.

Tests

Plug HL1

5. The following wiring checks on plug HL1 are to be carried out if the plug has been changed or if the input connections are suspected of being faulty.

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

(2) Remove chassis assembly (App. 4).

(3) Check that each pin of plug HL1 is connected to the required points as shown on the circuit diagram (Chap. 3, fig. 7), using the multimeter set to the ohms ÷100 range. The resistance should not exceed 2 ohms.

Note . . .

To facilitate the wiring checks, a locally manufactured test board as shown in fig. 1 may be used.

(4) Using the insulation resistance tester, check that the insulation resistance between each pin of plug HL1 and earth is greater than 2M ohms.

(5) Refit chassis assembly.

Servo amplifier

6. If the servomechanism runs away and does not tend to a null, switch off the power supplies and check the servo amplifier as follows:—

(1) Remove cover (App. 4).

(2) Disconnect pin A on the magnetic amplifier.

(3) Disconnect pin N on the magnetic amplifier and connect a multimeter, set to the 10mA d.c. range, between pin N and the loose wire.

(4) Turn the transducer on to its side and connect to the test set as described in App. 1, with the static connection open to atmosphere.

(5) Check that switch S1 is set to OFF, and switch on the 115V 400 c/s 3-phase supply to the P.S.U.

(6) Set switch S2 to ON and ensure that the variac output is 50V. Set switch S3 to ON.

(7) Rotate gear A (fig. 2) through not more than one revolution in either direction against the servo action. A current of at least 4 mA on the multimeter should be produced. If the correct reading is obtained proceed to sub-para. (9). If not, check the capsule output, as measured across C1 (fig. 3), for one revolution of gear A. This must be at least 5mV r.m.s. If correct, check the supplies to the transistor amplifier in accordance with Table 1, and the 7·5V–0–7·5V supplies from T1.

(8) If all the power supplies are satisfactory, measure the resistances of the diodes MR1 to MR4, with the multimeter set to the ±100 range. The resistances should be 15 to 25 ohms in one direction and 125 to 175 ohms in the other direction. If the supplies and the diode resistances are correct, a transistor amplifier fault exists.

(9) If the correct reading was obtained in the test described in sub-para. (7), connect the valve voltmeter, set to the 100V range,

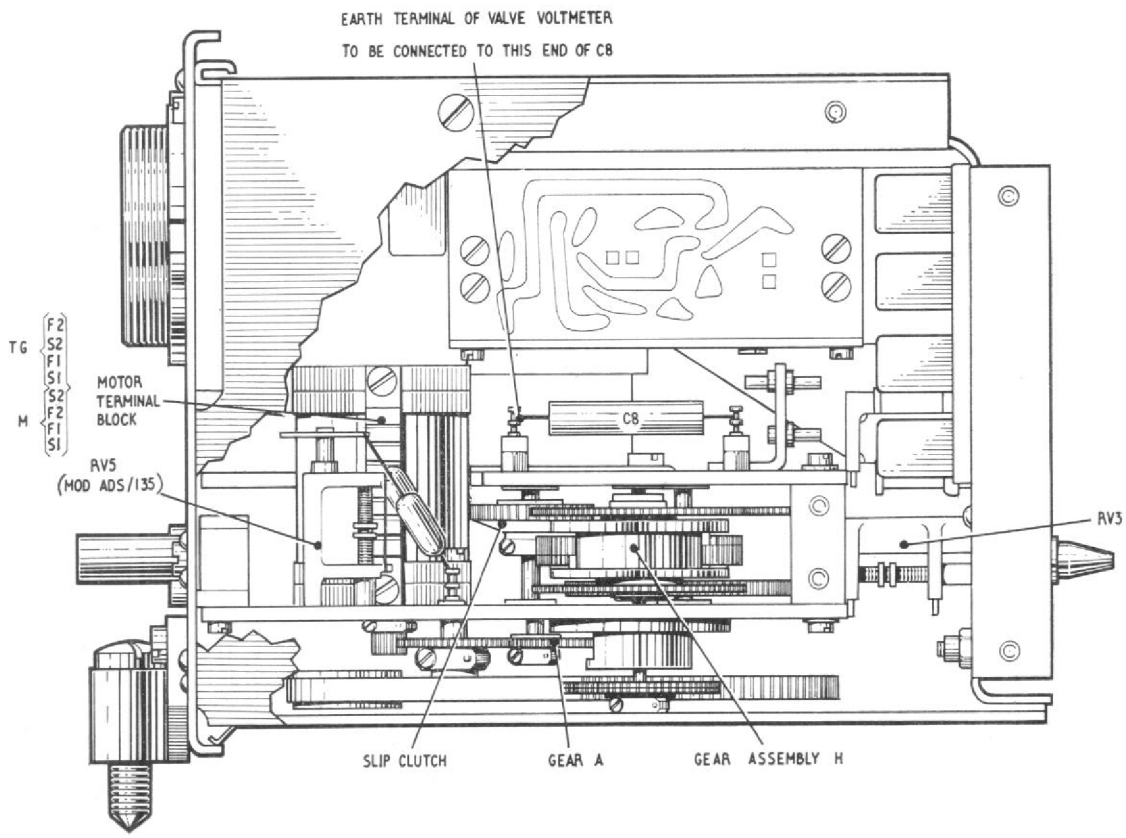

Fig. 2. Side view of transducer

across capacitor C8 (fig. 2). Ensure that the valve voltmeter earth terminal is connected as shown on fig. 2.

(10) Repeat test described in sub-para. (7) noting the valve voltmeter reading in addition to the multimeter reading. When the multimeter reads 4mA the valve voltmeter reading should be greater than 30V. If not check the supplies to the magnetic amplifier in accordance with Table 1. If the supplies to the magnetic amplifier are satisfactory, a magnetic amplifier fault exists.

(11) Reconnect or replace the transistor amplifier or magnetic amplifier.

Gear train

7. If the servomechanism does not drive, or if the servo action is sluggish or erratic, check the gear train for freedom of operation as follows:—

(1) Remove cover (App. 4).

(2) Turn the transducer onto its side and insert a gramme gauge into one of the holes in gear A (fig. 2).

(3) Measure the force required to slip the clutch whilst holding gear assembly H (fig. 2) to prevent the gear from moving. The force required should be between 50 and 150 gm.

(4) Insert the gramme gauge into one of the holes in gear A and measure the force required to move the gear train ensuring that the slip clutch does not slip. The force required should not exceed 8 gm.

(5) If tests were correct carry out S.S.T. (App. 1). If incorrect reject transducer.

Relay operation

8. If the servomechanism does not drive or if there is no height lock output, check the operation of the relays as follows:—

(1) Remove cover (App. 4).

(2) Connect the transducer to the test set as detailed in App. 1, with the static connection open to atmosphere.

(3) Switch on the 115V 400 c/s 3-phase supply to the P.S.U. and set switch S2 to ON. Adjust the variac to give an output of 50V and set S3 to ON.

(4) Set switch S1 to ON and check that relay RLW/1 operates removing the 50V 400 c/s supply to the motor as measured at S2 (violet lead) and F2 (dark blue lead) on the motor tagboard (fig. 2).

(5) Set S1 to OFF and check that the 50V supply is now present at the motor. Set S3 to OFF and check that RLJA/1 operates removing the 50V supply to the motor.

Adjustments

General

9. Setting-up the height lock transducer involves the adjustment of five variable resistors. As some of these interact, adjusting one resistor may necessitate the readjustment of one previously set-up. The following paragraph details the progression through the stages of initially setting-up the height lock transducer:—

Setting-up transducer

10. (1) Remove cover (App. 4).

(2) Turn the transducer onto its side and connect to the test set as detailed in App. 1, with the static connection open to atmosphere.

(3) Switch on the 115V, 400 c/s, 3-phase supply to the P.S.U. and set switch S2 to ON. Adjust the variac to give an output of 50V.

(4) Set switches S3 and S1 to ON and allow 15 min. warm up period.

(5) Position RV2 (fig. 3) and RV5 (fig. 2) to approximately their mid position.

(6) Turn RV1 (fig. 3) fully counter-clockwise for maximum gain of buffer amplifier.

Note . . .

The maximum gain of the buffer amplifier is approximately 100. *A check on the gain may be made by measuring the input to the amplifier across capacitor C*1 *(fig.* 3) *using the valve voltmeter.*

(7) Set the valve voltmeter to 1V range and tune for minimum capsule unit output by alternately adjusting RV4 (fig. 3) and turning the servo by hand on gear A (fig. 2). The final null should not be greater than 0·25V r.m.s.

(8) Connect the multimeter, set to the 2·5V d.c. range, across the DC and E terminals of the test set. Observe the multimeter reading and adjust RV2 until the reading on the multimeter is a minimum. The null on the valve voltmeter should not be greater than 0·25V r.m.s.

(9) Set S1 and S3 to OFF. Switch off the the power supplies.

(10) Set the sylphon bellows to its mid-range position.

(11) Set the aneroid barometer to the ambient pressure.

(12) Interconnect the transducer, sylphon bellows and aneroid barometer as shown in App. 1.

(13) Switch on the power supplies and set S3 to ON. Allow transducer three min. to warm up and set S1 to ON. The reading on the valve voltmeter should be the same as that obtained in sub-para. (8).

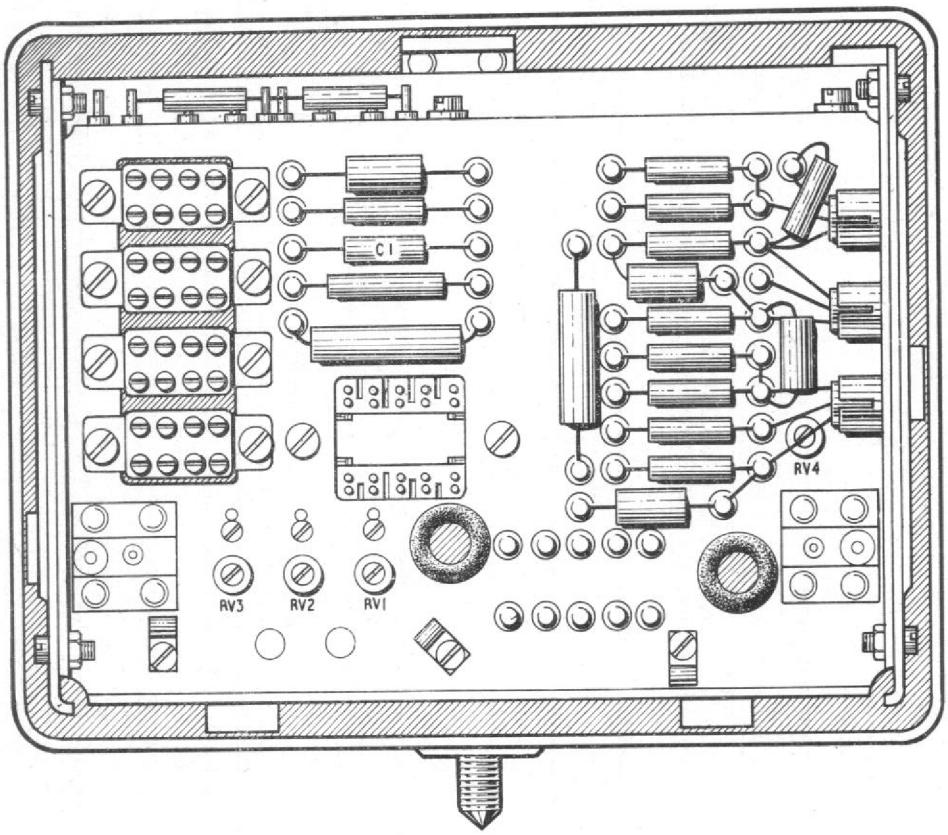

Fig. 3. Rear view of transducer

(14) Vary the input pressure to the transducer in steps of 0·5mb over the range ±5·5 mb from the ambient pressure, by increasing or decreasing the barometer reading, pressing the operating button and adjusting the sylphon bellows until the barometer indicates the new pressure is correctly set. Observe the valve voltmeter readings at each step and plot the outputs over the ranges±0·5mb to ±4·5mb from ambient as in App. 1, fig. 4. The slope of the lines must be 0·68V r.m.s. ±0·05V per mb with all readings within 20 per cent of these lines. If not, adjust RV1 until both outputs are correct, and RV5 to bring both outputs symmetrical.

Note . . .

If adjustment of RV5 was necessary, readjust RV4 as in sub-para. (7) to obtain the minimum output, and RV2 as in sub-para. (8) to obtain a minimum output as measured at the DC and E terminals.

(15) Set S1 to OFF and adjust RV3 (fig. 3) so that when gear A is displaced approximately five turns in either direction against the servo action and released, the servo makes one overshoot and one undershoot only before becoming stationary.

(16) Set S3 to OFF and switch off power supplies to the P.S.U.

(17) Disconnect transducer from test equipment.

TABLE 1

Height lock transducer, Type A amplifier supplies

Pins	Voltage	Tolerance
Transistor amplifier		
J-B	−6V d.c.	±1V
H-B	−6V d.c.	±1V
D-B	+9V d.c.	±1V
Magnetic amplifier		
J-H	85V a.c.	±5V
G-H	85V a.c.	±5V
K-H	−30V d.c.	±2·5V

Note . . .

Pin H of magnetic amplifier to be connected to bias E (Pin HL1/J). Voltage at pins G-H of magnetic amplifier is in phase with the reference voltage.