

## Appendix 3

## STATIC TRANSDUCER, TYPE B, Ref. No. 6A/6434

## SERVICING

## TESTS AND ADJUSTMENTS

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**General**

1. The tests detailed in this appendix are additional to the standard serviceability test (Appendix 1) and are necessary either when certain components are replaced (Appendix 4) or during fault diagnosis (Appendix 2). Unless instructed to the contrary, these tests are to be performed with the transducer connected to the test set, Type 9B, and either the pitot/static test set, Mk. 3 or the air data test set, Type B, as shown in Appendix 1, fig. 1, and the cover removed. The procedures detailed in Appendix 1, para. 4-15 must all have been carried out.

2. The transducer is illustrated in Chap. 11 and a circuit diagram is given at fig. 17 (pre-mod. ADS/75) and fig. 18 (post-mod. ADS/75) of that Chapter.

3. Should a fault develop in any sub-unit or component for which spares are not held (i.e. shown in Appendix 4, Table 1 as not to be serviced) the transducer will be declared unserviceable and returned for repair in accordance with current servicing instructions.

4. On adjustment or replacement of a faulty sub-unit or component, the transducer will be subjected to the standard serviceability test to ensure that only this sub-unit/component is at fault.

5. The conditions under which servicing is to be carried out must be closely controlled regarding freedom from dust and dirt and temperature environment.

6. Appendix 1, Table 1 gives a list of abbrevia-

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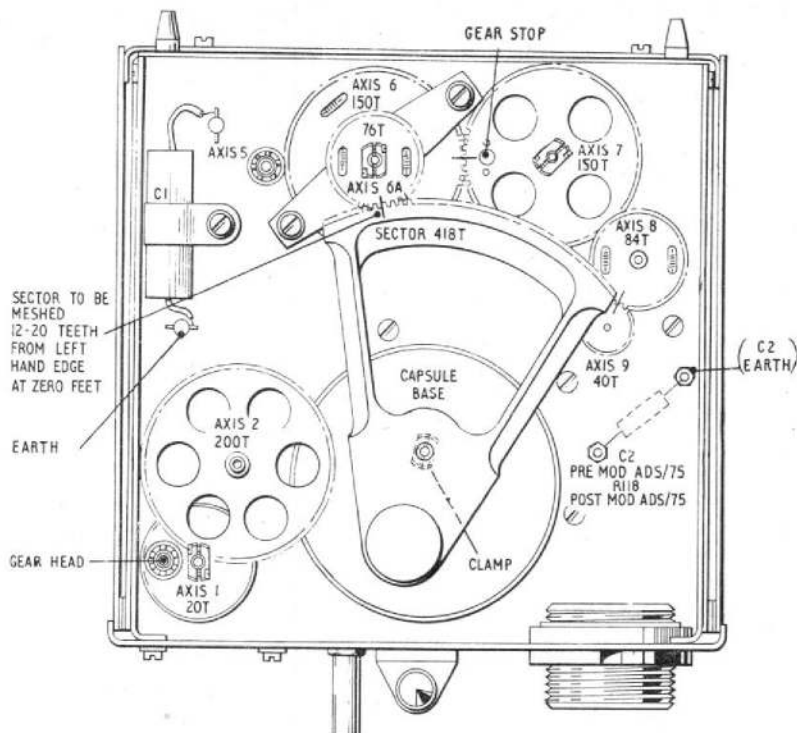


Fig. 1. Static transducer, Type B—underside view

tions used for test equipment components. Additional test equipment to that of Appendix 1, para. 2 is required as below:—

- (1) Insulation resistance tester Type C, Ref. No. 5G/1621.
- (2) Voltage divider box, 4 dial to an accuracy of 0.1%, Ref. No. 6C/2352.

**Note . . .**

*Instruments of similar range and accuracy to those of sub-para. (1) and (2) will be accepted.*

- (3) Pneumatic supplies, as follows:—

- (a) Vacuum supply, capable of simulating 50 000 ft. (3.425 in. Hg) standard conditions.
- (b) Pressure supply not exceeding 20 lb/in<sup>2</sup>.

**Note . . .**

*Should a "tapped" station or ship supply be used, periodic checks of its state of cleanliness should be made, and pressure is to be controlled with safety valve, Ref. No. 6C/1017.*

**Setting of RV5 (units pre-mod. ADS/75)**

7. Connect the valve voltmeter set to the 300mV range across capacitor C2 with the earth terminal of the meter connected to the earth terminal of

C2 (fig. 1). Set the PCU mains switch and switch S1 (test set, Type 9B) to ON. Reduce the range of the valve voltmeter as necessary and check that the null indicated on the meter is not greater than 2mV r.m.s., if necessary adjust RV5 (Chap. 11, fig. 2) to achieve this. If the smallest null obtained is greater than 2mV, carry out the checks of Appendix 2, para. 10. If these are correct, then declare the transducer unserviceable.

**Note . . .**

*If the servo runs away and does not tend to null, disconnect pin A of the magnetic amplifier and proceed to the servo amplifier checks (para. 20).*

8. Wind the 200T gear of axis 2 five revolutions clockwise away from the null and note the valve voltmeter reading at every revolution. These readings should agree with the value shown in col. (c) of Table 1 within the tolerances given in col. (d).

9. If the required figures of para. 7 and 8 cannot be achieved by the adjustment of RV5 then the transducer should be declared unserviceable.

**Setting of RV1 (units pre-mod. ADS/75)**

10. With switches set as in para. 7 displace the 200T gear of axis 2 (fig. 1) one turn against the servo action and release it; it should make one overshoot in either direction before coming to rest. Repeat displacing the servo in the opposite direction. RV1 should be adjusted, if necessary, to achieve the required conditions.

**TABLE 1**  
**Pick-off sensitivity**

Item (a)	200T gear (revolutions) (b)	Required output (mV) (c)	Tolerance (d)
1	1	24.4	} ±5.5mV
2	2	48.6	
3	3	73.2	
4	4	97.7	
5	5	122.0	

**Note . . .**

If the conditions of para. 10 cannot be obtained, measure the resistance value of R7 and RV1 and check for smooth wiper operation. Change R7 or RV1 if out of tolerance. Change motor-tachogenerator if R7 and RV1 are within tolerance and retest. If the conditions still cannot be obtained, replace the original motor-tachogenerator and proceed to the servo amplifier checks.

**Setting of RV103 (units post-mod. ADS/75)**

11. Connect the valve voltmeter set to the 300mV range between terminals B and G of TB1 (Chap. 11, fig. 3) with the earth terminal of the meter connected to terminal B. Connect terminals B, H and J of TB1 together. Set PCU mains and switch S1 (test set, Type 9B) to ON and S4 to HT 4T. Turn the 200T gear of axis 2 until G1 registers 200 divisions. Holding axis 2 steady, adjust RV103, if necessary, until the valve voltmeter registers  $24\text{mV} \pm 4\text{mV}$ . Release axis 2 and repeat.

**Note . . .**

If sufficient adjustment cannot be obtained with RV103, measure the resistance of RV103 and check for smooth wiper operation. Change RV103 if out of tolerance and repeat para. 11. If RV103 is within tolerance, measure the resistance of R101, change if out of tolerance and repeat para. 11.

**Check of R7 (post-mod. ADS/75)**

12. With switches set as in para. 7, displace the 200T gear of axis 2 (fig. 1) one turn against the servo action and release it; it should make one overshoot in either direction before coming to rest. Repeat displacing the servo in the opposite direction. If the required condition is not satisfied, measure the resistance of R7; if out of tolerance, change R7 and retest; if within tolerance, change the motor-tachogenerator and retest.

If the conditions still cannot be obtained, replace the original motor-tachogenerator and proceed to the servo amplifier checks.

**Capacitor C1**

13. Connect the valve voltmeter set to the 10V range across capacitor C1 with the meter earth terminal connected to the capacitor earth terminal (fig. 1). Set the PCU mains switch and switch S1 (test set, Type 9B) to ON. The voltage as read on the valve voltmeter should not exceed 5V r.m.s.

14. Rotate the 200T gear of axis 2, three revolutions clockwise against the servo action. Release the gear and mark the position at which it comes to rest; repeat the manoeuvre counter-clockwise. The difference between the two positions at which the gear comes to rest should not be greater than  $5^\circ$ .

**Note . . .**

If this test fails then change C1 and repeat. If the test still fails, replace the original capacitor, change the motor-tachogenerator and repeat. If the test still fails, replace the original motor-tachogenerator and proceed to the servo amplifier checks.

**Calibration of CX2 (HT 4T synchro)**

15. (1) Release the transistor amplifier as described in Appendix 4, without unsoldering the connections to the nine pins, lift clear together with the plinth and locate conveniently.

(2) Set the controlled static pressure to 1013.2 mb (pitot/static test set, Mk. 3) or zero feet height (ADS test set, Type B).

(3) Switch S4 (test set, Type 9B) to TEST 2 and check that G1 reads  $00000 \pm 1$  divisions.

(4) Switch S4 to HT 4T, allow 15 minutes

warming up time and check that G1 now reads  $00000 \pm 10$  divisions.

(5) If the result of sub-para. (4) is incorrect, slacken off the three 6BA screws securing the clamps of CX2 and rotate the synchro until G1 reads  $00000 \pm 10$  divisions. Refasten the clamping screws, ensuring that the reading of G1 does not alter and carry out the ranging test of Appendix 1, in respect of the HT 4T synchro.

(6) If the readings obtained are out of tolerance set the pitot/static test set, Mk. 3 or ADS test set, Type B, to the reading which gives the greatest error and adjust CX2 as in sub-para. (5) until the G1 reading is within tolerance. Repeat the relevant ranging test of Appendix 1.

(7) Repeat sub-para. (6) until all readings are within tolerance.

(8) Replace the transistor amplifier.

#### Adjustable cam setting

##### Note . . .

*The ensuing adjustments should be made only by specially trained personnel.*

16. If the provisions of para. 15 (7) cannot be met, even after the synchro has been changed, the following procedure may be adopted as a final check before the transducer is declared unserviceable:—

(1) Ensure that power has been switched on for at least thirty minutes and comply with the conditions of para. 15 (1), (2) (3) and (4).

(2) Screw back the outer ring of screws on the adjustable cam (Chap. 11, fig. 2) until they are all at least  $\frac{1}{16}$  in. clear of the cam track.

(3) Re-set the static pressure to the height at which the largest error occurred during the test of para. 15 and re-adjust synchro CX2 to give the correct reading at this point (Appendix 1, Table 3).

(4) Reduce height in steps of 5000 ft to 0 ft and if required adjust the setting of the inner ring of screws at each point to bring the G1 reading towards the required value. Repeat this process working from the starting point (sub-para. (3)) to 50 000 ft. Do not attempt to correct the readings completely on the first adjustment; adjust each screw not more than one turn before proceeding to the next one.

(5) Continue to adjust the inner ring of screws, working backwards and forwards towards 0 ft in one direction and 50 000 ft in the other, until all G1 readings are about 20 divisions lower than the true readings in Appendix 1, Table 3.

(6) Set the static pressure to 0 ft, then increase height in steps of 5000 ft, screwing down the outer ring of screws at each setting to bring the G1 reading within the tolerances of Appendix 1, Table 3, ensuring that in all cases the outer screws are bearing against the cam. To achieve this the outer ring of screws should not be screwed down more than one turn beyond the point where it touches the cam.

(7) To check the condition of sub-para. (6), set the static pressure to bring the cam follower beneath a particular screw. Upward movement of the screw should cause the G1 pointer to deflect.

(8) Carry out the ranging test of Appendix 1 in respect of the HT 4T synchro. If the G1 readings obtained are not within the tolerances of Appendix 1, Table 3, re-adjust the cam screws where necessary, ensuring that each of the outer screws still bears against the cam.

(9) Repeat sub-para. (8) until all G1 readings are within the permitted tolerances. Replace the transistor amplifier.

(10) If the conditions of sub-para. (9) cannot be obtained then the transducer should be declared unserviceable.

#### Calibration of CX1 (HT 10T synchro)

17. (1) Release the three 6BA screws clamping CX1.

##### Note . . .

*On units modified to ADS/75 standard, it is necessary to release TB1 (Appendix 4, para. 21) without unsoldering the TB connections.*

(2) Switch S4 (test set, Type 9B) to HT 10T.

(3) Set the controlled static pressure to 1013.2 mb (pitot/static test set, Mk. 3) or zero feet height (ADS test set, Type B) and rotate CX1 until G1 reads  $00000 \pm 1$  division.

(4) Re-fasten the clamping screws ensuring that the G1 reading does not alter.

(5) Carry out the ranging tests (Appendix 1) in respect of the HT 10T synchro.

(6) If the readings obtained are out of tolerance set the pitot/static test set, Mk. 3 or ADS test set, Type B to the reading which gives the greater error and adjust CX1 as in sub-para. (3) until the G1 reading is within tolerance. Repeat the relevant ranging test of Appendix 1.

(7) Repeat the procedure of sub-para. (6) until both readings are within tolerance.

(8) On units modified to ADS/75 replace TB1.

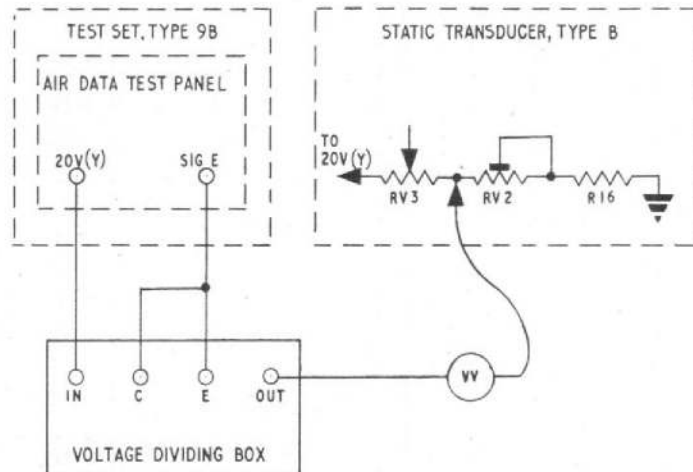


Fig. 2. Test connections for log S calibration—pre-mod. ADS/75

**Calibration of RV3 (log S potentiometer) (pre-mod. ADS/75)**

18. (1) Switch S1 (test set, Type 9B) to OFF.
- (2) Release and swing clear the transistor amplifier as described in Appendix 4, without disturbing the cable connections.
- (3) Connect a shorting link between the junction of RV3 and RV4, and the 20V(Y) side of R15.
- (4) Connect up subsidiary test equipment as shown in fig. 2.
- (5) Set the voltage dividing box to a ratio of 0.3307, switch S1 (test set, Type 9B) to ON and adjust RV2 until the valve voltmeter indicates a null.
- (6) Remove the shorting link across R15 and RV4, and disconnect the wander lead.
- (7) Set the controlled static pressure to 1013.2 mb (pitot/static test set, Mk. 3) or zero feet height (ADS test set, Type B).
- (8) Ensure that the cam follower of CU1A mechanism is resting at a point  $\frac{1}{8}$  in. clockwise (when viewed from the top) of the small dip in the cam profile. If the cam follower is incorrectly set refer to para. 24.
- (9) Connect the wander lead of the subsidiary test equipment to the junction of RV3 and RV4 and set the voltage dividing box to 7450. Adjust RV4 until the valve voltmeter indicates a null.
- (10) Disconnect the wander lead from the junction of RV3 and RV4, connect it to T1 INPUT on the ADTP of the test set, Type 9B and set S4 to LOG S.
- (11) Release the three 6BA screws clamping RV3, set the dividing box to 7338 and turn RV3 until the valve voltmeter indicates a null.
- (12) Disconnect the wander lead from T1

INPUT and repeat the procedure of sub-para. (9), (10) and (11).

(13) Refasten the three clamping screws, ensuring that the valve voltmeter remains at the null while doing so, and remove subsidiary test equipment.

(14) Carry out the ranging tests of Appendix 1 in respect of LOG S.

19. If all the readings obtained are out of tolerance, proceed as follows:—

(1) Using the procedure of para. 24, move the cam follower to a position nearer to the "dip" in the cam profile if the readings are too high or further away from the "dip" if the readings are too low.

(2) Reconnect subsidiary test equipment and repeat para. 18 (7) and 18 (9) to (14).

20. If only some of the readings obtained are out of tolerance, proceed as follows:—

(1) Set the controlled static pressure (pitot/static test set, Mk. 3) or height (ADS test set, Type B) to the G1 reading which gives the greatest error.

(2) Release the clamping screws and adjust RV3 until the G1 reading is within tolerance.

(3) Repeat the relevant ranging test of Appendix 1.

(4) Repeat from sub-para. (1) until all readings are within tolerance.

(5) Reclamp RV3 and replace the transistor amplifier.

**Note . . .**

*If the condition of para. 20 (4) cannot be satisfied and the ranging tests in respect of the HT 10T and HT 4T synchros are correct, carry out the checks of Appendix 2, para. 5 and 7 and repeat the ranging test. If still incorrect, declare the transducer unserviceable.*

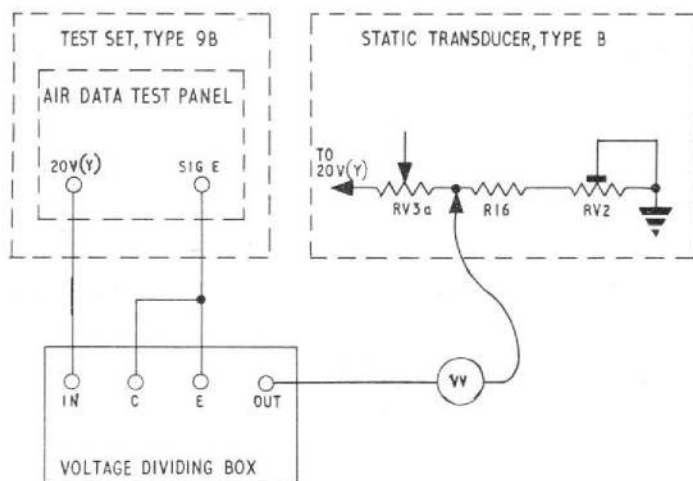


Fig. 3. Test connections for log S calibration—post-mod. ADS/75

### Calibration of RV3a (log S potentiometer) (post-mod. ADS/75)

21. (1) Switch S1 (test set, Type 9B) to OFF.

(2) Release and swing clear the transistor amplifier as per Appendix 4, para. 11 without disturbing the cable connections.

(3) Connect a shorting link between the junction of RV3a and R15 and the 20V(Y) side of RV4.

(4) Connect up subsidiary test equipment as shown in fig. 3.

(5) Set the voltage dividing box to a ratio of 0.3307, switch test set, Type 9B S1 to ON and adjust RV2 until the valve voltmeter indicates a null.

(6) Remove the shorting link across R15 and RV4, and disconnect the wander lead.

(7) Set the controlled static pressure to 1013.2 mb (pitot/static test set, Mk. 3) or zero feet height (ADS test set, Type B).

(8) Ensure that the cam follower of CUIA mechanism is resting at a point  $\frac{1}{8}$  in. clockwise (when viewed from the top) of the small dip in cam profile. If the cam follower is incorrectly set refer to para. 24.

(9) Connect the wander lead of the subsidiary test equipment to the junction of RV3a and R15, set the divider box to 7450 and adjust RV4 until the valve voltmeter indicates a null.

(10) Disconnect the wander lead from the junction of RV3a and R15, connect it to T1 INPUT on the ADTP of test set, Type 9B and set S4 to LOG S.

(11) Release the three 6BA screws clamping RV3, set the voltage divider box to 7338 and turn RV3 until the valve voltmeter indicates a null.

(12) Disconnect the wander lead from T1 INPUT and repeat the procedure of sub-para. (9), (10) and (11).

(13) Refasten the three clamping screws ensuring that the valve voltmeter remains at the null while doing so, and remove subsidiary test equipment.

(14) Carry out the ranging tests of Appendix 1 in respect of LOG S.

22. If all the readings obtained are out of tolerance, proceed as follows:—

(1) Using the procedure of para. 24, move the cam follower to a position nearer to the "dip" in the cam profile if the readings are too high or further away from the "dip" if the readings are too low.

(2) Reconnect subsidiary equipment and repeat para. 21 (7) and 21 (9) to (14).

23. If only some of the readings obtained are out of tolerance proceed as follows:—

(1) Set the controlled static pressure (pitot/static test set, Mk. 3) or height (ADS test set, Type B) to the G1 reading which gives the greatest error.

(2) Release the clamping screws and adjust RV3 until the G1 reading is within tolerance.

(3) Repeat the relevant ranging test of Appendix 1.

(4) Repeat from sub-para. (1) until all readings are within tolerance.

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- (5) Reclamp RV3 and replace the transistor amplifier.

**Note . . .**

*If the conditions of sub-para. (4) cannot be satisfied and the ranging tests in respect of the HT 10T and HT 4T synchros are correct carry out the checks of Appendix 2, para. 5, 6 and 7, and repeat the ranging test. If still incorrect, declare the transducer unserviceable.*

**Adjustment of CUIA cam follower**

24. (1) Slacken off the split clamp on axis 7 (fig. 1).
- (2) Rotate the cam mechanism without disturbing the gear train until the cam follower is resting at a point approximately  $\frac{1}{8}$  in. clockwise (when viewed from above) of the small "dip" in the cam profile.
- (3) Refasten the split clamp, ensuring that the gear train and cam follower are not disturbed whilst doing so.

**Servo amplifier checks**

**Note . . .**

*Detailed servicing of the transistor amplifier is covered in Chap. 7, Appendix 4.*

25. (1) Switch S1 (test set, Type 9B) to OFF.
- (2) Disconnect pin N on the magnetic amplifier.
- (3) Connect the multimeter set to the 10mA d.c. range between pin N and the loose lead, and switch S1 (test set, Type 9B) to ON.
- (4) Rotate the 200T gear of axis 2 (fig. 1) against the action of the servo until the multimeter indicates 4mA; to achieve this the gear should not rotate through more than one-third of a revolution.

**Note . . .**

*If the conditions of the note to para. 7 have been implemented, i.e. pin A disconnected, there will be no servo action. Under these conditions the 200T gear of axis 2 will simply be rotated first in one direction and then in the other.*

- (5) Repeat sub-para. (4) in the opposite direction.

26. If the test of para. 25 fails, check the power supplies to the transistor amplifier and the modulator as follows:—

Between pins	Voltage range
j and c	-5½V to -9V d.c.
h and c	-5½V to -9V d.c.
d and c	+8V to +11V d.c.

(pin c should connect to signal earth)  
ST1/W and MA1/H 25V ± 1V a.c.  
(pin MA1/H should connect to bias earth)

27. If the power supplies are satisfactory, switch S1 (test set, Type 9B) to OFF and measure the resistance of MR1 and MR2. With the multimeter set to ÷100 range the resistance should be 15-25 ohms in one direction and 40-50 ohms in the other.

28. At this stage, if the test of para. 26 has failed and the test of para. 27 proved satisfactory the transistor amplifier should be changed and the routines of para. 25 to 27 repeated.

29. Connect the valve voltmeter set to the 100V range across capacitor C1 with the meter earth terminal connected to the capacitor earth terminal (fig. 1). Repeat the test of para. 25, noting the valve voltmeter reading and the multimeter reading. When the multimeter reads 4mA, the valve voltmeter should read greater than 30V in each direction of revolution of the gear.

30. If this test fails, check the power supplies to the magnetic amplifier as follows:—

Between pins	Voltage range
J and H	80V to 90V a.c.
G and H	80V to 90V a.c.
K and H	-32V to -25V d.c.

(pin H should connect to bias earth)

31. At this stage, if the test of para. 29 has failed and the test of para. 30 proved satisfactory, the magnetic amplifier should be changed and the routines of para. 29 and 30 repeated.

32. Disconnect the meter and resolder the connection to pin N.

**Switching off and disconnecting equipment**

33. Carry out the procedure of Appendix 1, para. 18.



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