

## Appendix 4

## HEIGHT LOCK TRANSDUCER, Type B, Ref. No. 6TD/812

## SERVICING

## COMPONENT REMOVAL AND REPLACEMENT

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**Introduction**

1. This appendix covers the removal and replacement at second line servicing of all electrical components of the height lock transducer, Type B, Ref. No. 6TD/812, excepting the capsule unit and gear train assembly. The detailed setting-up of the capsule unit and the assembly of the gear train is not covered at second line servicing, therefore removal of the capsule unit from the gear train, or components from within the capsule unit and gear train is not permitted.

**Note . . .**

*After replacing a component and completing any necessary tests and adjustments, the transducer cover must be replaced and the unit subjected to the complete S.S.T. detailed in App. 1.*

**Tools**

2. No special tools are required other than those necessary for removing the Plessey plug, and for tightening the split clamp securing screws. Torque wrenches and test rigs required for correct split clamp loading are: —

(1) Torque wrench (with screwdriver attachments).

(a) 0.3 to 2.59 kgm.cm. Ref. No. 1C/7039.

(b) 4.61 to 41.47 kgm.cm. Ref. No. 1C/7085.

(2) Test rig for torque wrenches.

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(a) Ref. No. 4A/2359 for torque wrench  
Ref. No. 1C/7039.

(b) Ref. No. 4A/2433 for torque wrench  
Ref. No. 1C/7085.

### Servicing methods and procedures

3. To facilitate the removal or replacement of a component and to safeguard the equipment, the following methods and procedures should be employed:—

(1) When soldering or unsoldering transistors or diodes use thermal shunts and avoid prolonged use of the soldering iron.

(2) Label all leads prior to, or immediately after unsoldering, to facilitate reconnection.

(3) When using a soldering iron, take care not to touch adjacent cables or components.

(4) When renewing a transistor, rectifier, capacitor or resistor, trim the wires of the component sufficiently to hook neatly round the respective terminals.

(5) Insulate all rectifiers, resistors and capacitors, except R11, R12, R36 to R39 and C12, using sleeving of the recommended materials.

(6) When replacing polarized components, ensure their correct connection into the circuit.

(7) Secure all capacitors, except C12, to the chassis using a recommended sealing compound.

(8) If applicable, lock all screws not otherwise secured, using a recommended sealant.

(9) When refitting or tightening a split clamp, the screws must be adjusted evenly so that the gaps between the halves are maintained equal. Finally torque tighten the screws using the appropriate torque screwdriver for the size and type of screw. The torque loadings are listed in Table 1.

#### Note . . .

*Incorrect loading of the clamp screws may result in slipping when the loading is below the correct figure and possible breakage of clamp when above the correct figure.*

### Cover

4. (1) To remove cover, remove the two 6 B.A. ch. hd. screws situated at the rear of the transducer and slide the cover towards the rear.

(2) To refit cover, slide the cover over the transducer, ensuring that the front edge engages tightly with the spring clips attached to the front panel.

(3) Refit the two 6 B.A. ch. hd. retaining screws.

### Chassis assembly (chap. 4, fig. 3)

5. (1) Remove cover (para. 4).

(2) Remove the eleven 4-40 U.N.C. pan.hd. screws securing the chassis assembly to the front panel and side frames.

(3) Carefully pull the chassis assembly rearwards until plug HL1 clears the front panel.

(4) Lift the chassis just clear of the side frames and place the assembly on its rear, adjacent to the transducer, ensuring not to pull the cableform attaching the chassis assembly to the terminal bracket assembly within the transducer. For freedom of movement the 4-40 U.N.C. pan.hd. screws securing the cable clip to the rear of the chassis assembly may be removed, allowing extra cableform.

(5) To refit the chassis assembly, reverse the above procedure.

### Plug HL1

#### Removal

6. (1) Remove cover (para. 4).

(2) Remove chassis assembly (para. 5).

(3) Unscrew and remove the 8 B.A. ch.hd. screw and nut securing the clip holding the cable assembly from the plug, to the side of the chassis assembly.

(4) Using a suitable tool, slacken the lockring on plug HL1.

(5) Unscrew and remove the lockring and washer.

(6) Pull plug HL1 from rear of chassis assembly extension.

(7) Roll back the rubber sleeving on each wire in turn to expose the soldered connection and unsolder the wire.

#### Replacement

7. (1) Ensure that the wire ends are tinned and do not carry excess solder.

(2) Check that the replacement plug is of the correct orientation.

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- (3) Solder each wire in turn into the respective pin on the plug.

**Note . . .**

*The bucket ends of the pin inserts are supplied already tinned with solder and care should be taken when soldering to avoid any overflow of solder from the buckets.*

- (4) Roll the rubber sleeving over the soldered connection.
- (5) After soldering, ensure that adequate clearance exists between adjacent connections.
- (6) Insert the plug from the rear of the chassis assembly extension.
- (7) Place the lockring and washer on the plug body.
- (8) Using a suitable tool, tighten the lockring.
- (9) Carry out plug wiring test (App. 3).
- (10) Secure cable clip to side of chassis assembly.
- (11) Refit chassis assembly.

**Transistor amplifier (TA1)**

8. (1) Remove cover (para. 4).
- (2) Remove chassis assembly (para. 5).
- (3) Unsolder the connections to the amplifier which protrude through the rear of the chassis assembly.
- (4) Unscrew and remove the four 6 B.A. ch.hd. screws and washers securing the terminal board assembly to the amplifier, taking care not to lose the spacers between the terminal board and amplifier. Fold back terminal board on cable loom.
- (5) Unscrew and remove the four 6 B.A. ch.hd. screws and washers securing the amplifier to the rear of the chassis assembly and remove the amplifier.
- (6) Refitting or renewing is a reversal of the above procedure.
- (7) Refit chassis assembly.
- (8) Carry out setting-up instructions, App. 3).

**Motor M1****Removal**

9. (1) Remove cover (para. 4).
- (2) Remove chassis assembly (para. 5).
- (3) Unscrew and remove the four 6 B.A. ch.hd. screws and plain washers supporting the gear train assembly between the side frames, and the two 2 B.A. ch.hd. screws and one 4 B.A. ch.hd. screw, passing through the front panel into the capsule unit base and gear train fixing block respectively. Withdraw the front panel and side frames from the gear train assembly.

**Note . . .**

*If the protective cap fitted to the static input adapter was removed to withdraw the front panel and side frames, it must be refitted before commencing work on the gear train. To avoid damage to the gear train, the gear train must be placed on its side so as to rest on the gear plate and motor plate, and not on the gears and spindles.*

- (4) Untie the lacing from the motor leads, roll back the rubber sleeving and unsolder the leads from the connections on the motor terminal block.

**Caution . . .**

*Extra care must be taken with the motor leads as these are very fragile.*

- (5) Unscrew and remove the four 4-40 U.N.C. pan.hd. screws and plain washers from the motor flange and lift the motor vertically, taking care not to damage the 48T pinion on the motor shaft and the 192T gear on the d.c. tachogenerator shaft.
- (6) Slacken the split clamp securing the 48T pinion on the motor shaft and remove pinion.

**Replacement**

10. (1) Place the 48T pinion on the motor shaft. Torque tighten the split clamp screws in accordance with Table 1, ensuring that the two halves of the clamp are symmetrical on the shaft.
- (2) Slacken the two special screws and the 4-40 U.N.C. pan.hd. screw on the motor mounting plate. Turn the eccentric screw to obtain clearance for the motor pinion.
- (3) Place the motor on the motor mounting plate taking care not to damage the pinion

and the 192T gear on the d.c. tachogenerator shaft. Refit the four 4-40 U.N.C. pan.hd. screws and plain washers securing the motor to the motor mounting plate.

(4) Adjust the motor mounting plate by means of the eccentric screw to give smooth running and minimum backlash between the motor pinion and the 192T gear. Tighten the special screws and the 4-40 U.N.C. pan. hd. screw on the motor mounting plate. Carry out gear train checks as detailed in App. 3.

(5) Resolder the leads to the connections on the motor terminal block and roll the rubber sleeves over the connections. Lace the leads and tie to motor.

(6) Place the front panel and side frames over the gear train assembly and refit the four 6 B.A. securing screws through the side frames, and the 4 B.A. and two 2 B.A. screws through the front panel.

(7) Refit chassis assembly.

#### D.C. tachogenerator (TX1)

##### Removal

11. (1) Remove cover (para. 4).
- (2) Remove chassis assembly (para. 5).
- (3) Unscrew and remove the four 6 B.A. ch.hd. screws and plain washers supporting the gear train assembly between the side frames, and the two 2 B.A. ch.hd. screws and one 4 B.A. ch.hd. screw passing through the front panel into the capsule unit base and gear train fixing block respectively. Withdraw the front panel and side frames from the gear train assembly.

##### Note . . .

*If the protective cap fitted to the static input adapter was removed to withdraw the front panel and side frames, it must be refitted before commencing work on the gear train. To avoid damage to the gear train, the gear train must be placed on its side so as to rest on the gear plate and motor plate, and not on the gears and spindles.*

- (4) Untie the lacing round the tachogenerator supporting the leads and cable loom.
- (5) Unscrew and remove the two 6 B.A. rd.hd. screws securing the leads to the tachogenerator.
- (6) Slacken the split clamp securing the 192T gear and 88T pinion to the tachogenerator shaft. Unscrew and remove the three 4-40 U.N.C. pan.hd. screws and clamps securing the tachogenerator to the motor plate.

Holding the gear and pinion, carefully lift the tachogenerator from the motor plate, and withdraw the gear and pinion from the gear train.

##### Replacement

12. (1) Slacken the two special screws and the 4-40 U.N.C. pan.hd. screw on the motor mounting plate. Turn the eccentric screw on the motor mounting plate to give maximum clearance between motor pinion and 192T gear. Supporting the 192T gear and 88T pinion in position in the gear train, mount the tachogenerator on the motor plate, placing the gear and pinion on the tachogenerator shaft. Spring load split gear  $\frac{1}{2}$  to 1 tooth and mesh with the 88T pinion. Refit the tachogenerator securing clamps and tighten the split clamp screws, see para. 3 sub-para. (9).

(2) Adjust the motor mounting plate by means of the eccentric screw, to give smooth running and minimum backlash between the motor pinion and the 192T gear. Tighten the special screw and the 4-40 U.N.C. pan.hd. screw on the motor mounting plate. Carry out gear train checks as detailed in App. 3.

(3) Reconnect the leads to the tachogenerator, black to pin 1 and red to pin 2. Support the leads and cable loom by tying to the tachogenerator.

(4) Place the front panel and side frames over the gear train assembly and refit the four 6 B.A. securing screws through the side frames, and the 4 B.A. and two 2 B.A. screws through the front panel.

(5) Refit chassis assembly.

##### Microswitches

13. (1) Remove cover (para. 4).
- (2) Unsolder the leads from the microswitch terminals.

##### Note . . .

*It may be necessary to move the sector from the microswitch to obtain access to the leads.*

- (3) Unscrew and remove the two 2-56 U.N.C. pan.hd. screws securing the microswitch to the microswitch mounting block.
- (4) Refitting or renewing is a reversal of the above procedure.

##### Note . . .

*Ensure that the microswitch leads are below the level of the microswitch, otherwise they may foul the sector.*

- (5) Adjust microswitch mounting block in accordance with setting-up procedure (App. 3) to give correct operation of microswitch.

### Relays

14. (1) Remove cover (para. 4).
- (2) Unsolder the leads from the connections on the relay which is to be removed.
- (3) If relay RLJA3-4 or RLWA1-2 is to be removed, unscrew and remove the two 4-40 U.N.C. pan.hd. screws and plain washers attaching the relay to the side of the chassis assembly. Withdraw relay from chassis assembly.
- (4) If relay RLZA1, RLWA3 or RLJA1-2 is to be removed, remove chassis assembly (para. 5). Unscrew and remove the two 4-40 U.N.C. pan.hd. screws, washers and plain nuts attaching the relay to the chassis assembly. Withdraw relay from chassis assembly.

#### Note . . .

*To prevent chafing of the cableform passing through the grommet beneath RLZA 1, the relay securing screw above the grommet is fitted with the head inside the chassis.*

- (5) Refitting or renewing is a reversal of the above procedure.
- (6) If necessary, refit chassis assembly.

### Transformers

15. (1) Remove cover (para. 4).
- (2) Unsolder the leads from the connections on the transformer.
- (3) Remove chassis assembly (para. 5).
- (4) Unscrew and remove the four 4-40 U.N.C. pan.hd. screws, and washers (T1), or four 8 B.A. ch.hd. screws and plain washers (T2 and T3), securing the transformer to the chassis assembly. Lift transformer clear of chassis.
- (5) Refitting or renewing is a reversal of the above procedure.
- (6) Refit chassis assembly and reconnect leads to transformer.

### Potentiometers

16. (1) Remove cover (para. 4).

- (2) If necessary, remove chassis assembly (para. 5) to obtain access to the potentiometer mounting plate. Unsolder the leads from the connections on the potentiometer.

#### Note . . .

*When removing the screws securing RV5 it is necessary to untie the cable loom from the tie rail and pull down the cable to expose the screws.*

- (3) To remove RV1 or RV2, unscrew and remove the two 8 B.A. ch.hd. screws and plain nuts securing the potentiometer to the chassis. A glass fibre packing piece is interposed between the potentiometers, and between RV2 and the chassis. Unsolder the leads from the connections on the potentiometer.

- (4) To remove RV3 or RV7, unscrew and remove the four 6 B.A. ch.hd. screws and washers securing the terminal board assembly to the transistor amplifier. Unscrew and remove the two 8 B.A. ch.hd. screws, washers and plain nuts securing the potentiometer to the terminal board. A glass fibre packing piece is interposed between each potentiometer and the terminal boards. Unsolder the leads from the connections on the potentiometer.

#### Note . . .

*One of the screws securing RV7 also secures a cable clip for the wiring loom to the terminal board and to remove RV3 it may be necessary to release this clip to obtain freedom of the wire connections. After replacing RV3 or RV7 ensure that the wires are well away from R38, since this becomes hot during operation.*

- (5) Refitting or renewing is a reversal of the above procedures. When remaking the connections, the pins of the potentiometers are not to be bent or twisted in any way.

- (6) Refit chassis assembly.

- (7) Carry out setting-up procedure as detailed in App. 3.

### Transistors

17. (1) Remove cover (para. 4).
- (2) Carefully unsolder transistor leads from the terminals, see para. 3 sub-para. (1), and prise transistor from its mounting clip.
- (3) Transistors VT6 and VT7 are mounted in heat sinks. To remove heat sink, unscrew and remove the two 8 B.A. screws and

washers securing the heat sink to the rear of the chassis assembly. Before replacing heat sink ensure that the insulating sleeves for the screws are not damaged.

(4) When replacing a transistor trim the leads of the transistor as required for re-connection and carefully resolder to the respective terminals. Place transistor in its clip.

#### Resistors, capacitors and rectifiers

18. (1) Remove cover (para. 4).
- (2) If necessary, remove chassis assembly (para. 5).
- (3) All the components may be readily unsoldered from their respective terminals and removed. Capacitor C12 is secured to the inside of the rear of the chassis assembly by a clip attached to the chassis by a 4-40 U.N.C. pan.hd. screw.
- (4) Replace components, referring to those methods and procedures of para. 3 which are applicable.
- (5) If necessary, refit chassis assembly.

#### Slip clutch (chap. 4, fig. 3 and fig. 6).

19. (1) Remove cover (para. 4).
- (2) Remove chassis assembly (para. 5).
- (3) Release the split clamp screws of the 185T split gear (axis 4) which overlaps the slip clutch, and its meshing 35T pinion (axis 3). Remove gear and pinion.
- (4) Release the slip clutch split clamp screws and remove slip clutch.
- (5) Fit replacement slip clutch, spring loading the slip clutch split gear  $\frac{1}{2}$  to 1 tooth before meshing with 60T pinion (axis 6). Tighten the split clamp securing screws (para. 3 sub-para. (9)).
- (6) Replace 35T pinion on axis 3 and 185T split gear on axis 4, spring loading the split gear  $\frac{1}{2}$  to 1 tooth before meshing with pinion. Tighten the split clamp securing screws in accordance with Table 1.
- (7) Carry out the mechanical checks on the slip clutch in accordance with App. 3.
- (8) Refit chassis assembly.

#### Capsule unit sector

##### Removal

20. (1) Remove cover (para. 4).
- (2) Remove chassis assembly (para. 5).

(3) Unscrew and remove the four 6 B.A. ch.hd. screws and plain washers supporting the gear train assembly between the side frames, and the two 2 B.A. ch.hd. screws and one 4 B.A. ch.hd. screw passing through the front panel into the capsule unit base and gear train fixing block respectively. Withdraw the front panel and side frames from the gear train assembly.

#### Note . . .

*If the protective cap fitted to the static input adapter was removed to withdraw the front panel and side frames, it must be refitted before commencing work on the gear train. To avoid damage to the gear train, the gear train must be placed on its side so as to rest on the gear plate and motor plate and not on the gears and spindles.*

(4) Slacken the split clamp securing the sector to the capsule unit spindle and carefully remove the sector.

#### Replacement

21. The capsule unit spindle must be positioned and the sector set-up on the spindle in accordance with the setting-up instructions detailed in App. 3. After initially setting-up the sector on the spindle, the necessary tests and adjustments (App. 3) must be completed before reassembly of the unit.

#### Gears and pinions

22. The procedure for removing and replacing the gears and pinions of the transducer is straightforward and has been partially described for some in the removal and replacement instructions detailed in the preceding paragraphs. The removal and replacement of the gears and pinions above the gear plate, with the exception of the 60T pinion meshing with the slip clutch gear, has been covered with the removal of the slip clutch assembly in para. 19. The motor pinion and the tachogenerator gear and pinion were removed in para. 9 and 11 respectively, and the capsule unit sector in para. 20. To remove the 60T pinion above the gear plate and the gears and pinions remaining beneath the motor plate, proceed as follows:—

- (1) Remove cover (para. 4).
- (2) If necessary, remove chassis assembly (para. 5), or the capsule unit sector (para. 20).
- (3) Slacken the split clamp screws and remove the gears or pinions.
- (4) When replacing a split gear, or a pinion or gear that meshes with a split gear, load the split gear  $\frac{1}{2}$  to 1 tooth before meshing.

- (5) Tighten the split clamp screws in accordance with Table 1.
- (6) If the sector was removed, set-up the capsule unit spindle and replace the sector as detailed in App. 3.
- (7) Carry out the mechanical checks on the gear train as detailed in App. 3.
- (8) Refit chassis assembly.

#### Capsule unit cover sealing ring

23. (1) Remove cover (para. 4).
- (2) Remove chassis assembly (para. 5).
  - (3) Remove the three 4 B.A. ch.hd. screws securing the capsule unit cover on the gear plate and carefully remove the cover.
  - (4) Remove the rubber 'O' ring from its groove in the capsule unit base.

(5) Before replacing the rubber 'O' ring ensure that the groove in the base is clean. Lightly grease the 'O' ring with an approved grease and carefully fit into the groove.

(6) Place the cover in the correct position over the capsule assembly and secure with the three 4 B.A. ch.hd. screws. Lock screws with a sealant.

(7) Refit chassis assembly.

**TABLE 1**  
**Torque loadings for stainless steel split clamp securing screws**

Screw size	Loading (kgm.cm.)
12 B.A.	0.850
10 B.A.	1.900
8 B.A.	6.000
6 B.A.	To be issued later

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