Chapter 2 I.L.S.

LIST OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

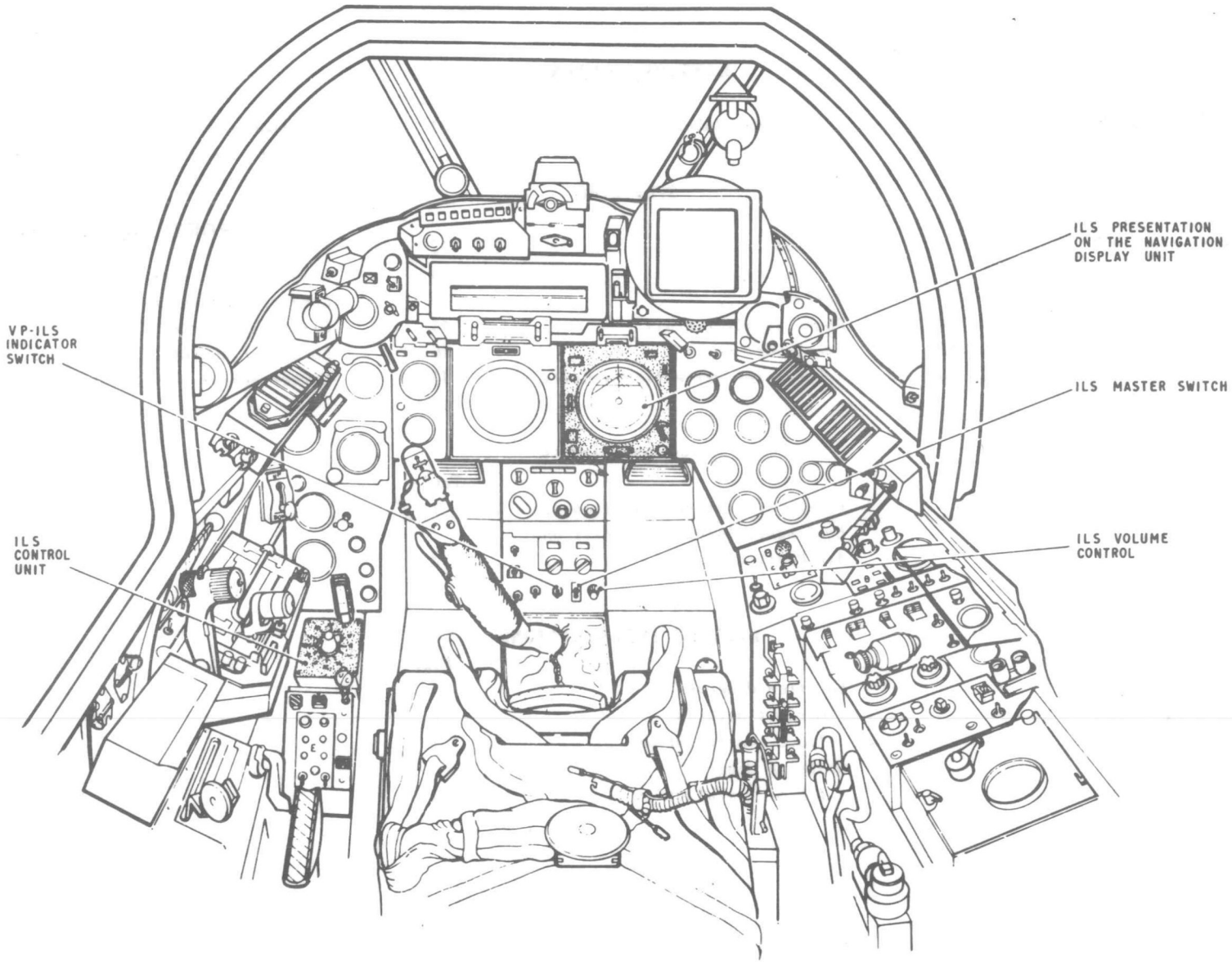

FIG. I. COCKPIT DETAILS

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DESCRIPTION

General

1. The Instrument Landing System (I.L.S.), (A.R.I.18011) operates in conjunction with ground beacon transmitters to provide visual and audio indications of the position of the aircraft relative to the runway touchdown point. Presentation of the I.L.S. localizer glide path and marker signals are displayed on the flight system navigation display unit when it is selected for I.L.S. operation.

2. The main components of the airborne installation are a glide path receiver, localizer/marker receiver, control unit, indicator, and three aerials. Other items used in the circuit are a voltage regulator, master switch, V.P./I.L.S. INDR. homing switch, volume control and a marker lamp.

Glide path receiver

3. A Type R.1965B receiver, together with its complementary JB.159A, is installed in a vertical position on the aft face of frame 52 port. Connections between the receiver and the aircraft are made via plugs and sockets and the junction box. Multi-pin connectors integral with the receiver and junction box enable the receiver unit to be removed whilst leaving the junction box and wiring in situ.

Localizer/marker receiver

4. A Type R 1964B receiver, together with its complementary JB.158A, is positioned vertically on the forward face of frame 50, port. Connections to the receiver are made via the JB.158A in an identical manner to that adopted ◀ for the glide path receiver and JB.159A ▶ as described in para.3.

Control unit

5. With the exception of the I.L.S. master switch on the U.H.F. panel, the system is controlled by a Type 705 control unit fitted to the side panel of the port console. The control unit incorporates a channel selector switch having twelve positions identified 'A' to 'L' and a red lamp, which when alight, indicates that the I.L.S. is operative. Each position of the switch brings into circuit two crystals, selecting the particular reception frequencies for the localizer and glide path receivers. The marker receiver is fixed tuned and is not affected by operation of the switch.

Indications

6. Visual indication of the aircraft's position relative to the runway prior to touchdown, is shown on the navigation display unit of the flight control system. The localizer beam is represented by a pair of parallel lines on the roller blind of the display unit and the glide path is represented by a bar which is driven into position between the compass card and the roller blind. A marker lamp also located on the display unit gives indication that the aircraft is over a particular beacon, by flashing in a sequence which identifies the beacon. The pilot will also receive a sequenced signal in his headphones, which will give him audio identification of the beacon.

7. In addition to the presentation of I.L.S. U.H.F. homing information is also displayed on the navigation display unit. Selection of either system is controlled by a VP-I.L.S. INDR. switch fitted on the U.H.F. switch panel. When the switch is set to I.L.S. INDR, I.L.S. is presented on the navigation display unit. When the switch is set to V.P., U.H.F. homing is presented on the navigation display unit.

Aerials

8. The aerials required by the I.L.S. comprise a glide path aerial in the leading edge of the starboard wing, a localizer aerial in the leading edge of the port wing, and a marker aerial located between frames 59 and 60 in the underside of the rear fuselage.

Volume control

9. Audio signals from the I.L.S. are fed into the pilot's headset via a volume control mounted on the U.H.F. switch panel.

Power supplies

10. The I.L.S. circuit operates from the normal 28-volt d.c. supply, the H.T. required for the receivers is provided by rotary transformers, incorporated in each receiver unit.

Voltage regulator

11. A controlled 19-volt d.c. supply for the valve heaters in the receiver units is provided by a Type 60 voltage regulator, installed adjacent to the localizer/marker receiver. Connection to the regulator from the d.c. supply is made via a 10-way terminal block

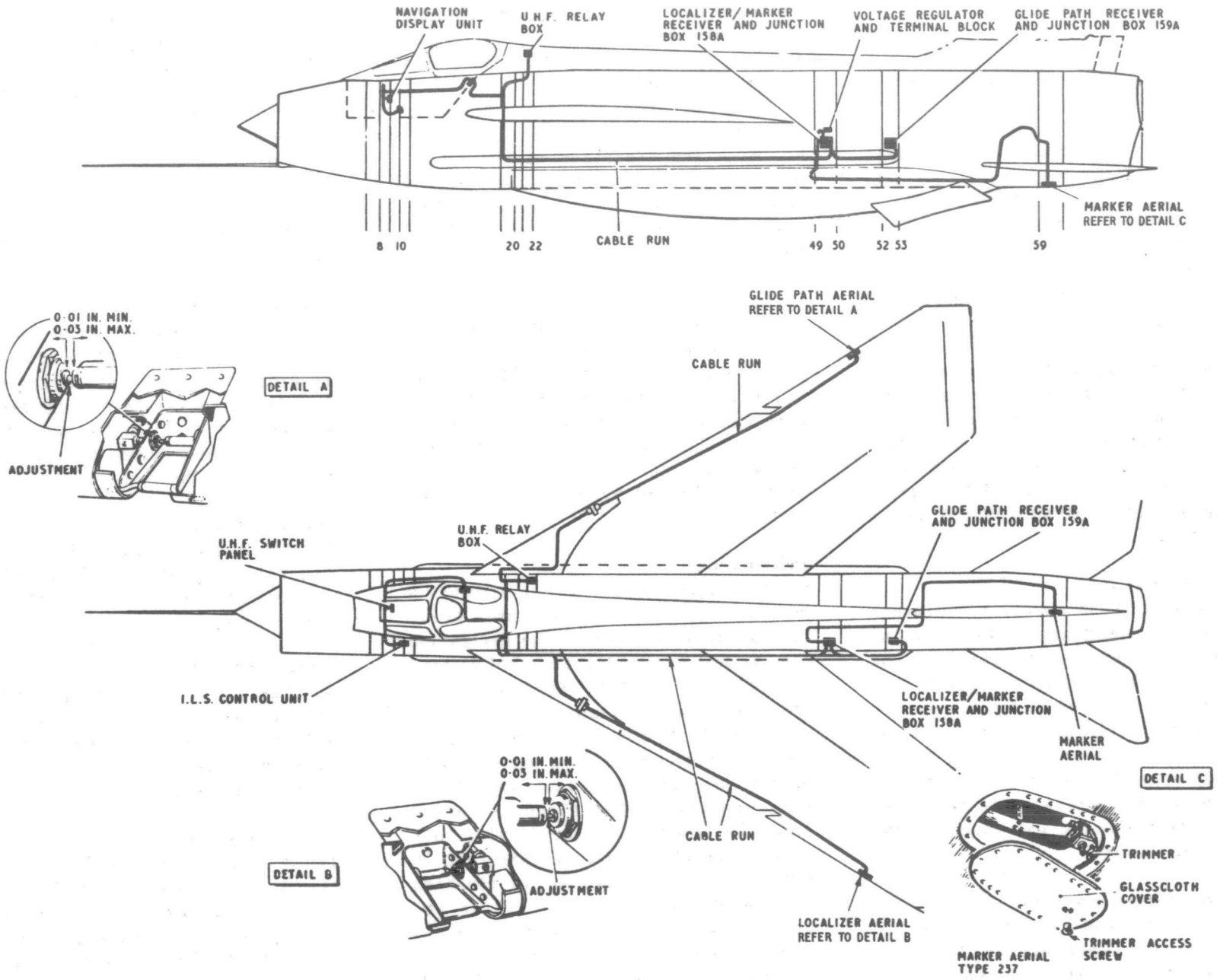

FIG. 2. I.L.S. INSTALLATION

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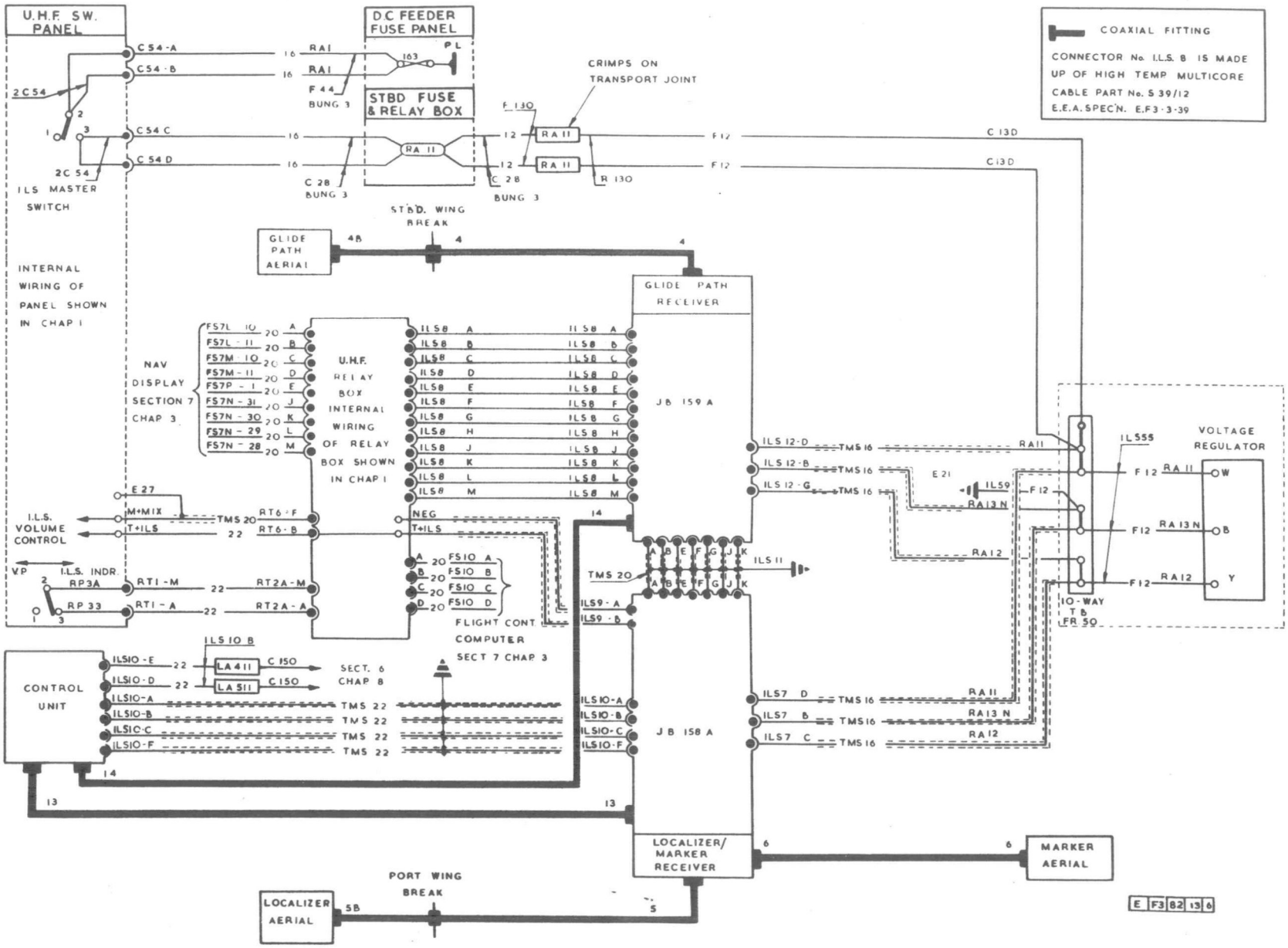

FIG. 3. I.L.S. INSTALLATION

◀ MOD. 4658 INCORPORATED ▶

located on frame 5A, port. The routeing diagram covering the power supplies is included in Sect.6, Chap.11.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cockpit or performing any operations upon the aircraft.

General

12. All I.L.S. equipment and cables should be checked periodically for security and freedom from damage. Detailed servicing of individual units will be found in A.P.116B-0408-1.

Crystal replacement

13. The 24 crystals which can be selected by the control unit are mounted in sockets arranged around the spindle of the control unit and can be seen after removal of the front cover. Change of crystal according to requirement can be accomplished by carrying out the following procedure.

(1) Release the Oddie fasteners holding the front cover of the control unit.

(2) Remove the cover, the switch knob will come away with it.

(3) The crystals will now be exposed housed in their sockets. Identify the one required and rock it gently to ease the pins in their sockets, at the same time pulling gently to remove.

(4) Fit a new crystal.

(5) When replacing the cover, ensure that the flat on the spindle engages with the corresponding flat on the switch knob.

(6) Press home the cover firmly and secure the Oddie fasteners.

Aerials

14. The three aerials should be examined periodically for signs of corrosion and cleaned if necessary. The marker aerial incorporates a trimmer for tuning to the operating frequency of 75 MHz. The trimmer is accessible after removing the countersunk screw located at the centre of the aerial cover.

Power supply circuit

15. When investigating faults or making continuity checks on the power supply circuit, reference should be made to the routeing diagram in Sect.6, Chap.11.

Functional tests

16. The I.L.S. functioning test should be carried out at the times stated in Vol.4 of this publication. Before attempting these tests it should be first ascertained that those detailed in the dynamic reference system *(Sect.7, Chap.3)* have been completed. The following test equipment is required:-

Test set, Type 391, Ref.No.10S/16374

Headset, Type 9, Ref.No.10AH/14

Microphone assembly, Ref.No.10A/14381

Localizer deflection sensitivity

17.

(1) Check that the seals on the preset controls of the localizer/marker and glide path receivers are intact.

Note...

If any seal is broken, return the equipment for bay servicing.

(2) Place the test set Type 391 as near as possible to the localizer aerial.

(3) Extend the localizer aerial on the test set.

(4) Connect the test set to a 28V d.c. supply, ensuring correct polarity.

(5) Switch the test set to ON, depress the SUPPLY OPERATE switch and check that the pointer on the test set meter falls within the red section of the scale.

(6) Set the I.L.S. MASTER switch to ON and allow a 5-minute warm up period.

(7) Set the V.P.-I.L.S. INDR. switch to I.L.S. INDR.

(8) Set the channel selector switch on the I.L.S. control unit, to a channel corresponding to the working frequency of the test set.

(9) Plug a headset into the pilot's mic/tel socket - refer to para.22.

(10) Set the POWER switch on the U.H.F. switch panel to NORMAL.

(11) Set the function switch on the U.H.F. control unit to T/R.

(12) Turn the VOL. control on the U.H.F. control unit to maximum (clockwise).

(13) Allow two minutes for a warm up period.

(14) Turn the I.L.S. VOLUME control on the U.H.F. switch panel to maximum (clockwise).

Switch positions

18.

(1) Set the STANDBY INVERTER switch to NORMAL.

(2) Set the M.R.G. ON/OFF switch to OFF.

(3) Set the FAST ERECT switch to OFF.

(4) Set the mode switch on the navigation display unit to I.L.S.

(5) Set the INST. MASTER switch to ON.

(6) Pull out the HDG knob on the navigation display unit and rotate until the localizer zero mark is at the 12 o'clock position.

19.

(1) Set up the test set as follows:-

Function switch to LOCAL

Tuning switch to XTAL

Adjust the deflection control for a zero reading on the test set meter.

(2) Check that navigation display unit BEAM flag appears (i.e. obscures the amber light), and that the I.L.S. beam indicator shows an ON COURSE position.

(3) Adjust the deflection control to give a maximum reading to the left on the test set meter.

(4) Check that the localizer indicator on the navigation display unit shows maximum deflection to the left (i.e. approx. ¾ in. from zero mark).

(5) Adjust the deflection control to give a maximum reading to the right on the test set meter.

(6) Check that the localizer indicator on the navigation display unit shows maximum deflection to the right (i.e. approx. ¾ in. from zero mark).

(7) Set the test set function switch to LOC. AUDIO; set the FREQ. MOD. (c/s) switch to 1300 and check that a 1300 Hz note is heard in the headset.

(8) Set the test set tuning switch to AUTO.

(9) Check that the localizer indicator on the navigation display unit moves to the left when the channel selector switch on the I.L.S. control unit is set to any channel incorporating crystals.

Glide path deflection sensitivity

20.

(1) Place the test set as near as possible to the glide path aerial.

(2) Extend the glide path aerial on the test set.

(3) Set the function switch to GLIDE PATH and the tuning switch to XTAL.

Note...

If test set is being used on MANUAL retune to a glide path frequency.

(4) Adjust the test set deflection control for a zero meter reading.

(5) Check that the navigation display unit GLIDE flag appears (i.e. obscures the amber light) and that the I.L.S. glide bar shows an ON COURSE position.

(6) Adjust the test set deflection control to give a maximum reading to the left on the test set meter.

(7) Check that the glide bar on the navigation display unit reaches the upper limit mark on the navigation display window.

(8) Adjust the test set deflection control to give a maximum reading to the right on the test set meter.

(9) Check that the glide bar on the navigation display unit reaches the lower limit mark on the navigation display window.

(10) Set the test set tuning switch to AUTO.

(11) Check that the glide bar on the navigation display unit moves upward when channel selector on I.L.S. control unit is set to any channel incorporating crystals.

Marker receiver

21.

(1) Extend the test set marker aerial and place the test set as near as possible to the marker aerial.

(2) Set the test set function switch to MARKER; the tuning switch to XTAL and the FREQ. MOD. (c/s) switch to 1300.

(3) Check that the aircraft marker lamp on the navigation display unit is illuminated and that a 1300 Hz note is heard in the headset.

(4) Check the I.L.S. VOLUME control, by operation, for correct functioning.

(5) Switch the test set OFF and ON repeatedly, and check that the marker lamp flashes OFF and ON in sympathy with the operation of the ON/OFF switch on the test set.

(6) Set the I.L.S. MASTER switch to OFF.

(7) Set the function switch on the U.H.F. control unit to OFF.

(8) Set the INST. MASTER switch to OFF.

(9) Disconnect the headset from pilot's mic/tel socket.

(10) Switch OFF the test set, disconnect power supplies and stow aerials.

(11) Ensure that the seals on the preset controls of the localizer/marker and glide path receivers are intact.

22. The mic/tel plug on the headset will not mate with the personal equipment connector on the pilot's seat. The personal equipment connector (man portion) Ref.No.6D/2073, should therefore be used, together with an adapter, if necessary, to enable a (large mic/tel) plug, Type 119, Ref.No.10H/10991, to connect to the (small mic/tel) socket Ref.No.10H/18574.

REMOVAL AND ASSEMBLY

Glide path receiver

23. To remove the glide path receiver:-

(1) Render the aircraft electrically safe.

(2) Remove panel 87P.

(3) Disconnect the aerial lead.

(4) Loosen the thumb nut and lift out the receiver.

On assembly, reverse the above sequence of operations.

(5) Carry out a function test of the I.L.S. system.

Localizer/marker receiver

24. To remove this receiver:-

(1) Render the aircraft electrically safe.

(2) Remove panel 69P.

(3) Disconnect the aerial leads.

(4) Loosen the thumb nut and lift out the receiver.

On assembly, reverse the above sequence of operations.

(5) Carry out a function test of the I.L.S. system.

Glide path aerial

25. When renewing an unserviceable aerial assembly ensure that the dimension *(fig. 2, detail A)* is between the limits 0.01 in. min. and 0.03 in. max. Any adjustments required can be made by inserting shim washers between the shoulders of the two components.

Localizer aerial

26. When removing an unserviceable localizer aerial, in addition to ensuring that the dimension is correct *(fig. 2, detail B)* it is also necessary to check that the loop attached to the capacitor has been removed.

Note...

Access to these two aerials is obtained by removing their plastic covers.

Marker aerial

27. After installation of a marker aerial, it is necessary to tune to the single marker frequency of 75 MHz. This is achieved by adjustment of the trimmer, access to which is via a hole in the aerial base plate, after removal of the screw plug *(fig. 2, detail C)*.

TABLE 1

Fuses, circuit and location

Fuse No.	Circuit	Location
163	RA1 I.L.S. supplies	D.C. feeder fuse panel

TABLE 2

Equipment, location, access and Air Publication

Equipment	Location	Access	Air Publication
I.L.S. control unit, Type 705A	Port console	Via cockpit	A.P.116B-0408-1
I.L.S. MASTER switch I.L.S. V.P.-I.L.S. INDR. switch I.L.S. VOLUME control	Part of the U.H.F. control unit	Via cockpit	Chap.1 of this section
Localizer/marker receiver, Type R1964B and associated JB.158A	Between fr.49-50, port side	69P	A.P.116B-0408-1
Glide path receiver, Type R1965B and associated JB.159A	Between fr.52-53, port side	87P	A.P.116B-0408-1
Voltage regulator, Type 60	Between fr.49-50, port side	69P	A.P.116B-0408-1
Marker aerial, Type 237	Between fr.59-60 underside of aircraft		A.P.116B-0408-1
Glide path aerial, Type 238	Leading edge of starboard wing		A.P.116B-0408-1
Localizer aerial, Type 239	Leading edge of port wing		A.P.116B-0408-1