

Chapter 2 I.L.S.

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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. The navigation display unit of the flight instrument system is used to give indications of the aircraft's position during I.L.S. operation. It is also used as a bearing indicator during U.H.F. homing, and in the Tacan and

Data Link modes provides the appropriate presentations.

2. The main components of the airborne installation are a glide path receiver, localizer 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 in-

stalled 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 receiver

4. This receiver, Type R. 1964B, together with its complementary JB.158A, is positioned vertically on the forward face of frame 50, port. Connections to

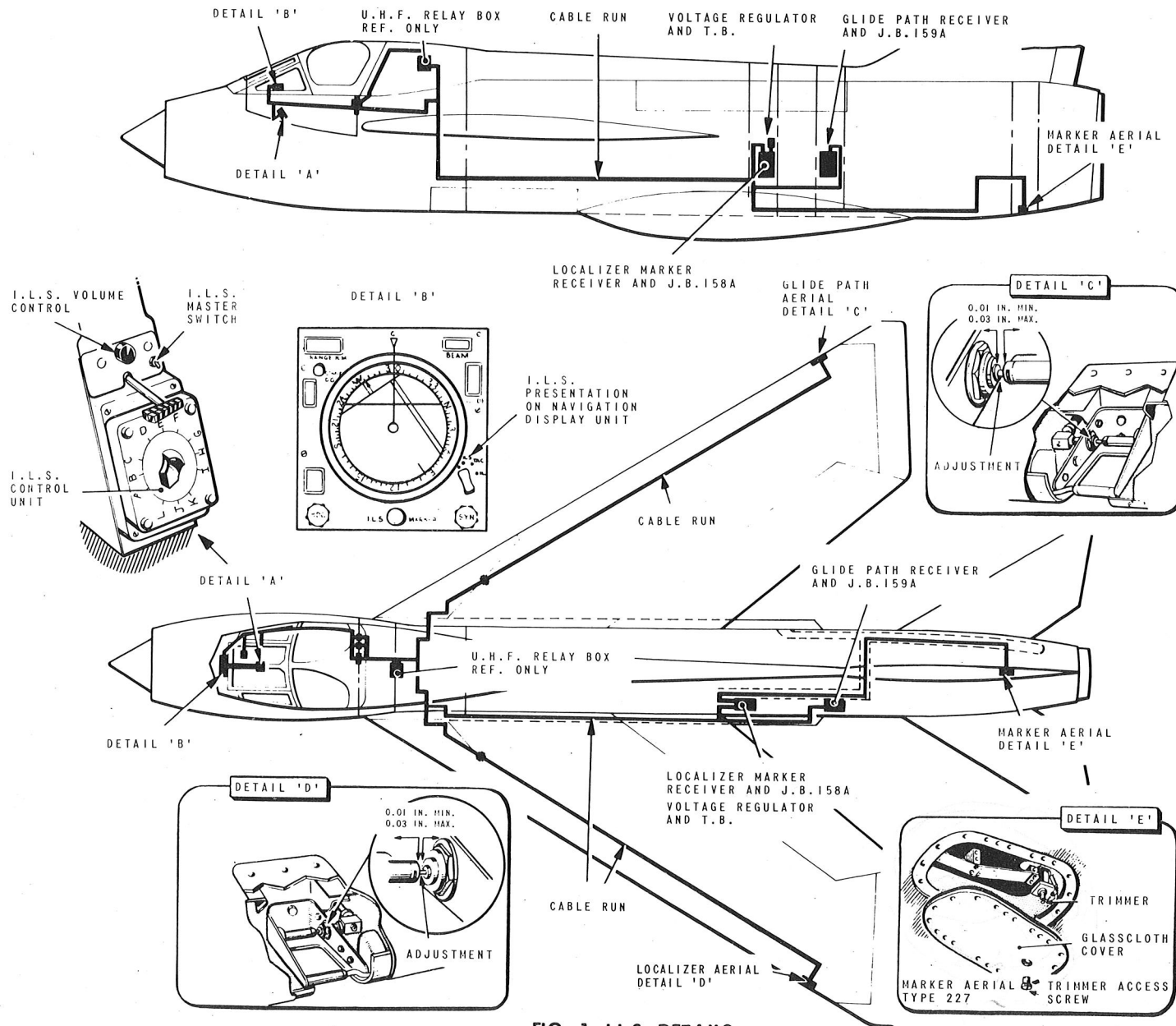


FIG. 1. I.L.S. DETAILS

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the unit are made via the JB.158A in an identical manner to that adopted for the glide path receiver and JB.195A as described in para.3.

Control unit

5. With the exception of the I.L.S. master switch, the system is controlled by a Type 705 control unit fitted to the bottom part of panel A4. 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. A marker lamp is also located on the display unit and 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. As well as the I.L.S. indications, provision is also made for a homing facility, the indications of which are given on the navigation display unit. Selection of either system is made by

the V.P.-I.L.S.INDR. switch on the panel A3. With the switch set to I.L.S. the No.1 relay in the U.H.F. relay box (Chap.1) is de-energized and the I.L.S. output is arranged to show I.L.S. indication on the display unit. The I.L.S. is also connected to the flight control computer which governs autopilot operation. Selection of the switch to V.P. energizes No.1 relay, breaking the circuit between the I.L.S. and the display unit, and making the circuit between the homing A.F. unit and the 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 panel A4.

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 receiver. Connection to the regulator from the d.c. supply is made via a 10-way terminal block located on frame 5A, port. The routing 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.2534E, Vol.1.

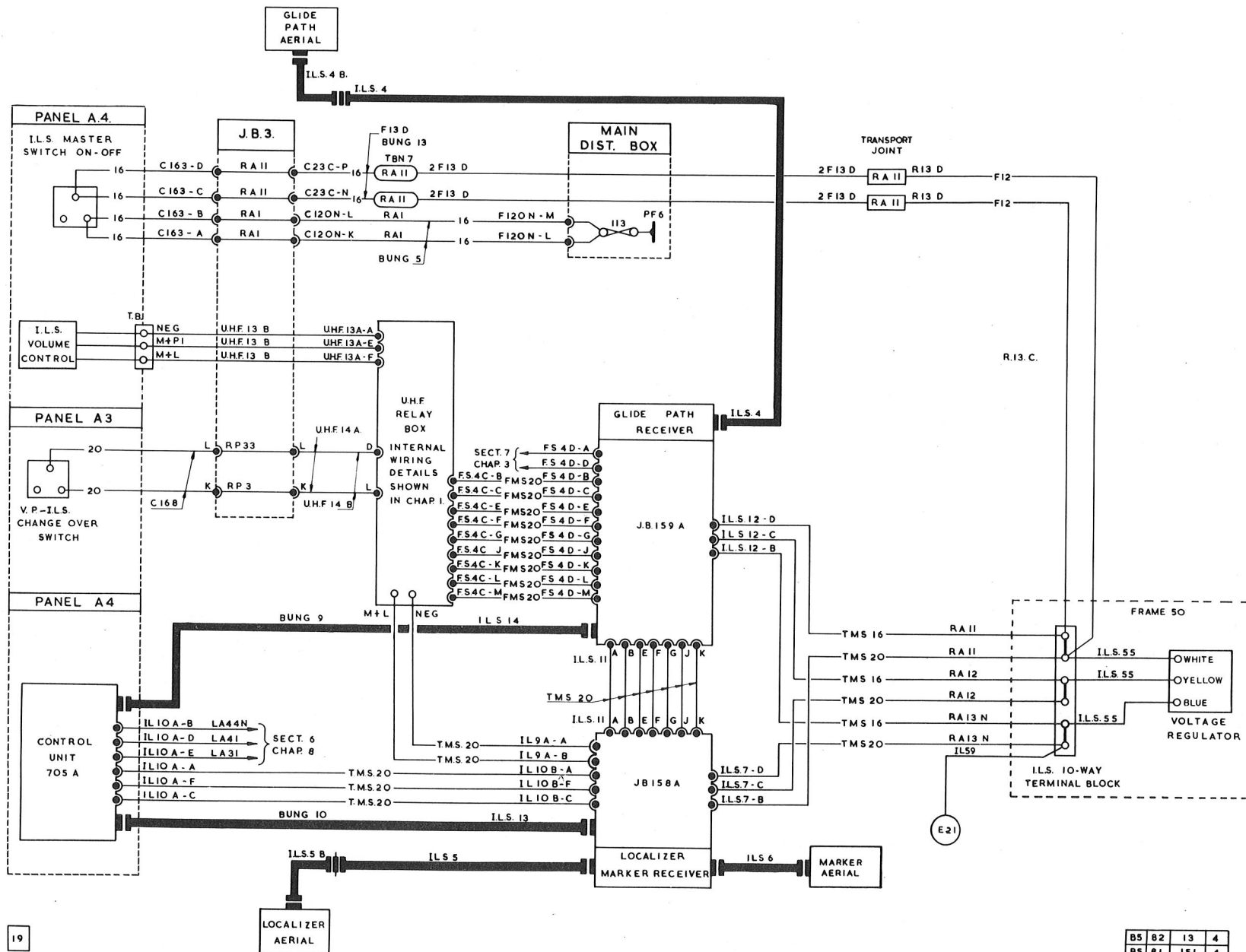
Crystal replacement

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) Pull away 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



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FIG. 2. ILS. INSTALLATION

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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 Mc/s. The trimmer is accessible after removing the countersunk screw 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 routing 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 (Chap.3) have been done. 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 seals on preset controls of R1964B and R1965B are intact.

Note...

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

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

(3) Extend localizer aerial on test set.

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

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

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

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

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

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

(10) Select NORMAL on U.H.F. set selector switch.

(11) Select T/R on U.H.F. control unit.

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

(13) Allow two minutes warm up period.

(14) Turn I.L.S. VOL. control, to maximum (clockwise).

Switch positions

18.

(1) Stand-by inverter switch to NORMAL.

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

(3) Fast erection switch to OFF.

(4) Navigation display mode switch to I.L.S.

(5) Instrument master switch to ON.

(6) Pull out the HDG knob and rotate until the localizer zero mark is in the 12 o'clock position.

19.

(1) Set up test set as follows:-

Functioning switch to LOCAL

Tuning switch to XTAL

Adjust deflection control for zero reading on meter.

(2) Check that navigation display BEAM flag clears (i.e., shows blank indication), and that the I.L.S. beam indicator shows an ON COURSE position.

(3) Adjust deflection control to give 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. $\frac{3}{4}$ in. from zero mark).

(5) Adjust deflection control to give 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. $\frac{3}{4}$ in from zero mark).

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

(8) Set test set tuning switch to AUTO.

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

Glide path deflection sensitivity 20.

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

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

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

Note...

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

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

(5) Check that the navigation GLIDE flag clears (i.e., shows blank indication) and that the I.L.S. glide bar shows an ON COURSE position.

(6) Adjust test set deflection control to give 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 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 test set tuning switch to AUTO.

(11) Check that glide bar on 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 test set marker aerial and place test set as near as possible to aircraft marker aerial.

(2) Set test set function switch to MARKER, tuning switch to XTAL and 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 c/s note is heard in the headset.

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

(5) Switch 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 I.L.S. MASTER switch to OFF.

(7) Set U.H.F. control unit to OFF.

(8) Set INSTRUMENT MASTER switch to OFF.

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

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

(11) Ensure seals on preset controls of R1964B and R1965B are intact.

22. The mic/tel plug on the headset will not mate with the personal services connector on the pilot's seat. The personal services 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.

TABLE 1
Equipment details

Equipment	Location	Access	Air publication
I.L.S. control unit, Type 705	On panel A4	Via cockpit	2534E, Vol. 1, Part 1, Chap. 2
I.L.S. master switch, Type 8810/B104	On panel A4	Via cockpit	4343C, Vol. 1
I.L.S. volume control	On panel A4	Via cockpit	
I.L.S. VP/I.L.S. switch, Type 8810/B104	On panel A3	Via cockpit	4343C, Vol. 1
Localizer marker receiver, Type R1964B and associated J.B. 158A	Between frames 49-50, port side	67P	2534E, Vol. 1, Part 1, Chap. 4
Glide path receiver, Type R1965B and associated J.B. 159A	Between frames 52-53, port side	87P	2534E, Vol. 1, Part 1, Chap. 4
Voltage regulator, Type 60, and associated T.B.	Between frames 49-50, port side	69P	2534E, Vol. 1, Part 1, Chap. 4
Localizer aerial, Type 239, Ref.No. 10B/16708	Leading edge of port wing	Leading edge panel	2534E, Vol. 1, Part 1, Chap. 5
Glide path aerial, Type 238, Ref.No. 10B/16707	Leading edge of starboard wing	Leading edge panel	2534E, Vol. 1, Part 1, Chap. 5
Marker aerial, Type 237	Between frames 59-60 underside of aircraft		2534E, Vol. 1, Part 1, Chap. 5

REMOVAL AND ASSEMBLY

Glide path receiver

23. To remove the glide path receiver:-

- (1) Remove panel 87P.
- (2) Disconnect aerial leads.
- (3) Loosen thumb nut and lift out the set.

On reassembly, reverse the above sequence of operations.

Localizer receiver

24. To remove this receiver:-

- (1) Remove panel 69P.

(2) Disconnect aerial leads.

(3) Loosen thumb nut and lift out the set.

On reassembly, reverse the above sequence of operations.

Glide path aerial

25. When renewing an unserviceable aerial assembly ensure that the dimension (*fig.1, detail C*) 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 ensur-

ing that the dimension is correct (*fig. 1, detail D*) 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 Mc/s. This is achieved by adjustment of the trimmer, access to which is via a hole in the aerial base plate, after removal of the metal screw plug (*fig.1, detail E*).

TABLE 2
Fuses, circuits and location

Fuse No.	Rating	Code	Circuit	Location
113	20A	RA1	I.L.S. supply	A.C./D.C. fuse and relay box

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