Appendix 1 WIRELESS INSTALLATION

Note . . . *This Appendix deals with aircraft fitted with Mk. 3 ejector seats (Mod. N600) Earlier aircraft are covered in Chap. 1.*

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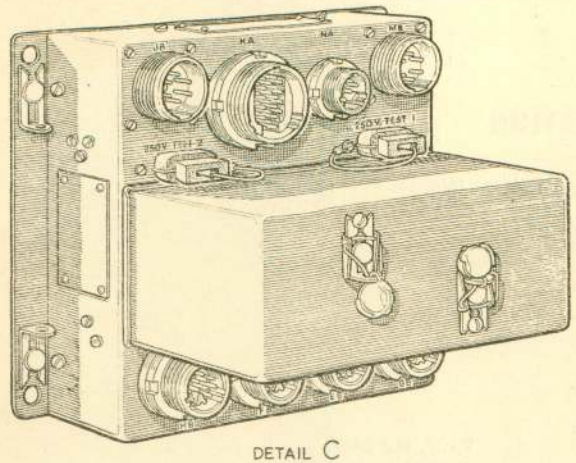
Introduction

1. This chapter contains a description of the A.R.I. 5491 wireless and the A.1961 intercommunication equipment installed in the aircraft. Also included is an illustration showing the location of the units and components in the fuselage and wings together with a wiring diagram giving interconnections, cable breakdown points and a reference to the power supply source. The function of circuits external to the transmitter-receivers and that of other main units is described briefly with reference to the wiring diagram. Where further information is required, reference should be made to the relevant specialist Air Publications.



DETAIL C

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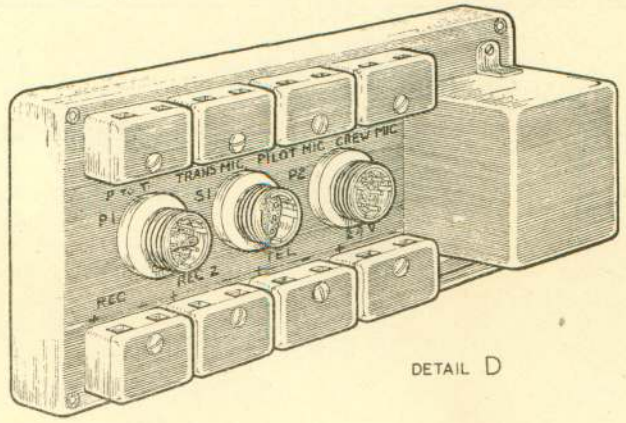

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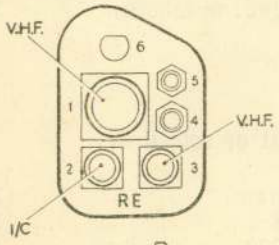
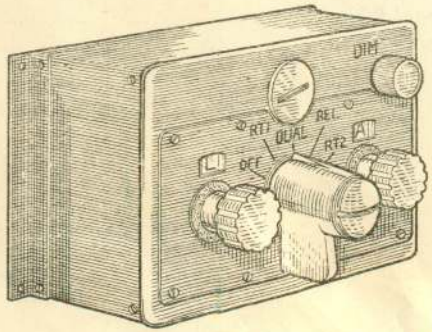


DETAIL B



DETAIL A

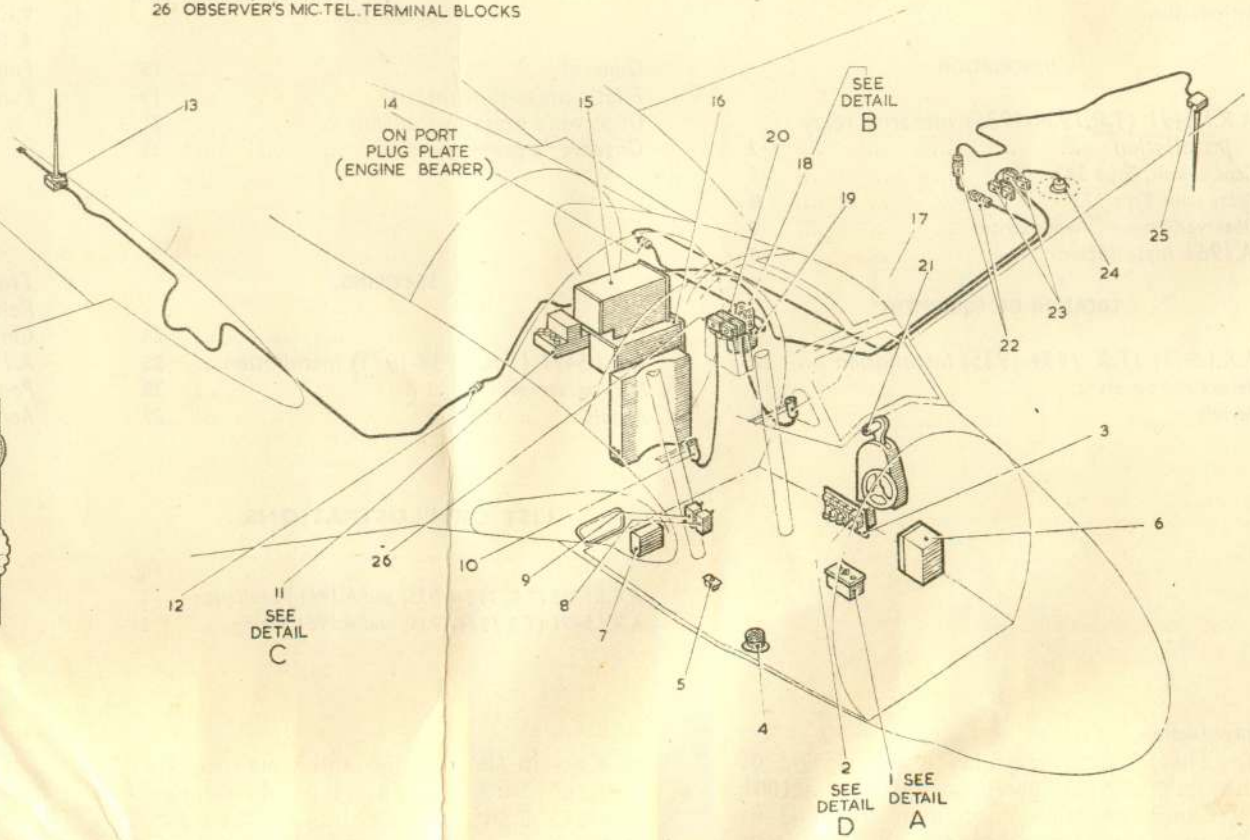


Fig. 1. A.R.I.5491 (T.R. 1934-1935) and A.1961 installation

DESCRIPTION

A.R.I.5491 (T.R. 1934-1935) Airborne Relay Installation

2. This installation comprises the following major items:— two V.H.F. transmitter-receivers, one Type 1934 and the other a Type 1935; a control unit, Type 383; a relay unit, Type 123; and two aerials, one a Type 228 and the other a Type 229, one for each transmitter-receiver.

3. The T.R. 1934-1935 equipment provides wireless communication on any one of twenty separate frequency channels. It can also be used as an airborne relay installation for the purpose of increasing the range of communication between a fixed station, or a mobile station, such as an aircraft carrier, and a forward reconnaissance aircraft. The forward reconnaissance aircraft is normally fitted with a standard V.H.F. ten or twenty-channel installation and flies beyond the normal communication range of the fixed or mobile transmitting station.

4. When used for relaying transmissions the two sets of the relaying aircraft are normally in the 'receive' condition until a transmission is made from either end of the radio link up. When this takes place, one of the two sets (depending upon the frequency of the transmission) receives the signal. At the same time, the other set commences automatic re-transmission of the signal to the opposite end of the radio link. On completion of the initial transmission the two sets return to the 'receive' condition until a further transmission takes place, when the sequence is repeated. It is stressed that automatic re-transmission of received signals only takes place when the controller system switch is placed in the REL position. The other facilities provided by the controller, Type 383, are described in para. 6. A full description of each item of equipment comprising the installation will be found in A.P.2538HA, Vol. 1.

Control unit, Type 383

5. The control unit, Type 383, provides full facilities for the overriding control of all messages to be relayed. Thus, the pilot in the relay aircraft may decide whether or not a message should be relayed. In addition, he has the means of holding independent communication with either end of the relay link.

6. The control unit also provides the pilot with complete operational control of the V.H.F. relay installation. It may be set for automatic operation of the relay system by incoming signals, or alternatively switched to give comprehensive control of the dual transmitter-receivers. The controller system switch has five positions; they are OFF, RT1, DUAL, REL, and RT2. The facilities offered in these positions are as follows:—

RT1—Gives complete control over transmission and reception of No. 1 transmitter-receiver. In this position of the system switch, the pilot in the relay aircraft has direct two-way communication with the base station to the exclusion of the forward reconnaissance aircraft.

DUAL—Signals received by both No. 1 and No. 2 transmitter-receivers will be heard in the pilot's or observer's telephones. In the event of signals being received by No. 1 and No. 2 set at the same time, the first signal to operate the master relay in relay unit Type 123 will be heard, the other signal being suppressed. It will thus be seen that only one signal at a time can be received. On the other hand, the pilot or observer, by use of his press-to-transmit switch, can transmit simultaneously on No. 1 and No. 2 sets.

REL—In this position the equipment behaves as an automatic relay system. Signals received in No. 1 set will be automatically re-transmitted by No. 2 set and vice versa. In this position of the controller system switch it is not necessary to operate the press-to-transmit switches, but monitoring is afforded of whichever station is transmitting.

RT2—Gives complete control over transmission and reception of No. 2 set. The pilot has direct two-way communication with the forward reconnaissance aircraft to the exclusion of the fixed or mobile station.

7. In addition to the system switch, the controller has separate channel selector switches for each transmitter-receiver, together with a dimmer control for the dial lamp.

Relay unit, Type 123

8. The relay unit, Type 123, is, in effect, a junction box between the two transmitter-receivers and the control unit Type 383. Its main function is the automatic switching of the transmitter-receivers, but at the same time it offers facilities for an overriding manual control by virtue of its connections to the control unit, Type 383.

Observer's press-to-mute switch

9. The observer's press-to-mute foot switch is used only for suppressing incoming wireless signals should he consider it necessary when using the intercommunication system. The muting switch suppresses both receivers, irrespective of the position of the system switch on the control unit, Type 383.

A.1961 intercommunication

10. This aircraft is fitted with an intercommunication amplifier, Type 1961, which operates in conjunction with a mic.-tel. junction box, Type 154. The amplifier is controlled by two remote switches mounted on the observer's switch panel on the starboard cockpit wall. One switch, labelled ON/OFF, controls the power supply to the amplifier. The other switch, labelled NORMAL/EMERGENCY, provides the following facilities:

In the NORMAL position, the amplifier is used for intercommunication between pilot and observer. When switched to the EMERGENCY position, the pilot's and the observer's mic.-tel. circuits are connected direct to the audio frequency stages of the V.H.F. receiver. which

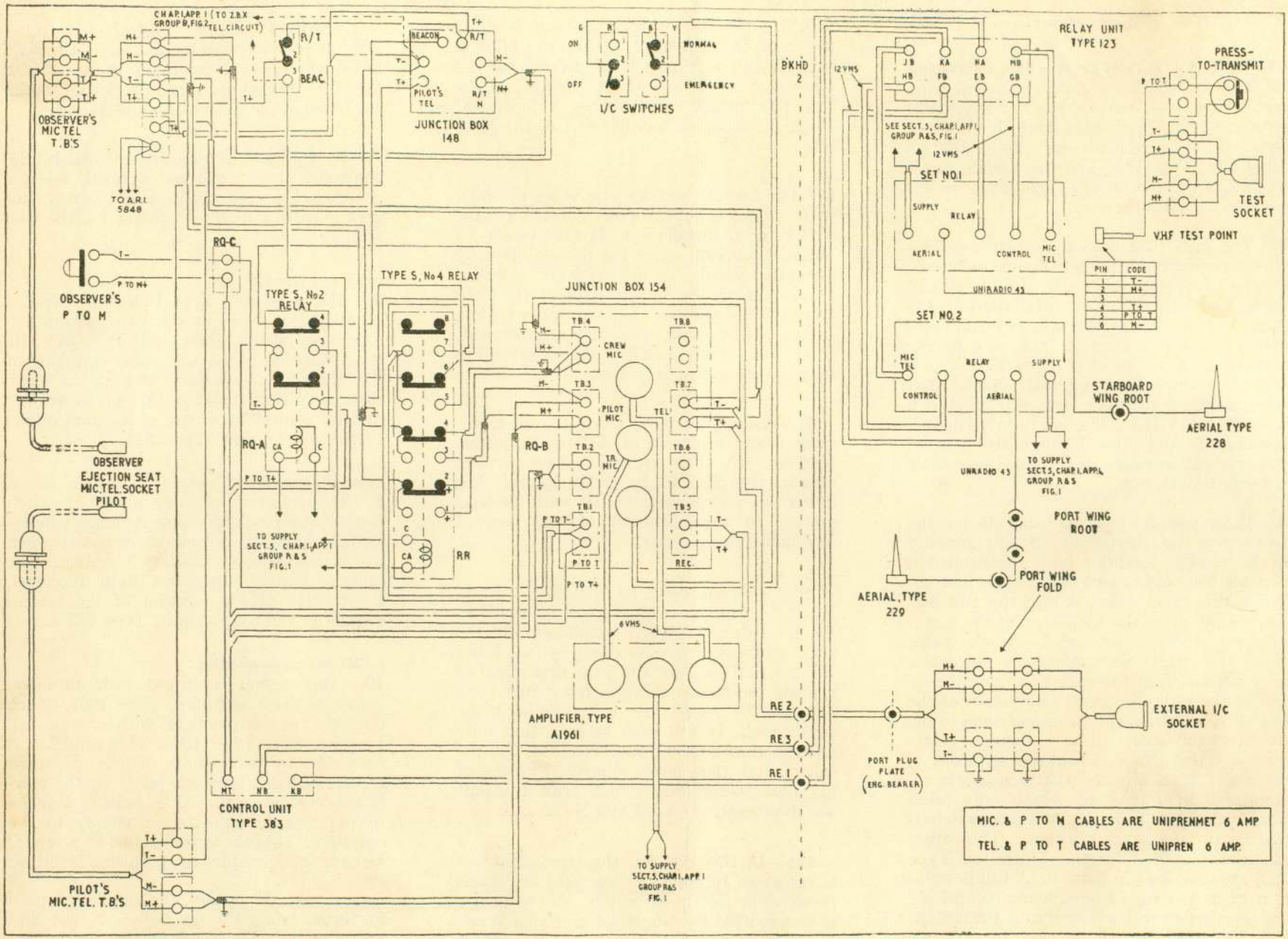


Fig. 2. A.R.I.5491 (T.R. 1934-1935) and A.1961 wiring

are used as an alternative intercommunication source should the amplifier fail. The amplifier and the junction box, Type 154, are described in A.P.2876E, Vol. 1.

11. In the NORMAL position of the NORMAL/EMERGENCY switch the pilot's and observer's microphones are alive at all times and intercommunication can take place as required. For use during ground servicing or during engine running, an extension mic.-tel. seven-pin plug is located behind a spring-loaded flap outboard of the wingfold.

LOCATION OF EQUIPMENT

A.R.I.5491 (T.R. 1934-1935) Installation

12. The two transmitter-receivers, together with the relay Type 123 and the V.H.F. test panel are located in the ammunition compartment between bulkheads 2 and 3. Access to the equipment is by way of the ammunition hatches on either side of the fuselage.

13. In the cockpit, the pilot's control unit, Type 383, is mounted on panel AF above the nosewheel tunnel. His mic.-tel. socket is fitted to the left shoulder strap on the ejector seat and is connected, via a plug and socket on the rear of the seat structure, to two terminal blocks on fuse box C. The pilot's press-to-transmit switch is incorporated in the gyro gun-sight twist grip control on the throttle handle.

14. The observer's mic.-tel. socket is located in the same relative position on his ejector seat as the pilot's and is connected via a plug and socket on the seat structure to two terminal blocks on fuse box C. The observer's press-to-transmit switch is located on panel A on the starboard side of the cockpit; it is a spring-loaded 'dolly' type switch. The foot-operated muting switch is located on the starboard side of the cockpit floor, convenient to the observer's foot.

Relays and panels

15. The panel assembly RQ contains three items, the pilot's transmit relay Type S, No. 2, RQ-A, the intercommunication junction box, Type 154, RQ-B, and a terminal block which forms a break in the muting lead, RQ-C. It is located on a support bracket on the cockpit floor, outboard of the pilot's seat. The observer's transmit relay RR is located on the cockpit floor in the starboard aft corner. The amplifier A.1961 is located on the pilot's false floor forward of the control column.

Aerials

16. The aerial, Type 228, for No. 1 set, is mounted on the upper surface of the starboard tail boom with the base block secured to a mounting bracket inside the boom, the whip section passing through a grommet and grommet plate in the boom surface.

17. The aerial, Type 229, for No. 2 set, is mounted on a detachable panel in the underside of the port wing outboard of the wingfold. The base block of the aerial is mounted on a bracket secured to the detachable panel, the whip passing through a rubber grommet and projecting downwards.

OPERATION

General

18. The information under this heading deals with the operation of the transmit relays and the routing of circuits when the press-to-transmit switches or muting foot switch are operated. No attempt is made to describe the internal circuits of units and components. This is beyond the scope of this handbook, and if such information is required, reference should be made to the appropriate specialist Air Publications mentioned previously in the text.

Pilot's press-to-transmit

19. When the pilot operates his press-to-transmit switch, a d.c. supply is connected to the operating coil of the transmit relay, Type S, No. 2, RQ-A. Referring to the wiring diagram (*fig.* 2), and to Sect. 5, Chap. 1, App. 1, Group R and S, fig. 1, contacts 1 and 1A on relay RQ-A are now closed, connecting the P to T+ line from the transmitter in use to P to T— or earth. This is the condition required to bring the selected transmitter into operation.

20. Contacts 3 and 3A on relay RQ–A are also closed connecting a further P to T+ line from T.B.1 on the junction box, Type 154, to P to T—. This is a further condition required for transmission. In addition, the contacts 4 and 4A on relay RQ–A which were closed are now open and the Z.B.X. Tel.+ line broken. This is necessary when operating with the RT.MIX.BEACON switch on the pilot's junction box, Type 148, in the MIX position, to prevent beacon signals modulating the transmission.

Observer's press-to-transmit

21. Referring again to fig. 2, also fig. 1 in Group R and S of Sect. 5, Chap. 1, App. 1, when the observer closes his transmit switch, a d.c. supply is connected to the operating coil of the observer's transmit relay RR. Contacts 7 and 7A now close, connecting the P to T+ line from T.B.1 on the junction box, Type 154, to the P and T— line. Contacts 5 and 5A are also closed and the V.H.F. P to T+ line, paralleled from the pilot's transmit relay RQ–A, contact 1, is connected to P to T— and earth. This is the condition required to bring the selected transmitter into operation. Contacts 6 and 6A which are normally closed, now open and interrupt the Z.B.X. Tel.+ line in the same manner as in the pilot's transmit relay, RQ–A.

22. Contacts 2 and 4 on the observer's transmit relay RR which normally connect his microphone to the CREW MIC. T.B. on junction box, Type 154, now open and the microphone is connected via contacts 1 and 3, now closed, to the PILOT MIC. T.B. on junction box, Type 154. In this manner, closing the observer's transmit switch connects up his microphone to the transmitter in use via the internal wiring of junction box, Type 154.

(A.L.35, Feb. 56)

Observer's press-to-mute

23. When the observer presses the foot-operated muting switch the contacts of the switch connect the P to M+ line to Tel.— or earth, via T.B. RQ–C on panel RQ. This mutes both receivers, irrespective of the set being used.

SERVICING

General

24. The information under this heading deals only with the in situ servicing of units and components. The detailed servicing of the wireless and intercomm. equipment is fully described in the relevant Air Publication (A.P.2538HA, Vol. 1, for T.R. 1934-1935, and A.P.2876E, Vol. 1, for A.1961). Before servicing or removal is carried out, the aircraft must be rendered electrically safe by opening the battery isolation switch.

A.R.I.5491 (T.R. 1934-1935) Installation

25. The V.H.F. transmitter-receivers and the relay unit, Type 123, are accessible through the ammunition bay doors on either side of the fuselage between bulkheads 2 and 3.

26. Each set should be checked for rigidity in its mounting crate, and the anti-vibration mountings for correct functioning. The set should not foul adjacent aircraft structure under conditions of normal vibration, neither should the mounting 'bottom' on the cross member below it. The knurled securing nuts on the front of the mounting should be tight. With the securing nuts disengaged and all plugs and sockets disconnected, the set should be free to slide in and out of the mounting-tray.

27. Both sets must be checked for signs of damage or deterioration, and where necessary, the appropriate remedial action taken. All plugs and sockets must be free from damage or corrosion. To facilitate reconnection and to obviate any likelihood of the threads binding, a light smear of lubricant, DTD.577, should be applied to all threaded portions of plugs and sockets. The cables and connectors associated with the installation must be clean and tightly clipped to the aircraft structure to ensure good bonding of the connector braided covers. The V.H.F. test panel located on bulkhead No. 2 port, must be inspected to ensure that it is in good condition and that the connections at the terminal blocks are clean and tight.

Mic.-tel.sockets

28. The mic.-tel. connections at the terminal blocks should be inspected for security and cleanliness and the mic.-tel. sockets both at the rear of the seat structure and on the left-hand shoulder strap of the ejector seats, must be checked for security, ingress of moisture, and damage. The spring-loaded flap on the socket at the rear of the seats should be inspected for serviceability of the spring and the effectiveness of the flap in sealing the top of the socket from moisture and dirt when the seat plug is removed.

WARNING

When servicing the mic.-tel. sockets, take care not to disturb the ejector seat mechanism.

Aerials

29. The aerials should be inspected periodically for signs of corrosion and fatigue. The rubber grommet should be checked for signs of perishing and the moulded base blocks for damage.

30. The inner conductor of each matching stub is connected to the outer braiding at the end remote from the aerial. For this reason, an insulation check will show a zero reading. The matching stub should be disconnected when carrying out insulation checks of the aerial feeders.

V.H.F. test panel

31. The V.H.F. test panel on the rear of bulkhead 2 provides facilities for tuning and testing each transmitter-receiver individually. Either set is connected to the test point by means of a wandering connector and socket, after the appropriate mic.-tel. press-to-transmit socket has been removed from the top right-hand corner plug on the front of the set. The test panel press-to-transmit switch is operated accordingly. The test socket should be returned to the stowage socket provided on No. 3 bulkhead when not in use.

A.1961 installation

32. The in-situ servicing of the A.1961 amplifier is limited to the inspection of the unit and its mounting, its associated plugs, sockets and connectors for signs of deterioration or damage. Particular attention should be paid to the junction box, Type 154, beneath the pilot's seat. All connections at the terminal blocks should be clean and secure and the insulation of cables and leads should be checked for fraying or damage.

Functional test—T.R. 1934-1935 installation

33. After the V.H.F. installation has been set up in accordance with the instructions in A.P.2538HA, Vol. 1, the functional test consists of checking that the transmitter-receivers, the control unit, and other associated equipment are operating satisfactorily. The procedure for testing the installation is as follows:—

(1) Connect a standard headset to each crew member's mic.-tel. socket.

(2) Place the system switch on the V.H.F. controller to the RT1 position for testing No. 1 transmitter-receiver. Select a suitable test frequency.

Note . . .
Ensure that the switch on the junction box, Type 148 *(R.T./Z.B.X. mixing box) is set to the* RT *position.*

(3) After a warming up period, background noise will be heard in the phones. Press the observer's foot-operated muting switch and check that the receiver background noise cuts out.

(4) Operate the pilot's press-to-transmit switch, and ask control for a report on signals. Release the push switch to receive.

(5) If satisfactory, check the correct operation of the observer's transmit switch.

Note . . .
Ensure that the observer's RT/BEACON *switch is in the* RT *position.*

(6) Turn the system switch on the V.H.F. control unit to the DUAL position, and select a suitable frequency on No. 2 set by means of the channel selector switch on the control unit. Receiver background noise will not be heard in the phones until a signal is received by either set. The first transmission received will suppress any signal from the other set. Operate the press-to-transmit switch and check that both sets are radiating, either by a check with control or by means of a field strength meter.

(7) Turn the system switch to the RT2 position for testing No. 2 transmitter-receiver. Select a suitable test frequency, and proceed as for RT1 (operations 3 and 4).

(8) Turn the system switch to REL and carry out a check as described in A.P.2538HA, Vol. 1, Part 1, Sect. 2, Chap. 3, Para. 12-21.

Note . . .
The switch on junction box, Type 148, *should remain at the* RT *or* MIX *position, and the observer's* RT/BEACON *switch at the* RT *position throughout these tests.*

This completes the tests for the V.H.F. installation.

Functional test—A.1961 installation

34. A.1961 intercommunication equipment should be tested after testing the V.H.F. installation as detailed in para. 33. The V.H.F. transmitter-receivers are left running by placing the controller system switch at RT1 or RT2. This is necessary for testing the emergency intercommunication facilities available through the audio-frequency stages of the transmitter-receivers. The testing of the A.1961 is as follows:—

(1) Switch on the A.1961 by means of the switch on the observer's switch panel and place the I/C. system switch in the NORMAL position. Allow a warming up period.

(2) Check intercommunication between the two crew positions and at the external mic.-tel. position under the port wing.

(3) Place the I/C. system switch at the EMERGENCY position.

(4) Place the V.H.F. control unit in the RT1 position and check that intercommunication is available at the crew positions. This completes the EMERGENCY intercommunication test using No. 1 V.H.F. set audio-frequency stages.

(5) Place the V.H.F. control unit at RT2 and proceed as in operation (4). This completes the tests for the normal and emergency intercommunication facilities.

(6) Switch off the amplifier, Type 1961, and V.H.F. transmitter-receivers. Remove the headsets.

REMOVAL OF EQUIPMENT

Transmitter-receivers

35. Access to the transmitter-receivers is through the port ammunition compartment door, between bulkheads 2 and 3. To remove either or both sets adopt the following procedure:—

(1) Disconnect all plugs and sockets from the front of each transmitter-receiver, and the V.H.F. test point socket from its stowage.

(2) Unscrew the two knurled securing nuts on the front of the mounting and slide the set to port, clear of the mounting.

Note . . .
To hold the loose connectors clear when withdrawing the sets through the door aperture, a large spring clip is fitted to No. 3 *bulkhead near the top rear corner of the aperture.*

Reverse the procedure when refitting the units.

Relay unit, Type 123

36. Access to the relay unit, Type 123, is by way of the starboard ammunition compartment door. To remove the unit, adopt the following procedure:—

(1) Disconnect all plugs and sockets from the unit.

(2) Remove the locking wire from the four slide fasteners on the base of the unit and release the slide fasteners.

(3) Remove the unit from its mounting.

Note . . .
To facilitate connecting and disconnecting the four sockets and plugs on the inboard side of the unit, the shelf to which the relay and its mounting are attached may be tilted downwards. A quick-release pip pin on the after side of the shelf can be withdrawn allowing the shelf and unit to tilt. A short check chain prevents the shelf from tilting too far and jerking the connectors.

Refitting the unit is the reverse of removal. Ensure that the slide fasteners are wire-locked on completion of refitting.

Control unit, Type 383

37. The control unit is secured to the central pedestal panel AF by means of four fixing screws. To remove the unit disconnect the three plugs and sockets on the underside of the unit and detach the four fixing screws. Lift the unit clear of the panel. Reverse the procedure when refitting.

(A.L.35, Feb. 56)

A.1961 amplifier

38. The amplifier is mounted in a tray on the pilot's false floor forward of the control column. To remove the amplifier, disconnect the three plugs and sockets on the front face of the unit, unscrew the knurled nut at the front of the mounting, release the securing latch, and slide the unit clear of the mounting. Refitting is the reverse of removal, but care must be taken to ensure that the amplifier carrying handle is under the securing latch when tightening the knurled nut.

Panel RQ

39. It is necessary to remove the pilot's ejector seat to gain access to panel RQ and the I/C junction box, Type 154. When this has been done the method of removal of panel RQ is as follows:—

(1) Disconnect the three plugs and sockets on junction box, Type 154, and remove the covers from the terminal blocks and the Type S2 transmit relay RQ–A.

(2) Disconnect all leads from the terminal blocks and the Type S2 relay. Ensure that the lead identifications are clearly marked.

(3) Detach the four fixing screws securing the panel RQ to the support brackets and remove the panel. Refitting is the reverse of removal, but care should be taken to ensure that all connections to terminal blocks and relay are replaced correctly, and that the requirements for bonding and screening are complied with.

Aerials

40. The aerial for No. 1 set is located on the starboard boom, and the aerial for No. 2 set is located on the underside of the port wing near the leading edge outboard of the wing-fold.

41. To remove No. 1 set aerial, adopt the following procedure:—

(1) Remove either the inboard or outboard access panel in the boom below the aerial. Each panel is secured by 16 csk/hd. screws.

(2) Remove the two csk/hd. screws securing the matching stub to the boom.

(3) Remove the cover on the base of the aerial mounting block by unscrewing the two ch/hd. screws. Remove the large nut at the base of the aerial rod and the saddle clip holding the coaxial connector ferrule and disconnect the aerial coaxial feeder.

(4) To remove the complete aerial assembly, unscrew the four csk/hd. screws securing the mounting bracket to the surface of the tail boom. The complete assembly can now be withdrawn through the inspection panel in the boom, the whip being pulled through the rubber grommet.

(5) The mounting bracket can now be removed from the aerial base block by unscrewing the four nuts, one at each corner of the mounting.

42. If it is desired to remove the aerial whip only, proceed as in operations (1), (2), (3), and (4). Loosen the lock-nut at the base of the rod and unscrew the whip through the base block. This completes the removal of the aerial. When refitting the aerial, reverse the procedure, taking care to secure the bonding strips beneath the securing bolts on the mounting bracket.

Note . . .

It is not necessary to disturb the rubber grommet or the grommet plate unless these items need renewing.

43. No. 2 set aerial is removed in the following manner:—

(1) Remove the 12 csk/hd. screws securing the aerial mounting panel to the underside of the wing. This allows the complete aerial assembly to be detached from the aircraft to the limit of the aerial feeder. Remove the moulded cover on the base block of the aerial and disconnect the coaxial connector.

(2) The aerial assembly can now be removed from the aerial mounting bracket by unscrewing the four cheese head screws in the recesses at the corners of the base block. It is not necessary to disturb the grommet in the mounting plate for normal servicing purposes.

This completes the removal of No. 2 aerial. Refitting is the reverse of removal.

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