

GROUP A. A.R.I. 5491 (TR. 1934-1935 AIRBORNE RELAY) INSTALLATION
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Introduction

1. This group describes the A.R.I. 5491 airborne relay installation in the aircraft. It includes a brief description of the function of the relay system, and notes on servicing the equipment in situ and removal and refitting instructions. Fig. 1 gives the location of the units comprising the installation and fig. 2 is a wiring diagram giving the interconnections between units, relays, switches, terminal blocks etc. Fig. 1 of Chap. 1, Group R and S gives the routing and source of d.c. power supply for the equipment.

2. The function of circuits external to the transmitter-receivers and other main units is described in conjunction with the wiring diagram fig. 2. For detailed descriptions of the circuits of

the transmitter-receivers and the airborne relay systems as well as servicing and bench testing procedures, reference should be made to A.P. 2538 HA, Vol. 1.

DESCRIPTION

3. The A.R.I. 5491 airborne relay installation utilizes two V.H.F. transmitter-receivers, one a Type TR. 1934 covering the 100-125 Mc/s band, and the other a Type TR. 1935 covering the 124.5-156 Mc/s. band. An airborne relay unit, Type 123, enables the mic.-tel. and press-to-transmit services of each transmitter-receiver to be integrated so that the signal input of one set may be automatically retransmitted by the other set on a different frequency. The aircraft thus acts as a V.H.F. radio link between two stations, such as an aircraft on

reconnaissance and the parent carrier, when the reconnaissance aircraft is beyond normal V.H.F. range.

4. The switching of outputs and press-to-transmit services is effected electronically in the airborne relay unit, the particular facility desired and the frequencies to be used being selected on a control unit, Type 383. This control unit has four controls, two of which select any two of twenty spot frequencies covered by the transmitter-receivers. The TR. 1934 is referred to as No. 1 V.H.F. set and the TR. 1935 as No. 2 V.H.F. set. A central system switch on the control unit selects the facility required. This switch has five positions, OFF, RT1, DUAL, REL and RT2 in that order.

5. In the RT1 position of the system switch the pilot has complete control of No.1 V.H.F. set enabling him to carry out two-way communication on any one of ten spot frequencies as selected on the No.1 set channel selector switch. The supply to the other V.H.F. set will be completed and the motor generator will run but the mic. -tel. services will be disconnected. The airborne relay will also be inoperative.

6. In the DUAL position of the system switch signals received by either V.H.F. receiver will be heard in the pilot's and observer's telephones. In the event of both sets receiving signals at the same time, the signal to operate the master relay in the airborne relay unit first will be heard, the other signal being suppressed, i.e. only one signal will be heard at a time. On the other hand, the pilot or observer, by use of his press-to-transmit switch, can transmit simultaneously with both transmitters.

7. In the REL position of the system switch the installation becomes an airborne relay station. Signals received by one V.H.F. set will be automatically re-transmitted by the other set. The pilot has no control over transmissions in the REL position but he will be able to hear the signals being relayed.

8. In the RT2 position of the system switch the pilot or observer can main-

tain two-way communication using No. 2 V.H.F. set on the channel selected. The airborne-relay is inoperative and No.1 set mic. -tel. services disconnected.

9. The fourth control on the control unit, Type 383, is a dial lights dimming control which adjusts the strength of the dial illumination.

10. Each transmitter-receiver is connected to a rod type aerial, the TR.1934 being connected to an aerial, Type 228, and the TR.1935 to an aerial, Type 229. Before connection to the aerial socket of their respective V.H.F. set the aerial feeders are routed via the aerial junction box in the A.R.I.18049 V.H.F. homing installation described in Group B.

11. The microphone and telephone outputs from the two V.H.F. sets are routed into the airborne relay. From the relay unit the mic. -tel. services of the set in use are routed via the control unit to an intercomf. junction box, Type 154 on panel RQ, where they are integrated with the intercom. system as described in Group C.

12. A V.H.F. test point is provided to enable the sets to be tuned in situ. It consists of a mic. -tel. socket and press-to-transmit switch and a 'wandering' connector which can be plugged in to the mic. -tel. output socket on the front face of either transmitter-receiver. When not in use the

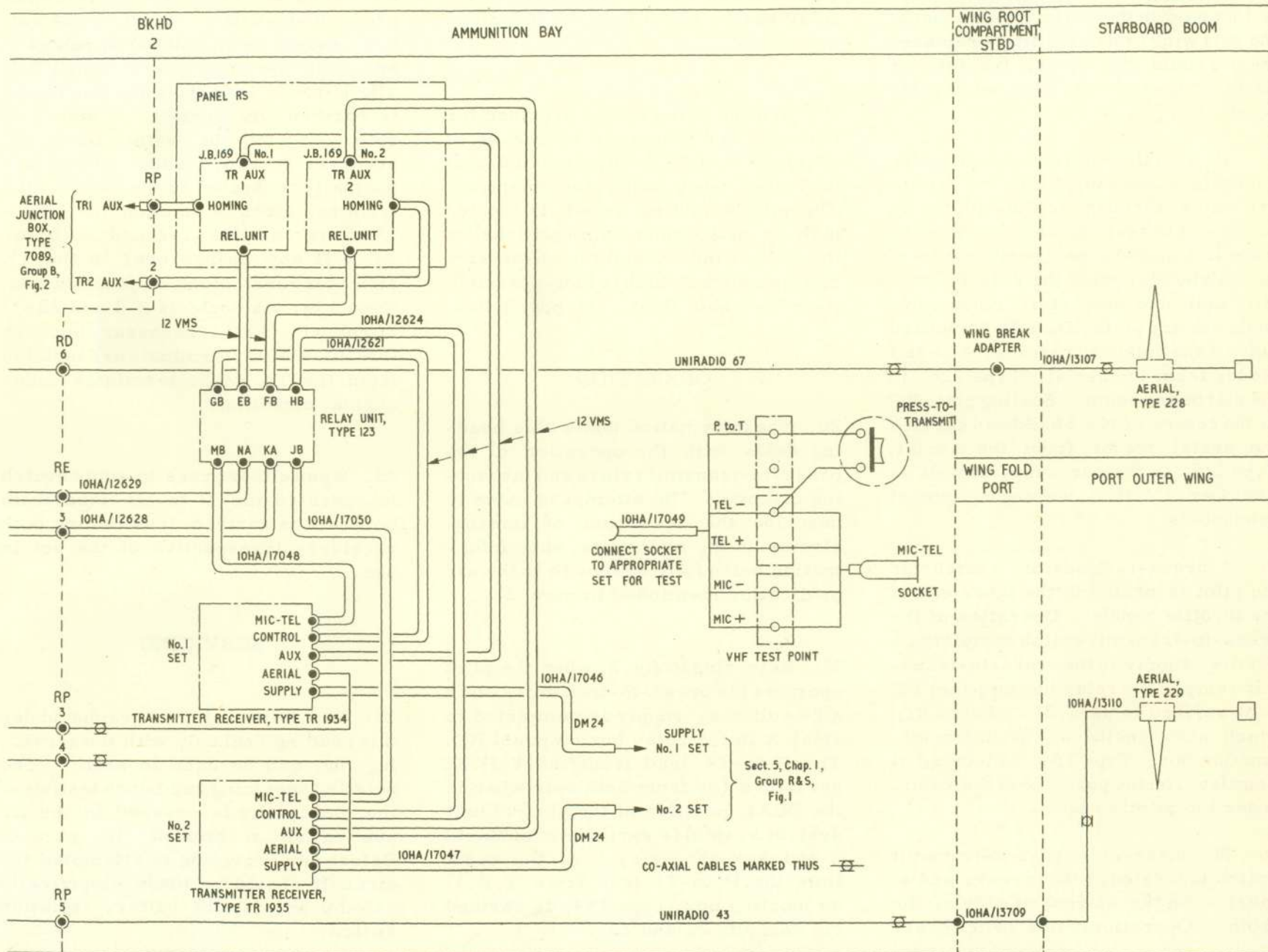
test point connector is stowed in a dummy socket on bulkhead 3 adjacent to the top V.H.F. set.

Location of Equipment

13. The two transmitter-receivers are secured in anti-vibration mounting trays in the ammunition compartment between bulkheads 2 and 3. The sets are mounted one above the other, the TR.1935 uppermost, and access to either unit is via the port ammunition bay access door. The V.H.F. test point is secured to the aft face of No.2 bulkhead just inside the access door on the port side of the ammunition bay. The relay unit, Type 123, is mounted in the same compartment between bulkheads 2 and 3 and access to this unit is via the starboard ammunition bay access door.

14. The control unit, Type 383, is mounted on panel AF in the cabin above the nose wheel tunnel. The aerial, Type 228, is located on the upper surface of the starboard boom, the aerial base block being secured to a mounting bracket inside the boom. The aerial rod passes through a rubber grommet in the boom surface.

15. The aerial, Type 229, is located on a detachable panel in the underside of the port outer wing, the rod projecting downwards through a rubber grommet in the undersurface of the panel. A short length of coaxial cable



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1935) airborne relay wiring

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in the form of an 'expendable' feeder is inserted in the aerial feeder run at the port wing fold to facilitate replacement should the feeder fracture or sustain damage at this vulnerable point.

16. All aerial feeders and multi-way connectors are routed into the pressure cabin through sealing plates in the rear pressure bulkhead. Sealing plate RE in the upper port corner of the bulkhead carries the V.H.F. control unit and mic.-tel. connectors while sealing plate RD on the starboard side of the bulkhead carries the aerial feeder from the aerial, Type 228, in the starboard boom. Sealing plate RP in the centre of No. 2 bulkhead carries the aerial feeder from the aerial, Type 229, in the port wing, as well as a number of V.H.F. homing equipment connectors.

17. A press-to-transmit switch for the pilot is located in the inner end of the throttle handle. Operation of the press-to-transmit switch completes a 24v d.c. supply to the press-to-transmit relay in the relay box on panel RQ as described in para. 21. Panel RQ, which also includes the intercom. junction box, Type 154, is located at floor level on the port side of the cabin, under the pilot's seat.

18. The observer's press-to-transmit switch is located at the forward end of panel A on the starboard side of the cabin. Operation of this switch ener-

gizes a press-to-transmit relay in the relay box on panel RQ, as described in para. 22.

19. Muting switches are provided for the pilot and observer by means of which the V.H.F. receiver output may be muted when using the intercom. The pilot's muting switch is located high up on the port cabin wall below the D.V. window, and the observer's muting switch, which is foot-operated, is on the cabin floor, starboard side.

OPERATION

20. The information under this heading deals with the operation of the press-to-transmit relays and the muting circuits. No attempt is made to describe the operation of internal circuits in the main units, such information being fully dealt with in the air publication mentioned in para. 2.

21. Referring to fig. 2, when the pilot operates his press-to-transmit switch a 24 volt d.c. supply is completed to relay A in the relay box on panel RQ. The P-to-T+ lead from the V.H.F. set in use (or from both sets when in the DUAL position of the control unit system switch) is earthed via contacts 2 and 3 of the relay. At the same time the P-to-T+ lead from T.B.1: on junction box, Type 154, is earthed via contacts 22 and 23.

22. When the observer operates his press-to-transmit switch a 24 volt d.c. supply is completed to relays B and C in the relay box on panel RQ. The P-to-T+ lead from the set in use is earthed via contacts 2 and 3 of relay C. At the same time the observer's mic. leads which are normally connected to the CREW MIC terminal block in junction box, Type 154, via contacts 1-2 and 21-22 or relay B now change over to the TX MIX. terminal block on junction box, Type 154, via contacts 2-3 and 22-23 of relay B. This is necessary because the CREW MIC. terminals are isolated from the TX MIC. terminals under normal conditions.

23. When either press-to-mute switch is operated the P-to-M+ lead from both sets is earthed, thus muting both receivers irrespective of the set in use.

SERVICING

24. The following paragraphs under this heading deal only with the servicing that can be done in situ. The detailed servicing and bench testing of the main units is covered in the air publication mentioned in para. 2. Before any servicing is attempted the aircraft should be made electrically safe by opening the battery isolation switch.

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25. Each transmitter-receiver should be checked for security in its mounting tray ensuring that the knurled lock-nuts are tight and that the spigots at the rear of the set engage in their mating holes in the mounting tray. The anti-vibration mountings should be checked for effectiveness, ensuring that the sets do not foul adjacent aircraft structure under normal vibration. The connecting plugs and sockets should be examined for signs of damage or corrosion and should be check-tightened.

26. The airborne relay should be examined for security of attachment to its mounting tray and for signs of damage and corrosion. The unit is held in its tray by four slide fasteners and these should be securely wire-locked in the closed position. The connecting plugs and sockets should be screwed well home and the anti-vibration mountings should be checked for effectiveness ensuring that adequate clearance exists between the unit and adjacent structure.

27. All cables and connectors associated with the installation should be securely clipped to the aircraft structure to ensure efficient bonding of the metal braided connector covers. The Mic.-tel. sockets are fully described in Group C which deals with the inter-com. system.

28. The aerials should be inspected periodically for signs of corrosion or

fatigue. The rubber grommet should be changed if it shows signs of splitting or perishing. The inner conductor of the matching stub on each aerial is connected to the outer braided cover at the end remote from the aerial. An insulation check of the aerial system will show zero if the matching stub is not disconnected.

Functional test

29. A functional test of the V.H.F. airborne relay installation may be carried out in the following manner:-

(1) Complete the battery supply by operating the battery isolation switch or plugging in a ground supply.

(2) Connect a standard headset to the pilot's and observer's mic.-tel. sockets.

(3) Place the system switch on the V.H.F. control unit, Type 383, in the RT1 position and select suitable test frequencies for No. 1 and No. 2 set.

(4) After a short warming up period, background noise will be heard in the phones. Press the pilot's press-to-mute switch and note that the background noise (or signal strength if signals are available) is reduced. Repeat the operation using the observer's foot-operated muting switch.

(5) Operate the pilot's press-to-

transmit switch and make a check call with control tower or radio test room. Release the press-to-transmit switch to receive.

(6) If two-way communication is satisfactory, check the operation of the observer's press-to-transmit switch.

(7) Turn the system switch on the control unit to the DUAL position. Receiver background noise will not be heard in the phones until a signal is received by one of the receivers. 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 or dummy load.

(8) Turn the system switch to RT2 and carry out a check with control or radio test room, proceeding as in (5) and (6) using the pilot's press-to-transmit switch only.

(9) Turn the system switch to REL and check the operation of the airborne relay system, ensuring that the frequencies chosen will not give rise to mutual interference. Full details of the airborne relay operation, functional tests and mutual interference considerations are given in A.P. 2538 HA, Vol. 1, Part 1, Sect. 2, Chap. 3.

(10) Switch off the installation and remove the headsets.

REMOVAL AND INSTALLATION

30. Access to the transmitter-receivers is through the ammunition loading bay door in the port side of the fuselage between bulkheads 2 and 3. Disconnect all plugs and sockets from the front face of the units and unscrew the knurled securing nuts at the front end of the mounting tray. The units can then be withdrawn from their mounting trays. It will be necessary to remove the lower set first to provide clearance for the upper set when that unit is removed. Before removing the upper set, disconnect the V.H.F. test connector from the dummy socket on No. 3 bulkhead adjacent to the set.

31. Mod. N. 924 introduces additional cooling blowers to the V.H.F. sets and it will be necessary to remove the upper cooling blower and its mounting cradle before removing either set. To remove the upper blower unscrew the knurled locknut securing the mounting cradle in its mounting bracket and disconnect the supply socket. The complete blower assembly can now be removed. The connection between the blower and the V.H.F. set is via an aperture in the crystal cover, a sponge rubber ring being interposed between the cover and the blower. The ring is secured to the blower with Bostik adhesive and is withdrawn with the motor.

32. It is not necessary to remove the lower blower as withdrawing the lower V.H.F. set will withdraw the duct on the side of the cover from a sponge rubber ring attached to the blower. The covers on the upper and lower sets are modified by R.M.C. action to accommodate the blower motor air connections.

33. When refitting the transmitter-receivers, fit the upper set first, ensuring that the unit slides freely in its tray and that the spigots at the rear of the set engage in the holes in the mounting tray. Reconnect all plugs and sockets and replace the test connector in its stowage socket. Refit the upper blower assembly ensuring that the sponge rubber ring seats correctly over the aperture in the crystal cover. The knurled locknut securing the cradle in its mounting bracket should be wirelocked on completion. Ensure that the duct on the lower crystal cover engages in the rubber ring on the blower.

34. To gain access to the airborne relay unit, open up the access door in the starboard side of the ammunition loading bay between bulkheads 2 and 3. The relay and mounting tray are secured to a hinged shelf held in position by a pip pin. After disconnecting the four outboard plugs and sockets on the relay unit, remove the pip pin and lower the shelf sufficiently to provide easy access to the remaining four connectors on the inboard side of the

relay unit. Disconnect these plugs and sockets and remove the wirelocking on the slide fasteners securing the unit in its mounting tray. Release the fasteners and lift the unit clear of the mounting.

35. Reverse the procedure when refitting ensuring that all the plug and socket connections are screwed well home. A light smear of lubricant, DTD. 577, applied to the threaded portion of the plugs and sockets will facilitate removal and refitting and prevent the threads from binding. Wirelock the slide fasteners on completion of refitting.

36. The removal of the control unit on the central panel AF in the cabin is self-evident when viewed in situ and needs no description here.

37. Before removing the aerial, Type 228, in the starboard boom it will be necessary to open up the inspection panels on either side of the boom below the aerial. These are held in position by sixteen 2 B.A. csk./hd. screws. When the panels have been removed unscrew the two 4 B.A. ch./hd. screws securing the cover to the base block of the aerial. The aerial feeder can now be disconnected after removing the locknut at the base of the aerial rod and the saddle clamp over the ferrule. Release the matching stub by unscrewing the two 4 B.A. csk./hd. screws in the boom upper surface aft of the aerial.

38. Unscrew the four 2 B.A. csk./hd. screws securing the aerial mounting bracket to the inside of the boom and remove the complete aerial assembly from the boom, pulling the aerial rod down through the rubber grommet. If difficulty is experienced in pulling the rod down through the grommet a light smear of a vegetable base lubricant such as Hellerman fluid on the rod will facilitate its withdrawal. Reverse the procedure when refitting.

39. To remove the aerial, Type 229,

in the underside of the port wing, first unscrew the twelve 2 B.A. csk./hd. screws securing the mounting plate to the wing undersurface. The aerial assembly and mounting plate can now be removed from the wing to the limit of the aerial feeder. Remove the cover on the base block and disconnect the feeder as described in para. 37. Unscrew the four 2 B.A. ch./hd. screws securing the block in the mounting bracket and remove the aerial, pulling the rod through the grommet. Reverse the procedure

when refitting.

40. When removing the expendable aerial feeder at the port wingfold, disconnect the plug and socket at either end and unhook the bungee rubber cord from the small bracket on rib 7a. The expendable feeders are supplied with the rubber cord attached. The point of attachment of the cord to the feeder should be 3 in. from the end in order to maintain a constant strain on the feeder while the wing is folding or spreading.

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