CHAPTER 2 RADAR INSTALLATION

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LIST OF ILLUSTRATIONS

Equipment employed

1. The Radar Installation equipment employed in this aircraft are listed below, together with the relevant Air Publications to which reference should be made for a description and the necessary servicing required to maintain them in an efficient condition.

Radar Ranging Installation	
Ranging unit, Type X.1219	*A.P.2917E, Vol. 1*
Radar head, Type 2	
Junction box, Type 370	
Inverter, Type 200	*A.P.4343B, Vol. 1, Book 3, Sect. 16*
Tumbler switch S.P./C.O., Type XD.441/1 *(target reject)* ...	*A.P.4343C, Vol. 1, Book 1, Sect. 1*
I.F.F. Installation	
Receiver, Type R.3121A	*A.P.2887D, Vol. 1*
Mounting rack, Type 1110	
Control unit, Type 89	
Control unit, Type 90	
Aerial, Type A.193159	*Hawker design*
Aerial adaptor, Type 145	—

DESCRIPTION

General

2. This Chapter contains a description of the radar equipment installed in this aircraft. including the servicing necessary to maintain the installation in an efficient condition. Information on the removal of the various components, together with illustrations showing the location and interconnection of the equipment is also included. The Radar Installation consists of an I.F.F. installation and a radar ranging installation. The transmitter-receiver of the I.F.F. installation is carried on a radio mounting structure extending between frames 16 and 19 on the port side of the radio bay *(front fuselage)* and employs a suppressed aerial. The radar head of the radar ranging installation is located in the nose of the aircraft, while the ranging unit is situated just forward of frame 6 *(front fuselage)*. The installations are remotely operated by control units situated in the cabin.

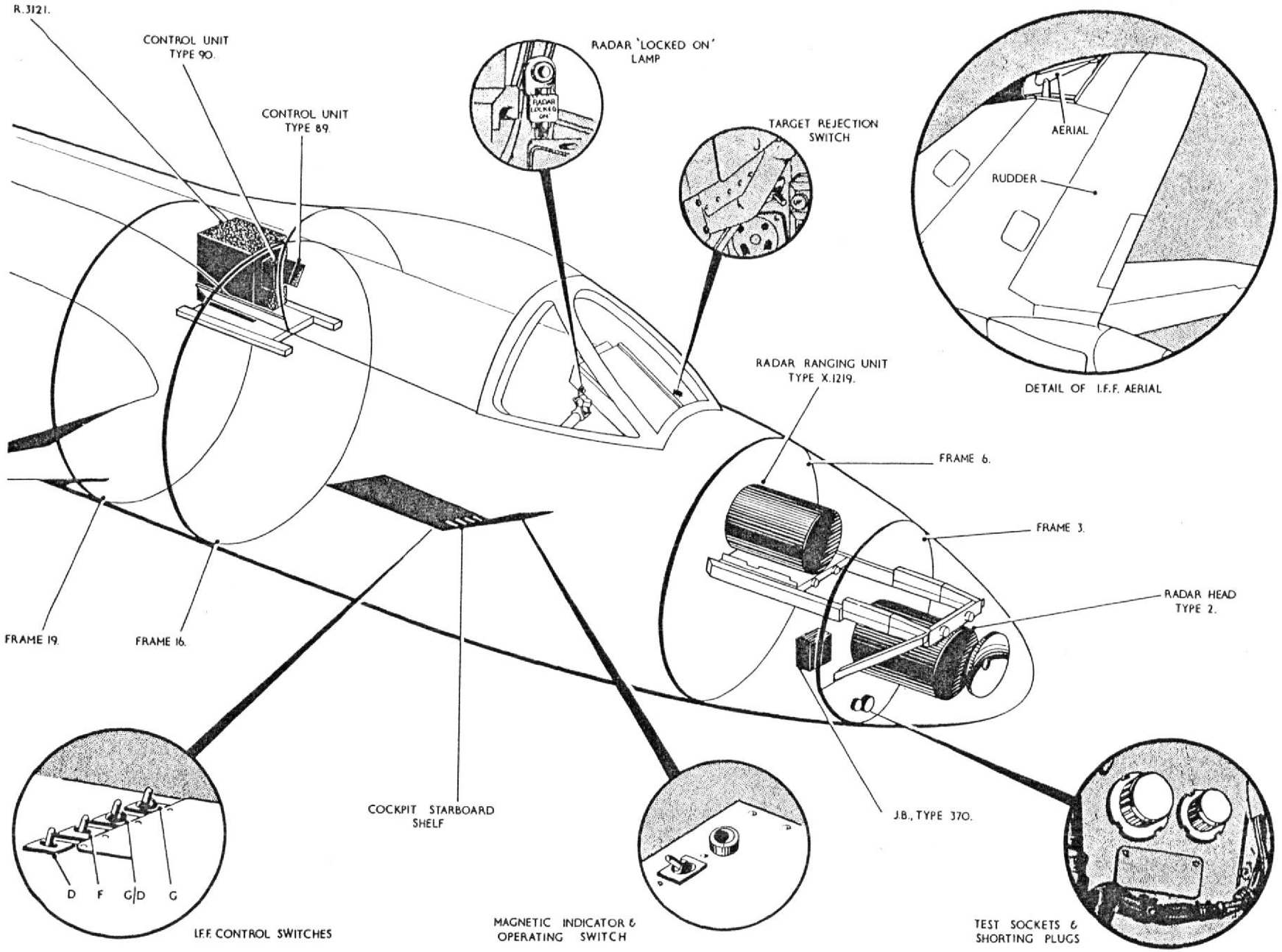

Fig. 1. Location

Radar ranging installation

3. The radar ranging installation for use in conjunction with the gyro gun sight *(described in Sect. 5, Chap. 2, Group 4A)*, employs a radar head and a ranging unit, which are interconnected by a junction box. The radar head is carried on a mounting structure extending forward from frame 3 in the nose of the aircraft, while the ranging unit is located between frames 4 and 6 on a mounting structure at the top of the nose wheel bay. The junction box is bolted to the rear face of frame 3 on the starboard side below the ranging unit.

4. The power supply for the installation is obtained from No. 2 inverter in the A.C. supplies circuit *(Sect. 5, Chap. 1, Group E.1)* and from an inverter mounted on the underside of the radio mounting structure in the radio bay. The equipment is switched on by a switch located on the forward portion of the cabin port shelf, and a magnetic indicator adjacent to this switch is provided to show when the installation is operating. A lamp on the starboard side of the gun sight mounting structure is provided to indicate when the radar has 'locked on' to a target, and a target rejection switch is located on frame 9 above the cabin port shelf.

5. To enable the installation to be checked for correct operation, test sockets with shorting plugs and a test switch are provided. The test sockets are located on the rear face of frame 3, and the test switch is situated on the rear portion of the cabin port shelf. The radar head, ranging unit and the inverter are all cooled by the circulation of spent air taken from the cabin pressurization system *(Sect. 3, Chap. 8)* before final discharge to atmosphere. A connection, for the introduction of cooling air when ground testing the installation, is provided in the port side of the front fuselage skin. The electrical supply circuit of the installation is described in Sect. 5, Chap. 1, Group H.1. When the radar head and ranging unit are not installed, special ballast weights *(para. 26)* must be fitted in lieu.

I.F.F. Installation

6. This installation, the basic purpose of which is to enable the aircraft automatically to identify itself as friendly when challenged by appropriately equipped air, sea and ground forces, also has a supplementary purpose to enable the aircraft to serve as a beacon on which other appropriately equipped aircraft can 'home'. In addition, identification can be given to G.C.I. stations. The installation employs a receiver, carried on a mounting rack located on the top platform of the radio mounting structure in the radio bay, a suppressed aerial in the leading edge of the fin, near the top, controls, which are used to pre-set the installation before flight, consisting of control units mounted together on the rear face of frame 16 above the radio mounting structure, and four separate switches, marked G, G/D, F and D respectively, situated on the cabin starboard shelf for remote control of the installation in flight. The electrical supply circuit of the installation is described in Sect. 5, Chap. 1, Group H.1, and the installation operates in the three following frequency ranges:—

A—band 157 to 187 Mc/s.
R—band 172 to 182 Mc/s.
G—band 200 to 210 Mc/s.

Interconnection

7. The various components of each radar installation are interconnected *(as shown in figs. 2 and 3)* by a number of connectors strapped and clipped to the aircraft structure. These connectors are of the metal-braided and non-braided type fitted with standard and miniature plug and socket type breakdown points.

OPERATION

General

8. For the guidance of servicing personnel a brief description of the operating procedure for the radar installation installed in this aircraft, will be found in the following paragraphs.

Radar ranging installation

9. The setting-up and operating instructions for the installation are given in full detail in the relevant Air Publications *(listed in para. 1)*, but for those who do not require this amount of detail, the following brief summary is given.

10. The installation operates in conjunction with the gyro gun sight to provide continuous range information of a traget within the limits of the radar beam from the nose of the aircraft and is switched on by an ON-OFF switch marked G.G.S., RADAR RANGE, and a magnetic indicator, which is marked RADAR SUPPLY IND., is located adjacent to this ON-OFF switch to indicate when the installation is being supplied and is ready for operation. The gyro gun sight supply is independent of the radar ranging installation and the sight must be switched on separately by means of the gun sight master switch.

11. It must be noted that the ranging installation will only control the range mechanism of the gun sight when the gun sight selector-dimmer control unit is set to the G or G and F positions. The throttle twist grip, used as a manual range control of the gun sight, will normally override the ranging installation when set to the minimum range position.

12. When following a target, the radar equipment will lock-on to it when it is within a range of 1,500 yards and within the beam. This is indicated by the lighting of the 'locked on' lamp mounted on the sighting head of the gun sight. The installation is provided with a spring loaded target reject switch marked IN and OUT. This switch is used to check that the installation has locked-on to the desired target and to unlock the installation from an unwanted target, ground reflection or cloud with a large water content. When the switch is moved to the IN position, the strobe circuits in the ranging unit are moved inwards in range from the

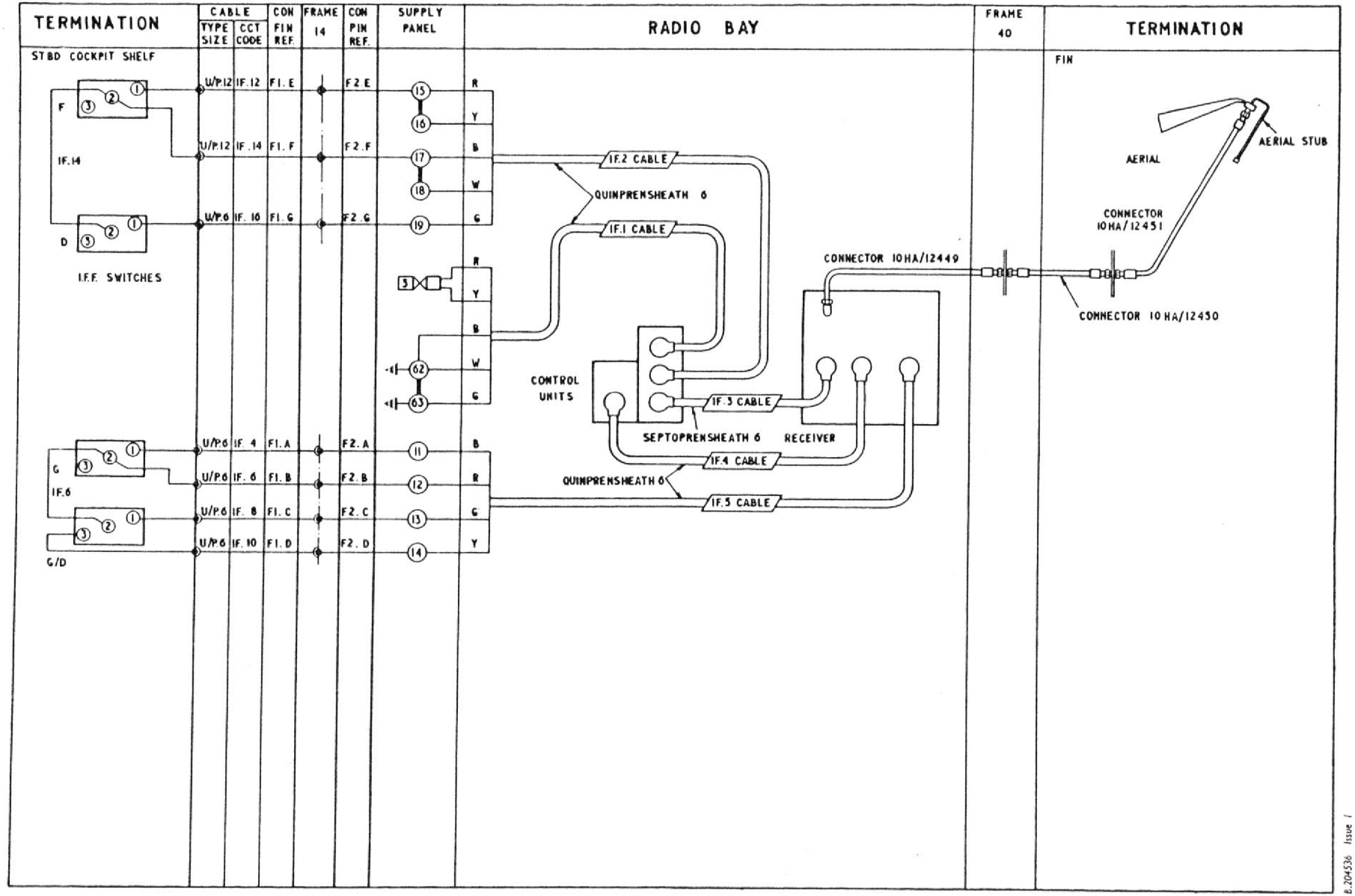

Fig. 2. Interconnection (I.F.F.)

unwanted target and then continue to search inwards regardless of whether the switch is released or not. If they do not encounter another target before reaching the minimum range they are flashed out to maximum range and the normal search cycle continues. When the switch is operated to the OUT position, the strobes are moved outwards in range and continue to search outwards to maximum range. The strobes will remain at maximum range as long as the switch is held, but when it is released, the strobes will resume the normal inwards search.

I.F.F. installation

13. The setting-up and operating instructions for this installation are given in full detail in the relevant Air Publications *(listed in para. 1)* but for those who do not require this amount of detail, the following brief summary is given.

14. The code selector switch on the control unit is set before flight in accordance with the orders of the day and the installation is entirely automatic in operation. Four control switches are, however, provided on the cabin starboard shelf for switching on the equipment and for selecting the various operational facilities. These switches are as follows:—

(1) F-SWITCH. This is a single-pole ON-OFF switch with an upright off position. It is used to switch on the installation and normal A-band operation results.

(2) D-SWITCH. This is also a single-pole ON-OFF switch with an upright off position. It is employed in an emergency, and when placed in the ON position will give a distress signal to all stations.

(3) G-SWITCH. This is a single-pole ON-OFF switch with a spring-return to the centre off position. It is operated only on instruction from the ground controller and alternate G and A-band operation results for 35 seconds.

(4) GD-SWITCH. This is a single-pole change-over switch with no off position. It is employed when operating with a G.C.I. station, and when placed in the ON position will give a distress signal to that particular station.

SERVICING

General

15. The servicing necessary to maintain the installation in an efficient condition and the standard serviceability tests, which should be applied, together with the equipment to be used and the method of conducting the tests is contained in the relevant Air Publications *(listed in para. 1)*. Any units suspected of being unserviceable should be carefully checked *in situ* and if found to be faulty, removed from the aircraft and taken into the workshop for rectification action as necessary. The location of the radar equipment is illustrated in fig. 1, the interconnection in figs. 2 and 3, and wiring diagrams of the power supplies will be found in Sect. 5, Chap. 1, Group H.1.

Power supply

16. If a fault is reported in the radar installations, the power supply should first be checked, in conjunction with the routing and theoretical diagrams given in Sect. 5, Chap. 1, Group H.1, to ensure that the trouble is not located in the aircraft electrical system. The voltage, both on and off load, must be tested and a check made to ensure that the connectors carrying the supply to the equipment are correctly assembled.

Cables and connectors

17. Servicing of cables and connectors consists of the standard continuity and insulating resistance tests and of a periodical examination throughout their entire length for any signs of damage or deterioration of the insulation. If any signs of these defects are found, the complete cable or connector must be replaced. All the clips and straps securing the connectors to the structure must also be examined for signs of looseness and rectified as necessary to prevent chafing. All the plug and socket connections must be checked to ensure that they are fitted properly and that the fixings are tightened securely.

Radar ranging installation

18. The necessary servicing information for this installation is contained in the relevant Air Publications *(listed in para. 1)*, together with the test sets and ancillary equipment required.

I.F.F. installation

19. A detailed description of the servicing necessary to maintain this installation in an efficient condition, together with information on testing and fault diagnosis will be found in the relevant Air Publications *(listed in para. 1)* together with the test sets and ancillary equipment required.

Final check

20. After servicing the radar installation, ensure that the equipment is switched OFF and that all access doors, and the panels which were removed in order to gain access, are correctly replaced and secured.

REMOVAL AND ASSEMBLY

General

21. The recommended procedure for removing the majority of the components comprising the radar installation is given in the following paragraphs. The method of assembly is, in general, the reverse of the removal sequence, but when there is any special assembly feature it is covered by a note in the appropriate paragraph. Before removing or replacing any component, the aircraft electrical system must be rendered safe *(Sect. 5, Chap. 1, Group A.1)*.

Inverter, Type 200

22. The recommended method of removing this component is covered in the removal of the gun firing panel *(described in Sect. 5, Chap. 1, Group A.2)*.

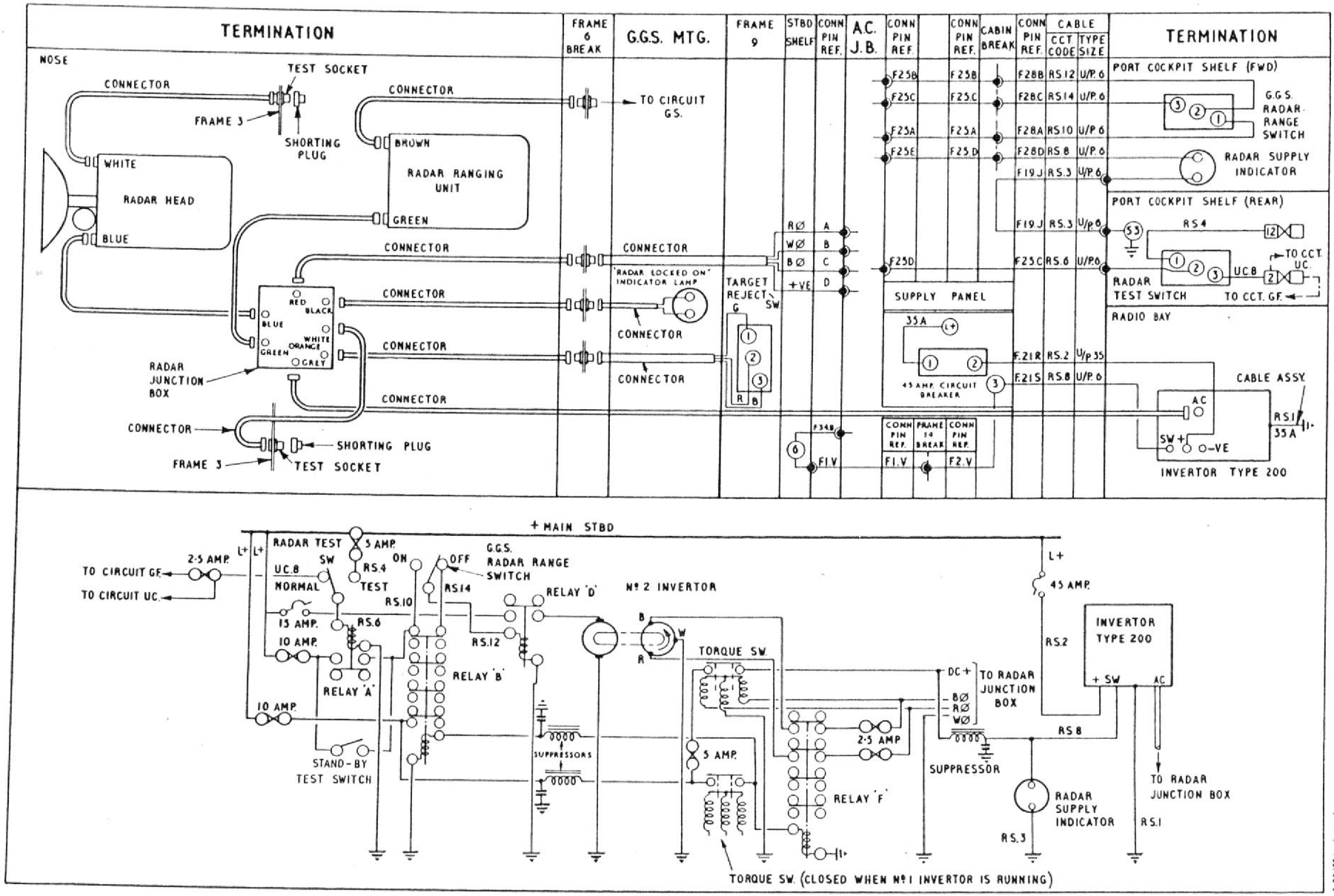

Fig. 3. Interconnection (Radar Ranging)

Radar head, Type 2

23. The recommended method for removing this component is as follows:—

(1) *Render the aircraft electrically safe (Sect, 5, Chap. 1, Group A.1).*

(2) Gain access to the radar head by removing the nose piece *(Sect. 3, Chap. 1).*

(3) Disconnect the two connectors at the radar head. Fit approved caps and covers to the plugs and sockets and stow the connectors clear of the unit.

(4) Disconnect the cooling air pipe from the port side of the radar head. Mask off the end of the air pipe and the entry into the radar head to prevent the ingress of foreign matter.

(5) Disengage the two catch assemblies retaining the radar head in its mounting rails and remove the component from the aircraft by carefully withdrawing it forward along the rails until it is clear of the structure.

Ranging unit

24. To remove this unit proceed as follows:

(1) *Render the aircraft electrically safe (Sect. 5, Chap. 1, Group A.1).*

(2) Gain access to the nose wheel bay and disconnect the two connectors from the forward end of the ranging unit. Fit approved caps and covers to the plugs and sockets and stow the connectors clear of the unit.

(3) Disconnect the cooling pipe from the port side of the ranging unit. Mask off the end of the air pipe and the entry into the ranging unit to prevent the ingress of foreign matter.

(4) Taking the weight of the unit, withdraw the spring-loaded catch pins securing the mounting tray to the mounting beam. Still supporting the tray and ranging unit, allow them to swing down, under control, to their full extent.

(5) To remove the ranging unit from its mounting tray, support the unit and disengage the two catch assemblies retaining it in the tray. Carefully withdraw the unit from the tray and remove it from the aircraft.

(4) Disconnect the cooling pipe from the port side of the radar head. Mask off the end of the air pipe and the entry into the radar head to prevent the entry of foreign matter.

(5) Disengage the two catch assemblies retaining the radar head in its mounting rails and remove the component from the aircraft by carefully withdrawing it forward along the rails until it is clear of the structure.

Receiver 3121

25. To remove this receiver, proceed as follows:—

(1) *Render the aircraft electrically safe (Sect. 5, Chap. 1, Group A.1).*

(2) Disconnect the connectors from the receiver and fit approved caps and covers to the plugs and sockets. Stow the connectors clear of the set.

(3) Unscrew and disengage the two knurled catches securing the receiver to the mounting rack and pull the receiver inboard to release the two retaining spigots at the rear of the receiver.

(4) Remove the receiver from the aircraft.

Control units, Type 89 and 90

26. The recommended procedure for removing these control units is as follows:—

(1) *Render the aircraft electrically safe (Sect. 5, Chap. 1, Group A.1).*

(2) Diseonnect the connector from the Type 89 control unit and the three connectors from the Type 90 control unit. Fit approved caps and covers to the plugs and sockets and stow the connectors clear of the control units.

(3) Remove the four bolts securing the Type 90 control unit and its mounting bracket to frame 16 and remove the bracket complete with control unit, from the aircraft, taking care to retain the four washers.

(4) Remove the two bolts securing the Type 89 control unit and its mounting bracket to frame 16 and remove the bracket, complete with control unit, from the aircraft, taking care to retain the two washers.

(5) To remove the control units from their mounting brackets it is only necessary to remove the screws passing through the brackets and into the back plates of the control units, taking care to retain the spring washers. The Type 89 control unit is secured by two screws, while the Type 90 unit is retained by three screws.

Note . . .

On re-assembly of the mounting brackets and control units to frame 16, ensure that the bonding wires from the pressurization pipes are replaced under the heads of the top fizing bolts.

Receiver 3121 Aerial

27. The recommended method of removing this aerial is as follows:—

(1) *Render the aircraft electrically safe (Sect. 5, Chap. 1, Group A.1).*

(2) Remove the aerial access door from the leading edge of the fin.

(3) Remove the nut and bolt securing the lower end of the aerial blade to the insulator bracket.

(4) Remove the nut from the adapter mounted on the fin rear spar extension and disconnect the aerial matching stub.

(5) Disengage the aerial blade from the adapter and remove it from the aircraft.

Junction box Type 370

28. The recommended procedure for removing this junction box is as follows:—

(1) *Render the aircraft electrically safe (Sect. 5, Chap. 1, Group A.1).*

(2) Gain access to the junction box by removing the access door from the undersurface of the front fuselage forward of the nose wheel bay.

(3) Disconnect the seven connectors from the junction box and fit approved caps and covers to the plugs and sockets. Stow the connectors clear of the junction box.

(4) The junction box may now be removed from the structure by removing the four bolts securing it to the mounting brackets on frame 3, taking care to retain the washers.

Note . . .

On re-assembly of the junction box, ensure that the bonding connector is refitted on the outboard bottom attachment bolt.

Ballast for radar ranging

29. Ballast weights *(Ref. 26FX/3963 and 26FX/3964)*, representing the ranging unit and radar head respectively, are supplied to special order only *(Mod. H.21)* for fitment when this radar equipment is not installed. These weights incorporate stowage points for the electrical cables and cooling air pipes and are carried on the mounting structure normally used by the radar equipment. The assembly of the weights is similar to that for the radar equipment, which is a reversal of the removal instructions given in paras. 23 and 24 of this Chapter, with the exception that the retaining catches, which normally engage with the radar equipment, should in the case of the ballast weights pass through the holes in the forward plates of each weight and engage with the chamfered portion at the lower edge of each hole.