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**CHAPTER 2A**

**▶ ARI-23090 ◀**

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**Introduction**

1. This chapter deals with the installation and general functioning of the ARI-23090 introduced by Mod.2300. The location of the

major components will be found in fig.1; a connector table and routing chart are provided at the end of the text. Description and servicing details for the ARI-23090 are given

in AP 116D-0102-1A which should be read in conjunction with the information contained in this chapter. The associated 28-volt dc power supplies are fully described in Sect.6., Chap.6 of this publication.

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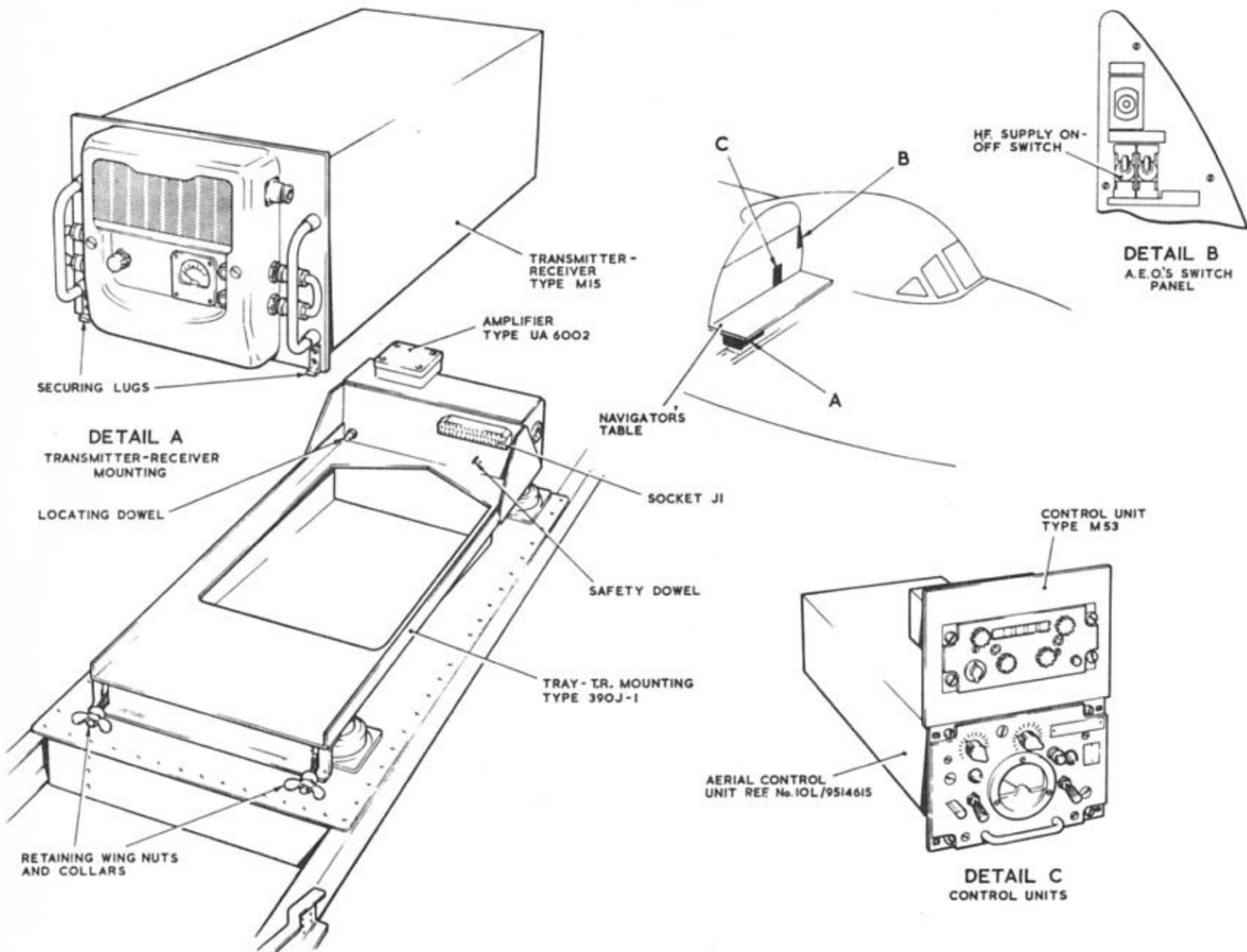


Fig.1 (1) Component location

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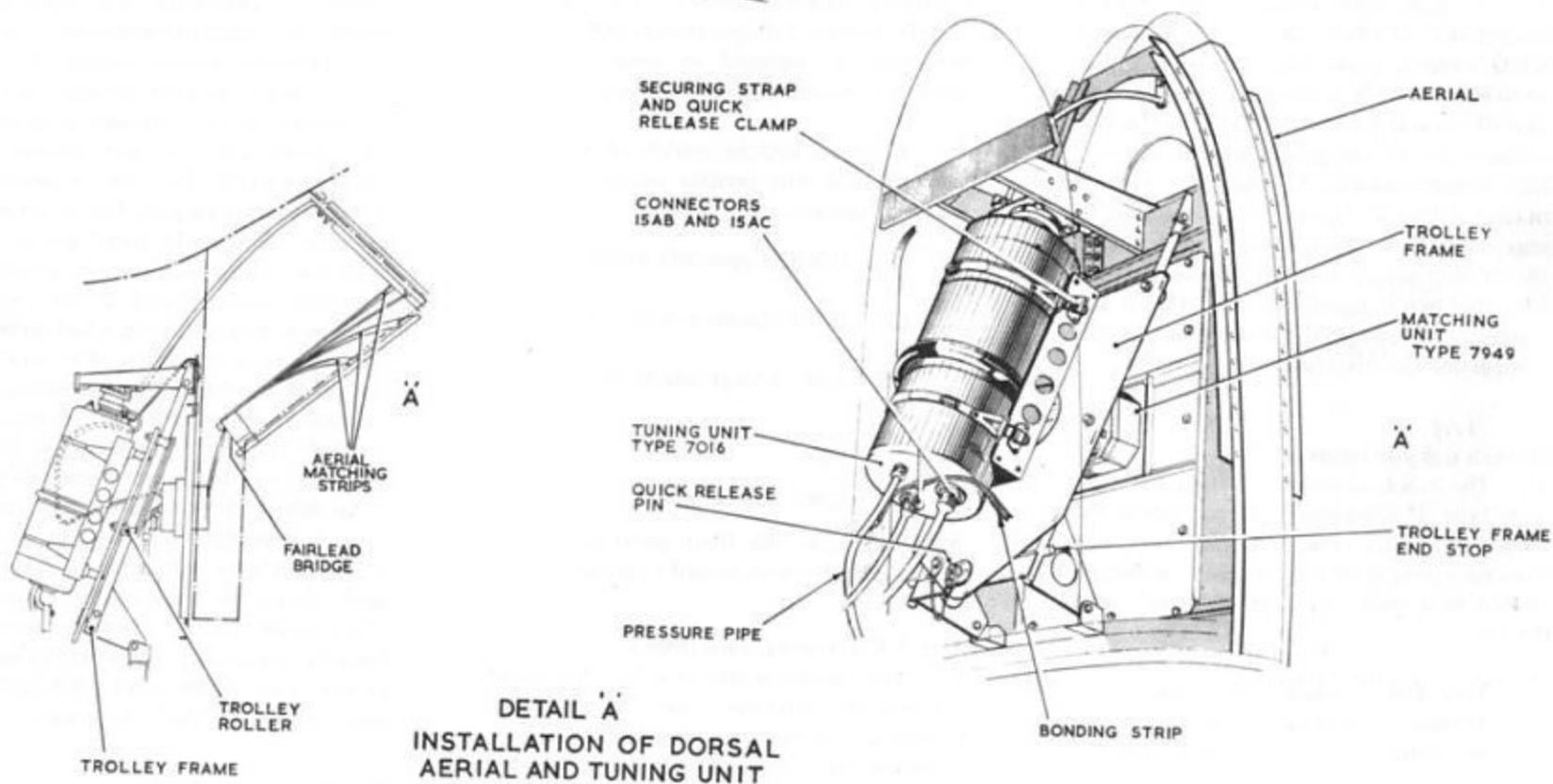
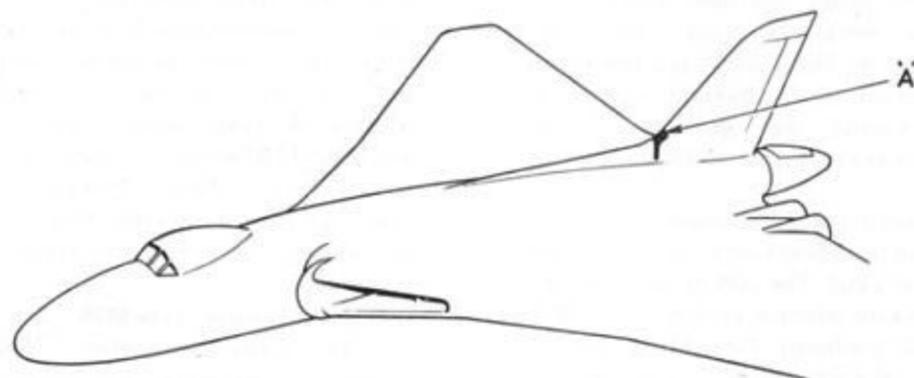


Fig.1 (2) Component location

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## DESCRIPTION AND OPERATION

### Brief description

2. The installation is a multi-channel transmitter-receiver providing Radio Telephone, Carrier Wave or Data communication within the high frequency band from 2 MHz to 30 MHz. The equipment will transmit or receive on any one of 28,000 selected carrier frequencies spaced at intervals of 1 KHz.

### Power supplies

3. A single-pole power supply switch labelled H.F. SUPPLY-OFF is located on the A.E.O.'s switch panel (fig.1). With the switch set to H.F. SUPPLY, a 28-volt d.c. supply from fuse 697 in panel 48P is fed via closed switch contacts 2-1 to energize relay 334 in panel 28P. Relay contacts A1 and A2 close to connect a 28-volt d.c. supply from C.B.52 in panel 15P to the A.R.I. equipment. A further 28-volt d.c. supply is fed to the equipment from fuse 696 in panel 48P. The 115-volt a.c. supply for the equipment is fed from fuse 259 in panel 25P (Sect.6, Chap.4).

### Controls and unit location

4. The A.R.I. is controlled from a control unit, Type M53, located at the port side of the navigator's panel. The following associated units are mounted on anti-vibration mountings, located on a shelf below the navigator's table (fig.1).

Tray, T/R mounting	Type 390J-1
Transmitter-receiver	Type M15
Amplifier	Type UA6002

### Control unit, Type M53

5. The control unit, Type M53, consists of

a rectangular casing and front panel which, collectively house frequency and mode selection circuits. The front panel is fitted with various controls which allow the operator to remotely control the operation of the transmitter-receiver, Type M15 (fig.1).

6. Transmitter-receiver frequency selection is controlled from four rotary selector switches on the front panel. The selector switches form part of a binary selection control system; MHz control (28 positions), 100 KHz control (10 positions); 10 KHz control (10 positions) and 1 KHz control (10 positions). The selected frequency is displayed on counters visible through a window in the front panel.

7. A mode selector switch at the front panel of the unit permits selection of the following services:-

- (1) U.S.B. (Upper Side Band)
- (2) L.S.B. (Lower Side Band)
- (3) A.M. (Amplitude Modulation)
- (4) DATA
- (5) C.W. (Carrier Wave)

8. Fitted on the front panel is an R.F. SENS. control which is used to adjust r.f. gain.

### Tray T/R mounting, Type 390J-1

9. The mounting tray is a flat rectangular framework supported on four resilient mountings. At its rear, a backplate carries an interconnection panel comprising two terminal boards and a sixty-pole socket which engages with a corresponding sixty-pole plug on the transmitter-receiver. The backplate is also

fitted with a single safety dowel which locates with a corresponding hole at the rear of the transmitter receiver. The safety dowel prevents a transmitter receiver incorporating an incompatible power supply module from being inadvertently located in the tray. Two locating dowels fitted to the tray backplate, and two wing nuts fitted to the front transverse member secure the transmitter receiver.

### Transmitter-receiver, Type M15

10. The transmitter-receiver, Type M15, comprises a rectangular case which houses a number of transistorized modules constituting the transmitter-receiver circuits. The case is fitted with a front panel on which is located a five position selector test switch, an associated panel meter and two jack sockets labelled PHONE and MIC. The selector switch, meter and jack sockets are used for testing purposes. At either side of the panel are six co-axial connectors which accommodate aerial and link connector cables. Fitted at the rear of the casing is a sixty-pole plug which provides the connection point between the transmitter-receiver, the remaining A.R.I. equipment units and the external power supplies. The rear of the casing is also fitted with two locating dowel holes and a safety dowel hole. The position of the safety dowel hole is dependant on the type of internal power supply module fitted to the unit. The safety dowel hole mates with a corresponding safety dowel fitted to the unit mounting tray (para.9). Air cooling is provided by an internal blower motor which draws cabin air through a pipe connector at the front panel.

### Amplifier, Type UA6002

11. The amplifier, which is located at the rear of the transmitter-receiver, is contained in

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a rectangular metal case. The purpose of the amplifier is to provide suitable matching between the aircraft intercom, microphones and the transmitter modulating circuits. Amplifier input, output and power supplies are routed via a single multi-core cable connector direct to the transmitter-receiver unit rear connector plug.

#### Suppressed aerial system, Type 9502

12. The suppressed aerial system, Type 9502, is fitted to the aircraft for the A.R.I. This takes the form of a notched excitation aerial fitted in the lower part of the dorsal fin (fig.1). The notch provides a cavity in the aircraft structure which is tunable to resonance through a frequency range of 2 MHz to 30 MHz. The aircraft structure when connected via an impedance matching unit to the transmitter-receiver, functions as a dual purpose aerial element.

#### Aerial components

13. The units which constitute the notch aerial system are as follows:-

Impedance matching unit	Type 7949
Aerial tuning unit	Type 7016
Aerial control unit	10L/9514615

#### Impedance matching unit, Type 7949

14. The impedance matching unit, Type 7949, is mounted in the dorsal fin and provides the means of varying the inductive value of the tuned circuit. The unit is designed to maintain a reasonable match between the input impedance of the aircraft excitation system and the output impedance of the transmitter at all frequencies within the band.

#### Aerial tuning unit, Type 7016

15. The aerial tuning unit, Type 7016, is fitted adjacent to the notched aerial cavity in

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the dorsal fin and consists mainly of an electro-mechanical device driving a three-section variable capacitor in association with a fixed capacitor.

16. The unit (housed in a canister pressurized by air or post Mod.2193 nitrogen to 20 lb/in<sup>2</sup>a or 5 lb/in<sup>2</sup>g) is mounted outside the aircraft pressure hull, and subject to extreme changes in pressure. Two pressure operated safety switches form an integral part of the unit. One switch, which operates should the canister pressure fall below 16 lb/in<sup>2</sup>a, extinguishes a normally illuminated SAFE lamp at the aerial control unit front panel. The other pressure switch also operates and its contacts (which form part of the transmitter control circuits) close to automatically switch the transmitter to the lower power condition. With transmitter power reduced, the likelihood of r.f. breakdown is minimised. For further details of the canister pressurization system reference should be made to Sect.3, Chap.16.

#### Aerial control unit

17. The aerial control unit Ref. No. 10L/9514615, consists of a rectangular box structure mounted below the control transmitter, Type M53, at the port side of the navigator's panel (fig.1). A front panel fitted to the unit houses various controls and visual indicators. Electrical connections are made via a 32-pole connector and two co-axial connectors fitted to the rear panel. The unit enables the selection of any desired spot frequency within the frequency band 2 MHz to 24 MHz and initiates automatic (coarse) tuning of the aerial cavity to the selected frequency, via the associated aerial tuning and matching units.

18. The unit incorporates facilities for manual fine-tuning of the selected frequency, visual indication of certain fault conditions within the associated units, and continuous monitoring of the r.f. energy fed to the aerial cavity.

19. The controls and indicators located at the unit front panel are as follows:-

- (1) A 23-position rotary switch labelled MHz which enables the selection of frequencies in steps of 1.0 MHz throughout the entire frequency range.
- (2) A 10-position rotary switch labelled 0.1 MHz which enables the selection of frequencies in steps of 0.1 MHz. The switch can be operated through the entire range, but it is only effective between the lower limit of the band (approx. 2 MHz) and 5.0 MHz.
- (3) A two-position toggle switch labelled SENS-FINE which is biased to the SENS position. When held in the FINE position the sensitivity of the automatic tuning is increased.
- (4) A three-position toggle switch labelled FREQ. SHIFT which is biased to the central, neutral position. When the switch is operated to position H (high) or L (low) the tuning motor is inched back or forth for maximum r.f. output.
- (5) A meter having two scales calibrated in watts. The outer scale from 0 to 500 watts indicates the aerial forward power while the

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inner scale from 0 to 60 watts indicates the aerial reflected power.

- (6) A toggle switch labelled METER-FORWARD which is biased to METER. In this position the meter indicates the aerial

reflected power. When switched to FORWARD the meter indicates the aerial forward power.

- (7) A warning lamp labelled TUNE, illuminated during the tuning operation, warns the operator not to key the transmitter.

- (8) A warning lamp labelled SAFE which glows giving an indication that pressurization of the aerial tuning unit is satisfactory. In the event of a pressurization fault the SAFE lamp will be extinguished.

## SERVICING

### Precautions

20. Servicing personnel are reminded that a.c. or d.c. voltages in excess of 100-volts can be dangerous, to the extent of causing personal injury, fatal or otherwise. It is essential that the closest attention be given to servicing instructions where matters of safety are concerned, and also that maximum

co-operation be maintained between trades concerned in servicing operations.

### Installation

21. Setting up, operating and servicing instructions for the A.R.I. and its associated equipment are contained in A.P.116D-0102-1A

while servicing instructions for the suppressed aerial system are in A.P.116D-0102-1B. The security of all components should be checked regularly in addition to minor and major servicing. All plugs, sockets, terminal blocks, connectors and strain cords should be examined for damage and ingress of dirt and moisture.

## REMOVAL AND ASSEMBLY

### Transmitter-receiver, Type M15

22. The transmitter-receiver is removed by releasing the two wing nuts and collars at its front panel and carefully withdrawing the unit from its mounting tray. The front of the unit, which is provided with a handle to facilitate removal, should not be raised until the rear of the unit is clear of its locating and safety dowels. To install the unit, reverse the procedure for removal taking care that the unit rear locating holes engage properly with the dowels fitted to the mounting tray.

### A.E.O's panel

23. The following units are mounted on the panel:-

Control unit	Type M53
Aerial control unit	10/L9514615

Either unit is withdrawn from the panel by

removing its securing screws and disconnecting its associated cable(s). Installation is the reverse of removal.

### Aerial tuning unit, Type 7016

24. Access to the tuning unit is through a removeable panel located at the aft end of the bomb bay roof. Where long range fuel tanks are fitted in the bomb bay it is necessary to remove the rear fuel tank for access to the panel. Full details concerning fuel tank removal are in Sect.4, Chap.2. Once access to the roof panel is made, the following procedure should be adopted to remove the aerial tuning unit:-

- ◀ (1) Turn off the life valve on the pressurization system panel (Sect.3, Chap.16). ▶

- (2) Remove the panel, which is secured by twelve screws, from the bomb-bay roof.

- (3) Disconnect plug 15AB, socket 15AC and the two bonding strips at the base of the unit. The bonding strip securing nuts should be replaced to prevent the weight of the unit end cover being taken by the poles of the connectors.

- (4) Disconnect the two bonding strips from the aft terminal at the top of the unit.

- ◀ (5) Disconnect the pressure pipe.

- (6) Remove the quick release pip pin ▶ at the base of the trolley frame and

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allow the unit to slide onto the trolley frame end stops.

- (7) Cut and remove the locking wire at each of the four quick-release clamps which secure the unit to the trolley frame.
- (8) Holding the unit firmly with one hand, unfasten the quick release clamps and remove the unit from the trolley frame.

When replacing the unit, care should be taken

to slide it into the trolley frame so that the aerial coupling engage at the top of the unit. The four quick release clamps should then be wire-locked and the remaining removal procedure carried out in reverse.

#### Matching unit, Type 7949

25. With a servicing ladder giraffe, Type D4, remove the dielectric cover at the base of the dorsal fin, disconnect the four copper braid aerial matching strips from the airframe, slacken off the insulated clamp on the fairlead

bridge and slide out the aerial matching strips. Remove the aerial tuning unit and trolley frame, as detailed in para.24. Disconnect the three connector plugs from the matching unit and remove the panel containing the matching unit by releasing twelve securing screws. Then carefully lower the panel through the bomb bay roof access panel, drawing with it the aerial matching strips. Next remove the four attachment bolts on the matching unit and withdraw the unit from the panel. It should be noted that all nuts, bolts screws and washers, should be replaced loosely in their appropriate holes to prevent loss.

TABLE 1

Connections for A.R.I.23090

Part No.	Cable form	Connecting
2/F2625	Uninyvin 16	Transmitter-receiver, T.B.2 to PL347
5/T4324	Miniature cable 25C	Aerial tuning unit to PL489
6/T4324	Miniature cable 12C	Matching unit, to aerial tuning unit
2/T8077	Miniature cable 6D	Transmitter-receiver to J.B. 54p, Chap.1
3/T8077	Uniradio 67	PL490 to matching unit
4/T8077	Uninyvin 10	Transmitter-receiver, T.B.2-3 to relay 334-A1
10HB/21398	-	Transmitter-receiver to aerial control unit
10HB/21399	-	Aerial control unit to PL490
10HB/21405	-	Aerial control unit to PL489, control unit and transmitter-receiver

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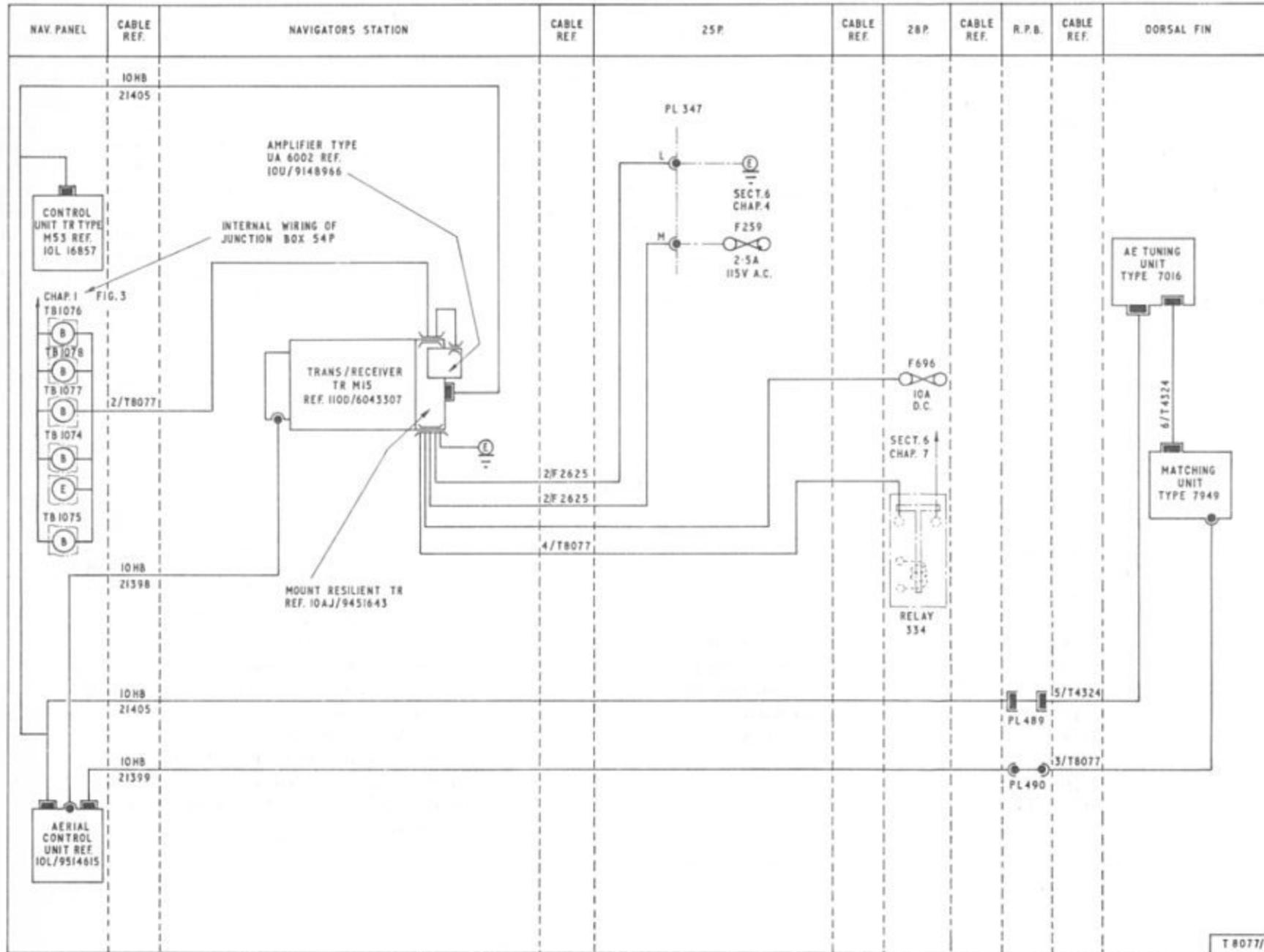


Fig. 2 A.R.I. 23090  
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