Chapter 2

A.R.I.5874

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Introduction

1. This chapter deals with the installation and general functioning of the H.F. communication installation. The location of major components will be found in fig.1; a connector table and routing chart are provided at the end of the text. Descriptive and servicing details for the A.R.I.5874 are given in A.P. 116D-0117-1, which should be read in conjunction with the information contained in this chapter. The associated 28-volt d.c. power supplies are dealt with in Sect.6, Chap.6 of this publication.

NOTE . . .
Mod.2300 fits A.R.I.23090 in lieu of A.R.I.5874. Details are in Chap.2A.

1A. The following modifications are incorporated in this chapter.

Mod.939 To eliminate electrical interference in the intercommunication system with Mod.446 embodied.

Mod.961 To change the morse key type F to a Type 51.

Mod.1779 To make provision for a junction box H.S.A. Pt. No.11/T4743 in lieu of 10/T4743.

DESCRIPTION AND OPERATION

BRIEF DESCRIPTION

2. The basic equipment of A.R.I.5874 includes a 24-channel crystal-controlled transmitter and receiver, operating in the H.F. band 2.8 MHz to 18.1 MHz. Operation may be on C.W., M.C.W., or R.T. with a transmitter carrier output of approx. 100 watts. The complete installation forms a general purpose airborne H.F. communications system, and is used in conjunction with a suppressed aerial system.

POWER SUPPLIES

3. Two single pole switches labelled, H.F. SUPPLY–OFF and H.F. OUTPUT LOW–HIGH, are located on the A.E.O's switch panel, and a morse key, Type F, (Pre.Mod.961) or Type 51 (Post Mod.961), is secured to the table at the A.E.O's position. A d.c. supply via fuse 700 in panel 48P through the H.F. supply switch energizes relay 334. With relay contacts A1-A2 closed, a d.c. supply is fed via C.B.52 in panel 15P, to the power and radio unit, Type 4192, and a voltage regulator, Type 228. The 28-volt d.c. input to the power and radio unit, provides H.T. for the transmitter unit. The receiver unit incorporates its own rotary transformer which supplies 220-volts H.T. for the receiver circuits. For certain L.T. circuits a stabilized supply of 19-volts d.c. is required; this is provided by the carbon pile voltage regulator.

INTER–UNIT CONNECTION

4. Connection between the units is made by engaging the plugs and sockets at the rear of individual units with the respective sockets and plugs on the ends of the cables located in the back-plates of the mounting racks. Each back-plate has two locating spigots which align the units to the back-plates. To improve the mating of multi-pole plugs, sockets and co-axial sockets a certain amount of 'float' has been allowed for in design.

CONTROLS AND UNIT LOCATION

5. The A.R.I.5874 is controlled from a remote control unit, Type 4189, located on the port side of the navigator's panel. The remainder of the equipment is located on a shelf below the navigator's table, fitted with anti-vibration trays containing the following units:-

Power and radio unit,	Type 4192
Transmitter,	Type T.4188
Control unit,	Type 4190
Receiver,	Type R.4187
Junction box,	Type 4191
Voltage regulator,	Type 228

Remote control unit, Type 4189

6. All units are operated from the remote control unit; no local controls facilities are available. The unit provides the following controls and indications:-

(1) Power supply switching
(2) Selection of type of transmission
(3) Selection of frequency with fine tuning and lamp indications
(4) R.F. gain control
(5) Aerial excitation meter
(6) Dimmer switch for dial light of the frequency selector switches

Power and radio unit, Type 4192

7. The chassis of the unit carries the following main units:-

Rotary transformer
Amplifying unit
Transformer

The unit provides H.T. power for the transmitter circuits, the power outputs being 300-volt and 600-volt respectively. Air cooling is obtained by a fan, mounted on the rotary transformer shaft, drawing air through an air filter unit.

Transmitter, Type T.4188

8. The transmitter, Type T.4188, consists mainly of three tuned amplifiers, a mechanical drive unit, which includes the tuning motor and a motor for air-cooling the P.A. stage. All the components are mounted on a cast aluminium chassis. The frequency range of the transmitter is provided in two bands namely:-

Band 1 - 2.8 to 7.0 MHz
Band 2 - 7.0 to 18.1 MHz

Referring to the front panel of the transmitter (fig.1), a TUNE key is provided to facilitate the checking of the valve currents with the aid of the meter switch. The changeover from automatic to manual control is made possible by using the AUTO/MAN switch. In the manual condition, the transmitter coils can be rotated, by means of the TRANS/TUNE knob, to enable a mechanical check to be made during inspection of the equipment. The transmitter H.T. is not available in this condition.

Control unit, Type 4190

9. The control unit, Type 4190, is fitted only to aircraft with suppressed aerial systems. This is the control and drive unit of the transmitter, together with the pre-set potentiometers for setting up

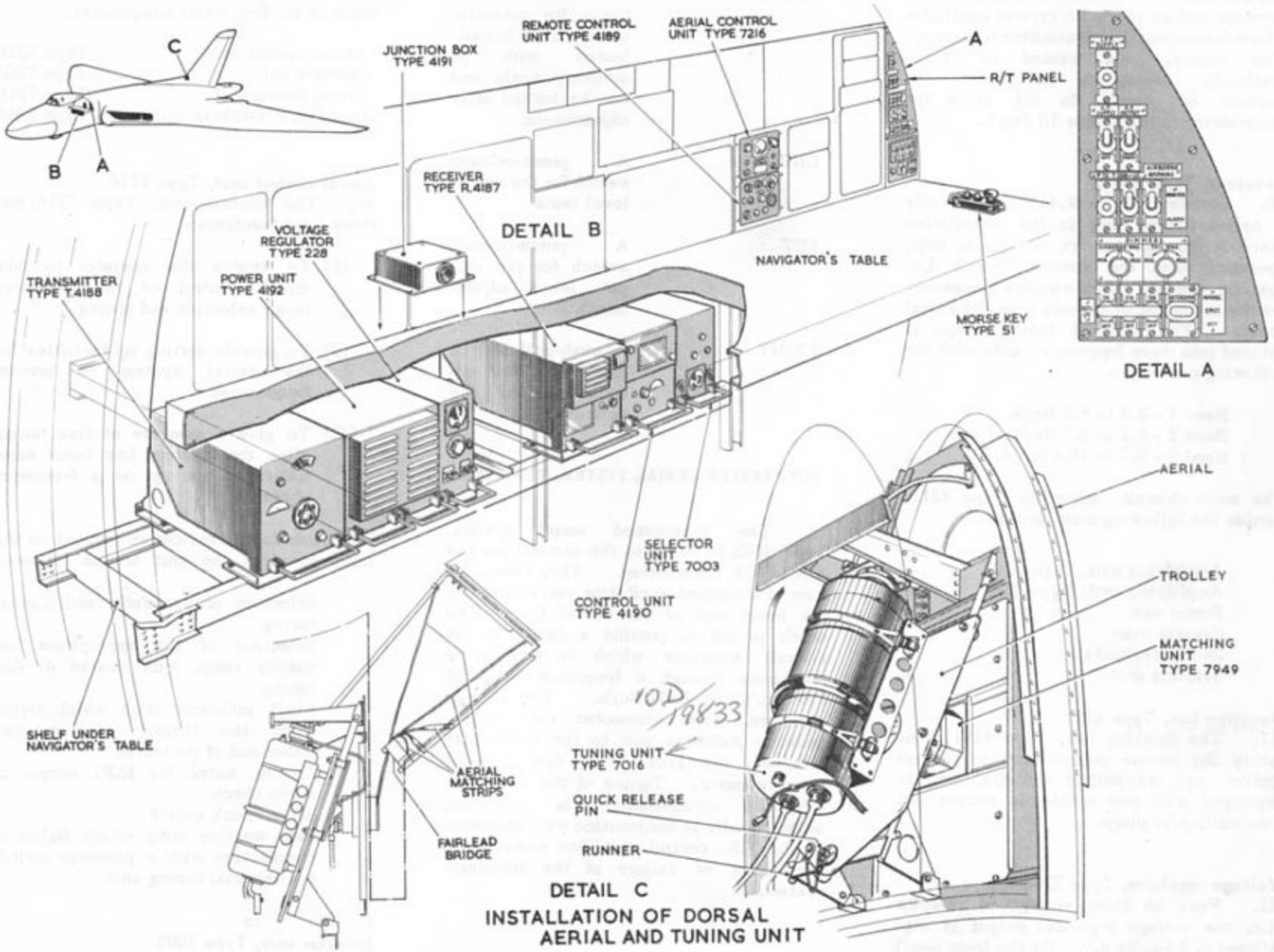

Fig.1 Component location

Morse key type 51 was type F

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the channels. The unit is fitted with 24 crystals and an aperiodic crystal oscillator which determines the transmitter frequency. The crystals are heated in thermostatically controlled enclosures, the heaters of which do not allow the temperature to fall below 10 deg.C.

Receiver, Type R.4187

10. Receiver, Type R.4187, is virtually a self-contained unit in the installation since it incorporates its own power unit, operating from the aircraft 28-volt d.c. system, and all those circuits necessary for the reception of signals from the aerial input. The receiver tuning range is divided into three frequency bands with the following coverage:-

Band 1 - 2.8 to 5.2 Mc/s.
Band 2 - 5.2 to 9.7 Mc/s.
Band 3 - 9.7 to 18.1 Mc/s.

The main chassis, assembly Type 4211, carries the following main units:-

Amplifying unit, Type 4207
Amplifying unit, Type 4208
Power unit
Crystal oven
24 crystal units
Selector unit

Junction box, Type 4191

11. The junction box, Type 4191, connects the remote control unit to the receiver and transmitter circuits, and is equipped with one multi-pole socket and two multi-pole plugs.

Voltage regulator, Type 228

12. From an input voltage of 28-volts d.c. the voltage regulator output is stabilised at 19-volts d.c. On the front panel of the unit are mounted a voltmeter and the following controls and switches:-

ADJUST VOLTS	A manual control of the volts potentiometers which is calibrated with an arbitrary scale and can be locked after adjustments.
CHECK	A press-release switch for the output level tests
SET	A press-release switch for the output level adjustments
LIGHT	A push-pull switch controlling the illumination of the voltmeter

SUPPRESSED AERIAL SYSTEM, TYPE 9502

13. The suppressed aerial system, Type 9502, is fitted to the aircraft for the A.R.I.5874 installation. This takes the form of a notched excitation aerial fitted in the lower part of the dorsal fin. The notch is cut to provide a cavity in the aircraft structure which is tunable to resonance through a frequency range of 2.8 Mc/s. to 18.1 Mc/s. The aircraft structure, when connected via the impedance matching unit to the transmitter receiver, functions as a dual purpose aerial element. Tuning of the system is effected automatically or manually, automatically in conjunction with selection on the T.R. control unit, and manually in the event of failure of the automatic system.

Aerial component location

14. Referring to fig.1, it will be seen that the suppressed aerial system consists of the four major components:-

Aerial control unit	Type 7216
Selector unit	Type 7003
Aerial tuning unit	Type 7016
Impedance matching unit	Type 7949

Aerial control unit, Type 7216

15. The control unit, Type 7216, has three main functions:-

(1) To enable the operator to take direct control of the frequency range selection and timing

(2) To provide setting up facilities for the aerial system on pre-set frequencies

(3) To give a measure of fine tuning after the system has been automatically set up on a frequency channel

The controls and indicators located on the front panel of the unit are as follows:-

Selection of automatic and manual tuning
Selection of the appropriate frequency range with coarse or fine tuning
Limit indicator lamp which lights when the timing motor reaches either end of its travel
Tuning meter for R.F. output or servo check
Servo check switch
Safe warning lamp which lights in conjunction with a pressure switch in the aerial tuning unit

Selector unit, Type 7003

16. The selector unit, Type 7003, contains the master elements for all servo

channel selection and tuning systems. The following pre-setting controls and indications are provided on the front panel:-

Selected channel indicator, this operates in conjunction with the remote control unit, Type 4189
Selection of tune, operate and test conditions effecting the transmitter power output, with lamp indication of tune conditions
Frequency range setting and capacitor tuning
R.F. output and servo check meter
Servo check switch

Aerial tuning unit, Type 7016

17. The aerial tuning unit, Type 7016, consists mainly of an electro-mechanical drive unit, driving a three section variable capacitor in association with a fixed capacitor. Since the unit is outside the pressure section, it is contained in a cannister which is pressurized to 20 p.s.i.a. or 5 p.s.i. gauge. Two pressure switches are fitted, one operates the SAFE lamp on the control unit, Type 7216; the SAFE lamp is extinguished if the pressure in the cannister falls below 16 p.s.i.a. R.F. breakdown is prevented by the second pressure switch, which automatically switches the transmitter to the low power condition should the pressure fall below 16 p.s.i..

Impedance matching unit, Type 7949

18. The impedance matching unit, Type 7949, provides the means of varying the inductive value in the tuned circuit. It 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.

SERVICING

Precautions

19. Servicing personnel in particular are warned 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

20. Setting up, operating and servicing instructions for the installation and its components, including the suppressed aerial system, are contained in A.P.2535E, Vol.1. The security of all components should be checked regularly in addition to minor and major servicing. All plugs, sockets, terminal block connectors, personnel equipment connectors and strain cords should be examined for damage and ingress of dirt and moisture.

Power supplies

21. In conjunction with the servicing of the system as laid down in A.P.101B-1902-4, periodic checks should be made with a suitable test voltmeter to check that the d.c. output at T.B.400-A is 28-volts. At T.B.398-B, test that the output from the voltage regulator is 19-volts. Both T.B.'s are located on the port rear supporting leg of the navigator's table.

REMOVAL AND ASSEMBLY

Units below navigator's table

22. The following units are located below the navigator's table and are mounted on standard S.B.A.C. racking:-

Power and radio unit	Type 4192
Transmitter	Type T.4188
Control unit	Type 4190
Receiver	Type R.4187
Selector unit	Type 7003
Junction box	Type 4191
Voltage regulator	Type 228

The units are removed by releasing the knurled screws securing the handles, and withdrawing the units from the racks. On replacement, care should be taken to ensure that the locating dowels engage properly in order to align the plugs and sockets at the rear of the units with those on the racks.

A.E.O's panel

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

Remote control unit	Type 4189
Aerial control unit	Type 7216

The units are withdrawn from the panel by removing the securing screws and then disconnecting the associated cables.

Aerial tuning unit, Type 7016

24. Access to the tuning unit is obtained through an access panel at the aft end of the bomb bay roof. The removal procedure is as follows:-

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

(2) Disconnect the two bonding strips from the aft terminal at the top of the unit

(3) Remove the securing nut at the base of the carriage, and allow the unit to slide onto the stops

(4) Break the locking wire of the four quick release clamps, which secure the unit to the carriage

(5) Holding the unit firmly with one hand, unfasten the quick release clamps and remove the unit

When replacing the unit care should be taken to slide it into the carriage so that the aerial coupling at the top of the unit engages; the four quick release clamps should then be wirelocked.

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 five copper braid aerial matching strips from the airframe, slacken off the insulated clamp on the fairlead bridge and slide the aerial matching strips through. As in para.24, remove the aerial tuning unit and trolley frame. Disconnect the three plugs to the matching unit, remove the strengthened panel containing the matching unit by releasing the twelve attachment 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 strengthened 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

CONNECTORS FOR A.R.I.5874

A.V.Roe Item No.	Cable form		Connecting between
1/T4053	Equip. wire	(6145-100168 - 10 off (6145-100179 - 10 off (6145-100229 - 3 off (6145-100249 - 1 off	Power and radio unit (3D) to transmitter (2D)
2/T4053	Uniradio 70		Control unit, Type 4190 (1B) to transmitter (2B)
3/T4053	Miniature cable 25C		Control unit, Type 4190 (1AF) to selector unit, Type 7003 (13AF)
4/T4053	Miniature cable 25C		Control unit, Type 4190 (1AE) to junction box,Type 4191 (12AE)
5/T4053	Miniature cable 25C		Receiver, Type R.4187 (4AD) to junction box, Type 4191 (12AD)
6/T4053	Equip. wire	(6145-100249 - 1 off (6145-100179 - 2 off	Receiver, Type R.4187 (4N) to power and radio unit (3N)
7/T4053	Equip. wire	(6145-100179 - 17 off (6145-100229 - 3 off	Control unit, Type 4190 (1A) to power and radio unit (3A)
8/T4053	Unipren 12 - 3 off		Receiver, Type R.4187 (4M) to power supply T.B.398
9/T4053	Uniradio 70		Control unit, Type 4190 (1L) to receiver, Type R.4187 (4L)
10/T4053	Uniradio 65		Power and radio unit (3E) to transmitter (2E)
11/T4053	Uniradio 65		Control unit, Type 4190 (1AG) to b/head break plug 490
12/T4053	Miniature cable 25C		Selector unit, Type 7003 (13AB) to b/head break plug 489
15/T4053	Unipren 4-18 off Unipren 6-2 off		Power and radio unit (3P) to power supply, T.B.400 and 398
16/T4053	Unipren 4-14 off Unipren 12-1 off		Volt regulator to power supply, T.B.400 and 398
17/T4053	Uniradio 65		Control unit, Type 4190 (1C) to transmitter (2C)
2/T4324	Miniature cable 18C		Aerial selector unit, (13AA) to aerial control, Type 7261 (14AA)
3/T4324	Miniature cable 25C		Junction box, Type 4191 (12AH) to remote control unit,Type 4189 (11AH)
4/T4324	Uniradio 65		B/head break plug 490 to matching unit, Type 7949 (16AG)
5/T4324	Miniature cable 25C		Aerial tuning unit, Type 7016 (15AB) to b/head breaks plug 489
6/T4324	Miniature cable 12C		Matching unit, Type 7949 (16AC) to aerial tuning unit, Type 7016 (15AG)
7/T4324	Unipren 4		T.X. shorting plug (3J)
8/T4324	Miniature cable 6D		Power and radio unit (3F) to 54 i/c junction box (Inlet 7)

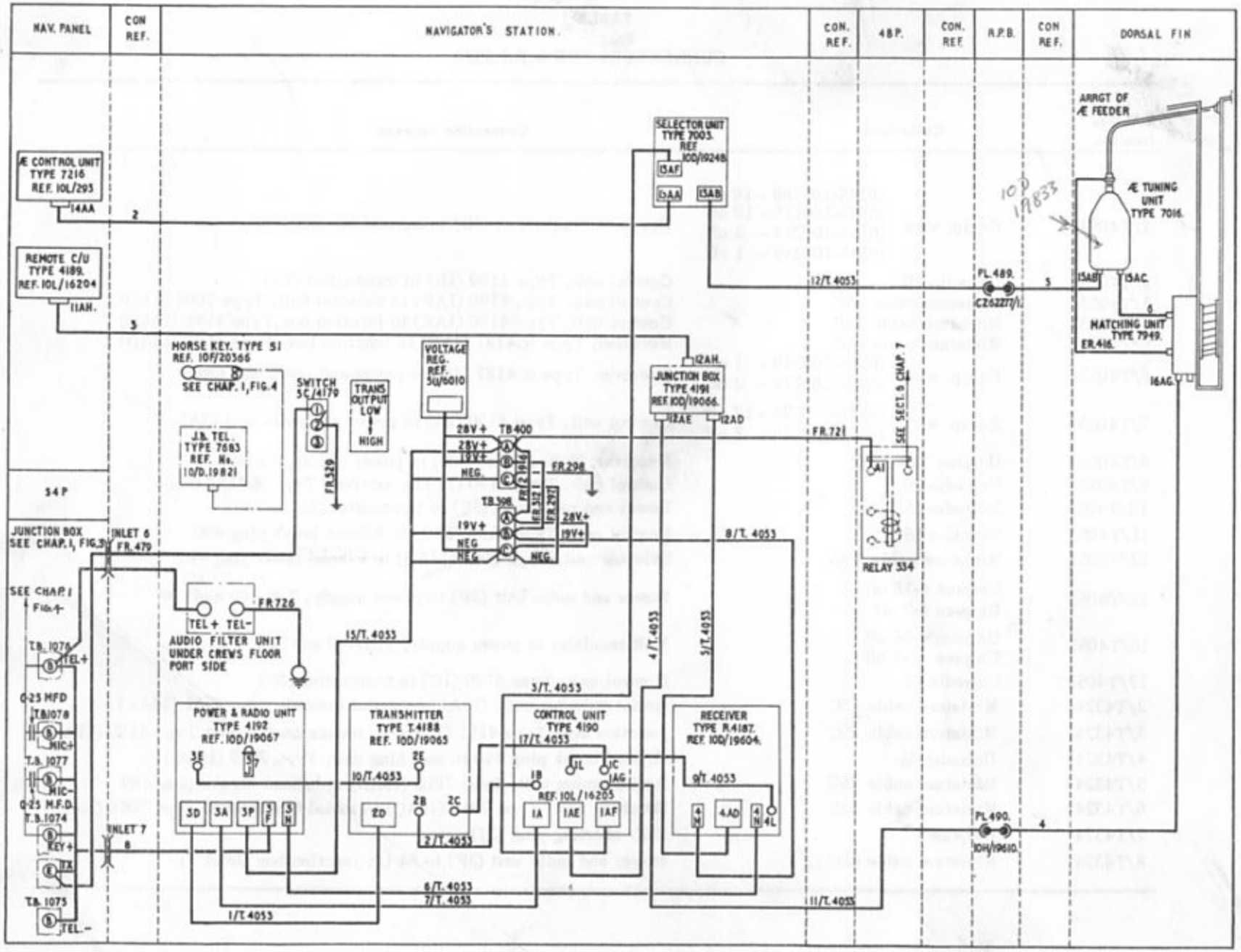

Fig. 2. A.R.I. 5874.

(◀ Mod 939, 961 and 1779 embodied ▶)

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