Chapter 2

RECEIVER TYPE R.4187

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

INTRODUCTION

1. The receiver Type R.4187 consists of a number of individual units mounted on one main chassis assembly, these include a power unit providing HT for the receiver circuits.

2. The complement of units in the receiver is as follows :—

Receiver Type R.4187 (10D/19064) consisting of :—

(1)	Chassis assembly Type 4211	10D/19077
(2)	Amplifying unit Type 4207 (RF unit)	10U/16831
(3)	Amplifying unit Type 4208 (IF unit)	10U/16832
(4)	Power unit Type 4231	10K/17986
(5)	Selector unit Type 4230	10D/19085
(6)	Drive unit mechanical Type 4243	10AR/2219
(7)	Filter unit Type 4235	10P/16065
(8)	Filter unit Type 4236	10P/16066

3. In addition to the above items the chassis assembly Type 4211 includes a crystal oven Type 12 in which are accommodated 24 crystal units ZDH at plus or minus 2·15 Mc/s off signal frequency (*para.* 4).

4. The receiver frequency range is divided into three frequency bands with the following coverage.

Band 1.....2·8 to 5·2 Mc/s (crystal frequency =signal frequency + 2·15 Mc/s).

Band 2.....5·2 to 9·7 Mc/s (crystal frequency =signal frequency + 2·15 Mc/s).

Band 3.....9·7 to 18·1 Mc/s (crystal frequency =signal frequency — 2·15 Mc/s).

5. The operative frequency band is selected by "Band" relays in the RF amplifier, the selected inductors being tuned by a motor-driven ganged capacitor.

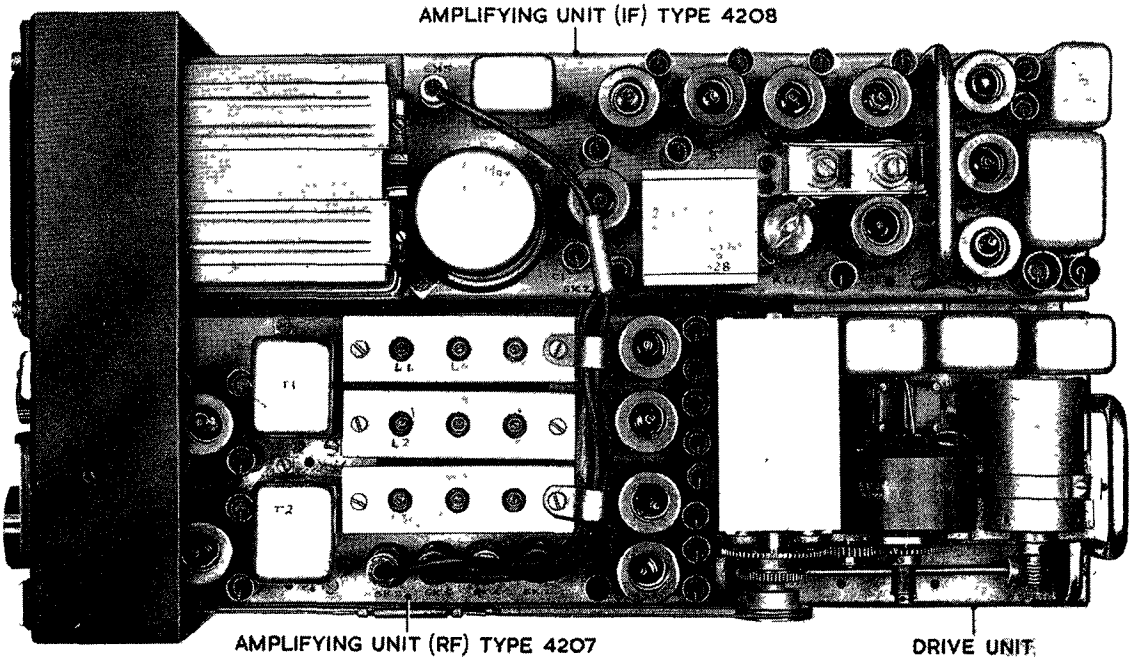

Fig. 1. Receiver-top of chassis

CONSTRUCTION

6. The receiver Type R.4187 consists of a chassis assembly supporting the front panel measuring 8 × 8 in., on which is mounted all the manual controls required for setting-up purposes. The depth of the receiver is $12\frac{1}{2}$ in.

7. On top of the chassis assembly (*fig.* 1) is fitted the RF unit (amplifying unit Type 4207) and the IF unit (amplifying unit Type 4208). The complete chassis and sub-units are enclosed by a removable dust cover fixed by quick release fasteners at the rear.

Chassis assembly Type 4211

8. The chassis assembly Type 4211 consists mainly of the power supply and remote control circuits and comprises the lower half of the complete receiver with the front panel attached (*fig.* 2).

9. At the rear of the chassis is a bracket on which is horizontally mounted two 12-way sockets SK1 and SK2 connecting with the RF and IF units. The rear face of the bracket has a wire mesh outlet for the cooling air and mounts the four plugs engaging with the cables mounted on the backplate of the receiver mounting unit. These are :—

(4L)	PL1	Coaxial plug	Input from tuned aerial.
(4M)	PL5	4-pole plug	Aircraft power supply input (19V and 28V).
(4N)	PL6	4-pole plug	Audio output to telephones.
(4AD)	PL7	28-pole plug	Connections to remote control unit.

Note .

The references in parentheses are the back-plate codings for the associated sockets (Chap. 10).

10. Immediately in front of the rear bracket is mounted the rotary transformer. This, with its interference suppression filters forming a mounting base, is a complete power unit Type 4231 and can be withdrawn on removal of four screws through the base of the chassis (*fig.* 3). The electrical connections to the main chassis are made via the terminal block G and these must be disconnected before removing the power unit.

11. A fan on the rotary transformer draws air through the body of the receiver from a filtered inlet on the front panel and expels it through the outlet on the rear bracket. The housing of the machine and the bracket form an enclosure from the rest of the equipment (*fig.* 2).

Crystal oven Type 12

12. In front of the power unit enclosure at the side of the main chassis is mounted the crystal oven Type 12 (*fig.* 4). The oven accommodates 24 crystals in numbered sockets and is thermostatically controlled at 50 deg. C to restrict the temperature range (40 to 70 deg. C) over which the crystals are to operate.

Selector unit Type 4230

13. At the left-hand front of the main chassis is the selector unit Type 4230. This includes two 12-way potentiometers and 24 3-position switches which protrude through the front panel. The two potentiometers POT. 1 and POT. 2 have plug connections

and are capable of withdrawal through the front panel (*fig.* 5).

14. To the rear of the 3-position switches is the selector motor, its filter, and the gearing which turns the potentiometers and operates the 8-bank ganged switch S1. The four rear banks of the switch are connected to the crystals oven for the selection of the channel crystals.

15. The bracket on which is mounted the selector motor also carries the double-triode valve V1 and associated components of the crystal oscillator.

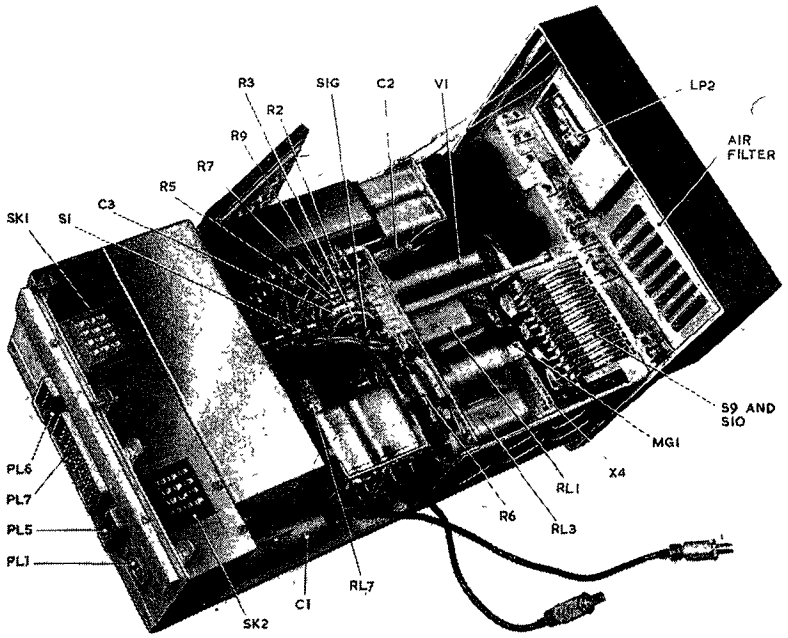

Fig. 2. Chassis assembly Type 4211

Front panel assembly

16. The front panel is bolted on the front of the chassis assembly and carries the controls and switches listed below (*fig.* 6).

(1) Drum dial and TUNE control used in setting-up receiving channels with dial lamp PL2 at rear.

(2) Receiver TUNING indicator lamp LP1.

(3) Channel band switches S9 and S10 (under cover).

(4) Two 12-way potentiometers POT. 1 and POT. 2 (under cover).

(5) Fuses: F1—HT; F2—19V; F3—28V (and spares for each)

(6) TUNE/NORMAL switch S2.

(7) AGC ON/OFF switch S3.

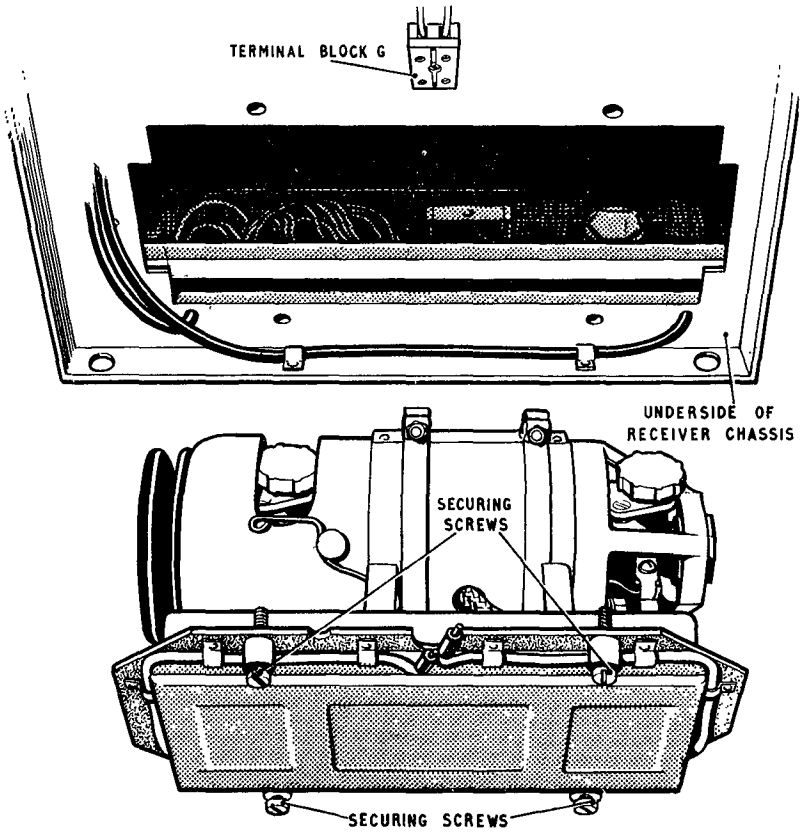

Fig. 3. Removal of power unit

17. In addition to the items listed above is an air filter which is used as an air inlet for the cooling system of the receiver; this can be exposed and withdrawn after removal of the louvred cover at the top left of the front panel.

18. Access to the potentiometers and channel band switches is by removal of the cover carrying the CHANNEL/FREQUENCY allocation card at the lower left of the front panel. This cover is constructed with a special projection to prevent the TUNE/NORMAL switch being left in the TUNE position when the cover is in position. The function of the front panel controls is explained in the circuit description (*para.* 69 to 74).

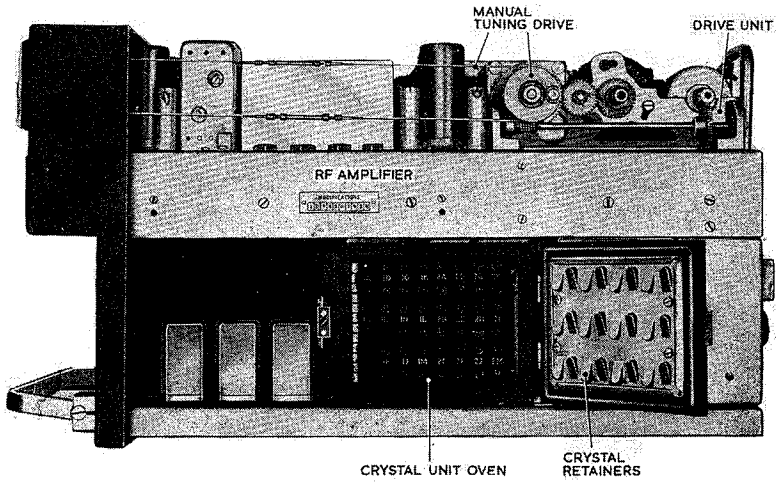

Fig. 4. Side view of receiver

19. The underside of the shallow chassis forming the base of the chassis assembly has fixed to it three tag strips (*fig.* 7) ; each tag is being marked with a number. To these are brought the cable forms from the front panel, the selector unit, the back bracket and the control relays. The tag strips enable the necessary cross connections to be made between these units, and provide accessible test points.

Amplifying unit Type 4207 (RF unit)

20. The amplifying unit Type 4207 is mounted on the right-hand side on top of the chassis assembly (*fig.* 8). The RF unit measures 4 by $12\frac{3}{8}$ by $1\frac{5}{8}$ in. deep with the valves and coil assemblies mounted on its upper surface ; it is held in position by two spigots engaging on the front panel of the receiver and by two screws on the rear bracket.

21. When the RF unit is in position on the main chassis a 12-pole plug PL1 on the underside of the chassis engages with a socket SK1 on the rear bracket of the receiver. Four coaxial plug-socket connections are also made to the chassis assembly (SK2–3–4–5).

22. At the rear of the unit is the drive unit mechanical Type 4243 including the tuning motor geared to a 3-gang variable capacitor and to the balancing potentiometer of the remote control circuit. The associated relays RL1, RL2 and RL3 are mounted alongside the drive unit.

23. In front of the drive unit are the valves of the first stages V1 to V4 and the coil assemblies of the RF stages. Each assembly consists of three coils, one for each of the three frequency bands into which the receiver frequency range is divided. These coils are mounted in a single screening can which also carries on its base the two sealed relays that effect band change (*fig.* 9).

24. The coil assemblies are held on the chassis by two screws ; the trimmer capacitors C2, C10 and C17 for the 3-gang capacitor associated with the coils are mounted in screened compartments on the underside of the chassis.

25. At the side of the coil assemblies are the four coloured RF sockets which connect the RF unit to the remainder of the receiver. These are from front to back (of the receiver) :—

SK3 2nd oscillator input —green—To IF unit.

SK5 Aerial input—red —To chassis assembly.

SK4 1st IF output—yellow—To IF unit.

SK2 1st oscillator input —blue—To chassis assembly.

26. At the front of the RF unit are the two 1st IF transformers T1 and T2 and the 1st IF amplifier valve V5 and 2nd frequency-changer valve V6.

27. The interference suppression filter for the tuning motor is mounted on the underside of the chassis below the motor.

Amplifying unit Type 4208 (IF unit)

28. The amplifying unit Type 4208 is located at the left-hand side of the top of the chassis assembly (*fig.* 10). The IF unit measures $3\frac{3}{8} \times 12\frac{3}{8} \times 1\frac{5}{8}$ in. deep. It is held in position by two spigots engaging on the front panel of the receiver and by two screws on the rear bracket.

29. A 12-pole plug PL1 on the underside of the IF unit engages with a similar socket SK2 on the chassis assembly. Two coaxial sockets are used to join the IF unit to the RF unit when in position on the main chassis assembly.

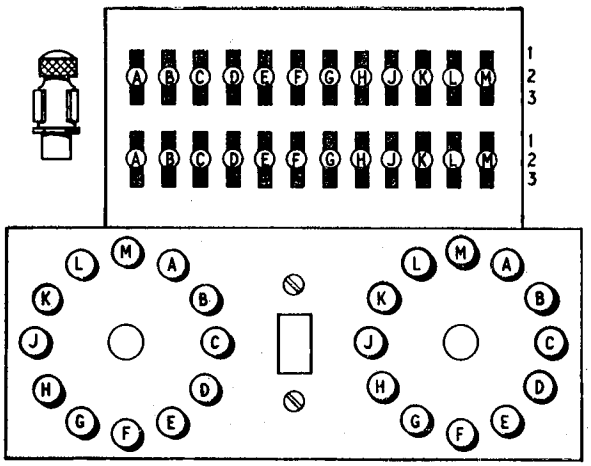

Fig. 5. Selector unit Type 4230—front

30. At the rear of the IF unit is mounted the audio output transformer T1, the audio valve stages V7–8–9 and the two potentiometers RV3 and RV4 presetting the audio output on R/T and CW.

31. In front of these is the crystal XL1 and the CW oscillator valve V6, the valves of the 2nd IF amplifier V2–3–4 and the variable second oscillator V1. The latter consists of a coil and capacitor assembly X2 mounted in a screened box and a variable capacitor operated by means of a Desynn motor, which controls the tuning of the oscillator V1.

32. The variable capacitor is mounted in a sealed oil-filled container to provide mechanical damping; this together with its motor, forms an assembly X1 which plugs into a valve socket. This capacitor assembly X1 is compensated against the core and capacitor assembly X2 in production and the two units bear the same serial number.

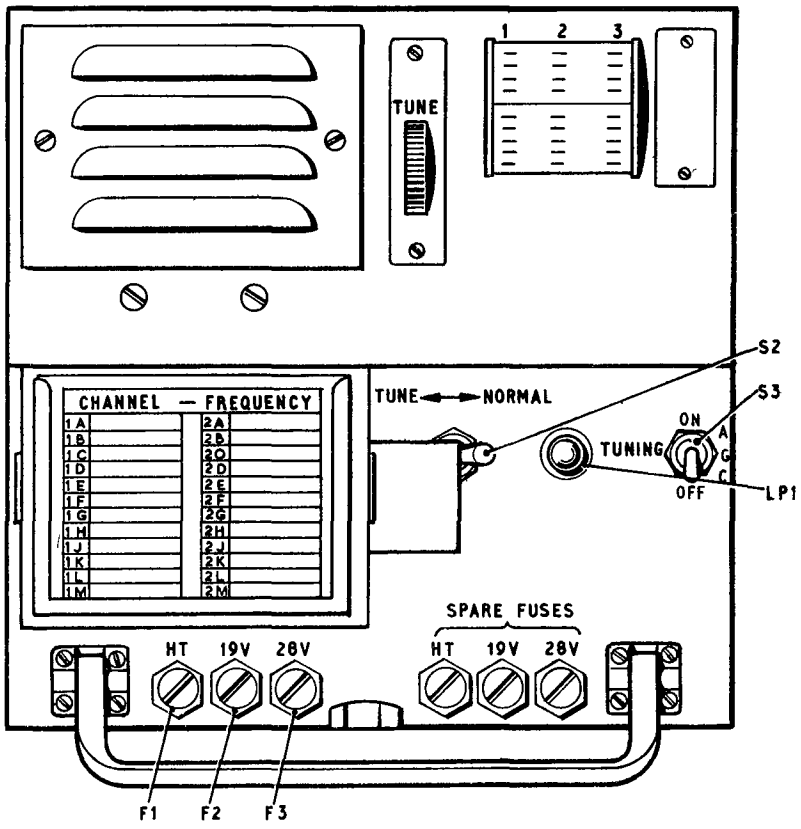

Fig. 6. Front panel of receiver

Note . . .

It is most important that these two units always have the same Serial number especially as the variable capacitor is a plug-in unit. In the event of unserviceability of either unit both must be replaced. The units are available as spares in the form of matched pairs. (In an **emergency** *the compensation error produced by changing only one of the pair could be tolerated).*

33. Two coaxial coloured sockets are mounted on top of the chassis and are joined by means of coaxial cables to the RF unit.

(1) SK2 2nd oscillator output—green

(2) SK3 IF input—yellow.

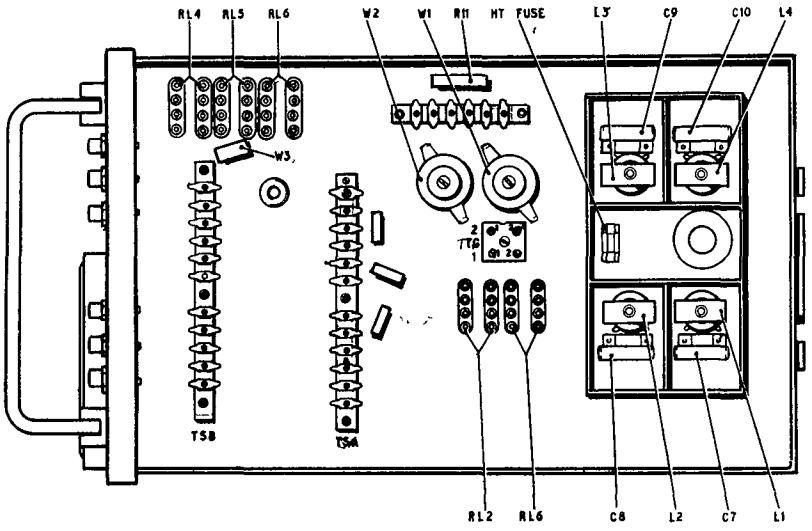

Fig. 7. Underside of receiver chassis

34. At the front of the IF unit are the two 100 kc/s IF filters X3 and X4; these are in sealed boxes and the wide-band filter (the larger) is mounted on top of the chassis, whilst the narrow-band filter (the smaller) is mounted on the underside of the chassis. Both are held in position by retainer clamps.

35. The underside of the chassis (*fig.* 11) is sub-divided into compartments separating the stages of the amplifier.

CIRCUIT DESCRIPTION

36. The receiver circuit is covered by three diagrams:—

Amplifying unit Type 4207 (RF unit)—fig. 13.

Amplifying unit Type 4208 (IF unit)—fig. 14.

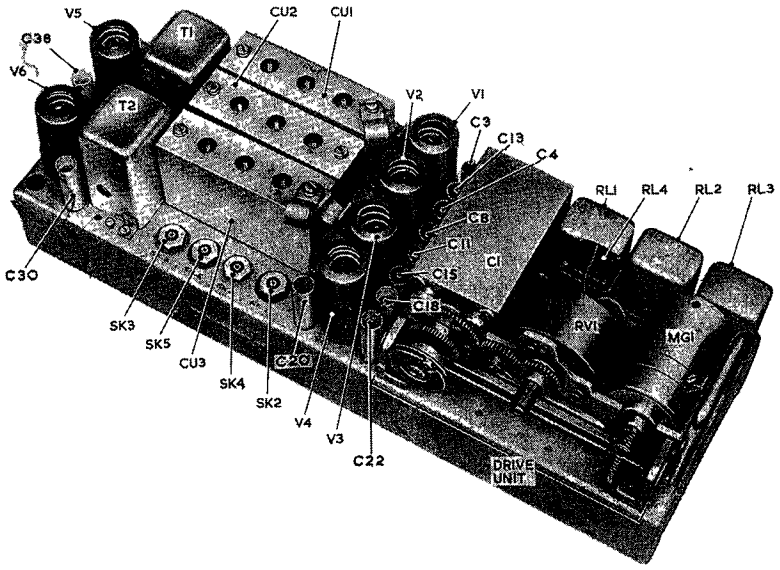

Fig. 8. Amplifying unit Type 4207 (RF unit)

Chassis assembly Type 4211 (main chassis)—fig. 15.

These circuits cannot be described separately and reference will be made to the various diagrams as the description proceeds. The block schematic diagram in fig. 12 shows the circuit layout of the complete receiver.

Note . . .

The following references are not used in the circuit diagrams :—

Fig. 13—*RF unit*—*C33*—*C34*—*SK1*.

Fig. 14—*IF unit*—*SK1*.

Fig. 15—*Chassis assembly*—*S4 to S8*—*PL2*.

Aerial input to receiver

37. The received signal is applied to plug PL1 at the rear of the receiver chassis (*fig.* 15) and is passed to the aerial input of the RF unit via plug PL3 on the chassis assembly and socket SK5 on the RF unit (coil unit CU1—*fig.* 13).

Band selection

38. Coil unit CU1 provides the inductance of the first tuned RF circuit in three values corresponding to the three frequency bands of the receiver tuning range. The operative frequency band is selected by the band relays RL5/2 and RL6/2 as follows :—

(1) *Band* 1 (2·8—5·2 *Mc/s*) RL5/2 operates, contact 5A closes and connects L1a as the coupling winding to an inductance comprising L7, L4 and L1 in series. Contact 5B opens to remove the short circuit on L1.

(2) *Band* 2 (5·2—9·7 *Mc/s*) Both relays in the coil unit are at rest and winding L4a is coupled to the inductance formed by L7 and L4 in series. L1 is short-circuited by contact 5B at rest.

(3) *Band* 3 (9·7—18·1 *Mc/s*) Relay RL6/2 operates, closing contacts 6A and providing L7a as the coupling winding to the tuning inductance of L7, the other two coils L1 and L4 being shorted to earth by contacts 5B and 6B respectively. The coils L1, L4 and L7 can be adjusted by preset dust cores for trimming purposes.

39. The selected inductance for the particular frequency range is tuned by section C1A of the

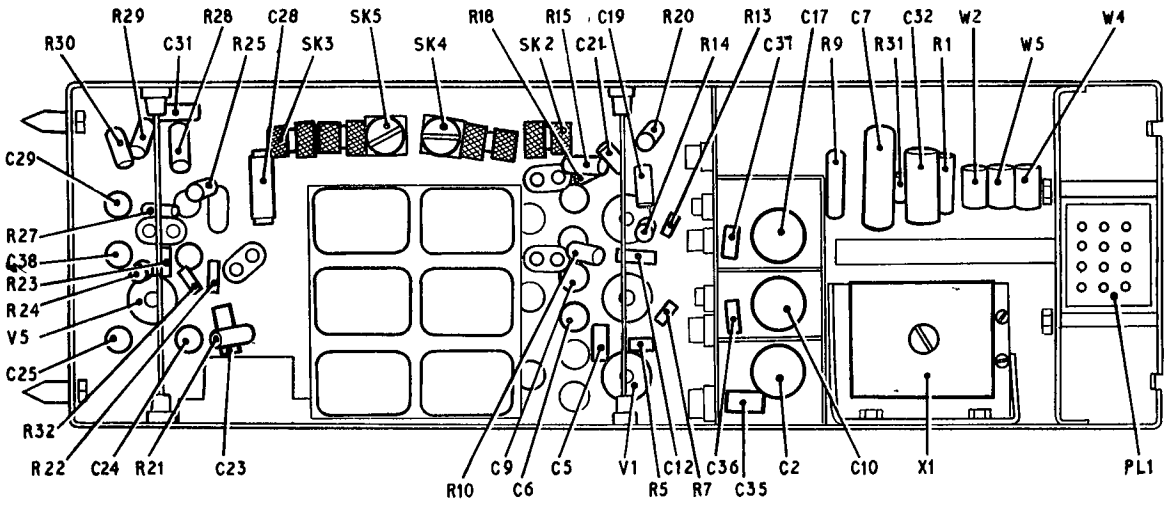

Fig. 9. RF unit—underside of chassis

motor-driven ganged capacitor. The preset capacitor C2, paralleled by C35, is the associated trimming capacitor.

Limiter

40. Across the output of the tuned circuit of coil unit CU1 is connected diode V1a. This is one diode of a CV140 and provides protection against excessive voltage from the aerial input. Conduction of the diode takes place at approximately 1 volt RMS. A standing cathode-bias from the 6·3V heater connection is obtained at the junction of potential divider R3/R4.

RF amplifiers

41. The signal input is taken via C5 to the grid of the 1st RF pentode amplifier V2. AGC voltages are fed back from the 1st IF amplifier V5 to the grid of V2 via the resistor R6.

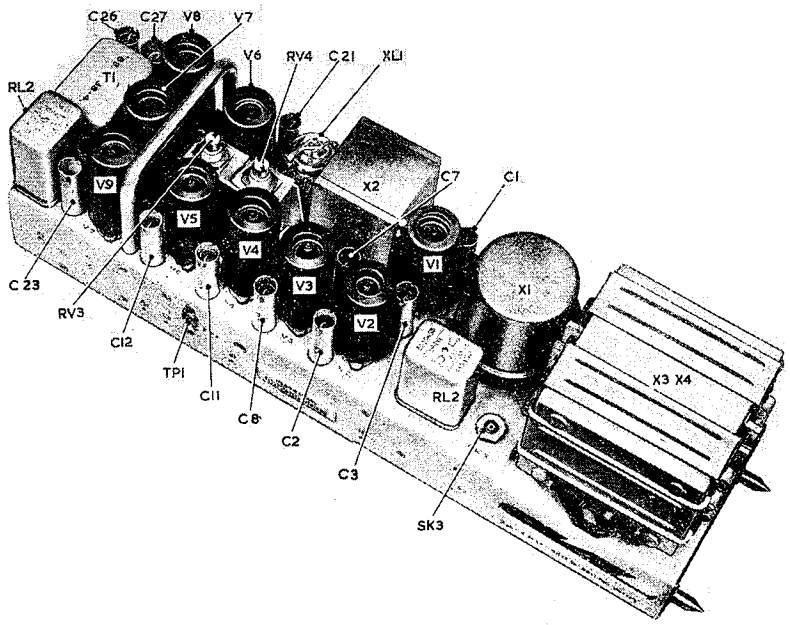

Fig. 10. Amplifying unit Type 4208 (IF unit)

42. Cathode-bias for V2 is developed by R7 and R31, the latter being shunted by the RF GAIN control 11RV3 in the remote control unit. The RF gain adjustment is also common to the 2nd RF amplifier V3, the connection being made at the junction of R13 and R31.

43. The anode of the 1st RF amplifier is coupled to the grid of the 2nd RF pentode by the tuned circuit formed by CU2 and the C1B section of the ganged capacitor with the trimmer C10 shunted by C36.

44. Coil unit CU2 is a three-band coil assembly operated by relays RL7/2 and RL8/2 as follows:—

(1) *Band* 1. RL7/2 operates; contact 7A opens and provides the three coils L8, L5 and L2 in series as the tuning inductance. Each of these coils can be preset by means of an iron dust core trimmer.

(2) *Band* 2. Both relays are at rest; contact 7A short-circuits coil L2; L5 and L8 are connected in series as the tuning inductance.

(3) *Band* 3. Relay RL8/2 operates to close contact 8A leaving L8 as the tuning inductance; both L2 and L5 are short-circuited. Resistors R34, R35 and R36 are damping resistances across L8, L5 and L2 respectively.

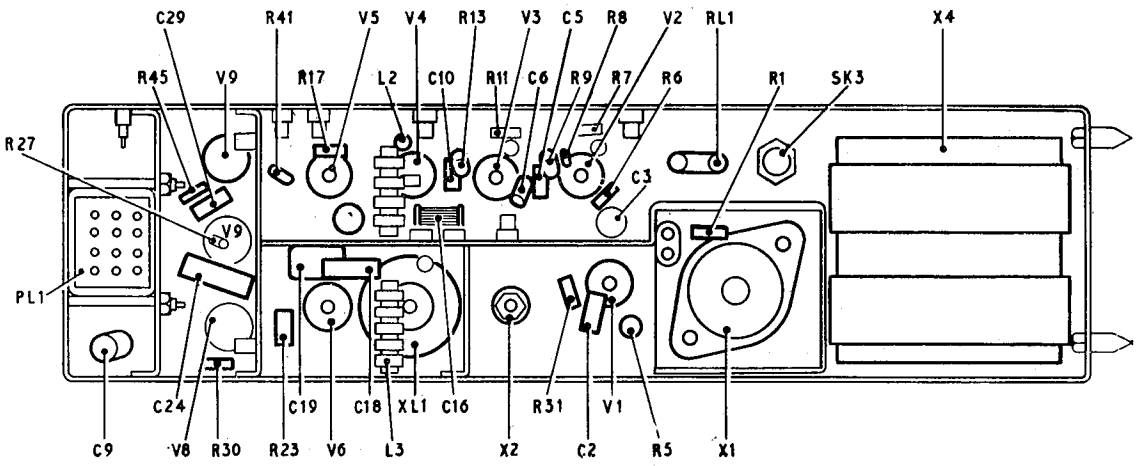

Fig. 11. IF unit—underside of chassis

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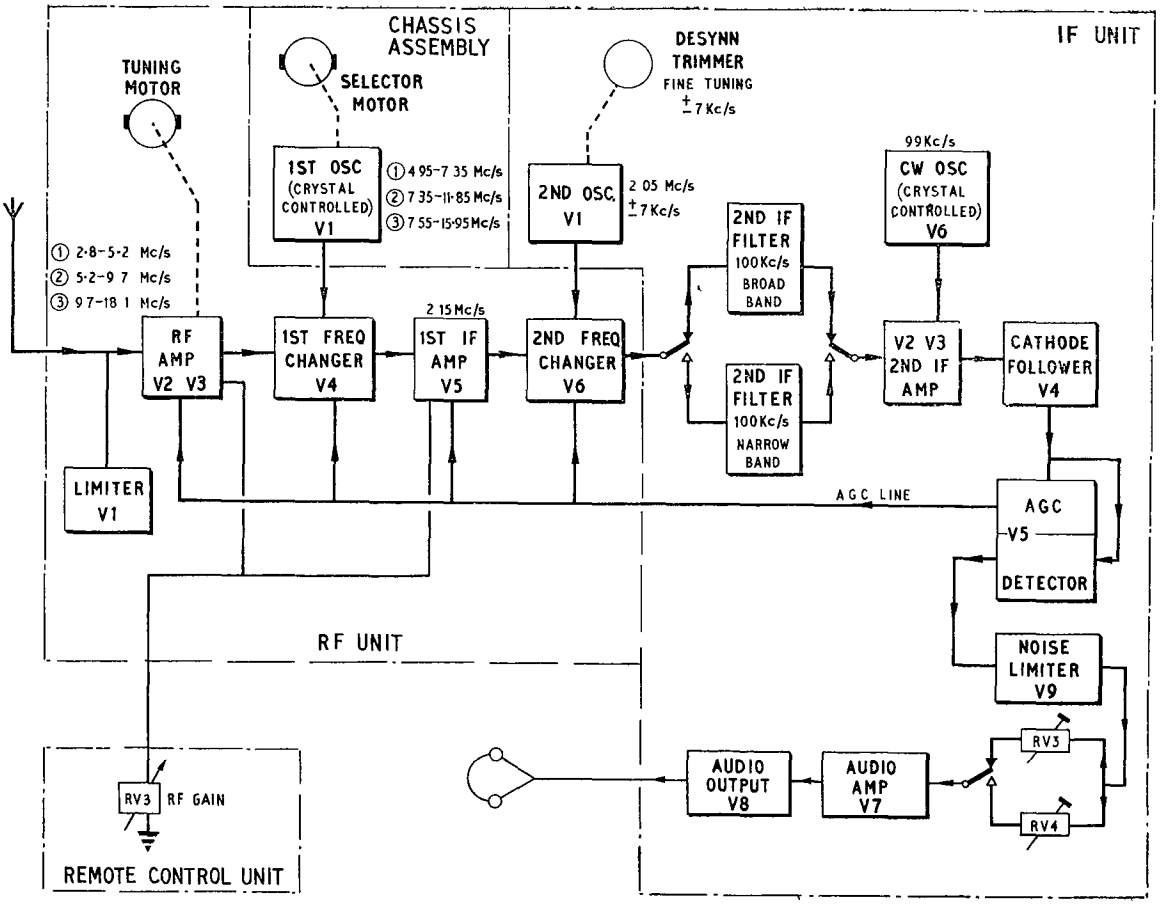

Fig. 12. Block diagram of receiver circuit

45. The anode and screen supplies for the pentodes V3 and V4 are conventionally connected to the 200-volt HT supply via pin 3 of PL1 through the dropping resistor R9. Coupling between the anode of V2 and the grid of V3 is via C12.

First frequency-changer

46. The output of V3 is coupled to the heptode 1st frequency-changer V4 by the third tuned circuit CU3 and C1C. The inductance of CUC is changed for each band by relays RL9 and RL10 operating in a similar manner to RL7 and RL8 in CU2.

47. Signal voltages from the anode of the pentagrid V3 are applied to the control grid (g3) of V4 which, in addition to the cathode-bias provided by R18 is biased from the AGC line. The screen grids (g2 and g4) and anode potentials are obtained from the 200V input in the normal way. The 1st oscillator injection from the coaxial plug 1st OSC INPUT (SK2) is applied to the 1st grid (g1) biased by R19 through C21.

48. Reference is made to the circuit diagram fig. 15. The 1st oscillator, crystal-controlled at the signal frequency plus or minus 2·15 Mc/s (*para.* 4), is mounted on the main chassis assembly and consists of an aperiodic Colpitts oscillator using one-half of a double-triode V1.

49. Any one of the 24 crystal units, selected by switches S1H-S1Q and contact 1A, is connected between the grid and earth of V1. Capacitor C2 provides the feedback between the cathode and grid, the oscillator being biased partly by cathode resistors R4 and R5. The oscillator is coupled by C5 to the second triode of V1 connected as a cathode-follower, the output of which is taken to PL4 and thence to RF unit. The output of the 1st oscillator has an impedance of approximately 200 ohms.

First IF amplifier

50. The intermediate frequency of 2·15 Mc/s is selected at the anode of V4 (*fig.* 13) by the primary of the IF transformer T1 preset by the trimmer C40. The secondary of T1 is coupled to the grid of the 1st IF amplifier V5, this is a conventional amplifier also with the grid bias controlled by the AGC line.

Second frequency-changer

51. The anode of V5 is coupled by IF transformer T2 to the control grid of the second heptode frequency-changer V6, the second oscillator injection frequency being applied to its first grid (g1) from the coaxial socket 2nd OSC INPUT (SK3). The second oscillator is at 2·05 Mc/s and is variable for

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fine tuning at plus or minus 7 kc/s, thus providing this variation at the signal frequency (*para.* 52). The two IF transformers preceding this second frequency-changer have a pass-band wide enough to accommodate signals of this deviation.

52. The second oscillator is mounted on the IF unit, a circuit diagram of which is given in fig. 14. The oscillator consists of a pentode valve V1 operating as a modified Colpitts oscillator. The resonant circuit is contained in a small box X2 which obviates differential heating and in which the components are temperature compensated.

53. A small capacitor varied by a Desynn motor X1 is connected across the whole of the tuned circuit and effects the required plus or minus 7kc/s deviation. The output from the second oscillator at the anode of V1 is coupled by R4 and C2 to the 2nd frequency-changer V6 (*fig.* 13) via the 2nd OSC OUTPUT socket SK2 (*fig.* 14).

Second IF amplifier

54. The second intermediate frequency at 100 kc/s is derived from the anode of V6 (*fig.* 13) and is coupled by means of C31 via the output socket SK4 (IF OUTPUT). Here it enters the IF unit at SK3 and by means of the changeover relay contact 1A is switched to one of the two 100 kc/s filters X3 and X4.

55. These filters are composed of a number of resonant units at specified frequencies. Each consists of a toriodally wound coil on a permalloy dust core and a silver-mica condenser moulded in a block of synthetic resin. The complete filter is tropically sealed and being preset requires no further adjustment in service. Filter X3 is used on R/T, MCW or CW operation (3 kc/s 6dB down). For narrow-band CW2 operation filter X4 is used (500 c/s 6dB down).

56. The output of either of these filters is selected by the relay contact 1B and applied to the grid of V2 of a two-stage IF amplifier designed to compensate for the insertion loss of the filters. The pentode valves V2 and V3 are resistance-capacitive coupled by C5 and R9 in a conventional manner.

CW reception

57. An additional coupling to the grid of V3 is made from the 99 kc/s oscillator V6. This is a CW oscillator used in conditions of CW reception and producing a 1,000 c/s beat note on a signal that is on its nominated frequency. The preset capacitor C16 affords an adjustment of the injection level.

58. The oscillator is crystal-controlled using a 99 kc/s crystal XL1 connected in the grid circuit of V6. The connection of HT to the oscillator anode is controlled by relay RL2/2 which is energized when the equipment is in the CW condition. Contact 2A completes the 200V supply to the anode via R23 from pin 3 of PL1 (*fig.* 14).

59. A cathode-follower V4 is connected in the output of the second 100 kc/s IF amplifier V3. The cathode load of the former consists of the 150-ohm resistor R16 with the coil L2 in series, the path to earth being completed by R21. The low impedance output from this stage is coupled to the double-diode V5 which is connected as an AGC rectifier and audio detector.

AGC circuit

60. The cathode of the AGC diode is fed with signals from the junction of R16 and L2 with R17 and C12 connected as the diode load ; the AGC bias across this load is filtered by R18 and C9 and then connected via pin 8 of PL1 to those valves controlled by AGC. These are the RF amplifiers, the 1st frequency changer, the 1st IF amplifier and the 2nd frequency-changer (V2, V3, V4, V5 and V6 on the RF unit). The delay bias for the AGC rectifier is developed mainly by R21.

Audio detector

61. Input to the audio detector diode V5b is also taken from the junction R16 and L2, the detector load being the resistors R42, R41 and R39 bypassed by C13. A test point (used for alignment purposes) is connected across R39 for measurement of the potential developed by the detector current.

Noise limiting

62. Noise limiting is provided by the double-diode V9 connected in the output from the audio detector. The full audio output from V5b is filtered by R43 and C30 and applied to the anodes of V9 via R44 giving the potential proportional to the carrier level at V5.

63. Approximately half the audio signal voltage is taken from the junction of the potential divider R41, R42 and applied to the cathode of V9b, this cathode is thus held negative to its anode. In these conditions the diode conducts thus passing the audio signal to the grid of the audio amplifier stage V7 via the relay contact 2B.

64. At 100 per cent modulation the average value of the potential at the cathode of V9b rises to the same potential as the anode and the diode cuts off. This occurs whenever impulsive noise exceeds the level of 100 per cent modulation and removes the audio signal to the output stage. Should a noise pulse considerably exceed the cut-off potential of this limiter the self-capacitance of the diode still allows the signal to pass to V7. In this event the anode of V9a becomes positive with respect to its cathode, diode V9a conducts and virtually short-circuits the load (R41, R42) of V5 via C30 thus again cutting the audio output.

AF amplification

65. The audio signal from V9 is coupled to the audio stage V7 by means of C29 and RV3 or C29 and RV4, according to the position of the relay contact 2B, and thence by R30, C24 to the AF output valve V8. This valve is transformer coupled to the output by T1.

66. Capacitors C14, C25 and C28 provide tone correction and negative feedback from the potential

divider R34 and R35 in the output is applied over stages V7 and V8.

67. The potentiometers RV3 and RV4 provide independent adjustment of audio level, according to the position of the relay contact 2B. Relay RL2/2 is energized in CW conditions and contact 2B selects potentiometer RV4. In conditions for R/T the relay contact selects potentiometer RV3.

Control circuits

68. This description refers mainly to the circuits of the main chassis assembly and reference should be made to the circuit in fig. 15. The receiver has only one tuning motor and this is mounted on the RF unit, the setting of the tuning motor MG1 (*fig.* 13) is controlled by two 12-way potentiometers POT. 1 and POT. 2 (*fig.* 15).

Front panel controls

69. TUNE/NORMAL switch (S2). In the NORMAL position the tuning motor circuit (MG1) on the RF unit is connected to the 19V supply via pin 3 of PL5 (*fig.* 15). The tuning lamp LP1 is disconnected from the 19V supply.

70. In the TUNE position the tuning motor circuit is disconnected from the 19V supply ; this permits manual operation of the manual TUNE control and the associated drum tuning dial (*fig.* 6). The lamp LP1 is connected to the 19V supply and will glow as long as the switch is in the TUNE position. The RF GAIN control on the remote control unit is earthed via pin 2 of PL6.

71. *Receiver band switches S9 and S10.* These are in two banks of twelve switches, there is one switch for each channel and each switch has three positions :—

(1) 2·8 to 5·2 Mc/s—UP position.

(2) 5·2 to 9·7 Mc/s—MID position.

(3) 9·7 to 18·1 Mc/s—DOWN position.

72. POT. 1/POT. 2. The two twelve-way potentiometers POT. 1 and POT. 2 can be adjusted for the selected channel by means of the 24 control knobs located on the front panel just below the band switches S9 and S10.

Motor-operated channel selection circuits

Selector switch S1

73. The selector switch S1 is driven by the selector motor MG1 (*fig.* 15). The function of the various sectors of the switch is described below :—

(1) S1B is the searching bank for the channel letter connections from the remote control unit switch 6S1 (via PL7, pins 7 to 12). The method of selection of any one of twelve channels by means of six connections is described in Chap. 7.

(2) S1A is mechanically ganged to S1B and will assume a similar angular position to the latter as the motor-driven switch-shaft rotates. Six connections from S1A are taken to the searching switch-bank in the transmitter control circuit (via PL7, pins 1 to 6).

(3) S1C to S1F are the switch sectors selecting the particular 3-pole band switch for the selected channel. They are grouped as follows :—

Channels 1A to 1M employ S9A to S9M via S1E and S1F.

Channels 2A to 2M employ S10A to S10M via S1C and S1D.

The selection of S1E and S1F, S1C and S1D is made by the number relay RL2/2.

(4) S1G is the " clicker " switch on the motor " stop " circuit and is associated with S1B and motor relay RL3/2.

(5) S1H to S1Q are the crystal selection switches. These are in pairs, each selecting one of six crystals, e.g. S1Q earths all crystals except the one selected, while S1P connects that crystal via " number " relay RL1/2 (contact 1B) to the grid of the oscillator V1.
The switch sectors are connected in pairs so that the relay contact 1B selects two banks of 12 crystals as follows :—

Channels 1A to 1M employ S1H to S1L to select crystals XL1 to XL12.

Channels 2A to 2M employ S1M to S1Q to select crystals XL13 to XL24.

POT.1/POT.2

74. Ganged to the same shaft as S1H are the two 12-channel potentiometers shown as POT. 1 and POT. 2 in fig. 15. These are selected for channels 1A to 1M and 2A to 2M respectively, by the relay contact 1B

Relay circuits

75. The function of each relay is given below, the operation of the relays within the receiver tuning circuit is described in para. 38.

76. RL1/2 and RL2/2 are the number relays each having " changeover " contacts. In each position of the contacts twelve of the crystals, twelve of the band switches and one of the 12-way potentiometers are connected to the channel selector switches. Contact 1A selects the crystal banks ; contact 1B selects either POT. 1 or POT. 2 ; contact 1B and 2B select the band switch sectors S1E to S1F.

77. RL3/2 is the selector motor relay. Contact 3A switches the motor on and off (shorting the armature to earth in the off position, thus providing braking). Contact 3B completes the energizing circuit of the receiver muting relay RL6/1.

78. RL4/1 is the " Receiver ON " relay and is energized when the 19V supply is applied to the receiver. Contact 4A completes the 28V supply to the receiver control circuits.

79. When the 28V is applied to the receiver control circuits, relay RL5/1 is energized. Contact 5A connects the 19V supply to the receiver control circuits.

80. RL6/1 is the receiver muting relay and is operated either by the " service " switch in the

remote control unit, the "key" circuit via pin 6 of PL6, or the motor relay RL3/2 contact 3B.

81. RL7/1 is the crystal-oven control relay and is energized via the bimetal thermal regulator X2. Contact 7A completes the 28V supply to the heater R1 in the crystal-oven (*para.* 85). The capacitors C9, C10 prevent RF leakage from the oven to the control winding.

Receiver power supply circuits

82. With the power switch 11S3 (remote control unit) in the STB/BY (receiver ON) position, the 19V supply from the aircraft battery at the PL5 pin 3 is connected through the fuse F2 to energize relay RL4/1. Contact 4A applies the 28V battery supply to the rotary transformer at TG2 and also to the remainder of the receiver control circuits requiring this supply (through fuse F3).

83. With the closing of contact 4A, relay RL5/1 is energized and contact 5A switches the 19V supply to the 19V control circuits.

84. The rotary transformer is filtered at input and output by two sections of interference filtering enclosed in a screened box X1. The fuse in X1 protects the HT filter components. The output at 200V DC through fuse F1 is smoothed by C1 and taken to the general 200V supply to the receiver circuits. The distribution is to the anode of V1 via R10, to the RF unit through SK1 pin 3 and to the IF unit through SK2 pin 3.

85. The crystal oven is heated by a resistance winding R1 mounted in the oven door. The bimetal thermal regulator X2, set at 50 deg. C nominal, is closed at normal ambient temperature and in these conditions completes the energizing circuit of relay RL7/1.

86. Contact 7A closes and completes the 28V supply to the heater resistor R1. The heating is cut-off when the thermal regulator X2 cuts off the supply to relay RL7/1. The earth return of R1 is taken through a second regulator X3 which operates at 60 deg. C. This regulator will open if X2 fails and so prevents damage due to overheating.

Function of receiver tuning circuits when setting-up a channel

87. Assume that a channel has been selected in the 1A to 1M range and the associated adjusting knob on the potentiometer POT. 1 has been turned fully counter-clockwise.

88. The TUNE/NORMAL switch S2 is put to the TUNE position. This places the receiver at maximum RF gain and removes the motor 19V supply to the selector motor MG1 (*fig.* 15); at the same time the dial illumination lamp LP2 is connected to the 19V supply.

89. The bridge formed by POT. 1 and RV1 is unbalanced and RL4/1 operates thus closing either of the slave relays (RL1/2 or RL2/2) of the tuning motor (*fig.* 13).

90. These put an earth on the receiver mute line via PL1 pin 9, SK1 pin 9 to the TUNING lamp LP1 (*fig.* 13), thus completing the lamp circuit and causing it to glow. The muting relay RL6/1 will also be energized.

91. The receiver tuning capacitor is now tuned manually for maximum noise by the drum dial on the front panel, thus altering the setting of RV1 which is geared to the capacitor shaft. The TUNING lamp LP1 remains aglow as the bridge is still unbalanced.

92. The adjusting knob of the associated channel on POT. 1 is now turned clockwise until the bridge is balanced; relay RL4/1 then returns to its neutral position thus releasing its slave relays, removing the earth from the receiver mute line, extinguishing the TUNING lamp and indicating that the tuning setting is reached.

93. The TUNE/NORMAL switch is then reset to the position NORMAL for operation at the remote control point.

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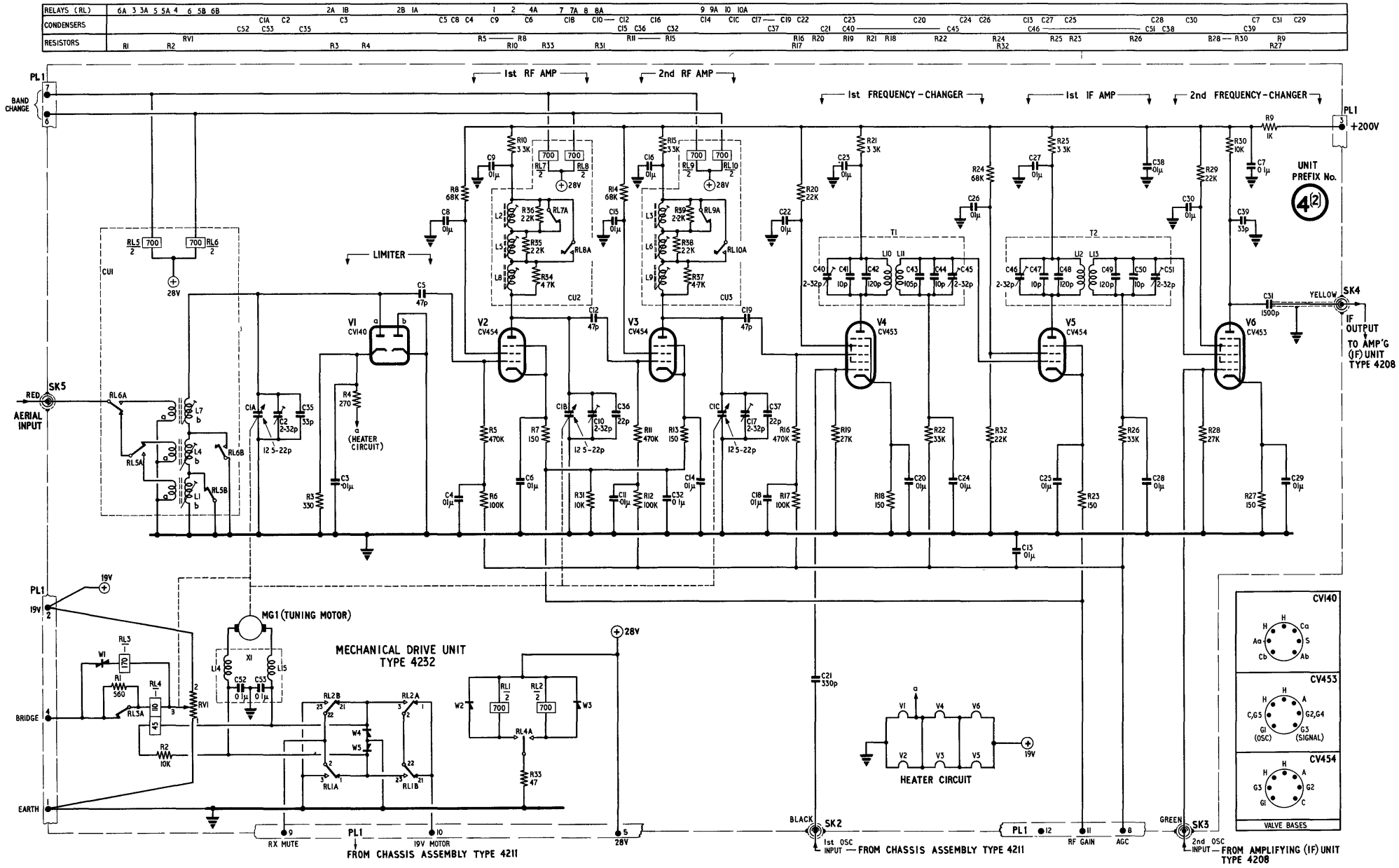

AIR DIAGRAM
6103E/MIN.
ISSUE 1
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A.R.I 5874 – Amplifying unit (RF) Type 4207 — circuit (Receiver R4187)

Fig. 13

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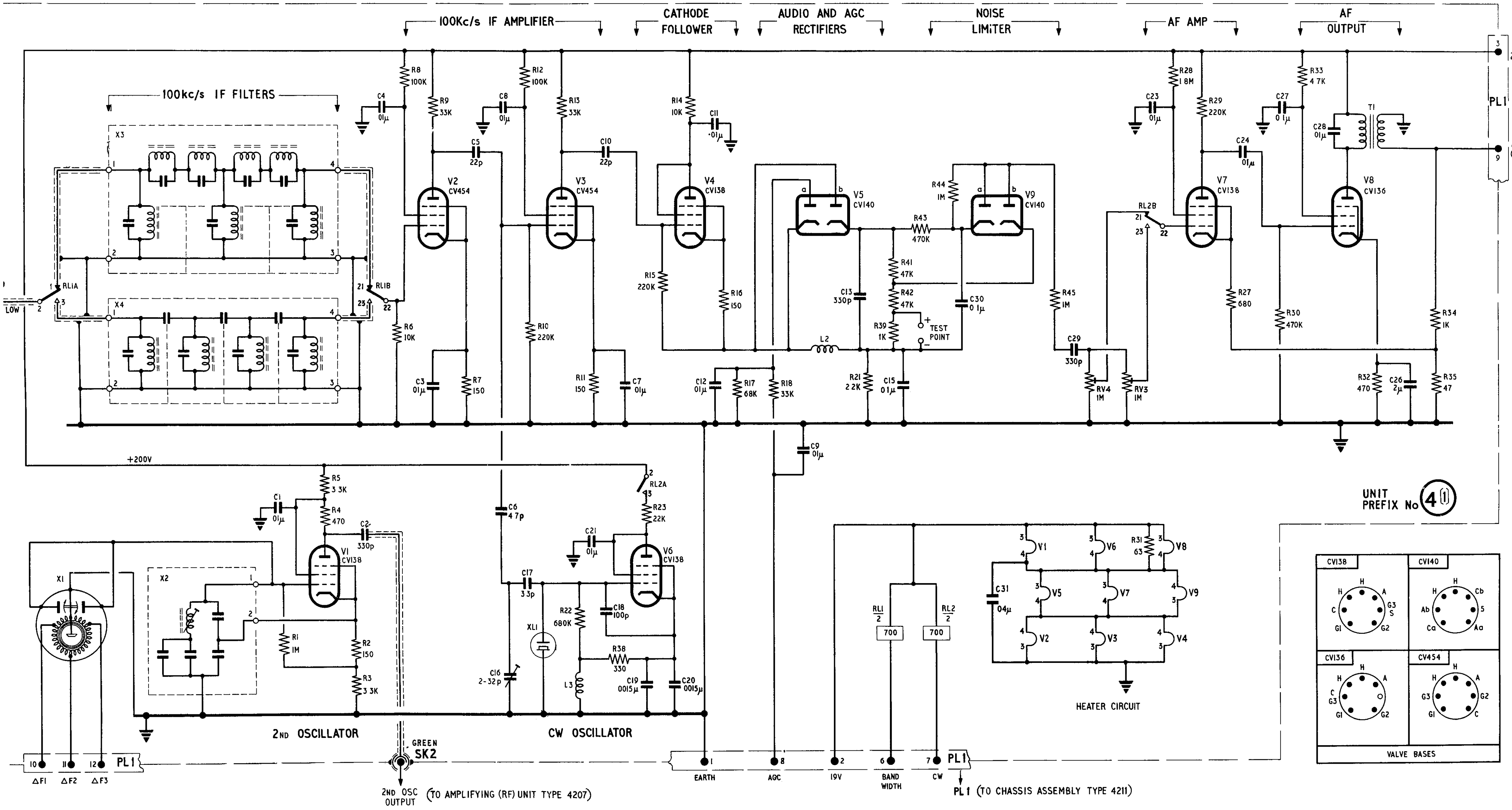
CONDENSERS: C1 C2 C4 C3 C5 C6 C8 C16 C17 C10 C7 C18 —— C21 C11 C12 C9 C13 C15 C30 C29 C23 C24 C27 C28 C26

RESISTORS: R1 R5 R4 R2 R3 R6 R8 R9 R7 R12 R10 R13 R22 R11 R38 R23 R15 R14 R16 R17 R18 R41 R39 R42 R43 R21 R44 R45 RV4 RV3 R31 R28 R29 R27 R30 R33 R32 R34 R35



ARI.5874 - Amplifying unit (I.F.) Type 4208 - circuit (Receiver R4187)

Fig 14

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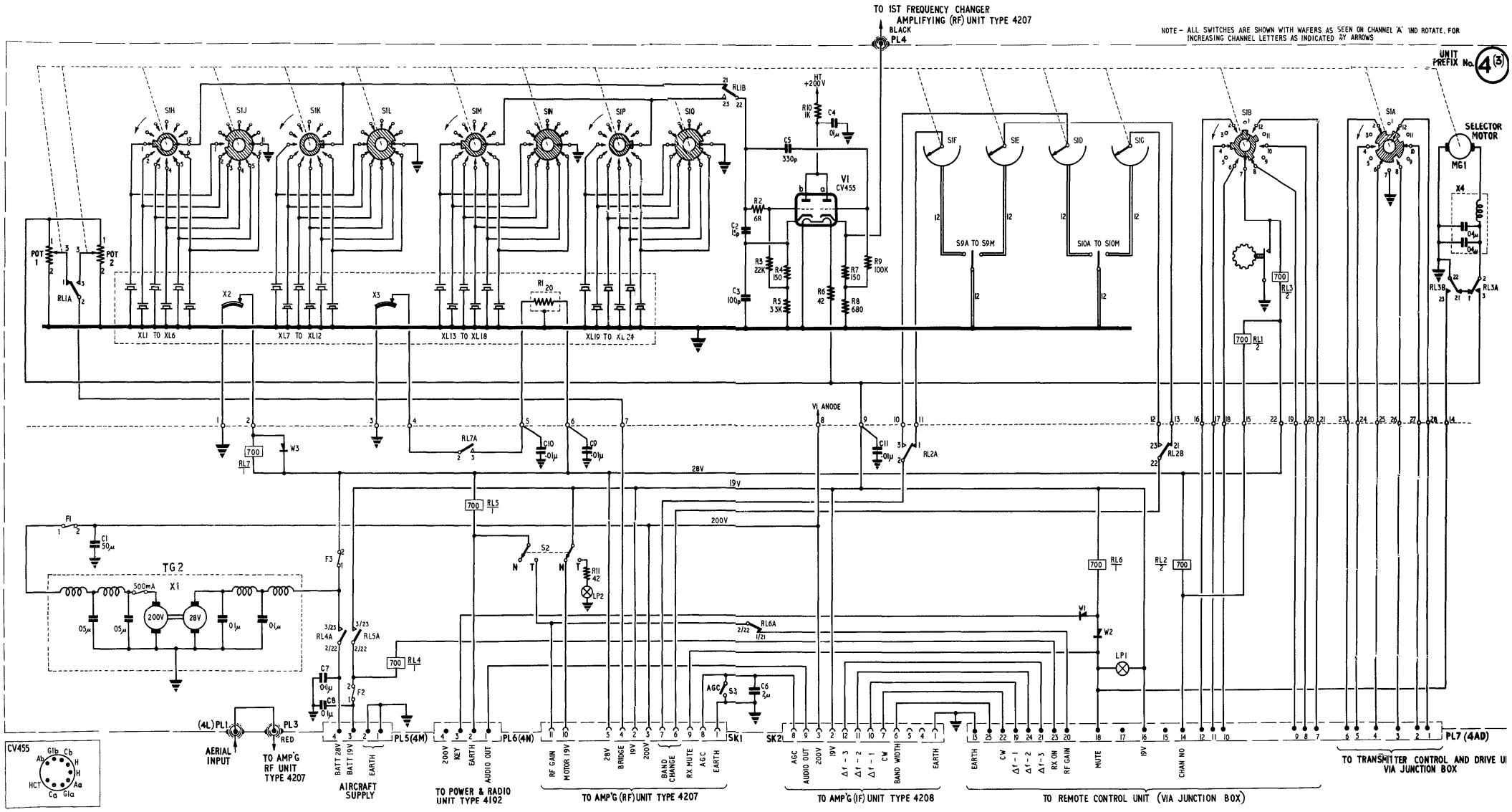
462723 / 7318 625 11/54 BBLtd Gp 979

(A.L.9. Oct 54



AIR DIAGRAM
6103G/MIN
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ARI.5874 – Chassis assembly Type 4211 - circuit (Receiver R.4187)

Fig.

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