

Chapter 2

CONTROL UNIT TYPE 4243

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INTRODUCTION

1. The control unit Type 4243 is used in aircraft installations of the ARI.5874 with fixed wire aerial systems; for those aircraft fitted with ARI.5874 using suppressed aerals, control unit Type 4190

is used, this is described in Sect. 1, Chap. 3. The control unit Type 4243 is the control and drive unit of the transmitter (when using a wire aerial) and includes all the control circuits necessary to operate the transmitter and the aerial tuning unit.

The unit is better known as "the control and drive unit."

CONSTRUCTION

2. The chassis is constructed as a rectangular framework on which a detachable front panel is mounted. A loose dust cover is fitted and can be removed from the rear of the chassis after the release of an Oddie fastener.

Front panel controls and switches

3. An illustration of the front panel of the control and drive unit is given in fig. 1. The panel is fitted with controls which in conjunction with the remote control unit can be used to set up channels on any frequency in the band without access to the transmitter or the aerial tuning unit. These channels can then be selected at the remote control unit.

4. The upper half of the front panel gives access to a group of eight 12-way potentiometers and

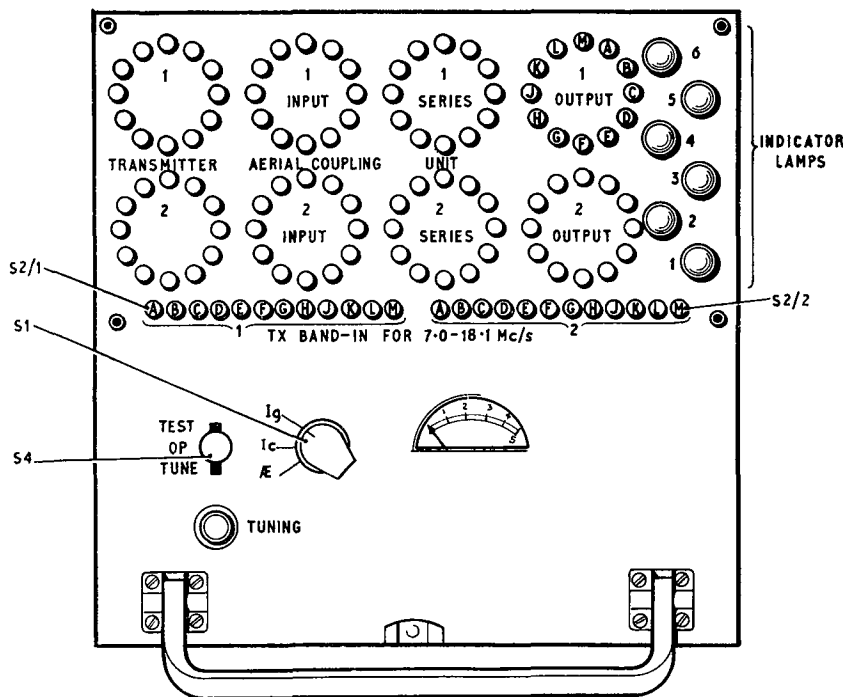


Fig. 1. Control unit Type 4243—front panel

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mounts six capacitor position lamps. The potentiometers and associated mounting plate may be withdrawn through the front panel.

5. Beneath the potentiometers and the lamps is mounted an assembly of 24 frequency band switches used for setting up. The assembly is known as switch unit Type 7289 (10F/17582) and consists of single-pole switches of the push button type. The switches in the normal position are "OFF." Twelve of the switch knobs are in white perspex (S2/1) and the remaining twelve in black ebonite (S2/2). The two rows of knobs are engraved A-M in each case.

6. The detachable front panel (panel, control Type 7509—10D/19280) may be unplugged from the remainder of the chassis after releasing a number of securing screws. This allows access to the front part of the chassis for servicing purposes.

Chassis layout

7. A selector motor (motor unit Type 4214) is mounted in the centre of the chassis and drives a shaft operating a 7-way multibank switch S3 (fig. 2) from which is made all the switching necessary for automatic channel selection of the transmitter and aerial tuning circuits.

8. Three banks of the switch (S3A-B-C) associated with the control wiring are mounted at the front. Four banks, (S3E-F-G-H) at the rear and in the space between the two vertical banks of the crystal sockets, are used to select one of the 24 crystals for each channel.

9. A gear train from the same motor shaft engages

with a gear train at the rear of the eight 12-way potentiometers (fig. 3) and thus turns these in unison to the selected channel position.

10. Above the crystal sockets is mounted the sub-chassis of the crystal oscillator (oscillator unit Type 4215), connection being made to the crystal switches by means of spring contacts. Behind the crystal oscillator are four sealed relays, part of the control circuit (para. 12).

11. Two crystal ovens, Type 13 and Type 14, house the 24 crystal units which are switched-in by the channel selection system and applied to the crystal oscillator circuit. The ovens are fitted with heaters and thermostatic control which keeps the crystal temperature at about 10 degrees C. (nominal).

12. A number of relays are fitted to the control unit chassis, one of which is the low impedance aerial changeover relay which changes the feed cable to the aerial tuning unit from the receiver to the transmitter, when the key is pressed. The key relay is mounted on a panel at the rear of the chassis and is designated relay unit Type 4216. Three coaxial plugs are connected to this relay, thus enabling the aerial to be connected through the relay to either the transmitter or the receiver (para. 15).

13. On the rear panel of the unit (fig 4) are mounted plugs and sockets for interconnection with other units of the installation, the connections are made through the back-plate of the unit. (Chap. 3.)

14. The back-plate is interconnected to the

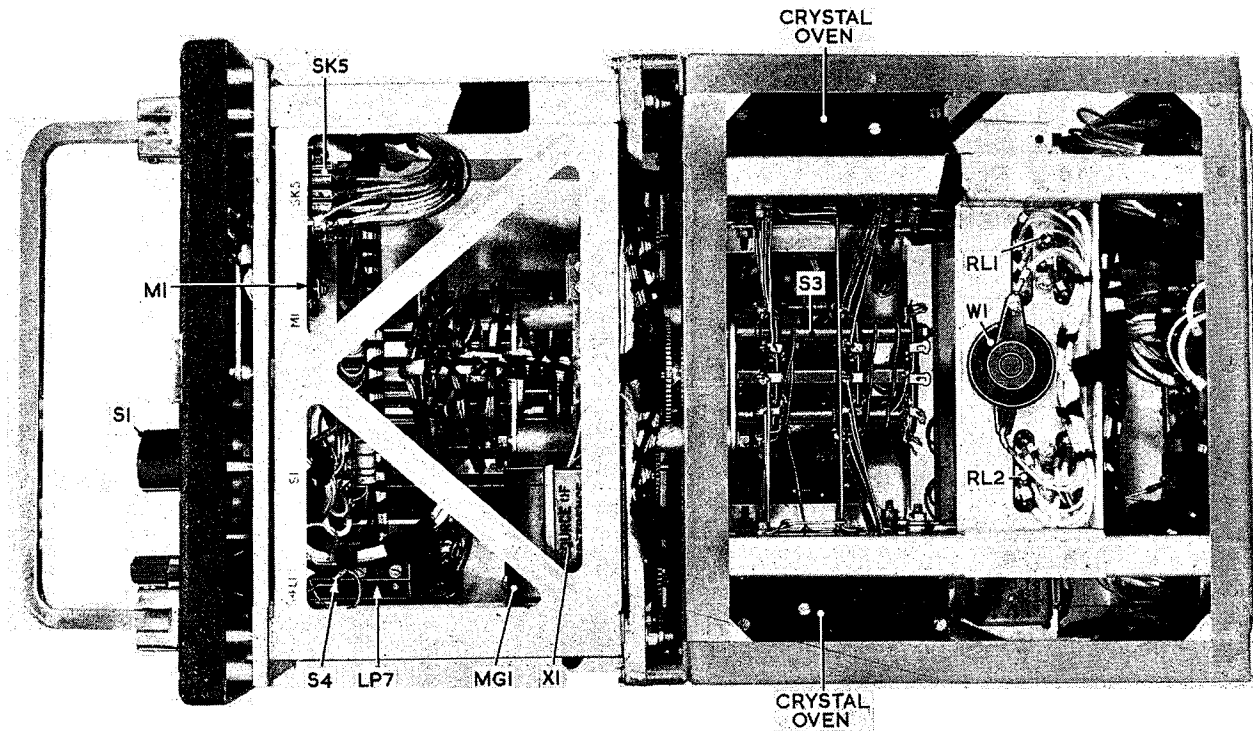


Fig. 2. Control unit chassis—underside

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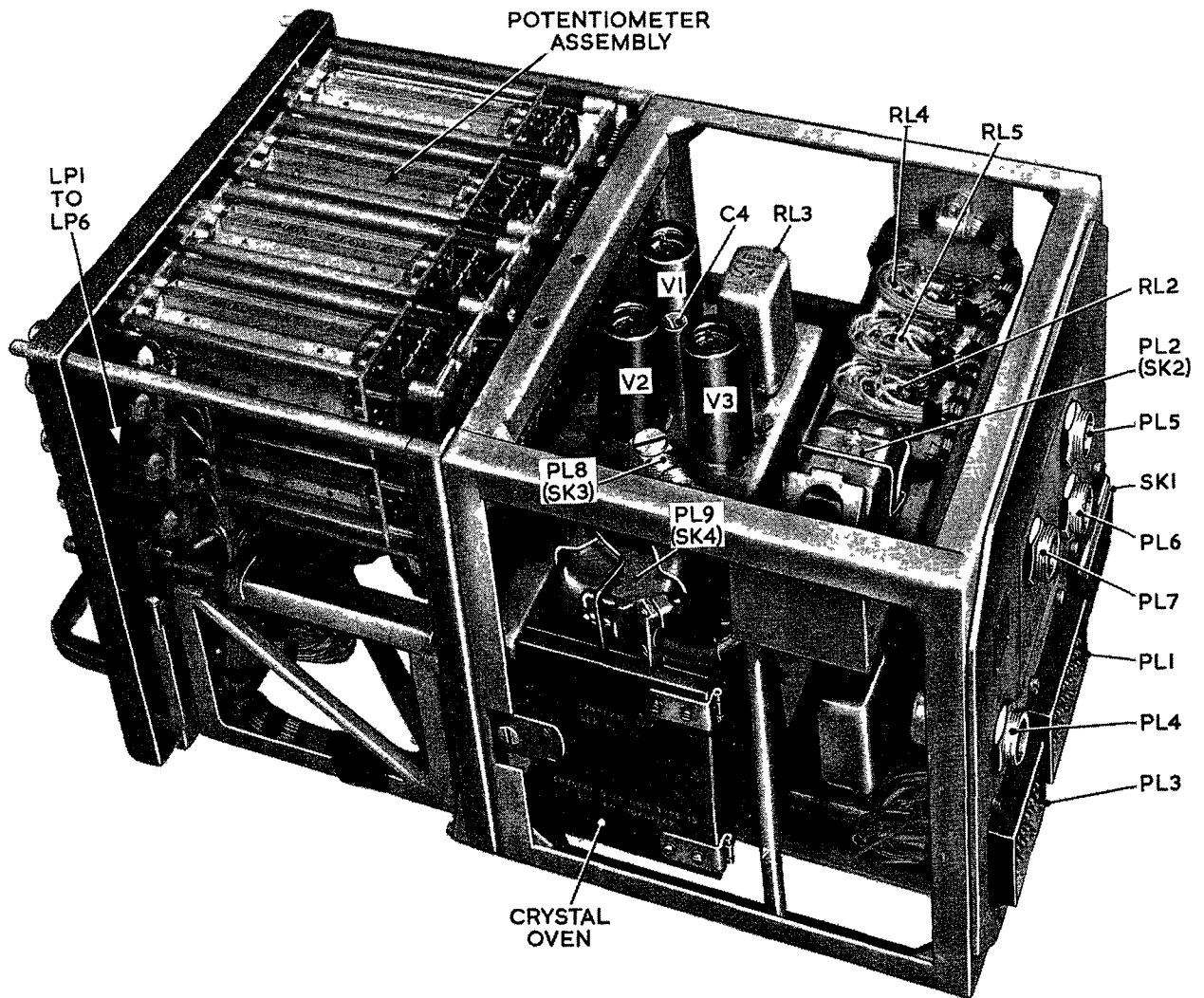


Fig. 3. Control unit chassis

remainder of the installation by means of connectors permanently wired to the back-plates of other units of the installation. Some details of the plugs and sockets at the rear of the control unit Type 4243 are given below; a more complete account is given in Chap. 3.

- (1S) SK1—28-way socket Channel selection control to aerial tuning unit Type 7180.
- (1AE) PL1—28-way plug Connections to remote control unit Type 4189 through junction box Type 4191.
- (1A) PL3—20-way plug Control and power supplies from power and radio unit.
- (1B) PL4—coaxial plug Crystal oscillator output to transmitter.

- (1C) PL5—coaxial plug Aerial connection to transmitter.
- (1R) PL6—coaxial plug Connection from aerial tuning unit to aerial changeover relay (*para.* 12).
- (1L) PL7—coaxial plug Aerial connection to receiver.

Note . . .

The references in brackets refer to the back-plate and connector coding (Chap. 3).

CIRCUIT DESCRIPTION

15. The circuit of the control unit Type 4243 includes those parts of the transmitting circuit controlling the signal frequency and channel selection. The control unit also includes the tuning potentiometers and the capacitor indicating lamps of the aerial tuning unit.

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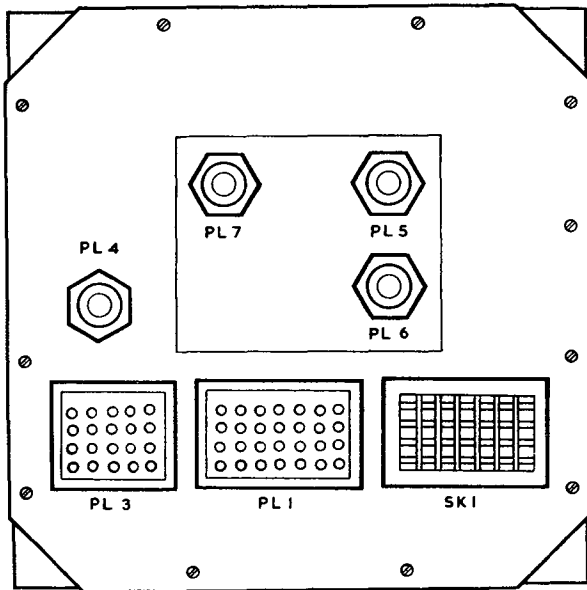


Fig. 4. Rear panel of control unit

16. A complete circuit diagram is given in fig. 6. The circuit can be divided into four parts, three of which are indicated in the block schematic fig. 5.

- (1) The crystal-controlled oscillator.
- (2) The channel selector motor and channel selection circuits.
- (3) The transmitter metering circuits (fig. 6).
- (4) The aerial system tuning potentiometers and capacitor indicating lamps circuit.

Oscillator unit Type 4215

17. The oscillator unit Type 4215 includes three HF pentodes CV138. The oscillator V1 is triode-connected in an aperiodic Colpitts oscillator with feed-back provided by the capacitors C1 and C2.

18. Any one of the 24 crystals can be connected between grid and earth of V1, the selection being made as follows. The crystals are in two banks of twelve; those for the channels 1A-1M are selected by switch wafers S3E and S3F; S3E earthing all crystals with the exception of the one selected while S3F makes contact only with the crystal selected.

19. Switch wafers S3G and S3H operate similarly on the other crystal bank. Contact 3A of relay RL3/2 connects the oscillator grid to one or other of the crystal banks, the bank not in use being earthed by contact 3B.

20. The anode of V1 is coupled by C5 and R7 to the grids of the valves V2 and V3 connected in parallel and as a cathode-follower with load R10, R11. The output through C6 is taken to plug PL4 at the rear of the control unit Type 4243 via SK3 on the oscillator chassis and is a nominal 2 volts RMS into a cable of 70 ohms impedance.

21. The valve heaters are connected in series with the 19V supply. The 300V supply to the anodes is connected via PL9 and SK4 and obtained from the keying relay 2RL4/2 in the transmitter unit (via relay 3RL1/2 in the power and radio unit).

Crystal units

22. Each bank of 12 crystal units is plugged into an enclosure or oven which is thermostatically controlled to a temperature about 10 degrees C. (nominal) by means of heaters R15 and R16. The

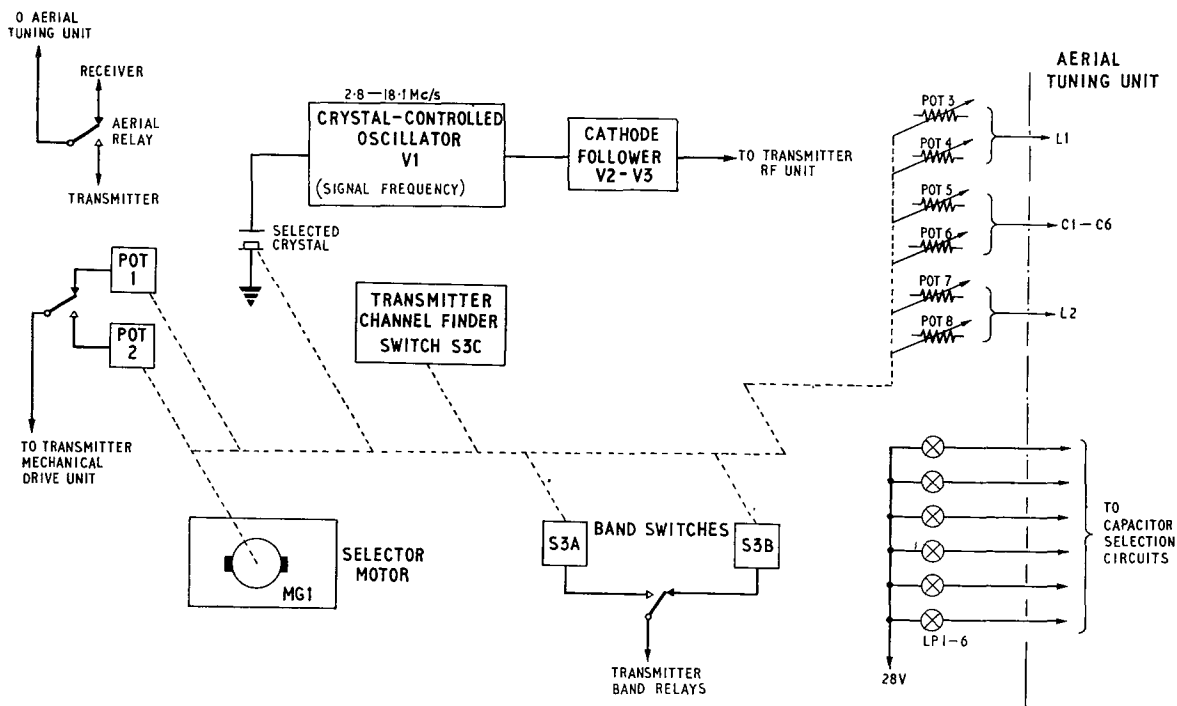


Fig. 5. Block schematic of control and drive unit

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latter are switched in by the bimetal regulators X2 and X3.

Control circuits

23. A full description of the channel selection and control circuits is given in Chap. 7 of Sect. 1, but a brief description of the control and switching circuits of the transmitter is given below:—

Front panel switches

Meter switch—(S1)

24. The meter M1 is connected so that it may be switched to measure the grid current of the transmitter P.A. stage (I_g), the cathode current of the P.A. stage (I_c) and the aerial excitation (AE) from the metering circuit of the aerial tuning unit.

TEST/TUNE switch—(S4)

25. This is a spring-loaded key switch which normally rests in the centre position. The circuit for the three positions is as follows:—

OPERATE (Centre) The “low power” line is open - circuited. (S4D). The “Key” line is open-circuited (S4B).

TUNE (up) The “Key” line is earthed and the aerial changeover relay RL6/2 energized (S4B). The “safe” relay RL7 is earthed (S4D) and the 19V supply is removed from the “intertune” line to allow the transmitter to be adjusted (S4A). The transmitter is switched to R/T by removing the earth from 3RL3 in the power and radio unit (relay contact 7A). Contact 7B removes the earth from the low power line (PL3/20) and allows tuning under “safe” power conditions only, i.e. at nearly full power (*para* 39.)

TEST (down) The earth is removed from the low power line. The “Key” line is earthed (S4C) this allows normal “key down” operation.

Band switches (S2/1 and S2/2)

26. The band switches are selected one per channel by means of the motor-operated switches S3B and S3A respectively. The two groups of switches S2/1 and S2/2 are selected by relay contact 4A and 4B.

27. When the band switches are in the OUT position they switch the 28V supply to the band change relays 2RL1/1, 2RL2/1 and 2RL3/1, thus changing the transmitter tuned circuits from the 7 to 18 Mc/s range to the 2.8 to 7 Mc/s range. (*Sect. 1, Chap. 4*).

TUNING lamp (LPI)

28. The TUNING lamp commences to glow when the TUNE line is earthed, i.e. whenever one of the tuning motors of the transmitter or receiver operates. It is permanently on when the transmitter is switched for MANUAL operation. The TUNE lamp, is of course, visible when the top cover of the front panel is in position and serves as a reminder if the transmitter is left in the MANUAL condition after setting up.

Selector circuit switches and relays

Selector switches (S3)

29. S3A-B As already stated these select the individual band switches of the groups S2/1 and S2/2.

S3C This is the searching bank when the channel is being chosen at the remote control unit. Six wires run from this switch sector to the channel letter pins 1 to 6 on PL1 and thence to the receiver via the junction box; “wire saving” switch banks are used. The method of selection of twelve channels on each band is explained in Chap. 7.

S3J This is a cam-operated clicker switch associated with the channel selector switch S3D. Its operation is explained in Sect. 1, Chap. 7.

S3E-H These select the crystal unit for the channel required.

Relays

30. The relays are grouped by function as follows:—

- (1) Motor relays—RL1/2 and RL2/2
- (2) Number relays—RL3/2, RL4/2, RL5/2 and RL8/2.
- (3) Aerial relay—RL6/2 (low-impedance send-receive aerial switching).
- (4) Low power relay RL7/2 (SAFE).

Motor relays

31. When power is first applied to the control and drive unit, the relays RL1/2 and RL2/2 are energized owing to the earth provided by the connection to S3C or S3J.

32. The motor MG1 starts when 19V is connected via relay contact 1A and rotates until the unearthed position on S3C is reached (“checked” by clicker switch S3J). Relays RL1/2 and RL2/2 then release, thus interrupting the motor circuit (contact 1A), and at the same time, removing the earth from the tune line (contact 1B). The motor is braked dynamically by short-circuiting the armature with contacts 1A and 1B.

33. Relay contacts 2A and 2B make and switch

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the 19V supply to the tuning head of the aerial tuning unit and the transmitter respectively, this prevents the tuning heads from hunting during the rotation of the selector switch S3.

Number relays

34. The number relays operate when position 2 of the number switch is chosen. Contacts 4A and 4B operate and select the group of band switches S2/2. Relay contact 5A changes control of the transmitter from POT 1 to POT 2. Contacts 5B, 8A and 8B change control of the aerial tuning unit from POT 3 to POT 4, POT 7 to POT 8 and POT 5 to POT 6. These potentiometers control the INPUT, OUTPUT and SERIES controls on the aerial tuning unit. Contacts 3A and 3B change over the crystal groups.

Aerial or "keying" relay

35. The aerial relay RL6/2 is mounted in a fully screened box on the rear panel of the control unit (relay unit Type 4216). Its function is that of an aerial changeover switch. The supply to the relay coil is filtered by means of L1, C9 and L2, C10.

36. If the low impedance of aerial switching is not required for use, the links of TSB (tag strip B) at

the rear of the unit between TSB1 and 3, and TSB2 and 4 should be removed.

37. The low impedance feeder from the aerial tuning unit enters at PL6 and on "space" conditions, contact 6A puts this to the receiver via PL7.

38. On "mark" the aerial is switched by contact 6A to the transmitter output which is connected to PL5; at the same time the receiver aerial is earthed by means of contact 6B.

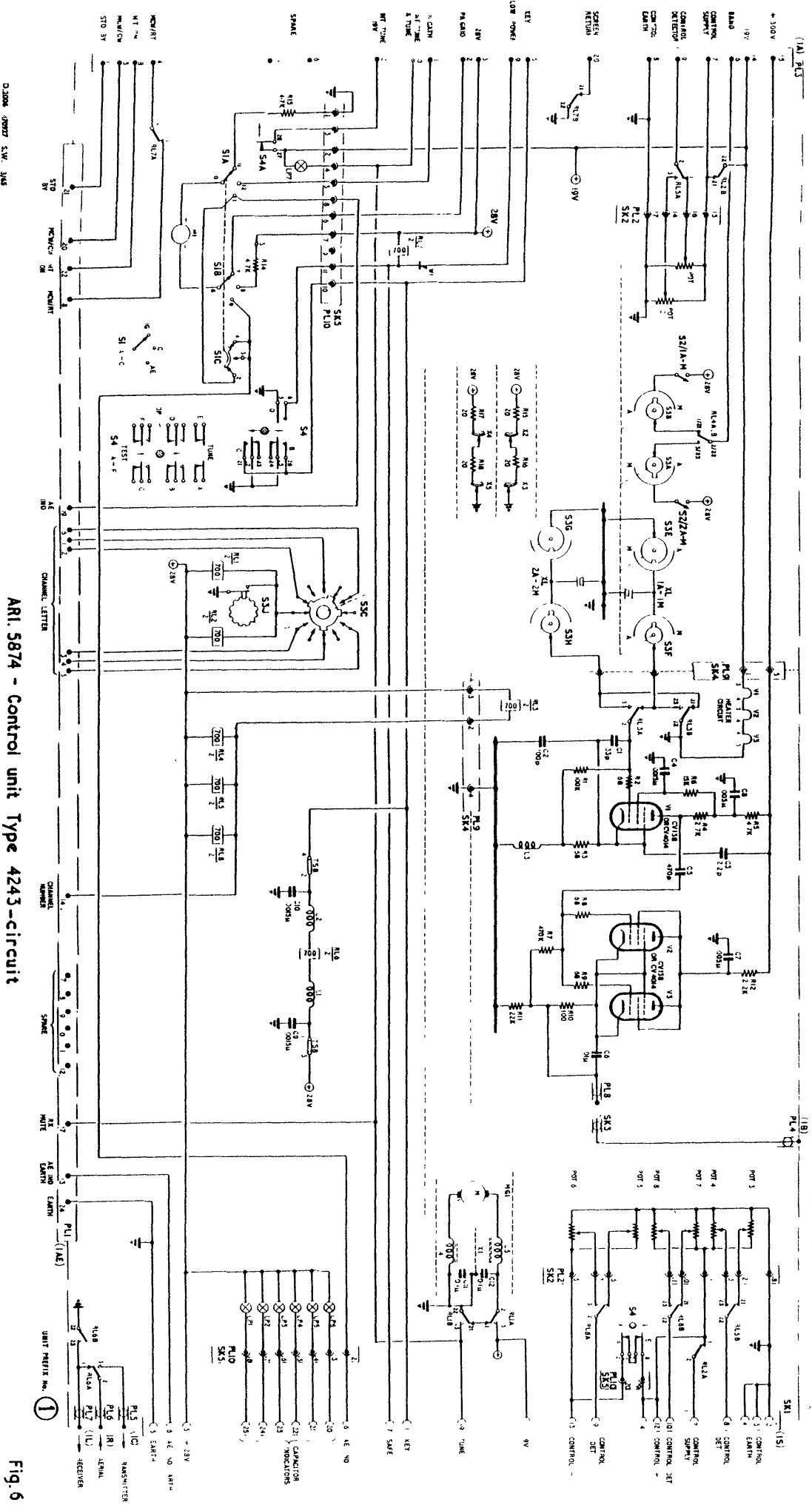
Low power or "safe" relay

39. The "safe" relay RL7 is operated by the switch 8S2B in the TUNE position at the aerial tuning unit which applies an earth to pin 17 of SK1. Relay contact 7B opens to give "safe" operation and contact 7A opens to place the transmitter on R/T condition by breaking the MCW/RT line at SK1/20. (Switch 8S2A gives "key down" conditions).

Capacitor indicating lamps

40. One of the capacitor indicating lamps LP1 to LP6 indicates the series capacitor selected in the aerial tuning unit when one of the six connecting wires is earthed at that unit by the rotary 6-position switch 8S3A.

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ARI. 5874 - Control unit Type 4243-circuit

Fig. 6

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