

# RECEPTION SET R 210

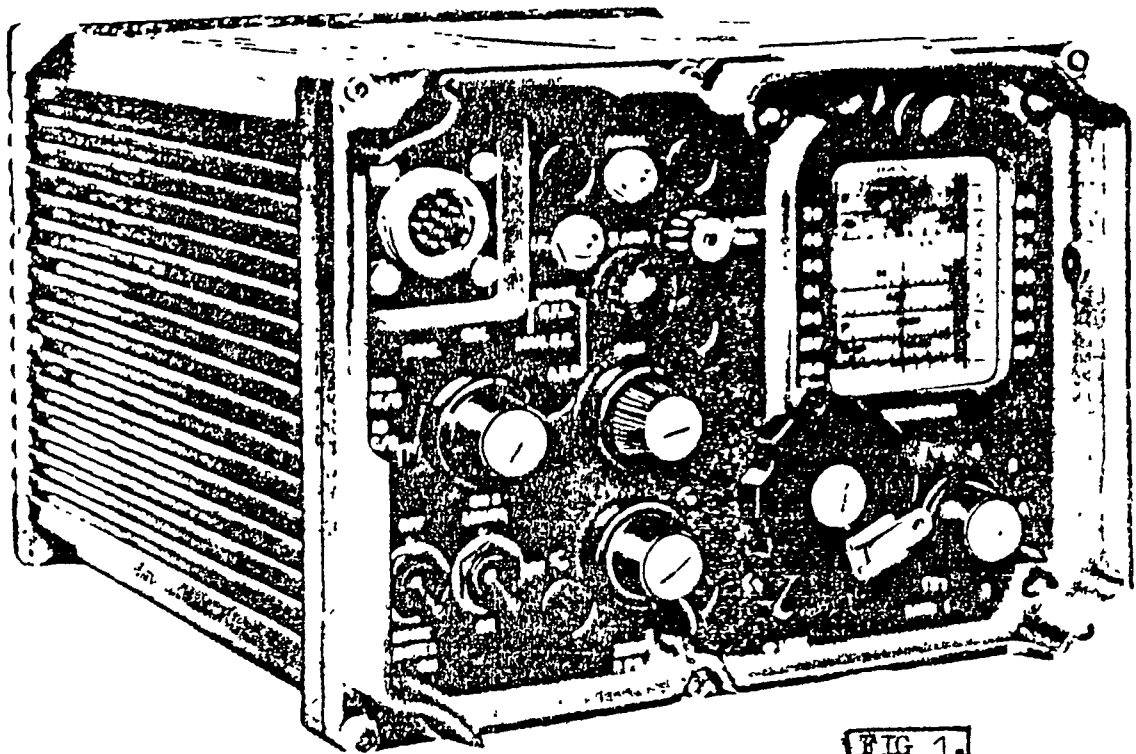
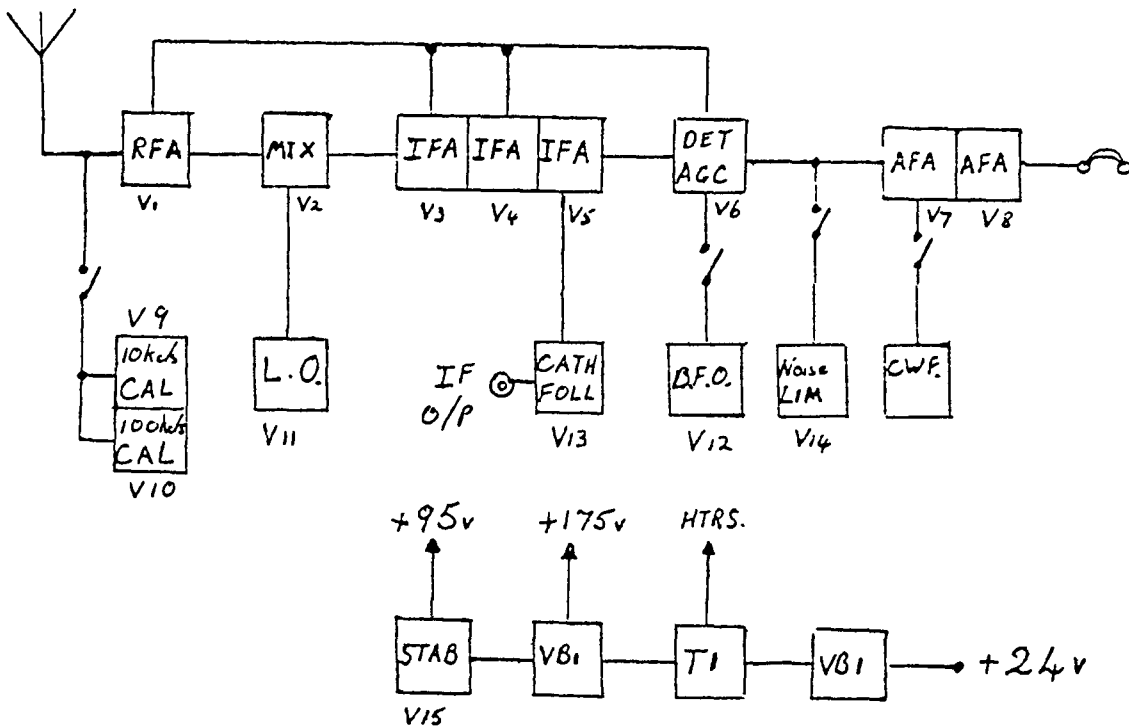


FIG. 1.

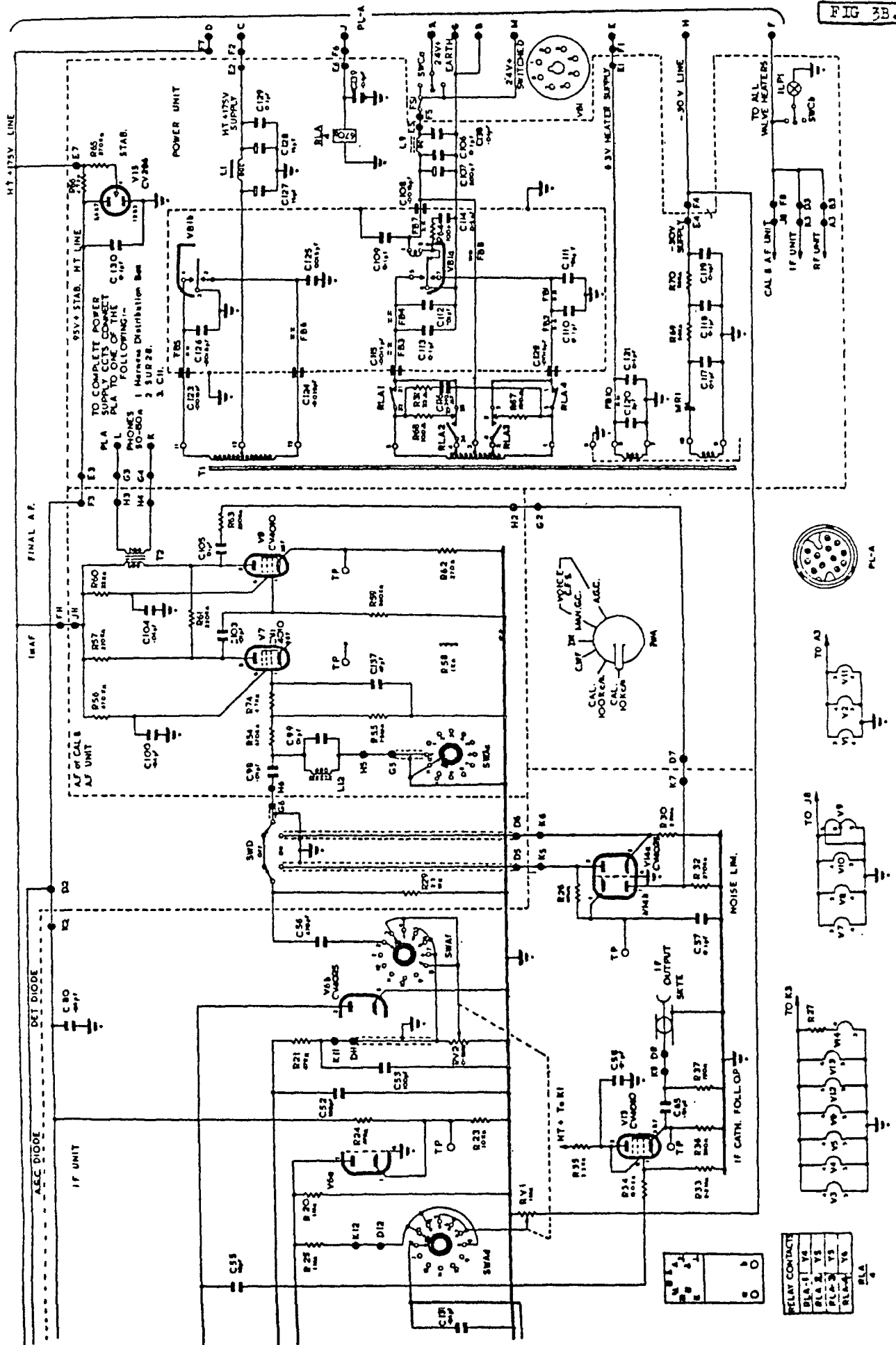


| VALVE                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------|
| V <sub>1</sub> , V <sub>2</sub> , V <sub>3</sub> , V <sub>4</sub>                                                       |
| V <sub>5</sub> , V <sub>6</sub> , V <sub>10</sub> , V <sub>11</sub> , V <sub>7</sub> , V <sub>8</sub> , V <sub>13</sub> |
| V <sub>9</sub> , V <sub>14</sub>                                                                                        |
| V <sub>2</sub>                                                                                                          |
| V <sub>9</sub>                                                                                                          |
| V <sub>15</sub>                                                                                                         |

| C.V. No. |      |
|----------|------|
| 4015     | EF92 |
| 4010     | CAK5 |
| 4025     | EB91 |
| 4012     | CBCL |
| 4003     |      |
| 286      |      |

| OLD No. |
|---------|
| 131     |
| 850     |
| 140     |
| 453     |
| 491     |
|         |

FIG 3B.



ELECTRODE VOLTAGE READINGS

The following readings were taken with a model 8 AVO

| VALVE | ANODE        | SCREEN | CATHODE |
|-------|--------------|--------|---------|
| V1    | 140V         | 140V   | 1.26V   |
| V2    | 93.5V        | 52.5V  | 1.3V    |
| V3    | 166V         | 146V   | 2.5V    |
| V4    | 166V         | 146V   | 2.5V    |
| V5    | 164V         | 143V   | 1V      |
| V13   | 147V         | -      | 2.9V    |
| V7    | 73.5V        | 43.5V  | 1.23V   |
| V8    | 170V         | 134V   | 2.5V    |
| V9a   | 72V          | -      | -       |
| V9G   | 112V         | -      | -       |
| V10   | 8.5V         | 74V    | -       |
| V11   | 74V          | 74V    | -       |
| V12   | (BFO ON)133V | 134V   | -       |

VALVE TESTING DATA (suitable for AVO Valve tester No. 3 and testers valve CT160)

| CV No            | SWITCH      | HTRS | GI  | Va  | VS  | MA<br>Ia | MA/V<br>GM |
|------------------|-------------|------|-----|-----|-----|----------|------------|
| CV 4003          | 741 226 413 | 6    | 8.5 | 250 | -   | 10.5     | 2.2        |
| 6AK5<br>CV 4010  | 412 365 100 | 6    | 2   | 150 | 125 | 7.5      | 5          |
| 6BE6<br>CV 4012  | 412 366 400 | 6    | 2   | 100 | -   | 11       | 7          |
| EF 92<br>CV 4015 | 412 361 500 | 6    | 2.5 | 250 | 250 | 8        | 2.5        |
| EF 91<br>CV 4025 | 192 310 800 | 6    | -   | D   | -   |          |            |

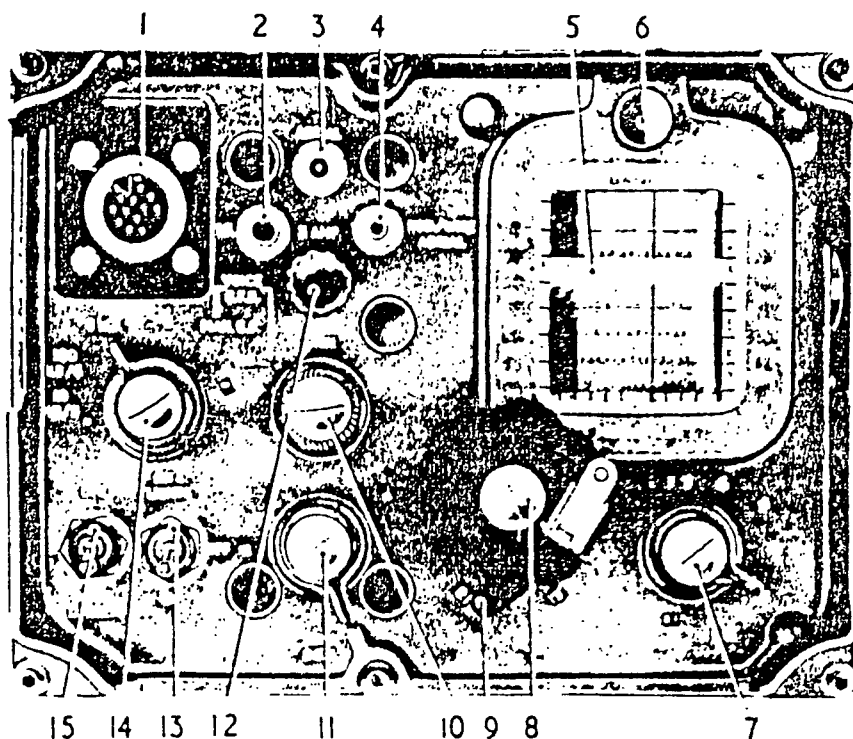


FIG 4.

| Ref. No. | Control              | Description and Purpose                                                                                                                                                                                                                                                                                          |
|----------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | Power Input Plug     | 12 point panel mounted Mk. 4 plug. Termination for connector from wireless sender, the adaptor unit (DC operation) or the AC PSU (AC operation).                                                                                                                                                                 |
| 2        | IF                   | Coaxial socket for connection to ancillary equipment requiring IF output.                                                                                                                                                                                                                                        |
| 3        | AE 80 ohm            | Plug termination for low impedance aerials or feeders.                                                                                                                                                                                                                                                           |
| 4        | ROD/WIRE AE          | Screwed terminal for connection to either rod or wire aerials.                                                                                                                                                                                                                                                   |
| 5        | Tuning Scale         | Seven band scales in parallel on a strip of 70 mm film. The particular band in use is emphasized by the white background strip which moves into position behind the film by operation of the range switch.                                                                                                       |
| 6        | Cursor control       | Controls the position of the movable cursor..                                                                                                                                                                                                                                                                    |
| 7        | BAND switch          | 7-position switch controlling the seven bands. Operation of this switch also controls the position of the white background strip behind the film scale.                                                                                                                                                          |
| 8        | Main Tuning Control  | Controls variable tuning capacitors geared through a reduction drive to the frequency scale.                                                                                                                                                                                                                     |
| 9        | Tuning Control Lock  | Locking device fitted to the tuning control drive. Enables the operator to secure the control in any desired position.                                                                                                                                                                                           |
| 10       | VOLUME Control       | Ganged potentiometer. This component performs two functions. With the system switch at AM, 100 kc/s and 10 kc/s position, a variable resistor, used as an AF gain control, is in circuit. With the system switch at CW, CWF or MAN. GC, another resistor acts as an RF gain control, the AGC being disconnected. |
| 11       | BFO                  | Controls variable capacitor for adjustment of beat note.                                                                                                                                                                                                                                                         |
| 12       | FUSE                 | 3 Amp cartridge type fuse for 24 volt DC input                                                                                                                                                                                                                                                                   |
| 13       | ON-OFF-ON and LIGHTS | 3-position switch. The receiver is switched on without dial lighting, at the ON position. At the ON and LIGHTS position, the receiver is on and the dial is illuminated. Other position is OFF.                                                                                                                  |

| Ref. No.          | Control                           | Description and Purpose                                                                                                                                                                                                                                                |
|-------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14                | System switch                     | 6-position switch controlling system of operation, i.e. CW or AM. Position CWR switches in audio filter. Position 10 or 100 kc/s switches the calibrator in circuit with check points as indicated. The MAN. GC position is mainly used for frequency shift operation. |
| 15                | NOISE LIMITER                     | 2-way ON-OFF switch; enables noise limiter to be switched into circuit when static interference, etc. is troublesome.                                                                                                                                                  |
| 16<br>(Not Shown) | HUMIDITY INDICATOR and DESICCATOR | This is installed in the rear of the case. Contains a quicklime drying agent. Also gives visual indication of presence of moisture in interior of set.                                                                                                                 |

VALVE LAYOUT.

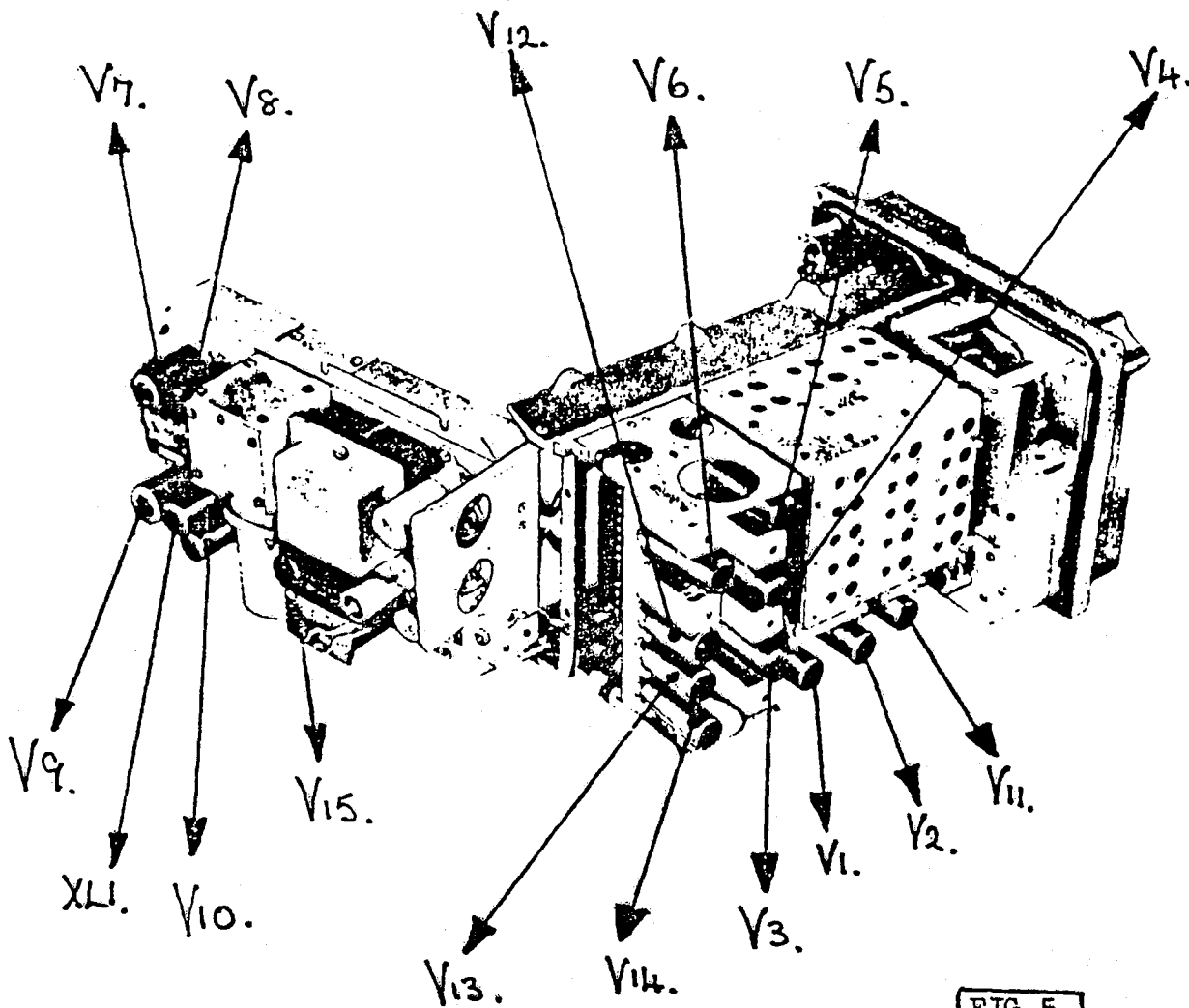


FIG 5.

KEY TO LAYOUT DIAGRAMS OF SUB UNITS.

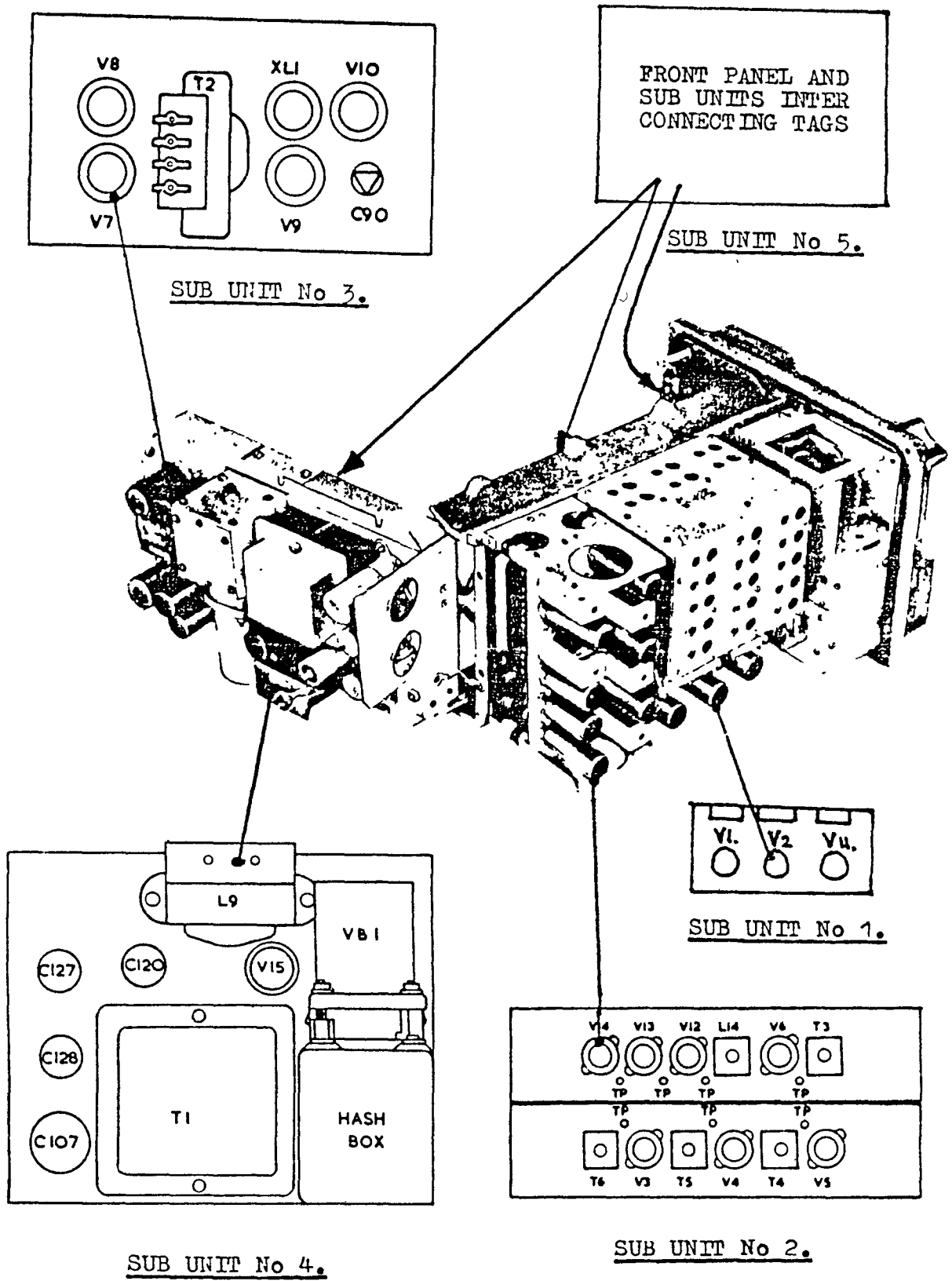
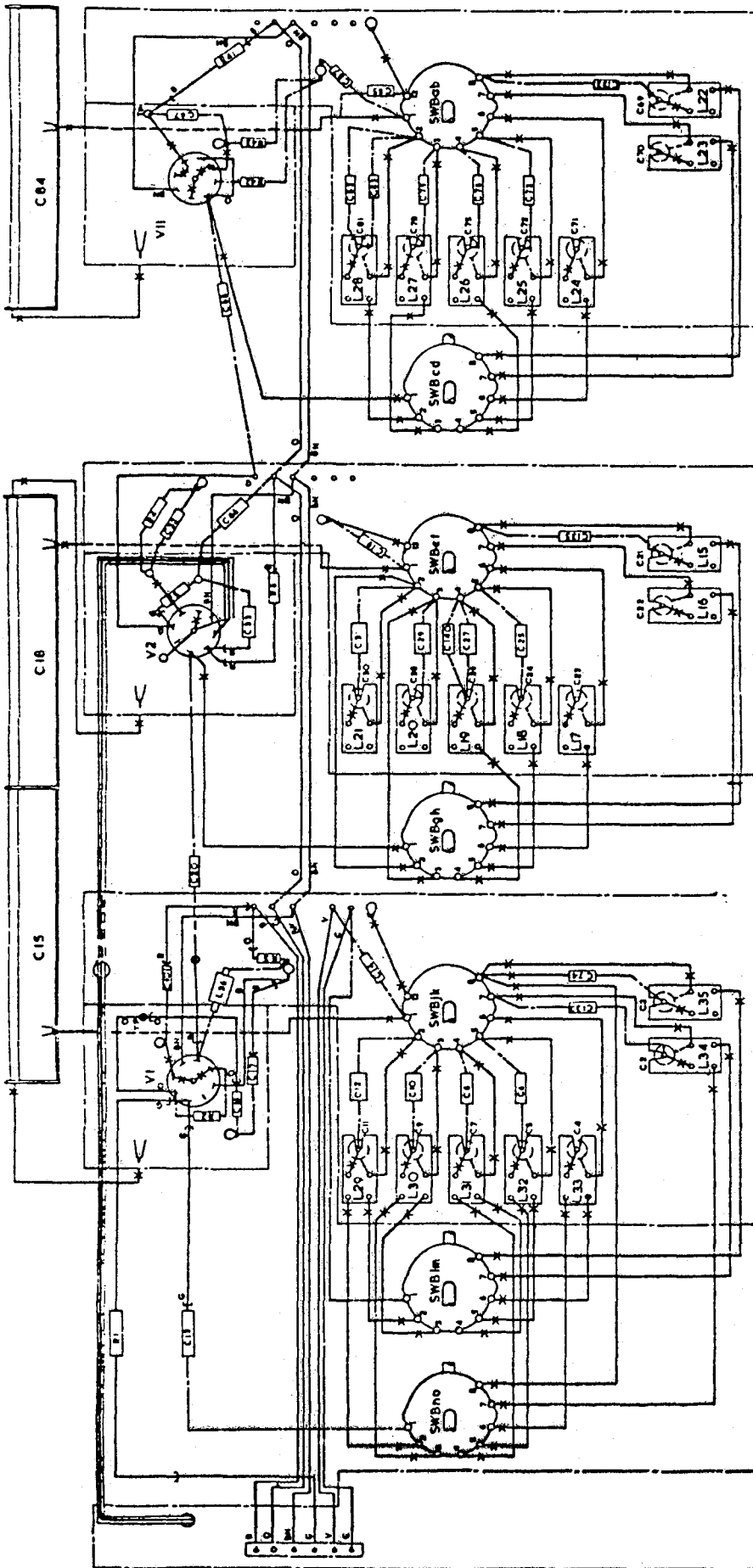


FIG 6.

SUB UNIT No 1.

RF CHASSIS.

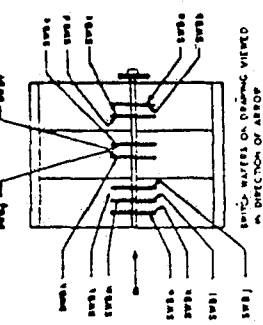


Dotted line --- DENOTES WIRE FORMING PART OF COMPONENTS  
 Solid line --- DENOTES OUTLINE OF CHASSIS

SUB UNIT No 1.

RF CHASSIS.

| GROUP | AMOUNT | REMARKS |
|-------|--------|---------|
| 1     | 1      | SWBnd   |
| 2     | 1      | SWBln   |
| 3     | 1      | SWB1n   |
| 4     | 1      | SWBd1   |
| 5     | 1      | SWBcd   |
| 6     | 1      | SWBdb   |
| 7     | 1      | V1      |
| 8     | 1      | V2      |
| 9     | 1      | V7      |
| 10    | 1      | V8      |
| 11    | 1      | V9      |
| 12    | 1      | V10     |
| 13    | 1      | V11     |
| 14    | 1      | V12     |
| 15    | 1      | V13     |
| 16    | 1      | V14     |
| 17    | 1      | V15     |
| 18    | 1      | V16     |
| 19    | 1      | V17     |
| 20    | 1      | V18     |
| 21    | 1      | V19     |
| 22    | 1      | V20     |
| 23    | 1      | V21     |
| 24    | 1      | V22     |
| 25    | 1      | V23     |
| 26    | 1      | V24     |
| 27    | 1      | V25     |
| 28    | 1      | V26     |
| 29    | 1      | V27     |
| 30    | 1      | V28     |
| 31    | 1      | V29     |
| 32    | 1      | V30     |
| 33    | 1      | V31     |
| 34    | 1      | V32     |
| 35    | 1      | V33     |
| 36    | 1      | V34     |
| 37    | 1      | V35     |
| 38    | 1      | V36     |
| 39    | 1      | V37     |
| 40    | 1      | V38     |
| 41    | 1      | V39     |
| 42    | 1      | V40     |
| 43    | 1      | V41     |
| 44    | 1      | V42     |
| 45    | 1      | V43     |
| 46    | 1      | V44     |
| 47    | 1      | V45     |
| 48    | 1      | V46     |
| 49    | 1      | V47     |
| 50    | 1      | V48     |
| 51    | 1      | V49     |
| 52    | 1      | V50     |
| 53    | 1      | V51     |
| 54    | 1      | V52     |
| 55    | 1      | V53     |
| 56    | 1      | V54     |
| 57    | 1      | V55     |
| 58    | 1      | V56     |
| 59    | 1      | V57     |
| 60    | 1      | V58     |
| 61    | 1      | V59     |
| 62    | 1      | V60     |
| 63    | 1      | V61     |
| 64    | 1      | V62     |
| 65    | 1      | V63     |
| 66    | 1      | V64     |
| 67    | 1      | V65     |
| 68    | 1      | V66     |
| 69    | 1      | V67     |
| 70    | 1      | V68     |
| 71    | 1      | V69     |
| 72    | 1      | V70     |
| 73    | 1      | V71     |
| 74    | 1      | V72     |
| 75    | 1      | V73     |
| 76    | 1      | V74     |
| 77    | 1      | V75     |
| 78    | 1      | V76     |
| 79    | 1      | V77     |
| 80    | 1      | V78     |
| 81    | 1      | V79     |
| 82    | 1      | V80     |
| 83    | 1      | V81     |
| 84    | 1      | V82     |
| 85    | 1      | V83     |
| 86    | 1      | V84     |
| 87    | 1      | V85     |
| 88    | 1      | V86     |
| 89    | 1      | V87     |
| 90    | 1      | V88     |
| 91    | 1      | V89     |
| 92    | 1      | V90     |
| 93    | 1      | V91     |
| 94    | 1      | V92     |
| 95    | 1      | V93     |
| 96    | 1      | V94     |
| 97    | 1      | V95     |
| 98    | 1      | V96     |
| 99    | 1      | V97     |
| 100   | 1      | V98     |



TRANSFORMERS ASSOCIATED WITH COILS L18-L33  
 TO BE CONNECTED TO CHASSIS THIS CHASSIS AS SHOWN.

FIG 7.

SUB UNIT No 2.

IF CHASSIS.

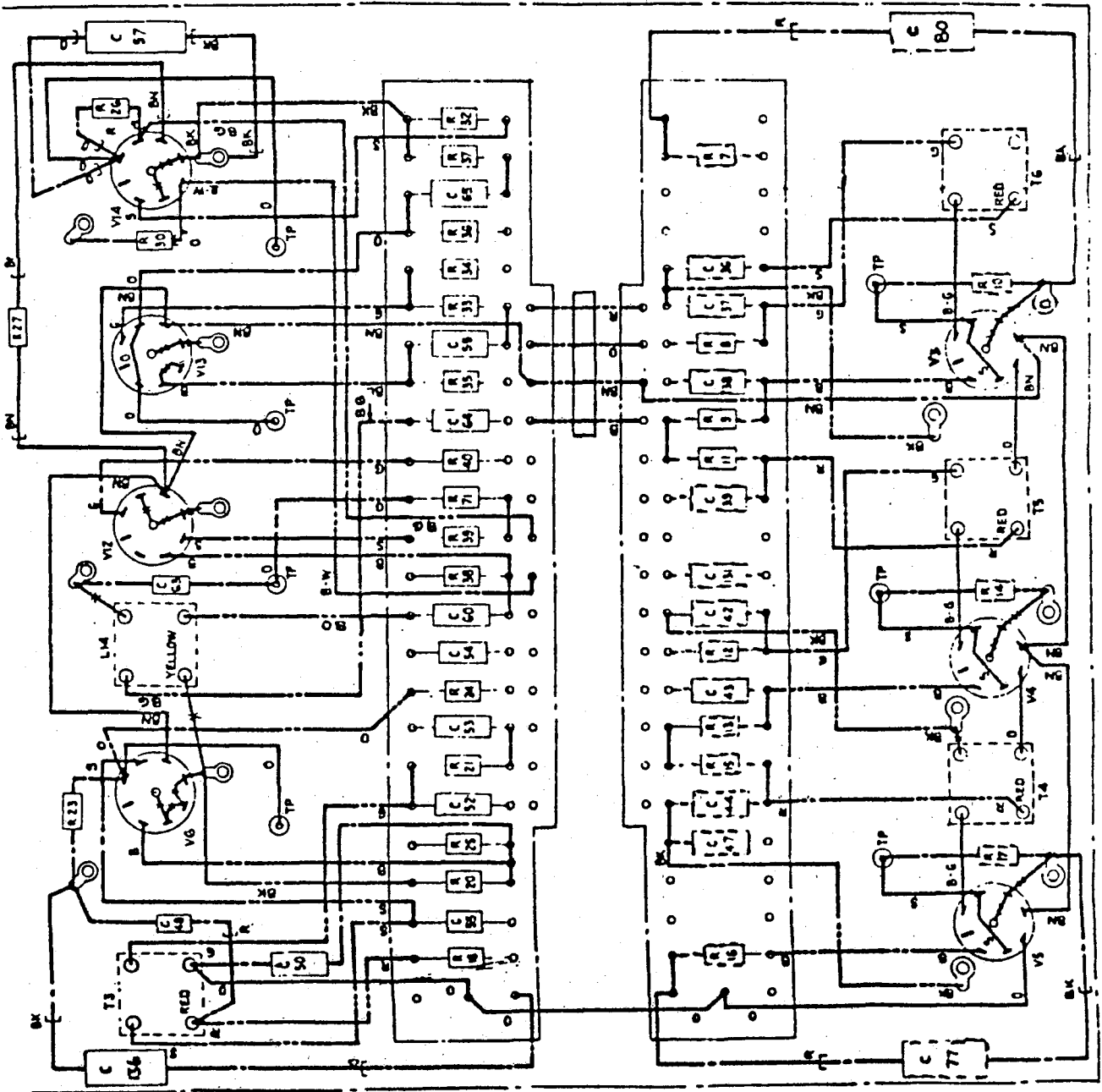
**FIG 8.**

| COLOR       | TERMINATION AS SHOWN ON WIRE | REMARKS               |
|-------------|------------------------------|-----------------------|
| BLACK       | BK                           | M/40 BURA WHITE S     |
| BROWN       | BN                           | .                     |
| RED         | R                            | .                     |
| BROWN       | B                            | .                     |
| GREEN       | G                            | .                     |
| BLUE        | B                            | .                     |
| SLATE       | S                            | .                     |
| BLACK/SLATE | B-O                          | .                     |
| BLUE/SLATE  | B-S                          | .                     |
| BLUE/WHITE  | B-W                          | .                     |
|             |                              | 22 SWG THINNED COPPER |
| BLACK       |                              | 1MM PVC SLEEVING      |
| RED         |                              | .                     |
| BROWN       |                              | .                     |
| ORANGE      |                              | .                     |
| SLEEVE      |                              | MELLERMAN WIZ X 1     |

UNDERSIDE

SUB UNIT No 2.

IF CHASSIS.





SUB UNIT No 3.

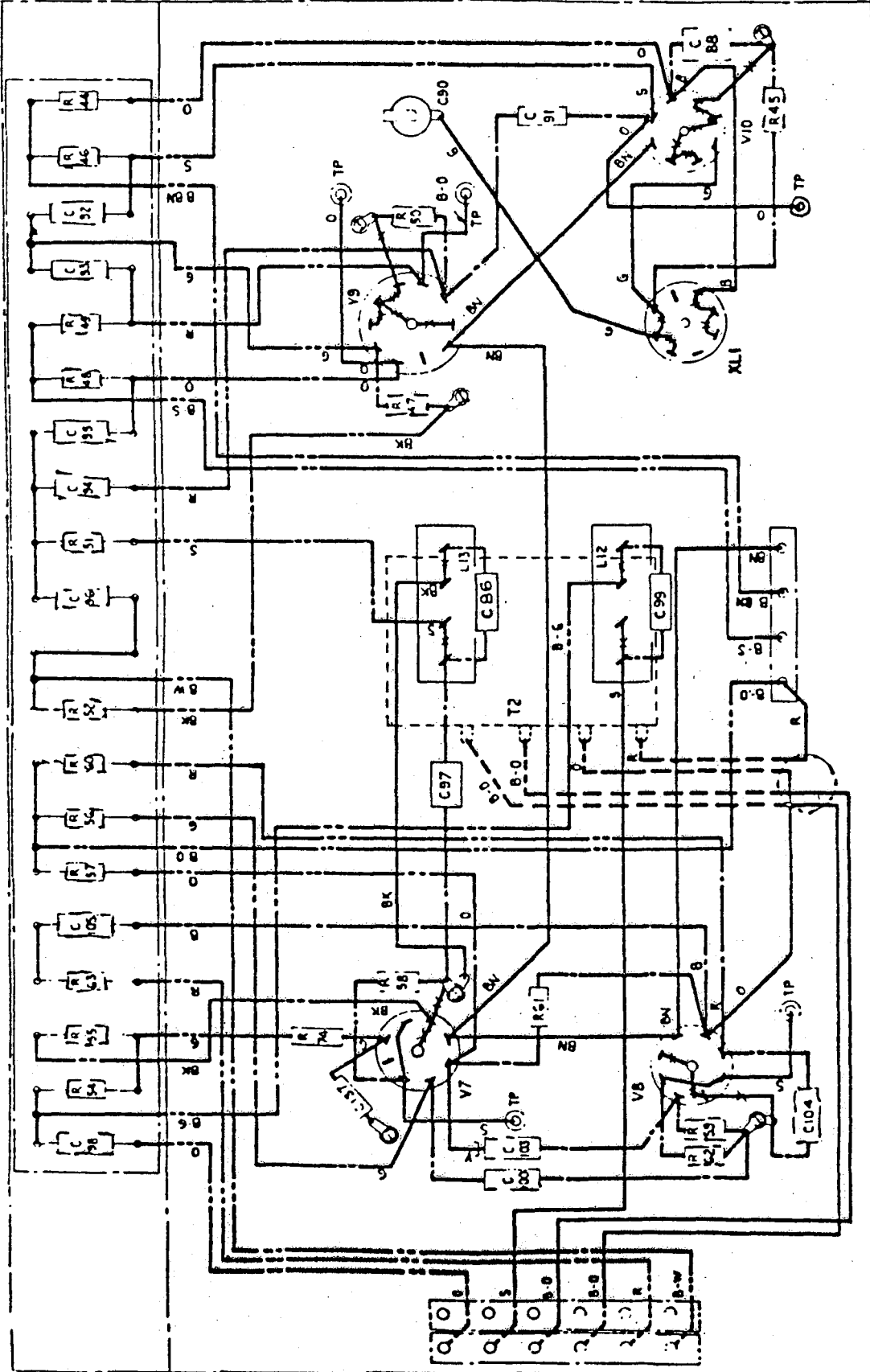
AF CHASSIS.

' W.S. C11 / R210. '

Section 3.

FIG 9.

| COLOUR      | PARLIAMEN<br>TARY<br>WIRING<br>SYMBOL | REMARKS              |
|-------------|---------------------------------------|----------------------|
| BLACK       | BK                                    | M/40 DURA WIRE 3     |
| GREEN       | G                                     |                      |
| ORANGE      | O                                     |                      |
| BLUE        | B                                     |                      |
| SLATE       | S                                     |                      |
| RED         | R                                     |                      |
| BLUE-ORANGE | B-O                                   |                      |
| BLUE-WHITE  | B-W                                   |                      |
| BROWN       | BN                                    |                      |
| BLUE-GREEN  | B-G                                   |                      |
| BLUE-SLATE  | B-S                                   |                      |
| BLUE-BROWN  | B-BN                                  |                      |
| VIOLET      | V                                     | 1MM PVC SLEEVING     |
|             |                                       | 22 SWG TINNED COPPER |

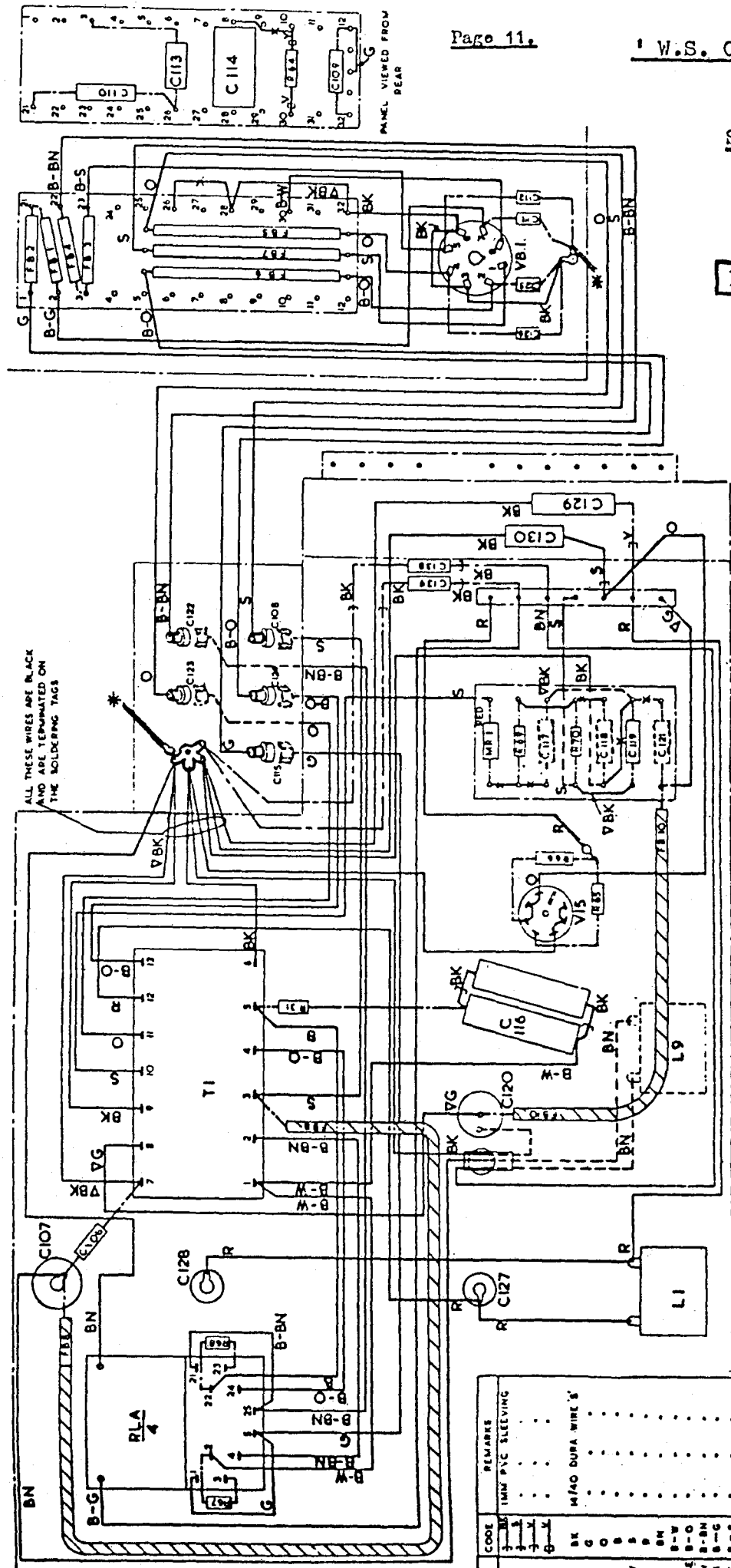


AF CHASSIS.

SUB UNIT No 3.

Section 3.

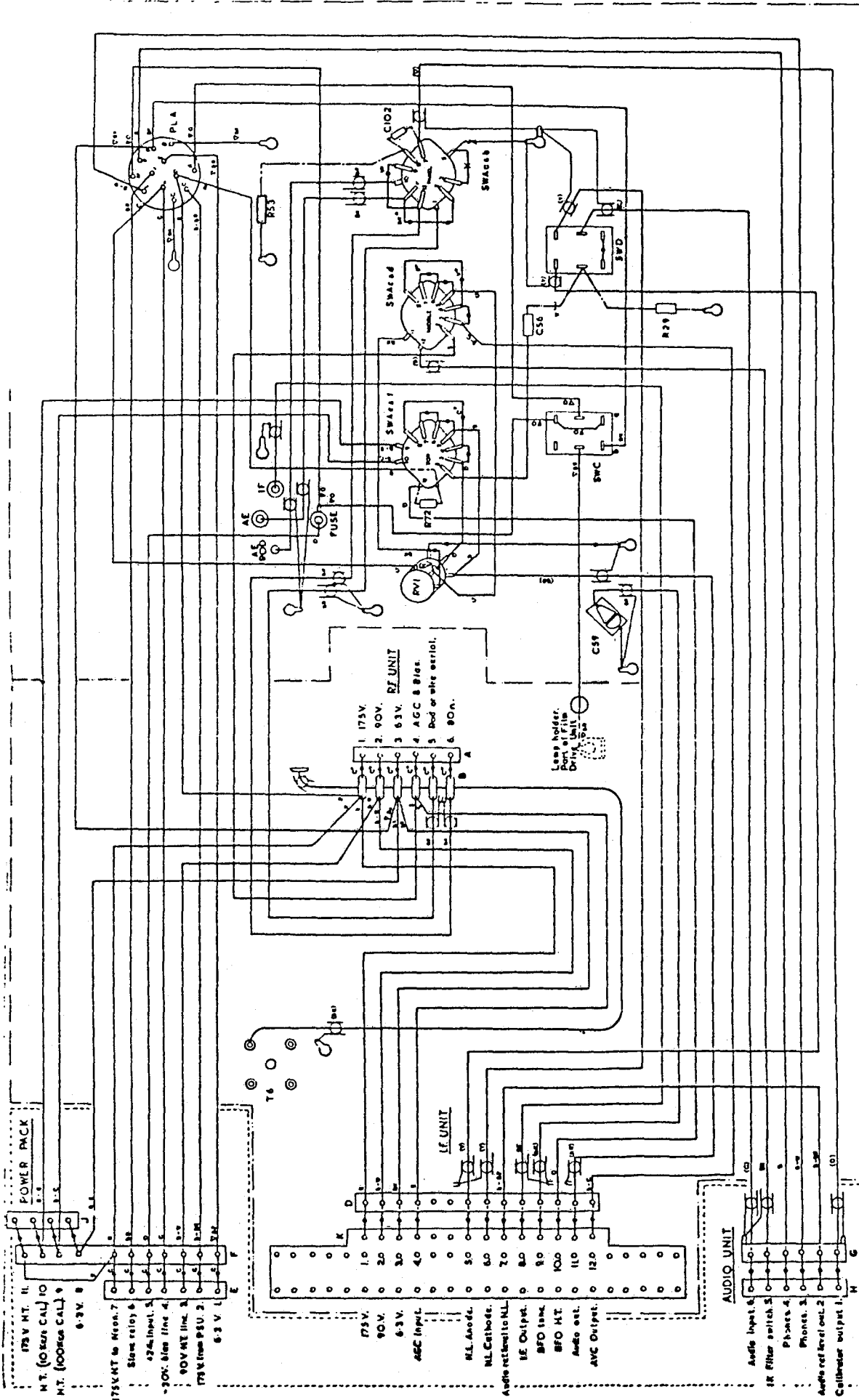
FIG 10.



ALL THESE WIRES ARE BLACK AND ARE TERMINATED ON THE SOLDERING TAGS

SUB UNIT NO 4. DC PSU.

| COLOUR      | CODE | REMARKS                  |
|-------------|------|--------------------------|
| BLACK       | BK   | 1MM PVC SLEEVING         |
| SLATE GREY  | G    |                          |
| VIOLET      | V    |                          |
| VIOLET      | X    |                          |
| BLACK       | BK   | M/AO DURA WIRE S         |
| GREEN       | G    |                          |
| ORANGE      | O    |                          |
| BLUE        | B    |                          |
| SLATE GREY  | S    |                          |
| RED         | R    |                          |
| BROWN       | BN   |                          |
| BLUE-WHITE  | B-W  |                          |
| BLUE-ORANGE | B-O  |                          |
| BLUE-BROWN  | B-BN |                          |
| BLUE-GREEN  | B-G  |                          |
| BLUE-SLATE  | B-S  |                          |
| BLACK       | BK   | M/FOON PVC COVERED       |
| GREEN       | G    | 22 SWG THRED COPPER WIRE |
|             |      | COPPER BRAID             |

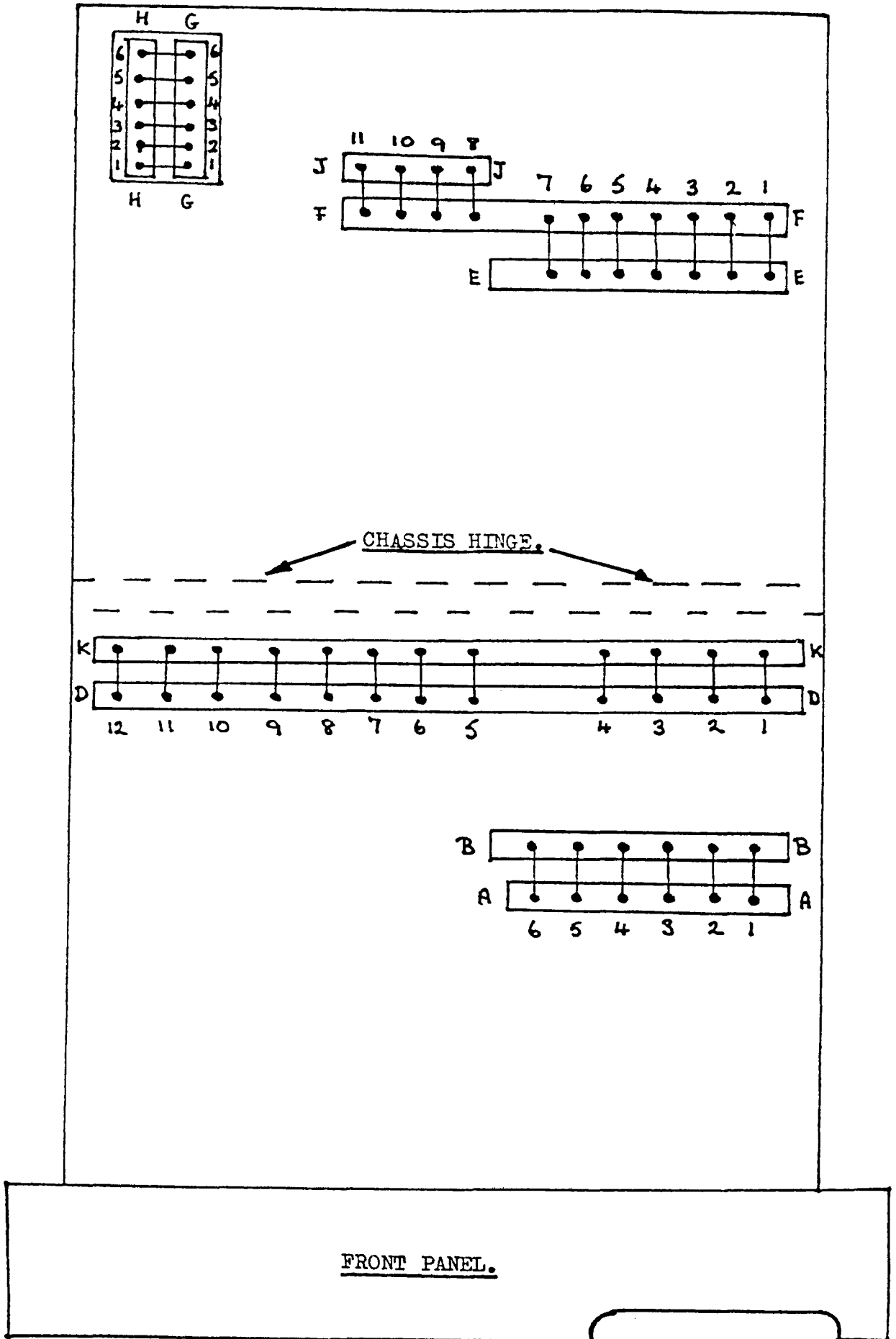


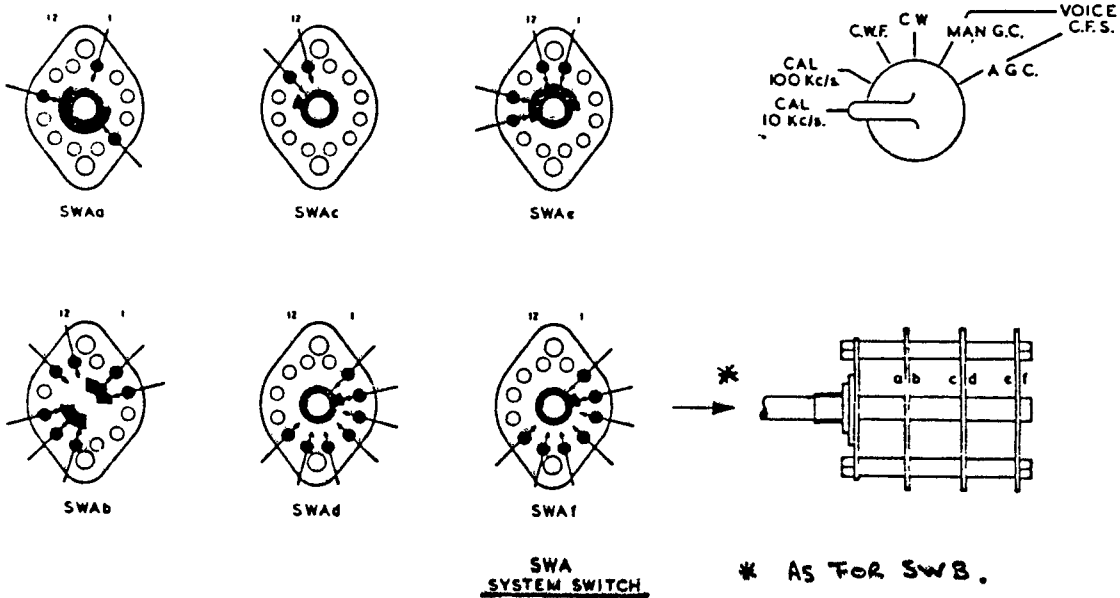
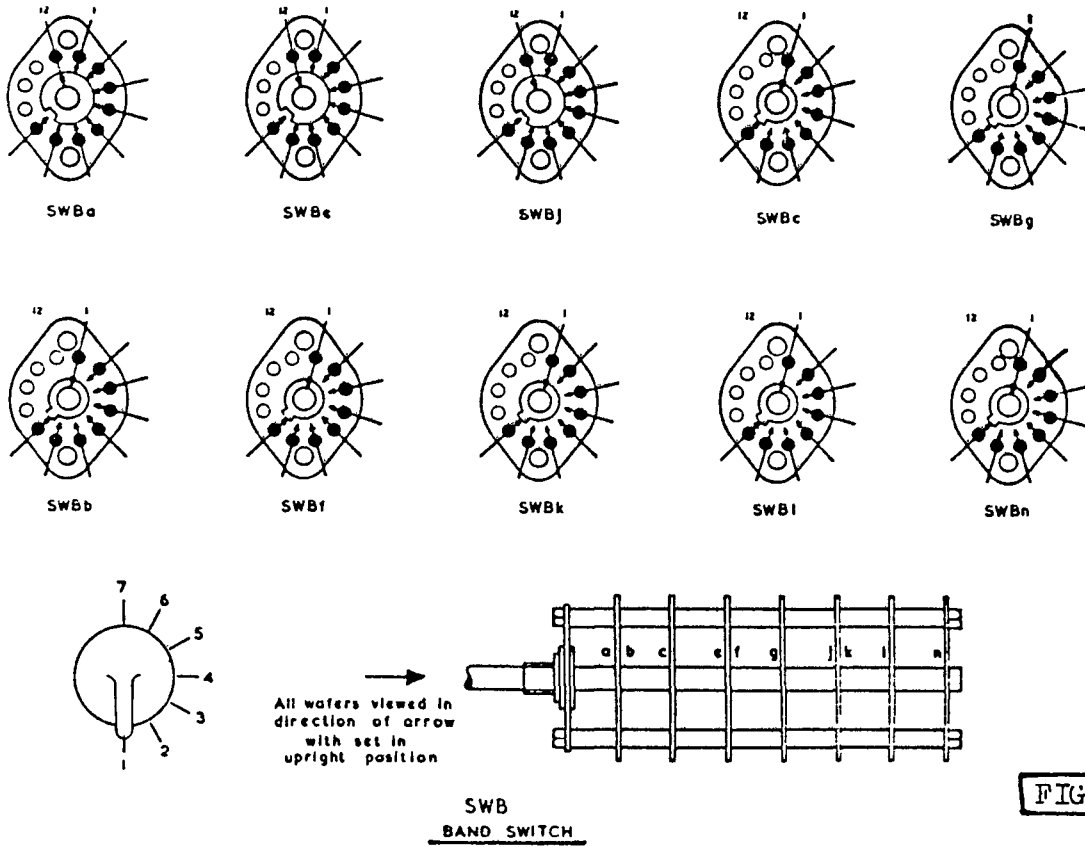
SUB UNIT No. 5.

FIG 11.

SUB UNIT No 5.

FIG 12.

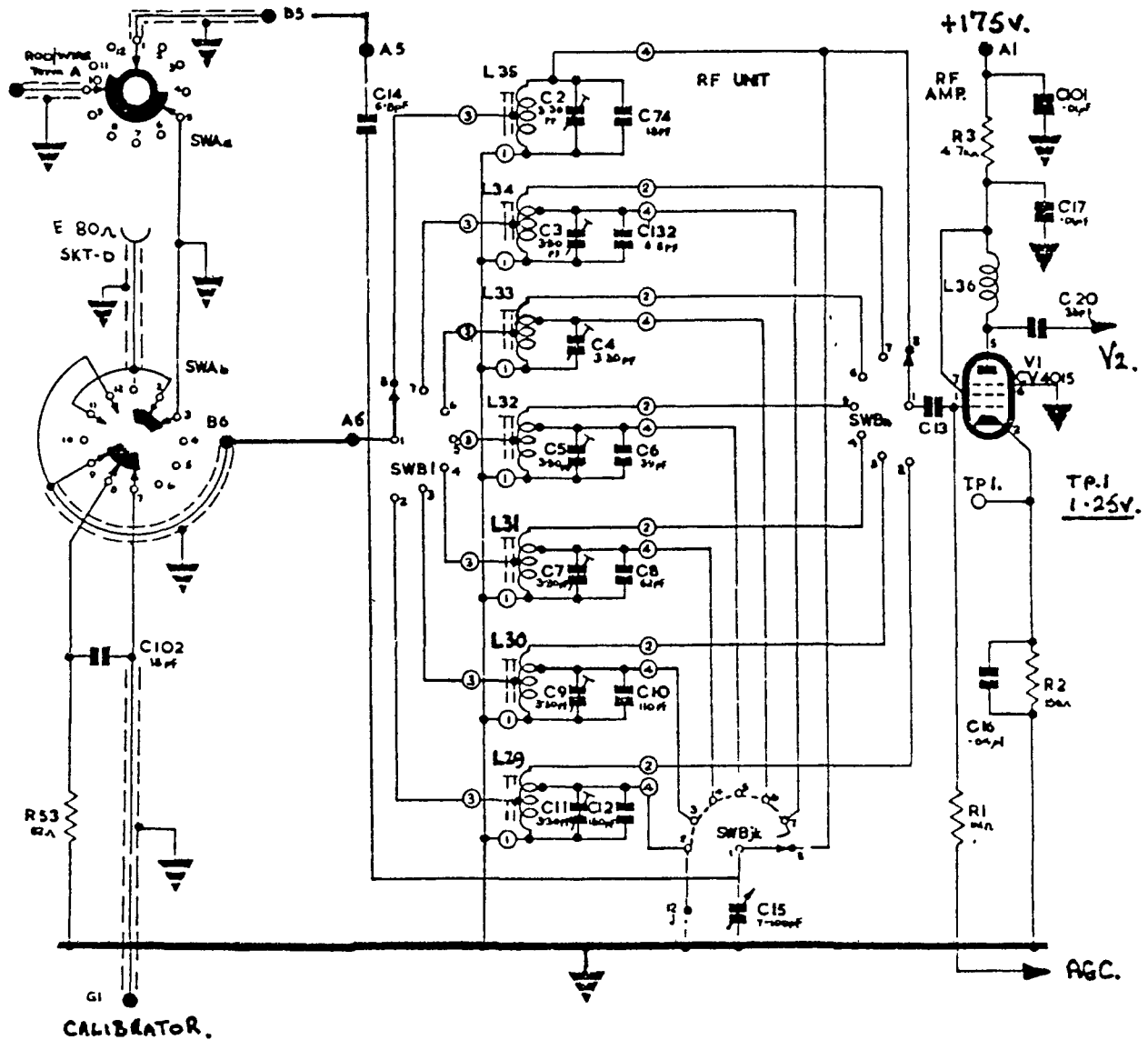




TECHNICAL DESCRIPTION.

## RF Amplifier V1.

FIG 15.

RF Amplifier V1

Provision is made for high and low impedance aerials, connected to terminal A for rod/wire and to coaxial socket SKTD for 80Ω feeders.

Both inputs are routed to the r.f. coils via contacts on SWA which cuts off aerial inputs on the two calibrate positions.

Signals from the low impedance feeder are fed from SWA through to contacts on BAND switch SWB to a low impedance tapping point on the appropriate aerial coil, whilst high impedance signals are fed directly via C14 to the fixed vanes of the first section (C15) of the gang tuning condenser and via further contacts on SWB to the aerial coil. All aerial coils not in use are shorted to earth by contacts on SWB (wafers j and k) to prevent unwanted absorption effects.

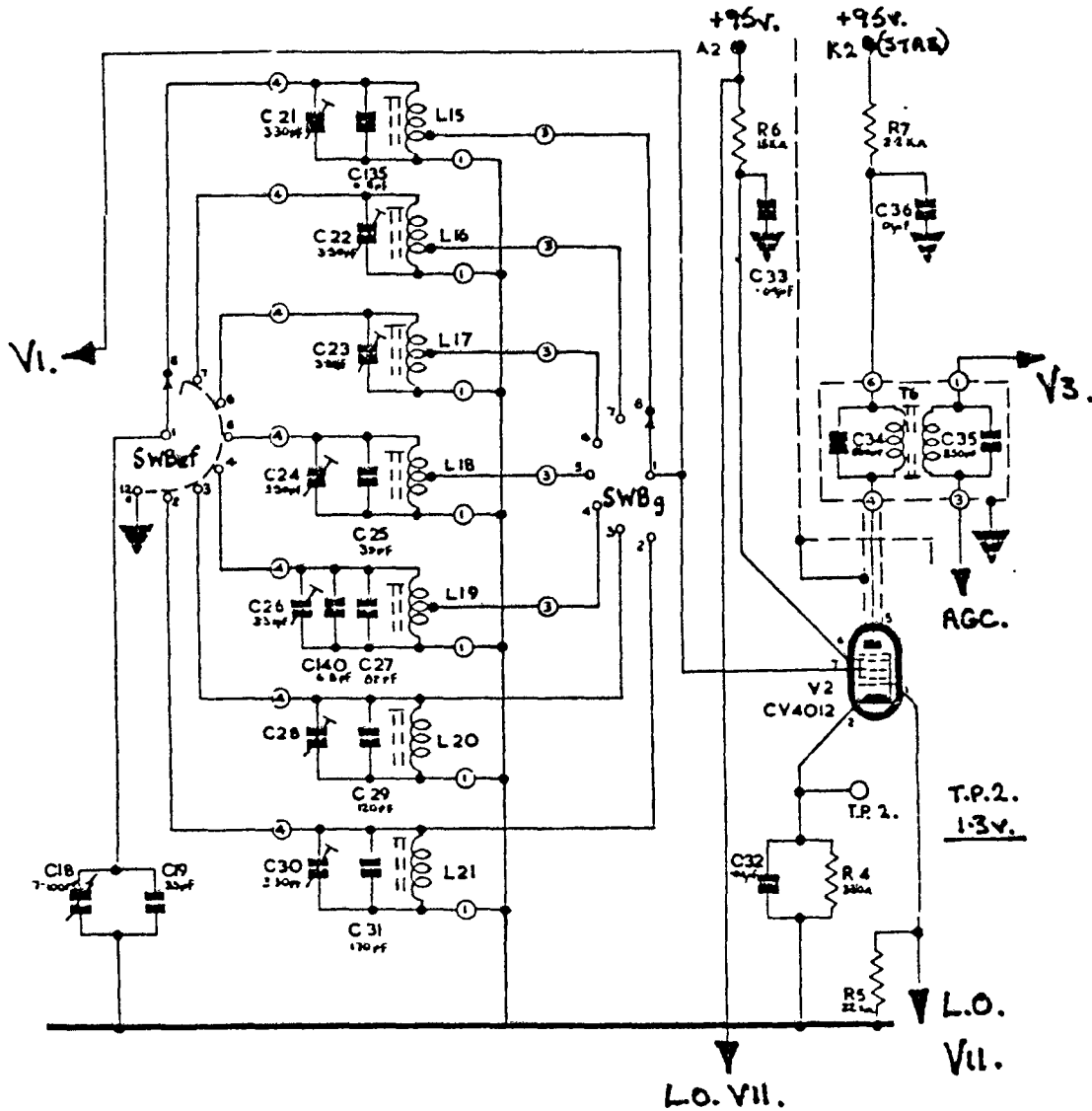
The grid circuit of V1 is connected to the appropriate aerial coil via contacts on SWB and in all cases except band 1 via a small auto winding, this assists in providing a good signal to noise ratio in the r.f. stage.

Parallel fed a.g.c. or manual bias is applied via R1 directly to the grid of V1, C13 provides a signal path to the grid and also acts as a blocking capacitor, thus allowing the gang section to be returned to earth.

The anode circuit is parallel tuned to avoid h.t. on the r.f. section of the gang, tuning coils, and switching. The anode load is L36 and r.f. decoupling is provided by C101, R3 and C17.

Mixer V2.

Fig 16.



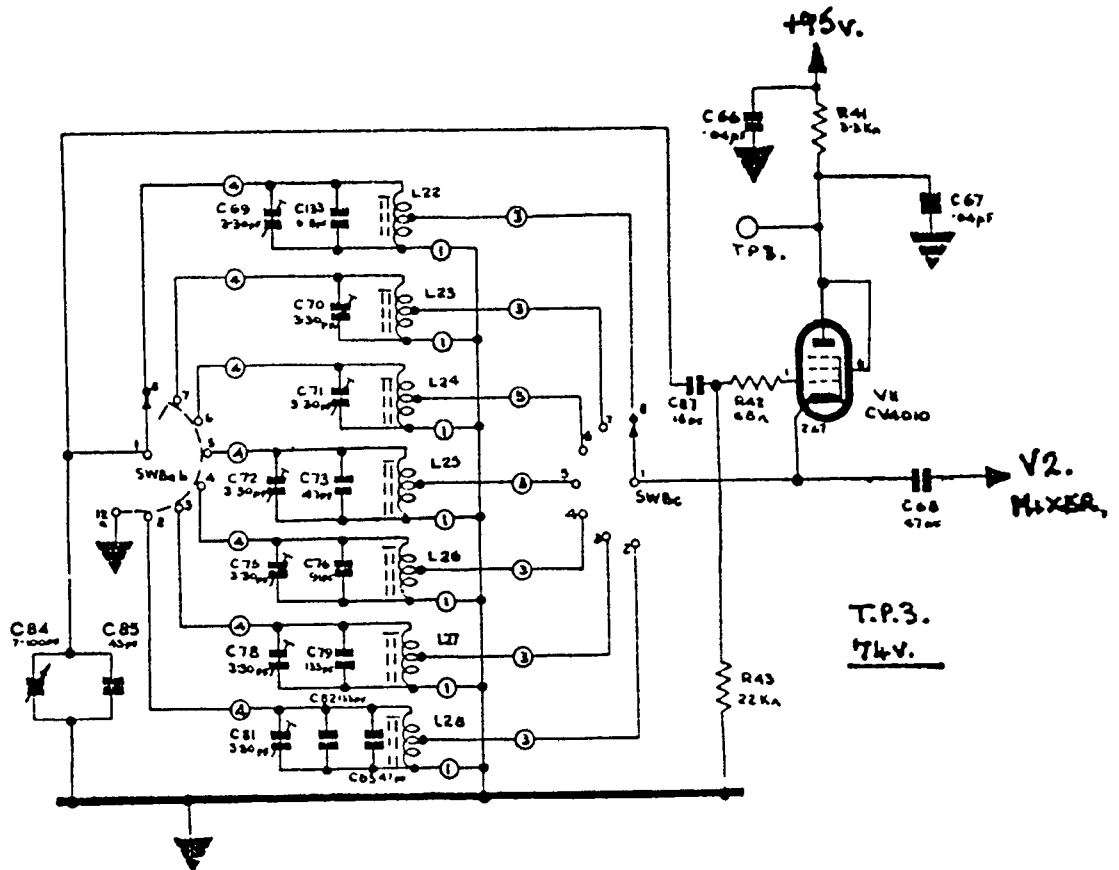
Mixer V2

Bands 1 to 5 have the grid connection tapped down to assist in maintaining constant overall gain on all bands. All coils not in use are shorted to earth by contacts on SWB (wafers e and f) this section also selects the operative coil in conjunction with SWBg. Tuning of this stage is carried out by the r.f. section of the gang C18 and the fixed shunt capacitor C19.

The mixer is a pentagrid working with a separate local oscillator V11. Input to the mixer signal grid is directly from the r.f. tuned circuits with injection from the oscillator cathode on grid 1 across the grid leak R5. Auto bias is obtained by R4 decoupled by C32. Output at i.f. frequency (460c/s) is obtained from the anode circuit to which T6, the first i.f. transformer, is tuned. Anode r.f. decoupling is obtained by R7 and C36. R6 is the screen dropping resistor decoupled by C33. A test point is provided across V2 cathode circuit for checking purposes.

## Local Oscillator V11.

FIG 17.

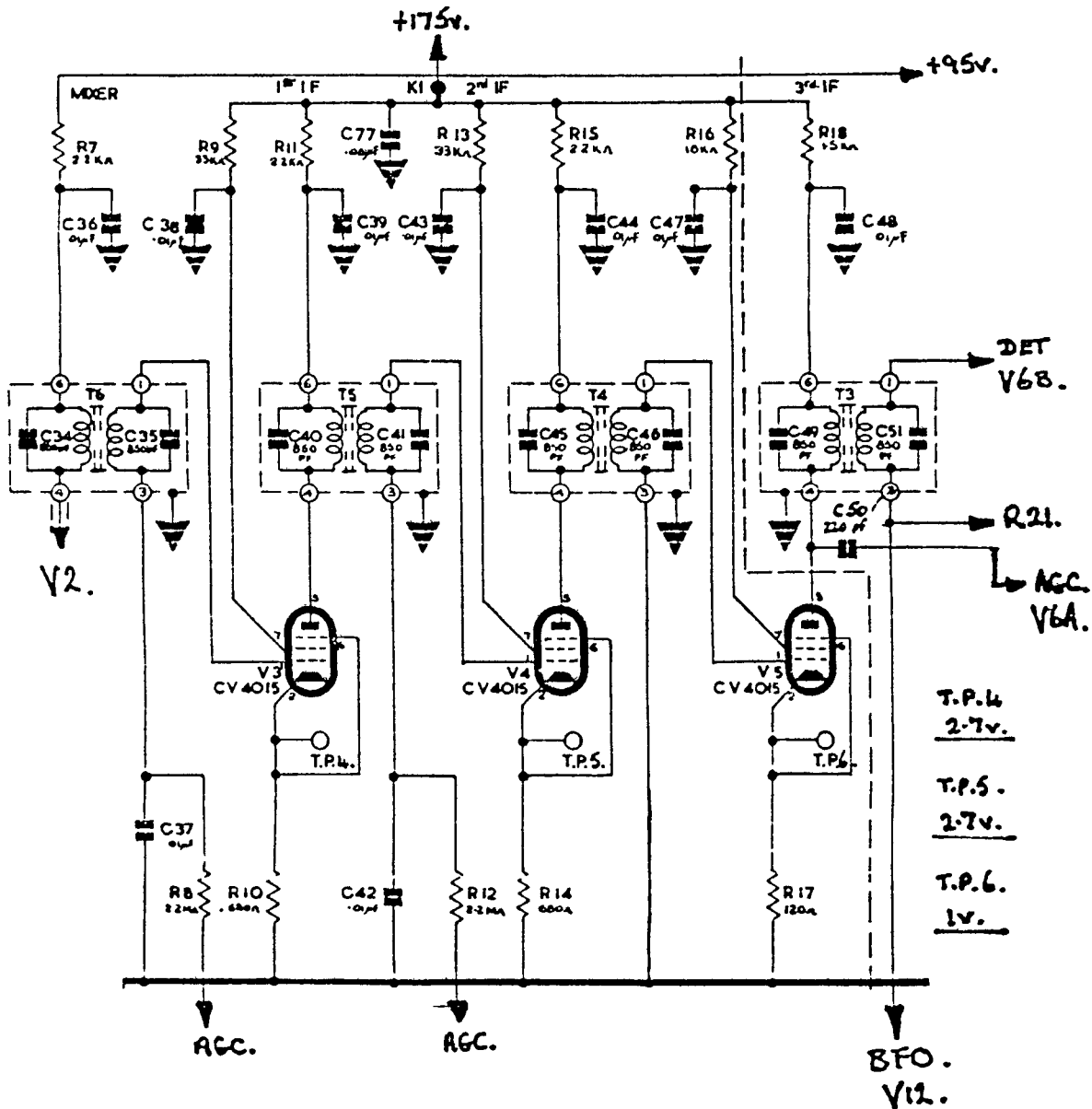
Local oscillator V11

The local oscillator is a triode connected r.f. pentode operating in an inverted Hartley circuit, self-biased by R43 and C87. R42 assists in maintaining level oscillator amplitude throughout the operating range. Frequency stability is maintained by using negative temperature co-efficient capacitors in positions C85 (N150), C133, C73, C76, C79, C82 and C83 (these are all N30) and by a stabilised H.T. supply. The oscillator tuning capacitor is the third gang section C84 in conjunction with the fixed capacitor C85. Two point tracking is used on all bands and the oscillator circuit operates 460 kc/s above the r.f. circuits. A test point is included in V11 anode circuit for use with an external meter.



IF Amplifiers V3 V4 V5.

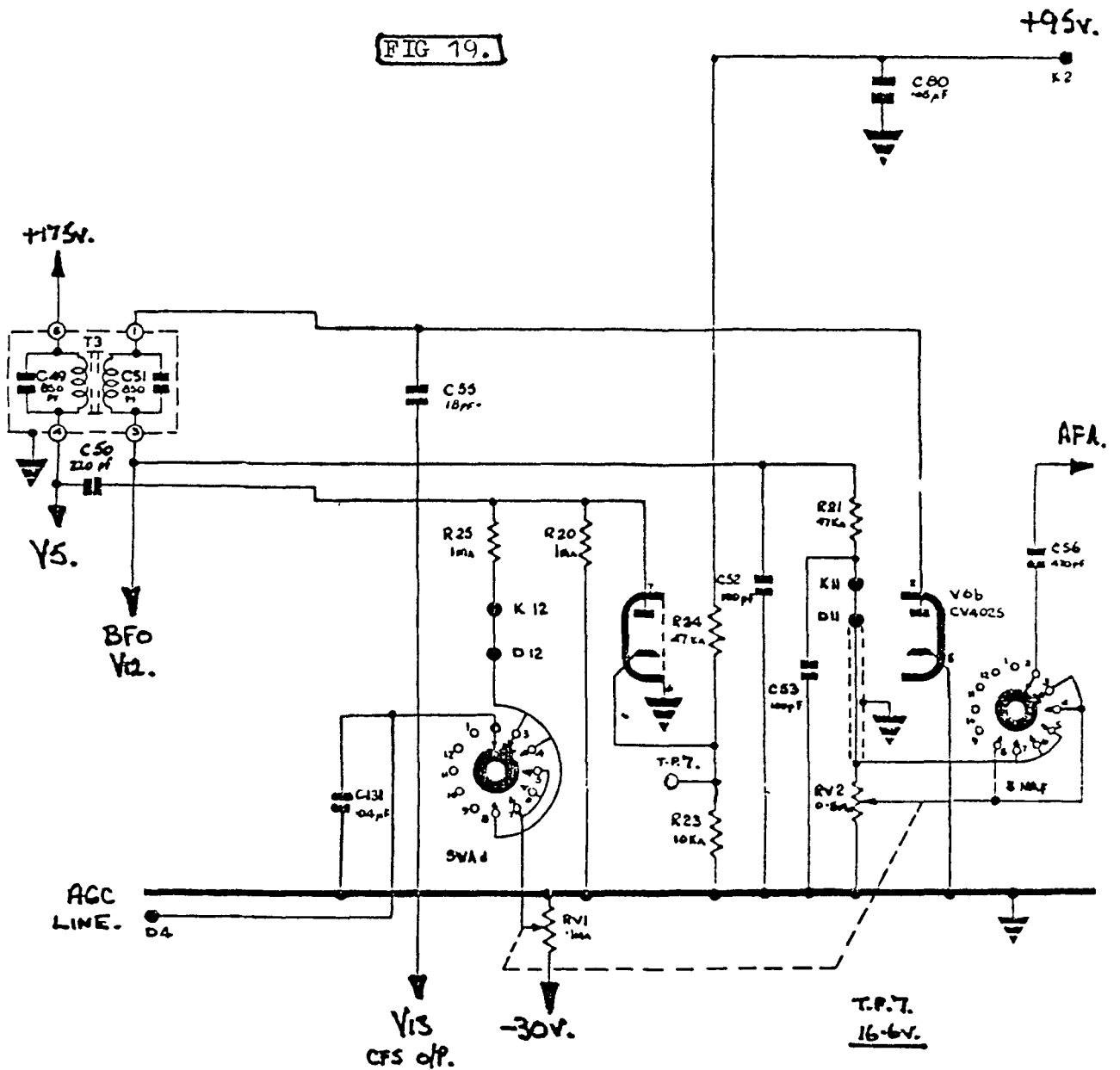
FIG 18.



3-stage i.f. amplifier V3-V5

The first two stages of the i.f. amplifier are identical, the amplifier is conventional in design and series feed a.g.c. or manual gain control bias is applied to the first two stages. Slight changes in circuit values are used in the final stage to prevent overloading. Test points are provided across each cathode resistor to check correct operation and all cathodes are unbypassed to prevent excessive gain, and to improve stability.

Detector and A.G.C. diodes V6A and V6B.

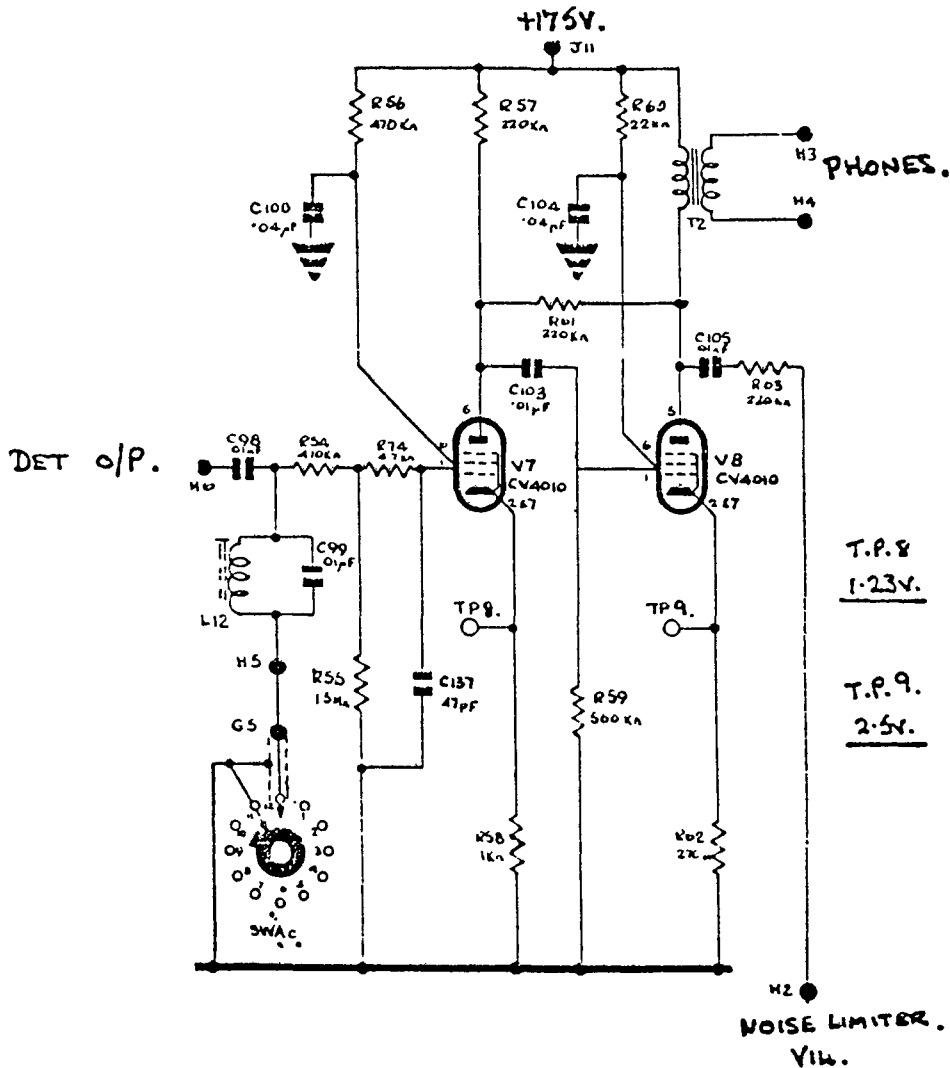


Detector and a.g.c. diodes V6a and V6b

These stages consist of a double diode one half of which, V6a is used as the a.g.c. rectifier and V6b for detector. V6a diode anode receives the i.f. signal from V5 anode via the coupling capacitor C50, the diode load is R20, and the cathode is connected to the junction of R23, R24 which is a potential divider across the h.t. line, this provides approximately 17 volts delay in the a.g.c. network. The action of a.g.c. is controlled by contacts on SWA4 which switches the developed a.g.c. voltage into the line on positions CAL 10kc/s, CAL 100kc/s and AGC. In the other three positions CWF, CW and MAN G.C. SWA4 opens the a.g.c. line and substitutes the manual gain control RV1, this potentiometer is connected across the -30 volt bias line and the voltage tapped off by the slider is routed via SWA4 to the grids of the stages normally controlled by a.g.c. The detector diode circuit is conventional in design, C52, R21 and C53 form an i.f. filter and RV2 forms the diode load and also the a.f. gain control when SWA4 is in positions where a.g.c. is operative. In the other three positions of SWA4 RV2 becomes the diode load only - the slider output being disconnected. A test point is provided in V6a cathode circuit, which enables a check to be made on the delay voltage.

AF Amplifiers V7 V8.

FIG 20.

1st a.f. stage V7

The first a.f. stage receives input to the grid via contacts on SWD and blocking capacitor C98 which is introduced to prevent V7 interacting with the noise limiter diode potentials. The grid circuit also includes the 1kc/s filter L12 tuned by C99, this is automatically switched into circuit by a contact on SWAc in position CWF, in all other positions the filter is cut of circuit. The action of the filter, when in circuit, is to present a low impedance to frequencies above and below 1kc/s and to accentuate a narrow pass band around 1kc/s at which frequency it presents a high impedance between grid and earth. The grid is fed from the junction of R54 and R55 which form a potential divider across the signal path, R55 is also the grid leak. R74 and C137 together prevent parasitic effects. The anode load is R57 and bias is provided by R58 which is not decoupled and due to this provides an amount of current negative feedback. Voltage feedback from the anode of the final a.f. stage is also fed back to the anode of V7 via R61. A test point is provided across R58 to check correct operation of the stage.

Final a.f. stage V8

The final a.f. stage is r.c. coupled via C103 and R59 from the anode of V7. It is a r.f. pentode and provides approximately 150mW of a.f. Output is fed to low impedance phones via the output transformer T2, the output is fed to the front panel and terminates on pins L and K of the 12-way Mx 4 plug PLA.

Noise limiter V14.

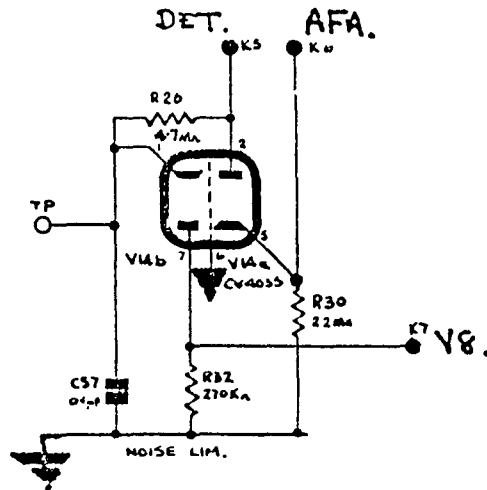


FIG 21.

Noise limiter V14

The noise limiter is the double diode V14a, V14b. Its operation is controlled by the front panel switch SWD, which in the OFF position switches V14a completely out of the signal path. When in circuit it is fed with modulation signals from the detector V6b, via contacts on SWAF and the coupling capacitor C56, this has a low value of 470pF to keep the l.f. gain of the audio stages down and so reduce hum effects. A.F. output from V8 is applied via C105 across the potential divider network R63 and R32. The voltage developed across R32 is applied to the diode anode V14b and C57 charges to a value approximately equal to the peak positive value of the signal at V14b anode. This voltage is fed to the anode of V14a via R26 thus rendering V14a conductive unless negative going pulses are received whose amplitude exceeds the voltage across C57, under these circumstances V14a becomes non-conducting and the noise pulses are suppressed. A dropping resistor R27 is wired in series with the heater of V14 to reduce hum level which would otherwise be introduced by the stage. Test points are provided at the cathode of V14a and V14b for checking correct operation.

IF Cathode follower V13.

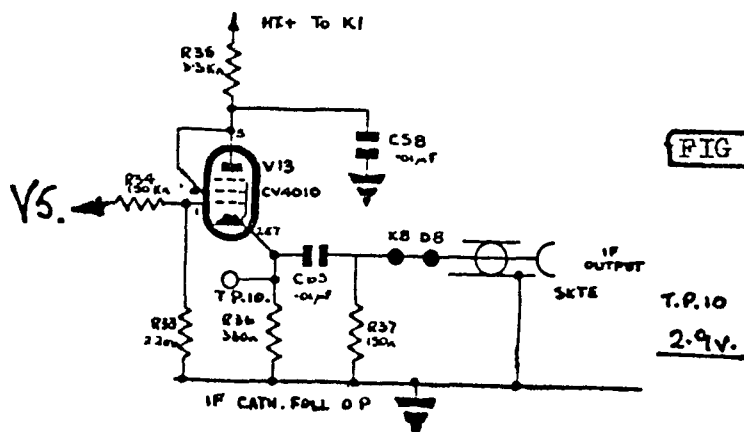


FIG 22.

I.F. cathode follower

This stage is provided primarily to fulfil the requirement for c.f.s. output via IF OUTPUT SKTE (80Ω coaxial line). Input to the stage, which is triode connected, is via the coupling capacitor C55, whilst the output is taken across the cathode load consisting of R36, C65 and R37. C65 is inserted in series with the signal path to prevent shorting the cathode load in instances where the signal is injected into a link coil.

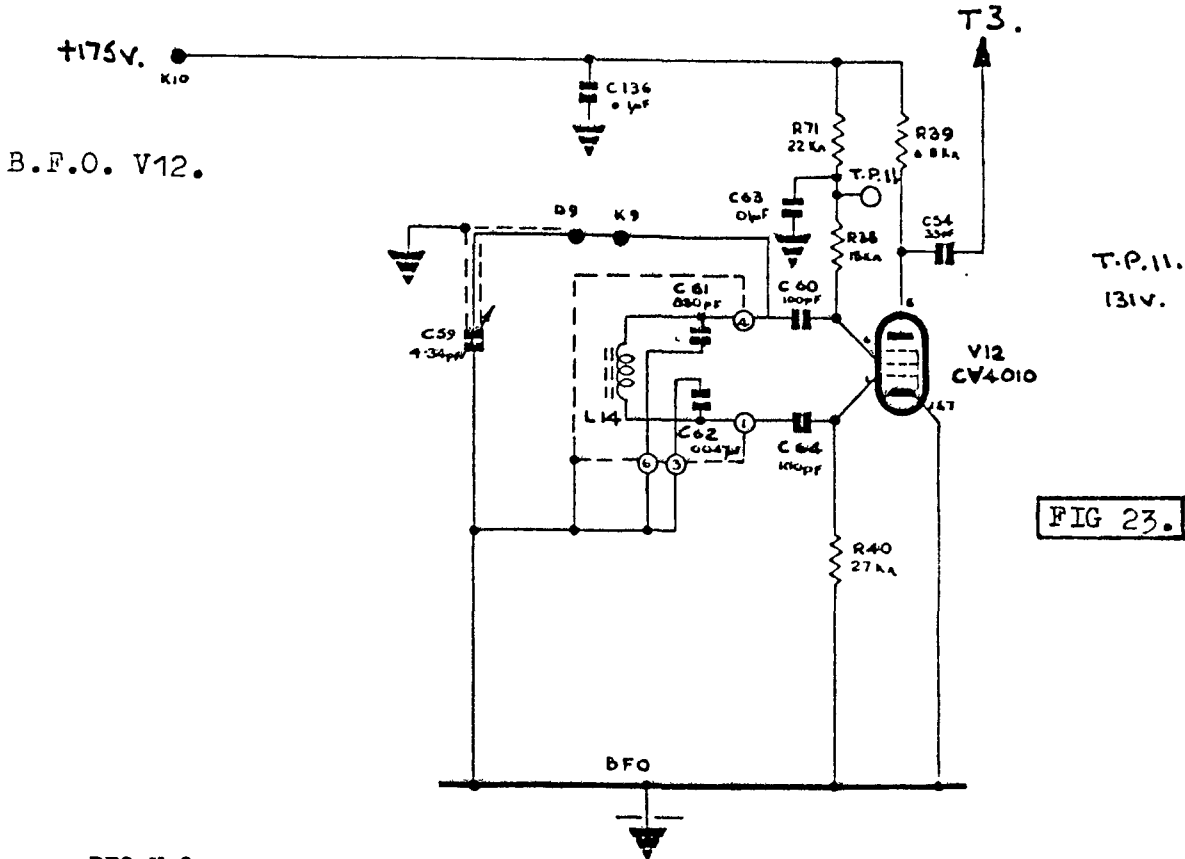


FIG 23.

BFO V12

The b.f.o. uses a Colpitts type oscillator circuit between the grid and screen. Frequency is controlled by the variable capacitor C59 giving a sweep of approximately  $\pm 5$ kc/s. This is the front panel control B.F.O. Injection of b.f.o. signal into the demodulator is via C54 from the anode of the oscillator to the last i.f. secondary. Operation of the b.f.o. is controlled by the system switch SWA which stops the b.f.o. operating when receiving a.m. signals A 2.2MΩ resistor R72 is switched in series with the screen and anode supplies to render the stage inoperative and also prevent cathode poisoning.

Calibrators V9 V10.

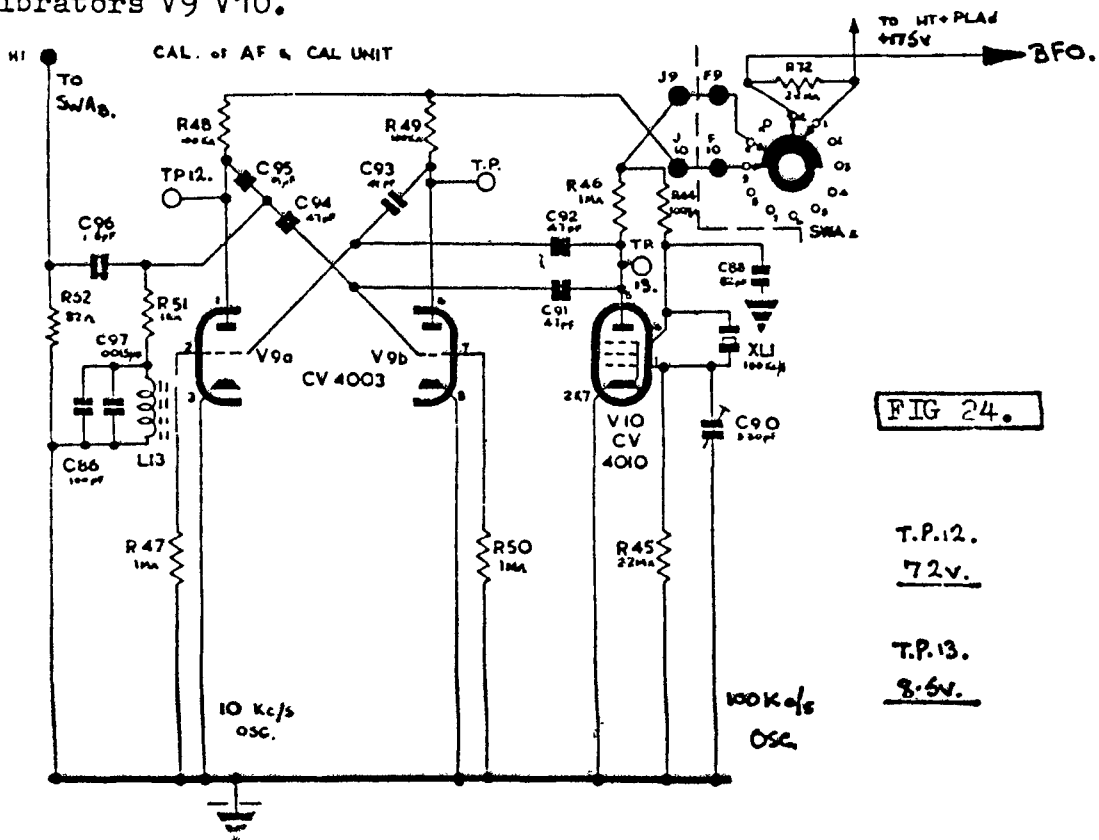


FIG 24.

T.P.12.  
72V.

T.P.13.  
8.5V.

Calibrator oscillators V10 and V9

The calibrator is two stage and consists of a crystal oscillator operating at 100kc/s and a multivibrator triggered from the 100kc/s source and dividing down to 10kc/s. With SWA in position CAL 100kc/s the crystal oscillator only is in operation, the output signal is then fed via C91, C94 and via further contacts on SWA to the aerial circuits. A pre-set trimmer C90 is provided to accurately align the oscillator to 100kc/s. On position CAL 10kc/s the double triode multivibrator V9a, V9b is brought into operation in addition to the 100kc/s oscillator, the frequency of oscillation is held to 10kc/s by means of the tuned circuit L13 and C97 in the anode circuit of V9a. Test points are provided at the anodes of V9a, V9b and V10 for use with an external meter.

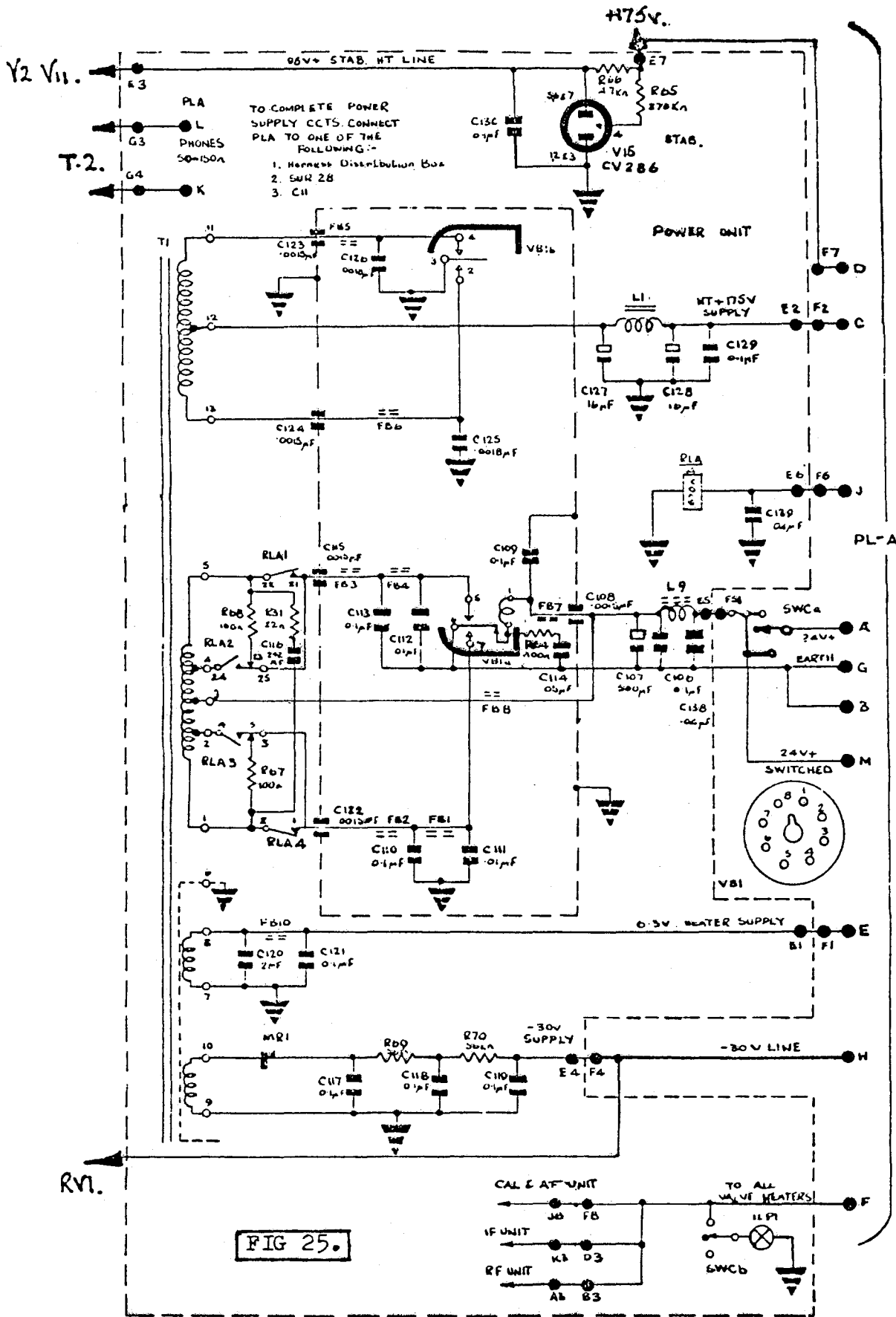
D.C. power unit

The built-in power unit supplies all the requirements of the receiver from a 24V battery, the power unit is used when the receiver is operating alone on d.c. and also when operating with the Sender C11 on d.c.

Supply is fed into the power unit across pins A and B of PLA. B is earthed and is the negative pole, whilst the positive side is fed via the three-way 2 pole toggle switch S/WC. This switch provides an OFF position and two ON positions, one being ON with pilot lamp ILP1 on and the other with set ON and the pilot lamp off, this function is controlled by contacts b on S/WC. The supply is then routed via the fuse F31 through the r.f. filter L9 by-passed by C106 and smoothed by the high value capacitor C107 (500  $\mu$ F), it is then fed into the hash box in which is contained the self-rectifying vibrator VB1 and various filter capacitors and ferrite bead filters, these components keep the hash generated by the vibrator contacts within the confines of the screened box. The ferrite beads are slipped over the leads in lieu of series h.f. chokes, they operate in a similar manner to chokes in that they develop a high impedance to r.f. at the point of insertion.

One set of contacts (VB1a) operate across the ends to earth of the centre tapped primary of the vibrator/power transformer T1 whilst the other pair of contacts (VB1b) switch alternately across the centre tapped h.t. secondary winding, thus providing unidirectional d.c. pulses from the centre tap, this output is smoothed by the reservoir capacitor C127 in conjunction with L11 and C128, C129 is an r.f. filter capacitor. The smoothed supplies are fed out to pin C of PLA and thence to pin D and the main h.t. line.

The slave relay RLA is brought into circuit when the R210 is receiving its d.c. input from the C11 sender. Under these conditions the operating coil of the relay (RLA/4) is coupled to the C11 voltage control circuit via pin J of PLA. Under high input voltage conditions RLA/4 is not energised and the tapping points across T1 primary are switched on shown in Fig 25. If, however, the input of the C11 drops below 23.5V, RLA/4 is operated by the voltage control relay in the C11 and contacts RLA2 and 3 close and contacts RLA1 and 4 open, thus altering the primary/secondary ratio of T1 sufficiently to maintain correct secondary voltages. R67, R68 form a surge arrester network as contacts RLA2 and 3 make before RLA1 and 4 break. R31 and C116 form a buffer network to prevent arcing at the vibrator contacts. When the R210 is used with its own d.c. supplies, the operating coil of RLA/4 is energised and contacts RLA2/RLA3 are permanently made. Heater supplies are 6.3V a.c. (developed by the vibrator) and are fed from a secondary winding on T1 to the heaters via a link between pins E and F on PLA, smoothing and filtering is carried out by C120 and C121. When heater supplies come from the C11 this link is disconnected and 6.3V a.c. is fed in at pin F. The same applies when the R210 is used with its own a.c. PSU. The 30 volt bias supply also originates from a secondary winding on T1, rectified by the half wave rectifier MR1 and smoothed by the network R69, R79, C117, C118 and C119. The output is applied across the r.f. gain control RV1. When the R210 receives its supplies from the C11, or its own a.c. PSU, the bias supply is fed in at pin H of PLA, across the existing circuit. The voltage stabiliser V15 is in use under all conditions, it provides a stable 90V h.t. line for the oscillator and mixer.



# SUTR. 24v.

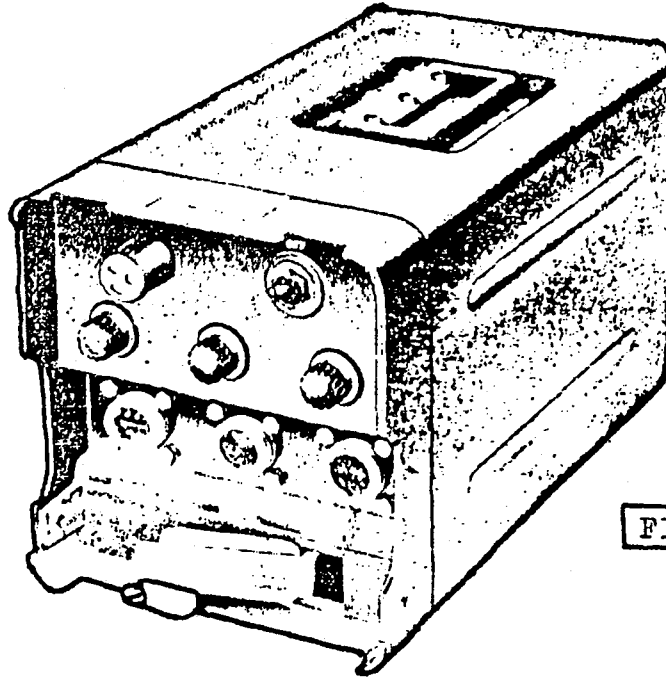


FIG 1.

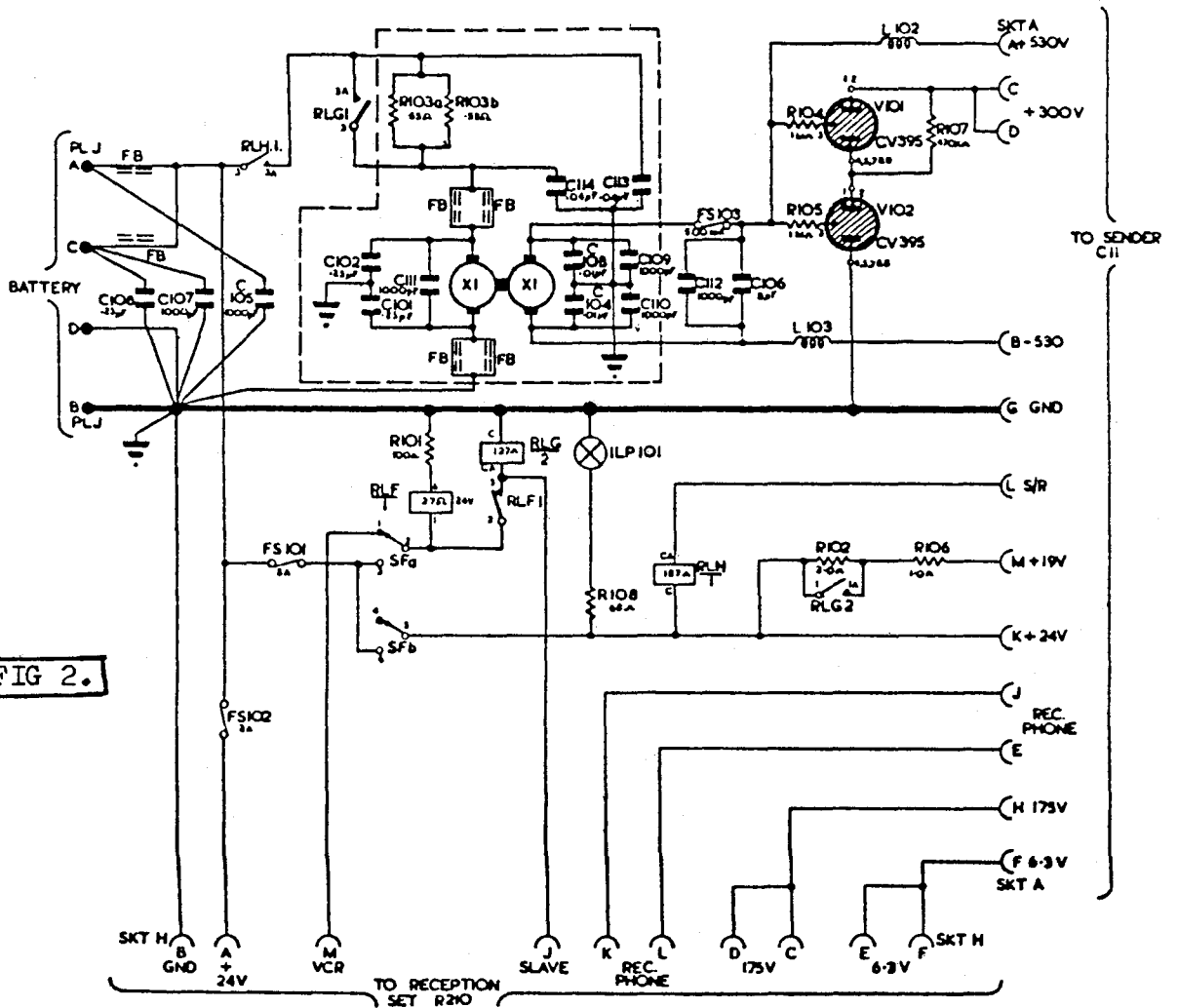


FIG 2.



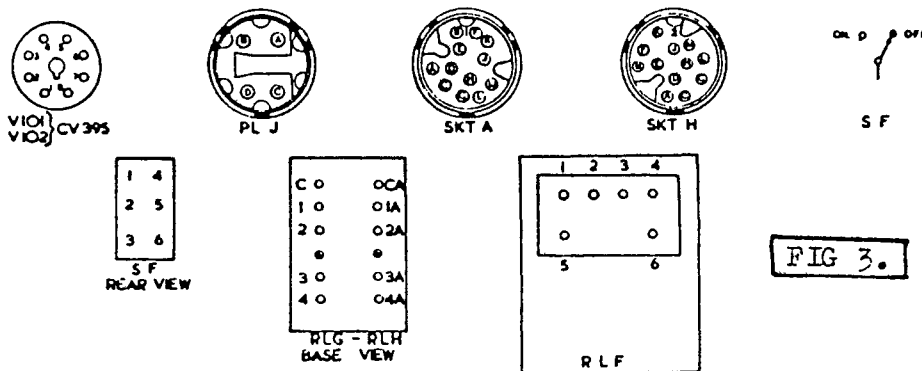


FIG 3.

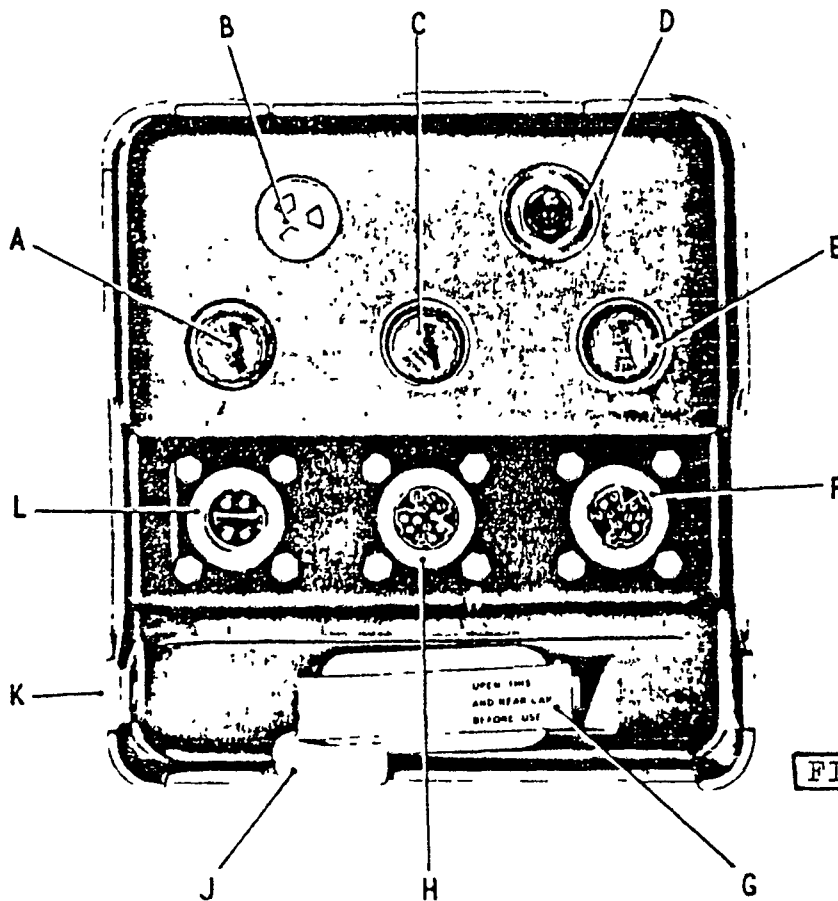
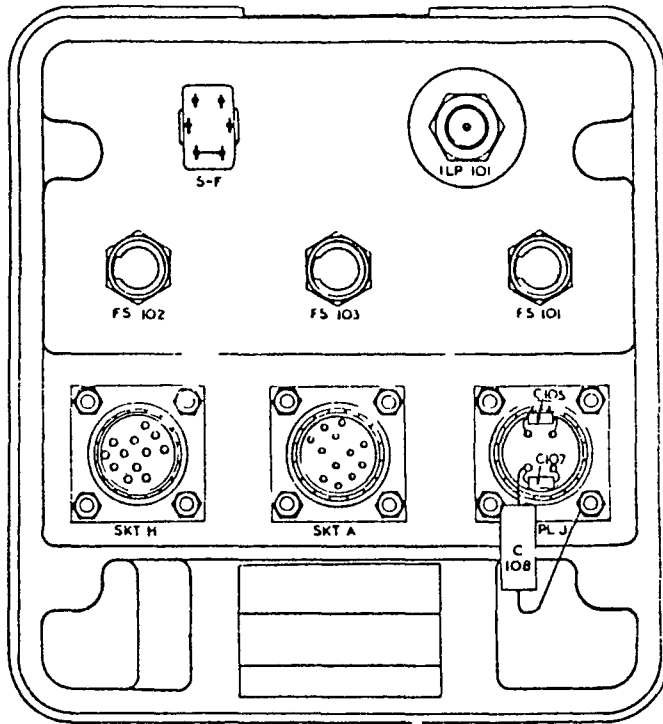


FIG 4.

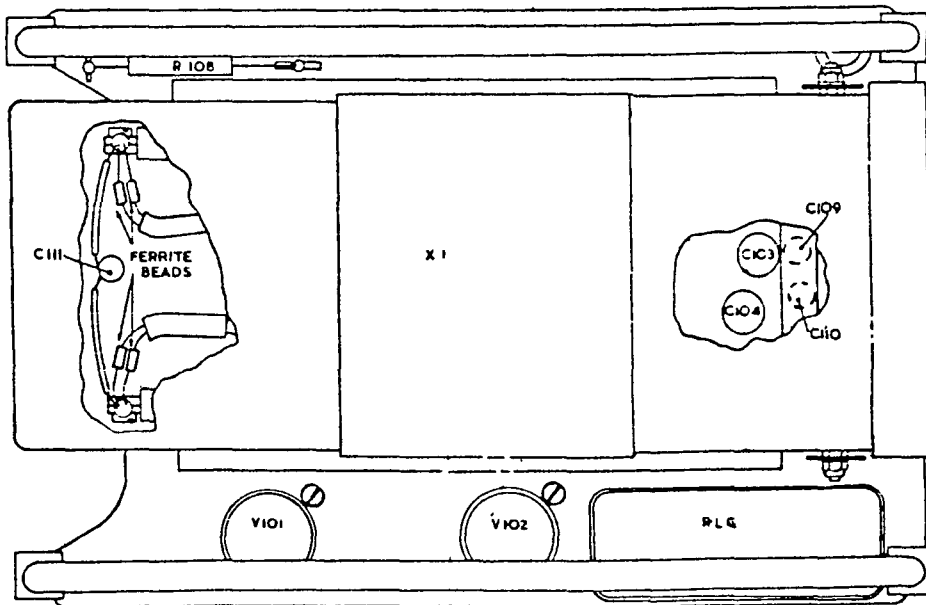
CONTROLS:-

- A.....7 Amp fuse. FS. 101.
- B.....Indicator lamp. ILP. 101.
- C.....1 Amp fuse. FS. 103.
- D.....Off / On switch. SF.
- E.....3 Amp fuse. FS. 102.



REAR VIEW OF PANEL

FIG 7.



TOP VIEW OF CHASSIS

FIG 8.

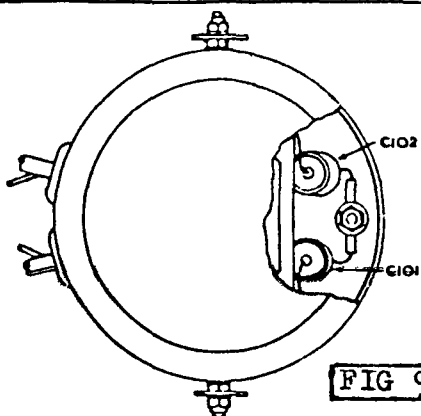


FIG 9.

END VIEW OF TRANSFORMER

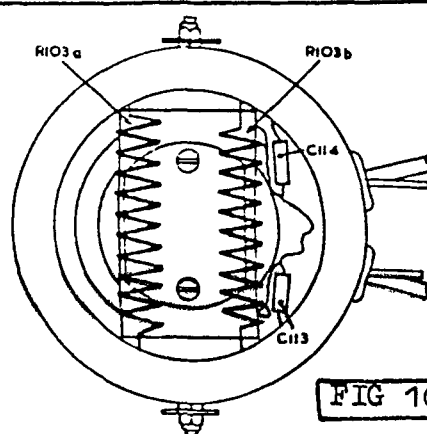


FIG 10.

END VIEW OF TRANSFORMER

S.U.T.R. TECHNICAL DESCRIPTIONSender supplies

When SF is closed +24V is applied from PLJ, through FS101, to the indicator lamp ILP101 relays RLF, RLG and RLH and, via SKTA-K, to the relays in the sender C11. Heater voltages are supplied to the sender via R102, R106 and SKTA-M.

RLH is energised when the send/receive line SKTA-L is earthed and +24V is fed through RLH1 to the rotary transformer X1 via R103 or RLG1. The positive output of X1 is taken through FS103 and r.f. choke L102 to SKTA-A and the negative line through choke L103 to SKTA-B giving 530V d.c. between these pins. A stabilised 300V d.c. supply is available between pins C and D and earth when the sender is connected. R104 and R105 provide the priming voltage for the stabilisers V101 and V102 but the dropping resistor to V101 from the +530V d.c. is situated in the sender, (R40 Fig. 6B). This prevents a heavy current through the neon stabilisers when the sender is disconnected.

C106 smooths the rotary transformer output and r.f. suppression is achieved by fitting ferrite beads (FB) on the input leads to X1 primary and by capacitors C101-C104 and C109-C114. Further ferrite beads and capacitors C105, C107 and C108 at the input plug PLJ complete the suppression circuits.

Voltage control

The input voltage to the p.s.u. may vary from 20.7V to 29V dependent on the state of charge of the battery and the conditions of use. A voltage-sensitive relay RLF is included to reduce the effect of this variation. The relay operates when the applied voltage rises above 25.5V (+0 -0.3V) and releases when the voltage falls to 23.5V (+0.3 -0V). In the unoperated, or 'low volts', condition RLF1 is closed and RLG energised. RLG1 short-circuits R103a, R103b in series with X1 primary and RLG2 short-circuits R102 in the heater line. In the operated or 'high volts' condition these resistors are in circuit and tend to reduce the effect of the change in battery volts on the output voltages of the p.s.u.

SKTH supplies 24V d.c. input to the Receiver R210 p.s.u. via pin A. If SF is off and the Receiver R210 p.s.u. is on SKTH-M is connected to +24V in the receiver. Voltage-sensitive relay RLF can then be utilised to energise, via SKTH-J and RLF1, the coil of a relay in the receiver similar in action to RLG. When both p.s.u. are on this relay will operate simultaneously with RLG.

Receiver connections

In addition to the input and voltage control connections SKTH is used to connect the receiver output, via the sender relays and switching, to the phones. (SKTH pins K and L and SKTA pins J and E). A 6.3V heater supply for the intercomm amplifier is obtained from a winding on the Receiver R210 d.c. p.s.u. vibrator transformer and coupled to the sender via SKTH pins E and F and SKTA-F. H.T. for the intercomm amplifier is coupled from the receiver p.s.u. by SKTH pins C and D and SKTA-H. Both h.t. and l.t. are referred to chassis.

SUPPLY UNIT RECTIFIER No.30

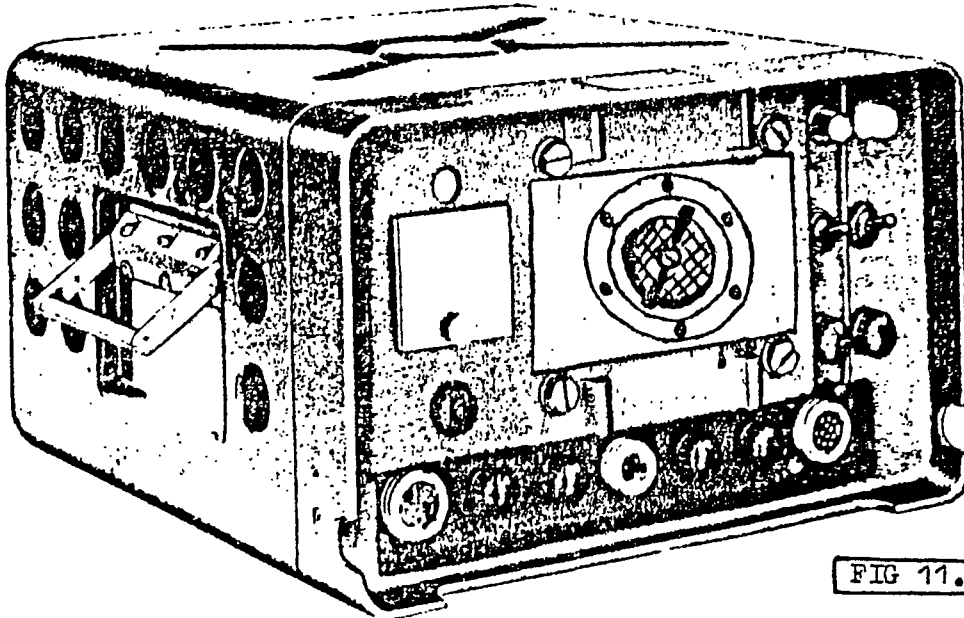


FIG 11.

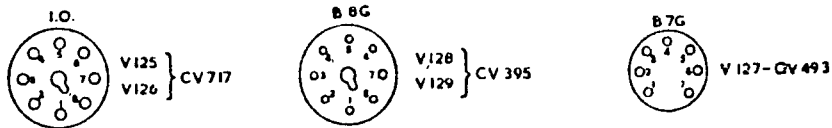
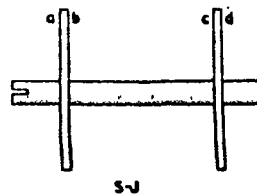
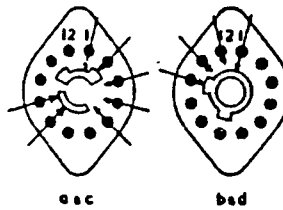
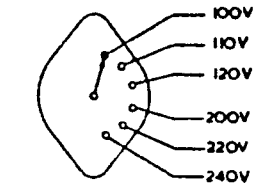
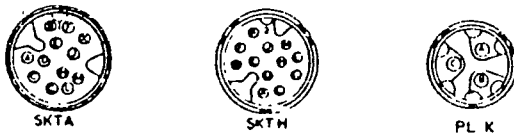


FIG 12.

FIG 13.



ALL SWITCH WAFERS VIEWED FROM FRONT END OF SWITCH

FIG 15.

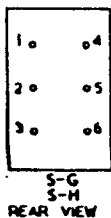
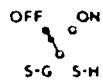
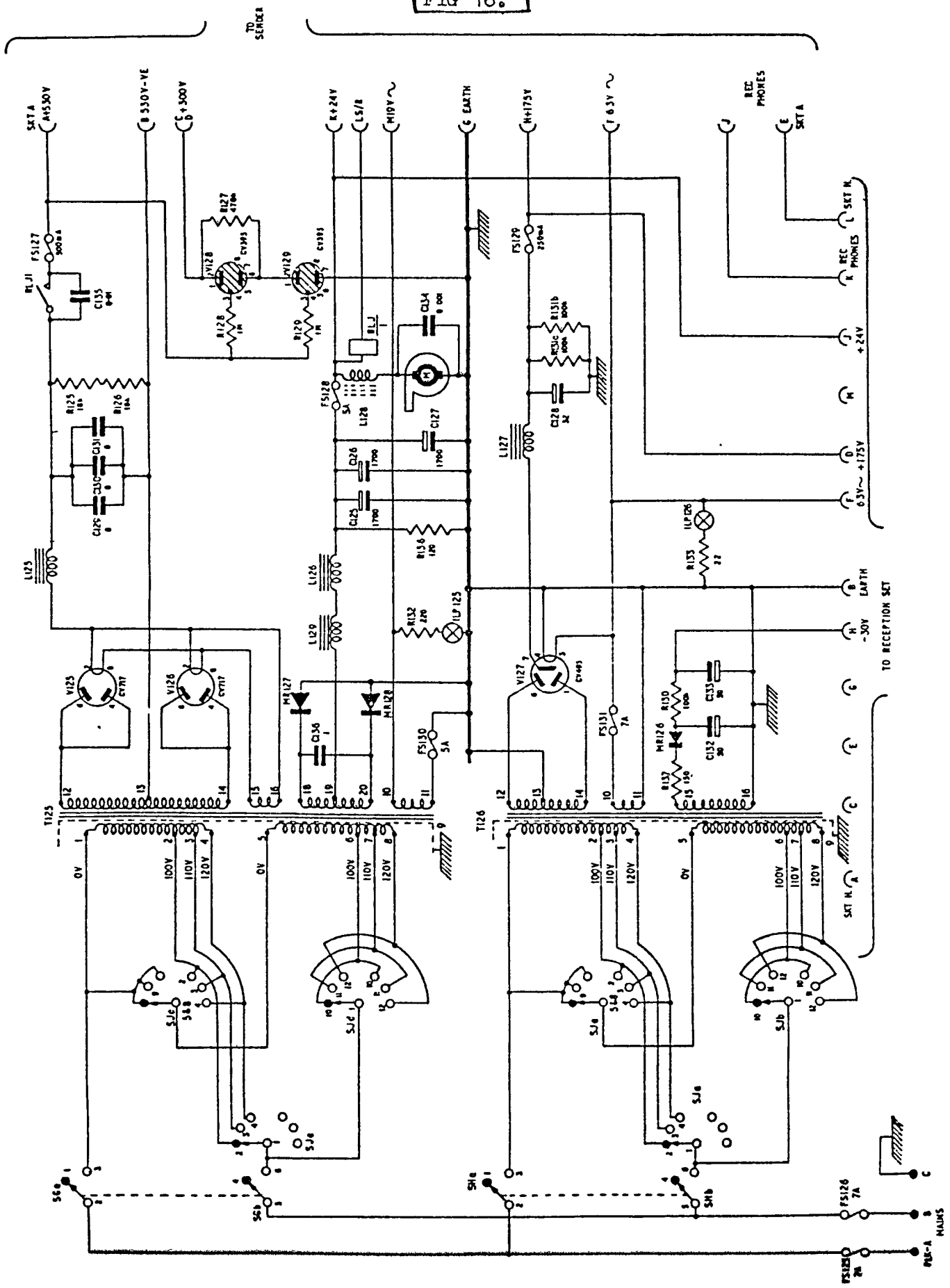


FIG 14.

FIG 16.



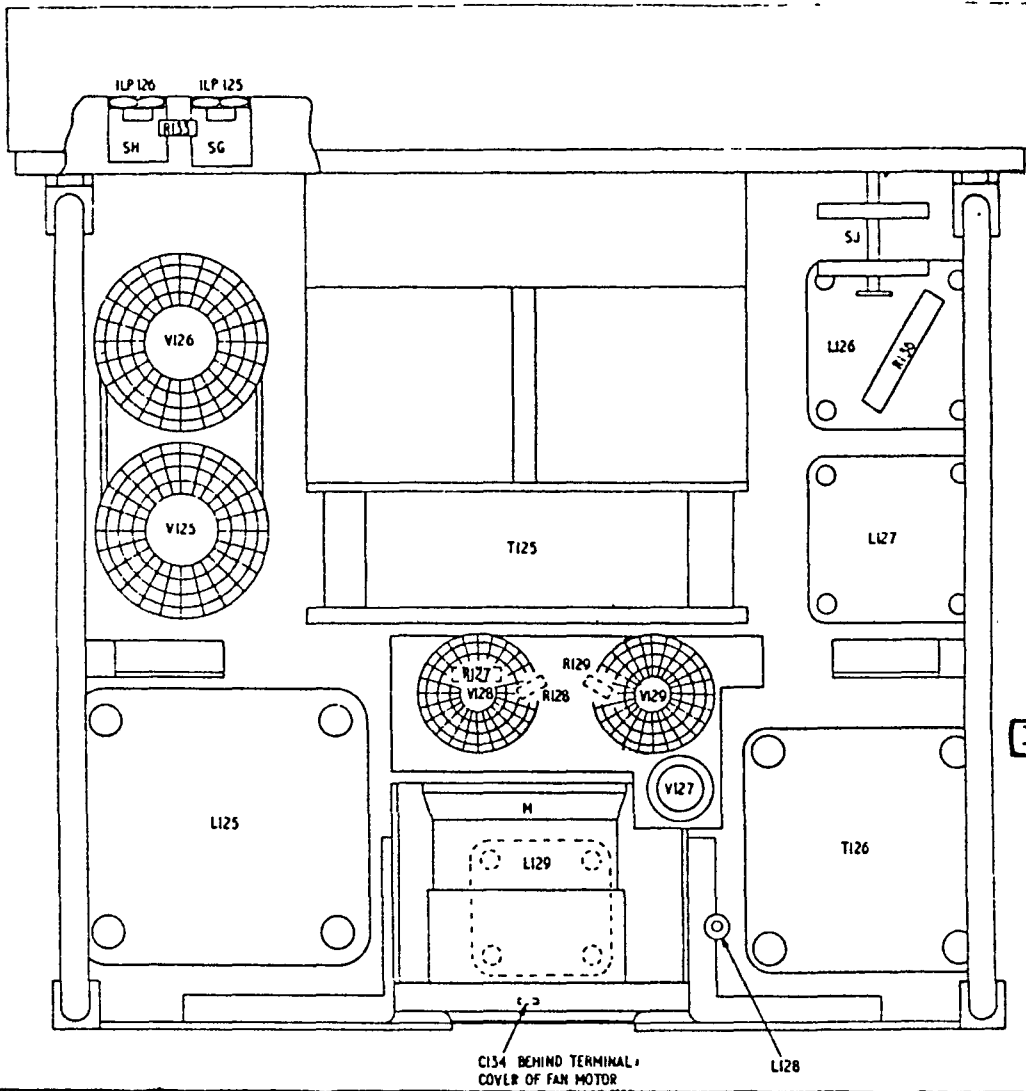


FIG 17.

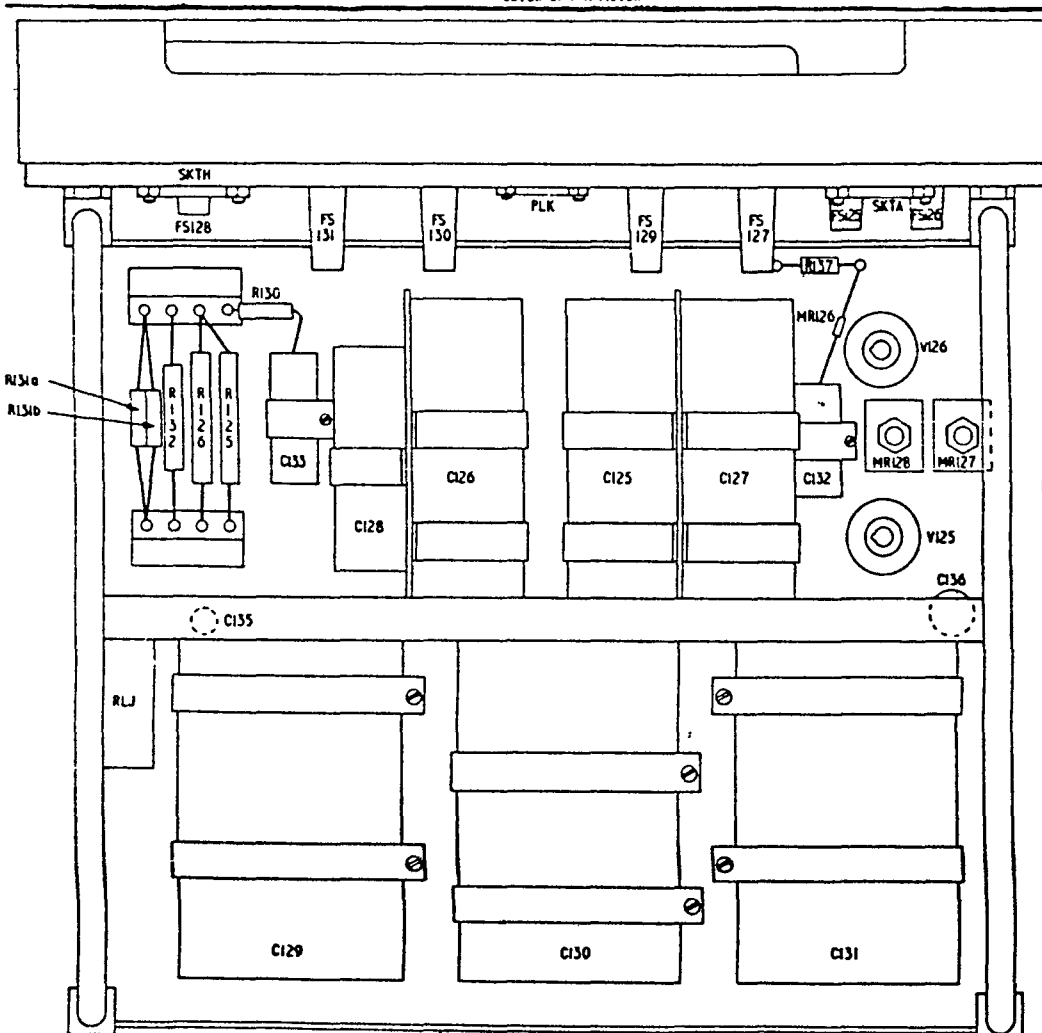


FIG 18.

SUPPLY UNIT, RECTIFIER, NO 30

Introduction

The Supply unit, rectifier, No 30 (a.c. p.s.u.) is designed to provide all the supplies necessary for the Sender C11 and the Receiver R210 from an a.c. input of 100-120V or 200-240V. It is intended for use when this combination is used as a ground station.

Construction

The a.c. p.s.u. is the same size as the sender but weighs more (APP 60 LBS) Cooling is achieved by the use of a built in blower motor. Voltage selection is made by a rotary switch with a slotted spindle and indication of the voltage setting is given by a numbered disc visible through a window on the front panel.

Controls

An engraved plate on the front panel provides the key to all switches, lamps, fuses etc. The controls on the front panel consist of:-

- SG A double-pole double-throw toggle switch which connects the mains to sender transformer T125.
- SH A double-pole double-throw toggle switch which connects the mains to receiver transformer T126.
- SJ A 6-position rotary switch which selects voltage taps of 100, 110, 120 and 200, 220, 240V.
- ILP125 Indicator lamp lit by 19V sender heaters supply.
- ILP126 Indicator lamp lit by 6.3V receiver and intercomm heaters supply.
- PLK A 3-way Mk 4B plug for the mains input.
- SKTA A 12-way Mk 4B socket (orientation 1) which connects all the voltages required by the sender and intercomm amplifier. It also connects the receiver phones to sender.
- SKTH A 12-way Mk 4B socket (orientation 2) which connects h.t., l.t. and bias supplies to the Receiver R210 and connects the receiver phone output for linking to SKTA.

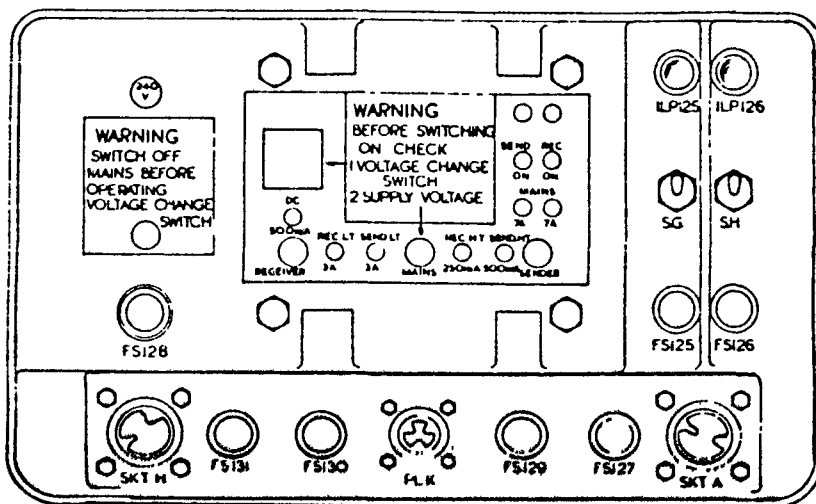


FIG 19.

TECHNICAL DESCRIPTION (See Figure 16)

Both sender and receiver mains transformers (T125 and T126) have double-wound primaries. Voltage selector switch SJ connects the windings of each primary in parallel across the supply on the 100, 110 and 120V taps and in series on the 200, 220 and 240V taps.

Sender supplies

Switch SG connects the mains supply via SJ to the sender transformer T125 which has four secondary outputs used as follows:-

- (a) A 740V-0-740V winding connected to valves V125 and V126 which provide full-wave rectification. This gives a 530V d.c. output, smoothed by choke-input filter L125, C129, C130 and C131, between SKTA-A and SKTA-B when RLJ is energised by earthing the send/receive line SKTA-L. R125 and R126 form a bleeder across the 530V supply. A 300V d.c. stabilised supply is obtained across V128 and V129 when a sender is connected; the dropping resistor from the +530V is in the sender.
- (b) A 5V heater supply for rectifiers V125 and V126.
- (c) A 30.5V winding connected to full-wave rectifiers MR127 and MR128. The rectified output, filtered by L126, C125 and C126, supplies +24V d.c. to RLJ and, via PS128 and SKTA-K, to the sender relays, and also operates the PSU cooling fan through L128.
- (d) A 19V heater supply fed to the sender by SKTA-M. This supply is used for the SEND ON indicator lamp ILP125.

Receiver supplies

Switch SH connects the mains via SJ to transformer T126 which has three secondary outputs used as follows:-

- (a) A 255-0-255V winding connected to a full-wave rectifier V127. The rectified output is filtered by L127 and C128, fed as 175V h.t. to the sender for the intercomm amplifier by SKTA-H and to the receiver by SKTA-D.
- (b) A 6.3V winding supplying intercomm amplifier heaters through SKTA-F and receiver heaters through SKTH-F. This supply is used for RECEIVER indicator lamp ILP126.
- (c) A 26.5V winding half-wave rectified by MR126. The capacity-input filter C132, R130 and C133 gives a d.c. output of -30V fed as a bias supply to the receiver by SKTH-H.

Pins K and L of SKTH and pins J and E of SKTA are used to feed the receiver output to the phones through the sender switching.



AC./P.S.U. FOR RECEPTION SET R210.

(S.U.R. No 28.)

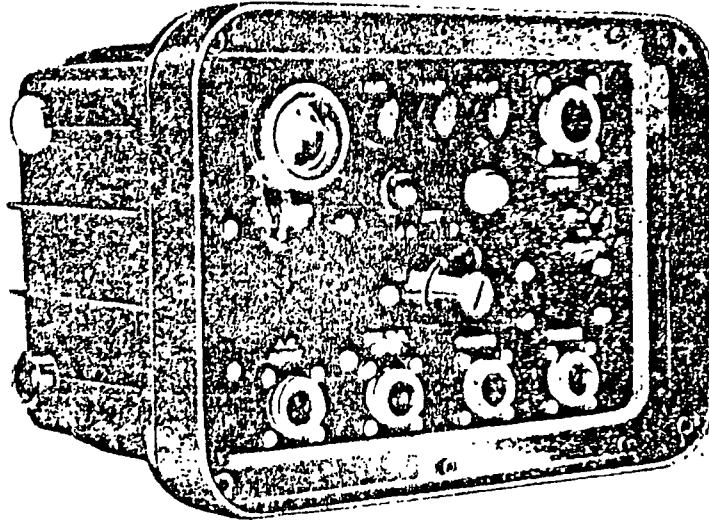


FIG 20.



FIG 21.

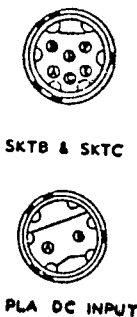


FIG 23.

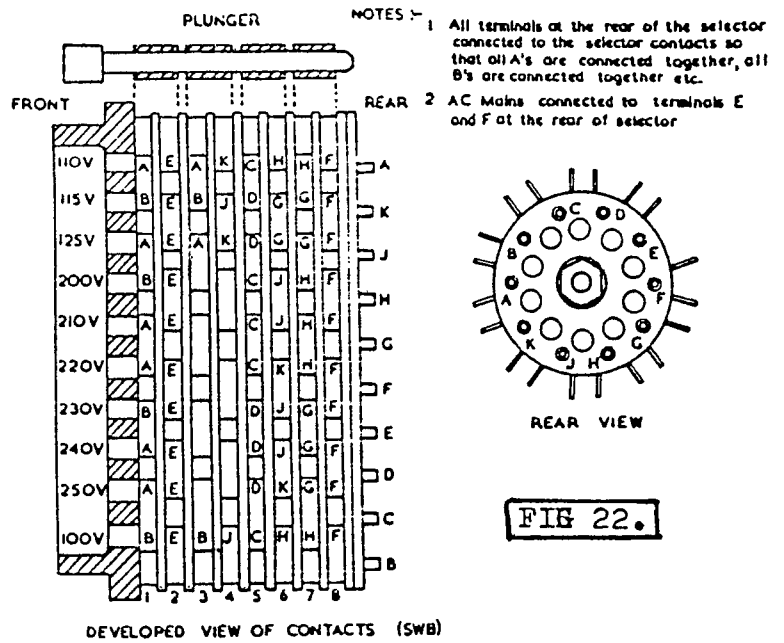


FIG 22.



FIG 24.

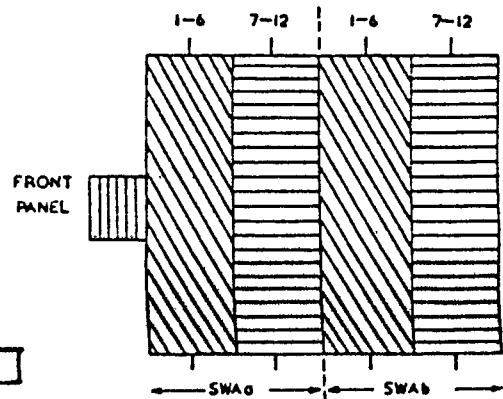
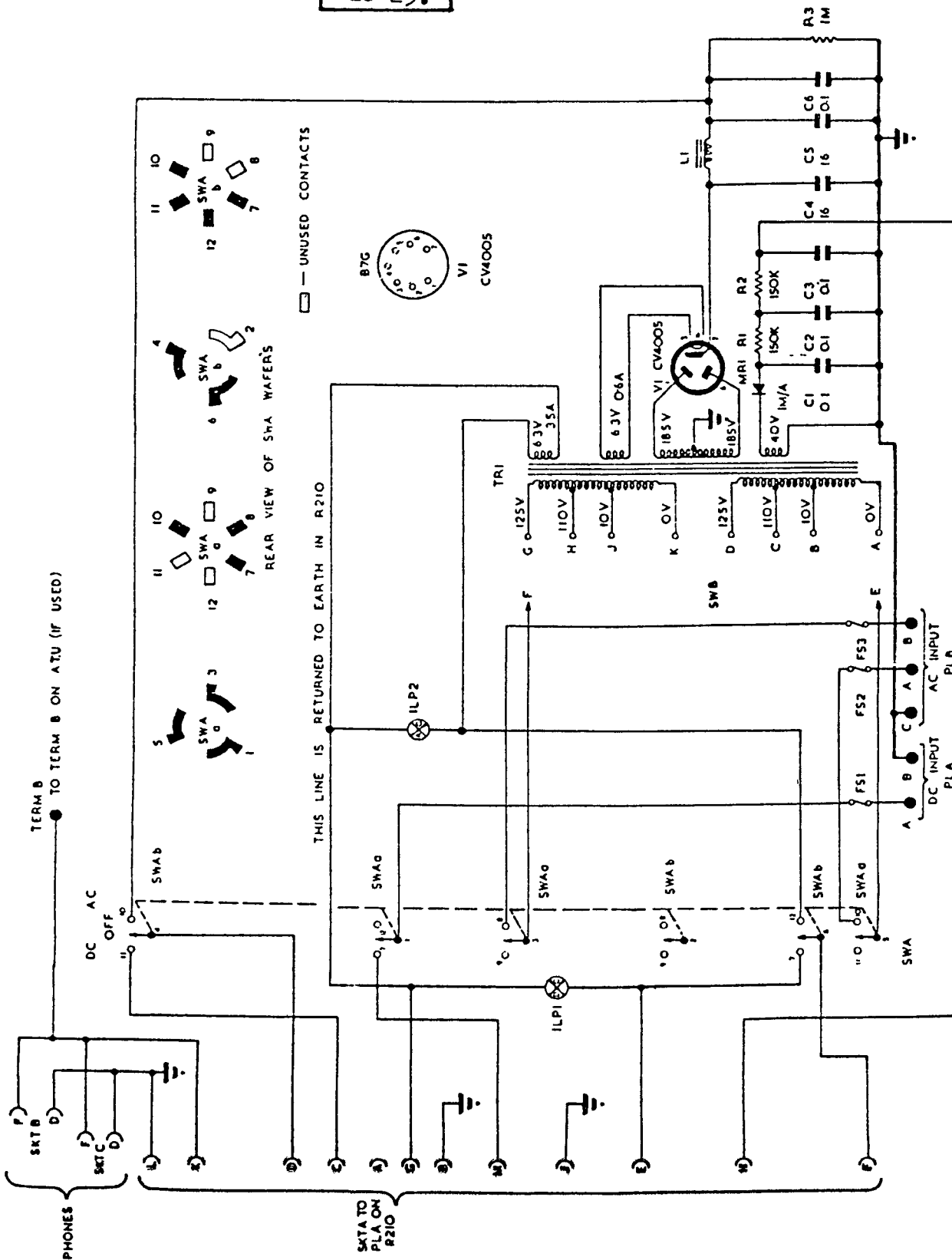


FIG 25.



SUR No 28

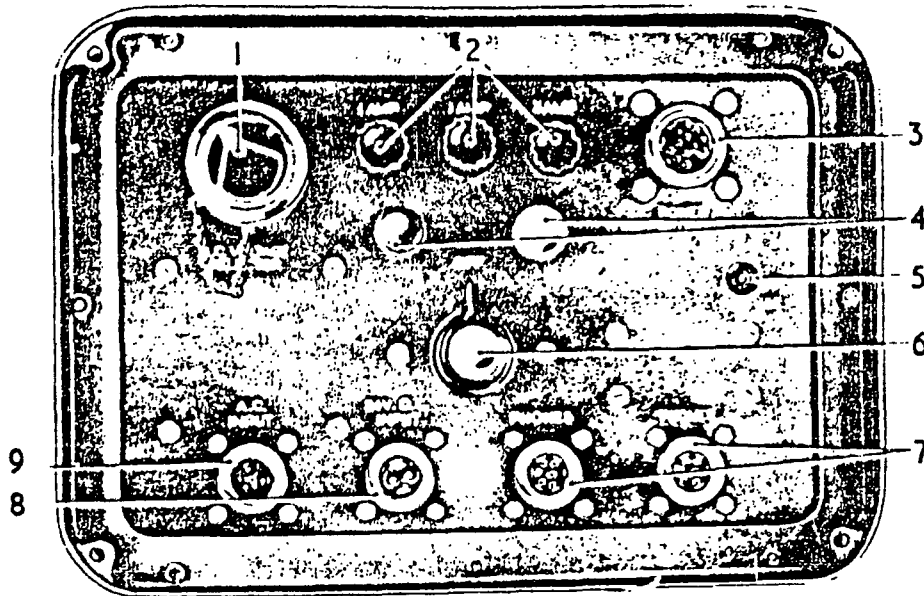
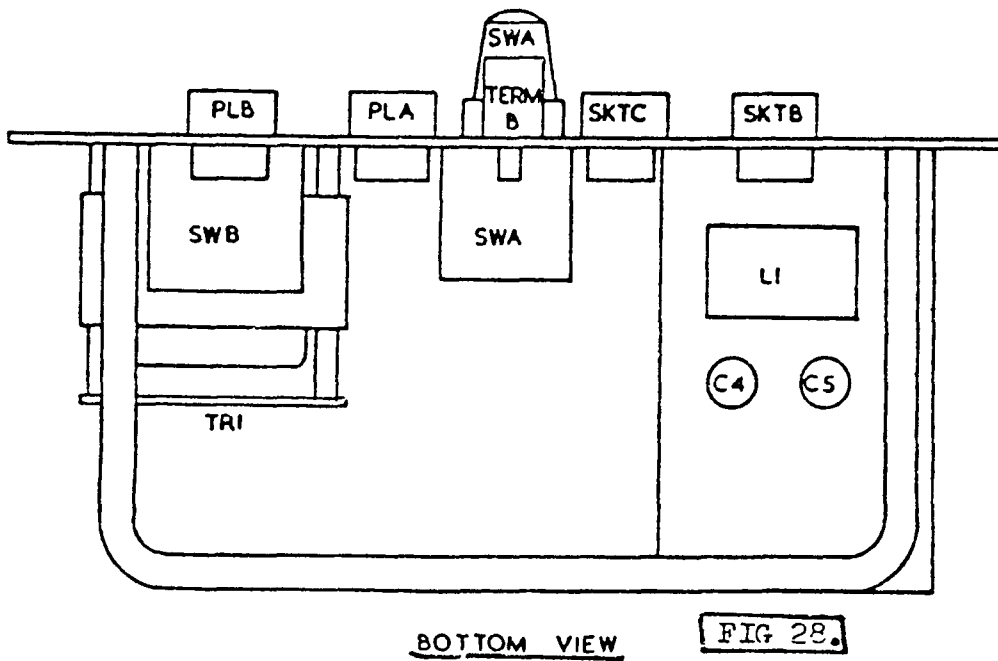
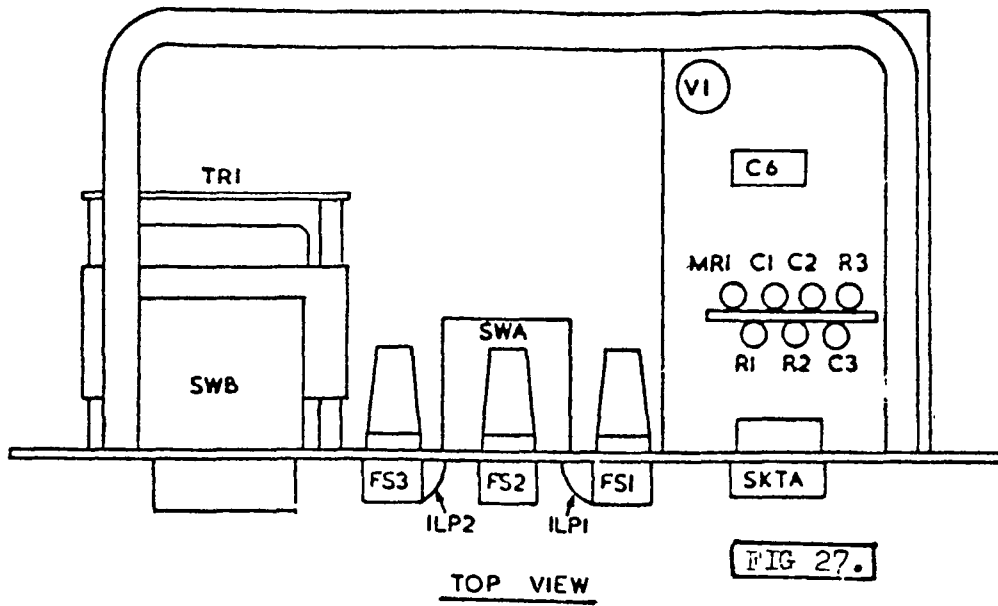
CONTROLS.

FIG 26.

## SUR No 28 AC Power Supply Unit

| Ref. No. | Control                   | Description and Purpose                                                                                                                                                     |
|----------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | AC Voltage Selector       | Enables the correct tapping on the mains transformer to be selected to suit local AC mains.                                                                                 |
| 2        | Fuse positions            | Three fuseholders suitably engraved with the correct rating.                                                                                                                |
| 3        | POWER OUTPUT              | 12 pt. Mk. 4 socket providing means of connecting the power output to the set and also returning audio output from the set to the 6 pt. phone socket on front panel of FSU. |
| 4        | PHONES OUT                | Screwed terminal to enable phones output of set to be connected, via D10 cable, to the remote ATU.                                                                          |
| 5        | Indicator lamps AC and DC | Two coloured lamp holders containing small 6 volt lamps. The RED is illuminated when AC is on and the GREEN is illuminated when DC is on.                                   |
| 6        | AC-DC ON/OFF switch       | Rotary switch controlling supplies.                                                                                                                                         |
| 7        | PHONES                    | Two 6 pt. Mk. 4 sockets providing means of connecting phones to audio output of set.                                                                                        |
| 8        | 24V DC INPUT              | 2 pt. Mk. 4 plug for connecting DC battery supply to FSU.                                                                                                                   |
| 9        | AC INPUT                  | 3 pt. Mk. 4 plug for connecting AC mains to FSU.                                                                                                                            |



SUR No 28

The supply unit ( SUR No 28 ) is designed to operate the R210 from AC mains when the receiver is used separate from the C11, in addition, to cover the possibility of mains failure, facilities for rapid change over to 24v DC operation are provided. The unit also acts as a terminating box for the R210, sockets being provided for the attachment of head-phones.

Technical description.

AC mains are fed into the unit at the 3 way plug PLB, via the two fuses FS2, FS3, and thence to the selector switch SWA, from the switch to the AC voltage selector SWB and thence to the primary windings of T1.

The selector switch has three positions AC-OFF-DC. When the SUR28 is in use, SWA becomes the operational control switch for the R210, it also provides the necessary linkages across pins D-C and E-F of SKT.A. to complete the HT and LT circuits when operating on DC.

When switch SWA is in the DC position, the 24v supply fed in at PLA, the negative pole is earthed at pin B and the positive side is passed via fuse FS1 to contacts 1 and 7 on SWAa and out to SKT.A. on pin M, this brings the R210 DC power supply into operation via the connecting cable and PLA. Contacts 6 and 7 of SWAb complete the circuit to operate the DC indicator lamp ILP1.

Phone output from the R210 is fed into the SUR28 via the connecting cable to pins L and K of SKT.A. and thence to the two parallel sockets SKT.B. and SKT.C. on the front panel.

The HT-LT and bias circuits of the SUR28 are conventional in design, the full wave rectifier V1 CV493 provides a line voltage of 175v which is smoothed by C4 L1 C5, this is fed to the R210 via contacts 4 and 10 of SWAb and pin D of SKT.A.. Heater supplies of 6.3v at 3.5A are fed via contacts 6 and 12 of SWAb and pin F of SKT.A.

The bias supply of -30v is developed from a 40v 1mA winding on T1, rectified by the unistor MR1 and smoothed by the RC network C1 R1 C2 R2 and C3. This supply is fed out to the R210 on pin H of SKT.A.

Circuit of filter X1. (See Fig 11.)

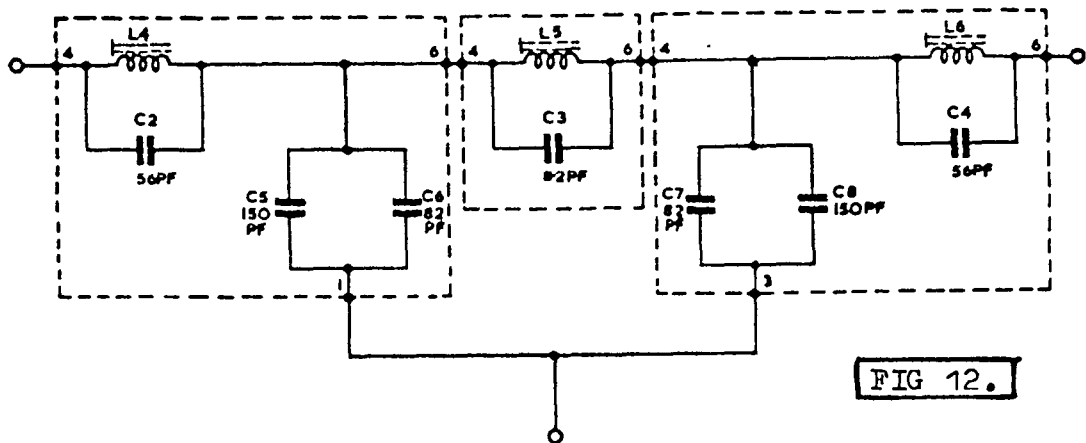


FIG 12.

CONTROLS.

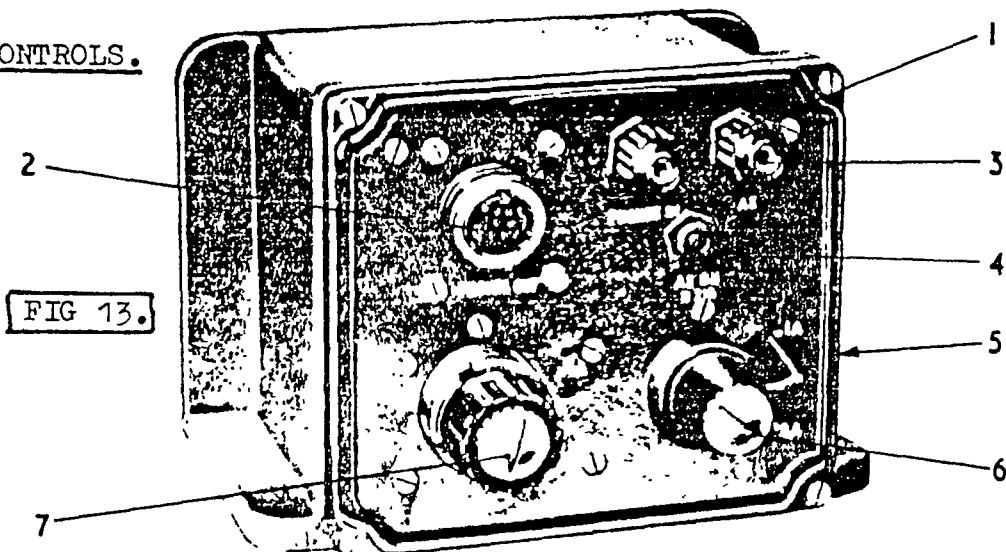
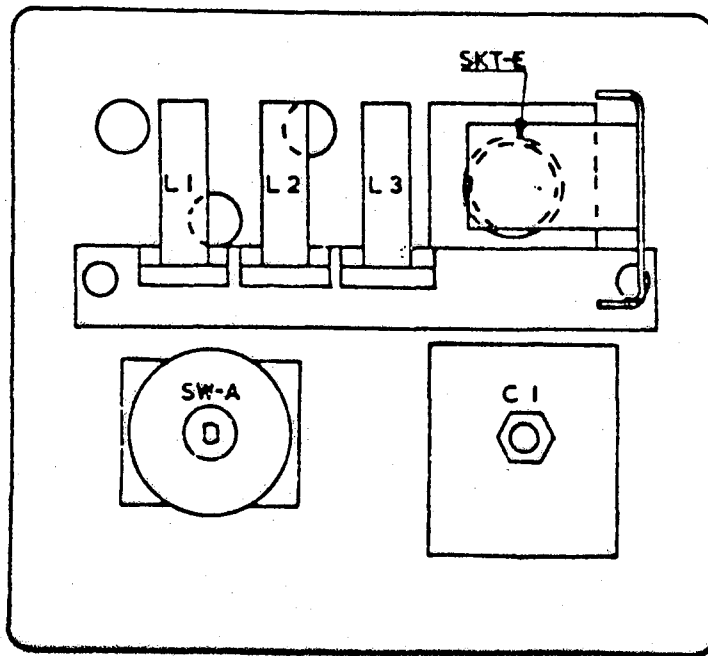
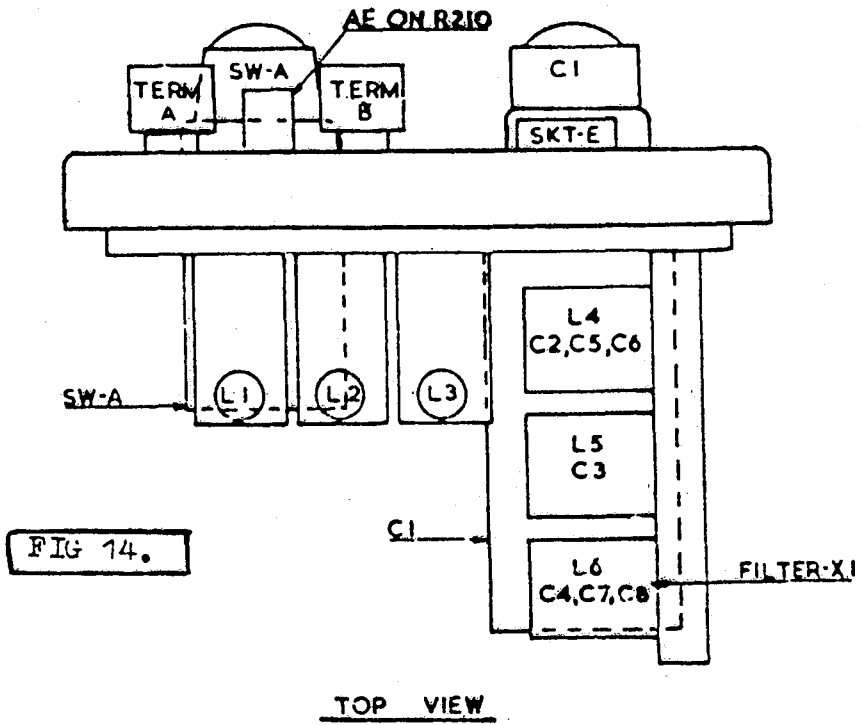


FIG 13.

Aerial Tuning Unit

| Ref. No. | Control            | Description and Purpose                                                                                                                                                                |
|----------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | PHONES IN          | Insulated screw terminal connected internally to the 6 pt. Mk. 4 phone socket. The terminal provides a means of connecting cable from the PHONES OUT terminal of the Adaptor Unit 'A'. |
| 2        | 6 pt. Mk. 4 SOCKET | For connecting phones to the unit.                                                                                                                                                     |
| 3        | AE Terminal        | Insulated screw terminal for connection to the aerial.                                                                                                                                 |
| 4        | AE on R210         | Coaxial socket termination. Provides the means of connecting a coaxial feeder (up to 100 yards in length) between the ATU and the reception set.                                       |
| 5        | EARTH Terminal     | This terminal (not shown in photograph) is fitted on the rear right hand flange of the unit. It provides a means of attaching an earth connection to the unit.                         |
| 6        | Range Switch       | A 6 pt. rotary switch which selects either of two positions on any one of the three range coils.                                                                                       |
| 7        | Tuning             | Small capacitor to adjust the tuning of the selected coil.                                                                                                                             |



REAR VIEW

FIG 15.

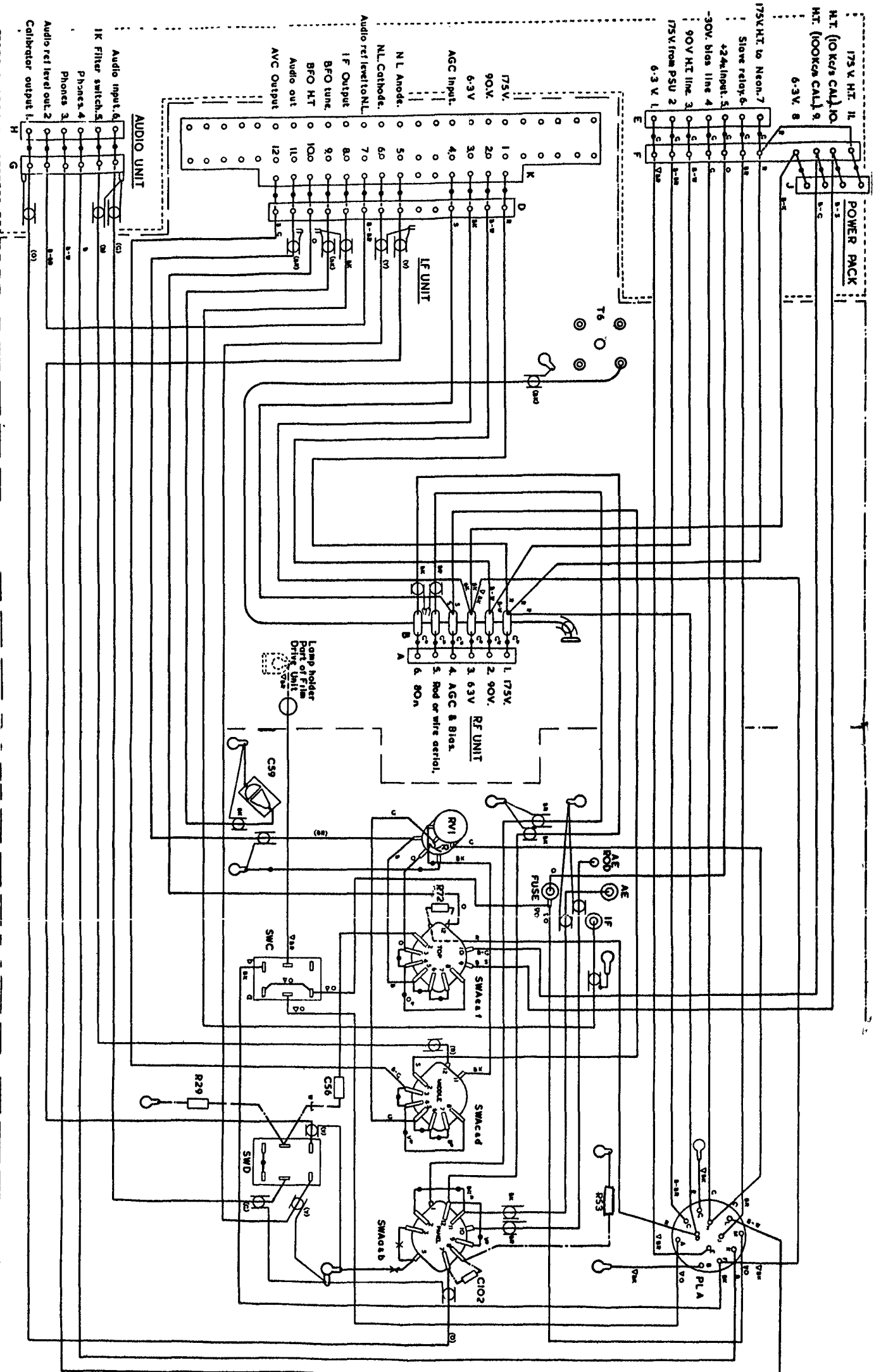
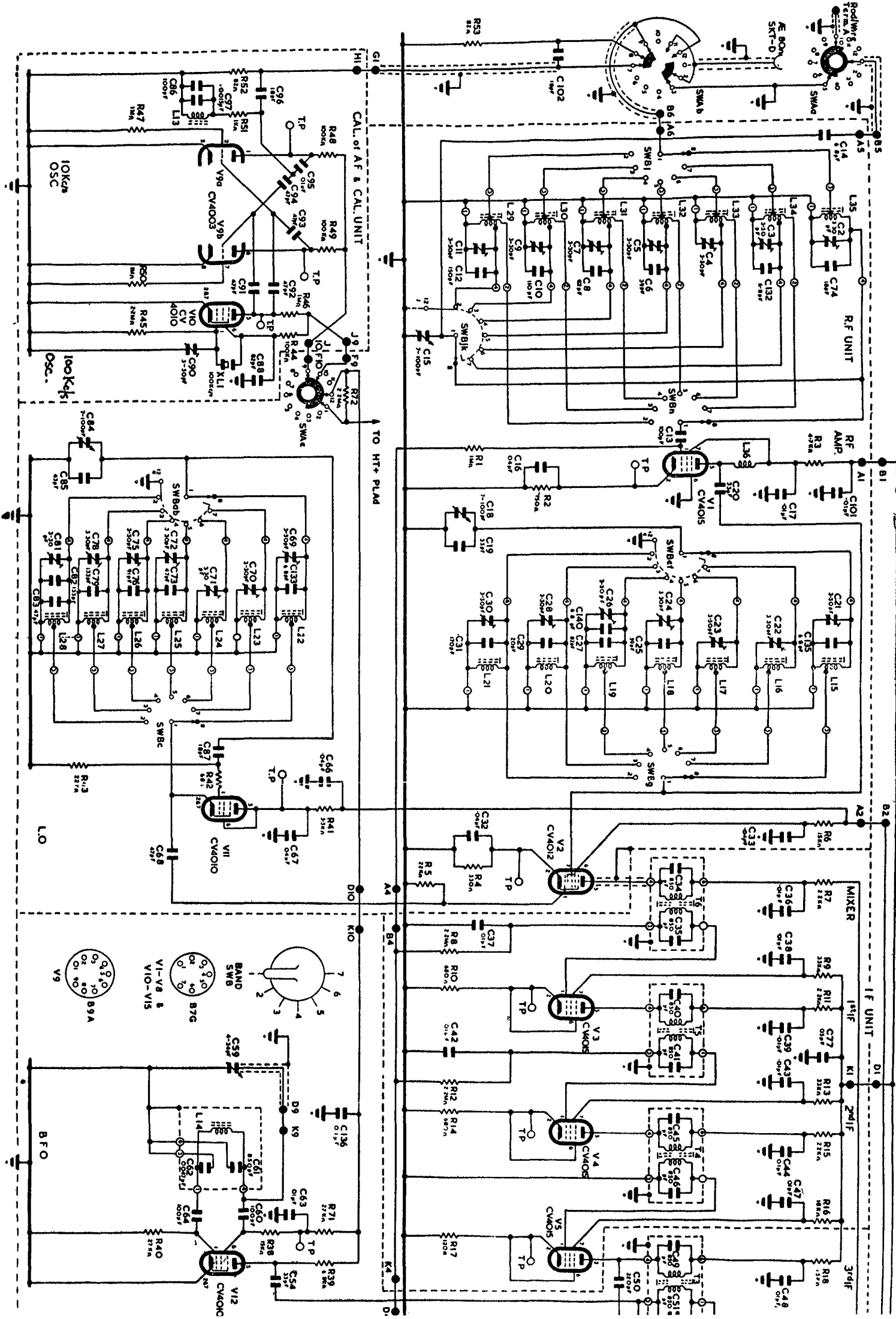
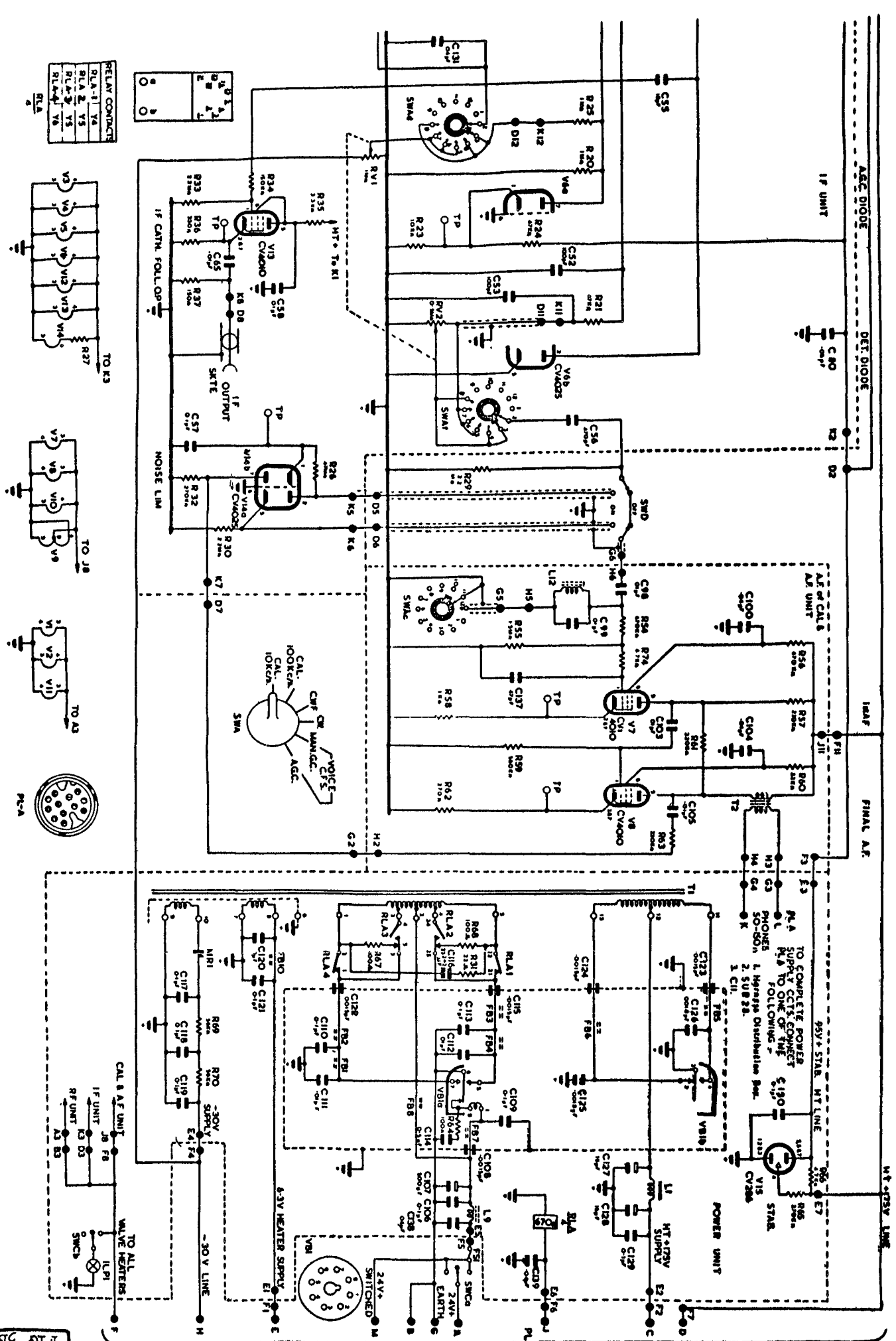


FIG 11







RELAY CONDUCTS

|       |   |   |
|-------|---|---|
| RLA-1 | 1 | 4 |
| RLA-2 | 2 | 5 |
| RLA-3 | 3 | 6 |
| RLA-4 | 4 | 7 |
| RLA   | 5 | 8 |

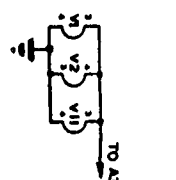
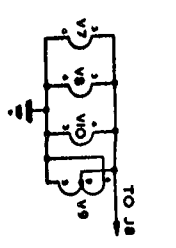
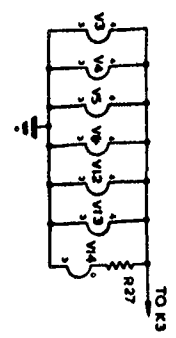
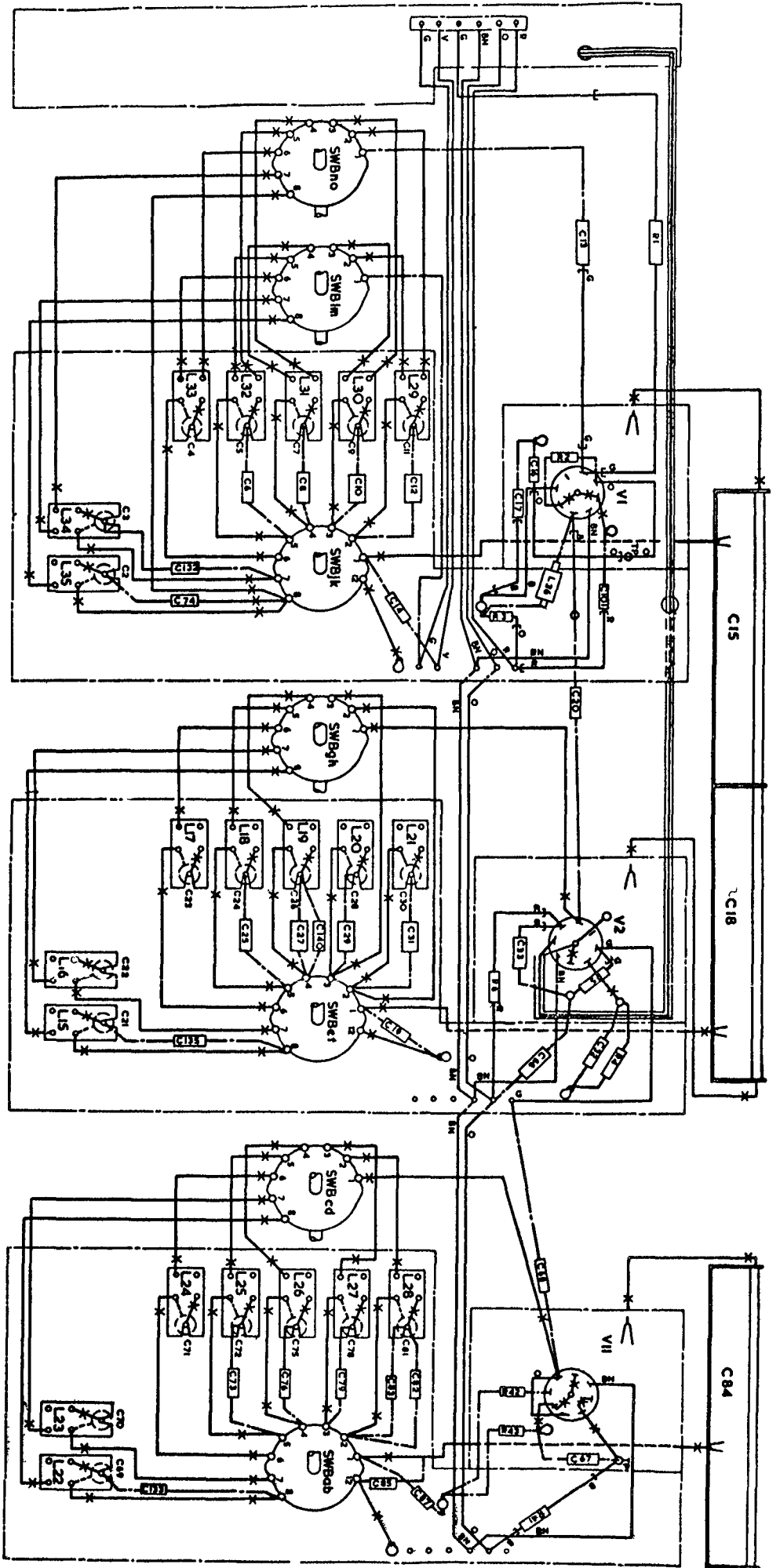


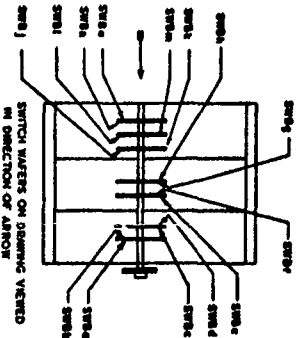
FIG 3B.

| COL. CHAR. | ASSY | REMARKS              |
|------------|------|----------------------|
| —          | —    | 30 SWG TINNED COPPER |
| —          | —    | CO-AXIAL BLACK       |
| ORANGE     | O    | 33WAG PVC COVERED    |
| RED        | R    | "                    |
| BROWN      | BH   | "                    |
| VIOLET     | V    | 23 SWG. PVC COVERED  |
| GREEN      | G    | "                    |
| RED        | R    | 3MM PVC SLIDING      |
| ORANGE     | O    | "                    |
| BLUE       | B    | "                    |
| GREEN      | G    | "                    |



NOTES  
 1 ——— DENOTES WIRE FORMING PART OF COMPONENTS  
 2 ——— DENOTES OUTLINE OF CHASSIS

**SUB UNIT No 1.**  
**RF CHASSIS.**



**FIG 7.**

TUNING INDICATORS ASSOCIATED WITH COILS L5-L15 TO BE CONNECTED TO MAIN CHASSIS AS SHOWN.



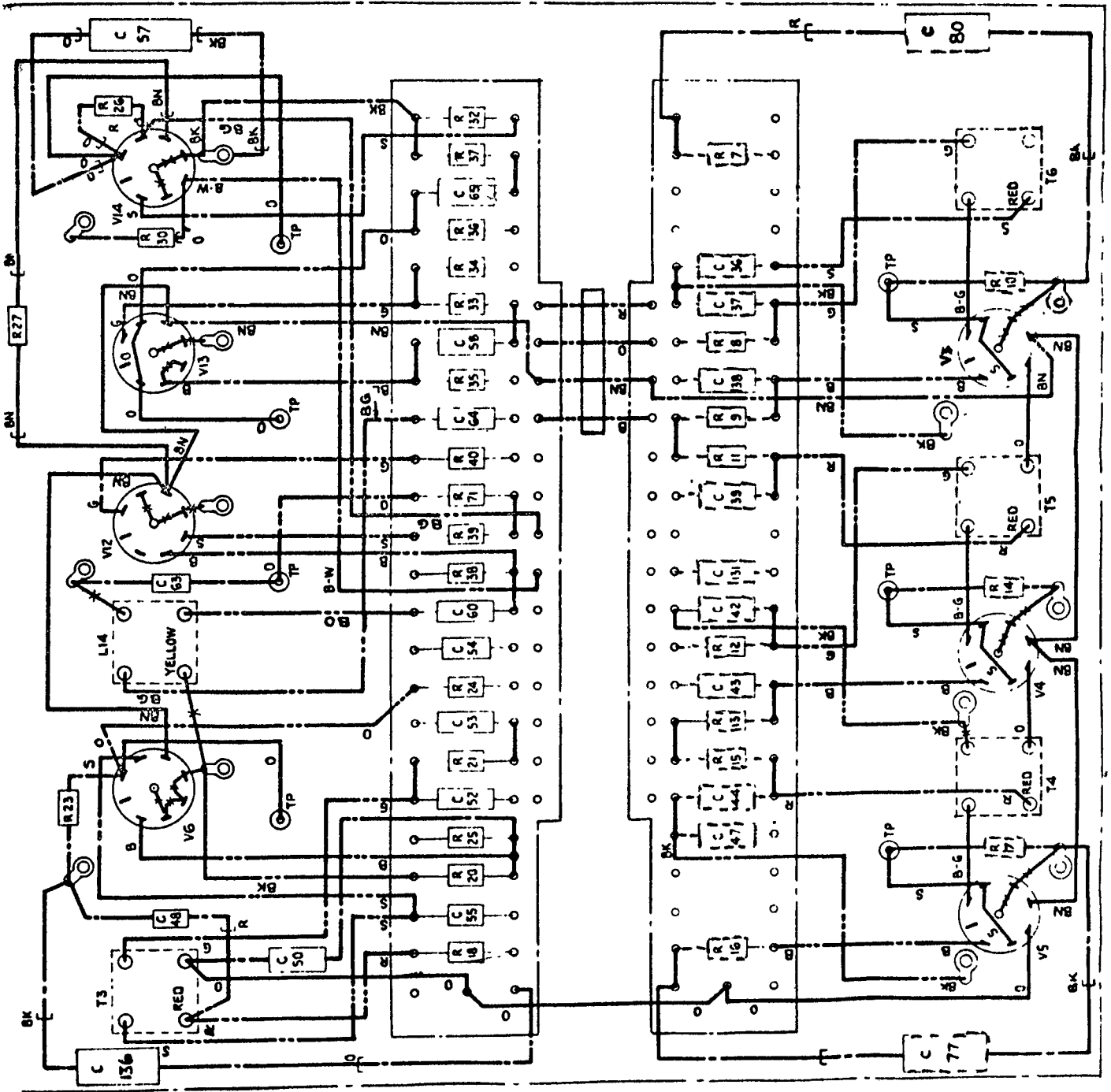
FIG 8.

| COLOUR      | ABBREVIATION AS SHOWN ON WIRE | REMARKS              |
|-------------|-------------------------------|----------------------|
| BLACK       | BK                            | 14/40 DURA WIRE 3    |
| BROWN       | BN                            | .                    |
| RED         | R                             | .                    |
| ORANGE      | O                             | .                    |
| GREEN       | G                             | .                    |
| BLUE        | B                             | .                    |
| SLATE       | S                             | .                    |
| BLUE ORANGE | B-O                           | .                    |
| BLUE GREEN  | B-G                           | .                    |
| BLUE WHITE  | B-W                           | .                    |
|             |                               | 22 SWG TINNED COPPER |
| BLACK       | BK                            | 1MM PVC SLEEVING     |
| RED         | R                             | .                    |
| BROWN       | BN                            | .                    |
| ORANGE      | O                             | .                    |
| SLEEVE      | —                             | HELLERMAN #2 X 1     |

UNDERSIDE

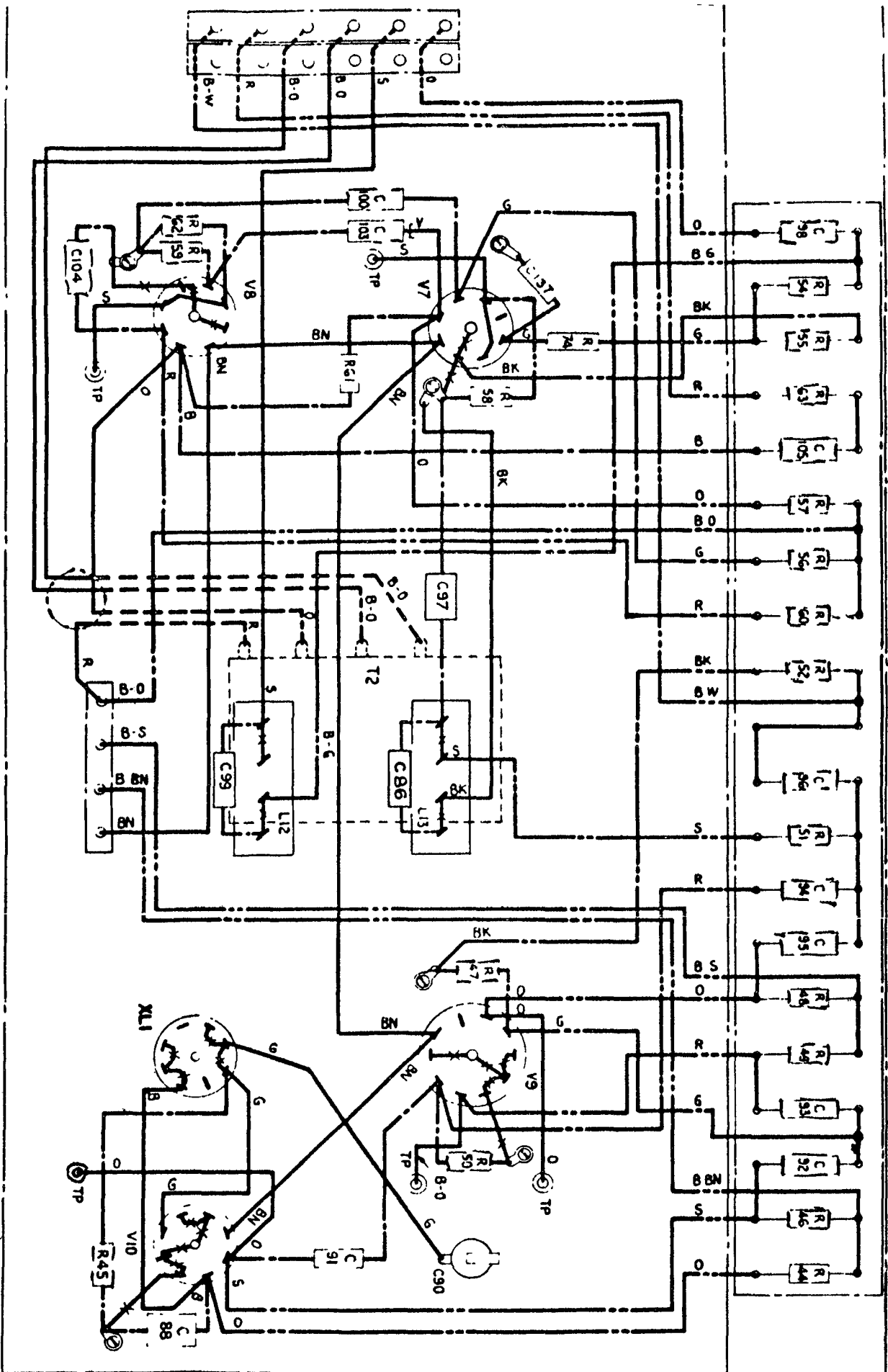
SUB UNIT No 2.

IF CHASSIS.



SUB UNIT No 3.

AF CHASSIS.



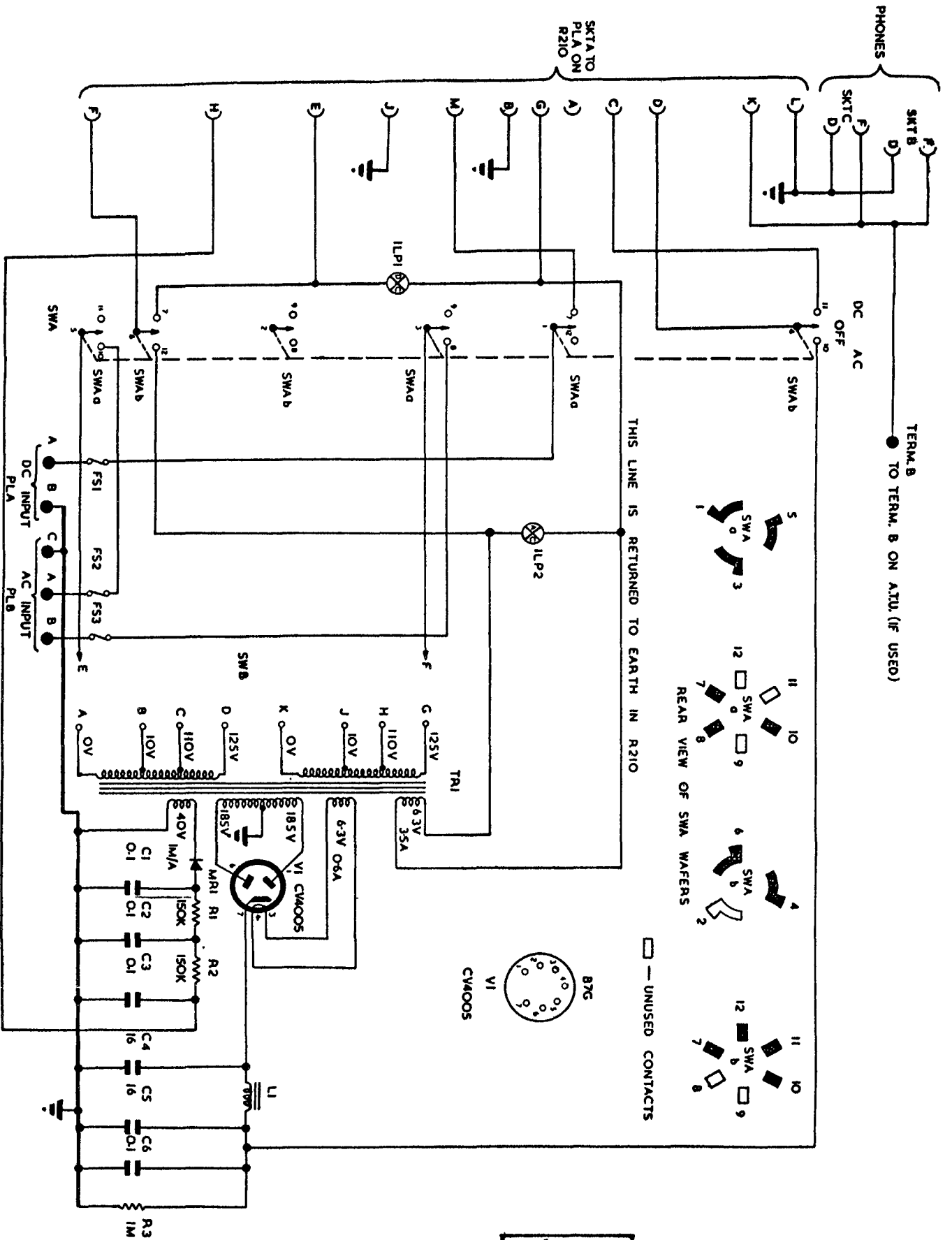


FIG. 25.

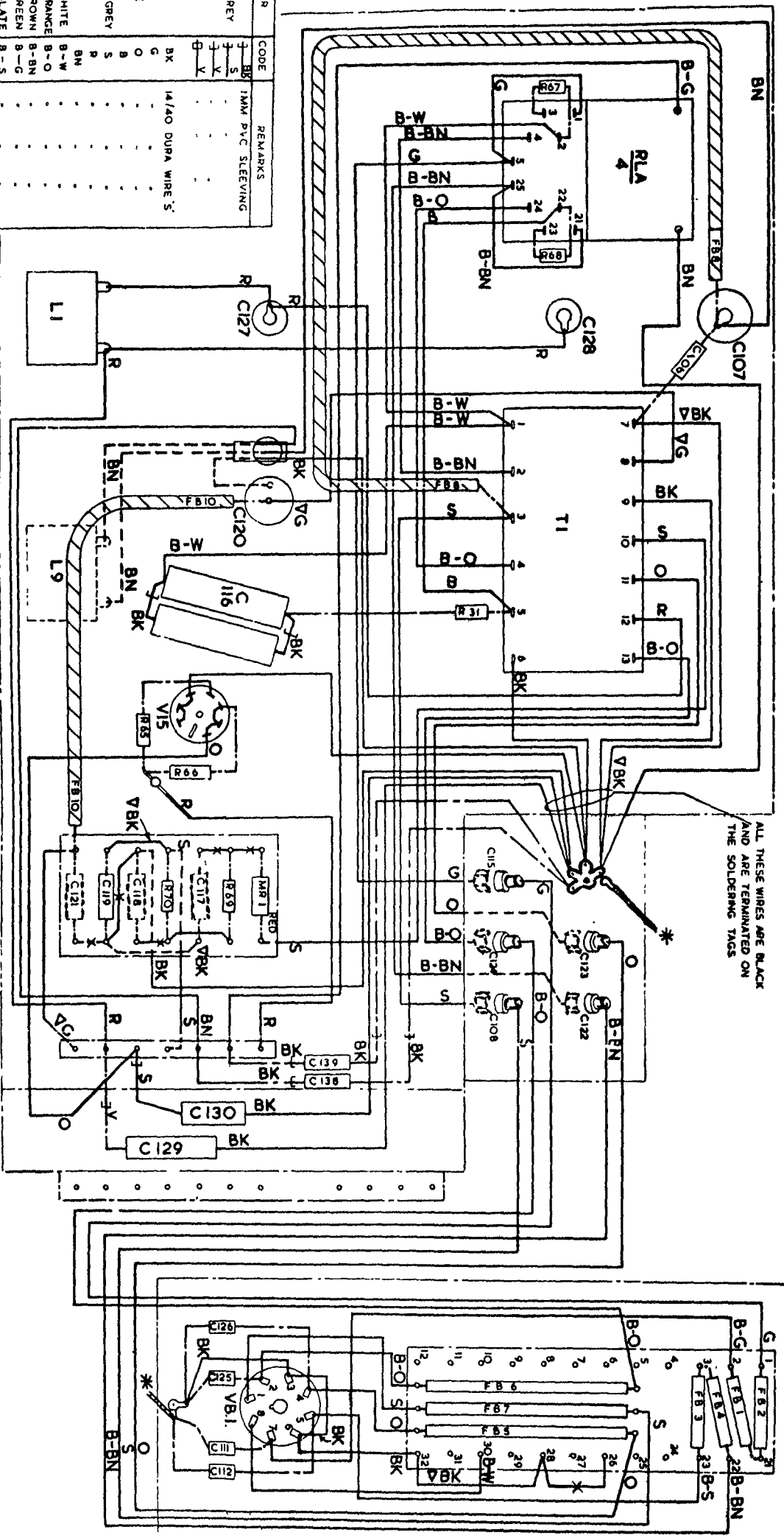
| COLOUR      | CODE | REMARKS             |
|-------------|------|---------------------|
| BLACK       | BK   | 1MM PVC SLEEVING    |
| SLATE GREY  | S    |                     |
| VIOLET      | V    |                     |
| VIOLET      | V    |                     |
| BLACK       | BK   | 14/40 DURO WIRE 'S' |
| GREEN       | G    |                     |
| ORANGE      | O    |                     |
| BLUE        | B    |                     |
| SLATE GREY  | S    |                     |
| RED         | R    |                     |
| BROWN       | BN   |                     |
| BLUE-WHITE  | B-W  |                     |
| BLUE-ORANGE | B-O  |                     |
| BLUE BROWN  | B-BN |                     |
| BLUE GREEN  | B-G  |                     |
| BLUE-SLATE  | B-S  |                     |
| BLACK       | BK   |                     |
| GREEN       | G    |                     |

| CODE    | REMARKS            |
|---------|--------------------|
| 22 SWC. | TINNED COPPER WIRE |
| 14/0076 | PVC COVERED        |
| V G     |                    |
| V BK    |                    |
| 22 SWC. | TINNED COPPER WIRE |
|         | COPPER BRAID       |

SUB UNIT NO 4.

DC PSU.



ALL THESE WIRES ARE BLACK AND ARE TERMINATED ON THE SOLDERING TAGS