A26 RECEIVER

TECHNICAL NOTES

Owing to production changes it may be found that individual receivers differ in minor details from the ensuing description.

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033/5/35

THE CIRCUIT

The Murphy A26 may be described as a four valve set in so far as it contains four valve sockets—omitting the one for the mains rectifying valve. However, owing to the use of high efficiency valves and to the fact that some of the valve envelopes contain multi-electrode systems, the A26 should be classified according to its performance rather than the apparent number of valves employed.

The accompanying schematic diagram (Fig. 2, page 9) shows the circuit.

In order to discriminate between two valve systems contained in the same envelope, distinguishing names will be given to them. Thus the two valves enclosed within the V1 envelope will be spoken of as V1Pen. and V1Triode respectively. Examination of the circuit diagram shows the position of the special valves employed in this receiver : these are V1, and V3. V1 combines an R.F. pentode and triode oscillator, whilst V3 is a double diode rectifier. The remaining valves V2 and V4 are both high slope pentodes, the former being specially designed for R.F. amplification and the latter being an extremely sensitive output valve.

Referring again to the circuit diagram it is seen that the aerial is coupled to a band pass tuning arrangement (L3, L7, C1A, C1B, etc.) which incorporates an image frequency suppression circuit (Lo, Co). From the secondary of the aerial band pass tuning circuit signals are passed on to the grid of V1Pen., where they are mixed with the local oscillations generated by V1Triode and rectified, thus producing an I.F. signal at 117 k.c. This signal is fed through the I.F. transformer L15, L16 to the I.F. amplifier V2 and thence through the I.F. transformer L17, L18 to the detector V3 diode (A1).

At this point the signal encounters the A.V.C. system of which a brief description will be given here. The central idea behind this system is to arrange the circuits in such a way that the D.C. voltage produced by rectification of the I.F. carrier wave acts as a bias for V1 Pentode and V2. One of the diodes in V3 is used for this purpose, and it is fed from the primary of the second I.F. transformer. A delay voltage which prevents the operation of A.V.C. for weak inputs, is obtained from the voltage drop across R15, R16, in the cathode circuit of V4.

After rectification the signal is passed to the grid of V4 *via* the volume control R19, and the coupling condenser C25. C28 and R21 act as the tone control, R21 being adjustable. It should be noted that this control is shunted across the primary of the output transformer, instead of between V4 anode and chassis: this method of connection limits the voltage on C28 to that developed across T1.

The H.T. is supplied by a full wave rectifier, U12, the majority of the smoothing being carried out by the speaker field, in conjunction with C29, C30 and C20. The function of the hum bucking coil fitted to the speaker is to inject externally into the speech coil a certain percentage of any A.C. voltage which may be present in the speaker field. In this way the corresponding hum-voltage normally induced in the speech coil is neutralised.

The actual controls of the set are four in number:

(1) Upper central knob:	Ganged tuning condenser.
(2) Left-hand knob:	Volume control and on-off switch.
(3) Central knob:	Tone control.
(4) Right-hand knob:	Wave-change switch.

There are one or two special points in this receiver which call for attention.

Item (1) The position of the following components should be noticed; the image frequency suppressor condenser Co, the band pass coupling L5, L6 and the output transformer T1. All these items are mounted underneath the chassis and may be seen in Figure 4.

Item (2) The potential of V3 cathode; from the circuit diagram it is seen that the cathode of V3 is considerably positive with respect to chassis. This voltage is derived from a resistance in the cathode circuit of V4, and provides the delay for the A.V.C. system.

DISMANTLING

To remove the chassis from the Cabinet, first take off all control knobs. Then loosen the four screws at the corners of the fibre back (it is unnecessary to remove them altogether) and the back will come off.

Take out the Loudspeaker plugs from the sockets on the left, and also the field plugs from the socket strip on the mains transformer. Then with a quarter-inch Whitworth box spanner remove the three hex-headed holding-down screws. This must be done working from below, with the set projecting over the edge of the bench.

The chassis will now slide out.

Note that the number of the set is given on the name plate fixed to the cabinet back; it is repeated on the chassis itself (see Fig. 2). If by any chance two sets are taken down at the same time make sure that each back and cabinet are kept together, so that when replacing the chassis they may be returned to their correct cabinets.

PRACTICAL LAYOUT

The practical layout of the A26 differs from that of the A24 in several respects. Amongst other points may be mentioned the absence of the heterodyne filter, and the new position of the electrolytic condensers and output transformer underneath instead of above the chassis; the electrolytic condensers being included in the W2030 Bank, while the output transformer is situated behind the volume control.

The W2030 bank consists of large capacity electrolytic condensers only; all other condensers and resistances are accommodated on the sub-panels and in the I.F. assemblies.

An important change has been made in the position of the on-off switch, this now being ganged to the volume control in order to minimise the pick-up of mains noise. On account of this alteration the wave-change switch has only two positions.

Fig. 3 is a plan of the chassis. It shows the components that are above the base, and also the fittings on the back edge. The sequence of the valves is similar to that obtaining in the circuit diagram. The actual valves used are:

Left hand	V1	Mazda AC/TP	(met).
Second	V2	„ AC/VP1	(met).
Third	V3	„ V914	(clear).
Right hand	V4	„ AC/2Pen	(clear).
Back right hand	V5	Marconi or Osram U12. or Mazda UU3.	

In order that the details of the wiring of the components enclosed within the coil cans may be clearly seen, diagramatic views of these assemblies are shown in Figures 5, 6, 7, 8 and 9; the views being obtained by looking at the coils from the top with the cans removed. In reading these diagrams care must be taken to see that the coloured tracers in the external connecting wires correspond exactly to the colours given in the illustrations. Otherwise confusion may arise owing to the diagram and the actual assembly being looked at from different angles.

On turning the chassis over, we get the "worm's eye" view shown in Fig. 4. Most of this is clear enough, but there are four component assemblies that call for special notice and we also give separate illustrations of these.

W2030. This is a block of four electrolytic condensers. Fig. 1 shows how it is arranged looking at the side where the tags show. The reference numbers on the condensers show where they are in circuit by referring to the schematic diagram, Fig. 2.

The arrow heads show where all the external connections go to, so that by the aid of the diagram one can change the assembly, and put in a spare without errors in re-wiring.

V2048. This lies behind V3; the internal and external connections can be seen in Fig. 10.

V2049. This is adjacent to the output transformer. Connections are given in Fig. 11.

V2053. This lies behind V1. Connections are given in Fig. 12.

Voltages and Currents

The following table of voltages is given as a guide only—considerable variations may occur without seriously detracting from the efficiency of the receivers.

Owing to the particular circuit employed in the A26, the various voltages depend to some extent on the strength of the applied signal. For this reason certain readings were taken with and without a strong signal, in order to give an idea of the changes to be expected under working conditions. A larger or smaller signal than that used in taking these readings, will, of course, give correspondingly different variations.

Except where otherwise stated voltages are to chassis ; they are those obtained with a " 1000 ohm per volt " meter, using a D.C. range of 250 volts wherever possible.

VALVE OR COMPONENT	TESTING POINT		VOLTS	mAmps
V.1 Pentode	A	Strong signal	240v.	1
	A	No signal	200v.	5
	S.G.	No signal	180v.	1.5
	C	Strong signal	2.5v.	
	C	No signal	7. v.	
V.1 Triode	A	Strong signal	85v.	1.4
	A	No signal	75v.	
V.2	A	Strong signal	245v.	3.5
	A	No signal	240v.	7
	S.G.	No signal	220v.	1.5
	C	Strong signal	1v.	
	C	No signal	3v.	
V.3	D1A	Strong signal		
	D1A	No signal	—	
	D2A	Strong signal	25v.	
	D2A	No signal	—	
	C		15v.	
V.4	A		220v.	28
	S.G.		240v.	7
	C		15v.	
L.S. Field	(Tag F.)		115v.	
H.T. Volts. across C.30.	(Tag B.)		240v.	
Rect. H.T. across C.29.	Tags B and F.		355v.	

TRIMMING

A modulated oscillator is highly desirable for trimming the A26 receiver : if this is not available only the radio frequency circuits can be adjusted and sets with faulty I.F. trimming must be returned to the Factory.

APPARATUS REQUIRED

(1) An insulated screwdriver. The blade should be either covered with sleeving or wrapped with insulating tape for about an inch from the tip, leaving only 1/16th-inch of the tip of the blade exposed.

(2) 0-1.5v. or 0-50v. A.C. voltmeter. Alternatively 0-10 milliammeter.

If an 0-1.5 voltmeter is used it must be connected directly across the speech coil of the loudspeaker : if, however, an 0-50 voltmeter is used this must be connected in series with a 1.0 mfd condenser and the two together then connected across T1 primary. Alternatively they may be connected between V4 anode and chassis. The 0-10 milliammeter should be connected between Tag B on the W2030 bank and the pink lead from the 2nd I.F. can : *i.e.* in V2 anode lead.

GENERAL INSTRUCTIONS FOR TRIMMING

(*a*) When using a voltmeter indicator the input must be kept low enough to prevent the A.V.C. coming into operation, or alternatively, the latter must be cut out by disconnecting the green wire from the D2A socket. When a milliammeter is used, however, the A.V.C. must not be cut out, otherwise no deflection will be obtained.

(*b*) Set the manual volume control at its maximum position: this ensures that, provided the receiver is worked at a normal volume level, overloading will not take place in the H.F. stages.

(*c*) Make all trimming adjustments with the greatest possible care, bearing in mind that the operation is essentially critical and that faulty trimming will completely spoil the performance of a receiver.

TRIMMING BY MEANS OF A BROADCAST SIGNAL

Note—When trimming by means of a broadcast signal, a milliammeter must be used for the purpose and not an output meter.

(1) Tune in a fairly strong station between 200-220m. : identify it definitely and look up its wavelength in the *World Radio*. Compare with the reading on the set. If it is correct, go on at once to (2) below. If not correct, adjust the tuning control to exactly the right wavelength of the station, and then trim on C6 till you get the biggest meter deflection.

(2) Trim C2 to increase the deflection if possible.

(3) Do not touch the main tuning control. Trim C4 to best output ; go back to C2 and see if it needs further adjustment, then continue checking C2 and C4 alternatively until no improvement is obtained.

(4) Switch to long waves. Tune in Oslo or the nearest station to 1100m. available. Check its wavelength in *World Radio* against the setting, if correct go on to (5). If not, set the tuning to the right wavelength, and trim on C7 to maximum meter deflection.

(5) Leave the tuning control set, and do as in (2) and (3) but working on C3 and C5 instead of C2 and C4.

TRIMMING BY MEANS OF A MODULATED OSCILLATOR

(1) Tune the oscillator to 200m. and switch to internal modulation. Connect the output of the oscillator to the aerial and earth of the receiver (*via* the dummy aerial if this is provided). Now tune the set to receive this 200m. signal at maximum strength and adjust the oscillator output to give about half scale reading on the meter. Check the reading on the set, if it is exactly 200m. go on at once to (2) below. If it is not correct, adjust the receiver dial to 200m. and then trim C6 for maximum meter deflection.

(2) Trim C2 to increase the deflection, if possible.

(3) Do not touch the main tuning control. Trim C4 to best output: go back to C2 and see if it needs further adjustment, then continue checking C2 and C4 alternatively until no improvement is obtained.

(4) Switch to long waves. Tune the oscillator to 950m. and tune the set to receive this signal at maximum strength, again adjusting the oscillator output to give a reasonable reading on the meter. Check the reading on the set, if it is exactly 950m. go on at once to (5) below. If it is not correct, adjust the receiver dial to 950m. and trim C7 for maximum output.

(5) Leave the tuning control set and adjust as in (3) and (4) but working on C3 and C5 instead of C2 and C4.

I.F. TRIMMING

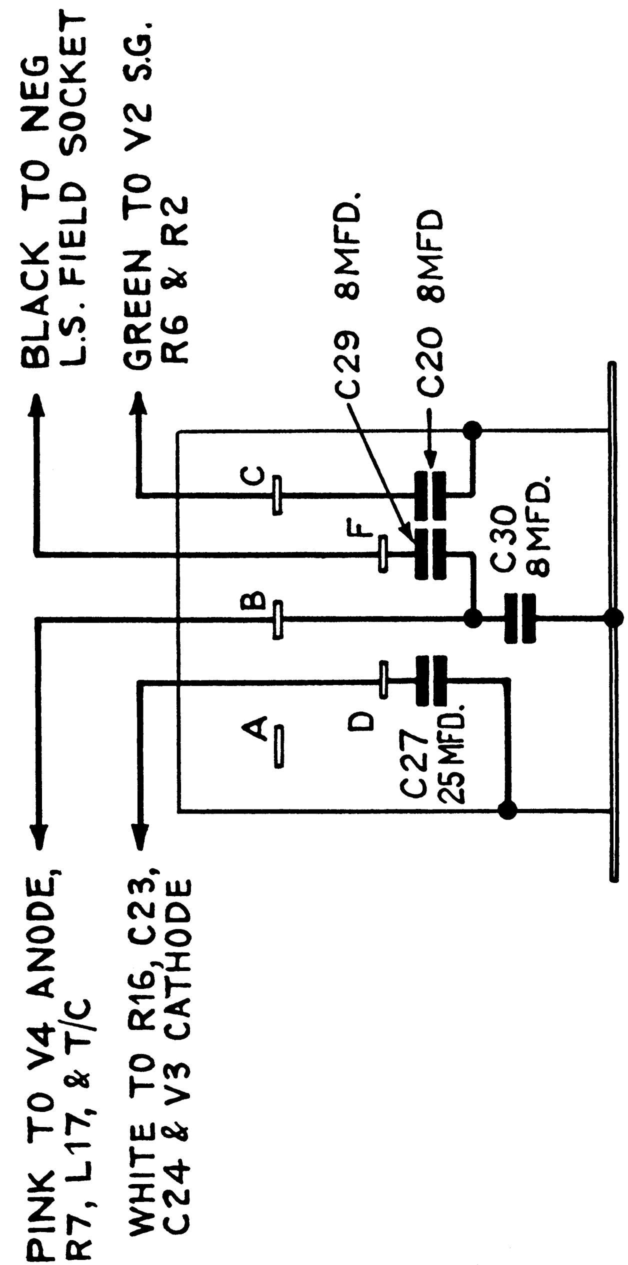
When I.F. trimming is necessary it should be carried out before the R.F. trimming; as, however, the latter is somewhat simpler it will probably be done first whenever the general symptons indicate faulty trimming. However, if R.F. trimming does not clear the trouble and I.F. trimming has to be resorted to, then, when this is complete the R.F. circuits must be re-trimmed.

First switch the receiver to medium waves and short circuit L9 or L11 to prevent V1 oscillating. Then tune the oscillator to 117 K.C. and feed its output (*via* the dummy aerial) to the input circuit of V2. That is, connect the A & E terminals on the oscillator to the grid of V2 and chassis, respectively. The output control is set to give a small reading on the indicator and trimmers C18, C17 are adjusted (in turn) until a maximum deflection is obtained. This is followed by the adjustment of C16 and C15, the oscillator output in this case being transferred to the grid of V1 Pen and chassis. When all four circuits have been trimmed for resonance the adjustment is complete and the R.F. circuits can be proceeded with.

N.B.—Sets bearing serial numbers upwards from A26 10,299, A26C 5735, A26RG 2567, have their I.F. circuits adjusted to 119Kc/s.

ADJUSTING THE IMAGE FREQUENCY SUPPRESSOR

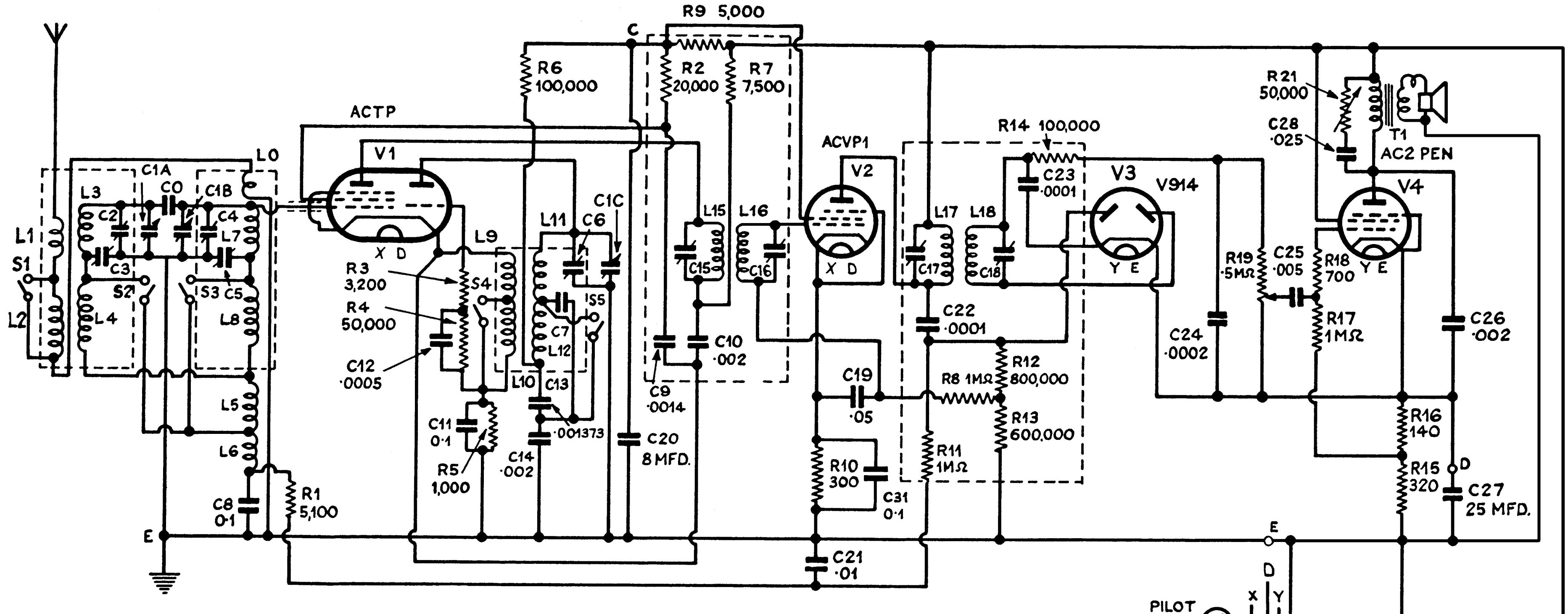
This operation differs from normal R.F. and I.F. trimming in two important particulars; in the first place the maximum possible output is required from the oscillator and in the second place the adjustment is for minimum and not maximum speaker response. The latter condition necessitates the use of the ear as an indicator, as in this special case an aural test is far more sensitive than the use of a meter. The actual adjustment is fairly simple, the oscillator is tuned to 333m. and the receiver to 450m.; these being the conditions under which the set will receive a weak " image " signal from the oscillator. Hence, when this image signal is heard, it is necessary to adjust carefully the erinoid screw (situated on top of the band pass secondary coil) until the absolute minimum signal is heard in the speaker. Under these conditions the image frequency suppression system will be correctly adjusted.

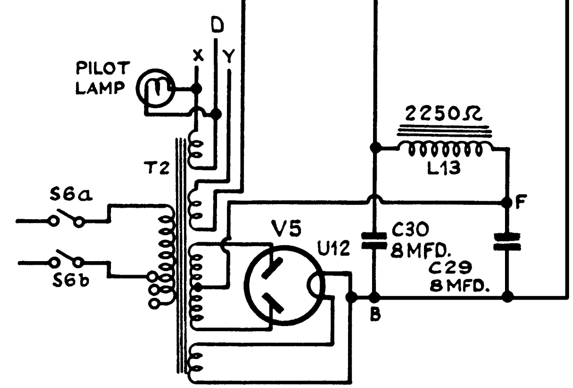


W2030 CONDENSER BANK

FIG. 1

FIG 2.





Values and Functions of Components not given in the Diagram						
CONDENSERS		INDUCTANCES		TRANSFORMERS		
No.	CAPACITY	No.	D.C. RESISTANCE	No. & MODEL	WINDING	RESISTANCE
C0	2 μμf.	L0	0.25 Ω	T2 200v. 50∽	Primary	200.214v. 24 Ω
C1A	.0005 μf.	L1	1.0 Ω			215.232v. 26 Ω
C1B	.0005 μf.	L2	7.0 Ω			233.250v. 29 Ω
C1C	.0005 μf.	L3	5.0 Ω		H.T. Sec.	255-255 Ω
C2	10/50 μμf.	L4	12.0 Ω	T2 100v. 50∽	Primary	100.108v. 5.5 Ω
C3	10/80 μμf.	L5	2.75 Ω			109.120v. 6.0 Ω
C4	10/50 μμf.	L6	0.75 Ω		H.T. Sec.	255-255. Ω
C5	10/80 μμf.	L7	5.0 Ω	T2 200v. 25∽	Primary	200.214v. 36 Ω
C6	10/50 μμf.	L8	12.0 Ω			215.232v. 39 Ω
C7	10/80 μμf.	L9	1.0 Ω			233.250v. 43 Ω
C15	70/140 μμf.	L10	2.5 Ω		H.T. Sec.	398-398 Ω
C16	70/140 μμf.	L11	4.0 Ω	T1	Primary	650 Ω
C17	70/140 μμf.	L12	8.0 Ω		Secondary	0.25 Ω
C18	70/140 μμf.	L13	2400 Ω	L.S.	Speech Coil	2 Ω
		L15	40 Ω			
		L16	40 Ω			
		L17	40 Ω			
		L18	40 Ω			

ALL RESISTANCE VALUES ARE IN OHMS AND CONDENSER VALUES ARE IN MICROFARADS UNLESS OTHERWISE STATED. BLOCK LETTERS, A.B.C., ETC., REFER TO THE POSITION OF SOLDER TAGS IN CONDENSER BLOCK W.2030.

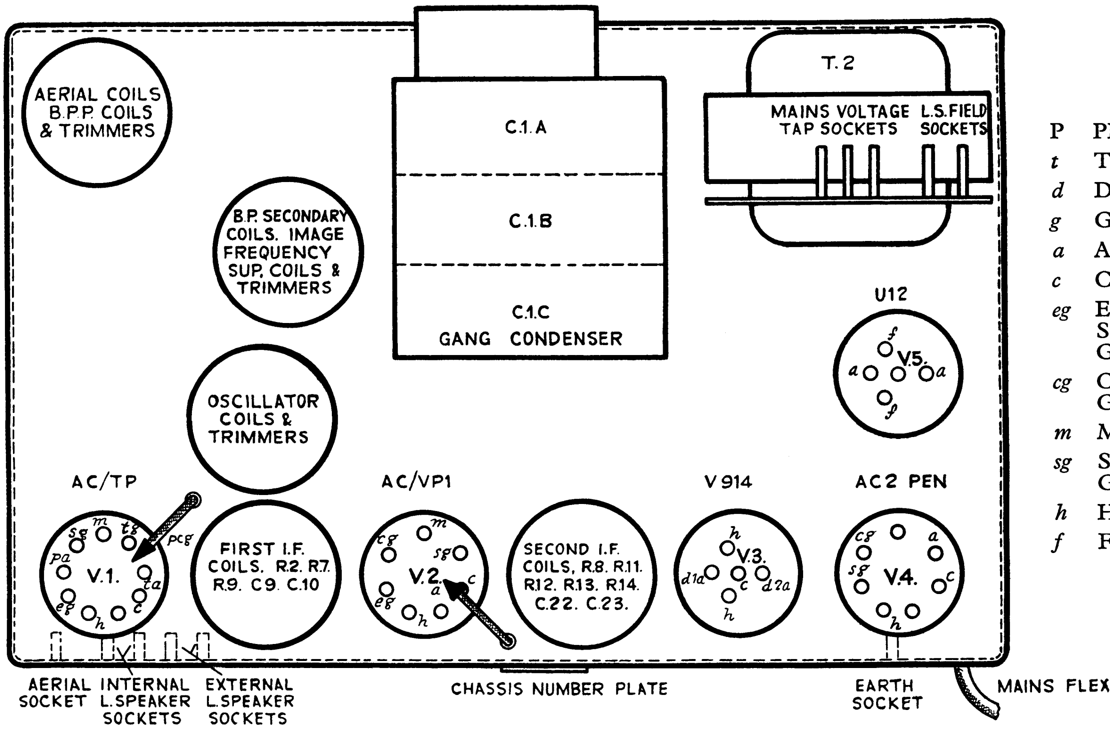


FIG 3. PLAN OF CHASSIS

P PENTODE
t TRIODE
d DIODE
g GRID
a ANODE
c CATHODE
eg EARTH OR SUPPRESSOR GRID
cg CONTROL GRID
m METALLISED
sg SCREENING GRID
h HEATER
f FILAMENT

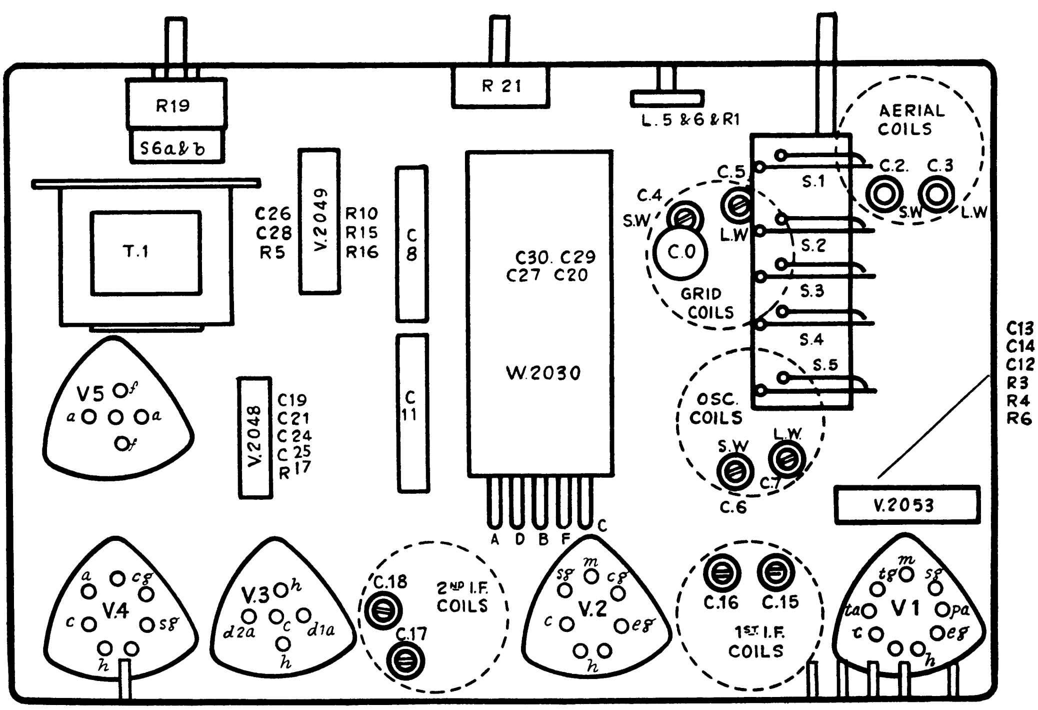
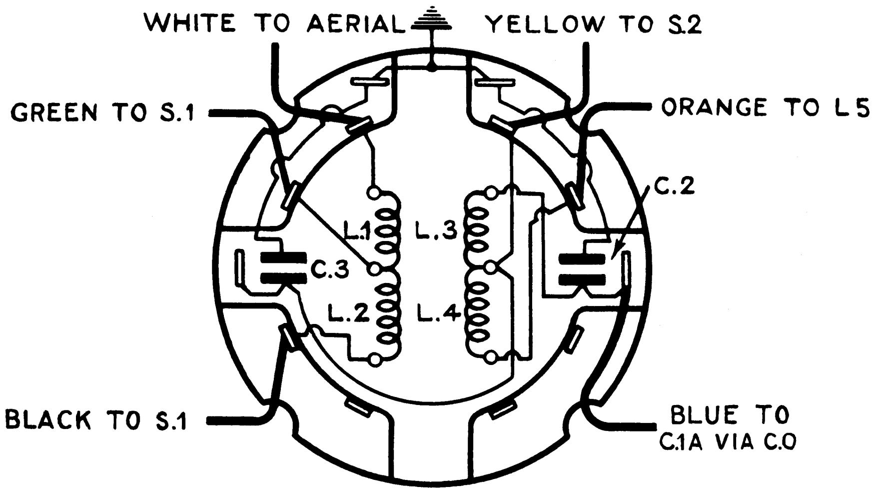


FIG. 4 UNDERSIDE OF CHASSIS

P PENTODE
t TRIODE
d DIODE
g GRID
a ANODE
c CATHODE
eg EARTH OR SUPPRESSOR GRID
cg CONTROL GRID
m METALLISED
sg SCREENING GRID
h HEATER
f FILAMENT

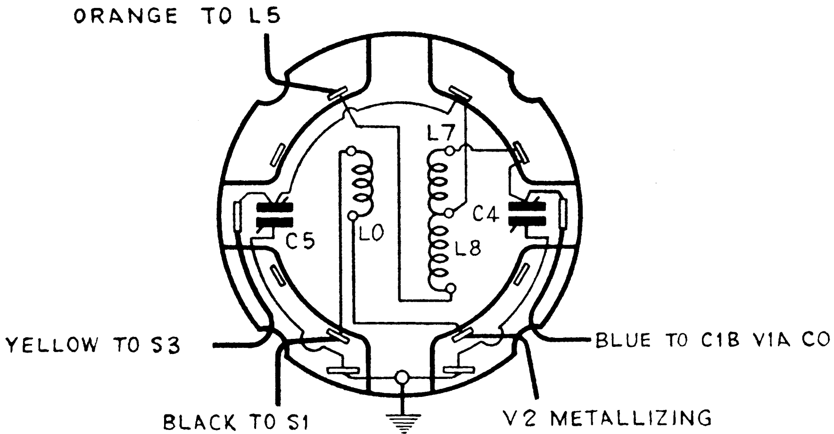
AERIAL COILS

FIG. 5.



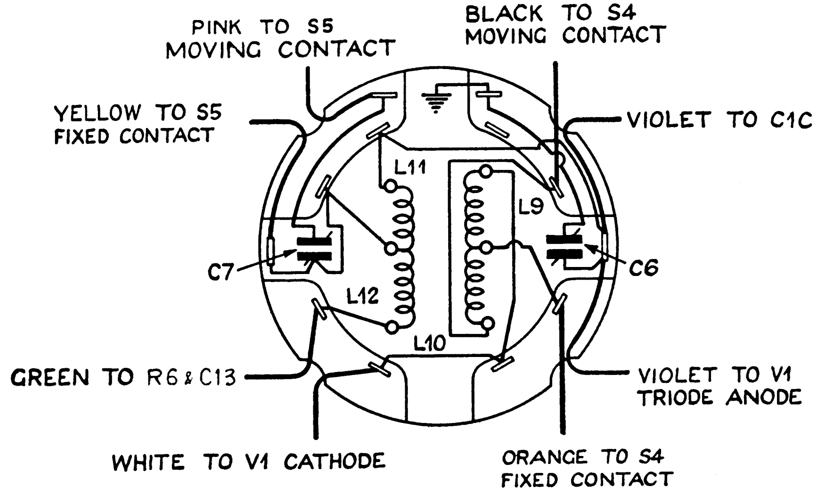
GRID COILS

FIG. 6.



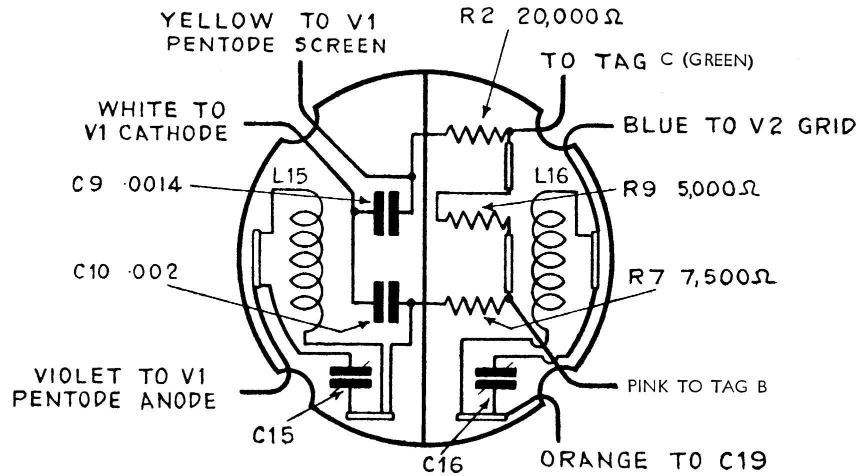
OSCILLATOR COILS

FIG. 7



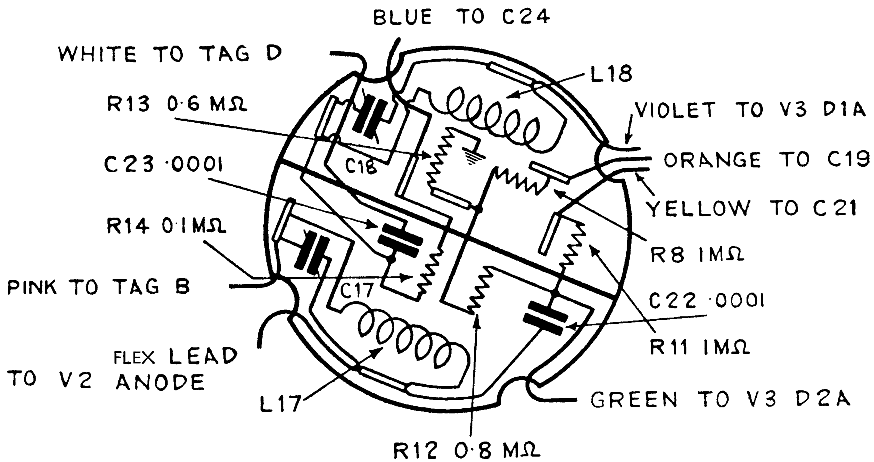
FIRST I.F. COILS

FIG. 8.



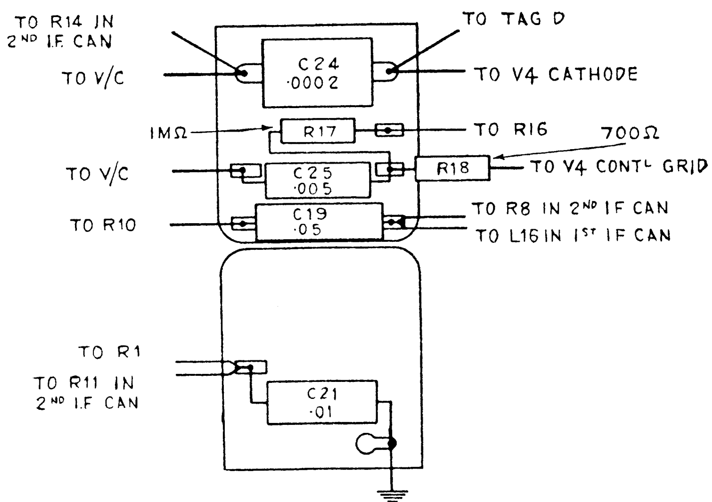
SECOND I.F. COILS

FIG. 9.



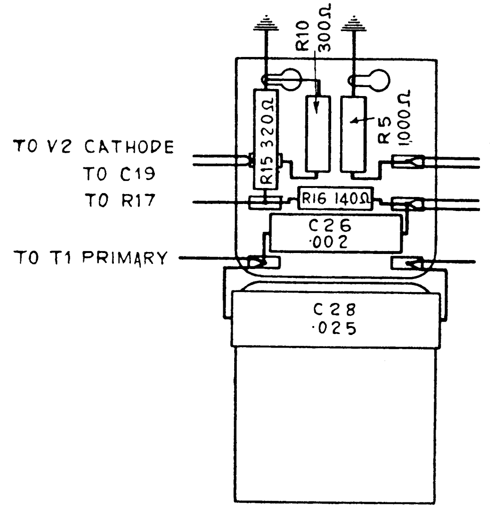
V2048 ASSEMBLY

FIG. 10.



V2049 ASSEMBLY

FIG. 11.



V2053 ASSEMBLY

FIG. 12.