K.B. 426 UNIVERSAL SUPERHET

Circuit. — The first-detector oscillator valve, 13PGA (V1), is preceded by a band-pass aerial coupling. Bias for the screen-grid section is by cathode resistance and A.V.C., and coupling to the next valve is by band-pass I.F. transformer (frequency 130 kc.). Tuning of the oscillator is in the grid circuit.

The I.F. valve, 9D2 or 13VPA (V2), is also biased by cathode resistance and A.V.C., and is followed by a second band-pass I.F. transformer.

The second detector is a double diode, 10D1 (V3), one anode of which is used for L.F. purposes and the other, coupled to the first by a condenser, C13, for A.V.C. L.F. coupling to the output valve is by resistance capacity filter, R11, C11, while the volume control VR1 forms the grid leak of the output valve.

This is a Pen. 3520 (V4), which is tone compensated by a condenser and resistance between anode and cathode.

Mains equipment consists of H.F. chokes in each mains lead, half-wave 1 DS indirectly-heated rectifier for H.T., and a voltage adjustment resistance R1 for the heater supply.

The order of the heater wiring is, from R1 to chassis : V5, V4, V2, V1, V3.

H.T. smoothing is by the 1,000-ohm field coil L7 and an L.F. choke L8 in conjunction with electrolytic condensers.

Pilot Lamps.—These are 6.2 v. .3 amp., and the one in use for the M.W. or L.W. is connected across R14, which is in series with the mains lead—that is, returned to chassis.

Special Notes.—Both on A.C. and D.C. mains the chassis may be live with relation to true earth, and suitable precautions should be taken.

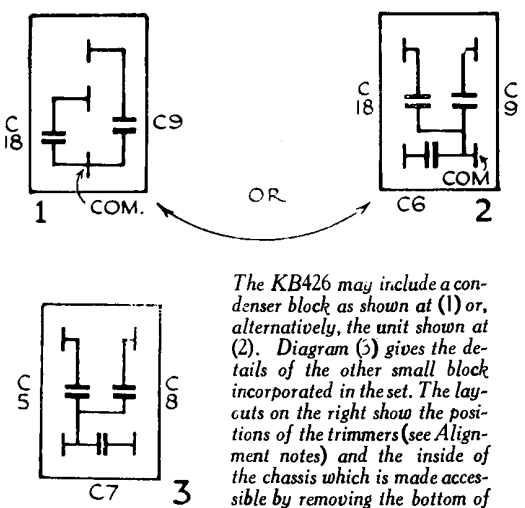
In this model the C and E sockets are connected together. If a Rejectostat aerial system is employed, the connection should be

(*Continued on opposite page.*)

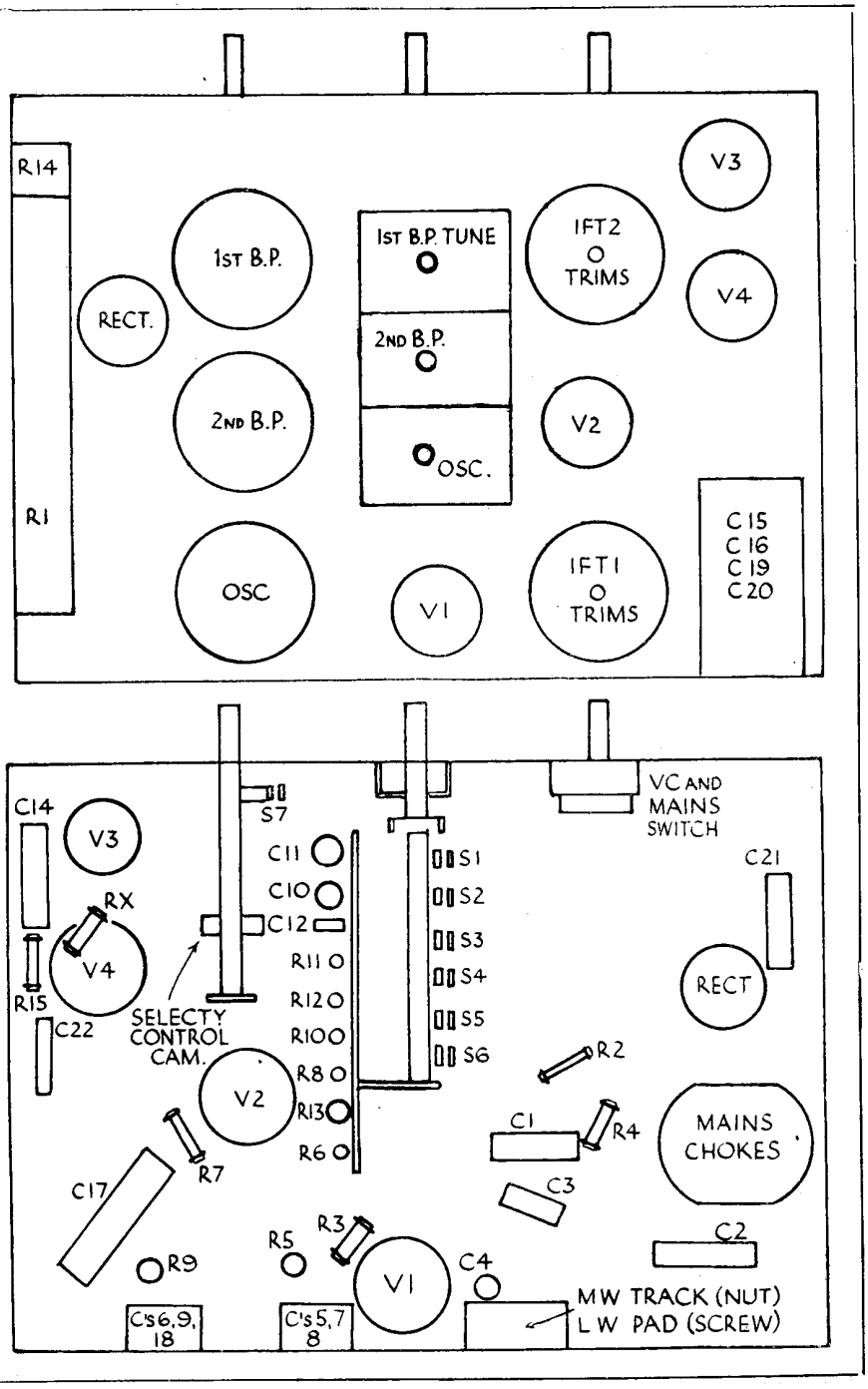
VALVE READINGS

No signal. Taken on 225v., A.C. mains.

Valve.	Type.	Electrode.	Volts.	M.a.
1	13PGA plain (7)	anode ..	170	3
		screen ..	65	2.25
		osc. anode	100	3
2	9D2 or 13VPA (7)	anode ..	165	1.5
		aux. grid	105	1
3	10D1, 2D13C or V13DD (5)	diode	—	—
		valve only		
4	Pen.3520 (7)	anode ..	160	30
		aux. grid	174	7



The KB426 may include a condenser block as shown at (1) or, alternatively, the unit shown at (2). Diagram (3) gives the details of the other small block incorporated in the set. The layouts on the right show the positions of the trimmers (see Alignment notes) and the inside of the chassis which is made accessible by removing the bottom of the cabinet.



(*Continued from previous page.*)

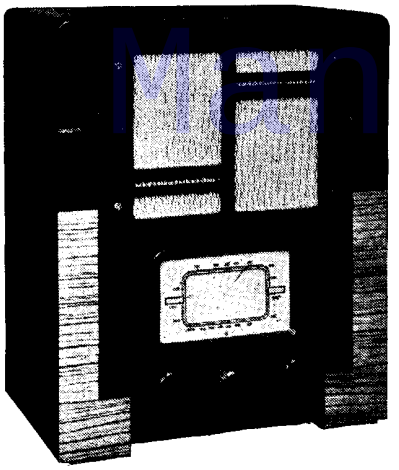
General Notes.—Alterations to the sensitivity control. The new control is a special component, part No. 82006, and with it a ¼-watt resistance R27 of 1,000 ohms is required. These are supplied complete with a paxolin anchorage bracket at a cost of 3s. on application to the manufacturers.

In carrying out the operation, replace the old control by the new one, soldering the connection to the resistance terminals in the same order. Remove the front fixing nut and bolt Y of C23 and replace the bolt by the longer one supplied with the components, placing the paxolin anchorage under the bolt and fixing it securely.

Solder the connections as shown in the diagram, taking the insulated leads from the switch on R3 as close to the chassis as possible.

An additional refinement which also increases sensitivity is the addition of a 5-mmfd. condenser (component No. 66000; price 3d.) to the band-pass coupling. To carry out this alteration, remove the screening can of the band-pass coils by loosening the clips that hold the screened leads and unsoldering the leads from the gang condenser, and then undoing the two 4 BA nuts underneath the chassis (a box spanner is required). The connections for the additional condenser are shown in the diagram. In replacing the can, the small round-headed screw should project through the central hole in the top of the can.

Replacing Chassis.—Lay the chassis inside the cabinet, replace the holding screws, the speaker plugs and the knobs.



The Kolster-Brandes 426 is a 4-valve plus rectifier A.C.-D.C. superhet receiver incorporating variable selectivity.

RESISTANCES

R.	Purpose.	Ohms.
1	Heater supply. 418+100+100 +125 ohms.	743
2	V1 grid stabiliser..	400*
3	V1 osc. grid leak	25,000*
4	Decoupling A.V.C. to V1 ..	100,000*
5	V1 cathode bias	150*
6	Voltage dropping to V1 screen	15,000*
7	Decoupling V1 anode	1,000*
8	Decoupling A.V.C. to V1 and V2	100,000*
9	V2 cathode bias	300*
10	A.V.C. diode load	.5 meg.*
11	Diode load	.5 meg.*
12	V4 cathode bias	150*
13	Voltage dropping to V2 aux. grid and to V1.	10,000*
14	Across pilot lamp (on R1 former)	35
15	V4 tone compensating circuit ..	10,000*
X	V4 grid stabiliser..	7,000*

*Half watt type.
CX is not in all models.

K.B. 426 UNIVERSAL SUPERHET (Cont.)

broken. To reach this, it is necessary only to remove the board underneath the cabinet.

The smoothing choke L8 is mounted on the left-hand side of the speaker (looking from the back) and the output transformer on the right.

Quick Tests.—To connect the mains with the back cover off, remove the small panel with the safety switch contacts from the cover and insert into the corresponding slits.

Voltages between the following points and chassis on 225 volt A.C. mains and 225 tapping :—

L.F. choke, top terminal, black, 234 volts; L.F. choke, lower terminal, black and red, 250 volts (H.T. unsmoothed).

Output transformer terminals in order from the top :—

(1) Black, 234 volts H.T. + from choke.
(2) and (3) Red, 174 volts, H.T. smoothed.
(4) 160 volts, V4 anode.
(5), (6) and (7) are output transformer secondary connections, A, B and C respectively.

Removing Chassis.—To reveal the components underneath the chassis, remove the wood board from underneath the cabinet.

When the chassis has to be removed completely, undo the knobs (grub screw), remove the four holding screws from underneath the cabinet and free the speaker leads from the cleat holding them to the cabinet.

It may be necessary to unsolder the five leads mentioned in "Quick Tests," in which the connections are given.

General Notes.—For an extra speaker,

(*Continued on next page.*)

CONDENSERS

C.	Purpose.	Mfd.
1	Band pass coupling	.02
2	Series earth	.01
3	V1 osc. grid reservoir	.0001
4	Fixed part of osc. M.W. tracking	.001
5	V1 cathode by-pass	.1
6	Decoupling V1 anode	.1
7	V1 screen by-pass	.1
8	Decoupling V2 grid	.1
9	V2 cathode by-pass	.1
10	Optional tone condenser ..	.001
11	L.F. coupling	.02
12	H.F. by-pass from diode ..	.0005
13	I.F. feed to A.V.C. diode anode	.000012
14	V4 tone compensating circuit ..	.01
15	*V4 cathode by-pass .. el.	25 (25 v).
16	*H.T. smoothing .. .. el.	8
17	V2 cathode by-pass .. el.	10 (150 v)
18	V2 cathode by-pass (parallel with C17).	.1
19	*H.T. smoothing .. .. el.	8
20	*H.T. smoothing .. .. el.	8
21	H.F. by-pass from mains ..	.01

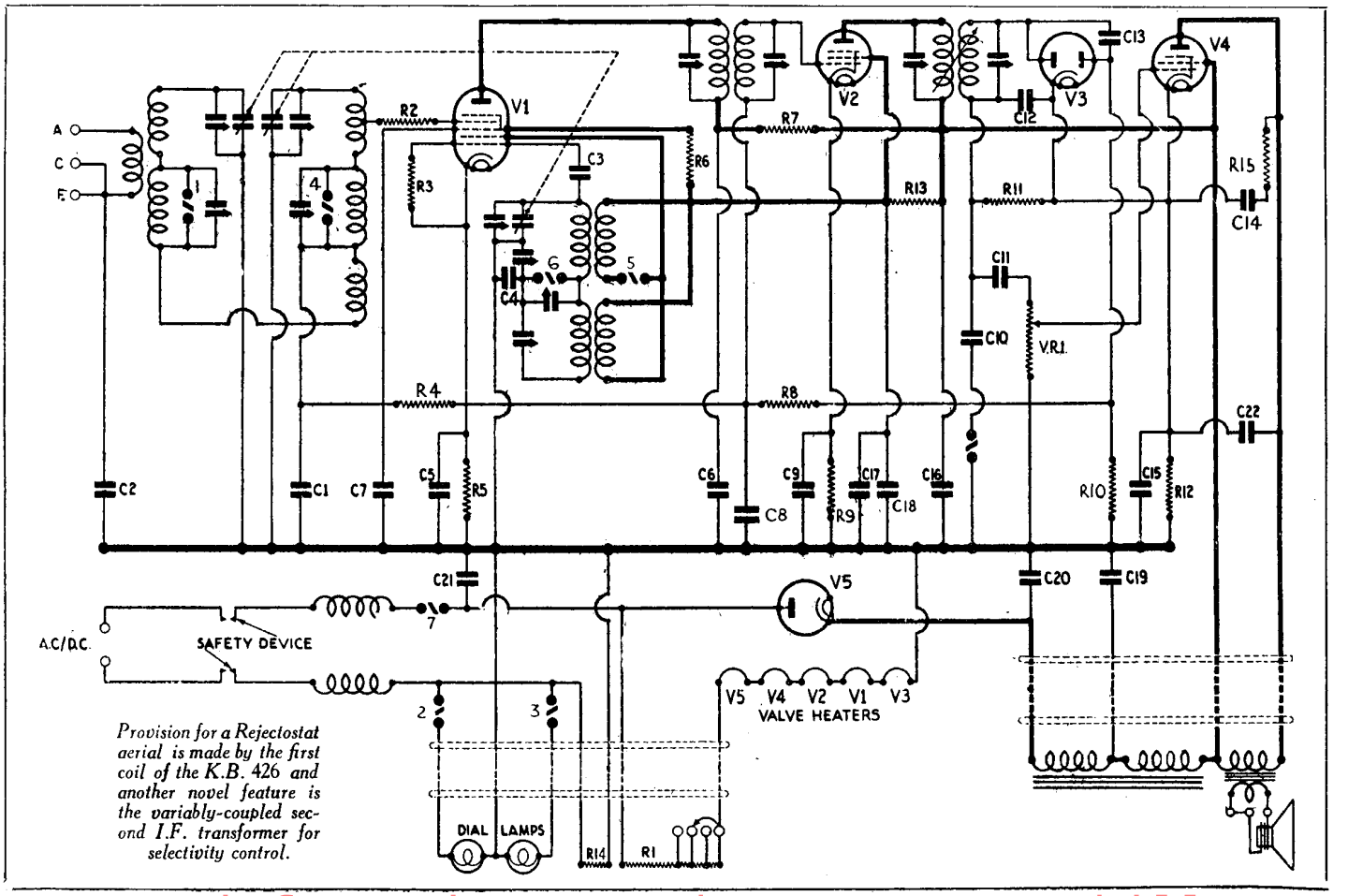
* In electrolytic block.

SWITCH POSITIONS

	1	2	3	4	5	6
M.W.	C	C	O	C	C	C
L.W. ..	O	O	C	O	O	O

RESISTANCES OF WINDINGS

Description	Ohms.
1st band pass coil—	
Aerial coil	11
M.W. winding	5
L.W. winding	20
2nd band pass coil—	
M.W. winding	5
L.W. winding	20
Coupling	.25
Oscillator coils—	
Anode coil M.W.	2
Anode coil L.W.	9
Grid coil M.W.	4
Grid coil L.W.	13
I.F.T.1, P. and S., I.F.T.2, P. and S.	70
Output transformer primary	360
Field coil	1,000
Smoothing choke..	240
Mains H.F. filters	5 and 3



Provision for a Rejectostat aerial is made by the first coil of the K.B. 426 and another novel feature is the variably-coupled second I.F. transformer for selectivity control.

K.B. 426 UNIVERSAL SUPERHET (Cont.)

a moving-coil model of 1 to 5 ohms impedance should be used, and the leads should be connected to B and C, the two lowest terminals on the output transformer.

If it is necessary to switch off the extra speaker, the connecting wire between A and B should be removed and a switch connected in its place.

Block condenser connections: The small block containing C9 and C18 may also contain C6, so that details of the connections may lead to confusion. The resistance R9 is across C9, and the other leads should be traced to their respective components, C6 to the I.F. transformer and C18 to V2 screening grid. When not included in the block C6 is mounted underneath.

In the other small block containing C5, C7 and C8, C5 is red, C7 is blue (opposite C5), and C8 is also blue (opposite the common negative).

In the electrolytic block, C19 and C20 are each 8 mfd. (red); C15 is 25 mfd. (green), and C16 is 8 mfd. (yellow).

Care should be taken to check the connections, as these colourings may not be used in all models. The condenser values and colours are marked on the carton. Note that the leads from C16 and R7 are connected to the aux. grid terminal of V2 holder.

Alignment of Tuned Circuits.—The trimming condensers of I.F.T.1 and I.F.T.2 can be reached through the apertures in the tops of the screening cans. A special bakelite box spanner can be obtained from the manufacturers, price 1s. 6d. The screws adjust the primaries and the nuts, concentric with the screws, the secondaries.

Switch on the set and make sure that the pointer is horizontal and the illuminated line is showing on the indicator when the condenser vanes are turned fully out. If the pointer and illuminated "line" are not in line, the station name-plate can be adjusted by slackening the screws in the fixing bush. The small marks on the inside of the apertures should also be in line, and, if not, the dial itself should be adjusted.

Inject signal on 130 kc. with the set on long waves, the volume control at maximum, and the selectivity control turned fully clockwise. Slacken the I.F. trimmers and adjust for maximum output on the secondary and primary of I.F.T.2 and then of I.F.T.1.

Inject 1,200 kc. to A and E sockets with set on medium waves, and turn the tuning condenser to the small mark at 250 m.

In some early models the mark is at 214 metres, in which case 1,400 kc. should be injected.

Unscrew the oscillator trimmer (on gang condenser) and tighten the band-pass trimmers.

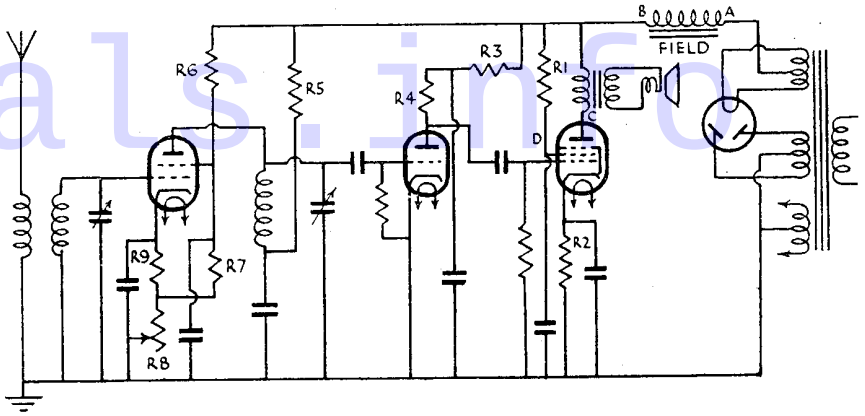
Tune the oscillator trimmer until the first signal is received. (There are two positions, that of minimum capacity being the correct one.) Tune the second and first band-pass trimmers (in this order) and then retune to improve output by the oscillator trimmer.

Inject a signal on 600 kc. and tune the receiver to this. Adjust the M.W. tracking condenser (nut), and at the same time turn the pointer to exactly 500 m.—if necessary by undoing the two screws on the spindle behind the dial plate.

Inject on 175 kc., and, tuning to this, adjust the L.W. padding condenser for maximum.

Finally, inject on 300 kc., turn the tuning till the pointer reads 1,000 m., and adjust the band-pass L.W. pads and the oscillator L.W. tracking condensers underneath the coils.

Replacing Chassis.—Lay chassis inside the cabinet, replace the holding screws, clear the speaker leads (or resolder them), and replace the knobs.



This circuit is used in the accompanying article to show the factors effecting calculations.

(*Continued from page* 93.)

resistance of R2 can be obtained from (3) and is $\frac{9}{\cdot 045}$ or 200 ohms.

From (4), (5) or (6) we see that the wattage actually dissipated is .405 watts, so that a standard 1 watt resistance will provide an ample margin of safety.

Analysing the circuits in the same way for the detector stage, the current flowing through R3 and R4 is only the current taken by the valve, and, having measured this, or calculated it from the valve maker's curve, the requisite wattage rating can be calculated by (6).

With the circuit employed for the H.F. valve the current flowing through R5 is for the valve anode circuit, while for R6 the total current includes the current flowing in the screen grid circuit and the current flowing in the potentiometer formed by R6, R7, and the section of R8. The total current flowing through R9 and R8 is the sum of the anode and screen currents.

It very frequently happens that when a resistance requires replacement the correct value is not immediately available, and two resistances have to be used in place of one. In this event the formulæ (7) and (8) are particularly useful.

Where the values of two resistances in series add up to the correct amount the simple formula of (8) is applicable, and the correct wattage rating can be obtained from one of (4), (5) or (6); but when this is not possible No. (7) must be employed to ascertain if two or more resistances in parallel will be suitable.

As an example, a grid bias resistance of 200 ohms is required, and the available resistances are 100, 150, 250, 350, 450, 500 and 1,000 ohms. As 100 and 150 are the only ones below 200 and do not add up to 200, it is obvious that two of the other resistances will have to be used in parallel. Possibly one, with two others, connected in series, joined across it, will be required.

The best thing to do is to calculate the resistance required in parallel with one of the others to give the correct value.

Beginning with the 250 ohms resistance, the formula (8) gives us $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$

We know that R must be 200 and that R1 will be 250. Therefore we rewrite the formulæ in equivalent mathematical form as follows:—

$$\frac{1}{R_2} = \frac{1}{R} - \frac{1}{R_1}$$

Substituting we get

$$\frac{1}{R_2} = \frac{1}{200} - \frac{1}{250} = \frac{5-4}{1000} = \frac{1}{1000}$$

R2 therefore equals 1,000 ohms.

This is a fortunate case, but if the 1,000 ohm resistance had not been to hand, the resistances of 450 and 500 ohms would, in series, have given us 950 ohms. This value, in parallel with a 250 ohm resistance, would drop the resultant resistance by only 2 ohms, a negligible amount.

In calculating the wattage dissipated in such a combination of resistances, the series resistances should be treated as a single resistance and formula (5) used. The actual dissipation is divided between them in direct proportion to their respective values. If, for example, the resistances are as chosen above, 450 and 500 ohms, the proportion of the wattage dissipated will be as 45 : 50.

On the other hand for resistances in parallel the relative wattage dissipation is in inverse proportion to the values of resistances.

For resistances in parallel formula (5) must be used. The voltage at the ends of the resistances is the same, so that E and therefore E2 is the same in each. As $W = \frac{E^2}{R}$ the respective dissipations will be $\frac{E^2}{R_1}$ and $\frac{E^2}{R_2}$, showing that these vary in indirect proportion to the values of R1 and R2.

Suppressor Condensers

Mr. E. M. Lee, B.Sc., of Belling and Lee, Ltd., writes to SERVICE ENGINEER: "I was pleased to read in the November SERVICE ENGINEER the advice to service men upon interference suppression.

"I would like, however, to call attention to one little detail in the article which, I think, might possibly lead to mistakes. This point is on the first page under the sub-heading of 'Preventing Radiation,' where, in the first paragraph, it is stated that 'Condensers should be rated at three times the working voltage both between terminals and between each terminal and the case.'

"Unfortunately, this reference to 'rated voltage' does not specify the type of condensers to be used, since different makers in different countries, and even different makers in this country have very different ratios between their so-called rated voltage and their test voltages.

"In the course of the British Standard Institution's deliberations, it was decided to omit all reference to rated voltages or working voltages, and refer only to test voltages, in order to eliminate all possible misunderstanding. The test voltages in question are 1,500 volts D.C., for condensers between poles, or 2,250 volts D.C., for condensers between poles and case or earth.

"The statement in the article is therefore quite in order if it is supplemented by the definition that the condenser is tested at a D.C. voltage of three times its rated voltage, thus giving a D.C. test voltage of nine times the working voltage in the most stringent case."

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