EDDYSTONE

COMMUNICATIONS RECEIVER FOR VHF

Model S. 890, 70 – 90 Mc/s

Model S. 890/1, 100 – 120 Mc/s

September 11th, 1956

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Ted Moore/ Jim Murphy. EUG.

EDDYSTONE FM/AM RECEIVER TYPE S.890 (70-90 Mc/s).
& S.890/1 (100-120 Mc/s).

- The Eddystone S.890 and S.890/1 receivers are a compact single range AM/FM receiver with automatic frequency control.
- The 10 valve superheterodyne circuit is comprised of a pentode RF stage, a triode pentode frequency changer and two stages of IF amplification. For AM reception rectification occurs at the limiter grid and this is then amplified and fed to the triode output valve.
- In the FM position the IF output is passed to a limiter stage and from thence to a Foster-Seeley discriminator, the AF output is then arranged as per the AM switch position.
- A high degree of automatic frequency control is available in both FM and AM switch positions. This is arranged by utilising a Ferrite cored reactor with control valve in a novel circuit.
- The receivers, which have a frequency range of 70-90 Mc/s or 100-120 Mc/s (according to the model) have a built in monitor loudspeaker and the unit is housed in a steel cabinet with a durable finish. They are suitable for use in tropical climates providing that suitable precautions are taken as regards ventilation, i.e. the cabinet vents must not be blocked off.
- The voltage supply that is required is from 100 - 120 or 200 - 240 volts A.C mains ONLY. Connection to DC mains will inevitably result in severe and permanent damage to the receiver.

OPERATING INSTRUCTIONS.

- The receivers are normally supplied with the mains transfo tappings arranged for 240 volts, the UK standard. Should the available supply voltage differ from this then suitable adjustment to the mains transformer tappings must be made in accordance with the diagram in this manual. This MUST be done before the receiver is connected to the mains supply. A label indicating the actual voltage for which the set is adjusted should be affixed to the rear of the cabinet, close to the mains input.
- Connect a suitable aerial, for the frequency to be received, and with an impedance of 75 ohms to the aerial socket at the rear of the receiver. The Belling-Lee type of 75 ohm plug is suitable and good quality co-axial cable must be used. Aerials of the dipole, discone, or yagi type are of a suitable impedance.
- Switch on the receiver by turning the Volume control clockwise. AM or FM may now be selected by use of the switch on the front panel, as desired. The AFC switch should be left in the OFF position, by rotating the knob fully anti-clockwise.
- The wanted signal is now tuned in by using the central tuning knob and the sensitivity of the set may now be varied using the pre-set RF GAIN control at the rear of the set. Set it for a comfortable level with the AF GAIN control at about halfway up.
- The AUTOMATIC FREQUENCY control may be switched in now and the receiver will follow the wanted signal should it drift off frequency. The degree of AFC used is dependant on whether there is a strong adjacent channel signal. With no such signal within plus or minus 500 Kc/s of the desired frequency maximum AFC may be used, but with a closer interfering signal the degree of AFC used must be reduced in order that the receiver does not lock onto the interfering signal in lieu of locking onto the wanted signal.
- If the monitor loudspeaker is not required headphones may be connected to the jack on the front panel, these should be of the medium to high impedance type. Low impedance headphones are not suitable as this will introduce some distortion in the AF signal heard. The use of headphones automatically mutes the monitor speaker. No provision is made for an external loudspeaker.

ALIGNMENT INSTRUCTIONS.

- For complete re-alignment the following equipment is necessary;-

i, A signal generator (S.G) with a frequency range of from 70 - 120 Mc/s with provision for AM and FM modulation of the RF carrier.
ii, A 50 microamp meter, DC reading.
iii, A standard AF output meter with a 3 ohms load impedance.
iv, An insulated trimming tool with a screwdriver bit.
v, An insulated trimming tool for use with Philips trimmers.
vi, A crystal calibrator unit with preferably 10 Mc/s, 5 Mc/s and 1 Mc/s outputs.

I.F. ALIGNMENT.

- Unsolder the earthy end of R27 and connect the 50 microamp meter in series with this resistor end and the earth tag. The positive terminal will go to earth (chassis) and the negative to the freed end of R27.
- The output of the signal generator which is set to exactly 10.7 Mc/s is connected between the grid of V4 and earth.
- A damping resistor of 1 kilohm is connected temporarily across the primary of T3, and the output of the SG is increased until a deflection is obtained on the microammeter. The secondary core is then adjusted for maximum deflection.
- The 1 kilohm resistor is now connected across the secondary winding, adjust the core for maximum deflection. A sensitivity of approximately 15 mV should be obtained when the damping resistor is removed.
- The same procedure as outlined above is now repeated with the SG coupled to the grid of V3 and earth. Care must be taken not to disturb the adjustments already made to T3 whilst adjusting the cores of T2. The sensitivity overall of both stages will now be of the order of 370 micro volts.
- To complete the alignment of the 10.7 Mc/s IF amplifier chain unsolder C9 at the grid of V2, this is pin 2. Connect the SG between this pin and earth, & now align T1 as above for T2 and T3. The overall sensitivity of the IF amplifier chain should now be in the region of 7 microvolts.

R.F. ALIGNMENT.

- Set the pointer on the tuning scale to either 90 Mc/s or to 120 Mc/s depending upon the model. Check the frequency with the crystal calibrator and feed in the SG signal at the aerial socket. C15 is then adjusted with the insulated tool for a maximum deflection of the microammeter. Repeat the procedure at 70 Mc/s (or 100 Mc/s) and should there be an appreciable falling off in the output then a slight adjustment to the inductance is required. Repeat as necessary until good tracking is obtained. With the SG frequency set at 85 Mc/s (115 Mc/s) C2 and C10 are trimmed for maximum deflection.

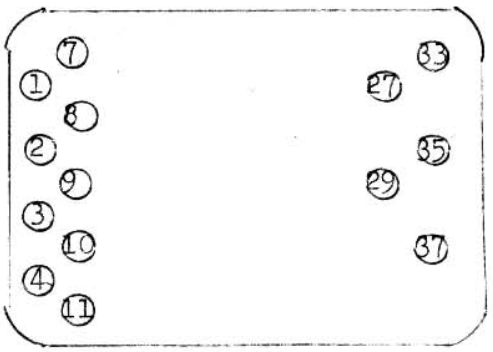
DISCRIMINATOR ALIGNMENT.

- With the SG set at 10.7 Mc/s and with the maximum output (1 volt), connect the SG to the limiter grid (V5, pin 1). At the junction of R29 and the screened lead (R29 = 68K), connect a 50 - 0 - 50 microammeter to earth.
- If the discriminator is properly aligned there should be no reading, moving the input equal amounts either side of the 10.7 Mc/s IF frequency equal deflection should be obtained on the meter.
- To re-align the discriminator set the secondary core of T4 flush with the top of the screening can. Then adjust the primary core for maximum deflection of the microammeter, after which the secondary core should be adjusted for a zero reading on the microammeter.
- The balance should be checked as before and any unbalance corrected by adjustment of the primary core. The peak deflection obtained should be in the region of 30 microamps.

MAINS VOLTAGE ADJUSTMENT.

Inputs.

0 v.	- Term;	1.
100 v.	- "	2.
110 v.	- "	3.
120 v.	- "	4.
0 v.	- "	8.
100 v.	- "	9.
110 v.	- "	10.
120 v.	- "	11.



Outputs.

HT. 250 v.	- Term;	33.
C.T 0 v.	- "	35.
HT. 250 v.	- "	37.
6.3 v. 3 A.	- "	27.
6.3 v. 3 A (no C.T.)	- "	29.
Screen.	- "	7.

Underside View of the Mains Transformer.

- For 100 volt Operation,-
  Link 1 to 8 & 2 to 9 — connect input from mains switch to 1 and 9.
- For 110 volt Operation,-
  Link 1 to 8 & 3 to 10 — connect input to 1 and 10
- For 120 volt Operation,-
  Link 1 to 8 & 4 to 11 — connect input to 1 and 11.
- For 200 volt Operation,-
  Link 2 to 8 — connect input to 1 and 9.
- For 210 volt Operation,-
  Link 3 to 8 — connect input to 1 and 9.
- For 220 volt Operation,-
  Link 4 to 8 — connect input to 1 and 9.
- For 230 volt Operation,-
  Link 4 to 8 — connect input to 1 and 10.
- For 240 volt Operation,-
  Link 4 to 8 — connect input to 1 and 11.

- Nota Bene, IT IS IMPORTANT THAT ONLY WINDINGS OF EQUAL VOLTAGE RATINGS SHOULD BE CONNECTED IN PARALLEL OTHERWISE PERMANENT DAMAGE WILL RESULT TO THE TRANSFORMER.

BC/CVS. 5th October, 1956.

EDDYSTONE FM/AM RECEIVER TYPE S.890 (70 - 90 Mc/s).
& S.890/1 (100 - 120 Mc/s).

SUMMARY OF PERFORMANCE SPECIFICATION.

R.F. SENSITIVITY.

A.M. Absolute - better than 3 microvolts.
15 db S/N - better than 12 microvolts.

F.M. For 1 volt limiter grid - better than 4 microvolts.
For 20 db S/N, 25 Kc/s deviation - better than 6 microvolts.

- Model 890 - Image at 80 Mc/s less than 20 db.
- Model 890/1 - Image at 110 Mc/s less than 20 db.

NOISE FACTOR.

Model 890 - Measured at 80 Mc/s circa 5.5db.
Model 890/1 - Measured at 110 Mc/s circa 5.5db.

I.F. SELECTIVITY.

Bandwidth at 6db points - 300 Kc/s.
Response at ± 200 Kc/s off tune - 15 db.
Response at ± 400 Kc/s off tune - 45 db.

MAXIMUM AUDIO OUTPUT.

200 milliwatts into a 3 ohm load (internal monitor speaker).
Distortion at 100 milliwatts less than 6%.

AUDIO RESPONSE.

Within 3 db from 400 c/s to 10 Kc/s.
Better than -40 db at 50 c/s.

AUTOMATIC FREQUENCY CONTROL.

Maximum throw out frequency - 1500 Kc/s.
Maximum pull in frequency - 550 Kc/s.

POWER CONSUMPTION.

Normal operating condition approximately 48 volt/amps.

RAT/CVS. 21st March, 1956.

EDDYSTONE FM/AM RECEIVER TYPE S.890 (70 - 90 Mc/s).
& S.890/1 (100 - 120 Mc/s).

Component Values to Schematic Number BP.922.

CONDENSERS.

C 1.	50pF ceramic.
C 2.	1-30pF trimmer.
C 3.	2-19pF part tuning gang.
C 4.	500pF tubular paper.
C 5.	500pF tubular paper.
C 6.	500pF tubular paper.
C 7.	500pF tubular paper.
C 8.	10pF ceramic.
C 9.	50pF ceramic.
C 10.	1-30pF trimmer.
C 11.	2-19pF part tuning gang.
C 12.	3000pF tubular paper.
C 13.	1pF silver mica.
C 14.	3000pF tubular paper.
C 15.	50pF ceramic.
C 16.	1-30pF trimmer.
C 17.	2-19pF part tuning gang.
C 18.	0.01uF tubular paper.
C 19.	0.01uF tubular paper.
C 20.	3000pF tubular paper.
C 21.	40pF silver mica.
C 22.	40pF silver mica.
C 23.	40pF silver mica.
C 24.	40pF silver mica.
C 25.	0.01uF tubular paper.
C 26.	0.01uF tubular paper.
C 27.	3000pF tubular paper.
C 28.	0.01uF tubular paper.
C 29.	0.01uF tubular paper.
C 30.	3000pF tubular paper.
C 31.	0.01uF tubular paper.
C 32.	40pF silver mica.
C 33.	40pF silver mica.
C 34.	0.01uF tubular paper.
C 35.	50pF ceramic.
C 36.	0.01uF tubular paper.
C 37.	0.01uF tubular paper.
C 38.	3000pF tubular paper.
C 39.	100pF silver mica.
C 40.	50pF silver mica.
C 41.	50pF ceramic.
C 42.	0.01uF tubular paper.
C 43.	100pF ceramic.
C 44.	100pF ceramic.
C 45.	0.01uF moulded mica.
C 46.	100pF ceramic.
C 47.	0.1uF tubular paper.
C 48.	0.01uF tubular paper.
C 49.	15uF 30vw DC tubular e'lytic.
C 50.	3000pF tubular paper.
C 51.	3000pF tubular paper.
C 52.	3000pF tubular paper.
C 53.	0.01uF tubular paper.
C 54.	32 + 32 dual e'lytic 350 vw.
C 55.	500pF tubular paper.

NOTA BENE;- With the exception of those with marked working voltages the paper condensers are rated at 250 vw DC, and the ceramic and mica types are rated at 500 vw DC.

RAT/CVS. 21st March, 1956.

EDDYSTONE FM/AM RECEIVER TYPE S.890 (70 - 90 Mc/s).
& S.890/1 (100 - 120 Mc/s).

Component Values to Schematic Number BP.922.

RESISTORS.

R 1.	2,200 ohm.	R 24.	68,000 ohm.
R 2.	2,200 ohm.	R 25.	100 Kilohm.
R 3.	4,700 ohm. 2 watts.	R 26.	22,000 ohm.
R 4.	10,000 ohm.	R 27.	100 Kilohm.
R 5.	2,200 ohm.	R 28.	22,000 ohm.
R 6.	10,000 ohm.	R 29.	68,000 ohm.
R 7.	2,200 ohm.	R 30.	0.5 Megohm pot; Log;
R 8.	27,000 ohm.	R 31.	68,000 ohm.
R 9.	1 Megohm.	R 32.	0.5 Megohm pot; Lin;
R 10.	270 Kilohm.	R 33.	100 Kilohm.
R 11.	270 Kilohm.	R 34.	100 Kilohm Nominal. S on T.
R 12.	150 ohm.	R 35.	100 Kilohm.
R 13.	10,000 ohm pot; Lin;	R 36.	100 Kilohm.
R 14.	270 Kilohm.	R 37.	2,200 ohm.
R 15.	22,000 ohm.	R 38.	180 Kilohm.
R 16.	6,800 ohm.	R 39.	180 Kilohm.
R 17.	22,000 ohm.	R 40.	180 Kilohm.
R 18.	1,000 ohm.	R 41.	330 ohm.
R 19.	270 Kilohm.	R 42.	4,700 ohm.
R 20.	200 ohm.	R 43.	47,000 ohm.
R 21.	270 Kilohm.	R 44.	500 ohm. 2 watt. Wirewound.
R 22.	200 ohm.	R 45.	10,000 ohm.
R 23.	470 Kilohm.	R 46.	33,000 ohm.

NOTA BENE;-

With the exception of those resistors with marked power ratings, i.e. R3 & R44, all resistors are $\frac{1}{2}$ watt nominal dissipation.
R13 is a Wirewound pot; and R30 & R32 are carbon track pots;

RAT/CVS. 21st March, 1956.

EDDYSTONE FM/AM RECEIVER TYPE S.890 (70 - 90 Mc/s).
& S.890/1 (100 - 120 Mc/s).

Voltage Values applicable to Schematic BP.922.

NO SIGNAL CONDITIONS. Point.	20,000 ohm/volt (Avo Model 8).	600 ohm/volt (Avo Model 40).
A.	197	190
B.	200	195
C.	1.45	1.4
D.	100	67
E.	150	147
F.	110	84
G.	200	185
H.	200	190
J.	1.65	1.6
K.	200	185
L.	200	190
M.	1.65	1.6
N.	58	46
P.	58	46
Q.	90	10
R.	87	9.0
S.	1.6	0.9
T.	221	219
U.	0.9	0.36
V.	222	220
W.	248	246
X.	250 RMS	248 RMS
Z.	250 RMS	248 RMS
A-.	190	160
B-.	2.3	2.0

NOTA BENE:-
Readings taken with other meters of higher or lower internal resistance may be very much different to the above.

HT CURRENT DRAIN.
At normal operating temperatures circa 57 milliamps.

INPUT FROM AC MAINS:-
At normal operating temperature circa 48 volt/amps.

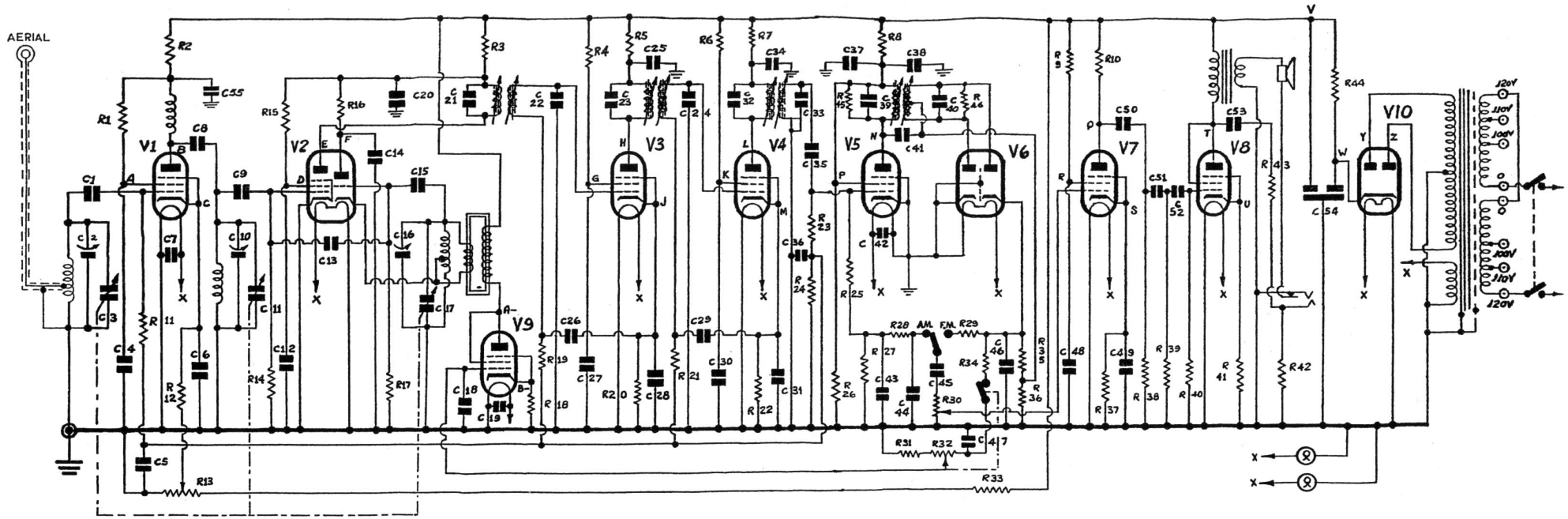
DB/PM. 12th Sept; 1956.

EDDYSTONE FM/AM RECEIVER TYPE S.890 (70 - 90 Mc/s).
& S.890/1 (100 - 120 Mc/s).

Valve Nomenclatures & Recommended Equivalents.

Valve Number.	Type & Equivs;	Function.
V 1.	6AM6 - EF91 - CV138.	RF amp;
V 2.	6U8 - ECF82 - CV5065.	Freq; Changer.
V 3.	6AM6 - EF91 - CV138.	1st IF amp;
V 4.	6AM6 - EF91 - CV138.	2nd IF amp;
V 5.	6AM6 - EF91 - CV138.	Limiter.
V 6.	6AL5 - EB91 - CV140.	Discriminator.
V 7.	6AM6 - EF91 - CV138.	AF amp;
V 8.	6AM6 - EF91 - CV 138.	AF output.
V 9.	6AM6 - EF91 - CV138.	AFC control.
V 10.	EZ41 - CV3891.	Rectifier.

NOTA BENE;-
Use of types other than those recommended above is liable to affect the correct operation of the receiver.



F.M.–A.M. RECEIVER WITH A.F.C. TYPE 890 & 890/1. BP922.

RESISTORS.

R 1.	2,200 ohm.	R 24.	68,000 ohm.
R 2.	2,200 ohm.	R 25.	100 Kilohm.
R 3.	4,700 ohm. 2 watts.	R 26.	22,000 ohm.
R 4.	10,000 ohm.	R 27.	100 Kilohm.
R 5.	2,200 ohm.	R 28.	22,000 ohm.
R 6.	10,000 ohm.	R 29.	68,000 ohm.
R 7.	2,200 ohm.	R 30.	0.5 Megohm pot; Log;
R 8.	27,000 ohm.	R 31.	68,000 ohm.
R 9.	1 Megohm.	R 32.	0.5 Megohm pot; Lin;
R 10.	270 Kilohm.	R 33.	100 Kilohm.
R 11.	270 Kilohm.	R 34.	100 Kilohm Nominal. S on T.
R 12.	150 ohm.	R 35.	100 Kilohm.
R 13.	10,000 ohm pot; Lin;	R 36.	100 Kilohm.
R 14.	270 Kilohm.	R 37.	2,200 ohm.
R 15.	22,000 ohm.	R 38.	180 Kilohm.
R 16.	6,800 ohm.	R 39.	180 Kilohm.
R 17.	22,000 ohm.	R 40.	180 Kilohm.
R 18.	1,000 ohm.	R 41.	330 ohm.
R 19.	270 Kilohm.	R 42.	4,700 ohm,
R 20.	200 ohm.	R 43.	47,000 ohm.
R 21.	270 Kilohm.	R 44.	500 ohm. 2 watt. Wirewound.
R 22.	200 ohm.	R 45.	10,000 ohm.
R 23.	470 Kilohm.	R 46.	33,000 ohm.

NOTA BENE:-

With the exception of those resistors with marked power ratings, i.e. R3 & R44, all resistors are ½ watt nominal dissipation. R13 is a Wirewound pot; and R30 & R32 are carbon track pots;

CONDENSERS.

C 1.	50pF ceramic.	C 28.	0.01uF tubular paper.
C 2.	1-30pF trimmer.	C 29.	0.01uF tubular paper.
C 3.	2-19pF part tuning gang.	C 30.	3000pF tubular paper.
C 4.	500pF tubular paper.	C 31.	0.01uF tubular paper.
C 5.	500pF tubular paper.	C 32.	40pF silver mica.
C 6.	500pF tubular paper.	C 33.	40pF silver mica.
C 7.	500pF tubular paper.	C 34.	0.01uF tubular paper.
C 8.	10pF ceramic.	C 35.	50pF ceramic.
C 9.	50pF ceramic.	C 36.	0.01uF tubular paper.
C 10.	1-30pF trimmer.	C 37.	0.01uF tubular paper.
C 11.	2-19pF part tuning gang.	C 38.	3000pF tubular paper.
C 12.	3000pF tubular paper.	C 39.	100pF silver mica.
C 13.	1pF silver mica.	C 40.	50pF silver mica.
C 14.	3000pF tubular paper.	C 41.	50pF ceramic.
C 15.	50pF ceramic.	C 42.	0.01uF tubular paper.
C 16.	1-30pF trimmer.	C 43.	100pF ceramic.
C 17.	2-19pF part tuning gang.	C 44.	100pF ceramic.
C 18.	0.01uF tubular paper.	C 45.	0.01uF moulded mica.
C 19.	0.01uF tubular paper.	C 46.	100pF ceramic.
C 20.	3000pF tubular paper.	C 47.	0.1uF tubular paper.
C 21.	40pF silver mica.	C 48.	0.01uF tubular paper.
C 22.	40pF silver mica.	C 49.	15uF 30vw DC tubular e'lytic.
C 23.	40pF silver mica.	C 50.	3000pF tubular paper.
C 24.	40pF silver mica.	C 51.	3000pF tubular paper.
C 25.	0.01uF tubular paper.	C 52.	3000pF tubular paper.
C 26.	0.01uF tubular paper.	C 53.	0.01uF tubular paper.
C 27.	3000pF tubular paper.	C 54.	32 + 32 dual e'lytic 350 vw.
		C 55.	500pF tubular paper.

NOTA BENE:- With the exception of those with marked working voltages the paper condensers are rated at 250 vw DC, and the ceramic and mica types are rated at 500 vw DC.