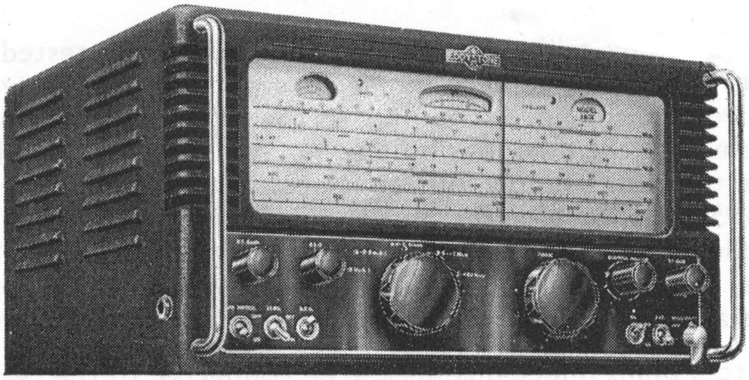


EDDYSTONE

"Model 680X"

COMMUNICATIONS RECEIVER

Instruction Manual

Great care has been exercised in the design of the "680X" receiver. The modern circuitry, thorough screening, selective choice of components, first-class workmanship and sturdy construction are all factors which add up to an outstanding performance, with a high degree of reliability under any climatic conditions.

A total of fifteen valves is employed. Thirteen are of the miniature type, the two remaining (rectifier and stabiliser) having octal bases. Details of the base connections are included with the circuit diagram.

The specification includes variable selectivity, the four position switch providing also a measure of gain compensation. Where not otherwise stated, technical performance figures should be taken from the series of graphs provided.

The five frequency ranges are as follows:—

Band 1	...	30 Mc/s.	to	12·3 Mc/s.
Band 2	...	12·5 Mc/s.	to	5·3 Mc/s.
Band 3	...	5·7 Mc/s.	to	2·5 Mc/s.
Band 4	...	2·5 Mc/s.	to	1·11 Mc/s.
Band 5	...	1120 kc/s.	to	480 kc/s.

INSTALLATION

The receiver has been carefully calibrated, aligned and thoroughly tested before despatch, and the only adjustment that may be necessary before putting the receiver into operation is to the mains input voltage tapping. The plug in the selector panel on the mains transformer (easily accessible with the lid open) is fitted normally in the 230 volt position, where it should remain when the mains supply voltage is between 220 and 250 volts. If the mains voltage lies between 195 and 215 volts, the plug should be changed to the 200 volt marking. The 110 volt tap applies when the mains supply is between 100 and 120 volts. Unless specially ordered, the transformer is unsuitable for 25 cycle mains. DC mains supplies are entirely unsuitable and if connected will cause serious damage to the mains transformer.

A loud speaker of 2·5 to 3 ohms impedance should be connected to the two upper terminals (marked "L.S.") at the rear — the Eddystone Cat. No. 811 Diecast Speaker is especially recommended, since it represents a perfect match to the receiver, physically and electrically. As an alternative to the use of a speaker, high resistance telephones (2,000 to 4,000 ohms) may be plugged into the jack on the left-hand side of the receiver. The brilliance of the dial lights can be adjusted by the small knob at the rear.

AERIAL CONNECTIONS

The input impedance at the aerial terminals is nominally 400 ohms, but good results are obtainable with aerials of widely varying impedance. If a single wire is used (or an aerial with a single wire feeder), connection is made to the rear terminal marked "A," the other "AE" terminal remaining strapped to the chassis terminal. A good earth connected by a short lead to this chassis terminal will improve results, particularly on the lower frequencies, but if there is any doubt about the effectiveness of the earth, it may be better to leave it off. When using a twin feeder, the shorting strap is removed and the ends of the feeder attached to "A" and "AE" (an earth is still desirable). For optimum performance, both as regards bringing in weak signals and for keeping noise down to a minimum, an aerial cut to resonate over the frequency band in which the user is mainly interested is strongly recommended. The lengths for dipole aerials to give optimum results at certain frequencies are tabulated below.

For details of other types of aerials and feeder systems, the reader is advised to consult the various Handbooks which deal with these specialised subjects.

	Broadcast							Amateur		
Wavelength (Metres) ...	49	31	25	19	16	13	11	40	20	10
Frequency (Megacycles)	6·1	9·6	11·8	15·1	17·8	21·5	26	7	24	28
Length of each arm (feet)	40	26	20	15·5	13	10·5	9	33	16·5	8·25

RECEPTION OF TELEPHONY

The panel controls should be set as follows:—

AGC	"on"
BFO	"off"
RF Gain	maximum
Crystal Phasing Knob ...	spot against "off" position
AF Gain	adjusted to give requisite volume.

For the best possible audio quality, the variable selectivity control should be set to minimum. When heterodyne interference is experienced, the selectivity should be increased by

and OPERATION

moving the switch to one of the intermediate positions. A certain amount of gain compensation is automatically provided with movement of the switch. It may be mentioned that a very strong signal, say from a local broadcasting station, may overload the first stage of the receiver, necessitating a reduction of RF gain.

The tuning scales are calibrated direct in frequency to a high degree of accuracy and the flywheel controlled drive permits fine tuning on all ranges.

The mechanical bandspread device assists in the logging of particular stations. One complete revolution of the rotating scale (at the top of the dial) corresponds to a movement of the main pointer over one marked division of the lowest scale on the main dial, the length of the latter being opened out to the equivalent of 360 inches. The settings of a given station can be recorded for future use.

USE OF SIGNAL STRENGTH METER

The Signal Strength Meter fitted is a useful adjunct towards tuning in a signal accurately. It also enables comparative readings to be taken on the strength of signals. The sensitive meter movement is protected by placing in series with the winding one half of a double-diode valve, thereby preventing current flowing in the reverse direction. For this reason the meter will only give readings when the RF gain control is fully advanced, as in any case it should be to give maximum automatic gain control action.

To adjust the meter initially, the aerial and earth terminals should temporarily be shorted and the needle of the instrument made to coincide with zero by movement of the adjuster at the rear (see Fig. 2). On removing the aerial short, the meter will indicate the strength of the carrier wave. The tuning is correct when the meter reading is at maximum.

RECEPTION OF C.W. TELEGRAPHY

The panel controls should be set as follows:—

AGC	"off"
BFO	"on"
Crystal Phasing Knob ...	white spot at "off"
BFO Pitch Control ...	spot slightly to one side of centre
RF Gain	adjust as necessary
Selectivity	maximum or intermediate

The settings of the controls depends on a number of factors, including the strength of incoming signals, amount of interference present and the efficiency of the aerial. If the latter is poor, it will be advisable to use maximum RF gain, but often the RF gain can be reduced with advantage. It should always be reduced when the signals are strong.

The BFO pitch control gives a swing of approximately 3,000 cycles each side of zero beat (white spot central). Normally it will be set to give a beat note of about 1,000 cycles but careful handling of this control will often enable a desired signal to be separated from an interfering one. It is sometimes of benefit to rotate the knob from one side of zero beat to the other when interference is present.

USE OF CRYSTAL FILTER

It is advantageous to employ a high degree of selectivity because the noise output from the receiver is partly dependent on the IF bandwidth and the narrower this is made, the less the noise for the same amount of gain. It will therefore generally be desirable, when receiving CW telegraphy, to operate with selectivity at maximum.

A further increase in selectivity is obtained when the crystal filter is switched in. Moving the phasing knob away from the indicated "off" position brings the crystal into circuit. As the graphs indicate, the slope of the selectivity curve (with crystal in) can be varied by movement of the phasing control to give extremely high attenuation one side or the other of the centre frequency. This feature is invaluable when interfering signals are objectionable.

NOISE LIMITER

In a quiet situation, it will not be necessary to make use of the noise limiter but when electrical interference of a staccato nature is experienced (on telephony or CW), switching on the noise limiter will effectively remove a high percentage of the interfering noise, with little effect on the strength of the signal and without introducing distortion. The noise limiter must not be expected to act effectively with noise of a mushy type, as generated by vacuum cleaners and other electrical equipment incorporating motors — these should be filtered with suppressors at the source.

In a noisy location, it is well to erect an aerial well in the clear and as far as possible from electric light wiring. The stronger the incoming signal, the more the gain of the receiver can be reduced (automatically on telephony, manually on CW) thereby reducing also the effect of any interference being picked up.

STANDBY SWITCH

The standby switch on the front panel (easily identified by virtue of the long "dolly") breaks the HT supply when moved to "off" (send position) and is for use when an associated transmitter is in actual operation. Additional contacts in this switch are taken to the terminals marked "Ext. Relay" at the rear and control of the transmitter is thus possible with the one switch.

GRAMOPHONE PICK-UP

The two terminals situated below the "LS" terminals at the rear are for the connection of a gramophone pick-up and they are useful also for feeding in any external audio voltage when it is desired to use only the AF section of the receiver. The nominal input impedance is 100,000 ohms and either a crystal or a light-weight magnetic pick-up will give good results.

Normally, the selectivity control should be set to minimum when using a pick-up. A useful degree of top-cut results when selectivity is set to maximum and this feature may sometimes prove of advantage.

STRATTON & Co., Ltd., West Heath Birmingham 31

Cables: "STRATNOID" Birmingham   Telephone: PRIory 2231-2-3-4

Printed in England.

GENERAL SERVICING

The standard "680X" receiver operates from AC mains of 40/60 cycles, the consumption being approximately 80 watts. The fuse is in series with the AC supply and is rated at 1 ampere standard type, or 750 mA Magnickel type.

The holders for the lamps which illuminate the dial are sprung into place. To change a lamp, it is only necessary to press the side of the holder and pull out. The lamp is rated at 6·5 volts 0·3 amperes (M.C.C. Round radio panel type).

Should the performance fall off or perhaps fail completely, it will be well in the first place to inspect the valves for the normal heater glow. Where a metal screening can is fitted to a valve, it is easily removable with a twist and a pull. The VR150/30 stabiliser valve normally exhibits a violet glow.

If it becomes necessary to obtain access to the interior, the cabinet can be completely removed after withdrawal of the four large screws at the rear. A check should be made against the normal operating voltages given in the table and any serious discrepancy will indicate at which stage in the circuit a fault has developed.

VALVE TYPES AND FUNCTIONS.

Position	*Function*	*Type*	*Make*
V1 and V2	RF Amplifier	6BA6	Brimar
V3	Frequency Changer	6BE6	Brimar
V4	Oscillator	6AM6/Z77	Brimar
			Osram
V5 and V6	I.F. Amplifier	6BA6	Brimar
V7	AGC and Detector	6AL5/D77	Brimar
			Osram
V8 and V9	Audio Amplifier	8D5 (6BR7)	Brimar
V10 and V11	Push-pull Output	6AM5/EL91	Brimar
			Mullard
V12	Beat Frequency Oscillator	6BA6	Brimar
V13	Noise Limiter/"S" Meter	6AL5/D77	Brimar
			Osram
V14	Rectifier	5Z4G	Brimar
V15	Voltage Stabiliser	VR150/30	Brimar

RE-ALIGNMENT.

The tuned circuits in the "680X" receiver will hold their proper alignment over a long period of time and it is inadvisable to make adjustments unless the need thereof is justified. The alignment of a receiver of the "680X" type is a skilled operation and it is most unwise to judge the effect of adjustments by ear alone. It is therefore assumed test instruments are available — in particular, a Signal Generator covering from 450 kc/s. to 32 Mc/s., provided with internal audio modulation (30%) and with a calibrated attenuator; and an Audio Output Meter, scaled in milliwatts and decibels and adjustable to match the receiver output impedance of 2·5 ohms. Trimming should be carried out with a non-metallic tool such as the Eddystone Cat. No. 122T.

IF AMPLIFIER.

The alignment of a modern variable selectivity IF amplifier as in the "680X" requires the use of a frequency modulated signal generator ("Wobbulator") and an oscilloscope, presenting a visual display to the operator.

It is unlikely that a fault will develop in one of the IF transformers and the adjustment of these should not be disturbed unless absolutely necessary. For check purposes, however, the following information and sensitivity figures may occasionally be useful. To obviate unsoldering the grid leads to the IF valves, the figures have been taken with these wires connected and are therefore not strictly true ones. Nevertheless, they are quite adequate for comparison purposes. Reference should be made to Fig. 3 and Fig. 5 for locations of IF valves and transformers.

The intermediate frequency is 450 kc/s. (± 1·5 kc/s. = crystal tolerance).

The following conditions apply when taking measurements:—

Receiver	Wavechange Switch Range 1 AGC, BFO, NL off Crystal Phasing Knob at "OFF" Selectivity maximum RF Gain maximum
Sig. Gen.	30% Modulation Direct output

Output Meter across and matched to speaker terminals

Input for 50mW output (approximate):—

Between grid V6 and chassis 11 millivolts.
,, ,, V5 ,, ,, 220 microvolts.

To measure the overall sensitivity of the IF amplifier at the mixer valve signal grid (V3) it will be necessary to unsolder a lead in the frequency changer compartment of the coil box. This lead is identified in Fig. 4 by an arrow and cross. The sign. gen. leads are connected between this lead and chassis. The sensitivity at this point should be in the region of 20 microvolts.

BFO ADJUSTMENT.

With the BFO switch off, the modulated (IF) signal applied to the receiver should be tuned in accurately with the aid of the "S" Meter, selectivity remaining at maximum. The modulation is switched off, the BFO switched on, and with the pitch control condenser at half mesh, indicated by the white spot being central at the top, the core in the BFO unit (see Fig. 4) is adjusted (if found necessary) to give zero beat against the applied signal.

ALIGNMENT OF RF SECTION.

All receiver controls are left as for IF check. The dummy aerial of the signal generator is connected between aerial and earth terminals at the rear of the coil box. It will be found helpful to connect the speaker as well as the output meter for the first stage of the following procedure, which is calibration. For this, a 1000/100 kc/s. crystal oscillator, with harmonics usable up to 30 Mc/s., is essential, since the desired maximum calibration error on the dial of the receiver is 0·5%. As only the most expensive signal generators give an accuracy greater than some 1%, it is futile to use one as a calibration master.

The locations of the various trimmers and cores are shown in Fig. 4. Connect the crystal oscillator in shunt with the dummy aerial, switch on the BFO with the white spot at "12 o'clock," and using the RF gain only as volume control, check on Range 1. Should the 28 Mc/s. and 14Mc/s. harmonics be appreciably off their marks when tuned to zero beat, proceed to correct the 14Mc/s. harmonic by means of the Range 1 oscillator coil CORE. The 28 Mc/s. harmonic is corrected by means of the TRIMMER. With these two points accurately fixed, the rest of the calibrations will automatically conform to the desired 0·5% accuracy. The same procedure is used on all other ranges, the two setting points on each range being as follows:—

Range 1. 28 Mc/s. and 13 Mc/s.
Range 2. 12 Mc/s. and 6 Mc/s.
Range 3. 5·6 Mc/s. and 2·5 Mc/s.
Range 4. 2·5 Mc/s. and 1·2 Mc/s.
Range 5. 1000 kc/s. and 500 kc/s.

Always, as on Range 1, adjust the TRIMMERS at the high frequency ends of the bands and the CORES at the low frequency end. This hard and fast rule applies also in the alignment of the RF and FC coils.

Remove the crystal oscillator leads and use only the signal generator with its attenuator set to give about 10 microvolts. Switch off BFO. Then proceed as follows:—

Inject a 13·3 Mc/s. modulated signal into the receiver and tune in on Range 1 for maximum deflection on the output meter, using the RF gain to keep the needle on the scale. Now proceed to adjust the CORES only of the two RF coils and the one FC coil for highest output as indicated on the output meter. Next, inject a 28 Mc/s. signal and peak this by means of the three appropriate trimmers. Repeat the whole procedure until no improvement is possible. Use the same procedure on all other ranges. The high and low frequency alignment points on each range are as follows:—

Range	*Trimmer Frequency*	*Core Frequency*
1	28 Mc/s.	13·3 Mc/s.
2	12 Mc/s.	6·0 Mc/s.
3	5·4 Mc/s.	2·6 Mc/s.
4	2·3 Mc/s.	1·2 Mc/s.
5	1000 kc/s.	520 kc/s.

GRAPHS.

The average sensitivity of each range in a standard "680X" receiver is indicated in the curves shown in Fig. 6. Also given are typical sensitivity curves for each position of the selectivity control switch, including (at maximum selectivity) crystal rejection curves. Further graphs show the audio frequency response and the AGC characteristic.

VOLTAGE VALUES.

The voltages are between the point indicated and the chassis. Set the receiver at 1000 kc/s. on Range 5 with the aerial shorted out, RF control set at maximum. AF gain control set at minimum with BFO on. Two sets of values are given using different meters as shown. It will be evident that the actual voltage indicated depends on the meter employed. A tolerance of plus or minus 5% should be allowed on the values given.

Point	*Avo*	*Weston* (1000 *o.p.v.*)
A	205 volts	218 volts
B	80 ,,	84 ,,
C	·8 ,,	1 ,,
D	210 ,,	218 ,,
E	80 ,,	83 ,,
F	1 ,,	1·9 ,,
G	212 ,,	220 ,,
H	100 ,,	100 ,,
J	1·1 ,,	1·2 ,,
K	85 ,,	100 ,,
L	206 ,,	210 ,,
M	88 ,,	93 ,,
N	1 ,,	1 ,,
O	206 ,,	210 ,,
P	75 ,,	80 ,,
Q	1 ,,	1 ,,
R	11·5 ,,	11·5 ,,
S	20 ,,	25 ,,
T	18 ,,	25 ,,
U	·7 ,,	·8 ,,
V	18 ,,	22 ,,
W	15 ,,	22 ,,
X	·8 ,,	·8 ,,
Y	218 ,,	220 ,,
Z	220 ,,	225 ,,
A—	11·5 ,,	11·5 ,,
B—	85 ,,	85 ,,
C—	142 ,,	150 ,,
D—	252 ,,	260 ,,
E—	240 ,, (AC)	245 ,, (AC)
F—	150 ,,	150 ,,

Total HT Current: 110 mA.
Heater to Heater voltage: 6·3 AC.

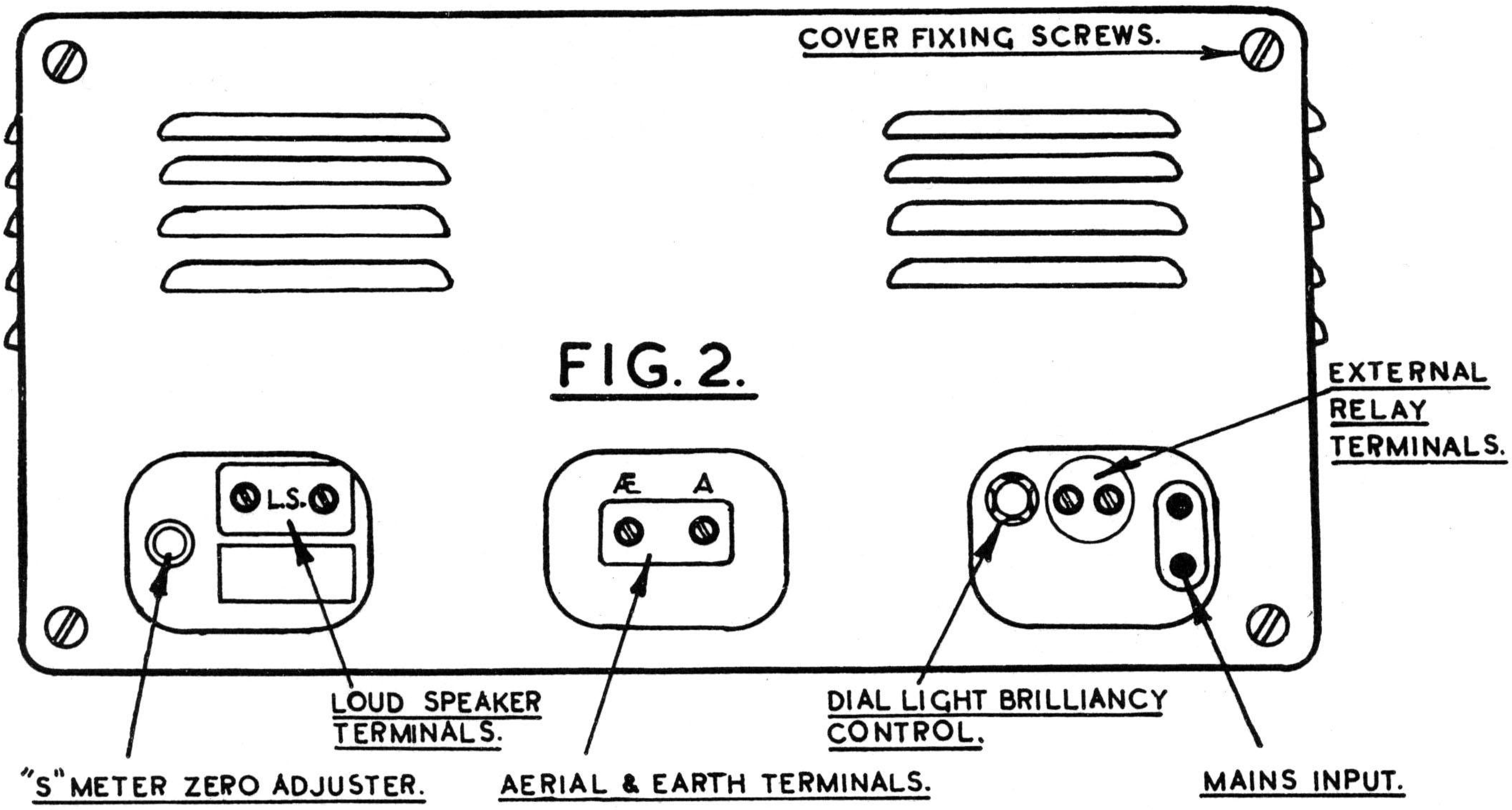
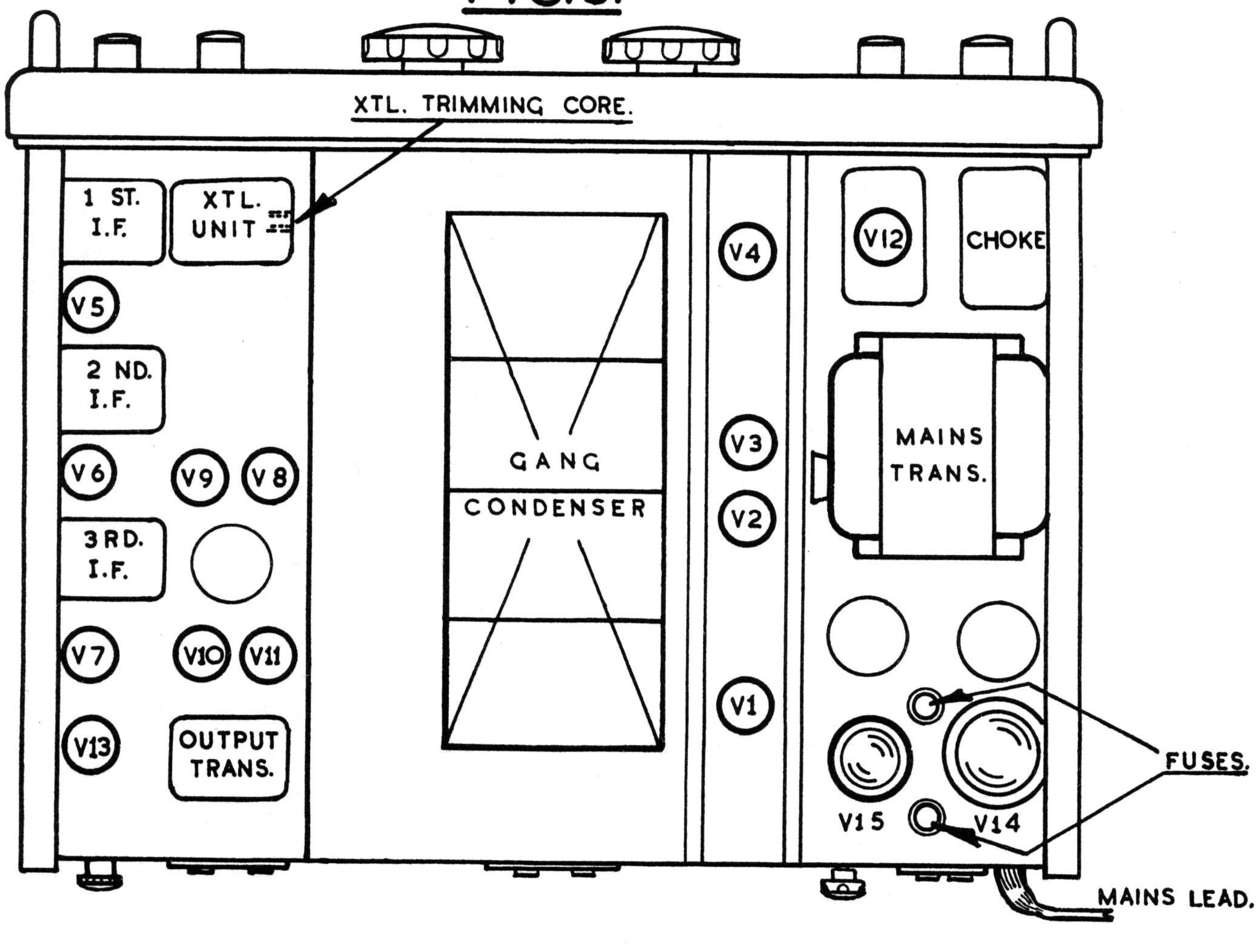

COVER FIXING SCREWS.
L.S.
Æ A
EXTERNAL RELAY TERMINALS.
LOUD SPEAKER TERMINALS.
DIAL LIGHT BRILLIANCY CONTROL.
"S" METER ZERO ADJUSTER.
AERIAL & EARTH TERMINALS.
MAINS INPUT.

FIG. 2.

FIG. 3.


XTL. TRIMMING CORE.
1 ST. I.F.
XTL. UNIT
V5
2 ND. I.F.
V6
V9
V8
3 RD. I.F.
V7
V10
V11
V13
OUTPUT TRANS.
GANG CONDENSER
V4
V3
V2
V1
V12
CHOKE
MAINS TRANS.
FUSES.
V15
V14
MAINS LEAD.

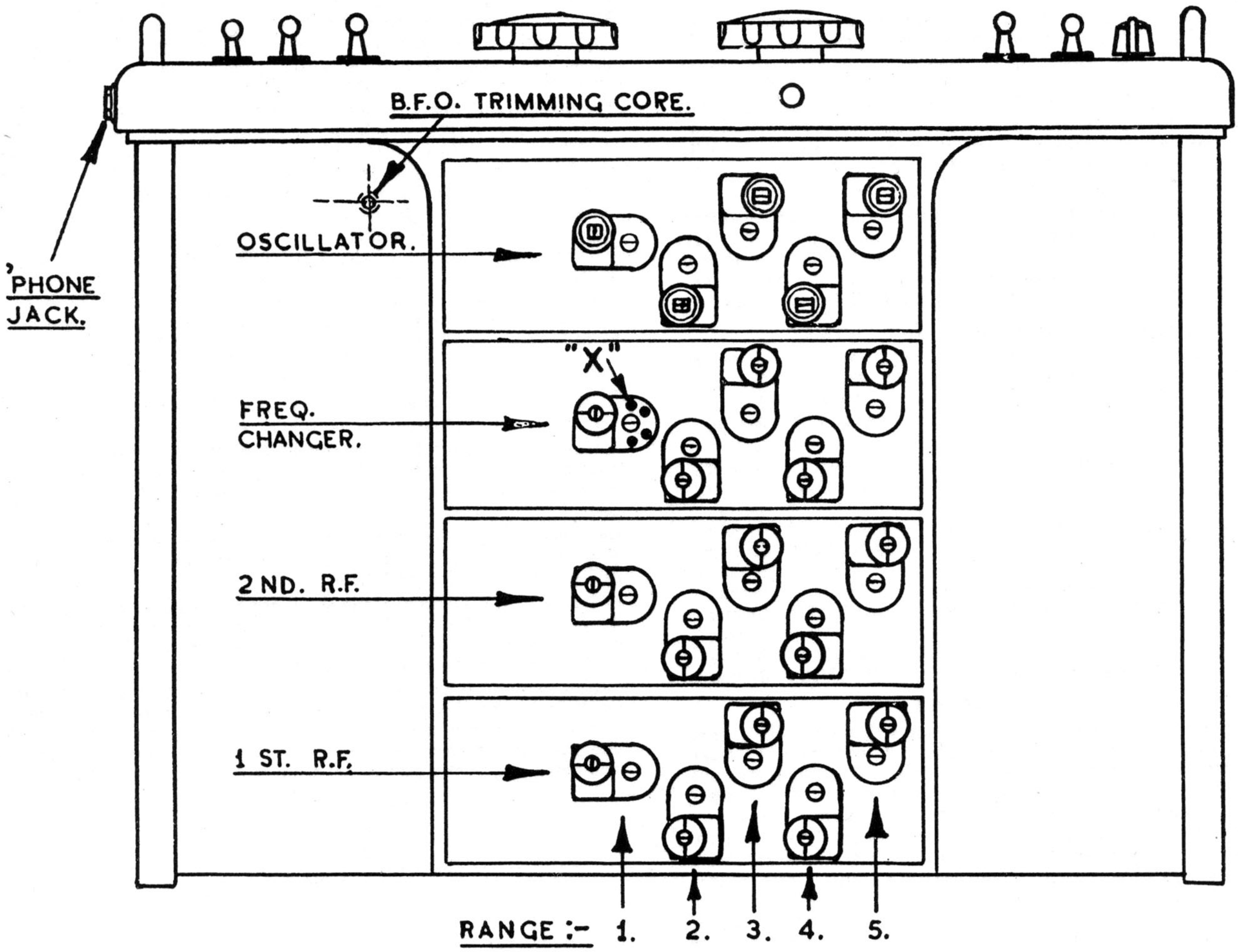

B.F.O. TRIMMING CORE.
'PHONE JACK.
OSCILLATOR.
"X"
FREQ. CHANGER.
2 ND. R.F.
1 ST. R.F.
RANGE :- 1. 2. 3. 4. 5.

FIG. 4.

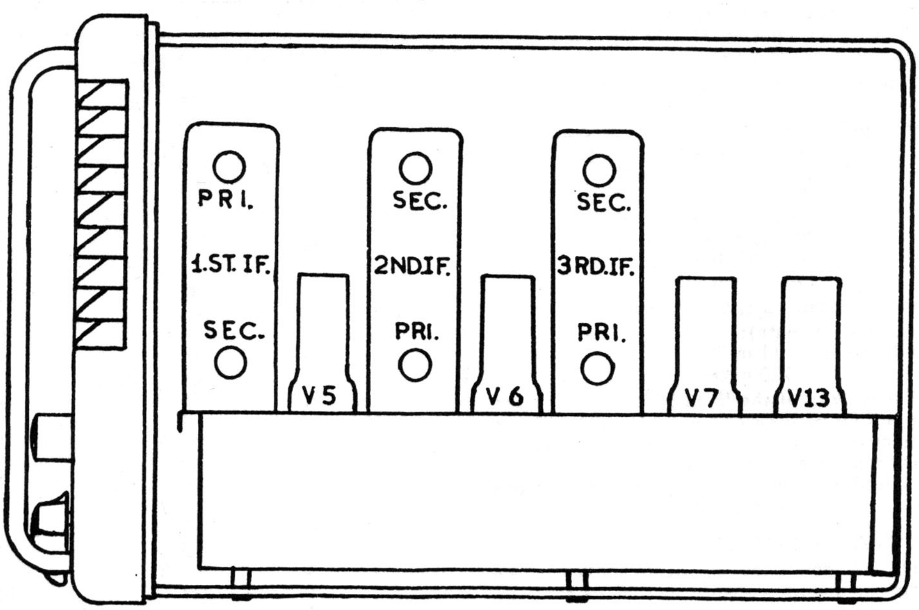
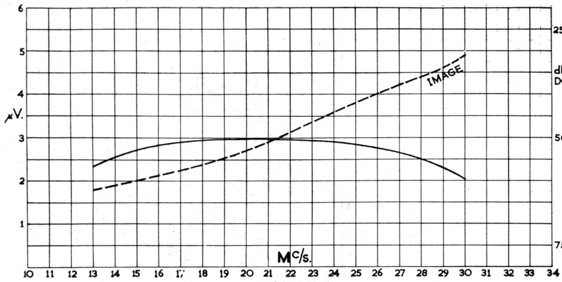
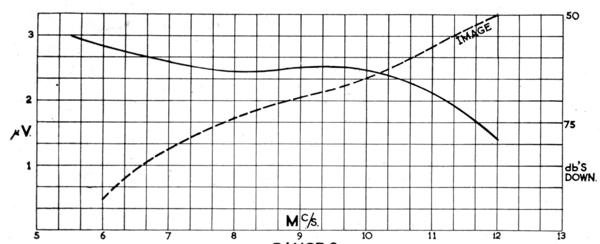

PRI.
1.ST. IF.
SEC.
V5
SEC.
2ND.I.F.
PRI.
V6
SEC.
3RD.I.F.
PRI.
V7
V13

FIG. 5.

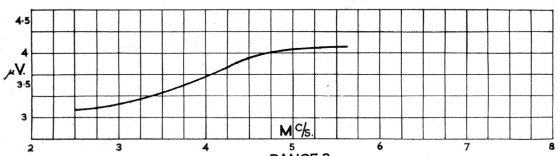
PERFORMANCE CURVES FOR THE EDDYSTONE '680X' RECEIVER



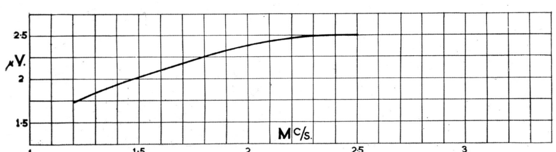
RANGE 1.



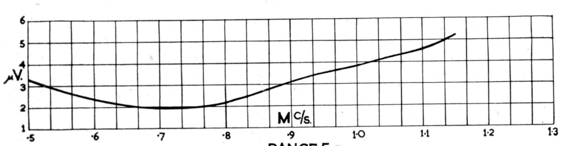
RANGE 2.



RANGE 3.



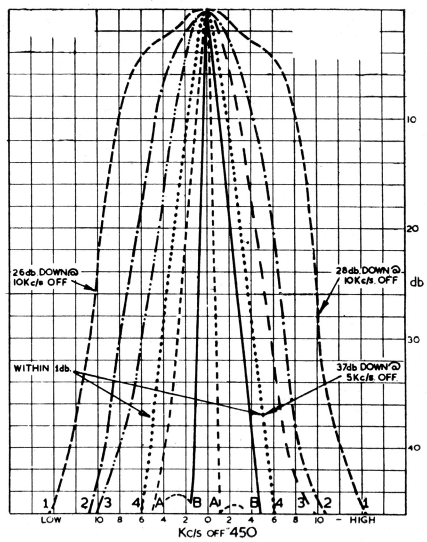
RANGE 4.



RANGE 5.

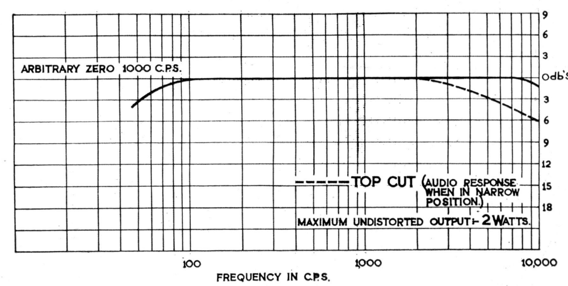
Above are sensitivity curves for an average "680X" Receiver.

They are based on a 15 db signal-to-noise ratio and an audio output of 50 milliwatts.



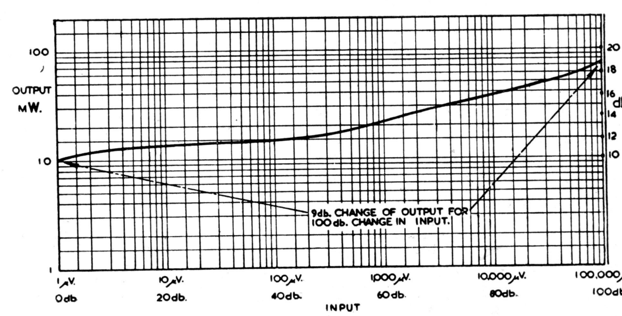
Selectivity curves for the "680X" Receiver.

(1)	——— ———	minimum position.
(2)	— · — · —	first intermediate position.
(3)	— · · — · · —	second intermediate position.
(4)	· · · · · · ·	maximum selectivity.
(A)	— — — — —	maximum selectivity, with crystal filter in, and phased to reject signal on one side.
(B)	—————	as "A," but with crystal phased on other side.



Response curve of the Audio Amplifier stages of the "680X" Receiver. When the selectivity switch is at maximum, an additional top cut is introduced, the effect being indicated above by the dotted line curve.

The figure of 2·0 watts represents distortionless output, over a wide range of frequencies. Considerably more output power is actually available without appreciable distortion.



AGC. Characteristic of the "680X" Receiver (taken at 9 Mc/s).

FIG. 6.

EDDYSTONE '680X' COMPONENT VALUES

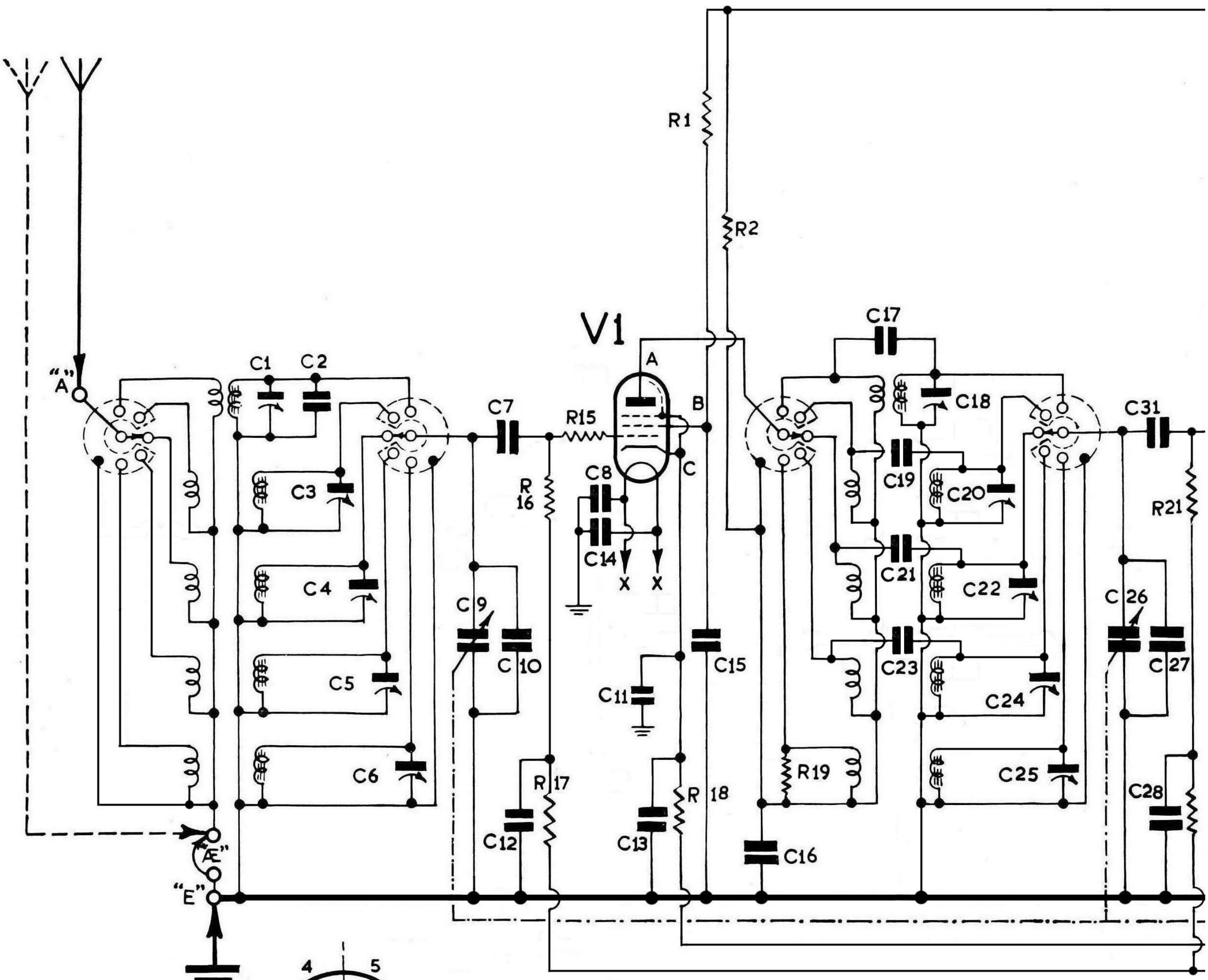
CONDENSERS.

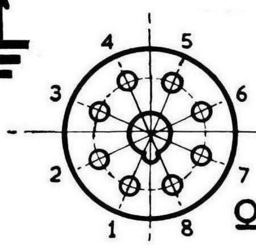
C1	3-23 pF.	Air Trimmer
C2	10 pF.	Silvered Mica
C3	3-23 pF.	Air Trimmer
C4	3-23 pF.	Air Trimmer
C5	3-23 pF.	Air Trimmer
C6	3-23 pF.	Air Trimmer
C7	100 pF.	Silvered Mica
C8	·0005 mfd.	Moulded Mica
C9	10-367·75 pF.	1st RF Tuning
C10	25 pF.	Silvered Mica
C11	·01 mfd.	Tub. Paper
C12	·01 mfd.	Tub. Paper
C13	·1 mfd.	Tub. Paper
C14	·0005 mfd.	Moulded Mica
C15	·1 mfd.	Tub. Paper
C16	·1 mfd.	Tub. Paper
C17	20 pF.	Silvered Mica
C18	3-23 pF.	Air Trimmer
C19	6 pF.	Silvered Mica
C20	3-23 pF.	Air Trimmer
C21	3 pF.	Silvered Mica
C22	3-23 pF.	Air Trimmer
C23	3 pF.	Silvered Mica
C24	3-23 pF.	Air Trimmer
C25	3-23 pF.	Air Trimmer
C26	10-367·75 pF.	2nd RF Tuning
C27	25 pF.	Silvered Mica
C28	·01 mfd.	Tub. Paper
C29	·1 mfd.	Tub. Paper
C30	·01 mfd.	Tub. Paper
C31	100 pF.	Silvered Mica
C32	·1 mfd.	Tub. Paper
C33	·1 mfd.	Tub. Paper
C34	20 pF.	Silvered Mica
C35	3-23 pF.	Air Trimmer
C36	3 pF.	Silvered Mica
C37	6 pF.	Silvered Mica
C38	3-23 pF.	Air Trimmer
C39	3 pF.	Silvered Mica
C40	3-23 pF.	Air Trimmer
C41	3 pF.	Silvered Mica
C42	3-23 pF.	Air Trimmer
C43	3-23 pF.	Air Trimmer
C44	10-367·75 pF.	FC Tuning
C45	25 pF.	Silvered Mica
C46	·1 mfd.	Tub. Paper
C47	·1 mfd.	Tub. Paper
C48	·01 mfd.	Tub. Paper
C49	10 pF.	Ceramic
C50	7000 pF.	Silvered Mica ±1%
C51	3625 pF.	Silvered Mica ±1%
C52	1625 pF.	Silvered Mica ±1%
C53	900 pF.	Silvered Mica ±1%
C54	440 pF.	Silvered Mica ±1%
C55	3-23 pF.	Air Trimmer
C56	3-23 pF.	Air Trimmer
C57	3-23 pF.	Air Trimmer
C58	10 pF.	Silvered Mica
C59	3-23 pF.	Air Trimmer
C60	20 pF.	Silvered Mica
C61	20 pF.	Silvered Mica
C62	3-23 pF.	Air Trimmer
C63	10-367·75 pF.	Osc. Tuning
C64	12 pF.	Ceramic
C65	200 pF.	Silvered Mica ±2%
C66	50 pF.	Silvered Mica
C67	·0005 mfd.	Moulded Mica
C68	·0005 mfd.	Moulded Mica
C69	·1 mfd.	Tub. Paper
C70	·1 mfd.	Tub. Paper
C71	400 pF.	Silvered Mica ±2%
C72	800 pF.	Silvered Mica ±2%
C73	800 pF.	Silvered Mica ±2%
C74		Crystal Phasing Condenser
C75	20 pF.	Silvered Mica
C76	·01 mfd.	Moulded Mica
C77	500 pF.	Silvered Mica ±2%
C78	400 pF.	Silvered Mica ±2%
C79	·1 mfd.	Tub. Paper
C80	400 pF.	Silvered Mica ±2%
C81	·01 mfd.	Tub. Paper
C82	400 pF.	Silvered Mica ±2%
C83	·1 mfd.	Tub. Paper
C84	400 pF.	Silvered Mica ±2%
C85	10 pF.	Silvered Mica
C86	8 mfd.	Tub. elect. 350v. DC Wkg.
C87	·01 mfd.	Moulded Mica
C88	·01 mfd.	Tub. Paper
C89	·1 mfd.	Tub. Paper
C90	·1 mfd.	Tub. Paper
C91	·1 mfd.	Tub. Paper
C92	·1 mfd.	Tub. Paper
C93	·1 mfd.	Tub. Paper
C94	100 pF.	Silvered Mica
C95	100 pF.	Silvered Mica
C96	·5 mfd.	Tub. Paper 200v. DC Wkg.
C97	·01 mfd.	Tub. Paper
C98	30 mfd.	Tub. elect. 15v. DC Wkg.
C99	30 mfd.	Tub. elect. 15v. DC Wkg.
C100	·01 mfd.	Moulded Mica
C101	·5 mfd.	Tub. Paper 200v. DC Wkg.
C102	30 mfd.	Tub. Paper 15v. DC Wkg.
C103	·002 mfd.	Moulded Mica
C104	·01 mfd.	Tub. Paper
C105	·002 mfd.	Moulded Mica
C106	·01 mfd.	Moulded Mica
C107	8 pF.	Silvered Mica
C108	100 pF.	Silvered Mica
C109	100 pF.	Silvered Mica
C110		B.F.O. Pitch Condenser
C111	·01 mfd.	Tub. Paper
C112	·01 mfd.	Tub. Paper
C113	·01 mfd.	Tub. Paper
C114	16 mfd.	Tub. elect. 450v. DC Wkg.
C115	40 mfd.	Tub. elect. 350v. DC Wkg.

RESISTORS.

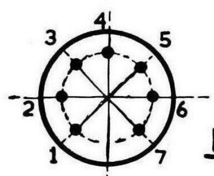
R1	33,000 ohms	1W
R2	1,000 ohms	
R3	33,000 ohms	1W
R4	1,000 ohms	
R5	1,000 ohms	
R6	15,000 ohms	
R7	1,000 ohms	
R8	33,000 ohms	1W
R9	1,000 ohms	
R10	1 megohm	
R11	·27 megohm	
R12	10,000 ohms	
R13	·27 megohm	
R14	1 megohm	
R15	12 ohms	
R16	·47megohm	
R17	·47 megohm	
R18	68 ohms	
R19	150 ohms	
R20	12 ohms	
R21	·47 megohm	
R22	·47 megohm	
R23	68 ohms	
R24	150 ohms	
R25	1,500 ohms	
R26	12 ohms	
R27	150 ohms	
R28	100,000 ohms	
R29	2,200 ohms	
R30	2,200 ohms	
R31	10,000 ohms	
R32	1,000 ohms	
R33	22,000 ohms	
R34	·47 megohm	
R35	15,000 ohms	
R36	68 ohms	
R37	·47 megohm	
R38	560 ohms	
R39	68 ohms	
R40	1 megohm	
R41	100,000 ohms	
R42	100,000 ohms	
R43	·47 megohm	
R44	1 megohm	
R45	·5 megohm	Potentiometer
R46	1,500 ohms	
R47	3 megohms	
R48	1,500 ohms	
R49	6,800 ohms	
R50	·47 megohm	
R51	620 ohms	
R52	·47 megohm	
R53	3 megohms	
R54	100,000 ohms	
R55	2,200 ohms	
R56	27,000 ohms	
R57	5,000 ohms	Potentiometer
R58	10,000 ohms	
R59	2 megohms	
R60	47,000 ohms	
R61	10,000 ohms	
R62	10,000 ohms	Potentiometer
R63	·27 megohm	
R64	5 ohms	Potentiometer
R65	6,800 ohms	
R66	2,700 ohms	Wire Wound
R67	4,700 ohms	
R68	22,000 ohms	1W.

ALL FIXED RESISTORS (EXCEPT WIRE WOUND) OF UNSPECIFIED WATTAGE ARE UNDER ½ WATT.

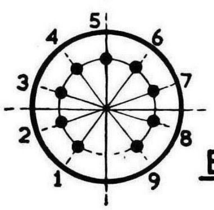




OCTAL SERIES.

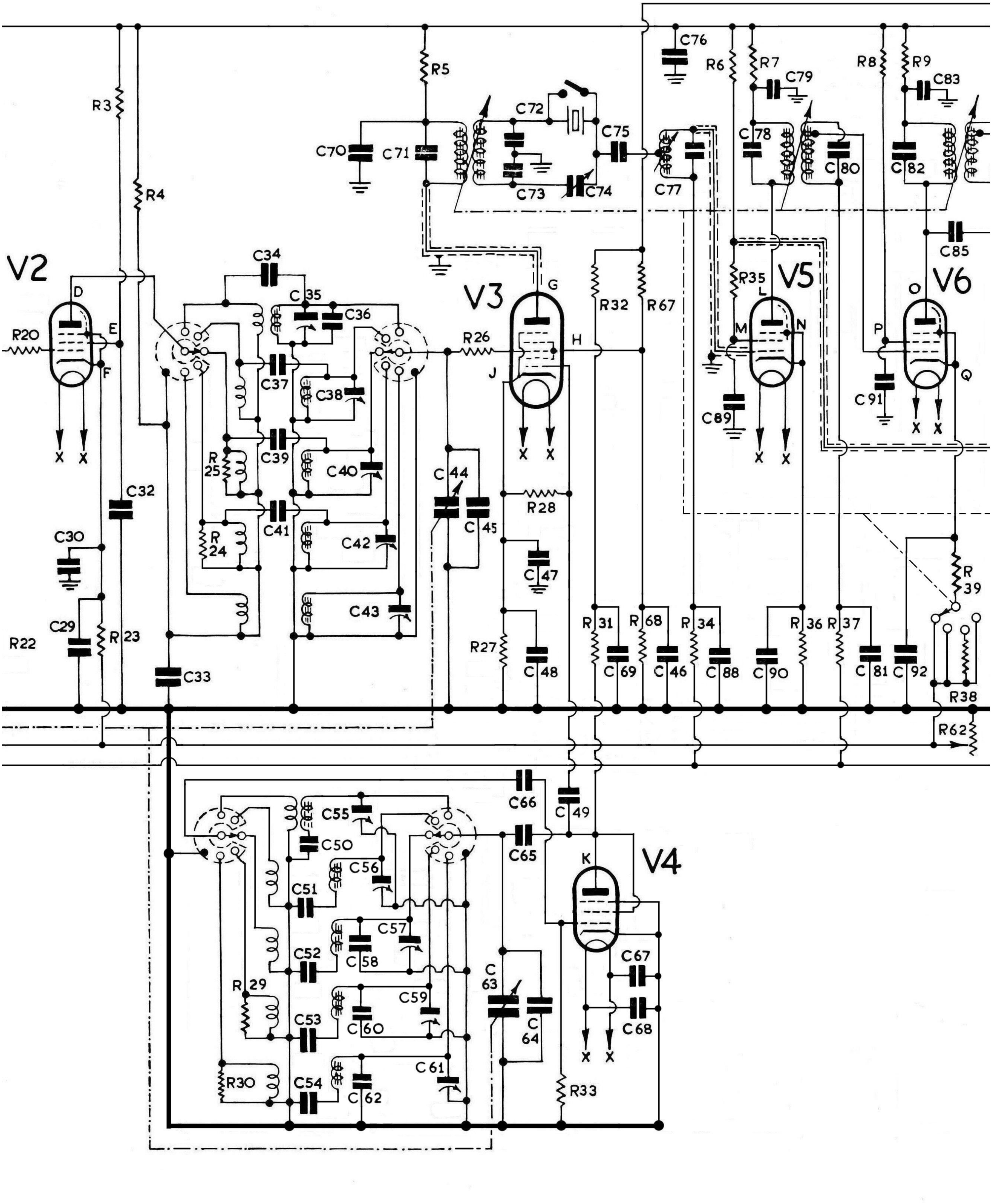


B7G SERIES.



(NOVAL.)
B9A SERIES.

VALVE	V. No.	PIN CONNECTIONS. 1	2	3	4	5	6	7	8	9	SERIES.
6BA6	V1,2,5,6, & 12.	G1	G3 S	H	H	A	G2	K	—	—	B7G.
6BE6	V3	G1	K G5	H	H	A	G2 G4	G3	—	—	B7G.
8D5 (6BR7)	V8 & 9	—	G1	K	H	H	S	A	G2	G3	B9A. (NOVAL)
8D3 (6AM6)	V4.	G1	K	H	H	A	G3 S	G2	—	—	B7G.
7D9 (6AM5)	V10 & 11	G1	K G3	H	H	A	—	G2	—	—	B7G.
5Z4G	V14.	—	H	—	A2	—	A1	—	K H	—	OCTAL.
VR150/30	V15.	—	K	—	—	A	—	—	—	—	OCTAL.
6AL5	V7 & 13	K1	A2	H	H	K2	S	A1			B7G.



V2
V3
V4
V5
V6
R3
R4
R5
R6
R7
R8
R9
R20
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
R62
R67
R68
C29
C30
C32
C33
C34
C35
C36
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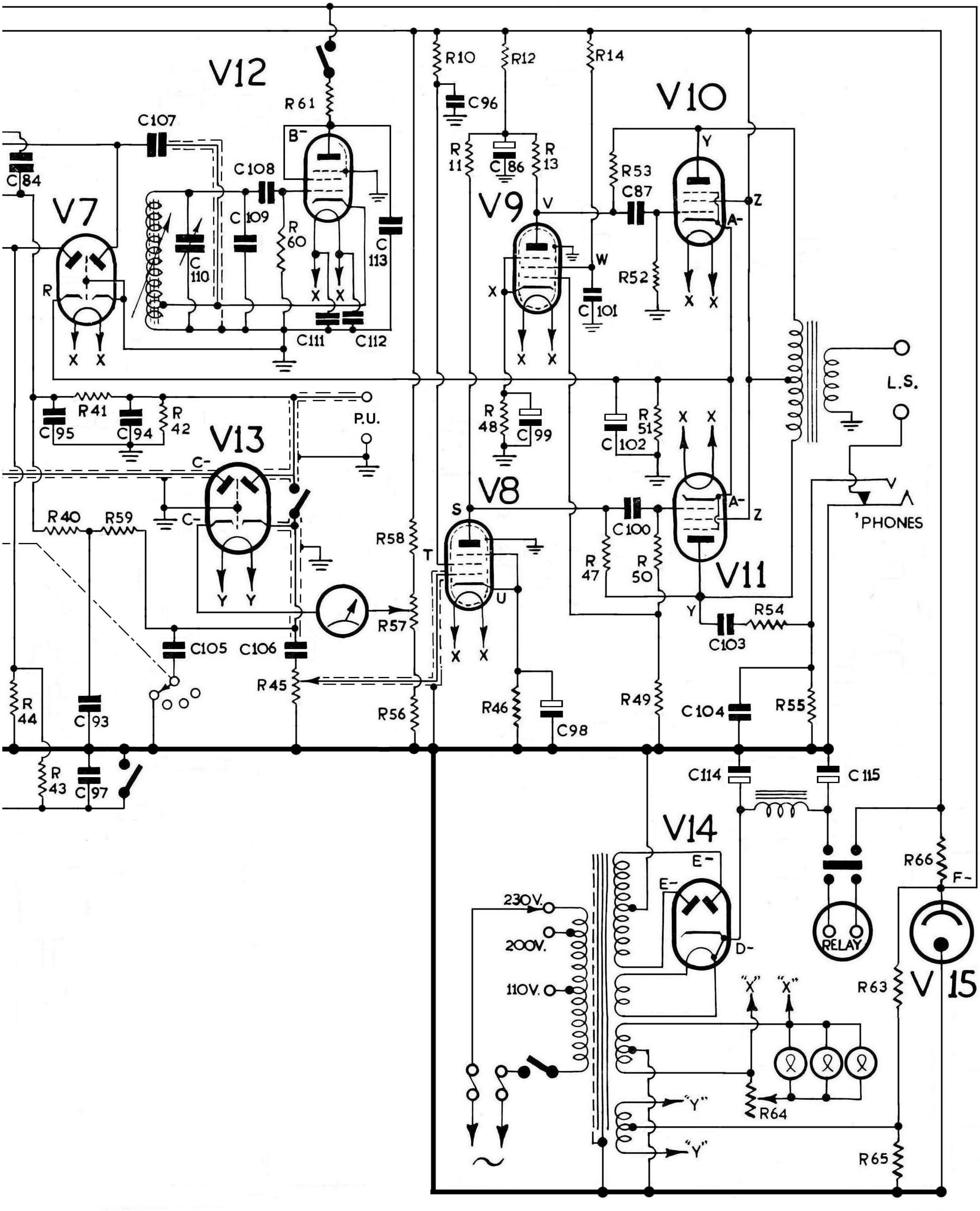
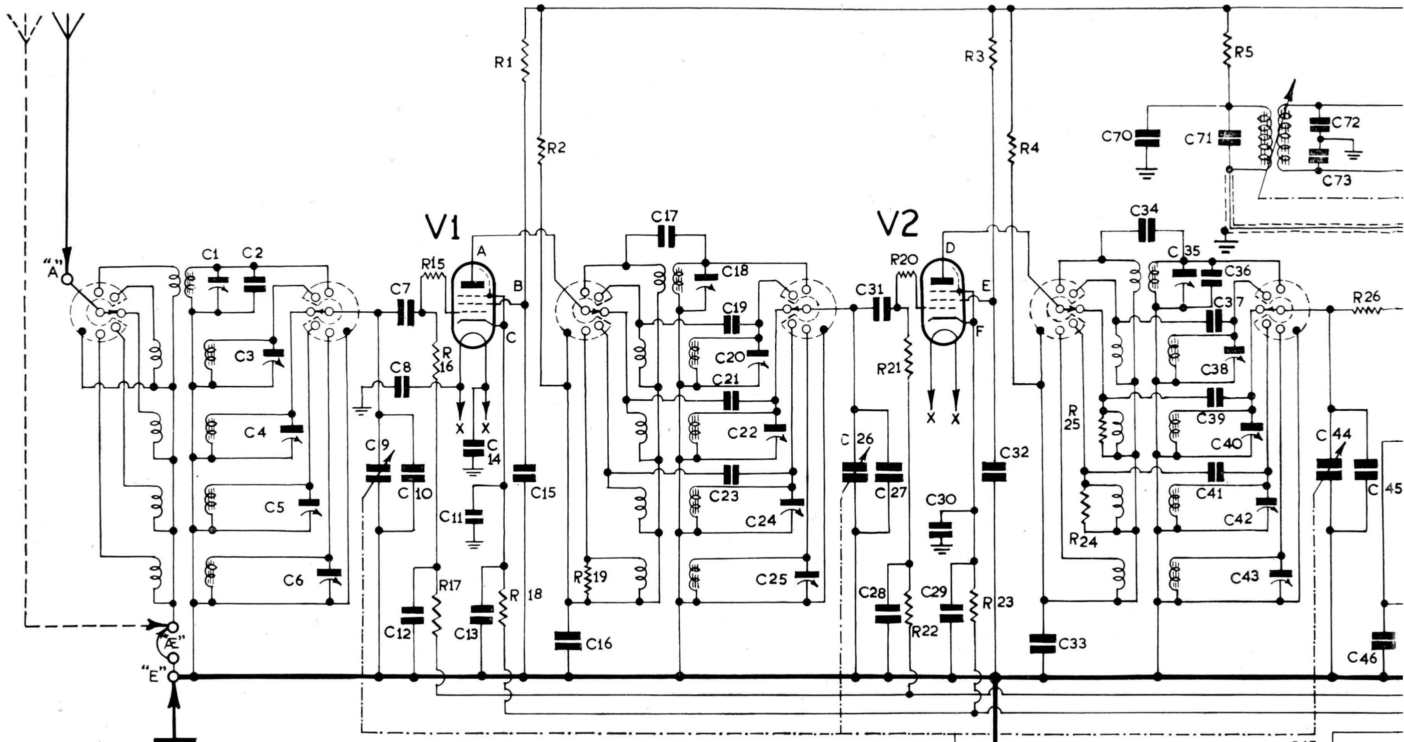
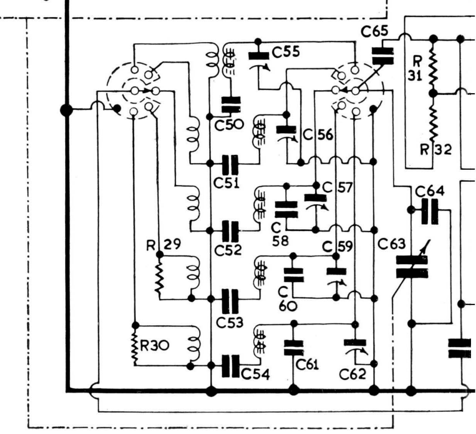
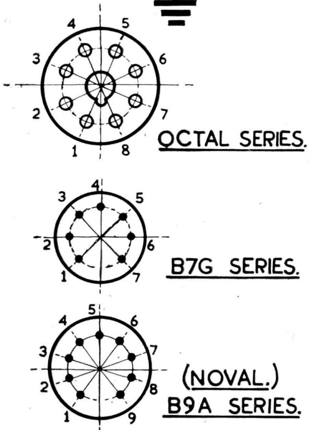
C78
C79
C80
C81
C82
C83
C85
C88
C89
C90
C91
C92
D
E
F
G
H
J
K
L
M
N
O
P
Q
X



V12
R61
B-
C107
C108
C84
V7
C109
C110
R60
C113
R
C111
C112
R10
C96
R12
R11
C86
R13
R14
V9
V
W
C101
V10
Y
R53
C87
Z
A-
R52
R41
R42
C95
C94
R48
C99
C102
R51
L.S.
V13
C-
P.U.
R40
R59
R58
V8
S
T
U
C100
R47
R50
V11
'PHONES
R57
R54
C103
C105
C106
R45
R46
C98
R49
C104
R55
R44
C93
R56
R43
C97
C114
C115
V14
E-
D-
230V.
200V.
110V.
R66
F-
RELAY
R63
V15
R64
"X"
"Y"
R65







VALVE	V.No	1	2	3	4	5	6	7	8	9	SERIES.
		PIN CONNECTIONS.									
6BA6	V1,2,5,6, &12.	G1	G3 S	H	H	A	G2	K	—	—	B7G.
6BE6	V3	G1	K G5	H	H	A	G2 G4	G3	—	—	B7G.
8D5 (6BR7)	V8 & 9	—	G1	K	H	H	S	A	G2	G3	B9A. (NOVAL)
8D3 (6AM6)	V4.	G1	K	H	H	A	G3 S	G2	—	—	B7G.
7D9 (6AM5)	V10 & 11	G1	K G3	H	H	A	—	G2	—	—	B7G.
5Z4G	V14.	—	H	—	A2	—	A1	—	K H	—	OCTAL.
VR150/30	V15.	—	K	—	—	A	—	—	—	—	OCTAL.
6AL5	V7&13	K1	A2	H	H	K2	S	A1			B7G.

CONDENSERS.

C1	3-23 pF.	Air Trimmer
C2	10 pF.	Silvered Mica
C3	3-23 pF.	Air Trimmer
C4	3-23 pF.	Air Trimmer
C5	3-23 pF.	Air Trimmer
C6	3-23 pF.	Air Trimmer
C7	100 pF.	Silvered Mica
C8	·0005 mfd.	Moulded Mica
C9	10-367·75 pF.	1st RF Tuning
C10	25 pF.	Silvered Mica
C11	·01 mfd.	Tub. Paper
C12	·01 mfd.	Tub. Paper
C13	·1 mfd.	Tub. Paper
C14	·0005 mfd.	Moulded Mica
C15	·1 mfd.	Tub. Paper
C16	·1 mfd.	Tub. Paper
C17	20 pF.	Silvered Mica
C18	3-23 pF.	Air Trimmer
C19	6 pF.	Silvered Mica
C20	3-23 pF.	Air Trimmer
C21	3 pF.	Silvered Mica
C22	3-23 pF.	Air Trimmer
C23	3 pF.	Silvered Mica
C24	3-23 pF.	Air Trimmer
C25	3-23 pF.	Air Trimmer
C26	10-367·75 pF.	2nd RF Tuning
C27	25pF.	Silvered Mica
C28	·01 mfd.	Tub. Paper

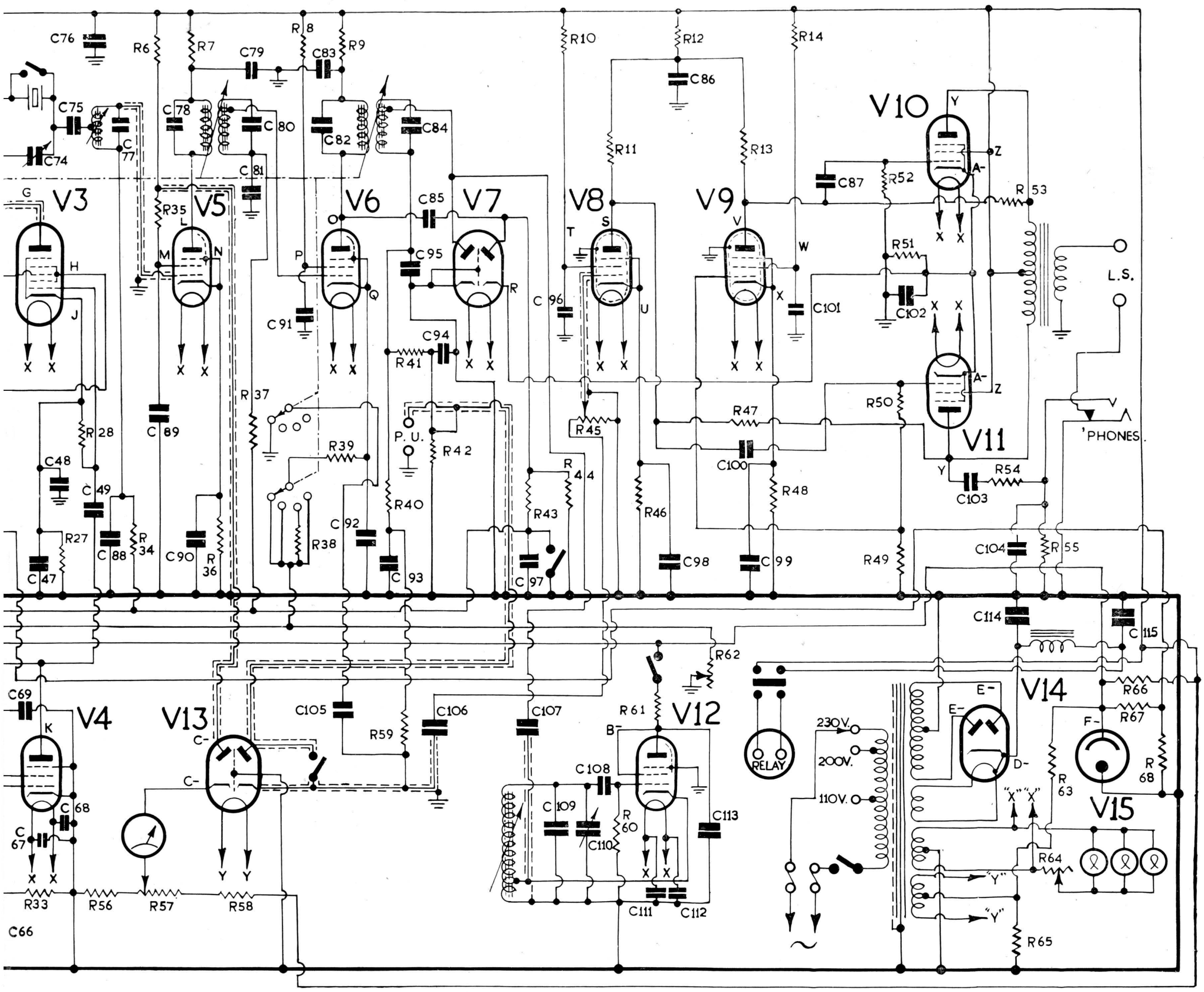
C29	·1 mfd.	Tub. Paper
C30	·01 mfd.	Tub. Paper
C31	100 pF.	Silvered Mica
C32	·1 mfd.	Tub. Paper
C33	·1 mfd.	Tub. Paper
C34	20 pF.	Silvered Mica
C35	3-23 pF.	Air Trimmer
C36	3 pF.	Silvered Mica
C37	6 pF.	Silvered Mica
C38	3-23 pF.	Air Trimmer
C39	3 pF.	Silvered Mica
C40	3-23 pF.	Air Trimmer
C41	3 pF.	Silvered Mica
C42	3-23 pF.	Air Trimmer
C43	3-23 pF.	Air Trimmer
C44	10-367·75 pF.	FC Tuning
C45	25 pF.	Silvered Mica
C46	·1 mfd.	Tub. Paper
C47	·1 mfd.	Tub. Paper
C48	·01 mfd.	Tub. Paper
C49	10 pF.	Ceramic
C50	7000 pF.	Silvered Mica ± 1%
C51	3625 pF.	Silvered Mica ± 1%
C52	1625 pF.	Silvered Mica ± 1%
C53	900 pF.	Silvered Mica ± 1%
C54	440 pF.	Silvered Mica ± 1%
C55	3-23 pF.	Air Trimmer
C56	3-23 pF.	Air Trimmer
C57	3-23 pF.	Air Trimmer
C58	10 pF.	Silvered Mica

EDDYSTONE '680X'

C59	3-23 pF.	Air Trimmer
C60	20 pF.	Silvered Mica
C61	20 pF.	Silvered Mica
C62	3-23 pF.	Air Trimmer
C63	10-367·75 pF.	Osc. Tuning
C64	12 pF.	Ceramic
C65	200 pF.	Silvered Mica ± 2%
C66	50 pF.	Silvered Mica
C67	·0005 mfd.	Moulded Mica
C68	·0005 mfd.	Moulded Mica
C69	·1 mfd.	Tub. Paper
C70	·1 mfd.	Tub. Paper
C71	400 pF.	Silvered Mica ± 2%
C72	800 pF.	Silvered Mica ± 2%
C73	800 pF.	Silvered Mica ± 2%
C74		Crystal Phasing Condenser
C75	20 pF.	Silvered Mica
C76	·01 mfd.	Moulded Mica
C77	500 pF.	Silvered Mica ± 2%
C78	400 pF.	Silvered Mica ± 2%
C79	·1 mfd.	Tub. Paper
C80	400 pF.	Silvered Mica ± 2%
C81	·01 mfd.	Tub. Paper
C82	400 pF.	Silvered Mica ± 2%
C83	·1 mfd.	Tub. Paper

C84	400 pF.
C85	10 pF.
C86	8 mfd.
C87	·01 mfd.
C88	·01 mfd.
C89	·1 mfd.
C90	·1 mfd.
C91	·1 mfd.
C92	·1 mfd.
C93	·1 mfd.
C94	100 pF.
C95	100 pF.
C96	·5 mfd.
C97	·01 mfd.
C98	30 mfd.
C99	30 mfd.
C100	·01 mfd.
C101	·5 mfd.
C102	30 mfd.
C103	·002 mfd.

ALL FIXED RESISTORS (EXCEPT WIRE WOUND)



COMPONENT VALUES

Silvered Mica ± 2%
Silvered Mica
Tub. elect. 350v. DC Wkg.
Moulded Mica
Tub. Paper
Tub. Paper
Tub. Paper
Tub. Paper
Tub. Paper
Tub. Paper
Silvered Mica
Silvered Mica
Tub. Paper 200v. DC Wkg.
Tub. Paper
Tub. elect. 15v. DC Wkg.
Tub. elect. 15v. DC Wkg.
Moulded Mica
Tub. Paper 200v. DC Wkg.
Tub. Paper 15v. DC Wkg.
Moulded Mica

C104	·01 mfd.	Tub. Paper
C105	·002 mfd.	Moulded Mica
C106	·01 mfd.	Moulded Mica
C107	8 pF.	Silvered Mica
C108	100 pF.	Silvered Mica
C109	100 pF.	Silvered Mica
C110		B.F.O. Pitch Condenser
C111	·01 mfd.	Tub. Paper
C112	·01 mfd.	Tub. Paper
C113	·01 mfd.	Tub. Paper
C114	16 mfd.	Tub. elect. 450v. DC Wkg.
C115	40 mfd.	Tub. elect. 350v. DC Wkg.

RESISTORS.

R1	33,000 ohms	1W.
R2	1,000 ohms	
R3	33,000 ohms	1W.
R4	1,000 ohms	
R5	1,000 ohms	
R6	15,000 ohms	
R7	1,000 ohms	
R8	33,000 ohms	1W.
R9	1,000 ohms	
R10	1 megohm	
R11	·27 megohm	
R12	10,000 ohms	
R13	·27 megohm	
R14	1 megohm	
R15	12 ohms	
R16	·47 megohm	
R17	·47 megohm	
R18	68 ohms	
R19	150 ohms	
R20	12 ohms	
R21	·47 megohm	
R22	·47 megohm	
R23	68 ohms	
R24	150 ohms	
R25	1,500 ohms	
R26	12 ohms	
R27	150 ohms	
R28	100,000 ohms	
R29	2,200 ohms	
R30	2,200 ohms	
R31	10,000 ohms	
R32	1,000 ohms	
R33	22,000 ohms	
R34	·47 megohm	
R35	15,000 ohms	
R36	68 ohms	
R37	·47 megohm	
R38	560 ohms	
R39	68 ohms	
R40	1 megohm	
R41	100,000 ohms	
R42	100,000 ohms	
R43	·47 megohm	
R44	1 megohm	
R45	·5 megohm	Potentiometer
R46	1,500 ohms	
R47	3 megohms	
R48	1,500 ohms	
R49	6,800 ohms	
R50	·47 megohm	
R51	620 ohms	
R52	·47 megohm	
R53	3 megohms	
R54	100,000 ohms	
R55	2,200 ohms	
R56	27,000 ohms	
R57	5,000 ohms	Potentiometer
R58	10,000 ohms	
R59	2 megohms	
R60	47,000 ohms	
R61	10,000 ohms	
R62	10,000 ohms	Potentiometer
R63	·27 megohm	
R64	5 ohms	Potentiometer
R65	6,800 ohms	
R66	2,700 ohms	Wire Wound
R67	4,700 ohms	
R68	22,000 ohms	1W.

OF UNSPECIFIED WATTAGE ARE UNDER ½ WATT.