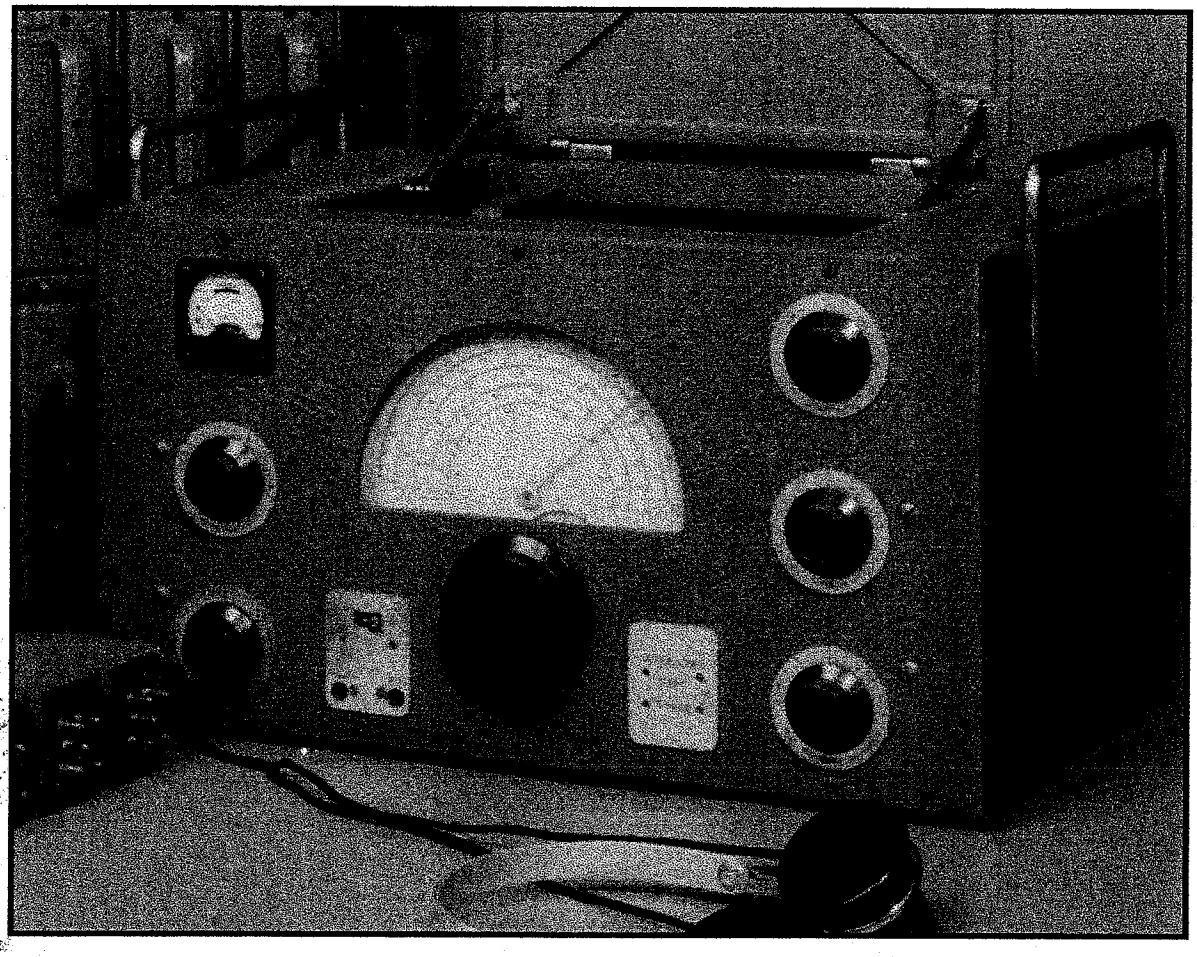


Eddystone Model 400B

Air Ministry R.1448

(1943)

RECEIVER TYPE S400B

(Circuit No. BP516)

1. SPECIFICATION.

GENERAL.

Similar in appearance to the types 358X and 400X receivers, this receiver is designed for the reception of C.W. Signals only, having a total range of 2,200 Kc/s to 130 Kc/s.

This coverage is obtained by the use of four plug-in coil units as follows:-

Range AA	1,000 to 2,200 Kc/s.
Range BB	500 to 1,000 Kc/s.
Range CC	250 to 500 Kc/s.
Range DD	130 to 250 Kc/s.

These ranges are all calibrated on four separate scales on the tuning dial which also has an outer artitrary scale marked from 0-100 over 180°. A logging scale as on other models is also incorporated.

Power input to the receiver is provided by a separate power supply unit type S.390B which operates from 200-250 volts 40-60 cycle mains. The output of this unit is 6 volt 1.4 amps. A.C. and 175 - 180 volts 65 m A.D.C.

For operation from a 6 volt accumulator, a rotary transformer unit type S.497 can be supplied to provide the necessary H.T.

The output of the receiver is taken to two jacks in parallel, mounted on the front panel, and is arranged so that two pairs of 2,000 ohms headphones may be used simultaneously.

The circuit which is of the double super heterodyne type comprises one pentode R.F. amplifier, triode hexodes as 1st and 2nd frequency changers, two pentode I.F. amplifiers and a pentode output valve.

The intermediate frequency is 110 Kc/s.
The second frequency changer circuit has a mean oscillating frequency of 110 Kc/s, which can be varied above and below this to produce an audio frequency of up to 1,000 c/s.

A band pass crystal circuit is included in the first I.F. stage, and two degrees of selectivity are obtainable viz. 2 Kc/s when the crystal is out of circuit and 250 c/s when the crystal is switched in. Either of these band widths may be put into operation by means of a two position control on the front panel.

VALVES.

Circuit Position	Makor's Type.	Inter Service Type	Function.
V.1.	E.F.39	VR.53	R.F. Amplifier.
V.2.	ECH 35	ARTH.2	1st frequency changer.
V.3.	E.F. 39	VR 53	1st. I.F. amplifier.
V.4.	E.F.39	VR53	2nd I.F. amplifier.
V.5.	ECH.35	ARTH.2	2nd frequency changer.
V.6.	6V6G	6V6G	Output.

CONTROLS.

H.T. On-off switch. This is for bringing the receiver into operation. Always place in the "off" position when changing coil units.

L.F. Gain. This can be set from time to time at a position which allows reception at the desired strength. To decrease volume, turn anti-clockwise.

H.F. Gain. As this controls the actual gain of the high frequency amplifier, its regulation depends upon the type of signal being received. Rotation in a clockwise direction increases the gain.

Beat Frequency control. Adjustment of this control alters the audible pitch of the received signal. A centre zero scale is used reading up to 5 on either side of this. When this control is set to zero, the oscillator circuit is tuned to 110 Kc/s and no signal will be heard, the audible pitch being zero or nearly so. At approximately 2 to 3, the audible pitch will be 1000 c/s. It should here be noted that sensitivity is at its maximum in this position, and falls off appreciably towards zero on the scale; a signal should therefore be received with the beat frequency control at approximately 2 to 3.

Selectivity. This switch controls the band pass crystal filter included in the first I.F. stage. When the switch is turned to the right, the crystal is out of circuit and an I.F. bandwidth of 2 Kc/s is produced whilst, to bring the crystal into use the switch is turned to the left, thus giving a bandwidth of 250 c/s.

Tuning control. The large centre knob is the tuning control. This operates the three-gang condenser; it causes the pointer to traverse the dial and also revolves the small circular logging dial.

The four inner scales on the main tuning dial are directly calibrated for the four coil units, the outer scale in conjunction with the logging dial can be used for accurately logging known stations, which is particularly useful when the receiver is used for spot frequency work.

Check Meter. This is included to provide an indication of the condition of the valves in use thus, if the receiver at any time is suspected of being faulty, valve emission may be the cause. This will be indicated on the check meter by using the "Anode Current Switch" to switch the meter into the anode circuit of each valve in turn. The meter reading for each position should be within the "Normal" band on the scale. If this is not the case, then the appropriate valve or valves should be substituted. V.2 and V. 5 have two positions each, the first being the triode portion of the valve in each case.

OPERATING.

After plugging the appropriate coil unit into the receiver and switching on, set the H.F. and L.F gain controls to a suitable position, say about half way. Turn the selectivity switch to the 2 Kc/s position. Set the beat frequency control to zero and proceed to tune in a signal. As soon as the desired signal is found, tune it to the silent point. Now adjust the beat frequency control to give a beat note of the desired pitch; remembering that maximum sensitivity is at 2 to 3 on the dial.

RECEIVER TYPE S.400 B.

2. ALIGNMENT.

These instructions should be carried out with great care since, with correct operation of the receiver, performance depends entirely upon adjustment of the various parts of the circuit.

Apparatus required.

A signal generator to produce unmodulated signals of frequencies equal to the extreme frequencies of the coil units and 110 Kc/s (I.F).
Output meter - 6,000 ohms impedance approx.
Headphones (2,000 ohms) or loud speaker (type S.399 is suitable.)
A standard dummy aerial as normally supplied with signal generators.

Before commencing alignment, one should make quite certain that the receiver is otherwise in the same condition as it will be when operated. All valves should be tightly in place and the earth connected. The aerial link should be connected to "A2" and "E" terminals. Switch on the receiver and the signal generator for at least five minutes before attempting to retrim, so that full operating temperature is attained and frequency drift is at a minimum.

The first procedure is to align the I.F. amplifier.

I.F. Amplifier.

For aligning the I.F. amplifier stages, the output from the generator should be direct, i.e. no dummy aerial is required. Connect a loud speaker and output meter to the output jacks of the receiver. Connect the low potential lead of the generator to earth and the high potential lead to the grid of the first frequency changer valve (V.2.) removing the grid cap. Switch selectivity to 2 Kc/s i.e. crystal out and inject a 110 Kc/s unmodulated signal from the generator. Adjust the beat frequency control to about 2 or 3 on the dial for maximum output; this will occur at a frequency of 1000 c/s. Adjust all six. I.F. trimmers for maximum output; these are C2 and C.39 in the first I.F. Unit and C.39 in the second and 3rd I.F. Units. (refer to circuit BP.516)

Now switch selectivity to 250 c/s i.e. crystal in, and swing the generator frequency control slowly about its present position (110 Kc/s). Two well defined peaks in output will be in evidence; set the generator frequency control to the "trough" between these peaks and re-adjust the six I.F. trimmers for maximum output.

Beat Frequency Now adjust the beat frequency control to "0" on the dial, all audio output should then disappear. If a note is still heard, adjust the beat frequency trimmer (C.1 in the triode anode circuit of V.5) until the pitch of the note falls to zero. This trimmer is accessible through a hole in the bottom of the receiver cabinet.

COIL UNITS.

The coil units are very carefully adjusted before leaving the factory, the trimmers being set to give the greatest possible officiency. If however, it is found necessary to re-adjust these units, the method which follows should be carriedout systematically. Condenser circuit references are shown on coil unit diagram BP.517 and on the main circuit diagram BP.516. The method of adjusting coil units is the same for each range, the high and low frequencies used in each case being as follows:-

	Aligning		Tracking
Range AA	2200Kc/s	and	1,000 Kc/s
Range BB	1000Kc/s	and	500 Kc/s
Range CC	550Kc/s	and	250 Kc/s
Range DD	290Kc/s	and	130 Kc/s

The generator should have the dummy load attached and the output leads should be connected to the aerial and earth terminals of the receiver.

Set the beat frequency control at zero. Switch selectivity control to 2 Kc/s (crystal out). Set the tuning control with the pointer at the aligning frequency for the unit being adjusted, and inject this frequency from the generator e.g. Range AA is 2,200 Kc/s.

Adjust the oscillator trimmer Cx to the inaudible point or zero beat of the signal. If the receiver is considerably out of calibration, the signal will have to be searched for on the tuning dial, and drawn to its correct position by means of Cx; the reading on the dial should then indicate the frequency injected by the generator, that is 2,200 Kc/s for range AA aligning frequency.

Now turn the tuning pointer to the tracking frequency, for range AA this is 1,000 Kc/s. Inject this frequency from the generator and adjust the oscillator tracking condenser Cy, to the zero beat of the signal as in the case of CX.

As Cx and Cy are mutually inter-active, it will be advisable to return to the H.F. end and repeat this process.

To trim the aerial and mixer circuits, turn the beat frequency control just off zero to obtain an audible signal, and adjust C1 and C2 for maximum output.

RECEIVER TYPE S. 400B.

(A.M. TYPE R.1448)

(CIRCUIT NO. BP516)

3. COMPONENT VALUES.

		Total			Total
R.2	300 ohms ½ W	1	C.1	15-45 pf	1
R.4	5,000 ohms ½ W	1	C.2	50mmfd	1
R.5	50,000 ohms ½W	4	C.9	.1mfd	15
R.8	1.0 mogohms ½ W	1	C.10	.0005 mfd	4
R.9	1,000 ohms ½ W	1	C.16	.5 mfd	1
R.10	0.1 mogohms ½ W	3	C.21	75 pf	1
R.15	500 ohms ½ W	2	C.32	273mmfd/Sect 3 gang	1
R.25	20,000 ohms ½ W	2	C.33	.0003 mfd	1
R.59	30,000 ohms ½ W	4	C.34	.01mfd	4
R.60	250 ohms ½ W	1	C.35	260 pf	1
R.61	200 ohms ½ W	1	C.36	600 pf	6
R.62	.5 mogohms Pot.	1	C.37	23.5 mmfd	1
R.63	10,000 ohms Variable	1	C.39	100mmfd	5
R.64	19 ohms shunt	1			
R.65	40 ohms shunt	1			
R.66	100 ohms shunt	1			
R.67	50 ohms shunt	2			
R.68	30 ohms shunt	1			
R.69	180 ohms shunt	1			
R.70	3.5 ohms shunt	1			

COIL UNITS

Range	Rx.	Cx.	Cy.
AA	1000 ohms ½ W	3-20 pf	1000 pf (Max.) + .0019mfd
BB	3000 ohms ½ W	15-45 pf	1000 pf " + .0005 mfd
CC	3000 ohms ½ W	15-45 pf	1000 pf "
DD	5000 ohms ½ W	15-45 pf	1000 pf "

RECEIVER TYPE S400B

(A.M. TYPE R.1448).

4. VOLTAGE VALUES.

CIRCUIT NO. BP.516

Voltages were measured between points indicated and chassis, using a standard Avometer.

Coil Range "AA" was used. Tuning dial set at Zero.

H.F. Gain at Max. L.F. Gain at Max. B.F.O at zero.

Selectivity at 2 Kc/s. Aerial disconnected.

H.T. supply 190 volts.

CONTACT POINT	VOLTAGE	CONTACT POINT	VOLTAGE
A	190	L	190
B	90	M	65
C	2.8	N	3.1
D	165	O	190
E	80	P	40
F	65	Q	0.6
G	1.8	R	100
H	190	S	185
J	70	T	190
K	3.7	U	9.7

RECEIVER TYPE S.400B

5. SENSITIVITY AND NOISE.

Range	Kc/s	Gen. Input.	db above 4 db Noise.	Output for 1V Input at 110 Kc/s all Controls full on. B.F.O. at zero.
AA	1000	10 micro V	Better	2 db.
	1400	10 micro V	than	2 db.
	2000	10 micro V	14	6 db.
BB	500	10 micro V	Better	9 db.
	700	10 micro V	than	10 db.
	1000	10 micro V	13	16 db.
CC	250	10 micro V	Better	11 db.
	350	10 micro V	than	11 db.
	500	10 micro V	12	12 db.
DD	130	1 micro V	Better	5 db.
	210	1 micro V	than	9 db.
	250	1 micro V	9	9 db.

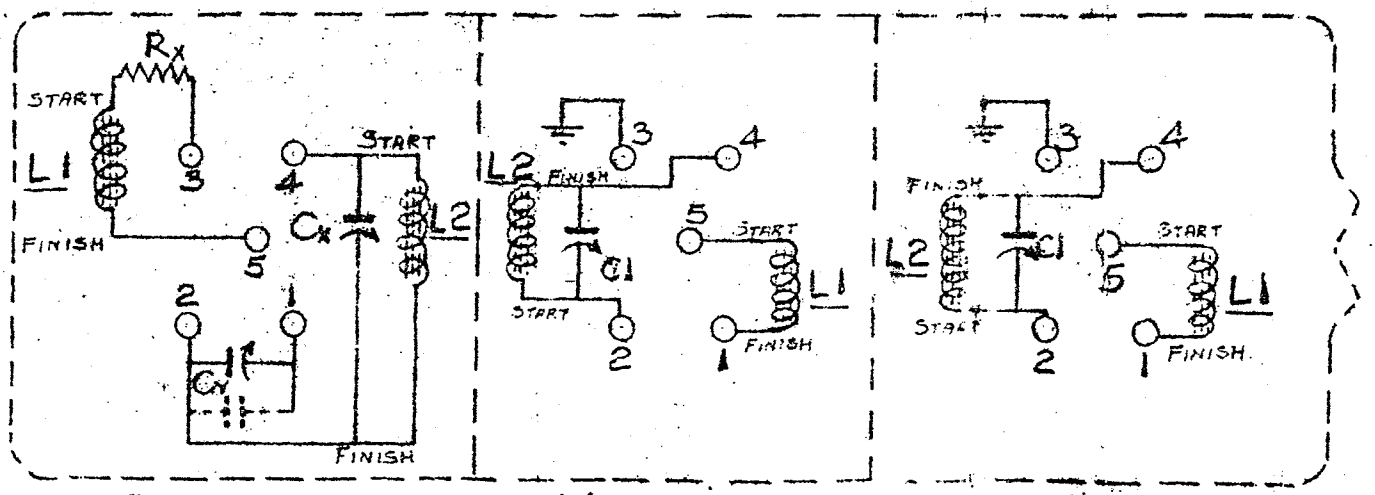
Output meter set for 2000 ohms.

Line Volts 190. Current 56 mA.

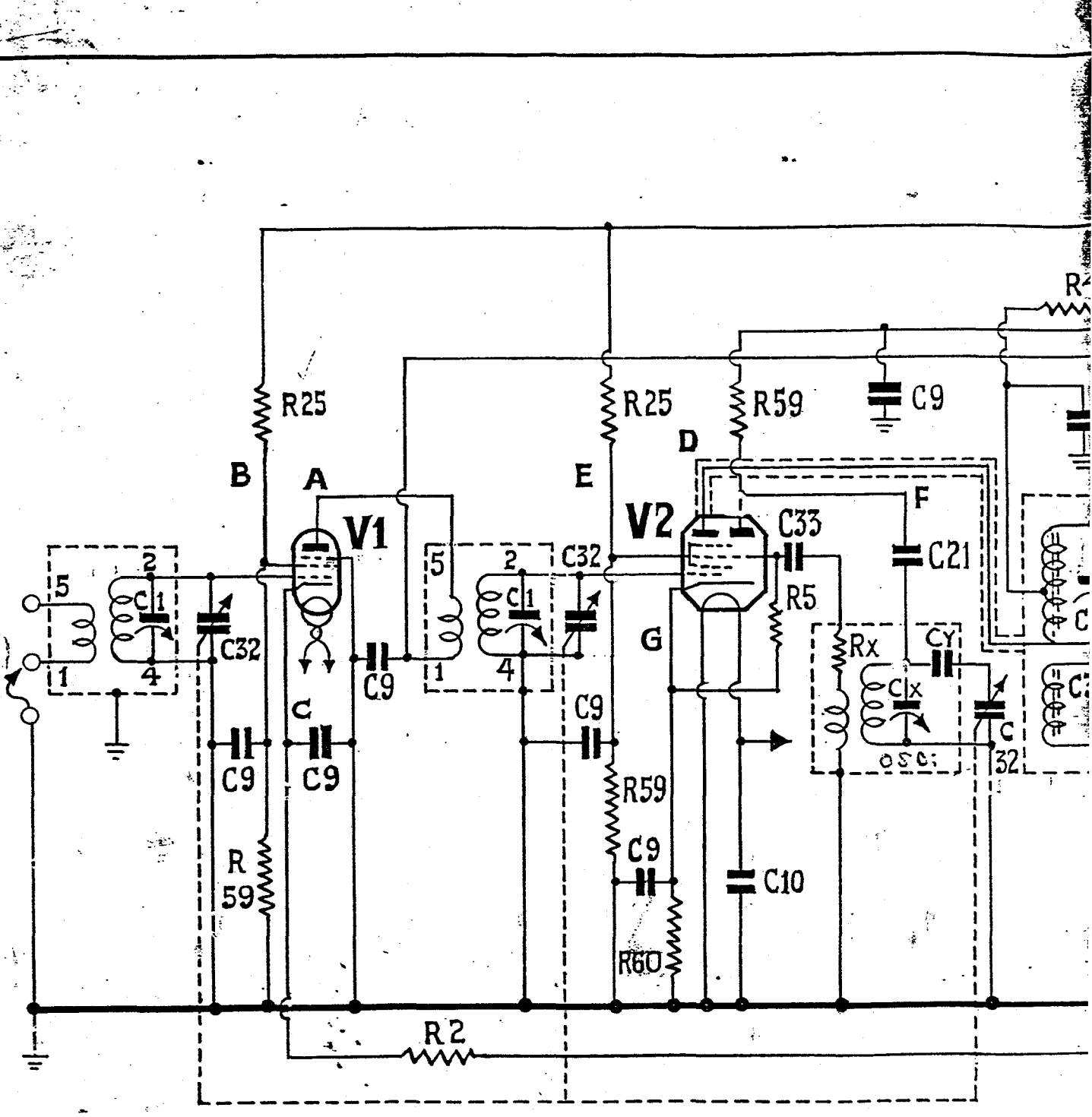
These figures were obtained on sample Receiver No. FU101.

RANGE	R_x	C1	C_x	C_y
AA	(R9) 1000 Ω	15 - 45 PF.	(C40) 3 - 20 PF.	1000 PF (MAX) (C41) + .002 MFD. (C42)
BB	(R71) 3000 Ω	15 - 45 PF.	(C1) 15 - 45 PF.	1000 PF (MAX) (C41) + .005 MFD (C43)
CC	(R71) 3000 Ω	15 - 45 PF.	(C1) 15 - 45 PF.	1000 PF (MAX) (C41)
DD	(R4) 5000 Ω	15 - 45 PF.	(C1) 15 - 45 PF.	1000 PF (MAX) (C41)

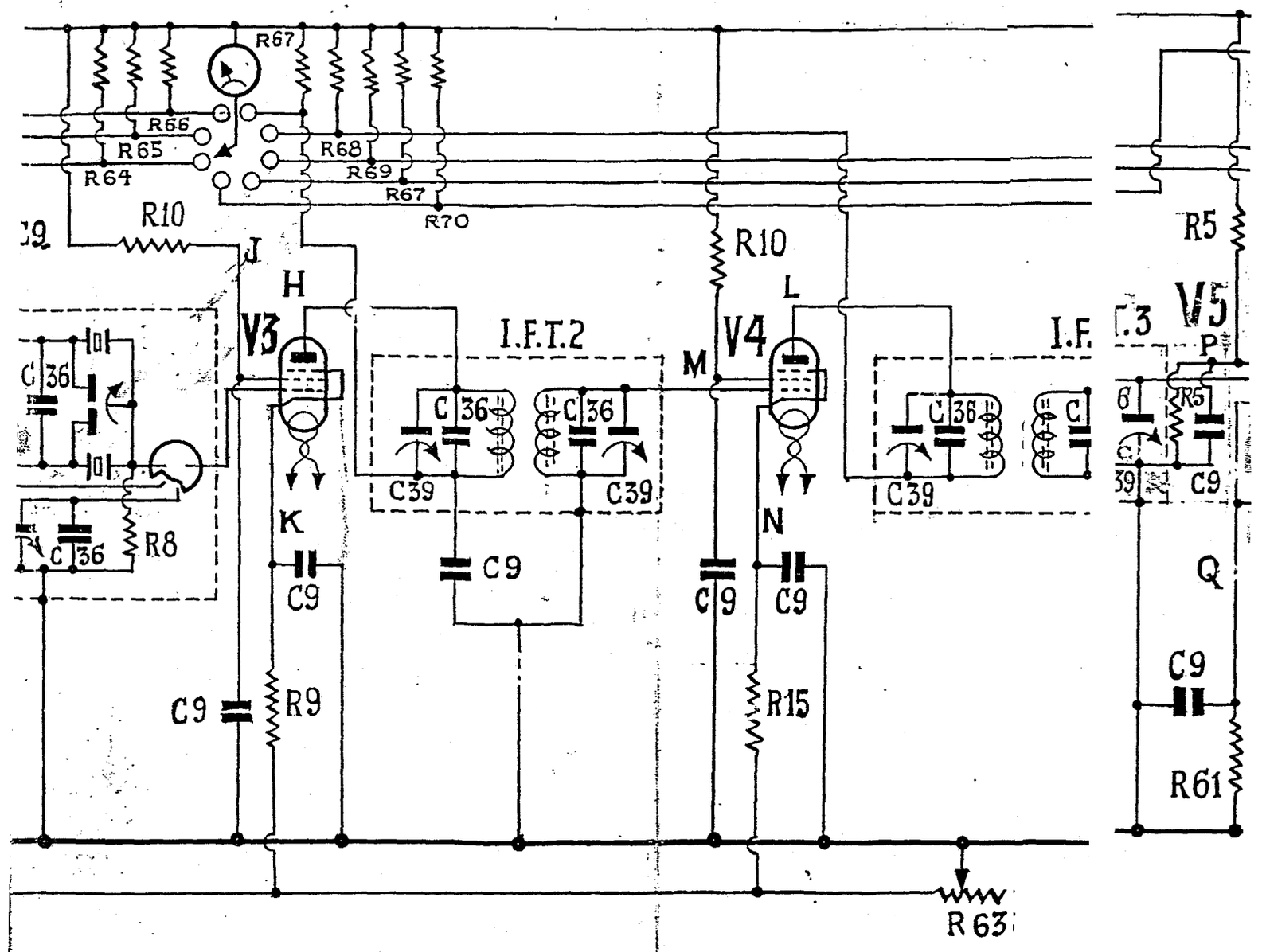
FOR COIL WINDING DETAILS SEE DRG. Nº D525.



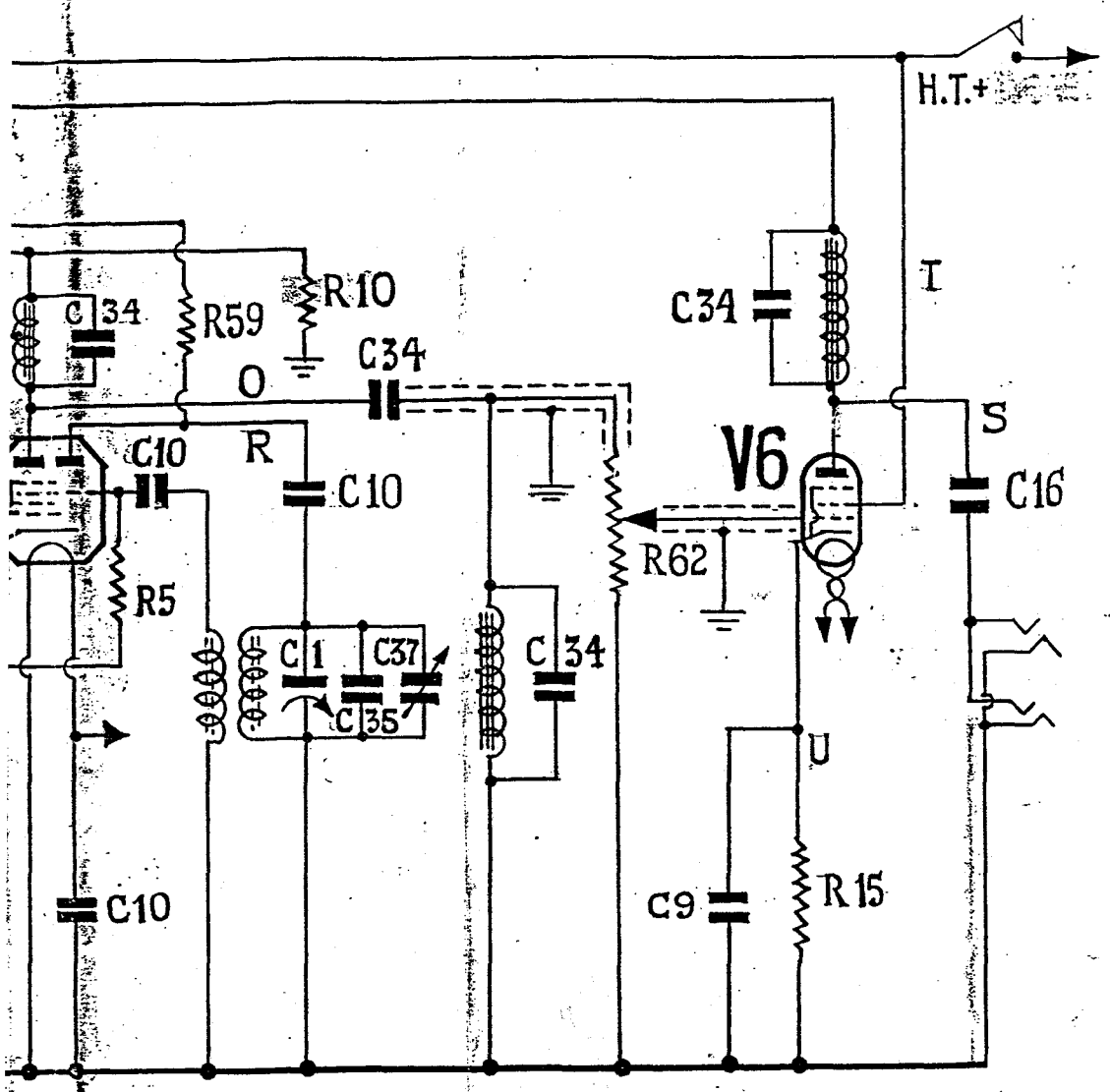
OSC. MIXER AERIAL



FOR VALUES OF CONDENSERS Cx, Cy, AND RESISTOR Rx. SEE COIL UNIT INFORMATION.


R67
R66
R65
R64
R68
R69
R67
R70
R10
J
H
V3
I.F.T.2
C 36
C39
C9
K
R8
R9
R10
L
V4
M
N
R15
R5
V5
P
Q
R61
R63

Rx 400B



BP 516

REVISIONS

1. V3 V4 - EF39.
2. V2 V5 - EF36.
V6 - 6V6GT.
No A.V.C.

STRATTON & CO. LTD.
BIRMINGHAM.
ENGLAND.

DRAWING No. BP 516	
DRAWN	F.
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