

EDDYSTONE MODEL 'S930'  
A.M./F.M. V.H.F. RECEIVER

INTRODUCTION

The EDDYSTONE Model 'S930' is a compact AM/FM single conversion superhet receiver covering any specified tuning range with a ratio of 1.2 : 1 in the band 50 - 130 Mc/s.

The receiver contains its own power supply for operation from all standard AC mains voltages and is provided with an internal loudspeaker for monitoring purposes. Telephones may be used when 'speaker reception is not convenient and a further output is available for connection to remote lines.

Automatic Frequency Control may be used during both AM or FM reception, the degree of AFC being adjustable by means of a panel control.

The ten valves used are all standard types and replacements are easily obtainable.

TECHNICAL INFORMATION

Frequency Coverage.

One range as selected, to an approximate ratio of 1.2 : 1 , between limits of 50 Mc/s and 130 Mc/s.

Intermediate Frequency.

10.7 Mc/s.

Valve Sequence.

A total of 10 valves are employed, their types and functions being given in the Table below.

Circuit Ref	Type	Circuit Function
V1	6AM6 (CV138)	RF Amplifier.
V2	6U8	Frequency Changer.
V3	6AM6 (CV138)	1st IF Amplifier.
V4	6AM6 (CV138)	2nd IF Amplifier.
V5	6AM6 (CV138)	FM Limiter, AM Detector and AGC Rectifier.
V6	6AL5 (CV140)	FM Discriminator.
V7	6AM6 (CV138)	AF Amplifier.
V8	6AM6 (CV138)	AF Output.
V9	6AM6 (CV138)	AFC.
V10	EZ41	HT Rectifier.

### Input and Output Impedances.

Aerial Input . . . . 75 ohms ( nominal ) unbalanced  
Line Output. . . . . 600 ohms (balanced or unbalanced)  
Telephone Output . . . . 2000 ohms (nominal)

### Power Supply.

100 - 120 volts or 200 - 250 volts AC ( 40-60 c/s )  
See Table on page 4 for mains transformer voltage adjustments.

### PERFORMANCE

#### AM Sensitivity.

12 microvolts for an output of 50 milliwatts with a signal modulated to a depth of 30% ( 400 c/s ), and a signal-to-noise ratio of 15dB.

#### FM Sensitivity.

With 22,5 kc/s deviation ( equivalent 30% mod ) at 1000 c/s, a 20dB signal-to-noise ratio is obtained with a signal of 7 microvolts.

Full limiting action ( 1 volt at grid of Limiter, V5 ) results with a signal input of 5 microvolts.

#### Selectivity.

300 kc/s at 6dB down.

#### Image Rejection.

Approximately 20dB at 80 Mc/s.

#### Deviation.

The FM Discriminator is designed to accept FM signals with deviations of up to 75 kc/s.

#### Audio Output and Response.

An output of 100 milliwatts is available at a low level of distortion, the maximum output being approximately 200 milliwatts.

Response is level within 6dB over the frequency range 100 - 10,000 c/s.

### CIRCUIT DESCRIPTION

The RF Section of the Model 'S930' comprises V1 and V2 which function as RF Amplifier and Frequency Changer respectively. AGC is shunt fed to V1 via R11 but no AGC is applied to the pentode Mixer. The cathode of V1 is returned to the slider of the potentiometer ( R13 ) so providing a means of manual RF gain control. R13 is a pre-set control located at the rear of the receiver.

The triode portion of V2 functions as the Local Oscillator using a standard ECO circuit. Associated with this stage is V9, the AFC valve which is controlled by the output from the Discriminator, V6. The frequency control system utilises a 'Ferrite' reactor connected across the Local Oscillator tuned circuit. The Discriminator remains in use when switched to AM so that AFC is available for either mode of reception. When not required, the AFC can be taken out of operation by means of the switch ganged to the AFC potentiometer, R32.

The 10.7 Mc/s IF output from the Mixer Stage is amplified by two high slope RF pentodes ( V3 and V4 ) which feed V5. Both stages operate with AGC, series fed via R19 and R21; no manual gain control is provided.

V5 functions as Limiter on FM and Detector on AM, the voltage developed across the lower part of the grid return ( R24 ) being used as AGC for V1, V3 and V4.

The IF output from V5 feeds the Foster-Seeley Discriminator, V6 whose audio output is taken to one side of the Signal Mode Switch. The other side of this switch picks up the audio from the Limiter grid ( R27 ) when switched to AM.

The audio is then fed via C45 to the AF Gain control R30, and thence to the AF Amplifier V7. This stage is resistance-capacity coupled to the triode AF Output Stage ( V8 ) feeding the internal loudspeaker and line output via T5 and the telephone output via C51. Insertion of the telephone jack disconnects the internal loudspeaker but does not interrupt the line output.

The power supply circuitry is conventional in all respects except perhaps the use of resistive smoothing in place of the more usual choke. The mains input is switched in both live and neutral poles.

## CONSTRUCTION

### General.

A diecast front panel is securely bolted to the main chassis, which is of brass. The outer cabinet is steel, easily detached by the removal of four screws. Chassis, panel and cabinet are finished durable grey enamel while the finger plate is black anodised aluminium. The chromium plated panel handles - besides their normal use in lifting the receiver - allow it to be placed 'face down' when carrying out maintenance.

### Dimensions and Weight.

Width . . . .	11.1/16" ( 28 cm )	Depth . . . .	8.3/16" ( 20.8 cm. )
Height . . . .	6.3/8" ( 15.7 cm )	Weight . . . .	13.5 lbs. ( 6.1 kg )

## INSTALLATION

Apart from adjustment of the mains transformer tapings, no special instructions are necessary for the installation of the Model 'S930' except

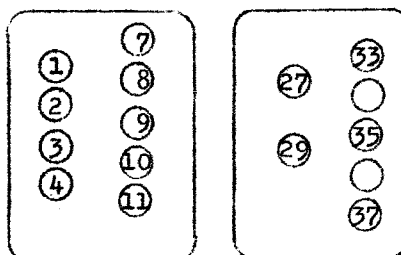
That the receiver should be mounted in a position conveniently located for operation and connection to the aerial, mains and remote lines ( if used ). A coaxial aerial plug is supplied with the receiver.

Mains Voltage Adjustment.

As despatched, the receiver is adjusted for operation from 240/250 volt AC mains supplies. For operation from other voltages the transformer tappings should be adjusted as shown in the Table below.

Voltage	Strap	Input to	Voltage	Strap	Input to
100	1 & 8	1 & 9	200	2 & 8	1 & 9
	2 & 9		210	3 & 8	1 & 9
110	1 & 8	1 & 10	220	4 & 8	1 & 9
	3 & 10		230	4 & 8	1 & 10
120	1 & 8	1 & 11	240/250	4 & 8	1 & 11
	4 & 11				

0V : 1  
 100V : 2  
 110V : 3  
 120V : 4  
 0V : 8  
 100V : 9  
 110V : 10  
 120V : 11



HT 250V : 33  
 CT : 35  
 HT 250V : 37

6.3V @ 3A : 27/29  
 Screen : 7

Underside view of Mains Transformer connections

NOTE: It is important that only windings of equal voltage ratings should be connected in parallel otherwise damage may result to the transformer.

OPERATION

First check that the AC mains supply is available to the receiver and that a suitable aerial for the frequencies to be tuned is connected to the aerial socket at the rear.

Switch on by rotating the volume control in a clockwise direction and set the Signal Mode Switch for the desired type of reception. The AFC should be placed at 'Off' by rotating the knob in an anti-clockwise direction.

The wanted signal is tuned in by means of the central control knob and the sensitivity may be varied by means of the PRE-SET RF Gain Control at the rear of the receiver.

The AFC may now be switched in and the receiver will follow the wanted signal should it drift. The degree of AFC used is dependent 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 amount of AFC must be reduced, in order that the receiver will not lock on the unwanted signal

If the monitor loudspeaker is not required, headphones may be connected to the jack socket in the front panel thus muting the internal speaker. This does not interrupt the 600 ohm output.

#### RE-ALIGNMENT

For complete re-alignment the following equipment is necessary:

A signal generator covering the range 10 - 130 Mc/s with AM and FM modulation facilities.

A centre-zero 50 - 0 - 50 microammeter.

A standard output meter matched to either 2.5/3 or 600 ohms.

An insulated screwdriver type trimming tool and a Phillips trimmer tool.

A crystal calibrator providing harmonic output in the range 50 to 130 Mc/s from fundamentals of 5 Mc/s and 1 Mc/s.

#### IF Alignment.

Unsolder the earthy end of R27 and connect the microammeter in series with this resistor and the earth tag. The output from the signal generator tuned to 10.7 Mc/s is connected between the grid of V4 and earth. A damping resistor of 1000 ohms is connected across the primary of T3 and the output from the signal generator increased until a deflection is obtained on the microammeter. The secondary core ( TOP ) is then adjusted for maximum deflection of the meter needle. With the damping resistor now connected across the secondary, adjust the primary core for maximum output.

If the output meter is now connected, a sensitivity of approximately 15 millivolts should be obtained for an output of 50 milliwatts.

The same procedure is repeated with the signal generator connected between the grid of V3 and earth taking care not to disturb the adjustment of T3. When T2 has been adjusted, the sensitivity for 50 milliwatts output should be of the order of 370 microvolts.

To complete the alignment of the 10.7 Mc/s IF amplifier, unsolder C9 at pin of V2, connect the signal generator between this pin and earth and align T1 as above. The sensitivity should now be approximately 7 microvolts.

#### Discriminator Alignment.

With the signal generator set to 10.7 Mc/s and with maximum output ( 1 volt ) connect the output lead to the Limiter grid ( V5 ). At the junction of R29 ( 68,000 ohms ) and the screened lead, connect the microammeter to earth.

If the Discriminator is correctly aligned there should be no reading

and moving the input frequency equal amounts either side of 10.7 Mc/s should produce equal deflection of the meter needle in each direction.

To re-align the Discriminator, set the secondary core ( TOP ) 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 is adjusted for a zero reading on the meter.

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 order of 30 microamps.

RF alignment.

Set the pointer to the HF end of the scale at the last numbered Mc/s ( say 120 Mc/s for a Model 'S930/1' ), chacking the frequency with the crystal calibrator, and feed in the signal generator at the aerial socket. C16 is then adjusted for maximum deflection of the microammeter ( connected between R27 and earth ) or maximum output as indicated by the output meter connected to the audio output points.

Repeat this procedure with pointer set at the low frequency end of the scale at the last numbered Mc/s ( 100 Mc/s, Model 'S930/1' ) and should there be an appreciable falling off in the output, a slight adjustment of the inductance is required. Repeat as necessary until good tracking is obtained.

Having completed this step, set the generator to the mid scale frequency, tune in the signal and adjust C10 and C2 for maximum signal.

An overall sensitivity check may now be carried out by referance to the sensitivity figures given earlier in this manual.

APPENDIX 'A'

VALVE BASE CONNECTIONS

Pin	Valve and Base Type			
	6AM6 ( B7G )	6U8 ( B9A )	6AL5 ( B7G )	EZ41 ( B8A )
1	G1	A <sub>t</sub>	K'	H
2	K	G1 <sub>p</sub>	A''	A'
3	H	G2 <sub>p</sub>	H	-
4	H	H	H	-
5	A	H	K''	-
6	G3,S	A <sub>p</sub>	S	A''
7	G2	K <sub>p</sub> , G3 <sub>p</sub> , S	-	K
8	-	K <sub>t</sub>	-	H
9	-	G1 <sub>t</sub>	-	-

APPENDIX 'B'

COMPONENT VALUES

Capacitors.

C1	50 pF Ceramic	C28	0.01 mfd Tub. Paper
C2	1-30 pF Trimmer	C29	0.01 mfd Tub. Paper
C3	2-19 pF ( part of gang )	C30	3000 pF Tub. Paper
C4	500 pF Tub. Paper	C31	0.01 mfd Tub. Paper
C5	500 pF Tub. Paper	C32	40 pF Silvered Mica
C6	500 pF Tub. Paper	C33	40 pF Silvered Mica
C7	500 pF Tub. Paper	C34	0.01 mfd Tubular Paper
C8	10 pF Ceramic	C35	50 pF Ceramic
C9	50 pF Ceramic	C36	0.01 mfd Tub. Paper
C10	1-30 pF Trimmer	C37	0.01 mfd Tub. Paper
C11	2-19 pF ( part of gang )	C38	3000 pF Tub. Paper
C12	3000 pF Tub. Paper	C39	100 pF Silvered Mica
C13	1 pF Silvered Mica	C40	50 pF Silvered Mica
C14	3000 pF Tub. Paper	C41	50 pF Ceramic
C15	50 pF Ceramic	C42	0.01 mfd Tub. Paper
C16	1-30 pF Trimmer	C43	100 pF Ceramic
C17	2-19 pF ( part of gang )	C44	100 pF Ceramic
C18	0.01 mfd Tub. Paper	C45	0.01 mfd Moulded Mica
C19	0.01 mfd Tub. Paper	C46	100 pF Ceramic
C20	3000 pF Tub. Paper	C47	0.1 mfd Tub. Paper
C21	40 pF Silvered Mica	C48	0.01 mfd Tub. Paper
C22	40 pF Silvered Mica	C49	30 mfd Tub. Electrolytic 15V DC
C23	40 pF Silvered Mica	C50	0.01 mfd Moulded Mica
C24	40 pF Silvered Mica	C51	0.01 mfd Moulded Mica
C25	0.01 mfd Tub. Paper	C52	32 + 32 mfd Tub. Electrolytic
C26	0.01 mfd Tub. Paper	C53/54	not applicable
C27	3000 pF Tub. Paper	C55	500 pF Tub. Paper

Resistors.

R1	2,200 ohm	R23	470,000 ohm
R2	2,200 ohm	R24	68,000 ohm
R3	4,700 ohm 2 watt	R25	100,000 ohm
R4	10,000 ohm	R26	22,000 ohm
R5	2,200 ohm	R27	100,000 ohm
R6	10,000 ohm	R28	22,000 ohm
R7	2,200 ohm	R29	68,000 ohm
R8	27,000 ohm	R30	0.5 Megohm Pot
R9	1 Megohm	R31	68,000 ohm
R10	270,000 ohm	R32	0.5 Megohm Pot
R11	270,000 ohm	R33	100,000 ohm
R12	150 ohm	R34	100,000 ohm ( nominal )
R13	10,000 ohm Pot	R35	100,000 ohm
R14	270,000 ohm	R36	100,000 ohm
R15	22,000 ohm	R37	2,200 ohm
R16	6,800 ohm	R38	470,000 ohm
R17	22,000 ohm	R39	330 ohm
R18	1,000 ohm	R40	4,700 ohm
R19	270,000 ohm	R41	47,000 ohm
R20	200 ohm	R42	500 ohm 2 watt wirewound
R21	270,000 ohm	R43	10,000 ohm
R22	200 ohm	R44	33,000 ohm

APPENDIX 'C'

VOLTAGE VALUES

The following Table gives voltages at various points in the circuit and will be of use during fault finding.

All voltages are quoted under no signal conditions and the 'letter reference' appears on the circuit diagram at the rear of the manual.

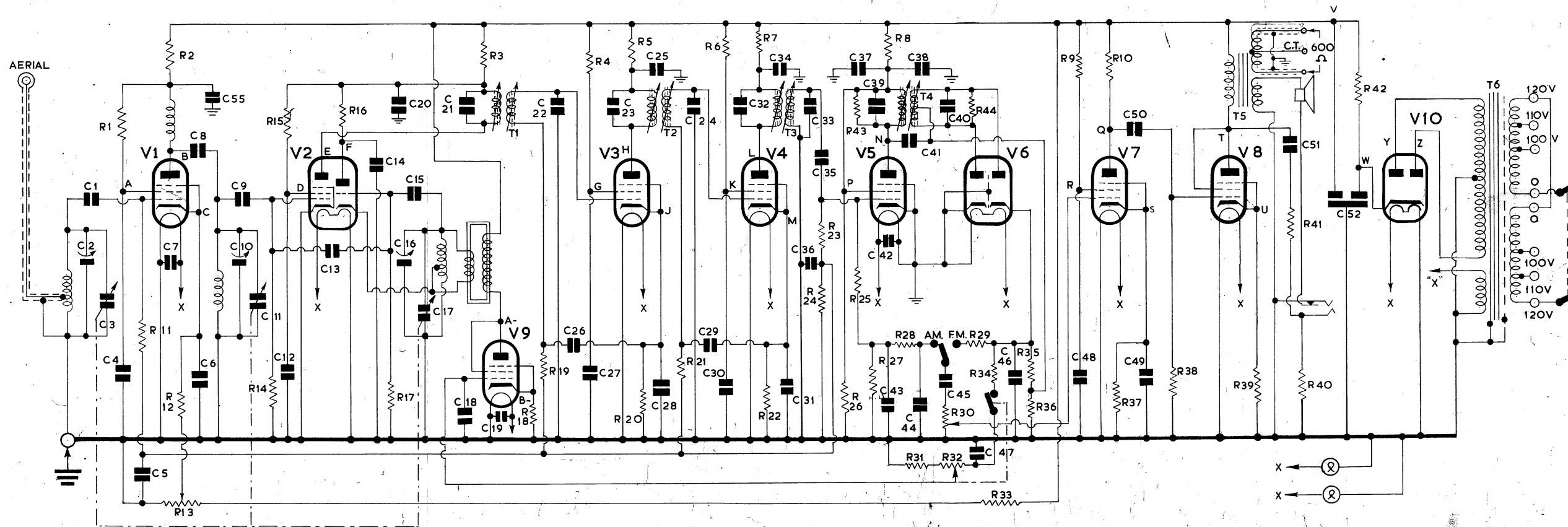
<u>Reference</u>	<u>AVO Model 8</u> ( 20,000 ohm/volt )	<u>AVO Model 40</u> ( 600 ohm/volt )
A . . . .	197	190
B . . . .	200	195
C . . . .	1.45	1.4
D . . . .	100	67
E . . . .	150	147
F . . . .	110	84
G . . . .	200	185
H . . . .	200	190
J . . . .	1.65	1
K . . . .	200	185
L . . . .	200	190
M . . . .	1.65	1.6
N . . . .	58	46
P . . . .	58	46
Q . . . .	90	10
R . . . .	87	9
S . . . .	1.6	0.9
T . . . .	221	219
U . . . .	0.9	0.36
V . . . .	222	220
W . . . .	248	246
Y . . . .	250 RMS	248 RMS
Z . . . .	250 RMS	248 RMS
A- . . . .	190	160
B- . . . .	2.3	2.0

HT Current Drain : 57 mA.

Input Volt.Amps : 48

J.A.B. 7/59/100





**V.H.F. RECEIVER "TYPE 930." BP 961.**