Supplement to The Wireless & Electrical Trader, Jan. 20, 1940.

"TRADER" SERVICE SHEET

446

COSSOR 73

AC SUPERHET

THE Cossor model 73 receiver is a 5-valve (plus valve rectifier) 3-band AC superhet, employing an RF stage preceding the frequency changer, and a triode output stage. 2-position selectivity switching is provided, and a tuning indicator is fitted.

The SW range is 16-49 m, and the receiver is suitable for use on 200-250 V. 40-100 C/S AC mains.

Release date: February, 1939.

CIRCUIT DESCRIPTION

Aerial input via series condenser **C1** and coupling coils **L1** (SW), **L2** (MW) and **L3** (LW) to single tuned circuits **L4, C34** (SW), **L5, C34** (MW) and **L6, C34** (LW) which precede variable-mu pentode RF amplifying valve **(V1, Cossor metallised MVS Pen).**

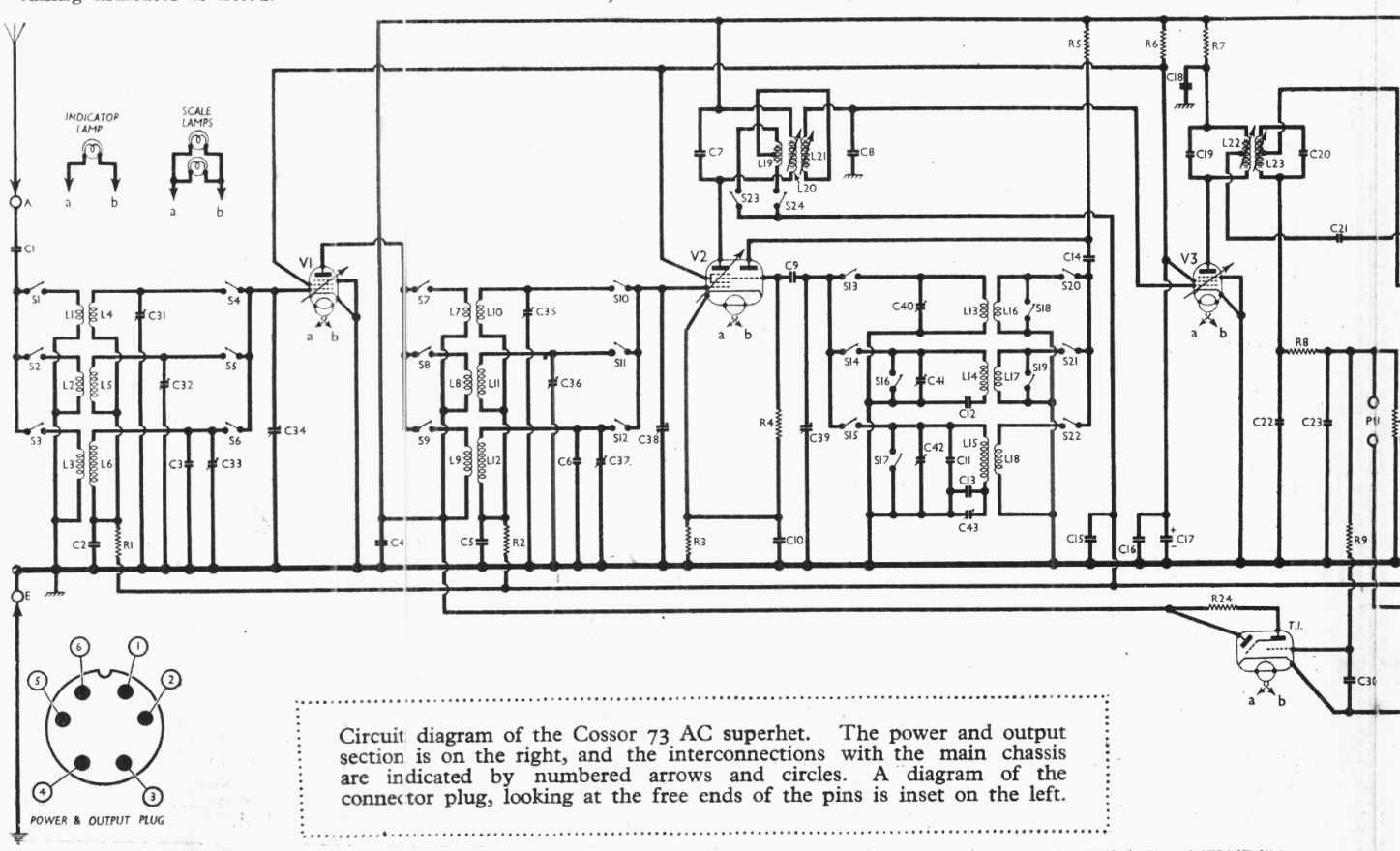
Tuned-secondary RF transformer coupling by **L7, L10, C38** (SW), **L8, L11, C38** (MW) and **L9, L12, C38** (LW) between **V1** and triode hexode valve **(V2, Cossor metallised 41STH** or **40THA)** which operates as frequency changer with internal coupling. Triode oscillator grid coils **L13** (SW), **L14** (MW) and **L15** (LW) are tuned by **C39;** parallel trimming by **C40** (SW), **C41,** (MW) and **C11, C42** (LW); series tracking by **C12** (MW) and **C13, C43** (LW). Reaction by coils **L16** (SW), **L17** (MW) and **L18** (LW).

Third valve **(V3, Cossor metallised MVS Pen B)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary iron-cored transformer couplings **C7, L20, L21, C8** and **C19, L22, L23, C20.**

The band-width to which the first IF transformer will respond is modified by the effect of the coil **L19,** to whose centre is connected the low-potential end of **L21.** Thus variable selectivity is attained by reversing the sense in which **L19** is connected, according to whether **S23** or **S24** is closed.

IF alignment is effected by adjustment of the transformer cores.

Intermediate Frequency 465 KC/S. Diode second detector is part of double diode triode valve **(V4, Cossor metallised DDT).** Audio frequency component in rectified output is developed across manual volume control **R10,** which also operates as load resistance, and passed via AF coupling condenser **C24** and grid stopper **R12** to CG of triode section, which operates as AF amplifier. IF filtering by **C22, R8** and **C23.** Provision for connection of gramophone pick-up across **R10.** Variable tone control by **C25, R16** in triode anode circuit.



Circuit diagram of the Cossor 73 AC superhet. The power and output section is on the right, and the interconnections with the main chassis are indicated by numbered arrows and circles. A diagram of the connector plug, looking at the free ends of the pins is inset on the left.

Control potential for cathode ray tuning indicator **(T.I., Cossor 41ME)** is obtained from junction of **R8** and **R10** and fed via decoupling circuit **R9, C30** to T.I. CG.

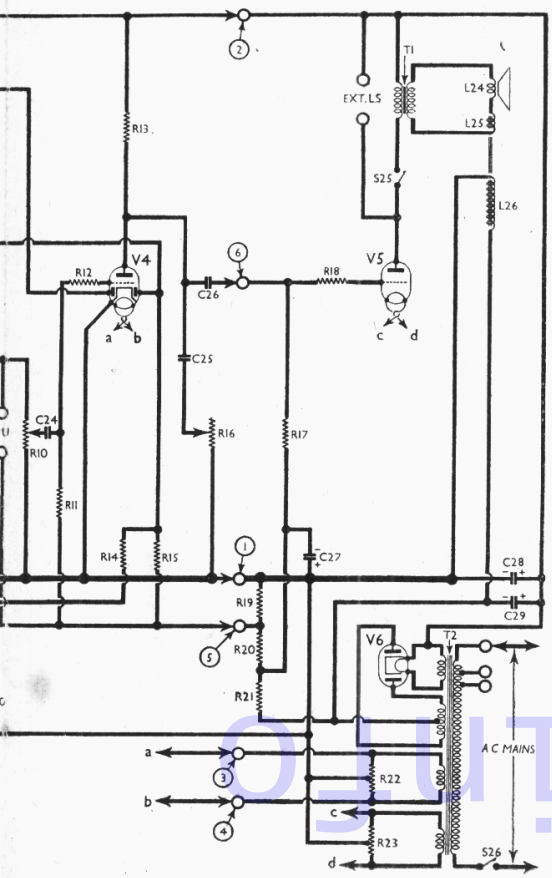
Second diode of **V4**, fed from tapping on **L22** via **C21,** provides DC potential which is developed across load resistance **R15** and fed back through decoupling circuits as GB to RF, FC and IF valves, giving automatic volume control.

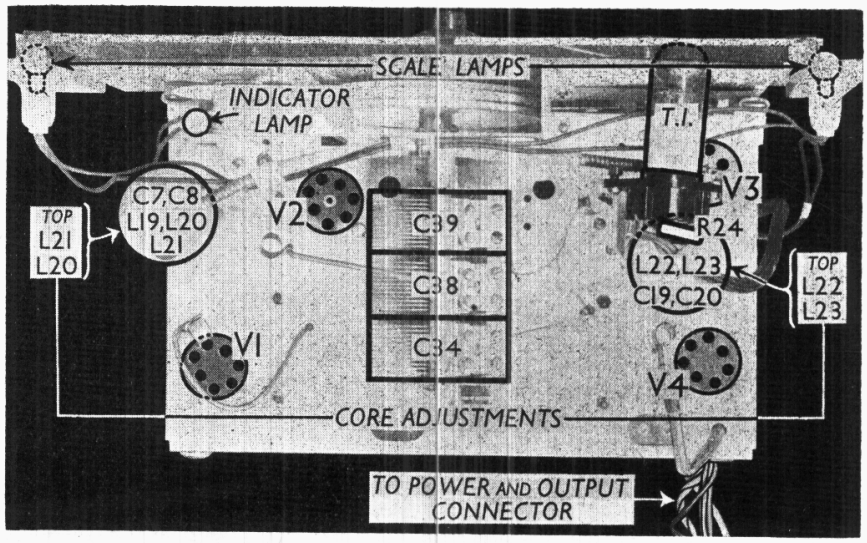
Resistance-capacity coupling by **R13, C26** and **R17,** via grid stopper **R18,** between **V4** triode and directly heated triode output valve **(V5, Cossor 2XP).** Provision for connection of high impedance external speaker between **V5** anode and HT positive line. Switch **S25** between internal speaker input transformer **T1** primary and **V5** anode permits internal speaker to be muted.

It should be noted that, when **S25** is open, HT current to **V5** must flow via the external speaker circuit.

HT current is supplied by IHC full-wave rectifying valve **(V6, Cossor 431U).** Smoothing by speaker field **L26** which is connected in HT negative lead to chassis, and electrolytic condensers **C28, C29.**

Fixed GB potential for **V1, V2** and **V3,** GB potentials for **V4** triode and **V5,** and AVC delay potential are obtained automatically from potential divider comprising resistances **R19, R20** and **R21** which are connected across **L26.**





Plan view of the main chassis. **R24** is associated with the T.I. holder. The core adjustments of the two IF transformers are indicated. Each unit also contains two fixed trimmer condensers.

DISMANTLING THE SET

Removing Chassis.—The receiver comprises two chassis units: the main receiver chassis and the power and output unit. Both are independently mounted.

To remove the main chassis, first remove the four control knobs (recessed screws) and withdraw the interconnecting plug from the power and output unit.

Now remove the four small round-head wood screws holding the scale assembly to the front of the cabinet, and then, while supporting the chassis from the rear with one hand, with the other remove the two cheese-head screws (with metal washers) holding the wooden batten against the rear of the chassis.

When this batten is thus removed, the chassis is free to be withdrawn, and care must be taken to see that it does not fall.

When replacing, see that the chassis supporting pegs inside the front of the cabinet, and those on the batten at the rear, are located in the rubber grommets provided for them in the chassis.

Also note that a large rubber washer is fitted at each end of the batten, between it and its brackets.

Removing Power and Output Unit.—Withdraw the interconnecting plug from the side of the unit, disconnect from the terminal strip on the speaker transformer the four leads connecting the unit to the speaker, and remove the fixing nut from the toggle switch at the side of the cabinet.

Now remove the four screws (with large metal and rubber washers) holding the unit to the bottom of the cabinet, when the unit is free to be withdrawn.

When replacing, two large rubber washers should be fitted to each fixing bolt, one going on either side of the bottom of the cabinet. A ninth rubber washer is clamped under the edge of the front member of the unit, upon a wooden supporting block.

The four leads should be connected to the terminal strip on the speaker transformer in the following order, numbering from left to right: 1, blue; 2, red; 3, yellow; 4, black.

Removing Speaker.—Loosen the four clamping nuts and swivel the clamps out of the way.

When replacing, the transformer should be at the bottom.

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Aerial series condenser ...	0·0005
C2	V1 CG decoupling	0·05
C3	Aerial LW fixed trimmer ...	0·000015
C4	HT circuit RF by-pass ...	0·1
C5	V2 hexode CG decoupling...	0·05
C6	RF trans. LW fixed trimmer	0·000015
C7	1st IF transformer tuning condensers	0·000225
C8		0·000225
C9	V2 osc. CG condenser ...	0·0001
C10	V2 cathode by-pass... ...	0·1
C11	Osc. circ. LW fixed trimmer	0·00004
C12	Osc. circuit MW tracker ...	0·00057
C13	Osc. circ. LW fixed tracker	0·00012
C14	V1 osc. anode coupling ...	0·0002
C15	V3 CG decoupling	0·05
C16	V1, V2, V3 SG's decoupling condensers	0·1
C17*		2·0
C18	V3 anode decoupling ...	0·1
C19	2nd IF transformer tuning condensers	0·00006
C20		0·000075
C21	Coupling to V4 AVC diode	0·00005
C22	IF by-pass condensers ...	0·00005
C23		0·00005
C24	AF coupling to V4 triode ...	0·1
C25	Part variable tone control	0·03
C26	V3 triode to V4 AF coupling	0·01
C27*	V5 CG decoupling	10·0
C28*	HT smoothing condensers	16·0
C29*		16·0
C30	T.I. CG decoupling	0·01
C31‡	Aerial circuit SW trimmer	—
C32‡	Aerial circuit MW trimmer	—
C33‡	Aerial circuit LW trimmer	—
C34†	Aerial circuit tuning	—
C35‡	RF trans. sec. SW trimmer	—
C36‡	RF trans. sec. MW trimmer	—
C37‡	RF trans. sec. LW trimmer	—
C38†	RF trans. sec. tuning ...	—
C39†	Oscillator circuit tuning ...	—
C40‡	Osc. circuit SW trimmer ...	—
C41‡	Osc. circuit MW trimmer ...	—
C42‡	Osc. circuit LW trimmer ...	—
C43‡	Osc. circuit LW tracker ...	—

* Electrolytic. † Variable. ‡ Pre-Set.

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	RESISTANCES	Values (ohms)
R1	V1 CG decoupling	500,000
R2	V2 hexode CG decoupling...	500,000
R3	V2 fixed GB resistance ...	300
R4	V2 osc. CG resistance ...	25,000
R5	V2 osc. anode HT feed ...	30,000
R6	V1, V2, V3 SG's HT feed ...	15,000
R7	V3 anode HT feed	5,000
R8	IF stopper	50,000
R9	T.I. CG decoupling	2,000,000
R10	Manual volume control; V4 signal diode load	500,000
R11	V4 triode CG resistance ...	2,000,000
R12	V4 triode grid stopper ...	100,000
R13	V4 triode anode load ...	50,000
R14	AVC line decoupling ...	2,000,000
R15	V4 AVC diode load	1,000,000
R16	Variable tone control ...	100,000
R17	V5 CG resistance	500,000
R18	V5 grid stopper	100,000
R19	V1, V2, V3 fixed GB; V4,	20,000
R20	V5 GB; and AVC delay	300,000
R21	potential divider	750,000
R22	V1-V4 heater pot., total ...	25*
R23	V5 heater pot., total ...	25*
R24	T.I. anode HT feed	2,000,000

* Centre-tapped.

	OTHER COMPONENTS		Approx Values (ohms)
L1	Aerial SW coupling coil ...		1·0
L2	Aerial MW coupling coil ...		16·0
L3	Aerial LW coupling coil ...		115·0
L4	Aerial SW tuning coil ...		very low
L5	Aerial MW tuning coil ...		2·7
L6	Aerial LW tuning coil ...		36·0
L7	RF trans. SW pri.		0·5
L8	RF trans. MW pri.		5·0
L9	RF trans. LW pri.		13·0
L10	RF trans. SW sec.		very low
L11	RF trans. MW sec.		2·7
L12	RF trans. LW sec.		31·0
L13	Osc. circuit SW tuning ...		very low
L14	Osc. circuit MW tuning ...		3·6
L15	Osc. circuit LW tuning ...		9·4
L16	Oscillator SW reaction ...		0·5
L17	Oscillator MW reaction ...		1·7
L18	Oscillator LW reaction ...		3·2
L19	Variable selectivity coil, total		0·2
L20	1st IF trans.	Pri.	3·5
L21		Sec.	3·5
L22	2nd IF trans.	Pri.	18·0
L23		Sec.	18·0
L24	Speaker speech coil		4·5
L25	Hum neutralising coil ...		0·4
L26	Speaker field coil		1,250·0
T1	Speaker input trans.	Pri. ...	320·0
		Sec. ...	0·6
T2	Mains trans.	Pri. total ...	29·0
		V1-V4 heat sec....	0·05
		V5 heater sec. ...	0·05
		Rect. heat. sec....	0·1
		HT sec., total ...	250·0
S1-S22	Waveband switches		—
S23, S24	Variable selectivity switches, ganged R16		—
S25	Internal speaker switch ...		—
S26	Mains switch		—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on AC mains of 235 V, using the 240 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of the model 7 Universal Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 MVS Pen	232	5·4	102	2·0
V2 41 STH	232	1·9	102	3·8
	Oscillator 66	4·7		
V3 MVS Pen B	194	6·6	102	2·2
V4 DDT	115	2·3	—	—
V5 2XP	211	56·0	—	—
V6 43 IU	315†	—	—	—
T.I. 41 ME	21	0·12	—	—
	Target 232	0·45		

† Each anode, AC.

GENERAL NOTES

Switches.—S1-S22 are the waveband switches, in three rotary units beneath the chassis. They are indicated in our under-chassis view, and shown in detail in the diagrams in col. 3, where they are drawn as seen looking from the rear of the underside of the chassis. The table (col. 3) gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C**, closed.

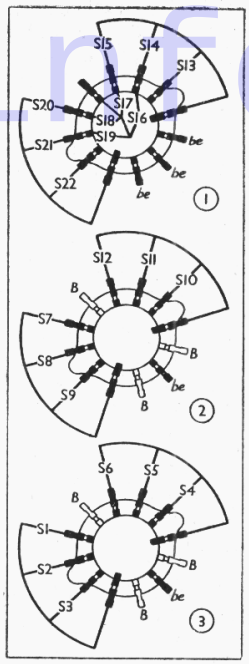
S23, S24 are the variable selectivity switches, ganged with the tone control **R16.** They are of the QMB type, and have a common tag (which is connected to **C15**). The other two tags are the other connections of the two switches, and have leads running into the first IF unit. One of the switches closes when the tone control knob is turned fully clockwise (minimum selectivity) while the other closes when the knob is turned anti-clockwise.

S25 is the internal speaker switch, associated with one of the external speaker sockets in the power and output unit. When an external speaker is fully plugged in, **S25** opens and mutes the internal speaker.

S26 is the QMB main switch, mounted at the side of the cabinet, and shown in our underneath view of the power and output unit.

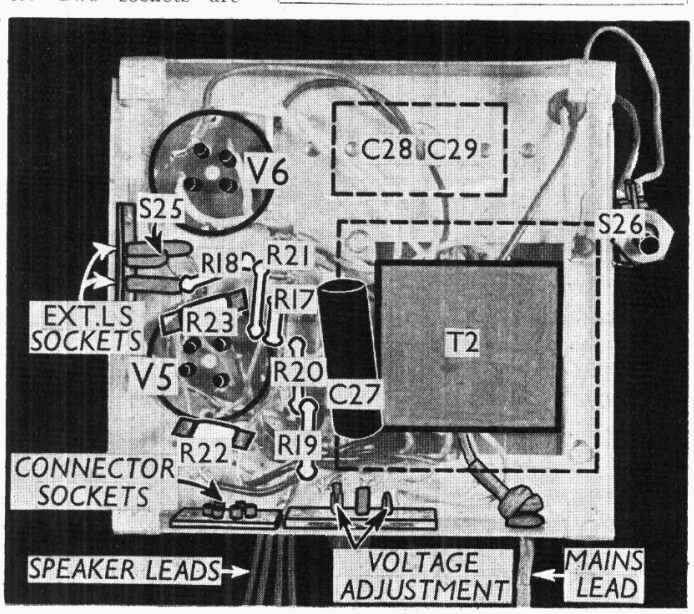
Coils.—L1-L18 are in pairs in nine unscreened tubular units beneath the chassis. They are all indicated in our under-chassis view. The IF transformers **L19-L21** and **L22, L23** are in two screened units on the chassis deck. These units also contain their associated fixed trimmers. The positions of the core adjustments are indicated in our plan chassis view.

External Speaker.—Two sockets are

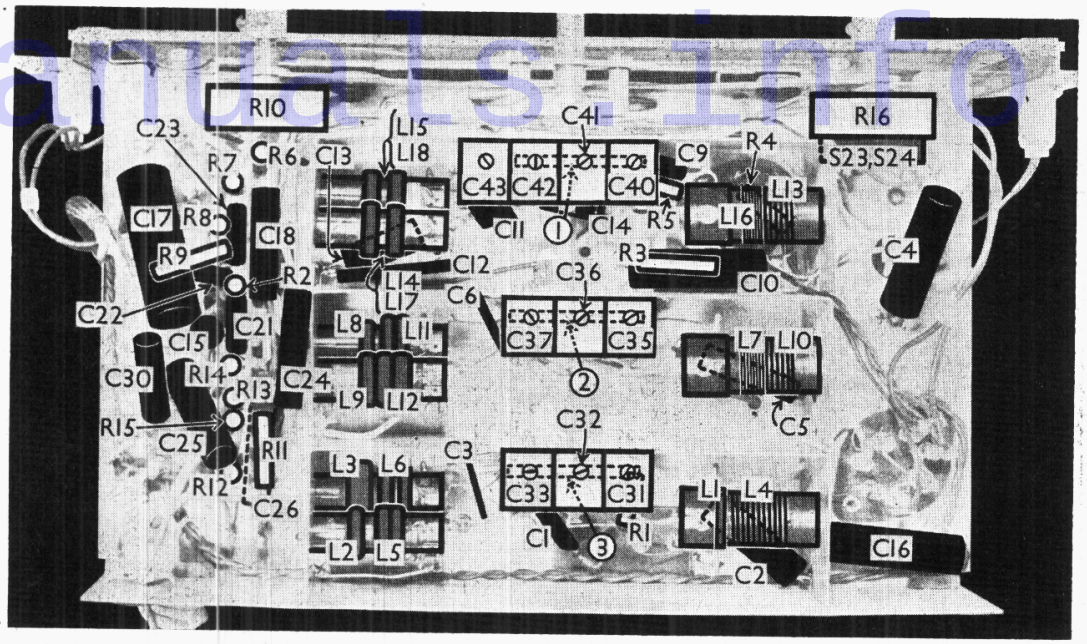


Diagrams of the three wavechange switch units, as seen looking from the rear of the underside of the chassis. Note the blank (B) and bearer (be) tags. Below is the switch table.

Switch	SW	MW	LW
S1	C	—	—
S2	—	C	—
S3	—	—	C
S4	C	—	—
S5	—	C	—
S6	—	—	C
S7	C	—	—
S8	—	C	—
S9	—	—	C
S10	C	—	—
S11	—	C	—
S12	—	—	C
S13	C	—	—
S14	—	C	—
S15	—	—	C
S16	C	—	—
S17	C	C	—
S18	—	C	C
S19	—	—	C
S20	C	—	—
S21	—	C	—
S22	—	—	C



Underneath view of the power and output unit. **C28** and **C29** are mounted on its deck. **R22** and **R23** are centre-tapped wire-wound resistors. **S25** is associated with one of the external speaker sockets, while **S26** is normally mounted on the side of the cabinet.



Underneath view of the main chassis. The three wavechange switch units are indicated beneath the banks of trimmers, and are shown in detail in column 3 on the left. **S23, S24** are QMB selectivity switches ganged with **R16.**

provided on the side of the power and output unit for a high impedance (3,000 Ω) external speaker. If the plug is pushed fully home, **S25** opens and mutes the internal speaker.

Scale and Indicator Lamps.—These are three Osram M.E.S. types, rated at 6.5V, 0.3A, and having small clear bulbs.

Condensers C28, C29.—These are two 16μF dry electrolytics in a single carton on the deck of the power and output unit, having a common positive (red) lead. The black lead is the negative of **C28**, and the blue lead is the negative of **C29**.

Chassis Interconnections.—The main chassis is connected to the power and output unit by a 6-pin plug and socket. A diagram of the plug, looking at the free ends of the pins is beneath the circuit diagram. The pins are numbered to agree with the corresponding arrows and circles in the circuit diagram. The coding of the leads to the plug is: 1, black; 2, yellow; 3, yellow systoflex; 4, yellow systoflex; 5, blue; 6, red.

Resistances R22, R23.—These are two centre-tapped wire-wound resistors located in the power and output unit.

Valve V5.—Note that the 2XP triode output valve is directly-heated, and is run from a separate winding on **T2.**

Condenser C27.—The *positive* side of this electrolytic is connected to chassis.

CIRCUIT ALIGNMENT

IF Stages.—A Cossor ganging oscillator and double-beam oscilloscope are recommended. Switch set to MW, turn tone control anti-clockwise until selectivity switch operates and set volume control to minimum (maximum if alignment is carried out with an ordinary signal generator and output meter). To connect up the oscilloscope, connect amplifier terminal for one Y plate to the junction of **R14, R15** and the terminal for the other Y plate to the junction of **R8, R9, R10.** A 2MO resistance can be connected in series with either lead to act as an RF stopper if necessary.

Connect ganging oscillator (465 KC/S) via a 0.01μF condenser to control grid (top cap) of **V3,** and chassis, leaving existing connection in place. De-tune **L22,** and align **L23** for maximum output. Then adjust **L22** until the middle points of the two curves coincide, and the peaks of the primary are symmetrical.

Transfer ganging oscillator to control grid (top cap) of **V2,** and adjust **L20** and **L21** so that the curves coincide with the position on the screen of the **L22, L23** curves.

When the tone control is turned fully clockwise so that the selectivity switches operate, the secondary curve should have a reasonably flat top, and the primary a wide peaked curve whose trough should coincide with the middle of the secondary curve, and should have symmetrical peaks.

If no oscilloscope is available, the usual method of alignment should be followed, attempting to secure a flat topped response curve.

RF and Oscillator Stages.—An ordinary signal generator can be used for this, connecting it to the **A** and **E** sockets; via a suitable dummy aerial. With gang at maximum, pointer should cover sloping lines at right hand ends of scales. Tone control should be turned anti-clockwise.

MW.—Switch set to MW, and tune to 214 m on scale. Feed in a 214 m (1,400 KC/S) signal, and adjust **C41, C36** and **C32** for maximum output.

LW.—Switch set to LW, tune to 1,200m on scale, feed in a 1,200 m (250 KC/S) signal and adjust **C42, C37** and **C33** for maximum output. Feed in a 1,875m (160 KC/S) signal, tune it in, and adjust **C43** for maximum output, while rocking the gang for optimum results.

SW.—Switch set to SW, tune to 18 MC/S on scale, feed in an 18 MC/S (16.67m) signal and adjust **C40** for maximum output, using the peak involving the lesser trimmer capacity. Then adjust **C35** and **C31** for maximum output. Re-check all these settings.

Cossor Oscilloscope Manual

THE Cossor model 3,339 double-beam oscilloscope created a good deal of interest in technical circles when it was introduced over a year ago, and Cossor have now introduced a 36-page instruction manual for use with it.

The manual sets out to describe the features of the instrument and the methods of obtaining various indications on it. A full list of the applications of the instrument is given, but one is not told in detail how to set it up for these applications. In other words, the instructions, though given in detail, are general ones, and it is left to the user to apply the instrument to his particular requirements.

After giving an extensive list of applications of the instrument, the book contains a description of its construction, with illustrations and a circuit diagram. This is followed by some notes on general operation occupying over eight pages. Full details as to the amplifiers, with response curves under various conditions, are included. Under wide-band conditions the drop in gain at 3 MC/S is only 4 or 5dB, while at 2 MC/S it is only 2 or 3dB.

The next section of the book deals with supplementary operational instructions, explaining, among other things, the theory of the time-base used, the significance of the input impedance of the instrument, and the various re-arrangements of the circuits which can be carried out for different investigations.

Eight pages are then devoted to photography, and cover this subject in an exhaustive manner. The book concludes with abridged instructions for quick reference, and a very complete general specification giving all the data on performance which may be needed.

The book is supplied free with the instrument, but those interested may obtain a copy, price 1s. 6d. net, from A. C. Cossor, Ltd.

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