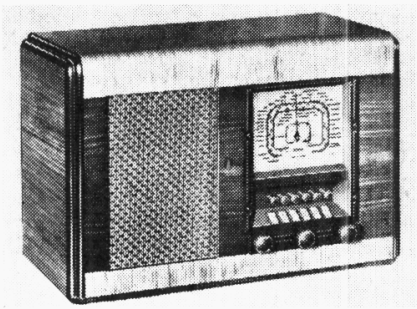
Supplement to The Wireless & Electrical Trader, April 13, 1940

"TRADER" SERVICE SHEET 460

COSSOR 33

3-BAND BATTERY SUPERHET



THE Cossor 33 is a 3-band battery superhet employing four valves, and fitted with a mechanical press-button system for six stations.

The SW range is 16.5 to 50m and there is provision for an external speaker (with internal speaker muting).

Release date: May, 1939.

CIRCUIT DESCRIPTION

Aerial input via IF rejector circuit **L1, C1**, series condenser **C2** and coupling coils **L2** (SW), **L3** (MW) and **L4** (LW), with additional top coupling by **C3** on MW, to single tuned circuits **L5, C32** (SW), **L6, C32** (MW) and **L7, C32** (LW).

First valve **(V1, Cossor metallised 220TH)** is a triode heptode operating as frequency changer with internal coupling. Triode oscillator grid coils **L8** (SW), **L9** (MW) and **L10** (LW) are tuned by **C33**; parallel trimming by **C34** (SW), **C35** (MW) and **C9, C36** (LW); series tracking by **C10** (MW) and **C11, C37** (LW). Reaction by anode coils **L11** (SW), **L12** (MW) and **L13** (LW).

Second valve **(V2, Cossor metallised 210VPA)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary iron-cored transformer couplings **C6, L14, L15, C7** and **C15, L16, L17, C16**, in which the tuning condensers are fixed and alignment is carried out by adjustment of the core positions.

Intermediate frequency 465KC/S.

Diode second detector is part of double diode triode valve **(V3, Cossor metallised 210DDT)**. Audio frequency component in rectified output is developed across manual volume control **R9**, which also operates as load resistance, and passed via AF coupling condenser **C20** and CG resistance **R10** to CG of triode section, which operates as AF amplifier.

IF filtering in diode circuit by **C18, R8** and **C19**, and in triode anode circuit by **C21**.

Second diode of **V3**, fed from **V2** anode via **C17**, provides DC potential which is developed across load resistance **R12** and fed back through decoupling circuits as GB to FC (except on SW) and IF valves, giving automatic volume control.

Resistance-capacity coupling by **R11, C22** and **R14**, via grid stopper **R15**, between **V3** triode and tetrode output valve **(V4, Cossor 220 OT** or **220HPT)**. Variable tone control in control grid circuit by **R13, C23** across **R14**. Fixed tone correction in anode circuit by **C24, R16, C25**.

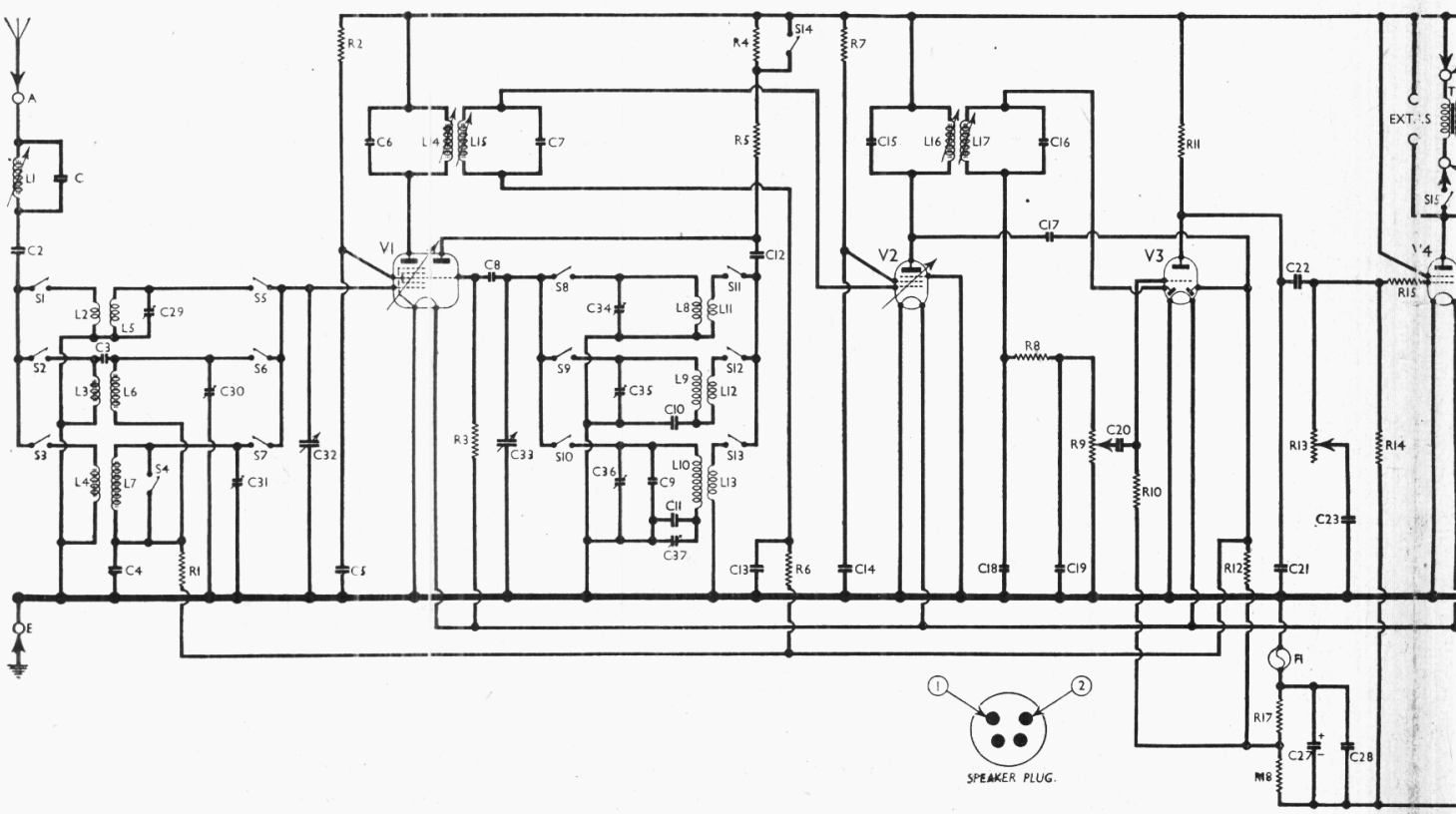
Fixed GB potential for **V1** and **V2**, GB potentials for **V3** triode and **V4**, and AVC delay voltage are obtained automatically from drop along resistances **R17, R18**, which form a potential divider in negative HT lead to chassis.

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (recessed screws) and the six press-button knobs (pull-off) from the front of the cabinet;

remove the tuning knob (two recessed screws) and the switch knob (screw inside cabinet) from the side of the cabinet;

remove the two wood screws holding the pear-shaped escutcheon to the side of the cabinet;



withdraw the speaker connecting plug;
remove the two wood screws (with metal washers and rubber grommets) holding the top of the scale assembly to the front of the cabinet;
remove the four bolts (with large metal washers) holding the chassis to the bottom of the cabinet.

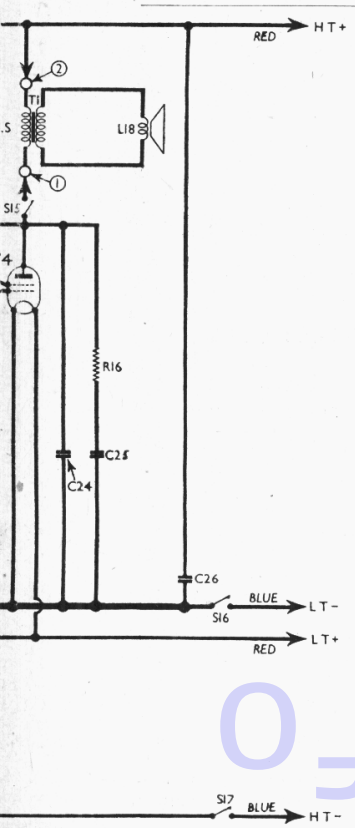
When replacing, use the short bronzed wood screws to fix the pear-shaped escutcheon, and replace the felt washer between the switch knob and the cabinet.

Removing speaker.—Withdraw the connecting plug from the socket on the transformer;
loosen the four clamp nuts and swivel the clamps holding the speaker to the sub-baffle.

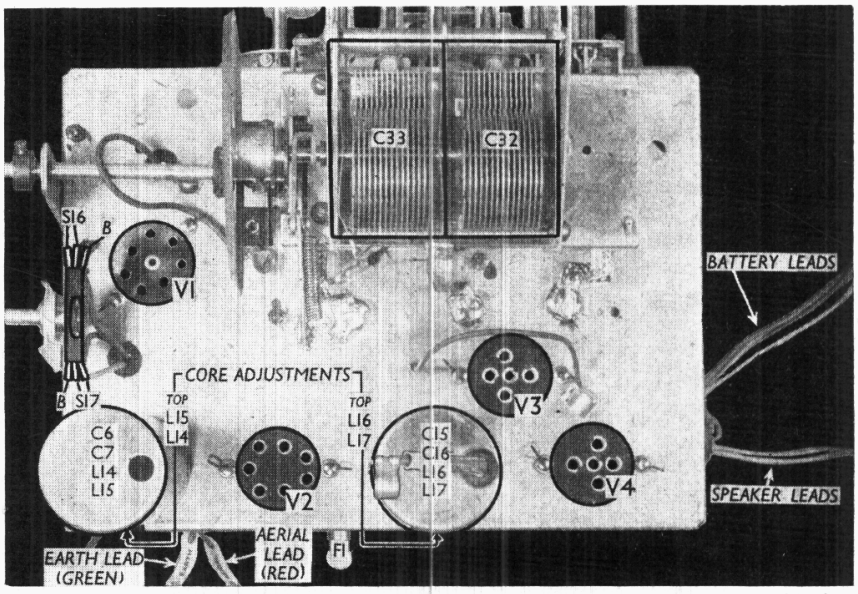
When replacing, the transformer should be at the bottom.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 heptode CG decoupling...	3,000,000
R2	V1 SG HT feed	70,000
R3	V1 osc. CG resistance ...	25,000
R4	V1 osc. anode HT feed resistances	50,000
R5		20,000
R6	V2 CG decoupling	3,000,000
R7	V2 SG HT feed	100,000
R8	IF stopper	50,000
R9	Manual volume control; V3 signal diode load	500,000
R10	V3 triode CG resistance ...	2,000,000
R11	V3 triode anode load... ...	100,000
R12	V3 AVC diode load	2,000,000
R13	Variable tone control ...	250,000
R14	V4 CG resistance	1,000,000
R15	V4 grid stopper	100,000
R16	Part of fixed tone corrector	25,000
R17	V1,V2 fixed GB,V3 triode GB	150
R18	V4 GB and AVC delay pot.	250



Circuit diagram of the Cossor 33 3-band battery superhet. The automatic tuning device, being purely mechanical, does not enter into the circuit. Note the position of the fuse (between chassis and **R17**). A diagram of the speaker plug, viewed from the free ends of the pins, is inset



Plan view of the chassis, showing the IF core adjustments and the battery circuit switches

	CONDENSERS	Values (μF)
C1	Aerial IF rejector tuning ...	0·000225
C2	Aerial series condenser ..	0·0005
C3	Aerial MW "top" coupling	0·00001
C4	V1 heptode CG decoupling	0·05
C5	V1 SG decoupling	0·05
C6	1st IF transformer tuning condensers	0·000053
C7		0·000058
C8	V1 osc. CG condenser ...	0·00005
C9	Osc. circ. LW fixed trimmer	0·00005
C10	Osc. circuit MW tracker ...	0·000468
C11	Osc. circ. LW fixed tracker	0·00014
C12	V1 osc. anode coupling ...	0·0005
C13	V2 CG decoupling	0·05
C14	V2 SG decoupling	0·1
C15	2nd IF transformer tuning condensers	0·000045
C16		0·000065
C17	Coupling to V3 AVC diode	0·00005
C18	IF by-pass condensers ...	0·00005
C19		0·00005
C20	AF coupling to V3 triode ...	0·05
C21	IF by-pass	0·0002
C22	V3 triode to V4 AF coupling	0·01
C23	Part of variable tone control	0·01
C24	Parts of fixed tone corrector	0·001
C25		0·002
C26	HT reservoir condenser ...	2·0
C27*	Auto GB circuit by-pass condensers	20·0
C28		0·1
C29‡	Aerial circuit SW trimmer	—
C30‡	Aerial circuit MW trimmer	—
C31‡	Aerial circuit LW trimmer	—
C32†	Aerial circuit tuning ...	—
C33†	Oscillator circuit tuning ...	—
C34‡	Osc. circuit SW trimmer ...	—
C35‡	Osc. circuit MW trimmer ...	—
C36‡	Osc. circuit LW trimmer ...	—
C37‡	Osc. circuit LW tracker ...	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial IF rejector coil ...	4·0
L2	Aerial SW coupling coil ...	0·4
L3	Aerial MW coupling coil ..	24·0
L4	Aerial LW coupling coil ...	130·0
L5	Aerial SW tuning coil ...	Very low
L6	Aerial MW tuning coil ...	2·0
L7	Aerial LW tuning coil ...	16·0
L8	Osc. circuit SW tuning coil	Very low
L9	Osc. circuit MW tuning coil	5·5
L10	Osc. circuit LW tuning coil	13·5
L11	Oscillator SW reaction ...	0·3
L12	Oscillator MW reaction ...	2·0
L13	Oscillator LW reaction ...	6·25
L14	1st IF trans. Pri.	7·5
L15	1st IF trans. Sec.	7·5
L16	2nd IF trans. Pri.	18·0
L17	2nd IF trans. Sec.	16·0

	OTHER COMPONENTS (*continued*)	Approx. Values (ohms)
L18	Speaker speech coil ...	2·0
T1	Speaker input trans. Pri. ...	1,100·0
	Speaker input trans. Sec. ...	0·2
S1–S14	Waveband switches ...	—
S15	Speaker muting switch ...	—
S16	LT circuit switch	—
S17	HT circuit switch	—
F1	HT circuit fuse	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with a new HT battery reading 120V on load. 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 400V scale of a model 7 Universal Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 220 TH	115 Oscillator 23	0·3 1·3	60	0·6
V2 210 VPA	115	1·6	56	0·6
V3 210 DDT	74	0·2	—	—
V4 220 OT	107	5·0	115	1·3

GENERAL NOTES

Switches.—S1—S14 are the waveband switches, in two rotary units beneath the chassis. These are indicated in our under-chassis view, and shown in detail in the diagrams overleaf, where they are drawn as seen looking from the front of the underside of the chassis. The table overleaf gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C**, closed.

S15 is the internal speaker muting switch, associated with one of the external speaker sockets. On fully insert-

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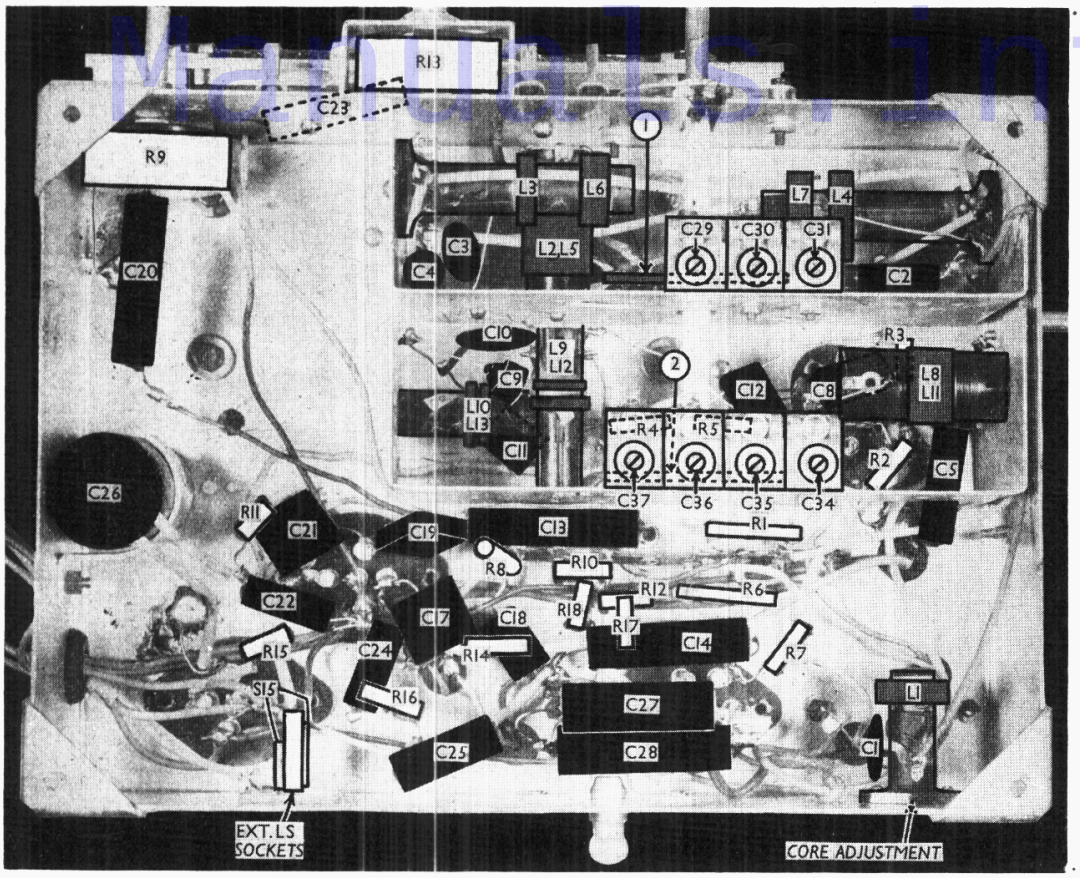


Under-chassis view. Diagrams of the two wave-change switch units are in col. 1 below. The seven trimmers are clearly indicated, together with the position of the core adjustment of **L1**. **S15** is a jack type of switch, associated with one of the external speaker sockets. All the coils, except the IF transformers which are on the chassis deck, are indicated.

ing the external speaker plug, **S15** opens and breaks the primary circuit of **T1**.

S16, S17 are the LT and HT circuit switches, ganged in a small rotary unit on a bracket fitted to the side of the chassis. They are shown in our plan chassis view, their respective tags being indicated. Both switches are closed when the knob is turned clockwise.

Coils.—All the RF and oscillator coils are in seven unscreened units beneath the chassis. In the case of the SW units **L5** and **L8** are the thick wire windings. **L1** has a variable iron core.

The IF transformers **L14, L15** and **L16, L17,** are in two screened units on the chassis deck. The coils have adjustable iron cores, reached through holes in the rear of the cans. These adjustments are indicated in our plan chassis view. Each of the IF coil units also contains its associated fixed tuning condensers.

Fuse F1.—This is an Osram MES type bulb, rated at 3.5V, 0.15A. It is screwed into a holder at the rear of the chassis.

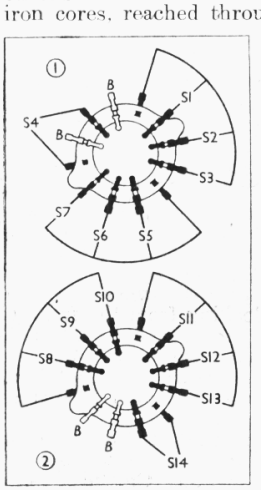
External Speaker.—Two sockets are provided at the rear of the chassis for a high impedance (20,000 O) external speaker. Associated with one of the sockets is the jack switch **S15.** On fully inserting the external speaker plug, the internal speaker is muted.

Trimmer Condensers.—The six trimmers and one tracker are in two rows, mounted in the coil compartments beneath the chassis. The only other variable adjustments are the cores of **L1** and of the IF coils, **L14—L17.**

Batteries.—LT, 2V accumulator cell, capacity not less than 45AH (Cossor E245 or E370). HT, 120V dry battery, which need not be tapped (Cossor 6120 or 2120). GB is automatic.

Battery Leads and Voltages.—Blue lead, black spade tag, LT negative; red lead, red spade tag, LT positive 2V; blue lead, black plug, HT negative; red lead, blue plug, HT positive 120V.

Speaker Plug.—The speaker leads from the chassis terminate in a 4-pin plug (of which two pins are used), and this plug fits a socket on the speaker transformer. The connections are shown in the circuit diagram, and a diagram of the plug, looking at the free ends of the pins, is inset beneath the circuit.



Diagrams of the two switch units, as seen from the front of the underside of the chassis

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	—	—

PRESS-BUTTON UNIT

A mechanical press-button unit is employed for automatic tuning, in which the gang condenser spindle is connected up by means of a system of links and a crank to a stout metal pressing which is pivoted at each end. When this pressing is rocked on its pivots, the gang condenser is rotated.

Each press-button, of which there are six, actuates a plunger carrying a semi-circular contact plate. When a button is depressed, this plate moves towards the rocking mechanism, and eventually rotates it to a certain degree depending on the angle of the leading edge of the contact plate.

The angle of the contact plate can be altered by virtue of the fact that the plate is pivoted. It is normally clamped by screwing up its press-button, but when the button is slacked off, the contact plate can be reset to any position

required, and then clamped again.

To select a station, tune it in manually, then unscrew the chosen button a turn or two and depress it fully. Keeping it depressed, screw it up enough to hold the contact plate, then allow it to return to its normal position, and tighten it up firmly. Check the setting by changing from manual to automatic tuning, and vice-versa.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator to control grid (top cap) of **V1** and chassis. Short-circuit **C33**, and disconnect AVC line between the top of **R12** and the junction of **R1, R6**, connecting this junction to chassis. Feed in a 465 KC/S signal, and adjust cores of **L17, L16, L15** and **L14** in turn for maximum output, first softening the wax over each core with a warm screwdriver blade. Remove the short from **C33**, and re-connect the AVC line.

IF Rejector.—Feed a strong 465 KC/S signal into the **A** and **E** leads, and adjust core of **L1** for *minimum* output.

RF and Oscillator Stages.—Connect signal generator to **A** and **E** leads via a suitable dummy aerial. Disconnect the AVC line (as for IF alignment), or use a low input from the signal generator. With gang at maximum, pointer should cover the sloping lines at the upper wavelength ends of the scales.

MW.—Switch set to MW, tune to 214m on scale, feed in a 214m (1,400 KC/S) signal, and adjust **C35**, then **C30**, for maximum output.

LW.—Switch set to LW, tune to 1,200m on scale, feed in a 1,200m (250 KC/S) signal, and adjust **C36**, then **C31**, for maximum output. Feed in an 1,875m (160 KC/S) signal, tune it in, and adjust **C37** 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 **C34** for maximum output, using the peak involving the lower trimmer capacity. Then adjust **C29** for maximum output.

SOME PORTABLE AND SEMI-MIDGET VALVE BASES

VALVE TYPE	★BASE TYPE	PIN or CONTACT CONNECTIONS 1	2	3	4	5	6	7	8	TOP CAP	BASE DIAGRAM
ECH2, ECH3, EK2, EK3 ...	Mull.	Met.	H	H	C	Osc.A	Osc.G	S	A	G	
EF5, EF6, EF9...	Mull.	Met.	H	H	C	Supp.	—	S	A	G	
EBC3	Mull.	Met.	H	H	C	D1	D2	—	A	G	
EL3, EL6 ...	Mull.	—	H	H	C	—	G	S	A	·	
CL4	Mull.	—	H	H	C	—	—	S	A	G	
EBL1	Mull.	—	H	H	C	D1	D2	S	A	G	
AZ1	Mull.	—	H	H	—	A1	—	—	A2	·	
CY1	Mull.	—	H	H	C	—	—	—	A	·	
DK1	Mull.	Met.	F	F	—	Osc. A	Osc. G	S	A	G	
DF1	Mull.	Met.	F	F	—	—	—	S	A	G	
DAC1	Mull.	Met.	F	F	—	—	D	—	A	G	
DL2	Mull.	—	F	F	—	—	G	S	A	·	
6A8	A. Oct.	—	H	A	S	Osc. G	Osc. A	H	C	G	
6K7, 6J7 ...	A. Oct.	—	H	A	S	Supp.	·	H	C	G	
6Q7	A. Oct.	—	H	A	D1	D2	·	H	C	G	
25A6	A. Oct.	—	H	A	S	G	·	H	C	·	
25Z6	A. Oct.	—	H	A1	C1	A2	·	H	C2	·	
1A7, X14 ...	A. Oct.	—	F	A	S	Osc. G	Osc. A	F	—	G	
1N5, Z14 ...	A. Oct.	—	F	A	S	—	·	F	—	G	
1H5, HD14 ...	A. Oct.	—	F	A	—	D	·	F	—	G	
1C5, N14 ...	A. Oct.	—	F	A	S	G	·	F	—	·	
7A5, 7B5, 7C5 ...	Loct.	H	A	S	—	—	G	C	H	·	
7A7, 7B7, 7C7 ...	Loct.	H	A	S	Supp.	Shld.	G	C	H	·	
7A8, 7B8... ...	Loct.	H	A	Osc. A	Osc. G	S	G	C	H	·	
7B6, 7C6, 7E6 ...	Loct.	H	A	G	Shld.	D1	D2	C	H	·	
7Y4, 7Z4 ...	Loct.	H	—	A1	—	—	A2	C	H	·	
1LA4	Loct.	F	A	S	—	—	G	—	F	·	
1LA6	Loct.	F	A	Osc.A	Osc.G	S	G	—	F	·	
1LH4	Loct.	F	A	—	D	—	G	—	F	·	
1LN5	Loct.	F	A	S	Supp.	Shld.	G	—	F	·	
TP25, FC141 ...	M. Oct.	F	—	A	Osc.A	Osc.G	M	S	F	G	
VP23, SP141 ...	M. Oct.	F	·	A	S	Supp.	M	·	F	G	
HL23DD	M. Oct.	F	—	A	—	D2	M	D1	F	G	
H141D	M. Oct.	F	—	A	—	D	M	—	F	G	
Pen 141	M. Oct.	F	·	A	S	G	—	·	F	·	
QP 25	M. Oct.	F	—	A1	S	G1	G2	A2	F	·	

★ **BASES: Mull. = Mullard; A. Oct. = American Octal; Loct. = Loctal; M. Oct. Mazda Octal.**

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