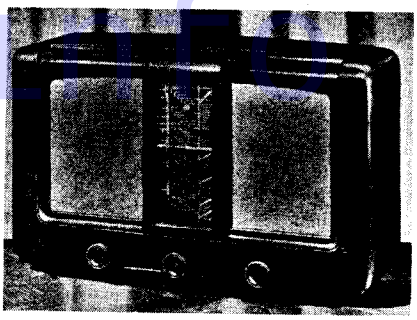
MULLARD MAS15 THREE-BAND



A four-valve, plus rectifier, three-band model, the Mullard MAS15 has a moulded cabinet and includes a cathode-ray tuning indicator and the new E valves.

CIRCUIT.—A low-noise pentode is used for the first valve and the aerial input is obtained by means of coupled circuits on each of the three wavebands, separate trimmers being provided. A.V.C. is applied by a shunt feed through a condenser and resistance combination.

Transformers lead to V2, the mixing valve. These have tuned secondaries, and the primary windings for the medium and long waves have fixed condensers in shunt. The mixing circuit of V2 is orthodox, and on the oscillator section a fixed padder is used for the short waves and variable padders for the medium and long.

Permeability-tuned I.F. transformers are used between V2 and V3, and between V3 and the demodulating diode of V4. The transformers are adjusted to 470 kc. and have fixed condensers across the windings.

V3, the I.F. amplifier, is an EF9. The values in the network feeding this valve are slightly different from those of an ordinary screened pentode. This is because the EF9 is a "sliding screen" pentode. Such a valve has a somewhat unorthodox electrode assembly, being designed to overcome some of the defects to which an ordinary pentode is prone, giving greater freedom from modulation distortion.

The A.V.C. diode of V4, fed from the anode of V3, supplies a control bias to V1 and V2 through a common decoupling circuit. V3, the I.F. amplifier, has fixed bias provided by R17.

The load for the demodulator diode is formed in part by the volume control, the slider of which is taken to the grid of the triode section through an isolating condenser. Tone compensation is provided by means of a resistance-capacity network which is joined to a tapping on the volume control. The tuning indicator, V6, is connected through the usual resistance capacity filter from the diode load. The output circuit is orthodox and calls for no comment.

For high tension purposes there is a full-wave rectifier, V5. An interesting feature is the use of a mains filter condenser between the earth line and one-half of the high-voltage winding of the transformer. It should also be noticed that this receiver uses a small smoothing choke and large-capacity condensers. The mains transformer also includes a separate winding for the pilot lamps.

Chassis Removal.—The chassis can be removed completely from the cabinet by removing the three knobs on the front, withdrawing the knob and spindle for the tone control at the side, and releasing the 10 bolts which hold the framework on to the bakelite cabinet.

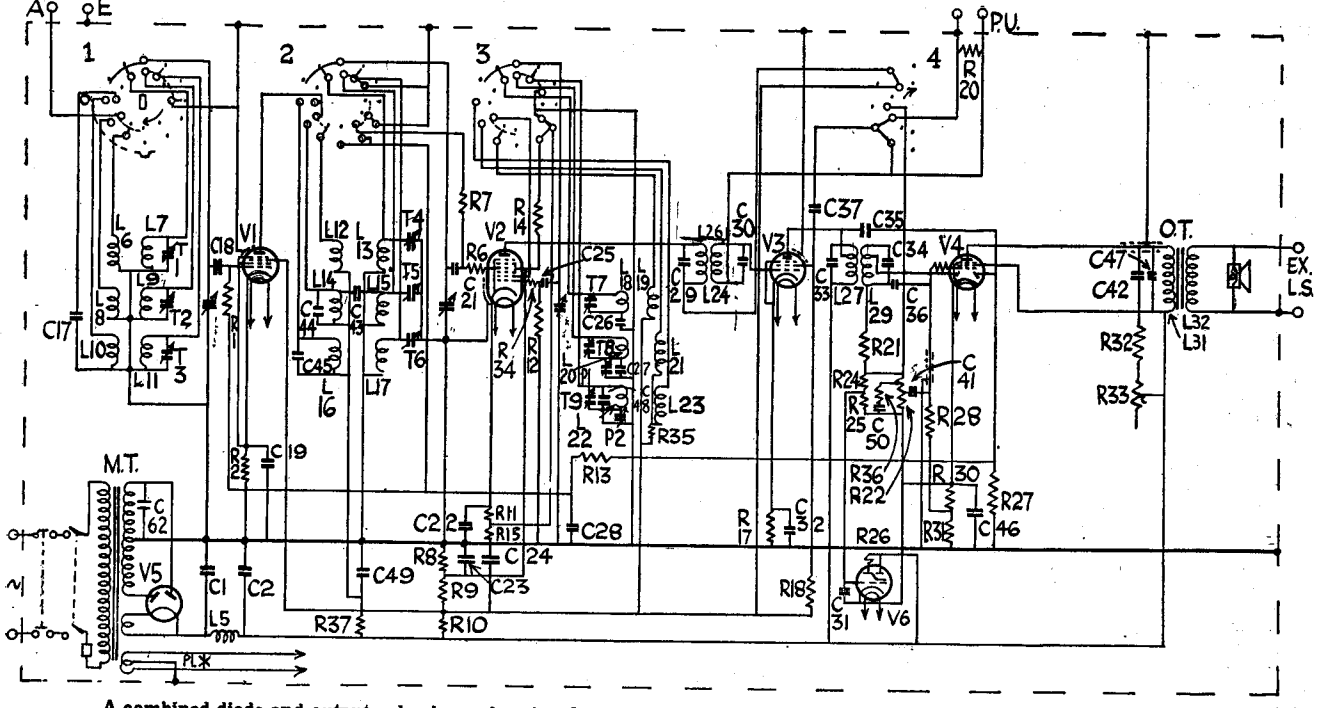
For minor servicing, however, the chassis can be tilted or hinged on two girders by releasing four bolts, two of which are accessible from the inside of the cabinet and two through a small slot in the base below the tuning scale. The knobs have to be removed in the normal manner, and it is also necessary to unsolder the leads to the speaker.

Special Notes.—The padding for the medium and long waves is by means of fixed and adjustable condensers in parallel. The adjustable elements are not of the screw type and comprise a spiral wire assembly. They consist of an insulating tube with a sprayed metal deposit inside and an outside covering of copper wire.

Trimming is carried out by altering the number of turns of wire while observing the output meter with an injected signal.

VALVE READINGS

V.	Type.	Electrode.	Volts.	Ma.
	All Mullard.			
1	EF8	Anode ..	265	4.3
		Screen ..	190	.1
2	EK2	Anode ..	190	2.2
		Screen ..	180	3.5
		Osc. anode	90	1.3
3	EF9	Anode ..	260	6.4
		Screen ..	90	2
4	EBL1 ..	Anode ..	235	34
		Screen ..	260	5.5
5	AZ1	Cathode	277	—
6	EM1	Anode ..	260	.1
Pilot lamps	8045D-00 ..		—	—



A combined diode and output valve is employed and consequently, although a "four," the MAS15 includes a R.F. amplifier stage. The switch diagrams, representing the actual banks, are in the S.W. position. The gram. switch (4) is at radio.

Should a capacity be too low the manufacturers recommend the fitting of a new padder of larger size, which is then adjusted by removing turns gradually.

Certain resistances will be found inside small sleeving tubes, as indicated in the lay-out diagram, and some resistances and condensers are very similar in appearance.

In removing the chassis, in some cases it may be found that the small metal bar which holds the clip fixing the back fouls an extended screen at the bottom of the chassis. The bar must be removed.

RESISTANCES

R.	Purpose.	Ohms.
1	V1 grid return	800,000
2	V1 cathode bias	400
6	V2 grid suppressor	32
7	V2 grid return	800,000
8	V2 screen potr. (part)	50,000
9	V2 screen potr. (part)	32,000
10	Second H.T. line feed	8,000
11	V2 cathode bias (part)	500
12	V2 osc. grid leak	50,000
13	V1 and V2 A.V.C. decoupling	1.25 meg.
14	V2 screen potr. (part)	20,000
15	V2 cathode bias (part)	160
17	V3 cathode bias	320
18	V3 screen decoupling	50,000
20	Pick-up shunt	500,000
21	H.F. filter	50,000
22	Volume control	350,000
24	T.I. input potr. (part)	5 meg.
25	T.I. input potr. (part)	640,000
26	T.I. anode feed	2 meg.
27	A.V.C. diode load	640,000
28	V4 grid return	1 meg.
29	V4 grid stopper	1,000
30	V4 cathode bias (part)	160
31	V4 cathode bias (part)	200
33	Tone control	50,000
34	V2 osc. grid suppressor	50
35	Regeneration modifier	2,000
36	Tone filter	50,000
37	V1 anode decoupling	2,000

R29 is on the top of V4 and R26 on the tuning indicator. Cs 29, 30, 33 and 34 are in the I.F. coil cans and C43 in the H.F. coil can.

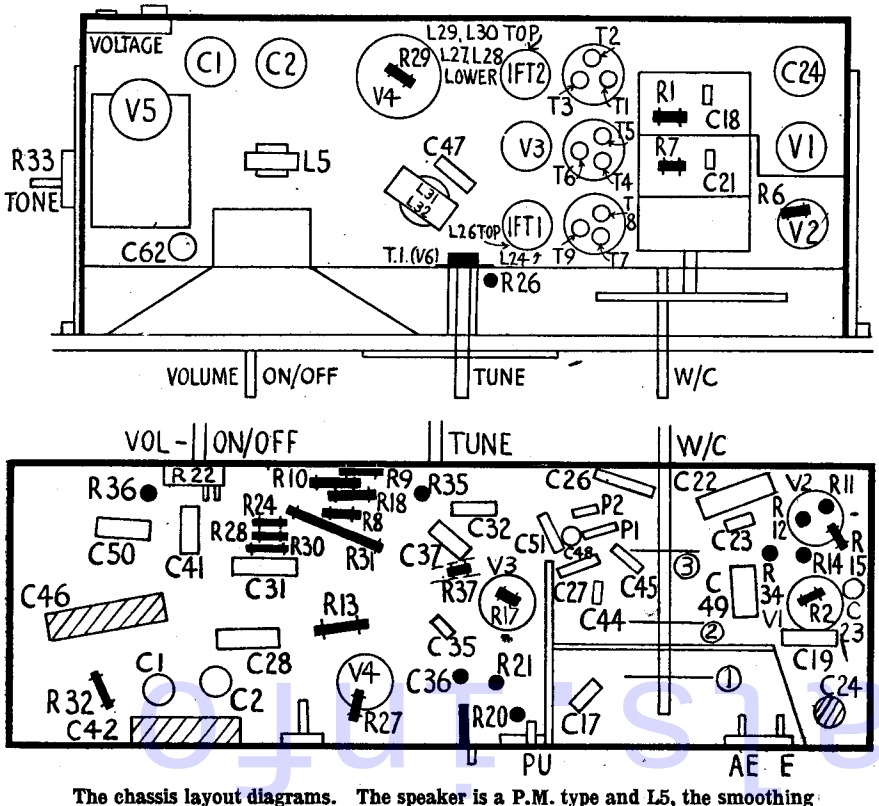
Alignment Notes

I.F. Circuits.—Set wavelength switch to medium waves and earth the receiver. Turn variable gang to minimum. Set volume control to maximum and render A.V.C. ineffective by short-circuiting C28.

Apply modulated 470-kc. signal to the grid of V2 across 32,000-mmfd. condenser.

CONDENSERS

C.	Purpose.	Mfds.
1	H.T. smoothing	28
2	H.T. smoothing	32
17	L.W. aerial	.00008
18	V1 grid	.0001
19	V1 cathode bias shunt	.1
21	Grid isolating	.0001
22	V2 cathode bias shunt	.1
23	V2 screen decoupling	.1
24	Second H.T. line decoupling	32
25	V2 osc. grid condenser	.00005
26	S.W. fixed padder	.0047
27	M.W. fixed padder	.0004
28	A.V.C. decoupling	.1
31	T.I. grid shunt	.05
32	V3 cathode bias shunt	.05
35	A.V.C. coupling	.000008
36	H.F. filter	.00005
37	V3 screen decoupling	.05
41	L.F. coupling	.02
42	Pentode correction	.05
44	M.W. transformer primary shunt	25
46	V4 bias shunt	25
47	Output transformer primary shunt	.002
48	L.W. osc. fixed trimmer	.00004
49	V1 anode decoupling	.05
50	Tone filters	.05
51	Long wave fixed padder	.000136
62	Mains filter	.02



The chassis layout diagrams. The speaker is a P.M. type and L5, the smoothing choke, and also the output transformer (L31, L32), are on the top of the chassis.

Mullard MAS15 on Test

MODEL MAS15.—A.C. mains operation, 100-250 volts, 50-100 cycles. Price, 10 gns.

DESCRIPTION.—Four-valve, plus rectifier, three-band superhet using E type valves.

FEATURES.—Full-vision vertical scale incorporating tuning indicator and waveband marker. Controls for volume and master switching, tuning and wave selection. Tone control knob at side. Scale centrally mounted with speaker to the left and dummy opening to the right. Sockets for extension speaker and switched pick-up at back of chassis. All-bakelite cabinet.

LOADING.—56 watts.

Sensitivity and Selectivity

SHORT WAVES (16.7-51 metres).—Excellent gain and selectivity with easy handling. No drift and quiet background.

MEDIUM WAVES (200-585 metres).—Excellent sensitivity well maintained and very good selectivity, with local station spread on adjacent channels only. Clean background.

LONG WAVES (708-2,000 metres).—Similar performance to medium waves, with very small side splash on Deutschlandsender.

Acoustic Output

Ample volume for an ordinary room, with very well balanced tone and excellent clean, crisp attack. No noticeable colouration on speech and a generally pleasing balance on orchestral music.

Connect output indicator, *via* transformer, to the extension speaker sockets.

Detune the third I.F. circuit by connecting 80-mmfd. condenser in parallel with L27 + L28, and trim L29, L30, in the fourth I.F. circuit. Detune fourth I.F. circuit, with 80-mmfd. in parallel with L30, trim L27, L28, in the third I.F. circuit.

Detune the first I.F. circuit with 80-mmfd. across L24, trim L26 in the second I.F. section. Detune second I.F. circuit with 80-mmfd. and trim L24 in the first I.F. circuit.

Lock the coil cores, remove short-circuit from C28 and disconnect 80-mmfd. condenser.

Medium Waves.—Set wavelength switch to medium waves and volume control to maximum. Fit 15 deg. jig (available from Mullard) and set variable condenser to it (minimum capacity). Connect output meter to extension speaker sockets *via* transformer.

Apply modulated 1,442-kc. signal to aerial socket *via* standard artificial aerial. Trim T8, T5 and T2 successively for maximum output. Remove 15 deg. jig.

Connect an aperiodic amplifier (such as Mullard GM2404) to anode of V2 across 25-mmfd. condenser and connect output meter to output of amplifier. Short-circuit oscillator by wire across C5.

Apply modulated 550-kc. signal to aerial

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Ultra 209 Push-button Five

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is attached to the push-button and main condenser assembly, and comes away with the chassis. The scale need not be removed. The lower pilot lamp holder is fitted with a special extension clip to facilitate removal.

The internal speaker is disconnected by a plug-and-socket arrangement on the back of the chassis. Colour coded leads to the speaker strip are provided by small dabs of paint on a uniform yellow coloured braid.

Special Notes.—It is important to see that the push-button knobs are screwed up tightly, as otherwise the setting will slip.

Both leads of the pilot lamps circuit are insulated from the chassis.

All adjustments can be carried out without removing the chassis, the trimmers and padders being available by removing the inspection cover from the base of the cabinet. The trap circuit trimmer is accessible from the back of the cabinet.

Wavechange Switches.—Wavechanging is accomplished by two switch wafers, one wafer controlling the aerial and input-tuned circuit and the other the oscillator circuits. The third position of the switch changes over the oscillator circuit to the gramophone input as explained above.

The wafer nearer the click plate carries the aerial circuits—that is, W1 and W2—and the second wafer carries W3 and W4, controlling the oscillator and pick-up.

Alignment Notes

I.F. Circuits.—Connect an output meter across the primary of the speaker transformer, switch receiver to MW band, turn gang to maximum capacity, tone to "high" position and volume to maximum.

Connect a service oscillator between the top grid cap of V1 and chassis.

Tune service oscillator to 470 kc. and adjust trimmers of the I.F. transformers (starting with I.F.T. 2) for maximum response, reducing the input from the service oscillator as the circuits come into line to render the A.V.C. inoperative.

Signal Circuits.—Connect the service oscillator to the aerial and earth sockets, progressively reducing the input as the circuits come into line so as to obtain only reliable peaks in the output meter.

I.F. Wave-trap.—Tune the set to 950 metres on scale, inject a strong 470 kcs. signal from the output meter, and adjust T1 for minimum response.

Medium Waves.—Tune set and oscillator to 200 metres (1,500 kc.) and adjust T5, then T3 for maximum.

Tune set and oscillator to 500 metres (600 kc.) and adjust P2 for maximum, simultaneously rocking the gang.

Repeat both operations until no further improvement results.

Long Waves.—Tune set and oscillator to 1,300 metres (230 kc.) and adjust T4 and then T2 for maximum.

Tune set and oscillator to 1,700 metres (176.5 kc.) and adjust P1 for maximum, simultaneously rocking the gang.

Repeat both operations until no further improvement results.

QUICK TESTS

Quick tests are available between the chassis and the colour coded leads on the speaker strip.
Black lead, 235 volts, smoothed H.T.
White, 220 volts, output anode.
Red, 310 volts, unsmoothed H.T.

VALVE READINGS

V.	Type.	Electrode.	Volts.	Ma.
	All Mazda.			
1	AC/TH1 ..	Anode ..	180	6.75
		Screen ..	110	7
		Osc.anode	65	3
2	AC/VP2 ..	Anode ..	230	12
		Screen ..	182	2.2
3	V914	Diodes	only.	
5	AC/5/Pen ..	Anode ..	220	38
		Screen ..	185	6
6	UU4	Heater ..	310	—
	Pilot lamp .. (Osram).		4.5	300

Adjustment of Push-buttons

(*Continued from page* 45.)

button. Then, holding the manual tuning control to prevent any shift, press home the push-button. Tighten up the button while holding it "home."

Finally, check the automatic against the manual setting to make sure no slip has occurred.

Replacement Condensers

Exact replacement condensers are available from A. H. Hunt, Ltd., Garratt Lane, Wandsworth, London, S.W.18, as follows: for C24 and C25, 1014, price 9s. 6d.; C23, 2915, 1s. 9d.; and C13, 2958, 2s. 6d.

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socket of receiver *via* normal artificial aerial. Tune auxiliary apparatus to about 550 m. Tune the receiver under test.

Disconnect auxiliary apparatus and condenser short-circuit. Connect output indicator to receiver. Do not alter the setting of the variable condenser.

Trim P1 for maximum output. Replace 15-deg. jig in position and adjust variable condenser to it (minimum capacity). Apply modulated 1,442-kc. signal to aerial socket *via* standard artificial aerial. Retrim T8 for maximum output.

Long Waves.—Fit 15-deg. jig and set variable condenser to it (minimum capacity). Switch receiver to long waves and turn volume control to maximum.

Apply modulated 405-kc. signal to aerial socket *via* standard artificial aerial. Successively trim T9, T6 and T3 for maximum output. Remove 15-deg. jig.

Connect auxiliary apparatus to anode of V2 *via* 25-mmfd. condenser and connect output indicator to output of auxiliary apparatus. Short-circuit oscillator by means of a piece of wire across C5.

Apply modulated 160-kc. signal to aerial socket of receiver under test *via* standard artificial aerial. Tune both auxiliary apparatus and receiver to about 1,875 m. Disconnect auxiliary apparatus and condenser short-circuit. Connect output indicator to receiver under test. Do not alter setting of variable condenser.

Trim P2 for maximum output. Replace 15-deg. jig and set condenser (minimum capacity). Apply modulated 405-kc. signal to aerial socket *via* standard artificial aerial, and retrim T9. Remove 15-deg. jig and lock trimmers.

Short Waves.—Fit 15-deg. jig and set variable condenser to it (minimum capacity). Switch receiver to short waves and apply modulated 17-mc. signal to aerial socket *via* short-wave artificial aerial.

Successively trim T11, T4, and T1 for maximum output (adjust T11 to first peak from minimum capacity). Remove 15-deg. jig and lock trimmers.

Calibrating.—Connect output indicator to output of receiver. Set volume control to maximum and wavelength switch to medium waves. Apply modulated 811-kc. signal (370 m.) to aerial socket *via* standard artificial aerial. Tune the receiver. Adjust the pointer carefully to 370 m. by means of the knurled screw.

Replacement Condensers

Exact replacement condensers are available from A. H. Hunt, Ltd., Garratt Lane, Wandsworth, London, S.W.18. These are: C1, unit 4233, 7s.; C2, 2989, 7s. 6d.; C24, 4232, 6s. 6d.; and for C46, 2918, 1s. 9d.

WINDINGS (D.C. Resistances)

L.	Ohms.	Range.	Where Measured.
5	280	Any	C1 and C2.
6	3.5	S.W.	Chassis and aerial switch.
7	Very low	S.W.	Ch. and first gang.
8	28	M.W.	Chassis and aerial switch.
9	5	M.W.	Ch. and first gang.
10	100	L.W.	Chassis and aerial switch.
11	45	L.W.	Ch and first gang.
12	2.5	S.W.	Anode V1 and (R37 and C49).
13	Very low.	S.W.	Ch. and aerial gang.
14	280	M.W.	Anode V1 and (R37 and C49).
15	5	M.W.	Ch. and aerial gang.
16	470	L.W.	Anode V1 and (R37 and C49).
17	45	L.W.	Chassis and aerial gang.
18	Very low.	S.W.	Osc. gang and C26.
19	1	S.W.	Osc. anode and (R10 and R35).
20	8.5	M.W.	Osc. gang and P1.
21	35	M.W.	Osc. anode and R35.
22	19	L.W.	Osc. gang and P2.
23	3.5	L.W.	Osc. anode and R35.
24	7.5	Any	V2 anode and H.T. plus.
26	7.5	Any	V3 grid and P.U. socket.
27	4.5	Any	V3 anode and C33.
28	3.5	Any	C33 and H.T. plus.
29		Any	C34 and demodulator diode.
30	5	Any	Demodulator diode and C36.
31	640	Any	On tags.
M.T. prim.	52	Any	Mains plug.